



**PM790 Radio**

**MAINTENANCE MANUAL**

**(Level1) V1.0**



## PM790 Radio Maintenance Manual (Level1) V1.0

Version	Date	Author	Update	Remarks
V1.0	2020/5/11			

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# 1 Overview

## 1.1 Appearance



**Note:**

*This picture is for reference only, please refer to the actual product.*

## 1.2 Standard Package

SN	Item	Quantity (PCS)
1	PM790 Radio Unit	1
2	Keypad Microphone	1
3	Power Cable	1
4	Quick Start Guide	1
5	Screw	5
6	Fuse	1
7	Mounting Bracket	1
8	Bracket Screw	2
9	GPS/BeiDou/GLONASS Active Antenna	1

### 1.3 Specification

General	
Frequency	UHF1: 400-470MHz      UHF3: 350-400MHz VHF: 136-174MHz
Channel Capacity	1024
Zone Capacity	64 (maximum 32 channels per zone)
Channel Spacing	12.5kHz/20KHz/25KHz
Operating Voltage	DC 13.6V $\pm$ 15%
Size (H*W*D)	49*178*156mm
Weight	<1.8Kg
Screen	2.0" TFT LCD, 220*176, 4 Lines
Vocoder	AMBE++
Receiver	
Sensitivity(Analog)	0.3uV (12dB SINAD)
Sensitivity(Digital)	0.3uV (5% BER)
Adjacent Channel Selectivity	50 dB@12.5KHz /75 dB@25KHz (TIA603D)
	60 dB@12.5KHz /70 dB@25KHz (ETS)
Intermodulation	75 dB (TIA603D)
	70 dB (ETS)
Spurious Rejection	75 dB (TIA603D)
	70 dB (ETS)
Blocking or Desensitization	90dB (TIA603D)
	84dB (ETSI)
Co-channel Rejection	-12~0 dB @12.5KHz
Hum and Noise	-40 dB@12.5KHz /-45 dB@25KHz
Rated Audio Power	3W (Build-in)
Max Audio Power	6W (Build-in)
Audio Distortion @ Rated Audio	3%
Audio Response	+1~-3dB
Conducted Spurious Emission	-57 dBm (TIA603D)
Transmitter	
Low Power Output	1-24W/5-44W (UHF3/UHF1); 1-24W/5-49W (VHF)
High Power Output	2-25W/6-45W (UHF1/UHF2/UHF3); 2-25W/6-50W (VHF)
FM Modulation	12.5KHz: 11K0F3E / 25KHz: 16K0F3E
4FSK Digital	12.5KHz Data Only: 7K60F1D&7K60FXD

Modulation	12.5KHz Voice Only: 7K60F1E&7K60FXE
	12.5KHz Voice and Data: 7K60F1W
Conducted/Radiated Emission	-36dBm <1GHz ; -30dBm >1GHz
Modulation Limiting	±2.5KHz @12.5KHz /±5.0KHz @25KHz
FM Hum and Noise	-40 dB@12.5KHz /-45 dB@25KHz
Adjacent Channel Power	60 dB@12.5KHz /70 dB @25KHz
Audio Response	+1~-3dB
Audio Distortion	3%
<b>Environmental</b>	
Operating Temperature	-30°C ~ +60°C
Storage Temperature	-40°C ~ +85°C
ESD	IEC 61000-4-2 (level 4) ±8kV (Contact) ±15kV(Air)
Dust and Water Resistance	IP54
Thermal and Humidity	GJB 150-2009 and MIL-STD-810 C/D/E/F/G
Shock and Vibration	GJB 150-2009 and MIL-STD-810 C/D/E/F/G
<b>GPS</b>	
Accuracy specs are for long-term tracking (95th percentile values>5satellites visible at nominal -130 dBm signal strength)	
TTFF (Time To First Fix) - Cold Start	<60s
TTFF (Time To First Fix) - Hot Start	<10s
Horizontal Accuracy	<10m

## 2 Function Test

### 2.1 Basic Function Test

Item	Test Method and Requirements	Component Involved
------	------------------------------	--------------------



1.Basic requirement	<ol style="list-style-type: none"> <li>1. Radio accessories complete.</li> <li>2. No dismantle label complete.</li> <li>3. Waterproof label no discoloration.</li> <li>4. No physical damage.</li> <li>5. Within the warranty period.</li> </ol>	None
2.Failure Re-present	<ol style="list-style-type: none"> <li>1. Radio can power on normally.</li> <li>2. Detect the fault as the customer described, referring to radio user guide.</li> </ol>	Radio Unit, Power
3.Function Test	<ol style="list-style-type: none"> <li>1. Test the PTT call to confirm the function is normal.</li> <li>2. Confirm it can transmit and receive voice normally and the actual voice quality is good.</li> </ol>	Keypad Microphone

**Note:**


For other items that cannot be detected in steps (1) to (3), please refer to the radio user manual. If a fault is found in one step, the subsequent detection steps are suspended as the mobile radio is treated faulty.

## 2.2 Check Firmware Version and Device Information

Check the firmware version and device information as below:

- 1) Go to the home screen;



- 2) Press “” button to enter the main menu and choose “Device Info”;
- 3) Check the firmware version, DSP version, RCDB version, frequency range and serial number, etc.

Or get the device information by reading through CPS. You can contact after sales to get version comparison table.

## 3 Software Upgrade

### 3.1 Before Upgrade

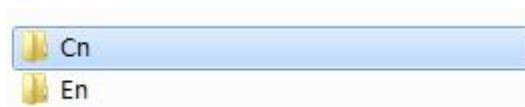
1. Get the one-click upgrade software for the target version.
2. Prepare the mobile radio to upgrade.
3. Prepare the data cable (Type: AP200). Connect its USB port to your computer USB port, connect the other side to your radio accessory interface port and fasten it.

AP200 Data Cable:

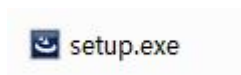


### 3.2 Upgrade Procedure

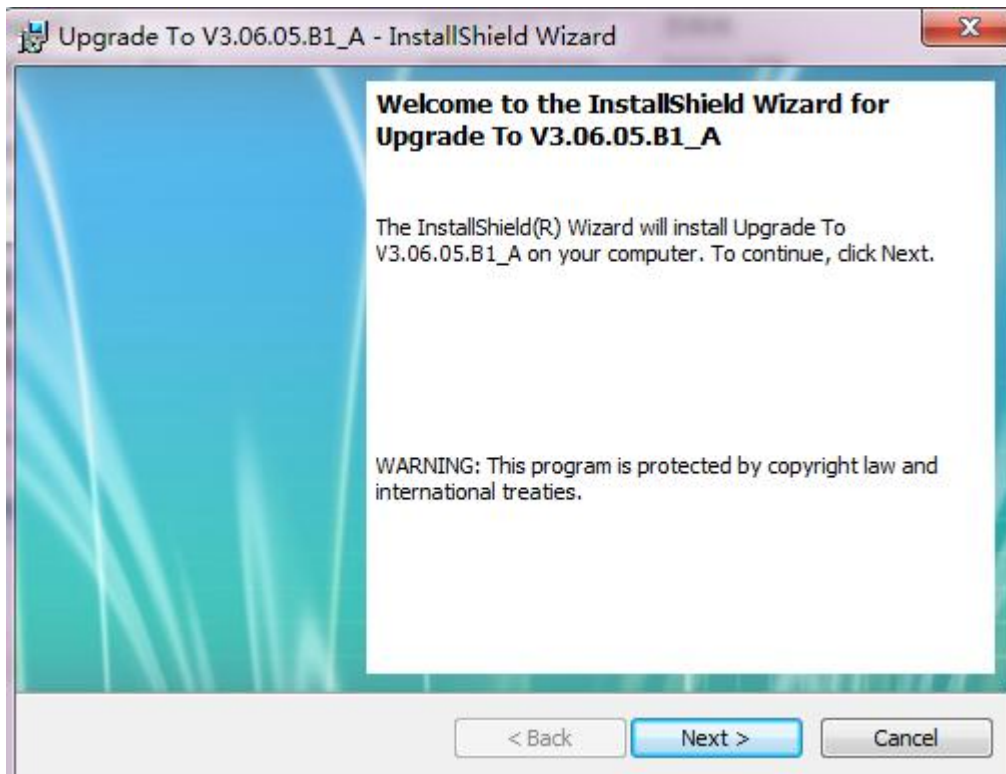
1. Install the upgrade software package
  - 1) Click to open the upgrade software, choose the language according to your requirement (Cn for Chines, En for English);



- 2) Double click setup.exe in the chosen language folder;



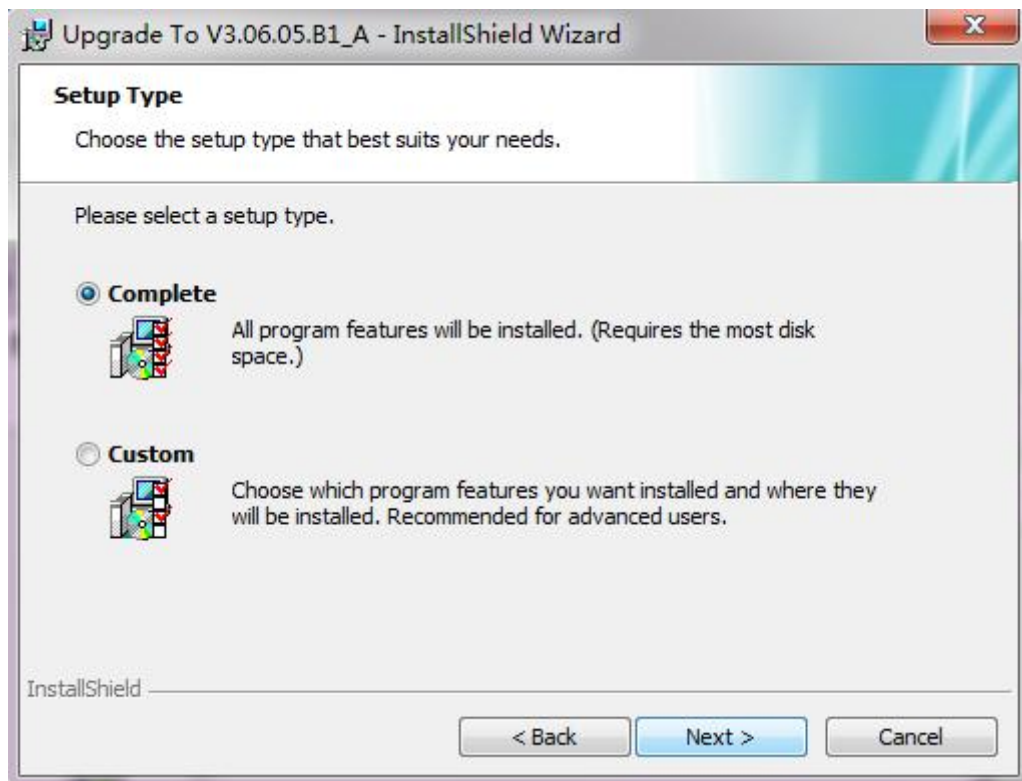
- 3) Click Next in the below interface;



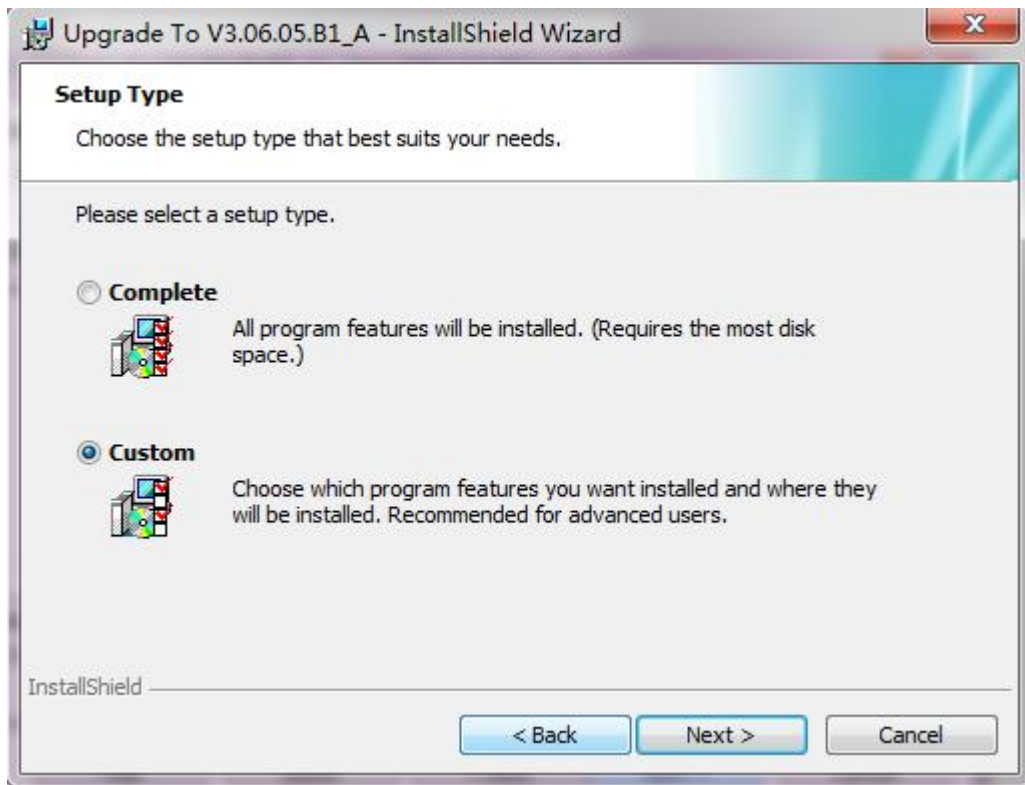
4) Select 'I accept' and click Next in the below interface;



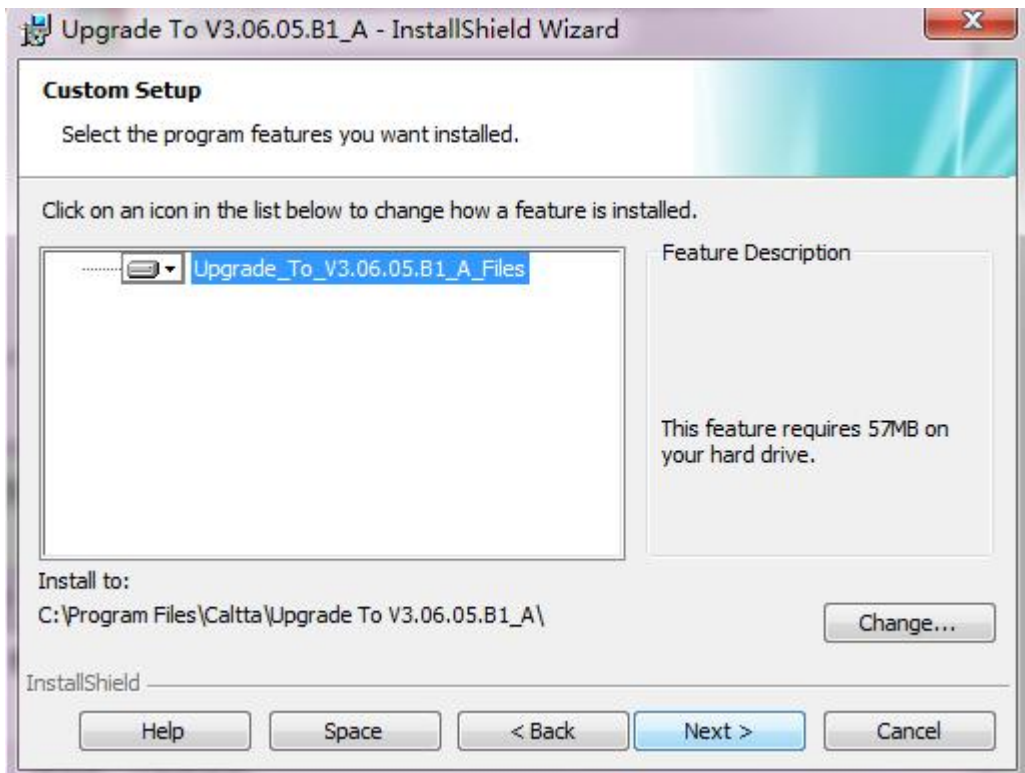
5) Select Complete and click Next if you use the default installation path;



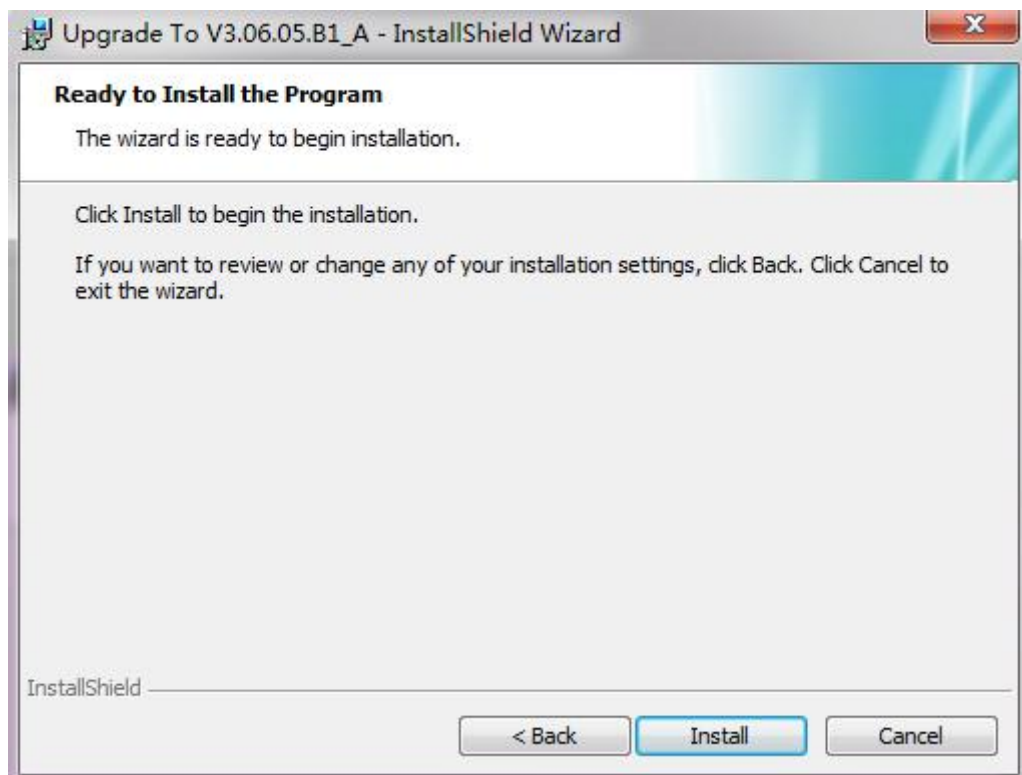
Select Custom and click Next if you choose your own installation path;



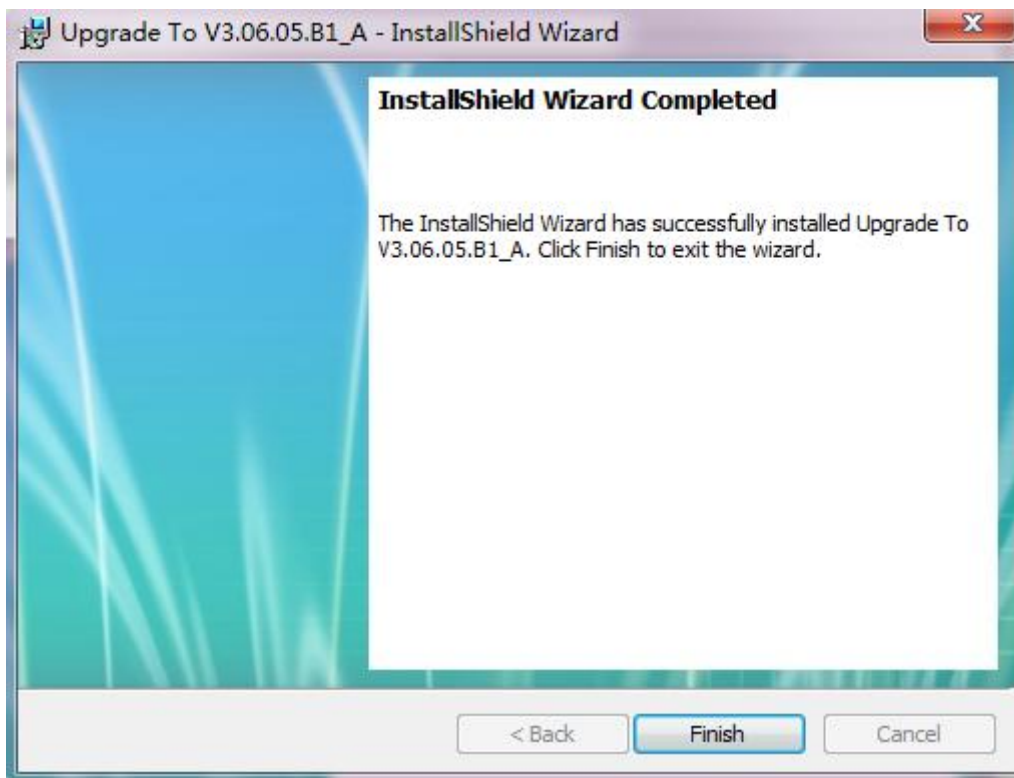
Click Change to modify the installation path, then click Next;



6) Click Install to confirm installation.



7) Wait the installation to complete. Click Finish to end one-click upgrade procedure.



8) An icon will be on desktop after installation.



## 2. Radio Upgrade

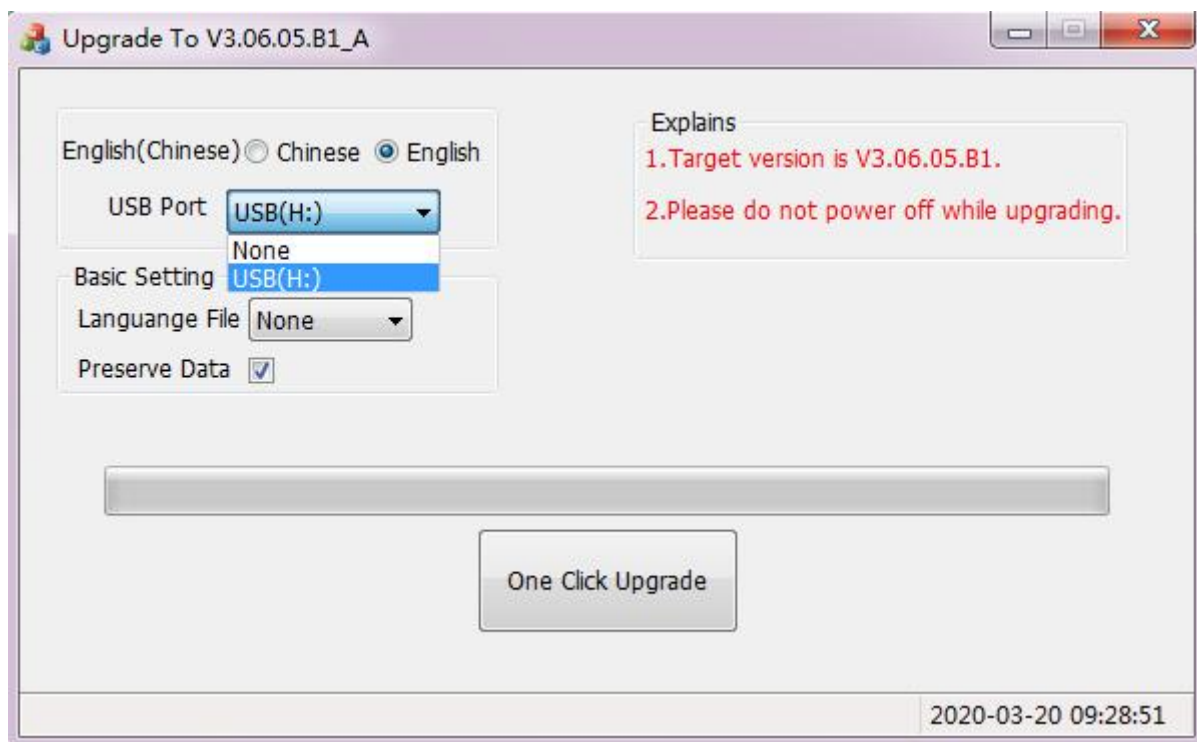
- 1) Connect the radio to the PC through the data cable;
- 2) Double click the upgrade tools icon to run it;
- 3) The radio enters into the flash burn mode, turn the data cable switch to DL, power on the radio, the radio enters into the upgrade mode;

The LED indicator glows green in upgrade mode:

- 4) After the upgrade software detects the USB port and displays it, you can select the

corresponding USB port and click to upgrade.

5) You can choose Chinese or English language, and choose if preserve the current setting data when upgrade the radio.



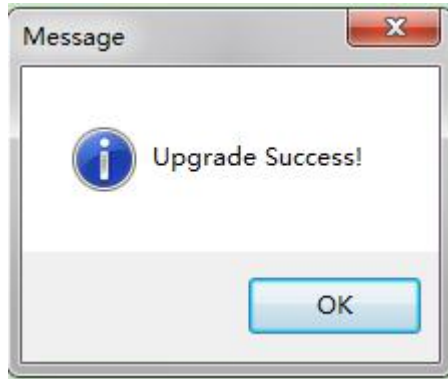
6) The LED indicator flashes green during the upgrade, the radio displays the following interface:



7) Upgrade complete prompt;



After upgrade completes, the software tools will display as below:



*Note:*


- *Don't power off the radio during the upgrade.*
- *If upgrade fails, please repeat the upgrade procedure.*

8) Reboot the radio after upgrade to check if the firmware is the target version.

### 3.3 CPS Software

#### 1. CPS Software Installation Procedure



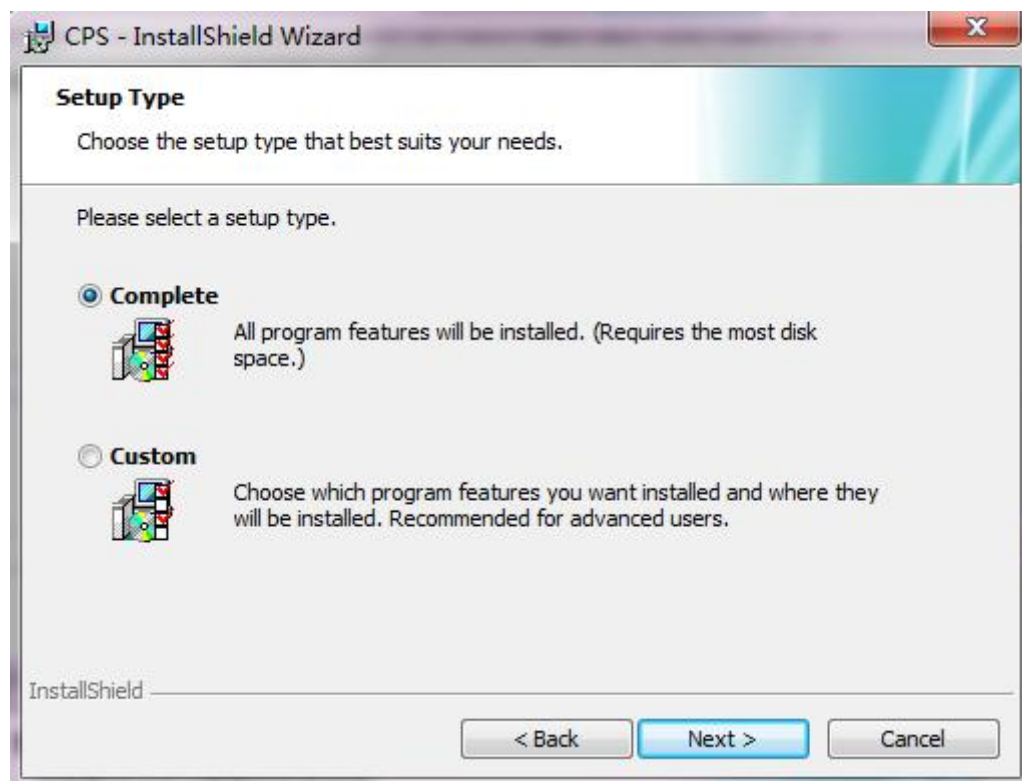
- 1) Start installation, double click  to install;
- 2) Click Next following the prompt.



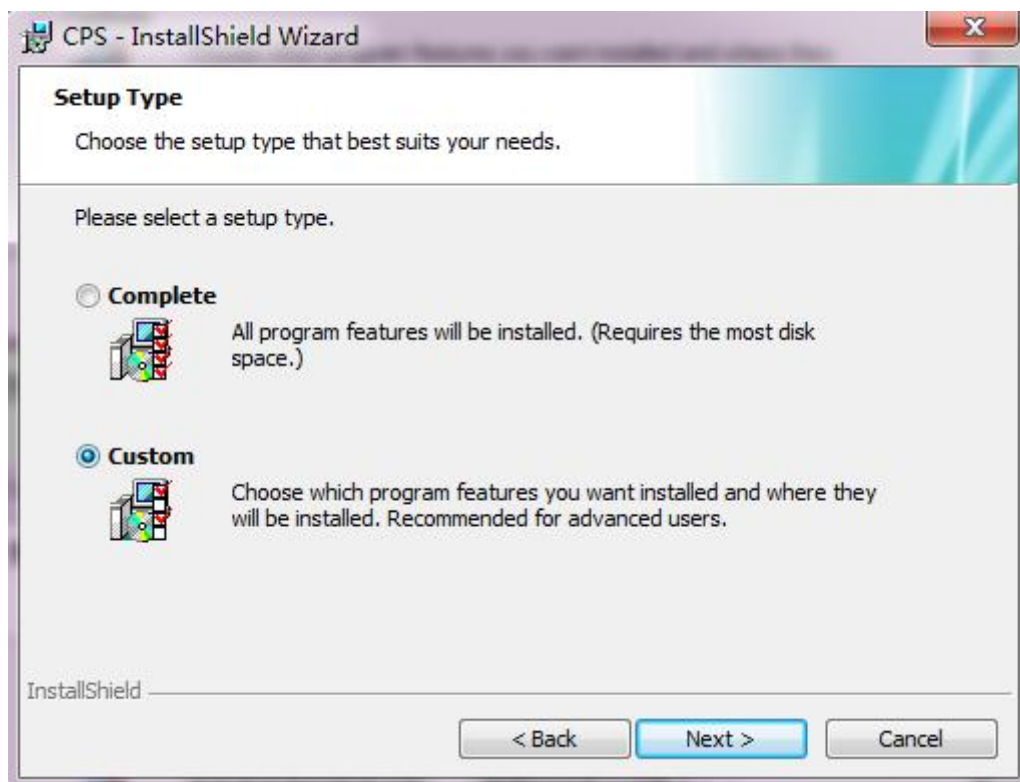
3) Select 'I Accept' and click Next.



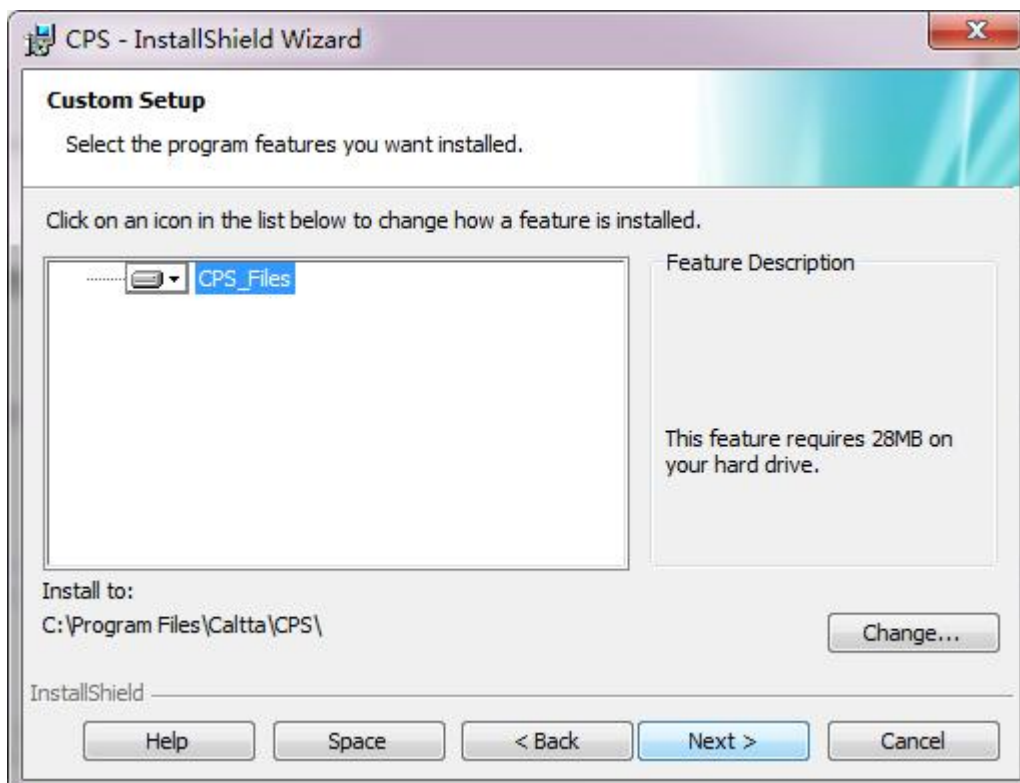
4) Select Complete and click Next if you use the default installation path.



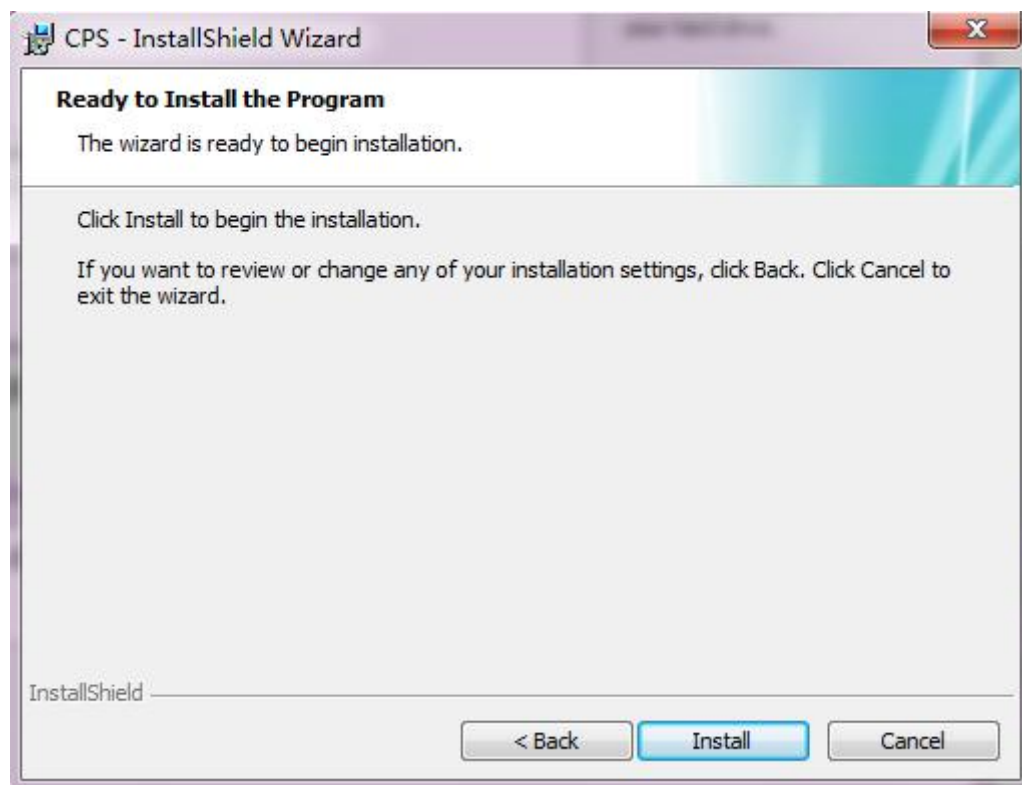
Select Custom and click Next if you choose your own installation path.



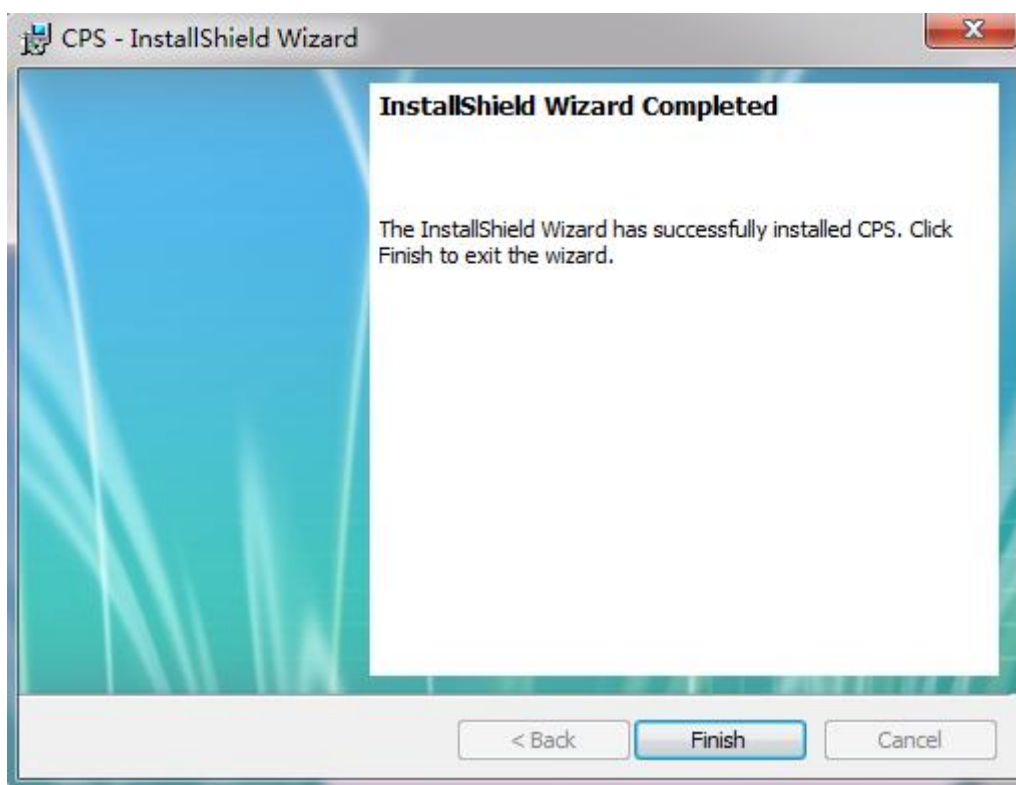
Click Change to modify the installation path, then click Next.



5) Click Install to confirm installation.




6) Wait the installation to complete. Click Finish to end CPS tools installation procedure.



7) An icon will be on desktop after installation:

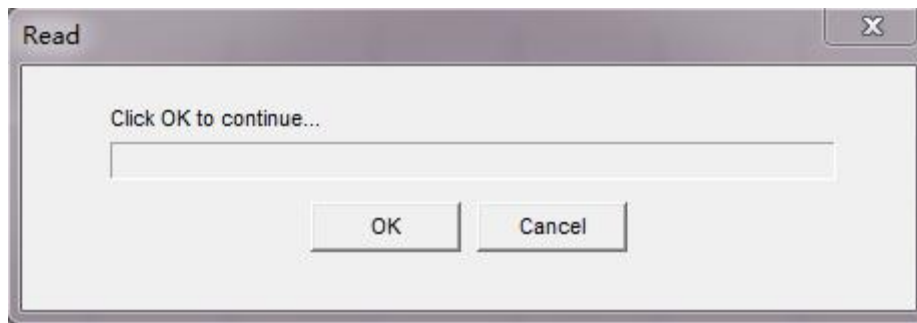


## 2. CPS Read

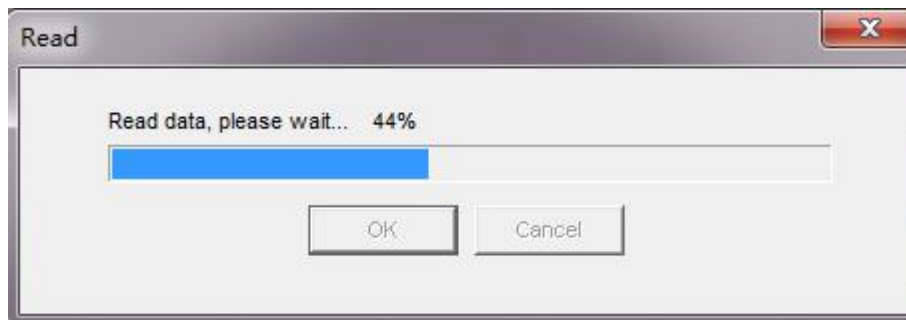
CPS read function can be started by shortcut key combination Ctrl + R or shortcut icon  to read data from the radio.

Precondition: The radio is power on in user mode.

1) Connect the radio with data cable, and connect data cable USB port to the computer, click CPS read to display the following interface;



2) Click OK to continue, the radio displays reading and the CPS interface displays as below;




3) A pop-up message on the radio display will indicate read success after about 10 seconds, the radio goes back to home display. The CPS will indicate read success as below.



4) Click OK to complete CPS read.

### 3. CPS Write

CPS write function can be started by shortcut key combination Ctrl + W or shortcut icon  to write data into the radio.

Precondition: The radio database version and type code are consistent with the database version and type code of the data currently edited by the CPS software. The radio is power on in user

mode.

- 1) CPS software is used to configure data in template.
- 2) Connect the radio with data cable, and connect data cable USB port to the computer, click CPS write to display the following interface;

Write

Radio Name My Radio

DMR Conventional

Auto Increase

Radio Start ID 11

Written Count 0

Next ID 11

DMR Trunking

Auto Increase

Radio Start ID 0000001

Written Count 0

Next ID 0000001

MPT Trunking

Auto Increase

Radio Start ID 20020200

Written Count 0

Next ID 20020200

Click OK to continue...

OK Cancel

- 3) Click OK to continue, the radio displays writing and the CPS interface displays as below;



Write

Radio Name

**DMR Conventional**

Auto Increase

Radio Start ID

Written Count

Next ID

**DMR Trunking**

Auto Increase

Radio Start ID

Written Count

Next ID

**MPT Trunking**

Auto Increase

Radio Start ID

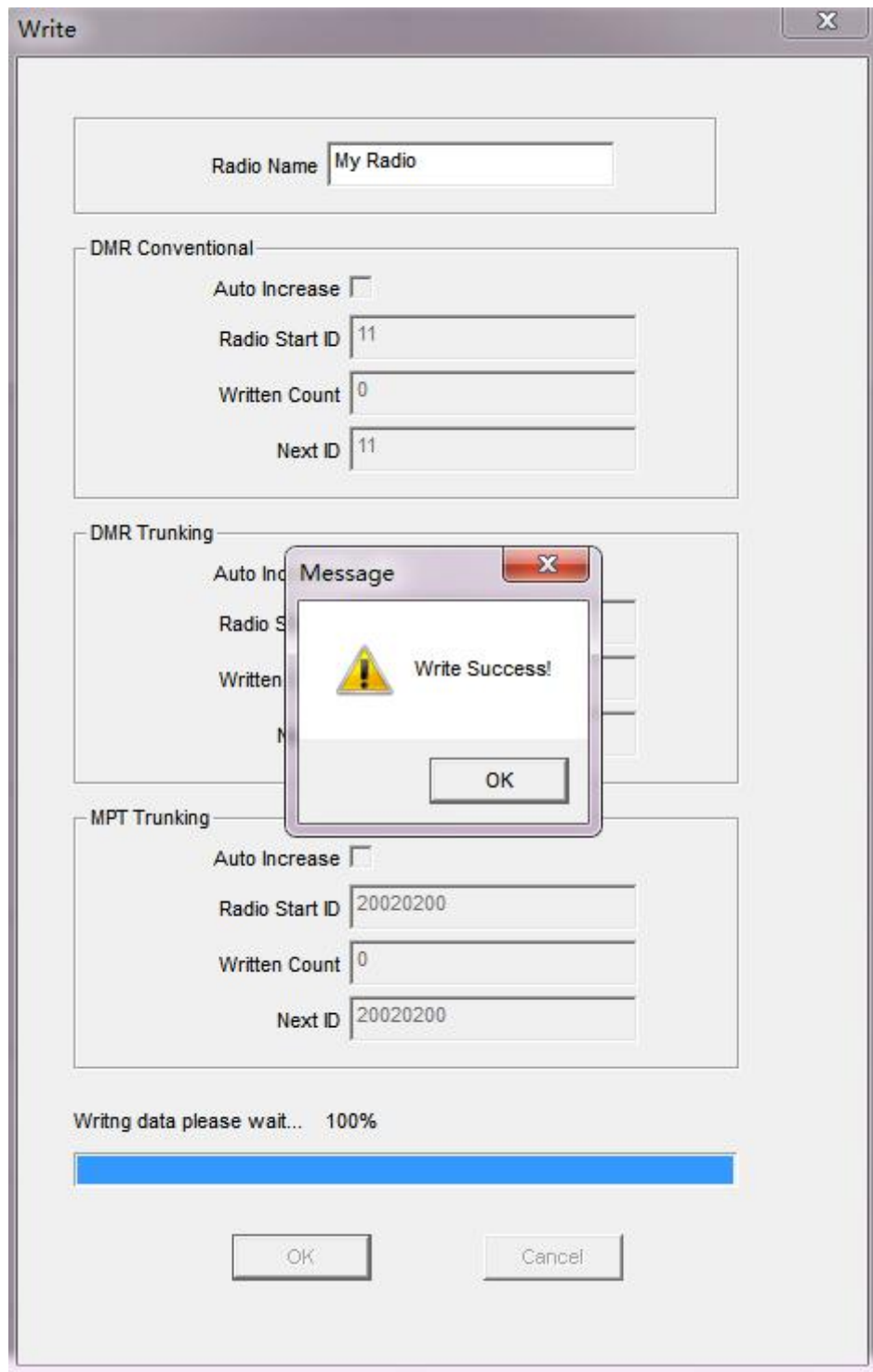
Written Count

Next ID

Writing data please wait... 21%

OK Cancel

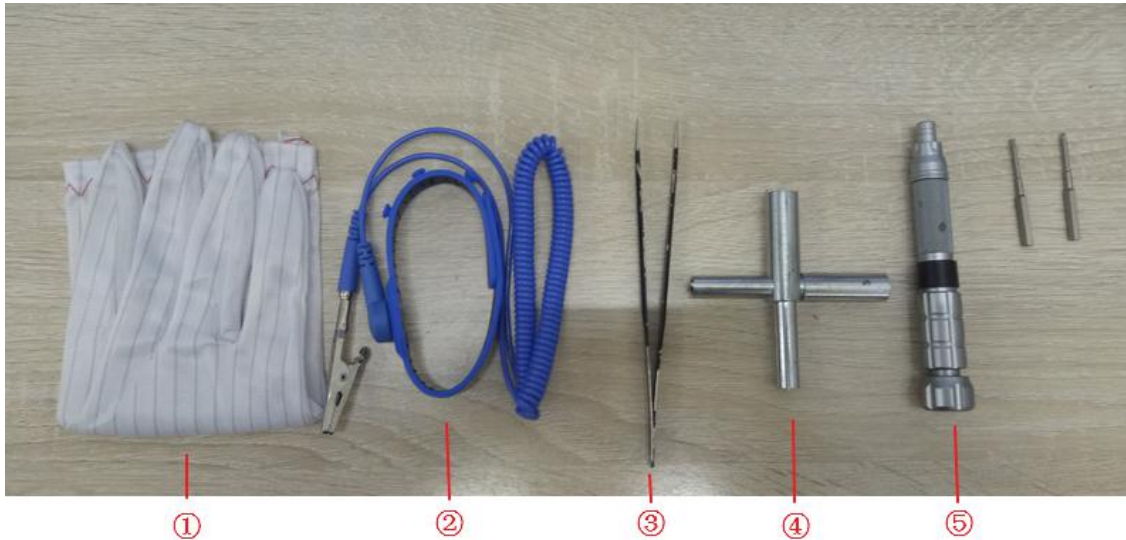
4) The radio automatically reboots after about 10 seconds. The CPS will indicate write success as below.



5) Click OK to complete CPS write.

## 4 Radio Disassemble Demonstration

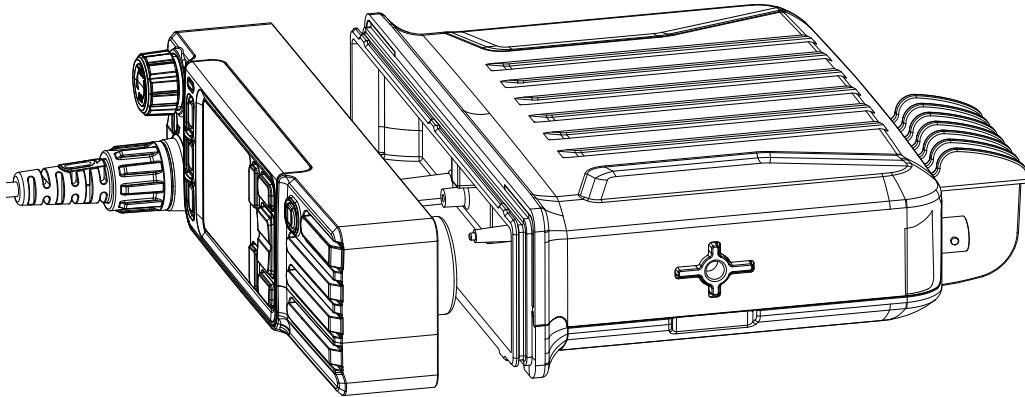
### 4.1 Tools



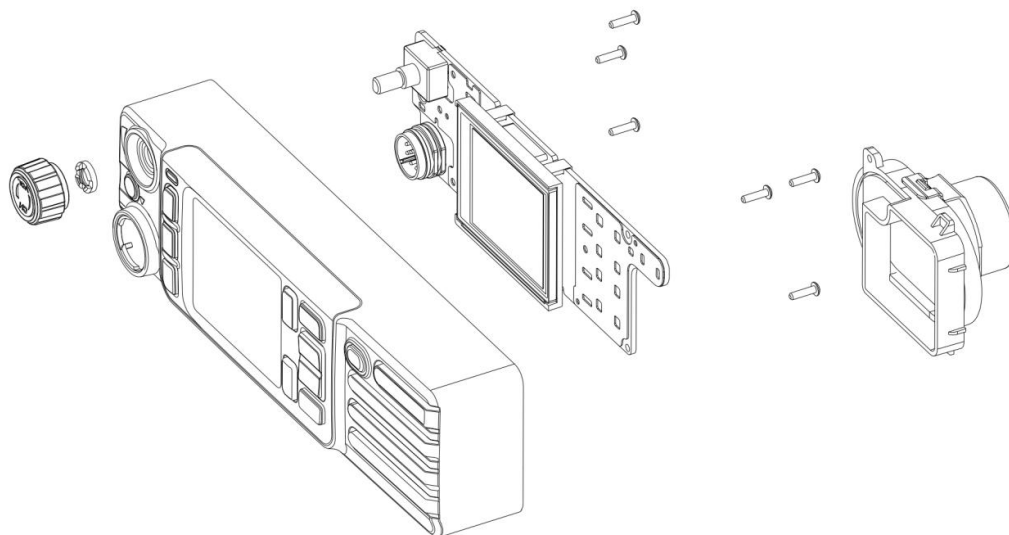
SN	Item
1	Anti-static Glove
2	Anti-static Wrist Strap
3	Tweezers
4	Sockets
5	Screwdriver (Cross Screwdriver, Slotted Screwdriver, T6 Torx Screwdriver)
6	Soldering Iron

## 4.2 Disassemble Steps

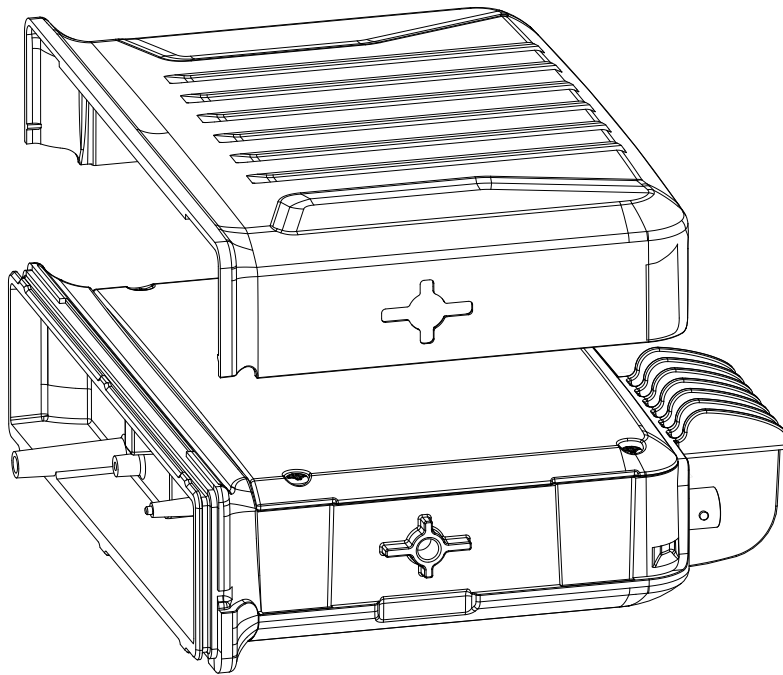
1. Turn off the power, remove the power cable, rotate the antenna and remove it.
2. Dismount the control panel, disconnect the FPC from the control panel.



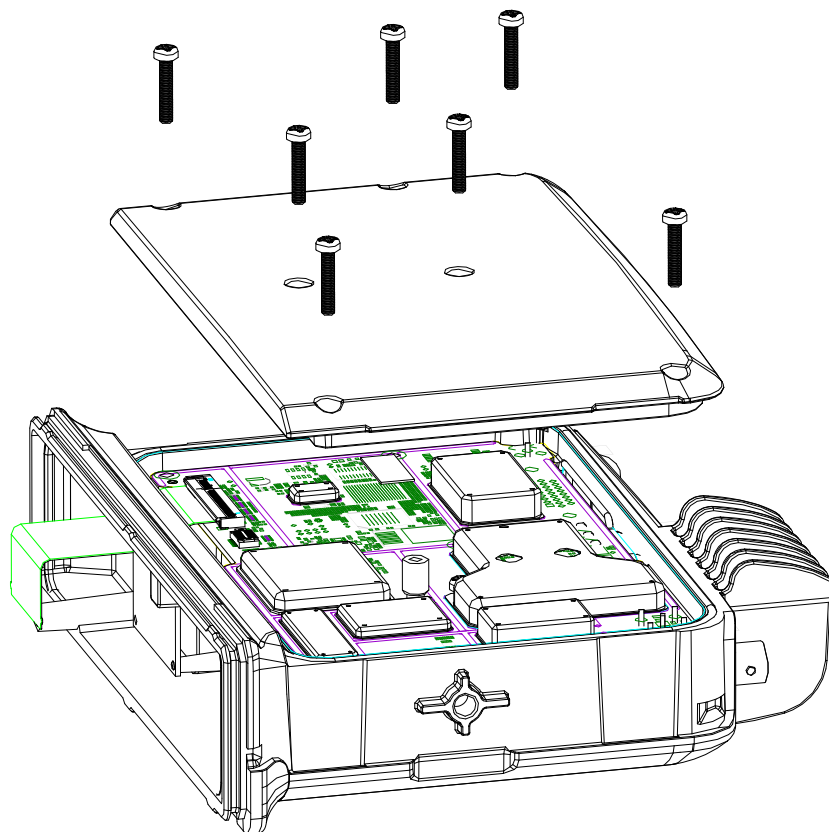
3. Remove the volume knob, loosen the six fixing screws, take out the speaker and PCB from the control panel.



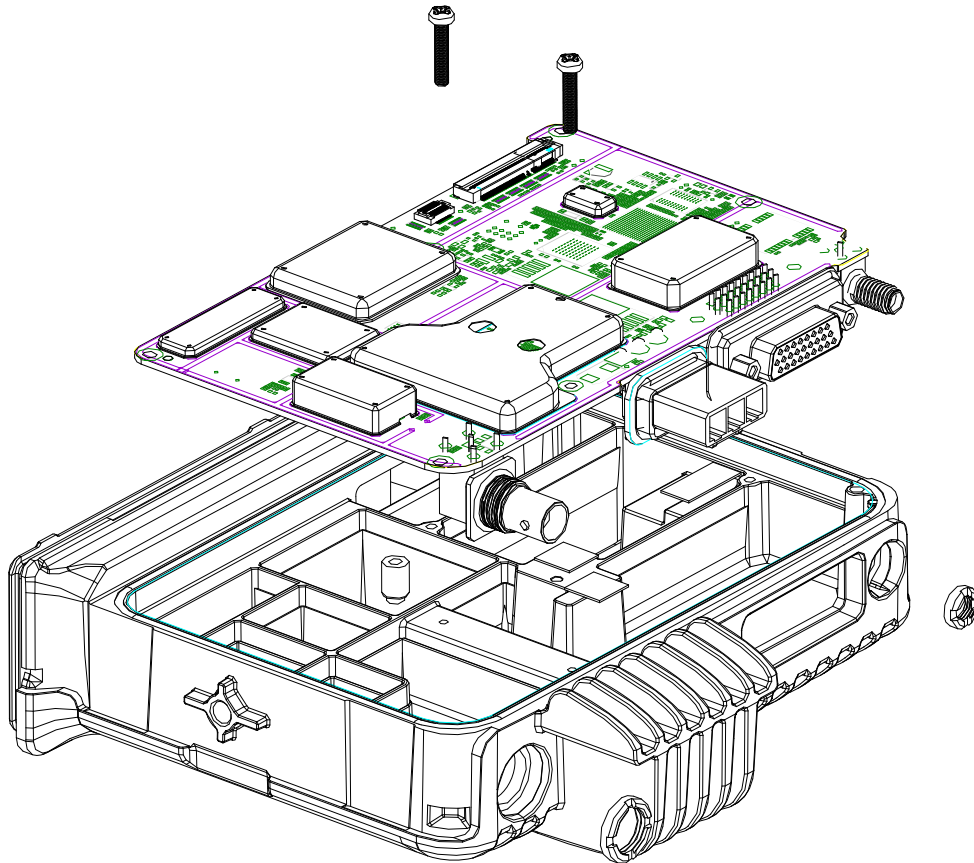
4. Use the slotted screwdriver to open the buckles on both sides of the radio to remove the back cover.



5. Remove the seven fixing screws of the aluminum case top cover, and take away the top cover.



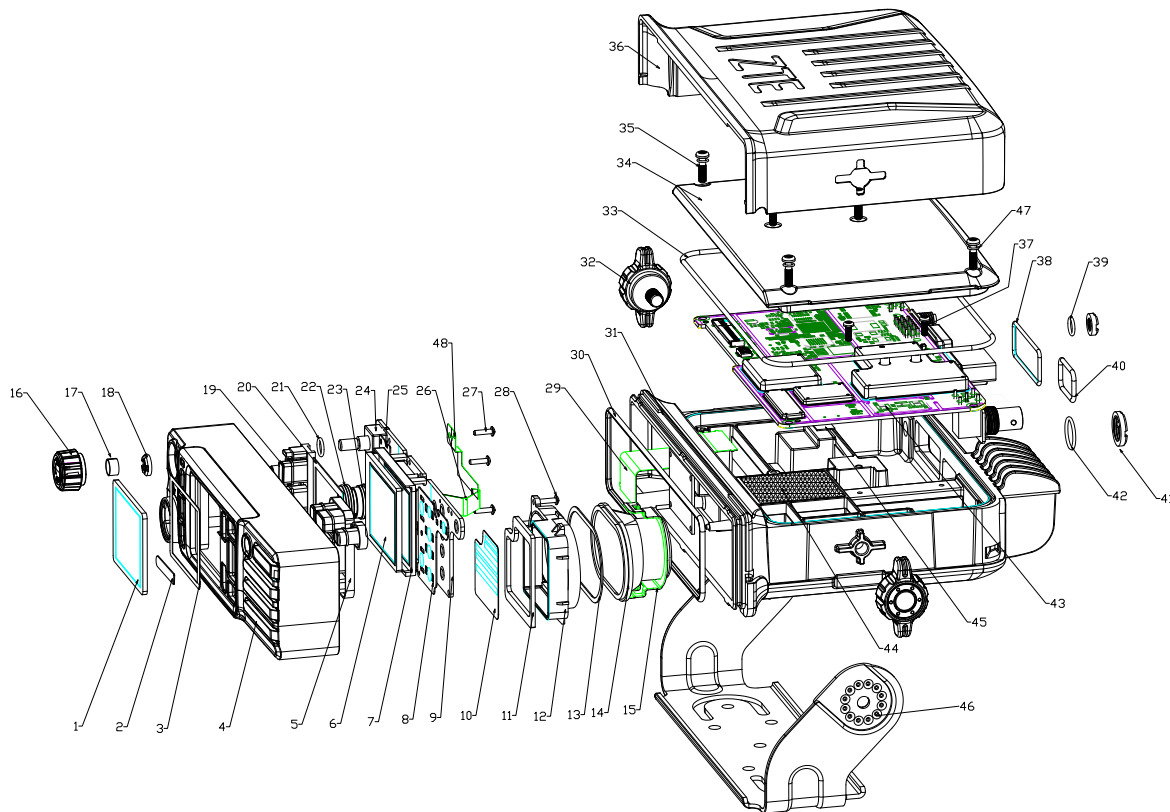
6. Remove the fixing nuts of GPS antenna interface and signal antenna interface, remove the two screws of PA module, remove the FPC and take out the main PCB.



### 4.3 Assemble Steps

The assemble steps can refer to the disassemble steps and vice versa.

### 4.4 Components



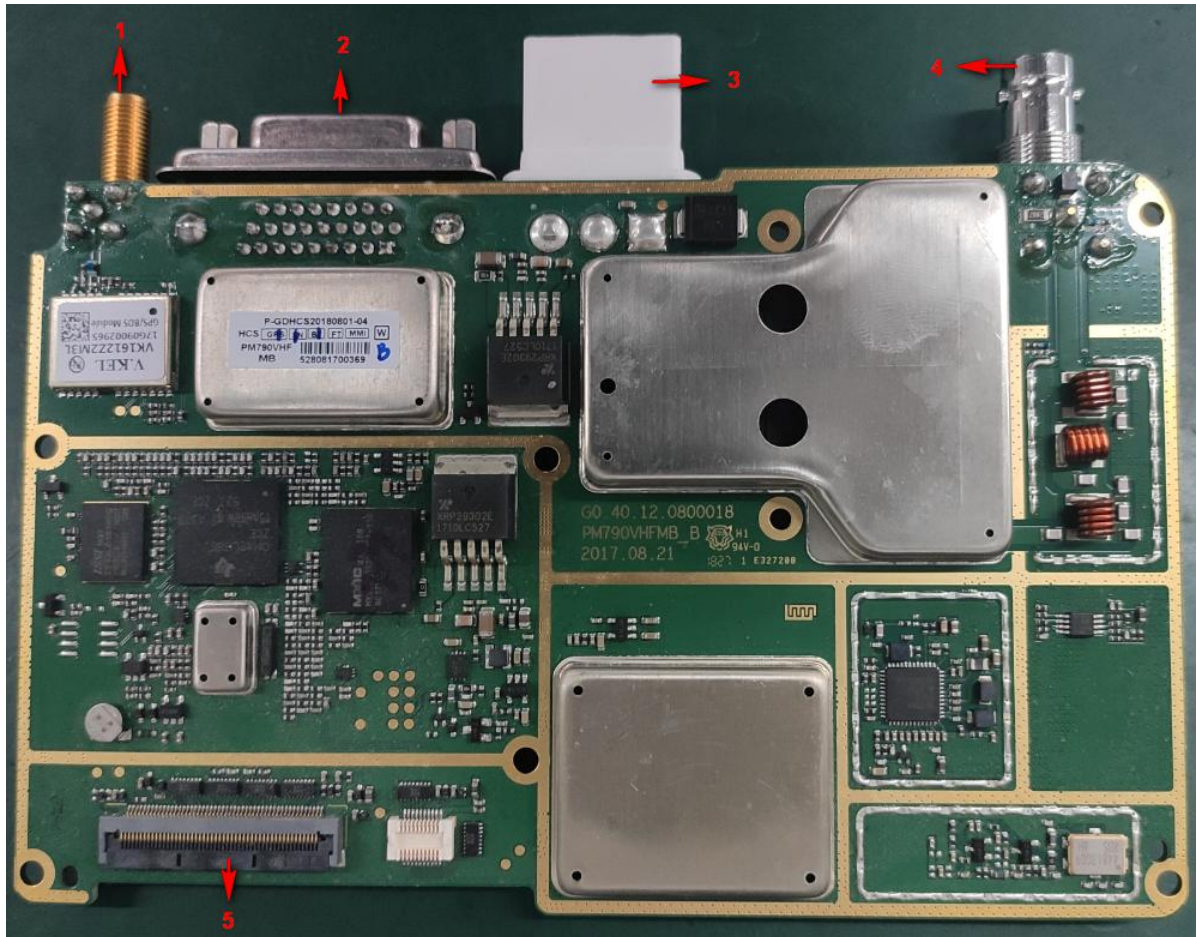
SN	Item	Qty	SN	Item	Qty
1	PM790 LCD Lens	1	25	PM790 Button 2 Dome	1
2	PM790 Logo Label	1	26	PM790 Ground Steel Sheet	1
3	PM790 LCD Double-sided Seal	1	27	PH790 Screw ST1.9*5.0mm	4
4	PM790 Front Panel	1	28	PM790 Screw M2.0*8mm	2
5	PM790 Button 1	1	29	PM790 FPC	1
6	LCD Module	1	30	PM790 Front Cover Sealing Gasket	1
7	PM790 LCD Holder	1	31	PM790 Aluminum Case	1
8	PM790 Button 1 Dome	1	32	GM650 Bracket Screw	2
9	PM790 Keyboard	1	33	PM790 Back Cover Sealing Gasket	1
10	PM790 Speaker Air Filter	1	34	PM790 Aluminum Back Cover	1
11	PM790 Speaker Sealing Gasket	1	35	GM650 Screw M3*12.5	7
12	PM790 Speaker Holder	1	36	PM790 Plastic Back Cover	1
13	PM790 Speaker Sealing	1	37	GM650 Screw M2.5*6	2

	Foam				
14	PM790 Speaker	1	38	PM790 DB26 Sealing Gasket	1
15	PM790 Speaker Fixing Buckle	1	39	PH790 O Ring	1
16	GH650 Knob	1	40	PM790 Power Interface Sealing Gasket	1
17	PH790 Knob Inner Holder	1	41	BNC Antenna Interface Nut M12*0.75mm	1
18	PH790 Switch Nut	1	42	PM790 BNC O Ring	1
19	PM790 Button 2	1	43	PM790 Main PCB	1
20	PM790 LCD Foam	1	44	PM790 Foam	1
21	PH790 O Ring	1	45	PM790 Cooling Silicone 1	1
22	GM650 10 Pin Connector Sealing Gasket	1	46	PM790 Bracket	1
23	10 Pin Plug Connector	1	47	GM680 M3 Screw Sealing Gasket	7
24	Coding Switch	1	48	PM790 Ground Steel Sheet 1	1



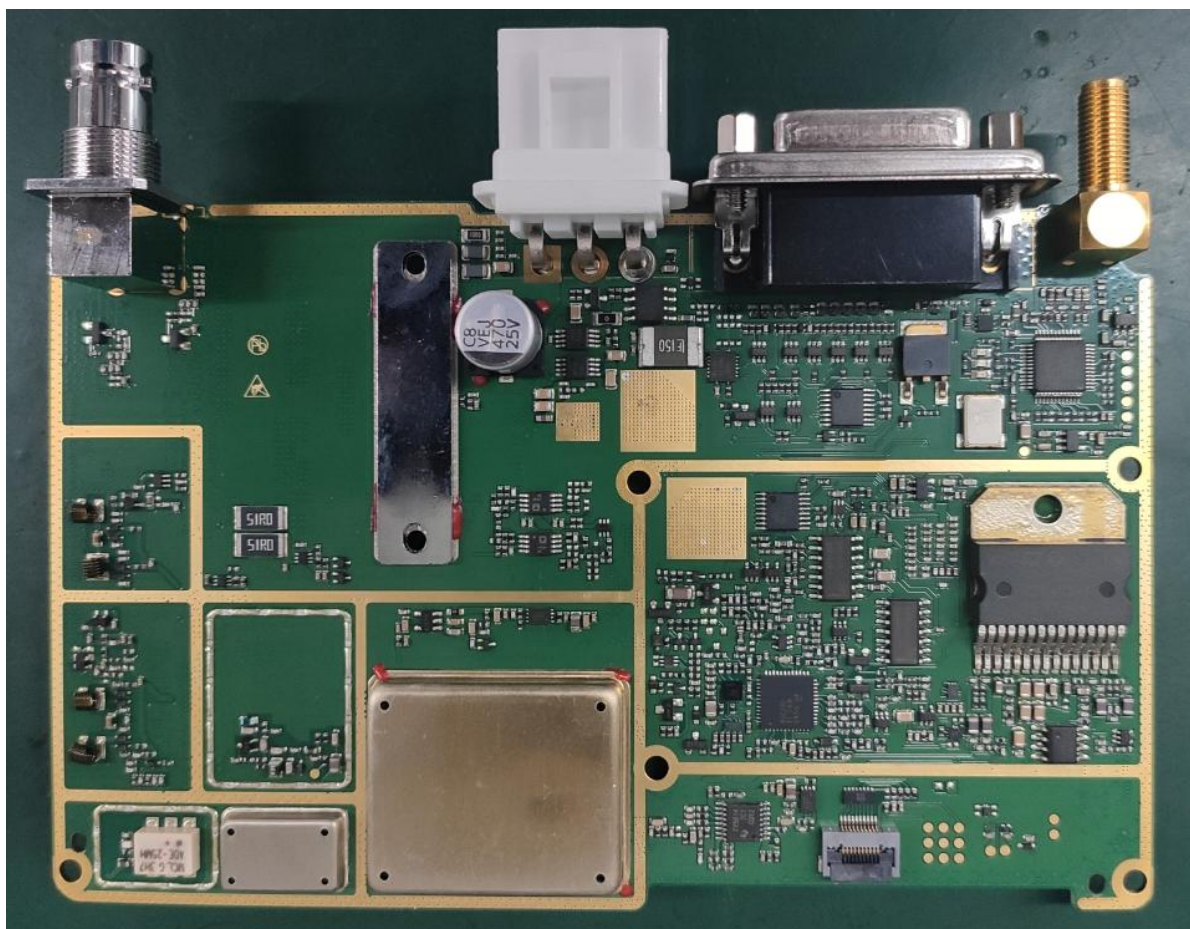
## 5 Hardware Pictures

### 5.1 Front of Main PCB



SN	Item
1	GPS Antenna Interface
2	DB26 Interface
3	Power Interface
4	Antenna Interface
5	50 Pin FPC Interface

## 5.2 Back of Main PCB



## 6 Troubleshooting Maintenance Flow

### 6.1 Structural Part Failure

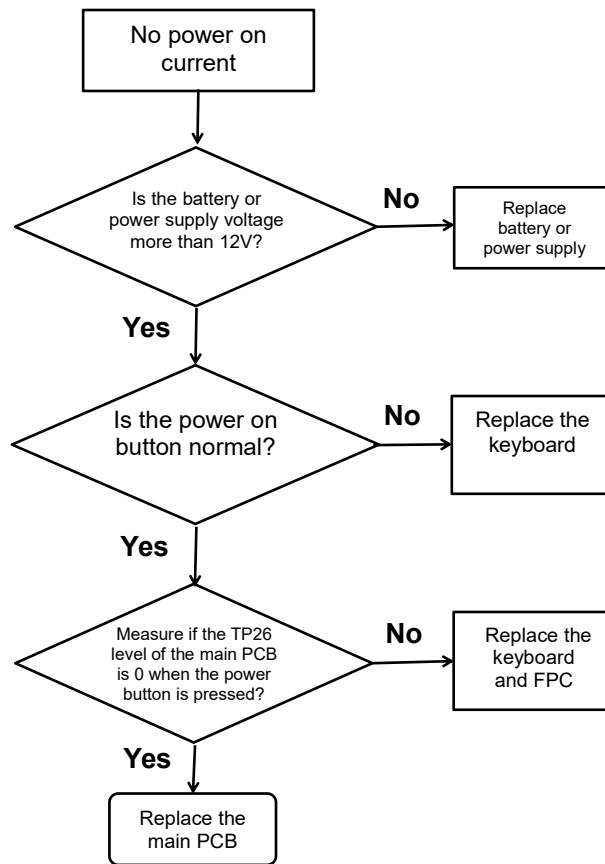
For the failure of radio structural parts, please refer to 4.2 Disassemble Steps for replacement.

### 6.2 Baseband Circuits Troubleshooting Overview

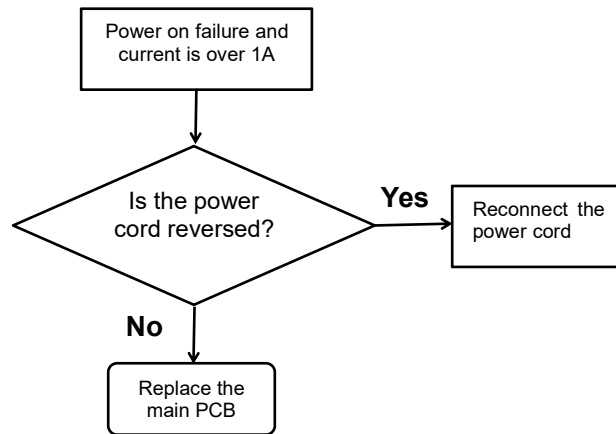
After the radio is powered on, the radio starts normally and the current is about 330mA. During the startup process, the LED indicator flashes green and the LCD displays normally. When the LCD

backlight is off, the current is about 300mA. To test the USB data cable, it must be connected before power on so that it can be detected. The LCD displays the accessory icon, USB will automatically turn on. Each function button responds normally, the radio transmission will be started after pressing the PTT button, the call is normal. The volume & channel knob responds normally.

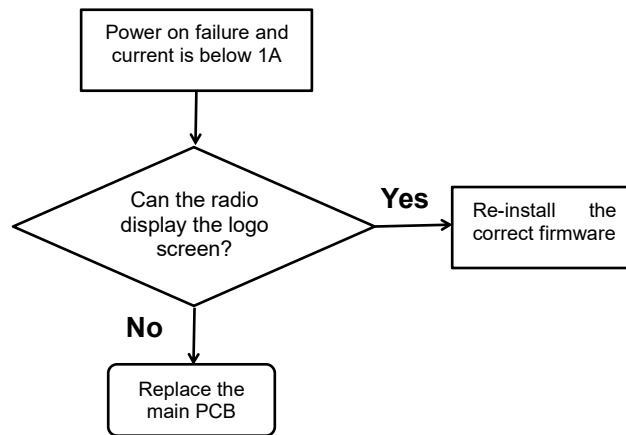
### 6.3 No Power On Current



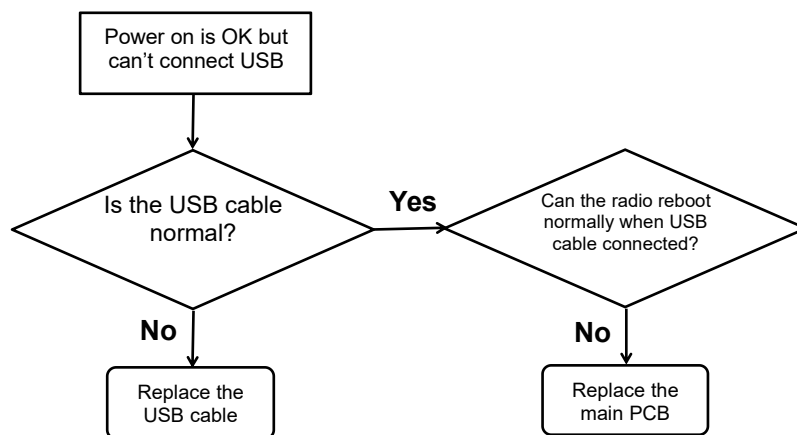
### 6.4 Power On Failure and Current Over 1A



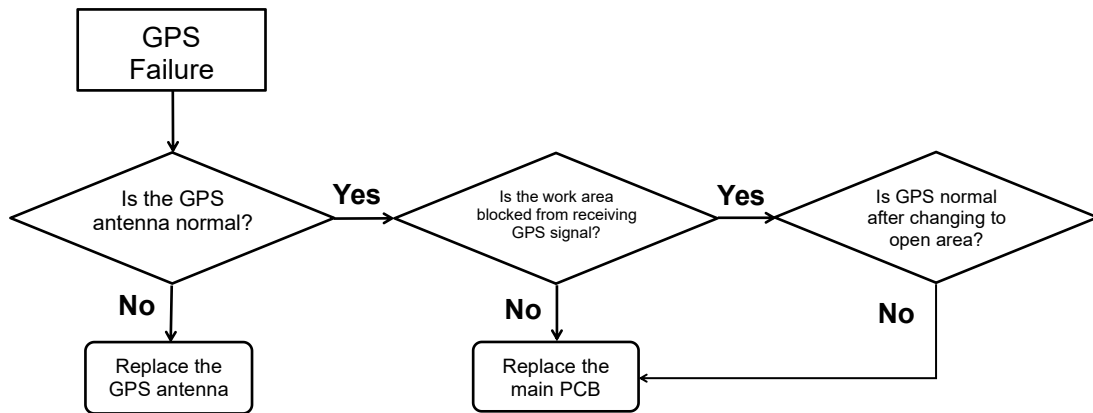
### 6.5 Power On Failure and Current Below 1A



### 6.6 Power On OK and USB Failure

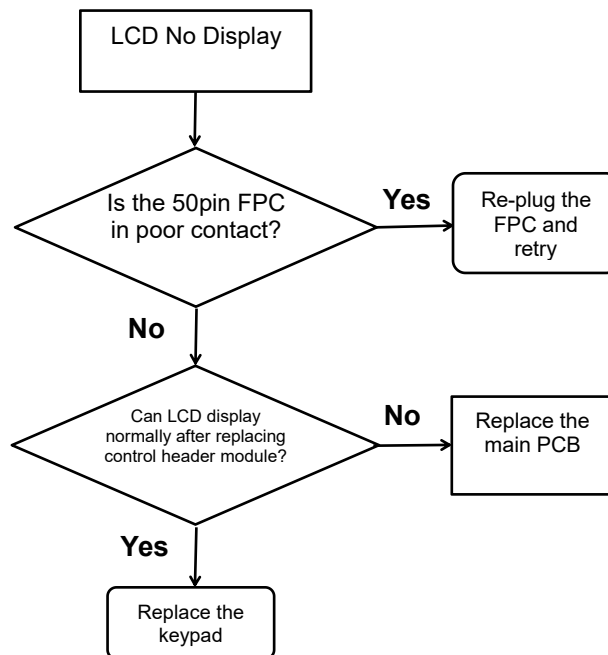


## 6.7 GPS Failure

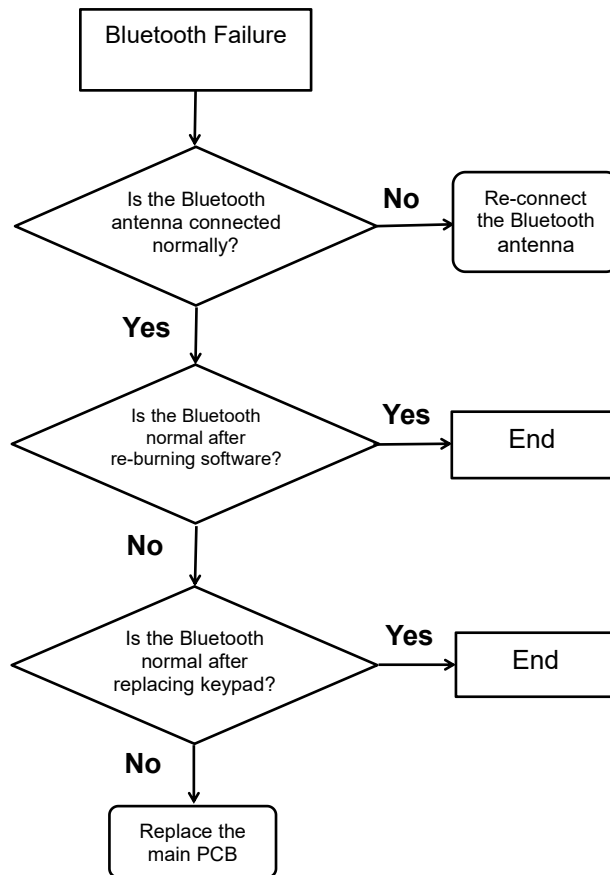


## 6.8 Control Panel Troubleshooting

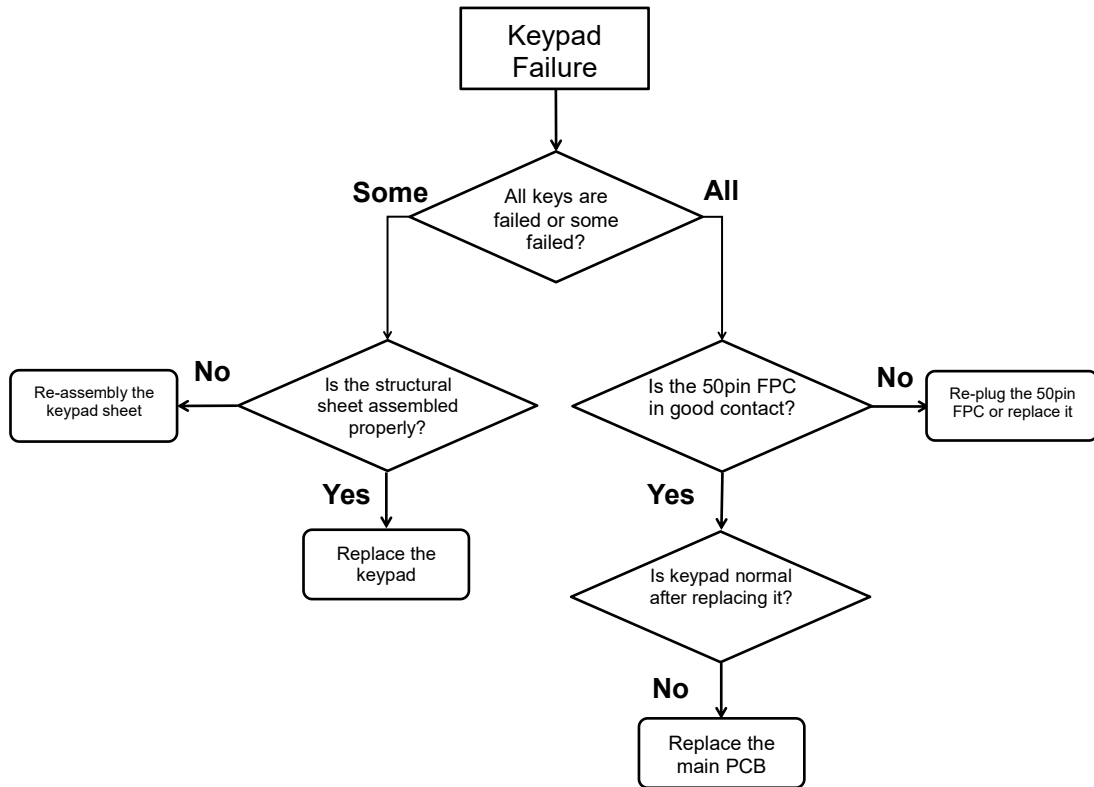
### 6.8.1 LCD No Display



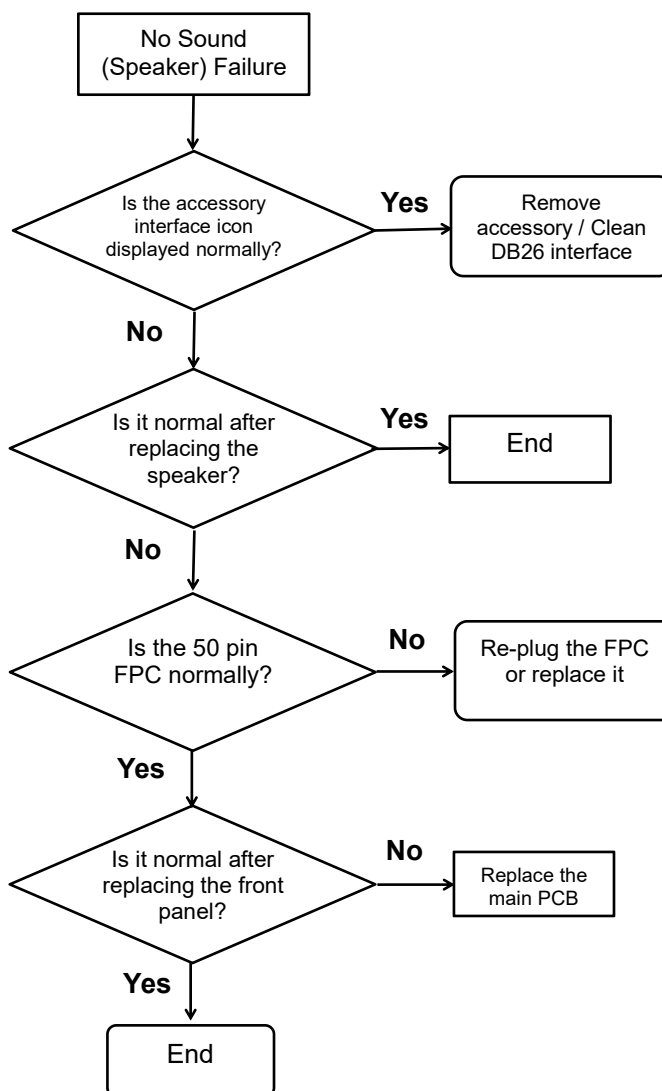
### 6.8.2 Bluetooth Failure



### 6.8.3 Keypad Failure

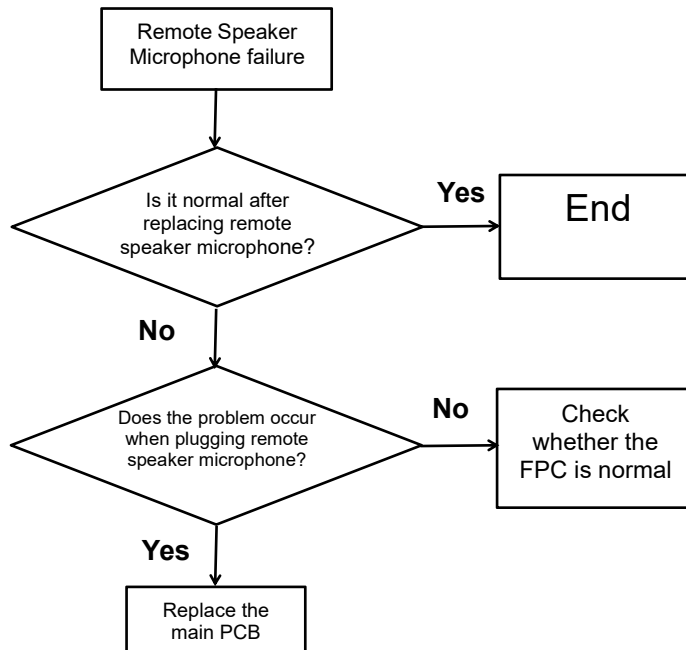


### 6.8.4 No Sound (Speaker) Failure

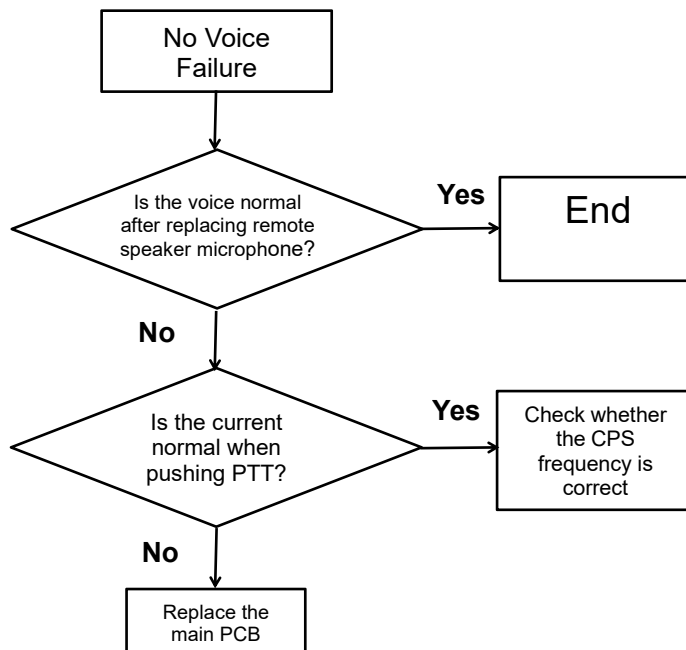




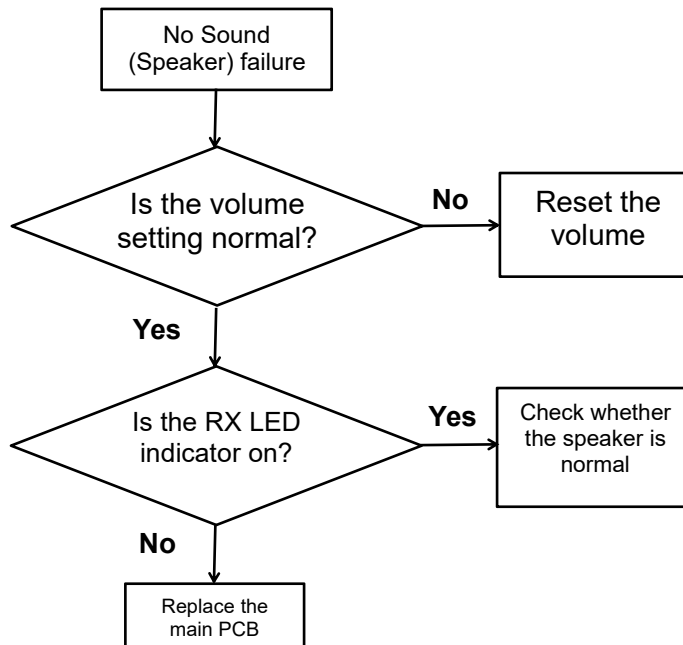
### 6.8.5 Remote Speaker Microphone Failure



### 6.9 No Voice Failure



## 6.10 No Sound (Speaker) Failure



## 7 Check After Maintenance

### 7.1 Check Latest Firmware Version and Device Information

Please refer to 2.2 Check Firmware Version and Device Information.

### 7.2 Function Check

After the radio maintenance, check if every function is available. Follow the steps:

1. After assemble the radio, check if all screws and components are installed, there should be no extra screws.
2. Check if the volume/channel knob and channel knob can operate normally.
3. Install the power supply and power on the radio to check that radio can power on normally and LED indicator is normal.

4. Check if the front cover keypad is normal and the key can respond normally to touch.
5. Connect the data cable to check if the radio can CPS read and write normally.
6. Turn coding knob to adjust radio frequency and set work mode to the same as another normal radio, and make a voice call test to check if the call can be sent, received, and if the voice is normal.
7. Finish checking.