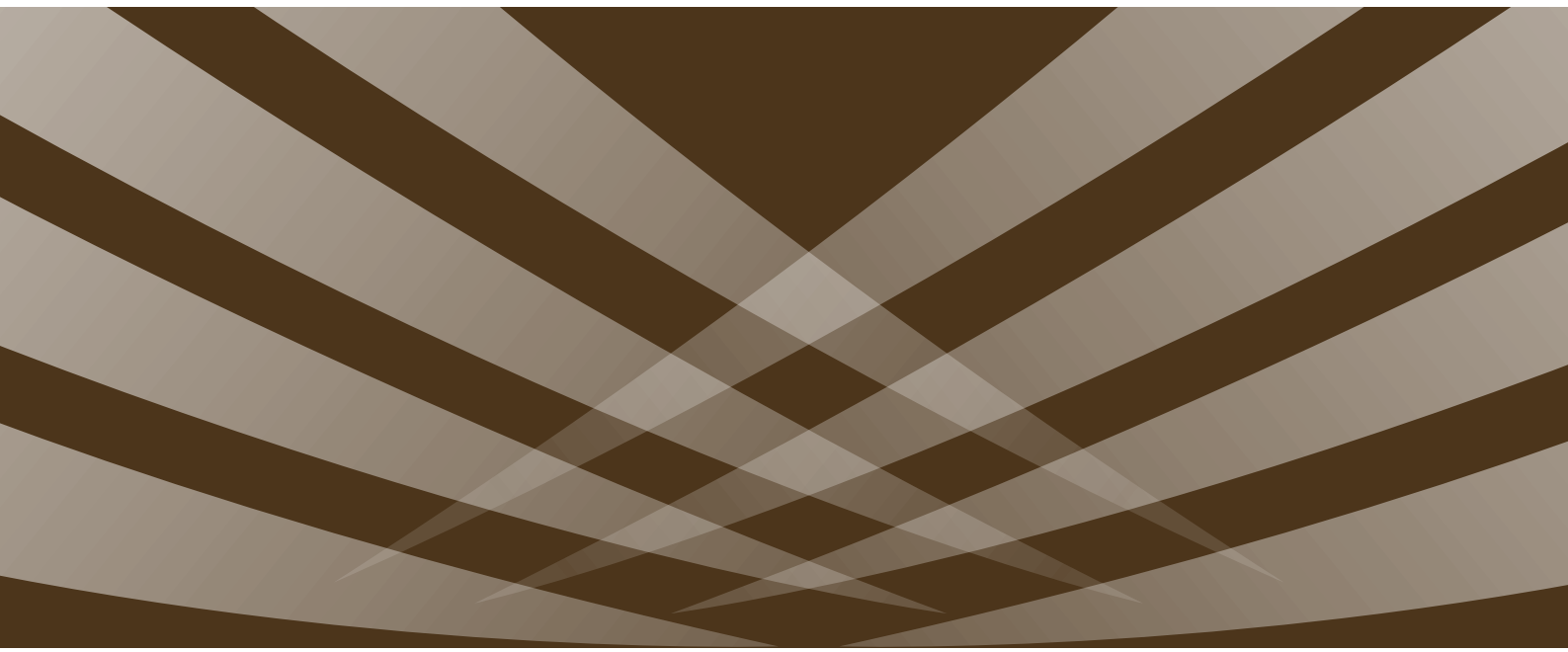
Hytera

SERVICE MANUAL

PNC370 Smart LTE Terminal



Preface

This manual describes the information related to the product repair. It is intended for use by qualified technicians only. To repair the product properly, please read this manual carefully before repairing.

This manual is applicable to the following product:

PNC370 PoC Terminal

Copyright Information

Disclaimer

Documentation Information

Conventions

Instructional Conventions

Icon	Description
TIP	Indicates information that can help you make better use of your product.
NOTE	Indicates references that can further describe the related topics.
CAUTION	Indicates situations that could cause data loss or equipment damage.
WARNING	Indicates situations that could cause minor personal injury.
DANGER	Indicates situations that could cause major personal injury or even death.

Notational Conventions

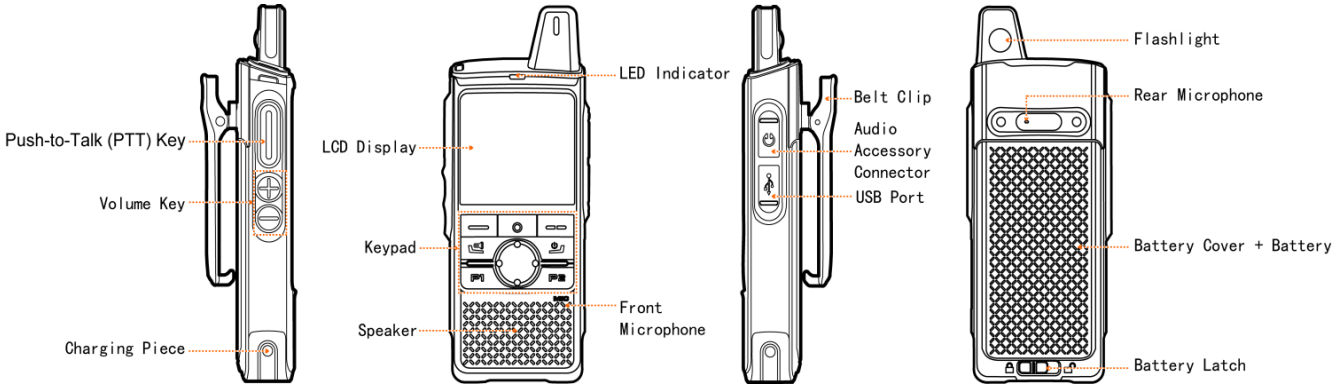
Convention	Description
“ ”	The quotation marks enclose the name of a software interface element. For example, click “OK”.
Bold	The text in boldface denotes the name of a hardware button. For example, press the **PTT** key.
->	The symbol directs you to access a multi-level menu. For example, to select “New” from the “File” menu, we will describe it as follows: “File -> New”.

Revision History

Version	Release Date	Description
V00	May 2019	Initial release.

Contents

1. Product Layout



2. Disassembly and Reassembly

This chapter describes how to disassemble the radio. To reassemble the radio, do vice versa.

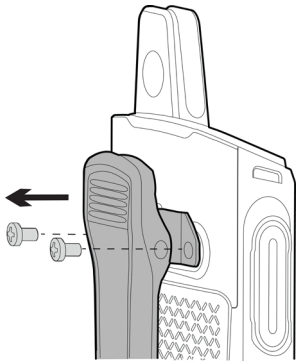
CAUTION
When reassembling the terminal, make sure that the waterproof ring is evenly inserted into the original position to ensure the waterproof performance of the terminal.

2.1 Tools

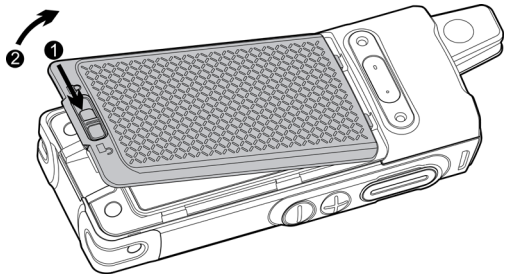
- Phillips screwdriver
- T8 screwdriver
- Needle-nose pliers
- Tweezers

2.2 Procedures

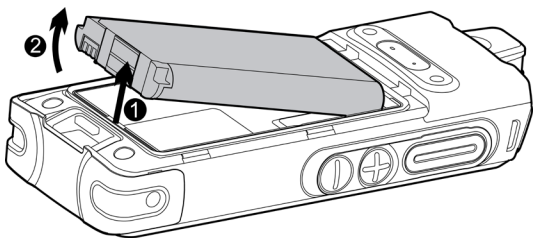
1. Use a Phillips screwdriver to remove the two screws fixing the belt clip, and then remove the belt clip.



2. Slide the battery latch to the position, and then remove the battery cover.



3. Lift the bottom of the battery to remove the battery from the radio.

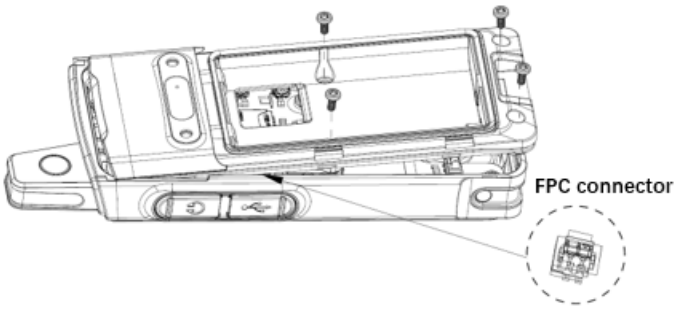


4. Remove the chassis as follows:

a. Use a T8 screwdriver to remove the four screws on the chassis.

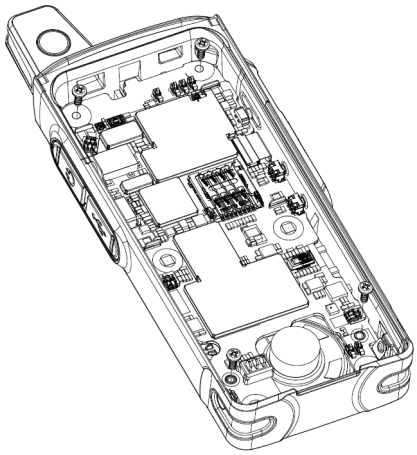
b. Use a tweezer to remove the FPC connector between the chassis and main board.

c. Remove the chassis.



5. Remove the main board as follows:

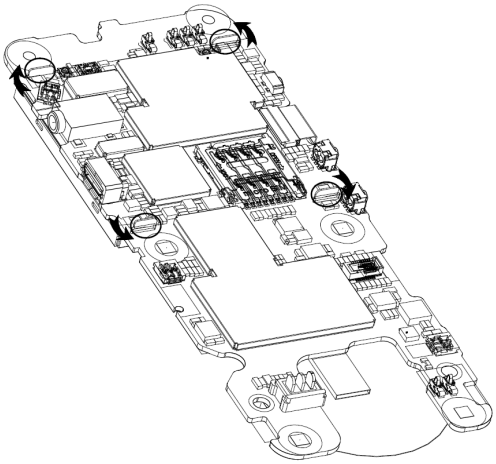
a. Use a Phillips screwdriver to remove the four screws on the main board.



b. Remove the four FPC connectors on the main board.

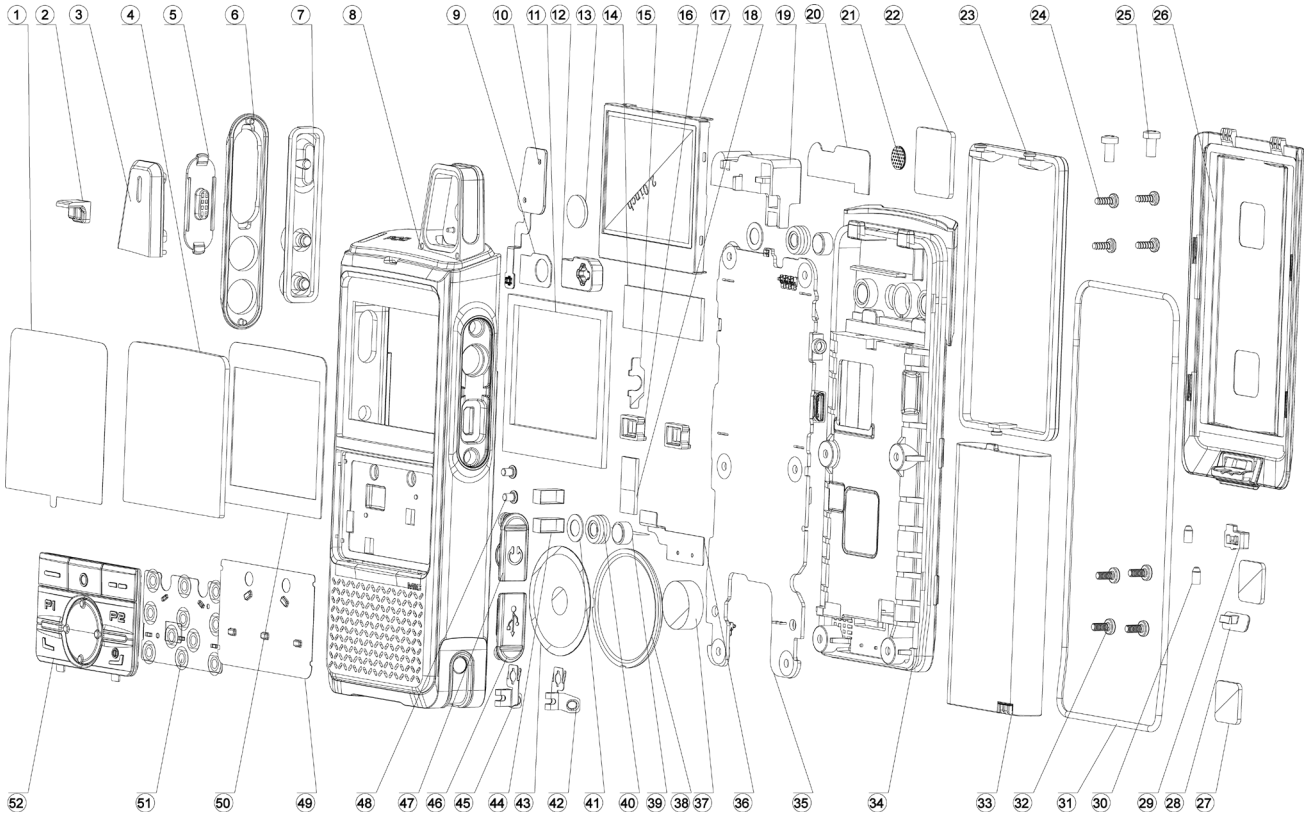
c. Remove the main board.

6. Use the needle-nose pliers to straighten the four clips and remove the screen holder and screen.



3. Exploded View and Packaging Guide

3.1 Exploded View



The table below lists the parts.

No.	Part No.	Description	Qty
1	5113010000352A	Protective film for lens	1
2	5110990000021A	Light guide	1
3	5116000002477A	LED Cover	1
4	5116000002578A	LCD lens	1
5	5116000002472A	PTT key bracket	1
6	5116000002473A	PTT key cover	1
7	5110020000013A	PTT key	1
8	5116000002470A	Front housing	1
9	5113070000150A	Double-sided tape for GPS antenna	1
10	/	FPC for flashlight	1
11	5113050000344A	Buffer foam for LCD	1
12	50151100000039	GPS/WIFI/BT antenna	1

No.	Part No.	Description	Qty
27	5113050000345A	Preloaded foam for battery cover	2
28	5116000000243A	Battery Latch	1
29	5116000000480A	Slider for battery latch	1
30	5116000001552A	Stopper for accessory connector cover	2
31	5110000000607A	Waterproof ring	1
32	5107000000234A	Machine screw	4
33	32010000000227	Li-ion battery	1
34	5116000002471A	Chassis	1
35	/	Main board	1
36	50151100000041	Diversity antenna	1
37	5113050000346A	Preloaded foam for speaker	1
38	51020600000125	Speaker	1

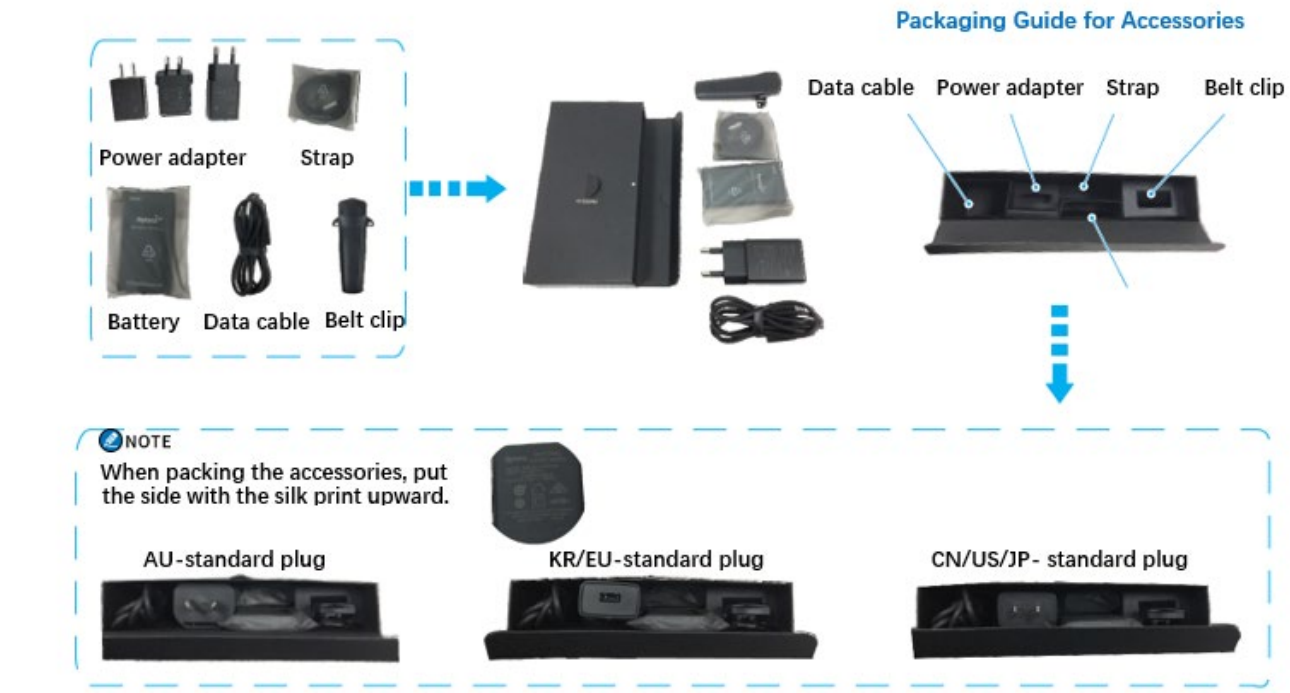
No.	Part No.	Description	Qty
13	5116000001101A	Convex lens	1
14	5115020000048A	Grounded conductive foam for LCD	1
15	5113010000351A	PC plate for earpiece jack	1
16	5110010000019A	Silicone rubber cover for battery connector	2
17	50100200000048	LCD Display	1
18	5115020000046A	Grounded conductive foam for speaker	1
19	50151100000040	LDS main antenna	1
20	5113070000149A	Double-sided tape for main antenna	1
21	5113030000004A	Waterproof and breathable film	1
22	5110010000018A	Silicone rubber cover for micro SIM card	1
23	5110030000014A	Waterproof ring for battery cover	1
24	5107000000157A	Self-tapping screw	4
25	5107000000051A	Machine screw	2
26	5116000002474A	Battery cover	1

No.	Part No.	Description	Qty
39	51020200000053	Microphone	2
40	5110000000033A	Silicone MIC cover	2
41	5113030000026A	Waterproof MIC mesh	2
42	5111000002116A	Left charging piece	1
43	5113040000197A	Speaker felt	1
44	5115020000047A	Grounded conductive foam for key	2
45	5111000002117A	Right charging piece	1
46	5116000000841A	USB connector cover	1
47	5116000001582A	Accessory connector cover	1
48	5107000000507B	Machine screw	2
49	/	Key FPC	1
50	5113070000151A	Double-sided tape for LENS	1
51	5112010000112A	Metal dome	1
52	5116000002484A	P&R key	1

NOTE

The part number is subject to change without notice due to product upgrade.

3.2 Packaging Guide



4. Specifications

General		
Operating system	Android 5.1	
CPU	Qualcomm MSM8909, 1.1 GHz	
Storage	4 GB ROM and 512 MB RAM	
Dimensions (H x W x D) (with standard battery)	121 mm x 55.5 mm x 24 mm	
Weight (with standard battery)	185 g	
Display	• Size: 2.0 inch • Resolution: 320 x 240 • Color screen	
Battery	3100 mAh Li-Ion battery	
Battery Life (5-5-90 Duty Cycle)	>20 h	
Charge Mode	Desktop charger or multi-unit charger	
Operating Voltage	3.3-4.2 V	
Micro-SIM Card	• Size: 12 mm x 15 mm • Quantity: 1	
Accessory Port	• USB 2.0 • Audio connector: 2.5 mm • Charging port	
Audio	Microphone	• Quantity: 2 • Noise reduction
	Speaker	• Quantity: 1 • Rated power: 1 W
Network		
Network	All networks	

Frequency Band	• GSM 900/1800 MHz • TD-SCDMA B34/B39 • CDMA BC0 • WCDMA B1/B8 • TDD-LTE B38/B39/B40/B41 • FDD-LTE B1/B3/B5/B8	
LTE Protocol	3GPP	
Speed Class	CAT4	
Wireless Module		
BT	BT4.1	
WLAN	2.4 GHz, 802.11 b/g/n	
Positioning System	GPS，GLONASS，BDS	
Positioning Accuracy (in the open area)	• Tracking sensitivity: < -154 dB • Time to First Fix (cold start): < 50s@–130 dBm • Time to First Fix (hot start): < 5s@–130 dBm • Recapture: < 5s@–130 dBm • Positional accuracy: < 10 m@–130 dBm	
Environment		
Storage Temperature	-30℃ to +70℃	
Operating Temperature	-20℃ to +60℃	
Wet, Shock & Vibration Protection	MIL-STD 810G	
United States Military Standard		
Electrostatic Discharge (ESD)	IEC 61000-4-2（level 4）	±15 kV (air) ±8 kV (contact)
Water & Dust Protection	IP55	

NOTE

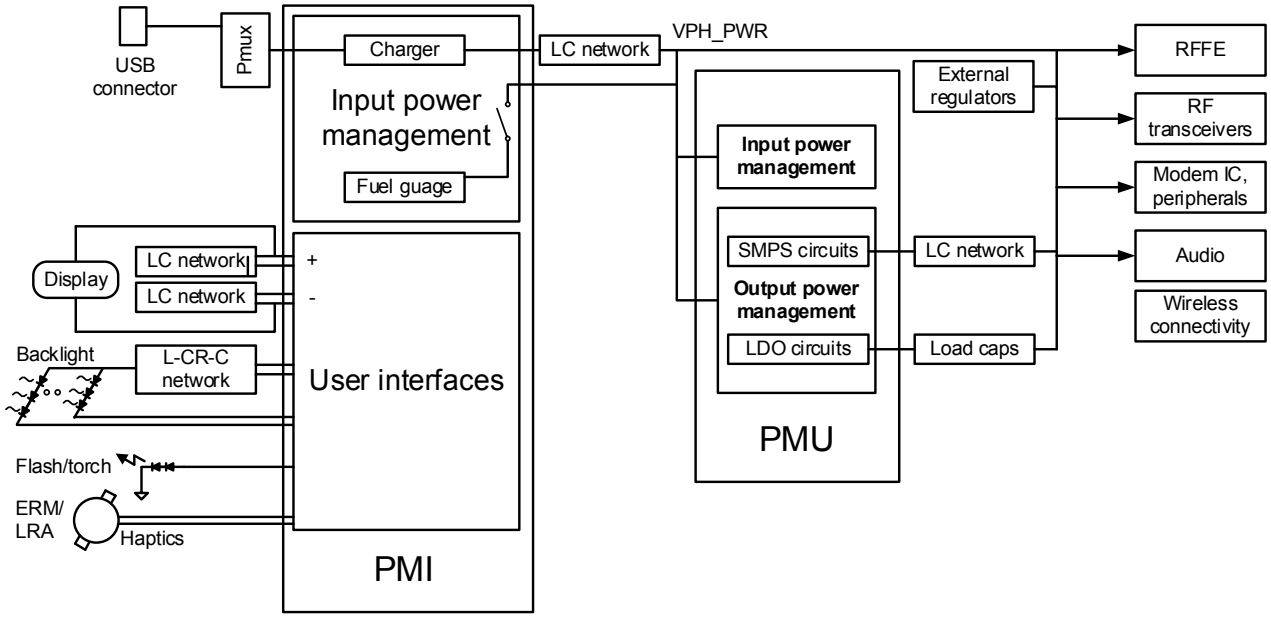
All specifications are tested according to applicable standards, and subject to change without notice due to continuous technological development.

5. Circuit Description

5.1 Baseband Section

5.1.1 Control Module

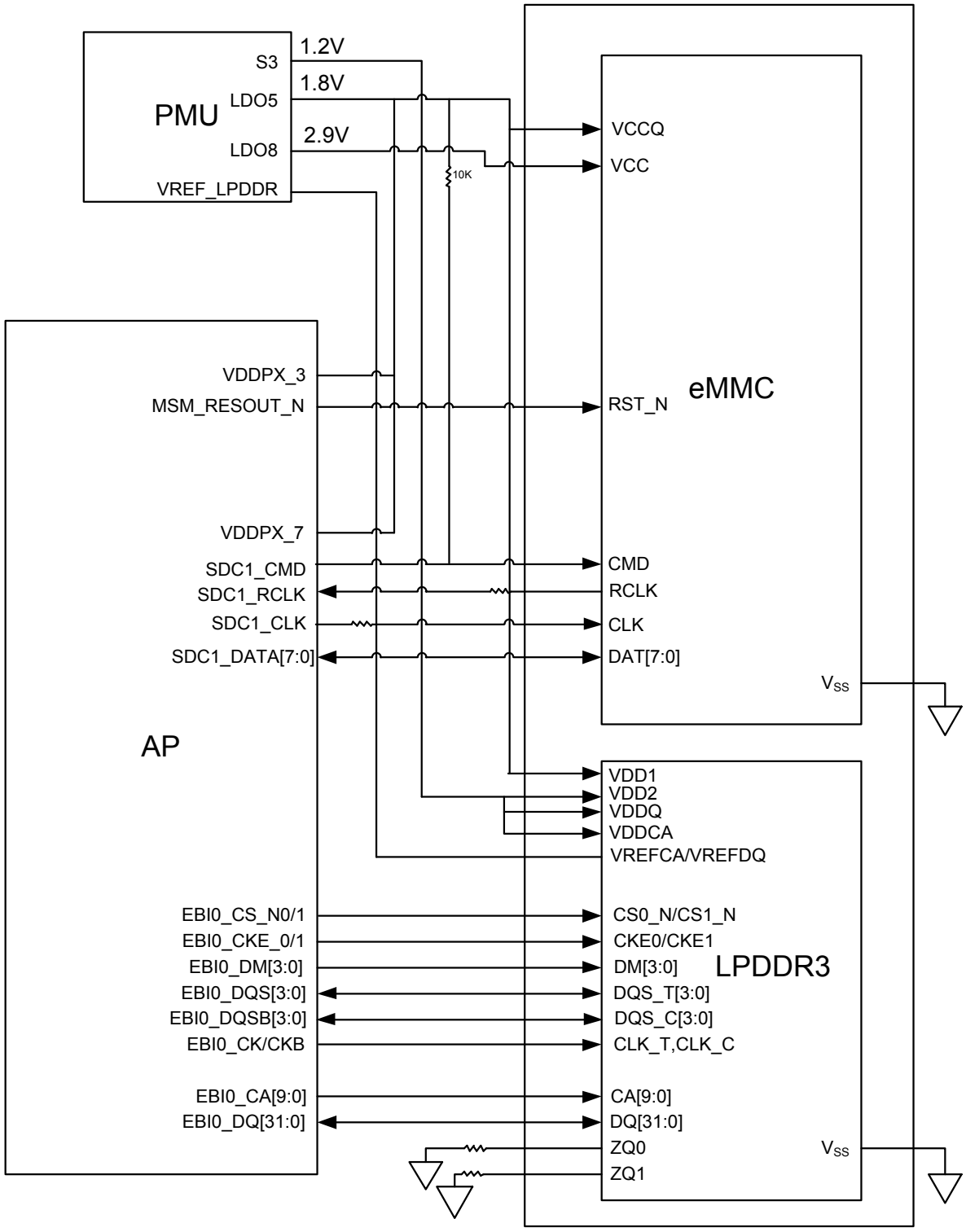
Power Supply Module



The power supply employs a 3.7 V battery. The power supply management IC consists of PMI and PMU.

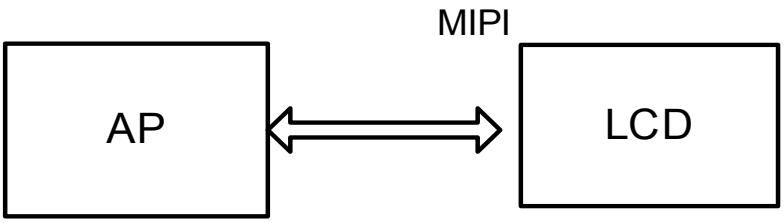
- PMI: It is controlled by the CPU and is responsible for powering the switch and LCD.
- PMU: It is controlled by the CPU and integrates 7 DC/DCs and 23 LDOs to provide power for the baseband section.

External Memory



I/O Interface	Description
EBI	Single channel 32-bit LPDDR3 SDRAM (Dual rank)

Display



AP is connected to LCD (a 2.0-inch screen with resolution of 320 x 240) through MIPI.

5.1.2 Audio and Peripheral Module

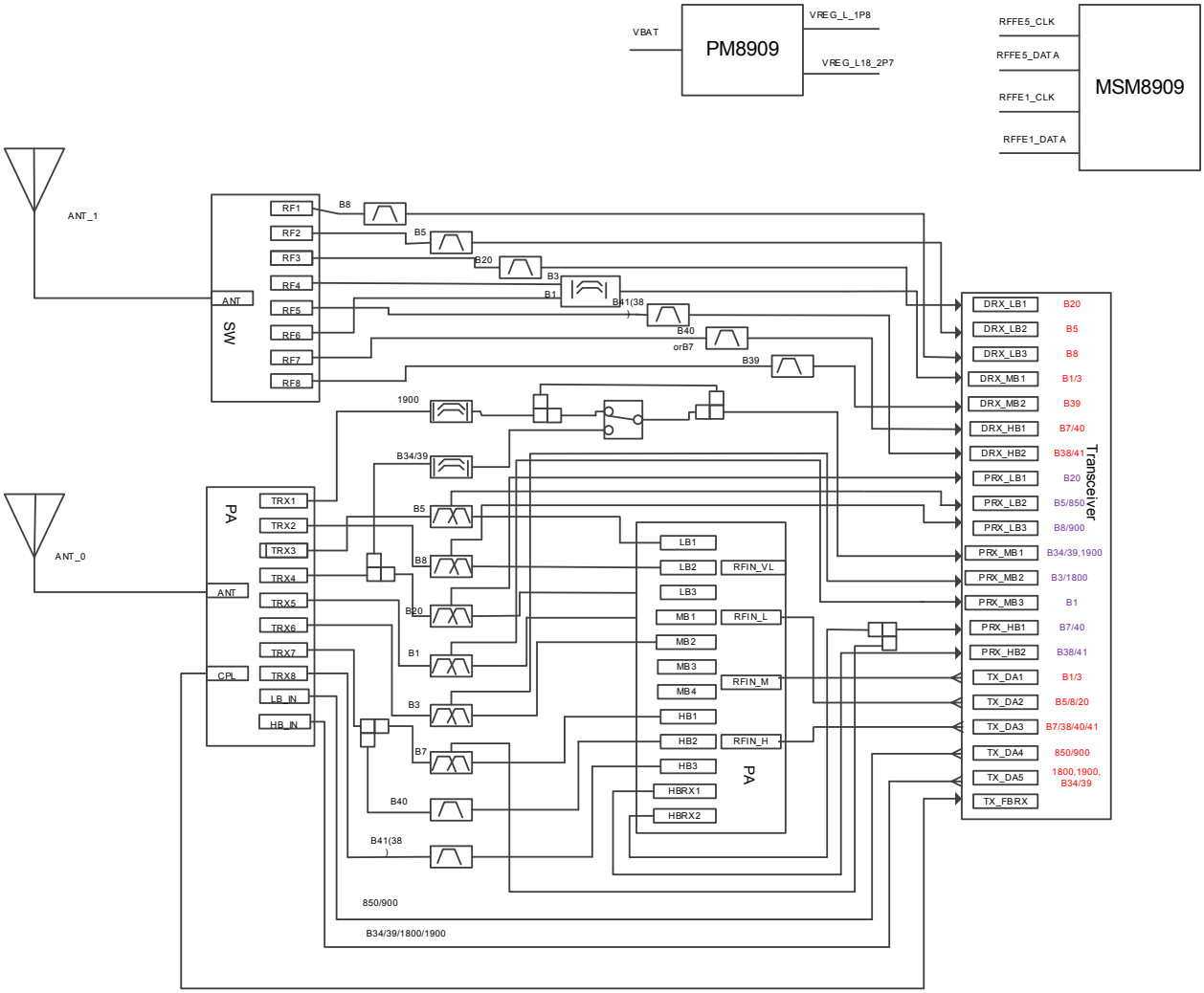
Audio Module

The audio module consists of PMU and PA. The built-in CODEC of the PMU converses and processes the voice and digital signal. The built-in audio processor of the PMU cancels noise and echo. The PA amplifies the voice signal.

Peripheral Module

The main board consists of the circuits for peripheral module, including the earpiece jack, battery charger, and USB connector.

5.2 RF Section



5.2.1 Communication Mode

GSM and CDMA are second-generation (2G) standards. W-CDMA and CDMA BC0 are third-generation (3G) standards. LTE is a fourth-generation standard. Only LTE supports diversity reception.

5.2.2 TX Circuit

GSM TX Circuit

The original GSM RF signal transmitted by the Transceiver goes to the switch path, and then to the PA for amplification. Afterwards, the GSM RF signal switches to the ANT port, and then to the antenna unit.

FDD TX Circuit

Part of the original FDD RF signal transmitted by the Transceiver, goes to the switch path. Other part goes to the PA for amplification, and then to the DUP for filtering. Afterwards, the filtered signal goes to the PA, switches to the ANT port, and then to the antenna unit.

TDD TX Circuit

The original TDD RF signal transmitted by the Transceiver goes to the PA for amplification, and then to the Filter for filtering. Afterwards, the filtered signal goes to the PA, switches to the ANT port, and then to the antenna unit.

5.2.3 Main Receiving Circuit

FDD RX Circuit

The FDD RF signal from the antenna goes to the ANT port of the PA (U1203), the TRX port, and then the DUP for filtering. The filtered signal goes to the switch for channel switching, and then to the main receiving interface of the Transceiver.

TDD RX Circuit

The TDD RF signal from the antenna goes to the ANT port of the PA, the TRX port, and then the DUP for filtering. The filtered LTE signal goes to the PA for switching, and then to the main receiving interface of the Transceiver.

5.2.4 Diversity Receiving Circuit

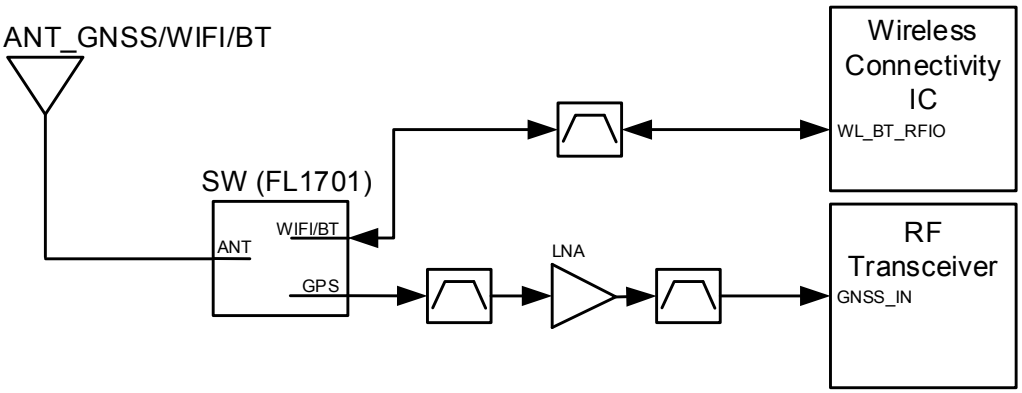
FDD RX Circuit

The FDD RF signal received by the antenna goes to the ANT port in the Switch unit, the RF port, and then the Filter for filtering. The filtered signal goes to the switch for switching, and then to the main receiving interface of the Transceiver.

TDD RX Circuit

The TDD RF signal received by the antenna goes to the ANT port of the Switch, the RF port, and then the Filter for filtering. The filtered signal goes to the main receiving interface of the Transceiver.

5.2.5 GNSS/WLAN/BT Circuit



The GNSS signal goes to the Switch through the GNSS/WLAN/BT three-in-one antenna, and then it is shunted to the pre-filter for LNA amplification. Afterwards, the amplified signal passes through the

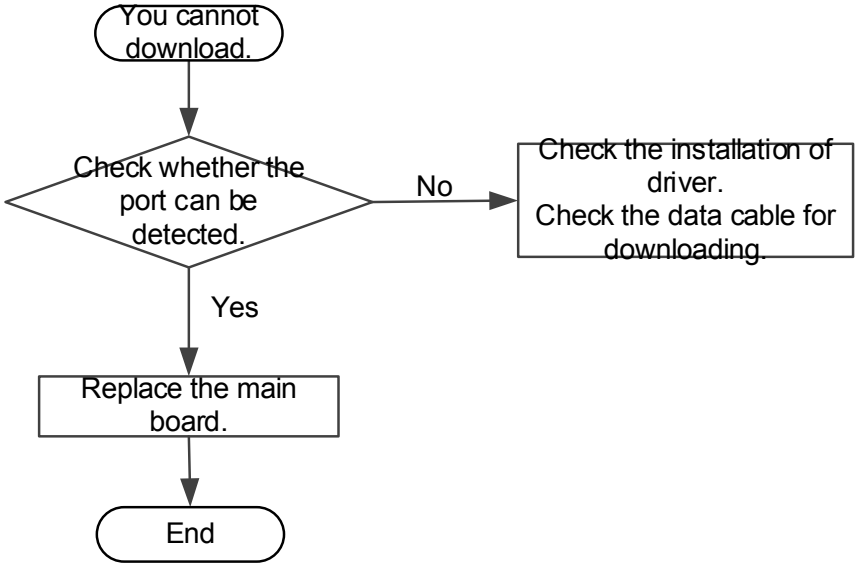
post-filter to the RF Transceiver for demodulation.

The WLAN/BT signal goes to the Switch through the GNSS/WLAN/BT three-in-one antenna, and then passes through the filter to the WLAN module for demodulation. At the same time, the WLAN/BT signal can be modulated in the WLAN module, and then passes through the filter and the Switch to the GNSS/WLAN/BT three-in-one antenna for transmission.

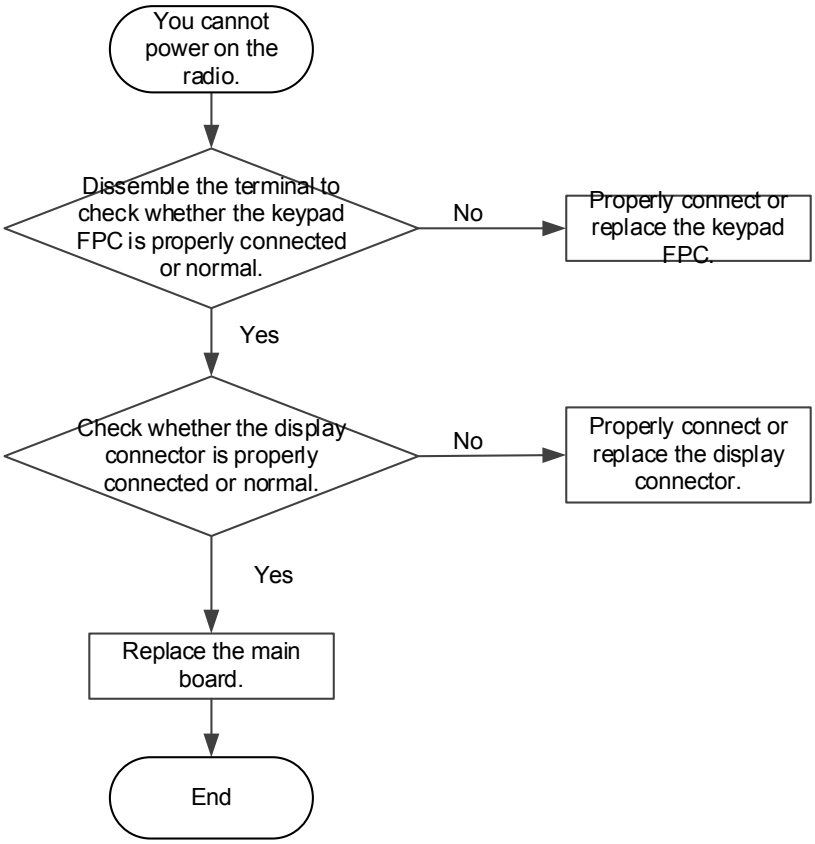
6. Circuit Inspection

6.1 Baseband Section

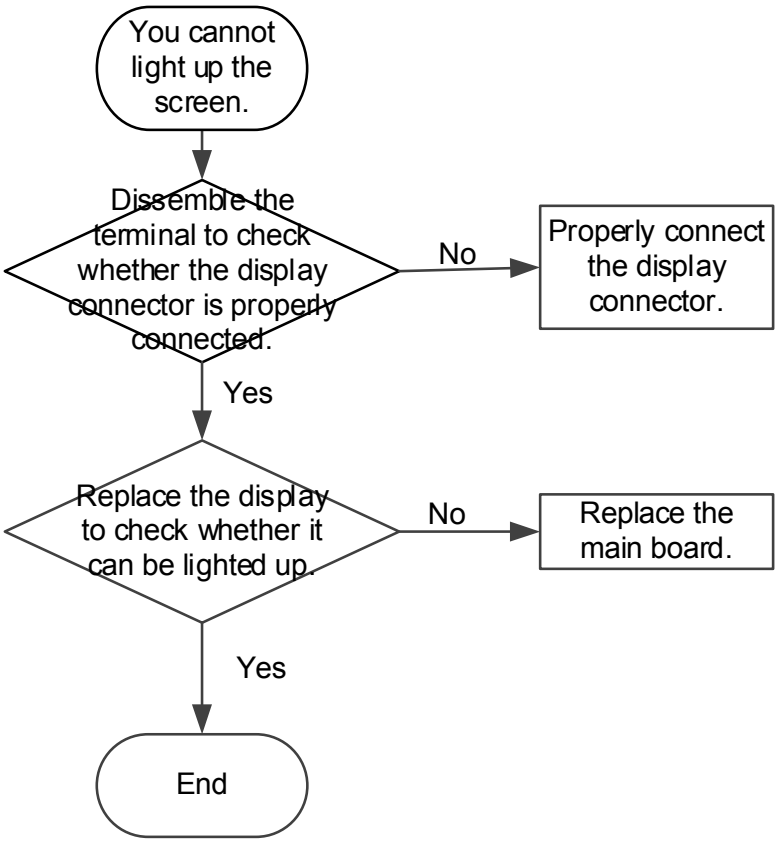
6.1.1 Downloading Failed



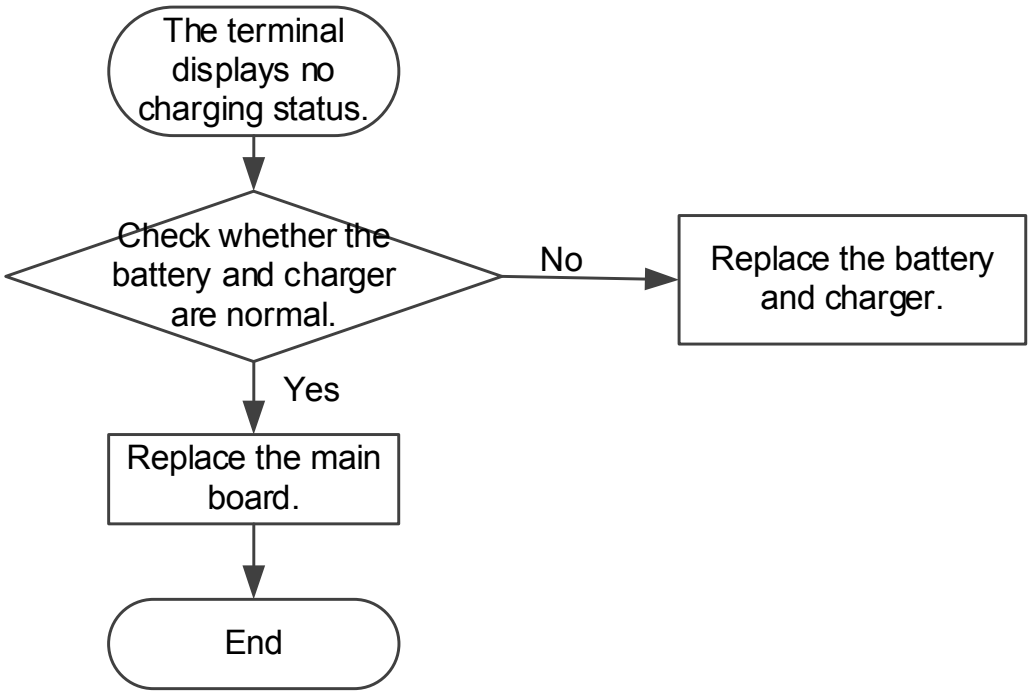
6.1.2 Powering On Failed



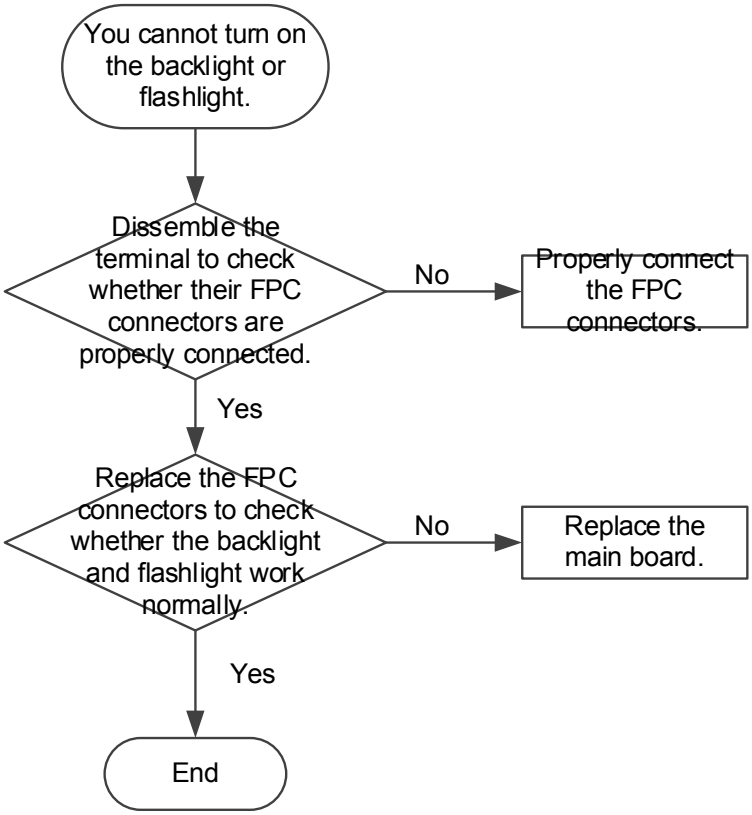
6.1.3 Lighting Up Screen Failed



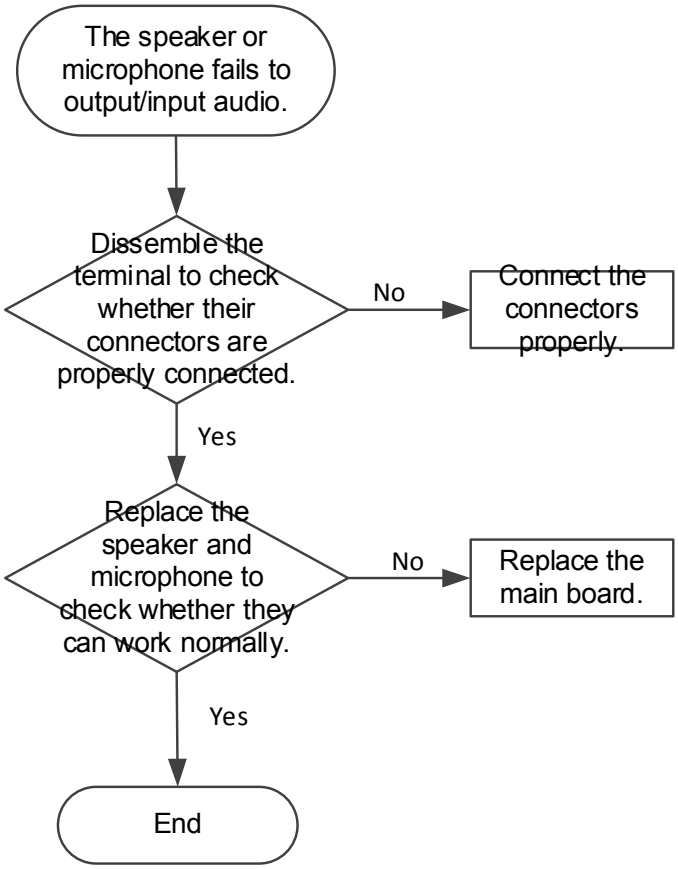
6.1.4 Charging Status Displaying Failed



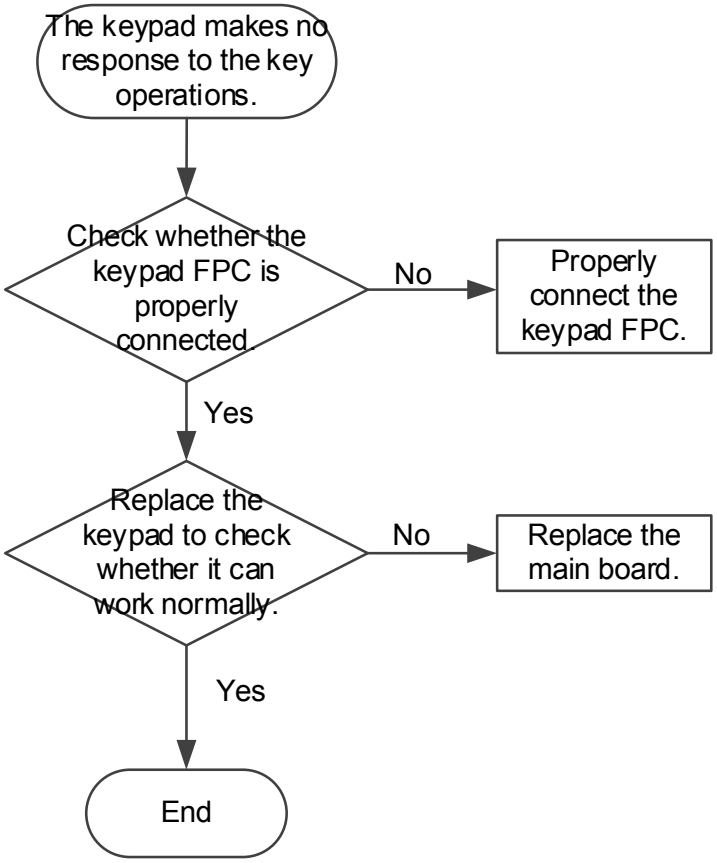
6.1.5 Turning On Backlight/Flashlight Failed



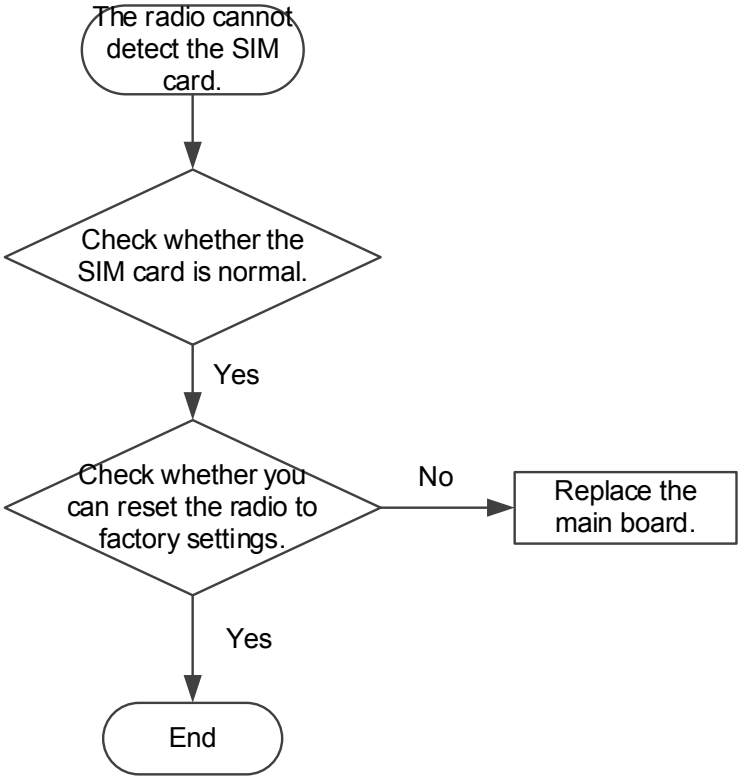
6.1.6 Speaker/Microphone Failed to Output/Input Audio



6.1.7 Keypad Failed to Respond



6.1.8 SIM Card Failed to Be Detected



6.2 RF Section

6.2.1 Calibration Totally Failed

1. Detect whether short circuit exists in the power-on current, and high current exists in the power-off mode.
2. Check whether the port in the Device Manager on the computer is normal.
3. Check whether it is properly soldered from the antenna switch to test socket. The check path is J1000 > R1001 > U1000.
4. If the test fails in diversity module, check whether it is properly soldered from the diversity switch to diversity test socket. The check paths are J1100 > C1127 > U1116, and J1100 > C1110.

6.2.2 XO Calibration Failed

1. Check whether it is properly soldered at crystal oscillator, and whether C1300, R1300, and C1301 are properly attached.
2. Check whether for B5 the circuit from the PA to test charger is normal, including the PA voltage and PA output power. To check the PA output power, in the signaling mode, use QRCT.

6.2.3 Calibration Partly Failed

The following takes LTE B1 for example.

- Tx calibration failed

  Signal path: U13300 > C1312 > L1221/C1211 > U1201 > L1234/R1210 > U1203 > L1227/R1208/L1228 > U1000.

  To identify the problems, use QRCT to transmit RF signals, and then use a spectrum analyzer or CMW500 or other devices to detect whether the output/input signal has big attenuation.

- Rx0 (main reception) calibration failed

  Signal path: U1000 > L1228/R1208/L1227 > U1203 > L1262/C1215 > L1233/C1217/L1231 > U1300.

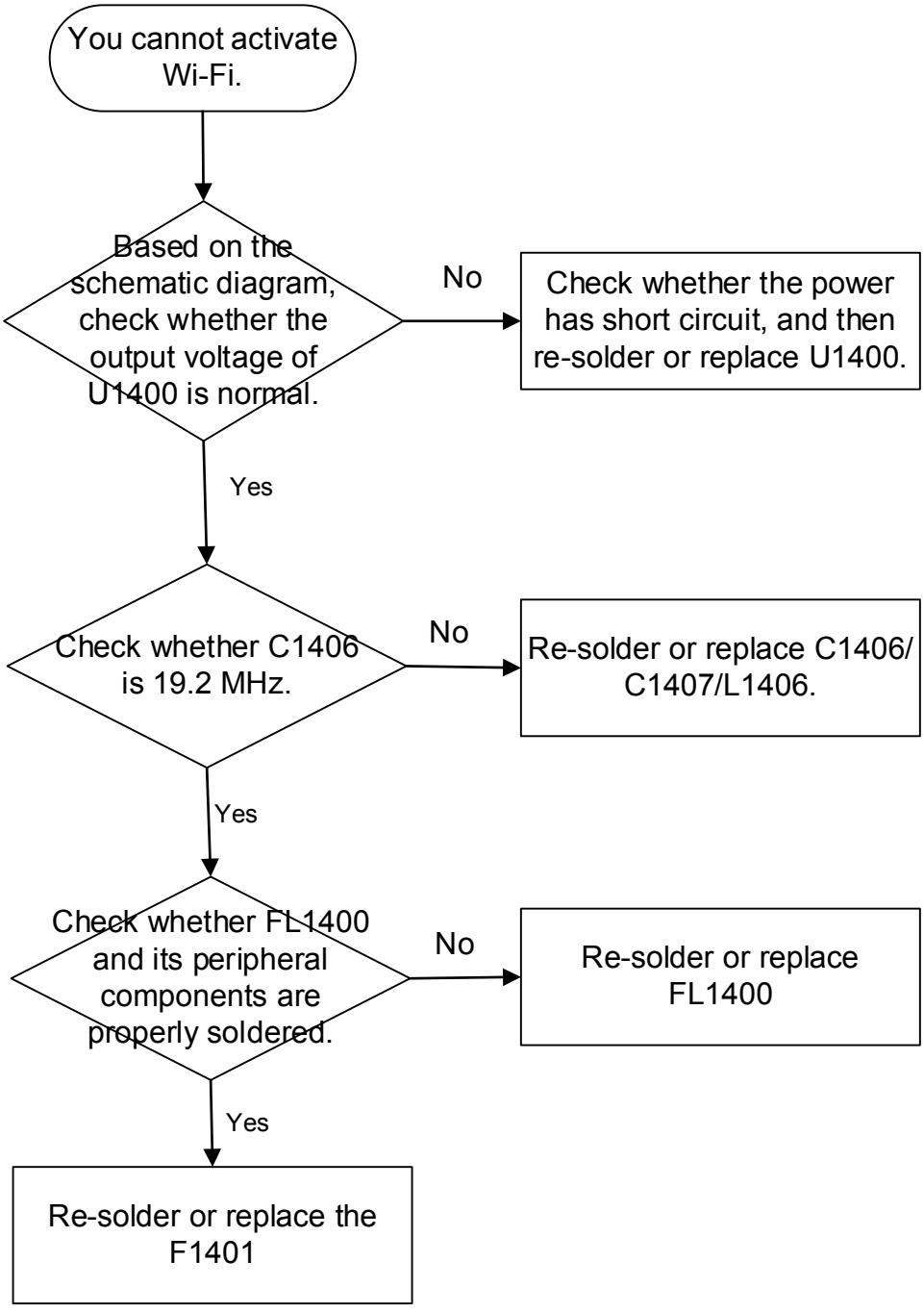
- RX1(Diversity or MIMO) calibration failed

  Signal path: U1100 > C1109/L1112 > F1102 > L1110/C1107 > L1111/C1108/L1109 > U1300.

The signal paths of Tx, Rx0, and Rx1 for other frequency bands are similar to the above.

6.3 Wi-Fi Section

6.3.1 Connecting to Wi-Fi Networks Failed



6.3.2 Poor Wi-Fi Network Performance

Use QRCT to force the system to transmit the WLAN signal, and then check whether the WLAN signal can reach the expected power level. If not, on the circuit diagram check whether the Wi-Fi RF circuit is normal and whether the parts are well soldered and normal. RF signal path: J1400 > L1408 > R1403 > F1401 > L1404 > L1400 > L1405 > FL1400 > C14020 > L1401 > C1415 > C1408 > U1400.

7. Interface Details

Interface	Pin No.	Signal
USB connector	1	VBUS
	2	USB_DM
	3	USB_DP
	4	USB_HS_ID
	5	GND
Audio connector	1	SPK+
	2	MIC+
	3	GND
SIM card Interface	1, 6	VREG_L14_UIM1
	2	UIM1_RESET
	3	UIM1_CLK
	4, 8	/
	5	GND
	7	UIM1_DATA

8. Tuning Description

All software and tools are available in the software package published by the Company.

8.1 Installing Driver

When the terminal is successfully connected to PC through the USB cable, the PC Device Manager displays the port of Diagnostic and ADB. To ensure the successful connection between PC and terminal, use the right installation file or package of the USB driver.

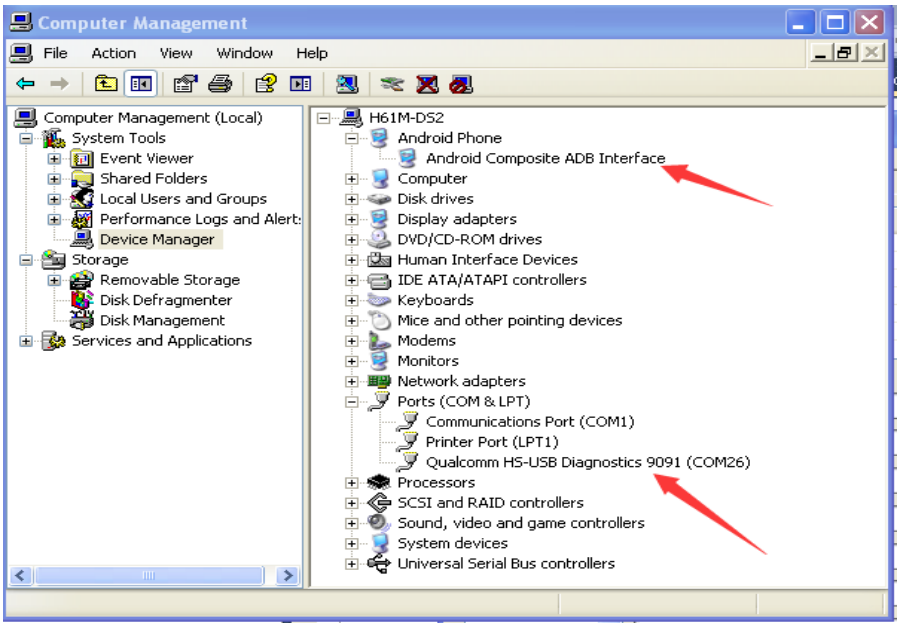
8.2 Upgrading Software

8.2.1 Preparation

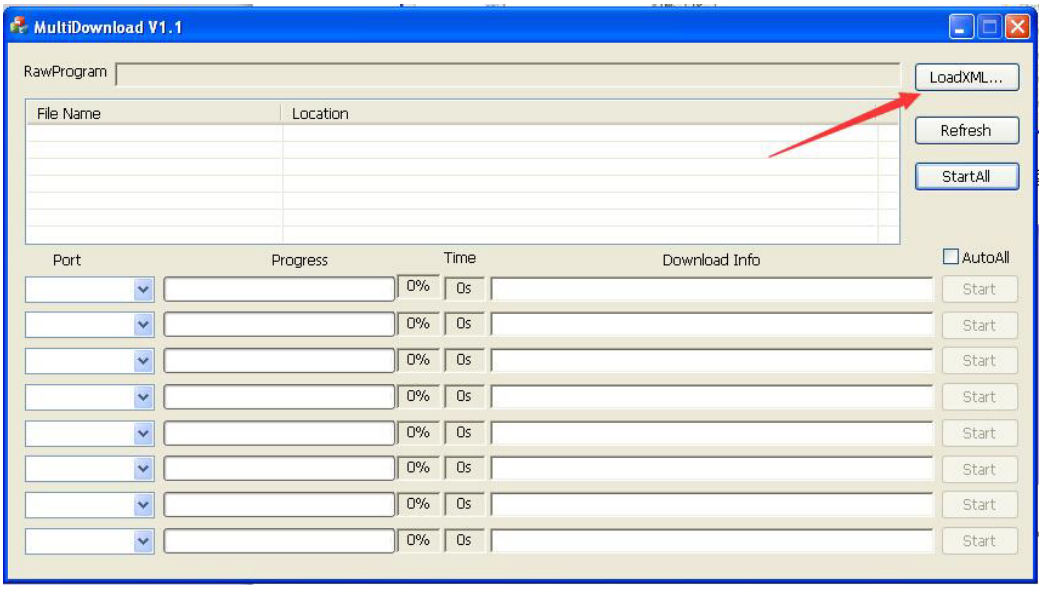
You have obtained the broadband software package, MultiDownload_V2.1.

8.2.2 Procedure

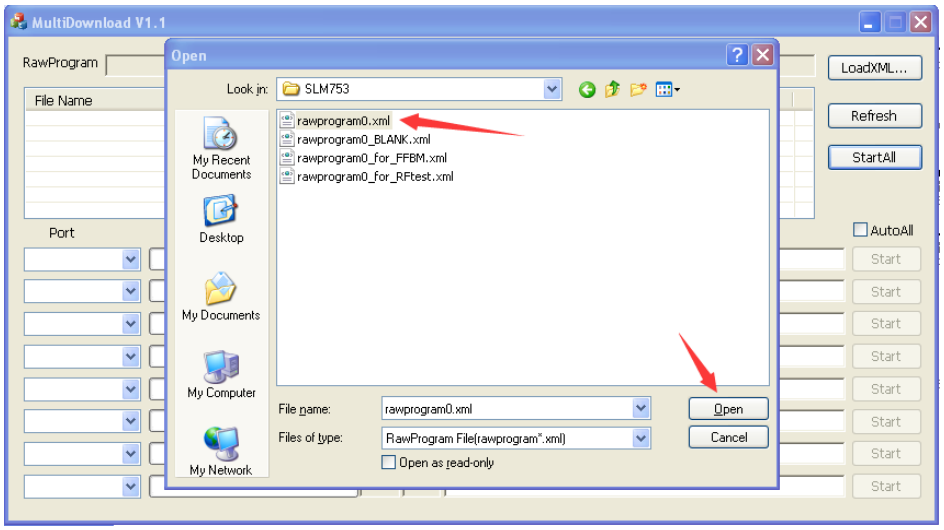
1. Press two **Volume key**s at the same time, and then press the **On-Off** key.
2. Unzip the upgrade tool "MultiDownload_V2.1".
3. Connect the radio to the PC using the USB cable. The device manager displays the COM serial port of Qualcomm 9091. If not, ensure that the Qualcomm driver is installed on the computer.



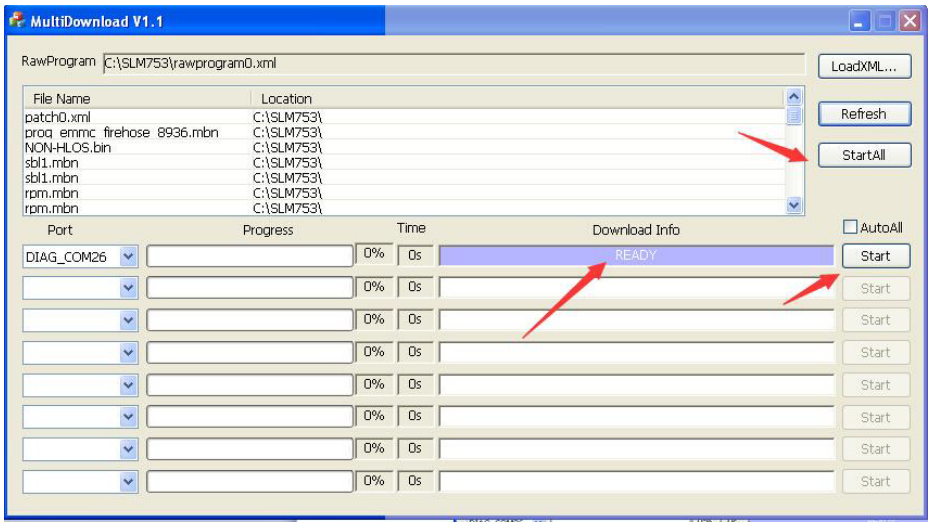
4. Open MultiDownload, click **LoadXML** to select the software for burning, and then enter the password **123456** when you are notified to.



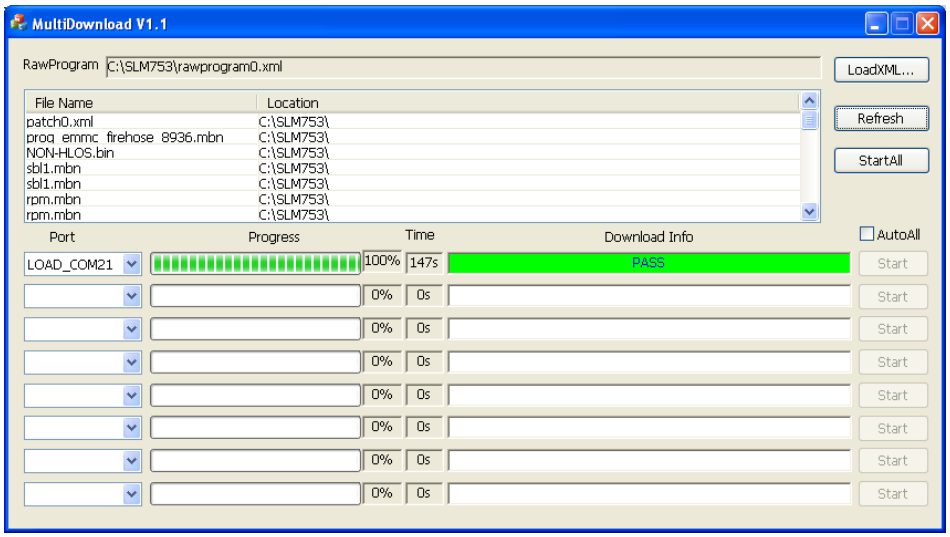
5. Select the **rawprogram0.xml** file to download. (If you find no such file, consult the relevant R&D or technical support engineer.)



6. Click **Start**. The **Download Info** panel displays **PASS** when the burning is completed.



7. Restart the terminal.



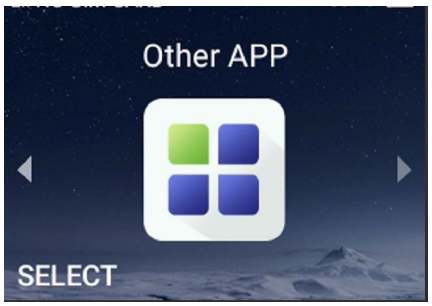
8.3 Testing the Radio

8.3.1 Preparation

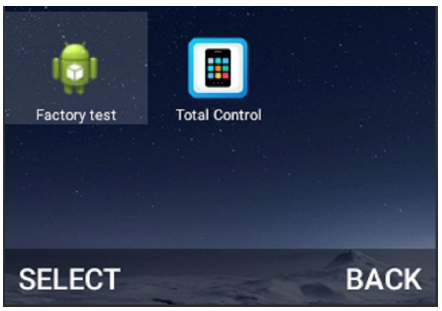
You have prepared the following devices: the terminal of PNC370, battery, USB cable, SIM card, earpiece, desktop charger, WIFI network, and BT device.

8.3.2 Procedure

1. Power on the radio with the SIM card inserted.
2. Select **Other app**.

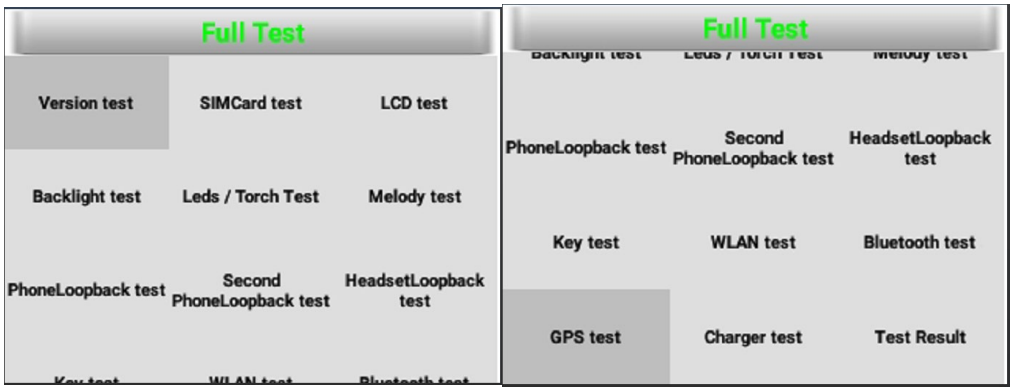


The following interface appears.



3. Select **Factory test**. (If **Factory test** does not appear on the interface, run the **open test** file to make it show up. If the screen turns to black and white when power-on, the terminal enters the FFBM mode.)

4. Press the **P1** key, and then the automatic test starts from the first item to the last one (15 test items in total).



8.3.3 Judgement Standard for Test Items

The table below lists the details of each test item.

No.	Test Item	Operation & Judgement Standard	Note
1	Version test	The screen displays information.	/
2	SIM card test	Before powering on the terminal, insert the SIM card properly.	/
3	LCD test	Check the screen color. The color displays normally.	/
4	Backlight test	Check the backlight brightness from the lowest to highest level.	/
5	Leds/Torch test	Press and hold the **P1** key, and check the LED status. In the normal case, after pressing the **P1** key for ten times, you can pass the test.	If you find the keypad backlight dim, move away from strong light, or block the environment light with your hand.
6	Melody test	The speaker sounds at a normal volume level.	/
7	PhoneLoopback test	Test the front microphone. Press the **P1** key to start recording. Press the **P1** key again to start playing	Key test item.

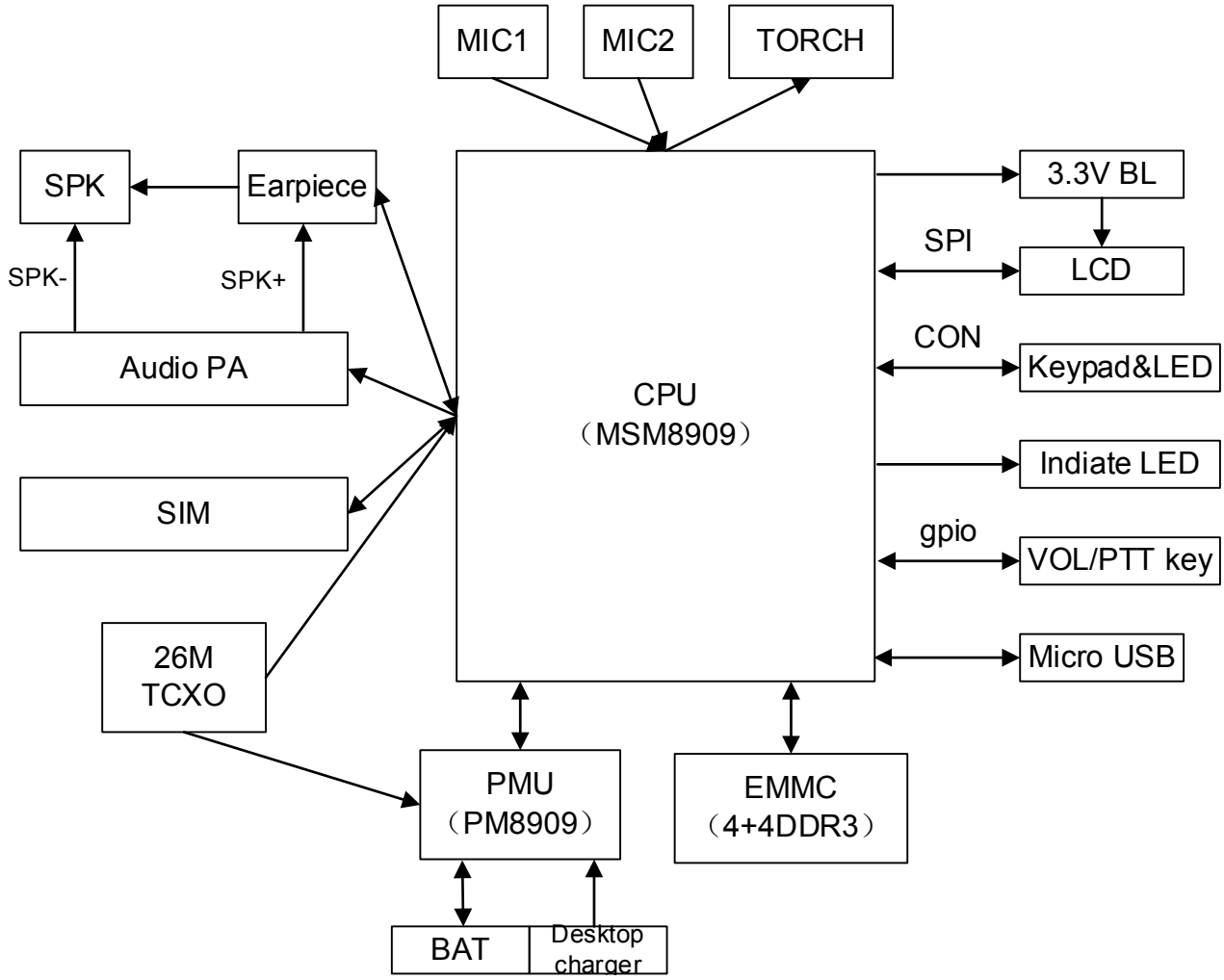
No.	Test Item	Operation & Judgement Standard	Note
		the recorded file.	
8	Second PhoneLoopback test	Test the rear microphone. Press the **P1** key to start recording. Press the **P1** key again to start playing the recorded file.	Key test item.
9	HandsetLoopback test	Insert the earpiece, and then press the **PTT** key to speak into the earpiece MIC. When releasing the **PTT** key, you hear your voice clearly.	Key test item.
10	Key test	Press all keys (including 11 keys on the front case and 3 keys on the left side) on the terminal once. If the notification “PASS” appears, the test passes.	Key test item. Pay special attention to the test on the **PTT** key and **volume** key.
11	WLAN test	The terminal recognizes the WLAN network.	/
12	Bluetooth test	The terminal recognizes the BT device.	/
13	GPS test	Select **PASS**.	/
14	Charger test	Connect the terminal to the USB port or desktop charger. If the terminal displays the charging icon, and the notification “PASS” appears, the test passes.	Key test item. Ensure that the charging piece of the desktop charger is properly installed.
15	Test Result	When all test items are passed, you can view the test result.	/

8.3.4 Hiding the Test App

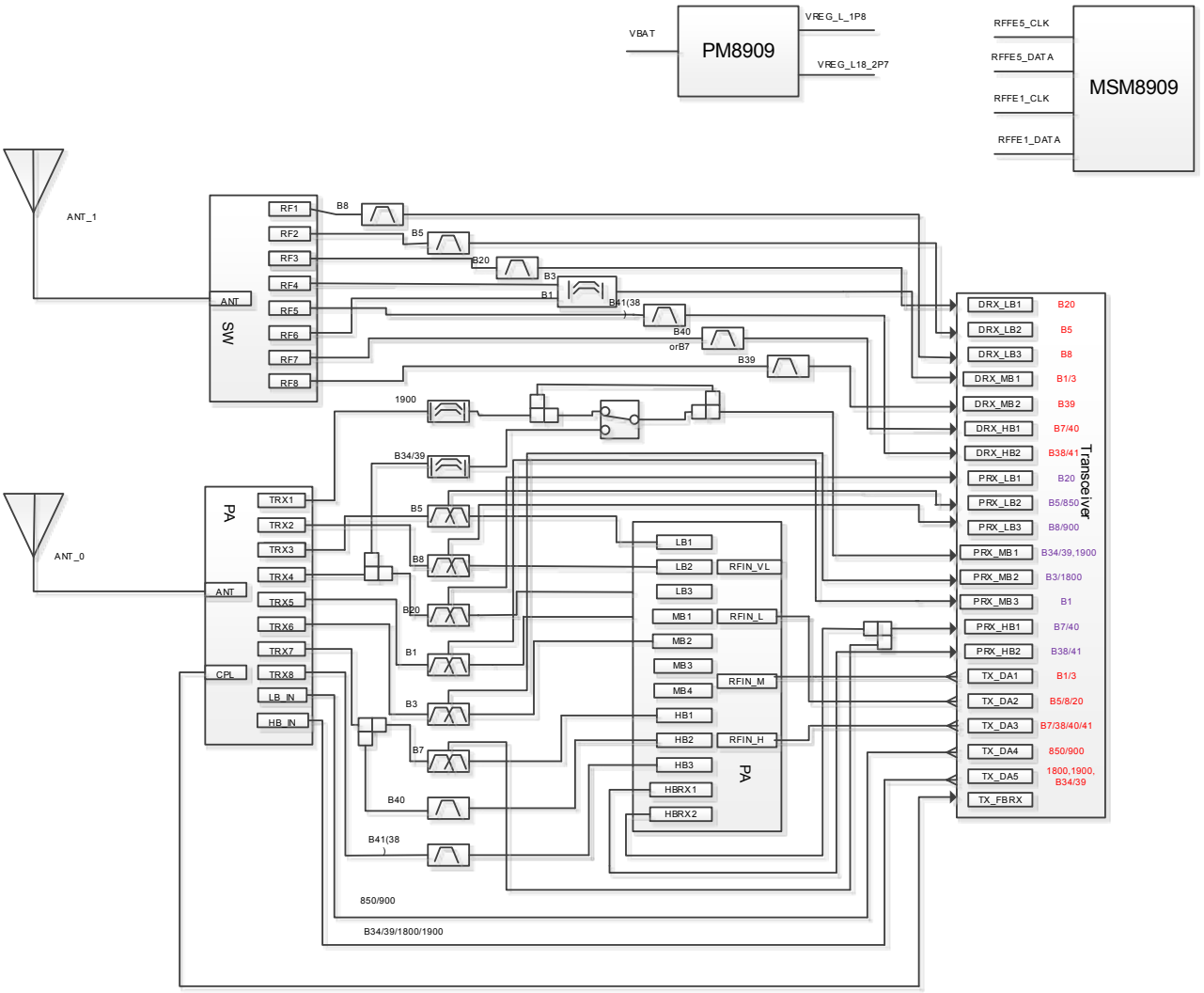
To hide the test app after you get the test result, press the **P1** key, and then select **OK** in the pop-up notification.

9. Block Diagram

9.1 Baseband Section



9.2 RF Section



10. Part List

No.	Ref No.	Part No.	Priority	Description	Qty
1	/	X0000002268	/	Mechanical material for radio unit	1
2	34	5116000002471A	/	Chassis	1
3	19	50151100000040	Optional	Antenna	1
4	20	5116000000841A	/	Micro USB cover	1
5	21	5116000001582A	/	Accessory connector cover	1
6	22	5116000001552A	/	Stopper for accessory connector cover	2
7	41	5110000000033A	/	Silicone rubber cover for microphone	1
8	40	51020200000053	Optional	Microphone	1
9	/	50151100000041	Optional	Diversity antenna	1
10	20	5113070000149A	/	Double-sided tape for main antenna	1
11	15	5113010000351A	/	PC plate for earpiece jack	1
12	18	5115020000046A	/	Grounded conductive foam for speaker	1
13	32	5107000000234A	/	Machine screw	4
14	24	5107000000157A	/	Self-tapping screw	4
15	25	5107000000051A	/	Machine screw	2
16	38	5113050000346A	/	Preloaded foam for speaker	1
17	14	5115020000048A	/	Grounded conductive foam for LCD	1
18	1097	5113030000026A	/	Waterproof MIC mesh	1
19	/	5110000000402A	/	Waterproof ring for M2 screw	2
20	36	5115020000050A	/	Grounded conductive foam for keypad screw	2
21	23	5110030000035A	/	Waterproof ring for battery cover	1
22	22	5110990000026A	/	Silicone rubber cover for Micro SIM card	1
23	16	5110010000026A	/	Silicone rubber cover for battery	1

No.	Ref No.	Part No.	Priority	Description	Qty
				connector	
24	31	5110030000050A	/	Waterproof ring	1
25	45	5115020000047A	/	Grounded conductive foam for key	2
26	17	50100200000057	Optional	TFT LCD	1
27	/	5113070000151A	/	Double-sided tape for LENS	1
28	/	5116000002578B	/	LCD lens	1
29	/	11510000062236	/	Front case processing component	1
30	/	5116000002470A	/	Front housing	1.01
31	/	5116000002472A	/	PTT key bracket	1.01
32	/	5116000002477A	/	LED cover	1.01
33	/	5116000001101A	/	Convex lens	1
34	/	5116000002484A	/	P&R key	1
35	/	50151100000039	Optional	GPS/Wi-Fi/BT antenna	1
36	/	5112010000112A	/	Metal dome	1
37	/	5110000000033A	/	Silicone rubber cover for microphone	1
38	/	51020200000053	Optional	Microphone	1
39	/	51020600000125	Optional	Speaker	1
40	/	5113050000344A	/	Buffer foam for LCD	1
41	/	5113070000148A	/	Double-sided tape for flashlight lens	1
42	/	5113070000150A	/	Double-sided tape for GPS antenna	1
43	/	5113030000026A	/	Waterproof MIC mesh	1
44	/	5113040000197A	/	Speaker felt	1
45	/	5107000000507B	/	Machine screw	2
46	/	11500000004820	/	Semi-finished flashlight board	1
47	D1	50050600000178	Optional	LED	1

No.	Ref No.	Part No.	Priority	Description	Qty
48	T1	50050800000051	Optional	ESD protection diode	1
49	CON1	51040100000261	Optional	Board-to-board connector	1
50	/	5001020000539C	N/A	FPC	1
51	/	11500000004819	/	Semi-finished keypad	1
52	C1	50020100001205	Optimized	Chip capacitor	1
53	D1, D2, D3, D4, D5	50050600000125	Optional	LED	5
54	J1	51040100000058	Optimized	Board-to-board connector	1
55	Q2	50070300000055	Optional	N-MOSFET	1
56	R12	50030100001917	Optimized	Chip resistor	
57	T1, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22	50050800000049	Optional	ESD protection diode	11
58	T23	50050800000051	Optional	ESD protection diode	1
59	R25, R26, R27, R28, R29	50030100000497	Optimized	Chip resistor	5
60	/	5001020000524D	N/A	FPC	1
61	/	5113070000154A	/	Double-sided tape for flashlight FPC	1
62	/	5113070000155A	/	Dual-sided tape for keypad	1
63	/	5110990000025A	/	Light guide	1
64	/	5110020000027A	/	Silicone rubber PTT key	1
65	/	5116000061272A	/	**PTT** key	1
66	/	5111000060729A	/	Left charging piece	1
67	/	5111000060736A	/	Right charging piece	1
68	/	50099900000001	/	B3 main board for Korea	1
69	/	54991010002244	/	B3 main board for Israel	1

No.	Ref No.	Part No.	Priority	Description	Qty
70	/	50099900000006	/	B4 main board for China	1
71	/	54991010002080	/	B5 (FDD-LTE: B1/B3/B5/B7/B8/B20) MEIG main board	1
72	/	54991010002840	/	B6 main board for Americas	1

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