Profession Wirsless communication system solution supplier

T60/T65
Handheld Two-Way Radio
Service Manual

Version: V1.1

Fujian Kirisun Communications Co.,Ltd

Contents

1 Overview

1.1 Range of Application

This manual is applicable to the maintenance and repair of the T60 / T65 handheld two-way radio based on public network. The manual is intended for use only by the engineers and professional technicians who have received training from Kirisun. The manual is subject to change because of technology development. For the latest technical data of the product, please contact Kirisun or a local agent.

Before maintaining the device, please read this manual carefully.

1.2 Safety Precaution

Electromagnetic Radiation

Two-way radios generate and radiate electromagnetic energy. The electromagnetic radiation of Kirisun two-way radios conforms to the Chinese and international standards. To ensure the best communication effect and personal safety, keep the radio vertical to the ground and the microphone 2 to 5 centimeters from the mouth while using the radio.

Electromagnetic Interference

To avoid electromagnetic interference, turn off the radio in a place where it is clearly required, for example, a hospitals, health center or airport.

Explosive Harmful Gas

- It is better to shut down the radio in an area with explosive harmful gas, for example, the lower deck of a hull, a facility for containing or transporting fuel oil or chemicals, and an area with chemical substances or particles, dust or metallic dusts in the air.
- Shut down the radio if you are near a blast are or an electric blasting detonator.
- It is prohibited to replace or charge the battery in a potentially explosive atmosphere.

Damaged Antenna

A broken antenna may cause mild burn when contacts with human skin. It is better not to use the radio if the antenna is broken.

Part Replacement

Pay attention to the model when you replace a part. Do not use a part incompliant with the requirements stated in the materials provided by the company.

1.3 Maintenance Service

The Chinese standard of “guarantee of repair, replacement and refund” is provided to wireless two-way radios.

A warranty of 12 months is provided to the main part of the radio, and a warranty of 6 months for the accessories (including the battery, transformer, earphone, antenna and charger). However, the warranty will be voided under any of the following

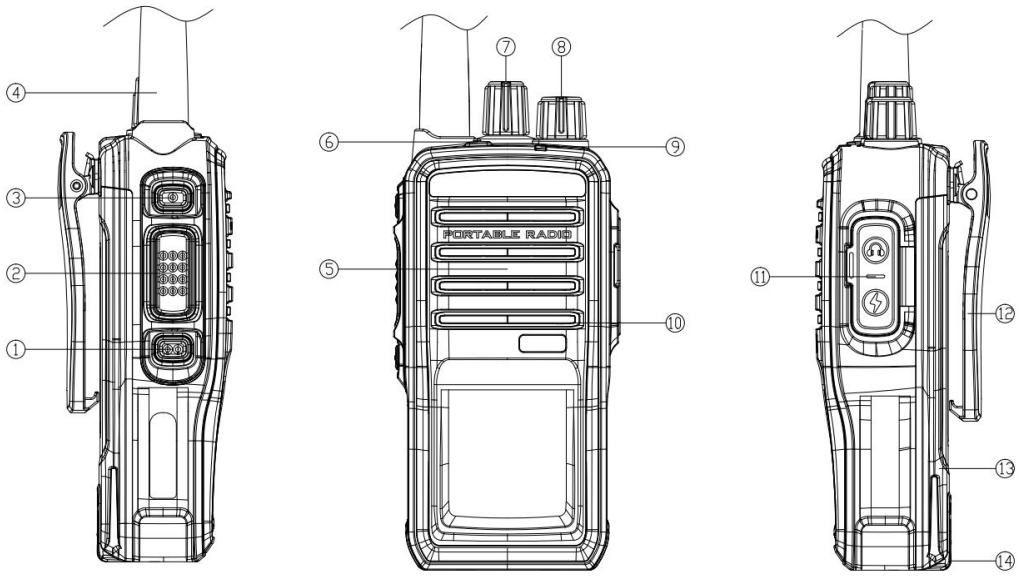
circumstances.

- Failure to present a valid warranty card or original invoice.
- Malfunction caused by unpermitted disassembly, repair or modification.
- Damage of the product due to wear, mechanical damage, burn or inlet of water.
- Damaged product SN or unidentifiable brand.

Lifelong maintenance service will be provided, and parts will be provided to maintenance stations and maintenance personnel at preferential prices after the warranty period.

2 External View and LED Indicator

2.1 External View



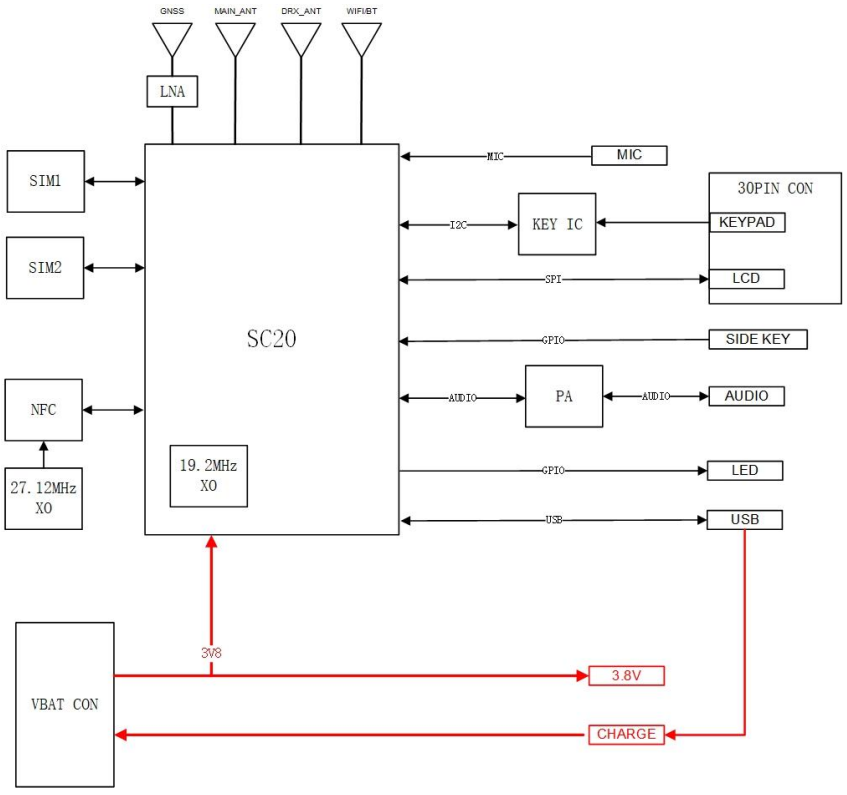
SN	Part Name	SN	Part Name
1	Side Key 2 Programmable key, no function by default	10	Microphone
2	PTT Key	11	Earphone/USB port
3	Side Key 1 Programmable key, no function by default	12	Belt clip
4	Antenna	13	Battery
5	Speaker	14	Battery latch
6	Alarm Key		
7	Encoding knob		
8	Volume knob		
9	Light pipe		

2.2 LED Indicator

LED State	Radio State
Red light on	No SIM card, or charging in progress
Red light flashing	Not registered, and searching network (SIM card and Wi-Fi are detected)
Green light on	Charging finished, or signals being received or transmitted
Green light flashing	Registered successfully and in standby mode
Orange light flashing	Being powered on
Orange light on	Individual call being made or received, or the account not deployed in the platform

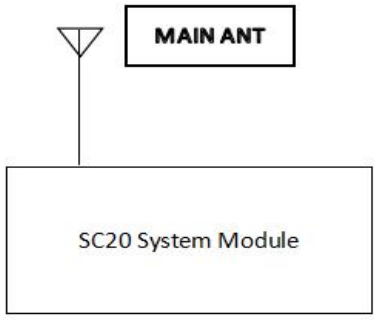
3 Circuit Description

3.1 Circuit Diagram

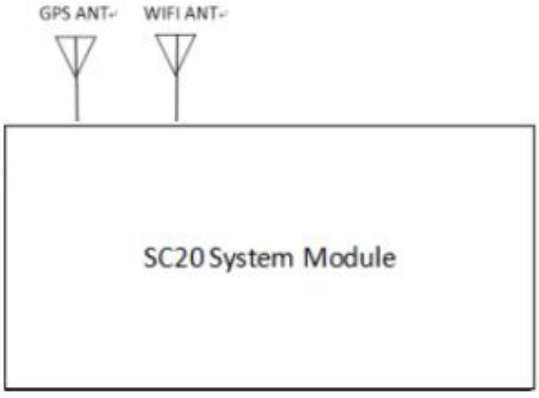


The radio is composed of these function modules: a LCD module, a key detector module, an audio power amplifier, an NFC module, a SIM card module, a USB storage module, a Wi-Fi module, a GPS module and a BT module.

3.2 RF Circuit

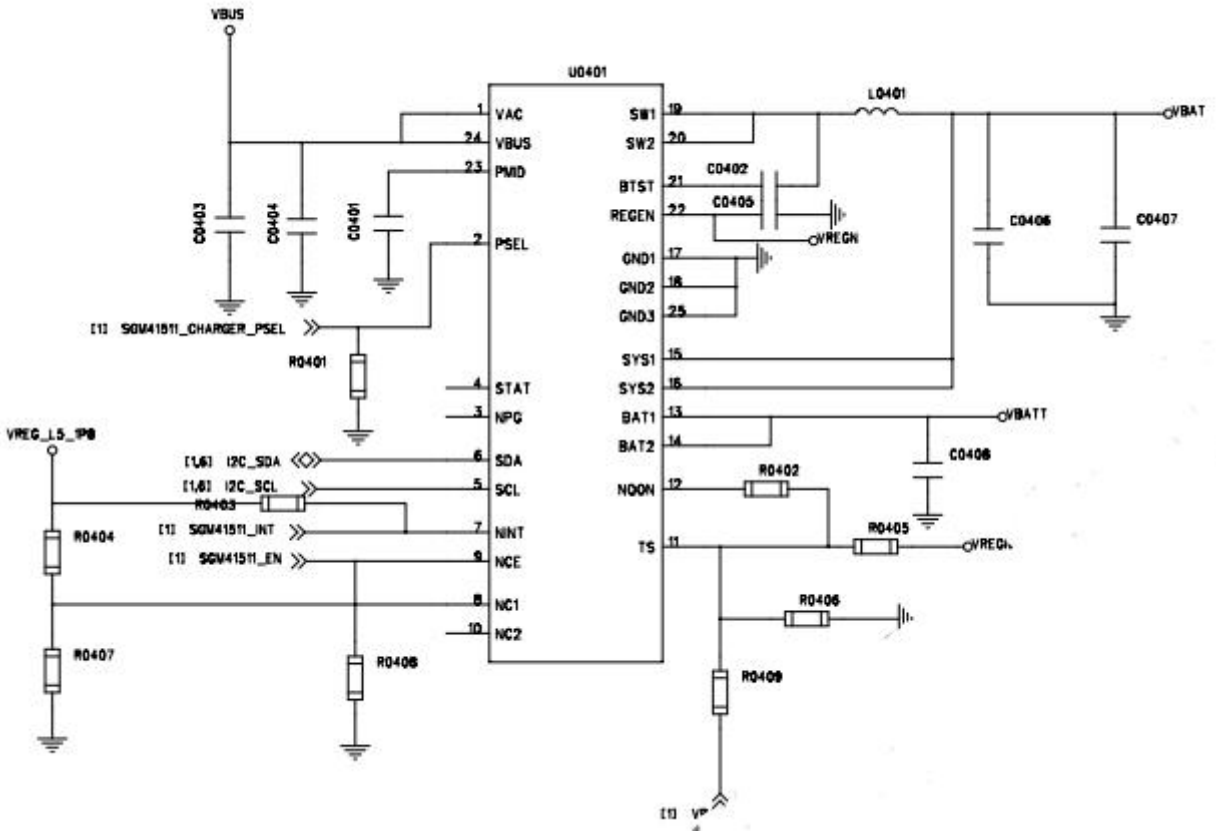


3.3 Wi-Fi/GPS Circuit

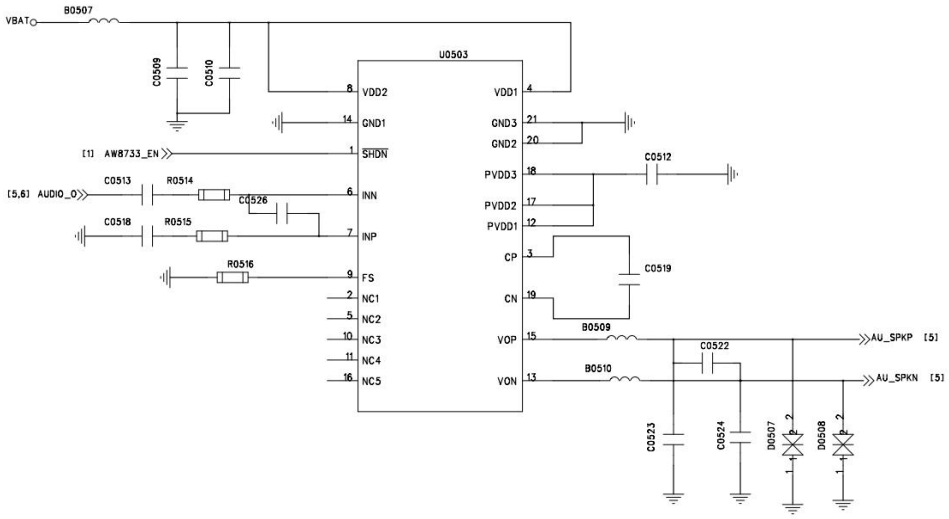


3.4 Baseband Circuits

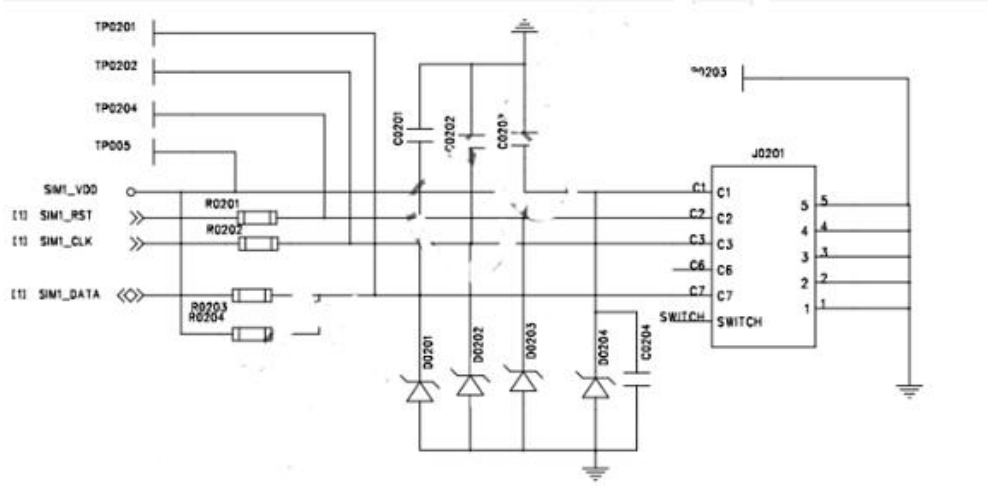
3.4.1 Power Supply Circuit

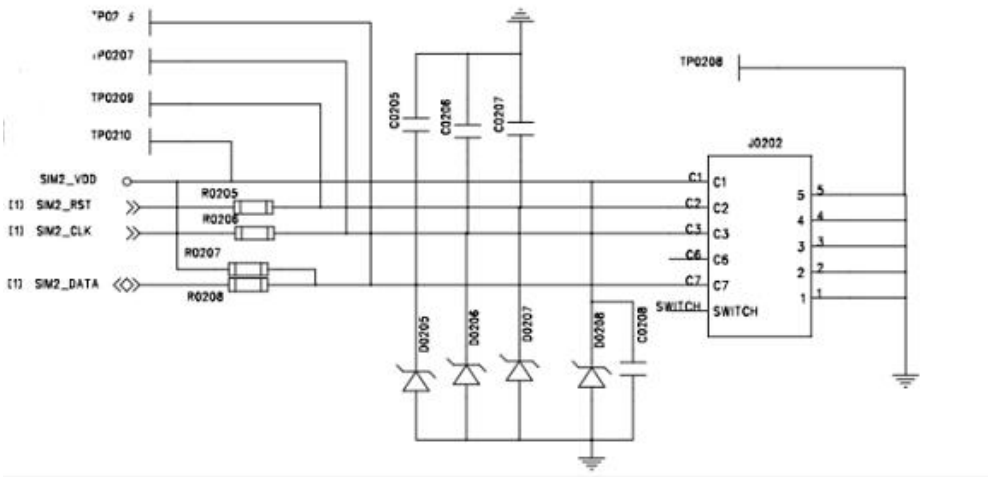


3.4.2 Audio Frequency Circuit

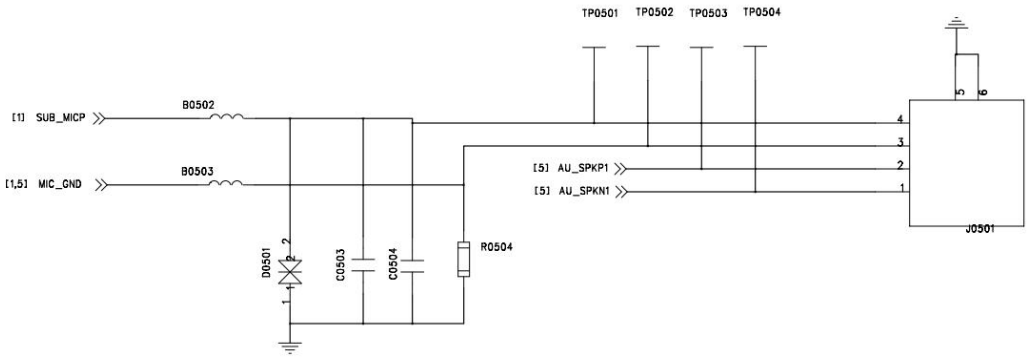


3.4.3 SIM Card Interface Circuit

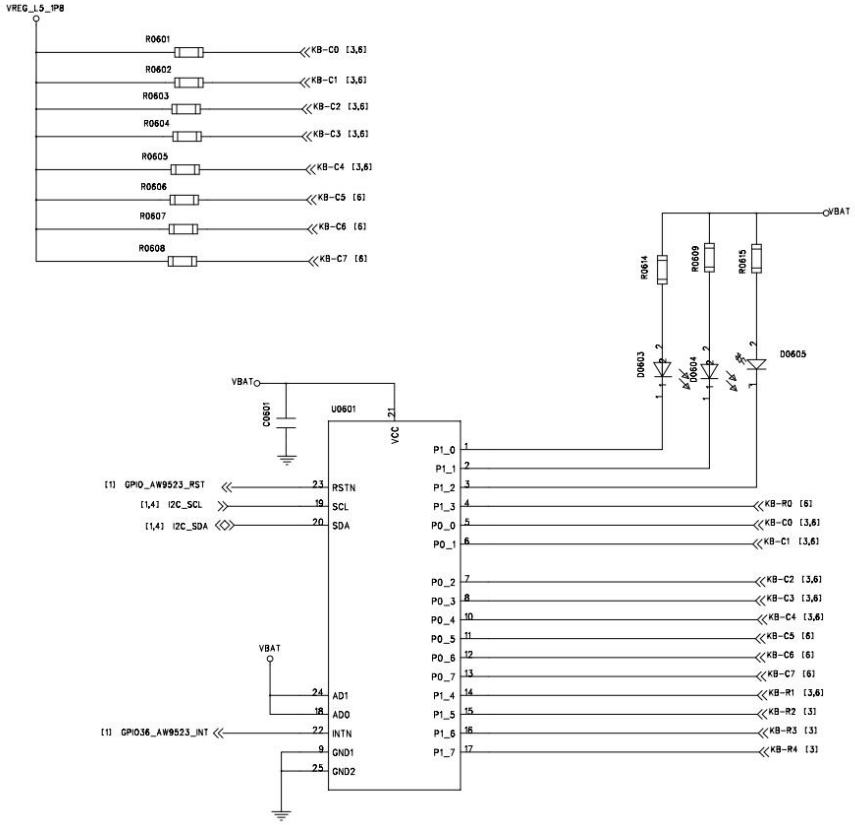




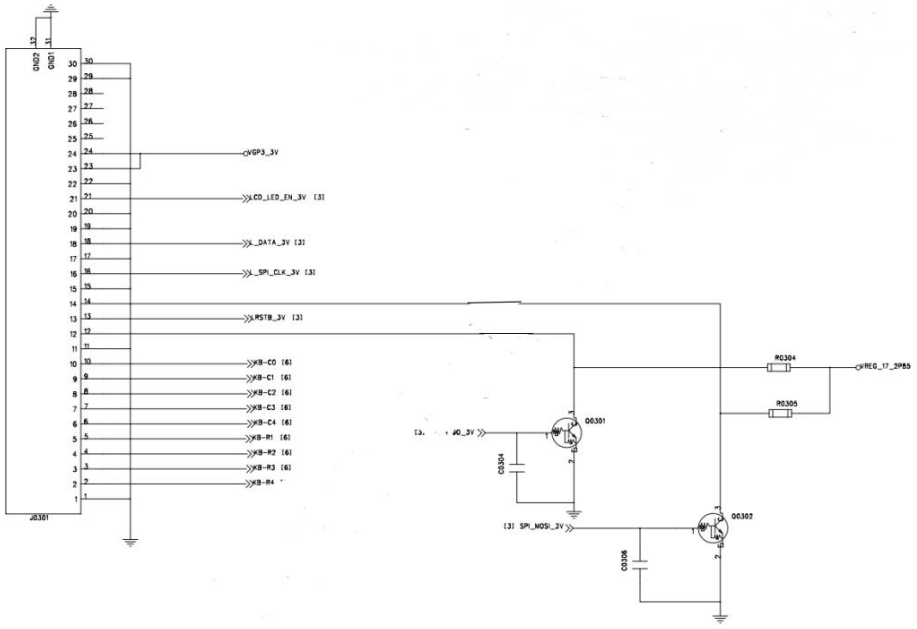
3.4.4 MIC Circuit



3.4.5 Key Circuit



3.4.6 LCM Circuit



4 Functions and Parameters

4.1 Basic Functions

- Voice: Individual call, group call
- SMS: Sending and receiving short messages coded by the platform
- GPS: Positioning and data submission
- Graphic UIs
- SOS alarm, call alert
- Bluetooth, Wi-Fi
- Multi-lingual display and broadcasting

4.2 Advanced Functions

- Frequency bands:

  2G GSM: B2+B5

  3G WCDMA: B1+B2+B4+B5+B8

  4G LTE: FDD: B2/B4/B5/B7/B12/B13/B25/B26

- Display of field intensity to indicate signal strength
- Display of battery capacity, alarm for low voltage
- Display of groups and states of terminals

4.3 Parameter Settings

The radio has been set before delivery. However, to meet customers' requirements, further configuration may be necessary, for example, programming of a function key, Wi-Fi, Bluetooth, roaming and Pin lock. This can be achieved by the programming software PC Tool developed by Kirisun. It is user-friendly and easy to operate, and supports Chinese, English and Turkish.

Take the following steps to set parameters of the radio on a PC.

1. Install the PC Tool on the PC. (By default, the language is set automatically language system)

2. Charge the radio. Connect the radio to the PC using the programming cable.

Note: While connecting the radio and the PC, make sure they are powered off.

3. Power on the PC.

4. Power on the radio.

5. Run the PC Tool.

6. Click Read from the menu, and the PC will read the parameters of the radio.

7. There are two ways to write data. One is to go to a menu item and click Set, and the other is to click Write after setting all parameters.

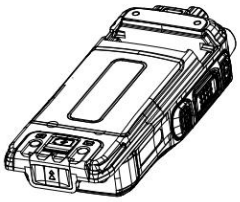
5. Disassembly

5.1 Installing/Uninstalling the Battery

Installing the Battery

1. Put the battery into the aluminum-alloy holder at the back of the radio.

2. Push the battery upwards to the upper edge of the holder, and then push it down until a click is heard.



Uninstalling the Battery

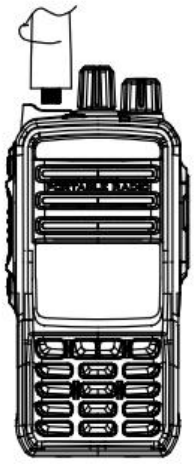
1. Push upward the battery latch at the bottom of the radio.

2. Take down the battery.

5.2 Installing/Uninstalling the Antenna

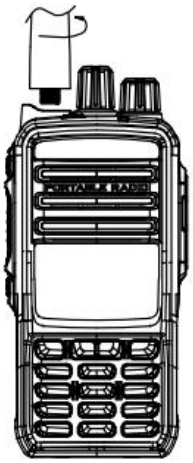
Installing the Antenna

Insert the whorled end into the slot at the top of the radio, and then turn the antenna clockwise to tighten it.



Uninstalling the Antenna

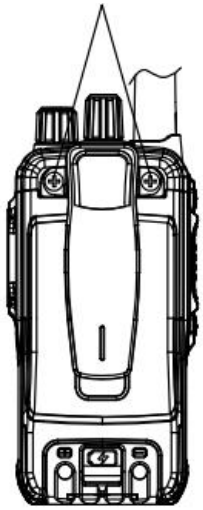
Hold the lower part of the antenna, and then turn it counterclockwise.



5.3 Installing/Uninstalling Belt Clip

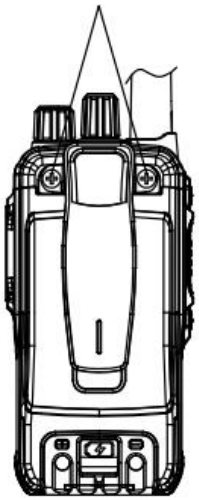
Installing Belt Clip

Align the two screw holes on the belt clip with the two at the back of the radio, and tighten the screws using a cross screwdriver.



Uninstalling Belt Clip

To uninstall the belt clip, loosen the screws using a cross screwdriver, and then take off the belt clip.



5.4 Disassembling Aluminum-alloy Holder and Components of Main Part

1. Take down the belt clip. See 5.3 Installing/Uninstalling Belt Clip for details.

2. Take down the antenna. See 5.2 Installing/Uninstalling the Antenna for details.

3. Take down the battery. See 5.1 Installing/Uninstalling the Battery for details.

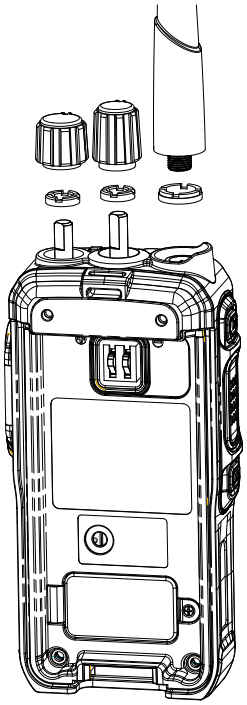
4. Take down the two bolts at the bottom of the radio, the nut fixing the antenna, and take down the two screws fastening the battery holder using a tool.

Insert the end of the straight screwdriver into the battery buckle and lift it gently until it goes up.

Note:

Avoid pulling the antenna conductor and the GPS/Wi-Fi antenna with force.

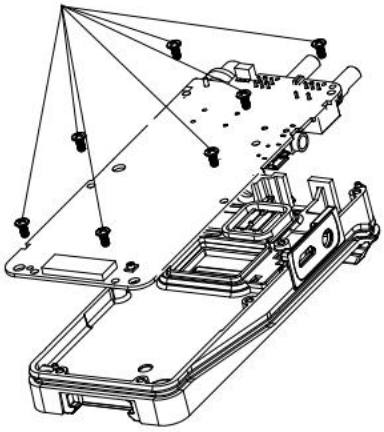
5. Hold the battery holder, and draw the shell backwards, so that the antenna connector at the top of the aluminum-alloy holder turns up. Take out the flexible flat cable from the socket. Now the assembly of the aluminum-alloy holder and the main board is detached.



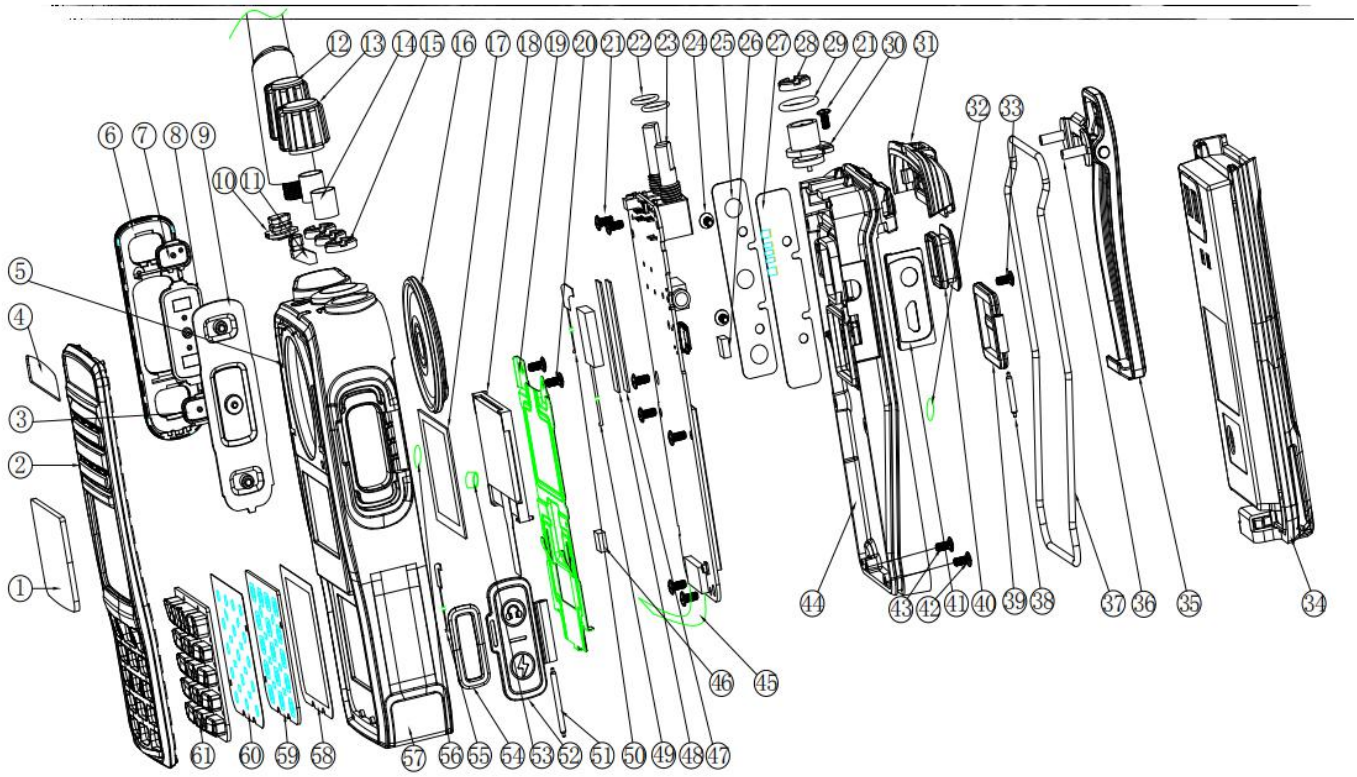
5.5 Detaching Main Board from Aluminum-Alloy Holder

1. Take down the ten bolts from the main board.

2. Screw down all the screws (two at the PTT key). Now the aluminum-alloy holder and the main board are separated.



Explosion Diagram



SN	Material NO	Specifications	QTY
1	7MBP-4207-02A-W0	Glass (for model DP480)	1
2	147K01000060	Front shell cover (for model DP480)	1
3	7MHP-4207-06A-W0	Side key cap (down) (for model DP586)	1
4	7PLJ-4230-E01B	Nameplate (for model DP585)	1
5	7GCB-448280-W0A	Speaker dust screen	1
6	7MHP-4207-04A-W0	PTT cover (for model DP586)	1
7	7MHP-4207-05A-W0	Side key cap (up) (for model DP586)	1
8	7MHP-4207-01A-W6	Plastic PTT key (Blue) (for model DP586)	1
9	7MHR-4207-03B-W0	Silicon PTT key (for model DP586)	1
10	7MHR-4207-04A-W3	Alarm key (for model DP586)	1
11	7MHR-4207-05A-WC	Light pipe (for model DP586)	1
12	7MHP-4182-01A-W0	Volume knob (for model DP990)	1
13	7MHP-4182-02A-W0	Encoding knob (for model DP990)	1
14	7MHS-4072-08A-W	STP knob circlip	2

SN	Material NO	Specifications	QTY
15	7MHC-4072-01A-W	STP knob nut	2
16	124S01000001	Speaker	1
17	7GCM-411294-J	Sponge pad for FP560 LCD	1
18	157F01000008	LCD module (for model W60)	1
19	7MHS-4245-02B-W	LCD hardware holder (for model T60)	1
20	7STF-019047B-SZHT-X	M1.9*4.7 thick-head self-tapping Phillips screw	2
21	7SMF-020040M-SZYB-N	R M2*4 cross recessed mushroom-head machine screw (558/PT4200)	7
22	7MHR-4072-05A-W0	O-RING, material: silicone rubber, outer diameter 8mm, wire diameter 1.5mm	2
23	62DI000234	4G main board PCBA suite (for model T60)， Quectel ， SC20 Module	1
24	7SMF-020037M-SZCT-N	M2.0*3.7 cross recessed countersunk-head machine screw AP570/DP570/T3500S	2
25	7MHS-4207-03A-W	PTT metal dome array (for model DP586)	1
26	7GCM-120070030-J	IPEX anti-drop sponge (for model W65)	3
27	6PD7-4232-HPA	PTT board (for model W60)	1
28	7NRC-4078-01A-N	Antenna connector nut (for model TP660)	1
29	7MHR-4207-06A-W0	O-shape ring of antenna (for model DP586), outer diameter 11mm, wire diameter 1.5mm	1
30	133W05000008	RF coaxial connector, cable, IPEX4 plug	1
31	7MHP-4207-03A-W0	DP586 top cover	1
32	7GCB-070001	Dustproof cloth for speaker, φ7	1
33	7SMS-014040M-SZCT-W	M1.4*4 cross recessed mushroom-head machine screw	2
34	63DC000016	KB-W65 battery, no logo	1
35	63BJ000002	KBJ-17 belt clip	1
36	7SMF-025080M-SZYB-Z	M2.5*8 cross round-and-mushroom headed machine	2

SN	Material NO	Specifications	QTY
		screw	
37	7MHR-4207-01A-W3	Waterproof ring (for model DP586)	1
38	7MJS-4142-02A-W0	F9 PTT key spindle (limited)	1
39	7MHR-4182-05C-W0	SIM card silicon cover (for model W65)	1
40	7MHR-4182-01A-W0	Discharge waterproof pad (for model DP990)	1
41	147K01000141	Waterproof pad for earphone jack (for model W65)	1
42	7MHR-4072-06A-W0	O-RING, silicon rubber, outer diameter 4mm, wire diameter 1.0mm	2
43	7SMS-025075M-SZYB-N1	M2.5*7.5 torx round-head machine screw	2
44	147K03000005	Aluminum housing (for model W65)	1
45	3WF7-05030-500C4	FPC cable	1
46	7WFP-4281-01A	Sponge mat (for model DP990)	2
47	7MHB-4323-02A-W	Insulative PET sheet for W60 GPS antenna	1
48	7MHB-4323-01A-W	Conductive cloth of GPS antenna (for model W60)	1
49	8ATX010015	GPS antenna (for model T60)	1
50	8ATX-2R4G-WE	Wi-Fi + Bluetooth antenna	1
51	7MJS-4038-01A-W0	S760 spindle	1
52	147K01000140	Earphone cover (for model DP485)	1
53	7MHR-1727-09A-W3	Hand microphone case for R558 radio	1
54	7MHR-4253-01A-W3	Waterproof ring of earphone cover (for model DP485)	1
55	8ATX-4345-FJ-WA	4G diversity antenna (for model T60)	1
56	157F15000095	Microphone cloth (for models DP770 and PT567)	1
57	147K01000139	DP485 front housing	1
58	7MHJ-4245-01A-W	Dual-sided adhesive for key PCB (for model DP580)	1
59	6SS1-4323-HKB	SMD nesting for key PCB (for model W60)	1

SN	Material NO	Specifications	QTY
60	7MHS-4245-01A-W	Metal dome array of numeric keyboard (for model DP580)	1
61	7MHR-4245-02A-W0	Numeric keyboard (for model DP580)	1

6 Debugging

6.1 Preparation

Prepare the followings.

- Antenna interface converter
- Universal interface
- Test card
- General-purpose tester CWM500/8960

6.2 Index Verification

6.2.1 Frequency Bands

Model	T60/T65											
Frequency Band	B2(1900MHz）			B4（1700MHz）			B5（850MHz）			B7（2600MHz）		
Test ID	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
	18650	18900	19150	2000	20175	20350	20450	20525	20600	20800	21100	21400
Model	T60/T65											
Frequency Band	B12 (700MHZ)			B13(700MHZ)			B25(1900MHZ)			B26 (850MHZ)		
Test ID	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
	23060	23095	23130	23230	23230	23230	26090	26365	26640	26740	26865	26990
Model	T60/T65											
Frequency Band	WCDMA-B1(2100MHZ)			WCDMA-B2(1900MHZ)			WCDMA-B4(1700)			WCDMA-B5(850MHZ)		
Test ID	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
	10562	10700	10838	9662	9800	9938	1537	1675	1738	4357	4408	4458
Frequency Band	B41			GSM850			GSM900			GSM1800		
Test ID	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
	40265	40620	40215	128	192	251	1	62	124	512	698	885
Frequency Band	WCDMA-B8(900MHZ)			GSM-B2(1900MHZ)			GSM-B5(850MHZ)					

Test ID	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH			
	2937	3013	3088	512	661	810	128	190	251			

6.2.2 Performance Indexes

Test Item	Test Condition	Test Equipment	Index	Note
Tx Index	General-purpose tester set to Tx state	Tester 8960, CMW500	WCDMA:22dBm+1/-3dBM LTE: 22dBm+1/-3Dbm GSM850/900: 32+1/-1Dbm GSM1800/1900: 29+1/-1Dbm	A test card is used.
Rx Index	General-purpose tester set to Rx state	Tester 8960, CMW500	WCDMA:BER< 0.001 when Îor = -106.7 (-108) dBm GSM:BER< 2.4% when Îor =-108dBm (LTE indexes is shown in the following table)	

Table 7.3.1-1: Reference sensitivity QPSK $P_{REFSENS}$

E-UTRA Band	Channel bandwidth 1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1			-100	-97	-95.2	-94	FDD
2	-102.7	-99.7	-98	-95	-93.2	-92	FDD
3	-101.7	-98.7	-97	-94	-92.2	-91	FDD
4	-104.7	-101.7	-100	-97	-95.2	-94	FDD
5	-103.2	-100.2	-98	-95			FDD
6			-100	-97			FDD
7			-98	-95	-93.2	-92	FDD
8	-102.2	-99.2	-97	-94			FDD
9			-99	-96	-94.2	-93	FDD
10			-100	-97	-95.2	-94	FDD
11			-100	-97			FDD
12	-101.7	-98.7	-97	-94			FDD
13			-97	-94			FDD
14			-97	-94			FDD
...							
17			-97	-94			FDD
18			-100[7]	-97[7]	-95.2[7]		FDD
19			-100	-97	-95.2		FDD
20			-97	-94	-91.2	-90	FDD
21			-100	-97	-95.2		FDD
22			-97	-94	-92.2	-91	FDD
23	-104.7	-101.7	-100	-97	-95.2	-94	FDD
24			-100	-97			FDD
25	-101.2	-98.2	-96.5	-93.5	-91.7	-90.5	FDD
26	-102.7	-99.7	-97.5[6]	-94.5[6]	-92.7[6]		FDD
27	-103.2	-100.2	-98	-95			FDD
28		-100.2	-98.5	-95.5	-93.7	-91	FDD
30			-99	-96			FDD
31	-99.0	-95.7	-93.5				FDD
...							
33			-100	-97	-95.2	-94	TDD
34			-100	-97	-95.2		TDD
35	-106.2	-102.2	-100	-97	-95.2	-94	TDD
36	-106.2	-102.2	-100	-97	-95.2	-94	TDD
37			-100	-97	-95.2	-94	TDD
38			-100	-97	-95.2	-94	TDD
39			-100	-97	-95.2	-94	TDD
40			-100	-97	-95.2	-94	TDD
41			-98	-95	-93.2	-92	TDD
42			-99	-96	-94.2	-93	TDD
43			-99	-96	-94.2	-93	TDD
44		[-100.2]	[-98]	[-95]	[-93.2]	[-92]	TDD

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5
NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
NOTE 3: The signal power is specified per port
NOTE 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
NOTE 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
NOTE 6: [6] indicates that the requirement is modified by -0.5 dB when the carrier

7 Technical Specifications

General Specifications	
Frequency Range	LTE FDD: B2/B4/B5/B7/B12/B13/B25/B26

	WCDMA: B1/B2/B4/B5/B8 GSM: 850/1900MHz
Weight	300g (include battery and antenna)
Rated Operating Voltage	3.7V
Average battery duration (5-5-90, high-power emission), 3600mAh lithium battery	≥22 hrs
Environmental Indexes	
Operating Temperature	-20°C ~+60°C
Storage Temperature	-40°C ~+85°C
Water-proofing and dust-proofing	IP54
ESD protection level	±6kV (contact discharge) ±8kV (air discharge)

8 Devices for Maintenance and Test

The followings are used in maintenance and debugging.

Apparatus	Description
General-purpose tester 8960	Transmit WCDMA signals, and acquire and compare BERs. Transmit GSM signals, and acquire and compare BERs.
Test card	A SIM card for testing a mobile phone. It is usually white, and widely applied to the production and testing in the communication industry. It is used to test the performance of a mobile phone, for example, display and BER.
Power supply or battery of the main part	Battery or power supply, with an output of 3.7V DC

9 Troubleshooting

SN	Failure Description	Troubleshooting
1	Red light flashing, cannot login	A. Check the validity of the SIM card. B. Check whether the radio can be registered through Wi-Fi connection. C. Check whether the server set network management platform can be connected. D. Check the display of signal strength. If there is no signal, replace the antenna.
2	Communication between radios failed	A. Check whether the caller and the callee are in the same group B. Check whether the caller and the callee have logged in to the same server. C. Check whether the callee receives a prompt of call admission; if yes,

		check the volume. Check whether the caller's microphone is broken or a Bluetooth device is connected.
3	Abnormal frequency programming	A. Check the wiring. B. Check whether a USB driver is installed. C. Check the contact of the earphone interface board. In case of poor contact, replace the USB socket.