Professional wireless communication system solution supplier

UP305

SERVICE MANUAL

V221010

Kirisun Communications Co.,Ltd.

Contents

1. Overview

1.1.Range of Application

This manual is intended for the maintenance of UP305 frequency-modulated handheld two-way radio, and can be used only by the engineers and professional technicians trained by Kirisun. The parameters in this manual are subject to change because of technology improvement. For the latest information, please contact Kirisun or your local dealer.

Please carefully read this manual before repairing the radio.

1.2.Safety Precaution

Electromagnetic Radiation

A two-way radio generates and radiates electromagnetic energy. Kirisun two-way radios strictly conform to Chinese and international standards of electromagnetic radiation. To ensure ideal communication and human safety, please keep the device vertical to the ground and keep the microphone 2 ~ 5cm away from the mouth while using the radio.

Electromagnetic Interference

To avoid electromagnetic interference, turn off the radio in a place where you are so instructed, for example, a hospital, a health center and an airport.

Explosive Gases

You'd better shut down the radio when you are in an area with explosive gas (for example, the lower deck of a hull, a container or transport facility of fuel oil or chemicals) or with chemical or particles, dust or metallic dusts in the air, or near a blast area or an electric blasting detonator. Replacing or recharging the battery in potentially explosive atmospheres is prohibited.

Damaged Antenna

You are suggested not to use the radio if the antenna is damaged. A damaged antenna may cause mild burns when contacted with human skin.

Battery Life

To prolong the service life of the battery, avoid fully discharging the battery frequently. Please charge and discharge the battery repeatedly if it will be not used for a long time. For satisfactory performance and safety, you are suggested to replace the battery every two years.

Part Replacement

Pay attention to the model while replacing a part. Do not use a component not meeting the requirements of Kirisun.

1.3.Maintenance Service

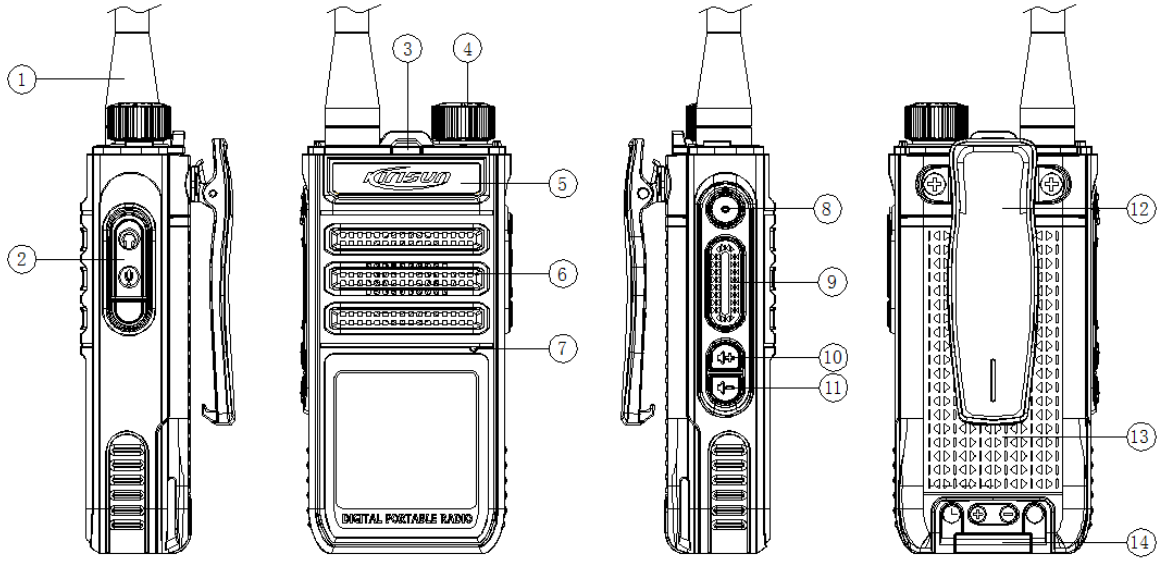
Warranty service is provided to the radio and the accessories, except in any of the following situations.

- No provision of a valid warranty card or an original invoice
- Malfunction due to 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

Paid maintenance service will be provided after the warranty period. Meanwhile, we offer parts to authorized maintenance stations and dealers at preferential prices, except those of discontinued products).

2. External View and Keys

2.1.External View



NO.	Description	NO.	Description
1	Antenna	2	Earphone jack
3	Light pipe	4	Power key/ Channel knob
5	Nameplate	6	Speaker
7	Microphone	8	Programmable key
9	PTT key	10	Volume+ key
11	Volume- key	12	Belt clip
13	Battery	14	Battery latch

2.2.Programmable Keys

To cater to users' habits of operating the radio, programmable keys (i.e. side keys) are provided, which can be configured as shortcut keys through programming by the dealer.

Note:

- *Press: Press down and release quickly.*
- *Press and hold: Press down and hold still for a period, which is set through the CPS (customer programming software).*

NO.	Programming Function	Function Description
1	None	The radio does not respond when this key is pressed.
2	Battery Level Announcement	Announce the current battery level.
3	High/Low Power	Switch to high/low power.
4	Broadcast Call	Initiate a broadcast call.
5	Monitor	Switch to carrier squelch mode (i.e. cancel CTCSS) when the selected analogue channel is CTCSS enabled. If carrier is matched, voice will be output. To go back to the previous state, press the key again.
6	Emergency On	Send an emergency alarm. It is used to seek help under emergency.
7	Emergency Off	Exit emergency alarm.
8	Squelch On/Off	- Under analogue channel, open voice reception path to receive weak signals. - Under digital channel, no response when this key is pressed.
9	Zone Selection	Switch to next zone.
10	Scan	Start/stop scanning other channels and receive traffic from them.
11	Alert Tone On/Off	Enable/disable all alert tones.
12	Nuisance Delete	Delete an unnecessary channel (e.g. interference channel) dwelled on during scan, and then continue scan.

NO.	Programming Function	Function Description
13	Repeater/Talk Around	On a repeater channel, press it to enter/exit repeater mode.

2.3.LED Indicator

LED Indication	Radio State
Red light on	Transmitting signals.
Red light flashing	Low battery.
Green light on	Receiving signals (voice or data), or traffic detected.
Green light flashing	Scanning in progress.
Yellow light flashing	Receiving emergency alarm, or startup self-test failed.

3. Basic Operation

3.1.Powering On/Off

To power on the radio, hold down the Power key/ Channel knob until green LED light is on. You will hear a power-on alert tone.

To power off the radio, hold down the Power key/ Channel knob until yellow LED light is on. You will hear a power-off tone.

3.2.Selecting a Channel

In standby state, rotate the Power key/ Channel knob to select a channel.

3.3.Adjusting Volume

In standby state, press the Volume+ key to increase the volume or Volume- key to decrease it.

The volume ranges from mute to L14.

3.4.Initiating a Call

Hold down the PTT key to initiate a call.

Release the PTT key to quit call mode.

3.5.Receiving a Call

When signals are received, the green LED light will be on.

When an individual call, a group call or an all call is received over a digital channel, voice will be output.

When an individual call, a group call or an all call is received over an analog channel, with the CTCSS/CDCSS code matching the set value or analog signaling disabled, voice will be output.

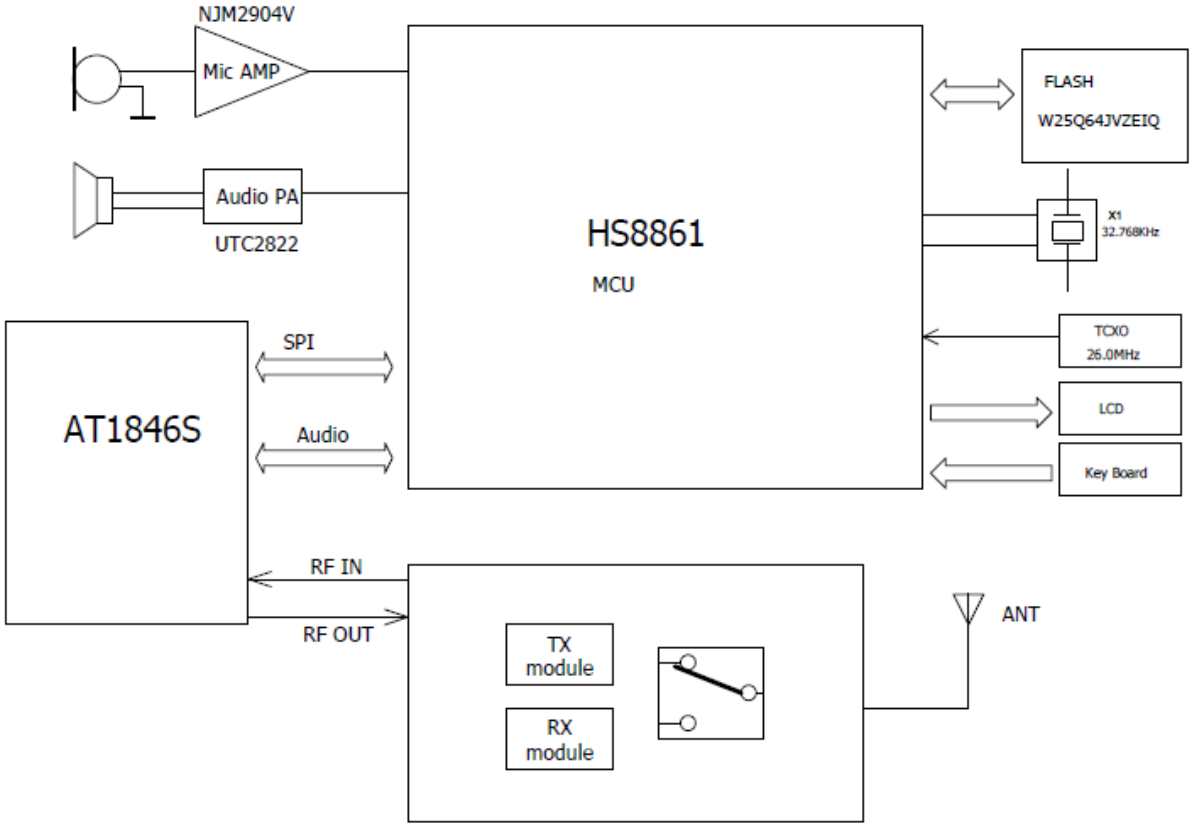
3.6.Calling Back

When the selected channel is digital channel and after a call is received, press the PTT button within the calling duration to call back. If the calling duration is up, you need to initiate a call. The calling duration can be set by the dealer.

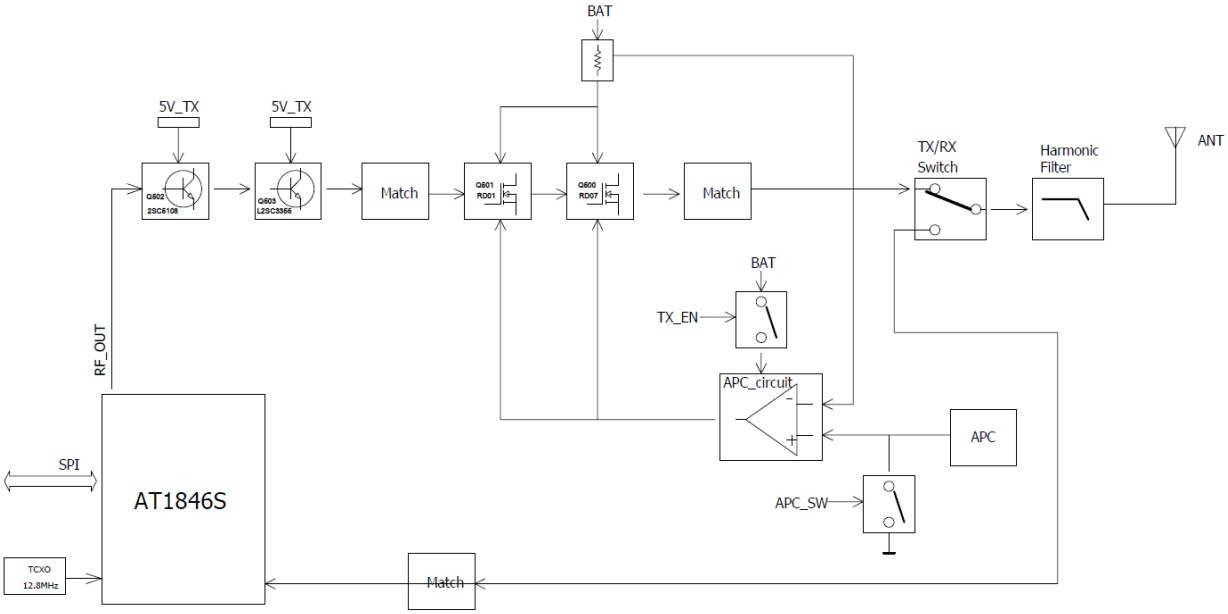
When the selected channel is analogue channel and after a call is received, press the PTT button and speak to the microphone to call back.

4. Circuit Description

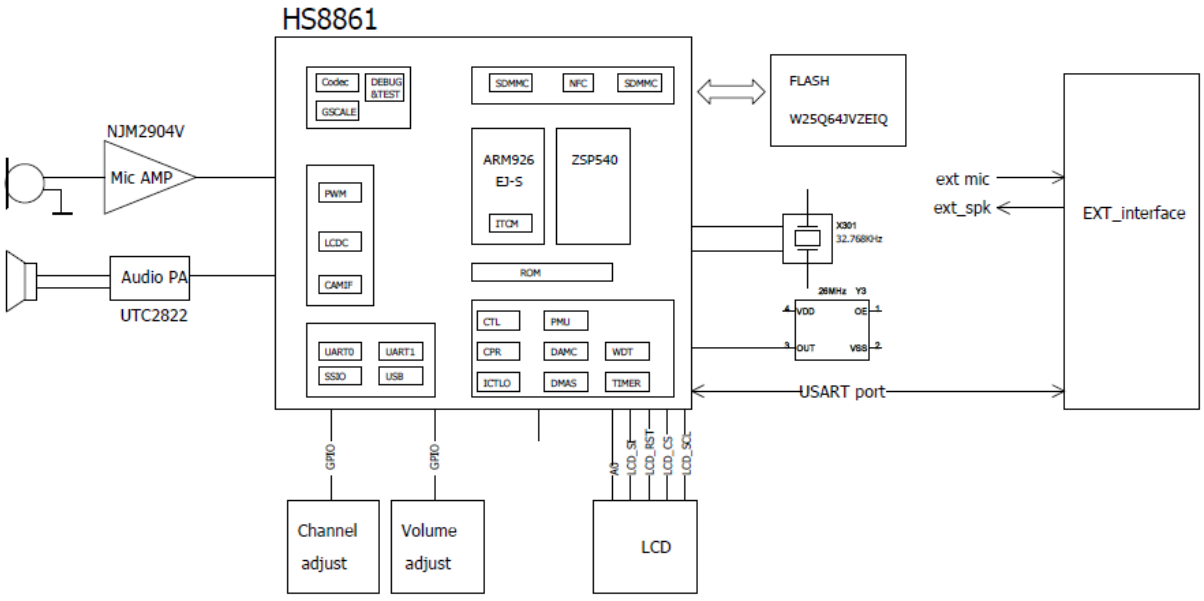
4.1.Circuit Diagram of Main Board



4.2.RF Circuit Diagram



4.3.Baseband Circuit Diagram



4.4.TX Circuit

The TX circuit includes an RF power amplification circuit, a low pass filter circuit and an automatic power control circuit.

● RF Power Amplification Circuit

AT1846S outputs RF signal from pin 18 and enters first-level pre-drive amplifier (Q502) for initial amplification; then it enters second-level pre-drive amplifier (Q503) and drive amplifier (Q501) for further power amplification, ensuring sufficient drive power signal can be offered to final amplifier (Q500) for ultimate power amplification; after amplification by multiple amplifiers, the transmitted signal will complete the output impedance match at the output terminal of final power amplifier through a section of microstripe, so as to minimize output power loss from impedance match failure; afterwards, the transmitted signal will enter the low pass filter through TX/RX switch.

● Low Pass Filter Circuit

The low pass filter which suppresses harmonic wave is an advanced Chebyshev filter composed of lumped parameter inductor and capacitor. On a certain basis of in-band fluctuation, the filter can improve suppression to out-of-band harmonic wave and spurious signal.

● Automatic Power Control Circuit (APC)

In the automatic power control circuit, the drain current from drive power amplifier and final power amplifier completes switch from current to voltage through the sampling resistor and subtraction circuit which is made of the first operational amplifier; the voltage will be compared with the APC control voltage output from DAC at the second operational amplifier, and the error voltage that is output will change the transmitting power through the grid bias voltage of the control power amplifier tube (including the drive level and final level).

4.5.RX Circuit

The RX circuit is mainly composed of RF low pass filter, RX/TX switch, AT1846S, HS8861 and audio power amplifier.

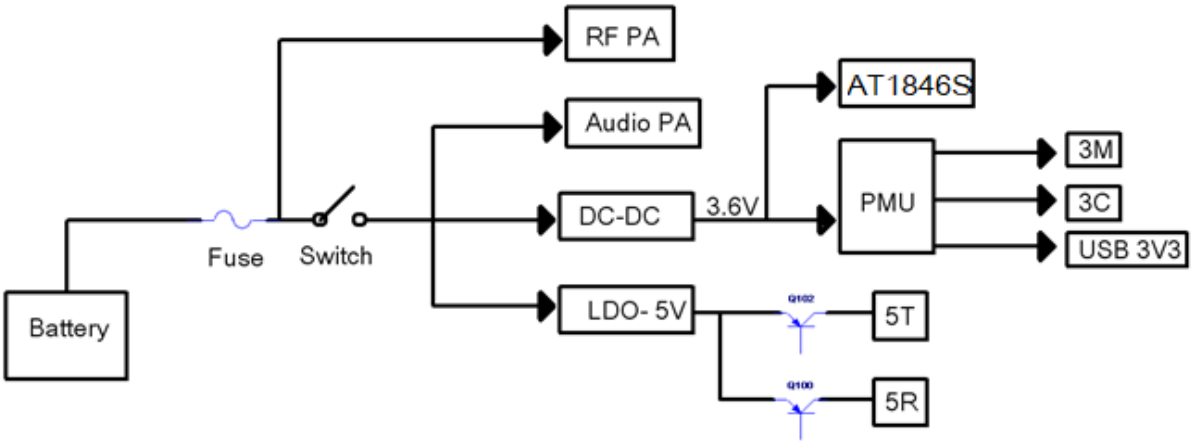
● RX Circuit Front-end

The signal from antenna is sent though RX/TX switches (D500, D501, D502 and D503) to the U500 (AT1846S) for demodulation and output.

● RX Circuit Back-end

The analogue/digital signal which is demodulated and output by AT1846S, after completing demodulation and processing of digital signal through DSP in HS8861, will be input to digital audio processor module for further processing, and then be switched to analogue voice signal through the DAC of the codec; the analogue voice signal will finally be amplified by external audio amplifier to drive the speaker.

4.6.Power Section



The device applies 7.4V lithium-ion battery for power supply. RF power amplification and audio power amplification are directly powered by the battery; the battery outputs 3.6V through DC-DC switch to power the AT1846S, HS8861 and LDO; 3M, 3C and USB3.3V output by the PMU separately supplies power to other baseband circuits; the battery outputs 5V through LDO and then outputs 5T after control by Q102.

RF PA: RF power amplifier circuit Q500 (RD07MUS2B), Q501 (RD01MUS2)

Audio PA: Audio power amplifier circuit U600 (TDA2822)

3.3V: X500(26M VC-TCXO), X2(26M TCXO)

5T: RF pre-drive amplifier circuit Q502 (2SC4726TLP), Q503 (L2SC3356)

DC-DC: U2100 (HS8861), U500 (AT1846S)

4.7.IC Description

4.7.1.Features of AT1846S

a. Integrated CMOS RF front-end

b. High linearity low-noise amplifier and mixer

c. Low IF receiver path

- Automatic DC offset calibration circuit
- High performance analogue/digital converter and digital/analogue converter
- Fully-integrated receiver filter
- Digital AGC
- Modulation and demodulation technique based on digital signal processing technology

d. TX path of direct frequency synthesis

- Modulation method of direct frequency synthesis
- TX filter based on digital signal processing technology
- TX modulation gain number is adjustable
- Digital voice activates TX control

e. High-performance fractional PLL frequency synthesizer

- Fully-integrated in-chip RF VCO
- Fully-integrated internal loop filter
- Low phase noise
- Fast lock of phase
- High-frequency resolution with random frequency adjustable
- Built-in transistor frequency error calibration circuit

f. Sleep mode of ultra-low loss

g. Three wire serial digital interface control

4.7.2.Port Description of AT1846S

AVDD	1	Power supply
SCLK	2	Clock input for serial control bus
SDIO	3	Data input/output for serial control bus
AVDD	4	Power supply
XTAL1	5	Oscillator pin 1
XTAL2	6	Oscillator pin 2,control interface select
MODE	7	When MODE = VL, I2C Interface is select; When MODE = VH, SPI Interface is select
SENB	8	Latch enable (active low) input for serial control bus
AFOUT	9	Audio signal output to speaker
NC*	10	No connection
MIC_IN	11	MIC input
Cc	12	Compensation capacitor connection

AVDD	13	Power supply
NC*	14	No connection
RFIN	15	RF signal input
AVDD	16	Power supply
NC*	17	No connection
RFOUT	18	RF signal output
NC*	19	No connection
NC*	20	No connection
AVDD	21	Power supply
PABIAS	22	PA bias supply for PA
AVDD	23	Power supply
PDN	24	Chip enable, high active; Chip sleep, low active
GPIO7	25	Gpio7/vox (When Gpio7=VH, vox is active; else VL)
GPIO6	26	Gpio6 / sq (When Gpio6=VH, sq is active; else VL)
GPIO5	27	Gpio5 / txon (When Gpio5=VH, txon is active; else VL)
GPIO4	28	Gpio4 / rxon (When Gpio4=VH, rxon is active; else VL)
GPIO3	29	Gpio3 / sdo (Gpio3=VH or VL, it is the output register data in 4 wire control Interface mode)
GPIO2	30	Gpio2 / int (When Gpio2=VH, int is active; else VL)
GPIO1	31	Gpio1 / code_in / code_out (Gpio1=VH or VL, it is the input/output code data)
GPIO0	32	Gpio0 / css_in / css_out (Gpio0=VH or VL, it is the input/output CTCSS/CDCSS signal)

4.7.3.Port Description of Master Chip HS8861

PIN NO.	Port NO.	Port Name	Function
R17	VBAT_SENSE	BAT_DET	Battery capacity detection
C16	GPIO_D7	PF KEY0	Input from side key
H3	GPIO_0	ECN_0	Channel switch
F2	GPIO_1	ECN_1	Channel switch
H2	GPIO_2	ECN_2	Channel switch
F1	GPIO_3	ECN_3	Channel switch
V5	GPIO_D100	MAND_INT	IC power supply control under Man Down state
W5	GPIO_D22	EXT_PTT	External PTT
B15	SSI0_DI	SSI0_DI	FLASH
C15	SSI0_DO	SSI0_DO	LCD/FLASH
B16	SSN1	FLASH_CS	FLASH
D16	SSI0_CLK	SSI0_CLK	LCD/FLASH
E2	GPIO_D76	UART_RXD0	Serial port 0
A2	GPIO_D75	UART_TXD0	Serial port 0
B2	GPIO_D25	UART_TXD1	Serial port 1
D2	GPIO_D26	UART_RXD1	Serial port 1
G3	GPIO_D74	TONE_OUT	Output alert tone in PWM mode
B19	GPIO_D51	AFCO1	Audio power amplifier MUTE
R3	GPIO_D48	5TC	5TC
B8	GPIO_D52	DACS_SW1	DA_MCP4802
C7	GPIO_D50	LDAC_PC/TV	DA_MCP4802
E17	GPIO_D46	RDA_PDN	AT1846S
F17	GPIO_D58	SPI/CS	AT1846S

PIN NO.	Port NO.	Port Name	Function
B11	GPIO_D57	SPI/CLK	AT1846S
B10	GPIO_D56	SPI/DA_OUT	AT1846S
F10	GPIO_D0	RDA_SQL	SQL
E10	GPIO_D3	KEYPAD_BL	Backlight control
K18	GPIO_D107	NC	NC
B9	GPIO_D21	ECN1	Channel switch
A8	GPIO_D18	GREEN_LED	Green LED control
B8	GPIO_D16	PTT	PTT
A7	GPIO_D19		NC_GPIO
B7	GPIO_D20	ECO_0	Channel switch
C7	GPIO_D17	RED_LED	Red LED control
C3	AUX_OUTP	SPK+	Audio output after demodulation by HS8851
D3	AUX_OUTN	SPK-	NC
D1	M_MICP	AFDET	Transmit to HS8851 after reception and demodulation by AT1846S
D2	M_MICN	NC	NC
E2	HP_MICN	MIC1	Transmit MIC signals to HS8851
H5	DM	USB_DM	USB
J5	DP	USB_DP	USB
L1	HPL_OUT	MOD1	Output digital MIC signals
M1	HPR_OUT	MOD2	NC
D21	SINK3	NC_SINK3	NC
B12	GPIO_D45	NC	NC
C11	GPIO_D55	NC_GPIO	NC
A9	GPIO_D59	APC_SW2	APC_SW2

PIN NO.	Port NO.	Port Name	Function
C9	GPIO_D105	NC_GPIO	NC
C8	GPIO_D43	APC_SW1	APC_SW1
F15	GPIO_D8	NC_GPIO	NC
F14	GPIO_D9	QT/DQT IN	QT/DQT IN
F13	GPIO_D1	LCD_BL	LCD backlight control

4.7.4.Feature Description of Semiconductor Devices

Component NO.	Model	Description
IC500	LM2904	APC, voltage comparison, drive
U2100	HS8861	MCU
U600	TDA2822	Receiver audio power amplification
Q500	RD07S2B	TX final power amplification
Q4	DTC144EE	APC output switch
Q200	DTC144EE	Red LED driver
Q201	DTC144EE	Green LED driver
Q501	RD01MUS1	Transmitter power amplifier drive
Q10	DTC144EE	Audio power amplifier control switch
IC100	XC6204B502 MR	Stabilized 5V voltage output
IC102	R1244N001B	3.6V DC-DC output
U20	MCP4802	DA chip, used for modulation of power and frequency stability
IC302	LM2904	Operational amplifier for MIC signals

5. Feature Description and Parameter Setting

5.1.Stun, Revive and Remote Monitor

Stun

You can enable this function, so that the radio can be stunned after receiving a Stun command. A stunned radio can only receive a Revive command but cannot send or receive other signals.

Revive

You can enable this function, so that a stunned radio can be revived after receiving a Revive command. After the radio is revived, it can operate normally again.

Remote Monitor

When the radio receives Remote Monitor command, it will automatically turn on the transmitting and the monitoring party can listen to the surroundings around the monitored radio.

5.2.Scan

Enabling Scan

Press the Scan programmable key to enable Scan and listen to activities on other channels. Press Scan key again to exit Scan.

Scan List

Each channel can be related to one “Scan List” though dealer programming. The radio can only start Scan on channels related with “Scan List”. Each “Scan List” contains a maximum of 16 channels (including the current channel), and both analogue channels and digital channels can be contained. By selecting “Scan List” menu, you can check the scan channels included in the “Scan List” used by the current channel.

Note:

If the scan channels in the list are changed, other channels which are related with the same list will be affected during channel scan.

Nuisance (Temporary) Delete

During scan, when the radio stops on an unnecessary channel, e.g. interference channel, it can select Nuisance Delete to delete this channel before it goes on scanning. You can also add a temporary channel during scan. After exiting scan mode, the channel which is temporarily deleted or added will turn invalid.

Scanning Revert Channel

During radio scan, press the PTT key to enable the radio to transmit or talk on the preset channel. This channel can be set by local dealer using programming software.

Prior Scan

If a priority channel is set in a scan list, the channel will be scanned in cycle, i.e. being scanned once before each common channel is scanned. For example, if a scan list has channels 1, 2, 3 and 4 with channel 2 set

as a prior channel, the scan order will be 1 → 2 → 3 → 2 → 4 → 1.

5.3.Zones

A group of available traffic channels constitute a zone. Please select a zone by pressing a side key.

5.4.Setting

The radio can be set to cater to your habits or meet your needs. Settings include power, squelch level, alert tones, sleep mode, CPS password and speech encryption, and they may vary for different dealers.

Power

Under high power, communication distance is longer but battery life is shorter; under low power, communication distance is shorter and battery life is longer. You can set a power level for each channel.

Squelch Level

You can set the squelch level of the radio to any of 0 to 9. The higher the squelch level is, the more noise interference there will be and the harder to receive weak signals.

Alert Tone

You can enable or disable various alert tones via the PC Tool.

Microphone Gain

Microphone gain is the value based on which an audio level is amplified. You can adjust volume by setting a microphone gain. The higher the gain is, the higher the volume will be.

Note:

To avoid speech distortion, do not set a too high gain.

Power-saving Mode

You can enable this mode to enable the radio to automatically enter power-saving mode if it has not transmitted or received carriers for a set period. In this mode, fewer programs are run and less battery is consumed, so that battery life is prolonged.

CPS Password

You can set a password for the CPS (customer programming software).

Speech Encryption

You can enable/disable speech encryption for the current channel, so that speech is sent after encryption.

5.5.TOT (Time-Out-Timer)

This function is to prevent overlong channel occupation. If the radio keeps transmitting signals for a duration longer than the one set by a dealer through programming, the radio will stop transmitting and warning tone will ring. To stop the tone, release the PTT key. You can transmit again after a period (set by a dealer) by holding down the PTT key.

If early warning is enabled, you will receive an early warning of transmission halt when time is nearly out.

5.6.Emergency Alarm

Under emergency, you can send an emergency alarm by pressing the side key programmed as the Emergency Alarm key. Please specify acousto-optic effect by setting an alarm type and the content to send to other radios in the group by setting an alarm mode.

You can have these settings done by a local dealer through programming. To quit emergency alarm, press the side key programmed as the Quit Emergency Alarm key.

Alarm Types

1) Siren Only —— After the radio enters the emergency state, the siren only sounds locally and the control center will not receive any alarm signal.

2) Regular —— The radio sends emergency alarm and audio-video alert.

3) Silent —— The radio sends emergency alarm but no audio-video alert. When the radio receives speech signals, the speaker will not be turned on until the PTT button is pressed.

4) Silent with voice —— The radio sends emergency alarm without audio-video alert. When the radio receives speech signals, there will be no audio-video alert until the PTT button is pressed.

Alarm Modes

1) Alarm: The radio sends an emergency alarm and then quits alarm mode.

2) Alarm with call: The radio sends an emergency alarm can initiates an emergency call by holding down the PTT key.

3) Alarm with voice to follow: The radio sends an emergency alarm and then sends background tone periodically.

Note:

An emergency alarm is non-speech signals sent from a radio in a group to other radios in the group, so that alarm prompt will be given off on these radios.

To guarantee communication under emergency, an alarm call has a higher call priority than a common call does.

5.7.Settings

The radio has been set before delivery. However, to meet customers' requirements, it may be necessary to set such digital functions as operating frequencies, channels, DT/DQT and automatic scan. This can be achieved by the programming software CPSM Vx.xx developed by Kirisun. It is user-friendly and easy to operate, and supports Chinese and English.

To set the parameters of the radio using the software, take the following steps.

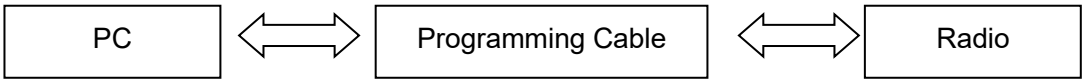
Step 1. Install the CPS software on your PC.

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

Note:

Make sure the radio is powered on.

Step 3. While connecting the programming cable for the first time, please install its driver.



Step 4. Run the CPS software Kirisun CPSm_VX.XX.

Step 5. Click Setting → Communication Port, and select the serial port to which the programming cable is connected.

Step 6. In the software, select Program → Read Data. In the prompted dialog box, click Read. The radio parameters will be read.

Step 7. In the software interface, modify parameters, select Program → Write Data. In the prompted dialog box, click Write. The radio parameters will be written.

5.8.Upgrade

To upgrade the radio program using the software, take the following steps.

Step 1. Power off the radio. Connect the radio to the PC using the programming cable.

Note:

If this is your first time to upgrade firmware through PC, you need to install a driver. For details, refer to the file HKU2S Driver Installation Description.doc in the package.

Step 2. Double click the upgrade tool as shown below.

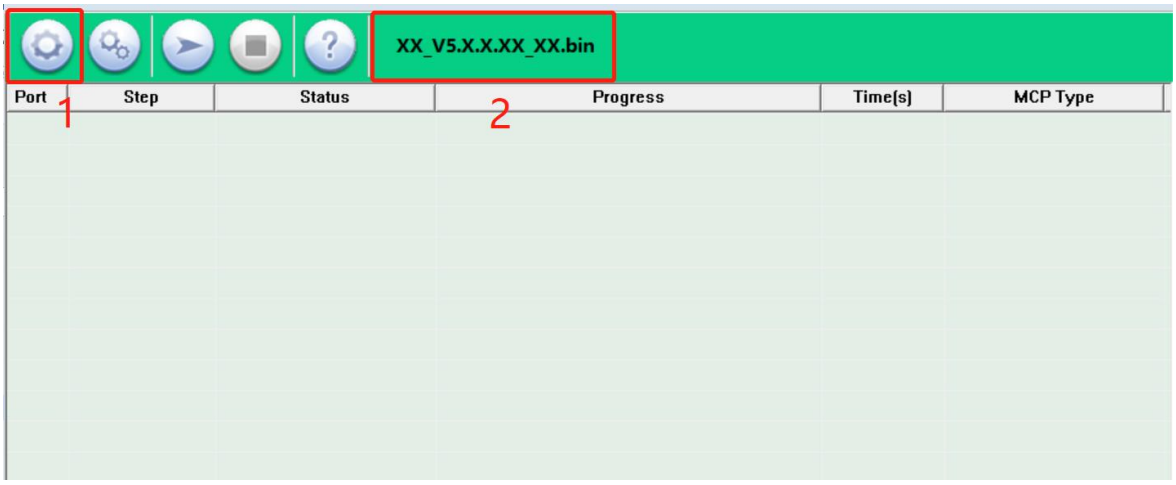
DMR Software Upgrade Tool.exe

Note:

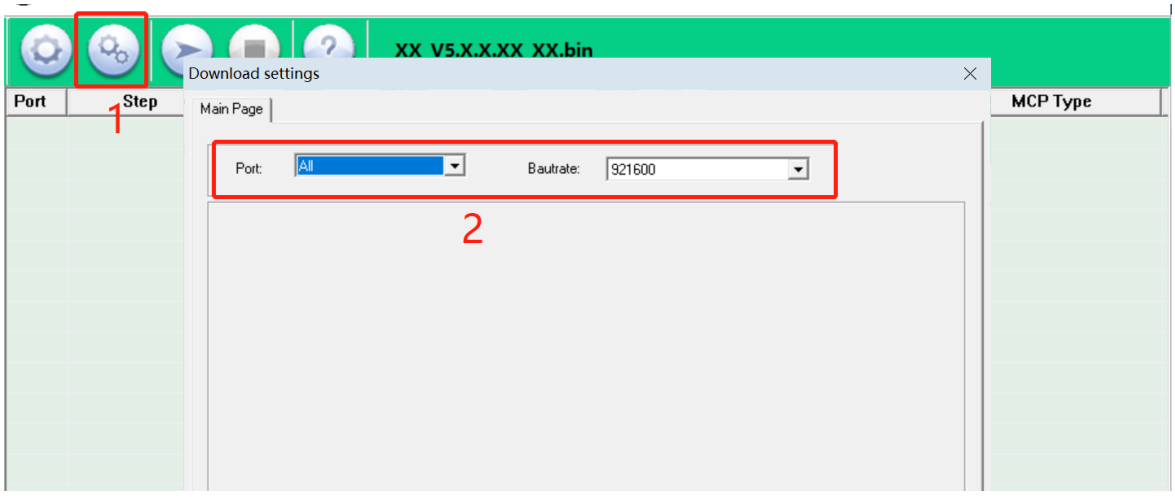
This tool upgrades firmware while retaining the previous programming and calibration data.

Step 3. The following interface will be displayed.

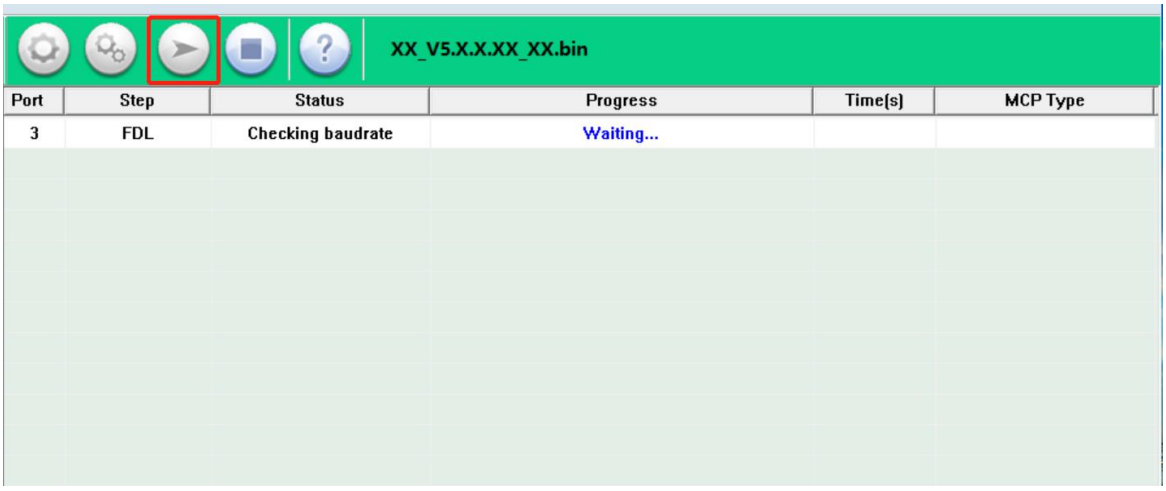
Step 4. Click “Load file”, select a firmware to upgrade. The file name will be displayed.



Step 5. Click “Setting”, select the port of the programming cable and the baud rate 921600.



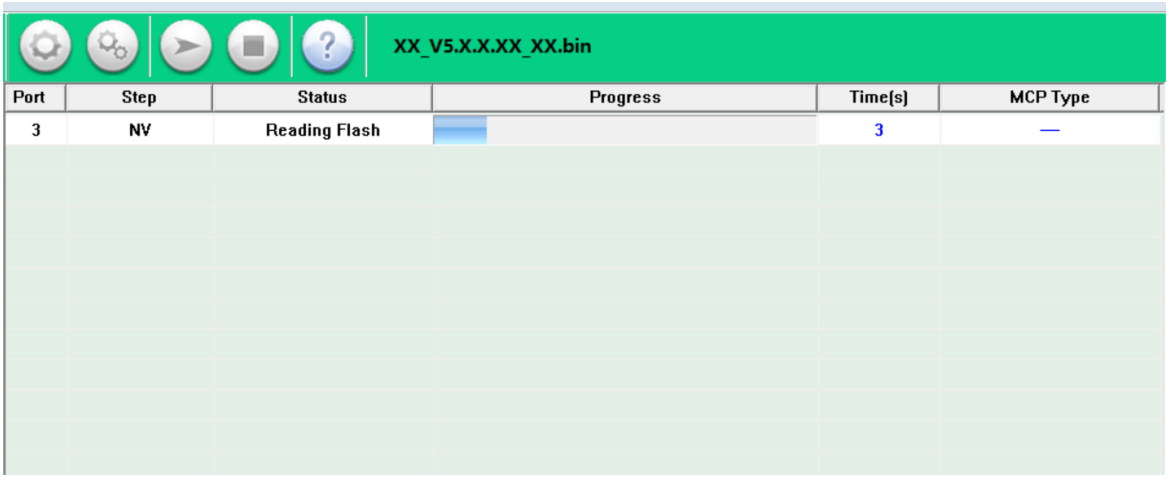
Step 6. Click “Start downloading”, start upgrade and the message “Waiting” will be displayed.



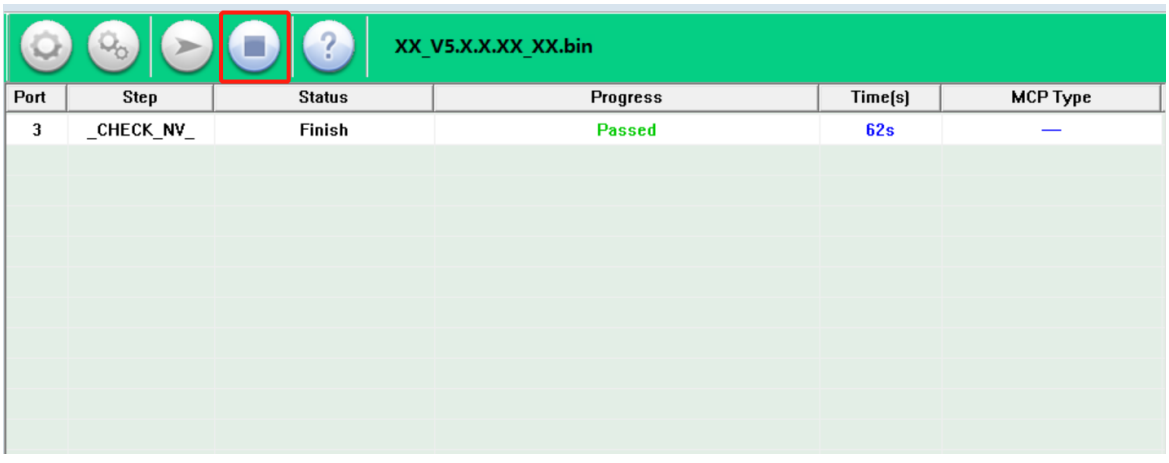
Step 7. Hold down the PTT key and press the Power key at the top of the radio. The radio enter upgrade mode. About 5 seconds after the progress is started, release the both keys.

Note:

Make sure the radio is connected with the programming cable.



Step 8. After upgrading is finished, “Passed” will be displayed. Click “Stop downloading”.



6. Assembly and Disassembly

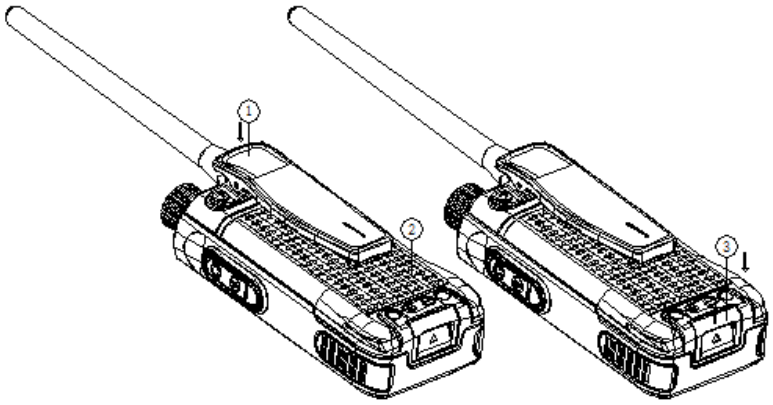
This radio is a sophisticated communication device with precise and compact structure. Please be careful with the repair.

6.1.Installing and Uninstalling the Battery

Installing the Battery

With the belt clip installed, press ① in the figure below, so that the other end of the clip rises.

The two convex positions on the upper end of the battery are aligned with the corresponding slots above the aluminum housing and snap in the direction as shown in ②. Press the lower side of the battery as shown in ③ so tact the battery is hooked.



Note:

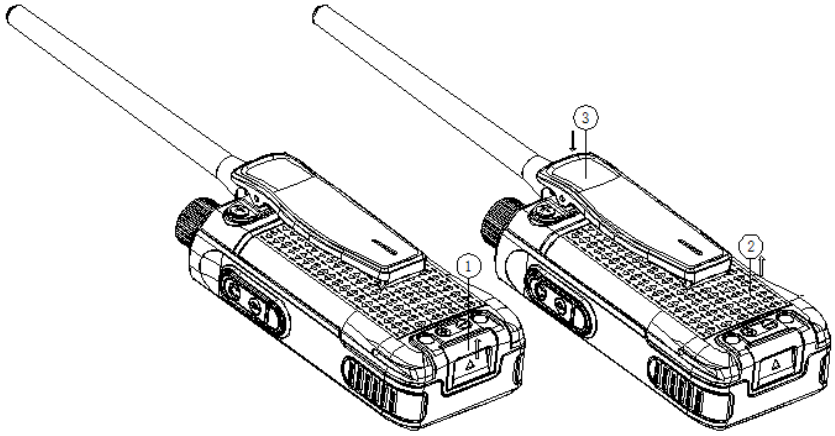
Do not short circuit the battery terminals or discard the battery in a fire.

Do not disassemble the battery housing.

Uninstalling the Battery

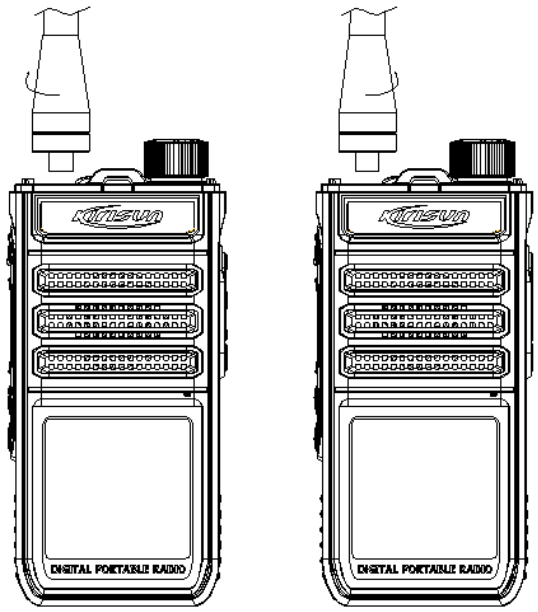
Please turn off the radio before removing the battery.

To remove the battery, toggle the battery latch (see ① in the figure). The battery will bounce (see ②), and press the belt clip (see ④) and pull out the battery.



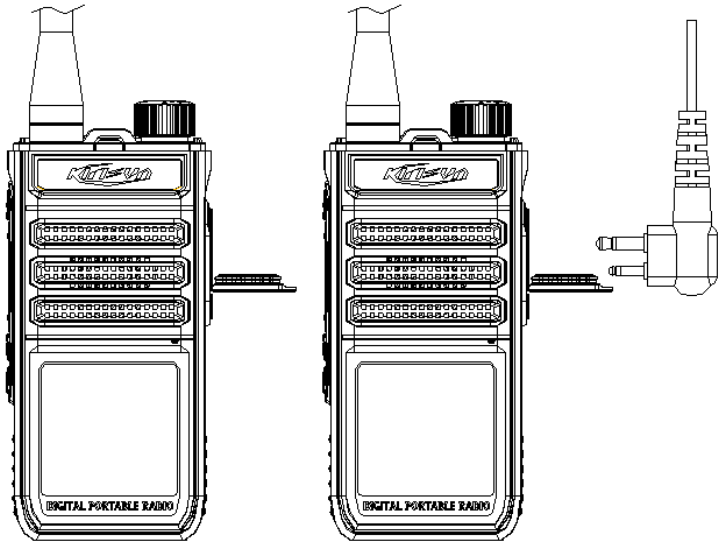
6.2.Installing and Uninstalling the Antenna

To install the antenna, insert the antenna on the top of the radio and turn it clockwise until it is fastened. To uninstall the antenna, turn it counter-clockwise to loosen it.



6.3.Using an Earphone

To connect an earphone, remove the earphone cover at the upper part of the right side of the radio, and plug the earphone connector into the jack.



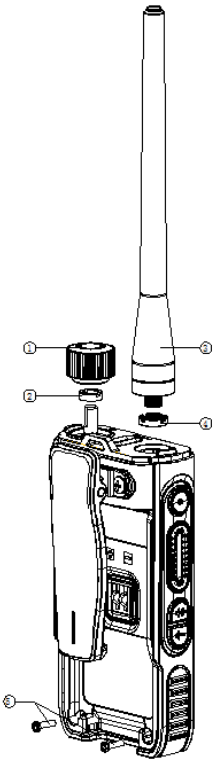
6.4.Detaching Aluminum Housing

Step 1. Screw down the knob (① in the figure) and the antenna (③).

Step 2. Remove the knob nuts (② and ④) using a cross sleeve.

Step 3. Remove the two screws (⑤) at the lower part of the housing.

Step 4. Insert the blade of a straight screwdriver into the seal slot of the aluminum-alloy holder, prise the aluminum housing upwards to separate it from the plastic housing, draw the housing backwards to take it out.



6.5.Detaching Main Board from the Base

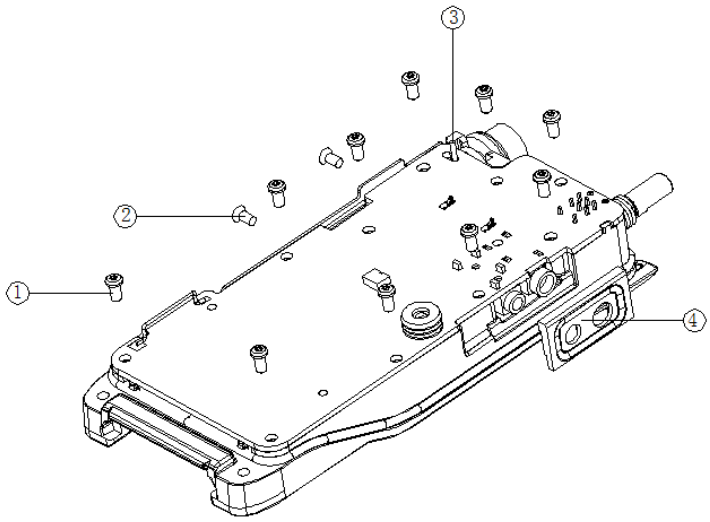
Step 1. Take down the two bolts of the PTT key board.

Step 2. Take off the ten bolts (① in the figure) of the main board.

Step 3. Take off the earphone-jack pad (④).

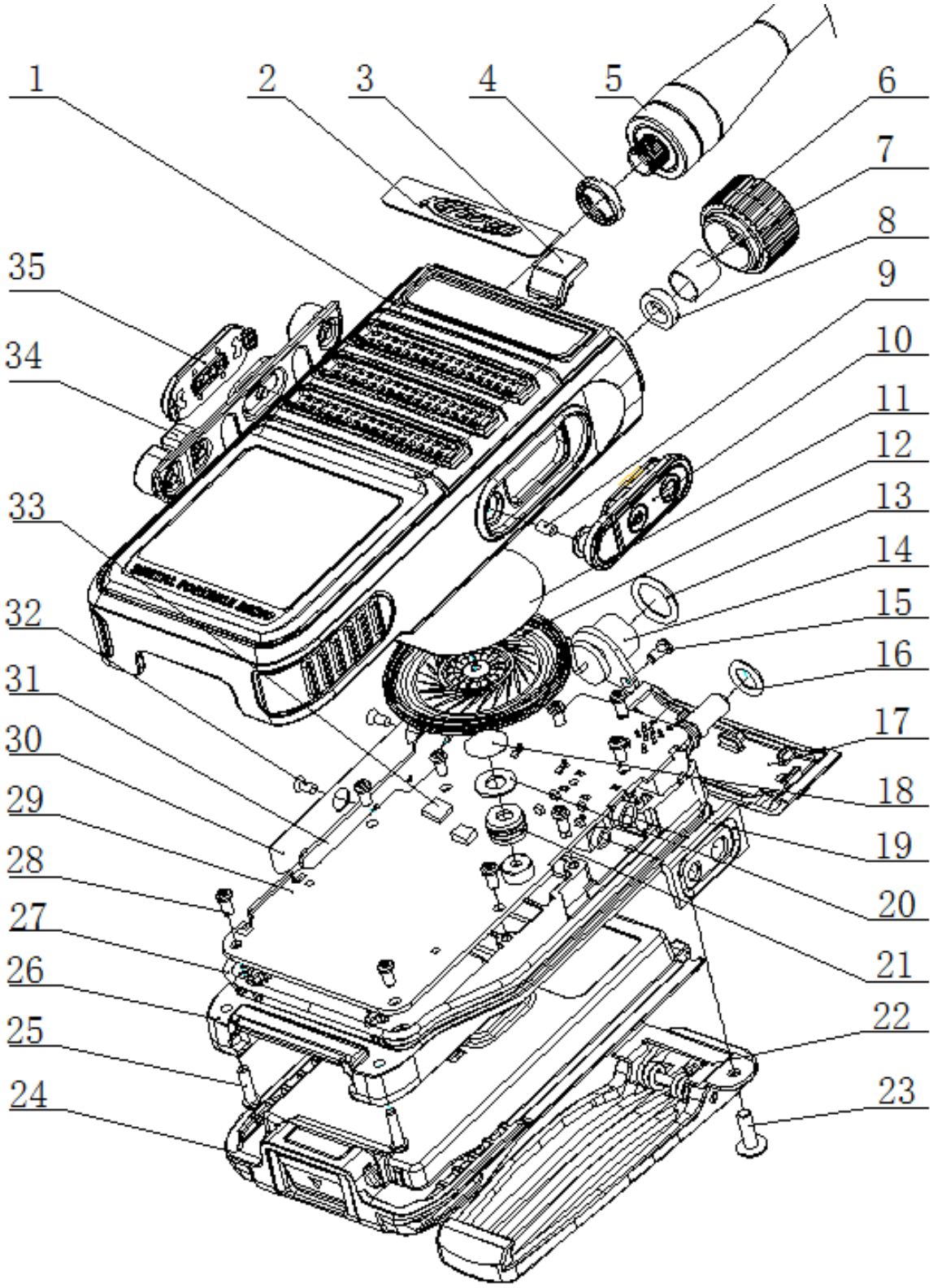
Step 4. Unsolder the antenna connector (③) using a soldering iron, separating the connector pin from the main board.

Step 5. Remove the main board and the PTT key board.



After disassembly, repair and modulation can then be performed.

6.6.Explosion Diagram



SN	Material Code	Material Name	Specification	QTY
1	147K01000224	Upper housing	PC1414,dual-color (black + gray, Panton430C),etched	1

SN	Material Code	Material Name	Specification	QTY
1	167W11000043	Nameplate sticker	39*8,PC, specular silver screen print "kirisun"	1
2	147K01000229	Light pipe	PC,transparent,etched	1
3	157F10000008	Antenna connector nut	Stainless steel 304, φ11.3*M9*0.75*2.5	1
4	8ATX010025	Antenna	400-480MHz,138mm,SMA-K	1
5	147K01000238	Knob cap	PC1414,dual-color (black + orange, Panton172C),etched	1
6	147K02000149	Inner liner of volume knob	Manganese steel, black, electrophoresis	1
7	157F10000009	Knob nut	Stainless steel 304, φ8.0*M6*0.75*2.5	1
8	147K01000230	Column stopper for earphone cover	PC1414, black	1
9	147K01000240	Earphone cover	PC1414,black,etched	1
10	157F15000189	Speaker dust screen	Dense net, black, φ32.5mm	1
11	157F04000015	Speaker	Diameter 36*5.4,1W,16Ω	1
12	7MHR-4207-06A-W0	O-ring of antenna pedestal	Outer diameter 11mm, wire diameter 1.5mm	1
13	3CR7-SMA-50JF-4	RF coaxial cable	SMA-J, install using flange	1
14	7SMF-020040M-SZYB-N	M2*4 machine screw	Harden iron; Φ2*4mm, nickel plated, metric coarse thread, nylok	11
15	7MHR-4072-05A-W0	O-ring	Silicon rubber,outer diameter 8mm,wire diameter 1.5mm	1
16	147K01000225	Top cover	PC1414,black,etched	1
17	7GCB-070001	φ7 dust cloth for microphone	Black, nylon, φ7mm *0.1 mm	1
18	147K01000259	Waterproof pad for earphone	TPU,80 degree,black,etched,co-moulded shut-off gate	1
19	7GCM-075045005	Sponge mat for microphone	Single-sided adhesive, outer diameter Φ7.5, inner diameter Φ4.5	1

SN	Material Code	Material Name	Specification	QTY
20	7MHR-1727-09A-W3	Hand-microphone case	Silica gel, hardness 40°, orange	1
21	63BJ000002	Belt-clip assembly	Black, PC1414, improved weld line, etched	1
22	7SMF-025080M-SZYB-Z1	Cross round-and-mushroom headed machine screw	Harden iron, Φ2.5mm*8mm, black nickel plated, metric coarse thread	2
23	63DC000034	Battery pack	1200mAh,7.4V,black cell	1
24	7SMF-020080M-MHHT-N1	Torx thick-head machine screw	Hardened iron,nickel plated,Φ2mm*8mm,metric coarse thread, nylok	2
25	147K01000233	Aluminum casing	ADC12,oiled jet	1
26	147K01000231	Master waterproof ring	High-elasticity silica gel, hardness 45°, black	1
27	157F08000013	M2.0*4.0, torx pan-head machine screw	Low-carbon steel, hardened, nickel plated, pan-head, T6 torx, nylok	1
28	62DI000375	PCBA component	NA	1
29	147K02000139	Dome array for PTT key	Stainless steel,original color,φ5,circular,multi-point,elasticity 180 (+/-20)g	1
30	136P03000059	Dual-side PCB	PTT board, 10.85*56.3mm, 2-layer, 0.6mm	1
31	7SMF-020037M-SZCT-N	Cross recessed countersunk-head machine screw	M2.0*3.7,low-carbon steel, nickel plated	2
32	157F15000210	Conductive sponge	8*6*0.5mm	1
33	147K01000242	Slica-gel PTT key	Silica gel,hardness 60 degree,black	1
34	147K01000239	Rubber cap of PTT key	PC1414,dual-color (black + orange, Panton172C),etched	1

7. Debugging

7.1.Debugging Method

During the repair, if the components are changed, you need to test and adjust the technical specification.

7.1.1.Components needed for adjustment

(1) Antenna interface converter

(2) Universal interface

7.1.2.PC Test Mode Modulation Method

Tx Section

- **Tx Frequency**

Under computer mode (frequency stability), adjust Tx frequency as reference frequency within ±100Hz.

- **Power**

a. Under computer mode (Tx high power) (five frequencies), adjust Tx high power as 3.5-5.0W.

b. Under computer mode (Tx low power) (five frequencies), adjust Tx low power as 0.5-1.5W.

c. Battery low power indication during transmission: set power voltage as 6.5V, and under computer mode (Tx low voltage), click Ok after digits are stable.

Rx Section

- **Maximum Volume**

Set the RF frequency of integrated tester as center frequency, signal strength as 1mV, modulated frequency deviation as 3.0 kHz /1.5kHz (wide/narrow band). Under computer mode(max volume, wide/narrow band), adjust audio power as 1.2-1.5W.

- **Squelch**

a. RF signal is set to -121dBm, modulated frequency deviation to 3.0kHz/1.5kHz (narrow/wide band). Under computer mode (SQL on, narrow/wide band) (five frequencies), click Ok when the value is stable.

b. RF signal is set to -123dBm, modulated frequency deviation to 3.0kHz/1.5kHz (wide/narrow ban). Under computer mode (SQL off, narrow/wide band) (five frequencies), click Ok when the value is stable.

7.2.Radio Test

(1) Voltage used in test: 7.5V ±0.1V room temperature

(2) Frequency range: 400 ~470MHz

The specifications should be tested in the test mode:

Rx Section

1. Sensitivity: ≤-119dBm (0.25uV) (wide band, narrow band) 12dB SINAD

2. Distortion: ≤5%

3. Current: static current : ≤100mA

Received working current: ≤400mA

4. Squelch off Sensitivity: when RF input ≤-124dBm, squelch off.

5. Squelch on Sensitivity: when RF input ≥-119dBm, squelch on.

Tx Section

1. Output Power: high (3.8W---4.8W) low (0.7W---1.3W)

2. Tx Current: high power Tx≤ 1.6A; low power Tx ≤1.0A

3. Tx Distortion: ≤5%

4. Tx Frequency Deviation: reference frequency +/-500Hz

5. Undervoltage Indication: when voltage is 6.2V, the red indicator should flash when pressing PTT, and no Tx power occurs.

8. General Specification

Model	UP305
Frequency	400MHz~470MHz
Channel Capacity	16 zones*16 channels
Channel Spacing	25kHz/12.5kHz
Operating Voltage	7.4V negative pole grounded
Operating Temperature	-25℃~+55℃
Antenna Impedance	50Ω
Mic Impedance	2.2kΩ
Battery	Lithium-ion battery DC 7.4V, 1200mAh
Receiving sensitivity (12dB SINAD)	≤-119dBm
Squelch Sensitivity (Level 3)	≤-120dBm
Adjacent Channel Selectivity	≥70dB/≥60dB
Intermodulation Immunity	≥65dB
Spurious Response Rejection	≥70dB
Audio Output Power	0.5W, @distortion ≤5%, 16Ω
Current Consumption (Rx)	≤400mA
TX Power	4W/1W@7.4V DC (Band U);
Frequency Stability	≤±2.5ppm
Maximum Modulation Offset	±5kHz/ ±2.5kHz
Modulation Distortion (300~3000Hz)	≤3%
Tx Power of Adjacent Channel	≤-60dbm/ ≤-50dbm
Spurious Emission	≤-36dB
Current Consumption (Tx)	≤1.5A@7.4V DC

9. Equipment for Maintenance and Test

1. Wireless general-purpose tester HP8920/8921

2. Digital multimeter

3. Regulated DC power supply

Equipment	Specification
Standard signal generator	Frequency range: 400MHz~470MHz Modulation: Frequency modulation and external modulation Output: -127dBm/0.1uV to > -47dBm/1mV
Power meter	Input impedance: 50Ω Operating frequency: 400MHz~470MHz Measurement range: About 10W
Frequency deviation meter	Frequency range: 400MHz~470MHz
Digital voltmeter	Measurement range: DC 10mV~10V Input impedance: High input impedance of minimum circuit load
Oscilloscope	Max 30MHz DC bandwidth
High-sensitivity frequency counter	Frequency range: 50Hz~10KHz Frequency stability: 0.2ppm or lower
Ammeter	5A
Audio voltmeter	Frequency range: 50Hz~10KHz Voltage range: 1mV~10V
Audio sweep generator	Frequency range: 50Hz~5KHz or higher Output: 0V~1V
Distortion tester	Capability: 3% or lower at 1KHz Input level: 50mV~10Vms
Spectrum analyzer	Measurement range: Max 1GHz DC or higher
Trajectory generator	Center frequency: 50kHz~600MHz Output voltage: 100mv or above
Dummy load	About 16Ω, 3W
Adjustable power supply	5V~10V, about 5A

10.Troubleshooting

SN	Failure Description	Troubleshooting
1	Startup fails	A. Check the battery. If it is low, charge or replace it. B. The Power key does not work well. Replace the key. C. The CPU does not work well. Replace the IC.
2	PLL unlocked (with “di di” tone)	A. PLL crystal oscillator X500 is broken. Replace it. B. The IC AT1846S is broken. Replace it.
3	Communication fails	A. Make sure the channels the both radios communicate on are of the same frequency. B. The radios use different CTCSS/DCS signaling codes. Set the same one via PC. C. Out of communication range.
4	Cannot receive signals	A. The antenna has bad contact. Screw up the antenna connector. B. Sensitivity is low. Fine tune the “tuning mode”. C. The squelch level is too high, so that squelch cannot be enabled. Set a lower level via PC.
5	Red light on during transmitting, but receiver hears no voice	A. The tube power amplifier outputs no power. Replace with a new amplifier. B. The microphone does not work well. Replace with a new microphone.
6	Green light on during receiving, but cannot hear voice	A. The speaker does not work well. Replace with a new speaker. B. The audio amplifier U3 does not work well. Replace it.
7	Programming fails	A. Check wiring. B. The programming cable driver is not installed properly. Reinstall it.

Appendix 1 Abbreviations

AMP	Amplify, amplifier
ANT	Antenna
APC	Automatic power control
BPF	Band-pass filter
CTCSS	Continuous tone control squelch system
DCS	Digital code squelch
DEMOD	Demodulation
E2PROM	Electrically Erasable Programmable Read-Only Memory
HPF	High-pass filter
IDC	Instantaneous deviation control
IF	Intermediate frequency
LED	Light-emitting diode
LNA	Low-noise amplifier
LPF	Low-pass filter
MCU	Micro control unit
MIC	Microphone
MOD	Modulation
MONI	Monitor
PLL	Phase lock loop
PTT	Push-to-talk
RX	Receiver
SPK	Speaker
TCXO	Temperature controlled crystal oscillator
TX	Transmitter

Appendix 2 Material List (Electronic Part)

SN	Material Code	Material Name	Specification	QTY	Position
1	157F02000003	Power/channel encoder switch	Waterproof, RE08127HX-V02-0698 A0367	1	
2	136X03000010	Bluetooth antenna	Single-core copper wire,diameter 0.6mm,length 24.3mm,red peel,tin-dipped	1	
3	4SM7-6027-A40B	Earphone for handheld radios (558S, 7200, 558, S785)	EM6027MP2.8-C,-20~60°C	1	
4	3CE3-CZ25-D	Earphone jack	2.5mm earphone, 4.5mm high, pin length 2.5mm	1	J601
5	133C07000002	3.5mm earphone socket	4-pin, with switch	1	J600
6	136P04000154	Multi-layer PCB	45.2*92mm,4-layer,1.2mm	1	PCB
7	157F12000099	Speaker shrapnel	SUS301,2.8*1.55*1.38mm, JM-SH02-14,T=0.1mm,high:0.9mm	4	J2,J3,J4,J5
8	124P01000009	Light emitting diode	HJ-19UGC-T4,emerald,(2.8V-3.2V)@20mA,1.6mm*0.8mm*0.6mm,-40~85°C	1	D205
9	124P01000006	Light emitting diode	HJ-19URC-T6,red light,2V@20mA,1.6mm*0.8mm*0.6mm,-40~85°C	1	D203
10	121I04000031	General-purpose linear IC	LM2904XTS8G/TR,TSSOP-8,-40℃ to125℃,	2	IC302,IC500
11	121T01000013	SMD triode	ROHM,2SC4726TLP,SOT-416,-55~125℃	1	Q502
12	121I05000110	SMT IC	WL2836D33-4/TR,DFN1x1-4L,-40 to +85℃,	2	U10,U11

13	121D03000007	SMD Schottky barrier diode	SD103AW,SOD-323，2.7mm*1.35mm*1.0mm,-55℃ to 150℃,	1	D101
14	135F04000011	Bead	GZ1608U601CTF,1608	8	L30,L32,L100,L104,L105,L515,L521,L600
15	121D03000006	Rectifier diode	ROHM,RB706UM-40	1	D4
16	125O02000001	Voltage controlled crystal oscillator	26MHz±2ppm,VC-TCXO,2.4-3.3V	1	X500
17	121I05000076	SMT IC	Lead free	1	U500
18	112C03000146	Ceramic capacitor	1uF,±10%,16V,0402,X5R	18	C7,C16,C22,C615,C158,C159,C172,C174,C177,C178,C179,C180,C181,C182,C183,C184,C189,C15
19	112C03000209	Ceramic capacitor	6pF,±0.25pF,50V,1005,NPO	2	C520,C561
20	7MHP-4002-01C-W	TD7700 battery connector (high shrapnel)	BC-2P-4.1PH-6.8H, 7.5mm high shrapnel	1	J1
21	5FE1-BLM21P300S	SMD EMI suppression filter	murata,BLM21PG300SN1D,2012.0	2	L512,L514
22	3FW1-42932-302320	Fuse	CCC compliant, littelfuse,429003/433003/466003,3216,3A/32V	1	F100
23	3FW1-0805L035	Fuse	CCC compliant, Littelfuse,0805L035,0603,-40 to +85℃	1	F101
24	2RS1-32-R39J	Chip resistor	yageo,RC1206JR-070R39L,0.39,Ω,±5%,3216	4	R520,R521,R522,R523
25	2RS1-16-560J	Chip resistor	yageo,RC0603JR-0756RL,56,Ω,±5%,1608	1	L513
26	2RS1-16-271J	Chip resistor	yageo,RC0603JR-07270RL,270,Ω,±5%,1608	1	R505
27	2RS1-16-150J	Chip resistor	yageo,RC0603JR-0715RL,15,Ω,±5%,1608	1	R40
28	2RS1-16-103J	Chip resistor	yageo,RC0603JR-0710KL,10,KΩ,±	1	R12

			5%,1608		
29	2RS1-16-000O	Chip resistor	yageo,RC0603JR-070RL,0,Ω,±5%,1608	3	L6,L33,L510
30	2RS1-10-821J	Chip resistor	yageo,RC0402JR-07820RL,820,Ω,±5%,1005	2	R32,R37
31	2RS1-10-682J	Chip resistor	yageo,RC0402JR-076K8L,6.8,KΩ,±5%,1005	1	R503
32	2RS1-10-563J	Chip resistor	yageo,RC0402JR-0756KL,56,KΩ,±5%,0402	2	R38,R509
33	2RS1-10-562J	Chip resistor	yageo,RC0402JR-075K6L,5.6,KΩ,±5%,0402	1	R613
34	2RS1-10-511J	Chip resistor	yageo,RC0402JR-07510RL,510,Ω,±5%,0402	2	R137,R138
35	2RS1-10-4R7J	Chip resistor	yageo,RC0402JR-074R7L,4.7,Ω,±5%,0402	2	R84,R85
36	2RS1-10-474J	Chip resistor	yageo,RC0402JR-07470KL,470,KΩ,±5%,0402	1	R11
37	2RS1-10-473J	Chip resistor	yageo,RC0402JR-0747KL,47,KΩ,±5%,0402	7	R14,R58,R69,R70,R501,R508,R513
38	2RS1-10-472J	Chip resistor	yageo,RC0402JR-074K7L,4.7,KΩ,±5%,0402	4	R39,R561,R562,R615
39	2RS1-10-471J	Chip resistor	yageo,RC0402JR-07470RL,470,Ω,±5%,0402	2	R612,R624
40	2RS1-10-470J	Chip resistor	yageo,RC0402JR-0747RL,47,Ω,±5%,0402	1	R500
41	2RS1-10-393J	Chip resistor	yageo,RC0402JR-0739KL,39,KΩ,±5%,0402	1	R631
42	2RS1-10-392J	Chip resistor	yageo,RC0402JR-073K9L,3.9,KΩ,±5%,0402	3	C23,R31,R632
43	2RS1-10-333J	Chip resistor	yageo,RC0402JR-0733KL,33,KΩ,±5%,0402	5	R8,R18,R29,R616,R617

44	2RS1-10-332J	Chip resistor	yageo,RC0402JR-073K3L,3.3,KΩ,±5%,0402	2	R56,R81
45	2RS1-10-330J	Chip resistor	yageo,RC0402JR-0733RL,33,Ω,±5%,0402	1	R510
46	2RS1-10-271J	Chip resistor	yageo,RC0402JR-07270RL,270,Ω,±5%,0402	1	R515
47	2RS1-10-225J	Chip resistor	yageo,RC0402JR-072M2L,2.2,MΩ,±5%,0402	2	C25,R517
48	2RS1-10-223J	Chip resistor	yageo,RC0402JR-0722KL,22,KΩ,±5%,0402	1	R27
49	2RS1-10-222J	Chip resistor	yageo,RC0402JR-072K2L,2.2,KΩ,±5%,0402	1	R102
50	2RS1-10-221J	Chip resistor	yageo,RC0402JR-07220RL,220,Ω,±5%,0402	1	R13
51	2RS1-10-220J	Chip resistor	yageo,RC0402JR-0722RL,22,Ω,±5%,0402	1	R511
52	2RS1-10-203J	Chip resistor	yageo,RC0402JR-0720KL,20,KΩ,±5%,0402	1	R529
53	2RS1-10-182J	Chip resistor	yageo,RC0402JR-071K8L,1.8,KΩ,±5%,0402	2	R244,R618
54	2RS1-10-155J	Chip resistor	yageo,RC0402JR-071M5L,1.5,MΩ,±5%,0402	1	C109
55	2RS1-10-153J	Chip resistor	yageo,RC0402JR-0715KL,15,KΩ,±5%,0402	1	R512
56	2RS1-10-152J	Chip resistor	yageo,RC0402JR-071K5L,1.5,KΩ,±5%,0402	1	R507
57	2RS1-10-103J	Chip resistor	yageo,RC0402JR-0710KL,10,KΩ,±5%,0402	11	R30,R86,R98,R103,R110,R212,R223,R601,R614,R139,R140
58	2RS1-10-102J	Chip resistor	yageo,RC0402JR-071KL,1KΩ,±5%,0402	9	R6,R10,R108,R236,R237,R238,R239,R502,R131

59	2RS1-10-101J	Chip resistor	yageo,RC0402JR-07100RL,100,Ω,±5%,0402	2	R135,R136
60	2RS1-10-100J	Chip resistor	yageo,RC0402JR-0710RL,10,Ω,±5%,0402	1	R559
61	2RS1-10-000O	Chip resistor	yageo,RC0402JR-070RL,0,Ω,±5%,0402	13	C73,C558,L1,R9,R17,R49,R89,R167,R504,R516,R519,R115,R116
62	2RS1-06-473J	Chip resistor	yageo,RC0201JR-0747KL,47,KΩ,±5%,0201	8	R265,R266,R267,R268,R540,R541,R557,R558
63	2RS1-06-471J	Chip resistor	470Ω,±5%,0201,	2	R15,R65
64	2RS1-06-153J	Chip resistor	yageo,RC0201JR-0715KL,15,KΩ,±5%,0201	1	R542
65	2RS1-06-103J	Chip resistor	yageo,RC0201JR-0710KL,10,KΩ,±5%,0201	5	R48,R51,R55,R117,R122
66	2RS1-06-102J	Chip resistor	yageo,RC0201JR-071KL,1,KΩ,±5%,0201	9	R3,R50,R539,R544,R545,R547,R551,R622,R623
67	2RS1-06-000O	Chip resistor	yageo,RC0201JR-070RL,0,Ω,±5%,0201	4	R19,R26,R33,R34
68	2RE1-10-5602	SMD precision resistor	yageo,RC0402FR-0756KL,56,KΩ,±1%,0402	1	R104
69	2RE1-10-2203	SMD precision resistor	YAGEO,RC0402FR-07220KL,220,KΩ,±1%,0402	1	R42
70	2RE1-10-1602	SMD precision resistor	YAGEO,RC0402FR-0716K2L,16.2,KΩ,±1%,0402	1	R106
71	2RE1-10-1503	SMD precision resistor	1005,150KΩ±1%	2	R518,R525
72	2RE1-10-1003	SMD precision resistor	1005,100K±1%	5	R105,R107,R526,R527,R528
73	2LW1-20UC-221JC	SMD wire wound inductor	FHW0805UCR22JGB,220nH,±5%,0805,	1	L508
74	2LW1-16UC-150J	SMD wire wound inductor	sagami,C1608CB-15NJ,15,nH,±5%,1608	1	L3
75	2LL1-16-2N2SB	Multi-layer chip inductor	SunLord,SDCL1608C2N2STDF,2.2,nH,±0.3nH,1608	1	L504
76	2LL1-16-22NJB	Multi-layer chip inductor	SunLord,SDCL1608C22NJTDF,22,nH,±5%,1608	2	L509,L511
77	2LL1-10-18NJB	Multi-layer chip inductor	SDCL1005C18NJ,18nH,±5%,1005,	2	L8,L39

78	2LH1-R501R5-L05-05	SMD air core inductor	E20.50*1.5*5TR	1	L506
79	2LH1-R401R5-R08-05	SMD air core inductor	E20.40*1.5*8TL	1	L507
80	2LH1-R401R5-R04-05	SMD air core inductor	E20.40*1.5*4TL	1	L502
81	2LH1-R401R5-R03-05	SMD air core inductor	E20.40*1.5*3TL	4	L500,L501,L503,L505
82	2LG1-VLS3012ET-100M	SMD power inductor	TDK,VLS3012ET-100M,10,uH,±20%,3*3*1.2	1	L107
83	2CC1-20-Y5V160-106Z	Multi-layer chip capacitor	murata,GRM21BF51C106ZE15L,10,uF,+80%/-20%,16V,2012,Y5V	20	C28,C39,C47,C50,C51,C86,C91,C103,C106,C108,C123,C582,C606,C617,C119,C169,C170,C171,C185,C186
84	2CC1-16-X5R160-105K	Multi-layer chip capacitor	murata,GRM188R61C105KA12D,1,uF,±10%,16V,1608,X5R	3	C78,C187,C188
85	2CC1-16-C0G500-9R0C	Multi-layer chip capacitor	murata,GRM1885C1H9R0CA01D,9pF,±0.25pF,50V,1608,C0G	1	C509
86	2CC1-16-C0G500-6R0C	Multi-layer chip capacitor	murata,GRM1885C1H6R0CA01D,6,pF,±0.25pF,50V,1608,C0G	2	C515,C516
87	2CC1-16-C0G500-680J	Multi-layer chip capacitor	murata,GRM1885C1H680JA01D,68,pF,±5%,50V,1608,C0G	1	C510
88	2CC1-16-C0G500-5R0C	Multi-layer chip capacitor	murata,GRM1885C1H5R0CA01D,5,pF,±0.25pF,50V,1608,C0G	1	C513
89	2CC1-16-C0G500-4R0B	Multi-layer chip capacitor	murata,GRM1885C1H4R0BA01D,4,pF,±0.1pF,50V,1608,C0G	4	C503,C505,C514,C517
90	2CC1-16-C0G500-240J	Multi-layer chip capacitor	murata,GRM1885C1H240JA01D,24,pF,±5%,50V,1608,C0G	1	C501
91	2CC1-16-C0G500-220J	Multi-layer chip capacitor	murata,GRM1885C1H220JA01D,22,pF,±5%,50V,1608,C0G	1	C507
92	2CC1-16-C0G500-1R0B	Multi-layer chip capacitor	murata,GRM1885C1H1R0BA01D,1,pF,±0.1pF,50V,1608,C0G	2	C502,C504

93	2CC1-16-C0G500-150J	Multi-layer chip capacitor	murata,GRM1885C1H150JA01D,15,pF,±5%,50V,1608,C0G	1	C508
94	2CC1-16-C0G500-121J	Multi-layer chip capacitor	murata,GRM1885C1H121JA01D,120,pF,±5%,50V,1608,C0G	1	C511
95	2CC1-10-X7R500-471K	Multi-layer chip capacitor	murata,GRM155R71H471KA01D,470,pF,±10%,50V,1005,X7R	27	C5,C8,C11,C21,C32,C38,C54,C55,C113,C118,C122,C333,C519,C522,C523,C528,C530,C531,C532,C533,C535,C537,C538,C549,C554,C624,R25
96	2CC1-10-X7R500-222K	Multi-layer chip capacitor	MURATA,GRM155R71H222KA01D,2.2,nF,±10%,50V,0402,X7R	1	C526
97	2CC1-10-X7R500-153K	Multi-layer chip capacitor	MURATA,GRM155R71H153KA12D,15,nF,±10%,50V,0402,X7R	1	C547
98	2CC1-10-X7R500-103K	Multi-layer chip capacitor	MURATA,GRM155R71H103KA88D,10,nF,±10%,50V,0402,X7R	17	C9,C10,C26,C42,C49,C61,C110,C112,C115,C529,C539,C540,C612,C72,C146,C147,C157
99	2CC1-10-X7R500-102K	Multi-layer chip capacitor	MURATA,GRM155R71H102KA01D,1,nF,±10%,50V,0402,X7R	16	C31,C613,C614,C52,C94,C95,C96,C97,C120,C124,C536,C573,C581,C156,C160,C161
100	2CC1-10-X7R250-333K	Multi-layer chip capacitor	MURATA,GRM155R71E333K,33,nF,±10%,25V,0402,X7R	1	C583
101	2CC1-10-X7R250-223K	Multi-layer chip capacitor	MURATA,GRM155R71E223KA61D,22,nF,±10%,25V,0402,X7R	2	C545,C584
102	2CC1-10-X7R160-473K	Multi-layer chip capacitor	MURATA,GRM155R71C473KA01D,47,nF,±10%,16V,0402,X7R	2	C40,C92
103	2CC1-10-X7R160-104K	Multi-layer chip capacitor	MURATA,GRM155R71C104KA88D,100,nF,±10%,16V,0402,X7R	11	C33,C43,C46,C101,C111,C114,C117,C346,C604,C609,C148
104	2CC1-10-X7R100-393K	Multi-layer chip capacitor	MURATA,GRM155R71A393KA01D,39,nF,±10%,10V,0402,X7R	1	C527
105	2CC1-10-X5R100-474K	Multi-layer chip capacitor	MURATA,GRM155R61A474KE15D,470,nF,±10%,10V,0402,X5R	2	R61,R62

106	2CC1-10-C0G500-430J	Multi-layer chip capacitor	MURATA,GRM1555C1H430JA01D,43,pF,±5%,50V,0402,C0G	1	C518
107	2CC1-10-C0G500-330J	Multi-layer chip capacitor	MURATA,GRM1555C1H330JA01D,33,pF,±5%,50V,0402,C0G	1	C521
108	2CC1-10-C0G500-271J	Multi-layer chip capacitor	MURATA,GRM1555C1H271JA01D,270,pF,±5%,50V,0402,C0G	1	C36
109	2CC1-10-C0G500-200J	Multi-layer chip capacitor	MURATA,GRM1555C1H200JA01D,20,pF,±5%,50V,0402,C0G	1	C560
110	2CC1-10-C0G500-101J	Multi-layer chip capacitor	MURATA,GRM1555C1H101JA01D,100,pF,±5%,50V,0402,C0G	1	C512
111	2CC1-10-C0G500-100D	Multi-layer chip capacitor	MURATA,GRM1555C1H100JA01D,10,pF,±5%,50V,0402,C0G	1	C35
112	2CC1-06-X7R500-333K	SMD capacitor	MURATA,GRM033R61A333KE84D,33,nF,±10%,50V,0201,X7R	3	C99,C100,C125
113	2CC1-06-X5R100-105M	SMD capacitor	MURATA,GRM033R61A105M,1,uF,±20%,10V,0201,X5R	4	C155,C173,C175,C176
114	2CC1-06-X5R100-104	Multi-layer chip capacitor	MURATA,GRM033R61A104KE15D,100,nF,±10%,10V,0201,X5R	5	C75,C79,C105,C126,C127
115	1TT1-L2SC3356LT1	SMD transistor	LRC,L2SC3356LT1,SOT-23,-~150℃	1	Q503
116	1TT1-DTC144EE	SMD transistor	ROHM,DTC144EE,EMT3,-~150℃	6	Q4,Q10,Q103,Q200,Q201,Q606
117	1TT1-2SC4116-GR	SMD transistor	TOSHIBA,2SC4116-GR,SOT-323/SC-70,-~125℃	1	Q2
118	1TT1-2SA1586	SMD transistor	TOSHIBA,2SA1586,SC-70,-~125℃	1	Q605
119	1TF1-ST2301	SMD field effect transistor	Stanson,ST2301,SOT-23-3L,-~150℃	3	Q1,Q102,Q600
120	1TF1-SSM3K15AFS	SMD field effect transistor	TOSHIBA,SSM3K15AFS,2-2H1B,-~150℃	1	Q3
121	1TF1-RD07MUS2B-501	ER SMD field effect transistor	MITSUBISHI,RD07MUS2B-501,SLP,-~150℃	1	Q500
122	1TF1-RD01MUS2-501	SMD field effect transistor (for portable digital and analog radios)	MITSUBISHI,RD01MUS2-501,S0T-89,-~150℃	1	Q501

123	1TC1-UMC4	SMD Darlington tube	Rohm,UMC4N,UMT5,-~150℃	1	U301
124	1IS1-XC6209F502PR	SMD voltage regulator IC	XC6209F502PR,SOT-89-5,-40~85°	1	IC100
125	1IS1-TDA2822	ER SMD IC	UTC,TDA2822,SOP8,-20 to +85℃	1	U600
126	1IS1-R1244N001B	DCDC power converter chip	R1244N001B,SOT23-6	1	IC102
127	1IS1-MCP4802-A	D/A converter IC	MICROCHIP,MCP4802	1	U20
128	1DS1-RN142S	SMD switch diode	ROHM,RN142S,1.6mm*0.8mm*0.6mm,-55℃ to 150℃	2	D500,D501
129	1DS1-1SS390	SMD switch diode	ROHM,1SS390,1.6mm*0.8mm*0.6mm,-55℃ to 125℃	2	D502,D503
130	1DS1-1SS387	Switch diode	TOSHIBA,1SS387,1.6mm*0.8mm*0.6mm	3	D3,D8,D10
131	1DR1-RB521S30	Schottky barrier diode	ROHM,RB521S30,SOD-523,1.6mm*0.8mm*0.6mm,-40℃ to 125℃	4	D1,D2,D5,D6
132	1DR1-1SR154-400	SMD rectifier diode	rohm,1SR154-400,4.5mm*2.6mm*2.0mm,-55℃ to 150℃	1	D100
133	121I01000003	MCU + baseband processing IC	HS8861;175;TFBGA;7.8X7.8;040;BB,	1	U2100
134	112C03000026	Ceramic capacitor	MURATA,GRM0335C1E471JA01,470pF,±5%,25V,0201,C0G	18	C19,C76,C77,C93,C98,C199,C45,C107,C326,C327,C328,C329,C550,C551,C553,C559,C564,C565

Appendix 3 Material List (Structural Section)

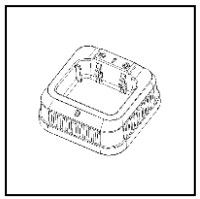
SN	Material NO.	Material Name	Specification	QTY
1	7SMF-020040M-SZYB-N	Cross recessed mushroom-head machine screw	Hardened iron; Φ2mm*4mm, nickel plated, metric coarse thread, nylok	1

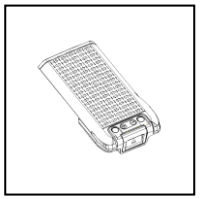
SN	Material NO.	Material Name	Specification	QTY
2	147K01000225	Top cover	PC1414, black, etched	1
3	7MHR-4207-06A-W0	O-ring of antenna pedestal	Silica gel, outer diameter 11mm, wire diameter 1.5mm	1
4	7MHR-4072-05A-W0	O-ring	Outer diameter 8mm, wire diameter 1.5mm	1
5	7SMF-020037M-SZCT-N	M2.0*3.7 cross recessed countersunk-head machine screw	Low-carbon steel, nickel plated, Φ2.0*3.7	2
6	147K04000024	Waterproof pad for discharge	High-elasticity silica gel (with high-elasticity ingredient 15% or more),hardness 50±5°,orange	1
7	7MHZ-1731-01A-J5	Insulative paper for speaker	N/A	1
8	147K01000239	Plastic PTT-key cap	PC1414, dual-color (black + orange Panton172C), etched	1
9	7MHR-1727-09A-W3	Hand-microphone case	Silica gel, hardness 40°, orange	1
10	63MK000068	Top housing assembly	Dual-color (black + gray)	1
11	63BJ000002	Belt-clip assembly	Black, PC1414, etched	1
12	136P03000059	Dual-side PTT PCB	10.85*56.3mm,2-layer,0.6mm	1
13	7SMF-025080M-SZYB-Z1	Cross recessed mushroom-head machine screw	Hardened iron, Φ2.5mm*8mm,black nickel plated, metric coarse thread	2
14	147K02000149	Inner liner of volume knob	Manganese steel, black, electrophoresis	1
15	157F10000008	Antenna connector nut	Stainless steel 304, φ11.3*M9*0.75*2.5	1
16	3CR7-SMA-50JF-4	RF coaxial cable	Install with flange plate	1
17	7MHR-7042-06C-W0	Heat-conducting silicon pad	Silica gel, black, 3*6*9mm	1
18	7SMF-020080M-MHHT-N1	Torx thick-head machine screw	Hardened iron,Φ2mm*8mm, metric coarse thread, nylok	2
19	157F10000009	Knob nut	Stainless steel 304, φ8.0*M6*0.75*2.5	1
20	147K02000139	Dome array for PTT key	Stainless-steel plate, original color, φ5, circular, multi-point dome array, elasticity 180 (+/-20)g	1
21	147K01000231	Master waterproof ring	High-elasticity silica gel, hardness 45°	1

SN	Material NO.	Material Name	Specification	QTY
22	147K01000233	Aluminum housing	ADC12,oil sprayed	1
23	147K01000259	Waterproof pad of earphone	Hardness 80 degree,black,etched,with co-moulded shut-off gate	1
24	147K01000238	Knob cap	PC1414,dual-color,etched,with screen print	1
25	157F15000210	Conductive sponge	8*6*2.0mm	1

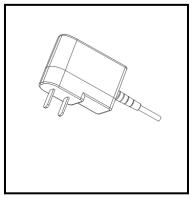
Appendix 4 Accessory List

Accessory	QTY
Radio	1
Charger	1
Power adapter	1
Battery	1
Belt clip	1
Antenna	1
Strap	1
User Manual	1

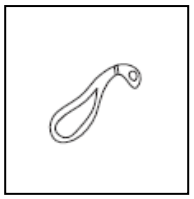

Charger


Battery


Belt clip + screws

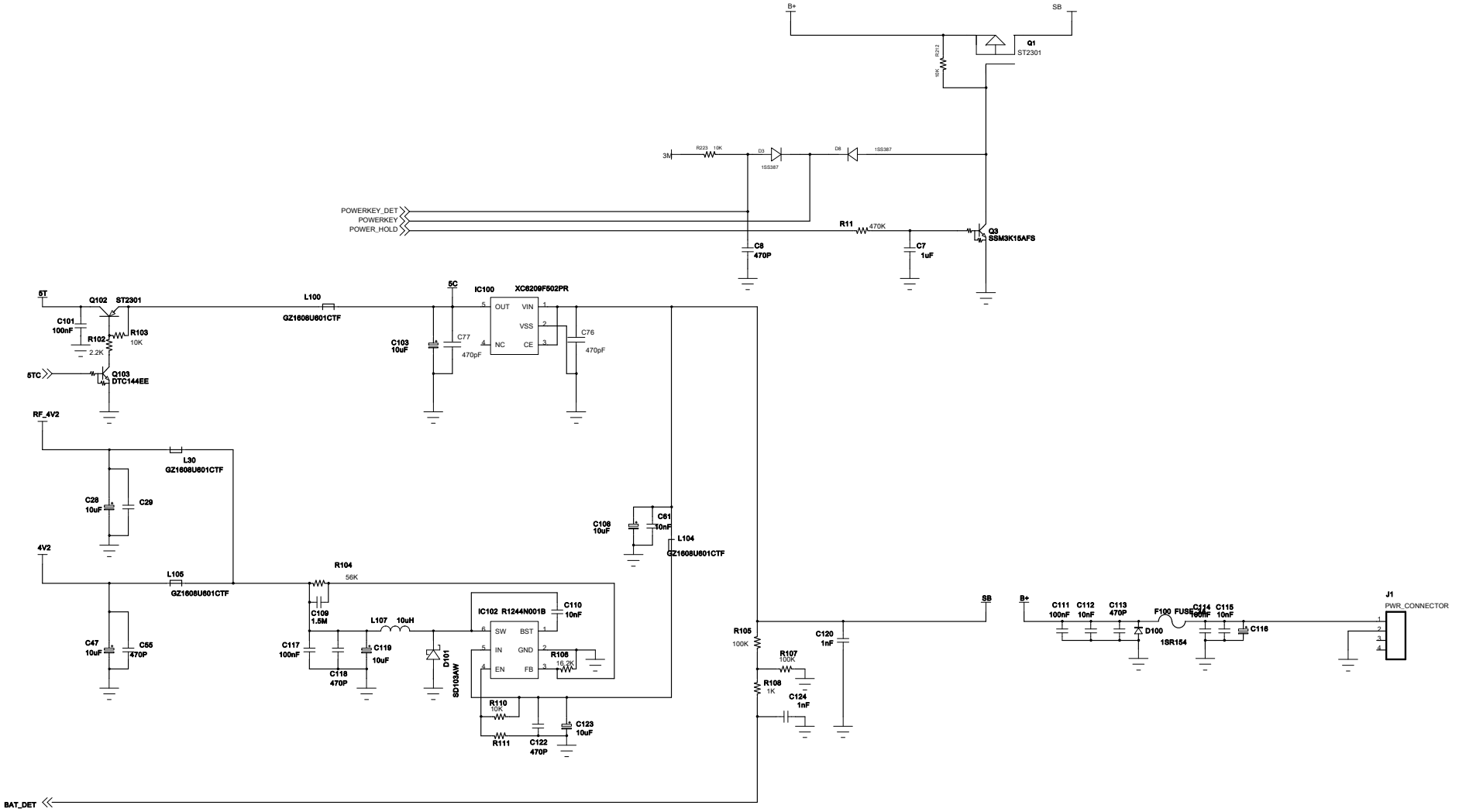

Power Adapter

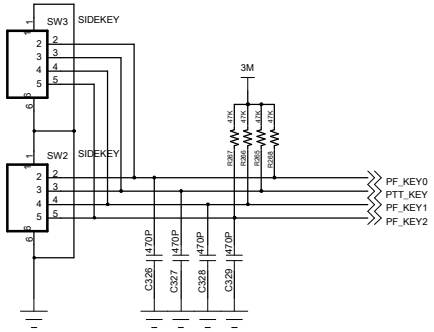

Antenna


Strap

Appendix 5 Schematic Diagrams and Layout Drawings

Schematic Diagrams of Main Board

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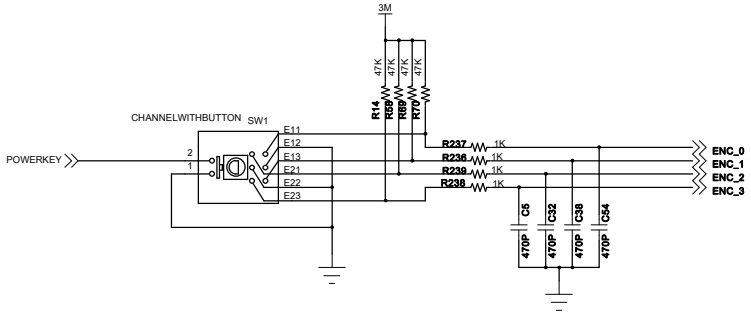
SW2
SIDEKEY
3M
R367
R366
R365
R368
47K
PF_KEY0
PTT_KEY
PF_KEY1
PF_KEY2
C326
C327
C328
C329
470P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R14
R59
R69
R70
47K
CHANNELWITHBUTTON
SW1
POWERKEY
E11
E12
E13
E21
E22
E23
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R238
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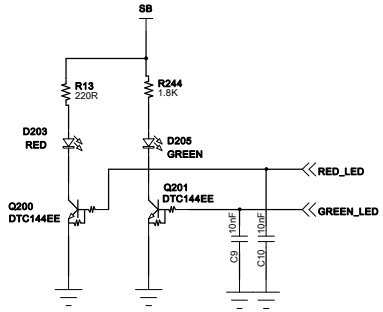
ENC_3
C5
C32
C38
C54
470P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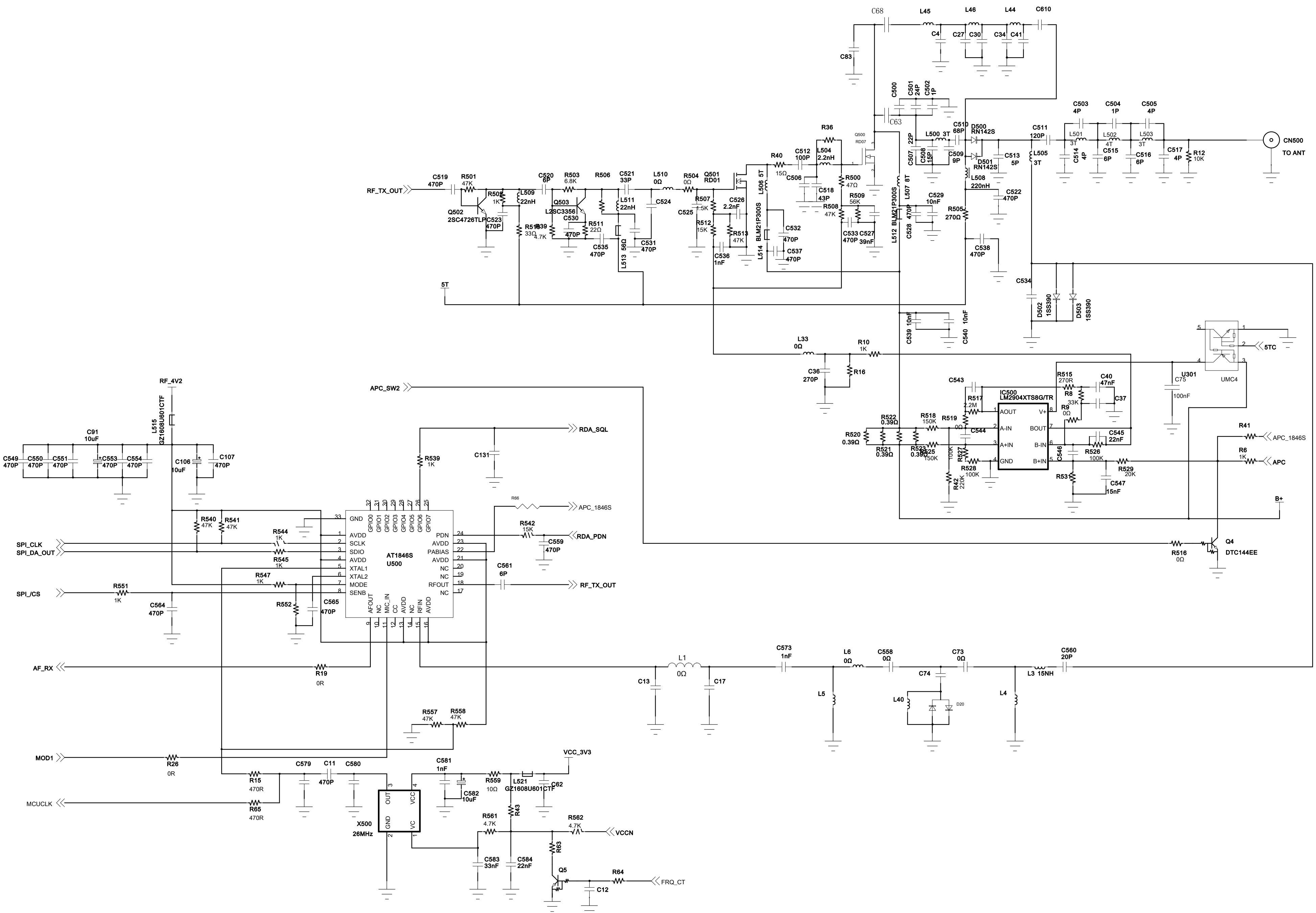
220R
R244
1.8K
D203
RED
D205
GREEN
RED_LED
Q201
DTC144EE
Q200
DTC144EE
GREEN_LED
C9
C10
10nF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5T
RF_4V2
APC_SW2
RDA_SQL
APC_1846S
RDA_PDN
RF_TX_OUT
SPI_CLK
SPI_DA_OUT
SPI_CS
AF_RX
MOD1
MCUCLK
VCC_3V3
VCCN
FRQ_CT
CN500
TO ANT
5TC
APC_1846S
APC
B+
AT1846S
U500
GND
AVDD
SCLK
SDIO
AVDD
XTAL1
XTAL2
MODE
SENB
PDN
AVDD
PABIAS
AVDD
NC
NC
RFOUT
NC
GPIO0
GPIO1
GPIO2
GPIO3
GPIO4
GPIO5
GPIO6
GPIO7
AFOUT
NC
MIC_IN
CC
AVDD
NC
RFIN
AVDD
IC500
LM2904XTS8G/TR
AOUT
A-IN
A+IN
GND
V+
BOUT
B-IN
B+IN
U301
UMC4
Q4
DTC144EE
Q5
X500
26MHz
OUT
VCC
GND
VC
Q500
RD07
Q501
RD01
Q502
2SC4726TLP
Q503
2SC3356
D500
RN142S
D501
RN142S
D502
1SS390
D503
1SS390
L515
GZ1608U601CTF
L521
GZ1608U601CTF
L512 BLM21P300S
L514 BLM21P300S
L1
0Ω
L3 15NH
C68
C63
C91
10uF
C106
10uF
C107
470P
C582
10uF
C583
33nF
C584
22nF
C560
20P
C573
1nF
C581
1nF
R19
0R
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470R
R539
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4.7K
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R6
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R10
1K
L33
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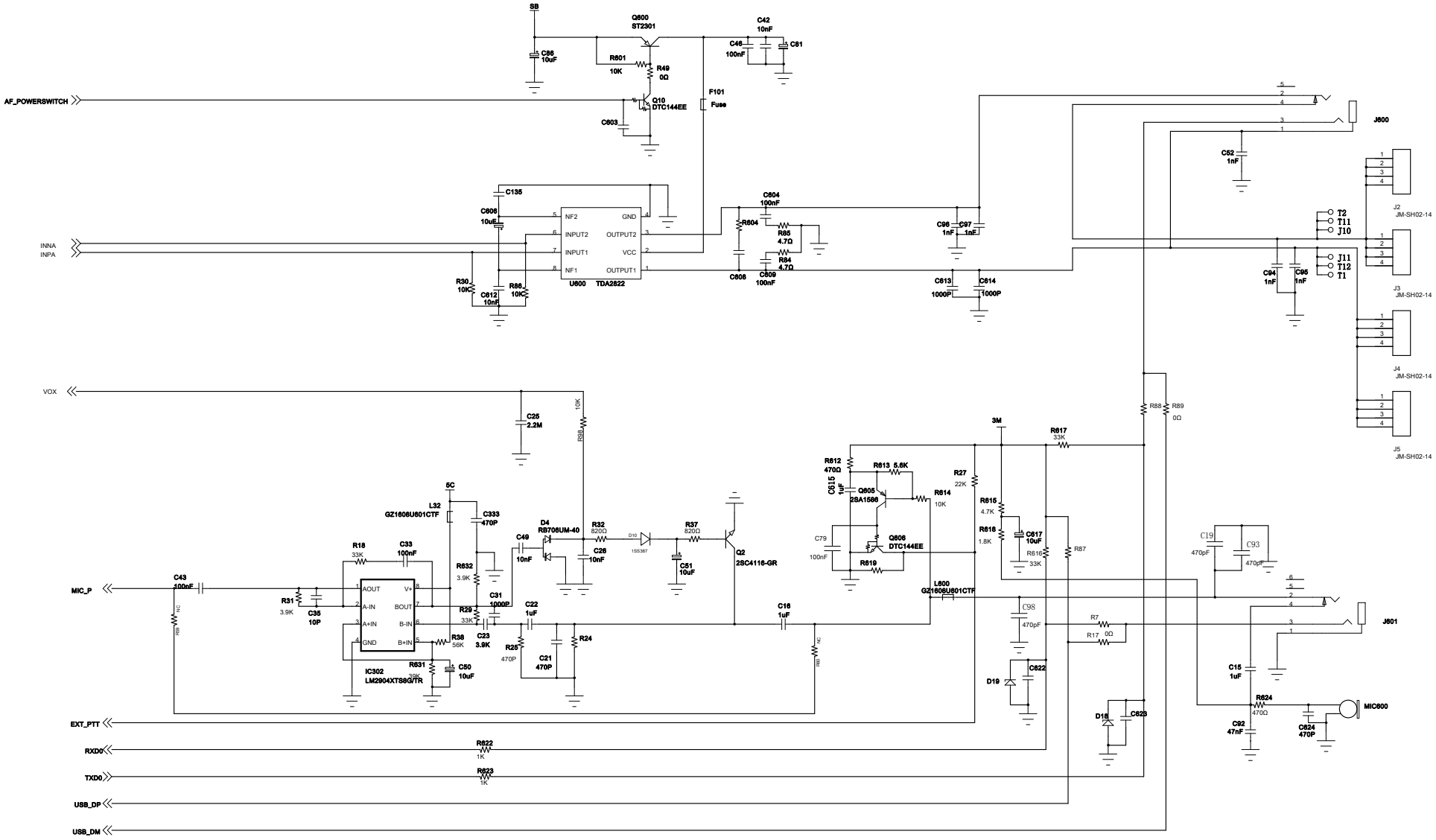
C36
270P
R16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C42
10nF
C46
100nF
C81
C86
10uF
R801
10K
R49
0Ω
F101
Fuse
AF_POWERSWITCH
Q10
DTC144EE
C803
J600
C52
1nF
C135
C808
10uF
NF2
GND
INPUT2
OUTPUT2
INPUT1
VCC
NF1
OUTPUT1
U800
TDA2822
C804
100nF
R604
R85
4.7Ω
R84
4.7Ω
C808
C809
100nF
C96
C97
1nF
1nF
C613
1000P
C614
1000P
INNA
INPA
R30
10K
C812
10nF
R86
10K
T2
T11
J10
J11
T12
T1
C94
1nF
C95
1nF
J2
JM-SH02-14
J3
JM-SH02-14
J4
JM-SH02-14
J5
JM-SH02-14
VOX
C25
2.2M
R88
R89
0Ω
3M
R817
33K
R812
470Ω
R813
5.6K
C615
1uF
Q805
2SA1586
R614
10K
R27
22K
R615
4.7K
R616
1.8K
C817
10uF
R616
33K
R87
Q806
DTC144EE
R619
C79
100nF
5C
L32
GZ1608U601CTF
C333
470P
D4
RB706UM-40
R32
820Ω
D10
1SS387
R37
820Ω
Q2
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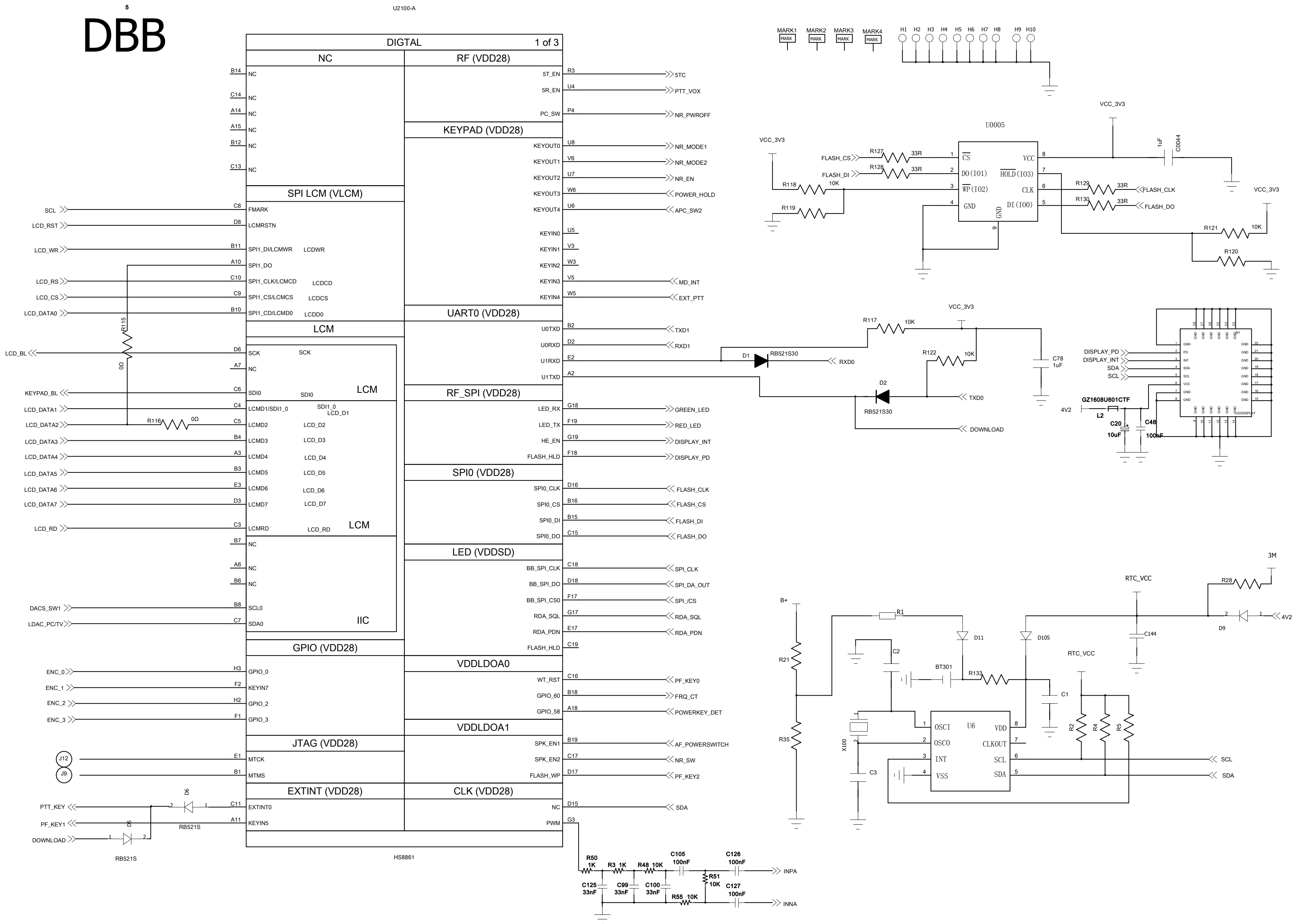
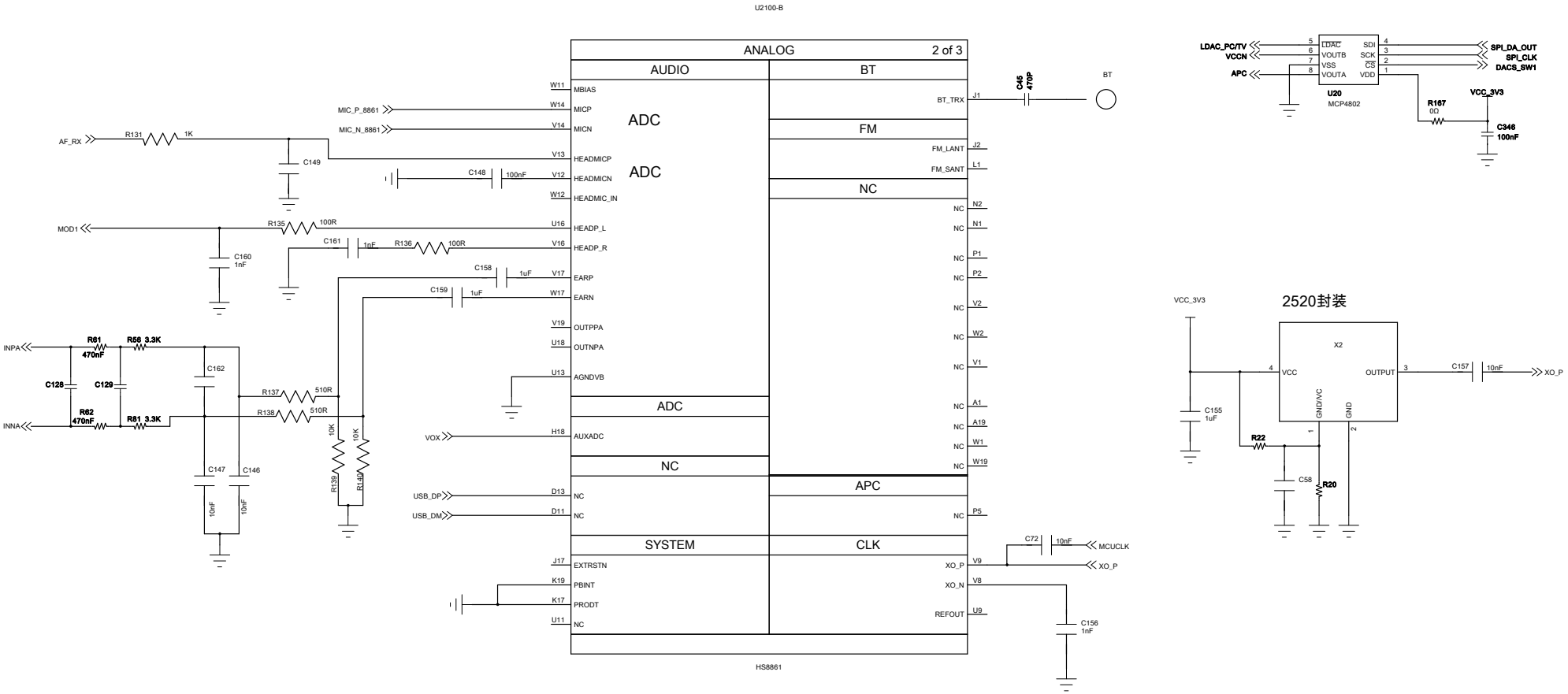
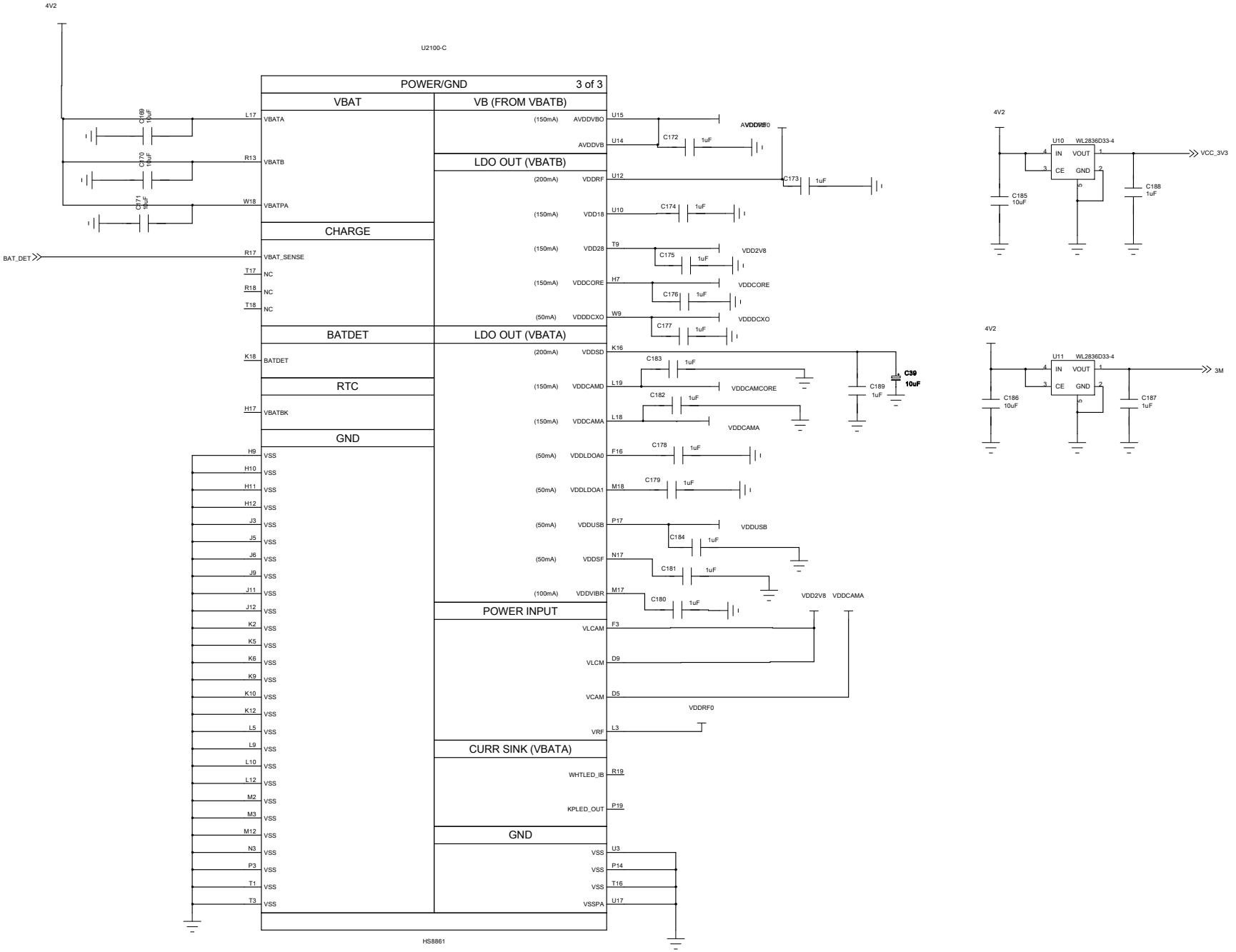
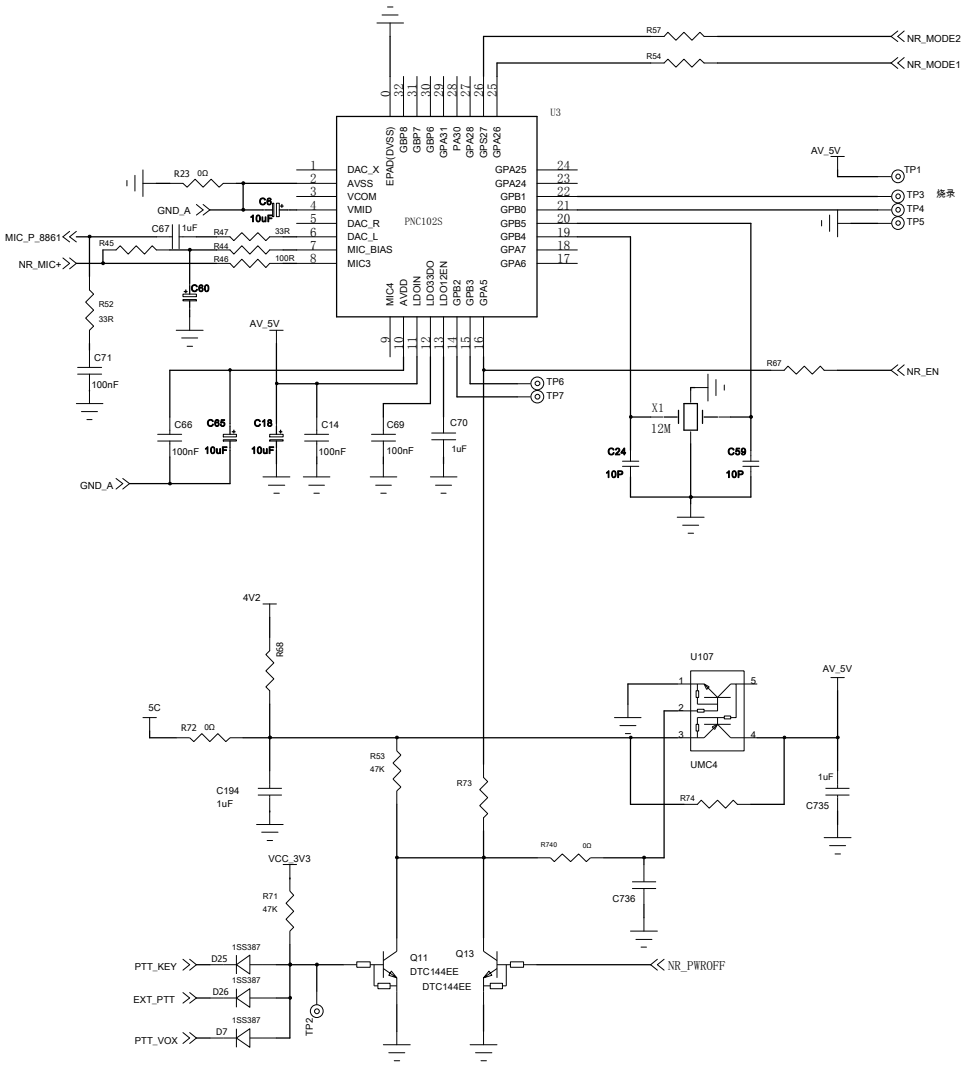
C49
10nF
C26
10nF
C51
10uF
R18
33K
C33
100nF
R832
3.9K
C31
1000P
R29
33K
C23
3.9K
R36
56K
R631
39K
C50
10uF
IC302
LM2904XTSSGTR
AOUT
V+
A-IN
BOUT
A+IN
B-IN
GND
B+IN
C22
1uF
R25
470P
C21
470P
R24
C16
1uF
L600
GZ1608U601CTF
C98
470pF
R7
R17
0Ω
J601
C19
470pF
C93
470pF
C15
1uF
R624
470Ω
C92
47nF
C824
470P
MIC600
D19
C822
D18
C823
MIC_P
C43
100nF
R31
3.9K
C35
10P
EXT_PTT
RXD0
R822
1K
TXD0
R823
1K
USB_DP
USB_DM

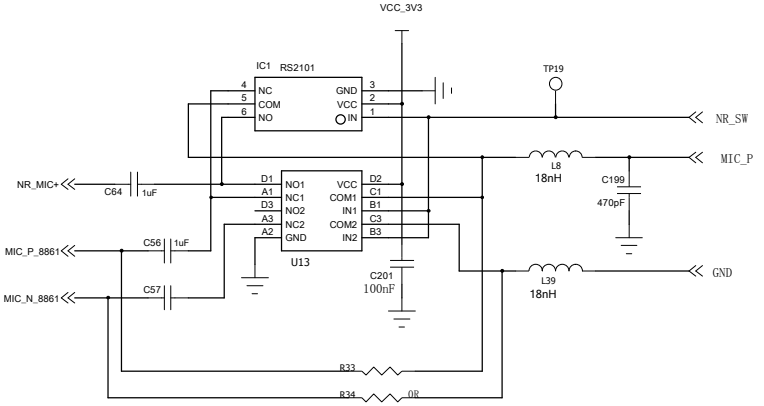
DBB

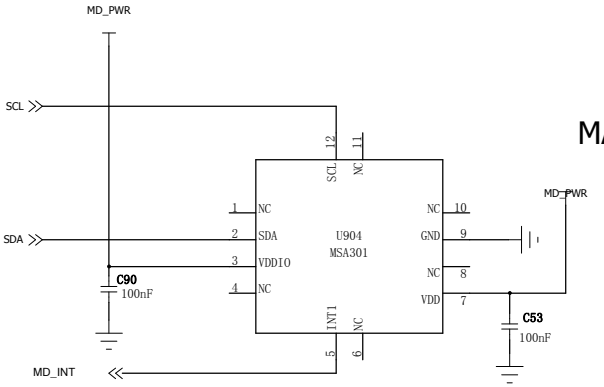

U2100-A
DIGTAL
1 of 3
NC
RF (VDD28)
KEYPAD (VDD28)
SPI LCM (VLCM)
UART0 (VDD28)
LCM
RF_SPI (VDD28)
SPI0 (VDD28)
LED (VDDSD)
IIC
GPIO (VDD28)
VDDLDOA0
VDDLDOA1
JTAG (VDD28)
EXTINT (VDD28)
CLK (VDD28)
HS8861
U0005
U6
VCC_3V3
RTC_VCC
B+
4V2
3M
GZ1608U601CTF
INPA
INNA


U2100-B
ANALOG
2 of 3
AUDIO
BT
ADC
FM
ADC
NC
ADC
NC
APC
SYSTEM
CLK
HS8861
MBIAS
MICP
MICN
HEADMICP
HEADMICN
HEADMIC_IN
HEADP_L
HEADP_R
EARP
EARN
OUTPPA
OUTNPA
AGNDVB
AUXADC
NC
NC
EXTRSTN
PBINT
PRODT
NC
BT_TRX
FM_LANT
FM_SANT
XO_P
XO_N
REFOUT
MIC_P_8861
MIC_N_8861
AF_RX
MOD1
VOX
USB_DP
USB_DM
INPA
INNA
MCUCLK
LDAC_PC/TV
VCCN
APC
SPI_DA_OUT
SPI_CLK
DACS_SW1
U20
MCP4802
VCC_3V3
2520封装
X2
VCC
OUTPUT
GND/VC
GND
XO_P

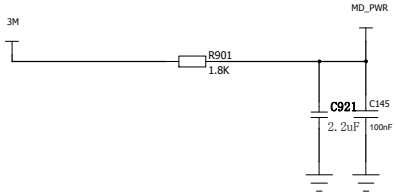

4V2
U2100-C
POWER/GND 3 of 3
VBAT
VB (FROM VBATB)
LDO OUT (VBATB)
CHARGE
BATDET
LDO OUT (VBATA)
RTC
GND
POWER INPUT
CURR SINK (VBATA)
GND
L17 VBATA
R13 VBATB
W18 VBATPA
R17 VBAT_SENSE
T17 NC
R18 NC
T18 NC
K18 BATDET
H17 VBATBK
H9 VSS
H10 VSS
H11 VSS
H12 VSS
J3 VSS
J5 VSS
J6 VSS
J9 VSS
J11 VSS
J12 VSS
K2 VSS
K5 VSS
K6 VSS
K9 VSS
K10 VSS
K12 VSS
L5 VSS
L9 VSS
L10 VSS
L12 VSS
M2 VSS
M3 VSS
M12 VSS
N3 VSS
P3 VSS
T1 VSS
T3 VSS
(150mA) AVDDVBO U15
AVDDVB U14
(200mA) VDDRF U12
(150mA) VDD18 U10
(150mA) VDD28 T9
(150mA) VDDCORE H7
(50mA) VDDDCXO W9
(200mA) VDDSD K16
(150mA) VDDCAMD L19
(150mA) VDDCAMA L18
(50mA) VDDLDOA0 F16
(50mA) VDDLDOA1 M18
(50mA) VDDUSB P17
(50mA) VDDSF N17
(100mA) VDDVIBR M17
VLCAM F3
VLCM D9
VCAM D5
VRF L3
WHTLED_IB R19
KPLED_OUT P19
VSS U3
VSS P14
VSS T16
VSSPA U17
C172 1uF
C173 1uF
C174 1uF
C175 1uF
C176 1uF
C177 1uF
C183 1uF
C182 1uF
C178 1uF
C179 1uF
C184 1uF
C181 1uF
C180 1uF
C189 1uF
C39 10uF
C169 10uF
C170 10uF
C171 10uF
BAT_DET
VDD2V8
VDDCORE
VDDDCXO
VDDCAMCORE
VDDCAMA
VDDUSB
VDDRF0
HS8861
4V2
U10 WL2836D33-4
IN VOUT
CE GND
VCC_3V3
C185 10uF
C188 1uF
4V2
U11 WL2836D33-4
IN VOUT
CE GND
3M
C186 10uF
C187 1uF


U3
PNC102S
DAC_X
AVSS
VCOM
VMID
DAC_R
DAC_L
MIC_BIAS
MIC3
EPAD(DVSS)
GBP8
GBP7
GBP6
GPA31
PA30
GPA28
GPS27
GPA26
GPA25
GPA24
GPB1
GPB0
GPB5
GPB4
GPA7
GPA6
MIC4
AVDD
LDOIN
LDO33DO
LDO12EN
GPB2
GPB3
GPA5
R57
R54
NR_MODE2
NR_MODE1
AV_5V
TP1
TP3
TP4
TP5
烧录
R23 0Ω
GND_A
C6
10uF
MIC_P_8861
NR_MIC+
C67 1uF
R47 33R
R44
R46 100R
R45
C60
R52 33R
C71 100nF
TP6
TP7
R67
NR_EN
X1
12M
C24 10P
C59 10P
C66 100nF
C65 10uF
C18 10uF
C14 100nF
C69 100nF
C70 1uF
4V2
R68
5C
R72 0Ω
C194 1uF
R53 47K
R73
U107
UMC4
R74
C735 1uF
R740 0Ω
C736
VCC_3V3
R71 47K
PTT_KEY
EXT_PTT
PTT_VOX
D25
D26
D7
1SS387
Q11
Q13
DTC144EE
NR_PWROFF
TP2

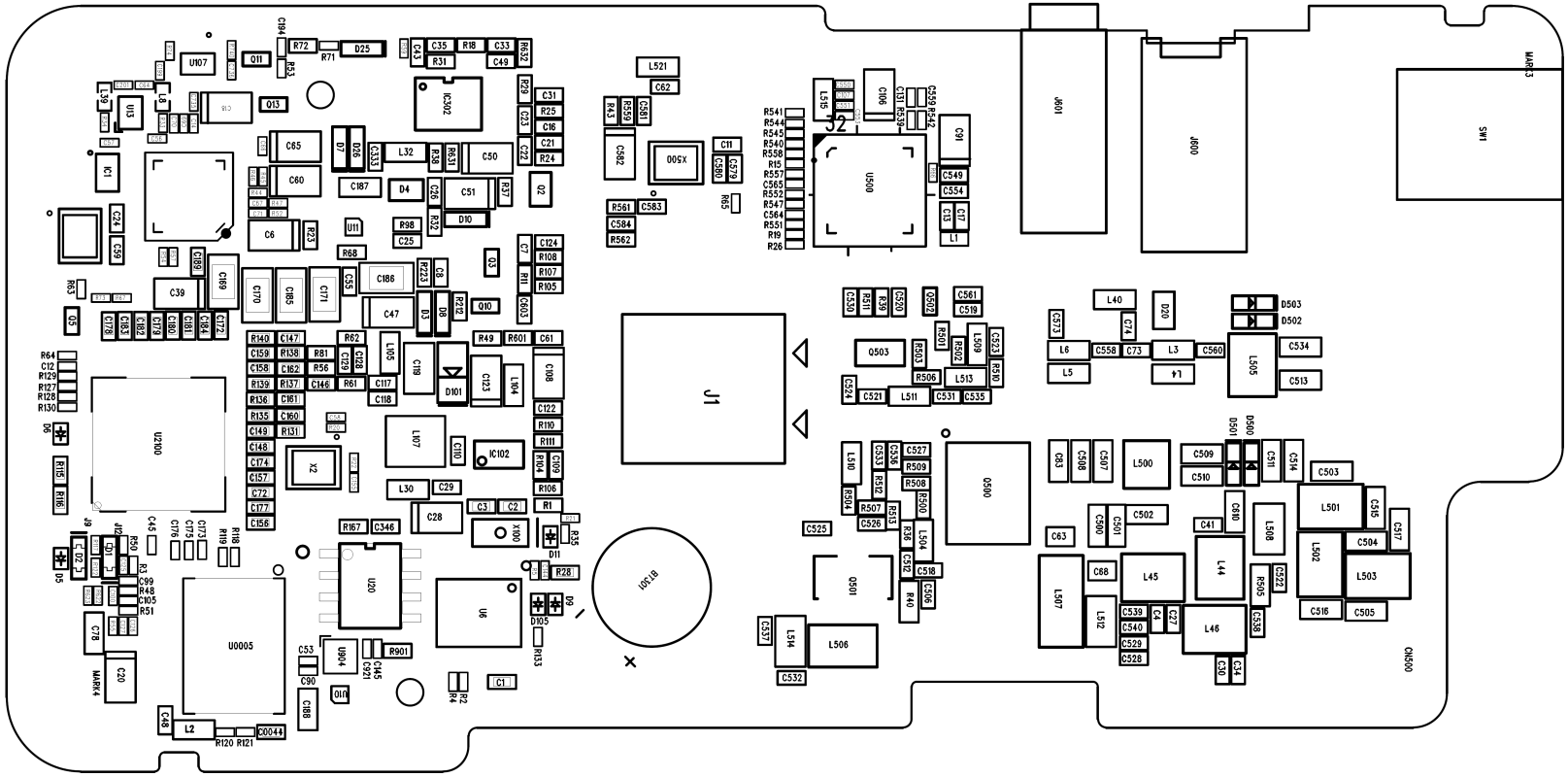

VCC_3V3
IC1 RS2101
NC
COM
NO
GND
VCC
IN
TP19
NR_SW
MIC_P
L8
18nH
C199
470pF
NR_MIC+
C64 1uF
MIC_P_8861
C56 1uF
MIC_N_8861
C57
U13
NO1
NC1
NO2
NC2
COM1
COM2
IN1
IN2
C201
100nF
L39
18nH
GND
R33
R34 0R


MD_PWR
SCL
SDA
MD_INT
C90
100nF
U904
MSA301
NC
SDA
VDDIO
NC
SCL
NC
INT1
NC
GND
VDD
C53
100nF
MD_PWR

MANDOWN


3M
R901
1.8K
MD_PWR
C921
2.2uF
C145
100nF

Top-Layer Layout Drawing of Main Board



Bottom-Layer Layout Drawing of Main Board