



Professional wireless communication system solution supplier



# **FP520**

## **Service Manual**

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## Chapter 1 Overview

### 1.1 Introduction

This manual applies to the service and maintenance of FP520 FM portable radios, and is intended for use by engineers and professional technicians that have been trained by Kirisun. It contains all the required service information for the equipment. Kirisun reserves the right to modify the product structure and specifications without notice in order to enhance product performance and quality. You can also contact your local dealer or us to get the latest service manual.

Please read this manual before repairing the product.

### 1.2 Safety Precautions

#### Electromagnetic Energy Exposure

Radios will generate and radiate electromagnetic energy during transmit mode. Kirisun radio is designed to comply with national and international standards for human exposure to radio frequency electromagnetic energy.

To derive optimal performance, and to guarantee that the electromagnetic radiation does no harm to you, always keep the radio in a vertical position to the ground and make sure that the microphone is 2-5cms from your mouth while using.

#### Electromagnetic Interference

In order to avoid electromagnetic interference, please turn off the radio in the place where there is a warning, e.g. hospital, health care center, airport and etc.

#### Explosive Atmosphere

It's prohibited to use radios in the following places:

Areas with a potentially explosive atmosphere, e.g. the lower deck of the ship, the storage and transportation equipment for fuel and chemical, places where there are chemical substances, particles, dust or metal dust.

Places near blasting sites or area with electrical blasting cap.

It is also prohibited to change or charge the battery in any area with a potentially explosive atmosphere.

#### Antenna

If the antenna is damaged, do not use the radio. Damaged antenna may cause light burning to skin.

#### Replacement Parts

All the components should be supplied by Kirisun.

Please use the components with the corresponding model number for repair. Do not take the risk of using any improper components which are not required in Kirisun's service manual.



## Chapter 2 External View and Functional Keys

### 2.1 External View

As figure 1 shows

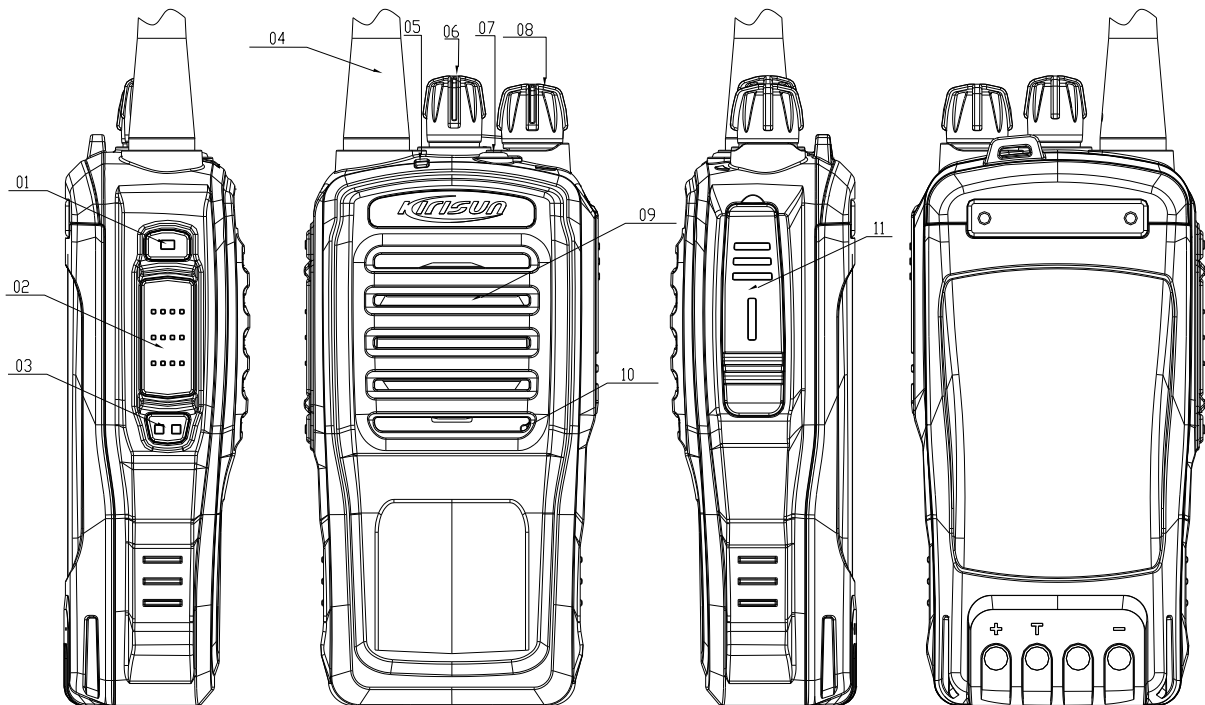


Fig. 1

### 2.2 Functional Key Description

1. Side Button 1 (Programmable Button)

2. PTT (PUSH-TO-TALK) Button

Press and hold the PTT button and talk to the microphone to transmit; release it to listen.

3. Side Button 2 (Programmable Button)

4. Antenna

5. LED Indicator

The LED indicator lights up red when transmitting, and lights up green when receiving. In the condition of low battery, the LED indicator flashes red.

6. Channel Knob

Rotate to select channel 1-16.

7. Emergency Button

8. On/Off/Volume Control Knob

Rotate clockwise to turn on the radio, and counter-clockwise until a click is heard to turn off.

When the radio is on, rotate to adjust the volume.

9. Speaker

10. Microphone

11. Speaker/ Microphone Interface

Open the cover to connect the radio with the external speaker and microphone.

### Programmable Button

You can require the dealer to program the keys listed below as shortcuts to certain functions for your convenience:

Long press key and short press key can be set: Side Button, Emergency Button.

Long press key can be set: menu key, cancel key.

Note:

Short Press: Press and release it quickly.

Long Press: Press and hold it down for 2 seconds, then release.

Available Functions:

None: No feature will be enabled.

Power Level Adjustment: Switch to high/low power.

Monitor: If there is CTCSS/CDCSS in the current analog channel, press the key and switch to squelch mode to cancel the CTCSS/CDCSS feature. Press the key again to return to the original status.

Emergency Alarm On: Enable the emergency alarm feature to seek help.

Emergency Alarm Off: Disable the emergency alarm feature.

Squelch On/Off: Enable the squelch feature to receive the weak signal on the analog channel.

Squelch Level Adjustment: Adjust the signal strengthness the radio needs when receiving.

Scan: Receives the activity of other channels. Press to enable/disable the scan feature.

Whisper: Enable/disable the whisper feature. The receiver can hear clearly when you speak in a low voice with this feature on.

### 2.3 LED Indicator

The LED lights up red when transmitting

The LED lights up green when receiving

The LED flashes red in the condition of low battery.

## Chapter 3 Circuit Description

### 3.1 Overview

This radio is FM portable equipment.

### 3.2 Frequency Configuration

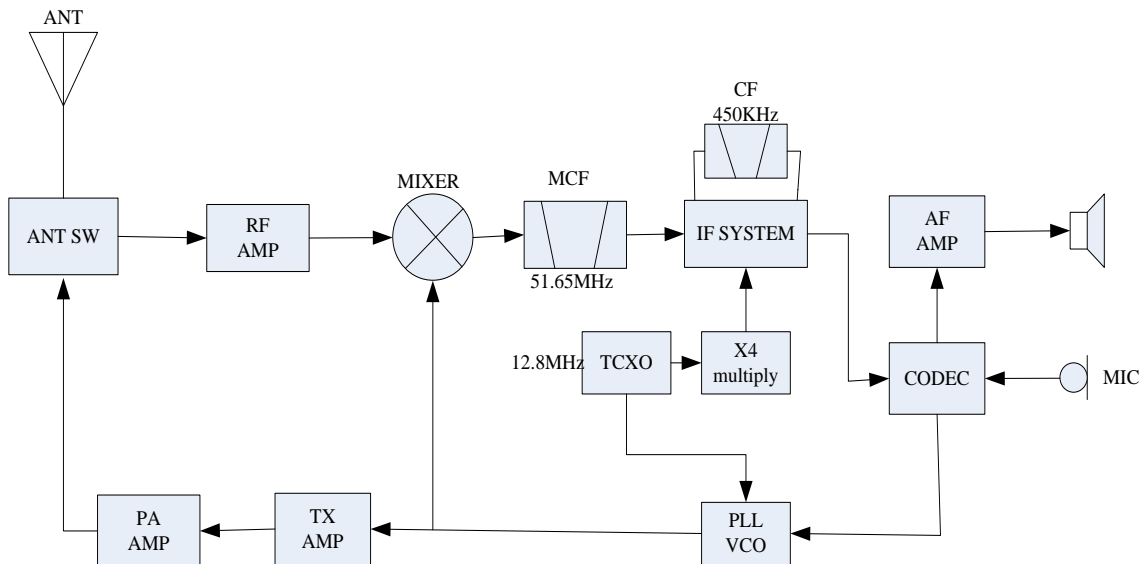


Fig 3.1 Circuit Diagram

This Radio applies twice frequency mixing method. The first intermediate-frequency is 51.65MHz. The second intermediate-frequency is 450 kHz.

The first local oscillation is generated by frequency synthesizer, and the second local oscillation is generated by the quadruple frequency of 12.8MHz.

The transmitting signal is generated by frequency synthesizer.

The reference frequency of frequency synthesizer is generated by TCXO.

### 3.3 Principle of Receiver (RX)

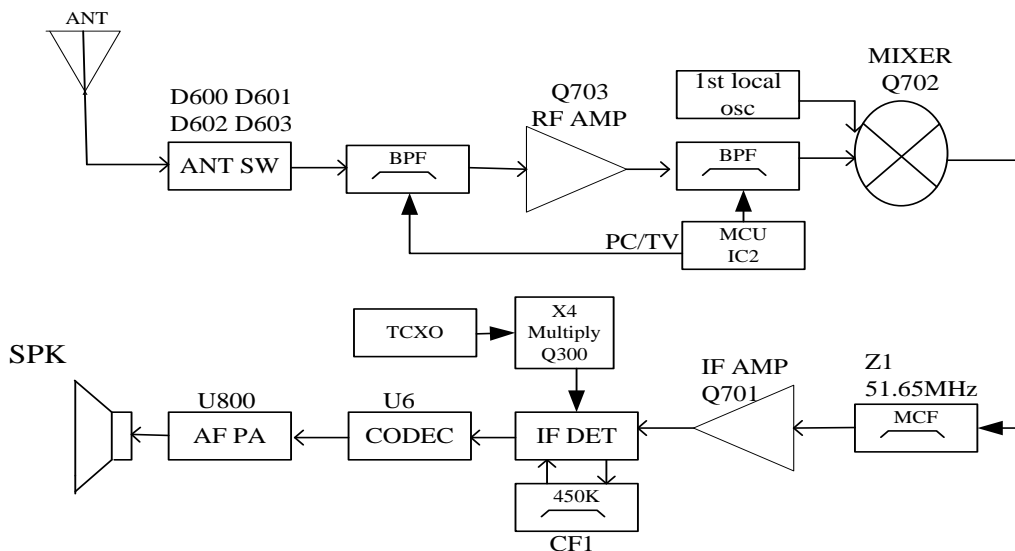


Fig. 3.2 Principle of Receiver

**Receiver Front End**

Signals from the antenna through the receiving/transmission (RX/TX) switch (D600, D601, D602, D603), which passed the band-pass filter (BPF) consisting of two levels of LC to eliminate the unnecessary signals, then sent to the low noise amplifier (LNA) consisting of Q703 and its peripheral components for enlargement.

After passing the band-pass filter (BPF) consisting of three levels of LC to further eliminate the unnecessary out-of-band signals, the output of LNA is then sent to the first frequency mixer (Q702).

**The First Frequency Mixer**

The signal from LNA is mixed with the first local oscillator signal from the frequency synthesizer to generate the first intermediate-frequency signal (51.65MHz).

**IF Circuit**

The first intermediate-frequency signal eliminates the signals from the adjacent channels or other signals through the crystal filter. (Z1)

The first intermediate-frequency signal from the crystal filter, being amplified by the first intermediate-frequency (IF) amplifier (Q701), then sent to IF processing IC ( IC700, GT3136).

IF IC consists of the second frequency mixer, IF amplifier, amplitude limiter, frequency detector, noise amplifier, audio low pass filter.

The 12.8MHz signal from X300, being amplified by Q300 and its peripheral circuit, becomes the second local oscillation signal (51.2MHz). The second local oscillation signal (51.2MHz) mixes with the first intermediate-frequency signal (51.65MHz) in IC700 to generate the second intermediate-frequency signal. The second intermediate-frequency signal amplified in IC700 with its amplitude being limited, being filtered by the FD1 ceramic filter ( 450kHz ) , is demodulated by IC700 to generate the audio signal.

**Squelch Circuit**

The signal demodulated by IC700 is sent to its own noise amplifier for amplification, and the amplified signal is sent to Q700 for further amplification and to D701 for detection; the produced direct current is then sent to MCU squelch control circuit, and its voltage is inversely proportional to the input signal.

**3.4 Principle of Transmitter (TX)**

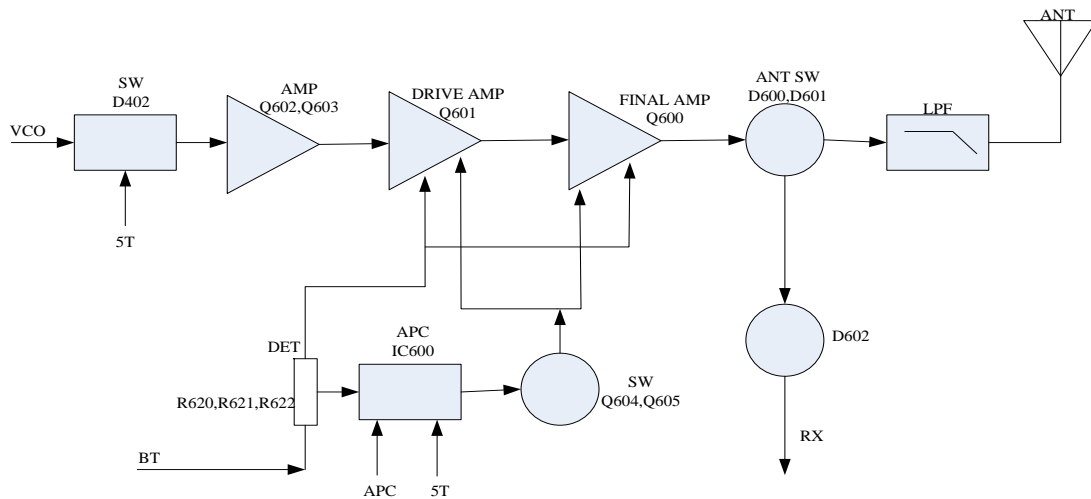


Fig.3.3 Diagram of Power Amplification and Antenna Switch Principle

The modulated RF signal from VCO, being amplified by Q303、Q304、Q602、Q603、Q601, is sent to Q600 for power amplification.

The grid bias of Q601 and Q600 is controlled by APC (Automatic Power Control) circuit. Change the grid bias voltage to easily control the output power strength of the transmitter.

**APC (Automatic Power Control) Circuit**

R620, R621 and R622 are power amplifier current detection, and IC600A is a power amplifier current sampling amplifier. IC600B is a power comparison amplifier.

The extra high output power of the transmitter will increase the power amplifier current and IC600A output with a decrease in IC600B output voltage. It will also decrease the bias voltage on Q601 and Q600, which decreases the output power of the transmitter, and vice versa. This enables the stability of the output power in different working circumstances.

MCU changes the voltage being sent to IC600B to set the power.

**3.5 Principle of Frequency Synthesizer**

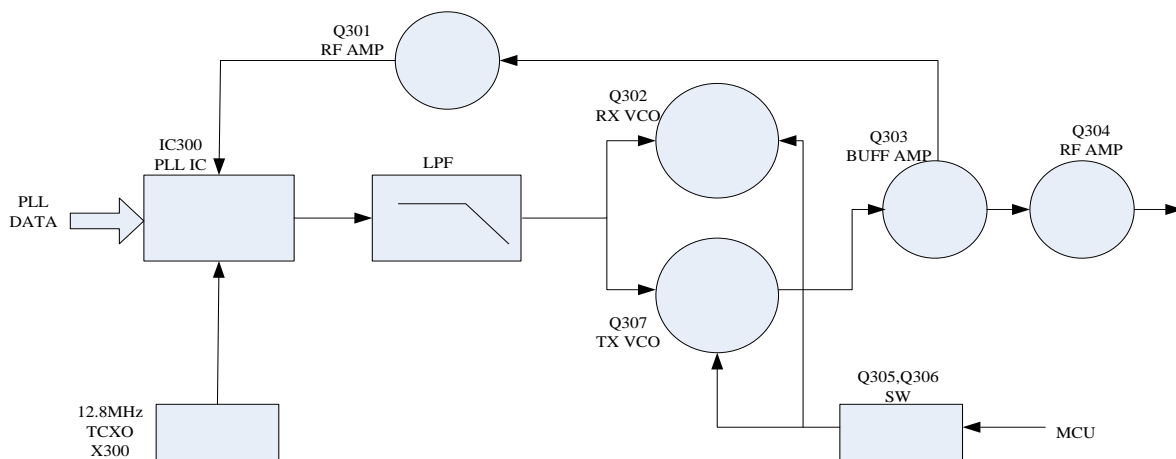


Fig 3.4 Diagram of Frequency Synthesizer

This radio applies PLL frequency synthesizer.

The frequency synthesizer consists of reference oscillator, voltage controlled oscillator (VCO), programmable frequency divider, phase comparator and low pass filter.

Q307, D305, D306, D307, D308 and other resistance-capacitance units make up the transmitting VCO unit. D304 is the modulation circuit of the transmitting VCO.

Q302、D300、D301、D302、D303 and other resistance-capacitance units make up the receiving VCO unit.

IC300 (MB15E03) is a PLL integrated circuit which contains a programmable reference frequency divider, programmable frequency divider, phase comparator and charge pump.

R329, C358, R330, C359, R331, R332 and C360 make up the loop filter.

The reference frequency is provided by X300 (TCXO, 12.8MHz).

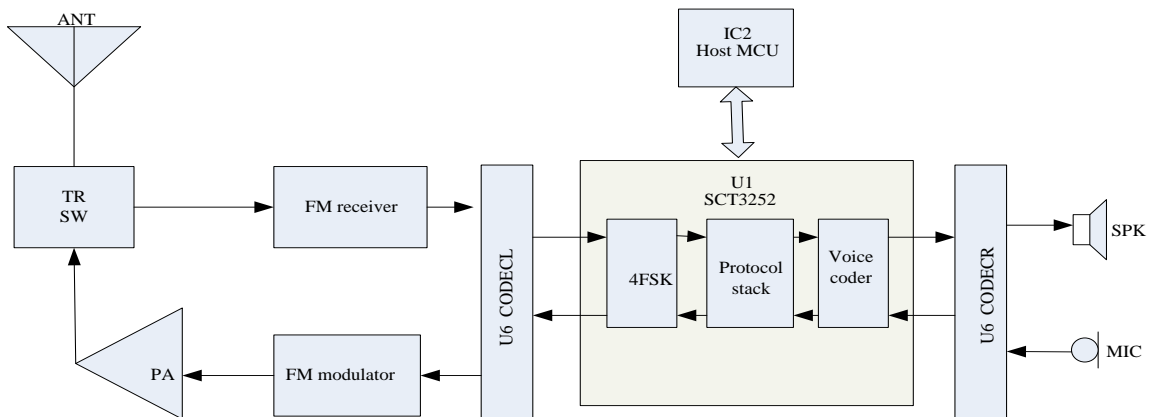
The reference frequency from TCXO (Temperature Controlled Crystal Oscillator) is divided by the programmable reference frequency divider in IC300 to become the 5kHz or 6.25kHz (controlled by MCU, according to the setting channel) reference frequency .

The oscillation frequency from VCO, being amplified by the two-time frequency multiplier circuit, is sent to IC300 for

comparison with reference frequency after being divided by the programmable frequency divider, and the error signal is then generated to change the oscillation frequency of VCO after filtered by the low pass filter. VCO is locked when the frequency of VCO reaches a certain set value.

Loss of Lock Detection: When PLL loses its lock, IC300 pin14 outputs the electric level signal to MCU, and MCU control transmitter forbids transmitting and issues an alert tone. The output voltage of IC300 pin14 is high electric level when it is locked.

### 3.6 Audio Processing Circuit



#### MIC Signal Processing:

The speech signal from MIC is sent to U6 for A/D switch, and sent to U1 SCT3252 for audio coding/decoding, communication protocol processing, channel coding modulation. Afterwards, the signal outputs MOD2 and MOD1 separately from U6, and then sends them to TCXO and VCO for two-point modulation. The signal outputs 4FSK modulating signal in digital state, and sine wave signal in analog state.

#### Receiving Audio Signal Processing:

The audio signal demodulated from IC700 is sent to U1 SCT3252 for processing after finishing A/D switch by U6. After the audio encoding/decoding, communication protocol processing and DSP, the audio signal is sent to U6 for D/A switch, and it is then output to the U800 (TDA2822) audio power amplifier for amplification so as to sound the speaker.

Squelch Circuit: It is output from IC700 after demodulation, and it filters out the noise from the demodulated signal after going through the filter circuit. It is sent to MCU after being detected by D701 and amplified by Q700. The MCU identifies the noise level and controls the squelch.

Speaker Impedance: 16  $\Omega$

Note: Any terminal of the speaker must not be attached to the ground!

The emergency alert tone is not controlled by volume.

### 3.7 Power Supply

This radio applies 7.4V battery. The transmitter power amplifier circuit (Q601, Q600) and receiver audio processor (U800) directly use the battery for power supply with other circuits using the voltage stabilized 5V for power supply.

Q102: 5T switch, controlled by MCU.

5T: Supplies power for the transmitter front end.

Q100: 5R switch, controlled by MCU.

5R: Supplies power for the receiver RF amplifier, frequency mixer, IF processor, audio signal processor and the like.

Q1: 5C switch, controlled by MCU.

5C: The 5V power source controlled by power saving, and it supplies power for frequency synthesizer unit.

### 3.8 MCU Unit

MCU unit controls every unit operation of the radio to perform all the radio functions.

Communicates with the external PC

Deposits and withdraws the radio status data

Controls PLL to generates the local oscillation frequency of receiving and transmitting

Acquires the current channel status

Controls the LED status indication

Controls the power supply status of every unit

Detects the operation of every function key

Generates CTCSS signal

Generates DCS signal

Generates power-controlled signal

Completes CTCSS decoding

Completes DCS decoding

Squelch detection and control

Controls the content of voice prompt

#### Memorizer (E<sup>2</sup>PROM, AT24LC512BN)

It stores the radio channel data, CTCSS/DCS data, other function setting data and parameter adjustment data.

#### CTCSS/DCS Signal Encoding and Decoding:

The CTCSS/DCS signal generated by MCU is sent separately to VCO and TCXO for modulation.

The CTCSS/DCS signal from the receiver is sent to MCU for decoding. The MCU identifies whether the CTCSS/DCS signal of the radio is the same as the receiving signal so as to turn on the speaker.

#### CTCSS

CTCSS (continuous tone control squelch system), a squelch control system modulated on the carrier with the CTCSS signal being the pilot frequency. If the CTCSS feature is set, the conversation is enabled only when the CTCSS frequency from the receiver and transmitter is the same to avoid interference from other signals.

39 groups of standard CTCSS frequency of this radio are available. See Chart 1.

CTCSS signal is generated by MCU (PWM wave form), and it is sent to VCO for modulation after being filtered by the low pass filter composed of RC for eliminating the frequency higher than 300Hz.

Chart 3.1 CTCSS Frequency Chart

No.	Frequency [Hz]	No.	Frequency [Hz]	No.	Frequency [Hz]	No.	Frequency [Hz]
1	67.0	11	94.8	21	131.8	31	186.2
2	69.3	12	97.4	22	136.5	32	192.8
3	71.9	13	100.0	23	141.3	33	203.5
4	74.4	14	103.5	24	146.2	34	210.7

5	77.0	15	107.2	25	151.4	35	218.1
6	79.7	16	110.9	26	156.7	36	225.7
7	82.5	17	114.8	27	162.2	37	233.6
8	85.4	18	118.8	28	167.9	38	241.8
9	88.5	19	123.0	29	173.8	39	250.3
10	91.5	20	127.3	30	179.9		

**DCS Signaling:**

DCS (Digital code squelch, ), a continuous numerical code which is modulated along with the speech signal on the carrier to control the squelch. If the DCS feature is set, the speaker is on only when the same DCS code is received to avoid the unnecessary signal interference.

83 kinds of standard code of this radio are available. See chart 2.

DCS signal is generated by MCU (PWM wave form), and it is sent to VCO and TCXO for modulation after being filtered by the low pass filter composed of RC for eliminating the frequency higher than 300Hz. VCO modulates the high frequency of DCS signal and TCXO modulates the low frequency of DCS signal.

CTCSS/DCS signal from the receiver is sent to MCU for decoding. MCU identifies whether the receiving signal has the same DCS code as the radio so as to turn on the speaker.

**Chart 3.2 DCS Coding Chart**

023	114	174	315	445	631
025	115	205	331	464	632
026	116	223	343	465	654
031	125	226	346	466	662
032	131	243	351	503	664
043	132	244	364	506	703
047	134	245	365	516	712
051	143	251	371	532	723
054	152	261	411	546	731
065	155	263	412	565	732
071	156	265	413	606	734
072	162	271	423	612	743
073	165	306	431	624	754
074	172	311	432	627	

**3.9 Semiconductor Device Description**

**MCU Description**

**Chart 3.3 Microprocessor (M30620) Port Description**

Pin No.	Port Name	Input/ output	Function
1	VCCN	D/A Output	TCXO tuned voltage output
2	TONE-OUT	D/A Output	TONE output
3	NC	I	NC



4	EPDT	I/O	EEPROM data input/ output
5	EPCK	O	EEPROM clock
6	BYTE	I	Gnd
7	CNVSS	I	Gnd
8	BSHIFT	O	clock beat frequency control
9	SV	O	Min. volume control
10	RESET	I	CPU reset input
11	XOUT	O	CPU clock output
12	VSS	-	Gnd
13	XIN	I	CPU clock input
14	VCC	-	+5V
15	NC	I	+5V
16	PTT	I	PTT control pin input
17	EXT-PTT	I	External PTT control pin input
18	ENC_0	I	channel switch control pin input
19	ENC_1	I	channel switch control pin input
20	ENC_2	I	channel switch control pin input
21	ENC_3	I	channel switch control pin input
22	S_CS	I	data input pin ( connects 3252 )
23	S_SO	I	data input pin ( connects 3252 )
24	NC	O	NC
25	S_SCK	O	data input pin ( connects 3252 )
26	PC/TV	O	tuned voltage output pin
27	S_SI	I	3M
28	3M	O	3M
29	TXD	O	TXD1 output
30	RXD	I	RXD1 input
31	C_CLK	O	JTAG test point
32	C_BUSY	O	JTAG test point
33	NC	-	NC
34	NC	-	NC
35	AFCO_1	O	RX control output pin
36	AFCO_2	O	RX control output pin
37	RX SW	O	Receiver VCO switch
38	TX SW	O	Transmitter VCO switch
39	C_EPN	I	JTAG test point
40	DT	I	PLL data pin
41	LE	O	PLL chip select pin
42	CK	O	PLL clock pin
43	UL	O	PLL losing lock detection pin
44	C_CE	I	JTAG test point
45	SCT3252MOD	O	data output pin ( connects 3252 )
46	GREEN_LED	I	green light control switch

47	RED_LED	I	red light control switch
48	5TC	O	5T control pin
49	5RC	O	5R control pin
50	SAVE	I	5C control pin
51	INTO	O	data output pin ( connects 3252 )
52	PLLBYPASS	O	data output pin ( connects 3252 )
53	PLLSEL2	O	data output pin ( connects 3252 )
54	HCSN	O	data output pin ( connects 3252 )
55	HWRN	I	data input pin ( connects 3252 )
56	HRDN	O	data output pin ( connects 3252 )
57	HOBIB	O	data output pin ( connects 3252 )
58	RSTN_3252	O	data output pin ( connects 3252 )
59	NMI	O	data output pin ( connects 3252 )
60	ACC	-	3M
61	PIO3	O	data output pin ( connects 3252 )
62	VSS	-	Gnd
63	HPI_DATA0	I/O	HPI Data Bus ( connects 3252 )
64	HPI_DATA1	I/O	HPI Data Bus ( connects 3252 )
65	HPI_DATA2	I/O	HPI Data Bus ( connects 3252 )
66	HPI_DATA3	I/O	HPI Data Bus ( connects 3252 )
67	HPI_DATA4	I/O	HPI Data Bus ( connects 3252 )
68	HPI_DATA5	I/O	HPI Data Bus ( connects 3252 )
69	HPI_DATA6	I/O	HPI Data Bus ( connects 3252 )
70	HPI_DATA7	I/O	HPI Data Bus ( connects 3252 )
71	NC	-	NC
72	NC	-	NC
73	SI/D7	O	LCD control pin
74	SCL/D6	O	LCD control pin
75	AO	O	LCD control pin
76	/RST	O	LCD control pin
77	/CS1	O	LCD control pin
78	LAMP	O	backlight control pin
79	K0	O/I	digital key detection pin
80	K1	O/I	digital key detection pin
81	K2	O/I	digital key detection pin
82	K3	O/I	digital key detection pin
83	K4	O/I	digital key detection pin
84	K5	O/I	digital key detection pin
85	K6	O/I	digital key detection pin
86	K7	O/I	digital key detection pin
87	BATT	I	Voltage check input
88	RSSI	I	Receiving filed intensity signal input
89	BUSY	I	Squelch voltage check input

90	VOL_DET	I	digital potentiometer detection pin
91	NC	-	NC
92	GND	I	GND
93	PF	I	extension key detection pin
94	GND	-	Gnd
95	HEADPHONE_DET	I	NC
96	VREF	-	+5V
97	AVCC	-	+5V
98	GPS_C	O	GPS power control pin
99	BASSBAND_C	O	power time-delay control pin
100	BEEP_C	O	BEEP control pin

Chart 3.4 Semiconductor Device Function Description

Position No.	Item No.	Function Description
U1	SCT3252	4FSK baseband processing chip
U6	WM8758B	stereophonic encoder-decoder
IC202	PST9140NR	MCU reset circuit
U300	MB15E03	frequency synthesizer
IC600	NJM2904	APC, voltage comparison, drive
IC700	GT3136	the second local oscillation, the second intermediate frequency amplification, amplitude limiting, demodulation, noise amplification
IC204	NJM2902	demodulation signal amplification, filter
IC2	M30620	MCU
IC200	AT24C512C	E <sup>2</sup> PROM, stores channel frequency data, function setting parameter, modulating status parameter
U800	TDA2822	receiver audio power amplification
Q302	2SK508NV	receiver VCO oscillator pipe
Q304	2SC5108	VCO buffer amplifier
Q305	DTA143TE	transmitter VCO control switch
Q301	2SC5108	feedback loop amplifier
Q306	DTA143TE	transmitter VCO control switch
Q308	2SC4617	VCO power filter
Q303	2SC5108	VCO buffer amplifier
Q300	2SC5108	receiver the second local oscillation amplifier
Q307	2SK508NV	transmitting VCO oscillator pipe
Q601	RD01MUS1	transmitter power amplifier drive
Q600	RD07S2B	transmitter the last stage power amplifier

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Q602	2SC5108	transmitter 1 <sup>st</sup> amplification
Q603	2SC3356	transmitter 2 <sup>rd</sup> amplification
Q604	DTA144EE	APC output switch
Q703	3SK318	receiver low noise amplifier
Q702	3SK318	the 1 <sup>st</sup> level frequency mixer
Q701	2SC5108	the 1 <sup>st</sup> intermediate frequency amplifier
Q700	2SC4617	receiver noise amplifier
Q800	FMMT717	audio output control switch
Q801	DTC144EE	audio power amplifier control switch
IC100	XC6204B502MR	adjustable 5C stable voltage output
IC100	XC6204B502MR	adjustable 5R stable voltage output
IC100	XC6204B502MR	adjustable 5T stable voltage output
IC102	XC6228D122VR	adjustable 1.8V voltage output
IC101	XC6204B332MR	adjustable 3V voltage output

Chart 3.5 Diode Function Description

Item	Item no.	Function Description
D309	DA2S10100L	losing lock detection diode
D310	DA2S10100L	VCO power filter accelerating diode
D304	1SV278	transmitter VCO modulation diode
D305,D306 D307,D308	HVC376	transmitter VCO oscillation variode
D300,D301 D302,D303	HVC376	receiver VCO oscillation variode
D402	HSC277	VCO output switch
D604	HZU5ALL	APC output voltage limiting diode
D600,D601 D602,D603	HVC131	transmitter antenna switch diode
D704,D705,D706, D707,D708	HVC355B	receiver band pass filter and variode
D701	RB706F	communication diode

## Chapter 4 Function Description and Parameter Settings

### 4.1 Time-out Timer

This feature prevents the user from long occupation of the channel. If the transmitting period exceeds the dealer's preprogrammed time, the radio stops transmitting and the rings alert tone. To stop the alert tone, please release the PTT button. For a second transmission, please press the PTT button after a certain period (set by the dealer). If the dealer preprograms the pre-warning feature, a warning is given when the transmitting period gets close to its time-out-timer limitation, indicating the transmission is forbidden soon.

### 4.2 Channel Scan

The channel scan is able to search for the channel where there is a signal, and the radio stays on the channel where a signal is detected for making a conversation. The scanning mode is the carrier control scan.

#### 4.2.1 Carrier Control Scan

The radio scan stays on a busy channel until it is no longer busy, and the scan is enabled automatically after a certain period (the specific period time is set by the local dealer).

Press the Scan shortcut key, and the radio scans the scan list of the current channel. When the radio is scanning, you can press the "Scan" shortcut key to stop the scanning.

#### 4.2.2 Scan Reply Channel

When the radio is scanning, press the PTT button to transmit and make a conversation on a preset channel, and the channel is preprogrammed by the local dealer.

### 4.3 Kill and Activation

If the dealer preprograms this feature, the radio can receive and decode other radio's signals of kill and activation before responding accordingly. After being killed, the radio can only receive the activated signal without being able to transmit or receive other signals. The radio is back to normal after activation.

### 4.4 Emergency

In a state of emergency, press the "Emergency On" shortcut key for the alarm call. The alarm method is composed of two parts: Alarm type, which mainly specifies the acoustooptic reaction in the state of alarm call; Alarm mode, which specifies the sending content in the state of alarm call. You can set these parameters through the dealer to meet your requirements. To disable the emergency feature, please press the "Emergency Off" shortcut key.

Alarm Type:

- ◆None: No alarm feature (by default), and the alarm feature cannot be enabled by pressing the emergency button.
- ◆Siren Only: The radio only emits siren locally.
- ◆Regular: The acoustooptic alert can be enabled, and the radio is able to receive.
- ◆Secret: No acoustooptic alert and the radio is not able to receive.
- ◆Secret but receivable: No acoustooptic alert but the radio is able to receive.

Alarm Mode:

- ◆Emergency Alarm: After the alarm feature is enabled, the radio only transmits an emergency alert, and afterwards, then automatic exit the alarm status.
- ◆Emergency Alarm + Emergent Call: The radio transmits an emergency alarm and sends out an emergency call by pressing the PTT button.
- ◆Emergency Alarm + Auto Transmission of Background Tone: The radio transmits an emergency alarm, and the background tone will be sent out periodically and automatically in the way of emergency call.

Note:

Emergency Alarm: A non-speech signal transmitted by the radio to inform other radios to send out an alert.

Emergency Call: A call mode in the priority of using the channel to ensure a successful call during emergency.

#### 4.5 Parameter Settings

The radio is preset before the factory delivery, but the parameter of the digital feature, operational frequency, channel, QT/DQT, and auto scan feature may be reset according to different requirements of the customers. Hence, Kirisun designed a Chinese/English FP520 programming software with friendly interface, easy operation and clear visual display to complete the parameter settings for FP520.

The procedure of setting the parameter using a computer.

A. Install the FP520 programming software on the computer.

B. As Fig 4.5 shows, using the FP520 programming cable to connects the computer with the radio

Note: During the connection, ① make sure the computer is off.

② make sure the radio is off.

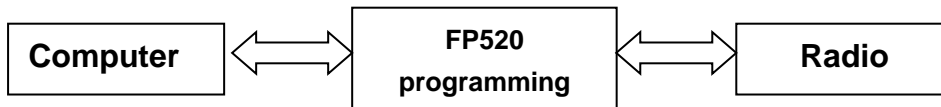


Fig 4.5

C. Turn on the computer.

D. Turn on the Radio.

E. Click the execution procedure, and operate FP520 programming software.

F. In the main menu of FP520 programming software, click “read” menu to input the radio parameter into the computer.

G. For detailed operation, please refer to the “assistance” file of the programming software.

## Chapter 5 Assembly and Disassembly

This radio is sophisticated communication equipment with a precise and compact mechanism. The assembly and disassembly of the radio must be carefully done during the repair. The description is as follows:

### 5.1 Installing/Removing the Battery

Installing the Battery:

Press ① to bounce the belt clip; align the two bulges on the battery top with the corresponding slots on the aluminum shell, and insert the battery into the aluminum shell in the direction as ② shows. Press the battery bottom as ③ shows to completely bounce the latch, and the battery is attached until the battery is hooked as ④ shows (see Fig. 18).

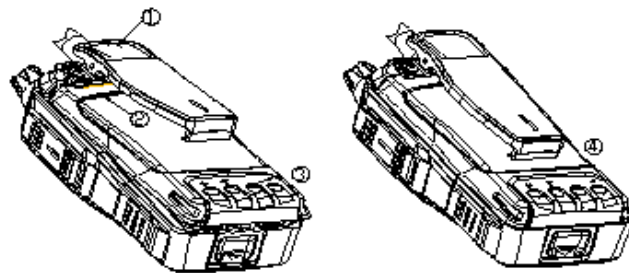


Fig. 18

Removing the Battery:

Make sure the radio is off when removing the battery.

To remove the battery, please push the battery latch as ① shows to bounce the bottom of the battery as ② shows, and take out the battery as ③ shows; if the belt clip is attached, please press it as ④ shows and remove the battery downwards.

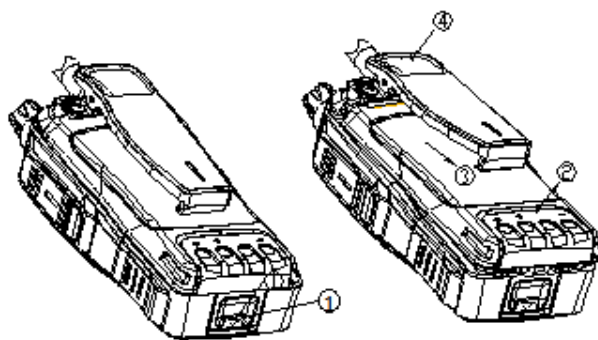


Fig 19

Notes::

Do not short circuit the battery terminals or abandon the battery into fire.

Do not take the risk of disassembling the battery shell.

### 5.2 Installing/Removing the Antenna (see Fig. 20)

When installing, put the antenna end with screw thread into the threaded hole of the radio top, and turn it clockwise until it is fastened.

For the removing, hold the antenna bottom and turn it counterclockwise.



Fig. 20

### 5.3 Installing/Removing the Belt Clip (see Fig.21)

When installing, align the screw holes of the belt clip with the corresponding ones of the radio back shell, and use two 2.5x8.0 machine screws to fasten.

Loosen the two 2.5x8.0 machine screws to detach the belt clip.

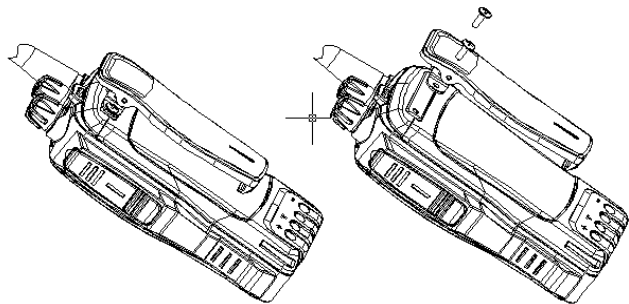


Fig. 21

### 5.4 Installing the Earphone (see Fig. 22)

When the earphone is needed, open the earphone cover on the upper right side of the radio, and put the earphone plug into the interface.

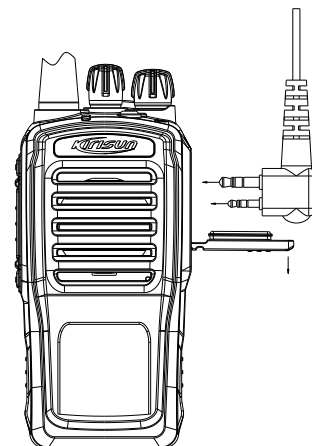


Fig. 22



### 5.5 Separating the Front Cover from the Chassis (see Fig. 23)

1. Removing the antenna, volume knob and channel knob;
2. Removing the two knob nuts and one antenna nut;
3. Removing the two aluminum screws with wabblers;
4. Use a pair of tweezers or other tools to lever open the bottom;
5. Pull out the Front Cover;
6. Use an electric soldering iron to cut off the speaker wire and MIC wire, and the separation is done.

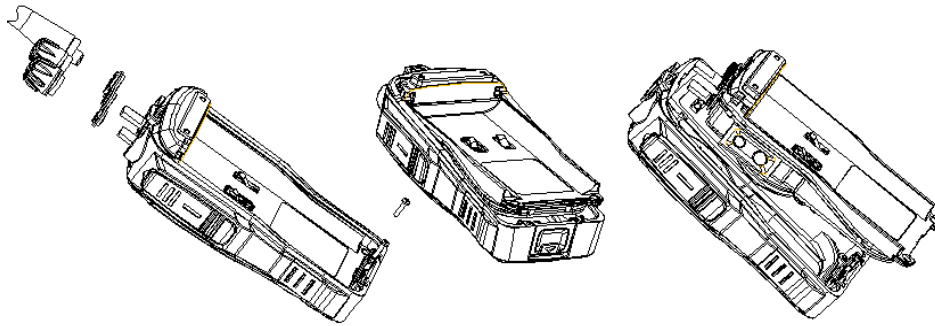


Fig. 23

### 5.6 Separating the PCB Board from the Chassis (See Fig. 24)

1. Remove the potentiometer waterproof pad on top;
2. Remove the earphone waterproof plug;
3. Remove the screws on the PCB mainboard;
4. Remove the two screws on the side PTT PCB;
5. Use an electric soldering iron to cut off the antenna terminal and the PCB board is removed. (PTT PCB is connected with the PCB mainboard. To avoid bonding pad damage, use an electric soldering iron to separate them instead of dividing them with force)

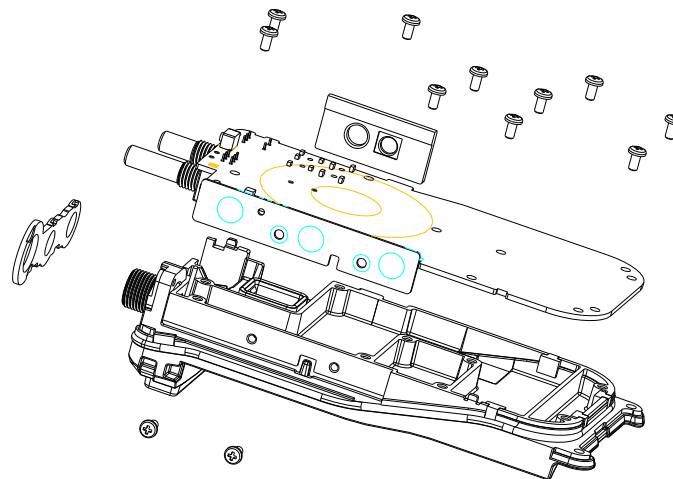
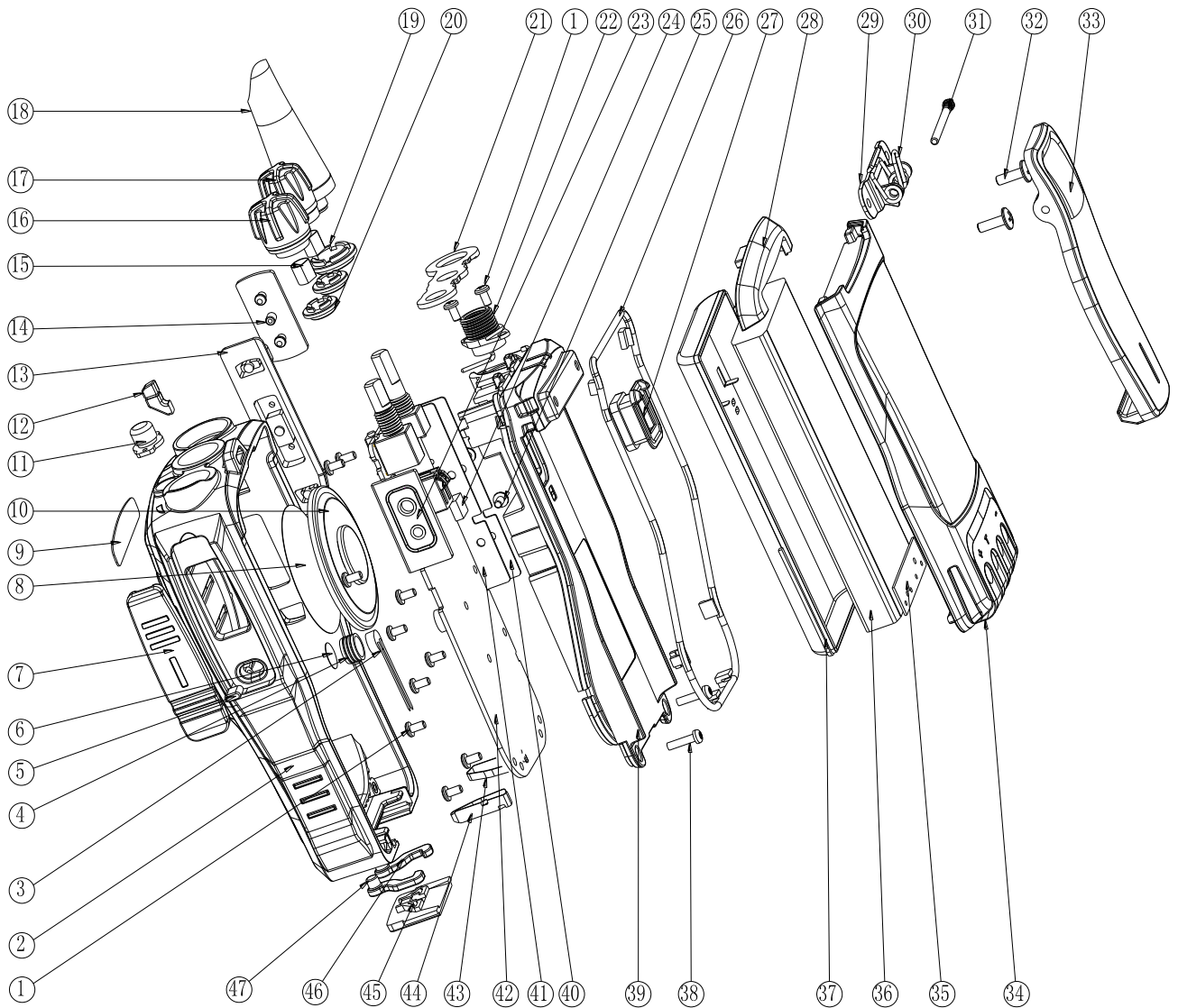


Fig. 24

After the disassembly above is completed, the repair and adjustment can then be done.

### 5.7 Exploded View



No	Part no.	Description	Quantity	Remark
1	7SMF-020040M-SZYB-N	M2*4 round flat head machine screw	13	fixes the PCB board, PTT button and antenna screw
2	7MHP-4083-01A-W0	FP520 front cover	1	ABS+PC;black;silk screen/texturing
3	4SM7-6027-A40C	MIC microphone	1	Φ6.0, -40±2dB omnidirectional,2.2KΩ,2V, with 80mm red black wire
4	7MHR-1727-09A-W3	microphone cover	1	Silica gel, hardness 40, orange
5	7MHP-7208-06A-W0	earphone cover plug	1	ABS+PC;black;texturing
6	7GCB-070001	microphone waterproof cloth	1	waterproof cloth, diameterφ7mm, thickness 0.1mm
7	7MHP-7208-07A-W0	earphone cover	1	TPU;black
8	7GCB-360001-W0	speaker waterproof net	1	Black, φ36
9	7PLJ-4083-E01A	LOGO sticker	1	T=0.3mm PC
10	4SS7-4050-016-100	speaker	1	MM4050-1638,16Ω,1W, ∅40
11	7MHR-7208-05A-W3	emergency button	1	silica gel; orange

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12	7MHR-7208-04A-W9	light pipe	1	silica gel; transparent ; milk white
13	7MHR-7208-06A-W0	silica gel side button	1	silica gel; black
14	7MHP-7208-05A-W0	PTT cover	1	ABS+PC,black; texturing
15	7MHS-1140-01A-W	knob circlip	2	Material: spring steel
16	7MHP-7208-01A-W0	volume knob	1	ABS;black; white paint
17	7MHP-7208-02A-W0	channel knob	1	ABS;black; white paint
18		antenna	1	14mm diameter
19	7NRC-090136039-B1	antenna nut	1	yellow copper,inside diameter M9mm, outside diameter $\phi$ 13.6mm, 3.9mm thickness, black passivation
20	7NRC-060100035-B1	switch nut	2	yellow copper, inside diameter M6mm, outside diameter $\phi$ 10mm,3.5mm thickness, black passivation
21	7MHR-7208-02A-W0	top waterproof ring	1	silica gel; black
22	3CR7-SMA-50JFB-4	RF coaxial connector	1	SMA-J, attaching flange
23	7MHP-7208-04A-W0	earphone jack waterproof plug	1	TPU; black
24	7MHR-7042-06B-W0	thermally conductive silica gel gasket	1	silica gel, black,3*6*9mm
25	7SMF-020037M-SZCT-N	M2.0*3.7 cross countersunk head machine screw	2	fixes PTT PCB
26	7MHR-7208-01A-W0	radio big waterproof rubber ring	1	silica gel; black; polishing
27	7MHR-4083-01A-W0	pedestal waterproof pad		silica gel, black, 60-degree hardness
28	7MHP-7208-03A-W0	main unit top cover	1	ABS,+PC black, texture
29	7MJS-7013-01B-N	KBJ-09 belt clip bracket	1	Stainless steel(SUS304), 1.00THK,bright nickel plating
30	7MJS-7013-02A-W	KBJ-09 belt clip torsion spring	1	
31	7MJS-7013-03A-N	KBJ-09 belt clip rotation shaft	1	
32	7SMF-025080M-SZYB-Z1	M2.5*8 cross round flat head machine screw	2	fixes the belt clip
33	7MJP-4026-01A-W0	KBJ-15 belt clip	1	DP770 belt clip, PC+ABS, black,
34	7MDP-7208-01A-W0A	battery top shell	1	ABS+PC; texturing
35	6PD7-7215-DPA	charging PCB	1	0.6MM thickness
36	6BLM-103445-074150-A	battery cell	1	Li-ion 1500mHA
37	7MDP-4083-03A-W0A	battery bottom cover	1	
38	7SMF-020080M-MHHT-N1	M2*8 plum blossom type thick head machine screw	2	fixes the aluminum shell
39	7MHL-4083-01A-W	Aluminum shell	1	ADC12

40	7MHS-4083-01A-W	PTT button metal dome	1	φ6mm,SUS301 square metal dome
41	6PD7-4083-HPA	PTT PCB	1	
42	6PM7-4085-HMB(VHF) 6PM7-4083-HMB(UHF)	main PCB	1	1.2mm thickness
43	7MHS-7042-01B-W	latch spring2	1	stainless steel (SUS301),0.25THK
44	7MHS-7042-01A-W	latch spring1	1	stainless steel(SUS301),0.25THK
45	7MHP-7042-14A-W0	battery latch	1	POM,black
46	7MHX-7042-02B-Z	battery hook 2	1	zinc alloy(Zn3#), eletrophoresis, black
47	7MHX-7042-02A-Z	battery hook 1	1	zinc alloy (Zn3#), electrophoresis, black

## Chapter 6 Adjustment

### 6.1 Method of Adjustment

During the service, a proper test and adjustment to the radio's technical criteria is necessary after changing the components.

#### 6.1.1 Components Needed for the Adjustment

- (1) antenna interface convertor
- (2) universal interface

#### 6.1.2 Manual Mode Adjustment

- (1) The radio needs 5 frequency adjustment.

The frequency for the five digital keys is as follows:

Model	Digital key 1	Digital key 2	Digital key 3	Digital key 4	Digital key 5
FP520 (VHF)	136.05MHz	145.55MHz	155.05MHz	164.55MHz	173.95MHz
FP520 (UHF)	400.05MHz	415.05MHz	435.05MHz	455.05MH	469.975MHz

#### 6.1.3 Computer Adjustment Method:

##### A. VCO

The radio is receiving,

- a) The channel is on the receiving high frequency, adjust C335 and test T300, the spot voltage is  $3.6 \pm 0.1V$ .
- b) The channel is on the receiving low frequency, test T300, the spot voltage  $> 0.6V$

The radio is transmitting :

- a) The channel is on the transmitting high frequency, adjust C371 test T300, spot voltage as  $3.6 \pm 0.1V$
- d) The channel is on the transmitting low frequency, test T300, the spot voltage  $> 0.6V$

##### B. TX Part

##### 1). Transmitting Frequency

Under the computer mode, the transmitting frequency is adjusted within  $\pm 100Hz$ .

##### 2). Power

- a. Under the computer mode (transmitting high power) (test in 5 frequency points), the transmitting high power is adjusted to 3.8-4.2W.
- b. Under the computer mode (transmitting low power) (test in 5 frequency points), the transmitting low power is

adjusted to 0.8-1.1W.

3). The Maximum Frequency Deviation (the modulation signal is 1kHz/120mV)

Under the computer mode [the maximum audio frequency deviation] (the broadband has five frequencies and the narrowband has one; six frequencies in total), adjust the maximum transmitting frequency deviation to 1.8-2.5 kHz.

4). DTMF Frequency Deviation

Under the computer mode [DTMF frequency deviation] (six frequencies in total), adjust the DTMF frequency deviation to 1.5-2 kHz.

5). DCS Balance

Under the computer mode, [DCS balance] (the broadband has five frequencies), adjust the DQT and make it balanced, so the demodulated DQT wave can be square and smooth.

6). DCS Frequency Deviation (DQT: 023N)

Under the computer mode, [DCS frequency deviation] (the broadband has five frequencies and the narrowband has one; six frequencies in total), adjust DCS frequency to 0.3-0.5kHz.

7). CTCSS Frequency Deviation (QT: 67.0Hz, 150.4Hz, 250.4Hz)

Under the computer mode, [CTCSS (67Hz, 150.4Hz, 250.4Hz) frequency deviation] adjust the CTCSS frequency deviation to 0.3-0.5kHz.

8). Battery low voltage indication when transmitting: the voltage is set as 6.8V, under the computer mode [transmitting low voltage], click confirm when the digits are stabilized.

### C. RX Part

1). Receiver Pass Band

a. Program the spectrum analyzer, and test the receiver pass band at the test point with a high frequency probe.  
b. Under the computer mode [receiving sensitivity] (test in five frequency points), adjust the receiver pass band to the corresponding center frequency.

2). The Maximum Volume

Set the RF frequency as the center frequency, the signal strength as 1mV, and the modulated frequency deviation as 1.5 kHz. Under the computer mode, set the computer audio power as 1.1-1.3W.

3). Squelch

a. Set the RF signal as -121dBm and the modulated frequency deviation as 1.5 kHz. Under the computer mode (on) (five frequency points), click confirm when the digits are stabilized.  
b. Set the RF signal as -123dBm and the modulated frequency deviation as 1.5 kHz. Under the computer mode (off) (five frequency points), click confirm when the digits are stabilized.

4). Field Strength

a. Set the RF signal as -121dBm and the modulated frequency deviation as 1.5 kHz. Under the computer mode (low RSSI) (five frequency points), click confirm when the digits are stabilized.  
b. Set the RF signal as -70dBm and the modulated frequency deviation as 1.5 kHz. Under the computer mode (high RSSI) (five frequency points), click confirm when the digits are stabilized.

## 6.2 Radio Test

The following criteria should be tested:

A. Receiving part

- 1). Sensitivity:  $\leq -119\text{dBm}$  (0.25uV) (broad band, narrow band) 12dB SINAD
- 2). Distorsion:  $\leq 5\%$
- 3). Current: static current:  $\leq 100\text{mA}$

Receiving working current:  $\leq 400\text{mA}$

- 4). QT/DQT decode:  $\leq -116\text{dBm}$  (0.35 $\mu\text{V}$ ) (broad band, narrow band) the radio could decode correctly.
- 5). Sensitivity of squelch-off: the RF input  $\leq -124\text{dBm}$ , the squelch feature should be disabled.
- 6). Sensitivity of squelch-on: the RF input  $\geq -119\text{dBm}$ , the squelch feature should be enabled.

**B. Transmitting part**

- 1). Output power: High (3.5W---8W); low (0.3W---0.7W)
- 2). Transmitting current: High power transmitting  $\leq 1.6\text{A}$ ; low power transmitting  $\leq 1.0\text{A}$
- 3). The maximum frequency deviation: 3.8 kHz---4.8 kHz (broad band)  
1.8 kHz---2.5 kHz (narrow band)
- 4). Distortion of transmitting :  $\leq 5\%$
- 5). QT/DQT frequency deviation : 0.5---0.85 kHz (broad band); 0.3---0.5kHz (narrow band) ; with a good wave.
- 6). Transmitting frequency deviation: nominal frequency  $\pm 500\text{Hz}$
- 7). DTMF frequency deviation: 3~4kHz (broad band)/1.5~2.0 kHz(narrow band)
- 8). FFSK frequency deviation: 3~4kHz (broad band)/1.5~2.0 kHz(narrow band)
- 9). Under voltage indication: The voltage is set as 6.6V, and the red light flashes without the transmitting power when press the PTT button.

## Chapter 7 Major Specifications

### 7.1 General Specification

Model	FP520	
Frequency	(400 ~ 470) MHz	(136 ~ 174) MHz
Modulation Method	4FSK	
Channel Capacity	32 (two zones)	
Channel Spacing	12.5kHz	
Intermediate Frequency	The first intermediate frequency: 51.65MHz; the second intermediate frequency:	
Voltage	7.5V negative pole is connected to the ground	
Temperature	-25°C ~ +55°C	
Antenna Impedance	50Ω	
Microphone Impedance	2.2kΩ	
Battery (Standard)	Li-ion battery DC 7.4V , 1500mAh, duration: 12.5 hours	
Dimension	118.2mm x55.7mmx32.9mm (widthxheightxthickness)	
Weight	250 (with battery and antenna)	

### 7.2 RX Part

Sensitivity (12dB SINAD)	≤0.25μV
Squelch-On Sensitivity	≤0.18uV
Receiver Residual Output	≤-35dB
Modulation Receiving Bandwidth	±3.5kHz
Adjacent Channel Selectivity	≥50dB
Intermodulation Interference Rejection	≥65dB
Spurious Response Rejection	≥70dB
Audio Output Power	1.3W, BTL @Distortion≤10%, 16Ω
Receiving Consumption Current	≤400mA

### 7.3 TX Part

Tx Power	4.0W/1.0W @ 7.5V DC
Frequency Stability	≤ ±2.5ppm
The Maximum Modulation Frequency Deviation	±2.5kHz
Modulation Distortion (300~3000Hz)	≤ 3%
Adjacent Channel Transmitting Power	≥60dB
Spurious Transmitting	≥70 dB
Residual Modulation Frequency	≥40 dB
Transmitting Consumption Current	≤1.7A @ 7.5V DC

## Chapter 8 Service and Test Equipment

During the service and test, the following equipment and apparatus are needed.

No.	Equipment	Specification
1.	Standard Signal Generator	Frequency Range: 136-174MHz, 400-470MHz Modulation: FM and External Modulation Output: $-127\text{dBm}/0.1\mu\text{v}$ or $\geq -47\text{dBm}/1\text{mv}$
2.	Power Meter	Input Impedance: $50\Omega$ Operation Frequency: 136-174MHz and 400-470MHz Measurement Range: About 10W
3.	Deviation Meter	Frequency Range: 136-174MHz, 400-470MHz
4.	Digital Voltmeter	Measurement Range: DC 10mv-10v Input Impedance: high input impedance for the minimum circuit
5.	Oscilloscope	Frequency Range: DC to 30MHz
6.	High Sensitivity Frequency Counter	Frequency Range: 50Hz to 10KHz Frequency Stability: 0.2ppm or lower
7.	Ammeter	Maximum Current: 5A
8.	Audio Frequency Voltmeter	Frequency Range: 50Hz to 10KHz Volt Range: 1mv to 10v
9.	Audio Frequency Generator	Frequency Range: 50Hz to 5KHz or higher Output: 0V to 1V
10.	Spectrum	Measurement Range: DC - 1GHz or higher
11.	Path Generator	Center Frequency: 50KHz to 600MHz Output Voltage: 100mv or higher
12.	16 $\Omega$ Dummy Load	About 16 $\Omega$ , 3W
13.	Adjustable Power Supply	5v to 10v, about 5A



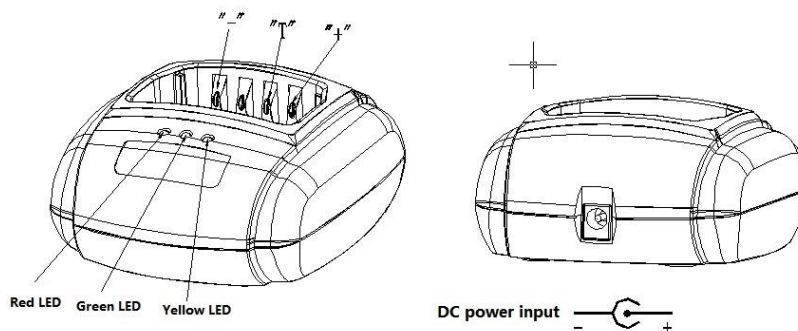
## Chapter 9 KBC-51 Charger

### 9.1 The Operational Conditions and Basic Specification of Charger

- a) Battery Specification: Li-ion (2\*3.7V), Ni-MH (6\*1.2V), battery capacity (1~2.4AH).
- b) Power Adaptor Specification: DC 11V~16V, 500~1500mA power adaptor, standard voltage is 12V.
- c) No-load Input Current:  $\leq 15\text{mA}$
- d) Precharged Current:  $75\text{mA} \pm 10\text{mA}$
- e) Precharged Time Limit: 15Min
- f) Constant Current Charging Current:  $400\text{mA} \pm 40\text{mA}$
- g) Maximum Li-ion Charging Voltage: 8.32~8.42V; Maximum Ni-MH Charging Voltage:  $9.6 \pm 0.1\text{V}$

### 9.2 Function Introduction

1. This charger is intelligent with fast charging, reliability, safety and high charging saturation.
2. Status Indication: The indicator flashes red for precharging and lights red for charging; it lights green for full charging, no battery and battery protection; it flashes yellow for battery output short circuit.
3. The external port identifies the lithium battery and Ni-MH battery.
4. Battery Short Circuit Protection: When there is a short circuit in the negative and positive pole of the charger, the indicator flashes yellow and the charging current will be cut off. The charging will continue automatically after troubleshooting.
5. The full battery is recharged for identification: When the full NI-MH battery is recharged, it will continue the charging. The charger according the normal  $\Delta V$  to identify if the battery is full charged. When the full Li battery is recharged, if the voltage is higher than 8.25V, the charging stops, and if it is lower than 8.25V, the charging continues.
6. Temperature Protection: When the Li-ion battery is charging, the charging stops with the yellow light on if the temperature is higher than 55 degrees. The charging is restarted when the temperature is down to 45 degrees. When the Ni-MH battery is charging, the charging stops with the yellow light on if the temperature is higher than 60 degrees. The charging is restarted when the temperature is down to 50 degrees.
7. Put the radio on the charger when it is on standby mode, and the charging automatically begins when the battery voltage is lower than 8.2 V.
8. The yellow light indicates the charger automatic protection. The charging is restarted after the troubleshooting.



LED lights red: Charging

LED lights green: Full battery

LED lights yellow: Abnormal charging

## Chapter 10 Troubleshooting

No.	Problems	Causes and Solutions
1	Power-on Failure	<p>A. The battery pack may be out of power. Please charge it or change to a new one, then try again.</p> <p>B. The power switch failure. Change to a new power switch.</p> <p>C. CPU failure. Change to a new CPU.</p> <p>D. Protective tube F100 failure. Change to a new protective tube.</p>
2	PLL is unlocked (beeping)	<p>A. The PLL crystal oscillator is broken, please change to a new one.</p> <p>B. The oscillation tube is broken, please change to a new one.</p> <p>C. The PLL chip IC300 is broken, please change to a new one.</p>
3	Communication Failure	<p>A. The frequency is not the same. Please reselect a channel with the same frequency</p> <p>B. The signaling codes of CTCSS/DCS are different, please reset them with the computer.</p> <p>C. Beyond the communication range.</p>
4	No Signal	<p>A. The antenna is in poor contact, please fasten it again.</p> <p>B. Low sensitivity, adjust the parameter in the "test mode".</p> <p>C. The high-mu tube Q703 is broken, please change it.</p> <p>D. The squelch level is too high to turn it on, please adjust the squelch level.</p> <p>E. Mixer tube Q702 is broken, please change it.</p> <p>F. FM processing chip IC700 is broken, please change to a new IC.</p>
5	No voice on the receiving radio when the indicator glows red on the transmitting radio.	<p>A. The power amplifying tube is broken with no power output, please change it.</p> <p>B. The microphone is broken, please change it.</p> <p>C. The operational amplifier Q601 is broken, please change it.</p>
6	No voice received when the indicator glows green.	<p>A. The speaker is broken, please change it.</p> <p>B. The audio power amplifier U800 is broken, please change to a new IC.</p> <p>C. The switch diode Q801 is broken, please change it.</p>
7	Abnormal Programming	<p>A. Improper connection, please check the cable connection.</p> <p>B. The computer serial port output is abnormal, please check the computer.</p> <p>C. The earphone jack is in poor contact, please check it and change it if broken.</p>

## Appendix 1 Abbreviation

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
E <sup>2</sup> PROM	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 Control Oscillator
TX	Transmitter
UL	Un-Lock
VCO	Voltage Control Oscillator

**Appendix 2 Spare Part List (Electronic Part 400-470MHz)**

Part No.	Item Name.	Specification	Quantity	Plug-in Position
6PM7-4083-HMB	FP520 PCB Board	FP520U-MAIN-140106.PCB;1.0MM: 47X101.5MM: FR-4, four layers, Pb-free	1	Mainboard PCB
1DS1-HSC277	Chip switch diode	HSC277,1608	3	D402, D602, D700
1DS1-HVC131	Chip switch diode	HVC131(P1),1608	2	D600, D601
1DS1-DA2S10100L	Chip switch diode	DA2S10100L	3	D309, D310, D709
1DS1-RB706F-40	Chip switch diode	schottky diode RB706F-40,SOT-323	1	D701
1DV1-1SV278	chip varactor	1SV278(T1)	1	D304
1DV1-HVC376B	chip varactor	HVC376B(B9)	13	D300, D301, D302, D303, D305, D306, D307, D308, D704, D705, D706, D707, D708
1DZ1-HZU5ALL	Chip voltage stabilizing diode	HZU5ALL,2012,5V	1	D604
1IL1-NJM2904V	chip linear IC	Dual operation amplifier NJM2904V,TSSOP-8	1	IC600
1IM1-AT24C512C	Chip memorizer IC (1IM1-AT24C512BN replaceable)	AT24C512C,manufaturer: ATMEL, Pb-free	1	IC200
1IS1-MB15E03SL	chip PLL IC	MB15E03SL,TSSOP-16	1	IC300
1IS1-PST9124NR	chip reset IC	reset IC,PST9124NR	1	IC202
1IS1-SCT3252PS	digital baseband processing chip	SCT3252PS, LQFP100, Nantong vocoder, Pb-free	1	U1
1IS1-GT3136	chip special IC	GT3136,SSOP16	1	IC700
1IS1-TDA2822	chip special IC	TDA2822	1	U800
1IS1-WM8758B	CODEC chip	WM8758CB, 32-Pin QPN encapsulation 5*5*0.9MM, Pb-free	1	U6
1IS1-XC6204B502MR	chip voltage stabilization IC	voltage stabilization IC 5V, SOT-23-5	1	IC100
1TF1-2SK1824	chip FET	2SK1824(B1)	3	Q606, Q6, Q704
1TF1-2SK508NV-K52	chip FET		2	Q302, Q307
1TF1-3SK318	chip dual-gate FET	3SK318(YB-)	2	Q702, Q703
1TF1-RD01MUS2	chip FET		1	Q601
1TF1-RD07MUS2B	chip FET	Mitsubishi, RD07MUS2B, Pb-free	1	Q600
1TF1-ST2302	chip FET	ST2302,SOT-23	2	Q802, Q803
1TT1-2SA1586	chip triode	2SA1586	1	Q805
1TT1-2SC3356-R24	chip triode	2SC3356-R24,SOT23,NPN	1	Q603
1TT1-2SC4617-R	chip triode	2SC4617-R(BR),EMT3	2	Q308, Q700
1TT1-2SC5108-Y	chip triode	2SC5108-Y(MC),NPN	6	Q300, Q301, Q303, Q304, Q602, Q701
1TT1-DTA143TE	chip triode	Digital diode DTA143TE(93), SOT323	3	Q305, Q306, Q604
1TT1-DTC144EE	chip triode	Digital diode DTC144EE(26), SOT323	11	Q2, Q4, Q101, Q103, Q200, Q201, Q605, Q801, Q804, Q806, Q707
1TT1-FMMT717TA	chip triode	FMMT717A,PNP,SOT23	1	Q800
1TT1-KTA1298-Y	chip triode	KTA1298-Y,SOT23	4	Q1, Q3, Q100, Q102
2CA1-TZVY2Z100A110	chip Trimmer capacitance	2-10P,+100/-0%,NP0±300PPm/°C	2	C335, C371
2CC1-10-C0G500-100D	Chip multilayer capacitance	1005,10P±0.5P,50V,C0G	4	C308, C309, C318, C321
2CC1-10-C0G500-101J	Chip multilayer capacitance	1005,100P±5%,50V,C0G	6	C329, C361, C375, C621, C643, C765

2CC1-10-C0G500-120J	Chip multilayer capacitance	1005,12P±5%,50V,C0G	2	C331, C363
2CC1-10-C0G500-150J	Chip multilayer capacitance	1005,15P±5%,50V,C0G	1	C327
2CC1-10-C0G500-160J	Chip multilayer capacitance	1005,16P±5%,50V,C0G	1	C311
2CC1-10-C0G500-180J	Chip multilayer capacitance	1005,18P±5%,50V,C0G	2	C620, C732
2CC1-10-C0G500-220J	Chip multilayer capacitance	1005,22P±5%,50V,C0G	3	C225, C227, C618
2CC1-10-C0G500-270J	Chip multilayer capacitance	1005,27P±5%,50V,C0G	1	C313
2CC1-10-C0G500-2R0C	Chip multilayer capacitance	1005,2P±0.25P,50V,C0G	2	C302,C731
2CC1-10-C0G500-330J	Chip multilayer capacitance	1005,33P±5%,50V,C0G	2	C754,C355
2CC1-10-C0G500-3R0C	Chip multilayer capacitance	1005,3P±0.25P,50V,C0G	6	C702, C328, C305, C741, C725, C724
2CC1-10-C0G500-470J	Chip multilayer capacitance	1005,47P±5%,50V,C0G	1	C306
2CC1-10-C0G500-4R0C	Chip multilayer capacitance	1005,4P±0.25P,50V,C0G	3	C324, C332, C364
2CC1-10-C0G500-5R0C	Chip multilayer capacitance	1005,5P±0.25P,50V,C0G	5	C314, C315, C356, C703, C704
2CC1-10-C0G500-680J	Chip multilayer capacitance	1005,68P±5%,50V,C0G	1	C323
2CC1-10-C0G500-6R0C	Chip multilayer capacitance	1005,6P±0.25P,50V,C0G	4	C723, C700,C736,C333
2CC1-10-C0G500-820J	Chip multilayer capacitance	1005,82P±5%,50V,C0G	1	C759
2CC1-10-C0G500-R50B	Chip multilayer capacitance	1005,0.5P±0.1P,50V,C0G	4	C343, C362, C325, C357
2CC1-10-X5R6R3-105K	Chip multilayer capacitance	1005,1uF±10%,6.3V,X5R	6	C81, C6, C60, C61, R807, C38
2CC1-10-X7R160-104K	Chip multilayer capacitance	1005,100nF±10%,16V,X7R	38	C40, C10, C12, C14, C21, C22, C23, C24, C25, C26, C27, C28, C32, C39, C50, C51, C55, C56, C89, C91, C92, C100, C101, C111, C114, C224, C334, C345,C707, C715, C749, C764, C801, C808, C816, C818, C819, C822
2CC1-10-X7R500-333K	Chip multilayer capacitance	1005,33nF±10%,25V,X7R,2CC1-10-X7R250-333K 代用	2	C48, C57
2CC1-10-X7R500-102K	Chip multilayer capacitance	1005,1000P±10%,50V,X7R	24	C34, C122, C304, C322, C347, C351, C366, C612, C636, C645, C647, C706, C709, C711, C712, C713, C714, C742, C743, C751, C753, C72, C54, C41
2CC1-10-X7R500-103K	Chip multilayer capacitance	1005,10nF±10%,50V,X7R	15	C46, C47, C720, C719, C5, C341, C112, C115, C629, C639, C640, C648, C726, C800, C812
2CC1-10-X7R500-182K	Chip multilayer capacitance	1005,1800P±10%,50V,X7R	2	C708, C820
2CC1-10-X7R500-471K	Chip multilayer capacitance	1005,470P±10%,50V,X7R	81	C42, C43, C45, C58, C59, C102, C104, C105, C107, C108, C110, C113, C207, C208, C221, C222, C230, C231, C232, C233, C300, C301, C307, C316, C320, C336, C337, C338, C339, C53, C52, C755, C756, C757, C758, C760, C762, C763, C803, C804, C809, C810, C813, C814, C821
2CC1-16-C0G500-120J	Chip multilayer capacitance	1608,12P±5%,50V,C0G	1	C607
2CC1-16-C0G500-1R0C	Chip multilayer capacitance	1608,1P±0.25P,50V,C0G	1	C634
2CC1-16-C0G500-1R5C	Chip multilayer capacitance	1608,1.5P±0.25P,50V,C0G	1	C604
2CC1-16-C0G500-220J	Chip multilayer capacitance	1608,22P±5%,50V,C0G	1	C602
2CC1-16-C0G500-270J	Chip multilayer capacitance	1608,27P±5%,50V,C0G	1	C610
2CC1-16-C0G500-2R0C	Chip multilayer capacitance	1608,2P±0.25P,50V,C0G	2	C603, C614
2CC1-16-C0G500-330J	Chip multilayer capacitance	1608,33P±5%,50V,C0G	1	C326
2CC1-16-C0G500-3R5C	Chip multilayer capacitance	1608,3.5P/3.6±0.25P,50V,C0G	1	C605
2CC1-16-C0G500-4R0C	Chip multilayer capacitance	1608,4P±0.25P,50V,C0G	1	C616
2CC1-16-C0G500-5R0C	Chip multilayer capacitance	1608,5P±0.25P,50V,C0G	4	C365, C601, C613, C615

2CC1-16-C0G500-6R0C	Chip multilayer capacitance	1608,6P±0.25P ,50V,C0G	1	C608
2CC1-16-C0G500-6R0D	Chip multilayer capacitance	1608,6P±0.5P,50V,C0G	1	C609
2CC1-16-X7R500-471K	Chip multilayer capacitance	1608,470P±10%,50V,X7R	1	C611
2CC1-20-Y5V160-106Z	chip multilayer capacitance	2012,10uF+80%/-20%,16V,Y5V	24	C8, C9, C11, C15, C16, C17, C18, C63, C103, C106, C109, C116, C119, C319, C344, C348, C642, C750, C752, C802, C806, C815, C817, C49
2CT1-TS32-160-1R0M	chip tantalum capacitance	3216,1μF±20%,16V,TS series (A level)	1	C359
2CT1-TS32-350-R10M	chip tantalum capacitance	3216,0.1μF±20%,35V, TS series (A level)	1	C358
2CT1-TS32-6R3-150M	chip tantalum capacitance	3216,15μF±20%,6.3V,TS TS series (A level)	2	C1, C376
2CT1-TS35-6R3-101M	chip tantalum capacitance	C-TAN,100uF,20%,SIZE-B,6.3V	1	C805
2LH1-R401R5-R03-05	chip air core inductance	wire diameter φ0.40,inner diameter φ1.5,3 circles, pin height 0.5mm, clockwise circling	8	L600, L601, L603, L709, L710, L711, L713, L714
2LH1-R401R5-R04-05	chip air core inductance	wire diameter φ0.40, inner diameter φ1.5,4 circles, pin height 0.5mm,clockwise circling	2	L602, L605
2LH1-R401R5-R08-05	chip air core inductance	wire diameter φ0.40, inner diameter φ1.5,8 circles, high pin	1	L607
2LH1-R501R5-L05-05	chip air core inductance	wire diameter φ0.50, inner diameter φ1.5,5 circles, high pin	1	L606
2LL1-16-12NJ	laminated inductance	1608,12nH±5%(MLG1608B12NJ/LL1608-FH12N)	1	L611
2LL1-16-1R0K	laminated inductance	1608,1μH±10%(MLF1608A1R0K)	1	L703
2LL1-16-22NJ	laminated inductance	1608,22nH±5%(MLG1608B22NJ)	1	L311
2LL1-16-27NJ	laminated inductance	1608,27nH±5%(MLG1608B27NJ)	1	L609
2LL1-16-33NJ	laminated inductance	1608,33nH±5%(MLG1608B33NJ)	1	L313
2LL1-16-3N9S	laminated inductance	1608,3.9nH±0.3nH(MLG1608B3N9S)	1	L604
2LL1-16-3R3K	laminated inductance	1608,3.3μH±10%(MLF1608A3R3K TA00)	2	L309, L323
2LL1-16-82NJ	laminated inductance	1608,82nH±5%(MLG1608B82NJ)	2	L307, L310
2LL1-16-R22J	laminated inductance	1608,0.22μH±5%(LG HK 1608R22J-T/MLG1608B220N)	4	L306, L319, L324,,L303
2LL1-16-R56K	laminated inductance	1608,560nH±10%(MLF1608DR56K)	1	L300
2LW1-16UC-180J	chip wire wound inductance	1608,18nH±5%,ceramic core (C1608CB-18NJ)	3	L301, L700, L304
2LW1-16UC-181J	chip wind wound inductance	1608,180nH±5%, ceramic core (C1608CB-R18J)	1	L321
2LW1-16UC-680J	chip wind wound inductance	1608,68nH±5%, ceramic core (C1608CB-68NJ)	2	L701, L706
2LW1-20UC-221J	chip wind wound inductance	2012,220nH±5%, ceramic core (LQN21AR22J/LQW2BHNR22J03L)	1	L608
2LW1-25UC-103J	chip wind wound inductance	2520,10μH±5%, ceramic core (FLM2520-100J)	1	L305
2LW1-25UC-331K	chip wind wound inductance	2520,330nH±10%, ceramic core (FLM2520-R33K/SGWI2520HR33J)	1	L704
2LW1-25UC-561K	chip wind wound inductance	2520,560nH±10%, ceramic core (FLM2520-R56K)	1	L705
2LW1-32UC-170J	chip wind wound inductance	3216,17nH±5%,air cored wire (LQN1A23NJ04/LQW31HN17NJ03L)	1	L322
2LW1-32UC-270J	chip wind wound inductance	3216,27nH±5%, air cored wire (LQN1A27NJ04/LQW31HN27NJ01L)	1	L308
2RE1-10-22R0	chip precision resistance	1005,22Ω±1%	1	R804
2RE1-16-1503	chip precision resistance	1608,150K±1%	7	R617, R618, R619, R624, R625, R627, R628
2RS1-10-000O	chip resistance	1005,0Ω	22	R45, C2, C3, R13, R206, R41, R14, R19, R1, R16, R17, R18, R39, R40, R107, R143, R604, R616, R824, C73, C74, R51
2RS1-10-100J	chip resistance	1005,10Ω±5%	5	R231, R244, R300, R308, R324
2RS1-10-101J	chip resistance	1005,100Ω±5%	3	R321, R703, R248
2RS1-10-102J	chip resistance	1005,1K±5%	23	R813, R823, R15, R38, R106, R197, R198, R229, R236, R237, R238, R239, R254, R255, R301, R304, R341, R602, R606, R719, R53, R50, R57

2RS1-10-103J	chip resistance	1005,10K±5%	27	R809, R815, R822, R806, R32,R227, R8, R33, R34, R35, R36, R37, R43, R100, R103, R250, R251, R252, R327, R337, R338, R339, R340, R344, R718, R801, R816,
2RS1-10-104J	chip resistance	1005,100K±5%	9	R105, R342, R704, R724, R727, R739, R316, R4, C7
2RS1-10-105J	chip resistance	1005,1M±5%	8	R626, R725, R729, R730, R731, R732, R733, R734
2RS1-10-151J	chip resistance	1005,150Ω±5%	1	R333
2RS1-10-152J	chip resistance	1005,1.5K±5%	3	R607, R817, R331
2RS1-10-153J	chip resistance	1005,15K±5%	1	R25
2RS1-10-154J	chip resistance	1005,150K±5%	4	R716, R303, R314, R728
2RS1-10-182J	chip resistance	1005,1.8K±5%	1	R44
2RS1-10-184J	chip resistance	1005,180K±5%	1	R736
2RS1-10-204J	chip resistance	1005,200K±5%	1	R302
2RS1-10-220J	chip resistance	1005,22Ω±5%	5	R305, R323, R611, R715, R721
2RS1-10-221J	chip resistance	1005,220Ω±5%	2	R722, R726
2RS1-10-222J	chip resistance	1005,2.2K±5%	5	R7, R42, R101, R102, R800
2RS1-10-223J	chip resistance	1005,22K±5%	1	R26
2RS1-10-241J	chip resistance	1005,240Ω±5%	2	R310, R328
2RS1-10-271J	Chip resistance	1005,270Ω±5%	3	R309, R318, R605
2RS1-10-272J	Chip resistance	1005,2.7K±5%	1	R313
2RS1-10-273J	Chip resistance	1005,27K±5%	2	R631, R720
2RS1-10-274J	Chip resistance	1005,270K±5%	3	R104, R325, R326
2RS1-10-330J	Chip resistance	1005,33Ω±5%	1	R610
2RS1-10-332J	Chip resistance	1005,3.3K±5%	4	R312, R708, R711, R735
2RS1-10-333J	Chip resistance	1005,33K±5%	2	C811, R701
2RS1-10-334J	Chip resistance	1005,330K±5%	2	R228, R702
2RS1-10-392J	Chip resistance	1005,3.9K±5%	2	R614,R738
2RS1-10-393J	Chip resistance	1005,39K±5%	1	R612
2RS1-10-470J	Chip resistance	1005,47Ω±5%	1	R600
2RS1-10-471J	Chip resistance	1005,470Ω±5%	3	R11, R814, R811
2RS1-10-472J	Chip resistance	1005,4.7K±5%	6	R706, R322, R343, R406, R407, R700
2RS1-10-473J	Chip resistance	1005,47K±5%	16	R22, R23, R24, R27,R29, R30, R31, R240, R241, R242, R243, R601, R608, R613, R61, R62
2RS1-10-474J	Chip resistance	1005,470K±5%	1	R805
2RS1-10-512J	Chip resistance	1005,5.1K±5%	3	R199, R200, R218
2RS1-10-560J	Chip resistance	1005,56Ω±5%	1	R710
2RS1-10-562J	Chip resistance	1005,5.6K±5%	4	R812, R317, R603, R2
2RS1-10-563J	Chip resistance	1005,56K±5%	3	R629, R705, R723
2RS1-10-564J	Chip resistance	1005,560K±5%	1	R712
2RS1-10-823J	Chip resistance	1005,82K±5%	1	R609
2RS1-16-000O	Chip resistance	1608,0Ω	5	L100, L102, L103, L708, L610

2RS1-16-153J	Chip resistance	1608,15K±5%	1	R615
2RS1-20-000O	Chip resistance	2012,0Ω	1	L707
2RS1-32-R47J	Chip resistance	3216,0.47Ω±5%	3	R620, R621, R622
2RT1-NTH5G16P42B104K	chip thermal resistance	1608,NTH5G16P42B104K07TH	1	R707
3ST1-SKRTLBE010	chip touch switch	SKRTLBE010,4.5*3.55*3.3mm(ALPS)	1	S1
4PE1-16-F2	chip LED	1608, red light, 19-21SUR/S530-A2/TR8	1	D202
4PE1-16-F5	chip LED	1608, green light ,H19-213SYGC	1	D203
5FC1-D51606GQ1-0705	chip crystal filter	DSF753SDF,51.65MHz±3KHz/5dB, 7.0*5.0*1.3	1	Z1
5FE1-BLM11A221SPT	chip EMI suppression filter	1608,BLM11A221SPT/BLM18AG221S(0138-05)	9	FB1, FB7, FB8, FB9, FB12, FB16, FB17, L4, L5
5FE1-BLM11A601S	chip EMI suppression filter	1608,BLM11A601S/BLM18AG601S(0138-05)	15	L6, L7, L8, L10, L203, L314, L315, L316, L317, L318, L320, L613, L712, L715, L800
5FE1-BLM21P300S	chip EMI suppression filter	2012,BLM21P300S/BLM21PG300S (0149-05)	2	L612, L614
5OD1-12R28-ACL-2520	chip temperature compensated crystal oscillator	Shangjie, DSA221SJ, 12.2880MHz, ±1.5PPm, -40~+85°C, 2.5*2.0*0.8mm	1	Y3
5OT1-12R8-CEC3-0503	chip temperature compensated crystal oscillator (TCXO)	NT5032SA/NT5032SC,12.8MHz±2.5PPm, 5.0*3.2*1.6mm	1	X300
5XC1-9R8-MPL20-0503	chip crystal resonator	9.8304MHz±30PPM, ±50PPM, 16P, -40°Cto+80°C, NX5032GA	1	X200
7MHP-7042-12A-W	battery connector (subassembly)		1	DC1
1ID1-MC74VHC1GT04	Single inverter IC	MC74VHC1GT04, SC-88A/SOT353, Pb-free	1	U8
2CC1-20-Y5V160-105Z	Chip multilayer capacitance	2012,1uF+80%/-20%,16V,Y5V	2	C36, C218
3CF1-BL112-30RU	chip FFC/FPC connector	Interval 0.5mm, 30 core, horizontal	1	J4
3FW1-42932-302320	chip fuse	429003/433003/466003,3216,3A/32V	1	F100
2CC1-10-C0G500-3R0D	chip multilayer capacitance	1005,3.0P±0.25P,50V,C0G,GJM1555C1H3R0CB01, muRata, HIQ	1	C226
2CC1-20-Y5V100-334Z	Chip multilayer capacitance	2012, 330nF+80%/-20%, 10V, Y5V	1	C705
2CC1-10-C0G500-1R0C	Chip multilayer capacitance	1005,1P±0.25P,50V,C0G	2	C728, C739
2CC1-10-C0G500-8R0C	chip multilayer capacitance	1005,8P±0.25P,50V,C0G	4	C738, C740, C734, C744
2CC1-10-C0G500-R75B	Chip multilayer capacitance	1005,0.75P±0.1P,50V,C0G	1	C729
1IS1-XC6204B332MR	Chip voltage stabilization IC	voltage stabilization integration 3.3V, SOT-23-5,150mA	2	IC101, IC4
2CC1-16-C0G500-1R5B	chip multilayer capacitance	1608,1.5P±0.1P,50V,C0G	1	D703
1IS1-XC6228D122VR	special chip IC	Power IC, XC6228D122VR-G, SOT-25J, 5PIN, Pb-free	1	IC102
2CT1-TS32-350-R33M	chip tantalum capacitance	3216,0.33μF±20%,35V,TS series (A level)	1	C360
1DV1-HVC350B	chip varactor (production halts)	HVC350B(B0),SOD523	1	D702
2RS1-10-331J	Chip resistance	1005,330Ω±5%	4	R713, R714, R330, R247
2CC1-10-C0G500-7R0C	chip multilayer capacitance	1005,7P±0.25P,50V,C0G	1	C746
2RS1-10-123J	Chip resistance	1005,12K±5%	1	C823
2RS1-10-511J	Chip resistance	1005,510Ω±5%	1	R332
2RS1-10-122J	Chip resistance	1005,1.2K±5%	1	R329
2RS1-10-682J	Chip resistance	1005,6.8K±5%	2	R20, R21
1IP1-0FP520-R01	CPU chip	CPU,M16C-M3062LFGPGP, Pb-free	1	IC2
1IP1-M16CM3062LFGPGP	Chip CPU	the empty chip should be burned, CPU, M16C-M3062LFGPGP, FLASH	1	
1IM1-25X32VSI	chip memorizer IC	25Q32BVSSIG, 8PIN, SOIC, Huabang IC, Pb-free	1	IC3



**Appendix 3 Spare Part List (Electronic Part 136-174MHz)**

Part No.	Name	Specification	Quantity	Plug-in Position
6PM7-4085-HMB	FP520 VHF main board	FP520V-MAIN-140106.PCB;1.0MM; 47X101.5MM; FR-4;four layers; Pb-free	1	FP520- VHF mainboard PCB
7MHP-7042-12A-W	battery connector (subassembly)		1	DC1
1DS1-DA2S10100L	Chip switch diode	DA2S10100L	3	D309, D310, D709
1DS1-HSC277	Chip switch diode	HSC277,1608	2	D402, D700
1DS1-HVC131	Chip switch diode	HVC131(P1),1608	4	D600, D601, D602, D603
1DS1-RB706F-40	Chip switch diode	The Schottky diode RB706F-40,SOT-323	1	D701
1DV1-1SV278	Chip varactor	1SV278(T1)	1	D304
1DV1-1SV305	Chip varactor	1SV305	4	D704, D706, D707, D708
1DV1-1SV325	Chip varactor	1SV325(V8)	2	D300, D302
1DV1-HVC376B	Chip varactor	HVC376B(B9)	4	D305, D306, D307, D308
1DZ1-HZU5ALL	R chip voltage stabilization diode	HZU5ALL,2012,5V	1	D604
1ID1-MC74VHC1GT04	Single inverter IC	MC74VHC1GT04, SC-88A/SOT353, Pb-free	1	U8
1IL1-NJM2904V	chip linearity IC	Dual operation amplifier NJM2904V,TSSOP-8	1	IC600
1IM1-25X32VSIG	Chip memorizer IC	25Q32BVSSIG,8PIN,SOIC,HaubangIC, Pb-free	1	IC3
1IM1-AT24C512C	Chip memorizer IC 1IM1-AT24C512BNreplaceable	AT24C512C,manufacturer:ATMEL, Pb-free	1	IC200
1IS1-GT3136	special chip IC	GT3136,SSOP16	1	IC700
1IS1-MB15E03SL	chip PLL IC	MB15E03SL,TSSOP-16	1	IC300
1IS1-PST9124NR	chip reset IC	Reset IC,PST9124NR	1	IC202
1IS1-SCT3252PS	Digital base-band processing chip	SCT3252PS, LQFP100, Nantongyuan vocoder, Pb-free	1	U1
1IS1-TDA2822	special chip IC	TDA2822	1	U800
1IS1-UPB1509GV	special chip IC	Frequency divider UPB1509GV,SSOP	1	IC4
1IS1-WM8758B	CODEC chip	WM8758CB, 32-Pin QPN encapsulation 5*5*0.9MM, Pb-free	1	U6
1IS1-XC6204B332MR	Chip voltage stabilization IC	Voltage stabilization integration 3.3V,SOT-23-5,150mA	2	IC101, IC5
1IS1-XC6204B502MR	Chip voltage stabilization IC	Voltage stabilization integration 5V,SOT-23-5	1	IC100
1TF1-2SK1824	chip FET	2SK1824(B1)	3	Q606, Q6, Q704
1TF1-RD07MUS2B	chip FET	Mitsubishi, RD07MUS2B, Pb-free	1	Q600
1TF1-2SK508NV-K52	chip FET		2	Q302, Q307
1TF1-3SK318	chip dual-gate FET	3SK318(YB-)	2	Q702, Q703
1TF1-RD01MUS2	chip FET		1	Q601
1TF1-ST2302	chip FET	ST2302,SOT-23	2	Q802, Q803
1TT1-2SA1586	Chip triode	2SA1586	1	Q805
1TT1-2SC3356-R24	Chip triode	2SC3356-R24,SOT23,NPN	1	Q603
1TT1-2SC4617-R	Chip triode	2SC4617-R(BR),EMT3	2	Q308, Q700
1TT1-2SC5108-Y	Chip triode	2SC5108-Y(MC),NPN	6	Q300, Q301, Q303, Q304, Q602, Q701
1TT1-DTA143TE	Chip triode	digital triode DTA143TE(93), SOT323	3	Q305, Q306, Q604
1TT1-DTC144EE	Chip triode	digital triode DTC144EE(26), SOT323	11	Q2, Q4, Q101, Q103, Q200, Q201, Q605, Q801, Q804, Q806, Q707

1TT1-FMMT717TA	Chip triode	FMMT717A,PNP,SOT23	1	Q800
1TT1-KTA1298-Y	Chip triode	KTA1298-Y,SOT23	4	Q1, Q3, Q100, Q102
2CA1-TZVY2Z100A110	chip trimmer capacitance	2-10P,+100/-0%,NP0±300PPm/°C	2	C335, C371
2CC1-10-C0G500-100D	Chip multilayer capacitance	1005,10P±0.5P,50V,C0G	5	C308, C309, C318, C321, C328
2CC1-10-C0G500-101J	Chip multilayer capacitance	1005,100P±5%,50V,C0G	6	C612, C765, C375, C643, C725, C751
2CC1-10-C0G500-151J	Chip multilayer capacitance	1005,150P±5%,50V,C0G	3	C323, C718, C722
2CC1-10-C0G500-150J	Chip multilayer capacitance	1005,15P±5%,50V,C0G	1	C62
2CC1-10-C0G500-160J	chip multilayer capacitance	1005,16P±5%,50V,C0G	1	C311
2CC1-10-C0G500-180J	Chip multilayer capacitance	1005,18P±5%,50V,C0G	2	C620, C732
2CC1-10-C0G500-181J	Chip multilayer capacitance	1005,180P±5%,50V,C0G	1	C355
2CC1-10-C0G500-220J	Chip multilayer capacitance	1005,22P±5%,50V,C0G	1	C52
2CC1-10-C0G500-270J	Chip multilayer capacitance	1005,27P±5%,50V,C0G	4	C618, C313, C225, C227
2CC1-10-C0G500-2R0C	Chip multilayer capacitance	1005,2P±0.25P,50V,C0G	3	C302, C747, C729
2CC1-10-C0G500-330J	Chip multilayer capacitance	1005,33P±5%,50V,C0G	6	C704, C736, C740, C744, C746, C754
2CC1-10-C0G500-3R0C	Chip multilayer capacitance	1005,3P±0.25P,50V,C0G	3	C305, C731, C745
2CC1-10-C0G500-3R5C	Chip multilayer capacitance	1005,3.5P±0.25P,50V,C0G	1	C332
2CC1-10-C0G500-470J	Chip multilayer capacitance	1005,47P±5%,50V,C0G	1	C306
2CC1-10-C0G500-4R0C	Chip multilayer capacitance	1005,4P±0.25P,50V,C0G	5	C364, C724, C737, C356, C363
2CC1-10-C0G500-4R7C	Chip multilayer capacitance	1005,4.7P±0.25P,50V,C0G	1	C741
2CC1-10-C0G500-5R0C	Chip multilayer capacitance	1005,5P±0.25P,50V,C0G	4	C314, C315, C324, C723
2CC1-10-C0G500-820J	Chip multilayer capacitance	1005,82P±5%,50V,C0G	1	C759
2CC1-10-C0G500-8R0D	Chip multilayer capacitance	1005,8P±0.5P,50V,C0G	1	C703
2CC1-10-C0G500-9R0D	Chip multilayer capacitance	1005,9P±0.5P,50V,C0G	2	C621, C702
2CC1-10-C0G500-R50B	Chip multilayer capacitance	1005,0.5P±0.1P,50V,C0G	3	C325, C343, C357
2CC1-10-X5R6R3-105K	Chip multilayer capacitance	1005,1uF±10%,6.3V,X5R	6	C81, C38, C60, C61, R807, C6
2CC1-10-X7R160-104K	Chip multilayer capacitance	1005,100nF±10%,16V,X7R	39	C40, C10, C21, C22, C24, C25, C26, C27, C28, C32, C50, C51, C55, C56, C89, C91, C14, C23, C12, C39, C92, C100, C101, C111, C114, C224, C334, C345, C707, C715, C749, C764, C801, C808, C816, C818, C819, C822, C712
2CC1-10-X7R500-333K	Chip multilayer capacitance	1005,33nF±10%,25V,X7R,2CC1-10-X7R250-333K	2	C48, C57
2CC1-10-X7R500-102K	Chip multilayer capacitance	1005,1000P±10%,50V,X7R	34	R12, C34, C64, C327, C622, C633, C638, C733, C735, C742, C743, C757, C758, C760, C762, C763, C122, C304, C322, C347, C351, C366, C636, C645, C647, C706, C709, C711, C713, C714, C719, C753, C72, C71
2CC1-10-X7R500-103K	Chip multilayer capacitance	1005,10nF±10%,50V,X7R	12	C5, C112, C115, C629, C639, C640, C648, C726, C800, C812, C720, C41
2CC1-10-X7R500-182K	Chip multilayer capacitance	1005,1800P±10%,50V,X7R	2	C708, C820
2CC1-10-X7R500-471K	Chip multilayer capacitance	1005,470P±10%,50V,X7R	70	C338, C339, C340, C346, C349, C350, C352, C353, C367, C368, C369, C372, C373, C432, C619, C623, C626, C627, C628, C630, C631, C632, C635, C641, C644, C646, C716, C717, C727, C755, C756, C803, C804, C809, C810, C813, C814, C821, C730, C70, C69
2CC1-16-C0G500-100D	Chip multilayer capacitance	1608,10P±0.5P,50V,C0G	4	C501, C508, C509, C514
2CC1-16-C0G500-110J	Chip multilayer capacitance	1608,11P±5%,50V,C0G	1	C504
2CC1-16-C0G500-120J	Chip multilayer capacitance	1608,12P±5%,50V,C0G	1	C503
2CC1-16-C0G500-130J	Chip multilayer capacitance	1608,13P±5%,50V,C0G	1	C516

2CC1-16-C0G500-180J	Chip multilayer capacitance	1608,18P±5%,50V,C0G	1	C515
2CC1-16-C0G500-270J	Chip multilayer capacitance	1608,27P±5%,50V,C0G	1	C65
2CC1-16-C0G500-330J	Chip multilayer capacitance	1608,33P±5%,50V,C0G	1	C326
2CC1-16-C0G500-5R0C	Chip multilayer capacitance	1608,5P±0.25P,50V,C0G	1	C365
2CC1-16-C0G500-680J	Chip multilayer capacitance	1608,68P±5%,50V,C0G	2	C66, C634
2CC1-16-C0G500-7R0D	Chip multilayer capacitance	1608,7P±0.5P,50V,C0G	1	C505
2CC1-16-X7R500-102K	Chip multilayer capacitance	1608,1000P±10%,50V,X7R	1	C611
2CC1-20-Y5V100-334Z	Chip multilayer capacitance	2012,330nF+80%/-20%,10V,Y5V	1	C705
2CC1-20-Y5V160-106Z	Chip multilayer capacitance	2012,10uF+80%/-20%,16V,Y5V	24	C8, C9, C11, C15, C16, C17, C18, C63, C103, C106, C109, C116, C119, C319, C344, C348, C642, C750, C752, C802, C806, C815, C817, C68
2CT1-TS32-160-3R3M	chip tantalum capacitance	3216,3.3μF±20%,16V,TS series (A level)	1	C359
2CT1-TS32-350-R10M	Chip tantalum capacitance	3216,0.1μF±20%,35V,TS series (A level)	1	C360
2CT1-TS32-350-R33M	Chip tantalum capacitance	3216,0.33μF±20%,35V,TS series (A level)	1	C358
2CT1-TS32-6R3-150M	Chip tantalum capacitance	3216,15μF±20%,6.3V,TS series (A level)	2	C1, C376
2CT1-TS35-100-470M	Chip tantalum capacitance	3528,47μF±20%,10V,TS series (B level)	1	C805
2LH1-R301R5-L05-05	chip air core inductance	wire diameter φ0.30 inner diameter φ1.5 5 circle rewind, high pin	1	L11
2LH1-R301R0-L07-05	chip air core inductance	wire diameter φ0.30, inner diameter φ1.0,7circle rewind, high pin	1	L501
2LH1-R301R5-R07-05	chip air core inductance	wire diameter φ0.30 inner diameter φ1.5 7 circle, wind, high pin	3	L505, L502, L503
2LH1-R401R5-R03-05	chip air core inductance	wire diameterφ0.40, inner diameter φ1.5,3circle, pin height 0.5mm,wind	2	L9, L500
2LH1-R401R5-L08-05	chip air core inductance	wire diameter φ0.40,inner diameter φ1.5,8 circle, reverse, high pin	1	L607
2LL1-16-1R0K	laminated inductance	1608,1μH±10%(MLF1608A1R0K)	1	L703
2LL1-16-22NJ	Laminated inductance	1608,22nH±5%(MLG1608B22NJ)	1	L610
2LL1-16-33NJ	Laminated inductance	1608,33nH±5%(MLG1608B33NJ)	2	L700, L301
2LL1-16-39NJ	Laminated inductance	1608,39nH±5%(MLG1608B39NJ)	1	L311
2LL1-16-3R3K	Laminated inductance	1608,3.3μH±10%(MLF1608A3R3K TA00)	2	L309, L323
2LL1-16-82NJ	Laminated inductance	1608,82nH±5%(MLG1608B82NJ)	2	L313, L609
2LL1-16-R10J	Laminated inductance	1608,0.1uH±5%(MLG1608BR10JMLG1608B100NJ/HK1608R10J-T)	2	L611, L307
2LL1-16-68NJ	Laminated inductance	1608,68nH±5%(MLG1608B68NJ)	1	L701
2LL1-16-R18J	Laminated inductance	1608,0.18μH±5%(LG HK 1608R18J-T/MLG1608B180N)	2	L321, L324
2LL1-16-R22J	Laminated inductance	1608,0.22μH±5%(LG HK 1608R22J-T/MLG1608B220N)	4	L306, L310, L319, L303
2LL1-16-R56K	Laminated inductance	1608,560nH±10%(MLF1608DR56K)	1	L300
2LW1-16UC-180J	chip wire wound inductance	1608,18nH±5%,ceramic core (C1608CB-18NJ)	1	L304
2LW1-20UC-220G	chip wire wound inductance	2012,22nH±2%, ceramic core (C2012CB-22NG)	1	L308
2LW1-20UC-221J	chip wire wound inductance	2012,220nH±5%, ceramic core (LQN21AR22J/LQW2BHNR22J03L)	1	L608
2LW1-20UC-390GA	chip wire wound inductance	2012,39nH±2%, ceramic core (C2012C-39NG)	1	L322
2LW1-20UC-470J	chip wire wound inductance	2012,47nH±5%, ceramic core (C2012C-47NJ)	1	L714
2LW1-20UC-680J	chip wire wound inductance	2012,68nH±5%, ceramic core (C2012C-68NJ)	1	L2
2LW1-20UC-560JA	chip wire wound inductance	2012,56nH±5%, ceramic core (C2012C-56NJ)	3	L706, L709, L713
2LW1-25UC-102JA	chip wire wound inductance	2520,1μH±5%, ceramic core (FHW1008UC1R0J)	1	L606
2LW1-25UC-103J	chip wire wound inductance	2520,10μH±5%, ceramic core (FLM2520-100J)	1	L305
2LW1-25UC-331K	chip wire wound inductance	2520,330nH±10%, ceramic core (FLM2520-R33K/SGWI2520HR33J)	1	L704

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2LW1-25UC-821K	chip wire wound inductance	2520,820nH±10%, ceramic core (FLM2520-R82K)	1	L705
2RE1-16-1503	chip precision resistance	1608,150K±1%	7	R617 R618 R619 R624 R625 R627 R628
2RS1-10-000O	chip resistance	1005,0Ω	28	C700,C2,C3,C73,C74,R65,C226 R1, R16, R17, R18, R39, R40, R107, R143, R604, R616, R20, R824, R721, R739, C721, R206, R13, R14, R19, R60, R41
2RS1-10-100J	Chip resistance	1005,10Ω±5%	5	R231, R244, R300, R308, R324
2RS1-10-101J	Chip resistance	1005,100Ω±5%	6	R321, R309, R328, R333, R703, R248
2RS1-10-102J	Chip resistance	1005,1K±5%	24	R813, R717, R15, R51, R106, R197, R198, R229, R236, R237, R238, R239, R254, R255, R301, R304, R341, R602, R822, R823, R331, R52, R53, R57,
2RS1-10-103J	Chip resistance	1005,10K±5%	28	R809, R806, R603, R8, R33, R34, R35, R36, R37, R38, R43, R100, R103, R250, R251, R252, R327, R337, R338, R339, R340, R344, R700, R718, R801, R815, R816, R32
2RS1-10-123J	Chip resistance	1005,12K±5%	2	C823, R21
2RS1-10-104J	Chip resistance	1005,100K±5%	2	R704, R724, R105, R342, R736, R316, R601, R4, C7
2RS1-10-105J	Chip resistance	1005,1M±5%	5	R626, R729, R731, R732, R734
2RS1-10-152J	Chip resistance	1005,1.5K±5%	1	R607
2RS1-10-153J	Chip resistance	1005,15K±5%	1	R25
2RS1-10-154J	Chip resistance	1005,150K±5%	2	R303, R314
2RS1-10-181J	Chip resistance	1005,180Ω±5%	1	R310
2RS1-10-182J	Chip resistance	1005,1.8K±5%	2	R44, R817
2RS1-10-184J	Chip resistance	1005,180K±5%	1	R727
2RS1-10-204J	Chip resistance	1005,200K±5%	1	R302
2RS1-10-220J	Chip resistance	1005,22Ω±5%	4	R305, R611, R715, R804
2RS1-10-221J	Chip resistance	1005,220Ω±5%	1	R726
2RS1-10-222J	Chip resistance	1005,2.2K±5%	5	R7, R42, R101, R102, R800
2RS1-10-223J	Chip resistance	1005,22K±5%	1	R26
2RS1-10-271J	Chip resistance	1005,270Ω±5%	1	R605
2RS1-10-272J	Chip resistance	1005,2.7K±5%	2	R313,C46
2RS1-10-273J	Chip resistance	1005,27K±5%	2	R631, R720
2RS1-10-274J	Chip resistance	1005,270K±5%	3	R104, R325, R326
2RS1-10-330J	Chip resistance	1005,33Ω±5%	1	R610
2RS1-10-331J	Chip resistance	1005,330Ω±5%	7	R50, R318, R606, R714, R330, R713, R247
2RS1-10-332J	Chip resistance	1005,3.3K±5%	4	R317, R708, R711, R735
2RS1-10-333J	Chip resistance	1005,33K±5%	4	C811, R701,R613,R609
2RS1-10-334J	Chip resistance	1005,330K±5%	2	R228, R702
2RS1-10-392J	Chip resistance	1005,3.9K±5%	2	R614, R738
2RS1-10-393J	Chip resistance	1005,39K±5%	1	R612
2RS1-10-470J	Chip resistance	1005,47Ω±5%	2	R323, R600
2RS1-10-471J	Chip resistance	1005,470Ω±5%	3	R811, R814, R332
2RS1-10-562J	Chip resistance	1005,5.6K±5%	3	R2, R312, R812
2RS1-10-472J	Chip resistance	1005,4.7K±5%	5	R706, R322, R343, R406, R407

2RS1-10-473J	Chip resistance	1005,47K±5%	14	R22, R23, R24, R27, R29, R30, R31, R227, R240, R241, R242, R243, R608, R61
2RS1-10-474J	Chip resistance	1005,470K±5%	2	R716, R805
2RS1-10-512J	Chip resistance	1005,5.1K±5%	3	R199, R200, R218
2RS1-10-560J	Chip resistance	1005,56Ω±5%	2	R710, R722
2RS1-10-563J	Chip resistance	1005,56K±5%	1	R629
2RS1-10-564J	Chip resistance	1005,560K±5%	1	R712
2RS1-10-823J	Chip resistance	1005,82K±5%	2	R705, R723
2RS1-16-000O	Chip resistance	1608,0Ω	4	L100, L102, L103, L708
2RS1-16-153J	Chip resistance	1608,15K±5%	1	R615
2RS1-20-000O	Chip resistance	2012,0Ω	1	L707
2RS1-32-R47J	Chip resistance	3216,0.47Ω±5%	3	R620, R621, R622
2RT1-NTH5G16P42B104K	chip thermal resistance	1608,NTH5G16P42B104K07TH	1	R707
3CF1-BL112-30RU	Chip FFC/FPC connector	Interval 0.5mm,30 core, horizontal	1	J201
3FW1-42932-302320	chip fuse	429003/433003/466003,3216,3A/32V	1	F100
3ST1-SKRTLBE010	chip tact switch (portable) S series is excluded	SKRTLBE010,4.5*3.55*3.3mm(ALPS)	1	S1
4PE1-16-F2	chip LED	1608,red light,19-21SUR/S530-A2/TR8	1	D202
4PE1-16-F5	chip LED	1608,green light ,H19-213SYGC	1	D203
5FC1-D51606GQ1-0705	chip crystal filter FP520	DSF753SDF,51.65MHz±3KHz/5dB,7.0*5.0*1.3	1	Z1
5FE1-BLM11A221SPT	chip EMI suppression filter	1608,BLM11A221SPT/BLM18AG221S(0138-05)	9	FB1, FB7, FB8, FB9, FB12, FB16, FB17, L4, L5
5FE1-BLM11A601S	chip EMI suppression filter	1608,BLM11A601S/BLM18AG601S(0138-05)	16	L3, L6, L7, L8, L10, L203, L314, L315, L316, L317, L318, L320, L613, L712, L715, L800
5FE1-BLM21P300S	chip EMI suppression filter	2012,BLM21P300S/BLM21PG300S(0149-05)	2	L612, L614
5OD1-12R28-ACL-2520	chip temperature compensated crystal oscillator (TCXO)	Shangjie, DSA221SJ, 12.2880MHz, ±1.5PPm, -40~+85°C, 2.5*2.0*0.8mm	1	Y3
5OT1-12R8-ACL4-0303	chip temperature compensated crystal oscillator (TCXO)	12.8MHz±1.5ppm,Vcont=1.5V±1.0V. towing range ±20ppm,-40°C~+85	1	X300
5XC1-9R8-MPL20-0503	chip crystal oscillator; applied to : PT65/68/72/78/81/8200/CD3700	9.8304MHz±30PPM,±50PPM,16P,-40°Cto+80°C,NX5032GA	1	X200
1DR1-1SR154-400	chip commutation diode	1SR154-400,4532	1	D100
1IS1-XC6228D122VR	special chip IC	Power IC,XC6228D122VR-G,SOT-25J,5PIN, Pb-free	1	IC102
2LL1-16-18NJ	laminated capacitance	1608,18nH±5%(MLG1608B18NJ)	1	L604
2RS1-10-224J	Chip resistance	1005,220K±5%	1	R728
2CC1-10-C0G500-390J	Chip multilayer capacitance	1005,39P±5%,50V,C0G	1	C734
2CC1-10-C0G500-7R0D	Chip multilayer capacitance	1005,7P±0.5P,50V,C0G	2	C333, C331
2RS1-10-681J	Chip resistance	1005,680Ω±5%	1	R329
2CC1-20-Y5V160-105Z	Chip multilayer capacitance	2012,1uF+80%/-20%,16V,Y5V	2	C36, C218
2CC1-16-C0G500-200J	Chip multilayer capacitance	1608,20P±5%,50V,C0G	1	C613
2CC1-16-C0G500-121J	Chip multilayer capacitance	1608,120P±5%,50V,C0G	1	C610
1IP1-0FP520-R01	FP520 burning chip	CPU,M16C-M3062LFGPGP, Pb-free	1	IC2
1IP1-M16CM3062LFGPGP	E R chip CPU	Empty chip should be burned, CPU,M16C-M3062LFGPGP,FLASH	1	
1IM1-25X32VSI	Chip memorizer IC	25Q32BVSSIG,8PIN,SOIC,HuabangIC, Pb-free	1	IC3

Appendix 4 Spare Part List (Structural Material)

Part No.	Part Name	Specification	Quantity
7MHP-7208-01B-W0	volume knob	Material: ABS,black,white; shares the same front mould with PT7200;140307 revised, Pb-free	1
7MHP-7208-02A-W0	channel knob	Material: ABS, black, white; shares the same front mould with PT7200; Pb-free	1
7MHP-7208-03A-W0	top cover	Material: ABS, black,texturing;Kexin; Pb-free	1
7MHR-7208-01A-W0	major waterproof ring	Material: silica gel; black; polished; Mingkun; Pb-free	1
7MHP-4083-02A-W0	waterproof plug of earphone jack	Material: TPU; black;Fengyu; Pb-free	1
7MHR-7208-02A-W0	top code waterproof ring	Material: silica gel; black;Mingkun; Pb-free	1
7MHR-7042-06B-W0	thermally conductive silica gel spacer	Silica gel, black, 3*6*9mm, Shenzhen Kuayue Electronic, softer than A version. Pb-free	1
7MHL-4083-01A-W	aluminum alloy shell	Material:ADC12aluminum alloy, blasting surface, magnetic abrasive finishing, Fuda, Pb-free	1
3CR7-SMA-50JFB-4	RF coaxial connector analog machine	SMA-J, Flange plate assembly(558,hole distance 14mm,core length 10.5mm)	1
7NRC-090136039-B1A	Antenna nut	Material: brass, inner diameter M9mm,outer diameterφ13.6mm,thickness 3.9mm,black passivation, Junyu	1
7SMF-020040M-SZYB-N	M2*4 cross round flat machine screw	Material: hardened iron,Φ2mm*4mm cross round flat head nickel-plated machine teeth, metric coarse thread	11
7SMF-020037M-SZCT-N	M2.0*3.7 cross countersunk head machine screw	Material:1018ardened iron,Φ2.0*3.7mm cross countersunk head nickel-plated machine teeth	2
7SMF-020080M-MHHT-N1	M2*8 plum-blossom thick-headed machine screw	Material: hardened iron,Φ2mm*8mm plum-blossom thick-headed nickel-plated machine teeth, metric coarse thread	2
7NRC-060100035-B1A	Switch nut	Material: brass, inner diameter M6mm, outer diameterφ10mm,thickness 3.5mm,black passivation, Junyu	2
7MHS-1140-01A-W	knob circlip	Material: spring steel	2
7MHR-4083-01A-W0	pedestal waterproof pad	Silica gel, black, hardness 60 degrees, Mingkun, Pb-free	1
4SS7-4050-016-100	speaker	MM4050-1638,16Ω,1W, Pb-free	1
7GCB-360001-W0	φ36 speaker waterproof net	Material: black waterproof cloth, diameter φ36mm*thickness 0.1mm(558)	1
7MHP-4083-01A-W0	front cover	Material: PC/ABS ;black; screen printing/texturing; Kexin; Pb-free	1
7MHR-7208-04A-W9	light pipe	Material: silica gel; transparent milk white; Mingkun; Pb-free	1
7MHR-7208-05A-W3	emergency button	Material: silica gel; black; Mingkun; Pb-free	1
7MHR-7208-06A-W0	side silica gel button	Material: silica gel; black; Mingkun; Pb-free	1
7MHR-1727-09A-W3	microphone cover	Material: silica gel, hardness 40,orange,no surface treatment	1
7MHP-7042-14B-W0	battery latch	POM, black, 1208 mold change, Pb-free	1
7MHS-7042-01A-W	latch plate 1	Material: stainless steel(SUS301),0.25THK, Pb-free	1
7MHS-7042-01B-W	latch plate 2	Material: stainless steel (SUS301),0.25THK, Pb-free	1
7MHX-7042-02A-Z	battery clamping hook 1	Material: zinc alloy (Zn3#),black zinc plated, Pb-free	1
7MHX-7042-02B-Z	battery clamping hook 2	Material: zinc alloy (Zn3#), black zinc plated, Pb-free	1
7MHP-7208-05A-W0	PTT cover	Material: ABS, black; texturing; Kexin; Pb-free	1
4SM7-6027-A40C	MIC	Φ6.0,height 2.7,-40±2dB all around,2.2KΩ,2V,with 80mm red black wire(Skinning dipping 2mm)	1
7GCB-070001	φ7 Mic waterproof cloth	Material: waterproof cloth,diameterφ7mm,thickness0.1mm	1
7MHP-7208-06A-W0	earphone cover plate plug	Material: ABS; black; texturing; Kexin; Pb-free	1
7MHP-7208-07A-W0	earphone cover plate	Material:TPU; black; Kexin; Pb-free	1
6SS3-BJ4026-A	KBJ-15 belt clip	DP770 belt clip, PC+ABS, black, Mingli, Pb-free	1
7MJP-4026-01A-W0	KBJ-15 belt clip	DP770 belt clip, PC+ABS, black, Mingli, Pb-free	1
7MJS-7013-01B-N	KBJ-09 belt clip bracket	stainless steel (SUS304),1.00THK,bright nickel plated, Quanzhou Pingan hardware, Pb-free	1
7MJS-7013-02A-W	KBJ-09 belt clip torsional clip general material	φ1.00 stainless steel wire , Pb-free	1
7MJS-7013-03A-N	KBJ-09 belt clip rotation shaft	1018,φ2x24.4,nickel-plated, Pb-free	1
7SMF-026060M-SZHT-B1	M2.6*6 cross machine screw	Material: hardened iron, M2.5*6.0 flat round cross black zinc machine teeth	2

7MHZ-1731-01A-J5	speaker insulation paper	Material: dark green highland barley paper, length 18mm*width 8mmthickness 0.2mm,rubber on single side	1
7MHS-4083-01A-W	PTT button metal dome	Material:φ6mm,SUS301 square metal dome; Lixinghui; Pb-free	1

### Appendix 5 Accessory List

Accessory	Quantity
Antenna	1
Battery	1
Belt Clip	1
Intelligent Charger	1
Power Adaptor	1
Strap	1
Service Manual	1
Warranty	1

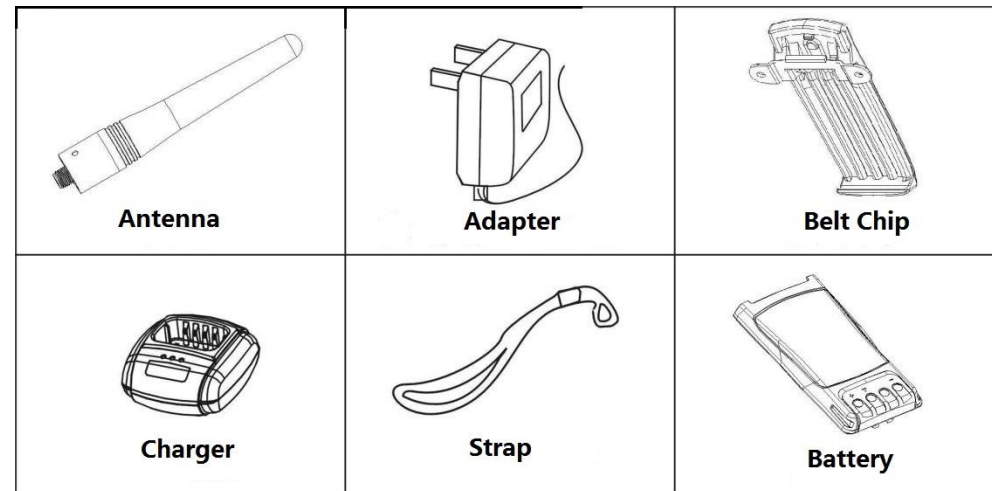
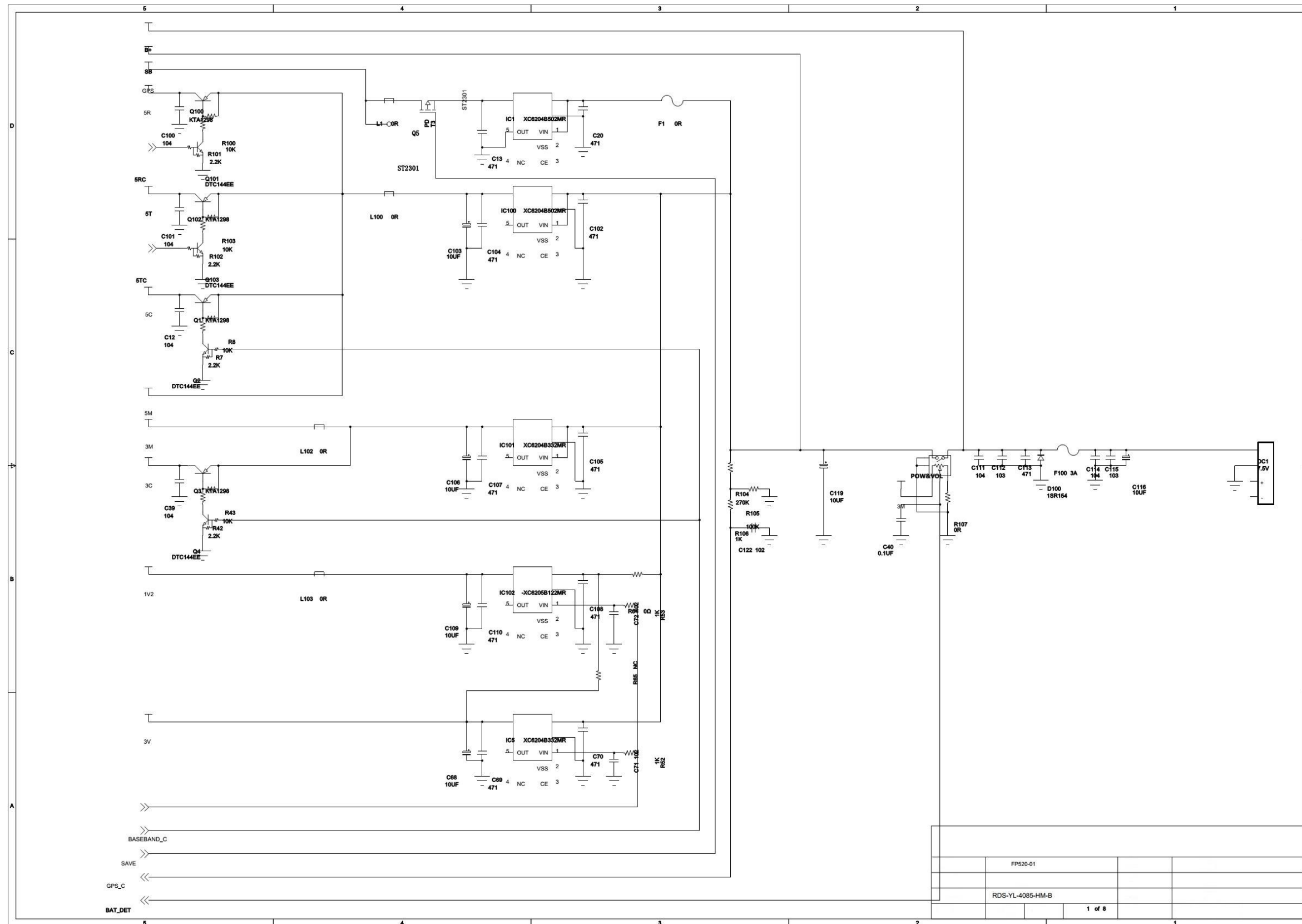
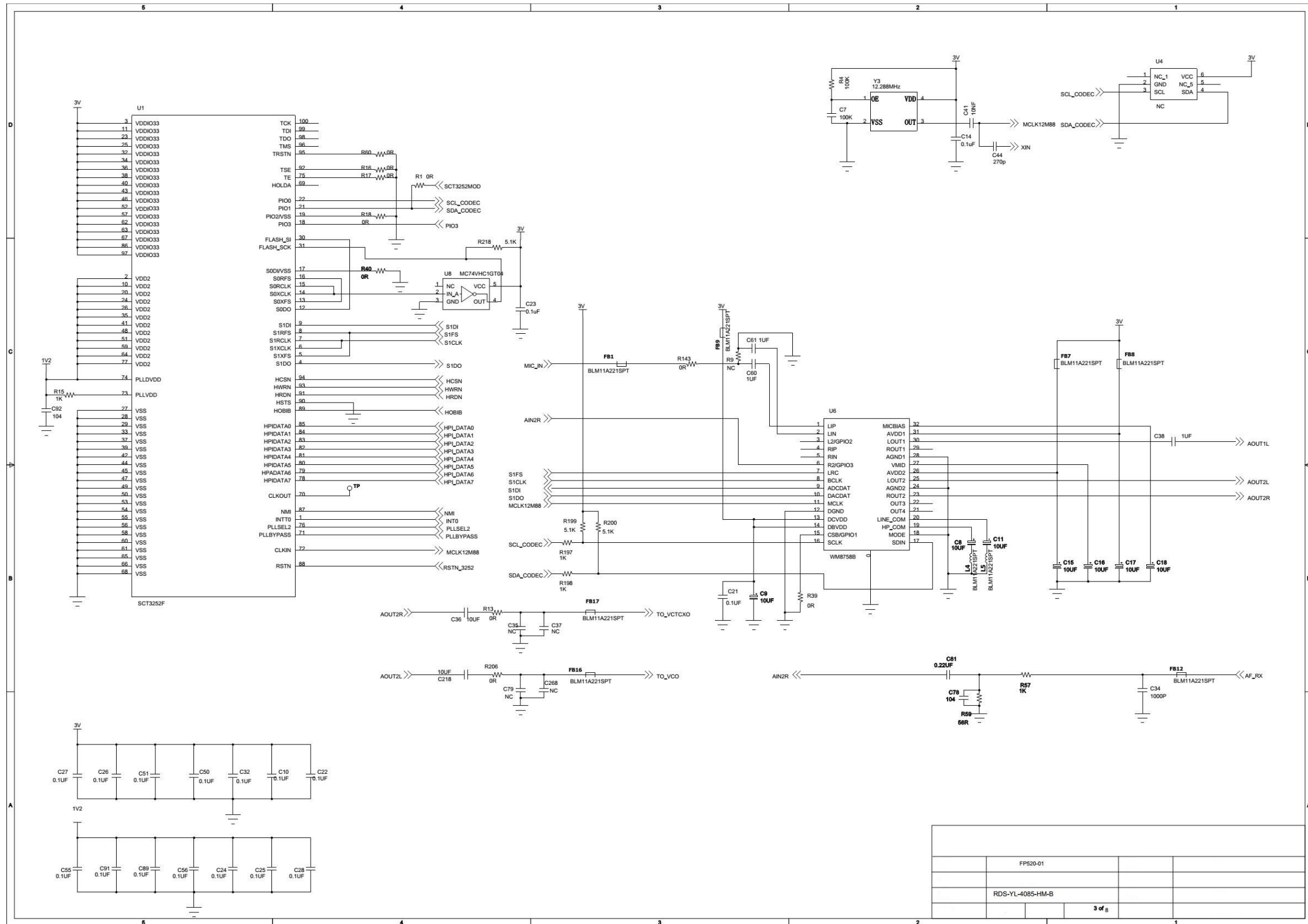


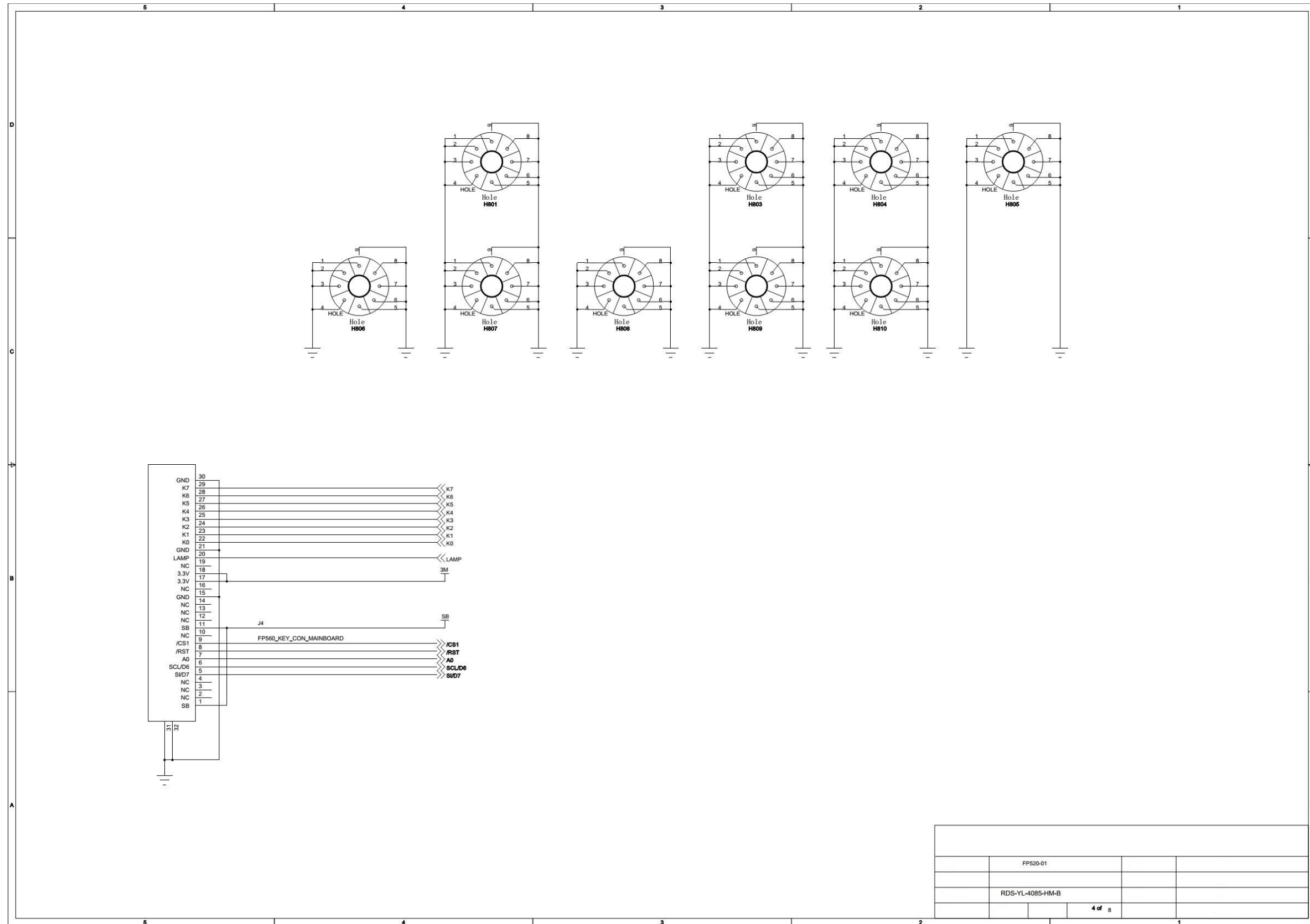
Figure 1 FP520-01 Mainboard Schematic Diagram (136-174MHz)





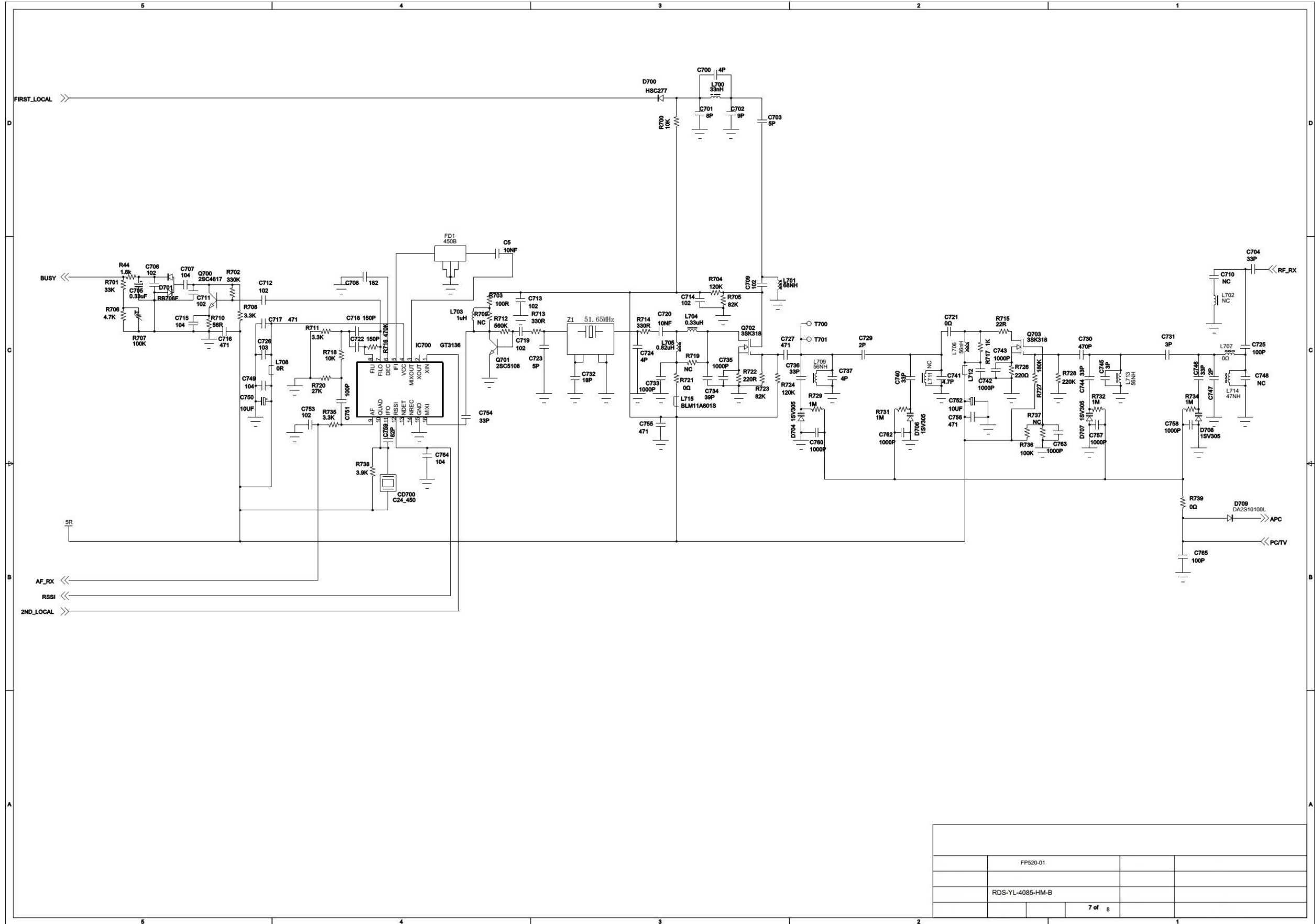




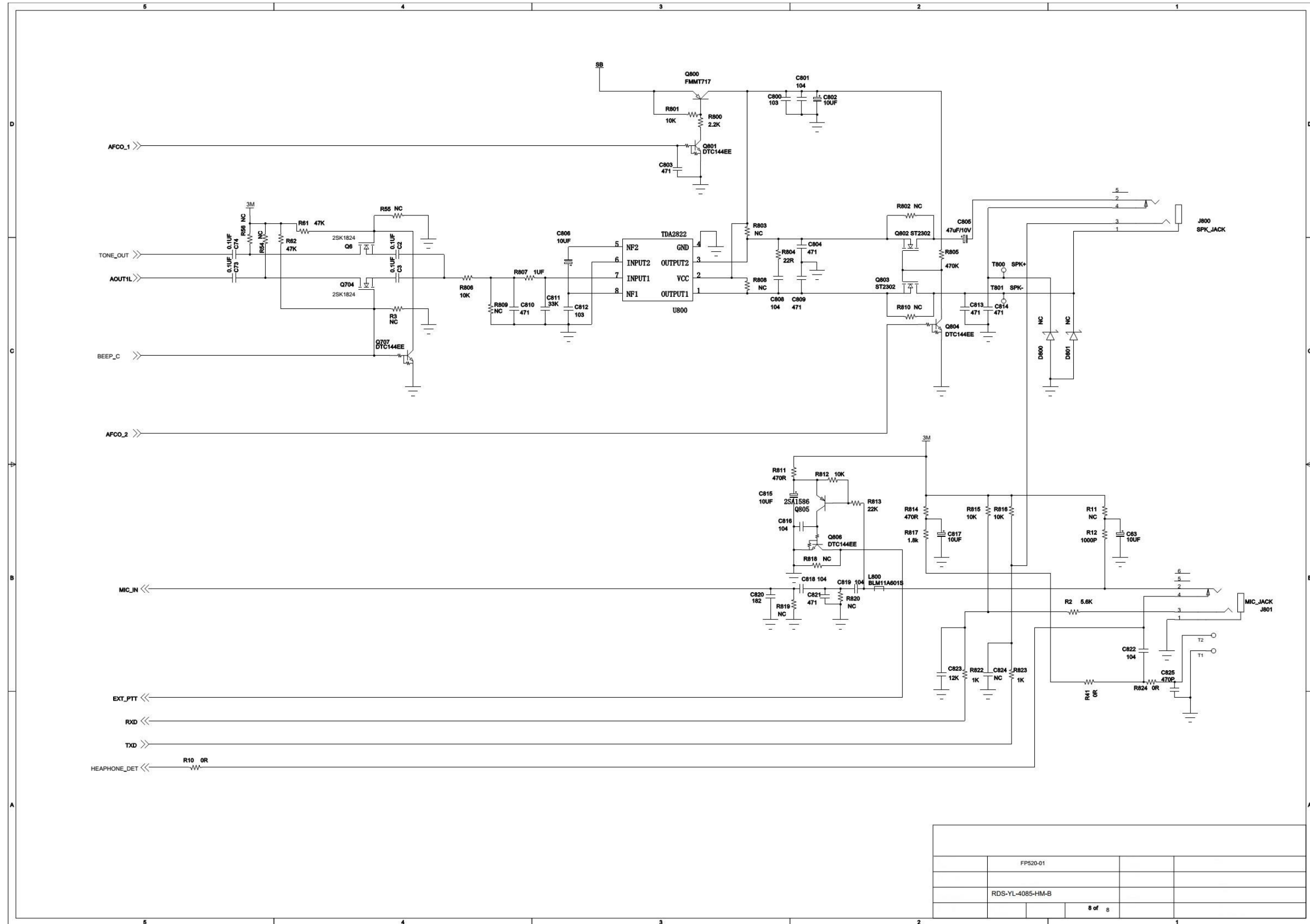












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Figure 2 FP520-01 Top Board Position Mark Diagram (136-174MHz)

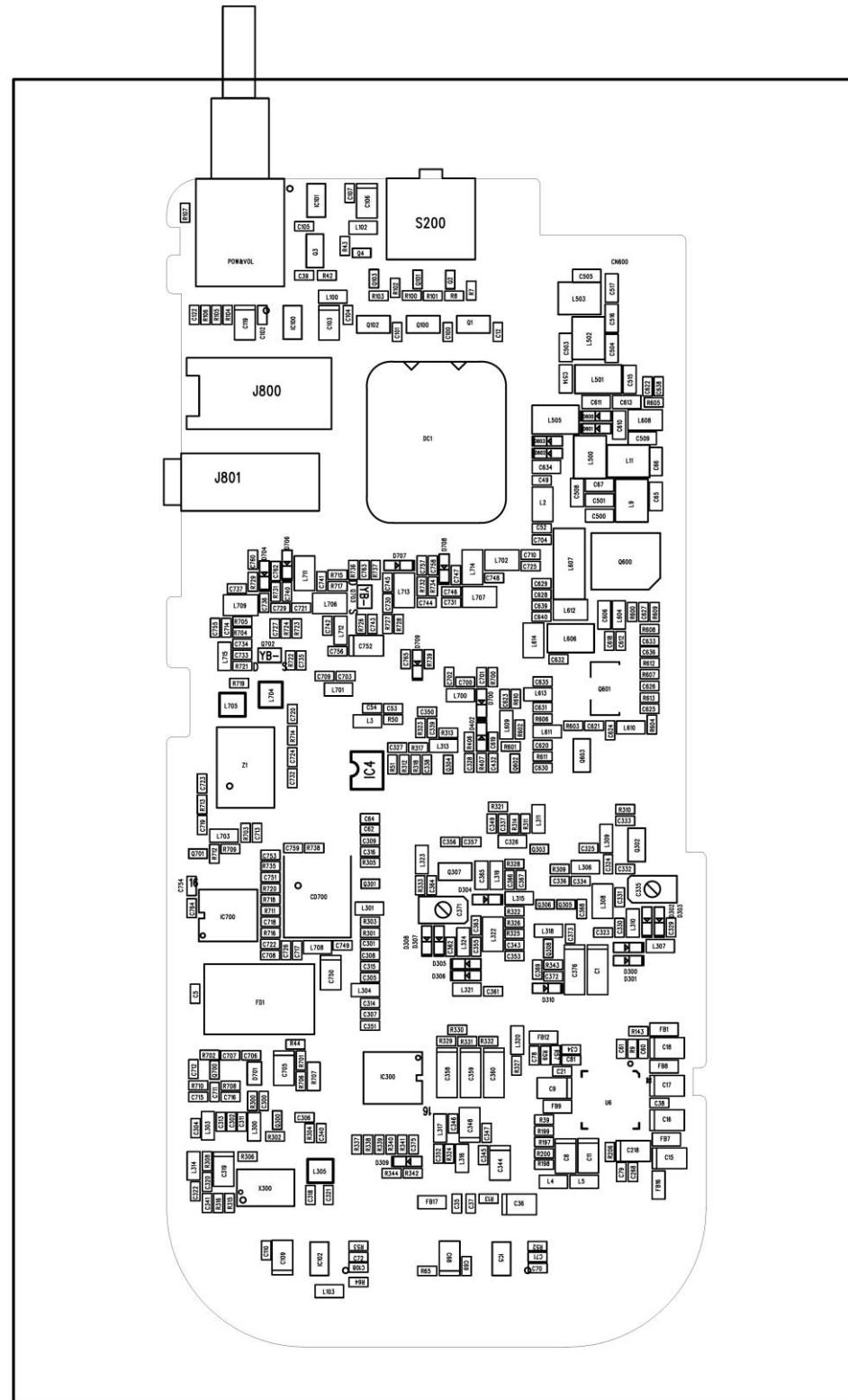




Figure 3 FP520-01Bottom Board Position Mark Diagram (136-174MHz)

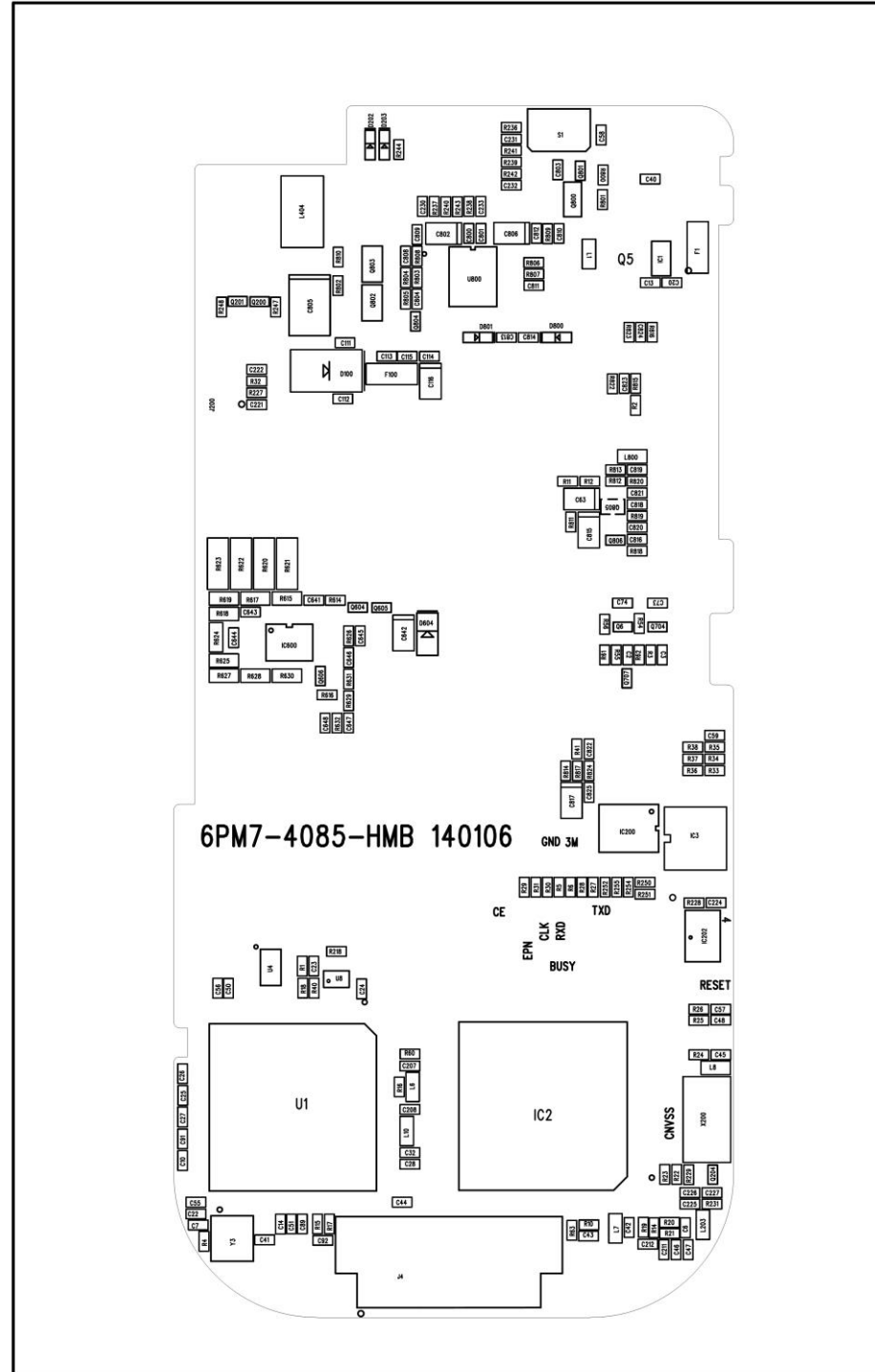
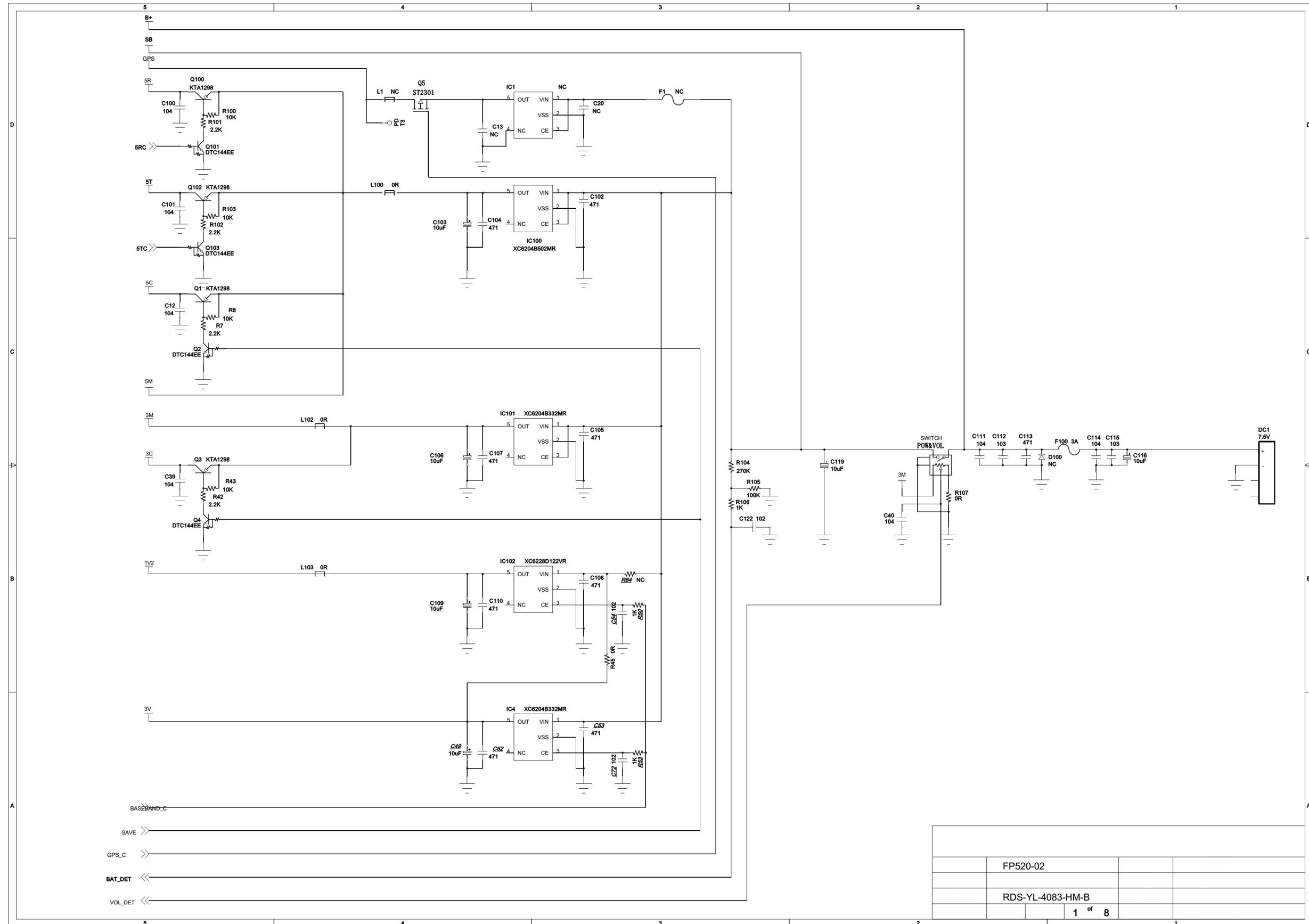
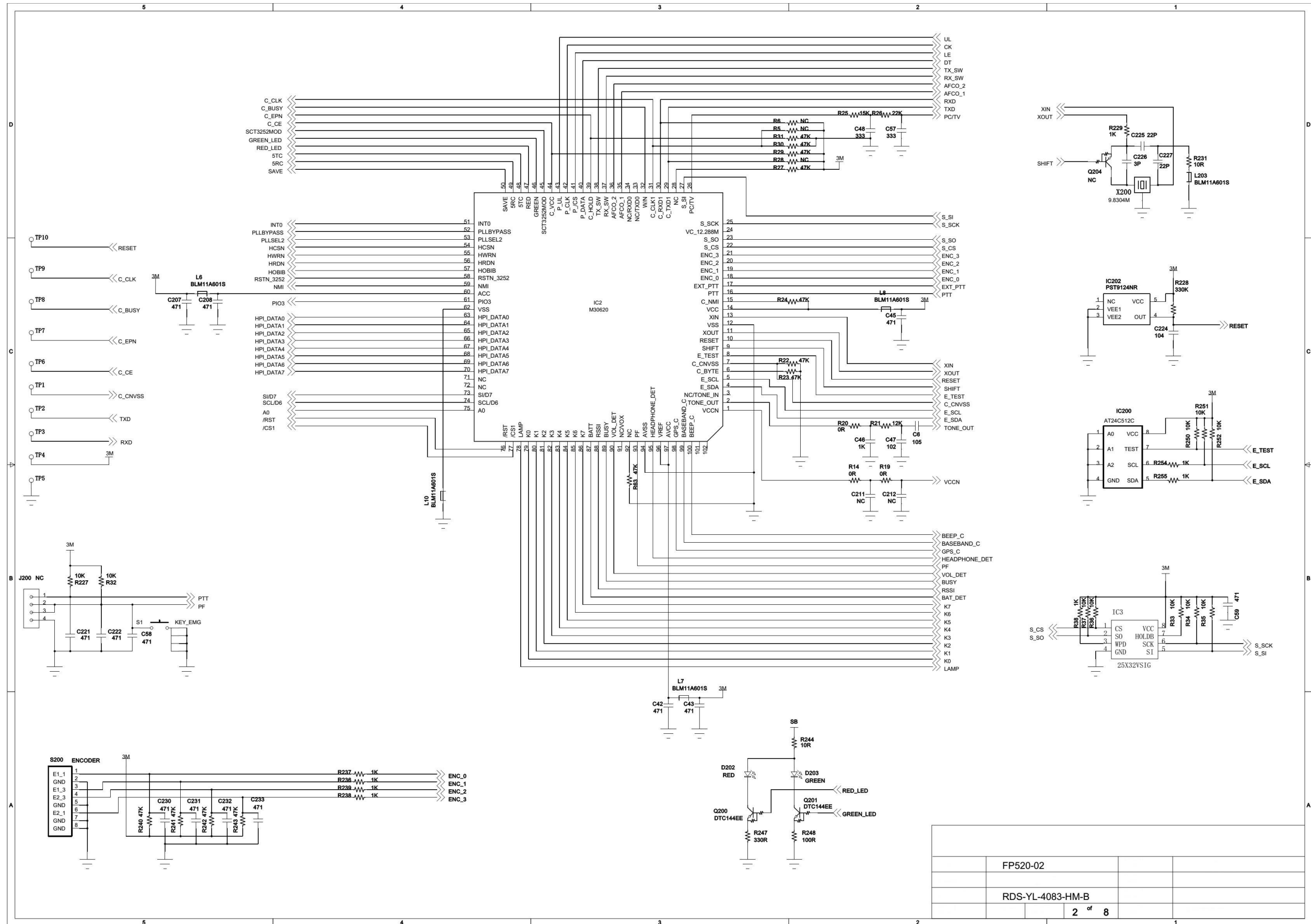
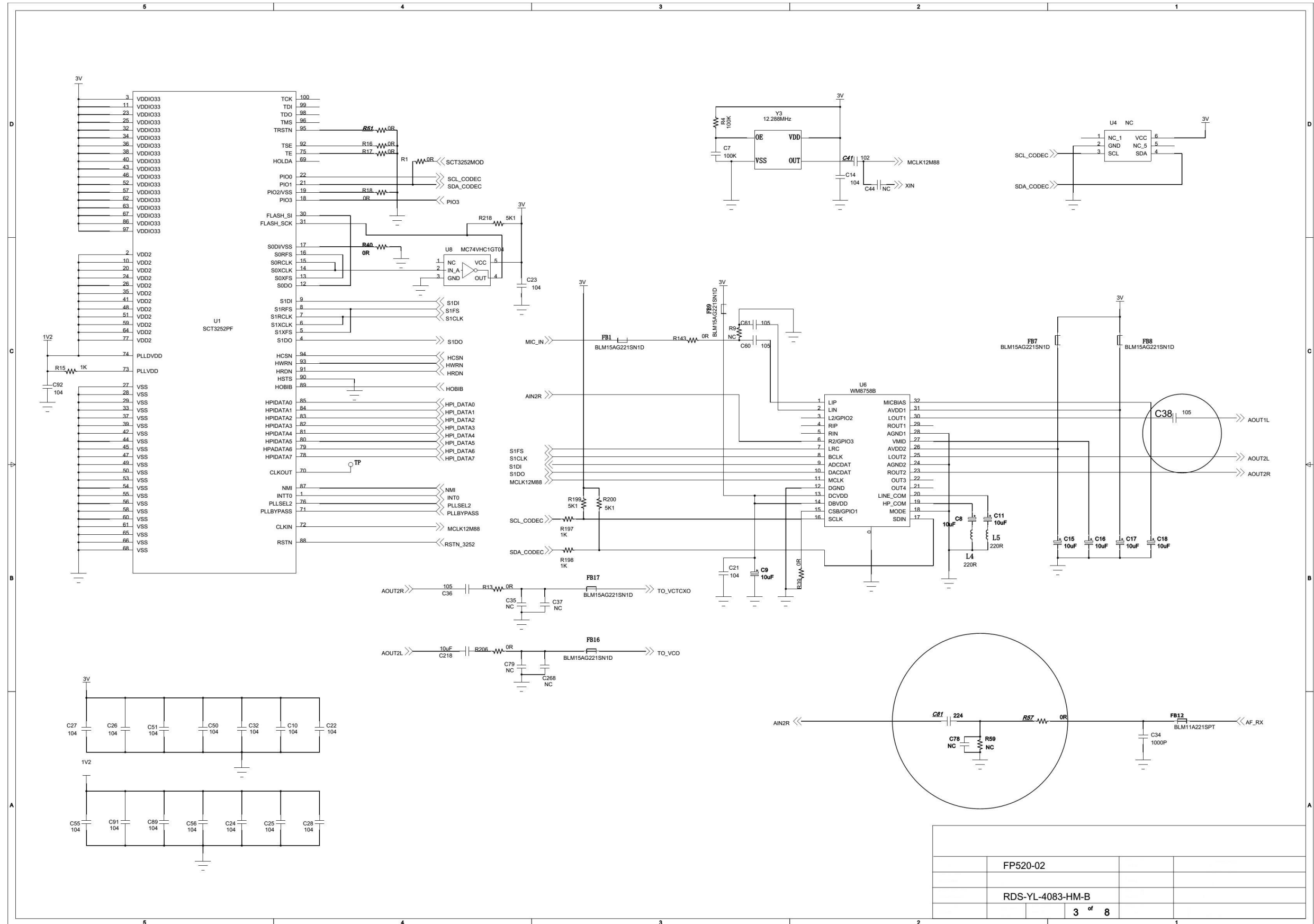


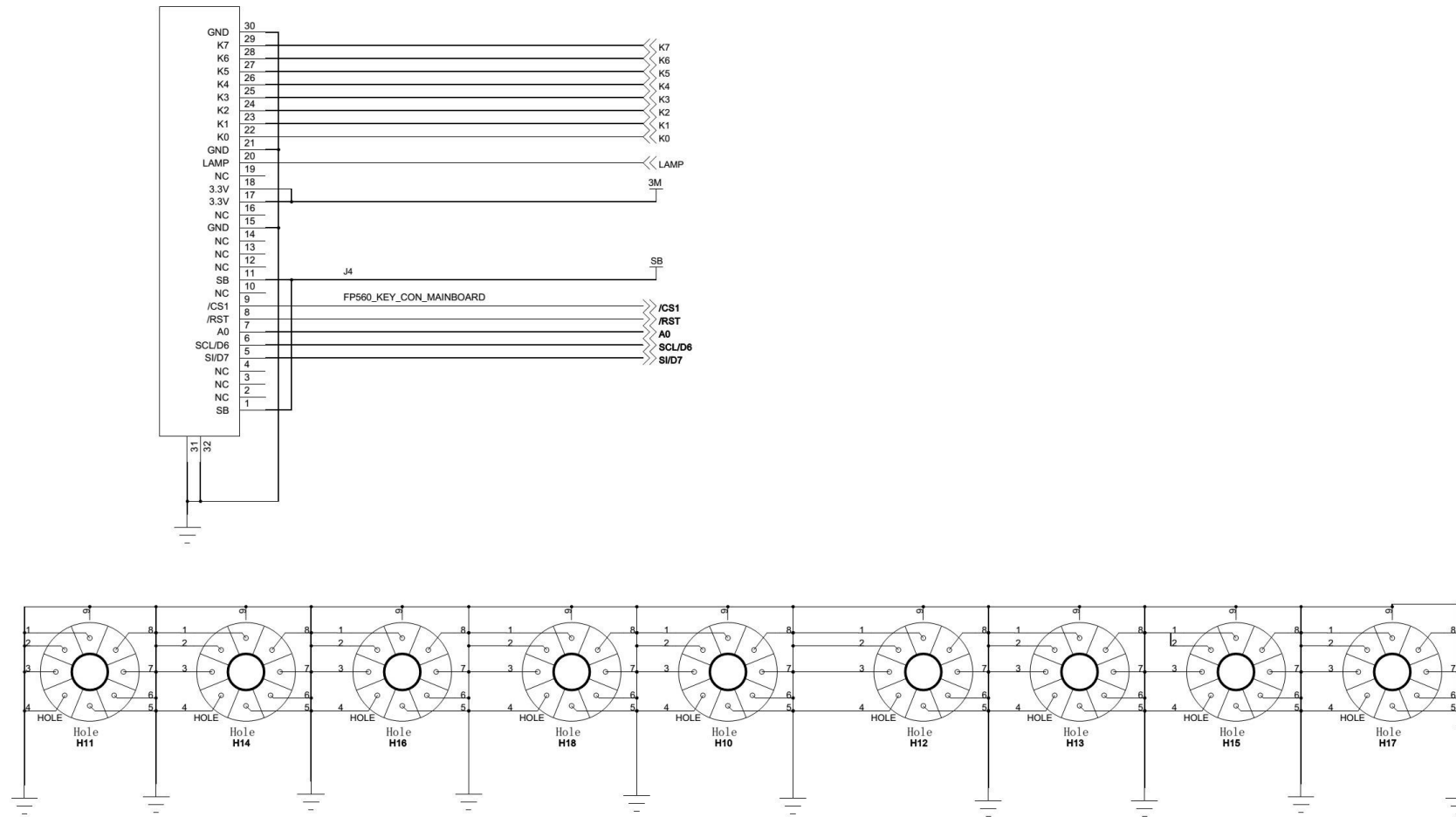
Figure 4 FP520-02 Mainboard Schematic Diagram (400-470MHz)



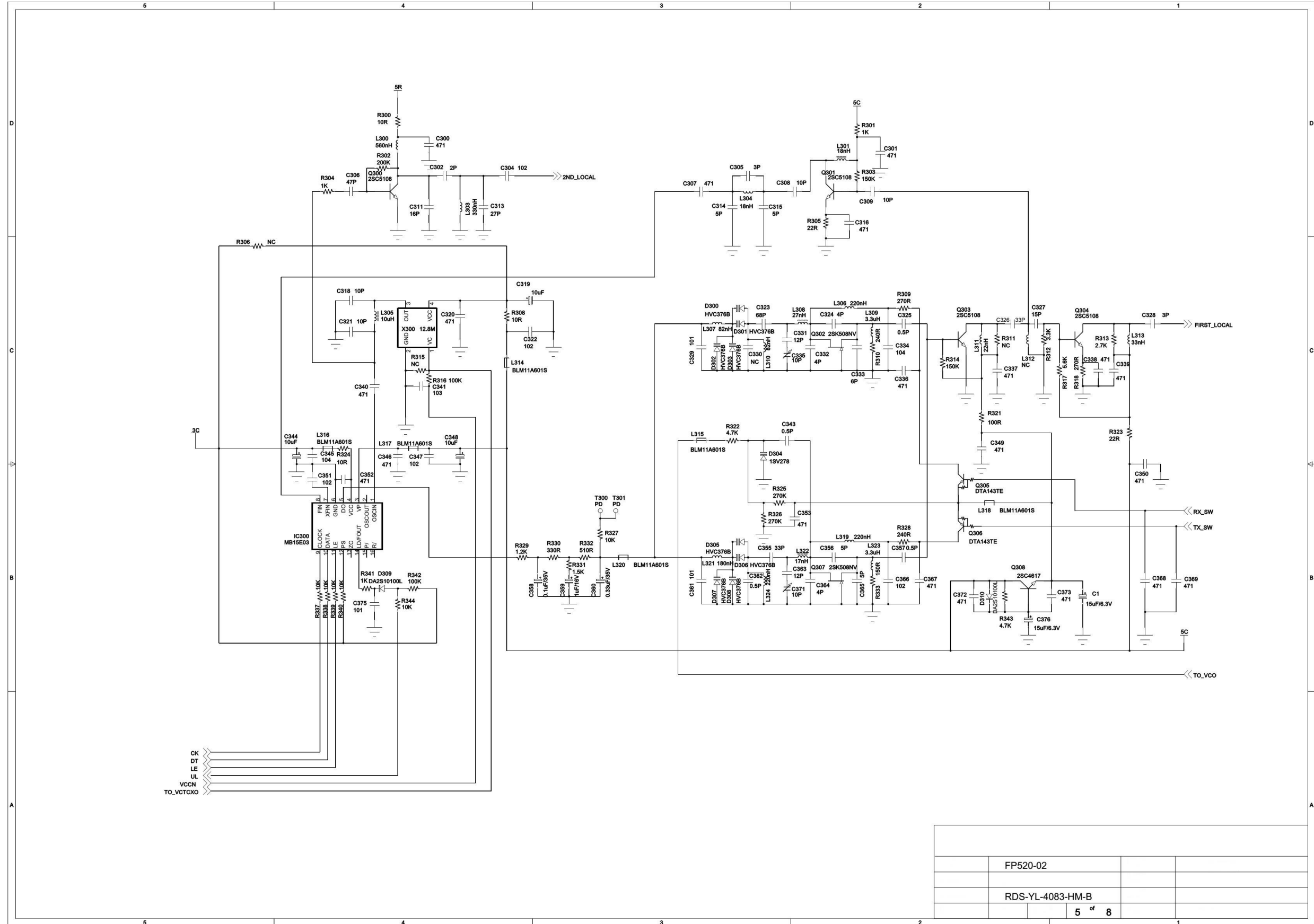


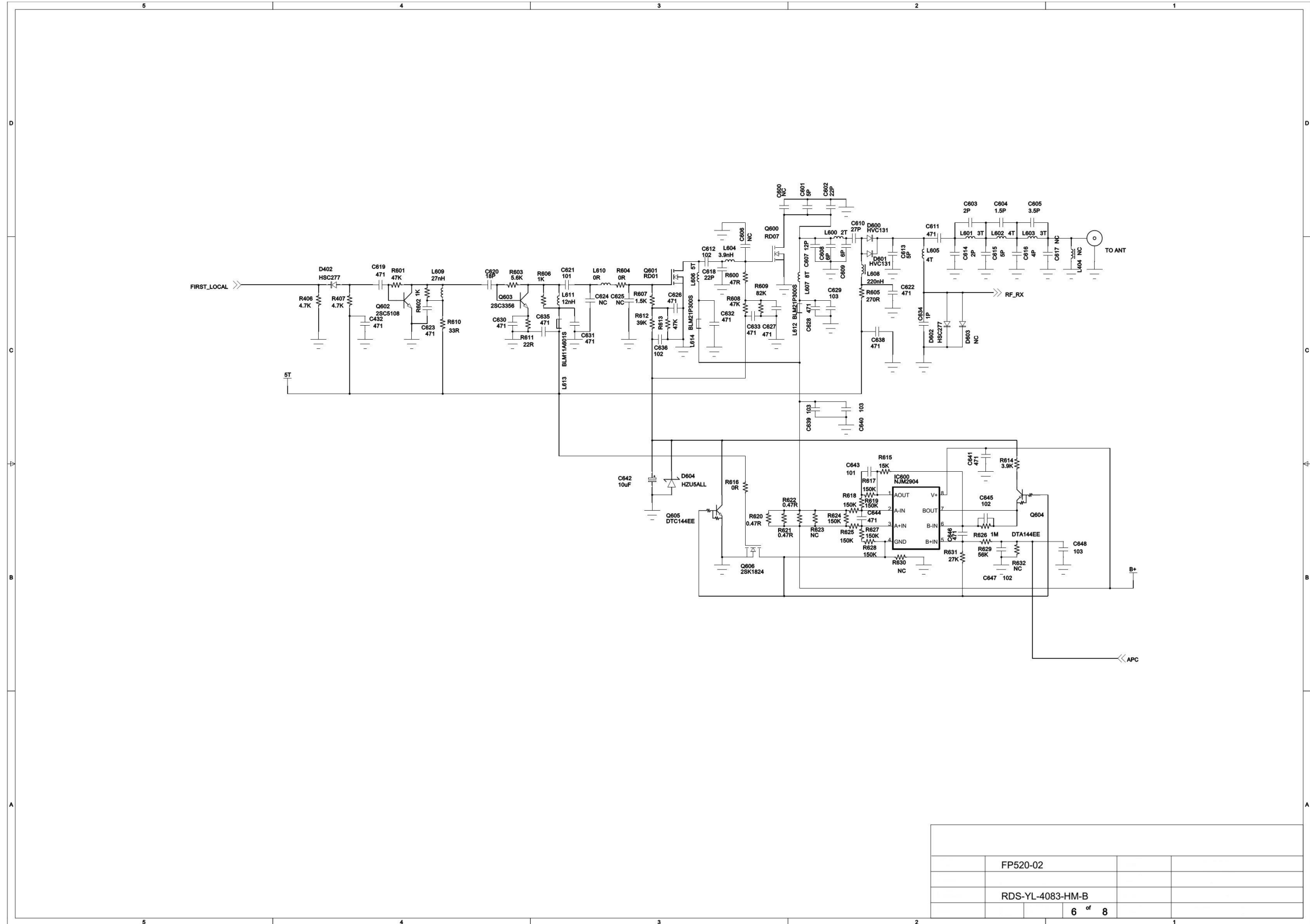


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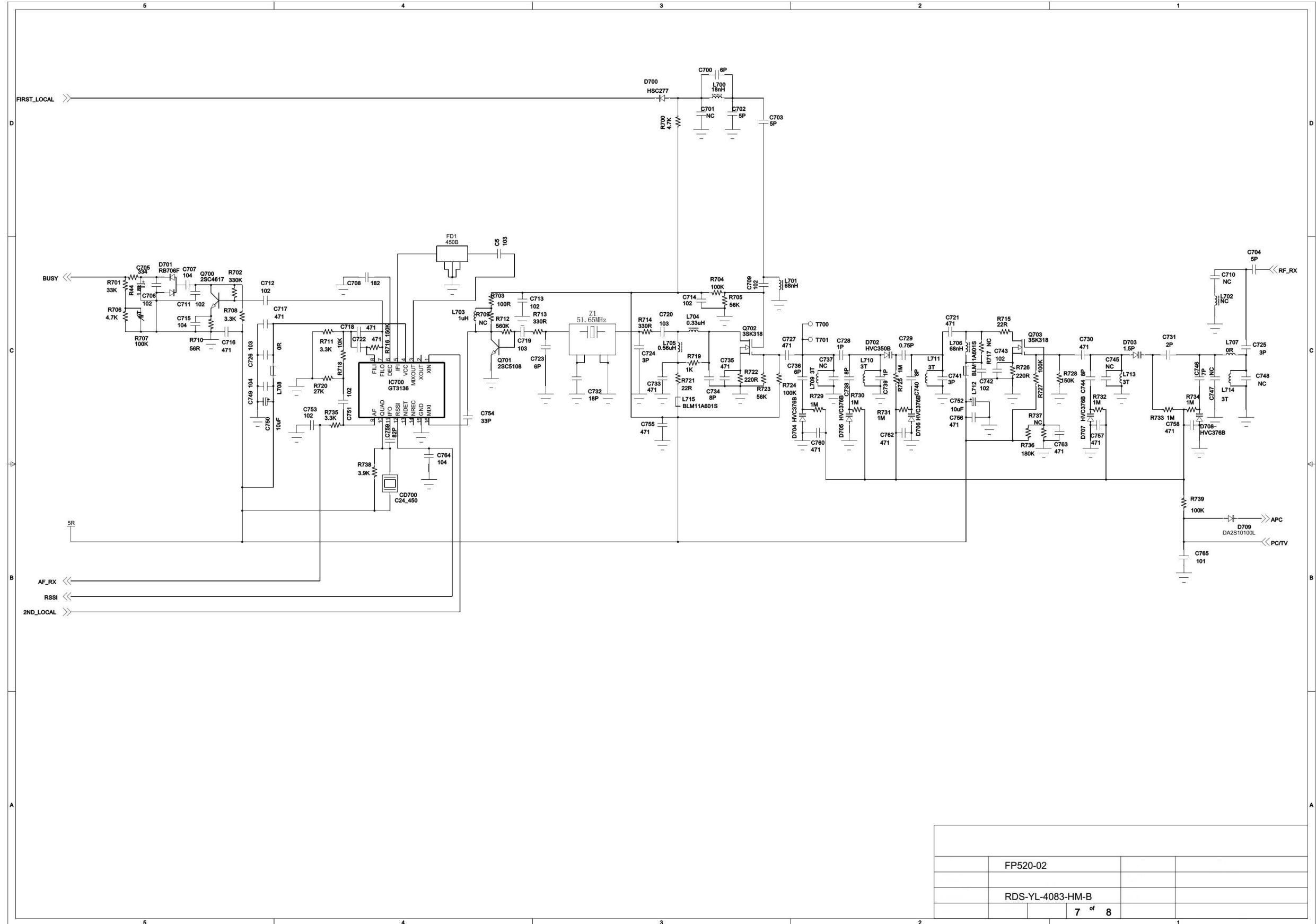


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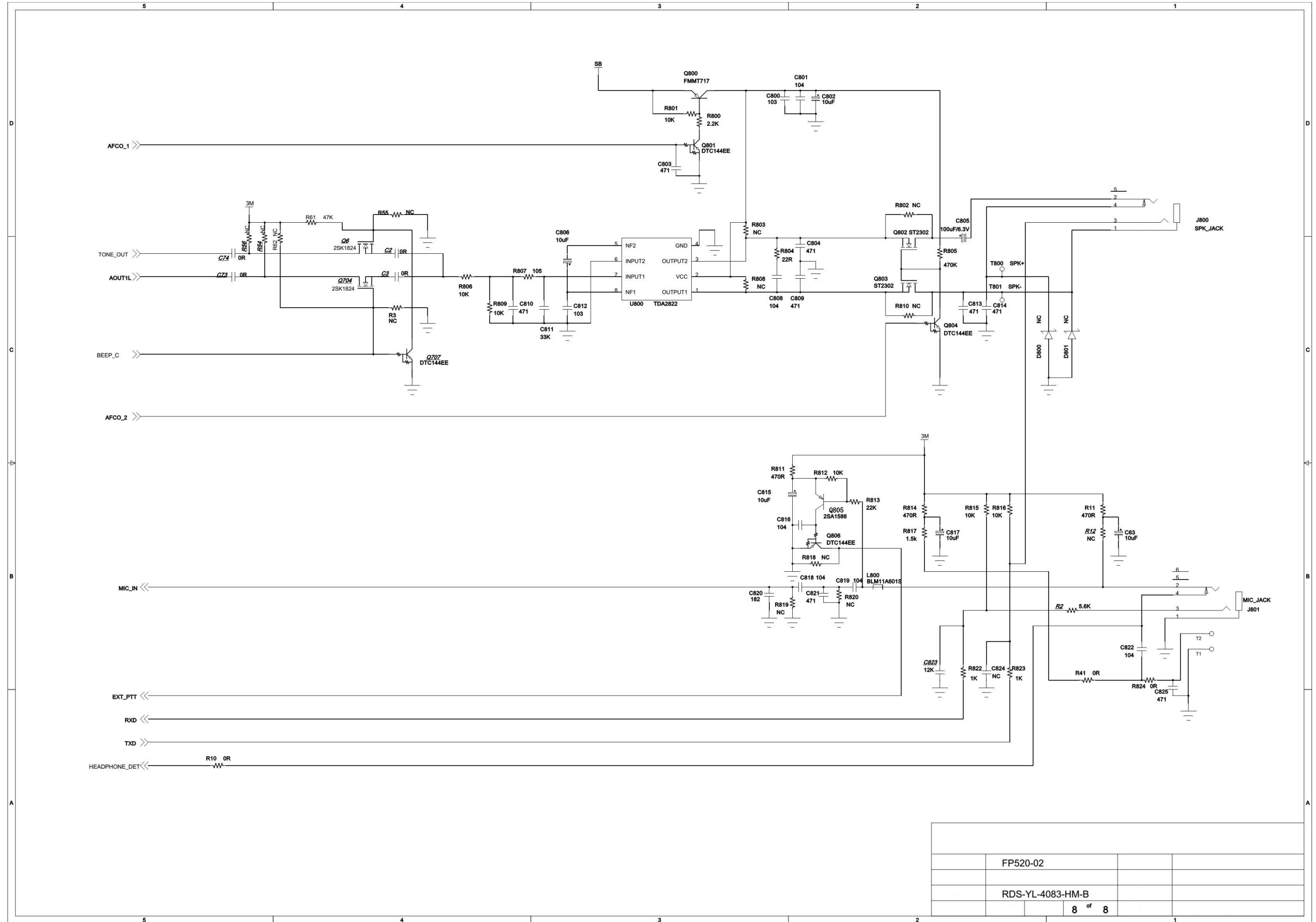


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Figure 7 KBC-51 7.4V Electrical Schematic Diagram

