HYT

SERVICE MANUAL

TWO-WAY RADIO

POWER446

Contents

Revision History

Version	Date of Issue	Description
V00	05-2011	Initial Release

Copyright Information

Disclaimer

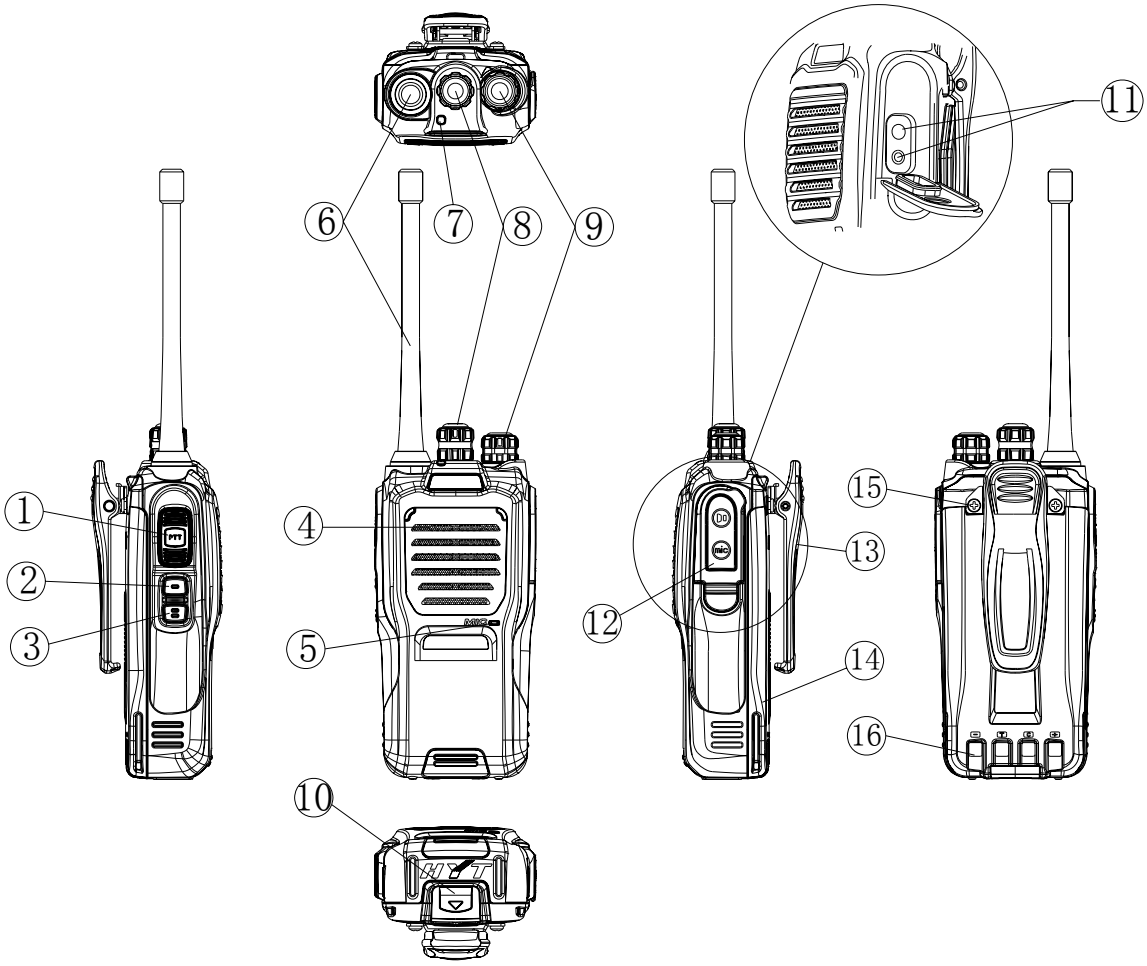
If you have any suggestions or would like to learn more details, please visit our website at: http://www.hytera.com.

Product Overview

Intended User

This manual is intended for use by qualified technicians only.

Product Controls



No.	Part Name	No.	Part Name	No.	Part Name
①	PTT Key	②	SK1 (programmable)	③	SK2 (programmable)
④	Speaker	⑤	Microphone	⑥	Antenna
⑦	LED Indicator	⑧	Channel Selector Knob	⑨	Radio On-Off/Volume Control Knob
⑩	Battery Latch	⑪	Accessory Jack	⑫	Accessory Jack Cover
⑬	Belt Clip	⑭	Battery	⑮	Screw (Belt Clip)
⑯	Charging Piece				

Software Specifications

Description of Modes

User Mode

It is a conventional communication mode. The radio will enter this mode by default after power-on.

PC Programming Mode

You can use the programming software to access this mode and to set appropriate radio functions and tuning parameters.

Wired Clone Mode

1. Description

Wired Clone mode is an independent mode, including User Clone Mode and Factory Clone Mode.

To access other modes, you must restart the radio.

1) User Clone Mode:

Connect two radios using a clone cable. Power on the source radio while holding down **SK2**, and it will enter User Clone Mode after 2 seconds. The target radio can be directly turned on to enter the User Mode. In this mode, data stored in EEPROM of the source radio will be cloned to EEPROM of the target radio. The data transferred only involves channel data and general parameters, excluding tuning data, version and serial No. and etc.

2) Factory Clone Mode:

Firstly, make sure that the SELF pin of MCU on the source radio is grounded correctly, and then connect two radios using a clone cable. Power on the source radio while holding down **SK2**, and it will enter Factory Clone Mode after 2 seconds. The target radio can be directly turned on to enter the User Mode. The data transferred involves all data in EEPROM (including settings for the Manual Tune Switch), other than the serial No.

2. Process

1) The LED flashes orange once after the source radio enters the Wired Clone Mode. Press **SK2** again to clone data to the target radio.

2) During cloning, the LED of the source radio flashes red, and the LED of the target radio flashes green. When cloning is completed, both LEDs go out, indicating that both radios are ready for another cloning.

3) If any abnormal situation occurs during cloning, the source radio will stop cloning and its red LED will go out, indicating that it is ready for another cloning.

4) When cloning is completed, the source radio goes back to the standby status. Press **SK2** again to begin another cloning.

Manual Tune Mode

Hold down **PTT** and **SK2** on the radio while powering it on, and the radio enters Manual Tune Mode (Note: To enter the Manual Tune Mode, make sure its switch is set to Open via the programming software.)

Do keep this option unchecked after setting in the factory, to avoid any unexpected modification. Such values can only be reset and changed in Manual Tune Mode only.

Description of Tuning:

1. **To enter Manual Tune Mode**

   Hold down **PTT** and **SK2** for 2 seconds while powering on the radio. The LED glows orange to indicate that the radio has entered the Manual Tune Mode. After the keys are released, the radio directly enters the TX group by default (the tuning item depends on the position where the **Channel Selector** knob locates). At this time, its LED glows red.

2. **To switch between TX tuning items and RX tuning items**

   Rotate the **Channel Selector** knob to CH16 and long press **PTT** key to switch between TX group and RX group.

   The LED glows red in TX group.

   The LED glows green in RX group.

3. **To switch between tuning items within TX group/RX group**

   This operation is done through the **Channel Selector** knob.

   TX group: CH1 to CH14 respectively represent TX Preset Power, TX Low Power, TX Medium Power, TX High Power, CDCSS Deviation, CTCSS Deviation (low), CTCSS Deviation (medium), CTCSS Deviation (high), MSK Deviation (reserved), VOX Level 1, VOX Level 2, VOX Level 3, VOX Level 4, VOX Level 5 and TX Low Voltage Threshold.

   The LED solidly glows red during TX group tuning (CH1 to CH14).

   The red LED goes out during TX group tuning (CH15).

   RX group: CH1 to CH8 respectively represent SQL On 1, SQL On 5, SQL On 9, SQL Off 1, SQL Off 5, SQL Off 9, RX Low Voltage Threshold and RX Bandpass Filter.

   The LED solidly glows green during RX group tuning (CH1 to CH8).

   The green LED goes out during RX group tuning (CH9 to CH15).

4. To switch within narrow bands

Under a certain tuning item, long press **PTT** (the LED flashes orange to indicate valid press) to enter narrow bands; short press **PTT** to switch the frequency orderly.

5. To tune the value

Short press **SK1** to increase the value in step of 1, or hold down this key to successively increase the value in steps of 1. The value will remain unchanged once it reaches the allowed maximum value.

Short press **SK2** to decrease the value in step of 1, or hold down this key to successively decrease the value in steps of 1. The value will remain unchanged once it reaches the allowed minimum value.

6. About several special items

TX group: CH9 to CH14 stand for VOX Level 1, VOX Level 2, VOX Level 3, VOX Level 4, VOX Level 5 and TX Low Voltage Threshold respectively. These tuning items are related to AD sampling. Press **SK1** or **SK2** after entering the above items, to activate AD sampling (including calculation) once. Rotate the **Channel Selector** knob to save the current AD sampling value.

RX group: CH1 to CH7 stand for SQL On 1, SQL On 5, SQL On 9, SQL Off 1, SQL Off 5, SQL Off 9, RX Low Voltage Threshold respectively. . These tuning items are related to AD sampling. Press **SK1** or **SK2** after entering the above items, to activate AD sampling (including calculation) once. Rotate the **Channel Selector** knob to save the current AD sampling value.

7. About the key-press

Short press: key-press time shorter than 1.5 seconds;

Long press: key-press time not shorter than 1.5 seconds.

Circuit Description

1 PLL Frequency Synthesizer

The PLL circuit mainly provides the local oscillator signal for RX and RF carrier signal for TX. It is composed of VCO and the baseband processor IC, allowing frequency tracking and channel switching under the control of MCU signals.

1) PLL

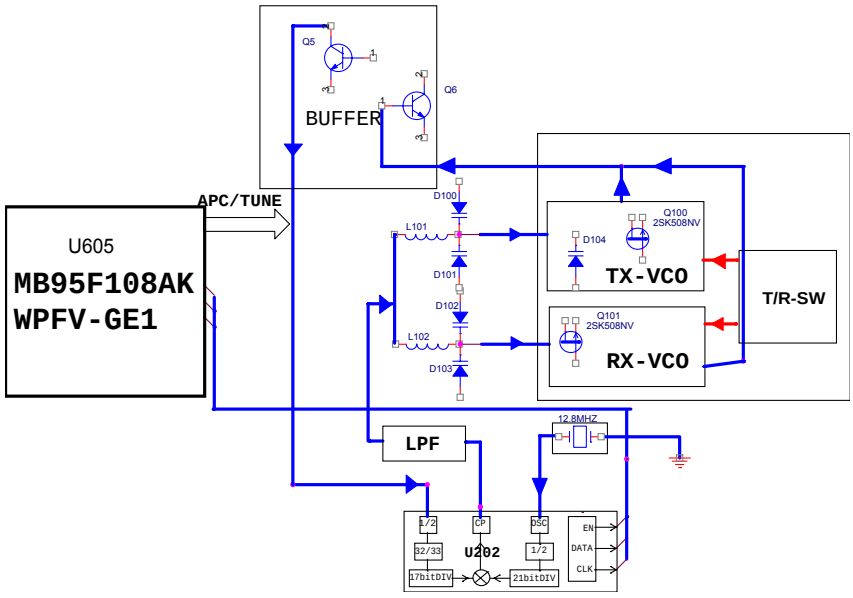


Figure 1

The step frequency of the PLL circuit is 5.0 KHz, 6.25 KHz, 10.0 KHz or 12.5 KHz. In U202, the 38.4MHz reference oscillator signal is divided into 5.0 KHz, 6.25 KHz, 10.0 KHz or 12.5 KHz reference frequencies via a fixed counter. The signal from the VCO enters U202 after processed by the buffer Q102 and amplifier Q103, and then it is applied to the variable frequency-divider in PLL for division. After division, the signal is compared with the reference frequency at a phase detector (PD) in PLL. The signal from the PD passes through a low-pass filter and then is applied to the varactors (D100、D101、D102 and D103) of VCO so as to control the output frequency.

2) VCO

The VCO section is realized by the three-point capacitor oscillator circuit.

The oscillation frequency of VCO is generated by Q100 in TX mode and by Q101 in RX mode respectively.

U202 generates a control voltage via PD to control the varactors (D100 and D101 in TX mode; D102 and D103 in RX mode), making the oscillation frequency of VCO consistent with the preset frequency of MCU in a wide frequency range.

Q652 performs switching between transmission and reception under the control of T/R: in TX mode, T/R is set to low level and Q653 is turned on, making Q100 operate; in RX mode, T/R is set to high level and Q653 is cut off, making Q101 operate. The output from Q100 and Q101 is amplified by Q102 and then feeds to the buffer amplifier for further processing.

When the PLL is unlocked, the LD pin of U202 outputs low level. If the microprocessor detects such situation, TX/RX operation is prohibited, and an alarm sounds.

2. RF Power Amplifier Circuit (TX Section)

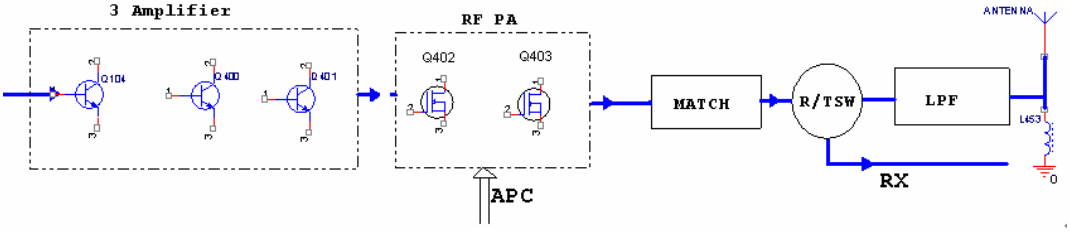


Figure 2

To obtain the desired RF power, the RF signal from VCO goes to the buffer Q104 and to the driver amplifiers Q400 and Q401 in sequence. Then the amplified RF signal goes to Q402, which pre-amplifies power of the input signal to drive the final-stage power amplifier Q403. The input RF signal is then further amplified by Q403, and goes to the LC low-pass filter (LPF) through the TX/RX switching diode D401. Finally, it is transmitted from the antenna after high-order harmonics are removed by LPF

3. RX Amplifier and Mixer Circuit (RX Section)

1) Low-noise Amplifier and Bandpass Filter Circuit

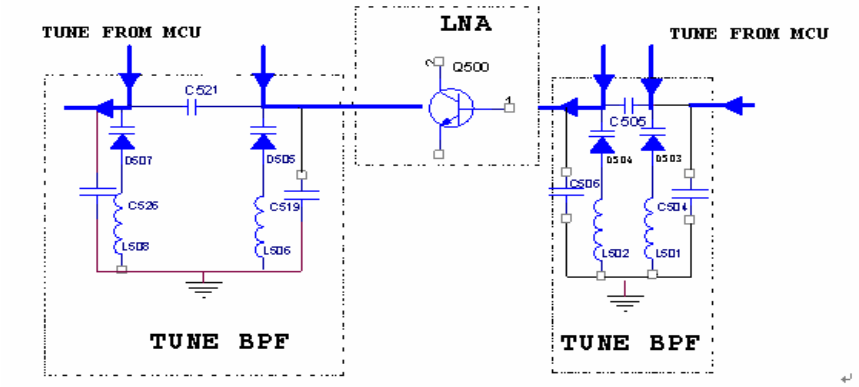


Figure 3

After the RX signals are received by the antenna, the undesired out-of-band signals are filtered out at the electrically tunable bandpass circuit (D503, D504, L501, L502, C503, C505 and 507). Then the signals are amplified by the low-noise amplifier (LNA) Q500 to reach a certain level for receiving. Afterwards, the amplified signals pass through a two-stage bandpass circuit (mainly composed of D505, D507 and

peripheral components) to effectively eliminate out-of-band interference and to obtain pure RX RF signals. Finally, the signals feed to the mixer circuit.

The electrically tunable control signal (its level can be obtained by searching the corresponding table, or calculated by the formula) is provided by MCU, so that the varactor can operate within an appropriate voltage range. It forms a bandpass filter with the peripheral inductors/capacitors, and changes with the MCU control voltage so as to satisfy the requirements for preset RX sensitivity and out-of-band rejection.

2) Mixer and IF Bandpass Filter Circuit

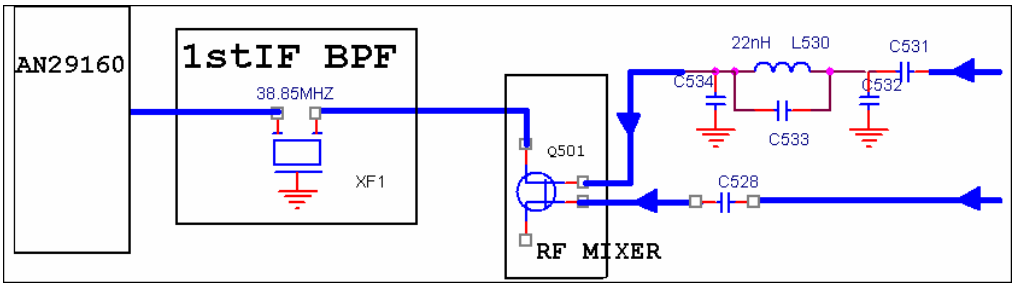


Figure 4

This circuit applies active mixer to mix the local oscillator signal from VCO with the RX RF signal, to provide the first IF signal for frequency discrimination by the demodulator chip.

The mixer Q501 employs a dual-gate MOSFET (3SK318) for better noise-control and square-law performance, as well as high isolation degree between the local oscillator signal and the RX signal. In addition, the mixer has a certain gain (adjustable via offset), so as to assure sufficient sensitivity.

After residual spurious signals are removed by the inductor L509, the signals from the mixer go to the first IF filter, which employs a first-class crystal filter to assure sufficient bandwidth and good selectivity. Then the signals go to the baseband processor (AN29160) for demodulation.

4. Automatic Power Control Circuit

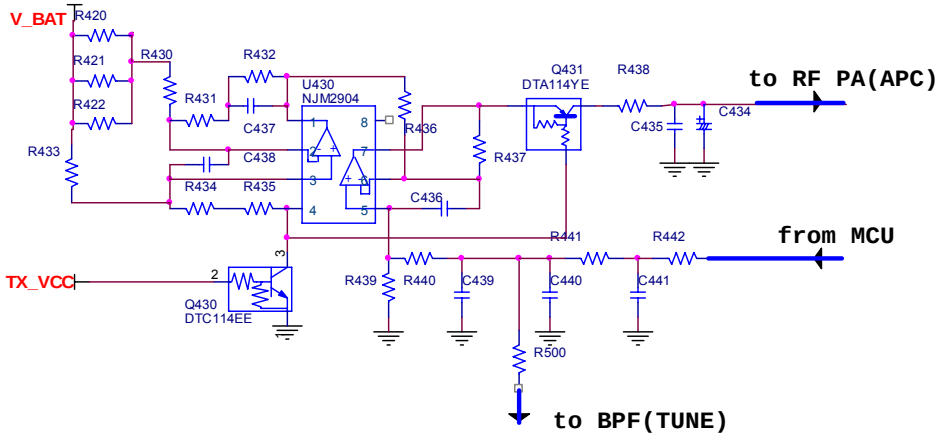


Figure 5

MCU outputs appropriate PWM waveform according to the selected channel. This waveform is then rectified by the RC filter circuit (R441, R442, C440 and C441) to generate level of APC/TUNE control signal. One flow of the signal goes to R500 to serve as control voltage of the RX electrically tunable circuit. In TX mode, the signal goes to R439 and R440 for voltage division, so as to get APC reference voltage.

The error detect voltage is derived after the TX current goes through R420, R421 and R422. Then the voltage is compared and amplified by the operational amplifier U430, and further compared with the APC reference voltage. After these operations, the APC control voltage is output, and the close-loop negative feedback control power is generated when the TX current changes.

5. Audio and Signaling Processing Circuit

The baseband processor (AN29160) is highly integrated and has multiple functions such as VOX Level Detect & Output, SQ Level Detect & Output, RX/TX Audio Process & Convert, Audio Amplify, etc. In addition, it can be used for both transmission and reception.

1) TX Audio & Signaling Process

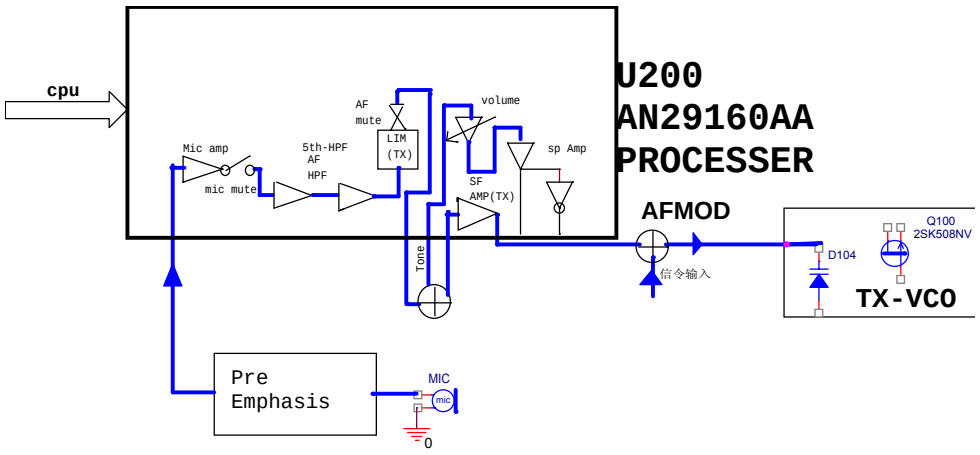


Figure 6

a. TX audio processing: The audio signal from MIC is converted to electrical signal via acoustoelectric conversion of MIC. After pre-emphasized, the audio signal is processed by a limiting amplifier (at U200). Then the processed signal goes to the low-pass filter circuit to remove frequencies over 3KHz. Finally, the signal goes to the potentiometer (VR200) and then to VCO for direct frequency modulation.

b. TX signaling processing: MCU outputs, via the QTO port, signaling code waveform, which is divided via RC circuit into two flows. One flow modulates the reference frequency oscillator of PLL directly, while the other flow modulates VCO. Note: VR260 adjusts the amplitude proportion between the two flows, to optimize the signaling waveform modulated on the carrier.

2) RX Audio & Signaling Process

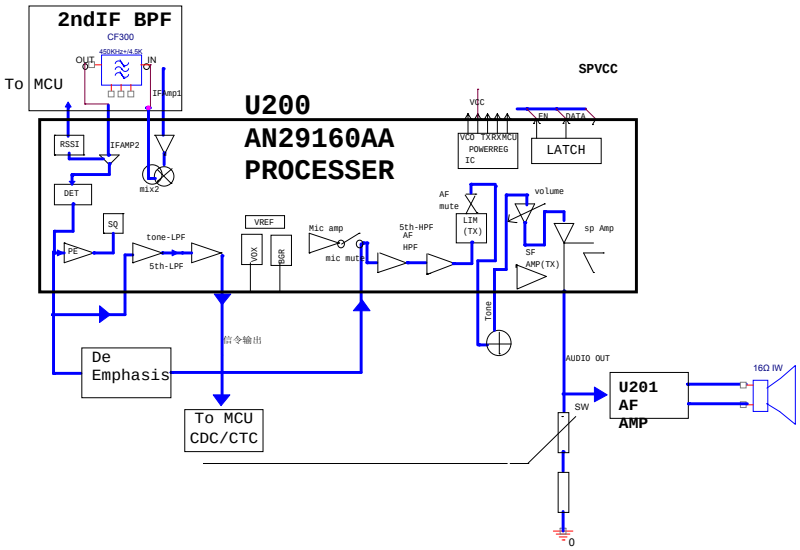


Figure 7

After demodulating the received signal, U200 outputs initial audio signal, which contains noise, signaling and voice components. Therefore, audio is processed as follows:

a. RX audio processing: One flow of audio signal from U200 goes back to U200 after passing through the RC low-pass filter and de-emphasis circuit. This flow of audio signal is amplified at U200, and restored after frequencies below 300Hz are removed. The restored audio signal is adjusted by the potentiometer and then applied to the audio power amplifier (U201), which performs power amplification to drive the speaker directly. To obtain higher power, BTL output is adopted.

b. RX signaling processing: One flow of audio signal from U200 goes to the 300Hz low-pass filter circuit (U640). After audio signals above 300Hz are removed, signaling (CTCSS or CDCSS) goes to the QTIN pin of CPU. Then the input signaling is decoded by CPU.

c. Noise Signal Processing: One flow of audio signal from U200 goes back to U200. After they are filtered, amplified and rectified at U200, a DC voltage signal (SQ) is derived and is sent to the BUSY pin of MCU by the ND pin of U200. Then MCU processes the input signal.

6. MCU Control Section

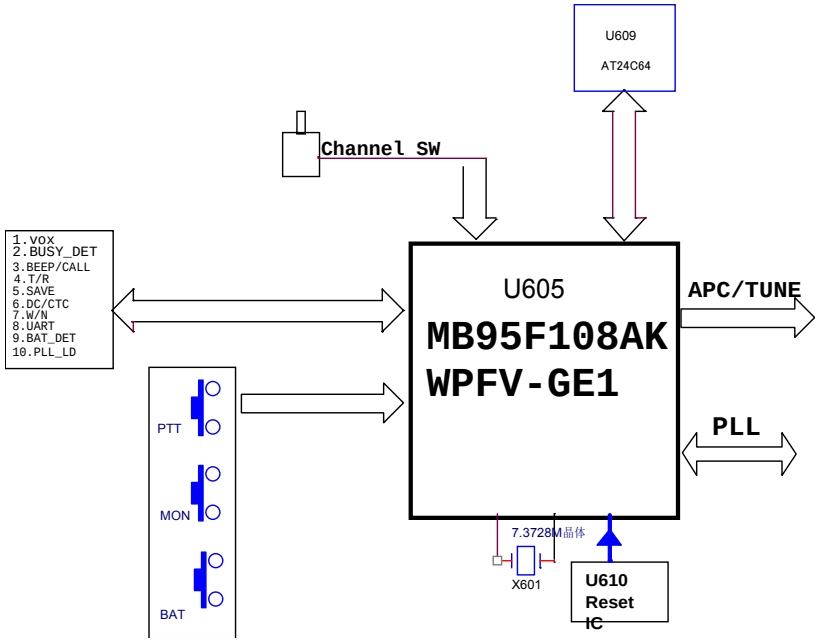


Figure 8

MCU operates at the clock frequency of 7.3728MHz. The MCU control circuit is mainly composed of MCU, EEPROM, reset IC, keys and knobs etc. This section has the following functions:

1. Signal Control:

   To control Battery Save Mode;

   To control narrow band;

   To control TX/RX switch;

   To control APC/TUNE output voltage;

   To control power supply of transmitter and audio amplifier;

   To control SQL Off detection.

2. Signal Detect:

   To detect startup of external PTT, MONI and VOX;

   To detect PLL Unlock;

   To detect VOX ON level;

   To detect low battery alert;

   To detect and determine external earpiece.

3. Data Transfer and Process:

   To initialize EEPROM data;

To transfer programming data;

To process the code of **Channel Selector** knob;

To encode and decode signaling;

To transfer data of baseband processing chip (PLL).

7. Power Supply Processing

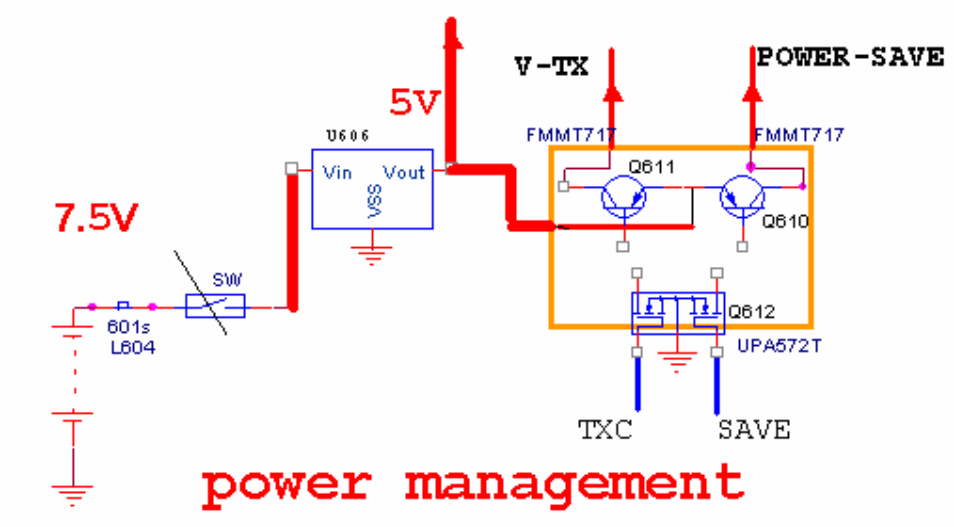


Figure 9

After power-on, one flow of battery voltage is filtered by L604 and C682, and then goes to the RF power amplifier and audio power amplifier for amplification. Another flow goes to the 5V regulator (U606). After regulated, the VCC_5V voltage is output for use by MCU and baseband processing chip. As the radio operates at half-duplex mode, the TX and RX power supplies need to be controlled alternately. In addition, to meet requirements of battery save mode, MCU needs to output a pulse signal (SAVE control signal) with fixed duty ratio. If the SAVE control signal is at high level, Q610 is turned on and provides the 5V voltage (V_SAVE) for the operating circuit (PLL and RX circuit). If the SAVE control signal is a pulse signal, the radio will enter Battery Save Mode. During transmission, CPU control signal (TXC) is at high level. Then Q611 is turned on and provides 5V voltage (TX_VCC) for the operating circuit (TX circuit).

The power supply of the TX and RX circuits are protected by symmetrical voltage regulation measures. When output voltage and current change are subject to the change of load, the close-loop feedback circuit operates, regulating the output voltage to 5V.

8. VOX Realization Circuit

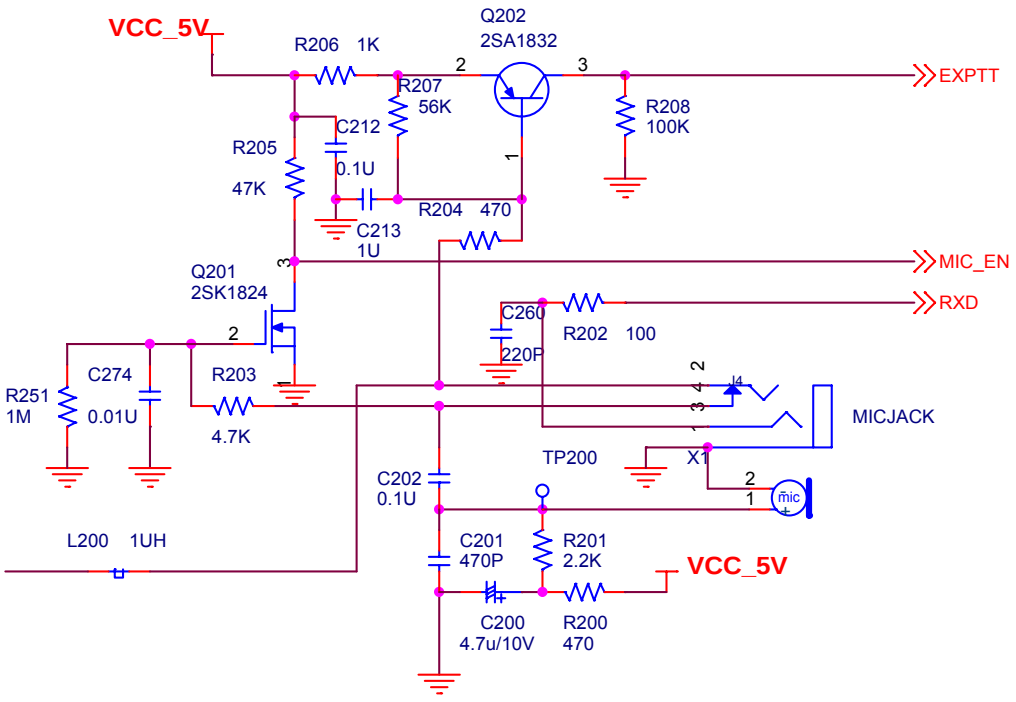


Figure 10

Press the programmed **VOX** key, and the radio enters the VOX status. The VOX can be activated only when MIC_EN and EXT-PTT are detected by MCU to switch from low level to high level within several hundred milliseconds. Otherwise, it is detected as the earpiece without VOX so as to disable the VOX function.

1. When a VOX earpiece is plugged into the accessory jack, Q201 is cut off, and MIC_EN switches from low level to high level. Meantime, Q202 and R204 form a loop circuit with the external earpiece (Q202 is conductive), and EXT-PTT switches from low level to high level. In this case, the VOX earpiece is determined by MCU, and the VOX function is enabled. When the VOX level (5 selectable levels) gets to the preset value, transmission is initiated, and the voice signal enters the baseband processor (AN29160) via the processing path.
2. If it is an earpiece without VOX (namely an earpiece with PTT), Q201 is cut off, and MIC_EN switches from low level to high level. However, Q202 does not form a loop circuit (maintaining the cut-off status) and EXT-PTT is still at low level. In this case, MCU detects it as the earpiece without VOX. The radio will return to normal mode, and will transmit if the PTT key on the earpiece is held down.

CPU Pins

Pin No.	Port Name	Pin Name	I/O	Description
1	AVcc	Vcc	I	A/D power supply pin; to connect with the power supply.
2	AVR	Vcc	I	A/D reference input pin; to connect with the power supply.
3	PE3/INT13	PTT	I	PTT key input pin (connected with external pull-up resistor) (valid at low level).
4	PE2/INT12	A_KEY	I	SK1 input pin (connected with external pull-up resistor) (valid at low level)
5	PE1/INT11	EXT-PTT	I	Earpiece PTT input pin (connected with external pull-down resistor) (valid at high level)
6	PE0/INT10	B_KEY	I	SK2 input pin (connected with external pull-up resistor) (valid at low level)
7	P83	ENC3	I	Channel Selector knob input pin (connected with external pull-up resistor)
8	P82	ENC2	I	
9	P81	ENC1	I	
10	P80	ENC0	I	
11	P71/TI0	T/R	O	For TX/RX switch control: High (RX)/Low(TX)
12	P70/TO0	Reserve	O	Reserved
13	MOD	Programming	I	During programming, this pin is used to connect with VCC and a 47K resistor is connected between the pin and the grounded Vss; otherwise, only a 47K resistor is connected between the pin and the grounded Vss.
14	X0	OSC0	O	For 7.3728MHz main crystal oscillator
15	X1	OSC1	I	
16	Vss	GND	/	For grounding (During programming, this pin is

				connected to GND.)
17	Vcc	VCC	I	5V power supply pin (During programming, this pin is connected with VCC.)
18	PG0	C	/	Not used as I/O; a capacitor is connected between the pin and the grounded Vss.
19	PG2/X1A	OSC32K	O	Subordinate crystal oscillator pin (reserved)
20	PG1/X0A	OSC32K	O	
21	/RST	RESET	I	Reset pin (During programming, this pin is connected to RSTX.)
22	P00/INT00	Reserve	O	Reserved
23	P01/INT01	Reserve	O	
24	P02/INT02	Reserve	O	
25	P03/INT03	Reserve	O	
26	P04/INT04	PLLEN2	O	PLL enable pin
27	P05/INT05	PLLDATA2	O	PLL data pin
28	P06/INT06	PLLCLK2	O	PLL clock pin
29	P07/INT07	UL2	I	For detection of PLL circuit (TB31202) (H: locked; L: unlocked) (connected with external pull-up resistor)
30	P10/UI0	RXD	I	UART RX pin (During programming, this pin is connected to UI.)
31	P11/UO0	TXD	O	UART TX pin (During programming, this pin is connected to UO.)
32	P12/UCK0	Reserve	O	Reserved
33	P13/TRG0/ADTG	Reserve	I	Reserved
34	P14/PPG0	MIC_EN	I	For checking MIC connection (connected with external pull-down resistor) (valid at high level)

35	P20/PPG00	CTC_DCS	PWM	CTCSS/CDCSS output pin
36	P21/PPG01	Reserve	O	Reserved
37	P22/TO00	TONE	O	Beep tone/Call tone output pin
38	P23/TO01	W/N	O	Wide/narrow band control pin (L: wide; H: narrow)
39	P24/EC0	Reserve	O	Reserved
40	P50/SCL0	SCL	SCL	EEPROM clock pin
41	P51/SDA0	SDA	SDA	EEPROM data pin
42	P52/PPG1	AP/TU	PWM	APC/TUNE pin
43	P53/TRG1	TX_CTRL	O	TX power control pin (valid at high level)
44	P60/PPG10	PLLCLK	O	PLL clock pin
45	P61/PPG11	PLLDATA	O	PLL data pin
46	P62/TO10	PLLEN	O	PLL enable pin
47	P63/TO11	Reserve	O	Reserved
48	P64/EC1	Reserve	O	Reserved
49	P65/SCK	Reserve	O	Reserved
50	P66/SOT	Reserve	O	Reserved
51	P67/SIN	Self	I	Test pin (used for Factory Clone Mode, connected with pull-up resistor)
52	P43/AN11	SPCNT	O	Power control pin for main audio (valid at high level)
53	P42/AN10	PCONT	O	Power control pin for AN29160AA
54	P41/AN09	RLED	O	Red LED pin
55	P40/AN08	GLED	O	Green LED pin
56	P37/AN07	Reserve	O	Reserved
57	P36/AN06	Reserve	O	Reserved
58	P35/AN05	TI	I/AD	CTCSS/CDCSS input pin
59	P34/AN04	BUSY	I/AD	Busy channel detection pin
60	P33/AN03	BAT_DET	I/AD	Battery strength detection pin

61	P32/AN02	Reserve	O	Reserved
62	P31/AN01	Reserve	I/AD	VOX detection input pin
63	P30/AN00	Reserve	/	Reserved
64	AVss	GND	/	For grounding

Parts List 1

No.	Part No.	Description	Qty.	Ref No.	Print No.
1	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	C222	T2K
2	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R13	B4K
3	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R248	T4K
4	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R269	B2K
5	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R275	B4H
6	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R308	T4J
7	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R317	T3I
8	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R318	B3J
9	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R321	B1I
10	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R408	T5F
11	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R443	B5D
12	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R704	T3K
13	3001050000000	Chip resistor 0Ω J 1/16W (RoHS)	1	R710	T3K
14	3001051000020	Chip resistor 10Ω F 1/16W (RoHS)	1	R116	T3G
15	3001051000020	Chip resistor 10Ω F 1/16W (RoHS)	1	R241	B3K
16	3001051000020	Chip resistor 10Ω F 1/16W (RoHS)	1	R243	B2A
17	3001051000020	Chip resistor 10Ω F 1/16W (RoHS)	1	R247	B2C
18	3001051000020	Chip resistor 10Ω F 1/16W (RoHS)	1	R406	T5F
19	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R202	B1D
20	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R540	T2G
21	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R653	T4G
22	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R654	T4G
23	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R660	B5J
24	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R697	B4J
25	3001051010040	Chip resistor 100Ω F 1/16W (RoHS)	1	R698	B4J
26	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R102	T4I
27	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R108	T4G
28	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R110	T3G
29	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R206	B1F
30	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R244	B1E
31	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R246	B2D
32	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R250	B1C
33	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R309	T3I
34	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R310	T4J
35	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R631	B3B
36	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R632	B3A
37	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R633	B3B
38	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R634	B3A
39	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R643	T2E
40	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R644	B3I
41	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R649	T2D
42	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R650	T4G

No.	Part No.	Description	Qty.	Ref No.	Print No.
43	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R657	B3I
44	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R658	B3J
45	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R670	B5K
46	3001051020000	Chip resistor 1KΩ F 1/16W (RoHS)	1	R694	B3J
47	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R104	T5I
48	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R112	T3G
49	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R212	T2J
50	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R213	T1K
51	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R256	B1E
52	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R259	B2K
53	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R261	B4I
54	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R268	B2K
55	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R300	T3J
56	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R301	T3J
57	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R302	T3J
58	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R400	T3F
59	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R436	B4C
60	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R530	T3F
61	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R695	B3J
62	3001051030000	Chip resistor 10KΩ J 1/16W (RoHS)	1	R696	B3J
63	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R208	B1F
64	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R260	B4I
65	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R262	B4H
66	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R266	T4H
67	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R311	T2I
68	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R501	T3D
69	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R502	T3D
70	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R507	T2E
71	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R509	T2F
72	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R645	B4I
73	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R646	B4I
74	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R647	B3I
75	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R652	T4G
76	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R655	B3J
77	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R669	B3J
78	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R707	T3K
79	3001051040000	Chip resistor 100KΩ F 1/16W (RoHS)	1	R708	T3K
80	3001051050000	Chip resistor 1MΩ F 1/16W (RoHS)	1	R211	T3J
81	3001051050000	Chip resistor 1MΩ F 1/16W (RoHS)	1	R251	B1F
82	3001051050000	Chip resistor 1MΩ F 1/16W (RoHS)	1	R437	B4D
83	3001051050000	Chip resistor 1MΩ F 1/16W (RoHS)	1	R500	T2E
84	3001051050000	Chip resistor 1MΩ F 1/16W (RoHS)	1	R667	B4I
85	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R222	T2K
86	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R242	B3K

No.	Part No.	Description	Qty.	Ref No.	Print No.
87	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R313	T3I
88	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R314	T3J
89	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R315	T3J
90	3001051230000	Chip resistor 12KΩ J 1/16W (RoHS)	1	R504	T3F
91	3001051240000	Chip resistor 120KΩ J 1/16W (RoHS)	1	R109	T3G
92	3001051240000	Chip resistor 120KΩ J 1/16W (RoHS)	1	R229	T3K
93	3001051520010	Chip resistor 1.5KΩ F 1/16W (RoHS)	1	R404	T5F
94	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R225	T2K
95	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R306	T5J
96	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R430	B4C
97	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R431	B4C
98	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R432	B4C
99	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R433	B4C
100	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R434	B4C
101	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R435	B4C
102	3001051540000	Chip resistor 150KΩ F 1/16W (RoHS)	1	R439	B4D
103	3001051820000	Chip resistor 1.8KΩ J 1/16W (RoHS)	1	R303	T4J
104	3001051820000	Chip resistor 1.8KΩ J 1/16W (RoHS)	1	R506	T3E
105	3001051830000	Chip resistor 18KΩ J 1/16W (RoHS)	1	R216	T2K
106	3001051830000	Chip resistor 18KΩ J 1/16W (RoHS)	1	R224	T2K
107	3001051830000	Chip resistor 18KΩ J 1/16W (RoHS)	1	R233	T4K
108	3001051830000	Chip resistor 18KΩ J 1/16W (RoHS)	1	R239	T4K
109	3001051840000	Chip resistor 180KΩ J 1/16W (RoHS)	1	R107	T4G
110	3001051840000	Chip resistor 180KΩ J 1/16W (RoHS)	1	R238	T4K
111	3001051840000	Chip resistor 180KΩ J 1/16W (RoHS)	1	R316	T3I
112	3001051850000	Chip resistor 1.8MΩ J 1/16W (RoHS)	1	R228	T3K
113	3001052200010	Chip resistor 22Ω F 1/16W (RoHS)	1	R401	T4F
114	3001052220000	Chip resistor 2.2KΩ J 1/16W (RoHS)	1	R103	T4I
115	3001052220000	Chip resistor 2.2KΩ J 1/16W (RoHS)	1	R201	T1F
116	3001052220000	Chip resistor 2.2KΩ J 1/16W (RoHS)	1	R235	T4K
117	3001052230010	Chip resistor 22KΩ J 1/16W (RoHS)	1	R214	T2K
118	3001052230010	Chip resistor 22KΩ J 1/16W (RoHS)	1	R221	T2K
119	3001052720000	Chip resistor 2.7KΩ J 1/16W(RoHS)	1	R520	T2I
120	3001052720000	Chip resistor 2.7KΩ J 1/16W(RoHS)	1	R659	T2E
121	3001052720000	Chip resistor 2.7KΩ J 1/16W(RoHS)	1	R663	T2D
122	3001053030000	Chip resistor 30KΩ F 1/16W (RoHS)	1	R218	T2K
123	3001053310010	Chip resistor 330Ω J 1/16W (RoHS)	1	R114	T3G
124	3001053310010	Chip resistor 330Ω J 1/16W (RoHS)	1	R403	T4F
125	3001053310010	Chip resistor 330Ω J 1/16W (RoHS)	1	R407	T4F
126	3001053310010	Chip resistor 330Ω J 1/16W (RoHS)	1	R656	B4A
127	3001053310010	Chip resistor 330Ω J 1/16W (RoHS)	1	R689	B4A
128	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R101	T4I
129	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R111	T3G
130	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R113	T3G

No.	Part No.	Description	Qty.	Ref No.	Print No.
131	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R115	T3F
132	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R230	T3K
133	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R236	T4K
134	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R263	B4H
135	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R312	B1I
136	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R639	T2D
137	3001053320000	Chip resistor 3.3KΩ J 1/16W(RoHS)	1	R664	T2D
138	3001053330000	Chip resistor 33KΩ F 1/16W (RoHS)	1	R417	T5E
139	3001053330000	Chip resistor 33KΩ F 1/16W (RoHS)	1	R512	T2G
140	3001053330000	Chip resistor 33KΩ F 1/16W (RoHS)	1	R514	T2G
141	3001053340000	Chip resistor 330KΩ J 1/16W (RoHS)	1	R701	B5J
142	3001053630000	Chip resistor 36KΩ J 1/16W (RoHS)	1	R226	T2K
143	3001053940000	Chip resistor 390KΩ J 1/16W (RoHS)	1	R223	T2K
144	3001053940000	Chip resistor 390KΩ J 1/16W (RoHS)	1	R227	T2K
145	3001054700000	Chip resistor 47Ω J 1/16W (RoHS)	1	R410	T5F
146	3001054700000	Chip resistor 47Ω J 1/16W (RoHS)	1	R415	T5E
147	3001054700000	Chip resistor 47Ω J 1/16W (RoHS)	1	R510	T2G
148	3001054710000	Chip resistor 470Ω J 1/16W (RoHS)	1	R200	T1F
149	3001054710000	Chip resistor 470Ω J 1/16W (RoHS)	1	R204	B1F
150	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R203	B1F
151	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R231	T3K
152	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R412	T5F
153	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R441	B4J
154	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R442	B4J
155	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R651	T5G
156	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R699	B4J
157	3001054720000	Chip resistor 4.7KΩ J 1/16W(RoHS)	1	R700	B4K
158	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R205	B1F
159	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R237	T4K
160	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R245	B2D
161	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R267	T4H
162	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R304	T4J
163	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R305	T4J
164	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R402	T4F
165	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R416	T5E
166	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R636	B4I
167	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R637	B4I
168	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R638	B4I
169	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R641	B4I
170	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R668	B4J
171	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R690	B5J
172	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R692	T1E
173	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R693	B5I
174	3001054730000	Chip resistor 47KΩ J 1/16W (RoHS)	1	R702	T1D

No.	Part No.	Description	Qty.	Ref No.	Print No.
175	3001054740000	Chip resistor 470KΩ J 1/16W (RoHS)	1	R642	B2I
176	3001054740000	Chip resistor 470KΩ J 1/16W (RoHS)	1	R648	B3I
177	3001054790000	Chip resistor 4.7Ω J 1/16W (RoHS)	1	R249	B1E
178	3001054790000	Chip resistor 4.7Ω J 1/16W (RoHS)	1	R255	B2E
179	3001055610000	Chip resistor 560Ω J 1/16W (RoHS)	1	R100	T4I
180	3001055630000	Chip resistor 56KΩ J 1/16W (RoHS)	1	R207	B1F
181	3001055630000	Chip resistor 56KΩ J 1/16W (RoHS)	1	R219	T2K
182	3001055630000	Chip resistor 56KΩ J 1/16W (RoHS)	1	R254	B2K
183	3001055630000	Chip resistor 56KΩ J 1/16W (RoHS)	1	R411	T5F
184	3001055640000	Chip resistor 560KΩ J 1/16W (RoHS)	1	R519	T2I
185	3001056810000	Chip resistor 680Ω J 1/16W (RoHS)	1	R405	T5F
186	3001056810000	Chip resistor 680Ω J 1/16W (RoHS)	1	R515	T2G
187	3001058210000	Chip resistor 820Ω J 1/16W (RoHS)	1	R661	T2D
188	3001058220010	Chip resistor 8.2KΩ F 1/16W (RoHS)	1	R234	T4K
189	3001058230000	Chip resistor 82KΩ J 1/16W (RoHS)	1	R253	B3K
190	3001058230000	Chip resistor 82KΩ J 1/16W (RoHS)	1	R264	B4H
191	3001058230000	Chip resistor 82KΩ J 1/16W (RoHS)	1	R307	T5J
192	3001058240000	Chip resistor 820KΩ F 1/16W (RoHS)	1	R232	T3K
193	3001058240000	Chip resistor 820KΩ F 1/16W (RoHS)	1	R240	T4K
194	3001058240000	Chip resistor 820KΩ F 1/16W (RoHS)	1	R440	B4D
195	3001058240000	Chip resistor 820KΩ F 1/16W (RoHS)	1	R705	T3K
196	3001058240000	Chip resistor 820KΩ F 1/16W (RoHS)	1	R706	T3K
197	3001061510000	Chip resistor 150Ω J 1/10W (RoHS)	1	R419	B5C
198	3001070000000	Chip resistor 0Ω J 1/8W (RoHS)	1	L202	B2D
199	3001070000000	Chip resistor 0Ω J 1/8W (RoHS)	1	R413	T5E
200	3005051020010	Integrated resistor 1K J 1/16W (RoHS)	1	RN1	T4J
201	3099080398000	Chip resistor 0.39Ω J 1/4W (RoHS)	1	R420	B4C
202	3099080398000	Chip resistor 0.39Ω J 1/4W (RoHS)	1	R421	B4C
203	3099080398000	Chip resistor 0.39Ω J 1/4W (RoHS)	1	R422	B4C
204	3101050200010	Chip capacitor 2PF B 50V (RoHS)	1	C133	T3G
205	3101050200010	Chip capacitor 2PF B 50V (RoHS)	1	C501	T3D
206	3101050200010	Chip capacitor 2PF B 50V (RoHS)	1	C535	T2F
207	3101050200010	Chip capacitor 2PF B 50V (RoHS)	1	C561	T2H
208	3101050300000	Chip capacitor 3PF B 50V(RoHS)	1	C137	T3H
209	3101050300000	Chip capacitor 3PF B 50V(RoHS)	1	C500	T4D
210	3101050300000	Chip capacitor 3PF B 50V(RoHS)	1	C505	T3D
211	3101050300000	Chip capacitor 3PF B 50V(RoHS)	1	C560	T2H
212	3101050400010	Chip capacitor 4PF B 50V(RoHS)	1	C516	T3E
213	3101050400010	Chip capacitor 4PF B 50V(RoHS)	1	C532	T3F
214	3101050500010	Chip capacitor 5PF B 50V(RoHS)	1	C136	T3H
215	3101050500010	Chip capacitor 5PF B 50V(RoHS)	1	C138	T3H
216	3101050500010	Chip capacitor 5PF B 50V(RoHS)	1	C518	T2F
217	3101050590020	Chip capacitor 0.5PF B 50V(RoHS)	1	C400	T3F
218	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C111	T5H

No.	Part No.	Description	Qty.	Ref No.	Print No.
219	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C120	T3H
220	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C130	T3G
221	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C141	T3G
222	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C402	T4F
223	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C405	T5F
224	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C503	T3D
225	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C507	T3E
226	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C519	T2F
227	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C526	T2F
228	3101050600010	Chip capacitor 6PF B 50V(RoHS)	1	C531	T3F
229	3101050800000	Chip capacitor 8PF B 50V(RoHS)	1	C528	T2F
230	3101050800000	Chip capacitor 8PF B 50V(RoHS)	1	C645	B5I
231	3101050800000	Chip capacitor 8PF B 50V(RoHS)	1	C691	B4I
232	3101050900000	Chip capacitor 9PF B 50V (RoHS)	1	C110	T5H
233	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C132	T3G
234	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C135	T3H
235	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C321	T5I
236	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C322	T5I
237	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C435	B5D
238	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C522	T2E
239	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C541	T2G
240	3101051000020	Chip capacitor 10PF J 50V(RoHS)	1	C543	CT2F
241	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C107	T5I
242	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C201	T1F
243	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C206	T3K
244	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C266	B4H
245	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C303	T3J
246	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C304	T3J
247	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C305	T3J
248	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C334	B1I
249	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C514	T3E
250	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C545	T2F
251	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C548	T2F
252	3101051010030	Chip capacitor 100PF J 50V(RoHS)	1	C669	T4J
253	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C105	T5H
254	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C106	T4H
255	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C204	T3K
256	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C248	B1E
257	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C250	B1E
258	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C254	B2D
259	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C265	T4H
260	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C320	T5I
261	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C323	T5I
262	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C341	T3I

No.	Part No.	Description	Qty.	Ref No.	Print No.
263	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C408	T5F
264	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C414	T5E
265	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C439	B4D
266	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C509	T3E
267	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C527	T2E
268	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C609	B3I
269	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C641	B4A
270	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C644	B4B
271	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C646	T2D
272	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C651	T4G
273	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C653	T5G
274	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C657	T2D
275	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C658	T1E
276	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C661	T1D
277	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C666	B4A
278	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C667	B3A
279	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C670	B5I
280	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C680	B3I
281	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C684	T1D
282	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C685	B5J
283	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C686	B2I
284	3101051020010	Chip capacitor 1000PF K 50V(RoHS)	1	C689	B4I
285	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C237	T3K
286	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C259	B2E
287	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C274	B1F
288	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C277	B4K
289	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C300	T3I
290	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C311	B3I
291	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C313	B2K
292	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C416	T4D
293	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C419	B4C
294	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C529	T2G
295	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C540	T1G
296	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C542	T2H
297	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C546	T2I
298	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C547	T2I
299	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C656	B4K
300	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C662	T2D
301	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C677	T1E
302	3101051030020	Chip capacitor 0.01UF K 25V(RoHS)	1	C681	B3I
303	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C1	B5I
304	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C118	T4G
305	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C127	T3G
306	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C143	T3G

No.	Part No.	Description	Qty.	Ref No.	Print No.
307	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C212	B1F
308	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C217	T2K
309	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C231	B2J
310	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C240	T4K
311	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C249	T2B
312	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C253	T4J
313	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C255	B2D
314	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C256	B1E
315	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C257	B2C
316	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C272	B2E
317	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C278	B3J
318	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C315	T4J
319	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C324	T2I
320	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C325	T2I
321	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C326	T2J
322	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C329	T2J
323	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C330	T2I
324	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C331	T2I
325	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C332	T2I
326	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C333	B1I
327	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C409	T4E
328	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C415	T4D
329	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C418	B4C
330	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C433	B4D
331	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C511	T3F
332	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C515	T3F
333	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C537	T2G
334	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C549	T2I
335	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C642	B3J
336	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C650	T4G
337	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C655	T5G
338	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C683	B2I
339	3101051040060	Chip capacitor 0.1UF K 16V(RoHS)	1	C687	B5I
340	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C213	B1F
341	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C216	T1K
342	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C218	T2J
343	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C226	T2K
344	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C230	B2J
345	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C241	T4K
346	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C242	T4K
347	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C271	B2K
348	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C273	B2K
349	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C301	T3I
350	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C306	T3I

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351	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C307	T3I
352	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C309	T3I
353	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C310	B3I
354	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C440	B4J
355	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C441	B4K
356	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C446	B5E
357	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C678	B4K
358	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C690	B3I
359	3101051050000	Chip capacitor 1UF K 6.3V(RoHS)	1	C692	T3K
360	3101051200020	Chip capacitor 12PF J 50V (RoHS)	1	C506	T3D
361	3101051200020	Chip capacitor 12PF J 50V (RoHS)	1	C520	T4E
362	3101051200020	Chip capacitor 12PF J 50V (RoHS)	1	C544	T2H
363	3101051230000	Chip capacitor 0.012UF K 25V(RoHS)	1	C238	T3K
364	3101051230000	Chip capacitor 0.012UF K 25V(RoHS)	1	C270	B2K
365	3101051500020	Chip capacitor 15PF J 50V(RoHS)	1	C121	T3H
366	3101051500020	Chip capacitor 15PF J 50V(RoHS)	1	C407	T5E
367	3101051520000	Chip capacitor 1500PF K 50V(RoHS)	1	C224	T2J
368	3101051520000	Chip capacitor 1500PF K 50V(RoHS)	1	C233	T3K
369	3101051590000	Chip capacitor 1.5PF B 50V (RoHS)	1	C533	T2F
370	3101051810010	Chip capacitor 180p J 50V(RoHS)	1	C513	T3F
371	3101051820000	Chip capacitor 1800PF K 50V(RoHS)	1	C235	T3K
372	3101051830000	Chip capacitor 0.018UF K 16V(RoHS)	1	C207	T3K
373	3101052200010	Chip capacitor 22PF J 50V(RoHS)	1	C245	T4K
374	3101052210010	Chip capacitor 220PF K 50V(RoHS)	1	C260	B1D
375	3101052210010	Chip capacitor 220PF K 50V(RoHS)	1	C275	B1C
376	3101052220010	Chip capacitor 2200pF K 50V(RoHS)	1	C243	T4K
377	3101052220010	Chip capacitor 2200pF K 50V(RoHS)	1	C258	T4K
378	3101052230000	Chip capacitor 0.022UF K 16V(RoHS)	1	C205	T3K
379	3101052230000	Chip capacitor 0.022UF K 16V(RoHS)	1	C215	T1K
380	3101052230000	Chip capacitor 0.022UF K 16V(RoHS)	1	C663	B4K
381	3101052710000	Chip capacitor 270PF J 50V(RoHS)	1	C412	T5E
382	3101053340010	Chip capacitor 0.33UF K 6.3V(RoHS)	1	C102	T4I
383	3101053340010	Chip capacitor 0.33UF K 6.3V(RoHS)	1	C104	T5I
384	3101053910000	Chip capacitor 390PF J 50V(RoHS)	1	C228	T2J
385	3101053910000	Chip capacitor 390PF J 50V(RoHS)	1	C234	T3K
386	3101053920000	Chip capacitor 3900PF K 50V(RoHS)	1	C267	B3K
387	3101053920000	Chip capacitor 3900PF K 50V(RoHS)	1	C679	B4K
388	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C117	T4G
389	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C126	T3G
390	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C131	T4G
391	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C134	T3G
392	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C139	T3H
393	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C140	T3G
394	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C142	T3G

No.	Part No.	Description	Qty.	Ref No.	Print No.
395	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C316	T4J
396	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C335	T4I
397	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C337	T3I
398	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C342	T3I
399	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C401	T4F
400	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C403	T5F
401	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C404	T4F
402	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C406	T5F
403	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C410	T4E
404	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C417	T4D
405	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C430	B5C
406	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C432	B4D
407	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C436	B4D
408	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C437	B4C
409	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C442	B5C
410	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C445	B5E
411	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C512	T3F
412	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C530	T2G
413	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C536	T3F
414	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C538	T2G
415	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C539	T1G
416	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C601	T2B
417	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C602	T2B
418	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C648	B3A
419	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C649	B2A
420	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C654	T5G
421	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C659	B3A
422	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C660	B3B
423	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C671	B5F
424	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C675	B5F
425	3101054710010	Chip capacitor 470PF K 50V(RoHS)	1	C676	B5F
426	3101054730000	Chip capacitor 0.047UF K 10V(RoHS)	1	C223	T2K
427	3101054730000	Chip capacitor 0.047UF K 10V(RoHS)	1	C225	T2K
428	3101054730000	Chip capacitor 0.047UF K 10V(RoHS)	1	C232	T3K
429	3101054730000	Chip capacitor 0.047UF K 10V(RoHS)	1	R220	T2K
430	3101055600000	Chip capacitor 56PF J 50V (RoHS)	1	C339	T3I
431	3101055600000	Chip capacitor 56PF J 50V (RoHS)	1	C343	T3I
432	3101055620010	Chip capacitor 5600PF K 25V(RoHS)	1	C244	T4K
433	3101055620010	Chip capacitor 5600PF K 25V(RoHS)	1	C261	B4H
434	3101055630000	Chip capacitor 0.056UF K 10V(RoHS)	1	C236	T3K
435	3101056800000	Chip capacitor 68PF J 50V(RoHS)	1	C219	T2K
436	3101056800000	Chip capacitor 68PF J 50V(RoHS)	1	C220	T2K
437	3101056800000	Chip capacitor 68PF J 50V(RoHS)	1	C221	T2J
438	3101056800000	Chip capacitor 68PF J 50V(RoHS)	1	C340	T3I

No.	Part No.	Description	Qty.	Ref No.	Print No.
439	3101056820000	Chip capacitor 6800PF K 25V(RoHS)	1	C239	T3K
440	3101056830000	Chip capacitor 0.068UF K 6.3V(RoHS)	1	C227	T3K
441	3101060100010	Chip capacitor 1PF B 50V(RoHS)	1	C125	T4G
442	3101060100010	Chip capacitor 1PF B 50V(RoHS)	1	C452	T4C
443	3101060100010	Chip capacitor 1PF B 50V(RoHS)	1	C459	T5C
444	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C115	T4G
445	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C425	T5D
446	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C427	T5C
447	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C451	T3B
448	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C455	T4B
449	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C461	B2B
450	3101060300010	Chip capacitor 3PF B 50V(RoHS)	1	C462	B2B
451	3101060390000	Chip capacitor 0.3PF B 50V(RoHS)	1	C116	T4G
452	3101060400010	Chip capacitor 4PF B 50V(RoHS)	1	C114	T4H
453	3101060400010	Chip capacitor 4PF B 50V(RoHS)	1	C428	T5C
454	3101060500010	Chip capacitor 5PF B 50V(RoHS)	1	C113	T4H
455	3101060500010	Chip capacitor 5PF B 50V(RoHS)	1	C122	T3G
456	3101060500010	Chip capacitor 5PF B 50V(RoHS)	1	C124	T4G
457	3101060500010	Chip capacitor 5PF B 50V(RoHS)	1	C453	T4B
458	3101060590010	Chip capacitor 0.5PF B 50V(RoHS)	1	C112	T4H
459	3101060590010	Chip capacitor 0.5PF B 50V(RoHS)	1	C424	T4D
460	3101060590010	Chip capacitor 0.5PF B 50V(RoHS)	1	C426	T5C
461	3101061000000	Chip capacitor 10PF J 50V(RoHS)	1	C423	T4D
462	3101061010010	Chip capacitor 100PF J 50V(RoHS)	1	C450	T4C
463	3101061020000	Chip capacitor 1000PF K 50V(RoHS)	1	C458	T5C
464	3101061050020	Chip capacitor 1UF K 25V (RoHS)	1	C246	B3J
465	3101061050020	Chip capacitor 1UF K 25V (RoHS)	1	C247	B1E
466	3101061050020	Chip capacitor 1UF K 25V (RoHS)	1	C308	B3I
467	3101061590010	Chip capacitor 1.5PF B 50V(RoHS)	1	C454	T4C
468	3101061590010	Chip capacitor 1.5PF B 50V(RoHS)	1	C456	T4C
469	3101062240000	Chip capacitor 0.22UF K 10V(RoHS)	1	C100	T4I
470	3101062700010	Chip capacitor 27PF J 50V (RoHS)	1	C429	T4C
471	3101102260010	Chip capacitor 22uF Z 10V (RoHS)	1	C251	B1D
472	3102992000040	Adjustable capacitor 10pF ±2.5pF 55V (RoHS)	1	TC100	T5G
473	3102992000040	Adjustable capacitor 10pF ±2.5pF 55V (RoHS)	1	TC101	T4H
474	3210108230010	Wire-wound chip inductor 23nH J 590mA 0.046ohm(RoHS)	1	L104	T5H
475	3210305180000	Multi-layer chip inductor18nH J 300mA 0.36ohm (RoHS)	1	L113	T3H
476	3210305220000	Multi-layer chip inductor22nH J 300mA 0.42ohm (RoHS)	1	L114	T3G
477	3210305220000	Multi-layer chip inductor22nH J 300mA 0.42ohm (RoHS)	1	L400	T4F
478	3210305220000	Multi-layer chip inductor22nH J 300mA 0.42ohm (RoHS)	1	L530	T2F
479	3210305330000	Multi-layer chip inductor33nH J 200mA 0.58ohm (RoHS)	1	L115	T3G
480	3210305390000	Multi-layer chip inductor39nH J 200mA 0.65ohm (RoHS)	1	L111	T4G
481	3210306101000	Multi-layer chip inductor100nH J 300mA 0.90ohm (RoHS)	1	L504	T3F
482	3210306220000	Multi-layer chip inductor22nH J 300mA 0.50ohm (RoHS)	1	L401	T4F

No.	Part No.	Description	Qty.	Ref No.	Print No.
483	3210306561010	Multi-layer chip inductor560nH K 35mA 1.55ohm (RoHS)	1	L304	T3I
484	3210406331000	Multi-layer chip inductor330nH K 35mA 0.85ohm (RoHS)	1	L303	T3I
485	3210406331000	Multi-layer chip inductor330nH K 35mA 0.85ohm (RoHS)	1	L306	T3I
486	3212105470000	Multi-layer chip inductor47nH J 200mA 0.58ohm (RoHS)	1	L112	T3G
487	3213212102000	Wire-wound chip inductor 1uH J 245mA 1.1Ω (RoHS)	1	L403	T4E
488	3213212102000	Wire-wound chip inductor 1uH J 245mA 1.1Ω (RoHS)	1	L453	B4B
489	3213212820010	Wire-wound chip inductor 82nH J 300mA 0.75Ω(RoHS)	1	L408	B5C
490	3213306102000	Multi-layer chip inductor1uH K 25mA 0.6Ω(RoHS)	1	L200	T3K
491	3213306102000	Multi-layer chip inductor1uH K 25mA 0.6Ω(RoHS)	1	L300	T4J
492	3213306102000	Multi-layer chip inductor1uH K 25mA 0.6Ω(RoHS)	1	L301	T5I
493	3213306102000	Multi-layer chip inductor1uH K 25mA 0.6Ω(RoHS)	1	L307	T3I
494	3213306102000	Multi-layer chip inductor1uH K 25mA 0.6Ω(RoHS)	1	L308	T4I
495	3213306221010	Multi-layer chip inductor0.22uH K 50mA 0.8Ω(RoHS)	1	L607	B3I
496	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L101	T5H
497	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L102	T3H
498	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L103	T5H
499	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L105	T4G
500	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L106	T3H
501	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L108	T4G
502	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L109	T4H
503	3213306332000	Multi-layer chip inductor3.3uH K 15mA 1.55Ω(RoHS)	1	L305	T3I
504	3221506601000	Bead600Ω 100MHz ±25% 500mA (RoHS)	1	L100	T5I
505	3221506601000	Bead600Ω 100MHz ±25% 500mA (RoHS)	1	L402	T4F
506	3221506601000	Bead600Ω 100MHz ±25% 500mA (RoHS)	1	L650	T4G
507	3221507221000	Bead220Ω 100MHz ±25% 2000mA (RoHS)	1	L404	T4E
508	3221507600000	Bead60Ω 100MHz ±25% 3000mA (RoHS)	1	L407	T4D
509	3221507600000	Bead60Ω 100MHz ±25% 3000mA (RoHS)	1	L604	T2B
510	3231351640000	Air-core inductor E2-0.35*1.6*4TL(RoHS)	1	L450	T4C
511	3231351640000	Air-core inductor E2-0.35*1.6*4TL(RoHS)	1	L451	T4C
512	3231351640000	Air-core inductor E2-0.35*1.6*4TL(RoHS)	1	L452	T4B
513	3231351640000	Air-core inductor E2-0.35*1.6*4TL(RoHS)	1	L454	T5B
514	3231351640000	Air-core inductor E2-0.35*1.6*4TL(RoHS)	1	L500	T4D
515	3231351680000	Air-core inductor E2-0.35*1.6*8TR(RoHS)	1	L406	T4D
516	3304040200000	Varactor VR:30V 19.7pF/1VR 2.1pF/28VR(RoHS)	1	D104	T4H
517	3304060300050	Varactor VR:15V 16.4pF/1VR 5.5pF/4VR (RoHS)	1	D100	T5H
518	3304060300050	Varactor VR:15V 16.4pF/1VR 5.5pF/5VR (RoHS)	1	D101	T5H
519	3304060300050	Varactor VR:15V 16.4pF/1VR 5.5pF/6VR (RoHS)	1	D102	T3H
520	3304060300050	Varactor VR:15V 16.4pF/1VR 5.5pF/7VR (RoHS)	1	D103	T3H
521	3307110100070	LED super red 100mcd 30mA 1.85V (RoHS)	1	D602	B4A
522	3307110100080	LED super green 15mcd 25mA 2.2V(RoHS)	1	D601	B4A
523	3399990000260	Rectifier diode 10V 15mA 380mV/1mA(RoHS)	1	D508	T3E
524	3401001000080	PNP transistor 15V 800mA (RoHS)	1	Q654	T1E
525	3401001000490	PNP transistor 50V 150mA (RoHS)	1	Q202	B1F
526	3401001000490	PNP transistor 50V 150mA (RoHS)	1	Q655	T3K

No.	Part No.	Description	Qty.	Ref No.	Print No.
527	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q102	T4G
528	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q103	T3H
529	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q104	T3G
530	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q105	T3I
531	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q400	T4F
532	3401002000990	NPN transistor10V 30mA (RoHS)	1	Q502	T2I
533	3403007000000	Transistor Vce:50V Vloff:0.5V Vlon:3V 70mA(RoHS)	1	Q300	T2I
534	3403007000020	Transistor Vce:50V Vloff:0.3V Vlon:1.4V 70mA(RoHS)	1	Q431	B4D
535	3403008000010	Transistor Vce:50V Vloff:0.5V Vlon:3V 100mA (RoHS)	1	Q204	B2D
536	3403008000010	Transistor Vce:50V Vloff:0.5V Vlon:3V 100mA (RoHS)	1	Q430	B5C
537	3403008000010	Transistor Vce:50V Vloff:0.5V Vlon:3V 100mA (RoHS)	1	Q614	B4A
538	3403008000010	Transistor Vce:50V Vloff:0.5V Vlon:3V 100mA (RoHS)	1	Q615	B4A
539	3403009000010	Transistor 50V -100mA (RoHS)	1	Q609	T2D
540	3403009000010	Transistor 50V -100mA (RoHS)	1	Q613	T2E
541	3406001000090	NPN transistor9V 100mA(RoHS)	1	Q401	T4F
542	3411002000020	NPN transistor50V 150mA(RoHS)	1	Q650	T4G
543	3418001000010	NPN transistor10V 50mA (RoHS)	1	Q500	T3E
544	3499000000140	N-JFET VGS:15V VGSoff:-1.4V IDSS:50mA(RoHS)	1	Q100	T4H
545	3499000000140	N-JFET VGS:15V VGSoff:-1.4V IDSS:50mA(RoHS)	1	Q101	T3G
546	3499000000150	Transistor -50V/50V -100mA/100mA (RoHS)	1	Q652	T4G
547	3499000000180	PNP transistor 12V 2.5A(RoHS)	1	Q205	B2D
548	3499000000180	PNP transistor 12V 2.5A(RoHS)	1	Q610	T2E
549	3499000000180	PNP transistor 12V 2.5A(RoHS)	1	Q611	T2D
550	3501020000030	N-MOSFET VDS:6V ID:20mA VGS(th):0.7V(RoHS)	1	Q501	T2G
551	3503010000010	P-MOSFET VDS:-30V ID:-100mA VGS(th):-1.9V(RoHS)	1	Q653	T4G
552	3503020000030	N-MOSFET VDS:30V ID:100mA VGS(th):3.0V (RoHS)	1	Q201	B1F
553	3503020000030	N-MOSFET VDS:30V ID:100mA VGS(th):3.0V (RoHS)	1	Q203	T4K
554	3503020000030	N-MOSFET VDS:30V ID:100mA VGS(th):3.0V (RoHS)	1	Q657	B5D
555	3503040000000	Compound MOSFET VDS:30V ID:0.2A VGS(th):1V(RoHS)	1	Q612	T1E
556	3504990000010	PA MOSFET VDS:30V ID:600mA VGS(th):1.8V 1.4W(RoHS)	1	Q402	T5E
557	3604999000010	PLL IC 100MHZ~1.4G 2.4V~5V(RoHS)	1	U202	T4I
558	3605008005070	Operational amplifier 3~32V 300mW 100dB dual-operation(RoHS)	1	U430	B4D
559	3605008005070	Operational amplifier 3~32V 300mW 100dB dual-operation(RoHS)	1	U431	B2K
560	3605017005540	Operational amplifier 1.8~15V 220mW 39dB dual-operation(RoHS)	1	U201	B2E
561	3608015000000	Power management IC 5V (RoHS)	1	U606	B3I
562	3609016000000	RF/If demodulation chip HSOP056-P-0300A AN29160AA(RoHS)	1	U200	T3J
563	3610007000020	MCU 8-bit 2.7~5.5V 10MHz(RoHS)	1	U605	B4J
564	3619006005220	Reset IC 1.5Vdd 4.5Vdect(RoHS)	1	U610	B5J
565	3701012850010	Temperature compensated crystal oscillator 12.8MHz (RoHS)	1	X300	T5J
566	3701737230020	Crystal 7.3728MHz 30~100ppm 8~12pF (RoHS)	1	X601	B4I
567	3802388540010	Crystal filter 38.850MHz ±5.0KHz 4.0dB (RoHS)	1	XF1	T2H
568	3101054700010	Chip capacitor 47PF J 50V(RoHS)	1	C280	B1A
569	3101054740000	Chip capacitor 0.47UF Z 6.3V(RoHS)	1	C202	T1F
570	3001061020010	Chip resistor 1KΩ J 1/10W (RoHS)	1	R409	T5F

No.	Part No.	Description	Qty.	Ref No.	Print No.
571	3302030500020	Zener diode 18V (RoHS)	1	D610	T2B
572	3399990000080	Zener diode 6.8V (RoHS)	1	D210	B1D
573	3399990000080	Zener diode 6.8V (RoHS)	1	D220	B1C
574	3399990000080	Zener diode 6.8V (RoHS)	1	D250	B1E
575	3399990000080	Zener diode 6.8V (RoHS)	1	D430	B5D
576	3104082260060	Tantalum capacitor22UF K 10V (RoHS)	1	C673	B3I
577	3104081060120	Tantalum capacitor10UF M 16V (RoHS)	1	C229	B2J
578	3104081060120	Tantalum capacitor10UF M 16V (RoHS)	1	C252	B1E
579	3104081060120	Tantalum capacitor10UF M 16V (RoHS)	1	C431	B4C
580	3104074750070	Tantalum capacitor4.7UF M 10V (RoHS)	1	C200	T1F
581	3104074750070	Tantalum capacitor4.7UF M 10V (RoHS)	1	C262	B4H
582	3104074750070	Tantalum capacitor4.7UF M 10V (RoHS)	1	C695	T3K
583	3104074750070	Tantalum capacitor4.7UF M 10V (RoHS)	1	C696	T3K
584	3104072250060	Tantalum capacitor2.2UF M 10V (RoHS)	1	C302	T3I
585	3104072250060	Tantalum capacitor2.2UF M 10V (RoHS)	1	C434	B5D
586	3104072250060	Tantalum capacitor2.2UF M 10V (RoHS)	1	C643	T2E
587	3104072250060	Tantalum capacitor2.2UF M 10V (RoHS)	1	C664	T2D
588	3104072250060	Tantalum capacitor2.2UF M 10V (RoHS)	1	C665	T2E
589	3104071050070	Tantalum capacitor1UF M 16V (RoHS)	1	C264	B4H
590	3104081560050	Tantalum capacitor15UF M 10V(RoHS)	1	C652	T5G
591	3104084750040	Tantalum capacitor4.7uF K 16V (RoHS)	1	C101	T4I
592	3104071560040	Tantalum capacitor15UF M 6.3V (RoHS)	1	C312	B2I
593	3001051250000	Chip resistor 1.2M J 1/16W (RoHS)	1	R217	T2J
594	3001052210000	Chip resistor 220Ω J 1/16W(RoHS)	1	R709	T3K
595	3001055600000	Chip resistor 56Ω J 1/16W (RoHS)	1	R105	T5G
596	3101060700020	Chip capacitor 7PF B 50V (RoHS)	1	C422	T4D
597	3101061200000	Chip capacitor 12PF J 50V (RoHS)	1	C421	T5D
598	3303030300000	Schottky barrier diode 40V 30mA 0.26V/1mA (RoHS)	1	D651	T3K
599	3401002000150	NPN transistor50V 150mA (RoHS)	1	Q656	T3K
600	3002996830060	Trimmer resistor 68K ±25% 0.15W (RoHS)	1	VR200	B4K
601	3002996830060	Trimmer resistor 68K ±25% 0.15W (RoHS)	1	VR260	B5H
602	3002996830060	Trimmer resistor 68K ±25% 0.15W (RoHS)	1	VR300	T4J
603	3002996830060	Trimmer resistor 68K ±25% 0.15W (RoHS)	1	VR601	B5J
604	3104274760000	Tantalum capacitor 47UF M 16V (RoHS)	1	C682	T3B
605	3305180300000	Diode 100mA max 1Ω (RoHS)	1	D401	T4C
606	3101074750010	Chip capacitor 4.7UF K 10V(RoHS)	1	C318	T5J
607	3215006100010	Multi-layer chip inductor10nH J 600mA 0.12Ω(RoHS)	1	L405	T4E
608	3303240000000	Switching diode 75V 200mA 1.25V 6ns (RoHS)	1	D607	B5J
609	3303240000000	Switching diode 75V 200mA 1.25V 6ns (RoHS)	1	D650	T5G
610	3303990000060	Switching diode 35V 100mA 1V (RoHS)	1	D400	T3F
611	3303990000060	Switching diode 35V 100mA 1V (RoHS)	1	D500	T3F
612	3303990000060	Switching diode 35V 100mA 1V (RoHS)	1	D501	T3D
613	3303990000060	Switching diode 35V 100mA 1V (RoHS)	1	D502	T3D
614	41006101000L0	PCB main board (RoHS)	1		

No.	Part No.	Description	Qty.	Ref No.	Print No.
615	3001054730010	Chip resistor 47KΩ F 1/16W (RoHS)	1	R513	T2G
616	3001052710010	Chip resistor 270Ω J 1/16W (RoHS)	1	R503	T3F
617	3001052710010	Chip resistor 270Ω J 1/16W (RoHS)	1	R516	T2G
618	3001052710010	Chip resistor 270Ω J 1/16W (RoHS)	1	R517	T2H
619	3001052710010	Chip resistor 270Ω J 1/16W (RoHS)	1	R518	T2I
620	3001053930000	Chip resistor 39KΩ J 1/16W (RoHS)	1	R257	B2K
621	3001053930000	Chip resistor 39KΩ J 1/16W (RoHS)	1	R270	B3K
622	3001056830000	Chip resistor 68KΩ J 1/16W (RoHS)	1	R252	B3K
623	3001056830000	Chip resistor 68KΩ J 1/16W (RoHS)	1	R258	B2K
624	3001058220000	Chip resistor 8.2KΩ J 1/16W(RoHS)	1	R438	B4D
625	3001058220000	Chip resistor 8.2KΩ J 1/16W(RoHS)	1	R505	T3E
626	3001055630010	Chip resistor 56KΩ F 1/16W (RoHS)	1	R511	T2G
627	3101052000020	Chip capacitor 20PF J 50V(RoHS)	1	C510	T3E
628	3101053900000	Chip capacitor 39PF J 50V(RoHS)	1	C411	T4E
629	3101058200000	Chip capacitor 82PF J 50V(RoHS)	1	C269	B2K
630	3101058210010	Chip capacitor 820PF K 50V (RoHS)	1	C268	B3K
631	3101060200010	Chip capacitor 2PF B 50V (RoHS)	1	C457	T4B
632	3210306180000	Multi-layer chip inductor18nH J 350mA 0.45ohm (RoHS)	1	L503	T3E
633	3210306270000	Multi-layer chip inductor27nH J 300mA 0.55ohm (RoHS)	1	L512	T2F
634	3210306330000	Multi-layer chip inductor33nH J 300mA 0.60ohm (RoHS)	1	L511	T2F
635	3213212331000	Wire-wound chip inductor 330nH J 400mA 0.6Ω (RoHS)	1	L509	T2G
636	3217105010000	Wire-wound chip inductor 1nH J 1360mA 0.045Ω(RoHS)	1	R521	T3E
637	3217106829010	Wire-wound chip inductor 8.2nH G 700mA (RoHS)	1	L505	T2F
638	3217112102020	Wire-wound chip inductor 1uH J 370mA 1.75Ω (RoHS)	1	L510	T1G
639	3231351650000	Air-core inductor E2-0.35*1.6*5TL(RoHS)	1	L501	T3D
640	3231351650000	Air-core inductor E2-0.35*1.6*5TL(RoHS)	1	L502	T3E
641	3231351650000	Air-core inductor E2-0.35*1.6*5TL(RoHS)	1	L506	T3F
642	3231351650000	Air-core inductor E2-0.35*1.6*5TL(RoHS)	1	L508	T2F
643	3304180000000	Varactor 15V 9.3~21pF (RoHS)	1	D503	T3D
644	3304180000000	Varactor 15V 9.3~21pF (RoHS)	1	D504	T3E
645	3304180000000	Varactor 15V 9.3~21pF (RoHS)	1	D505	T2F
646	3304180000000	Varactor 15V 9.3~21pF (RoHS)	1	D507	T2F
647	3504990000040	PA MOSFET 10uA 25V 10uA 7.2V 7W (RoHS)	1	Q403	T5E
648	3801045030170	Ceramic filter 450KHz ±4.5KHz 6.0dB (RoHS)	1	CF300	T1J
649	5205000001530	Battery connector, black (RoHS)	1	G1	T3C
650	3101060600010	Chip capacitor 6PF B 50V (RoHS)	1	C123	T3G
651	3210108270000	Wire-wound chip inductor 27nH J 560mA 0.051ohm (RoHS)	1	L107	T3H
652	3212106221000	Multi-layer chip inductor220nH J 300mA 0.4ohm (RoHS)	1	L110	T3G
653	3001051510000	Chip resistor 150Ω J 1/16W (RoHS)	1	R106	T4H
654	3101052240080	Chip capacitor 0.22uF K 16V(RoHS)	1	C203	T3K
655	3101055690110	Chip capacitor 5.6PF B 50V(RoHS)	1	C502	T3D
656	3101055690110	Chip capacitor 5.6PF B 50V(RoHS)	1	C508	T3E
657	3101052790060	Chip capacitor 2.7PF B 50V(RoHS)	1	C521	T2F
658	3612031000130	Memory EEPROM 64K 1.7-5.5V (RoHS)	1	U609	B3K

Tuning Description

I Required Test Instruments:

Radio communication test set (HP8921) 1 set

10V/3A regulated DC power supply 1 set

Digital voltmeter 1 set

Ammeter 1 set

II Preparation

Place the board to be tested on the test fixture (please ensure good connection between each test point and the fixture), and connect the board to a power supply.

III Tuning Procedures

Description of Tuning Procedures

1) PCB Tuning

Before the PCB arrives at each work station for specification inspection, programs must be downloaded and EEPROM must be initialized by the profiles (downloading with a test framework/ initializing via programming software or through wired clone). If any adjustment is required, connect the programming cable to the radio and enter the tuning mode for PC adjustment.

2) Radio Tuning

Rotate the **Channel Selector** knob to CH1, and hold down **PTT** and **SK2** for 1.5 seconds while powering on the radio. The LED will glow orange when the radio enters the Tuning Mode. After the keys are released, the radio will enter the default tuning item in TX group (preset power), and the LED will glow red. Then follow the instructions to tune each item.

Or connect the programming cable to the radio for real-time tuning in PC Programming Mode.

2. Description of Tuning Items:

Channel	Tunable Frequency	Wide Band					Narrow Band				
		Freq.1	Freq.2	Freq.3	Freq.4	Freq.5	Freq.1	Freq.2	Freq.3	Freq.4	Freq.5
TX Item											
1	TX Preset Power			Y							
2	TX Low Power	Y	Y	Y	Y	Y					
3	TX Medium Power (Reserved)										
4	TX High Power	Y	Y	Y	Y	Y					

5	CDCSS Deviation						Y	Y	Y	Y	Y
6	CTCSS Deviation(67Hz)						Y	Y	Y	Y	Y
7	CTCSS Deviation(151.8Hz)						Y	Y	Y	Y	Y
8	CTCSS Deviation(254.1Hz)						Y	Y	Y	Y	Y
9	MSK Deviation (reserved)										
10	VOX Level 1			Y							
11	VOX Level 2			Y							
12	VOX Level 3			Y							
13	VOX Level 4			Y							
14	VOX Level 5			Y							
15	TX Low Voltage Threshold			Y							
RX Item											
1	SQL On 1						Y	Y	Y	Y	Y
2	SQL On 5						Y	Y	Y	Y	Y
3	SQL On 9						Y	Y	Y	Y	Y
4	SQL Off 1						Y	Y	Y	Y	Y
5	SQL Off 5						Y	Y	Y	Y	Y
6	SQL Off 9						Y	Y	Y	Y	Y
7	RX Low Voltage Threshold			Y							
8	Bandpass Filter	Y	Y	Y	Y	Y					
Note: Y indicates frequencies available for tuning, and the rest are blank channels without tuning items.											

3. Specific Operations and Requirements:

(1) Tuning outside the mode (conventional tuning items): TX Frequency Tolerance, VCO Lock Voltage, Maximum Deviation and Modulation Sensitivity.

Note: CH1, CH2 and CH3 have been preset as narrow bands with low, medium and high frequencies respectively. Make sure the antenna or load is connected before tuning.

Item	Condition	Measurement		Tuning		Specifications / Remarks
		Test Instrument	Test Point	Part	Method	

TX Frequency Tolerance	Set to CH2 and hold down **PTT** to transmit.		Communication Test Set	Antenna	VR300	Tune VR300 with ceramic tuning tool to control the center frequency within the error range.	≤150Hz
TX VCO Lock Voltage	Set to CH1 and hold down **PTT** to transmit.		Digital Voltmeter	CV	TC100	Tune TC100 with ceramic tuning tool until the lock voltage meets the requirements.	1.1~1.3V
	Set to CH3 and hold down **PTT** to transmit.					Check	≥1V
RX VCO Lock Voltage	Set to CH1				TC101	Tune TC101 with ceramic tuning tool until the lock voltage meets the requirements.	1.1~1.3V
	Set to CH3					Check	≥1V
Maximum Frequency Deviation	Narrow Band	Set to CH1, CH2 and CH3 respectively, and hold down **PTT** to transmit.	Communication Test Set BFP: <20Hz~15kHz AF: 1kHz 150mV	Antenna Earpiece Socket	VR200	Tune VR200 with ceramic tuning tool until the frequency deviation satisfies the requirements.	1.8~2.1KHz
Modulation Sensitivity	Narrow Band	Set to CH1, CH2 and CH3 respectively, and hold down **PTT** to transmit.	Communication Test Set BPF: 0.3 KHz～3KHz AF:1KHz			Tune audio output signal of the communication test set, until the frequency deviation reaches 1.5KHz.	9±3mV

(2) Tuning in the mode (Note: Make sure that the antenna or load is connected before tuning.)

Item		Condition	Measurement		Tuning		Specifications /Remarks
			Test Instrument	Test Point	Part	Method	
TX Power	High	Set to CH4 and hold down **PTT** to enable this function at low frequency.	Communication Test Set Ammeter	Antenna Connector	SK1 SK2	Press **SK1** or **SK2** to tune the output power, and rotate the **Channel Selector** knob to save it.	4-4.3W I≤1.4A
		Short press **PTT** to switch frequencies (refer to the table of Tuning Items).					
	Low	Set to CH2 and hold down **PTT** to enable this function at low frequency.				Press **SK1** or **SK2** to tune the output power, and rotate the **Channel Selector** knob to save it.	0.5W±0.1W I≤0.8A
		Short press **PTT** to switch frequencies (refer to the table of Tuning Items).					
CDCSS Waveform		Set to CH5 and hold down **PTT** to enable this function at low frequency. Short press **PTT** to switch frequencies.	Communication Test Set BPF: <20Hz~300Hz	Antenna	VR260	Tune VR260 with ceramic tuning tool and make the waveform similar to square waveform.	
CDCSS Deviation		Set to CH5 and hold down **PTT** to enable this function at low frequency. Short press **PTT** to switch frequencies.			VR601 SK1 SK2	Enter the Tuning Mode if necessary, and press **SK1** or **SK2** to make slight tuning untilthe CDCSS deviation meets the requirements.	350~600Hz(380~420Hz is recommended)

CTCSS Deviation	Set to CH6, CH7 and CH8 respectively, and hold down **PTT** to enable this function at low frequency. Short press **PTT** to switch frequencies.	Communication Test Set BPF: <20Hz~300Hz	Antenna	VR601 SK1 SK2	Enter the Tuning Mode if necessary, and press **SK1** or **SK2** to make slight tuning until the CTCSS deviation meets the requirements.	350~600Hz (380~420Hz is recommended)
VOX	Set to CH10 and VOX Level 1. Press **SK1** or **SK2** to enable this function.	Communication Test Set BPF: <20Hz~15kHz AF: 1kHz 10mV	Antenna Earpiece socket	SK1 SK2	Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after one-point tuning.	
	Set to CH11 and VOX Level 2. Press **SK1** or **SK2** to enable this function.	Communication Test Set BPF: <20Hz~15kHz AF: 1kHz 6mV			Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after one-point tuning.	
	Set to CH12 and VOX Level 3. Press **SK1** or **SK2** to enable this function.	Communication Test Set BPF: <20Hz~15kHz AF: 1kHz 4.5mV			Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after one-point tuning.	

		Set to CH13 and VOX Level 4. Press **SK1** or **SK2** to enable this function.	Communication Test Set BPF: <20Hz~15kHz AF: 1kHz 3.5mV			Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after one-point tuning.	
		Set to CH14 and VOX Level 5. Press **SK1** or **SK2** to enable this function.	Communication Test Set BPF: <20Hz~15kHz AF: 1kHz 2mV			Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after one-point tuning.	
TX Low Voltage Threshold			Digital Voltmeter	Power Supply Port	Power supply	Tune the output voltage and check the emergency level.	≤5.9V: the alert tone will sound to indicate transmission inhibition if **PTT** is held down.
RX Sensitivity (Bandpass)		Set to CH8 at low frequency Short press **PTT** to switch frequencies.	Communication Test Set SSG: -119dBm MOD: 1KHz DEV: 3.0KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	SK1 SK2	Check the bandpass waveform. Apply **SK1** or **SK2** to perform tuning, and rotate the **Channel Selector** knob to save it after five-point tuning.	Rotate the **Volume Control** knob to a proper location until the output amplitude is not limited. SINAD: ≥12dB
Squelch On	Narrow Band	Long press **PTT** to enter narrow band, and hold down **SK1** or **SK2** to enable this function. Short press **PTT**	Communication Test Set SSG: -125dBm MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz			Tune the SSG output signal to squelch level. Rotate the **Channel Selector** knob to save the	Squelch level (Level 1): -125±1dB

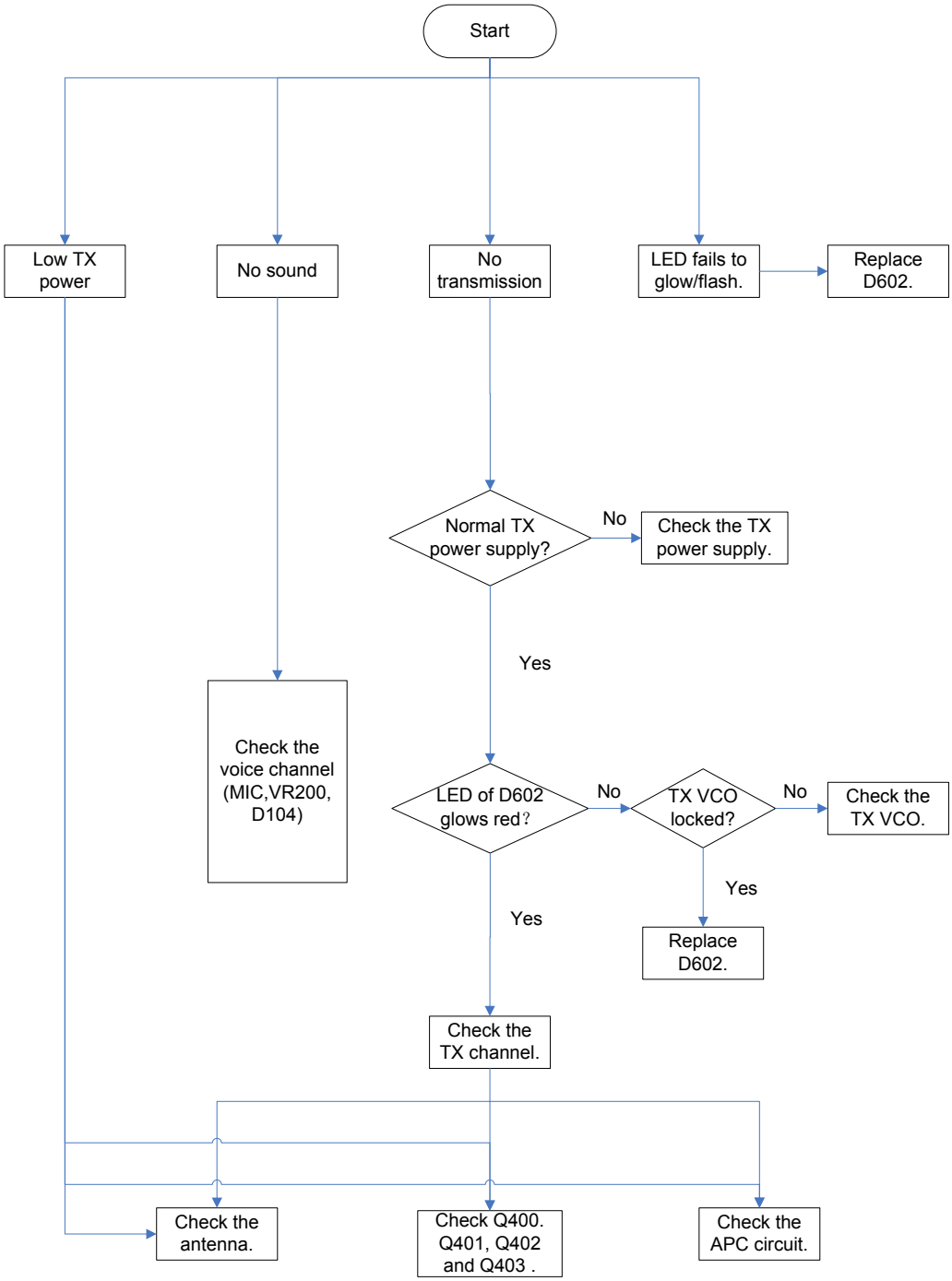
		to switch the frequency.	Communication Test Set SSG: -113dBm MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz			value after five-point tuning.	Squelch level (Level 9): SINAD: 20±1dB
Squelch Off	Narrow Band	Long press **PTT** to enter narrow band, and hold down **SK1** or **SK2** to enable this function. Short press **PTT** to switch the frequency.	Communication Test Set SSG: -123dBm MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	SK1 SK2	Tune the SSG output signal to squelch level. Rotate the **Channel Selector** knob to save the value after five-point tuning.	Squelch level (Level 1): -128±1dB
			Communication Test Set SSG: -115dBm MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz				Squelch level (Level 9): SINAD: 17±1dB
RX Low Voltage Threshold			Digital Voltmeter	Power Supply Port	Power supply	Tune the output voltage and check the emergency level.	≤7.2V: the LED (excluding the LED of 7.4V) flashes and the alert tone sounds; ≤6.56V:the alert tone sounds to indicate transmission inhibition in case of holding down PTT for transmission.

Appendix 1: Reference Value for Source Radio

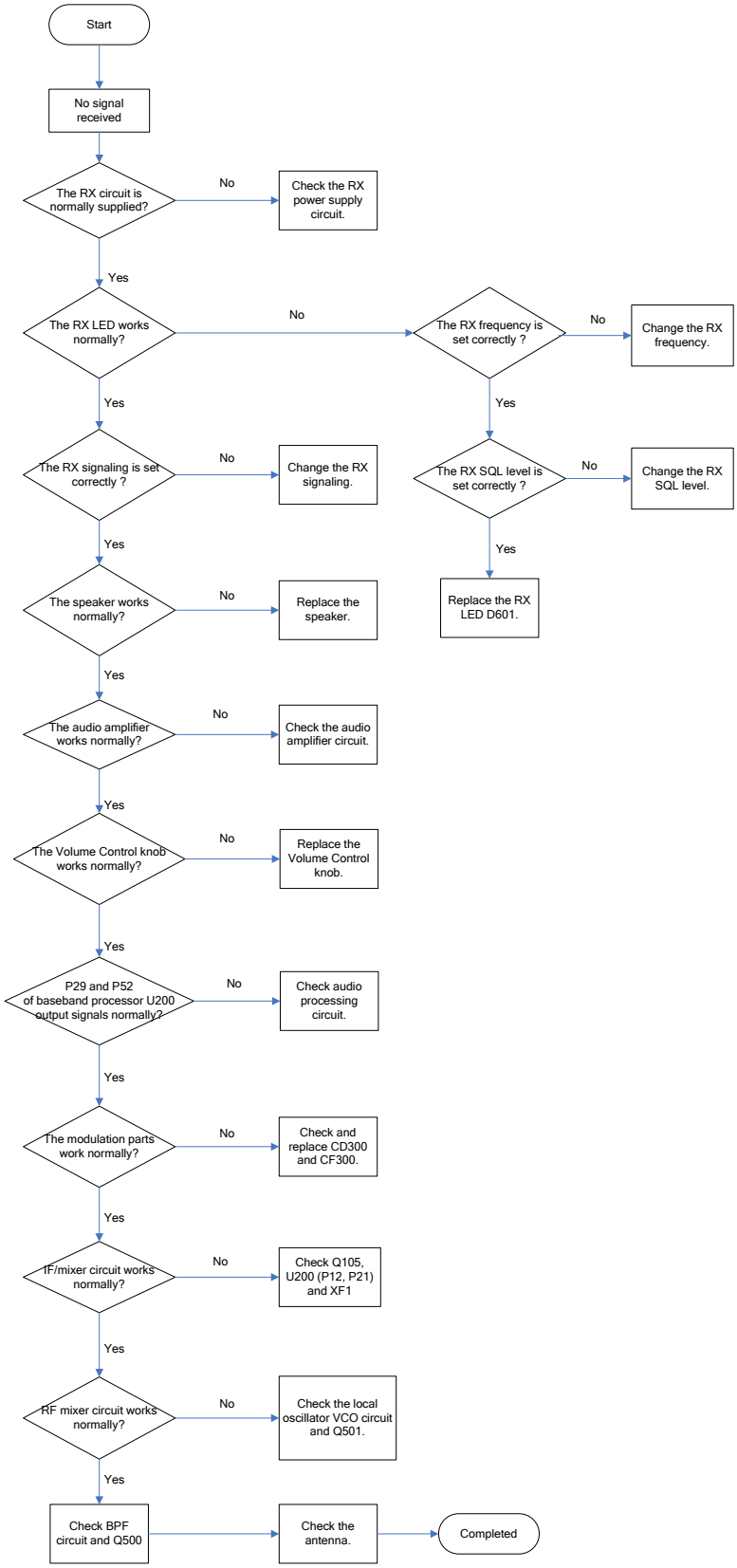
Item	Wide Bandwidth					Narrow Bandwidth				
	Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5	Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5
TX Preset Power			446							
TX Low Power	742	714	692	676	672					
TX High Power	1111	1076	1055	1047	1072					
CDCSS Deviation	66	67	67	67	69	38	38	39	40	39
CTCSS Deviation(67Hz)	121	125	128	131	135	69	72	72	75	77
CTCSS Deviation(151.8Hz)	121	124	126	128	131	68	70	72	73	75
CTCSS Deviation(254.1Hz)	133	135	137	140	143	75	77	78	78	81
VOX Level 1			55							
VOX Level 2			45							
VOX Level 3			25							
VOX Level 4			19							
VOX Level 5			15							
TX Low Voltage Threshold			158							
SQL On 1	27	25	27	25	24	18	18	17	17	20
SQL On 5	21	19	19	18	19	14	13	13	13	14
SQL On 9	9	9	9	9	9	7	7	7	7	7
SQL Off 1	39	30	31	32	32	27	26	24	25	26
SQL Off 5	28	25	25	25	26	21	21	19	17	19
SQL Off 9	12	11	12	11	13	8	8	8	8	8
RX Low Voltage Threshold			166							
Bandpass Filter	353	401	428	470	500					

Troubleshooting Flow Chart

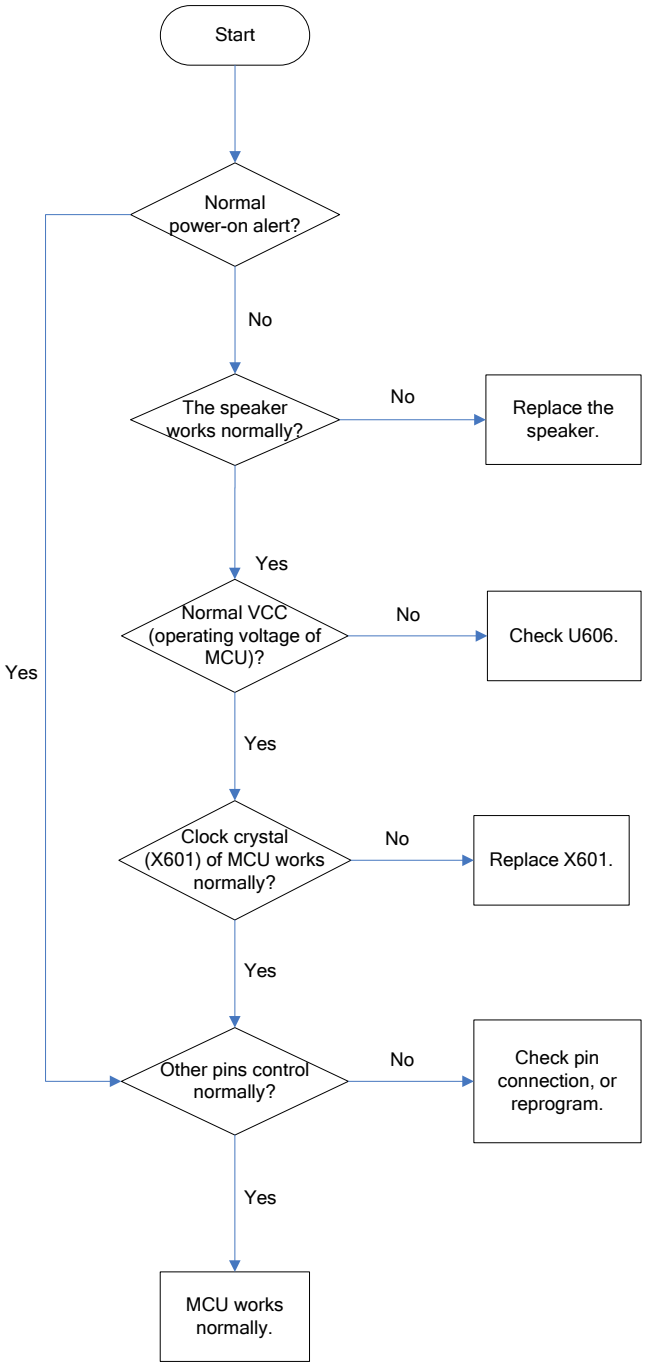
TX Circuit



RX Circuit


Start
No signal received
The RX circuit is normally supplied?
No
Check the RX power supply circuit.
Yes
The RX LED works normally?
No
The RX frequency is set correctly ?
No
Change the RX frequency.
Yes
Yes
The RX signaling is set correctly ?
No
Change the RX signaling.
The RX SQL level is set correctly ?
No
Change the RX SQL level.
Yes
Yes
The speaker works normally?
No
Replace the speaker.
Replace the RX LED D601.
Yes
The audio amplifier works normally?
No
Check the audio amplifier circuit.
Yes
The Volume Control knob works normally?
No
Replace the Volume Control knob.
Yes
P29 and P52 of baseband processor U200 output signals normally?
No
Check audio processing circuit.
Yes
The modulation parts work normally?
No
Check and replace CD300 and CF300.
Yes
IF/mixer circuit works normally?
No
Check Q105, U200 (P12, P21) and XF1
Yes
RF mixer circuit works normally?
No
Check the local oscillator VCO circuit and Q501.
Yes
Check BPF circuit and Q500
Check the antenna.
Completed

MCU


Start
Normal power-on alert?
No
The speaker works normally?
No
Replace the speaker.
Yes
Normal VCC (operating voltage of MCU)?
No
Check U606.
Yes
Yes
Clock crystal (X601) of MCU works normally?
No
Replace X601.
Yes
Other pins control normally?
No
Check pin connection, or reprogram.
Yes
MCU works normally.
Yes

Disassembly and Assembly

Disassembling the Aluminum Chassis

① Remove the volume control knob.

② Remove the channel selector knob.

③ Unscrew the nut for the volume control knob.

④ Unscrew the nut for the channel selector knob.

⑤ Unfasten the two screws at the bottom of the radio.

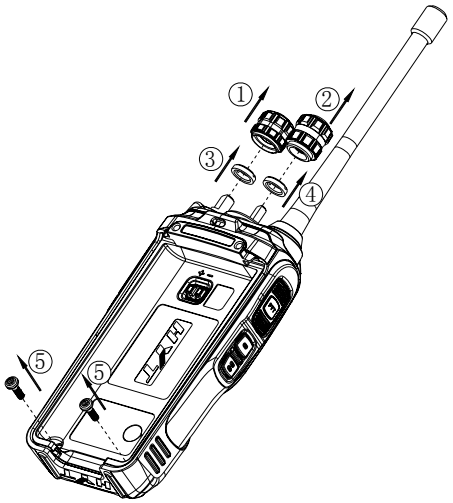


Figure 1

⑥ Lift the bottom of the aluminum chassis, pull the aluminum chassis backwards and take it out.

⑦ Remove the rear cover.

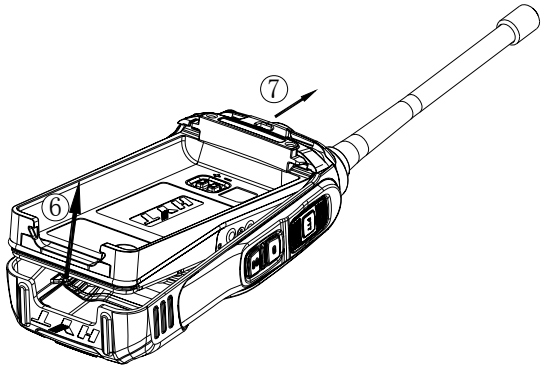


Figure 2

⑧ The disassembled parts are shown as figure 3.

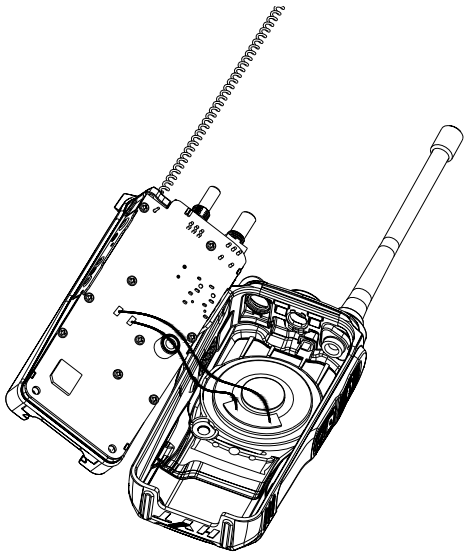
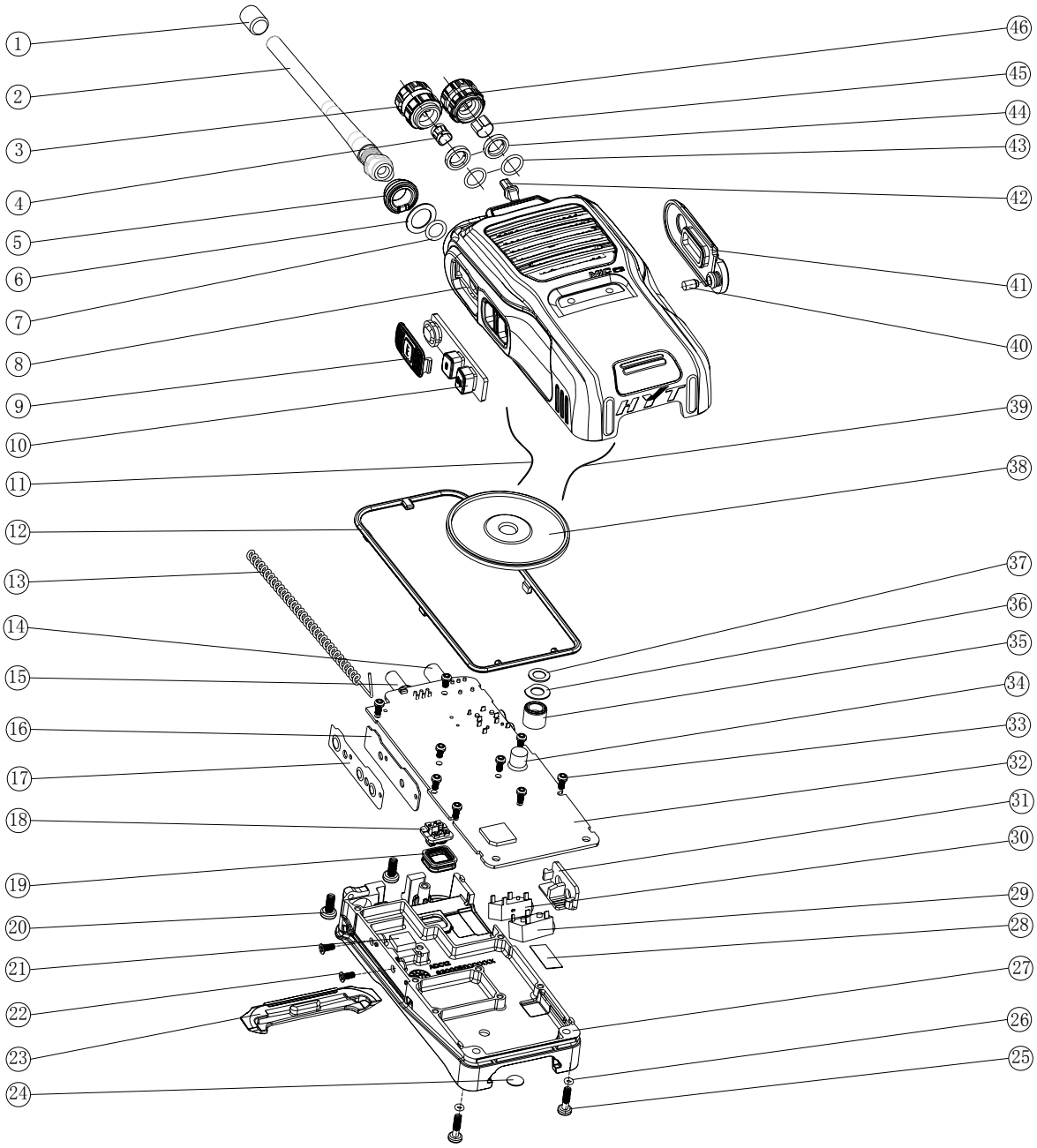


Figure 3

Assembling the Aluminum Chassis

To assemble the aluminum chassis, please perform the above steps in a reverse way.

Exploded View

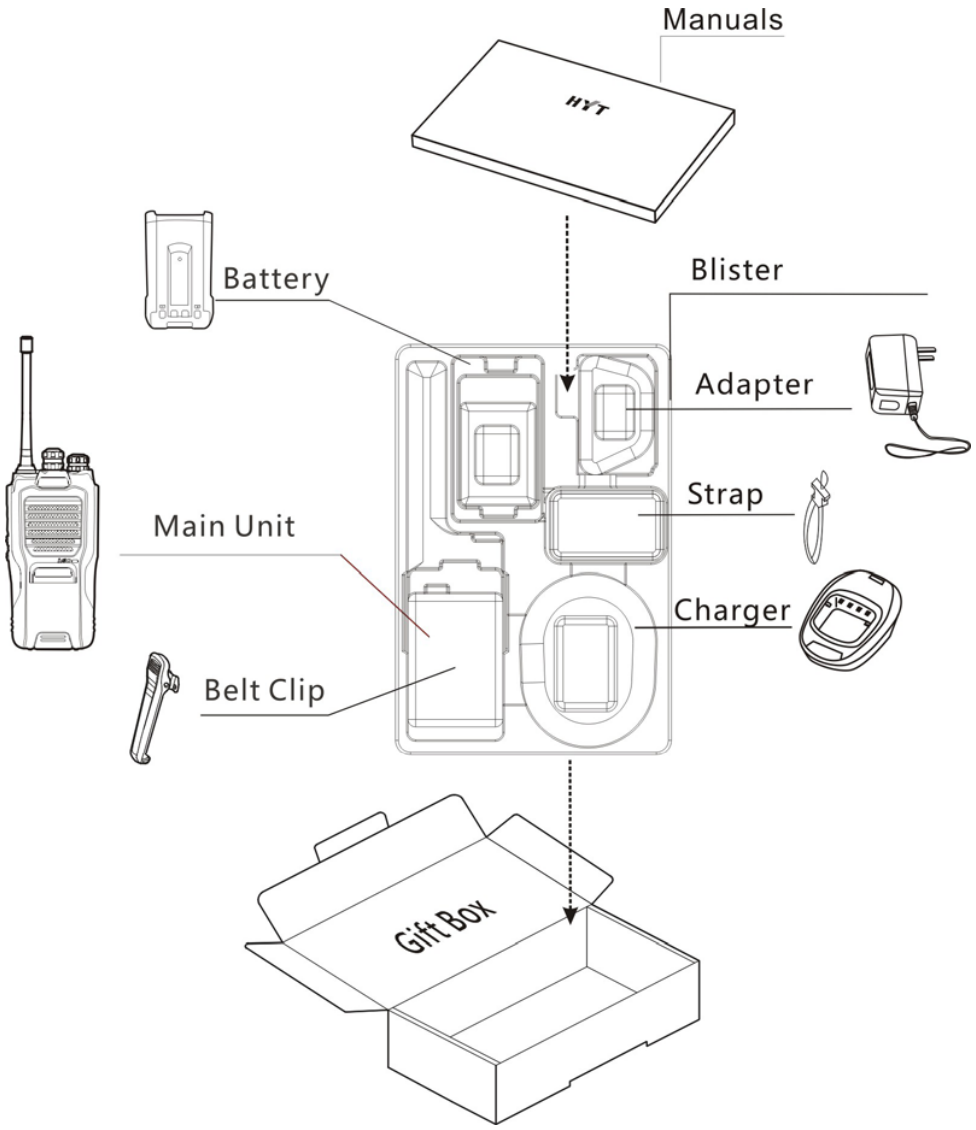


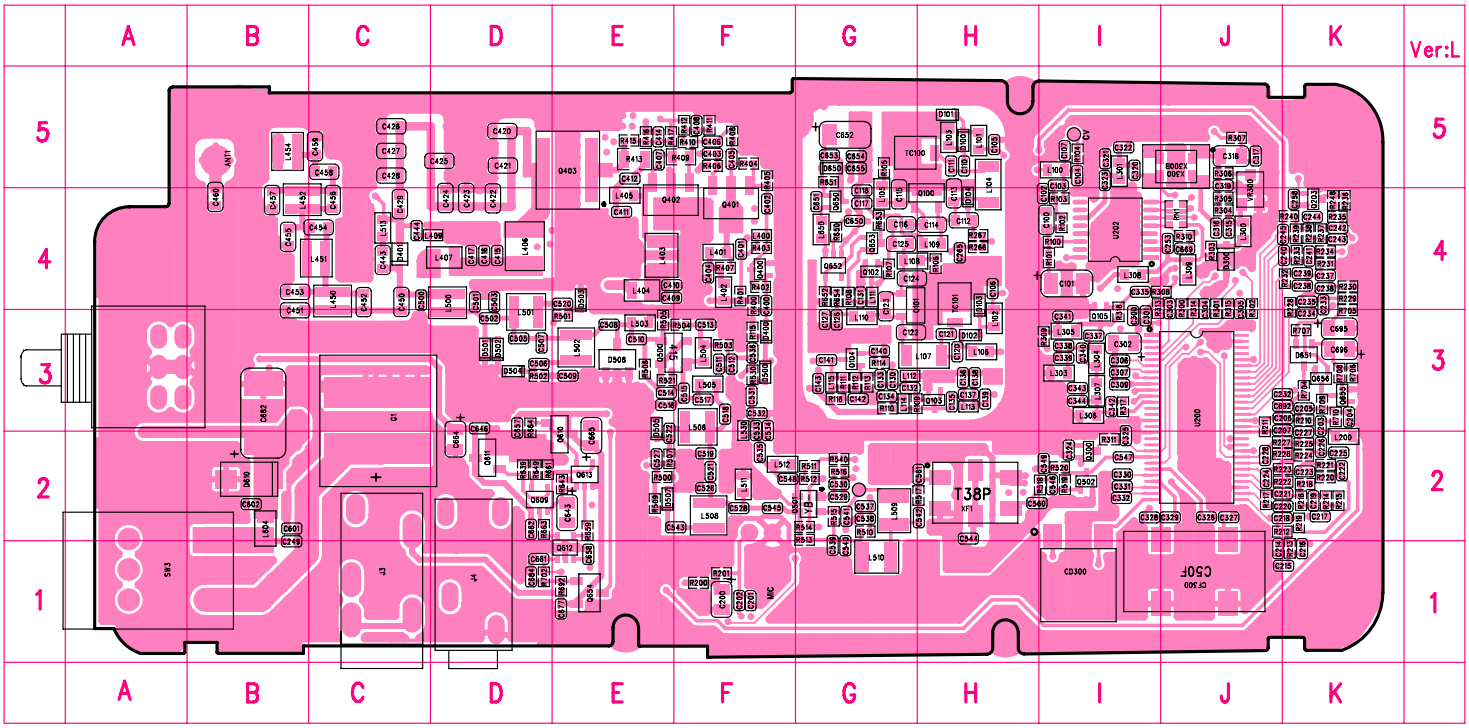
Parts List 2

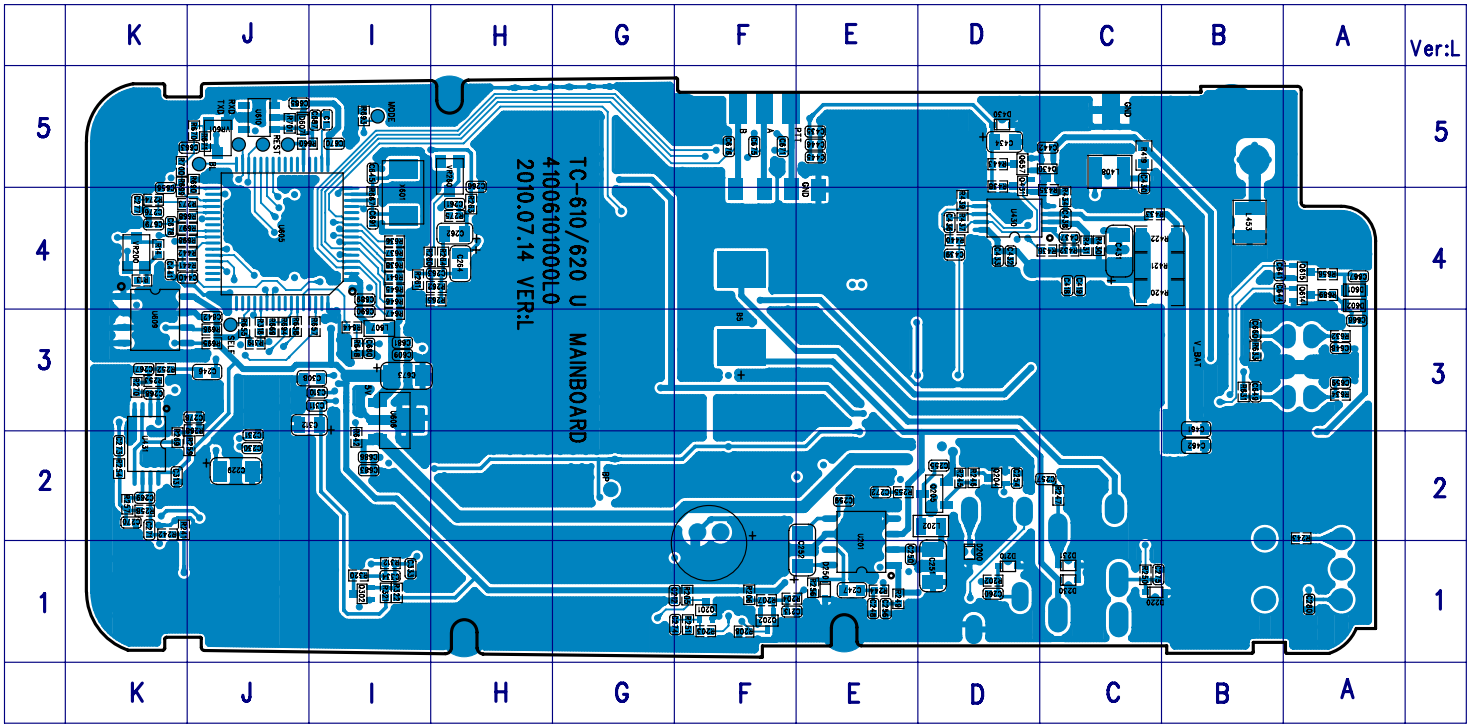
No.	Part Number	Description	Qty.
1	6000374000000	Antenna cap 00 (RoHS)	1
2	6001311000000	Antenna sleeve 00 (RoHS)	1
3	6000845100020	Encoder knob 02 (RoHS)	1
4	6201739000000	Inner lining of knob 00 (RoHS)	1
5	6001315000000	Antenna washer 00 (RoHS)	1
6	7400366000000	PC pad for antenna 00 (RoHS)	1
7	6100487000000	O_ring for antenna 00 (RoHS)	1
8	6000884100010	Ultrasonic front case 01 (RoHS)	1
9	6000842100010	Plastic PTT key 01 (RoHS)	1
10	6100312000010	PTT key (silicone rubber) 01 (RoHS)	1
11	4210060000000	Lead (RoHS)	1
12	6100307000010	Waterproof ring for radio 01 (RoHS)	1
13	7000276000000	Antenna core 00 (RoHS)	1
14	4302020000140	Volume switch (RoHS)	1
15	4304030000010	Gray code rotary switch (RoHS)	1
16	41006103000D0	PCB for PTT key (RoHS)	1
17	7300032000000	Metal dome for PTT key 00 (RoHS)	1
18	5205000001000	Battery connector (RoHS)	1
19	6100314000000	Waterproof ring for battery connector 00 (RoHS)	1
20	7103006001000	Machine screw 00 (RoHS)	2
21	7500116000020	Heat sink pad 02 (RoHS)	1
22	7102005000000	Machine screw 00 (RoHS)	2
23	6000843100000	Rear cover 00 (RoHS)	1
24	7400218000000	Waterproof and dustproof breathable film 00 (RoHS)	1
25	7102508000010	Machine screw 01 (RoHS)	2
26	6100333000010	O-ring for screw 01 (RoHS)	2
27	6300058000010	Aluminum chassis 01 (RoHS)	1
28	7400023010010	PC sheet 01 (RoHS)	1
29	5205004000030	Earpiece jack (RoHS)	1
30	5205005000040	Earpiece jack (RoHS)	1
31	6000852000000	Earpiece jack bracket 00 (RoHS)	1
32	1300004460020	Main board (RoHS)	1
33	7101904020200	Self-tapping screw 00 (RoHS)	9
34	5002220000070	Microphone (RoHS)	1
35	6100345000000	MIC cover 00 (RoHS)	1
36	7400217100000	MIC pad 00 (RoHS)	1
37	7400222000000	Waterproof MIC net 00 (RoHS)	1
38	5001210000030	Speaker (RoHS)	1
39	4210060000100	Lead (RoHS)	1

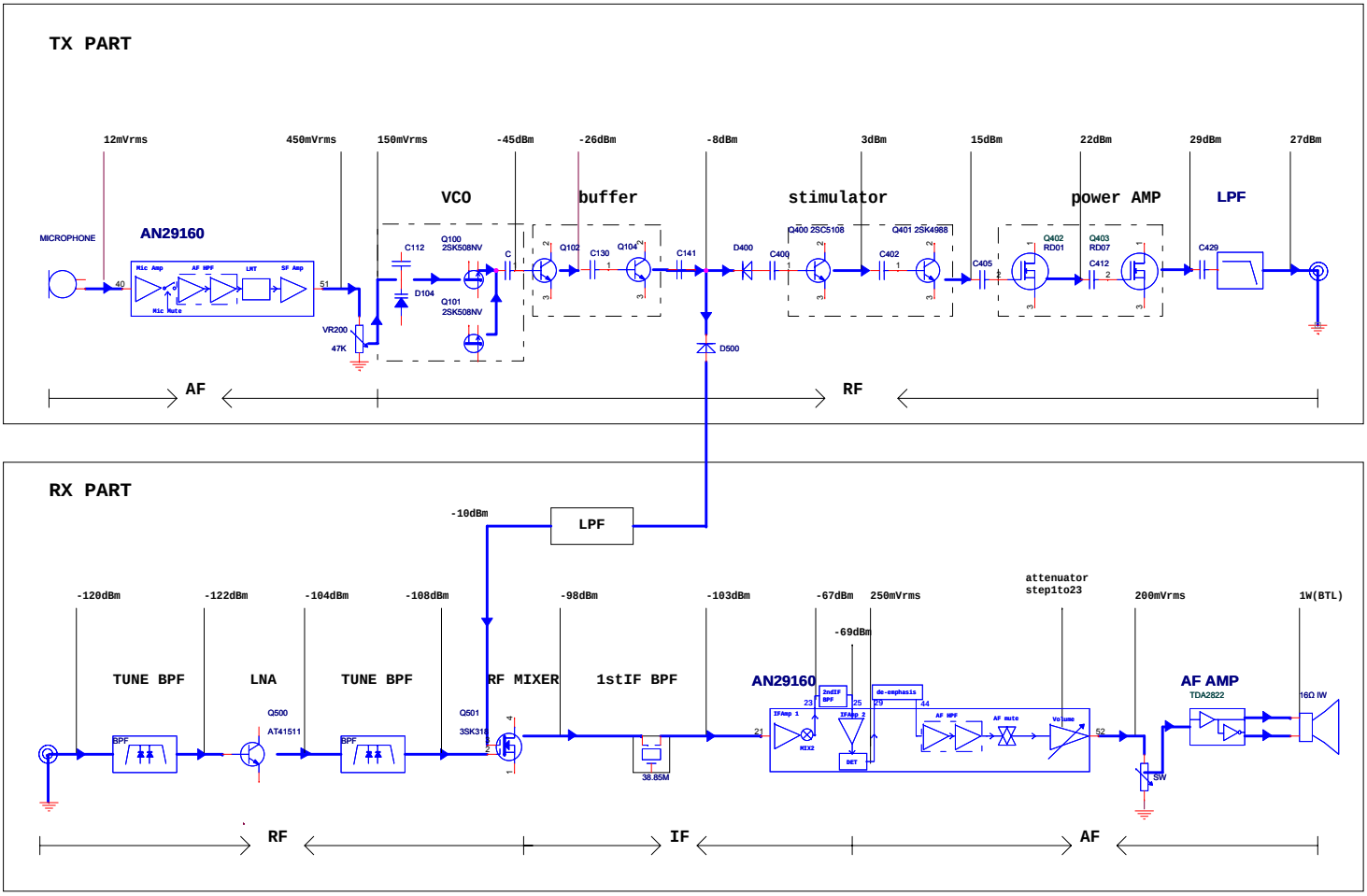
40	6000700000000	Plug for earpiece jack cover 00 (RoHS)	1
41	6000848000010	Earpiece jack cover 01 (RoHS)	1
42	6000847000000	Light guide 00 (RoHS)	1
43	6100334000000	O-ring for encoder switch 00 (RoHS)	2
44	7207002200200	Nut 00(RoHS)	2
45	6202157000000	Inner lining of volume control knob 00 (RoHS)	1
46	6000846100010	Volume control knob 01 (RoHS)	1

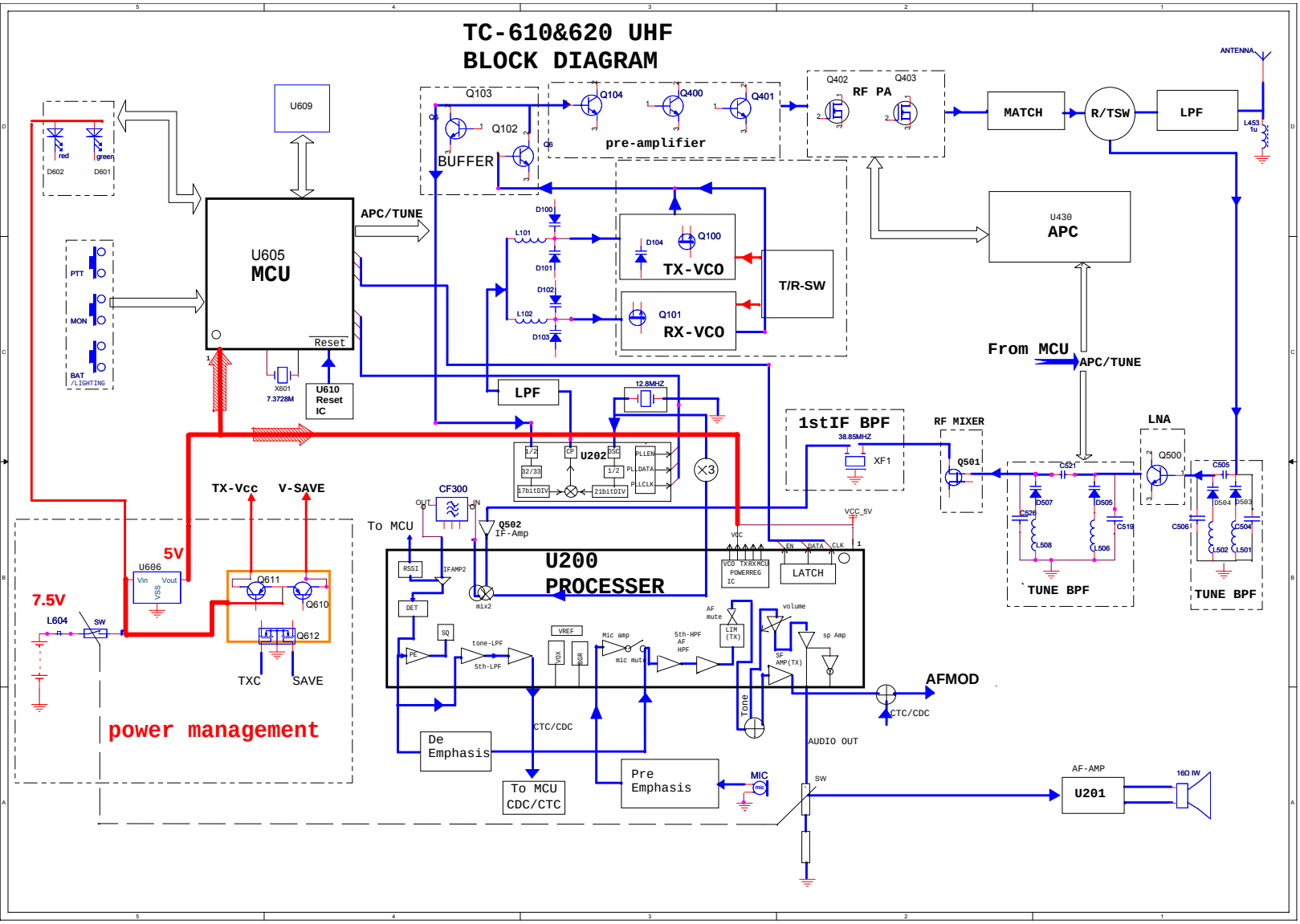
Packing Guide

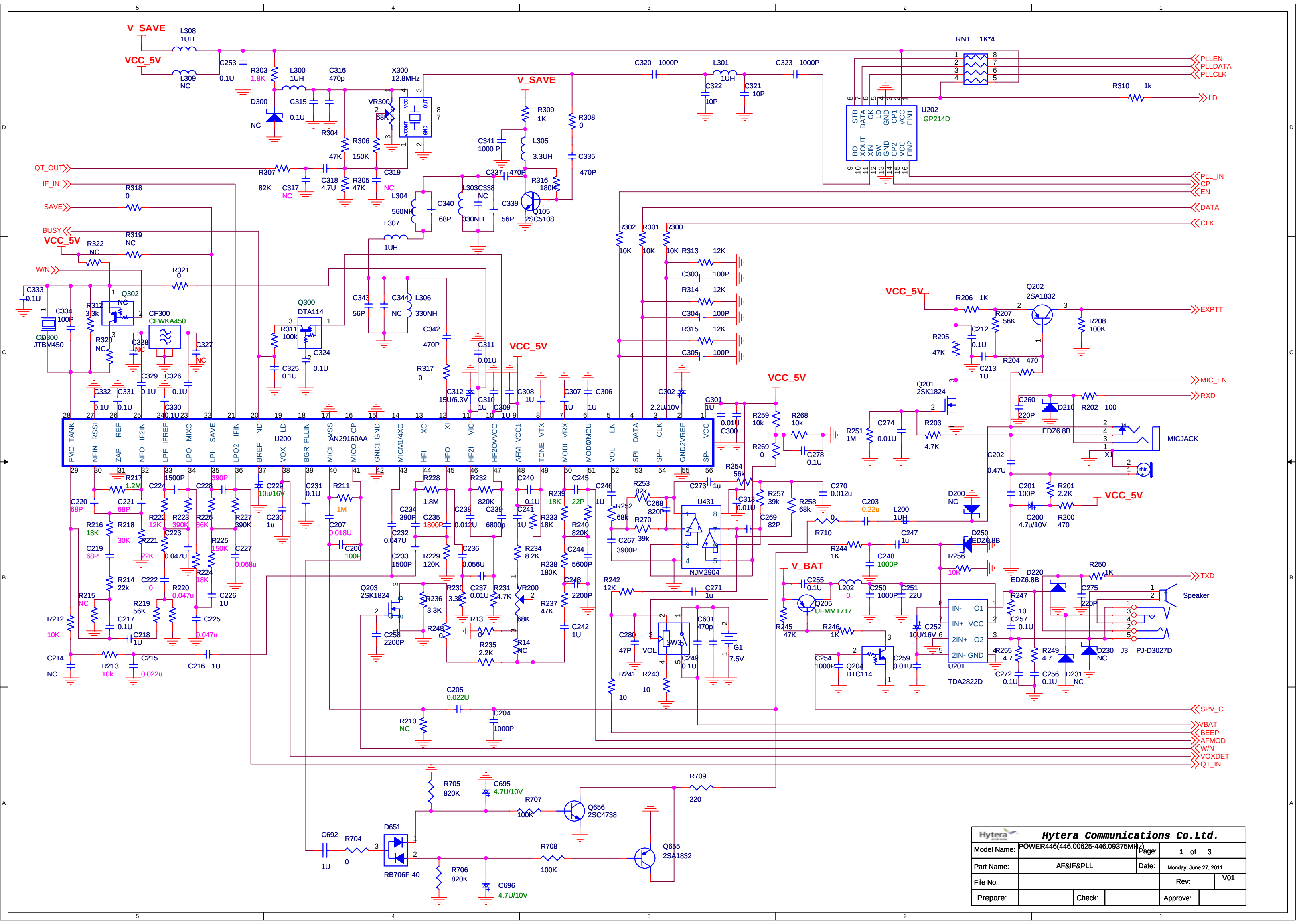



A
B
C
D
E
F
G
H
I
J
K
Ver:L
5
4
3
2
1
T38P
XFT
C530F
CD300


K J I H G F E D C B A Ver:L
5 4 3 2 1
TC-610/620 U MAINBOARD
4100610000L0
2010.07.14 VER:L


TX PART
12mVrms
450mVrms
150mVrms
-45dBm
-26dBm
-8dBm
3dBm
15dBm
22dBm
29dBm
27dBm
VCO
buffer
stimulator
power AMP
LPF
MICROPHONE
AN29160
Mic Amp
AF HPF
LMT
SP Amp
Mic Mute
C112
Q100
2SK508NV
D104
Q101
2SK508NV
C
Q102
C130
Q104
C141
D400
C400
Q400 2SC5108
C402
Q401 2SK4988
C405
Q402
RD01
Q403
RD07
C412
C429
VR200
47K
D500
AF
RF
RX PART
-10dBm
LPF
-120dBm
-122dBm
-104dBm
-108dBm
-98dBm
-103dBm
-67dBm
250mVrms
-69dBm
attenuator
step1to23
200mVrms
1W(BTL)
TUNE BPF
LNA
TUNE BPF
RF MIXER
1stIF BPF
AN29160
AF AMP
TDA2822
Q500
AT41511
Q501
3SK318
BPF
BPF
38.85M
1FAmp 1
MIX2
2ndIF BPF
1FAmp 2
DET
de-emphasis
AF HPF
AF mute
Volume
SW
16Ω IW
RF
IF
AF


TC-610&620 UHF
BLOCK DIAGRAM
ANTENNA
U609
Q103
Q104
Q400
Q401
Q402
Q403
RF PA
MATCH
R/TSW
LPF
L453
1u
BUFFER
pre-amplifier
U430
APC
red
green
D602
D601
PTT
MON
BAT
/LIGHTING
U605
MCU
APC/TUNE
Reset
X601
7.3728M
U610
Reset
IC
D100
L101
D101
D102
L102
D103
D104
Q100
TX-VCO
Q101
RX-VCO
T/R-SW
From MCU
APC/TUNE
LPF
12.8MHZ
1stIF BPF
38.85MHZ
XF1
RF MIXER
Q501
LNA
Q500
C521
C505
D507
D505
D504
D503
C526
C519
C506
C504
L508
L506
L502
L501
TUNE BPF
TUNE BPF
U202
1/2
32/33
17bitDIV
21bitDIV
PLLEN
PL_DATA
PLLCLK
OSC
CP
x3
TX-Vcc
V-SAVE
CF300
OUT
IN
To MCU
Q502
IF-Amp
U200
PROCESSER
VCC_5V
VCC
VCO TX RX MCU
POWERREG
IC
LATCH
EN
DATA
CLK
RSSI
IFAMP2
mix2
DET
SQ
PE
tone-LPF
5th-LPF
VREF
VOX
BGR
Mic amp
mic mute
5th-HPF
AF
HPF
AF
mute
LIN
(TX)
volume
sp Amp
SF
AMP(TX)
Tone
AFMOD
CTC/CDC
AUDIO OUT
5V
U606
Vin
Vout
VSS
7.5V
L604
SW
Q611
Q610
Q612
TXC
SAVE
power management
De
Emphasis
CTC/CDC
To MCU
CDC/CTC
Pre
Emphasis
MIC
SW
AF-AMP
U201
16Ω 1W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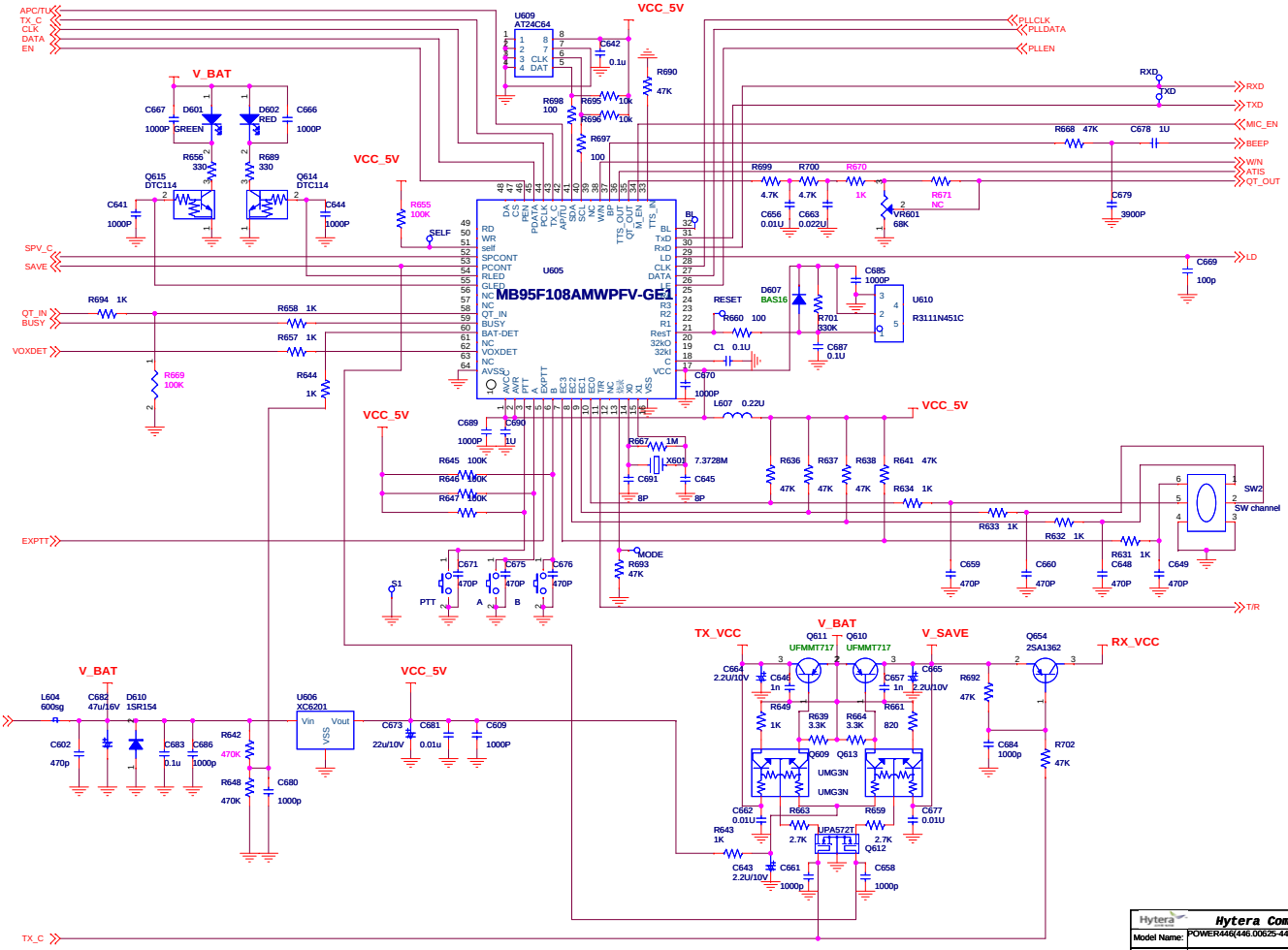
Model Name: POWER446(446.00625-446.09375MHz)
Page: 1 of 3
Part Name: AF&IF&PLL
Date: Monday, June 27, 2011
File No.:
Rev: V01
Prepare:
Check:
Approve:
V_SAVE
VCC_5V
V_BAT
U200 AN29160AA
U202 GP214D
U431 NJM2904
U201 TDA2822D
X300 12.8MHz
CF300 CFWKA450
CD300 JTBM450
Q300 DTA114
Q302
Q105 2SC5108
Q202 2SA1832
Q201 2SK1824
Q203 2SK1824
Q204 DTC114
Q205 UFMMT717
Q656 2SC4738
Q655 2SA1832
D651 RB706F-40
RN1 1K*4
MICJACK
Speaker
J3 PJ-D3027D
PLLEN
PLLDATA
PLLCLK
LD
PLL_IN
CP
EN
DATA
CLK
EXPTT
MIC_EN
RXD
TXD
SPV_C
VBAT
BEEP
AFMOD
W/N
VOXDET
QT_IN
QT_OUT
IF_IN
SAVE
BUSY



Hytera	**Hytera Communications Co.Ltd.**				
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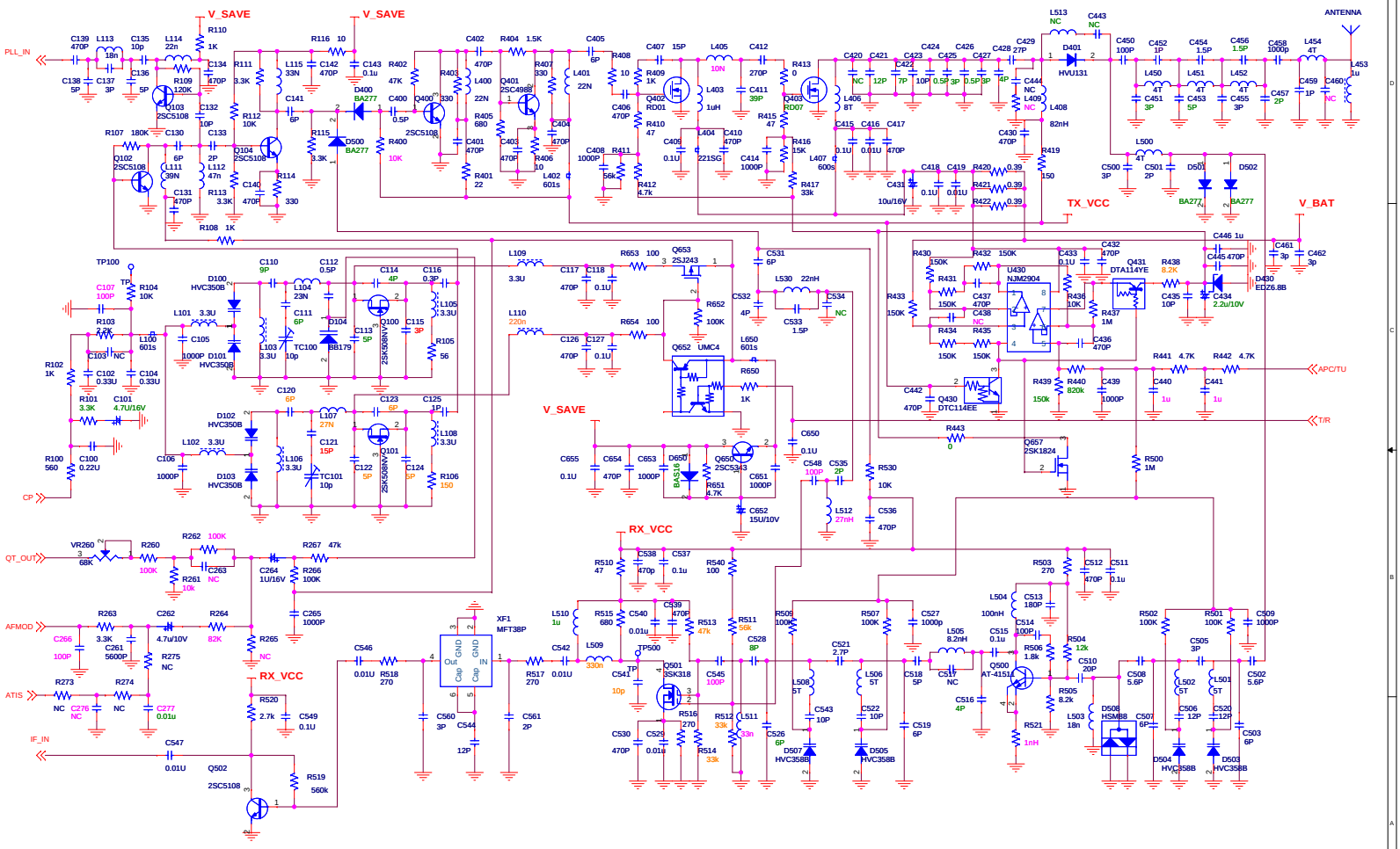
Part Name:	MCU&POWER			Date:	Monday, June 27, 2011
File No.:				Rev:	V01
Prepare:		Check:		Approve:	


V_SAVE
V_SAVE
PLL_IN
ANTENNA
TX_VCC
V_BAT
APC/TU
T/R
V_SAVE
RX_VCC
QT_OUT
AFMOD
ATIS
IF_IN
CP
RX_VCC
TP100
XF1
MFT38P
Hytera Communications Co.Ltd.
Model Name: POWER446(446.00625-446.09375MHz)
Page: 3 of 3
Part Name: VCO&RF
Date: Monday, June 27, 2011
File No.:
Rev: V01
Prepare:
Check:
Approve:

Specifications

General	
Frequency Range	446.00625-446.09375MHz
Channel Capacity	16
Channel Spacing	12.5KHz
Operating Voltage	7.4V DC
Battery	2000mAh Li-Ion battery
Battery Life (5-5-90 Duty Cycle)	≥25H (2000mAh)
Operating Temperature	-25℃～+65℃
Frequency Stability	±2.5ppm
Receiver	
Sensitivity	≤ 0.282uV
Adjacent Channel Selectivity	≥60dB
Intermodulation	≥60dB
Spurious Response Rejection	≥70dB
Rated Audio Power Output	800mW
Rated Audio Distortion	≤5%（800mW）
Transmitter	
RF Power Output	＜0.5W
Spurious and Harmonics	-36dBm (frequency＜1GHz)　-30dBm (frequency＞1GHz)
Modulation Limiting	≤2.5KHz
Modulation Distortion	≤5%

Note: All Specifications are tested according to TIA/EIA-603, and subject to change without notice due to continuous development.

Address: HYT Tower, Hi-Tech Industrial Park North, Beihuan RD., Nanshan District, Shenzhen, China
Postcode:518057
http://www.hytera.com

8130044600200