Contents

Edition	Release Date	Revised Content
8130070000000	2005/09/22	Initial release
	2006/09/22	1) 2-Tone/5-Tone, add HDC1200 and HDC2400™ 2) Update schematic diagram and part list 3) Update exploded view, part list and diagram for disassembly and assembly

General

Manual Scope

This manual is intended for use by experienced technicians familiar with similar types of communication equipment. It contains all service information required for the equipment and is current as of the publication date.

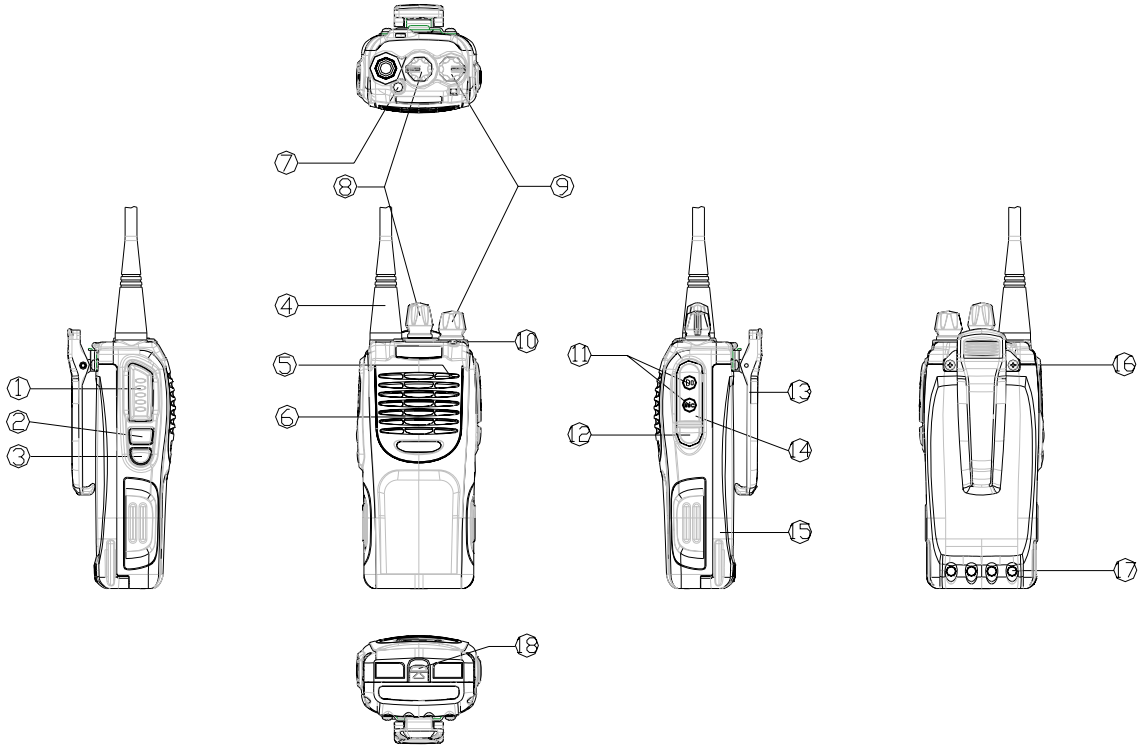
User Safety Information

The following precautions are recommended for personnel safety:

- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and do not operate this equipment near electrical blasting caps or in an explosive atmosphere.
- When in vehicles with an airbag, do not place a portable radio in the area over an airbag or in the airbag deployment area.
- Do not expose the radio to direct sunlight for a long time nor place it close to a heating source.
- Do not use any portable radio with a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn may result.
- When transmitting with a portable radio, hold the radio in a vertical position with its microphone about 5 centimeters away from your mouth.
- If you wear a portable radio on your body, be sure to keep the antenna at least 2.5 centimeters away from your head or body when transmitting.
- This equipment should be serviced by a qualified technician only.

Brief Introduction

Control Knob and Function Key



(1) PTT Key（Push-To-Talk Key）

Select transmit/receive mode. Press and hold PTT, radio operates in transmit mode. Release PTT, radio returns to receive mode.

(2) SK1 Key

Side Key1, programmable key

(3) SK2 Key

Side Key2, programmable key

(4) Antenna

(5) Microphone

(6) Speaker

(7) TK Key

Top Key, programmable

(8) Channel Selector Knob

Rotate the knob to select Channel1 to 16

(9) Power/Volume Control Knob

Rotate the Power/Volume Control Knob clockwise to turn the radio on; fully counter clockwise to turn the radio off. Increase or decrease volume by adjusting the volume control accordingly.

(10) LED Indicator

Red LED glows while transmitting; green LED glows while receiving; red LED flashes when the battery voltage is low.

(11) External Jack

(12) Earplug Cover Screw

(13) Earplug Cover

(14) Belt Clip

(15) Battery

(16) Belt Clip Screw

(17) Charging Connector

(18) Release Button

Software Specification

Specification:

◆ Conventional Mode

1. Mechanical Knob (16 channels)

   VHF:136～174MHz

   UHF:400-470MHz, 450～520MHz
2. Channel Spacing: 25/20/12.5KHz (Wide/Medium/Narrow bandwidth compatible)
3. Step: 2.5/5/6.25KHz
4. LED Indicator: Red/Green
5. 3 Programmable Function Keys
6. CTCSS/CDCSS Encode & Decode
7. DTMF Encode
8. 2-Tone (2-Tone version) / 5-Tone (5-Tone version)
9. HDC2400^{TM} Encode & Decode
10. HDC1200 Encode & Decode
11. Squelch Mode:
    1) Carrier
    2) CDCSS/CTCSS
    3) Optional Signalling
    4) CTCSS/CDCSS AND 2-Tone/5-Tone/ HDC2400^{TM}/HDC1200
    5) CTCSS/CDCSS OR 2-Tone/5-Tone/ HDC2400^{TM}/HDC1200
12. Scan
13. Time-Out-Timer (TOT)
14. Rent
15. Battery Save
16. Emergency
17. PTT ID
18. Busy Channel Lockout & Busy Tone Lockout

Description

1. User Mode

This mode is for normal operation.

2. All Reset Mode

Firstly ground the SELF point, and then turn the power on while holding down TK key for 2 seconds. The radio enters all reset mode with green LED flashing twice. Turn the channel selector knob to the

selected channel and press PTT, the radio data is all reset (All clone modes will be automatically activated when All Reset is completed). Frequency settings are shown as follows:

Channel data is shown as follows:

Channel	RX Frequency (MHZ)	TX Frequency (MHZ)	Signaling	Power	Channel Spacing
1	RX1	TX1	None	H	25KHZ
2	RX3	TX3	None	H	25KHZ
3	RX5	TX5	None	H	25KHZ
4	RX1	RX1	None	LO	20KHZ
5	RX3	RX3	None	LO	20KHZ
6	RX5	RX5	None	LO	20KHZ
7	RX1	RX1	None	LO	12.5KHZ
8	RX3	RX3	None	LO	12.5KHZ
9	RX5	RX5	None	LO	12.5KHZ
10	RX3	RX3	67HZ	LO	25KHZ
11	RX3	RX3	254.1HZ	LO	25KHZ
12	RX3	RX3	023	LO	25KHZ
13	RX3	RX3	754	LO	25KHZ
14	RX3	RX3	2-TONE	LO	25KHZ
15	RX3	RX3	5-TONE	LO	25KHZ
16	RX3	RX3	None	LO	25KHZ

3. Wireless Clone Mode

Select wireless clone from optional functions in programming software, turn the power on while holding down PTT and SK1 key simultaneously for 2 seconds, then the source and target radios enter wireless clone mode with orange LED flashing one time（After the source and target radios are turned on and stay in the same channel, hold down PTT on the source radio to begin cloning）. During cloning, the LED of the source radio glows red and that of the target radio glows green. The target radio flashes green and two Beeps are heard in case of successful cloning, it flashes red in case of cloning failure.

4. User Wired Clone Mode

Select Wired Clone from optional functions in programming software, turn the power on while holding down PTT and SK2 key simultaneously for 2 seconds, then the source radio enters user wired clone mode with orange LED flashing twice. Then directly turn the target radio on. Hold down PTT on the source radio to begin cloning. During cloning, the LED of the source radio glows red and that of the target radio glows green. The LED of the source radio goes out in case of successful cloning, it flashes red in case of cloning failure.

5. Manual Adjust Mode

Manual adjustment is performed to adjust frequency deviation, power, sensitivity, squelch, etc.
Note: Prior to entry for mode startup, select Manual Adjust Mode from optional functions in programming software.

Manual Adjust Mode Description

(1) Enter the manual adjust mode

Turn the power on by holding down TK and SK2 key simultaneously for 2 seconds, then the radio enters manual adjust mode with red LED flashing twice.

(2) Channel number on the channel selector knob

Each channel on the channel selector knob is defined as a setting item. 25KHz bandwidth and low frequency (F1) is set on the next channel each time the Channel Selector Knob is rotated.

(3) SK2 key

Used to set the frequency. 1 point tuning adjusts center frequency; 3 point tuning adjusts F1, F3, F5; 5 point tuning adjusts F1-F5.

The frequency toggles from low frequency to high frequency. Green LED flashes once when F1 is selected.

(4) TK key

Use to toggle the channel bandwidth among 25 KHz, 20 KHz and 12.5 KHz. Red LED flashes once when the bandwidth is 25 KHz.

(5) PTT/SK1

PTT→Increase

SK1→Decrease

PTT/SK1 is pressed to adjust upward/downward. Red LED glows indicating the maximum adjust value and green LED indicating the minimum value. Hold down the key to increase/decrease the adjustment value continuously.

Press PTT key to save the BATT LOW, and SQL settings, then green LED glows once.

(6) Select adjustment item group

The first group of adjustment items is selected when the radio enters the manual adjust mode. Turn to CH16 and press PTT key to enter the next group. Press it again to return to the first group. Orange LED flashes once when the first group of adjustment items is selected and flashes twice when the second group is selected.

(7) Frequency Setting

5 point tuning（MHz）	TX: {TX1,TX2,TX3,TX4,TX5}
	RX: {RX1,RX2,RX3,RX4,RX5}
3 point tuning（MHz）	TX: {TX1, TX3, TX5}
	RX: {RX1, RX3, RX5}
1 point tuning（MHz）	TX: {TX3}
	RX: {RX3}

First Group of Adjustment Items				
Channel No.	**Adjustment Item**	**Remarks**		
		25KHz	20KHz	12.5KHz
1	TX power LOW	5 point tuning		
2	CDCSS PLL balance	3 point tuning (wideband)		
3	CDCSS deviation	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
4	CTCSS deviation LOW (67Hz)	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
5	CTCSS deviation CENTER (136.5Hz)	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
6	CTCSS deviation HIGH (254.1Hz)	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
7	AK2346 audio deviation (TX)	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
8	2 TONE deviation	1 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
9	DTMF deviation	1 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
10	MSK deviation	3 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
11	TX power HIGH	5 point tuning		
12	TX voltage LOW	1 point tuning		

Second Group of Adjustment Items				
Channel No.	**Adjustment Item**	**Remarks**		
		25KHz	20KHz	12.5KHz
1	RX sensitivity	5 point tuning		
2	AK2346 volume (RX)	1 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
3	Squelch level 3 (OPEN)	5 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
4	Squelch level 3 (SQUELCH)	5 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
5	Squelch level 9 (OPEN)	5 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
6	Squelch level 9 (SQUELCH)	5 point tuning (wideband)	1 point tuning	1 point tuning (narrowband)
7	RX voltage LOW	1 point tuning		

6. PC Adjust Mode

Select test mode from programming items in programming software and then begin adjustment.

Circuit Description

1. Power Supply

Power supply of the radio is derived from the battery, which supplies battery B+ after passing through fuse 3A and then feeds through power switch. The power supplies voltage for three AVRs. IC504 supplies 5V (M5V) voltage for the control circuit. And IC503 supplies 5V (C5V) voltage for the shared circuit. IC502 supplies voltage for the transmit/receive circuit. In transmit mode, T5C becomes low voltage and Q502 is turned on to supply 5V (T5v) voltage for the transmit circuit. In receive mode, R5C becomes low voltage and Q504 is turned on to supply 5V (R5V) voltage for the receive circuit.

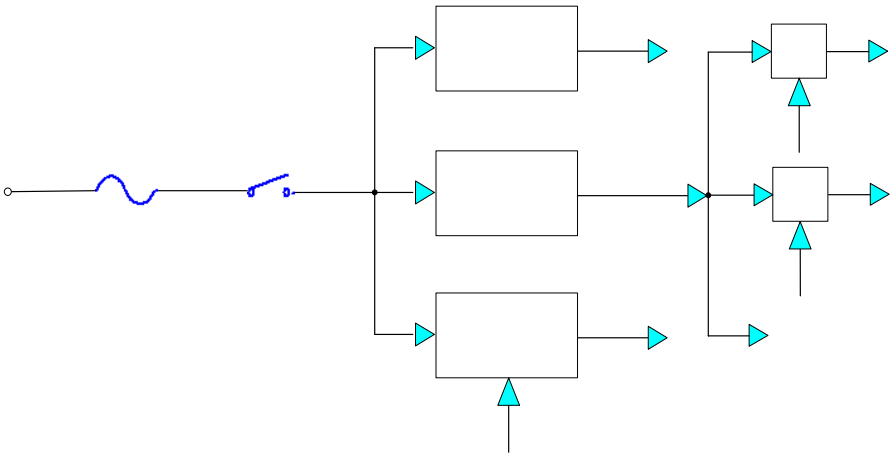


Fig. 1 Power Supply Block Diagram

2. PLL Frequency Synthesizer

PLL circuit generates the first local oscillator signal for reception and RF signal for transmission.

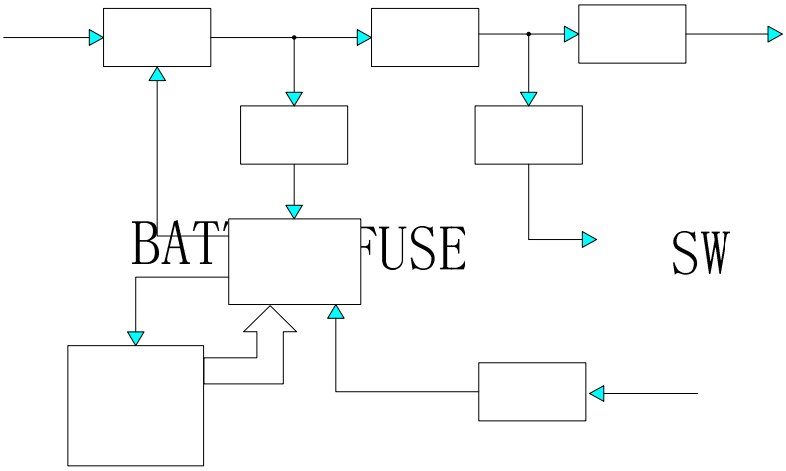


Fig.2 PLL Block Diagram

1） PLL Circuit

Step frequency of PLL can be 2.5 KHz, 5.0 KHz or 6.25 KHz. A 16.8MHz reference oscillator signal is divided at IC301 by a counter to generate a 2.5 KHz, 5.0 KHz or 6.25 KHz reference frequency. Output signal from VCO is buffer amplified by Q301 and divided at IC301 by a frequency divider. The divided signal is compared with 2.5 KHz, 5.0 KHz or 6.25 KHz reference signal in the phase comparator of IC301. The output signal from phase comparator is filtered through a low pass filter to generate a level D.C., and the level D.C. controls oscillator frequency by controlling VCO.

2） VCO

The operating frequency is generated by Q302 in transmit mode and by Q307 in receive mode. Operating frequency generate a control voltage by phase comparator to control varactor diodes so that the oscillator frequency is consistent with the MCU preset frequency(D301、D302、D303 and D304 in transmit mode, and D307、D308、D309 and D310 in receive mode). T/R pin is set high level in receive mode, and low level in transmit mode. The output from Q302 and Q307 is amplified by Q304 and sent to buffer amplifier.

3） Unlock Detector

An unlock condition appears if low level appears at MUXOUT pin of IC301. Transmission is forbidden if this condition is detected by microprocessor.

3. Receiver

The receiver utilizes double conversion superheterodyne (UHF)/(VHF).

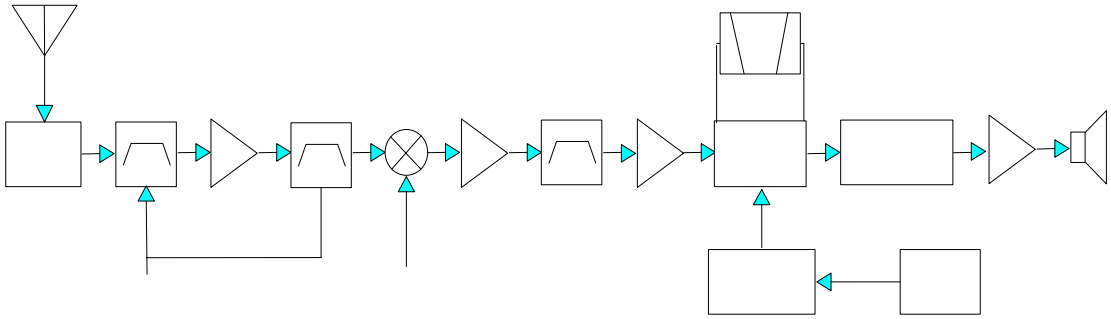


Fig. 3 Receiver Section Configuration

1） Front-end RF Amplifier

The signal from antenna is amplified at RF amplifier (Q207) after passing through a transmit/receive circuit and a band pass filter. Before passing the first mixer, the amplified signal is filtered through another band pass filter to remove unwanted signals.

2） First Mixer

The signal from RF amplifier is mixed with the first local from PLL frequency synthesizer circuit at the fix mixer (IC202) to create a 49.95MHz first IF signal. The first IF signal is then fed through a crystal filter (XF203) to further remove unwanted signals.

3） IF Amplifier

The first IF signal is amplified by Q206 before passing through crystal filter and by Q204 after crystal filter and then enters IF processing chip IC204. The signal from IC204 is mixed with the second oscillator signal again in IC204 to create a 450 KHz second IF signal. The second IF signal then passes through a 450KHz ceramic filter (wideband: CF201，narrowband: CF202) to eliminate unwanted signals before it is amplified and detected in IC204.

4） Narrowband/Wideband Switch Circuit

Pin WCON and NCON of IC500 outputs wideband (high level) and narrowband (low level) controlling signal respectively to turn on corresponding diode-connector, and to choose ceramic filter CF201 (wideband) or CF202 (narrowband) to filter useless spurious signal.

5） AF Amplifier

The resulting AF signal from IC204 enters base band processing chip IC408. The processed AF signal is then amplified by an AF power amplifier (IC401) to drive the speaker.

4. Transmitter

1） AF and Signaling

AF signal from the microphone is amplified and low-pass-filtered in IC402 before it enters base band processing chip IC408, which also enters CTC/CDC/DTMF/2-Tone/5-Tone etc signaling generated by CPU. The IC408 processed mixing signal enters VCO for direct FM modulation (see fig.5).

2） RF Power Amplifier

The transmit signal from VCO buffer amplifier (Q111) is amplified by Q101 and Q102. The amplified signal is then amplified by the power amplifier Q103 and Q104 (including a two-stage FET amplifier) to create 4.0W (UHF)/5.0W (VHF) RF power (see Fig. 6).

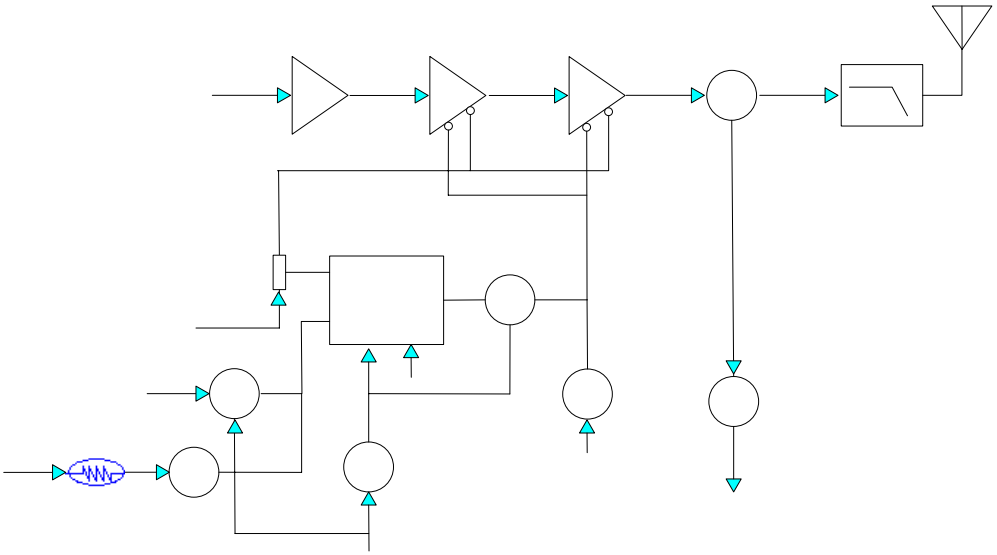


Fig. 4　APC System

3） Antenna Switch and LPF

Output signal from RF amplifier passes through a low-pass filter network and a transmit/receive switch circuit comprised of D102，D103 and D104 before it reaches the antenna terminal. D103 and D104 is turned on (conductive) in transmit mode and off (isolated) in receive mode.

4） APC

The automatic power control (APC) circuit stabilizes the transmit output power by detecting the drain current of final stage amplifier FET. IC101 (2/2) compares the preset reference voltage with the voltage obtained from final current. APC voltage is proportional to the difference between auto detect voltage and reference voltage output from IC101 (1/2). The output voltage controls FET power.

5. Base Band and Signaling System

The block diagram of signaling section is shown as figure 5.

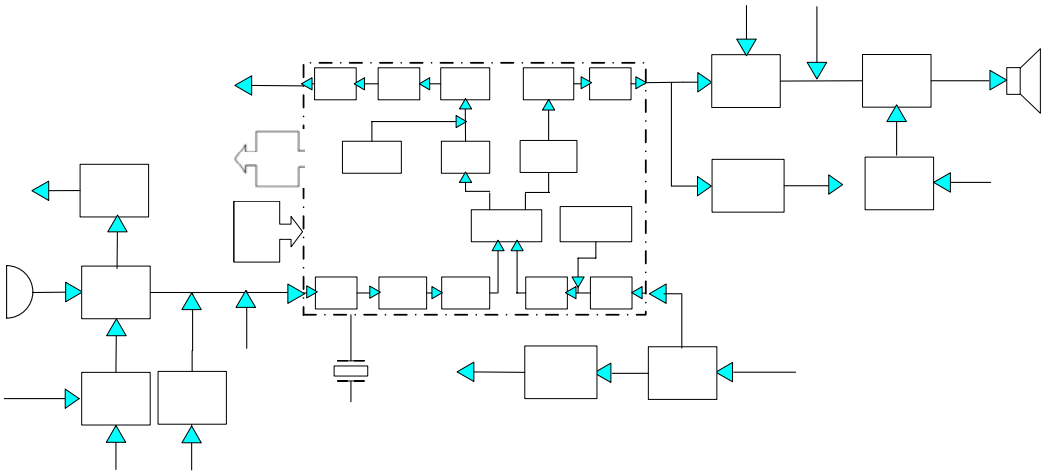


Fig. 5 AF and Signaling Circuit

1） CTC/CDC

Transmit: CTC/CDC signaling produced by CTC_PLL pass a low pass filter and then enters VCXO. CTC/CDC signaling produced by CTC_OUT pass a low pass filter and then mixed with AF before enters VCO.

Receive: Demodulated signal enters MCU after pass IC404、IC405. MCU then judges whether CTC/CDC matches the preset values or not. According the result, the out tone will be controlled by AFMUTE.

2） 2-Tone / 5-Tone and DTMF

Transmit: The signal produced by MCU provides a TX and SP out tone, and is then applied to the base band processing IC. The signal in mixed with the audio signal and goes to the VCO。

Receive: Demodulated signal is filtered after passing base band processing IC, and then enters MCU for decoding.

AUDIO PROCESSO
IC408
AK2346
MOD SMF VR2 Splatter
AFCK
CODIC
AFRDF
MSK
Modulator
Limiter
VOX D402
RB706F-4C
AFDI
AFSK
AFDIR
1/20SD
TONEC
Scrambler
DeScramble
MIC

3） MSK

Transmit: MSK signal produced by base band processing IC enters VCO together with AF signal for modulation.

Receive: MSK input of demodulating IC is sent to AK2346 for demodulation after being amplified. The demodulated signal is then sent to MCU for decoding.

4） AF

Transmit: AF signal from MIC enters base band processed IC for amplification, pre-emphasis etc. after being amplified. And then it enters VCO for modulation.

Receive: Demodulated AF signal enters the base band processing IC for amplification, de-emphasis etc. after being amplified. And then it enters AF power amplifier drived speaker.

Base band processed chip provides functions for processing signal as amplifying, filtering, emphasizing, scrambling, companding, and amplitude limiting.

6. Control System

The IC500 CPU operates at 9.8304 MHz.

The block diagram of MCU control system is shown as following：

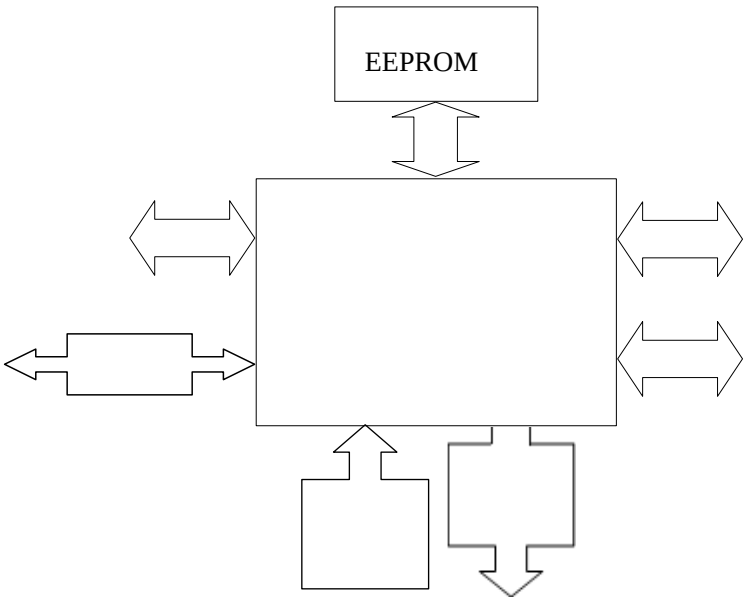


Fig.6 MCU Block Diagram

Circuit in this section is mainly comprised of MCU, EEPROM etc.

MCU control circuit accomplishes the following functions: accomplish the reset initialization according to the programmed feature of the radio when power on; detect keying signal and monitor battery voltage; send necessary frequency data to PLL according to encode of the channel; switch and control transmit/receive according to the signal input from PTT; turn on/off the mute circuit according to the input signaling decode signal and squelch level signal; output control signal to control the light/off of LED; control signaling process IC to perform tasks.

CPU Pins

1. CPU pins are as follows:

No.	MCU Port Name	Port Name	Input/Output	Features
1	P94/DA1	APC/TV	O	Automatic Power Control
2	P93/DA0	TONEO	O	DTMF/2-5Tone/Beep tone output/ ALARM tone output
3	P92/TB2IN	NC	O	NC
4	P91		O	
5	P90	SHIFT	O	Clock beat-frequency
6	BYTE	BYTE	I	
7	CNVSS	CNVSS	I	
8	P87/XCIN		O	
9	P86/XCOUT		O	
10	RESET	RESET	I	Input low level to enter all reset mode
11	XOUT	XOUT	O	Crystal oscillator output pin
12	VSS	GND	I	GND
13	XIN	XIN	I	Crystal oscillator output pin
14	VCC	VCC	I	VCC
15	P85/NMI	NMI	I	
16	P84/INT2	AFCK	I	2346 TCLK
17	P83/INT1	AUX1	O	Indication for external scrambler
18	P82/INT0	AFRDF	I	2346 RDF
19	P81		O	
20	P80	PTTCO	O	PTTCO
21	P77	NC	O	
22	P76/TA3O	CTCOUT	O	CTC _OUT (PWM) TO VCO
23	P75	NC	O	
24	P74/TA2O	CTC_PLL	O	CTC_PLL (PWM)
25	P73	AUX2	COM5	Indication for receive/transmit status
26	P72/TA1O	1/2OSC	O	
27	P71/RxD2/TB5IN	TONEI	O	
28	P70/TxD2			
29	P67/TxD1	TXD	O	Serial date output.
30	P66/RxD1	RXD	I	Serial date input.
31	P65		I	
32	P64		O	
33	P63/TxD0		I	COM4 MANDOWN Input Pin
34	P62/RxD0		O	COM3

35	P61			COM1
36	P60			COM2
37	P57/RDY	EEDAT	I/O	EEPROM DATA, date input/output.
38	P56/ALE	EECLK	O	EEPROM CLK
39	P55/HOLD			
40	P54/HLDA	AFDIR	O	AK2346 DIR
41	P53/BLCK	AFSCK	O	2346 SCLK
42	P52/RD	NC	O	
43	P51/BHE	AFDT	O	2346 TDATA
44	P50/WR	WE	I	
45	P47/CS3	CODIO	I/O	Common date control (AK2346 DATA).
46	P46/CS2			
47	P45/CS1	SAVE	O	SAVE, power save control
48	P44/CS0	R5C	O	R5C Rx circuit power supply control
49	P43/A19	T5C	O	T5C Tx circuit power supply control
50	P42/A18			
51	P41/A17			
52	P40/A16			
53	P37/A15			
54	P36/A14			
55	P35/A13			
56	P34/A12			
57	P33/A11			
58	P32/A10			
59	P31/A9			
60	Vcc	VCC	I	VCC
61	P30/A8	NCON	O	Narrowband control
62	Vss	GND	I	GND
63	P27/A7	AFCO	O	AFCO
64	P26/A6	WCON	O	Wideband control
65	P25/A5	LEDR	O	Red light control：H，lit；L，out
66	P24/A4	LEDG	O	Green light control：H，lit；L，out
67	P23/A3	EN2	I	EN2
68	P22/A2	EN4	I	EN4
69	P21/A1	EN3	I	EN3
70	P20/A0	EN1	I	EN1
71	P17/INT5			
72	P16/INT4	AFMUTE		

73	P15/INT3			
74	P14	TK	I	Top Key
75	P13	DC-Switch	O	
76	P12	PLL_UL	I	PLL unlock detect
77	P11	PLL_STB	O	PLL strobe output
78	P10	MICMUTE	O	MICMUTE
79	P07/D7	Option1	I	Programming cable detect.
80	P06/D6	PLL_DATA	O	PLL date input
81	P05/D5	PLL_CLK	O	PLL clock output
82	P04/D4	T/R	O	Receive/transmit control
83	P03/D3	APC-Switch	O	
84	P02/D2	PTT	I	PTT
85	P01/D1	SK1	I	Side Key1
86	P00/D0	SK2	I	Side Key2
87	P107/AN7		I	MIC signal input
88	P106/AN6	BATT	I	BATT, battery voltage detect
89	P105/AN5	BATTSEL	I	Battery detect
90	P104/AN4	NC	I	
91	P103/AN3	SELF	I	Reset mode control：ground this pin to enter reset mode.
92	P102/AN2	RSSI	I	RSSI detect pin
93	P101/AN1	SQL	I	Squelch level input
94	AVSS	GND	I	A/D conversion power supply input.
95	P100/AN0	CTCIN	I	CTCSS output
96	VREF	VCC	I	A/D conversion reference voltage
97	AVCC	VCC	I	A/D conversion power supply input.
98	P97		O	
99	P96		O	
100	P95		O	

TC-700 Part List 1

Adjustment Description

Adjust the radio by PC programming software or by manual adjustment. In manual adjustment mode, the adjustment method is shown as follows: (Refer to “Software Specification” for the manual adjustment mode)

Required Test Instrument

Radio Communication Test Set	1 set
Scanner	1 set
3A/10V Power Supply	1 set
Digital Voltmeter	1 set
3A Ammeter	1 set

Adjustment

1. Adjustment in user mode

Firstly ground the SELF point, turn on the power by holding down TK for 2 seconds, and then the radio enters reset mode with green LED flashing twice. Turn the channel selector knob to the selected channel and press PTT, the radio data is all reset (All clone modes will be automatically activated when reset is completed). Refer to All Reset Mode in Software Specification for more details:

VCO

Item	Condition	Measurement		Adjustment		Specification /Remarks
		Test Instrument	Terminal	Parts	Method	
1. Setting	Power supply voltage					
2.Transmit VCO lock voltage	1. CH: TX high	Digital Voltmeter	CV	TC301 TC302	3.9V±0.1V	
	2. TX Low				Check	>0.5V
3.Receive VCO lock voltage	1. CH: RX high				3.9V±0.1V	
	2. RX low				Check	>0.5V

2. Manual Adjust Mode Description

(1) Enter the manual adjust mode

Turn the power on by holding down TK and SK2 key simultaneously for 2 seconds, the radio enters manual adjust mode with red LED flashes twice. (TK: Top key; SK1: Side key1; SK2: Side key2)

(2) Channel number on the channel selector knob

Each channel number on the channel selector knob is defined a setting item. The bandwidth is 25 KHz and low frequency (F1) each time the channel selector knob is rotated.

(3) SK2 key

Used to set the frequency. 1 point tuning is used to adjust center frequency, 3 point tuning adjusts F1, F3, F5 and 5 point tuning adjusts F1-F5. The frequency toggles from low frequency to high frequency. Green LED flashes once when F1 is selected.

(4) TK key

Use to toggle the channel bandwidth among 25 KHz, 20 KHz and 12.5 KHz. Red LED flashes once when the bandwidth is 25 KHz.

(5) PTT/SK1

PTT→Increase

SK1→Decrease

PTT/SK1 is pressed to adjust upward/downward. Red LED glows indicating the maximum adjust value and green LED indicating the minimum value. Hold down the key to increase/decrease the adjust value continuously.

Press PTT key to save the BATT LOW and SQL settings, then green LED glows once.

(6) Select adjustment item group

The first group of adjustment item is selected when the radio enters the manual adjust mode. Turn to CH16 and press PTT key to enter the next group. Press again to return to the first group. Orange LED flashes once when the first group is selected. Orange LED flashes twice when the second group is selected.

(7) Frequency Setting (can be set via programming software)

5 point tuning（MHz） TX: {TX1,TX2,TX3,TX4,TX5}
RX: {RX1,RX2,RX3,RX4,RX5}

3 point tuning（MHz） TX: {TX1, TX3, TX5}
RX: {RX1, RX3, RX5}

1 point tuning（MHz） TX: {TX3}
RX: {RX3}

3. Adjustment Method

Turn the power on by holding down TK and SK2 key simultaneously for 2 seconds, the radio enters manual adjust mode with red LED flashes twice. Refer to Manual Adjust Mode in TC-700 Software Specification for more details.

(1) Transmitter

Item		Condition	Test Instrument	Method	Purpose
Group 1	Adjust a channel	Enter the adjust mode; Turn to CH1; TX mode.	Radio Communication Test Set; TX Test	Adjust VR1	Frequency Error ≤100Hz
	1. TX power Low	Enter the adjust mode. Turn to CH1. Adjust at 5 point (wideband).	Radio Communication Test Set TX TEST HPF：20HZ LPF：300HZ	PTT key (increase) SK1 key (decrease)	Adjust power to: 1W±0.1W
	2. CDCSS balance	Enter the adjust mode. Turn to CH3. Adjust at 3 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		PTT key (increase) SK1 key (decrease)	No adjustment
	3. CDCSS deviation	Enter the adjust mode. Turn to CH3. Adjust at 3 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		PTT key (increase) SK1 key (decrease)	Adjust deviation to 750Hz (wideband), 600Hz (medium band) and 400Hz (narrowband) respectively.
	4. CTCSS (67.0Hz) deviation Low	Enter the adjust mode. Turn to CH4. Adjust at 3 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		PTT key (increase) SK1 key (decrease)	
	5. CTCSS (136.5Hz) deviation Center	Enter the adjust mode. Turn to CH5. Adjust at 3 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		PTT key (increase) SK1 key (decrease)	

Group 1	6. CTCSS (254.1Hz) deviation High	Enter the adjust mode. Turn to CH6. Adjust at 3 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		PTT key (increase) SK1 key (decrease)	
	7. AK2346 Transmit Audio Deviation	Enter the adjust mode. Turn to CH7. Adjust at 3 point (wideband), 1 point (medium band), 1 point (narrow band).	Radio Communication Test Set HPF: 20Hz LPF: 15KHz 1KHz 120mV	PTT key (increase) SK1 key (decrease)	Adjust deviation to 4KHz (wideband), 3.2KHz (medium band) and 2KHz (narrowband) respectively.
	8. 2 Tone deviation	Enter the adjust mode. Turn to CH8. Adjust at 1 point (wideband), 1 point (medium band), 1 point (narrow band).	Radio Communication Test Set TX Test HPF: 20Hz LPF: 15KHz No modulation signal.	PTT key (increase) SK1 key (decrease)	Adjust deviation to 3.2KHz (wideband), 2.5KHz (medium band) and 1.8KHz (narrowband) respectively.
	9. DTMF deviation	Enter the adjust mode. Turn to CH9. Adjust at 1 point (wideband), 1 point (medium band), and 1 point (narrow band).		PTT key (increase) SK1 key (decrease)	Adjust deviation to 3.2KHz (wideband), 2.5KHz (medium band) and 1.8KHz (narrowband) respectively.
	10. MSK deviation	Enter the adjust mode. Turn to CH10. Adjust at 3 point (wideband), 1 point (medium band), 1 point (narrow band).		PTT key (increase) SK1 key (decrease)	Adjust deviation to 3.2KHz (wideband), 2.5KHz (medium band) and 1.8KHz (narrowband) respectively.

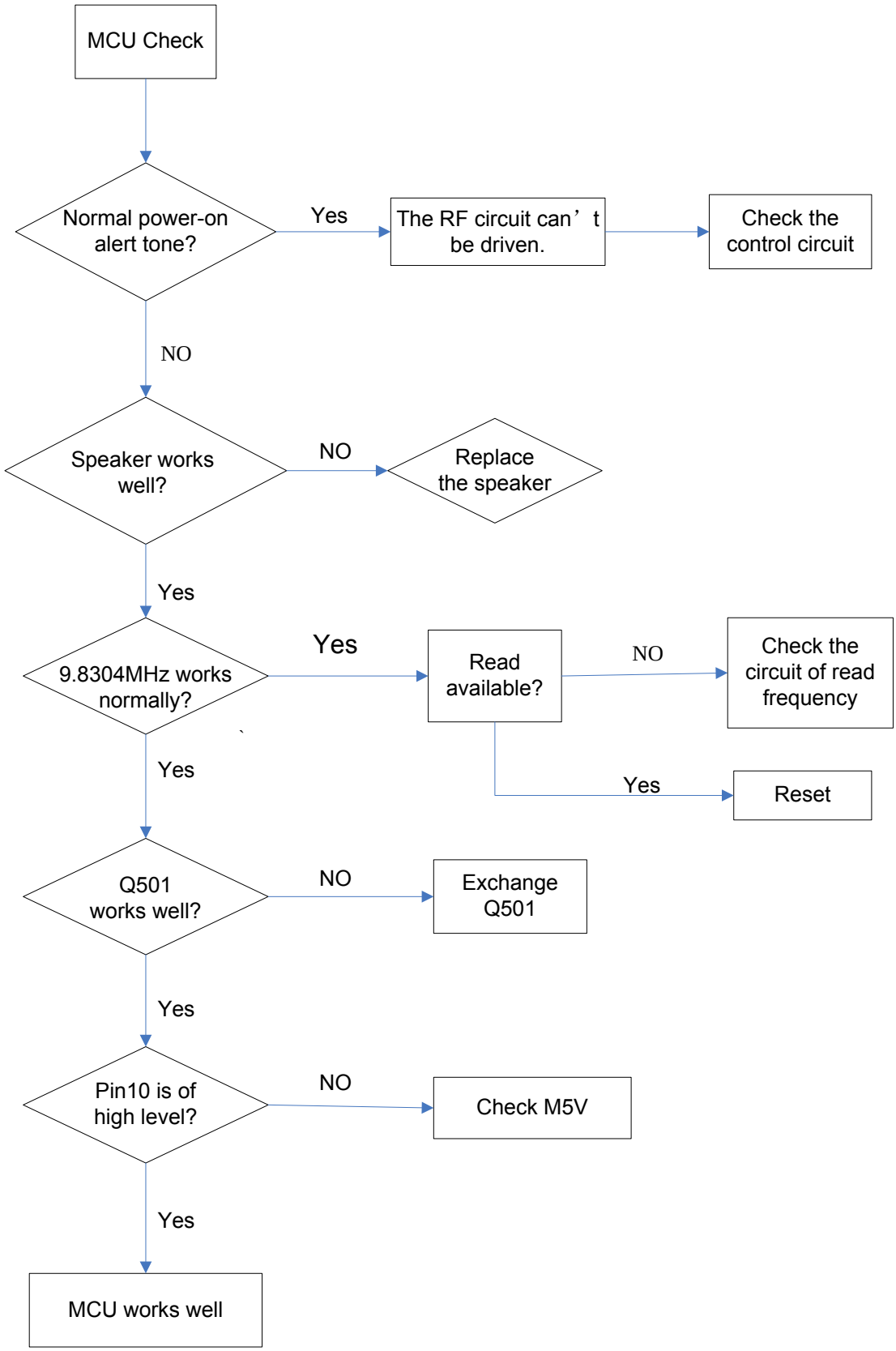
Group 1	11. TX power HIGH	Enter the adjust mode. Turn to CH13. Adjust at 5 point (wideband).	Radio Communication Test Set TX TEST	PTT key (increase) SK1 key (decrease)	Adjust power to 5W(4W)±0.1W VHF: 5W, UHF: 4W
	12. TX voltage Low	Enter the adjust mode. Turn to CH14. Adjust at 1 point (wideband).		Save	Adjust voltage to 5.8V,press PTT to save

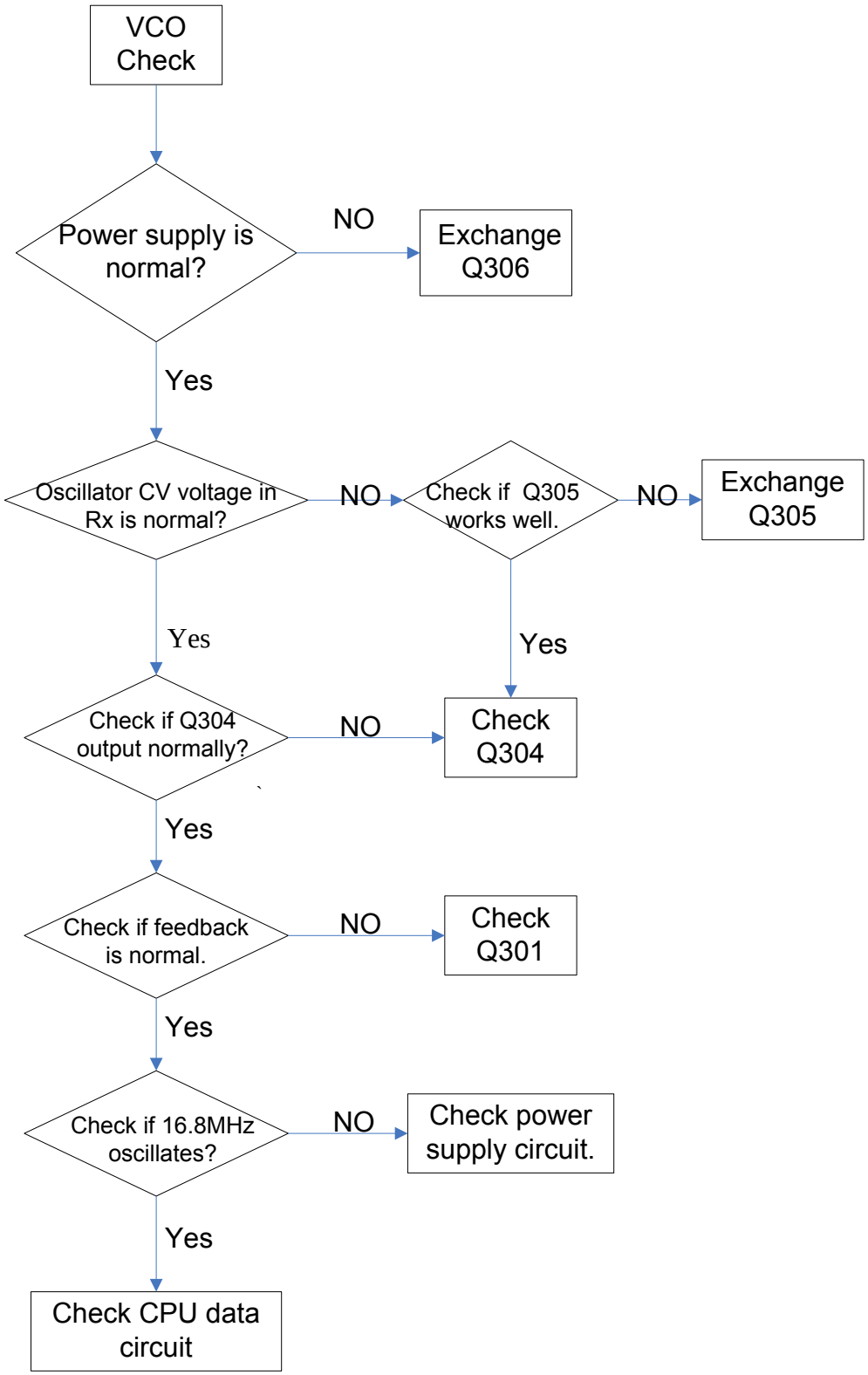
Receiver

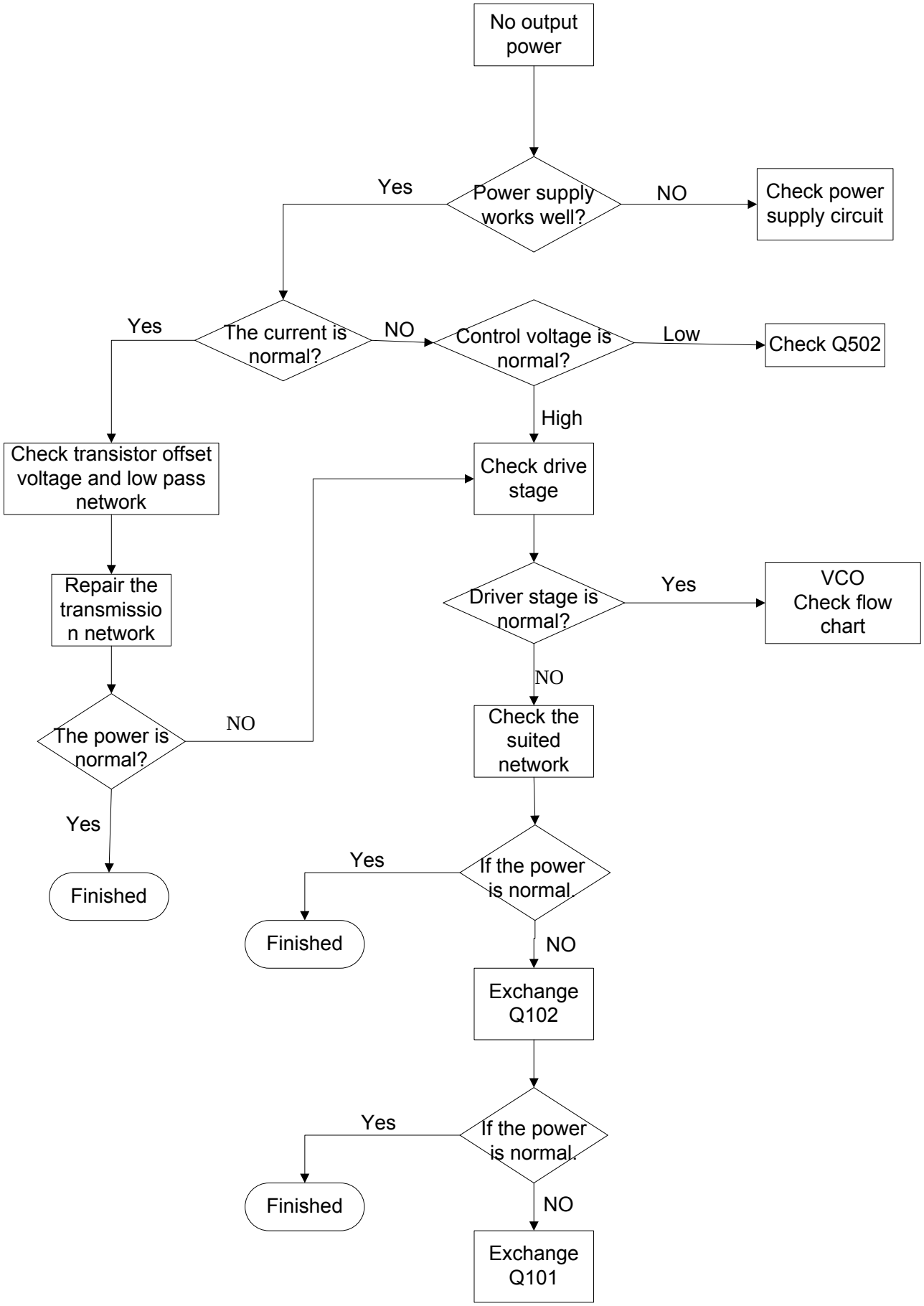
Item		Condition	Test Instrument	Method	Purpose
Group 2	1. RX sensitivity	Enter the adjust mode. Turn to CH1. Adjust at 5 point (wideband).	Radio Communication Test Set RX TEST HPF：300HZ LPF：3KHZ	PTT key SK1 key	Adjust level to 119dBm. SINAD≥12dB
	2. AK2346 RX volume	Enter the adjust mode. Turn to CH2. Adjust 1 point at wideband, medium band and narrowband respectively.		PTT key (Increase) SK1 key (Decrease	When Max. volume is set, adjust AC level to 1W (16Ω), single input 2.5V, dual input 5V
	3. Squelch Level 3 (OPEN)	Enter the adjust mode. Turn to CH3. Adjust at 5 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		Save	Adjust level to -123dBm，press PTT to save
	4. Squelch Level 3 (SQUELCH)	Enter the adjust mode. Turn to CH4. Adjust at 5 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		Save	Adjust level to -125dBm，press PTT to save
	5. Squelch Level 9 (OPEN)	Enter the adjust mode. Turn to CH5. Adjust at 5 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		Save	Adjust level to -117dBm，press PTT to save
	6. Squelch Level 9 (SQUELCH)	Enter the adjust mode. Turn to CH6. Adjust at 5 point (wideband), 1 point (medium band) and 1 point (narrowband) respectively.		Save	Adjust level to -119dBm，press PTT to save
	7. RX voltage Low	Enter the adjust mode. Turn to CH7. Adjust at 1 point (wideband).		Save	Adjust power supply voltage to 6.3V, press PTT to save

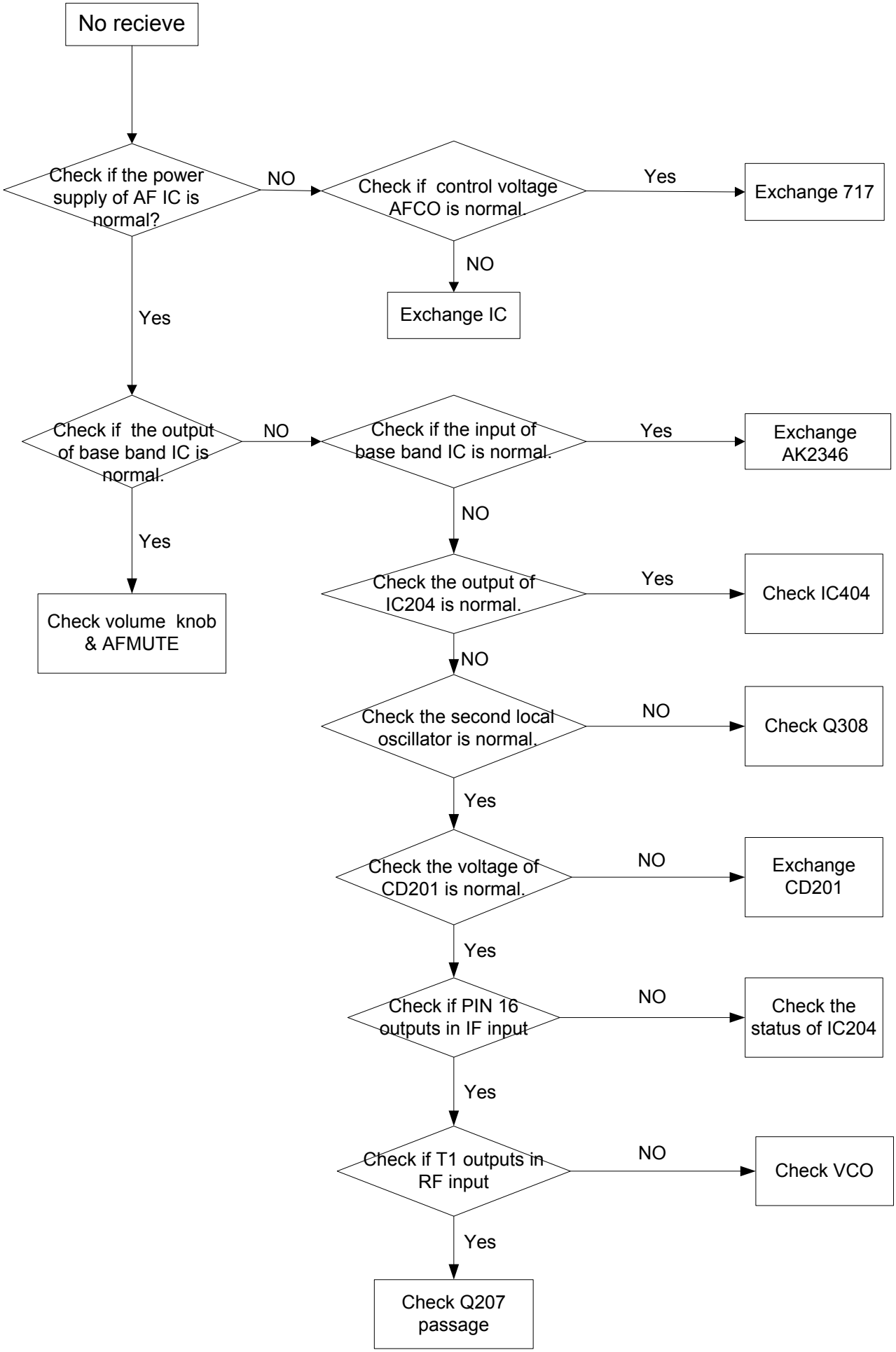
Note: AF deviation of the receiver is 3KHz (wideband)，2.5KHz(medium band) and 1.5KHz (narrowband)

Trouble-shooting Chart




VCO Check
Power supply is normal?
NO
Exchange Q306
Yes
Oscillator CV voltage in Rx is normal?
NO
Check if Q305 works well.
NO
Exchange Q305
Yes
Yes
Check if Q304 output normally?
NO
Check Q304
Yes
Check if feedback is normal.
NO
Check Q301
Yes
Check if 16.8MHz oscillates?
NO
Check power supply circuit.
Yes
Check CPU data circuit


No output power
Power supply works well?
Yes
NO
Check power supply circuit
The current is normal?
Yes
NO
Control voltage is normal?
Low
Check Q502
High
Check transistor offset voltage and low pass network
Check drive stage
Repair the transmissio n network
Driver stage is normal?
Yes
VCO Check flow chart
NO
The power is normal?
NO
Check the suited network
Yes
Finished
If the power is normal.
Yes
Finished
NO
Exchange Q102
If the power is normal.
Yes
Finished
NO
Exchange Q101


No recieve
Check if the power supply of AF IC is normal?
NO
Check if control voltage AFCO is normal.
Yes
Exchange 717
NO
Exchange IC
Yes
Check if the output of base band IC is normal.
NO
Check if the input of base band IC is normal.
Yes
Exchange AK2346
NO
Yes
Check volume knob & AFMUTE
Check the output of IC204 is normal.
Yes
Check IC404
NO
Check the second local oscillator is normal.
NO
Check Q308
Yes
Check the voltage of CD201 is normal.
NO
Exchange CD201
Yes
Check if PIN 16 outputs in IF input
NO
Check the status of IC204
Yes
Check if T1 outputs in RF input
NO
Check VCO
Yes
Check Q207 passage

Disassembly and Assembly for Repair

1. Remove the case assembly from the chassis (as shown in Fig. 1)

1. Remove the volume knob and channel knob①.
2. Remove the two screws ②.
3. Lift the both sides of chassis from the case assembly ③.

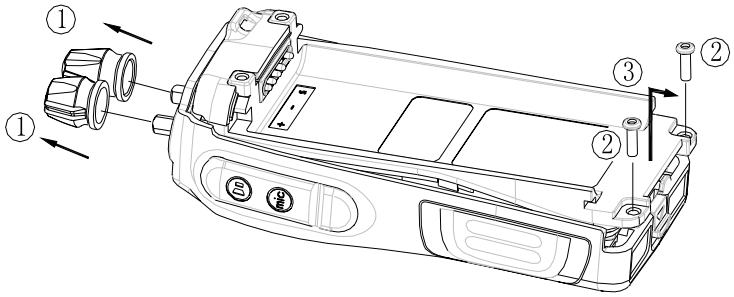


Fig. 1

2. Remove the speaker (as shown in Fig. 2)

1. Remove the three screws on the fixing ring of the speaker ④ and take out the fixing ring ⑤.
   Note: be careful not to snap the speaker's lead wire.
2. Take out the speaker and water-proof gasket ⑥.

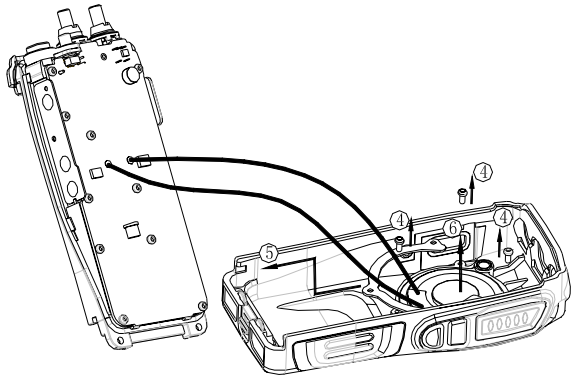


Fig. 2

3. Removing the Tx-Rx unit from the chassis (as shown in Fig. 3)

1. Loosen the nut on channel switch ⑦ and that on volume switch ⑧, and remove earphone holder ⑨.
2. Remove the screw ⑩ on the PTT key board.
3. Remove the ten screws ⑾ fixing the control board.
4. Remove the solder of the antenna terminal with a soldering iron ⑿.

5. Remove the solder of the positive and negative terminal on the battery's connector with a soldering iron ⑬.
6. Lift and remove the main unit board ⑭ from the chassis.

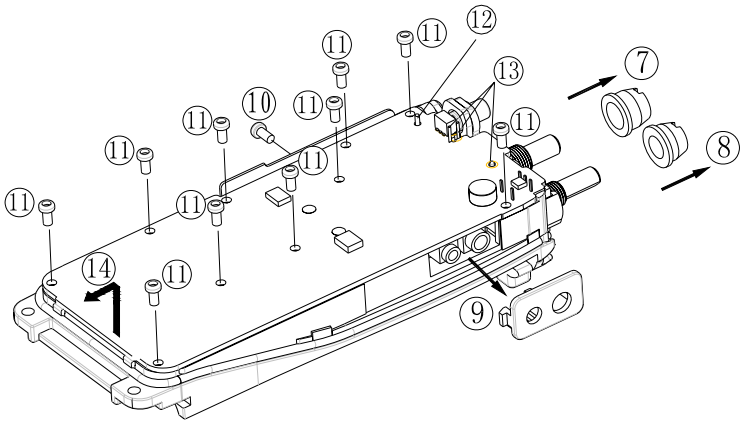


Fig. 3

Cautions for assembly:

4. Attaching the case assembly and chassis (as shown in Fig. 4, 5 & 6)

1. Make sure the water-proof packing attached to the circumference of the chassis is securely inserted in the groove of the chassis ①.
2. Attach speaker and its water-proof ring to the corresponding place on the chassis ②.

   Note: ensure the speaker and the ring is securely inserted.

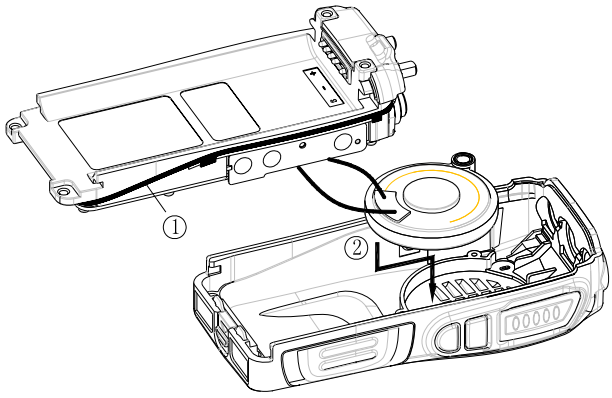


Fig. 4

3. Press the stainless fixing ring on the water-proof packing of the speaker, and attach the screw ③.
4. Insert the upper part of the chassis into the case assembly ④.

   Note: Make sure the speaker lead wire does not press on the microphone magnetic core.
5. Press downward the chassis ⑤, enabling the chassis and the case to fit together.

   Note: If the packing of the SP/MIC does not come to the correct position after attaching the chassis to the case assembly, reposition the packing with your fingers.

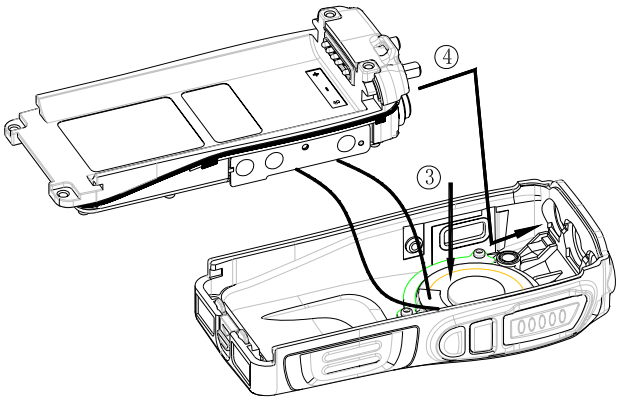


Fig. 5

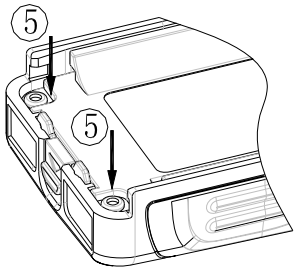
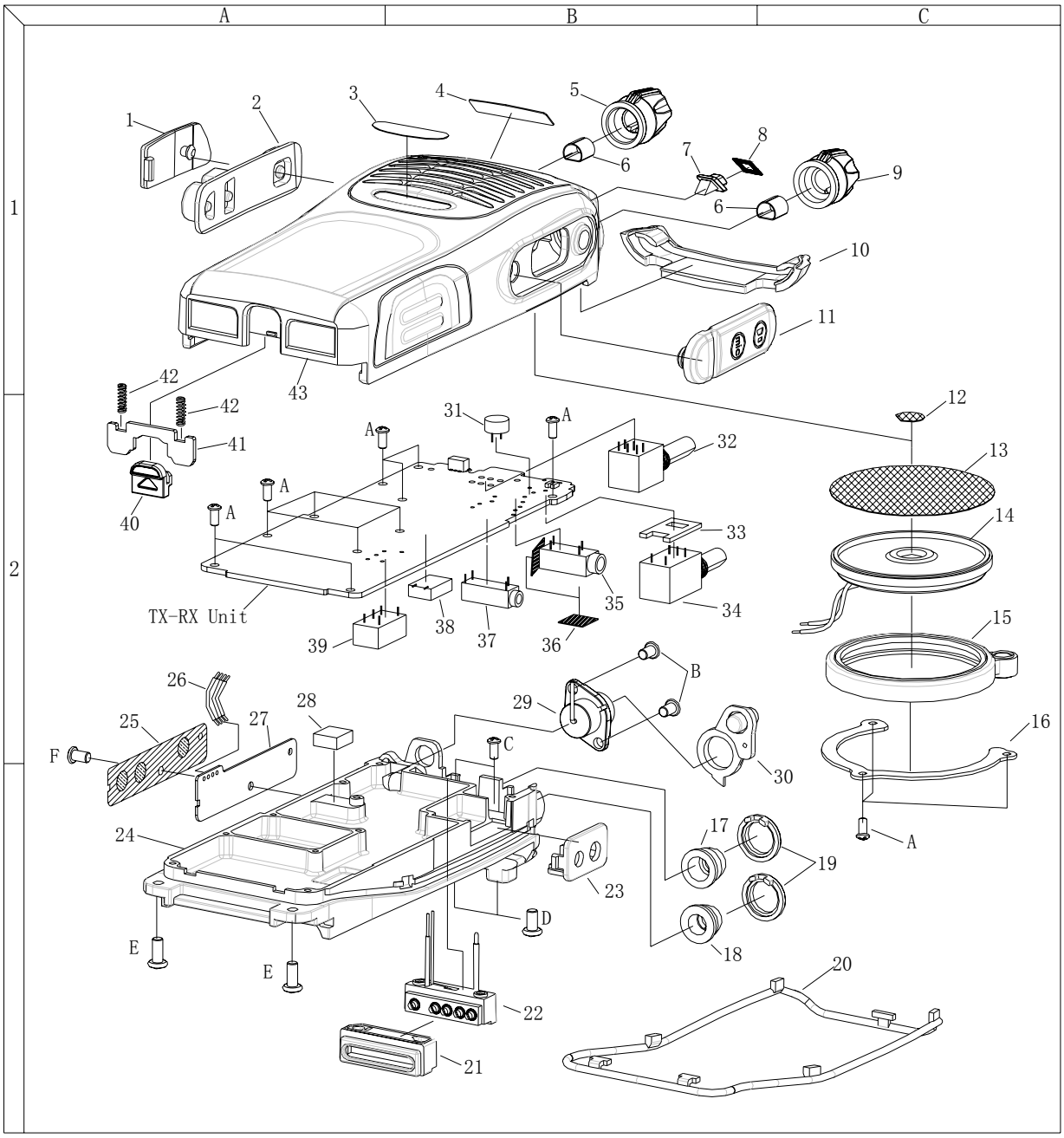


Fig. 6

Exploded View

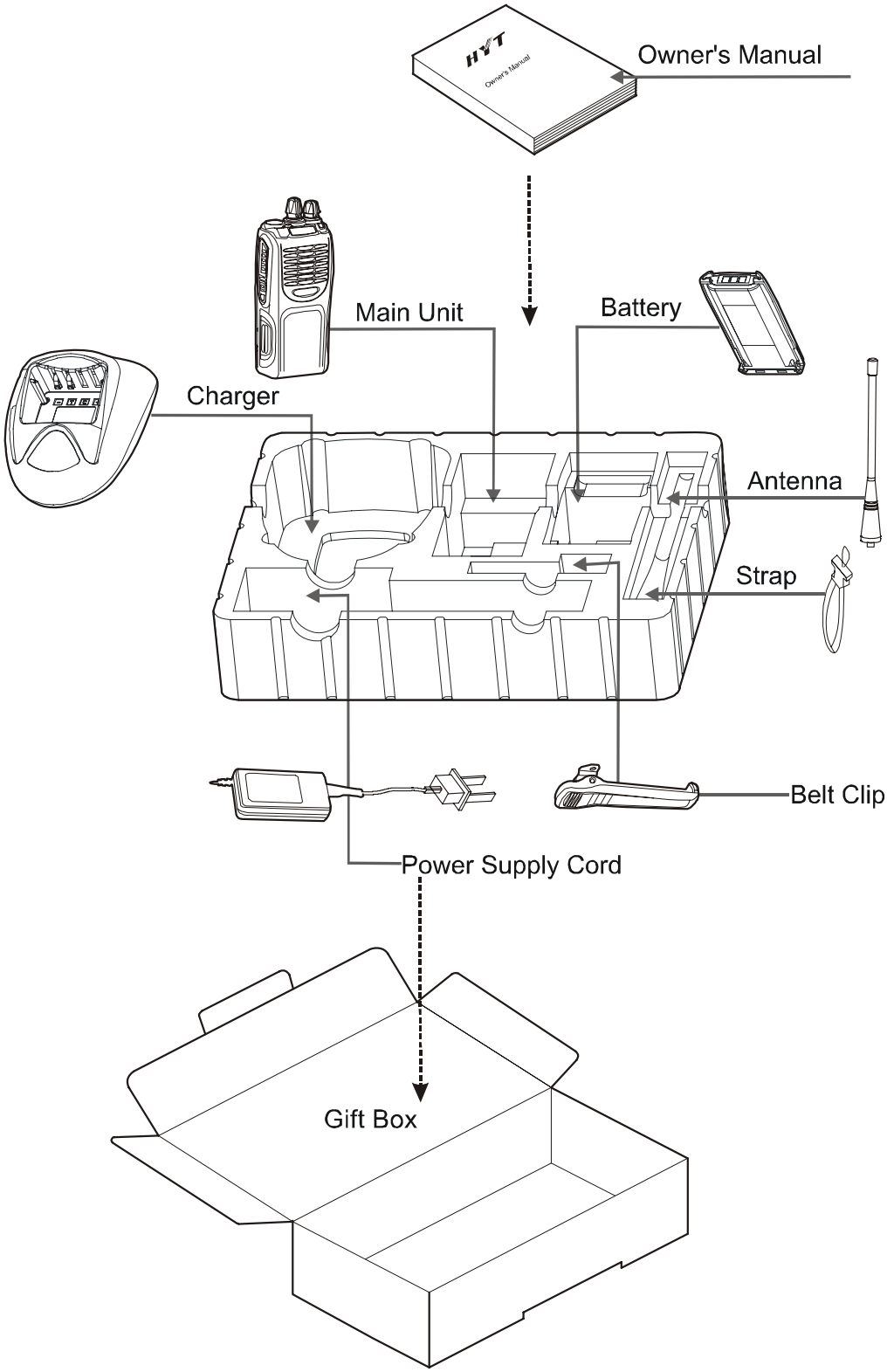


TC-700 Part List 2

No.	P/N	Part Description	Qty
1	6000135000000	TC-700S PTT key cover Black	1.00
2	6100068000000	TC-700S PTT silica rubber key Black	1.00
3	8600700500000	TC-700 Model label	1.00
4	8600700500100	HYT-LOGO Logo	1.00
5	6000076000020	TC700 Knob (encoder)	1.00
6	6201006000000	TC2088 Inner liner knob	2.00
7	6000136000000	TC-700S Light guide	1.00
8	750700S000000	TC700S Light guide 3M (9448) adhesive paper	1.00
9	6000077000020	TC700 Knob (volume)	1.00
10	6000134000000	TC-700S Rear cover (main unit)	1.00
11	6000138000000	TC-700S Dust-proof cover	1.00
12	7400051000000	TC700S Mic mesh	1.00
13	7400054000000	Speaker mesh	1.00
14	5001040000000	Speaker 16Ω 1W D: 40mm	1.00
15	6100066000000	TC-700S Water-proof gasket (speaker)	1.00
16	6201078000000	TC-700S Stainless fixing ring (speaker)	1.00
17	7207005400000	Nut M7.0*5.4mm	1.00
18	7206004200000	Nut M6.0*4.2mm	1.00
19	6100069000000	TC-700S Water-proof gasket (volume knob)	2.00
20	6100065000000	TC-700S Water-proof gasket (main unit)	1.00
21	6100070000000	TC-700S Water-proof gasket (battery connector)	1.00
22	5202003100010	TC-700S 3P battery connector socket	1.00
23	6000137000000	TC-700S Mic holder Black	1.00
24	6300016000000	TC-700S Aluminum chassis	1.00
25	7300001000000	TC700S PTT metal dome (3-key)	1.00
26	4210047000000	TC-700 Key board connection cable 47mm	0.50
27	4100700101100	TC-700S PT PCB FR4 0.6T/2L	1.00
28	7500114000000	TC500 Gap pad	1.00
29	4400000000000	SMA-type MSMA1551D5-001-NT3G-50 connector Male	1.00
30	6100067000000	TC-700S Antenna water-proof gasket	1.00
31	5002110000020	Mic cover CZII-T6027P-C33 -60dB±3dB φ6.0*2.27	1.00
32	4304030000010	Gray-code encoder switch	1.00
33	7500044000000	TC700 Volume switch pad 1.0mm-thick	1.00
34	4302020000040	Volume switch TC3000 TP76N17N 15F(A103)	1.00
35	5205000000280	Speaker jack HSJ1456-010320	1.00
36	7400023000010	TC-500 PVC sheet 0.2mm-thick	2.00
37	5205000000190	Earpiece jack HSJ1650-010020	1.00
38	3920450300000	Demodulator plug-in 450KHz±4kHz	1.00
39	3801045030090	Ceramic filter 450KHz±6.0KHz	1.00
40	6000128000000	TC-700 Battery latch Black	1.00

41	6201078000000	TC-700S Battery latch baffle 1.2mmSUS304	1.00
42	7000036000000	TC-700S Spring Φ0.35*Φ2.3*10mm	2.00
43	6000133000000	TC-700S Main unit front case Black	1.00
A	7101904020020	Self-tapping ST1.9*4.0mm	13.00
B	7102504000300	Machine screw M2.5*4.0mm Ultra-thin cross-head	2.00
C	7102004520000	Self-tapping ST2.0*4.5mm pan head	2.00
D	7103006001000	Machine screw M3.0*6.0mm pan head	2.00
E	7102508000000	Machine screw M2.5*8.0mm Hex wobbler	2.00
F	7102004020050	Self-tapping ST2.0*4.0mm cross recessed pan head	1.00

Packing


Owner's Manual
Main Unit
Battery
Charger
Antenna
Strap
Belt Clip
Power Supply Cord
Gift Box

Description of TC-700 Desktop Charger

Ⅰ. General Description

The charger is developed & designed for TC-700 wireless series. The charger adopts bq2000T——a programmable multi-chemistry fast-charge management IC.

The charger is for fast-charge management of nickel cadmium (Ni-Cd), nickel metal-hydride (Ni-MH), or lithium-ion (Li-Ion) batteries in single or multi-chemistry applications.

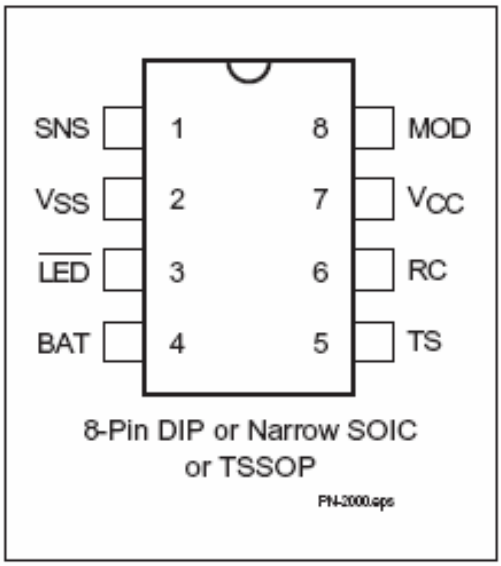
High-frequency switching controller for efficient and simple charge design, provides over 90% efficiency rating.

Ⅱ. General description of bq2000T functions

The bq2000T detects the battery chemistry and proceeds with the optional charging and termination algorithms. This process eliminates undesirable undercharged or overcharged conditions and allows accurate and safe termination of fast charge.
Depending on the chemistry, the bq2000T provides a number of charge termination criteria:

- Peak voltage detection (PVD) (for NiCd and NiMH)
- Minimum charging current (for Li-Ion)
- Maximum temperature
- Maximum charge time

Pin Connections



Pin Names and Descriptions:

SNS: Current-sense input

Enables the bq2000T to sense the battery current via the voltage developed on this pin by an external sense-resistor connected in series with the battery pack.

Vss: System ground

LED: Charge-status output

Open-drain output that indicates the charging status by turning on, turning off, or flashing an external LED.

BAT: Battery-voltage input

Battery-voltage sense input. A simple resistive divider, across the battery terminals, generates this input.

TS: Temperature-sense input

Input for an external battery-temperature monitoring circuit. An external resistive divider network with a negative temperature-coefficient thermistor sets the lower and upper temperature thresholds.

RC: Timer-program input

RC input used to program the maximum charge-time, hold-off period, and trickle rate during the charge cycle, and to disable or enable top-off charge.

Vcc: Supply-voltage input

MOD: Modulation-control output

Push-pull output that controls the charging current to the battery. MOD switches high to enable charging current to flow and low to inhibit charging current flow.

Charge Termination

1. Maximum Charge Time (NiCd, NiMH, and Li-Ion)

The bq2000T sets the maximum charge-time through pin RC. With the proper selection of external resistor and capacitor, various time-out values may be achieved. Figure Ⅱ shows a typical connection.

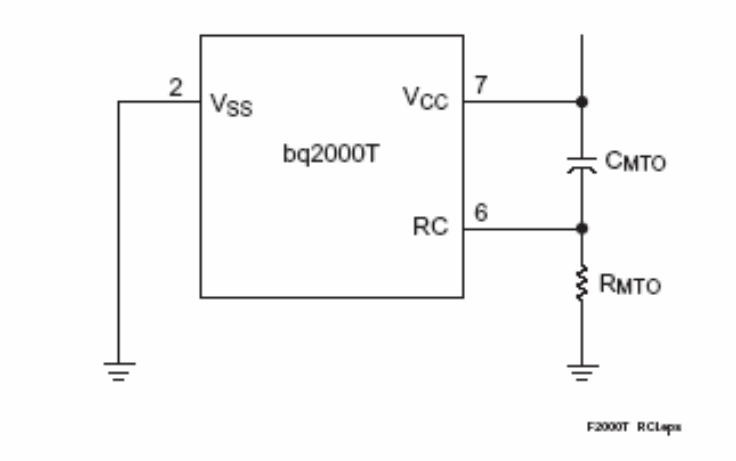


Figure Ⅱ Typical Connection for the RC Input

2. Maximum Temperature (NiCd, NiMH, and Li-Ion)

During fast charge, the bq2000T compares the battery temperature to an internal high-temperature cutoff threshold, V_{TCO}. As shown in Figure Ⅲ, high-temperature termination occurs when voltage at pin TS is less than this threshold.

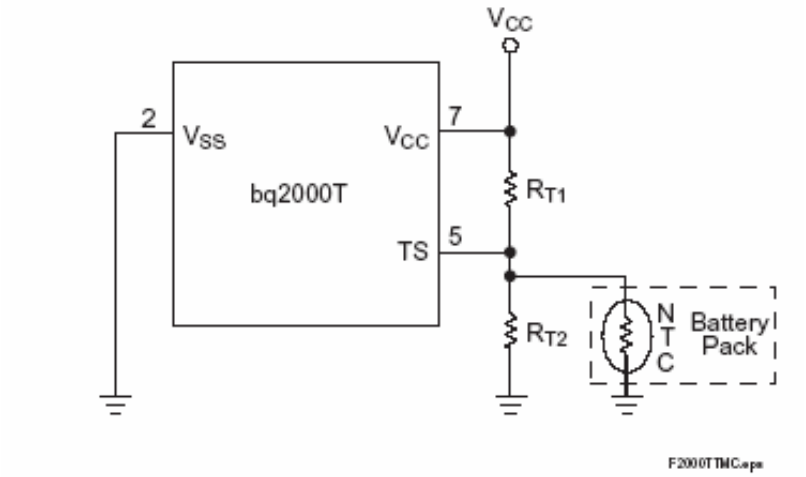


Figure Ⅲ Temperature Monitoring Configuration

3. Peak Voltage Detection (Ni-Cd, Ni-MH battery) (PVD)

bq2000T adopts PVD method to stop the charging of Ni-Cd and Ni-MH batteries. It continuously samples the voltage of BAT pin which reflects the voltage of the whole battery. Bq2000T begins PVD function if this voltage is less than the maximum sampling voltage 3.8mv (PVD). As shown in Fig. IV, the resistor-divider between the anode of the battery clip and Vss pin determines the voltage of BAT pin.

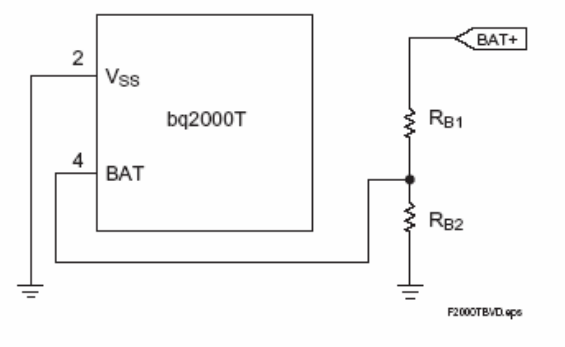


Figure Ⅳ Battery Voltage Divider

For Li-Ion battery packs, the resistor values R_{B1} and R_{B2} are calculated by the following equation:

$$\frac{R_{B1}}{R_{B2}} = \left(N * \frac{V_{CELL}}{V_{MCV}}\right) - 1$$

Where N is the number of cells in series. The end-to-end input impedance of this resistive divider network should be at least 200KΩ and no more than 1MΩ.

A NiCd or NiMH battery pack consisting of N series-cells may benefit by the selection of the R_{B1} value to be N-1 times larger than the R_{B2} value.

In a mixed-chemistry design, a common voltage divider is used as long as the maximum charge voltage of the nickel-based pack is below that of the Li-Ion pack. Otherwise, different scaling is required.

4. Charge Current Control

The bq2000T controls the charge current through the MOD output pin. The current-control circuit supports a switching-current regulator with frequencies up to 500kHz. The bq2000T monitors charge current at the SNS input by the voltage drop across a sense-resistor, R_{SNS}, in series with the battery pack. See Figure Ⅴ for a typical current-sensing circuit. R_{SNS} is sized to provide the desired fast-charge current (I_{MAX}).

If the voltage at the SNS is lower than VSNSLO or higher than VSNSHI, the bq2000T switches the MOD output high to pass charge current to the battery. When the SNS voltage is less than VSNSL or greater than VSNSHI, the bq2000T switches the MOD output low to shut off charging current to the battery.

$$I_{MAX} = \frac{0.05}{R_{SNS}}$$

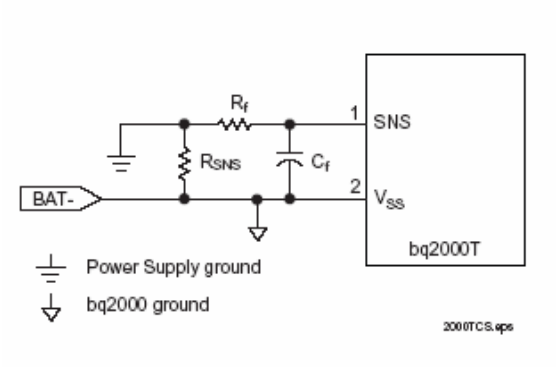


Figure Ⅴ Current-Sensing Circuit

Ⅲ. Specifications

1. Output voltage and current

Input: 12±3V 1000mA
Output: 8-12V 20～1000mA
(Input: 12V 1000mA DC
Output: 800mA DC）

2. Charging current

1) Li-ion battery
Fast charging current: 800±200mA
Minimum charging current: 75±20mA

2) Ni-MH battery
Fast charging current: 850±100 mA
Supplementary charging current: 65±10mA
Trickle charging current: 25~35mA

IV. Charging process and indicator

1. Li-ion battery

1) Constant-current charging: charging current is 800±200mA and the indicator turns red. The battery switches to constant voltage charging when the voltage rises to 8.4±0.1V.
2) Constant voltage charging: with 8.4±0.1V voltage and indicator turns red.
3) Completed: battery voltage: 8.4±0.1V; the minimum charging current drops to 75±20mA; LED indicator turns green.

2. Ni-MH battery

1) Fast charge: current: 850±100mA; LED indicator: red; switch to supplementary charging when rate of temperature rise dT/dt=0.9～1/min or the temperature rises to 50℃.
2) Supplementary charging: charging current: 65±10mA; LED indicator: green; switch to trickle charging if the supplementary charging time reaches or exceeds MTO.

3) Trickle charging: charging current: 25~35mA; LED indicator: green.

Specifications

General	
Frequency Range	VHF: 136-174MHz UHF:300-350MHz,350-390MHz, 400-450MHz, 420-470MHz 440-490MHz,470-520MHz
Number of Channels	16
Channel Spacing	25 /20/12.5 KHz
Operating Voltage	7.5 V
Battery Life	About 14 hours (5-5-90 duty cycle)
Operating Temperature Range	-20℃ — +50℃
Dimensions and Weight	119 mm×54mm×46mm、400 g
Receiver	
Reference Sensitivity	0.25/0.35 μV
Adjacent Channel Selectivity	70/60dB
Intermodulation Rejection	65dB
Spurious Response	70dB
Audio Power Output	1W
Frequency Stability	±2.5 ppm
Transmitter	
RF Power Output	3.5W/2W/1W
Spurious and Harmonics	-36dBm<1GHz -30dBm>1GHz
Modulation Limitation	±5/4/3kHz
FM Noise	45/40dB
Audio Distortion	≤5%
Frequency Stability	±2.5 ppm

The specifications are tested according to EIA-603 and are subject to change without notice due to enhancement in technology.