Adjustment Description

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

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.

Tuning Procedures

1. Operations before Tuning

1) PCB Tuning:

Before the PCB arrives 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, apply a programming cable to enter the adjustment mode for PC programming or manual adjustment.

2) Radio Tuning:

1) Manual Tuning: Hold down **PTT** and **SK1** for 2 seconds while powering on the radio. Then the LCD displays “Tuning Mode”. After the keys are released, press **OK**, and then press **UP/DN** to select your desired tuning item. To enter this item, press **OK** again. To return to the previous menu, press **C**. The LED solidly glows red for TX group items and green for RX group items. Follow the operation instructions to tune each item.

2) Automatic Tuning: Connect a programming cable to the radio for real-time tuning through PC.

3) Wired Clone:

1) Connect two radios using a cloning cable. Then hold down **SK1** for 2 seconds while powering the source radio on, and the radio enters Clone mode, with red LED flashing once. The target radio can be directly turned on to enter the mode.

2) Press **SK2** in Clone mode to switch to Factory Clone mode, with red LED flashing twice.

(Note: The Factory Clone Mode option must be checked through the programming software.)

3) Press **PTT** to begin cloning. During cloning, LED of the source radio glows red, while LED of the target radio glows green. Upon completion of cloning, LED of the source radio solidly glows orange. If any error occurs during cloning, LED of the source radio flashes orange. Press **OK** to return to Clone mode upon either cloning success or failure.

4) You can clone the data to multiple target radios in the same way.

2. Description of Tuning Items

TC-580 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 Section												
1	Preset Power				Y							
2	Frequency Tolerance				Y							
3	TX Low Power		Y	Y	Y	Y	Y					
4	TX High Power		Y	Y	Y	Y	Y					
5	CDCSS Balance		Y	Y	Y	Y	Y					
6	CDCSS Deviation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	CTCSS L Deviation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	CTCSS M Deviation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	CTCSS H Deviation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	DTMF Deviation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	VOX Gain	VOX Gain 1			Y							
		VOX Gain 2			Y							
		VOX Gain 3			Y							
		VOX Gain 4			Y							
		VOX Gain 5			Y							
12	TX Low Voltage Threshold				Y							
13	Max. Deviation of TX Audio		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

RX Section											
14	SQL Level 1 ON	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
15	SQL Level 5 ON	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
16	SQL Level 9 ON	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
17	SQL Level 1 OFF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
18	SQL Level 5 OFF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
19	SQL Level 9 OFF	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
20	RX Low Voltage Threshold			Y							
21	Max. RX Volume			Y							
22	Bandpass Filter	Y	Y	Y	Y	Y					
	Note: Y indicates frequencies that can be tuned, and the rest are blank channels not available for tuning.										

1) Entry into a tuning item

Hold down **PTT** and **SK1** for 2 seconds while powering on the radio. Then the LCD displays “Tuning Mode”. Press **OK** to enter the item. (Please note that TX Item is the default item.) And use **UP/DN** to switch between TX Item and RX Item. After the item is selected, press **OK** to enter submenu under this item. Press **OK** to enter the desired tuning item or press **C** to return to the previous menu.

2) Wide/Narrow Bandwidth Switch and Frequency Switch in a Tuning Item

After an item is entered, press **UP/DN** to switch the frequency or wide/narrow bandwidth. Press **OK** to save and return to the previous menu upon completion of tuning.

3) Value Tuning

Short press **SK1** under certain bandwidth and certain tuning item to decrease the tuning value in the step of 1; hold down the key to decrease the value continuously in steps of 1. The tuning value will remain unchanged once it reaches the allowed minimum value.

Short press **SK2** under certain bandwidth and certain tuning item to increase the tuning value in the step of 1; hold down the key to increase the value continuously in steps of 1. The tuning value will remain unchanged once it reaches the allowed maximum value.

4) Measures on special items

SQL On 5, SQL Off 5 and RX Low Voltage Threshold: These tuning items are related to AD

sampling. Press **SK1** or **SK2** after entering the above items, to activate AD sampling (including calculation) once. Press **OK** to save the current AD sampling value and exit. If neither of **SK1** or **SK2** is pressed, the tuning value will not be updated, and AD sampling will not be activated.

5) Description of key-press

Please refer to "Software Specifications →Description of Modes → Manual Tune Mode → Description of key-press" on page **12.**

6) Tuning Items

TX group items: include the Preset Power, Frequency Tolerance, TX Low Power, TX High Power, CDCSS Balance, CDCSS Deviation, CTCSS Deviation (low), CTCSS Deviation (Medium), CTCSS Deviation (high), DTMF Deviation, TX Low Voltage Threshold and Max. Deviation of TX Audio tuned in tuning mode via software, and VCO Lock Voltage tuned out of the tuning mode via hardware.

Rx Group Items: include the Squelch, RX Low Voltage Threshold, Max. RX Volume and RX Bandpass Filter tuned in tuning mode, and VCO Lock Voltage tuned out of the tuning mode.

3. Specific Operations and Requirements

1) Tuning out of the mode

Note: CH1, CH2 and CH3 must be preset as wide bandwidth with low, medium and high frequency respectively and CH4, CH5 and CH6 as narrow bandwidth with low, medium and high frequency respectively. Make sure the antenna or load is connected before adjustment.

Tuning of TX/RX VCO Voltage

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Condition</th><th colspan="2">Test</th><th colspan="2">Adjustment</th><th rowspan="2">Specifications / Remarks</th></tr>
<tr><th>Test Instrument</th><th>Test point</th><th>Part</th><th>Method</th></tr>
<tr><td rowspan="2">TX VCO Lock Voltage</td><td>Set the channel to CH3 and press PTT to transmit.</td><td rowspan="4">Digital Voltmeter</td><td rowspan="4">CV</td><td rowspan="2">TC101</td><td>Adjust TC101 with ceramic tuning tool until the lock voltage meets the requirements.</td><td>4.0V±0.2V</td></tr>
<tr><td>Set the channel to CH1 and press PTT to transmit.</td><td>Check</td><td>≥0.5V</td></tr>
<tr><td rowspan="2">Rx VCO Lock Voltage</td><td>Set the channel to CH3.</td><td rowspan="2">TC102</td><td>Adjust TC102 with ceramic tuning tool until the lock voltage meets the requirements.</td><td>4.0V±0.2V</td></tr>
<tr><td>Set the channel to CH1.</td><td>Check</td><td>≥0.5V</td></tr>
</table>

2) Tuning in the mode

Note: Make sure the antenna or load is connected before adjustment.

TX group items: go to tune TX items under TX Item menu.

Item		Condition	Test		Adjustment		Specifications / Remarks
			Test Instrument	Test point	Part	Method	
Preset Power		Switch to and enter Pre Power, and set to WFP3.	Communication Test Set	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the TX preset power value, and press **OK** to save and exit.	1.0W
Frequency Tolerance		Switch to and enter Freq Offset, and set to WFP3.	Communication Test Set	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the TX carrier frequency tolerance, and press **OK** to save and exit.	＜300Hz
TX Power	High Power	Switch to and enter TX Power H. WFP1 at low frequency is set by default.	Communication Test Set / Ammeter	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the TX power, and press **OK** to save and exit upon completion of all settings.	UHF: 4.0W±0.2W I≤1.4A VHF/245MHz : 4.5W~5.0W I≤1.5A
		Short press **UP/DN** to switch the frequency (refer to the tunable frequencies).					
	Low Power	Switch to and enter TX Power L. WFP1 at low frequency is set by default.				Press **SK1/SK2** to tune the TX power, and press **OK** to save and exit upon completion of all settings.	1W±0.3W I≤1.0A
		Short press **UP/DN** to switch the frequency (refer to the tunable frequencies).					
CDCSS Balance		Switch to and enter CDC Blance. WFP1 at low frequency is set by default.	Communication Test Set BPF: <20Hz~300Hz	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the CDCSS waveform, and press **OK** to save and exit upon completion of all settings.	
		Short press **UP/DN** to switch the frequency.					

CDCSS Deviation	Wide Band	Switch to and enter CDC Dev. WFP1 at low frequency is set by default.	Communication Test Set BPF: <20Hz~300Hz AF Genl Lvl: off	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the CDCSS deviation, and press **OK** to save and exit upon completion of all settings.	700±50Hz
		Short press **UP/DN** to switch the frequency.					
	Narrow Band	Tune WFP5 in CDC Dev, and then press **UP** to enter NFP1 at low frequency.					450±50Hz
		Short press **UP/DN** to switch the frequency.					
CTCSS Deviation	Low Frequency	Switch to and enter CTC Dev L. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set BPF: <20Hz~300Hz AF Genl Lvl: off	Antenna Connector	Press **SK1/ SK2**	Press **SK1/SK2** to tune the CTCSS deviation, and press **OK** to save and exit upon completion of all settings.	Wide band: 700±50Hz Narrow band: 450±50Hz
		Tune WFP5 in CTC Dev L, and then press **UP** to enter NFP1 at low frequency.					
	Medium Frequency	Switch to and enter CTC Dev M. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.					
		Tune WFP5 in CTC Dev M, and then press **UP** to enter NFP1 at low frequency.					
	High Frequency	Switch to and enter CTC Dev H. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.					
		Tune WFP5 in CTC Dev H, and then press **UP** to enter NFP1 at low frequency.					

DTMF Deviation	Wide Band	Switch to and enter DTMF Dev. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set BPF: <20Hz~15KHz AF Genl Lvl: off	Antenna	Press **SK1/ SK2**	Press **SK1/SK2** to tune the DTMF deviation, and press **OK** to save and exit upon completion of all settings.	3±0.1kHz
	Narrow Band	Tune WFP5 in DTMF Dev, and then press **UP** to enter NFP at low frequency.					1.8±0.1kHz
Max. Modulation Frequency Deviation	Wide Band	Switch to and enter TX Max Dev. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set BPF: <20Hz~15KHz AF Genl Lvl: 120mV	Antenna Earpiece Socket	Press **SK1/ SK2**	Press **SK1/SK2** to tune the audio deviation, and press **OK** to save and exit upon completion of all settings.	3.9KHz~4.1KHz
	Narrow Band	Tune WFP5 in TX Max Dev, and then press **UP** to enter NFP1 at low frequency.					1.9KHz~2.1KHz
VOX Gain		Switch to VOX Gain and press OK to enter its menu. Select VOX Gain1 and enter, and set to WFP3.	Communication Test Set BPF: <20Hz~15KHz AF Genl Lvl: 1.5mV	Antenna Earpiece Socket	Press **SK1/ SK2**	Press **SK1/SK2** to begin sampling. Press **OK** to save and return to the previous menu upon completion of sampling.	VOX Gain1: 7.0mV VOX Gain2: 4.0mV VOX Gain3: 3.0mV VOX Gain4: 2.5mV VOX Gain5: 1.5mV
		In the menu of VOX Gain, press **UP/DN** to switch among items from VOX Gain1 to VOX Gain5.					
TX Low Voltage Threshold		Switch to and enter TX Low Batt, and set to WFP3.	Digital Voltmeter	Power Supply port	Power Supply	Check the value, adjust the output voltage and inspect the emergency level.	A. 6.4~6.6V: the alert tone sounds to indicate transmission inhibition upon press of **PTT**. B. ≤6.2V: the alert tone will sound to indicate transmission inhibition if **PTT** is held down.

RX group items: go to tune RX items under RX Item menu.

Items		Condition	Test		Adjustment		Specifications / Remarks
			Test Instrument	Test point	Part	Method	
RX Sensitivity (Bandpass)		Switch to and enter BPF Tune. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set SSG: -119dBm MOD: 1KHz DEV: 3.0KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	Press **SK1/ SK2**	Check the bandpass waveform and press **SK1/SK2** to adjust the BPF Tune waveform. Press **OK** to save and exit upon completion of all settings.	Adjust the volume to an appropriate value before tuning, so that the output amplitude is not limited. SINAD: ≥12dB
Squelch Open	Wide Band	Switch to and enter SQL Open5. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set SSG: -121dB MOD: 1KHz DEV: 3KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	Press **SK1/ SK2**	Tune the SSG output signal to squelch level. Press **OK** to save and exit upon completion of all settings.	Squelch level (Level 5): -121dB
		Refer to method of SQL Open5 for that of SQL Open1 and SQL Open9.					Squelch Level: Level 1: -124dB Level 9: -117dB
	Narrow Band	Tune WFP5 in SQL Open5, and then press **DN** to enter NFP1 at low frequency.	Communication Test Set SSG: -120dB MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz				Squelch Level (5): -120dB
		Refer to method of SQL Open5 for that of SQL Open1 and SQL Open9.					Squelch Level: Level 1: -123dB Level 9: -116dB
Squelch Close	Wide Band	Switch to and enter SQL Close5. WFP1 at low frequency is set by default. Short press **UP/DN** to switch the frequency.	Communication Test Set SSG: -123dBm MOD: 1KHz DEV: 3KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	Press **SK1/ SK2**	Tune the SSG output signal to squelch level. Press **OK** to save and exit upon completion of all settings.	Squelch level (Level 5): -123dB
		Refer to method of SQLClose 5 for that of SQL Close 1 and SQL Close 9.					Squelch Level: Level 1: -126dB Level 9: -119dB

Squelch Close	Narrow Band	Tune WFP5 in SQL Close5, and then press **UP** to enter NFP1 at low frequency.	Communication Test Set SSG: -122dBm MOD: 1KHz DEV: 1.5KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	Press **SK1/ SK2**	Refer to the above.	Squelch level (Level 5): -122dB
		Refer to method of SQLClose 5 for that of SQL Close 1 and SQL Close 9.					Squelch Level: Level 1: -125dB Level 9: -118dB
RX Low Voltage Threshold		Switch to Rx Low Batt, and set to WFP3.	Digital Voltmeter	Power Supply Port	Power Supply	Check the value, adjust the output voltage and inspect the emergency level (red LED flashes and alert tone sounds).	7.0~7.2V: the red LED flashes and alert tone sounds.
Max. RX Volume		Switch to Rx Max Dev, and set to WFP3.	Communication Test Set SSG: -47dBm MOD: 1KHz DEV: 3KHz Filter: 0.3~3KHz	Antenna Earpiece Socket	Press **SK1/ SK2**	Press **SK1/SK2** to tune the maximum volume, Press **OK** to save and exit upon completion of all settings.	1.3~1.5W (2.28~2.45V)

Appendix 1: Reference Value for TC-580U Source Radio

Tuning Item	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 Section										
Preset Power			167							
Frequency Tolerance			608							
TX Low Power	176	167	167	170	159					
TX High Power	400	397	389	390	387					
CDCSS Balance	89	91	110	113	89					
CDCSS Deviation	101	101	117	115	115	57	61	71	73	68
CTCSS L Deviation	152	163	136	169	171	96	104	85	106	110
CTCSS M Deviation	139	151	175	170	162	89	97	110	111	101
CTCSS H Deviation	151	155	173	169	174	94	98	109	109	109
DTMF Deviation	94	96	102	102	112	55	55	59	62	63
TX Low Voltage Threshold			202							

VOX Gain	VOX Gain1			71						
	VOX Gain2			32						
	VOX Gain3			20						
	VOX Gain4			14						
	VOX Gain5			4						
Max Deviation of TX Audio		16	17	18	19	22	16	17	18	20	22
Rx Item Section											
SQL Level 1 ON		78	69	65	67	65	82	72	68	66	70
SQL Level 5 ON		61	50	44	44	47	64	55	48	48	48
SQL Level 9 ON		32	23	19	20	21	38	26	23	23	24
SQL Level 1 OFF		85	78	76	75	79	91	84	79	80	79
SQL Level 5 OFF		72	63	59	58	61	75	66	59	62	61
SQL Level 9 OFF		46	35	31	33	31	51	39	34	33	36
RX Low Voltage Threshold				200							
Max. RX Volume				33							
Bandpass Filter		210	320	429	536	631					

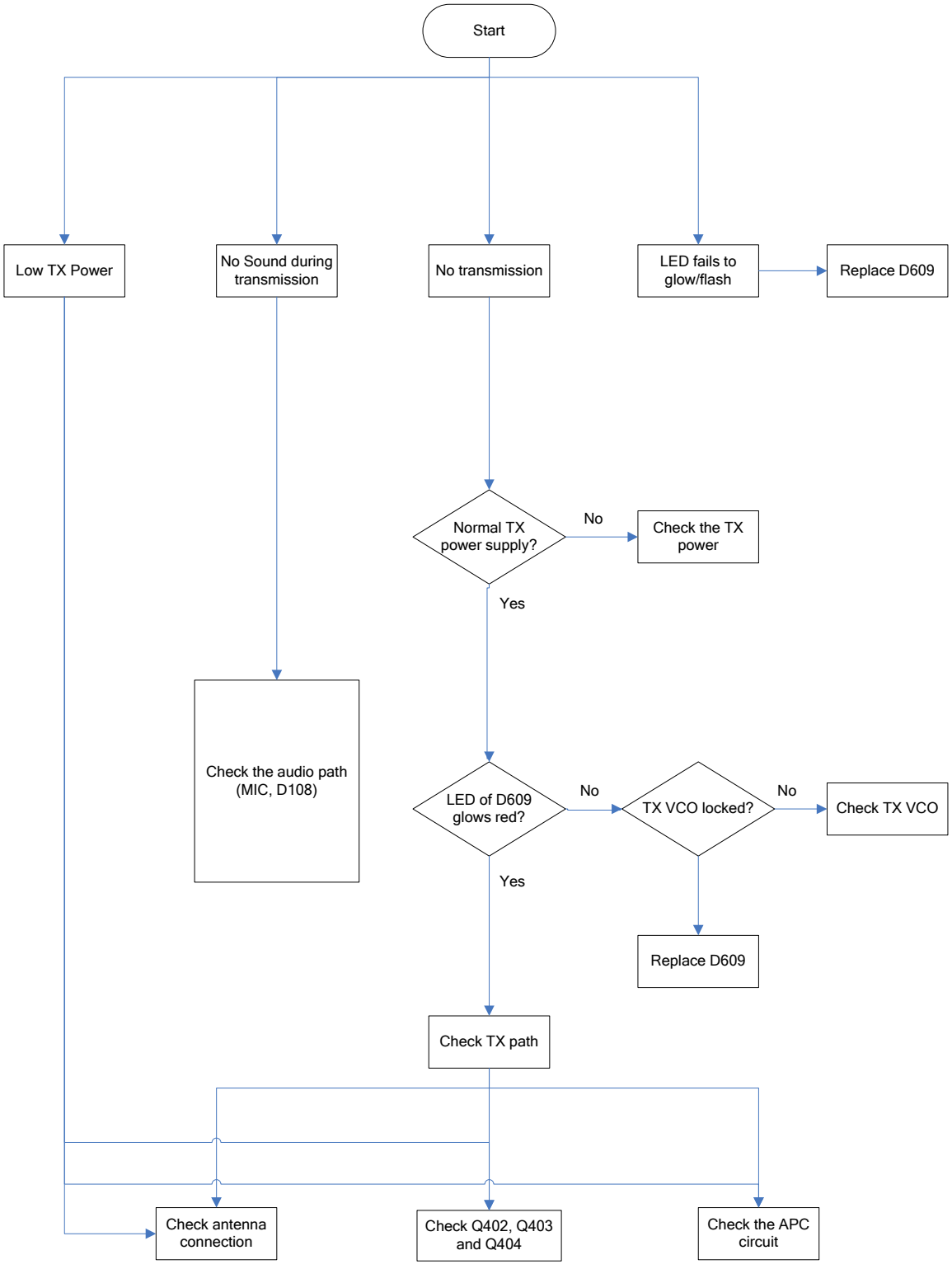
Note: The value is subject to that of the source radio.

Appendix 2: Reference Value for TC-580 Battery Strength

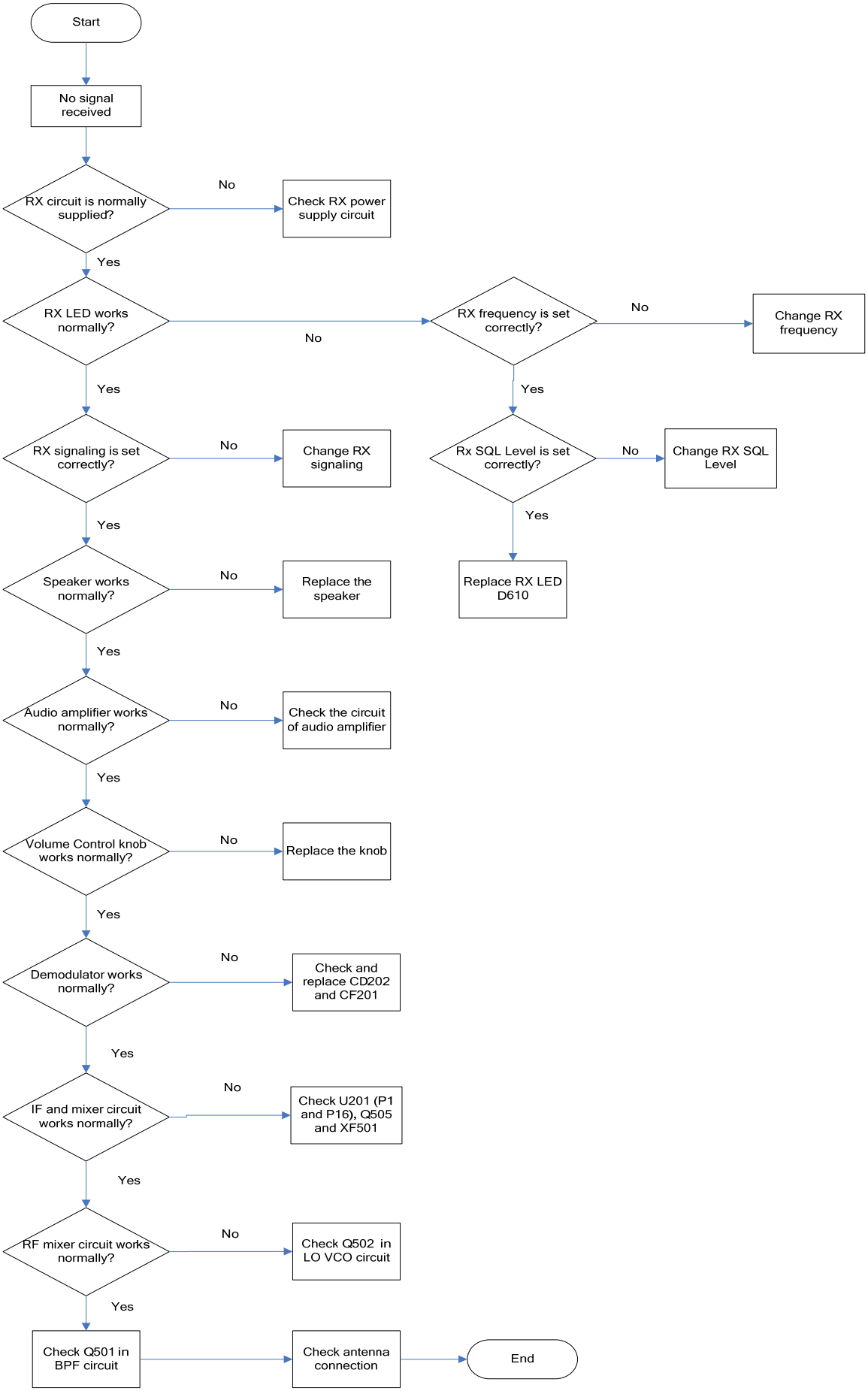
Detection in TX status		
Green LED glows (70%-100%)	>7.46V	Duration: 18 minutes
Orange LED glows (50%-70%)	7.15V - 7.35V	Duration: 12 minutes
Red LED glows (30%-50%)	7.00V - 7.15V	Duration: 12 minutes
Red LED flashes (<30%)	6.20V - 7.00V	Duration: 18 minutes
Red LED flashes and Alert tone sounds	5.80V - 6.20V	
Radio is powered off.	<5.80V	
Detection in Rx and Standby status (or press the Battery Strength Indicator key)		
Green LED glows (70%-100%)	>7.55V	Duration: 18 minutes
Orange LED glows (50%-70%)	7.35V -7.55V	Duration: 12 minutes
Red LED glows (30%-50%)	7.00V - 7.35V	Duration: 20 minutes
Red LED flashes (<30%)	6.50V - 7.00V	Duration: 18 minutes
Red LED flashes and low battery alert tone sounds every ten seconds.	5.80V - 6.50V	

Troubleshooting Flow Chart

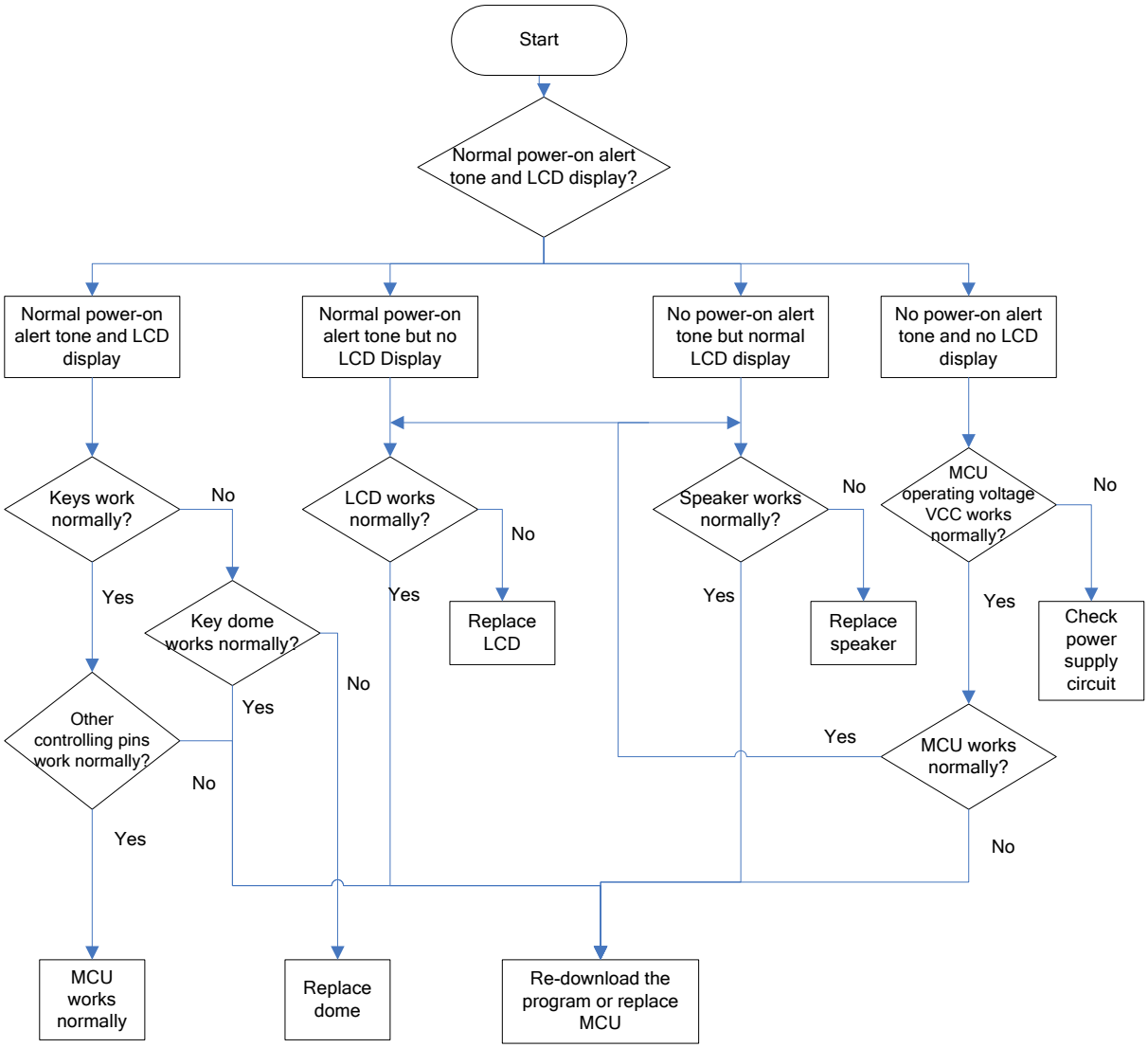
TX Section



RX Section


Start
No signal received
RX circuit is normally supplied?
No
Check RX power supply circuit
Yes
RX LED works normally?
No
RX frequency is set correctly?
No
Change RX frequency
Yes
Yes
RX signaling is set correctly?
No
Change RX signaling
Rx SQL Level is set correctly?
No
Change RX SQL Level
Yes
Yes
Speaker works normally?
No
Replace the speaker
Replace RX LED D610
Yes
Audio amplifier works normally?
No
Check the circuit of audio amplifier
Yes
Volume Control knob works normally?
No
Replace the knob
Yes
Demodulator works normally?
No
Check and replace CD202 and CF201
Yes
IF and mixer circuit works normally?
No
Check U201 (P1 and P16), Q505 and XF501
Yes
RF mixer circuit works normally?
No
Check Q502 in LO VCO circuit
Yes
Check Q501 in BPF circuit
Check antenna connection
End

MCU Section


Start
Normal power-on alert tone and LCD display?
Normal power-on alert tone and LCD display
Normal power-on alert tone but no LCD Display
No power-on alert tone but normal LCD display
No power-on alert tone and no LCD display
Keys work normally?
No
Yes
Key dome works normally?
No
Yes
Other controlling pins work normally?
No
Yes
MCU works normally
Replace dome
LCD works normally?
No
Yes
Replace LCD
Speaker works normally?
No
Yes
Replace speaker
MCU operating voltage VCC works normally?
No
Yes
Check power supply circuit
MCU works normally?
Yes
No
Re-download the program or replace MCU