

TUNE UP PROCEDURE FOR PT4200-01

- THE BUILT-IN CHANNELS ARE 15 CHANNELS +1 SCAN CHANNEL
 - THE RANGE OF FREQUENCY IS 421--470MHz .
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Before test/debugging, make sure all the equipments have been well connected to the ground.

Before test/debugging, make sure the antenna output terminal has been connected properly to the corresponding devices and load.

The transmitter output must pass RF power attenuator before being connected to the standard signal source/ frequency deviator/ frequency spectrum.

When testing the receiver, make sure not to conduct transmitting operation.

When in debugging/testing/service, make sure static free measures for human body and equipments.

1.1 Service Equipment and Software.

The following equipments and software in Table 1.1 are necessary for the service and test of the radio.

Table 1.1 For Test and Service: Equipment and Software

No.	Item	Specifications
1	Computer	Higher than P2, compatible with IBM PC, WINDOWS 98/ME/2000/XP
2	Programming Software	KSP-20
3	Programming Line	KSPL02
4	Cloning Line	KCL01
5	DC Regulated Power	Output voltage: 7.5V, Output current: $\geq 5A$
6	RF power meter	Test range: 0.5--10W Frequency range: 100MHz—500MHz Impedance: 50 Ω SWR ≤ 1.2
7	Frequency Meter	Frequency range: 0.1—600MHz Frequency precision: Higher than $\pm 1 \times 10^{-6}$ Sensitivity: Higher than 100mV
8	Frequency Deviator	Frequency range: DC—600MHz Test range: 0-- $\pm 5kHz$
9	Digital	Input impedance: Higher than 10M Ω/V DC , with the ability of testing voltage,

	Multimeter	current, impedance.
10	Audio Signal Generator	Frequency range: 2---3000Hz Output level: 1---500mV
11	RF power Attenuator	Attenuation: 40dB or 50dB Supporting power: Bigger than 10W
12	Standard signal source	Frequency range: 10MHz---1000MHz Output level: 0.1uV~32mV (-127dBm~-17dBm)
13	Oscillograph	Frequency range: DC~20MHz Test range: 10mV~20V
14	Audio voltmeter	Test range: 10mV~10V

The equipments in item 6, 7, 8, 10, 11, and 12 can be replaced by a comprehensive test instrument.

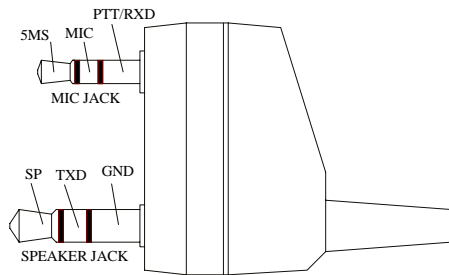


Figure 1.1 External Speaker/Mic Connector Definition

1.2 Debugging Items

During the course of maintenance, the radio needs to be tested and debugged after replacing components. Some certain radio parameters can be modified (computer mode) with our KSP 20 programming software. The modifiable parameters are as follows:

- 1) Frequency difference
- 2) TX power
- 3) Low battery power warning threshold
- 4) Squelch level
- 5) CTCSS frequency deviation
- 6) DCS frequency deviation

Debugging Procedures

- a. Enter the computer test mode.
- b. Select the "Test Mode" option to enter the computer test mode.
- c. Select the options that you want to adjust and adjust the parameters on the computer.
- d. After adjustment, exit the computer test mode.

1.3 Debugging

1.3.1 VCO Modification

Turn off the power saving mode. Set the frequency at the low frequency (see Table 1.2). In receiving status, test the PD power with the digital multimeter. Adjust the trimming capacitor C180 to make the PD power at $1V \pm 0.1V$.

Set the TX frequency at high frequency, press the PTT button, test the PD power with the digital multimeter. The power should lower than 3.5V.

1.3.2 PLL Frequency Adjustment

Under the computer test mode, select “frequency tune” option and click “adjustment” to enter. Adjust the TX frequency among 0~255 to the specified value. (Frequency error should less than 200Hz.)

1.3.3 TX Frequency Adjustment

Under the computer test mode, select “high power, low frequency” and click “adjustment” to enter. Adjust the TX power among 0~255 to 4W. And watch the working current and make sure it not higher than 1.5A.

Adjust “high power, medium frequency”, “high power, high frequency” to set the TX power at 4W.

1.3.4 TX Low Power Warning

Adjust the power to 6.8V.

Under the computer test mode, select “the low power threshold”, and click “adjustment” to enter. Adjust the figure among 0~255 to make the red light flash.

1.3.5 Frequency Deviation Adjustment

Input 100mV, 1000Hz audio signals from the radio MIC, and adjust the potentiometer VR2 to set the TX frequency deviation at $\pm 2.2\text{kHz}$.

1.3.6 DCS TX Signal Wave Shape and Frequency Adjustment

Under the computer test mode, select “DCS wide band modulation”, and click “adjustment” to enter. Adjust the potentiometer VR1, and watch the demodulation signals. The wave shape should be smooth (close to square wave) and then adjust the figure to set the frequency deviation at 0.35kHz.

1.3.7 CTCSS Frequency Deviation Adjustment

Under the computer test mode, select “CTCSS wide band modulation”, and click “adjustment” to enter. Adjust the figure to set the frequency deviation at 0.35kHz.

1.3.8 Receiver Sensitivity

Repeat adjusting L9, L10, L6, and L5 to make the frequencies at highest sensitivity.

1.3.9 Receiver Squelch Setting

Under the computer test mode, select “the 9th squelch” and click “adjustment” to enter. Input the receiver with the signals of 1kHz modulation frequency, 3kHz frequency deviation, and -117dBm level. Adjust the figure to make the green light flash.

Under the computer test mode, select “the 3rd squelch” and click “adjustment” to enter. Input the receiver with the signals of 1kHz modulation frequency, 3kHz frequency deviation, and -124dBm level. Adjust the figure to make the green light flash.

1.4 Debugging

The above debugging refers to Table3, Table4, and Table 5.

Table 1.3 Voltage Controlled Oscillator (VCO)

Item	Test Condition	Test Equipment	Test Point	Adjustment Part	Requirement	Note
Setting	Battery Power: 7.5V	Digital Multimeter	PD			
Locked Power	CH: RX Low Frequency			C180	1.0V±0.1V	Adjustment
	CH: RX High Frequency				Lower than 3.5V	Watch
	CH: TX Low Frequency			C181	1.0V±0.1V	Adjustment
	CH: TX High Frequency				Lower than 3.5V	Watch

Table 1.4 Receiver

Item	Test Condition	Test Equipment	Test Point	Adjustment	Requirement	Note
Band Pass Filter		Spectroanalyzer/ Comprehensive Test Device	Before Mixing	Computer Test Mode		Not recommend the user to adjust it!
Audio Level	Test Frequency : MF Antenna Input: RF OUT : -53dBm(501µV) MOD: 1kHz DEV: ±3.0kHz Audio Load : 16Ω	RF Audio Signal Generator Oscillator Audio Voltmeter	Speaker Connector		(Turn the volume knob clockwise) Audio power >0.3 W	Inner speaker power > 1.2W
Sensitivity	CH: MF CH: LF CH: HF RF OUT: -116dBm(0.35µV) MOD: 1kHz DEV: ±1.5kHz	Distortion Test Device /Comprehensive Test Device		Computer Test Mode	SINAD: 12dB or higher	
Squelch Activation Sensitivity	CH: Receiving Center Frequency				After adjustment, squelch	

	9th RF OUT : -117dBm			Computer Test Mode	activation is normal.	
	3rd RF OUT : -124dBm				After adjustment, squelch activation is normal.	

Table 1.5 Transmitter

Item	Test Condition	Test Equipment	Test Point	Adjustment	Requirement	Note
TX Frequency		Frequency Meter/ Comprehensive Test Device	Antenna	Computer Test Mode	Within $\pm 200\text{Hz}$	
DCS Wave Shape (Balance)		Oscillator / Comprehensive Test Device		VR1	Wave shape is close to smooth square wave.	
Power		Power Meter/ Comprehensive Test Device/ Ammeter		Computer Test Mode	Adjust to 4.7W	Within $\pm 0.2\text{W}$
Maximum Modulation Frequency Deviation	CH: TX Center Frequency AG: 1kHz/220mV	Frequency Deviation Meter/ Comprehensive Test Device		VR2	Adjust to $\pm 2.2\text{kHz}$	$\pm 200\text{Hz}$
Modulation Sensitivity	CH: TX Center Frequency AG: 1kHz/22mV			Checking frequency: 1.1kHz~1.9kHz		
CTCSS DEV	CTCSS: 67Hz	Frequency Deviation Meter/ Comprehensive Test Device		Computer Test Mode	Adjust to $\pm 0.35\text{kHz}$	$\pm 50\text{Hz}$
DCS DEV	DCS: 023N	Frequency Deviation Meter/ Comprehensive Test Device		Computer Test Mode	Adjust to $\pm 0.35\text{kHz}$	$\pm 50\text{Hz}$
Battery Power Warning	Battery Terminal: 6.8V				Computer Test Mode	After adjustment, the indicator flashes.