

**CS2000 AND CS2001 ALIGNMENT  
REFERENCE MANUAL**

**FM HANDHELD TRANCEIVER**

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**Version 1.01**

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## TUNING SELECTION SCREEN

To use the tuning mode, the following two null files have to be inserted into the directory running the program:

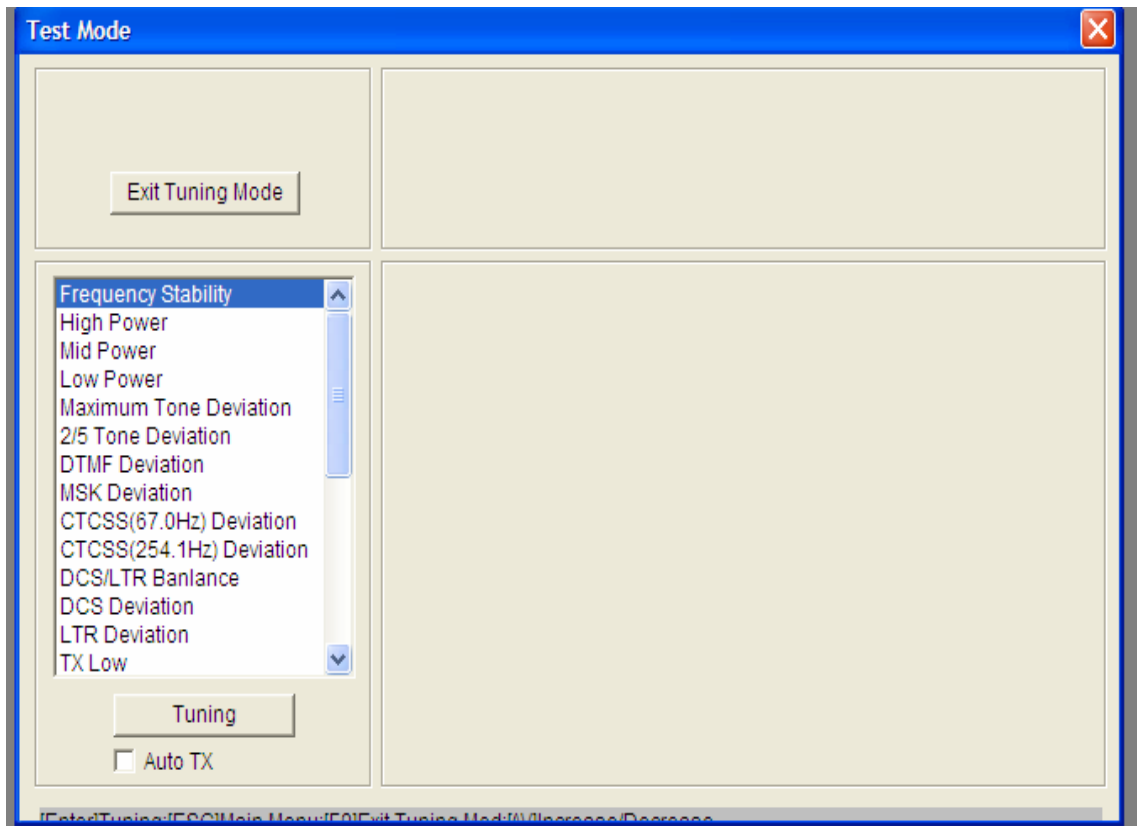
PT7200DBG.txt

PT7200TBG.txt

These files can be created with any text editor such as NOTEPAD or WORD.

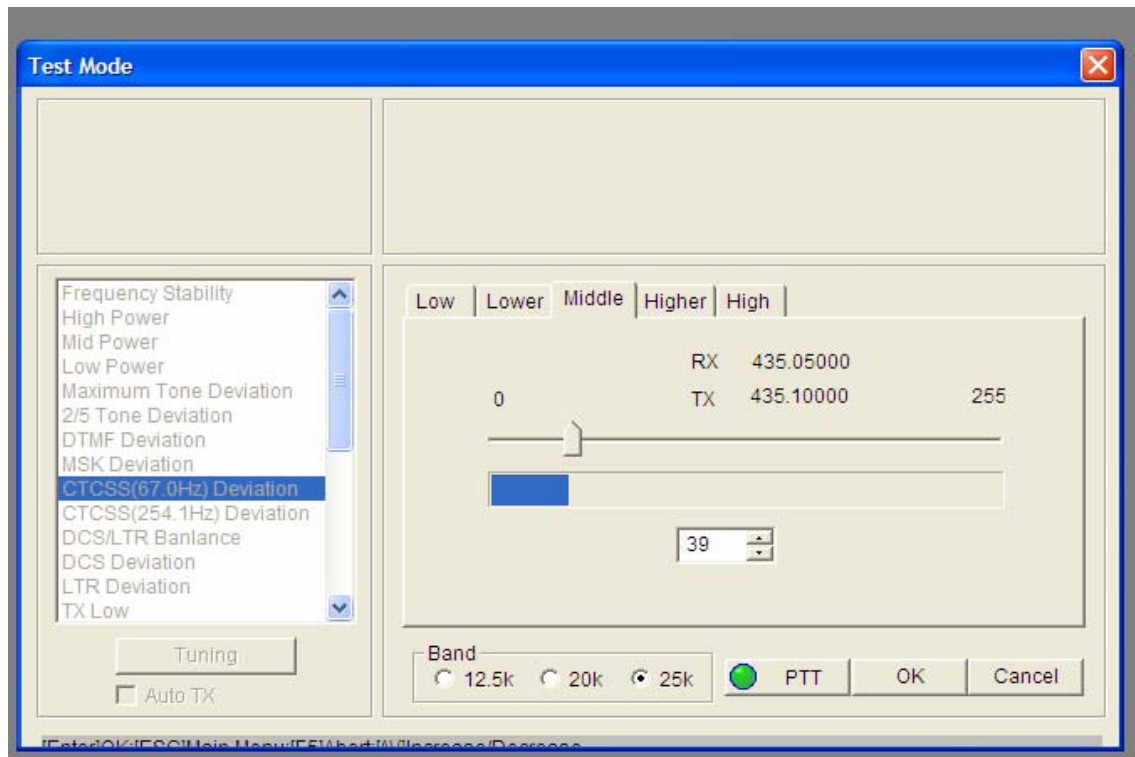
The fundamental screen necessary to understand the alignment is shown below. The dealer should not normally have to use the alignment screens but if they do we are providing sufficient information on what parameters can be adjusted.

The alignment of a radio requires specialized test equipment and the tuning of these various parameters should not be done without the proper test equipment. Setting the parameters improperly could make the radio non FCC compliant.



If you check the Auto TX box, when you get into a parameter that requires the transmitter to turn on the transmitter will immediately turn on when you enter that parameter. If the box is not checked, then you will have to manually press the PTT on the screen when you enter a parameter that requires a transmitter to turn on.

## TUNING SCREEN



When you double click on an item in the Tuning Item List you will get a screen such as shown above. Notice you have the following choices:

### **Narrow Band Special, or Wide Band**

Select Narrow Band (12.5 KHz), Mid Band(20KHz) or Wide Band (25 KHz) for the alignment. Some of the parameters do not give you a choice of band selection.

### **Five Different Frequencies**

Align the parameters at the frequencies shown above. Note for certain parameters you are adjusting at the RX Frequency and other parameters you are adjusting at the TX Frequency. It is up to the dealer to understand if they should be using receive or transmit frequencies. Some of the parameters do not give you a choice of frequencies.

### **PTT**

Once you select a value you would like, click on the PTT button. The button will go from Green to Red and the transmitter will turn on. When you are finished making your selection, press the PTT button again and it will go from Red to Green and the Transmitter will turn off.

### **OK**

After you do the tuning and before you get out of this screen, you have the choice of saving the work you completed.

**Cancel**

If you made a mistake and would like to ignore what was done, press Cancel and all your hard work will be lost.

**Adjusting the Parameter**

The parameter can be adjusted by moving the slider or changing the number below.

**HELPFUL HINT**

When the tuning parameter has multiple frequencies to program do them all. If the frequency in your radio is not within the range of the frequency in the alignment screen you just programmed, it will have no effect. If you program all the frequencies in the alignment screen, then it is guaranteed you will cover whatever is programmed in your radio.

# PARAMETERS ALLOWED FOR THE CS2000 TO BE ADJUSTED

## Frequency Stability

### 6250Hz Precision (Tab 1)

This parameter is used to adjust the temperature compensated crystal controlled voltage controlled oscillator (TCXVCO). Channel spacing in the standard radio is either 6,250 Hz, 12,500 Hz, and 25,000 Hz. It is no coincidence that the 6250 is a sub-multiple of all the standard frequency spacing. What this parameter actually does is provide a slight DC bias on the TCXVCO to move the frequency slightly to allow the PLL frequency to be exactly on frequency. While the radio should never need adjustment because it is adjusted at the factory, if the oscillator does drift this parameter can be used to compensate for that drift.

### 2500Hz Precision (Tab 2)

This parameter is used exactly like the parameter above except it is used for non standard spacing such as 5 KHz, 10 KHz, and 20 KHz.

## High Power

The radio is aligned from the factory to output 5 watts on VHF and 4 watts on UHF in the high power setting. This adjustment can be used to change the default. To prevent interference under certain circumstances or to extend the battery life, it might be desirable to lower the maximum output power to something below what the transmitter is actually capable of. This adjustment is done at the following frequencies:

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

## Mid Power

The radio is aligned from the factory to output 2.0 – 2.2 watts on both VHF and UHF in the mid power setting. This adjustment can be used to change the default. To prevent interference under certain circumstances or to extend the battery life, it might be desirable to change the output power of the low power setting. This adjustment is done at the following frequencies:

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### Low Power

The radio is aligned from the factory to output 1.0 – 1.2 watts on both VHF and UHF in the low power setting. This adjustment can be used to change the default. To prevent interference under certain circumstances or to extend the battery life, it might be desirable to change the output power of the low power setting. This adjustment is done at the following frequencies:

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### Maximum Tone Deviation

This parameter is used to adjust the maximum deviation of voice to an appropriate value. Narrow band is adjust from 1.9 KHz to 2.1 KHz, mid band is adjusted from 3.5 KHz to 3.7 KHz and wide band is adjusted from 3.9 KHz to 4.1 KHz.

If the maximum deviation of voice is set too large, it will exceed the value specified by the FCC regulations. If the maximum deviation is set too small, the voice in the receiving radio might not be loud enough.

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### 2/5 Tone Deviation

This radio can generate both two tone signaling and five tone signaling. This parameter sets the deviation for those tones. Narrow Band is adjusted from 1.1 KHz to 1.9 KHz, Mid Band is adjusted from 2.0 KHz to 3.5 KHz and Wide Band is adjusted from 3.0 KHz to 3.8 KHz.

### DTMF Deviation

This radio can generate DTMF tones for purposes of identification when the PTT is pressed or released and for emergency alarms. This parameter sets the deviation for the DTMF tones. Narrow Band is adjusted from 1.1 KHz to 1.9 KHz, Mid Band is adjusted from 2.0 KHz to 3.5 KHz and Wide Band is adjusted from 3.0 KHz to 3.8 KHz.

### **MSK Deviation**

This radio has the ability to generate MDC1200 signals by means of a built in MSK modem. This parameter sets the deviation for the MSK tones. Narrow Band is adjusted from 1.1 KHz to 1.9 KHz, Mid Band is adjusted from 2.0 KHz to 3.5 KHz and Wide Band is adjusted from 3.0 KHz to 3.8 KHz. If in Wide Band, the adjustment is done at the five different frequencies shown below.

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### **CTCSS (67.0Hz) and (254.1Hz) Deviation**

The radio is aligned from the factory for 600 Hz to 800 Hz deviation in Wide Band (25 KHz), 500 Hz to 650 Hz deviation in Mid Band (20 KHz), and 300 Hz to 500 Hz deviation in Narrow Band (12.5 KHz). This adjustment allows the dealer to change the default settings. In the Narrow Band and Mid Band the adjustment is done at 435.10000 for UHF and 155.10000 for VHF but in the Wide Band there are five choice. The choices correspond to the test frequencies as shown below. To get more accurate deviation readings over the CTCSS frequency range, the product allows you to align at the CTCSS frequencies of 67.0 Hz and 254.1 Hz.

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### **DCS/LTR Balance**

This radio uses a two point modulation scheme to minimize the droop when sending digital waveforms. This parameter adjusts the relative value between the two different modulation points. It should be adjusted to get the proper waveform.

### DCS Deviation

The radio is aligned from the factory for 800 Hz to 1000 Hz deviation in Wide Band (25 KHz), 600 Hz to 850 Hz deviation in Mid Band (20 KHz) and 400 Hz to 600 Hz deviation in Narrow Band (12.5 KHz). This adjustment allows the dealer to change the default settings. In the Narrow Band the adjustment is done at 435.10000 for UHF and 155.10000 for VHF but in the Wide Band there are five choices. The choices correspond to the test frequencies as shown below.

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### LTR Deviation

The radio is aligned from the factory for 800 Hz to 1000 Hz deviation in Wide Band (25 KHz), 600 Hz to 850 Hz deviation in Mid Band (20 KHz) and 400 Hz to 600 Hz deviation in Narrow Band (12.5 KHz). This adjustment allows the dealer to change the default settings. In the Narrow Band the adjustment is done at 435.10000 for UHF and 155.10000 for VHF but in the Wide Band there are five choices. The choices correspond to the test frequencies as shown below.

	VHF	UHF
Lowest	136.10000	400.10000
Low	145.60000	417.60000
Mid	155.10000	435.10000
High	164.60000	452.60000
Highest	173.90000	469.90000

### TX Low

This setting determines the lowest voltage the battery will be in the transmitting mode. If the voltage goes below that point then the system will not transmit. The factory setting for the TX Low Voltage is 6.8 Volts.

### Sensitivity

The front end of the radio has a bandpass filter that can be electronically adjustable by varying the voltage on the varactors. The adjustment for the sensitivity is used to optimize the center frequency of the bandpass filter for the frequencies specified below.

	VHF	UHF
Lowest	136.05000	400.05000
Low	145.55000	417.55000
Mid	155.05000	435.05000
High	164.55000	452.55000
Highest	173.95000	469.95000

## Squelch

Squelch Level is an analog reference level number that the transceiver's CPU uses to set the internal squelch threshold. The range is between 0 (open) to 9 (tight). The alignment of the radio allows you to set Squelch level 1 and squelch level 9. The other levels are interpolated. The factory defaults for these two levels are as follows:

SQ1 On -123 dBm (Wide Band) -123 dBm (Narrow Band)

SQ1 Off -125 dBm (Wide Band) -125 dBm (Narrow Band)

SQ9 On -116 dBm (Wide Band) -118 dBm (Narrow Band)

SQ9 Off -116 dBm (Wide Band) -118 dBm (Narrow Band)

The adjustment is done at the following five frequencies for both Wide Band and Narrow Band:

	VHF	UHF
Lowest	136.05000	400.05000
Low	145.55000	417.55000
Mid	155.05000	435.05000
High	164.55000	452.55000
Highest	173.95000	469.95000

## Maximum Receive Volume

This parameter is not used in the radio at this time.

## Minimum Receive Volume

This parameter is not used in the radio at this time.

## VOX 1

This radio has the ability to work hands free using VOX 1 (Voice operated transmitter). VOX is the minimum sensitivity setting and is adjusted using a 50 mV 1KHz sine wave signal into the mike terminal.

## VOX 10

This radio has the ability to work hands free using VOX (Voice operated transmitter). VOX 10 is the maximum sensitivity setting and is adjusted using a 5 mV 1KHz sine wave signal into the mike terminal.

## RX Low Voltage

This setting determines the lowest voltage the battery will be in the receiving mode. If the voltage goes below that point then the system will not receive. The factory setting for the RX Low Voltage is 6.8 Volts.

**RSSI (-120 dBm) & RSSI (-70 dBm)**

The RSSI adjustment is only used for 5 tone operation and is used to determine if the squelch is active. If the receiver of the radio is not getting a strong enough signal, then the 5 tone signal is ignored.

## CHANGES TO THE MANUAL

### **Version 1.00**

Original Release

### **Version 1.01**

Added information on files needed to enter into tuning mode.