

## Introduction

The **EVX-53x** series has been aligned at the factory for the specified performance across the entire frequency range specified. Realignment should therefore not be necessary except in the event of a component failure. All component replacement and service should be performed only by an authorized Vertex Standard representative, or the warranty policy may be voided.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver has left the factory. However, if damage occurs and some parts are replaced, realignment may be required. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced.

We recommend that servicing be performed only by authorized Vertex Standard service technicians who are experienced with the circuitry and fully equipped for repair and alignment. Therefore, if a fault is suspected, contact the dealer from whom the transceiver was purchased for instructions regarding repair. Authorized Vertex Standard service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components. Those who do undertake any of the following alignments are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, Vertex Standard must reserve the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners. Under no circumstances should any alignment be attempted unless the normal function and operation of the transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and the need for realignment determined to be absolutely necessary. The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy. While most steps do not require all of the equipment listed, the interactions of some adjustments may require that more complex adjustments be performed afterwards. Do not attempt to perform only a single step unless it is clearly isolated electrically from all other steps. Have all test equipment ready before beginning, and follow all of the steps in a section in the order presented.

## Required Test Equipment

- Radio Tester with calibrated output level at 600 MHz
- In-line Wattmeter with 5% accuracy at 600 MHz
- 50-ohm, 10-W RF Dummy Load
- Regulated DC Power Supply (standard 7.5 VDC, 3 A)
- Frequency Counter:  $\pm 0.2$  ppm accuracy at 600 MHz
- AF Signal Generator
- AC Voltmeter
- DC Voltmeter
- UHF Sampling Coupler
- IBM PC/Compatible Computer with Microsoft® Windows® 2000, XP, Vista, or 7
- Microsoft® Net Framework 2.0 or later
- Vertex Standard CE142 Alignment Program
- Vertex Standard FIF-12 USB Programming Interface and CT-106 PC Programming Cable
- Vertex Standard FRB-6 Tuning Interface Box and CT-160 Connection Cable

## Alignment Preparation & Precautions

A 50-Ohm RF Dummy Load and in-line wattmeter must be connected to the main antenna jack in all procedures that call for transmission, except where specified otherwise. Correct alignment is not possible with an antenna.

After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, if connected) before proceeding.

Correct alignment requires that the ambient temperature be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 °C and 30 °C. When the transceiver is brought into the shop from hot or cold air, it should be allowed time to come to room temperature before alignment.

Whenever possible, alignments should be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

**Note:** Signal levels in dB referred to in this procedure are based on 0 dB $\mu$  EMF = 1.0  $\mu$ V.

## Test Setup

Setup the test equipment as shown below for transceiver alignment, then apply 7.5 V DC power to the transceiver.

## The Alignment Tool Outline

### Installation the tool

- Install the CE142 Alignment Program to your PC.
- Execute the “Alignment” function in the “Radio” menu of CE142.

### Action of the switches

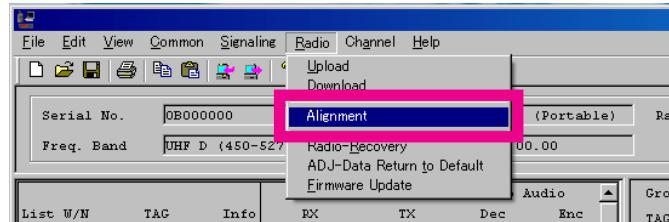
When the transceiver is in “Alignment mode”, the action of PTT and KEY is ignored. All of the action is remote controlled by Computer.

### Caution!

Please never turn off a power supply while alignment. If the power supply turn off while alignment, the setting data is failed.

## Alignment Mode

In the “Alignment mode”, the aligned data written in the radio will be able to re-align its alignment data. The value of each parameter can be changed to desired position by “ $\leftarrow$ ”/“ $\rightarrow$ ” arrow key for up/down, direct number input and drag the mouse.



To enter the “Alignment Mode”, select “Alignment” in the main menu “Radio”. It will start to “Read” the written personalized data from the radio. Then pressing the button “OK” will start the Basic Alignment Mode.

**Note:** when all items are aligned, it is strongly recommended to align according to following order. The detail information is written in the help of CE142 (Clone Editor).

1. VCO (Please do not adjust it)
2. PLL Reference Frequency (Frequency)
3. RX Sensitivity (RX Tune)
4. Squelch (SQL/RSSI)
5. TX Power <High/Low3/Low2/Low1>
6. Maximum Deviation <Wide/Narrow>

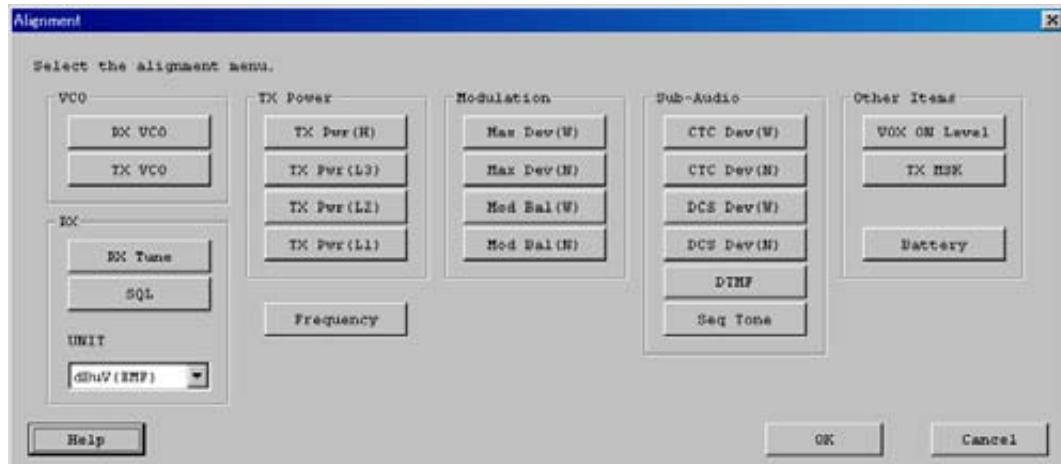
Adjust the following items when needed.

- Modulation Balance <Wide/Narrow>
- CTCSS Deviation <Wide/Narrow>
- DCS Deviation <Wide/Narrow>
- DTMF Alignment
- Seq Tone
- VOX ON Level
- TX MSK
- Battery

### Unit

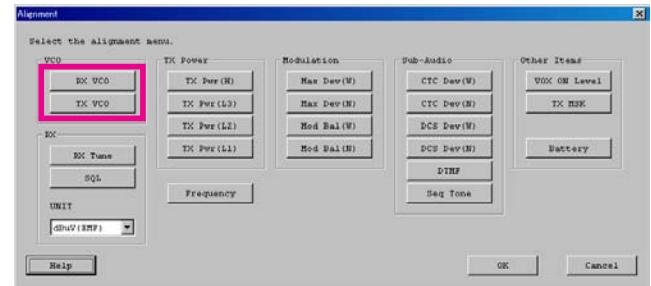
During alignment, you may select the value among dB $\mu$ V,  $\mu$ V (EMF or PD), or dBm by the “UNIT” button.

When perform the RX Tune and SQL alignment, the RF level shows this unit according to this setting.



## **1. VCO (RX VCO/TX VCO) - Normally there is no need to adjust this parameter -**

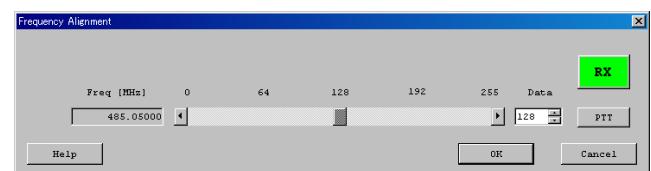
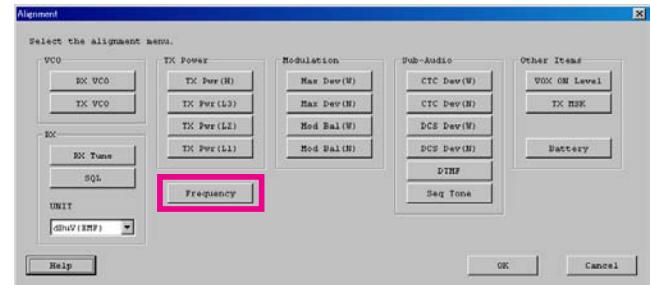
This parameter is to align the VCO Voltage adjustment.



## **2. PLL REFERENCE FREQUENCY (FREQUENCY)**

This parameter is to align the reference frequency for PLL.

1. Press the “Frequency” button to start the alignment.  
The Frequency Alignment window will appear.
2. Click the “PTT” button or press the “SPACE” bar, and the radio will start to transmit on the center frequency channel.
3. Set the value to get the desired frequency by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box.
4. After getting the desired frequency click the “PTT” button or press the “SPACE” bar to stop transmitting.
5. Click the “OK” button to finish the frequency alignment and save the data.



### 3. RX SENSITIVITY (RX TUNE)

This parameter is to align the RX BPF (Band Pass Filter) for Receive (RX) sensitivity. The PLL Reference Frequency (Frequency) alignment must be done before this alignment is performed.

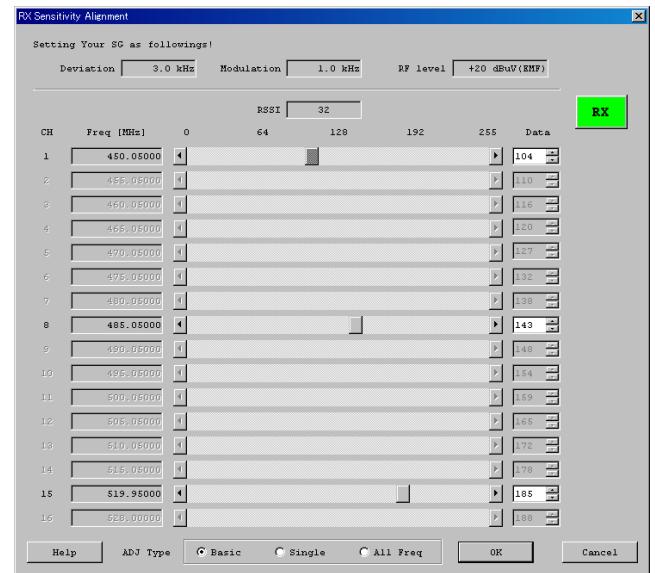
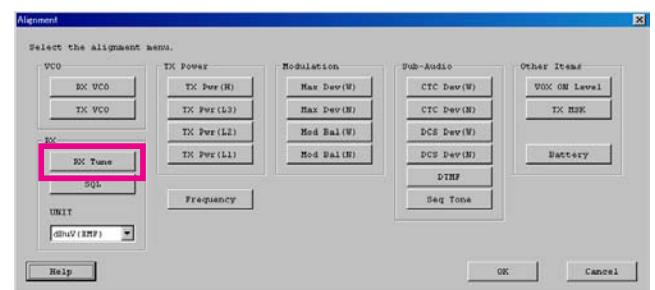
1. Press the “RX Tune” button to start the alignment. The RX Sensitivity Alignment window will appear.
2. Click the left mouse button on the slide bar or press Up / Down arrow key, to switch to the selected channel.
3. Set the Signal Generator according to the indication at the top of the screen (Setting Your SG as followings).
4. Drag the slide bar, click the up-down buttons, press the left or right arrow key, or enter the value in the entry box to get the best RX sensitivity (Highest RSSI value).
5. Click the “OK” button to finish the RX Sensitivity alignment and save the data.

#### ADJ Type

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

**All Freq:** Alignment value changes on all channels.



## 4. SQUELCH (SQL)

This parameter is to align the SQL (Squelch) Sensitivity.

There are several alignments as follows in the Squelch Sensitivity.

### Tight SQL Level (TI NSQ W/N)

The Alignment for the Noise SQL Tight level at Wide (5k/4k) or Narrow (2.5k).

### Threshold SQL Level (TH NSQ W/N)

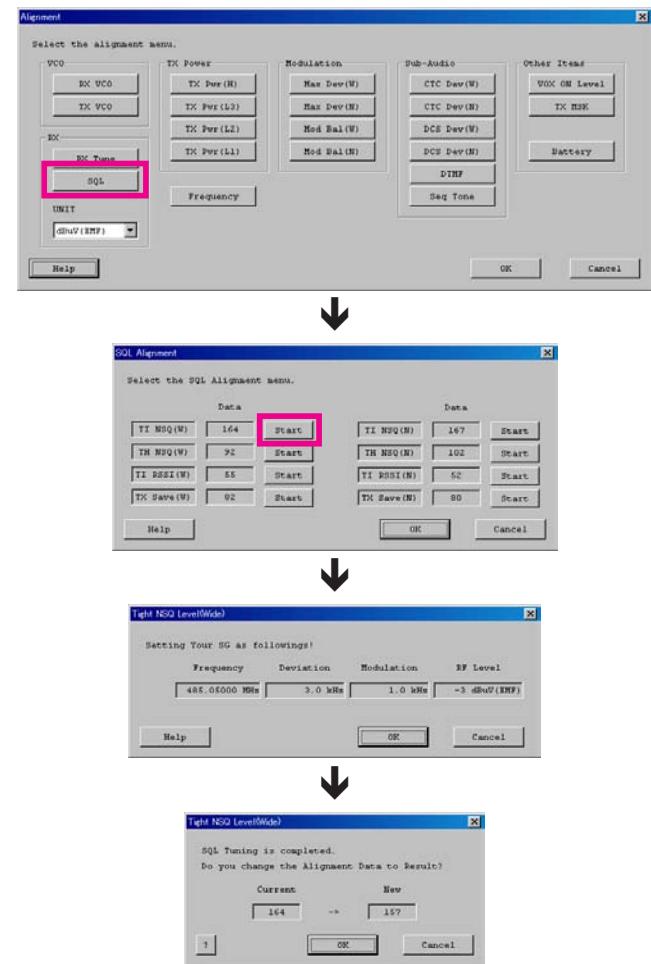
The Alignment for the Noise SQL Threshold level at Wide (5k/4k) or Narrow (2.5k).

### Tight SQL RSSI Level (TI RSSI W/N)

The Alignment for the “level 14” of the RSSI SQL level at Wide (5k/4k) or Narrow (2.5k).

The procedure for all the alignments is as follows.

1. Click the “Start” button to open the alignment window in the SQL/RSSI Alignment menu.
2. The Alignment window will appear, Set the Signal Generator according to the indication, then click the “Start” button.
3. The automatic alignment will start to get the SQL or RSSI level.
4. It will show the alignment result in the “New” box.
5. Click the “OK” button, then the data will be saved and the alignment is finished.



## 5. TX POWER

This parameter is to align the “Power High”, “Power Low3”, “Power Low2”, or “Power Low1” for the selected channel.

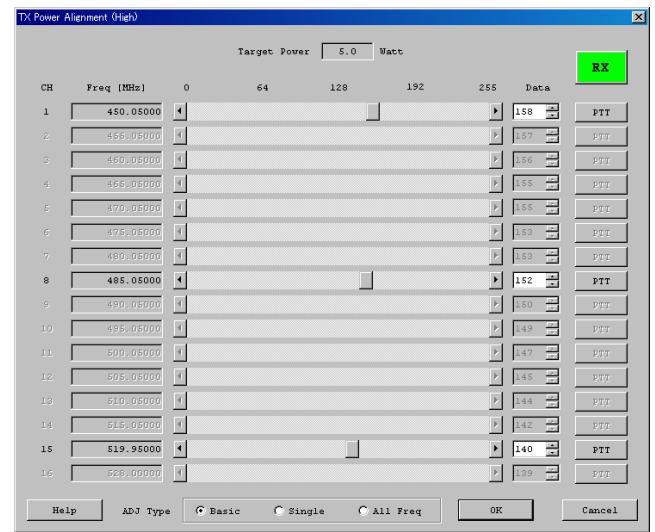
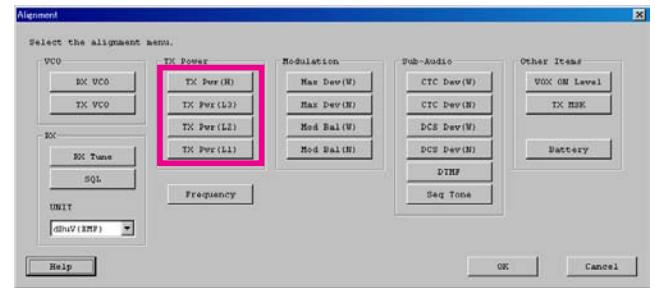
1. Press the “TX Pwr (H / L3 / L2 / L1)” button to start the alignment. The TX Power Alignment window will appear.
2. Click the left mouse button on the slide bar or press the Up / Down arrow key, to select the desired channel.
3. Click the “PTT” button or press the “SPACE” bar at the desired channel, then the radio starts to transmit on the selected channel.
4. Set the value to get desired output power (High: 5 W, Low3: 2.5 W, Low2: 1 W, Low1: 250 mW) on the Power Meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
5. After getting the desired output power click the “PTT” button or press the “SPACE” bar to stop transmitting.
6. Click the “OK” button to finish the TX Power alignment and save the data.

### ADJ Type

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

**All Freq:** Alignment value changes on all channels.



## 6. MAXIMUM DEVIATION <WIDE> / <NARROW>

This parameter is to align the “Maximum Deviation” (Wide/Narrow).

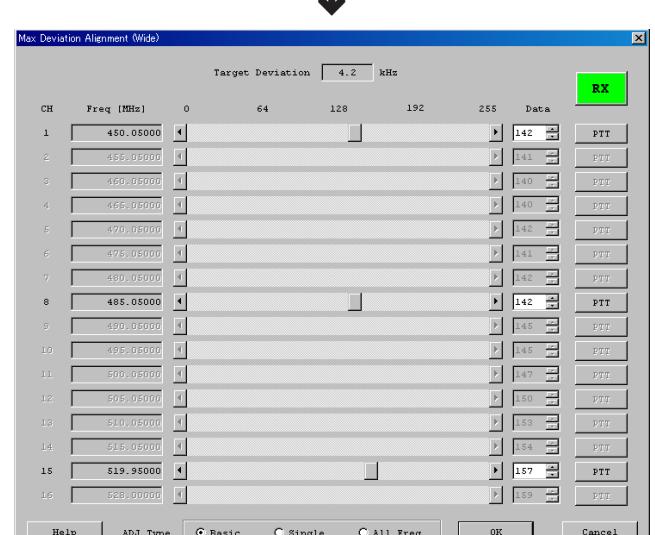
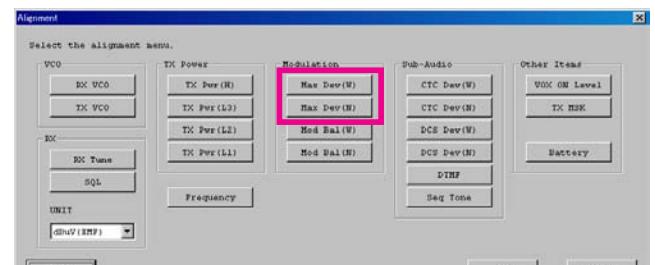
1. Press the “Max Dev (W / N)” button to start the alignment.
2. The Max Deviation alignment window will appear.
3. Connect the Generator, Inject a 1 kHz tone / Sine Wave / -10 dBm to the MIC jack.
4. Click the left mouse button on the slide bar or press the Up / Down arrow key, to select the desired channel.
5. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit on the selected channel.
6. Set the value to get desired deviation (Wide: 4.2kHz, Narrow: 2.1kHz) on the deviation meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
7. After getting the desired deviation click the “PTT” button or press the “SPACE” bar to stop transmitting.
8. Click the “OK” button to finish the Max Deviation alignment and save the data.

### ADJ Type

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

**All Freq:** Alignment value changes on all channels.



## Please adjust the following items when needed.

### MODULATION BALANCE <WIDE> / <NARROW> (THIS ALIGNMENT IS DIFFICULT.)

This parameter is to align the “Modulation Balance” (Wide/Narrow).

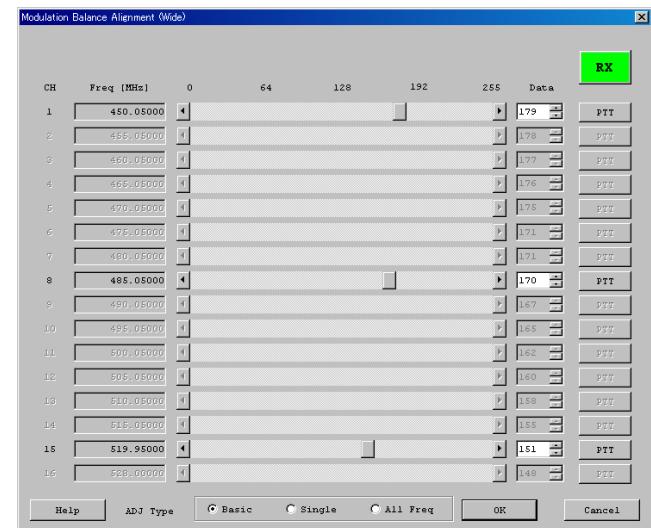
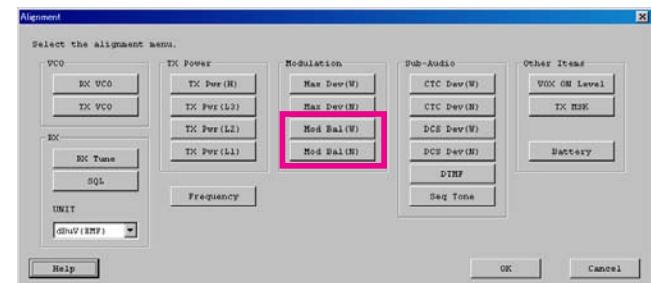
1. Press the “Mod Bal (W / N)” button to start the alignment.
2. The Modulation Balance Alignment window will appear.
3. Connect the Generator, Inject a 400Hz tone / Sine Wave / -10 dBm to the MIC jack.
4. Click the left mouse button on the slide bar or press the Up / Down arrow key, to select the desired channel.
5. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit on the selected channel.
6. Set the value to get “the best square wave” on the Oscilloscope by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
7. After getting the “the best square wave”, click the “PTT” button or press the “SPACE” bar to stop transmitting.
8. Click the “OK” button to finish the Modulation Balance alignment and save the data.

#### ADJ Type

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

**All Freq:** Alignment value changes on all channels.



## CTCSS DEVIATION <WIDE> / <NARROW>

This parameter is to align CTCSS Deviation of the selected channel.

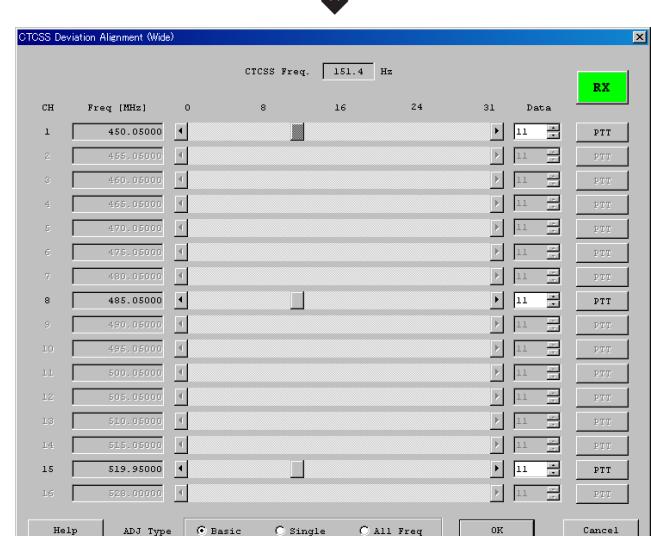
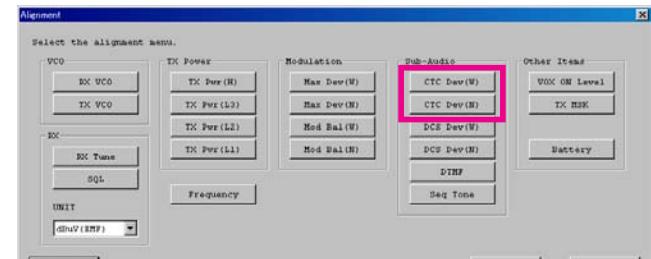
1. Press the “CTC Dev (W / N)” button to start the alignment. The CTCSS Deviation Alignment window will appear.
2. Click the left mouse button on the slide bar or press the Up / Down arrow key, to select the desired channel.
3. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit with CTCSS tone on the selected channel.
4. Set the value to get desired deviation on the deviation meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
5. After getting the desired deviation (Wide: 0.6 kHz, Narrow: 0.3 kHz) click the “PTT” button or press “SPACE” bar to stop transmitting.
6. Click the “OK” button to finish the CTCSS Deviation alignment and save the data.

#### ADJ Type

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

**All Freq:** Alignment value changes on all channels.



## DCS DEVIATION <WIDE> / <NARROW>

This parameter is to align “DCS Deviation” of the selected channel.

1. Press the “DCS Dev (W / N)” button to start the alignment. The DCS Deviation Alignment window will appear.
2. Click the left mouse button on the slide bar or press the Up / Down arrow key, to select the desired channel.
3. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit with DCS Code on the selected channel.
4. Set the value to get desired deviation (Wide: 0.6 kHz, Narrow: 0.3 kHz) on the deviation meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
5. After getting the desired deviation click “PTT” button or press “SPACE” bar to stop transmitting.
6. Click the “OK” button to finish the DCS Deviation alignment and save the data.

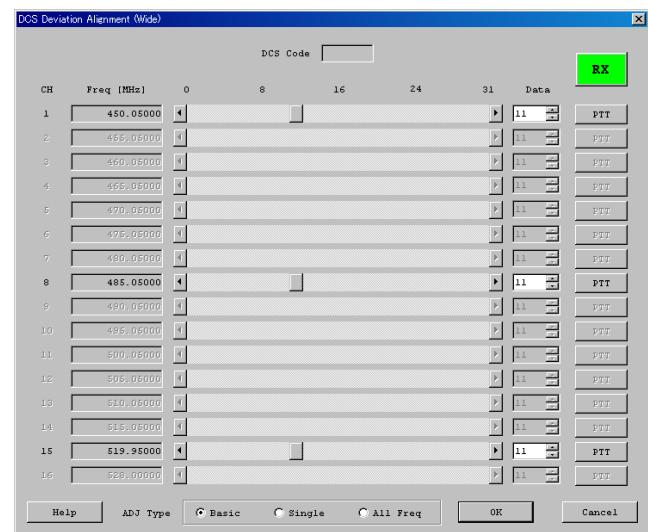
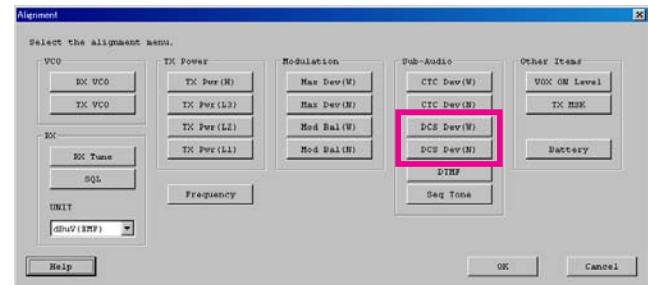
**ADJ Type**

**ADJ Type**

**Basic:** “Low-edge / band center / high-edge” and select the channel for alignment (Default).

**Single:** Alignment value changes only on the selected channel.

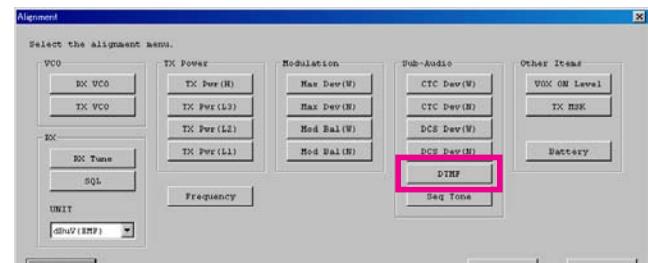
**All Freq:** Alignment value changes on all channels.



## DTMF DEVIATION

This parameter is to align “DTMF Deviation”.

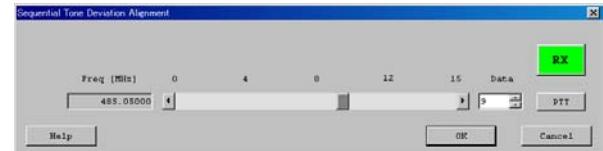
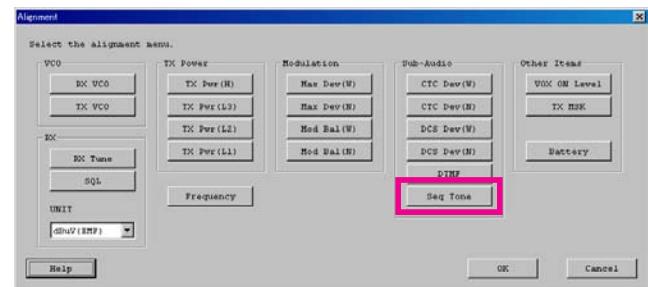
1. Press the “DTMF” button to start the alignment. The DTMF Alignment window will appear.
2. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit on the Center frequency channel.
3. Set the value to get desired deviation (3.0 kHz) on the deviation meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box on the selected channel.
4. After getting the desired deviation click the “PTT” button or press the “SPACE” bar to stop transmitting.
5. Click the “OK” button to finish the DTMF Deviation alignment and save the data.



## SEQUENTIAL TONE DEVIATION

This parameter is to align “Sequential Tone Deviation”.

1. Press the “Seq Tone” button to start the alignment. The Sequential Tone Deviation Alignment window will appear.
2. Click the “PTT” button or press the “SPACE” bar, the radio starts to transmit on the Center frequency channel.
3. Set the value to get desired deviation (3.0 kHz) on the deviation meter by dragging the slide bar, clicking the up-down button, pressing the left or right arrow key, or entering the value in the entry box.
4. After getting the desired deviation click the “PTT” button or press the “SPACE” bar to stop transmitting.
5. Click the “OK” button to finish the Sequential Tone Deviation alignment and save the data.

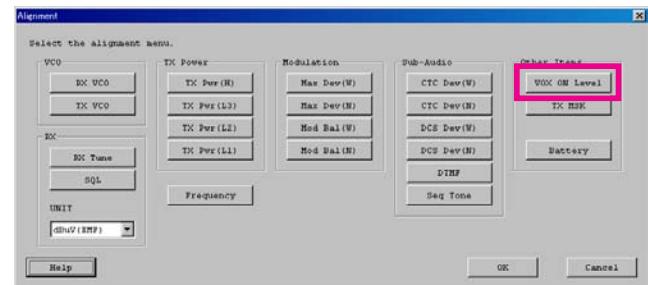


## VOX ON LEVEL

This parameter is to align the “VOX On Level”.

Set the Sensitivity of the VOX circuitry’s input audio detector.

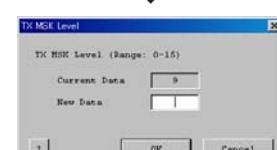
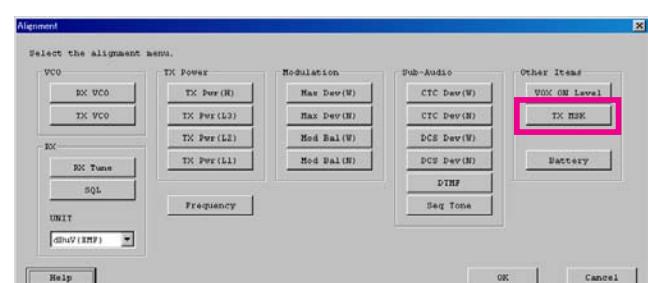
1. Press the “VOX ON Level” button to start the alignment. The VOX ON Level window will appear.
2. Then input the alignment value in the “New” box.  
Default: 80  
Input Range: 0 (Level Down) ~ 255 (Level Up)
3. Click the “OK” button, the data will be saved and the alignment is complete.



## TX MSK LEVEL

This parameter is to align the modulation level of the ANI function.

1. Press the “TX MSK” button to start the alignment. The TX MSK Level window will appear.
2. Then input the alignment value in the “New” box.  
Default: 9  
Input Range: 0 (Level Down) ~ 15 (Level Up)
3. Click the “OK” button, the data will be saved and the alignment is complete.



## BATTERY

This parameter is to align the “Low Battery Alert Level” and “EEPROM Protect Level” voltage. When the DC power source voltage drops below the “EEPROM Protect Level” voltage, the radio will stop writing data to the EEPROM to prevent erroneous writing.

1. Set the value of the DC Power source to 6.5V (according to the indication) and click the “Start” button.  
The new alignment value will show in the “New” box.
2. Set the value of the DC Power source to 5.5V (according to the indication) and click the “Start” button.  
The new alignment value will show in the “New” box.
3. Click the “OK” button, the data will be saved and the alignment is complete.
4. Set the value of the DC Power source to 7.5V (according to the indication).

