EVX-5300/5400(UHF)Alignment

Introduction

The **EVX**-5300/-5400 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 200 MHz
- ❑ In-line Wattmeter with 5% accuracy at 200 MHz
- ❑ 50-ohm, 100 W RF Dummy Load
- ❑ Regulated DC Power Supply (standard 13.6 VDC, 15 A)
- ❑ Frequency Counter: ±0.2 ppm accuracy at 200 MHz
- ❑ AF Signal Generator
- ❑ AC Voltmeter
- ❑ DC Voltmeter
- ❑ VHF Sampling Coupler
- ❑ IBM PC/Compatible Computer with Microsoft® Windows® 2000, XP, Vista, or 7
- ❑ Vertex Standard CE142 PC Programming Software
- ❑ Vertex Standard FIF-12 USB Programming Interface and CT-104A or CT-171 PC Programming Cable
- ❑ Vertex Standard FRB-6 Tuning Interface Box and CT-159 Connection Cable

Alignment Preparation & Precautions

A 50- 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 dBμ EMF = 1.0 μV.
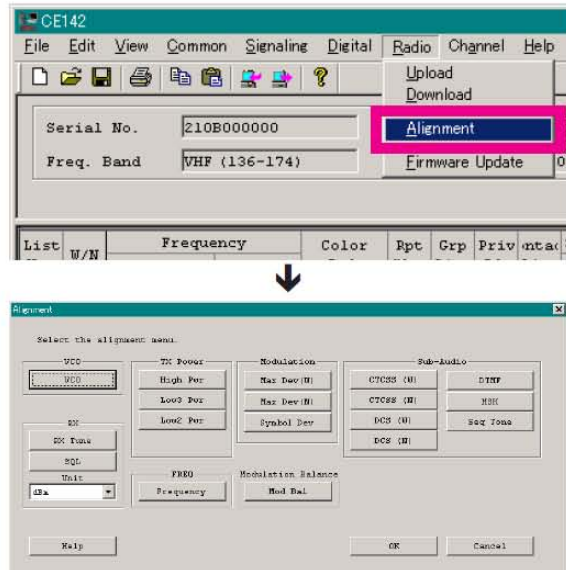
Test Setup

Setup the test equipment as shown below for transceiver alignment, then apply 13.6 V DC power to the transceiver.
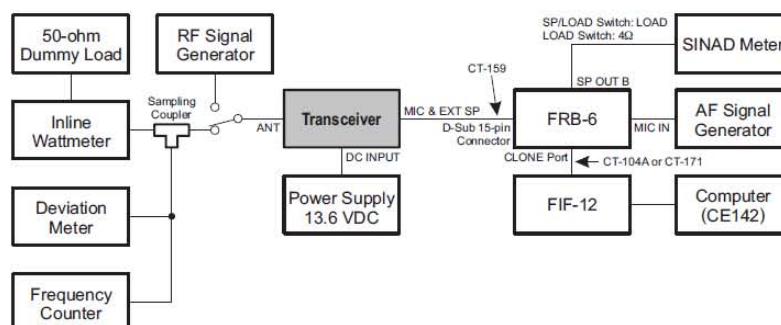
The Alignment Tool Outline

Installation the tool

❐ Install the CE142 PC Programming Software 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.

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 "←"/"→" arrow key for data up/down, "↑"/"↓" arrow key for channel up/down, direct number input, and drag the mouse.

Note: when all items are aligned, it is strongly recommended to align according to following order. The detail information is written in the help document of CE142 PC Programming Software.
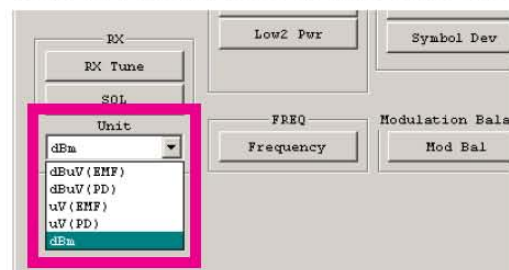
1. VCO (confirmation only)
2. PLL Reference Frequency (Frequency)
3. RX Sensitivity (RX Tune)
4. Squelch (SQL/RSSI)
5. TX Power <High/Low3/Low2/Low1>
6. Maximum Deviation <Wide/Narrow>

Adjust the following items when needed.
○ Symbol Deviation
○ Modulation Balance
○ CTCSS Deviation <Wide/Narrow>
○ DCS Deviation <Wide/Narrow>
○ DTMF Deviation
○ MSK Deviation
○ Sequential Tone Deviation

Unit

During alignment, you may select the value among dBμV, μV (EMF or PD), or dBm by the "UNIT" box.

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

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1. VCO (RX VCO/TX VCO) - *This parameter is for confirmation only and cannot align -*

This parameter is to confirm whether the VCO status shall be "Lock" or "Unlock".

1. Click the "VCO" button to open the "VCO" window.
2. Click the "CH" button on the desired channel. The RX VCO status ("Lock" or "Unlock") will appear in the "RX" box.
3. Click the "PTT" button. The radio starts to transmit on the selected channel, and the TX VCO status ("Lock" or "Unlock") will appear in the "TX" box.
4. Click the "PTT" button again to stop transmitting.
5. Click the "OK" button to finish the confirmation of the VCO status.
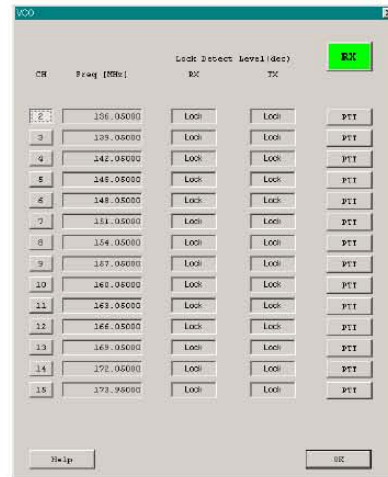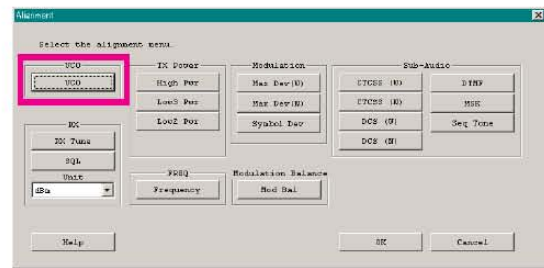
2. PLL REFERENCE FREQUENCY (FREQUENCY)

This parameter is to align the reference frequency for PLL.

1. Click the "Frequency" button to open the "Frequency Alignment" window.
2. Click the "PTT" button or press the "SPACE" bar of the computer's keyboard, the radio will start to transmit on the center frequency channel.
3. Set the value to get the desired frequency according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0000" - "FFFF") in the "Current Data" box from the computer's keyboard
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.

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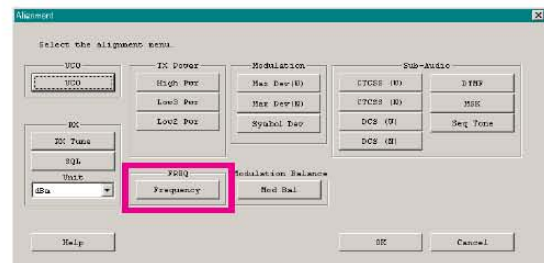
## 3. RX SENSITIVITY (RX TUNE)

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. Click the "RX Tune" button to open the "RX Sensitivity Alignment" window.
2. Click the "Auto" button on the desired channel. The "Auto Tuning" window will appear.
3. Set the RF Signal Generator output according to the indication of the screen.
4. Click the "Start" button to start the automatic alignment to get the best RX sensitivity (Highest RSSI value).
5. Click the "OK" button to finish the RX Sensitivity alignment and save the data.

1) You may adjust the RX sensitivity manually by the following method:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("800"- "FFF") in the "Current Data" box from the computer's keyboard

2) You may select the alignment type from the "Radio" button (**ADJ Type**) located at the bottom of the screen, as needed.

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.
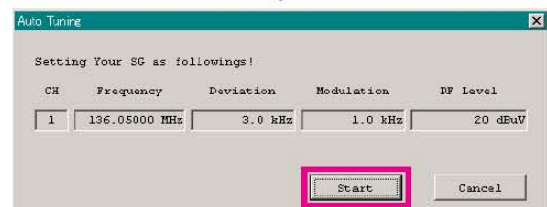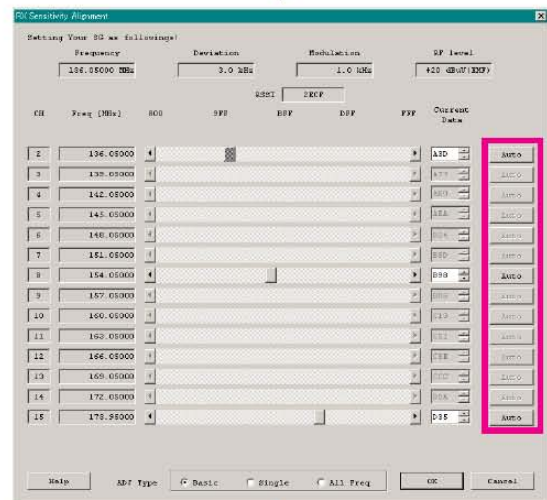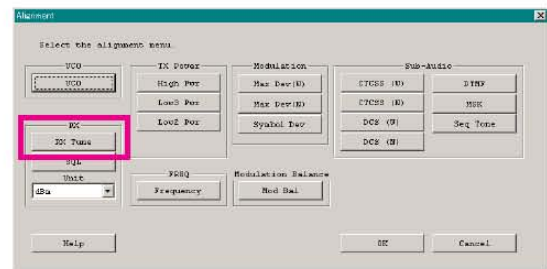
4. SQUELCH (SQL)

This parameter is to align the SQL (Squelch) Sensitivity. There are several alignment items as follows in the Squelch Sensitivity.

Threshold SQL Level (Wide/Narrow)

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

Normal RSSI Level (Wide/Narrow)

The alignment for the RSSI Normal level at Wide (5k/4k) or Narrow (2.5k).

Tight RSSI Level (Wide/Narrow)

The alignment for the RSSI Tight level at Wide (5k/4k) or Narrow (2.5k).

SQL Close Level (Wide/Narrow)

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

RSSI Close Level (Wide/Narrow)

The alignment for the RSSI Close level at Wide (5k/4k) or Narrow (2.5k).

The procedure for all the alignments is as follows.

1. Click the "Start" button you wish to align to open the "SQL/RSSI Alignment" window.
2. Click the "Start" button on the desired alignment item to open other window.
3. Set the RF Signal Generator according to the indication of the window, then click the "Start" button.
4. The automatic alignment will start to get the optimum level.
5. The alignment result will appear in the "New" box.
   On the following alignment items, click the "Next" button and then repeat step 2-5 several times according to the indication of the window.
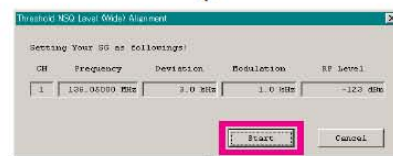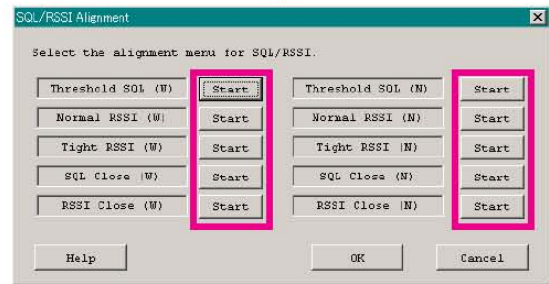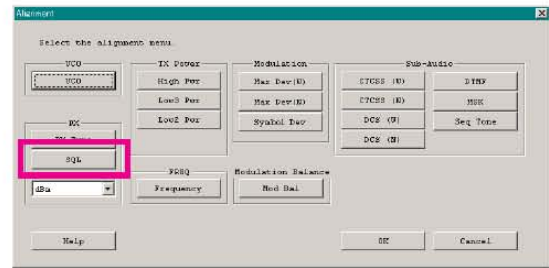   > **Threshold SQL Level (Wide/Narrow)**
   > **Normal RSSI Level (Wide/Narrow)**
   > **Tight RSSI Level (Wide/Narrow)**

   Other alignment items has not extra step; only one step procedure.
6. Click the "OK" button, then the data will be saved and the alignment is finished.

5. TX POWER

This parameter is to align the "High Power", "Low3 Power" and "Low2 Power" for the selected channel.

1. Click the "TX Power (High Pwr / Low3 Pwr / Low2 Pwr)" button to open the "TX Power Alignment" window.
2. Click the "PTT" button on the desired channel. The radio starts to transmit on the selected channel.
3. Set the value to get desired output power on the Power Meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value in the entry box from the computer's keyboard

Model	50 W	25 W
High	50 W	25 W
Low 3	25 W	10 W
Low 2	5 W	10 W

4. After getting the desired output power, click the "PTT" button or press the "SPACE" bar to stop transmitting.
5. Click the "OK" button to finish the TX Power alignment and save the data.

You may select the adjusting type from the "Radio" button (**ADJ Type**) located at the bottom of the screen, as needed.

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.
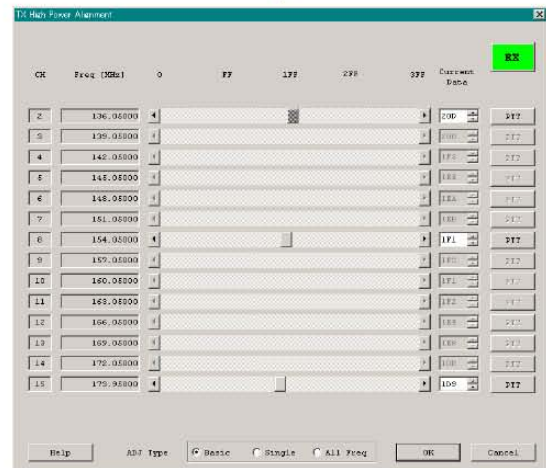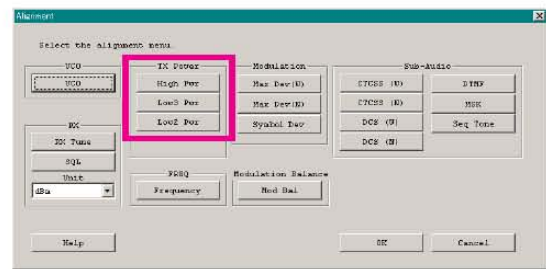
6. MAXIMUM DEVIATION <WIDE> / <NARROW>
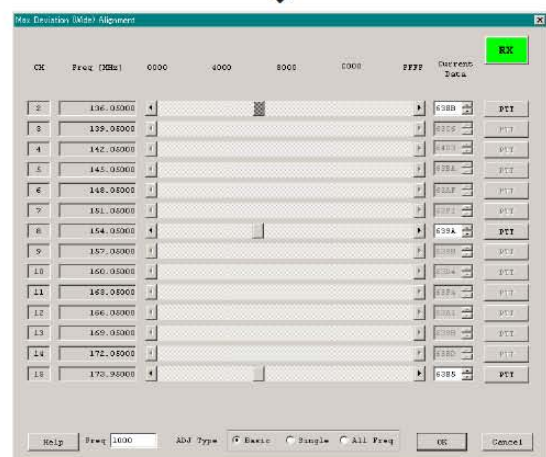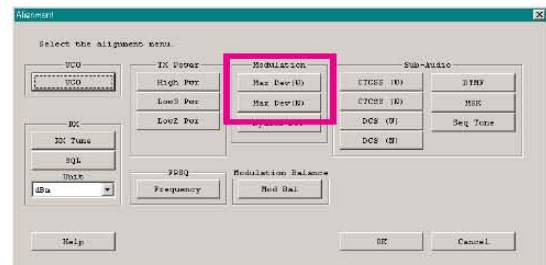
This parameter is to align the "Maximum Deviation" (Wide/Narrow).

1. Press the "Max Dev (W/N)" button to open the "Max Deviation Alignment" window.
2. Click the "PTT" button on the desired channel. The radio starts to transmit on the selected channel.
3. Set the value to get desired deviation (Wide: 4.2 kHz, Narrow: 2.1 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the up-down key of the computer's keyboard
   - Entering the value in the entry box from the computer's keyboard
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 Max Deviation alignment and save the data.

1) You may align the deviation level by any modulation frequency by changing the value of the "Freq" box located at the bottom left of the screen, if needed.
2) You may select the alignment type from the "Radio" button (**ADJ Type**) located at the bottom of the screen, as needed.

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.

Perform the following alignments as needed.

SYMBOL DEVIATION

This parameter is to align the deviation of the digital mode artificially.
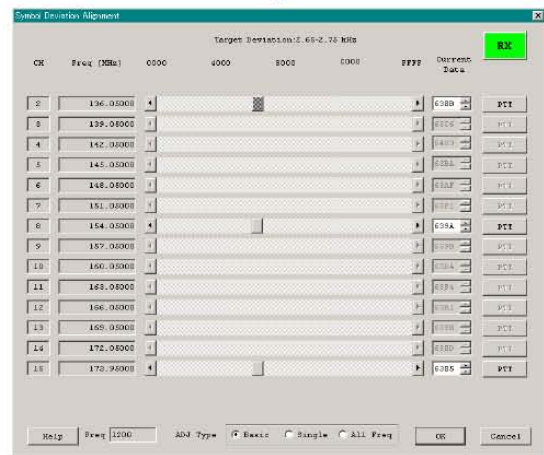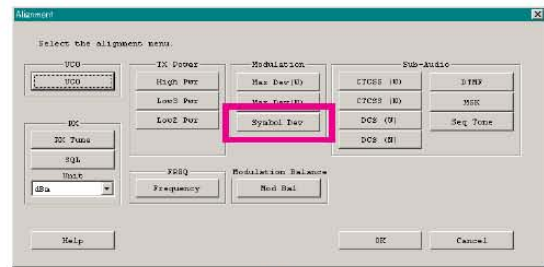
1. Press the "Symbol Dev" button to open the "Symbol Deviation Alignment" window.

2. Click the "PTT" button on the desired channel. The radio starts to transmit on the selected channel.

3. Set the value to get Target Deviation (which is indicated on the screen) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the up-down key of the computer's keyboard
   - Entering the value in the entry box from the computer's keyboard

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 Symbol Deviation alignment and save the data.

You may select the alignment type from the "Radio" button (**ADJ Type**) located at the bottom of the screen, as needed.

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.

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

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

1. Press the "Mod Bal" button to open the "Modulation Balance Alignment" window.

2. Confirm the modulation frequency which is indicated in the "Freq" box located at the bottom left of the screen is "50 (Hz)". If not, enter the value (50) in the "Freq" box from the computer's keyboard.

3. Click the "PTT" button on the desired channel. The radio starts to transmit on the selected channel.

4. Write down a deviation level, then enter the "4000 (Hz)" of the modulation frequency to the "Freq" box.

5. Set the value to get the same deviation level that wrote down according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("0" - "3FF") in the "Current Data" box from the computer's keyboard

6. Click the "PTT" button or press the "SPACE" bar to stop transmitting.

7. Click the "OK" button to finish the Modulation Balance alignment and save the data.

1) You may align the modulation balance by any frequency pair by changing the value of the "Freq" box located at the bottom left of the screen, if needed.

2) You may select the alignment type from the "Radio" button (**ADJ Type**) located at the bottom of the screen, as needed.

   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.
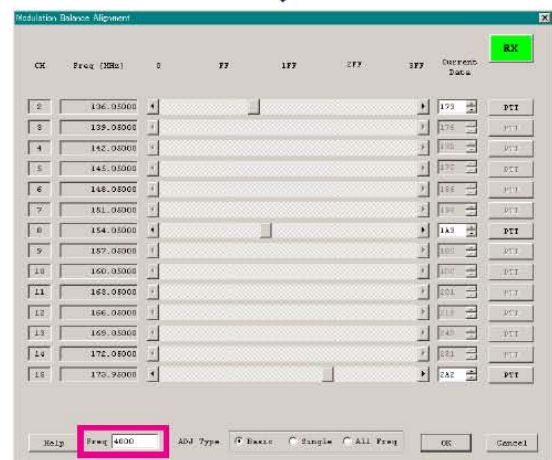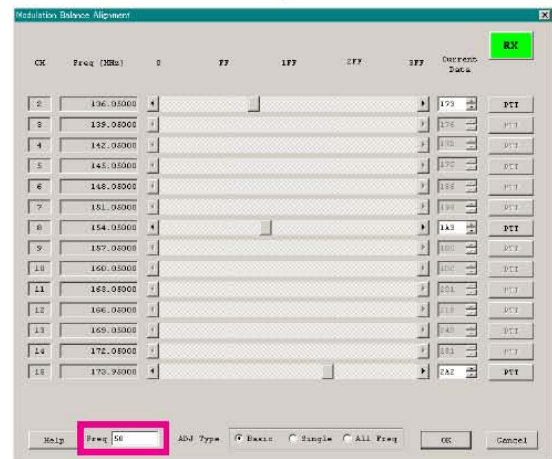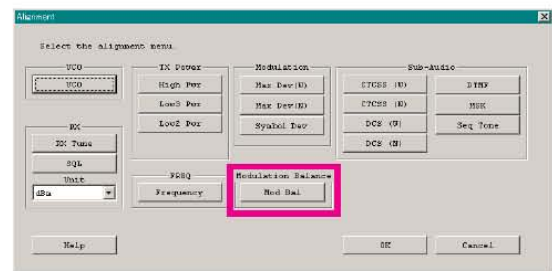
CTCSS DEVIATION <WIDE> / <NARROW>

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

1. Press the "CTCSS (W/N)" button to open the "CTCSS Deviation Alignment" window.
2. Click the "PTT" button or press the "SPACE" bar of the computer's keyboard to transmit the radio.
3. Set the value to get desired deviation (Nominal: Wide: 0.6 kHz, Narrow: 0.35 kHz) on the deviation meter according to the following ways:
   ● Dragging the slide bar
   ● Clicking the arrow buttons
   ● Pressing the left/right arrow key of the computer's keyboard
   ● Entering the value ("–20.00" - "20.00") in the "Currend Data" box from the computer's keyboard
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 CTCSS Deviation alignment and save the data.
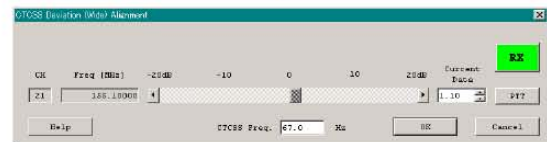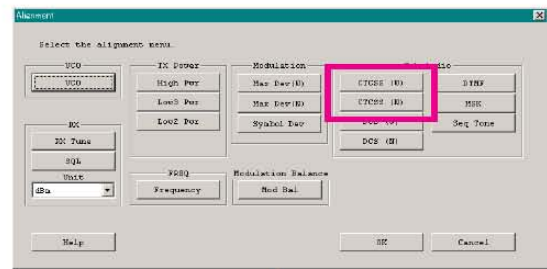
You may align the deviation level by any CTCSS tone frequency (default: 67.0 Hz) by changing the value of the "CTCSS Freq" box located at the bottom of the screen, if needed.

DCS DEVIATION <WIDE> / <NARROW>

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

1. Press the "DCS (W/N)" button to open the "DCS Deviation Alignment" window.
2. Click the "PTT" button or press the "SPACE" bar of the computer's keyboard to transmit the radio.
3. Set the value to get desired deviation (Nominal: Wide: 0.65 kHz, Narrow: 0.4 kHz) on the deviation meter according to the following ways:
   ● Dragging the slide bar
   ● Clicking the arrow buttons
   ● Pressing the left/right arrow key of the computer's keyboard
   ● Entering the value ("–20.00" - "20.00") in the "Currend Data" box from the computer's keyboard
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 DCS Deviation alignment and save the data.
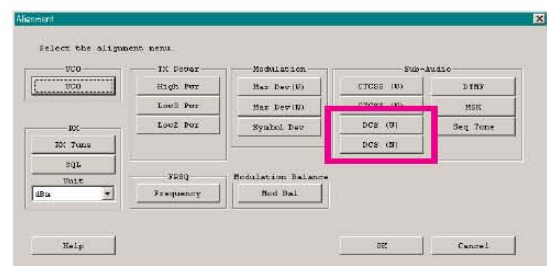
You may align the deviation level by any DCS code (default: 532) by changing the value of the "DCS Code" box located at the bottom of the screen, if needed.

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DTMF Deviation

This parameter is to align "DTMF Deviation".

1. Press the "DTMF" button to open the "DTMF Deviation Alignment" window.
2. Click the "PTT" button or press the "SPACE" bar of the computer's keyboard to transmit the radio.
3. Set the value to get desired deviation (Nominal: 3.0 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("–20.00" - "20.00") in the "Currend Data" box from the computer's keyboard
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.

You may align the deviation level by any DTMF tone (default: "A", available selection: "0" - "9", "A" - "D", "E(*)", and "F(#)") by changing the value of the "DTMF Code" box located at the bottom of the screen, if needed.
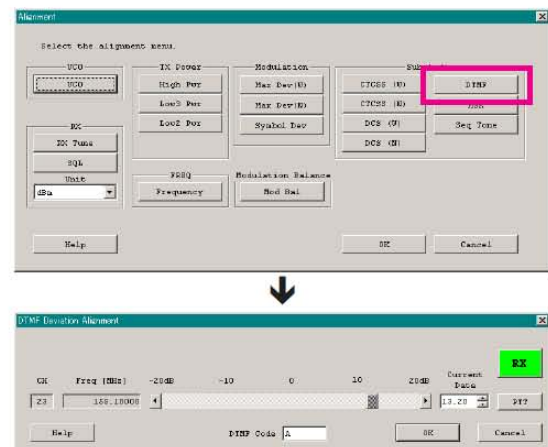
MSK Deviation

This parameter is to align "MSK Deviation" which use for the ANI operation of the MDC1200 System.

1. Press the "MSK" button to open the "MSK Deviation Alignment" window.
2. Click the "PTT" button or press the "SPACE" bar of the computer's keyboard to transmit the radio.
3. Set the value to get desired deviation (Nominal: 3.0 kHz) on the deviation meter according to the following ways:
   - Dragging the slide bar
   - Clicking the arrow buttons
   - Pressing the left/right arrow key of the computer's keyboard
   - Entering the value ("–20.00" - "20.00") in the "Currend Data" box from the computer's keyboard
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 MSK Deviation alignment and save the data.
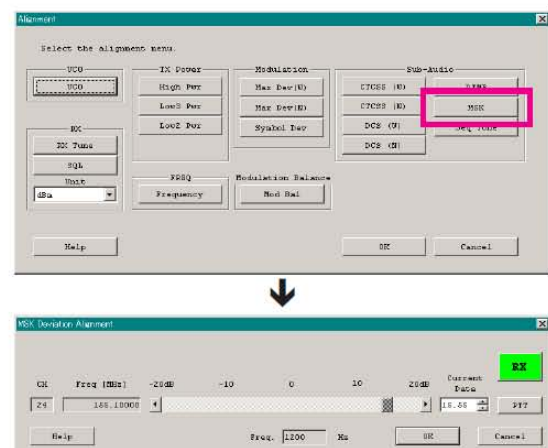
SEQUENTIAL TONE DEVIATION

This parameter is to fine-tune of the "Sequential Tone Deviation" for the 2-Tone and 5-Tone Encoder.

1. Press the "Seq Tone" button to open the "Sequential Tone De-viation Alignment" window.
2. Entering the desired value in the "New" box from the comput-er's keyboard.
3. Click the "OK" button to finish the Sequential Tone Deviation alignment and save the data.