

## VXR-7000U Alignment

The VXR-7000 is carefully aligned at the factory for the specified performance across the entire operating frequency range. 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 Yaesu/Vertex representative, or the warranty policy may be void.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the repeater has left the factory. However, if damage occurs and some parts subsequently are placed, 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 Yaesu/Vertex 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 repeater was purchased for instructions regarding repair. Authorized Yaesu/Vertex 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, Yaesu/Vertex reserves 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 repeater are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and 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**

- RF Signal Generator with calibrated output level at 1,000 MHz
- Deviation Meter (linear detector)
- In-line Wattmeter with 5% accuracy at 1,000 MHz
- 50  $\Omega$  RF Dummy Load with power rating 100W at 1,000MHz
- 4  $\Omega$  AF Dummy Load
- Frequency Counter with 0.2ppm accuracy at 1,000MHz
- AF Signal Generator
- AC Voltmeter
- DC Voltmeter: High input impedance
- VHF Sampling Coupler
- SINAD Meter

- IBM PC / compatible Computer with MS-DOS or later operating system
- Yaesu VPL-1 Connection Cable & CE-27 Channel/Alignment Diskette

### Alignment Preparation & Precautions

A 50  $\Omega$  RF Dummy Load and in-line wattmeter must be connected to the TX 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, in connected) before proceeding.

Correct alignment requires that the ambient temperature be the same as that of the repeater and test equipment, and that this temperature be held constant between 20° and 30 °C (68° ~ 86 °F). When the repeater 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 the alignment procedure are based on  $0dB\mu = 0.5\mu V$ .*

Set up the test equipment as shown below, and apply AC power to the repeater.

The repeater must be programmed for use in the intended system before alignment is attempted. The frequency and other parameters are loaded from the file during the alignment process.

In order to facilitate alignment over the complete switching range of the equipment it is recommended that the channel data first be uploaded and then stored to disk. Channels at the upper, lower and middle band edges should then be downloaded. The original data can be replaced at the end of the alignment process.

<u>CHANNEL</u>	<u>FREQUENCY</u>
Low band edge	450.000 MHz
Center	465.000 MHz
High band edge	480.000 MHz

### Transmitter

Press the **BASE/REPEATER** switch on the front panel of the repeater so as to set it to the “**BASE**” mode if the **REPEATER** LED is on. You should see the **REPEATER** LED turn off, indicating that the repeater is now in the “**BASE**” mode.

#### *PLL VCV (Varactor Control Voltage) Check*

- Connect the DC voltmeter between the VCV check point (on the TX Unit) and chassis ground.
- Select the High band edge channel, and then key the repeater. Confirm that the DC voltmeter reading is  $4.2 \pm 0.3$  VDC.

#### *PLL Reference Frequency Adjustment*

- Select the Center channel, and then key the repeater.

- Adjust **TC2001** (on the TX unit), if necessary, so that the frequency counter reading is within  $\pm 100\text{Hz}$  of the programmed Center channel frequency.

*Transmitter parameters (excluding PLL)*

- The following transmitter parameters can be adjusted from the computer by utilizing the CE-27 Channel/Alignment Diskette. Refer to the onboard help of the CE-27 Channel/Alignment Diskette for details.

<u>TX PARAMETERS</u>	<u>DATA</u>
TX Power Level (High)	0 (00h) ~ 255 (FFh)
TX Power Level (Low)	0 (00h) ~ 255 (FFh)
Maximum Deviation	0 (00h) ~ 255 (FFh)
CTCSS Deviation	0 (00h) ~ 255 (FFh)
DCS Deviation	0 (00h) ~ 255 (FFh)

**Receiver**

*PLL VCV (Varactor Control Voltage) Check*

- Connect the DC voltmeter between the VCV check point (on the RX Unit) and chassis ground.
- Select the High band edge channel, and confirm that the DC voltmeter reading is  $4.1 \pm 0.3 \text{ VDC}$ .

*PLL Reference Frequency Adjustment*

- Connect the Frequency counter to **J3001** on the RX Unit.
- Select the Center channel, adjust **TC3001** (on the RX Unit), if necessary, so that the frequency counter reading is within  $\pm 100\text{Hz}$  of the programmed Center channel frequency.

*Receiver parameters (excluding PLL)*

- The following receiver parameters can be adjusted from the computer by utilizing the CE-27 Channel/Alignment Diskette. Refer to the onboard help of the CE-27 Channel/Alignment Diskette for details

<u>RX PARAMETERS</u>	<u>DATA</u>
Squelch Threshold Level	0 (00h) ~ 255 (FFh)
Squelch W/N Level	0 (00h) ~ 255 (FFh)
RSSI Threshold Level	0 (00h) ~ 255 (FFh)
RX Tune Level	0 (00h) ~ 255 (FFh)

**Repeater Mode**

*Deviation Adjustment*

- First ensure that the “DUPLEX” mode of operation is enabled via CE-27 programming.
- Set the **BASE/REPEATER** switch on the front panel of the repeater to the “REPEATER” mode (the **REPEATER** LED will turn on).
- Inject a signal on the Center channel frequency at a level of  $40 \text{ dB}\mu$  (1 kHz tone @  $\pm 3 \text{ kHz}$  deviation) from the RF Signal Generator into the **RX** antenna jack, and adjust **VR4001** (on the CNTL Unit) so that the deviation meter reading (TX deviation) is  $\pm 3.0 \text{ kHz}$  ( $\pm 0.1 \text{ kHz}$ ) deviation.

## Base Mode

### *Alignment Setup*

- Set the **BASE** switch on the front panel of the repeater to the “**BASE**” mode (the **REPEATER** LED will turn off).
- Press the **LOCAL/REMOTE** switch on the front panel of the repeater to the “**REMOTE**” mode (the **REMOTE** LED will turn on).
- Set **S4001** and **S4002** on the CNTL Unit to the “0 (off)” position and “1 (on)” position respectively, and then select the Center channel.

### *Audio Level Adjustment (LINE OUT Level)*

- Inject a signal on the Center channel frequency at a level of 40 dB $\mu$  (1 kHz tone @  $\pm 3.0$  kHz deviation) from the RF Signal Generator into the **RX** antenna jack, and adjust **VR4002** (on the CNTL Unit) so that the “Line Out” audio level (**LINE** jack pins 5 and 6) is  $-10$  dBm ( $\pm 0.1$  dBm).

### *Deviation Adjustment (LINE IN Level)*

- Connect the AF generator to **LINE** jack pins 3 and 4, and the AF generator output level to
  - @• @• |10 dBm, at a frequency of 1 kHz.
- Key the repeater, and adjust **VR4003** (on the CNTL Unit) so that the deviation meter reading (TX deviation) is 3.0 kHz ( $\pm 0.1$  kHz) deviation.