

## VX-414/424 Alignment

The VX-414/424 has been carefully aligned at the factory for the specified performance across the frequency range specified for each version. Re-alignment should therefore not be necessary except in the event of component failure, or altering version type. All component replacement and service should only be performed by an authorized VERTEX STANDARD representative, or the warranty policy may be void.

### Required Test Equipment

- CT-42 Programming Cable with CE64 Channel Programming Diskette
- RF Signal Generator with calibrated output level at 1 GHz.
- Deviation Meter (Linear Detector)
- AC Voltmeter
- SINAD Meter
- In-Line Wattmeter with 5 % accuracy at 500 MHz
- Regulated DC Power Supply adjustable from 4 to 10 V, 3 A
- 50  $\Omega$  Non-reactive Dummy Load: 10 W at 500 MHz
- Frequency Counter:  $\pm 0.2$  ppm accuracy at 500 MHz
- AF Signal Generator
- DC Voltmeter: High impedance

Before beginning alignment, connect the transceiver and PC using the CT-42 Programming Cable, and run the CE64 Channel Programming Diskette, then download the EEPROM data from the transceiver to the computer.

Then store this data in a disk file so that it can be uploaded when alignment is finished.

You should find the corresponding data file on the computer disk for the transceiver version you are aligning, containing channel settings for the high edge, middle and low edge of the transceiver's frequency range in channels 1,2 and 3, respectively. Up-load this file to the transceiver.

Low Band Edge	(Channel 1): 146.000MHz
Band Center	(Channel 2): 160.000MHz
High Band Edge	(Channel 3): 174.000MHz

**Note:** Signal levels in dB referred in the alignment procedure are based on 0 dB $\mu$  = 0.5  $\mu$ V.

### PLL & Transmitter

Set up the test equipment as shown for transmitter alignment. Adjust the supply voltage to 7.5 V for all steps where not specified otherwise.

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

- Connect the DC voltmeter between TP1045 on the Main Unit and Ground.
- Set the transceiver to CH3 (high band edge), and adjust L1036 on the Main Unit for 3.8 V  $\pm$  0.1V on the DC voltmeter, while receiving.
- Set the transceiver to CH3 (high band edge), and adjust L1038 on the Main Unit for 3.8 V  $\pm$  0.1V on the DC Voltmeter, while transmitting.
- Set the transceiver to CH1 (low band edge), and confirm the low-end VCV is more than 1.3 V while receiving, and more than 1.2 V while transmitting.

#### **PLL Reference**

- Set the transceiver to CH2 (band center).

- Open the “Alignment” window on the CE64, and then select “RF frequency” parameter.
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the frequency counter displays band center frequency  $\pm 100$  Hz (for the version being aligned).

### **Transmitter Output Power**

- Set the transceiver to CH2 (band center).
- Open the “Adjust” window on the CE64, and then select “RF Power (High)” parameter. ( only when “Pwr H/L” parameter is select “H”)
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the power meter reading is 5 W. Confirm that the current consumption is 2.0 A or below.
- Select “RF Power (Low)” parameter. ( only when “Pwr H/L” parameter is select “L”)
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the power meter reading is 1 W. Confirm that the current consumption is 1.0 A or below.

### **Modulation Level**

#### **MIC Sensitivity**

- Set the transceiver to CH2 (band center)
- Inject a 1 kHz tone at 10mVrms to the MIC jack.
- Open the “Alignment” window on the CE64, and then select “MIC Sensitivity” parameter.
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the deviation meter reading is  $\pm 3.0$  kHz (for 25 kHz steps) or  $\pm 1.5$  kHz (for 12.5 kHz steps) deviation.

#### **Max Deviation: (VCO Modulation)**

- Set the transceiver to CH2 (band center).
- Inject a 1 kHz tone at 100mVrms to the MIC jack.
- Open the “Alignment” window on the CE64, and then select “Max Deviation” parameter.
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the deviation meter reading is  $\pm 4.2$  kHz (for 25 kHz steps) or  $\pm 2.1$  kHz (for 12.5 kHz steps) deviation.

#### **Max Ref Deviation: (Reference Modulation)**

- Set the transceiver to CH2 (band center).
- Open the “Alignment” window on the CE64, and then select “Max Ref Deviation” parameter.
- Press the [ENTER] key to enable programming of this parameter, then enter the “200” using the numeric key.

#### **CTCSS Deviation**

- Set the transceiver to CH2 (band center).
- Open the “Alignment” window on the CE64, and then select “CTCSS Deviation” parameter. (only CTCSS frequencies are selected)
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the deviation meter reading is  $\pm 0.7$  kHz (for 25kHz steps) or  $\pm 0.35$  kHz (for 12.5kHz steps) deviation.

#### **CDCSS Deviation**

- Set the transceiver to CH2 (band center).
- Open the “Alignment” window on the CE64, and then select “CDCSS Deviation”

parameter. (only when CDCSS codes are selected)

- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the deviation meter reading is  $\pm 0.7$  kHz (for 25kHz steps) or  $\pm 0.35$  kHz (for 12.5kHz steps) deviation.

#### **DTMF Deviation**

- Set the transceiver to CH2 (band center).
- Open the “Alignment” window on the CE64, and then select “DTMF Deviation” parameter.
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the deviation meter reading is  $\pm 2.5$  kHz (for 25kHz steps) or  $\pm 1.25$  kHz (for 12.5kHz steps) deviation.

#### **Receiver**

Set up the test equipment as shown for receiver alignment.

#### **Sensitivity**

- Set the transceiver to CH3 (high band edge)
- Turn the RF signal generator to the same frequency of the transceiver, than set the generator output level to 40 dB $\mu$ V with  $\pm 3.0$  kHz deviation @ 1 kHz tone modulation.
- Open the “Adjust” window on the CE64, and then select “RX Sensitivity” parameter.
- Press the [ENTER] key to enable programming of this parameter, use the [LEFT] or [RIGHT] arrow keys so that the RF signal generator output level should be -7dB or less for 12dB SINAD.