# VX-1210 Alignment

The VX-1210 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 Vertex Standard 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 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 repeater 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 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 30 MHz
- ❒ In-line Wattmeter with 5% accuracy at 30 MHz
- ❒ 50 Ω RF Dummy Load with power rating 50W at 30MHz
- ❒ 16 Ω RF Dummy Load with power rating 50W at 30MHz
- ❒ Frequency Counter with 0.02ppm accuracy at 40MHz
- ❒ AF Signal Generator
- ❒ AC Voltmeter
- ❒ DC Voltmeter: High input impedance
- ❒ DC Ammeter
- ❒ HF Sampling Coupler
- ❒ IBM PC / compatible Computer with MS-DOS or later operating system
- ❒ Yaesu ___ Connection Cable & ___ Channel/Alignment Diskette

**Alignment Preparation & Precautions**

A 50 Ω RF Dummy Load and in-line wattmeter must be connected to the ANT 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 20º and 30 °C (68º ~ 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 0dBμ = 0.5μV.*

Set up the test equipment as shown below, and apply 13.8V DC power to the transceiver.

The VX-1210 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. Alignment Channel data should then be downloaded. The original data can be replaced at the end of the alignment process.

**PLL Alignment**

*PLL Reference Frequency Alignment*

- ❒ Remove the coaxial plug from J2009 on the CNTL Unit, and connect the Frequency Counter to J2009.
- ❒ Adjust TC2001 on the CNTL Unit for 36.355 MHz ±10 Hz on the frequency Counter.

*2nd Local Output Level*

- ❒ Disconnect the Frequency Counter, and connect the RF millivoltmeter to J2009.
- ❒ Confirm that the output level is 0 dBm ±2dB on the RF millivoltmeter.
- ❒ Disconnect the RF millivoltmeter, and replace the plug into J2009.

*Carrier Output Level*

- ❒ Remove the coaxial plug from J2008 on the CNTL Unit, and connect the RF millivoltmeter to J2008.
- ❒ Select the “VCO1 U” channel (8.99999 MHz, USB), and confirm that the output level is –5.5 dBm ±2 dB.
- ❒ Disconnect the RF millivoltmeter, and replace the plug into J2008.

*VCO VCV Alignment*

- ❒ Connect the DC voltmeter to TP2005 on the CNTL Unit, and referring Table below, turn the transceiver to each channel listed. Then adjust the listed component for the required voltage or confirm that the correct voltage is present.

| Tune to: | Adjust or Confirm: | For: |
|---|---|---|
| "VCO1 U" channel (8.9999 MHz, USB) | T2001 | 6.0 V ±0.1 V |
| "VCO1 L" channel (0.50000 MHz, USB) | Confirm | 1.3 ~ 2.3 V |
| "VCO2 U" channel (18.9999 MHz, USB) | T2002 | 6.0 V ±0.1 V |
| "VCO2 L" channel (9.00000 MHz, USB) | Confirm | 1.0 ~ 2.0 V |
| "VCO3 U" channel (30.00000 MHz, USB) | T2003 | 6.0 V ±0.1 V |
| "VCO3 L" channel (19.00000 MHz, USB) | Confirm | 1.0 ~ 2.0 V |

*1st Local Output Level*

❒ Connect the RF millivoltmeter to TP1001 on MAIN Unit.
❒ Confirm that the output level is 13 dBm ±3 dB.

**Receiver Alignment**

*RX IF Coils Alignment*

❒ Connect the RF Signal Generator to ANT jack, and connect the DC voltmeter to TP1005 on the MAIN Unit.
❒ Select the "RX IF" channel (10.15000 MHz, USB).
❒ Inject a signal from the RF Signal Generator to 10.15100 MHz, then adjust the RF Signal Generator output level so that the DC voltmeter reading is approximately 3 V.
❒ Adjust T1008, T1009, T1010, T1011, T1012, T1015, T1016, and T1017 in succession several times for minimum indication on the DC Voltmeter.

*RX Gain Alignment*

❒ Connect the RF Signal Generator to ANT jack, and connect the DC voltmeter to TP1005 on the MAIN Unit.
❒ Select the "RX IF" channel (10.15000 MHz, USB), and recall the [RX GAIN] parameter on the computer.
❒ Inject a signal from the RF Signal Generator to 10.15100 MHz, then adjust the RF Signal Generator output level for 6 dBμ.
❒ Press the UP(π)/DOWN(θ) key so that the difference of the DC Voltmeter reading is 0.2 V ±0.1 V when the RF Signal Generator on and off.

*Noise Blanker Alignment*

❒ Connect the RF Signal Generator to ANT jack, and connect the DC voltmeter to TP1004 on the MAIN Unit.
❒ Select the "RX IF" channel (10.15000 MHz, USB).
❒ Inject a signal from the RF Signal Generator to 10.15100 MHz, then adjust the RF Signal Generator output level so that the DC voltmeter reading is approximately 3 V.
❒ Adjust T1013 and T1014 for minimum indication on the DC Voltmeter.

*47.055 MHz IF Trap Alignment*

❒ Connect the RF Signal Generator to ANT jack, and connect the DC voltmeter to TP1005 on the MAIN Unit.
❒ Select the "IF TRAP" channel (30.00000 MHz, USB).
❒ Inject a signal from the RF Signal Generator to 47.05400 MHz, then adjust the RF Signal Generator output level for 100 dBμ.
❒ Adjust T1002 for maximum indication on the DC Voltmeter.

**Transmitter Alignment**

*TX IF Coils Alignment*

- ❒ Remove the coaxial plug from J1004 on the MAIN Unit, then connect the RF millivoltmeter and 50 Ω resistor to J1004.
- ❒ Connect the AF Generator to pin 4 of the MIC jack.
- ❒ Select the "TX IF" channel (10.25000 MHz, USB).
- ❒ Inject a signal from the AF Generator to 1500 Hz, then adjust the AF Generator output level so that the RF millivoltmeter reading is approximately 0 dBm.
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND), adjust T1010, T1018, T1019, T1020, and T1022 on the MAIN Unit in succession several times for maximum indication on the RF millivoltmeter.
- ❒ Disconnect the RF millivoltmeter, and replace the plug into J1004.

*MIC Gain Alignment*

- ❒ Connect the AF millivoltmeter to TP1003 on the MAIN Unit.
- ❒ Connect the AF Generator to pin 4 of the MIC jack.
- ❒ Select the "TX IF" channel (10.25000 MHz, USB).
- ❒ Inject a signal from the AF Generator to 1500 Hz, then adjust the AF Generator output level for 8 mV.
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND), adjust VR1001 on the MAIN Unit for 30 mV ± 3 mV on the RF millivoltmeter.

*Carrier Balance Pre-Alignment*

- ❒ Remove the coaxial plug from J1004 on the MAIN Unit, then connect the RF millivoltmeter and 50 Ω resistor to J1004.
- ❒ Select the "TX IF" channel (10.25000 MHz, USB).
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, adjust TC1002 and VR1003 on the MAIN Unit for minimum indication on the RF millivoltmeter.
- ❒ Disconnect the RF millivoltmeter, and replace the plug into J1004.

*Driver Section Idling Current Alignment*

- ❒ Remove the Short-plug from J3505 on the PA Unit, then connect the DC Ammeter to J3505 (pin 1: "–" lead, pin 2: "+" lead).
- ❒ Select the "TX IF" channel (10.25000 MHz, USB).
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, adjust VR3501 on the PA Unit for 50 mA ± 5 mA on the DC Ammeter.
- ❒ Disconnect the DC Ammeter, and replace the Short-plug into J3505.

*Final Section Idling Current Alignment*

- ❒ Remove the Solder jumper from JP3501 on the PA Unit, and connect the DC Ammeter to J3506 (pin 1: "–" lead, pin 2: "+" lead) on the PA Unit.
- ❒ Select the "TX IF" channel (10.25000 MHz, USB).
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, adjust VR3502 on the PA Unit for 100 mA ± 10 mA on the DC Ammeter.
- ❒ Disconnect the DC Ammeter, and connect JP3501 by solder jumper.

*CM Coupler Balance*

- ❒ Connect the 50Ω Dummy Load and Inline Wattmeter to the ANT jack, then connect the AF Generator to pin 4 of the MIC jack, and adjust the AF Generator to 1500 Hz.
- ❒ Connect the DC voltmeter to pin 3 of JP3003 ("+" lead, "–" lead: GND) on the CNTL Unit.
- ❒ Select the "CM BAL" channel (29.9000 MHz, USB).
- ❒ Key the transmitter (connect pin 5 of the MIC jack to GND), then adjust the AF Generator

output level so that the Inline Wattmeter reading is approximately 20 Watts.

❒ Now, adjust TC3001 for minimum indication on the DC voltmeter.

*TX Gain Alignment (SSB)*

❒ Connect the 50Ω Dummy Load and Inline Wattmeter to the ANT jack, then connect the AF Generator to pin 4 of the MIC jack, and adjust the AF Generator to 1500 Hz, 8 mV.

❒ Referring Table below, turn the transceiver to each channel listed, and recall the computer to each parameter listed. Then key the transmitter and press the UP/DOWN key for the required output.

| Tune to: | Recall Parameter: | For: |
|---|---|---|
| "TXG S 1H" channel (3.50000 MHz, USB) | [TX GAIN SSB/H (~4)] | 20 W |
| "TXG S 2H" channel (5.00000 MHz, USB) | [TX GAIN SSB/H (4~6)] | 20 W |
| "TXG S 3H" channel (7.50000 MHz, USB) | [TX GAIN SSB/H (6~9)] | 20 W |
| "TXG S 4H" channel (11.00000 MHz, USB) | [TX GAIN SSB/H (9~13)] | 20 W |
| "TXG S 5H" channel (16.50000 MHz, USB) | [TX GAIN SSB/H (13~20)] | 20 W |
| "TXG S 6H" channel (25.00000 MHz, USB) | [TX GAIN SSB/H (20~30)] | 20 W |

*SSB Output Power Alignment*

❒ Connect the 50Ω Dummy Load and Inline Wattmeter to the ANT jack, then connect the AF Generator to pin 4 of the MIC jack, and adjust the AF Generator to 1500 Hz, 25 mV.

❒ Referring Table below, turn the transceiver to each channel listed, and recall the computer to each parameter listed. Then key the transmitter and press the UP/DOWN key for the required output.

| Tune to: | Recall Parameter: | For: |
|---|---|---|
| "TXP S 1H" channel (6.50000 MHz, USB) | [SSB PO (H ~10)] | 20 W |
| "TXP S 2H" channel (15.00000 MHz, USB) | [SSB PO (H 10~20)] | 20 W |
| "TXP S 3H" channel (25.00000 MHz, USB) | [SSB PO (H 20~30)] | 20 W |

*REV ALC Alignment*

❒ Connect the 50Ω Dummy Load to the ANT jack, then connect the DC voltmeter to pin 3 of J1010 ("+" lead, "–" lead: GND) on the MAIN Unit.

❒ Select the "REV ALC" channel (10.25000 MHz), and recall the [REV ALC] parameter on the computer.

❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, then press the UP/DOWN key so that the DC voltmeter reading is xx V ± xx V.

*HI SWR Indicator Alignment*

❒ Connect the 16 Ω Dummy Load (or three 50 Ω Dummy Loads in parallel) to the ANT jack.

❒ Select the "REV ALC" channel (10.25000 MHz), and recall the [HI SWR] parameter on the computer.

❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, then press the UP/DOWN key so that the front panels LED indicator will blinks yellow.

*Carrier Balance Alignment*

❒ With the 50 dB Attenuator (or 50 Ω Dummy Load and Sampling Coupler) and Spectrum Analyzer connected to the ANT jack.

❒ Select the "xxx" channel (xxx MHz, xxx).

❒ Key the transmitter (connect pin 5 of the MIC jack to GND) with no microphone input, adjust TC1002 and VR1003 on the MAIN Unit for minimum indication on the Spectrum Analyzer.