

## **VX-120/VX-170 Alignment**

### **Introduction and Precautions**

The VX-120/VX-170 has been carefully aligned at the factory for the specified performance across the 144 MHz amateur band. 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 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 Yaesu 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 Yaesu 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 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.

### **Required Test Equipment**

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.

- Regulated DC Power Supply: adjustable from 10 to 17 VDC, 15 A
- RF Signal Generator with calibrated output level at 500 MHz
- Frequency Counter:  $\pm 0.1$  ppm accuracy at 500 MHz
- AF Signal Generator
- SINAD Meter
- Oscilloscope
- Spectrum Analyzer
- Deviation Meter (linear detector)
- AF Milivoltmeter
- AF Dummy Load: 4  $\Omega$ , 5 W
- DC Voltmeter: high impedance
- Inline Wattmeter with 5% accuracy at 500 MHz
- 50-Ohm non-reactive Dummy Load: 100 watts at 500 MHz
- VHF/UHF Sampling Coupler

### **Alignment Preparation & Precautions**

A dummy load and inline 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 in the repair shop be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 °C and 30 °C (68 °C to 86 °F). When the transceiver is brought into the shop from hot or cold air it should be allowed some time for thermal equalization with the environment before alignment. If 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.

*Notes: Signal levels in dB referred to in alignment are based on  $0\text{ dB}\mu = 0.5\text{ }\mu\text{V}$ .*

All items tune and/or adjust by Auto-Tuning Mode or Manual Tuning Mode.

#### **PLL Reference Frequency**

- With the wattmeter, dummy load and frequency counter connected to the antenna jack.
- Tune the transceiver 146.05 MHz and set the TX power level to low power mode.
- Key the transceiver, adjust the counter frequency is within  $\pm 30$  Hz of 146.05 MHz.

#### **Transmitter Deviation**

- With the wattmeter, dummy load and deviation meter connected to the antenna jack.
- Inject a 1 kHz audio signal as a level of 80 mV to the microphone-input port.
- Key the transmitter on 146.05 MHz. Adjust the frequency deviation is within 4.2-4.7 kHz on the deviation meter.

#### **CTCSS Deviation**

- With the wattmeter, dummy load and deviation meter connected to the antenna jack.
- Key the transmitter on 146.05 MHz. Adjust the frequency deviation is within 0.65-0.75 kHz on the deviation meter.

#### **DCS Deviation**

- With the wattmeter, dummy load and deviation meter connected to the antenna jack.
- Key the transmitter on 146.05 MHz. Adjust the frequency deviation is within 0.60-0.70 kHz on the deviation meter.

### **Transmitter Power**

- With the power meter, dummy load and deviation meter connected to the antenna jack.
- Key the transmitter on 146.05 MHz. Adjust the output power is within  $5 \pm 0.1$  W on the power meter. (HI)
- Key the transmitter on 146.05 MHz. Adjust the output power is within  $2 \pm 0.1$  W on the power meter. (MID)
- Key the transmitter on 146.05 MHz. Adjust the output power is within  $0.5 \pm 0.05$  W on the power meter. (LOW)

### **Receiver Sensitivity**

- With the dummy load and SINAD meter connected to the external speaker jack.
- Inject a RF signal as a level of  $-9$  dB $\mu$ V to the antenna jack.
- Tune the receiver on 146.05 MHz. Adjust the SINAD is above 12 dB on the SINAD meter.