

## HX460S Alignment

The HX460S has been carefully aligned at the factory for the specified performance across the 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. 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

1. RF Signal Generator with calibrated output level at 200 MHz
2. Deviation Meter (linear detector)
3. AF Millivoltmeter
4. SINAD Meter
5. Inline Wattmeter with 5% accuracy at 200 MHz
6. Regulated DC Power Supply: adjustable from 6 to 17 VDC, 3A
7. 50-ohm Non-reactive Dummy Load: 10W at 200 MHz
8. Frequency Counter: >0.1 ppm accuracy at 200 MHz
9. AF Signal Generator
10. DC Voltmeter: high impedance
11. VHF Sampling Coupler

12. AF Dummy Load: 8 ohm, 2W
13. Oscilloscope
14. Spectrum Analyzer

### 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 be the same as that of the transceiver and test equipment, and that this temperature be held constant between 20 and 30°C (68-86°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.

*Note: Signal levels in dB referred to in this procedure are based on 0 dBm = 0.5  $\mu$ V (closed circuit).*

### PLL & Transmitter

Set up the test equipment as shown for transmitter alignment. Maintain the supply voltage at 7.5V DC for all steps.

To set up Alignment, press the [▼] key and [MEM] key while turning the transceiver on.

#### PLL Reference Frequency

Push the [▼] or [▲] key, and set [r\*\*] on display.

With the wattmeter, dummy load and frequency counter connected to the antenna jack, while transmit this frequency, and push the [16/9] key and adjust frequency, if necessary, so the counter frequency is within 100 Hz of this frequency. And push the [16/9] key to return to the menu mode.

#### Transmitter Output

- 1) Push the [▼] or [▲] key, and set [P\*\*A] on display. The radio now is in the Transmitter Output Alignment Mode.
- 2) push the [16/9] key to align low power for lower frequency. While transmit this frequency, push the [▼] or [▲] key, and set the low power to 1W.
- 3) Push the [H/L] key to align mid power for lower frequency. While transmit this frequency, push the [▼] or [▲] key, and set the mid power to 2.5W.
- 4) Push the [H/L] key to align high power for lower frequency. While transmit this frequency, push the [▼] or [▲] key, and set the high power to 5W.
- 5) Push the [H/L] key at 1 second to align low power for higher frequency. While

transmit this frequency, push the [▼] or [▲] key, and set the low power to 1W.

6) Same as [3),4)], Set the mid power and high power. And push the [16/9] key to return to the menu mode.

#### Transmitter Deviation

1) While tuned to 146.000 MHz, adjust the AF generator level for 50 mV output at 1kHz to the MIC jack.

2) Push the [▼] or [▲] key, and set [d\*\*A] on display. The radio now is in the Transmitter Deviation Alignment Mode.

3) push the [16/9] key to alignment Max deviation for lower frequency. While transmit this frequency, push the [▼] or [▲] key, and set the deviation to  $\pm 4.2$  KHz.

4) Push the [H/L] key at 1 second to alignment Max deviation for higher frequency. While transmit this frequency, push the [▼] or [▲] key, and set the deviation to  $\pm 4.2$  KHz.

5) Push the [16/9] key to return to the menu mode.

#### Receiver

Set up the test equipment as shown below for receiver alignment.

Interstage Transformers

154.90 MHz : lower frequency, 163.60 MHz : higher frequency.

1) The RF signal generator turned to the lower or higher frequency, set the generator for  $\pm 3.5$  kHz deviation with 1kHz tone modulation, and set the output level for 20 $\mu$ V at the antenna jack.

2) Push the [▼] or [▲] key, and set [t\*\*A] on display. The radio now is in the Receiver BPF Alignment Mode.

3) push the [16/9] key to alignment BPF for lower frequency. While receive this frequency, push the [▼] or [▲] key, and set the sensitivity to better.

4) Push the [H/L] key at 1 second to alignment BPF for higher frequency. While receive this frequency, push the [▼] or [▲] key, and set the sensitivity to better.

5) Push the [16/9] key to return to the menu mode.

6) Push the [WX] key to write the alignment data to EEPROM. And return to the normal mode.