

## HX290 Alignment

The HX290 has been carefully aligned at the factory for the specified performance across the marine 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 Standard Horizon 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 Standard Horizon 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 Standard Horizon 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, Standard Horizon, a division of Vertex Standard 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**

- RF Signal Generator with calibrated output level at 200 MHz
- Deviation Meter (linear detector)
- AF Millivoltmeter
- SINAD Meter
- Inline Wattmeter with 5% accuracy at 200 MHz
- Regulated DC Power Supply: 0V to 10 VDC, 3A
- 50-ohm Non-reactive Dummy Load: 10W at 200 MHz
- Frequency Counter: >0.1 ppm accuracy at 200 MHz
- AF Signal Generator
- DC Voltmeter: high impedance
- VHF Sampling Coupler
- AF Dummy Load: 16 Ohms, 1 W
- Oscilloscope
- Spectrum Analyzer
- HX270S Marine Transceiver
- IBM® PC/compatible computer with Microsoft® Windows® 2000, XP, or Vista
- Standard Horizon HX290 Service Flag Controller Program and Alignment Jig.

### **Alignment Preparation & Precautions**

A dummy load and inline wattmeter must be connected to the main antenna jack in all procedures that call for transmission. 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 68 °F and 86 °F (20 °C and 30 °C). 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 dB $\mu$  = 0.5  $\mu$ V (closed circuit).

### **Before Alignment**

- Install the HX290 Service Flag Controller Program to your computer.
- Set up the test equipment as shown below, and set the DC Power Supply voltage to 8.0 V.
- Execute the HX290 Service Flag Controller Program.
- Select the COM port number which is connected to the HX290 Alignment Jig.
- Press and hold in the [PRESET] key while turning the transceiver on to enter the Alignment Mode.
- Select “Alignment” ON of HX290 Service Flag Controller Program.
- Click the left mouse button on the [SET] button of the HX290 Service Flag Controller Program.

### **Main Reference Frequency Adjustment**

- Setup the test equipment as shown below.
- Set the channel to CH16.
- Use the [H/L] key to set the transceiver to “LOW” power.
- With the PTT switch pressed, adjust VR1002 so that the Frequency Counter reading is 156.800 MHz  $\pm$ 100 Hz.

### **Transmit Power Adjustment**

- Setup the test equipment as shown below.
- Set the channel to CH16.
- Use the [H/L] key to set the transceiver to “HI” power.
- With the PTT switch pressed, adjust VR1003 so that RF output power is 5 W  $\pm$ 0.1 W.
- Release the PTT switch, then set the transceiver to “LOW” power by the [H/L] key.
- With the PTT switch pressed, adjust VR1001 so that RF output power is 0.8 W  $\pm$ 0.1 W.
- Release the PTT switch.

### **TX Deviation Adjustment**

- Setup the test equipment as shown below.
- Set the AF Signal Generator output to 200 mV rms at 1 kHz.
- Set the channel to CH16.
- With the PTT switch pressed, adjust VR1004 so that the maximum deviation is 4.2 kHz  $\pm$ 0.1 kHz.

- Release the PTT switch.

### **Software Alignment/Confirmation Mode**

#### Overview of Software Alignment Mode

The “Software Alignment Mode” has been build in the microprocessor in order to adjust and confirm the performance of transceiver.

The purpose is to adjust transceiver simply and to confirm the performance of transceiver smoothly.

#### Starting Software Alignment Mode

- Set the channel to CH16, then turn the VOL knob counter clockwise to turn off the radio.
- Setup the test equipment as shown below.
- Turn the VOL knob clockwise to turn on the radio while press and holding the [PRESET] keys. The LCD will be shown the Alignment mode “AL”.
- Press the [SCAN] key. Then the LCD will be shown the Alignment Item (1<sup>st</sup> Item is Threshold “tH”).
- Set the RF Signal Generator output to 156.800 MHz, at a level of  $-8\text{dB}\mu$ ,  $\pm 3.0$  kHz deviation with a 1 kHz audio tone.
- Press the [PRESET] key to record a threshold level.
- Press the [H/L] key to save the new setting.
- Press the [SCAN] key to recall the Alignment Item “Ti (TIGHT)”.
- Set the RF Signal Generator output to 156.800 MHz, at a level of  $+0\text{dB}\mu$ ,  $\pm 3.0$  kHz deviation with a 1 kHz audio tone.
- Press the [PRESET] key to record a tight level.
- Press the [H/L] key to save the new setting.
- Press the [SCAN] key to recall the Alignment Item “dC”.
- Press the [PRESET] key to record a DC level.
- Press the [MEM] key to save the new setting.

This completes the Software Alignment Mode. To save all settings and exit, press and hold the [16/9] key for one second. Then turn off the transceiver.

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**After Alignment**

- Execute the HX290 Service Flag Controller Program again.
- Select the COM port number which is connected to the HX290 Alignment Jig.
- Press and hold in the [PRESET] key while turning the transceiver on to enter the Alignment Mode.
- Select "Alignment" OFF of HX290 Service Flag Controller Program.
- Click the left mouse button on the [SET] button of the HX290 Service Flag Controller Program.
- Turn off the transceiver.