

Alignment

The **HX470S** has been carefully aligned at the factory for the specified performance across the marine, FRS, MURS, AIR, AM broadcast and FM broadcast bands.

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 the 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 500 MHz
- ☐ Deviation Meter (linear detector)
- ☐ AF Millivoltmeter
- ☐ SINAD Meter
- ☐ Inline Wattmeter with 5% accuracy at 500 MHz
- ☐ Regulated DC Power Supply: adjustable from 6 to 17 VDC, 3A
- ☐ 50-ohm Non-reactive Dummy Load: 10W at 500 MHz
- ☐ Frequency Counter: >0.1 ppm accuracy at 500 MHz
- ☐ AF Signal Generator
- ☐ DC Voltmeter: high impedance
- ☐ VHF Sampling Coupler
- ☐ AF Dummy Load: 8 ohm, 2W
- ☐ Oscilloscope
- ☐ Spectrum Analyzer
- ☐ Special Screw Driver (VXSTD P/N: S7000421)

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 and 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 μ V(closed circuit).

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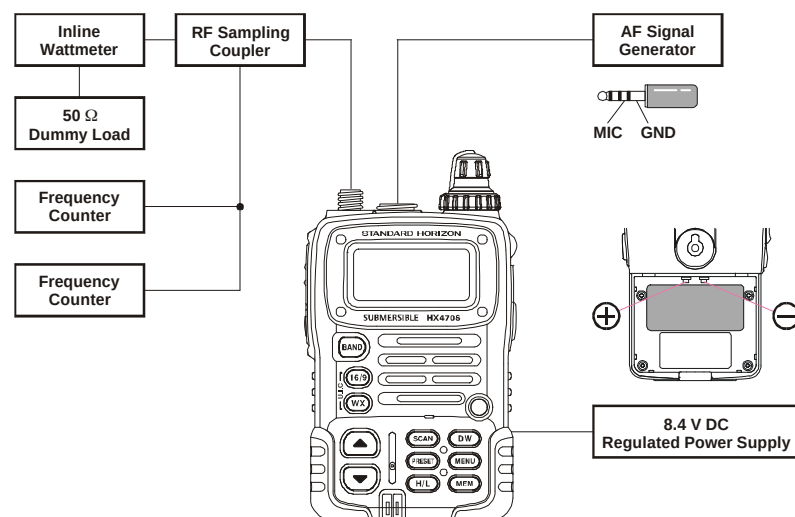
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Alignment Procedure

- ❑ Before alignment, disconnect the antenna from the transceiver using the Special Screw Driver.
- ❑ Set up the test equipment as shown for transmitter alignment.
- ❑ Maintain the supply voltage at 8.4V DC for all steps.
- ❑ To set up Alignment mode, press the [▼], [MEM] and [16/9] key while turning the transceiver on.

PLL Reference Frequency

- ❑ With the wattmeter, dummy load and frequency counter connected to the antenna jack.
- ❑ Press the [▲] or [▼] key to select the display to [PLL REF **] ([**] is “00” to “FF” Hex data). The radio now is in the Reference Frequency Alignment Mode.
- ❑ Press the [MENU] key to enable adjustment of the PLL Reference Frequency.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the frequency so the counter frequency is 467.7125 MHz (± 100 Hz).
- ❑ Press the [MENU] key to exit this Alignment Mode.



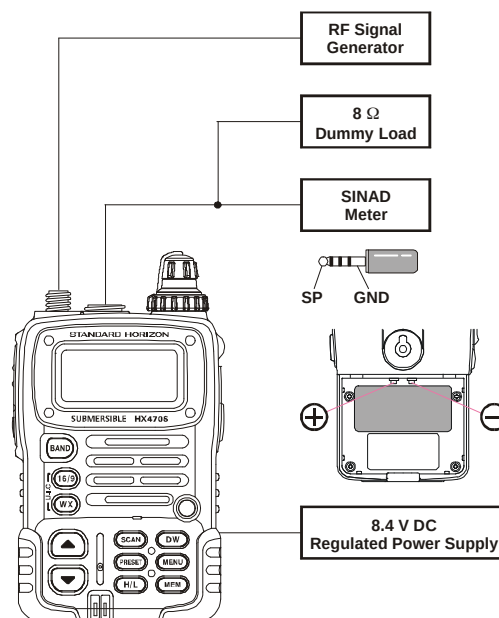
PLL & Transmitter Section Alignment Setup

Receiver Circuit

- ❑ Set up the test equipment as shown below for receiver alignment.
- ❑ Maintain the supply voltage at 8.4V DC for all steps.

Sensitivity & Squelch Threshold (Marine Band)

- ❑ Press the [▲] key to select the display to [MARINE SQL **] ([**] is “00” to “FF” Hex data). The radio now is in the Alignment Mode of the Sensitivity & Squelch Threshold of the Marine Band.
- ❑ Set the RF signal generator output to 158.510 MHz, at a level of $-8\text{dB}\mu$ with ± 3.5 kHz deviation with a 1 kHz audio tone.
- ❑ Confirm that the SINAD meter reading is better than $-12\text{dB}\mu$.
- ❑ Rotate the **SQL** knob to the 10 o'clock position and press the [MENU] key.
- ❑ Reduce the RF signal generator output to $-13\text{dB}\mu$, then press the [SCAN] key to read the Squelch Threshold data.
- ❑ Press the [SCAN] key again to save the new setting.
- ❑ Press the [MENU] key to exit this Alignment Mode.



Receiver Section Alignment Setup

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Sensitivity & Squelch Threshold (FRS Band)

- ❑ Press the [▲] key to select the display to [FRS SQL **] ([**] is “00” to “FF” Hex data). The radio now is in the Alignment Mode of the Sensitivity & Squelch Threshold of the FRS Band.
- ❑ Set the RF signal generator output to 465.1375 MHz, at a level of -8dBμ with ±3.5 kHz deviation with a 1 kHz audio tone.
- ❑ Confirm that the SINAD meter reading is better than -12dBμ.
- ❑ Rotate the **SQL** knob to the 10 o'clock position and press the [MENU] key.
- ❑ Reduce the RF signal generator output to -13dBμ, then press the [SCAN] key to read the Squelch Threshold data.
- ❑ Press the [SCAN] key again to save the new setting.
- ❑ Press the [MENU] key to exit this Alignment Mode.

Sensitivity & Squelch Threshold (FM Broadcast Band)

- ❑ Press the [▲] key to select the display to [WFM SQL **] ([**] is “00” to “FF” Hex data). The radio now is in the Alignment Mode of the Sensitivity & Squelch Threshold of the FM Broadcast Band.
- ❑ Set the RF signal generator output to 88.100 MHz, at a level of +5dBμ with ±22 kHz deviation with a 1 kHz audio tone.
- ❑ Confirm that the SINAD meter reading is better than -12dBμ.
- ❑ Press the [MENU] key.
- ❑ Reduce the RF signal generator output to +7dBμ, then press the [SCAN] key to read the Squelch Threshold data.
- ❑ Press the [SCAN] key again to save the new setting.
- ❑ Press the [MENU] key to exit this Alignment Mode.

Transmitter Circuit

- ❑ Set up the test equipment as shown below for transmitter alignment.
- ❑ Maintain the supply voltage at 8.4V DC for all steps.

Transmitter Output (Marine Band)

- ❑ Press the [▲] key to select the display to [HIGH POWER **] ([**] is “00” to “FF” Hex data). The radio now is in the Alignment Mode of the Transmitter Output of the Marine Band.
- ❑ Press the [MENU] key to enable adjustment of this Alignment Mode.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 5.0 W (±0.3 W), then press the [MENU] key to save the new setting.
- ❑ Press the [▲] key to select the display to [MID POWER **], then press the [MENU] key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 2.5 W (±0.2 W), then press the [MENU] key to save the new setting.
- ❑ Press the [▲] key to select the display to [LOW POWER **], then press the [MENU] key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 1.0 W (±0.1 W), then press the [MENU] key to save the new setting.
- ❑ Press the [BAND] key (Change the frequency display to 162.025 from 155.000 MHz), then press the [MENU] key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 1.0 W (±0.1 W), then press the [MENU] key to save the new setting.
- ❑ Press the [▼] key to select the display to [MID POWER **], then press the [MENU] key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 2.5 W (±0.2 W), then press the [MENU] key to save the new setting.
- ❑ Press the [▼] key to select the display to [HIGH POWER **], then press the [MENU] key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the output power to 4.5 W (±0.3 W), then press the [MENU] key to save the new setting.
- ❑ Press the [▲] key three times to select the display to [MARINE DEV **], then press the [MENU] key. The radio now is in the Alignment Mode of the TX deviation of the Marine Band.
- ❑ Set the Audio generator output to 50 mV at 1 kHz.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the [▲] or [▼] key to adjust the deviation

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to 4.2 kHz (± 0.2 kHz), then press the **[MENU]** key to save the new setting.

- ❑ Press the **[BAND]** key (Change the frequency display to 162.025 from 155.000 MHz), then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 4.2 kHz (± 0.2 kHz), then press the **[MENU]** key to save the new setting.

Transmitter Output (FRS Band)

- ❑ Press the **[▲]** key three times to select the display to **[FRS POWER **]** (** is “00” to “FF” Hex data). The radio now is in the Alignment Mode of the Transmitter Output of the FRS Band.
- ❑ Press the **[MENU]** key to enable adjustment of this Alignment Mode.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the output power to 0.5 W (± 0.05 W), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[BAND]** key (Change the frequency display to 467.712 from 462.562 MHz), then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the output power to 0.5 W (± 0.05 W), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[▲]** key to select the display to **[FRS DEV **]**, then press the **[MENU]** key. The radio now is in the Alignment Mode of the TX deviation of the FRS Band.
- ❑ Set the Audio generator output to 50 mV at 1 kHz.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 2.1 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[BAND]** key (Change the frequency display to 467.712 from 462.562 MHz), then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 2.1 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.

- ❑ Turn off the Audio generator output.
- ❑ Press the **[▲]** key to select the display to **[FRS 67.0 **]**, then press the **[MENU]** key. The radio now is in the Alignment Mode of the CTCSS deviation of the FRS Band.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[▲]** key to select the display to **[FRS 100.0 **]**, then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[▲]** key to select the display to **[FRS 250.3 **]**, then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[BAND]** key (Change the frequency display to 467.712 from 462.562 MHz), then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[▼]** key to select the display to **[FRS 100.0 **]**, then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.
- ❑ Press the **[▲]** key to select the display to **[FRS 67.0 **]**, then press the **[MENU]** key.
- ❑ Press the **PTT** key to transmit the transceiver, if necessary, press the **[▲]** or **[▼]** key to adjust the deviation to 0.5 kHz (± 0.1 kHz), then press the **[MENU]** key to save the new setting.

Press the **[16/9]** key to save the new setting and exit to the normal operation.