

## VX-8GR Alignment

### Introduction

The VX-8GR is 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. Only an authorized Yaesu representative should perform all component replacement and service, or the warranty policy may be void. The following procedures cover the adjustments that are not normally required once the transceiver has left the factory. However, if damage occurs and some parts subsequently 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. 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 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 transceiver 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 familiarity with its 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 1 GHz
- Deviation Meter (linear detector)

- In-line Wattmeter with 5% accuracy at 500 MHz
- 50-ohm, 10-W RF Dummy Load
- 8-ohm AF Dummy Load
- Regulated DC Power Supply adjustable from 3 to 15 V DC, 3A
- Frequency Counter: 0.2-ppm accuracy at 1 GHz
- AF Signal Generator
- AC Voltmeter
- DC Voltmeter: high impedance
- UHF Sampling Coupler
- SINAD Meter

### **Alignment Preparation & Precautions**

A 10-W RF load and in-line wattmeter must be connected to the main antenna jack in all procedures that call for transmission, alignment is not possible with an antenna. After completing one step, read the next step to see if the same test equipment is 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 ~ 86 °F (20 ~ 30°C). When the transceiver is brought into the shop from hot or cold air, it should be allowed some 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 0 dB $\mu$ =0.5  $\mu$ V (closed circuit).

### **Test Setup**

Set up the test equipment as shown below for transceiver alignment, and apply 8.4 V DC power to the transceiver. Refer to the drawings for Alignment Points.

### **Internal System Alignment Routine**

This uses a programmed routine in the transceiver which simplifies many previously complex discrete component settings and adjustments with digitally-controlled settings via front panel buttons and LCD indications.

To enter the alignment routine:

Set the transceiver to the 430 MHz band, then turn the transceiver off. Now, press and hold

the [HM/RV] key while powering the radio on again. The display will show the first setting.

To exit the alignment routine, press the [HM/RV] key.

After performing the system alignment in its entirety, individual settings can be returned to and adjusted should the need arise.

#### **PLL Reference Frequency (PLL REF)**

- Rotate the DIAL knob to select the display “PLL REF”.
- Press the [V/M] key to enable adjustment of the PLL Reference Frequency.
- Press the PTT switch to transmit the transceiver, rotate the DIAL knob so that the Frequency Counter reading is same frequency of the transceiver’s display ( $\pm 100$  Hz).
- Press the [V/M] key to save the new setting

#### **A Band Adjustment**

##### **430 MHz Band RX Sensitivity (TUNE DC)**

- Rotate the DIAL knob to select the display “TUNE DC”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-10$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band RX Sensitivity.
- Rotate the DIAL knob for maximum deflection of the SINAD meter.
- Press the [V/M] key to save the new setting

##### **430 MHz Band Squelch Hysteresis (HIS SQL)**

- Rotate the DIAL knob to select the display “HIS SQL”.
- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Hysteresis.
- Rotate the DIAL knob to set the display to “0”.
- Press the [V/M] key to save the new setting.

##### **430 MHz Band Squelch Threshold (THLD SQL)**

- Rotate the DIAL knob to select the display “THLD SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-12$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Threshold.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz Band Squelch Tight (TIGH SQL)**

- Rotate the DIAL knob to select the display “TIGH SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-4$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Tight.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz Band FM S-Meter S-1 Level (S1 LEVEL)**

- Rotate the DIAL knob to select the display “S1 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-7$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 430 MHz Band FM S-Meter S-1 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz Band FM S-Meter S-9 Level (S9 LEVEL)**

- Rotate the DIAL knob to select the display “S9 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $+20$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band FM S-Meter S-9 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz TX High Power (HI POWER)**

- Rotate the DIAL knob to select the display “HI POWER”.
- Press the [V/M] key to enable adjustment of the 430 MHz TX High Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 5.0 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **430 MHz TX L3 Power (L3 POWER)**

- Rotate the DIAL knob to select the display “L3 POWER”.
- Press the [V/M] key to enable adjustment of the 430 MHz TX L3 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 2.5 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **430 MHz TX L2 Power (L2 POWER)**

- Rotate the DIAL knob to select the display “L2 POWER”.
- Press the [V/M] key to enable adjustment of the 430 MHz TX L2 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 1.0 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **430 MHz TX L1 Power (L1 POWER)**

- Rotate the DIAL knob to select the display “L1 POWER”.
- Press the [V/M] key to enable adjustment of the 430 MHz TX L1 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 50 m W  $\pm 20$  m W.
- Press the [V/M] key to save the new setting.

#### **430 MHz MAX Deviation (MAX DEV)**

- Inject a 1 kHz audio tone at a level of 50mV (r ms) to the MIC jack.
- Rotate the DIAL knob to select the display “MAX DEV”.
- Press the [V/M] key to enable adjustment of the 430 MHz MAX Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 4.2 kHz  $\pm 0.2$  kHz (USA version, EXP version: 4.5 kHz  $\pm 0.2$  kHz).
- Press the [V/M] key to save the new setting.

#### **430 MHz CTCSS Deviation (100.0 Hz)**

- Rotate the DIAL knob to select the display “100.0 Hz”.
- Press the [V/M] key to enable adjustment of the 430 MHz CTCSS Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 0.65 kHz  $\pm 0.05$  kHz.
- Press the [V/M] key to save the new setting.

#### **430 MHz DCS Deviation (DCS 023)**

- Rotate the DIAL knob to select the display “DCS 023”.
- Press the [V/M] key to enable adjustment of the 430 MHz DCS Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 0.65 kHz  $\pm$ 0.05 kHz.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band RX Sensitivity (TUNE DC)**

- Press the [BAND] key to switch the operating band to 144 MHz Band.
- Rotate the DIAL knob to select the display “TUNE DC”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-10$  dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band RX Sensitivity.
- Rotate the DIAL knob for maximum deflection of the SINAD meter.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Hysteresis (HIS SQL)**

- Rotate the DIAL knob to select the display “HIS SQL”.
- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Hysteresis.
- Rotate the DIAL knob to set the display to “0”.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Threshold (THLD SQL)**

- Rotate the DIAL knob to select the display “THLD SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-12$  dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Threshold.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Tight (TIGH SQL)**

- Rotate the DIAL knob to select the display “TIGH SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then

adjust the RF Signal Generator output level to  $-4$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)

- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Tight.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band FM S-Meter S-1 Level (S1 LEVEL)**

- Rotate the DIAL knob to select the display “S1 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-7$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 144 MHz Band FM S-Meter S-1 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band FM S-Meter S-9 Level (S9 LEVEL)**

- Rotate the DIAL knob to select the display “S9 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $+20$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band FM S-Meter S-9 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz TX High Power (HI POWER)**

- Rotate the DIAL knob to select the display “HI POWER”.
- Press the [V/M] key to enable adjustment of the 144 MHz TX High Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 5.0 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **144 MHz TX L3 Power (L3 POWER)**

- Rotate the DIAL knob to select the display “L3 POWER”.

- Press the [V/M] key to enable adjustment of the 144 MHz TX L3 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 2.5 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **144 MHz TX L2 Power (L2 POWER)**

- Rotate the DIAL knob to select the display "L2 POWER".
- Press the [V/M] key to enable adjustment of the 144 MHz TX L2 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 1.0 W  $\pm 0.1$  W.
- Press the [V/M] key to save the new setting.

#### **144 MHz TX L1 Power (L1 POWER)**

- Rotate the DIAL knob to select the display "L1 POWER".
- Press the [V/M] key to enable adjustment of the 144 MHz TX L1 Power.
- Press the PTT switch, then rotate the DIAL knob so that the PO meter reading is 50 m W  $\pm 20$  m W.
- Press the [V/M] key to save the new setting.

#### **144 MHz MAX Deviation (MAX DEV)**

- Inject a 1 kHz audio tone at a level of 50 mV (r ms) to the MIC jack.
- Rotate the DIAL knob to select the display "MAX DEV".
- Press the [V/M] key to enable adjustment of the 144 MHz MAX Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 4.2 kHz  $\pm 0.2$  kHz (USA version, EXP version: 4.5 kHz  $\pm 0.2$  kHz).
- Press the [V/M] key to save the new setting.

#### **144 MHz CTCSS Deviation (100.0 Hz)**

- Rotate the DIAL knob to select the display "100.0 Hz".
- Press the [V/M] key to enable adjustment of the 144 MHz CTCSS Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 0.65 kHz  $\pm 0.05$  kHz.
- Press the [V/M] key to save the new setting.

#### **144 MHz DCS Deviation (DCS 023)**

- Rotate the DIAL knob to select the display "DCS 023".



- Press the [V/M] key to enable adjustment of the 144 MHz DCS Deviation.
- Press the PTT switch, then rotate the DIAL knob so that the Deviation meter reading is 0.65 kHz  $\pm$ 0.05 kHz.
- Press the [V/M] key to save the new setting.

## **B Band Adjustment**

Press the [B] key to switch the B Band to Main band.

### **430 MHz Band RX Sensitivity (TUNE DC)**

- Rotate the DIAL knob to select the display "TUNE DC".
- Set the RF Signal Generator to the same frequency of the transceiver's display, then adjust the RF Signal Generator output level to  $-10$  dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band RX Sensitivity.
- Rotate the DIAL knob for maximum deflection of the SINAD meter.
- Press the [V/M] key to save the new setting

### **430 MHz Band Squelch Hysteresis (HIS SQL)**

- Rotate the DIAL knob to select the display "HIS SQL".
- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Hysteresis.
- Rotate the DIAL knob to set the display to "0".
- Press the [V/M] key to save the new setting.

### **430 MHz Band Squelch Threshold (THLD SQL)**

- Rotate the DIAL knob to select the display "THLD SQL".
- Set the RF Signal Generator to the same frequency of the transceiver's display, then adjust the RF Signal Generator output level to  $-12$  dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Threshold.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

### **430 MHz Band Squelch Tight (TIGH SQL)**

- Rotate the DIAL knob to select the display "TIGH SQL".
- Set the RF Signal Generator to the same frequency of the transceiver's display, then adjust the RF Signal Generator output level to  $-4$  dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz

tone)

- Press the [V/M] key to enable adjustment of the 430 MHz Band Squelch Tight.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz Band FM S-Meter S-1 Level (S1 LEVEL)**

- Rotate the DIAL knob to select the display “S1 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-7$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 430 MHz Band FM S-Meter S-1 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **430 MHz Band FM S-Meter S-9 Level (S9 LEVEL)**

- Rotate the DIAL knob to select the display “S9 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $+20$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 430 MHz Band FM S-Meter S-9 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band RX Sensitivity (TUNE DC)**

- Press the [BAND] key to switch the operating band to 144 MHz Band.
- Rotate the DIAL knob to select the display “TUNE DC”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-10$  dB $\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band RX Sensitivity.
- Rotate the DIAL knob for maximum deflection of the SINAD meter.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Hysteresis (HIS SQL)**

- Rotate the DIAL knob to select the display “HIS SQL”.
- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Hysteresis.
- Rotate the DIAL knob to set the display to “0”.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Threshold (THLD SQL)**

- Rotate the DIAL knob to select the display “THLD SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-12\text{ dB}\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Threshold.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band Squelch Tight (TIGH SQL)**

- Rotate the DIAL knob to select the display “TIGH SQL”.
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-4\text{ dB}\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 144 MHz Band Squelch Tight.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band FM S-Meter S-1 Level (S1 LEVEL)**

- Rotate the DIAL knob to select the display “S1 LEVEL” and “NFM” icon (@bottom right corner).
- Set the RF Signal Generator to the same frequency of the transceiver’s display, then adjust the RF Signal Generator output level to  $-7\text{ dB}\mu$  (with 1 kHz tone @ $\pm 3.0$  kHz tone)
- Press the [V/M] key to enable adjustment of the 144 MHz Band FM S-Meter S-1 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

#### **144 MHz Band FM S-Meter S-9 Level (S9 LEVEL)**

- Rotate the DIAL knob to select the display “S9 LEVEL” and “NFM” icon (@bottom right corner).

- Set the RF Signal Generator to the same frequency of the transceiver's display, then adjust the RF Signal Generator output level to +20 dB $\mu$  (with 1 kHz tone @ $\pm$ 3.0 kHz tone).
- Press the [V/M] key to enable adjustment of the 144 MHz Band FM S-Meter S-9 Level.
- Press the [MONI/T-CALL] switch twice.
- Press the [V/M] key to save the new setting.

This completes the internal alignment routine for all bands.

Press the [HM/RV] key to save all settings and exit to the normal operation.