

**VADER**  
**PROFESSIONAL SECURE RADIO**  
**ALIGNMENT PROCEDURES**

**1. Set-up of the Radio for Test Mode & Test Frequency**

“Refer to **VADER Programming Instructions.**”

- a. Using “GF Command”, write the 7 frequencies in 2 MHz step within the applied bandwidth (150-162 MHz or 160-172 MHz) on the No.1 channel of each Group #1 ~ #7.

<Step-1; in case of using 4 MHz band in 150-162 MHz>:

GF0101150.0250[cr]

GF0201152.0250[cr]

GF0301154.0250[cr]

GF0401156.0250[cr]

GF0501158.0250[cr]

GF0601160.0250[cr]

GF0701161.9750[cr]

- b. Using “RT Command”, set the Transmit and Receive frequency to be fixed on the No.1 channel of each Group.

<Step-2>: RT01[cr]

With this procedure, both Transmit and Receive frequencies are fixed at Group #1 150.025MHz, #2 152.025MHz, #3 154.025MHz, #4 156.025MHz, #5 158.025, #6 160.025MHz, and #7 161.975MHz.

**Remarks:** It is not obliged to use the Group # and Channel No. as like above for setting-up the testing of the VADER radio, but it is compulsory to set the same Channel in each Group.

- c. Using “TO Command”, disable the TIME-OUT-TIMER.

<Step-3>: TO990[cr]

**2. Adjustment of VCO**

**Remarks:** This adjustment is not required for changing the frequency band on the radio already having proper function.

- a. Select Group #1 by Group Selector Switch. Connect a DC Voltmeter having high input impedance on the test point “PCV” on the MAIN PWB.
- b. Connect a Dummy Load of  $50\Omega$  on Antenna Connector and adjust T9 to indicate the DC Volt Meter at 0.5V +/-0.1V in Transmit.
- c. Connect a SSG being set at the frequency of Group #1 on Antenna Connector and adjust T10 to indicate the DC Volt Meter at 0.5V +/-0.1V in Receive.

**Remarks:** When adjusting T10 in Receive, the radio receiver must receive the carrier wave. Otherwise the detected voltage on DC Voltmeter tends to be unstable due to channel scanning function.

### **3. Adjustment of Transmitter and Modulator**

- a. Connect a RF Power Meter having impedance of  $50\Omega$ , Frequency Counter, and Deviation Meter to Antenna connector. Connect an Audio Oscillator to MIC terminal.
- b. By Group Selector Switch, select appropriate Group of which the frequency has been set nearly in the midst of the 4MHz band to be used.
- c. By Power Selector Switch, select the RF output power to Hi.
- d. Adjust the RV1 on MAIN PWB to obtain the maximum reference voltage.
- e. Press PTT Button to engage the Transmitter in Transmit.
- f. Adjust T1, T2, VC1, VC2, and VC3 to obtain the maximum value (200-250mW) at the RF Power Meter.
- g. Try selecting the Group having frequency closer to both band-edges in 4MHz band and check if the RF output power has no significant deterioration (below 150mW). If the RF output power significantly drops at any band-edge, retry the procedure f. and make balancing the RF output power at both edges and center of the band. When the adjustment is properly done, the VADER radio has approx.  $\pm 4$ MHz of efficient bandwidth.
- h. Adjust RV1 on MAIN PWB to obtain 100mW at the RF Power Meter.
- i. Adjust Trimmer TCX1 on MAIN PWB to obtain the frequency error in 1PPM at the Frequency Counter.

**Remarks: This adjustment is not required for changing the frequency band on the radio already having proper function. For adjusting this, the CPU PWB has to be taken off.**

- j. Adjust RV2 on MAIN PWB to obtain 10mW at the RF Power Meter.
- k. Adjust the Audio Oscillator to obtain the voltage of 100mVrms/1KHz at the MIC terminal. Select appropriate Group of which the frequency has been set nearly in the midst of the 4MHz band to be used.
- l. Turn the RV1, RV3 on DSP PWB and RV4 on CPU PWB to maximum. Adjust RV2 on DSP PWB to obtain the voltage of 0.7V P-P at the #4 pin of CN2 on DSP PWB.
- m. Adjust RV5 on MAIN PWB to obtain the value of Deviation Meter at  $\pm 4.8$ KHz.
- n. Adjust the Audio Oscillator to obtain the voltage of 1mVrms/1KHz at MIC terminal.
- o. Adjust the RV1 on DSP PWB to obtain the value of Deviation Meter at  $\pm 4$ KHz.
- p. Check the function of transmitter at both edges of 4MHz band to be used.

#### **4. Adjustment of Receiver**

- a. Connect SSG to Antenna terminal and SINAD Meter to SPK terminal.
- b. Select appropriate Group at nearly the center of 4MHz band to be used.
- c. Set the frequency of SSG with the selected Group. Set the RF output at  $1 \mu \text{V}$ , modulating frequency at 1KHz, and frequency transition at +/-3KHz.
- d. Adjust the RV3 on MAIN PWB to open squelch.
- e. Adjust T3 ~ T7 alternatively to obtain the value of SINAD Meter at maximum. If necessary, the RF output from SSG may be changed.
- f. Set the RF output from SSG at  $0.5 \mu \text{V}$ .
- g. Adjust the RV3 on MAIN PWB to the limit at where the squelch is about to open.
- h. Check the function of Receiver at both edges of 4MHz band to be used. When the adjustment is properly done, the VADER radio has approx. +/-4MHz (-3dB band) of efficient bandwidth.
- i. If the deterioration of Receiver sensitivity is observed at any band-edge, retry above procedures and make balancing the sensitivity at both edges and center of the band to be used.

**Notes:** Using the Tracking Generator and Spectrum Analyzer makes easier adjustment while observing the shape of band. In this case, the output of Tracking Generator is to be set at -30dBm, and the Reference Level of Spectrum Analyzer at approx. -30dBm, and get the signal from the Drain of Q3 to be picked-up by an high impedance probe.