Command Radio Tuning Procedure.

TRANSMITTER TUNING

Preliminary

1. Set R56 to maximum CCW.
2. Connect 50 Ohm RF Load (10 Watt minimum rating) to J25 (Antenna). See Figure 1.
3. Connect frequency counter and a FM modulation analyzer to RF Load output.
4. All adjustments are made with the transmitter PTT depressed.

Frequency Adjust.

1. Set Transmitter to a frequency near 161.0000 MHz in high power mode.
2. Push PTT and temporarily adjust R56 for a RF power level of 3 watts.
3. Adjust Trimmer Capacitor on the TCXO module (Mod 2) for a frequency of 161.00000 MHz ± 50 Hz.

VCO Adjust

1. Set Transmitter to a frequency near 173.9500 MHz.
2. Adjust L1 on Transmitter VCO Board (Mod 1) for a DC voltage of 10 Volts at the junction U12-1 and R116.
3. Set Transmitter to a frequency near 150.0500 MHz.
4. Check that the DC voltage on Vt at the junction U12-1 and R116 is between 2.75 and 3.25 Volts.

Master Deviation Adjust

1. Preset R36 (Master Deviation) and R89 (Balance) on RF Board to mid- range.
2. Set unit to non-tone/data channel near the middle of the frequency range.
3. Connect dummy microphone circuit to P5 (External Speaker and Microphone Plug). Connect an Audio generator to the dummy microphone circuit. See Figure 1.
4. Connect an oscilloscope to the FM Modulation Analyzer. Set audio generator to 1000 Hz and increase audio output level until the sine wave on the oscilloscope just shows clipping. Increase the audio output level by 20 dB (10 times).
5. Adjust R36 (Master Deviation) trimmer for ±4.2 kHz deviation. Change the frequency of the audio generator to 300 Hz and adjust R89 (Balance) for ±4.2 kHz deviation. Observe the demodulated waveform on the oscilloscope. The correct waveform is shown below:

a. Correct

b. Incorrect

c. Incorrect

6. Repeat step 5 several times checking deviation and the demodulated waveform since R36 (Master Deviation) and R89 (Balance) interact.

CTCSS/DCS Adjust

1. Remove the 300 or 1000 Hz tone from dummy microphone circuit.

2. Set the unit to a frequency programmed for a CTCSS tone.
3. Adjust R14 (Tone Deviation) for ± 700 Hz deviation.
4. Set unit to a frequency programmed with a DCS tone. Check that deviation is with in 50 Hz of ±700 Hz.

DTMF Adjust

1. Set unit to a channel with the DTMF option.
2. Hold down pushbutton numbered 5 and set R15 (DTMF Adjust) for ± 3.5 kHz deviation.

DSC Adjust

1. Set unit to test channel (X) that provides continuous DSC coding.
2. Adjust R16 (DSC Adjust) for ±3.5 kHz deviation.

4FSK Adjust

1. Set unit to non-tone/data channel.
2. Connect 4FSK Data Generator with RS232 interconnect to the Options Connector. See Figure 1.
   Note: This disconnects the audio generator from the dummy microphone circuit.
3. Adjust R17 (4FSK Adjust) for ±3.5 kHz deviation.

RF Power Adjust

Note: Continuous transmission will cause the PA Module (Mod4) to heat up. These adjustments should be made with PA Module near ambient temperature.

1. Set unit to channel near the middle of the frequency range that is programmed for high power.
2. Adjust R56 (Hi Power) for 5 watts maximum.
3. Set unit to channel near the middle of the frequency range that is programmed for low power.
4. Adjust R57 (Lo Power) for 1 watts typical.

RECEIVER TUNING

Main Receiver Section

VCO Adjust

1. Set Main Receiver to a frequency near 173.9500 MHz.
2. Adjust L1 on Main Receiver VCO Board (Mod 3) for a DC voltage of 10 Volts at the junction U12-1 and R116.
3. Set Main Receiver to a frequency near 150.0500 MHz.
4. Check that the DC voltage at the junction U12-1 and R116 is between 2.75 and 3.25 Volts.

Front End Alignment.

1. Set Main receiver to a frequency near 161.0000 MHz.
2. With FM signal generator set to the receive frequency, adjust output level for 0.1 Vpp (455 kHz) at via going to Pin 5 of U2.

3. Adjust L1, L2 L3 and L4 (in that order) on the main receiver Front End board (FE) (Mod 8) for maximum signal on the oscilloscope. Reduce RF signal generator output level as necessary to keep near 0.1 Vpp on oscilloscope. Repeat.

IF Alignment

1. Using same frequency, set RF level to 100 μV and modulate RF generator with 1000 Hz tone deviated at 1.5 kHz.
2. Connect AC Voltmeter to external speaker. Use 3 Volt scale.
3. Unsquelch radio (maximum CCW position) and adjust volume control for mid range reading on the AC Voltmeter.
4. Adjust L2 on the RF board for maximum 1000 Hz level on the AC Voltmeter. Readjust volume control if necessary.
5. DC voltage on pin 19 of P3 should be 2.1 volts. Slight adjustment of L2 may be necessary.
6. Check 12 dB SINAD on this channel and the two channels used for VCO adjust. RF level for 12 dB SINAD should be less than 0.35 μV.

Guard Receiver Section

VCO Adjust

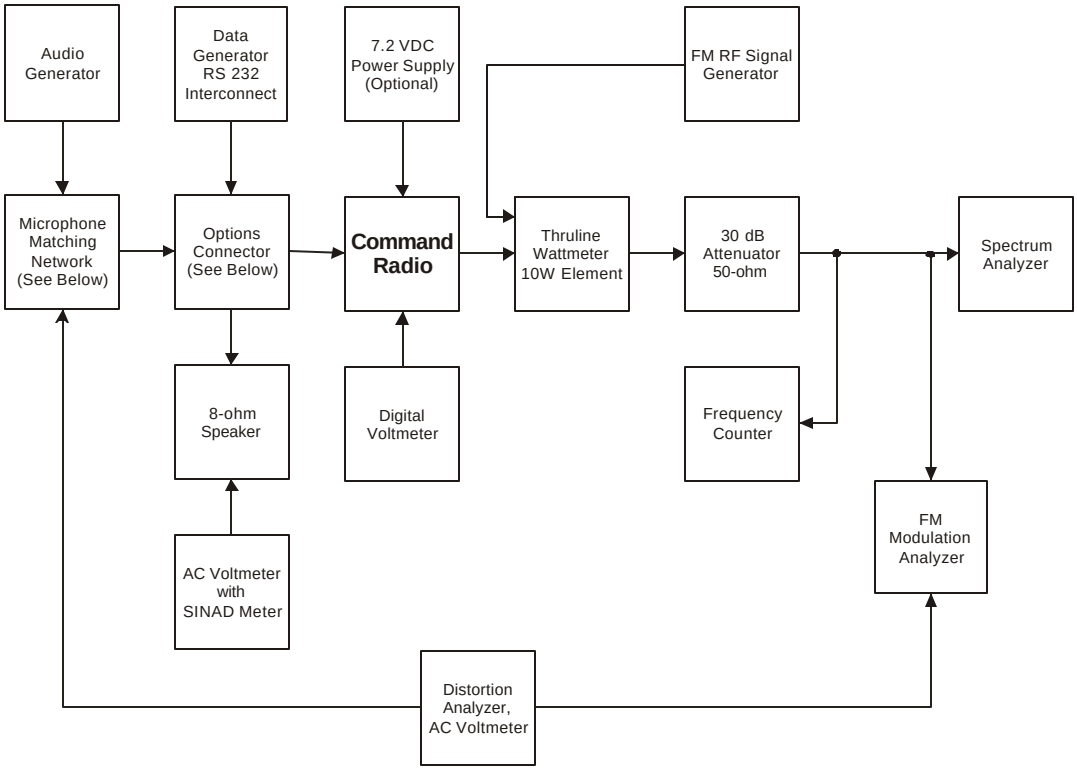
1. Set Guard Receiver to a frequency near 173.9500 MHz.
2. Adjust L1 on Guard VCO Board (Mod 6) for a DC voltage of 10 Volts at the junction U13-1 andR14.
3. Set Guard Receiver to a frequency near 150.0500 MHz.
4. Check that the DC voltage at the junction of U13-1 and R14 is between 2.75 and 3.25 Volts.

Front End Alignment.

1. Set Guard receiver to a frequency near 161.0000 MHz.
2. With FM signal generator set to the receive frequency, adjust output level for 0.1 Vpp (455 kHz) at via going to Pin 5 of U1.
3. Adjust L1, L2 L3 and L4 (in that order) on the guard receiver FE board (Mod 9) for maximum signal on the oscilloscope. Reduce RF signal generator output level as necessary to keep near 0.1 Vpp on oscilloscope. Repeat.

IF Alignment

1. Using same frequency, set RF level to 100 μV and modulate RF generator with 1000 Hz tone deviated at 1.5 kHz.
2. Temporarily connect 18K resistor in series with 47000 pF capacitor to ground to pin 19 of P3. Connect an Oscilloscope to the junction of the resistor and capacitor. Use 0.1 volt/div scale.
3. Adjust L2 on the RF board for maximum 1000 Hz signal on the oscilloscope.
4. DC voltage on pin 20 of P3 should be 2.1 volts. Slight adjustment of L2 may be necessary.
5. Check 12 dB SINAD on this channel and the two channels used for VCO adjust. RF level for 12 dB SINAD should be less than 0.35 μV.



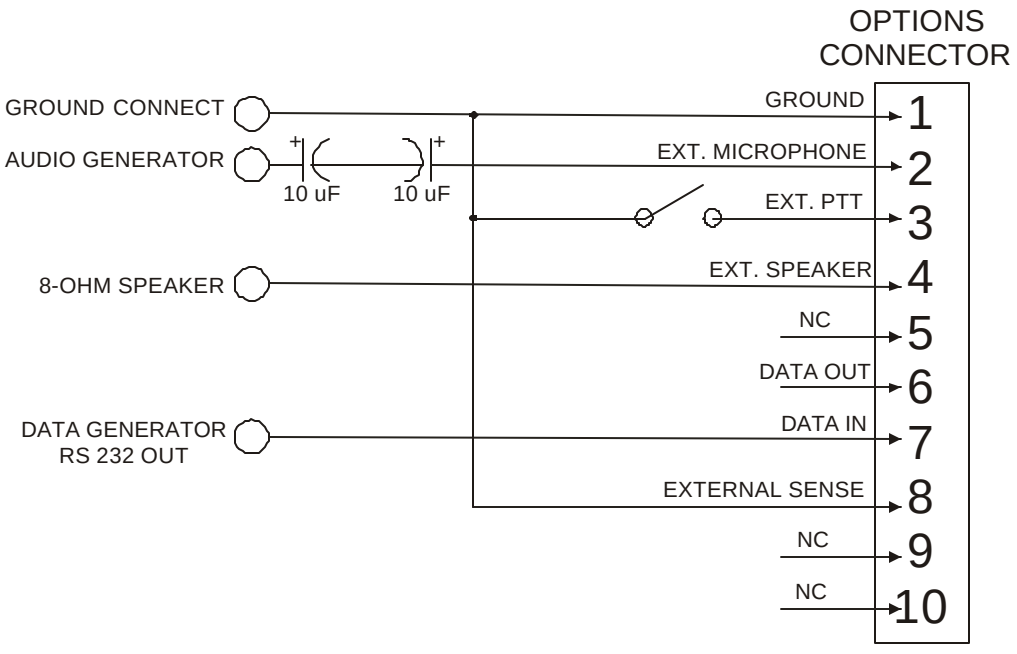


FIGURE 1. 10-1-1999