



Application Note:  
**Testing Analog PMR Radios Using the  
Freedom Communications System Analyzer**

### Test Configuration

The test procedures detailed below show a sub-set of tests that may be performed when the breakout Test Box is not available. However, you will need the test box to conduct absolute TX & RX audio quality measurements.

**CAUTION:** Some of the following tests are qualitative, not quantitative, but they still provide a quick and easy method to determine the radio's basic functionality and performance. The tests are accurate and reliable for most parametric values, but for absolute measurements refer and adhere to the test procedures detailed in the appropriate service manual for the Radio.

### Analog Transmitter Tests

Set the R8000 configuration as follows:

- Press the "Monitor" key then RF Zone.
- Select "Monitor Frequency" and using the numeric keypad enter the frequency of the channel to be tested, for example: 403.025000 MHz.
- Select "Attenuation", set to 40dB.
- Select "Modulation Type", set to FM from the bottom softkey menu.
- Select "Bandwidth", set to 12.5 KHz from the bottom softkey menu.
- Select "More 1 of 2".
- Select "Mon Port", set to "RF In/Out" using the cursors or spin knob.
- Select numeric key "4" to enter the Display Zone.
- Select "Select Display", set "Bar Graphs" from the bottom menu. Optionally select "Spec An" if you wish to monitor the TX spectrum.
- Select numeric key "7" (shortcut key) to enter the "Meter Zone".
- Select "Select Meter", set "Frequency Counter" from the bottom menu. This will display the transmitted audio frequency that is modulating the TX.
- Connect the Radio's Antenna port using a SMA Adaptor and coaxial cable to the RF In/Out port of the R8000. Turn on the Radio and Select channel 2 or the channel you have programmed for Analog.
- The configuration is now complete and you are ready to test the radio transmitter parameters.
- Key the PTT and observe the measurements being displayed on the R8000; RF Power, Deviation, Frequency Error, and Modulating Audio 3 frequency. Speaking into the microphone will result in your speech being broadcast from the R8000 speaker.

#### Note 1:

Motorola Test Box RLN4460 is required to test more complex functions of the transmitter. The above procedure tests only the basic operation and functionality of the radio.

#### Note 2:

The above R8000 configuration and settings may be saved as a "Preset".

This avoids having to go through the above procedure every time you need to conduct this test.

### Preset Save Procedure

- Press the blue "Test" hard key
- Select "Save Configuration As"
- Using the Alpha Numeric keypad and Spin Knob enter a file name that will identify this test to you at a later date. Example, "ANALOG TX"
- Press the Enter key. This configuration will have populated into the list of available "Presets"

### Analog Receiver Tests

- Press the "Generate" blue hard key.
- Select "RF Zone".

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- Select “Generate Frequency” and using the numeric keypad enter the frequency of the channel to be tested, in this case 403.025000 MHz.
- Select “Modulation Type”. set to FM.
- Select “Output Level” and using the numeric keypad or Spin Knob enter the desired RF output power. -50dBm is a good place to start.
- Select “Gen Port”. Set, RF In/Out using the Spin Knob.
- Select “Bandwidth”, set to 12.5kHz from the bottom menu.
- Select numeric key “2” (shortcut key) to enter the “Audio Zone”.
- Select “Fixed 1kHz Level”, set to 2 kHz using keypad or spin knob.
- Select “Fixed 1kHz Mode”, set to “Continuous”.
- Press “More 1 of 5” until you reach the page 4 menu.
- Select “Microphone Mode”, set to “Continuous”.
- Select “Microphone Level”, set to 3 kHz using keypad or Spin Knob.
- Select numeric key “4” (shortcut key) to enter “Display Zone”.
- Select “Select Display”, set for “Mod Scope”.
- Adjust the Scope’s Vertical and Horizontal scales as desired to display the modulation being sent to the radio.
- Select numeric key “7” (shortcut key) to enter the “Meter Zone”.
- Select “Select Meter”, set to “SINAD” from the bottom menu keys. 4
- Connect the radio’s antenna port using an SMA adaptor and coaxial cable to the RF In/Out port of the R8000. Turn on the radio and select channel 2 or the channel you have programmed for Analog.
- The configuration is now complete and you are ready to test the radio transmitter parameters.
- You will hear a 1 kHz tone on the radio’s speaker, and speaking into the R8000 microphone will result in speech from the radio’s speaker.
- A good approximation of RX sensitivity may be achieved by reducing the RF signal amplitude until the heard 1kHz tone begins to weaken and distort.

### **Note 1:**

The absolute measurement of SINAD and RX Sensitivity requires Motorola Test Box RLN4460.

### **Note 2:**

Testing analog radios with PL or DPL enabled will be the subject of a separate application note.

### **Preset Save Procedure:**

- Press the blue “Test” hard key
- Select “Save Configuration As”
- Using the Alpha Numeric keypad and Spin Knob enter a file name that will identify this test to you at a later date. Example “ANALOG RX”
- Press the Enter key. This configuration will have populated into the list of available “Presets”