

**TYPE OF EXHIBIT:** TUNE-UP PROCEDURE  
**FCC PART:** 2.1033 (c)(9)  
**MANUFACTURER:** RITRON, INC.  
505 West Carmel Drive  
Carmel, IN 46032  
**FCC ID:** AIERIT19-150  
**MODELS:** SPX-200  
**DATE:** January 19, 2005

The tune-up procedure included in this exhibit is an excerpt of the Maintenance and Operating Manual for RITRON Model SPX-200 VHF-FM Portable Transceiver. The complete Maintenance and Operating Manual is included with this application for Certification as a separate exhibit.

Signed:   
Kevin G. Matson - Project Engineer

## **5. ALIGNMENT PROCEDURE**

### ***1) MEASUREMENT CONDITION***

The following sections describes the alignment procedure for SPX-200 transceiver under the following reference environment conditions:

Temperature	:	25° C (77° F)
Relative Humidity	:	65%
Power Supply Voltage	:	7.5VDC +/- 5%

### **TEST EQUIPMENT / TOOLS REQUIRED**

The following list of equipment is recommended for use in setting up the radio properly. Please ensure the test equipment are calibrated according to the manufacturer's instructions:

- Frequency counter more than 1GHz +/-100Hz tolerance, high input impedance and high sensitivity
- FM Signal generator, 1GHz with adjustable frequency, FM deviation, and RF output attenuators. 50Ω Output impedance.
- Oscilloscope, high input impedance.
- 16Ω 1 Watt resistor as loudspeaker load
- Audio Signal Generator, 10Hz to 20KHz, 600Ω impedance with attenuators.
- RF Watt meter, with 50Ω 10 Watt termination resistor (Or RF Voltmeter with 50Ω termination and external 50Ω attenuators)
- Regulated Power Supply 7.5VDC 3A output
- Digital A-V-O Multi-meter
- SINAD Meter
- External Speaker Mic. plug (or special audio test jig)
- Interconnection test cable for RF and Control PCB
- Circuit Diagram for SPX-200
- PCB layout diagram for SPX-200
- Tuning tools for RF/IF transformer and the VR potentiometers

### ***2) DISASSEMBLING THE UNIT***

The antenna

Disconnect the antenna.

The Cover

- 1- Remove the battery.
- 2- Remove the Volume Knob.
- 3- Remove the 2 screws on the back panel.
- 4- The case could then be opened for servicing.
- 5- Be careful NOT to disconnect the pin connector between RF board and Control board.

The PCBs

- The radio consists of two PCBs, the RF (rear side) and control board (front side)..
- On the RF Board, connect ANT1 to a signal generator or RF power meter.
- On the RF Board, connect Power Supply to the battery terminal contacts.
- Connect External Speaker Mic Plug (or Audio Test Jig) to J3.

### ***3) TRANSMITTER CIRCUIT ADJUSTMENT***

- Crystal frequency  
On receiving mode, check Crystal output is at 12.8MHz
- Transmitter Frequency  
Connect RF Power meter to ANT1, Activate PTT to transmit on 154.570MHz.

- Transmitter Output Power  
Activate PTT to transmit on 154.570MHz, Output power is adjustable by software
- Transmitter Sub-Audible Tone Deviation  
Set radio to transmit on 154.570Hz, with CTCSS code 01 (67Hz) and no audio modulation. It is adjustable by software for 0.35KHz deviation.
- Transmitter Deviation Limit  
Set radio to transmit on 154.570MHz, with CTCSS code 01 (67Hz) and audio modulation. At the external microphone input, inject 1KHz tone at -20dBm. It is adjustable by software for 2.3KHz deviation.

#### ***4) RECEIVER CIRCUIT ADJUSTMENT***

- FM Demodulator Adjustment  
Set radio to receive on 154.570MHz, No CTCSS or DCS. Connect RF Signal Generator to ANT1, Set generator to 154.570MHz at -60dBm (50Ω) output with 1KHz tone modulation at 1.5KHz deviation.
- Receiver Squelch Adjustment  
After checking the receiver sensitivity, further lower the RF Signal Generator output to 8-10dB SINAD and observe the squelch circuit operates.