Tune Up Procedure

for the

Radium 922T Xmtter

810-7403-102

3/19/04	A	Init Release	DT
DATE	**REV**	**REV RECORD**	**AUTH**

PhonicEar®

3880 Cypress Drive, Petaluma, CA 94954

CHECKED BY	**DATE**
Dave T	
APPROVED BY	**DATE**
Lee H	

TITLE **Tune Up Procedure for the Radium 922T Xmtter**

DWG. NO. **810-7403-102**

REV. A

General description - The 922T is a lightweight handheld microphone containing a built in transmitter. The dimensions of the 922T are approximately 2.1" in diameter by 9.3" in length.

The 922T handheld transmitter is designed to be in compliance with Part 95 Subpart G – Low Power Radio Service 95.1009 (a) and (b). The intended use of this product is to support language translation and /or auditory assistance in an educational setting.

There are two connection points, two adjustment controls and a battery/low power indicator.

Connection points:

Microphone input – The 922T has a built-in dynamic microphone. A nominal input level of -35 dBV RMS will correspond to +/- 5 KHz peak deviation The 922T employs an automatic level control circuit to limit the peak deviation to less than +/- 8 kHz. This circuit is further described in the operation section of this report.

Battery Charger contacts - Two contacts at the base of the microphone are provided to charge the internal rechargeable batteries if so equipped. The charger is composed of a desktop stand, allowing up to two units to be placed in the charger. Due to the physical nature of the 922T charger, the user is discouraged from operating the transmitter while it is in the charger stand. In addition, the charger output current is limited and unable to provide adequate current to support the operation of the unit while it is in the charging mode.

Adjustment controls:

On/Standby/Off- This is a three position slider switch located on the side of the unit. In the "Off" mode, all power to the unit is disconnected. In the "Standby" mode all the circuitry is active, but all audio signals are muted, resulting in an un-modulated RF carrier. The purpose of this mode is to allow the operator to have private comments but keep the transmitter and receiver units in a ready mode allowing fast re-acquisition when the "On" mode is selected.

Channel Selection - This model features frequency synthesized channel selection. The channel spacing is set at 50 kHz and the design is capable of operation using extra band channels 41 though 60 (except channel 50) as defined in Part 95.629 section (c) (2). The current model supports only a 16 channel selection switch, located on the side of the unit, and Phonic Ear has chosen channels 41-48 and 51-58 as its 16 primary operating channel frequencies. At no point is channel 50 used.

Indicator – A dual colored LED indicator is located on the side of the unit. When the indicator is green the unit is powered up and ready for operation. If the indicator turns red, a low battery condition exists and the user must recharge the unit or replace the internal batteries. The low battery indicator is set to trigger at approximately 2.1 Volts giving the operator adequate time to change batteries or replace it with a fully charged unit. All the frequency determining devices and modulation controls are powered by an internal, well regulated DC/DC converter. If the operator keeps using the unit past the low battery warning, the unit will continue to operate within FCC limits until the battery voltage reaches of approximately 1.2 Volts and the DC/DC converter simply shuts off.

The 922T consists of two PCB's, board "A" and board "B", and a DC-DC converter module. The unit is designed for high volume production and requires a minimum amount of tuning up and alignment.

Tune up procedure:

1. Place a 200 mA current limited operating voltage of 2.5 volts +/- .1 volts to battery terminals of the DUT.
2. Move the power switch to standby mode and verify the operating current is 90 mA +/- 30 mA.
3. Verify the DUT power indicator is green
4. Check to see the 6.5V supply is 6.5V +/- .2 at L2 (board A).
5. Check to see the 3.3V supply is 3.3V +/- .1 at the junction of L7 and C41 (board B).
6. Verify there is less than 20 mV pk-pk AC ripple on either the 6.5V or 3.3V supply.
7. Next check for proper operation of the 12 MHz reference clock by placing the RF probe near R27, XL1. Correct the reference to 12 MHz +/- 60 Hz (5 PPM) by adjusting tuning capacitor VC1
8. Set the channel selector to channel "48" or 216.375 MHz. Using a voltmeter, measure the PLL tuning voltage at the positive side of C34 (board B). Verify the voltage is 2.0 +/- .2 Volts. If needed, change the value of C46 to bring the PLL tuning voltage with in tolerance. If the initial tuning voltage is too high, lower the value of C46. If the tuning voltage is too low, increase the value of C46. A suggested increment value is .5pF.
9. Change the channel selector to channel "41" and check to see if the PLL voltage is 1.8 +/- .2 Volts.
10. Change the channel selector to channel "58" and check to see if the PLL voltage is 2.2 +/- .2 Volts.
11. The PLL should be locked, and the PA enabled. Verify the operating current is now 100 mA +/- 10 mA.
12. Using an RF probe, verify the RF output power is 10 dBm +1/-3dB at the antenna port (board B) next to L25.
13. Place the RF output to an RF FM modulation analyzer.
14. Verify the DUT has less than 20 Hz of RMS residual FM deviation (300-15 KHz BW) bandwidth.
15. With no audio input, switch the power switch to the "on" position.
16. Adjust the pilot tone VR2 (board A) to produce 825 Hz +/- 75 Hz of deviation.
17. Switch the audio bandwidth on the FM modulation analyzer to 300 – 3 kHz.
18. Place a -35 dBV RMS, 1 KHz audio tone to the microphone input.
19. Adjust modulation adjustment VR1 (board B) to produce +/- 5 KHz peak deviation.
20. Switch the audio bandwidth on the FM modulation analyzer to 300 – 15 kHz.
21. Change the audio input to -15 dBV and verify the peak deviation does not exceed +/- 8.5 KHz peak deviation.

Tune up procedure (continued):

22. Switch the audio bandwidth on the FM modulation analyzer to 300 – 3 kHz.

23. Reduce the audio input to produce +/- 2.5 kHz peak deviation.

24. Confirm the modulation distortion is less than 1%.

25. Reset the modulation analyzer to read the FM demodulated AC RMS voltage.

26. Set the Modulation analyzer from absolute to relative and set this level as the 0dB point. Now change the audio frequency to 8 kHz. The reading on the meter should be + 4 dB +/- 1dB.

27. Note: This TX audio 75us frequency emphasis is processed by a compressor and will read ½ of the normal value.

28. Connect the RF output to a spectrum analyzer and note the frequency domain response of output.

29. Next, slowly reduce the power supply voltage while watching the frequency domain response of the DUT. As soon as the supply reaches 2.0 Volts the power indicator should switch from green to red. Note no change in the RF spectrum should be noted with the exception of a typical 3 dB reduction of the RF output power.

30. Using a voltmeter, measure the microphone bias voltage across Pin1 and Pin4 of CN4. The voltage should be 6.45V +/-50 mV.

31. The tune up and check out procedure is now complete.