1. Tuning Description

1.1 Required Test Instruments

- Radio communication test set (Aeroflex 3920 and HP8921)

    18V/3A regulated DC power supply

- Multimeter

- Tuner software

1.2 Tuning Procedures

1.2.1 Tuning a Radio

After the radio is reassembled, it is required to use the Tuner software to tune it.

The specific operations are described in the table below:

Item	Method
TX Section	
Reference Oscillator Warp	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to TX test mode. 2. Open the Tuner software, go to "TUNE_DATA -> TX" and double click "Reference Oscillator Warp" from the navigation tree on the left. Then click the "Transmit On" button. 3. Observe the frequency displayed on HP8921, and adjust the vernier until the frequency offset is less than or equals to 40Hz. 4. Click the "Transmit Off" button. 5. Click the "Save" button to save your settings.
Transmit Power Calibration	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to TX test mode. 2. Open the Tuner software, go to "TUNE_DATA -> TX" and double click "Transmit Power Calibration" from the navigation tree on the left. Then select an appropriate channel. 3. Click the "Transmit On" button.

Item	Method
	4. Adjust the power to the required level as described below: **L: (29.5-30)dBm** **H :(35.50~36.02)dBm** 5. Click the "Save" button to save your settings.
Transmit-to-Deviation	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to TX test mode. 2. Set the HP8921 as follows: IF Filter: 230kHz Filter1: <20Hz HPF Filter2: <15kHz LPF De-Emphasis: OFF 3. Open the Tuner software, go to "TUNE_DATA -> TX" and double click "Transmit-to-Deviation" from the navigation tree on the left. Then click the "Transmit On" button. 4. Observe the frequency deviation displayed on HP8921, and adjust the vernier until it is 5k±50Hz. 5. Click the "Transmit Off" button. 6. Click the "Save" button to save your settings.
Modulation Balance	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to TX test mode. 2. Set the HP8921 as follows: IF Filter: 230kHz Filter1: <20Hz HPF Filter2: <15kHz LPF De-Emphasis: OFF 3. Open the Tuner software, go to "TUNE_DATA -> TX" and double click "Modulation Balance" from the navigation tree on the left. Then select an appropriate channel. 4. Click the "Transmit On" button.

Item	Method
	5. Adjust the value in the dialog box until the frequency deviation displayed on HP8921 is 5k±50Hz. 6. Press the Enter key on the keyboard to confirm your settings. 7. Click the "Transmit Off" button. 8. Click the "Save" button to save your settings.
Transmit Oscillator Voltage	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to TX test mode. 2. Open the Tuner software, go to "TUNE_DATA -> TX" and double click "Transmit Oscillator Voltage" from the navigation tree on the left. 3. Click the "Save" button to save the existing value to DH-9100.
RX Section	
Front-end Filter	1. Connect the antenna connecto DH-9100 with the HP8921. 2. Connect the Audio Out port of DH-9100 with the Audio In port of the HP8921, and set the HP8921 to RX test mode. 3. Set HP8921 as follows: Output RF signal: -118dBm/Frequency (current channel frequency) Modulation frequency: 1kHz Modulation deviation: 3kHz De-Emphasis: 750 us 4. Observe the value displayed on the HP8921 and adjust the vernier until the SINAD value is more than 14dB. 5. Set the HP8921 as follows: Output RF signal: VHF: -25Bm/(current channel frequency: -29.025MHz) 6. Observe the SINAD value displayed on the HP8921 and adjust the vernier until it is less than 14 dB. 7. Press the **Enter** key on the keyboard to confirm your settings. 8. Click the "Save" button to save your settings.
RX Front-End Gain	1.Connect the antenna connector of DH-9100 with the HP8921, and set the

Item	Method
	HP8921 to RX test mode.
	2. Set the HP8921 to output -70dBm / Frequency (current channel frequency) unmodulated RF signal.
	3. Press the Enter key on the keyboard to confirm your settings.
	4. Click the "Save" button to save your settings.
Receive Oscillator Voltage	1. Connect the antenna connector of DH-9100 with the HP8921, and set the HP8921 to RX test mode.
	2. Open the Tuner software, go to "TUNE_DATA -> RX" and double click "Receive Oscillator Voltage" from the navigation tree on the left.
	3. Click "Save" to save the existing value to DH-9100.
Mandown Calibration	1. Keep DH-9100 in a vertical position.
	2. Open the Tuner software, go to "TUNE_DATA -> RX" and double click "Mandown Calibration" from the navigation tree on the left.
	3. Click Read button to read the calibration data.
	4. Click the "Save" button to save the calibration data.

1.2.2 Testing a Radio

After tuning DH-9100 , it is required to test the digital RF signal.

Transmitting

Step 1 Open the Tuner software and go to "TEST -> TX", and double click "Transmit BER (0.153)" from the navigation tree on the left.

Step 2 Select the frequency to be tested.

Step 3 Click the "Transmit On" button.

Step 4 Set the Aeroflex 3920.

- Frequency: be consistent with the frequency to be tested.
- STD IB 511(.153)

Step 5 View all items on the Aeroflex 3920.

- Frequency Error≤100Hz

  Transmit Power: 0.8~1.2W

- FSK Error ≤5%

- Magnitude Error ≤1%

Receiving

Step 1 Open the Tuner software and go to "TEST -> RX", and double click "Receiver BER (0.153)" from the navigation tree on the left.

Step 2 Select the frequency to be tested.

Step 3 Set the Aeroflex 3920.

- Frequency: be consistent with the frequency to be tested.

- STD IB 511(.153)

- Lvl: -116.0dBm

Step 4 Click the "Start" button.

Step 5 The average error rate is less than or equal to 5%.