

4. Alignment

This procedure is applicable to all versions of **SRM9000** mobile transceivers.

Caution

Preparing the radio will erase from the radio all customer PMR and Trunking configuration data (channel, signalling information etc). The only data retained by the Alignment Tool is the alignment data from the radio (DAC settings for TX power, front-end tuning etc).

If the radio contains customer configuration data that must be retained, you **must first** use the SRM9000 Configuration Programmer (FPP) software to read the radio and store the data on an FPP file **before** commencing with the alignment procedure.

When the Alignment is completed, use the SRM9000 Configuration Programmer (FPP) software to retrieve this stored data from the FPP file and write it back to the radio.

It is preferred that the radio remain installed in its aluminium extruded case throughout this alignment procedure. If the radio is to be aligned when removed from the case, a temporary heat sink must be fitted under the Transmitter PA module and the receiver output must be kept below 100 mW.

4.1 TEST EQUIPMENT

- | | |
|---|---|
| 1. Radio transceiver test set | CMT, 52/82 or similar. |
| 2. Variable DC power supply | 10.8V to 16.2V at 10 amps |
| 3. Oscilloscope | 20 MHz bandwidth minimum |
| 4. SRM9000 Programming & Alignment Breakout Box | As detailed in Figure 4-1 |
| 5. SRM9000 Speaker O/P Breakout Box | As detailed in Figure 4-2 |
| 6. Personal Computer | 486 DX 66 or better.
Operating system Windows 95 or later.
Minimum RAM - 16MB.
5MB free hard disk space.
Floppy drive - 1.44MB.
Mouse and serial port required |
| 7. SRM9000 Alignment Tool | Computer Software file |
| 8. SRM9000 Configuration Programmer (FPP) | Computer Software file |

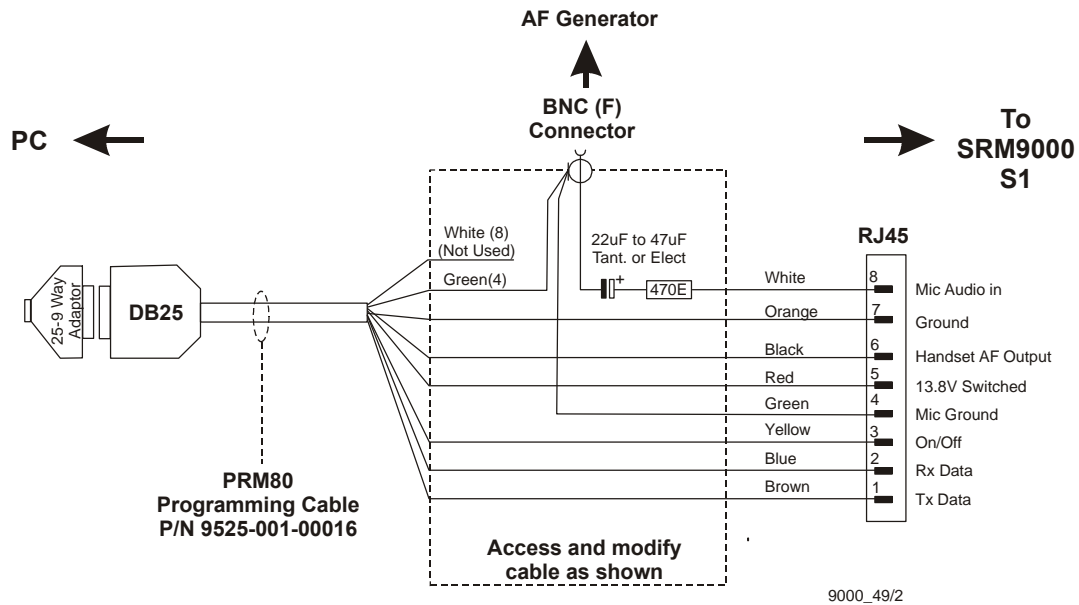


Figure 4-1 SRM9000 Programming & Alignment Breakout Box

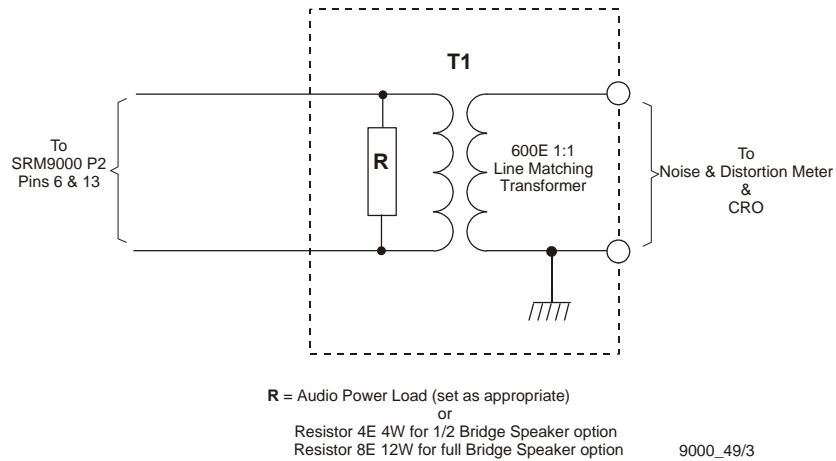
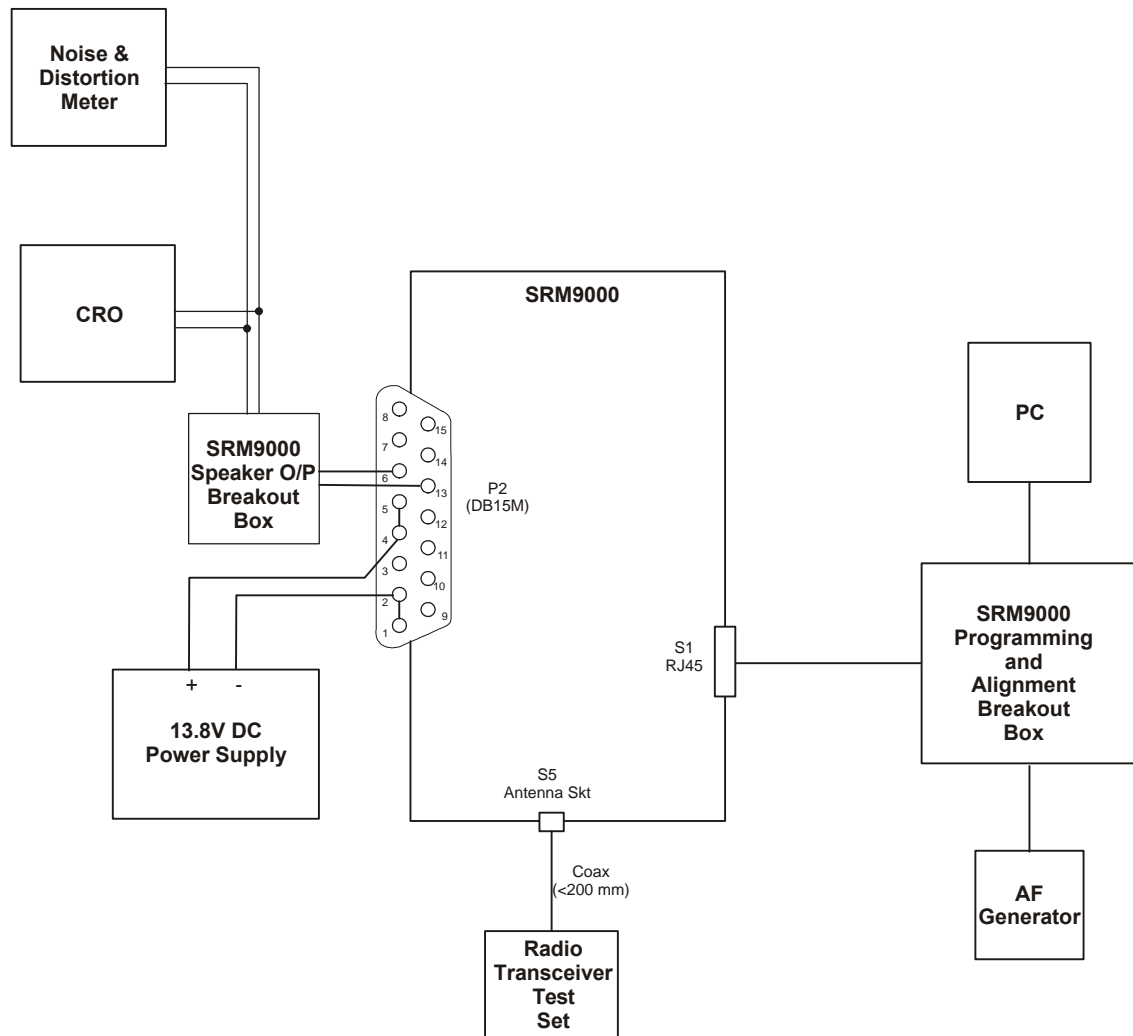


Figure 4-2 SRM9000 Speaker Output Breakout Box

4.2 test set up



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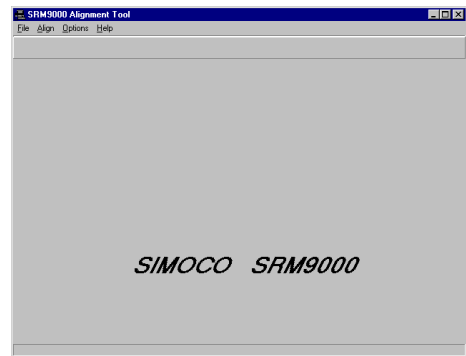
Figure 4-3 Test Set up

1. Connect the radio to the test equipment as shown in Figure 4-3.
2. Switch on the DC Power Supply.

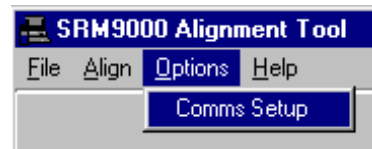
4.2.1 COMMS Set up

1. Copy the SRM9000 Alignment Tool Computer Software file to the PC hard drive and run the program

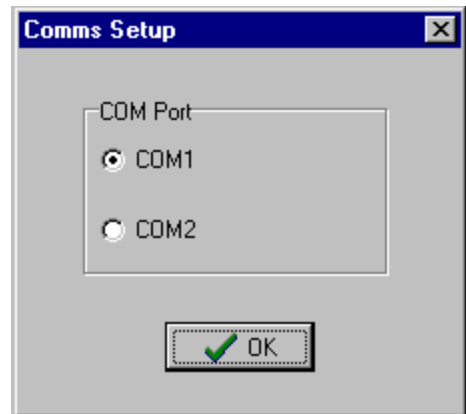
The Alignment Tool Opening Menu is displayed.



2. Go to the **Options** menu and choose **Comms Setup**.



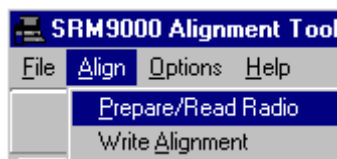
3. The **Comms Setup** dialogue box is displayed.
Select the Comms Port setting appropriate to the configuration of your PC and choose ✓OK.
(Usually COM1)



4.2.2 Radio Preparation

Radio parameters are to be aligned sequentially as detailed in this procedure.

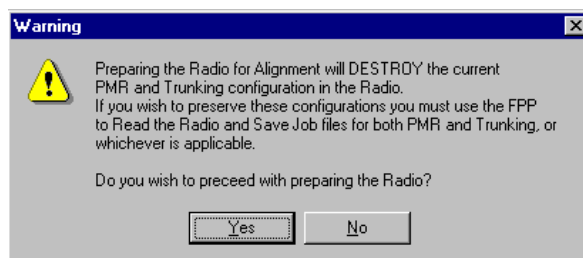
1. At the Opening Menu, select the **Align Menu** and choose **Prepare/Read Radio**.



2. The **WARNING** is displayed.

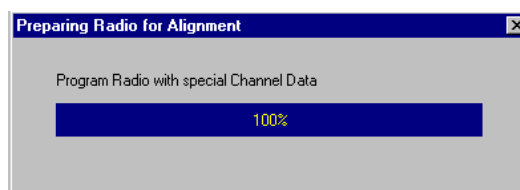
Choose **No** if you want to save the configuration and use the FPP software to read and save the data to a file.

Choose **Yes** if you want to proceed and go to step 3.



3. The radio alignment data is read (indicated by percentage bar) and stored.

The test alignment data is downloaded into the radio.

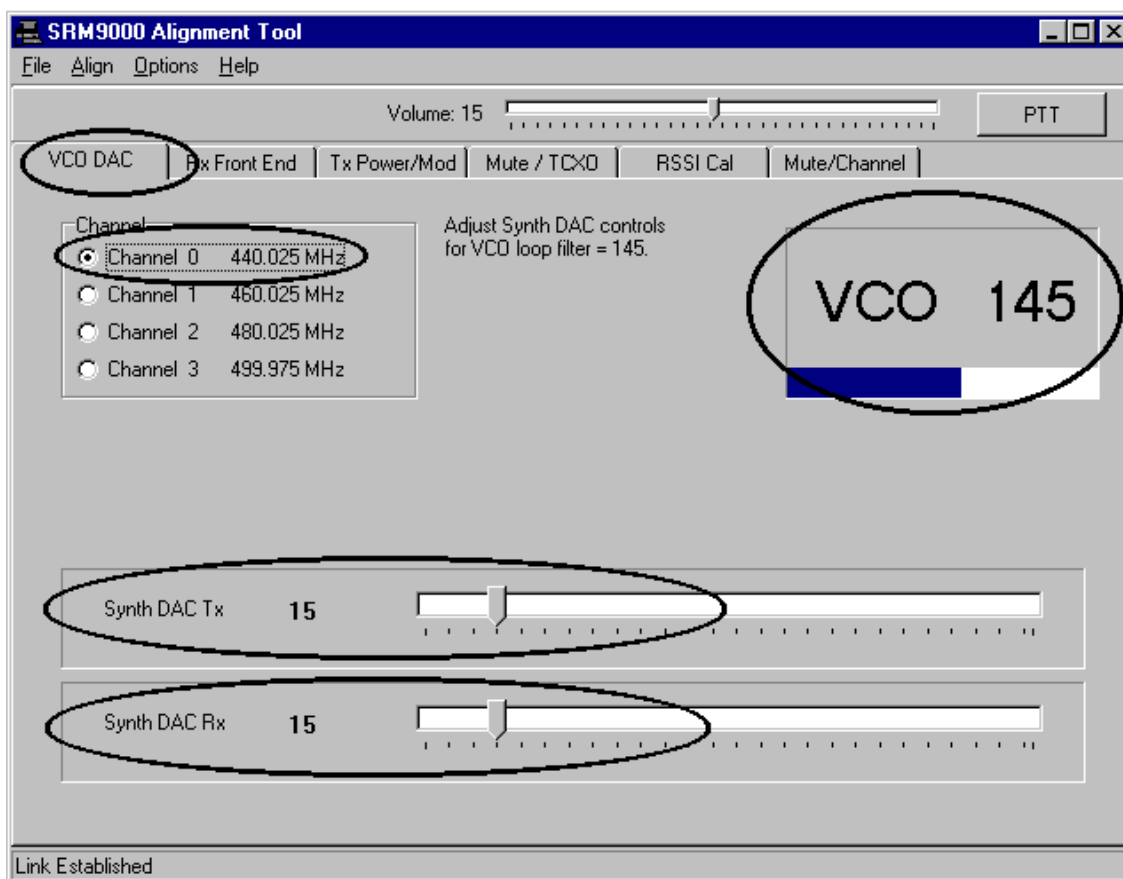


Note: *In test alignment mode the radio is configured only for 12.5 kHz channel spacing, therefore all alignment is carried out at 12.5 kHz levels. When the radio is configured with the FPP for other channel spacings, the deviation related levels are calculated on a per channel basis by the radio software.*

4.2.3 ALIGNMENT PROCEDURE

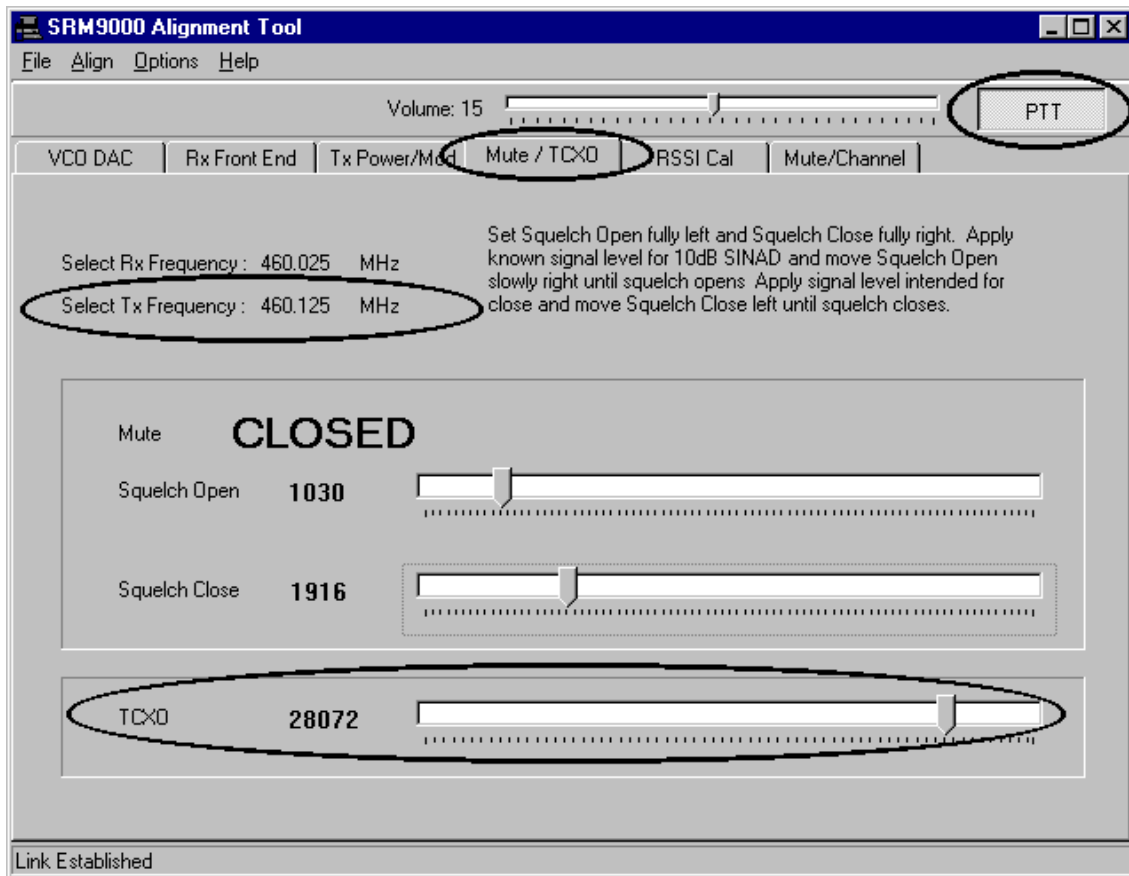
Radio alignment must be done in the sequence detailed in the following paragraphs. This alignment assumes that the radio is functioning normally.

4.2.3.1 VCO DAC Alignment



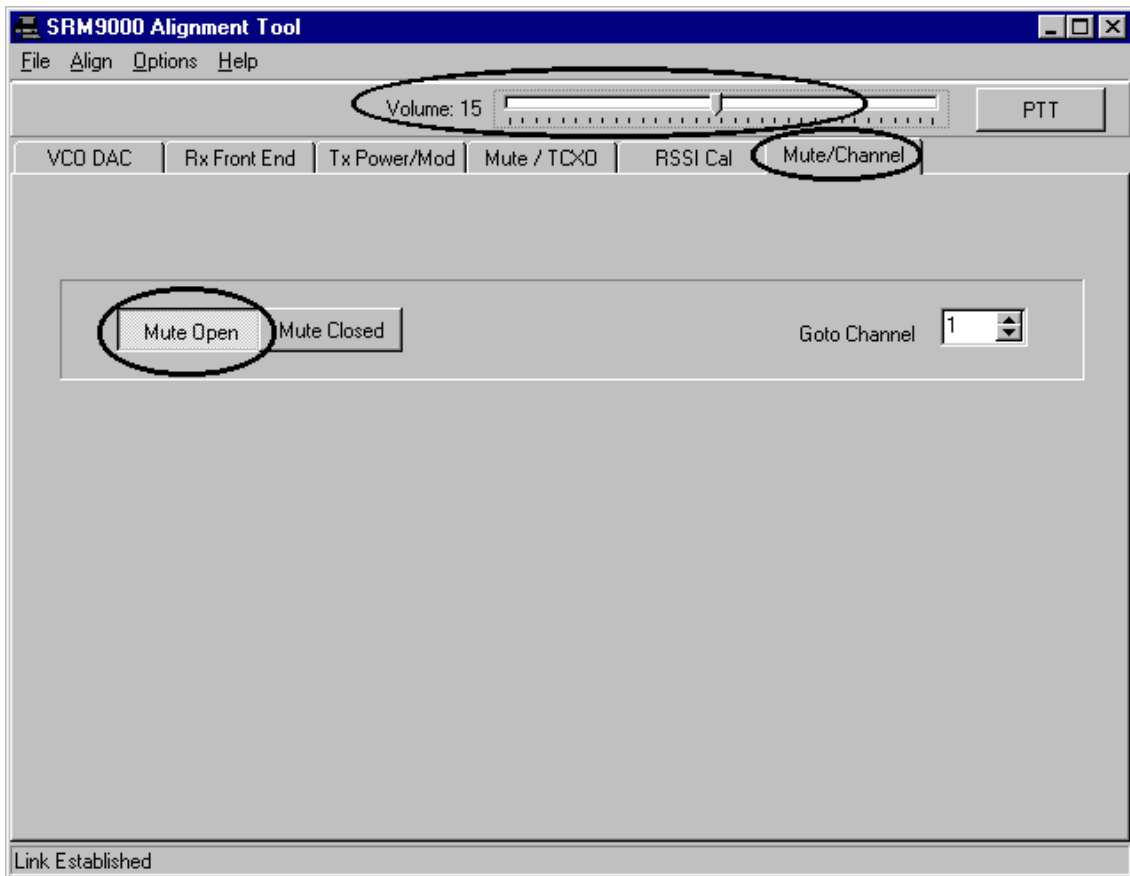
1. Select the *VCO DAC* page and choose Channel 0.
The channel number and frequency will be highlighted.
2. Select the **Synth DAC Rx** slider (slider will be highlighted) and (using the left/right arrow keys or the mouse) adjust for a VCO reading as close to 145 as possible (must be between 140 and 150).
3. Repeat Step 2 for the remaining 3 Channels (1, 2, & 3, in turn)
4. Select Channel 0.
5. Select **PTT** and adjust the **Synth DAC Tx** slider for a VCO reading as close to 145 as possible (must be between 140 and 150).
6. Repeat Step 5 for the remaining 3 Channels (1, 2, & 3).
7. Release the **PTT**.

4.2.3.2 TCXO (Radio Netting Adjustment)



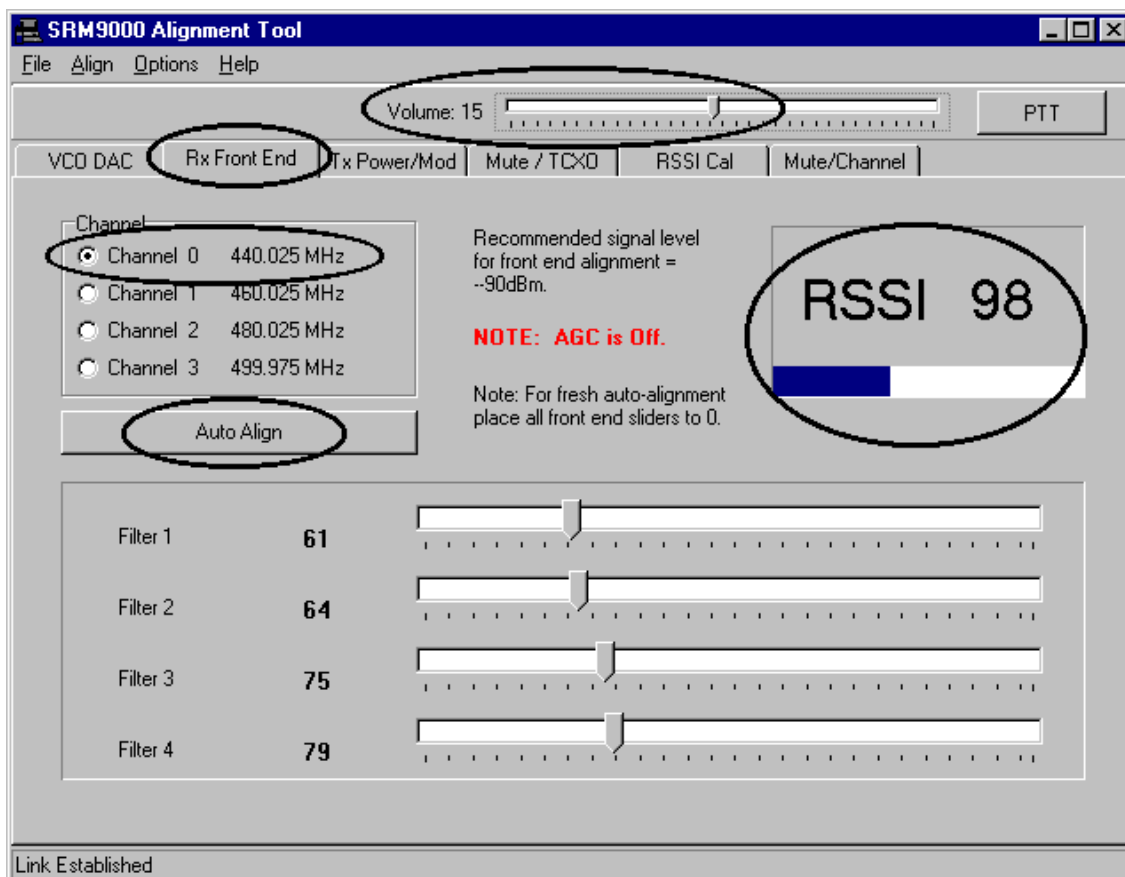
1. Select the **Mute/TCXO** page.
2. Select **PTT**.
3. Adjust the **TCXO** slider to ensure that the transmit frequency error is within normal tolerance for the selected channel (to be measured on the RF Test Set frequency counter).

4.2.3.3 RX FRONT END



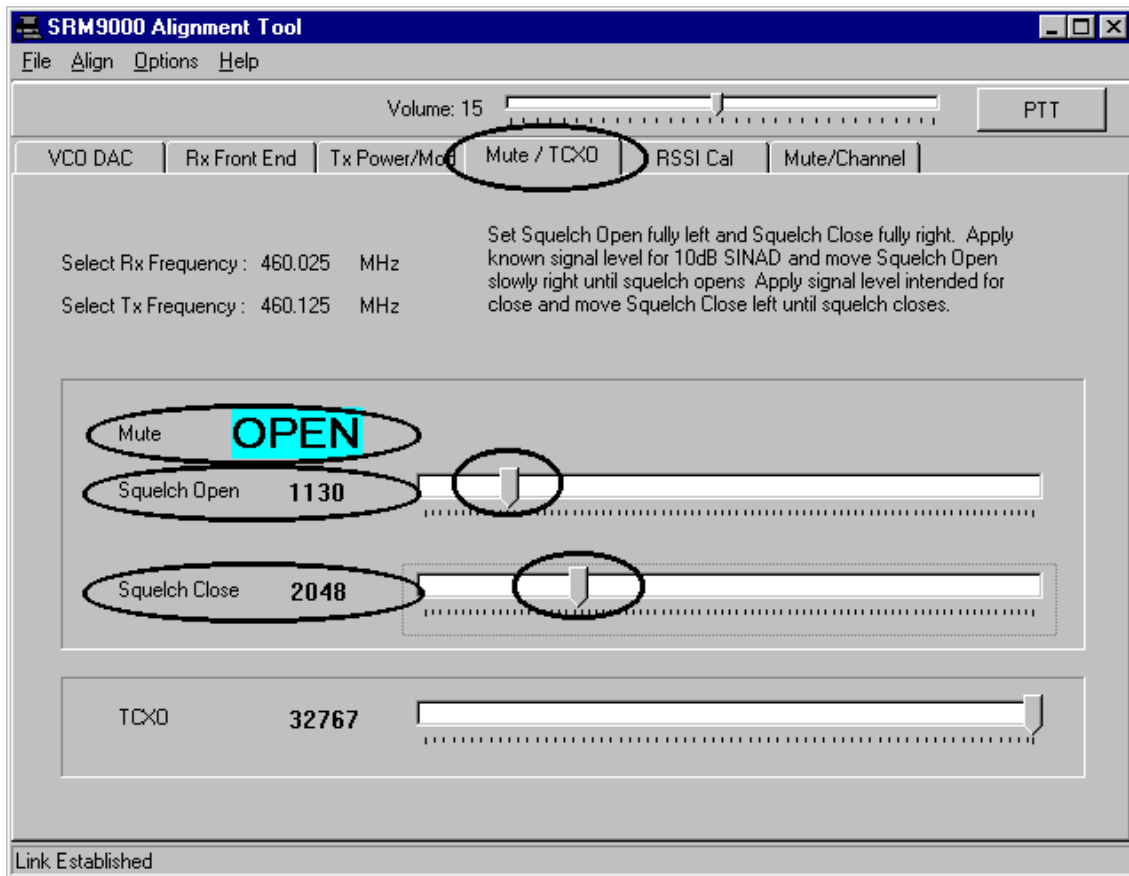
1. Ensure that the TCX0 Alignment has been done before proceeding with this section.
2. Select the **Mute/Channel** page
3. Select **Mute Open**.
4. Set the **Volume** slider to 15.

Speaker audio should now be visible on the CRO, if required readjust the **Volume** slider to a suitable level.



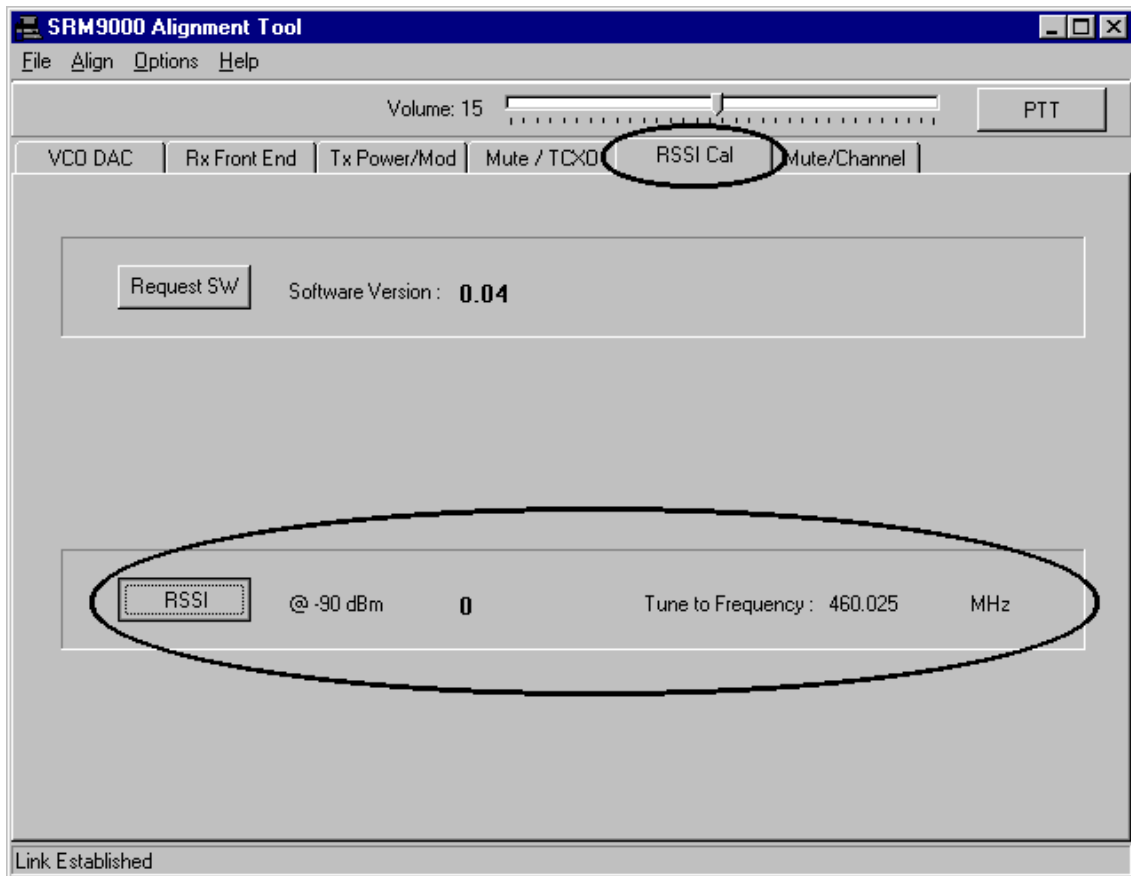
5. Select the **Rx Front End** Page
6. Select **Channel 0**
7. Set the Signal Generator to the Channel 0 carrier frequency, with a 1000Hz modulation signal, a deviation of ± 1.5 kHz and a RF level of -90dBm.
The RSSI bargraph display should now be (typically) well above a reading of 20 - if so, jump to step 9.
8. If the RSSI is not visible or is very low, Manual Tuning may be required. To do this, adjust the four Filter sliders (1-4) in combination for the maximum RSSI reading or for the best sinad reading. Proceed to step 9 when an RSSI of better than 20 is achieved.
Note: For optimum results, the sliders should be adjusted to be approximately in line.
9. Select **Auto Align**.
The front end will be tuned automatically.
1. Verify that the receiver sensitivity is better than -117.5dBm for 12dB sinad. (Sensitivity is typically -120dBm).
0. typically -120dBm).
1. Repeat Steps 7 to 10 for the remaining 3 Channels (1, 2, & 3).
- 1.

4.2.3.4 MUTE ADJUSTMENT



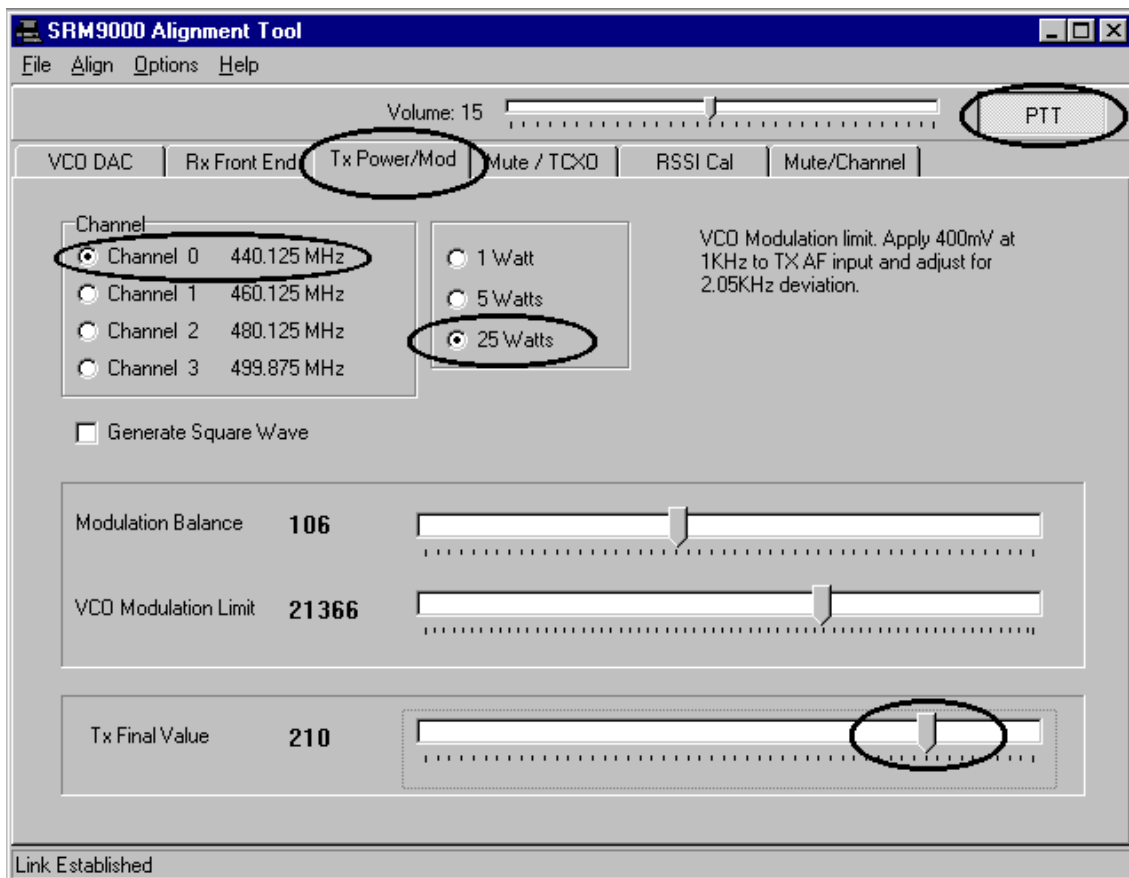
1. Select the **Mute/Channel** page, and ensure that the **Mute Open** option is selected.
2. Set the RF signal generator to the receiver alignment frequency, and adjust the RF level such that the desired mute opening sinad (typically 10dB sinad) is achieved.
3. Select **Mute Closed** and remove the RF input from the radio.
4. Select the **Mute/TCXO** page
5. Set the **Squelch Open** and **Squelch Close** sliders to the fully left position. This ensures the receiver will be muted.
6. Set the **Squelch Close** slider to the fully right position.
7. Reconnect the RF input to the radio.
8. Adjust the **Squelch Open** slider to the right until the mute opens.
9. Reduce the Signal Generator output level by approximately 2dB (or by an amount equal to the desired mute hysteresis level).
10. Adjust the **Squelch Close** slider to the left until the mute closes.
11. The mute should now open and closes at the desired RF levels.

4.2.3.5 RSSI



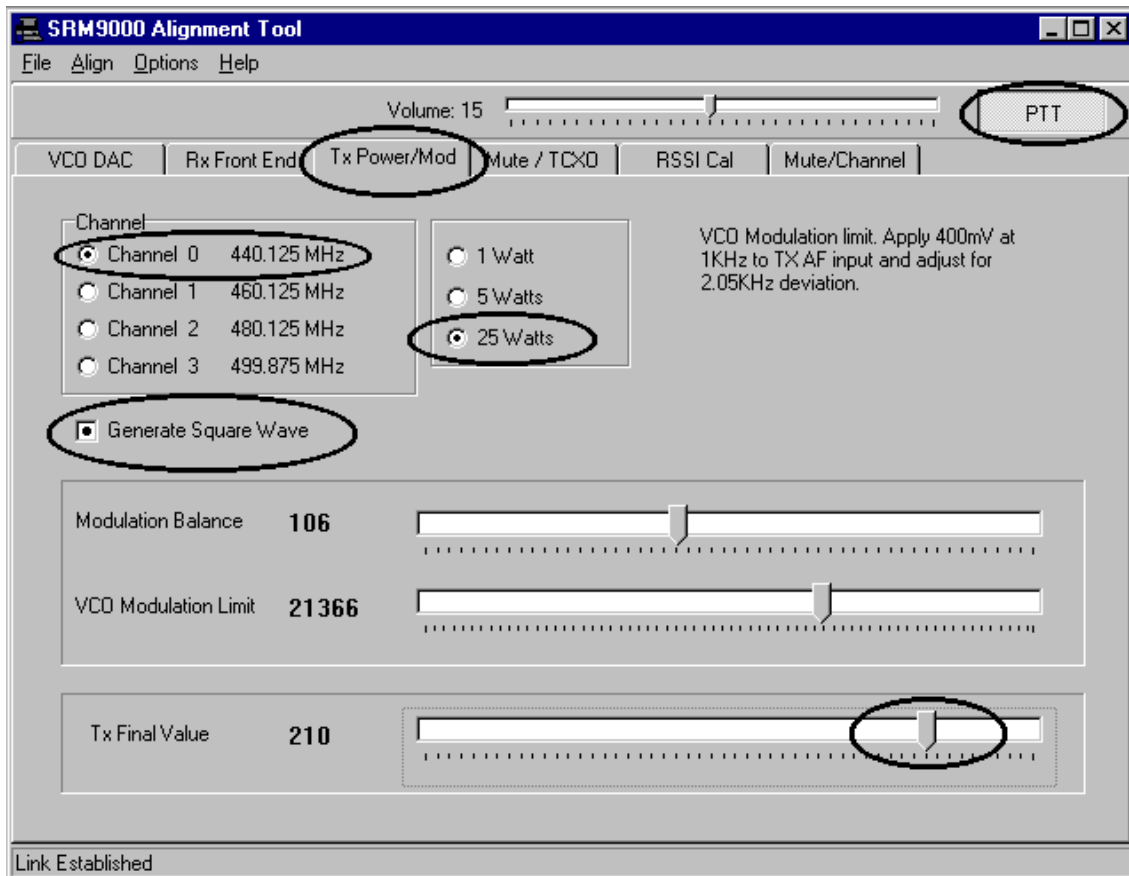
1. Select the **RSSI Cal** page.
2. Set the Signal Generator for a RF output level of -90dBm at the specified frequency.
3. Activate the **RSSI** button.
The receiver RSSI threshold setting is calibrated.

4.2.3.6 TX POWER



1. Select ***Tx Power/Mod*** page.
2. Select ***Channel 0***.
3. Select the ***25W***-power level.
4. Press the ***PTT*** button.
5. Adjust the ***Tx Final Value*** slider for a power output of 25W.
The supply current shall be less than 7.5A (UHF) and 6.5A (VHF).
6. Select the ***5W***-power level.
7. Adjust the ***Tx Final Value*** slider for a power output of 5W.
8. Select the ***1W*** power level.
9. Adjust the ***Tx Final Value*** slider for a power output of 1W.
10. Release the ***PTT*** button.
11. Repeat steps 2 to 10 inclusive for the remaining 3 Channels (1, 2, & 3).

4.2.3.7 MODULATION



1. Select ***Tx Power/Mod*** page.
2. Select ***Channel 0***.
3. Select the ***1W*** power level.
4. Set the microphone input signal from the Audio Generator to 1000Hz at 400 mV RMS.
5. Adjust the ***VCO Modulation Limit*** slider for a deviation of $\pm 2.05\text{kHz}$
6. Reduce the microphone input level to 40mV RMS and check that the deviation is within the range $\pm 1.25\text{ kHz}$ to $\pm 1.75\text{ kHz}$.
7. Repeat steps 2 to 7 inclusive for the remaining 3 Channels (1, 2, & 3).
8. Remove the microphone audio input signal
9. Select the ***Generate Square Wave*** function.
10. Select ***PTT*** and, while viewing the de-modulated signal on the transceiver test set oscilloscope, adjust the ***Modulation Balance*** slider for the best square wave symmetry.
11. Repeat steps 8 to 11 inclusive for the remaining 3 Channels (1, 2, & 3).

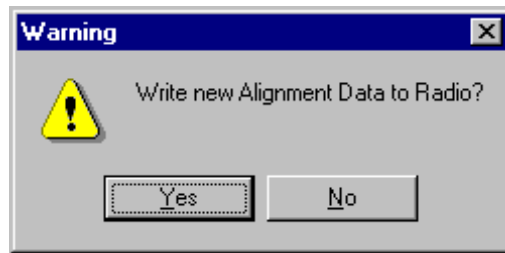
4.2.3.8 PROGRAMMING

When all channels have been aligned the radio is programmed with the new alignment data:

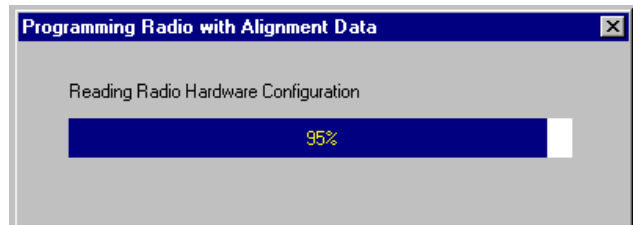
1. Select **Align** and choose **Write Alignment**.



2. A warning message is displayed.



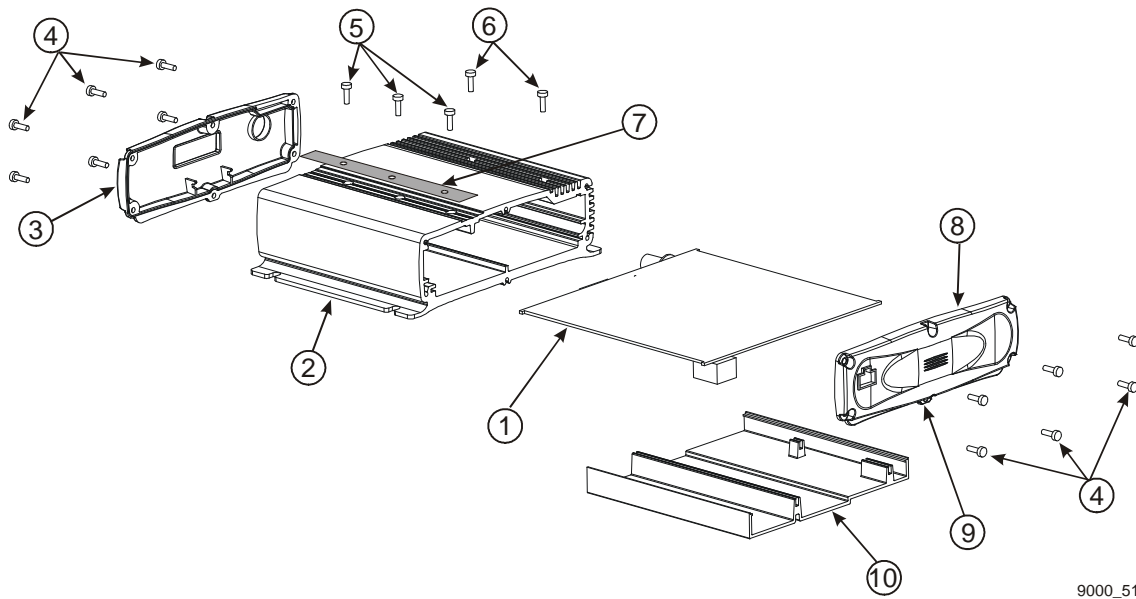
3. Choose **Yes**.
New alignment data is written to the radio.



4.2.3.9 Customers Radio Configuration Data

If the Customers Radio Configuration Data was stored in an FPP file, use the SRM9000 Configuration Programmer to write this data to the radio.

5. Replaceable Parts



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Figure 5-1 Replaceable Parts

Ident	Description	Quantity per Assembly	Part Number
1	PCB E0-Band Transceiver	1	3513-570-13371
1	PCB AC-Band Transceiver	1	3513-570-13361
1	PCB KM-Band Transceiver	1	3513-570-13381
1	PCB TK-Band Transceiver	1	3513-570-13391
1	PCB UW-Band Transceiver	1	3513-570-13401
1	PCB WR-Band Transceiver	1	tba
2	Case	1	3513-901-70071
3	End Cap, Rear	1	3513-903-91081
4	Screw End Cap	12	PT Type DG
5	Screw Tray Retention	3	M3 x 16
6	Screw Tray Retention	2	M3 x 12
7	Label Transceiver Top	1	3513-903-8219A
8	End Cap, Front	1	3513-903-91071
9	Label Front End Cap	1	3513-903-8220A
10	Inner Tray	1	3502-310-63310
11	LT Lead - 5m	1	3502-350-11251
12	BNC Connector, Crimp	1	3513-505-05991
13	Fuse Holder	1	2422-088-00185
14	Fuse 10A Quickblow	1	2422-086-10096
15	TX PA Shield cover		3502-310-63221
16	RJ45 Connector	1	3513-999-99331
17	DB15 Connector	1	3513-999-02063
18	Antenna BNC connector	1	3513-505-05991
19	Audio PA Module U5	1	3513-999-52036
20	Voltage Regulator 8V, U310	1	3513-999-52031
21	Voltage Regulator U311 & U312	1	3513-999-52032
22	Temperature Controlled Crystal Oscillator U700	1	3513-999-99200
23	Transient Suppressor Diode D1	1	3513-999-24014
24	ALC Regulator Q3	1	3513-999-05031

DRAFT D

Ident	Description	Quantity per Assembly	Part Number
25	Transmit Receive Switch Q4	1	3513-999-00006
26	Supply Regulator Switch Q14	1	3513-999-05032
27	Option Switch Q105	1	3513-999-00006
28	Output 0 Driver Q320	1	9336-630-70115
29	ON/OFF FET Q350	1	9336-630-05032

Figure 5-2 Band-Specific Parts

Ident	Description	Quantity per Assembly	Part Number
1	Tx PA Module U2 (E0 Band)	1	tba
1	Tx PA Module U2 (AC Band)	1	tba
1	Tx PA Module U2 (KM Band)	1	tba
1	Tx PA Module U2 (TK Band)	1	tba
1	Tx PA Module U2 (UW Band)	1	3513-999-52033
1	Tx PA Module U2 (WR Band)	1	tba