

## ALIGNMENT (LEVEL 3 SERVICE ONLY)

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

### Caution

**Preparing the radio for alignment 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 factory alignment data for the radio (DAC settings for Tx power, front-end tuning, etc).**

**Using the Alignment Tool will allow changes to the original factory alignment and will invalidate all warranties and guarantees unless performed by an authorised level 3 service centre.**

If the radio contains customer configuration data that must be retained, you **must first** use the SRM/SRP Personality Programmer (FPP) software to read all radio configuration files and save them on to alternative media **before** commencing the alignment procedure.

When the Alignment is completed, use the FPP software to retrieve this stored data 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 100mW.

Note. Final Tx power adjustments must be performed with the radio board installed in the chassis.

## TEST EQUIPMENT

- |   |   |
|---|---|
| 1. Radio transceiver test set                   | CMT, 52/82 or similar.<br><br>Note. For alternative equipment, the Mod Balance test requires internal DC coupling between the demodulated signal and demodulation output connector. |
| 2. Variable DC power supply                     | 10.8V to 16.3V current limited to 7 amps  |
| 3. Oscilloscope                                 | 20 MHz bandwidth minimum  |
| 4. SRM9000 Programming & Alignment Breakout Box | As detailed in Figure 0   |
| 5. SRM9000 Speaker O/P Breakout Box             | As detailed in Figure 1   |
| 6. Personal Computer                            | 486 DX 66 or better.<br><br>Operating system Windows 95 or later.<br>Minimum RAM - 16MB.<br>5MB free hard disk space.<br>Floppy drive - 1.44MB.<br>Mouse and serial port required   |
| 7. SRM/SRP Alignment Tool                       | Computer Software file  |
| 8. SRM/SRP Field Personality Programmer (FPP)   | Computer Software file  |

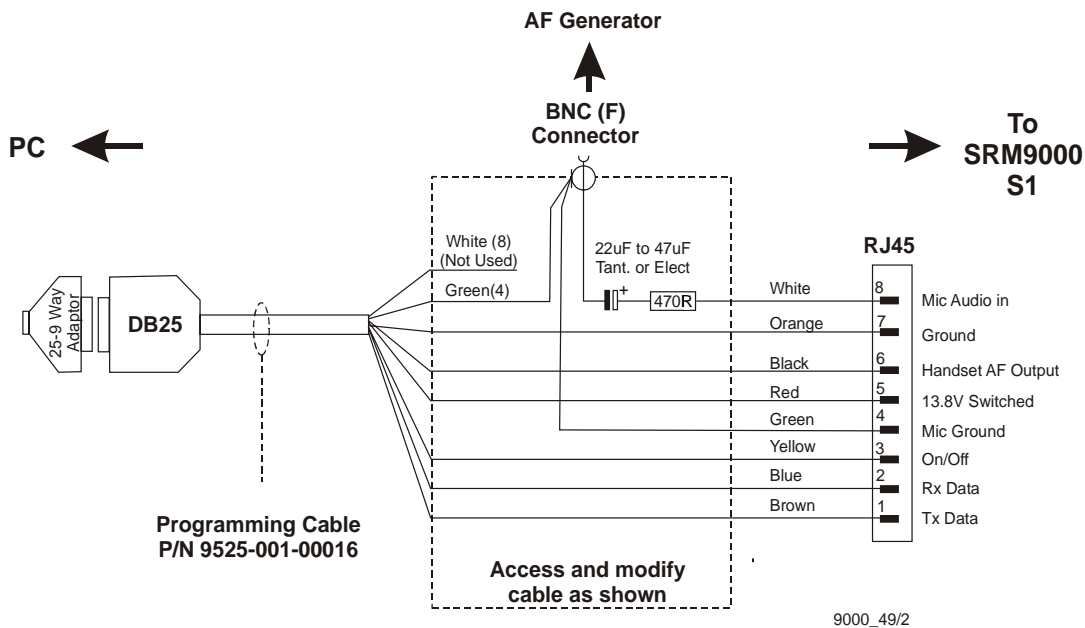


Figure 0 SRM9000 Programming & Alignment Breakout Box

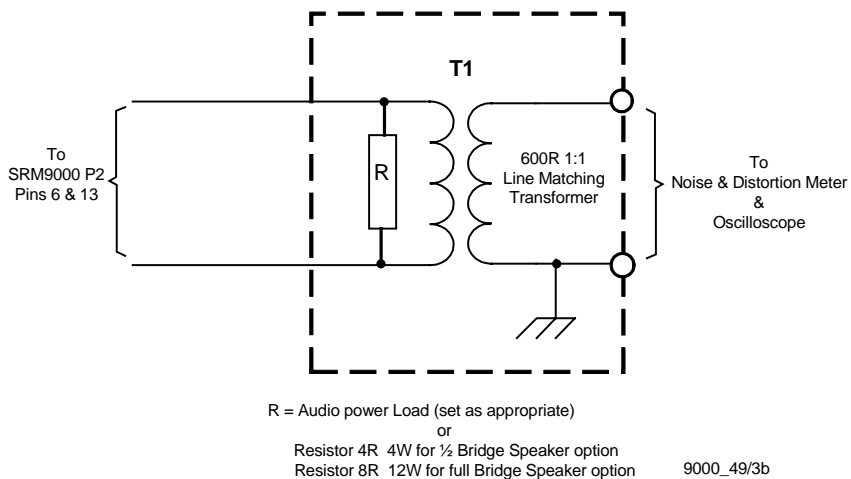
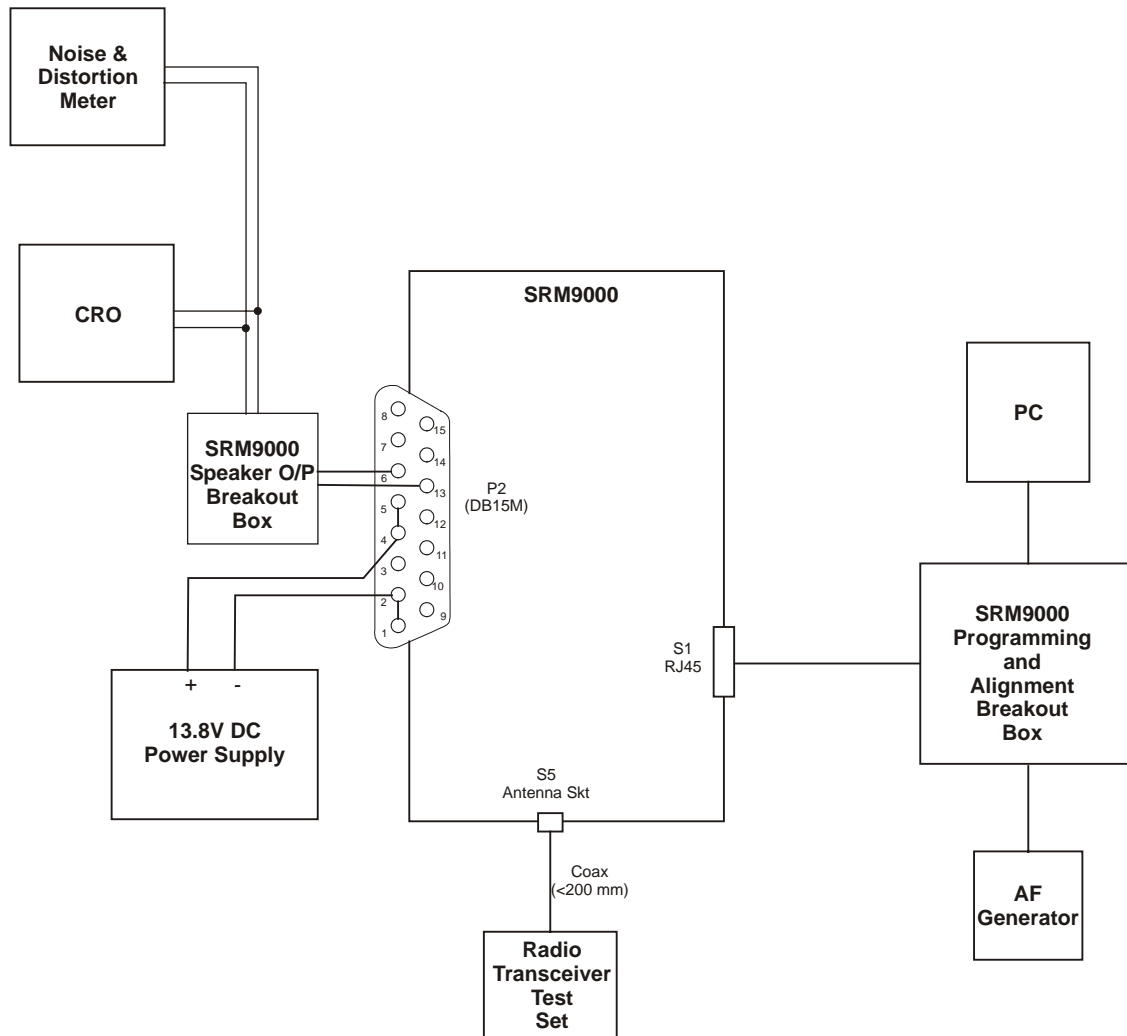


Figure 1 SRM9000 Speaker Output Breakout Box

## TEST SET-UP



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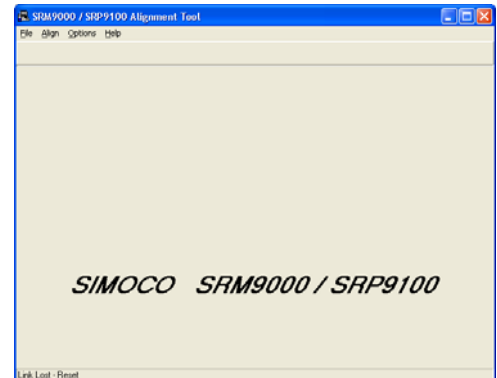
Figure 2 Test Set-up

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

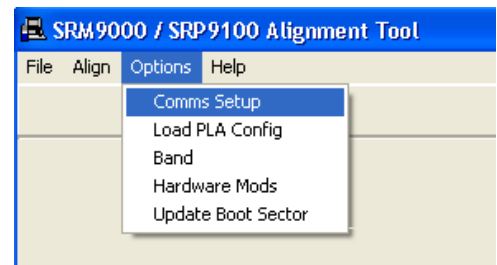
## COMMS Set up

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

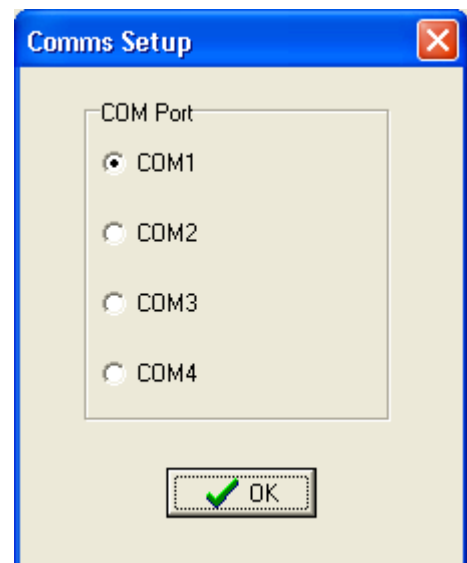
The Alignment Tool Opening Menu is displayed.



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



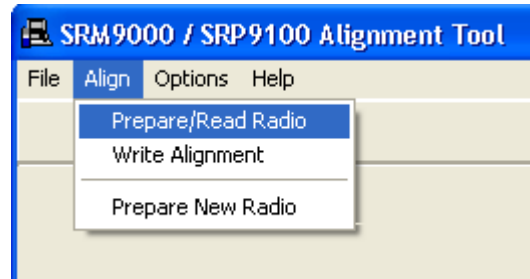
3. The **Comms Setup** dialogue box is displayed.  
Select the Comms Port setting appropriate to the configuration of your PC and choose **✓OK**.  
(Usually COM1)



## Radio Preparation

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

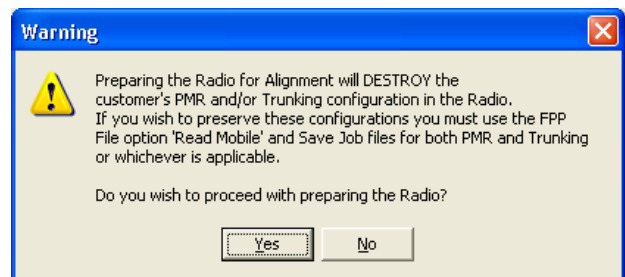
1. At the Opening Menu, select the **Align Menu** and choose **Prepare/Read Radio**.



2. The **WARNING** is displayed.

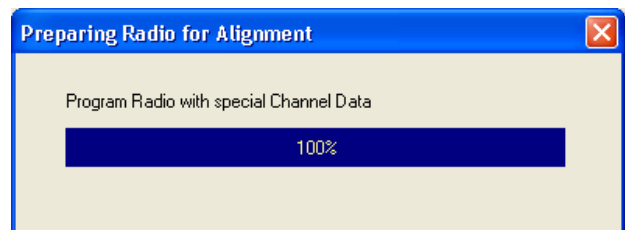
Choose **No** if you want to save the configuration and use the FPP software to read and save the data to a file.

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.

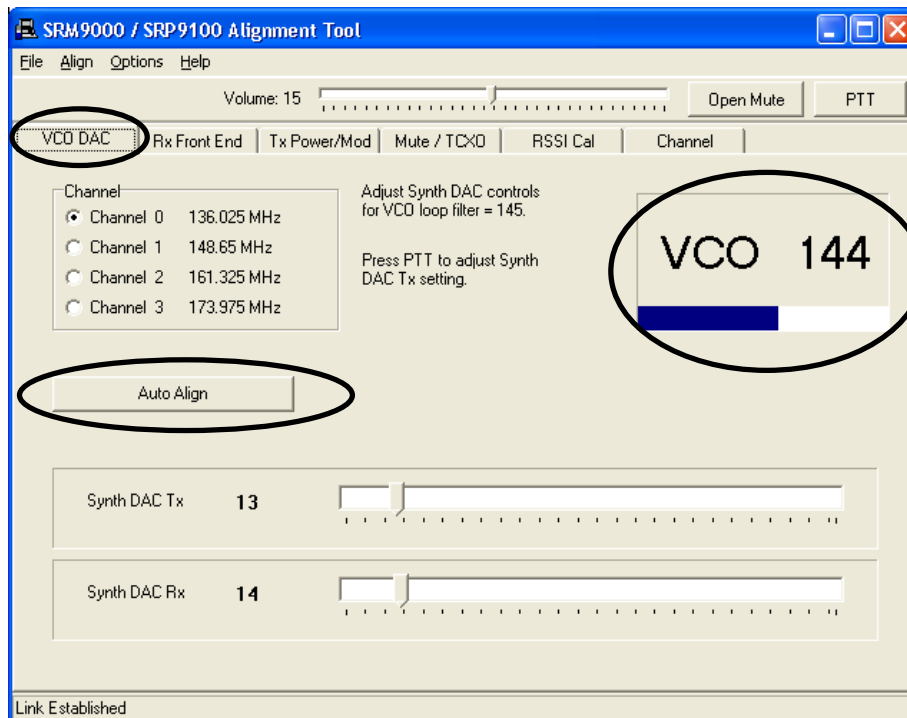


*Note: In test alignment mode the radio is configured only for 12.5 kHz channel spacing, therefore all alignment is carried out at 12.5 kHz settings unless otherwise specified. When the radio is configured with the FPP for other channel spacings, the deviation related levels are calculated on a per channel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

## Alignment Procedure

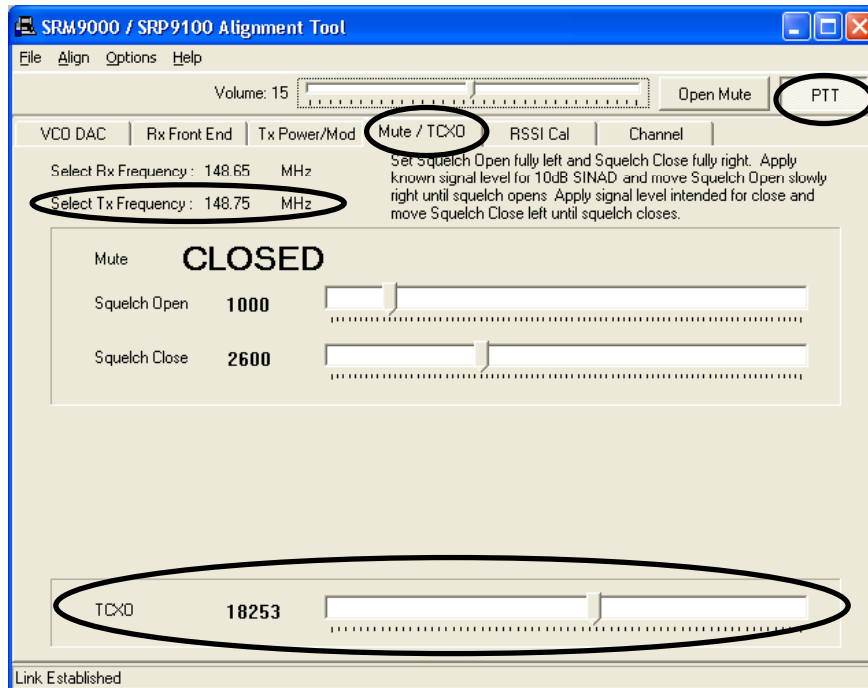
Radio alignment must be done in the sequence detailed in the following paragraphs. This alignment assumes that the radio is functioning normally.

### VCO DAC Alignment

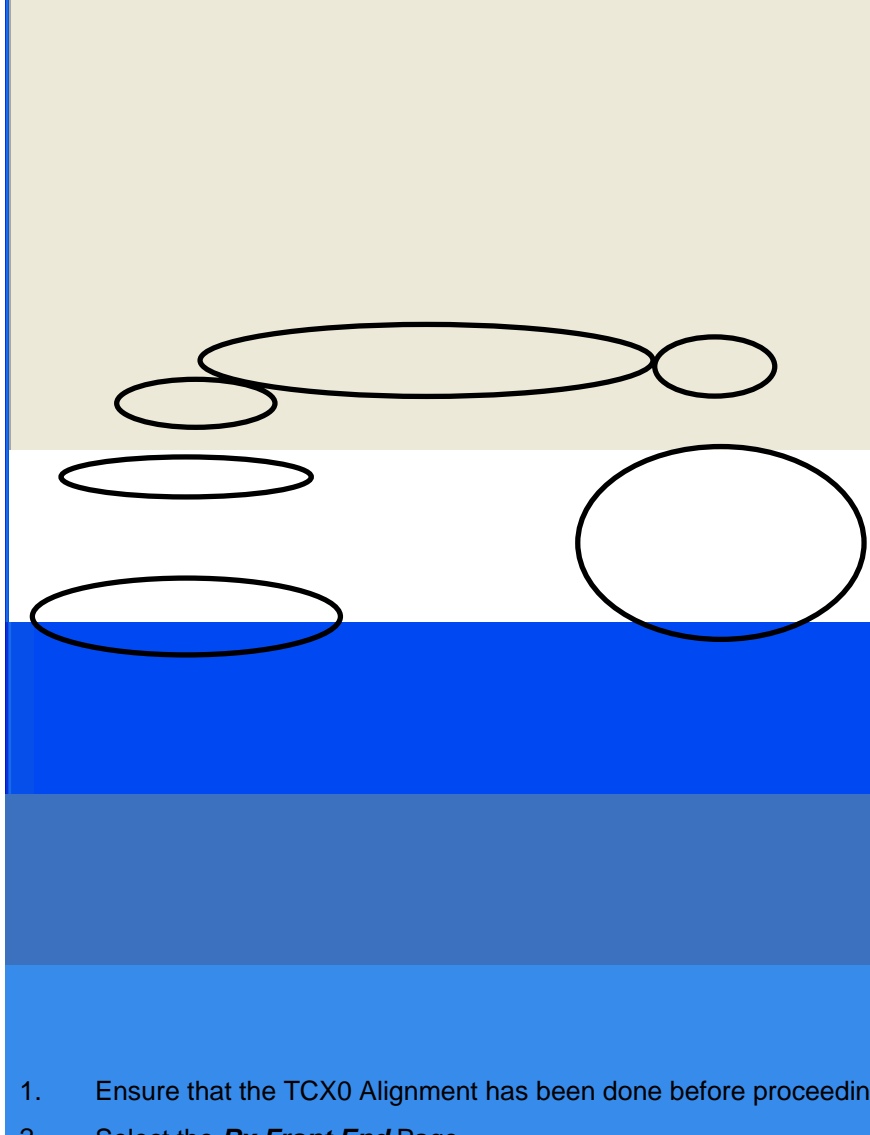


1. Select the **VCO DAC** page.
2. Select **Auto Align**. The Synth DAC Rx slider will automatically adjust its value for each receiver alignment frequency to set the VCO loop filter value between 140 and 150.
3. Select **PTT** and then select **Auto Align**. The Synth DAC Tx slider will automatically adjust its value for each transmitter alignment frequency to set the VCO loop filter value between 140 and 150.

## TCXO (Radio Netting Adjustment)



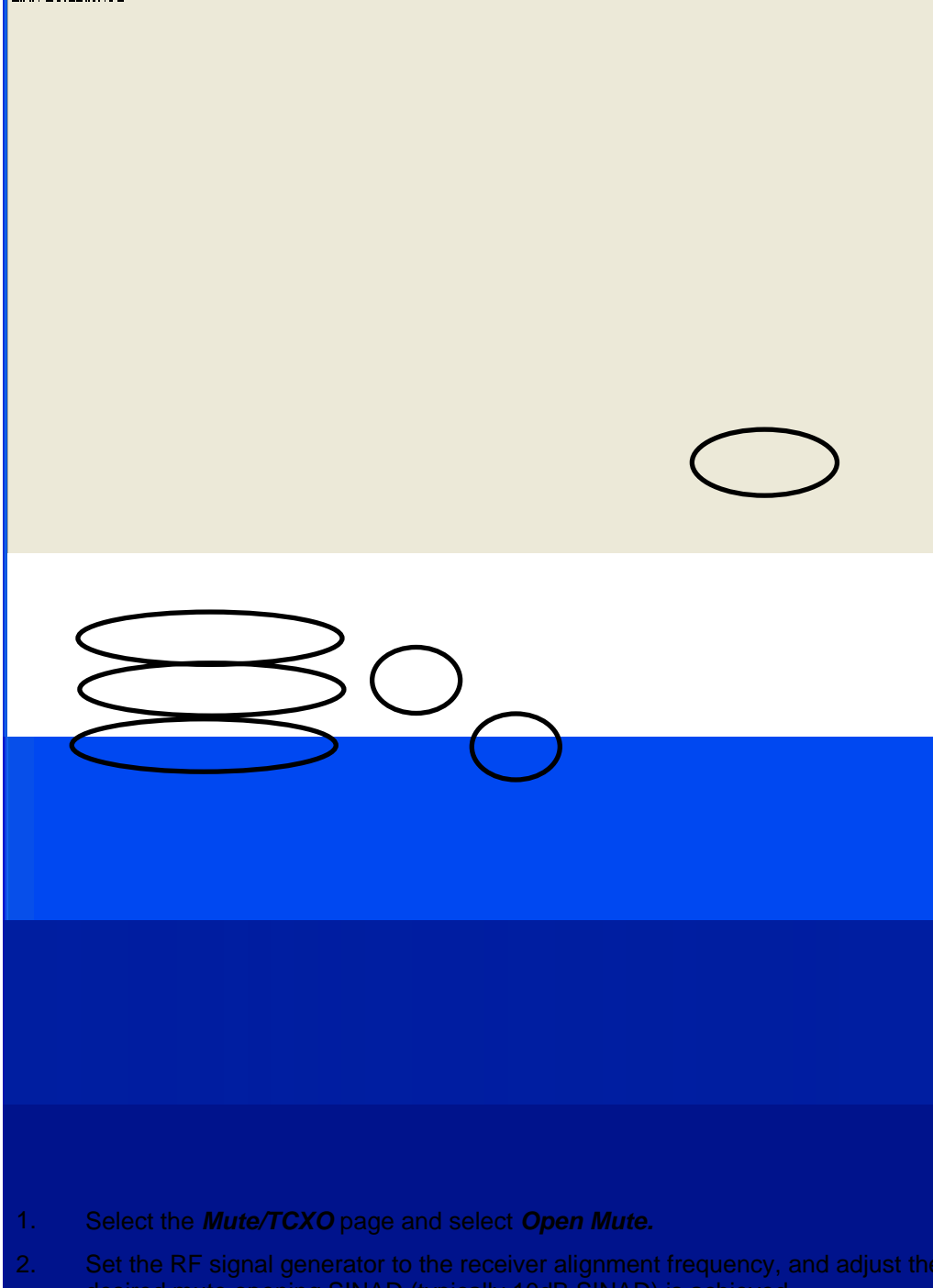
1. Select the **Mute/TCXO** page.
2. Select **PTT**.
3. Adjust the **TCXO** slider to ensure that the transmit frequency error is within 50Hz for the selected channel (to be measured on the RF Test Set frequency counter).



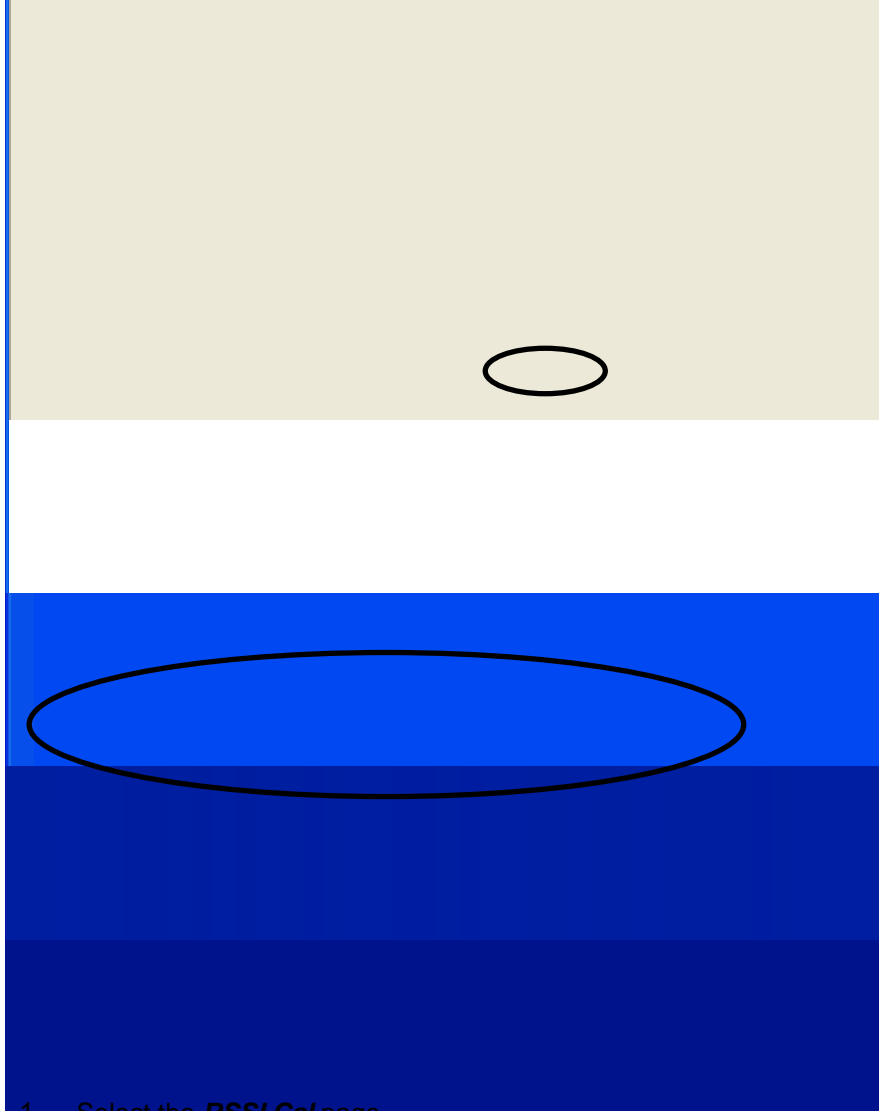
1. Ensure that the TCX0 Alignment has been done before proceeding with this section.
2. Select the **Rx Front End** Page.
3. Select **Open Mute**.
4. Set the **Volume** slider to 15.  
Speaker audio should now be visible on the Scope. If required readjust the **Volume** slider to a suitable level.
5. Set the Signal Generator to the Channel 0 carrier frequency, with a 1000Hz modulation signal, a deviation of  $\pm 2$  kHz and an RF level of -90dBm.
6. Select **Channel 0**.
7. Select **Auto Align**.  
The front end will be tuned automatically and finish with an RSSI reading of typically around 150.
8. Repeat Steps 7 to 8 for the remaining 3 Channels (1, 2, & 3).
9. Change deviation to 1.5kHz.
10. Verify that the receiver sensitivity is better than -117.5dBm for 12dB sinad on all channels.  
(Sensitivity is typically -120dBm).



except for specific

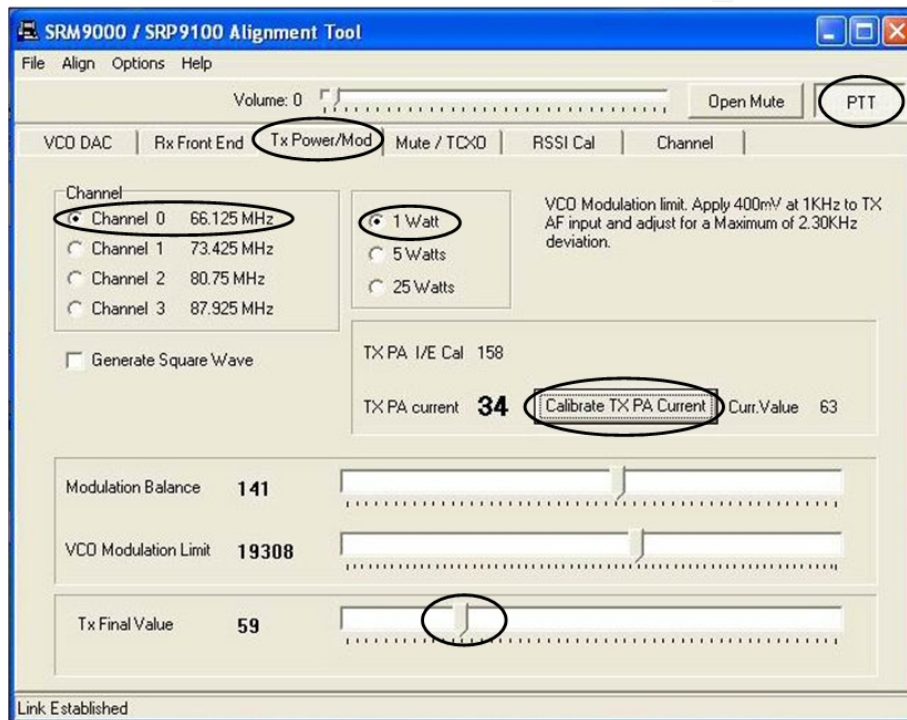


1. Select the **Mute/TCXO** page and select **Open Mute**.
2. Set the RF signal generator to the receiver alignment frequency, and adjust the RF level such that the desired mute opening SINAD (typically 10dB SINAD) is achieved.
3. Select **Close Mute** and remove the RF input from the radio.
4. Set the **Squelch Open** and **Squelch Close** sliders to the fully left position. This ensures the receiver will be muted.
5. Set the **Squelch Close** slider to the fully right position.
6. Reconnect the RF input to the radio.
7. Adjust the **Squelch Open** slider to the right until the mute opens.
8. Reduce the Signal Generator output level by approximately 2dB (or by an amount equal to the desired mute hysteresis level).
9. Adjust the **Squelch Close** slider to the left until the mute closes.
10. The mute should now open and close at the desired RF levels.
15. Note. On revision 9 radios and higher, an additional **Tx Audio Balance** DAC is also provided. For these radios, the **Tx Audio Balance** DAC is defaulted to zero for normal setting. However, for a more accurate setting, the DC voltage at TP745 needs to be noted during Rx and adjusted by the **Tx Audio Balance** DAC to give the same reading (to within 10mV).



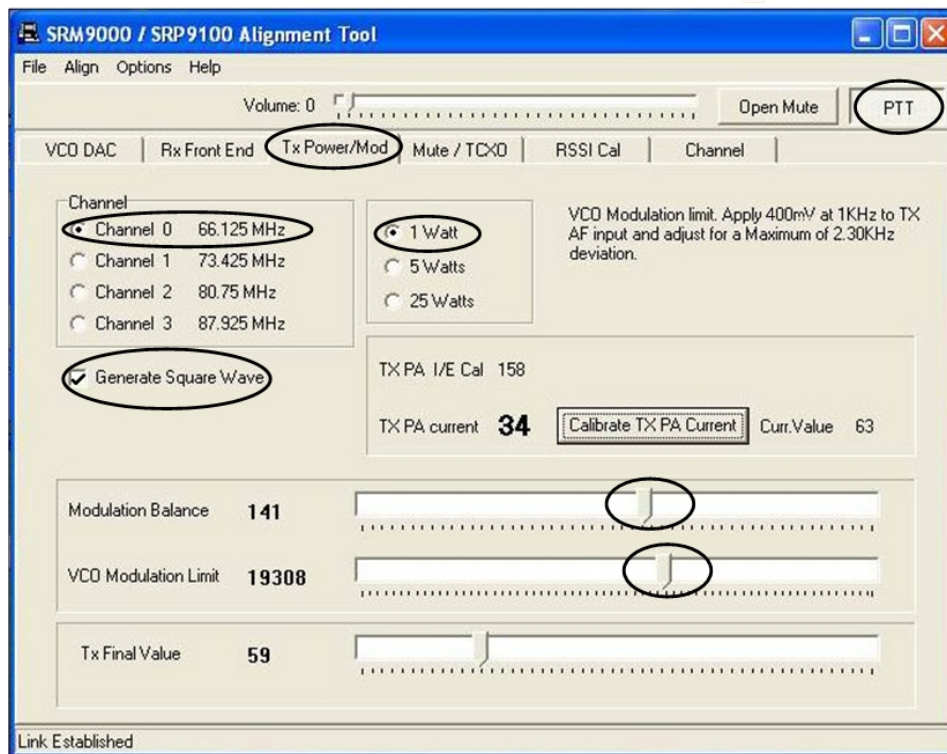
1. Select the **RSSI Cal** page.
2. Set the Signal Generator for a RF output level of -90dBm and 2kHz deviation at the specified frequency.
3. Activate the **Store RSSI** button.  
The receiver RSSI threshold setting is calibrated.

## Tx Power



1. Select **Tx Power/Mod** page.
2. Select **Channel 0**.
3. Select the **1W** power level.
4. Press the **PTT** button.
5. Adjust the **Tx Final Value** slider for a power output of 1W.
6. Repeat step 5 for the remaining 3 Channels (1, 2, & 3).
7. Select the **5W** power level.
8. Adjust the **Tx Final Value** slider for a power output of 5W.
9. Repeat step 8 for the remaining 3 Channels (2, 1 & 0).
10. Select the **25W** power level.
11. Adjust the **Tx Final Value** slider for a power output of 25W.  
Note that the supply current is less than 6.5A.
12. Repeat step 11 for the remaining 3 Channels (1, 2, & 3).
13. Rev 9C+ only, press "Calibrate TX PA Current" button to automatically set the maximum current limit.  
Note: This feature is not available on earlier radios and therefore will not be displayed.
14. Release the **PTT** button.

## Modulation

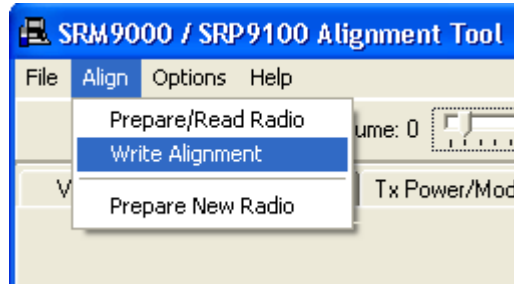


1. Select **Tx Power/Mod** page.
2. Select **Channel 0**.
3. Select the **1W** power level.
4. Set the microphone input signal from the Audio Generator to 1000Hz at 400 mV RMS.
5. Adjust the **VCO Modulation Limit** slider for a maximum peak deviation of  $\pm 2.3$  kHz
6. Reduce the microphone input level to 40mV RMS and check that the deviation is within the range  $\pm 1.25$  kHz to  $\pm 1.75$  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.  
Note. DC coupling is required on the scope for optimum setting accuracy.
11. Repeat steps 8 to 11 inclusive for the remaining 3 Channels (1, 2, & 3).

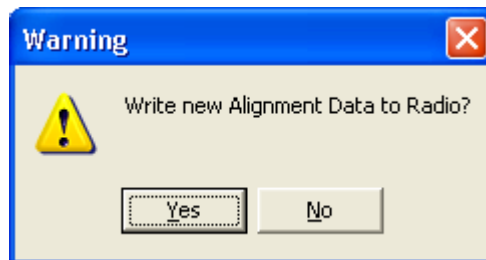
## Programming

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

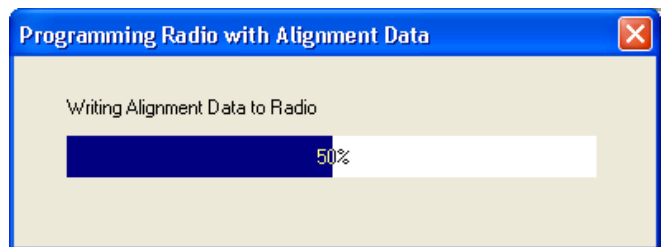
1. Select **Align** and choose **Write Alignment**.



2. A warning message is displayed.



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



## Customers Radio Personality Data

If the Customers Radio Personality Data was saved as a separate file, use the FPP Programmer to write this data to the radio.