MOTOTRBO™
Mobile and Portable
Automated
Test and Alignment
Operational Requirements
MOTOTRBO Automatic Test and Alignment

• VIAVI 8800SX
  • Option 01 – DMR Conventional Operation
  • Option 104 – Motorola MOTOTRBO Series Auto-Test / Alignment
  • AC24011 – 10 AMP Current Shunt 0.01 Ohm (for Mobile PA BIAS Alignment)

• Variable Power Supply (30 Amp rating for High Power mobiles)
  • Battery Eliminator (for portables) – (For Motorola part numbers see page 4)
  • Battery Eliminator Interface box (for portables) – (Motorola RLN 4510)

• Test Cable (Low Loss Phase Stable recommended for best accuracy) BNC (M) – BNC (M)

• Reference Cable (Short 6”) BNC (M) – BNC (M)
  • 6 dB Pad BNC (M) – BNC (F) (Optional but recommended for best accuracy)

• Connector Adapters
  • BNC (F) – BNC (F)
  • BNC (F) – SMA (F)
  • BNC (F) – UHF Mini (M)
  • TNC (M) – BNC (F)
  • N (M) – BNC (F)

• For best accuracy, use the 8800SX External 10 MHz connected to a high stability Rubidium standard.
MOTOTRBO Portable Interconnect

- Connect a 12 VDC power supply to the RLN-4510.
- Connect Radio ANT to 8800SX TR Port.
- Connect Radio Programming cable to 8800SX USB port.
- Connect RLN 4460 to Programming cable and the Audio In port on the 8800SX.
- All Motorola part numbers are listed on the following page.
Motorola Part Numbers for MOTOTRBO

<table>
<thead>
<tr>
<th>Subscriber</th>
<th>Type</th>
<th>Programming Cable - USB</th>
<th>Battery Eliminator</th>
<th>Audio Break out box</th>
<th>Antenna Test Adapter (portables only)</th>
<th>Antenna Adapter Holder (portables only)</th>
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MOTOTRBO Mobile Interconnect

- Connect Mobile TX Out to 8800SX TR port.
- Connect Mobile Programming cable to 8800SX USB port.
- Connect Power supply to Mobile with Positive lead through the AC 24011 Current shunt if PA BIAS alignment is to be performed.
- RLN 4460 connection not shown in this diagram
Auto-Test Menu

Access to the Application and System through Auto-Test

- The Auto-Test Menu can be accessed by:
  - Select the Utilities dropdown menu then select Auto-Test.
  - Select Motorola MOTOTRBO Series from the Radio OEM menu.
MOTOTRBO Primary Test Screen

Function Keys

- **Read Radio**
  - This key will query the radio to determine the model of the radio under test then display this information in the “Model-Band” field.

- **Run**
  - This key will execute the selected test or alignment.

- **Last Results**
  - By selecting this key, after the test, will display the current radio’s test results

- **Browse Results**
  - Allows access to all previous results for all past radio tests.

- **Manage Config**
  - Access to Radio Connect diagrams and special features.

- **Cable Loss**
  - Allows access to the Cable Loss table so the user can enter cable loss factors for separate frequency bands. See Page 10 for more detail.

- **Select All**
  - Selects all tests available for the radio under test

- **Deselect All**
  - Deselects all available tests
MOTOTRBO Primary Test Screen

Test Selections

- The Summary tab will display the Test Summary window showing current test conditions (P)ass (F)ail (S)kip (A)bort (R)unning

- The Test tab will display the Test Configuration window allowing separate tests to be selected and configuration information which will be displayed in the final results.
The Options tab will display the Options window allowing the user to configure various items. Along with selecting the frequency bands to be tested or aligned.

- **EOT Beep**
  The 8800SX will produce an audible beep at the completion of the test to draw attention to the operator that the test or alignment is done.

- **Message Beep**
  When testing dual band mobiles, you will be prompted to move the test cable when moving from one band connector to the other. This option will produce an audible beep for the operator to change the cable connection. Note: The highest frequency band that is selected is always tested first.

- **Extended Logging**
  Diagnostic mode that shows all adjustments to soft pot values.

- **Reset Skip**
  Some mobiles require this setting to be enabled. It does not cause any issue to have it selected for other radios.
Cable Loss Basics

- Every coaxial cable has a loss associated with it. If extremely short, the loss may be negligible. However, any loss that is not compensated will have an effect on radio measurements. For example, a 4’ length of RG-58, used to test a 50 Watt mobile radio at 800 MHz will impart an error of approximately 0.7 dB. While this seems insignificant, when converted to a percentage, its importance becomes clear. That 50 Watt mobile is actually transmitting almost 60 Watts!

- To eliminate this error, compensation must take place.
- The following pages show how to measure the cable loss for a coaxial cable used to test a radio, but the same procedure can be used for measuring insertion loss of attenuators and other devices, as well.
Cable Loss Basics

• In general, it is not necessary to test every frequency that will be checked on the radio. Checking the middle of each applicable band is normally sufficient. Examples are below.
  
  − VHF Band
    Test frequency range: 130-180 MHz
    Cable loss measurement frequency: 155 MHz
  
  − UHF Band
    Test frequency range: 320-560 MHz
    Cable loss measurement frequency: 440 MHz
  
  − 700/800 Band
    Test frequency range: 750-870 MHz
    Cable loss measurement frequency: 810 MHz
Performing Cable Loss Measurement

- To perform the cable loss measurement, you will need the following:
  - the cable being measured (Cable Under Test)
  - a second, “reference”, cable
  - a “barrel” connector for connecting the two cables together
  - adapters to connect the ends of the cables to the GEN and ANT ports on the 8800SX.

  NOTE: The “reference” cable does not need to be a low loss cable, or anything exotic. It should be a good quality cable with undamaged connectors with little wear.

(2) RF Cables
1. Reference Cable
2. Cable Under Test

(1) BNC F to F Adaptor

Example
Set-Up

- From the top menu bar, open the Generator, Receiver, and RSSI tiles.
  - Connect the reference cable to the GEN and ANT ports on the front of the 8800SX.
Set the Generator and Receiver Tiles as follows:

- **Generator**
  - Frequency as described above
  - Port = GEN
  - Enable = ON
  - Level = -5 dBm

- **Receiver**
  - Frequency = Same as Generator
  - Port = Ant
  - Remaining fields can be left as shown.
  - Offset = 0.0 dB
Establish a Reference

- Connect the “Reference” cable from the Gen Port to the Ant Port
  - Toggle the Gen Enable OFF then back ON
  - Make note of the RSSI reading and set the Receiver Offset to that number.
  - Verify the RSSI meter now reads 0 dBm.
  - If necessary, adjust the “Offset” value until the RSSI meter reads 0 dBm.
Connect Cable Under Test

• Disconnect the reference cable from the ANT port.
  • Using the “barrel” connector, connect the loose end of the Reference Cable to one end of the Cable Under Test.
  • Connect the loose end of the Cable Under Test to the ANT port.
• Record the new RSSI meter reading as the cable or insertion loss for the frequency being checked.
  • Repeat these steps for all applicable frequencies.
• Connect a 12 VDC power supply to the RLN-4510.
• Connect Radio ANT to 8800SX TR Port.
• Connect Radio Programming cable to 8800SX USB port.
• Connect RLN 4460 to Programming cable and the Audio In port on the 8800SX
• All Motorola part numbers are listed on page 4.
MOTOTRBO Radio Interconnect Diagrams

Radio Connections to the 8800SX

- **Interconnect for Mobile Radio**
  1. The Mobile radio requires a USB connection from the radio to one of the VIAVI 8800SX USB ports. The radio may be connected through the connector on the radios rear section or to the radios control head.
  2. The AC24011 current shunt must be used and connected as the diagram indicates only for Power alignment. The current shunt is not required for power testing.
  3. The power supply should be capable of supplying the required amount of current and the current limiting should not be set too low. Proper gauge wires should also be used.
  4. For connection to the current shunt, the positive wire must be cut and connected to the current shunt as indicated in the drawing. The current shunt is connected to the 8800SX V/ohm and COM connectors on the DMM.
**MOTOTRBO Mobile Interconnect**

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  5. RLN 4460 connection not shown
Step by Step Procedure

1. Select the Auto-Test system and execute the MOTOTRBO Auto-Test.
2. Connect the Portable or Mobile radio to be tested.
3. Select Test or Align & Test from the menu.
4. Options Screen
   - Select as shown.
5. From the Test Screen, select all or individual tests to be performed
6. Select Run