VIAVI Solutions

Motorola MOTOTRBO™ Auto-Test and Alignment

8800SX Digital Radio Test Set

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This guide describes how to setup and use the Motorola MOTOTRBO Auto-Test application on the 8800SX.

Supported Models by Region

North America	Asia	Europe	Latin America
CM200d / CM300d	XiR M3188 / 3688	DM1400 / 1600	DEM 300 / 400
CP200d	XiR P3688	DP1400	DEP 450
SL300	SL1M	SL1600	SL470 / 500
SL7550 / 7580 / 7590	SL1K	SL4000 / 4010	SL8050 / 8550
XPR 2500	XiR M6660	DM2600	DEM 500
XPR 3300 / 3500	XiR P6600 / 6620	DP2400 / 2600	DEP 550 / 570
XPR 4350 / 4380 / 4550 / 4580	XiR M8220 / 8228 / 8260 / 8268	DM3400 / 3401 / 3600 / 3601	DGM 4100 / 4100+ / 6100 / 6100+
XPR 5350 / 5380 / 5550 / 5580	XiR M8620 / 8628 / 8660 / 8668 / CM7668	DM4400 / 4401 / 4600 / 4601	DGM 5000 / 5500 / 8000
XPR 6100 / 6300 / 6350 / 6380 /6500 / 6550 / 6580	XiR P8100 / 8200 / 8208 / 8260 / 8268	DP3200 / 3400 / 3401 / 3600 / 3601	DGP 4050 / 4150 / 4150+ / 6150 / 6150+
XPR 7350 / 7380 / 7550 / 7580	XiR P8600 / 8608 / 8620 / 8628 / 8660 / 8668 / CP7668 / GP328D / GP338D	DP4401 / 4600 / 4601 / 4800 / 4801	DGM 4100 / 4100+ / 6100 / 6100+

Equipment Requirements

8800SX with options

- Option 01 – DMR Conventional Operation
- Option 104 – Motorola MOTOTRBO Series Auto-Test and Alignment

Test Hardware

- VIAVI 112277 – 10 Amp Current Shunt 0.01 Ohm (for Mobile PA BIAS Alignment)
- Radio Programming Cable (See Table 1)
- Audio Test Box – RLN4460 (See Table 1 for model compatibility)
- Variable Power Supply (30 Amp rating for High Power mobiles)
- Battery Eliminator and Interface Box (for portables)
    - Battery Eliminator (See Table 1)
    - Motorola RLN 4510 if available)
- Test Cable (Low Loss Phase Stable recommended for best accuracy) BNC (M) – BNC (M)
- Reference Cable (Short 6”) BNC (M) – BNC (M)
- 10 dB attenuator BNC (M) – BNC (F) (Optional but recommended for best accuracy)
- Connector Adapters
    - BNC (F) – BNC (F)
    - N (M) – BNC (F)
    - Antenna Test Adapter (See Table 1)
    - Antenna Adapter Holder (See Table 1)
- For best accuracy, the 8800SX should be connected and configured to use an external 10 MHz Standard.

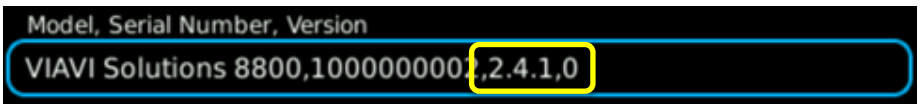
Motorola Part Numbers						
Subscriber	**Type**	**Programming Cable**	**Battery Eliminator**	**Audio Test Box**	**Antenna Adapter**	**Antenna Adapter Holder**
CP200d	portable	PMKN4128	0180305K08EPP	RLN4460	5886564Z01	n/a
XPR 3300 / 3500	portable	PMKN4115	PMNN4428	RLN4460	PMLN6154	PMLN6201
XPR 6100 / 6300 / 6350 / 6380 / 6500 / 6550 / 6580	portable	PMKN4012	PMNN4076	RLN4460	5880348B33	n/a
XPR 7500 IS	portable	PMKN4012B+	PMLN6430	RLN4460	5880384G68	n/a
XPR 7350 / 7380 / 7550 / 7580	portable	PMKN4012B+	PMNN4428	RLN4460	PMLN6154	PMLN6155
SL 300	portable	CB000262A01	HW000405A01	RLN4460	28012039001	HW000406A01
SL 7550 / 7580 / 7590	portable	25-124330-01R	HW000405A01	n/a	28012039001	7012042001
CM200d / CM300d	mobile	PMKN4147	n/a	RLN4460	n/a	n/a
XPR 2500	mobile	PMKN4147	n/a	RLN4460	n/a	n/a
XPR 4350 / 4380 / 4550 / 4580	mobile	PMKN4010	n/a	RLN4460	n/a	n/a
XPR 5350 / 5380/ 5550 / 5580	mobile	HKN6184	n/a	RLN4460	n/a	n/a

Table 1

Note: The above table includes radio models for the North American region. For a list of the comparable model names for all regions please reference the above supported models list or Motorola's documentation.

Before you Begin

- Before testing begins, be sure to check the system software version of your 8800. Select Utilities>Software>Update from the menu to see the installed system software version.
- The system version is indicated at the bottom right of the System Update screen, after the Model and Serial Number.



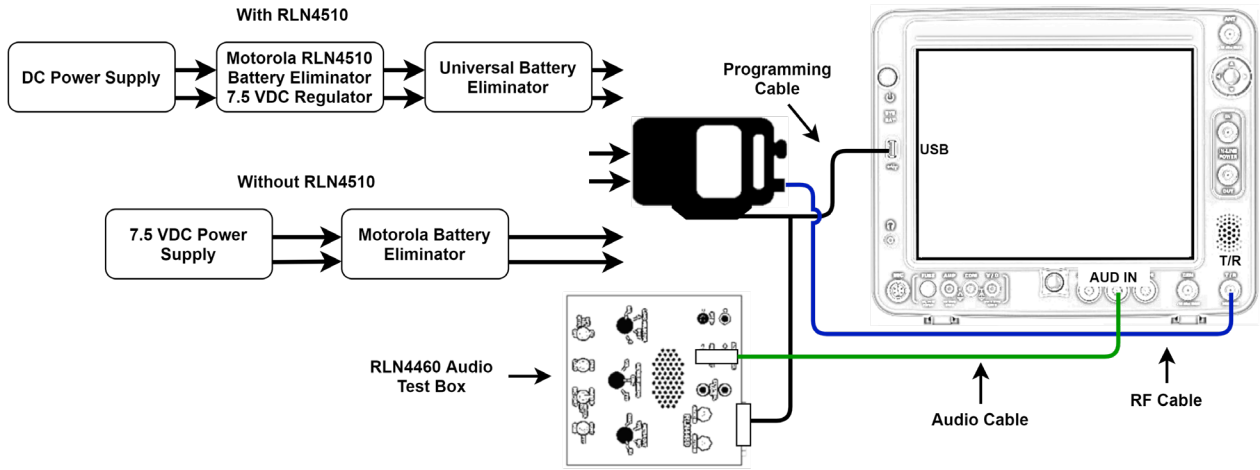
- The Motorola MOTOTRBO application version is displayed in the Auto-Test screen with the Radio OEM.

- Check for software updates on the VIAVI 8800 Series Software webpage at www.viavisolutions.com/en-us/software-download/8800-series-software The current system software version is displayed next to 8800 Series Software Update.
- If your system software version is older than the version listed on this site, download the software, release notes, and installation instructions and update your system software. The system software download includes the latest Auto-Test Software Update.

- If the system software version is current, check your Auto-Test application version, as the test scripts are updated more frequently than system software. The Auto-Test Release Notes will list current versions in order of most recently updated.
- The Auto-Test Software Update includes all currently released test scripts.

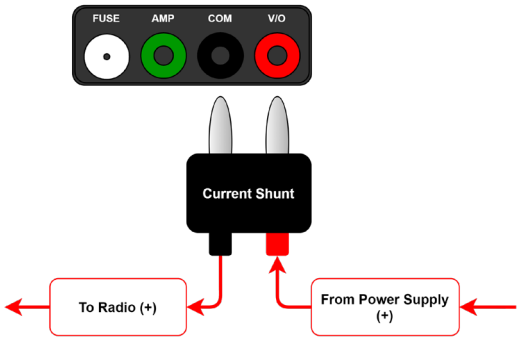
MOTOTRBO Portable Interconnect

1. Connect a 12 VDC power supply to the RLN4510 or battery eliminator.
2. If the RLN4510 is not used, set the power supply to 7.5 VDC. The power supply should be rated at 5 amps.
3. Connect radio ANT to 8800 T/R port.
4. Connect radio programming cable to 8800 USB port and audio test box if performing audio tests.
5. Connect radio programming cable to RLN4460 audio test box and audio cable to 8800 Audio In port if performing audio tests.

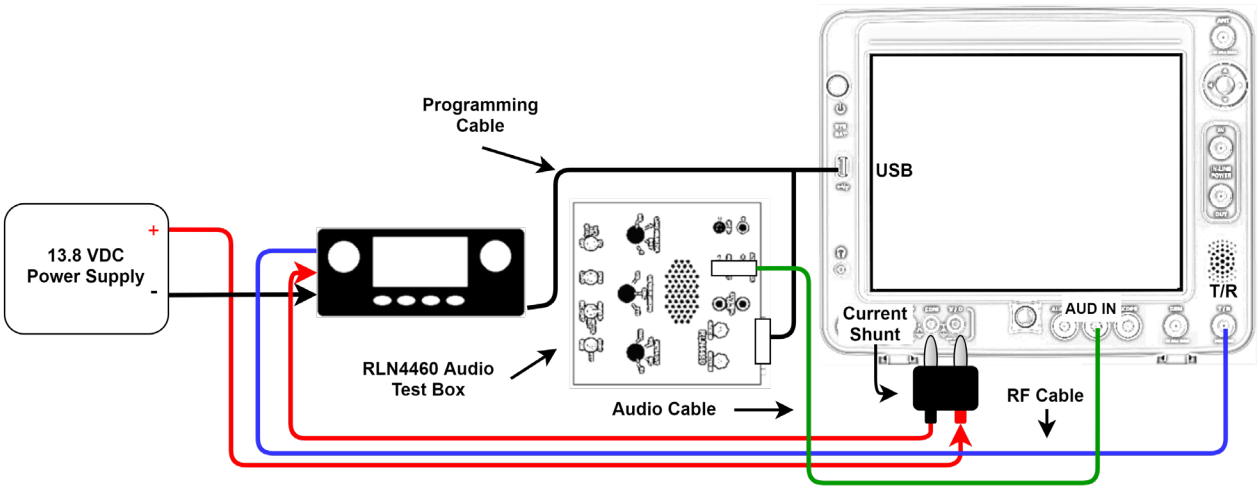


MOTOTRBO Mobile Interconnect

1. Connect radio TX Out to 8800 T/R port.
2. Connect radio programming cable to 8800 USB port and audio test box if performing audio tests.
3. Connect power supply to radio with positive lead through the current shunt if PA BIAS alignment is to be performed. The current shunt is not required for power testing.
4. 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.



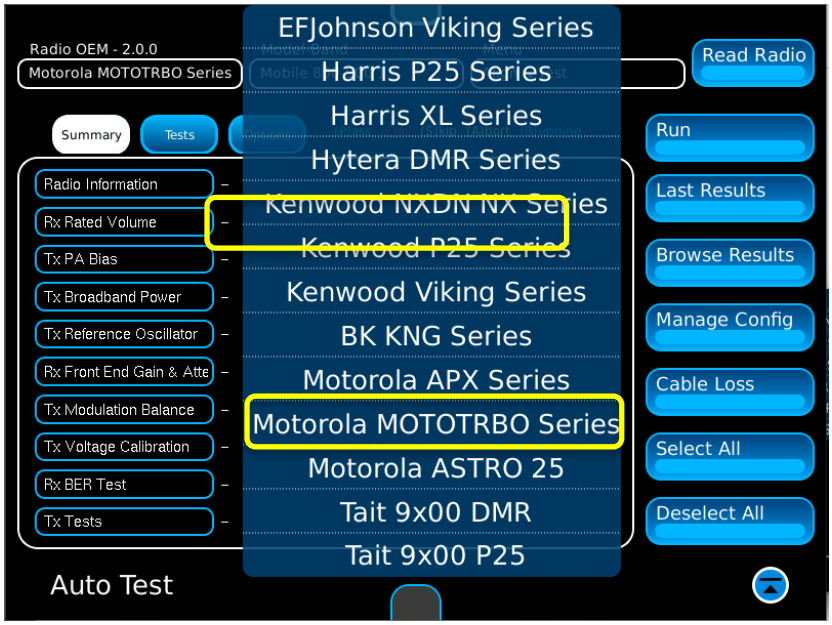
5. Connect radio programming cable to RLN4460 audio test box and audio cable to 8800 Audio In port if performing audio tests.



Access to the Application

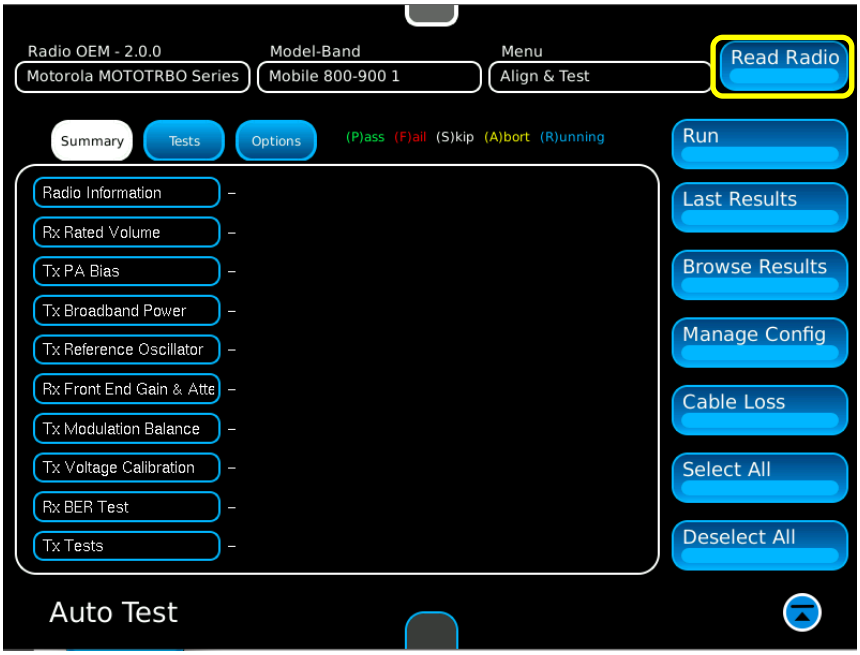
1. Select the Utilities dropdown menu, then select Auto-Test.

2. Select Motorola MOTOTRBO Series from the Radio OEM menu.



Test Screen – Function Keys

After selecting the Radio OEM, use the Read Radio button to query the radio. This will determine the model of the radio under test then display this information in the “Model-Band” field.



Run
- This will execute the selected test or alignment process.

Last Results
- Displays the test results of the last radio tested.

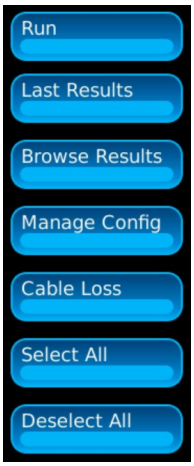
Browse Results
- Allows access to all previous results for all past radio tests.

Manage Config
- Store and Recall of user defined specification tables.

Cable Loss
- Allows the user to enter cable loss factors for separate frequency bands.

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

Deselect All
- Deselects all available tests.



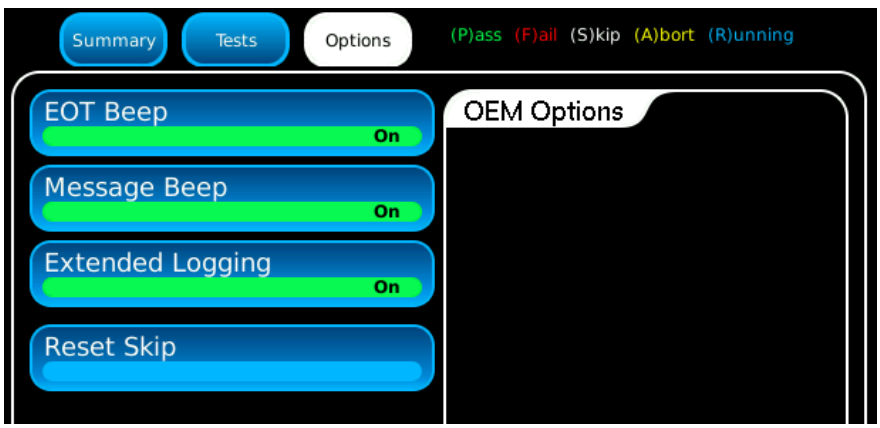
Note: All menu selections are maintained separately for each model as well as for the Align & Test and Test selection. It is important to either perform the Read Radio or select your model from the Model-Band menu prior to making test selections.

Test Screen – Test Selections

Summary
- Displays the Test Summary window showing current test conditions (P)ass (F)ail (S)kip (A)bort (R)unning.

Tests
- Displays the Test Configuration window allowing separate tests to be selected and configured. Some tests allow entry of test parameters. Available configurations may change between Test and Align & Test menu selections.
- Configure buttons allow access to specifications or other user entries.
- Configure for Radio Information allows three lines of user text to be entered that will be visible at the beginning of the printout in the Test Results file. These could be used to identify a Technician ID, Company Name or anything that might be useful at the beginning of the printout.

Options
- Allows 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 all tests and alignments to notify 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 to prompt the operator to change the cable connection. Note: The highest frequency band that is selected is always tested first.
- When testing radios supporting audio tests, you will be prompted to connect the audio test box or select skip to not perform audio tests.

Extended Logging

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

Reset Skip

- Resets the prompt for connecting the audio test box to appear again during tests if Skip was selected.

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 affect radio measurements. For example, a 4' length of RG-58, used to test a 50 watt mobile radio at 800 MHz could impart an error of approximately 0.7 dB. While this seems insignificant, when converted to a percentage, its importance becomes clear. A compensation factor of 0.4 dB is equivalent to a 10% error in power measurement.

- To eliminate this error, compensation must take place.
- The following procedure shows 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 Calibration

1. On the 8800, press the home button to access the System Menu. Select the "Sys Reset" button and select "Yes" when you receive the prompt: "Do you want to restore factory defaults?"
   Note: This will not delete any user files.

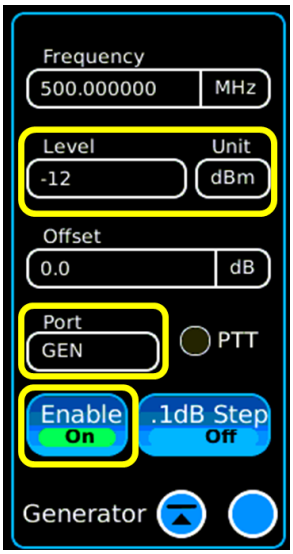
2. From the Utilities Menu, select Presets>Clear Display to remove any tiles that may have been previously displayed.
   Note: Touch the grey bar at the top to access the menu bar.

3. Select the following tiles to be displayed:
   - Generators – Generator
   - Receivers – Receiver
   - Meters – RSSI

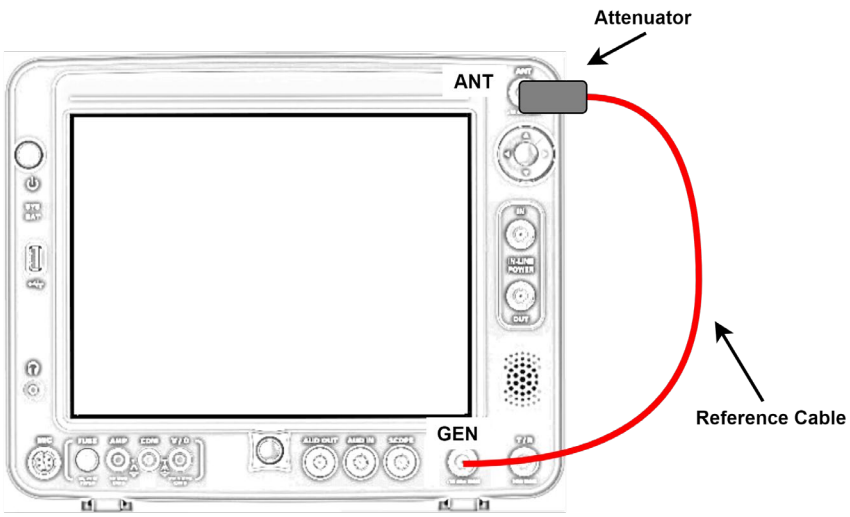
4. Maximize the Generator and Receiver Tiles.

5. Configure the RF Generator Tile.
   - Port: GEN
   - Enable: ON
   - Level: -12 dBm

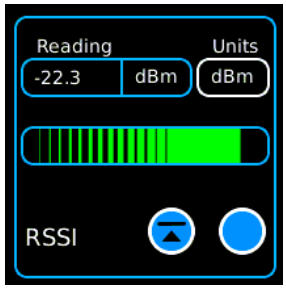
6. Configure the RF Receiver Tile.
   - Frequency: 136.125 MHz
   - Gen Offset: 0.00 MHz
   - Lock: ON
   - IF BW: 10 kHz
   - Port: ANT
   - AGC: Auto



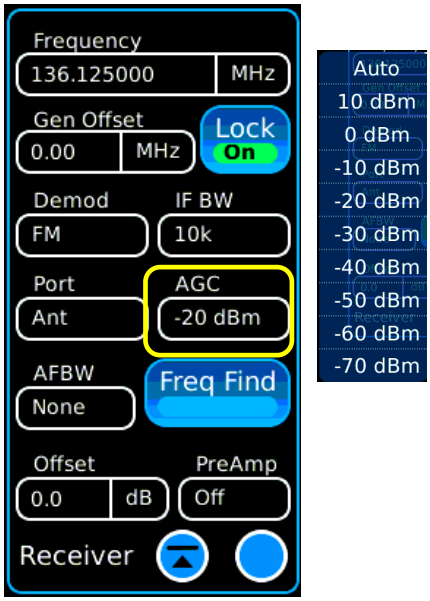
7. Connect Type N adapters to 8800 GEN and ANT ports.
8. Connect the 10 dB Attenuator to the N adapter on the 8800 ANT port.
9. Connect the Reference cable from the 8800 GEN port to the attenuator on the 8800 ANT port.



10. Note the level displayed on the RSSI Meter. Example: -22.3 dBm

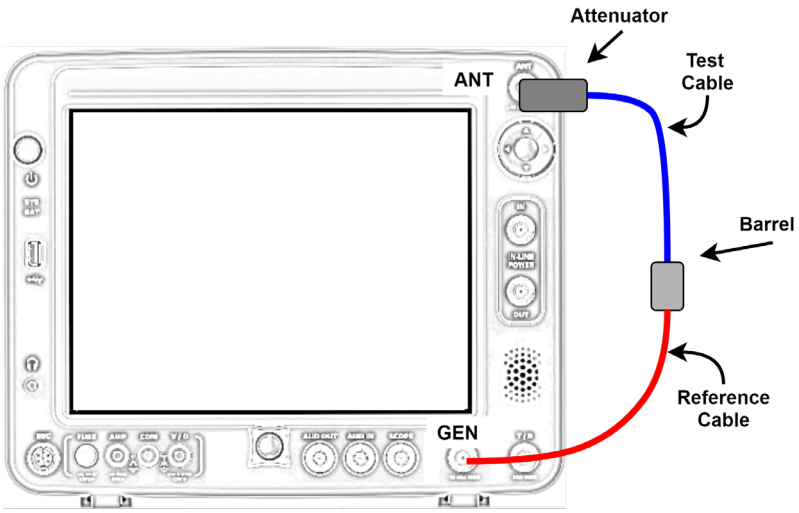


11. Set the Receiver Tile AGC setting from auto to manual.
    - This value should be the next higher value than what is indicated by the RSSI meter. Setting the AGC to a fixed range prevents automatic ranging from choosing a different setting. For -22.3 dBm, set AGC to -20 dBm.



12. Establish a zero dB Reference (dBr).
    - Change the RSSI Meter units control from dBm to dBr.
    - Note that the meter now reads 0.00 dBr.

13. Add the Test cable in-line with the Reference cable.
    - Disconnect the Reference cable from the 10 dB Attenuator on the 8800 ANT port. (Leave the attenuator on the 8800 ANT port.)
    - Using a BNC barrel connector, connect the Test cable to the Reference cable as shown.
    - Connect the other end of the Test cable to the 10 dB Attenuator on the 8800 ANT port.



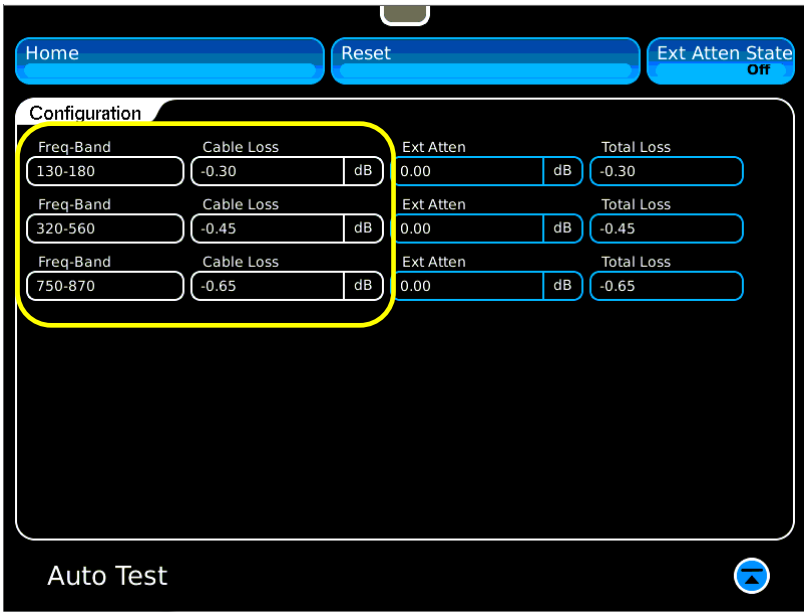
14. Record the measured Cable Loss of the Test Cable.
    - RSSI meter now indicates the amount of insertion loss of the Test cable at this frequency.
        - Record the Loss factor for this frequency.
        - Set the RSSI Meter Units back to dBm.

15. Repeat steps 9 through 14 for the following frequencies:
    - 440.125 MHz
    - 810.125 MHz

Cable Loss Entry

1. Access the Auto-Test application and select the Cable Loss function button.

2. Enter the recorded Loss values into the appropriate frequency band areas on the Cable Loss screen.



3. Select Home when finished to return to the Auto-Test screen.

4. The cable calibration is now complete. The Auto-Test application will use the entered values to correct the measured power meter readings by the amount of the cable loss.

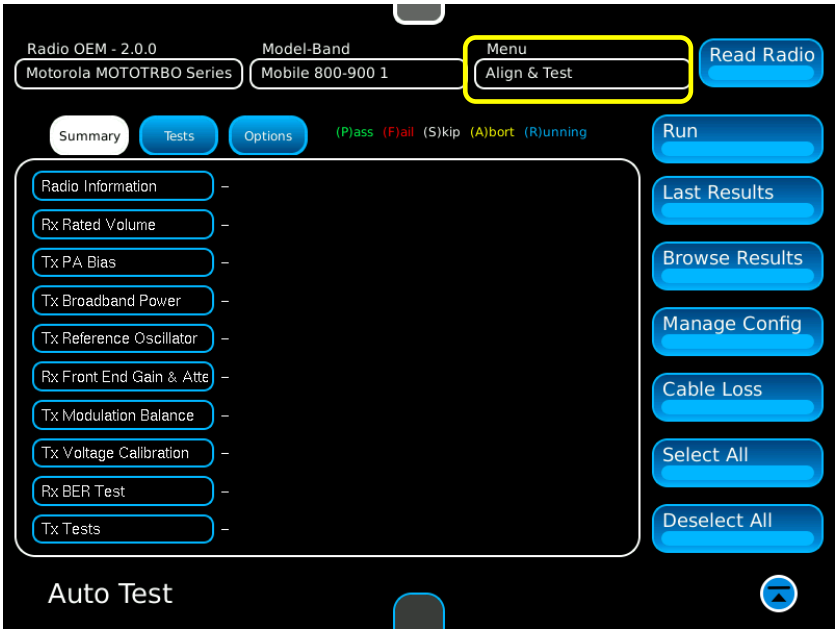
Test and Align & Test Functions

Test Function

- When selected, the menu will change to show only Test items.
- No alignments will be made. A test report of pass/fail results will be recorded. Radio model will be automatically identified, and the appropriate specification table will be used for testing.

Align & Test Function

- All selected items that are capable of being aligned will be aligned. Performance tests will also be performed to validate the alignment.



Select All

- This will enable all tests.

Deselect All

Last Results

Displays the most recently completed test result.

- Shows Time Date stamp along with the 8800's serial number and version information for both the system and the application.
- Shows radio model, serial number along with radio software versions and configurations.
- Shows the Flash Code

Select Home to return to the Auto-Test screen.

Press the  icon to exit the Auto-Test screen.

Browse Results

Shows all test result files for the current Auto-Test application.

Select

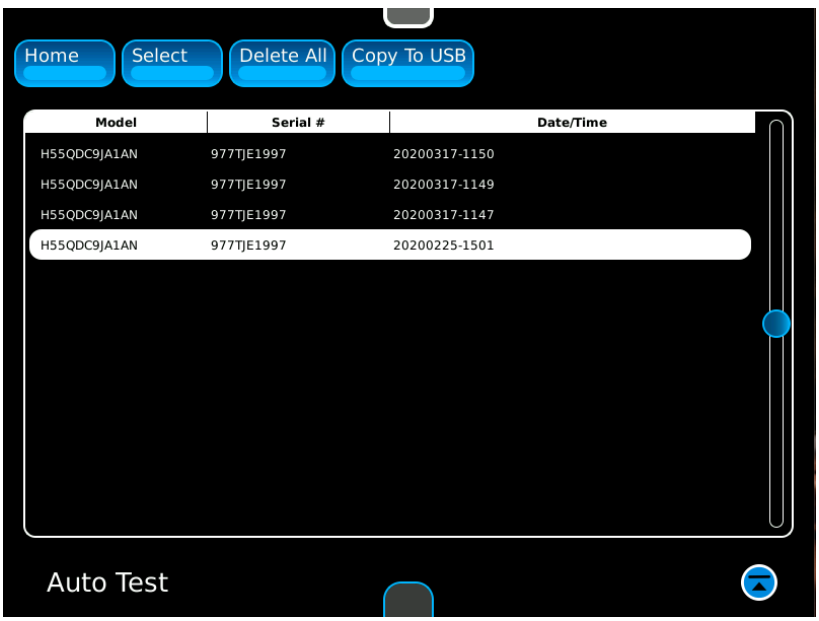
- Allows a test results file to be loaded and displayed.

Copy to USB

- Copies ALL test result files for the current Auto-Test application to a connected USB memory stick.
- After inserting the USB stick, wait several seconds (or until its light stops flickering on the drive) before selecting Copy to USB.
- Be sure to leave the USB stick in long enough for the file copy to complete, waiting 15-20 seconds after the completion message appears.
    - Removing the USB stick early may result in files not being copied to the memory stick successfully or showing as empty (0 kB in size).

Delete All

- Deletes ALL test result files for the current Auto-Test application.



Running the Auto-Test, Step by Step

1. Select Auto-Test from the Utilities menu and select MOTOTRBO Auto-test from the Radio OEM list.
2. Connect the Portable or Mobile radio to be tested.
3. Select Read Radio.
    - Check that there are Loss values entered in the Cable Loss Screen for the bands being tested.
    - If Loss values are not entered, then perform the Cable Loss Calibration procedure.
4. Select Test or Align & Test from the menu.
5. From the Tests Tab, choose all individual tests to be performed.
6. Press Run to begin the Test or Alignment.
7. Failed tests should be confirmed by re-testing.

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