

E7495A/B Manual Operation / Verification

Manual Verification Procedures

The Manual verification procedures allow you to check out the functionality of the major sections of the hardware that do not have automated On-board Verification Tests.

[Verifying the E7495A/B RF Functionality](#)

[Verifying the CW Source Functionality \(Option 500/510 only\)](#)

[Verifying the Complex Modulation Functionality \(Option 510 only\)](#)

[Verifying the Power Meter Functionality \(Option 600 only\)](#)

[Battery Management Verification Tests](#)

COPYRIGHT AND DISCLAIMER NOTICE

Copyright – Agilent Technologies, Inc. Reproduced with the permission of Agilent Technologies Inc. Agilent Technologies, Inc. makes no warranty of any kind with regard to this material including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies, Inc. is not liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material or data.

Verifying the E7495A/B RF Functionality

The base product of the E7495A/B consists of two main blocks: Source and Receiver. The antenna/cable measurements use both of these blocks and, using the Insertion Loss and Return Loss measurements, verify the correct operation of both the source and receiver.

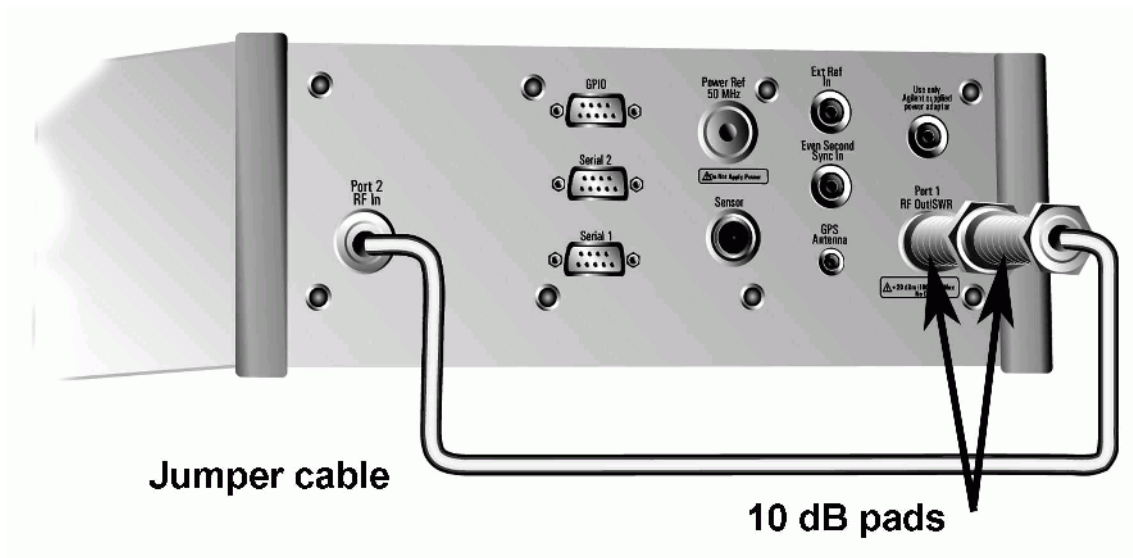
Test equipment

- 2 - 10 dB Type-N pads (Part of E7495A/B Cal kit)
- Short Type-N cable (Part of E7495A/B Cal kit)
- 6, 20, and 30 dB 849xx series Type-N pads or a 10 dB step attenuator

Insertion loss procedure

1. Press **[MODE] Antenna/Cable, Two Port Insertion Loss**.
2. Set the Start Frequency to **375 MHz**; Stop Frequency to **2500 MHz**.
3. Press **Setup, Optimize** and verify it is set to Accuracy.
4. Connect the two 10 dB pads and a short Type-N cable as shown in Figure 1 on page 2.

Figure 1 Connect the 10 dB pads.



A3 RF Functionality

5. Press **Frequency/Normalize** and follow the instructions.

The junction of the 10 dB pads forms a calibrated plane. Measuring unknowns or standards is performed by splitting the plane and inserting the unknown or standard between the 10 dB pads.

6. Connect the 6 dB pad between the two 10 dB pads.
7. Use the marker function to verify that the measured value agrees with the pad.
8. Repeat steps 6 and 7, using different pads in order to cover the range of 6 – 60 dB.

Return Loss procedure

1. Press [MODE] **Antenna/Cable test; Return Loss**.
2. Set the Start Frequency to **375 MHz**, Stop Frequency to **2500 MHz**.
3. Perform the open/load and short calibration.
4. Connect a 6 dB pad to the end of the cable connected to Port 1.
5. **Average/Sweep** turn off averaging to clear the buffer.
6. Turn on averaging.

The best and worst return loss should be between 10 and 14 dB.

If you find a failure

- Double-check your attenuators! When you stack attenuators the overall insertion loss is slightly higher than the sum of the values.
- Check the Port 1 and Port 2 Type-N connectors for contamination, damage, or loose connectors.
- Reload the latest firmware.

In the event of a performance failure, you must have the instrument sent in for repair.

Verifying the CW Source Functionality (Option 500/510 only)

The optional CW source uses the same internal source as is used for the antenna cable measurements. The option adds an internal step 5 dB attenuator to increase the output range.

Test equipment

- Spectrum analyzer
- Type-N cable

Test procedure

You will connect the source directly to the spectrum analyzer's input and step the CW source in 1 dB increments while reading the spectrum analyzer's peak marker. The value should always be within 2 dB of the CW sources stated output.

1. Perform the RF Functionality test procedure on page 2.
2. Verify the step attenuator's functionality.

On the E7495A/B

1. Press **[Mode]**, **Spectrum/Tools**.
2. Press **Signal Generator**.
3. Set the units to **Frequency**.
4. Set the frequency to **375 MHz**.
5. Set the amplitude step to **2 dB**.
6. Set the amplitude to **-25 dBm**.
7. Turn the RF **On**.

On the Spectrum Analyzer

1. Set the frequency to **375 MHz**.
2. Set the span to **10 KHz**.
3. Increase the resolution BW to **1 KHz**, if the update rate is very slow.
4. Set the Reference Level to **-25 dBm**.
5. Press **Marker Peak Search**.
6. While you watch the marker readout on the spectrum analyzer, step the E7495A/B amplitude from -25 to -89 dBm by pressing the down arrow.

The Marker amplitude should show a $2 \text{ dB} \pm .5 \text{ dB}$ change for each press of the down arrow. Any amplitude should be within 2 dB ($\pm$ the uncertain of the spectrum analyzer used).

If you find a failure

- Reload the latest firmware and repeat the test.

If the test results are slightly outside the stated limits

- *Verify the connectors are clean and the connections are tight. In the event of a performance failure the instrument must be sent in for repair.*

Verifying the Complex Modulation Functionality (Option 510 only)

The Complex Modulation option adds a DSP and a special DAC in order to output complex signals such as CDMA and CDMA2000. The output of the DAC is mixed with the CW Source to set the output frequency. The CW signal is not suppressed so you can see a signal ~60 MHz away from the set frequency.

There are seven different waveforms that can be output in the Complex Modulation mode. Generally, if one works, they all will.

Test equipment

- Spectrum analyzer
- Type-N cable

Test procedure

On the E7495A/B

1. Press [**Mode**], **Spectrum/Tools**.
2. Press **Signal Generator**.
3. Set the units to **Frequency**.
4. Set the frequency to **375 MHz**.
5. Set the modulation to **CW**.
6. Set the amplitude to **-50 dBm**.
7. Turn the RF **On**.

On the Spectrum Analyzer

8. Set the frequency to **375 MHz**.
9. Set the span to **2 MHz**.
10. Set the reference level to **-45 dBm**.
11. Press **Marker Peak Search**.
12. Verify the amplitude of the CW signal is $-50 \text{ dBm} \pm 2 \text{ dB}$.
13. On the E7495A/B, change the modulation to **CDMA Forward Link Pilot Only w/o Eq**.
14. On the Spectrum Analyzer, you should see a broad spectrum signal approximately 1.23 MHz wide.
15. Check each of the modulations available. They should all look the same as the CDMA Forward link Pilot only.
16. Repeat steps 1 – 13 at **2.49 GHz**.

If you find a failure

- If one or more complex modulation types look correct but others don't, reload the latest firmware and repeat the test.
- In order to test against any limits, you must have a spectrum analyzer that can measure channel power or a device capable of demodulating and measuring complex signals.

In the event of a performance failure, you must send the instrument in for repair.

Verifying the Power Meter Functionality (Option 600 only)

The Power Meter option uses the same measuring hardware as the E4418B Power Meter. The capabilities are modified for use with the Base Station Test market.

Test equipment

- 8482A power sensor and cable

Test procedure

- For a basic checkout, if you are able to zero and cal the sensor, the circuit is functioning correctly.

If you find a failure

If the meter does not respond to any controls or the controls are grayed out:

- Check that the power meter option is enabled
- Reload the instrument firmware

If the meter does not zero or calibrate check or replace the following:

- Power Sensor Cable
- Power Sensor

If the power meter is still not functioning properly it must be sent in for repair.

Battery Management Verification Tests

Definition

The Battery Management Functional Test verifies the functionality of the E7495A/B battery charge/discharge circuitry, and its ability to switch between Battery and External DC Power.

The Battery Management Functional Test is a manual test. This procedure is comprised of 4 tests to check out the Power Management functionality:

- **External DC Power Test** – Verifies the Test Set's ability to operate off of External DC Power. During the External DC Power Test, the operator will verify the status of the Display Icons and the Front Panel Battery LED's while operating on EXT DC Power.
- **Internal Battery Power Test** – Verifies the Test Set's ability to operate off of the Internal Battery(s). During the Internal Battery Power Test, the operator will verify the status of the Display Icons and the Front Panel Battery LED's while operating on Battery Power.
- **Battery Charge Statistics** - Verifies the Test Set's ability to control the charge functionality, communicate and Display the Data received from the Battery. During this test the operator will verify the status of the Display Icons, the Front Panel Battery LED's, and the Battery Statistics Screen.
- **Battery Discharge Statistics** – Verifies the Test Set's ability to switch between Batteries and control the discharge functions of the Battery Controller board. During this test the operator will verify the status of the Display Icons, the Front Panel Battery LED's, and the Battery Statistics Screen.

Battery Management Functionality
Step 3 - Verify Test Set Functionality

If any of the above tests fail:

1. Insure the External DC Power Supply is functioning properly.
2. Insure the Battery is functioning properly, a recondition of the battery may be necessary.

If the external DC Power Supply and Battery are functioning properly and any of the above tests fail, the instrument will need to be sent in for repair.

Test Equipment

AC to DC Power Supply (supplied with E7495A/B)	0950-4404
NI2040AG Battery (supplied with E7495A/B)	1420-0883

Running the Battery Management Functional Test

NOTE

When connecting or removing the Ext DC Power, the E7495A/B Test Set can take up to 20 seconds for the Battery Status Indicators to update.

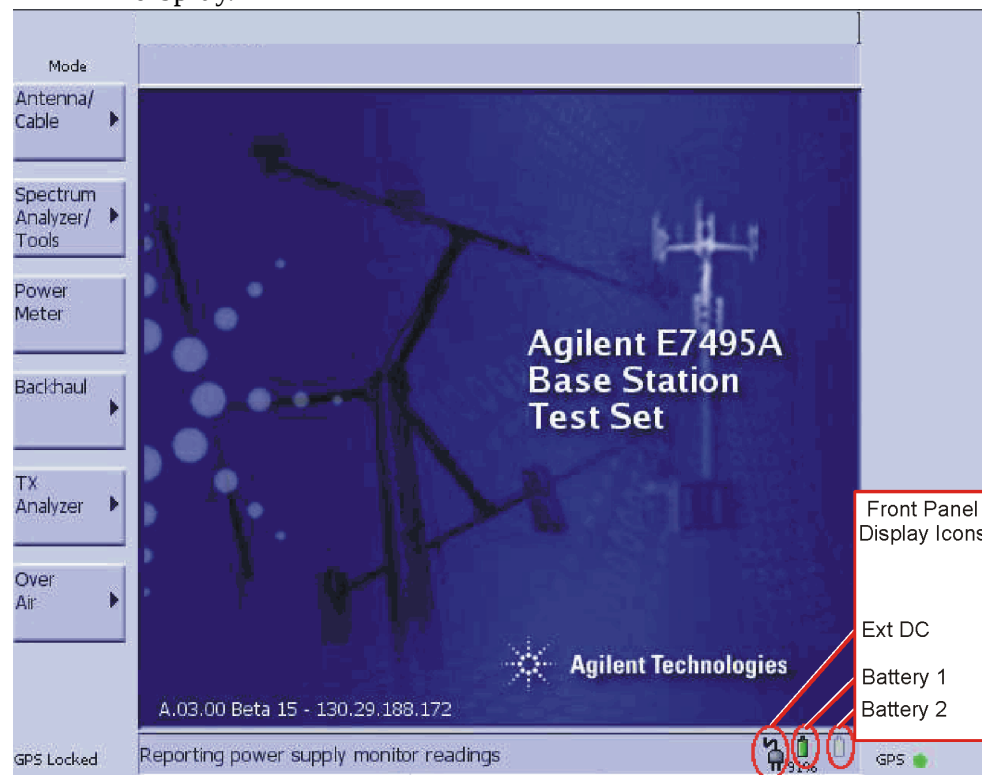
1. External DC Power Test

Setup

- Install battery into Battery Position #2 (Closest to the back of the E7495A/B case)
- Plug the Ext DC power into the E7495A/B
- Turn the Ext DC power supply's switch to on
- Turn the E7495A/B on and allow it to fully power-up

Test Results

- On the Front Panel Display, verify that the External DC icon (Plug icon) is present on the lower right hand portion of the display.



- Verify that the Battery Icons on the Front Panel Display accurately represent the condition of the installed battery.

Battery Management Functionality

Battery 1:	(Light Grey: No Battery Installed)
Battery 2 should be one of the following:	(Green: Greater than 25% Charge remaining) (Yellow: 10 to 15% Charge remaining) (Red: Less than 10% Charge remaining) (Dark Grey: No Charge remaining)

- Verify that the Front Panel Battery LED's accurately indicates the correct status of the battery(s) installed in the Test Set.



Battery 1:	(Off: No Battery Installed)
Battery 2 should be one of the following:	(Blinking Green: Battery is Charging) (Solid Green: Battery in Fully Charged)

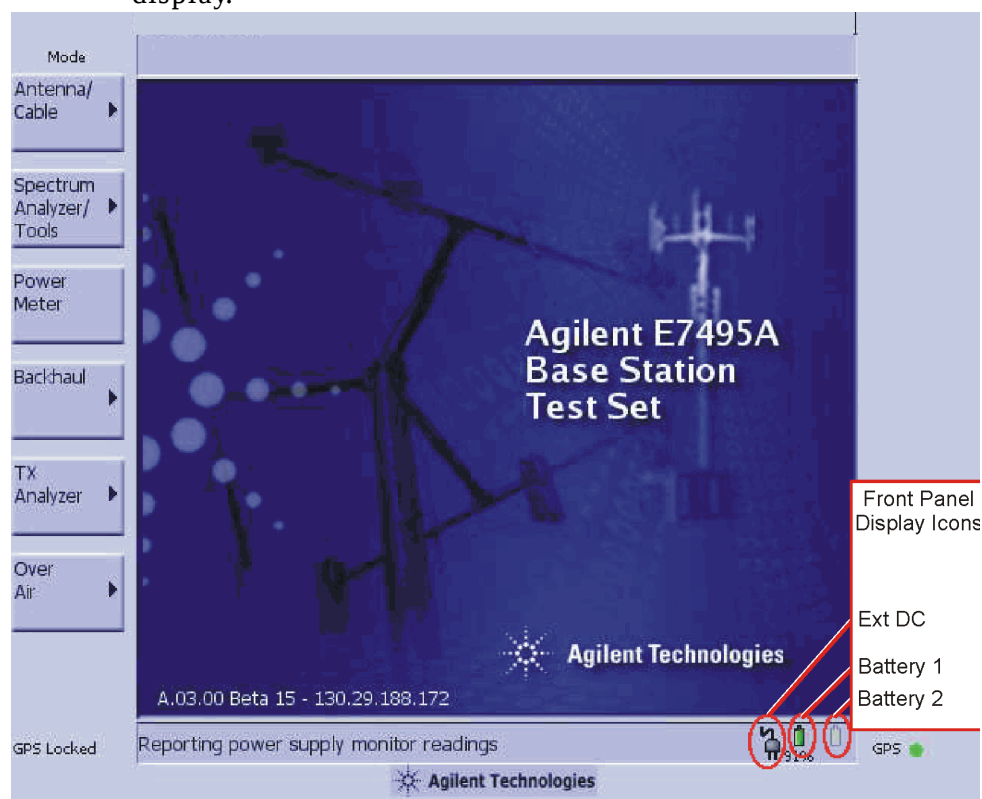
2. Internal Battery Power Test

Setup

- Insure a battery with >10% charge is installed in Battery Position #2
- Remove the Ext DC Power from the E7495A/B

Test Results

- On the Front Panel Display, verify the External DC icon (Plug icon) is NOT present on the lower right hand portion of the display.



- Verify the Battery Icons on the Front Panel Display accurately represent the condition of the installed battery.

Battery 1:	(Light Grey: No Battery Installed)
Battery 2 should be one of the following:	(Green: Greater than 25% Charge remaining) (Yellow: 10 to 15% Charge remaining) (Red: Less than 10% Charge remaining) (Dark Grey: No Charge remaining)

Battery Management Functionality

- Verify that the Front Panel Battery LED's accurately indicates the correct status of the battery(s) installed in the Test Set.



Battery 1:	(Off: No Battery Installed)
Battery 2 should be one of the following:	(Green: Greater than 25% charge remaining) (Yellow: 10 to 25% charge remaining) (Red: Less than 10% charge remaining)

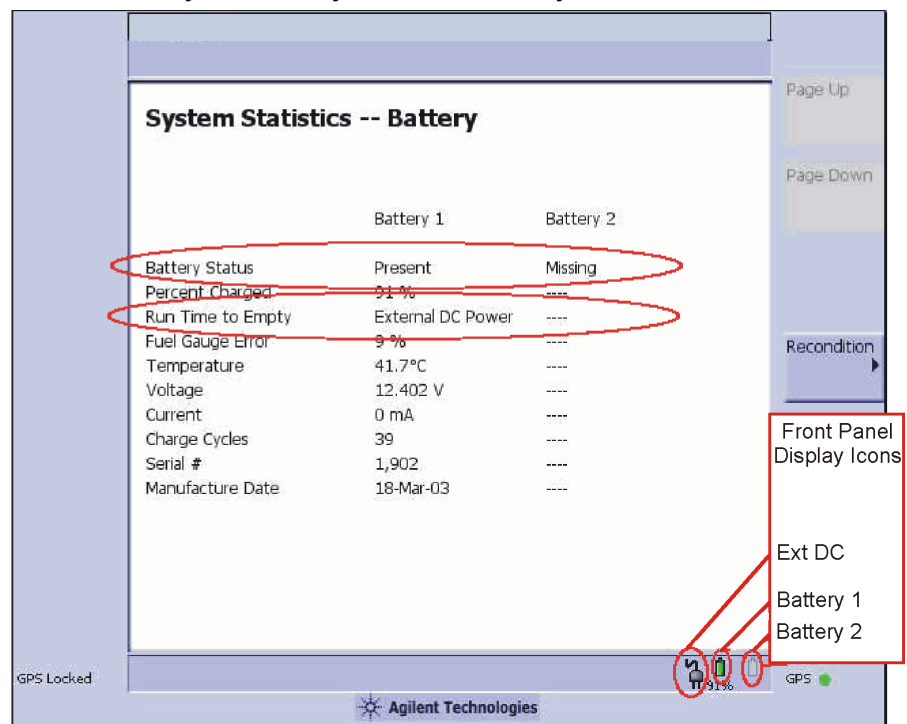
3. Battery Charge Statistics

Setup

- Reconnect the Ext DC power to the E7495A/B.
- Insure a charged battery is installed in the E7495A/B in Battery Position #2.

Test Results

- Access the Battery Statistics Screen
 - Press the **[System]** Key
 - Press the **[More 1 of 2]** Softkey
 - Press the **[System Stats]** Softkey
 - Press the **[Battery]** Softkey
- Verify the following fields on the Battery Status Screen with a Battery in Battery Position #2 only.



Battery Status

- Battery 1 field = Missing
- Battery 2 field = Present

Run Time to Empty

- Battery 1 field = ---
- Battery 2 field = External DC Power

4. Battery Discharge Statistics

Setup

- Move Battery to Battery Position #1 (closest to the Front Display)
- Remove the Ext DC Power from the E7495A/B

Test Results

- Verify the following fields on the Battery Status Screen with a Battery in Battery Position #1 only

Battery Status

- Battery 1 field = Present
- Battery 2 field = Missing

Run Time to Empty

- Battery 1 field = XXX Minutes (XXX should be 10 or greater for a battery with 10% charge)
- Battery 2 field = ----