# N7811A ESA Utilities Overview

## Initialization Utilities

The Initialization Utilities listed below will write the default calibration constants into the memory of the board assembly after replacement or installation.

- Processor Initialization
- RF Initialization
- Flatness Initialization

## Power Sensor/Power Splitter Characterization

The power sensor/power splitter characterization utilities listed below allow you to perform the necessary characterizations once and use the data multiple times, for a period of up to 7 days. The characterization data may be used by the various frequency response performance test and adjustment procedures. Using this data will reduce test time by 20 to 45 minutes per analyzer, depending upon installed options.

- 50 Ohm Power Sensor/Power Splitter Characterization
- 75 Ohm Power Sensor/Power Splitter Characterization

Utilities are selected the same way as performance tests or adjustments.

# Processor Initialization

This procedure must be used whenever a new A4 processor assembly is installed. The analyzer's product number, and serial number are first downloaded into the analyzer's EEROM.

NOTE

- A new TME order **MUST** be created when replacing the A4 processor assembly and before running this utility. The process of creating the new order will cause the model number and serial number of the UUT to be initialized. Otherwise the device will have an empty serial number and default model number which will cause an error in TME that it does not recognize the device.
- The UUT *must* be connected to the test station on GPIB bus 0 at address 18. The utility procedure will *not* work on GPIB bus 1.
- This procedure can be used to change the analyzer's serial number only from the default serial number stored on replacement A4 Processor Assemblies. It does not allow the serial number to be changed if a valid serial number is already stored in EEROM.

Several parameters are initialized based upon the frequency range of the analyzer and whether the analyzer is an E-Series or L-Series spectrum analyzer or an EMC analyzer. The time, date, and amplitude units (for both log and linear scales) are then set. Default values for parameters such as the date mode, printer control language, print orientation, GPIB address (Option A4H only), baud rate (Option 1AX only), and viewing angle are stored. Lastly, amplitude correction and limitline data is initialized. The analyzer is preset once all this data has been stored in EEROM.

**Related performance test:** none

## Required Equipment

None required.

## Additional Information

The following data is initialized in this procedure:

| Parameter | Default Value |
|---|---|

| | |
|---|---|
| Product Number | For example, E4401B |
| Serial Number | For example, US39010218 |
| L-Series versus E-Series versus EMC Analyzer | L-Series if E4403B, E4408B, or E4411B;<br>E-Series if E4401B, E4402B, E4404B, E4405B, or E4407B,<br>Otherwise, EMC Analyzer |
| Upper Frequency Limit (E4404B, E4405B, E4407B, E4408B, E7403A, E7404A, E7405A only) | 6.7 GHz (E4404B and E7403A only)<br>13.2 GHz (E4405B and E7404A only)<br>26.5 GHz (E4407B, E4408B, and E7405A only) |
| APC 3.5 Connector | True if Option BAB |
| Time | Current time |
| Date | Current date |
| Log Scale Amplitude Units | dBm if non-Option 1DP; dBmV if Option 1DP;<br>dBmV if EMC analyzer |
| Linear Scale Amplitude Units | Volts |
| Power-On Mode | IP (Preset) |
| DTR Control | On |
| RTS Control | Input Buffer Full mode |
| Receive Pacing | None |
| Transmit Pacing | None |
| Color Palette | Default |
| Date Mode | Month-Day-Year |
| Time and Date Display | On |
| Print Mode | Screen |
| Printer | None |
| Printer Control Language | PCL3 |
| Color Capable? | No |
| Color Printing | Off |
| Prints per Page | 1 |
| GPIB Address (Option A4H only) | 18 on GPIB bus 0<br><br>NOTE: The UUT *must* be connected to the test station on GPIB bus 0. The utility procedure will *not* work on GPIB bus 1. |
| Baud Rate (Option 1AX only) | 9600 |
| Viewing Angle | 5 |
| Volume | 0 |

TOP

## RF Initialization

Several parameters stored in the EEROM on the A8 1.5 GHz RF Assembly (E4401B, E4411B, or E7401A) or A8A1 3.0 GHz RF Assembly (E4402B, E4403B, E4404B, E4405B, E4407B, E4408B, E7402A, E7403A, E7404A, or E7405A), or A7A4 Frequency Extension Assembly (E4404B, E4405B, E4407B, E4408B, E7403A, E7404A, or E7405A) are initialized to default values by this procedure. When initializing an analyzer with both an A8A1 and A7A4, you may choose to do an RF Initialization of either assembly or both assemblies.

It will be necessary to perform the following adjustments after initializing the RF assembly:

| Adjustment Required | Assembly Initialized |
|---|---|

| | A8 | A8A1 | A7A4 |
|---|---|---|---|
| IF Amplitude | X | X | |
| 50 MHz Amplitude Reference | X | X | |
| 10 MHz Reference | X | X | |
| LO Amplitude | | X | X |
| Frequency Response, Low Band | X | X | |
| Frequency Response, High Band | | | X |
| YTF | | | X |

This procedure should only be necessary if the 1.5 GHz or 3.0 GHz RF Assembly, or the Frequency Extension Assembly has been repaired; replacement assemblies are already initialized.

**Related performance test:** none

### Required Equipment

None required.

### Additional Information

The following data is initialized in this procedure.

| Parameter | Default Value |
|---|---|
| 21.4 MHz IF Alignment Signal Amplitude | -57 dBm |
| 50 MHz Amplitude Reference Signal Amplitude | -27 dBm (E4401B, E4411B, E7401A)-20 dBm (E4402B, E4403B, E4404B, E4405B, E4407B, E4408B, E7402A, E7403A, E7404A, E7405A) |
| Coarse Timebase DAC | 128 |
| Fine Timebase DAC | 128 |
| LO Level DAC | Product number dependent |
| YTF Tuning Constants | Product number dependent |
| Temperature Compensation Constants | Product number dependent |
| External Mixing Amplitude Offset | 0 dB |

TOP

## Flatness Initialization

Default flatness data for the entire analyzer frequency range are stored in EEROM. For the E4401B, E4411B, and E7401A all the flatness data is stored on the EEROM on the A8 1.5 GHz RF Assembly. For the E4402B, E4403B, and E7402A all the flatness data is stored on the EEROM on the A8A1A2 Front End/LO Assembly. For the E4404B, E4405B, E4407B, E4408B, and E7403A, E7404A, and E7405A the flatness data for frequencies <= 3 GHz (Band 0) are stored on the EEROM on A8A1A2, and the flatness data for frequencies > 3 GHz (Bands 1, 2, 3, and 4) are stored on the A7A4 Frequency Extension Assembly. When initializing an analyzer with both an A8A1 and A7A4, you may choose to do a Flatness Initialization of either assembly or both assemblies. It will be necessary to perform the Frequency Response adjustment after initializing the flatness data.

**Related performance test:** none

### Required Equipment

None required.

### Additional Information

The following table indicates the assemblies into which the default flatness data is stored for each product number.

| Product | A8 1.5 GHz RF Assembly | A8A1 3.0 GHz RF Assembly | A7A4 Frequency Extension Assembly |
|---|---|---|---|
| E4401B | X | | |
| E4402B | | X | |
| E4403B | | X | |
| E4404B | | X | X |
| E4405B | | X | X |
| E4407B | | X | X |
| E4408B | | X | X |
| E4411B | X | | |
| E7401A | X | | |
| E7402A | | X | |
| E7403A | | X | X |
| E7404A | | X | X |
| E7405A | | X | X |

TOP

## 50 W Power Sensor/Power Splitter Characterization

This topic includes the following sections (click on the link to jump to that section):



### Introduction

The test and adjustments listed below require the use of a characterized power sensor/ power splitter combination.

- Frequency Response Performance Test (Preamp On and Preamp Off)
- Comms Frequency Response Performance Test (Opt BAC and BAH only)
- Frequency Response Adjustment (Preamp On and Preamp Off)

The characterizations required for testing and adjusting one ESA/EMC analyzer can take up to approximately 45 minutes to perform. The Power Sensor/Power Splitter characterization utility allows you to perform the characterizations once and use the data on multiple ESA/EMC analyzers, thereby reducing the time to test and adjust multiple analyzers.

There are actually two power sensor/power splitter combinations necessary to cover all 50 W ESA/EMC analyzers:

**50 W, Medium Power**

- Consists of N8482A Power Sensor and 11667A Power Splitter
- Used for the following tests and adjustments:
    - Frequency Response (Preamp Off) Performance Test
    - Comms Frequency Response Test (Opt BAC and BAH only)
    - Frequency Response (Preamp Off) Adjustment

**50 W, Low Power**

- Consists of N8482A Power Sensor, 11667A Power Splitter, and 8491A Opt 020 20 dB Attenuator
- Used for the following tests and adjustments:
    - Frequency Response (Preamp On) Performance Test (Opt 1DS)
    - Comms Frequency Response Test (Opt 1DS and Opt BAC or BAH only)
    - Frequency Response (Preamp On) Adjustment (Opt 1DS)

NOTE Only one power sensor/power splitter combination of each type (i.e. 50 W, Medium Power) may be used with a single station. You cannot, for example, have two 50 W, Medium Power combinations mapped to one station, but you can have one 50 W, Medium Power and one 50 W, Low Power combination mapped to that station.

Once a power sensor/power splitter combination has been characterized, the characterization data remains valid for up to one week (7 days). However, for the data to remain valid during this time, the power sensor and power splitter must remain together and not be separated.

NOTE Keysight recommends that calibration seals be used at each RF connection between the power sensor, power splitter, and attenuator, as applicable, to discourage these components from being disconnected.

It is not mandatory to perform the characterizations using this utility. When each of the tests listed above starts, the test will check to see if valid characterization data exists and if so will use that data and power sensor/power splitter combination. If valid characterization data does not exist, the user will be prompted to perform the characterization as part of performing the test or adjustment.

NOTE The characterization data measured as part of performing a test or adjustment is not saved for future use.

**Related Performance Tests and Adjustments:**

- Frequency Response Performance Test (Preamp On and Preamp Off)
- Comms Frequency Response Performance Test (Opt BAC and BAH only)
- Frequency Response Adjustment (Preamp On and Preamp Off)

TOP

## Metrology Impact

The use of the characterization data generated by this utility has no impact on the metrology of any of the frequency response tests in which the characterization data is used. There are only two differences between using the utility-generated characterization data and using the test-generated characterization data.

The first difference is that the frequency response test procedure both zeroes and calibrates the buried sensor, whereas the utility procedure only zeroes the buried sensor. The calibration step has no effect on the measurement integrity and is not a factor in the measurement uncertainty analysis.

The second difference is that the utility-generated characterization data may be used up to seven days after it was generated, whereas the test-generated characterization data is used immediately. Several hundred ESA and EMC analyzers have been tested in the factory using data that was up to seven days old with no measurable difference compared to testing using data that was less than one day old.

## Running the Utility

When you start the Utility, the status of the current characterizations is displayed, including whether or not the characterization data has expired. You may choose to update the characterizations (whether they are expired or not) or you may add a characterization for a new power sensor/ power splitter combination.

For the 50 W, Medium Power and 50 W, Low Power characterizations, you may also choose a sub-characterization. The sub-characterizations available, and the number of frequencies included in each, are as follows:

**50 W, Medium Power (233 frequencies)**

- 1.5 GHz Frequency Response Test & Adjustment (66 frequencies)
- 3.0 GHz Frequency Response Test & Adjustment (114 frequencies)
- Comms Frequency Response Test (53 frequencies)

**50 W, Low Power (185 frequencies)**

- 1.5 GHz Frequency Response Test & Adjustment (54 frequencies)
- 3.0 GHz Frequency Response Test & Adjustment (78 frequencies)
- Comms Frequency Response Test (53 frequencies)

You can save time doing the characterizations if you know that certain tests and adjustments will not be run during the next week. For example, if your company owns only 1.5 GHz ESA/EMC analyzers, you will not need to perform the 3.0 GHz Frequency Response Test & Adjustment and Comms Frequency Response Test sub-characterizations.

If you are not sure what ESA/EMC analyzers will be tested over the next week, we recommend performing all sub-characterizations. Even if the data from a sub-characterization is used only once during the week, while data from another sub-characterization is used several times, there will still be a reduction in test time.

## Selecting Equipment

The following table summarizes the components of the power sensor/power splitter combinations to be characterized:

| Combination | Power Splitter | Power Sensor | Attenuator |
|---|---|---|---|
| 50 W, Medium Power | 11667A | N8482A-CFT | N/A |
| 50 W, Low Power | 11667A | N8482A-CFT | 8491A-020 |

The power sensor listed in the table above is referred to as the “buried sensor”; it becomes part of (or “buried in”) the power splitter because of the characterization being performed.

The characterization also requires one or two sources, and a “reference sensor”. The choice of sources depends upon the maximum frequency characterized. The table below summarizes the sources and reference sensor required.

| Maximum Frequency | Input Impedance | RF Source | Low Frequency Source | Reference Sensor |
|---|---|---|---|---|
| 1.5 GHz | 50 W | Synthesized Signal Generator | N/A | N8482A |
| 2.0 GHz | 50 W | Synthesized Sweeper | Function Generator | N8482A |
| 3.0 GHz | 50 W | Synthesized Sweeper | Function Generator | N8482A |

A power meter, cables, and a few adapters will also be necessary:

- N1914A Dual Channel Power Meter
- 11500B/C Type N Cable
- 8120-2582 BNC Cable
- 1250-1745 Type N(f) to 3.5(f) Adapter
- 1250-0780 Type N(m) to BNC(f) Adapter

TOP

## Performing the Characterizations

After you have chosen the characterizations to be performed and have assembled the necessary equipment, the software will prompt you how to calibrate the power sensors and connect the equipment. The software will then perform the characterization measurements and store the data on the PC. If more than one characterization has been selected, you will be prompted when to connect a new power sensor/power splitter combination.

Keysight recommends placing calibration seals over the RF connections in the power sensor / power splitter combinations to discourage the disconnection of the various components of each combination. The connections requiring seals depends upon the power sensor/power splitter combination:

**50 W, Medium Power**

Place seal over buried power sensor / power splitter connection.

**50 W, Low Power**

Place seal over buried power sensor / power splitter connection.

Place seal over power splitter / 20 dB attenuator connection.

## Using Characterization Data

When performing a test or adjustment that requires a power sensor / power splitter characterization, the software will automatically check to see if valid characterization data already exists. If valid data exists, the software will prompt you whether you want to use the stored characterization data or not. If you select Yes, the software will prompt you to connect the appropriate power sensor / power splitter combination to the test setup. Check the power sensor / power splitter combination to ensure that all calibration seals are intact. If you select No, the stored characterization data will be invalidated.

If valid characterization data does not exist, the software will prompt you to perform the characterization using the equipment already configured. Please note that the characterization data obtained as part of running a test or adjustment will not be stored for future use.

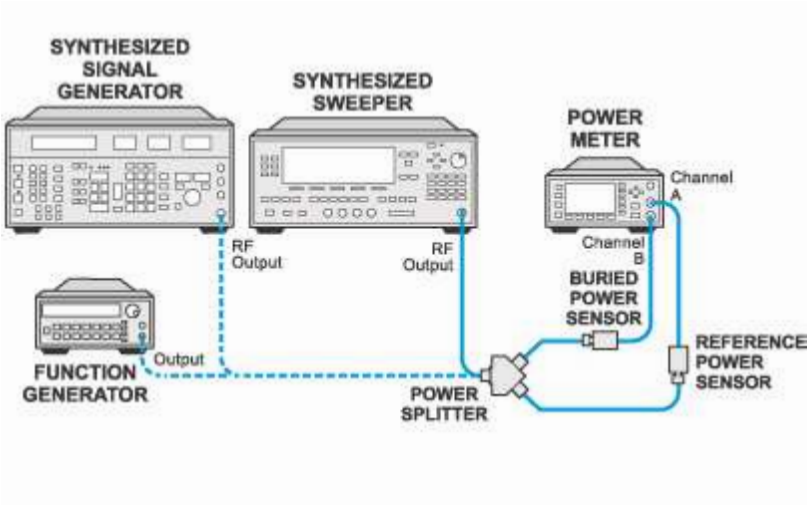
## Required Equipment

| Equipment | Recommended Model | For Characterization |
|---|---|---|
| Synthesized Signal Generator | E8257D | 1.5 GHz characterizations |
| Function Generator | 33622A | 1.5 GHz characterizations |
| Synthesized Sweeper | E8257D | >1.5 GHz characterizations |
| Power Meter | N1914A | All |
| Power Sensor | | |
| Buried Sensor<br>(one required for each characterization performed) | N8482A-CFT | All |
| Reference Sensor | N8482A-CFT | All |
| Fixed Attenuator | 8491A<br>Option 020 | Low Power characterizations only |
| Power Splitter<br>(one required for each characterization performed) | 11667A | All |
| Cable, Type N | 11500B/C | All |
| | | |

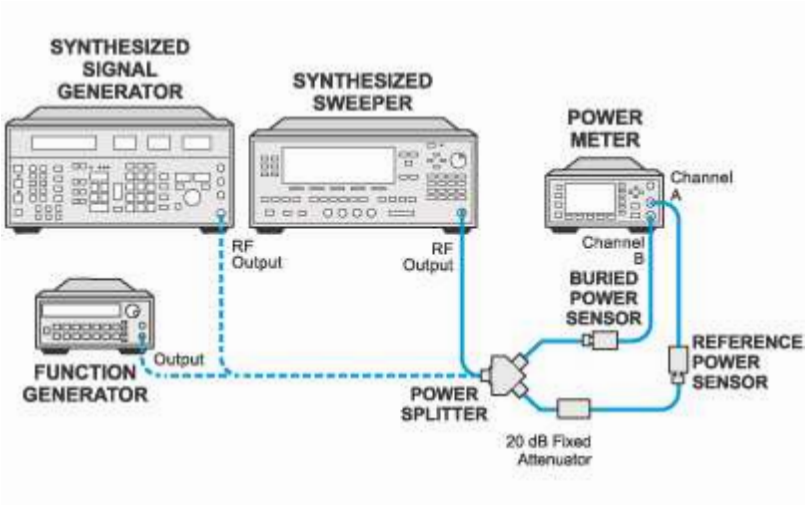
| | | |
|---|---|---|
| Cable, BNC | 8120-2582 | All |
| Adapter, Type N (f) to 3.5 mm (f) | 1250-1745 | >1.5 GHz characterizations |
| Adapter, Type N (m) to BNC (f), 50 W | 1250-0780 | All |

## Connection Setups

**Power Sensor/Splitter Characterization Setup, Medium Power**




**Power Sensor/Splitter Characterization Setup, Low Power**




TOP

## 75 W Power Sensor/Power Splitter Characterization

This topic includes the following sections (click on the link to jump to that section):

- Selecting Equipment
- Performing the Characterizations
- Using Characterization Data
- Required Equipment
- Connection Setups

## Introduction

The test and adjustments listed below require the use of a characterized power sensor/ power splitter combination.

- Frequency Response Performance Test (Preamp On and Preamp Off)
- Frequency Response Adjustment (Preamp On and Preamp Off)

The characterizations required for testing and adjusting one ESA analyzer can take up to approximately 45 minutes to perform. The Power Sensor/Power Splitter characterization utility allows you to perform the characterizations once and use the data on multiple ESA analyzers, thereby reducing the time to test and adjust multiple analyzers.

There are actually two power sensor/power splitter combinations necessary to cover all 75 W ESA analyzers:

**75 W, Medium Power**

- Consists of N8482A Power Sensor, 11667A Power Splitter, and 11852B Opt 004 Minimum Loss Pad
- Used for the following tests and adjustments:
  - Frequency Response (Preamp Off) Performance Test (Opt 1DP)
  - Frequency Response (Preamp Off) Adjustment (Opt 1DP)

**75 W, Low Power**

- Consists of N8482A Power Sensor, 11667A Power Splitter, 8491A Opt 020 20 dB Attenuator, and 11852B Opt 004 Minimum Loss Pad
- Used for the following tests and adjustments:
  - Frequency Response (Preamp On) Performance Test (Opt 1DP and 1DS)
  - Frequency Response (Preamp On) Adjustment (Opt 1DP and 1DS)

NOTE

Only one power sensor/power splitter combination of each type (i.e. 75 W, Medium Power) may be used with a single station. You cannot, for example, have two 75 W, Medium Power combinations mapped to one station, but you can have one 75 W, Medium Power and one 75 W, Low Power combination mapped to that station.

Once a power sensor/power splitter combination has been characterized, the characterization data remains valid for up to one week (7 days). However, for the data to remain valid during this time, the power sensor and power splitter must remain together and not be separated.

NOTE

Keysight recommends that calibration seals be used at each RF connection between the power sensor, power splitter, attenuator, and minimum loss pad, as applicable, to discourage these components from being disconnected.

It is not mandatory to perform the characterizations using this utility. When each of the tests listed above starts, the test will check to see if valid characterization data exists and if so will use that data and power sensor/power splitter combination. If valid characterization data does not exist, the user will be prompted to perform the characterization as part of performing the test or adjustment.

**NOTE** The characterization data measured as part of performing a test or adjustment is not saved for future use.

**Related Performance Tests and Adjustments:**

- Frequency Response Performance Test (Preamp On and Preamp Off)
- Frequency Response Adjustment (Preamp On and Preamp Off)

TOP

## Metrology Impact

The use of the characterization data generated by this utility has no impact on the metrology of any of the frequency response tests in which the characterization data is used. There are only two differences between using the utility-generated characterization data and using the test-generated characterization data.

The first difference is that the frequency response test procedure both zeroes and calibrates the buried sensor, whereas the utility procedure only zeroes the buried sensor. The calibration step has no effect on the measurement integrity and is not a factor in the measurement uncertainty analysis.

The second difference is that the utility-generated characterization data may be used up to seven days after it was generated, whereas the test-generated characterization data is used immediately. Several hundred ESA and EMC analyzers have been tested in the factory using data that was up to seven days old with no measurable difference compared to testing using data that was less than one day old.

## Running the Utility

When you start the Utility, the status of the current characterizations is displayed, including whether or not the characterization data has expired. You may choose to update the characterizations (whether they are expired or not) or you may add a characterization for a new power sensor/ power splitter combination.

## Selecting Equipment

The following table summarizes the components of the power sensor/power splitter combinations to be characterized:

| Combination | Power Splitter | Power Sensor | Attenuator | Minimum Loss Pad |
|---|---|---|---|---|
| 75 W, Medium Power | 11667A | N8482A-CFT | N/A | 11852B-004 |
| 75 W, Low Power | 11667A | N8482A-CFT | 8491A-020 | 11852B-004 |

The power sensor listed in the table above is referred to as the “buried sensor”; it becomes part of (or “buried in”) the power splitter because of the characterization being performed.

The characterization also requires a source and a “reference sensor”.
The table below summarizes the sources and reference sensor required.

| Maximum Frequency | Input Impedance | RF Source | Reference Sensor |
|---|---|---|---|
| 1.5 GHz | 75 W | Synthesized Signal Generator | 8483A* |

* A 50 W (m) to 75 W (f) Mechanical Adapter, part number 1250-0597, must be used to calibrate the 8483A.

A power meter and a cable will also be necessary:

- N1914A Dual Channel Power Meter
- 11500B/C Type N Cable

TOP

## Performing the Characterizations

After you have chosen the characterizations to be performed and have assembled the necessary equipment, the software will prompt you how to calibrate the power sensors and connect the equipment. The software will then perform the characterization measurements and store the data on the PC. If more than one characterization has been selected, you will be prompted when to connect a new power sensor/power splitter combination.

Keysight recommends placing calibration seals over the RF connections in the power sensor / power splitter combinations to discourage the disconnection of the various components of each combination. The connections requiring seals depends upon the power sensor/power splitter combination:

**75 W, Medium Power**

Place seal over buried power sensor / power splitter connection.

Place seal over power splitter / minimum loss pad connection.

**75 W, Low Power**

Place seal over buried power sensor / power splitter connection.

Place seal over power splitter / 20 dB attenuator connection.

Place seal over 20 dB attenuator / minimum loss pad connection.

## Using Characterization Data

When performing a test or adjustment that requires a power sensor / power splitter characterization, the software will automatically check to see if valid characterization data already exists. If valid data exists, the software will prompt you whether you want to use the stored characterization data or not. If you select Yes, the software will prompt you to connect the appropriate power sensor / power splitter combination to the test setup. Check the power sensor / power splitter combination to ensure that all calibration seals are intact. If you select No, the stored characterization data will be invalidated.

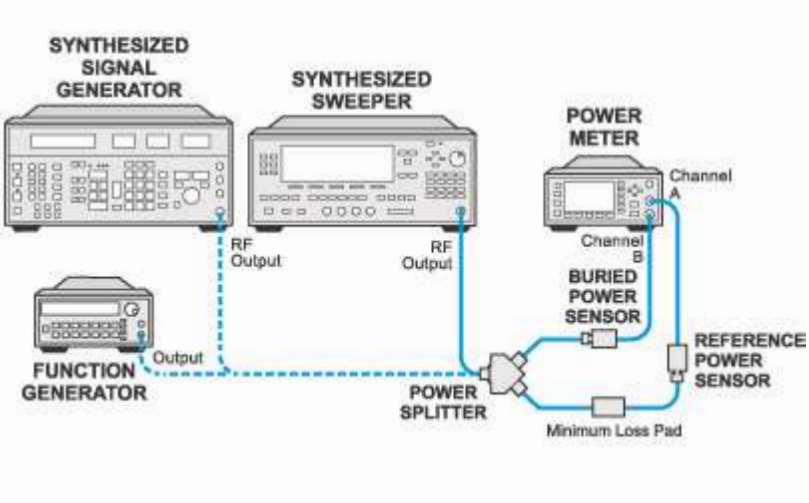
If valid characterization data does not exist, the software will prompt you to perform the characterization using the equipment already configured. Please note that the characterization data obtained as part of running a test or adjustment will not be stored for future use.

## Required Equipment

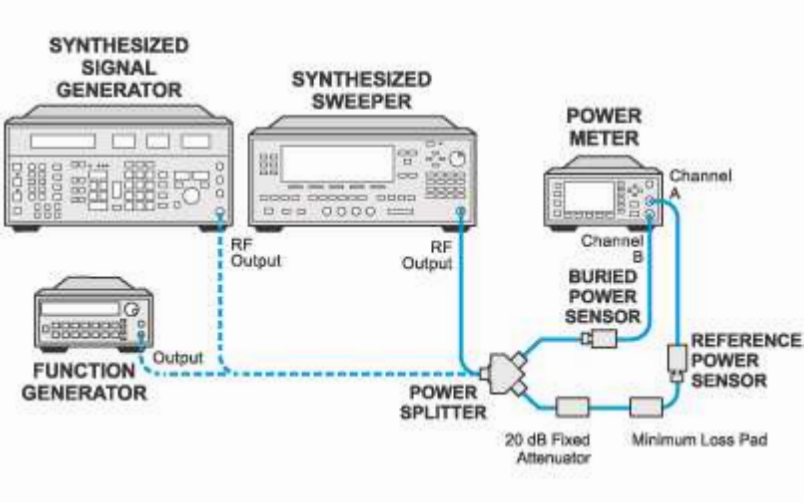
| Equipment | Recommended Model | For Characterization |
|---|---|---|
| Synthesized Signal Generator | E8257D | 1.5 GHz characterizations |
| Power Meter | N1914A | All |
| Power Sensor | | |
| Buried Sensor<br>(one required for each characterization performed) | N8482A-CFT | 75 W characterizations |
| Reference Sensor | 8483A | 75 W characterizations |
| Fixed Attenuator | 8491A<br>Option 020 | Low Power characterization |
| Minimum-Loss Pad | 11852B<br>Option 004 | 75 W characterizations |
| Power Splitter<br>(one required for each characterization performed) | 11667A | All |
| Cable, Type N | 11500B/C | All |
| Adapter, Type N (m) 50 W to Type N (f), 75 W | 1250-0597 | 75 W characterizations |

## Connection Setups

**Power Sensor/Splitter Characterization Setup, Medium Power**




**Power Sensor/Splitter Characterization Setup, Low Power**




TOP