Keysight Technologies
N8480 Series Power Sensors

Selection Guide

Upgrade your 8480 Power Sensor to the N8480 Series

KEYSIGHT TECHNOLOGIES

Contents

A New Thermocouple Power Sensor for Average or Complex Modulations Power Measurement

Keysight Technologies, Inc. is introducing the N8480 Series power sensors to replace its legacy 8480 Series power sensor (excluding the D-model sensor). The new N8480 Series power sensors offers new features, including a built-in EEPROM, better dynamic range up to 55 dB, better measurement accuracy and repeatability, as well as backward compatibility with existing Keysight power meters.

This document compares the legacy 8480 and the new N8480 power sensors. It also outlines the step-by-step migration from the 8480 to the N8480 Series with the EPM power meter.

Introduction

The 8480 Series power sensor is well recognized as an industry standard for power measurements. It has been available to the industry for over 30 years and is widely used in design, manufacturing, or metrology applications for continuous wave (CW) or complex modulated signals.

Keysight is introducing the N8480 Series power sensors, a new thermocouple power sensors as a replacement for the 8480 Series power sensors (excluding the D-model sensors). It is enhanced with a few key features such as built-in EEPROM, extended dynamic range, wider frequency range, and – most important– better accuracy and repeatability.

The N8480 Series is capable of measuring true average power for CW or complex modulated signals such as WLAN, WiMAX, or pulse signals. The N8480 Series is compatible with the EPM (E4418/19B and N1913/14A), EPM-P (E4416A/17A), and P-Series (N1911/12A) power meters. The N848x-CFT option is compatible with the power meter function of the Keysight Base Station Test Set (E7495A/B).

The N8480 Series sensors excluding Option CFT (N848x) measure power from –35 dBm to +44 dBm (sensor dependent), at frequencies from 100 kHz to 67 GHz.

The N8480 Series sensors with Option CFT (N848x-CFT) has SCPI compatibility with the 8480 Series and covers the dynamic range from –30 dBm to +44 dBm (sensor dependent).

Note

- The legacy power sensors 8481D, 8485D, 8487D, R8486D, Q8486D, V8486A, and W8486A are diode-based sensors and are not replaced.
- The N8480 Series power sensors refers to all respective power sensors unless otherwise stated.
- The N8480 Series Standard (N848x) in this document refers to the N8481A/B/H, N8482A/B/H, N8485A, N8487A, N8486AQ, N8486AR, and N8488A, while the N8480 Series Option CFT (N848x-CFT) refers to the N8481A/B/H-CFT, N8482A/B/H-CFT, N8485A-CFT, N8487A-CFT, N8486AQ-CFT, or N8486AR-CFT.

N8480 Series Power Sensors

Traditionally, legacy 8480 Series power sensors are designed without EEPROM and thus require cal factor data to be manually keyed into the power meter. The new N8480 Series comes with a built-in EEPROM that helps you to simplify your measurement processes by eliminating the needs to key in cal factors manually. However, you are required to modify your test software to accommodate this new feature of the N8480 Series power sensor. In order to maintain backward compatibility with the legacy 8480 Series, the N8480 Series was developed with the following two variants:

N8480 Series Standard (N848x)

- Similar to E-Series sensor behavior
- Automatically retrieve the EEPROM cal factor
- SCPI commands are exactly the same as the E-Series sensors

N8480 Series Option CFT (N848x-CFT)

- Similar to 8480 Series sensor behavior
- Manually enter the cal factor into power meter
- Cal factor table label available at the back of the sensor
- Supports all 8480 SCPI commands

Figure 1. N8480 Series power sensor

N8480 Series Standard (N848x)

The N8480 Series power sensor incorporates the latest sensing technology, with value-added features such as the built-in EEPROM circuit, wider dynamic range, and better linearity and accuracy.

Similar to the E-Series power sensors, the N8480 Series power sensors are designed with a built-in EEPROM to store the sensor characteristics such as model number, serial number, linearity, temperature compensation, calibration factors, and so forth. This feature ensures that this correction data will be loaded into the power meter when the sensor is moved from one power meter to another power meter. Therefore, it provides ease of use and convenience to you.

- Wider dynamic range: –35 dBm to +44 dBm (5 dB improvement from legacy 8480 Series)
  - –5 dBm to +20 dBm (N8481/82/85/87A/86AQ/86AR/88A)
  - 15 dBm to +35 dBm (N8481/82H)
  - 5 dBm to +44 dBm (N8481/82B)
- Wider frequency coverage: 100 kHz to 67 GHz (sensor dependent)
- Excellent power linearity of less than 1%
- EEPROM feature to store cal factors
- Compatible with EPM, EPM-P, and P-Series power meters (only applicable when used with compatible firmware)

N8480 Series Option CFT (N848x-CFT)*

The N848x-CFT behaves as the legacy 8480 Series sensors. You are required to enter the cal factor data manually for a particular frequency prior to make a measurement or enter the sensor cal factor table manually and select the frequency of signal to be measured.

- Dynamic Range: –30 dBm to +44 dBm (same as legacy 8480 Series)
  - –30 dBm to +20 dBm (N8481/82/85/87A/86AQ/86AR-CFT)
  - –10 dBm to +35 dBm (N8481/82H-CFT)
  - 0 dBm to +44 dBm (N8481/82B-CFT)
- Backward compatible with 8480 Series SCPI codes
- EEPROM feature is disabled to maintain backward compatibility with 8480
- Excellent power linearity of less than 1%
- Compatible with EPM, EPM-P, and P-Series power meters and E7495A/B base station test set.

1. * Not applicable for N8488A power sensor.

Key Specifications and Features

Key Specifications

Table 1: Comparison of Keysight 8480 and N8480 Series power sensors

	848x (Legacy Power Sensor)	N848x (Standard)	N848x-CFT (Option CFT)
Frequency	8481A/B/H: 10 MHz – 18 GHz 8482A/B/H: 100 kHz – 4.2GHz 8485A: 50 MHz – 26.5 GHz 8485A-033: 50 MHz – 33 GHz 8487A: 50 MHz – 50 GHz R8486A: 26.5 GHz – 40 GHz Q8486A: 33 GHz – 50 GHz	N8481A/B/H: 10 MHz – 18 GHz N8482A/B/H: 100 kHz – 6 GHz N8485A: 10 MHz – 26.5 GHz N8485A-033: 10 MHz – 33 GHz N8487A: 50 MHz – 50 GHz N8486AR: 26.5 GHz – 40 GHz N8486AQ: 33 GHz – 50 GHz N8488A: 10 MHz – 67 GHz*	N8481A/B/H: 10 MHz – 18 GHz N8482A/B/H: 100 kHz – 6 GHz N8485A: 10 MHz – 26.5 GHz N8485A-033: 10 MHz – 33 GHz N8487A: 50 MHz – 50 GHz N8486AR: 26.5 GHz – 40 GHz N8486AQ: 33 GHz – 50 GHz
Dynamic Range	8481/82/85/87A/R8486A/Q8486A: –30 dBm to +20 dBm 8481/82H: –10 dBm to +35 dBm 8481/82B: 0 dBm to +44 dBm	N8481/82/85/87A/86AR/ 86AQ/88A: –35 dBm to +20 dBm N8481/82H: –15 dBm to +35 dBm N8481/82B: –5 dBm to +44 dBm	N8481/82/85/87A/86AR/ 86AQ-CFT: –30 dBm to +20 dBm N8481/82H-CFT: –10 dBm to +35 dBm N8481/82B-CFT: 0 dBm to +44 dBm
Operations	Average thermocouple sensor	Behave like E-Series	Behave like 8480 Series
EEPROM	Manually enter cal factors into power meter	EEPROM's cal factors automatically loaded into power meter	Manually enter cal factors into power meter
Cal Factor Label	Cal factor label is attached to the sensor's cover	No cal factor label is attached to the sensor's cover	Cal factor label is attached to the sensor's cover
Programming Code	SCPI compliance	SCPI commands same as E-Series power sensor	SCPI commands same as 8480 Series power sensor
Dimension (mm)	8481/82A: 38(W) x 30(H) x 105(L) 8485/87A: 38(W) x 30(H) x 95(L) 8481/82B: 83(W) x 114(H) x 248(L) 8481/82H: 38(W) x 30(H) x 149(L) R8486A/Q8486A: 38(W) x 62(H) x 127(L)	N8481/82A: 38(W) x 30(H) x 130(L) N8485/87A: 38(W) x 30(H) x 121(L) N8481/82B: 83(W) x 114(H) x 283(L) N8481/82H: 38(W) x 30(H) x 174(L) N8486AR/AQ: 38(W) x 62(H) x 152(L) N8488A: 38(W) x 30(H) x 115(L)	N8481/82A: 38(W) x 30(H) x 130(L) N8485/87A: 38(W) x 30(H) x 121(L) N8481/82B: 83(W) x 114(H) x 283(L) N8481/82H: 38(W) x 30(H) x 174(L) N8486AR/AQ: 38(W) x 62(H) x 152(L)
Linearity	8481/82/85/87/R8486A/Q8486A: 3% (>10 dBm)	N8481/82/85/87/86AR/86AQ/ 88A: ±0.52% (–1 to <+15 dBm at 25 °C ±10 °C) ±0.80% (+15 dBm to +20 dBm at 25 °C ±10 °C)	N8481/82/85/87/86AR/86AQ: ±0.52% (–1 to <+15 dBm at 25 °C ± 10 °C) ±0.80% (+15 dBm to +20 dBm at 25 °C ±10 °C)

Key Specifications and Features (continued)

Table 1: Comparison of Keysight 8480 and N8480 Series power sensors

	848x (Legacy Power Sensor)	N848x (Standard)	N848x-CFT (Option CFT)
Linearity	8481/82B: 4% (>35 dBm) 8481/82H: 3% (>25 dBm)	N8481/82B: ±0.52% (29 dBm to <39 dBm at 25 °C ±10 °C) ±1.66% (39 dBm to 44 dBm at 25 °C ±10 °C) N8481/82H: ±0.77% (17 dBm to <30 dBm at 25 °C ±10 °C) ±2.84% (30 dBm to 35 dBm at 25 °C ±10 °C)	N8481/82B: ±0.52% (29 dBm to <39 dBm at 25 °C ±10 °C) ±1.66% (39 dBm to 44 dBm at 25 °C ±10 °C) N8481/82H: ±0.77% (17 dBm to <30 dBm at 25 °C ±10 °C) ±2.84% (30 dBm to 35 dBm at 25 °C ±10 °C)
Zero Set**	8481/82/85/87/R8486A/Q8486A: ±50 nW 8481/82B: ±50 µW 8481/82H: ±5 µW	N8481/82/85/87/86AQ/86AR/88A: ±25 nW N8481/82B: ±25 µW N8481/82H: ±2.5 µW	N8481/82/85/87/86AQ/86AR: ±63 nW N8481/82B: ±63 µW N8481/82H: ±6.3 µW
Zero Drift**	8481/82/85/87/R8486A/Q8486A: < ±10 nW 8481/82B: < ±10 µW 8481/82H: < ±1 µW	N8481/82/85/87/86AQ/86AR/88A: < ±3 nW N8481/82B: < ±3 µW N8481/82H: < ±0.3 µW	N8481/82/85/87/86AQ/86AR: < ±7 nW N8481/82B: < ±7 µW N8481/82H: < ±0.7 µW
Measurement Noise**	8481/82/85/87/R8486A/Q8486A: < 110 nW 8481/82B: < ± 110 µW 8481/82H: < ±10 µW	N8481/82/85/87/86AQ/86AR/88A: < ±80 nW N8481/82B: < ±80 uW N8481/82H: < ±8 µW	N8481/82/85/87/86AQ/86AR: < ±114 nW N8481/82B: < ±114 µW N8481/82H: < ±11.4 µW
Measurement Speed (readings/second)	20/40 s	20/40 s	20/40 s

* The N8488A is functional up to 70 GHz; with typical specification ranging from 67 GHz to 70 GHz.
** The zero set, zero drift, and measurement noise specifications are tested at 50 MHz.

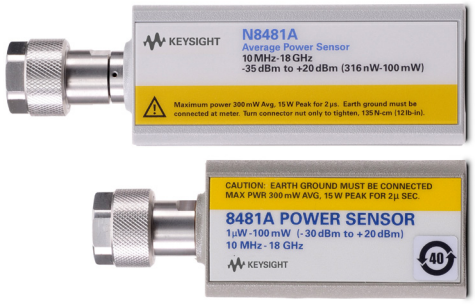

Figure 2. 8481A and N8481A sensor physical comparison

Calibration Factor Uncertainties Comparison

Calibration factor (CF) data is unique to each power sensor. The CF corrects the frequency response of the sensor. The Keysight EPM, EPM-P, and P-Series power meters automatically read the CF data stored in the sensor EEPROM and use it to make corrections.

Typical measurements uncertainties of the calibration factor for legacy 8480 and N8480 are shown in Figure 3. There is only one set of CF data used for both high and low range of each sensor. The typical measurement uncertainty data is meant to help you on the measurement uncertainty estimation. These values are only a guideline and are not to be used in any accurate uncertainty calculations.

For accurate measurement uncertainty values, please refer to the measurement report[1] of the specific power sensor.

1. Only applicable with the purchase of Option 1A7 or Option A6J

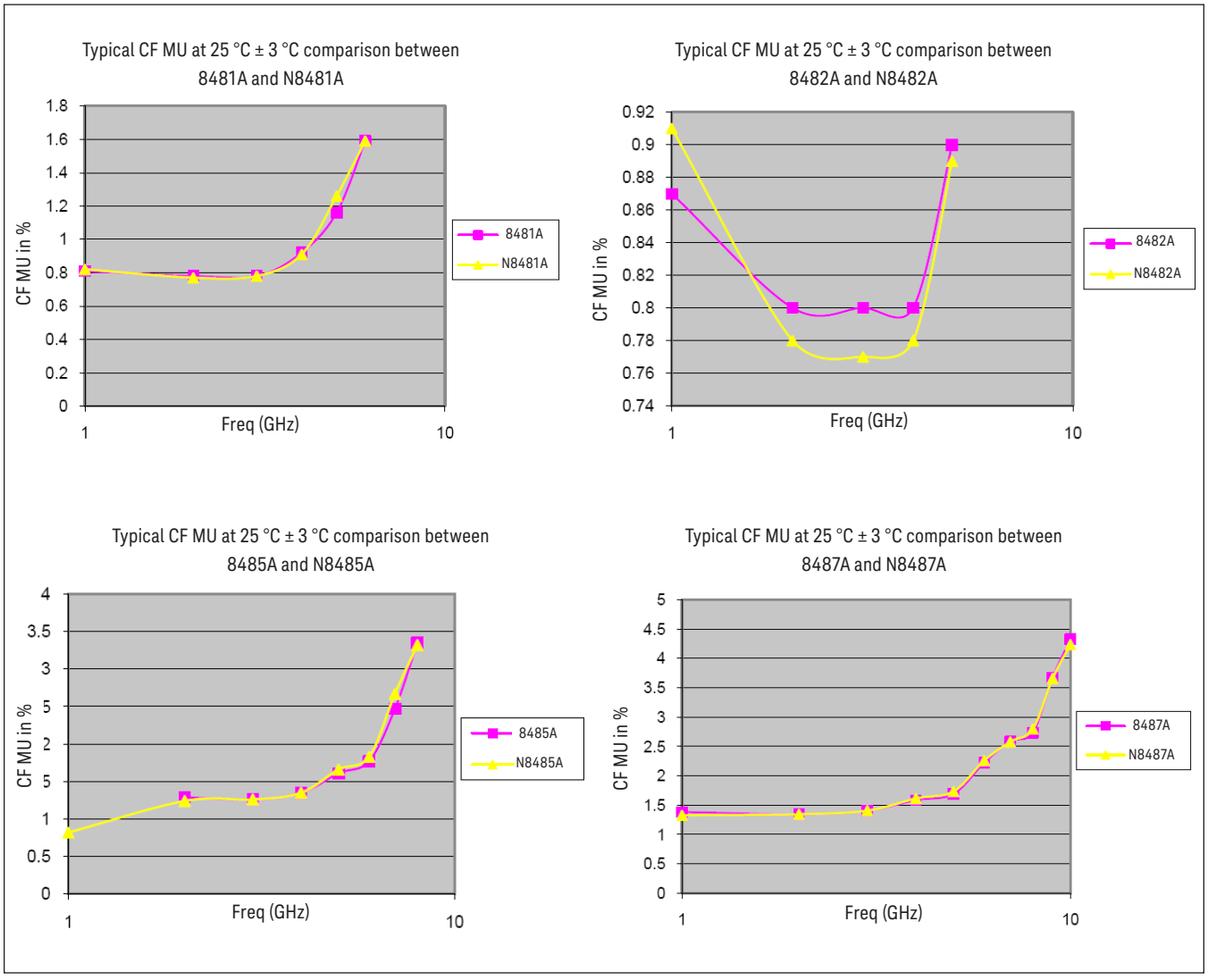

Figure 3. Typical calibration factor uncertainties comparison between the legacy 8480 and N8480

Power Meter Compatibility

The N8480 Series power sensors operate with the Keysight EPM, EPM-P, and P-Series power meters and also the Base Station Test Set (see Table 2). Firmware upgrades of the supported instruments are needed to ensure compatibility with the N8480 Series power sensors (see Table 3) .

Go to www.keysight.com/find/pm_firmware to download the latest firmware release. You may also locate the EPM, EPM-P, and P-Series power meters' firmware and firmware upgrade procedure in the *N8480 Series Power Sensors Product Reference CD*. Download the firmware upgrade and follow the process to upgrade the power meters firmware.

The legacy 8480 Series power sensors are designed for use with the power meters as shown in Table 2. To ensure power meter compatibility, you may need to migrate the unsupported power meter to EPM power meters when you migrate your legacy 8480 Series to the new N8480 Series power sensor.

For help to migrate the 435/6/7/8A/B power meter to the EPM power meter, refer to the *Keysight EPM Series 437B and 438A Compatibility application note*, publication number: 5968-4519E.

Table 2. Keysight instrument supportability with 8480 the Series and N8480 Series power sensors

	848x	N848x (standard)	N848x-CFT
EPM Series power meter (E4418/19B and N1913/14A)	Yes	Yes	Yes
EPM-P Series power meter (E4416/17A)	Yes	Yes	Yes
P-Series power meter (N1911/12A)	Yes	Yes	Yes
P-Series modular (N8262A)	Yes	No	No
Power meter (435/6/7/8A/B)	Yes	No	No
Power meter module (70100A)	Yes	No	No
VXI power meter (E1416A)	Yes	No	No
Microwave counter/Power meter/DVM (53147/8/9A)	Yes	No	No
Base station test set (E7495A/B)*	Yes	No	Yes

Table 3. Keysight instrument firmware revisions that support the N8480 Series power sensors

Power Meter	Model Number	Compatible Firmware Revision
EPM Series power meter	N1913A	A.01.00 and above
	N1914A	
	E4418B	A1.09.01 and above
	E4419B	A2.09.01 and above
EPM-P Series power meter	E4416A	A1.05.01 and above
	E4417A	A2.05.01 and above
P-Series power meter	N1911A	A.05.02 and above
	N1912A	
Base station test set	E7495A/B	A.06.24 and above

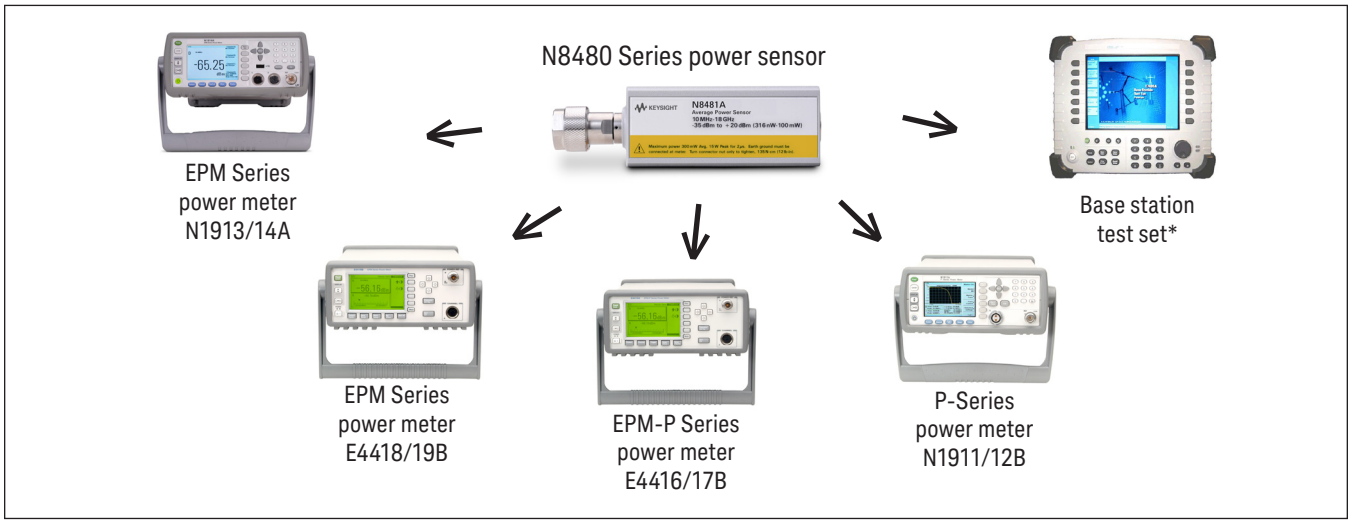

Figure 4. Power Meter compatibility

1. * Keysight Base Station Test Set (E7495A/B) supports 848x and N848x-CFT option power sensor.

SCPI Compatibility

Figure 5 illustrates the SCPI-command compatibility of the 8480, N848x, and N848x-CFT power sensors. The N848x-CFT provides SCPI backward compatibility with the legacy 8480 power sensor SCPI commands. No software change is needed in the existing test system for the N848X-CFT power sensor when working with a power meter. You are only required to upgrade the power meter firmware to the latest revision in order to operate with the N8480-CFT.

The N8480 Series provides an enhanced SCPI command set that is in general backward compatible with the 8480 Series power sensor. However, due to some new features and functions, some SCPI commands that work on the N8480 are unable to work on the 8480 and vice versa. For this reason, the N848x-CFT option was created for customers who require a full backward compatibility with the 8480 Series legacy power sensor.

Most of the SCPI commands supported by the legacy 8480 Series power sensor and N848x-CFT but not supported by the new N848x option are related to the entry, delete, rename, and selection of the sensor calibration factor table in the power meter (see Table 4). This is due to the cal factors that are automatically downloaded from the sensor EEPROM upon connection to the power meter.

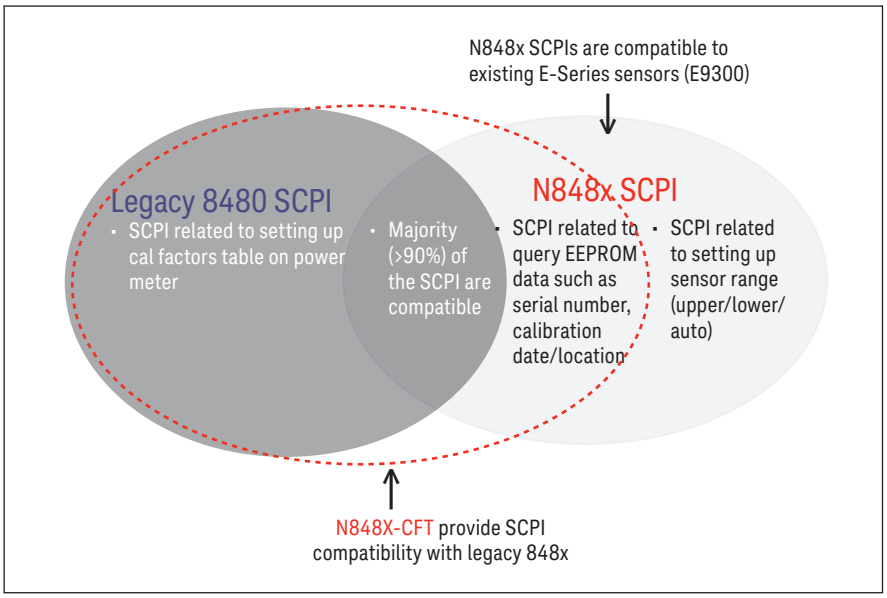

Figure 5. SCPI command compatibility for 8480, N848x, and N848x-CFT

Table 4. SCPI commands supported by the 848x and N848x-CFT, but not supported by the N848x

SCPI Commands	Function
CALibration:RCFactor	Setup the correct reference cal factors
SENSe1:CORRection:CSET1:STATe OFF/ON	Turn OFF/ON the sensor calibration table
SENSe1:CORRection:CSET1[:SELECT <string>	Select sensor calibration table.
SENSe1:CORRection:CSET1:STATE ON	Enable sensor calibration table
CORR:CSET1?	Query sensor calibration table for channel A
SENS2:V2P DTYP	Select the D-type linearity correction to be applied for channel B

There are some SCPI commands supported by N848x and N848x-CFT but not supported by the legacy 8480 power sensor (see Table 5). Most of the SCPI commands supported by N848x and N848x-CFT are related to EEPROM data such as calibration date, location of calibration, and serial number of sensor. These SCPI commands are not supported by the legacy 8480 because EEPROM is unavailable in these sensors.

Table 5. SCPI commands supported by N848x and N848x-CFT but not supported by the 8480 Series power sensors

SCPI Commands	Function
SERV:SENS1:CDATE?	Query calibration date for channel A
SERV:SENS1:CPL?	Query calibration location for channel A
SERV:SENS1:SNUM?	Query serial number for channel A

Table 6 shows the SCPIs supported by N848x (standard option) only. The SCPI commands are related to sensor ranging: lower, upper, or auto range. There is only one range in the 8480 Series and N8480-CFT; thus, range-switching commands are not supported.

Table 6. SCPI commands supported by N848x (standard option) only

SCPI Commands	Function
MEAS1? -30, DEF, (@1)	Perform power measurement with three optional parameters: expected power level, display resolution, and channel. In this example, –30 dBm is the expected power level.
CONF1 -30, DEF, (@2)	Configure the upper window to make a measurement with three optional parameters: expected power level, display resolution, and channel. In this example, –30 dBm is the expected power level.
SENS1:POW:AC:RANG 0|1	Set to lower or upper range
SENS1:POW:AC:RANG AUTO ON	Enable auto-ranging of the sensor
SERV:SENS:CAL	To access cal factor data in the EEPROM (only available when used with P-Series or EPM-P power meter)

Zeroing and Calibration

Standard (N848x-STD)

Similar to the E-Series and P-Series power sensors, N8480 Series power sensors require zero and calibration routines to be performed with the power meter to ensure the accuracy of the measurement. The Keysight N8480 Series (standard option) power sensor sets the reference calibration factor automatically. The power meter automatically reads the calibration factor (CF) data that is stored in the EEPROM of the sensor and uses it to make corrections. You no longer need to manually key-in the calibration factor into the power meter to optimize measurement accuracy.

Option-CFT (N848x-CFT) Calibration Factor Data Key-In into Power Meter

Similar to the 8480 Series power sensor, the Keysight N848x-CFT requires you to set the reference calibration factor. The calibration factor must be manually keyed into the power meter. Sensor calibration factors table are supplied with each power sensor on the calibration factor (CF) label pasted on every Option CFT unit.

There are two methods of providing correction data to the power meter, depending on the setting. If the sensor calibration table is turned OFF and the sensor calibration tables are not used, perform the following steps to make a measurement:

Step	Description
1	Zero and calibrate the power meter with the sensor connected.
2	Set the calibration factor (by referring to the CF label on the sensor base) on the frequency of the signal you want to measure.
3	Make the measurement.

In the second method, the sensor calibration table is turned ON, and the sensor calibration tables are used. This provides you with a quick and convenient method for making power measurements at a range of frequencies using one or more power sensors. Note that with the sensor calibration table selected, the reference calibration values (RCF) from the table overrides any value previously set. To use the sensor calibration tables:

Step	Description
1	Edit the sensor calibration table if necessary.
2	Select the sensor calibration table.
3	Enable the sensor calibration table.
4	Zero and calibrate the power meter..
5	Specify the frequency of the signal you want to measure. The calibration factor is automatically set by the power meter from the sensor calibration table.
6	Make the measurement.

Measurement Range Selection

The N848x has two measurement ranges: upper range and lower range (see Table 7). With the N848x sensors, the range can be set either automatically or manually. The manual range is invariably used to obtain faster measurement speed because the up/down range-switching associated with autoranging is inhibited. Use autoranging when you are not sure of the power level you will be measuring.

By default, the N848x sensor is set to AUTO range upon connecting to the power meter. The power meter thus will select the most suitable range for making the measurement.

The N848x-CFT sensors only have a single range (UPPER range). Therefore, range selection is not allowed.

Table 7. N848x (standard) measurement range selection

Sensor	Range Setting	Lower Range	Upper Range
N8481/2/5/7/8A, N8486AR/AQ excluding Option CFT	AUTO (default)	–35 dBm to –1 dBm	–1 dBm to +20 dBm
	LOWER	–35 dBm to –1 dBm	–
	UPPER	–	–30 dBm to +20 dBm
N8481/2B excluding Option CFT	AUTO (default)	–5 dBm to 29 dBm	+29 dBm to +44 dBm
	LOWER	–5 dBm to 29 dBm	–
	UPPER	–	0 dBm to +44 dBm
N8481/2H excluding Option CFT	AUTO (default)	–15 dBm to +17 dBm	+17 dBm to +35 dBm
	LOWER	–15 dBm to +17 dBm	–
	UPPER	–	–10 dBm to +35 dBm

Setting the Range
To set the range manually, use the following command:
[SENSe[1]]:POWer:AC:RANGe <numeric_value>

If the <numeric_value> is set to:
- 0, the sensor's lower range is selected.
- 1, the sensor's upper range is selected.

To enable autoranging use the following command:
[SENSe[1]]: POWer:AC:RANGe:AUTO ON

Measurement Speed

Like the 8480 Series power sensors, the N8480 Series power sensor measurement speeds are available in NORMAL and DOUBLE (2x) mode. The speed setting controls the cycle time of the measurement; i.e. 50 ms and 25 ms respectively. The typical maximum speed is shown in Table 8.

Fast speed is not available for N8480 Series power sensors. In Normal and Double modes, the power meter is operating at full instrument functionality.

Table 8. Measurement speed for N848x and N848x-CFT Series power sensor.

Sensor Type	Measurement speed (readings/second)	
	Normal	Double (x2)
N848x	20	40
N848x CFT	20	40

Setting the Measurement Speed
To set the measurement speed, use the following command:
[SENSe[1]]:MRATe <NORMal|DOUBle>
or
[SENSe[1]]:SPEed <20|40>

To check the measurement speed, use the following command:
[SENSe[1]]:SPEed?
or
[SENSe[1]]:MRATe?

Measurement Accuracy and Repeatability

This section shows the experiment results of measurement accuracy and repeatability for the 8481A legacy power sensors compared with the N8481A power sensors. The experiment was carried out under the following conditions. See Figure 6 for setup configuration:

i) Frequency = 1 GHz
ii) Power level = +20, 0, –30, and –35 dBm
iii) Test time duration = 15 hours
iv) Measurement reading = 1 measurement reading per minute

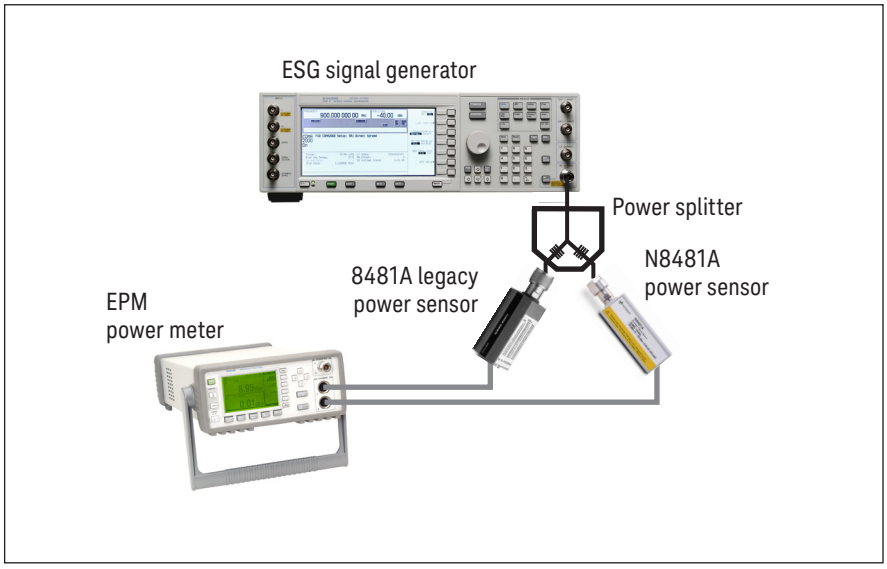

Figure 6. EPM, 8481A, N8481A, and ESG configuration diagram

The graph in Figure 7 shows the measurement accuracy and repeatability of the 8481A compared with the N8481A at power level +20 dBm. Both power sensors show ±0.01 dB measurement accuracy and repeatability.

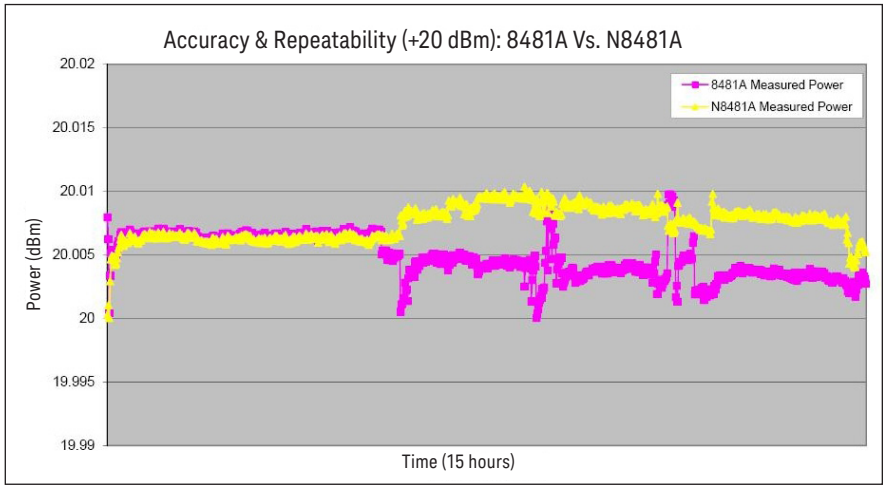

Figure 7. Measurement accuracy and repeatability graph, 8481A vs. N8481A at power level +20 dBm.

The graph in Figure 8 shows the measurement accuracy and repeatability of the 8481A compared with the N8481A at power level 0 dBm. Both power sensors show ±0.008 dB measurement accuracy and repeatability.

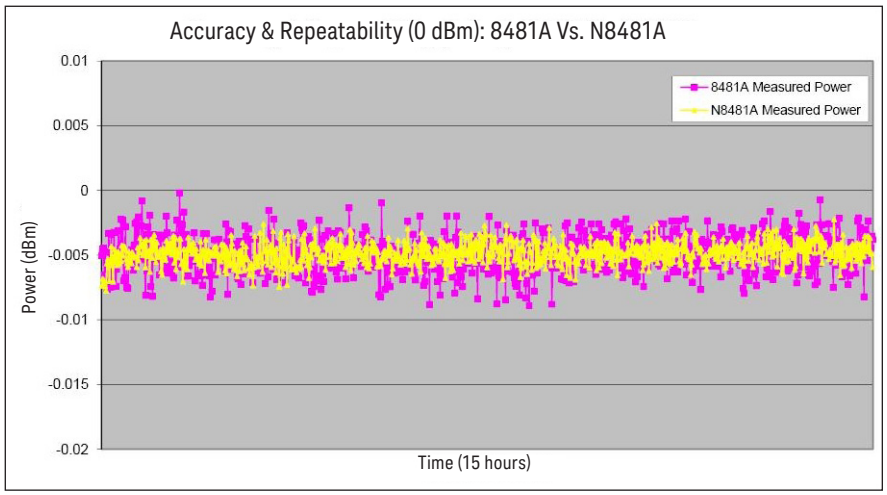

Figure 8. Measurement accuracy and repeatability graph, 8481A vs. N8481A at power level 0 dBm

The graph in Figure 9 shows the measurement accuracy and repeatability of the 8481A vs. N8481A at power level –30 dBm. At this power level, the 8481A power sensor shows ±0.4 dB variance measurement repeatability and accuracy versus ±0.1 dB for N8481A.

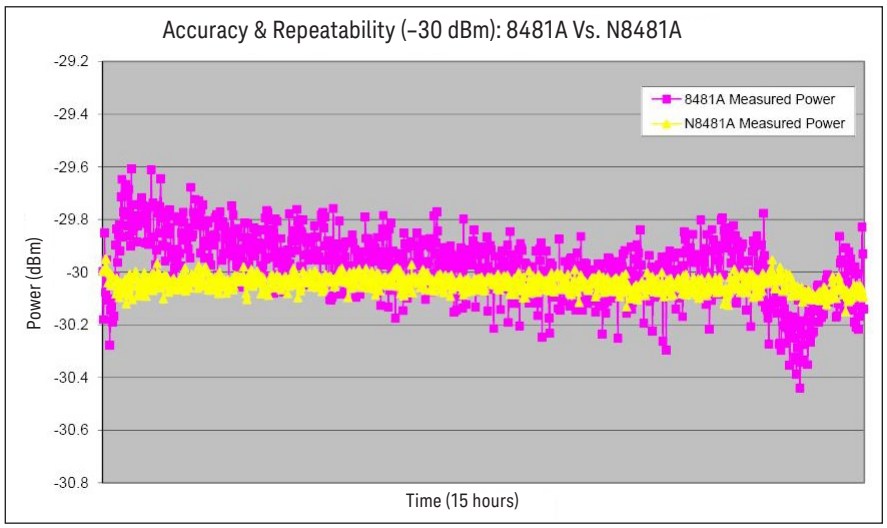

Figure 9. Measurement accuracy and repeatability graph, 8481A vs. N8481A at power level –30 dBm

Figure 10 shows the graph of measurement accuracy and repeatability for N8481A at power level –35 dBm. The N8481A achieves ±0.2 dB repeatability at –35 dBm. At –35 dBm, the power level is beyond the power range of the 8481A, and therefore no experiment was conducted.

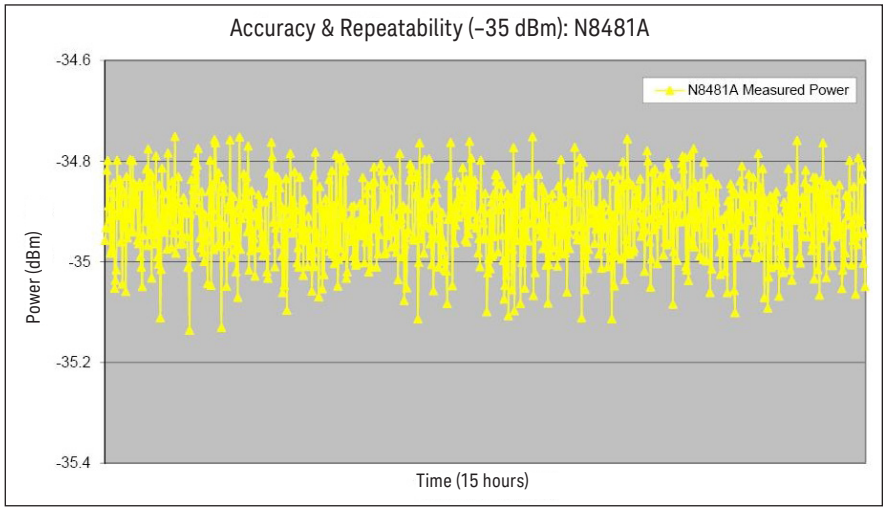

Figure 10. Measurement accuracy and repeatability graph for N8481A at power level –35 dBm

Step-by-Step Migration Guide from 8480 to N848x with EPM Power Meter

Prior to operating the N8480 Series power sensor, the power meter firmware needs to be upgraded to allow compatibility and full functionality. See Table 2 and Table 3 (Page 7) for the power meter compatibility and firmware revisions that support the N8480 Series power sensor.

Note
In some cases, the programming codes are written to query the sensor identification before performing the sub-routine process. The legacy 8480 Series power sensor will return “A”, “B”, “D”, or “H”. The new 8480 Series power sensor will return the model number stored in the sensor’s EEPROM. See example below:

When SERVice:SENSe:TYPE? is executed, each power sensors will return a different naming convention
8480 Series power sensor: A
N8480 Series power sensor: N8481A
N8480-CFT Series power sensor: N8481A-CFT

If you are using the N8480-CFT to replace the legacy 8480 sensor, and the SERVice:SENSe:TYPE? command to query the sensor identification, you should add the N848x-CFT model identification number into your programming code.

How to Use the N848x with the EPM Series Power Meter

Step	Description
1	Make sure the power meter firmware is upgraded to the latest revision.
2	Connect the N8481A to the EPM power meter (see Figure 11).
3	Turn on the power meter.
4	Connect the N8481A power sensor to the POWER REF port of the power meter.
5	Perform zeroing and calibration. Upon powering up, the N8481A power sensor calibration factor is automatically downloaded into the power meter. Press [Zero/Cal], {Zero}, and {Cal} (see Figure 12).
6	Enter the frequency of the signal you want to measure. Press [Frequency | Cal Factor] and {A Freq} (see Figure 13). Press the [↑], [↓], [→], or [←] key to change the frequency.
7	Start the measurement.

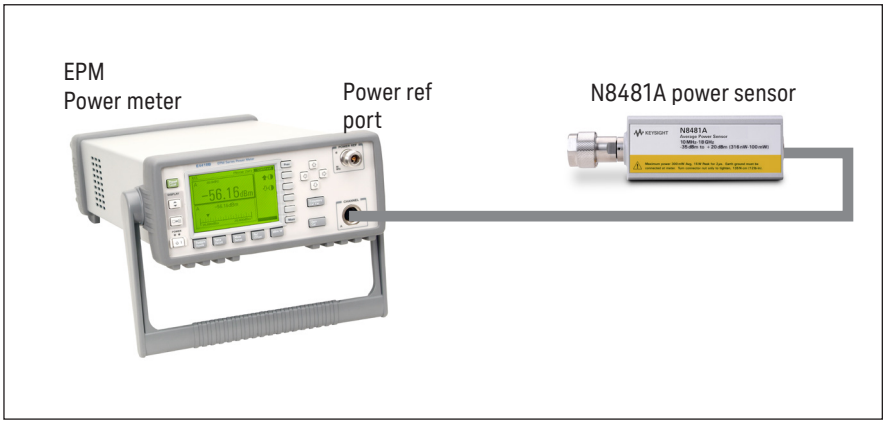

Figure 11. N8481A power sensor and EPM power meter connection configuration

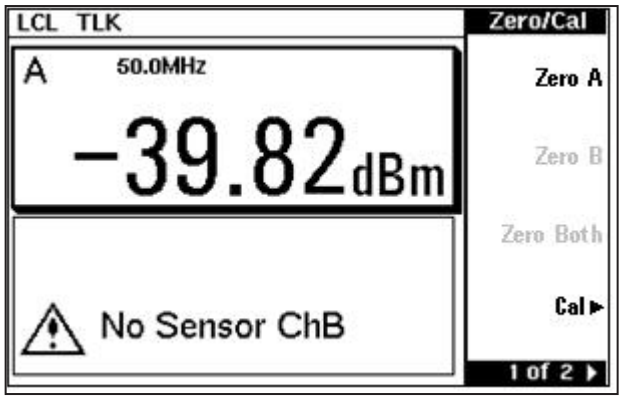

Figure 12. Power meter zero and cal menu

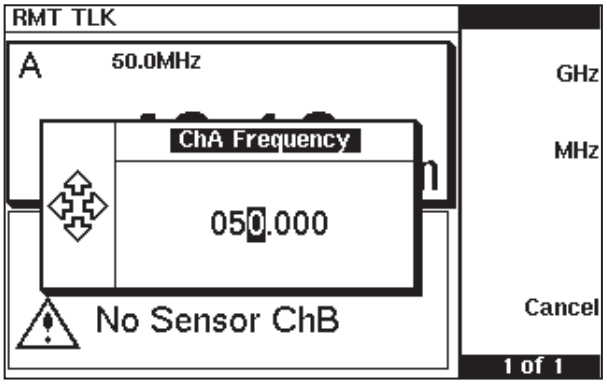

Figure 13. Frequency edit screen

How to Use the N848x-CFT with the EPM Series Power Meter

Step	Description
1	Make sure the power meter firmware is upgraded to the latest revision.
2	Connect the N8481A-CFT to the EPM power meter (see Figure 14).
3	Turn on the power meter.
4	Key in the cal factor into the power meter. The N8481A-CFT requires you to manually key the cal-factor value into the power meter, based on the attached CF label on the CFT unit power sensor. i.Press [System|Input], {Tables ▶}, and {Sensor Cal Tables} (see Figure 15). ii.Manually rename one of the tables to "N8481" and key in the cal factor value. In this example, we are using Table 0: "Default." Press {Edit Table}; Press [↑], [↓], [→], or [←] key to add the frequency point and its CF value (see Figure 15). After you have done keying in the CF value, press {Done}. iii.Turn on the table cal factor. Press {A Table} to "On" and press {Done} (see Figure15) to complete the editing process and save the table.
5	Perform zeroing and calibration. Press [Zero/ Call] (see Figure 12).
6	Enter the frequency of the signal you want to measure. Press [Frequency | Cal Factor] and {A Freq} (see Figure 14). Press [↑], [↓], [→], or [←] key to change the frequency.
7	Start the measurement.

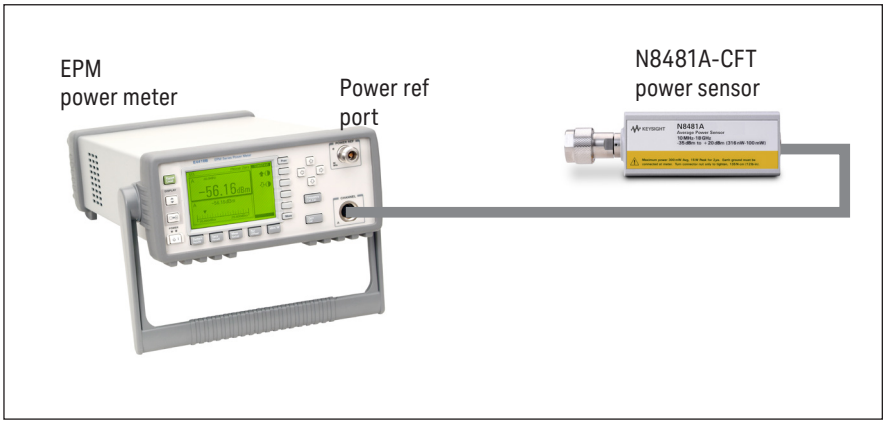

Figure 14. N8481A-CFT power sensor and EPM power meter connection configuration

RMT TLK

Sensor Tbls

Tbl	Name	State	Pts
0	DEFAULT	off	2
1	HP8481A	off	19
2	HP8482A	off	12
3	HP8483A	off	10
4	HP8481D	off	21
5	HP8485A	off	18
6	R8486A	off	17
7	Q8486A	off	19
8	R8486D	off	0
9	HP8487A	off	54

Edit Table

A Table
Off On

B Table
Off On

Done

1 of 1

Figure 15: Sensor table selected screen

RMT TLK

Edit Cal

Name: N8481
Ref CF: 100.0%

Freq	Cal Fac
100.000MHz	99.9%
2.000GHz	98.2%
3.000GHz	97.9%
4.000GHz	97.6%
5.000GHz	97.3%
6.000GHz	97.0%
7.000GHz	96.6%
8.000GHz	96.1%

Change

Insert

Delete

Done

1 of 1

Figure 16. “Edit Cal” screen

Conclusion

Migrating the legacy 8480 power sensor to the N8480 Series power sensor is a simple process that has been outlined in this migration guide. You will benefit from the new features added to the N8480 Series power sensor:

- Built-in EEPROM to store cal factor, N848x (standard option)
- Easy calibration without having to manually key-in the calibration factors leads to increased productivity and reduced operator errors.
- Wide dynamic range up to 55 dBm, N848x (standard option)
- Extend the measurement dynamic measurement range to 55 dBm for single thermocouples power sensor.
- Better measurement accuracy and repeatability
- Measurement accuracy and repeatability are improved, especially at low power ranges, compared with the legacy 8480 power sensor.
- Compatible with Keysight EPM, EPM-P, and P-Series power meters
- SCPI command's backward compatibility with the N8480 Series power sensor minimize the programming re-coding needed. The backward compatibility with Keysight EPM, EPM-P, and P-Series power meter protects your investment in Keysight products.
- Only the N848x-CFT option is compatible with the power meter function of the Keysight Base Station Test Set (E7495A/B).

References

- *4 Steps for Making Better Power Measurements Application Note,* publication number: 5968-4519EN
- *EPM Series 437B and 438A Compatibility Application Note*, publication number: 5968-4519EN

Related Literatures

- *Internal Zeroing and Calibration for RF Power Sensors, Application Note,* publication number: 5989-6509EN
- *N8480 Series Thermocouple Power Sensor,* Data Sheet, publication number: 5989-9333EN
- *N8480 Series Thermocouple Power Sensor,* Technical Overview, publication number: 5990-3857EN

Related Links

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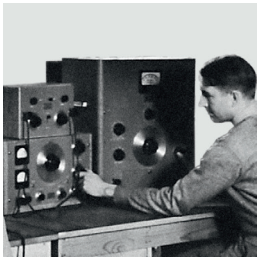

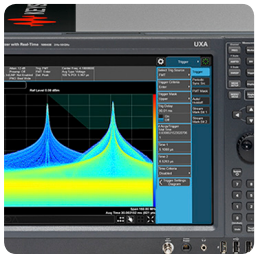

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