Agilent U8480 Series USB Thermocouple Power Sensor

Service Guide

Agilent Technologies

Notices

Manual Part Number

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The following general safety precautions must be observed during all phases of operation, service, and repair of this device. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the device. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

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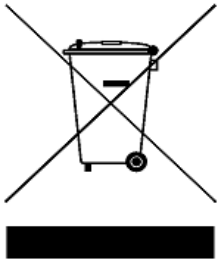

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To return this unwanted device, contact your nearest Agilent office, or visit

www.agilent.com/environment/product

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Environmental Conditions

This device is designed for indoor use only. The following table shows the general environmental requirements for this device.

Operating environment

Environmental condition	Requirement
Temperature	0 °C to 55 °C (operating)
Humidity	Maximum: 95% RH at 40 °C (non-condensing) Minimum: 15% RH at 25 °C (non-condensing)
Altitude	Operating up to 4.6 km (15000 ft)

Storage condition

Environmental condition	Requirement
Temperature	–40 °C to 71 °C (non-operating)
Humidity	Non-operating up to 90% RH at 65 °C (non-condensing)
Altitude	Non-operating up to 4.6 km (15000 ft)

Regulatory information

The U8480 Series USB thermocouple power sensor complies with the following EMC requirements:

- IEC 61326-1:2005 / EN 61326-1:2006
- Canada: ICES/NMB-001: Issue 4, June 2006
- Australia/New Zealand: AS/NZS CISPR11:2004

Declaration of Conformity (DoC)

The Declaration of Conformity (DoC) for this device is available on our Web site. You can search for the DoC by its product model or description.

http://regulations.corporate.agilent.com/DoC/search.htm

NOTE If you are unable to search for the respective DoC, contact your local Agilent representative.

In This Guide...

1 General Information

Chapter 1 provides the specifications and maintenance information of the U8480 Series.

2 Performance Verification and Adjustments

Chapter 2 contains the performance verification procedures which verify that the U8480 Series is operating within its published specifications. This chapter also provides information on adjustments performed after a performance verification fails.

3 Theory of Operation

Chapter 3 describes the operation and functions of the U8480 Series assembly.

4 Repair Guide

Chapter 4 details the replaceable parts of the U8480 Series. It also explains how to assemble and disassemble the U8480 Series.

5 Contacting Agilent

Chapter 5 explains the appropriate actions to take if you have a problem with your U8480 Series.

Contents

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1 General Information

This chapter provides the specifications and maintenance information of the U8480 Series USB thermocouple power sensor.

Specifications and Characteristics

For the U8480 Series specifications and characteristics, refer to the *U8480 Series User's Guide*.

Cleaning

Use a clean, water-dampened cloth to clean the body of the U8480 Series.

Connector care

A solution of pure isopropyl or ethyl alcohol can be used to clean the connector but make sure to keep in mind its flammable nature.

CAUTION

- The RF connector beads deteriorate when contacted by hydrocarbon compounds such as acetone, trichloroethylene, carbon tetrachloride, and benzene.
- Do not attempt to clean the connector with anything metallic such as pins or paper clips.
- Clean the connector only at a static-free workstation. Electrostatic discharge to the center pin of the connector will render the U8480 Series inoperative.

Clean the connector face by first using a blast of compressed air. If the compressed air fails to remove contaminants, use a foam swab dipped in isopropyl or ethyl alcohol. If the swab is too big, use a round wooden toothpick wrapped in a lint-free cloth dipped in isopropyl or ethyl alcohol.

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2 Performance Verification and Adjustments

This chapter contains the performance verification procedures which verify that the U8480 Series is operating within its published specifications. This chapter also provides information on adjustments performed after a performance verification fails.

NOTE

For valid performance verification, the following conditions must be met:

- The U8480 Series and test equipment must be allowed a 1-hour warm up period for all specifications.
- The ambient temperature must be within 25 °C ± 10 °C.

Equipment List

The following equipment are required for performance verification:

Equipment	Critical specification	Recommended Agilent model number/part number
Signal generator	Power range: –50 dBm to +20 dBm at 1 GHz Output resistance: 50 Ω	N5182A/E8257D/E8267D
Network analyzer	Frequency range: • 10 MHz to 67 GHz (dependent on DUT[1]) • 9 kHz to 6 GHz (for the Option 200)	E8361A/E8361C/E8363B/E8363C E5071C
Calibration kit	Frequency range: DC to 67 GHz (dependent on DUT)	85054A/85054D/85056A/85056D/ 85058B
Power splitter	Two-resistor type power splitter • N-type (f) • 3.5 mm (f) • 2.4 mm (f) Frequency range: DC to 67 GHz (dependent on DUT)	11667A/11667B/11667C/11667CH65
Power meter	Average power meter, compatible with 8480 Series and N8480 Series power sensors Absolute accuracy: ±0.8%	N1913A/N1914A/E4416A/E4417A
Power sensor	Frequency: 10 MHz or above Power range: –30 dBm to +20 dBm Standing wave ratio (SWR): ≤1.15 at 50 MHz	N8481A/N8485A/N8487A/N8488A
Sensor cable	Sensor cable for the average power measurement	11730A
Amplifier	Maximum output power: ≥30 dBm	—

Equipment	Critical specification	Recommended Agilent model number/part number
Attenuator/switch driver	—	11713B
Attenuator	8494H: 0 to 11 dB programmable step attenuator, 0 to 18 GHz 8496H: 0 to 110 dB programmable step attenuator, 0 to 18 GHz 8491B: 10 dB coaxial fixed attenuator, DC to 18 GHz (N-type) 8493C: 10 dB coaxial fixed attenuator, DC to 26.5 GHz (3.5 mm)	8494H, 8496H, 8491B, 8493C
Connector	N-type (m)-to-3.5 mm (f) connector N-type (m)-to-2.4 mm (f) connector Characteristic impedance: 50 Ω	08485-60005 08487-60001
Computer	Desktop PC: 1.3 GHz Pentium® IV or higher recommended Laptop PC: 900 MHz Pentium® M or higher recommended RAM: 1.0 GB or higher Operating system: Windows® XP Professional Service Pack 2 or above (32-bit) Software: Agilent N1918A Power Analysis Manager (version R03.09.00 or above) and Agilent IO Libraries Suite 16.0 or above	—

[1] DUT stands for Device-Under-Test.

Voltage Standing Wave Ratio (VSWR) Performance Verification

VSWR is a measure of how efficiently RF power is transmitted from an RF power source. In real systems, mismatched impedances between the RF source and load can cause some of the power to be reflected back towards the source and vary the VSWR.

Procedure (DC to 10 MHz)

This performance verification requires the following equipment:

- network analyzer (E8361A/3B/4B)
- mechanical calibration kit (85054B/D)

1. Turn on the network analyzer and allow it to warm up for approximately an hour.
2. Set the start frequency of the network analyzer to 9 kHz and the stop frequency to 10 MHz (for the Option 200 model of the U8481A/85A).
3. Calibrate the network analyzer using the appropriate calibration kit. Perform calibration for the open, short, and load circuits of the network analyzer.
4. After calibration, connect the U8480 Series to the test port of the network analyzer. Turn on **Correction** on the network analyzer to perform the VSWR measurement.
5. Compare the measured results to the specifications in the table below. If the verification fails, refer to "Adjustments" on page 22.

Procedure (10 MHz to 67 GHz)

This performance verification requires the following equipment:

- network analyzer (E8361A/3B/4B)
- calibration kit (85054B/D, 85056A/D, 85058B/E)

1. Turn on the network analyzer and allow it to warm up for approximately an hour.
2. Set the start frequency of the network analyzer to 10 MHz and the stop frequency to 18 GHz (for the U8481A), 33 GHz (for the U8485A), 50 GHz (for the U8487A), or 67 GHz (for the U8488A).

3 Calibrate the network analyzer using the appropriate calibration kit (85054B/D for the U8481A, 85052B/C for the U8485A, 85056A/D for the U8487A, and 85058B/E for the U8488A). Perform calibration for the open, short, and load circuits of the network analyzer.

4 After calibration, connect the U8480 Series to the test port of the network analyzer. Turn on **Correction** on the network analyzer to perform the VSWR measurement.

5 Compare the measured results to the specifications in the table below. If the verification fails, refer to "Adjustments" on page 22.

Frequency band	U8481A	Frequency band	U8485A
	25 °C ± 10 °C		25 °C ± 10 °C
DC to 10 MHz[1]	1.11	DC to 10 MHz[1]	1.07
10 MHz to 30 MHz	1.37	10 MHz to 50 MHz	1.33
30 MHz to 50 MHz	1.14	50 MHz to 100 MHz	1.08
50 MHz to 2 GHz	1.08	100 MHz to 2 GHz	1.05
2 GHz to 12.4 GHz	1.16	2 GHz to 12.4 GHz	1.14
12.4 GHz to 18 GHz	1.23	12.4 GHz to 18 GHz	1.19
—	—	18 GHz to 26.5 GHz	1.26
—	—	26.5 GHz to 33 GHz	1.37
Frequency band	**U8487A**	**Frequency band**	**U8488A**
	25 °C ± 10 °C		**25 °C ± 10 °C**
10 MHz to 50 MHz	1.35	10 MHz to 100 MHz	1.06
50 MHz to 100 MHz	1.08	100 MHz to 2.4 GHz	1.06
100 MHz to 2 GHz	1.05	2.4 GHz to 12.4 GHz	1.13
2 GHz 12.4 GHz	1.10	12.4 GHz to 18 GHz	1.14
12.4 GHz to 18 GHz	1.16	18 GHz to 26.5 GHz	1.20
18 GHz to 26.5 GHz	1.22	26.5 GHz to 40 GHz	1.25
26.5 GHz to 40 GHz	1.30	40 GHz to 67 GHz	1.42
40 GHz to 50 GHz	1.34	*67 GHz to 70 GHz*	*1.36*

[1] Only applicable for the U8480 Series Option 200 models.

Power Linearity Performance Verification

The power linearity performance verification measures the relative linearity error of the U8480 Series. All measurements are performed at 50 MHz. The reference power level for the linearity measurement is 0 dBm for the U8481A, U8485A, U8487A, and U8488A.

This performance verification requires the following equipment:

- signal generator (N5182A)
- thermocouple-based average power sensor, as a reference sensor (N8481/85/87/88A)
- power meter (N1914A)
- power splitter (11667A/B/C)
- amplifier
- step attenuators (8494H and 8496H)
- attenuator/switch driver (11713B)
- computer, with the N1918A Power Analysis Manager and the Agilent IO Libraries Suite installed

System specifications (*after zeroing and calibration at ambient environmental conditions*):

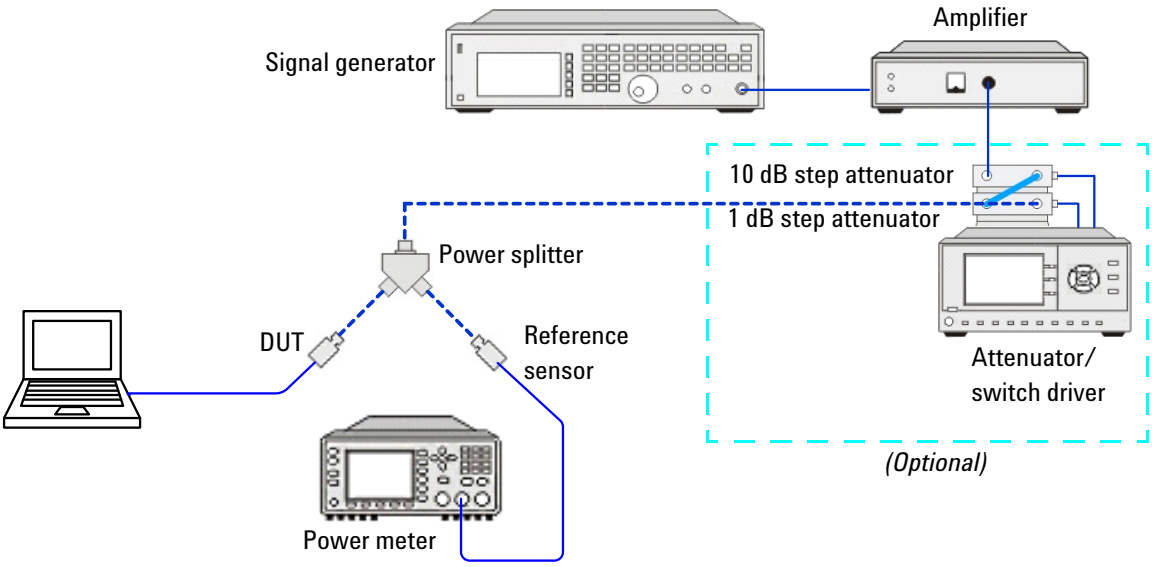
- –1 to 15 dBm, ± 0.50% (25 °C ± 10 °C)
- 15 to 20 dBm, ± 0.55% (25 °C ± 10 °C)

NOTE The linearity specification is calculated with a root sum of the squares (RSS) of the U8480 Series linearity specification and the reference power sensor linearity specification. Refer to "Power linearity performance verification" on page 19 for details.

Procedure

1. Turn on the signal generator and power meter (with the reference sensor connected). Connect the DUT (U8480 Series) to the computer. Allow them to warm up for approximately an hour.
2. Zero and calibrate the DUT using the N1918A software and the reference sensor with the power meter.

3 Connect the power splitter to the RF output of the signal generator. The equipment setup is as shown below.



4 Set the continuous wave signal frequency of the signal generator, DUT, and reference sensor to 50 MHz.

5 Start tuning the signal generator and/or attenuator/switch driver (optional) until the DUT measures the power level as close as 0 dBm. Record the values as $P_{DUT\ at\ 0\ dBm}$ and $P_{ref\ at\ 0\ dBm}$.

CAUTION Do not exceed the maximum input power (27 dBm) of the power splitter to avoid damage to the power splitter.

6 Record the power measured by the power meter as P_{ref} and the DUT power measured via the N1918A as P_{DUT}.

7 Normalize both P_{ref} and P_{DUT} to the power measured at 0 dBm, based on the following equation:

Normalization
= Measured Power ($P_{DUT/ref}$) – Measured Power at 0 dBm ($P_{DUT/ref\ at\ 0\ dBm}$)

8 Calculate the linearity error of the DUT for the power level using the following equation:

$$\text{Linearity error (dB)} = [P_{DUT}]_{\text{norm to 0 dBm}} - [P_{ref}]_{\text{norm to 0 dBm}}$$

$$\text{Linearity error (\%)} = \left[Antilog\left(\frac{[P_{DUT}]_{\text{norm to 0 dBm}} - [P_{ref}]_{\text{norm to 0 dBm}}}{10} \right) - 1 \right] \times 100$$

9 Compare the calculated linearity error to the system specifications, and record the linearity error in the table at "Power linearity performance verification" on page 19. If the verification fails, refer to "Adjustments" on page 22.

10 Repeat steps 6 to 9 by sweeping through the power levels from –1 dBm to 20 dBm with the same frequency of 50 MHz.

11 For the range of 16 to 20 dBm, add a 10 dB attenuator (8491B/8493C) before the reference sensor and repeat step 5 once. This is to ensure that the linearity specification of the reference sensor is within the range of –1 to <15 dBm (± 0.52%) instead of 15 to 20 dBm (± 0.80%).

Zero Set Performance Verification

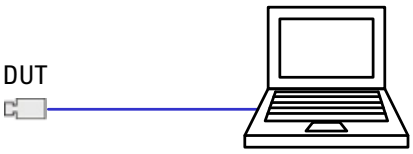
This performance verification is carried out to verify that a minimal amount of residual offset error is present after zeroing has been performed. The offset error is caused by contamination from several sources including the noise of the device-under-test (DUT) itself. Zero set is the difference between the power levels indicated by the DUT, after executing zeroing and the true zero power. Ideally, this difference should be zero.

This performance verification requires a computer with the Agilent IO Libraries Suite installed.

System specification: ± 25 nW, tested at 50 MHz

Procedure

1 Connect the DUT (U8480 Series) to the computer as shown in the following diagram. Then, launch the Agilent IO Libraries Suite on the computer.



2 Warm up the DUT for approximately an hour.

3 Launch the Interactive IO on the Agilent IO Libraries Suite to send SCPI commands to the DUT.

4 Terminate the DUT with a load.[1]

5 Perform zeroing for the DUT by sending "`CAL:ZERO:AUTO ONCE`".

6 Perform internal calibration for the DUT by sending "`CAL:TYPE INT`" and "`CAL:AUTO ONCE`".

7 Set the frequency of the DUT to 50 MHz by sending "`FREQ 50MHz`".

8 Enable auto-averaging for the DUT by sending "`AVER:COUN:AUTO ON`".

1 Optional for all models except the U8488A.

9 Change the power measurement unit of the DUT to watt by sending "UNIT:POW W".

10 Set the DUT to the single trigger mode by sending "INIT:CONT OFF".

11 Read the noise level of the DUT by sending "READ?" and then record the reading.

12 Repeat step 10 for 10 times, and then calculate the mean value of the readings.

13 Compare the calculated mean value to the system specification. If the verification fails, refer to "Adjustments" on page 22.

Internal Calibration Performance Verification

This performance verification is carried out to verify the accuracy of the U8480 Series internal calibration.

This performance verification requires the following equipment:

- power meter (N1914A)
- computer, with the N1918A Power Analysis Manager and the Agilent IO Libraries Suite installed

System specification: ± 0.52% ≈ ± 0.0225 dB (25 ± 10 °C)

This specification applies for the 50 MHz frequency and at least 3 hours of settling time with internal calibration.

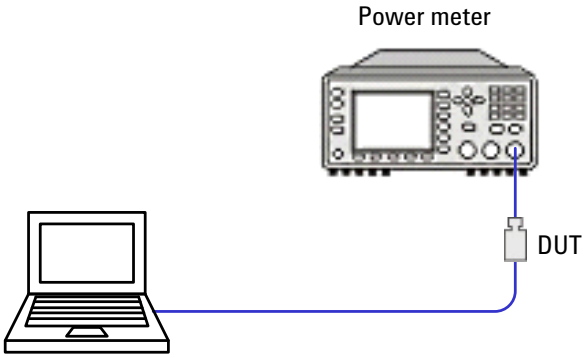
NOTE

This test verifies the power level accuracy of the internal 50 MHz reference source. The power reference output is factory-adjusted to 1 mW ± 0.52% (for 25 °C ± 10 °C). This accuracy includes a performance limit of 0.27% and a system measurement uncertainty figure of 0.25% (traceable to the National Physical Laboratory (NPL), United Kingdom).

The setting of the internal reference source output accuracy is determined from the product performance test line limit plus system measurement uncertainty. For example, with a product performance test line limit of 1 mW ± 0.27% and using a system measurement uncertainty of ± 0.4%, the overall accuracy of the test setup for the 1 mW power output becomes 0.27% + 0.4%, giving a setting accuracy of 0.67%.

Procedure

1. Turn on the power meter, and connect the DUT (U8480 Series) to the computer.
2. Launch the Agilent IO Libraries Suite on the computer, and connect the DUT to the 1 mW reference calibration connector of the power meter. The equipment setup is as shown on the following page.



3 Perform internal calibration for the DUT by sending "CAL:TYPE INT" followed by "CAL:ALL".

4 Change the power measurement unit of the DUT to watt by sending "UNIT:POW W".

5 Turn on the 1 mW reference calibration source of the power meter, and then wait for 3 hours.

6 Set the DUT to the single trigger mode by sending "INIT:CONT OFF".

7 Read the power level of the DUT by sending "READ?", and then record the reading.

8 Compare the reading to the system specification. If the verification fails, repeat steps 3 to 7. If the verification fails for three times consecutively, refer to "Adjustments" on page 22.

Performance Verification Test Records

VSWR performance verification

Sensor model	Frequency band	Maximum VSWR 25 °C ± 10 °C	Actual result
U8481A	DC to 10 MHz[1]	1.11	
	10 MHz to 30 MHz	1.37	
	30 MHz to 50 MHz	1.14	
	50 MHz to 2 GHz	1.08	
	2 GHz to 12.4 GHz	1.16	
	12.4 GHz to 18 GHz	1.23	
U8485A	DC to 10 MHz[1]	1.07	
	10 MHz to 50 MHz	1.33	
	50 MHz to 100 MHz	1.08	
	100 MHz to 2 GHz	1.05	
	2 GHz to 12.4 GHz	1.14	
	12.4 GHz to 18 GHz	1.19	
	18 GHz to 26.5 GHz	1.26	
	26.5 GHz to 33 GHz	1.37	

[1] Only applicable for the U8480 Series Option 200 models.

Sensor model	Frequency band	Maximum VSWR 25 °C ± 10 °C	Actual result
U8487A	10 MHz to 50 MHz	1.35	
	50 MHz to 100 MHz	1.08	
	100 MHz to 2 GHz	1.05	
	2 GHz 12.4 GHz	1.10	
	12.4 GHz to 18 GHz	1.16	
	18 GHz to 26.5 GHz	1.22	
	26.5 GHz to 40 GHz	1.30	
	40 GHz to 50 GHz	1.34	
U8488A	10 MHz to 100 MHz	1.06	
	100 MHz to 2.4 GHz	1.06	
	2.4 GHz to 12.4 GHz	1.13	
	12.4 GHz to 18 GHz	1.14	
	18 GHz to 26.5 GHz	1.20	
	26.5 GHz to 40 GHz	1.25	
	40 GHz to 67 GHz	1.42	
	67 GHz to 70 GHz	*1.36*	

Power linearity performance verification

Power level (dBm)	Power linearity specification (%)		Calculated linearity error (%)
	25 °C ± 10 °C		
	U8481A, U8485A	U8487A, U8488A	
–1	±0.60	±0.59	
0	±0.60	±0.59	
1	±0.60	±0.59	
2	±0.60	±0.59	
3	±0.60	±0.59	
4	±0.60	±0.59	
5	±0.60	±0.59	
6	±0.60	±0.59	
7	±0.60	±0.59	
8	±0.60	±0.59	
9	±0.60	±0.59	
10	±0.60	±0.59	
11	±0.60	±0.59	
12	±0.60	±0.59	
13	±0.60	±0.59	
14	±0.60	±0.59	
15	±0.60	±0.59	
16	±0.75	±0.60	
17	±0.75	±0.60	
18	±0.75	±0.60	

Power level (dBm)	Power linearity specification (%)		Calculated linearity error (%)
	25 °C ± 10 °C		
	U8481A, U8485A	U8487A, U8488A	
19	±0.75	±0.60	
20	±0.75	±0.60	

NOTE

The linearity specification is calculated with a root sum of the squares (RSS) of the U8480 Series linearity specification and the reference sensor linearity specification.

For the range of –1 to 15 dBm:

- The U8481A/U8485A linearity specification is 0.29%.
- The N8481A/N8485A reference sensor linearity specification is 0.52%.

Therefore, the linearity specification is equal to $\sqrt{(0.29^2 + 0.52^2)} = 0.5954 \approx 0.60$

- The U8487A/U8488A linearity specification is 0.27%.
- The N8487A/N8488A reference sensor linearity specification is 0.52%.

Therefore, the linearity specification is equal to $\sqrt{(0.27^2 + 0.52^2)} = 0.5859 \approx 0.59$

For the range of 15 to 20 dBm:

- The U8481A/U8485A linearity specification is 0.54%.
- The N8481A/N8485A reference sensor linearity specification is 0.52% (referring to the N8481A/N8485A linearity specification for the –1 to 15 dBm range).

Therefore, the linearity specification is equal to $\sqrt{(0.54^2 + 0.52^2)} = 0.7497 \approx 0.75$

- The U8487A/U8488A linearity specification is 0.30%.
- The N8487A/N8488A reference sensor linearity specification is 0.52% (referring to the N8487A/N8488A linearity specification for the –1 to 15 dBm range).

Therefore, the linearity specification is equal to $\sqrt{(0.30^2 + 0.52^2)} = 0.6003 \approx 0.60$

Zero set performance verification

Zero set specification (nW)	Actual result (nW)
±25	

Internal calibration performance verification

Internal calibration accuracy (mW) at 25 °C ± 10 °C		Actual result (mW)
Minimum	Maximum	
–0.9948	1.0052	

Adjustments

Adjustments are usually required on a yearly basis. They are normally performed only after a performance verification has indicated that some parameters are out of specification. Performance verification must be completed after any repairs that may have altered the characteristics of the U8480 Series.

The U8480 Series is required to be returned to Agilent for adjustments. To arrange this, contact the Agilent Service Center. Refer to "Contacting Agilent" on page 33 or **Contact us** on the last page of this guide for information.

3
Theory of Operation

This chapter describes the operation and functions of the U8480 Series assembly.

Theory of Operation

The U8480 Series is an RF/µW power measurement device which is based on the thermocouple sensing element in order to provide a wider frequency range, and most importantly, higher accuracy and repeatability.

This new thermocouple-based USB power sensor is a combination of Agilent's traditional power meter and power sensor packaged in a smaller form factor. It offers the advantages of a USB power sensor in terms of connectivity, flexibility, form factor, and pricing along with the performance of a thermocouple power sensor.

As a thermocouple-based USB power sensor, the U8480 Series is able to perform a true average power measurement on both CW and modulated signals. It is a standalone power sensor which is capable of sensing, signal conditioning, acquiring, and processing the intended RF/µW signal for measurement.

The U8480 Series measurement functions and performance closely resemble Agilent's well-known N8480 Series power sensor connected to a power meter.

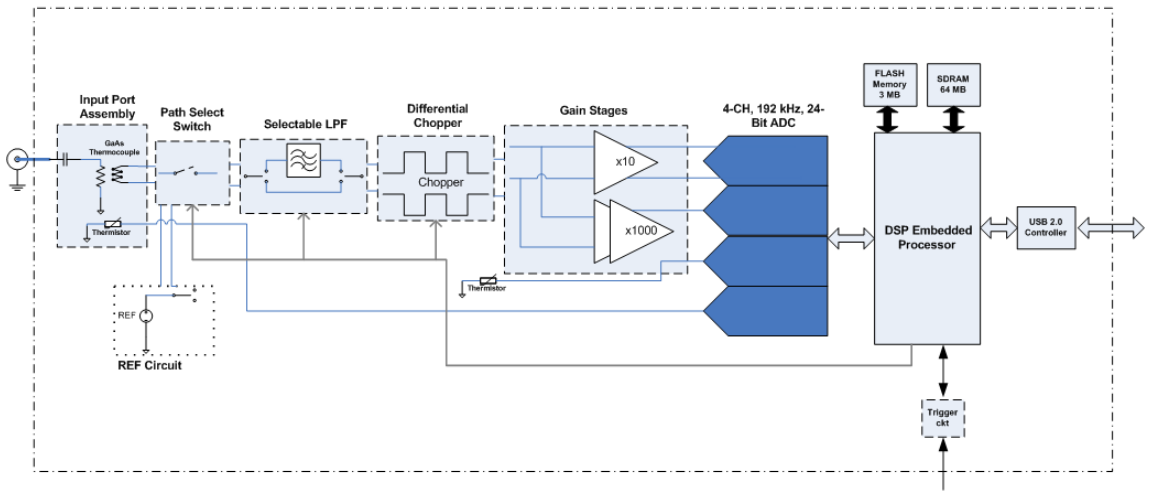


Figure 3-1 U8480 Series (AC-coupled) block diagram

Figure 3-1 illustrates the block diagram of the AC-coupled U8480 Series. The U8480 Series input consists of the bulkhead assembly which has a built-in GaAs thermocouple IC for optimum VSWR and isolation performance. The bulkhead assembly has embedded a thermistor for close temperature monitoring and a DC block for the standard model.

The heat generated by the RF/µW signal in the load termination of the thermocouple is converted to a differential signal by the thermopile which is then fed into a differential chopper, gain stages, and to a 4-channel 24-bit analog-to-digital converter (ADC) in the later processing stage.

The U8480 Series control and processing is provided by a DSP embedded processor which is supported by a 64 MB SDRAM. The available processing power enables the implementation of correction algorithm such as the linearity correction, calibration factor, and temperature compensation algorithm. The correction factors, firmware, and default settings for the U8480 Series are stored in the 3 MB non-volatile memory.

The U8480 Series is equipped with an internal calibration function which enables the U8480 Series to perform self-calibration without the need of the 1 mW 50 MHz reference calibrator. During the internal calibration process, the switch for path selection directs the analog circuitry to the on-board reference circuit. The reference circuitry provides a very accurate source that has negligible long term drift during the U8480 Series calibration cycle which is used to correct for analog circuitry drift and aging. The analog circuitry correction is combined with the linearity correction algorithm to achieve the internal calibration process. Internal calibration is allowable if there is RF input to the U8480 Series; it will not impact the U8480 Series performance.

The trigger input port which is based on TTL enables the U8480 Series to synchronize with events. Communications and remote control of the U8480 Series is via the Universal Serial Bus (USB) connectivity which is USB-TMC compliant.

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4
Repair Guide

This chapter details the replaceable parts of the U8480 Series. It also explains how to assemble and disassemble the U8480 Series.

Replaceable Parts

NOTE Replaceable parts are only available for the use of Agilent Service Center personnel and are not available for trade sales.

The following figure illustrates the parts breakdown of the U8480 Series which identifies all the replaceable parts. If you want to order a part, quote the Agilent part number, specify the quantity required, and address the order to the nearest Agilent Sales and Service office.

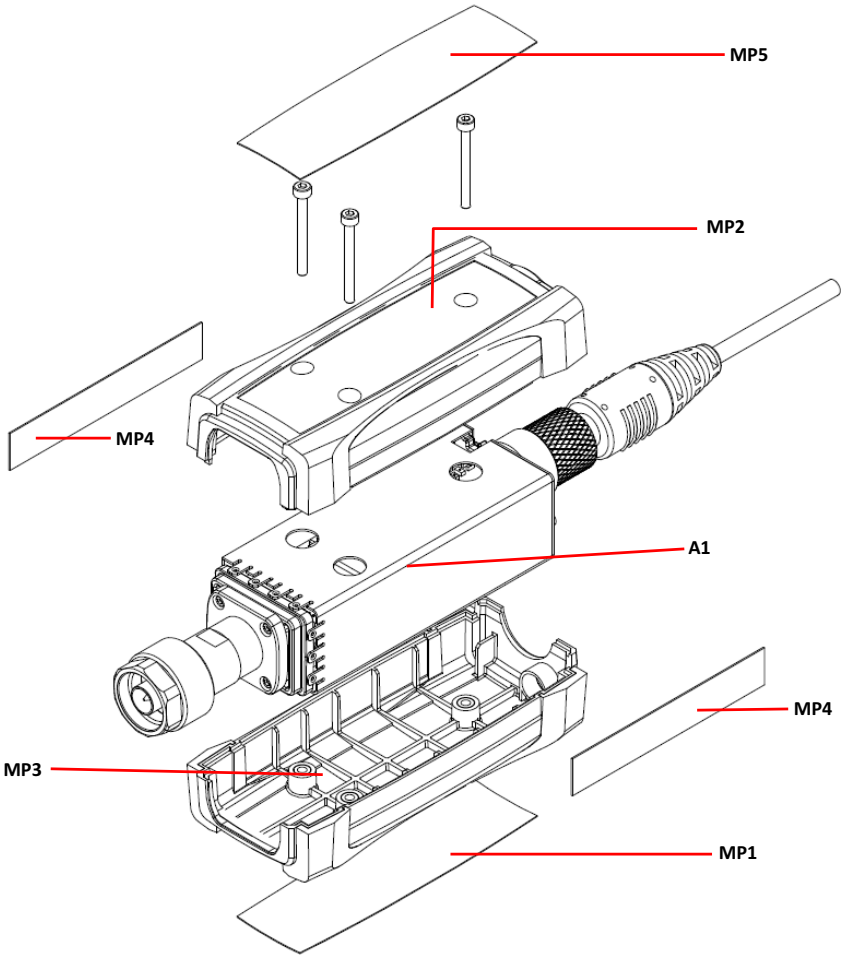

Figure 4-1 Illustrated parts breakdown

Table 4-1 Replaceable parts list for the U8480 Series

Reference designation	Option	Part number	Quantity	Description
A1				
U8481A	100	U8481-66001	1	U8481A replacement sensor module — AC-coupled
	200	U8481-66002	1	U8481A replacement sensor module — DC-coupled
U8485A	100	U8485-66001	1	U8485A replacement sensor module — AC-coupled
	200	U8485-66002	1	U8485A replacement sensor module — DC-coupled
U8487A	100	U8487-66001	1	U8487A replacement sensor module — AC-coupled
U8488A	100	U8488-66001	1	U8488A replacement sensor module — AC-coupled
Chassis part				
MP1	—	5190-0060	1	Bottom label
MP2	—	U2000-20001	1	Housing, top and overmold
MP3	—	U2000-20003	1	Housing, bottom and overmold
MP4	—	5190-0061	2	Middle label
MP5:				
U8481A	100	U8481-84302	1	Top label — AC-coupled
	200	U8481-84303	1	Top label — DC-coupled
U8485A	100	U8485-84301	1	Top label — AC-coupled
	200	U8485-84302	1	Top label — DC-coupled
U8487A	100	U8487-84301	1	Top label — AC-coupled
U8488A	100	U8488-84301	1	Top label — AC-coupled

Disassembly/Reassembly Procedure

CAUTION Disassemble the U8480 Series only in a static-free workstation. Electrostatic discharge renders the U8480 Series inoperative.

Disassembly procedure

Use the following steps to disassemble the U8480 Series.

1 Remove the top label as shown below.

2 Loosen the three screws by using the M2 Torx screwdriver to remove the housing.

3 Replace the defective module with a new module.

Reassembly procedure

Tools required for reassembly

Tool	Purpose	Quantity	Torque value
M2 Torx screwdriver	To fit the housing	1	4.0 lbs. in.

Reassembly instructions

The reassembly procedure is simply the reversal of the disassembly procedure.

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5 Contacting Agilent

This chapter explains the appropriate actions to take if you have a problem with your U8480 Series.

Introduction

This section provides the information on what to do if you encounter problems with your U8480 Series.

If you wish to contact Agilent to enquire about the U8480 Series, from service problems to ordering information, refer to **Contact us** on the last page of this guide.

If you wish to return the U8480 Series to Agilent, refer to "Returning the U8480 Series for Service" on page 36.

Instrument serial number

Agilent makes frequent improvements to its products to enhance their performance, usability, and reliability. Agilent service personnel have access to complete records of design changes for each instrument. The information is based on the serial number and option designation of each U8480 Series.

Whenever you contact Agilent about your U8480 Series, have a complete serial number available. This ensures you obtain the most complete and accurate service information. The serial number can be obtained from the serial number label.

The serial number label is attached to the side panel of the U8480 Series. This label has two instrument identification entries. The first provides the instrument serial number and the second provides the identification number for each option built into the instrument.

The serial number is divided into two parts: the prefix (two letters and the first four numbers), and the suffix (the last four numbers).

- The prefix letters indicate the country of manufacture. This code is based on the ISO international country code standard and is used to designate the specific country of manufacture for the individual product. The same product number could be manufactured in two different countries. In this case, the individual product serial numbers would reflect different country of manufacture codes. The prefix also consists of four numbers. This is a code identifying the date of the last major design change.

- The suffix indicates an alphanumeric code which is used to ensure unique identification of each product throughout Agilent.

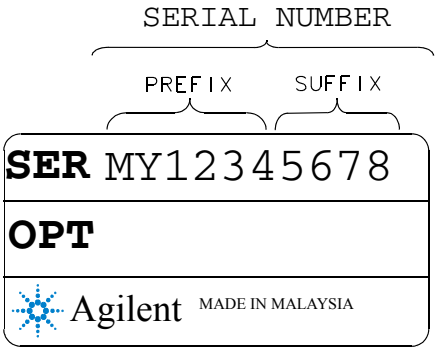

Figure 5-2 Serial number

Recommended calibration interval

Agilent recommends a one-year calibration cycle for the U8480 Series.

Returning the U8480 Series for Service

Use the information in this section if you need to return your U8480 Series to Agilent.

Packaging the U8480 Series for shipment

Use the following procedure to package the U8480 Series for shipment to Agilent for servicing:

- Be as specific as possible about the nature of the problem. Send a copy of any information on the performance of the U8480 Series.

CAUTION Damage to the instrument can result from using packaging material other than those specified. Never use styrene pellets in any shape as packaging material. They do not adequately cushion the instrument nor prevent it from shifting in the carton. Styrene pellets cause instrument damage by generating static electricity and by getting lodged in the instrument panels.

- Use the original packaging material or a strong shipping container made of double-walled, corrugated cardboard with 91 kg (200 lb.) bursting strength. The carton must be large and strong enough to accommodate the U8480 Series and allow at least 3 to 4 inches on all sides of the U8480 Series for packing material.
- Surround the U8480 Series with at least 3 to 4 inches of packing material, or enough to prevent the U8480 Series from moving in the carton. If packing foam is not available, the best alternative is SD-240 Air Cap™ from Sealed Air Corporation (Commerce, CA 90001). Air Cap looks like a plastic sheet covered with 1-1/4 inch air-filled bubbles. Use the pink Air Cap to reduce static electricity. Wrap the U8480 Series several times in the material as protection and to prevent it from moving in the carton.
- Seal the shipping container securely with strong nylon adhesive tape.
- Mark the shipping container as “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
- Retain copies of all shipping papers.

www.agilent.com

Contact us

To obtain service, warranty, or technical assistance, contact us at the following phone or fax numbers:

United States:
(tel) (800) 829 4444 (fax) (800) 829 4433
Canada:
(tel) (877) 894 4414 (fax) (800) 746 4866
China:
(tel) 800 810 0189 (fax) 800 820 2816
Europe:
(tel) 31 20 547 2111
Japan:
(tel) 0120 (421) 345 (fax) 0120 (421) 678
Korea:
(tel) (080) 769 0800 (fax) (080) 769 0900
Latin America:
(tel) 305 269 7500
Taiwan:
(tel) 0800 047 866 (fax) 0800 286 331
Other Asia Pacific Countries:
(tel) (65) 6375 8100 (fax) (65) 6755 0042

Or visit Agilent World Wide Web at:
www.agilent.com/find/assist

Product specifications and descriptions in this document are subject to change without notice. Always refer to the Agilent Web site for the latest revision.

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