

Errata

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. To reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product number/name was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648 is now model number Agilent 8648.

Ce manuel peut contenir des références à <<HP>> ou <<Hewlett-Packard.>> Veuillez noter que les produits de test et mesure, de semi-conducteur et d'analyse chimique qui avaient fait partie de la société Hewlett-Packard sont maintenant une partie de la société Agilent Technologies. Pour réduire la confusion potentielle, le seul changement aux noms de référence a été dans le préfixe de nom de société : là où un nom de référence était HP XXXX, le nouveau nom de référence est maintenant Agilent XXXX. Par exemple, le HP 8648 s'appelle maintenant Agilent 8648.

Diese Gebrauchsanweisung kann Bezug nehmen auf die Namen HP oder Hewlett-Packard. Bitte beachten Sie, dass ehemalige Betriebsbereiche von Hewlett-Packard wie HP-Halbleiterprodukte, HP-chemische Analysen oder HP-Test- und Messwesen nun zu der Firma Agilent Technology gehören. Um Verwirrung zu vermeiden wurde lediglich bei Produktname und - Nummer der vor laufende Firmenname geändert: Produkte mit dem Namen/Nummer HP XXXX lauten nun mehr Agilent XXXX. Z.B. das Modell HP 8648 heißt nun Agilent 8648.

Questo manuale potrebbe contenere riferimenti ad HP o Hewlett-Packard. Si noti che le attività precedentemente gestite da Hewlett-Packard nel campo di Test & Misura, Semiconduttori, ed Analisi Chimica sono ora diventate parte di Agilent Technologies. Al fine di ridurre il rischio di confusione, l'unica modifica effettuata sui numeri di prodotto e sui nomi ha riguardato il prefisso con il nome dell'azienda : dove precedentemente compariva "HP XXXX" compare ora "Agilent XXXX". Ad esempio: il modello HP8648 è ora indicato come Agilent 8648.

Este manual puede hacer referencias a HP o Hewlett Packard. Las organizaciones de Prueba y Medición (Test and Measurement), Semiconductores (Semiconductor Products) y Análisis Químico (Chemical Analysis) que pertenecían a Hewlett Packard, ahora forman parte de Agilent Technologies. Para reducir una potencial confusión, el único cambio en el número de producto y nombre, es el prefijo de la compañía: Si el producto solía ser HP XXXX, ahora pasa a ser Agilent XXXX. Por ejemplo, el modelo HP8648 es ahora Agilent 8648.

这个手册里面可能含有惠普公司的资料。请注意惠普公司以前的测试, 半导体产品, 化学分析部门现在属于安捷伦公司。为了减少可能的误解, 产品号码和名字只改变最前面的公司名字。如果一个产品的号码/名字以前是HP XXXX, 现在的号码/名字是安捷伦 XXXX。例如模型号码是惠普8648。现在是模型号码安捷伦8648。

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Agilent Technologies

マニュアル・チェンジ

変更

本文中の「HP (YHP)」、または「(横河)ヒューレット・パッカー株式会社」という語句を、「Agilent」、または「アジレント・テクノロジー株式会社」と変更してください。

ヒューレット・パッカー社の電子計測、半導体製品、化学分析ビジネス部門は分離独立し、アジレント・テクノロジー社となりました。

社名変更に伴うお客様の混乱を避けるため、製品番号の接頭部のみ変更しております。

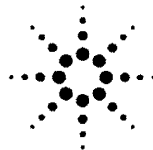
(例: 旧製品名 HP 4294A は、現在 Agilent 4294A として販売いたしております。)

**R8486D/Q8486D
Power Sensor
Operating Manual**

Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.



Agilent Technologies

R8486D Q8486D POWER SENSOR

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 2805A for the R8486D and 2742A for the Q8486D.

For additional important information about serial numbers, see INSTRUMENTS COVERED BY THIS MANUAL in Section I.



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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

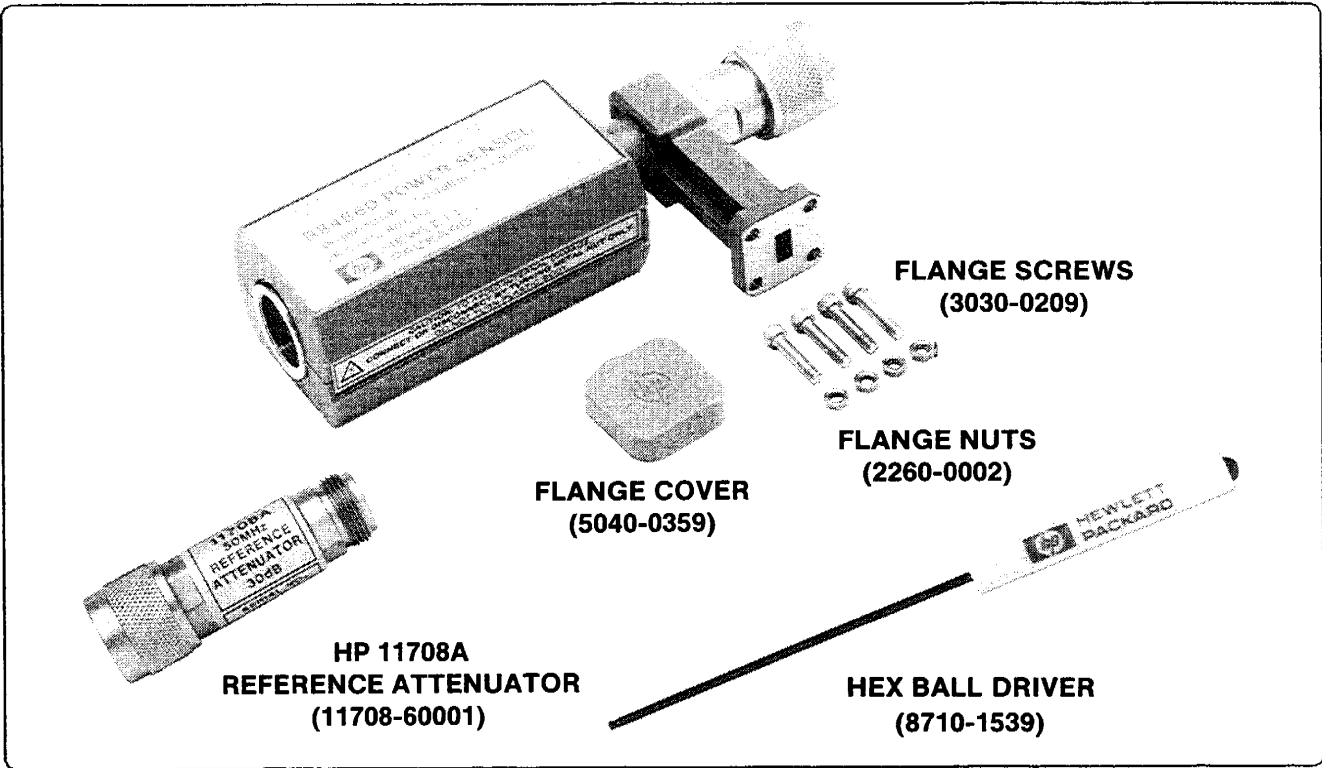


Figure 1. HP R8486D Power Sensor with Accessories and Hardware

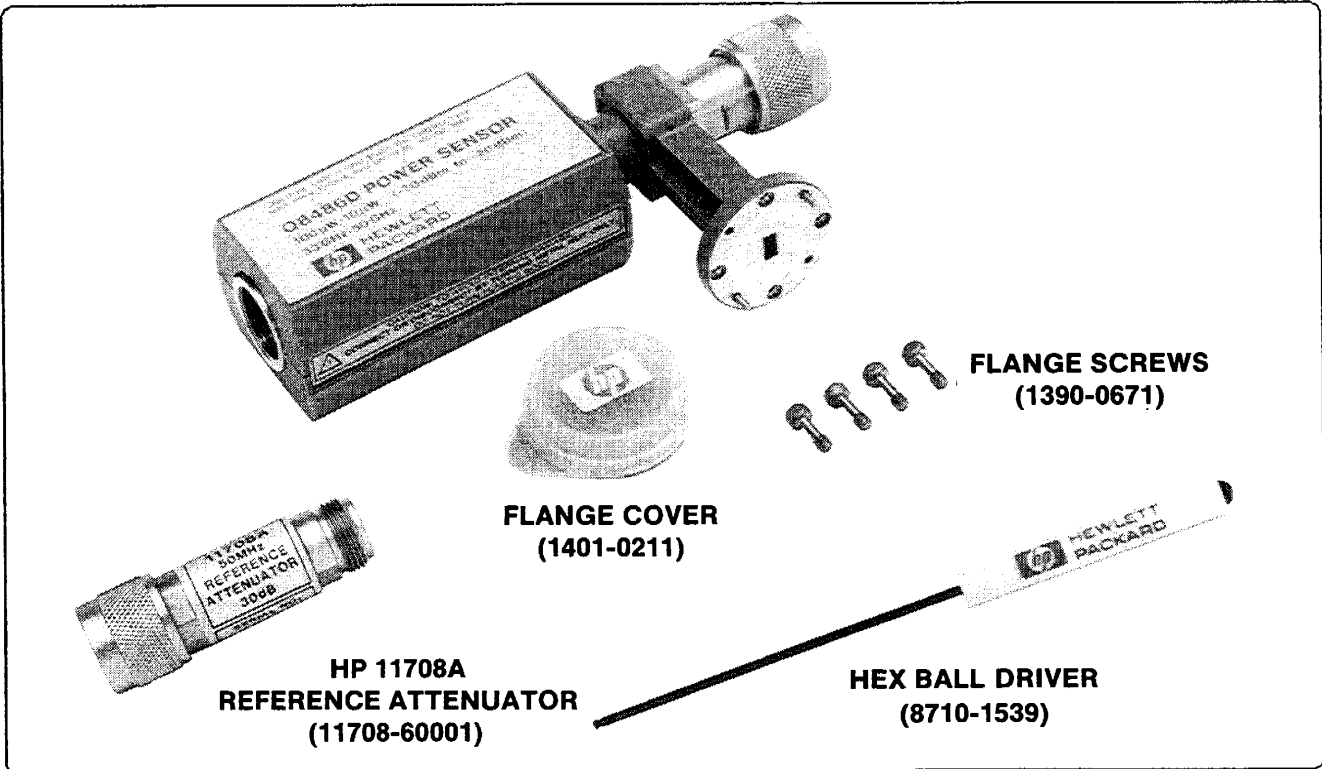


Figure 2. HP Q8486D Power Sensor with Accessories and Hardware

**GENERAL
INFORMATION**

This Operating Manual contains information about initial inspection and operation of the HP R8486D and HP Q8486D Power Sensors.

**Instruments Covered
by Manual**

These instruments have two-part serial numbers. The first four digits and the letter comprise the serial number prefix. The last five digits form a sequential suffix which is unique to each instrument. The contents of this manual apply directly to instruments having the serial number prefix listed under SERIAL NUMBERS on the title page.

Microfiche Manual

On the title page of this manual is a "Microfiche" part number. This number can be used to order a 10 X 15 cm (4 x 6-inch) microfilm transparency of the manual.

**Manual Changes
Supplement**

An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the manual for this instrument is supplied with a yellow Manual Changes supplement that documents the differences.

In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement is keyed to the manual print date and part number, both of which appear on the title page.

Complimentary copies of the supplement are available on request from your nearest Hewlett-Packard office.

For information concerning a serial number prefix not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

Warranty

The Power Sensors are warranted and certified as indicated on the last page of this manual. Do not open the Power Sensors. Any attempt to disassemble the Power Sensors will void warranty.

Description

The HP R8486D and HP Q8486D are diode power sensors. They measure power levels in a range from -70 dBm to -20 dBm (0.1 nW to 10 μ W). The HP R8486D measures at frequencies from 26.5 GHz to 40 GHz. The HP Q8486D measures at frequencies from 33 GHz to 50 GHz. (Specifications for the Power Sensors are in Table 1.)

The Power Sensors measure the power dissipated in a 50 Ω load placed on the microwave source. The power is determined from the ac voltage developed across the 50 Ω load. The diodes convert this ac voltage to dc. The dc voltage produced is the square of the ac voltage. This low-level dc voltage requires amplification before it can be transferred on standard cables to the power meter.

The amplification is provided by an input amplifier assembly which consists of a chopper (sampling gate) and an input amplifier. The dc voltage is routed to the chopper circuit which converts the low-level dc voltage to an ac voltage. The chopper is driven by a 220 Hz square wave generated by the power meter. The result is an ac output signal proportional to the dc input. The ac signal is then amplified by the input amplifier. The relatively high-level ac signal output can now be routed by standard cables.

Note



The HP R/Q 8486D Power Sensors are compatible with the HP 435B, HP 436A, HP 437B, and HP 438A Power Meters. The HP R/Q 8486D Power Sensors cannot be used with HP 435A Power Meters.

In application, the Power Sensors are connected between a microwave source and a compatible power meter. The Power Sensors provide a matched load to the microwave source for very low SWR. The power meter indicates the power dissipated in the load in μ W, nW or in dBm.

Caution



Do not disassemble the Power Sensors. The Power Sensors are extremely static sensitive and can be easily damaged.

Accessories

Included with each Power Sensor is the HP 11708A 30 dB Reference Attenuator (Figure 1). To calibrate the Power Sensors, the reference attenuator must be used to reduce the 1 mW calibration signal provided by the power meter to 1 μ W. Also included is a hex ball driver plus the waveguide mounting screws. Refer to Figure 1 for a visual check of what should be included with your power sensor.

Caution

Do not use HP 11708A 30 dB Reference Attenuator for any purpose other than calibrating the power meter and Power Sensor. It is intended for use only at the 50 MHz 1 mW reference signal port on the power meter front panel. Its usefulness as a calibration reference may be compromised if used for other purposes.

Specifications

The specifications listed in Table 1 are the performance standards or limits against which the Power Sensors may be tested.

Table 1. Specifications

Characteristics and Conditions	Limits	Comments
Frequency Range HP R8486D HP Q8486D	26.5 to 40 GHz 33.0 to 50 GHz	
Power Range	100 pW to 10 μ W (-70 dBm to -20 dBm)	
Nominal Impedance	50 Ω	
Connectors 50 MHz Calibration Port HP R8486D Waveguide Flange HP Q8486D Waveguide Flange	Type N (Male) UG-599/U Flange UG-383/U Flange (Modified)	50 Ω nominal impedance Mates to standard UG-383/U
Maximum Standing Wave Ratio (SWR) and Reflection Coefficient (Rho) HP R8486D HP Q8486D 50 MHz Calibration Port HP 11708A	SWR Rho 1.4 0.167 1.4 0.167 1.4 0.167 1.05 0.025	For both R&Q sensors.
Maximum Power	100 mW (peak) 100 mW (average)	Any port Any port
Worst Case Power Linearity	1 μ W to 3.16 μ W (-30 to -25 dBm), \pm 3% 3.16 μ W to 10 μ W, (-25 to -20 dBm) \pm 5%	Negligible deviation except for those power ranges noted.

Table 1. Specifications (Cont.)

Characteristics and Conditions	Limits	Comments
HP 11708A Accuracy at 50MHz, 25 ° C	30 ± 0.05 dB	Accuracy traceable to NBS, with temperature coefficient typically 0.003 dB per degree C.
Operating Temperature Range	0 to 55 ° C	
Net Weight HP R8486D HP Q8486D HP 11708A	0.25 kg (0.55 lb) 0.26 kg (0.57 lb) 0.085 kg (3 oz)	Excluding HP 11708A Excluding HP 11708A
Dimensions HP R8486D HP Q8486D HP 11708A	Width: 60 mm (2.36 in) Length: 126 mm (4.96 in) Height: 30 mm (1.18 in) Width: 65 mm (2.56 in) Length: 126 mm (4.96 in) Height: 30 mm (1.18 in) Length: 60 mm (2.4 in) Diameter: 20 mm (0.79 in)	

Calibration Factor (CF) and Reflection Coefficient (Rho)

The CAL FACTOR compensates for the frequency response of the sensors. CAL FACTOR and reflection coefficient data are provided on a label attached to the sensor cover. Maximum and probable uncertainties of the CAL FACTOR data are listed in Tables 2 and 3. Probable uncertainties are calculated using the root sum of the squares (RSS) method. To use CAL FACTOR data during power measurements see Power Measurements in this manual.

Reflection Coefficient (Rho, or p) relates to SWR according to the following formula:

$$SWR = (1+p)/(1-p)$$

Table 2. HP R8486D Calibration Factor Uncertainty at 1 μ W

Frequency	Worst Case Uncertainty	(RSS) Probable Uncertainty
26.5 GHz	9.1 %	3.0 %
27	9.6	3.2
28	9.5	3.2
29	9.0	2.9
30	9.2	3.0
31	9.1	3.0
32	9.7	3.3
33	9.1	3.0
34	9.2	3.0
34.5	9.0	3.0
35	9.2	3.0
36	9.0	3.0
37	9.0	3.0
38	9.2	3.0
39	9.4	3.1
40	9.1	3.0

Table 3. HP Q8486D Calibration Factor Uncertainty at 1 μ W

Frequency	Worst Case Uncertainty	(RSS) Probable Uncertainty
33 GHz	11.6 %	4.2 %
34	11.8	4.3
34.5	11.6	4.2
35	11.8	4.3
36	11.6	4.2
37	11.7	4.2
38	12.1	4.4
39	12.1	4.4
40	11.7	4.2
41	13.7	4.8
42	14.0	4.9
43	14.3	5.0
44	14.6	5.1
45	14.9	5.3
46	15.2	5.5
47	15.5	5.7
48	15.7	5.8
49	16.0	6.0
50	16.3	6.2

INSTALLATION

Initial Inspection

Inspect the shipping container for damage. If the shipping container or packaging material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass the performance tests, notify the nearest Hewlett-Packard office. Keep the damaged shipping materials (if any) for inspection by the carrier and a Hewlett-Packard representative.

Interconnections

The HP R8486D and HP Q8486D Power Sensors have two inputs: a Type-N connector and a waveguide flange. During calibration, the Type-N connector is used to connect to the HP 11708A Reference Attenuator which is connected to the calibration port of the power meter. The waveguide flange is connected to the device under test.

The HP Q8486D waveguide flange holes are threaded to allow screws to be inserted from either side of the connection.

Use the plastic flange cover to protect the waveguide connector from dirt and mechanical damage whenever it is not in use. Any burn, dents or dirt on the flange or waveguide surface will increase the SWR and change the Cal Factor.

Refer to the power meter operating and service manual for interconnecting instructions.

Caution



Connect the Power Sensor by turning only the nut on the Type-N connector. Damage can occur if torque is applied to the Power Sensor body.

The waveguide flanges can be damaged if the flange screws are over-tightened. Do not fully tighten one flange screw without tightening the one opposite. First insert screws and tighten until finger tight. If you are using the hex ball driver, hold the driver between thumb and forefinger while incrementally tightening screws opposite each other. If you are using a torque driver, incrementally tighten screws opposite each other until reaching a maximum torque of 60 inch-ounces (0.42 N x m).

Storage and Shipment

Environment

The instruments should be stored in a clean, dry environment. The following limitations apply to both storage and shipment:

Temperature	-40 to +75 °C
Relative Humidity	less than 95% at 40 °C
Altitude	less than 15,300 metres (25,000 feet)

Original Packaging

Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and serial number.

OPERATION

Warning 

BEFORE CONNECTING THE POWER SENSOR TO OTHER INSTRUMENTS ensure that all instruments are connected to the protective (earth) ground. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

Operating Environment

The operating environment for the Power Sensors should be within the following limits:

Temperature	0 to 55 °C
Relative humidity	less than 95%
Altitude	less than 4550 metres (15,000 feet)

Operating Precautions

If the following energy and power levels are exceeded, the power meter system may be damaged.

- a. Maximum Average Power: 100 mW
- b. Maximum Peak Power: 100 mW

Connect the Power Sensors by turning only the nut on the Type-N connector.

Damage can occur if torque is applied to the Power Sensor body.

The waveguide flanges can be damaged if the flange screws are over-tightened. Do not fully tighten one flange screw without tightening the one opposite. First insert screws and tighten until finger tight. If you are using the hex ball driver, hold the driver between thumb and forefinger while incrementally tightening screws opposite each other. If you are using a torque driver, incrementally tighten screws opposite each other until reaching a maximum torque of 60 inch-ounces (0.42 N x m).

Use the plastic flange cover to protect the waveguide connector from dirt and mechanical damage whenever it is not in use. Any burn, dents or dirt on the flange or waveguide surface will increase the SWR and change the Cal Factor.

The Type-N connector plastic bead deteriorates when contacted by any chlorinated or aromatic hydrocarbons such as acetone, trichlorethylene, carbon tetrachloride, benzene, etc. Clean the connector face with a cotton swab saturated in isopropyl alcohol.

Power Meter Calibrations

The procedure for calibrating one power meter may be different for another power meter. Follow the calibration directions given in your power meter manual.

Note



Terminate the waveguide flange with a waveguide short (HP R921A or Q921A) when calibrating. Due to the sensitivity of these sensors, stray millimeter waves can be sensed.

Power Measurements

To correct for varying responses at different frequencies a cal factor chart is included on the Power Sensors. To use the cal factor at the frequency of interest, adjust the power meter's CAL FACTOR control according to the instructions in the power meter's operating and service manual.

If you are using an HP 435B or HP 436A, the minimum cal factor setting is 85% and the maximum is 100%. If the cal factor setting for your frequency of interest is below the meter's minimum or above the meter's maximum, set the cal factor control to 100%, and divide the reading, in watts units, by the decimal equivalent of the cal factor. For example, if the cal factor is 75%, divide the reading by 0.75. (This will result in a larger value of power than that displayed by the meter.) If the cal factor is 104% divide the reading by 1.04. (This will result in a smaller value of power than that displayed by the meter.)

If reading in dBm, use the chart in Table 4 to convert the cal factor to dB and add this value to the reading. Interpolate for values between those shown. Set the cal factor control to 100%. If the cal factor is 75%, *add* 1.25 dB to the displayed value. On the other hand, if the cal factor is 104% *subtract* 0.170 from the displayed reading.

Note



The above procedure has eliminated some mathematical steps, the following formula may be of some use:

$$\text{Correction dB} = \text{Reading dBm} - 10 \times \text{Log}_{10} \text{ Cal Factor (decimal)}$$

Table 4. Cal Factor to dB Conversion Chart

Cal Factor	dB	Cal Factor	dB
70%	1.55	101%	-0.43
71	1.49	102	-0.86
72	1.43	103	-0.128
73	1.37	104	-0.170
74	1.31	105	-0.212
75	1.25	106	-0.253
76	1.19	107	-0.294
77	1.14	108	-0.334
78	1.08	109	-0.374
79	1.02	110	-0.414
80	0.97		
81	0.92		
82	0.86		
83	0.81		
84	0.76		
85	0.71		

The sensitivity of the power sensors is influenced by ambient temperature. The sensors should be recalibrated at each change in temperature to obtain the most accurate results. Typical temperature sensitivity variations are shown in Figure 3.

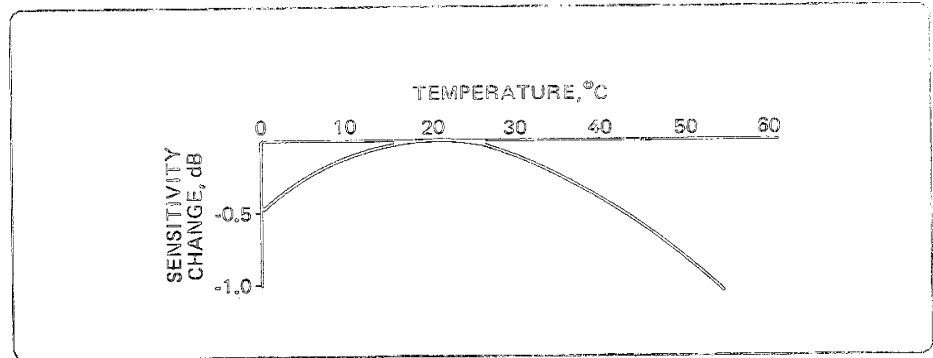


Figure 3. Typical Influence of Temperature on Sensitivity

Operating Instructions

To operate the Power Sensor, refer to the operating instructions in Section III of the power meter operating and service manual.

Note



If having an open RF connection on your system is a concern, terminate the sensor Type N calibration port with a 50Ω load.

Modulation Effects

When measuring microwave sources that are modulated at the chopper frequency (nominally 220 Hz), or at the first or second harmonic or submultiples of the chopper frequency, beat notes will occur. Unless these beat notes are exactly the chopper frequency, they can usually be eliminated by averaging since the amplitudes are plus and minus the actual power. These frequencies may also be avoided by changing the modulation frequency slightly, if possible.

If you are using an HP 437B Power Meter select a manual filter setting of at least 128 (as displayed on power meter) to minimize beat note interference. To minimize beat note interference using an HP 438A Power Meter select a filter number of at least 7.

PERFORMANCE TESTS

This section does not establish SWR test procedures since there are several test methods and different equipment available for testing the SWR or reflection coefficient. Therefore, the actual accuracy of the test equipment, all source match corrections, and all harmonics must be accounted for when measuring against instrument specifications to determine a pass or fail condition.

To measure the SWR across the waveguide band, use a directional coupler and detector selected for the band of interest. The directional coupler should have a directivity greater than 40 dB. The detector should have greater than 0.4 mV/ μ W sensitivity and should be calibrated with a rotary vane attenuator with an accuracy of 2%. Incident power should be less than -20 dBm. A convenient source is a frequency tripler driven by an HP 8350B and an HP 83594A.

To check the calibration factor, the Power Sensors should be compared with another recently calibrated power sensor. The source should be leveled with a reference coupler that has low SWR and high directivity to monitor or level the incident power (which should be less than -30 dBm).

For reflection measurements we suggest HP Application Note 183 "High Frequency Swept Measurements." For calibration factor and error analysis we suggest HP Application Note 64-1 "Fundamentals of RF and Microwave Power Measurements."

Note



While the flange of the HP R8486D is similar to the one described in MIL F-3922/54C-003, the HP Q8486D has been modified to mate with greater precision to MIL-3922/67B-006 flanges. The true position of the holes relative to each other are held to a diameter tolerance of 0.0254 mm (0.001). The holes are held to 1.664 mm (0.0655) minimum diameter while the pins are held to 1.61 mm (0.0634) maximum diameter.

REPLACEABLE PARTS

The HP 11708A 30 dB Attenuator, the hex ball driver, the flange covers, and the hardware are the only replaceable parts. The part numbers are listed in Figure 1. A listing of Hewlett-Packard sales and service offices is located inside the front cover of this manual.

**REPAIR AND
ADJUSTMENTS**

Do not attempt to repair or adjust the Power Sensors. Due to the extreme static sensitivity of the Power Sensors, customer repair is not recommended. If your Power Sensor should fail or need calibration, return it to Hewlett-Packard.

Caution 

Do not disassemble the Power Sensors. The Power Sensors are extremely static sensitive and can be easily damaged. If the Power Sensors show evidence of attempted customer repair, the warranty may be voided.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

Table 1-1. Hewlett-Packard Sales and Service Offices

US FIELD OPERATIONS		
<p>Headquarters Hewlett-Packard Co. 19320 Pruneridge Avenue Cupertino, CA 95014 (800) 752-0900</p>	<p>California, Northern Hewlett-Packard Co. 301 E. Evelyn Mountain View, CA 94041 (415) 694-2000</p>	<p>California, Southern Hewlett-Packard Co. 1421 South Manhattan Ave. Fullerton, CA 92631 (714) 999-6700</p>
<p>Colorado Hewlett-Packard Co. 24 Inverness Place, East Englewood, CO 80112 (303) 649-5512</p>	<p>Georgia Hewlett-Packard Co. 2000 South Park Place Atlanta, GA 30339 (404) 955-1500</p>	<p>Illinois Hewlett-Packard Co. 5201 Tollview Drive Rolling Meadows, IL 60008 (708) 255-9800</p>
<p>New Jersey Hewlett-Packard Co. 150 Green Pond Rd. Rockaway, NJ 07866 (201) 586-5400</p>	<p>Texas Hewlett-Packard Co. 930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101</p>	
EUROPEAN FIELD OPERATIONS		
<p>Headquarters Hewlett-Packard S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/Geneva Switzerland (41 22) 780.8111</p>	<p>France Hewlett-Packard France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60</p>	<p>Germany Hewlett-Packard GmbH Hewlett-Packard Strasse 61352 Bad Homburg v.d.H Germany (49 6172) 16-0</p>
<p>Great Britain Hewlett-Packard Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG41 5DZ England (44 734) 696622</p>		
INTERCON FIELD OPERATIONS		
<p>Headquarters Hewlett-Packard Company 3495 Deer Creek Road Palo Alto, California, USA 94304-1316 (415) 857-5027</p>	<p>Australia Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 895-2895</p>	<p>Canada Hewlett-Packard (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (514) 697-4232</p>
<p>China China Hewlett-Packard Company 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, China (86 1) 256-6888</p>	<p>Japan Hewlett-Packard Japan, Ltd. 1-27-15 Yabe, Sagami-hara Kanagawa 229, Japan (81 427) 59-1311</p>	<p>Singapore Hewlett-Packard Singapore (Pte.) Ltd. 150 Beach Road #29-00 Gateway West Singapore 0718 (65) 291-9088</p>
<p>Taiwan Hewlett-Packard Taiwan 8th Floor, H-P Building 337 Fu Hsing North Road Taipei, Taiwan (886 2) 712-0404</p>		



08486-90017

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