HEWLETT PACKARD

HP 70100A
Power Meter Module
100 kHz to 50 GHz

Technical Data

A High-performance Power Meter with the Power of Modularity

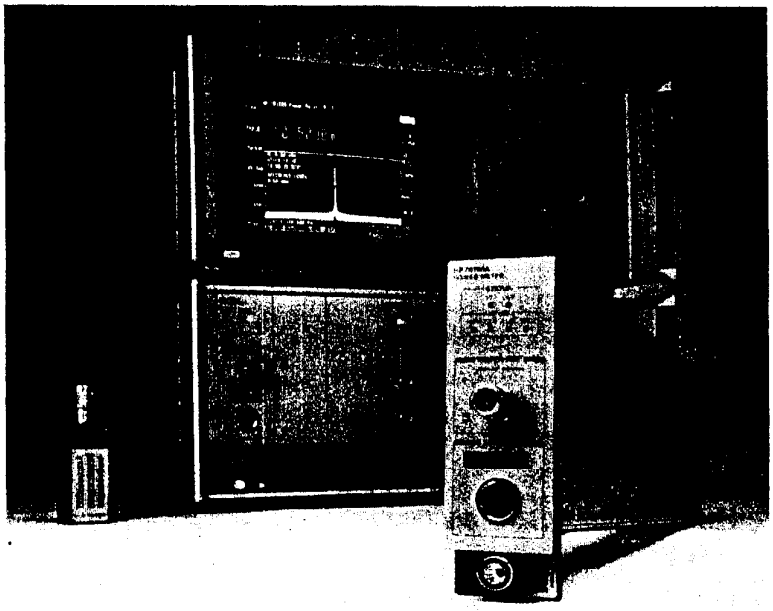
Get all the performance of a modern single-channel power meter.

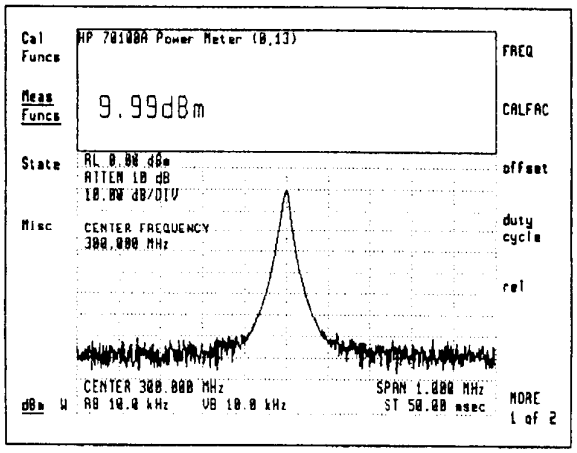
The HP 70100A is a full-feature, single-channel power meter module for the Modular Measurement System. It has all the capability of the HP 437B Power Meter in a 1/8th rack-width module.

Exceptional meter linearity and low sensor SWR combine to give you outstanding measurement accuracy in demanding situations. Instrumentation accuracy is specified to be ±0.5% in linear mode or ±0.02 dB in logarithmic mode, making instrumentation uncertainty a negligible part of your total measurement error. Features include automatic calibration and zeroing, frequency (and cal factor) entry, rel, offset, selectable resolution, duty cycle, manual range setting, and save/recall of meter settings.

The HP 70100A is compatible with the HP 8480 series of power sensors. It is HP-IB compatible with programs written for the HP 438A Power Meter.[1]

[1]The HP 70100A does not respond to software commands involving two or more channels (like the A/B command "AR"). Also, one HP 70100A cannot control another HP 70100A for dual-channel capability. You can, however, get dual-channel capability by controlling two HP 70100As with a DLP (downloadable program) from your modular spectrum analyzer.





The Modular Measurement System allows you to customize your CRT to display up to 4 instruments at one time. In the picture at left, an HP 70100A Power Meter Module is displayed in the top window and a spectrum analyzer is displayed in the bottom window.

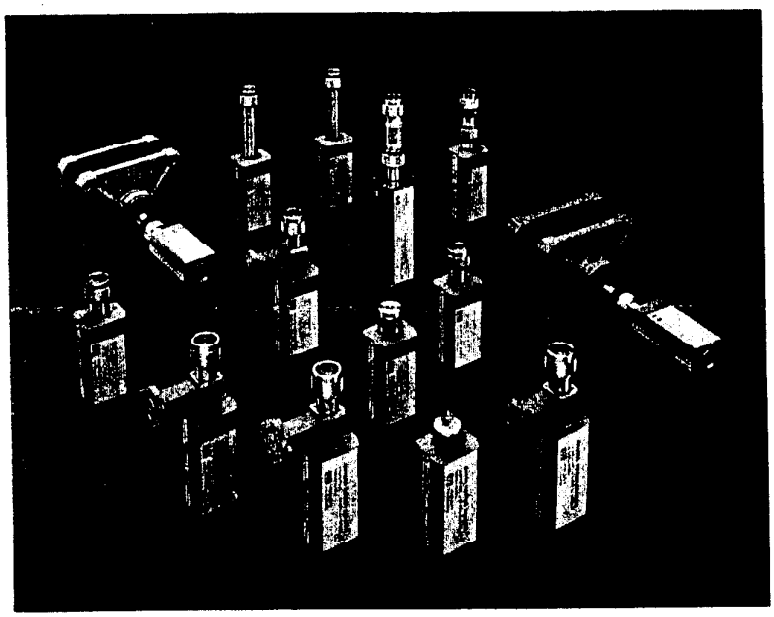
Your Measurement is Covered with Our Complete Power Sensor Family

Minimize Your Measurement Uncertainty.

A power meter's overall performance depends heavily on its sensors. They determine frequency coverage, dynamic range and measurement accuracy. With the HP 70100A your investment in HP 8480 series power sensors is secure. This family of sensors provides extraordinary accuracy, stability and SWR over a wide range of frequencies (100 kHz to 50 GHz) and power levels (—70 to +44 dBm).

Low SWR: The HP 8481/2/3/5A/6A/7A sensors use a very small silicon monolithic thermocouple as the sensing element, which enables the sensors to have a very low SWR even at mm-wave frequencies. This reduces mismatch uncertainty, usually the largest single source of error in power measurements. The HP 8484A/5D/6D use Schottky and advanced Planar Doped Barrier diode technology for high sensitivity measurements while still maintaining excellent SWR.

Individually Calibrated: Each sensor supported by the HP 70100A is individually calibrated and traceable to the U.S. National Institute of Standards and Technology (NIST, formerly NBS). The calibration factor is printed on the sensor for easy reference. This Cal Factor can be entered into the meter to compensate for sensor efficiency at any frequency. The ten Cal-Factor-versus-frequency tables in the HP 70100A make it easy to use different sensors without the need of entering the cal factor for each measurement set-up.



HP's complete power sensor family satisfies your most demanding applications.

114 dB of Power Measurement Range, from 100 kHz to 50 GHz

Combining HP 8480 series power sensors gives you 114 dB dynamic range, from —70 to +44 dBm. We offer low, mid and high sensitivity sensors to satisfy your most demanding applications.

25 Watt Sensors 0 to +44 dBm (1 mW to 25W)
Ideal for transmitter test, these sensors handle pulses up to 500 W peak. The Cal Factors include attenuator characteristics for improved accuracy.

3 Watt Sensors —10 to +35 dBm (100 μW to 3W)
General purpose medium power measurements. Handles pulses up to 100W peak.

100 mW Sensors —30 to + 20 dBm (1 μW to 100 mW)
General purpose measurements to millimeter-wave frequencies. The 75-ohm HP 8483A is compatible with television and telephone transmission lines.

High Sensitivity Sensors —70 to —20 dBm (100 pW to 10 μW)
Excellent for accurate measurements of true RMS power at very low power levels. 40 dB of overrange protection prevents accidental burnouts. These sensors are furnished with the HP 11708A 50 MHz reference attenuator for precise calibration with the power meter's reference oscillator.

This extensive and growing family of power sensors, gives you the most accurate and complete power measurement solution available.

Sensor Specifications

HP Model (Nominal Impedance)	Frequency Range	Power Range	Maximum Power	Power Linearity[2]	Maximum SWR (Reflection Coefficient)	Size mm (in.) / Shipping Weight kg (lb)	RF Connector	Price	
8481A (50 Ω)	10 MHz-18 GHz	1 µW to 100 mW	300 mW avg. 15 W peak 30 W • µs (per pulse)	+10 to +20 dBm +2, –4%	10 MHz - 30 MHz: 1.40 (0.166) 30 MHz - 50 MHz: 1.18 (0.083) 50 MHz - 2 GHz: 1.10 (0.048) 2 - 12.4 GHz: 1.18 (0.083) 12.4 - 18 GHz: 1.28 (0.123)	30 x 38 x 105 (1.2 x 1.5 x 4.1)	N(m)	$650	☎
						0.5 (1)			
Option 001							APC-7	add $25	
8481B (50 Ω)	10 MHz-18 GHz	1 mW to 25W	0-35°C: 30 W avg.[1] 35°C-55°C: 25 W avg.	+35 to +44 dBm ±4%	10 MHz - 2 GHz: 1.10 (0.048) 2-12.4 GHz: 1.18 (0.083) 12.4-18 GHz: 1.28 (0.123)	83 x 114 x 248 (3.25 x 4.5 x 9.75)	N(m)	$1500	☎
						1.5 (3.2)			
			10 MHz-5.8 GHz 500 W peak 5.8-18 GHz 125 W peak						
			500 W • µs (per pulse)						
8481H (50 Ω)	10 MHz-18 GHz	100 µW to 3W	3.5 W avg. 100 W peak 100W • µs (per pulse)	+25 to +35 dBm ±5%	10 MHz - 8 GHz: 1.20 (0.091) 8-12.4 GHz: 1.25 (0.110) 12.4 - 18 GHz: 1.30 (0.130)	30 x 38 x 149 (1.2 x 1.5 x 5.9)	N(m)	$825	☎
						0.5 (1)			
8482A (50 Ω)	100 kHz-4.2 GHz	1.0 µW to 100 mW	300 mW avg. 15 W peak 30 W • µs (per pulse)	+10 to +20 dBm +2, –4%	100-300 kHz: 1.60 (0.231) 300 kHz - 1 MHz: 1.20 (0.091) 1 MHz - 2 GHz: 1.10 (0.048) 2-4.2 GHz: 1.30 (0.130)	30 x 38 x 105 (1.2 x 1.5 x 4.1)	N(m)	$650	☎
						0.5 (1)			
8482B (50 Ω)	100 kHz-4.2 GHz	1 mW to 25W	0-35°C: 30 W avg.[1] 35°C-55°C: 25 W avg.	+35 to +44 dBm ±4%	100 kHz - 2 GHz: 1.10 (0.048) 2 GHz - 4.2 GHz: 1.18 (0.083)	83 x 114 x 248 (3.2 x 4.5 x 9.7)	N(m)	$1440	☎
						1.5 (3.2)			
			500 W peak						
			500 W • µs (per pulse)						
8482H (50 Ω)	100 kHz-4.2 GHz	100 µW to 3W	3.5 W avg. 100 W peak 100 W • µs (per pulse)	+25 to +35 dBm ±5%	100 kHz-4.2 GHz: 1.20 (0.091)	30 x 38 x 149 (1.2 x 1.5 x 5.9)	N(m)	$800	☎
						0.5 (1)			
8483A[3] (75 Ω)	100 kHz-2 GHz	1.0 µW to 100 mW	300 mW avg. 10 W peak 30 W • µs (per pulse)	+10 to +20 dBm +2, –4%	100-600 kHz: 1.80 (0.286) 600 kHz - 2 GHz: 1.18 (0.083)	30 x 38 x 105 (1.2 x 1.5 x 4.1)	N(m) 75 Ω	$650	☎
						0.5 (1)			
8484A[4] (50 Ω)	10 MHz-18 GHz	0.1 nW to 10 µW	200 mW avg. 200 mW peak	–30 to –20 dBm ±1%	10-30 MHz: 1.40 (0.166) 30 MHz - 4 GHz: 1.15 (0.070) 4-10 GHz: 1.20 (0.091) 10-15 GHz: 1.30 (0.130) 15-18 GHz: 1.35 (0.149)	36 x 44 x 133 (1.4 x 1.7 x 5.2)	N(m)	$900	☎
						0.5 (1)			
8485A (50 Ω)	50 MHz-26.5 GHz	1 µW to 100 mW	300 mW avg. 15 W peak 30 W • µs (per pulse)	+10 to +20 dBm +2, –4%	50 MHz-100 MHz: 1.15 (0.070) 100 MHz-2 GHz: 1.10 (0.048) 2-12.4 GHz: 1.15 (0.070) 12.4-18 GHz: 1.20 (0.091) 18-26.5 GHz: 1.25 (0.111)	30 x 38 x 95 (1.2 x 1.5 x 3.7)	APC-3.5(m)	$950	☎
						0.5 (1)			
8485D[4] (50 Ω)	50MHz-26.5 GHz	100 pW to 10 µW	100 mW avg. 100 mW peak	–30 to –20 dBm ±2% (0°C to 55°C) ±1% (15° to 40°C)	50 MHz - 4 GHz: 1.19 (0.087) 4-18 GHz: 1.25 (0.111) 18-26.5 GHz: 1.29 (0.127)	30 x 38 x 102 (1.2 x 1.5 x 4.03)	APC-3.5(m)	$1,350	☎
						0.5 (1.0)			
R8486A (Waveguide)	26.5-40 GHz	1 µW to 100 mW	300 mW avg. 15 W peak 30W • µs pulse	+10 to +20 dBm +2, –4%	1.4 (0.167)	30 x 38 x 126 (1.2 x 1.5 x 50)	Waveguide Flange UG-599/U	$2,000	
						0.4 (0.9)			
Q8486A (Waveguide)	33-50 GHz	1µW to 100 mW	300 mW avg. 15 W peak 30W • µs pulse	+10 to +20 dBm +2, –4%	1.5 (0.200)	30 x 38 x 126 (1.2 x 1.5 x 50)	Waveguide Flange UG-383/U	$2,600	
						0.4 (0.9)			
R8486D[4] (Waveguide)	26.5-40 GHz	100 pW to 10 µW	100 mW avg. 100 mW peak	–30 to –25 dBm ±3% –25 to –20 dBm ±5%	1.4 (0.167)	30 x 65 x 126 (1.19 x 2.56 x 4.96)	Waveguide Flange UG-599/U	$2,700	
						0.66 (1.3)			
Q8486D[4] (Waveguide)	33-50 GHz	100 pW to 10 µW	100 mW avg. 100 mW peak	–30 to –25 dBm ±3% –25 to –20 dBm ±5%	1.4 (0.167)	30 x 65 x 126 (1.19 x 2.56 x 4.96)	Waveguide Flange UG-383/U	$3,900	
						0.66 (1.3)			
8487A (50 Ω)	50 MHz-50 GHz	1 µW to 100 mW	300 mW avg. 15 W peak 30 W µS (per pulse)	+10 to +20 dBm +2, –4%	50-100 MHz: 1.15 (0.070) 100 MHz - 2 GHz: 1.10 (0.048) 2-12.4 GHz: 1.15 (0.07) 12.4-18 GHz: 1.20 (0.091) 18-26.5 GHz: 1.25 (0.111) 26.5-40 GHz: 1.30 (0.130) 40-50 GHz: 1.50 (0.200)	30 x 38 x 94 (1.19 x 1.5 x 3.70)	2.4 mm(m)	$1,800	☎
						0.48 (1.07)			

[1]For pulses greater than 30 W the maximum average power (Pa) is limited by the energy per pulse (E) in W • µs according to Pa = 30–0.02E.
[2]Negligible deviation except to those power ranges noted.
[3]Includes HP 1250-0597 adapter from 75 Ω type N to 50 Ω type N for calibration.
[4]Includes HP 11708A 30 dB attenuator for calibrating against a 0 dBm, 50 MHz power reference. HP 11708A is factory set to 30 dB ± 0.05 dB at 50 MHz, traceable to NBS. SWR <1.05 at 50 MHz.

☎ Fast-Ship Product. Shipped the same day if you order from HP direct at 800-538-8787 (U.S. Shipments only)

HP 70100A Power Meter Module Specifications

SPECIFICATIONS describe the instrument's warranted performance over the 0 to 55° C temperature range. *SUPPLEMENTAL CHARACTERISTICS (indicated by italic type) are intended to provide information useful in applying the instrument by giving typical, but nonwarranted, performance standards.*

SPECIFICATIONS

Frequency: 100 kHz to 50 GHz, sensor dependent.
Power Range: -70 to +44 dBm (100 pW to 25W), sensor dependent.
Power Sensors: compatible with all HP 8480 series sensors.
Dynamic Range: 50 dB in 10 dB steps.
Display Units: W, dBm (absolute); %, dB (relative).
Accuracy
Instrumentation: ±0.02 dB or ±0.5%
In Rel mode: ±0.02 dB or ±0.5% within calibration range; ±0.04 dB or ±1% outside calibration range.
Zero Set[1]**:** ±0.5% of full scale on most sensitive range. Divide percentage by a factor 10 for each higher range, ±1 display count.
EMI: Radiated interference is within the requirements of MIL-STD-461B, Class Alc, RE02.

SUPPLEMENTAL CHARACTERISTICS

Meter noise (% of full scale, constant temperature, range 1, measured over one minute interval, two standard deviations). Decrease noise by a factor of 10 for each higher range for all sensors and all filters.
HP 8481/2/3/5A/6A/7A Sensors

Averages	1	4	8	16	32	64	128	256	512	1024
Noise(%)	12	2.4	1.8	.9	.7	.5	.4	.3	.2	.15

HP 8484A/5D Sensors: multiply noise levels by 4.
HP R/Q8486D Sensors: multiply noise levels by 6.
Zero Drift of sensors (% of full scale, 1 hour, at constant temperature after 24-hour warm up). Divide percentage by 10 for each higher range.
HP 8481/2/3/5A/6A/7A: <0.3% of full scale (range 1).
HP 8484A/5D/6D: <2.0% of full scale (range 1).
Settling Time: (0 to 99% settled readings over the bus). Range HOLD, 10 dB decreasing power step.

Filter No.	0	1	2	3	4	5	6	7	8	9
Averages	1	4	8	16	32	64	128	256	512	1024
Settling Time(s)	.03	.13	.25	1.0	1.4	2.2	3.7	6.9	14	27

Settling Time(s) vs. Range and Resolution (for Auto Filter Mode)

	Res 1 (0.1 dB, 1% F.S.)	Res 2 (0.01 dB, 0.1% F.S.)	Res 3 (0.001 dB, 0.01% F.S.)
Highest 5	.1	.1	1.0
Power 4	.1	.1	1.4
3	.1	.15	2.2
Lowest 2	.1	1.0	14.0
Power 1	1.0	6.9	6.9

[1]If using the HP 8484A/85D/86D Power Sensors: ±2% of full Scale

Default resolution of 0.01 dB, range HOLD, 10 dB decreasing power step:

<7.0s	*range 1*	*<150ms*	*range 3*
<1.0s	*range 2*	*<100ms*	*ranges 4-5*

Measurement Speed over HP-IB, Free-Running Trigger: 40 readings per second.

POWER REFERENCE

Power Output: 1.00 mW. Factory set to ±0.7% traceable to U.S. National Institute of Standards and Technology (NIST, formerly NBS)
Accuracy: ±1.2% worst case (±0.9% RSS) for one year.

POWER METER FUNCTIONS

Frequency: Allows entry of test signal frequency for Cal Factor selection.
Offset: Allows power measurement to be offset by -99.99 dB to +99.99 dB.
Resolution: Selectable resolution of 0.1, 0.01, and 0.001 dB in logarithmic mode; 1%, 0.1%, and 0.01% of full scale in linear mode. Auto Filter Mode: The meter automatically selects the required number of averages for the chosen range and resolution.
Averaging: Selectable from 1 to 1024 readings (in powers of 2).
Duty Cycle: Displays peak power representation of measured RMS power for rectangular pulses.
Limits: The meter automatically displays "Over Limit" or "Under Limit" when the power measured is outside the limit boundaries. Entry range: -299.999 dBm and +299.999 dBm.
Sensor Tables: Allows entry and editing of up to 10 Frequency versus Cal Factor sensor tables.
Save/Recall States: Saves and Recalls 10 complete HP 70100A operating states.

GENERAL

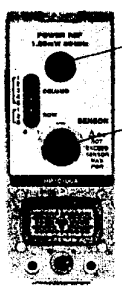
Dimensions/weight: 14.6 mm H x 4.8 mm W x 46.7 mm D (5.8" x 1.9" x 18.4")/1.9 kg (4.2 lb.)

ACCESSORIES PROVIDED

HP 11730A: One 1.5-metre (5 ft) sensor cable.

ORDERING INFORMATION

HP 70100A Power Meter Module	$2,900
Opt. 003: Moves reference oscillator from front to rear panel	$0
Opt. 004: Delete sensor cable	less $75
Opt. 005: Delete reference oscillator	less $250
Opt. 915: Service Manual	$25
Opt. 916: Extra Operating Manual	$25
Opt. W30: Two additional years of return-to-HP warranty (3 years total).	$50



Prices and Data Subject to Change
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