

Figure 1-1. HP 438A Power Meter with Accessories Supplied.

Table 1-1. Specifications

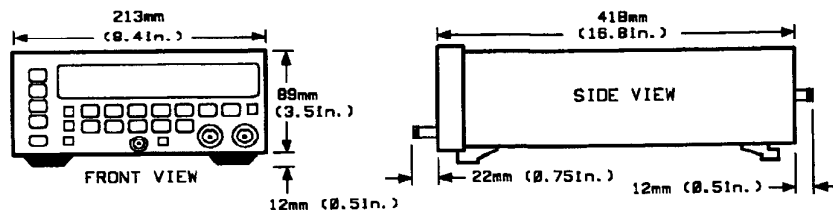
Electrical Characteristics	Performance Limits	Conditions
<b>Meter</b>		
Frequency range	100 kHz to 26.5 GHz	Sensor dependent
Power range	-70 dBm to +44 dBm (100 pW to 25W)	Sensor dependent
Dynamic range	50 dB total range	5 ranges of 10 dB steps for 50 dB total
<b>Inputs</b>		
Rear panel output	Channel A and B 0-1 volt analog	Multiplexed dual sensors Without digital filtering 1kΩ output impedance BNC connector
Measurement modes	A, B, A-B, B-A, A/B, B/A	Normal or relative all modes
Display units	Watts or dBm Percent or dB Percent or dB	Absolute A, B, A-B, B-A Ratio A/B, B/A Relative
<b>Resolution</b>		
Normal	0.1% full scale (0.01 dB) 0.01 dB	Auto filter watts or percent dBm or dB
High	0.01% full scale 0.001dB	Manual filter watts or percent dBm or dB
<b>Accuracy</b>		
Instrumentation, includes sensor linearity <sup>1</sup>		
Single channel mode:	±0.02 dB Plus ±0.02 dB	Within same calibration range Outside calibration range
Dual channel mode: <sup>2</sup> (ratio or difference)	Multiply single channel specifications by 2	
Zero set (digital settability of zero)	±0.5% full scale	Most sensitive range. Decrease percentage by a factor of 10 for each higher range ± one count.
<b>EMI</b>		
Radiated and Conducted Emissions and Radiated and Conducted Susceptibility are within the requirements of RE02, CE03, RS01/03 and CS01/02 called out in MIL-STD-461C, and within the requirements of VDE 0871 and CISPR Publication 11.		

1 When operating in Range 5, add the corresponding sensor power linearity percentage.

2 Accuracy does not depend on the meter being in Normal or Relative mode.

Table 1-1. Specifications (continued)

Electrical Characteristics	Performance Limits	Conditions
Power reference	1.00 mW	Internal 50 MHz oscillator factory set to $\pm 0.7\%$ traceable to National Bureau of Standards.
Power reference accuracy	$\pm 1.2\%$ $\pm 0.9\%$	Worst case RSS for one year.
<b>General</b>		
Operating temperature range	0° C to 55° C	
Power Requirements	65 VA, 35 watts	Maximum
Line Voltage	100, 120, 220, or 240 Vac, +5% to -10%	
Line Frequency	48 to 66 Hz  360 to 440 Hz	All specified line voltages may be used.  Limited to line voltages of 100 or 120 Vac.
Power Dissipation	<10 VA (8 watts max)	
Remote Operation	HP-IB	All functions except power switch, clear entry, HP-IB address
Compatibility	HP-IB interface	SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP1, DC1, DT1, C0
Memory	Non-volatile	Contains complete meter operating state of both channels plus contents of store/recall registers
Operating and non-operating environment	Temperature, humidity, shock, and vibration type tested to MIL-T-28800B Class V requirements.	
Safety	Meets requirements of IEC 348	
Net weight	5.9 kg (13 lbs.)	
Dimensions	89mm H x 213mm W x 418mm D (3.5 H x 8.4 W x 16.8 inches D) (3.5 H x 8.4 W x 16.8 inches D)	EIA and IEC racking standards: 3.5 H x 0.5 W x 17 D



Note: For ordering cabinet accessories, the module sizes are 3-1/2H, 1/2MW, and 17D.

Table 1-2. Supplemental Characteristics

<b>Zero drift of sensors</b> As a % of full scale, 1 hour, at constant temperature after 24 hours warmup.	
<b>Sensors:</b> HP 8481A, 8481B, 8481H, 8482A, 8482B, 8482H, 8483A, 8485A:	$\pm 0.1\%$ of full scale on range 1.
<b>Sensors:</b> HP 8484A:	$\pm 2.0\%$ of full scale on range 1.
Decrease percentage by a factor of 10 for each higher range.	
<b>Measurement speed</b> Over HP-IB and free running trigger.	
Single channel	20 readings per second
Dual channel	2 readings per second
<b>Channel switching delay</b>	200 ms
<b>Power reference</b>	
Frequency	50 MHz nominal
SWR	1.05 maximum
Connector	Type N female
<b>Meter adjustments:</b>	
<b>CAL FACTOR</b>	Key pad entry or programmable. Sets calibration factor for the meter. Overrides current value. Range: 1-150% in 0.1% increments.
<b>ZERO</b>	Key pad entry or programmable. Zeros all 5 ranges, reference oscillator automatically switched off during zeroing.
<b>CAL ADJ</b>	Automatic, key pad entry or programmable. Calibrates meter using internal 1.00 mW reference or external reference oscillator. Reference Cal Factor settable from 50.0% to 120.0%.
<b>OFFSET</b>	Key pad entry or programmable. Range: -99.99 to +99.99 dB in 0.01 dB increments.
<b>Digital Filter Length</b>	Keypad entry or programmable. Averages power readings from 1 to 512 successive values in increments by factors of 2 (1, 2, 4, ... 256, 512).
<b>High/Low Power Limits</b>	Programmable only. Activates Service Request and flashing front panel indicator. Individual channel values from -299.99 to +299.99 dBm in 0.001 dB increments.
<b>STORE/RECALL Registers</b>	Nineteen registers to store complete operating state of meter for later recall.
<b>REL</b>	Key pad entry or programmable. Displays all successive measurements relative to the last displayed value when activated. Units are in dB or %.

**Table 1-3. Additional Supplemental Characteristics**

<p><b>Meter Noise</b> As a % of full scale, with constant temperature, range 1, measured over a one minute interval, and two standard deviations.</p> <p><b>Sensors:</b> HP 8481A, 8481B, 8481H, 8482A, 8482B, 8482H, 8483A, 8485A:</p>		
	<b>Filter Number</b>	<b>Noise (%)</b>
	0	6.0
	1	2.4
	2	1.8
	3	0.9
	4	0.7
	5	0.5
	6	0.4
	7	0.3
	8	0.2
	9	0.15
<p><b>Sensors:</b> HP 8484A: Multiply noise levels by 4 for all filters. Decrease noise by a factor of 10 for each higher range for all sensors and all filters.</p>		
<p><b>Settling Time</b> 0 to 99% settled readings over the bus. AUTO filter, range hold, 10 dB decreasing power step.</p>		
<b>Single channel</b>	<b>Range</b>	<b>Settling Time</b>
	1	<3.0 s
	2	<1.0 s
	3	<150 ms
	4-5	<100 ms
<p>Manual filter, range hold, 10 dB decreasing power step.</p>		
<b>Single channel</b>	<b>Filter Number</b>	<b>Response Time(s)</b>
	0	0.10
	1	0.15
	2	0.25
	3	1.0
	4	1.4
	5	2.2
	6	3.7
	7	6.9
	8	14.0
	9	27.0
<p><b>Dual channel (ratio or difference mode):</b> Approximately the sum of the individual response times of each channel, plus channel switching delay.</p>		

**Table 1-4. Recommended Test Equipment**

Instrument	Critical Specifications	Recommended Model	Use <sup>1</sup>
Digital Voltmeter	Range 0 to 20 Vdc Resolution: 0.01 Volt	HP 3456A	P, A, T
Oscilloscope	>200 MHz bandwidth	HP 1725A	T
Range Calibrator	Calibration uncertainty ±0.25%	HP 11683A	P, A, T
Signature Multimeter	Qualified Signature Analysis	HP 5005B	T
Frequency Counter	Range: 10 Hz to 50 MHz Resolution: 1 Hz	HP 5328A Option 031	P, A, T
Power Splitter	Frequency: 50 Mhz Impedance: 50 Ohms Connectors: Type N	HP 11667A	O
Power Meter	Range: 1 mW Transfer Accuracy: 0.2% (Input to output)	HP 432A	P, A, T
Thermistor Mount	SWR: 1.05 at 50 MHz Accuracy: ±0.5% at 50 MHz	HP 478A-H75 HP 478A-H76 <sup>2</sup>	P, A

<sup>1</sup> \*P=Performance Tests, A=Adjustments, T=Troubleshooting.

<sup>2</sup> Calibrated by the National Institute of Standards and Technology (NIST) for this accuracy.

**Table 1-5. Service Accessories**

Accessory <sup>1</sup>	Specification	Suggested Model
Open-end wrench (SMC connectors)	1/4-inch	Utica Tool Co. <sup>2</sup> , Open End Standard, Model No. OP82, 1/4-inch
Extender Board	36 contacts (2 x 18)	HP 08684-60018
Foam Pad	Conductive polyurethane foam, 12 x 12 x 0.25 inches	HP 4208-0094

<sup>1</sup> Refer to section 8, "Service" for applications.

<sup>2</sup> Utica Tool Company, Inc. Orangeburg, SC 29115 or the nearest Utica Tool Company distributor.