

SPECIFICATIONS

B-1 INTRODUCTION

The specifications for the HP 5347A/48A Microwave Counter/Power Meter are shown in *Table B-1*.

Table B-1. HP 5347A/48A Specifications

Counter Specifications

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

INPUT 1	HP 5347A	HP 5348A	OPTIONAL INCREASED DAMAGE LEVEL OPTION 006
Frequency Range:	500 MHz – 20.0 GHz	500 MHz – 26.5 GHz	
Sensitivity: 500 MHz – 12.4 GHz 12.4 GHz – 20.0 GHz 20.0 GHz – 26.5 GHz	-32 dBm (-35 dBm typical) -27 dBm (-32 dBm typical) N/A	-32 dBm (-35 dBm typical) -27 dBm (-32 dBm typical) -20 dBm (-27 dBm typical)	Sensitivity is reduced by: 3 dB 4 dB 5 dB
Impedance:	50 Ohms nominal	50 Ohms nominal	
Damage Level:	+25 dBm, peak	+25 dBm peak	500 MHz to 6 GHz +39 dBm (8 Watts) 6 GHz to 18 GHz +36 dBm (4 Watts) 18 GHz to 26.5 GHz +34.8 dBm (3 Watts)
Connector:	N(f)	APC 3.5(m)	
SWR: 500 MHz – 10.0 GHz 10 GHz – 20 GHz 20 GHz – 26.5 GHz	<2:1 typical <3:1 typical N/A	<2:1 typical <3:1 typical <3:1 typical	<2.5:1 typical <3.5:1 typical <3.5:1 typical
Coupling:	ac	ac	
Accuracy: ^a	± 1 LSD rms ± time base error × frequency		
Residual Stability:	When counter and source use common 10 MHz time base or counter uses external higher stability time base, 1 LSD rms typical for 1 Hz resolution at 25°C.		
Resolution:	1 Hz or 10 kHz, selectable		

Note:
a) Accuracy specification applies from 0° to 50°C when using internal time base, 0° to 55°C with external time base.

Table B-1. HP 5347A/48A Specifications (Continued)

Counter Specifications (Continued):

INPUT 1	HP 5347A	HP 5348A
Gate Time:	For 1 Hz resolution	
	500 MHz - 5.7 GHz 200 ms 5.7 GHz - 11.3 GHz 400 ms 11.3 GHz - 16.9 GHz 600 ms 16.9 GHz - 22.5 GHz 800 ms >22.5 GHz 1000 ms	
INPUT 2	HP 5347A/5348A	
Frequency Range:	10 Hz - 525 MHz	
Sensitivity:	25 mV rms (15 mV rms typical)	
Impedance:	1 MΩ nominal shunted by <70 pF (10 Hz to 80 MHz) or 50Ω nominal (10 MHz to 525 MHz)	
Maximum Input:	+10 dBm (50Ω input), 1 V rms (1 MΩ input)	
Damage Level:	50Ω or 1 MΩ, dc - 5 kHz: 250V (dc + ac peak); >5 kHz: 5.5V rms (+28 dBm) + 1.25 x 10 ⁶ V rms/FREQ	
Connector:	BNC (f)	
Coupling:	ac	
Accuracy:	± 1 LSD ± [(1.4 x Trigger Error ^b /Gate Time) ± Time Base Error] x frequency	
Resolution:	1 Hz or 10 kHz, selectable	
Gate Time:	1/Resolution 1 ms minimum	

Automatic Amplitude Discrimination:

Automatically measures the largest of all signals present, provided that signal is >6 dB (typical) above any signal within 500 MHz; > 20 dB (typical) above any signal within 500 MHz to 20 GHz (26.5 GHz).

Maximum Deviation:

20 MHz p-p, Automatic mode
60 MHz p-p, Manual mode^c

Maximum FM Rate: 10 MHz

Tracking Speed:

Resolution = 1 Hz, Speed = 1 MHz/sec
Resolution = 10 kHz, Speed = 1 GHz/sec

AM Tolerance:

Any modulation index provided the minimum signal level is not less than the sensitivity specification.

Acquisition Time:

Resolution = 1 Hz, Time = < 125 ms
Resolution = 10 kHz, Time = < 60 ms

Notes:

b) Trigger Error:

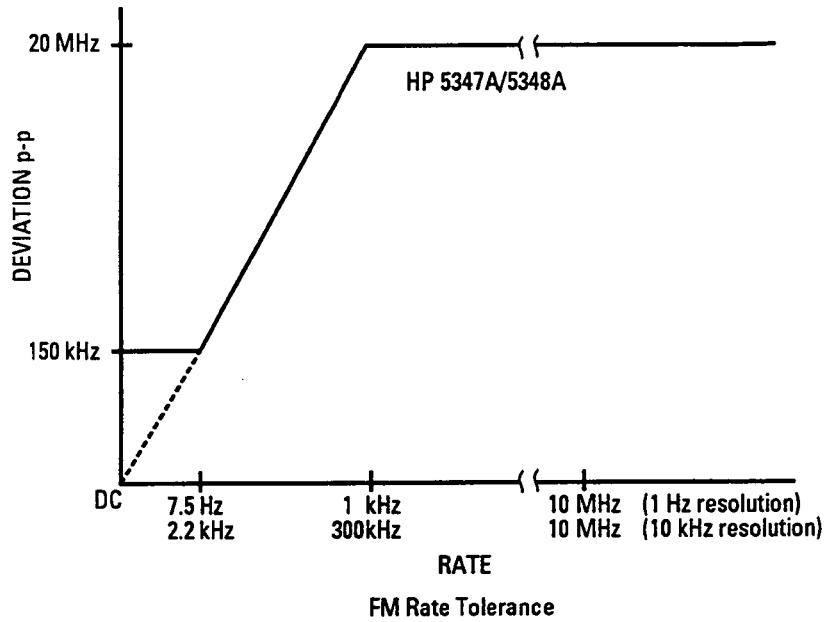
$$\frac{\sqrt{(e_t^2 + e_n^2)}}{\text{Input Slew Rate in V/s at Trigger point}} \text{ s rms}$$

Where e_t = Effective rms noise of counter's input channel. (100 μV typical)
e_n = rms noise of the input signal for a 500 MHz bandwidth.

c) Manual Mode is only accessible via HP-IB.

Table B-1. HP 5347A/48A Specifications (Continued)

Counter Specifications (Continued):



TCXO Time Base

Crystal Frequency: 10 MHz

Stability:

Aging Rate:

< 1×10^{-7} per month

Short Term:

< 1×10^{-9} for 1 s averaging time

Temperature:

< 1×10^{-6} , 0 - 50° C, if referenced to +25° C and set to the offset frequency.

Line Variation:

< 1×10^{-7} for 10 % change from nominal

External Time Base:

10 MHz, 0.7 V min. to 8 V max p-p sine wave or square wave into > 1 K Ω shunted by < 30 pF, via front panel BNC connector.

Table B-1. HP 5347A/48A Specifications (Continued)

Power Meter Specifications

Frequency Range:
10 MHz to 26.5 GHz, sensor dependent

Power Range:
-70 to +20 dBm (100 pW to 100 mW),
sensor dependent

Power Sensors:
HP 8481A, HP 8481D^d, HP 8484A, HP 8485A

Dynamic Range: 50 dB in 10 dB steps

Display Units: Watts, dBm

Resolution:
0.01 dB in logarithmic mode,
0.1% of full scale in linear mode

Auto Filter:

The meter automatically selects the required number of averages for the selected range.

Range	5	4	3	2	1
# of Avg	4	4	4	8	128

Accuracy

Instrumentation:^e

±0.02 dB or ±0.5%

Zero Set (digital settability of zero):^f

±0.5% of full scale on most sensitive range. Decrease percentage by a factor of 10 for each higher range, ±1 display count.

Power Meter Supplemental Characteristics

Table 1
Uncertainties in Power Measurements

Source of Error	Typical Value	Reduce To	Reduce Error by
Mismatch	1.8 %	<±0.1 %	Tuning at each frequency
Calibration Factor Uncertainty	1.5 % - 4.2%		N/A
Power Reference Uncertainty	1.2 %	<0.7 %	Special calibration by standards lab
HP 11708A Calibration Pad (HP 8484A)	1.1 %	<0.5 %	"
Instrumentation Uncertainty *	0.5 %	N/A	N/A
Zero Set	0.2 %	N/A	N/A
Noise	0.2 %	<0.1 %	Average several readings
Power Reference Mismatch Uncertainty	0.2 %	<0.2 %	Tuning

* Add sensor power linearity error (see sensor specification) on top range only.

Notes:

- d) The HP 8481D sensor is a direct replacement for the HP 8484A.
- e) When operating on power measurement Range 4 and 5, add the power linearity percentages found in the Power Sensor Matrix on page 6.
- f) If using the HP 8484A Power Sensor: ±2% of full scale.

Table B-1. HP 5347A/48A Specifications (Continued)

Power Meter Supplemental Characteristics (Continued):

Meter Noise:

(% of full scale, constant temperature, range 1, measured over one minute interval, two standard deviations).

HP 8481A, HP 8485A Sensors

Range	1	2	3	4	5
Noise (%)	0.3	0.09	0.02	0.002	0.0002

HP 8484A Sensor: multiply noise levels by 4

Range 1 is the lowest power measurement range, range 5 is the highest.

Zero Drift of sensors:

(% of full scale, 1 hour, at constant temperature after 24-hour warm-up). Decrease noise by a factor of 10 for each higher range.

HP 8481A, HP 8485A: < 0.1% of full scale on range 1.

HP 8484A: < 2.0% of full scale on range 1.

Settling Time:

(0 to 99% settled readings over the bus). 10 dB decreasing power step.

Range	1	2	3-5
Settling Time	< 7.0 s	< 1.0 s	< 250 ms

Power Reference Specifications

Power Output:

1.00 mW. Factory set to $\pm 0.7\%$ traceable to U.S. National Institute of Standards.

Accuracy:

$\pm 1.2\%$ worst case ($\pm 0.9\%$ RSS) for one year.

Power Reference Supplemental Characteristics

Frequency: 50 MHz nominal

SWR: 1.05 maximum

Front Panel Connector: N (f)

Table B-1. HP 5347A/48A Specifications (Continued)

Sensor Specifications

Model	HP 8481A	HP 8484A ^g	HP 8485A
Power Range	1 μ W to 100 mW -30 dBm to +20 dBm	100 pW to 10 μ W -70 dBm to -20 dBm	1 μ W to 100 mW -30 dBm to +20 dBm
Frequency Range	10 MHz - 18 GHz	10 MHz - 18 GHz	50 MHz - 26.5 GHz
Maximum SWR	10 MHz - 30 MHz : 1.40 30 MHz - 50 MHz : 1.18 50 MHz - 2 GHz : 1.10 2 GHz - 12.4 GHz : 1.18 12.4 GHz - 18 GHz : 1.28	10 MHz - 30 MHz : 1.40 30 MHz - 4 GHz : 1.15 4 GHz - 10 GHz : 1.20 10 GHz - 15 GHz : 1.30 15 GHz - 18 GHz : 1.35	50 MHz - 100 MHz : 1.15 100 MHz - 2 GHz : 1.10 2 GHz - 12.4 GHz : 1.15 12.4 GHz - 18 GHz : 1.20 18 GHz - 26.5 GHz : 1.25
Power Linearity ^h	+10 to +20 dBm +2, -4%	-30 dBm to -20 dBm \pm 1%	+10 to +20 dBm +2, -4%
Maximum Power	300 mW avg., 15W peak 30W μ s per pulse	200 mW average 200 mW peak	300 mW avg., 15W peak 30W μ s per pulse
Connector	N (m)	N (m)	APC 3.5 (m)

* The HP 8481D power sensor is a direct replacement for the HP 8484A.

General

Diagnostics:

Rear panel or HP-IB selectable, service diagnostics and user information.

Data Output:

90 meas/sec, counter - varies with frequency (10 kHz resolution, "DUMP MODE")
18 meas/sec, power meter.

Overload Indication:

"OVRLOAD" A user message; External pad or signal attenuation should be used to avoid damage.

Sleep Mode:

Counter Input 1 conducted emissions are reduced to < -70 dBm (typical) when sleep mode, input 2, or power meter is selected.

HP-IB:

Functions and diagnostics are programmable; Default switches on rear panel; IEEE 488 compatible command structure; Function subset SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1.

Operating Temperature: 0° C to 55° C

Power Requirements: 50 VA maximum

Line Select:

100 V (90 - 105 VAC rms; 47.5 - 440 Hz)
115/120 V (104 - 126 VAC rms; 47.5 - 440 Hz)
220 V (198 - 231 VAC rms; 47.5 - 66 Hz)
230/240 V (207 - 252 VAC rms; 47.5 - 66 Hz)

External DC:

12 to 26 VDC, 40 W, Binding Post

Battery (Option 002):

1 to 2 hours operation (typical),
12 hours to charge (typical)

Accessories Supplied:

Power cord, Operating/Programming manual, power sensor cable (HP 11730)

Dimensions:

144 mm H x 325 mm W x 456 mm D
5.66" H x 12.8" W x 18.0" D

Weight:

9.1 kg, 20 lbs
(10.4 kg, 23 lbs with battery)

Notes:

- g) Includes HP 11708A 30 dB attenuator for calibrating against a 0 dBm, 50 MHz power reference. HP 11708A is factor set to 30 dB \pm 0.5 dB at 50 MHz, traceable to NIS. SWR < 1.05 at 50 MHz.
- h) Negligible deviation except for those power ranges noted.