

- Quick, easy power and frequency measurements
- Portable; battery operation

- Built-in sensor calibration tables
- Supports many HP power sensors



HP 5347A portable microwave counter/power meter. (Shown with Option 803, HP 8485A power sensor, and Option 070 soft carrying case.)

### HP 5347A and HP 5348A Microwave Counter/Power Meters

The HP 5347A and HP 5348A microwave counter/power meters offer the convenience of a single instrument that meets both your frequency and power measurement needs. The HP 5347A counter/power meter makes these measurements to 20 GHz; the HP 5348A, to 26.5 GHz. Both counter/power meters offer the accuracy and resolution that previously required a standalone counter and a separate power meter. Measurements are easy. The HP 5347A and 5348A are designed for ease of use; they have only five function keys. They are rugged, lightweight, and battery powered.

#### True Power Meter Performance

As power meters, the HP 5347A and 5348A offer excellent dynamic range, linearity, and accuracy. They use the same proven power sensors used with Hewlett-Packard's standalone power meters. Power sensors and accurate, wide-range measurements go hand in hand. Power measurements can be made from  $-70$  dBm to  $+20$  dBm over a 10 MHz to 26.5 GHz frequency range, depending on the sensors used. Exceptional power-meter linearity and low sensor SWR combine to give you outstanding measurement accuracy. The instrumentation accuracy is  $\pm 0.5\%$  in linear mode or  $\pm 0.02$  dB in logarithmic mode, making power-meter uncertainty a negligible part of your total measurement error.

#### Outstanding Frequency Measurements

The frequency counter performance rivals that of HP's highest-performance standalone CW microwave counters. The HP 5347A measures frequency from 10 Hz to 20 GHz; the HP 5348A, from 10 Hz to 26.5 GHz. You can select either 1 Hz or 10 kHz resolution while measuring signals down to  $-35$  dBm.

#### Portable, Easy to Use

The HP 5347A and 5348A come in a rugged, lightweight, and portable package. Several features have been designed in for quick and easy, portable measurements. An internal-battery option, for example, provides up to two hours of cordless measurements.

#### Designed for Measurement Ease

How many times have you purchased test equipment only to find that you never use most of the available functionality? The excess functionality only clutters the front panel and makes measurements difficult. Hewlett-Packard recognizes the importance of quick and easy measurements to field service personnel. The HP 5347A and HP 5348A are designed for ease of use.

#### Five Function Keys Simplify Operation

Unnecessary functions were designed out of the HP 5347A and HP 5348A counter/power meters. Only five function keys are required to make accurate frequency and power measurements. The chance of getting an incorrect reading due to instrument setup is almost eliminated. Little or no time is required to learn how to use these instruments. A one-page starter guide is shipped with every instrument.

#### No Need for Calibration Tables

An average calibration table is permanently stored in memory. You no longer need to spend time entering power sensor calibration factors. Using average calibration tables results in only a slight reduction in overall measurement accuracy. With the HP 5347A and 5348A, the press of a single key stores a frequency measurement for use in a power measurement. The stored frequency is then used to access the power sensor calibration factor in the permanently stored calibration-factor-versus-frequency tables.

DESIGNED FOR  
HP-IB  
SYSTEMS

## Internal Battery for Cordless Measurements

An optional internal battery allows you to make cordless measurements for up to two hours. In the field, you do not need a power cord. Just walk right up to the output port and make your measurement.

Because at times it might be more convenient to operate the instrument from a dc supply, an external dc input is available for even greater flexibility in choosing a power source.

## A Rugged Package for Tough Environments

These instruments are designed to survive the harsh transportation and operation environments common to portable applications. Their membrane front panels keep dirt and moisture from entering the instruments. An optional soft carrying case stores accessories, protects the unit during transit, and frees your hands to make measurements.

## For Benchtop and ATE Systems Too

Having frequency and true power measurements in a single portable package saves valuable bench space in a manufacturing environment. The ease-of-use features will also be greatly appreciated.

A rackmount kit and HP-IB option are available for using the HP 5347A or HP 5348A in an ATE system.

## Counter Specifications

### Input 1

#### Frequency Range:

HP 5347A: 500 MHz to 20.0 GHz

HP 5348A: 500 MHz to 26.5 GHz

#### Sensitivity:

HP 5347A/48A: 500 MHz to 12.4 GHz: -32 dBm  
(-35 dBm typical)  
12.4 GHz to 20.0 GHz: -27 dBm  
(-32 dBm typical)

HP 5348A: 20.0 GHz to 26.5 GHz: -20 dBm (-27 dBm typical)

Maximum Input: +7 dBm

Damage Level: +25 dBm, peak

Connector: HP 5347A: N(f); HP 5348A: APC 3.5(m)

Coupling: AC

Accuracy:  $\pm$  LSD  $\pm$  timebase error  $\times$  frequency

Accuracy specification applies from 0° to 50° C when using internal timebase, 0° to 55° C with external timebase.

Resolution: 1 Hz or 10 kHz, selectable

Tracking Speed: Resolution = 1 Hz, speed = 1 MHz/s  
Resolution = 10 kHz, speed = 1 GHz/s

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

Maximum Deviation: 20 MHz peak-to-peak, automatic mode

Maximum FM Rate: 10 MHz

AM Tolerance: Any modulation index, provided the minimum signal level is not less than the sensitivity specification.

TCXO Timebase: See page 111

for a general description of timebases.

External Timebase: 10 MHz, 0.7 V min. to 8 V max peak-to-peak sine wave or square wave into > 1 K $\Omega$  shunted by < 30 pF, via front-panel BNC connector.

### Input 2

Frequency Range: 10 Hz to 525 MHz

Sensitivity: 25 mV rms (15 mV rms typical)

Impedance: 1 M $\Omega$  nominal shunted by < 70 pF (10 Hz to 80 MHz) or 50  $\Omega$  nominal (10 MHz to 525 MHz)

Maximum Input: +10 dBm (50  $\Omega$  input), 1 V rms (1 M $\Omega$  input)

Connector: BNC (f)

Coupling: AC

Resolution: 1 Hz or 10 kHz, selectable

### Options

Battery (Option 002): 1 to 2 hours of operation (typical); 12 hours to charge (typical)

Microwave Level Limiter (Option 006)

Damage level: 500 MHz to 6 GHz: 39 dBm; 6 GHz to 18 GHz: 36 dBm; 18 GHz to 26 GHz: 34.8 dBm

Sensitivity, reduced by: 500 MHz to 12.4 GHz: 3 dBm; 12.4 GHz to 20 GHz: 4 dBm; 20 GHz to 26 GHz: 5 dBm

Oven Timebase: Special option

## Power Meter Specifications

Frequency Range: 10 to 26.5 GHz, sensor-dependent

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

Power Sensors: Orderable as options with the instrument.

Opt 801: HP 8481A Power Sensor, .01 to 18 GHz, -30 to +20 dBm

Opt 802: HP 8481D Diode Power Sensor, .01 to 18 GHz, -70 to -20 dBm

Opt 803: HP 8485A Power Sensor, .05 to 26.5 GHz, -30 to +20 dBm

Dynamic Range: 50 dB in 10 dB steps

Display Units: Watts, dBm

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

### Accuracy

Instrumentation:  $\pm$ 0.02 dB or  $\pm$ 0.5%

Zero set (digital settability of zero):  $\pm$ 0.5% of full scale on most sensitive range

### Power Reference

Power output: 1.00 mW. Factory set to  $\pm$ 0.7% traceable to U.S. National Institute of Standards and Technology.

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

## General

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

Data Output: Counter: varies with frequency (90 measurements/sec with 10 kHz resol, DUMP mode); Power Meter: 18 measurements/sec

HP-IB Interface Functions: SHI, AHI, T5, I4, SR1, RLI, DC1, DT1, E1

Operating Temperature: 0° to 55° C

Power Requirements: 50 VA maximum

Line Select: 100V (90 to 105 Vac rms; 47.5 440 Hz)

115/120V (104 to 126 Vac rms; 47.5 to 440 Hz)

220V (198 to 231 Vac rms; 47.5 to 66 Hz)

230/240V (207 to 252 Vac rms; 47.5 to 66 Hz)

External dc: 14 to 26 Vdc, 40 W, binding post

Accessories Supplied: Power cord, operating/programming manual, power sensor cable (HP 11730A)

Size: 325 mm W  $\times$  144 mm H  $\times$  456 mm D (12.8 in  $\times$  5.66 in  $\times$  18.0 in)

Weight: 9.1 kg (20 lb); with battery, 10.4 kg (23 lb)

## Ordering Information

HP 5347A 20 GHz Counter/Power Meter

\$8,750

HP 5348A 26.5 GHz Counter/Power Meter

\$9,850

### Options for HP 5347A and HP 5348A

Opt 002 Battery Pack

+ \$450

Opt 006 Microwave Level Limiter

+ \$1,000

Opt 011 HP-IB Interface

+ \$350

Oven Timebase Special Option

Call HP

Opt 070 Soft Carrying Case

+ \$350

Opt 801 HP 8481A Power Sensor

+ \$810

Opt 802 HP 8481D Diode Power Sensor

+ \$1,145

Opt 803 HP 8485A Power Sensor

+ \$1,250

Opt 913 Rack Mount Kit

+ \$480

Opt 915 Service Manual

+ \$175

Opt 916 Additional Operating/Programming Manual

+ \$50

Opt W30 (HP 5347A) Extended Repair Service

+ \$190

(see page 588)

Opt W30 (HP 5348A) Extended Repair Service

+ \$215

(see page 588)

Opt W32 (HP 5347A/48A) Calibration Service

+ \$955

(see page 588)

### HP Power Sensor Cables

This instrument is supplied with one HP 11730A 1.5 m (5 ft)

Sensor Cable. Longer cables are available separately.

HP 11730B 3.0-m (10-ft) Sensor Cable

\$122

HP 11730C 6.1-m (20-ft) Sensor Cable

\$179

HP 11730D 15.2-m (50-ft) Sensor Cable

\$255

HP 11730E 30.5-m (100-ft) Sensor Cable

\$355

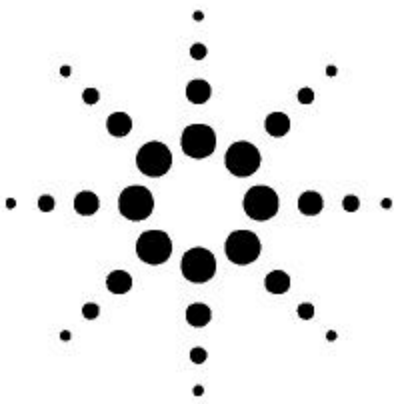
HP 11730F 61.0-m (200-ft) Sensor Cable

\$560

### Additional equipment available:

Transit Case 9211-2649 (see page 568)

\$480



# Agilent 5347A 20 GHz Microwave Counter / Power Meter

## Data Sheet

### Product Specifications

Frequency Range: 500 MHz to 20 GHz Sensitivity 500 MHz - 12.4 GHz: -32 dBm (-35 dBm typical) 12.4 GHz - 20.0 GHz: -27 dBm (-32 dBm typical)

Maximum Input: +7 dBm Damage Level: +25 dBm, peak SWR 500 MHz - 12.4 GHz: <2:1 typical 12.4 GHz - 20.0 GHz: <3:1 typical Accuracy:  $\pm 1$  LSD  $\pm$ time base error x frequency

Resolution: 1 Hz or 10 kHz, selectable

**Optional Increased Damage Level Opt 006** Protects Input 1 from damage by limiting high level signals. All specifications are the same except Input 1.

Damage Level 500 MHz to 6 GHz: +39 dBm (8 watts) 6 GHz to 18 GHz: +36 dBm (4 watts) Sensitivity reduced by 3 dBm, 500 MHz to 12.4 GHz 4 dBm, 12.4 GHz to 20.0 GHz

### Input 2

Frequency Range: 10 Hz - 525 MHz

Sensitivity: 25 mV rms (15 mV rms typical)

Impedance: 1 Mohm nominal shunted by <70 pF (10 Hz to 80 MHz) or 50  $\Omega$  nominal (10 MHz to 525 MHz)

Damage Level: 50  $\Omega$  or 1 M $\Omega$  dc - 5 kHz: 250V (dc + ac peak) >5 KHz: 5.5V rms (+28 dBm) + 1.25 x 10<sup>6</sup> V rms/FREQ

Accuracy:  $\pm 1$  LSD  $\pm$ [(1.4 x Trigger Error/Gate Time) $\pm$ Time Base Error] x frequency

Resolution: 1 Hz or 10 kHz, selectable

**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.

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

Resolution = 1 Hz, Time = <125 ms Resolution = 10 kHz, Time = <60 ms Maximum Deviation 20 MHz p-p, Automatic mode 60 MHz p-p, Manual mode (via HP-IB only)

Maximum FM Rate: 10 MHz

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

### Power Meter

Frequency Range: 0 MHz to 20 GHz, sensor dependent Power Range: -70 dBm to +20 dBm (100 pW to 100 mW), sensor dependent

Dynamic Range: 50 dB in 10 dB steps 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.

Accuracy Instrumentation:  $\pm 0.02$  dB or  $\pm 5\%$

Zero Set (digital settability of zero):  $\pm 5\%$  of full scale on most sensitive range. Decrease percentage by a factor of 10 for each higher range,  $\pm 1$  display count.