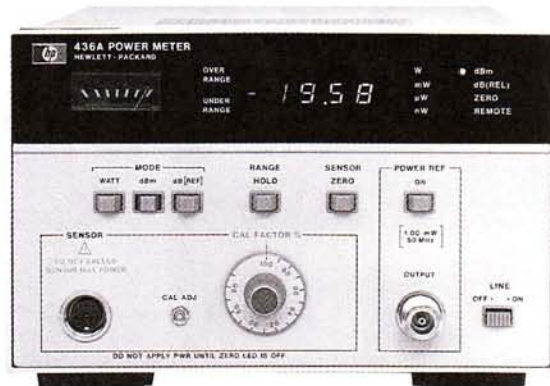


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800-517-8431

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HP 436A



- Ideal for ATE applications
- Dual power sensors
- Innovative ratio & difference measurements



HP 438A



HP 436A Power Meter

The HP 436A Power Meter is a general-purpose digital power meter intended for manual and automatic radio-frequency (RF) and microwave-power measurements. It is compatible with the entire series of HP 8480 thermocouple and diode power sensors.

The HP 436A measures either absolute or relative power. It displays absolute power in either watts or dBm, and relative power in dB. The HP 436A offers intuitive and straightforward manual operation as well as optional HP-IB programmability (Option 022).

Specifications

Frequency Range: 100 kHz to 110 GHz, sensor dependent

Power Range: -70 to +44 dBm (100 pW to 25 W), sensor dependent

Accuracy

Instrumentation

Watt mode: ±0.5%

dBm mode: ±0.02 dB ±0.001 dB/°C

dB (REL) mode¹: ±0.02 dB ±0.001 dB/°C

Zero: Automatic, operated via front panel switch

Zero set: ±0.5% of full scale on most sensitive range, typical

Zero carry over: ±0.2% of full scale when zeroed on the most sensitive range

Power reference: Internal 50 MHz oscillator with Type-N female connector on front panel (or rear panel, Opt 003)

Power output: 1.0 mW. Factory set to ±0.7% traceable to the U.S. National Institute of Standards and Technology

Accuracy: ±1.2% worst case (±0.9% rss) for one year

Supplemental Characteristics

Recorder Output: Linearly proportional to indicated power with 1 volt corresponding to full scale and 0.316 volts to -5 dB; 1 kΩ output impedance, BNC connector

Power Consumption: 100, 120, 220, 240V (+5%, -10%), 48 to 66 Hz, and 360 to 440 Hz; <20 VA (<23 VA with Opt 022)

HP-IB Function Codes: AH1, C0, DC2, DT0, LE0, P0, RL2, SH1, SR0, T3, TE0

Weight: Net, 4.5 kg (10 lb); shipping, 5.5 kg (12 lb)

Size: 134 mm H × 213 mm W × 279 mm D (5.2 in × 8.4 in × 11.0 in)

Accessories

Furnished: HP 11730A, 1.5-m (5-ft) power sensor cable; 2.3-m (7.5-ft) power cable

Available: To select and substitute nonstandard lengths for power sensor cables, see page 178. HP 5061-9657 rackmount adapter kit (one HP 436A by itself).

Ordering Information

HP 436A Power Meter

Price

\$4,750

Opt 003 Reference oscillator output on rear panel only

\$50

Opt 004 Delete Power Sensor Cable

-\$50

Opt 022 Digital Input/Output, fully HP-IB compatible

\$0

Opt 908 Kit for rackmounting one HP 436A

+\$53

Opt 910 Extra Operating and Service Manual (00436-90034)

+\$25

Opt W30 Extended Repair Service (see page 624)

+\$80

Opt W32 Calibration Service (see page 624)

\$685

¹Specifications for within range measurements. For range-to-range accuracy add ±0.02 dB.

HP 438A Power Meter

The HP 438A Power Meter is a dual-channel power meter designed specifically for ATE systems. The compact front panel saves critical rack space, while the dual channel design allows simple and accurate measurements of the ratio and difference of power levels from two separate sensors. This meter is compatible with the HP 8480 Series of thermocouple and diode power sensors.

HP-IB capability is standard on the HP 438A. For U.S. Air Force Modular Automatic Test Equipment (MATE) system application, Option 700 provides the HP 438A with the internal capability to be controlled by the MATE Control Interface Intermediate Language (CIIL).

Specifications

Frequency Range: 100 kHz to 110 GHz, sensor dependent

Power Range: -70 to +44 dBm (100 pW to 25W), sensor dependent. Uses HP 8480 Series power sensors

Instrumentation Accuracy

Single channel: ±0.5% (watt mode) or ±0.02 dB (dBm mode)

Dual channel: ±1% (watt mode) or ±0.04 dB (dBm mode)

Zeroing: Automatic, ±0.5% of full scale on most sensitive range

Power Reference

Power output: 1.00 mW. Factory set to ±0.7%, traceable to the U.S. National Institute Standards and Technology

Accuracy: ±1.2% worst case (±0.9% rss) for 1 year

Connector: front panel Type-N female (also rear panel Opt 002)

Supplemental Characteristics

Recorder Output: Linearly proportional to indicated power in watts. One volt corresponds to full scale; 1 kΩ output impedance. BNC rear panel female connector

Line Voltage: 100, 120, 220, or 240 Vac +5% -10%. 100 and 120 volts, 48 to 66 Hz and 300 to 440Hz. 220 and 240 volts, 48 to 66 Hz only

Power Requirements: 65 VA, 35 watts, maximum

HP-IB Interface Codes: SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP1, DC1, DT1, C0

Weight: Net, 5.9 kg (13 lb); shipping, 9.1 kg (20 lb)

Size: 89 mm H × 213 mm W × 418 mm D (3.5 in × 8.4 in × 16.8 in)

Accessories

Furnished: HP 11730A, 2 each, 1.5-meter (5-ft) power sensor cables. Power cable, 1 each, 2.4 meters (7.5 ft). Mains plug matches destination requirements.

Available: To select and substitute nonstandard lengths for power sensor cables, see page 178.

Ordering Information

HP 438A Dual Channel Power Meter

Price

\$5,350

Opt 002 Rear Panel Sensor Connector (in parallel with front panel) and additional reference oscillator with rear panel output

+450

Opt 700 Internal MATE Programming

+\$2,000

Opt 004 Delete Power Sensor Cables

-\$100

Opt 910 Additional Manual (00438-90015)

+\$25

Opt W30 Extended Repair Service (see page 624)

+\$130

Opt W32 Calibration Service (see page 624)

\$305

☎ For off-the-shelf shipment, call 800-452-4844.

POWER METERS

Power Meters

HP 437B, 70100A, E1416A

Test Equipment Depot
99 Washington Street
Melrose, MA 02176-6024

www.testequipmentdepot.com

800-517-8431

781-665-0780 FAX



HP 437B

HP 437B Power Meter

The HP 437B is a low-cost, high-performance, single-channel, programmable, average power meter compatible with the HP 8480 family of thermocouple and diode power sensors. Depending on which power sensor is used, the HP 437B can measure from -70 dBm (100 pW) to +44 dBm (25 W) at frequencies from 100 KHz to 110 GHz.

Designed for ATE systems and demanding benchtop measurements, the HP 437B Power Meter makes fast, accurate, and reliable average power measurements. Only 3 inches high and half rack wide, the HP 437B minimizes the use of critical rack space in ATE systems. The advanced plastics technology used in the HP 437B cabinet combines the light weight of plastic with the shielding effectiveness of metal, making the HP 437B the only power meter to meet MIL-STD-461C EMI specifications.

A modern and flexible feature set makes this meter easy to use in any application:

- Automatic calibration and zeroing
- Frequency entry instead of Cal Factor
- Ten pre-loaded sensor Cal Factor versus frequency tables
- Selectable resolution to 0.001 dB
- Offset entry in dB
- Duty cycle entry for a convenient peak power representation of the measured average power
- Ten store/recall registers
- HP-IB is standard
- Analog meter is a standard feature

With a measurement speed twice as fast as that of the industry-standard HP 436A, powerful programming capability, state-of-the-art accuracy, and exceptional reliability, the HP 437B lets you measure your test signal with speed, precision, and confidence.

HP 70100A and E1416A

MMS and VXI Power Meters

The HP 70100A is a full-feature single-channel power meter module for the Modular Measurement System (see page 94). It has all the capability of the HP 437B Power Meter in an 1/8th rack-width module. The HP 70100A features the same modern and flexible feature set as the HP 437B, the same state-of-the-art accuracy, and is also fully compatible with the HP 8480 series of power sensors. The HP E1416A power meter is a VXI version of the HP 70100A. For information on the HP E1416A, refer to page 174.

HP 437B, 70100A, and E1416A Specifications

Frequency Range: 100 kHz to 110 GHz, sensor dependent
Power Range: -70 to +44 dBm (100 pW to 25 W), sensor dependent
Power Sensors: Compatible with all HP 8480 Series power sensors
Dynamic Range: 50 dB in 10 dB steps
Display Units: Absolute: Watts, dBm; relative: percent, dB
Resolution: Selectable resolution of 0.1, 0.01, and 0.001 dB in logarithmic mode; or 1%, 0.1%, and 0.01% of full scale in linear mode

For the most current prices and product information, contact your local Hewlett-Packard sales office—see page 654.



HP 70100A



HP E1416A

Accuracy

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

In REL Mode: ± 0.02 dB or $\pm 0.5\%$ within measurement range; ± 0.04 dB or 1% outside measurement range

Zero Set: $\pm 0.5\%$ of full scale on most sensitive range

Power Reference

Power Output: 1.00 mW, Factory set to $\pm 0.7\%$ traceable to US National Institute of Standards and Technology

Accuracy: $\pm 1.2\%$ worst case ($\pm 0.9\%$ RSS) for 1 year

General (HP 437B only)

EMI: Radiated and Conducted Emissions and Radiated and Conducted Susceptibility are within the requirements of RE02, CE03, RS01/03 and CS01/03 called out in MIL-STD-461C, and within the requirements of VDE 0871 and CISPR Publication 11

Rear-Panel Output: Analog 0-1 volt without digital filtering or Cal Factor correction, 1 k Ω output impedance, BNC connector

Line Voltage: 100 and 120 Vac, +5%-10%, 48-66 Hz, 360-440 Hz; 220 and 240 Vac, +5% to 10%, 48 to 66 Hz

Power Requirement: 8 watts maximum (10 VA max)

HP-IB Codes: SH1, AH1, T5, TE0, L4, LE0, SRI, RLI, PPI, DC1, DT1, C0

Weight: Net 2.6 kg (5.9 lb); shipping 4.5 kg (10 lb)

Size: 88 mm H \times 212 mm W \times 273 mm D (3.46 in \times 8.35 in \times 10.75 in)

Accessories

Furnished: HP 11730A, 1.5 m (5 ft) cable for power sensors; 2.4m (7.5 ft) power cable. Mains plug shipped to match destination requirements.

Available: To select or substitute nonstandard lengths for power sensor cable, see page 175. To rackmount one HP 437B, order HP p/n 5060-0173. To rackmount two HP 437B power meters, order HP p/n 5060-0174.

Ordering Information

HP 437B Power Meter

Opt 002 Supplies a parallel rear-panel sensor input

Opt 003 Supplies a parallel rear-panel sensor input

and moves reference oscillator to rear-panel

Opt 004 Delete the HP 11730A sensor cable

Opt 401 Provides side-carrying handle and standoff feet

Opt 915 Service Manual

Opt 916 Extra operating manual (00437-90015)

Opt W30 Two additional years of return-to-HP warranty

HP 70100A Power Meter Module

Opt 003 Moves reference oscillator from front to rear panel

Opt 004 Delete the HP 11730A Power Sensor Cable

Opt 005 Delete Reference Oscillator

Opt W30 Extended Repair Service (see page 624)

For off-the-shelf shipment, call 800-452-4844.

Price

\$2,725

+ \$100

+ \$100

- \$50

+ \$50

+ \$25

+ \$25

+ \$65

\$3,200

\$0

- \$75

- \$255

+ \$70





435A



11683A

435A Power meter

The 435A Power Meter is an analog power meter, compatible with the entire series of 8480 power sensors. Depending on which sensor is used, the 435A can measure power from -65 dBm to $+35$ dBm, full scale, at frequencies from 100 kHz to 18 GHz. This versatile instrument also features $<1\%$ instrumentation uncertainty, low noise and drift, auto-zero, recorder output, optional battery operation, and long cable options (up to 200 ft).

11683A Range calibrator

The 11683A calibrator is specifically designed for use with the 435A and 436A power meters. It allows verification of full-scale meter readings on all ranges, as well as meter tracking. Simply connect the cable between the power meter and calibrator. The CAL ADJ control, on the power meter, is used to set the meter to full scale on the 1 mW range. The calibrator and meter are then stepped through the other ranges verifying accuracy within $\pm 1\%$ plus noise and drift. The 11683A also has a polarity switch which tests the Auto-Zero circuit.

Specifications

435A power meter

Frequency range: 100 kHz to 18 GHz (depending on power sensor used).

Power range

435A calibrated in watts and dB in 5 dB steps.

With 8481A, 8482A, or 8483A: -25 dBm ($3 \mu\text{W}$) to $+20$ dBm (100 mW) full scale.

With 8481H or 8482H: -5 dBm (0.3 mW) to $+35$ dBm (3W) full scale.

With 8484A: -65 dBm (300 pW) to -20 dBm (100 W) full scale.

Instrumentation uncertainty: $\pm 1\%$ of full scale on all ranges (0° to 55°C).

Zero carryover: $\pm 0.5\%$ of full scale when zeroed on the most sensitive range.

Reference Oscillator: internal 50 MHz oscillator with Type N female connector on front panel or rear panel (Option 003 only).

Power output: 1.0 mW. Factory set to $\pm 0.7\%$ traceable to the National Bureau of Standards.

Accuracy: $\pm 1.2\%$ worst case ($\pm 0.9\%$ rms) for one year (0°C to 55°C).

Noise and drift: (% of full scale peak on most sensitive range; typical, at constant temperature).

8481A, 8482A, 8483A: $<1.5\%$; less on higher ranges.

8481H, 8482H: $<1.5\%$; $<2\%$ of full scale on top range; less on other ranges.

8484A: $<5\%$; less on higher ranges.

Response time: 2 seconds on $3 \mu\text{W}$ range, 0.75 second on $10 \mu\text{W}$ range, 0.25 second on $30 \mu\text{W}$ range, and 100 msec on all other ranges. (Typical, time constant measured at recorder output.)

Zero: automatic, operated by front panel switch.

Cal factor: 16-Position switch normalizes meter reading to account

for calibration factor or effective efficiency. Range 85% to 100% in 1% steps.

Recorder output: proportional to indicated power with 1 volt corresponding to full scale; $1 \text{ k}\Omega$ output impedance, BNC connector.

RF blanking output: provides a contact closure to ground when auto-zero mode is engaged.

Cal adj: front panel adjustment provides capability to adjust gain of meter to match power sensor in use.

Power: 100, 120, 220, or 240 V $\pm 5\%$, -10% , 48 to 440 Hz, less than 4 watts (less than 10 watts for option 001 when recharging battery).

Weight: net, 2.6 kg (5 lb, 12 oz). Shipping, 4.2 kg (9 lb, 3 oz).

Dimensions: 155 mm high, 130 mm wide, and 279 mm deep ($6\frac{1}{32} \times 5\frac{1}{8} \times 11$ in.).

Accessories furnished: 1.52 m (5 ft) cable for the power sensor; 2.29 m ($7\frac{1}{2}$ ft) power cable. Mains plug shipped to match destination requirements.

Accessories available

11076A carrying case.

5060-8762 rack adapter frame (holds three instruments the size of the 435A).

Combining cases

1051A: 286 mm ($11\frac{1}{4}$ in.) deep.

1052A: 416 mm ($16\frac{3}{8}$ in.) deep.

The combining cases accept the $\frac{1}{3}$ -module Hewlett-Packard instruments for bench use or rack mounting. See 1051A data sheet for details.

11683A Range calibrator

Calibration functions: outputs corresponding to meter readings of 3, 10, 30, 100 and $300 \mu\text{W}$; 1, 3, 10, 30, and 100 mW.

Calibration uncertainty: $\pm 0.25\%$ in all ranges.

Power: 115 or 230 V $\pm 10\%$; 50-400 Hz, less than 2 W.

Weight: net, 1.13 kg (2 lb 8 oz). Shipping, 1.9 kg (4 lb 3 oz).

Dimensions: 88.9 mm high, 133.35 mm wide, and 215.9 mm deep ($3\frac{1}{2} \times 5\frac{1}{4} \times 8\frac{1}{2}$ in.).

Options

001: rechargeable battery installed, provides up to 16 hours of continuous operation

add \$100

002: input connector placed on rear panel in parallel with front

add \$25

003: input connector and reference oscillator output on rear panel only

add \$10

009: 3.05 m (10-foot) cable for power sensor

add \$30

010: 6.10 m (20-foot) cable for power sensor

add \$55

011: 15.24 m (50-foot) cable for power sensor

add \$105

012: 30.48 m (100-foot) cable for power sensor

add \$155

013: 60.96 m (200-foot) cable for power sensor

add \$260

Model number and name

11683A range calibrator

\$525

435A power meter

\$850