

# POWER & NOISE FIGURE METERS

Thermocouple Power Meter, Range Calibrator

Model 435B, 11683A



435B



11683A

## 435B Power Meter

The 435B Power Meter is an analog power meter, compatible with the entire series of 8480 power sensors. Depending on which sensor is used, the 435B can measure power from  $-65$  dBm to  $+44$  dBm, full scale, at frequencies from 100 kHz to 26.5 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 61 m (200 ft).

## 11683A Range Calibrator

The 11683A calibrator is specifically designed for use with the 435B 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.

## 435B Specifications

**Frequency range:** 100 kHz to 26.5 GHz (depending on power sensor used).

**Power range** (calibrated in watts and dB in 5 dB steps).

With 8481A, 8482A, 8483A or 8485A:  $-25$  dBm ( $3 \mu\text{W}$ ) to  $+20$  dBm (100 mW) full scale.

With 8481B or 8482B:  $+5$  dBm (3 mW) to  $+44$  dBm (25 W) full scale.

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

With 8484A:  $-65$  dBm (300 pW) to  $-20$  dBm ( $10 \mu\text{W}$ ) full scale.

### Accuracy

**Instrumentation:**  $\pm 1\%$  of full scale on all ranges.

**Zero:** automatic, operated by front-panel switch.

**Zero set:**  $\pm 0.5\%$  of full scale on most sensitive range, typical.

**Zero carryover:**  $\pm 0.5\%$  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. Option 003 only).

**Power output:** 1.00 mW. Factory set to  $\pm 0.7\%$  traceable to the National Bureau of Standards.

**Accuracy:**  $\pm 1.2\%$  worst case ( $\pm 0.9\%$  rss) for one year ( $0^\circ\text{C}$  to  $55^\circ\text{C}$ ).

### Supplemental Characteristics

**Noise** (typical, at constant temperature, peak change over any one-minute interval): 20 pW (8484A); 40 nW (8481A, 8482A, 8483A, 8485A); 40  $\mu\text{W}$  (8481B, 8482B); 4  $\mu\text{W}$  (8481H, 8482H).

**Drift** (1 hour, typical, at constant temperature after 24-hour warm-up): 40 pW (8484A); 15 nW (8481A, 8482A, 8483A, 8485A); 15  $\mu\text{W}$  (8481B, 8482B); 1.5  $\mu\text{W}$  (8481H, 8482H).

**Response Time** (typical, measured at recorder output, 0 to 99% of reading):

Range 1 (most sensitive range)	$<10.0$ seconds
Range 2	$<3.8$ seconds
Range 3	$<1.3$ seconds
Ranges 4 to 10	$<500$ milliseconds

**Cal factor:** 16-position switch normalizes meter reading to account for calibration factor; range 85% to 100% in 1% steps.

**Recorder output:** linearly proportional to indicated power with 1 volt corresponding to full scale: 1 k $\Omega$  output impedance, BNC connector.

**RF blanking output:** provides a contact closure to ground. Used for turning off RF input to sensor during auto-zeroing. BNC connector.

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

**Power consumption:** 110 or 120 V ( $+5\%$ ,  $-10\%$ ), 48 to 66 Hz and 360 to 440 Hz; also 220 or 240 V ( $+5\%$ ,  $-10\%$ ), 48 to 66 Hz only:  $<20\text{V} \cdot \text{A}$ .

**Weight:** net, 2.7 kg (5.9 lb); shipping, 4.2 kg (9.2 lb).

**Size:** 155 H x 130 W x 279 mm D (6.3 x 5.1 x 11 in.).

### Accessories

**Furnished:** 1.52 m (5 ft) cable for the power sensor; 2.3 m (7.5 ft) power cable, (mains plug shipped to match destination requirements).

**Available** (see page 721)

**11076A:** Carrying case.

**5060-8762:** Rack adapter frame (holds three instruments the size of the 435B).

**Combining cases** (see page 720)

**1051A:** 286 mm (11.25") deep.

**1052A:** 416 mm (16.4") deep.

These combining cases accept  $\frac{1}{2}$ -module Hewlett-Packard instruments for bench use or rack mounting.

### 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 (2.5 lb); shipping, 1.9 kg (4.2 lb).

**Size:** 89 H x 133 W x 216 mm D (3.5 x 5.25 x 8.5 in.).

### Ordering Information

11683A Range Calibrator	Price
435B Power Meter	\$625
435B Options	\$1100

<b>001:</b> Rechargeable battery installed provides up to 16 hours of continuous operation	add \$100
<b>002:</b> Input connector placed on rear panel in parallel with front	add \$25
<b>003:</b> Input connector and reference oscillator output on rear panel only	add \$10
<b>009:</b> 3.0 m (10-foot) cable for power sensor	add \$30
<b>010:</b> 6.1 m (20-foot) cable for power sensor	add \$55
<b>011:</b> 15.2 m (50-foot) cable for power sensor	add \$105
<b>012:</b> 30.5 m (100-foot) cable for power sensor	add \$155
<b>013:</b> 61 m (200-foot) cable for power sensor	add \$260
<b>910:</b> Extra operating and service manual	add \$7.50