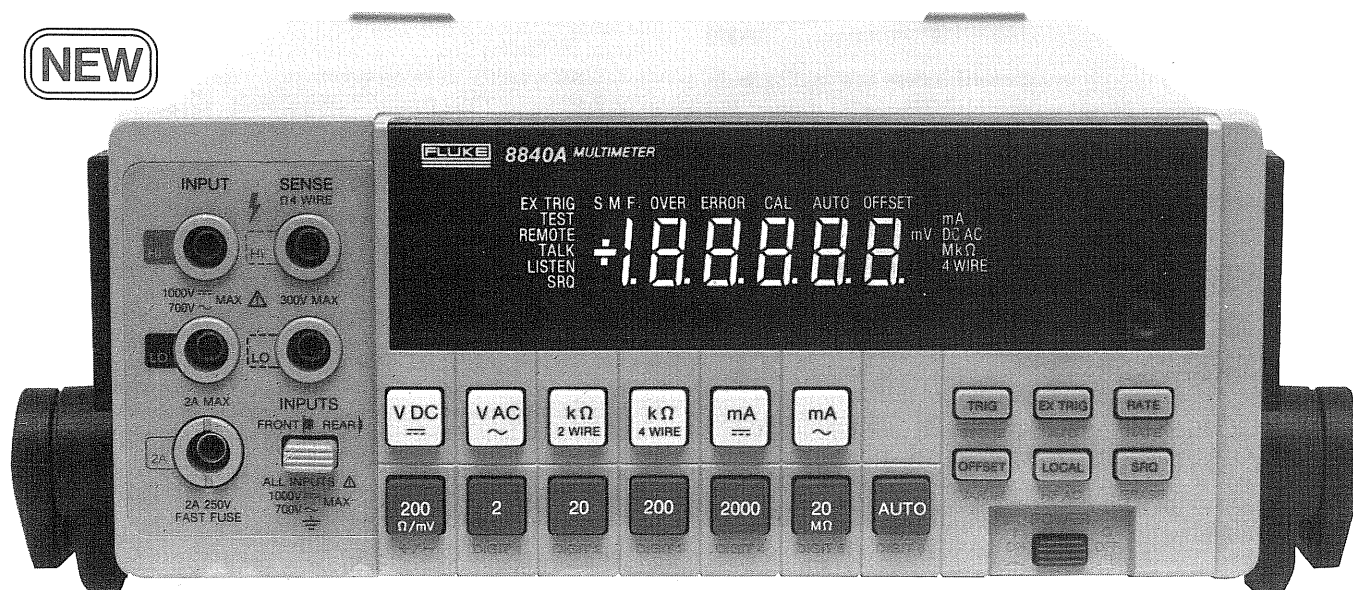


DIGITAL MULTIMETER

8840A



8840A

8840A, Accuracy and Low Cost

- 0.005% basic 1-year dc accuracy
- Ohms and dc current standard
- Ac voltage and current optional
- Full system capability with optional IEEE-488 interface
- Up to 100 readings/second system speed
- Vacuum fluorescent display
- Closed-case calibration
- Comprehensive self test

The 8840A introduces new standards of accuracy, speed, resolution, and convenience in a 5½-digit DMM. It comes with full dc voltage, current, and resistance capabilities, vacuum fluorescent display, and offers optional true rms ac and IEEE-488 interface capabilities.

Performance

The 8840A has performance you would expect in multimeters costing twice as much. Basic dc accuracy is 0.005% for 1 year and 0.002% for 24 hours. Basic ac accuracy is 0.16% for 1 year. See the specifications that follow for complete information on measurement ranges and accuracy.

Closed-Case Calibration

No internal adjustments are required for calibration. After you initiate calibration via a recessed front panel switch, you are led through a software controlled procedure that even double checks to ensure that appropriate reference inputs have been applied. Calibration can be performed under front panel or IEEE-488 control.

Self Testing

The 8840A automatically performs a digital self test each time it is powered up. Additionally, you can initiate a comprehensive analog and digital diagnostic self test from the front panel or through the IEEE-488 interface.

Powerful System Capabilities

Adding the inexpensive IEEE-488 interface option to the 8840A provides system capability which includes complete system control of functions, ranges, and reading rates. Front or rear panel inputs are switch-selectable from the front panel (and you can sense the status of the switch over the bus). Calibration and self-test can also be controlled over the bus.

The mechanical design contributes to performance and convenience in system applications. The 8840A's metal case provides EMI shielding to ensure measurement integrity. The unit can be mounted in a half-rack slot simply by removing the handle, turning the "twist-away" rear feet, and bolting on rack-mount brackets.

Embodying all these features, the 8840A is a fully programmable, powerful digital multimeter within reach of every system builder.

Technology

A monolithic A/D converter uses CMOS IC design to achieve the superb accuracy, speed, and reliability of the 8840A.

Analog switch ICs developed by Fluke replace discrete switching devices to create superior performance, reliability, and serviceability.

A voltage reference device similar to that found in the Fluke 732A DC Reference Standard provides unmatched stability.

Precision thin film resistor networks establish the accuracy and maintain the stability of the 8840A.

DIGITAL MULTIMETER

8840A

Specifications

DC Voltage

Input Characteristics

Range	Full Scale 5½ Digits	Resolution		Input Resistance
		5½ Digits	4½ Digits*	
200 mV	199.999 mV	1 µV	10 µV	≥10,000 MΩ
2V	1.99999V	10 µV	100 µV	≥10,000 MΩ
20V	19.9999V	100 µV	1 mV	≥10,000 MΩ
200V	199.999V	1 mV	10 mV	10 MΩ
1000V	1000.00V	10 mV	100 mV	10 MΩ

*4½-digits at the fastest reading rate.

Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)

Range	24 Hour* 23°±1°C	90 Day 23°±5°C	1 Year 23°±5°C
200 mV**	0.003 + 3	0.007 + 4	0.008 + 4
2V	0.002 + 2	0.004 + 3	0.005 + 3
20V	0.002 + 2	0.005 + 3	0.006 + 3
200V	0.002 + 2	0.005 + 3	0.006 + 3
1000V	0.003 + 2	0.005 + 3	0.007 + 3

*Relative to calibration standards

**Using Offset control

Medium and Fast Rates: In medium rate, add 2 counts to number of counts. In fast rate, use 2 counts for the number of counts

Operating Characteristics

Temperature Coefficient: >±(0.0006% of Reading + 0.3 Count) per °C from 18°C to 0°C and 28°C to 50°C

Maximum Input: 1000V dc or peak ac on any range

Noise Rejection: Automatically optimized at power-up for 50, 60 or 400 Hz

Rate	Readings/ Second ¹	Filter	NMRR ²	Peak NM Signal	CMRR ³
S	2.5	Analog & Digital	>98 dB	20V or 2xFS ⁴	>140 dB
M	20	Digital	>45 dB	1xFS	>100 dB
F	100	None	—	1xFS	>60 dB

¹ Reading rate with internal trigger and 60 Hz power line frequency. See "Reading Rates" for more detail

² Normal Mode Rejection Ratio, at 50 or 60 Hz ±0.1%. The NMRR for 400 Hz ±0.1% is 85 dB in S rate and 35 dB in M rate

³ Common Mode Rejection Ratio at 50 or 60 Hz ±0.1%, with 1 kΩ in series with either lead. The CMRR is >140 dB at dc for all reading rates

⁴ 20 volts or 2 times Full Scale whichever is greater, not to exceed 1000V

True-RMS AC Voltage Option (-09)

Input Characteristics

Range	Full Scale 5½ Digits	Resolution		Input Impedance
		5½ Digits	4½ Digits*	
200 mV	199.999 mV	1 µV	10 µV	1 MΩ
2V	1.99999V	10 µV	100 µV	shunted
20V	19.9999V	100 µV	1 mV	by
200V	199.999V	1 mV	10 mV	<100 pF
700V	700.00V	10 mV	100 mV	

*4½-digits at the fastest reading rate.

Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)
For sinewave inputs ≥10,000 counts¹

Frequency (Hz)	24 Hour ² 23°±1°C	90 Day 23°±5°C	1 Year 23°±5°C
20-45	1.2 + 100	1.2 + 100	1.2 + 100
45-100	0.3 + 100	0.35 + 100	0.4 + 100
100-20k	0.07 + 100	0.14 + 100	0.16 + 100
20k-50k	0.15 + 120	0.19 + 150	0.21 + 200
50k-100k	0.4 + 300	0.5 + 300	0.5 + 400

¹ For sinewave inputs between 1,000 and 10,000 counts, add to Number of Counts 100 counts for frequencies 20 Hz to 20 kHz, 200 counts for 20 kHz to 50 kHz, and 500 counts for 50 kHz to 100 kHz

² Relative to calibration standards

Medium and Fast Reading Rates: In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ≥1000 counts and >100 Hz

Operating Characteristics

Temperature Coefficient: ±(% of Reading + Number of Counts) per °C, 18°C to 0°C and 28°C to 50°C

For Inputs	Frequency in Hz		
	20-20k	20k-50k	50k-100k
≥10,000 counts	0.019 + 9	0.021 + 9	0.027 + 10
≥1,000 counts	0.019 + 12	0.021 + 15	0.027 + 21

Crest Factor

Nonsinusoidal Inputs: For nonsinusoidal inputs ≥10,000 counts with frequency components ≤ 100 kHz, and the following % of reading to the accuracy specifications

Fundamental Frequency	1.0 to 1.5	1.5 to 2.0	2.0 to 3.0
45 Hz to 20 kHz	0.05	0.15	0.3
20 Hz to 45 Hz and 20 kHz to 50 kHz	0.2	0.7	1.5

Maximum Input: 700V rms, 1000V peak or 2 x 10⁷ volts-hertz product (whichever is less) for any range

Common Mode Rejection: >60 dB at 50 or 60 Hz with 1 kΩ in either lead

DC Current

Input Characteristics

Range	Full Scale 5½ Digits	Resolution	
		5½ Digits	4½ Digits*
2000 mA	1999.99 mA	10 µA	100 µA

*4½-digits at the fastest reading rate

Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)

Current	90 Days 23°±5°C	1 Year 23°±5°C
≤1A	0.04 + 4	0.05 + 4
>1A	0.1 + 4	0.1 + 4

Medium and Fast Reading Rates: In medium reading rate, add 2 counts to number of counts. In fast reading rate, use 2 counts for number of counts

AC Current (Requires Option -09)

Input Characteristics:

AC Accuracy

Normal (S) Reading Rate: \pm (% of Reading + Number of Counts)

1 Year, $23^{\circ}\pm 5^{\circ}\text{C}$, for sinewave inputs $\geq 10,000$ counts

Frequency in Hertz		
20-45	45-100	100-5k*
2.0 + 200	0.5 + 200	0.4 + 200

*Typically 20 kHz

Medium and Fast Reading Rates: In medium reading rate, add 50 counts to number of counts. In fast reading rate, for sinewave inputs ≥ 1000 counts and frequencies > 100 Hz, the accuracy is \pm (0.2% of reading + 30 counts)

Operating Characteristics

Temperature Coefficient: Less than 0.1 x accuracy specification per $^{\circ}\text{C}$ from 18°C to 0°C and 28°C to 50°C

Maximum Input: 2A dc or rms ac. Protected with 2A, 250V fuse accessible at front panel, and internal 3A, 600V fuse

Burden Voltage: 1V dc or rms ac typical at full scale

Resistance

Input Characteristics

Range	Resolution			Current Through Unknown
	Full Scale 5 $\frac{1}{2}$ Digits	5 $\frac{1}{2}$ Digits	4 $\frac{1}{2}$ Digits*	
200 Ω	199.999 Ω	1 m Ω	10 m Ω	1 mA
2 k Ω	1.99999 k Ω	10 m Ω	100 m Ω	1 mA
20 k Ω	19.9999 k Ω	100 m Ω	1 Ω	100 μA
200 k Ω	199.999 k Ω	1 Ω	10 Ω	10 μA
2000 k Ω	1999.99 k Ω	10 Ω	100 Ω	5 μA
20 M Ω	19.9999 M Ω	100 Ω	1 k Ω	0.5 μA

*4 $\frac{1}{2}$ -digits at the fastest reading rate.

Accuracy

Normal (S) Reading Rate: \pm (% of Reading + Number of Counts)¹

Range	24 Hour ² 23 $^{\circ}\pm 1^{\circ}\text{C}$	90 Day 23 $^{\circ}\pm 5^{\circ}\text{C}$	1 Year 23 $^{\circ}\pm 5^{\circ}\text{C}$
200 Ω	0.004 + 3	0.011 + 4	0.014 + 4
2 k Ω	0.0028 + 2	0.01 + 3	0.013 + 3
20 k Ω	0.0028 + 2	0.01 + 3	0.013 + 3
200 k Ω	0.0028 + 2	0.01 + 3	0.013 + 3
2000 k Ω	0.023 + 3	0.027 + 3	0.028 + 3
20 M Ω	0.023 + 3	0.043 + 4	0.044 + 4

¹Using Offset control

²Relative to calibration standards

Medium and Fast Reading Rates: In medium rate, add to the number of counts 2 counts for the 2 k Ω through 200 k Ω ranges and 3 counts for the 2000 k Ω and 20 M Ω ranges. In fast reading rate, use for the number of counts 3 counts for the 200 Ω range, and 2 counts for all other ranges.

Operating Characteristics

Temperature Coefficient: Less than 0.1 x accuracy specification per $^{\circ}\text{C}$ from 18°C to 0°C and 28°C to 50°C

Measurement Configuration: 2-wire or 4-wire

Open Circuit Voltage: Less than 6.5V on the 200 Ω through 200 k Ω ranges. Less than 13V on the 2000 k Ω and 20 M Ω ranges

Input Protection: To 300V rms

Reading Rates

Reading Rates With Internal Trigger (readings per second):

Rate	Power Line Frequency*		
	50 Hz	60 Hz	400 Hz
S	2.08	2.5	2.27
M	16.7	20	18.2
F	100	100	100

*Sensed automatically at power-up

General Specifications

Option -05 IEEE-488 Interface Function: Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PPO and C0

Common Mode Voltage: 1000V dc or peak ac, or 700V rms ac from any input to earth

Temperature Range: 0°C to 50°C operating; -40°C to 70°C storage

Humidity Range: 80% RH from 0 to 35°C ; 70% to 50°C

Warmup Time: 1 hour to rated specifications

Power: 100, 120, 220, or 240V ac $\pm 10\%$ (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20V A maximum

Vibration: Meets requirements of MIL-T-28800C for Type III, Class 3, Style E equipment

Protection: ANSI C39.5 and IEC 348, Class I

Size: 8.9 cm H x 21.6 cm W x 37.1 cm D (3.5 in x 8.5 in x 14.6 in)

Weight: Net, 3.4 kg *7.5 lb; shipping 4.5 kg (10 lb)

Included: Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide, and instrument performance record

Model

8840A Digital Multimeter

Options

8840A-05 IEEE-488 Interface

8840A-05K Field Installable IEEE-488 Interface

8840A-09 True-RMS AC

8840A-09K Field Installable True-RMS AC

Accessories (Also see page 55)

Y8834 Single Rack Mount Kit

Y8835 Dual Rack Mount Kit

Y8021 1m IEEE-488 Shielded Cable

Y8022 2m IEEE-488 Shielded Cable

Y8023 4m IEEE-488 Shielded Cable

Y8077 Four Terminal Short

A90 6-Range Current Shunt