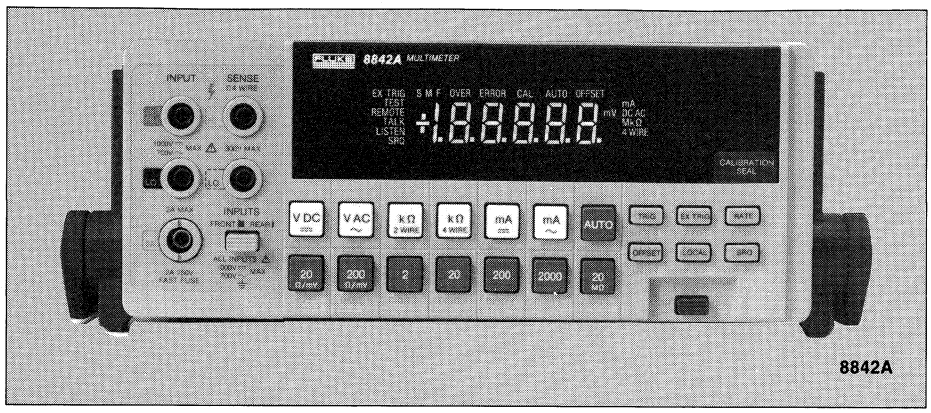
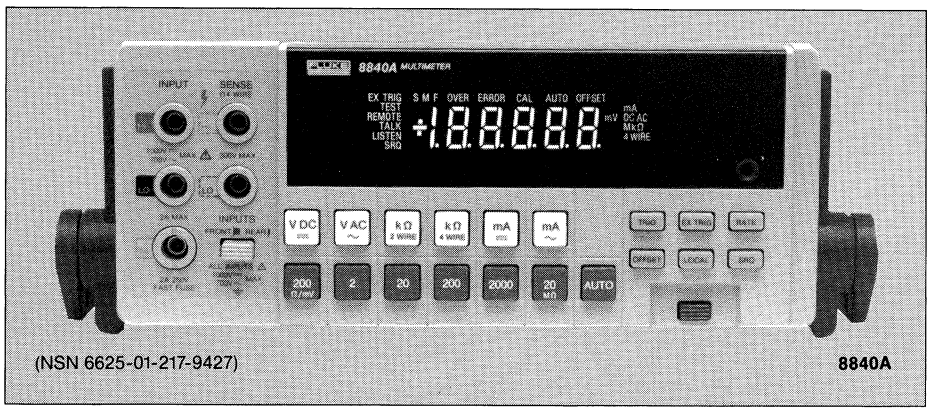
8840 Series

GPIB IEEE-488

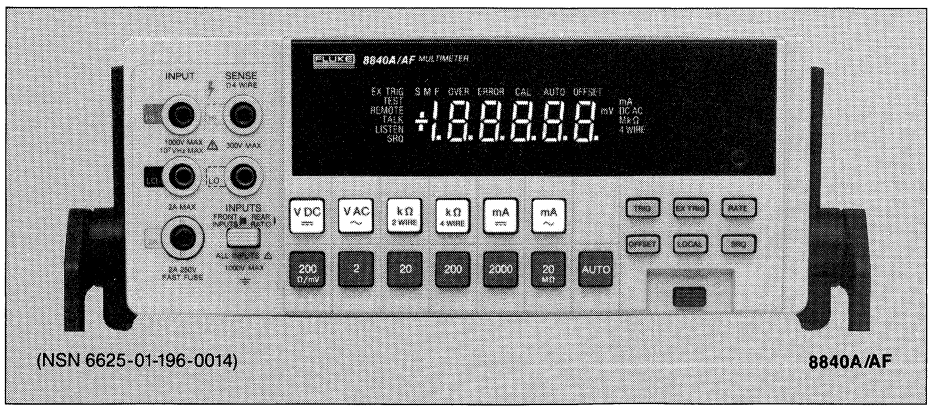


8842A



(NSN 6625-01-217-9427)

8840A



(NSN 6625-01-196-0014)

8840A/AF

8840 Series: 5½-Digit Multimeters

- Basic 1-year dc accuracies to 0.003%; ohms accuracy to 0.008%
- Ohms and dc current standard • Ac voltage and current optional (8842A, 8840A)
- Full system capability with optional IEEE-488 interface
- Up to 100 readings/second system speed
- Vacuum fluorescent display
- Closed-case calibration • Comprehensive self test

Performance

The 8840 Series has performance you would expect in multimeters costing much more. Basic dc accuracies to 0.003% and basic ac accuracies to 0.08% at one year are available. 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 8840 Series 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 8840 Series provides system capability which includes complete system control of functions, ranges, and reading rates. Front and 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.

Powerful yet simple device dependent IEEE-488 code allows the 8840 Series DMMs to be easily integrated into your system. System software written for the 8840A is compatible with the 8842A and 8840A/AF.

The mechanical design also contributes to performance and convenience in system applications. The 8840A Series' 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 8840 Series DMMs are fully programmable, powerful digital multimeters 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 8840 Series.

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 8840 Series.

8842A

Now You Can Choose The 8840 Series DMM To Meet Your Performance Needs

8842A: Premium Performance

The 8842A, top of the 8840 line, delivers all the features of the popular 8840A plus new hermetically sealed thin film resistors. These resistors make possible:

- **Increased measurement power:**
  100 nV resolution with a 20 mV range
  1 μA °C resolution with 200 mA range
  100 μΩ resolution with a 20Ω range
- **Enhanced accuracy in V dc, V ac, Ω**
  0.003% basic dc accuracy at 1 year
  0.08% basic ac accuracy at 1 year
  0.006% basic Ω accuracy at 1 year
- **Extended cal cycles, with 2 year specifications**
  0.005% basic dc accuracy at 2 years
- **Two year warranty**

8840A: The Original Value Leader

The original 8840A continues to provide an outstanding combination of low price and high performance. These features, common to all members of the 8840 Series, are responsible for the popularity of the 8840A.

- 0.005% basic dc accuracy at 1 year
- Ease of IEEE-488 system integration
- Closed case calibration
- Extensive self test
- High reliability
- Vacuum fluorescent display.
- Fluke's one year warranty applies.

8840A/AF: For Tough Assignments

The 8840A/AF delivers all of the 8840A capabilities, plus:

- Expanded environmental envelope
- Compliance with MIL-T-28800C Type II, Class 3, Style B
- True rms ac voltage/current capability is standard
- 1000V rms ac maximum allowable input
- Enhanced EMI/RFI protection.
- Fluke's one year warranty applies.

8842A Specifications

Technical Specifications

DC Voltage

Input Characteristics

Range	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Input Resistance
20 mV	19.9999 mV	0.1 μV	1 μV	⩾10,000 MΩ
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[1] 23±1°C	90 Day 23±5°C	1 Year 23±5°C	2 Year 23±5°C
20 mV[2]	0.0050+20	0.0070+30	0.0100+30	0.0120+40
200 mV[2]	0.0030+2	0.0045+3	0.0070+3	0.0100+4
2V	0.0015+2	0.0025+2	0.0030+2	0.0050+3
20V	0.0015+2	0.0030+2	0.0035+2	0.0060+3
200V	0.0015+2	0.0030+2	0.0035+2	0.0060+3
1000V	0.0020+2	0.0035+2	0.0045+2	0.0070+3

[1]Relative to calibration standards.
[2]Within one hour of dc zero, using offset control.

Medium and Fast Rates: In medium rate, add 2 counts (20 counts on 20 mV range) to number of counts. In fast rate, use two 4½ digit counts (20 counts on 20 mV range) 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[5]	Analog & Digital	>98 dB	20V or 2 x FS[4]	>140 dB
M	20[6]	Digital	>45 dB	1 x FS	>100 dB
F	100	None	—	1 x FS	>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.
[5]Reading rate — .31 rdg/sec. in the 20 mV, 20Ω, 200 mA dc ranges.
[6]Reading rate — 1.25 rdg/sec. in the 20 mV, 20Ω, 200 mA dc ranges.

True-RMS AC Voltage Option (-09)

Input Characteristics

Range	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Input Resistance
200 mV	199.999 mV	1 μV	10 μV	1 MΩ shunted by >100 pF
2V	1.99999V	10 μV	100 μV	
20V	19.9999V	100 μV	1 mV	
200V	199.999V	1 mV	10 mV	
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 counts[1] (5% of range)

Freq (Hz)	24 Hour[1] 23±1°C	90 Day 23±5°C	1 Year 23±5°C	2 Year 23±5°C
20-45	1.2+100	1.2+100	1.2+100	1.2+100
45-200	0.3+100	0.35+100	0.4+100	0.5+100
200-20k (200 mV)	0.06+100	0.08+100	0.10+100	0.20+100
(2-200V)	0.05+80	0.07+80	0.08+80	0.15+80
(700V)	0.06+100	0.08+100	0.10+100	0.20+100
20-50k	0.15+120	0.19+150	0.21+200	0.25+250
50-100k	0.4+300	0.5+300	0.5+400	0.5+500

[1]For sinewave inputs between 1000 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 Rates: In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ⩾1000 4½ digit counts and >100 Hz

Nonsinusoidal Inputs: For nonsinusoidal inputs ⩾10,000 counts with frequency components ⩽100 kHz, add the following % of reading to the accuracy specifications

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

Operating Characteristics

Maximum Input: 700V rms, 1000V peak or 2 x 10^7 Volts-Hertz product (whichever is less) for any range

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

For Inputs	Frequency in Hertz 20k-20k	Frequency in Hertz 20k-50k	Frequency in Hertz 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

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

Current

Input Characteristics

Range	Full Scale 5½ Digits	Resolution	
		5½ Digits	4½ Digits[1]
200 mA[2]	199.999 mA	1 μA	10 μA
2000 mA	1999.99 mA	10 μA	100 μA

[1]*4½ digits at the fastest reading rate.*
[2]*200 mA range is dc only*

DC Accuracy

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

Range	90 Days 23±5°C	1 Year 23±5°C	2 Years 23±5°C
200 mA	0.04+40	0.05+40	0.08+40
2000 mA			
≤1A	0.04+4	0.05+4	0.08+4
>1A	0.1+4	0.1+4	0.15+4

Medium and Fast Rates: In medium reading rate, add 2 counts (20 counts on 20 mA range) to number of counts. In fast reading rate, use two 4½ digit counts (20 counts on 200 mA range) for number of counts

AC Accuracy (Requires Option -09)
Normal (S) Reading Rate: ±(% of Reading + Number of Counts) 23°±5°C, for sinewave inputs ≥10,000 counts

Time	Frequency in Hertz		
	20-45	45-100	100-5k*
One Year	2.0+200	0.5+200	0.4+200
Two Years	3.0+300	0.7+300	0.6+300

**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 4½ digit counts and frequencies >100 Hz, the accuracy is ±(0.2% of reading + 30 counts)
Nonsinusoidal Inputs: For nonsinusoidal inputs ≥10,000 counts with frequency components ≤100 kHz, add the following % of reading to the accuracy specifications

Fundamental Frequency	Frequency in Hertz		
	1.0 to 1.5	1.5 to 2.0	2.0 to 3.0
45 Hz to 5 kHz	0.05	0.15	0.3
20 Hz to 45 Hz	0.2	0.7	1.5

Operating Chracteristics

Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°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	Full Scale 5½ Digits	Resolution		Current Through Unknown
		5½ Digits	4½[1] Digits	
20Ω[2]	19.9999Ω	0.1 mΩ	1 mΩ	1 mA
200Ω	199.999Ω	1mΩ	10mΩ	1mA
2kΩ	1.99999kΩ	10mΩ	100mΩ	1mA
20kΩ	19.0000kΩ	100mΩ	1Ω	100μA
200kΩ	199.999kΩ	1Ω	10Ω	10μA
2000kΩ	1999.99kΩ	10Ω	100Ω	5μA
20MΩ	19.9999MΩ	100Ω	1kΩ	0.5μA

[1]*4½ digits at the fastest reading rate*
[2]*4-wire ohms only*

Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)[1]

Range	24 Hour[2] 23±1°C	90 Day 23±5°C	1 Year 23±5°C	2 Year 23±5°C
20Ω[3]	0.007+30	0.009+40	0.012+40	0.015+40
200Ω	0.0040+3	0.007+4	0.010+4	0.012+4
2 kΩ	0.0025+2	0.005+3	0.008+3	0.010+3
20 kΩ	0.0025+2	0.005+3	0.008+3	0.010+3
200 kΩ	0.0025+2	0.006+3	0.010+3	0.012+3
2000 kΩ	0.023+3	0.025+3	0.027+3	0.030+3
20 MΩ	0.023+3	0.040+4	0.042+4	0.050+4

[1]*Within one hour of ohms zero, using offset control.*
[2]*Relative to calibration standards.*
[3]*4-wire ohms only.*

Medium and Fast Reading Rates: In medium rate, add 2 counts to the number of counts for the 200Ω through 200 kΩ ranges, 3 counts for the 2000 kΩ and 20 MΩ ranges, and 20 counts for the 20Ω range. In fast reading rate, use three 4½ digit for the number of counts for the 200Ω range, 20 4½ digit counts for the 20Ω range, and two 4½ digit for all other ranges

Operating Chracteristics

Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°C and 28°C to 50°C
Measurement Configuration: 2-wire or 4-wire (20Ω range is 4-wire only)
Open Circuit Voltage: Less than 6.5V on the 20Ω through 200 kΩ ranges. Less than 13V on the 2000 kΩ and 20 MΩ ranges
Input Protection: To 300V rms

Reading Rates and Ranging

Reading Rates With Internal Trigger (readings per second):

Rate	Power Line Frequency[1]		
	50 Hz	60 Hz	400 Hz
S	2.08 (.26[2])	2.5 (.31[2])	2.38 (.30[2])
M	16.7 (1.04[2])	20 (1.25[2])	19.0 (1.19[2])
F	100	100	100

[1]*Sensed automatically at power-up.*
[2]*In the 20 mV, 20Ω, and 200 mA ranges. The 8842A does not autorange down into these ranges. To access these ranges, select the specific range, from the front panel or over the bus.*

IEEE-488 Interface Option (-05)

Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0

General Specifications

Common Mode Voltage: 1000V dc or peak ac, or 700V rms ac from any input to earth ground
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 ±10% (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum
Vibration: Meets requirements of MIL-T-28800C for Type III, Class 3, Style E equipment
Safety: ANSI C39.5 and IEC 348, Class I and VDE 0411 Marks License
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 5 kg (11 lb)
Warranty Period: Two years
Included: Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide, instrument performance verification record and serialized and dated calibration sheet

Ordering Information

Models

8842A* Basic Digital Multimeter
8842A/05 w/IEEE-488 Interface
8842A/09 w/AC Measurement Capability
8842A/059 w/IEEE-488 I/F and AC Measurements
** /09 or /059 needed to measure ac*

Options (for 8842A)

-05K IEEE-488 Interface Kit
-09K* True-RMS AC Kit
**Requires recalibration*

Accessories

Y8834 Single Rack Mount Kit Offset
Y8835 Dual Rack Mount Kit
Y8836 Center 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

8840A Specifications

Technical Specifications

DC Voltage

Input Characteristics

Range	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Input Resistance
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[1] 23±1°C	90 Day 23±5°C	1 Year 23±5°C
200 mV[2]	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

[1]Relative to calibration standards
[2]Using Offset control

Medium and Fast Rates: In medium rate, add 2 counts. In fast rate, use two 4½ digit 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 2 x FS[4]	>140 dB
M	20	Digital	>45 dB	1 x FS	>100 dB
F	100	None	—	1 x FS	>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 5½ Digits	Resolution 4½* Digits	Input Resistance
200 mV	199.999 mV	1 μV	10 μV	1 MΩ shunted by >100 pf
2V	1.99999V	10 μV	100 μV	
20V	19.9999V	100 μV	1 mV	
200V	199.999V	1 mV	10 mV	
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 counts[1] (5% of range)

Range	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 1000 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 Rates: In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ⩾1000 4½ digit counts and >100 Hz

Operating Characteristics

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

For Inputs	Frequency in Hertz 20k-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

Nonsinusoidal Inputs: For nonsinusoidal inputs ⩾10,000 counts with frequency components ⩽100 kHz, add 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 & 20 kHz to 50 kHz	0.2	0.7	1.5

**Crest Factor*

Maximum Input: 700V rms, 1000V peak or 2 x 10^7 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

Current

Input Characteristics

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

**4½ digits at the fastest reading rate.*

DC 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 Rates: In medium reading rate, add 2 counts (20 counts on 20 mA range) to number of counts. In fast reading rate, use two 4½ digit counts (20 counts on 200 mA range) for number of counts

AC Accuracy (Requires Option -09)
Normal (S) Reading Rate: ±(% of Reading + Number of Counts) 23°±5°C, for sinewave inputs ⩾10,000 counts

Time	Frequency in Hertz 20-45	45-100	100-5k*
One Year	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 4½ digit counts and frequencies >100 Hz, the accuracy is ±(0.2% of reading + 30 counts)

Operating Chracteristics

Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°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	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Current Through Unknown
200Ω	199.999Ω	1mΩ	10mΩ	1 mA
2kΩ	1.99999kΩ	10mΩ	100mΩ	1 mA
20kΩ	19.9999kΩ	100mΩ	1Ω	100 μA
200kΩ	199.999kΩ	1Ω	10Ω	10 μA
2000kΩ	1999.99kΩ	10Ω	100Ω	5 μA
20MΩ	19.9999MΩ	100Ω	1kΩ	0.5 μA

**4½ digits at the fastest reading rate*

Accuracy
Normal (S) Reading Rate: ±(% of Reading + Number of Counts)[1]

Range	24 Hour[2] 23±1°C	90 Day 23±5°C	1 Year 23±5°C
200 Ω	0.004+3	0.011+4	0.014+4
2 kΩ	0.0028+2	0.01+3	0.013+3
20 kΩ	0.0028+2	0.01+3	0.013+3
200 kΩ	0.0028+2	0.01+3	0.013+3
2000 kΩ	0.023+3	0.027+3	0.028+3
20 MΩ	0.023+3	0.043+4	0.044+4

[1]Using Offset control
[2]Relative to calibration standards

Medium and Fast Reading Rates: In medium rate, add to the number of counts 2 counts for the 200Ω through 200 kΩ ranges and 3 counts for the 2000 kΩ and 20 MΩ ranges. In fast reading rate, use for the number of counts three 4½ digit counts for the 200Ω range and two 4½ digit counts

Operating Chracteristics
Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°C and 28°C to 50°C
Measurement Configuration: 2-wire or 4-wire
Open Circuit Voltage: Less than 6.5V on the 20Ω through 200 kΩ ranges. Less than 13V on the 2000 kΩ and 20 MΩ 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	2.38
M	16.7	20	19.0
F	100	100	100

**Sensed automatically at power-up.*

IEEE-488 Interface Option (-05)

Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0

General Specifications

Common Mode Voltage: 1000V dc or peak ac, or 700V rms ac from any input to earth ground
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 ±10% (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum
Vibration: Meets requirements of MIL-T-28800C for Type III, Class 3, Style E equipment
Safety: ANSI C39.5 and IEC 348, Class I and VDE 0411 Marks License
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 5 kg (11 lb)
Warranty Period: One year
Included: Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide, instrument performance verification record, and serialized/dated calibration certification sheet

Ordering Information

Models

8840A* Basic Digital Multimeter
8840A/05 w/IEEE-488 Interface
8840A/09 w/AC Measurement Capability
8840A/059 w/IEEE-488 I/F and AC Measurements
** /09 or /059 needed to measure ac*

Options (for 8840A)

-05K Field Installable IEEE-488 Interface Kit
-09K* Field Installable True-RMS AC
** Requires recalibration*

Accessories

See page 65 for a list of accessories

8840A/AF Specifications

Technical Specifications

DC Voltage

Input Characteristics

Range	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Input Resistance
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[1] 23±1°C	90 Day 23±5°C	1 Year 23±5°C
200 mV[2]	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

[1]Relative to calibration standards
[2]Using Offset control

Medium and Fast Rates: In medium rate, add 2 counts. In fast rate, use two 4½ digit 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 2 x FS[4]	>140 dB
M	20	Digital	>45 dB	1 x FS	>100 dB
F	100	None	—	1 x FS	>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

Input Characteristics

Range	Full Scale 5½ Digits	Resolution 5½ Digits	Resolution 4½* Digits	Input Resistance
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
1000V	100.00V	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 counts[1]

Range	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 1000 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 Rates: In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ≥1000 4½ digit counts and >100 Hz

8840A/AF

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

For Inputs	Frequency in Hertz		
	20k-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

Nonsinusoidal Inputs: For nonsinusoidal inputs ≥10,000 counts with frequency components ≤100 kHz, add 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 & 20 kHz to 50 kHz	0.2	0.7	1.5

**Crest Factor*

Maximum Input: 1000V rms or 2 x 10^7 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

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.*

DC 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 Rates: In medium reading rate, add 2 counts (20 counts on 20 mA range) to number of counts. In fast reading rate, use two 4½ digit counts (20 counts on 200 mA range) for number of counts

AC Accuracy
Normal (S) Reading Rate: ±(% of Reading + Number of Counts) 23°±5°C, for sinewave inputs ≥10,000 counts

Time	Frequency in Hertz		
	20-45	45-100	100-5k*
One Year	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 4½ digit counts and frequencies >100 Hz, the accuracy is ±(0.2% of reading + 30 counts)

Operating Chracteristics
Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°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	Full Scale 5½ Digits	Resolution		Current Through Unknown
		5½ Digits	4½* Digits	
200Ω	199.999Ω	1mΩ	10mΩ	1 mA
2kΩ	1.99999kΩ	10mΩ	100mΩ	1 mA
20kΩ	19.9999kΩ	100mΩ	1Ω	100 μA
200kΩ	199.999kΩ	1Ω	10Ω	10 μA
2000kΩ	1999.99kΩ	10Ω	100Ω	5 μA
20MΩ	19.9999MΩ	100Ω	1kΩ	0.5 μA

**4½ digits at the fastest reading rate*

Accuracy
Normal (S) Reading Rate: ±(% of Reading + Number of Counts)[1]

Range	24 Hour[2] 23±1°C	90 Day 23±5°C	1 Year 23±5°C
200 Ω	0.004+3	0.011+4	0.014+4
2 kΩ	0.0028+2	0.01+3	0.013+3
20 kΩ	0.0028+2	0.01+3	0.013+3
200 kΩ	0.0028+2	0.01+3	0.013+3
2000 kΩ	0.023+3	0.027+3	0.028+3
20 MΩ	0.023+3	0.043+4	0.044+4

[1]Using Offset control
[2]Relative to calibration standards

Medium and Fast Reading Rates: In medium rate, add to the number of counts 2 counts for the 200Ω through 200 kΩ ranges and 3 counts for the 2000 kΩ and 20 MΩ ranges. In fast reading rate, use for the number of counts three 4½ digit counts for the 200Ω range and two 4½ digit counts

Operating Chracteristics
Temperature Coefficient: Less than 0.1 x accuracy specification per °C from 0°C to 18°C and 28°C to 50°C
Measurement Configuration: 2-wire or 4-wire
Open Circuit Voltage: Less than 6.5V on the 20Ω through 200 kΩ ranges. Less than 13V on the 2000 kΩ and 20 MΩ 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	2.38
M	16.7	20	19.0
F	100	100	100

**Sensed automatically at power-up.*

IEEE-488 Interface Option (-05)

Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0

General Specifications

Common Mode Voltage: 1000V dc or peak ac, or 700V rms ac from any input to earth ground
Temperature Range: 0°C to 55°C operating; -62°C to +85°C storage
Humidity Range: 95% RH, +5% to 0%
EMI: Complies with CE01 (relaxed 20 dB), CE03 (relaxed 10 dB), CS01, CS02, CS06, and RE02 (relaxed 10 dB) as specified in MIL-STD-461
Altitude: 4,500m (15,000 ft) operating; 12,000m (40,000 ft) non-operating
Warmup Time: 1 hour to rated specifications
Power: 100, 120, 220, or 240V ac ±10% (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum
Vibration: Meets requirements of MIL-T-28800C for Type III, Class 3, Style B equipment
Safety: ANSI C39.5 and IEC 348, Class I and VDE 0411 Marks License
Size: 8.9 cm H x 21.6 cm W x 37.1 cm D (3.47 in x 8.5 in x 14.6 in)
Weight: Net, 3.4 kg (7.5 lb); shipping 5 kg (11 lb)
Warranty Period: One year
Included: Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide, (with Option -05 only), instrument performance verification record, and serialized/dated calibration certification sheet

Ordering Information

Model

8840A/AF Digital Multimeter

Options (for 8840A/AF)

-05 IEEE-488 Interface
-05K Field Installable IEEE-488 Interface Kit