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8845A/8846A

Digital Multimeter

Users Manual

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Chapter 1

Introduction and Specifications

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Introduction

The 8845A and 8846A are 6-1/2 digit, dual-display multimeters designed for bench-top, field service, and system applications. Their full complement of measurement functions plus its RS-232, IEEE 488, and Ethernet Remote Interfaces makes these multimeters ideal candidates for precision manual measurements and use in automated systems. For portability, these multimeters include a carrying handle that also serves as a bail for bench top operation.

There are a few feature differences between these two multimeters, and some specifications are tighter for the 8846A. Features that exist in only one multimeter will be identified with the addition of “8846A Only” by each feature that is found only in that model. Separate specification tables are also used to clarify the differences between these two models.

The following is a list of some of the features and functions:

- Bright, large-digit, wide-viewing-angle display
- Dual display for displaying two properties of an input signal (e.g., ac voltage in one display and frequency in the other).
- Remote operation via IEEE 488, RS-232, and Ethernet interface.
- Trigger in and measurement-complete out
- Front panel USB port for optional memory (8846A Only)
- 6-1/2 digit resolution
- Half-rack width
- True rms ac
- 2 and 4-wire resistance measurements
- Extended 10 Ω and 1 G Ω ranges (8846A Only)
- Frequency measurements to 300 kHz (8846A to 1 MHz)
- Capacitance measurements (8846A Only)
- Temperature measurement (8846A Only)
- 10 A current capability
- Decibels (dB and dBm) with variable reference impedance and audio power measurement capability
- Input terminals on both front and rear panels of the meter
- Closed-case calibration (no internal calibration adjustments)

Manual Set

The manual set for these multimeters consists of a *Users Manual* and *Programmers Manual* on a CD ROM. The *Users Manual* contains information on specifications, setup, and operating from the front panel. The *Programmers Manual* covers operating the Meter from a PC or controller.

About this Manual

This is the *Users Manual* for the 8845A and 8846A Digital Multimeters (hereafter referred to as the Meter). It contains all of the information a new user will need to operate the Meter effectively. The manual is divided into the following chapters:

Chapter 1 “Introduction and Specifications” provides information on how to safely use the Meter, standard and optional accessories, and specifications.

Chapter 2 “Preparing for Operation” provides information on setting the Meter’s line voltage, connecting it to a power source, and turning the Meter on.


Chapter 3 “Front Panel Operation” introduces the controls and connections on the front and rear panels of the Meter.


Chapter 4 “Making Measurements” provides detailed information on using the Meter to make electrical measurements.

Appendices

Safety Information

This section addresses safety considerations and describes symbols that may appear on the Meter or in the manual.

A  **Warning** statement identifies conditions or practices that could result in injury or death.

A  **Caution** statement identifies conditions or practices that could result in damage to the Meter or equipment to which it is connected.

Warning

To avoid electric shock, personal injury, or death, carefully read the information under “Safety Information” before attempting to install, use, or service the Meter.

General Safety Summary

This instrument has been designed and tested in accordance with the European standard publication EN 61010-1:2001 and U.S. / Canadian standard publications UL 61010-1A1 and CAN/CSA-C22.2 No.61010.1. The Meter has been supplied in a safe condition.

This manual contains information and warnings that must be observed to keep the instrument in a safe condition and ensure safe operation.

To use the Meter correctly and safely, read and follow the precautions in Table 1-1, and follow all the safety instructions or warnings given throughout this manual that relate to specific measurement functions. In addition, follow all generally accepted safety practices and procedures required when working with and around electricity.

CAT I equipment is designed to protect against transients from high-voltage, low-energy sources, such as electronic circuits or a copy machine.

CAT II equipment is designed to protect against transients from energy-consuming equipment supplied from the fixed installation, such as TVs, PCs, portable tools, and other household appliances.

Table 1-1. Safety Information

⚠ ⚠ Warning









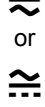









To avoid possible electric shock, personal injury, or death, read the following before using the Meter:

- Use the Meter only as specified in this manual, or the protection provided by the Meter might be impaired.
- Do not use the Meter in wet environments.
- Inspect the Meter before using it. Do not use the Meter if it appears damaged.
- Inspect the test leads before use. Do not use them if insulation is damaged or metal is exposed. Check the test leads for continuity. Replace damaged test leads before using the Meter.
- Verify the Meter's operation by measuring a known voltage before and after using it. Do not use the Meter if it operates abnormally. Protection may be impaired. If in doubt, have the Meter serviced.
- Whenever it is likely that safety protection has been impaired, make the Meter inoperative and secure it against any unintended operation.
- Have the Meter serviced only by qualified service personnel.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and earth ground.
- Always use the power cord and connector appropriate for the voltage and outlet of the country or location in which you are working.
- Remove test leads from the Meter before opening the case.
- Never remove the cover or open the case of the Meter without first removing it from the main power source.
- Never operate the Meter with the cover removed or the case open.
- Use caution when working with voltages above 30 V ac rms, 42 V ac peak, or 42 V dc. These voltages pose a shock hazard.
- Use only the replacement fuse(s) specified by the manual.
- Use the proper terminals, function, and range for your measurements.
- Do not operate the Meter around explosive gas, vapor, or dust.
- When using probes, keep your fingers behind the finger guards.
- When making electrical connections, connect the common test lead before connecting the live test lead; when disconnecting, disconnect the live test lead before disconnecting the common test lead.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Before measuring current, check the Meter's fuses and turn OFF power to the circuit before connecting the Meter to the circuit.
- When servicing the Meter, use only specified replacement parts.

Symbols

Table 1-2 is a list of safety and electrical symbols that appear on the Meter or in this manual.

Table 1-2. Safety and Electrical Symbols

Symbol	Description	Symbol	Description
	Risk of danger. Important information. See manual		Display ON / OFF
	Hazardous voltage. Voltage >30 V dc or ac peak might be present		Earth ground
	AC (Alternating Current)		Capacitance
	DC (Direct Current)		Diode
	AC or DC (Alternating or Direct Current)		Fuse
			Digital signal
	Continuity test or continuity beeper tone		Maintenance or Service
	Potentially hazardous voltage	CAT II	IEC 61010 Overvoltage (installation or measurement) Category 2.
	Double insulated		Recycle
	Static awareness. Static discharge can damage part(s)		Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

Instrument Security Procedures

This section describes the Meter's memory elements and the procedures for clearing them.

Volatile Memory

Table 1-3 lists the Meter's volatile memory elements.

Table 1-3. Volatile Memory Space

Type	Size	Function
SDRAM	128 MB	Out-guard measurement data, user strings, temporary configuration information, and Ethernet Host name.
SRAM	4 MB	In-guard Measurement data and configuration information.

To clear both volatile memory elements listed in Table 1-3:

1. Press **MEMORY**.
2. Press the **MANAGE MEMORY** soft key.
3. Press the **ERASE MEMORY** soft key.

Non Volatile Memory

Table 1-4 lists the Meter's non-volatile memory elements.

Table 1-4. Non-volatile Memory Space

Type	Size	Function
Flash	128 MB	Application program storage, user string, user data, user remote interface settings, calibration constants.
Flash	4 MB	FPGA hardware setup, application program storage, calibration constants.

To clear the 128 MB of non-volatile flash memory listed in Table 1-4:

1. Press **MEMORY**.
2. Press the **MANAGE MEMORY** soft key.
3. Press the **ERASE USB / FLK** soft key.

This process clears only the user accessible portion of memory.

Note

The 4 MB non-volatile memory element is not usable and cannot be cleared by the user.

Media Memory (8846A Only)

The 8846A has a front-panel USB port for connecting flash memory modules up to 2 Gigabytes capacity to store Meter configuration and measurement data. To clear a memory module while connected to the 8846A:

1. Press **MEMORY**.
2. Press the **MANAGE MEMORY** soft key.
3. Press the **ERASE USB MEMORY** soft key.

Accessories

Table 1-5 lists the available accessories for the 8845A and 8846A.

Table 1-5. Accessories

Model/Fluke PN	Description
TL71	Premium Test Lead Set
6303	Kelvin Probes
6730	Kelvin Lead Set with Alligator Clips
5940	Kelvin clip set
5143	SMD Test Tweezer Leads
6275	Precision Electronic Probe Set
6344	Basic Electronic DMM Test Set
884X-Short	4-Wire Short

Table 1-5. Accessories (cont)

Model/Fluke PN	Description
884X-Case	Black plastic case
TL910	Precision Electronic Probe Set
TL910	Precision Electronic Probe Set
TL80A	Basic Electronic DMM Test Set
TL2X4W-PTII	2X4 Wire Ohms Test Lead
TL2X4W-TWZ	2X4 Wire Ohms SMD Test Tweezer
8845A-EFPT	Test Probe Tip Adapter, Extended Fine Point
8845A-TPIT	Test Probe Tip Adapter, IC Probe Tip
803293	Fuse, 11 A, 1000 V, Fast, .406INX1.5IN, Bulk
943121	Fuse, 440 mA, 1000 V, Fast, .406X1.375, Bulk
884X-RTD	100 Ohm RTD Temperature Probe
Y8846S	Rack Mount Kit 8845A & 8846A Single
Y8846D	Rackmount Kit 8845A & 8846A Dual
Y8021	Shielded IEEE 488 one-meter (39.4 inches) cable, with plug and jack at each end.
Y8022	Shielded IEEE 488 two-meter (78.8 inches) cable, with plug and jack at each end.
884X-USB	USB to RS-232 Cable Adapter
RS43	Shielded RS-232 Cable (2 Meters)
884X-ETH	Ethernet Cable
884X-512M	512 Mbyte memory (8846A only)
884X-1G	1 Gbyte memory (8846A only)
FVF-SC5	FlukeView Forms, Basic Software
FVF-UG	FlukeView Forms, Software Upgrade – No Cable
FVF-SC4	Extended FlukeView Forms with USB Cable
2132558	Calibration, traceable with data
1259800	Calibration, traceable without data
1256480	Calibration, Z540 traceable with data
1258910	Calibration, Z540 traceable, without data
1256990	Calibration, accredited
1024830	Agreement, Extended Warranty
2426684	Agreement, Calibration, Traceable, with data
1028820	Agreement, Calibration, Traceable, without data
1259170	Agreement, Calibration, Z540 Traceable, with data
1258730	Agreement, Calibration, Z540 Traceable, without data

Table 1-5. Accessories (cont)

Model/Fluke PN	Description
1259340	Agreement, Calibration, Accredited
2441827	Agreement, Calibration, primary standards lab
1540600	Agreement, Calibration, artifact

General Specifications

Power

Voltage

100 V Setting	90 V to 110 V
120 V Setting	108 V to 132 V
220 V Setting	198 V to 242 V
240 V Setting	216 V to 264 V

Frequency 47 Hz to 440 Hz. Automatically sensed at power-on.

Power Consumption..... 28 VA peak (12 Watt average)

Dimensions

Height.....	88 mm (3.46 in.)
Width.....	217 mm (8.56 in.)
Depth	297 mm (11.7 in.)
Weight.....	3.6 kg (8.0 lb)
Shipping Weight.....	5.0 kg (11.0 lb)

Display

Vacuum Fluorescent Display, dot matrix

Environment

Temperature

Operating	0 °C to 55 °C
Storage	-40 °C to 70 °C
Warm Up.....	1 hour to full uncertainty specifications

Relative Humidity (non-condensing)

Operating	0 °C to 28 °C <90 %
	28 °C to 40 °C <80 %
	40 °C to 55 °C <50 %
Storage	-40 °C to 70 °C <95 %

Altitude

Operating	2,000 Meters
Storage	12,000 Meters

Vibration and Shock..... Complies with Mil-T-28800F Type III, Class 5 (Sine only)

Safety

Designed to comply with IEC 61010-1:2000-1, UL 61010-1A1, CAN/CSA-C22.2 No. 61010.1, CAT I 1000V/CAT II 600V

EMC

Designed to comply with IEC 61326-1:2000-11 (EMC) when used with shielded communications cables. This Meter has shown susceptibility to radiated frequencies greater than 1 V/m from 250 to 450 MHz.

Triggering

Samples per Trigger	1 to 50,000
---------------------------	-------------

Trigger Delay	0 s to 3600 s; in 10 μ S increments
External Trigger Delay	<1 mS
External Trigger Jitter	<500 μ S
Trigger Input	TTL Levels
Trigger Output	5 V maximum (open collector)

Memory

8845A	10,000 measurements, internal only
8846A	10,000 measurements, internal, and up to 2 Gigabyte capacity with USB memory module (available separately, see "Accessories") through front-panel USB port

Math Functions

Zero, dBm, dB, MX+B, Offset, DCV ratio and TrendPlot, Histogram, Statistics (min/max/average/standard deviation), and Limit Test

Electrical

Input Protection	1000 V all ranges
Overrange	20 % on all ranges except 1000 V dc, 1000 V ac (8846A), 750 V ac (8845A), Diode, and 10 A ranges

Remote Interfaces

RS-232C, DTE 9-pin, 1200 to 230400 baud (RS-232C to USB cable available to connect the Meter to a PC USB port. See Accessories)

IEEE 488.2

LAN and "Ethernet 10/100 base T with DHCP (for IP_ADDRESS) option"

Warranty

One year

Electrical Specifications

Accuracy specifications are valid for 6½ digit resolution mode after at least a 1-hour warm-up with Auto Zero enabled.

24-hour specifications are relative to calibration standards and assume a controlled electromagnetic environment per EN 61326-1:2000-11

DC Voltage Specifications

Maximum Input	1000 V on any range
Common Mode Rejection	140 dB at 50 or 60 Hz \pm 0.1 % (1 k Ω unbalance)
Normal Mode Rejection	60 dB for NPLC of 1 or greater with analog filter off and power line frequency \pm 0.1 % 100 dB for NPLC of 1 or greater with analog filter on and power line frequency \pm 0.1 %
Measurement Method	Multi-ramp A/D
A/D Linearity	0.0002 % of measurement +0.0001 % of range
Input Bias Current	<30 pA at 25 °C
Autozero Off Operation	Following instrument warm-up at calibration temperature \pm 1 °C and less than 10 minutes, add error: 0.0002 % range additional error +5 μ V.
Analog Filter	When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.
DC Ratio	Accuracy is +/- (Input accuracy + Reference accuracy), where Input accuracy = DC Voltage accuracy for the HI to LO Input (in ppm of the Input voltage), and Reference accuracy = DC Voltage accuracy for the HI to LO (Sense) Reference (in ppm of the Reference voltage).
Settling Considerations	Measurement settling times are affected by source impedance, cable dielectric characteristics, and input signal changes.

Input Characteristics

Range	Resolution	Resolution			Input Impedance
		4½ Digits	5½ Digits	6½ Digits	
100 mV	100.0000 mV	10 µV	1 µV	100 nV	10 MΩ or >10 GΩ ^[1]
1 V	1.000000 V	100 µV	10 µV	1 µV	10 MΩ or >10 GΩ ^[1]
10 V	10.00000 V	1 mV	100 µV	10 µV	10 MΩ or >10 GΩ ^[1]
100 V	100.0000 V	10 mV	1 mV	100 µV	10 MΩ ±1%
1000 V	1,000.000 V	100 mV	10 mV	1 mV	10 MΩ ±1%

[1] Inputs beyond ±14 V are clamped through 200 kΩ typical. 10 MΩ is default input impedance.

8846A Accuracy

Accuracy is given as ± (% measurement + % of range)

Range	24 Hour (23 ±1 °C)	90 Days (23 ±5 °C)	1 Year (23 ±5 °C)	Temperature Coefficient/ °C Outside 18 to 28 °C
100 mV	0.0025 + 0.003	0.0025 + 0.0035	0.0037 + 0.0035	0.0005 + 0.0005
1 V	0.0018 + 0.0006	0.0018 + 0.0007	0.0025 + 0.0007	0.0005 + 0.0001
10 V	0.0013 + 0.0004	0.0018 + 0.0005	0.0024 + 0.0005	0.0005 + 0.0001
100 V	0.0018 + 0.0006	0.0027 + 0.0006	0.0038 + 0.0006	0.0005 + 0.0001
1000 V	0.0018 + 0.0006	0.0031 + 0.001	0.0041 + 0.001	0.0005 + 0.0001

8845A Accuracy

Accuracy is given as ± (% measurement + % of range)

Range	24 Hour (23 ±1 °C)	90 Days (23 ±5 °C)	1 Year (23 ±5 °C)	Temperature Coefficient/ °C Outside 18 to 28 °C
100 mV	0.003 + 0.003	0.004 + 0.0035	0.005 + 0.0035	0.0005 + 0.0005
1 V	0.002 + 0.0006	0.003 + 0.0007	0.004 + 0.0007	0.0005 + 0.0001
10 V	0.0015 + 0.0004	0.002 + 0.0005	0.0035 + 0.0005	0.0005 + 0.0001
100 V	0.002 + 0.0006	0.0035 + 0.0006	0.0045 + 0.0006	0.0005 + 0.0001
1000 V	0.002 + 0.0006	0.0035 + 0.0010	0.0045 + 0.0010	0.0005 + 0.0001

Additional Errors

Digits	NPLC	Additional NPLC Noise Error
6½	100	0 % of range
6½	10	0 % of range
5½	1	0.001 % of range
5½	.2	0.0025 % of range +12 µV
4½	0.02	0.017 % of range +17 µV

AC Voltage Specifications

AC Voltage specifications are for ac sine wave signals >5 % of range. For inputs from 1 % to 5 % of range and <50 kHz, add an additional error of 0.1 % of range, and for 50 kHz to 100 kHz, add 0.13 % of range.

Maximum Input 750 V rms or 1000 V peak (8845A), 1000 V rms or 1414 V peak (8846A) or 8×10^7 volts-Hertz product (whichever is less) for any range.

Measurement Method AC-coupled true-rms. Measures the ac component of input with up to 1000 V dc bias on any range.

AC Filter Bandwidth:

Slow 3 Hz – 300 kHz

Medium 20 Hz – 300 kHz

Fast 200 Hz – 300 kHz

Common Mode Rejection 70 dB at 50 Hz or 60 Hz ±0.1 % (1 kΩ unbalance)

Crest Factor Error (applies to non-sinusoidal waveforms only)

Maximum Crest Factor 5:1 at Full Scale

Additional Crest Factor Errors (<100 Hz)..... Crest factor 1-2, 0.05 % of full scale
 Crest factor 2-3, 0.2 % of full scale
 Crest factor 3-4, 0.4 % of full scale
 Crest factor 4-5, 0.5 % of full scale

Input Characteristics

Range	Resolution	Resolution			Input Impedance
		4½ Digits	5½ Digits	6½ Digits	
100 mV	100.0000 mV	10 µV	1 µV	100 nV	1 MΩ ±2 % shunted by <100 pf
1 V	1.000000 V	100 µV	10 µV	1 µV	
10 V	10.00000 V	1 mV	100 µV	10 µV	
100 V	100.0000 V	10 mV	1 mV	100 µV	
1000 V	1,000.000 V	100 mV	10 mV	1 mV	

8846A Accuracy

Accuracy is given as ± (% measurement + % of range)

Range	Frequency	24 Hour (23 ±1 °C)	90 Days (23 ±5 °C)	1 Year (23 ±5 °C)	Temperature Coefficient/ °C Outside 18 to 28 °C
100 mV	3 – 5 Hz	1.0 + 0.03	1.0 + 0.04	1.0 + 0.04	0.1 + 0.004
	5 – 10 Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
	10 Hz – 20 kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005 + 0.004
	20 – 50 kHz	0.1 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.20 + 0.02
1 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
10 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
100 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
1000 V	3 – 5 Hz	1.0 + 0.015	1.0 + 0.0225	1.0 + 0.0225	0.1 + 0.00225
	5 – 10 Hz	0.35 + 0.015	0.35 + 0.0225	0.35 + 0.0225	0.035 + 0.00225
	10 Hz – 20 kHz	0.04 + 0.015	0.05 + 0.0225	0.06 + 0.0225	0.005 + 0.00225
	20 – 50 kHz	0.1 + 0.03	0.11 + 0.0375	0.12 + 0.0375	0.011 + 0.00375
	50 – 100 kHz ^[2]	0.55 + 0.06	0.6 + 0.06	0.6 + 0.06	0.06 + 0.006
	100 – 300 kHz ^{[1][2]}	4.0 + 0.375	4.0 + 0.375	4.0 + 0.375	0.2 + 0.015

[1] Typically 30 % reading error at 1 MHz
 [2] 1000 Volt range is limited to 8 X 10⁷ volt-Hertz

8845A Accuracy

Accuracy is given as \pm (% measurement + % of range)

Range	Frequency (Hz)	24 Hour (23 \pm 1 $^{\circ}$ C)	90 Days (23 \pm 5 $^{\circ}$ C)	1 Year (23 \pm 5 $^{\circ}$ C)	Temperature Coefficient/ $^{\circ}$ C Outside 18 to 28 $^{\circ}$ C
100 mV	3 – 5 Hz	1.0 + 0.03	1.0 + 0.04	1.0 + 0.04	0.10 + 0.004
	5 – 10 Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
	10 Hz – 20 kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005 + 0.004
	20 – 50 kHz	0.1 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
1 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
10 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
100 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^[1]	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.2 + 0.02
750 V	3 – 5 Hz	1.0 + 0.02	1.0 + 0.03	1.0 + 0.03	0.1 + 0.003
	5 – 10 Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
	10 Hz – 20 kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
	20 – 50 kHz	0.1 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
	50 – 100 kHz ^[2]	0.55 + 0.08	0.6 + 0.08	0.6 + 0.08	0.06 + 0.008
	100 – 300 kHz ^{[1] [2]}	4.0 + 0.5	4.0 + 0.5	4.0 + 0.5	0.2 + 0.02

[1] Typically 30 % reading error at 1 MHz
 [2] 750 Volt range is limited to 8 X 10⁷ volt-Hertz

Additional Low Frequency Errors

Error is stated as % of reading.

Frequency	AC Filter		
	3 HZ (slow)	20 HZ (medium)	200 HZ (fast)
10 – 20 Hz	0	0.25	–
20 – 40 Hz	0	0.02	–
40 – 100 Hz	0	0.01	0.55
100 – 200 Hz	0	0	0.2
200 Hz – 1 kHz	0	0	0.02
>1 kHz	0	0	0

Resistance

Specifications are for 4-wire resistance function, 2 x 4-wire resistance, or 2-wire resistance with zero. If zero is not used, add 0.2 Ω for 2-wire resistance plus lead resistance, and add 20 m Ω for 2 x 4-wire resistance function.

Measurement Method	Current source referenced to LO input
Max. Lead Resistance (4-wire ohms)	10 % of range per lead for 10 Ω , 100 Ω , 1 k Ω ranges. 1 k Ω per lead on all other ranges
Input Protection	1000 V on all ranges
Common Mode Rejection	140 dB at 50 or 60 Hz \pm 0.1 % (1 k Ω unbalance)
Normal Mode Rejection	60 dB for NPLC of 1 or greater with analog filter off and power line frequency \pm 0.1 % 100 dB for NPLC of 1 or greater with analog filter on and power line frequency \pm 0.1 %
Analog Filter	When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.

Input Characteristics

Range	Resolution	Resolution			Source Current
		4½ Digits	5½ Digits	6½ Digits	
10 Ω ^[1]	10.00000 Ω	1 m Ω	100 $\mu\Omega$	10 $\mu\Omega$	5 mA/13 V
100 Ω	100.0000 Ω	10 m Ω	1 m Ω	100 $\mu\Omega$	1 mA/6 V
1 k Ω	1.000000 k Ω	100 m Ω	10 m Ω	1 m Ω	1 mA/6 V
10 k Ω	10.00000 k Ω	1 Ω	100 m Ω	10 m Ω	100 μ A/6 V
100 k Ω	100.0000 k Ω	10 Ω	1 Ω	100 m Ω	100 μ A/13 V
1 M Ω	1.000000 M Ω	100 Ω	10 Ω	1 Ω	10 μ A/13 V
10 M Ω	10.00000 M Ω	1 k Ω	100 Ω	10 Ω	1 μ A/13 V
100 M Ω	100.0000 M Ω	10 k Ω	1 k Ω	100 Ω	1 μ A 10 M Ω /10 V
1.0 G Ω ^[1]	1.000000 G Ω	100 k Ω	10 k Ω	1 k Ω	1 μ A 10 M Ω /10 V

[1] 8846A Only

8846A Accuracy

Accuracy is given as \pm (% measurement + % of range)

Range	24 Hour (23 \pm 1 $^{\circ}$ C)	90 Days (23 \pm 5 $^{\circ}$ C)	1 Year (23 \pm 5 $^{\circ}$ C)	Temperature Coefficient/ $^{\circ}$ C Outside 18 to 28 $^{\circ}$ C
10 Ω	0.003 + 0.01	0.008 + 0.03	0.01 + 0.03	0.0006 + 0.0005
100 Ω	0.003 + 0.003	0.008 + 0.004	0.01 + 0.004	0.0006 + 0.0005
1 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
10 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
100 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
1 M Ω	0.002 + 0.001	0.008 + 0.001	0.01 + 0.001	0.001 + 0.0002
10 M Ω	0.015 + 0.001	0.02 + 0.001	0.04 + 0.001	0.003 + 0.0004
100 M Ω	0.3 + 0.01	0.8 + 0.01	0.8 + 0.01	0.15 + 0.0002
1 G Ω	1.0 + 0.01	1.5 + 0.01	2.0 + 0.01	0.6 + 0.0002

8845A Accuracy

Accuracy is given as \pm (% measurement + % of range)

Range	24 Hour (23 \pm 1 °C)	90 Days (23 \pm 5 °C)	1 Year (23 \pm 5 °C)	Temperature Coefficient/ °C Outside 18 to 28 °C
100 Ω	0.003 + 0.003	0.008 + 0.004	0.01 + 0.004	0.0006 + 0.0005
1 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
10 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
100 k Ω	0.002 + 0.0005	0.008 + 0.001	0.01 + 0.001	0.0006 + 0.0001
1 M Ω	0.002 + 0.001	0.008 + 0.001	0.01 + 0.001	0.0010 + 0.0002
10 M Ω	0.015 + 0.001	0.02 + 0.001	0.04 + 0.001	0.0030 + 0.0004
100 M Ω	0.3 + 0.01	0.8 + 0.01	0.8 + 0.01	0.1500 + 0.0002

Additional Ohms Errors

Digits	NPLC	Additional NPLC Noise Error
6½	100	0 % of range
6½	10	0 % of range
5½	1	0.001 % of range
5½	0.2	0.003 % of range \pm 7 m Ω
4½	0.02	0.017 % of range \pm 15 m Ω

DC Current

Input Protection..... Tool-accessible 11 A/1000 V and 440 mA/1000 V fuses, limits of 400 mA continuous 550 mA for 2 minutes on, 1 minute off.

Common Mode Rejection 140 dB at 50 or 60 Hz \pm 0.1 % (1 k Ω unbalance)

Normal Mode Rejection 60 dB for NPLC of 1 or greater with analog filter off and power line frequency \pm 0.1 %
100 dB for NPLC of 1 or greater with analog filter on and power line frequency \pm 0.1 %

Analog Filter..... When using the analog filter, specifications are relative to within one hour of using the ZERO function for that range and NPLC setting.

Input Characteristics

Range	Resolution	Resolution			Shunt Resistance (Ohms)	Burden Voltage
		4½ Digits	5½ Digits	6½ Digits		
100 μ A	100.0000 μ A	10 nA	1 nA	100 pA	100 Ω	<0.015 V
1 mA	1.000000 mA	100 nA	10 nA	1 nA	100 Ω	<0.15 V
10 mA	10.000000 mA	1 μ A	100 nA	10 nA	1 Ω	<0.025 V
100 mA	100.0000 mA	10 μ A	1 μ A	100 nA	1 Ω	<0.25 V
400 mA ^[3]	400.0000 mA	100 μ A	10 μ A	1 μ A	1 Ω	<0.50 V
1 A ^[2]	1.000000 A	100 μ A	10 μ A	1 μ A	0.01 Ω	<0.05 V
3 A ^[1]	3.000000 A	1 mA	100 μ A	10 μ A	0.01 Ω	<0.15 V
10 A	10.000000 A	1 mA	100 μ A	10 μ A	0.01 Ω	<0.5 V

[1] Part of 10 A range.

[2] Available on the front panel terminal only.

[3] 400 mA available in software version 2.0 or greater only. 400 mA continuously; 550 mA for 2 minutes on, 1 minute off.