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FLUKE®

8808A

Digital Multimeter

Users Manual

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Chapter 1

Introduction and Specifications

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Introduction

The Fluke 8808A Digital Multimeter (hereafter referred to as the Meter) is a 5-1/2 digit dual-display multimeter designed for bench-top, field service, and system applications. The multiple measurement functions, plus the RS-232 remote interface, make the Meter an ideal candidate for precision manual measurements and use in automated systems. For portability, the Meter includes a carrying handle that also serves as a bail for bench-top operation.

Some features provided by the Meter are:

- A dual vacuum fluorescent display that allows two properties of an input signal to be displayed at the same time (e.g., ac voltage in one display and frequency in the other)
- 5-1/2 digit resolution
- True-rms ac
- 2, 4 wire resistance or patented 2x4 wire resistance measurement technique
- 200 mV to 1000 Vdc range with 1 μ V sensitivity
- 200 mV to 750 Vac rms with 1 μ V sensitivity
- 200 Ω to 100 M Ω with 1 m Ω sensitivity
- 200 μ A to 10 Adc with 1 nA sensitivity
- 20 mA to 10 Aac with 100 nA sensitivity
- Frequency measurements from 20 Hz to 1 MHz
- Continuity and diode test
- Measurement rates of 2.5, 20 and 100 samples/second (slow, medium and fast, respectively)
- Front-panel setup key for single key access to saved setups
- A compare mode to determine if a measurement is within defined limits
- Remote operation via the RS-232 interface
- Closed-case calibration (no internal calibration adjustments)

Manual Set

The manual set for this Meter consists of a printed *Getting Started Manual* and a *Users Manual* on a CD-ROM. The *Getting Started Manual* contains basic getting started information, contacting Fluke, unpacking, and general specifications.

About this Manual

This manual contains all the information a new user will need to operate the Meter effectively. This manual is divided into the following chapters:

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

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

Chapter 3, “Operating the Meter from the Front Panel,” provides detailed information on using the Meter from the front panel.

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

Chapter 5, “Operating the Meter using the Computer Interface,” describes how to set up, configure, and operate the Meter via the RS-232 computer interface on the Meter’s rear panel.

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 in Table 1-1, “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 EN61010-1: 2001 and U.S. / Canadian standard publications UL 61010-1:2004 and CAN/CSA-C22.2 No.61010.1:2004. 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.

Table 1-1. Safety Information

⚠ ⚠ Warning









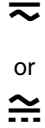









To avoid possible electric shock, personal injury, or death, read the following before using the Meter:

- 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 fuses 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 lists 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.		Standby power 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
	Continuity test or continuity beeper tone		Digital signal
	Potentially hazardous voltage		Maintenance or Service
	Double insulated		Recycle
	Static awareness. Static discharge can damage parts.		Do not dispose of this product as unsorted municipal waste. Contact Fluke or a qualified recycler for disposal.
CAT II	Measurement Category II is for measurements performed on circuits directly connected to the low voltage installation.	CAT I	Measurement Category I is for measurements not directly connected to mains.

Options and Accessories

Table 1-3 lists available options and accessories.

Table 1-3. Accessories

Item	Model / Part Number
Premium Test Lead Set	TL71
Fuse, .25*1.25, 0.063 A, 250 V, Slow	163030
Fuse, .25*1.25, 0.125 A, 250 V, Slow	166488
F1 - Fuse, 11 A, 1000 V, Fast, 406INX1.5IN, BULK	803293
F2 - Fuse, 440 mA, 1000 V, Fast, 406INX1.375IN, BULK	943121
Rack Mount Kit 8845A & 8846A Single	Y8846S
Rack Mount Kit 8845A & 8846A Dual	Y8846D
RS-232 Cable (2 m)	RS43
Precision Electronic Prob Set	TL910
2X4 Wire Ohms 1000 V Test Lead	TL2X4W-PTII
FlukeView Forms Basic Software	FVF-SC5
FlukeView Forms Software Upgrade to enhanced version	FVF-UG

General Specifications

Voltage

100V Setting	90 V to 110 V
120V Setting	108 V to 132 V
220V Setting	198 V to 242 V
240V Setting	216 V to 264 V
Frequency.....	47 Hz to 440 Hz
Power Consumption	15 VA peak (10 W average)

Dimensions

Height.....	88 mm (3.46 in)
Width.....	217 mm (8.56 in)
Depth	297 mm (11.7 in)
Weight.....	2.1 kg (4.6 lb)

Display

Vacuum Fluorescent Display, segment

Environment

Temperature

Operating.....	0 °C to 50 °C
Storage	-40 °C to 70 °C
Warm Up.....	½ hour to full uncertainty specifications

Relative Humidity (non-condensing)

Operating	Uncontrolled (< 10°C)
	<90 % (10 °C to 30 °C)
	<75 % (30 °C to 40 °C)
	<45 % (40 °C to 50 °C)
Storage	-40 °C to 70 °C <95 %

Altitude

Operating	2,000 Meters
Storage.....	12,000 Meters
Vibration	Complies with MIL-PRF-28800F Class 3

Safety

Complies with IEC 61010-1:2001, ANSI/ISA 61010-1 (S82.02.01):2004, UL 61010-1:2004, CAN/CSA C22.2 No. 61010.1:2004, CAT I 1000V/CAT II 600 V

EMC

Designed to comply with IEC 61326-1:1997+A1:1998+A2:2000

Triggering

Trigger Delay	400 ms
External Trigger Delay	<2 ms
External Trigger Jitter	<1 ms
Trigger Input	TTL Levels
Trigger Output.....	5 V max

Math Functions

Min/max, relative, hold, compare and dB functions

Electrical

Input Protection 1000 V all ranges
Overrange 10 % on the largest ranges of all functions except continuity and diode test

Remote Interfaces

RS-232C

Warranty

One year

Electrical Specifications

Accuracy specifications are valid for 5-½ digit mode and after at least a half-hour warm-up

DC Voltage Specifications

Maximum Input 1000 V on any range
Common Mode Rejection 120 dB at 50 or 60 Hz ±0.1% (1 kΩ unbalance)
Normal Mode Rejection 80 dB at Slow Rate
A/D Nonlinearity 15 ppm of range
Input Bias Current <30 pA at 25 °C
Settling Considerations Measurement settling times are affected by source impedance, cable dielectric characteristics, and input signal changes

Input Characteristics

Range	Full-Scale (5-1/2 Digits)	Resolution			Input Impedance
		Slow	Medium	Fast	
200 mV	199.999 mV	1 μV	10 μV	10 μV	>10 GΩ ^[1]
2 V	1.99999 V	10 μV	100 μV	100 μV	>10 GΩ ^[1]
20 V	19.9999 V	100 μV	1000 μV	1000 μV	10 MΩ±1 %
200 V	199.999 V	1 mV	10 mV	10 mV	10 MΩ±1 %
1000 V	1000.00 V	10 mV	100 mV	100 mV	10 MΩ±1 %

Notes:
 [1] At some dual display measurements, the input impedance of 200 mV and 2 V ranges may be changed to 10 MΩ.

Accuracy

Range	Accuracy ^[1]		Temperature Coefficient/°C Outside 18 – 28 °C
	90 days	1 year	
	23 °C ± 5 °C	23 °C ± 5 °C	
200 mV	0.01 + 0.003	0.015 + 0.004	0.0015 + 0.0005
2 V	0.01 + 0.002	0.015 + 0.003	0.001 + 0.0005
20 V	0.01 + 0.003	0.015 + 0.004	0.0020 + 0.0005
200 V	0.01 + 0.002	0.015 + 0.003	0.0015 + 0.0005
1000 V	0.01 + 0.002	0.015 + 0.003	0.0015 + 0.0005

Notes:
 [1] Accuracy given as ± (% of reading + % of range)

AC Voltage Specifications

AC Voltage specifications are for ac sinewave 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 50kHz to 100 kHz, add 0.13 % of range.

Maximum Input 750 V rms or 1000 V peak or 8×10^7 Volts-Hertz product
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 20 Hz – 100 kHz

Common Mode Rejection 60 dB at 50 Hz or 60 Hz (1 k Ω unbalance)

Maximum Crest Factor 3:1 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

Input Characteristics

Range	Full-Scale (5-1/2 Digits)	Resolution			Input Impedance
		Slow	Medium	Fast	
200 mV	199.999 mV	1 μ V	10 μ V	10 μ V	1 M Ω \pm 2 % shunted by <100 pf
2 V	1.99999 V	10 μ V	100 μ V	100 μ V	
20 V	19.9999 V	100 μ V	1000 μ V	1000 μ V	
200 V	199.999 V	1 mV	10 mV	10 mV	
750 V	750.00 V	10 mV	100 mV	100 mV	

Accuracy

Range	Frequency	Accuracy ^[1]		Temperature Coefficient/ $^{\circ}$ C Outside 18 – 28 $^{\circ}$ C
		90 days	1 year	
		23 $^{\circ}$ C \pm 5 $^{\circ}$ C	23 $^{\circ}$ C \pm 5 $^{\circ}$ C	
200 mV	20 Hz – 45Hz	0.8 + 0.05	0.9 + 0.05	0.01 + 0.005
	45 Hz – 20 kHz	0.15 + 0.05	0.2 + 0.05	0.01 + 0.005
	20 kHz – 50 kHz	0.3 + 0.05	0.35 + 0.05	0.01 + 0.005
	50 kHz – 100 kHz	0.8 + 0.05	0.9 + 0.05	0.05 + 0.01
2 V	20 Hz – 45Hz	0.8 + 0.05	0.9 + 0.05	0.01 + 0.005
	45 Hz – 20 kHz	0.15 + 0.05	0.2 + 0.05	0.01 + 0.005
	20 kHz – 50 kHz	0.3 + 0.05	0.35 + 0.05	0.01 + 0.005
	50 kHz – 100 kHz	0.8 + 0.05	0.9 + 0.05	0.05 + 0.01
20 V	20 Hz – 45 Hz	0.8 + 0.05	0.9 + 0.05	0.01 + 0.005
	45 Hz – 20 kHz	0.15 + 0.05	0.2 + 0.05	0.01 + 0.005
	20 kHz – 50 kHz	0.3 + 0.05	0.35 + 0.05	0.01 + 0.005
	50 kHz – 100 kHz	0.8 + 0.05	0.9 + 0.05	0.05 + 0.01
200 V	20 Hz – 45Hz	0.8 + 0.05	0.9 + 0.05	0.01 + 0.005
	45 Hz – 20 kHz	0.15 + 0.05	0.2 + 0.05	0.01 + 0.005
	20 kHz – 50 kHz	0.3 + 0.05	0.35 + 0.05	0.01 + 0.005
	50 kHz – 100 kHz	0.8 + 0.05	0.9 + 0.05	0.05 + 0.01
750 V	20 Hz – 45Hz	0.8 + 0.05	0.9 + 0.05	0.01 + 0.005
	45 Hz – 20 kHz	0.15 + 0.05	0.2 + 0.05	0.01 + 0.005
	20 kHz – 50 kHz	0.3 + 0.05	0.35 + 0.05	0.01 + 0.005
	50 kHz – 100 kHz	0.8 + 0.05	0.9 + 0.05	0.05 + 0.01

Notes:

[1] Accuracy given as \pm (% of reading + % of range)

Resistance

Specifications are for 4-wire resistance function, or 2-wire resistance with REL. If REL is not used, add 0.2 Ω for 2-wire resistance plus lead resistance.

- Measurement Method** Current source referenced to LO input
- Max Lead Resistance (4-wire ohms)** 10 % of range per lead for 200 Ω, 2 kΩ ranges. 1 kΩ per lead on all other ranges.
- Input Protection** 1000 V on all ranges

Input Characteristics

Range	Full-Scale (5-1/2 Digits)	Resolution			Current Source
		Slow	Medium	Fast	
200 Ω	199.999 Ω	0.001 Ω	0.01 Ω	0.01 Ω	0.8 mA
2 kΩ	1.99999 kΩ	0.01 Ω	0.1 Ω	0.1 Ω	0.8 mA
20 kΩ	19.9999 kΩ	0.1 Ω	1 Ω	1 Ω	0.08 mA
200 kΩ	199.999 kΩ	1 Ω	10 Ω	10 Ω	0.008 mA
2 MΩ	1.99999 MΩ	10 Ω	100 Ω	100 Ω	0.9 μA
20 MΩ	19.9999 MΩ	100 Ω	1 kΩ	1 kΩ	0.16 μA
100 MΩ	100.000 MΩ	1 kΩ	10 kΩ	10 kΩ	0.16 μA 10 MΩ

Accuracy

Range	Accuracy ^[1]		Temperature Coefficient/°C Outside 18 – 28 °C
	90 days	1 year	
	23 °C ± 5 °C	23 °C ± 5 °C	
200 Ω	0.02 + 0.004	0.03 + 0.004	0.003 + 0.0006
2 kΩ	0.015 + 0.002	0.02 + 0.003	0.003 + 0.0005
20 kΩ	0.015 + 0.002	0.02 + 0.003	0.003 + 0.0005
200 kΩ	0.015 + 0.002	0.02 + 0.003	0.003 + 0.0005
2 MΩ	0.03 + 0.003	0.04 + 0.004	0.004 + 0.0005
20 MΩ	0.2 + 0.003	0.25 + 0.003	0.01 + 0.0005
100 MΩ	1.5 + 0.004	1.75 + 0.004	0.2 + 0.0005

Notes:
[1] Accuracy given as ± (% of reading + % of range)

DC Current

- Input Protection** Tool accessible 11 A / 1000 V and 440 mA / 1000 V fuses.
- Shunt Resistance** 0.01 Ω for 2 A and 10 A ranges
1 Ω for 20 mA and 200 mA
Burden voltage < 1 mV for 200 uA and 2 mA range.

Input Characteristics

Range	Full-Scale (5-1/2 Digits)	Resolution			Burden Voltage
		Slow	Medium	Fast	
200 uA	199.999 μA	0.001 μA	0.01 μA	0.01 μA	<1 mV
2 mA	1999.99 μA	0.01 μA	0.1 μA	0.1 μA	<1 mV
20 mA	19.9999 mA	0.1 μA	1 μA	1 μA	<0.05 V
200 mA	199.999 mA	1 μA	10 μA	10 μA	<0.5 V
2 A	1.99999 A	10 μA	100 μA	100 μA	<0.1 V
10 A	10.0000 A	100 μA	1 mA	1 mA	<0.5 V

Accuracy

Range	Accuracy ^[1]		Temperature Coefficient/°C Outside 18 – 28 °C
	90 days	1 year	
	23 °C ± 5 °C	23 °C ± 5 °C	
200 µA	0.02 + 0.005	0.03 + 0.005	0.003 + 0.001
2 mA	0.015 + 0.005	0.02 + 0.005	0.002 + 0.001
20 mA	0.03 + 0.02	0.04 + 0.02	0.005 + 0.001
200 mA	0.02 + 0.005	0.03 + 0.008	0.005 + 0.001
2 A	0.05 + 0.02	0.08 + 0.02	0.008 + 0.001
10 A	0.18 + 0.01	0.2 + 0.01	0.008 + 0.001

Notes:
[1] Accuracy given as ± (% of reading + % of range)

AC Current

The following ac current specifications are for sinusoidal signals with amplitudes greater than 5 % of range. For inputs from 1 % to 5 % of range, add an additional error of 0.1 % of range.

Input Protection Tool accessible 11 A / 1000 V and 440 mA / 1000 V fuses

Measurement Method AC-coupled True RMS

Shunt Resistance 0.01 Ω for 2 A and 10 A ranges
1 Ω for 20 mA and 200 mA

AC Filter Bandwidth:

Slow 20 Hz – 100 kHz

Maximum Crest Factor 3:1 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

Input Characteristics

Range	Full-Scale (5-1/2 Digits)	Resolution			Burden Voltage
		Slow	Medium	Fast	
20 mA	19.9999 mA	0.1 µA	1 µA	1 µA	<0.05 V
200 mA	199.999 mA	1 µA	10 µA	10 µA	<0.5 V
2 A	1.99999 A	10 µA	100 µA	100 µA	<0.1 V
10 A	10.0000 A	100 µA	1 mA	1 mA	<0.5 V

Accuracy

Range	Frequency	Accuracy ^[1]		Temperature Coefficient/°C Outside 18 – 28 °C
		90 days	1 year	
		23 °C ± 5 °C	23 °C ± 5 °C	
20 mA	20 Hz - 45Hz	1 + 0.05	1.25 + 0.06	0.015 + 0.005
	45 Hz - 2 kHz	0.25 + 0.05	0.3 + 0.06	0.015 + 0.005
200 mA	20 Hz - 45Hz	0.8 + 0.05	1 + 0.06	0.015 + 0.005
	45 Hz - 2 kHz	0.25 + 0.05	0.3 + 0.06	0.015 + 0.005
2 A	20 Hz - 45Hz	1 + 0.05	1.25 + 0.06	0.015 + 0.005
	45 Hz - 2 kHz	0.25 + 0.05	0.3 + 0.06	0.015 + 0.005
10 A	20 Hz - 45Hz	1 + 0.1	1.25 + 0.12	0.015 + 0.005
	45 Hz - 2 kHz	0.35 + 0.1	0.5 + 0.12	0.015 + 0.005

Notes:
[1] Accuracy given as ± (% of reading + % of range)

Frequency

Gate Time 131 ms
Measurement Method AC-coupled input using the ac voltage measurement function.
Settling Considerations When measuring frequency after a dc offset voltage change, errors may occur. For the most accurate measurement, wait up to 1 second to allow input blocking RC time constant to settle.
Measurement Considerations To minimize measurement errors, shield inputs from external noise when measuring low voltage, low frequency signals.

Accuracy

Range	Frequency	Accuracy		Temperature Coefficient/°C Outside 18 – 28 °C
		90 days	1 year	
		23 °C ± 5 °C	23 °C ± 5 °C	
100 mV to 750 V ^[1,2]	20 Hz – 2 kHz	0.01 + 0.002	0.01 + 0.003	0.002 + 0.001
	2 kHz – 20 kHz	0.01 + 0.002	0.01 + 0.003	0.002 + 0.001
	20 kHz – 200 kHz	0.01 + 0.002	0.01 + 0.003	0.002 + 0.001
	200 kHz – 1 MHz	0.01 + 0.004	0.01 + 0.006	0.002 + 0.002
Notes:				
[1] Input > 100 mV				
[2] Limited to 8×10^7 V Hz				

Continuity

Continuity Threshold 20 Ω
Test Currents 1 mA
Response Time 100 samples/sec with audible tone
Rate Fast
Maximum Reading 199.99 Ω
Resolution 0.01 Ω

Diode Test

Response Time 100 samples/sec with audible tone
Rate Fast
Maximum Reading 1.9999 V
Resolution 0.1 mV

Chapter 2

Preparing the Meter for Operation

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