

FLUKE®

287/289

True-rms Digital Multimeters

Getting Started

PN 2748860

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Lifetime Limited Warranty

Each Fluke 20, 70, 80, 170, 180 and 280 Series DMM will be free from defects in material and workmanship for its lifetime. As used herein, "lifetime" is defined as seven years after Fluke discontinues manufacturing the product, but the warranty period shall be at least ten years from the date of purchase. This warranty does not cover fuses, disposable batteries, damage from neglect, misuse, contamination, alteration, accident or abnormal conditions of operation or handling, including failures caused by use outside of the product's specifications, or normal wear and tear of mechanical components. This warranty covers the original purchaser only and is not transferable.

For ten years from the date of purchase, this warranty also covers the LCD. Thereafter, for the lifetime of the DMM, Fluke will replace the LCD for a fee based on then current component acquisition costs.

To establish original ownership and prove date of purchase, please complete and return the registration card accompanying the product, or register your product on <http://www.fluke.com>. Fluke will, at its option, repair at no charge, replace or refund the purchase price of a defective product purchased through a Fluke authorized sales outlet and at the applicable international price. Fluke reserves the right to charge for importation costs of repair/replacement parts if the product purchased in one country is sent for repair elsewhere.

If the product is defective, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Fluke will pay return transportation for product repaired or replaced in-warranty. Before making any non-warranty repair, Fluke will estimate cost and obtain authorization, then invoice you for repair and return transportation.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY. AUTHORIZED RESELLERS ARE NOT AUTHORIZED TO EXTEND ANY DIFFERENT WARRANTY ON FLUKE'S BEHALF. Since some states do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you. If any provision of this warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

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Introduction



Warning

Read “Safety Information” before using this Meter

Except where noted, the descriptions and instructions in this manual apply to both the Fluke 287 and 289 True-rms Digital Multimeters (hereafter referred to as “the Meter”). Model 289 appears in all illustrations.

This manual covers information for turning on the Meter, understanding its controls, and basic maintenance. For complete operational instructions, refer to the *287/289 Users Manual* contained on the accompanying CD.

Contacting Fluke

To contact Fluke, call one of the following telephone numbers:

USA: 1-888-993-5853

Canada: 1-800-363-5853

Europe: +31 402-675-200

Japan: +81-3-3434-0181

Singapore: +65-738-5655

Anywhere in the world: +1-425-446-5500

Visit Fluke's web site at: www.fluke.com.

Register your Meter at: <http://register.fluke.com>.

To view, print, or download the latest manual supplement, visit <http://us.fluke.com/usen/support/manuals>.

Safety Information

The Meter complies with:

- ANSI/ISA 82.02.01 (61010-1) 2004
- UL 61010B (2003)
- CAN/CSA-C22.2 No. 61010-1-04
- IEC/EN 61010-1 2nd Edition Pollution Degree 2
- EMC EN 61326-1
- Measurement Category III, 1000V, Pollution Degree 2
- Measurement Category IV, 600 V, Pollution Degree 2

In this manual, a **Warning** identifies hazardous conditions and actions that could cause bodily harm or death. A **Caution** identifies conditions and actions that could damage the Meter, the equipment under test, or cause permanent loss of data.

Symbols used on the Meter and in this manual are explained in Table 1.



Warning

To avoid possible electric shock or personal injury, follow these guidelines:












- Use this Meter only as specified in this manual or the protection provided by the Meter might be impaired.
- Do not use the Meter if it is damaged. Before you use the Meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Make sure the battery door is closed and latched before operating the Meter.

- Remove test leads from the Meter before opening the battery door.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the Meter.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and earth ground.
- 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 60 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 measurements.
- Avoid working alone.
- When measuring current, turn off circuit power before connecting the Meter in the circuit. Remember to place the Meter in series with the circuit.
- 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.
- Do not use the Meter if it operates abnormally. Protection may be impaired. When in doubt, have the Meter serviced.
- Do not operate the Meter around explosive gas, vapor, or dust.
- Use only 1.5 V AA batteries, properly installed in the Meter case, to power the Meter.
- When servicing the Meter, use only specified replacement parts.
- When using probes, keep fingers behind the finger guards on the probes.
- Do not use the Low Pass Filter option to verify the presence of hazardous voltages. Voltages greater than what is indicated may be present. First, make a voltage measurement without the filter to detect the possible presence of hazardous voltage. Then select the filter function.
- Only use test leads that have the same voltage, category, and amperage ratings as the meter and that have been approved by a safety agency.
- Use proper protective equipment, as required by local or national authorities when working in hazardous areas.
- Comply with local and national safety requirements when working in hazardous locations.

Symbols

Table 1 lists and describes the symbols appearing on the Meter and in this manual.

Table 1. Symbols


Symbol	Description	Symbol	Description
~	AC (Alternating Current or Voltage)		Fuse
≡	DC (Direct Current or Voltage)		Double Insulated
	Hazardous voltage		Important Information; refer to manual
	Battery (Low battery when shown on the display)		Earth ground
)))	Continuity test or continuity beeper tone		Conforms to relevant Canadian and US standards
CE	Conforms to European Union directives		Conforms to relevant Australian standards
	Underwriters Laboratory listed product.		Inspected and licensed by TÜV Product Services
CAT III	IEC Measurement Category III – CAT III equipment is designed to protect against transients in equipment in fixed equipment installations, such as distribution panels, feeders and short branch circuits, and lighting systems in large buildings.	CAT IV	IEC Measurement Category IV – CAT IV equipment is designed to protect against transients from the primary supply level, such as an electricity meter or an overhead or underground utility service.
	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.		

 Caution



To avoid possible damage to the Meter or the equipment under test, follow these guidelines:

- Disconnect circuit power and discharge all high voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Use the proper terminals, function, and range for all measurements.
- Do not remove batteries while the Meter is turned on or a signal is applied to the Meter's input jacks.
- Before measuring current, check the Meter's fuses. (See "Testing the Fuses" in the Users Manual on the accompanying CD.)
- Do not use the LoZ mode to measure voltages in circuits that could be damaged by this mode's low impedance ($\approx 3 \text{ k}\Omega$). (model 289 only)




Hazardous Voltage

To alert you to the presence of a potentially hazardous voltage, when the Meter detects a voltage $\geq 30 \text{ V}$ or a voltage overload (**OL**), the  symbol is displayed.

Turning the Meter On

With the Meter off, press  to turn on the Meter. Pressing  while the Meter is on, causes it to turn off.

Setting the Meter's Language

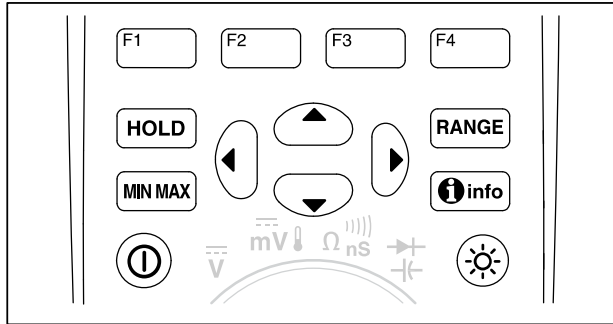
The Meter comes from the factory with the display language set to English. To select another language, open the setup menu by pressing the softkey labeled **Setup**. Move the menu selector next to the menu item labeled **Display**. Next, press the softkey labeled **Format** (F2) to open the format menu. If not already selected, move the menu selector to the left of the menu item labeled **Language** and press the softkey labeled **Edit**. The currently selected language becomes highlighted and  appears to the right of the language. Use  and  to scroll through the available languages, then press the softkey labeled **OK** to set the Meter's display language. Press the softkey labeled **Close** to return to normal Meter operation.

Features

Tables 2 through 5, and the following sections briefly describe the Meter's features.

Understanding the Push Buttons

The 14 pushbuttons on the front of the Meter activate features that augment the function selected using the rotary switch, navigate menus or control power to Meter circuits. The buttons shown in Figure 1 are described in Table 2.



est02.emf

Figure 1. Push Buttons

Table 2. Push Buttons

Button	Function
ⓘ	Turns the Meter on or off.
F1 F2 F3 F4	Selects sub-functions and modes related to the rotary switch function.
⬅️ ⬆️ ⬇️ ⬇️ ⬇️ ⬇️ ⬆️ ➡️	Cursor buttons select an item in a menu, adjust display contrast, scroll through information, and perform data entry.
HOLD	Freezes the present reading in the display and allows the display to be saved. Also accesses AutoHold.
RANGE	Switches the Meter range mode to manual and then cycles through all ranges. To return to autoranging, press the button for 1 second.
MIN MAX	Starts and stops MIN MAX recording.
ⓘ info	Displays information about the present function or items on the display at the moment the info button is pressed.
☀️	Switches the display backlight between off, low, and high.

Understanding the Display

Display features shown in Figure 2 are described in Table 3 and the following sections. Major display features are described in the *287/289 Users Manual* contained on the accompanying CD.

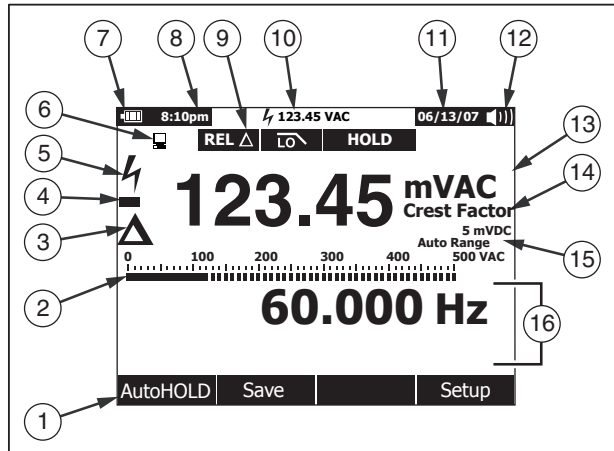


Figure 2. Display Features

est01.eps

Table 3. Display Features

Item	Function	Indication
①	Softkey labels	Indicates the function of the button just below the displayed label.
②	Bar graph	Analog display of the input signal (See the "Bar Graph" section below for more information).
③	Relative	Indicates the displayed value is relative to a reference value.
④	Minus sign	Indicates a negative reading.
⑤	Lightning bolt	Indicates hazardous voltage present at the Meter's input.
⑥	Remote communication	Indicates activity over the communication link.
⑦	Battery level	Indicates the charge level of the six AA batteries.
⑧	Time	Indicates the time set in the internal clock.
⑨	Mode annunciators	Indicates the Meter's mode.

Table 3. Display Features (cont.)

Item	Function	Indication
⑩	Mini-measurement	Displays the lightning bolt (when necessary) and the input value when the primary and secondary displays are covered by a menu or pop-up message.
⑪	Date	Indicates the date set in the internal clock.
⑫	Beeper	Indicates the Meter's beeper is enabled (not associated with the continuity beeper).
⑬	Units	Indicates the units of measure.
⑭	Auxiliary Units	Indicates unitless measurements like Crest Factor.
⑮	Range indicator	Indicates the range the Meter is in and the ranging mode (auto or manual).
⑯	Secondary display	Displays secondary measurement information about the input signal.

Bar Graph

The analog bar graph functions like the needle on an analog meter, but without the overshoot. The bar graph updates 30 times per second. Because the graph updates faster than the digital display, it is useful for making peak and null adjustments and observing rapidly changing inputs. For frequency, duty cycle, pulse width, dBm, and crest factor functions, the bar graph represents the amplitude of the input signal (volts or amps) and not the value in the primary display. The bar graph is not shown for capacitance, temperature, LoZ, AC+DC, AC over DC, peak, or min max functions.

For dc voltage, dc current, and all relative percent modes, a zero-centered bar graph is displayed. For dc voltage and current, the bar graph range is the maximum of the selected range. For relative percent mode, the bar graph goes to $\pm 10\%$.

The number of lit segments indicates the measured value and is relative to the full-scale value of the selected range. In the 50 Vac range, for example, the major divisions on the scale represent 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50 Vac. An input of 25 Vac turns on segments up to the middle of the scale.

For off-scale values, **▶** appears to the right of the normal bar graph. For the zero-center bar graph, a **◀** appears at the left end of the bar graph for negative off-scale values and **▶** appears on the right end for positive off-scale values.

Adjusting Display Contrast

When not selecting items on a menu or inputting data, **☺** increases display contrast and **☹** decreases it.

Understanding the Rotary Switch

Select a primary measurement function by positioning the rotary switch to one of the icons around its perimeter. For each function, the Meter presents a standard display for that function (range, measurement units, and modifiers). Button choices made in one function do not carry over into another function. The model 289 offers two additional functions: low ohms (**50Ω**) and low impedance (**LoZ**) ac volts. Each position shown in Figure 3 is described in Table 4.

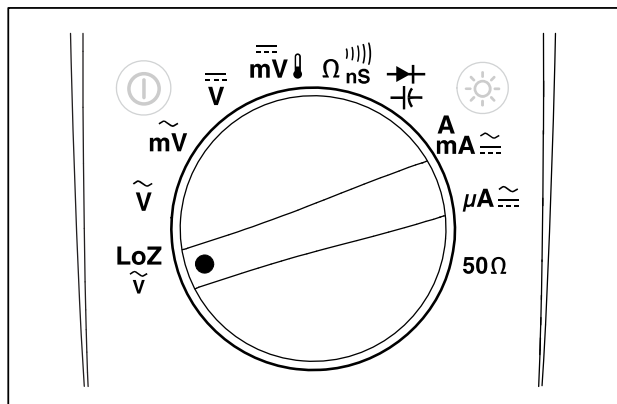


Figure 3. Rotary Switch

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Table 4. Rotary Switch Positions

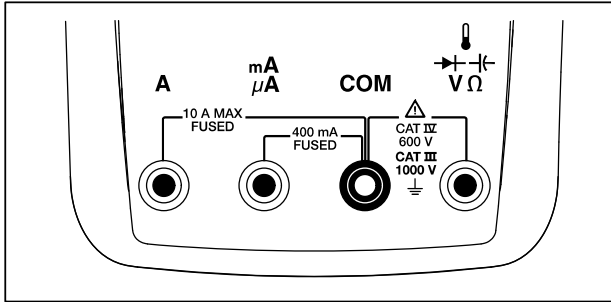
Switch Position	Function
LoZ V	AC voltage measurement using a low input impedance (model 289 only)
V	AC voltage measurements
mV	AC millivolt measurements
V	DC and ac+dc voltage measurements
mV	DC millivolts, ac+dc millivolt, and temperature measurements
Ω nS	Resistance, continuity, and conductance measurements
Diode test and capacitance measurements	Diode test and capacitance measurements
A mA	AC, dc, and ac+dc amps and milliamps measurements
μA	AC dc, and ac+dc microampere measurements up to 5,000 μA
50Ω	Resistance measurements with 50Ω range (model 289 only)

Using the Input Terminals

All functions except current use the $\text{V } \Omega$ and **COM** input terminals. The two current input terminals (A and mA/ μ A) are used as follows:

Current from 0 to 400 mA, use the $\frac{\text{mA}}{\mu\text{A}}$ and **COM** terminals.

Current between 0 and 10 A use the **A** and **COM** terminals.



est04.emf

Figure 4. Input Terminals






Table 5. Input Terminals

Terminal	Description
A	Input for 0 A to 10.00 A current (20VA for 30 overload for 30 seconds on, 10 minutes off), frequency, and duty-cycle measurements.
$\frac{\text{mA}}{\mu\text{A}}$	Input for 0 A to 400 mA current measurements, frequency, and duty cycle.
COM	Return terminal for all measurements.
$\text{V } \Omega$	Input for voltage, continuity, resistance, diode test, conductance, capacitance, frequency, temperature, period, and duty-cycle measurements.

Battery Level Indicator

The battery level indicator in the upper left-hand corner of the display indicates the relative condition of the batteries. Table 6 describes the various battery levels the indicator represents.

Table 6. Battery Level Indicator

Indication	Battery Capacity
	Full capacity
	¾ capacity
	½ capacity
	¼ capacity
	Almost empty (less than one day)

[1] When critically low, a “Replace batteries” pop-up message appears 15 seconds before the Meter shuts down.

The Meter will display a “Batteries low” message whenever the battery level will not support a selected function.

Input Alert™ Feature

If a test lead is plugged into the μA or **A** terminal, but the rotary switch is not set to the correct current position, the Meter makes a chirping sound and displays “Leads connected incorrectly”. This warning is intended to stop you

from attempting to measure voltage, continuity, resistance, capacitance, or diode values when the leads are plugged into a current terminal.

Caution

To avoid circuit damage and possibly blowing the Meter's current fuse, do not place the probes across (in parallel with) a powered circuit when a lead is plugged into a current terminal. This causes a short circuit because the resistance through the Meter's current terminals is very low.

Maintenance

Warning

To avoid electrical shock or personal injury, repairs or servicing not covered in this manual should be performed only by qualified personnel as described in the 287/289 Service Information.

General Maintenance

For general maintenance refer to the 287/289 Users Manual on the accompanying CD.

Testing the Fuses

With the Meter in the Ω_{ns} function, insert a test lead into the $\downarrow \rightarrow \leftarrow \text{V}\Omega$ jack and place the probe tip on the other end of the test lead against the metal of the current input jack. If the “Leads Connected Incorrectly” message appears, the probe tip has been inserted too far into the amps input jack. Back the lead out a bit until the message disappears and either OL or a resistance reading appears in the Meter's display. The resistance value should be between 0.00 and 0.50 Ω for the **A** jack and 10.00 \pm 0.05 k Ω for the μA jack.

Warning

To avoid electrical shock or personal injury, remove the test leads and any input signals before replacing the battery or fuses. To prevent damage or injury, install **only** Fluke specified replacement fuses with the amperage, voltage, and speed ratings shown in the parts list at the back of this manual.

Replacing the Fuses

To replace the Meter's fuses:

1. Turn the Meter off and remove the test leads from the terminals.
2. Remove the battery door assembly by using a standard-blade screwdriver to turn the battery door screw one-half turn counterclockwise.
3. Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket.
4. Install **only** Fluke specified replacement fuses with the amperage, voltage, and interupt ratings shown in the parts list at the back of this manual.
5. Reinstall the battery door assembly and secure it by turning the screw one-half turn clockwise.

Replacing the Batteries

To replace the batteries:

1. Turn the Meter off and remove the test leads from the terminals.

2. Remove the battery door assembly by using a standard-blade screwdriver to turn the battery door screw one-half turn counterclockwise.
3. Replace the batteries with 1.5 volt AA batteries (NEDA 15A IEC LR6). Observe proper polarity.
4. Reinstall the battery door assembly and secure it by turning the screw one-half turn clockwise.

In Case of Difficulty

If the Meter does not seem to work properly:

1. Check that all batteries are installed with the correct polarity.
2. Examine the case for damage. If damage is detected, contact Fluke. See the "Contacting Fluke" section earlier in this manual.
3. Check and replace (as needed) the batteries, fuses, and test leads.
4. Review the Users manual on the accompanying CD to verify correct operation.
5. If the Meter still does not work, pack it securely and forward it, postage paid, to the location provided by the appropriate Fluke contact. Include a description of the problem. Fluke assumes no responsibility for damage in transit.

A Meter under warranty will be repaired or replaced (at Fluke's option) and returned at no charge. See the registration card for warranty terms.

