

FLUKE®

27 II/28 II

Digital Multimeters

Getting Started Manual

Specifications

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Introduction

Warning

Read “Safety Information” before using the Meter.

Except where noted, the descriptions and instructions in this manual refer to both Series II Models 27 and 28 multimeters (hereafter referred to as “the Meter”). Model 28 II appears in all illustrations.

The Model 27 II is an average-responding Digital Multimeter while the 28 II is a True-rms Digital Multimeter. In addition the 28 II measures temperature using a type-K thermocouple.

This manual covers information for turning on the Meter, understanding its controls, and basic maintenance. For complete operational instructions, refer to the *27 II/28 II Users Manual* contained on the accompanying CD.

How to Contact Fluke

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

Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)

Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)

Canada: 1-800-36-FLUKE (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

Or, visit Fluke's website at www.fluke.com.

To register your product, visit <http://register.fluke.com>.

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

Safety Information

The Meter complies with:

- ISA-82.02.01
- CAN/CSA-C22.2 No. 61010-1-04
- IEC Standard No. 61010-1:2001
- Measurement Category III, 1000V, Pollution Degree 2
- Measurement Category IV, 600V, Pollution Degree 2

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user. A **Caution** identifies conditions and actions that may damage the Meter or the equipment under test.

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 secured before operating the Meter.
- Replace the battery as soon as the battery indicator () appears.
- 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 use the Meter around explosive gas, vapor or in damp or wet environments.
- Use only three 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 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 add the filter.

⚠ Caution

To avoid possible damage to the Meter or to 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.
- Before measuring current, check the Meter's fuses. (See "Fuse Test".)

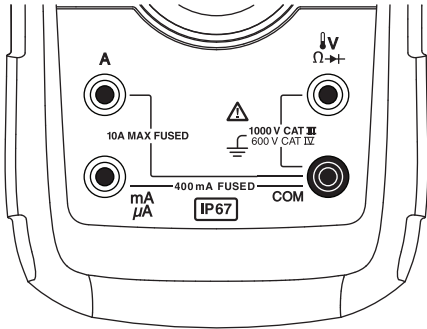
Table 1. Symbols

	AC (Alternating Current)		Earth ground
	DC (Direct Current)		Fuse
	Hazardous voltage		Conforms to European Union directives.
	Risk of Danger. Important information. See Manual.		Conforms to relevant Canadian Standards Association directives.
	Battery. Low battery when displayed.		Double insulated
	Continuity test or continuity beeper tone.		Capacitance
CAT III	IEC Overvoltage 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 Overvoltage 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.		Diode
	Inspected and licensed by TÜV Product Services.	 N10140	Conforms to relevant Australian standards.

Features

Tables 2 through 5 briefly describe the features of the Meter.

Table 2. Inputs



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Terminal	Description
A	Input for 0 A to 10.00 A current (10 - 20 A overload for 30 seconds maximum), current frequency, and duty cycle measurements.
mA μA	Input for 0 μA to 400 mA current measurements (600 mA for 18 hrs) and current frequency and duty cycle.
COM	Return terminal for all measurements.
V Ω →	Input for voltage, continuity, resistance, diode, capacitance, frequency, temperature (28 II only), and duty cycle measurements.

Table 3. Rotary Switch Positions

Switch Position	Function
Any Position	When the Meter is turned on, the Meter model number briefly appears on the display.
	AC voltage measurement Press  (yellow) for low-pass filter () (28 II only)
	DC voltage measurement
	600 mV dc voltage range Press  (yellow) for temperature () (28 II only)
	Press  for continuity test. Ω Resistance measurement Press  (yellow) for capacitance measurement.
	Diode test
	AC current measurements from 0 mA to 10.00 A Press  (yellow) for dc current measurements, from 0 mA to 10.00 A.
	AC current measurements from 0 μA to 6000 μA Press  (yellow) for dc current measurements from 0 μA to 6000 μA.

Table 4. Pushbuttons

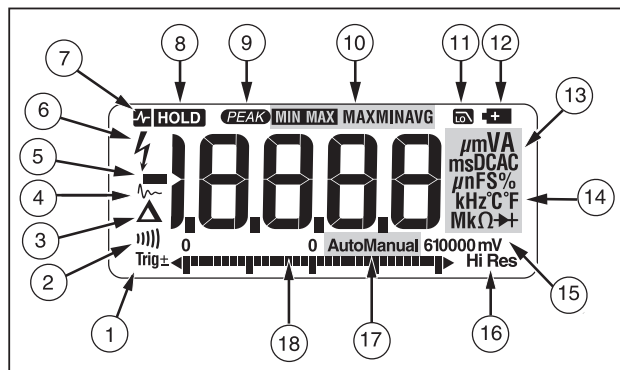
Button	Switch Position	Function
 (Yellow)	    	Selects capacitance Selects temperature (28 II only) Selects ac low-pass filter function (28 II only) Switches between dc and ac current Switches between dc and ac current
	Any switch position 	Switches between the ranges available for the selected function. To return to autoranging, hold the button down for 1 second. Switches between °C and °F. (28 II only)
	Any switch position MIN MAX recording Frequency counter	AutoHOLD (formerly TouchHold) captures the present reading on the display. When a new, stable reading is detected, the Meter beeps and displays the new reading. Stops and starts recording without erasing recorded values. Stops and starts the frequency counter.

Table 4. Pushbuttons (cont.)

Button	Switch Position	Function
	Continuity  Ω  MIN MAX recording Hz, Duty Cycle	Turns the continuity beeper on and off Switches between Peak (250 μ s) and Normal (100 ms) response times. (28 II only) Toggles the meter to trigger on positive or negative slope.
	Any switch position	Turns the button backlight and display backlight on, makes them brighter, and turns them off. For Model 28 II, hold  down for one second to enter the HiRes digit mode. The “HiRes” icon appears on the display. To return to the 3-1/2 digit mode, hold  down for one second. HiRes=19,999
	Any switch position	Starts recording of minimum and maximum values. Steps the display through MAX, MIN, AVG (average), and present readings. Cancels MIN MAX (hold for 1 second)

Table 4. Pushbuttons (cont.)

Button	Switch Position	Function
 (Relative mode)	Any switch position	Stores the present reading as a reference for subsequent readings. The display is zeroed, and the stored reading is subtracted from all subsequent readings.
	Any switch position except diode test	Press  for frequency measurements. Starts the frequency counter. Press again to enter duty cycle mode.



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Figure 1. Display Features

Table 5. Display Features

Number	Feature	Indication
①	±	Polarity indicator for the analog bargraph.
	Trig±	Positive or negative slope indicator for Hz/duty cycle triggering.
②		The continuity beeper is on.
③	Δ	Relative (REL) mode is active.
④	~~~~	Smoothing is active.

Number	Feature	Indication
⑤	-	Negative readings. In relative mode, this sign indicates that the present input is less than the stored reference.
⑥	⚡	High voltage present at the input. Appears if the input voltage is 30 V or greater (ac or dc). Also appears in low-pass filter mode. Also appears in cal, Hz, and duty cycle modes.
⑦	⌂ HOLD	AutoHOLD is active.
⑧	HOLD	Display HOLD is active,
⑨	PEAK	Peak Min Max modes and the response time is 250 μs (28 II only).
⑩	MIN MAX MAX MIN AVG	Minimum-maximum recording mode.
⑪	ⓁⓅ	Low-pass filter mode (28 II Only). See "Low-pass Filter (28 II)".

Table 5. Display Features (cont.)

Number	Feature	Indication
⑫		Low battery. ⚠ ⚠ Warning: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
⑬	A, μA, mA V, mV μF, nF nS % Ω, MΩ, kΩ Hz, kHz  AC DC	amperes (amps), microamp, milliamp volts, millivolts microfarad, nanofarad nanosiemens Percent. Used for duty cycle measurements. ohm, megohm, kilohm hertz, kilohertz Diode test mode. Alternating current, direct current

Number	Feature	Indication
⑭	$^{\circ}\text{C}$, $^{\circ}\text{F}$	Degrees Celsius, Degrees Fahrenheit
⑮	610000 mV	Displays selected range
⑯	HiRes	High resolution (Hi Res) mode. HiRes=19,999 (28 II only)
⑰	Auto	Autorange mode. Automatically selects the range with the best resolution
	Manual	Manual range mode
⑱		The number of segments is relative to the full-scale value of the selected range. In normal operation 0 (zero) is on the left. The polarity indicator at the left of the graph indicates the polarity of the input. The graph does not operate with the capacitance, or frequency counter functions. For more information, see "Bargraph". The bargraph also has a zoom function, as described under "Zoom Mode".

Table 5. Display Features (cont.)

Number	Feature	Indication
--	OL	Overload condition is detected.
Error Messages		
bAtt		Replace the battery immediately.
d, Sc		In the capacitance function, too much electrical charge is present on the capacitor being tested.
Cal Err		Invalid calibration data. Calibrate Meter.
EEP Err		Invalid EEPROM data. Have the Meter serviced.
OPEn		Open thermocouple detected.
F2-		Invalid model. Have the Meter serviced.
LEAd		⚠ Test lead alert. Displayed when the test leads are in the A or mA/μA terminal and the selected rotary switch position does not correspond to the terminal being used.

Automatic Power-Off

The Meter automatically turns off if you do not turn the rotary switch or press a button for 30 minutes. If MIN MAX Recording is enabled, the Meter will not power off. Refer to Table 6 to disable automatic power-off.

Input Alert™ Feature

If a test lead is plugged into the mA/μA or A terminal, but the rotary switch is not set to the correct current position, the beeper warns you by making a chirping sound and the display flashes "LEAd". This warning is intended to stop you from attempting to measure voltage, continuity, resistance, capacitance, or diode values with the leads are plugged into a current terminal.

⚠ Caution

Placing the probes across (in parallel with) a powered circuit when a lead is plugged into a current terminal can damage the circuit you are testing and blow the Meter's fuse. This can happen because the resistance through the Meter's current terminals is very low, so the Meter acts like a short circuit.

Power-Up Options

Holding a button down while turning the Meter on activates a power-up option. Table 6 describes power-up options.

Table 6. Power-Up Options

Button	Power-Up Option
 (Yellow)	Disables automatic power-off feature (Meter normally powers off in 30 minutes). The Meter reads "PoFF" until  is released.
	Enables the Meter's calibration mode and prompts for a password. The Meter reads "tRl" and enters calibration mode. See 27 II/28 II <i>Calibration Information</i> .
	Enables the Meter's smoothing feature. The Meter reads "S--" until  is released.
	Turns on all LCD segments.
	Disables the beeper for all functions. The Meter reads "bEEP" until  is released.
	Disables auto backlight off (backlight normally disables after 2 minutes). The Meter reads "LoFF" until  is released.
 (Relative mode)	Enables zoom mode for the bargraph. The Meter reads "REL" until  is released.
	Enables the Meter's high impedance mode when the mV dc function is used. The Meter reads "Hi Z" until  is released. (28 II only)

Maintenance

⚠⚠ Warning

To avoid possible electric shock or personal injury, repairs or servicing not covered in this manual should be performed only by qualified personnel as described in the 27 II/28 II Calibration Information.

General Maintenance

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings and can falsely activate the Input Alert feature. Clean the terminals as follows:

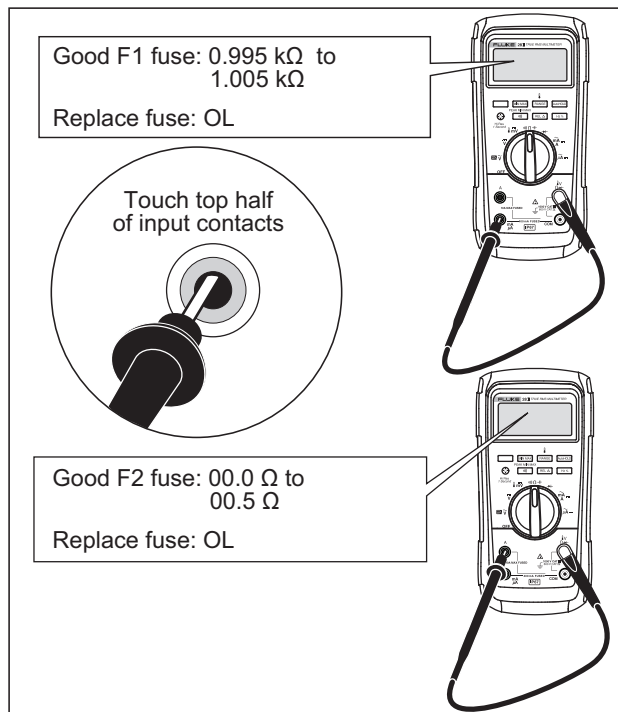
1. Turn the Meter off and remove all test leads.
2. Shake out any dirt that may be in the terminals.
3. Soak a clean swab with mild detergent and water. Work the swab around in each terminal. Dry each terminal using canned air to force the water and detergent out of the terminals.

Fuse Test

As shown in Figure 2, with the Meter in the Ω function, insert a test lead into the Ω jack and place the probe tip on the other end of the test lead against the metal of the current input jack. If "LEd" appears in the display, 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 display. The resistance value should be as shown in Figure 2. If the tests give readings other than those shown, have the Meter serviced.

⚠⚠ 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 specified replacement fuses with the amperage, voltage, and speed ratings shown in Table 7.



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Figure 2. Current Fuse Test

How to Replace the Batteries

Replace the batteries with three AA batteries (NEDA 15A IEC LR6).

⚠ ⚠ Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator (⚡) appears. If the display shows "batt" the Meter will not function until the battery is replaced.

Replace the battery as follows, refer to Figure 3:

1. Turn the rotary switch to OFF and remove the test leads from the terminals.
2. Remove the six Phillips-head screws from the case bottom and remove the battery door (①).

Note

While lifting the battery door, ensure the rubber gasket stays attached to the battery compartment barrier.

3. Remove the three batteries and replace all three with AA Alkaline batteries (②).

4. Ensure the battery compartment gasket (③) is properly installed around the outside edge of the battery compartment barrier.
5. Replace the battery door by aligning the battery compartment barrier with battery compartment.
6. Secure the door with the six Phillips-head screws.

How to Replace the Fuses

Referring to Figure 3, examine or replace the Meter's fuses as follows:

1. Turn the rotary switch to OFF and remove the test leads from the terminals
2. Refer to step 2 under the How to Replace the Batteries section above to remove the battery door.
3. Remove the fuse compartment seal (④) from the fuse compartment.
4. Gently lift out the fuse compartment door (⑤) from the fuse compartment.
5. Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket (⑥).
6. Install ONLY specified replacement fuses with the amperage, voltage, and speed ratings shown in Table 7. The 440-mA fuse is shorter than the 10-A fuse. For correct placement of each fuse, note the marking on the printed circuit board under each fuse.

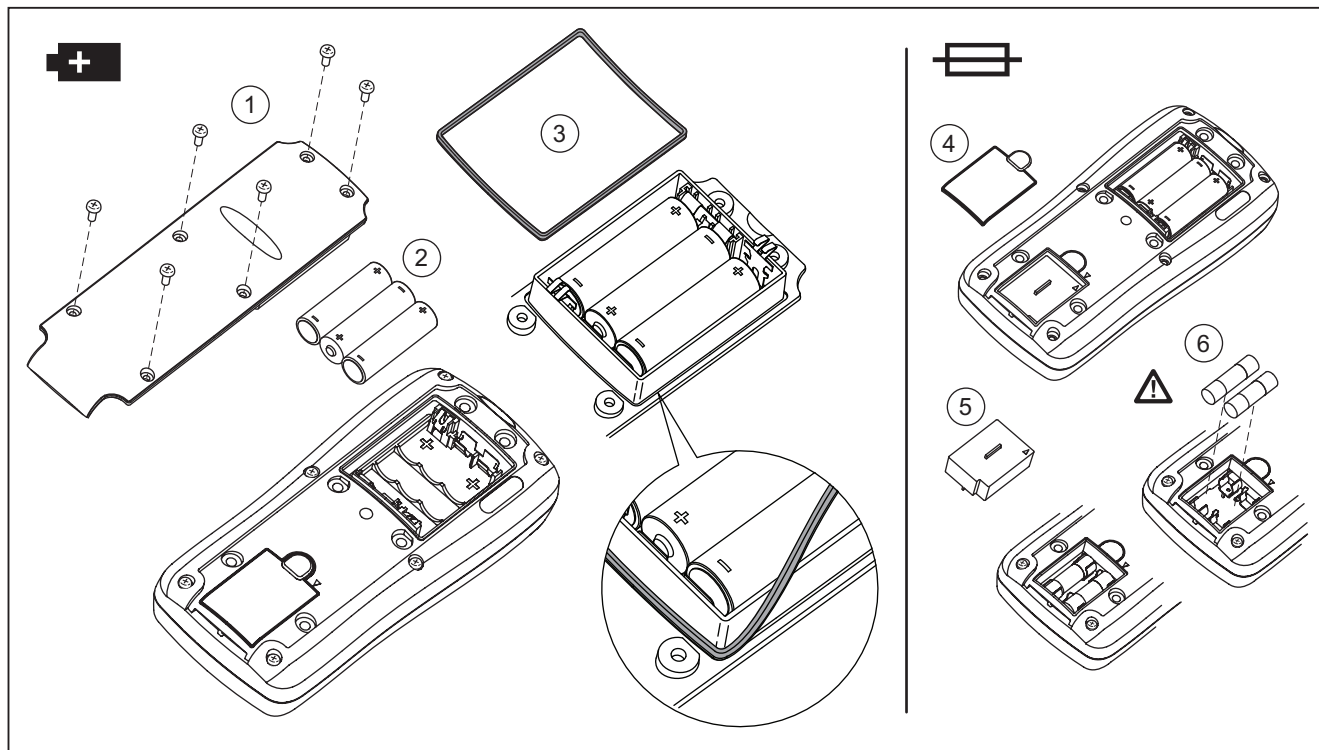
7. Replace the fuse compartment door by aligning the arrow on the fuse door with the arrow on the case bottom and lowering the door into the fuse compartment.
8. Replace the fuse compartment seal by aligning the tab on the seal with the outline on the case bottom. Ensure the seal (④) is properly seated.
9. Refer to steps four through six under the Replacing the Batteries section above to reinstall the battery door.

Service and Parts

If the Meter fails, check the battery and fuses. Review this manual to verify proper use of the Meter.

Replacement parts and accessories are shown in Table 7 and Figure 4.

To order parts and accessories, refer to "How to Contact Fluke".



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Figure 3. Battery and Fuse Replacement