

FLUKE®

110/113/114/115/117

True-rms Multimeter

Users Manual

Introduction

The Fluke Model 110, Model 113, Model 114, Model 115, and Model 117 (the Meter or Product) are battery-powered, true-rms multimeters with a 6000-count display and a bar graph. This manual applies to all models. All figures show the Model 117 unless indicated.

Safety Information

For Product safety information, see the printed *110/113/114/115/117 Safety Information* included with the Product or located on the Fluke website.

Unsafe Voltage

To alert you to the presence of a potentially hazardous voltage, the ⚡ symbol is displayed when the Meter measures a voltage ≥ 30 V or a voltage overload (**OL**) condition. When making frequency measurements >1 kHz, the ⚡ symbol is unspecified.

Test Lead Alert

⚠⚠ Warning

Personal injury or damage to the Meter can occur if you attempt to make a measurement with a lead in an incorrect terminal.

To remind you to check that the test leads are in the correct terminals, **LEAD** is briefly displayed and an audible beep sounds when you move the rotary switch to or from any **A** (Amps) position.

Product Familiarization

The manual explains features for multiple models. Because models have different features, not all of the information in the manual may apply to your Meter. Use Table 1 to identify the features of your Meter.

Features

Table 1 is a list of the features for each Meter.

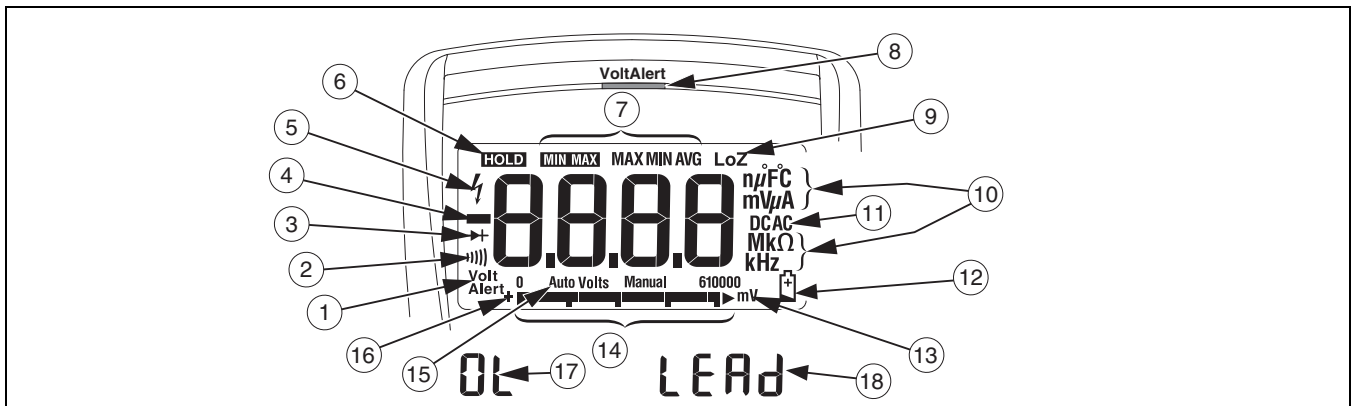
Table 1. Features

Switch Position	Measurement Function	110	113	114	115	117
OFF	The Meter is turned off.	●	●	●	●	●
AUTO-V LoZ	Automatically selects ac or dc volts based on the sensed input with a low impedance input.			●		●
\sim Hz V	AC voltage from 0.06 V to 600 V. Frequency from 5 Hz to 100 kHz.	●		●	●	●
$\overline{\text{V}}$	DC voltage from 0.001 V to 600 V.	●		●	●	●
\sim mV $\overline{\text{---}}$	AC voltage from 6.0 to 600 mV, dc-coupled. DC voltage from 0.1 to 600 mV.	●		●	●	●
Ω	Ohms from 0.1 Ω to 40 M Ω .	●	●	●	●	●
 	Continuity beeper turns on at <20 Ω and turns off at >250 Ω .	●	●	●	●	●
V CHEK	LoZ low impedance measurement function to simultaneously test for voltage or continuity.		●			
\rightarrow	Diode Test. Displays OL above 2.0 V.		●		●	●
\leftarrow	Farads from 1 nF to 9999 μ F.		●		●	●
\sim A _{Hz}	AC current from 0.1 A to 10 A (>10 to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed. DC-coupled. Frequency from 45 Hz to 5 kHz.				●	●
$\overline{\text{A}}$	DC current from 0.001 A to 10 A (>10 A to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed.				●	●
Volt Alert	Non-contact sensing of ac voltage.					●
<p>Note: All ac functions and Auto-V LoZ are true-rms. AC voltage is ac-coupled. Auto-V LoZ, AC mV and AC amps are dc-coupled.</p>						

Display




Table 2 is a list of the features for each display.

Table 2. Display



No.	Symbol	Meaning	Model
①	Volt Alert	The Meter is in the VoltAlert™ non-contact voltage detect mode.	117
②	⎓	The Meter function is set to Continuity.	110, 113, 114, 115, 117
③	➤	The Meter function is set to Diode Test	113, 115, 117
④	-	Input is a negative value.	110, 113, 114, 115, 117
⑤	⚡	⚠ Unsafe voltage. Measured input voltage ≥ 30 V, or voltage overload condition (OL).	110, 113, 114, 115, 117
⑥	HOLD	Display hold enabled. Display freezes present reading.	110, 113, 114, 115, 117
⑦	MIN MAX MAX MIN AVG	MIN MAX AVG mode enabled. Maximum, minimum, average or present reading displays	110, 113, 114, 115, 117
⑧	(Red LED)	Voltage presence through the non-contact VoltAlert sensor	117
⑨	LoZ	The Meter is measuring voltage or capacitance with a low input impedance.	113, 114, 115, 117
⑩	nμF mV μA MkΩ kHz	Measurement units.	110, 114, 115, 117
⑪	DC AC	Direct current or alternating current	110, 113, 114, 115, 117
⑫		Battery low warning.	110, 113, 114, 115, 117
⑬	610000 mV	Indicates the Meter's range selection.	110, 114, 115, 117
⑭	(Bar graph)	Analog display.	110, 113, 114, 115, 117

Table 2. Display (cont.)

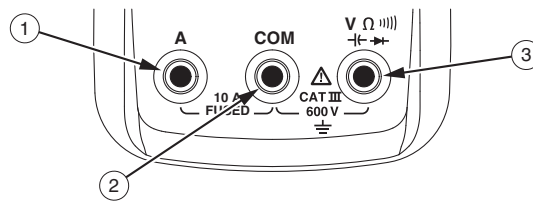
No.	Symbol	Meaning	Model
⑮	Auto Volts	The Meter is in the Auto Volts function.	114, 117
	Auto	Autoranging. The Meter selects the range for best resolution.	110, 113, 114, 115, 117
	Manual	Manual ranging. User sets the Meter's range.	110, 113, 114, 115, 117
⑯	+	Bar graph polarity	110, 113, 114, 115, 117
⑰		 The input is too large for the selected range.	110, 113, 114, 115, 117
⑱	LEAD	 Test lead alert. Briefly displayed whenever the Meter's function switch is rotated to or from any A position.	115, 117

Terminals

Table 3 is a list of terminals on the Meter.

Table 3. Terminals

No.	Description	Model
①	Input terminal for measuring ac and dc current to 10 A.	115, 117
②	Common (return) terminal for all measurements.	110, 113, 114, 115, 117
③	Input terminal for measuring voltage, continuity, resistance, capacitance, frequency and testing diodes.	110, 113, 114, 115, 117



Error Messages

Table 4 is a list of error messages for the Meter.

Table 4. Error Messages

Error Messages	
bAtt	Battery must be replaced before the Meter will operate.
Cal Err	Calibration required. Meter calibration is required before the Meter will operate.
EEP Err	Internal error. The Meter must be repaired before it will operate.
Flt Err	Internal error. The Meter must be repaired before it will operate.

Battery Saver™ (Sleep Mode)

If the Meter is ON, but inactive and not connected to voltage for more than 20 minutes, the display goes blank to save battery life. To use the Meter, press any button or turn the rotary switch. To disable the Sleep mode, see [Power-Up Options](#). The Sleep mode is always disabled in the MIN MAX AVG mode.

MIN MAX AVG Recording Mode

The MIN MAX AVG recording mode captures the minimum and maximum input values (ignoring overloads), and calculates a running average of all readings. When the Meter detects a new high or low, the Meter beeps.

Note

Autoranging and Battery Saver™ are disabled in MIN MAX AVG mode.



1. Select the measurement function and range.
2. Push **MIN MAX** to enter MIN MAX AVG mode.
MIN MAX and MAX show on the display. The highest reading detected since entering MIN MAX AVG shows on the display.
3. Push **MIN MAX** to step through the low (MIN), average (AVG), and present readings.
4. To pause MIN MAX AVG recording without erasing stored values, push **HOLD**. (**HOLD** shows on the display.)
5. To resume MIN MAX AVG recording, push **HOLD** again.
6. To exit and erase stored readings, push **MIN MAX** for at least one second, or turn the rotary switch.

Display HOLD


Warning

To avoid electric shock, when Display HOLD is activated, be aware that the display will not change when you apply a different voltage.

In the Display HOLD mode, the Meter freezes the display.


1. Push  to activate Display HOLD. (**HOLD** shows on the display.)
2. To exit and return to normal operation, push  or turn the rotary switch.



Backlight

Push  to toggle the backlight on and off.


The backlight automatically turns off after 40 seconds. To disable backlight auto-off, see [Power-Up Options](#).

Manual and Autoranging

The Meter has both Manual and Autorange modes. The Meter defaults to Autorange. To toggle between Manual and Autorange, push  for 1 second.

- In the Autorange mode, the Meter selects the range with the best resolution.
- In the Manual Range mode, you override Autorange and select the range yourself. Push  for 1 second to enter Manual range. (**Manual** shows on the display.) Push  to increment the range. After the highest range, the Meter wraps to the lowest range.






Note

You cannot manually change the range in the MIN MAX AVG or Display HOLD modes. If you push  while in MIN MAX AVG or Display Hold, the Meter beeps twice, indicating an invalid operation and the range does not change.

Power-Up Options

To select a Power-Up Option, hold down the button indicated in Table 5 while turning the Meter from OFF to any other function. Power-Up Options are canceled when you turn off the Meter and when sleep mode is activated.

Table 5. Power-Up Options

Button	Power-Up Options
	Turns on all display segments until button is released.
	Disables beeper. bEEP shows when enabled.
	113 - Turns on all display segments until button is released.
	115, 117 - Enables low impedance capacitance measurements. LCAP shows when enabled.
	Disables Battery Saver™ (Sleep mode). Poff shows when enabled.
	Disables auto backlight off. Loff is displayed when enabled.

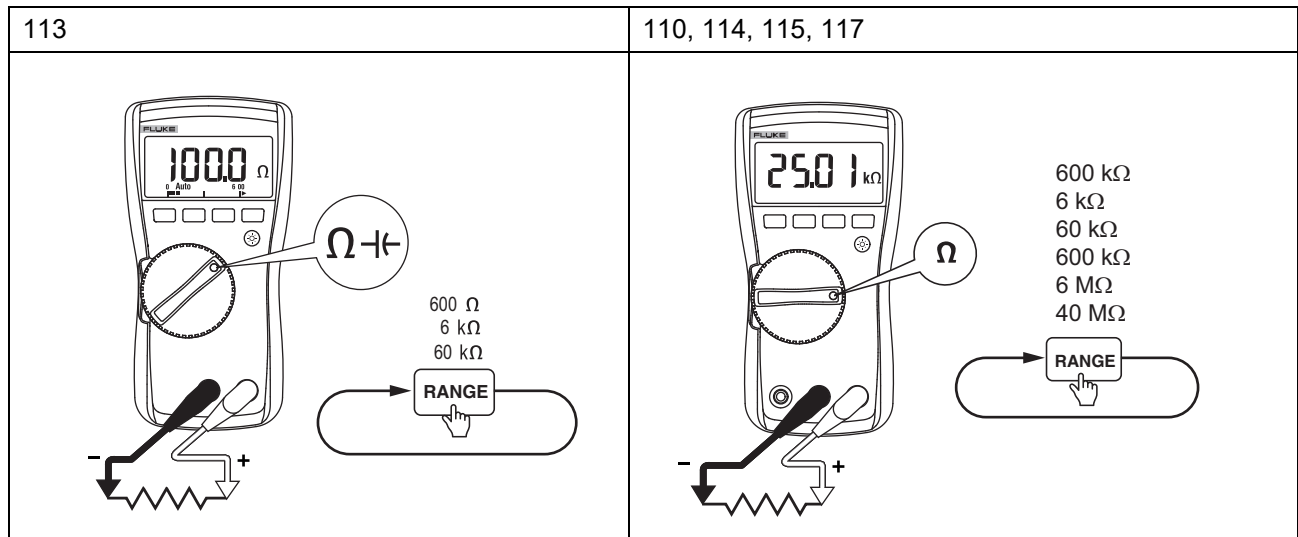
Making Basic Measurements

When connecting the test leads to the circuit or device, connect the common (**COM**) test lead before connecting the live lead; when removing the test leads, remove the live lead before removing the common test lead.

⚠⚠ Warning

To avoid electric shock, injury, or damage to the Meter, disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.

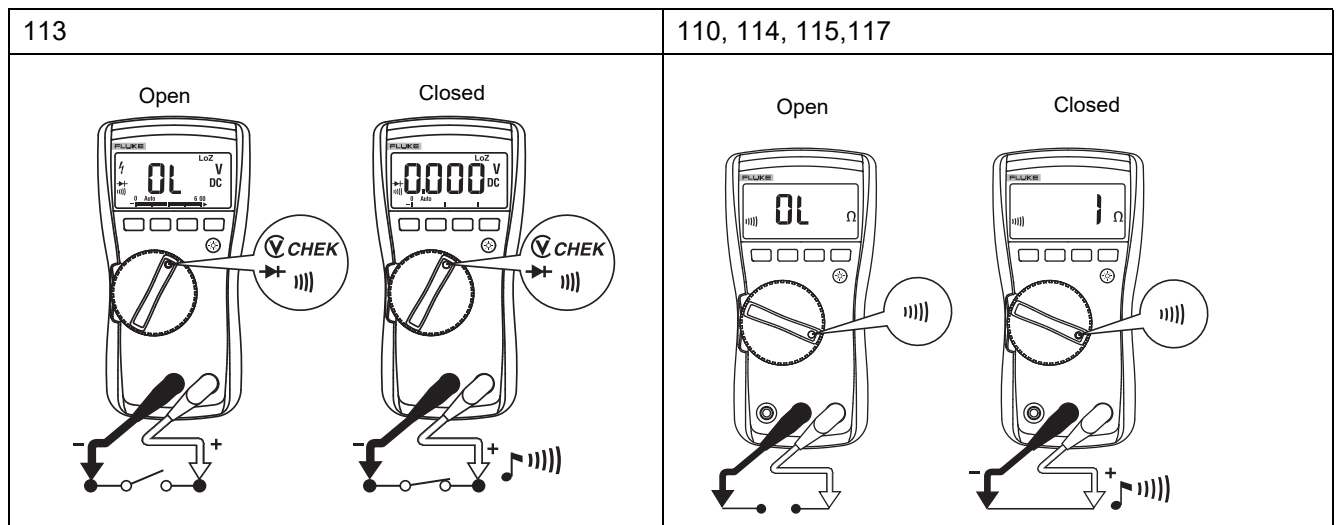
Measuring Resistance



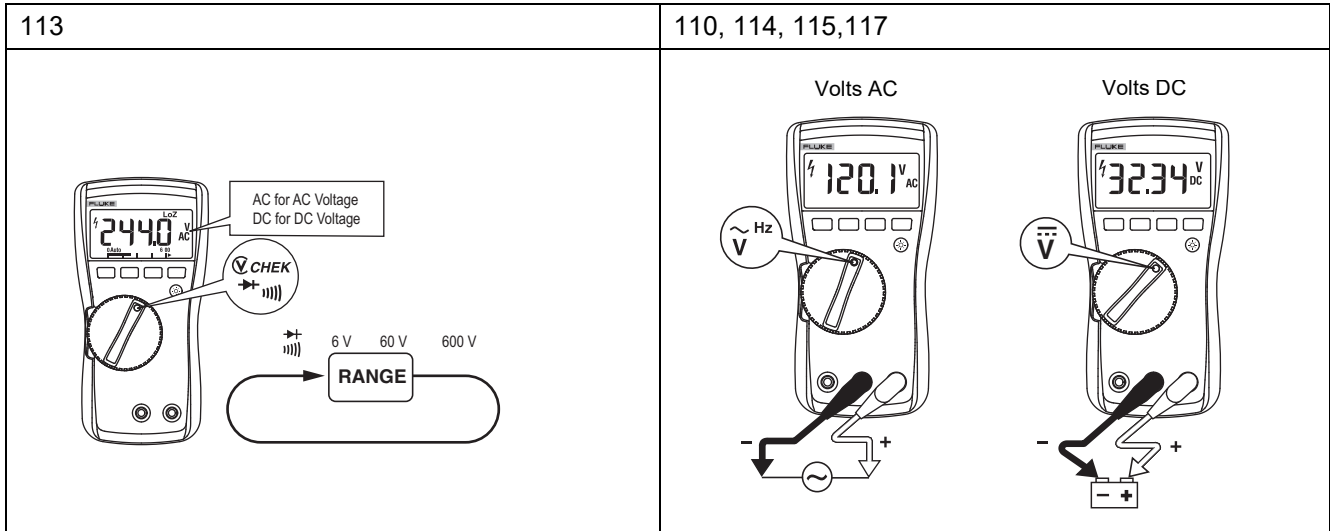
Testing for Continuity

Note

Use the continuity function as a fast, convenient method to check for opens and shorts. For maximum accuracy in making resistance measurements, use the Meter's resistance (Ω) function.



Measuring AC and DC Voltage



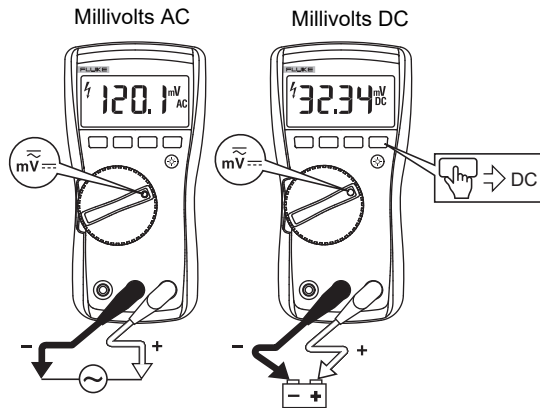
Using Auto Volts Selection (114, 117)

With the function switch in the $\overset{\text{AUTO-V}}{\text{LoZ}}$ position, the Meter automatically selects a dc or ac voltage measurement based on the input applied between the **V** or **+** and **COM** jacks.

This function also sets the Meter's input impedance to approximately 3 k Ω to reduce the possibility of false readings due to ghost voltages.

Measuring AC and DC Millivolts (110, 114, 115, 117)

With the function switch in the $\overset{\sim}{\text{mV}}$ position, the Meter measures ac plus dc millivolts. Press to set the Meter to dc millivolts.



Measuring AC or DC Current (115, 117)

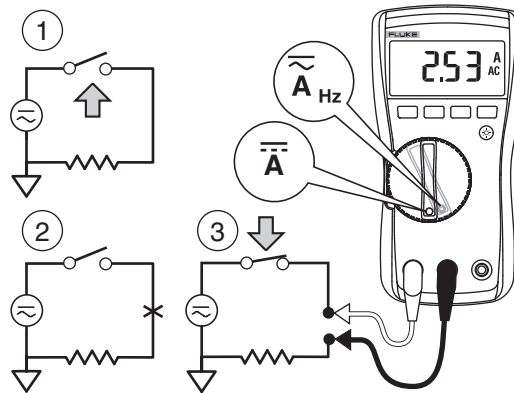
⚠⚠ Warning

To avoid personal injury or damage to the Meter:

- Never attempt to make an in-circuit current measurement when the open-circuit potential to earth is >600 V.
- Check the Meter's fuse before testing. See [Testing the Fuse \(115, 117\)](#).
- Use the proper terminals, switch position, and range for your measurement.
- Never place the probes in parallel with a circuit or component when the leads are plugged into the A (Amps) terminals.

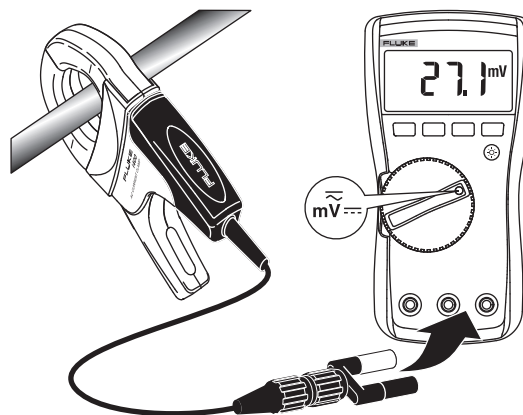
To measure current:

1. Turn circuit power off.
2. Break the circuit
3. Insert the Meter in series with the circuit, and then turn circuit power on.

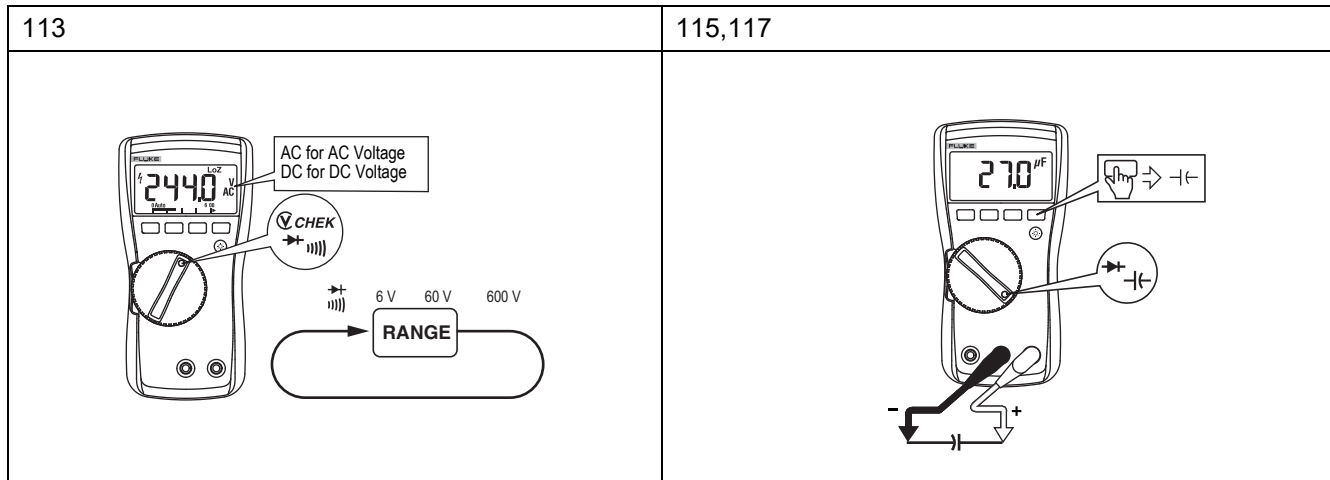


Measuring Current above 10 Amps (110, 114, 115, 117)

The millivolt and voltage function of the Meter can be used with an optional mV/A output Current Probe to measure currents that exceed the rating of the Meter. Make sure the Meter has the correct function selected, AC or DC, for your current probe. Refer to a Fluke catalog or contact your local Fluke representative for compatible current clamps.



Measuring Capacitance (113, 115, 117)



Measuring Frequency (115, 117)

⚠⚠ Warning

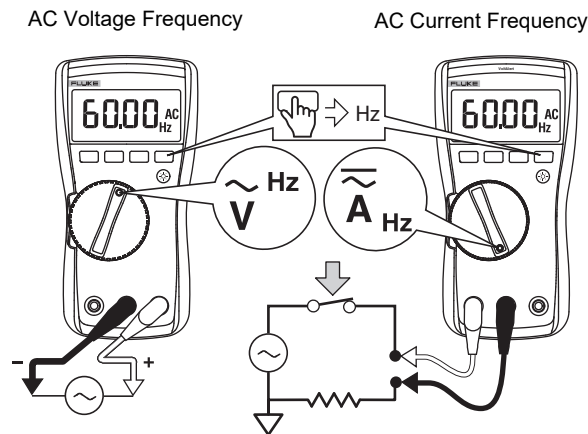
To avoid electrical shock, disregard the bar graph for frequencies >1 kHz. If the frequency of the measured signal is >1 kHz, the bar graph and ζ are unspecified.

The Meter measures the frequency of a signal by counting the number of times the signal crosses a trigger level each second. The trigger level is 0 V, 0 A for all ranges.

Press to turn on or turn off the frequency measurement function on and off. Frequency works with ac functions only.

In frequency, the bar graph and range annunciator indicate the ac voltage or current present.

Select progressively lower ranges using manual ranging for a stable reading.



Detecting AC Voltage Presence (117)

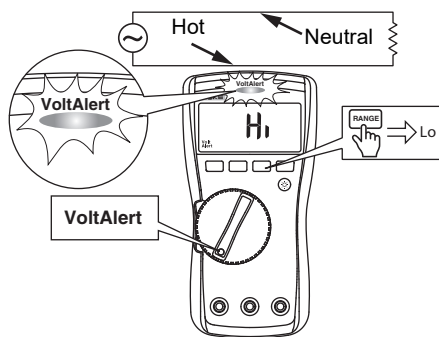
To detect the presence of ac voltage, place the top of the Meter close to a conductor. The Meter gives an audible as well as visual indication when voltage is detected. The sensitivity settings are:

- Lo: use on flush mounted wall sockets, power strips, flush mounted industrial outlets and various power cords.
- Hi: for ac voltage detection on other styles of recessed power connectors or sockets where the actual ac voltage is recessed within the connector itself.

The VoltAlert detector works in bare wire applications with voltages as low as 24 V in the Hi setting.

⚠⚠ Warning

If there is no indication, voltage could still be present. Do not rely on the VoltAlert detector with shielded wire. Operation may be effected by differences in socket design, insulation thickness and type.



Making Low Impedance Capacitance Measurements (115, 117)

For making capacitance measurements on cables with ghost voltage:

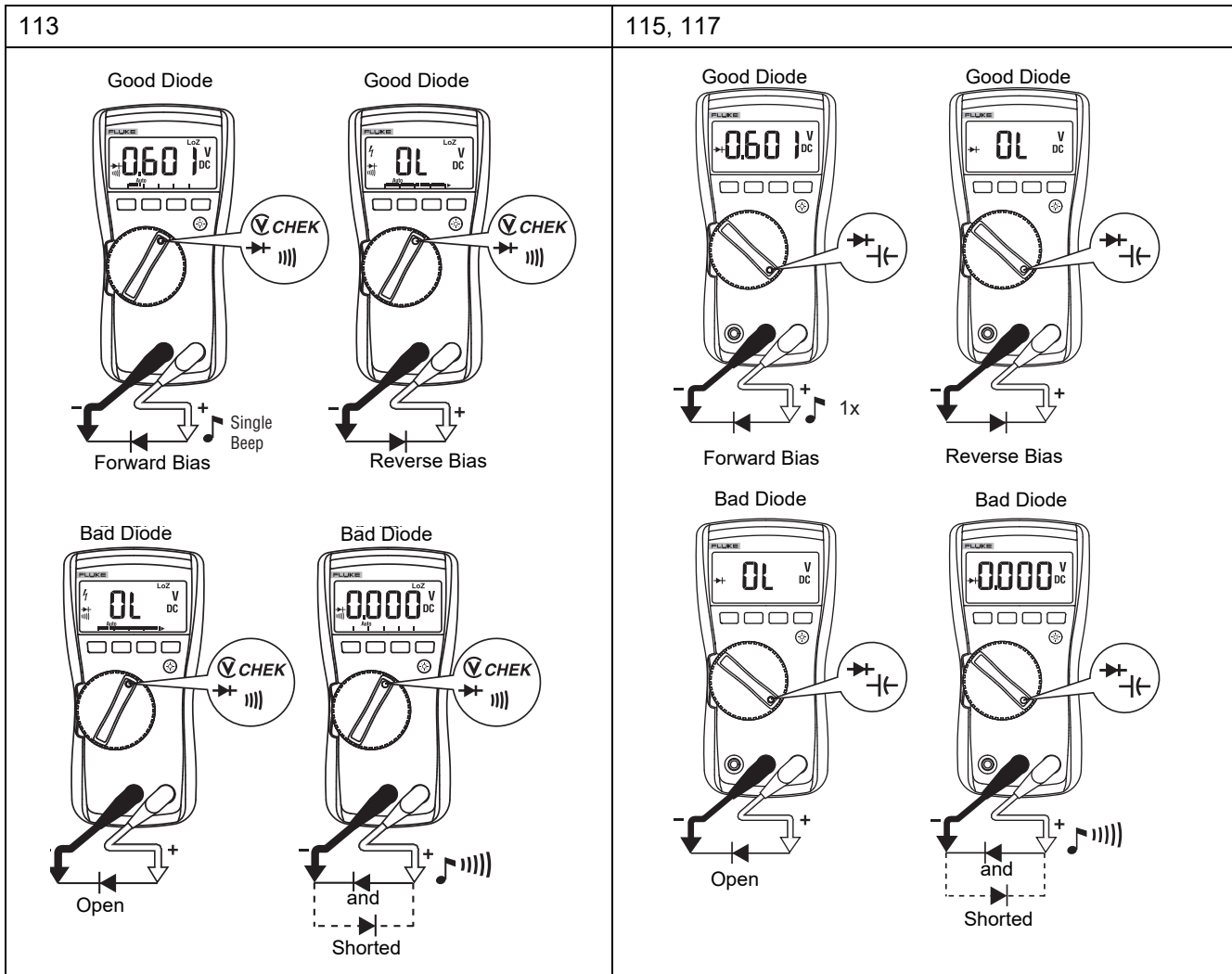
1. Hold **RANGE** as you turn on the Meter to enable the low-input impedance Capacitance mode.
2. Wait until **LCAP** shows on the display.

In this mode, capacitance measurements will have a lower accuracy and lower dynamic range.

Note

This setting is not saved when the Meter is turned off or goes into sleep mode.

Testing Diodes (113, 115, 117)



Using the Bargraph

The bar graph is like the needle on an analog meter. It has an overload indicator (▶) to the right and a polarity indicator (⊕) to the left.

Because the bar graph is much faster than the digital display, the bar graph is useful for making peak and null adjustments.

The bar graph is disabled when measuring capacitance. In frequency, the bar graph and range annunciator indicates the underlying voltage or current up to 1 kHz.

The number of segments indicates the measured value and is relative to the full-scale value of the selected range.

In the 60 V range, for example (see below), the major divisions on the scale represent 0, 15, 30, 45, and 60 V. An input of -30 V turns on the negative sign and the segments up to the middle of the scale.



Maintenance

Maintenance of the Meter consists of battery and fuse replacement, as well as case cleaning.

Testing the Fuse (115, 117)

Test fuse as shown in Figure 1.

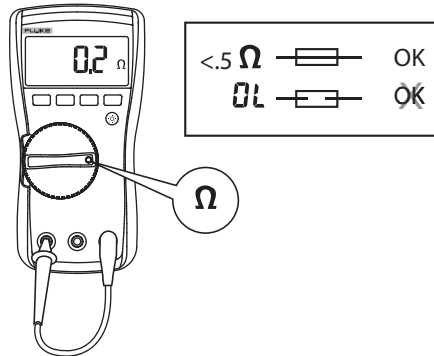


Figure 1. Test the Fuse

Replacing the Battery and Fuse

⚠ ⚠ Warning

To avoid shock, injury, or damage to the Meter:

- Remove test leads from the Meter before opening the case or battery door.
- Use **ONLY** a fuse with the amperage, interrupt voltage, and speed ratings specified.

See Figure 2 for disassembly.

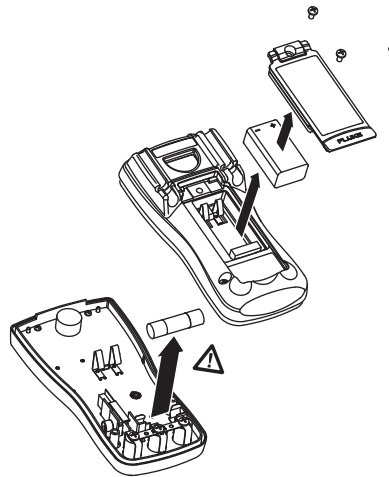


Figure 2. Disassembly

To remove the battery door for battery replacement:

1. Remove the test leads from the Meter.
2. Remove the battery door screw.
3. Use the finger recess to lift the door slightly.
4. Lift the door straight up to separate it from the case.
5. The battery fits inside the battery door, which is then inserted into the case, bottom edge first, until it is fully seated. Do not attempt to install the battery directly into the case.
6. Install and tighten battery door screw.

To open the case for fuse replacement:

1. Remove the test leads from the Meter.
2. Remove the Meter from its holster.
3. Remove two screws from the case bottom.
4. Separate the case bottom from the case top.
5. Remove the fuse from its holder and replace it with an 11 A, 1000 V, FAST fuse having a minimum interrupt rating of 17,000 A. Use only Fluke PN 803293.
6. To re-assemble the Meter, first attach the case bottom to the case top, then install the two screws. Finally, insert the Meter into its holster.

Cleaning

Wipe the case with a damp cloth and mild detergent. Dirt or moisture in the terminals can affect readings.

Specifications

Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, with relative humidity at 0 % to 90 %.
Extended specifications are available at www.Fluke.com.

Maximum voltage between any terminal and earth ground 600 V

⚠ Fuse for A input (115 & 117 only)..... 11 A, 1000 V, IR 17 kA

Display

Digital..... 6000 counts, updates 4/s

Bar Graph 33 segments, updates 32/s

Temperature

Operating..... -10 °C to 50 °C

Storage -40 °C to 60 °C

Temperature Coefficient..... 0.1 x (specified accuracy)/°C (<18 °C or >28 °C)

Altitude

Operating..... 2000 meters

Storage 10 000 meters

Relative Humidity..... 95 % to 30 °C, 75 % to 40 °C, 45 % to 50 °C

Battery..... IEC 6LR61

Battery Life

113..... Alkaline: 300 hours typical, without backlight

110, 114, 115, 117..... Alkaline: 400 hours typical, without backlight

Safety IEC 61010-1: Pollution Degree 2
IEC 61010-2-033

113..... Measurement CAT IV 600 V

110, 114..... Measurement CAT III 600 V

115, 117..... Measurement CAT III 600 V, 10 A

Ingress Protection IEC 60529: IP42 (non-operating)

Electromagnetic Compatibility (EMC)

International..... IEC 61326-1: Portable Electromagnetic Environment
CISPR 11: Group 1, Class A

Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.

Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.

Korea (KCC)..... Class A Equipment (Industrial Broadcasting & Communication Equipment)

Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.

USA (FCC) 47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.

Table 6. Accuracy Specifications

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])		Model
DC Millivolts	600.0 mV	0.1 mV	0.5 % + 2		110, 114, 115, 117
DC Volts	6.000 V	0.001 V	0.5 % + 2		110, 114, 115, 117
	60.00 V	0.01 V			
	600.0 V	0.1 V			
			DC, 45 to 500 Hz	500 Hz to 1 kHz	
Auto-V LoZ ^[1] True-rms	600.0 V	0.1 V	2.0 % + 3	4.0 % + 3	114, 117
Ⓢ CHEK ^[4]	6.000 V	0.001 V	2.0 % + 3		113
	60.00 V	0.01 V			
	600.0 V	0.1 V			
			45 to 500 Hz	500 Hz to 1 kHz	
AC millivolts ^[1] True-rms	600.0 mV	0.1 mV	1.0 % + 3	2.0 % + 3	110, 114, 115, 117
AC Volts ^[1] True-rms	6.000 V	0.001 V	1.0 % + 3		110, 114, 115, 117
	60.00 V	0.01 V			
	600.0 V	0.1 V			
Continuity ^[5]	600 Ω	1 Ω	Beeper on <20 Ω, off >250 Ω. Detects opens or shorts of 500 μs or longer.		110, 114, 115, 117
	---	---			113
Ohms ^[5]	600.0 Ω	0.1 Ω	0.9 % + 2		110, 113, 114, 115, 117
	6.000 kΩ	0.001 kΩ	0.9 % + 1		
	60.00 kΩ	0.01 kΩ	0.9 % + 1		
	600.0 kΩ	0.1 kΩ	0.9 % + 1		110, 114, 115, 117
	6.000 MΩ	0.001 MΩ	0.9 % + 1		
	40.00 MΩ	0.01 MΩ	5.0 % + 2		
Diode Test ^[5]	2.000 V	0.001 V	0.9 % + 2		115, 117
			2.0 % + 3		113
Capacitance ^[5]	1000 nF	1 nF	1.9 % + 2		113, 115, 117
	10.00 μF	0.01 μF	1.9 % + 2		
	100.0 μF	0.1 μF	1.9 % + 2		
	9999 μF	1 μF	100 μF - 1000 μF: 1.9 % + 2 >1000 μF: 5 % + 20		
Lo-Z Capacitance (Power-up option)	1 nF to 500 μF		10 % + 2 typical		115, 117
AC Amps True-rms ^[1] (45 Hz to 500 Hz)	6.000 A	0.001 A	1.5 % + 3		115, 117
	10.00 A ^[3]	0.01 A			
DC Amps	6.000 A	0.001 A	1.0 % + 3		115, 117
	10.00 A ^[3]	0.01 A			

Table 6. Accuracy Specifications (cont.)

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])	Model
Hz (V or A input) ^[2]	99.99 Hz	0.01 Hz	0.1 % + 2	115, 117
	999.9 Hz	0.1 Hz		
	9.999 kHz	0.001 kHz		
	50.00 kHz	0.01 kHz		
	99.99 kHz	0.01 kHz		
Notes:				
[1] All ac ranges except Auto-V LoZ are specified from 1 % to 100 % of range. Auto-V LoZ is specified from 0.0 V. Because inputs below 1 % of range are not specified, it is normal for this and other true-rms meters to display non-zero readings when the test leads are disconnected from a circuit or are shorted together. For volts, crest factor of ≤3 at 4000 counts, decreasing linearly to 1.5 at full scale. For amps, crest factor of ≤3. AC volts is ac-coupled. Auto-V LoZ, AC mV, and AC amps are dc-coupled.				
[2] AC Volts Hz is ac-coupled and specified from 5 Hz to 99.99 kHz. Minimum input required above 50.00 kHz typically is >1.1 vac sine. Minimum input typical and not specified. AC Amps Hz is dc-coupled and specified from 45 Hz to 5 kHz.				
[3] Δ >10 A unspecified. Duty cycle: >10 A to 20 A, 30 seconds on, 10 minutes off.				
[4] 113 only: All \checkmark <i>CHEK</i> voltage ranges are specified from 60 counts to 100 % of range. Because inputs <60 counts are not specified, it is possible and normal for this and other true-rms meters to display non-zero readings when the test leads are disconnected from a circuit or are shorted together. Crest factor of ≤3 at 4000 counts, decreasing linearly to 1.5 at full scale.				
[5] 113 only: After measuring voltage, a wait time of 1 minute is required to maintain accuracy of ohms, capacitance, diode test, and continuity.				

Table 7. Input Characteristics (110, 114, 115, 117)

Function	Input Impedance (Nominal)	Common Mode Rejection Ratio (1 k Ω Unbalanced)		Normal Mode Rejection
		>60 dB at dc, 50 or 60 Hz	0.5 % + 2	
Volts AC	>5 M Ω <100 pF	>60 dB at dc, 50 or 60 Hz	0.5 % + 2	- - -
Volts DC	>10 M Ω <100 pF	>100 dB at dc, 50 or 60 Hz	0.5 % + 2	- - -
Auto-V LoZ	~3 k Ω <500 pF	>60 dB at dc, 50 or 60 Hz		- - -
	Open Circuit Test Voltage	Full Scale Voltage		Short Circuit Current
Ohms	<2.7 V dc	to 6.0 M Ω	40 M Ω	<350 μ A
		<0.7 V dc	<0.9 V dc	
Diode Test	<2.7 V dc	2.000 V dc		<1.2 mA

Table 8. Input Characteristics (113)

Function	Input Impedance (Nominal)	Common Mode Rejection Ratio
☑ CHEK	~3 kΩ <300 pF	>60 dB at dc, 50 or 60 Hz
	Open Circuit Test Voltage	Full Scale Voltage
Ohms	<2.7 V dc	<0.7 V dc
Diode Test	<2.7 V dc	<2.000 V dc
	Short Circuit Current	
Ohms		<350 μA
Diode Test		<1.0 mA

MIN MAX Recording Accuracy and Response Time (113)

Specified accuracy of the measurement function ± 40 counts in ☑ CHEK for changes >500 ms in duration, ± 12 counts in Ω for changes >325 ms in duration. Typical 100 ms response to 80 %. Response time not specified for capacitance.

FLUKE®

115C and 117C

True-rms Multimeters

Users Manual

True-rms Multimeters

Introduction

The Fluke **Model 115C**, and **Model 117C** are battery-powered, true-rms multimeters (hereafter "the Meter") with a 6000-count display and a bar graph. This manual applies to both models. All figures show the Model 117C.

These meters meet CAT III IEC 61010-1 2nd Edition standards. The IEC 61010-1 2nd Edition safety standard defines four measurement categories (CAT I to IV) based on the magnitude of danger from transient impulses. CAT III meters are designed to protect against transients in fixed-equipment installations at the distribution level.

Unsafe Voltage

To alert you to the presence of a potentially hazardous voltage, the ⚡ symbol is displayed when the Meter measures a voltage ≥ 30 V or a voltage overload (OL) condition. When making frequency measurements >1 kHz, the ⚡ symbol is unspecified.

Test Lead Alert

Warning

Personal injury or damage to the Meter can occur if you attempt to make a measurement with a lead in an incorrect terminal.

To remind you to check that the test leads are in the correct terminals, LEAD is briefly displayed and an audible beep sounds when you move the rotary switch to or from any **A** (Amps) position.

Safety Information

A "⚠️⚠️Warning" statement identifies hazardous conditions and actions that could cause bodily harm or death.

A "⚠️Caution" statement identifies conditions and actions that could damage the Meter or the equipment under test.

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











- **Use the Meter only as specified in this manual or the protection provided by the Meter might be impaired.**
- **Do not use the Meter or test leads if they appear damaged, or if the Meter is not operating properly.**
- **Always use proper terminals, switch position, and range for measurements.**
- **Verify the Meter's operation by measuring a known voltage. If in doubt, have the Meter serviced.**
- **Do not apply more than the rated voltage, as marked on Meter, between terminals or between any terminal and earth ground.**
- **Use caution with voltages above 30 V ac rms, 42 V ac peak, or 60 V dc. These voltages pose a shock hazard.**
- **Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.**
- **Do not use the Meter around explosive gas or vapor.**
- **When using test leads or probes, keep your fingers behind the finger guards.**
- **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.**
- **Remove test leads from Meter before opening the battery door or Meter case.**

True-rms Multimeters

Safety Information

- Comply with local and national safety requirements when working in hazardous locations.
- Use proper protective equipment, as required by local or national authorities when working in hazardous areas.
- Avoid working alone.
- Use only the replacement fuse specified or the protection may be impaired.
- Check the test leads for continuity before use. Do not use if the readings are high or noisy.
- Do not use the Auto Volts function to measure voltages in circuits that could be damaged by this function's low input impedance ($\approx 3 \text{ k}\Omega$)(117 only).

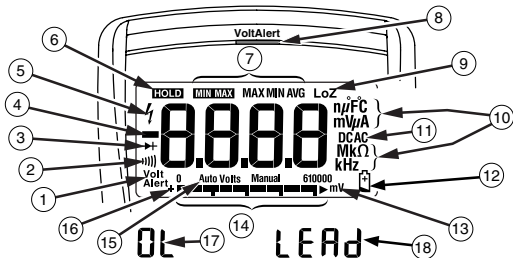
Symbols

	AC (Alternating Current)		Fuse
	DC (Direct Current)		Double Insulated
	Hazardous voltage		Important Information; Refer to manual
	Battery (Low battery when shown on the display.)		Earth ground
	Do not dispose of this product as unsorted municipal waste. Contact Fluke or a qualified recycler for disposal.		AC and DC

115C and 117C

Users Manual

Display






edy02f.eps

No.	Symbol	Meaning	Model
①	Volt Alert	The Meter is in the VoltAlert™ non-contact voltage detect mode.	117C
②	⎓	The Meter function is set to Continuity.	115C & 117C
③	→	The Meter function is set to Diode Test	115C & 117C
④	-	Input is a negative value.	115C & 117C
⑤	⚡	⚠ Unsafe voltage. Measured input voltage ≥ 30 V, or voltage overload condition (OL).	115C & 117C

True-rms Multimeters

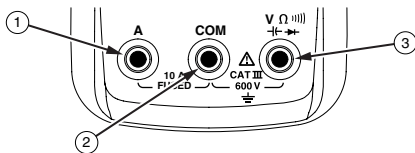
Display

⑥	HOLD	Display hold enabled. Display freezes present reading.	115C & 117C
⑦	MIN MAX MAX MIN AVG	MIN MAX AVG mode enabled. Maximum, minimum, average or present reading displayed	115C & 117C
⑧	(Red LED)	Voltage presence through the non-contact VoltAlert sensor	117C
⑨	LoZ	The Meter is measuring voltage or capacitance with a low input impedance.	115C & 117C
⑩	nμF mVμA MkΩ kHz	Measurement units.	115C & 117C
⑪	DC AC	Direct current or alternating current	115C & 117C
⑫		Battery low warning.	115C & 117C
⑬	610000 mV	Indicates the Meter's range selection.	115C & 117C
⑭	(Bar graph)	Analog display.	115C & 117C
⑮	Auto Volts Auto Manual	The Meter is in the Auto Volts function. Auto ranging. The Meter selects the range for best resolution. Manual ranging. User sets the Meter's range.	117C 115C & 117C 115C & 117C
⑯	+	Bar graph polarity	115C & 117C
⑰	OL	 The input is too large for the selected range.	115C & 117C
⑱	LEAD	 Test lead alert. Briefly displayed whenever the Meter's function switch is rotated to or from any A position.	115C & 117C

115C and 117C

Users Manual

Terminals



edy01f.eps

No.	Description	Model
①	Input terminal for measuring ac and dc current to 10 A.	115C & 117C
②	Common (return) terminal for all measurements.	115C & 117C
③	Input terminal for measuring voltage, continuity, resistance, capacitance, frequency and testing diodes.	115C & 117C

Error Messages

bAtt	Battery must be replaced before the Meter will operate.
Cal Err	Calibration required. Meter calibration is required before the Meter will operate.
EEP_r Err	Internal error. The Meter must be repaired before it will operate.
F I D Err	Internal error. The Meter must be repaired before it will operate.

True-rms Multimeters

Rotary Switch Positions


Rotary Switch Positions

Switch Position	Measurement Function	Model
AUTO-V LoZ	Automatically selects ac or dc volts based on the sensed input with a low impedance input.	117C
\tilde{V} Hz (button)	AC voltage from 0.06 mV to 600 V. Frequency from 5 Hz to 50 kHz.	115C & 117C 115C & 117C
$\overline{\overline{V}}$	DC voltage from .001 V to 600 V.	115C & 117C
$\overline{\overline{mV}}$	AC voltage from 6.0 to 600 mV, dc-coupled. DC voltage from 0.1 to 600 mV.	115C & 117C
Ω	Ohms from 0.1 Ω to 40 M Ω .	115C & 117C
$\text{ })$	Continuity beeper turns on at <20 Ω and turns off at >250 Ω .	115C & 117C
$\rightarrow $	Diode Test. Displays OL above 2.0 V.	115C & 117C
$\leftarrow $	Farads from 1 nF to 9999 μ F.	115C & 117C
\tilde{A} Hz (button)	AC current from 0.1 to 10 A (>10 to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed. DC-coupled. Frequency from 45 Hz to 5 kHz.	115C & 117C
$\overline{\overline{A}}$	DC current from 0.001 A to 10 A (>10 to 20 A, 30 seconds on, 10 minutes off). >10.00 A display flashes. >20 A, OL is displayed.	115C & 117C
Volt Alert	Non-contact sensing of ac voltage.	117C
Note: All ac functions and Auto-V LoZ are true-rms. AC voltage is ac-coupled. Auto-V LoZ, AC mV and AC amps are dc coupled.		

115C and 117C






Users Manual

Battery Saver ("Sleep Mode")

The Meter automatically enters "Sleep mode" and blanks the display if there is no function change, range change, or button press for 20 minutes. Pressing any button or turning the rotary switch awakens the Meter. To disable the Sleep mode, hold down the  button while turning the Meter on. The Sleep mode is always disabled in the MIN MAX AVG mode.

MIN MAX AVG Recording Mode

The MIN MAX AVG recording mode captures the minimum and maximum input values (ignoring overloads), and calculates a running average of all readings. When a new high or low is detected, the Meter beeps.



- Put the Meter in the desired measurement function and range.
- Press  to enter MIN MAX AVG mode.
- **MIN MAX** and MAX are displayed and the highest reading detected since entering MIN MAX AVG is displayed.
- Press  to step through the low (MIN), average (AVG), and present readings.
- To pause MIN MAX AVG recording without erasing stored values, press . **HOLD** is displayed.
- To resume MIN MAX AVG recording, press  again.
- To exit and erase stored readings, press  for at least one second or turn the rotary switch.

Display HOLD



To avoid electric shock, when Display HOLD is activated, be aware that the display will not change when you apply a different voltage.

In the Display HOLD mode, the Meter freezes the display.

1. Press  to activate Display HOLD. (**HOLD** is displayed.)
2. To exit and return to normal operation, press  or turn the rotary switch.

Backlight

Press  to toggle the backlight on and off. The backlight automatically turns off after 40 seconds. To disable backlight auto-off, hold down  while turning the Meter on.

Manual and Autoranging

The Meter has both Manual and Autorange modes.

- In the Autorange mode, the Meter selects the range with the best resolution.
- In the Manual Range mode, you override Autorange and select the range yourself.

True-rms Multimeters

Power-Up Options

When you turn the Meter on, it defaults to Autorange and **Auto** is displayed.

1. To enter the Manual Range mode, press **RANGE** . **Manual** is displayed.
2. In the Manual Range mode, press **RANGE** to increment the range. After the highest range, the Meter wraps to the lowest range.

Note






You cannot manually change the range in the MIN MAX AVG or Display HOLD modes.

*If you press **RANGE** while in MIN MAX AVG or Display Hold, the Meter beeps twice, indicating an invalid operation, and the range does not change.*

3. To exit Manual Range, press **RANGE** for at least 1 second or turn the rotary switch. The Meter returns to Autorange and **Auto** is displayed.

Power-Up Options

To select a Power-Up Option, hold down the button indicated in the following table while turning the Meter on. Power-Up Options are canceled when you turn the Meter off and when sleep mode is activated.

Button	Power-Up Options
	Turns on all display segments.
	Disables beeper. bEEP is displayed when enabled.
	Enables low impedance capacitance measurements. LCAP is displayed when enabled. See page 14.
	Disables automatic power-down ("Sleep mode"). PaFF is displayed when enabled.
	Disables auto backlight off. LoFF is displayed when enabled.

Making Basic Measurements

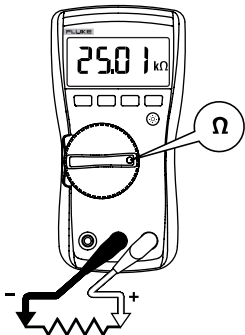
The figures on the following pages show how to make basic measurements.

When connecting the test leads to the circuit or device, connect the common (**COM**) test lead before connecting the live lead; when removing the test leads, remove the live lead before removing the common test lead.

115C and 117C

Users Manual

Measuring Resistance

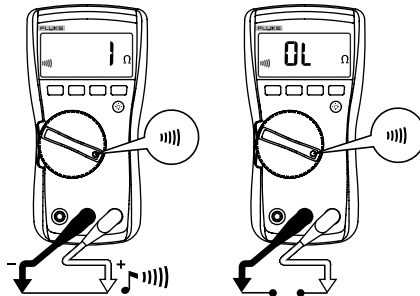


⚠ ⚠ Warning

To avoid electric shock, injury, or damage to the Meter, disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.

edy04f.eps

Testing for Continuity



edy06f.eps

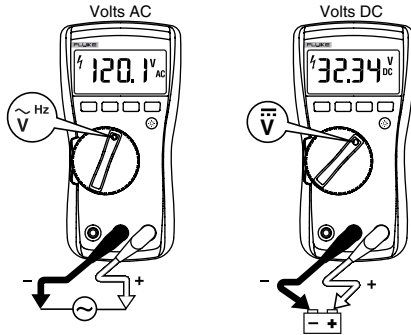
Note

The continuity function works best as a fast, convenient method to check for opens and shorts. For maximum accuracy in making resistance measurements, use the Meter's resistance (Ω) function.

True-rms Multimeters

Making Basic Measurements

Measuring AC and DC Voltage



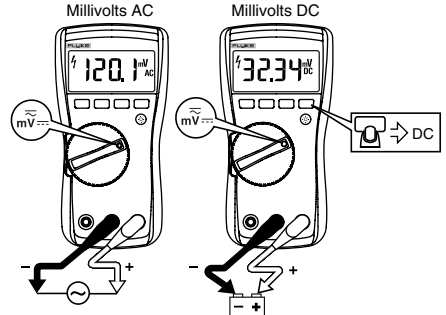
edy03f.eps

Using Auto Volts Selection (117C only)

With the function switch in the $\overline{\text{AUTO-V}}$ position, the Meter automatically selects a dc or ac voltage measurement based on the input applied between the **V** and **COM** jacks.

This function also sets the Meter's input impedance to approximately 3 k Ω to reduce the possibility of false readings due to ghost voltages.

Measuring AC and DC Millivolts



edy18f.eps

With the function switch in the $\overline{\text{mV}}$ position, the Meter measures ac plus dc millivolts. Press to switch the Meter to dc millivolts.

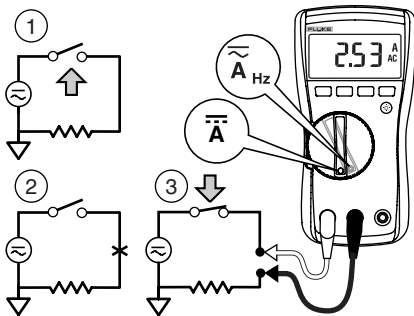
Measuring AC or DC Current

⚠ ⚠ Warning

115C and 117C Users Manual

To avoid personal injury or damage to the Meter:

- Never attempt to make an in-circuit current measurement when the open-circuit potential to earth is > 600 V.
- Check the Meter's fuse before testing. (See "Testing the Fuse")
- Use the proper terminals, switch position, and range for your measurement.
- Never place the probes in parallel with a circuit or component when the leads are plugged into the A (Amps) terminals.



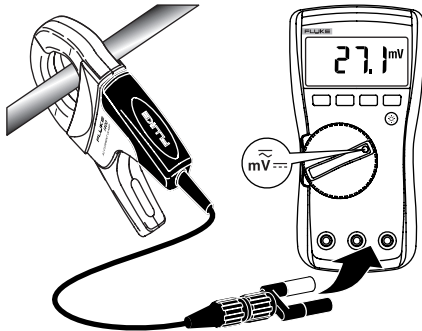
edy08f.eps

Turn circuit power off, break the circuit, insert the Meter in series with the circuit and then turn circuit power on.

True-rms Multimeters Making Basic Measurements

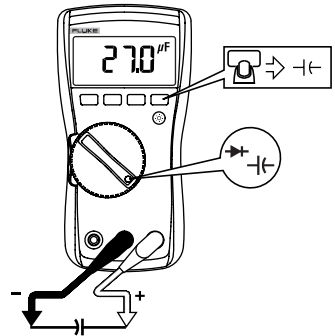
Measuring Current above 10 Amps

The millivolt and voltage function of the Meter can be used with an optional mV/A output Current Probe to measure currents that exceed the rating of the Meter. Make sure the Meter has the correct function selected, AC or DC, for your current probe. Refer to a Fluke catalog or contact your local Fluke representative for compatible current clamps.



edy14f.eps

Measuring Capacitance



edy05f.eps

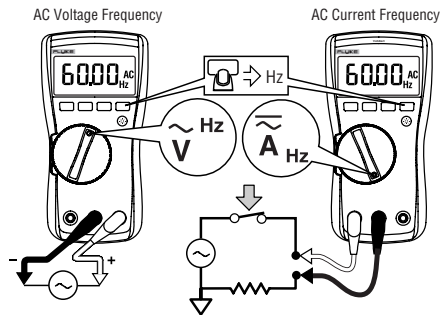
115C and 117C

Users Manual

Measuring Frequency

⚠⚠ Warning

To avoid electrical shock, disregard the bar graph for frequencies >1 kHz. If the frequency of the measured signal is >1 kHz, the bar graph and Hz are unspecified.



edy09f.eps

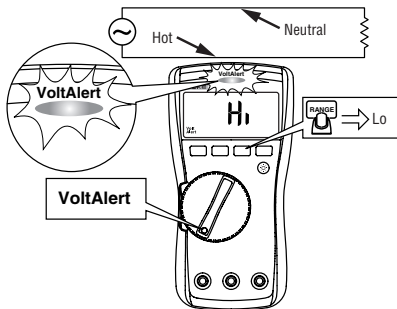
The Meter measures the frequency of a signal by counting the number of times the signal crosses a trigger level each second. The trigger level is 0 V, 0 A for all ranges.

Press to turn the frequency measurement function on and off. Frequency works with ac functions only.

In frequency, the bar graph and range annunciator indicate the ac voltage or current present.

Select progressively lower ranges using manual ranging for a stable reading.

Detecting AC Voltage Presence (117C only)



edy13f.eps

True-rms Multimeters Making Basic Measurements

To detect the presence of ac voltage, place the top of the Meter close to a conductor. The Meter gives an audible as well as visual indication when voltage is detected. There are two sensitivity settings. The "Lo" setting can be used on flush mounted wall sockets, power strips, flush mounted industrial outlets and various power cords. The "H" setting allows for ac voltage detection on other styles of recessed power connectors or sockets where the actual ac voltage is recessed within the connector itself. The VoltAlert detector works in bare wire applications with voltages as low as 24 V in the "H" setting.

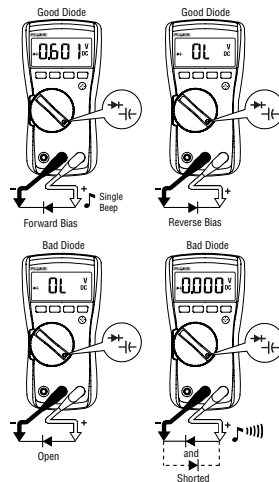
⚠️ WARNING

If there is no indication, voltage could still be present. Do not rely on the VoltAlert detector with shielded wire. Operation may be effected by differences in socket design, insulation thickness and type.

Making Low Impedance Capacitance Measurements

For making capacitance measurements on cables with ghost voltage, hold **RANGE** while turning on the Meter to switch the Meter into LoZ, (low input impedance) Capacitance mode. In this mode, capacitance measurements will have a lower accuracy and lower dynamic range. This setting is not saved when the Meter is turned off or goes into sleep mode.

Testing Diodes



115C and 117C

Users Manual

Using the Bargraph

The bar graph is like the needle on an analog meter. It has an overload indicator (▶) to the right and a polarity indicator (⊕) to the left.

Because the bar graph is much faster than the digital display, the bar graph is useful for making peak and null adjustments.

The bar graph is disabled when measuring capacitance. In frequency, the bar graph and range annunciator indicates the underlying voltage or current up to 1 kHz.

The number of segments indicates the measured value and is relative to the full-scale value of the selected range.

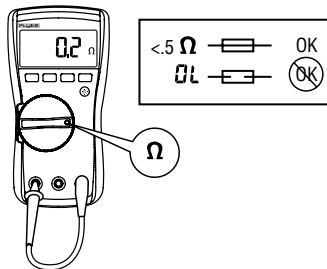
In the 60 V range, for example (see below), the major divisions on the scale represent 0, 15, 30, 45, and 60 V. An input of -30 V turns on the negative sign and the segments up to the middle of the scale.



aej11f.eps

Testing the Fuse

Test fuse as shown below.



edy10f.eps

Maintenance

Maintenance of the Meter consists of battery and fuse replacement, as well as case cleaning.

Replacing the Battery and Fuse

⚠ ⚠ Warning

To avoid shock, injury, or damage to the Meter:

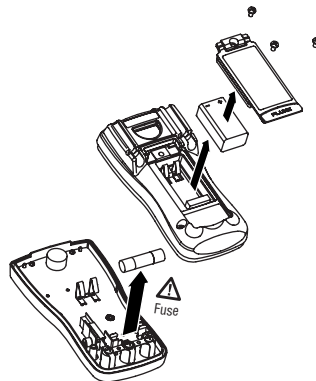
- Remove test leads from the Meter before opening the case or battery door.
- Use **ONLY** a fuse with the amperage, interrupt voltage, and speed ratings specified.

To remove the battery door for battery replacement:

1. Remove the test leads from the Meter.
2. Remove the battery door screw.
3. Use the finger recess to lift the door slightly.
4. Lift the door straight up to separate it from the case.

The battery fits inside the battery door, which is then inserted into the case, bottom edge first, until it is fully seated. Do not attempt to install the battery directly into the case.

5. Install and tighten battery door screw.



115C and 117C

Users Manual

To open the case for fuse replacement:

1. Remove the test leads from the Meter
2. Remove the Meter from its holster.
3. Remove two screws from the case bottom.
4. Separate the case bottom from the case top.
5. Remove the fuse from its holder and replace it with an 11 A, 1000 V, FAST fuse having a minimum interrupt rating of 17,000 A. Use only Fluke PN 803293.
6. To re-assemble the Meter, first attach the case bottom to the case top, then install the two screws. Finally, insert the Meter into its holster.

Cleaning

Wipe the case with a damp cloth and mild detergent. **Do not use abrasives, isopropyl alcohol, or solvents to clean the case or lens/window.** Dirt or moisture in the terminals can affect readings.

True-rms Multimeters

General Specifications

General Specifications


Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, with relative humidity at 0 % to 90 %.

Extended specifications are available at www.Fluke.com.

Maximum voltage between any terminal and earth ground	600 V
Surge Protection	6 kV peak per IEC 61010-1 600V CAT III, Pollution Degree 2
⚠ Fuse for A input:	11 A, 1000 V 17 kA FAST Fuse (Fluke PN 803293)
Display	Digital: 6,000 counts, updates 4/sec Bar Graph: 33 segments, updates 32/sec
Temperature	Operating: -10 °C to + 50 °C Storage: -40 °C to + 60 °C
Temperature Coefficient	0.1 x (specified accuracy)/°C (<18 °C or >28 °C)
Operating Altitude	2,000 meters
Battery	9 Volt Alkaline, NEDA 1604A / IEC 6LR61
Battery Life	Alkaline: 400 hours typical, without backlight
Safety Compliances	Complies with ANSI/ISA 82.02.01 (61010-1) 2004, CAN/CSA-C22.2 No 61010-1-04, UL 6101B (2003) and IEC/EN 61010-1 2 nd Edition for measurement Category III, 600 V, Pollution Degree 2, EMC EN61326-1

115C and 117C

Users Manual

CertificationsUL, CE, CSA, TÜV,  (N10140), VDE

IP Rating (dust and water protection) IP42

Table 1. Accuracy Specifications

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])		Model
DC millivolts	600.0 mV	0.1 mV	0.5 % + 2		115C, 117C
DC Volts	6.000 V 60.00 V 600.0 V	0.001 V 0.01 V 0.1 V	0.5 % + 2		115C, 117C
			DC, 45 to 500 Hz	500 Hz to 1 kHz	
Auto-V LoZ ^[1] True-rms	600.0 V	0.1 V	2.0 % + 3	4.0 % + 3	117C
			45 to 500 Hz	500 Hz to 1 kHz	
AC millivolts ^[1] True-rms	600.0 mV	0.1 mV	1.0 % + 3	2.0 % + 3	115C, 117C
AC Volts ^[1] True-rms	6.000 V 60.00 V 600.0 V	0.001 V 0.01 V 0.1 V	1.0 % + 3	2.0 % + 3	115C, 117C

True-rms Multimeters
General Specifications

Table 1 Accuracy Specifications (cont.)

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])	Model
Continuity	600 Ω	1 Ω	Beeper on < 20 Ω, off > 250 Ω; detects opens or shorts of 500 μs or longer.	115C, 117C
Ohms	600.0 Ω 6.000 kΩ 60.00 kΩ 600.0 kΩ 6.000 MΩ 40.00 MΩ	0.1 Ω 0.001 kΩ 0.01 kΩ 0.1 kΩ 0.001 MΩ 0.01 MΩ	0.9 % + 2 0.9 % + 1 0.9 % + 1 0.9 % + 1 0.9 % + 1 5 % + 2	115C, 117C
Diode test	2.000 V	0.001 V	0.9 % + 2	115C, 117C
Capacitance	1000 nF 10.00 μF 100.0 μF 9999 μF	1 nF 0.01 μF 0.1 μF 1 μF	1.9 % + 2 1.9 % + 2 1.9 % + 2 100 μF - 1000 μF: 1.9 % + 2 > 1000 μF: 5 % + 20	115C, 117C
Lo-Z Capacitance (Power-up option)	1 nF to 500 μF		10% + 2 typical	115C, 117C

115C and 117C

Users Manual

Table 1 Accuracy Specifications (cont.)

Function	Range	Resolution	Accuracy ± ([% of Reading] + [Counts])	Model
AC Amps True-rms ^[1] (45 Hz to 500 Hz)	6.000 A 10.00 A ^[3] 20 A for 30 seconds max., 10 minutes rest min.	0.001 A 0.01 A	1.5 % + 3	115, 117
DC Amps	6.000 A 10.00 A ^[3] 20 A for 30 seconds max., 10 minutes rest min.	0.001 A 0.01 A	1.0 % + 3	115, 117
Hz (V or A input) ^[2]	99.99 Hz 999.9 Hz 9.999 kHz 50.00 kHz	0.01 Hz 0.1 Hz 0.001 kHz 0.01 kHz	0.1 % + 2	115, 117

Notes:

- [1] All ac ranges except Auto-V LoZ are specified from 1 % to 100 % of range. Auto-V LoZ is specified from 0.0 V. Because inputs below 1 % of range are not specified, it is normal for this and other true-rms meters to display non-zero readings when the test leads are disconnected from a circuit or are shorted together. For volts, crest factor of ≤ 3 at 4000 counts, decreasing linearly to 1.5 at full scale. For amps, crest factor of ≤ 3 . AC volts is ac-coupled. Auto-V LoZ, AC mV, and AC amps are dc-coupled.
- [2] AC Volts Hz is ac-coupled and specified from 5 Hz to 50 kHz. AC Amps Hz is dc-coupled and specified from 45 Hz to 5 kHz.
- [3] >10 A unspecified.

True-rms Multimeters
General Specifications

Table 2. Input Characteristics

Function	Input Impedance (Nominal)	Common Mode Rejection Ratio (1 kΩ Unbalanced)		Normal Mode Rejection
Volts AC	>5 M Ω <100 pF	>60 dB at dc, 50 or 60 Hz		
Volts DC	>10 M Ω <100 pF	>100 dB at dc, 50 or 60 Hz		>60 dB at 50 or 60 Hz
Auto-V LoZ	~3 k Ω <500 pF	>60 dB at dc, 50 or 60 Hz		
	Open Circuit Test Voltage	Full Scale Voltage		Short Circuit Current
Ohms	<2.7 V dc	To 6.0 MΩ	40 MΩ	<350 μ A
		<0.7 V dc	<0.9 V dc	
Diode Test	<2.7 V dc	2.000 V dc		<1.2 mA