

Operating Instruction for True RMS Autoranging Digital Multimeter




Please read this manual before switching the unit on.
Important safety information inside.

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1. Safety

1-1. International Safety Symbols

 This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.

 This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present.

1-2. Safety Notes

- Do not exceed the maximum allowable input range of any function.
- Do not apply voltage to meter when resistance function is selected.
- Set the function switch OFF when the meter is not in use.

WARNINGS

- Set function switch to the appropriate position before measuring.
- When measuring volts do not switch to current/resistance modes.
- Do not measure current on a circuit whose voltage exceeds 240V.
- When changing ranges using the selector switch always disconnect the test leads from the circuit under test.
- Do not exceed the maximum rated input limits.

CAUTIONS

- Improper use of this meter can cause damage, shock, injury or death.
- Read and understand this user manual before operating the meter.
- Always remove the test leads before replacing the battery.
- Inspect the condition of the test leads and the meter itself for any damage before operating the meter, repair or replace any damage parts before use.
- Use carefully when making measurements if the voltages are greater than 25VAC rms or 35VDC, these voltages are considered a shock hazard.
- Remove the battery if the meter is to be stored for long periods.
- Always discharge capacitors and remove power from the device under test before performing Diode, Resistance or Continuity tests.
- Voltage checks on electrical outlets can be difficult and misleading because of the uncertainty of connection to the recessed electrical contacts, other means should be used to ensure that the terminals are not "live".

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1-3.Input Limits

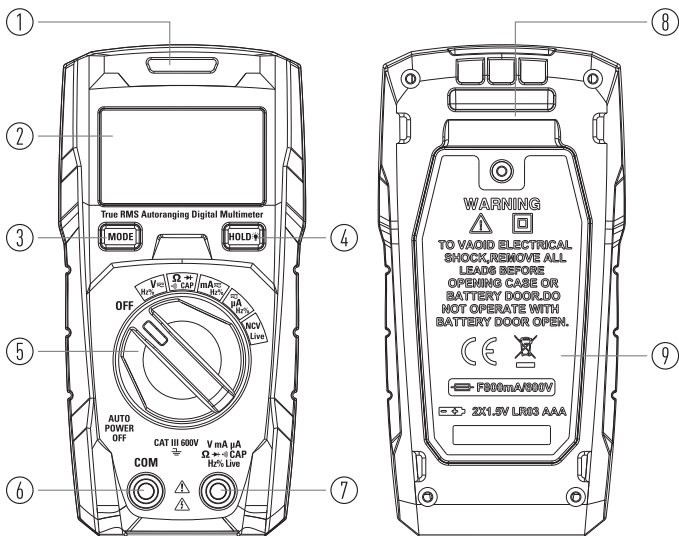
Function	Maximum Input
mA AC/DC	800mA 600V fast acting fuse
V DC, V AC	600V DC/600V AC
Frequency, Duty Cycle, Resistance, Diode, Continuity, CAP	250V DC/AC

- When the measured voltage exceeds the range, the buzzer will continue to sound as a warning of exceeding the range.

2. Description

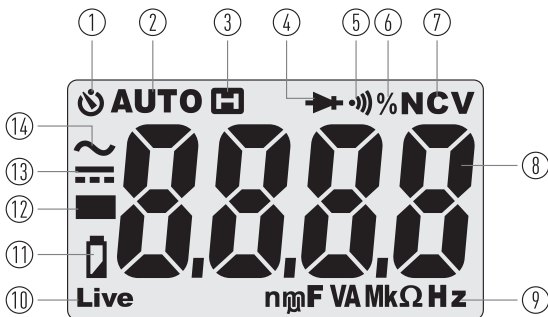
2-1. Meter Description

- | | |
|---------------------------------|-----------------------|
| 1-Non-Contact Voltage Indicator | 6-COM Input Jack |
| 2-LCD Display | 7-Positive Input Jack |
| 3-MODE Button | 8-Lanyard Hole |
| 4-Data Hold/Backlight Button | 9-Battery Cover |
| 5-Rotary Function Switch | |



2-2. Symbols on the Display

- | | |
|------------------------------------|--|
| 1-Auto Power Off | 8-Measurement Reading |
| 2-Auto Ranging | 9-Units of Measure List |
| 3-Display Hold | 10-Firewire Identification Measurement |
| 4-Diode Test | 11-Low Battery |
| 5-Continuity | 12-Minus Sign |
| 6-Percent (Duty Cycle) | 13-Direct Current |
| 7-Non-Contact AC Voltage Detection | 14-Alternating Current |

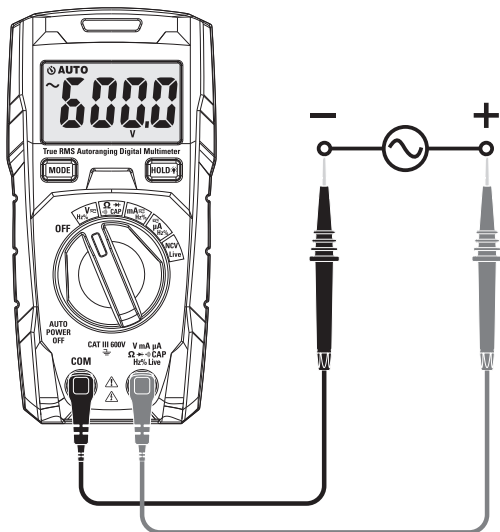


3.Operation

Notices: Read and understand all warning and precaution statements listed in the safety section of this operation manual prior to using this meter. Set the function select switch to the **OFF** Position when the meter is not in use.

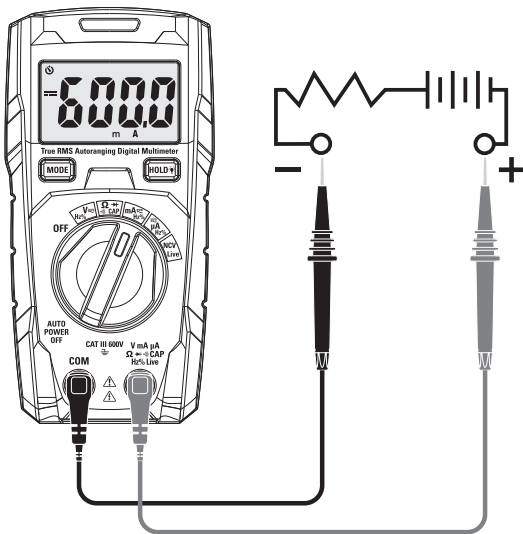
3-1.AC/DC Voltage (Frequency/Duty Cycle) Measurement

- 1.Set the function switch to the **VAC/DC/Hz/%** Position.
- 2.Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
- 3.Use the **MODE** Button to select AC or DC Voltage.
- 4.Position the black test probe tip and red test probe tip respectively in the spots of the circuit to be measured.
- 5.Read the voltage in the display.
- 6.In the **VAC** mode, press and hold the **MODE** Button for >1 second to indicate "**Hz**",read the frequency in the display.
- 7.Press the **MODE** Button again to indicate "**%**", read the % of duty cycle in the display.



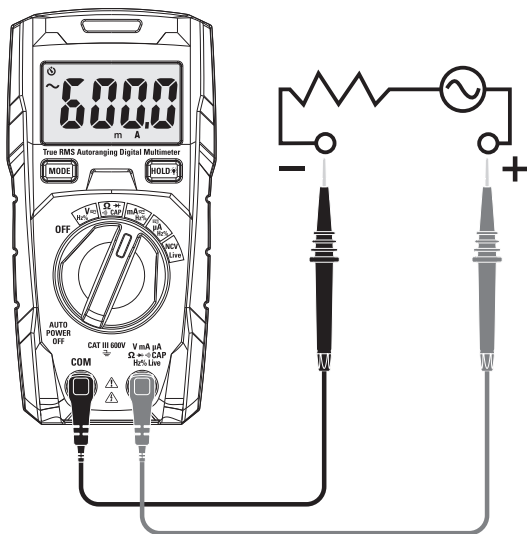
3-2.DC Current Measurement

- 1.Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
- 2.For current measurements up to **6000 μ A DC**, set the function switch to the **μ A AC/DC/Hz/%** Position.
- 3.For current measurements up to **600mA DC**, set the function switch to the **mA AC/DC/Hz/%** Position.
- 4.Press the **MODE** Button to indicate “**DC**” on the display.
- 5.Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 6.Touch the black test probe tip to the negative side of the circuit; Touch the red test probe tip to the positive side of the circuit.
- 7.Apply power to the circuit.
- 8.Read the current in the display.



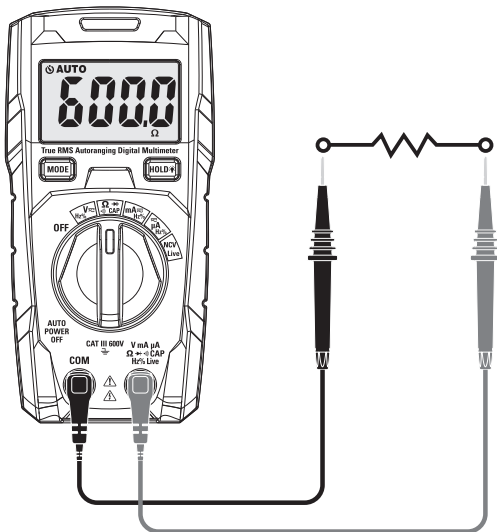
3-3.AC Current (Frequency/Duty Cycle) Measurement

- 1.Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
- 2.For current measurements up to **6000 μ A AC**, set the function switch to the **μ A AC/DC/Hz/%** Position.
- 3.For current measurements up to **600mA AC**, set the function switch to the **mA AC/DC/Hz/%** Position.
- 4.Press the **MODE** Button to indicate “**AC**” on the display.
- 5.Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 6.Touch the black test probe tip to the negative side of the circuit; Touch the red test probe tip to the positive side of the circuit.
- 7.Apply power to the circuit.
- 8.Read the current in the display.
- 9.Press and hold the **MODE** Button for >1 second to indicate “**Hz**”, read the frequency in the display.
- 10.Press the **MODE** Button again to indicate “**%**”, read the % of duty cycle in the display.



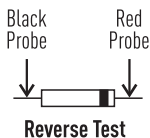
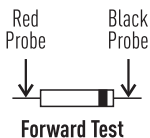
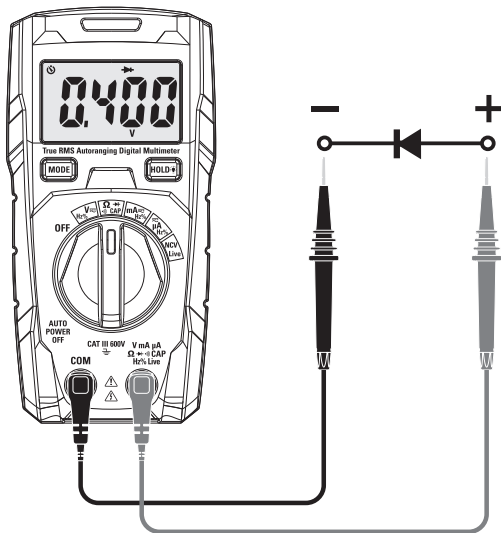
3-4. Resistance Measurement

1. Set the function switch to the Ω \rightarrow CAP Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
3. Press the **MODE** Button to indicate “ Ω ” on the Display.
4. Touch the test probe tips across the circuit or component under test, it is best to disconnect one side of the device under test so the rest of the circuit will not interfere with the resistance reading.
5. For Resistance tests, read the resistance on the LCD display.





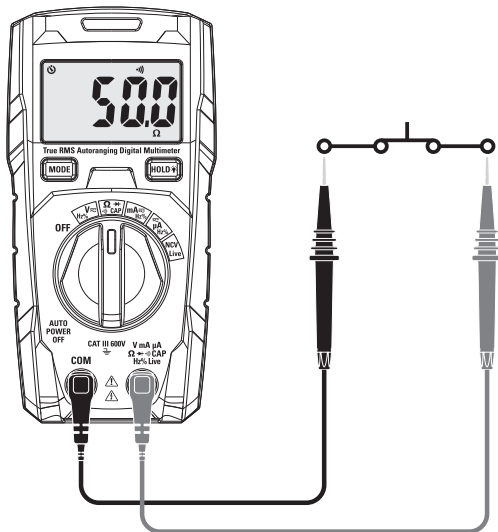
3-5. Diode Measurement

1. Set the function switch to the Ω \rightarrow CAP Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
3. Press the **MODE** Button until " \rightarrow " and "V" appears in the display.
4. Touch the test probes to the diode under test, forward voltage will indicate 0.4V to 0.7V; Reverse voltage will indicate "OL"; Shorted devices will indicate near 0mV and an open device will indicate "OL" in both polarities.



3-6. Continuity Check

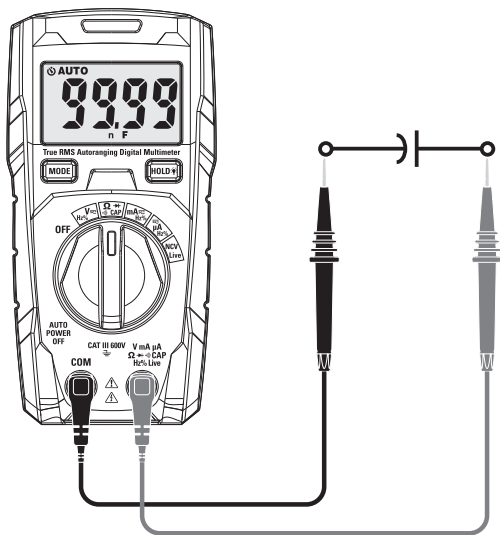
1. Set the function switch to the Ω  \rightarrow CAP Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
3. Press the **MODE** Button until “” and “ Ω ” appears in the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately 50Ω , the audible signal will sound; If the circuit is open, the display will indicate “OL”.



3-7.Capacitance Measurement

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

- 1.Set the function switch to the Ω \rightarrow CAP Position.
- 2.Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jacks.
- 3.Press the **MODE** Button to indicate “nF” on the display.
- 4.Touch the test leads to the capacitor to be tested.
- 5.The test may take up to 3 minutes or more for large capacitors to charge, wait until the readings settle before ending the test.
- 6.Read the capacitance value in the display.



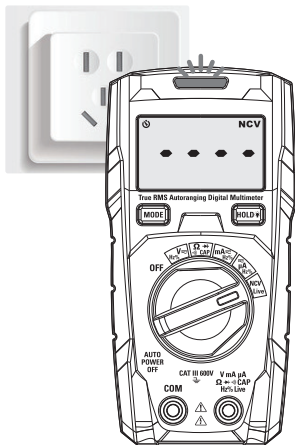
3-8. Non-Contact AC Voltage Measurement

WARNING: Risk of Electrocution. Before use, always test the Voltage Detector on a known live circuit to verify proper operation test the Voltage Detector on a known live circuit to verify proper operation.

1. Set the function switch to the **NCV/Live** Position.
2. Press the **MODE** Button to indicate “**NCV**” on the display.
3. Hold the detector close to the AC voltage being tested.
4. If no signal is detected, the LCD will show “EF”, NCV indicator light doesn't flashes and the buzzer is no sound; According to the detected signal strength, LCD displays different horizontal lines; When the signal is strongest, LCD displays four horizontal lines, when the signal is weakest, only one horizontal line, meanwhile NCV indicator light flashes, buzzer make different sound. The meter flashes three different colors of light depending on the strength of the ac signal it detects: bright green when the LCD displays one horizontal line, bright yellow when the LCD displays two horizontal lines, and bright red when the LCD displays three or four horizontal lines.

Note: The conductors in electrical cord sets are often twisted, for best results, rub the probe tip along a length of the cord to assure placing the tip in close proximity to the live conductor.

Note: The detector is designed with high sensitivity, static electricity or other sources of energy may randomly trip the sensor, this is normal operation.



3-9.Live Measurement

WARNING: Firewire test is to facilitate the use of the firewire with the distinction function, through this function can quickly locate the firewire, However safety should be paid attention to in terms of electricity consumption, if necessary please test the voltage with ac voltage file to confirm the voltage.

- 1.Set the function switch to the **NCV/Live** Position.
- 2.Press the **MODE** Button to indicate “**Live**” on the display.
- 3.Insert the red test lead into the **Positive** Input Jacks.
- 4.By inserting the red test probe tip into the electrical outlet hole alone, the red test probe tip touches the line under test, if the main display displays a large “**LIVE**” and a red light with LED flashing and buzzer sound, it is a Live wire.



4.Function

4-1.MODE Button

To select Ω /Diode/Continuity/CAP or DC/AC or Hz/% or NCV/Live.

4-2.HOLD Mode

- The hold function freezes the reading in the display.
- Press the **HOLD/Backlight** Button momentarily to activate or to exit the HOLD function.

Note: The HOLD feature will activate when the Backlight is turned on, press the **HOLD/Backlight** Button again to exit Hold.

4-3.Display Backlight

- Press and hold the **HOLD/Backlight** Button for >1 second to turn on or off the display backlight function.
- The backlight will automatically turn off after approx 5 minutes.

4-4.Auto Power Off

- The auto off feature will turn the meter off after approx 15 minutes.
- To disable the auto power off feature, hold down the **MODE** Button and turn the meter on.

5. Battery Replacement

1. Remove the one rear Phillips head screw.
2. Open the battery compartment.
3. Replace the requires two 1.5V "AAA" Batteries.
4. Re-assemble the meter.

6. Care and Maintenance

- Keep the meter dry, if it gets wet, wipe it off.
- Keep the meter clean. Wipe the case occasionally, do not use chemicals, cleaning solvents, or detergents.
- Handle the meter gently and carefully, dropping it can damage the electronic parts or the case.
- Use and store the meter in normal temperatures, temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
- Use only fresh batteries of the recommended size and type, remove old or weak batteries so they do not leak and damage the unit.
- If the meter is to be stored for a long period of time, the battery should be removed to prevent damage to the unit.

7. Specifications

7-1. Technical Specifications

Function	Range & Resolution	Accuracy
DC Voltage	600.0mV	$\pm(0.5\% + 10 \text{ digits})$
	6.000V	
	60.00V	
	600.0V	

AC Voltage	6.000V	$\pm(1.0\% + 4 \text{ digits})$
	60.00V	
	600.0V	

All AC voltage ranges are specified from 5% of range to 100% of range.

AC voltage bandwidth: 50Hz to 1kHz (Sine); 50Hz to 60Hz (All wave).

DC Current	600.0 μ A	$\pm(1.0\% + 3 \text{ digits})$
	6000 μ A	
	60.00mA	
	600.0mA	

AC Current	600.0 μ A	$\pm(1.5\% + 3 \text{ digits})$
	6000 μ A	
	60.00mA	
	600.0mA	

All AC Current ranges are specified from 5% of range to 100% of range.

AC Current 50Hz to 1kHz (Sine); 50Hz to 60Hz (All wave).

Resistance	600.0 Ω	$\pm(1.0\% + 3 \text{ digits})$
	6.000k Ω	
	60.00k Ω	$\pm(0.8\% + 2 \text{ digits})$
	600.0k Ω	
	6.000M Ω	$\pm(2.0\% + 3 \text{ digits})$
	60.00M Ω	

Function	Range & Resolution	Accuracy
Capacitance	99.99nF	$\pm(5.0\% + 20 \text{ digits})$
	999.9nF	
	9.999 μ F	$\pm(4\% + 5 \text{ digits})$
	99.99 μ F	
	999.9 μ F	
	9.999mF	$\pm(10\% \text{ reading})$
	99.99mF	

Frequency (Electrical)	10Hz to 100kHz	$\pm(1.2\% + 5 \text{ digits})$
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Sensitivity: ACV Range (>6% Range); 6000 μ A/600.0mA Range (>6% Range);
600.0 μ A/60.00mA Range (>60% Range).

Duty Cycle	0.5% to 99.9%	$\pm(1.2\% + 2 \text{ digits})$
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Pulse width: 0.1ms to 100ms; Frequency: 5Hz to 10kHz.


Sensitivity: ACV Range (>6% Range); 6000 μ A/600.0mA Range (>6% Range);
600.0 μ A/60.00mA Range (>60% Range).

Note: Accuracy specifications consist of two elements:

- (% reading)-This is the accuracy of the measurement circuit.
- (+ digits)-This is the accuracy of the analog to digital converter.

Note: Accuracy is given at 18 to 28°C (65 to 83°F), less than 70 % RH.

7-2. General Specifications

Insulation	Class 2
Display	6000 counts Backlight LCD
Polarity	Automatic (No indication for positive polarity) Minus symbol “-” is displayed for negative polarity
Overrange Indication	“OL” is displayed
Diode Test	Test current of 0.63mA typical; Open circuit voltage 3.2V DC typical.
Continuity Check	Threshold $<50\ \Omega$; Test current $< 1\text{mA}$
Low Battery Indication	“  ” is displayed
Measurements Rate	3 per second, nominal
Auto Power Off	After approx. 15 minutes
Input Impedance	$10\text{M}\ \Omega$ (VDC and VAC)
AC Response	True RMS
AC Voltage Bandwidth	50Hz to 1kHz (VAC)
Power Source (Battery)	Two 1.5V “AAA” Batteries
Operating Temperature	0 to 50°C (32 to 122°F)
Storage Temperature	-10 to 60°C (14 to 140°F)
Relative Humidity	$<70\%$ Operating; $<80\%$ Storage
Operating Altitude	2000 meters (7000ft.) maximum.
Over Voltage	Category III 600V
Safety	For indoor use and in accordance with Overvoltage Category II, Pollution Degree 2. Category II includes local level, appliance, portable equipment, etc., with transient overvoltages less than Overvoltage Category III. Probe assemblies to be used for mains measurements shall be rated as appropriate for measurement Category III according to IEC 61010-31 and shall have a voltage rating of at least the voltage of the circuit to be measured. Measurement category III (CAT III) is applicable to test and measuring circuits connected to the distribution part of the building’s low-voltage mains installation.

