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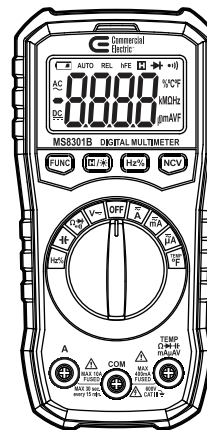
Retain this manual for future use.



Item # 1001 418 348  
Model # MS8301B

## USE AND CARE GUIDE

### DIGITAL MULTIMETER



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#### ***THANK YOU***

*We appreciate the trust and confidence you have placed in Commercial Electric through the purchase of this digital multimeter. We strive to continually create quality products designed to enhance your home. Visit us online to see our full line of products available for your home improvement needs. Thank you for choosing Commercial Electric!*

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## Safety Information

Please read this manual carefully and pay attention to related safe working standards before using this meter. Protection provided by the instrument will be impaired if used in a manner not specified by the manufacturer.

Symbol	Definition
	Indicates important safety information
	Alternating current (AC).
	Direct current (DC).
	The fuse must be replaced with the rating specified in this manual.
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION.
	Conforms to UL STD. 61010-1, 61010-2-030 and 61010-031.
	PROTECTIVE CONDUCTOR TERMINAL.
<b>CAT III</b>	(MEASUREMENT CATEGORY III) is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.

## Safety Information (continued)

### PRECAUTIONS

	<b>WARNING:</b> Measure known voltage with the meter to verify that the meter is working properly. If the meter is working abnormally, stop using it immediately. A protective device may be damaged. If there is any doubt, have the meter inspected by a qualified technician.		<b>WARNING:</b> Do not operate the meter with the case (or part of the case) removed or damaged.
	<b>WARNING:</b> Do not use the meter or test leads if they look damaged. Check to see if the test wire has insulation damage or bare metal. Check test wire continuity. If the wire is damaged, replace it with a new one before using the meter.		<b>WARNING:</b> When opening the case or part of the case, turn the meter off.
	<b>WARNING:</b> When testing voltage that exceeds 30V AC voltage RMS, 42V AC peak, or 60V DC, be particularly careful to avoid electric shock.		<b>WARNING:</b> When the battery low voltage indicator illuminates, replace the battery immediately. A low battery will cause meter reading errors and may result in electric shock or personal injury.
	<b>WARNING:</b> When measuring, use the correct jack, and select the proper function and measuring range.		<b>WARNING:</b> Do not operate the meter around explosive gas, vapor, or dust.
	<b>WARNING:</b> When making 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.		<b>CAUTION:</b> When the range of the value to be measured is unknown, check that the range initially set on the meter is the highest possible setting or, wherever possible, choose the auto-ranging mode.
	<b>WARNING:</b> For all DC functions, including manual or auto-ranging, avoid the risk of shock due to a possible inaccurate reading by verifying the presence of any AC voltages. Firstly, use the AC function and then select a DC voltage range equal to or greater than the AC range.		<b>CAUTION:</b> When repairing televisions or carrying out measurements on power-switching circuits, remember that high-amplitude voltage pulses at the test points can damage the meter. Use of a TV filter will attenuate any such pulses.

## Safety Information (continued)

**WARNING:** Disconnect power to the circuits and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.

**WARNING:** Before measuring current, check the meter's fuse and turn off power to the circuit before connecting the meter to the circuit.

**WARNING:** Do not measure voltages exceeding the rated voltage marked on the meter.

**CAUTION:** When maintaining the meter, use replacement parts specified by the manufacturer.

**CAUTION:** To avoid damage to the meter, do not exceed the maximum limits of the input values shown in the specification tables.

**CAUTION:** Before changing functions, disconnect the test leads from the circuit under test.

**NOTE:** Keep your fingers behind the protection guards while measuring.

## Warranty

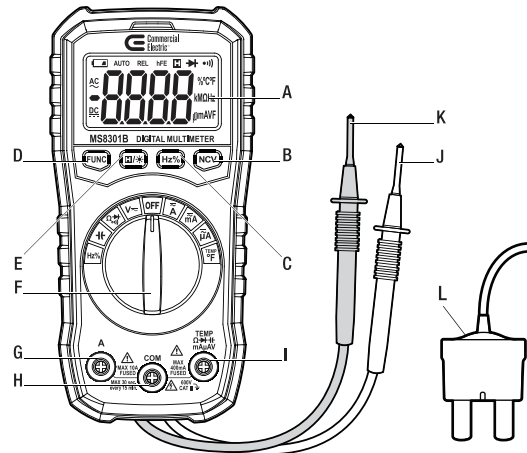
**WARRANTY:** 12 months

For one year from the date of purchase, this product is warranted against any defects in material or workmanship. This warranty is void if this product is ever used while providing commercial services or if rented to another person.

Contact the Customer Service Team at 1-877-527-0313 or visit [www.homedepot.com](http://www.homedepot.com).

## Pre-Operation

### PRODUCT DESCRIPTION



Part	Name	Description
A	LCD display	Displays the measured readings.
B	NCV button	Press and hold this button down in any mode to activate the non-contact voltage detection. For more information, see the Operation section, Step 2.
C	Frequency/duty ratio button	In AC voltage/current modes, press this button to show the frequency measurement. Press again to switch to duty cycle. Press this button a third time to return to normal display. In Hz duty cycle mode press this button to show the duty cycle. Press again to switch to the frequency measurement.

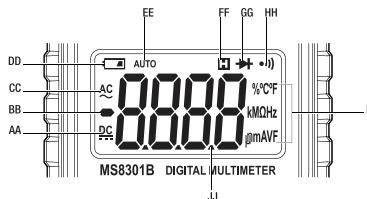
## Pre-Operation (continued)

D	Function (FUNC) selection button	Press this button to switch between functions or between AC/DC current and voltage.
E	Data hold/backlight button	Press to hold the current reading on the display. Press again to release the hold. Press for 2 seconds to turn on the backlight. Press for 2 seconds again to manually turn off the backlight.
F	Rotary switch	Rotate to select a measurement mode.
G	10A jack	Connect to the red test lead.
H	COM jack	Connect to the black test lead.
I	Positive input jack	Connect to the red test lead to measure voltage, resistance, capacitance, temperature, frequency/duty ratio, mA/ $\mu$ A current, diode and continuity.
J	Red test lead	Connect to positive input jack or 10A Positive input jack.
K	Black test lead	Connect to COM jack
L	K-type thermocouple	Connect to COM jack and positive input jack for temperature measurement.

## AUTOMATIC POWER OFF FUNCTION

If the meter remains idle for 30 minutes, the meter automatically enters a sleep state. Press the FUNC button to power on and cancel the automatic sleep mode.

## LCD DISPLAY DEFINITIONS




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## Pre-Operation (continued)

LCD Term	Description
AA	Direct current/voltage indicator
BB	Numerical value polarity indicator (negative sign)
CC	Alternating current/voltage indicator
DD	Battery low voltage indicator
EE	Automatic measuring range indicator
FF	Data hold indicator
GG	Diode measurement function indicator
HH	Continuity measurement indicator
II	Measurement unit
JJ	Measurement display value

## PRODUCT SPECIFICATIONS

Component	Description
Environmental conditions	600V CAT III
Pollution degree	2
Maximum voltage between terminals and earth (ground)	600V AC RMS or 600V DC
Altitude	Up to 2000 meters
Battery	2 x AAA 1.5V batteries
Low battery indication	When the battery voltage is lower than the normal operating voltage, "  " will display on the LCD display.
Fuse protection	F1:FF 10A H 600V F2:FF 400mA H 600V
Accuracy	Accuracy is specified for a period of one year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity up to 80%. Accuracy specifications take the form of: $\pm$ (% of reading + number of least significant digits).
Display	4000 counts

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## Pre-Operation (continued)

Component	Description
Over range indication	LCD displays "OL"
Polarity indication	"-" displayed for negative polarity
Operating environment	0°C - 40°C (32°F - 104°F), <80% relative humidity
Storage temperature	-10°C - 60°C (14°F - 140°F), <70% relative humidity, battery removed
Size	150 x 74 x 48 mm
Weight	Approximately 230g (battery included)

## DC VOLTAGE SPECIFICATIONS

Measuring Range	Resolution	Accuracy
400mV	0.1mV	± (0.5% of rdg + 3 digits)
4V	0.001V	
40V	0.01V	
400V	0.1V	
600V	1V	± (0.8% of rdg + 3 digits)

### Additional Specifications:

- Input Impedance: 10MΩ
- Maximum Input Voltage: 600V DC or AC RMS

## AC VOLTAGE SPECIFICATIONS

Measuring Range	Resolution	Accuracy
4V	0.001V	± (0.8% of rdg + 5 digits)
40V	0.01V	
400V	0.1V	
600V	1V	± (1.0% of rdg + 5 digits)

## Pre-Operation (continued)

### Additional Specifications:

- Input Impedance: 10MΩ
- Maximum Input Voltage: 600V DC or AC RMS
- Frequency Range: 40 - 400Hz, sine wave RMS (average response)

## DC CURRENT SPECIFICATIONS

Measuring Range	Resolution	Accuracy
400μA	0.1μA	± (1.0% of rdg + 5 digits)
4000μA	1μA	
40mA	0.01mA	
400mA	0.1mA	
10A	0.01A	± (2.0% of rdg + 10 digits)

### Additional Specifications:

- Overload Protection: grade mA: FF 400mA H 600V protection; grade 10A: FF 10A H 600V protection
- Maximum Input Current: grade mA: 400mA DC, grade 10A: 10A DC
- For measurements greater than 2A, the continuous measurement time cannot be more than 2 minutes. Disconnect the current and wait 10 minutes before making another measurement.

## AC CURRENT SPECIFICATIONS

Measuring Range	Resolution	Accuracy
400μA	0.1μA	± (1.2% of rdg + 5 digits)
4000μA	1μA	
40mA	0.01mA	
400mA	0.1mA	
10A	0.01A	± (2.5% of rdg + 10 digits)

## Pre-Operation (continued)

### Additional Specifications:

- Overload Protection: grade mA: FF 400mA H 600V protection; grade 10A: FF 10A H 600V protection
- Maximum Input Current: grade mA: 400mA AC RMS; grade 10A: 10A AC RMS
- Frequency Range: 40 - 400Hz, sine wave RMS (average response)
- For measurements greater than 2A, the continuous measurement time cannot be more than 2 minutes. Disconnect the current and wait 10 minutes before making another measurement.

### RESISTANCE SPECIFICATIONS

Measuring Range	Resolution	Accuracy
400Ω	0.1Ω	± (0.8% of rdg + 5 digits)
4kΩ	0.001kΩ	
40kΩ	0.01kΩ	
400kΩ	0.1kΩ	
4MΩ	0.001MkΩ	
40MΩ	0.01MΩ	

### Additional Specifications:

- Overload Protection: 250V DC or 250 V AC RMS

### CAPACITANCE SPECIFICATIONS


Measuring Range	Resolution	Accuracy
50nF	0.01nF	± (3.0% of rdg + 5 digits)
500nF	0.1nF	
5μF	0.001μF	
50μF	0.01μF	
100μF	0.1μF	

## Pre-Operation (continued)

### Additional Specifications:

- Overload Protection: 250V DC or 250 V AC RMS


### DIODE SPECIFICATIONS

Measuring Range	Resolution	Accuracy
 1.5V	0.001V	Display forward voltage drop of diode

### Additional Specifications:

- Overload Protection: 250V DC or 250V AC RMS

### AUDIBLE CONTINUITY SPECIFICATIONS

Measuring Range	Function
	When the built-in buzzer sounds, the resistance to be tested is less than 50Ω. The open circuit voltage is approximately 0.4V.

### Additional Specifications:

- Overload Protection: 250V DC or 250V AC RMS

### FREQUENCY SPECIFICATIONS – THROUGH GRADE HZ/DUTY

Measuring Range	Resolution	Accuracy
5.000Hz	0.001Hz	± (1.0% of rdg + 5 digits)
50.00Hz	0.01Hz	
500.0Hz	0.1Hz	
5.000KHz	0.001KHz	
50.00KHz	0.01KHz	
100.0KHz	0.1KHz	

## Pre-Operation (continued)

### Additional Specifications:

- Overload Protection: 250V AC RMS
- Input Voltage Range:  $\geq 2V$  AC RMS (input voltage increases when the frequency to be measured increases)

### FREQUENCY SPECIFICATIONS – THROUGH GRADE V OR A

Measuring Range	Resolution	Accuracy
50.00Hz	0.01Hz	$\pm (1.5\% \text{ of rdg} + 5 \text{ digits})$
500.00Hz	0.1Hz	

### Additional Specifications:

- Measuring scope: 40Hz - 400Hz
- Input Voltage Range:  $\geq 600mV$  AC RMS (input voltage increases when the frequency to be measured increases)
- Input Impedance: 10M $\Omega$
- Maximum Input Voltage: 600V AC RMS

### DUTY RATIO SPECIFICATIONS

Measuring Range	Resolution	Accuracy
0.1% - 99.9%	0.1%	$\pm 3.0\%$

### Through Grade HZ/DUTY:

- Frequency Response: 1 - 100.0KHz
- Input Voltage Range:  $\geq 2V$  AC RMS (input voltage increases when the frequency to be measured increases)
- Maximum Input Voltage: 250V AC RMS

## Pre-Operation (continued)

### Through Grade V or A:

- Frequency Response: 40 - 400Hz
- Input Voltage Range:  $\geq 600mV$  AC
- Input Impedance: 10M $\Omega$
- Maximum Input Voltage: 600V AC RMS

### TEMPERATURE SPECIFICATIONS

Measuring Range	Resolution	Accuracy
-4~1832°F	1°F	$\pm (3.0\% \text{ of rdg} + 3 \text{ digits})$

### Additional Specifications:

- Overload Protection: 250V DC or 250V AC RMS

## Operation

### BEFORE YOU TAKE A MEASUREMENT



**CAUTION:** If the current under measurement is higher than the selected value for a long period, overheating may take place, compromising the safety and operation of the inner circuits.



**IMPORTANT:** Warm up the meter for at least 30 seconds.



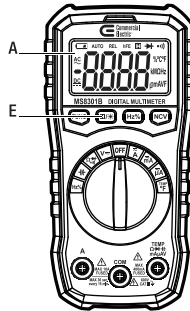
**CAUTION:** Do not measure currents on high-voltage conductors (>600V) in order to avoid the risk of discharge and/or incorrect readings.

## Operation (continued)

### 1 Using Data Hold Mode

Data Hold mode causes the meter to stop updating the LCD display. To enter and exit Data Hold mode:

- Press the Hold key (E). This fixes the LCD display (A) on the current value and an H is displayed.
- Press the Hold key (E) again to return the meter to normal mode.



### 2 Non-contact AC Voltage Detection

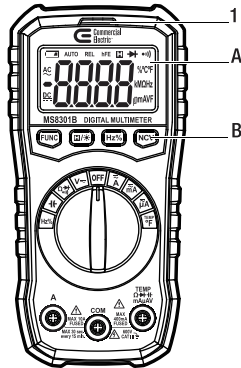
Hold down the NCV button (B) and move the top of the meter towards the conductor under test. When the live voltage is greater than 110V (RMS), the NCV indicator (1) flashes and the buzzer sounds.



**NOTE:** Even without LED indication, voltage may still exist. Do not rely on non-contact voltage detection to determine the presence of voltage wire. Detection operation may be subject to socket design, insulation thickness, and other factors.



**NOTE:** Keep the meter away from electrical noise sources during the tests, such as fluorescent lights, dimmable lights, motors, and so forth. These sources can trigger the non-contact AC voltage detection function and invalidate the test.



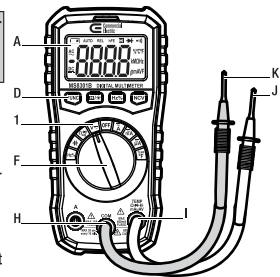
## Operation (continued)

### 3 Completing an AC or DC Voltage Measurement



**CAUTION:** To avoid electrical shock and/or damage to the meter, do not attempt to take any voltage measurement that might exceed 600V DC or AC rms.

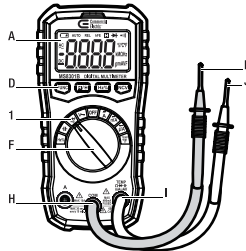
- Set the switch (F) to the proper AC or DC voltage range (1).
- Press the FUNC key (D) to select AC or DC voltage range.
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Connect the test leads (J and K) to the circuit being measured.
- Read the value on the LCD display (A). The polarity of the red test lead (J) connection will be indicated when making a DCV measurement.



## Operation (continued)

### 4 Completing a Resistance Measurement

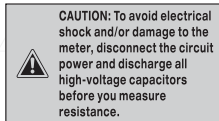
- Set the switch (F) to the proper resistance range (1) and turn on power to the circuit to be tested.
- If needed, press the FUNC button (D) to select the resistance measurement function.
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Connect the test leads (J and K) to the circuit being measured and read the value on the LCD display (A). If it is overload, "OL" appears on the LCD display.



#### Some tips for measuring resistance:

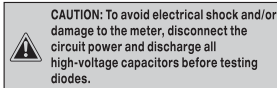
- The measured value of a resistor in a circuit is often different from the resistor's rated value. This is because the meter's test current flows through all possible paths between the test lead tips.
- In order to ensure the best accuracy for a low resistance measurement, short the test leads before measurement and remember the test probe resistance. This is necessary in order to subtract for the resistance of the test leads.

- When there is no input (for example, an open circuit), the display shows "OL". This means that the measured value is out of range.

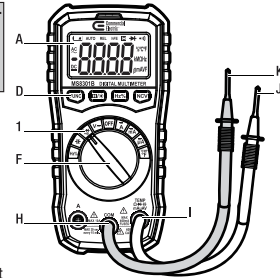


## Operation (continued)

### 5 Performing a Diode Test



- Set the switch (F) to the diode range (1) (indicated by an arrow symbol on the rotary dial). If needed, press the FUNC button (D) to select the diode measurement function.
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Place the red test lead (J) on the component's anode and place the black test lead (K) on the component's cathode. The meter will show the approximate forward voltage of the diode.
- The LCD display (A) shows the diode's forward bias voltage value. If the test probe polarity is reversed, the meter displays "OL" which distinguishes the diode's cathode and anode.



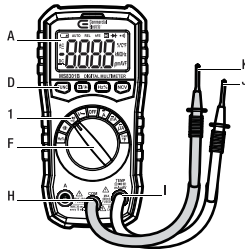
## Operation (continued)

### 6 Performing a Continuity Check



**CAUTION:** To avoid electrical shock and/or damage to the meter, disconnect the circuit power and discharge all high-voltage capacitors before testing for continuity.

- Set the switch (F) to the continuity range (1) (represented by a sound wave symbol). If needed, press the FUNC button (D) to select the continuity measurement function.
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Connect the test leads (J and K) to the circuit being measured.
- When the test lead to the circuit is below 50 Ohms, a continuous beeping sound occurs.



### 7 Performing a Current Measurement



**WARNING:** To avoid damage to the meter or injury if the fuse blows, do not make current measurements of the voltage exceeds 600V.

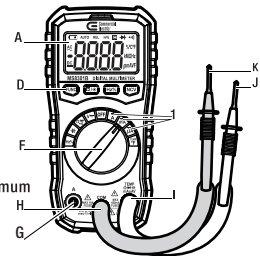


**CAUTION:** To avoid damage to the meter, check the meter's fuse before proceeding. Use the proper terminals, function, and range for your measurement. Never place the test leads in parallel with a circuit or component when the leads are plugged into the current terminals.

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## Operation (continued)

- Turn off the power of the measured circuit. Discharge all the high-voltage capacitors.
- Set the switch (F) to the proper current range (1).
- Press the FUNC button (D) to select AC or DC current.
- Connect the black test lead (K) to the COM terminal (H) and the red test lead (J) to the positive input jack (I) for a maximum of 200mA. For a maximum of 10A, move the red test lead (J) to the 10A jack (G).
- Turn off the circuit to be tested. The black test probe is connected to one end of disconnected circuit (low voltage relatively), and the red test probe is connected to the other end of the disconnected circuit (high voltage relatively). (When measuring direct current, connecting the test probe reversely makes the reading become negative, but does not damage the meter.).
- Connect the power to the circuit and read the display reading on the LCD display (A). If it is overload, "OL" appears on the LCD display.
- Turn off the power of the measured circuit and discharge all the high-voltage capacitors.
- Remove the test leads (J and K) and recover the measured circuit.



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## Operation (continued)

### 8 Performing a Capacitance Measurement

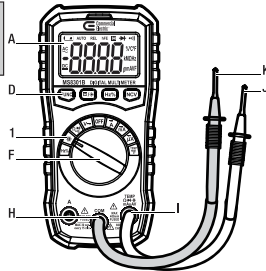


**CAUTION:** To avoid electrical shock and/or damage to the meter, disconnect the circuit power and discharge all high-voltage capacitors before measuring capacitance.

- Set the switch (F) to the capacitance range (1).
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Measure the capacitance of the circuit to be tested using the test leads.
- Read the capacitance measuring value on the LCD display (A). If it is overload, "OL" appears on the LCD display.

Some tips when measuring capacitance:

- When measuring bulk capacitors, readings stabilize after a few seconds.
- To improve the accuracy below 20nF, subtract the distributed capacitance of the meter and cable.



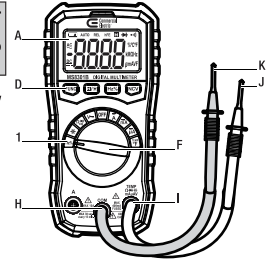
## Operation (continued)

### 9 Performing a Frequency/Duty Ratio Measurement



**CAUTION:** To prevent electric shock or meter damage, do not input the voltage higher than 60V DC or 30V AC in the frequency/duty ratio measurement position.

- Set the switch (F) to the frequency/duty ratio measurement position (1). If needed, press the FUNC button (D) to select the frequency/duty ratio measurement function.
- Connect the black (K) and red (J) test leads to the COM (H) and positive input (I) jacks respectively.
- Measure the circuit using the test leads and read the measured result from the LCD display (A).

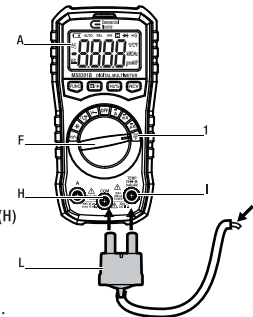


### 10 Performing a Temperature Measurement



**CAUTION:** To prevent electric shock or meter damage, do not input the voltage higher than 30V in the temperature measurement position.

- Set the switch (F) to the temperature measurement range (1).
- Connect the negative and positive end of a K-type thermocouple (L) to the COM (H) and positive input (I) jacks respectively.
- Place the K-type thermocouple (L) to the object or environment to be measured and read the result on the LCD display (A).



## Maintenance



**WARNING:** Before you open the meter, always disconnect it from all sources of electrical current and make sure you are not charged with static electricity, which may destroy the internal components.



**WARNING:** When you open the meter, remember that some internal capacitors can retain a dangerous voltage level even after the instrument is switched off.



**WARNING:** To avoid injury or damage to the meter, do not wet the inner parts of the meter. Before opening the case or battery cover, remove the connecting cable between the test probe and input signal.



**CAUTION:** If the meter is not going to be used for a long time, take out the battery and do not store the meter in a high temperature or high humidity environment.



**WARNING:** Any adjustment, maintenance, or repair work carried out on the meter while it is live should be carried out by a qualified electrician.

## REPLACING THE BATTERY AND FUSE



**WARNING:** To prevent electrical hazard or shock, turn off the meter and disconnect the test leads and any input signals before removing the battery cover.



**CAUTION:** Only use the specified batteries and fuses for replacement. See the Product Specifications section of this manual for more information.

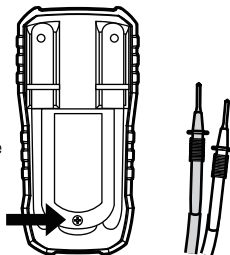


**WARNING:** Change the battery when the battery symbol appears on the LCD in order to avoid incorrect data, which could lead to electric shock or personal injury.



**WARNING:** Do not mix old and new batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable (ni-cad, ni-mh, etc) batteries.

- Turn the meter off by turning the switch to the OFF position.
- Disconnect the test leads and any connectors from the terminals on the meter.
- Use a screwdriver to unscrew and remove the battery cover located on the back of the meter. If you are replacing the fuse, unscrew all of the screws on the four corners of back of the meter.



## Maintenance (continued)

- Remove the used batteries or damaged fuse.
- Replace with two AAA 1.5V batteries or F1:FF 10A H 600V; F2:FF 400 mA H 600V
- Reattach the battery cover or whole back and secure with the screws.

## TEST LEAD REPLACEMENT

If the insulation on the leads is damaged, replace the test leads. Replacement test leads must meet the manufacturer's specifications (EN 61010-031 standard, 600V CAT III 10A, or better).

## Care and Cleaning

- 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.