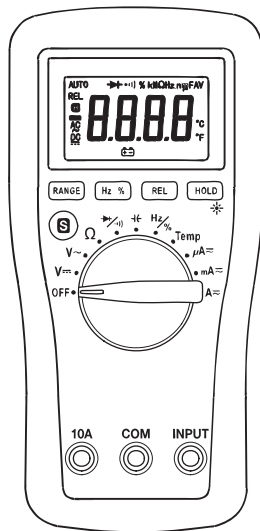


INSTRUCTION MANUAL



DM-45 Digital Multimeter

Read and understand all of the instructions and safety information in this manual before operating or servicing this tool.





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Description

The Greenlee DM-45 Digital Multimeter is a hand-held testing device with the following measurement capabilities: AC and DC voltage, AC and DC current, temperature (K-type thermocouples only), frequency, duty cycle, resistance, and capacitance. This meter also checks diodes and verifies continuity.

Other specialized capabilities and functions include:

- Backlighted LCD for reading in dim conditions.
- Relative zero mode.
- Data hold mode.
- Automatic power off.

Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

Purpose of This Manual

This instruction manual is intended to familiarize all personnel with the safe operation and maintenance procedures for the Greenlee DM-45 Digital Multimeter.



Do not discard this product or throw away!

All specifications are nominal and may change as design improvements occur. Greenlee Textron Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

© Registered: The color green for electrical test instruments is a registered trademark of Greenlee Textron Inc.

KEEP THIS MANUAL



Important Safety Information



SAFETY ALERT SYMBOL

This symbol is used to call your attention to hazards or unsafe practices which could result in an injury or property damage. The signal word, defined below, indicates the severity of the hazard. The message after the signal word provides information for preventing or avoiding the hazard.

DANGER

Immediate hazards which, if not avoided, **WILL** result in severe injury or death.

WARNING

Hazards which, if not avoided, **COULD** result in severe injury or death.

CAUTION

Hazards or unsafe practices which, if not avoided, **MAY** result in injury or property damage.



WARNING

Read and understand this material before operating or servicing this equipment. Failure to understand how to safely operate this tool could result in an accident causing serious injury or death.



WARNING

Electric shock hazard:
Contact with live circuits could result in severe injury or death.



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Important Safety Information

WARNING

Electric shock and fire hazard:

- Do not expose this unit to rain or moisture.
- Do not use the unit if it is wet or damaged.
- Use test leads or accessories that are appropriate for the application. Refer to the category and voltage rating of the test lead or accessory.
- Inspect the test leads or accessory before use. They must be clean and dry, and the insulation must be in good condition. Destroy test leads and replace immediately if the contrasting inner layer of insulation is visible.
- Use this unit for the manufacturer's intended purpose only, as described in this manual. Any other use can impair the protection provided by the unit.

Failure to observe these warnings could result in severe injury or death.

WARNING

Electric shock hazard:

- The test leads supplied with this product comply with IEC 61010-031:2008, UL 61010-031:2010 and CAN/CSA-C22.2 NO. 61010-031A-07–Amendment 1:2010. These safety standards limit the exposed length of the probe tip to 4 mm for measurement categories III and IV. These test leads include a cap that must be in place when used in measurement category III or IV applications.
- Do not apply more than the rated voltage between any two input terminals, or between any input terminal and earth ground.
- Do not contact the test lead tips or any uninsulated portion of the accessory.

Failure to observe these warnings could result in severe injury or death.

WARNING

Electric shock hazard:

- Do not operate with the case open.
- Before opening the case, remove the test leads from the circuit and shut off the unit.

Failure to observe these warnings could result in severe injury or death.



Important Safety Information

WARNING

Electric shock hazard:

The fuses are an integral part of the overvoltage protection. When fuse replacement is necessary, refer to "Specifications" for the correct type, size, and capacity. Using any other type of fuse will void the overvoltage protection rating of the unit.

Failure to observe this warning could result in severe injury or death.

WARNING

Electric shock hazard:

- Unless measuring voltage, current, or frequency, shut off and lock out power. Make sure that all capacitors are discharged. Voltage must not be present.
- Set the selector and connect the test leads so that they correspond to the intended measurement. Incorrect settings or connections can result in a blown fuse.
- Using this unit near equipment that generates electromagnetic interference can result in unstable or inaccurate readings.

Failure to observe these warnings could result in severe injury or death.

CAUTION

Electric shock hazard:

Do not change the measurement function while the test leads are connected to a component or circuit.

Failure to observe this precaution may result in injury and can damage the unit.

CAUTION

Electric shock hazard:

- Do not attempt to repair this unit. It contains no user-serviceable parts.
- Do not expose the unit to extremes in temperature or high humidity. Refer to "Specifications."

Failure to observe these precautions may result in injury and can damage the unit.



Identification

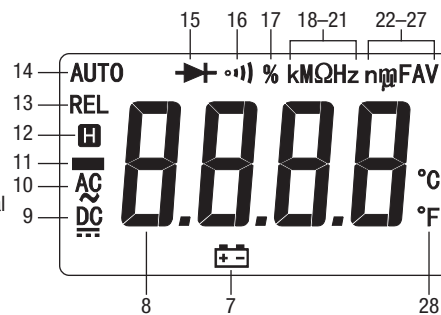
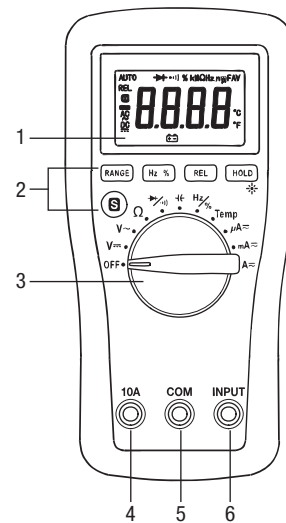
1. Display 4000-count LCD
2. Feature buttons Refer to explanations in the “Using the Features” section.
3. Selector Selects a function or turns power OFF.
4. **10A** Positive input terminal for high current measurements.
5. **COM** Negative, common, or ground input terminal for all measurements.
6. **INPUT** Positive input terminal for all measurements except high current.

Display Icons

7. Low battery
8. **8.8.8.8** Numeric display
9. **DC** DC measurement is selected.
10. **AC** AC measurement is selected.
11. **-** Polarity indicator
12. Hold function is enabled.
13. **REL** Relative zero function is enabled.
14. **AUTO** Automatic ranging is enabled.
15. Diode
16. Continuity
17. **%** Duty cycle function is enabled.
18. **k** Kilo (10^3)
19. **M** Mega (10^6)
20. **Ω** Ohm
21. **Hz** Hertz (frequency in cycles per second)
22. **n** Nano (10^{-9})
23. **m** Milli (10^{-3})
24. **μ** Micro (10^{-6})
25. **F** Farad
26. **A** Ampere
27. **V** Volt
28. **°C °F** Celsius or Fahrenheit indicator

Symbols on the Unit

9. Warning—Read the instruction manual
10. Risk of electric shock
11. Battery
12. Fuse
13. Double insulation



Using the Features

- **RANGE:** Press once to enter the manual ranging mode. "AUTO" will disappear from the display. Press repeatedly to step through the ranges. Press and hold to return to the automatic ranging mode.
- **Hz %:** Press momentarily to toggle between frequency and duty cycle functions. This button is active only when the selector is set to **Hz/%**.
- **REL:** Finds the difference between two measurements. While taking a measurement, press **REL** to set the display to zero. "REL" will appear on the display. Take the second measurement. The value on the display will be the difference between the two measurements. Press again to exit this mode.
- **HOLD:** Press momentarily to hold the present value on the display. Press again to exit this mode.
- *****: Press and hold until backlight illuminates. Press and hold again to turn off.
- **S:** Press momentarily to toggle between functions.
- **Automatic Power Off:** To extend battery life, the meter will shut itself off after approximately 15 minutes of inactivity. To restore power, press any button or turn the selector to **OFF** and then back on. To disable this feature, press any button while turning the meter on.

Using the Test Leads

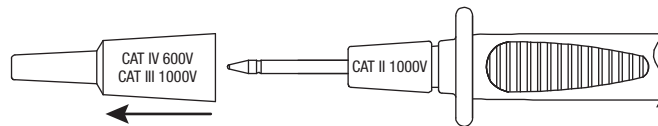
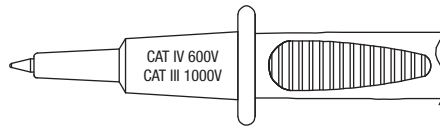
⚠ WARNING

Electric shock hazard:

The test leads supplied with this product comply with IEC 61010-031:2008, UL 61010-031:2010 and CAN/CSA-C22.2 NO. 61010-031A-07-Amendment 1:2010. These safety standards limit the exposed length of the probe tip to 4 mm for measurement categories III and IV. These test leads include a cap that must be in place when used in measurement category III or IV applications.

Failure to observe this warning could result in severe injury or death.

Cap must be in place for measurement category III or IV applications.



Cap can be removed for measurement category I or II applications.



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Operation



⚠ WARNING

Electric shock hazard:
Contact with live circuits could result in severe injury or death.

1. Refer to the Settings Table. Set the selector to the proper setting, press **S** (when instructed to do so), and connect the test leads to the meter.
2. Refer to "Typical Measurements" for specific measurement instructions.
3. Test the unit on a known functioning circuit or component.
 - If the unit does not function as expected on a known functioning circuit, replace the battery and/or fuses.
4. Take the reading from the circuit or component to be tested.

Operation (cont'd)

Settings Table

To measure this characteristic ...	Set the selector to this symbol ...	These icons will appear on the display ...	Connect the red lead to ...	Connect the black lead to ...
DC Voltage (600 V max)	V	DC and V	INPUT	COM
AC Voltage (600 V max)	V	AC and V	INPUT	COM
Resistance	Ω	MΩ	INPUT	COM
Continuity*	/ and press S	and Ω	INPUT	COM
Diode		and V		
Capacitance**		AUTO and nF	INPUT	COM
Frequency	Hz/% and press Hz %	AUTO and Hz	INPUT	COM
Duty Cycle		%		
Temperature	Temp	°C or °F (press S to change scale)	INPUT	COM
Current (4000 μ A max)†	μA	AUTO μA , or	INPUT	COM
Current (400 mA max)†	mA	AUTO mA , or	INPUT	COM
Current (10 A max)†	A	AUTO A , or	10A	COM

* Tone indicates continuity. The threshold is between 20 Ω and 150 Ω .

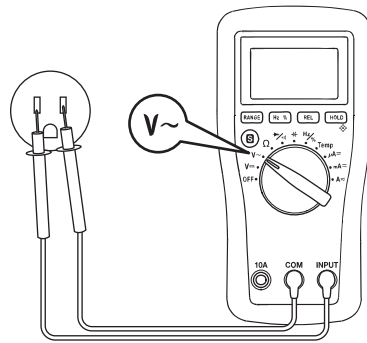
** Discharge capacitor before measurement. Discharge a large capacitor through an appropriate resistive load.

† Press **S** for AC or DC, as required.

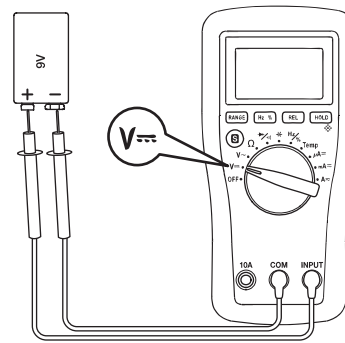


Typical Measurements

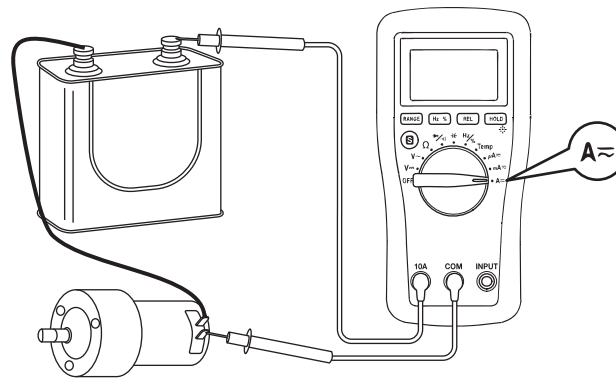
AC Voltage Measurement



DC Voltage Measurement

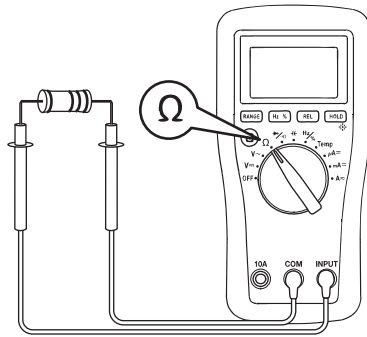


Current Measurement

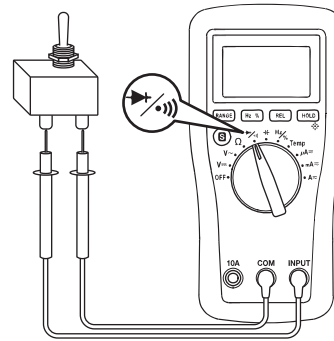


Typical Measurements

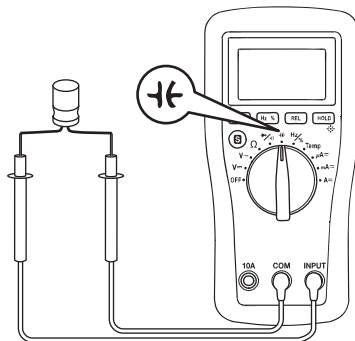
Resistance Measurement



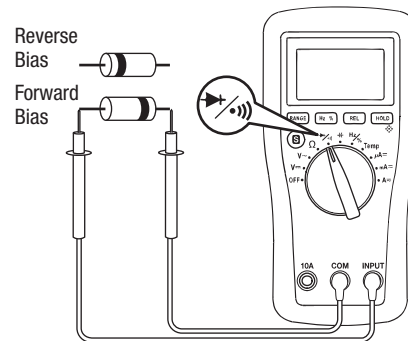
Continuity Check



Capacitance Measurement



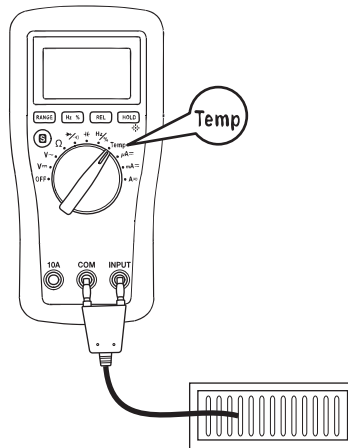
Diode Measurement





Typical Measurements

Temperature



Accuracy

Refer to the "Specifications" section for operating conditions and temperature coefficient.

Accuracy is specified as follows: $\pm$ (a percentage of the reading + a fixed amount) at $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ ($73.4\text{ }^{\circ}\text{F} \pm 9\text{ }^{\circ}\text{F}$), 0% to 75% relative humidity.

Accuracy is specified from 5% to 100% of the range unless noted otherwise.

AC Voltage

Range (40 Hz to 400 Hz)	Accuracy
4.000 V	$\pm (0.8\% + 0.005\text{ V})$
40.00 V	$\pm (1.2\% + 0.05\text{ V})$
400.0 V	$\pm (1.2\% + 0.5\text{ V})$
600 V*	$\pm (1.2\% + 5\text{ V})$

Input Impedance: $10\text{ M}\Omega$, $< 100\text{ pF}$

* 600 V range is specified from 20% to 100% of range.

DC Voltage

Range	Accuracy
400.0 mV	$\pm (0.8\% + 0.5\text{ mV})$
4.000 V	$\pm (0.8\% + 0.005\text{ V})$
40.00 V	$\pm (0.8\% + 0.05\text{ V})$
400.0 V	$\pm (0.8\% + 0.5\text{ V})$
600 V*	$\pm (1.0\% + 5\text{ V})$

Input Impedance:

400 mV Range: $> 100\text{ M}\Omega$

Other Ranges: $10\text{ M}\Omega$, $< 100\text{ pF}$

* 600 V range is specified from 20% to 100% of range.

Resistance

Range	Accuracy
400.0 Ω	$\pm (1.0\% + 0.5\text{ }\Omega)$
4.000 k Ω	$\pm (1.0\% + 0.005\text{ k}\Omega)$
40.00 k Ω	$\pm (1.0\% + 0.05\text{ k}\Omega)$
400.0 k Ω	$\pm (1.0\% + 0.5\text{ k}\Omega)$
4.000 M Ω	$\pm (1.5\% + 0.005\text{ M}\Omega)$
40.00 M Ω	$\pm (3.0\% + 0.10\text{ M}\Omega)$

Open Circuit Voltage: $< 0.7\text{ VDC}$

Diode Test

Measuring Range: 2.000 V

Test Current (typical): 0.8 mA

Open Circuit Voltage (typical): $< 3\text{ V}$

Continuity

Tone Threshold: Between 20 Ω and 150 Ω

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Accuracy (cont'd)

AC Current

Range (40 Hz to 400 Hz)	Accuracy	Burden Voltage (typical)
400.0 μ A	$\pm (1.8\% + 1.0 \mu\text{A})$	51 $\mu\text{V}/\mu\text{A}$
4000 μ A	$\pm (1.8\% + 10 \mu\text{A})$	
40.00 mA	$\pm (1.8\% + 0.10 \text{ mA})$	2.7 mV/mA
400.0 mA	$\pm (1.8\% + 1.0 \text{ mA})$	
4.000 A	$\pm (2.5\% + 0.010 \text{ A})$	0.04 V/A
10.00 A*	$\pm (2.5\% + 0.10 \text{ A})$	

* 2 A continuous, > 2 A to 10 A for 10 second max with 15 minutes cool down interval.
10.00 A range is specified from 20% to 100% of range.

DC Current

Range	Accuracy	Burden Voltage (typical)
400.0 μ A	$\pm (1.0\% + 0.7 \mu\text{A})$	51 $\mu\text{V}/\mu\text{A}$
4000 μ A	$\pm (1.0\% + 7 \mu\text{A})$	
40.00 mA	$\pm (1.0\% + 0.07 \text{ mA})$	2.7 mV/mA
400.0 mA	$\pm (1.0\% + 0.7 \text{ mA})$	
4.000 A	$\pm (1.5\% + 0.007 \text{ A})$	0.04 V/A
10.00 A*	$\pm (1.5\% + 0.07 \text{ A})$	

* 2 A continuous, > 2 A to 10 A for 10 second max with 15 minutes cool down interval.
10.00 A range is specified from 20% to 100% of range.

Frequency

Range	Accuracy
9.999 Hz	$\pm (1.0\% + 0.005 \text{ Hz})$
99.99 Hz	$\pm (1.0\% + 0.05 \text{ Hz})$
999.9 Hz	$\pm (1.0\% + 0.5 \text{ Hz})$
9.999 kHz	$\pm (1.0\% + 0.005 \text{ kHz})$
99.99 kHz	$\pm (1.0\% + 0.05 \text{ kHz})$
999.9 kHz	$\pm (1.0\% + 0.5 \text{ kHz})$
9.999 MHz	Unspecified

Input Voltage: 1 V rms ~ 20 V rms

Duty Cycle

Range: 5% ~ 95%

Accuracy: $\pm (2\% + 0.7)$

Input Voltage: 4 V ~ 10 V peak to peak

Frequency Range: 4 Hz ~ 1 kHz

Accuracy (cont'd)

Capacitance

Range	Accuracy
40.00 nF	$\pm (3.5\% + 0.20 \text{ nF})$
400.0 nF	$\pm (2.5\% + 0.5 \text{ nF})$
4.000 μF	$\pm (3.5\% + 0.005 \mu\text{F})$
40.00 μF	$\pm (4.0\% + 0.05 \mu\text{F})$
200.0 μF	$\pm (5.0\% + 0.5 \mu\text{F})$

Press **REL** before connecting test leads to capacitor.

This compensates for test lead capacitance.

Accuracies are for film capacitors (capacitors with negligible dielectric absorption); measurements of larger capacitors can take up to 10 seconds.

Temperature

	Range	Accuracy
°C	-20 °C ~ 0 °C	$\pm (6.0\% + 5 \text{ °C})$
	0 °C ~ 400 °C	$\pm (1.5\% + 4 \text{ °C})$
	400 °C ~ 1000 °C	$\pm (1.8\% + 5 \text{ °C})$
°F	-4 °F ~ 32 °F	$\pm (6.0\% + 9 \text{ °F})$
	32 °F ~ 752 °F	$\pm (1.5\% + 7.2 \text{ °F})$
	752 °F ~ 1832 °F	$\pm (1.8\% + 9 \text{ °F})$

K-type thermocouple range and accuracy not included.

Thermocouple supplied with meter is rated -50 °C to 204 °C (-58 °F to 400 °F).

Accuracy is $\pm 2.5 \text{ °C}$ (4.5 °F) or 0.75% of reading, whichever is greater.

Accuracy specification assumes ambient temperature is between 18 °C and 28 °C and is stable to $\pm 1 \text{ °C}$. For ambient temperature changes of $\pm 5 \text{ °C}$, rated accuracy applies after 1 hour.



Specifications

Display: 4000-count LCD

Polarity: Automatic

Numeric Display Sampling Rate: 3 per second

Temperature Coefficient: Nominal 0.2 x (specified accuracy) per °C
below 18 °C or above 28 °C

Automatic Power Off: After 15 minutes of inactivity.
To disable this feature, press any button while turning the meter on.

Operating Conditions:

Temperature: 0 °C to 40 °C (32 °F to 104 °F)

Relative Humidity (non-condensing): 75% maximum for temperatures up to 31 °C (88 °F),
decreasing linearly to 50% maximum at 40 °C (104 °F)

Altitude: 2000 m (6500') maximum

Indoor use only

Pollution Degree: 2

Storage Conditions:

Temperature: -10 °C to 50 °C (14 °F to 122 °F)

Relative Humidity (non-condensing): 0% to 85%

Remove battery.

Battery: One 9 V battery (6F22)

Overload Protections:

Input Terminal: 400 mA/600 V fast-acting fuse, minimum interrupting rating 20 kA,
13/32" x 1-1/2" or 13/32" x 1-3/8"

10A Terminal: 10 A/600 V fast-acting fuse, minimum interrupting rating 20 kA, 13/32" x 1-1/2"

Overvoltage Category: Category III 600 V

E.M.C: Meets EN61326-1:2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2,
EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11)

Measurement Categories

These definitions were derived from the international safety standard for insulation coordination as it applies to measurement, control, and laboratory equipment. These measurement categories are explained in more detail by the International Electrotechnical Commission; refer to either of their publications: IEC 61010-1 or IEC 60664.

Measurement Category I

Signal level. Electronic and telecommunication equipment, or parts thereof. Some examples include transient-protected electronic circuits inside photocopiers and modems.

Measurement Category II

Local level. Appliances, portable equipment, and the circuits they are plugged into. Some examples include light fixtures, televisions, and long branch circuits.

Measurement Category III

Distribution level. Permanently installed machines and the circuits they are hard-wired to. Some examples include conveyor systems and the main circuit breaker panels of a building's electrical system.

Measurement Category IV

Primary supply level. Overhead lines and other cable systems. Some examples include cables, meters, transformers, and other exterior equipment owned by the power utility.

Statement of Conformity

Greenlee Textron Inc. is certified in accordance with ISO 9001 (2000) for our Quality Management Systems.

The instrument enclosed has been checked and/or calibrated using equipment that is traceable to the National Institute for Standards and Technology (NIST).



Maintenance

⚠ WARNING

Electric shock hazard:

Before opening the case, remove the test leads from the circuit and shut off the unit.

Failure to observe this warning could result in severe injury or death.

⚠ WARNING

Electric shock hazard:

The fuses are an integral part of the overvoltage protection. When fuse replacement is necessary, refer to "Specifications" for the correct type, size, and capacity. Using any other type of fuse will void the overvoltage protection rating of the unit.

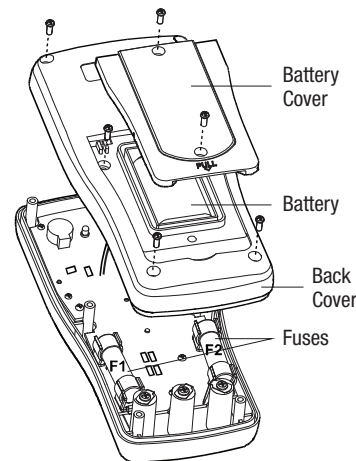
Failure to observe this warning could result in severe injury or death.

Replacing the Battery

1. Disconnect the unit from the circuit. Turn the unit OFF.
2. Remove the screws from the battery cover.
3. Remove the battery cover.
4. Replace the battery (observe polarity).
5. Replace the battery cover and screws.

Replacing the Fuses

1. Disconnect the unit from the circuit. Turn the unit OFF.
2. Remove the rubber boot.
3. Remove the screws from the battery cover.
4. Remove the battery cover.
5. Remove the screws from the back cover.
6. Remove the back cover.
7. Replace the fuse(s).
8. Replace the back cover and screws, battery cover and screws, and rubber boot.



Cleaning

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