

User's Manual



Mini MultiScope II

MODEL 381265



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381265 V2.0 6/00

Safety

This meter has been designed to be safe in use, but the operator must use caution in its operation. The rules listed below should be carefully followed for safe operation.

1. **NEVER** apply voltage or current to the meter that exceeds the specified maximum for the function selected.

Input Limits	
Function	Maximum Input
V DC	1000V DC
V AC	700V AC
Ohms	250V DC/AC
mA DC/AC	400mA DC/AC
20A DC/AC	20A DC/AC
Diode	250V DC/AC

2. **USE EXTREME CAUTION** when working with high voltages.
3. **DO NOT** measure voltage if the voltage on the "COM" input jack exceeds 500V above earth ground.
4. **NEVER** connect the meter leads across a voltage source while the function switch is in the current, resistance or diode mode. Doing so can damage the meter.
5. **ALWAYS** discharge capacitors in power supplies and disconnect the power when making resistance or diode tests.
6. **ALWAYS** turn off the power and disconnect the test leads before opening the back to replace the fuse or batteries.
7. **NEVER** operate the meter unless the back cover is in place and fastened securely.

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



Double insulation

Specifications

DIGITAL MULTIMETER

Function	Ranges	Resolution	Accuracy
DC Voltage	400mV	0.1mV	$\pm(0.75\%rdg + 10dgt)$
	4V	1mV	
	40V	10mV	
	400V	100mV	
	1000 V	1V	
AC Voltage True RMS	400mV	0.1mV	$\pm(1.0\%rdg + 10dgt)$ 50Hz to 1kHz (unspec'd 1kHz to 30kHz)
	4V	1mV	
	40V	10mV	
	400V	100mV	$\pm(1.5\%rdg + 10dgt)$
	700V	1V	
DC Current	400mA	100 μ A	$\pm(1.2\%rdg + 10dgt)$
	20A	10mA	
AC Current True RMS	400mA	100 μ A	$\pm(1.5\%rdg + 10dgt)$ 50Hz to 1kHz
	20A	10mA	
Resistance	400 ohms	0.1 ohms	$\pm(3.0\%rdg + 10dgt)$
	4K	1 ohm	
	40k	10 ohms	$\pm(1.0\%rdg + 5dgt)$
	400k	100 ohms	
	4Mohms	1k ohms	
40Mohms	10k ohms	$\pm(3.0\%rdg + 5dgt)$	
Capacitance	4nF	1pF	$\pm(3.0\%rdg + 5dgt)$
	40nF	10pF	
	400nF	100pF	
	4 μ F	1nF	
	40 μ F	10nF	
	400 μ F	100nF	
	4mF	1 μ F	Unspecified
Frequency	10Hz to 100kHz	0.1Hz to 1kHz	$\pm(1.0\%rdg + 5dgt)$
Period/Pulse Width	10 μ sec to 100msec	1 μ sec to 0.1msec	$\pm(3.0\%rdg + 5dgt)$
Duty Cycle	1 to 100%	1%	$\pm(3.0\%rdg + 5dgt)$
Signal Out	10Hz to 50kHz	1Hz to 10kHz	$\pm(1.2\% + 5\text{ digits})$

Diode Test Test current of approximately 2.4mA
Logic Check TTL, 3V CMOS, or 5V CMOS selectable
dB (-80 to +80dB) 2, 3, 8, 16, 50, 75, 93, 110, 125, 135, 150, 300, 600, 900, 1000, or 1200 ohms reference

DIGITAL STORAGE OSCILLOSCOPE

Bandwidth DC to 100kHz, 1 channel
Sample rate 1Meg samples per second
Divisions ±2 vertical, 9 horizontal
Record length 25 divisions
Time base 5µsec. to 1.3sec. per division
Vertical 75mV to 500V (17 steps)
 mA: 75 to 300mA (4 steps)
 A: 7.5 to 15A (2 steps)
Glitch capture 500nsec. (minimum)
Trigger Level adjustable ±2 divisions (in 0.1 steps)
 (Positive or negative edge moving trigger)

COMMON SPECIFICATIONS

Display 128x64 pixel graphic LCD
Viewing Area 2.8x1.5" (71.7x39mm)
Measurement rate Digital: 4 times/sec. Bargraph: 7 times/sec.
Auto Power Off 30 minutes
Overrange Indicates "OVER"
Power 6 size AA cells, 6 size AA NiCad batteries, 3 dual cell NiCad Battery Packs or AC adaptor
Operating time Alkaline (6hrs approx.), NiCad (8hrs approx.)
 NiCad Charging time (3hrs approx.)
Temperature Operating: 32°F to 104°F (0°C to 40°C),
 Storage (NiCad batteries removed): -4°F to 140°F (-20°C to 60°C),
 Charging: 32°F to 113°F (0°C to 45°C)
Min/Max/Avg. Displays minimum, average, & maximum readings over time
Hold Captures displayed reading
Storage 15 pages (text or graphics)
Dimensions 3.6x7.6x2.2inches (92x192x55mm)
Weight 1.0lbs. (450gm)

Meter Description

1. LCD Display
2. Function keys
3. Rotary range select switch
4. DMM banana input jacks
5. Protective rubber holster
6. AC Voltage adapter jack



Note: Tilt stand and battery compartment are on rear of unit.

Display Symbols and Function keys

Soft function keys F1, F2, F3, F4

These four keys perform the function indicated on the LCD display. The function will change depending on the position of the rotary switch and the mode of operation. Functions with a right arrow will produce a sub-menu on the display for further selection.



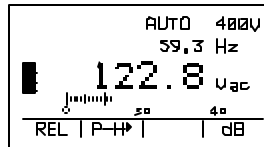
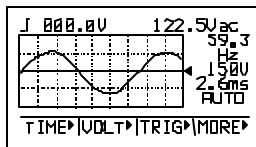
OTHER FUNCTION KEYS

- MODE** Toggles between the multimeter text mode and the oscilloscope graphics mode. The graphics mode is available in the V, A, mV, mA and HI-A modes.
- HOLD** "Freezes" the reading on the display. Press "HOLD" again to resume normal operation. The symbol **HOLD** will appear on the display when Hold is selected.
- STORAGE** Store and recall measurement data or graphical display.
- RANGE** Selects and holds a measurement range. Hold the key for 4 seconds to return to autorange mode.
- Hz/RESET** Press the "MODE" key for 4 seconds to select the Frequency mode in voltage functions.
- MIN/MAX** Press the "STORAGE" key for 4 seconds to select the MIN, MAX, Average display.
- AC/DC** Toggle between AC and DC measurements in mV, mA and A functions.











BASIC DISPLAYS

Refer to illustrations below. The Oscilloscope mode produces a graphical display (left). The Multimeter mode produces a numerical display with an analog bargraph (right).



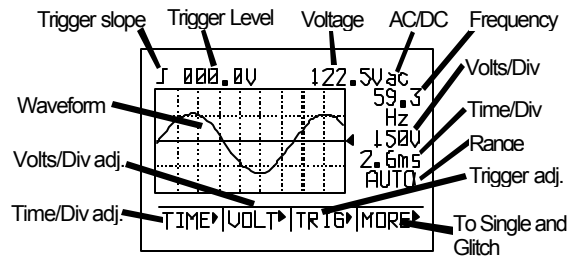
DISPLAY ICONS

A	Ampere	RANGE	Manual ranging
ac	Alternating current	REL	Relative
A/D	Amps per division	RESET	Reset
AUTO	Auto ranging	RUN	Record MIN/MAX mode
AVG	Average	SAVE	Saves present signal in memory
BEEPER	Audible beeper	SINGL	Single Waveform
CALL	Recall stored data	SLEEP	Auto shut-off
CLEAR	Remove stored data	TEST	Self Test
dB	Decibel	TIME	Manually change time base
dc	Direct current	TRIG	Frequency Trigger
DUTY	Duty cycle	V	Volts
F	Farads(capacitance)	Ω	Ohms (resistance)
LIMIT	Limit (compare)	%RH	Relative Humidity
GLITC	Glitch Waveform		Buzzer, Continuity
Hi-A	High Current		Cursor (left/right)
Hz	Hertz (frequency)		Cursor (up/down)
mA/D	mA per division		Low Battery
MANUA	Manual range		Overrange on A/V
MAX	Maximum		AC adaptor is connected
MIN	Minimum	Δt	Signal pulse width
ms	milliseconds	ΔT	Signal period
$^{\circ}\text{C}$	Degrees Centigrade		Time to Auto Off
$^{\circ}\text{F}$	Degrees Fahrenheit		Trigger slope
OUT	Signal out		
PAUSE	Pause in "MIN/MAX"		
P-H	Peak Hold		
Psi,kPa	Pressure		

Note: Inverse characters (white characters on a black background) indicate the function is active.

GRAPHICAL DISPLAY ILLUSTRATION

1. The graphical mode is entered when the "MODE" key is pressed and the function switch position is in the ACV, DCV, mV, A, mA or Hi-A in the ADAPTOR mode position
2. The amplitude (vertical) and time (horizontal) divisions are selected automatically by the meter in the autoranging mode. The time division will vary to display the best wave pattern in the autoranging mode or can be set manually using the "F1" and arrow keys. The volts/division is determined by the selected range or manually using the "F2" and arrow keys.
3. Trigger level and slope are manually adjustable using the "F3" and arrow keys.



Operating Instructions

1. ALWAYS set the power switch to the OFF position when the meter is not in use.
2. If "OVER" appears in the display during a measurement in the manual range mode, the value you are measuring exceeds the range you have selected. Change to a higher range.

AUTORANGE / MANUAL RANGE SELECTION

When the meter is powered ON, it is in the autoranging mode. For most applications this is the easiest and most accurate method of measurement. For measurements that require the range to be held:

1. Press the "RANGE" key. The display will change from "AUTO" to "RANGE" (manual range) with the full scale value displayed.
2. Each time the "RANGE" key is pressed, the next available range will be set.
3. To return to "AUTO" range, hold the "RANGE" key for 4 seconds.

DATA HOLD

The meter will freeze the displayed reading when the "HOLD" key is pressed. The "HOLD" icon will appear in the display when HOLD is activated. Press "HOLD" again to resume normal operation.

AUTO POWER OFF

The meter will automatically shut off after 30 minutes if a push button is not pressed or the rotary switch is not moved. The symbol in the upper left of the display (shown in the display icon chart) indicates the time to shut off. The black area of the icon will decrease as shutdown time approaches (10 minutes per area, 2 minutes per line). Disable AUTO POWER OFF in the SETUP utility by moving the Rotary switch to the SETUP position and using the function keys to program the meter.

LOCK-UP

The meter can "lock-up" during the first minute of operation if the circuitry used to maintain the setup conditions is not allowed to properly charge. If the meter has not been used for a long period of time, avoid entering the "SETUP" position for at least one minute.

AC AND DC VOLTAGE MEASUREMENTS

WARNING: Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances (contacts can be recessed deep in the outlets). As a result, the reading may show 0 volts when the outlet actually is live. Make sure the probe tips are contacting the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC or DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur during the ON or OFF operations that can damage the meter.

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
2. Set the function switch to a V AC or V DC range.
3. Touch the test probe tips to the circuit under test.
4. Read the voltage in the display. The display will indicate the proper decimal point, value and appropriate symbols.

mV AC AND DC VOLTAGE MEASUREMENTS

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
2. Turn the rotary switch to the mV position
3. Press "F3" to toggle between AC and DC measurement.
4. Read the voltage in the display. The display will indicate the proper decimal point, value and symbols. If the polarity is reversed, the display will show (-) minus before the value.

RESISTANCE MEASUREMENTS

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

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive resistance jack.

2. Set the function switch to the ohm position.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display. The display will indicate the proper decimal point, value and symbols.
5. Press F3 to toggle continuity on/off, press F2 to enter LIMIT mode.

CONTINUITY CHECK

WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive jack.
2. Set the function switch to the ohm position.
3. Press the F3 key (the continuity symbol will change to white on black).
4. Touch the test probe tips to the circuit or wire you wish to check. If the resistance is less than 50 ohms, the audible signal will sound.
5. Press F3 to return to normal operation.

CAPACITANCE MEASUREMENTS

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. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive (capacitance) jack
2. Turn the rotary switch to the Capacitance position.
3. The meter powers up in the capacitance autorange mode (capacitance symbol will be flashing).
4. Touch the test leads to the capacitor to be tested. The display will indicate the proper decimal point, value and symbol.

DIODE TEST

WARNING: To avoid electric shock, do not test any diode that has voltage on it.

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive diode symbol jack
2. Set the function switch to the Resistance/Continuity/Diode position..
3. Press the F4 function key to enter the Diode mode. The Diode symbol will change to white on black.
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading.
5. Reverse the probes polarity by switching probe position. Note this reading. The diode or junction can be evaluated as follows:
 - A. If one reading shows a voltage value (approximately 0.25V for germanium and 0.7V for silicon) and the other reading shows "OVER", the diode is good.
 - B. If both readings show "OVER", the Diode is open.
 - C. If both readings are very small or 0, the Diode is shorted.

NOTE: The value indicated in the display during the diode check is the forward voltage drop.

mA AC AND DC CURRENT MEASUREMENTS.

WARNING: To avoid electric shock do not measure AC current on any circuit whose voltage exceeds 250V AC.

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive mA jack
2. Turn the rotary switch to the mA position.
3. The meter powers up in the DC mA mode.
4. Press the AC/DC key to toggle between DC and AC measurements.
5. Connect the test probe tips in series with the circuit under test. The display will indicate the proper decimal point, value and symbol

AC AND DC CURRENT MEASUREMENTS

WARNING: To avoid electric shock do not measure AC current on any circuit whose voltage exceeds 250V AC.

CAUTION : Do not make current measurements on the 20A scale for longer than 30 seconds, Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive 20A jack
2. Turn the rotary switch to the A position.
3. Maximum allowed current is 20 Amps. Use a current clamp for larger currents.
4. Press the AC/DC key to change from DC to AC current.
5. Connect the test probe tips in series with the circuit under test. The display will indicate the proper decimal point, value and symbol.

LOGIC TEST

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive LOGIC jack
2. Turn the rotary switch to the LOGIC position
3. Press F1, F2, or F3 to select TTL, 3V CMOS or 5V CMOS logic circuitry. The type selected will appear on the display in white on black background.
4. Connect the test probe tips to the circuit under test. The display will indicate an UP arrow for a high, a DOWN arrow for a low and a DASHED line for undetermined. The measured voltage will also be displayed.

Logic Thresholds		
	Low	High
TTL	<0.8	>2.0
3VCM	<1.0	>2.0
5VCM	<1.7	>3.3

SIGNAL OUTPUT

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive SIG jack
2. Turn the rotary switch to the SIGNAL OUT position.
3. Press F1 to increase the frequency and F2 to decrease the frequency.
4. Press F3 to initiate the output. Press again to disable the output (the OUT icon will appear on the display while the output is active).

AUXILIARY ADAPTERS

The ADAPTER selection allows direct display of °C/°F, %RH, psi, or high current in the correct units when the meter is used with an external adapter. The adapter should output 1mV DC per unit measured (1mV AC or DC for the high current adapters).

1. Insert the black adapter banana plug into the negative COM jack and the red adapter banana plug into the positive AUX jack
2. Turn the rotary switch to the ADAPTER position.
3. Press the function key (F1 through F4) that matches the adaptor to be used.

SETUP FUNCTIONS

The Setup function provides a means to set three default Power-on conditions (dB Reference, Key Beeper, Sleep Mode (Auto Power Off)). Self Test can also be run from this utility.

1. Turn the rotary switch to the SETUP position.
2. Press the F1 key to select one of the three features.
3. Press F2 to enable or disable the feature or to set the dB reference level.
4. Press F3 to save the changes.
5. Press F4 to run the self test.

MIN/MAX Display

1. Press and hold the "MIN/MAX STORAGE" key for 4 seconds to enter this function.
2. The display will indicate the maximum value, the average value, and the minimum value since the mode was initiated (the relative time for each value is displayed next to the value).
3. The format for the relative time is Hours/Minutes/Seconds (H:MM:SS).
4. Press F1 to reset the time and begin recording a new series.
5. Press F3 to pause the recording.
6. Press F2 to resume recording after F3 is pressed.
7. Press and hold the "MIN/MAX STORAGE" key for 4 seconds to return to normal operation.

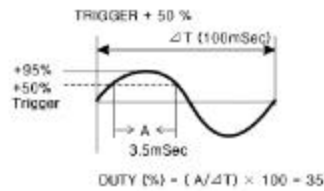
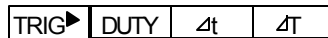
STORAGE FUNCTIONS

Note: It may take up to 15 seconds for some of the functions in the Storage mode to complete.

1. Press the "STORAGE" key to enter this feature.
2. The display will list 15 memory locations and indicate what type of data is stored in each location. Locations with no data will be left blank.
3. Press F1 to scroll the diamond cursor down through the 15 memory locations.
4. At the selected memory location, press F2 to store the last text or graphical display or press F3 to RECALL the stored data.
5. At the selected memory location, press F4 to clear the memory.
6. Press "STORAGE" to exit the feature.

HZ FREQUENCY MEASUREMENTS

1. Press and hold the "MODE Hz/RESET" key for 4 seconds in the ACV, DCV, mV, or A function to change to the frequency display. The frequency related soft keys appear on the display.
2. Frequency display soft-keys are shown and explained below.
3. To exit the Frequency mode press the "MODE Hz/reset" key for 4 seconds.



F1 "TRIG" trigger level

The Trigger Level allows adjustment of the trigger level from 0 to 95% of the peak of the measured signal.

1. Press F1 to change the polarity of the trigger.
2. Press F2 or F3 to adjust the % trigger level
3. Press F4 to exit the trigger level menu.

F2 "DUTY" duty ratio

The Duty function changes the display from frequency to duty ratio.

1. Press F2 to enter the DUTY function. The display will change to %.
2. Press F2 to exit the mode.

F3 "delta t" pulse width

The pulse width function changes the display from frequency to pulse width.

1. Press F3 to enter the pulse width function. The displayed units change to "ms" (milli-seconds).
2. Press F3 to exit the mode.

F4 “delta T” period

The period function changes the display from frequency to period.

1. Press F4 to enter the period function. The displayed units change to “ms” if a signal is present.
2. Press F4 to exit the mode.

RELATIVE MODE (text soft key)

1. The relative mode displays the difference between a reference value and the measured value
2. Press the F1 soft key when the measured reference value is on the display.
3. The “REL” label will appear as white on black and the “REL” icon will appear when the relative mode is active.
4. Each subsequent reading will be displayed relative to the stored reading.
5. Press “F1” to exit relative mode.

REL	P-H	▶	dB
F1	F2	F3	F4

PEAK HOLD (text soft key)

1. Press the “P-H” soft key to display the P-H menu.
2. The LCD will display the Peak value of the measured parameter (peak max and peak min values).
3. The meter will beep each time a new MAX or MIN is captured. Press F3 PAUSE to hold the min and max values.
4. Press F2 RUN to continue measuring.
5. Press F1 RESET to reset the values for a new run.
6. Press F4 to EXIT.

RESET	RUN	PAUSE	EXIT
F1	F2	F3	F4

LIMIT (text soft key)

The LIMIT function can be activated in the Voltage, Current, Resistance or Capacitance modes. This function allows testing of parameters to a user-defined tolerance (minimum and maximum limits).

1. Press the F2 "LIMIT" key to display the LIMIT menu. The first digit of the Minimum Limit display will blink.
2. Press the F1 or F2 up/down arrow keys to adjust the value of the digit.
3. Press the F3 "SET" key to store the value and move to the next digit.
4. Repeat steps 2 & 3 for all minimum and maximum digits.
5. If the measured value falls between the maximum and minimum limits, the display will indicate PASS and a continuous beep will occur.
6. If the measured value exceeds the maximum limit, "HIGH" will be displayed. "LOW" will be displayed if the value is less than the minimum limit.
7. Press F4 to exit this mode and return to normal operation.

dB DISPLAY (text soft key)

1. Press F4 "dB" to display dB. This feature is available in the V, mV and A functions.
2. The reference impedance can be entered during the setup function.
3. The "dB" symbol will appear as white on black when this feature is active.

TIME BASE (graphical soft key)

The meter must be in the scope mode. The TIME function is used to adjust the horizontal display rate in time/division.

1. Press the F1 "TIME" key to display the TIME menu.
2. Press the F1 or F2 up/down arrow keys to adjust the time.
3. Press F3 to toggle from "MANUAL" to "AUTO".
4. Press F4 "EXIT".

VOLT / DIV (graphical soft key)

The VOLT/DIV function is used to adjust vertical volts per division.

1. Press F2 "VOLT" to display the VOLT menu.
2. Press the F1 or F2 up/down arrow keys to adjust the volts / division
3. Press "F3" to toggle "AUTO" and "MANUAL".
4. Press F4 "EXIT" to return.

TIGGER LEVEL AND SLOPE (graphical soft key)

The TRIGGER function is used to capture irregular waveforms.

1. Press F3 "TRIG" to display the TRIGGER menu.
2. Press the F1 or F2 up/down arrow keys to adjust the Trigger level The arrow symbol on the right side of the graph will move up/down ± 20 vertical divisions. The trigger level is displayed on the top left corner of the display.
3. Press F3 to toggle between a trigger on the rising or falling edge of the signal. The slope symbol in the upper left of the display will indicate which edge has been selected.
4. Press F4 to exit.

SINGLE SWEEP (graphical soft key)

The SINGLE function will trigger a single measurement when the key is pressed.

1. Press the F4 "MORE" key to access the SINGLE function.
2. Press the F1 "SINGLE" key to trigger a single measurement and access the SINGLE sub-menu.
3. Press the sub-menu F1 or F2 arrow keys to change the time/division.
4. Press the sub-menu F3 key to trigger a new measurement. Press the F4 "EXIT" key to return to the graphical display.

GLITCH CAPTURE (graphical soft key)

The "GLITCH" function permits the meter to trigger a measurement on

- A. Any signal which causes an over-range indication
 - B. Any signal greater than one vertical division
 - C. Any signal greater than 10% of one horizontal division.
1. Press the F4 "MORE" key to access the GLITCH function
 2. Press the F2 "GLITCH" key to set the glitch mode and access the GLITCH sub-menu
 3. Any glitch will trigger a measurement.
 4. Press the sub-menu F1 or F2 arrow keys to change the time/division and reset the glitch trigger.
 5. Press the sub-menu F3 key to reset the glitch trigger.
 6. Press F4 "EXIT" to return to the graphical display.

Maintenance

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery/fuse cover.

WARNING: To avoid electric shock, do not operate your meter until the battery/fuse cover is in place and fastened securely.

This Multimeter is designed to provide years of dependable service, if the following care instructions are performed.

1. Keep the meter dry.
2. Use and store the meter in mild ambient conditions.
Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
3. Handle the meter gently. Dropping it can damage the electronic parts or the case.
4. Keep the meter clean. Wipe the case occasionally with a damp cloth. DO NOT use chemicals, cleaning solvents or detergents.
5. Use only fresh batteries of the recommended size and type. Remove old or weak batteries so they do not leak and damage the unit.
6. If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.

REPLACING THE BATTERY

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery/fuse cover.

1. When the “+” indicator appears in the upper center of the display, the battery should be replaced.
2. Follow the procedure in the “BATTERY INSTALLATION” paragraph located earlier in this manual.
3. Properly dispose of the used battery.

WARNING: To avoid electric shock, do not operate your meter until the battery/fuse cover is in place and fastened securely.

REPLACING THE FUSES

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing battery/fuse cover.

1. Disconnect the test leads from any circuit being measured.
2. Open the battery/fuse cover by loosening the three screws on the rear cover using a Phillips screwdriver
3. Remove the rear cover by lifting upward from the bottom until the cover snaps off at the top.
4. Remove the old fuse by gently pulling up on it.
5. Install the new fuse by gently pushing it into the holder.
6. Always use a fuse of the proper size and value (500mA/250V fast blow, or 20A/250V fast blow, high breaking capacity, ceramic).
7. Snap the cover back into place at the top and secure with the three screws.