

OPERATOR'S  
INSTRUCTION MANUAL

# M-1750

## 3 3/4 COUNT DIGITAL MULTIMETER



### Elenco™ Electronics, Inc.

150 W. Carpenter Avenue

Wheeling, IL 60090

(847) 541-3800

<http://www.elenco.com>

e-mail: [elenco@elenco.com](mailto:elenco@elenco.com)

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## **PLEASE READ THIS INSTRUCTION MANUAL CAREFULLY**

Misuse and/or abuse of this instruction cannot be prevented by any printed word and may cause injury and/or equipment damage.

Please follow all these instructions and measurement procedures faithfully, and adhere to all standard industrial safety rules and practices.

The multimeter shall be used in over voltage category II !

## 1. Safety Information

To ensure that the meter is used safely, follow all of the safety and operation instructions in this manual. If the meter is not used as described in the manual, the safety features of the meter might be impaired.

- Do not use the meter if the meter or the test leads look damaged, or if you suspect that the meter is not operating properly.
- Turn off the power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
- Use caution when working above 60VDC or 30VAC rms. Such voltages pose a shock hazard.
- When using the test lead, keep your fingers behind the guards on the test lead.
- Disconnect the live test lead before disconnecting the common test lead.
- This digital multimeter is designed for indoor use only.

## Safety Symbols



This marking adjacent to another marking, terminal, or operating device indicates that the operator must refer to the explanation in the operating instructions to avoid damage to the equipment and/or to avoid personal injury.

**WARNING**

This WARNING sign denotes a hazard. It calls attention to a procedure, practice or the like, which if not correctly performed or adhered to, could result in personal injury.

**CAUTION**

This CAUTION sign denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly adhered to, could result in damage to or destruction of part or all of the instrument.



500V max.

This marking advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage, with respect to earth ground, exceeds (in this case) 500 volts.



This symbol, adjacent to one or more terminals, identifies them as being associated with ranges that may in normal use be subjected to particularly hazardous voltages. For maximum safety, the instrument and its test leads should not be handled when these terminals are energized.



This marking indicates that equipment is protected completely by the double insulation.

## 2. Introduction

This meter is a 3 3/4 digit digital multimeter that is rugged, reliable and convenient to use, while providing all of the accuracy and features needed for any application. It performs DC/AC voltage, DC/AC current, resistance, transistor  $h_{FE}$  test, capacitance, frequency, diode, continuity test, and has Auto Power Off.

It is designed for the professional at work in the field or in the laboratory, even hobby and home applications.

## 6. Care and Maintenance

### 6-1. Caring for Your Multimeter

Your digital multimeter is an example of superior design and craftsmanship. The following suggestions will help you care for the multimeter so you can enjoy it for years.

1. Keep the multimeter dry. If it gets wet, wipe it dry immediately. Liquids can contain minerals that can corrode electronic circuits.
2. Use and store the multimeter only in normal temperature environments. Extreme temperatures can shorten the life of electronic devices, damage batteries, and distort or melt plastic parts.
3. Handle the multimeter gently and carefully. Dropping it can damage the circuit boards and case and can cause the multimeter to work improperly although the holster can provide enough protection.
4. Keep the multimeter away from dust and dirt, which can cause premature wear of parts.
5. Wipe the multimeter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the multimeter.
6. Use only fresh batteries of the required size and type. Always remove old or weak batteries. They can leak chemicals that destroy electronic circuits.

### 6-2. Maintenance

#### Battery Replacement

1. Make sure that the instrument is not connected to any external circuit. Set the selector switch to the OFF position and remove the test leads from the terminals.
2. Remove the screws from the bottom case and lift the case. Remove the spent batteries and replace them with batteries of the same type.

#### Fuse Replacement

Remove the screws from the bottom case and lift the case. Replace the fuse with the same type and rating: 5 x 20mm 0.5A/250V fast-blow fuse or 5 x 20mm 10@/250V fast-blow fuse as the replacements.

## WARNING



Before attempting battery & fuse removal or replacement, disconnect the test leads from any energized circuits to avoid hazard.

## 3. Features

- 9 Functions / 23 Measuring Ranges
- Surface Mounted PC Board Assembly
- Full Overload Protection
- Auto Power Off
- Tilt Stand
- Holster
- Low Battery Indicator

## 4. Specifications

### 4-1. General Specifications

<b>Display</b>	3 3/4 digit LCD with a max. reading of 4000.
<b>Range Control</b>	Manual range control (capacitance test is auto range control).
<b>Polarity</b>	Automatic “—” is displayed.
<b>Zero Adjustment</b>	Automatic.
<b>Overrange Indication</b>	“OL” on LCD is displayed.
<b>Low Battery Indication</b>	“  ” sign on LCD readout when the battery voltage is below 2.4V.
<b>Auto Power Off</b>	Approximately 15 minutes.
<b>Safety Standards</b>	 <b>EMC/LVD.</b> The meter is up to the standards of IEC1010 Pollution Degree 2, Overvoltage Category II.
<b>Operation Temperature</b>	32°F to 104°F (0°C to 40°C) less than 85% relative humidity
<b>Storage Temperature</b>	-4°F to 140°F (-20°C to 60°C) less than 95% relative humidity
<b>Power</b>	2 x 1.5V “AAA” batteries. (NEDA 1604)
<b>Dimensions</b>	5 15/16” (H) x 2 3/4” (W) x 1 1/2” (D) (w/o holster)
<b>Weight</b>	Approximately 0.44 lb. (w/o holster)
<b>Accessories</b>	Safety Test Leads - 1 pair Operator's Manual - 1 pc. Holster - 1 pc.

## 4-2. Measurement Specifications

Accuracy is  $\pm$ (% of reading + number in last digit) at 73°F (23°C)  $\pm 9^\circ\text{F}$  ( $\pm 5^\circ\text{C}$ ), <75% RH.

### DC Voltage

Range	Resolution	Accuracy	Maximum Input
400mV	100 $\mu\text{V}$	$\pm(0.5\%$ of rdg+3dgt)	250V=
4V	1mV	$\pm(0.5\%$ of rdg+3dgt)	600V=
40V	10mV	$\pm(0.5\%$ of rdg+3dgt)	600V=
400V	100mV	$\pm(0.5\%$ of rdg+3dgt)	600V=
600V	1V	$\pm(0.8\%$ of rdg+2dgt)	600V=

Impedance: 10M $\Omega$

**Note:** Maximum voltage from “V $\Omega$ mA” socket to “COM” socket is 600V=, from “COM” socket to earth is 300V=.

### AC Voltage

Range	Resolution	Accuracy	Maximum Input
400mV	100 $\mu\text{V}$	$\pm(1.2\%$ of rdg+3dgt)	250V=
4V	1mV	$\pm(0.8\%$ of rdg+3dgt)	600V=
40V	10mV	$\pm(0.8\%$ of rdg+3dgt)	600V=
400V	100mV	$\pm(0.8\%$ of rdg+3dgt)	600V=
600V	1V	$\pm(1.2\%$ of rdg+3dgt)	600V=

Frequency Response: 40-400Hz (40 - 100Hz on 600V range).

### Resistance

Range	Resolution	Accuracy	Overload Protection
400 $\Omega$	0.1 $\Omega$	$\pm(1.0\%$ of rdg+3dgt)	250V DC/ACrms
4k $\Omega$	1 $\Omega$	$\pm(1.0\%$ of rdg+3dgt)	
40k $\Omega$	10 $\Omega$	$\pm(1.0\%$ of rdg+3dgt)	
400k $\Omega$	100 $\Omega$	$\pm(1.0\%$ of rdg+3dgt)	
4M $\Omega$	1k $\Omega$	$\pm(1.0\%$ of rdg+3dgt)	
40M $\Omega$	10k $\Omega$	$\pm(2.0\%$ of rdg+3dgt)	

### DC Current

Range	Resolution	Accuracy	Overload Protection
400 $\mu\text{A}$	0.1 $\mu\text{A}$	$\pm(1.2\%$ of rdg+3dgt)	Protected by
4000 $\mu\text{A}$	1 $\mu\text{A}$	$\pm(1.2\%$ of rdg+3dgt)	Fast
40mA	10 $\mu\text{A}$	$\pm(1.5\%$ of rdg+3dgt)	0.5A/250V
400mA	100 $\mu\text{A}$	$\pm(1.5\%$ of rdg+3dgt)	Fuse
10A	1mA	$\pm(2.0\%$ of rdg+5dgt)	10A/250V Fuse

**Caution:** Maximum operation time is 15 seconds on 10A scale.

## (5) Frequency and Duty Cycle Measurement

1. Connect the black test lead to the “COM” socket and the red test lead to the “V $\Omega$ Hz” socket.
2. Set the selector switch to the “Hz” or “Duty” position.
3. Connect the probes across the source or load under measurement.

## (6) hFE Test

1. Set the selector switch to the desired “hFE” position (PNP or NPN type transistor).
2. Never apply an external voltage to the hFE sockets. Damage to the meter may result.
3. Plug the transistor directly into the hFE socket. The socket is labeled E, B, and C for Emitter, Base, and Collector.
4. Read the hFE (beta or DC current gain) in the display.

## (7) Relative Value Display

Press the “REL” button on the meter to use the relative measurement mode. The present value will be stored in memory. The new display value is equal to the measurement value minus the stored value.

Example:

When you test the capacitance, you can use the Relative function to eliminate the zero error.

## (8) Auto Power Off and Disable

1. When the meter has been turned on for 15 minutes without any action from the users, the meter will automatically turn itself off.
2. To disable the Auto Power Off function, press any button when the meter is on or switch the selector switch.

## 5-3. How to Make a Measurement

### (1) DC/AC Voltage Measurement



1. Connect the black test lead to the "COM" socket and the red test lead to the "V $\Omega$ Hz" socket.
2. Set the selector switch to the desired "V" position, and press the "DC/AC" button to choose the function. If the magnitude of the voltage is not known, set the selector switch to the highest range and reduce until a satisfactory reading is obtained.
3. Connect the probes across the source or load under measurement.

### (2) DC/AC Current Measurement

1. Set the selector switch to the desired "A" position, and press the "DC/AC" button to choose the function.
2. For current measurements less than 400mA, connect the black test lead to the "COM" socket and the red test lead to the "V $\Omega$ Hz" socket.
3. For current measurements over 400mA, connect the black test lead to the "COM" socket and the red test lead to the "10A" socket.
4. Disconnect the power from the circuit under test and open the normal circuit path where the measurement is to be taken. Connect the meter in series with the circuit.
5. Do not continually measure 10A as the shunt wire will heat up. Allow 30 seconds max. At 5A or less, continuous use is okay.

**NOTE: BE SURE TO MEASURE WITHIN 30 SECONDS TO AVOID HIGH CURRENT HAZARD.**

### (3) Resistance Measurement and Diode, Continuity Test

1. Connect the black test lead to the "COM" socket and the red test lead to the "V $\Omega$ Hz" socket.
2. Set the selector switch to the desired " $\Omega$ ", "" or "" position.
3. Remove the power from the equipment under test, connect the probes across the circuit to be tested.

**CAUTION:** Be sure that the circuit to be tested is "dead". Max. input overload: 250Vrms and <10sec.

### (4) Capacitance Measurement

1. Before testing, discharge the capacitor by shorting its leads together. Use caution in handling the capacitors because they may have a charge on them of considerable power before discharging.
2. Connect the black test lead to the "COM" socket and the red test lead to the "V $\Omega$ Hz" socket.
3. Set the selector switch to the "CAP" position.
4. Press the "REL" button. You can use the relative function to eliminate the zero error.
5. Connect the probes across the capacitor to be tested.

**NOTE:** When testing a 200 $\mu$ F capacitor, note that there will be approx. 30 sec. time lag.

## AC Current

Range	Resolution	Accuracy	Overload Protection
400 $\mu$ A	0.1 $\mu$ A	$\pm$ (1.5% of rdg+5dgt)	Protected by Fuse
4000 $\mu$ A	1 $\mu$ A	$\pm$ (1.5% of rdg+5dgt)	Fast
40mA	10 $\mu$ A	$\pm$ (2.0% of rdg+5dgt)	0.5A/250V Fuse
400mA	100 $\mu$ A	$\pm$ (2.0% of rdg+5dgt)	Fuse
10A	1mA	$\pm$ (2.5% of rdg+5dgt)	10A / 250V Fuse

**Caution:** Maximum operation time is 15 seconds on 10A scale.

Frequency Response: 40-400Hz.

## Capacitance (Auto Range)

Range	Resolution	Accuracy	Overload Protection
4nF	10pF	$\pm$ (5.0% of rdg+10dgt)	
40nF	100pF	$\pm$ (3.0% of rdg+10dgt)	
400nF	100pF	$\pm$ (2.0% of rdg+5dgt)	250V DC/ACrms
4 $\mu$ F	1nF	$\pm$ (2.0% of rdg+5dgt)	
40 $\mu$ F	10nF	$\pm$ (2.0% of rdg+5dgt)	
200 $\mu$ F	100nF	$\pm$ (4.0% of rdg+5dgt)	

## Frequency

Range	Resolution	Accuracy	Overload Protection
10Hz - 10MHz	0.001Hz	$\pm$ (0.1% of rdg+5dgt)	250V DC/ACrms

Sensitivity: Sine wave 0.6Vrms.

## Duty Cycle

Range	Accuracy	Overload Protection
0.1% - 99.9%	$\pm$ (2.0% of rdg+2dgt)	250V DC/ACrms

Sensitivity: Sine wave 0.6Vrms.

## Diode Test

Test Current	Test Voltage	Overload Protection
1 $\pm$ 0.6mA	Approx. 1.5V	250V DC/ACrms

## Continuity Test

Audible Indication: less than 120 $\Omega$  Approx.

Overload Protection: 250V DC/ACrms

## hFE Test

I<sub>b</sub> = 10 $\mu$ A

V<sub>ce</sub> = 2.5V Approx.


Test Range: 0-1000.

## 5. Operation

### WARNING

1. When measuring voltage, be sure that the instrument is not connected or switched to the resistance range. Always ensure that the correct terminals are used for the type of measurement to be made.
2. Use extra care when measuring voltage above 50V, especially from sources where high voltage is present.
3. Avoid making connections to live circuits whenever possible.
4. When making current measurements, be sure that the circuit is not live before opening it to connect the test leads.
5. Before making resistance measurements or diode test, ensure that the circuit under test is discharged.
6. Always ensure that the correct function and range is selected. In fact, in doubt on which range to use, start with the highest and work your way down.
7. Extreme care should be taken when using the instrument in conjunction with a current transformer connected to the terminals if an open circuit occurs.
8. Ensure that the test leads and probes are in good condition with no damage to the insulation.
9. Take care not to exceed the overload limits as shown in the specifications.
10. Before opening the case of the instrument to replace the battery, disconnect the test leads from any external circuit, set the selector switch to the OFF position.

### 5-1. Check the Batteries

If the battery is weak, a “” symbol will appear on the right of the display. It means that the battery should be replaced.

### 5-2. Front Panel Description

- |                                |                      |
|--------------------------------|----------------------|
| 1. Liquid Crystal Display      | 6. Common Input Jack |
| 2. Relative Measurement Button | 7. mA Input Jack     |
| 3. Function/Rotary Switch      | 8. DC/AC Button      |
| 4. TR $h_{FE}$ Test Socket     | 9. Holster           |
| 5. 10A Input Jack              |                      |

