

OPERATOR'S  
INSTRUCTION MANUAL  
**DIGITAL MULTIMETER**



**M-1000D**

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## WARNING



### 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.

## CAUTION

Failure to turn off the DMM before installing the battery could result in damage to the meter if the battery is connected to the battery terminal incorrectly.

### 6-2. Fuse Replacement

This meter is provided with a 250mA/250V fuse to protect 2000 $\mu$ A, 20mA, 200mA ranges.

#### NOTE: The 10A circuit is not fused.

1. Turn off the power.
2. Remove the two screws from the back of the case.
3. Remove the fuse from the holder and replace it with a new fuse of the specified value.

### Fuse Numbers

- 250mA/250V Bussman Fuse #GMA 250
- 250mA/250V Little Fuse #235-250
- 250mA/250V Elenco Fuse #533002

## 6. Maintenance

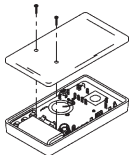
### WARNING

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

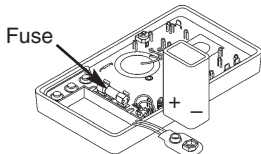
### 6-1. Battery Replacement

Replace the battery when “BAT” appears on the display.

1. Remove the two screws on the case cover. Then, detach it from the top case.



2. Unsnap the battery from the connector and replace it with a new 9 volt battery.





3. Close the case cover and secure it with the screws.

## 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.
- To avoid damage to the meter, do not exceed the input limits shown below.

FUNCTION	INPUT JACK	INPUT LIMITS
VDC	V/ $\Omega$ & COM	1000VDC or 750Vrms AC
VAC	V/ $\Omega$ & COM	600VDC or 750Vrms AC
$\Omega$ /  / 	V/ $\Omega$ & COM	250Vrms @ 15 sec.
$\mu$ A, mA DC 10A DC	mA & COM 10A & COM	250mA DC 10A DC

- This digital multimeter is designed for indoor use only.  
**Refer to Section 4-2 on page 6 for complete specifications.**

## Safety Symbols



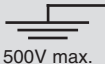
This marking adjacent to another marking, terminal, or operating device indicates that the operator must refer to the explanation in the operating instructions to avoid damage to the equipment and/or to avoid personal injury.

**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.



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 1/2 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, diode, audible continuity measurement and test signal. It is designed for technicians and students.


## Transistor $h_{FE}$ Measurement

1. Set the RANGE switch to the  $h_{FE}$  position.
2. Determine whether the transistor is an NPN or PNP-type and locate the Emitter, Base and Collector leads. Insert the leads into the proper holes of the  $h_{FE}$  socket on the front panel.
3. The meter will display the approximate  $h_{FE}$  value at the condition of base current  $10\mu A$  and  $V_{CE} 3V$ .

## Audible Continuity Test

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black test lead into the “COM” jack.
2. Set the RANGE switch to the  position.
3. Connect the test leads to two points of the circuit to be tested. If the resistance is lower than  $100\Omega$ , the buzzer will sound.


## Test Signal Use

1. Set the RANGE switch to the  position.
2. A test signal of 50Hz appears between the “V  $\Omega$  mA” and “COM” jacks. The output voltage is approximately 5Vpp with 50k $\Omega$  impedance.


## Resistance Measurement

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black test lead into the “COM” jack.
2. Set the RANGE switch to the desired  $\Omega$  position.
3. If the resistance being measured is connected to a circuit, turn off the power and discharge all capacitors before measuring.
4. Connect the test leads to the circuit to be measured.
5. Read the resistance value on the digital display.

## Diode Measurement

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black test lead into the “COM” jack.
2. Set the RANGE switch to the  position.
3. Connect the red test lead to the anode of the diode to be measured and the black test lead to the cathode.
4. The forward voltage drop in mV will be displayed. If the diode is reversed, the number “1” will be displayed.

## 3. Features

- 7 Functions / 17 Measuring Ranges
- 0.25% Basic Accuracy
- 1M $\Omega$  Input Impedance
- Overload Protection
- Transistor Test
- Pocket Size
- Audible Continuity Test
- Test Signal Generator 

## 4. Specifications

### 4-1. General Specifications

<b>Display</b>	3 1/2 LCD 1999 count display.
<b>Polarity</b>	Automatic “—” is displayed.
<b>Overrange Indication</b>	“1” on LCD is displayed.
<b>Low Battery Indication</b>	“BAT” sign on LCD readout.
<b>Operation Temperature</b>	32°F to 122°F
<b>Power</b>	9V Alkaline or Carbon Zinc battery (NEDA 1604)
<b>Battery Life (typical)</b>	100 hours w/ carbon zinc cells 200 hours w/ alkaline cells
<b>Dimensions</b>	5” (H) x 2 3/4” (W) x 7/8” (D)
<b>Weight</b>	Approximately 0.30 lb.
<b>Accessories</b>	Test Leads - 1 pair Operator’s Manual

## 4-2. Measurement Specifications

Accuracy of specifications apply for 1 year after purchase when operated in a temperature of 18°C to 28°C (64°F to 82°F) and a relative humidity of less than 75%.

Basic electrical specifications are given as  $\pm$ ([% of reading] + [number of least significant digits]).

### DC Voltage

Range	Resolution	Accuracy
200mV	100 $\mu$ V	$\pm$ (0.25% of rdg+2dgt)
2000mV	1mV	$\pm$ (0.5% of rdg+2dgt)
20V	10mV	$\pm$ (0.5% of rdg+2dgt)
200V	100mV	$\pm$ (0.5% of rdg+2dgt)
1000V	1V	$\pm$ (0.8% of rdg+2dgt)

OVERLOAD PROTECTION: 250Vrms AC for 200mV range and 1000VDC or 750Vrms AC for other ranges.

### AC Voltage

Range	Resolution	Accuracy
200V	100mV	$\pm$ (1.2% of rdg+10dgt)
750V	1V	$\pm$ (1.2% of rdg+10dgt)

OVERLOAD PROTECTION: 1000VDC for 750Vrms for all ranges.

RESPONSE: Average responding, calibrated in rms of a sine wave.

FREQUENCY RANGE: 45Hz - 450Hz

### DC Current

Range	Resolution	Accuracy
2000 $\mu$ A	1 $\mu$ A	$\pm$ (1% of rdg+2dgt)
20mA	10 $\mu$ A	$\pm$ (1% of rdg+2dgt)
200mA	100 $\mu$ A	$\pm$ (1.5% of rdg+2dgt)
10A	10mA	$\pm$ (3% of rdg+2dgt)

OVERLOAD PROTECTION: 250mA 250V fuse (10A range unfused).

MEASURING VOLTAGE DROP: 200mV.

## AC Voltage Measurement

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black lead into the “COM” jack.
2. Set the RANGE switch to the desired ACV position.
3. Connect the test leads to the device or circuit being measured.
4. Turn on the power of the device or circuit being measured. The voltage value will appear on the digital display.

## DC Current Measurement

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black test lead into the “COM” jack (for measurements between 200mA and 10A, connect the red test lead to the “10A” jack. Make sure that the test leads are pushed all the way into the jack).
2. Set the RANGE switch to the desired DCA position.
3. Open the circuit to be measured and connect the test leads IN SERIES with the load in which current is to be measured.
4. Read the current value on the digital display.

## 5-3. How to Make Measurements

### WARNING

1. To avoid electrical shock hazard and/or damage to the meter, do not measure voltages that might exceed 500V above earth ground.
2. Before using the instrument, inspect the test leads, connectors, and probes for cracks, breaks, or grazes in the insulation.

### DC Voltage Measurement

1. Plug the red test lead into the “V  $\Omega$  mA” jack and the black test lead into the “COM” jack.
2. Set the RANGE switch to the desired DCV position. If the voltage to be measured is not known beforehand, set the switch to the highest range and reduce it until a satisfactory reading is obtained.
3. Connect the test leads to the device or circuit being measured.
4. Turn on the power of the device or circuit being measured. The voltage value will appear on the digital display along with the voltage polarity.


### Resistance

Range	Resolution	Accuracy
200 $\Omega$	0.1 $\Omega$	$\pm(0.8\%$ of rdg+2dgt)
2k $\Omega$	1 $\Omega$	$\pm(0.8\%$ of rdg+2dgt)
20k $\Omega$	10 $\Omega$	$\pm(0.8\%$ of rdg+2dgt)
200k $\Omega$	100 $\Omega$	$\pm(0.8\%$ of rdg+2dgt)
2000k $\Omega$	1k $\Omega$	$\pm(1\%$ of rdg+2dgt)

OVERLOAD PROTECTION: 15 seconds maximum 250Vrms on all ranges.

MAXIMUM OPEN CIRCUIT VOLTAGE: 3.2V.

### Audible Continuity

Range	Description
	Built-in buzzer sounds if resistance is less than 100 $\Omega$ .

OVERLOAD PROTECTION: 250Vrms for a maximum of 15 seconds.

### TR $h_{FE}$

Range	Test Condition	Base Current
NPN	10 $\mu$ A DC	@3.0V DC
PNP	10 $\mu$ A DC	@3.0V DC

### DIODE TEST

Measures forward resistance of a semiconductor junction in k $\Omega$  at max. test current of 1.5mA.

## 5. Operation

### 5-1. Preparation & Caution Before Measurement

1. The function switch should be set to the range to be measured before operation. If the function must be switched during a measurement, always remove the test leads from the circuit being measured.
2. If the unit is used near noise-generating equipment, be aware that the display may become unstable or indicate large errors.
3. Avoid using the unit in places with rapid temperature variations.
4. In order to prevent damage or injury to the unit, never fail to keep the maximum tolerable voltage and current, especially for the 10A current range.
5. Carefully inspect the test leads. If damaged, discard and replace.
6. Be sure to check the annunciator on the display for safety indicator.

### 5-2. Front Panel Description

1. Liquid Crystal Display
2. Function/Rotary Switch
3. TR  $h_{FE}$  Test Socket
4. 10A Input Jack
5. Plug-in Connector for Red (positive) Test Lead.
6. Plug-in Connector for Black (negative) Test Lead.

