

# TENMA®

## Model 72-7770

### Operating Manual



**Palm Size Digital  
Multimeter**

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## Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the **Warnings** and **Notes** strictly.

 **Warning**

**To avoid electric shock or personal injury, read the “Safety Information” and “Rules for Safety Operation” carefully before using the Meter.**

The **Model 72-7770** Multimeter (hereafter referred as “the Meter”) is 3 1/2 digits with steady operations, fashionable design and highly reliable hand-held measuring instrument. The Meter measures AC/DC voltage, AC/DC Current, Resistance, Temperature, Diode and Continuity. It is an ideal tool for maintenance.



Model 72-7770: OPERATING MANUAL

## Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	English Operating Manual	1 piece
2	Test Lead	1 pair
3	Holster	1 piece

In the event you find items missing or damaged, please contact your dealer immediately.

## **Safety Information**

This Meter complies with the standards IEC61010: in pollution degree 2, overvoltage category (CAT I 600V, CAT II 300V) and double insulation.

CAT. I: Signal level, special equipment or parts of equipment, telecommunication, electronic, etc., with smaller transient overvoltages than overvoltages CAT. II.

CAT. II: Local level, appliance, PORTABLE EQUIPMENT etc., with smaller transient overvoltages than CAT. III

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired.



Model 72-7770: OPERATING MANUAL

## Safety Information(2)

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test. A **Note** identifies the information that user should pay attention on.

International electrical symbols used on the Meter and in this Operating Manual are explained on page 10.

 **Warning**


To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- 1 Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.
- 1 Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads with identical model number or electrical specifications before using the Meter.
- 1 Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and ground.
- 1 The rotary switch should be placed in the correct position and no change of range shall be made during measurement , to prevent



**Rules For Safe Operation (2)**












damage of the Meter.

- 1 When the Meter working at an effective voltage over 60V DC or 42V rms AC, special care should be taken for there is danger of electric shock.
- 1 Use the proper terminals, function, and range for your measurements.
- 1 Do not use or store the Meter in an environment of high temperature, humidity, explosive, flammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.
- 1 When using the test leads, keep your fingers behind the finger guards.
- 1 Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes and current.
- 1 Before measuring current, check the Meter's fuses and turn off power to the circuit before connecting the Meter to the circuit.
- 1 Replace the battery as soon as the battery indicator  appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.

Model 72-7770: OPERATING MANUAL  
**Rules For Safe Operation (3)**

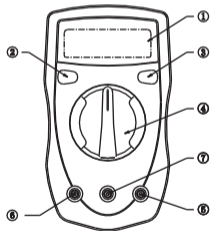
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- 1 **Remove test leads and temperature probe from the Meter and turn the Meter power off before opening the Meter case.**
- 1 **When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.**
- 1 **The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.**
- 1 **Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.**
- 1 **The Meter is suitable for indoor use.**
- 1 **Turn the Meter off when it is not in use and take out the battery when not using for a long time.**
- 1 **Periodically check the battery as it may leak after some time.If leakage is apparent,the battery should be immediately replaced to prevent damage.**

	AC or DC
	AC Current
	DC Current
	Earth Ground
	Double Insulated.
	Low Battery.
	Diode.
	Fuse.
	Continuity Test
	Safety Rules
	Conforms to Standards of European Union.

**The Meter Structure (figure 1)**


- 1) LCD Display
- 2) HOLD Button
- 3) Display Backlight Button
- 4) Rotary Switch
- 5) COM Input Terminal
- 6) 10A Input Terminal
- 7) Other Input Terminals



(figure 1)

**Functional Buttons**

The table below provides information about functional button operation.

<b>Button</b>	<b>Operation Performed</b>
<b>HOLD</b> button	1 Press <b>HOLD</b> once to enter hold mode.
	1 Press <b>HOLD</b> again to exit hold mode.
	1 In Hold mode,  is displayed and the present value is shown.
<b>BLUE</b> button	1 Press <b>BLUE</b> button once to turn the display backlight on.
	1 Press <b>BLUE</b> button again to turn the display backlight off.
	1 Display backlight does NOT be automatically turn off.

### A. DC Voltage Measurement (see figure 2)



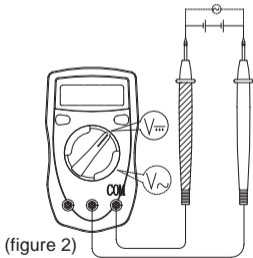
#### Warning

To avoid harm to you or damage to the Meter from electric shock, please do not attempt to measure voltages higher than 500V although readings may be obtained.

The DC Voltage ranges are: 200mV, 2000mV, 20V, 200V and 500V. To measure DC voltage, connect the Meter as follows:

1. Insert the red test lead into the **VΩmA** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to an appropriate measurement position in **V $\overline{\text{---}}$**  range.
3. Connect the test leads across with the object being measured.

The measured value shows on the display.



**Note**

- I If the value of voltage to be measured is unknown, use the maximum measurement position (500V) and reduce the range step by step until a satisfactory reading is obtained.
- I The LCD displays “1” indicating the existing selected range is overload; it is required to select a higher range in order to obtain a correct reading.
- I In each range, the Meter has an input impedance of approx. 10M $\Omega$ . This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10k $\Omega$ , the error is negligible (0.1% or less).
- I When DC voltage measurement has been completed, disconnect the connection between the test leads and the circuit under test.

**B. AC Voltage Measurement** (see figure 2)



**Warning**

**To avoid harm to you or damage to the Meter from electric shock, please do not attempt to measure voltages higher than 500Vrms although readings may be obtained.**

The AC voltage measurement positions are: 200V and 500V. To measure AC Voltage, connect the Meter as follows:

1. Insert the red test lead into the **VΩmA** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to an appropriate measurement position in **V~** range.
3. Connect the test leads across with the object being measured.

The measured value shows on the display, which is effective value of sine wave (mean value response).



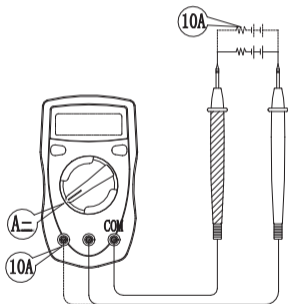
**Note**

- I If the value of voltage to be measured is unknown, use the maximum measurement position (500V) and reduce the range step by step until a satisfactory reading is obtained.
- I The LCD displays “1” indicating the existing selected range is overload, it is required to select a higher range in order to obtain a correct reading.
- I In each range, the Meter has an input impedance of approx. 10M $\Omega$ . This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10k $\Omega$ , the error is negligible (0.1% or less).
- I When AC voltage measurement has been completed, disconnect the connection between the test leads and the circuit under test.

C. DC Current Measurement (see figure 3)

**Warning**

Never attempt an in-circuit current measurement where the voltage between terminals and ground is greater than 60V. If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the test leads are connected to the current terminals, do not parallel them across any circuit.



( figure 3 )

Current measurement has 4 positions on the rotary switch:  
2000 $\mu$ A, 20mA, 200mA and 10A

To measure current, do the following:

1. Turn off power to the circuit. Discharge all high-voltage capacitors.
2. Insert the red test lead into the V $\Omega$ mA or 10A terminal and the black test lead into the COM terminal.
3. Set the rotary switch to an appropriate measurement position in A  $\overline{\text{---}}$  range.
4. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
5. Turn on power to the circuit.

The measured value shows on the display.

Note

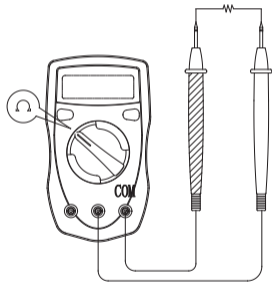
- I If the value of current to be measured is unknown, use the maximum measurement position (10A)
- I Reduce the range step by step until a satisfactory reading is obtained.
- I When current measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

**D. Measuring Resistance (see figure 4)** **Warning**

To avoid damage to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

Resistance measurement positions are:  
200 $\Omega$ , 2000 $\Omega$ , 20k $\Omega$ , 200k $\Omega$ , 20M $\Omega$   
and 200M $\Omega$

To measure resistance, connect the Meter as follows:



( figure 4)

1. Insert the red test lead into the  $V\Omega mA$  terminal and the black test lead into the COM terminal.
2. Set the rotary switch to an appropriate measurement position in  $\Omega$  range.
3. Connect the test leads across with the object being measured.

The measured value shows on the display.

#### Note

- 1 The test leads can add  $0.1\Omega$  to  $0.3\Omega$  of error to resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of  $200\Omega$ , short-circuit the input terminals beforehand and record the reading obtained (called this reading as X). (X) is the additional resistance from the test lead. Then use the equation:  
measured resistance value (Y) - (X) = precision readings of resistance.
- 1 For high-resistance measurement ( $>1M\Omega$ ), it normally takes several seconds to obtain a stable reading.
- 1 When resistance measurement has been completed, disconnect the connection

between the test leads and the circuit under test.

#### E. Diodes and Continuity Measurement (see figure 5)

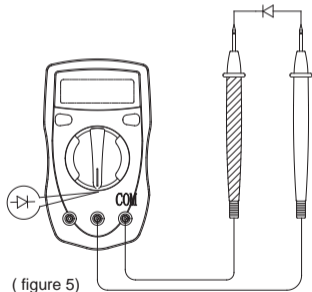
##### Testing Diodes



##### Warning

To avoid damage to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before diodes.


Use the diode test to check diodes, transistors, and other semiconductor devices. The diode test sends a current through the semiconductor junction, and then measures the voltage drop



(figure 5)

across the junction. A good silicon junction drops between 0.5V and 0.8V.

To test a diode out of a circuit, connect the Meter as follows:

1. Insert the red test lead into the V $\Omega$ mA terminal and the black test lead into the COM terminal.
2. Set the rotary switch to  (diode symbol).
3. For forward voltage drop readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.

The measured value shows on the display.

#### Note


- 1 In a circuit, a good diode should still produce a forward voltage drop reading of 0.5V to 0.8V; however, the reverse voltage drop reading can vary depending on the resistance of other pathways between the probe tips.



- I Connect the test leads to the proper terminals as said above to avoid error display. The LCD will display “1” indicating open-circuit for wrong connection. The unit of diode is Volt (V), displaying the positive-connection voltage-drop value.
- I When diode testing has been completed, disconnect the connection between the test leads and the circuit under test.

### Testing for Continuity

To test for continuity, connect the Meter as below:

1. Insert the red test lead into the  $V\Omega mA$  terminal and the black test lead into the COM terminal.
2. Set the rotary switch to .
3. Connect the test leads across with the object being measured.

The buzzer sounds if the resistance of a circuit under test is less than  $70\Omega$ .

### Note

- I The LCD displays “1” indicating the circuit being tested is open.

- I When continuity testing has been completed, disconnect the connection between the test leads and the circuit under test.

#### F. Square Wave Output



#### Warning

To avoid damage to the Meter, do not allow output terminals (red test lead) to reach higher than 10V.

To generate square wave output proceed as follows:

1. Set the rotary switch to  $\square$  OUT.
2. The square wave signal output is between V $\Omega$ mA and COM Terminals.

#### Note




- I The frequency is approx. 50Hz.
- I The output level is > 3Vpp at 1M $\Omega$  load.

**General Specifications(1)**

- I When square wave output testing has been completed, disconnect the connection between the testing leads and the circuit under test.

**General Specifications**

- I Maximum Voltage (including transients ) between any Terminals and Ground: 500V rms.
- I  $\Delta$ Fused Protection for V $\Omega$ mA Input Terminal: 315mA, 250V fast type,  $\phi$ 5x20 mm
- I 10A Terminal: Un-fused.
- I Range: Manual ranging
- I Maximum Display: Display: 1999.
- I Measurement Speed: Updates 2~3 times /second.
- I Temperature:
  - Operating: 0°C~40°C (32°F~104 °F).
  - Storage: -10°C~50°C (14°F~122°F).
- I Relative Humidity:  $\leq$ 75% @ 0°C - 30°C;  $\leq$ 50% @ 31 - 40°C.

- I Altitude:Operating: 2000 m.  
Storage: 10000 m.
- I Battery Type: One piece of 9V Battery NEDA 1604 or 6F22 or 006P.
- I Low Battery : Display: .
- I Negative reading: Display: .
- I Overloading: Display: 1.
- I Dimensions (HxWxL): 130 x 73.5 x 35mm.
- I Weight: Approx. 156g (battery included).
- I Safety/Compliances: IEC61010 CAT.I 600V overvoltage and double insulation standard.
- I Certification: 

Accuracy:  $\pm(a\% \text{ reading} + b \text{ digits})$ , guarantee for 1 year.

Operating temperature:  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

Relative humidity:  $<75\%$ .

Temperature coefficient:  $0.1 \times (\text{specified accuracy}) / 1^{\circ}\text{C}$ .

#### A. DC Voltage

Range	Resolution	Accuracy	Overload Protection
200mV	100 $\mu$ V	$\pm(0.5\%+2)$	250V DC or AC
2000mV	1mV		500V DC or AC
20V	10mV		
200V	100mV	$\pm(0.8\%+2)$	
500V	1V		

Remark: Input impedance: 10M $\Omega$ .

## B. AC Voltage

Range	Resolution	Accuracy	Overload Protection
200V	100mV	$\pm (1.2\%+10)$	500V DC or AC
500V	1V		

### Remarks:

- I Input impedance: approx. 5M $\Omega$ .
- I Displays effective value of sine wave (mean value response).
- I Frequency response 40Hz ~ 400Hz.

**C. DC Current**

Range	Resolution	Accuracy	Overload Protection
2000 $\mu$ A	1 $\mu$ A	$\pm(1\%+2)$	315mA, 250V fast type fuse: $\phi$ 5x20mm
20mA	10 $\mu$ A		
200mA	100 $\mu$ A	$\pm(1.2\%+2)$	
10A	10mA	$\pm(2\%+5)$	Un-Fused

**Remark:**

- I At 10A Range: For continuous measurement  $\leq 10$  seconds and interval not less than 15 minutes.

Model 72-7770: OPERATING MANUAL  
Accuracy Specifications(4)



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D. Resistance


Range	Resolution	Accuracy	Overload Protection
200Ω	0.1Ω	$\pm(0.8\%+5)$	250V DC or AC
2000Ω	1Ω	$\pm(0.8\%+2)$	
20kΩ	10Ω		
200kΩ	100Ω		
20MΩ	10kΩ	$\pm(1\%+5)$	
200MΩ	100kΩ	$\pm [5\%(\text{reading}-10)+10]$	



**E. Diodes and Continuity Measurement**

Range	Resolution	Remark	Overload Protection
	1mV	Displays approximate forward voltage drop: 0.5V~0.8V.	250V DC or AC
	1Ω	Buzzer beeps at <math><70\Omega</math>	

**F. Square Wave Output**

Range	Illustration
 OUT	Approx. output 50Hz square wave signal. As a simple signal source with 47kΩ resistance output.

**Remark:**

- 1 No overload protection.
- 1 Make sure voltage output of calibrated equipment level is less than 10V to avoid damages to the meter.

This section provides basic maintenance information including battery and fuse replacement instruction.

 Warning

Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information. To avoid electrical shock or damage to the Meter, do not get water inside the case.


A. General Service

- I Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- I To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- I Turn the Meter to OFF position when it is not in use and take out the battery when not using for a long time.

I Do not store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

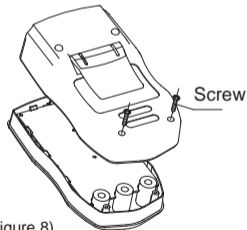
B. Replacing the Battery (see figure 8)

**⚠ Warning**

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator “” appears.

To replace the battery:

1. Disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.



( figure 8 )

2. Turn the Meter to OFF position.
  3. Remove the screw from case bottom, and separate the case bottom from the case top.
  4. Remove the battery from the battery compartment.
  5. Replace the battery with a new 9V battery (NEDA 1604 or 6F22 or 006P).
  6. Rejoin the case bottom and case top, and reinstall the screw.
- C. Replacing the Fuses (See figure 8)

 Warning

To avoid electrical shock, arc blast, personal injury or damage to the Meter, use specified fuses **ONLY** in accordance with the following procedure.

To replace the Meter's fuse:

1. Disconnect the connection between the test leads and the circuit under test, and remove the test leads from the input terminals of the Meter.
2. Turn the Meter to OFF position.

3. Remove the screw from case bottom, and separate the case bottom from the case top.
4. Remove the fuse by gently prying one end loose, and then take out the fuse from its bracket.
5. Install ONLY replacement fuses with the identical type and specification as follows and make sure the fuse is fixed firmly in the bracket. 315mA, 250V, fast type,  $\phi$  5x20mm.
6. Rejoin the case bottom and case top, and reinstall the screw.

Replacement of the fuses is seldom required. Burning of a fuse always results from improper operation.

\*\* END \*\*





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