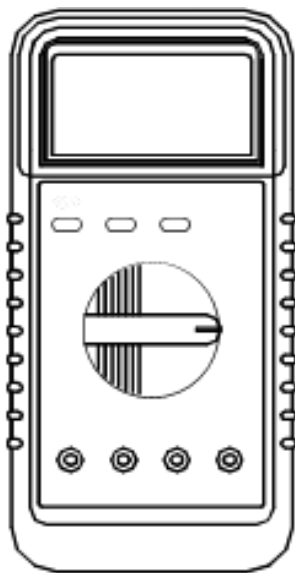


# **DIGITAL MULTIMETER**

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## **USER'S MANUAL**

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# 1. SAFETY INFORMATION

This multimeter has been designed according to IEC-61010 concerning electronic measuring instruments with an overvoltage category ( CAT III) and pollution 2. Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

## 1.1 PRELIMINARY

※ When using this meter, the user must observe all normal safety rules concerning:

- Protection against the dangers of electrical current.
- Protection of the meter against misuse.

※ Full compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electronic ratings. Measuring leads must be in good condition.

## 1.2 DURING USE

※ Never exceed the protection limit values indicated in specifications for each range of measurement.

※ When the meter is linked to measurement circuit, do not touch unused terminals.

※ When the value scale to be measured is unknown beforehand, set the range selector at the highest position.

※ Before rotating the range selector to change functions, disconnect test leads from the circuit under

test.

※ When carrying out measurements on TV or switching power circuits, always remember that there may be high amplitude voltages pulses at test points which can damage the meter.

※ Never perform resistance measurements on live circuits.

※ Always be careful when working with voltages above 60V dc or 30V ac rms. Keep fingers behind the probe barriers while measuring.

### 1.3 SYMBOLS



Important safety information, refer to the operating manual.



Dangerous voltage may be present.



Earth ground



Double insulation (Protection class II)

### 1.4 MAINTENANCE

※ Before opening the meter, always disconnect test leads from all sources of electric current.

※ For continue protection against fire, replace fuse only with the specified voltage and current ratings:  
F1: F 500mA/600V            F2: F 10A/600V

※ If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.


- ※ Never use the meter unless the back cover is in place and fastened fully.
- ※ To clean the meter, use a damp cloth and mild detergent only, do not use abrasives or solvents on it.

## **2. DESCRIPTION**

This meter is a portable professional measuring instrument with 3 1/2 digit LCD, capable of performing functions:

- DC and AC voltage measurement
- DC and AC current measurement
- Resistance measurement
- Capacitance measurement
- Diode test
- Temperature test
- Audible continuity test
- Frequency measurement
- Non-Contact Voltage Detect (NCV/EF)

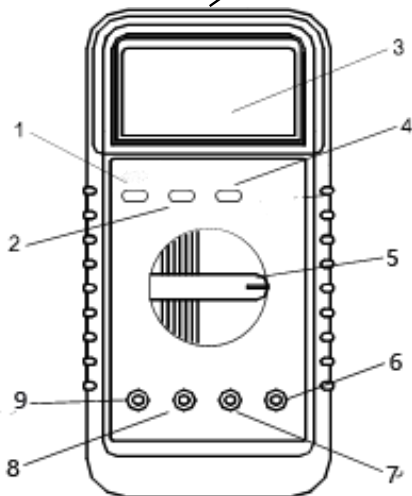
## **NAMES OF COMPONENTS**

1. Function button
2. Range control button
3. LCD display
4. Data hold button
5. Rotary switch/power switch
6. V/ $\Omega$ / $^{\circ}$  C//Hz input jack
7. COM input jack

8.  $\mu$  A/mA input jack

9. 10A input jack

Non-contact voltage detect  
(NCV/EF) test area



## 2.1 FUNC. Button

Push this button to select AC or DC current measuring function when the function switch is set at  $\mu$ A, mA, A positions.

Push this button to select AC or DC voltage measuring function when the function switch is set at mV.

Push this button to select  $\rightarrow|/\bullet$  measuring function when the function switch is set at  $\rightarrow|/\bullet$  positions.

Push this button to select  $\rightarrow|/\Omega$  measuring function when the function switch is set at  $\rightarrow|/\Omega$  positions.

## 2.2 RANGE CONTROL BUTTON

You can switch off the automatic measuring range and can measure AC/DC voltage, AC/DC current ( $\mu\text{A}$  and  $\text{mA}$  only) and resistance in manual range by pressing the Range key.

Manual mode is switched OFF if you keep pressing "Range" key until display shows "AUTO".






## 2.3 DATA HOLD BUTTON

When this button is pushed, the display will show the last reading and "H" symbol will appear until pushing it again.

Data holding will be canceled automatically when the function switch is rotated.

## 2.4 INPUT JACKS

This meter has four input jacks that are protected against overload to the limits. During use, connect the black test lead to the COM jack and red test lead as shown below:

Function	Red lead connection	Input limits
DCV/ACV	$\text{V}/\Omega/^\circ\text{C}/\text{Hz}$ 	1000V dc or 1000V rms ac
$\text{Hz}/^\circ\text{C}$	$\text{V}/\Omega/^\circ\text{C}/\text{Hz}$ 	250V dc or rms ac
$\Omega$ 	$\text{V}/\Omega/^\circ\text{C}/\text{Hz}$ 	250Vdc or rms ac
$\mu\text{A}/\text{mA}$	$\mu\text{A}/\text{mA}$	500mA dc or rms ac
$\text{nF}/\mu\text{F}$	$\text{V}/\Omega/^\circ\text{C}/\text{Hz}$ 	250Vdc or rms ac
A	A	10A dc or rms ac

$\mu\text{A}/\text{mA}$  and A ranges are protected by fuses.

## **3. OPERATING INSTRUCTION**

### **3.1 MEASURING VOLTAGE**

1. Connect the black test lead to the COM jack and the red test lead to the  $V/\Omega/\text{° C}/\text{Hz}$  jack.
2. Set the rotary switch at the desired  $V_{\square}$  or  $V_{\sim}$  range position and connect test leads across the source or load under measurement.
3. Read LCD display. The polarity of the red connection will be indicated when making a dc voltage measurement.

### **3.2 MEASURING CURRENT**

1. Connect the black test lead to the COM jack and the red test lead to the  $\mu\text{A}/\text{mA}$  jack for a maximum of 500mA. For a maximum of 10A, move the red lead to the A jack.
2. Set the rotary switch at  $\mu\text{A}/\text{mA}$  and A range position to be used and push FUNC. button to select DCA or ACA measuring mode.
3. Connect test leads in series with the load in which the current is to be measured.
4. Read LCD display. The polarity of read connection will be indicated when making a DC measurement.

### **3.3 MEASURING FREQUENCY**

1. Connect the black test leads to the COM jack and the red test lead to the  $V/\Omega/\text{° C}/\text{Hz}$  jack.
2. Set the rotary switch at Hz position and connect test leads across the source or load under measurement.

**NOTE:**

The input voltage should be between 200mV and 10V rms ac. If the voltage is more than 10V rms, reading may be out of the accuracy range.

**3.4 MEASURING RESISTANCE**

1. Connect the black test lead to the COM jack and the red test lead to the  $V/\Omega/^\circ C/\text{Hz}$  jack. ( NOTE :The polarity of red lead connection is positive“+”)
2. Set the rotary switch at desired  $\Omega$  range position and connect test leads across the resistance under measurement.

**NOTE:**

1. For resistance above  $4M\Omega$ , the meter may take a few seconds to stabilize reading.
2. When the input is not connected, i.e. at open circuit, the figure “OL” will be displayed for the overrange condition.
3. When checking in - circuit resistance, be sure the circuit under test has all power removed and all capacitors are full discharged.

**3.5 MEASURING CAPACITANCE**

1. Connect the black test lead to the COM jack and the red test lead to the  $V/\Omega/^\circ C/\text{Hz}$  jack. (NOTE: The polarity of the red lead is positive “+”.)
2. Set the function switch at desired  $\Omega$  range position and push the FUNC. button to select capacitance mode.

3. Connect test leads across the capacitor under measurement and be sure that the polarity of connection is observed.

**NOTE:**

1. When checking in-circuit capacitance, be sure that the circuit has all power removed and all capacitors are fully discharged.


2. The range control mode in capacitance measurement is auto ranging.

3. If range control button is used in this function measuring, decimal points may be at incorrect positions.

4. At the nF range, when the capacitor to be measured is not connected to test leads, the LCD may not read zero, but a few counts. These counts have to be subtracted from measuring results.

### **3.6 TESTING DIODE & CONTINUITY**

1. Connect the black test lead to the COM jack and the red test lead to the  $V/\Omega/^\circ C/\text{diode}/\text{Hz}$  jack. ( NOTE: The polarity of red lead connection is positive “ + ” .)


2. Set the rotary switch at  position and push the FUNC. button to select continuity or diode test mode.

3. In continuity testing, if continuity exists (i.e., resistance less than about  $50\Omega$ ), built-in buzzer will sound.

4. If diode test mode is selected, connect the red and black leads to the anode and cathode of the diode under test. The forward voltage drop of this diode in V

will be displayed.

### **3.7 TEMPERATURE TEST**

1. Set the rotary switch to °C range and the LCD will show the current environment temperature.
2. Connect the black test lead to the COM jack and the red test lead to the V/Ω/° C/  /Hz jack. ( NOTE: The polarity of red lead connection is positive “ + ”.)

### **3.8 Non-contact Voltage Detect (NCV/EF) Test**

1. Set the rotary switch to NCV range.
2. Make top of device (marking NCV) close to test wire/socket.
3. It will show 4 bars according to LIVE voltage level and distance.

## **4. SPECIFICATIONS**

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.

Accuracy specifications are given as:

± % of reading ± number of least significant digits.

#### **4.1 GENERAL**

MAXIMUM VOLTAGE BETWEEN TERMINALS AND EARTH GROUND:

1000V DC or 1000 rms AC (sine)

FUSE PROTECTION: mA: F 500mA/600V

A: F 10A/600V

POWER SUPPLY: 9V battery, NEDA 1604 or 6F22

DISPLAY: LCD, 3999 counts MAX, updates 2-3/sec

MEASURING METHOD:  $\Delta\Sigma$  A/D converter

OVERRANGE INDICATION:

“OL” figure only on the display

POLARITY INDICATION:

“–” displayed for negative polarity

LOW BATTERY INDICATION: “” displayed

OPERATING TEMPERATURE:

0°C to 40°C (32°F to 104°F)

STORAGE TEMPERATURE:

-10°C to 50°C (14°F to 122°F)

DIMENSION: 91×189×31.5mm

WEIGHT: 310g (including battery)

## 4.2 DC VOLTAGE

Range	Resolution	Accuracy
400mV	0.1mV	$\pm 0.5 \% \text{ of rdg} \pm 2 \text{ digit}$
4V	1mV	$\pm 0.5 \% \text{ of rdg} \pm 2 \text{ digit}$
40V	10mV	
400V	100mV	
1000V	1V	$\pm 0.5 \% \text{ of rdg} \pm 2 \text{ digit}$

Input impedance: 10M $\Omega$ , more than 100M $\Omega$  at 400mV range.

## 4.3 AC VOLTAGE

Range	Resolution	Accuracy
4V	1mV	$\pm 0.8 \% \text{ of rdg} \pm 3 \text{ digit}$
40V	10mV	
400V	100mV	
1000V	1V	

Input Impedance: 10M $\Omega$

Frequency range: 40 to 400Hz, 40 to 200Hz for 4V range.

Response: Average, calibrated in rms of sine wave.

## 4.4 AC CURRENT

Range	Resolution	Accuracy	Burden voltage
400 $\mu$ A	0.1 $\mu$ A	$\pm 1.5\% \pm 5$	0.5mV/ $\mu$ A
4000 $\mu$ A	1 $\mu$ A		8.0mV/mA
40mA	10 $\mu$ A		
400mA	0.1mA	$\pm 3.0 \% \pm 7$	0.02V/A
10A	10mA		

Overload protection: F 500mA fuse for A and mA ranges, F 10A fuse for A range.

Frequency Range: 40Hz to 400Hz

Response: Average, calibrated in rms of sine wave

#### 4.5 DC CURRENT

Range	Resolution	Accuracy	Burden voltage
400 $\mu$ A	0.1 $\mu$ A	$\pm 1.2\% \pm 3$	0.5mV/ $\mu$ A
4000 $\mu$ A	1 $\mu$ A		
40mA	10 $\mu$ A		8.0mV/mA
400mA	0.1mA		
10A	10mA	$\pm 2.0\% \pm 5$	0.02V/A

Overload protection: F 500mA fuse for A and mA ranges, F 10A fuse for A range.

#### 4.6 CAPACITANCE

Range	Resolution	Accuracy
4nF	0.001nF	$\pm 5.0\%$ of rdg $\pm 15$ digits
40nF	0.01nF	$\pm 4.0\%$ of rdg $\pm 5$ digits
400nF	0.1nF	
4 $\mu$ F	1nF	
40 $\mu$ F	10nF	
400 $\mu$ F	100nF	
4mF	1 $\mu$ F	

#### 4.7 FREQUENCY

Range	Resolution	Accuracy
40Hz	0.01 Hz	± 0.2% of rdg ± 3 digits
400Hz	0.1 Hz	
4KHz	1 Hz	
40KHz	10Hz	
400kHz	100Hz	
1MHz	1KHz	

Sensitivity: 200mV rms up to 50kHz, 1V rms for 50KHz to 400KHz.

#### 4.8 RESISTANCE

Range	Resolution	Accuracy
400Ω	0.1Ω	±0.8% rdg ± 3 digits
4KΩ	1Ω	±0.8% rdg ± 1 digits
40KΩ	10Ω	
400KΩ	100Ω	
4MΩ	1000Ω	
40MΩ	10KΩ	±1.5% rdg ± 2 digits

Maximum open circuit voltage: 1.3V

#### 4.9 TEMPERATURE (TC - K type)

Range	Resolution	Accuracy
-200°C~0°C	1°C	±5.0% rdg ± 4 digits
1°C~400°C		±2.0% rdg ± 3 digits
401°C~1200°C		±2.0% rdg

#### 4.10 DIODE TEST

Function	Range	Resolution	Accuracy
Diode Test ▶+	2.000V	0.001V	1.0% uncertainty

Overload protection: 250V dc or 250V ac rms.  
Test condition: Forward DC current approximately 1mA.  
Reversed DC voltage approximately 1.5V

#### 4.11 CONTINUITY CHECK

Function	Range	Resolution	Description
Continuity Test ▶	400.0Ω	0.1Ω	Continuity beeper ≤50Ω

Overload protection: 250V dc or 250V ac rms.  
Test condition: Open circuit voltage: approx. 0.5V

#### 4.12 Non-contact Voltage Detect

Voltage	Frequency	Indication
50~1000V	50Hz~400Hz	4 Bars display/ Beep

### 5. ACCESSORIES

#### 5.1 SUPPLIED WITH THE MULTIMETER

Test leads	Electric Rating 1000V, 10A	1 couple
Battery	9V NEDA 1604 or 6F22	1 pcs
Operating Manual		1 pcs
Holster		1 pcs
K-type thermocouple sensor		1 pcs

## 5.2 HOW TO USE THE HOLSTER

The holster is used to protect the meter and to make the measurement more comfortable, it comes with two stands installed together. The figure shows how to use the holster to:

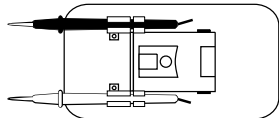
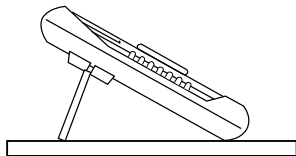
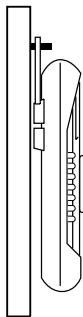
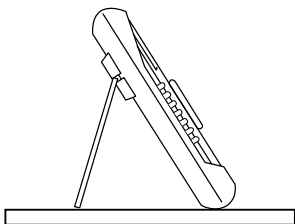
A: Support the meter with a standard angle.

B: Support the meter with a small angle using the little stand


C: Hang the meter on the wall using the little stand.

Take the little stand off from the back side of the large and insert it into holes located upper on the holster.

D. hold test leads



## 6. BATTERY & FUSE REPLACEMENT

If the sign “” appears on the LCD display, it indicates that battery should be replaced.

Remove screws on the back cover and open the case.

Replace the exhausted battery with a new one.

Fuse rarely need replacement and blow almost always as a result of the operator's error. Open the case as mentioned above, and then take the PCB out from the front cover. Replace the blown fuse with same ratings.



### WARNING

Before attempting to open the case, be sure that test leads have been disconnected from measurement circuits to avoid electric shock hazard.

For protection against fire, replace fuse only with specified ratings:

F1: 500mA/600V (quick acting)

F2: 10A/600V (quick acting)