

OPERATOR'S INSTRUCTION MANUAL

- AUTO-RANGE
- DUAL DISPLAY
- CONFORMED IEC1010

DIGITAL MULTIMETER



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1. SAFETY INFORMATION

The meter has been designed according to IEC-1010 concerning electronic measuring instruments with an overvoltage category (CAT II) 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 the 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

electric 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 a 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 voltage pulses at test points, which


can damage the meter.


- Never perform resistance measurements on live circuits.
- Always is 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:
F 15A/250V
- 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 an autoranging professional measuring instrument. Digit reading is 3999 counts and the bar graph consists of 38 segments for LCD, capable of performing functions:

- DC voltage measuring (Auto Ranging)
- AC voltage measuring (Auto Ranging)
- DC current measuring
- AC current measuring
- Temperature measuring
- Resistance measuring (Auto Ranging)
- Capacitance measuring

- Diode testing
- Transistor testing
- Audible continuity testing

2.1 ON/OFF SWITCH

A push – push switch is used to turn the meter on or off. When the switch is push the beeper will sound.

2.2 DC/AC OR Ω / \bullet) BUTTON

This button is used to select DCV or ACV on voltage range, DCA or ACA on current range, Ω or \bullet) on Ω / \bullet) range. When the button is push the beeper will sound.


2.3 R-H BUTTON

In auto-range, press this button to select manual range and “R-H” symbol will appear on

the LCD. Press the button again for more than 1 second will come back the auto-range mode.

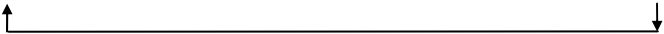
When the R-H button is pushed, voltage ranges will change as:

4V → 40V → 400V → 1000V



Or resistance ranges change as:

40MΩ → 4MΩ → 400kΩ → 40kΩ → 4kΩ → 400Ω




2.4 B/L BUTTON

Press this button to toggle back-lit ON. The screen of the meter will light. Press the button again, back-lit turn off.

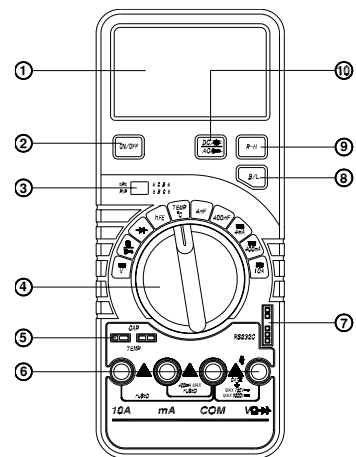
2.5 INPUT JACKS

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 the red test lead as shown below:

FUNCTION	RED LEAD CONNECTION	INPUT LIMITS
DCV/ACV	V/ Ω	1000V dc or 750V rms ac
Ω	V/ Ω	250V dc or rms ac
	V/ Ω	250V dc or rms ac
mA	mA	400mA dc or rms ac
10A	10A	10A dc or rms ac

2.6 FRONT PANEL

- . DISPLAY
- . ON/OFF SWITCH
- . TRANSISTOR TESTING SOCKET
- . FUNCTION SWITCH
- . CAPACITANCE OR TEMPERATURE TESTING SOCKET
- . INPUT JACKS
- . RS232C SOCKET
- . B/L BUTTON
- . R-H BUTTON
- . DC/AC OR Ω / \bullet ||) BUTTON



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3. OPERATING INSTRUCTION

3.1 VOLTAGE MEASURING

1. Connect the black test lead to the COM jack and the red test lead to the
2. V/ Ω jack.
3. Set the function switch at V range and connect test leads across the source or load under measurement.

4. Push the DC/AC button to select DCV or ACV measuring mode. (Push the R-H button to select manual range.)

Read LCD display. The polarity of red test lead connection will be indicated when making a DC measurement.

3.2 CURRENT MEASURING

1. Connect the black test lead to the COM jack and the red test lead to the mA jack for a maximum of 400mA. For a maximum of 10A, move the red lead to the 10A jack.
2. Set the function switch at mA or 10A range and push the DC/AC 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 red test lead connection will be indicated when making a DC measurement.

3.3 RESISTANCE MEASURING

1. Connect the black test lead to the COM jack and the red test lead to the V/ Ω jack. (NOTE: The polarity of the red test lead connection is positive "+")

2. Set the function switch at Ω range to be used and connect test leads across the resistance under measurement.

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NOTE:

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

3.4 CAPACITANCE MEASURING

1. Set the function switch at nF range.

~~2. Before inserting capacitor under measurement into capacitance testing socket,~~

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be sure that the capacitor has been discharged fully.

 WARNING:

Before attempting to insert capacitor for testing, always be sure that test leads have been disconnected from any measurement circuits.

Components should not be connected to the capacitor socket when making voltage measurements with test leads.

3.5 TEMPERATURE MEASURING

1. Set the function switch at TEMP range.

2. Insert "K" type thermocouple into the temperature measuring socket on front panel and contact the object to be measured with the thermocouple probe.

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 **WARNING:**

To avoid electric shock, be sure the thermocouple has been removed before changing to another function measurement. Before attempting to insert thermocouple for testing, always be sure that test leads have been disconnected from any measurement circuits.

3.6 AUDIBLE CONTINUITY TESTING

1. Connect the black test lead to the COM jack and the red test lead to the V/ Ω jack. (NOTE: The polarity of red test lead connection is positive "+")
2. Set the function switch at $\bullet \parallel$ position and push the $\Omega / \bullet \parallel$ button.
3. Connect test leads to two points of the circuit under measurement. If continuity exists (i.e., the resistance is lower than 30Ω), built-in buzzer will sound.

3.7 DIODE TESTING

1. Connect the black test lead to the COM jack and the red test lead to the V/ Ω jack.

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(NOTE: The polarity of the red test lead connection is positive "+")

2. Set the function switch at $\blacktriangleright +$ position.
3. Connect the red test lead to the anode of the diode to be tested and the black test lead to the cathode.

4. Read LCD display to get the forward voltage drop of the diode under testing.

3.8 TRANSISTOR TESTING

1. Set the function switch at hFE position.
2. Determine whether the transistor is NPN or PNP type and locate emitter, base, and collector lead. Insert leads of the transistor into proper holes of the transistor testing socket on the front panel.
3. The meter will show the approx. hFE value at test condition of base current $10\mu\text{A}$ and $V_{ce} 3.0\text{V}$.

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 **WARNING:**

Before attempting to insert transistor for testing, always be sure that test leads have been disconnected from any measurement circuits.

Components should not be connected to the transistor socket when making voltage measurements with test leads.

3.9 INTERFACING THE METER WITH A PC (OPTION)

1. Connect the RS232C cable between the meter and computer's serial ports.
2. Press ON/OFF to turn on the meter. Turn on the computer.

 **WARNING:**

~~1. Use only the type of serial interface cable RS232C cable exclusively designed~~

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for your meter. Never attempt to modify or extend the length of RS232C cable.

2. Please read this file of readme from Disks.

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 75%.

4.1 GENERAL

Max. Voltage Between Terminals and Earth Ground: 1000V dc or 750V rms ac (sine)


Power Supply: 9V NEDA1604 6F22 006P

Ranging Method: Auto / Manual

Display: LCD, 3999 counts max and bar graph consists of 38 segments

Overrange Indication: "OL" displayed

Polarity Indication: "-" displayed automatically

Low Battery Indication: "  "displayed

Operating Temperature: 5°C to 35°C (41°F to 95°F)

Storage Temperature: -10°C to 60°C (14°F to 140°F)

Dimension: 78mm × 186mm × 35mm

Weight: 300g (Including battery)

4.2 DC VOLTAGE

Range	Resolution	Accuracy
4V	1mV	±0.5% of rdg ± 3 digits
40V	10mV	
400V	0.1V	
1000V	1V	±0.8% of rdg ± 3 digits

Input Impedance: 10MΩ.

4.3 AC VOLTAGE

Range	Resolution	Accuracy
4V	1mV	± 1.2% of rdg ± 5 digits
40V	10mV	
400V	0.1V	
750V	1V	± 1.5% of rdg ± 5 digits

Input Impedance: 10M Ω

Frequency Range: 40 to 400Hz

Response: Average, calibrated in rms of sine wave.

4.4 RESISTANCE

Range	Resolution	Accuracy
400 Ω	0.1 Ω	$\pm 1.2\%$ of rdg ± 3 digits
4k Ω	1 Ω	
40k Ω	10 Ω	
400k Ω	0.1k Ω	
4M Ω	1k Ω	
40M Ω	10k Ω	$\pm 3.0\%$ of rdg ± 5 digits

Maximum Open Circuit Voltage: 3.0V

Overload Protection: 250V dc or rms.ac for all ranges.

4.5 DC CURRENT

Range	Resolution	Accuracy
4mA	1 μ A	$\pm 1.2\%$ of rdg ± 3 digits
400mA	0.1mA	
10A	10mA	$\pm 2.0\%$ of rdg ± 8 digits

Overload Protection: F 15A/250V fuse for 10A range.

4.6 AC CURRENT

Range	Resolution	Accuracy
4mA	1 μ A	$\pm 1.5\%$ of rdg ± 8 digits
400mA	0.1mA	
10A	10mA	$\pm 3.0\%$ of rdg ± 8 digits

Overload Protection: F 15A/250V fuse for 10A range.

Frequency Range: 40 to 400Hz

Response: Average, calibrated in rms of sine wave.

4.7 CAPACITANCE

Range	Resolution	Accuracy
4nF	1pF	±4.0% of rdg ±5 digits
400nF	0.1nF	

4.8 TEMPERATURE

Range	Resolution	Accuracy
0°C to 400°C	1°C	±3.0% of rdg ±3 digits
401°C to 750°C	1°C	±3.0% of rdg ±5 digits

4.9 AUDIBLE CONTINUITY

Function	Description
•))	Built-in buzzer will sound, if resistance is lower than 30Ω.

4.10 DIODE

Function	Resolution	Test Current	Open Circuit Voltage
▶	1mV	25μA	3.0V

4.11 TRANSISTOR

Function	Range	Base Current	Vce
hFE	1 to 1000	10μA	3.0V

5. ACCESSORIES


5.1 SUPPLIED WITH THE METER

- Operating Manual
- Set of test leads
- 9V battery. NEDA1604 6F22 006P
- "K" type thermocouple

5.2 OPTIONAL ACCESSORY

- Holster
- RS232C Cable
- Set of 3.5" 1.44MB disk

6. BATTERY AND FUSE REPLACEMENT

If the sign “  ” appears on the LCD display, it indicates that the 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 take the PCB assembly out from the case. Replace the blown fuse with ratings specified.

WARNING:

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

For protection against fire, replace fuses only with specified ratings: F 15A/250V

$$^{\circ}\text{F}=(^{\circ}\text{C} \times 1.8+32)$$

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