

# DIGITAL MULTIMETER OPERATION MANUAL






## 1. GENERAL

The instrument is a stable and good performance digital multimeter driven by battery. It uses the LCD with 42mm-high figure to make the reading clear. Unit symbol displaying, backlight and the function of overload protection make operation is convenient.

The instrument has the function of measuring DCV, ACV, DCA, ACA, resistance, capacitance, inductance, temperature and frequency, and diode, triode and continuity test. The instrument takes dual-integral A/D converter as key point, is an excellent tool.


## 2. SAFETY NOTES

This series meter meets the standard of IEC1010. Please read below notes carefully before operation.

- Do not input a limited voltage which RMS is over DC 1000V or AC 700V when measuring voltage.
- Voltage less than 36V is a safety voltage. When measuring voltage higher than DC 36V, AC 25V, check the connection and insulation of test leads to avoid electric shock.
- Be sure to keep the test leads off the testing point when converting function and range.
- Select correct function and range to avoid fault operation.
- When measuring current, do not input current over 20A.
- Safety symbols  
 exists high voltage,  "GND",  dual insulation,  must refer to manual,  low battery

## 3. SPECIFICATION

### 1) GENERAL

- 1-1. Displaying : LCD displaying
- 1-2. Max. indication: 1999 (3 1/2) , auto polarity indication
- 1-3. Measuring method: dual slope A/D transfer
- 1-4. Sampling rate: approx. 3 times/sec
- 1-5. Over range indication: MSD displays "1" / "OL" or "-1" / "-OL"
- 1-6. Low battery indication:  symbol displays
- 1-7. Operation: 0~40℃, relative humidity <80%
- 1-8. Storage: -10~50℃, relative humidity <80%
- 1-9. Power: one 9V battery (NEDA1604/6F22 or equivalent)
- 1-10. Size: 190x93.5x37mm
- 1-11. Weight: approx.448g (including a battery)

### 2) TECHNICAL DATA

**2-1. Accuracy:**  $\pm (a\% \times \text{reading} + \text{dgts})$  at  $(23 \pm 5)^\circ\text{C}$ , relative humidity<75%. One year guarantee since production date.

### 2-2. Function:

- DCV
- ACV
- DCA
- ACA
- Resistance  $\Omega$
- Diode continuity testing
- Triode hFE
- Capacitance C
- Temperature  $^\circ\text{C}$  &  $^\circ\text{F}$
- Frequency f
- Inductance L
- Auto power-off
- Backlight

## 2-3. TECHNICAL DATA

### 2-3-1. DC Voltage

Range	Accuracy	Resolution
200mV	$\pm(0.5\%+3)$	100uV
2V		1mV
20V		10mV
200V		100mV
1000V	$\pm(0.8\%+10)$	1V

Input resistance: The Max. input impedance:10M $\Omega$

Overload protection: Range 200mV: DC 250V or AC peak value  
Other ranges: DC 1000V or AC peak value

### 2-3-2. AC Voltage

Range	Accuracy	Resolution
200mV	$\pm(0.8\%+5)$	100uV
2V	$\pm(0.8\%+5)$	1mV
20V		10mV
200V		100mV
750V	$\pm(1.2\%+5)$	1V

Input impedance: It is 1M $\Omega$  at range 200mV or 2V, and be 10M $\Omega$  at others;

Overload protection: Range 200mV: DC 250V or AC peak value  
Other ranges: DC 1000V or AC peak value

Frequency response: Range less than 200V: 40~400Hz  
Range 750V: 40~100Hz

Displaying: RMS of sine wave (mean value response)

### 2-3-3. DCA

Range	Accuracy	Resolution
2mA	$\pm(0.8\%+10)$	1uA
20mA		10uA
200mA	$\pm(1.2\%+8)$	100uA
20A	$\pm(2.0\%+5)$	10mA

Max. measuring voltage drop: 200mV;

Max. input current: 20A (within 10 seconds)

Overload protection: 0.2A / 250V restorable fuse, range 20A infused.

### 2-3-4. ACA

Range	Accuracy	Resolution
2mA	$\pm(1.0\%+15)$	1uA
20mA		10uA
200mA	$\pm(2.0\%+5)$	100uA
20A	$\pm(3.0\%+10)$	10mA

Max. measuring voltage drop: 200mV

Max. input current: 20A (within 10 second)

Overload protection: 0.2A / 250V restorable fused, Range 20A infused.

Frequency response: 40~200Hz

Displaying: RMS of sine wave (mean value response)

### 2-3-5. Resistance ( $\Omega$ )

Range	Accuracy	Resolution
200 $\Omega$	$\pm (0.8\%+5)$	0.1 $\Omega$
2k $\Omega$		1 $\Omega$
20k $\Omega$		10 $\Omega$
200k $\Omega$		100 $\Omega$
2M $\Omega$	$\pm (0.8\%+3)$	1k $\Omega$
20M $\Omega$		10k $\Omega$

Open voltage: less than 3V

Overload protection: DC 250V or AC peak value

**NOTE:** A: At range 200  $\Omega$ , short-circuit the test leads to measure the wire resistance, then, subtracts it from the real measurement.

B: At range 200 M $\Omega$ , when the test leads short circuit, LCD displays 1.0 M $\Omega$ . In the same way, the reading is 10 M $\Omega$  while the test leads short at range 2000 M $\Omega$ . It's normal and doesn't affect the accuracy. Please deduct the value from the real measurement.

C: The reading be displayed slowly when the measurement is more than 1 M $\Omega$ . Please wait it to be stable.

### 2-3-6. Capacitance

Range	Accuracy	Resolution
20nF	$\pm(2.5\%+20)$	10pF
200nF		100pF
2uF		1nF
20uF	$\pm(5.0\%+10)$	10nF
200uF		100nF

Overload protection: DC 36V or AC peak value

### 2-3-7. Inductance (L)

Range	Accuracy	Resolution
2mH	$\pm(2.5\%+30)$	1uH
20mH		10uH
200mH		100uH
2H		1mH
20H		10mH

Overload protection: DC 36V or AC peak value

### 2-3-8. Temperature

Range	Accuracy	Resolution
(-20 ~ 1000) $^\circ\text{C}$	$\pm(1.0\%+5) < 400^\circ\text{C}$ $\pm(1.5\%+15) \geq 400^\circ\text{C}$	1 $^\circ\text{C}$
(0 ~ 1832) $^\circ\text{F}$	$\pm(0.75\%+5) < 750^\circ\text{F}$ $\pm(1.5\%+15) \geq 750^\circ\text{F}$	1 $^\circ\text{F}$

K-type thermocouple ( banana shape plug )


### 2-3-9. Frequency

Range	Accuracy	Resolution
200kHz	$\pm(3.0\%+18)$	100Hz

Input sensitivity: 1V RMS

Overload protection: DC 250V or AC peak value (within 10 seconds).

### 2-3-10. Diode and continuity testing

Range	Reading	Condition
	Forward voltage drop of diode	Forward DCA is approx. 1mA, the backward voltage is approx 3V
	Buzzer makes a long sound while resistance is less than 70 $\Omega$ $\pm$ 20 $\Omega$	Open voltage is approx. 3V

Overload protection: DC 250V or AC peak value

**CAUTION; DO NOT INPUT VOLTAGE AT THIS RANGE!**

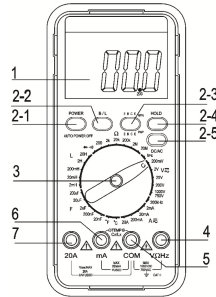
### 2-3-11. Transistor hFE DATA TEST

Range	Displaying range	Test condition
hFE NPN or PNP	0 ~ 1000	Basic current is approx. 10uA , $V_{ce}$ is about 3V

#### 4. OPERATION

##### 4-1. Panel description

- LCD: display the measuring value and unit.
- Function key
- 2-1. POWER switch: turn on/off the power.
- 2-2. Backlight key
- 2-3. Transistor test jack
- 2-4. HOLD key: press it, the present value is held on LCD and "H" symbol displays. Press it again, "H" symbol disappears, and the meter is exited the holding mode.
- 2-5. DC/AC key: set DC or AC working mode.
- Range knob: to select measuring function and range.



- Voltage, resistance and frequency COM
- GND
- COM for measuring current less than 200mA
- COM for measuring current 20A

SEE THE FIG.

##### 4-2. Voltage measurement

- Apply the black test lead to "COM" terminal and the red one to V/Ω/Hz terminal.
- Setup the Knob on a proper range "V". If the voltage range is unsure beforehand, please set it on the max., then measure diminishingly to reach a resolute value.
- Press the DC/AC key down to AC mode to measure AC voltage. Oppositely, resile the key to DC mode to measure DC voltage.
- Connecting the test leads reliably with the tested circuit, the voltage value will be displayed on LCD. While testing a DC voltage, the reading is voltage and polarity of the point connected by the red lead.

##### NOTE:

- While the reading is 1 or OL, the voltage is beyond the present range. Now you need to set the knob to the higher.
- Do not input a voltage over DC 1000V or AC 750V. Please keep the test leads off the circuit while switching the function or range
- Be carefully while measuring a high voltage. DO NOT touch the circuit.

##### 4-3. Current measurement

- Apply the black test lead to "COM" terminal and the red one to "mA" or "20A" terminal.
- Set the knob to a proper range A. If the current under tested is unsure beforehand, please set it on the max., then measure diminishingly to reach a resolute value.
- Press the DC/AC key down to AC mode to measure AC current. Oppositely, resiling the key to DC mode to measure DC current.
- Connecting the leads with the tested circuit in series, the current value is displayed on LCD. While testing a DC current, the reading is the value of current and polarity of the point connected by the red lead.

##### NOTE:

- If the LCD displays 1 or OL, it means the current is over range. Now you need to set the knob to the higher.
- Max. input current is 200mA or 20A (subject to where the red test lead apply to), too large current will blow the fuse. Be sure the test is less than 10 seconds. Please keep the leads off the circuit while switching the function and range knob.

##### 4-4. RESISTANCE MEASUREMENT

- Apply the black lest lead to COM terminal and the red one to V/Ω/Hz terminal.
- Set the knob to a proper resistance range, and connect the leads crossly with the resistor under tested.

##### NOTE:

- The LCD displays 1 or OL while the resistance is over the selected range. The knob should be adjusted to a higher range.
- When input terminal is in open circuit, overload displays.
- When measuring in line resistor, be sure that the power is off and all capacitors are released completely.
- Do not input any volt at resistance range.
- When measuring value is over 1MΩ, the reading will take a few seconds to be stable. It's normal for high resistance measuring.

##### 4-5. CAPACITANCE MEASUREMENT

Apply the knob to proper capacitance range, and insert the capacitor under tested into "mA" and "COM" terminal, be wary of polarity if necessary.

##### NOTE:

- If the capacitance under tested is over the max. value of selected range, LCD displays 1 or OL, thus, should set the knob to a higher range.
- It's normal that there is a remained value on LCD before capacitance measurement, and it doesn't affect the measurement.
- When measuring at large capacitance range, if capacitor is crept badly or broken, LCD displays a value and it's unstable.
- Release the capacitor completely before measuring.

##### 4-6. INDUCTANCE MEASUREMENT

Set the knob to a proper inductance range and insert the inductor to "mA" and "COM" terminal.

##### NOTE:

- The LCD displays 1 or OL while the tested inductance is over the selected range. Thus, the knob should be set to a higher range.
- The inductance may be different due to different resistance on a same inductor.
- At 2mH range, should make the test leads short and measure the inductance of wire, then, subtract from real measurement.

##### 4-7. TEMPERATURE MEASUREMENT

Set the knob to °C range, insert the black plug of cold end of thermocouple into mA com and the red plug to "COM" com, put working end into measurement place. Display reading is the temperature of measurement place in °C&°F.

##### NOTE:

- When input terminal is in open circuit, if the ambient temperature is over 18°C, under 28°C LCD displays the ambient temperature. If ambient temperature is lower than 18°C and over 28°C, LCD displays just for the reference.
- Do not try to change the thermocouple, or, the accuracy cannot be guaranteed.
- Do not input any volt at a temperature range.

##### 4-8. FREQUENCY MEASUREMENT

- Apply test leads or shield cable to COM and V/Ω/Hz terminal.
- Set the knob to frequency range, connect test leads or cable crossly to signal source or tested load.

##### NOTE:

- When input over 10V RMS, reading is workable but accuracy is not guaranteed.
- It is better to use shield cable to measure small signal at noisy environment.
- Be careful when measuring high volt circuit.
- Do not input voltage over DC 250V or AC peak value.
- Auto range test from 2kHz to 10MHz.

##### 4-9. TRANSISTOR hFE

- Set the knob to hFE range.
- insert the Test accessories to "mA" and "COM" terminal.
- Verify the transistor under tested is NPN or PNP, insert emitter, base and collector to proper jack.

##### 4-10. DIODE AND CONTINUITY TEST

- Apply the black test lead to "COM" terminal and the red one to V/Ω/Hz terminal the polarity of red lead is "+" .
- Set the knob to (→|→) range, connect test leads to the diode under tested, the red test connect to diode positive polarity, the reading is the approx. value of diode forward volt drop.
- Apply test leads to two points of tested circuit, if the inner buzzer sounds, the resistance is less than (70 ± 20) Ω.

##### 4-11. DATA HOLD

Press down the key, the present value is held on LCD. Press up the key and the function is cancelled.

##### 4-12. AUTO POWER OFF

After stop working for 20±10 minutes, the meter will be into sleep mode. Press "POWER" key twice to restart the power.

##### 4-13: Backlight

Press the "B/L" key to turn on the backlight, will be auto off after 10 sec.

##### 5. MAINTENANCE

##### Do not try to modify the electric circuit.

- Keep the meter away from water, dust and shock.
  - Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.
  - Wipe the case with a damp cloth and detergent, do not use abrasives and alcohol.
  - If do not operate for a long time, should take out the battery to avoid leakage
- Note:** When signal displays, should replace the battery following the steps

6. If the meter does not work properly, check the meter as following:

Fault	Solution
No reading on LCD	<ul style="list-style-type: none"> <li>●Power off--- Pls turn on the power</li> <li>●Holding key---PLs set a correct mode</li> <li>●Replace battery</li> </ul>
The signal  appears	<ul style="list-style-type: none"> <li>●Replace battery</li> </ul>
No current or temperature input	<ul style="list-style-type: none"> <li>●Replace fuse</li> </ul>
Error Value	<ul style="list-style-type: none"> <li>●Replace battery</li> </ul>

- The specifications are subject to change without notice.
- The content of this manual is regarded as correct, error or omits Pls. contact with factory.
- We hereby will not be responsible for the accident and damage caused by improper operation.
- The function stated for this User Manual cannot be the reason of special usage.