

DIGITAL MULTIMETER OPERATION MANUAL

1. GENERAL

The instrument is a stable and good performance digital multi-meter driven by battery. It uses the LCD with 26mm-high figure to make the reading clear. Unit symbol displaying, and the function of backlight and 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 points 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)°C, relative humidity <80%.
- 1-8. Power: one 9V battery (NEDA 1604/6F22 or equivalent).
- 1-9. Size: 190×88.5×27.5mm.
- 1-10. Weight: approx. 320g (including a battery).

2). TECHNICAL DATA

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

2-2. Function:

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

2-3. TECHNICAL DATA

2-3-1. DC Voltage

Range	Accuracy	Resolution
200mV	$\pm(0.5\%+3)$	0.1mV
2V		1mV
20V		10mV
200V		100mV
1000 V	$\pm(1.0\%+5)$	1V

Input resistance: 10M Ω for all ranges.

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

2-3-2. ACV Voltage

Range	Accuracy	Resolution
200mV	$\pm(1.2\%+3)$	0.1mV
2V	$\pm(0.8\%+5)$	1mV
20V		10mV
200V		100mV
700V		1V
700V	$\pm(1.2\%+5)$	1V

Input resistance: It is 1M Ω at range 200mV or 2V, and be 10M Ω at others.

Overload protection: DC 250V or AC peak value at range 200mV.
DC 1000 V or AC peak value at others.

Frequency response: Range less than 200V: (40~400)Hz.
Range 700V: (40~100)Hz.

Displaying: RMS of sine wave (mean value response).

2-3-3. DCA

Range	Accuracy	Resolution
2mA	$\pm(0.8\%+3)$	1uA

Range	Accuracy	Resolution
20mA	$\pm(0.8\%+3)$	10uA
200mA	$\pm(1.2\%+4)$	100uA
20A	$\pm(2.0\%+5)$	10mA

Max. measuring voltage drop: 200mV.

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

Overload protection: 0.2A/ 250V fast-blown fuse, range 20A infused.

2-3-4. ACA

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

Max. measuring voltage drop: 200mV.

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

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

Frequency response: (40~200)Hz.

Displaying: RMS of sine wave (mean value response).

2-3-5. RESISTANCE (Ω)

Range	Accuracy	Resolution
200 Ω	$\pm(0.8\%+5)$	0.1 Ω
2k Ω		1 Ω
20k Ω		10 Ω
200k Ω		100 Ω
2M Ω	$\pm(0.8\%+3)$	1k Ω
20M Ω		10k Ω
2000M Ω		1M Ω
2000M Ω	$\pm[5\%(\text{reading}-10)+20]$	1M Ω

Open voltage: less than 3V.

Overload protection: DC 250V or AC peak value.

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

B: At range 200M Ω , when the test leads short circuit, LCD displays 1.0M Ω . In the same way, the reading is 10M Ω while the test leads short at range 2000M Ω . 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 1M Ω .

Please wait it to be stable.

2-3-6. Capacitance

Range	Accuracy	Resolution
20nF	$\pm(2.5\%+20)$	10pF
200nF		100pF
2uF		1nF
20uF		10nF
200uF	$\pm(5.0\%+5)$	100nF

Test frequency: 100Hz.

Overload protection: DC 36V or AC peak value.

2-3-7. Inductance (L)

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

Test frequency: 100Hz.

Overload protection: DC 36V or AC peak value.

2-3-8. Temperature

Range	Accuracy	Resolution
(-40~1000)°C	$\pm(0.8\%+4) < 400^\circ\text{C}$ $\pm(1.5\%+15) \geq 400^\circ\text{C}$	1°C

K-type thermocouple (banana-shape plug).

2-3-9. Frequency

Range	Accuracy	Resolution
2kHz	$\pm(0.5\%+4)$	1Hz
20kHz		10Hz
200kHz		100Hz
2000kHz		1kHz
10MHz		10kHz

Input sensitivity: 1V RMS.

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

2-3-10. Diode and continuity testing

RANGE	Reading	Test Condition
	Forward voltage drop of diode	Forward DCA is approx. 1mA. backward voltage is approx. 3V
	Buzzer makes a long sound while resistance is less than (70±20)Ω	Open voltage is approx. 3V

Overload protection: DC 250V or AC peak value.

CAUTION: DO NOT INPUT VOLTAGE AT THIS RANGE!

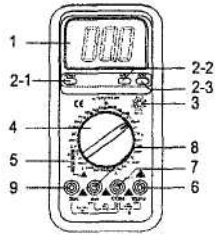
2-3-11. Transistor hFE DATA TEST

Range	Displaying range	Testing condition
hFE NPN or PNP	0~1000	Base current is approx. 10uA. Vce is approx. 3V

4. OPERATION

4-1. Panel description

- LCD: display the measuring value and unit.
- POWER switch: turn on/off the power.
- PK HOLD key: press it, the max. of presently measured value is held on LCD and symbol displays. Press it again, symbol disappears, and the meter is exited the holding mode.
- DC/AC key: set DC or AC working mode, 2-4. B/L key: turn on/off backlight.
- hFE hole: to measure hFE of triode.
- Range knob: to select measuring function and range.
- Capacity (Cx) or inductance (Lx) COM.
- 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 700V. 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 to 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 test 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 "Cx" terminal.
- Connect test leads with the two points of capacitor, 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 LX 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 V/Ω/Hz com, put working end into measurement place. Display reading is the temperature of measurement place in °C.

NOTE:

- When input terminal is in open circuit, if the ambient temperature is over 18°C, LCD displays the ambient temperature. If ambient temperature is lower than 18°C, LCD displays an un-normal temperature.
- 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 is from 2kHz to 10MHz.

4-9. TRANSISTOR hFE

- Set the knob to hFE range.
- 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 with 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. PEAK VALUE HOLD

Press down the key, the max. of presently measured value is held on LCD. Press up the key and the function is cancelled.

4-12. AUTO POWER OFF

The meter will be into sleeping mode when it works for (20±10) minutes. Press "POWER" key twice to restart the power.

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.
 - When signal displays, should replace the battery following the steps.
 - Unlock the button and remove the battery case, (see fig.1).
 - Take out the old battery and replace the new one. It's better to use alkaline battery for longer life.
 - Fit on the battery case and lock the button (see fig.2).

● How to remove the battery case

Unlock the button according to indication on the case, i.e. switch on both sides counter-clockwise, when and signal on left side are at the same direction, it's unlocked ; when and signal on right side are at the same direction, it's unlocked . When the signals are the same as fig.1, the battery case can be removed.

Fig.1



● How to fit on the battery case

Lock the button according to the indication on the case, i.e. switch two on both sides clockwise, when the signals are the same as fig.2, the battery case is fit on.

Fig.2



5-4-2. FUSE REPLACEMENT: Please use the same size fuse as replacement.

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"> ■ turn on the power ■ set the HOLD key to accorrect mode ■ Replace battery
Signal appears	■ Replace battery
NO current or temperature input	■ Replace fuse
Big error Value	■ Replace battery