

DIGITAL MULTIMETER OPERATION MANUAL

1. GENERAL

The meter is a stable 4 1/2 multimeter with LCD display, driven by battery. It's widely used on measuring DCV, ACV, DC current, AC current, resistance, conductance, capacitance, diode, transistor, continuity test and frequency, and has the function of overload protection, auto power off and data hold, etc.

2. SAFETY

Meet with IEC1010 standard

Read the safety note before operation.

2-1. Do not input a limited value over-ranged.

2-2. The voltage below 36V is safety. To avoid electric shock, check whether the test leads are connected correctly, whether the insulation is good when measuring over 36VDCV or 25VACV.

2-3. The test leads should be removed from the testing point when changing function and range.

2-4. Choose correct function and range to avoid wrong operation.

2-5. Do not take measurement if the battery is not fit on or rear cover ked.

2-6. Do not input voltage when measuring resistance.

2-7. Remove the test leads and turn the power off before replacing battery or fuse.

2-8. Specification of safety signal

“ \triangle ” existing dangerous volt “ $\frac{\square}{\square}$ ” GND “ \square ” dual insulation

“ \triangle ” operator must refer to the manual “ \square ” low battery indication

3. SPECIFICATION

3-1. GENERAL

3-1-1. Displaying: LCD display

3-1-2. Max. displaying: 19999 (4 1/2) auto-polarity display

3-1-3. Measuring method: dual-slope A/D transfer

3-1-4. Sampling rate: approx. 2-3 times/sec

3-1-5. Max. common mode voltage: 500V DC/AC RMS

3-1-6. Over-range display: the MSD displays “1” or “-1”

3-1-7. Low battery display: “ \square ” displays

3-1-8. Operation : (0~40)°C, relative humidity <80% R.H

3-1-9. Storage: (-10~50)°C, relative humidity <80% R.H

3-1-10. power: 9V battery (NEDA1604/6F22 or equivalent)

3-1-11. Dimension: 192mm×95mm×48 mm

3-1-12. Weight: approx. 455g (including battery)

3-2. TECHNICAL SPECIFICATION

3-2-1. Accuracy: $\pm(a\% \times \text{reading} + \text{digit})$ TEM: (23±5)°C, <75% R.H, one year

3-2-2. TECHNICAL DATA

3-2-2-1.DCV

Range	Accuracy	Resolution
200mV	$\pm(0.1\%+5)$	0.01mV
2V		0.0001V
20V		0.001V
200V		0.01V
1000V	$\pm(0.2\%+5)$	0.1V

Input impedance: 10M Ω for all ranges

Over-range protection: 250V DCV or ACV peak factor at 200mV range, 1000V DCV or ACV peak factor at other range

3-2-2-2.AC

Range	Accuracy	Resolution
2V	$\pm(0.8\%+25)$	1mV
20V		10mV
200V		100mV
750V	$\pm(1.0\%+25)$	1V

Input resistance: 2M Ω for all ranges

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

Other ranges: DC 1000V or AC peak value

Frequency response: below 200V: (40~400)Hz, 750V range:(40~200)Hz

Displaying: 1):sine wave RMS (mean value response)

2): Some can't turn to “0” which is normal phenomenon; it can't affect the test accuracy

3-2-2-3.DCA

Range	Accuracy	Resolution
200uA	$\pm(0.5\%+4)$	0.01uA
2mA		0.0001mA
20mA		0.001mA
200mA	$\pm(0.8\%+6)$	0.01mA
20A	$\pm(2.0\%+15)$	0.001A

Max. measuring volt drop: 200mV

Max. input current: 20A (less than 10 seconds)

Overload protection: 0.2A / 250V self resume fuse; 20A range without fuse.

3-2-2-4.ACA

Range	Accuracy	Resolution
200mA	$\pm(1.5\%+25)$	0.1mA
20A	$\pm(2.5\%+35)$	10mA

Max. measuring volt drop: 200mV

Max. input current: 20A (less than 10 seconds)

Overload protection: 0.2A / 250V self resume fuse, 20A range without fuse.

Frequency response: 40Hz ~200Hz

Displaying: sine wave RMS (mean value response)

3-2-2-5. RESISTANCE (Ω)

Range	Accuracy	Resolution
200 Ω	$\pm(0.4\%+10)$	0.01 Ω
2k Ω	$\pm(0.4\%+5)$	0.1 Ω
20k Ω		1 Ω
200k Ω		10 Ω
2M Ω		100 Ω
200M Ω	$\pm【5\%(\text{reading}-10.00)+30】$	10k Ω

Open voltage: less than 3V

Overload protection: 250V DCV or ACV peak factor

Note: In 200 Ω range, should make the test leads short, and measure the resistance of the wire, then, subtracts from the actual measuring value.

3-2-2-6.CAPACITANCE

Range	Accuracy	Resolution
20nF	$\pm(4.0\%+50)$	10pF
2uF		1000pF
200uF		10nF

Testing frequency: 400Hz

Overload protection: 36V DCV or ACV peak factor;630mA/250V fuse protection

3-2-2-7.FREQUENCY

Range	Accuracy	Resolution
20kHz	$\pm(1.5\%+25)$	10Hz
200kHz		100Hz

Input sensitivity: 120mV RMS

Overload protection: 250V DC or AC peak factor (less than 10sec.)

Note: 200kHz maybe can't return to “0”,this phenomenon is normal, it can't affect the test accuracy.

3-2-2-8.DIODE AND CONTINUITY TEST

RANGE	DISPLAYING VALUE	TEST CONDITION
$\rightarrow -\ominus)$	Diode forward volt drop	Forward DC current is approx. 1mA, backward voltage is approx. 3V
		Buzzer rings, the impedance between the two testing points is less than(70±20) Ω
		Open voltage is approx. 3V

Overload protection: 250V DC or AC peak factor

Warning: do not input any voltage value at this range for safety!

3-2-2-9. hFE

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

3-2-2-10. Conductance (resistance range:10,000M Ω -10M Ω)

Range	Accuracy	Resolution
(0.1-100)nS	$\pm(1.0\%+30)$	0.1nS

Open voltage is approx:3V

4.operation

4-1. Front panel

1. LCD: display the measured value

2-1 Power switch: turn on or off the power

2-2. Backlight key: turn on or off the power

2-3. hFE testing terminal: for measuring transistor hFE

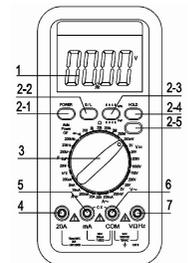
2-4. HOLD key: press the key down, the measured value will be hold and “ \square ” signal appears; press it down again, “ \square ” signal disappears and out of the HOLD mode.

2-5.Continuity buzzer key

3. Knob switch: for changing function and range

4. Testing terminal for 20A current

5. Testing terminal for less than 200mA current and conductance



- 6. Common ground
- 7. Terminal for Voltage, resistance, and frequency testing

4-2. DCV measurement

4-2-1. Apply the black test leads to “COM” terminal and the red one to “V/ Ω /Hz” terminal.

4-2-2. Switch the knob to a proper DCV range, then, connect the test leads across the measured circuit, the voltage and polarity of the point which connected with the red test lead will be displayed.

NOTE:

1. If the voltage under measured is unclear beforehand, should set the range knob to the highest range, then, switch to a proper range according to the displaying value. If LCD displays “1”, it means overrange, the range knob must be switched to a higher range.
2. Do not input a voltage over 1000V, or the meter might be damaged.
3. Be careful when measuring high voltage circuit.

4-3. ACV measurement

4-3-1. Apply the black test leads to “COM” terminal and the red one to “V/ Ω /Hz” terminal.

4-3-2. Set the range knob to a proper ACV range, then, connect the test leads cross to the measured circuit.

NOTE:

1. If the range under measured is unclear beforehand, should set the range knob to the highest range, then, switch to a proper range according to displaying value. If LCD displays “1”, it means overrange, should set the range knob to a higher range.
2. The remained digits do not affect on measuring accuracy.
3. Do not input a voltage over 1000Vrms, or, the meter might be damaged.
4. Be careful when measuring high voltage circuit.

4-4. DC current measurement

4-4-1. Apply the black test leads to “COM” terminal and the red one to “mA” terminal (Max.200mA), or the red test lead to “20A” terminal (max. 20A).

4-4-2. Set the range knob to a proper DCA current range, then, connect the meter to the measured circuit, the measured current value and the current polarity which the red test lead connect will be displayed on LCD.

NOTE:

1. If the range under measured is unknown beforehand, should set the range knob to the highest range, then, switch to a proper range according to the displaying value; If LCD displays “1”, it means overrange, the range knob must be set to a higher range.
2. The max. input current is 200mA or 20A (subject to the position where the red test lead insert), large current may blow the fuse. Be careful especially at 20A range, because there is no fuse protection at this range, large current may heat the circuit, even damage the meter.

4-5. AC current measurement

4-5-1. Apply the black test lead to “COM” terminal, and the red one to “mA” term (max. 200mA), or the red test lead to “20A” terminal (max. 20A);

4-5-2. Set the range knob to a proper ACA current range, then, connect the meter to the circuit under measured.

NOTE:

1. If the current range under measure is unknown beforehand, should set the range knob to the highest range, then, switch to the proper range according to the displaying value. If LCD displays “1”, it means overrange, must set the range knob to a higher range.
2. The max. input current is 200mA or 20A (subject to the position where the red test lead insert), large current might blow the fuse, be careful especially at 20A range, because there is no fuse protection at this range, large current may heat the circuit, even damage the meter.
3. The remained digits do not affect on measuring accuracy.

4-6. Resistance measurement

4-6-1. Apply the black test lead to “COM” terminal, and the red one to “V/ Ω /Hz” terminal.

4-6-2. Set the range knob to a proper resistance range, connect the test leads across the resistance under measured.

NOTE:

1. If the resistance value is over the selected range value, “1” displays, thus, should set to a higher range. When measuring value is over 1M Ω , the reading needs a few seconds to be stable. It's normal for high resistance measuring.
2. When input terminal is open-circuit, overload displays.
3. Before measuring in-line resistance, be sure that power is off and all capacitance are released.
4. Do not input voltage at this range.

4-7. Capacitance measurement

Set the knob to proper capacitance range, and insert the capacitor under tested.

NOTE:

1. If the capacitance is unknown beforehand, should set the range knob to the highest range, then, switch to a proper range according to the displaying value. If “1” displays, it means overrange, should set to a higher range.
2. Before taking measurement, LCD displaying might not be zero, the remaining will become smaller and smaller, it can be ignored.
3. If creeps seriously or the capacitor is breakdown when measuring large capacitance, some digits are displayed and unstable.
4. Before measuring, should release the capacitor completely to avoid damage.
5. unit: 1uF =1000 nF 1nF=1000pF

4-8. Transistor hFE

4-8-1. Set the range to “hFE” range.

4-8-2. Select NPN or PNP, insert separately emitter, base and collector to proper terminal.

4-9. Diode and continuity test

4-9-1. Apply the black test lead to “COM” terminal, and the red one to “V/ Ω /Hz” terminal (the polarity of the red test lead is “+”).

4-9-2. Set the range knob to “ \rightarrow ”)”, connect the test leads to the diode under measured, and the reading is close to the value of diode forward voltage drop.

4-9-3. Connect the test leads to two points of circuit under measured, if the built-in buzzer sounds, the resistance between two points is less than approx. (70 \pm 20) Ω .

NOTE: Do not input voltage at “ \rightarrow ”)” range to avoid damage the meter.

4-10. Frequency measurement

4-10-1. Apply the test leads or shield cable to “COM” and “V/ Ω /Hz” terminal.

4-10-2. Switch the range knob to frequency range, connect the test leads across to the signal source or the measured load.

NOTE:

1. When input is over 10Vrms, reading is possible but maybe overrange.
2. It's better to use shielding cable on noisy condition when measuring small signal.
3. Be careful when measuring high volt circuit.
4. Do not input a voltage over 250V DC or AC peak factor to avoid to damage the meter.

4-11. Conductance measurement

4-11-1. Apply the black test leads to “COM” terminal, and the red one to “mA” terminal.

4-11-2. Set the range knob to “nS” range, connect the test leads to the insulating resistance under measured.

4-12. DATA HOLD

PRESS “HOLD” key, the current data will be hold on LCD.

4-13. Auto Power Off

After working (20 \pm 10) minutes, the meter will be auto power off and to be sleeping mode. Press POWER key twice to restart the power.

4-14. BACKLIGHT

Press B/L key to turn on the backlight, and press it again to turn off.

NOTE: When turning on backlight, the working current will be enlarged, it leads to shorten battery usage and enlarge accuracy of some functions.

5. Maintenance

Do not try to modify the electric circuit.

- 5-1. Keep the meter away from water, dust and shock.
- 5-2. Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.
- 5-3. Wipe the case with a damp cloth and detergent, do not use abrasives and alcohol.
- 5-4. If do not operate for a long time, should take out the battery to avoid leakage
- 5-5. Change fuse
When replacing fuse, to use the same type and specification

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

CONDITIONS	WAY TO SOLVE
NO DISPLAYING	<ul style="list-style-type: none"> ● The power is not turned on ● HOLD key ● Replace battery
 symbol displays	● Replace battery
NO CURRENT INPUT	● Replace fuse
BIG ERROR	● Replace battery