

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 "OL"
- 1-6. Low battery indication:  symbol displays
- 1-7. Operation: 0~40°C, relative humidity <80%
- 1-8. Power: one 9V battery (NEDA1604/6F22 or equivalent)
- 1-9. Size: 190x88.5x27.5 mm
- 1-10. Weight: approx.422g (including 9V 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
- True RMS
- Resistance Ω
- Diode continuity testing
- Triode hFE
- Capacitance C
- Backlight
- Temperature $^\circ\text{C}$
- Frequency f
- Inductance L
- Auto power-off

2-3. TECHNICAL DATA

2-3-1. DC Voltage

Input resistance: All range is 10M Ω

Range	Accuracy	Resolution
200mV	$\pm(0.5\%+3)$	0.1mV
2V		0.001V
20V		0.01V
200V		0.1V
1000V	$\pm(0.8\%+10)$	1V

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	$\pm(0.8\%+5)$	0.1mV
2V		1mV
20V		10mV
200V		100mV
750V	$\pm(1.2\%+10)$	1V

Input impedance: All range is 10M Ω ;

The frequency response of the standard sine wave and triangular wave is 40Hz ~1kHz.

The frequency response of other waves is 40Hz ~200Hz

2-3-3. DCA

Range	Accuracy	Resolution
200 μ A	$\pm(0.8\%+10)$	0.1 μ A
2mA		0.001mA
20mA		0.01mA
200mA		0.1A
20A	$\pm(2.0\%+5)$	0.01A

Max. measuring voltage drop: 200mV;

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

Overload protection: 0.2A / 250V fuse ;20A/250V fast-melt fused.

2-3-4. ACA

Range	Accuracy	Resolution
200 μ A	$\pm(0.8\%+10)$	0.1 μ A
2mA		0.001mA
20mA		0.01mA
200mA		0.1A
20A	$\pm(2.0\%+5)$	0.01A

Max. measuring voltage drop: 200mV

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

Overload protection: 0.2A / 250V fuse ;20A/250V fast-melt fused.

Frequency response: sine and triangular wave: 40Hz~1kHz

Other wave: 40Hz~200Hz

Displaying: True RMS

2-3-5. Resistance (Ω)

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

200M Ω	$\pm(5.0\%+30)$	100k Ω
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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: The reading be displayed slowly when the measurement is more than 1 M Ω . Please wait it to be stable.

2-3-6. Capacitance

Range	Accuracy	Resolution
20nF	$\pm(3.5\%+20)$	10pF
200nF		100pF
2 μ F		1nF
20 μ F		10nF
200 μ F	$\pm(5.0\%+10)$	100nF
2000 μ F		1 μ F

Overload protection: DC 250V or AC peak value

2-3-7. Inductance (L)

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

Overload protection: DC 36V

DO NOT INPUT VOLTAGE AT THIS RANGE

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 $^\circ\text{F}$


2-3-9. Frequency

Range	Accuracy	Resolution
10Hz	$\pm(1.0\%+3)$	0.01Hz
100Hz		0.1Hz
1kHz		1Hz
10kHz		10Hz
100kHz		100Hz
1MHz/10MHz		1kHz/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	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 Ω \pm 20 Ω	Open voltage is approx. 3V

Overload protection: DC 250V or AC peak value

CAUTION: DO NOT INPUT VOLTAGE AT THIS RANGE!

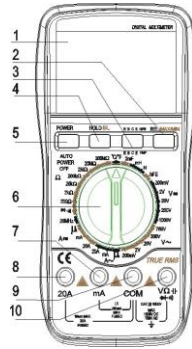
2-3-11. Transistor hFE DATA TEST

Range	Displaying range	Test condition
hFE NPN or PNP	0 ~ 1000 β	Basic current is approx. 10uA , Vce is about 3V

4. OPERATION

4-1. Panel description

- LCD: display the measuring value and unit.
- Press "REL/MAX/MIN", then you can test the relative magnitude. If you hold the "REL/MAX/MIN" for more than 2s, you can test the Max and Min value.
- Transistor input jack
- Backlight and function key; Diode/buzzer and frequency range, when press "HOLD/B/L", you can do the function change; When under other range, this is the hold key; press "HOLD/B/L" key for more than 2s, the backlight will on/off.
- Power on/off
- Switch: change the function or the range.
- 200mA current and inductance input jack
- 20A/2A current test jack
- Inductance, temperature, "-common input jack
- Voltage, resistance, diode, capacitance, frequency, temperature, "+" input jack.



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 "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, or after finished your testing.
- 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" (Max 200mA) or "20A"(Max 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 "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), too large current will blow the fuse. Be sure the test is less than 10 seconds when test 20A current. Please keep the leads off the circuit while switching the function and range knob.
- Do not input more than DC 36V, AC 25V between the current jack and "COM" jack.

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 "OL" while the resistance is over the selected range. The knob should be adjusted to a higher range.
- When test low resistance, test leads will bring internal resistance, in order to get a accurate readings, you can mark the short circuit value of the test leads, then subtract it from the value of the low resistance.
- 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 "V/Ω/Hz" 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 "OL", thus, should set the knob to a higher range.
- It's normal that there is a remained value on LCD before capacitance measurement when at the range 20nF and you can subtract it from the value.
- 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 "OL" while the tested inductance is over the selected range. Thus, the knob should be set to a higher range.
- Range "mH" is auto change of 2mH/20mH/200mH, and range "H" is the auto range of 2H/20H.
- Do not input voltage at this range.

4-7. 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.

4-8. 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.

4-9. 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 (50 ± 20) Ω.

NOTE: Do not input voltage at this function.

4-10. DATA HOLD/ BACKLIGHT

Except Diode, Buzzer and Frequency function, at all other functions, if you press "HOLD B/L", it will show "HOLD" symbol on the display, and the present value will be keep on it too, and if you press the key again, the symbol will disappear. If you press the key for more than 2s, it will be the backlight on/off.

4-11. AUTO POWER OFF

After stop working for 15 minutes, the meter will be into sleep mode. Press "POWER" key can back to work.

Press "REL/MAX/MIN" key and at the same time press the "POWER" the "APO" symbol will disappear, now you already closed the function of auto power off.

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, combustibile, 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.
 - 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, lock the button and put on the holster.
- Replace fuse: When replacing fuce, please use another same type and specification fuse.

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"> ● Power off--- Pls turn on the power ● Holding key---PLs set a correct mode ● Replace battery
The signal appears	● Replace battery
No current or temperature input	● Replace fuse
Error Value	● Replace battery