

DIGITAL MULTIMETER OPERATION MANUAL

1. SUMMARIZE

It is a handheld small and safe digital multimeter with 3 1/2 digits, full function and high performance for measuring DCV, ACV, DCA, resistance, diode, continuity and battery test, thus it is a portable and ideal tool for users. Please read the safety information and warning in this manual carefully, and strictly abide by it.

2. OPEN THE PACKAGE


Open the box, take out the meter, and then check the items below to make sure if they are missing or damaging:

Manual	1pc	1.5V AAA LR03 Battery	2pcs
Test lead	1pair	Holster	1pc

Please contact with your supplier, if you find out any problems.

3. SAFETY NOTE

Please pay attention to the warning which indicates a situation or action that poses a danger to the user and may cause damage to the instrument or the equipment under test. The instrument strictly follows GB4793.1 safety requirements for electric instruments and safety standard IEC61010 to design and produce, which is under the safety standards of double insulation, overvoltage standards (CAT II 1000V, CAT III 600V) and pollution level 2. Please read the operation manual carefully before operation, or the protection function will weakened or lost.

- 3-1. Please check whether the insulation surface of the test leads is intact before use it. If you found the insulation surface of the test leads or the cover of the meter is obviously damaged, or you think it can't work anymore, please do not use the meter again.
- 3-2. When you using the test leads, your fingers should be put after the finger protective part.
- 3-3. When the voltage under tested is higher than DC 36V and AC 25V RMS, be careful to prevent electric shock.
- 3-4. Do not operate the meter if battery case and back cover is not fixed.
- 3-5. The signal under tested should not be over range, in case to avoid the electric shock.
- 3-6. It is forbidden to change the range by the range knob under measurement.
- 3-7. Do not test the voltage by connecting the current terminal or at the current range.
- 3-8. When replacing fuses, please use the same type and specification fuses.
- 3-9. Do not change the inner circuit of meter, to avoid damage of the meter.
- 3-10. When the LCD displays  symbol, replace the batteries in time to ensure the measuring accuracy.
- 3-11. Please comply with local and national safety regulations. Wearing personal protective equipment (such as approved rubber gloves, face masks, and flame-retardant clothing etc.) to prevent the injury from electric shock and arc when charged conductors are exposed.
- 3-12. Do not store and operate the meter under the condition of high temperature, high humidity, combustible (flammable), explosive and strong magnetic place.
- 3-13. Wipe the case with a damp cloth and detergent, do not use abrasives and alcohol etc.

4. SAFETY SYMBOLS

	Warning		DC
	High Voltage danger		AC
	Ground		AC and DC
	Dual insulation		Accord with order of the European Union
	Low battery Voltage		Fuse

5. CHARACTERISTIC

5-1. Display : LCD displaying.

5-2. Max display: 1999 (3 1/2 digit) auto polarity indication.

5-3. Measuring method: A/D conversion

5-4. Exploit the technology of button calibrating

5-5. Sampling rate: approx.3 times/second.

5-6. Over range indication: the MSD displays “OL”

5-7. Low battery indication: “” appears.

5-8. Operation environment: (0~40) °C

relative humidity < 75% R.H

5-9. Storage environment: (-20~60) °C

relative humidity < 85% R.H.

5-10. Power: 2 * AAA 1.5V LR03 batteries

5-11. Size: (146*72*50) mm

5-12. Weight: approx. 232g (including batteries)

6. EXTERNAL STRUCTURE

6-1. Sound alert indicator

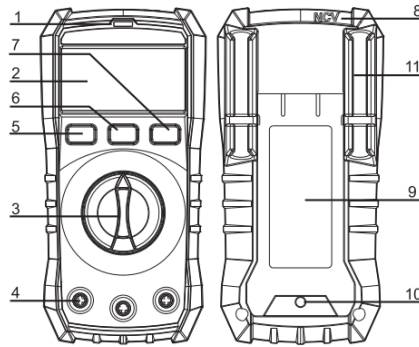
6-2. LCD display

6-3. Function / range knob

6-4. Measuring input terminal

6-5. Data hold

6-6. Turn on/off the back light



6-7. Relative value measurement; Turn on/off the torch

6-8. NCV sensing area

6-9. Holder

6-10. Screws for fixing the battery box

6-11. Bracket for fixing the test l

7. LCD DISPLAY



APO	Auto power off	AUTO	Auto range
DC	Direct current measurement	AC	Alternating current measurement
H	Data hold	NCV	Non-contact ACV measurement
	Battery low voltage	°C°F	Celsius, Fahrenheit
REL	Relative value measurement		High voltage
	Diode/continuity test	%	Duty cycle
nFVA	Capacitance, voltage, current	MkΩHz	Resistance, Frequency

8. KEY DESCRIPTION

8-1. Data hold:

Short press “HOLD” key, the present value will keep on the LCD, press this key again to exit this function.



Warning: to prevent electric shock, fire or personal injury, do not use the data hold function to measure the unknown voltage.

When open the HOLD function, the LCD will keep original data when measuring a different voltage.

8-2. Backlight function

Short press the “B/L” key to turn on/off the backlight, it will be auto powered off after 15 seconds since the back light is on.



8-3. Turn on/off the "REL/ " function:

Short press the "REL / " key at ACV, DCV, DCA range, at the relative value measurement mode, the symbol "REL" displays on the LCD at the same time. Long press the "REL / " key to open the torch, then long press this key again to turn off the torch.

8-4. Cancel the auto power off function

Press the REL key to turn on the meter, the "APO" symbol disappears, and then the auto power off function closed.

9. MEASUREMENT INSTRUCTIONS

First of all, please check the battery, and turn the knob to the proper range that you need. If the battery is out of power, the "" symbol will appear on the LCD. Pay attention to the  symbol next to the jack for test leads. This is a warning that the voltage and current should not exceed the displaying value.

9-1. DCV and ACV measurement

9-1-1. Set the range knob to a proper DCV/ACV range, if the range of voltage under tested is unsure beforehand, you should set the range knob to the highest range, then reduce it gradually until get the highest resolution readings.

9-1-2. Insert the black test lead to "COM" jack, the red one to  jack.

9-1-3. Connect the test leads to the test point, the LCD displays the voltage value under tested. When measuring DCV, the polarity and the voltage value of this point which connects to the red test lead will display on the LCD.

NOTE:

(1). Do not measure voltage higher than 600V, although it is possible to get the reading, it will damage the inner circuit and hurt yourself. If the range of voltage under tested is unsure beforehand, please start from the highest range then find the proper range according to the reading.


(2). If LCD displays "OL", it means over range, you should set the range knob to a higher range. In each range, the input impedance of the meter is $10M\ \Omega$. This load effect will cause measuring error when measuring the high resistance circuit. If the impedance of the circuit under test is less than $10k\ \Omega$, the error can be ignored (0.1% or less than 0.1%)

(3). After completing all the measurement operation, please disconnect the test leads from the circuit under test.

(4). When measuring more than 24V AC/DC, the LCD will show high voltage symbol. Please wear personal protective equipment (such as approved rubber gloves, face masks, and flame-retardant clothing etc.) to prevent the injury from electric shock and arc when charged conductors are exposed.

9-2. DCA measurement

9-2-1. Set the knob to a proper range, and then connecting the test leads to the circuit under test in series. When measuring DC value, the polarity and the current value of this point which connects to the red test lead will display on the LCD.

9-2-2. Insert the black test lead to "COM" jack, the red one to  or "10A" jack.

NOTE:

(1). Although for the current which is less than 200mA we have set the overvoltage protection, when the measured voltage between the input terminal and the ground exceeds 60V, do not try to measure the DCA value, to avoid damage to the instrument or the device

under tested and hurt yourself. This kind of voltage will bring the risk of electric shock,

(2). Be sure to cut off the power under tested before measurement, carefully check whether the input terminal and the range knob position are correct, then power on the meter and operate after confirming everything is no problems. If the range of current under tested is unsure beforehand, should set the range knob to the highest range, and then reduce it gradually.

(3). Input overload at the mA input jack will blow the built-in fuse, in this case the fuses should be replaced. The dimension of the fuse is $\phi 5 \times 20\text{mm}$, and the electrical specification is $200\text{mA} / 250\text{V}$. There's no built-in fuse for the 10A input jack, for safe use, each measuring time should be less than 10s, interval time should be more than 15 mins.

9-3. Resistance measurement

9-3-1. Set the range knob to a proper resistance range, and connecting the test leads across to the resistance under measured.

9-3-2. Insert the black test lead to "COM" jack and the red one to " $\frac{V\Omega}{mA}$ " jack.

NOTE:

(1). When measuring in-line resistance, be sure the circuit under tested has been switched off and all capacitors are fully discharged.

(2). At range $200\ \Omega$, the test leads lead will cause $0.1 \sim 0.3\ \Omega$ resistance measuring error. In order to get the accurate result, short-circuit the test leads to measure the wire resistance, then subtracts it from the reading.

(3). When the resistance is over $1\text{M}\Omega$, the meter may take a few seconds to stabilize. This is normal for high resistance readings.

(4). Do not input any voltage at resistance range.

9-4. Diode and continuity test

9-4-1. Insert the black test lead to "COM" jack, and the red one to " $\frac{V\Omega}{mA}$ " jack.

9-4-2. Set the range knob to the diode/continuity test range. (The range diode/continuity test is auto conversion) Connect the red test lead to the positive of the diode and the black one to the negative.

9-4-3. the reading on LCD is the diode positive voltage drop. If mistake the polarity, it will show "OL" on LCD.

9-4-4. Connect the test leads to two ends of the measured circuit, if the resistance is lower than approx. $(50 \pm 20)\ \Omega$, the buzzer sounds.

Note:

To avoid the damage of the meter, before measuring diode in-line, be sure the power has been switched off and all capacitors are fully discharged. The diode range can be measured the voltage drop of the diodes and other semiconductor component. For a normal structure of silicon semiconductor, the forward voltage drop should be $0.5\text{V} \sim 0.8\text{V}$. If you mistake the test leads connection, it will display "OL" and means it is an open circuit. Now the black test lead connect to the "+", and the red one to "-".

9-5. Battery measurement

Load resistance is $300\ \Omega$ at 1.5V range. Load resistance is $1.8\text{k}\Omega$ at 9V range.

9-5-1. Insert the black test lead to "COM" jack, and the red one to " $\frac{V\Omega}{mA}$ " jack.

9-5-2. Set the knob to the proper battery test range, connect the red test lead to the positive of the battery and the black one to the negative.

9-5-3. Get the reading from LCD.

Note:

Do not input the voltage which is higher than 60V DC or 30V AC to avoid the damage of the meter and hurt yourself.

9-6. Non-contact voltage sensing measurement NCV

9-6-1. Set the knob to NCV range

9-6-2. The NCV sensing voltage range is 48V~220V. Put the upper part of the meter close to the AC power line under test. When sensing the voltage of AC line, the red indicator will flash on the upper part of the meter and the buzzer will sound. The closer the AC power line is, the stronger the voltage of AC line shows, the faster the indicator flashes and buzzer sounds.

9-7. Auto power off

In order to save the battery energy, auto power off function already set by default when you turn on the meter, if you have no any operation in 14 minutes, the meter will beep for three times to hint, if there's still no any operation, the meter will long sound and auto power off after one min..

10. TECHNICAL CHARACTERISTIC


Accuracy: $\pm(a\% \times \text{rdg} + d)$ at $(23 \pm 5)^\circ\text{C}$, R.H. <75%

10-1. DCV

Range	Accuracy	Resolution	Input impedance	Overload protection
200mV	$\pm(0.5\%+3)$	0.1mV	About 10M Ω	250V DV/AC rms
2V		0.001V		600V DV/AC rms
20V		0.01V		
200V		0.1V		
600V	$\pm(1.0\%+10)$	1V		

10-2. ACV True RMS measurement

Range	Accuracy	Resolution	Input impedance	Overload protection
200V	$\pm(1.2\%+10)$	0.1V	About 10M Ω	600V DV/AC rms
600V		1V		


 Measuring scope of accuracy: 10% - 100% of the range; Frequency response: 40Hz-1kHz

Measuring way(sine wave): True RMS

Crest factor: $CF \leq 3$, when $CF \geq 2$, add an additional error of 1% of the reading

10-3. DCA

Range	Accuracy	Resolution	Load voltage	Overload protection
200uA	$\pm(1.0\%+10)$	0.1uA	0.1mV/uA	Fuse 200mA/250V
200mA	$\pm(1.2\%+8)$	0.1mA	3.64mV/mA	
10A	$\pm(2.0\%+5)$	0.01A	16.3mV/A	UNFUSED

 Max. Input current: 10A (less than 10 seconds)

Overload protection: 200mA/250V fast-melt fuse, no fuse at the 10A range.

Measuring time: Should be less than 10 seconds; Interval time: Should be more than 15 minutes

10-4. Resistance (Ω)

Range	Accuracy	Resolution	Short-circuit current	Open-circuit voltage	Overload protection
200 Ω	$\pm(0.8\%+5)$	0.1 Ω	About 0.3mA	About 1V	250V DV/AC rms
2k Ω	$\pm(0.8\%+3)$	0.001k Ω	About 0.3mA		
20k Ω		0.01k Ω	About 80 μ A		
200k Ω		0.1k Ω	About 10 μ A		
20M Ω	$\pm(1.0\%+5)$	0.01M Ω	About 0.1 μ A	About 0.5V	

⚠ Measuring error does not include lead resistance

10-5. Diode and continuity test

Range	Displaying value	Test condition	Error	Overload protection
→ →))	Positive voltage drop of diode	Measuring current: about 0.4 mA Open circuit voltage: about 2V	5%	250V DC/AC rms
	Buzzer sounds long, the resistance of two points is less than $(50\pm 20)\Omega$	Measuring current: approx. 0.2mA		

⚠ Warning: Do not input any voltage at this range.

11. BATTERIES AND FUSE REPLACEMENT

If the "🔋" symbol displays on the LCD, it means the battery needs to be replaced, please follow below steps:

11-1. Move the test leads from the circuit under test, pull out the test lead from the input jack, and turn the range knob to "OFF".

11-2. Use a screwdriver to twist off the screws on the battery cover, and remove the battery cover and bracket.

11-3. Take out the old battery or the broken fuse, then replace with a new battery or a new fuse.

11-4. Close the battery cover and use a screwdriver to tighten the screws on the battery cover.

11-5. Battery specifications: 1. 5V * 2 AAA LR03.

11-6. Fuse specifications: mA input fuse "FS1": ϕ 5 * 20mm 200mA/ 250V

Note: When the low voltage "🔋" symbol displays on the LCD, the battery should be replaced immediately, otherwise the measuring accuracy will be affected.

12. MAINTENANCE AND CARE

It is an accurate meter. Do not try to modify the electric circuit.

12-1. Beware of waterproof, dust-proof and shockproof.

12-2. Do not operate and store the meter in the circumstance of high temperature, high humidity, and flammability, explosive and strong magnetic field.

12-3. Use the damp cloth and soft solvent to clean the meter, do not use abrasive and alcohol.

12-4. If you do not operate it for a long time, you should take out the battery.

12-5. When replacing the fuses, please use the fuse with the same type and specification.