

DIGITAL MULTIMETER OPERATION MANUAL

1. GENERAL

The 4 1/2 digit instrument is a stable and good performance digital multimeter driven by battery. It uses the LCD with 42mm-high LCD to make the reading clear, about 15 seconds delay backlight and load protection function to make the operation more convenient.

The instrument has the function of measuring DCV, DCA, AC true RMS measurement, resistance, capacitance, conductance, triode, diode/continuity automatic identification function. The instrument takes dual-integral A/D converter as key point, AC true RMS measurement, it is an excellent tool.

2. OPEN PACKING FOR CHECKING

Open the box, take out the meter, checking the items below if they are missing or damaging:

1.5V AAA LR03 Battery	4pcs
Instruction	1pc
Test leads	1pair

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

3. SAFETY NOTES

This series meter meets the standard of IEC61010 (the safety standards request issued by IEC or equal GB4793.1 standards). Please read below notes carefully before operation.

3-1. Input of limit values beyond range is prohibited.

3-2. The voltage which is 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.

3-3. Be sure to keep the test leads off the testing point when converting function and range.

3-4. Select correct function and range to avoid fault operation.

3-5. When the battery is not installed and the back cover is not tightened, please do not use this table for testing;

3-6. When you measuring resistance, capacitor, diode, continuity test, do not input voltage signal;

3-7. Before replacing the battery or fuse, remove the test leads from the test point and turn off the power switch;

3-8. Comply with local and national safety regulations, wear personal protective equipment (approved rubber gloves, masks and flame retardant clothing, etc.), to prevent electric shock and arc injury caused by exposure of dangerous electric conductor.

3-9. Make measurements using only the correct measurement standard class (CAT), voltage and current rated probe, test conductor and adapter.

3-10. Safety symbols

"⚠" exists high voltage, "⚡" GND, "Ⓜ" dual insulation, "📖" must refer to manual. "🔋" low battery

4. ELECTRIC SYMBOL

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

5. GENERAL SPECIFICATION

- 5-1 Displaying: LCD displaying
- 5-2 Max. indication: 19999 (4 1/2) , auto polarity indication
- 5-3 Measuring method: dual slope A/D transfer
- 5-4 Sampling rate: approx. 3 times/sec
- 5-5 Over range indication: MSD displays "OL"
- 5-6 Low battery indication: "🔋" symbol displays
- 5-7 Operation: 0~40°C , relative humidity <75%
- 5-8 Storage environment: -20°C~60°C , relative humidity <85%RH;
- 5-9 Power: Four 1.5V AAA battery LR03
- 5-10 Size: 186×92×52 mm
- 5-11 Weight: approx.395g (including batteries)

6. APPEARANCE STRUCTURE (Figure 1)

- 6-1. Sound alarm indicator light
- 6-2. LCD display
- 6-3. Function/gear switch
- 6-4. Measurement input terminal
- 6-5. Power key
- 6-6. Triode test terminal
- 6-7. HOLD/backlight
- 6-8. Torch key
- 6-9. Torch window
- 6-10. Hang hole
- 6-11. Battery cover screw
- 6-12. Bracket
- 6-13. Test leads holder

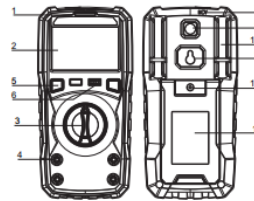
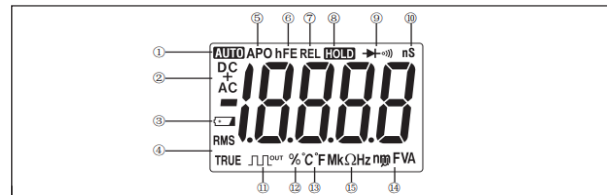


Figure 1

7. DISPLAY SCREEN



(1)	Automatic range	(2)	DC/AC
(3)	Low battery	(4)	True RMS
(5)	Auto power off	(6)	Triode
(7)	Relative value measurement	(8)	Data-hold
(9)	Diode / Continuity test	(10)	Conductance
(11)	Square wave output	(12)	Duty cycle
(13)	Temperature	(14)	Current
(15)	Resistance/Frequency		

8. KEY FUNCTION

8-1. Power on/off function

Long press the "POWER APO" button to turn on/off the POWER of the product. Press the "HOLD B/L" key to turn on the product, can cancel the auto power off (APO)

8-2. Backlight and Function select key (HOLD B/L)

Press the key, the LCD will display "HOLD" symbol, the current data will hold on the LCD, press the key again, to cancel the data hold function. Press the key at the frequency range, can switch the Hz/% (duty cycle) two modes. Press the key more

than two seconds, can turn on/off backlight function. Trigger this button in the square wave output key to change the frequency of the square wave output

⚠Warning: In order to avoid possible electric shock and fire injury, do not use the HOLD function to measure unknown potential. After the HOLD function is turned on, the display screen will not change when different potential is measured.

8-3. AC+DC mode key

At ACV/ACA range, press this key to change to AC+DC measurement mode; press this key again to cancel AC+DC measurement mode

9. OPERATION INSTRUCTION

First of all, please pay attention to check the battery, and place the knob in the position required to measure. If the power is low, the "🔋" symbol will appear on the LCD display. Note the symbol "⚠" next to the test leads socket, which warns you to pay attention to the test voltage and current, do not exceed the indicated value.

(1) AC/DC voltage measurement

1-1. Insert the red test lead into the "VΩHz" jack and the black test lead into the "COM" jack.

1-2. Turn the knob to the corresponding ACV/DCV gear, and connect the test leads across the circuit under test. The ACV value or DCV of the point which the red test lead connected will show on the LCD.

1-3. Read the measurement results from the display.

⚠ NOTE:

(1). If the measured voltage is unsure beforehand, should set the range knob to the highest range, then you can switch to a proper range according to the displayed value.

(2). If it shows "OL" on the LCD, it means the value is beyond the present range. Now you need to set the knob to a higher range.

(3). When measuring high voltage (above 220V), it's necessary to wear the personal protective equipment (approved rubber gloves, masks and flame-retardant clothes, etc.) to prevent the electric shock and arc damaged by the dangerous electric conductor exposes.

(2) AC/DC current measurement

2-1. Insert the red test lead into the "nS mA μA" jack (Max. 200mA) or 20A jack (Max. 20A), and the black test lead into the "COM" jack.

2-2. Turn the knob to the corresponding ACA/DCA gear position, and connect the test leads to the power supply or circuit under tested in series. The ACA value or DCA of the point which the red test lead connected will show on the LCD.

2-3. Read the measurement results from the LCD.

⚠ NOTE:

(1). If the range is unsure beforehand, please set it on the max range. Then choose the proper range according to the reading. Don't measure voltage in the current jack.

(2). If the reading is "OL", the value is beyond the present range. Now you need to set the knob to a higher range.

(3). Pay attention when measuring the current 20A, continuous measurement of large current will make the circuit heating, affect the measurement accuracy and even damage the instrument.

(4). When measuring large current (above 10A), personal protective equipment (approved rubber gloves, masks and flame retardant clothing, etc.) should be wore to prevent electric shock and arc injury when dangerous electric conduct or is exposed.

(3) Resistance measurement

3-1. Input the black test lead to "COM" terminal and the red one to "VΩHz" terminal.

3-2. Set the knob to a proper resistance range, and then connect the test leads

across to the resistance to be tested.

3-3. Read the measurement results from the LCD.

⚠ NOTE:

- (1). The LCD displays "OL" while the resistance is beyond the present range. The knob should be adjusted to a proper range. When measuring value is over 1MΩ, the reading will take a few seconds to be stable. It's normal for high resistance measuring.
- (2). The LCD displays "OL" while the input terminal is under an open circuit.
- (3). When measuring an on line resistance, be sure that the power is off and all capacitors are released completely.

(4).Capacitance measurement

4-1.Input the black test lead to "COM" terminal and the red test lead to "VΩHz" terminal.

4-2.Switch to a proper capacitance range, connect the correct polarity of the test leads (the polarity of the red test lead is "+") to the capacitor which is under tested.

4-3. Read the measurement results from the LCD.

⚠ NOTE:

- (1).The LCD displays "OL" while it is over range. The capacitance range is automatically converted; Maximum measurement: 2mF;
- (2). When measuring the capacitance, due to the influence of the distributed capacitance of the lead wire and the instrument, there may be some residual readings when the capacitance is not connected to the test, it is more obvious when measuring the range of small capacitance. In order to obtain accurate results, the residual readings can be subtracted from the measurement results to obtain more accurate readings. It doesn't affect the accuracy of the measurement.
- (3).When measuring large capacitance, the reading takes a few seconds to stabilize, which is normal when measuring large capacitance.
- (4). Please discharge the capacitor sufficiently before testing the capacity of the capacitor to prevent damage to the meter.
- (5). Unit: 1mF = 1000uF 1uF = 1000nF 1nF = 1000pF

(5). Diode and continuity test

5-1.Input the black test lead to "COM" terminal and the red one to "VΩHz" terminal (the polarity of red lead is "+") .

5-2. Turn the knob to "diode" range, diode range is default. The diode and buzzer range is convert automatically; Connect the test lead to the diode which is under tested and the reading is an approximation of the forward voltage drop of the diode; For silicon PN junction, generally about 500mV~800mV is confirmed as normal value. The LCD will display "OL" if the tested diode is under open circuit or connect the reverse polarity.

5-3.Connect the test leads to two points of the tested circuit, if the resistance value between the two points is lower than about 50±20Ω, the LCD will display "•|)" and the built-in buzzer sounds.

(6). Transistor hFE

6-1. Set the knob to "hFE" range.

6-2. Verify the transistor under tested is NPN or PNP, insert emitter, base and collector to proper jack.

6-3. Read the measurement results from the LCD.

(7). Automatic power on/off

When you stopped using this meter for about 15 minutes, the meter will automatically power off and enter hibernation state; Press the "POWER" key to connect the power again. Press "HOLD B/L" key and turn on the power switch at the same time, the "APO" symbol on the LCD will disappear and automatic power off function will be cancelled.

(8). Frequency measurement

- 8-1.Insert the black test lead to the "COM" jack and the red one to the "VΩHz" jack.
- 8-2.Set the knob to frequency range, connect test leads or shield cable across to the signal source or the load to be tested.

⚠ NOTE:

- (1).When input over 10V RMS, reading is workable but accuracy is not guaranteed.
- (2).It is better to use shield cable to measure small signal at noisy environment.
- (3).When measuring high voltage, don't touch high voltage circuits.
- (4).Do not input more than 250V DC or AC peak value voltage, to avoid the damage of the instrument.
- (5).This frequency range is an automatic range test, which can be measured from 10Hz to 2MHz.

(9) Square wave output

9-1. Connect the test leads or shielded cables to the "COM" and "V/Q/Hz" input terminals;

9-2. Turn the range switch to the square wave range, connect the test leads to the oscilloscope probe cable, and a signal of 50~5k Hz will be displayed.

⚠ Notice:

- (1).The initial square wave output is 50Hz. If you want to output signals of different frequencies, you can press the "HOLDB/L" button to select, and it will output 50Hz, 100Hz, 200Hz to 5kHz in turn, and output cyclically;
- (2) It is strictly forbidden to input voltage at this range.

10. Technical characteristics

Accuracy: ± (a% × reading + digit), at (23 ± 5) °C, relative humidity < 75%. One year guarantee since production date.

Performance (Note "▲" indicates that the meter has this range; "*" means the meter does not have this range.)

FUNCTION	INCLUDE OR NOT
DCV	▲
ACV	▲
DCA	▲
ACA	▲
Resistance Ω	▲
Diode / continuity testing	▲
Triode hFE	▲
Capacitance C	▲
Frequency F	▲
Square wave output	▲
True RMS	▲
AC+DC	▲
Flashlight	▲

(1).DC Voltage

Range	Accuracy	Resolution	Input impedance	Overload protection	
200mV	±(0.05%+5)	0.01mV	About 2MΩ	250V DC / AC RMS	
2V		0.0001V		About 10MΩ	1000V DC / AC RMS
20V		0.001V			
200V		0.01V			
1000V	±(0.1%+5)	0.1V			

Range	Accuracy	Resolution	Input impedance	Overload protection	
200mV	±(0.05%+5)	0.01mV	About 2MΩ	250V DC / AC RMS	
2V		0.0001V		About 10MΩ	1000V DC / AC RMS
20V		0.001V			
200V		0.01V			
1000V	±(0.1%+5)	0.1V			

(2).AC Voltage TRUE RMS MEASUREMENT

The meter extends the frequency response to accurately measure RMS values of various voltage wave forms (AC+DC measurement)

Range	Frequency range	Accuracy	Resolution	Input impedance	Overload protection
200mV	40Hz-400Hz	±(1.0%+25)	0.01mV	10MΩ	250VDC / AC RMS
	400Hz-20kHz	±(2.5%+60)			750VDC / AC RMS
2V	40Hz-400Hz	±(0.8%+25)	0.0001V		
	400Hz-20kHz	±(2.5%+60)			
20V	40Hz-400Hz	±(0.8%+25)	0.001V		
	400Hz-20kHz	±(2.5%+60)			
200V	40Hz-400Hz	±(0.8%+25)	0.01V		
	400Hz-5kHz	±(1.5%+25)			
750V	40Hz-200Hz	±(1.0%+25)	0.1V		
	200Hz-1kHz	±(1.5%+25)			

Display:

- 1) True RMS (applicable to 10% to 100% of the range);
- 2) Some gears may not return to zero, it's a normal phenomenon and it won't affect the measurement accuracy.
- 3) When measuring AC+DC, ± (1%+25) to the original accuracy.

(3).DCA

Range	Accuracy	Resolution	Load voltage	Overload protection
200uA	±(0.5%+4)	0.01uA	1.02mV / uA	FUSE 200mA/250V
2000uA		0.1uA	0.1mV / uA	
20mA		0.001mA	20mV / mA	
200mA		±(0.8%+6)	0.01mA	3.0mV / mA
2A	±(2.0%+15)	0.0001A	20mV / A	FUSE 20A/250V
20A		0.001A		

⚠ NOTE:

At 20A range: ≤5A Continuous measurement allowed
 5A~20A Continuous measurement time ≤10 seconds; Interval time ≥ 5 min
 20A: ≥10A measurement, the value will change, which is caused by the heating of the over-current device, and the change value is normal within the accuracy range.

(4).ACA TRUE RMS

Range	Accuracy	Resolution	Load voltage	Overload protection
200mA	±(1.5%+15)	0.01mA	About 3.0mV/mA	FUSE 200mF/250V
20A			±(2.5%+35)	0.001A

Frequency response: standard sine wave and triangle wave: 40Hz-1k Hz

Display: True RMS (applicable to 10%~100% of the range)

When measuring AC+DC, ± (1%+25) to the original accuracy

NOTE:

At 20A range: $\leq 5A$ Continuous measurement allowed
 5A~20A Continuous measurement time ≤ 10 seconds; Interval time ≥ 5 min
 20A: $\geq 10A$ measurement, the value will change, which is caused by the heating of the over-current device, and the change value is normal within the accuracy range.

(5).Resistance (Ω)

Range	Accuracy	Resolution	Fault current	Open-circuit current	Overload protection
200 Ω	$\pm (0.4\%+10)$	0.01 Ω	About 0.4mA	<1.5V	250V DC/AC RMS
2k Ω	$\pm (0.4\%+5)$	0.0001k Ω	About 100uA		
20k Ω		0.001k Ω	About 10uA		
200k Ω		0.01k Ω	About 1uA		
2M Ω	$\pm (1.2\%+25)$	0.0001M Ω	About 0.2uA		
20M Ω	$\pm (5.0\% + 45)$	0.001M Ω	About 0.2uA		
200M Ω		0.01M Ω	About 0.2uA		

NOTE: At the 200 Ω range, the test leads should be short-circuited first, measuring the lead resistance, and then subtract it from the final value.

(6).Capacitance

Range	Accuracy	Resolution	Over-load protection
20nF	$\pm(4.0\%+50)$	0.001nF	250V DC/AC RMS
200nF		0.01nF	
2uF		0.0001uF	
20uF		0.001uF	
200uF		0.01uF	
2mF		0.0001mF	

Accurate measurement range:10% - 100%.

Large capacitance response time: $\cong 1mF$ About 8s;

The measured error doesn't include lead capacitance

(7). Diode and continuity testing

Range	Reading	Condition	Error	Over-load protection
	Forward voltage drop of diode	Forward DCA about 1mA, the reverse voltage is about 3V	5%	250VDC/ AC RMS
	Buzzer makes a long sound and light alarm test two point resistance is less than 50 Ω \pm 20 Ω	Open-circuit voltage is about 1 A.		

(8).Frequency

Range	Accuracy	Resolution	Over-load protection
200Hz	$\pm(0.1\%+3)$	0.01Hz	250V DC/AC RMS
2kHz		0.0001kHz	
20kHz		0.001kHz	
200kHz		0.01kHz	
2MHz		0.0001MHz	

NOTE: For signals below 3Hz, the reading is zero.

1.5V RMS \leq Input sensitivity \leq 10V RMS.

(9).Transistor hFE DATA TEST

Range	Displaying range	Test condition

hFE NPN or PNP	The display value is approximate hFE of the triode test (0 ~ 1000 β)	Basic current is approx. 10uA, Vce is about 1.5V
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(10).Square wave output

Range	Voltage range	Frequency	Input protection
	About 3.3V	50Hz-5kHz	250Vrms

11. Replace the battery or fuse

Refer to below and follow these steps:

11-1.Take the test leads away from the circuit under tested, pull out the test leads from the input jack, and short press "POWER" to turn off the meter power.

11-2.Take out the screws on the battery door with a screwdriver and remove the battery door and bracket.

11-3. Take out the old battery or bad fuse and replace it with a new 1.5V alkaline battery or new fuse.

11-4. Cover the battery door and install the screws on the battery door with a screwdriver.

11-5. Battery specification: 1.5VX4 AAA

11-6. Fuse Specification:

mA input fuse "FS1": ϕ 5x20mm 200mA / 250V

20A input fuse "FS2": ϕ 5X20mm 20A / 250V

Note: when the low-voltage " " symbol is displayed on the LCD, the built-in battery should be replaced immediately, otherwise the measurement accuracy will be affected.

12. MAINTENANCE

Do not try to modify the electric circuit.

12-1. Keep the meter away from water, dust and shock.

12-2.Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.

12-3.Wipe the case with a damp cloth and detergent, do not use abrasives and alcohol.

12-4.If do not operate the meter for a long time, should take out the battery to avoid leakage

12-5. Replace fuse: When replacing fuse, please use another same type and specification fuse.

13. Trouble shooting

If your meter is not working properly, the following methods can help you quickly solve the problem. If the fault still cannot be removed, please contact the repair center or dealer.

Fault	Solution
No reading on LCD	<ul style="list-style-type: none"> Power off--- Turn on the power Holding key---Set a correct mode Replace battery
The signal appears	Replace battery
No current input	Replace fuse
Big error	Replace battery
LCD is dark	Replace battery

This manual is subject to change without notice;

The contents of this manual are considered to be correct. If the user finds any errors or omissions, please contact the manufacturer;

The company does not bear the accident and harm caused by the user's wrong operation;

The functions described in this manual are not used as a reason to use the product for a special purpose.