DIGITAL MULTIMETER

OPERATION MANUAL

1. GENERAL

The instrument is a stable and good performance digital multimeter driven by battery. It uses the LCD with 28mm-high figure to make the reading clear, and make the operation more convenient.

The instrument has the function of measuring DCV, ACV, DCA, ACA, resistance, capacitance, AC frequency, diode, triode and continuity test, temperature and automatic power off, backlight. The instrument takes dual-integral A/D converter as key point, it is an excellent tool.

The new generation series of products add NCV (non-contact ACV induction measurement) function and include the torch function, it is more convenient for users to use.

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. When the input ACV/DCV is more than 24V, the high voltage warning symbol " ⚡ "will be displayed.

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, temperature and on-off 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 elec tric 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	CE	Accord with order of the European Union
🔋	Low battery Voltage	▭	Fuse

5. GENERAL SPECIFICATION

5-1 Displaying: LCD displaying

5-2 Max. indication: 1999（3 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℃ relative humidity <75%

5-8 Storage environment:-20℃-60℃ 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. Function button

6-6. Triode test terminal

6-7. NCV Inductive position

6-8. Torch

6-9.Hang hole

6-10.Battery cover screw

6-11.Bracket

6-12.Test leads holder

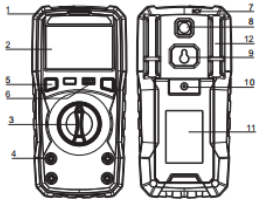
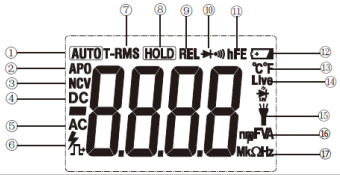


Figure 1

7. Display screen



(1)	Automatic range	(2)	Auto power off
(3)	Non-contact ACV measurement	(4)	DC measurement
(5)	AC measurement	(6)	High voltage
(7)	True RMS	(8)	Data-hold
(9)	Relative value measurement	(10)	Diode / Continuity test
(11)	Triode	(12)	Low battery
(13)	Temperature	(14)	Judgment of live line
(15)	Torch	(16)	Current
(17)	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.

8-2. Data hold

Short press the "HOLD B/L SELECT" button to keep the current measured value displayed on the LCD of the meter. Press the key again to exit the data hold function; except AC 750V and temperature measurement.

⚠⚠**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.Backlight control

Long press the "HOLD B/L SELECT" key to open the backlight, and long press it again to turn off the backlight.

8-4.Cancel automatic power off (APO) function:

In the power-on state, short press the "POWER APO" button to turn on/off the power switch.

8-5.Function conversion

Press the "HOLD B/L SELECT" key at AC1000V range, the LCD shows the current ACV frequency, press the key again can turn back to the voltage measurement function. Press "HOLD B/L SELECT" key at the temperature range to convert ℃ to ℉.

8-6.REL measurement mode

Short press the REL/ key, turn on/off the REL (relative value) measurement mode; the relative value symbol will display the LCD. (Applicable to ACV, DCV, ACA, DCA, capacitance and temperature range).

8-7. Torch

Long press the REL/ key. Turn on/off the torch (The torch is at the bottom of the multimeter). The torch will not be turned off when using. Please turn off the torch when you are not using it.

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. Turn the knob to the corresponding ACV/DCV gear, and connect the test leads to the circuit under test. The voltage and the polarity of the point which the red test lead connected will show on the LCD.

1-2. Insert the red test lead into the " VΩ⊣+ " jack and the black test lead into the "COM" jack.

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. 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 measured current value and the current polarity of the red test lead will be displayed on the screen at the same time.
2-2. Insert the red test lead into the " mAuA " jack (Max. 200mA) or 20A jack (Max. 20A), and the black test lead into the "COM" jack.
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. Set the knob to a proper resistance range, and then connect the test leads across to the resistance to be tested.
3-2. Input the black test lead to "COM" terminal and the red one to " VΩ⊣+ " terminal.
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. Switch to a proper capacitance range, connect the teat leads to the two side of the tested capacitor. (Red test lead is "+")
4-2. Input the black test lead to "COM" terminal and the red test lead to " VΩ⊣+ " terminal.
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: 20mF;
(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 will not affect the accuracy of the measurement; you can short press "REL" key to clear the base value of the open circuit, and then do the relative value measurement.
(3), when measuring serious leakage or breakdown of capacitance at large capacitance range, some values will be displayed and unstable; For large capacitance measurements, the reading takes a few seconds to stabilize, which is normal for large capacitance measurements; .
(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). TRANSISTOR hFE

5-1. Set the knob to "hFE" range.
5-2. Verify the transistor under tested is NPN or PNP, insert emitter, base and collector to proper jack.

(6). DIODE AND CONTINUITY TEST

6-1. Turn the knob to ⊣•)) 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; When the measuring voltage is lower than 50mV, it is automatically converted to continuity test function.
6-2. Input the black test lead to "COM" terminal and the red one to " VΩ⊣+ " terminal (the polarity of red lead is "+") .
6-3.Connect the test leads to two points of the tested circuit, if the resistance value between the two points is lower than about 50Ω, the LCD will display " •)) " and the built-in buzzer sounds. When the resistance value is higher than 200Ω, it is automatically converted to diode test function.

(7).LIVE LINE RECOGNITION

8-1. Set the knob to "Live" range, the LCD display "Live".
8-2. Input the red test lead to " VΩ⊣+ ", and use the red test lead to touch the measurement point.
8-3.If there is a sound and light alarm, and it shows high pressure symbol " ϟ " on the LCD, the red test lead is connected to the live line. If nothing changes, the red test lead is connected to the zero line.

⚠ **NOTE:**

(1). The range must be operated according to safety rules.
(2). The function only detects AC standard mains power lines (AC 110V~AC 380V).

(8). NON-CONTACT VOLTAGE INDUCTION MEASUREMENT NCV

10-1. Set the knob to "NCV" range.
10-2. NCV induction voltage range is 48V~220V, let the upper position of the multimeter close to the measured electric AC power line, when the ACV is sensed, the upper red indicator lights of the meter flashing and at the same time a buzzer alarm on, the more close to the AC power line, the more stronger the ACV sensed, the corresponding flashing lights, and the buzzer alarm sound faster.

(9).Automatic power on/off

In order to save power consumption and prolong battery life, the APO automatic shutdown function will be turned on by default after the meter is turned on. If the user does not operate the meter within 14 minutes, the meter will be prompted with 3sounds. If there is still no operation, the meter will automatically turn off the power after a long sound one minute later. When power on again, set the knob to "OFF" range and then knob to the needed function range. To cancel APO function, please refer to the instructions in section 8, "key function".

10. Technical characteristics

Accuracy: ± (a% × reading + digit), at (23 ± 5) ℃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.)

FUCTION	INCLUDE OR NOT
DCV	▲
ACV	▲
DCA	▲
ACA	▲
Resistance Ω	▲
Diode / continuity testing	▲
Capacitance C	▲
Temperature ℃℉	✻
Triode hFE	▲
Frequency F	✻
Auto power-off APO	▲
Backlight / Torch	▲
LIVE LINE judgement	▲
NCV	▲

(1).DC Voltage

Range	Accuracy	Resolution	Input impedance	Overload protection
200mV	±(0.5%+5)	100uV	About 10MΩ	1000V DC / AC RMS
2V	±(0.5%+3)	1mV		
20V		10mV		
200V		100mV		
1000V	±(1.0%+10)	1V		

(2).AC Voltage TRUE RMS MEASUREMENT

Range	Accuracy	Resolution	Input impedance	Overload protection
2V	±(0.8%+5)	1mV	About 10MΩ	1000V DC / AC RMS
20V		10mV		
200V		100mV		
1000V	±(1.2%+10)	1V		

Accurate measurement range: 10%-100% of the range;
Frequency response: 40Hz-1KHz
Measurement mode (sine wave) ： True RMS
Crest factor: CF≦3, adding an additional error of 1% to the reading at CF≧2.
AC frequency measurement error: 0.2%+0.02Hz;
AC frequency measurement range: 40Hz~1kHz;
AC frequency measurement input sensitivity: 80V~600V

(3).DCA

Range	Accuracy	Resolution	Load voltage	Overload protection
200uA	±(1.2%+8)	0.1uA	0.125mV / mA	FUSE 200mA/250V
2mA		1uA	125mV / mA	
20mA		10uA	3.75mV / mA	
200mA		10uA	3.75mV / mA	
2A	±(1.5%+10)	1mA	37.5mV / A	
20A	±(2.0%+5)	10mA	37.5mV / A	FUSE 20A/250V

20A (test within 10 seconds); Recovery time is 15 minutes.

(4).ACA

Range	Accuracy	Resolution	Load voltage	Overload protection
200mA	±(1.5%+15)	10uA	3.75mV / mA	FUSE 200mA/250V
2A	±(2.0%+5)	1mA	37.5mV / A	FUSE 20A/250V
20A	±(3.0%+10)	10mA	37.5mV / A	

Accuracy measurement range: 10%-100% of the range;
Frequency response: 40Hz-400Hz;
Measurement mode (sine wave): true RMS;
Crest factor: CF≦3, adding an additional error of 1% to the reading at CF≧2.
20A (test within 10 seconds); Recovery time is 15 minutes.

(5)Resistance（Ω）

Range	Accuracy	Resolution	Fault current	Overload protection
200Ω	± (0.8%+5)	0.1Ω	About 0.4mA	250VDC/ AC RMS
2kΩ	± (0.8%+3)	1Ω	About 100uA	
20kΩ		10Ω	About 10uA	
200kΩ		100Ω	About 1uA	
2MΩ		1kΩ	About 0.2uA	
20MΩ	± (1.0%+25)	10kΩ	About 0.2uA	
200MΩ	± (5.0% + 30)	100kΩ	About 0.2uA	

Open circuit voltage: about 1V
The measured error doesn't include lead resistance.

(6).Capacitance

Range	Accuracy	Resolution	Over-load protection
6nF	±(5.0%+40)	1pF	250VDC/ AC RMS
60nF	±(3.5%+20)	10pF	
600nF		100pF	
6uF		1nF	
60uF		10nF	
600uF	±(5.0%+10)	100nF	
6mF		1uF	
20mF	±(5.0%+40)	10uF	

Accurate measurement range:10% - 100%.
Large capacitance response time: ≧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	The test current is approx 0.4mA, the open circuit voltage is approx 3.3V	5%	250VDC/ AC RMS
	Buzzer makes a long sound while resistance is less than 50Ω±20Ω	The test current is approx 0.4mA.		

Caution：Do not input voltage at this range!

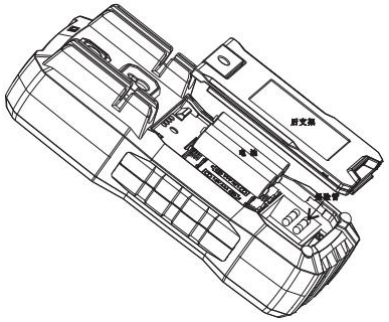
(8).Transistor hFE DATA TEST

Range	Displaying range	Test condition
hFE NPN or PNP	0 ~ 1000 β	Basic current is approx. 10uA ， Vce is about 1.5V

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 APO" 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 LR03
11-6. Fuse Specification:
mA input fuse "FS1": Φ5x20mm 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	●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.

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