

DIGITAL MULTIMETER USERS MANUAL

CONTENTS






1.	GENERAL DESCRIPTION
2.	SAFETY PRECAUTIONS.....
3.	FEATURES
4.	OPERATION INSTRUCTION.....
5.	MAINTENANCE
6.	TROUBLE SHOOTING

1. GENERAL DESCRIPTION

This 3 1/2 digital multimeter with highly stable performance is driven by 2 pieces 1.5V battery. It uses a LCD with 22mm high figure, which makes the reading clearer and the operation more convenient. It can test DCV, ACV, DCA, ACA, resistance, NCV, temperature, transistor, diode, and continuity. This meter also holds functions including unit symbol display, data hold, auto/manual range switching (RANGE), auto power off, backlight and warning functions. To assure high accuracy and resolution, it adopts an 8-bit microprocessor and a dual integral A/D conversion IC as its core which can drive LCD directly. It is an ideal tool for labs, factories and radio-technology.


2. SAFETY PRECAUTIONS

The instrument is designed according to IEC1010 standard (safety standard issued by International Electro technical Committee). Please read the following before operation.

- 2.1 Check the connection and insulation of test leads to avoid electric shock.
- 2.2 To avoid electric shock and damage to the meter, do not input voltage higher than DC 1000V or AC 750V during measurement.
- 2.3 When measuring voltage higher than DC 60V or AC 40V, please be careful.
- 2.4 Select correct function and range to avoid fault operation.
- 2.5 Please move the test leads away from test points when switching the function.
- 2.6 Please don't input voltage in current terminal.
- 2.7 Please don't modify the circuit arbitrarily, it may cause safety problem.
- 2.8 Introduction for safety symbols:
 exists high voltage,  GND,  dual insulation,  Operator must refer to manual,  Low battery indication.

3. FEATURES

3.1 General Characteristics

- 3.1.1 Display: LCD;
- 3.1.2 Max display: 2000 (3 1/2 digits, automatic polarity, and unit symbol display);
- 3.1.3 Measurement method: Analog to digital converter (in micro processor ADC+MCU);
- 3.1.4 Sampling rate: approx.3 times/sec.
- 3.1.5 Over-range display: "OL" displayed.
- 3.1.6 Low battery indicator: 
- 3.1.7 Working environment: (0~40)°C, relative humidity: <80%;

- 3.1.8 Store condition: (-10~50)°C, relative humidity: <80%
- 3.1.9 Battery: 2 pieces 1.5V battery (AAA);
- 3.1.10 Dimension: 170×86×35mm (length*width*height);
- 3.1.11 Weight: approx. 290g (including battery);
- 3.1.12 Accessories: test leads, user manual, temperature probe, gift box, and 2*1.5V batteries.

3.2 Technical Features

3.2.1 Accuracy: $\pm (a\% \times \text{reading data} + \text{digits})$. To assure accuracy, the environment temperature should be (23±5) °C, relative humidity should <75%. One year accuracy guarantee since production date.

3.2.2 DC Voltage (DCV)

Range	Accuracy	Resolution
200mV	$\pm(0.5\%+4)$	0.1mV
2V		1mV
20V		10mV
200V		100mV
1000V	$\pm(1.0\%+4)$	1V

Input impedance: at 200mv range >40MΩ, at other ranges is 10MΩ.

Overload protection: 1000V DC or 750V AC peak value

3.2.3 AC Voltage (ACV)

Range	Accuracy	Resolution
200mV	$\pm(1.5\%+10)$	0.1mV
2V	$\pm(0.8\%+6)$	1mV
20V		10mV
200V		100mV
750V	$\pm(1.0\%+6)$	1V

Input impedance: at 200mv range >40MΩ, at other ranges is 10MΩ.

Overload protection: 1000V DC or 750V AC peak value

Frequency response: at 750V range: 40~100Hz, at other ranges: 40~400Hz

Displaying: average value response (based on sine wave RMS)

3.2.4 DC Current (DCA)

Range	Accuracy	Resolution
200uA	$\pm(1.0\%+5)$	0.1μA
2000uA		1μA
20mA		10μA
200mA		100μA
2A		1mA
20A		$\pm(2.0\%+5)$

Maximum voltage drop: 200mV for all ranges.

Maximum input current: 20A (for 15 seconds).

Over load protection: 0.2A/250V fuse and 13A/250V fuse.

3.2.5 AC Current (ACA)

Range	Accuracy	Resolution
200uA	$\pm(1.5\%+5)$	0.1μA

2000uA		1μA
20mA		10μA
200mA		100μA
2A		1mA
20A		$\pm(2.0\%+10)$

Maximum voltage drop: 200mV for all ranges.

Maximum input current: 20A (for 15 seconds).

Over load protection: 0.2A/250V fuse and 13A/250V fuse.

Frequency response: 40~100Hz under 20A range, 40~400Hz at other ranges.

3.2.6 Resistance (Ω)

Range	Accuracy	Resolution
200Ω	$\pm(0.8\%+5)$	0.1Ω
2kΩ	$\pm(0.8\%+1)$	1Ω
20kΩ		10Ω
200kΩ		100Ω
2MΩ		1kΩ
20MΩ	$\pm(1.2\%+5)$	10kΩ

Open circuit voltage: 400mV


Overload protection: 250V DC/AC peak value.

NOTE: At 200 Ω range, short the test leads to measure the wire resistance, then subtracts it from the real measurement, or press "REL" to clear the wire resistance and read the value directly.

3.2.7 Transistor triode (hFE)

Measurement	Range	Test Conditions
NPN or PNP	0~1000	Base current is approximate 15uA, Vce is about 4.5V

3.2.8 Diode and Continuity Test

Range	Description	Test Conditions
	Diode forward voltage drop	Forward DC current is approx 0.5mA, reverse voltage is approx 1.5V.
	When the resistance under test is less than 50±10Ω, buzzer sounds continuously.	Open circuit voltage: 0.5V

Overload protection: 250V DC/AC peak value

WARNING: Do not input any voltage at this range.

3.2.9 Temperature (°C/°F)

Range	Accuracy	Resolution
-40°C~1000°C	<400°C $\pm(1.0\%+5)$ ≥400°C $\pm(1.5\%+15)$	1°C
0F~1832°F	<750°F $\pm(1.0\%+5)$ ≥750°F $\pm(1.5\%+15)$	°F

Thermocouple: K type

WARNING: do not input any voltage at this range.

4. OPERATION INSTRUCTION

4.1 Panel Description

① Input terminal:

Terminal	Description
A	Input terminal for AC and DC current from 0 to 20A (max for15 seconds)
uA/mA TEMP-	Input terminal for AC and DC current from 0uA to 200mA (less than 200mA can last 18 hours), and temperature negative (-) terminal
COM	Common terminal for all measurements
V Ω TEMP+	Input terminal for voltage, resistance, diode, and continuity, and temperature positive (+) terminal
hFE	Input terminal for triode measurement.

② Rotary switch: used to change the range and choose functions.

Switch position	Function
V~	AC voltage measurement
V---	DC voltage measurement
Ω	Resistance measurement
→))	Diode/continuity measurement. Press SELECT key (yellow) to choose diode or continuity range.
NCV	Non-contact voltage detect
°C/°F	Temperature measurement, press SELECT key (yellow) to choose °C or °F.
hFE	Triode magnification measurement
uA~	DC current measurement (from 0uA to 2000uA). Press SELECT key (yellow) to switch to AC current measurement (from 0uA to 2000uA).
mA~	DC current measurement (from 0mA to 200mA). Press SELECT key (yellow) to switch to AC current measurement (from 0mA to 200mA).
A~	DC current measurement (from 0A to 20A). Press SELECT key (yellow) to switch to AC current measurement (from 0A to 20A).

③ Function Button

③-1 LIGHT key: press "☀" light key for 2 seconds to turn on the backlight, the backlight can last 15 seconds. During 15 seconds, press "☀" light key again for 2 seconds will turn off the backlight.

③-2 MAX key: press MAX key to enter into MAX mode, which will update and store the maximum value of measurements automatically. Press MAX key again to exit MAX mode.

③-3 HOLD key: press HOLD key to enter HOLD mode, the current value will be hold, and symbol HOLD will be displayed. Press HOLD again can exit the HOLD mode.

③-4 RANGE key: for choosing auto or manual range. The default state is auto range, when you turn on the meter "AUTO" symbol displayed. Press RANGE key will enter manual range mode. Press RANGE key after that can switch between the ranges available for the manual range. To return to auto ranging, hold the button down for more than 2 seconds.

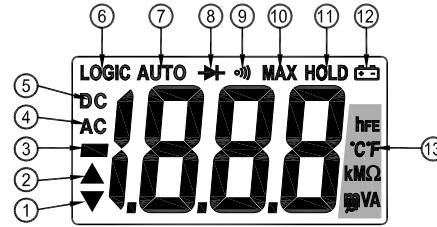
③-5 SELECT key (yellow):

③-5-1 At ~ range, press yellow key can choose DC or AC measurement. At →|)|) range, press yellow key can choose diode or continuity test. At temperature range, press yellow key can choose °C/°F.

③-5-2 When there is no measurement in 15 minutes, the meter will auto power off and enter

dormancy mode. In one minute before dormancy mode, the buzzer will beep 5 times to remind user. Press any button or turn the rotary switch will exit the dormancy mode. Press yellow key to active the meter from the dormancy mode or hold the yellow button down when turn on the meter, it will cancel auto power off function.

④ LCD: Display the data and unit symbol.



Number	Feature	Indication
1	▼	Null
2	▲	Null
3	-	Indicates negative readings.
4	AC	AC voltage or current measurement.
5	DC	DC voltage or current measurement.
6	LOGIC	Null
7	AUTO	Auto range mode.
8	→))	Diode test mode
9	·))	Continuity beeper is on.
10	MAX	Maximum value recording mode.
11	HOLD	Display Hold is active.
12	🔋	Low battery indication. Warning: To avoid false readings, which could lead to possible electric shock or personal injury, please replace the battery as soon as the battery indicator appears.
13	hFE °C/°F MΩ, kΩ, Ω mV, V uA, mA, A	hFE (Triode magnification measurement) Degrees Celsius, Degrees Fahrenheit Megohm, Kilohm, Ohm Millivolts, Volts Microamp, Milliamp, Amperes (amps)

⑤. NCV detector area and indicate light.

⑥. Holster and battery door.

4.2 DCV measurement

4.2.1 Insert the black test lead into "COM" terminal, and the red one into "V/Ω" terminal.

4.2.2 Set the rotary switch to "V---" range.

4.2.3 Auto range is the original states, it will display "AUTO" symbol. Press "RANGE" key to change to manual range mode, and 200mV, 2V, 20V, 200V, 1000V ranges are selectable;

4.2.4 Connect test leads to the test point; LCD will display polarity and voltage of the test point connected by the red test lead.

NOTE:

1. Under manual range mode, if LCD displays "OL", it means over range, you should select the higher range.

2. Do not input a voltage over DC 1000V. It may cause damage to the circuit of meter.

3. Be careful while measuring a high voltage circuit. DO NOT touch the high voltage circuit.

4. The built-in buzzer will beep to warn user, when the measuring voltage over DC1000V.

4.3 ACV measurement

4.3.1 Insert the black test lead into "COM" terminal, and the red one into "V/Ω" terminal.

4.3.2 Set the rotary switch to "V~" range.

4.3.3 Auto range is the original states, it will display "AUTO" symbol. Press "RANGE" key to change to manual range mode, and 200mV, 2V, 20V, 200V, 750V ranges are selectable;

4.3.4 Connect test leads to the test point; LCD will display voltage of the two test points.

Note:

1. Under manual range mode, if LCD displays "OL", it means over range, you should select the higher range.

2. Do not input a voltage over AC 750V. It may cause damage to the circuit of meter.

3. Be careful while measuring a high voltage circuit. DO NOT touch the high voltage circuit.

4. The built-in buzzer will beep to warn user, when the measuring voltage over AC750V.

4.4 DCA measurement

4.4.1 Insert the black test lead into "COM" terminal and the red one into "uAmA" terminal (Max. 200mA) or into "20A" terminal (Max.20A);

4.4.2 Set the rotary switch to a proper current range, and then connect the test leads to the circuit. LCD will display polarity and current of the test point connected by the red test lead.

Note:

1. Firstly users should select the highest range, if users not sure about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays "OL", it means the current is over range. Now you need to select a higher range.

3. Maximum input current is 200mA or 20A (subject to where the red test lead insert into).

Current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4.5 ACA measurement

4.5.1 Insert the black test lead into "COM" terminal and the red one into "uAmA" terminal (Max. 200mA) or into "A" terminal (Max.20A);

4.5.2 Set the rotary switch to a proper current range, press SELECT (yellow) key to select the AC mode, and then connect the test leads to the circuit. LCD will display current value.

Note:

1. Firstly users should select the highest range, if users not sure about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays "OL", it means the current is over range. Now you need to select a higher range.

3. Maximum input current is 200mA or 20A (subject to where the red test lead insert into). Current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4.6 Resistance measurement

4.6.1 Insert the black test lead into "COM" terminal and the red one into "V/Ω" terminal.

4.6.2 Set the rotary switch to Ω range.

4.6.3 Auto range is the original states. Press "RANGE" key can choose manual range.

Note:

1. Firstly users should select the highest range, if the value of resistance is unknown

beforehand, and then select the proper range based on displaying value.

2. The LCD displays “OL” when the resistance is over the selected range. The knob should be adjusted to a higher range. When measuring value is over $1M\Omega$, the reading will take a few seconds to be stable. It's normal for high resistance measurement.

3. When input terminal is in open circuit, LCD will display “OL”.

4. Before measuring in line resistor, make sure that the power is off and all capacitors are discharged completely.

5. When there is big error, it may be affected by other online component or there is voltage on the resistor.

6. Do not input any voltage at resistance range.

4.7 Non-contact voltage detector

Static electricity or other sources of energy may randomly trigger the sensor. The result is only for reference.

4.7.1 Turn the rotary switch to NCV position.

4.7.2 Hold the top of the meter very close to the voltage source under test.

4.7.3 If voltage is present, the LED above the display will glow, and buzzer will beep.

NOTE:

1. Even without indication of the detector, there might exist voltage. The result is only for reference.

2. The test result might be affect by many factors such as the design of the socket and the thickness of insulation material.

3. The LED light might glow when user inputs voltage into the meter terminal.

4. Flashlight or motor driver and other external sources of the disturbance might cause the wrong results.


4.8 Transistor hFE measurement

4.8.1 Set the rotary switch to hFE range;

4.8.2 Define the transistor is NPN or PNP type, then insert the emitter, base and collector separately into the relative hole, the value will be displayed on LCD.

4.9 Diode and Continuity test:

4.9.1 Insert the black test lead into “COM” terminal and the red one into “V/ Ω ” terminal (the polarity of red lead is “+”)

4.9.2 Set the rotary switch to  range, the original state is diode measurement mode;

4.9.3 Forward measurement: connect red test lead to the positive polarity and the black test lead to the cathode polarity of the diode. LCD will display the approx. value of forward voltage drop.


4.9.4 Backward measurement: connect red test lead to the cathode polarity and the black test lead to positive polarity of the diode. LCD will display “OL”.

4.9.5 The complete diode testing includes forward and backward measurement, if the result doesn't meet the descriptions above; it means the diode is broken.

4.9.6 Press SELECT (yellow) key to select the continuity measurement mode.

4.9.7 Connect test leads to two points of tested circuit, if the resistance is less than $(50\pm 10)\Omega$, the buzzer sounds.

Note:

1. Don't input voltage at  range.

2. When test circuits, make sure the power is off and all capacitors are discharged. Any negative potential or AC signal will make the buzzer sounds.

4.10 Temperature measurement

4.10.1 Set the rotary switch to “C/ $^{\circ}$ F” range.

4.10.2 Insert the cold terminal (free end) of thermocouple in “TEMP+” and “TEMP-” socket, and put the working terminal (temperature measuring end) of thermocouple on the surface or inside the object to be tested. Then you can read temperature from the screen, and the data is in Centigrade.

Note:

1. If insert the thermocouple oppositely, it will display the wrong value. When the temperature is rising, the value will be down.

2. When the input terminal is open circuit, it will display the environment temperature.

3. Don't change the temperature probe randomly, or the accuracy will not be guaranteed.

4. Don't input voltage at temperature range.

5. MAINTENANCE

The meter is a precise instrument. Random changes to the circuit are not allowed.

Note:

1. Don't input the voltage value higher than DC 1000V or AC 750V rms.

2. Don't input voltage at current, resistance, diode and continuity range.

3. Don't make any measurements when the battery isn't installed or the back cover isn't fixed.


4. Before replacing battery or fuse, please remove the test leads from the measuring point and cut off the power.

5. Keep the meter away from water, dust and shock.

6. Don't expose the meter under high temperature, high humidity, combustible, explosive and strong magnetic place.

7. Wipe the case with a damp cloth and detergent. Do not use abrasives and alcohol to clean the meter.

8. If do not operate for a long time, you should take out the battery to avoid leakage damage.

9. When  symbol is displayed, you should replace the battery according to the following steps:

9-1. Follow picture 2, and remove the holster at first.

9-2. Loosen the screw, unlock the battery door and remove the cover;

9-3. Replace the old battery with the new one. For longer using life, it's better to use alkaline battery.

9-4. Fix the battery door.

9-5. Follow the picture to put on the holster.

10. Fuse change: When replacing fuse, please use fuse with same type and specification.

10-1. Follow picture 2, and remove the holster at first, then unlock the battery door and remove the cover;


10-2. Take out the fuse and put on a new one.

10-3. Fix the battery door, and put on the holster.

6. TROUBLE SHOOTING

If the meter does not work properly, please check the meter as following steps:

(If the problems still cannot be solved, please refer to repairing center or contact the local dealers.)

Fault	Solution
No reading on LCD	<ul style="list-style-type: none">Turn on the powerReplace batteryRelease the HOLD key
 signal appears	<ul style="list-style-type: none">Replace battery
No current or temperature input	<ul style="list-style-type: none">Replace fuse
Big error Value	<ul style="list-style-type: none">Replace battery

- The specifications are subject to changes without prior notice.
- The content of this manual is regarded as correct. If users find out any mistakes or omissions, please kindly contact the manufacturer.
- The manufacturer will not be responsible for accidents and damage caused by improper operations. The functions described in this User Manual shall not be considered as the reason for any special usages.