

## DIGITAL MULTIMETER INSTRUCTION MANUAL

### 1. SUMMARY

This 3 3/4 digital multimeter with highly stable performance is driven by 2 pieces 1.5V battery. It uses a LCD with 32mm high figure, which makes the reading clearer and the operation more convenient.

The digital multimeter holds functions of measuring DCV, ACV, DCA, ACA, resistance, capacitance, frequency, temperature, duty cycle, transistor, diode, and continuity, etc. It also can provide special functions including unit symbol display, data holding, relative value measuring, auto/manual range switching (RANGE), auto power off and warning alarm. To assure high accuracy and resolution, it adopts an 4-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: 4000 (3 3/4) digits, automatic polarity and unit symbol display;

3.1.3 Measurement method: double integral A/D conversion;

3.1.4 Sampling rate: approx.3 times/sec.

3.1.5 Over-range display: “OL” displayed in the highest digit.

3.1.6 Low battery display: “”

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 Power supply: 2pcs 1.5V battery (“AAA”7# battery);

3.1.10 Dimension: 185×93×35mm (length\*width\*height);

3.1.11 Weight: approx. 290g (including battery);

3.1.12 Accessories: test leads, user manual, TP01 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 guarantee since production date.

#### 3.2.2 DC Voltage (DCV)

Range	Accuracy	Resolution
400mV	±(0.5%+4)	0.1mV
4V		1 mV

40V		10 mV
400V		100 mV
1000V	±(1.0%+4)	1V

Input impedance: at 400mv 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
400mV	±(1.5%+6)	0.1mV
4V		1 mV
40V	±(0.8%+6)	10 mV
400V		100 mV
750V	±(1.0%+6)	1V

Input impedance: at 400mv 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: sine wave RMS (average value response)

#### 3.2.4 DC Current (DCA)

Range	Accuracy	Resolution
400uA	±(1.0%+5)	0.1μA
4000uA		1μA
40mA		10μA
400mA		100μA
4A	±(2.0%+5)	1mA
20A		10mA

Maximum voltage drop: 400mV for mA range, and 200mV for A range

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

Over load protection: 0.5A/250V fast action fuse and 13A/250V fast action fuse.

#### 3.2.5 AC Current (ACA)

Range	Accuracy	Resolution
400uA	±(1.5%+5)	0.1μA
4000uA		1μA
40mA		10μA
400mA		100μA
4A	±(2.0%+10)	1mA
20A		10mA

Maximum voltage drop: 400mV for mA range, and 200mV for A range

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

Over load protection: 0.5A/250V fast action fuse and 13A/250V fast action fuse.

Frequency response: 40~100Hz under 10A range, 40~400Hz at other ranges.

#### 3.2.6 Resistance (Ω)

Range	Accuracy	Resolution
400Ω	±(0.8%+5)	0.1Ω
4kΩ		1Ω

40kΩ		10Ω
400kΩ		100Ω
4MΩ	±(1.2%+5)	1kΩ
40MΩ		10kΩ

Open circuit voltage: 400mV.

Overload protection: 250V DC/AC peak value

**NOTE:** At 400Ω range, short the test leads first to measure the wire resistance and then subtracts it from the real measurement. Or press “REL” to clear the wire resistance and read the value directly.

#### 3.2.7 Capacitance (C)

Range	Accuracy	Resolution
4nF	±(2.5%+6)	1pF
40nF		10pF
400nF		100pF
4μF		1nF
40μF	±(3.5%+8)	10nF
200μF		100nF

Overload protection: 250V DC/AC peak value

**WARNING:** Do not input any voltage at this range! The capacitor must be completely discharged before making measurement. When measuring in line capacitor, make sure the power is cut off before testing.

#### 3.2.8 Frequency (F)

Range	Accuracy	Resolution
10Hz	±(0.5%+4)	0.001Hz
100Hz		0.01Hz
1000Hz		0.1Hz
10kHz		1Hz
100kHz		10Hz
1MHz		100Hz
30MHz		1kHz


Input sensitivity: 0.7V.

Overload protection: 250V DC/AC peak value.

#### 3.2.9 Transistor (hFE)

Measurement	Range	Test conditions
hFE NPN or PNP	0~1000	Base current is approx 15uA, Vce is about 4.5V

#### 3.2.10 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 70±10Ω, buzzer sounds	Open circuit voltage: 0.5V

	continuously.	
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Overload protection: 250V DC/AC peak value

**WARNING:** Do not input any voltage at this range.

### 3.2.11 Temperature (°C)

Range	Accuracy	Resolution
-40°C-1000°C	<400°C ±(0.8%+4) ≥400°C±(1.5%+15)	1°C

Thermocouple: K type

**WARNING:** do not input any voltage at this range.

## 4. OPERATION

### 4.1 Panel Description

① LCD: display the measuring value and unit.

② Function key:

②-1. RST key: when the meter under sleep or lock states, press this key, the meter will be active.

②-2. Hz/DUTY key: when measuring the AC voltage/current, press Hz/DUTY can choose voltage/frequency/duty cycle or current/frequency/duty cycle mode. When measuring the Frequency, press Hz/DUTY will shift between frequency and duty cycle (1~99%) measurement.

②-3. REL key: press it to store the present reading as a reference for subsequent readings. The display is zeroed, and the stored reading is subtracted from all subsequent readings and REL symbol appears. REL (readings) = input value - reference value. Press it again to exit the REL mode and "REL" symbol will disappear.

②-4. HOLD key: press the key, the measuring value will be held on LCD and **HOLD** symbol appears. Press it again to exit the hold mode and **HOLD** symbol will disappear.

②-5. RANGE key: auto range is the default when you turn on the meter. Press RANGE it will enter manual range mode. Under manual range mode, press RANGE each time will select a higher range till reach the highest range then back to the lowest range. Press RANGE for 2 seconds it will back to auto range mode.

②-6. DC/AC key: select DC/AC mode.

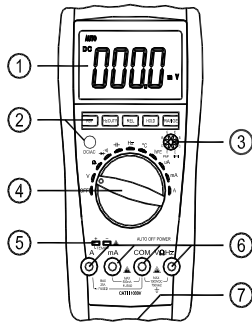
③ Input terminal for hFE measurement

④ Rotary switch: used to change the range and choose functions.

⑤ Input terminal for temperature measurement.

⑥ Voltage, current, resistance, frequency input terminal.

⑦ Battery case.



### 4.2 DCV measurement

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

4.2.2 Switch the knob to V range. Press DC/AC key to choose DC mode.

4.2.3 Auto range is the original states, it will display "AUTO" symbol. Press "RANGE" key to change to manual range mode, and 400mV, 4V, 40V, 400V, 1000V range is 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/Hz" terminal.

4.3.2 Switch the knob to V range, and press "DC/AC" key to choose AC mode;

4.3.3 Auto range is the original states, it will display "AUTO" symbol. Press "RANGE" key to change to manual range mode, and 400mV, 4V, 40V, 400V, 750V range is selectable;

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

### Note:

1. At 400mV range there is only manual range available.

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

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

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

5. 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 "mA" terminal (Max. 400mA) or into "A" terminal (Max.20A);

4.4.2 Switch the knob to a proper current range, and then connect the test leads to the electric 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. When tested current ≥10A at 20A range, buzzer will sound to remind user.

4. Maximum input current is 400mA 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 "mA" terminal (Max. 600mA) or into "A" terminal (Max.20A);

4.5.2 Switch the knob to a proper current range, press "DC/AC" key to select the AC mode, and then connect the test leads to the electric 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. When tested current ≥10A at 20A range, buzzer will sound to remind user.

4. Maximum input current is 400mA 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/Hz" terminal.

4.6.2 Switch the knob to Ω range, and connect the leads with the resistor under test.

4.6.3 Press "RANGE" key to choose auto or manual range.

4.6.4 Before measuring low resistance, you should make the test leads short-circuit at first, and then press "REL". By this way, you can get the actual value of the resistance.

### 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 1MΩ, 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 Capacitance measurement

4.7.1 Switch the knob to "C" range;

4.7.2 Insert the black test lead to "COM" terminal and the red one to "V/Ω/Hz" terminal;

4.7.3 If the LCD doesn't display "0", press "REL" to clear the reading;

4.7.4 Connect the capacitor to "COM" and "VΩHz" terminal. (Note: the red test lead is for positive pole ⊕).LCD displays capacitance value.

### Note:

1. Don't input voltage or current to the "VΩHz" terminal when measuring the capacitance or the capacitor still in the "Cx" terminal.

2. In order to assure the accuracy, please press "REL" to clear the reading before testing.

3. There is only the auto range mode under the capacitance range.

4. The capacitor must be completely discharged before testing.

5. The reading of 200uF range will take more than 15 seconds to be stable.

### 4.8 Frequency measurement

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

4.8.2 Switch the knob to "Hz" range, connect the test leads or shielded cable to the signal source or the load which is tested.

4.8.3 Press "Hz/DUTY" key to switch frequency/duty cycle measurement, LCD will display the frequency or duty cycle of the signal source which is tested.

### Note:

1. There is only the auto range mode under the frequency range;

2. The meter can still work if the input current is higher than 10V rms, but the accuracy is not guaranteed;

3. In noisy environment, it's better use shield cable to measure a low signal;

4. When measuring high voltage circuit, do not touch the high voltage circuit;

5. Don't input voltage higher than 250V DC or AC peak value, or it may damage the meter.


#### 4.9 Transistor hFE measurement

4.9.1 Switch the knob to hFE range;

4.9.2 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.

#### 4.10 Diode and Continuity test:

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

4.10.2 Switch the knob to  range, and press “DC/AC” key to select diode measurement mode, and then connect test leads with the diode under testing,

4.10.3 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.


4.10.4 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”.

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

4.10.6 Press “DC/AC” key to select the Continuity measurement mode.

4.10.7 Connect test leads to two points of tested circuit, if the resistance is less than  $(70 \pm 10) \Omega$ , the buzzer sounds.

#### Note:

1. Don't input voltage at  range.

2. Make sure the power is off and all capacitors are discharged. Any AC signal will make the buzzer sounds.

#### 4.11 Temperature measurement

4.11.1 Switch the knob to “C” range.

4.11.2 Insert the cold terminal (free end) of thermocouple in “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.

#### 4.12 Data hold

Press HOLD will enter HOLD mode, the current value will be held on LCD and  symbol will be displayed. Press HOLD again can exit the HOLD mode.

#### 4.13 Auto power off

4.13.1 If there is no measurement in 15 minutes, the meter will turn into dormancy mode. 1 minute before the auto power off the built-in buzzer will be sound 5 times. Press any key to restart the meter.

4.13.2 Keep “DC/AC” key down when turn on the meter, auto power off function will be canceled.

### 5. METER 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 fuse, please remove the test leads from the measuring point and turn 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. 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"> <li>■ Turn on the power</li> <li>■ Replace battery</li> </ul>
 signal appears	<ul style="list-style-type: none"> <li>■ Replace battery</li> </ul>
No current or temperature input	<ul style="list-style-type: none"> <li>■ Replace fuse</li> </ul>
Big error Value	<ul style="list-style-type: none"> <li>■ Replace battery</li> </ul>

■ 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.

