

# **DIGITAL MULTIMETER OPERATION MANUAL**

## **1. INTRODUCTION**

The instrument is a stable and high performance digital multimeter driven by battery. It uses the LCD with 42mm high to make the readings clearly.

The instrument has the function of measuring DCV, ACV, DCA, ACA, Resistance and Capacitance, Diode and Continuity test, Frequency, Temperature. The instrument takes dual-integral A/D converter as key point, is an excellent tools. It's an ideal tool for lab, factory and family.

## **2. SAFETY NOTES**

This series meter meets the standard of IEC61010. Read it before operation.

1. Input over range is prohibited in each range during the test.
2. Voltage less than 36V is safety voltage. When measuring voltage higher than 36V DC, 25V AC, check the connection, insulation of test leads to avoid electric shock.
3. When changing function and range, test leads should be

removed from testing point.

4. Select correct function and range.
5. Don't operate the meter when the battery case and back cover are not fixed
6. Don't input voltage during the resistance measurement.
7. Test lead should be removed from testing point before changing the batteries or fuses, and turn off the power.
8. Safety symbols  
“” exists high voltage, “”GND, “” dual insulation  
“” must refer to manual, “”low battery

### 3.SPECIFICATIONS

#### 3.1GENERAL SPECIFICATIONS

Display mode: LCD displaying.

Max. indication: 3999 (3 3/4) , auto polarity indication

Measuring method: Dual integral A/D conversion.

Sampling rate: Approx. 3times/second

Over range indication: “ OL” displays

Low battery : The “” displays.

Operating environment: (0 ~ 40)°C , humidity<75%RH.

Power: 9V battery (NEDA1604/6F22 or same model)

Dimension: 175mm×93mm ×55mm.

Weight: approx 400g (include 9V battery).

Accessories: -----

Operation manual, holster, gift box, TP01 thermocouple, test leads, 9V battery.

### 3.2 TECHNICAL FEATURE

Accuracy:  $\pm(\text{RDG} \times a\% + \text{b digit})$

Environment temperature: (23 ± 5)°C

Relative humidity: <75%RH.

#### DC Voltage

Range	Accuracy	Resolution
4V	$\pm(0.5\%+4)$	1mV
40V		10mV
400V		100mV
1000V	$\pm(1.0\%+6)$	1V

Input impedance: all the range is 10MΩ

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

### DC mV

Range	Accuracy	Resolution
400mV	$\pm(0.5\%+5)$	0.1mV

### AC mV (True RMS)

Range	Accuracy	Frequency range	Resolution
400mV	$\pm(1.0\%+6)$	40Hz-1kHz	0.1mV

### ACV (True RMS)

Range	Accuracy	Frequency Range	Resolution
4V	$\pm(0.8\%+10)$	40Hz-1kHz	1mV
40V			10mV
400V			100mV
750V			1V

Input impedance: 10M $\Omega$

Overload protection: 1000V DC/750V AC peak value.

Frequency response: 40Hz-1kHz (apply to standard sine wave and triangular wave.)

Display: True RMS (other wave which is more than 200Hz is for reference only)

## DCA

Range	Accuracy	Resolution
400uA	$\pm(1.0\%+10)$	0.1uA
4000uA		1uA
40mA	$\pm(1.2\%+8)$	10uA
400mA		100uA
10A	$\pm(1.2\%+10)$	10mA

Max. measuring voltage drop: Full scale mA range: 400mV;

A range : 100 mV

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

Overload protection: 0.4A/250V fuse, 10A/250V fuse.

## ACA (True RMS)

Range	Accuracy	Frequency Range	Resolution
400uA	$\pm(1.5\%+10)$	40Hz-1kHz	0.1uA
4000uA			1uA
40mA			10uA
400mA			100uA
10A	$\pm(2.0\%+5)$		10mA

Max. measuring voltage drop: Full scale mA range: 400mV ;

A range: 100mV

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

Overload protection: 0.4A/250V fuse, 10A/250V fuse

Frequency response: 40Hz-1kHz; (apply to standard sine wave and triangular wave. other wave which is more than 200Hz is for reference only)

### Resistance

Range	Accuracy	Resolution
400Ω	$\pm(0.8\%+5)$	0.1Ω
4kΩ	$\pm(0.8\%+4)$	1Ω
40kΩ		10Ω
400kΩ		100Ω
4MΩ		1kΩ
40MΩ	$\pm(1.2\%+10)$	10kΩ

Overload protection: 250V DC/AC peak value

Open circuit voltage: 400mV

Note: at 400Ω range, the test leads should be short-circuit, and measure the down-lead resistance ,then, subtract it from the real value.

### Capacitance

Range	Accuracy	Resolution
10nF	$\pm(5.0\%+20)$	10pF
100nF	$\pm(3.5\%+8)$	100pF
1u F		1nF
10uF		10nF

100uF		100nF
1mF/10mF/100 mF	$\pm(5.0\%+10)$	1 uF/10 uF/100 uF

Overload protection : 250V DC/AC peak value

### Frequency

Range	Accuracy	Resolution
100Hz	$\pm(0.5\%+10)$	0.1Hz
1000Hz		1Hz
10kHz		10Hz
100kHz		100Hz
1MHz		1kHz
30MHz		10kHz

Input sensitivity: 1.5V

Overload protection: 250V DC/AC peak value

Note: The reading will be zero if the signal is below 3Hz.

### Diode and continuity Test

Range	Displaying value	Test Condition
	Positive voltage drop of diode	The positive DC Current is approx 1mA. negative voltage is approx 3V.
	Buzzer sounds , the resistance is less than $50 \pm 20\Omega$	Open circuit voltage: 1V

Overload Protection : 250V DC/AC peak value

Warning: do not input voltage at this range for safety.

## Temperature

Range	Accuracy	Resolution
(-20~1000)°C	$\pm(1.0\%+5) < 400^{\circ}\text{C}$ $\pm(1.5\%+15) \geq 400^{\circ}\text{C}$	1 °C
(-4~1832)°F	$\pm(1.0\%+5) < 752^{\circ}\text{F}$ $\pm(1.5\%+15) \geq 752^{\circ}\text{F}$	1 °F

## 4. OPERATION

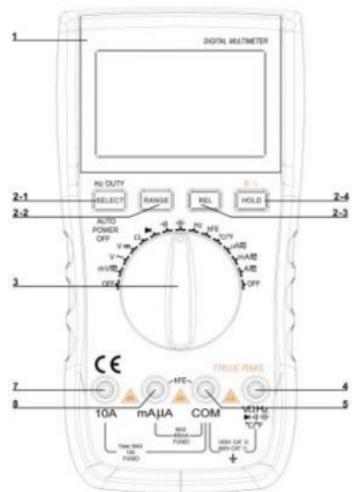
### 4.1 FRONT PANEL AND DESCRIPTION

1.LCD: display the measuring value and unit.

2.Function key

2-1. “select” key / Hz/DUTY Key: at the range DC/AC current, when choose DCA measurement, press this key to change it to ACA, When measure frequency, press the key to switch frequency/duty cycle(1~99%).

2-2. RANGE Key: select working mode of automatic



measurement and manual measurement. The default mode is automatic measurement and “AUTO” is displayed ,press the key turn into manual measurement , when you press the button once, the range change to a higher one, it repeats like this in the same order from low shift to high shift. Press the key incessantly for 2 sec. will return to automatic measurement condition.

2-3. Press the key at voltage ,current and capacitance range, reading is reset and enter into relative value measurement , LCD displaying “REL” symbol,press it again will exit the function.

2-4.HOLD Key:Press the key ,the present value is held on LCD and display “HOLD” ,press it again will exit the function ; Press the key for 2 sec. will turn to the backlight.

3.Rotary Switch:selecting measuring function and range.

4.Voltage, Resistance, Frequency socket.

5.GND.

6.COM for measuring current less than 400mA.

## 7. COM for measuring current 10A.

### 4.2 DCV measurement

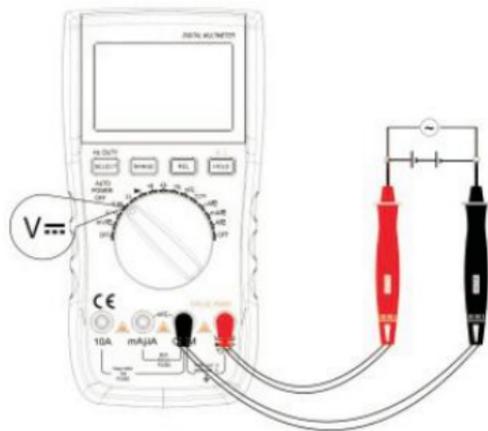
1) Insert the black test lead to “COM” jack and red test lead to the “V $\Omega$  Hz” jack.

2) Set the FUNCTION switch to “V $\overline{\text{---}}$ ” range.

3) The default range is

Auto range, and "AUTO" is displayed. Pressing RANGE key switch to manual range, 4V/40V/400V/1000V can be selected.

4) Connect the test leads to the tested point, the voltage and polarity which connected with the red lead will appear on LCD.



#### **Note:**

1) Under manual measurement, if LCD display "OL", it means over range, should set the range knob to a higher range.

- 2) Do not measure DCV over 1000V, or the meter will be damaged.
- 3) Caution to avoid contact with high voltage circuits when measuring high voltage.

#### **4.3. DC mV measurement**

- 1) Insert the black test lead to “COM” jack and red test lead to the “V $\Omega$  Hz” jack.
- 2) Set the FUNCTION switch to “mV” range.
- 3) There’s no “AUTO” shows on the LCD, only if measuring the voltage less than 400mV can use this range.
- 4) Connect the test leads to the tested point, the voltage and polarity which connected with the red lead will appear on the LCD.

#### **Note:**

- 1) If LCD display "OL", it means over range, should set the range knob to a higher range.
- 2) Do not measure DCV over 400mV, or, the meter will be damaged.

#### 4.4.AC mV RMS measurement

1) Insert the black test lead to “COM” jack and red test lead to the “VΩ Hz” jack.

2) Set the FUNCTION switch to “mV” range, press the “select” key.

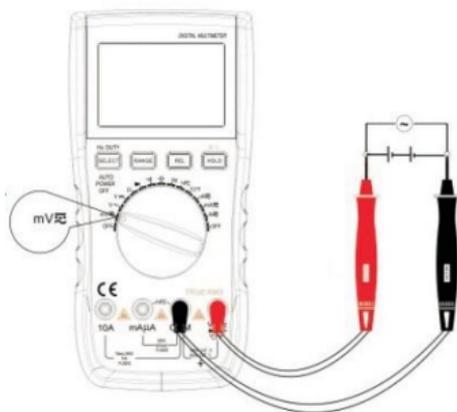
LCD display ACmV ,no automatic measurement function at this range . Do not measure ACV over 400mV at this range.

3) Connect the test leads to the tested point, the voltage of the two points which connected with the test leads will appear on LCD.

#### Note:

1)If LCD display "OL", it means over range, now you need to set the range knob to the higher range.

2) Do not measure ACV over 400mV, or, the meter will be



damaged.

#### **4.5.AC V RMS measurement**

- 1) Insert the black test lead to “COM” jack and the red one to “V $\Omega$  Hz” jack.
- 2) Set the function switch to “V” range.
- 3) The default range is Auto range, and "AUTO" is displayed on the LCD. Press RANGE key to switch to manual range, 4V/40V/400V/750V can be selected.
- 4) Connect the test leads to the test point, the polarity and the voltage of the two points which connected with the test leads will appear on LCD.

#### **Note:**

- 1) Under manual measurement,, If LCD display "OL", it means over range, should set the range knob to a higher range.
- 2) Do not measure ACV over 750V, or, the meter will be damaged.
- 3) Caution to avoid contact with high voltage circuits when

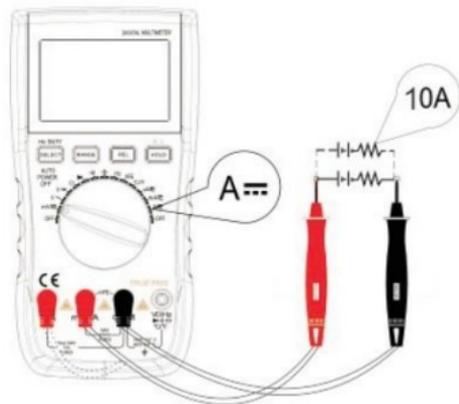
measuring high voltage.

#### 4.6 .DCA measurement

- 1) Insert the black test lead to “COM” jack and red test lead to the “mA”(max. 400mA) or "10A" jack (max. 10A).
- 2) Set the FUNCTION switch to current range. Press “SELECT” key to select DC measure mode, connect the test leads across to the tested circuit, the current value and polarity of the tested current will appear on LCD.

#### Note:

- 1) If the current range is unknown beforehand, set the switch to a high range then choose the proper range according to the reading.
- 2) If LCD display "OL", it means over range, now you need to set the range knob to the higher range.



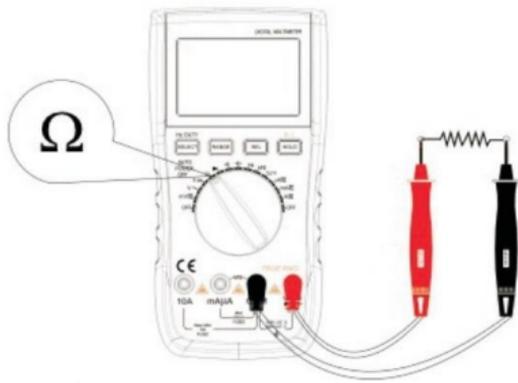
- 3) The max input current is 400mA or 10A depending upon the jack used. Excessive current will blow the fuse.
- 4) Do not input a value over DC 36V or AC 25V at “COM”, “mA” terminal.

#### 4.7. AC current true RMS measurement

△Note and operation, please refer to the same information of DCA measurement.

#### 4.8. Resistance measurement

- 1) Connect the black test lead to “COM” jack and red test lead to the “V $\Omega$  Hz” jack.
- 2) Set the FUNCTION Switch to “ $\Omega$ ” range. Then connecting the test leads to the tested resistance.
- 3) Press "RANGE" to select Auto/Manual measurement.
- 4) If measuring



small resistance, the test leads should be short-circuit, press "REL" once and measure the unknown resistance, ensure the accuracy of the value.

**Note:**

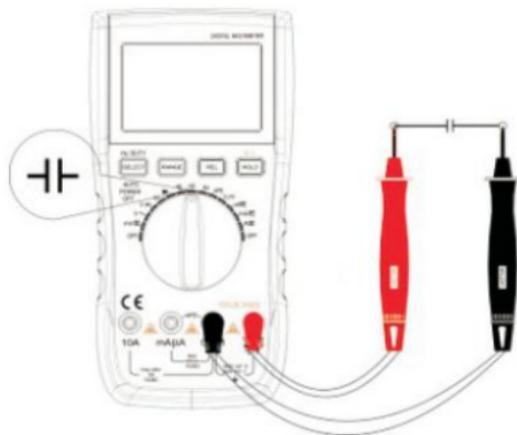
- 1) To use manual method, if the tested resistance is unknown beforehand, set the FUNCTION switch to the highest range.
- 2) If "OL" displays on LCD, it means over range, now you need to set the range knob to the higher range. When measuring resistance is more than  $1M\Omega$ , the reading may take a few seconds to stabilize. This is normal for high resistance measurement.
- 3) When the input terminal is under open circuit, the figure "OL" will be displayed for the overload condition.
- 4) When checking in-circuit resistance, be sure the power has been switched off and all capacitors are fully discharged.
- 5) Do not input any voltage at this range.

**4.9 .Capacitance measurement**

- 1) Connect the black test lead to “COM” jack and red one to the “VΩ Hz” jack.
- 2) Set the FUNCTION switch to “ $\text{—|—}$ ” position.
- 3) If it is not zero before testing, press “REL” once to adjust to zero. (only for less than 40nF)
- 4) Insert the proper polarity of tested capacitance into test leads “VΩ mA” (the polarity of the red lead is “+”), Connect the negative terminal of tested capacitance to “COM”, the value will be displayed on LCD.

**Note:**

- 1) Every time before measurement, you must press “REL” to ensure measure accuracy.
- 2) Capacitance range have no manual measurement function.
- 3) Discharge all capacitors completely to avoid damage.

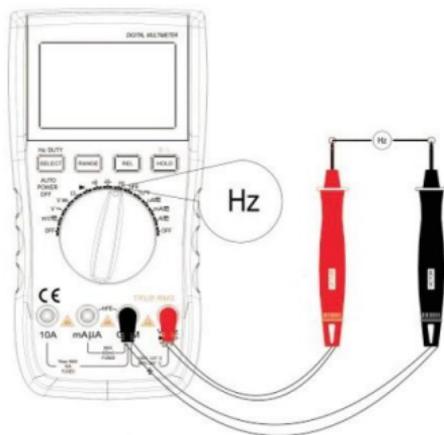


#### 4.10. Frequency measurement

- 1) Connect test leads or shield cable to "COM" and "V $\Omega$  Hz " jack.
- 2) Set the range knob to the frequency range, and connect the test leads or cable across to the signal source or load under tested.
- 3) Press "SELECT" key to switch frequency/duty cycle, and display the reading of frequency or duty cycle.

#### Note:

- 1) Frequency range have no manual measurement function.
- 2) Indication is possible at voltage more than 10V AC rms, but readings may be out of specification.
- 3) In noisy environment, it is preferable to use shield cable for

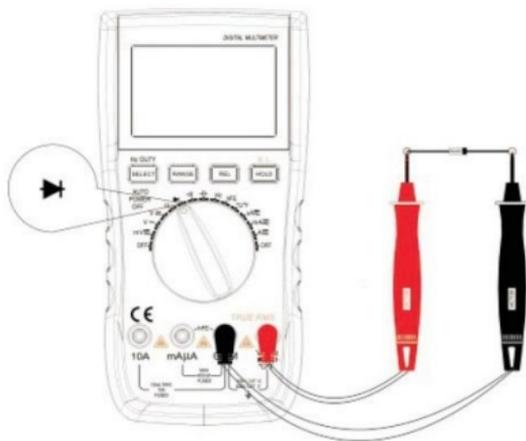


measuring small signal.

- 4) Be caution to avoid contact with high tension circuits when measurement high voltage.
- 5) Do not input over 250V DC or AC peak value, or the meter will be damaged.

#### 4.11. Diode and continuity Test

- 1) Connect the black test lead to “COM” jack and red test lead to the “VΩ Hz” jack. (Note: the polarity of the red lead is “+”)



- 2) Set the FUNCTION switch to  $\rightarrow$  or  $\cdot$ ) position.
- 3) Forward measurement: Connect red test lead to the positive of the tested diode, black one to the negative of the diode, then approx. reading of diode forward voltage displays on

LCD.

- 4) Connect black test lead to the positive of tested diode, red one to the negative, the mark "OL" will be displayed.
- 5) Proper diode testing should include both directions. If the result is not like what above descriptioned, it indicates the diode is damaged.
- 6) Connect the test leads to two points of circuit, if the resistance is less than  $50\Omega$  . Buzzer sounds.

**Note:** Do not input voltage at  $\rightarrow$  or  $\rightarrow$ ) range.

#### **4.12. Celsius degree measurement**

1. Set the function key to “°C” range.
2. Insert the negative pole (black plug) of the cold end (free end) of the thermocouple sensor to the COM terminal, and insert the positive pole (red plug) of the working end (temperature measuring end) of the thermocouple sensor to the “V $\Omega$  Hz” terminal, and place it in tested thermal field , the value will be displayed on LCD. The reading shows as Celsius unit.

**NOTE:**

1. When the input terminal is under open circuit, will display the “ normal temp.”
2. Do not change the temperature sensor, or, the accuracy can not be sure.
3. Do not input voltage at this range.

**4.13. Fahrenheit degree measurement**

1. Set the function key to “°F” range.
2. Insert the negative pole (black plug) of the cold end (free end) of the thermocouple sensor to the COM terminal, and insert the positive pole (red plug) of the working end (temperature measuring end) of the thermocouple sensor to the “VΩ Hz” terminal, and place it in tested thermal field , the value will be displayed on LCD. The reading shows as Fahrenheit unit.

**NOTE:**

1. When the input terminal is under open circuit, will display the “ normal temp.”

2. Do not change the temperature sensor, or, the accuracy can not be sure.
3. Do not input voltage at this range.

#### **4.14. Data hold**

Press “Hold” key, the current data will hold on LCD; Press the key again, will cancel the hold function.

#### **4.15.Backlight**

Press hold key for 2 sec. to turn on the backlight. It will be off after 10 sec.

#### **4.16. Auto power off**

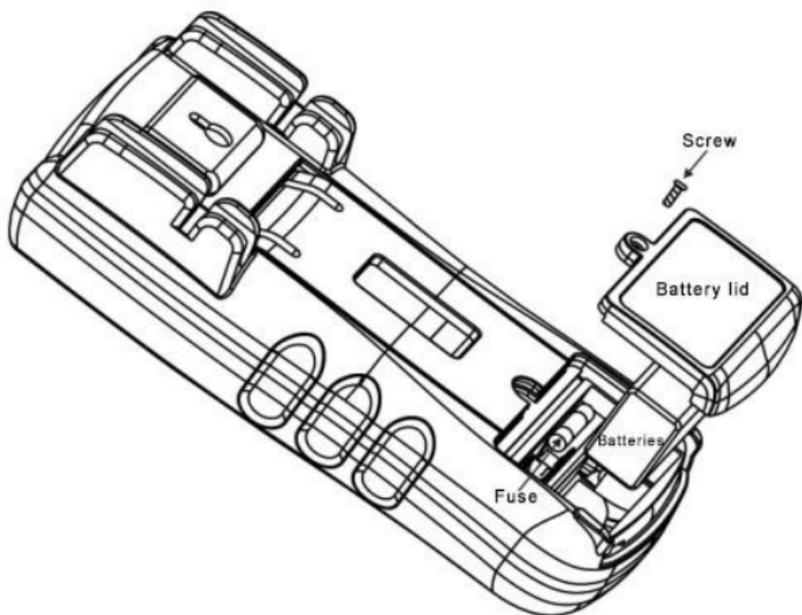
Stop working for 15mins, the instrument is auto off and into the sleep mode. The buzzer will sound before power off. Press “SELECT” key to power on the meter

### **5. BATTERY/FUSE REPLACEMENT**

When the “” sign appears on the display, please replace

the battery according to the following steps:

1. Test lead removed from measured circuit, then take out the test lead from the input jack, and switch the knob on the meter to the off gear to turn off the power.
2. To twist off the screw on the battery cover with screwdriver, move the battery cover away.
3. Take out the old battery or broken fuse and replace new battery 9V or new fuse.
4. Close the battery cover, tighten the screw on the battery cover with screwdriver.



## 6. MAINTENANCE

Do not try to modify the inner circuit.

- 1) Keep the meter away from water, dust and tumble.
- 2) Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.
- 3) Wipe the case with a damp cloth and detergent, do not use

abrasives and alcohol etc.

- 4) If do not operate the meter for a long time, should take out the battery to avoid leakage
- 5) When replacing fuse, please use another same type and specification fuse.

## 7. Trouble Shooting

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

Fault	Solution
No reading on LCD	● Power off--- Pls turn on the power
	● Holding key-- Pls set a correct mode
	● Replace battery
The signal  appears	● Replace battery
No current or temperature input	● Replace fuse
Error Value	● Replace battery

**This user's manual is subject to any change without further notice.**

**The content in this user's manual is deemed correct; if you find any mistake, omission, etc, please contact the manufacturer.**

**We will not be held liable for any accidents or harms caused due to your wrong operations.**

**The functions set forth in this user's manual shall not be regarded as reasons for applying this product for special purposes.**

**6010-0097-002B**