

3 1/2 DIGITAL MULTIMETER OPERATION MANUAL

1. INTRODUCTION

This instrument is a high performance stability, battery operated, 3 1/2 digital, 25mm high character jumbo LCD reading to 1999 multi-meter with the function of measuring DC and AC voltage, DC and AC current, Resistance, temperature and Capacitance, Diode and Continuity test, data hold. The Dual-slop A/D converter uses CMOS technology for auto-zero, polarity selection and over-range indication. Full overload protection is provided. Because of its outstanding features, it is most suitable for use in production line, lab, R & D, maintenance and repair work.

2. SAFETY NOTE

The meter meets the standards of IEC1010. Read the operation manual carefully before operation.

- 2-1. Do not input limit over-ranged.
- 2-2. The voltage below 36V is safety. To avoid electric shock, check whether the test leads are connected correctly, whether the insulation is good when measuring over 36DCV or 25ACV.
- 2-3. Remove the test leads when changing function and range.
- 2-4. To select correct function and range, beware of error operation.;
- 2-5. Do not operate the meter if battery case and back cover is not fixed.
- 2-6. Do not input voltage when measuring resistance.
- 2-7. Remove test leads from test point and turn off the power before replacing battery and fuse.
- 2-8. Safety symbols.

“⚠”Exists dangerous voltage, “GND”, “Dual insulation

“⚡”The operator must refer to the manual, “Low battery

3. CHARACTERISTIC

3.1 GENERAL

- 3-1-1. Display: LCD displaying.
- 3-1-2. Max. displaying: 1999 (3 1/2digit) auto polarity indication.
- 3-1-3. Measuring method : dual slope A/D conversion.
- 3-1-4. Sampling rate: approx. 3 times/second.
- 3-1-5. Over range indication: the MSD displays“1” or“-1”.
- 3-1-6. Low battery indication:“Low battery” appears.
- 3-1-7. Operation environment: Temperature (0°C to 40°C), humidity<85%RH.
- 3-1-8. Storage environment: Temperature (-10°C to 50°C), humidity<85%RH.
- 3-1-9. Power: 9V×1 (NEDA1604/6F22 or equivalent model) .
- 3-1-10. Size: 155mm×90mm×48mm
- 3-1-11. Weight: approx. 270g (including battery) .
- 3-1-12. Accessories: manual, holster, gift box, test lead a pair of TP01 thermocouple s, 9Vbattery.

3.2 ELECTRICAL SPECIFICATIONS

3-2-1. Accuracy is ±(percentage of reading + number of digit) at 23±5°C<75%RH.

3-3-2.DCV

Range	Accuracy	Resolution
200mV	±(0.5%+3)	100uV
2V		1mV
20V		10mV
200V		100mV
1000V	±(0.8%+5)	1V

Input impedance: 10MΩ of all ranges.

Overload protection: 250V DC or AC peak value at 200mV range.
1000V DC or AC peak value at other ranges.

3-2-3.ACVC

Range	Accuracy	Resolution
20V	±(0.8%+5)	10mV
200V		100mV
750V	±(1.2%+5)	1V

Input impedance: 10MΩ of all ranges.

Overload protection: 1000V DC or AC peak value.

Frequency response: ≤200V range: (40~400)Hz.
750V range: (40~200)Hz.

Display: Sine wave RMS (mean value response)

3-2-4.DCA

Range	Accuracy	Resolution
20mA	±(0.8%+5)	10uA
200mA		100uA
10A	±(2.0%+8)	10mA

Max input voltage: 200mV

Max input current: 10A (up to 10 seconds)

Overload protection: Fast 0.2A/250V fuse, 10A/250V fuse.

3-2-5.ACA

Range	Accuracy	Resolution
20mA	±(1.5%+5)	10uA
200mA		100uA
10A	±(3.0%+10)	10mA

Max measuring voltage: 200mV

Max input current: 10A (up to 10 seconds)

Overload protection: Fast 0.2A/250V fuse, 10A/250V fuse

Frequency response: (40~200)Hz

Display: Sine wave RMS (mean value response)

3-2-6.RESISTANCE

Range	Accuracy	Resolution
200Ω	±(0.8%+5)	0.1Ω
2kΩ		1Ω
20kΩ	±(0.8%+3)	10Ω
200kΩ		100Ω
2MΩ		1kΩ
20MΩ	±(1.2%+8)	10kΩ

Open circuit voltage: less than 3V.

Overload protection: 250V DC or AC peak value.

NOTE: at 200Ω range, the test leads should be short-circuit, and measure the down-lead resistance, then, subtract from the real measuring.

WARNING: Do not input any voltage at resistance range for safety!

3-2-7.CAPACITANCE

Range	Accuracy	Resolution
20nF	±(3.0%+10)	10pF
2uF		1nF
200uF		100nF

Overload protection: 36V DC or AC peak value.

3-2-8. TEMPERATURE

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

Sensor: K-type thermocouple (banana shape plug)

3-2-9.DIODE AND CONTINUITY TEST

Range	Description	Test Condition
→)	Forward voltage drop of diode	Forward DC Current approx. 1mA. Reversed DC voltage approx. 3V.
	Buzzer sounds if resistance between terminals V/Ωand COM is less than about(30±10)Ω.	Open circuit voltage approx. is 3V

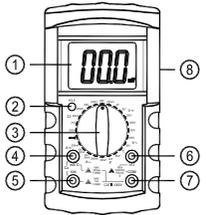
Overload Protection: 250V DC/AC RMS

WARNING: Do not input any voltage at resistance range for safety!

4. OPERATION

4-1. FRONT PANEL DESCRIPTION

1. LCD display: display measuring data and symbol.
2. DATA HOLD switch: press this key, “H” will display and the present value will be hold on LCD.
3. FUNCTION and RANGE switch: select the function and range.
4. test jack of current <200mA,capacitance”+” and temperature”-“ pole.
5. test jack of 10A current and capacitance “-“.
6. voltage and resistance test jack.
7. GND and temperature “+” test jack.
8. battery case.



4-2. DC VOLTAGE MEASUREMENT

- 4-2- 1. Insert the black test lead to “COM” jack, the red one to V/Ω jack.
- 4-2-2. Set the range knob to a proper DCV range, connect the test leads across to the circuit under tested, the polarity and voltage of the point which red lead connect will display on LCD.

NOTE:

1. If the measured voltage is unsure beforehand, should set the range knob to the highest range, then, switch to a proper range according to the displayed value.
2. If LCD displays “1”, it means over range, should set the range knob to a higher range.

4-3.AC VOLTAGE MEASUREMENT

- 4-3-1.Insert the black test lead to “COM” jack, the red one to V/Ω jack.
- 4-3-2. Set the range knob to a proper ACV range, connect the test leads across to the circuit under tested.

NOTE:

1. If the measured voltage is unsure beforehand, should set the range knob to the highest range, then, switch to a proper range according to the displayed value.
2. If LCD displays “1”, it means over range, should set the range knob to a higher range.

4-4. DCA MEASUREMENT

- 4-4-1. Insert the black test lead to “COM” jack and the red one to “mA” jack (max. 200mA), or insert the red one to “10A” jack (max. 10A) .
- 4-4-2. Set the range knob to a proper DCA range, connect the test leads across to the circuit under tested, the current value and polarity of the point which red lead connect will display on LCD.

NOTE:

1. If the measured current is unsure beforehand, should set the range knob to a higher range, then, switch to a proper range according to the displayed value.
2. If LCD displays “1”, it means overrange, should set the range knob to a higher range.
3. Max. input current is 200mA or 10A (subject to where red lead insert), excessive current will blow the fuse. Be careful when measuring 10A due to un-fused. Continuously measuring large current may heat the circuit, affect the accuracy, even damage the meter.

4-5. ACA MEASUREMENT

- 4-5-1. Insert the black test lead to “COM” jack and the red one to “mA” jack (max. 200mA), or insert the red one to “10A” jack (max. 10A) .
- 4-5-2. Set the range knob to a proper ACA range; connect the test leads across to the circuit under tested.

NOTE:

1. If the measured current range is unsure beforehand, should set the range knob to the highest range, then set to a proper range according to the displayed value.
2. If LCD displays “1”, it means overrange, should set the range knob to a higher range.
3. Max. input current is 200mA or 10A (subject to where the red lead insert to), excessive current will blow the fuse. Be careful when measuring 10A due to un-fused. Continuously measuring large current may heat the circuit, affect the accuracy, even damage the meter.

4-6. RESISTANCE MEASUREMENT

- 4-6-1. Insert the black test lead to “COM” jack and the red one to “V/Ω” jack.
- 4-6-2. Set the range knob to a proper resistance range, connect the test leads across to the resistance under measured.

NOTE:

1. If the resistance value being measured exceeds the max value of the range selected, LCD displays "1", thus, should set the range knob to a higher range. When the resistance is over 1MΩ, the meter may take a few seconds to stabilize. This is normal for high resistance readings.
2. When input terminal is in open circuit, overload displays.
3. When measuring in-line resistance, be sure that power is off and all capacitors are released

completely.

4-7. CAPACITANCE MEASUREMENT

- 4-7-1. Insert the red test lead to “10A” terminal and the black one to “mA Cx” jack.
- 4-7-2. Set the range knob to a proper capacitance range, connect the test leads to the capacitor under measured (note: the polarity of red test lead is “+”) .

NOTE:

1. If the capacitance range under measured is unsure beforehand, should set the range knob to the highest range, then, set to a proper range according to the displayed value.
2. If LCD displays “1”, it means over range, should set the range knob to a higher range.
3. Before measuring, LCD display might not be zero, the residual reading will be decreased gradually and could be disregarded.
4. When measuring large capacitance, if creeps seriously or break capacitance, LCD will display some instability value.
5. Discharge all capacitors completely before capacitance measurement to avoid damage.

6. UNIT: 1uF=1000nF 1nF=1000pF

4-9 .TEMPERATURE MEASUREMENT

Insert the cathode of thermocouple's cold end to "mA" jack and anode to "COM" terminal, put the working end on or in the tested object, temperature value can be read on LCD in Celsius.

- 4-9-1. Insert the black test lead to “COM” terminal and the red one to V/Ω jack (Note: the polarity of red test lead is “+”).

- 4-9-2. Set the range knob to “” range, connect the test leads to the diode under measured, reading is the approximation of the diode positive volt drop.

- 4-9-3. Connect the test leads to two points of the measured circuit, if buzzer sounds, the resistance is lower than approx. (30±20)Ω.

4-10. DATA HOLD

Press HOLD key, the present value will be hold on LCD.

5. MAINTENANCE

DO NOT try to verify the circuit for it's a precision meter.

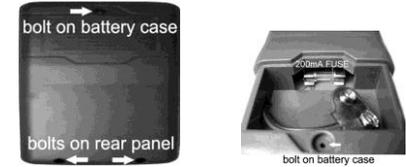
- 5-1. Be ware of waterproof, dustproof and shockproof.
- 5-2. Do not operate and store the meter in the circumstance of high temperature, high humidity, and flammability, explosive and strong magnetic field.
- 5-3. Use the damp cloth and soft solvent to clean the meter, do not use abrasive and alcohol.
- 5-4. If do not operate it for a long time, should take out the battery.
- 5-4-1. When LCD displays “” symbol, should replace the battery as below:
 - 5-4-1-1. Take out the holster and drop out the battery case.
 - 5-4-1-2. Take out the battery and replace a new one. It's better to use alkalescency battery for long time use.

- 5-4-1-3. Fix the battery case and take on the holster.

5-4-2. Fuse replacement

To use the specified type when replacement.

- 5-4-2-1. Take out the holster and drop out the battery case and the battery inside.
- 5-4-2-2. When you change the fuse of 200mA, please replace a new one as the following fig, then fit on the battery case, screw on the case and fit on the holster.



- 5-4-2-3. When you change the fuse of 10A, please take off the 9V battery and the screw fit on the back shell, then unscrew the fixed screws which showed on the following fig, uncover the PCB, and replace a new 10A fuse on the position of the small board showed., finally fit on the battery case, screw on the case and fit on the holster.

(It should operated by professional person.)



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

CONDITIONS	WAY TO SOLVE
NO DISPLAYING	<ul style="list-style-type: none"> ■ Power is off ■ HOLD key ■ Replace battery
 symbol displays	<ul style="list-style-type: none"> ■ Replace battery
NO CURRENT INPUT	<ul style="list-style-type: none"> ■ Replace fuse
BIG ERROR	<ul style="list-style-type: none"> ■ Replace battery