

Index

1、 General.....	2
2、 Open-Package Inspection.....	2
3、 Safety Note.....	3
4、 Safety Symbol Description.....	7
5、 Front Panel Description.....	7
6、 Button Function Description.....	8
7、 Other Function	10
8、 Characteristics.....	11
9、 Communications Interface	28
10、 Instrument Maintenance	29
11、 Fault Elimination	30

I、 General

It is a good performance and Auto Range 4 1/2 digital instrument with USB interface, driven by battery. It adopts the LCD with 42mm high figure to make the reading very clear and it possesses the Data Hold and Auto Power Off function to make the use more convenient.

This instrument has the function of measuring ACV, DCV, ACA, DCA, Resistance, Capacitance, Temperature, Diode, Continuity, Frequency, and Duty Circle, etc. It takes the dual-integral A/D Converter as core, and possesses the Auto Range and Manual Range selection function. It is an excellent tool and most suitable for lab, factory, maintenance and repair users.

II、 Open-Package Inspection

Open the gift box and take out the instrument, carefully check the following accessories. If any accessory is missed or damaged, please contact the manufactory at once.

●Digital Multimeter 1PC

- Holster.....1PC
- Operation Manual.....1PC
- Test Leads.....1SET
- Temperature Probe (K Type Thermocouple) ...1PC
- USB Interface Jack.....1PC
- Software CD.....1PC
- 9V Battery.....1PC

III、 Safety Note

The instrument meets the standard of IEC1010 (safety standard promulgated by the International Electrician Committee). Design and manufacture complied with the standard of Pollution Degree II.


Warning

To avoid endangering the safety of the users, should read the operation manual carefully before operation, and strictly abide by the safety warning information and operation description to use the instrument.










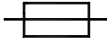
1. Caution to avoid the electric shock when measuring the voltage higher than 30V, the current higher than 10mA, AC Power Lines with Inductive Load and the AC Power Lines during the period of Electric Power Fluctuation.
2. Before measuring, should check if the function knob is set in the correct range, make sure the test lead connects reliably, links up correctly, and insulates properly to avoid the electric shock
3. It meets the requirements of the safety standard only to use the instrument with the equipped test lead. If the test lead is broken, should replace it by the same type and same electric specification test lead.
4. Do not replace the inside fuse by the unconfirmed one. Only replace it by the same type and specification fuse. Before replacement, should keep the test lead off the tested point to make sure there is no any signal at the input terminal.
5. Do not replace the inside battery by the unconfirmed one. Only replace it by the same type and electric specification battery. Before replacement, should keep the test lead off

the tested point to make sure there is no any signal at the input terminal.

6. When measuring electricity, do not connect the body with the ground directly, and do not touch the possible exposed metal terminal, output socket or lead clamp with ground potential. Usually use the dry cloth, rubber overshoes, rubber cushion and other insulated materials to keep the body isolated with the ground.
7. Do not store and use the instrument in high humidity, high temperature, combustible, explosive and strong magnetic places.
8. It is possible to damage the instrument and endanger the safety of the users when measuring the voltage over the range limit. The allowed maximum voltage is printed on the front panel of the instrument, do not input the range limit specified to avoid the electric shock and instrument damage
9. Do not measure any voltage when connecting the test lead with the current terminal to avoid damaging the instrument and endangering the safety of the users.

10. Do not try to calibrate or repair the instrument, should operate it by the specially trained or qualified professional people.
11. The function/range selection knob should be set in the correct range when measuring. When switching the function/range selection knob, keep the test lead off the tested object to make sure there is no any signal at the input terminal. Do not switch the function/range selection knob when measuring.
12. When LCD displays “  ”, please replace the battery in time to make sure the measuring accuracy.
13. Do not allow to measure the voltage when connecting the test lead with the current terminal!
14. Do not try to modify the inner circuit at will to avoid damaging the instrument and endangering the safety of the users.

IV、 Safety Symbol Description

	Warning		DCA
	High Voltage! Dangerous!		ACA
	GND		DCA & ACA
	Dual Insulation		Meets the direction of European IEC
	Low Battery		Fuse

V、Front Panel Description

1. LCD Display.
2. Function Button : Select each measuring function.

2-1 Frequency、Duty Circle selection button

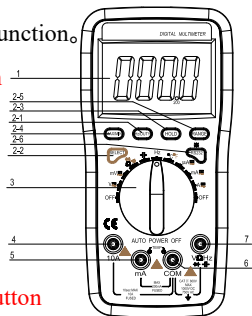
2-2 Function switch button

2-3 Data Hold button

2-4 Max/Min value button

2-5 Manual Range selection button

2-6 RS232 PC connect part and backlight button



3. Function/range selection knob: select the measuring function and range

4. 10A current input terminal: Measuring AC/DC 10A positive input terminal, insert the red test lead.
5. $\mu\text{A}/\text{mA}$ and Temperature input terminal: Measuring AC/DC $\mu\text{A}/\text{mA}$ and Temperature positive input terminal, insert the red test lead.
6. COM input terminal: negative input terminal, insert the black test lead.
7. $\text{V}\Omega\text{Hz}$ input terminal: measure Voltage, Frequency/Duty Circle, Resistance, Capacitance, Diode and Continuity positive input terminal, insert the red test lead.

VI、Button function description

- (1) SELECT: When there are two or more measuring functions compound at one range, press the button to switch the measuring function.
- (2) RANGE: Auto Range/ Manual Range switch, the default is set as Auto Range mode when turning on. Press the button and switch to Manual Range. Press the button once, the range is switched to the higher one at the mode, press the button again to switch the range to the lowest one when measuring the highest range, the

cycle is in proper order from low to high. Keep pressing the button more than 2 seconds, return to Auto Range mode. There is no Auto Range mode at Frequency and Capacitance range.

- (3) **MAX/MIN: Max value and Min value testing.**
- (4) **HZ/DUTY:** Frequency/Duty Circle selection button, press the button to switch between the Frequency and Duty Circle mode at Frequency Range; Press the button to switch to Voltage/Frequency/Duty Circle or Current/Frequency/Duty Circle model at AC/DC Voltage or AC/DC Current Range.
- (5) **HOLD:** Data Hold button, press the button, the value is held on LCD; Press the button again, exit the hold mode and get into the normal measuring status.
- (6) **RS232:** serial output control button, worked at the locked mode. When the button is close, RS232 symbol is displayed on LCD, it indicates the instrument is getting into the status of data transmission, and can transmit the data to outside; **When the button is in a open circle then exist this mode**, and data transmission is stopped. **Press the button for more than 2 seconds, the backlight open.**

VII Other Function

- (1) Auto Power Off function: no matter it is function button or range knob, the instrument will be “Auto Power Off” when there is no action about 15 minutes during measurement. In the mode of Auto Power Off, press the function button or switch the range knob, the instrument will “Auto power on”, get into the measuring mode. Press the select button when turning on, the Auto Power Off function is cancelled. The Auto Power Off is cancelled at RS232 work mode.



NOTE: “Auto Power Off” is a kind of sleeping mode, it still consumes the slight current (less than $5\mu\text{A}$), if the instrument isn't used for long time, it is better to cut the power.

- (2) BUZZER: Press any button, the buzzer is sound. The buzzer is sound when the resistance is less than $(30\pm 10)\Omega$ at Continuity Test.
- (3) Data transmission function: Install the software, accessory of the instrument. Connect the instrument to PC by USB Cable, and then can transmit the measuring data to PC, it is convenient to record, analyze, process and print the measuring results, etc.

VIII Characteristics

1. General Features:

1-1 Display: LCD

1-2 Max Display: 22000 (4 1/2) **digits** automatic polarity display and unit display.

1-3 Measuring method: dual-integral A/D converter

1-4 Sampling rate: 2 times/second

1-5 Over range indication: display “OL”

1-6 Low battery indication: “ ”appearance (approx. 6.2V)

1-7 RS232 serial data transmission

1-8 Auto Power Off function (**No Auto Power Off function at the output mode of RS232**)

1-9 Operation environment: 0~40°C , relative humidity <80%

1-10 Storage environment: -10~50°C , relative humidity <80%

1-11 Power: **1pcs** 9V batteries (NEDA1604/6F22 battery)

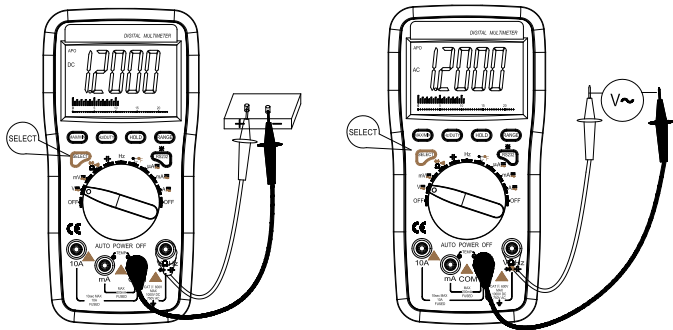
1-12 Dimension: 192mm x 95mm x 48mm (L*W*H)

1-13 Weight: Approx. 390g (including batteries)

2. Technical Features:

1. Accuracy: $(a\% \times \text{reading} + \text{digits})$ at $23 \pm 5^\circ\text{C}$, relative humidity $<75\%$.
2. One year calibration guarantee since the time dispatched from the factory.

2-1: ACV/DCV Measurement



A) Turn the function/range selection knob to $V \sim$ or $mV \sim$, the default is set as DCV measurement, if measuring ACV, press SELECT button to make it at the status of ACV measurement,.

- B) Insert the red and black test lead separately to VΩHz and COM input terminal.
- C) Connect the test lead to the tested circuit or power in parallel, the polarity of the red test lead and the tested voltage value will be displayed on LCD simultaneously.
- D) At the Manual Range mode, if “OL” is displayed on LCD, it indicates the tested voltage value has exceeded the present range limit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD.

DCV Technical Data:

Range	Accuracy	Resolution
220mV	±(0.05%+10d)	0.01mV
2.2V		0.1mV
22V		1mV
220V		10mV
1000V	±(0.1%+10d)	100mV

Input impedance: 10MΩ.

Overload protection : **220mV** gear: 250V DC or AC peak value.

Other gears: 1000V DC or 750V AC peak value.

ACV Technical Data:

Range	Accuracy	Resolution
220mV	$\pm(1.0\%+25)$	0.01mV
2.2V	$\pm(0.8\%+25)$	0.1mV
22V		1mV
220V		10mV
750V	$\pm(1.0\%+25d)$	100mV

Input impedance: 10M Ω .

Overload protection : **220mV** gear: 250V DC or AC peak value.

Other gears: 1000V DC or 750V AC peak value.

Frequency response: 40-400Hz

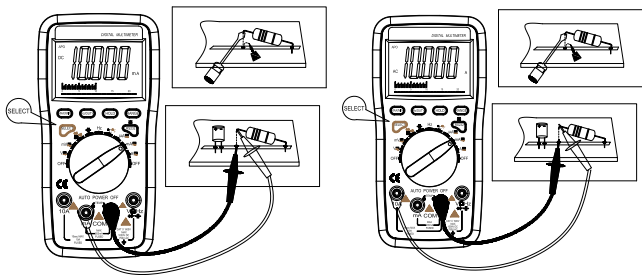
Indication: average value response (RMS of sine wave))



Note:

- a) Do not measure the voltage higher than DC 1000V or AC 750V.
- b) When measuring the high voltage, caution to avoid electric shock. Cut the connection between the test lead and tested circuit at once after measurement.

2-2: DCA/ACA Measurement



- A) Turn the function/range selection knob to μA 、 mA or A range, the default is set as DCA measurement, if measuring ACA , press **SELECT** button to make it at the status of ACA measurement displayed as the picture **above**.
- B) Insert the red and black test lead separately to $\mu\text{A}/\text{mA}$ and COM input terminal.
- C) Connect the test lead to the tested circuit or power in series, the polarity of the red test lead and the tested current value will be displayed on LCD simultaneously.
- D) At the Manual Range mode, if “OL” is displayed on LCD, it indicates the test current value has exceeded the present range limit, please select the higher range to complete the measurement.

E) Read the present test result from LCD display.

DCA Technical Data:

Range	Accuracy	Resolution
220uA	$\pm(0.5\%+10d)$	0.01 μ A
2200uA		0.1 μ A
22mA		1 μ A
220mA	$\pm(0.8\%+10d)$	10 μ A
10A	$\pm(2\%+25d)$	1mA

Max input current: 10A (less than 15 seconds).

Overload protection: uA/mA: 0.2A/250V fuse

10A: 10A/250V fuse

ACA Technical Data:

Range	Accuracy	Resolution
220uA	$\pm(1.2\%+25d)$	0.01 μ A
2200uA		0.1 μ A
22mA		1 μ A
220mA	$\pm(1.5\%+25d)$	10 μ A
10A	$\pm(2.5\%+35d)$	1mA

Max input current: 10A (less than 15 seconds).

Overload protection: uA/mA: 0.2A/250V fuse

10A: 10A/250V fuse

Frequency response: 40-400Hz



Note:

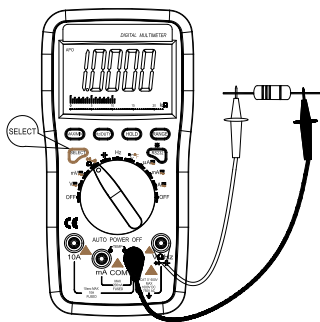
- Do not measure the current higher than 10A at Range 10A and higher than 220mA at uA and mA Range, otherwise the fuse will be burnt out or the instrument will be damaged.
- When measuring the high current, the time of each measurement can't be over 10 seconds, and the interval of each measurement should be longer than 15 seconds.
- Cut the connection between the test lead and tested circuit at once after measurement.

2-3: Resistance Measurement

- A) Turn the function/range selection knob to Ω , displayed as the following picture.
- B) Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- C) Connect the test lead to the tested resistance in parallel, the tested resistance value will be displayed on LCD.
- D) At the Manual Range mode, if “OL” is displayed on LCD, it indicates the tested resistance value has exceeded the present

range limit, please select the higher range to complete the measurement.

E) Read the present test result from LCD display.



⚠ Note:

- When measuring the in-circuit resistance, be sure the power of the circuit has been turned off and all capacitors are fully discharged.
- When the tested resistance is not connected, i.e. at open circuit, or its value exceeds the range limit, “OL” will be displayed on LCD.
- When measuring the resistance larger than $1\text{M}\Omega$, the reading may take a few seconds to be stable, it is normal for the high value

resistance measurement.

- Do not input the voltage when measuring the resistance. Otherwise it will cause the reading incorrect. If the voltage exceeds 250V, over-range protection voltage, it is possible to damage the instrument and endanger the safety of the users.
- Cut the connection between the test lead and tested circuit at once after measurement.

Resistance Technical Data:

Range	Accuracy	Resolution
220 Ω	$\pm(0.5\%+30d)$	0.01 Ω
2.2k Ω	$\pm(0.4\%+5d)$	0.1 Ω
22k Ω		1 Ω
220k Ω		10 Ω
2.2M Ω		100 Ω
22M Ω	$\pm(0.5\%+25d)$	1k Ω
220M Ω	$\pm(5\%+10d)$	100k Ω

Open circuit voltage: -500mV

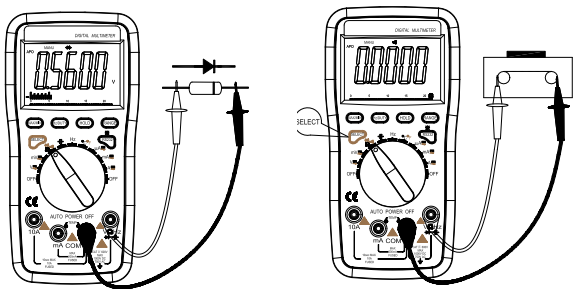
Overload protection: 250V AC/DC peak value.

At Range 220 Ω , short-circuit the test lead first, to measure

the wire resistance, and then subtract it from the real measurement.

2-4 Diode and Continuity Test:

2-4-1: Diode Test



- Turn the function/range selection knob to Ω .
- Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- Press the SELECT button to choose the diode measurement function, displayed as the following pictures.

- D) Connect the RED test lead to the positive pole of the tested diode, BLACK test lead to the negative pole.
- E) Read the present test result from LCD display.



Note:

- If the diode is open circuit or the polarity is connected counter, “OL” will be displayed on LCD.
- When measuring the in-circuit diode, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- Cut the connection between the test lead and tested circuit at once after measurement.

2-4-2: Continuity Test

Diode and Continuity Test Technical Data:

- A) Turn to Ω range.
- B) Input the testleads to V Ω Hz and COM terminal.
- C) Press SELECT button to choose the continuity test function.
- D) Connect the testleads to the two side of the the circle which is under test.
- E) If the resistance of the circle is less than $(30 \pm 10) \Omega$, the buzzer sound.

Range	Resolution	Test Condition
Diode Test	0.1mV	Open Voltage :2.5V Forward voltage drop: 0.5~0.8V
Continuity	0.01Ω	Open Voltage:-2.8V, Buzzer sound at less than 30Ω

Overload protection: 250V DC/AC peak value.



Note:

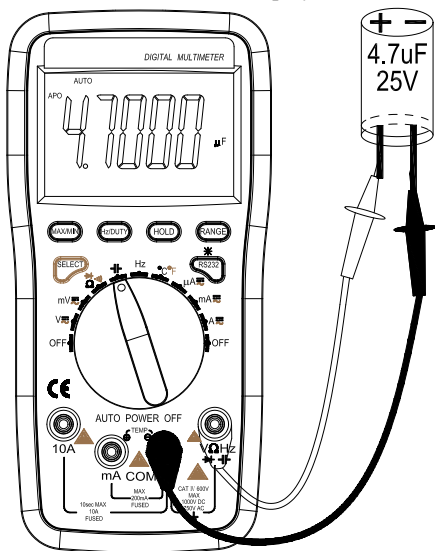
- If the tested circuit is open, “OL” will be displayed on LCD.
- When detecting the continuity of the circuit, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- Cut the connection between the test lead and tested circuit at once after measurement.

2-5 Capacitance Measurement

- A) Turn the function/range selection knob to Capacitance Range, displayed as the following picture.
- B) Insert the red and black test lead separately to VΩHz and COM

input terminal.

- C) Connect the test lead to the tested capacitor in parallel, the tested capacitor value will be displayed on LCD.
- D) At the Manual Range mode, if “OL” is displayed on LCD, it indicates the test capacitor value has exceeded the present range limit or the capacitor is short-circuit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD display.



Capacitance Technical Data:

Range	Accuracy	Resolution
22nF	$\pm(2.5\%+15d)$	1pF
220nF		10pF
2.2uF		100pF
22uF		1nF
220uF		10nF
2.2mF	$\pm(4.0\%+10d)$	100nF
22mF	/	
220mF		

Overload protection: 250V DC/AC peak value.



Note:

- When measuring the in-circuit capacitance, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- It requires longer testing time when measuring the Max. capacitance, it takes about 30 seconds at Range 220mF.
- Cut the connection between the test lead and tested circuit at once after measurement.

2-6 Frequency / Duty Circle measurement

- A) Turn the function/range selection knob to Hz Range, displayed as the following picture.
- B) Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- C) Connect the test lead to the tested signal source in parallel.
- D) When measuring Frequency, press the Hz/DUTY button once to get into the mode of DUTY Circle measurement, and press the Hz/DUTY button again to return to the mode of Frequency measurement.
- E) When measuring the current or voltage, press the Hz/DUTY button to get into the mode of Frequency measurement, and press the Hz/DUTY button again to get into the mode of Hz/DUTY measurement, and press the button third to return to the mode of current or voltage measurement.
- F) Read the present test result from LCD display.

NOTE: when measuring the high voltage frequency, please select the ACV Range, then press “Hz/duty” button to get into the mode of Frequency measurement.

Frequency/ Duty Circle Technical Data:

Range	Accuracy	Resolution
22.00Hz	(0.1%+4d)	0.01Hz
220.0Hz		0.1Hz
22.000kHz		1Hz
220.00kHz		10Hz
2.2000MHz		100Hz
22.000MHz	1kHz	
50.00MHz	(0.2%+4d)	10kHz
>50 MHz	/	
Duty Circle	5.0%~94.9%	

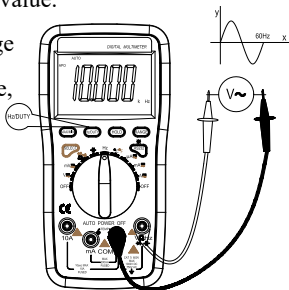
Input sensitivity: 1.5V RMS.

Overload protection: 250V DC/AC peak value.

Note: when measuring the high voltage frequency, please select the ACV Range, then press “Hz/duty” button to get into the mode of Frequency measurement.

 **Note:**

- Do not input the signal more than 60V. Otherwise it is possible to damage the instrument and endanger the safety of the users.
- Cut the connection between the test lead and tested circuit at



once after measurement.

2-7 Temperature Measurement

Range	Accuracy	Resolution
-20~400°C	$\pm(1.0\%+5^{\circ}\text{C})$	0.1°C
≥ 400 ~ 1000°C	$\pm(1.5\%+15^{\circ}\text{C})$	
-4~752°F	$\pm(1.2\%+6^{\circ}\text{F})$	0.1°F
≥ 752 ~ 1832°F	$\pm(1.9\%+25^{\circ}\text{F})$	

A) Turn the function/range selection knob to Temperature Range, displayed as the following picture.

B) Insert the red and black temperature sensor separately to uAmA and COM input terminal.

C) Connect the sensor of the temperature cable to the surface or inside of the tested object.

D) Read the present test result from LCD display.

Temperature Probe (K Type Thermocouple)

Overload protection: 0.2A/250V fuse.

 **Note:**

● Without the signal input, LCD automatically displays the inside temperature of the instrument.

- Do not input any other signal, caution to avoid damaging the instrument or endangering the safety of the users.

VIII Communications Interface

1. Please choose the right model in accordance with the model on your package, selecting setup - 86E.exe software to install.
2. Connect your meter with your computer via USB cable .
3. As the right picture shows.
4. Keep holding “REL/RS232” button more than 2 seconds, RS232 symbol is displayed on LCD.
5. When transmitting the measured data to PC, it is convenient to record, analyze, process and print the measuring results, etc. Please refer the details to the description in the software.

X. Instrument Maintenance

This is a highly precise instrument, do not try to modify the inner circuit at will.


1. Keep the instrument dry, and keep it away from dust and shock.
2. Do not store and use the instrument in high humidity, high temperature, combustible, explosive and strong magnetic

places.

3. Clean the surface of the instrument with the damp cloth and gentle detergent, do not use the strong solvent like the abrasive cleaner and alcohol, etc.
4. Take out the batteries if do not use the instrument for a long time to prevent the batteries from leaking the liquid to corrode the instrument.
 - 4-1. When LCD displays “ ” symbol, should replace the batteries as the following steps:
 - 4-1-1. Loose the screws , remove the battery case and then take out the battery
 - 4-1-2. Install 2pcs new battery. It is better to use alkaline battery for long period operation.
 - 4-1-3. Tighten the screws that fix the batteries.
6. Do not connect with high voltage above 1000V AC/DC Peak Value.
7. Fit on the battery case and tighten the screw.
8. When replacing the fuse, please use the same specification, same type of fuse. Please make sure your meter is on power off before replacing battery or fuse.

XI. Fault Elimination

If the instrument could not work properly, please try the following tips to solve some general problems. If the problems still exist, please contact the maintenance center or the distributor.

Fault	Solution
No Display	<ul style="list-style-type: none"> ● Turn on power; ● Replace battery.
 symbol appearance	<ul style="list-style-type: none"> ● Replace battery.
Big display error	<ul style="list-style-type: none"> ● Replace battery.

This Instruction is subjected to change without any further notice.

The content of this Instruction is considered correct, and in case readers find any errors and missing parts, please contact the manufacturer.

The Company shall not be held liable for any accidents and hazards resulted from the mal-operations by the user.

The function elaborated by this Instruction shall not be taken as the reasons for using the product for special purposes.