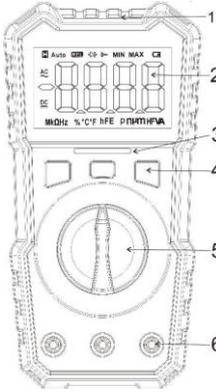


# MS850D Digital Multimeter User Manual

This product is a small handheld digital multimeter offering stable performance, high reliability, and anti-drop capabilities. The instrument features an LCD with 31.5 mm character height for clear readings. The circuit design centers around a large-scale dual-slope integrating A/D converter with overload protection, making this a superior and compact measurement tool.

The instrument can measure AC/DC voltage, AC/DC current, resistance, diodes, transistors, circuit continuity, temperature, frequency, duty cycle, and capacitance. It also functions as a live wire detector, and non-contact voltage (NCV) tester. The device is equipped with a backlight and a flashlight feature, allowing users to read measurements in low light and illuminate dark environments.

## Panel Diagram



1. NCV Sensing Area
2. Display: LCD screen with 31.5 mm character height
3. NCV Indicator Light
4. Three Buttons (SEL: press for function selection, hold down for flashlight; H: press to lock data (H), hold down for backlight; MIN/MAX/REL: press to switch between MAX/MIN, hold down to exit (REL) measurement mode)
5. Function/Range Selector Dial
6. Input Jacks

## Safety Information

This series of digital multimeters has been designed in accordance with IEC1010 600V (CAT III) and Pollution Degree 2 standards. Please read this user manual thoroughly to ensure safe instrument use and measurement accuracy.

## Safety Symbols

- Important safety symbol
- Grounding symbol
- High voltage symbol
- Double insulation symbol

## Operating Precautions

- To comply with safety standards, the instrument must be used with the provided test leads only. If the test leads are damaged, they must be replaced with the same model or with leads that have the same electrical specifications.
- Do not exceed the input limit specified for each range.
- Avoid touching unused input terminals during measurement.
- When the range of the value to be measured is unknown, set the function/range dial to the highest range.
- Before adjusting the function/range dial, ensure that the test leads are disconnected from the circuit being tested.
- Before measuring resistance in a live circuit, ensure that all power sources are turned off and all capacitors are fully discharged.
- Be cautious when measuring voltages above 60V DC or 30V AC. Do not touch the parts of the test leads beyond the finger guards.
- When measuring televisions or switch-mode power supplies, be aware that pulses in the circuit may damage the instrument.
- Before testing transistors, ensure that the test leads are not connected to any circuit.
- Before using the test leads to measure voltage, ensure that no electronic components are connected to the transistor test socket.

## Maintenance

- Disconnect the test leads from the circuit before opening the back cover.
- To protect the instrument's internal circuitry, always replace the fuse with one of the same specifications.
- Do not use the instrument if the back cover is not securely closed or if the screws are not tightened.
- Clean the instrument with a damp cloth and a small amount of detergent only. Do not use chemical solvents on the casing.
- If any abnormalities are observed, immediately discontinue use and send the instrument for repairs.

## Technical Specifications

Accuracy:  $\pm$ (percent of reading + number of counts), valid for 1 year  
 Environmental temperature: 18°C to 28°C. Environmental humidity:  $\leq$ 80%

## General Specifications:

- Maximum Voltage between Input and Ground: CAT III 600V

- Fuse: F200mA/250V, F10A/250V

- Power Supply: 1.5V AAA  $\times$ 2

Auto Power Off: The instrument will automatically power off after approximately 15 minutes.

- Maximum Display Value: 5999
- Overload Indicator: "OL"
- Polarity Display: Negative polarity is displayed as "--"
- Working Temperature: 0°C to 40°C
- Storage Temperature: -10°C to 50°C
- Low Battery Indicator: The display shows
- Dimensions: 150 mm  $\times$  75 mm  $\times$  47 mm
- Weight: Approximately 300 g (including batteries)

## DC Voltage & AC Voltage

Range	Resolution	DC Voltage Accuracy	AC Voltage Accuracy
600mV	0.1mV	$\pm$ 0.5% $\pm$ 3	$\pm$ 1.0% $\pm$ 10
6V	1mV	$\pm$ 0.5% $\pm$ 3	$\pm$ 1.0% $\pm$ 10
60V	10mV	$\pm$ 0.8% $\pm$ 3	$\pm$ 1.0% $\pm$ 10
600V	100mV	$\pm$ 0.8% $\pm$ 5	$\pm$ 1.0% $\pm$ 10

Input impedance: 10M $\Omega$

Overload protection: 600mV range: 250V DC or AC RMS; all other ranges: 600V DC or AC RMS

AC voltage frequency range: 40Hz to 1000Hz Display: True RMS

## DC Current & AC Current

Range	Resolution	DC Current Accuracy	AC Current Accuracy
600 $\mu$ A	0.1 $\mu$ A	$\pm$ 1.0% $\pm$ 5	$\pm$ 1.8% $\pm$ 5
6000 $\mu$ A	1 $\mu$ A	$\pm$ 1.0% $\pm$ 5	$\pm$ 1.8% $\pm$ 5
60mA	0.01mA	$\pm$ 1.0% $\pm$ 5	$\pm$ 1.8% $\pm$ 5
600mA	0.1mA	$\pm$ 2.0% $\pm$ 5	$\pm$ 2.0% $\pm$ 5
6A	0.001A	$\pm$ 2.0% $\pm$ 5	$\pm$ 2.0% $\pm$ 5
10A	0.01A	$\pm$ 2.0% $\pm$ 5	$\pm$ 2.0% $\pm$ 5

Overload protection: F500mA/250V fuse; F10A/250V fuse

Frequency range: 40Hz to 1000Hz Display: True RMS

## Resistance

Range	Resolution	Accuracy
600 $\Omega$	0.1 $\Omega$	$\pm$ 1.0% $\pm$ 5
6k $\Omega$	0.001k $\Omega$	$\pm$ 1.0% $\pm$ 5
60k $\Omega$	0.01k $\Omega$	$\pm$ 1.0% $\pm$ 5
600k $\Omega$	0.1k $\Omega$	$\pm$ 1.0% $\pm$ 5
6M $\Omega$	0.001M $\Omega$	$\pm$ 1.0% $\pm$ 5
60M $\Omega$	0.01M $\Omega$	$\pm$ 1.2% $\pm$ 8

Overload protection: 250V DC or AC RMS

## Frequency Test

Range	Resolution	Accuracy
10Hz	0.001Hz	$\pm$ 0.5% $\pm$ 4
100Hz	0.01Hz	
1kHz	0.1Hz	
10kHz	0.001kHz	
100kHz	0.01kHz	
1MHz	0.1kHz	
10MHz	0.001MHz	

Overload protection: 250V DC or AC RMS

## Capacitance Test

Range	Resolution	Accuracy
60nF	0.01nF	$\pm$ 4.0% $\pm$ 5

600nF	0.1nF	±4.0%±5
6μF	0.001μF	
60μF	0.01μF	
600μF	0.1μF	
6mF	0.001mF	±10%±5
60mF	0.01mF	
100mF	0.1mF	

Overload protection: 250V DC or AC RMS

### Diode and Continuity Test

Range	Description
Buzzer	If resistance is less than $50\Omega \pm 30\Omega$ , the buzzer will sound.
Diode	The approximate forward voltage drop is displayed.

Overload protection: 250V DC or AC RMS

### Temperature

Function	Range	Resolution	Accuracy
°C	-20°C to 0°C	1°C	±4°C
	0°C to 400°C		±(2.0%+3d)
	400°C to 1000°C		±(3.0%+3d)
°F	-4°F to 50°F	1°F	±5°F
	50°F to 750°F		±(2.0%+5d)
	750°F to 1832°F		±(3.0%+5d)

Overload protection: 250V DC or AC RMS

### Transistor hFE Parameter Test

Range	Description	Test Condition
hFE	Measures hFE parameter of NPN or PNP transistors (0–1000)	Base current approximately 10uA, Vce approximately 2.8V

### Duty Cycle Measurement

Range	Description	Accuracy
Duty %	0.1%–99.9%	±1.2%±3
	Typical Vrms=1V,f=1	
	0.1%–99.9% (≥1kHz)	±2.5%±3

Overload protection: 250V DC or AC RMS

**Non-Contact AC Voltage Detection (NCV):** Measures AC voltage >30V-1000V/50Hz-60Hz.

**Live Wire Identification (Live):** Measures AC voltage >90V-250V/50Hz-60Hz.

### Operation Instructions

#### Precautions before Operation:

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- Power on the instrument and check if it has sufficient battery. If the battery voltage is low, the  symbol will appear on the display, indicating that the battery needs to be replaced before use.
- The  symbol next to the test lead input jack indicates that the input voltage or current must not exceed the specified value to protect the internal circuitry from damage.
- Before testing, the function/range dial should be set to the desired range.

### Voltage Measurement

- Insert the red test lead into the **VΩmA** jack. Insert the black test lead into the **COM** jack.
- Set the function/range dial to the **DCV** or **ACV** voltage position. Use the test leads to measure the voltage of the circuit being tested (connect the test leads in parallel with the circuit).
- Read the measured voltage value from the LCD.
- When in the **ACV** voltage position, pressing the **SEL** button will switch the device to frequency measurement mode.

#### ⚠️ Note:

- The maximum input voltage for the voltage range is 600V RMS. To avoid risk of electric shock or instrument damage, do not attempt to measure voltage higher than 600V RMS.
- In the **600mV** range, the instrument may show a reading even without any input or connection to the test leads. This is normal and does not affect the accuracy of the measurements.

### Current Measurement

- Insert the black test lead into the **COM** jack. If the current to be measured is less than 600mA, insert the red test lead into the **VΩmA** jack; if the current is between 600mA and 10A, insert the red test lead into the **10A** jack.
- Set the function/range dial to the **Current** position, then press the **SEL** button to select “DCA” or “ACA” measurement mode, and connect the test leads in series

with the load to be tested. The current value and the polarity of the red test lead will be displayed simultaneously.

- Pressing the **SEL** button will also display the frequency of the measured current.

#### ⚠️ Note:

- If the current range to be measured is unknown, set the function dial to the highest range and gradually reduce it until satisfactory resolution is achieved.
- If the display shows only “OL”, it indicates an overload, and the function dial must be set to a higher range.
- The  symbol next to the test lead input jacks indicates a maximum input current of either 600mA or 10A, depending on the jack being used. Excessive current will blow the fuse.

### Frequency and Duty Cycle (Hz/%) Measurement

- Insert the black test lead into the **COM** jack. Insert the red test lead into the **VΩmA** jack.
- Connect the test leads to both ends of the signal source being measured. Read the measured value from the LCD.
- Press the **SEL** button to switch between frequency (Hz) and duty cycle (%) modes.

### Diode, Capacitance, Resistance, and Continuity Measurement

- Insert the black test lead into the **COM** jack. Insert the red test lead into the **VΩmA** jack.
- At this point, the red test lead will have a positive (+) polarity.
- Set the function/range dial to the  position, then press the **SEL** button to select the desired measurement mode. Connect the test leads to the circuit (red to “+”, black to “-”). Read the measured value from the LCD.

#### ⚠️ Note:

- When there is no input, e.g., when there is an open circuit, the instrument will display “OL” for diodes, resistance, and continuity, and “0000” for capacitance.
- Before measuring resistance in a live circuit, ensure that all power sources are turned off and all capacitors are fully discharged.

During continuity testing, if resistance is less than approximately  $50\Omega \pm 30\Omega$ , the built-in buzzer will sound, indicating continuity between two points

### Transistor hFE Measurement

- Set the function/range dial to the **hFE** position and properly insert the transistor test accessory.
- Determine whether the transistor is NPN or PNP type, then insert the E, B, and C terminals of the transistor into the corresponding sockets of the test accessory.
- The instrument will display the approximate hFE value. The test conditions are a base current of approximately 10uA and a Vce of approximately 2.8V.

### Temperature Measurement

- Turn the function/range dial to the °C/°F position. At this time, the LCD will display the ambient temperature of the instrument. Press the **SEL** button to switch between °C and °F measurement modes.
- When using a thermocouple for temperature measurement, insert the red plug of the K-type thermocouple into the °C/°F jack and the black plug into the **COM** jack. Use the thermocouple probe to contact the object or area to be measured.
- Read the temperature of the object being measured from the LCD.

⚠️ Note: The instrument uses a cold-junction compensation circuit located inside the front end of the instrument. Due to the instrument's good sealing, it takes time to reach thermal equilibrium with the measuring environment. Therefore, the instrument should be placed in the measuring environment for an extended period to obtain more accurate readings.

### Non-Contact Voltage Detection (NCV) and Live Wire Identification (Live)

- Set the function/range dial to the  position, then press the **SEL** button to select “NCV” or “Live” measurement mode. The LCD will display “EF” (for NCV mode) or “LIVE” (for Live mode).
- Insert the red test lead into the **VΩmA** jack.
- Move the NCV detection area at the top of the instrument (or the tip of the red test lead) close to the live object. If voltage is detected, the NCV indicator light will flash, and at the same time, the buzzer will emit a “beep-beep-beep” alarm sound to warn the user that voltage is present in the area.
- While in “Live” mode, use the tip of the red test lead to touch the AC voltage. When the instrument emits a “beep-beep-beep” alarm sound, the NCV indicator light flashes, and the LCD displays “LIVE”, the wire being touched is the live wire.

#### ⚠️ Note:

- Even if there is no indication, voltage may still be present. Do not rely solely on the NCV detector to determine whether a conductor is live.
- Detection results may be affected by factors such as socket design, insulation thickness, and material type.
- External sources of interference (e.g., flashlights, motors, etc.) may affect the instrument, causing inaccurate detection.
- If the circuit has severe leakage, the meter may also emit a warning sound when the red test lead touches the neutral wire.

## Replacing the Battery and Fuse

1. Under normal circumstances, the fuse does not need to be replaced. Power off the instrument and remove the test leads before proceeding with fuse or battery replacement. Unscrew the screws on the back cover to open the case.
2. The fuse specifications for this instrument are: F200mA/250V and F10A/250V fast-blow type. The replacement fuse must be of the same specification.
3. Use the same type of battery when replacing the battery.
4. After replacing the battery or fuse, the back cover must be securely tightened before using the instrument.



### Warning

- To avoid electric shock, ensure that the test leads are disconnected from the circuit before opening the back cover.
- Before using the instrument, ensure that the back cover is securely fastened.

## Accessories

- User manual: ×1                      Test leads: ×1 set
- Carrying case: ×1                    Rubber sleeve: ×1
- Temperature Probe: ×1              Battery: 1.5V AAA ×2