Battery Internal Resistance Tester

Battery Resistance · True-RMS Multimeter 2-in-1

BATTERY INTERNAL RESISTANCE TESTER · USER MANUAL

Model **RDM-1**



■ Battery Internal Resistance · True-RMS Multimeter

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This manual describes the safe operation, functions and specifications of the RDM-1 battery internal resistance tester — a 2-in-1 digital instrument combining a battery internal-resistance meter and a high-precision true-RMS multimeter. It features a 2.4-inch TFT display with one-key switching between the resistance-meter and multimeter modes. The resistance-meter section uses an aviation-plug input for measuring battery voltage and internal resistance; the multimeter mode offers a high-precision 25000-count display with waveform curve recording.

1 Safety

To avoid possible electric shock, fire or personal injury, read the safety precautions before use. Use the product only for its intended purpose, otherwise the protection provided by the product may be impaired.

- Before use, check the case for cracks or missing plastic and carefully inspect the insulation near the input terminals.
- Use the correct input terminals and correct settings, and measure within the specified ranges as described in this manual.
- Do not use the product around explosive gas or vapor, or in damp environments.
- Keep your fingers behind the finger guards of the test probes.
- Do not touch unused input terminals while the product is connected to a circuit under test.
- Disconnect the test leads from the circuit before changing the measurement mode.
- DC voltages above 36V or AC voltages above 25V may cause severe injury — avoid electric shock.
- Select the correct mode and range to avoid instrument damage or personal injury.
- Do not use the product with the front cover or rear cover removed.
- Low battery may affect measurement accuracy; charge the battery promptly.
- Keep the device stable during use and avoid violent shaking.

2 Parts and keys

2.1 Panel description



Fig. 1 Instrument panel

The top of the body is the battery-resistance input (BATT) and the USB port; the front contains the 2.4-inch display and the keypad; the bottom is the multimeter measurement input (VΩHz, COM); the power key has a built-in charging indicator.

2.2 Keypad

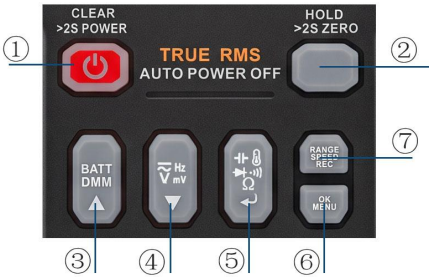


Fig. 2 Keypad

Key	Function
Power	Hold 2s to power on/off; short press clears the waveform curve in multimeter mode
HOLD/REL	Short press enters/exits data hold; long press enters relative-value mode and zeroes the reading
Up arrow	Long press switches between multimeter and resistance-meter modes; increases the value or moves left in settings
Down arrow	Toggles voltage measurement modes in multimeter mode; decreases the value or moves right in settings
Back	Returns or exits settings; toggles resistance, capacitance, diode, continuity and temperature modes in multimeter mode

RANGE/SPEED/REC	Adjusts the measurement speed (short press) or enters recording mode (long press) in resistance-meter mode; range selection in multimeter mode
OK/MENU	Long press opens the system settings; short press selects and confirms values

3 Display description

3.1 Resistance-meter display



Fig. 3 Resistance-meter display

①	Voltage	Shows the measured battery voltage
②	Resistance	Shows the measured battery internal resistance
③	Measurement speed	Shows the set measurement speed
④	Battery level	Shows the current power supply status
⑤	Voltage unit	Unit symbol of the voltage reading
⑥	Resistance unit	Unit symbol of the internal-resistance reading

⑦	Voltage lower limit	Lower judgement limit for voltage measurement
⑧	Resistance lower limit	Lower judgement limit for internal-resistance measurement
⑨	Resistance upper limit	Upper judgement limit for internal-resistance measurement
⑩	Voltage upper limit	Upper judgement limit for voltage measurement

3.2 Multimeter display



Fig. 4 Multimeter display

①	Measurement symbol	Shows the current measurement symbol: AC, DC, resistance, capacitance, diode or buzzer
②	Main reading	Shows the measured value, max 25000 counts
③	AUTO	Indicates auto ranging
④	Max	Shows the maximum value
⑤	FreQ	Shows the measured frequency value
⑥	Min	Shows the minimum value
⑦	AVG	Shows the average value
⑧	Waveform area	Automatically plots a waveform curve of the measured value to record signal changes

4 Battery resistance measurement

4.1 Input terminal

The input is an aviation plug (BATT) with a maximum allowable input voltage of DC 100V; AC voltage input is strictly prohibited.

4.2 Measurement method

1. Power on and wait a few seconds for the internal circuit to stabilize.
2. Long-press the up arrow (BATT/DMM) to switch to the resistance-measurement screen.
3. Insert the aviation-plug clips and attach them to the positive and negative terminals of the battery.
4. Read the battery internal resistance and voltage on the display.

> a. Red clip to the positive terminal, black clip to the negative terminal.
> b. Do not short-circuit the battery terminals during measurement. c. For resistance references, see the appendix tables (4.4, 4.5).

4.3 Clip connection and unplugging the aviation plug

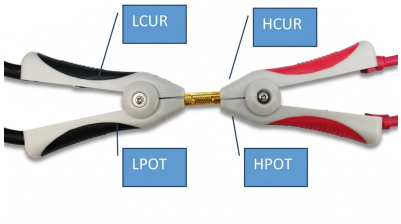


Fig. 5 Clip connection

1. Keep the clips parallel during measurement and avoid crossed wires.
2. Keep LCUR in the same direction as HCUR, and LPOT in the same direction as HPOT (as shown above).
3. To unplug the aviation plug, grip the metal outer ring and pull it straight out; never pull on the cable.

4.4 Appendix 1 Reference internal resistance of battery types

Battery type	Specification	Reference resistance
Lead-acid battery	Starter battery	2-5 mΩ
Lead-acid battery	Deep-cycle battery	5-20 mΩ
Lead-acid battery	VRLA battery	2-10 mΩ
Lithium-ion battery	18650	20-90 mΩ
Lithium-ion battery	Polymer lithium-ion	10-50 mΩ
Lithium-ion battery	LiFePO4 battery	10-30 mΩ
NiMH battery	AA/AAA NiMH	50-200 mΩ
NiMH battery	High-capacity NiMH	20-100 mΩ
NiCd battery	AA/AAA NiCd	50-150 mΩ

NiCd battery	High-capacity NiCd	20-100 mΩ
Alkaline battery	AA/AAA alkaline	100-300 mΩ
Zinc-carbon battery	AA/AAA zinc-carbon	200-600 mΩ
LiPo battery	High-rate LiPo	1-5 mΩ
LiPo battery	Standard LiPo	10-50 mΩ
Supercapacitor	Supercapacitor	0.1-10 mΩ

> Internal resistance varies with temperature — the lower the temperature, the higher the resistance. New batteries have lower resistance, which gradually increases with use. The ranges above are for reference only; refer to the battery datasheet for actual values.

4.5 Appendix 2 Internal resistance of batteries by capacity

No.	Capacity	Voltage	Resistance	No.	Capacity	Voltage	Resistance
1	0.8Ah	12V	120mΩ	33	150Ah	12V	4mΩ
2	1.3Ah	12V	102mΩ	34	200Ah	12V	3mΩ
3	2.2Ah	12V	63.7mΩ	35	230Ah	12V	2mΩ
4	3.3Ah	12V	55.7mΩ	36	250Ah	12V	1mΩ
5	4Ah	12V	46.9mΩ	37	1.3Ah	6V	55mΩ
6	5Ah	12V	37.4mΩ	38	2.8Ah	6V	40mΩ
7	6Ah	12V	30.2mΩ	39	3.2Ah	6V	28.5mΩ
8	7Ah	12V	23mΩ	40	4Ah	6V	24mΩ
9	8Ah	12V	20mΩ	41	5Ah	6V	18.3mΩ
10	9Ah	12V	19mΩ	42	7Ah	6V	14mΩ
11	10Ah	12V	18.7mΩ	43	10Ah	6V	12mΩ
12	12Ah	12V	14.4mΩ	44	110Ah	6V	4.3mΩ

13	14Ah	12V	13.6mΩ	45	200Ah	6V	1.7mΩ
14	15Ah	12V	13mΩ	46	100Ah	2V	1mΩ
15	17Ah	12V	12.1mΩ	47	150Ah	2V	0.83mΩ
16	18Ah	12V	11.4mΩ	48	170Ah	2V	0.76mΩ
17	20Ah	12V	10.6mΩ	49	200Ah	2V	0.7mΩ
18	24Ah	12V	9.8mΩ	50	250Ah	2V	0.68mΩ
19	25Ah	12V	9.5mΩ	51	300Ah	2V	0.65mΩ
20	26Ah	12V	9.2mΩ	52	350Ah	2V	0.6mΩ
21	28Ah	12V	8.9mΩ	53	400Ah	2V	0.5mΩ
22	31Ah	12V	8.6mΩ	54	420Ah	2V	0.48mΩ
23	33Ah	12V	8.4mΩ	55	450Ah	2V	0.45mΩ
24	38Ah	12V	8.2mΩ	56	462Ah	2V	0.43mΩ
25	40Ah	12V	7.9mΩ	57	500Ah	2V	0.4mΩ
26	60Ah	12V	6.5mΩ	58	600Ah	2V	0.32mΩ
27	65Ah	12V	5.8mΩ	59	800Ah	2V	0.24mΩ
28	75Ah	12V	5.5mΩ	60	1000Ah	2V	0.2mΩ
29	80Ah	12V	5.3mΩ	61	1500Ah	2V	0.16mΩ
30	85Ah	12V	5mΩ	62	2000Ah	2V	0.12mΩ
31	100Ah	12V	4.5mΩ	63	3000Ah	2V	0.11mΩ
32	120Ah	12V	4.3mΩ				

> This table is for reference only. Internal resistance varies between brands and manufacturing processes; refer to the factory-measured values of the battery.

4.6 Resistance-meter calibration

Long-press OK to open the system settings, page down to the calibration menu, and calibrate the resistance points 0Ω, 1mΩ, 10mΩ,

100mΩ, 1Ω, 10Ω, 100Ω, 1KΩ and the voltage points -60V, -10V, -1V, 1V, 10V, 60V — 14 points in total, individually or all together.

1. Select the point with the up/down keys, connect the corresponding standard source and press OK to start; the screen shows "calibrating".
2. When finished, the buzzer beeps once and the screen shows "calibration successful"; if the calibration value is wrong, the buzzer beeps twice and the screen shows "calibration failed".

> a. Use non-inductive standard resistors (never wire-wound). b. Use four-wire resistors for 10mΩ and 100mΩ. c. Voltage calibration requires a standard DC voltage source.
>
> The instrument is 100% calibrated before shipment — no user calibration is required. If calibration values become inaccurate or corrupted, restore factory settings to return to the factory calibration.

5 Multimeter functions

5.1 Input terminals



Fig. 7 Multimeter input terminals

①	VΩHz terminal	Input for AC/DC voltage, resistance, continuity, diode, capacitance, temperature and frequency measurements
②	COM terminal	Common (return) terminal for all measurements

5.2 Measuring AC/DC voltage

1. Insert the black lead into COM and the red lead into VΩHz.
2. Select the appropriate mode with the down arrow: DC voltage, AC voltage, DC millivolt or AC millivolt.
3. Touch the correct test points of the circuit with the probe tips.
4. Read the voltage on the display; for AC voltage the frequency is shown simultaneously.

a. Never exceed the rated maximum input, or the instrument may be damaged and personal injury may occur. b. When measuring high-voltage circuits, avoid contact with the high-voltage circuit.

5.3 Measuring resistance

1. Insert the black lead into COM and the red lead into VΩHz.
2. Press Back to select the resistance mode.
3. Touch the desired test points of the circuit with the probe tips.
4. Read the resistance on the display.

5.4 Continuity test

1. Insert the black lead into COM and the red lead into VΩHz.
2. Press Back to select the continuity mode.
3. Touch the two points of the circuit under test; the built-in buzzer sounds when a short circuit is detected.

a. Never apply voltage in the continuity and diode modes. b. Disconnect the circuit power and discharge all high-voltage capacitors before testing.

5.5 Diode test

1. Press Back to select the diode mode.
2. Connect the red probe to the anode and the black probe to the cathode of the diode, then read the forward voltage on the display. If the leads are reversed or the diode is defective, the display shows "OL".

Never apply voltage in the continuity and diode modes.

5.6 Capacitance measurement

1. Insert the black lead into COM and the red lead into VΩHz.
2. Press Back to select the capacitance mode.
3. Connect the red probe to the positive terminal and the black probe to the negative terminal of the capacitor.
4. Wait for the reading to stabilize, then read the capacitance on the display.

5.7 Temperature measurement

1. Insert the black thermocouple plug into COM and the red plug into VΩHz.
2. Press Back to select the temperature mode.
3. Touch the measurement point with the thermocouple probe.
4. Wait for the reading to stabilize, then read the temperature on the display.

6 Firmware upgrade

1. With the instrument off, hold HOLD and press the power key; "USB-Boot" appears on the display.
2. Connect to a computer with a TYPE-C cable; a BATT disk appears.
3. Copy the firmware file into the BATT disk; the upgrade runs automatically — do not operate the instrument during the upgrade.
4. The display returns to the measurement screen when the upgrade succeeds.

7 Maintenance

Except for basic maintenance, do not attempt to repair or modify the instrument unless you are qualified and have the corresponding calibration, performance-test and service instructions.

7.1 Cleaning

Clean the case with a damp cloth and mild detergent; do not use abrasives or solvents. Dust or moisture in the test terminals may affect reading accuracy.

> Remove all input signals before cleaning.

7.2 Charging the battery

When the low-battery symbol appears at the top-right of the display, charge the battery promptly:

1. Connect the TYPE-C cable to a DC 5V adapter.
2. Or connect the TYPE-C cable to a computer USB port.
3. While charging, the power indicator shows red.
4. When fully charged, the power indicator turns blue.

8 Specifications

8.1 General specifications

Item	Specification
Display (TFT)	2.4 inch, 320×240
Reading	25000 counts
Range	Auto/manual
Material	ABS+TPE
Sampling rate	3 readings/second
True RMS	Yes
Data hold	Yes
Backlight	Yes
Low battery indication	Yes
Auto power-off	Yes

8.2 Mechanical specifications

Item	Specification
Dimensions	149×76×35mm
Weight	200g (with battery)
Battery	2000mAh lithium battery ×1
Warranty period	One year

8.3 Environmental specifications

Item	Specification
Operating temperature	0~40℃

Operating humidity	<75%
Storage temperature	-20~60℃
Storage humidity	<80%

8.4 Multimeter specifications

Function	Range	Resolution	Accuracy
DC voltage (V)	2.5000V	0.0001V	±(0.05%+3)
	25.000V	0.001V	
	250.00V	0.01V	
	1000.0V	0.1V	
DC voltage (mV)	25.000mV	0.001mV	±(0.5%+3)
	250.00mV	0.01mV	
AC voltage (V)	2.5000V	0.0001V	±(0.5%+3)
	25.000V	0.001V	
	250.00V	0.01V	
	750.0V	0.1V	
AC voltage (mV)	25.000mV	0.001mV	±(0.8%+3)
	250.00mV	0.01mV	

AC voltage frequency response: 40Hz~1kHz

Function	Range	Resolution	Accuracy
Resistance	250.00Ω	0.01Ω	±(0.5%+3)
	2.5000kΩ	0.0001kΩ	±(0.2%+3)
	25.000kΩ	0.001kΩ	
	250.00kΩ	0.01kΩ	
	2.5000MΩ	0.0001MΩ	±(1%+3)

	25.00MΩ	0.01MΩ	
	250.0MΩ	0.1MΩ	±(5.0%+5)
Capacitance	9.999nF	0.001nF	±(5.0%+20)
	99.99nF	0.01nF	±(2.0%+5)
	999.9nF	0.1nF	
	9.999μF	0.001μF	
	99.99μF	0.01μF	
	999.9μF	0.1μF	
	9.999mF	0.001mF	±(5.0%+5)
	99.99mF	0.01mF	
Frequency	9.999Hz	0.001Hz	±(2.0%+2)
	99.99Hz	0.01Hz	±(0.1%+2)
	999.9Hz	0.1Hz	
	9.999kHz	0.001kHz	
	99.99kHz	0.01kHz	
	999.9kHz	0.1kHz	
Temperature	(-20~1000)℃	1℃	±(2.5%+5)
	(-4~1832)℉	1℉	
Diode	√		
Continuity	√		

8.5 Resistance-meter specifications

Feature	Specification
Measurement functions	Battery voltage, battery internal resistance
Voltage range	±100V

Resistance range	0.1mΩ~200Ω
Resistance accuracy	±0.5%
Voltage accuracy	±0.2%
Measurement speed	1, 2 or 4 readings per second
Output impedance	100Ω
Languages	Chinese, English
Brightness	10%~100% adjustable
Auto power-off	5~120 minutes adjustable, off
Buzzer volume	0%~100% adjustable
Calibration points	0Ω, 1mΩ, 10mΩ, 100mΩ, 1Ω, 10Ω, 100Ω, 200Ω, -60V, -10V, -1V, 1V, 10V, 60V

9 Warranty

This product is covered by a one-year warranty from the date of purchase. The warranty does not cover damage to general accessories, or damage caused by accidents, negligence, misuse, modification, contamination or abnormal operating conditions.

If the instrument freezes or malfunctions during use, restart it.

10 Compliance

10.1 Waste disposal and environmental protection (WEEE)

This product must not be disposed of as unsorted municipal waste. To minimize potential pollution to the environment and risks to human

health, separate this product from other waste and recycle it responsibly through an authorized local recycling facility.

10.2 Directives and standards

This product complies with the relevant EU directives and standards for CE certification.

Notes