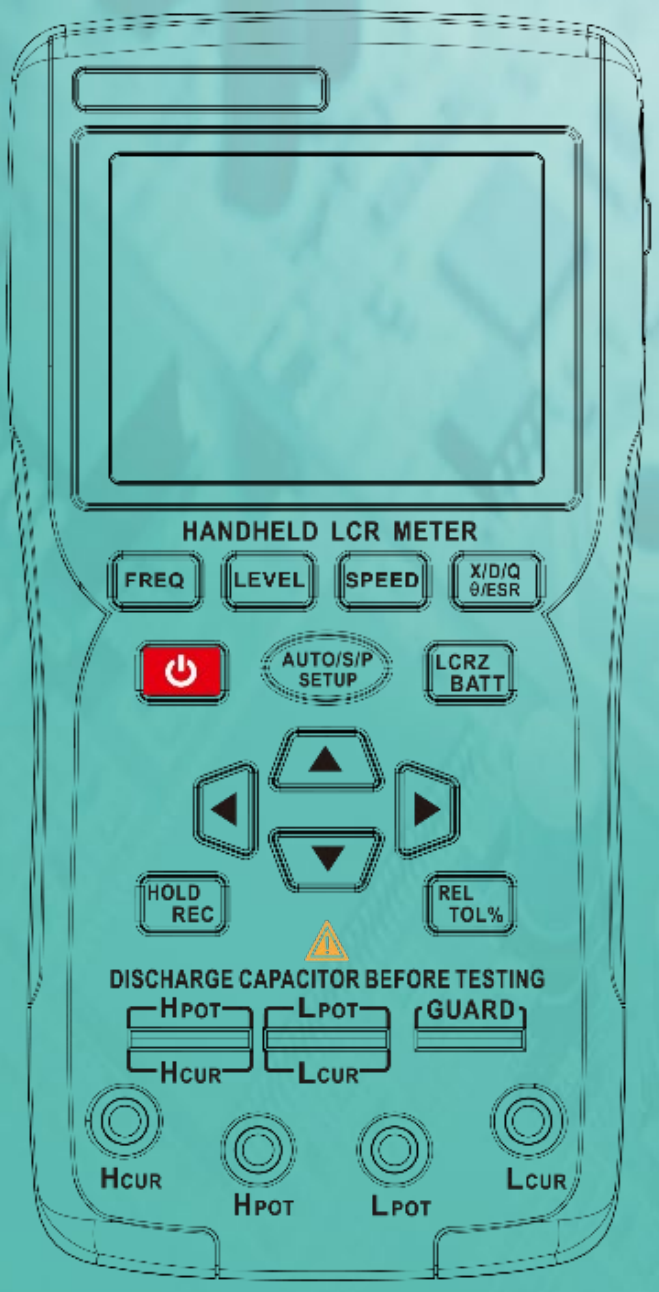
User manual



Limited warranty and scope of liability

This product comes with a one-year warranty from the date of purchase.

The warranty does not cover accessory damage or damage caused by accidents, negligence, improper use, modifications, exposure to contaminants, or operation in extreme conditions.

Note: If you encounter lag or freezing during use, please restart the device.

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Overview

This product is a handheld high-precision LCR digital bridge measuring instrument with a built-in battery internal resistance measurement function. It is designed to professionally measure various resistances, capacitances, inductances, and their characteristic parameters.

The battery internal resistance measurement section uses an aviation plug input, enabling precise measurement of battery voltage and internal resistance.The product features an elegant design, compact size, and flexible operation, with a 2.8-inch TFT high-definition display. It utilizes four-wire measurement input, significantly improving measurement accuracy and reliability.

With superior performance and powerful functions, this instrument meets a wide range of LCR and battery measurement needs.

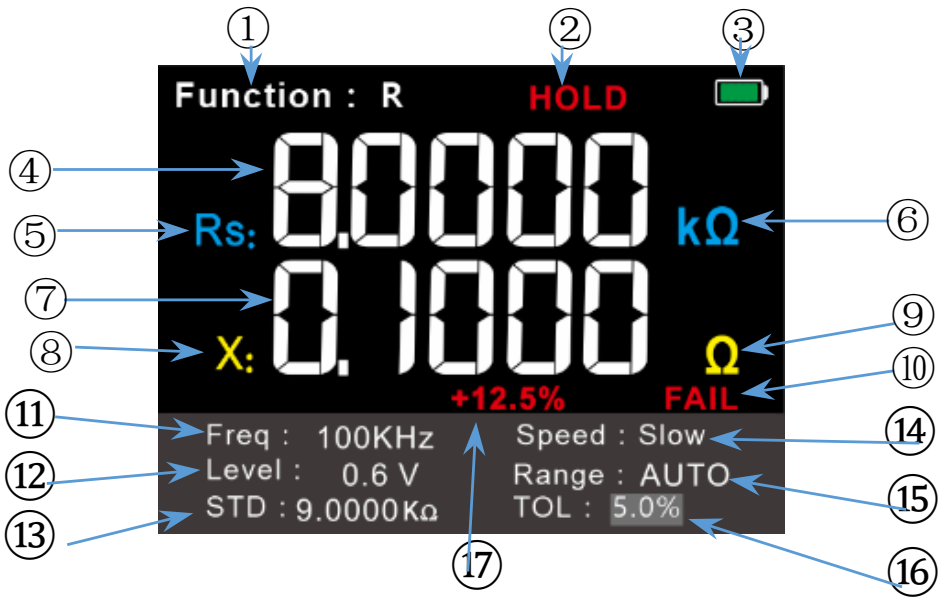
Safety notes

To avoid potential electric shock, fire, and personal injury, please read the safety precautions carefully before use. Only use the product for its intended purpose, as improper use may compromise its protective functions.

- Before using the product, inspect the casing for cracks or plastic damage. Pay special attention to the insulation near the input ports.
- Follow the instructions in this manual to select the correct input ports and settings, ensuring measurements are within the specified range. Do not use this product in explosive gas or vapor environments or humid conditions.
- Before measuring batteries, ensure the battery voltage does not exceed the measurement range. Voltages above 36V may cause serious injury, so users should take care to avoid electric shock.
- When measuring batteries, pay attention to the polarity and avoid short circuits to prevent sparking or damage.
- Do not use the product with the front or back cover open.
- If the battery voltage is low, it may affect the accuracy of test results — please recharge the device promptly.
- Before LCR measurement, ensure the circuit is not live and discharge capacitors before starting the measurement.
- Use separate input ports for LCR measurements and battery internal resistance measurements. Mixing them may damage the instrument.

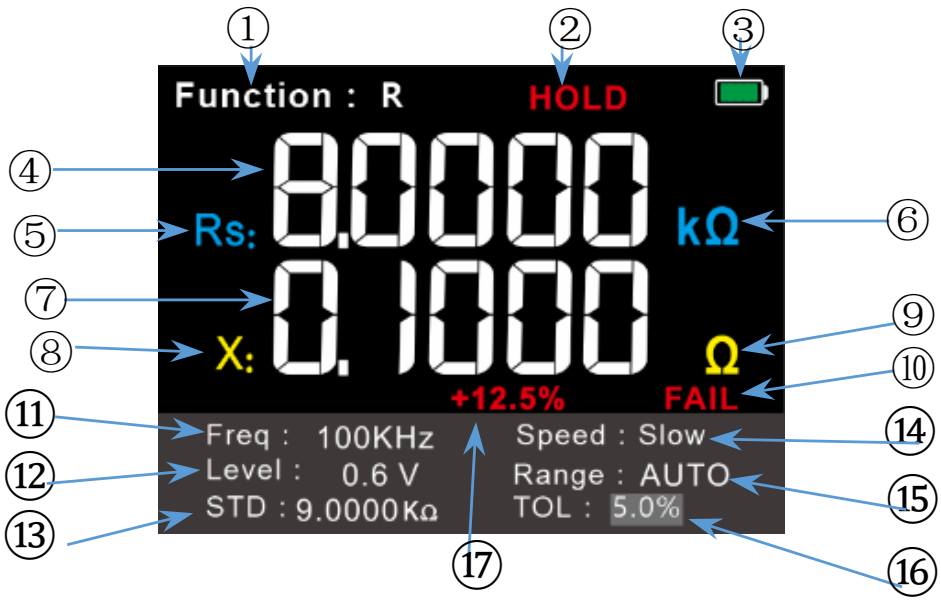
Meter panel instructions

Display interface instructions



1	Measuring function	Display measuring functions: Auto, resistance, capacitance, inductance, impedance, electrolytic capacitance, battery internal resistance
2	HOLD	Indicates that it is currently in data save mode
3	Battery symbol	Displays the current battery level status
4	Master display value	Display the main parameter measurements
5	Functional symbols	Displays the symbols for the current measurement function, where s represents series equivalent and p represents parallel equivalent.
6	Unit symbol	Displays the unit symbol of the current main parameter measurement
7	Secondary display values	Display sub-parameter measurements
8	Sub-parameters	Displays the secondary parameter function symbol for the current measurement

Show interface instructions



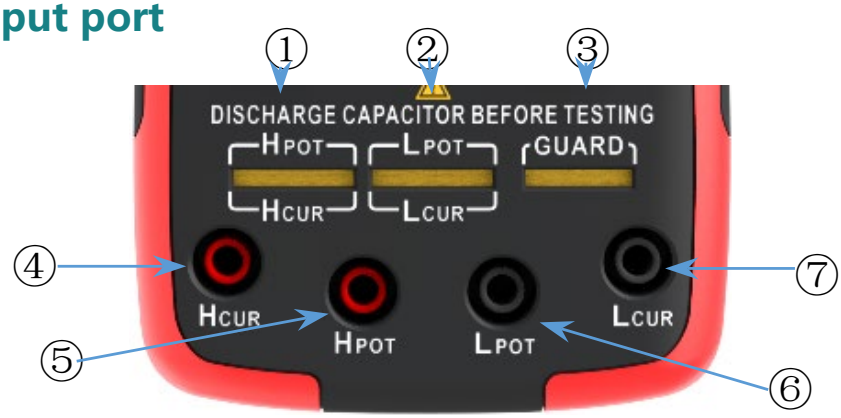
9	Unit symbol	The unit symbol that displays the value of the subparameter of the current measurement
10	Results	Display measurement results in tolerance mode judgement, PASS or FAIL
11	Frequency	Display the set measurement frequency
12	Levels	Display the set measurement level
13	Nominal value	Show the nominal value set in tolerance mode
14	Speed	Display the set measurement speed
15	Measuring Range	Displays the set resistance test range
16	Tolerance	Shows the allowable error range set in tolerance mode
17	Tolerance values	Displays the percentage of the margin of error between the measured physical value and the nominal value

Panel key function description

- Power Button: Press this button to turn the instrument on or off.
- FREQ Frequency Button: Press this button to select different measurement frequencies.
- LEVEL Level Button: Press this button to select different measurement levels.
- SPEED Measurement Speed button: Press this key to select different measurement speeds.
- X/D/Q θ/ESR Secondary parameter selection Button: Press this button to switch the display of different secondary parameter values.
- AUTO/S/P SETUP Setting Button: Short press this button to switch the measurement equivalent mode, and long press this button to enter the system setting interface.
- LCRZ BATT Main parameter selection Button : Press this button to switch between different functional measurements.
- Arrow Button: Press the up and down button to move the selection function menu, press the left and right button to modify the setting parameters.
- HOLD REC HOLD/REC Button: Press this button briefly to hold the measurement data, and press and hold it to enter measurement recording mode and toggle the connection with the host computer.
- REL TOL% REL/TOL Button: Press this button briefly to enter tolerance measurement mode, and press and hold it to reset the main parameter value to zero.

LCR functional measurement introduction

Measure input port



1	High-end input	Built-in gold-plated clip to insert the test piece pin, or a positive pin if the test piece has polarity
2	Low-end input	Built-in gold-plated clip to insert the part under test pin, or negative pin if the part under test has polarity
3	Ground end	Measure the grounding end of the connection wire
4	Hcur	Current sampling high end, connect the Kelvin clip red line
5	Hpot	Voltage sampling high end, Kelvin clamp wire
6	Lpot	Voltage sampling low end, connect Kelvin clip black wire
7	Lcur	Current sampling low end, connect Kelvin clip black wire

Note:

a. The pin of the part under test can be inserted directly into the 1 and 2 ports for measurement.

b. 4, 5, 6, and 7 are the 4-wire input ports, and the 4-wire terminals inserted into the random distribution clamp the pins of the parts under test for measurement.

c. Voltage and live devices are not measured at this port.

LCR measurement function introduction

Measurement Methods

1.Power on the device. When the measurement interface displays normally, the internal circuit will stabilize within a few seconds, and the measurement can begin.

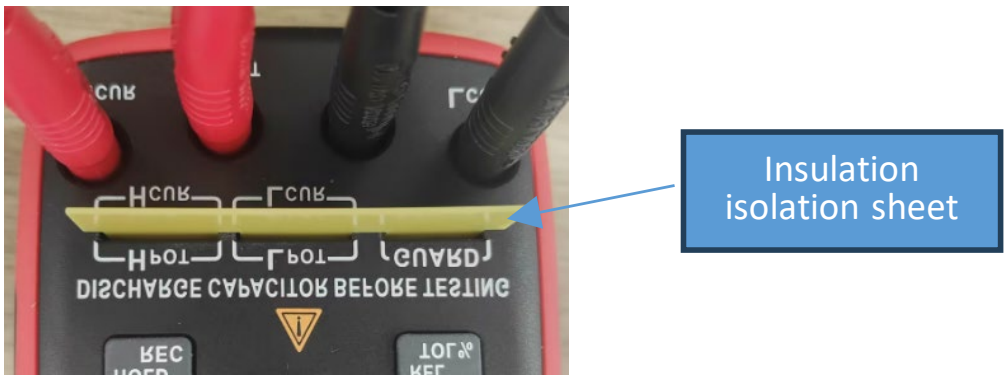
2.Insert the 4-wire Kelvin clips . Clip the test leads to both ends of the test object. Alternatively, insert the test object's pins directly into the clip input terminal.

3.Read the measurement value on the screen.

Note:

a. Do not apply voltage to the LCR port. Before measuring, make sure the circuit is de-energized and discharge any capacitors.

b. When using 4-wire measurement, it is recommended to insert the included insulation spacer between the clips to improve measurement accuracy.



c.When measuring low load and high impedance load, it is recommended to use the clip input terminal, as it has lower stray parameters and provides more accurate results.

d. Due to the varying AC characteristics of different components and circuits, selecting the appropriate measurement frequency, voltage level, and equivalent mode according to the test object's properties can improve measurement accuracy. You can refer to the following recommended settings.

LCR measurement function introduction

Measure resistance

1.Use the AUTO mode or manually adjust to the resistance mode, then clip the probes to both ends of the resistor.

2.When measuring low resistance, ensure the surface has sufficient contact. Oxidation on the surface can affect the measurement accuracy.

3.For high resistance and low resistance measurements, it is recommended to use the clip input terminal.

Measure capacitors

1.Use the AUTO mode or manually adjust to the capacitance mode, then clip the probes to both ends of the capacitor.

2.Before measuring the capacitance, ensure the capacitor is discharged to prevent any stored charge from damaging the instrument.

3.If the measurement value exceeds the range, the screen will display "OL".

For measuring capacitors above 1uF, selecting 1KHz or 100Hz frequency is more suitable; for measuring capacitors below 1uF, 1KHz or 10KHz frequency is recommended.

Measure inductance

1.Use the AUTO mode or manually adjust to the inductance mode, then clip the probes to both ends of the inductor.

2.For measuring inductors above 1H, selecting 1KHz or 100Hz frequency is more suitable; for measuring inductors below 1H, 1KHz or 10KHz frequency is recommended.

3.When using auto range and large inductance measurements result in significant errors, manually switch to the appropriate range for more accurate measurement. Refer to the following range setting method for guidance.

LCR measurement function introduction

Range setting

Press the left or right arrow key to select the range, then use the up or down arrow key to adjust the range setting.

1. The available ranges are Auto, 100Ω, 1KΩ, 10KΩ, and 100KΩ. Typically, the Auto mode is selected.

2. If you need to observe the characteristics under different ranges or if certain special impedance devices are not measured accurately, you can manually select the range.

3. When the impedance of the device under test is unclear, start by selecting the 100Ω range and gradually increase the range. The higher the range, the more accurate the result. If the measurement result fluctuates too much, lower the range setting.

Level setting

Press the left or right arrow key to select the level, then use the up or down arrow key or the LEVEL key to adjust the level setting.

The available level settings are 0.1V, 0.3V, and 0.6V. Typically, the 0.6V level is chosen for measurements. When performing online measurements, select 0.3V or 0.1V to avoid applying excessive excitation voltage that may trigger other devices.

Speed setting

Press the left or right arrow key to select the speed, then use the up or down arrow key or the SPEED key to adjust the measurement speed.

The available speed settings are slow, medium, and fast. Typically, slow speed is chosen to ensure more stable measurements. However, you can adjust the speed to medium or fast based on the actual measurement requirements.

LCR measurement function introduction

Frequency setting

Press the left or right arrow key to select the frequency, then use the up or down arrow keys or the FREQ key to adjust the frequency range.

1. The available frequencies are 100Hz, 120Hz, 1kHz, 10kHz, and 100kHz. Typically, 1kHz is used for measurement.

2. To view the device characteristics at different frequencies, press the FREQ key to switch between them.

Equivalent mode settings

Press the left or right arrow key to select the equivalent mode, then use the up or down arrow key to adjust it.

1. The equivalent modes are Auto, Series, and Parallel. Typically, the Auto mode is selected.

2. If you need to observe the device characteristics under different modes, press the left or right arrow key to switch between them.

Recommended measurement conditions reference table			
Component names	Specifications	Measuring frequency	Equivalent pattern
Capacitance	<1 μF	⩾1KHz	Automatic, parallel
Capacitors	⩾1 μF (non-electrolytic capacitance)	⩽ 1KHz	Automatic, parallel
Capacitors	⩾1μF (electrolytic capacitor)	⩽ 1KHz	Automatic, series
Inductance	<1H	⩾1KHz	Automatic, series
Inductance	⩾1H	⩽ 1KHz	Automatic, series
Resistance	< 10KΩ	1KHz	Automatic, tandem
Resistance	⩾ 10KΩ	1KHz	Automatic, parallel

LCR measurement function introduction

Tolerance pattern

The purpose of the tolerance mode is to set a nominal value and an allowable error range based on measurement requirements. The actual measured value is automatically compared with the nominal value, generating a measurement judgment result and tolerance percentage. This mode is suitable for batch component screening and comparative measurement.

Short press the REL/TOL% key to enter or exit the tolerance mode. The screen will display the nominal value and tolerance fields.

Press the up/down keys to enter the nominal value setting. Use the left/right keys to move the decimal point, then adjust the value with the up/down keys.

Once the settings are complete, press the AUTO/S/P key to confirm and exit.

Recording mode

1. Press and hold the HOLD/REC key to enter the automatic measurement recording mode, synchronizing with the PC software function.

2. The TYPE-C port supports remote control and data acquisition using the SCPI standard instrument protocol.

Battery internal resistance measurement function introduction

Input Port

The input port is an aviation plug, with a maximum allowable input voltage of DC 100V. AC voltage input is prohibited.

Measurement Method

1, Turn on the power. Once the screen measurement interface displays normally, and the internal circuit stabilizes after a few seconds of powering up, you can proceed with the measurement.

2, Press the LCRZ key to switch the measurement function to the internal resistance measurement interface.

3, Insert the supplied aviation plug clips and clamp them onto the positive and negative terminals of the battery to be measured.

4, Read the battery internal resistance value and voltage on the screen.

Remarks:

a. The red clip is for the battery's positive terminal, and the black clip is for the negative terminal.

b. Be cautious to prevent the battery's positive and negative terminals from touching and causing a short circuit during the measurement.

c. Refer to the appendix table for battery internal resistance.

Battery internal resistance measurement function introduction

Appendix 1

Reference range for internal resistance of various types of batteries		
Battery type	Specifications	Reference internal resistance
Lead-acid battery	Starter battery	2-5 mΩ
	Deep cycle battery	5-20 mΩ
	Valve-controlled lead-acid battery	2-10 mΩ
Lithium-ion batteries	18650	20-90 mΩ
	Polymer lithium-ion battery	10-50 mΩ
	Lithium iron phosphate battery	10-30 mΩ
Nimh battery	AA/AAA NIMH batteries	50-200 mΩ
	High capacity NIMH batteries	20-100 mΩ
Nickel-cadmium battery	AA/AAA nickel-cadmium batteries	50-150 mΩ
	High capacity nickel-cadmium battery	20-100 mΩ
Alkaline battery	AA/AAA alkaline batteries	100-300 mΩ
Zinc-carbon battery	AA/AAA zinc-carbon batteries	200-600 mΩ
Lithium polymer battery	High rate LiPo batteries	1-5 mΩ
	Regular LiPo batteries	10-50 mΩ
Supercapacitor	Supercapacitors	0.1-10 mΩ
Note: The internal resistance value varies with temperature; typically, the lower the temperature, the higher the internal resistance. New batteries have a relatively low internal resistance, which gradually increases as the battery is used over time. The above range is for reference only; the actual internal resistance value should be based on the parameters provided in the battery's specification sheet.		

This section describes the battery internal resistance measurement function

Appendix 2

Internal resistance reference table for batteries of different capacities							
Serial number	Capacity	Voltage	Internal resistance	Serial number	Capacity	Voltage	Internal resistance
one	0.8 Ah	12V	120mΩ	33	150Ah	12V	4mΩ
2	1.3 Ah	12V	102mΩ	34	200Ah	12V	3mΩ
3	2.2 Ah	12V	63.7 mΩ	35	230Ah	12V	2mΩ
4	3.3 Ah	12V	55.7mΩ	36	250Ah	12V	1mΩ
5	4Ah	12V	46.9mΩ	37	1.3 Ah	6V	55mΩ
6	5Ah	12V	37.4mΩ	38	2.8 Ah	6V	40mΩ
7	6Ah	12V	30.2mΩ	39	3.2 Ah	6V	28.5mΩ
8	7Ah	12V	23mΩ	40	4Ah	6V	24mΩ
9	8Ah	12V	20mΩ	41	5Ah	6V	18.3 mΩ
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	1.7 mΩ
14	15Ah	12V	13mΩ	46	100Ah	2V	1mΩ
15	17Ah	12V	12.1 mΩ	47	150Ah	2V	0.83 mΩ
16	18Ah	12V	11.4 mΩ	48	170Ah	2V	0.76 mΩ
17	20Ah	12V	10.6 mΩ	49	200Ah	2V	0.7mΩ
18	24Ah	12V	9.8 mΩ	50	250Ah	2V	0.68mΩ
19	25Ah	12V	9.5 mΩ	51	300Ah	2V	0.65mΩ
20	26Ah	12V	9.2 mΩ	52	350Ah	2V	0.6mΩ
21	28Ah	12V	8.9 mΩ	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	7.9 mΩ	57	500Ah	2V	0.4 mΩ
26	60Ah	12V	6.5 mΩ	58	600Ah	2V	0.32mΩ
27	65Ah	12V	5.8 mΩ	59	800Ah	2V	0.24mΩ
28	75Ah	12V	5.5 mΩ	60	1000Ah	2V	0.2mΩ
29	80Ah	12V	5.3 mΩ	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				
Note: This battery internal resistance table is for reference only. The internal resistance of batteries varies by brand and manufacturing process. The actual internal resistance should be based on the factory's measured values for the specific battery.							

System settings

1.Long press the AUTO key to enter the system settings menu, where you can set the language, backlight brightness, auto power-off time, buzzer, calibration settings, and restore factory settings.

2.Use the up and down keys to select the item to be set, then use the left and right keys to adjust the setting.

3.Once settings are complete, long press the AUTO key or short press the LCRZ key to exit the settings menu.

Calibrate Settings

- Bridge Calibration

Enter the settings menu and select "Bridge Calibration." You can input the following 12 resistance values: 0Ω, 10mΩ, 100mΩ, 1Ω, 10Ω, 100Ω, 1KΩ, 10KΩ, 100KΩ, 1MΩ, 10MΩ, OPEN. Calibration can also be done for individual resistance values.

1.Use the left and right keys to select the resistance value to calibrate, connect the corresponding standard resistor, and press the AUTO key to start the calibration. At this point, the screen's section will turn yellow.

2.The calibration process will take 45 seconds, so please be patient.

3.Calibration results: Green indicates OK, Red indicates NG. Press the LCRZ key to exit.

Notes:

a. Use non-inductive resistors for calibration. Do not use wound resistors.

b. For 10mΩ and 100mΩ standard resistors, it is recommended to use 4-wire resistors.

c. For OPEN calibration, do not connect any resistors.

- Internal Resistance Calibration

Enter the settings menu and select "Internal Resistance Calibration." You can input the following 15 resistance and voltage values: 0Ω, 1mΩ, 10mΩ, 100mΩ, 1Ω, 10Ω, 100Ω, 1KΩ, -60V, -10V, -1V, 1V, 10V, 60V. Calibration can also be done for individual values.

1. Use the left and right keys to select the resistance or voltage value to calibrate, connect the corresponding standard source, and press the AUTO key to begin calibration. The screen's section will turn yellow.

2. The calibration process will take a few seconds, so please be patient.

3. Calibration results: Green indicates OK, Red indicates NG.

* Notes:

a. Use non-inductive resistors for calibration. Do not use wound resistors.

b. For 10mΩ and 100mΩ standard resistors, it is recommended to use PBV 4-wire resistors.

c. Voltage calibration requires a standard DC voltage source.

Additional Notes:

1. Although this product provides an open user calibration learning mode, it has been 100% calibrated before leaving the factory, and no additional calibration is necessary for users. If calibration is required in special situations, the above method can be followed.

2. If calibration values are inaccurate or distorted, simply restore the factory settings to return to the factory calibration values.

Firmware Upgrade:

1. While the device is powered off, press and hold the X/D/Q key, then simultaneously press the power button until the screen displays “USB-Boot.”

2. Connect the device to a computer using a TYPE-C data cable. The computer will recognize it as an LCR disk.

3. Copy the prepared firmware upgrade file into the LCR disk. The device will automatically start the upgrade process. Do not perform any operations during the upgrade.

4. Once the upgrade is complete, the screen will automatically switch to the measurement interface, indicating a successful upgrade.

Maintenance and Care

Except for battery replacement, do not attempt to repair this product or modify its circuitry unless you have the appropriate qualifications and the corresponding calibration, performance testing, and repair instructions.

Clean the product

Please use a damp cloth and a mild cleaner to clean the exterior. Do not use corrosive agents or solvents. Dust or moisture on the testing ports may affect the accuracy of readings.

*Before cleaning the product, please remove all input signals.

Battery Charging

When the battery icon appears as "  " in the upper-right corner of the screen, it indicates that the device needs to be charged. Follow these steps:

1. Insert the included TYPE-C data cable and connect it to a DC 5V output adapter to charge.
2. During normal charging, the charging indicator light will be red.
3. Once fully charged, the charging indicator light will turn green.

Technical indicators

General Technical Indicators	
Display (TFT)	2.8 inches, 320*240
Measuring range	Auto
Material	ABS+TPE
Sampling rate	Adjustable
Data hold	√
Screen backlighting	√
Low battery tips	√
Automatic shutdown	√

Mechanical technical index	
Dimensions	177*89*40mm
Weight	345g (without battery)
Battery type	2000mAh lithium battery * 1
Warranty period	One year

Environmental technical indicators		
Working environment	Temperature	0 ~ 40 ℃
	Humidity	< 75%
Storage environment	Temperature	- 20 ~ 60 ℃
	Humidity	< 80%

Technical indicators of hand-held bridge	
Functional characteristics	Instructions
Measuring function	Automatic、resistance、 capacitor、 inductance, impedance、 electrolytic capacitor、 internal resistance of battery
Main Parameters	L, C, R, Z
Subparameters	X, D, Q, θ, ESR
Equivalent mode	Series, parallel
Inductive range	0~100H
Capacitance range	0~100000uF
Resistance range	0 ~ 10 m Ω
Test frequency	100Hz, 120Hz, 1KHz, 10KHz, 100KHz
Test level	0.1V, 0.3V, 0.6V
Highest accuracy	0.3%
Measuring speed	1 second/time, 2 seconds/time, 4 seconds/time
Output impedance	100 Ω
Internal resistance part of the battery	Voltage range: ±100V
	Resistance range: 0.1mΩ~200Ω
	Resistance accuracy: 0.5%
	Voltage accuracy: 0.2%
Language	Chinese, English
Brightness	25%, 50%, 75%, 100% adjustable
Automatic shutdown	15 minutes, 30 minutes, 45 minutes, 60 minutes, turn off
Buzzer	Open and close
Bridge calibration	Short circuit, open circuit
Endurance time	13h

Refer to the precision comparison table

Types	Range	100/120Hz	1KHz	10KHz	100KHz
Capacitance	1mF~100mF	5% ± 5	5% ± 5	---	---
	1uF~1mF	1% ± 5	1% ± 5	---	---
	1nF~1uF	2%±5	0.5% ± 5	0.5% ± 5	1% ± 5
	1pF~1nF	---	1.5% ± 5	2% ± 5	2% ± 5
Inductance	1H-100H	3% ± 5	3% ± 5	---	---
	1mH~1H	0.5% ± 5	0.5% ± 5	---	---
	10uH~1mH	3% ± 5	0.5% ± 5	0.5% ± 5	1.5% ± 5
	1uH~10uH	---	3% ± 5	3% ± 5	4% ± 5
Resistance	100KΩ ~ 10MΩ	5% ± 5	3% ± 5	---	---
	1 kΩ ~1 00KΩ	0.4% ± 5	0.3% ± 5	0.3% ± 5	0.5% ± 5
	1Ω~1 KΩ	1.5% ± 5	0.3% ± 5	0.3% ± 5	0.5% ± 5
	0.01 Ω to 1Ω	4% ± 5	3% ± 5	3% ± 5	5% ± 5

Bridge symbol Description			
Symbol	**Description**	**Symbol**	**Description**
R	Resistance	LEVEL	Voltage Level
C	Capacitance	SPEED	Measurement Speed
L	Inductance	AUTO	Auto mode
Z	Impedance	SETUP	Setup Mode
X	Reactive	HOLD	Hold Function
D	Wear and tear	BATT	Battery Internal Resistance
Q	Factor of quality	REC	Record Mode
Theta.	Phase Angle	TOL	Tolerance Mode
ESR	Equivalent resistance	REL	Relative Value
S	Tandem equivalent	Hpot	Voltage Sampling High End
P	Parallel equivalent	Hcur	Current Sampling High End
ECAP	Electrolytic capacitor	Lpot	Voltage Sampling Low End
FREQ	Frequency	Lcur	Current Sampling Low End