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UNI-TREND TECHNOLOGY (CHINA)CO.,LTD.
ISO9001

UT611

Operating Manual

LCR Meter

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REV.1

UT611 OPERATING MANUAL

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I. Common feature and safety instruction

Uni-trend UT611 LCR digital electric bridge supports intelligent detection and measurement, and provides series-parallel measurement modes: dual LCD display 6000/6000, quality factor, dissipation factor and phase angle. It also features four different measurement frequency 100Hz /120Hz/1kHz/10kHz, 15mA working current with low power consumption, 9V power, external dimensions: 224mm×172mm×59mm.

Measurement range and accuracy:

L: 600uH～200H Maximum accuracy (0.4%+2 words);
C: 600pF～10mf Maximum accuracy (0.4%+2 words);
R: 60Ω～20MΩ Maximum accuracy (0.4%+2 words);

* Note: when D>0.1, should be multiplied
Capacitance and impedance conversion formula: $Z_C=1/2\pi fC$
Induction and impedance conversion formula: $Z_L=2\pi fL$

To ensure the safety application of instrument, comply with following fix instructions:

1). The instrument will not be used in an explosive or flammable atmosphere as well as in an environment with dustiness, direct sunlight and high radiation.
2). Do not open the rear cover! Maintenance, component replacement and instrument calibration shall be performed by professionals, or contact relevant distributor and company for after-sale service.

3). Do not disassemble or modify the instrument since unauthorized modification may cause permanent damage to the instrument.
4). Prior to measuring circuit component, be sure circuit is powered off and all capacitance has been completely discharged.
5). It is forbidden to input voltage at the measurement port, electrical component like the capacitor prior to measurement should be completely discharged.
6). Powered by 9V battery.

II. Environmental condition

1). Altitude <2000m
2). Storage humidity ≤ 75% RH
3). Work environment 0℃～40 ℃
4) Storage environment －20℃～+50 ℃

III. Functional properties:

1). Main display 6000 counts, slave display 6000 counts.
2) Measuring frequency: 100Hz/120Hz/1KHz/10KHz Measuring voltage: 0.6Vrms
3). Output impedance: 120Ω
4). LCR automatic identification/manual measurement
5). DCR DC resistance measurement
6). Open-circuit/short-circuit
7). Auto power-off
8). Relative measurement and comparison feature

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IV. Description of impedance parameter

Based on the different measurement signal, impedance measurement instrument can be served for DC and AC impedance. Multimeter is usually designed to measure DC impedance while digital electric bridge can be served for measuring both DC and AC impedance. UT611 is an intelligent dual display handheld LCR digital electric bridge, featuring DC and AC impedance measurement function. Impedance is a fundamental parameter for electronic component and electrical circuit. In DC circuit, the resistance of linear two-port device is defined by Ohm's law, while in AC circuit, the ratio of voltage to current is a complex number. An impedance vector is composed of the real part (resistance R) and imaginary part (reactance X). Impedance is represented by R+jX in rectangular coordinate system, or by range |Z| and phase angle θ in polar coordinate system, with mutual relation as shown in (Figure 1-1):

$Rs = |Zs| \cos\theta$
$Xs = |Zs| \sin\theta$
$Xs/Rs = \tan\theta$
$\theta = \tan^{-1}(Xs/Rs)$

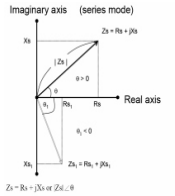


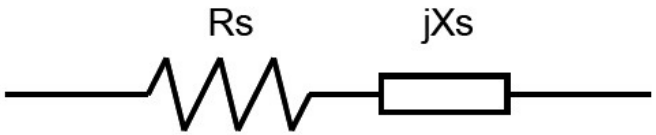
Figure 1

When θ >0, inductance reactance; when θ <0, capacitive reactance.

V. Measurement mode

Under series or parallel mode, impedance can be measured. Under series mode, impedance Z can be deemed as the mutual access to Y, defined by Y= G+ JB, where G means conductance, B means admittance.

❖Impedance in series mode



$$Z = Rs + jXs$$

Rs: Series connection mode of resistors
Xs: Series reactance mode
Cs: Series connection mode of capacitance
Ls: Series connection mode of inductance

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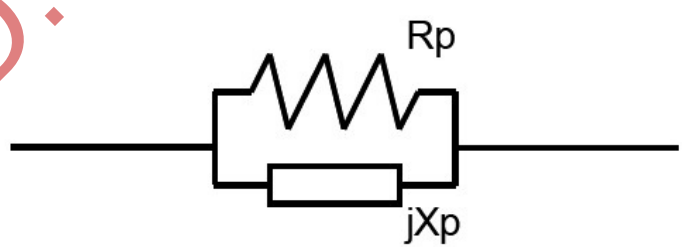
❖Admittance parallel connection mode



$$Y = 1/Z = 1/Rp + 1/jXp = G + jB$$

Rp: Parallel connection mode of resistors
Xp：Reactance in parallel connection mode
Cp：Capacitance in parallel connection mode
Lp: Inductance in parallel connection mode

VI. Description of LCD display (Figure 2)

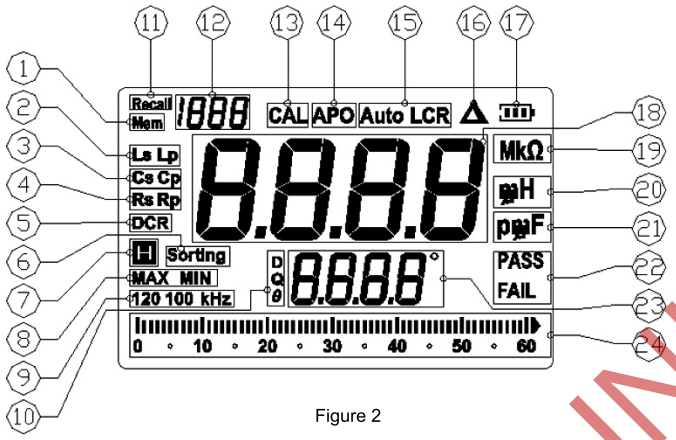


Figure 2

Description of major LCD display:

(1) MEM: data storage indicator;
(2) LS, LP: selection of inductance measurement mode: LS: inductance in series connection measurement mode, LP: inductance in parallel connection measurement mode
(3). S, CP: selection of capacitance measurement mode: CS: capacitance in series connection measurement mode, CP: capacitance in parallel connection measurement mode
(4) RS, RP: selection of resistance measurement mode: CS: resistance in series connection measurement mode, CP: resistance in parallel connection measurement mode
(5) DCR: DCR: Resistance under DC measurement mode
(6) SORTING: comparison function mode
(7) H: data hold
(8) MAX, MIN: upper and lower limitation for comparative model, MAX: the upper limit of comparison value, MIN: the lower limit of comparison value.
(9) Frequency: indicating the measured frequency, 1 0 0 HZ-> 120HZ->1KHZ->10KHZ will respectively display.
(10) D, Q, θ : Represented by the secondary parameter
(11). RECALL: recall stored data
(12) Number of stored data: displayed from 001 to 1000
(13). CAL: open circuit/short circuit correction indicator

(14) APO: Auto power-off indicator
(15). AUTO LCR: auto recognition mode
(16) Relative value identifier
(17) Battery capacity indicator
(18) Main parameter value display
(19) Resistance unit
(20) Inductance unit
(21) Capacitance unit
(22) PASS, FAIL: comparative result indicator, PASS: measured value within the range of upper and lower limitation; FAIL: measured value beyond the range of upper and lower limitation.
(23) Secondary parameter display
(24) Simulation bar

VII. Function description of UT611 front panel button (Figure 3)

Short press <1S(S: means second), long press >2S(S: means second), refers to the duration of press.
(1) STORE/RECALL: data storage and recall, STORT: short press, RECALL: long press
(2) Backlight key (long press)
(3) Frequency selection press (short press)
(4) On/off key
(5) Secondary parameter selection function
(6) LCD display area
(7) ENTER/CLEAN: Confirm (short press)/clear the stored value (long press).
(8) SETUP: upper and lower limit value setting key (long press)
(9) SORTING: comparative measurement mode (short press)
(10) CAL: open circuit/short circuit correction key (long press)
(11) FUNC: To toggle between LCR->L->C->R->DCR-> LCR main parameters
(12) HOLD: data hold key
(13) SER/PAL: serial/parallel connection conversion key
(14) REL: relative value.

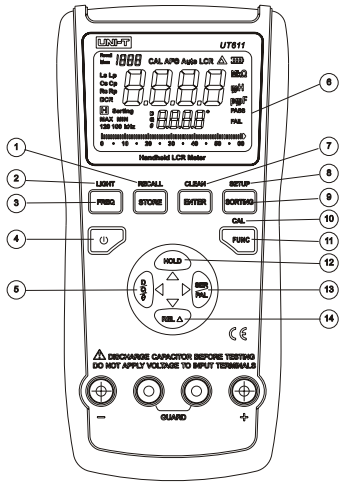


Figure 3

VIII. Operating instruction

1) Auto measurement

When instrument is started, it will enter the default status, automatic recognition mode, namely AUTO LCR, default frequency 1K. Under auto mode, instrument will automatically recognize the impedance characteristic of measured object, select the main and secondary parameters of L, C or R as well as its proper serial & parallel connection mode.

Correspondence between major and secondary parameter under auto mode:

Capacitance C dissipation factor D
Inductance L quality factor Q
Resistance R phase angle θ

Under auto measurement mode, the selection of serial and parallel connection should depend on the amount of impedance of measured object. When impedance is quite high (>10KΩ), select parallel connection mode; when impedance is quite low (<10KΩ), select serial connection mode.

2. Data hold

Press “HOLD” to start data hold, LCD displays data hold symbol “H”, repress the “HOLD” to quit and return to normal measurement mode.

3. Measure parameter under L/C/R mode

Select corresponding parameters under manual L/C/R mode

1). Selection of main parameter: default parameter will be AUTO LCR when instrument is started, by pressing “FUNC” key, the selected parameter will successively be:“AUTO LCR”AUTO L “AUTO C” AUTO R?DCR “AUTO LCR”.

2). Selection of secondary parameter: switch serial/parallel connection mode by pressing “SER/PAL” key under the main parameter measurement mode. Press “D/Q/ERS” key to select secondary parameter “D”, “Q” and “ESR” (Note: when selecting serial connection measurement, the mode is “ESR” while selecting parallel measurement, the mode will be “EPR”. Under “AUTO R” or “AUTO DCR” mode, secondary parameter is set to be neglected.

Note:

1. When measuring capacitance under “AUTO LCR” mode, in case of capacitance value is <5pF, secondary parameter is designed to substitute D dissipation factor with equivalent parallel resistance representative.
2. When performing “AUTO R” or “AUTO DCR” measurement under “AUTO LCR” mode, some secondary parameters will not be displayed on LCD.

4. Measure frequency

Ut611 provides four frequency test points: 100Hz/120Hz/1KHz /10KHz

The default frequency is 1K, it is able to select different frequency point for measurement by pressing “FREQ”, and “1KHz→10KHz→100Hz→120Hz→1KHz” will be displayed in circulation.

Note:

under “AUTO DCR” mode, DC impedance is measured while frequency measurement is neglected.

5. Comparative value measurement mode

Comparative value measurement mode is designed to rapidly sort the component with main parameter within a certain range. After pressing “FUNC” to enter manual mode, select the proper mode: “AUTO L”, “AUTO C”, “AUTO R” or “AUTO DCR”. Be sure testing terminal is connected to the component being measured. Press “SORTING” to enter “sorting mode”, LCD will display “Sorting”. Main display shows “PASS” while slave display shows the principal value of measured component and inputs nominal value. When the measured component is defined within the limit range, main display shows “PASS” and slave display shows its principal value, accompanied by a sound of buzzing; when exceeding the range, main display shows “FALL” and slave display shows its principal value

1) Set comparison range

With a long press on “Sorting”, start setting the upper and lower limit. When setting the maximum value, it will display MAX (default maximum value 5999), press “▼” to show values in descending order while values will be displayed in ascending order when pressing “▲”. Flashing position of main parameter will shift right when pressing “▶” and shift left when

pressing “▶”, value will be regulated accordingly. After setting the maximum value, press “Sorting” to proceed with the setting of lower limit, with the same method as maximum value setting. Be sure it is correctly set, press “ENTER” to quit.

Note: it is not necessary to input the point when setting the upper and lower limit value as the point will be automatically added according to the range of value.

2) Enter comparative mode

Press “Sorting” to enter comparative measurement mode. When measured value is between the rated maximum value and minimum value, the display will show PASS, or otherwise FAIL. Press “Sorting” again to quit the mode and back to normal measurement mode.

6. Calibration function

The calibration function, including short-circuit calibration and open circuit calibration, can effectively reduce the distributed parameter interference caused by testing line. Short-circuit calibration can reduce the impact on low impedance component measurement caused by contact resistance and testing line; open circuit calibration can reduce the the impact on high impedance component measurement caused by the distributed capacitance and resistance of testing line.

1) Enter calibration function (with insert picture)

After powering on the meter, long press “FUNCTION”button to access open-circuit calibration, ″OPEn″icon shows on the second display(See Figure 4), then press“ENTER”to start, progress bar and CAL icon blink simultaneously on the LCD. When open-circuit calibration finishes, ″PASS″ icon appears and the meter is ready to enter into short-circuit calibration（See Figure 5）.

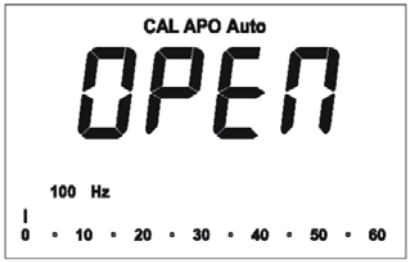


Figure 4

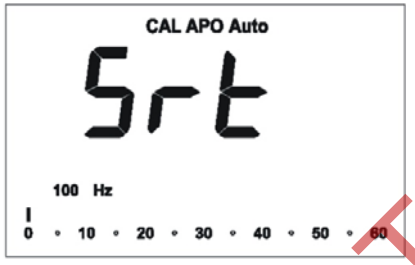


Figure 5

Then plug short-circuit device into test terminals, press "ENTER"button to start the calibration, LCD shows blinking progress bar and CAL icon. When PASS icon shows, short-circuit calibration finishes and the meter automatically returns to normal measuring mode. If the progress bar does not work, please check if short-circuit device is inserted into test terminals to ensure the circuit is shorted and begin the calibration again.

7. Backlight

After a long press on "LIGHT", LCD backlight will be illuminated and then automatically turned off after 60s; when backlight is on, it is able to turn off with a long press on "LIGHT".

8. Data storage and recall

The current displayed value will be saved after pressing "STORTE", saving one value after pressing once, and the stored number will automatically increase in sequence. When need to recall the data, it is able to check the value stored in the machine with a long press on "STORTE". Value will reduce when pressing " ◀ " and increase gradually when pressing " ▶".

IX. Instruction for rapid application

1. Selection of serial/parallel connection mode

More accurate measured data can be achieved by selecting the proper equivalent mode. Generally, serial connection equivalent mode should be selected when measuring low impedance component (lower then 10Ω), while parallel connection equivalent mode should be selected when measuring high impedance component (higher then 10kΩ). Serial/parallel connection mode may have little impact on the measured result when impedance is between above two values.

2. Inductance measurement

1) Press “POWER” to start up instrument.
2) Press “FUNC”, LCD will display “Lp”, select inductance measurement gear.
3) Connect inductance to the testing terminal or connect the corresponding accessory to the measured inductance (As shown in Figure 6).
4) Press “FERQ” to select proper testing frequency.
5) Press “D/Q/ θ ” to select the secondary parameter to be measured.

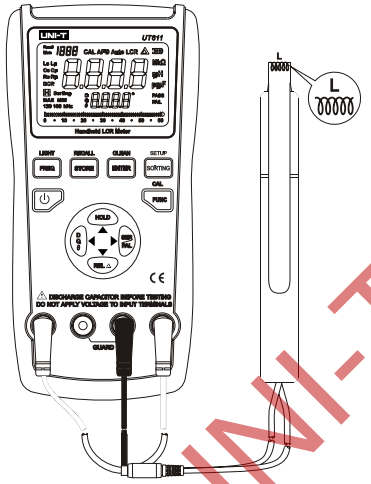


Figure 6

3. Capacitance measurement

Warning! Capacitance must be completely discharged prior to measurement.
1) Press “POWER” to start up instrument.
2) Press “FUNC”, LCD will display “Cp”, select capacitance measurement gear.
3) Connect capacitance to the testing terminal or connect the corresponding accessory to the measured capacitance (As shown in Figure 7).
4) Press “FERQ” to select proper testing frequency.
5) Press “ D/Q/ θ ”

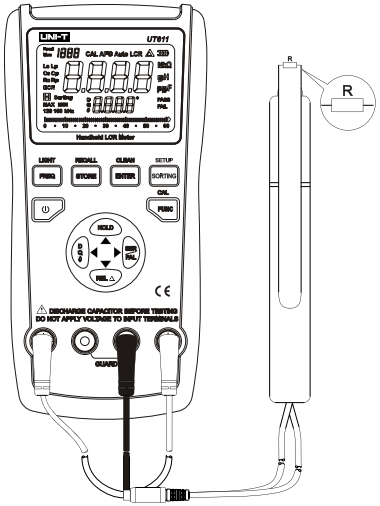


Figure 7

4. Resistance measurement

1) Press “POWER” to start up instrument.
2) Press “FUNC”, LCD will display “Rp”, select resistance measurement gear.
3) Connect resistance to the testing terminal or connect the corresponding accessory to the measured capacitance (As shown in Figure 8).
4) Press “D/Q/ θ ”

Note: secondary parameter will be neglected and not be displayed by LCD when measuring resistance.

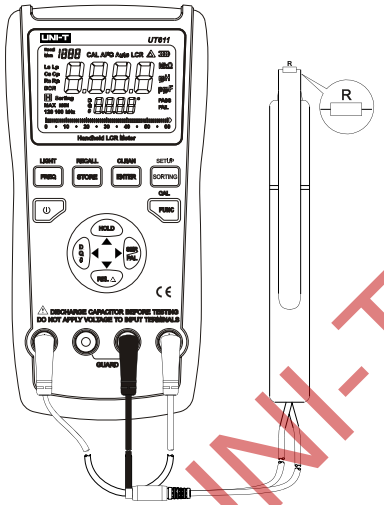


Figure 8

5. DC impedance measurement

1) Press “POWER” to start up instrument.
2) Press “FUNC”, LCD will display “DCR”, select DC impedance measurement gear.
3) Connect resistance to the testing terminal or connect the corresponding accessory to the measured resistance (As shown in Figure 9).

Note: Frequency and secondary parameter will be neglected and the secondary parameter will not be displayed by LCD when measuring DC resistance.

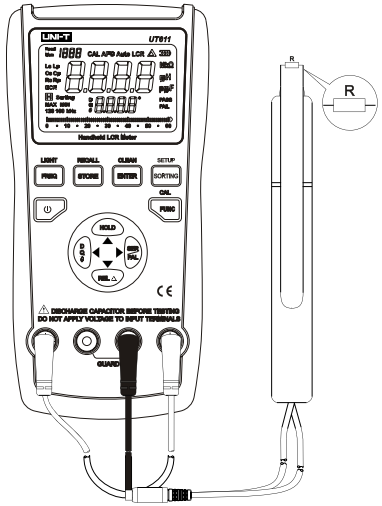


Figure 9

XI. Technical indicator

Precautions:

1). Testing environment temperature: 23℃±5℃, humidity: ≤75% R.H.
2). Preheat 10min prior to testing.
3). Carry out testing at the terminal slot.
4). Carry out open circuit/short circuit calibration prior to testing.
5). L, C, R functions are all for tests on passive (fixed) components

1. Inductance Specifications

Function	Frequency	Equivalent Mode	Range	Input	Accuracy	Minimum resolution
Inductance	100Hz /120Hz	LS	60.00mH	10.00mH	±2.0%+5d	0.01mH
			600.0mH	100.0mH	±1.0%+5d	0.1mH
			6.000H	1.000H	±1.0%+5d	0.001H
			60.00H	10.00H	±1.0%+5d	0.01H
			200.0H	100.0H	±1.5%+5d	0.1H
	1KHz	LS	6.000mH	1.000mH	±1.5%+5d	0.001mH
			60.00mH	10.00mH	±0.7%+5d	0.01mH
			600.0mH	100.0mH	±0.4%+2d	0.1mH
			6.000H	1.000H	±1.0%+5d	0.001H
			60.000H	10.00H	±1.5%+5d	0.01H
	10KHz	LS	600.00uH	100.00uH	±0.7%+5d	0.01uH
		LP	6.000mH	1.000mH	±0.7%+5d	0.001mH
			60.00mH	10.00mH	±1.0%+5d	0.01mH
			600.0mH	100.0mH	±1.0%+5d	0.1mH

Note：Fixed inductance input.

2. Capacitance Specifications

Function	Frequency	Equivalent Mode	Range	Input	Accuracy	Minimum resolution
Capacitance	100Hz /120Hz	CS/CP	60.00nF	19.00nF	±2.0%+5d	0.01nF
		CS/CP	600.0nF	190.0nF	±0.4%+2d	0.1nF
		CS/CP	6.000uF	1.90uF	±0.7%+3d	0.001uF
		CS/CP	60.00uF	10.00uF	±1.0%+5d	0.01uF
		CS/CP	600.0uF	100.0uF	±1.0%+5d	0.1uF
		CS	10.00mF	1.800mF	±1.5%+5d	0.001mF
	1KHz	CS/CP	6.000nF	1.000nF	±1.0%+5d	0.001nF
		CS/CP	60.00nF	19.00nF	±0.4%+2d	0.01nF
		CS/CP	600.0nF	190.0nF	±0.4%+2d	0.1nF
		CS/CP	6.000uF	1.90uF	±0.7%+3d	0.001uF
		CS/CP	60.00uF	10.00uF	±0.7%+3d	0.01uF
		CS	600.0uF	100.0uF	±1.0%+5d	0.1uF
	10KHz	CS/CP	600pF	300.0pF	±3%+5d	0.1pF
		CS/CP	6nF	1.000nF	±1.0%+5d	0.001nF
		CS/CP	60nF	19.00nF	±1.0%+5d	0.01nF
		CS/CP	600nF	190.0nF	±1.5%+5d	0.1nF
		CS/CP	6.000uF	1.000uF	±2.0%+5d	0.001uF

Note:
1. Fixed capacitance input.
2. 600pF range is for reference only.

3. Resistance Specifications

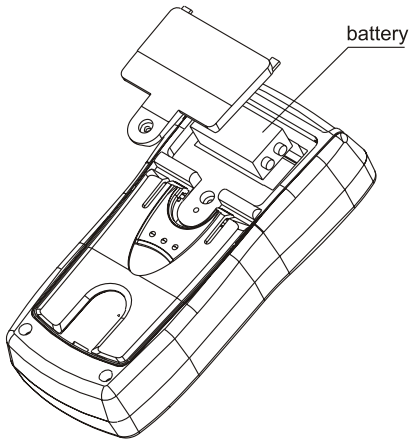
Function	Frequency	Equivalent Mode	Range	Input	Accuracy	Minimum resolution
Resistance	100Hz /120Hz	RS/RP	60.00Ω	19.00Ω	±0.5%+5d	0.01Ω
		RS/RP	600.0Ω	190.0Ω	±0.4%+2d	0.1Ω
		RS/RP	6.000kΩ	1.900kΩ	±0.4%+2d	0.001KΩ
		RS/RP	60.00kΩ	19.00kΩ	±0.4%+2d	0.01KΩ
		RS/RP	600.0kΩ	190.0kΩ	±0.7%+3d	0.1kΩ
		RS/RP	6.000MΩ	1.900MΩ	±1.5%+3d	0.001MΩ
		RP	20.00MΩ	19.00MΩ	±2.0%+5d	0.01MΩ
	1KHz	RS/RP	60.00Ω	19.00Ω	±0.4%+2d	0.01Ω
		RS/RP	600.0Ω	190.0Ω	±0.4%+2d	0.1Ω
		RS/RP	6.000kΩ	1.900kΩ	±0.4%+2d	0.001KΩ
		RS/RP	60.00kΩ	19.00kΩ	±0.4%+2d	0.01KΩ
		RS/RP	600.0kΩ	190.0kΩ	±0.7%+3d	0.1kΩ
		RS/RP	6.000MΩ	1.900MΩ	±1.5%+5d	0.001MΩ
		RP	20.00MΩ	19.00MΩ	±2.0%+5d	0.01MΩ
	10KHz	RS/RP	60.00Ω	19.00Ω	±0.4%+2d	0.01Ω
		RS/RP	600.0Ω	190.0Ω	±0.4%+2d	0.1Ω
		RS/RP	6.000kΩ	1.900kΩ	±0.4%+2d	0.001KΩ
		RS/RP	60.00kΩ	19.00kΩ	±0.4%+2d	0.01KΩ
		RS/RP	600.0kΩ	190.0kΩ	±0.7%+3d	0.1kΩ
		RS/RP	6.000MΩ	1.900MΩ	±3%+3d	0.001MΩ
	DCR		600.0Ω	190.0Ω	±1.0%+5d	0.1Ω
			6.000kΩ	1.900kΩ	±0.4%+2d	0.001kΩ
			60.00kΩ	19.00kΩ	±0.4%+2d	0.01kΩ
			600.0kΩ	190.0kΩ	±0.4%+2d	0.1kΩ
			6.000MΩ	1.900MΩ	±1.5%+5d	0.001MΩ
			20.00MΩ	19.00MΩ	±1.5%+5d	0.01MΩ

Note: 100HZ, 120HZ, 1KHZ, 10KHZ fixed resistances input

XII. Replacement of battery

Warning

When display shows "▭", replace the used battery timely with 9V alkaline battery to prevent affect on measuring precision.



XIII. Maintenance and upkeep

1) Cleaning
Prior to cleaning, power off, remove battery and external power supply. Wipe the dirt with soft and clean cloth with detergent and keep detergent out of the exterior of machine. After cleaning, machine body should be completed dried prior to use.

2) Damp proof
Use machine in a dry place, and restore the machine not in use in the dry place. In case of any water infiltration in the machine body, shut down the instrument and take out battery immediately. Machine shall not be disassembled without authorization, and should be delivered to relevant distributor or company for after-sale service detection.

3) Maintenance
In case instrument fails to be started due to fault, inspect battery, external power source and its power input socket; check if there is “POWER” failure.
In case of any abnormal measured result, check testing line and the contact between the spring plate inside testing terminal and component pin. Confirm proper operation and application. Please do not arbitrarily dismantle machine, replace component or modify circuit. When the maintenance is unable to be confirmed, contact relevant distributor or company for after-sale service detection.

The manual information is subject to changes without prior notice.

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