LCR Multimeter with USB

Model No. 72-10465

When using electrical appliances, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons or property.

Read all instructions before using the appliance and retain for future reference.

- Check the product before use for any damage. Should you notice any damage on the test leads or casing, do not use.
- This product contains no user-serviceable parts. All repairs should only be carried out by a qualified engineer. Improper repairs may place the user at risk of harm.
- Do not apply any input voltage to the meter.
- Turn off power and discharge any capacitors before connecting the meter to circuits or components to be tested.
- Do not make adjustments to the setting while connected to the circuit under test.
- Children should be supervised to ensure that they do not play with the product.
- Do not use the product for any purpose other than that for which it is designed.
- Do not operate the product around explosive gas, vapour, or dust.
- Do not operate or store in an environment of high humidity or where moisture may enter the product as this can reduce insulation and lead to electric shock.
- Turn the meter off when not in use to save the battery.
- Remove the battery if the meter is not to be used for long periods.
- Replace the battery as soon as the low battery warning appears on the display.

PRODUCT OVERVIEW

Main Features

- The meter is a 19,999 digit display, plus secondary display of 1,999.
- Measurement frequency 100Hz/120Hz/1kHz/10kHz/100kHz.
- Measurement voltage 0.6Vrms.
- Output impedance 120Ω
- Measurement of DCR DC resistance.
- Calibration compensation of open circuit/short circuit
- Automatic shutdown after 5 minutes of inactivity.
- Relative mode and tolerance sorting.
- USB power communication with PC for data acquisition and analysis.

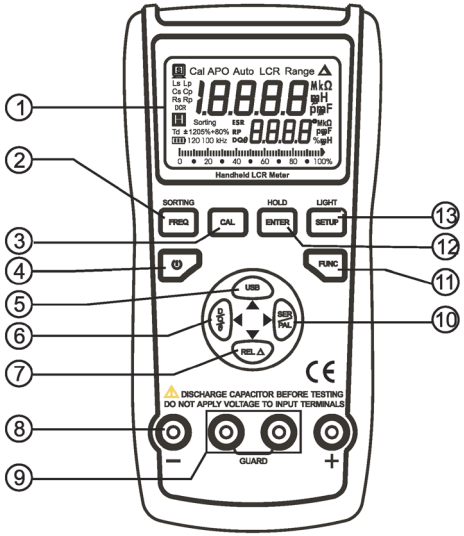
WHAT'S INCLUDED

- LCR meter with battery.
- Instruction manual.
- SMD test clamp.
- USB interface lead.
- PC software CD.
- Multi-purpose socket.
- Short circuit splice.

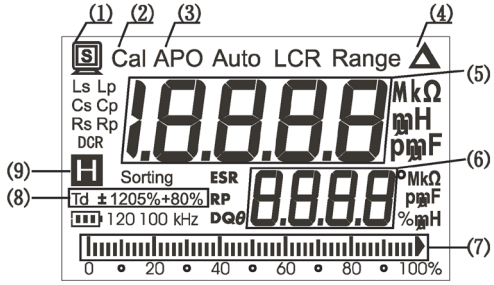
ELECTRICAL SYMBOLS GUIDE

	Low battery		Relative		PC Communication
	Resistor		Diode		Capacitance

CONTROLS AND CONNECTIONS



1. LCD Display
2. Frequency key/sort button
3. Calibration button
4. Power button
5. USB function button
6. Auxiliary function parameter button
7. Relative measurement button
8. Input connection
9. Shield ground terminals
10. Series/parallel button
11. Function button for inductance, capacitance or resistance
12. Hold/Enter button
13. Backlight/Setup button



1. LCD Display
2. Calibration of open/short circuit
3. Auto power off
4. Relative measurement
5. Main readout display
6. Auxiliary readout
7. Analogue bar graph
8. Sieving tolerance mode
9. Data Hold mode

FUNCTIONS

Automatic measurement

- Default status is set to automatic identification mode (AUTO LCR) on powering up.
- Default frequency is 1K - the meter will identify impedance characteristics automatically. It will also select the main parameter L,C or R and either serial or parallel modes.

Data Retention

- Press HOLD during measurement to lock the current displayed figure. Press HOLD again to return to normal measurement.

Manual L/C/R mode selection

- Press “FUNC” key repeatedly to select parameters of “AUTO, LCR-+AUTO, L-+AUTO, C-+AUTO, R-+DCR-+AUTO LCR”
- Press SERIES/PAR button to switch between series and parallel modes.
- Press D/Q/Θ to select auxiliary parameters of D, Q or ESR.

Note: Select serial mode for ESR and parallel for RP modes. In AUTO mode these auxiliary parameters can be ignored as they are automatically set.

Measurement Frequency

- The meter can provide 5 frequency testing points, namely, 100Hz/120Hz/1kHz/ 10kHz/100kHz. On powering on the default frequency is 1K.
- Press FREQ button to select different frequency points for measurement.

Note: DC impedance is measured under AUTO OCR mode and measurement frequency is automatically set.

Deviation ratio measurement

- Deviation measurement is used to compare with deviation the ratio of 2 elements.
- The main LCD display can be typed in automatically as the nominal value.
- Percentage display scope: -99.9%~99.9%.
- Display percentage: REL%=(D_{CUR} D_{REF}) / D_{REF} x 100%.
- DCUR: Main parameter of measured elements.
- DREF: Typed nominal value.
- Auxiliary display is OL% and the main display is the main parameter of measured elements if $D_{CUR} > D_{REF}$ or $2D_{CUR} < D_{REF}$.
- To select deviation measurement press FUNC button to select required mode AUTO L, AUTO C, AUTO R or AUTO DCR.
- Connect the test leads have been connected to the measured element and press REL to enter deviation proportion measurement mode. Δ displays on the LCD.
- The main display will show the main parameter of the measured element and the auxiliary display shows the deviation as a percentage.
- Press and hold REL button to exit deviation measurement.

Sorting Measurement

- Sorting mode is used to quickly sort elements of which the main parameter is within a certain scope.
- The sorting range can be set to ±0.25%, ±0.5%, ±1%, ±2%, ±5%, ±10%, ±20%, and +80%~-20%. Default is set to ±1%.
- Press SETUP button, RANGE displays on the LCD.
- Press ENTER to confirm then use ▼ or ▲ to decrease or increase the sort value or press ► or ◄ for to adjust the value of the main parameter.
- Press ENTER to confirm the sieving mode value settings.
- Press FUNC button to select required mode AUTO L, AUTO C, AUTO R or AUTO DCR.
- Connect the test leads have been connected to the measured element and press FREQ to enter sieving mode.
- The main display will show PASS and the auxiliary display shows the main value of measured elements if within the typed nominal value and the buzzer sounds.
- The main display will show FAIL and the auxiliary display shows the main value of measured elements if outside the typed nominal value.

Calibration function

- This can be used to reduce interference of distribution parameters introduced by the test leads. Calibration includes both short and open circuit.
- Short circuit calibration reduces the influence of the test leads and contact resistance when measuring low impedance elements.
- Open circuit calibration reduces the influence of the capacitance and distributed resistance when testing high impedance elements.
- Press and hold CAL button to enter open circuit calibration and the display shows OPEN. Press CAL again and the screen shows a countdown from 30 to 0 after which it displays PASS.

- Press CAL again and SRI is displayed in the auxiliary display.
- Insert a short circuit splice into the testing terminals and then press CAL again to begin calibration.
- A countdown from 30 to 0 starts then PR55 is displayed when short circuit calibration is complete.
- If the display shows FRIL the calibration has failed. Check that the short circuit splice is not fitted while performing an open circuit calibration and that it is connected correctly for a short circuit calibration.
- Press CAL again to exit and return to measurement mode.
- Remove the splice before continuing.

Backlight

- Press and hold the LIGHT button to switch on the LCD back light. This function will automatically cease after 60 seconds.

PC Communication Protocol

- Start PC communication function to connect instrument and computer by USB wire for data acquisition. Communication parameters:
  Bit rate: 9600
  Data bit: 8
  Start bit: 1
  Stop bit: 1
  Inspection: Without

PC Communication mode

- Press PC button to enter USB connection mode. The symbol is displayed on the LCD.
- Connect the USB lead between the meter and the computer and run the software program on the computer to start data transmission.
- Press PC button again to end transmission and disconnect the USB lead.

Note: Installation and operation guide for the PC interface are on the CD-ROM included.

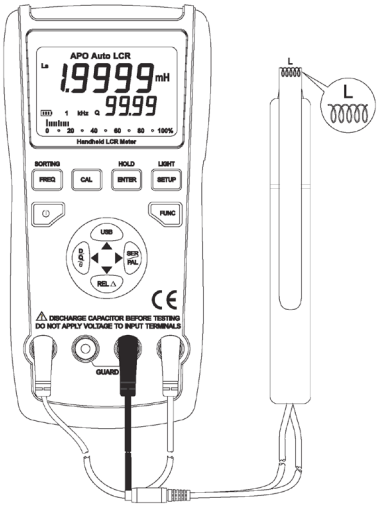
OPERATION

Serial or Parallel Mode

- It is suggested to use serial mode for low impedance elements less than 100Ω and parallel mode for high impedance elements more than 10kΩ.
- The mode used can improve accuracy of measurement in certain circumstances but in most cases has little influence on the measurement results.

Inductance Measurement

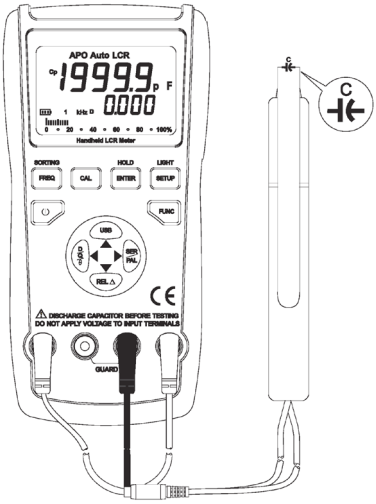
- Press the POWER button to turn on the meter.
- Press FUNC so Lp is displayed on the LCD.
- Insert the inductance element into the test port or measure using the test leads and clamp.
- Press FREQ to select suitable testing frequency.
- Press D/Q/Θ to select the auxiliary parameter to measure.



Capacitance Measurement

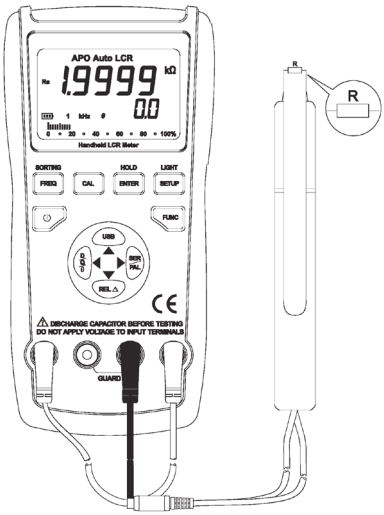
- Press the POWER button to turn on the meter.
- Press FUNC so Cp is displayed on the LCD.
- Insert the capacitance element into the test port or measure using the test leads and clamp.
- Press FREQ to select suitable testing frequency.
- Press D/Q/Θ to select the auxiliary parameter to measure.

Note: capacitors must be fully discharged before measuring.



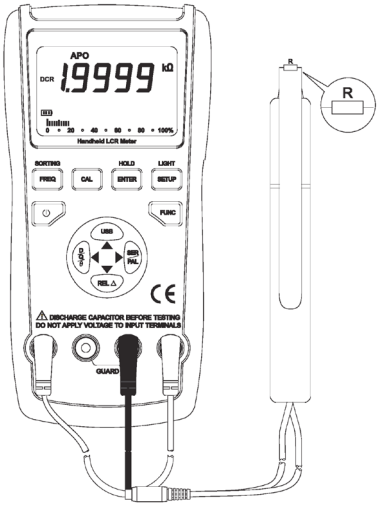
Resistance Measurement

- Press the POWER button to turn on the meter.
- Press FUNC so Rp is displayed on the LCD.
- Insert the resistance element into the test port or measure using the test leads and clamp.
- Press FREQ to select suitable testing frequency.
- Auxiliary parameter are not applicable in this mode and will not display a figure on the LCD.



DC Impedance Measurement

- Press the POWER button to turn on the meter.
- Press FUNC so OCR is displayed on the LCD.
- Insert the resistance element into the test port or measure using the test leads and clamp.
- Auxiliary parameter and measurement frequency are not applicable in this mode and will not display a figure on the LCD.



SPECIFICATION

Function	Measurement mode	Frequency	Range	Min Resolution	Precision
Inductance Gear	Rs / Rp	100Hz / 120Hz	20.000mH	1uH	1.0%+5
			200.00mH	001mH	0.5%+5
			2000.0mH	0.1mH	0.5%+5
			20.000H	1mH	0.5%+5
			200.00mH	0.01H	1.0%+5
			2000.0H	0.1H	1.0%+5
			20.000kH	0.001kH	2.0%+5
		1kHz	2000.0uH	0.1uH	1.0%+5
			20.000mH	1uH	0.5%+5
			200.00mH	0.01mH	0.5%+5
			2000.0mH	0.1mH	1.0%+5
			20.000H	1mH	1.0%+5
			200.00H	0.01H	2.0%+5
			2000.0H	0.1H	5.0%+5
		10kHz	200.00uH	0.01uH	1.0%+5
			2000.00uH	0.1uH	0.5%+5
			20.000mH	1uH	0.5%+5
			200.0mH	0.01mH	1.5%+5
			2000.0mH	0.1mH	2.0%+5
			20.000H	1mH	5.0%+5
		100kHz	20.00uH	0.001uH	1.0%+5
			200.00uH	0.01uH	2.0%+5
			2000.0uH	0.01uH	2.0%+5
			20.000mH	1uH	2.0%+5
			200.00mH	0.01mH	5.0%+5
Capacitance Gear	Cs / Cp	100Hz / 120Hz	20.000nF	1pF	2.0%+5
			200.00nF	0.01nF	0.5%+5
			2000.0nF	0.1nF	0.5%+5
			20.000uF	1nF	0.5%+5
			200.00uF	0.01uF	1.0%+5
			2000.0uF	0.1uF	2.0%+5
			20.000mF	0.01mF	2.0%+5
		1kHz	2000.0pF	0.01pF	1.0%+5
			20.000nF	0.1pF	1.0%+5
			200.00nF	0.01nF	0.5%+5

Capacitance Gear	Cs / Cp	1kHz	2000.0nF	0.1nF	0.5%+5
			20.000uF	1nF	0.5%+5
			200.00uF	0.01uF	1.0%+5
			2000uF	1uF	2.0%+5
		10kHz	200.00pF	0.01pF	2.0%+5
			2000.0pF	0.1pF	1.0%+5
			20.000nF	1pF	1.0%+5
			200.00nF	0.01nF	1.5%+5
			2000.0nF	0.1nF	2.0%+5
		100kHz	200.00pF	0.01pF	2.0%+5
			2000.0pF	0.1pF	2.0%+5
			20.000nF	1pF	2.0%+5
			200.00nF	0.01nF	5.0%+5
Resistance Gear	Rs / Rp	100Hz / 120Hz	200Ω	0.01Ω	1.0%+5
			2kΩ	0.1Ω	0.3%+5
			20kΩ	1Ω	0.3%+5
			200kΩ	0.01kΩ	0.5%+5
			2MΩ	0.1kΩ	1.0%+5
			20MΩ	1kΩ	2.0%+5
			200MΩ	0.1MΩ	2.0%+5
		1kHz	20Ω	1mΩ	1.0%+5
			200Ω	0.01Ω	1.0%+5
			2kΩ	0.1Ω	0.3%+5
			20kΩ	1Ω	0.3%+5
			200kΩ	0.01kΩ	0.5%+5
			2MΩ	0.1kΩ	1.0%+5
			20MΩ	1kΩ	2.0%+5
			200MΩ	0.1MΩ	5.0%+5
		10kHz	20Ω	1mΩ	1.0%+5
			200Ω	0.01Ω	1.0%+5
			2k0Ω	0.1Ω	0.3%+5
			20kΩ	1Ω	0.5%+5
			200kΩ	0.01kΩ	1.0%+5
		100kHz	20Ω	1mΩ	2.0%+5
			200Ω	0.01Ω	2.0%+5
			2kΩ	0.1Ω	1.0%+5
			20kΩ	1Ω	2.0%+5

Resistance Gear	DCR	200Ω	0.01Ω	1.0%+5
		2kΩ	0.1Ω	0.3%+5
		20kΩ	1Ω	0.3%+5
		200kΩ	0.01kΩ	0.3%+5
		2MΩ	0.1kΩ	0.5%+5
		20MΩ	1kΩ	11%+5
		200MΩ	0.1MΩ	21%+5

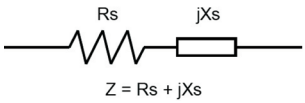
1. Precision ±(a% of reading + no of digits) (under 18°C to 28°C)

Note:

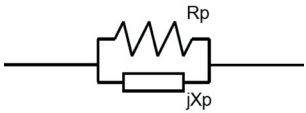
1. Testing ambient temperature: 23°C ±5°C; Humidity: =75% R.H
2. Warm up the meter for 10 minutes before performing any test.
3. The precision is evaluated if D is less than 0.1. Ae = Ae x $\sqrt{1+D^2}$ if D exceeds 0.1 (Ae=Precision)
4. Test on port slot of instruments.
5. Calibrate open circuit/short-circuit before test.
6. The actual measurement and displaying scope of the device go beyond those specified in the table, but no accuracy is specified for these.

Impedance Parameters

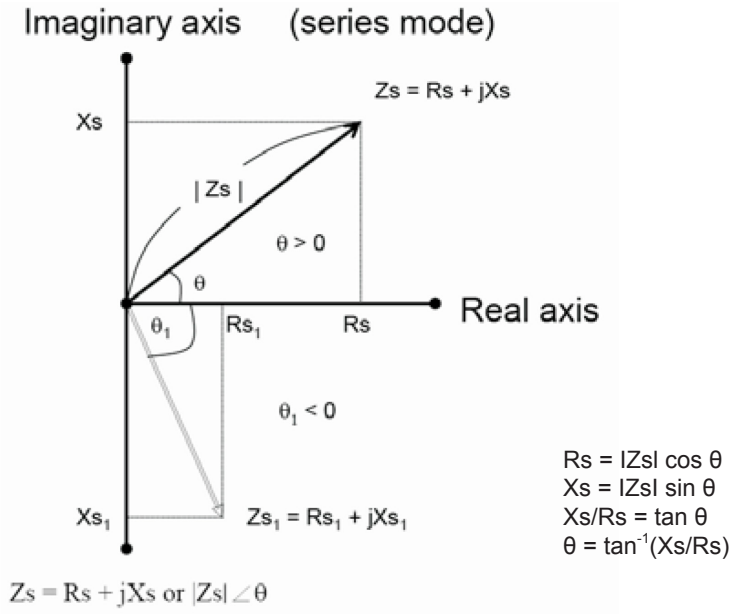
- Impedance measurement instruments can be classified as DC impedance and AC impedance types. A general multimeter can be used to measure DC impedance, while a bridging instrument (such as this) can be used to measure AC or DC impedance.
- The 72-10465 is an intelligent double-display portable LCR digital electric bridge, with DC & AC impedance measurement functions. Impedance is one of the most fundamental parameters to analyze electronic elements and circuits. The resistance of linear diode is defined by Ohm's Law as part of a DC power scenario. Ratio of voltage and current is a complex impedance as part of an AC power scenario. One impedance vector includes one real part (resistance R) and one imaginary part (reactance X). Impedance is expressed by R+jX in a rectangular coordinate, or expressed by the amplitude of real Z and phase angle of 0 in a polar coordinate system.



Impedance under serial link mode



Admittance parallel mode



Reaction is inductive if θ exceeds 0 or reaction is capacitive if θ is less than 0.

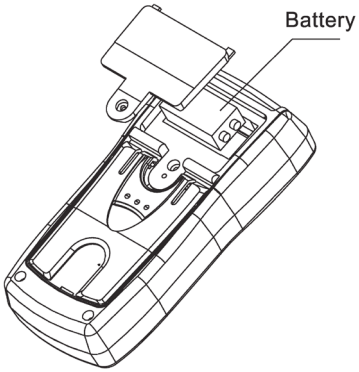
MAINTENANCE

Battery Replacement

Warning: Only replace the battery after the test leads are removed and the power is turned off.

To replace the battery,

- Remove the screw from the battery cover and separate the battery cover from the case bottom.
- Remove the battery from the battery compartment.
- Replace the battery with a new 9V battery (NEDA1604, 6F22 or 006P)
- Refit the battery cover to the case bottom, and reinstall the screw.



CLEANING

- Clean the meter with a clean, soft cloth.
- Do not use any chemicals, abrasives or solvents that could damage the meter.

INFORMATION ON WASTE DISPOSAL FOR CONSUMERS OF ELECTRICAL & ELECTRONIC EQUIPMENT.

These symbols indicate that separate collection of Waste Electrical and Electronic Equipment (WEEE) or waste batteries is required. Do not dispose of these items with general household waste. Separate for the treatment, recovery and recycling of the materials used. Waste batteries can be returned to any waste battery recycling point which are provided by most battery retailers. Contact your local authority for details of the battery and WEEE recycling schemes available in your area.

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