

LCR METER

INSTRUCTION
MANUAL

 BK PRECISION
MODEL 875A



BK PRECISION

6470 W. Cortland St. • Chicago, IL 60635

480-573-9-001C

Printed in Taiwan R.O.C.
91-25037-1B

WARRANTY INFORMATION

LIMITED ONE-YEAR WARRANTY

Maxtec International CORPORATION warrants to the original purchaser that its **B & K-Precision** product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

Maxtec will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized **B & K-Precision** service contractor or the factory service department, accompanied by proof of the purchase date in the form of a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty registration card Maxtec, **B & K-Precision**, 6470 West Cortland Street, Chicago, Illinois 60635 within fifteen (15) days from the date of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

Maxtec shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your **B & K-Precision** distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, please send the unit to **B & K-Precision** Service Department, 6470 West Cortland Street, Chicago, Illinois 60635, properly packaged to avoid damage in shipment.

B & K-Precision Test Instruments warrants products sold only in the U.S.A. and its overseas territories. In other countries, each distributor warrants the **B & K-Precision** products which it sells.

WARRANTY SERVICE INSTRUCTIONS (For U.S.A. and its Overseas Territories)

1. Refer to the MAINTENANCE section of your **B & K-Precision** instruction manual for adjustments that may be applicable.
2. If the above-mentioned does not correct the problem you are experiencing with your unit, pack it securely (preferably in the original carton or double-packed). Enclose a letter describing the problem and include your name and address. Deliver to, or ship PREPAID (UPS preferred in U.S.A.) to the nearest **B & K-Precision** authorized service agency (see list enclosed with unit).

If your list of authorized **B & K-Precision** service agencies has been misplaced, contact your distributor for the name of your nearest service agency, or write to:

B & K-Precision, Maxtec International Corp.
Factory Service Operations
6470 West Cortland Street
Chicago, Illinois 60635
Tel. (312) 889-1448

Also use this address for technical inquiries
and replacement parts orders.

SPECIFICATIONS

Specifications apply from +18°C to +28°C at relative humidity, less than 80% RH.

CAPACITANCE (Test circuit mode in parallel)

Range	Test Condition	Accuracy	Zero Reading	
200 pF	1 kHz, 100 mV	± (3% rdg + 1 dgt)	D < 0.1	
2 nF			< 5 digit	
20 nF		± (2% rdg + 1 dgt)	D < 0.5	
200 nF				≤ 3 digit
2 μF				
20 μF	120 Hz, 8.3 mV	± (3% rdg + 3 dgt)	D < 0.1	
200 μF				± (5% rdg + 3 dgt)
2 mF				

For highest accuracy, subtract the zero reading error from reading of measurement.

INDUCTANCE (Test circuit mode in series)

Range	Test Condition	Accuracy	Zero Reading
200 μH	1 kHz, 10 mA	± (3% rdg + 1 dgt)	D < 0.5
2 mH	1 kHz, 1 mA		
20 mH	1 kHz, 100 μA	± (2% rdg + 1 dgt)	≤ 10 digit
200 mH	1 kHz, 10 μA		
2 H	1 kHz, 1 μA		
20 H	120 Hz, 10 μA	± (3% rdg + 1 dgt)	
200 H	120 Hz, 1 μA		

For highest accuracy, subtract the zero reading error from reading of measurement.

RESISTANCE

Range	Accuracy	Zero Reading
20 Ω	± (2% rdg + 2 dgt)	≤ 10 digit
200 Ω		≤ 1 digit
2 kΩ	± (0.5% rdg + 1 dgt)	0
20 kΩ		
200 kΩ		
2 MΩ		
20 MΩ		

For highest accuracy, subtract the zero reading error from reading of measurement.





DISSIPATION FACTOR

$$D(L) = \frac{R_s}{2\pi f L_s} = \frac{1}{Q} \quad D(C) = \frac{1}{2\pi f C_p R_p}$$

Range	Accuracy D(L)	Range	Accuracy D(C)
200 μH	± 3% rdg ± (3 + $\frac{200}{L_s}$) dgt Q > 2	200 pF	± 3% ± (2 + $\frac{300}{C_p}$) dgt Q > 10
2 mH to 200 mH	± 2% rdg ± (3 + $\frac{200}{L_s}$) dgt Q > 2	2 nF to 2 μF	± 2% ± (2 + $\frac{300}{C_p}$) dgt Q > 2
2 H to 20 H	± 3% rdg ± (3 + $\frac{200}{L_s}$) dgt Q > 2	20 μF to 200 μF	± 3% ± (2 + $\frac{300}{C_p}$) dgt Q > 2
200 H	± 5% rdg ± (3 + $\frac{200}{L_s}$) dgt Q > 2	2000 μF	± 5% ± (2 + $\frac{300}{C_p}$) dgt Q > 10

There is a zero reading error of about 5 counts at 200 pF and 200 μH. For accurate measurement, subtract the zero reading error from reading of measurement.

TABLE A. Dissipation Factor Equations

Circuit Mode	Dissipation Factor	Conversion to Other Modes
Cp Mode 	$D = \frac{1}{2\pi f C_p R_p} (= \frac{1}{Q})$	$C_s = (1 + D^2) C_p, R_s = \frac{D^2}{1 + D^2} R_p$
Cs Mode 	$D = 2\pi f C_s R_s (= \frac{1}{Q})$	$C_p = \frac{1}{1 + D^2} C_s, R_p = \frac{1 + D^2}{D^2} R_s$
Lp Mode 	$D = \frac{2\pi f L_p}{R_p} (= \frac{1}{Q})$	$L_s = \frac{1}{1 + D^2} L_p, R_s = \frac{D^2}{1 + D^2} R_p$
Ls Mode 	$D = \frac{R_s}{2\pi f L_s} (= \frac{1}{Q})$	$L_p = (1 + D^2) L_s, R_p = \frac{1 + D^2}{D^2} R_s$

MEASUREMENT PARAMETER CONVERSION

Parameter values for a component measured in a parallel equivalent circuit and that measured in series equivalent circuit are different from each other. But the dissipation factor of a component always has the same dissipation factor at a given frequency for both parallel equivalent and series equivalent circuits. The equations in Table A show the relationship between parallel and series parameters of a component.

GENERAL SPECIFICATIONS

Display. 3-1/2 digit liquid crystal display (LCD) with a maximum reading of 1999.

Low Battery Indication. LO BAT displayed.

Sampling Rate. 2.5 measurements per second, nominal.

Temperature.

Full Operation: 0°C to +40°C

Storage: -20°C to +70°C.

Power. Single standard 9 V battery, NEDA 1604 or equivalent.

Battery Life. 40 hours typical (alkaline).

Calibration Cycle. 1 year.

Dimensions. (H x W x D) 1-3/8" x 3-9/16" x 7-1/2" (35 mm x 90 mm x 190 mm), 1-3/4" (45 mm) max height at tilted window.

Weight. 13 oz (365 g) including battery.

Supplied Accessories. Test clip (pair), spare fuse (70 mA), instruction manual.

FEATURES

- Portable, battery operated, hand held instrument convenience.
- Basic accuracy: $\pm 2\%$ Capacitance
 $\pm 3\%$ Inductance
 $\pm 0.5\%$ Resistance
- Eight capacitance ranges: 2000 μF to 200 pF.
- Seven inductance ranges: 200 μH to 200 H.
- Seven resistance ranges: 20 Ω to 20 M Ω .
- Single function and range control.
- 3-1/2 digit LCD display with large 0.5" digits.
- Dissipation factor readings for capacitors and inductors.
- Direct "plug-in" receptacles and test lead jacks provided.
- Auto zero.
- Overrange indication on all ranges.
- Check value and tolerance.
- Select precision values.
- Measure unmarked parts.
- Select matched sets.
- Shock resistant case withstands 4-foot drop.
- Tilt stand. Also converts for use as hanger strap.
- Slanted display for easy viewing.

OPTIONAL ACCESSORIES

- AC adapter Model BE-11
Carrying case Model LC-29

MAINTENANCE

WARNING

Remove test leads before changing battery or fuse or performing any servicing. Never operate instrument unless battery compartment cover is closed.

BATTERY REPLACEMENT

The LO BAT indication first appears when the battery is about 90% depleted. The meter may be operated for a short period but the battery should be replaced soon thereafter. Open the battery compartment and replace with a fresh 9 volt "transistor" battery. Use alkaline batteries for longer life. To prolong battery life, set POWER switch to OFF when not making measurements. For prolonged use, use the optional AC adapter.

FUSE REPLACEMENT

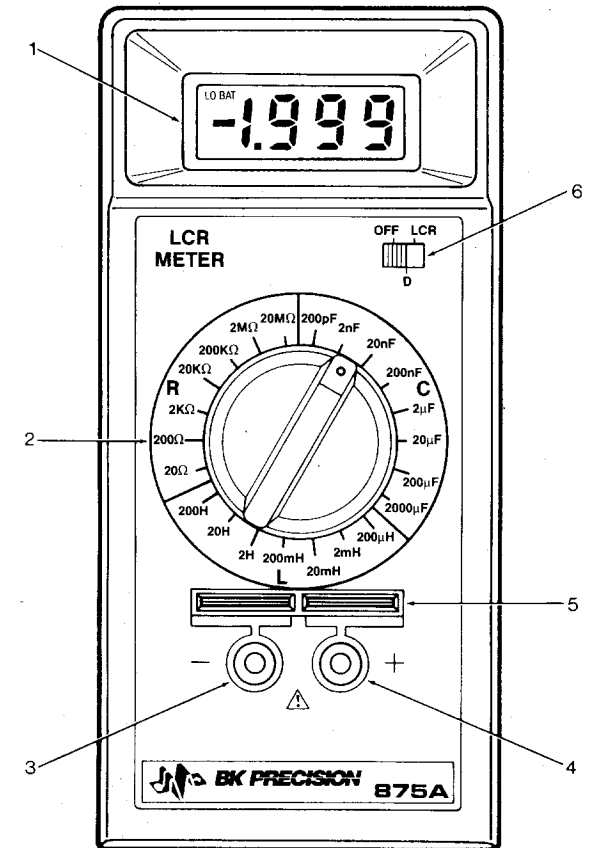
A fuse protects the meter from connection of a charged capacitor or accidental connection to an external voltage. If unit is inoperable, check for blown fuse. This fuse is located in the battery compartment. Replace only with original type 70 mA, 250 V, 5 x 20 mm fast acting fuse (B & K Part No. 194-029-9-001).

TEST LEADS

Periodically examine the test leads to ensure that the conductors are not intermittent or broken. Also make sure that good contact pressure exists at the test lead receptacles and fuseholder, and keep these areas free from dirt and corrosion.

CONTROLS AND INDICATORS

1. **Display.** 3-1/2 digit display (1999 maximum) with automatic decimal point and (-) sign. Indicates measured value. Overrange indicated by displaying most significant digit "1" and all other digits blank. Also indicates low battery.
2. **Function/Range Switch.** Selects function and range; C (2000 μF , 200 μF , 20 μF , 2 μF , 200 nF, 20 nF, 2 nF, or 200 pF), L (200 μH , 2 mH, 20 mH, 200 mH, 2 H, 20 H, or 200 H), R (20 M Ω , 2 M Ω , 200 k Ω , 20 k Ω , 2 k Ω , 200 Ω , or 20 Ω).
3. **(-) Jack (Black).** Common, reference, or foil side test jack for black lead.
4. **(+) Jack (Red).** Positive polarized test lead input for red lead. The test lead connected to this jack is applied to the positive (+) lead of a polarized capacitor.
5. **Component Lead Receptacles.** Use for direct plug in of component leads. Observe proper polarity when measuring polarized capacitors.
6. **Power/Selector Switch.** Turns unit on and off. LCR position allows for normal inductance (L), capacitance (C) or resistance (R) measurements as selected by the Function/Range switch. D position allows for measuring dissipation factor of capacitors or inductors as selected by the Function/Range switch.
7. **TILT STAND.** (Not shown) Folds out from rear of case. Can also be relocated to slot in top rear of case for use as a hanger strap.



OPERATING INSTRUCTIONS

PRELIMINARY

CAUTION

Never apply a voltage to the meter test jacks: serious internal damage to the meter may result.

Do not attempt to measure any component "in circuit."

RANGE SELECTION

1. If value to be measured is unknown, start with highest range.
2. When an overrange is indicated (most significant digit "1" on and all other digits blank) switch to the next highest range.
3. For best accuracy, reading should be greater than 10% of full scale if possible.

CAPACITANCE MEASUREMENTS

CAUTION

Fully discharge capacitors before measuring.

1. Set power/selector switch to the LCR position.
2. Set function switch to desired capacitance (C) range.
3. Plug capacitor leads directly into component lead receptacles, or use test leads if necessary. Note lead polarity when measuring polarized capacitors such as electrolytics.
4. A shorted capacitor is indicated by an overrange indication that persists regardless of range selection.
5. An open capacitor is indicated by a "000" reading regardless of range selection. Lowest ranges may indicate a reading slightly above zero due to test lead capacitance.
6. For the most accurate measurement on the 200 pF or 2 nF range, note the test lead and residual capacitance reading before connecting the capacitor. Subtract this value from the final reading.

USEFUL CONVERSIONS

pF	nF	μ F	mF	FARAD
1,000	1.0	0.001		
10,000	10.0	0.01		
100,000	100.0	0.1		
1,000,000	1000.0	1.0	0.001	
	10,000	10.	0.01	
	100,000	100.0	0.1	
	1,000,000	1000.0	1.0	0.001
		10,000	10.0	0.01
		100,000	100.0	0.1
		1,000,000	1000.0	1.0

pF = picofarads (10^{-12}) nF = nanofarads (10^{-9})
 μ F = microfarads (10^{-6}) mF = millifarads (10^{-3})

DISSIPATION FACTOR – CAPACITORS

1. Measure capacitance as described above.
2. Leave function switch on range that gives the capacitance reading with highest resolution.
3. Set power/selector switch to D position.
4. A low reading (near zero) is desirable, with least significant digit 1 or 2 counts maximum. Electrolytic capacitors will have a higher dissipation factor due to their normal high internal leakage.

INDUCTANCE MEASUREMENTS

1. Set power/selector switch to the LCR position.
2. Set function switch to desired inductance (L) range.
3. Plug inductor leads directly into component lead receptacles, or use test leads if necessary.
4. A shorted inductor yields a "000" reading regardless of range selection (or a reading slightly above zero on the 2 mH range).
5. An open inductor yields an overrange indication regardless of range selected.

6. For the most accurate reading on the 2 mH and 200 μ H ranges, short the test leads together and note the test lead and residual inductance reading before measuring inductance. Subtract this value from the final reading.

DISSIPATION FACTOR – INDUCTORS

1. Measure inductance as described above.
2. Leave the function switch on range that gives the inductance reading with highest resolution.
3. Set power/selector switch to D position.
4. A low reading (near zero) is desirable, however, some applications require inductors with a higher series resistance, thus producing a higher dissipation factor. Also note that for inductors with D greater than 1, the accuracy of the inductance reading is degraded.

RESISTANCE MEASUREMENTS

1. Set power/selector switch to the LCR position.
2. Set function switch to desired resistance (R) range.
3. Plug resistor leads directly into component lead receptacles, or use test leads if necessary.
4. For the most accurate reading on the 20 Ω and 200 Ω range, short the test leads together and note the residual resistance before taking measurement. Subtract this value from the final reading.

CONSIDERATIONS

1. When using to 200 pF or 2 nF capacitance range, avoid the use of long-length test leads. If a long-length test lead set must be used, note the cable capacitance and deduct it from the final reading. When using the 200 μ H, 2 mH, or 20 mH inductance range, test lead capacitance causes error due to the combination of erroneous reactive components plus the intended reactance of the element under test. The resulting error in the reading can not be deducted from the reading in any simple arithmetical manner. Therefore, it is recommended that only the supplied short-length test leads be used when using these ranges.

2. For all functions, avoid movement of the test leads while measurements are in progress. Subsequent movement of the test leads causes a change of test lead capacitance that degrades the accuracy of the reading.
3. Measuring the inductance value of laminated-core inductors (such as power supply chokes) with any low-current "L" instrument may yield erroneous readings. This is due to the fact that laminated-core inductors are typically designed for and rated at relatively high dc current levels, such as those encountered in practical applications. Therefore, an inductor rated at "6 H at 100 mA" may not produce this inductance when tested at the much lower current used by an "L" meter. *However, do not attempt a high-current simulation using an external biasing scheme with this or any other low current measuring device; serious damage to the instrument may result.*
4. This meter (as well as most similar meters) is intended solely for the measurement of elements possessing purely capacitive, inductive, or resistive characteristics. It is not intended for the measurement of components or networks possessing combined resistive, inductive, and/or capacitive characteristics. Attempting the measurement of capacitance of a resistor or the inductance of a wirewound resistor are such examples.
5. Use of the meter in close proximity to strong, low-frequency electromagnetic fields (such as found near large electric motors) may affect the accuracy of some readings.