

**INSTRUCTION
MANUAL**

BK PRECISION
MODEL 2870

Autorangeing - True RMS - 0.3%



SURVIVOR™
RUGGEDIZED
DIGITAL MULTIMETER

BK PRECISION
MAXTEC INTERNATIONAL CORP.
8470 W. Cortland St. • Chicago, IL 60635

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FEATURES

- Heavy Duty 1500 VDC, 750 VAC rating.
- Manual/Auto Ranging
- 65 Segment Analog Bar Graph display.
- True RMS
- Ruggedized Construction.
- Water Resistant
- Withstands 5-foot drop.
- 3-3/4 digit large (0.5" digits) high contrast LCD display.
- Auto Power Off extends battery life.
- Designed to stringent IEC-48 safety standards.
- Basic Accuracy: DCV $\pm 0.3\%$
- Resolution of 100 μ VDC, 1mVac, 0.1 Ω , 0.1 μ A
- Single function control.
- Five dc voltage ranges 320mV to 1500V
- Four ac voltage ranges 3.2V to 750V
- Five dc current ranges 320 μ A to 320mA and 10A
- Five ac current ranges 320 μ A to 320mA and 10A
- Six resistance ranges 320 Ω to 32M Ω
- Diode test function measured forward voltage drop
- Audible continuity buzzer
- Auto polarity, auto zero.
- Overrange indication on all ranges
- Low battery warning
- High energy fused
- Safety type test leads.
- Protective holster with probe holders for probe storage or one hand operation.
- Non-slip grip.
- Non-skid rubber feet

Accuracy specifications apply from +15° to +28°C at relative humidity up to 75% unless otherwise noted.

DC VOLTS Auto/Manual ranging

Range	Resolution	Accuracy	Overvoltage Protection
320mV	100 μ V		
3.2V	1 μ V		1100V (dc + ac peak)
32V	10mV	$\pm(0.3\% \text{ rdg} + 2 \text{ dgt})$	
320V	100mV		
1500V	1V		1500V (dc + ac peak)

Input impedance: $\geq 10M\Omega$

AC VOLTS Auto/Manual Ranging, ac coupled, true rms responding. Basic accuracy for sine wave to full scale, for non-sine wave to half-scale. 3.2V range accuracy is for sine wave only.

Range	Resolution	Accuracy	Overvoltage Protection
3.2V	1mV	$\pm(1.3\% \text{ rdg} + 3 \text{ dgt})$ 40 Hz-500 Hz	
32V	10mV		1100V (dc + ac peak)
320V	100mV	$\pm(1.3\% \text{ rdg} + 3 \text{ dgt})$ 40 Hz-1kHz	
750V	1V		

Input impedance: $\geq 10M\Omega$

Crest Factor: 1.4 to 2.0, add 0.5% to accuracy
2.0 to 2.5, add 2.0% to accuracy
2.5 to 3.0, add 4% to accuracy

DC CURRENT Auto/Manual ranging

Range	Resolution	Accuracy	Burden
320 μ A	0.1 μ A	$\pm(1.0\% \text{ rdg} + 2 \text{ dgt})$	200mV max
3.2mA	1 μ A	$\pm(1.2\% \text{ rdg} + 2 \text{ dgt})$	2V max
32mA	10 μ A	$\pm(1.0\% \text{ rdg} + 2 \text{ dgt})$	200mV max
300mA	0.1mA	$\pm(1.2\% \text{ rdg} + 2 \text{ dgt})$	2V max
10A	100mA	$\pm(2.0\% \text{ rdg} + 3 \text{ dgt})$	2V max

WARRANTY INFORMATION

LIMITED FIVE-YEAR WARRANTY

MAXTEC INTERNATIONAL CORPORATION warrants to the original purchaser that its **B-K Precision Model 2870 "Survivor"** Digital Multimeter, will be free from defects in workmanship and materials for a period of five years 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 to 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 limitations of incidental or consequential damages, so the above limitation 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.

CUSTOMER SUPPORT

1-800-462-9832

B-K Precision offers courteous, professional technical support services before and after the sale of their test instruments. The following services are typical of those available from our toll-free telephone number:

- Technical advice on the use of your instrument
- Technical advice on special applications of your instrument
- Technical advice on selecting the best instrument for a given task
- Information on optional accessories for your instrument
- Replacement parts ordering
- Information on other **B-K Precision** instruments
- Requests for a new **B-K Precision** catalog
- The name of your nearest **B-K Precision** distributor

Call Toll-Free 1-800-462-9832
Monday thru Friday 8:00 AM to 5:00 PM
Central Standard Time
(Central Daylight Time in summer)

SYMBOLS

- Do not exceed maximum ratings listed with this symbol.
- High Voltage terminal: up to 1500 volts may be present if connected to high voltage.
- COM Common input terminal
- Diode Test
- Continuity Buzzer
- 1500V MAX Connect COM to earth ground or reference point. COM may be floated to a voltage point, but the float voltage plus the measured voltage must not exceed 1500 V.
- 150V rms 750V MAX Maximum input rating of V Ω terminal with respect to COM input terminal or earth ground. (For voltage measurement functions only.)
- 320mA MAX Maximum input rating of mA/1A terminal with respect to COM input terminal.
- 10A Cont. Maximum input rating of 10A terminal with respect to COM input terminal.

SPECIFICATIONS

Overload protection high energy 500V 1A fuse for μ A/mA input, high energy 500V 10A fuse for A input.

AC CURRENT Auto/Manual ranging

Range	Resolution	Accuracy	Burden
320 μ A	0.1 μ A	$\pm(1.5\% \text{ rdg} + 3 \text{ dgt})$	200mV max
3.2mA	1 μ A		2V max
32mA	10 μ A		200mV max
300mA	0.1mA	$\pm(2\% \text{ rdg} + 3 \text{ dgt})$	2V max
10A	10mA	$\pm(2.5\% \text{ rdg} + 5 \text{ dgt})$	2V max

Frequency response 40Hz to 1kHz.

Overload protection high energy 500V 1A fuse for μ A/mA input, high energy 500V 10A fuse for A input.

Crest Factor: 1.4 to 2.0, add 0.5% to accuracy
2.0 to 2.5, add 2.0% to accuracy
2.5 to 3.0, add 4% to accuracy

Resistance Auto/Manual ranging

Range	Resolution	Accuracy
320 Ω	0.1 Ω	$\pm(0.7\% \text{ rdg} + 4 \text{ dgt})$
3.2k Ω	1 Ω	
32k Ω	10 Ω	$\pm(0.5\% \text{ rdg} + 2 \text{ dgt})$
320k Ω	100 Ω	
3.2M Ω	1k Ω	$\pm(1.0\% \text{ rdg} + 3 \text{ dgt})$
32M Ω	10k Ω	$\pm(2.0\% \text{ rdg} + 5 \text{ dgt})$

Overload protection 600V (dc + ac peak)

CONTINUITY CHECK

Buzzer Threshold: $\approx 100\Omega$ (Approximately 200 Ω)
Overload Protection: 600V (dc + ac peak)

DIODE CHECK

Measures forward voltage drop of diode or semiconductor junction in mV.

Range	Resolution	Accuracy	Max Test Current	Max Open Circuit Voltage
+	1mV	$\pm(1.5\% \text{ rdg} + 5 \text{ dgt})$ (0.4V to 0.8V)	1.5mA	3.3V

GENERAL SPECIFICATION

Display: 0.53" height high contrast LCD, 3200 count, with annunciators for units of measurement.

Analog Bar Graph: 65-segment LCD displayed in curved arc.

Polarity: Automatic, (-) negative polarity indication.

Overrange Indication: "OL" or "OL".

Low Battery Indication: "BAT" symbol displayed.

Sampling Rate: 2 measurements per second, normal for digital display

12 measurements per second for analog bar graph.

Auto Power Off: Approximately 10 minutes.

Audible Warning: Beeper sounds if test leads are connected to current input jack and function switch is not set for current measurement.

Temperature: Full operation: 0°C to 50°C, 0 to 80° R.H.

Storage: -20°C to +60°C, 0 to 80° R.H. with battery removed.

Temperature Coefficient: 0.15%/dec Accy 3°C, 10°C to 28°C.

Power: Single 9V battery 1604 or equivalent.

Battery Life: 200 hours typical (alkaline).

Dimensions (HxWxD): 6-7/8" x 3-5/16" x 1-1/4" (175mm x 84mm x 31mm).

Weight: 18.24 oz (517g) including battery and holster.

Supplied Accessories: Test Leads (pair), rubber holster, battery, instruction manual.

OPTIONAL ACCESSORIES

- Carrying Case Model LC-29A
- Replacement Test Leads Model TL-1
- Deluxe Test Leads Model TL-2
- Accessory Tip Kit (For TL-2) Model TL-3
- High Voltage Probe (40kVDC) Model PR-28
- High Voltage Probe (6kVDC) Model HV-6
- Temperature Adapter, Type K Thermocouple Model TP-30
- Current Clamp Adapter Model CP-3

TEST INSTRUMENT SAFETY

WARNING

An electrical shock causing 10 milliamperes of current to pass through the heart will stop most human heartbeats. Voltage as low as 35 volts DC or ac rms should be considered dangerous and hazardous since it can produce a fatal current under certain conditions. Higher voltages are even more dangerous. Observe the following safety precautions:

- Do not exceed the following input ratings. Personal injury or damage to the instrument may result.

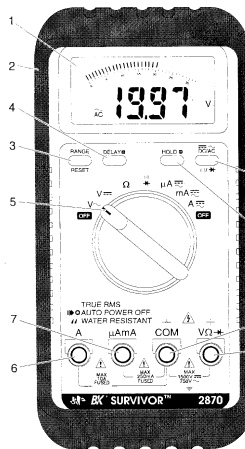
DC Volts	1500 V (dc - ac peak)
AC VOLTS	750 V rms
OHMS	600 VDC or AC rms
mA	300 mA (fuse protected)
A	10 A continuous, 20 A up to 30 seconds (fuse protection)

 Float voltage plus measured voltage must not exceed 1500 V (dc - ac peak).
- Never use the multimeter unless the case is closed.
- Remove test leads from the instrument and point of measurement before replacing batteries or fuses or performing any servicing on the multimeter.
- Use only shrouded safety type test leads like those supplied. Periodically inspect insulation for any burns, cuts, or breaks. Never use test leads with exposed bare wires or poor insulation.
- Turn off equipment while making test connections in high-voltage circuits. Discharge high-voltage capacitors.
- For voltage or current measurements in high voltage equipment do not touch equipment, meter or test leads while power is applied.

- If possible, familiarize yourself with the equipment being tested and the location of its high voltage points. However, remember that high voltages may appear at unexpected points in defective equipment.
- Use an insulated floor mat or floor mat to stand on, and an insulated work bench surface; make certain such surfaces are not damp or wet.
- Keep "one hand in the pocket" while handling an instrument probe. Be particularly careful to avoid contacting a nearby metal object that could provide a good ground return path.
- When using a probe, touch only the insulated portion. Never touch the exposed tip portion.
- Some equipment with a two-wire ac power cord, including some with polarized power plugs, is the "hot chassis" type. This includes most recent television receivers and audio equipment. A plastic or wooden cabinet insulates the chassis to protect the customer. When the cabinet is removed for servicing a serious shock hazard exists if the chassis is touched. Not only does this present a dangerous shock hazard, but damage to test instruments or the equipment under test may result. To make measurements on "hot chassis" equipment always connect an isolation transformer between the ac outlet and the equipment under test. The B-K Precision Model TR-110 or 1604 isolation transformer, or Model 1653 or 1655 AC Power Supply is suitable for most applications. To be on the safe side, treat all two-wire ac powered equipment as "hot chassis" unless you are sure it has an isolated chassis or an earth ground chassis.
- When testing ac power equipment, remember that ac line voltage is usually present on some power input circuits such as on-off switch, fuses, power transformer, etc. any time the equipment is connected to an ac outlet even if the equipment is turned off.
- Never work alone. Someone should be nearby to render aid if necessary. Training in CPR (cardio-pulmonary resuscitation) first aid is highly recommended.

CONTROLS AND INDICATORS

- Display:** 3-3/4 digit digital display (3200 maximum) with automatic decimal point and (-) sign and 6.5 segment analog display. Overrange indicated by displaying "OL". Also indicates low battery.
- Protective Case:**
- Range Reset:** Selects manual or auto ranging mode. Changes ranges in manual mode. Resets power after auto power-off.
- Delay H:** Delays hold operation.
- Function Switch:** Selects function for both autoranging and manual modes, OFF, \sim , V, Ω , \rightarrow , \leftarrow , (continuity), \rightarrow (diode), μ A, mA, A, OFF.
- A Jack:** Input for dc or ac current from 320mA to 10A.
- μ A mA:** Input for dc or ac current up to 320 mA.
- Ω COM JACK:** Input for common or reference test lead for all measurements. Connect to earth ground or reference point. May be floated to a voltage point, but the float voltage plus the measured voltage must not exceed 1500V from earth ground.
- +V Ω \rightarrow \leftarrow :** Input for dc and ac voltage, resistance, continuity, or diode test.
- HOLD H:** Activates data hold feature.
- DC/AC \rightarrow \leftarrow :** Switches between dc and ac when measuring current or between continuity and diode measurements.
- Tilt Stand:** (Not shown, on rear)



TILT STAND AND HANGER

The tilt stand and hanger are located on the back of the case. The tilt stand, Figure 3, can be used to position the unit at approximately a 45 degree angle on a bench top. The hanger clip can be used to support the meter on top of a panel or a door as shown in Figure 4.

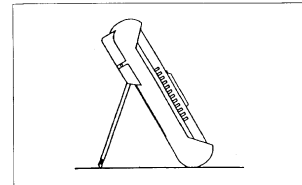


Figure 3. Tilt Stand

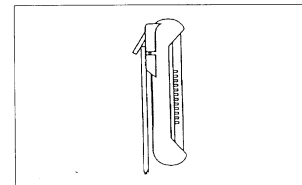


Figure 4. Hanging Hook

OPERATING INSTRUCTIONS

CURRENT MEASUREMENTS

WARNING

For current measurements, the meter must be connected in series with the load. If incorrectly connected in parallel with the load, the meter presents a very low impedance (almost a short), which may blow the fuse or damage the equipment under test.

NOTE

A warning tone will be heard if the test lead is connected to a mA input jack while the knob is not set to mA or μ A range. A warning tone will also be heard if the test lead is connected to A input jack while the knob is not set to A range.

- Set function/range switch to μ A, mA or A position as required. The annunciators in the lower left corner of the display indicate whether the ac or dc function is selected. The μ A, mA, or A annunciator on the lower right indicates that current is selected.
 - To measure ac current, momentarily depress the AC/DC switch as necessary for the AC annunciator to be illuminated.
 - To measure dc current, momentarily depress the AC/DC switch as necessary for the DC annunciator to be illuminated.
- For current measurements less than 320mA, connect the red test lead to the μ A/mA jack and the black test lead to the COM jack.
- For current measurements of 320mA or greater, connect the red test lead to the A jack and the black test lead to the COM jack. For current measurements greater than 2A, high current test leads are recommended.
- Remove power from the circuit under test and open the normal circuit path where the measurement is to be taken. Connect the meter in series with the circuit.
- Apply power and read the value from the display.

RESISTANCE MEASUREMENTS

- Set the Function/Range switch to Ω position.
- Remove power from the equipment under test.
- Connect the red test lead to the +V Ω \rightarrow \leftarrow jack and the black test lead to the COM jack. The red lead is (+) polarity.
- Connect the test leads to the points of measurements and read the value from the display.

CONTINUITY MEASUREMENTS

- Set the Function/Range switch to the \rightarrow \leftarrow position.
- To measure continuity, momentarily depress the AC/DC switch as necessary for the \rightarrow \leftarrow annunciator to be illuminated.
- Connect the red test lead to the +V Ω \rightarrow \leftarrow jack and the black test lead to the COM jack.
- Touch the test leads to the desired test point.
- The buzzer will sound when resistance is less than 200 Ω .

DIODE TEST

- Set the Function/Range switch to the \rightarrow \leftarrow position.
- To measure continuity, momentarily depress the AC/DC switch as necessary for the \rightarrow \leftarrow annunciator to be illuminated.
- Connect the red test lead to the +V Ω \rightarrow \leftarrow jack and the black test lead to the COM jack.
- To check forward voltage (V_f), connect the red test lead to the anode and the black test lead to the cathode of the diode. Diodes and semiconductor junctions with normal V_f of less than approximately 3.000V can be checked.
- The display indicates the forward voltage. Normal diode voltages are approximately 0.300V for germanium diodes, 0.700V for silicon diodes, and 1.600V for light emitting diodes (LED's). A reading of approximately 3.3V indicates an open diode. A shorted diode reads near 0V.
- To check reverse voltage, reverse the test lead connections to the diode. The reading should be the same as with open test leads (approx. 3.3V). Lower readings indicate a leaky diode.

HOLD H

Data hold can be used when making voltage or current measurements. When selected on the ON position the display will freeze. The test leads can then be disconnected without affecting the data display. Press HOLD H again to terminate the hold function.

DELAY H

The delay hold can be used to delay the hold function for 6 seconds. This could allow time to connect to the point of test after starting the delay function. Press HOLD H or DELAY H again to terminate the hold function.

MAINTENANCE

WARNING

Remove test leads before changing batteries or fuse or performing any servicing. Never operate instrument unless case is closed.

BATTERY REPLACEMENT

The low battery warning first appears when the battery is about 90% depleted. The meter may be operated a few more hours but the battery should be replaced as soon as possible. Refer to Figure 1 and remove the three screws from the case back, unstrap the case bottom from the case top at the LCD end, and lift off the case back. Replace the battery with a fresh 9-volt "transistor" battery. Make sure the gaskets are properly seated and the two straps on the case top are engaged when reassembling.

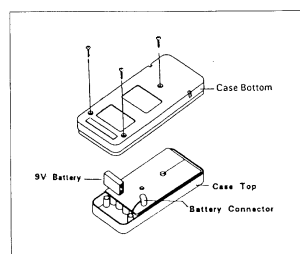


Figure 1. Battery Replacement

FUSE REPLACEMENT

If no current measurements are possible check for a blown overload protection fuse. There are two fuses, F1 for the μ A/mA jack and F2 for the A Jack. A quick check for a blown 10A fuse can be performed by inserting the probe into the 10A jack and setting the function switch to any other position except 10A or OFF. If no warning tone is heard the fuse is probably blown. This procedure can be used for the μ A/mA jack fuse by inserting the probe in the μ A/mA jack and setting the function switch to any position other than OFF, μ A, or mA positions.

For access to fuses, refer to Figure 2, remove the case back as described for battery replacement. Replace F1 only with the original type 1A, 500V fast acting ceramic. Replace F2 only with the original 10A, 500V, fast acting ceramic fuse.

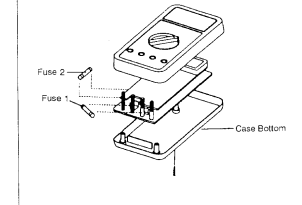


Figure 2. Fuse Replacement

TEST LEADS

Use only safety type leads, like those supplied. 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 receptacles and fuse holder, and keep these areas free from dirt and corrosion.