FEATURES

- 3-3/4 digit LCD display with functional annunciators.
- Analog Bar graph
- Basic accuracy: DCV ±0.25%.
- Resolution of 100 µV, 1µA, 0.1 Ω, 1 pF.
-Autoranging.
- Auto power off prolongs battery life.
- Five dc voltage ranges: 400 mV to 1000 V.
- Five ac voltage ranges: 400 mV to 750 V.
- Four dc current ranges: 4 mA to 20 A.
- Four ac current ranges: 4 mA to 20 A.
- Six resistance ranges: 400 Ω to 40 MΩ.
- Five capacitance ranges 4 nF to 40 µF.
- Five frequency ranges 100 Hz to 500 kHz.
- Diode test function: measures forward voltage drop.
- Audible continuity tester.
- Audible warning buzzer if probe inserted into wrong jack.
- Data hold function freezes value on display.
- Max/Min reading recorder.
- Relative mode measurements
- Auto polarity, auto zero.
- Overrange indication on all ranges.
- Fused mA range.
- Fused 20 A range.
- Safety type test leads.
- Shock resistant case in holster withstands 10-foot drop.
- Tilt stand. Hunger clip.
SAFETY

WARNING

An electrical shock causing 10 milliamps 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 precautions.

1. Do not exceed the following input ratings. Personal injury or damage to the instrument may result.
   - DC VOLTS 1100 V (dc or peak ac)
   - AC VOLTS 1100 V (dc or peak ac)
   - OHMS 500 V (dc or peak ac)
   - mA 500 mA (fuse protected)
   - 20 A 20 A (fuse protected)
   - COM Do not float more than 500 volts from earth ground.
   - LOGIC 500 V (dc or peak ac)

2. Remove test leads before replacing batteries or fuses, and before performing any servicing on the multimeter.

3. Use only the safety type test leads supplied with the multimeter.

4. Turn off equipment while making test connections in high voltage circuits. Discharge high-voltage capacitors after removing power.

5. For voltage or current measurements in high voltage equipment, do not touch equipment, meter or test leads while power is applied.

6. If possible, familiarize yourself with the equipment being tested and the location of its high voltage points. However, remember that high voltage may appear at unexpected points in defective equipment.

7. Use an insulated floor material or floor mat to stand on, and an insulated work bench surface, make certain such surfaces are not damp or wet.

8. 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.

9. When using a probe, touch only the insulated portion. Never touch the exposed tip portion.

10. Some equipment with a two-wire ac power cord, including some with polarized plug 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 in "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.

11. When testing ac powered equipment, remember that ac line voltage is usually present on some power input circuits such as an on-off switch, fuses, power transformer, etc. Any time the equipment is connected to an ac outlet, even if the equipment is turned off.

12. Never work alone. Someone should be nearby to render aid if necessary. Training in CPR (cardiopulmonary resuscitation) first aid is highly recommended.

MAINTENANCE

WARNING

Remove test leads before changing battery or fuse or performing any servicing.

BATTERY REPLACEMENT

A low battery is indicated when the - symbol in the upper right hand corner of the battery is about 90% depleted. The meter can be operated a few more hours but the battery should be replaced soon thereafter.

1. Remove rubber holster.

2. Remove two screws from back of unit securing the tilt stand.

3. Remove tilt stand.

4. Remove two screws securing case back, then carefully lift back off to gain access to battery. Remove and save the battery insert.

5. Place the dead battery with a fresh 9 V battery. Replace the battery insert. Use alkaline batteries for longer life. To prolong battery life set the Function/Range switch to the OFF position when not making measurements.

6. Reassemble back cover, tilt stand and holster.

FUSE REPLACEMENT

If no current measurements are possible, check for a blown overload protection fuse. Two fuses are used; F1 for the miliamp input and F2 for the 20 A input. A quick check for a blown 20A fuse can be performed by inserting the probe into the 20A jack and setting the function switch to any other position except 20A or OFF. If no warning tone is heard the fuse is probably blown. This procedure can also be used for the mA jack fuse by inserting the test lead into the mA jack and setting the function switch to any position other than OFF or one of the mA positions. Replace F1 only with the original type 0.5 A, 600 V, fast blow ceramic fuse (B-K Precision Part No. 194-045-9-001). Replace F2 only with the original type 20 A, 600 V, fast blow ceramic fuse (B-K Precision Part No. 194-043-9-001).

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 fuseholder, and keep these areas free from dirt and corrosion.
Specifications apply from +18°C to +28°C at relative humidity up to 75% unless otherwise noted.

**DC VOLTS Auto/Manual ranging.**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Overvoltage Protection</th>
<th>Input Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 mV</td>
<td>100 µV</td>
<td>±(0.25% rdg + 2 dgt)</td>
<td>1100 VDC or peak AC</td>
<td>1000 MΩ</td>
</tr>
<tr>
<td>4 V</td>
<td>1 mV</td>
<td>±(0.8% rdg + 2 dgt)</td>
<td></td>
<td>11 MΩ</td>
</tr>
<tr>
<td>40 V</td>
<td>10 mV</td>
<td>±(1.2% rdg + 4 dgt)</td>
<td></td>
<td>10 MΩ</td>
</tr>
<tr>
<td>400 V</td>
<td>100 mV</td>
<td>±(1.2% rdg + 4 dgt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 V</td>
<td>1 V</td>
<td>±(1.2% rdg + 5 dgt)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AC VOLTS Auto/Manual ranging. Average sensing, RMS Indicating**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 500 Hz)</th>
<th>Accuracy (500 Hz to 1 kHz)</th>
<th>Overvoltage Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 mV</td>
<td>100 µV</td>
<td>±(1.0% rdg + 5 dgt)*</td>
<td>Unspecified</td>
<td>1100 VDC or peak AC</td>
</tr>
<tr>
<td>4 V</td>
<td>1 mV</td>
<td>±(1.2% rdg + 5 dgt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 V</td>
<td>10 mV</td>
<td>±(0.8% rdg + 3 dgt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 V</td>
<td>100 mV</td>
<td>±(1.0% rdg + 5 dgt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>750 V</td>
<td>1 V</td>
<td>±(1.2% rdg + 5 dgt)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input Impedance . . . . . . . Same as DCV/less than 100 pF

*Freq. response for 400 mV range is 50-100 Hz

**DC CURRENT Manual ranging.**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 1 kHz)</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mA</td>
<td>1 µA</td>
<td>±(0.8% rdg + 2 dgt)</td>
<td>500 mV max.</td>
</tr>
<tr>
<td>40 mA</td>
<td>10 µA</td>
<td>±(0.7% rdg + 2 dgt)</td>
<td>900 mV max.</td>
</tr>
<tr>
<td>400 mA</td>
<td>100 µA</td>
<td>±(1.0% rdg + 4 dgt)</td>
<td>500 mV max.</td>
</tr>
<tr>
<td>20 A</td>
<td>10 mA</td>
<td>±(1.2% rdg + 4 dgt)</td>
<td>500 mV max.</td>
</tr>
</tbody>
</table>

Overload Protection . . . . . . . 0.5 A (600 V) fast blow ceramic fuse on mA input 20 A (600 V) fast blow ceramic fuse on 20 A input.

20 A Range Maximum Current . . . . . . . 10 A continuous 20 A for 30 sec. max.

**RESISTANCE Auto/Manual ranging.**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 1 kHz)</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Ω</td>
<td>0.1 Ω</td>
<td>±(0.8% rdg + 10 dgt)</td>
<td>400 mV max.</td>
</tr>
<tr>
<td>4 kΩ</td>
<td>1 Ω</td>
<td>±(0.7% rdg + 2 dgt)</td>
<td>900 mV max.</td>
</tr>
<tr>
<td>40 kΩ</td>
<td>10 Ω</td>
<td>±(1.0% rdg + 4 dgt)</td>
<td>500 mV max.</td>
</tr>
<tr>
<td>400 kΩ</td>
<td>100 Ω</td>
<td>±(1.3% rdg + 4 dgt)</td>
<td>500 mV max.</td>
</tr>
<tr>
<td>40 Ω</td>
<td>10 kΩ</td>
<td>±(1.2% rdg + 4 dgt)</td>
<td>500 mV max.</td>
</tr>
</tbody>
</table>

Overload Protection . . . . . . . 500 VDC or peak AC

**FREQUENCY COUNTER Auto ranging.**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 1 kHz)</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Hz</td>
<td>0.01 Hz</td>
<td>±(0.4% rdg + 10 dgt)</td>
<td>40 mV</td>
</tr>
<tr>
<td>1 kHz</td>
<td>0.1 Hz</td>
<td>±(0.25% rdg + 4 dgt)</td>
<td>400 mV</td>
</tr>
<tr>
<td>10 kHz</td>
<td>1 Hz</td>
<td>±(0.5% rdg + 5 dgt)</td>
<td>400 mV</td>
</tr>
<tr>
<td>100 kHz</td>
<td>10 Hz</td>
<td>±(0.8% rdg + 20 dgt)</td>
<td>400 mV</td>
</tr>
</tbody>
</table>

Overload Protection . . . . . . . 500 VDC or peak AC

**AC CURRENT Manual ranging. Average sensing, RMS Indicating**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 1 kHz)</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mA</td>
<td>1 µA</td>
<td>±(1.2% rdg + 4 dgt)</td>
<td>500 mV rms max.</td>
</tr>
<tr>
<td>40 mA</td>
<td>10 µA</td>
<td>±(1.0% rdg + 5 dgt)</td>
<td>900 mV rms max.</td>
</tr>
<tr>
<td>400 mA</td>
<td>100 µA</td>
<td>±(1.2% rdg + 5 dgt)</td>
<td>500 mV rms max.</td>
</tr>
<tr>
<td>20 A</td>
<td>10 mA</td>
<td>±(1.3% rdg + 4 dgt)</td>
<td>500 mV rms max.</td>
</tr>
</tbody>
</table>

Overload Protection . . . . . . . 0.5 A (600 V) fast blow ceramic fuse on mA input 20 A (600 V) fast blow ceramic fuse on 20 A input.

20 A Range Maximum Current . . . . . . . 10 A continuous 20 A for 30 sec. max.

**DIODE CHECK**

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy (50 Hz to 1 kHz)</th>
<th>Max Test Current</th>
<th>Max Open Circuit Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 V</td>
<td>1 mV</td>
<td>±(1.0% rdg + 1.0 dgt)</td>
<td>0.6 mA</td>
<td>3.0 VDC</td>
</tr>
</tbody>
</table>

Overload Protection . . . . . . . 500 VDC or peak AC
CONTINUITY TEST

<table>
<thead>
<tr>
<th>Range</th>
<th>Response Time</th>
<th>Description</th>
<th>Open Circuit Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Ω</td>
<td>Approx. 100 ms</td>
<td>Buzzer sounds below approx. 40 Ω</td>
<td>0.4 VDC</td>
</tr>
</tbody>
</table>

Overload Protection................. 500 V DC or peak AC

CAPACITANCE Auto/Manual Ranging

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 nF</td>
<td>1 pF</td>
<td>±(2.0% rdg + 20 dg)</td>
</tr>
<tr>
<td>40 nF</td>
<td>10 pF</td>
<td>±(2.0% rdg + 4 dg)</td>
</tr>
<tr>
<td>400 nF</td>
<td>100 pF</td>
<td>±(2.0% rdg + 4 dg)</td>
</tr>
<tr>
<td>4 μF</td>
<td>1 nF</td>
<td>±(2.0% rdg + 4 dg)</td>
</tr>
<tr>
<td>40 μF</td>
<td>10 nF</td>
<td>±(2.0% rdg + 4 dg) at ≤20 μF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±(5.0% rdg + 4 dg) at &gt;20 μF</td>
</tr>
</tbody>
</table>

Overload Protection................. 500 V DC or peak AC

*Accuracy using relative mode to zero meter.

GENERAL SPECIFICATIONS

Display: 3-3/4 digit liquid crystal display (LCD) with a maximum reading of 3999,9999 for frequency.

Analog Bar Graph: 42 segments with measurements 20 times per second.

Polarity: Automatic (+) negative polarity indication.

Overrange Indications: "4" flashing.

Low Battery Indicator: ≤ 1/2 battery displayed.

Sampling rate: 2 measurements per second, nominal, 1 time per second for capacitance and frequency measurements.

Temperature:
- Full Operation: 0 to +50°C <70% R.H.
- Storage: -20°C to 60°C at <80% R.H.

Power: 9V (NEDA 1604).

Battery life: 1000 hours typical (alkaline).

Auto Power off: Meter automatically shuts down after approx. 30 minutes of inactivity.

Dimensions (H x W x D): 1.5" x 3.4" x 7.5" (37 mm x 87 mm x 189 mm), with Holster 2" x 3.8" x 7.9" (52 mm x 96 mm x 200 mm)

Weight: 12.1 oz. (340 g) including battery, with Holster 17.0 oz. (482 g)

Supplied Accessories: Test leads (pair), battery, instruction manual, protective holster.

WARRANTY

LIMITED THREE-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 three 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 Corland 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 Corland 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.
1. Display, 3-3/4 digit (3999 maximum) with automatic decimal point analog bar graph, low battery and full annunciator for function and unit of measurement.
2. READ. Latches the HOLD mode and displays reading stored in memory.
3. MEM. Stores present reading in memory.
4. RESET. Resets all meter functions.
5. PWR RST. Restores power after auto power shutoff.
6. Function/Range Switch. Selects function for autoranging and function for manual ranging modes. \( V \), \( V_{\text{DC}} \), \( \Omega \), \( \Omega \), \( \mu \Omega \) (continuity). \( V \), \( V_{\text{DC}} \) (diode test), Hz, \( C \), \( C \), \( \mu F \), \( \mu F \), \( \mu F \), \( \mu F \), \( \mu F \) (continuity).
7. 20 A Jack. Input for up to 20 A dc or ac current range. For measurements greater than 3 A high current test leads are recommended.
8. mA Jack. Input for dc or ac current up to 400 mA.
9. COM Jack. Input for common reference test lead for all measurements. Connect to earth ground or reference point not more than 500 V MAX (dc + ac peak) from earth ground.
10. \( V_{\text{AC}} \), \( V_{\text{DC}} \). Input for dc and ac voltage, resistance, frequency, continuity, capacitance or diode test.
11. REL A Switch. Sets present reading as the zero reference.
12. RANGE Switch. Select autoranging mode or manually change ranges.
13. HOLD Switch. Activates data hold feature.

**OPERATING INSTRUCTIONS**

4. Display indicates the forward voltage. Normal diode voltages are approximately 0.4 V for germanium diodes, 0.7 V for silicon diodes, and 1.6 V for light-emitting diodes (LED). An open diode reads approximately 3 V. A shorted diode reads near 0 V.

5. Reverse test lead connections to diode. Reading should be the same as with open test leads (approximately 3 V). Lower readings indicate a leaky diode.

**CAPACITANCE MEASUREMENTS**

Never apply an external voltage when in the \( C \) position. Damage to the meter may result. Always short capacitor leads together before connecting to meter.

1. Set the Function/Range switch to \( C \) (capacitance).
2. Connect the COM and the \( V_{\text{AC}} \) \( V_{\text{DC}} \) Hz leads to the capacitor. Observe polarity when measuring polarized capacitors.
3. Read the capacitance directly from the display. A shorted capacitor will indicate an overrange. An open capacitor will indicate near zero on all ranges.
4. For maximum accuracy, step to the desired range in manual ranging, then press the REL \( \Delta \) button to zero test lead capacitance before the measurement.

**USEFUL CONVERSIONS**

<table>
<thead>
<tr>
<th>pF</th>
<th>nF</th>
<th>µF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>1.0</td>
<td>0.001</td>
</tr>
<tr>
<td>10,000</td>
<td>10.0</td>
<td>0.01</td>
</tr>
<tr>
<td>100,000</td>
<td>100.0</td>
<td>0.1</td>
</tr>
<tr>
<td>1,000,000</td>
<td>1,000.0</td>
<td>1.0</td>
</tr>
<tr>
<td>10,000,000</td>
<td>10,000.0</td>
<td>10.0</td>
</tr>
<tr>
<td>100,000,000</td>
<td>100,000.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

pF = picofarads (10⁻¹²), nF = nanofarads (10⁻⁹), µF = microfarads (10⁻⁶)
TILT STAND AND HANGER

The tilt stand and hanger are located on the back of the case. The tilt stand, Figure 1, can be used to position the unit at approximately a 45 degree angle of the bench top. The hanger clip can be used to support the meter on top of a panel as shown in Figure 2 or to suspend the meter from a wire, strap or screw as shown in Figure 3.

CURRENT MEASUREMENTS

WARNING

For current measurements, the meter must be connected in series with the lead. If incorrectly connected in parallel with the lead, 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 mA input jack while the knob is not set to mA range. A warning tone will also be heard if the test lead is connected to 20 A input jack while the knob is not set to 20 A range.

1. To measure dc current, set the function switch to the desired A range.
2. To measure ac current, set the function switch to the desired A range.
3. For current measurements under 400 mA, connect the red test lead to the mA jack and the black test lead to the COM jack.
4. For current measurements above 400 mA, connect the red test lead to the 20 A jack and the black test lead to the COM jack (set the Function/Range switch to the 20 A position). For current measurements greater than 3 A, high current test leads are recommended.
5. 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.
6. Apply power and read the value from the display.

MAX/MIN HOLD MODE

1. MAX/MIN mode will store and display the maximum or minimum values measured by the meter.
2. Select the desired function (MAX/MIN is not operational in “Hz” function).
3. Connect the meter to the point to be measured.
4. To observe the minimum value recorded, momentarily depress the MAX/MIN button. The “MIN” annunciator will be displayed along with the minimum recorded reading. The meter will record and hold any new minimum that occurs during the measurement.
5. To observe the maximum value recorded, momentarily depress the MAX/MIN button again. The “MAX” annunciator will be displayed along with the maximum recorded reading. The meter will record and hold any new maximum that occurs during the measurement.

DATA HOLD

Data hold can be used when making voltage, current, or frequency measurements. When switched to the ON position the display will freeze. The test leads can then be disconnected without affecting the data display.

RESET

Clears all stored reading and resets the meter.

STORE AND RECALL

Memory can be used to store any single reading. When MEM is pressed the memory annunciator comes on, the present reading is stored in memory and can be recalled at any time by pressing READ.

RELATIVE

When the REL button is pressed the present reading become the zero reading and all subsequent readings are displayed relative to this value. This function is cleared by pressing the RESET button which returns the meter to normal operation.

LEAD STORAGE

The holster provides a means of storing the test leads when not in use. Refer to Figure 5 and proceed as follows:

1. Press the probe end of the test leads into the storage slots with the end of the probes pointing toward the top of the unit.
2. Press the leads into the lead slots to prevent the leads from unwrapping.
3. Wrap both test leads together in the storage channel near the bottom of the holster leaving about a foot of test lead.
4. Turn the unit over, then plug the end of the test leads into the COM and Cx – V12 Hz connectors on the front of the unit.