



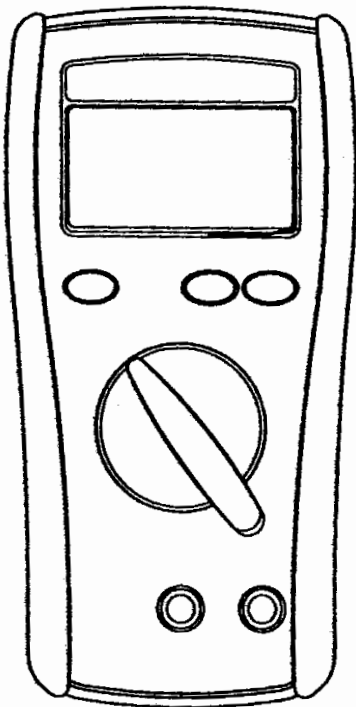
#61-320

Test Equipment
Depot



1-800-517-8431

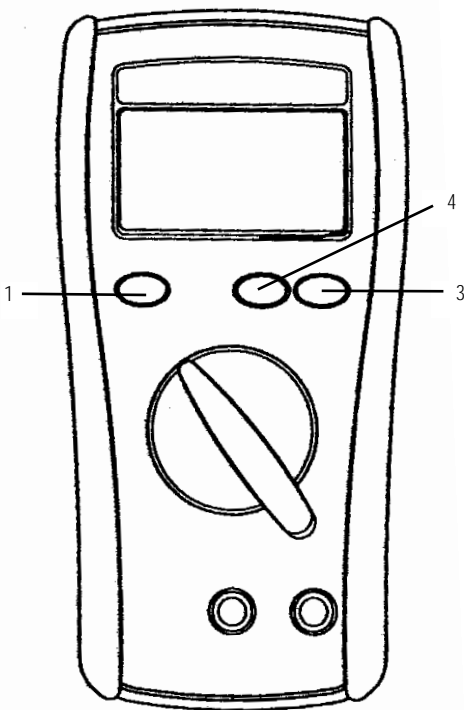
*320 Series
Grade Multimeter*



99 Washington Street
Melrose, MA 02176
Fax 781-665-0780
TestEquipmentDepot.com

WARNING!

1. DO NOT UNDER ANY CIRCUMSTANCES EXCEED THESE RATINGS:
 - Voltage is not to exceed 1000 Volts.
 - Resistance, Capacitance, Logic and Continuity functions are not to be performed on circuits capable of delivering greater than 600 Volts.
 - Current measurements are not to be performed on circuits capable of delivering greater than 500 Volts
2. To avoid electrical shock hazards and/or damage to the meter:
 - Do not exceed the voltage ratings for the meter. Use caution when measuring voltage.
 - Do not use during electrical storms. AC power sources with inductive loads or electrical storms may result in high voltage. High energy transients can damage meter and present a dangerous shock hazard.
 - Turn off power to the circuit or device being measured before taking resistance and capacitance measurements. Fully discharge all capacitors before measuring.
3. Ensure meter is in proper working order before using. Visually inspect meter for damage. Performing a continuity check can verify proper operation. If the meter reading goes from overload to zero, this typically means the meter is in proper working order.
4. Visually inspect leads for damage before using. Replace if insulation is damaged or leads appear suspect.
5. Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures etc. Keep your body isolated from ground by using dry clothing, rubber shoes, mats, or any other approved insulating material. Keep your fingers behind the finger guards on the probes. Work with others.
6. Before beginning all unknown measurements, set meter to highest possible range.
7. Before breaking a circuit for testing, turn off the power to the circuit. When disconnecting from a circuit, disconnect the hot lead first, then the common lead.
8. Disconnect the meter from the circuit before turning off any indicator, including motors, transformers, and solenoids.



1. Min/Max Switch

- Pressing this button once results in the displayed maximum value of the current reading.
- Pressing the min/max button once results in the displayed minimum value of the current reading.
- If pressed a third time "Max Min" will flash on the LCD indicating that the minimum and maximum value are being recorded while the current reading is displayed.
- Pressing the min/max button for > 2 seconds exits the Min/Max mode.

2. Range Button

- Pressing the range button selects the manual ranging mode.
- When the range button is pressed **RANGE** will appear in the upper left of the LCD display.
- WHEN in the manual range mode, pressing the range button changes the measurement range.
- To return to auto ranging, hold the range button for >2 seconds.

3. Hold Button

- The hold button is used to hold the measured value for all functions.
- The value is displayed along with the **H** annunciator.
- This function can be used in the min/max or peak min/max mode.

Auto Power Off (APO)

If the meter is left idle for more than 10 minutes, the meter automatically turns the power off. When this happens, the state (non-logic measurement) of the meter is saved, the meter can be turned back on by pushing any button or changing the rotary switch. The meter will give an alarm 15 seconds before the meter automatically turns the power off. To disable the auto power off function, power up the meter while pressing either the range or min/max button. To enable the auto power off, switch the meter off and then on again without depressing any buttons.

Overload Protection

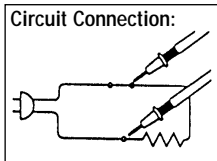
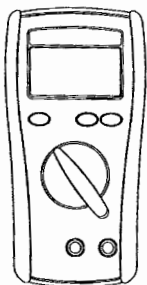
| | |
|-------------------|-------------------------------------|
| Function | Overload Protection |
| VAC & VDC | 1000V |
| ADC | μ A input: 600V RMS 16A/500V |
| Ohms (Ω) | 600VAC/600VDC |
| Diode | 600VAC/600VDC |
| Continuity | 600VAC/600VDC |

Unit of Measure Multipliers

For your reference, the following symbols are often used to make measurement easier:

| <u>Symbol</u> | <u>Verbal</u> | <u>Multiplier</u> |
|---------------|---------------|-------------------|
| M | mega | x 1,000,000 |
| k | kilo | x 1,000 |
| m | milli | \div 1,000 |
| μ | micro | \div 1,000,000 |

True RMS AC Volt



| Range | Resolution | Accuracy | Max. Display |
|-------|------------|-------------------------------|--------------|
| 600mV | 0.1mV | ±(0.9% reading + 5 digits) | 600.0 |
| 6V | 1mV | | 6.000 |
| 60V | 10mV | | 60.00 |
| 600V | 100mV | | 600.0 |
| 750V | 1V | | 750 |

AC Conversion Type: Conversions are average sensing RMS calibrated.

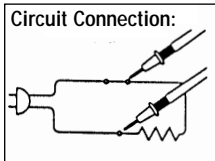
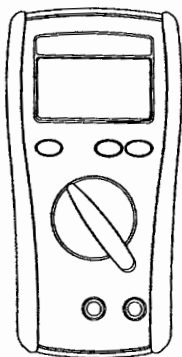
Input Impedance: 10M Ω less than 100 pF.

Frequency Response: 40 Hz ~ 500 Hz

To Measure AC Voltage:

1. Plug the black test lead into the COM port and the red test lead into the $\overleftarrow{\sim}$ Hz V Ω μ A port.
2. Set the rotary switch to the \tilde{v} position.
3. Connect the meter in parallel with the load or circuit.
4. Measure AC Voltage.

DC Volts



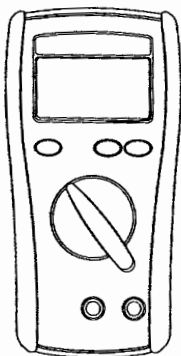
| Range | Resolution | Accuracy | Max. Display |
|-------|-------------|--------------------------------------|--------------|
| 600mV | 100 μ V | $\pm(0.5\%$ reading $+ 2$ digits) | 600.0 |
| 6V | 1mV | | 6.000 |
| 60V | 10mV | | 60.00 |
| 600V | 100mV | | 600.0 |
| 1000V | 1V | | 1000 |

Input Impedance: 10M Ω (over 1000M Ω in 600mV range)

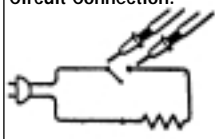
To Measure DC Voltage:

1. Plug the black test lead into the COM port and the red test lead into the \overline{V} Hz V Ω μ A port.
2. Set the rotary switch to the \overline{V} position.
3. Connect the meter in parallel with the load or circuit.
4. Measure DC Voltage

DC Current



Circuit Connection:



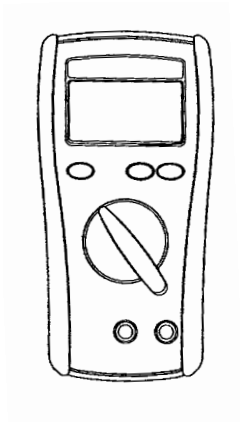
| Range | Resolution | Accuracy | Voltage Burden | Max |
|--------------|-------------|--------------------------------------|-----------------|-------|
| 600 μ A | 0.1 μ A | $\pm(1.0\%$ reading $+ 2$ digits) | < 4mV / μ A | 600.0 |
| 6000 μ A | 1 μ A | | | 6.000 |

Overload Protection: μ A input: 600V RMS

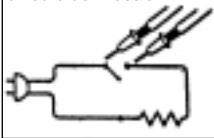
To Measure DC Current:

1. Plug the black test lead into the COM port and the red test lead into the $\overline{\text{Hz V } \Omega \mu\text{A}}$ port.
2. Set the rotary switch to the mA or A position.
3. Connect the meter in series with the load or circuit.
4. Measure DC Current.

Frequency/RPM



Circuit Connection:




| Range | Resolution | Sensitivity | Accuracy |
|--------|------------|-------------|-----------------------------------|
| 6000Hz | 1Hz | 100mV RMS | Frequency: 0.01% \pm 1 digit |
| 60KHz | 10Hz | | |
| 600KHz | 100Hz | | |
| 6MHz | 1KHz | 250mV RMS | |
| 60MHz | 10KHz | 1V RMS | |

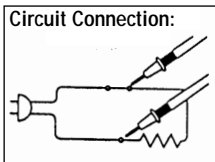
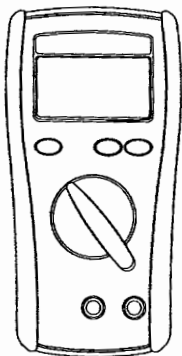
Overload Protection: 600V rms

*Less than 20Hz the sensitivity is 1.5V

To Measure Frequency:

1. Plug the black test lead into the COM port and the red test lead into the  Hz V Ω μ A port.
2. Set the rotary switch to the Hz position.
3. Connect the meter in parallel with the load or circuit.
4. Measure Frequency.


Resistance (Ohms)



| Range | Resolution | Accuracy | Max. Display |
|---------------|--------------|--------------------------------------|--------------|
| 600 Ω | 0.1 Ω | $\pm(0.7\%$ reading $+ 2$ digits) | 600.0 |
| 6K Ω | 1 Ω | | 6.000 |
| 60K Ω | 10 Ω | | 60.00 |
| 600K Ω | 100 Ω | | 600.0 |
| 6M Ω | 1K Ω | | 6.000 |
| 60M Ω | 10K Ω | | 60.00 |

Open Circuit Voltage: -1.3V approx.

To Measure Resistance:

1. Turn the power off to the circuit or device that is to be measured and discharge all capacitors before attempting a measurement.
2. Plug the black test lead into the COM port and the red test lead into the  Hz V Ω μ A port.
3. Set the rotary switch to the Ω position.
4. For correct reading, ensure that the device being tested contains no voltage.
5. Connect test leads across the resistor or circuit to be measured.
6. Measure resistance.

Multiplication Guide for Ohms (Ω):

400 = Meter indicates actual resistance

4k = Multiply meter display reading by 1,000 to acquire actual resistance.

40k = Multiply meter display reading by 1,000 to acquire actual resistance.

400k = Multiply meter display reading by 1,000 to acquire actual resistance.

4M = Multiply meter display reading by 1,000,000 to acquire actual resistance

400M = Multiply meter display reading by 1,000,000 to acquire actual resistance.

The meter displays total resistance through all possible paths between the probe-tips. These multiple paths may result in measurements that do not correspond to the ohm value indicated by the resistor color code.

Determining Resistor Values:

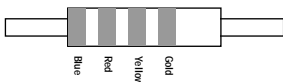
To determine the value of a resistor, use the color bands on the resistor and the table on the following page.



Resistor Color Code Table

| Color | 1st Digit | 2nd Digit | Multiplier | Tolerance (Percentage) |
|----------|-----------|-----------|---------------|------------------------|
| Black | 0 | 0 | 1 | |
| Brown | 1 | 1 | 10 | |
| Red | 2 | 2 | 100 | |
| Orange | 3 | 3 | 1,000 | |
| Yellow | 4 | 4 | 10,000 | |
| Green | 5 | 5 | 100,000 | |
| Blue | 6 | 6 | 1,000,000 | |
| Violet | 7 | 7 | 10,000,000 | |
| Gray | 8 | 8 | 100,000,000 | |
| White | 9 | 9 | 1,000,000,000 | |
| Gold | | | | +/- 5% |
| Silver | | | | +/- 10% |
| No Color | | | | +/- 20% |

Example:



1st color band is blue so the first digit is a 6

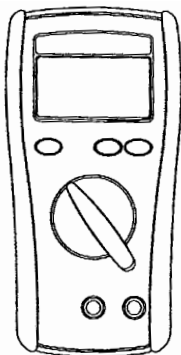
2nd color band is red so the second digit is a 2

3rd color band is yellow so multiply 62 x 10,000

4th color band is gold so the tolerance is $\pm 5\%$

Your Resistor value is 620,000 Ohms ($620\text{k}\Omega$) with a tolerance of $\pm 5\%$.

Diode Testing





| Function | Resolution | Accuracy | Max. Test Current | Max. Open Circuit Voltage |
|----------|------------|------------------|-------------------|---------------------------|
| | 1mV | $+(1.5\% + 5)^*$ | 1.5mA | 3V |

* For 0.4V to 0.8V.

Overload Protection: 600V rms max

Diode Check:

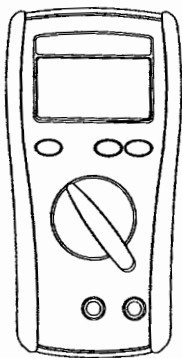
To ensure a proper functioning diode, the meter will develop a voltage across the component from a test current. The diode test function allows for measurements of forward voltage drops across diode and transistor junctions.

1. Turn off power to the device or circuit that is being tested and discharge all capacitors.
2. Plug the black test lead into the COM port and the red test lead into the  Hz V Ω μ A port.
3. Set the rotary switch to the  position.
5. Connect the test leads to the diode.

Forward bias: Good = 0.4 to 0.9V
 Bad = 0 or $\geq 2.0V$

Reverse bias: Good = OL
 Bad = $< 2.0V$



Capacitance



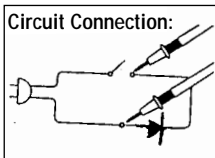
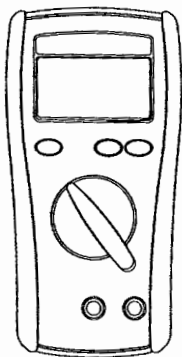
| Range | Resolution | Accuracy |
|-------|------------|------------------------------|
| 6nF | 1pF | ±(1.9% rading + 8 digits) |
| 60nF | 10pF | |
| 600nF | 100pF | |
| 6μF | 1nF | |
| 60μF | 10nF | |
| 600μF | 100nF | |
| 6mF | 1μF | |

Overload Protection: 600V rms

To Measure Capacitance:

1. Plug the black test lead into the COM port and the red test lead into the  Hz V Ω μ A port.
2. Set the rotary switch to the  position.
3. Connect the test leads.
4. Measure capacitance.

Continuity Check

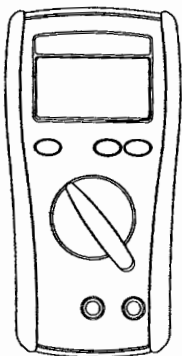


To Verify Continuity:

A continuity test ensures that all circuit connections are intact.

1. Plug the black test lead into the COM port and the red test lead into the \leftarrow Hz V Ω μ A port.
2. Set the rotary switch to the \rightarrow • ||| position.
3. Connect the test leads to the circuit to be measured. The buzzer will sound if the resistance of the circuit measured is lower than 200Ω .

Accessories



For AC Current Clamp (61-451):

1. Plug the black test lead of the clamp adapter handle into the COM port and the red test lead into the $\overline{\leftarrow}$ Hz V Ω μ A port.
2. Set the rotary switch to the \tilde{V} position.
3. Press the range button until mV is displayed. Snap the jaw of the current clamp around one of the current carrying conductors.


Additional Current Clamps:

| | |
|------------|--------|
| 200 AAC | 61-332 |
| 500 AAC | 61-333 |
| 600 AAC/DC | 61-334 |
| 1000 AAC | 61-436 |

Flexible Clamp Adapters

| | |
|----------|--------|
| 1000 AAC | 61-330 |
| 3000 AAC | 61-331 |

General Specifications

| | |
|---------------------------------|--|
| LCD Display: | 6000 count maximum reading |
| Polarity Indication: | Automatic, negative indicated, positive implied |
| Overrange Indication: | "OL" or "-OL" |
| Low Battery Indication: | "  " when the battery voltage drops below operating voltage |
| Size (WxHxD): | 82mm x 164mm x 44mm (without holster) |
| Sampling: | 1 times/sec LCD Display, |
| Auto Power Off: | Approx. 10 min. |
| Operating Temperature: | 0°C ~ 30°C (<80% RH), 30°C ~ 40°C (<75% RH), 40°C ~ 50°C (<45% RH) |
| Storage Temperature: | -20°C ~ 60°C (0~80% RH) when battery removed from meter |
| Temperature Coefficient: | 0.15 x (specified accuracy) / °C, <18°C or >28°C |
| Power Requirements: | IEC LR03, AM4 or AAA size 1.5v x 2 |
| Battery Life: | 300 hours (alkaline) |
| Installation Category: | IEC 1010, 1000V Cat. II, 600V Cat III |

Environmental Conditions

Indoor Use

| | |
|-------------------------------|--|
| Maximum Altitude: | 2000 Meter |
| Installation Category: | IEC 1010, 1000V Cat II, 600V Cat. III |
| Pollution Degree: | 2 |



Maintenance

Warning

To avoid electrical shock, remove test lead before opening the cover. Repairs or servicing not covered in this manual should only be performed by qualified personnel.

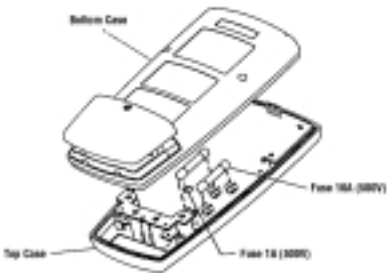
Battery Installation or Replacement:

The #61-320 is powered by two 1.5V batteries.

1. Remove the test leads from the front terminals and turn the meter off.
2. Remove the screw from the battery cover and lift to remove.
3. Replace battery.
4. Make sure the battery box leads do not become pinched between the case and battery cover before replacing the battery cover and screw.

Fuse Replacement

1. Remove the test leads from the front terminals and turn the meter off.
2. Remove the screw from the battery cover and lift to remove.
3. Remove the screws from the bottom case and the inside of the battery cover and lift the case bottom until it unsnaps from the case top.
4. Remove the defective fuse by gently prying one end of the fuse loose and sliding the fuse out of the fuse holder.
5. Install a new fuse of the same size and rating. Make sure it is centered in the fuse holder.
6. Make sure the battery box leads do not become pinched between the case and battery cover before replacing the bottom case and battery cover.



Lifetime Limited Warranty

This meter is warranted to the original purchaser against defects in material or workmanship for the lifetime of the meter. During this warranty period, IDEAL INDUSTRIES, INC. will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the instrument.

Any implied warranties arising out of the sale of an IDEAL product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. The manufacturer shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss.

State laws vary, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.