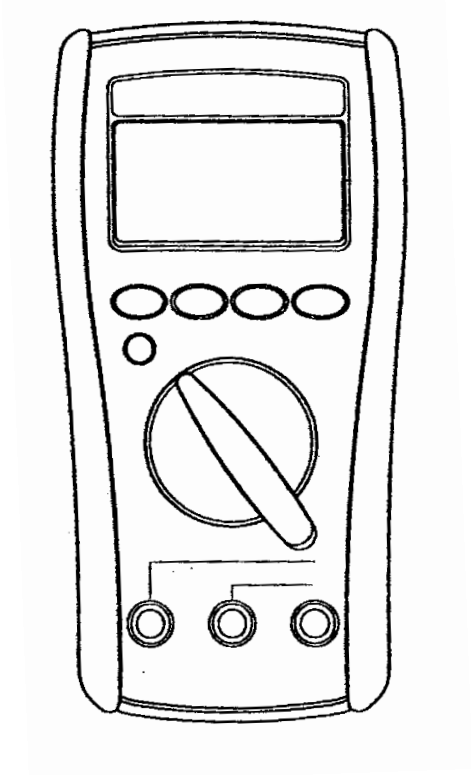
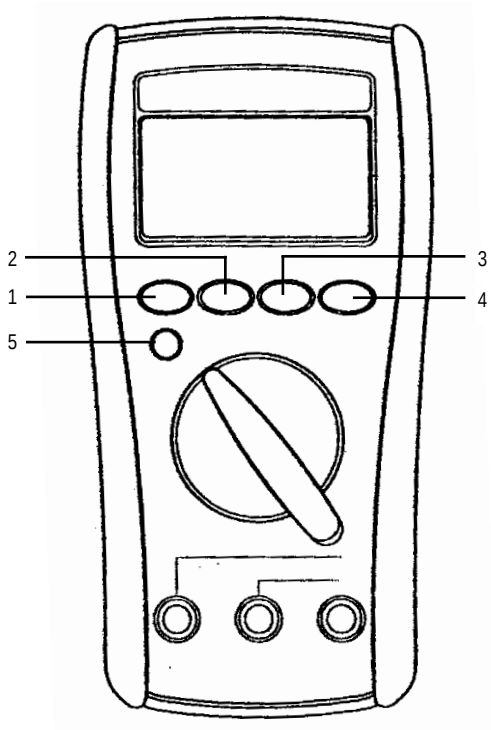
#61-322
#61-324

320 Series Contractor Grade Multimeter



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 more results in the displayed minimum value of the current reating.
- 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. RS-232 Button (61-324 only)

- Pressing the RS-232 button activates data acquisition
- When the RS-232 button is pressed RS232 will appear in the upper middle of the LCD display
- Data will be sent to the computer through the optical RS-232 connection.
- Press the RS-232 button again to stop data acquisition

3. 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 meaurement range.
- To return to auto ranging, hold the range button for >2 seconds.

4. Hold Switch

- The hold button is used to hold the mesured 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.

5. Backlight Buttong (61-324 only)

- Pressing the backlight button enables a light source allowing the end-user to view the LCD in dark areas.

Auto Power Off (APO)

If the meter idles 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 key switch or changing the rotary switch. The meter will give an alarm in 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, RS-232 or min/max. button.

Overload Protection

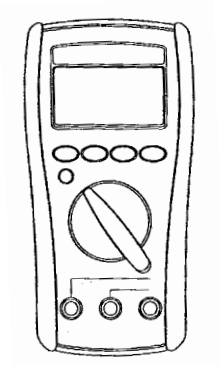
Function	Overload Protection
VAC & VDC	1000V
AAC & ADC	A input: 1A(600V) fast blow fuse µA input: 600V RMS
Ohms (Ω)	600VAC/600VDC
Diode	600VAC/600VDC
Continuity	600VAC/600VDC

Unit of Measure Multipliers

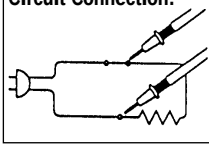
For your reference, the following symbols are often used to make measurement easier:

Symbol	Verbal	Multiplier
M	mega	x 1,000,000
k	kilo	x 1,000
m	milli	÷ 1,000
µ	micro	÷ 1,000,000

True RMS AC Volt



Circuit Connection:



Range	Resolution	Accuracy	Max. Display
600mV	100µV	±(0.9% reading + 5 digits)	600.0
6V	1mV		6.000
60V	10mV		60.00
600V	100mV		600.0
1000V	1V		1000

AC Conversion Type: AC conversions are AC-coupled, true RMS responding, calibrated to the RMS value sine wave input.

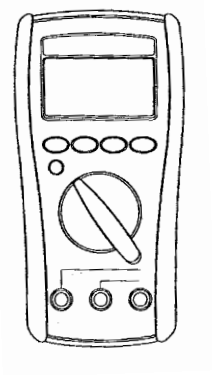
Input and Impedance: 10MΩ less than 100 pF.

Crest Factor: +1.5% additional error for C.F. from 1.4 to 3
+3.0% additional error for C.F. from 3 to 4

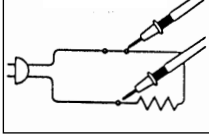
To Measure True RMS AC Voltage:

1. Plug the black test lead into the COM port and the red test lead into the ⊣⊢ Hz V Ω µA port.
2. Set the rotary switch to the Ṽ position.
3. Connect the meter in parallel with the load or circuit.
4. Measure AC Voltage.

DC Volts



Circuit Connection:



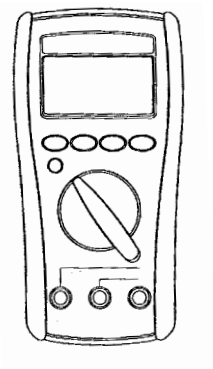
Range	Resolution	Accuracy	Max. Display
600mV	100µV	±(0.5% reading + 2 digits)	600.0
6V	1mV		6.000
60V	10mV		60.00
600V	100mV		600.0
1000V	1V		1000

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

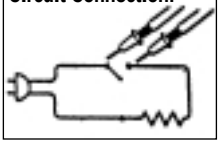
To Measure DC Voltage:

1. Plug the black test lead into the COM port and the red test lead into the ⊣⊱ Hz V Ω µA port.
2. Set the rotary switch to the V̿ position.
3. Connect the meter in parallel with the load or circuit.
4. Measure DC Voltage

True RMS AC Current



Circuit Connection:



Range	Resolution	Accuracy	Voltage Burden	Max
60mA	10µA	+(1.5%	2V max	60.00
600mA	100µA	reading +5		600.0

AC Conversion Type: AC conversions are AC-coupled, true RMS responding, calibrated to the RMS value sine wave input.

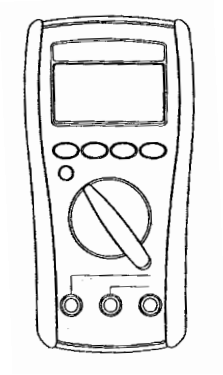
Overload Protection: A input: 1A (600V) fast blow fuse

Crest Factor: +1.5% additional error for C.F. from 1.4 to 3
+3.0% additional error for C.F. from 3 to 4

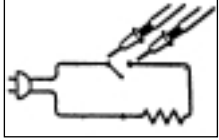
Frequency Response: 40 Hz ~ 500Hz

To Measure True RMS AC Current:
1. Plug the black test lead into the COM port and the red test lead into the mA.
2. Set the rotary switch to the $\tilde{\text{m}}$A.
3. Connect the meter in series with the load or circuit.
4. Measure AC Current.

DC Current



Circuit Connection:



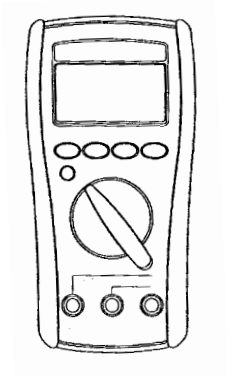
Range	Resolution	Accuracy	Voltage Burden	Max
600µA	0.1µA	±(1.0% reading + 2 digits)	< 4mV / µA	600.0
6000µA	1µA			6.000
60mA	10µA		2V max	60.00
600mA	100µA			600.0

Overload Protection: A Input: (600V) fast blow fuse
µA Input: 600V RMS

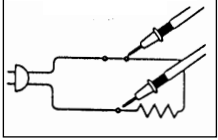
To Measure DC Current:

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

Frequency/RPM



Circuit Connection:



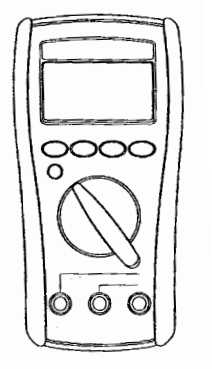
Range	Resolution	Sensitivity	Accuracy
6000Hz	1Hz	100mV RMS	Frequency: 0.01% ±1 digit
60KHz	10Hz		
600KHz	100Hz		
6MHz	1KHz	250mV RMS	
60MHz	10KHz	1V RMS	

Overload Protection: 600V rms
*Less than 20Hz the sensitivity is 1.5V

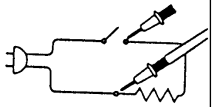
To Measure Frequency:

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

Resistance (Ohms)



Circuit Connection:



Range	Resolution	Accuracy	Max. Display
600Ω	0.1Ω	±(0.7% reading + 2 digits)	600.0
6KΩ	1Ω		6.000
60KΩ	10Ω		60.00
600KΩ	100Ω		600.0
6MΩ	1Ω		6.000
60MΩ	10Ω		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 µA 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 accross 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.

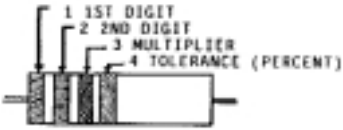
400k = Multiply meter display reading by 1,000 to acquire actual resistance.

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.

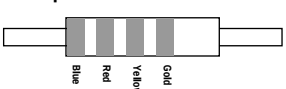
Determining Resistor Values:
To determine the value of a resistor, use the color bands on the resistor and the table on the following page.



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%

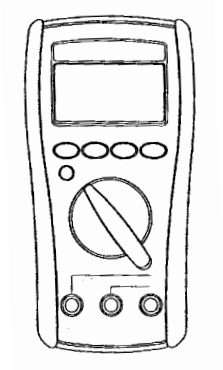
Example:



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 ±5%

Your Resistor value is 620,000 Ohms (620kΩ) with a tolerance of ±5%.

Diode Testing



Function	Resolution	Accuracy	Max.Test Current	Max.Open Circuit Voltage
⊣◀	1mV	+(1.5% +5)*	1.5mA	3V

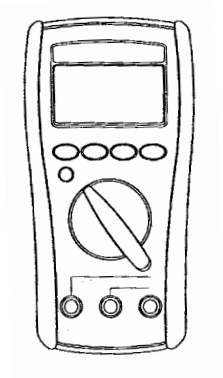
* For 0.4V to 0.8V.

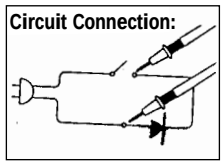
Overload Protection: 600V rms max

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 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 µA 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 ≥2.0V
   Reverse bias: Good = OL
   Bad = <2.0V

Capacitance





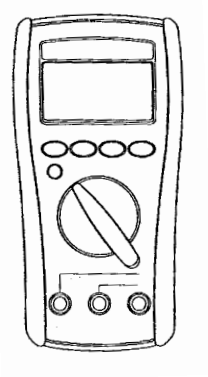
Range	Resolution	Accuracy
6nF	1pF	±(1.9% rading + 8 digits)
60nF	10pF	
600nF	100pF	
6µF	1nF	
60µF	10nF	
600µF	100nF	
6mF	1µF	

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 µA port.
2. Set the rotary switch to the ⊣⊢ position.
3. Connect the test leads to the circuit to be measured.
4. Measure capacitance.

Continuity Check

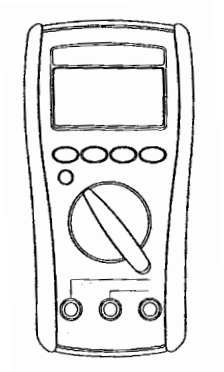


To Verify Continuity:

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 ⊣⋲ Hz V Ω μA port.
2. Set the rotary switch to the ✱ •)) 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 ⊣⊱ Hz V Ω µA port.
2. Set the rotary switch to the $\tilde{V}$ position.
3 Press the range button util mV is displayed. Snap the jaw of the current clamp around one of the current carrying conductors.

Additional Current Clamps:

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

Flexible Clamp Adapters:

1000 AAC	61-330
3000 AAC	61-31

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 time/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:	9V NEDA 1604, 1EC bf 22, J1S 006P
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.

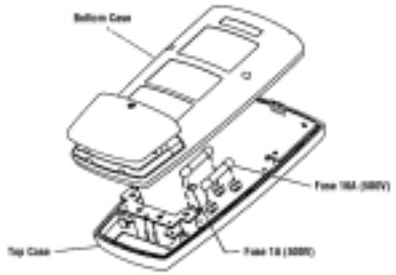
Battery Installation or Replacement:

The #61-324 is powered by one 9V battery.

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.

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