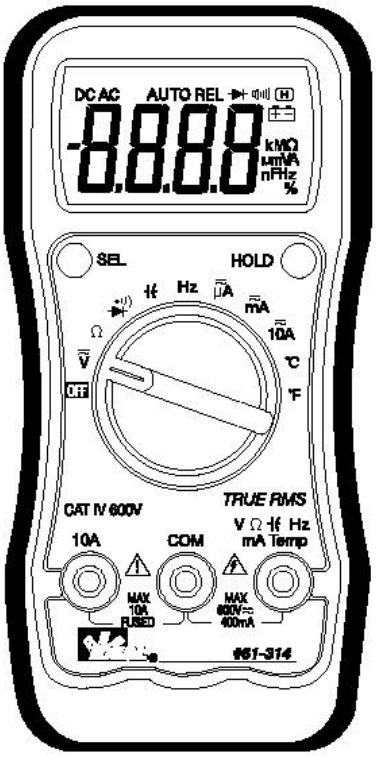
IDEAL INDUSTRIES, INC.

TECHNICAL MANUAL

MODELS: 61-312
61-314

The Service Information provides the following information:

- Precautions and safety information
- Specifications
- Basic maintenance (cleaning, replacing the battery and fuses)
- Performance test procedures
- Calibration and calibration adjustment procedures



Form Number: TM61312-4

Revision: 2. Date: August 2007

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Introduction

⚠Warning

To avoid shock or injury, do not perform the verification tests or calibration procedures described in the manual unless you are qualified to do so.
The information provided in this document is for the use of qualified personnel only.

⚠Caution

The 61-312 and 61-314 series contain parts that can be damaged by static discharge. Follow the standard practices for handling static sensitive devices.

For additional information about IDEAL INDUSTRIES, INC. and its products, and services, visit IDEAL INDUSTRIES, INC. web site at:
www.idealindustries.com

Precautions and Safety Information

Use the meter only as described in the Service Manual. If you do not do so, the protection provided by the meter may be impaired. Read the “Safety Information” page before servicing this product.
In this manual, a **Warning** identifies conditions and actions that pose hazard (s) to the user; a **Caution** identifies conditions and actions that may damage the meter or the test instruments.

The Symbols

The symbols used on the meter and in this manual are explained in Table A.

Table A. The Symbols

	Risk of electric shock
	Refer to the manual. Important information.
	DC measurement
	Equipment protected by double or reinforced insulation
	Battery
	Earth
	AC measurement
	Conforms to EU directives

SAFETY

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use the product only as specified.

For operating instructions, see the 61-312 / 61-314 Digital Multimeter Instruction Manual.

⚠**CAUTION:** These statements identify conditions or practices that could result in damage to the equipment or other property.

⚠**WARNING:** These statements identify conditions or practices that could result in personal injury or loss of life.

Use proper Fuse. To avoid fire hazard, use only the fuse type and rating specified for this product.

Do not operate without covers. To avoid personal injury, do not apply any voltage or current to the product without covers in place.

Do not Exceed the maximum rated input limits, as marked on the meter.

Electric overload. Never apply a voltage to a connector on the product that is outside the range specified for that connector.

Avoid electric shock. To avoid injury or loss of life, do not connect or disconnect probes or test leads while they are connected to a voltage source.

Do not operate in wet/damp conditions. To avoid electric shock, do not operate this product in wet or damp conditions.

Use great care when you are required to make measurements on live circuits that exceed 50V.

SPECIFICATIONS

All specifications are warranted unless noted typical and apply to the 61-312 & 61-314
Stated accuracies are at 23°C±5°C at less than 80% relative humidity and without the battery indicator displayed.

General specifications

Characteristics	Description
Display count	3 3/4 digit liquid crystal display, max count 3999
Numeric update rate	1.5 times / sec
Polarity display	Automatic
Over range display	"OL" is displayed
Low battery indicator	is indicated
Automatic power-off time	Automatic backlight off ≈ 15minutes
Power source	1.5V AAA ×2 battery for 61-312 9.0V battery: types- NEDA 1604, JIS006P, IEC6F22 for 61-314
*Maximum input voltage	600Vrms CAT II between V and COM
*Maximum floating voltage	600Vrms CAT II between any terminal and earth ground
Maximum input current	400mA between mA and COM
Overload protection mA connector	500mA (250V) fast blow fuse.
Overload protection 10A connector	10A (250V) fast blow fuse.
V connector	**V**~, **V**⎓, **Ω**, •))), ⊣◀, ⊣◀, Hz, mA, Temp
Temperature Coefficient	0.1×(Spec. Accuracy) per °C, <18°C or >28°C
Battery Life	Alkaline 1.5V×2 AA, ≈ 200 hours for 61-312 Alkaline 9V, ≈ 200 hours for 61-314

Measurement Characteristics

Accuracy is ±(% reading + number of digits) at 23°C ± 5°C, less than 80% R.H.

(1) DC Volts(for 61-312 / 61-314)

Range	Resolution	Accuracy	Over voltage protection
400.0mV	0.1mV	±(0.8% reading + 4 digits)	600V rms
4.000V	1mV		
40.00V	10mV		
400.0V	100mV		
600V	1V		

Input Impedance: 10MΩ

(2a) AC Volts (61-312 only)

Range	Resolution	Accuracy		Over voltage protection
4.000V	1mV	50-60Hz 1.2% + 5	40-400Hz 1.5% + 5	600V rms
40.00V	10mV			
400.0V	100mV			
600V	1V			

Input Impedance: 4.5MΩ

AC Conversion Type: 61-312: Average sensing rms indication calibrated to the sine wave input.

(2b) AC Volts (61-314 only)

Range	Resolution	Accuracy		Over voltage Protection
4.000V	1mV	50-60Hz 1.2% + 8	40-400Hz 1.5% + 8	600V rms
40.00V	10mV			
400.0V	100mV			
600V	1V			

Input Impedance: 4.5MΩ

AC Conversion Type:61-314 model only: AC conversion is ac-coupled, True RMS responding, calibrated to a sinusoidal waveform

Crest Factor: C.F. = Peak/RMS

For non-sinusoidal waveform, C.F. > 2 add ±1% to accuracy,

(3a) DC micro-amp and milli-amps (for 61-312 / 61-314)

Range	Resolution	Accuracy	Input Prodection
400.0µA	0.1µA	±(1.2% reading + 5 digits)*	500mA, 250V Fast Blow Fuse
4000µA	1µA		
40.00mA	10µA		
400.0mA	0.1mA		

Overload Protection: mA Input: 500mA, 250V Fast Blow fuse. (61-312 / 61-314)

(3b) DC Current (61-312 / 61-314)

Range	Resolution	Accuracy	Input Protection
4.000A	.001mA	±(1.5% reading + 5 digits)	10A, 250V Fast Blow Fuse
10.00A*	.01mA		

Overload Protection: A Input: 10A, 250V Fast Blow fuse. (61-312 / 61-314)

*⚠**Caution:** *Do not make high current measurements on the 10A scale for longer that 15 seconds. This should be followed by a 15 minute cool down period. Exceeding 15 seconds may cause damage to the meter and/or the test leads.*

(4a) AC micro-amp and milli-amps Current (61-312 / 61-314)

Range	Resolution	Accuracy	Input Protection
400.0µA	0.1µA	±(1.5% reading + 5 digits) *[1] 40Hz ~ 400Hz	500mA, 250V Fast Blow Fuse
4000µA	1µA		
40.00mA	10µA		
400.0mA	0.1mA		

Overload Protection: mA Input: 500mA, 250V Fast Blow fuse. (61-312 / 61-314)

(4b) AC Current (61-312 / 61-314)

Range	Resolution	Accuracy	Input Protection
4.000A	.001mA	±(2.0% reading + 5 digits) *[1] 40Hz ~ 400Hz	10A, 250V Fast Blow Fuse
10.00A*	.01mA		

Overload Protection: A Input: 10A (250V) Fast Blow fuse.

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

*[1] The specified accuracy is for sine wave at full scale and non-sine wave at half scale with crest factor up to 2.

*⚠**Caution:** *Do not make high current measurements on the 10A scale for longer that 15 seconds. This should be followed by a 15 minute cool down period. Exceeding 15 seconds may cause damage to the meter and/or the test leads.*

(5) Resistance (for 61-312 / 61-314)

Range	Resolution	Accuracy	Over voltage protection
400.0Ω *1	0.1Ω	±(1.0% reading + 4 digits)	250V rms
4.000KΩ	1Ω		
40.00KΩ	10Ω		
400.0KΩ	100Ω		
4.000MΩ	1KΩ	±(1.2% reading + 4 digits)	
40.00MΩ *2	10KΩ	±(1.5% reading + 5 digits)	

Open circuit Voltage: -1.5V approx.

*1 < 5 digit of reading rolling.

*2 < 2% of reading rolling.

(6) Diode Check and Continuity (for 61-312 / 61-314)

Range	Resolution	Accuracy	Max. Test Current	Max. Open Circuit Voltage
⊣◁⊢	1mV	Not specified *	<1mA, approx.	1.5V, approx.

Overload Protection: Not specified

Continuity: Built-in buzzer sounds when resistance is less than approximately 30 Ω with a response time of approximately 100 msec.

(7) Capacitance (for 61-312 / 61-314)

Range	Resolution	Accuracy	Over voltage Protection
4.000nF *1	1pF	±(3% reading + 5 digits)	250V rms
40.00nF	10pF		
400.0nF	100pF	±(3% reading + 5 digits)	
4.000μF	1nF		
40.00μF	10nF		
100μF	100nF		
4.000mF *1	1μF	±(5% reading + 20 digits) *2	
40.00mF *1	10μF		

*1 In this range the accuracy is not applicable and the reading maybe rolling within specification.

*2 Specify reading < half full scale of range.

Note: The meter selects the proper range automatically. Each measurement takes about one second per range. Readings >40.00μF will take ≈ 8 seconds or greater

(8) Frequency (for 61-312 / 61-314)

Range	Resolution	Sensitivity	Accuracy	Overload protection
10.00Hz	.01Hz	1V rms	Frequency: (±0.3% + 4 digits)	250V rms
100.0Hz	.1Hz			
1.000KHz	1Hz			
10.00KHz	10Hz			
100.0KHz	100Hz			
1.000MHz	1KHz	5V rms		
10.00MHz	10KHz			

(9) Temperature: Type K thermocouple (for 61-312 / 61-314)

Range	Resolution	Accuracy	Overload protection
-20 to 300 ºC	1º	±1.0% + 4	Not Specified
301 to 750 ºC	1º	±3.0% + 5	
-4 to 572 ºF	1º	±1.0% + 4	
573 to 1382ºF	1º	±3.0% + 5	

(10) Auto Power Off (APO)

If the meter idles for more than ≈ 15 minutes, the meter automatically turns the power off.

(11) Data Hold

Press the **HOLD** button to freeze the reading in the display, **"H"** will appear on LCD display.
Press the **HOLD** button again to release the data hold function.

Physical and Environmental Characteristics

Characteristics	Description
Dimensions (H×W×D)	150mm(H) ×76mm (W) ×38mm(D) (with holster) 5.9” (H) x 3.0”(W) x1.5”(D)
Weight (with battery& holster)	0.219Kg (7.1 oz.)
Environmental characteristics	**Description**
Temperature operating	0 to +40°C
Non-Operating	-20 to +60°C <80% R.H.
Humidity (operating)	<70% R.H.
Altitude	6561.7 Ft. (2000m)
Indoor Use	Indoor Use

Certifications and compliances

Safety	Complies with UL 61010B-1
Input Safety Rating	V / Ω/Temp/mA, UL 61010B-1, UL 61010-B-2-031, EU 61010-1 EN61010-2-031, Cat IV 600Volts, Cat III 1000V
	CAT IV: Service drop to service entrance,
	CAT III: Distribution level mains, fixed installation.
	CAT II: Local level mains, appliances, portable equipment
	CAT I: Signal level, special equipment or parts of equipment, telecommunication, electronics.
Pollution Degree 2	Do not operate in environments where conductive Pollutants may be present.
EC Declaration of Conformity	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/EEC for product safety. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities: En 55011 Class A: Radiated and Conducted Emissions. En 50082-1 Immunity: IEC 801-2 Electrostatic Discharge IEC 801-3 RF Radiated En 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

Required Equipment

Required equipment is listed in Table B. If the recommended models are not available, equipment with equivalent specifications may be used.
Repairs or servicing should be performed only by qualified personnel.

Table B. Required Equipment

Equipment	Required Characteristics	Recommended Model
Calibrator	**AC Voltage Range:** 0 ~ 750V AC **Accuracy:** ±0.07% (Basic) **Frequency Range:** 40 ~ 1KHz **Accuracy:** ±2% **DC Voltage Range:** 0 ~ 1000V DC **Accuracy:** ±0.006% (Basic) **Current Range:** 0 ~ 10A **Accuracy:** AC (40Hz to 1KHz): ±0.08% (Basic) DC: ±0.02% (Basic) **Frequency Source:** 5.00Hz ~ 100MHz **Accuracy:** ±0.001% **Amplitude:** 0.5V p-p ~ 1.0V p-p (square wave) **Accuracy:** ±5% **Resistance Range:** 1Ω ~ 100MΩ **Accuracy:** ±0.03% (Basic) **Capacitance Range:** 1pF ~ 10mF **Accuracy:** ±0.10% (Basic)	Fluke 5500 or Wavetek 9100 Calibrator or equipment

Basic Maintenance

⚠Warning

To avoid shock, remove the test leads and any input signals before opening the case or replacing the battery or fuses.

Opening the Meter Case

⚠Caution

To avoid unintentional shock circuit, always place the uncovered meter assembly on a protective surface. When the case of the meter is open, circuit connections are exposed.

1. Disconnect test leads from any live source, turn the rotary switch to OFF, and remove the test leads from front terminals.
2. For battery replacement, follow instructions under **Replacing the Battery** section
3. For Fuse replacement, follow instructions under **Fuse Replacement** section.

Replacing the Battery

The 61-312 Meter is powered by (2) AAA 1.5V batteries,

The 61-314 Meter is powered by (1) 9V battery, types are, NEDA 1604, JIS006P, IEC 6F22

1. Remove the rubber holster
2. Remove the two screws on the battery cover and open the battery cover
3. Unsnap or remove the old battery(s) and snap or install the new battery(s)
4. Return the battery cover and reinstall the two battery cover screws.
5. Replace the rubber boot.

Battery and Fuse Replacement

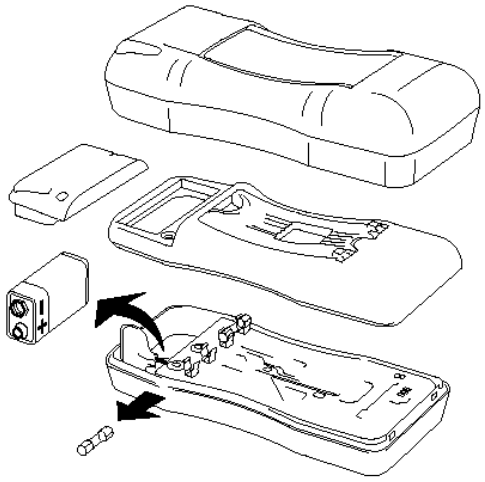


Figure 1

Replacing Fuses

⚠Warning

To avoid electrical shock, remove the test leads and any input signals before replacing the battery or fuses. To prevent damage or injury, INSTALL ONLY quick acting fuses with the following Volt/Amp current interrupt rating:

F312: 500mV, 250V Fast Blow Fuse

F314: 10A, 250V Fast Blow Fuse

Fuse Replacement

The **61-312** and **61-314** are fused in both the **VmA** input and **10A** input port.
The **VmA** input port is fused by a F312: 500mV, 250V FAST BLOW fuse.
The **10A** input port is fused by F314: 10A, 250V FAST BLOW fuse.

1. Remove the rubber holster
2. Remove the two screws on the battery cover and open the battery cover
3. Remove the two screws under the battery cover.
4. Unsnap or remove the old battery, and remove the back case cover.
5. * Replace the defective fuse with the standard rated fuse for this meter
6. Return the back case cover. Reinsert the case screws.
    a. It is recommended you replace the old battery(s) with new battery(s).
7. Return the battery cover and reinstall the two battery cover screws.
8. Replace the rubber boot.

***⚠CAUTION: Use only a fuse with the amperage, interrupt voltage, and speed rating specified.**

Cleaning

⚠Warning

To avoid electrical shock or damage to the meter, never allow water inside the case. To avoid damaging the meter's housing, never apply solvents to the meter.

Performance Tests

The following performance tests verify the complete operability of the meter and check the accuracy of each meter function against the meter's specifications.

For operating instructions, see the 61-312 / 61-314 Digital Multimeter Instruction Manual.

Accuracy specifications are valid for a period of one year after calibration, when measured at an operating temperature of 18°C to 28°C and a maximum of 80% relative humidity.

To perform the following tests, it is not necessary to open the case, no adjustments are necessary, merely make the required connections, apply the designated inputs, and determine if the reading on the meter display falls within the acceptable range indicated.

If the meter fails any of these tests, it needs calibration adjustment or repair.

Testing the Display

Check display as unit is powered up. You may need to power up and down several times to confirm display segments and HOLD indicator.

LCD Graphics 61-312 / 61-314

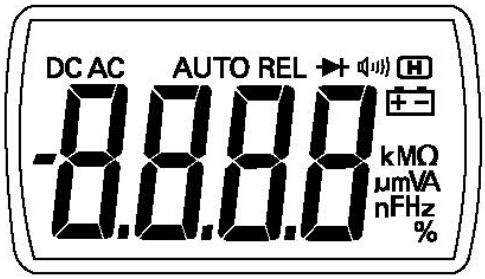


Figure 2 Display Test

Testing the Voltage Function (for 61-312 / 61-314)

To verify accuracy in the AC and DC voltage ranges, do the following:

1. Turn the rotary switch to "**V≂**" position.
   Press the **SEL** Button to select the **DC** function
2. Connect the calibrator to the **VΩ⊣⊢Hz** and **COM** inputs on the meter.
3. Set the calibrator for the voltage and frequency for steps 1 through 7 in Table 1.
4. Compare the reading on the meter display with the display reading shown in Table 1.
5. If the display reading falls outside of the range shown in Table 1, the meter does not meet specification.

Table 1 DC Voltage Test:

Step	Range	Input	Reading
1	400mV	-300.0mV	-297.2 to –302.8
2	400mV	4.0mV	3.6 to 4.4
3	400mV	300.0mV	297.2 to 302.8
4	4V	3.000V	2.972 to 3.028
5	40V	30.00V	29.72 to 30.28
6	400V	300.0V	297.2 to 302.8
7	600V	600V	591 to 609

6. Turn the rotary switch to position. **"V≂**"
   Press the **SEL** Button to select the **AC** function
7. Set the calibration for the voltage for steps 1 through 10 in Table 2.
8. Compare the reading on the meter display with the display reading shown in Table 2.
9. If the display reading falls outside of the range shown in Table 2, the meter does not meet specification.

Table 2 AC Voltage Test:

Step	Range	Input	Frequency	Reading 61-312	Reading 61-314
1	4V	3.000V	60Hz	2.959 to 3.041	2.959 to 3.041
2	4V	3.000V	400Hz	2.950 to 3.050	2.947 to 3.053
3	40V	30.00V	60Hz	29.59 to 30.41	29.59 to 30.50
4	40V	30.00V	400Hz	29.50 to 30.50	29.47 to 30.53
5	400V	300.0V	60Hz	295.9 to 304.1	295.9 to 304.1
6	400V	300.0V	400Hz	295.0 to 305.0	294.7 to 305.3
7	600V	600V	60Hz	588 to 612	588 to 612
8	600V	600V	400Hz	586 to 614	583 to 617

Testing the DC microamperes Function (for 61-312 and 61-314)

To verify the accuracy of **AC** and **DC** current measurement functions, do the following:

1. Connect the calibrator to the **VΩ⊣(Hz** and **COM** inputs on the meter.
2. Turn the rotary switch to μA≂.
   a. Press the **SEL** Button to select the **DC** function
3. Apply the inputs for steps 1 through 3 in Table 3a.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 3a
5. If the display reading falls outside of the range shown in Table 3a, the meter does not meet specification.

Table 3a DC microamperes Test:

Step	Range	Source	Reading
1	400μA	4.0μA	3.5 to 4.5
2	400μA	300.0μA	295.9 to 304.1
3	4000μA	3000μA	2959 to 3041

Testing the DC milliamperes Function (for 61-312 and 61-314)

1. Connect the calibrator to the **VΩ⊣(Hz** and **COM** inputs on the meter.
2. Turn the rotary switch to mA≂.
   a. Press the **SEL** button to select the **DC** function
3. Apply the inputs for steps 1 through 2 in Table 3b.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 3b
5. If the display reading falls outside of the range shown in Table 3b, the meter does not meet specification.

Table 3b DC mA Test:

Step	Range	Source	Reading
1	40mA	30.00mA	29.59 to 30.41
2	400mA	300.0mA	295.9 to 304.1

Testing the DC ampere Function (for 61-312 and 61-314)

1. Connect the calibrator to the **10A** and **COM** inputs on the meter.
2. Turn the rotary switch to A⎓.
    a. Press the **SEL** button to select the **DC** function
3. Apply the inputs for steps 1 through 2 in Table 3c.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 3c
5. If the display reading falls outside of the range shown in Table 3c, the meter does not meet specification.

Table 3c DCA Test:

Step	Range	Source	Reading
1	4A	3.000A	2.959 to 3.041
2	10A	10.00A	9.80 to 10.20

Testing the AC microampere Function (for 61-312 and 61-314)

To verify the accuracy of **AC** and **DC** current measurement functions, do the following:

1. 1.Connect the calibrator to the **VΩ~~kHz~~** and **COM** inputs on the meter.
2. Turn the rotary switch to μA⎓.
    a. Press the **SEL** button to select the **AC** function
3. Apply the inputs for steps 1 through 6 in Table 4a.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 4a
5. If the display reading falls outside of the range shown in Table 4a, the meter does not meet specification.

Table 4a AC microampere Test:

Step	Range	Source	Frequency	Reading
1	400µA	40µA	60Hz	29.0 to 40.9
2	400µA	40µA	400Hz	29.0 to 40.9
3	400µA	300.0µA	60Hz	295.0 to 305.0
4	400µA	300.0µA	400Hz	295.0 to 305.0
5	4000µA	3000µA	60Hz	2950 to 3050
6	4000µA	3000µA	400Hz	2950 to 3050

Testing the AC milliampere function: (for 61-312 and 61-314)

1. Connect the calibrator to the **VΩ⊣⊢Hz** and **COM** inputs on the meter.
2. Turn the rotary switch to mA≂.
   a. Press the **SEL** button to select the **AC** function
3. Apply the inputs for steps 1 through 4 in Table 4b.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 4b
5. If the display reading falls outside of the range shown in Table 4b, the meter does not meet specification.

Table 4b AC mA Test:

Step	Range	Source	Frequency	Reading
1	40mA	30.00mA	60Hz	29.50 to 30.50
2	40mA	30.00mA	400Hz	29.50 to 30.50
3	400mA	300.0mA	60Hz	295.0 to 305.0
4	400mA	300.0mA	400Hz	295.0 to 305.0

Testing the AC A function (for 61-312 / 61-314)

1. Connect the calibrator to the **VΩ⊣⊢Hz** and **COM** inputs on the meter.
2. Turn the rotary switch to A≂.
   a. Press the **SEL** button to select the **AC** function
3. Apply the inputs for steps 1 through 4 in Table 4c.
4. For each input, compare the reading on the meter display to the reading for your meter in Table 4c
5. If the display reading falls outside of the range shown in Table 4c, the meter does not meet specification.

Table 4c AC A Test:

Step	Range	Source	Frequency	Reading
1	4A	3.000A	60Hz	2.935 to 3.065
2	4A	3.000A	400Hz	2.935 to 3.065
3	10A	10A	60Hz	9.75 to 10.25
4	10A	10A	400Hz	9.75 to 10.25

Testing the Resistance Function (for 61-312 / 61-314)

To verify the accuracy of the resistance function, do the following:

1. Connect the calibrator to **VΩ~~kHz~~** and **COM** on the meter.
2. Turn the rotary switch to **Ω.**
3. Apply the inputs for steps 1 through 7 in Table 5.
4. Compare the meter display readings to the display readings in Table 5.
5. If the display reading falls outside of the range shown in Table 5, the meter does not meet specification.

Table 5 Ω Resistance Test:

Step	Range	Source	Reading
1	400Ω*	4.0Ω	3.6 to 4.4
2	400Ω*	300.0Ω	296.6 to 303.4
3	4kΩ	3.000KΩ	2.966 to 3.034
4	40kΩ	30.00KΩ	29.66 to 30.34
5	400kΩ	300.0KΩ	296.6 to 303.4
6	4MΩ	3.000MΩ	2.960 to 3.040
7	40MΩ	30.00MΩ	29.50 to 30.50

*Lead resistance on the 400Ω range is not included in error.

Testing the Capacitance Function (for 61-312 / 61-314)

The meter measures capacitance by charging the capacitor with a known direct current, measuring the resultant voltage, and calculating the capacitance. If the same capacitance is measured on an impedance bridge, a different reading may result. This variance is likely to be greater at higher frequencies.

To verify the accuracy of the capacitance measuring function, do the following:

1. Apply the capacitor to the **VΩ⊣⊢Hz** and **COM** inputs on the meter. For steps1 through 6 in Table 6.
2. Turn the rotary switch to ⊣⊢.
3. Compare the reading on the meter display to the reading in Table 6.

Note: The meter selects the proper range automatically. Each measurement takes about one second per range. Readings >40.00µF will take ≥ 5 to 10seconds

4. If the display reading falls outside of the range shown in Table 6, the meter does not meet specification.

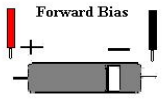
Table 6 Capacitance Test:

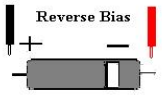
Step	Range	Source	Reading
1	40nF	10.000nF	9.65 to 10.35
2	40nF	30.00nF	29.05 to 30.95
3	400nF	300.0nF	290.5 to 309.5
4	4µF	3.000µF	2.905 to 3.095
5	40.00µF	30.00µF	29.05 to 30.95
6	100.0µF	100.0µF	96.5 to 103.5

Checking the Diode Test Function (for 61-312 / 61-314)

To check the diode test function, do the following:

1. Connect the DVM (Digital Voltage Meter) leads to the **VΩ⊣⊢Hz** and **COM** inputs on the meter.
2. Turn the meter's rotary switch to ⊣◀ •)).
   - The DVM display should display OL
3. Insert a Si diode with correct polarity "+" and "-"
   - The meter display should read within 0.5~0.7Vdc
4. Reverse polarity on the Si diode
   - The meter display should read OL
5. Apply a 20-ohm resistor to the meter, the built-in buzzer buzzes.





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Testing the Frequency Function (for 61-312 / 61-314)

To verify the accuracy of the meter's frequency function, do the following:

1. Connect the calibrator to the **VΩ~~K~~Hz** and **COM** inputs on the meter.

   Note: The accuracy of the calibrator's frequency function must be appropriate for the specified accuracy of the meter.
2. Set the rotary switch to **Hz**.
3. Set the calibrator or function generator for the square wave voltage and frequency for steps 1 through 6 of Table 7.
4. Compare the reading on the meter display with the display reading shown in Table 7.
5. If the display reading falls outside of the range shown in Table 7, the meter does not meet specification.

Table 7 Frequency Test:

Step	Range	Source	Level	Reading
1	10Hz	9.0Hz	3V rms	8.969 to 9.031
2	100Hz	90Hz	3V rms	89.69 to 90.31
3	1kHz	900Hz	3V rms	896.9 to 903.1
4	10kHz	9kHz	3V rms	8.969 to 9.031
5	100kHz	90kHz	3V rms	89.69 to 90.31
6	1MHz	900kHZ	3V rms	896.9 to 903.1

Testing the Temperature Function (for 61-312 / 61-314)

To verify the accuracy of the meter's frequency function, do the following:

1. Connect the calibrator to the **VΩ⊣⊢Hz** and **COM** inputs on the meter.
2. Set the rotary switch to the **ºC** or **ºF** as instructed in Table 8.
3. Set the calibrator temperature output to the source values in Table 8, steps 1 through 7.
4. Compare the reading on the meter display with the display reading shown in Table 8.
5. If the display reading falls outside of the range shown in Table 8, the meter does not meet specification.

Table 8 Temperature Test:

Step	Range	Source	Reading
1	ºC	-20 ºC	-24 to –16
2	ºC	0 ºC	-4 to 4
3	ºC	300 ºC	293 to 307
4	ºC	750 ºC	722 to 778
5	ºF	-4 ºF	-8 to 0
6	ºF	32 ºF	28 to 36
7	ºF	1382 ºF	1336 to 1428

Calibration Procedure

Recalibrate your meter:

It is recommended that the multimeter be calibrated once each year.

1. Perform calibration at an ambient temperature of 23°C±2°C and a relative humidity of <70%. Disconnect the test leads and turn the meter off. Remove the test leads from the front terminals.
2. Position the meter face down. Remove the battery cover screws and the 2 bottom case cover screws.
3. Lift the end of the bottom case cover until it gently unsnaps from the case top at the end nearest the LCD.

(A) DC V Calibration (Adjust VR1)

1. Set the rotary switch to position **"V≂**". Press the **SEL** button For the **DC** Volts Function.
2. Set the output of DC calibrator for 300.0mV and connect to **V/Ω/Temp** and **COM** input terminals on meter.
3. Using a small flat-tipped screwdriver, adjust **VR1** until the display reads 299.5 to 300.5mV
4. Disconnect the DC calibrator from the meter.

(B) AC V Calibration (Adjust VR2)

1. Set the rotary switch to position. **"V≂**" Press the **SEL** button For the **AC** Volts Function.
2. Set the output of the calibrator for 3.000V at 60Hz. and connect to **V/Ω/Temp** and **COM** input terminals on meter.
3. Using a small flat-tipped screwdriver, adjust **VR2** until the display reads 2.995 to 3.005Volts.
4. Disconnect the AC calibrator from the meter.

(C) DC A Calibration (Adjust VR7)

1. Set the rotary switch to the "**10A** " position and use the **SEL** button to set **DC** function.
2. Set the output of the calibrator to 3A DC
3. Connect the calibrator current output to the **10A** and **COM** input terminals on meter.
4. Using a small flat-tipped screwdriver to adjust **VR7** until the display reads 2.995 to 3.005 amps

(D) ºC Calibration (Adjust VR3)

1. Set the rotary switch to the **"ºC** " position.
2. Set the output of the calibrator to 0 ºC
3. Connect the calibrator temperature output to the **V/Ω/Temp** and **COM** input terminals
4. Using a small flat-tipped screwdriver to adjust **VR3** for a 0 ºC ±1ºC (-1 to 1) display

(E) ºC Calibration (Adjust VR5)

1. Set the rotary switch to the **"ºC** " position.
2. Set the output of the calibrator to 300 ºC
3. Connect the calibrator temperature output to the **V/Ω/Temp** and **COM** input
4. Using a small flat-tipped screwdriver adjust **VR5** for a 300 ºC ±1 ºC (299 to 301) display

(F) ºF Calibration (Adjust VR4)

1. Set the rotary switch to the **"ºF** " position.
2. Set the output of the calibrator to 32 ºF
3. Connect the calibrator temperature output to the **V/Ω/Temp** and **COM** input
4. Using a small flat-tipped screwdriver adjust **VR4** for a 32 ºF ±1ºF (31 to 33) display

(G) ºF Calibration (Adjust VR6)

1. Set the rotary switch to the **"ºF** " position.
2. Set the output of the calibrator to 572 ºF
3. Connect the calibrator temperature output to the **V/Ω/Temp** and **COM** input
4. Using a small flat-tipped screwdriver adjust **VR6** for a 572 ºF ±2ºF (570 to 574) display