

IDEAL INDUSTRIES, INC.

TECHNICAL MANUAL

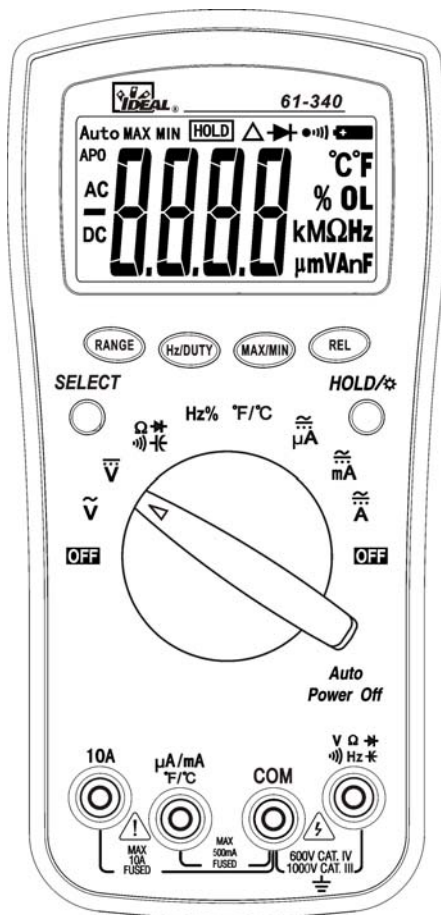
MODEL: 61-340

MODEL: 61-342

Multimeter Service Information

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: TM61340-2

Revision: 3. Date: January 2008

TABLE OF CONTENTS	Page
Introduction	1
Precautions and Safety Information	1
Symbols	1
Safety	2
Specifications	3
General Specifications	3
Measurement Characteristics	4
Voltage Specifications	4
Current Specifications	4/5
Resistance, Diode, Continuity, Capacitance Specifications	6
Frequency, Temperature Specifications	7
Auto Power Off, Data Hold/Backlight, SELECT, RANGE, REL, Hz/DUTY, MAX/MIN	7/8
Physical and Environment Characteristics	9
Certifications and Compliances	9
Required Equipment	10
Basic Maintenance	11
Opening the Meter Case	11
Replacing the Battery	11
Replacing Fuses	12
Fuse Replacement	12
Cleaning	12
Performance Tests	13
Testing the Display	13
Testing the Voltage Function	14/15
Testing the DC Current Functions	15/16
Testing the AC Current Functions	16/17
Testing the Resistance Function	18
Testing the Capacitance, Diode, Continuity Functions	18/19
Testing the Frequency Function	20
Testing the DUTY CYCLE Function	20
Testing the Temperature Function	21
Calibration	22
Calibration Adjustment, DCV, ACV DCA and Temperature Functions	22/23

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 61-340 serials 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
	See instruction card (Caution information)
	DC measurement
	Equipment protected by double or reinforced insulation
	Low Battery indicator
	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 61-340 / 61-342 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.

Measurement Characteristics

Accuracy is \pm (% reading + number of digits) at 23°C \pm 5°C, less than 75% R.H.

(1) DC Volts (for 61-340 / 61-342)

Range	Resolution	Accuracy	Over voltage protection
400.0mV	0.1mV	\pm (0.5% reading + 5 digits)	900VDC or 750VAC
4.000V	1mV		
40.00V	10mV		
400.0V	100mV		
600V	1V	\pm (1.0% reading + 3 digits)	

Input Impedance: 10M Ω

(2) AC Volts (61-340/61-342)

Range	Resolution	Accuracy	Over voltage protection
400.0mV	0.1mV	\pm (1.5% + 5)	900VDC or 750VAC
4.000V	1mV		
40.00V	10mV		
400.0V	100mV		
600V	1V		

Input Impedance: 10M Ω

AC Conversion Type: **61-340:** Average sensing rms indication calibrated to the sine wave input.

61-342: AC conversion is True RMS responding, calibrated to a sinusoidal waveform

Crest Factor: C.F. = Peak/RMS

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

Frequency response: 40~400Hz

(3a) DC micro-amp and milli-amps (for 61-340 / 61-342)

Range	Resolution	Accuracy	Input Protection
400.0 μ A	0.1 μ A	\pm (0.5% reading + 5 digits)	500mA, 600V Fast Blow Fuse
4000 μ A	1 μ A		
40.00mA	10 μ A		
400.0mA	0.1mA		

Overload Protection: mA Input: 500mA, 600V Fast Blow fuse. (61-340 / 61-342)

(3b) DC Current (61-340 / 61-342)

Range	Resolution	Accuracy	Input Protection
4.000A	0.001A	±(1.5% reading + 5 digits)	10A, 500V Fast Blow Fuse
10.00A*	0.01A		

Overload Protection: A Input: 10A, 500V Fast Blow fuse. (61-340 / 61-342)

***Caution:** Do not make high current measurements on the 10A scale for longer than 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 (61-340 / 61-342)

Range	Resolution	Accuracy	Input Protection
400.0µA	0.1µA	±(1.5% reading + 5 digits) ** 40Hz ~ 400Hz	500mA, 500V Fast Blow Fuse
4000µA	1µA		
40.00mA	10µA	±(2.0% reading + 5 digits) ** 40Hz ~ 400Hz	
400.0mA	0.1mA		

Overload Protection: µA / mA Input: 500mA, 500V Fast Blow fuse. (61-340 / 61-342)

(4b) AC Current (61-340 / 61-342)

Range	Resolution	Accuracy	Input Protection
4.000A	0.001mA	±(2.5% reading + 5 digits) ** 40Hz ~ 400Hz	10A, 500V Fast Blow Fuse
10.00A*	0.01mA		

Overload Protection: A Input: 10A, 500V Fast Blow fuse.

AC Conversion Type: AC conversions are True RMS responding, calibrated to the sine wave input.

***Caution:** Do not make high current measurements on the 10A scale for longer than 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.

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

(5) Resistance (for 61-340 / 61-342)


Range	Resolution	Accuracy	Over voltage protection
400.0Ω **	0.1Ω	±(1.2% reading + 5 digits)	600Vrms
4.000KΩ	1Ω	±(1.0% reading + 2 digits)	
40.00KΩ	10Ω		
400.0KΩ	100Ω		
4.000MΩ	1KΩ	±(1.2% reading + 2 digits)	
40.00MΩ ***	10KΩ	±(2.0% reading + 5 digits)	

Open circuit Voltage: 0.44V approx.

** < 5 digit of reading rolling.

*** < 2% of reading rolling.

(6) Diode Check and Continuity (for 61-340 / 61-342)

Range	Resolution	Accuracy	Max. Test Current	Max. Open Circuit Voltage
	1mV	Not specified	<1mA, approx.	2.5V, approx.

Overload Protection: Not specified

Continuity: Built-in buzzer sounds when resistance is less than approximately 120 Ω with a response time of approximately 100 msec.

(7) Capacitance (for 61-340 / 61-342)

Range	Resolution	Accuracy	Over voltage Protection
40.00nF	10pF	±(3.0% reading + 10 digits)	600Vrms
400.0nF	100pF	±(3.0% reading + 5 digits)	
4.000μF	1nF		
40.00μF	10nF		
400.0μF	100nF	±(20% reading + 5 digits) ***	
4000μF **	10μF		

** In this range the reading may be rolling within specification.

*** 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 61-340 / 61-342)

Range	Resolution	Sensitivity	Accuracy	Overload protection
10.00Hz	0.01Hz	0.7V rms	Frequency: ($\pm 0.1\%$ + 3 digit)	600V rms
100.0Hz	0.1Hz			
1.000KHz	1Hz			
10.00KHz	10Hz			
100.0KHz	100Hz			
1.000MHz	10KHz	5.0V rms		
10.000MHz	10KHz			

(9) Temperature: Type K thermocouple (for 61-340 / 61-342)

Range	Resolution	Accuracy	Overload protection
-50 to 800 °C	1°C	$\pm 3.0\% \pm 3$ °C	Not Specified
-58 to 1500 °F	1°F	$\pm 3.0\% \pm 5$ °F	

(10) Auto Power Off (APO)

If the meter is idle for more than ≈ 10 minutes, the meter automatically turns the power off.

(11) Data Hold/Backlight

Pressing this button for less than 2 seconds, the meter enters the data hold mode, the **HOLD** symbol appears on the LCD, and the momentary value while pressing the button is displayed on the LCD. Press it again to exit this mode and the **HOLD** symbol disappears on the display. As the data hold function, this button has no effect on the diode and continuity test functions. The secondary function of this button is to enable and disable the backlight. If you press this button for more than 2 seconds, the backlight will turn on and when you press it again for more than 2 seconds, the backlight will turn off.

(12) SELECT

There are positions on the rotary switch that have several functions. Pressing the **SELECT** button will select the function you want in each position. It allows you to select AC or DC current, resistance, diode, audible continuity, capacitance, °C or °F temperature measurement.

(13) RANGE

When powered on, the meter is in auto range mode. Pressing the **RANGE** button, you can select the measurement range you want. The range goes up with each press of the **RANGE** button until its max, then returns to the min range. Pressing the **RANGE** button for more than 2 seconds, the meter will return to auto range. This button has no effect on frequency, duty cycle, capacitance, diode & continuity tests and temperature measurement.

(14) REL

Press this button to have the meter enter relative measuring state and the “Δ” symbol will appear on the LCD. The result of the relative measurement is the difference between the measuring value and the reference value. The reference value is produced as the same as momentary reading value when pressing this button. Press it again to exit this state and the “Δ” symbol will disappear on the display. This button does not any effect on the frequency, diode and continuity test function. Pressing this button for less than 2 seconds, the meter enters the relative measuring state and the “Δ” symbol appears on the LCD.

(15) Hz/DUTY

Press this button to switch between Hz and Duty Cycle test modes while taking AC voltage or AC current measurements.

(16) MAX/MIN

Press the **MAX/MIN** button on the meter to enter maximum value / minimum value record mode and the “MAX” / “MIN” symbol will appear on the display. The maximum, or minimum, value since pressing the button will be displayed. Press the **MAX/MIN** button again for more than 2 seconds to exit this mode and the “MAX” / “MIN” symbol will disappear from the display. This button has no effect on the diode / continuity test function, capacitance measurement, or frequency measurement.

Physical and Environmental Characteristics

Characteristics	Description
Dimensions (H×W×D)	180mm(H) ×91mm (W) ×43mm(D) (with holster) 7.1" (H) x 3.6"(W) x1.7"(D)
Weight (with battery& holster)	0.379Kg (13.4 oz.)
Environmental characteristics	Description
Temperature operating	0 to +40°C
Non-Operating	-20 to +60°C <75% 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 : , 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 specifica- tions 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	<p>AC Voltage Range: 0 ~ 750V AC Accuracy: ±0.07% (Basic)</p> <p>Frequency Range: 40 ~ 1KHz Accuracy: ±2%</p> <p>DC Voltage Range: 0 ~ 1000V DC Accuracy: ±0.006% (Basic)</p> <p>Current Range: 0 ~ 10A Accuracy: AC (40Hz to 1KHz): ±0.08% (Basic) DC: ±0.02% (Basic)</p> <p>Frequency Source: 1.00Hz ~ 10MHz Accuracy: ±0.001%</p> <p>Amplitude: 0.5V p-p ~ 5.0V p-p (square wave) Accuracy: ±5%</p> <p>Resistance Range: 1Ω ~ 100MΩ Accuracy: ±0.03% (Basic)</p> <p>Capacitance Range: 1pF ~ 10mF Accuracy: ±0.10% (Basic)</p>	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 short 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 61-340 and 61-342 are both powered by a 9V battery. Types are: NEDA 1604, JIS006P, IEC 6F22

1. Remove the rubber holster
2. Remove the screw on the battery cover and open the battery cover
3. Remove the old battery and install the new battery
4. Return the battery cover and reinstall the battery cover screw.
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:

F340: 500mA, 500V Fast Blow Fuse

F342: 10A, 500V Fast Blow Fuse

Fuse Replacement

The 61-340 and 61-342 are fused in both the μA /mA input and 10 amperes input ports. The μA /mA input port is fused by F340: 500mA, 500V Fast Blow fuse. The 10A input port is fused by F342: 10A, 500V Fast Blow fuse

1. Remove the rubber holster
2. Remove the screw on the battery cover and open the battery cover.
3. Remove the two screws at the bottom of back cover and a screw under the support stand.
4. Take out the old battery, and remove the back case cover.
5. Replace the defective fuse with the standard rated fuse for this meter
6. Replace the back case cover. Reinsert the case screws. It is recommended you replace the old battery with a new battery.
7. Return the battery cover and reinstall the battery cover screw.
8. Replace the rubber boot.

 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 61-340 / 61-342 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 75% 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

Turning the meter on from the “OFF” position, the meter will full display all segment and symbols. Compare the display with the example in Figure 2.

LCD Graphics 61-340 / 61-342

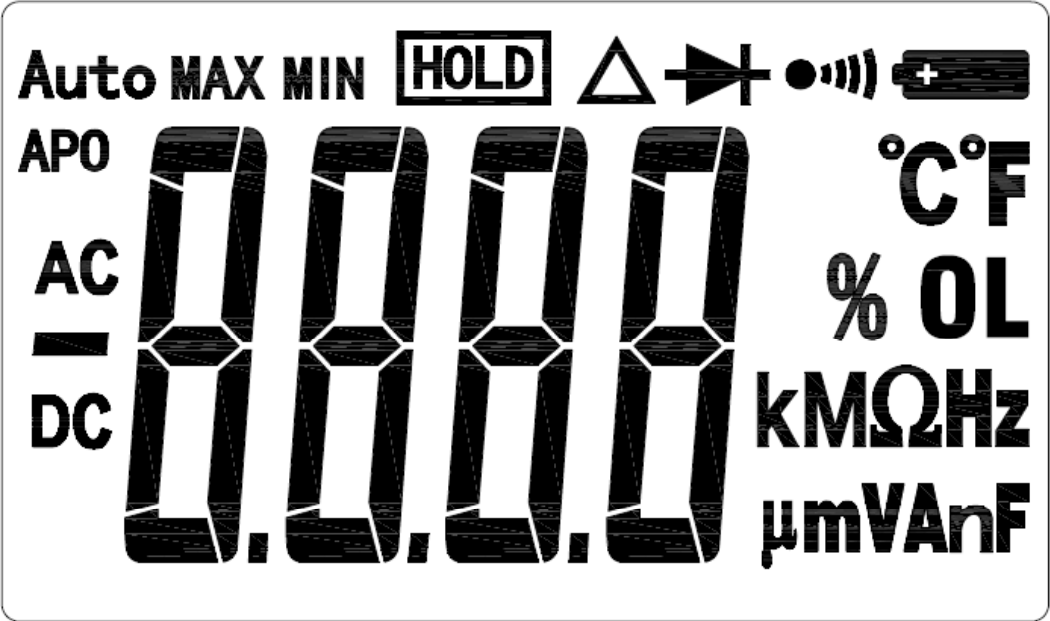


Figure 2 Display Test



Testing the Voltage Function (for 61-340 / 61-342)

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

1. Turn the rotary switch to the \bar{V} position.
2. Connect the calibrator to the $\overset{V \ \Omega \ \ast}{\text{Hz}}$ and **COM** inputs on the meter.
3. Set the calibrator for the voltage in steps 1 - 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	-302.0 to -298.0
2	400mV	4.0mV	3.5 to 4.5
3	400mV	300.0mV	298.0 to 302.0
4	4V	3.000V	2.980 to 3.020
5	40V	30.00V	29.80 to 30.20
6	400V	300.0V	298.0 to 302.0
7	600V	500V	492 to 508

1. Turn the rotary switch to the \tilde{V} position.
2. Set the calibration for the voltage and frequency in steps 1 - 10 in Table 2.
3. Compare the reading on the meter display with the display reading shown in Table 2.
4. 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
1	400mV	300.0mV	60Hz	295.0 to 305.0
2	400mV	300.0mV	400Hz	295.0 to 305.0
3	4V	3.000V	60Hz	2.950 to 3.050
4	4V	3.000V	400Hz	2.950 to 3.050
5	40V	30.00V	60Hz	29.50 to 30.50
6	40V	30.00V	400Hz	29.50 to 30.50
7	400V	300.0V	60Hz	295.0 to 305.0
8	400V	300.0V	400Hz	295.0 to 305.0
9	750V	600V	60Hz	586 to 614
10	750V	600V	400Hz	586 to 614

Testing the DC microamperes Function (for 61-340 and 61-342)

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

1. Connect the calibrator to the $\frac{\mu\text{A}/\text{mA}}{\text{F}/\text{C}}$ and **COM** inputs on the meter.
2. Turn the rotary switch to the $\frac{\mu\text{A}}{\text{mA}}$ position. Press the **SELECT** button to select the DC function.
3. Apply the inputs for steps 1 - 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	400 μA	4.0 μA	3.5 to 4.5
2	400 μA	300.0 μA	298.0 to 302.0
3	4000 μA	3000 μA	2980 to 3020

Testing the DC milli amperes Function (for 61-340 and 61-342)

1. Connect the calibrator to the $\frac{\mu\text{A}/\text{mA}}{\text{F}/\text{C}}$ and **COM** inputs on the meter.
2. Turn the rotary switch to the $\frac{\text{mA}}{\text{mA}}$ position. Press the **SELECT** button to select the DC function.
3. Apply the inputs for steps 1 - 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	29.80 to 30.20
2	400mA	300.0mA	298.0 to 302.0

Testing the DC ampere Function (for 61-340 and 61-342)

1. Connect the calibrator to the **10A** and **COM** inputs on the meter.
2. Turn the rotary switch to the $\overline{\text{A}}$ position. Press the **SELECT** button to select the DC function
3. Apply the inputs for steps 1 - 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	2.950 to 3.050
2	10A	9.00A	8.82 to 9.18

Testing the AC microampere Function (for 61-340 and 61-342)

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

1. Connect the calibrator to the $\frac{\mu\text{A}/\text{mA}}{\text{F}/\text{C}}$ and **COM** inputs on the meter.
2. Turn the rotary switch to the $\overline{\mu\text{A}}$ position. Press the **SELECT** button to select the AC function.
Press the **REL** button to make sure the display is zero.
3. Apply the inputs for steps 1 - 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	400 μA	40.0 μA	60Hz	38.9 to 41.1
2	400 μA	40.0 μA	400Hz	38.9 to 41.1
3	400 μA	300.0 μA	60Hz	295.0 to 305.0
4	400 μA	300.0 μA	400Hz	295.0 to 305.0
5	4000 μA	3000 μA	60Hz	2950 to 3050
6	4000 μA	3000 μA	400Hz	2950 to 3050

Testing the AC milliampere function: (for 61-340 and 61-342)

1. Connect the calibrator to the $\frac{\mu\text{A}/\text{mA}}{\text{F}/\text{C}}$ and **COM** inputs on the meter.
2. Turn the rotary switch to the $\frac{\approx}{\text{mA}}$ position. Press the **SELECT** button to select the AC function.
Press the **REL** button to make sure the display is zero.
3. Apply the inputs for steps 1 - 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 ACmA Test:

Step	Range	Source	Frequency	Reading
1	40 mA	30.00mA	60Hz	29.35 to 30.65
2	40 mA	30.00mA	400Hz	29.35 to 30.65
3	400 mA	300.0mA	60Hz	293.5 to 306.5
4	400 mA	300.0mA	400Hz	293.5 to 306.5

Testing the AC A function (for 61-340 / 61-342)

1. Connect the calibrator to the **10A** and **COM** inputs on the meter.
2. Turn the rotary switch to the $\frac{\approx}{\text{A}}$ position. Press the **SELECT** button to select the AC function.
Press the **REL** button to make the display is zero.
3. Apply the inputs for steps 1 - 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	2.920 to 3.080
2	4A	3.000A	400Hz	2.920 to 3.080
3	10A	9.00A	60Hz	8.73 to 9.27
4	10A	9.00A	400Hz	8.73 to 9.27

Testing the Resistance Function (for 61-340 / 61-342)

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



1. Connect the calibrator to  and **COM** on the meter.
2. Turn the rotary switch to the  position. Press the **SELECT** button to select the **Ω** function.
3. Apply the inputs for step 1 - 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	3.5 to 4.5
2	400Ω*	300.0Ω	295.9 to 304.1
3	4kΩ	3.000KΩ	2.968 to 3.032
4	40kΩ	30.00KΩ	29.68 to 30.32
5	400kΩ	300.0KΩ	296.8 to 303.2
6	4MΩ	3.000MΩ	2.962 to 3.038
7	40MΩ	30.00MΩ	29.35 to 30.65

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

Testing the Capacitance Function (for 61-340 / 61-342)

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  and **COM** inputs on the meter. For steps 1 - 7 in Table 6.
2. Turn the rotary switch to the  position. Press the **SELECT** button to select the  function. Press the **REL** button to make sure the display is zero.
3. Apply the inputs for step 1 - 7 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 30 seconds.
4. Compare the meter display readings to the display readings in Table 6.
5. If the display reading falls outside of the range shown in Table 6, the meter does not meet specification.



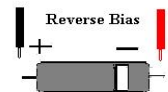
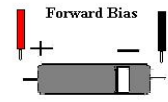
Table 6 Capacitance Test:

Step	Range	Source	Reading
1	40nF	10.00nF	9.60 to 10.40
2	40nF	30.00nF	29.00 to 31.00
3	400nF	300.0nF	290.5 to 309.5
4	4 μ F	3.000 μ F	2.905 to 3.095
5	40.00 μ F	30.00 μ F	29.05 to 30.95
6	400.0 μ F	300.0 μ F	239.5 to 360.5
7	4000 μ F	3000 μ F	2395 to 3605

Checking the Diode Test Function (for 61-340 / 61-342)

To check the diode test function, do the following:

1. Connect the test leads to the $\text{V } \Omega \text{ } \rightarrow$ and **COM** inputs on the meter.
2. Turn the meter's rotary switch to the $\text{V } \Omega \text{ } \rightarrow$ position. Press the **SELECT** button to select the \rightarrow function. The 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.



Checking the Continuity Function (for 61-340 / 61-342)

To check the diode test function, do the following:

1. Connect the test leads to the $\text{V } \Omega \text{ } \rightarrow$ and **COM** inputs on the meter.
2. Turn the meter's rotary switch to the $\text{V } \Omega \text{ } \rightarrow$ position. Press the **SELECT** button to select the $\bullet \rightarrow$ function. The display should display OL.
3. Insert a 20 Ω resistor. The meter's internal beeper will sound.

Testing the Frequency Function (for 61-340 / 61-342)

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

1. Connect the calibrator to the $\overset{V \ \Omega \ \ast}{\text{Hz}}$ 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 the **Hz%** position.
3. Set the calibrator or function generator for the square wave voltage and frequency for steps 1 - 6 of Table 7a.
4. Compare the reading on the meter display with the display reading shown in Table 7a.
5. If the display reading falls outside of the range shown in Table 7a, the meter does not meet specification.

Table 7a Frequency Test:

Step	Range	Source	Level	Reading
1	100Hz	9.0Hz	3V rms	8.988 to 9.012
2	100Hz	90Hz	3V rms	89.88 to 90.12
3	1kHz	900Hz	3V rms	898.8 to 901.2
4	10kHz	9kHz	3V rms	8.988 to 9.012
5	100kHz	90kHz	3V rms	89.88 to 90.12
6	1MHz	900kHz	3V rms	898.8 to 901.2
7	10MHz	9.00MHz	5V rms	8.97 to 9.03

Testing the Duty Cycle Function (for 61-340 / 61-342)

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

1. Connect the calibrator to the $\overset{V \ \Omega \ \ast}{\text{Hz}}$ 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 the **Hz%** position. Press the **Hz/DUTY** button to select the DUTY CYCLE function
3. Set the calibrator or function generator for the square wave voltage and frequency in Table 7b.
4. Compare the reading on the meter display with the display reading shown in Table 7b.
5. If the display reading falls outside of the range shown in Table 7b, the meter does not meet specification.

Table 7b Duty Cycle Test:

Step	Range	Source	Level	Reading
1	1kHz	1kHz	3V rms	48.3% to 51.7%



Testing the Temperature Function (for 61-340 / 61-342)

To verify the accuracy of the meter’s temperature function, do the following:

- 1. Connect the calibrator to the $\frac{\mu A/mA}{F/^{\circ}C}$ and **COM** inputs on the meter.
- 2. Set the rotary switch to the **°F / °C** position. Press the **SELECT** button to select the proper range as listed in Table 8.
- 3. Set the calibrators temperature output to the source for steps 1 - 7 in Table 8.
- 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	°C	-20 °C	-23 to -17
2	°C	0 °C	-3 to 3
3	°C	300 °C	288 to 312
4	°C	750 °C	725 to 775
5	°F	-4 °F	-9 to 1
6	°F	32 °F	26 to 38
7	°F	1382 °F	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 $23^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and a relative humidity of $<70\%$.
2. Disconnect the test leads and turn the meter off. Remove the test leads from the front terminals.
3. Position the meter face down. Remove the battery cover screw and the 2 bottom case cover screws.
4. 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 the $\overline{\text{V}}$ position for the DC Volts function.
2. Set the output of the calibrator for 300.0mV and connect to the $\overline{\text{V}}$ Ω Hz kHz and **COM** inputs on meter.
3. Using a small flat-tipped screwdriver, adjust VR1 until the display reads 299.5 to 300.5mV.
4. Disconnect the calibrator from the meter.

(B) AC V Calibration (Adjust VR2)

Model 61-340:

1. Set the rotary switch to the $\tilde{\text{V}}$ position for the AC Volts function.
2. Set the output of the calibrator for 3.000V at 60Hz and connect to the $\tilde{\text{V}}$ Ω Hz kHz and **COM** inputs on meter.
3. Using a small flat-tipped screwdriver, adjust VR2 until the display reads 2.995 to 3.005Volts.
4. Disconnect the calibrator from the meter.

Model 61-342:

1. Set the rotary switch to the $\tilde{\text{A}}$ position. Press the **SELECT** button to select AC A function, then press **RANGE** button to select the 10A range .
2. Using a small flat-tipped screwdriver, adjust VR4 until the display reads 0 to 3 digits.
3. Press **RANGE** button to select the 4A range and adjust VR5 until the display reads same as the digits at the AC 10A range (0 to 3 digits).
4. Set the rotary switch to the $\tilde{\text{V}}$ position for the AC Volts Function.
5. Set the output of the calibrator for 3.000V at 60Hz. and connect to the $\tilde{\text{V}}$ Ω Hz kHz and **COM** input terminals on meter.
6. Using a small flat-tipped screwdriver, adjust VR2 until the display reads 2.995 to 3.005Volts
7. Disconnect the calibrator from the meter.

(C) TEMP Calibration (Adjust VR3)

1. Set the rotary switch to the °F/ °C position.
2. Set the output of the calibrator to 300 °C.
3. Connect the calibrator temperature output to the $\frac{\mu\text{A}/\text{mA}}{\text{F}/\text{C}}$ and **COM** input terminals.
4. Using a small flat-tipped screwdriver, adjust VR3 for a 300 °C +/- 1 °C (299 to 301) display.