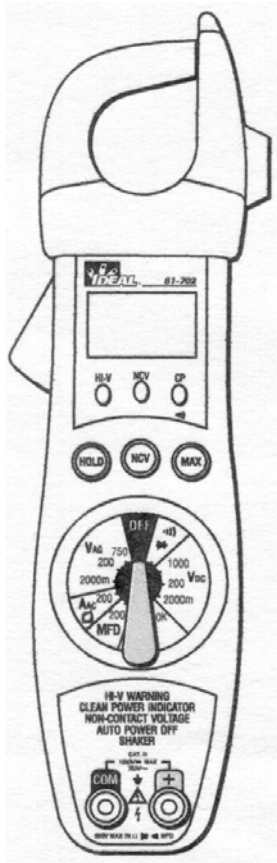




**IDEAL INDUSTRIES, INC.**  
**TECHNICAL MANUAL**  
**MODEL: 61-700**  
**MODEL: 61-701**  
**MODEL: 61-702**  
**MODEL: 61-704**

*The Service Information provides the following information:*

- Precautions and safety information
- Specifications
- Performance test procedure
- Calibration and calibration adjustment procedure
- Basic maintenance (replacing the battery)



Form number: TM61700-1-2-4  
Revision: 4. Date: Sept 2004

## **TABLE OF CONTENTS**

<b>Title</b>	<b>Page</b>
Introduction	1
Precautions and Safety Information	1
Symbol Table	1
Safety Information	2
Indicator Functions	2
Certifications and compliance	2
Specifications	3
General Specification	3
Voltage Specifications	4
Current Specifications	4
Resistance Specifications	4
Frequency Specification	4
Capacitance Specifications	4
Diode / Continuity Specifications	4
Performance Verification	5/6
Calibration	6/7
Calibration Reference Points	8
Replacing the Battery	9

Introduction



**To avoid shock or injury, do not perform the verification tests or calibration procedures described in this manual unless you are qualified to do so.**

**The information provided in this document is for the use of qualified personnel only.**



**The 61-700 series contains 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](http://www.idealindustries.com)*

**Precautions and Safety Information**

Use the meter only as described in the *Users 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 Symbols**

Symbol	Description	Symbol	Indicator Lights
	Battery	<b>HI-V</b>	High Voltage Indicator >30 V indicator is on
	Cautionary or important information in manual	<b>NCV</b>	Non-Contact indicator
	Danger- Risk of electrical shock		Continuity indicator
	Double Insulation- Protection Class II	<b>CP</b>	Clean power indicator On if power is Clean Off if power has > 5% THD
<b>CAT III</b>	IEC Over-voltage Category III		

**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.

**⚠ 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.

**Specific precautions:**

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

**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.


**Indicator Functions:**

- **Hi-V:** In ACV, DCV, Resistance, and Continuity/Diode test, the end user will get an audible warning and the Hi-V light will blink if there is Voltage Greater than 30V present at the input terminals.
  - In addition to the LED and audible beep, the 61-702 and 61-704 has a tactile vibration when voltage is present.
- **NCV:** When the NCV button is pressed, the analog to digital circuit is turned off and the NCV circuit is activated. Sensing for the NCV is at the tip of the Clamp Jaw or by the Red Test Lead in the red (+) input terminal. Follow the operation instructions giving in the operator's manual for proper use of this function. *The NCV function is on Ideal Models 61-701, 61-702, and 61-704.*
- **CP:** When the 60Hz AC power is clean, with less than 5% Total Harmonics Distortion (THD) on AC voltage, the green CP light will be energized. If there is greater than 5% THD on the line, the green CP light will be de-energized.

**Certifications and compliances**

Safety	Designed to IEC 1010-1, UL3111-1 and CSA specifications
Input rating	1000V DC Category III {61-702, 61-704}
	600V DC Category III {61-700, 61-701}
	750V AC Category III {61-702, 61-704}
	600V AC Category III {61-700, 61-701}
Over voltage category	CAT III: Distribution level mains, fixed installation.
	CAT II: Local level mains, appliances, and portable equipment.
	CAT I: Signal level, special equipment or parts of equipment, telecommunication, electronics.

**General specifications**

Characteristics	Description
Display	3½ Digit LCD display
Display Count	2000 count, maximum reading 1999
Over range Indication	“OL” is displayed
Sampling Rate	2.5 time/second
Operating Environment: Relative Humidity	0°C to 50°C (32°F to 122°F) 0 ~ 75% RH
Storage Environment:	-20°C to 60°C (-4°F to 140°F) at <80 relative humidity
Power source:	9V Battery (NEDA 1604)
Battery Live:	300 hours typical (alkaline) {61-700 and 61-701} 150 hours typical (alkaline) {61-702 and 61-704}
Low Battery Indicator:	 symbol indicates low battery voltage
Auto power off	Approximately 60 minutes
Dimensions	9.7” H X 3.7” W X 1.8” D 247mm H X 94mm W X 46mm D
Maximum Cable Size	ACA 1¼” (32mm)
Weight:	Approximately 13.4 oz. or 430g including battery

**RANGES and ACCURACY SPECIFICATION**

**Accuracy:** Accuracy specifications at 23°C ±5°C (73.4°F ±9°F) less than 75% RH.

**Temperature Coefficient:** 0.1 times the applicable accuracy specification per degree C from 0°C to 18°C and 28°C to 50°C (32°F to 64°F and 82°F to 122°F)

**Electrical Specification:** Accuracy are ±(reading plus number of digits) at 23°C ±5°C <75% RH

**61-700**

Function / Range	Ranges	Accuracy
AC Voltage	200V, 50Hz - 500Hz	1.2% + 3digits
	200V, 50Hz - 1KHz	2.0% + 5 digits
	600V, 50Hz - 500Hz	2.0% + 5 digits
DC Voltage	200mV/2000mV/200V/600V	0.5% + 1 digit
AC Current	200A, 50Hz - 60Hz	3.0% + 5 digit
	200A, 60Hz - 400Hz	5.0% + 5 digit
Frequency	2K ~ 40KHz (Auto-ranging only)	0.1% + 3 digits
Resistance	200Ω/200KΩ	1.0% + 3digit
Diode Check	1mA ± 0.6mA	Not specified
Continuity	<100Ω on $\rightarrow$ Diode, $\rightarrow$ Continuity	Not Specified

**61-701**

Function / Range	Ranges	Accuracy
AC Voltage	200V, 50Hz - 500Hz	1.2% + 3 digits
	200V, 50Hz - 1KHz	2.0% + 5 digits
	600V, 50Hz - 500Hz	2.0% + 5 digits
DC Voltage	2000mV/20V/ 600V	0.5% + 1 digit
AC Current	200A, 50Hz - 60Hz	3.0% + 5 digit
	200A, 60Hz - 400Hz	5.0% + 5 digit
Capacitance	200MFD	3.0% + 5 digits
Frequency	2K ~ 40KHz (Auto-ranging only)	0.1% + 3 digits
Resistance	200Ω/200KΩ	1.0% + 3digit
Diode Check	1mA ± 0.6mA	Not specified
Continuity	<100Ω on $\rightarrow$ Diode, $\rightarrow$ Continuity	Not specified

**61-702, 61-704**

Function / Range	Ranges	Accuracy
AC Voltage	2000mV/200V, 50Hz - 500Hz	1.2% + 3digits
	2000mV/200V, 500Hz - 1KHz	2.0% + 5 digits
	750V, 50Hz - 500Hz	2.0% + 5 digits
DC Voltage	2000mV/200V/1000V	0.5% + 1 digit
AC Current	200A, 50Hz - 60Hz	3.0% + 5 digit
	200A, 60Hz - 400Hz	5.0% + 5 digit
Capacitance	200MFD	3.0% + 5 digits
Frequency	2K ~ 40KHz (Auto-ranging only)	0.1% + 3 digits
Resistance	200Ω/200KΩ	1.0% + 3digit
Diode Check	1mA ± 0.6mA	Not specified
Continuity	<300Ω on $\rightarrow$ Diode, $\rightarrow$ Continuity	Not specified

**AC Converter:** Average responding, RMS Calibrated to Sine Wave

**Overload Protection:**

AC and DC Voltage: not to exceed 600V DC or VAC RMS for the model 61-700 and 61-701, and 1000V DC or 750V AC for the 61-702 and 61-704

Resistance: Not to exceed 500V DC or AC RMS

Capacitance, Frequency, Diode Check, Continuity: not to exceed 500V DC or VAC RMS

## PERFORMANCE VERIFICATIONS

Perform the following analysis; if the meter conforms to the limits listed in Table 1 through 5 the meter is functioning correctly. If the meter does not conform to any of the listed limits the calibration procedure must be performed.

### Performance Verification Preparation

1. Turn on the calibrator, allow calibrator to warm up. Temperature stabilization should be reached after 30 minutes.
2. Remove battery cover and using a calibrated meter to ensure the battery measures a minimum of 7.5V DC. If the battery measures under 7.5V DC, replace the battery before beginning the performance test.
3. Input the values listed in Table 1 through 5

**Table 1 AC Voltage Test**

Function /Range	Input	Low Limit	High Limit	Model number
V AC 2000mV	1900mV AC @ 50Hz	1874	1926	61-702, 61-704
V AC 2000mV	1900mV AC @ 500Hz	1874	1926	61-702, 61-704
V AC 2000mV	1900mV AC @ 1kHz	1857	1943	61-702, 61-704
V AC 200V	190V AC @ 50Hz	187.4	192.6	61-700, 61-701, 61-702, 61-704
V AC 200V	190V AC @ 500Hz	187.4	192.6	61-700, 61-701, 61-702, 61-704
V AC 200V	190V AC @ 1kHz	185.7	194.3	61-700, 61-701, 61-702, 61-704
V AC 600V	500V AC @ 50Hz	485	515	61-700, 61-701
V AC 600V	500V AC @ 500Hz	485	515	61-700, 61-701
V AC 750V	700V AC @ 50Hz	681	719	61-702, 61-704
V AC 750V	700V AC @ 500Hz	681	719	61-702, 61-704

**Table 2 DC Voltage Test**

Function /Range	Input	Low Limit	High Limit	Model number
V DC 200mV	190mV	188.9	191.1	61-700
V DC 2000mV	1900mV	1889	1911	61-700, 61-702, 61-704
V DC 20V	19V	18.89	19.11	61-701
V DC 200V	190V	188.9	191.1	61-700, 61-701, 61-702, 61-704
V DC 600V	500V	496	504	61-700, 61-701
V DC 1000V	900V	894	906	61-702, 61-704

**Table 3 AC Current Test**

Function /Range	Input	Low Limit	High Limit	Model number
A AC 200A	100A AC @ 50Hz	96.5	103.5	61-700, 61-701, 61-702, 61-704
A AC 200A	100A AC @ 400Hz	94.5	105.5	61-700, 61-701, 61-702, 61-704

**Table 4 Capacitance, Frequency, and Resistance Test**

Function /Range	Input	Low Limit	High Limit	Model number
Hz {auto}	1KHz @ 10V	.996	1.004	61-700, 61-701
Hz {auto}	10KHz @ 10V	9.96	10.04	61-700, 61-701
MFD 200	100 $\mu$ F	96.5	103.5	61-701, 61-702, 61-704
$\Omega$ 200	100 $\Omega$	98.7	101.3	61-700, 61-701, 61-702, 61-704
$\Omega$ 200K	100K $\Omega$	98.7	101.3	61-700, 61-701, 61-702, 61-704

**Table 5 Diode and Continuity Check**

Function /Range	Test Value	Low limits	High Limit	Model number
⚡ Diode	500mV DC	485	515	61-700, 61-701, 61-702, 61-704
🔊 Continuity	40 $\Omega$ beep on, 150 $\Omega$ beep off			61-700, 61-701
🔊 Continuity	50 $\Omega$ beep on, 300 $\Omega$ beep off			61-702, 61-704

## CALIBRATION

### Calibration Preparation

1. Turn on the calibrator, allow calibrator to warm up. Perform calibration at  $23\pm 2^{\circ}\text{C}$  at relative humidity of  $< 70\%$ . Temperature stabilization should be reached after 30 minutes.
2. Disconnect the test leads and turn the range switch to "OFF".
3. Remove the screws holding the battery cover and one at the jaw.
4. Remove the case bottom using care not to damage the battery connector and leads to the continuity beeper. (Beeper is attached to the bottom case cover.)
5. Using a calibrated meter ensure the battery measures a minimum of 7.5V DC. If the battery measures under 7.5V DC, replace the battery.

### Calibration Procedure

It is recommended that all IDEAL meters undergo the following calibration procedure on an annual basis.

The class of calibrator or equipment should have an accuracy that exceeds, by an expectable ratio the accuracy of this instrument.



**V DC Calibration****61-700 (Refer to Figure 1)**

1. Set the function / range to 200mV DC.
2. Connect the calibrator to the **V** and **COM** inputs on the meter.
3. Output 190.0mV DC.  
Adjust VR1 (VR 200 $\Omega$ ) until unit display reads 190.0  
De-energize source and remove test leads

**61-701 (Refer to Figure 2A)**

1. Set the function / range to 20V DC.
2. Connect the calibrator to the **V** and **COM** inputs on the meter.
3. Output 19.00V DC.  
Adjust VR1 (VR 200 $\Omega$ ) until unit display reads 19.00  
De-energize source and remove test leads

**61-702 (Refer to Figure 3A)****61-704 (Refer to Figure 4A)**

1. Set the function / range to 2000mV DC.
2. Connect the calibrator to the **V** and **COM** inputs on the meter.
3. Output 1.900 VDC.  
Adjust VR1 (VR 200 $\Omega$ ) until unit display reads 1900.  
De-energize source and remove test leads

**V AC Calibration:****61-704 only (Refer to Figure 4A)**

1. Set the function/range to the 2000mV AC.
2. Connect the calibrator to the **V** and **COM** inputs on the meter.
3. Output 1.900 VAC/50Hz  
Adjust VR5 (VR 100 $\Omega$ ) until unit display reads 1900V $\pm$  1 digit.  
De-energize source and remove test leads

**A AC Calibration:****61-700 (Refer to Figure 1)****61-701 (Refer to Figure 2B; peel front label back to access calibration hole)****61-702 (Refer to Figure 3B; peel front label back to access calibration hole)****61-704 (Refer to Figure 4B; peel front label back to access calibration hole)**

1. Set the function / range to the 200A AC
2. Set output of the AC calibrator for 10.00A/60Hz +/- 0.01% and connect it to Coil = 10N = 100.0A AC.
3. Clamp the jaws to the coil = 10N.
4. Adjust VR2 (VR 2K $\Omega$ ) for a display reading of 100.0  $\pm$ 1 digit

Calibration of the 61-700 series is complete.

Remove all leads from the calibrator and equipment.

Return unit to proper operating condition.

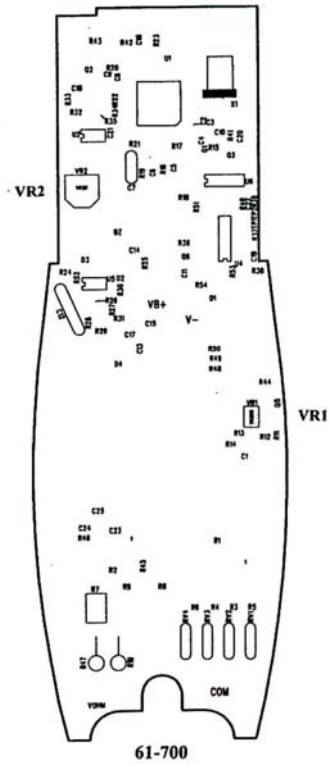


Figure 1

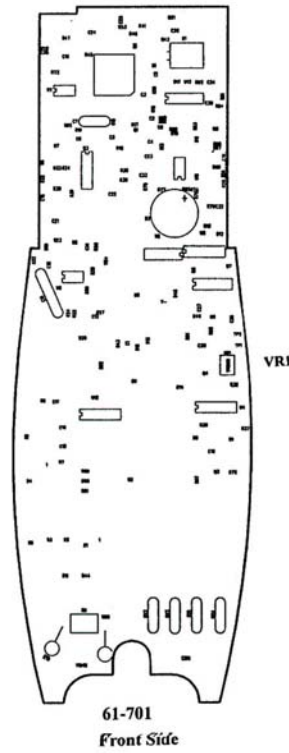


Figure 2A

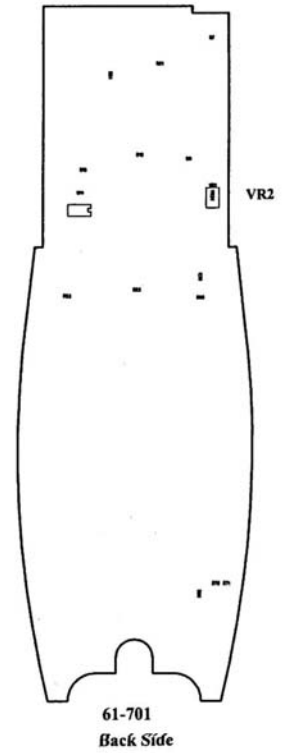


Figure 2B

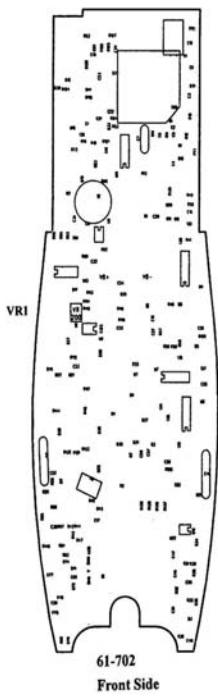


Figure 3A



Figure 3B

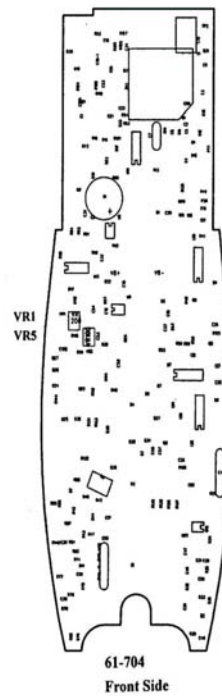


Figure 4A

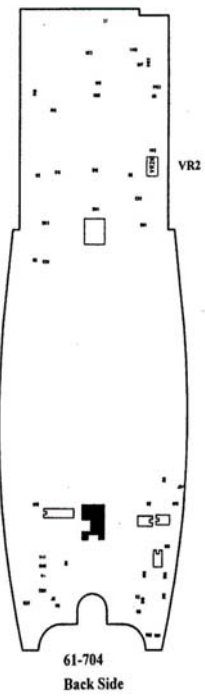
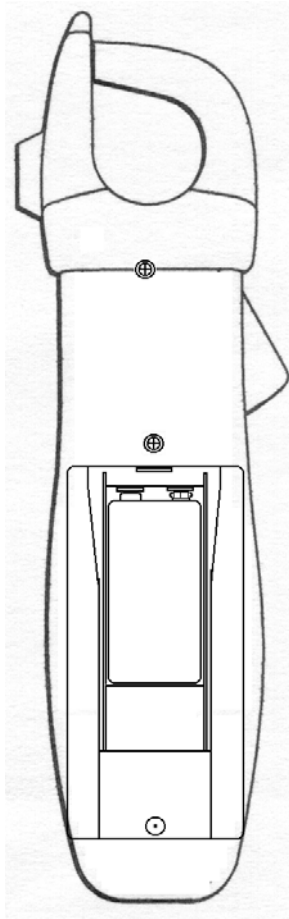


Figure 4B

**Battery Replacement (refer to Figure 5)**

1. Disconnect the test leads from any circuit under test and turn off meter.
2. Use a Philips head screwdriver to remove the screws on battery cover.
3. Remove battery from the battery compartment.
4. Install new 9V battery (NEDA #1604). An alkaline type is recommended.
5. Install new battery into compartment using care to install to proper polarity.
6. Reinstall battery cover.



**Figure 5**