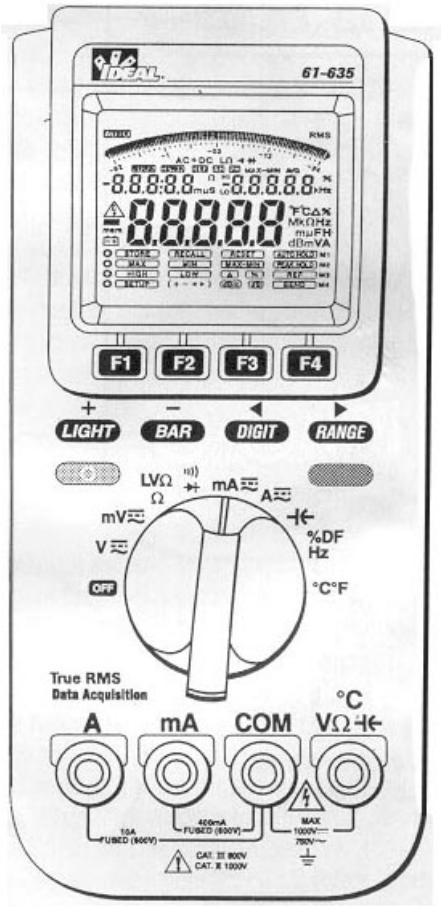
IDEAL INDUSTRIES INC.
TECHNICAL MANUAL
MODELS: 61-633
61-635

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: TM61633-5
Revision: 5. Date: December 2006

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Introduction

⚠Warning
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.

⚠ Caution
The 61-630 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 and its products, and services, visit IDEAL INDUSTRIES web site at:
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. The Symbols

Symbol	Meaning	Symbol	Meaning
~	Alternating signal		Battery
⎓	Direct signal		Earth ground
	Refer to the manual. Important information.		Fuse
	Take appropriate precautions. Hazardous voltage may be present		Double insulated
		CAT III	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

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 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.

SPECIFICATIONS

All specifications are warranted unless noted typical and apply to models 61-633 and 61-635.

Stated accuracies are at 23° ±5°C at less than 80% relative humidity and without the battery indicator displayed.

General specifications

Characteristics	Description
LCD display digits	4¾ or 3¾
Bargraph segments	80 Segment Graph
Display count	40,000 or 4,000
Numeric update rate	2 times / sec (40.000 count) 4 times / sec (4,000 count)
Bargraph	20 times/sec
Polarity display	Automatic
Overrange display	OL is displayed
Low voltage indicator	 is indicated
Automatic power-off time	Automatic backlit off = 15 minutes
Power source	One 9V dry cell battery
Maximum input voltage	1000V (750V AC) CAT II, Between V and COM
Maximum floating voltage	1000V (750V AC) CAT II, Between any terminal and earth ground
Maximum input current	400mA between mA and COM 10A continuous between A and COM (20A for 30 seconds, between A and COM)
Maximum open circuit Voltage (current inputs)	600V between A and COM and between mA and COM
Overload protection mA connector	1 A (600V) fast blow fuse
A connector	15A (600V) fast blow fuse
V connector	1100 Vp, V~, V⎓ AC+DC 850 Vp, mV~, mV⎓, AC+DC LVΩ, Ω, Hz, •))), ⊣◀, ⊣(, %DF, °C, °F
Temperature Coefficient	0.1 x (Spec. Accuracy) 1°C, < 18 C or > 28°C.
Battery Life	100 hours typical (alkaline)

Measurement Characteristics
All at 23°C ±5°C, < 80% Rh. Specifications are expressed as ±([% of reading] + [number of digits]).
Multiply accuracy Digits by l0 in 40,000 count Mode.

DC VOLTAGE:

DCV	61-633	61-635
40mV	± (0.20%+8d)	± (0.06% + 8d)
400mV	± (0.20% + 2d)	± (0.06% + 2d)
4V, 40V, 400V, 1000V	± (0.20% + 2d)	± (0.06% + 1d)

AC VOLTAGE:

ACV	61-633	61-635
400mV		
40Hz~ 100Hz	± (1.20% + 5d)	± (0.70% + 5d)
100Hz ~ 1KHz	± (2.00% + 5d)	± (1.00% + 5d)
4V		
40Hz ~ 100Hz	± (1.00% + 5d)	± (0.70% + 5d)
100Hz ~ 1KHz	± (2.00% + 5d)	± (1.00% + 5d)
1KHz ~ 10KHz	± (3.00% + 6d)	± (2.00% + 6d)
10KHz ~ 20KHz	N.A	± (3.00% + 7d)
20KHz ~ 50KHz	N.A	± (5.00% + 8d)
50KHz ~ 100KHz	N.A	± (10.00% + 10d)
40V		
40Hz ~ 100Hz	± (1.20% + 5d)	± (0.70% + 5d)
100Hz ~ 1KHz	± (2.00% + 5d)	± (1.00% + 5d)
1KHz ~ 10KHz	± (3.00% + 6d)	± (2.00% + 6d)
10KHz ~ 20KHz	N.A	± (3.00% + 7d)
20KHz ~ 50KHz	N.A	± (5.00% + 8d)
50KHz ~ 100KHz	N.A	± (10.00% + l0d)
400V		
40Hz ~ 100Hz	± (1.20% + 5d)	± (0.70% + 5d)
100Hz ~ 1KHz	± (2.00% + 5d)	± (1.00% + 5d)
1KHz ~ 10KHz	±(3.00% + 6d)	± (2.00% + 6d)
10KHz ~ 20KHz	N.A	± (3.00% + 7d)
20KHz ~ 50KHz	N.A	± (5.00% + 8d)
750V		
40Hz ~ 100Hz	±(1.20% + 5d)	± (0.70% + 5d)
100Hz ~ 1KHz	± (2.00% + 5d)	± (1,00% + 6d)
Bandwidth	40Hz ~ 10KHz	40Hz ~ 100 KHz

dBm (typical): -l5dBm to +55 dBm (0 dBm = lmW into 600Ω).
dBv (typical): -80 dBv to + 50 dBv (0 dBv = 1 Vrms).
Note: (ACV only)
Add additional 40Digits for reading under 30% of range.
Specifications exclude under 20% of range for 20KHz ~ 100KHz.
Resolution: 1μV in the 400mV range
Input Impedance: 10MΩ, <l00pF
Overload Protection: 1000V dc, 750V rms
AC Conversion Type: AC Coupled True RMS responding
AC + DC Volts: Same as AC(RMS) +1.00% + 8d
Crest Factor: +1.5% addition error for C.F. 1.4 to 3
+3.0% addition error for C.F. from 3 to 4

DC CURRENT:

DCA	61-633	61-635
40mA, 400mA, 4A, 10A	± (0.50% + 4d)	±(0.20% + 4d)

AC CURRENT:

ACA	61-633	61-635
40mA, 400mA, 4A, 10A	±(1.20% + 8d)	± (0.80% + 8d)
Bandwidth	40Hz ~ 400Hz	40Hz ~ 400Hz

Range: 40mA, 400mA, 4A, 10A
Resolution: 1µA in the 40mA range
Burden Voltage: 800mV max. for mA input, 1V max. for A input
AC Conversion Type: AC Coupled True RMS responding
Input Protection: Equipped with High Energy Fuse
1A, 600V, IR 10KV fuse (Bussmann BBS-1 or equivalent) for mA input
15A, 600V, IR 100KV fuse (Bussmann KTK 15 or equivalent) for A input
AC + DC Current: Same as AC(RMS) + 1.00% + 8d
C.F.: Same as ACV

PEAK HOLD: +[± (0.7% + 20)] additional error for >10% of full scale

RESISTANCE:

OHM	61-633	61-635
4000, 4K 0	± (0.50% + 2d)	± (0.30% + 2d)
40KQ, 400K0	± (0.50% + 2d)	± (0.30% + 2d)
4M0	± (0.50% + 4d)	± (0.30% + 4d)
40M0	± (5.00% + 5d)	± (5.00% + 5d)

LV OHM	61-633	61-635
4K0 ,40K0 400K 0	± (1.00% + 2d)	± (0.60% ÷ 2d)
4M0	± (1.00% + 4d)	± (0.60% + 4d)
40M0	± (7.00% + 5d)	± (7.00% + 5d)

Resolution: 0.01 Ω in the 4000 range
Open Circuit Voltage: 3.3V
Open Circuit Low Voltage: 0.6V
Input Protection: 600V rms

CONTINUITY CHECK
Continuity Threshold: Approximately 50Ω
Continuity Indicator: 2KHz Tone Buzzer
Input Protection: 600V rms

DIODE TEST
Test Current: 1.1 mA (Typical)
Open Circuit Voltage: 3.3V DC (max)
Input Protection: 600V rms

CAPACITANCE

Capacitance	61-633	61-635
4nF, 40nF 400nF, 4µF	± (1 .90% + 20d)	± (0.90% + 20d)
40µF, 400µF	± (2.90% + 20d)	± (1 .90% + 20d)
4mF, 10mF	± (3.90% + 20d)	± (2.90% + 20d)

Note: For best measurements, use REL △ mode in the nF ranges.
Range: 4nF, 40nF, 400nF, 4µF, 40µF, 400µF, 4mF, l0mF
Resolution: lpF in the 4nF range
Input Protection: 600V rms

FREQUENCY COUNTER
Range: 400Hz, 4KHz, 40KHz, 400KHz, 4MHz
Resolution: 0.01Hz in the 400Hz range
Accuracy: ± (0.01% + 1d)
Sensitivity: 0.5Vp-p, for 15Hz ~ 1 MHz, 1 Vp-p, for 1MHz ~ 4MHz
Min. Frequency: 15Hz.
Input Protection: 600V rms

DUTY FACTOR
Range: 20% ~ 80%
Resolution: 0.1%
Accuracy: ±6d (15Hz ~ 10KHz, 5Vp-p)

Temperature

Temperature	61-633	61-635
-50°C ~ 1200°C	N.A	1°C + ld
-100°C ~ -50°C	N.A	2°C + 1d
-200°C ~ 100°C	N.A	3°C + 1d

Physical Characteristics

Characteristics	Description
Dimensions (H x W x D)	200mm x 90mm x 42mm 212mm x 100mm x 55mm(with holster)
Weight (with battery)	0.4Kg
With holster	0.6Kg
Environmental Characteristics	**Description**
Temperature operating	0 to + 50
Non-Operating	-20 to + 60
Humidity (operating)	< 80% R.H.
Altitude Operating	2,222 m (7290 ft.)
Non-Operating	12,300 m (40354 ft.)
Vibration & shock Operating	MIL-T-28800E TYPE II Class 5 2.66gRMS, 5 to 500 Hz, 3axes (10 minutes each)
Dust / Water Protection IP Rating	IP 64
Indoor Use	

Certifications and compliances

Safety	Designed to IEC 1010-1, UL3111-1 and CSA specifications
Input rating	1000V DC Category II
	600V DC Category III
	750V AC Category II
	600V AC Category III
Over voltage category	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 ~ 100KHz **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 ~ 1.0000MHz **Accuracy:** ±0.001% **Amplitude:** 0.5V p-p ~ 1.0V p-p (square wave) **Accuracy:** ± 5% **Ω range:** 1Ω ~ 2G **Accuracy:** ±0.03% (Basic) **Capacitance Range:** 1PF ~ 40mF **Accuracy:** ±0.10% (Basic) **Temperature Range:** -200 ~ 1200 **Accuracy:** ±0.3 (Basic)	Fluke 5500 or Wavetek 9100 Calibrator or equivalent

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.

To open the Meter case, refer to Figure 1 and do the following:

1. Disconnect test leads from any live source, turn the rotary switch to OFF, and remove the test leads from the front terminals.
2. Remove the battery door by using a Phillips-head screwdriver to remove the screw to the battery door.
3. The case bottom is secured to the case top by three screws and two internal snaps (at the LCD end). Use a Phillips-head screwdriver to remove the three screws.
4. Un-snap the Battery and table the battery snap out of the battery room.

Note

The gasket between the two case halves is sealed to, and must remain with, the case bottom. The case top lifts away from the gasket easily. Do not damage the gasket or attempt to separate the case bottom from the gasket.

5. Hold the Meter display side up.
6. Lifting up on the input terminal end, disengage the case top from the gasket.
7. Gently unsnap the case top at the display end.

Battery Replacement (refer to Figure 1)

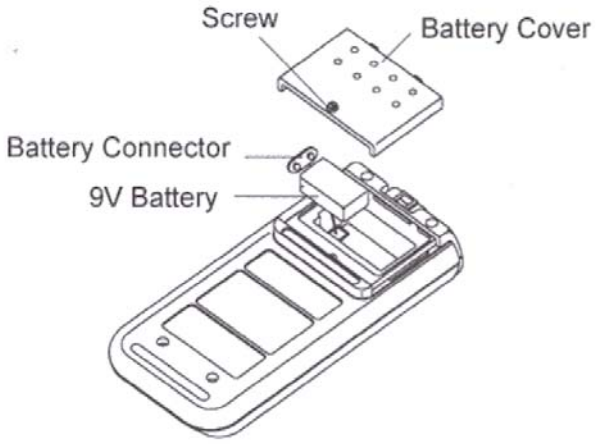
1. Disconnect the test leads from any circuit under test and turn off meter.
2. Remove the test leads from meter.
3. Loosen the screw from the battery cover on bottom case.
4. Remove battery cover.
5. Install a new battery after removing the original one.
6. Assemble battery cover onto bottom case with screwdriver and the screw described in step 3.

Testing Fuses (FS1 and FS2)

To test the internal fuses of the Meter, refer to Figure 1 and do the following:

1. Turn the rotary selector switch to the mA position for 1A fuse test FS1 or A position for 15A fuse test FS2.
2. To test FS1, plug a test lead into mA input terminal, and turn the rotary selector to the mA position.
   2.1 Fuse is OK if display shows normal functional graphics.
   2.2 Fuse is defective if "FUSE" is displayed, and the built-in beeper alarms.
3. To test FS2, plug a test lead into A input terminal, and turn the rotary selector to the A position.
   3.1 Fuse is OK if the display shows normal functional graphics
   3.2 Fuse is defective if "FUSE" is displayed, and the built-in beeper alarms.

Battery Replacement



Fuse Replacement

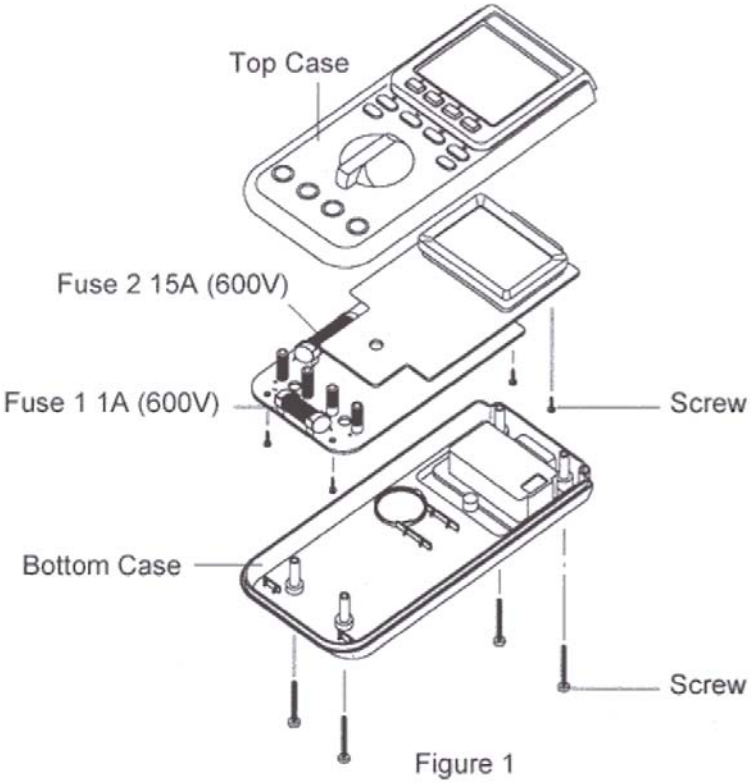


Figure 1

WARNING: Installing improper fuses can cause injury and product damange

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 Amp/Volt current interrupt rating:
FS1 Fuse: 1A, 600V, FAST. Minimum interrupt rating 10,000A
FS2 Fuse: 15A, 600V, FAST. Minimum interrupt rating 100,000A

To replace the Meter's fuses, refer to Figure 1 and do the following:
1. Follow step 1 to step 4 described in Battery Replacement.
2. Remove the battery from meter.
3. Remove 4 screws installed between the top case and bottom case of meter.
4. Separate bottom case from Meter, using care not damage battery wiring.
5. Remove 4 screws installed between the PCB and top case of meter.
6. Separate the PCB from the top case of Meter.
7. Replace a new fuse (FUSE 1 or FUSE 2).
8. Re-assemble the PCB with the top case of Meter.
9. Assemble the bottom case to top case using care not to damage battery wiring.
10. Install the battery removed before and re-assemble the battery cover.

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.

Input Terminals

Water, dirt, or other contamination in the A or mA input terminals may activate the Input Alert beeper even though test leads are not inserted. Such contamination might be dislodged by turning the Meter over and, with all test leads removed, gently tapping on the case.

To clean the input terminals, do the following:
1. Turn the Meter off and remove all test leads from the terminals.
2. Use a clean swab in each of the four terminals to dislodge and cleanout the contamination.
3. Moisten a new swab with a cleaning and oiling agent work this swab around in each of the four terminals. The oiling agent insulates the terminals from moisture related shorting and ensures against false Input Alerts.

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.
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 at 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.
The performance data in the following tables are in 40,000 count display mode.
In 4000 count mode disregard the less significant digit.

A Basic Operability Test

To check the basic operability do the following:

1. Turn the rotary switch to A and plug a test leads into A input terminal.
   Unit display is of normal functional graphics if the fuse is good.
2. Turn the rotary switch to mA input fuse (1A) insert a test lead into the mA input terminal. (A input must be cleared of connections).
   Unit display is of normal functional graphics if the fuse is good.

If the Meter fails to operate properly:

- Check the battery and fuses and replace as needed.
- Verify that you are operating the Meter correctly by reviewing the operation instructions found in the *Users Manual.*

To complete a comprehensive performance test and verify the accuracy of each Meter function and operation, perform the remainder of the tests under " Performance Tests ".

Testing the Display

Press and hold the "Bar" key while turning the unit ON to enter the Display Hold Mode function. Compare the display with the appropriate example in Figure 2.
Turn off the meter to escape the Display Hold Mode.

LCD graphics of 61-630 series

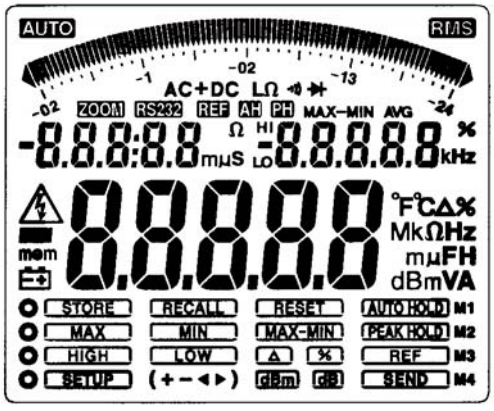


Figure 2 Display Test

Testing the Voltage Function

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

1. Connect the Calibrator to the **VΩ** and **COM** inputs on the Meter.
2. Set the Calibrator for the voltage from step 1 to 5 in Table 1.
   Compare the reading on the Meter display with the display reading shown in Table 1.
   If the display reading falls outside of the range shown in Table 1, the Meter does not meet specification.

Table 1. DC Voltage Test

Input		Reading	
Step	**Voltage**	**61-633**	**61-635**
1	3.6000V	3.5908 to 3.6092	3.5958 to 3.6042
2	-3.6000V	-3.5908 to -3.6092	-3.5958 to -3.6042
3	36.000V	35.908 to 36.092	35.954 to 36.042
4	360.00V	359.08 to 360.92	358.58 to 360.42
5	900V	896.2 to 903.8	897.46 to 902.54

3. Press the blue button on the Meter to toggle to ACV function.
4. Set the calibration for the voltage and frequency from step 1 to 17 in Table 2.
   Compare the reading on the Meter display with the display reading shown in Table 2.
   If the display reading falls outside of the range shown in Table 2, the meter does not meet specification.

Table 2. AC Voltage Test

Input			**Reading**	
Step	**Voltage**	**Frequency**	**61-633**	**61-635**
1	3.6000V	50Hz	3.5590 to 3.6410	3.5698 to 3.6302
2	3.6000V	1KHz	3.5230 to 3.6770	3.5590 to 3.6410
3	3.6000V	10KHz	3.4860 to 3.7140	3.5220 to 3.6780
4	3.6000V	20KHz	N.A	3.4850 to 3.7150
5	3.6000V	50KHz	N.A	3.4120 to 3.7880
6	36.000V	50Hz	35.518 to 36.482	35.698 to 36.302
7	36.000V	1KHz	35.230 to 36.770	35.590 to 36.410
8	36.000V	10KHz	34.320 to 37.680	35.220 to 36.780
9	36.000V	20KHz	N.A	34.850 to 37.150
10	36.000V	50KHz	N.A	34.120 to 37.880
11	360.00V	50Hz	355.18 to 364.82	356.98 to 363.02
12	360.00V	1KHz	352.30 to 367.70	355.90 to 364.10
13	360.00V	10KHz	348.60 to 371.40	352.20 to 367.80
14	360.00V	20KHz	N.A	348.50 to 371.50
15	360.00V	50KHz	N.A	341.20 to 378.80
16	720.0V	50Hz	706.4 to 733.6	709.96 to 730.04
17	720.0V	1KHz	699.6 to 740.4	703.20 to 736.80

Testing Millivoltage (mV) Function

To verify accuracy of the mV function, do the following.

1. Connect the Calibrator to the **VΩ** and **COM** inputs on the meter.
2. Turn the rotary switch to mV.
3. Set the calibrator for the voltage from step 1 to 3 in Table 3.
4. Compare the reading on the Meter display with the display reading in Table 3. If the display reading falls outside of the range shown in Table 3, the Meter does not meet specification.

Table 3. DC mV Test

Input		Reading	
Step	**Voltage**	**61-633**	**61-635**
1	36.000mV	35.848 to 36.156	35.894 to 36.102
2	-36.000mv	-35.848 to -36.156	-35.894 to -36.102
3	360.00mV	359.08 to 360.92	359.58 to 360.42

5. Press the blue button on the Meter to toggle to AC mV function.
6. Set the calibrator for the voltage and frequency from step 1 & 2 in Table 4.
7. Compare the reading on the Meter display with the display reading in Table 4. If the display reading falls outside of the range shown in Table 4, the Meter does not meet specification.

Table 4. AC mV Test

Input			Reading	
Step	**Voltage**	**Frequency**	**61-633**	**61-635**
1	360.00mV	50Hz	355.18 to 364.82	356.98 to 363.02
2	360.00mV	1KHz	352.30 to 367.70	355.90 to 364.10

Testing the PEAK HOLD Function

To verify operation of the PEAK HOLD feature, do the following.

1. Connect the Calibrator to the **VΩ** and **COM** inputs on the Meter.
2. Apply 1.0v ac rms at 60Hz from the Calibrator to the VΩ and COM inputs of the Meter.
3. Turn the rotary switch to V.

Note: The rms converter is not used in Peak Hold mode. The digital display represents the actual peak value of the input.

4. Press (PEAK H) and then (M/M/A).
5. The reading on sub-display should be within 1.441 (Max) and -1.441 (MIN).
6. Press (PEAK H) to escape.

Testing the Resistance Function

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

1. Connect the Calibrator to VΩ and COM on the Meter.
2. Turn the rotary switch to Ω
3. Apply the inputs for step 1-7 in Table 5.
   *Set reference if using a Multifunction Calibrator with diff or zero mode for steps 1, 2, and 3.
   Compare the Meter display readings to the display readings in Table 5 step 1-7.
4. If the display reading falls outside of the range shown in Table 5, the meter does not meet specification.

Table 5. Ω Test

Input		Readings	
Step	**Resistance Ω**	**61-633**	**61-635**
1	0.00	00.00 to 00.02	00.00 to 00.02
2	360.00	358.00 to 362.00	358.72 to 361.28
3	3.6000K	3.5800 to 3.6200	3.5872 to 3.6128
4	36.000K	35.800 to 36.200	35.872 to 36.128
5	360.00K	358.00 to 362.00	358.72 to 361.28
6	3.6000M	3.5780 to 3.6220	3.5852 to 3.6148
7	36.000M	34.150 to 37.850	34.150 to 37.850

5. Press the blue button on the meter to toggle to LVΩ function.
6. Apply the inputs for step 1-6 in Table 6.
   *Set reference if using a Multifunction Calibrator with diff or zero mode for steps 1 & 2.
   Compare the Meter display readings to the display readings in Table 6.
7. If the display reading falls outside of the reading shown in Table 6, the meter does not meet specification.

Table 6. LV Ω

Input		Readings	
Step	**Resistance Ω**	**61-633**	**61-635**
1	0.00	00.00 to 00.02	00.00 to 00.02
2	3.6000K	3.5620 to 3.6380	3.5764 to 3.6236
3	36.000K	35.620 to 36.380	35.764 to 36.230
4	360.00K	356.20 to 363.80	357.64 to 362.36
5	3.6000M	3.5600 to 3.6400	3.5744 to 3.6256
6	36.000M	33.430 to 38.570	33.430 to 38.570

Testing the Capacitance Function

The Meter measures capacitance by charging the capacitor with a known direct current, and 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** and **COM** inputs on the Meter.
2. For steps 1 through 8 in Table 7.
   a) Turn the rotary switch
   b) Set the **VΩ** and **COM** inputs un-connected
   c) Select Δ or (REL) for steps 1 and 2 in Table 7. After steps 1 and 2 are complete, escape from Δ mode and press (RANGE) key until (AUTO) is displayed.

Testing the Capacitance Function (cont'd)

d) For each input, compare the readings on the Meter display to display readings in Table 7. The meter selects the proper range automatically. Each measurement takes about one second per range. 5mF will taken about 15 seconds.

3. If the display reading falls outside of the range shown in Table 7, the Meter does not meet specification.

Table 7. Capacitance Test

Input		Readings	
Step	**Capacitance**	**61-633**	**61-635**
1	3.600nF	3.512 to 3.688	3.548 to 3.652
2	36.00nF	35.12 to 36.88	35.48 to 36.52
3	360.0nF	351.2 to 368.8	354.8 to 365.2
4	3600µF	3.512 to 3.688	3.548 to 3.652
5	36.00µF	34.76 to 37.24	35.12 to 36.88
6	360.0µF	347.6 to 372.4	351.2 to 368.8
7	1.000mF	.9410 to 1.059	.9510 to 1.049

Checking the Diode Test Function

To check the diode test function, do the following:

1. Connect the Calibrator to the **VΩ** and **COM** inputs on the Meter.
2. Turn the rotary switch to ⊣◀.
3. Apply 3.000V.
   The meter display should read approx. 3.000V dc.
4. Press "Blue" key to test •))) function.
5. Apply a 50Ω resistor to meter, the built-in beeper alarms.

Testing the Milliamp (mA) Function

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

1. Connect the Calibrator to the **mA** and **COM** inputs on the Meter.
2. Turn the rotary switch to mA.
3. Apply the inputs for steps 1-2 in Table 8.
4. For each input, compare the readings on the Meter display to the display readings in Table 8.

Table 8. DC mA Test

Input		Readings	
Step	**Current**	**61-633**	**61-635**
1	36.000rnA	35.780 to 36.220	35.888 to 36.112
2	360.00mA	357.80 to 362.20	358.88 to 361.12

5. Press the blue button on the Meter to toggle to AC measurement function.
6. Apply the inputs for steps 1-4 in Table 9.
7. For each input, compare the readings on the Meter display to the display readings in Table 9.
8. If the display reading falls outside of the range shown in the Tables, the meter does not meet specification.

Table 9. AC mA Test

Input			Readings	
Step	**Current**	**Frequency**	**61-633**	**61-635**
1	36.000mA	50 Hz	35.488 to 36.512	35.632 to 36.368
2	36.000mA	400 Hz	35.488 to 36.512	35.632 to 36.368
3	360.00mA	50 Hz	354.88 to 365.12	356.32 to 363.68
4	360.00mA	400Hzz	354.88 to 365.12	356.32 to 363.68

Testing the Amp (A) Function

To verify the accuracy in the ampere (A) measurement function, do the Following:

1. Connect the Calibrator to the **A** and **COM** inputs of the Meter.
2. Turn the rotary switch to A
3. Apply the inputs for steps 1-2 in Table 10.
4. For each input, compare the readings on the Meter display to the display readings in Table 10.
5. If the display reading falls outside of the range shown in Table 10, the meter does not meet specification.

Table 10. DCA Test

Input		Readings	
Step	**Current**	**61-633**	**61-635**
1	3.6000A	3.5780 to 3.6220	3.5888 to 3.6112
2	9.000A	8.9150 to 9.0850	8.9420 to 9.0580

6. Press the blue button on the Meter to toggle to the AC amp measurement function.
7. Apply the inputs for steps 1-4 in Table 11.
8. For each input, compare the reading on the Meter display to the display readings in Table 11.
9. If the display reading falls outside of the range shown in Table 11, the meter does not meet specification.

Table 11. ACA Test

Input			Readings	
Step	**Current**	**Frequency**	**61-633**	**61-635**
1	3.6000A	50 Hz	3.5488 to 3.6512	3.5632 to 3.6368
2	3.6000A	400 Hz	3.5488 to 3.6512	3.5632 to 3.6368
3	9.000A	50 Hz	8.8120 to 9.1888	8.8480 to 9.1520
4	9.000A	400 Hz	8.8120 to 9.1888	8.8480 to 9.1520

Testing the Frequency Function

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

1. Connect the Calibrator to the **VΩ** 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 Function Generator for the square wave voltage and frequency for steps 1-5 of Table 12.
4. Compare the reading on the Meter display with the display reading shown in Table 12.
5 If the display reading falls outside of the range shown in Table 12, the Meter does not meet specification.

Table 12. Frequency Test

Input			Reading	
Step	**Frequency**	**Level**	**61-633**	**61-635**
1	360Hz	0.5Vp-p	359.86 to 360.14	359.86 to 360.14
2	3.6000KHz	0.5Vp-p	3.5986 to 3.6014	3.5986 to 3.6014
3	36.000KHz	0.5Vp-p	35.986 to 36.014	35.986 to 36.014
4	360.00KHz	0.5Vp-p	359.86 to 360.14	359.86 to 360.14
5	3.6000MHz	1.5Vp-p	3.5986 to 3.6014	3.5986 to 3.6014

Testing the Duty Factor Function

To verify the accuracy of the Meter's Duty Factor function, do the following:

1. Connect the Calibrator to the **VΩ** and **COM** inputs on the Meter.
   Note The accuracy of the Calibrator's Duty function must be appropriate for the specified accuracy of the Meter.
2. Set the rotary switch to Hz.
3. Press the blue button on the meter to toggle to %DF function.
4. Set the Function Generator for square wave voltage for steps 1-3 of Table 13. (Frequency is about 1KHz)
5. Compare the reading on the Meter display with the display reading shown in Table 13.
6. If the display reading falls outside of the range shown in Table 13, the Meter does not meet specification.

Table 13. Duty Factor Test

Input			Readings	
Step	**Duty (%)**	**Level**	**61-633**	**61-635**
1	20.0	5Vp-p	14.0 to 26.0	14.0 to 26.0
2	50.0	5Vp-p	44.0 to 56.0	44.0 to 56.0
3	77.0	5Vp-p	71.0 to 83.0	71.0 to 83.0

Testing the Temperature Function

To verify the accuracy of the Meter's Temperature Function do the following:

1 Connect the calibrator to **VΩ** and via K-type wire and T-V adaptor (Ideal 61-635 TC adapter)
   Note: The T-V adaptor should be allowed to stabilize to the same room temperature as the meter before beginning test.
2. Set the rotary switch to °C.
3 Set the Calibrator for inputs in Table 14.
4. Compare the reading on the Meter display with the display reading shown in Table 14.
5. If the display reading falls outside of the range shown in Table 14, the Meter does not meet specification.

Table 14 Temperature Test

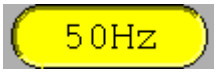
Input		Readings	
Step	**Temperature**	**61-633**	**61-635**
1	-50.0°C	N.A	-52.1 to -47.9.
2	-20.0°C	N.A	-21.1 to -18.9
3	0.0 °C	N.A	-1.1 to 1.1
4	20.0°C	N.A	18.9 to 21.1
5	50.0°C	N.A	48.9 to 51.1
6	100.0°C	N.A	98.9 to 101.1
7	500.0°C	N.A	498.9 to 501.1
8	1000°C	N.A	998.9 to 1001.1

IDEAL 61-630 Series calibration process

Calwin300 Software

1. Select communication port 

or 

2. Select power line frequency 

or 

3. Select item and check rotary switch with correct position at same time.

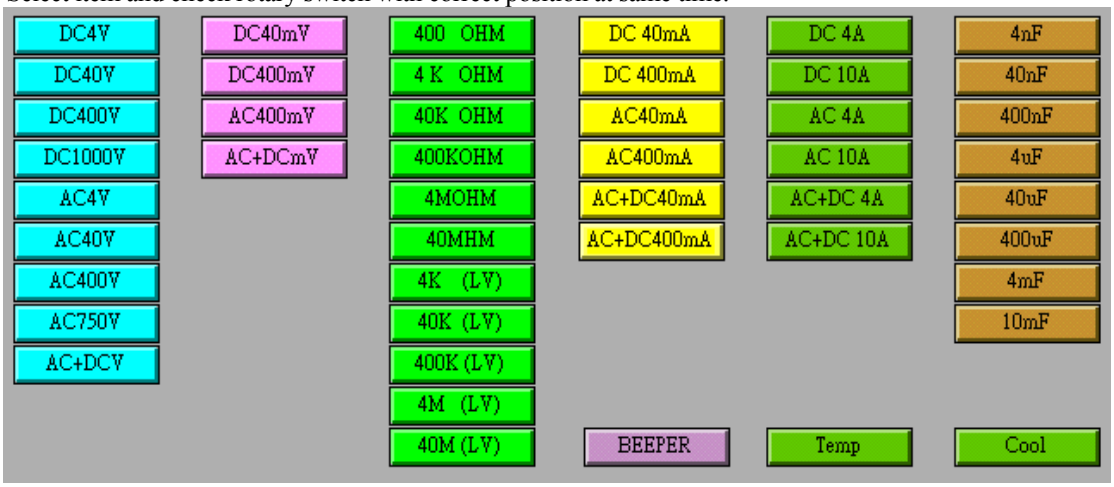
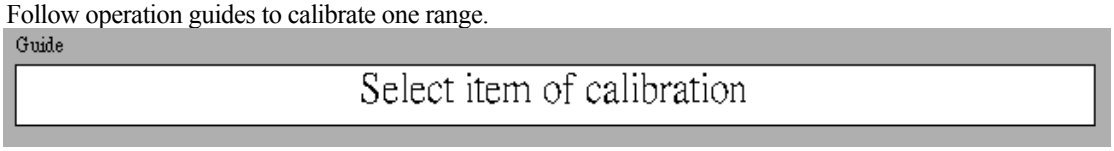
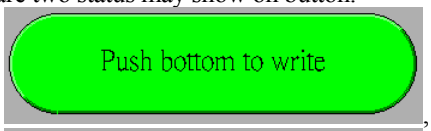


Figure 3

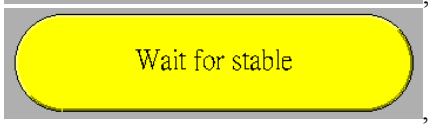
4. Follow operation guides to calibrate one range.



5.There are two status may show on button.

Case 1 

, push button and wait for process.

Case 2 

, wait for stable state or check input.

Note: There may be several processes (1-5) in each different item.

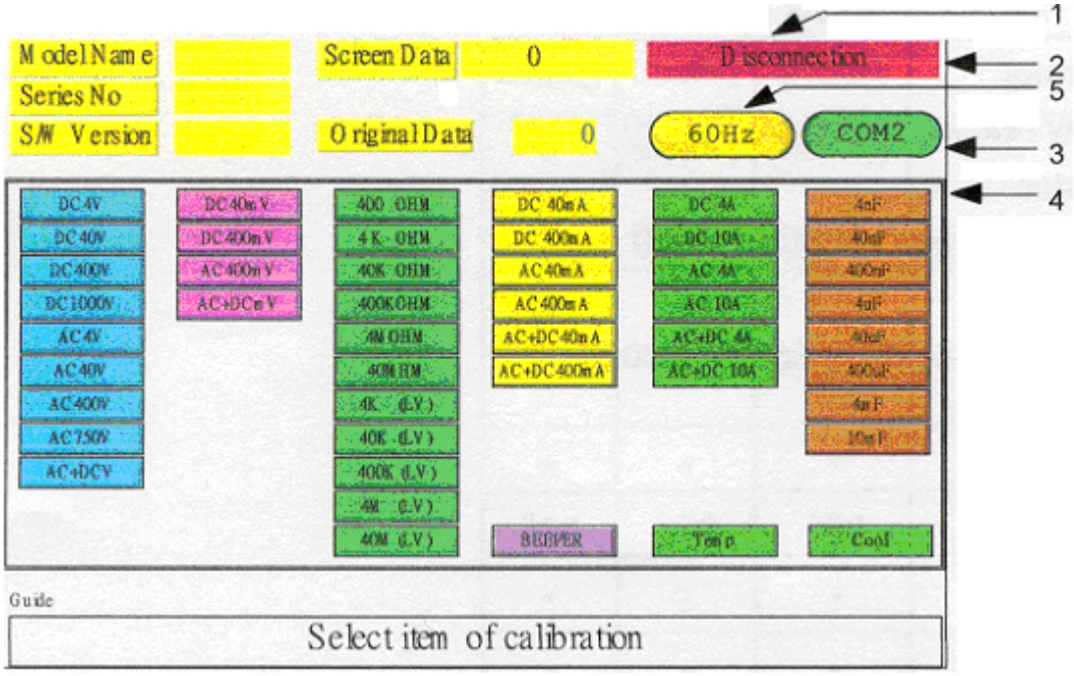


Figure 4

Calibration:

Calibration of the meter is recommended once a year to ensure performance according to the published specifications.
Calibration is performed with the use of "CalWin 300" Software as illustrated above.
(This software can be obtained by contacting customer service at Ideal Industries, Inc.)

Do not perform this step if software is already loaded
The software consists of two files titled "Setup.exe" and "Data001". After you execute the setup.exe program in the Windows (95 or 98) environment, you will have CalWin300 option in the PROGRAM set.

Execute "CalWin300" and you should get the screen shown in first Figure 3.

Description of CalWin300 window shown in Figure 4.

1. **Main Display:** Displays the main reading of the Meter.
2. **Connection Indicator:** "Connection" shows that the meter is connected to your Computer and the meter and computer are communicating. "Disconnection" shows that the meter and computer are not connected or aren't communicating.
3. **Communication Port:** Selects port available to connect to meter. Selectable ports are COM 1 or COM 2.
4. **Calibration Function Indicator and Selector:** Select item to be calibrated and select the Calibration Function desert.
5. **Fine Frequency Selector:** Selects the Frequency that's connected the meter, to select 50Hz or 60Hz.

Note:
Before the Calibration Function is selected, the function selected on the Meter has to be confirmed, to prevent functional error from occurring.

ACV High Frequency Calibration

Calibrating the ACV Frequency Response

1. 400V Range
   Set the calibrator to generate 200.00V / 10KHz ±0.07% at least, adjust VC3 to have a reading of 200.50± 20 count .
2. 40V Range
   Set the calibrator to generate 20.000V /10KHz±0.07% at least, adjust VC2 to have a reading of 20.050± 20 count .
3. 4V Range
   Set the calibrator to generate 2.0000V /10KHz±0.07% at least, adjust VC1 to have a reading of 2.0050± 20 count .