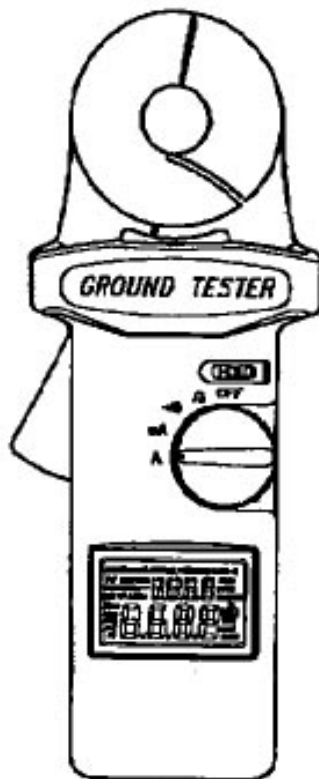




IDEAL INDUSTRIES, INC.
TECHNICAL MANUAL
MODEL: 61-781

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 and fuses)



Form number: TM61781
Revision: 2. Date: Feb 2002

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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 61-781 Ground Clamp 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





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

Meter Safety Symbol	Description
	Battery
	Cautionary or important information in manual
	Danger - Risk of electrical shock
	Double Insulation- Protection Class II
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.

Use of rubber gloves: is a good safety practice even if the equipment is properly operated and grounded

Use of Clamp jaws: do not attempt to use the ground tester to twist or pry the ground electrode or ground wire away from equipment or other obstructions. Non-repairable damage may occur.

General specifications

Characteristics	Description
Display	4 Digit LCD, 9999 count display
Conductor Size	23mm (0.9") approximately
Overrange Indication	"OL"
Sampling Rate	0.4 seconds
Operating Environment: Relative Humidity	4°C to 50°C (14°F to 122°F) 85% Relative Humidity
Storage Environment:	-20°C to 60°C (-4°F to 122°F) at <75% relative humidity
Power source:	9V Battery (NEDA 1604)
Battery Life:	150 hours typical (alkaline)
Low Battery Indicator:	<input checked="" type="checkbox"/> Symbol indicates low battery voltage
Power Consumption	40mA
Over-Load Protection: Current	100A Continuous, 200A < 60 seconds (50/60 Hz)
Dimensions	257mm L x 100mm W x 47mm D 10.1" H x 3.9" W x 1.9" D
Weight:	Approximately 640 g or 1.4 lbs. including battery

RANGES and ACCURACY SPECIFICATION

Measurement Characteristics

(All at 23°C ± 5°C, < 80% R.H.) ± ([% of reading] + [number of digits]).

Additional Temperature Coefficient (4°C ~ 18°C and 28°C ~ 50°C ± 0.15% per °C)

Ground Resistance

Range	Resolution	Accuracy
0.025Ω - 0.250Ω	0.002 Ω	± 1.5% ± 0.05Ω
0.250Ω - 9.999Ω	0.002Ω	± 1.5% ± 0.1Ω
10.00Ω - 99.99Ω	0.04Ω	± 2.0% ± 0.3Ω
100.0Ω - 199.9Ω	0.4Ω	± 3.0% ± 1.0Ω
200.0Ω - 400.0Ω	2Ω	± 5.0% ± 5Ω
400.0Ω - 600.0Ω	5Ω	± 10.0% ± 10Ω
600.0Ω - 1500Ω	20Ω	± 20% (Approximately)

Loop resistance: non-inductive, external field < 50A/m, external electrical field < 1v/m, conductor center.

Resistance Measurement Frequency: 1.667KHz

Continuity Measurement: Beep if resistance < 40.00 Ω (approximately)

Ground/Leakage Current

(Autorange, 50/60 Hz, True RMS, Crest Factor <3.0)

Range	Resolution	Accuracy
0.200mA – 1.000mA	0.001mA	± 2.5% ± 0.05mA
1.00mA – 10.00mA	0.01mA	± 2.5% ± 0.05mA
10.0mA – 100.0mA	0.1mA	± 2.0% ± 0.3mA
100mA – 1000mA	1mA	± 2.0% ± 3mA

Ground/Leakage Current

(Autorange, 50/60 Hz, True RMS, Crest Factor <2.0)

Range	Resolution	Accuracy
0.20A – 15.00A	0.01mA	± 2.0% ± 0.03A

Max. Current Protection: 100A continuous, 200A (<60 sec.) 50/60Hz

PERFORMANCE VERIFICATIONS

Perform the following analysis, if the meter conforms to the limits listed in Table 1 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 bottom case cover and use 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. The 61-781 comes with a Loop Test Board to perform a quick performance test of the unit. The error given in Table 1, steps 1 - 4 are for the Loop Test Board.
Note: Error for the Loop Test Board is not included in this data.
4. If the display reading falls outside of the range shown in the Table 1, steps 1 - 4, the meter does not meet specification.
5. Another method of testing the unit is to use 2 matching decade boxes connected by two 12 or 14 gauge wires cut 12 inches long. Dial in each box ½ the value called for in Table 1, steps 5 - 8 and place clamp in the center of one of the two wires.
Note: Error for the Decade Boxes is not included in this data.
6. If the display reading falls outside of the range shown in the Table 1, steps 5 - 8, the meter does not meet specification.

Table 1: Resistance Performance Verification

Steps	Input	Low Limit	High Limit
1	100Ω	96.0	104.0
2	10Ω	9.50	10.50
3	0.5Ω	0.392	0.607
4	0.474Ω	0.367	0.581
5	5Ω	4.825	5.175
6	20Ω	19.30	20.70
7	50Ω	48.70	51.30
8	500Ω	440.0	560.0

1. Connect the meter to a single wire loop on the calibrator and place the clamp around the center of the wire.
2. Apply the current listed in Table 2, steps 1 - 3.
3. If the display reading falls outside of the range shown in the Table 2, steps 1 - 3, the meter does not meet specification.

Table 2: mA, A Performance Verification

Steps	Input	Low Limit	High Limit
1	10mA	9.70	10.30
2	1000mA	977	1023
3	10A	9.77	10.23

CALIBRATION

Calibration Preparation

1. Remove the two Philips head screws and lift bottom case from unit
2. Remove the three Philips head screws that hold the plastic shield from upper section of PCB
Note: take care not to damage shield spring on lower right hand side of plastic shield.
3. To get to all adjustments, the battery holder and lower shield must be removed.
 - 3a. Use a small flat head screwdriver to slide down the inside center of either end of the battery holder to release clip on holder. Use extreme care not to damage circuit on the lower PCB.
 - 3b. Lift and remove battery holder and lower plastic shield.
4. Turn on the Calibrator, allow calibrator to warm up to normal temperature. Temperature Stabilization should be reached after 30 minutes.

Calibration Procedure

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

**Clamp Source/Masurement Resistance Adjustments
Switch**

1. To Enter the Calibration mode on the meter, Press and Hold down the [HOLD] button while turning the function rotary switch quickly to continuity [•]])] until “Harmonics” is displayed in upper left of LCD
2. Set VR2 to the bottom of it’s range contrary to current position.
{Don’t go beyond variable resistor range, a meter may be useful in making this adjustment.}
3. Adjust VR1 for a display reading of 200 ± 50 digits
{If VR1 will not adjust to this value it may be necessary to change the value of R122, R123 or R108}
Note: Change Values in 1000Ω steps, if increasing add resistance, if decreasing subtracts resistance.
(If needed value of R107 or R106 should be changed)
3. Adjust VR2 for “MINIMUM” reading on display.
{This is a null type adjustment; Do not go beyond variable resistor range,}.
4. Adjust VR1 for a display reading of 150 ± 5 digits
5. Apply the 5 ohms standard test set and adjust VR7 for “Maximum” reading on display
{You are adjusting the frequency of the Potential applied through the clamp.}
Note: Another method would be to measure the frequency across VR2 and adjust VR7 for a frequency of 1.667KHz
6. Set unit to the A function, and Adjust VR11 for a display of 0 ± 3 digits
7. Turn unit off. You will be applying to the unit a series of standard resistor test set values
Do not touch the jaw on the following adjustments.

8. Turn unit on to the Ω function.
 - 8.a Apply the 5 ohm standard and adjust VR10 for 5.000Ω {4.990 ~ 5.010}
 - 8.b Apply the 50 ohm standard and adjust VR3 for 50.00Ω {49.90 ~ 50.10}
 - 8.c Apply the 20 ohm standard and adjust VR11 for $20.00\Omega \pm 1$ digit
9. Apply from calibrator 90mA and adjust VR20 for 90mA {89.90 ~ 90.10}
10. Apply from calibrator 9.00A and adjust VR6 for $9.00A \pm 2$ digit

Note: *This completes the required services for the calibration of 61-781, Calibration is complete.*

Battery

1. Turn unit off
2. Remove the two screws from the bottom case
3. Lift and remove the bottom case
3. Remove battery from compartment and unsnap the battery connector.
4. Install new 9V battery (IEC 6LR61). An alkaline type is recommended.
5. Replace bottom case and secure with screws.

