IDEAL INDUSTRIES, INC.
TECHNICAL MANUAL
MODEL: 61-796

The Service Information provides the following information:

- Precautions and safety information
- Specifications
- Performance test procedure
- Calibration and calibration adjustment procedure
- Basic maintenance (Disassembly, Troubleshooting, Spare Parts list)

Form number: TM61796
Revision: 2. Date: May 2008

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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 61-796 Three Pole Ground Resistance Tester contains parts that can be damaged by static discharge. Follow the standard practices for handling static sensitive devices.

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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.
Before beginning read all warnings and precautions stated in the ***"Instruction Manual"***

General Specifications

Characteristics	Description
Display	LCD 3 ½ with 2000 counts, maximum display count of 1999
Over-range Indication	"1" in the Most Significant Digit (MSD)
Operation Frequency of Ω current	820Hz to 1.6kHz at approx. 2mA.
Earth Resistance Range	20Ω/200Ω/2000Ω
Resistance resolution	0.00 - 19.99 (0.01Ω) 00.0 - 199.9 (0.1Ω) 000 – 1999 (1Ω or .001KΩ)
Earth Resistance Accuracy	±(2% reading + 2 digits) or± 0.1Ω
Max Earth Voltage	0-200V AC, 40-500Hz
Earth Voltage Accuracy	± (1% reading + 2 digits)
Power on/off	Switch only / No auto power off mode
Low Battery Indicator:	Symbol indicates low battery voltage
Data Hold Indicator	HOLD Symbol indicates data hold
Power	8 x 1.5V AA Batteries (Alkaline preferred)
Applicable standards	IEC/EN 61010-1: (CAT III 200V) pollution degree2
Dimensions	8.3"H x 8.3"W x 4.0"D
Weight:	Approximately 3.0 lbs. (1361g) including battery
Storage Environment:	32°F to 122°F at <80% relative humidity
Operating Environment: Relative Humidity	32°F to 104°F 80% Relative Humidity
Accessories included	Hard Case, Test Lead Set (red-33m, yellow- 33m, green 5m) Red 1m dual input jack to alligator clip adapter lead, 2 Auxiliary earth spikes, and Instruction Manual

RANGES and ACCURACY SPECIFICATION
Measurement Characteristics
(All at 75°F ± 41°F, < 80% R.H.) Measurement accuracy is expressed as ±(% reading + digits) in the resistance and voltage functions

RESISTANCE:

Range	Measuring Range	Resolution	Accuracy
20Ω	0.00Ω - 19.99Ω	0.01Ω	±(2% reading+ 2 digits)[1]
200Ω	00.0Ω - 199.9Ω	0.1Ω	±(2% reading + 2 digits)
2000 Ω	000Ω - 1999Ω	1Ω or 0.001KΩ	±(2% reading + 2 digits)

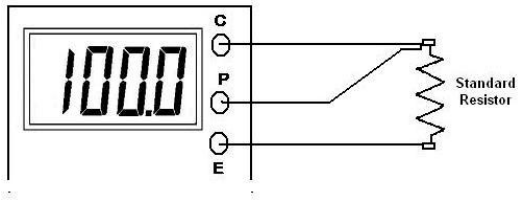
[1] **Error is** ± 2 digits or ± 0.1Ω, whichever is greater.
Operation frequency of current is 820Hz to 1.6kHz at approx. 2mA.

EARTH VOLTAGE POTENTIAL:

Range	Measuring Range	Resolution	Accuracy
0-200V AC	00.0 – 199.9V	.1mV	± 1.0% ± 2digits

Required Standards and Equipment

- Precision AC voltage source with a range of 0 to 200V AC @60Hz with an accuracy of .25% or better.
- To test the performance of the 61-796, you will need a set of fixed standard resistors with an accuracy of 0.5% or better. Values required are 1Ω, 10Ω, 100Ω, and 1000Ω.
    - All three test leads should be of equal length. **C** and **P** lead connections should be made at the standard resistors. This Source/Since method will reduce the lead resistance error in the measurement. See Figure 1 below.



E, P, and C should be equal in length and as short as possible
For best results P and C should be connected together at the measurement points as shown in this figure.

Figure 1

PERFORMANCE VERIFICATIONS

Perform the following analysis. If the meter conforms to the limits listed in Table 1, steps 1 - 6, the meter is functioning correctly. If the meter does not conform to any of the listed limits, the calibration procedure must be performed.

Battery Test

- Remove the battery cover and use a calibrated meter to ensure the battery pack measures a minimum of 11.5V DC. If the battery pack measures under 11.5V DC, replace all 8 x 1.5V batteries before beginning the performance test.

Frequency Test

- Turn the function switch to **20Ω** range,
- Connect a frequency counter to terminals **E** and **P**.
- Press and lock the **TEST** button. The output frequency should be 820Hz ±15Hz (805Hz~835Hz).

Resistance Test

- Connect the standard resistors to the unit under test as described in Figure 1.
- Select **20Ω** range.
- Short **E**, **P,** and **C** together, adjust **0Ω adj** dial for 0.00 ±0.01 ohms on the LCD display.
- Connect **E**, **P,** and **C** to the 1.0Ω standard resistor and verify the reading in Table 1, step 1.
- Repeat this process for steps 2 - 6 in Table 1.
    - It is not necessary to do the **0Ω adj** in the 200 and 2000 range.
- If the display reading falls outside of the range shown in Table 1, the meter does not meet specification.

Note: Error for the lead resistance is not included or accounted for in the test data in Table 1

Table 1. Resistance Test

Step	Range	Input	Low Limit	High Limit
1	20	1.00Ω	0.90	1.10
2	20	10.00Ω	9.90	10.10
3	200	10.0Ω	9.6	10.4
4	200	100.0Ω	97.8	102.2
5	2000	100.0Ω	96	104
6	2000	1000.0Ω	978	1022

AC Voltage Test

- Connect meter terminals **E** and **P** to the output of a precision AC voltage source.
- Apply the AC voltage listed in Table 2, steps 1 - 3.
- If the display reading falls outside of the limits shown in Table 2, the meter does not meet specification.

Table 2. AC Voltage Test

Steps	Range	Input	Low Limit	High Limit
1	Earth Voltage	12V @ 60Hz	11.7	12.3
2	Earth Voltage	120V @ 60Hz	118.6	121.4
3	Earth Voltage	190V @ 60Hz	187.9	192.1

Disassembly Instructions and Setup for Calibration *(refer to Figure 3)*

- Start with the unit top case lid closed.
- From the bottom, remove the battery cover.
- Remove the 2 screws that hold the measurement unit into the case.
    - One screw is in the top right corner of the battery compartment and one screw is in the lower right, just left of the fuse.
- Replace the battery cover and loosely tighten the screws.
- Open the case and carefully lift the unit from the case. There are several sets of wires attached to the bottom case so be very careful not to damage them.
- You should now have access to the main circuit board and adjustments.

Calibration

Qualified personnel should only perform calibration procedures described in this manual.
During this calibration it will be necessary to have the electronics of the instrument exposed.
A potential for hazardous voltage can be present during this procedure. **Use extreme caution**.

ACV Adjustment *(refer to Figure 2)*
Turn the function switch to **EARTH VOLTAGE** position.

- Press and lock the **TEST** button. The display should read AC 00.0V.
- Set the precision AC power source to standby with an output of 100V @ 60 Hz.
- Connect terminals **E** and **P** of the 61-796 to the output of the AC source. (**C** should be left open.)
- Energize the AC source.
- Adjust **VR6** on the circuit board for a display reading of AC 100.0V.
- Change the AC source to 190V @ 60Hz.
- Displayed should be 190V ±1.5V.
    - Maximum allowable error during calibration should not exceed ±0.7% reading ±2 digits.
- Release the **TEST** button. Turn off AC source and remove test leads. ACV calibration is complete.

Frequency Adjustment *(refer to Figure 2)*

- Turn the function switch to **20Ω** range.
- Connect a frequency counter to terminals **E** and **P**.
- Press and lock the **TEST** button and adjust **VR1** for a frequency output of 820Hz ±15Hz (805Hz~835Hz).
- Release the **TEST** button and remove the counter. Frequency adjustment is complete.

Ω Adjustment *(refer to Figure 2)*

Connect the 61-796 to the standard resistors as described in the performance test section, Figure 1.

Select 20Ω Range.

- Short **E**, **P,** and **C** together, adjust **0Ω adj** dial for 0.00 ±0.01 ohms on the LCD display.
- Connect **E**, **P,** and **C** to the 10Ω standard resistor; adjust **VR3** for a reading of 10.00Ω ±0.02.

Select 200Ω Range.

- Short **E**, **P,** and **C** together, check that the display reads 00.0 ±.2
- Connect **E**, **P,** and **C** to the 100Ω standard resistor; adjust **VR4** for a reading of 100. 0Ω ±0.2.

Select 2000Ω stage.

- Short **E**, **P,** and **C** together, check that the display reads 000 ±2
- Connect **E**, **P,** and **C** to the 1000Ω standard resistor; adjust **VR5** for a reading of 1000Ω ±2.

Ω Calibration Verification Test

The maximum allowable error just after calibration should not exceed those listed in Table 3.

Table 3. Ω Verification Test

Ranges	Ω Source	Adjustment	Accuracy	LCD indication
20Ω	10Ω	VR3	±1.0%rdg or± 0.1Ω	9.90~ 10.10Ω
200Ω	100Ω	VR4	±0.5%rdg±1dgt	99.50~100.5Ω
2000Ω	1000Ω	VR5	±0.5%rdg±1dgt	995~1005Ω

Calibration Adjustment Locations

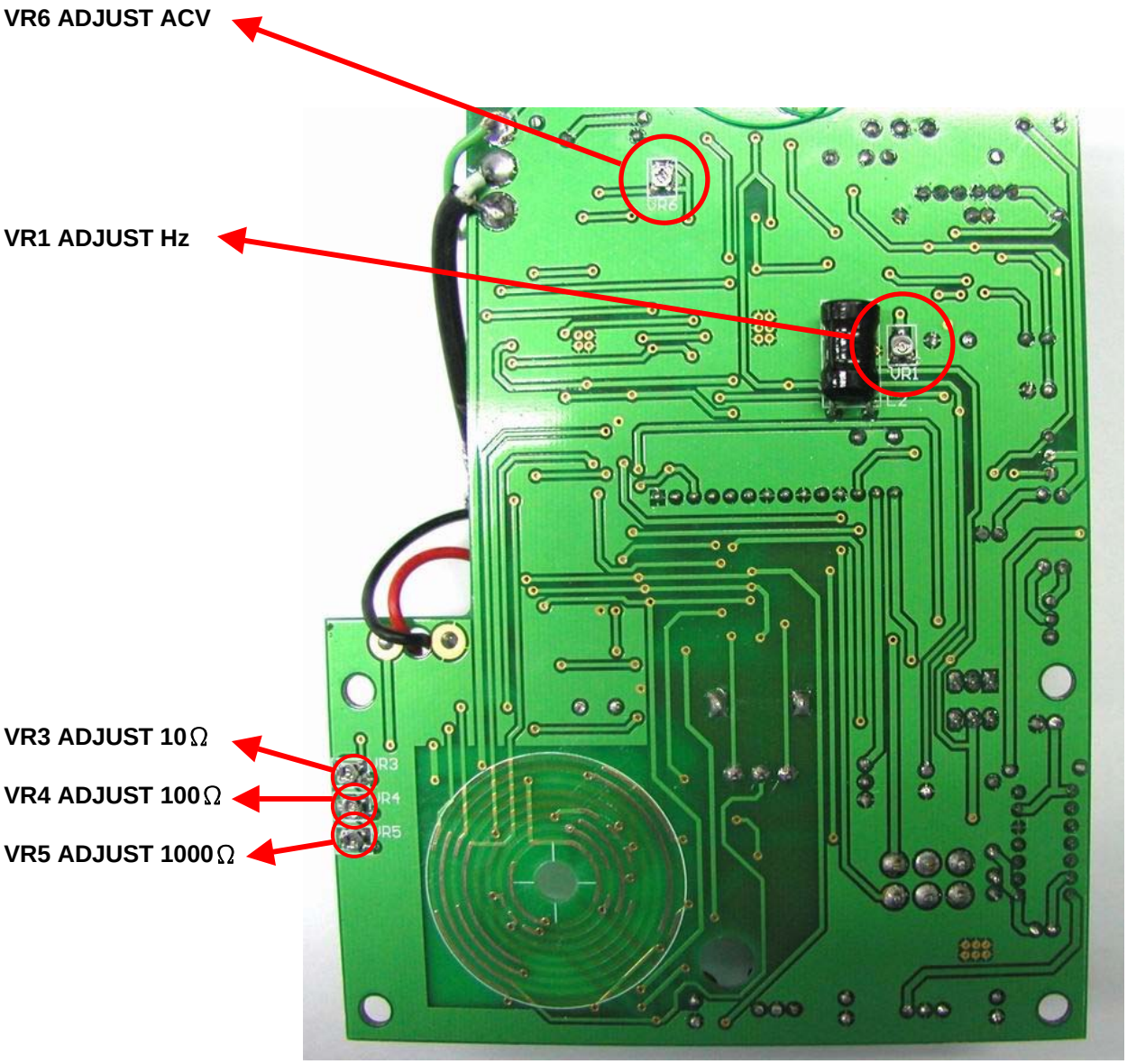


Figure 2

Componet Layout

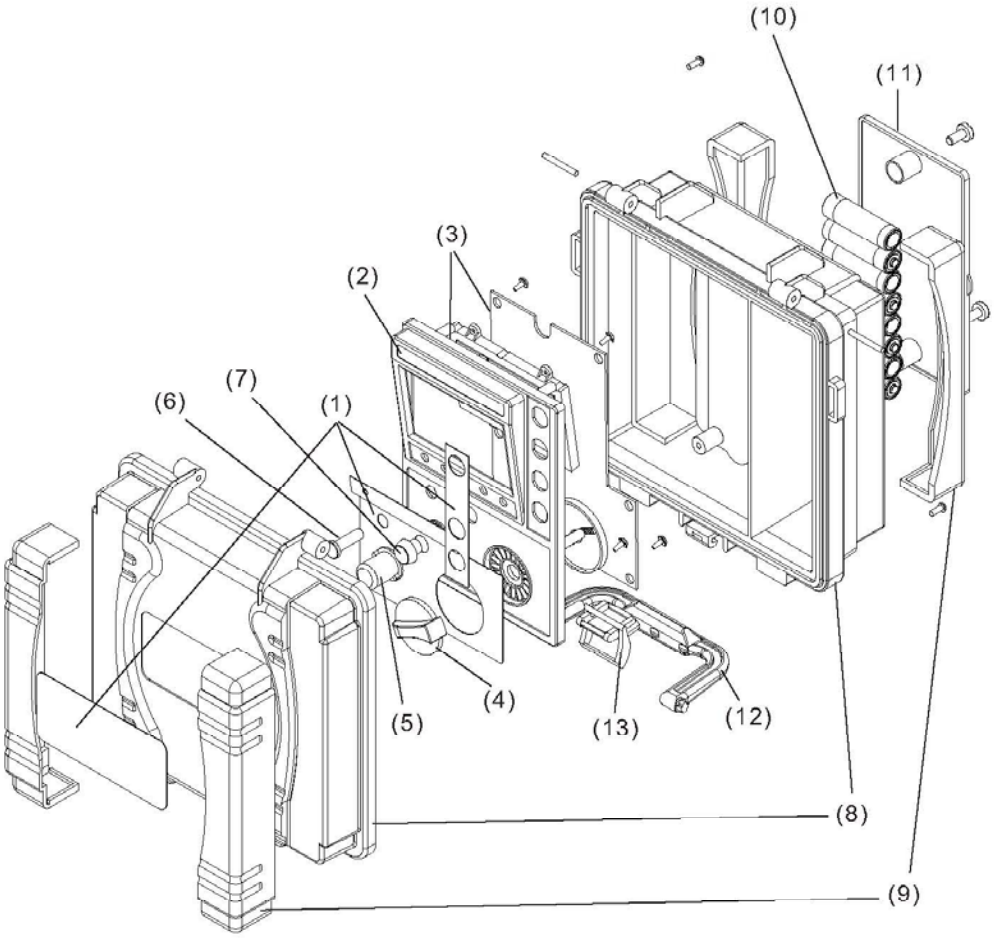


Figure 3

Troubleshooting

Symptoms	Possible Causes	Remedies
The LCD has no display	No batteries	Install the batteries
	Faulty battery polarity	Install the batteries in correct polarity
	Battery terminal oxidized	Replace new battery terminal
	Wire broken	Solder wire
	Q1 or Q8 broken	Replace Q1 (IC-7809FA) or Q8 (IC-78L05)
	Poor contact of battery harness	Replace the battery contacts
	Insufficient capacity of battery	Replace the batteries
Unable to measure due to unclear LCD	U4 or U21 broken	Replace U4 (IC-27M2) or U21 (IC-5106Q)
Digit incomplete	U21 broken	Replace U21 (IC-5106Q)
Vague font	U4 broken	Replace U4 (IC-27M2)
Reading not stable	U21 or CON2 broken	Replace U21 (IC-5106Q) or CON2
Hz no reading	Power transformer broken	Replace power transformer (PT-1505)
	C6, C10 broken	Replace C6 (CPE-220uF) C10 (CDM-1uF)
ACV no reading	C21 or Z2 broken	Replace C21 (CPE-22uF) or Z2 (TVS-6.5CA)
	Fuse broken	Replace Fuse
	U14 broken	Replace U14 (IC-062)
ACV reading abnormal	Diode broken	Replace Diode
ACV ≠ 0 (no test)	Z2 broken	Replace Z2 (TVS-6.5CA)
Ω reading shows "1"	Power transformer broken	Replace power transformer (PT-1505)
	L2 broken	Replace L2 (IND-254K)
	U4 broken	Replace U4 (IC-27M2)
When measuring "Ω" LED no indication	Q5 or Q6 broken	Replace Q5 (TRA-A673) OR Q6 (TRA-A673)
When "2KΩ" range, not going to zero	U13 broken	Replace U13 (IC-4053)
When "20Ω" range, not going to zero	U3, Q6 broken	Replace U3 (IC-LM358) Q6 (TRA-A673)
When measuring "Ω", the reading drops gradually	U3 broken	Replace U3 (IC-LM358)
Unable to measure "Ω"	Fuse broken	Replace Fuse

Spare Parts List

No.	Description	Parts No.	Qty.	Note
1	Nameplate		3	
2	UP-cover		1	
3	PCB		2	
4	Function switch		1	
5	Test button		1	
6	Hold button		1	
7	0 Ω adjust		1	
8	Housing case		1	
9	Protection cover		4	
10	Battery		8	
11	Battery case		1	
12	Handle		1	
13	Latch		1	
Others	Test leads		1 Kit	
	Simplified measurement probe		1	
	Auxiliary earth spikes		2	
	Shoulder belt		1	
	Instruction manual		1	