

Clamp-On Ground Resistance Testers Models 3711 & 3731



US Patent No: 362,639



Description

Models 3711 and 3731 measure ground rod and small grid resistance in any environment without the use of auxiliary ground rods. Clamp-on ground resistance testers are used in multi-grounded systems without disconnecting the ground under test. The Models 3711 and 3731 simply clamp around the ground conductor or rod and measure the resistance to ground.

By performing measurements on intact ground systems, the user also verifies the quality of the grounding connections and bonds. Resistance and continuity of grounding loops around pads and buildings may also be measured.

Both models include a current measurement function. The probe's high sensitivity enables measurement of

leakage current flowing to ground or circulating in ground loops down to 1mA and neutral currents to 30Arms. This feature provides additional information which is becoming vital as distribution ground networks carry higher levels of noise and harmonics, which affect power quality.

The Model 3731 offers an alarm function and a memory (logging) function. In the alarm mode, the probe will audibly and visually indicate if the reading is beyond an input set point. The user may also have the alarm initiated above or below the set point. This alarm feature permits quick field checks where only "pass" or "fail" readings will suffice.

Features

- ◆ NEW – Third generation of clamp-on ground testers
- ◆ NEW – Replace Models 3710/30 with TEN TIMES the resolution (measure 0.1 grounds!)
- ◆ HIGHER immunity to electrical noise for work around transmission towers and substations
- ◆ BETTER power management for extended battery life
- ◆ NEW – all new parts, design and manufacturing process for lower costs
- ◆ SAME external design, reliability and operation as previous Models 3710/30
- ◆ Simple and fast clamp-on operation - no leads, no auxiliary rods or spacing requirements
- ◆ Direct reading of ground resistance from 0.01 to 1200
- ◆ Direct reading of continuity and ground loop resistance
- ◆ Direct reading of ground leakage current from 1mA to 30Arms
- ◆ Jaw design with large 1.25" (32 mm) window accommodates up to 1000 MCM cables
- ◆ Auto-off for power management
- ◆ Alarm function with adjustable set point and buzzer for quick field checks
- ◆ Memory function to store 99 field measurements for later retrieval and analysis
- ◆ Meets IEC 1010 Cat. III and CE marked
- ◆ Designed to UL and CSA standards (agency approvals not available at time of document)
- ◆ Rugged Lexan® head and body construction with free three-year warranty
- ◆ Alarm settings and stored memory information saved during shutdown
- ◆ Patented design

Applications

- ◆ Measure ground rod and small grid resistance
- ◆ Use in multi-grounded systems without disconnecting the ground under test
- ◆ Measure resistance and continuity of grounding loops around pads and buildings
- ◆ Measure leakage current flowing to ground or circulating in ground loops
- ◆ Conduct quick field checks
- ◆ Conduct field surveys and retrieve and analyze readings at a later time

Product Construction

The Models 3711 and 3731 bodies are built of Lexan® (or equivalent poly-carbonate) for rugged use. The probe heads are encapsulated in a double-walled shell for extra strength and reinforced for enhanced field reliability. Overall construction and mechanical design ratings such as drop test, shock and vibration, weatherproofing against water projections or dust, meet or exceed IEC (International Electrotechnical Commission) standards. The products have been designed to IEC 1010 Cat. III and to meet UL, CSA and GS safety approvals (not available at time of printing). Both models CE marked.

The probe head, or jaw, is a key component in the measurement and overall product performance.

The large jaw thickness permits use on tight ground conductors on poles and in manholes. The 1.25" (32mm) opening accommodates not only ground rods, but larger ground conductors (up to 1000MCM) typically found in telecommunication buildings or railroad applications.

The inner jaw is composed of two independent and individually shielded magnetic cores permitting measurement without noise interference or cross talk common to separate probe instruments.

Thorough mechanical design, including small winglets, ensures reliable and repetitive jaw alignment for accuracy and prevents undesirable insertions into the jaw spring assembly.

The ergonomic body design permits one-handed operation. The guard provides additional strength, and prevents the hand from slipping or coming into contact with conductors under test. The LCD lens cover may be easily replaced if scratched. The sealed push-buttons directly access all test functions and are easily operated even with gloved hands.

Principle of Operation

A multigrounded distribution system may be represented as a simple circuit (see *Figures 1 and 2*). If a voltage E is applied with a special transformer (in the jaw) to a grounding rod or conductor R_x , a resulting current I flows through the circuit.

In the Models 3711 and 3731, a constant 2.403kHz voltage oscillator generates E , and the resulting current I is fed to a special transformer through a power amplifier. The receiver current probe picks up the current at the generated frequency flowing in the system. An internal filter eliminates earth currents and high frequency noise. If the current I that is flowing in the circuit is measured with the voltage E kept constant, then the resistance E of the ground R_x may be obtained and displayed.

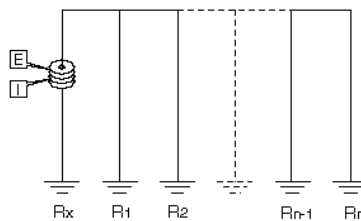


Figure 1

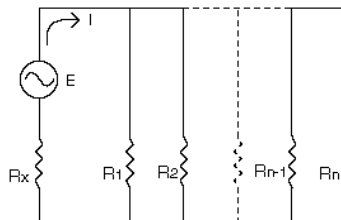


Figure 2

We may establish the following equation:

$$E/I = R_x + \frac{1}{n \sum_{k=1}^n \frac{1}{R_k}}$$

$$\text{where } R_x \gg \frac{1}{n \sum_{k=1}^n \frac{1}{R_k}}$$

and therefore, $E/I \cong R_x$.

Functions and Features

	3711	3731
Ohms Range	Yes	Yes
Arms Range	Yes	Yes
Hold Function	Yes	Yes
Self Testp	Yes	Yes
Auto-Off	Yes	Yes
Battery Life Indicator	Yes	Yes
Noise Indicator	Yes	Yes
Open Jaw Indicator	Yes	Yes
Closed Loop Indicator	Yes	Yes
Multi-Tone Beeper	Yes	Yes
Alarm Function	-	Yes
Memory (Logging)	-	Yes



Specifications

ELECTRICAL

Ground Resistance Ranges: Autoranging 0.01 to 1200

Meas.Range	0.10 to 1.00	1.0 to 50.0	50.0 to 100.0	100 to 200	200 to 400	400 to 600	600 to 1200
Resolution (r)	0.01	0.1	0.5	1	5	10	50
Accuracy	± 2.5% Rdg. ± 2r	± 1.5% Rdg. ± 2r	± 2% Rdg. ± 2r	± 3% Rdg. ± 2r	± 6% Rdg. ± 2r	± 10% Rdg. ± 2r	N/A

Current Measurement Ranges: Autoranging 1mA to 30.00Arms

Meas.Range	1 to 299mA	0.300A to 2.999A	3.00A to 29.99A
Resolution (r)	1mA	0.001A	0.01A
Accuracy	± 2.5% Rdg. ± 2r	± 2.5% Rdg. ± 2r	± 2.6% Rdg. ± 2r

ELECTRICAL

Resistance Measurement Frequency:
2403kHz

Current Measurement Frequency:
1 to 199

Current Overload:
OL displayed above 30Arms

Power Supply: 9V Alkaline battery
(IEC 6LF22 or NEDA 1604A)

Battery Life: typical: 8 hours or approx.
1,000 measurements of 30 seconds

MECHANICAL

Dimensions: 9.25" x 3.94" x 2.17"
(235mm x 100mm x 55mm)

Weight: 2.2lbs. (1kg)

Case Material: Lexan® 920A or
equivalent (UL94V2)

Jaw Cover Material: Lexan® 500R with
10% fiberglass charge (UL94V0)

LCD Cover Material:
Lexan® 920A (UL94V1)

Color: Gray body, red jaws

Jaw Window Diameter: 1.25" (32mm)

Jaw Opening: 1.38" (35mm)

Operating Temperature:
14 to 131°F (-10° to 55°C)

Operating Humidity: 0 to 90% RH @
14 to 104°F (-10°C to 40°C), 75% RH
@ 131°F (55°C)

Storage Temperature:
-40 to 158°F (-40°C to 70°C)

LCD: 3-3/4 Digit, 1.73" x 1.10"
(44 x 28 mm)

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NSN: 6625-01-377-8030

SAFETY

IEC 1010-1 Double Insulation

Environmental: IP30, IEC 359 Group III

Vibration Test: IEC 68-2-6

Shock Test: IEC 68-2-27

Drop Test (1m): IEC 68-2-32

Dielectric Test: 2500VAC

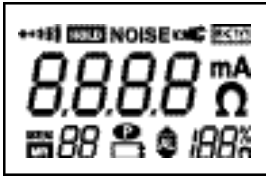
Working Voltage:
150V, Cat. III - Pollution Degree 2
300V, Cat. III - Pollution Degree 1

Max Overload (A or Function):
100A continuous, 200A (<5s) 50/60Hz



Large inner jaw diameter fits rods and
conductors up to 1000 MCM

Display



- Ω** Displayed when measuring resistance
- mA, A** Displayed when measuring current
- 100%** Percentage of battery life remaining
- Flashing indicates low battery condition
- P indicates the auto-off feature is inactive
- HOLD** HOLD push button has been pressed
- Active beeper function
- NOISE** Noise in the reading
- Probe jaws not closed properly.
- Alarm setpoints
- MEM** Memory function active
- MR 88** Memory Recall (MR) & register
- R<1** Resistance measured is below 1



Calibration Check Loop (included)

Push Buttons



ON/OFF
Power ON or power OFF.
Activates display self test at power-up

Ω
Resistance measurement. (Increment the alarm set point and the memory position when in programming mode.)

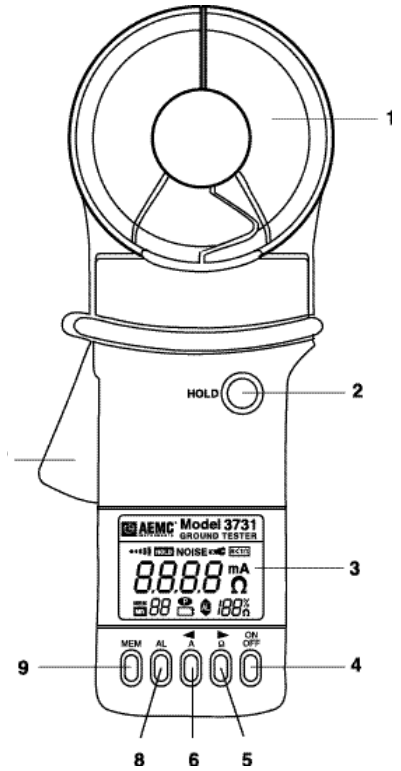
A
Current measurement. (Decrement the alarm set point and the memory position when in programming mode.)

AL (3731 only)
Activate/deactivate the alarm function.
Access the value of the alarm set point when in programming mode

MEM (3731 only)
Activate the memory function or to read the stored values in MR (Memory Recall). Clears the memory when in programming mode



*Clamp-on Ground Tester
Models 3711 & 3731 are packaged with calibration loop, battery and user manual in hard carrying case.*



1. Head assembly
2. Hold button
3. Display
4. On/Off
5. **A**: Current measurements
6. **AL**: Alarm button (3731 only)
7. Lever opens & closes jaws
8. **MEM**: Memory button (3731 only)
9. **MEM**: Memory button (3731 only)

ORDERING INFORMATION

CATALOG NO.

- | | |
|--|---------------------|
| Clamp-on Ground Resistance Tester Model 3711 | Cat.#2117.60 |
| includes hard carrying case, 9V Alkaline battery, 25 calibration check loop, and user manual | |
| Clamp-on Ground Resistance Tester Model 3731 | Cat.#2117.61 |
| includes hard carrying case, 9V Alkaline battery, 25 calibration check loop, and user manual | |



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