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# Clamp-On Ground Resistance Tester Models 3711 & 3731

Step-by-Step Instructions



APPLICATION NOTES | AUGUST 2011

# Clamp-On Ground Resistance Tester

## Models 3711 & 3731

### Step-by-Step Instructions



- 1 Turn instrument on by pressing the green **ON/OFF** button (far right). Continue holding the green button down until the battery life indicator comes on.
- 2 Check battery life indicator – make sure at least 20 percent remains.
- 3 Check calibration — locate the 25Ω calibration gauge supplied with the tester and clamp the meter around any leg of the gauge.
- 4 Observe instrument reading – the reading should be between 24.2 and 25.8. If reading is correct proceed to step 5. If not, clean instrument and repeat steps 3 and 4. If you are not able to get the instrument to read within 1.0Ω after cleaning instrument, **do not proceed**. Have the instrument sent in for calibration.
- 5 Remove instrument from gauge. Observe instrument reading with nothing in the clamps. The reading should be greater than 1000Ω **OR** read **OL**. If either of these conditions is observed, continue to step 6. If not, clean instrument (see instructions below) and repeat steps 3 through 5. If, after cleaning instrument, you are still unable to get the instrument to perform as described in steps 4 and 5, open the jaws approximately 1/2 inch and let them snap shut. Make sure that the jaws close properly. If the unit still does not perform properly, **do not proceed**. Have the instrument sent in for calibration.
- 6 Switch instrument to Current Mode. (Press button labeled “A” for Amps)
- 7 Clamp instrument around the ground wire or rod.
- 8 Observe reading – if less than 1.0A, proceed to step 9. If between 1.0 and 5.0A, make note of reading and continue to step 9. If greater than 5A, terminate test and remove instrument from the ground wire or rod and correct the problem before re-testing. Readings of 5A or greater cause errors for resistance measurements.
- 9 Switch instrument to Resistance (Ω) Mode. (Press button labeled with Ohm (Ω) symbol) If “**NOISE**” is displayed, this indicates voltage in excess of 50 volts and/or current in excess of 5A. Readings of resistance are not to be considered valid under these conditions.
- 10 Wait for reading to stabilize and record reading. Lock reading by pressing “**HOLD**”. Observe and write the measured value for your records
- 11 Remove instrument from ground wire or rod and **re-clamp to gauge**.
- 12 Observe reading – the reading should be within 1.0Ω of gauge value. If reading is OK – **measurement is valid**. If reading is wrong, clean instrument (see instructions below) and repeat from step 4.

### Cleaning the Heads

To ensure optimum performance, it is important to keep the probe jaw mating surfaces clean at all times. Failure to do so may result in erroneous readings. To clean the probe jaws, use a very fine sandpaper (600 grit) to avoid scratching the surface, then gently clean with a soft cloth. Make sure that the instrument is oriented such that no debris or filings will fall into the unit while cleaning. Check with your finger afterwards to be sure that no foreign material remains on the jaw surfaces (both top and bottom).

# Clamp-On Ground Resistance Testing

The clamp-on ground resistance testing technique offers the ability to measure the resistance without disconnecting the ground. This type of measurement also offers the advantage of including the bonding to ground and the overall grounding connection resistances.

## Principles of Operation

Usually, a common distribution line grounded system can be simulated as a simple basic circuit as shown in **Figure A** or an equivalent circuit, shown in **Figure B**. If voltage E is applied to any measured grounding system. Rx through a special transformer (used in Models 3711 and 3731), current I flows through the circuit, thereby establishing the following equation.

Therefore,  $E/I = R_x$  is established. If it is detected with E kept constant, measured grounding resistance can be obtained. Refer again to **Figures A and B**. Current is fed to a special transformer via a power amplifier from a 2.3 kHz constant voltage oscillator. This current is detected by a detection CT. Only the 2.3kHz signal frequency is amplified by a filter amplifier. This occurs before the A/D conversion and after synchronous rectification. It is then displayed on the LCD of the Model 3711/3731 meter.

The filter amplifier is used to cut off both earth current at commercial frequency and high-frequency noise. Voltage is detected by coils wound around the injection CT, which is then amplified, rectified, and compared by a level comparator. If the clamp is not closed properly, an "open jaw" annunciator appears on the LCD.

$$\frac{V}{I} = R_x + \frac{1}{\sum_{i=1}^n \frac{1}{R_i}}$$

where, usually

$$R_x \gg \frac{1}{\sum_{i=1}^n \frac{1}{R_i}}$$

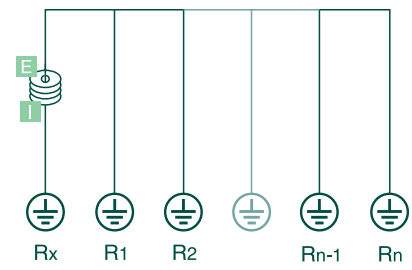


Figure A

## The important points to consider for proper use of the clamp-on ground tester are:

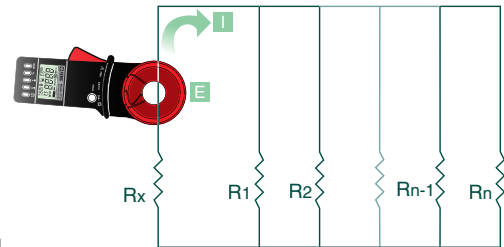


Figure B

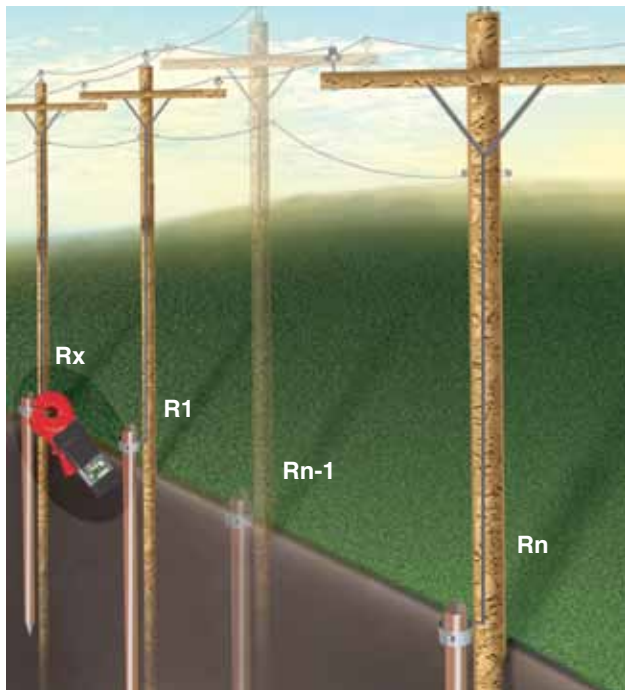


Figure C

There is a series-parallel resistance path down stream from the measurement point that is lower in resistance than the point being measured.

That the earth is the return path to the point where the clamp-on meter is connected and not wire or other metal structures (see **Figure C**).

If the measurement point is not connected to a series-parallel low resistance network (such as the case with a single rod), a temporary path may be created by connecting a jumper cable from the measurement point to a low resistance like a pole ground (see **Figure D**).

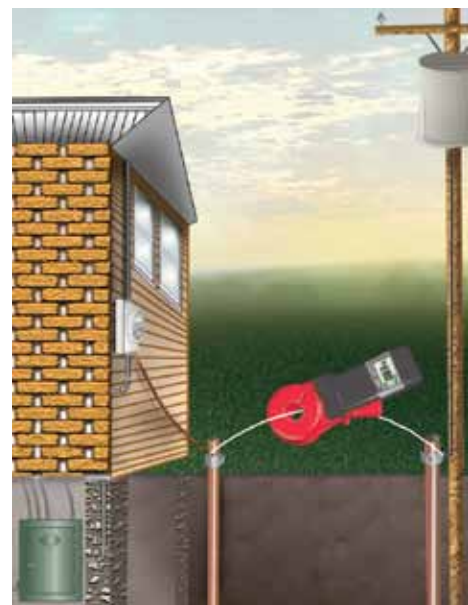


Figure D

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