

## EARTH HiTESTER 3143, 3151

Field measuring instruments



Ground resistance meter

### Say goodbye auxiliary grounding rods with the 3143.

Measure even on paved roads.



3-electrode measurement on the 3151 gives greater precision!



Tangle-free



ISO 9001  
JMI-0216



ISO 14001  
JQA-E-90091



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# The 3143 requires no auxiliary grounding rods, making measurement easy.

## Presenting a next-generation ground resistance meter

Grounding is increasingly important for the safe operation and maintenance of communications equipment and many other types of facilities. However, in an urban environment where the ground is covered with concrete or asphalt, conventional measurement methods that require inserting auxiliary grounding electrodes are difficult to use. The 3143 uses a new measurement principle that makes auxiliary grounding electrodes unnecessary, so it can be used to measure ground resistance on paved roads.

## Features

- **Auxiliary grounding rods are unnecessary, greatly reducing time and effort.**

Measurement can be done easily on concrete or asphalt pavements.

- **Measurements are easy to read.**

A large digital display shows measured values.

- **Resistant to dirt.**

Dust resistance of parts such as the power switch and measurement dial has been increased and durability has been improved.

## Measurement Principle of the 3143

The 3143 obtains ground resistance  $R_x$  by measuring the loop impedance of the closed path that goes from the lead wire to earth, then back to a return line which is strung along the surface of the earth.

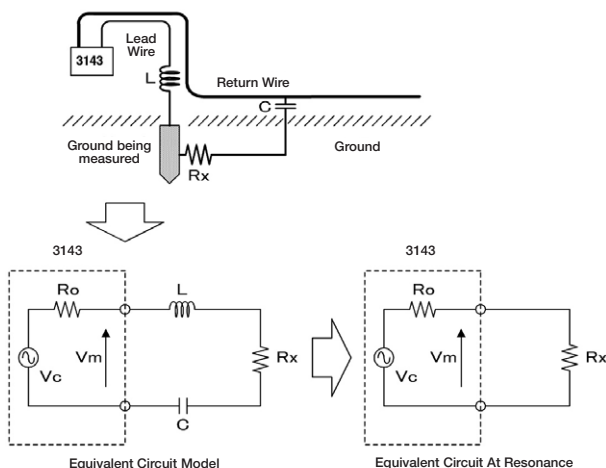
The drawing below shows an equivalent circuit, where  $R_x$  is the ground resistance of the object being measured,  $C$  is the capacitance of the return wire relative to ground, and  $L$  is the inductance of the measurement cable.

By varying the frequency of the measurement signal source so that LCR is serially resonant, the ground resistance  $R_x$  can be determined as follows.

$$R_x = V_m / (V_c - V_m) \times R_o$$

Here,  $V_c$  is the signal source voltage,  $V_m$  is the voltage between the measurement terminals, and  $R_o$  is the signal source output resistance.

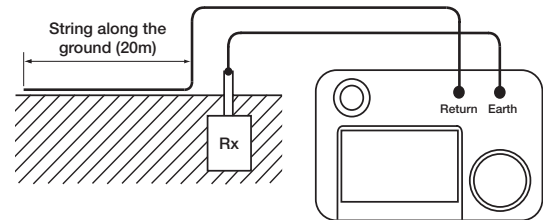
With the 3143 you turn the measurement knob to vary the signal source frequency. As the knob is turned, the smallest value that appears (the value at the resonance point) is the ground resistance value  $R_x$ .



## Using the 3143

1. Wire as shown in the diagram.
2. Turn the rotary knob to measure.

As the rotary knob is turned, the lowest resistance value that is displayed is the grounding resistance value.



The 3143 is most appropriate for measuring the ground resistance of an individually grounded rod-shaped electrode.

## Convenient Features

Bar graph display makes it easy to find measured resistance.  
Turn the rotary knob so that the graduations are centered.



## Differences from the Previous Instrument (Model 3151)

Common ground resistance meters such as the 3151 measure the resistance using a frequency between 500 Hz and several kHz. The 3143 uses a frequency between 100 kHz and 1.5 MHz, close to that of a lightning surge. Therefore, measurement errors can result if the 3143 is used in situations such as the following. In these instances, we recommend using Model 3151.

- Electrical grounding or mesh grounding.
- Electrical power equipment grounding.
- When the measurement point is located at a distance from the insertion point of the grounding electrode.

# Count on The 3151 for Dependable Measurements

## The 3151 is a Standard Ground Resistance Meter

Ground resistance measurement involves factors that are not encountered during ordinary resistance measurement, such as polarization of the earth, the influence of grounding current due to leak current and grounding voltage, and the influence of auxiliary grounding resistance. The 3151 is able to make more accurate measurements more safely under difficult conditions because it uses the alternating current potentiometer method to provide measurement accuracy, and because it contains features such as an auxiliary grounding resistance check feature and measurement frequency switching.

## Features

### Wide measurement range

Take measurements to 115% of the measurement range.

### More stable measurement

Easily check the grounding condition of auxiliary grounding rods for better accuracy. Further, the measurement frequency switching lets you avoid influences such as that of high frequency grounding current.

### Simple measurement feature

Switch between "normal" and "simple" measurement modes with the press of a button.

### Overvoltage protection and alarm feature

If wires are incorrectly connected (as often happens during simple measurement of commercial power supplies), safety is provided by an alarm buzzer and overvoltage protection.

### Resistant to dirt

Parts such as the measurement switches and measurement dial have increased dust resistance and durability.

### More convenient accessories

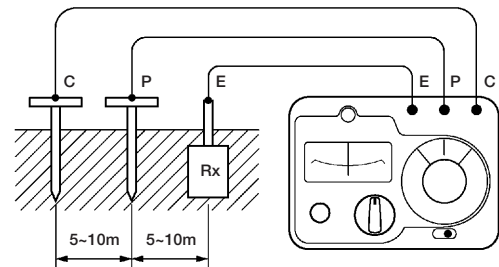
A cable winder ensures freedom from cable tangles, and a convenient carrying case accommodates all measurement materials.

## Using the 3151

### Normal Measurement (3 Electrode Method)

1. Wire as shown in the diagram.
2. Set the 2/3 electrode method switch to 3 electrode measurement.
3. Check for grounding voltage in the grounding voltage range.
4. Check the auxiliary grounding resistance values for C and P in the auxiliary grounding resistance range.
5. Measure using the appropriate resistance range.

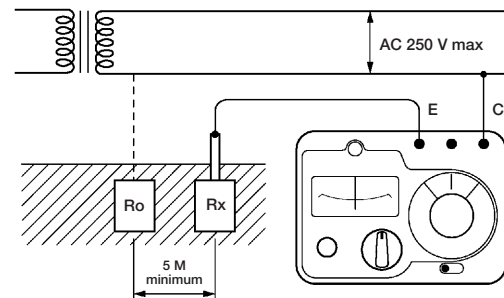
While pressing the measurement button, turn the resistance dial knob and read the resistance when the galvanometer reaches a balance.



### Simple Measurement (2 Electrode Method)

1. Wire as shown in the diagram. (Example of power supply grounding line connection)
2. Set the 2/3 electrode method switch to 2 electrode measurement.
3. Check for grounding voltage in the grounding voltage range.
4. Take measurements, choosing either  $\times 10$  or  $\times 100$ .

While pressing the measurement button, turn the resistance dial knob and read the resistance when the galvanometer reaches a balance. (Measured value =  $R_x + R_o$ .)



## Convenient Features



## 3143 Specifications

Measurement Item	Measurement Range	Accuracy
Grounding Resistance	20.0 to 49.9 $\Omega$	$\pm 10\%$ rdg.
	50.0 to 500.0 $\Omega$	$\pm 5\%$ rdg.

(Temperature and humidity: Within rated operating temperature and humidity range.)

- **Display:** 4-digit LCD, values above 999.9  $\Omega$  displayed as "OF"
- **Influence of grounding voltage:**  $\pm 5\%$  rdg. for 0 to 10 V
- **Principle of operation:** voltage comparison method  
(Measurement of voltage at loop impedance serial resonance)
- **Open circuit voltage:** AC 1 Vp typ
- **Measurement current:** AC 3.6 mA max (With terminals shorted)
- **Measurement frequency:** 100 kHz to 1.5 MHz
- **Features:**
  - Energy saving mode: after 3 minutes with no operation, displays "HOLD" and enters the standby state
  - Resonance indicator: bar graph indicator shows approximate location of resonance point
  - Battery check: battery light flashes when the power supply voltage drops
- **Operating temperature and humidity:**  
0 to 40°C, 80% rh maximum (no condensation)
- **Storage temperature and humidity:**  
-10 to 50°C, 80% rh maximum (no condensation)
- **Applicable standards:**
  - Safety: EN61010, Measurement Category I, Pollution Degree 2
  - EMC: EN61326
- **Power supply:** LR6 alkaline battery  $\times$  4
- **Operating time:** 8 hours continuous (23°C reference value)
- **Approximate dimensions and weight:**  
155 (W)  $\times$  98 (H)  $\times$  49 (D) mm (not including projections),  
380 g (main unit only)
- **Accessories:**  
**MEASURING CABLE 9265**  
(black 1 m, red 20 m, one each; cable winder  $\times$  1)  
**PORTABLE CASE 9338**

## 3151 Specifications

Measurement Item	Measurement Range	Nominal Deviation
Grounding Resistance	10 $\Omega$ (0 to 11.5 $\Omega$ )	$\pm 2.5\%$ f.s.
	100 $\Omega$ (0 to 115 $\Omega$ )	$\pm 2.5\%$ f.s.
	1000 $\Omega$ (0 to 1150 $\Omega$ )	$\pm 2.5\%$ f.s.
Grounding Voltage	30 V (0 to 30 V)	$\pm 3.0\%$ f.s.

(Temperature and humidity: 23°C  $\pm$  5°C, 80% rh maximum)  
(100 $\Omega$ /1000 $\Omega$  ranges only with 2 electrode measurement)

- **Influence of auxiliary grounding resistance:**  
 $\pm 5\%$  for a fluctuation of 0 to 5 k $\Omega$
- **Influence of grounding voltage:**  
 $\pm 2\%$  for 0 to 5 V  
 $\pm 5\%$  for 0 to 10 V (for 50/60 Hz)  
 $\pm 5\%$  for 0 to 3 V (for DC, 16<sup>2/3</sup>, 400 Hz)
- **Influence of power supply voltage:**  
within nominal deviation for DC 6 to 10 V
- **Operating method:** AC potentiometer method
- **Open circuit voltage:** AC 50V max
- **Measurement current:**  
AC 15 mA max (AC 3 mA max when using the two electrode method)
- **Measurement frequency:**  
575 Hz (with 3a or 2a selected) or 600 Hz (with 3b or 2b selected)
- **Operating temperature and humidity:**  
0 to 40°C, 80% rh maximum (no condensation)
- **Storage temperature and humidity:**  
-10 to 50°C, 80% rh maximum (no condensation)
- **Applicable standards:**
  - Safety: EN61010, Measurement Category II, Pollution Degree 2
  - EMC: EN61326
- **Environment protection:** IP40 (EN60529)
- **Overvoltage protection:**  
AC 250 V, 1 minute (between E - P (S), E - C (H) terminals)
- **Power supply:** R6P manganese battery  $\times$  6, or LR6 alkaline battery  $\times$  6
- **Operating time:** Approx 350 operations (using R6P battery)  
Approx 1100 operations (using LR6 battery)  
(30 seconds measurement / 30 seconds off condition)
- **Approximate dimensions and weight:**  
164 (W)  $\times$  119 (H)  $\times$  88 (D) mm (not including protrusions),  
800 g (main unit only)
- **Accessories:**  
**AUXILIARY GROUNDING RODS 9214**  $\times$  2  
**MEASURING CABLE 9215**  
(black 5 m, yellow 10 m, red 20 m, one each; cable winder  $\times$  3)  
**PORTABLE CASE 9393**
- **Optional accessory**  
**EARTH NETS 9050 (set of two)**  
Use in places where auxiliary grounding rods cannot be inserted  
(but where water can penetrate)

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