

LOW RESISTANCE MEASUREMENTS

In the ESD industry, most resistance measurements are made between 100 ohms (10^2) and 100 terohms (10^{14}). ETS occasionally receives requests from customers to measure low resistances, however we do not currently manufacture meters or probes capable of measurements in this range. Low resistance measurements are more accurately made using a four-point probe and meter designed for this specific application.

High resistance measurements are made by applying a known source voltage (V) and then measuring the current (I). The resistance is calculated using Ohm's Law, $R=V/I$. This works fine above about 10 ohms. Below 10 ohms, the resistance of the test leads starts affecting accuracy by causing a voltage drop - so the voltage at the load (device under test) is no longer the voltage put out by the voltage source. This throws off the resistance calculation.

To get around this lead resistance problem below 10 ohms, the 4-wire or Kelvin method is used. This also uses Ohm's Law but it applies a known current source (I) on one pair of leads and measures the voltage (V) across the load using another pair of leads. The lead resistance problem goes away when this method is used because the high currents which cause the voltage drops are not present in the voltage measurement leads.

The ETS 863/6487 is a current meter with an on-board voltage source so it is optimized for high resistance measurements above 50 ohms. It cannot be used to perform 4-wire measurements.

Basic information can be found on four-point probes at www.four-point-probes.com and additional information can be obtained from Keithley Instruments www.keithley.com in their book, "Low-Level Measurements" - 5th edition. This book is free from Keithley.

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