What is the difference between 4-wire and 2-wire Ohms measurements?

Figure 1 below illustrates the method used in 2-wire Ohms measurement. The test current (I) is forced through the test lead into the Device Under Test (R). The Voltmeter (Vm) measures the voltage developed at the HI and LO terminals. This voltage will be from the IxR drop across the Device Under Test (DUT) as well as from the IxR from the test leads.

$$\text{Measured Resistance} = \frac{Vm}{I} = Rs + (2xR_{Lead})$$

Typical Lead Resistance is in the range of 1mohm to 100mohms. This Lead Resistance will be a significant source of error if your DUT is below 10 Ohms.
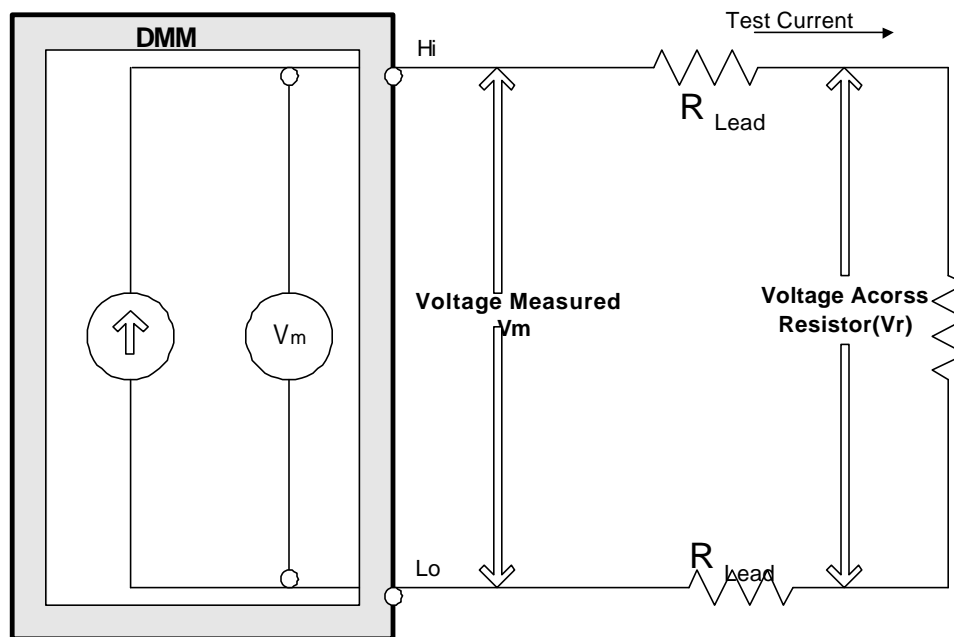

Figure 1

Figure 2 below illustrates the method used in 4-wire Ohms measurement. To use 4-wire ohms, four distinct connections are made to the DUT; these connections are typically called the source leads and the sense leads.

The Test current (I) is forced through the DUT as before on the source leads. However, this time the Voltmeter (Vm) measures the voltage developed only at the connection point of the sense leads that are connected at the DUT.

Since the input impedance of the voltmeter is many orders of magnitude larger than the DUT, negligible current flows into the Sense leads. Therefore, there is no IxR drop in the sense leads over which the voltage is measured. The measured voltage will be only from the IxR drop across the DUT.
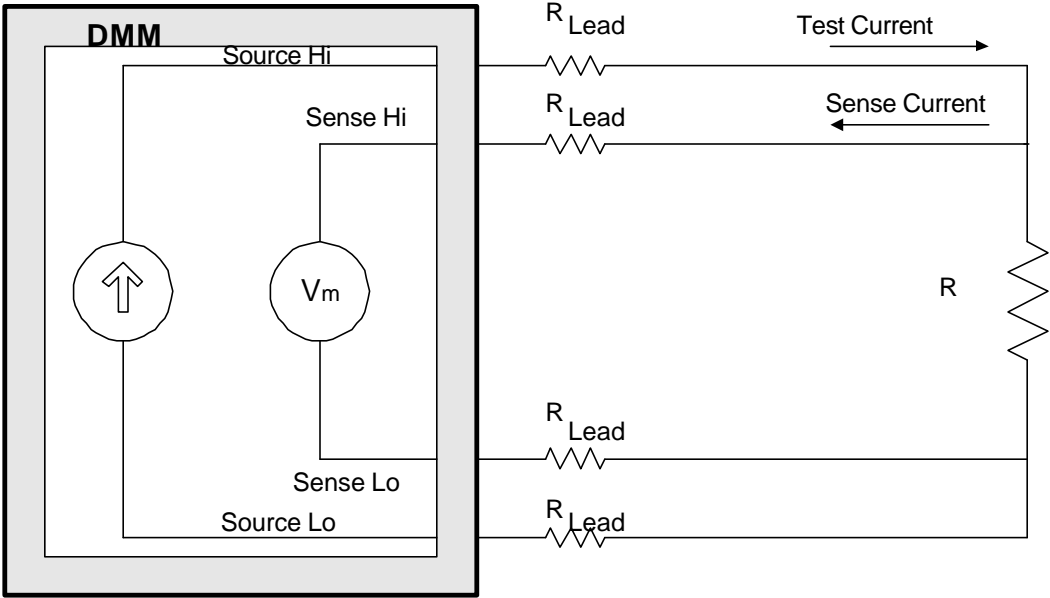
Figure 2