

Resistance Measurements*

Object

To measure resistances of various combinations of resistors.

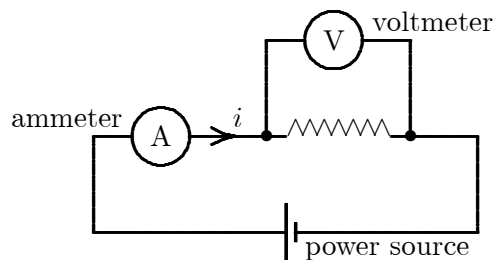
Theory

A network of resistors is often used in electrical circuits to produce effective resistances that are otherwise unavailable. One may also use networks to improve voltage or current tolerances.

In a network of resistors, each component can have a different current and voltage. But the ratio of the voltage across the whole network and the net current flowing into it can still be given the meaning of resistance. This is called the effective resistance of the network. To measure the effective resistance, one can use the method for single resistors by simply replacing the single resistor by the network.

The measurement method

The following circuit is used to make the measurements. The resistor symbol is used for the network being tested.



The commercially available resistors provided are expected to be ohmic. Hence, one careful measurement of voltage and current is enough to find the resistance of the network. The measured resistance is given by

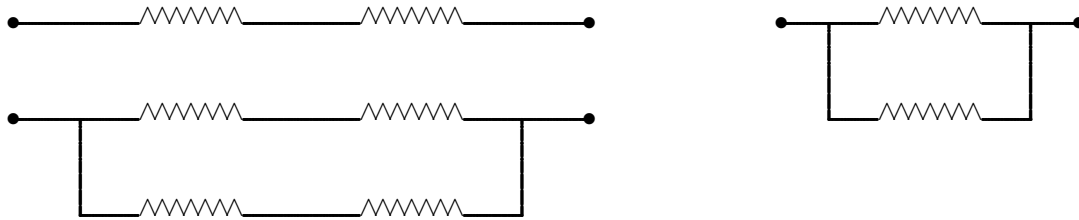
$$R = V/i.$$

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where V is the measured voltage and i is the measured current. Besides measuring the resistance of the networks, measure the resistance of each component resistor of the networks. The stamped values on the resistors are not always reliable. Use your measured values for computations to test theoretical formulas.

Some trials

Connect up resistors in various combinations and measure their effective resistances. Later you will learn to find the effective resistances of such combinations using theoretical methods. Then you can compare your experimental values to the predictions of theory. For now, try to predict what combination methods would increase or decrease effective resistances. Some combinations that you may try are as follows:



See if you can guess the weaknesses of this direct method of measuring resistances.