Exp. 4: Current and Resistance

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Abstract

An experiment was done to study current. This was done by using a circuit board and various resistors and wiring configurations to determine the circuit’s electrical output. When the circuit board was set up to measure the voltage when using a single resistor, the voltages across the battery terminals and the 10 Ω resistor were 5.18 and 5.176 V, respectively. When using two resistors, the voltages across the first and second 10 Ω resistors were 2.794 and 2.801 V, respectively. The measured value for the 10 Ω resistor was 9.827 Ω.

Introduction

In this experiment, the effects of various setups on a circuit board were tested to see what impact they would have on the circuit itself. When connected to the positive and negative terminals of a power source, a wire has a particular voltage (measured in Volts) and a current (measured in Coulombs) running through it. The amount of current in the circuit is directly impacted by the amount of resistance (in Ohms) in the wire. The amount of resistance can be altered by adding resistors to the circuit. The exact amount of current flowing through the wire can be calculated with the formula , where *I* is the current, *V* is the voltage, and *R* is the resistance. This means that the current in the wire is directly proportional to the voltage and the resistance in the wire. When using as power source (in this case four AA batteries), the voltage of the power source can be reduced by a particular amount, which will reduce the current of the circuit by the proportional value. This also applies to resistance. When resistors are set up on the circuit board, they increase the resistance by a specified amount (in this case 10 Ω per resistor) which decreases the current by the same proportional value.

Procedure

In this experiment, various tests were conducted using a circuit board. The circuit board had a power supply of four AA-cell batteries, and various wires with alligator clips were used to create circuits on the board. The first test involved a circuit where a round light bulb was slotted into the Lamp 1 socket and connected to the batteries and a switch. After viewing the brightness of the light bulb using the switch to close the circuit, it was changed out for a longer light bulb, and its brightness was viewed. A second long light bulb was then added to the Lamp 2 socket and connected to the other bulb in series. The brightness of these two bulbs was viewed, and they were then replaced with a single short bulb. A current probe was then connected to the circuit just before the Lamp 1 socket which measured the current flowing into the light bulb before, during, and after the switch was pressed to close the circuit. These measurements were then logged onto the computer. This test was repeated with a second current probe connected just after the Lamp 1 socket to measure the outgoing current from the light bulb.

To test the resistance of 10 Ω resistors, the previous setup was used, but with the current probes connected to the ingoing and outgoing portions of a 10 Ω resistor instead. The setup was then adjusted to have the two current probes connecting two 10 Ω resistors in series so that one probe would measure the current entering the first probe and the other would measure the current leaving the second probe. The current was only logged when the switch was held down for this test. This test was then repeated with only two batteries supplying power to the circuit.

The current probes were then swapped out for two voltage probes. One probe was connected across the battery terminals while the other was connected across one of the 10 Ω resistors. The voltage across each part was logged onto the computer. The voltage probes were then connected to the two 10 Ω resistors in series. The voltage across the resistors was then logged.

For the final test, one voltage probe was connected across a 10 Ω resistor with a current probe connected in series before it. The battery supply was then set to use only one battery, and the wire across the terminal was disconnected. A data point from the two probes was taken. After reconnecting the wire across the terminal, another data point was taken. Three more data points were taken, increasing the number of batteries used by one before each collection. A linear fit of the data was then taken, using the trendline’s slope as the resistance of the circuit.