Student Worksheet

Lesson 3: Thermistor Circuit

Objective:
The purpose of this experiment is to determine the function of an NTC thermistor in a circuit. In a prior lesson, you were introduced to two types of thermistor - those with a resistance that increase with temperature (Positive Temperature Coefficient – PTC) and those with a resistance that decreases with temperature (Negative Temperature Coefficient – NTC). In this lesson, you will learn the importance of thermistors in circuit protection by limiting the amount of current that can flow into it.

Materials

- Breadboard
- Power Supply
- 10 K NTC Thermistor
- Jumper wires
- Holiday Light bulb or LED
- Multimeter

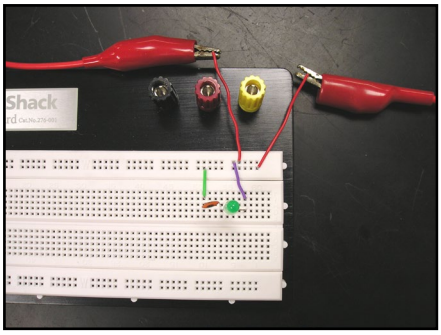

Figure 1. Breadboard setup.

Procedure:

Part A: Thermistors and Changing Potential Difference

1. Create a series circuit on the breadboard without attaching the power supply. Place the thermistor before the Holiday light bulb or LED. Figure 1 is the breadboard setup. Figure 2, below is the schematic.

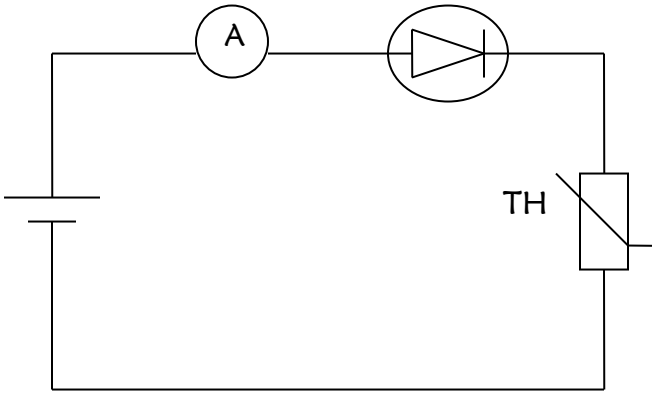

Figure 2. Series circuit of a thermistor and LED or light bulb.

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2. Attach a jumper wire to the thermistor to connect to the negative side of the battery. Do NOT turn on the power supply yet.

3. Attach a jumper wire to the light bulb or LED to connect to the positive side of the battery.

4. Now turn the voltage dial on the power supply to zero.

5. Turn on the power supply. Turn the dial to create a voltage of 1 V.

6. Measure the current in the circuit with the multimeter. Record the value for current in Table 1. Remember that the current is measured in series.

7. Measure the voltage across the thermistor. Record the value for voltage in the data table. The voltage is measured in parallel.

8. Increase the voltage by 0.2 V.

9. Repeat steps 6 through 8 until the LED or Holiday light turns on.

10. Do not increase the voltage after the LED or Holiday light turns on because the LED will burn out.

Part B: Thermistor Response to Heating while in a Circuit

1. Turn the voltage to a value between 2.5 V and 3.0 V. A voltage any higher will cause the LED to burn out.

2. Record the current with an ammeter in Table 2.

3. Heat the thermistor with a hair dryer.

4. What happens to the LED or light bulb?

5. Record the current as the thermistor becomes warmer in Table 2.

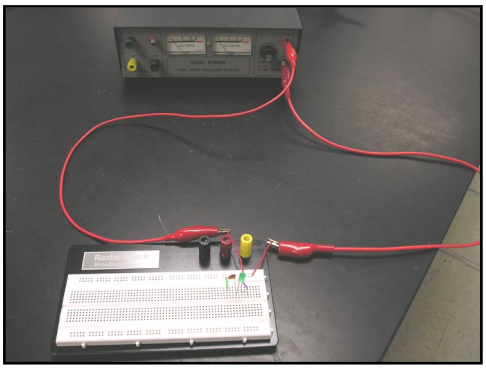

Figure 2. Lab setup.

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Record Data:

Table 1. Current, voltage, and resistance data for the thermistor circuit.

Power Supply Voltage (V)	Thermistor Voltage (V)	Current	Thermistor Resistance (Ω)	LED (On/Off)
1.0				
1.2				
1.4				
1.6				
1.8				
2.0				
2.2				
2.4				
2.6				
2.8				
3.0				
3.2				
3.4				
3.6				

Table 2. Current data.

	Current (A)
Room Temperature	
Hair Dryer	

Analysis and Conclusion:

1. At what temperature did the LED light up? Look at the lab data found from *Lesson 1*: *The Effect of Temperature on the Electrical Resistance Properties of a Thermistor.*

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2. Why does the LED eventually turn on?

3. If the light bulb were placed in parallel with the thermistor, what would happen to the lightbulb?

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