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Thermistor Sensor Circuit

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EEN2140

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Honors Contract Project

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Project Objective:
The objective of this project was to use my knowledge I have acquired in the semester from Circuit Theory II and individually build a thermistor sensor circuit also known as a fire alarm.

Components/Equipment:

- 9V Battery
- Buzzer
- LED
- 555 Timer IC
- Mega Variable resistor (POT)
- 2N3904 Transistor
- 10uf Electrolytic Capacitor
- 10K ohm Thermistor
- Jumper wires
- Resistors
- Battery clip
- Breadboard
- Heat source (match/lighter)

Abstract:
A series of experiments/labs and lectures were performed to introduce me to the basic understanding needed in the practice of electrical and electronic engineering to tackle this project. I was able to use my textbook, videos online, and my notes to help understand how I was going to build my thermistor sensor circuit. A thermistor is essentially a sensor that can be used in a circuit which detects whenever there is a high source of heat well above room temperature and sends a signal to the circuit or whatever the thermistor is connected to. As simple as it may sound, there is much more components needed for a thermistor sensor circuit to work properly as shown above in the components/equipment needed section.

Introduction:
Various instruments and techniques are used in the everyday practice of electrical engineering. These include the oscilloscope, function generator, and probes, resistors, and capacitors along with LTspice. In this project, I used a 9V Battery, Buzzer, LED, 555 Timer IC, Mega Variable resistor (POT), 2N3904 Transistor, 10uf Electrolytic Capacitor, 10K ohm Thermistor, Jumper wires, Resistors, Battery clip, Breadboard, and Heat source (match/lighter).

Methods:
There was a total of two different parts of the project. In part 1, I had to gather all my information and notes to begin to sketch out a diagram for what the circuit should look like and to get an idea of what components were absolutely necessary. I then took that diagram and designed it under a program known as LTSpice which is a software program that allows people to design and run circuits to test before building. For part 2, I then had to build the circuit and debug it whenever there were any minor errors or issues.

Results and Discussion (record your results in tables):

In part 1, I was able to sketch out a rough draft of what the circuit diagram should be like and listed what components were needed on the side. I then designed the program in LTSpice to make sure the circuit would/should work properly considering I can't technically apply heat to an online circuit. After drawing and designing a diagram, I was able to move onto part 2. Below is a picture of both the rough sketch along with the hardware needed and the official diagram of the circuit.

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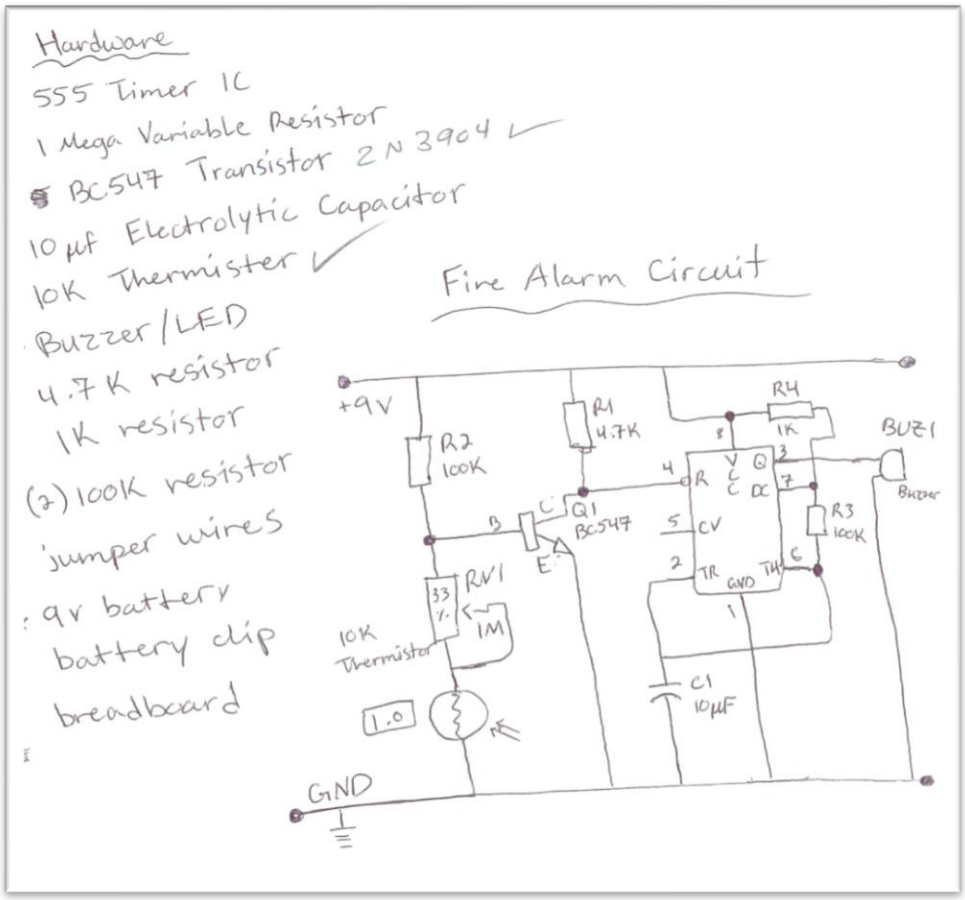

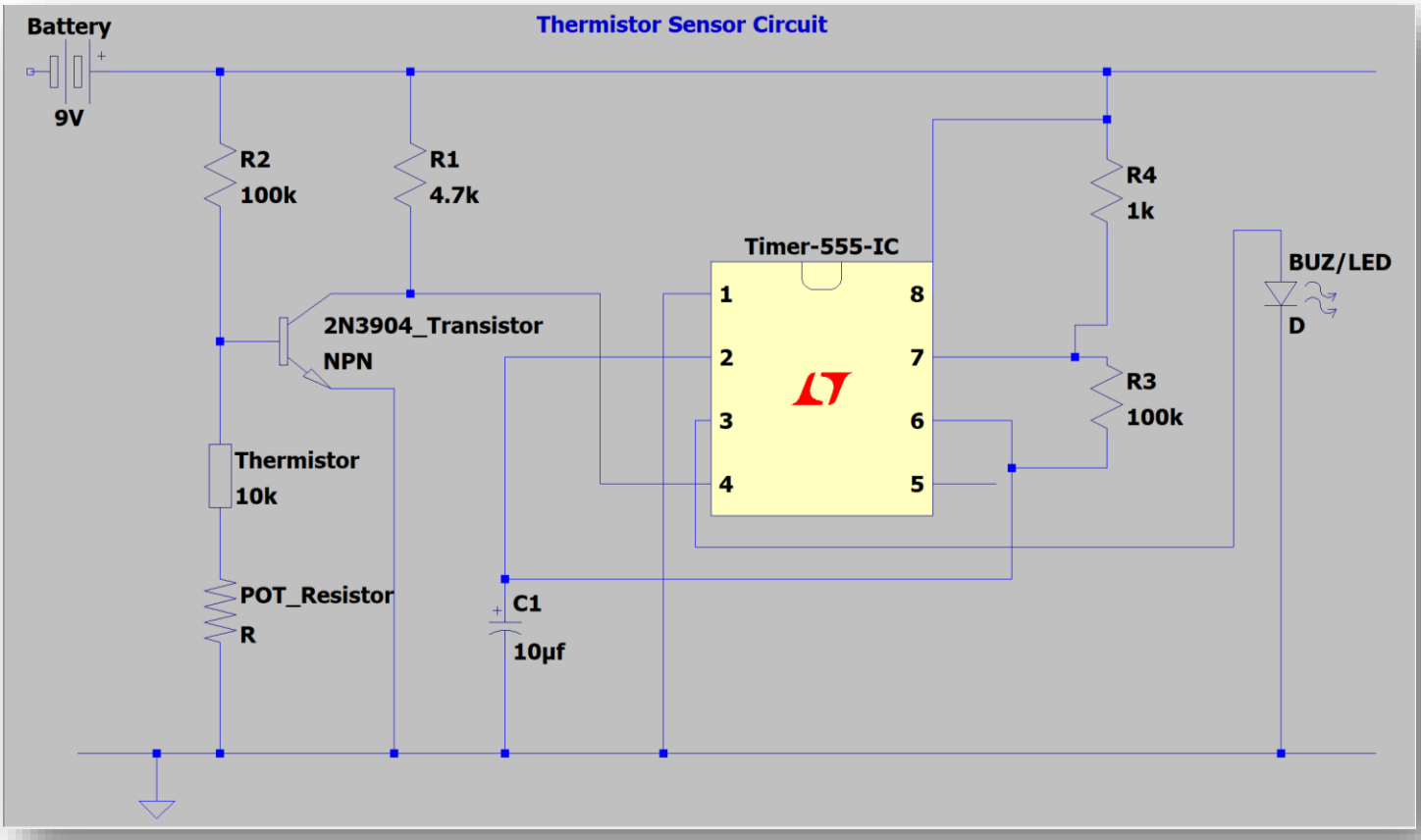

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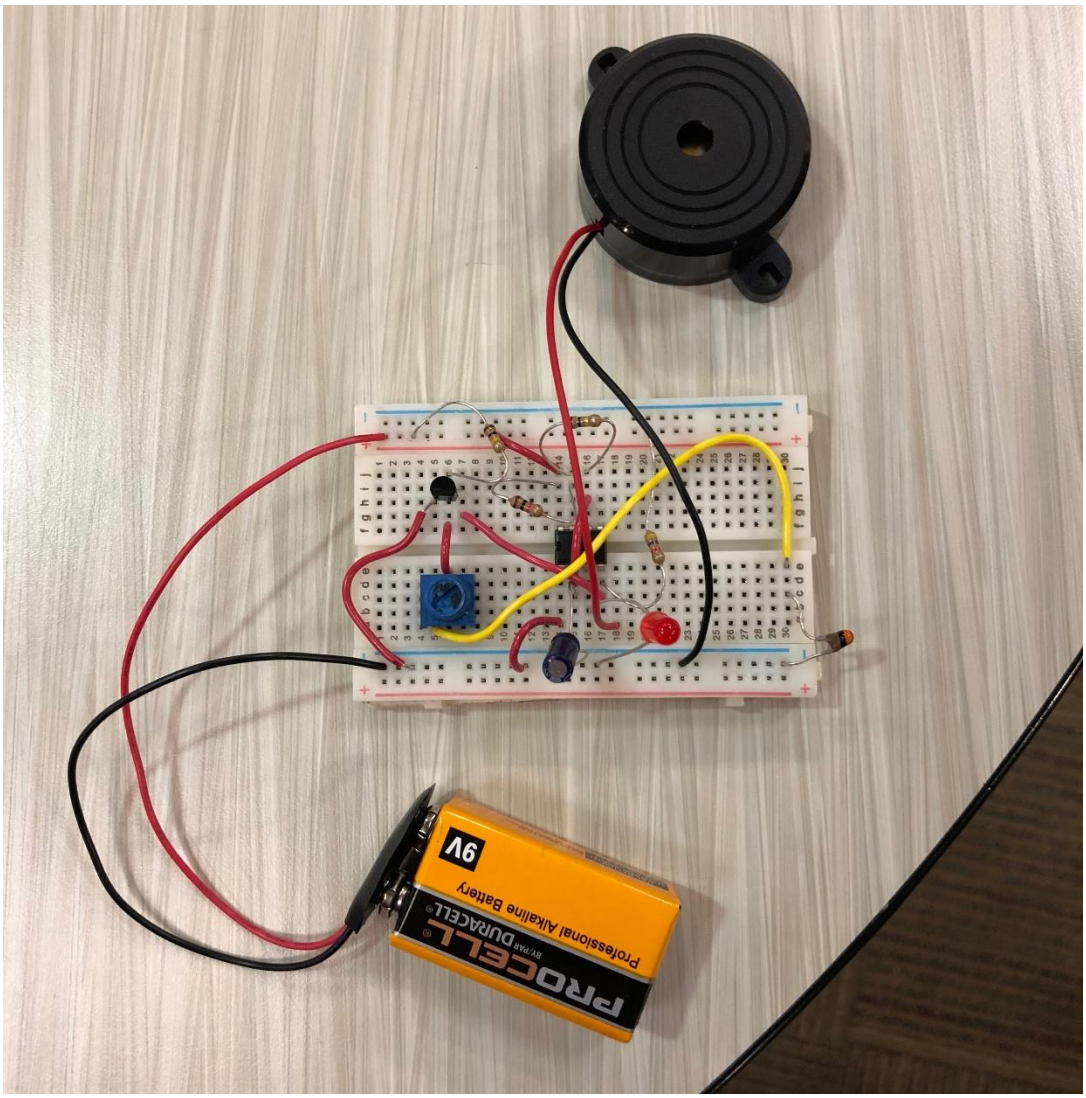
For part 2, I was able to build the actual circuit of the diagram. After a couple of minor trial and errors, mostly with the transistor and mega variable resistor, I was able to get the thermistor sensor circuit working properly. Below are two pictures of the circuit when there is no source of high heat and when there is a high source of heat detected. As you can see in the photos, when there is no source of heat, the LED is off meaning there is no loud buzzer sound going off. However, when the thermistor detects a high source of heat, the LED is on and the buzzer begins to sound. As soon as the thermistor cools back down to room temperature, both the LED and buzzer will go off again.



***LED and BUZZER are off while thermistor sensor detects no high heat source.**

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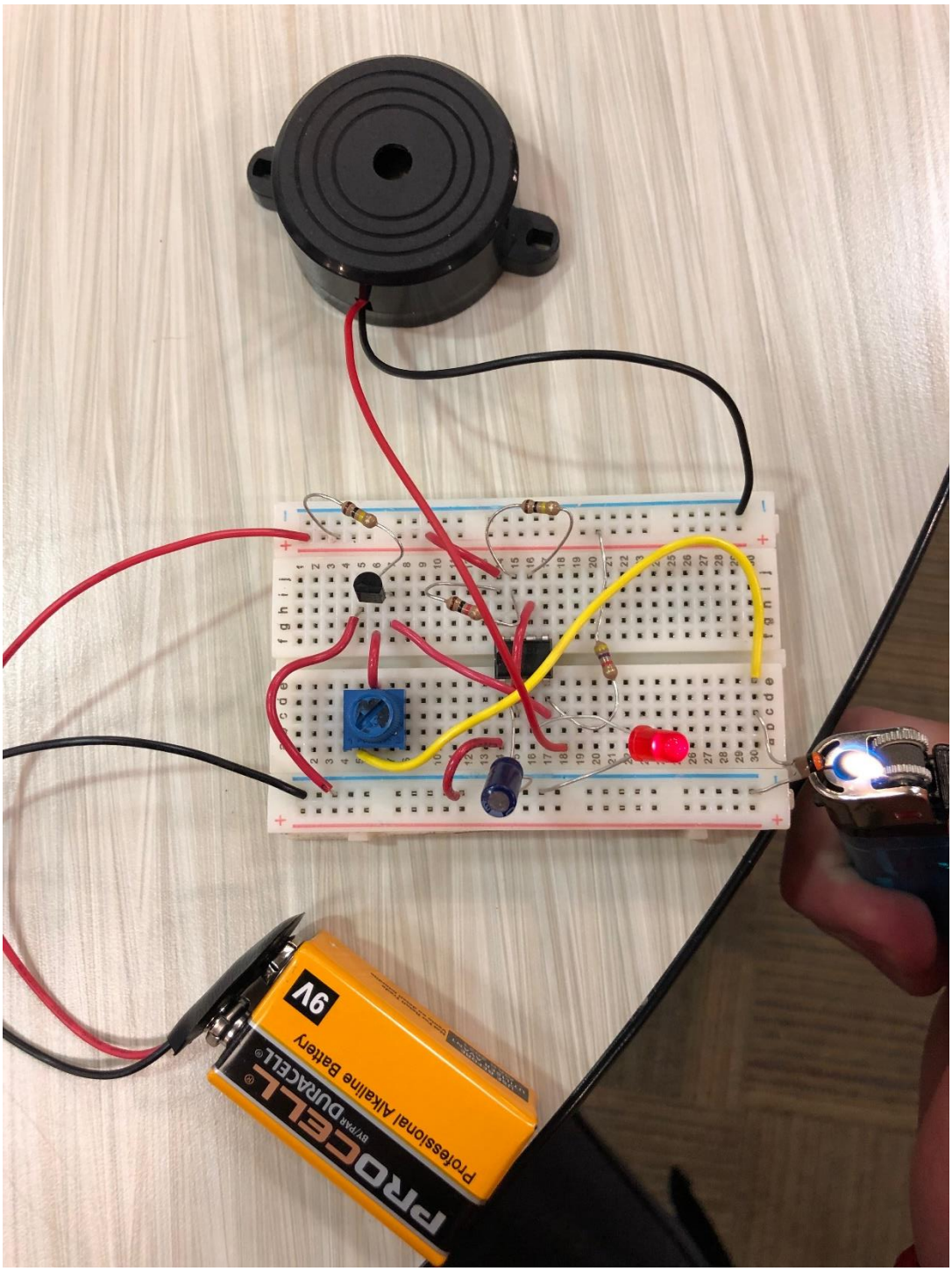

***LED and BUZZER are now on due to source of high heat detected by thermistor.**

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Conclusions:

The project was not as easy as putting together a couple of wires and components. The designing and planning to build a diagram took time because I came across many challenges such as what chip should I use, to how many resistors should I use and how many ohms should each resistor be measured so that the power could flow through the circuit, along with many other challenges in just designing the diagram. Doing an honors contract made me realize how great it is to challenge yourself in a course and go beyond what the syllabus requires from myself as a student. I was given the opportunity to build a thermistor sensor circuit (fire alarm) which is something I have always been curious about since I was younger and enjoyed the entire process of the project.