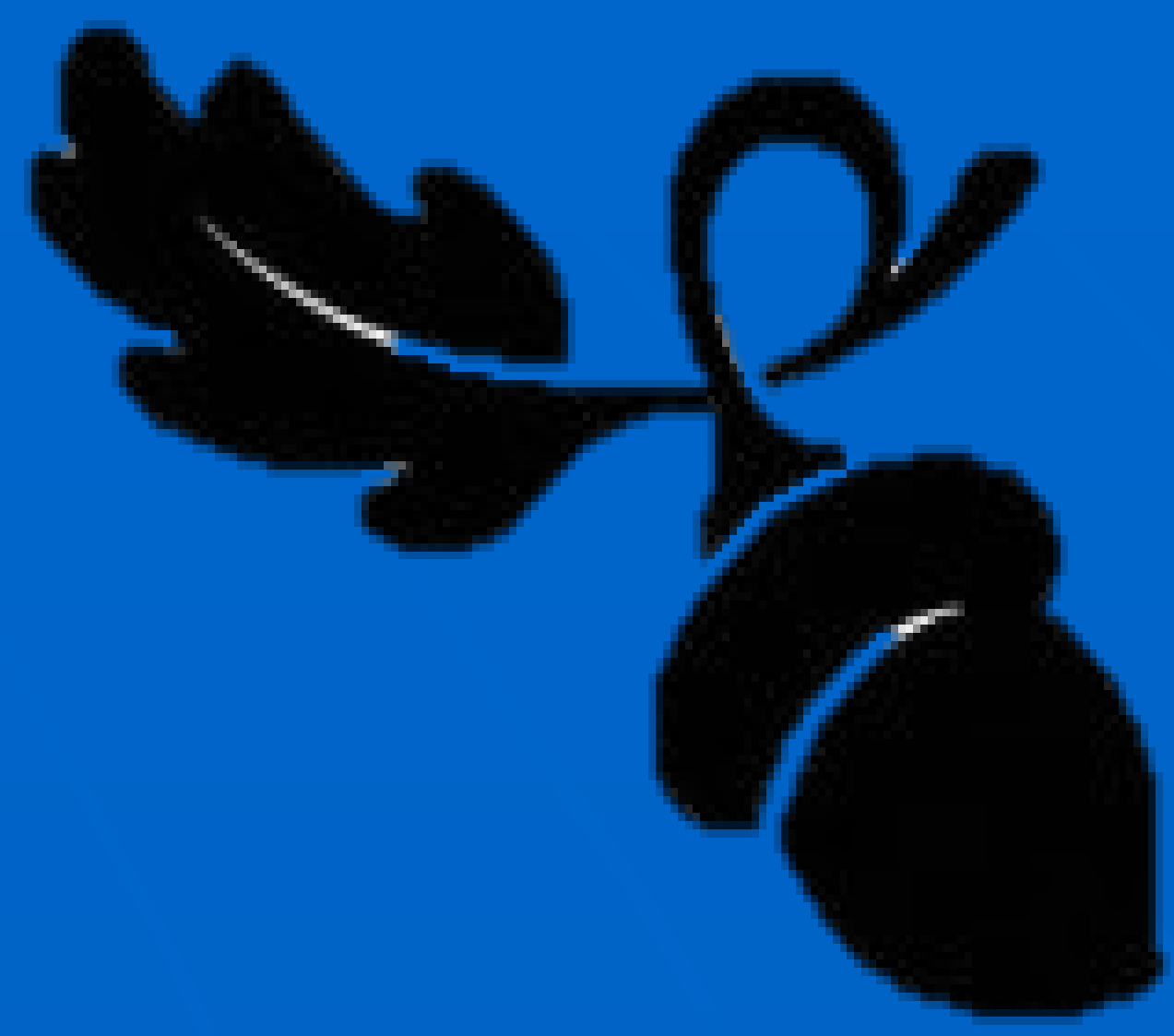




Automatic Pet Door with Magnetic Field Activation



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Abstract

Automatic pet doors are sold commercially as a completely built unit on today's market. A low cost design has been created to allow more flexible placement and construction of a door. This door is unlocked upon detection of a magnetic field originating from the pet's collar. The required activation signal has been carefully characterized to allow customization of the door and collar for a particular purpose. Detailed information on the operating circuit and sensor activation are provided. Results of how door is constructed and operated as well as personalization are presented.

Introduction

- Consumers want to purchase products that will make their lives easier and work for long a long period of time.
- To do so, parts costs should be minimized without sacrificing operation.
- Parts should be simplistic and strong enough to withstand elements.
- Price of current models and area of application can be improved through this project.

Activation

- Use of permanent magnets as a source of circuit activation.
- No need for power supply to power magnetic field

Circuit

- HSI Reed Sensors chosen to respond to magnetic field signal provided by pet collar. Act as a switch to the circuit.
- Half-wave rectifier consisting of diode-capacitor-resistor allows for timing control of voltage. Equation used $t=RC$
- Transistor is needed to draw current through solenoid and create a magnetic field due to heavy load of the solenoid.
- Solenoid is chosen as means to lock door due to fact it is made up of few moving parts.

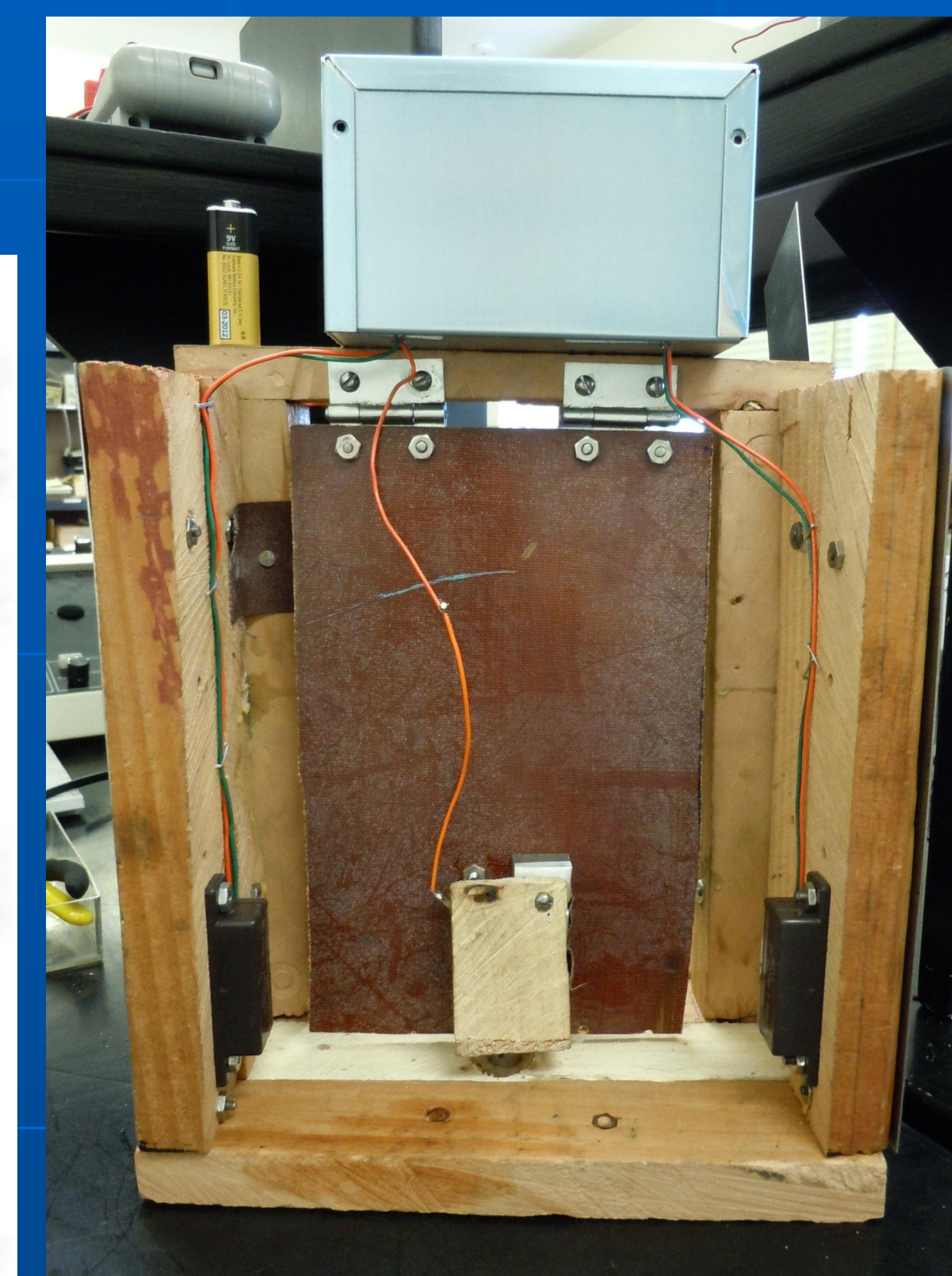
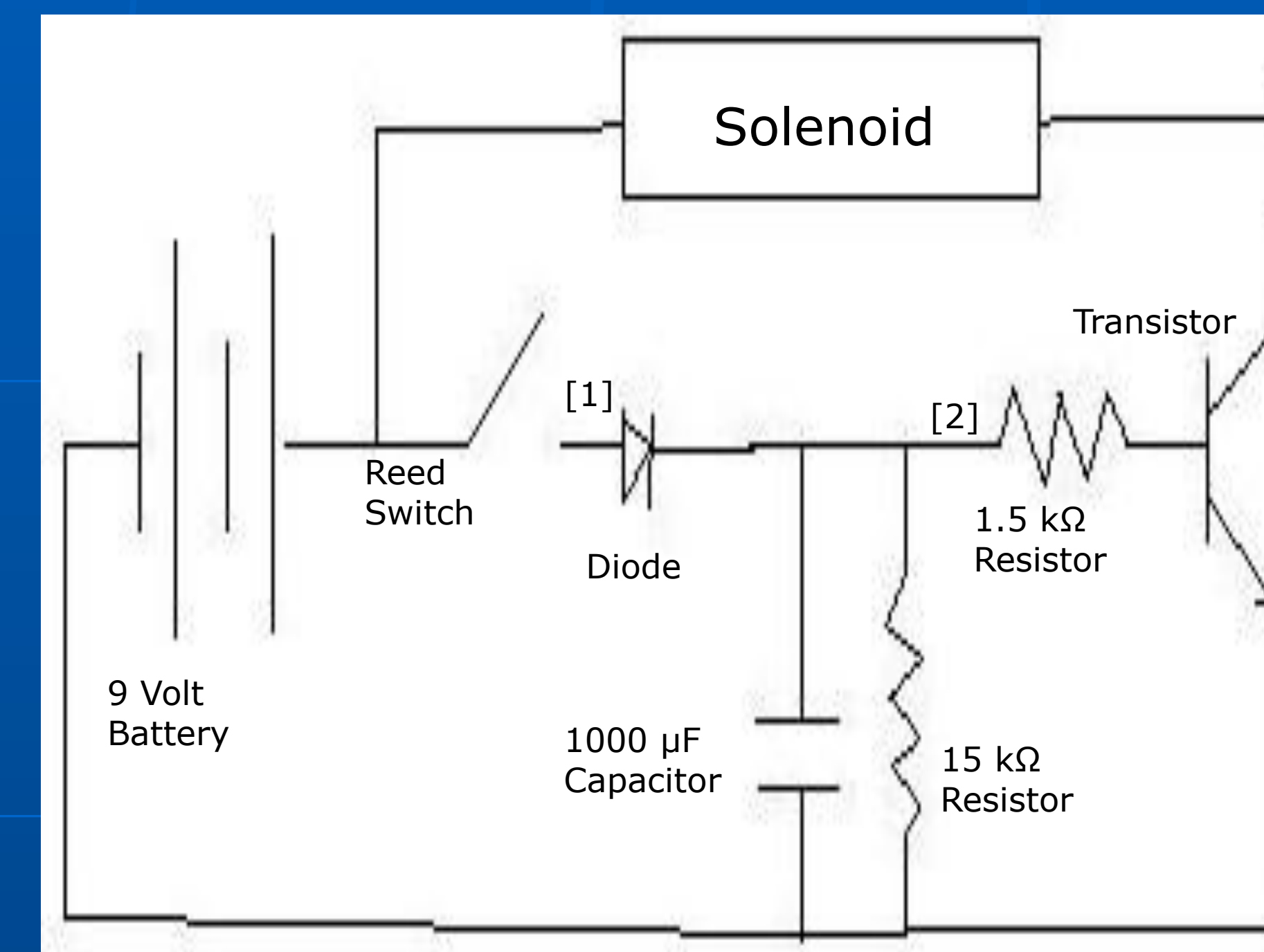


Figure 2: Sketch of circuit used to power door. Also pictured is complete door.

Magnet

- Use a hall probe to record magnetic field and distance at activation of the sensors.

Results and Analysis

- With parts used, able to create a door under \$50.
- Found that sensors were activated at 64 ± 10 gauss and not at a fixed distance.

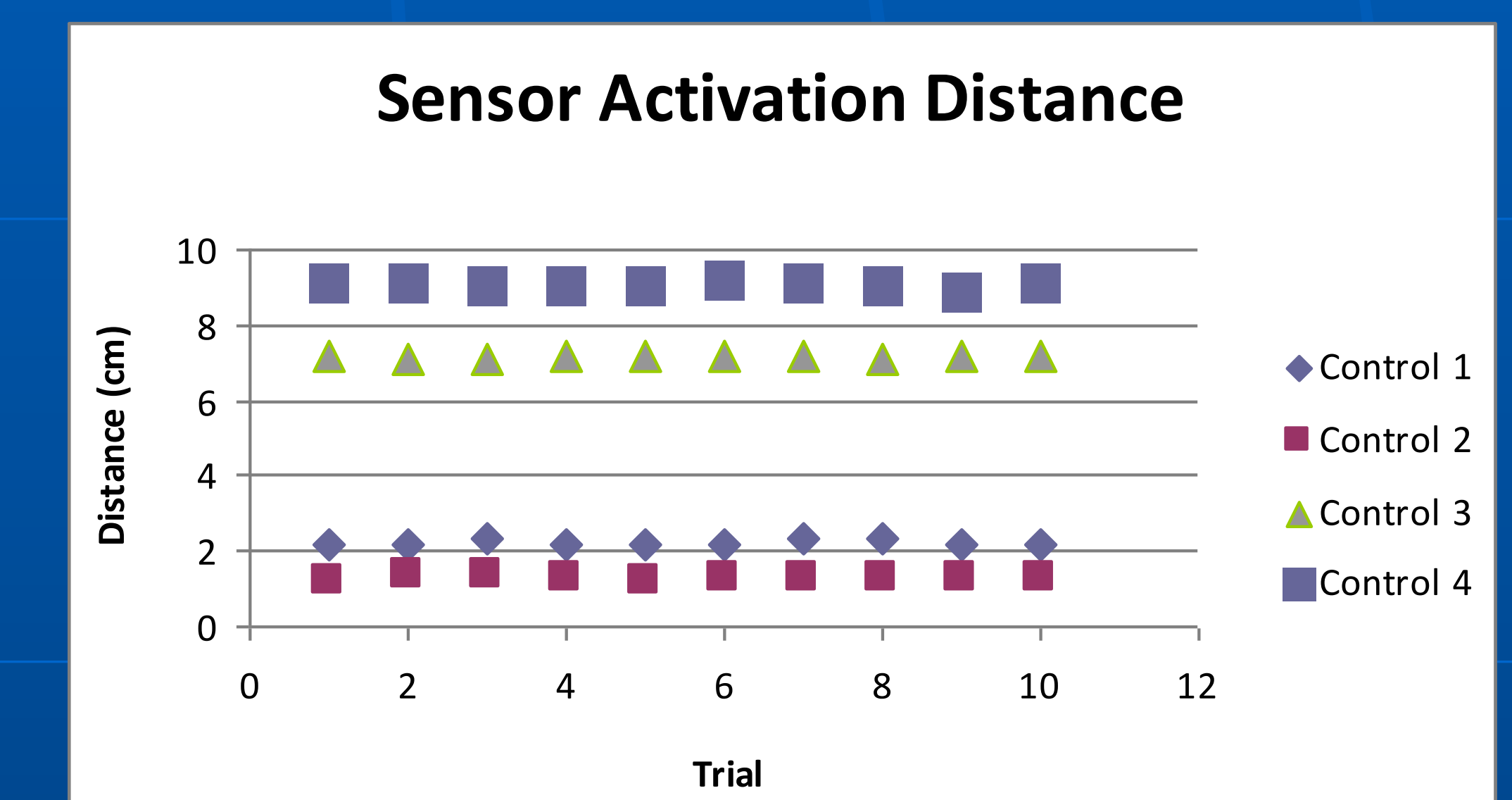


Figure 4: Graph created depicting the increase in activation distance strength of magnet is increased.

Testing of the Circuit and Magnet

Circuit

- Test each circuit component after it was completed and before moving on to next component.

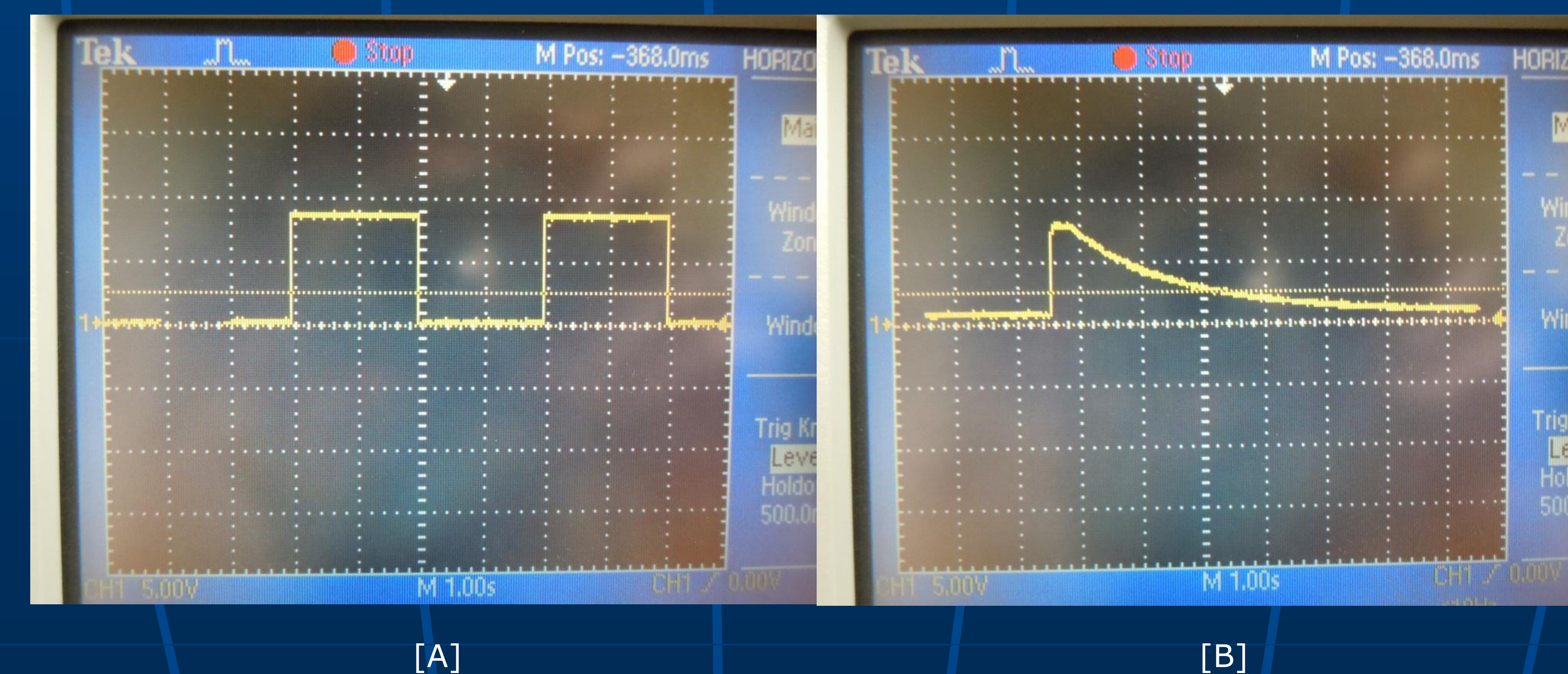


Figure 3: Outputs measured at points [1] and [2] as labeled in Figure 2 showing switch operation and the signal lasting 8 seconds after switch closes.

Collar Magnetic Field vs. Distance

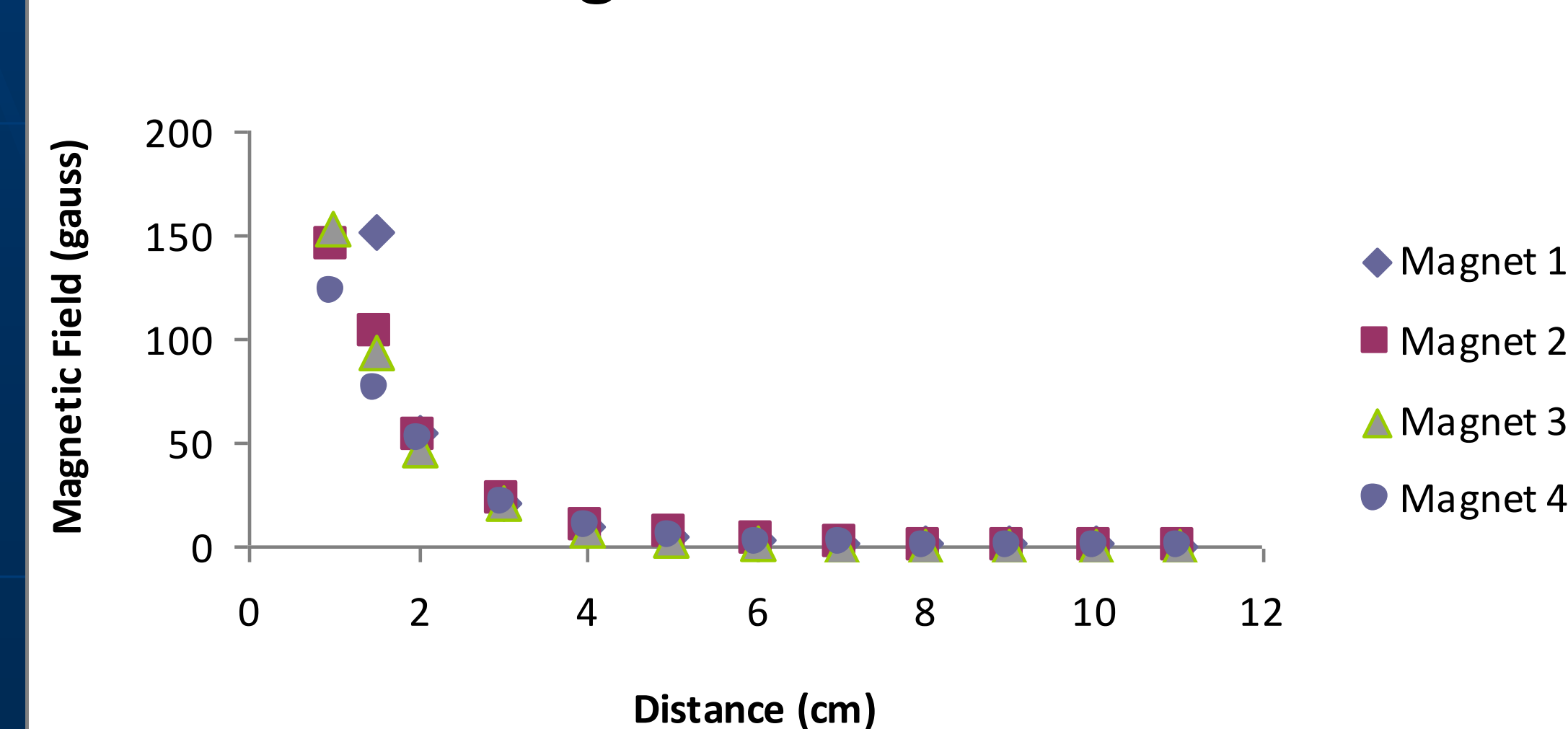


Figure 1: Graph of magnetic field versus distance for four magnets used in the pet collar as source of circuit activation.

Conclusion and Improvements

- Using the parts described an automatic pet door was created that works in the same fashion as those commercially available.
- Was able to show that sensors did not behave as listed on their companies data sheet.
- To improve I would purchase different parts that would activate the circuit at a much greater distance and would allow better operation.