Analog Circuits Lab Project

EC 212P

April 30, 2024

Problem Statement

The problem statement we are targeting can be summed up like this. We aim to address security concerns in more than one layers. Often security alarms are enforced entries, but these security system often ignores possibilities of other forms of entries and undermines the importance of information about the intruder during intrusion

Our Solution

The project that our team created is a home security system with two layers of security and location pinpointing of intruder during intrusion. Our system uses magnetic door alarm to provide security using a distracting high pitch buzzer.
Besides that, motion detectors have been installed in every room indicating a different output when triggered to pinpoint the location of intruder during the intrusion, this type of information is very useful for the owner to ensure his safety and can be used by authorities in tracking the movements of the intruder.
Here is the video demonstration of our project. VIDEO

Components

Magnetic Door Alarm

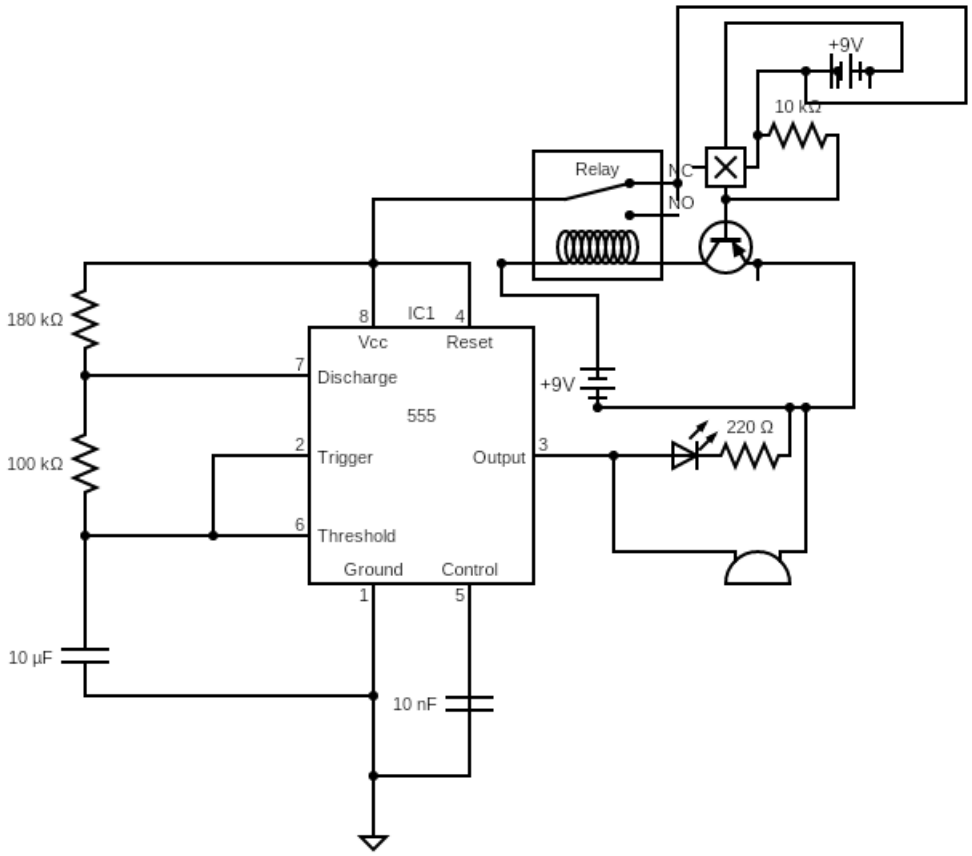
- 3144 magnetic hall effect sensor
- SPDT relay module
- 555 timer ic
- Piezo Component
- Resistors and Capacitors
- 9V battery supply

Motion Detectors

- IR sensor module
- 555 timer ic
- BC 557 transistor
- SPDT relay module
- Resistor and capacitors
- 9V power supply

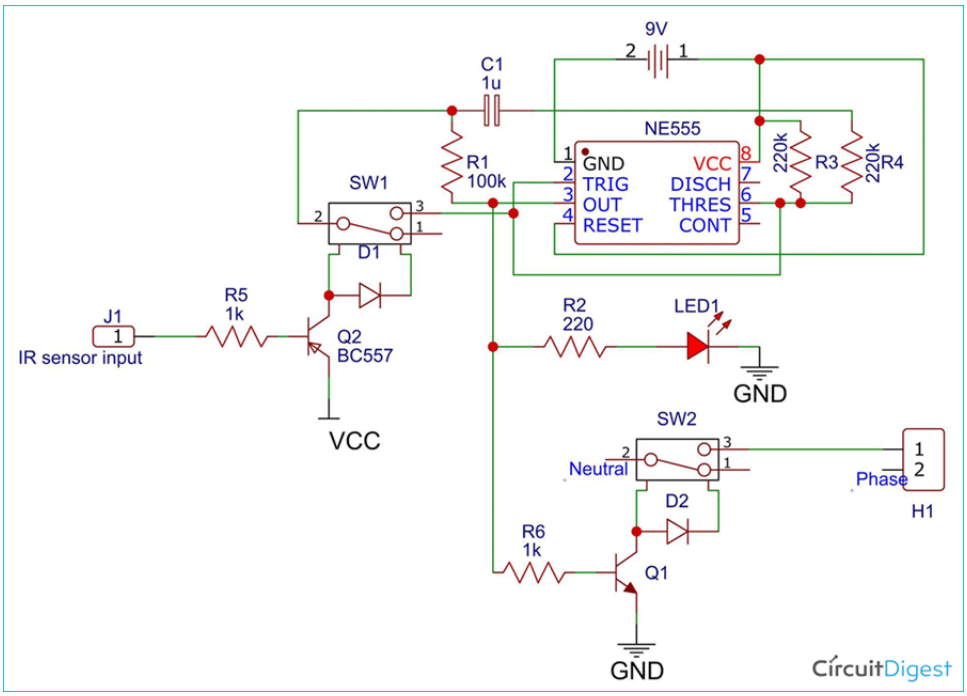
Working and Diagrams

Magnetic Door Alarm



In this Magnetic Door Alarm circuit, we have used a 555 timer IC in astable mode to generate a tone as an alarm. Frequency of tone can be adjustable by using a potentiometer. A Hall Effect Sensor or magnet sensor is used to detect if the door is open or closed. It's output connected to the base of the transistor BC547 which is responsible to provide a path to 555 timer IC. A buzzer and an LED are connected for indication of alarm. Finally, we have connected a 9v Battery to power the circuit.

Motion Detector



Initially, the 555 timer's output is off due to the voltage divider. When motion is sensed by the IR sensor, the capacitor begins to charge, altering the voltage at pin 2 and triggering the timer's output on. Once the capacitor fully charges, subsequent motion detection causes the voltage at pin 6 to rise, turning the output off. Transistors are utilized to drive relays due to their ideal switch characteristics, with a PNP transistor driving the main relay in response to the IR sensor's output and an NPN transistor controlling the output relay, synced with the 555 timer's active high output

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