Laser Trip Wire

By Jarrett Atkins, Guillermo Gutierrez, Cynthia Tetreault, Lashawn Nixon, Jaylen Thompson, and Bria Jacobs
From this power point you will understand:

- The benefits of a laser trip wire
- How to make a laser trip wire by yourself
- The components needed to make this project and the function of each
- How to interpret opto–electrical diagrams, designs and terms
Using sound and light the laser trip wire will detect movement of people or objects while passing through the laser beams and trigger an alarm when people move in the wrong direction.

This can be used to access a control system.
Project objectives
Components

- Lasers and Photodiodes
- 741 Comparator and Buffer
- Latch Circuit
- Speaker
- 555 Timer
Equipment

DC Power supply

Source measurement units

Function generator

Digital multimeter

oscilloscope
System level block diagram

Input Sensor
• Photodiode
• Laser
• Comparator

Logic Circuitry
• Latch Circuit

Pulse Generator
• 555 Timer
• One shot Generator
• Square Wave Generator

Output Stage
• Buffer
• Speaker
The comparator “compares” the voltage being received by it and converts the two inputs to either 5 volts or 0 volts.

- If it is high (photodiode on) it releases a digital 0
  \[ V^+ > V^- = 0 \]
- If it is low (photodiode off) it releases a digital 1
  \[ V^+ < V^- = 1 \]

A digital 1 will activate the diodes.
The logic switches activate the alarm
It also prevents the siren from going off twice when only one person blocks the laser path
The switches create an output which eventually leads to the sound created by the alarm when the photodiode does not receive light
Pulse Generator

- The one shot generator creates a time window.
- This makes it so that no matter how fast you cross the laser, the alarm will always go off for the same amount of time.
- The one shot generator sends a pulse that enables the square wave generator.
- The square wave generator sends a pulse that enables sound.
- The Square Wave Generator sets the frequency of the alarm.
Output Stage

- The buffer amplifies the volts received from the generator
- Thus allowing a louder sound for the speaker
Laser Module

- The laser module comprises of:
  - 2 Photodiodes
  - 2 LED’s
  - 2 Laser Pointers
- The photodiodes detect laser light
- When the laser beam is interrupted the LED’s turn on
- The order in which the lasers are blocked determines the voltage output
Demo
Key notes

- Laser – sends light to the photodiode
- Photodiode – detects light from the lasers
- Comparator – compares input voltages to a reference voltage of a 0 or 5
- Potentiometer – sets the reference voltage
- 555 timers – generates a single pulse or wave controlling the alarm
- LEDs – using different lights directs traffic and indicates whether a person or object is moving in the right direction
- Buffer – drives the speaker, which sounds the alarm
To Professor Allyosha Molnar for helping us to understand optoelectronics and our teaching assistant Carlos Quinonos for being with us every step of the way