ECE 411
Practicum Homework #3: Product Design Specification (PDS)/Requirements
Team 5: Jianyu Hao, Jaeyoon Lee, Kelly Makinster, Sean Schorzman
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Product: Shooting Chronograph

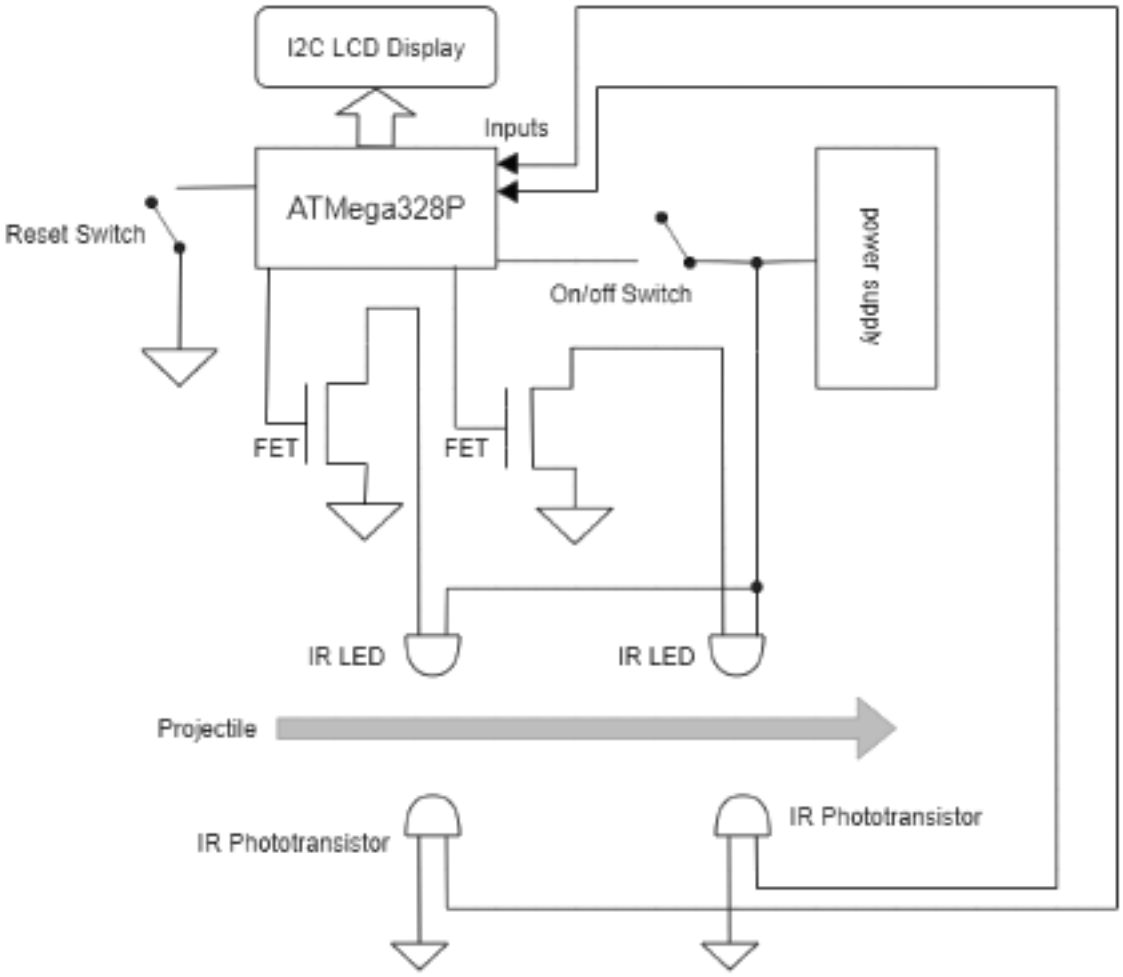
This device will capture velocity of objects that pass through a predetermined area. Chronographs are popular amongst hunters and marksman alike who want to measure the velocity of the bullets fired from their weapons. This will be used to increase shooting performance and analysis. The user will present an object and have it pass through an area, whether that be fired from a weapon, thrown by the user, or by a machine.

Intended customers will be researchers, athletes, airsoft enthusiasts who need to measure the speed of an object that passes through the chronograph for personal interest, safety, and more.

Currently there are chronograph manufacturers in the market that are usually priced high and offer only a small sized object to pass through its device. Professional chronograph that measure extremely fast moving object costs well over $100. Using our own equipment and parts, we believe we can market our chronograph as the affordable chronograph that can measure a reasonable range of speeds. We believe we can offer a competitive price at $30/unit.

- The Chronograph must be portable.
- It should be powered by a USB port.
- It must be able to measure as slow as 70 ft/s (Nerf dart)
- It must be able to measure speeds up to 250 ft/s (arrow speed)
- It may be able to measure speeds up to 2500 ft/s (rifle bullet speed)

- The chronograph must have a built in screen to display speeds
- The chronograph should have an enclosure so that it can be mounted on a tripod
- The chronograph must be safe to use (ie: no sharp edges on design)



Design Specification:

- Minimum of 2 optical sensors
  IR Phototransistor: IR Emitter/Detector pair x2

- Processor
  ATMega328P

- Actuator
  Digital Display Screen: 16x2 I2C LCD Display

- Power
  Low Power Consumption, voltage supplied by USB or battery (9V)
  Operating Voltage: 1.8-5.5 volts

- Firmware
  Code written in C

- Development environment
  Interface with CPU using AVR Dragon
  Use ATMEL Studio IDE
  EAGLE CAD

- Product Lifespan
  1-2 years

- Accuracy
  +/- 10% of object's known speed

- Temperature Range
  -40 to 150+ C
  -40 to 257+ F