

## **Executive Summary / Concept of Operations**

The device reads the current time from a clock chip, then displays the time on a clock by backlighting the appropriate words that spell out the time. The clock tells you the time using an expected formula. For example if the time is 8:15, only the phrases It is, quarter, past, eight, and o'clock will be lit. The device is meant to be a decorative wall clock.

## **Brief Market Analysis**

- **Who are the intended customers?**

People who like techie toys without the skill sets or just don't have the time to build this themselves, people with dyscalculia.

- **What is the competition? Why is your product different?**

There are not that many of these out on the market. Most sell between \$400-\$2200. It would be fairly straightforward to design a clock that can sell at a much lower price point, while still maintaining a very high profit margin per unit. The clock tells you the time in actual words, which may be a good alternative to a digital clock for individuals with dyscalculia (unverified). In addition, I have been unable to find many clocks for sale that have any additional features, which gives us room to expand future versions. They could include alarms, changing light colors, wifi communication to also display weather, etc without adding too much complexity.

- **What price will do you think you can sell this for, and why?**

For this base first version model, a cost of ~ \$150 -\$200 will keep us at less than half of the vast majority of the models currently available.

## **Requirements**

### *The Model Must*

- Have LEDs bright enough to see in a well lit room
- Be fully enclosed to look like a finished product
- Be powered by something the customer can easily handle (ie easily changeable batteries or a power cord)
- Be able to be manufactured with an absolute minimum of hand assembly
- Operate reliably in a range of normal room temperatures (~20-25 °C)

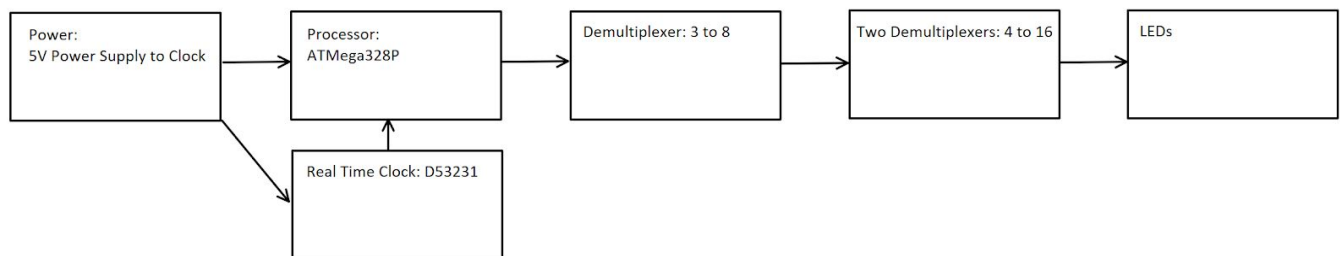
### The Model *Should*

- Use easily attainable off the shelf components
- Be attractive

### The Model *May*

- Have consumer changeable LEDs to extend the lifetime of the product
- Have the ability for the user to control LED brightness
- Have an alarm

## System Architecture



## Design Specification

**Sensor:** Push buttons for user to set the time, clock chip (DS3231)

**Processor:** ATmega328

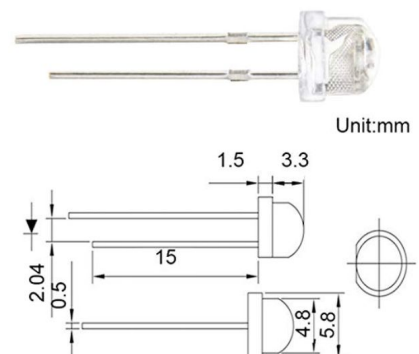
**Actuator:** Multiplexer/demultiplexer to LED display

**Power:** 5v vcc from 9v battery

**Mechanical design:** 3D-printed or laser-cut isolator for LED housing, laser-cut faceplate with opaque vinyl/plastic sheet to diffuse LED light. Thinking about various materials for clock housing (wood, copper, etc). No moving parts.

**Firmware:** Arduino bootloader, clock program written in C

**Development environment:** Arduino IDE/Vim



Collaboration will be done through Github.