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Executive Project Summary: Custom Timer

The problem that this project set out to solve was the creation of a timer for a certain customer. A timer should allow the user to define a time, then count down from that time and notify the user as to when their set time has passed. This customer had several requirements for the timer in order to guarantee its precision and wieldiness. The first customer requirement was that the system should be accurate within a second of every minute in order to be a true timepiece. This timer should use connectors, have a power switch, and be rated at least IP43 so that it is safe to use in everyday life. The screen and buttons should be easily readable and labeled for ease of use. When the time has passed, the alarm should be within $340\pm1Hz$, $440\pm1Hz$, or $540\pm1Hz$ at the user's discretion for a sound that's attention grabbing. Finally, the brightness should be able to be toggled for convenience.

When approaching this design project, the first thing to do was decide on the basic hardware level of the timer. We discussed a couple options for the timekeeping piece and had to decide between the DE10 Lite and the Arduino Uno. The Arduino Uno was ultimately chosen as it features a higher level language and more convenience as far as incorporating other utility blocks. Besides the Arduino and the code, an amplifier and interface would be needed to make sound and keep the hardware safe. The amplifier was relatively simple and a PCB was quickly developed and ordered in order to house the components. This amplifier would be driven and supplied by the Arduino and connect to a simple speaker capable of handling the frequencies expected. The interface was a 3D printed rectangular prism with buttons for controlling the timer. Most of the creation process went relatively smoothly, with little need for revisions or reworkings. The code took a few iterations to get functional, but it was eventually squared away and ready to be incorporated into the project. The block diagram went through some revisions to more accurately reflect the system, as some of the inputs and outputs were wrongly or vaguely worded.

The creation of this timer took place over the span of ten weeks and was completed in major chunks. The first 4 weeks were dedicated to familiarizing ourselves with the project and the creation of one block of the system for both team members. The proximal 4 weeks were spent with the second block, and the rest of the time being spent on connecting the blocks together. Documentation was a steady process throughout this project. The most important lesson learned throughout the entire process is that you are not beholden to your interface definitions or block diagrams previously agreed upon. Designing is a modular process, and changes and revisions should be expected before you get to the final completed state. Another important aspect to note was that input and output definitions need to be exact and measurable. These definitions are used by the rest of the team in order to plan for their own subsequent blocks, and as such what is decided upon for interface definitions needs to be quantitative and measurable. An important aspect of doing this project as a team was also respectful communication. The process was made a lot more simple when the team was verbose about their progress, setbacks, or need for help. In this way everyone feels heard and understood, and the team can adjust to difficulties as needed in order to keep the project a success.