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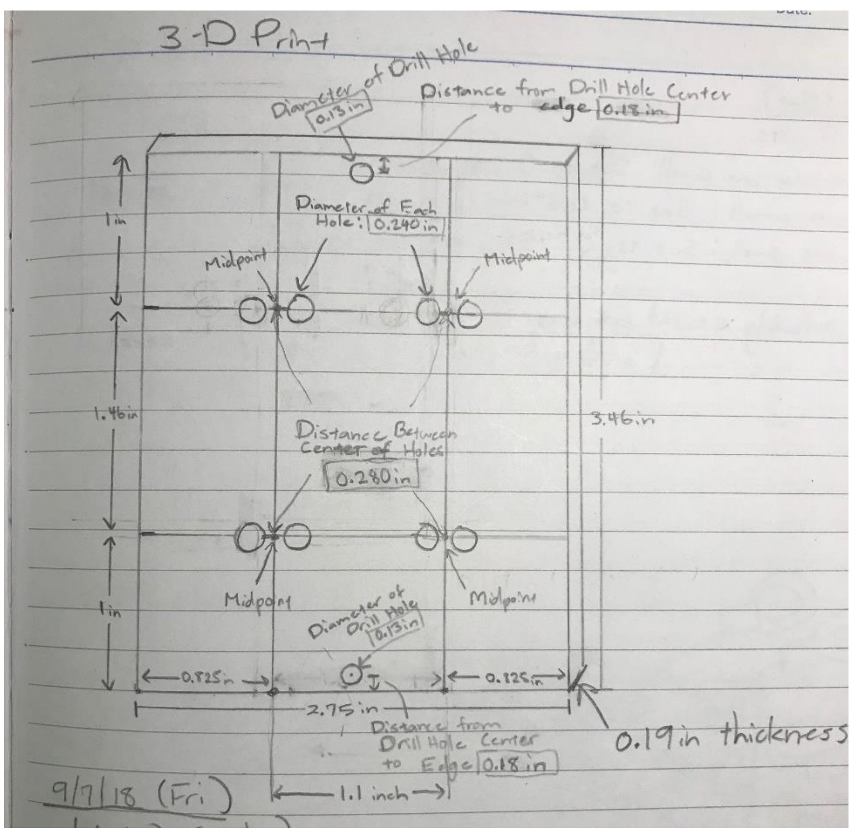
ENGR 396

Team Kanaloa: Technical Documentation Report

Coming into team Kanaloa, I had very few skills involving anything hardware related, but after spending numerous weekly hours in the lab, I see my passion as an engineer grow brighter and stronger. Here are some of the things I have worked on these past few months.

<u>Design</u>

Although there was no real "training" in Team Kanaloa, there were plenty of simpler tasks that you are started off with to help get familiar with the lab, WAM-V, tools and designs that we work with regularly. During my first few weeks, I was assigned soldering/basic design tasks that were eventually implemented into the high-current box for the WAM-V. Since I had no experience in SolidWorks at the time, I had no choice but to do the drawings by hand. This led to some complications such as missing dimensions and other specific details, which made things more time costly when trying to 3-D print things. Sample Design for High Current Box Thruster outlet below (Figure 1)

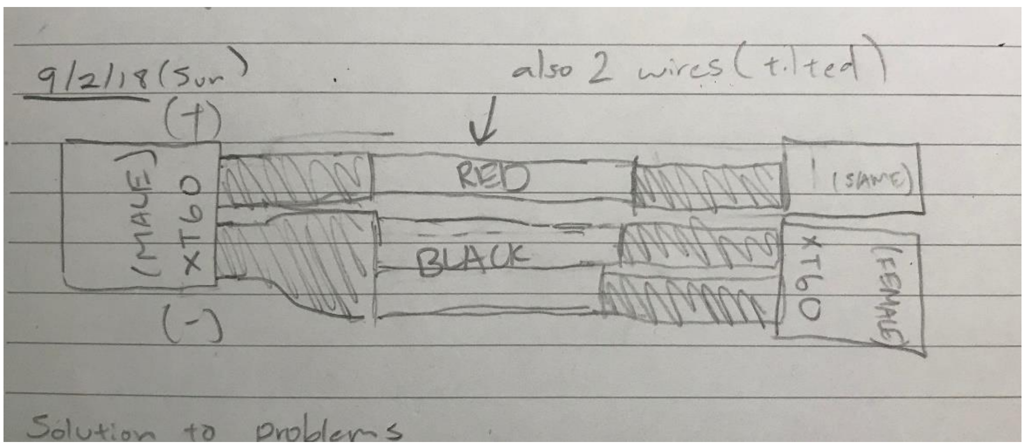


(Figure 1. Outlet Design)

Soldering

Soldering's primary use is to form a permanent connection between current flowing components. A common example is shown below (Figure 2) of an XT60 connector split in two, splitting current flow.

Like many things, soldering requires lots of practice before getting effective results. As an example, the first thing I soldered onto the WAM-V fell apart during a field test. Since then, I have learned techniques that reduced the amount of time and effort needed to get clean results. When soldering, keep a long line of solder wire and a brush handy to keep a clean tip and prevent burning due to solder bouncing off. Solder won't often drop in the desired spot consistently. A method to keep solder in place is to place the soldering tip onto the desired area and apply the wire to the tip until a nice bubble forms. Once the bubble gets to a significant size, spread the solder where needed. Do not leave the solder on for more than 5 minutes. This will cause the tip to begin oxidizing which will prevent the solder wire from melting upon contact.



(Figure 2: XT60 current splitter for High Current Box)

Light Pole

My first large task was to create a 6-ft. pole that would emit different colors of light with a circuitry box attached to it. Types of material didn't matter, but cost effectiveness and time spent on it did. We decided that the best approach was to design a cylindrical skeleton that would be slid onto two points of the pole, wrap that portion with bendable plastic, and append a around the cylinder where circuitry and wires can pass through.

As simple as this sounded, we ran into numerous problems rather quickly. The first of which were calculations. We had to be precise about every little detail, including width of cylindrical skeletons, thickness, circumference, and the same with the dimensions of the triangular cage. Since the cylindrical skeletons were being 3-D printed, we also needed to account for whatever extra material that would go into the 3-D print causing slight error in hole size and width. This was solved by decreasing the sizes of such dimension by a factor of a three hundredths of an inch.

Once printed, everything was assembled together, but not all of the glue holding everything together looked very nice. This could've been avoided by asking the subsystem lead of Project Manager if proceeding to the next part of the task is a good idea.

If I list the few things that I took away from this from an efficiency standpoint, here's what I would do:

1. Determine numerical values for everything before making any cuts/markings on materials; use scratch paper and write it out.
2. Materials aren't limited to what we have in the lab. Get creative and think of whatever we may need to buy to make something happen with long-lasting results.
3. Notify your project manager whenever you are about to perform a task that wouldn't normally be reversible. Although you may have an excellent idea, they may have or know something to add or build onto it.

Light Buoy

The second part of the light pole required us to get the system afloat. The toughest part about this task was to come up with effective ideas. In the end, we went with an idea that included setting up a wooden board with four buckets underneath to act as the buoy with the light pole going through the center of the board. From there, measurements were carried out on where the buckets would be placed and holes were cut for ratchet straps that would assist in securing the buckets.

A minor problem we ran into that cost us some time was not having proper fastener sizes and tools when needed. Similarly to the Light Pole, these could've been avoided had we tried to consider it sooner, allowing us to go to the store to make purchases without wasting much time. I've yet to learn from my mistakes. ☹ Thankfully, we were still able to complete the task in a timely manner, and also implement the Light Pole.

Mission Operations

Alongside everything else I've had to work on in RobotX, every week I was in charge of preparing each subsystem for a field test. The majority of this task was to fill out a checklist of all possible things that the team might need for a successful field test.

Unfortunately, during my first field test, I had forgotten a few things that would've made the work flow smoother and faster overall.

The issues were taken care of from that day onward. Whatever was missing on that field test day, I added an updated checklist and packed it for each future field test. What helped along the way was keeping notes on everything that went well and not so well during field test.

Research

This next portion was part of a task that I was responsible for, but was only able to contribute to through research. The mechanical subsystem was required to do something about a battery whose one of four cells had died. I had no idea on how to approach this problem. What helped guide me to a solution however was watching videos that had similar (but not identical) problems. Viewing 3 ~ 4 of these gave me tips as to not only how to go about the problems, but what I would need to fix them also.

For this particular task, what could've been a potential solution was to run a small current through the battery for a long period of time. This meant hours or maybe even days while checking on them periodically.

Even though we tried this, it didn't work. The project manager suspected it to be because of having multiple batteries act as one cell, the current wasn't sufficient in charging that one dead cell. Unfortunately, I don't remember the solution implemented to fix the battery, but it now holds less charge than it used to.

That sums up what I've learned so far on this team.