

VEX 8931F

VEX Robotics Competition

Make It Real CAD Engineering Challenge

4 December 2020

# Charging Station

Can't find your battery? What about where that cord leads to? That is a problem our team is tired of dealing with, so we decided to make a stylish, compact, travel-friendly charging station for the Make It Real CAD Engineering Challenge that solves this annoying problem. This report will cover what the presentation did not, including some behind the scenes work.

The first step we took was to do our design brief, which outlines any and all rules, requirements, and gives general structure to our challenge. Our design brief is as follows:

- Design Statement

- A team competing in the Make It Real CAD Engineering Challenge must design, model, and construct a unique solution to a unique problem in the VEX Robotics Competition; and can be utilized by said team.

- Constraints

- A Final Report (maximum length: 1000 words).
- You must use Autodesk Fusion 360, Inventor and/or Tinkercad to design the new part.
- Previous online challenge entries are not allowed.
- A photo of your 3D print (we want to see the physical object, not the digital rendering).
- Include at least one image of your design
- One final rendered image of your new part

- Deliverables

- Complete design brief
- Complete brainstorming ideas
- Complete model
- Complete construction
- Complete presentation

x	10/10/20
x	11/14/20
x	11/22/20
x	12/2/20
x	12/6/20

Our goal was to create a unique, small, and helpful charging station that would organize a team's batteries. There were no submissions ever that charged both the battery and controller, and so we pursued this idea. We took this, and ran with it. We wanted to create a charging station that compactly organized a team's electronics that need charging, and display the charging progress. It also must be easily usable, so not too compact to where a person struggles with using it. This would not only benefit our team, but possibly organize teams around the world if they so

chose to use this station. This will not only help the VEX competition, but also help teachers organize the charging of batteries for their robotics classrooms. It is relatively cheap to create, even if one does not have a 3D printer.

The charging station was created using Autodesk Inventor Professional 2021. Our plan was to design and make a compact charging station that would position wires to be able to charge at least one battery and controller in an organized fashion. There was a constraint to make the lights on the batteries displayed properly, as well as cords being easily plugged in and taken out from all locations, both of which were critical to the design due to the limited options for orientation. Here is a step-by-step guide to how a teammate created the model:

*I started with an extruded rectangle sketch to get the main shape, then after sizing, split the rectangle into three sections in the back so that two sections were for the batteries and one central wire management area. I then continued with an opening in the bottom to allow easy access to the wires. There are three openings in the front, two 0.4" diameter holes for the battery charge ports, and custom rectangle extrusion for the cords to go through. After finding the correct location where the V5 battery light is, I cut a rectangle so that the user can see the battery charge level. For the controller, there needed to be a large platform on top of the charging station, once completed, I added a truss for more support for the platform. With the help of CAD modelling physical properties, the centroid of the controller was found. A barrier to hold the controller in place and an opening to the cord to plug into was added after. To make the project look finished, I filleted all of the edges.*

To recap our experience, the hardest part of this process was making the V5 controller to interact with the CAD model, and to align the wires correctly. We learned at the end of this challenge that the charging station would not only benefit our team and our club, but other VEX teams in organizing their V5 electronics. We also learned how to dimension and model properly referencing CAD models to physical objects that suited our wants for form and functionality. We also improved our technical drawing skills on Autodesk Inventor Professional 2021. Our team, 8931F Firewall, would like to thank you for your time and for your consideration.