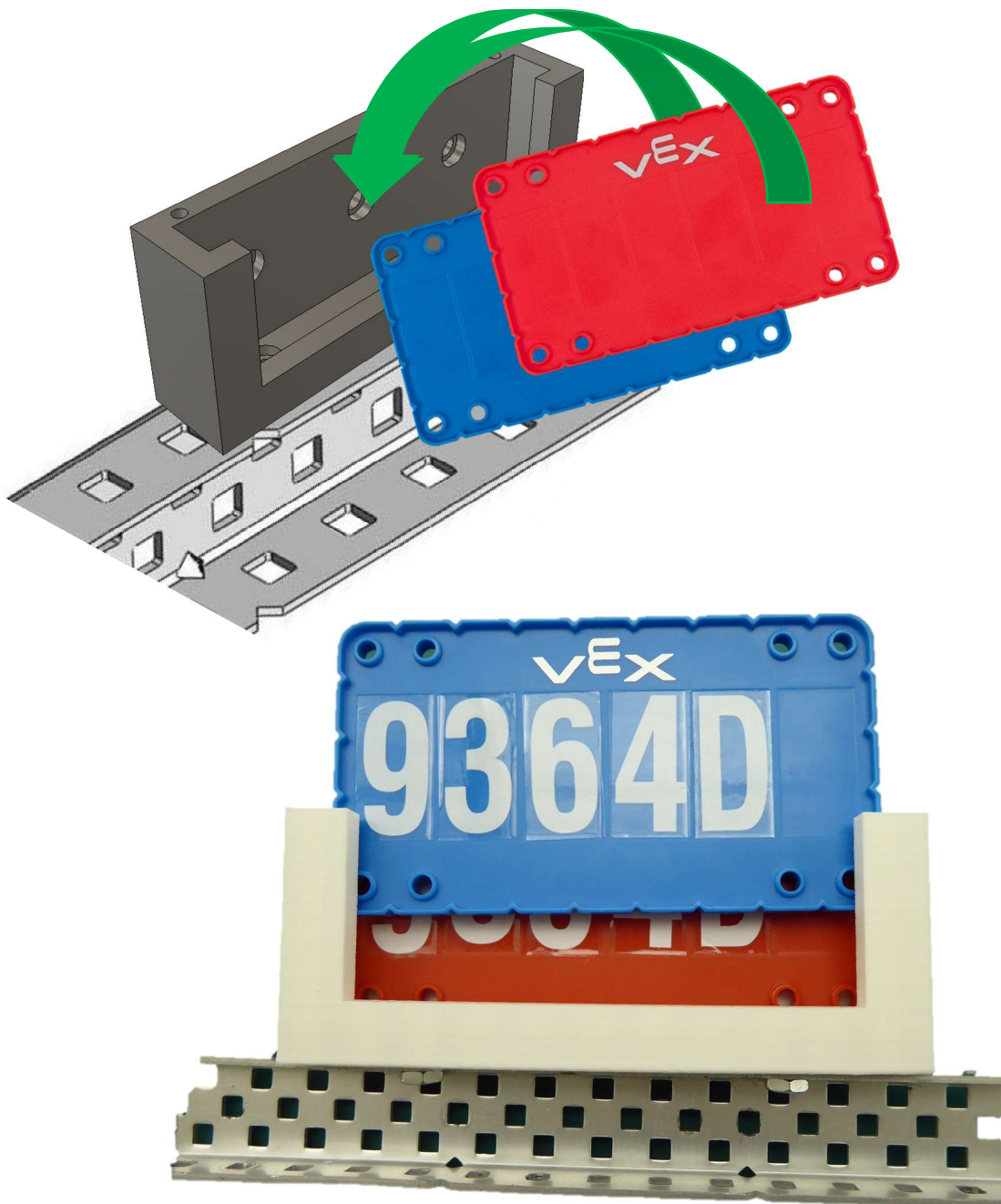


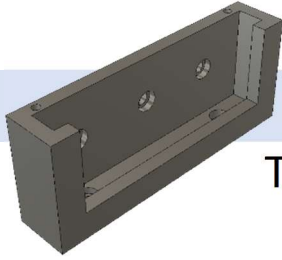
Make It Real CAD Engineering Challenge

Team 9364D - Brentwood Academy (Brentwood, TN)

MIDDLE SCHOOL DIVISION

VEX LICENSE PLATE HOLSTER





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The Challenge

One of the challenges that many teams have struggled with is attaching and changing license plates quickly and efficiently. My dad has been running inspection at a few of our tournaments and noticed that teams were frequently misplacing their plates, showing up at inspection with plates unattached, or unsure of how to attach plates to their robots. My Brentwood Academy robotics program has come up with many ways to attach license plates to our robots. A few of these ways involve using Velcro, zip ties, VEX IQ parts, offsets, or rubber bands. However, none of these methods are space efficient or make it easy to change license plates quickly. Because of this problem, my team has set out to find a way to make this task simple and efficient for all VEX robotics teams.

The Solution

The VEX License Plate Holster is a simple tool that can be mounted anywhere on your robot with either screws or zip ties. The holster is designed to fit both license plates snugly back-to-back, so all you must do is pull them out and turn them around. One of the benefits is that you don't have to keep up with both license plates during a tournament because they are already there waiting for you to change from red to blue. The holster is made with five circular depressions allowing the mounting screws to be flush with the side and two non-invasive hollows for zip tie attachments. Both methods are designed to permit the license plates to slide in and out of the holster without catching on the screws or zip ties. The plates are made to fit tight in the holster to allow for multiple mounting options. The advantage of this is that even if the robot flips or you place it sideways on an appendage, there is no opportunity for it to fall out. The VEX License Plate Holster is simply the most efficient way to attach plates to your robot.

Software

I chose to use Fusion 360 to create the License Plate Holster. I used the Student 2.0.2604 version of Fusion 360 software. I had never used any version of CAD before, so I began by watching some tutorial videos to get the general idea of how to make a new part on the computer. Once I got the hang of things, I took several days to think of an idea that would not only help my team, but help the rest of the VEX Robotics community as well. Eventually I came up with the VEX License Plate Holster.

After coming up with the License Plate Holster idea, I measured and sketched it out on graph paper. Then I turned to Fusion 360. First, I used a rectangular prism and hollowed it out using the “shell” feature to create a bracket to properly engage the license plates and hold them tightly in place. Then I created a hole that has a slight depression before the hole, allowing the screw to be flush to the inner side of the brackets. Then I copied it four more times to allow more options for mounting on the robot. Then using the “sketch” feature I add a small lip on the brackets, eliminating the risk of the plates falling out. After adding the lip, I also added small holes to the top and the back to allow the option to mount the license plate holster with zip ties.

I found using Fusion 360 to be very beneficial in creating my design for the VEX License Plate Holder, but the process was not without obstacles. I felt confident that I had designed the piece correctly, but once it was brought to life by the 3D printer, I realized my dimensions were off. So back to the drawing board to create the final version which worked. It was interesting to see how you can manipulate objects and then 3D print the designs to see what you created from the screen to an actual physical form.

Reflection

My hope is that this VEX License Plate Holster will revolutionize the attaching and changing of VEX license plates and benefit the entire VEX Robotics community. This project gave me a new skill-set and taught me that by using digital software, you can create virtually anything – the only limit being your imagination. I also learned a valuable lesson in the importance of taking accurate measurements. When my first prototype didn’t work because I didn’t account for the thickness of the sides in my measurements – the license plates space was too narrow and the retaining wall was too thin. If I had not had the opportunity to 3D print the prototype, I may not have realized my error. After carefully measuring and making a few adjustments, I was able to finalize the prototype and 3D print an actual working model.

I will plan to utilize this software in the future. Although I still have lots to learn, I look forward to using it to enhance my Engineering Notebook and would like to enter other REC Online Challenges involving CAD. On a competitive robotics team, I can see where CAD would also be useful for judging awards such as the Design Award, Build Award, and Excellence Award. In VEX U, I was excited to learn that teams can 3D print parts and Fusion would be super helpful. In the future, I want to be an Aerospace Engineer, and if I know how to use CAD, maybe I would be able to design a future space robot or rocket. For the present, my hope is for my Brentwood Academy team and the rest of the VEX community to have a more efficient way to change out their license plates with the VEX License Plate Holster.

From SKETCH to FUSION360 CAD to 3D PRINT REALITY

FRONT			
TOP			
BACK			
SIDE			
BOTTOM			

ASSEMBLING the LICENSE PLATES into the PROTOTYPE



MOUNTING OPTIONS in ANY DIRECTION

