2020 Online Electronics Challenge

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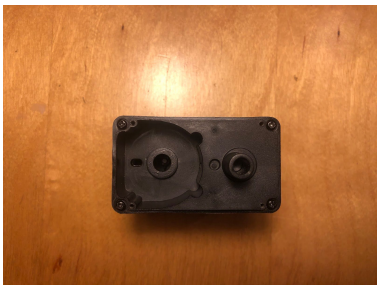
The device that we selected was a V5 smart motor because we thought that it would be helpful to fully understand the very motors that we use to compete. As freshmen, VEX robotics was very new to us. We thought one of the most helpful things would be to actually find out how the equipment we were using worked. The motor isn't made up of too many parts, the most important ones being the main motor engine, circuit board, area for gear cartridges, and the internal gearing.



Top View

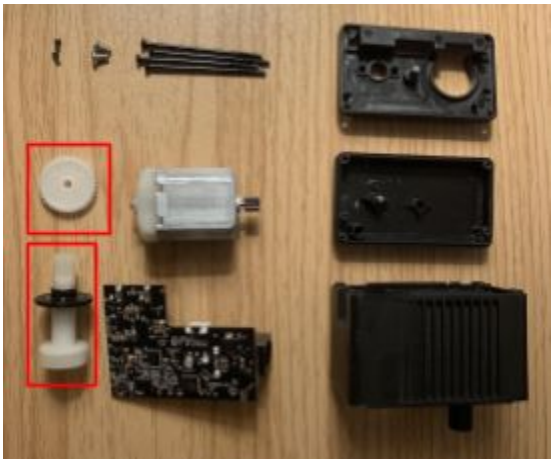
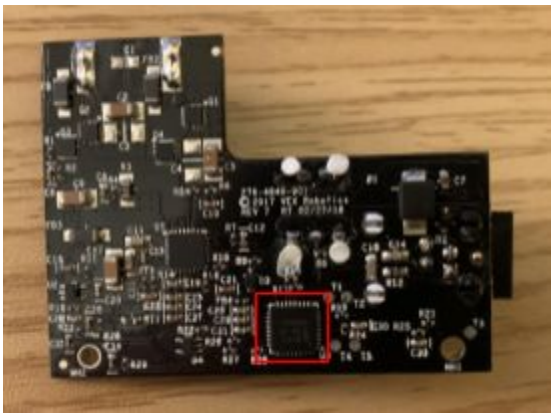
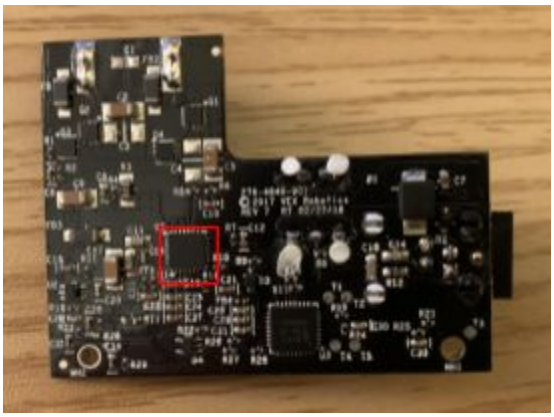
Bottom View

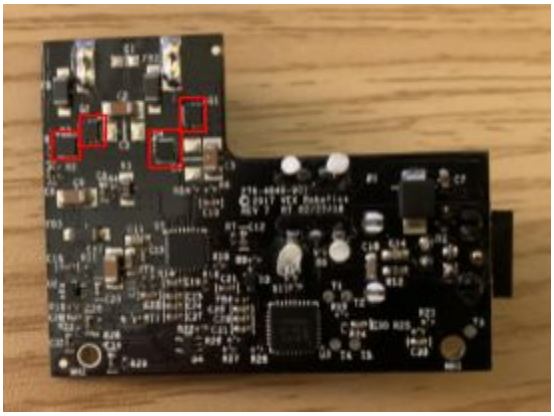
Side View

Motor Summary:

A lot of the chips and components that we found in the motor were made by many different manufacturers. Some of the main components included were a microcontroller, which controls all of the actions of the motor, a driver, which receives the commands from the microcontroller, and an H-Bridge, which can change the direction the motor spins, controlling whether it goes forwards or backward. It does this by changing which transistors are positive and negative. There is also a fault protected transceiver (TI component), which relays information to the motor and verifies data. The fault protection is very helpful to keep the robots, specifically the motor, from short-circuiting.

Our Findings:

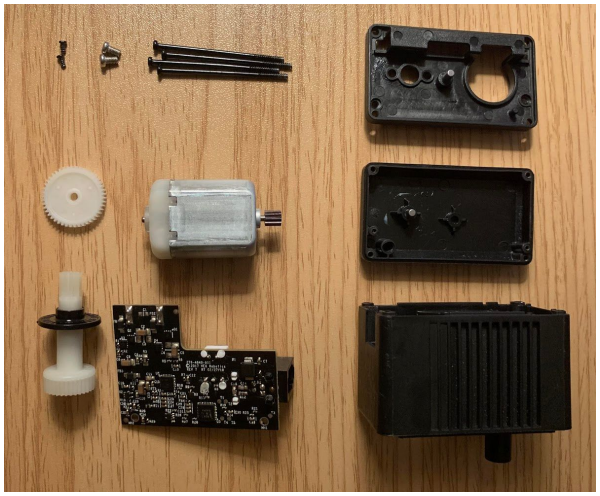
Picture of Component	Definition/Explanation of Component
	Gears: One of the simplest things we found inside of the electric motor was a few small(er) gears. These play a role in allowing the motor to have more or less torque and power, simply by changing how that power is distributed (transferred) from the motor to the wheel.
	U3 - Microcontroller: This controls all of the actions of the motor. It receives its instructions from the brain of the robot, whether the robot is driving autonomously or if a controller is connected.
	U1 - H-Bridge Gate Driver: This receives the commands from the microcontroller and controls the H-Bridge with this information.

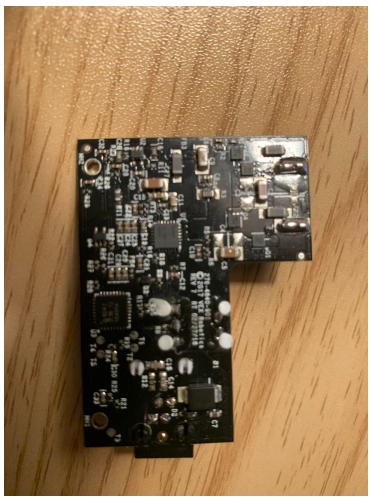
	Q1-4 - H-Bridge: This can change the direction the motor spins, controlling whether it goes forwards or backward. It does this by changing which transistors are positive and negative
 	Motor: The (main) motor is the powerhouse of the entire motor. The circuit board gives it commands and it translates that into what to do (either move forward or backward) and how fast to do that

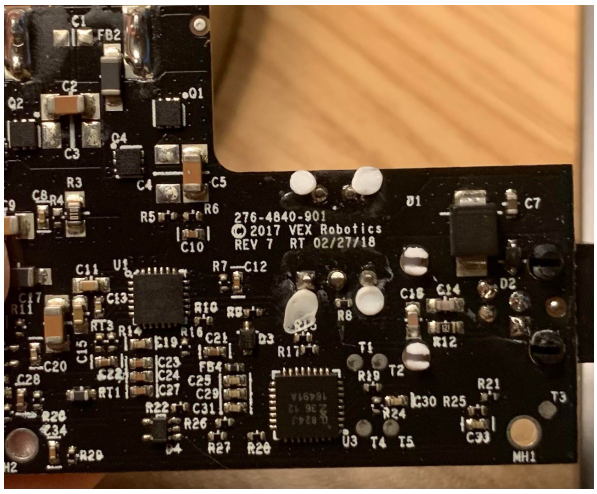
One of the simplest things we found inside of the electric motor was a few small(er) gears. These play a role in allowing the motor to have more or less torque and power, simply by changing how that power is distributed (transferred) from the motor to the wheel. A lot of the chips and components that we found in the motor were made by many different brands. The main components included were a microcontroller, which controls all of the actions of the motor, a driver, which receives the commands from the microcontroller, and an H-Bridge, which

can change the direction the motor spins, controlling whether it goes forwards or backward. It does this by changing which transistors are positive and negative. There is also a fault protected transceiver (TI, Texas Institute, component), which relays information to the motor and verifies data. The fault protection is very helpful to keep the robots, specifically the motor, from short-circuiting

Additional Photos:







Conclusion. What were the lessons you learned from this experiment?

We are all freshmen this year, so this project was a little difficult for us, due to our inexperience with electronics and circuits. Although some of the information that we learned from this will certainly be forgotten, like how an H bridge works, or what a driver does by the time we start actually building a robot, we have still learned some very important lessons. One of these was how to document our findings and work as a team. In addition, by simply learning this information, even though we may not ‘try’ to

remember it, more likely than not we will. A major aspect of the actual competition is creating a design notebook, and it is most people's least favorite job to have. Using our knowledge from this project, we will definitely be able to help our team make a great design notebook, and have more time to put effort into the building and the coding of the robot.

Sources:

TI Fault Protected Receiver

Brushed DC Motor Full-Bridge Gate Driver datasheet