ELECTRICAL

ABOUT

The electrical component is arguably the most important component of the robot. Poor wire management and bad practises can lead to serious issues and failures. This section outlines how our team approaches wiring our robot and maintaining a clean, reliable system. We also keep track of where wires are plugged in on the expansion hub in our electrical schematic, which is very helpful.

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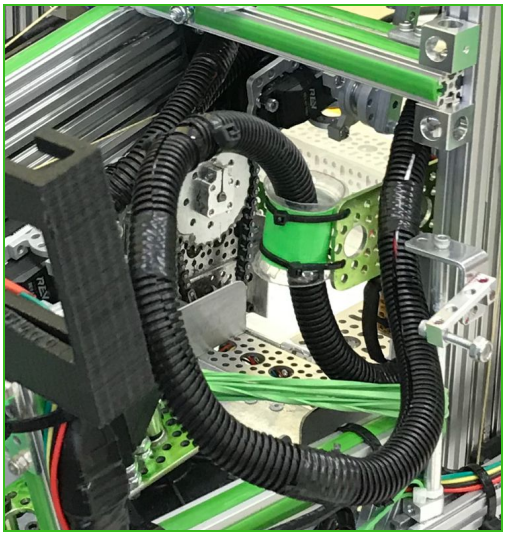
GOOD PRACTICE / WIRE MANAGEMENT

PROTECTIVE SLEEVES & CASING

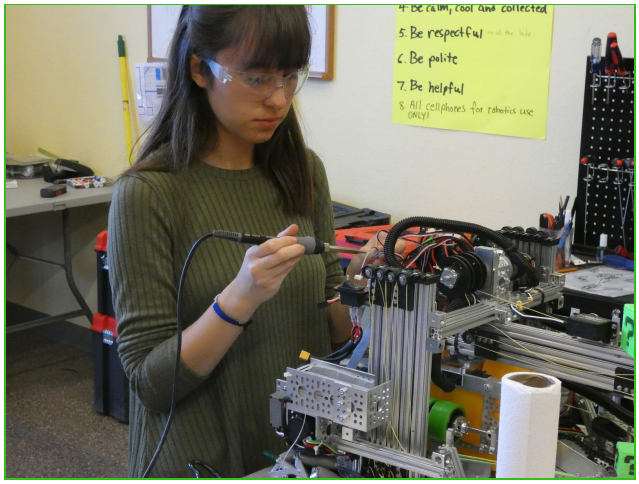
In order to prevent wires from sustaining damage from the robot, field, or other robots, almost all of our wires are fed through a flexible wire sleeve. This wire sleeving is extremely useful because not only does it protect the wires from damage, but it also collects a group of wires into one, manageable sleeve.



In addition to the sleeving, we also protect our wires at its connection points on the expansion hubs by wrapping the expansion hubs in a plexi glass casing (with green tape, of course). This casing makes our wire management look much cleaner, protects the wires and expansion husb from damage and metal shavings, and helps to keep our wires plugged in.

SOLDERING

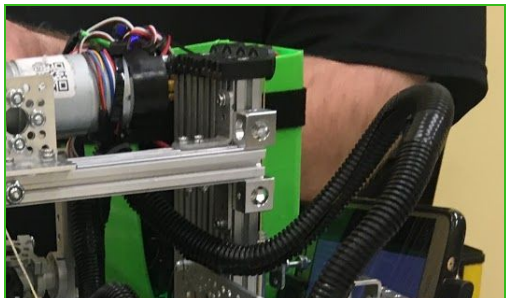
If a wire is not the correct length for its purpose, we cut and solder the wire in order to ensure it is not too short, or too long. A wire that is too short runs the risk of being pulled out of its connection or sustaining damage its connection points. A wire that is too long takes up space and could get tangled.



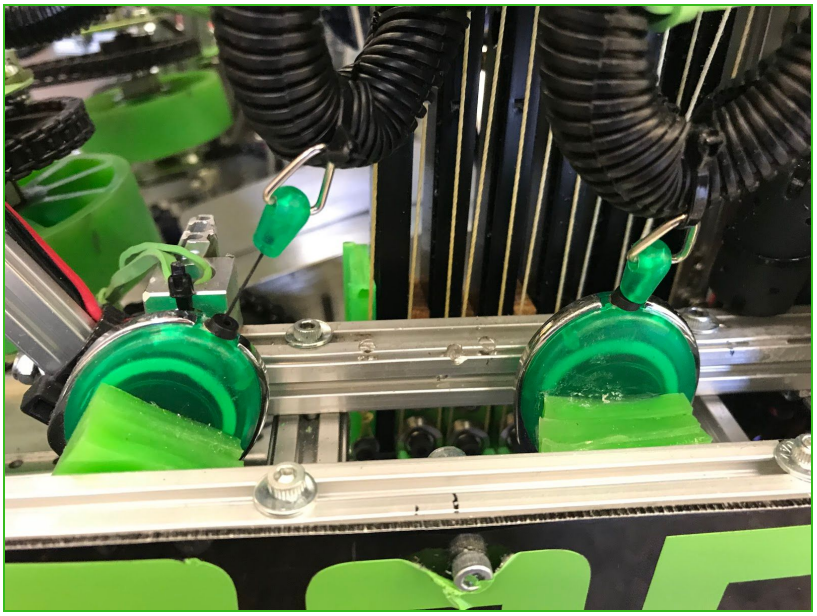
EXTENSION

Because there are two main points of extension on our robot, the vertical and horizontal slides, we had to focus a lot on wire management this season. Our vertical lifts extend about 4 ft, but retract to under 14”, so we **Hi my name is Felix and I want to tell you about how I joined ENIGMA. Before I joined the team I didn't even know what FIRST was but since I've joined it's been one of the coolest things ever done!**

I heard about ENIGMA through my sister that works next door to the shop that we meet at. My sister saw them working and got their information. I was really interested and called the next day and joined. I am really enjoying it and it is super fun. must manage over 4 ft of wire in a very small space on the robot. On the first iteration of the vertical slides, we put all of our wires in the protective sleeving, and then built a management sleeve that mounted on the last stage of the vertical slides. This helped to keep the bundle of wires that extended with the vertical lifts to the front right side of the robot, instead of going wherever it would naturally go when retracting and folding back into the robot.



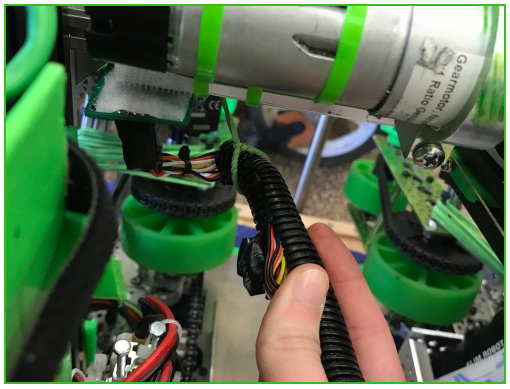
After we redid our vertical lifts, and added two stages, we had more extension, thus more wire to manage. This bundle of wire was too long to manage in the same, rather loose, way as the previous one, so we had to think of a different solution. After some prototyping, we decided to still use the same protective sleeving, but to manage it to the side of the slides and with much more restraint. The wire sleeve is attached to the top of the 2nd, 4th, and last slides. This forms a loop pattern. In order to keep the form of the loops when extending and retracting, we used rubber bands at each end of each loop. Finally, in order to ensure that the loops came into the same place on the robot every time, we used two chalk lines tied to the bottom of the first two loops. This management system has worked extremely well!



RUBBER BANDS

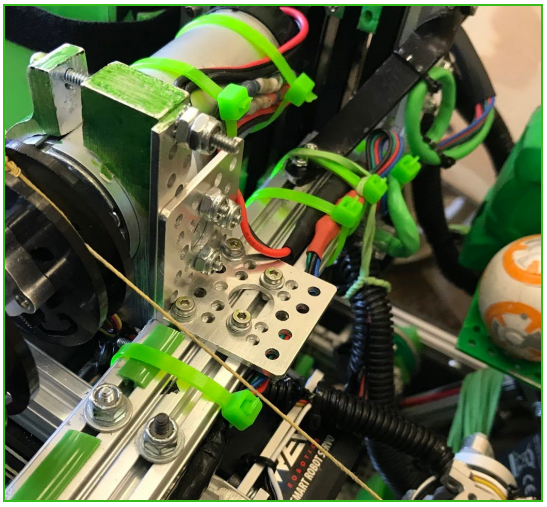
Because there is not as much extension or movement in other places on the robot as there is with the vertical lifts, rubber bands are used in other cases, such as the

horizontal slides and autonomous claw. These rubber bands assist the wire to return to the same place within the robot after each extension/movement.



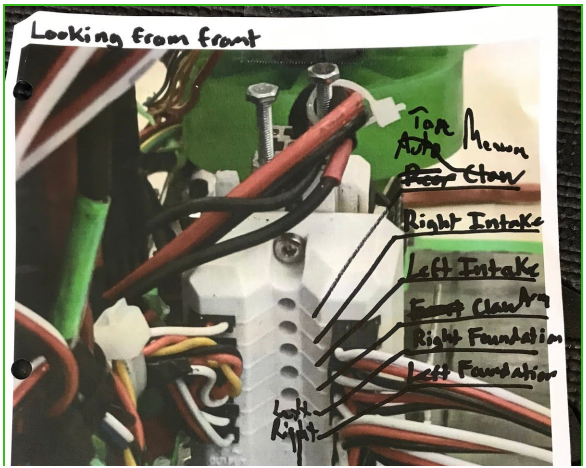
ZIP TIES

We utilize zip ties just about everywhere on our robot for wire management. The wires are zip tied down to the robot in order to ensure they do not get tangled or damaged. The more places wires are covered, protected, and tied down, the better for overall organization and performance.



KEEPING TRACK

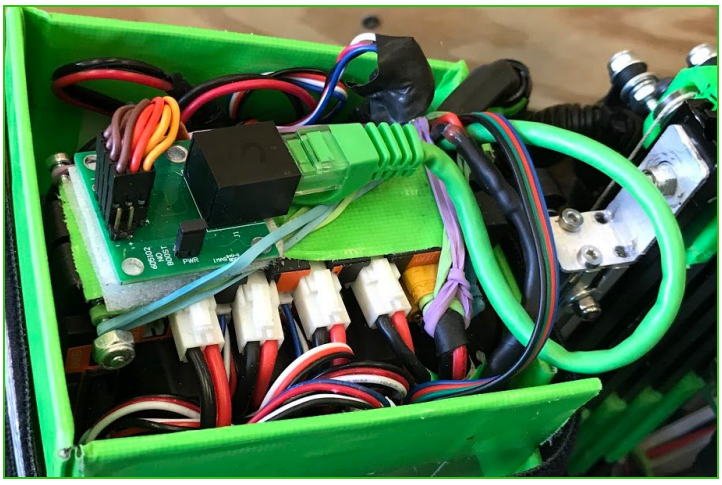
In order to keep track of where our wires are plugged in as we change them, we have a print out of the expansion hubs and the rev servo power module; these diagrams are then used to update the official wiring schematic.

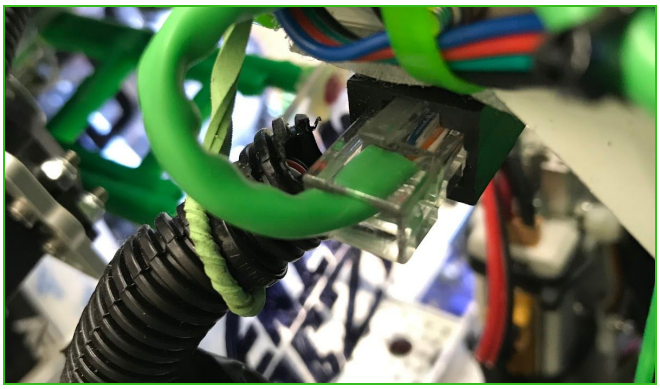


ENHANCEMENTS

CAT 6 CABLE FOR VERTICAL LIFTS

We use a cat 6 patch cable that spans between a servo sender which connects the servos to the hub, and a servo receiver that connects to the servos at the end of our nearly 5 ft lift. This cat 6 patch cable serves as part of our lift's wiring harness. It eliminates 4 wires, which is more than 1 pull set of servo wire, making our lift wire management much smaller and cleaner.

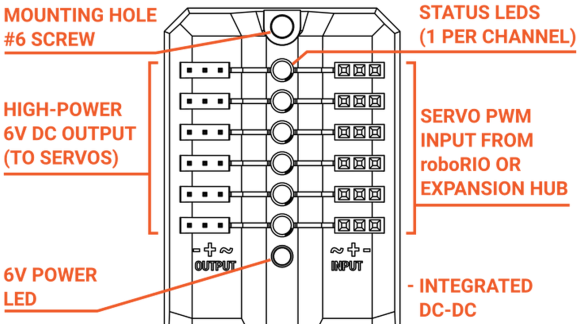




REV SERVO POWER MODULE

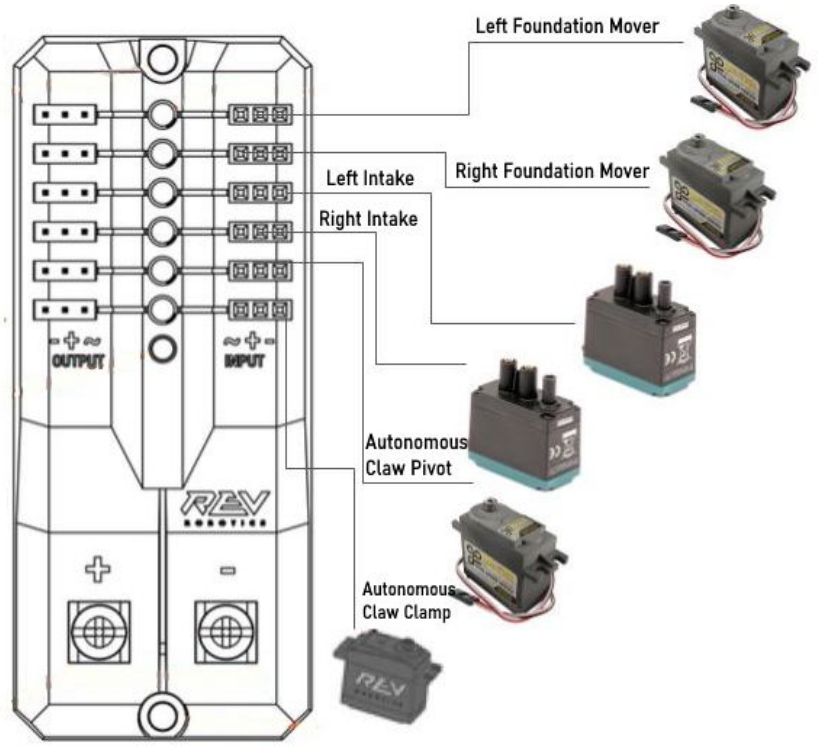
Source: revrobotics.com

The Servo Power Module is a 6V 90W power injector that enables the use of high-power RC servos in applications where a robot controller cannot directly provide adequate power. The Servo Power Unit passes through input signals unaltered while providing up to 90W of total output power across all six channels. The input and output channels accept standard 3-wire 0.1" pitch servo/PWM cables.



WIRING SCHEMATIC

Servo Power Module
Wiring Diagram



EXPANSION HUBS DIAGRAM