750W South Brunswick, New Jersey

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TI Reverse Engineering

VEXnet Joystick

Why we chose the VEXnet Joystick:
The VEXnet Joystick is a resourceful tool that we utilize in our robotics endeavors; out of curiosity, we chose to disassemble the last-generation VEX controller to have a deeper understanding of the inner workings of the object.

VEXnet Joystick Components

- Motherboard
- Battery
- Buttons
- Joystick

Motherboard

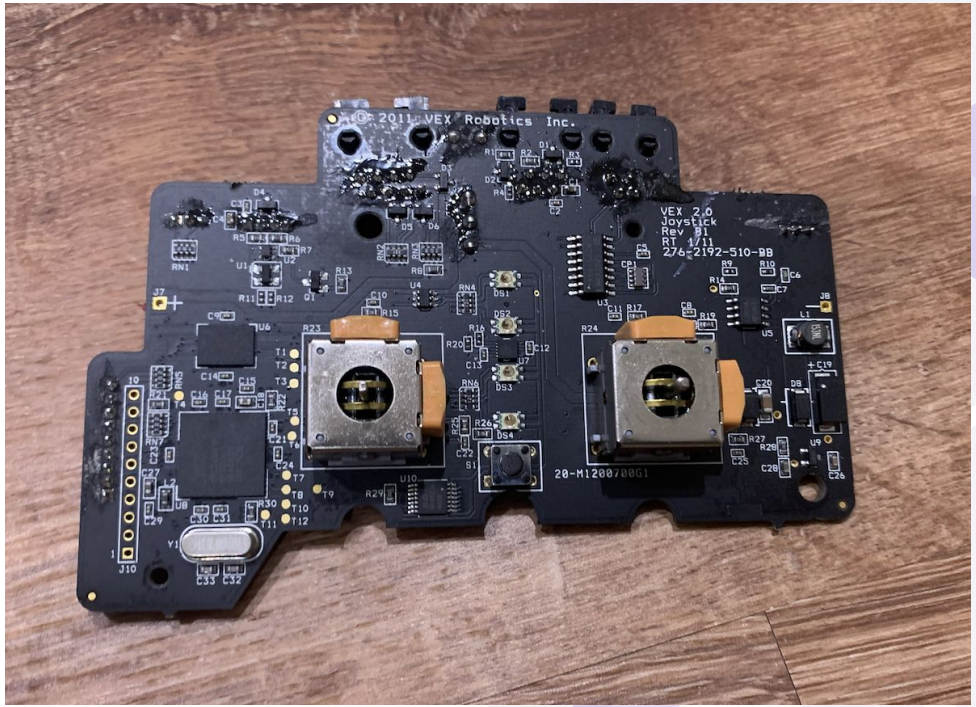
- Main printed circuit board, holds and allows communication between all the main components of the system

In relation to the controller, the Motherboard

- Handles controller functions (key presses and joystick movements)
- Manages the flow of current throughout the controller, the “brain” behind the system

Components Purpose and the role it plays in the system:

- Broken up into sections for inputs, voltage reduction, I/O (ports), and connection to the robot
- The back has the ports to connect the controller to the other components (a partner controller, computer) and the power switch for the controller



Battery

- Supplies power through a positive and negative charge
- The flow of electrons creates an electric current to do work
- The chemical reactions in a battery take place in an external circuit

<u>Function in relation to controller</u>

- The controller accepts 6 standard AA batteries

<u>Components purpose and the role it plays in the system:</u>

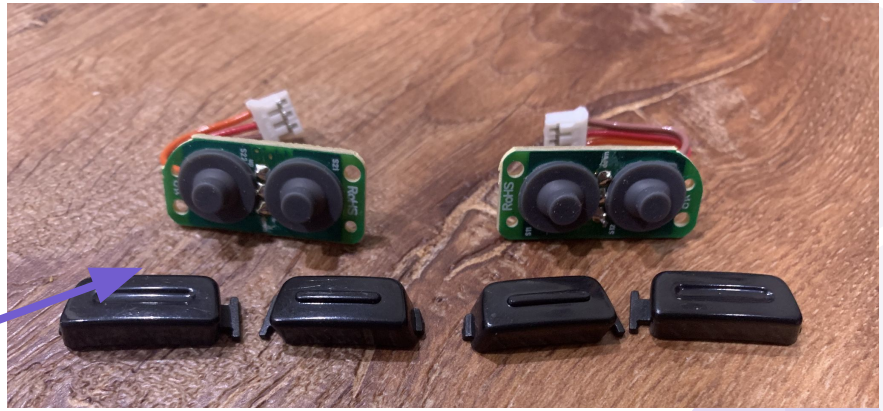
- The current flowing through the circuit allows the controller to operate

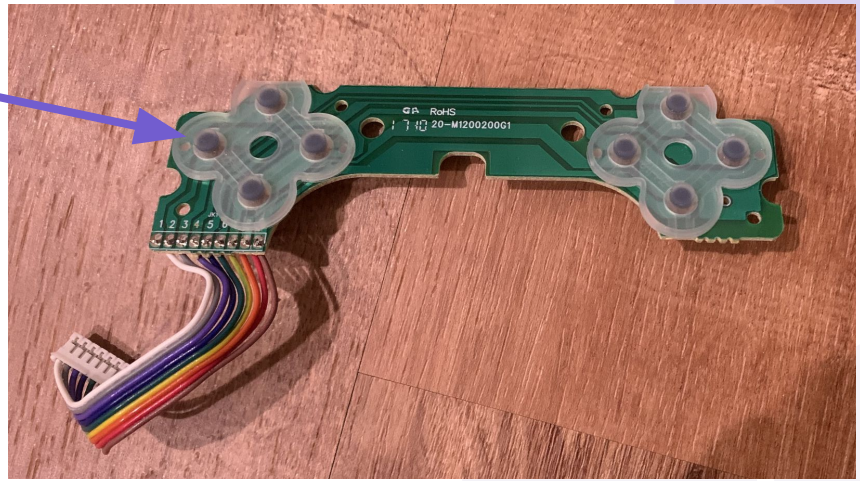
The section was connected to the motherboard using the solder joint circled in red (the wire was removed during disassembly).

Buttons

Function in relation to the Controller

- All of the switches on this controller use a rubber dome mechanism
  - The sheet of rubber has a small conductive layer under it
  - When pressed down, it completes a circuit and the switch registers a press
- Buttons allow the controller to receive and send signals to the robot, which turn into motion via uploaded code

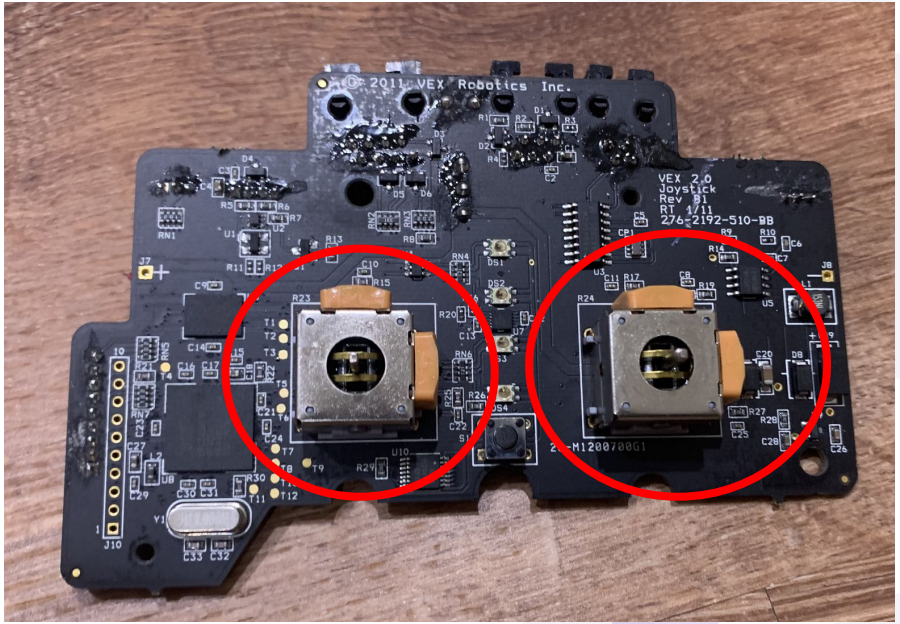




Joystick

Function in relation to the Controller

- Receives mechanical input from its motion and relays that information to the circuit board, which turns it into signals and eventually, motion
- Mechanical input comes from two potentiometers in the joystick's 2 axes of motion
- Potentiometer varies resistance based on position
  - Can send distinct signals for every distinct position the joystick is in



Conclusion

As members of our robotics team, we have always revolved around the idea of designing first via CAD before attempting to build anything. We were allowed to explore an unorthodox way to engineer something through this challenge: reverse-engineering!

From this experience, we have learned so much about this controller that we take for granted–if given the same parts, we would be able to put it back together. We walk away from this challenge with not only knowledge about a controller but with an even bigger idea: sometimes, to understand complicated systems, all it takes is a little bit of hands-on tinkering through reverse engineering!