

REVERSE ENGINEERING A VIDEO GAME CONTROLLER



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**COAST 2 COAST
ROBOTICS**

The object in question is a 3rd party video game controller which allows the user to remotely pilot a videogame character. The VEX controller we use to drive our robot has a very similar function and shape, except that it pilots a robot instead of a game character. Because we have had several controllers break in the past, we disassembled this controller in the hopes that we will learn how a VEX controller works by proxy without destroying one. With this knowledge, we will be able to address and fix minor controller issues in the future.

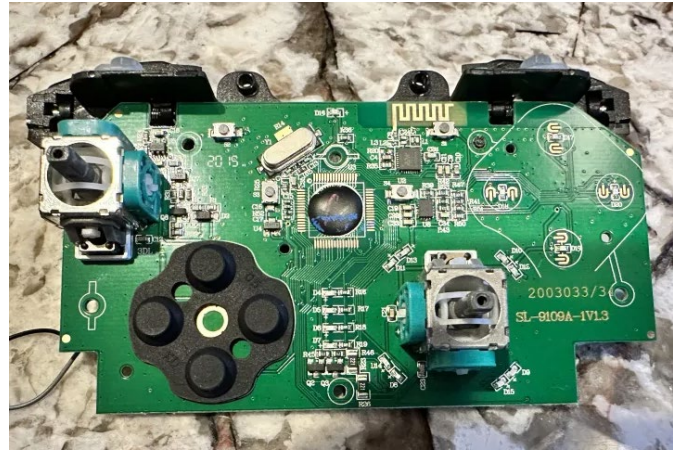


The controller has a similar control scheme to VEX controllers, with two analog sticks, one directional pad, and a set of 4 buttons. We can break down the controller into three parts: the shell, inputs, and electronics. The shell is composed of thin plastic, which reduces weight but still offers some protection in small collisions. Its primary function is to hold everything in place. It is clearly designed for user comfort and ease of use with an ergonomic design and input placements that are easy to use.

Second, we can look at the inputs, which come in the form of analog sticks and buttons. The A, B, X, and Y buttons are put in a socket on the outer shell and are backed by a silicon pad which is non-conductive, protecting the user and buttons. The silicon backing also acts as a spring for these buttons, reducing the chance of a user clicking a button by accident. The analog sticks have two axes to track motion as well as a button which can be pressed by pressing the stick. Each axis is a potentiometer, which can read the position of the joystick based on the amount of electricity flowing through.



Finally, these inputs are connected to a central motherboard. In addition to buttons and joysticks, the motherboard also features two vibrating modules that can provide haptic feedback to the player. This haptic feedback is very valuable as it allows the driver to gain information without having to look down at the controller. A radio module is also attached to the motherboard, allowing for wireless operation. Finally, all of these components are powered by a 9V rechargeable lithium-ion battery, which can last several hours of constant usage.



Reflecting on the deconstruction process, we learned many things that may help with identifying and fixing problems. A huge problem with controllers is stick drift, or the controller detecting an input from an analog stick when there was no human input. We now can fix this problem by inspecting the analog stick module and looking for any dust or obstructions and then removing it. We can use this process to fix other problems in the controller like buttons not having a good input. We also learned how the controller rumblers worked. With this knowledge we can effectively put them to use during VEX matches.

