VEX VRC 2022-23
Reverse Engineering Online Challenge

Team 19122A - Biohazard
Montverde, Florida
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1. Team and Electronic Device Introduction

Team 19122A consists of Annabelle, Alexa, Isabella (Isa), and Ismael. The team goes to school at Montverde Academy in Montverde, Florida. The team chose Nintendo's 1985 NES accessory, R.O.B., or Robotic Operating Buddy, as their subject for the Reverse Engineering Challenge. R.O.B. is a small robot that is able to move its arms up, down, left, and right after receiving green flashes from the television that is connected to.

R.O.B. is a very prominent part of team 19122A, being shown in many posters throughout the Vex workspace at Montverde Academy, as well as being an honorary member.

Figure 1: Team Photo of 19122A featuring Honorary Member: R.O.B.

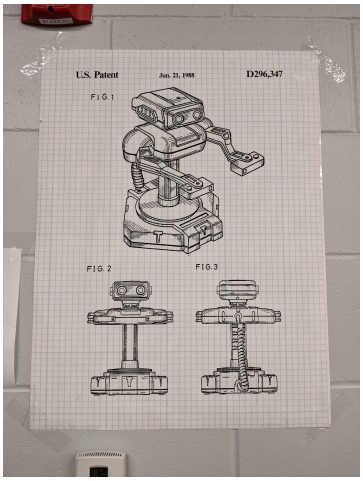


Figure 2: R.O.B. poster in classroom

Figure 3: Another R.O.B. poster in classroom

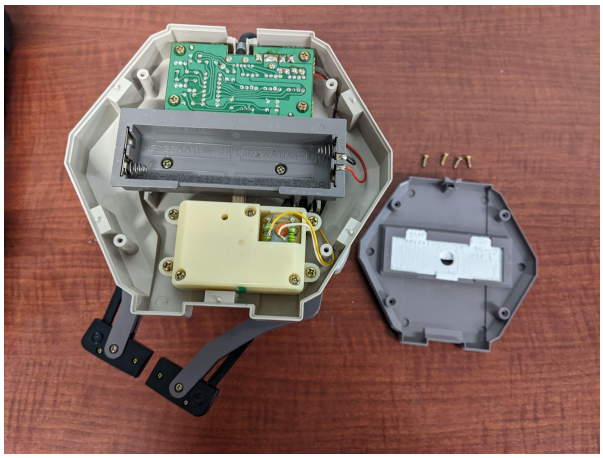
FIgure 4: Yet another R.O.B. poster in classroom

2. Deconstruction Plan

After looking at R.O.B., we decided that the best place to start the deconstruction process was R.O.B.'s base. After that is complete, we plan to work our way upwards and complete the deconstruction and research process at R.O.B.'s head.

Figure 5: Diagram of Deconstruction Plan of R.O.B.

3. Deconstruction and Research of Parts

	Step One - Identify Tools Needed and Where to Begin Deconstruction. ● Tools needed: Safety glasses and screwdriver. ● Deconstruction will begin with the four screws on the bottom of the base.
	Step Two - Identify Parts Inside of Base ● There is a circuit board and another enclosed unit.

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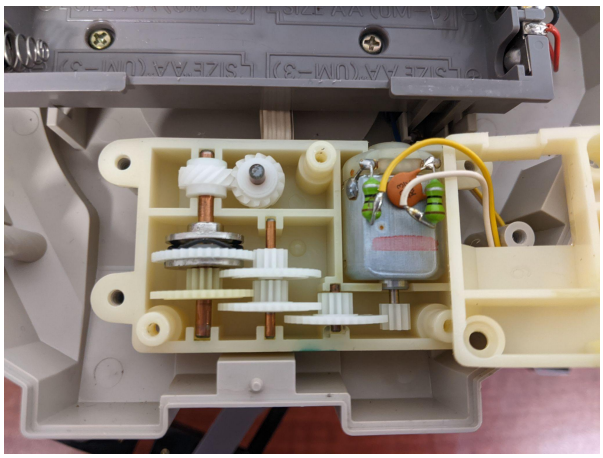
<td>  </td>
<td>Step Three - Open Unit and Identify Parts

● There is a motor and many small gears. The motor spins the narrow gears which turn the two circular gears that rotate around R.O.B.’s base that allow his arms to move left and right.</td>
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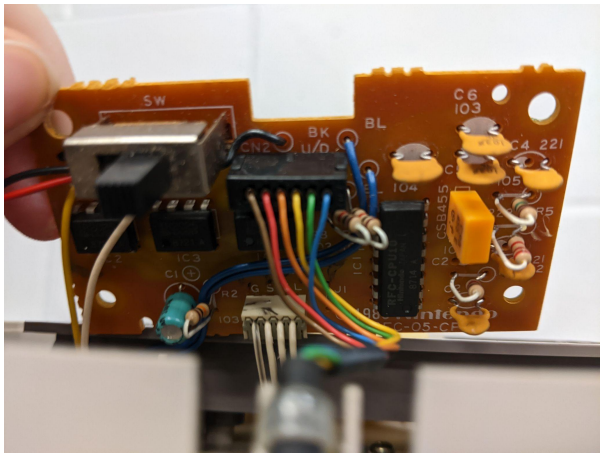
<td>  </td>
<td>Step Four - Unscrew Circuit Board and Identify Parts

● Underneath the circuit board were parts for the manual switch that turns R.O.B. on and off.

● The three black rectangles under the switch on the top left are motor control drivers that allow R.O.B. to move his arms up, down, left, and right.

● Those motors get their commands from the white wires located in the center at the bottom. Those wires connect all the way to R.O.B.’s head where he takes in the input from the television screen.

● The rainbow wire connects to R.O.B.’s midsection.

● The manual switch disconnects the power from the battery when it is in the “off” position.</td>
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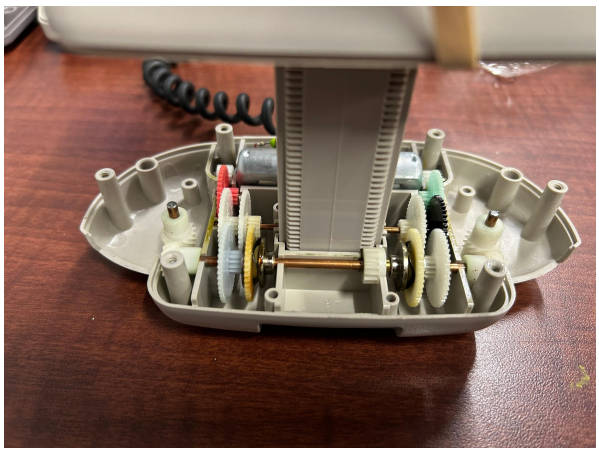
<td>  </td>
<td>Step Five - Open Midsection and Identify Parts

● R.O.B.’s midsection contains two motors and many gears. The motors are connected to wires that are attached to R.O.B.’s head.

● The motors and gears move R.O.B.’s arms both up and down and open and closed. The rod in the front center of R.O.B. has a gear that connects to the dashes along R.O.B’s “spine” that allow him to move his arms up and down.</td>
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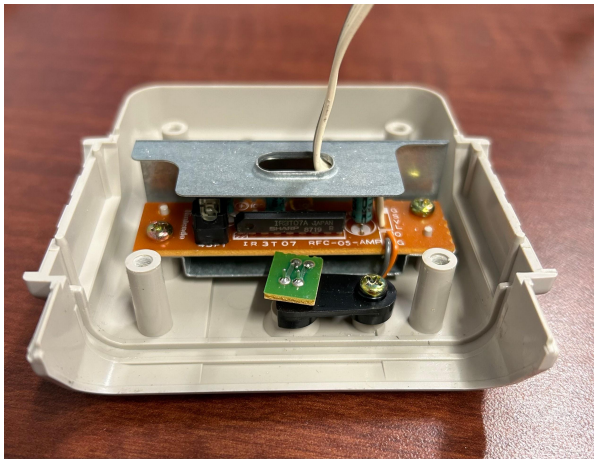
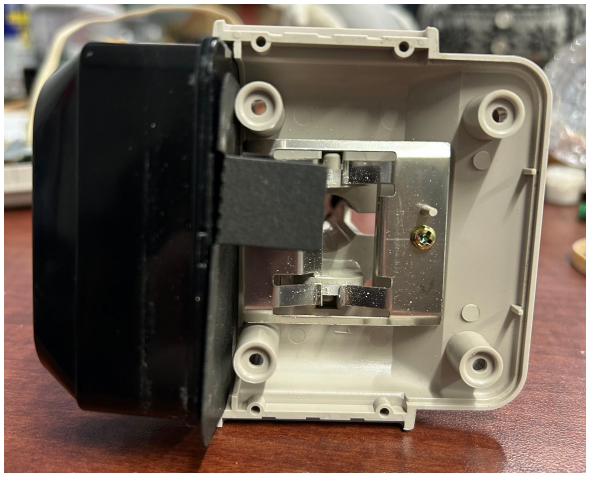
<td> 
  </td>
<td>Step Six - Open Head and Identify Parts

● The green square connects to R.O.B.’s red light on the top of his head. R.O.B. turns on his red light when he is connected to a television and ready to play.

● There is also a small circuit board that allows the input from the television to be turned into commands for R.O.B.’s movement.</td>
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4. Conclusion

During this challenge, team 19122A learned how the different sections of R.O.B. worked both together and separately. The team was able to learn how circuit boards worked and how R.O.B.'s motors and gears worked with them. This challenge was a lot of fun for the team as they were able to learn about one of their favorite robots and an iconic piece of retro gaming technology.