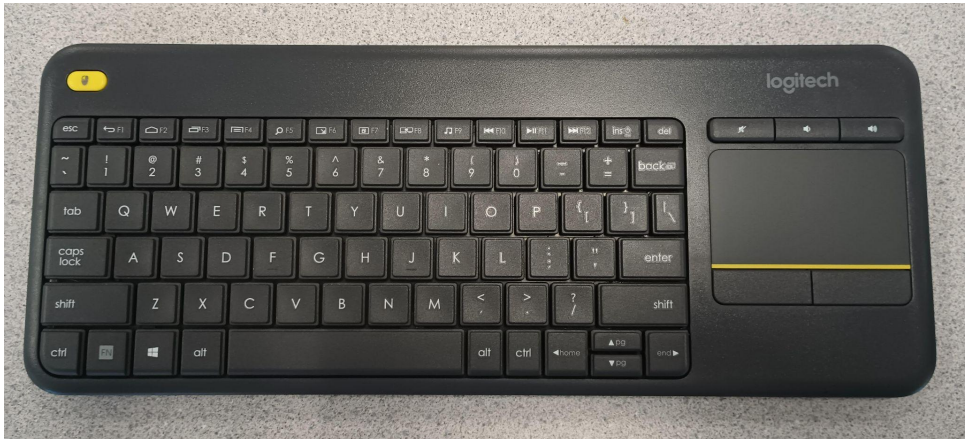
VRC High School - Reverse Engineering Challenge

606X Tucson, AZ
Members - Sai, Ben, Andy, Journey

Logitech K400 Plus Wireless Touch Keyboard

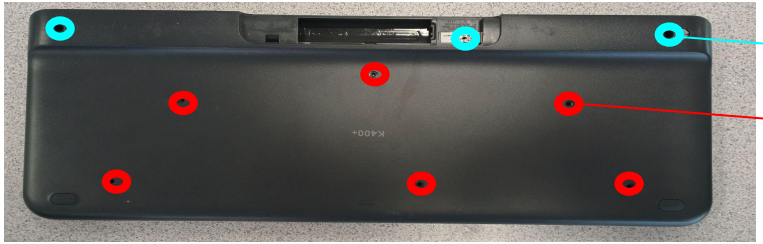
After one of our team members upgraded his keyboard to a newer one, we were interested to see the inner workings of these keyboards we use every day. We were especially interested in seeing how the keyboard's inner electronics enabled both the keyboard and touchscreen mouse pad to work.



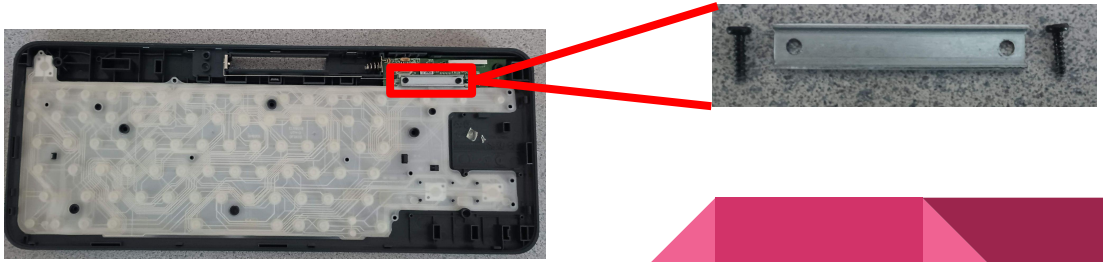
Disassembly

Tools used: Mini Phillips Screwdriver

There are a total of 9 screws on the exterior, with 3 hidden screws



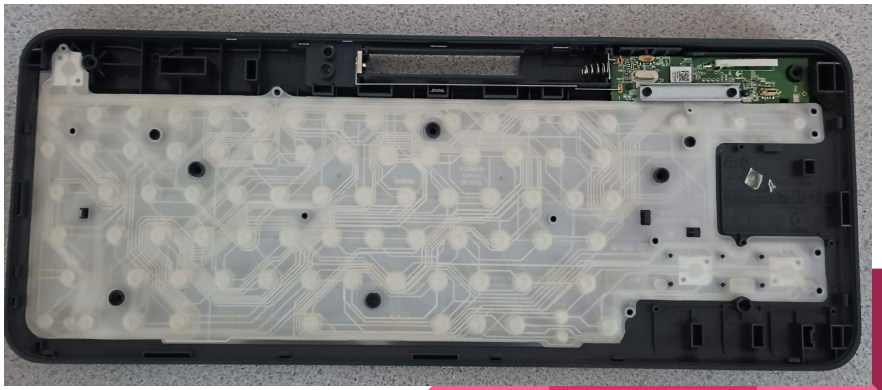
After removing the back cover, there were two more screws holding the remaining layers of the keyboard to the rest of the case



Interior of Keyboard

After opening the keyboard, we notice that there are two main parts:

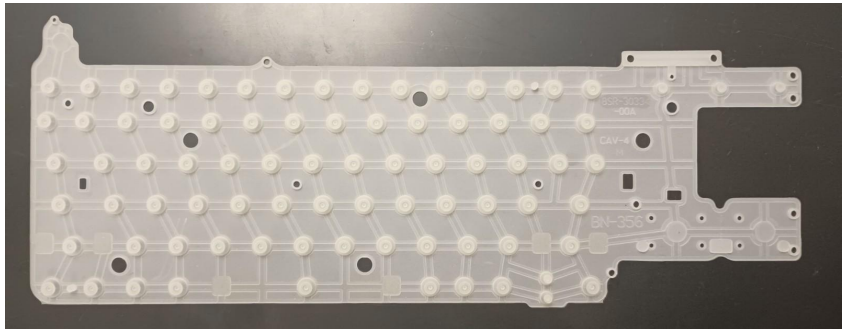
- The top part of the case has all of the mechanical keyboard switches and houses the mouse pad circuitry.
- The bottom part of the case houses most of the electronics of the keyboard as well as the circuit board /membrane for the keyboard

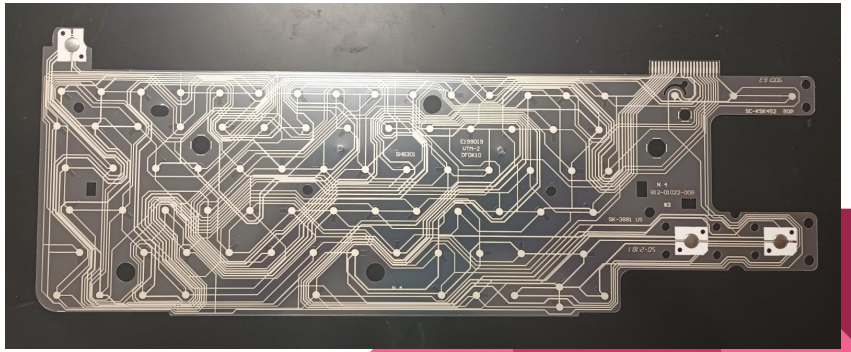


Inner Layers of Keyboard

There are two main inner layers of the keyboard:

- The first is the silicone rubber membrane. This is used to detect key presses from each individual key.
- The second is a pair of connected circuit boards. In this case the printed sheet is made up of mylar with the circuit wiring printed on.

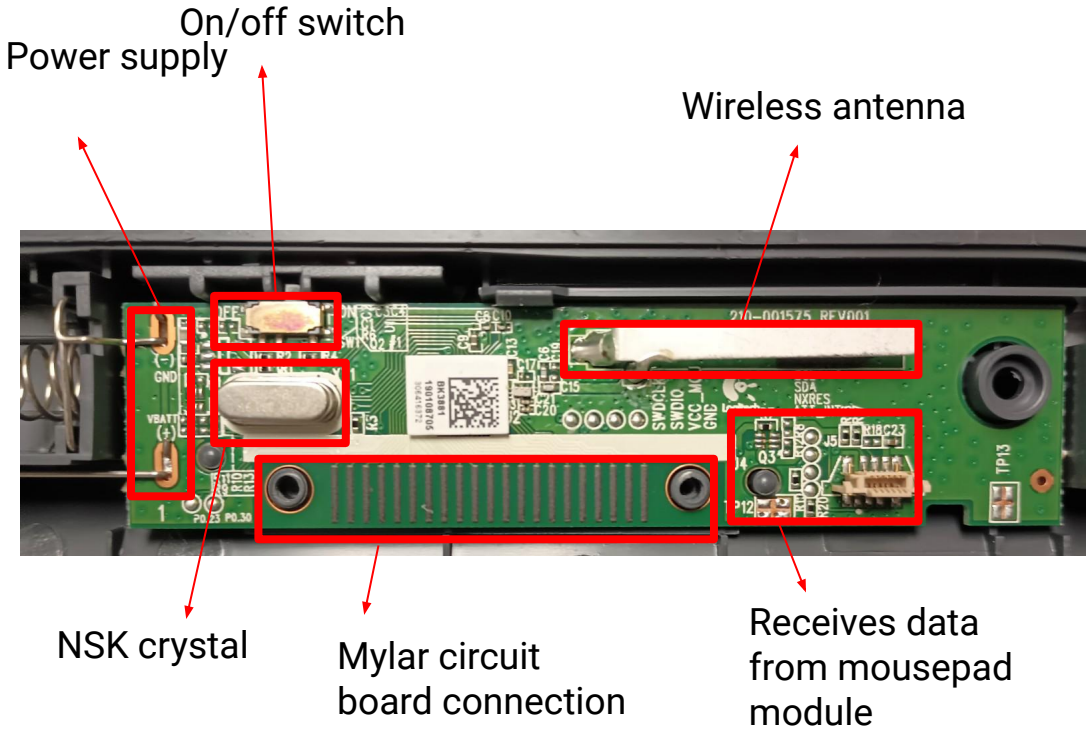




Keyboard Circuit

The following are the main components and their functions:

- Power supply
  - Provides power to the keyboard with two AA batteries
- On/off switch
  - Switch used to turn off keyboard when not in use
- Wireless antenna
  - Used by keyboard to communicate with external computer (through USB dongle)
- NSK crystal
  - Provides a consistent source of time for keyboard circuit functioning

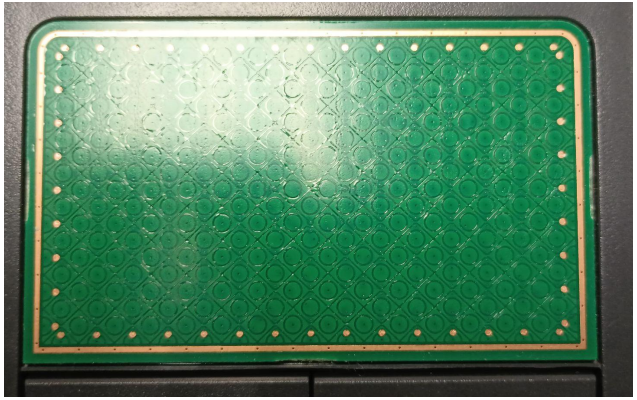


Mousepad Module Circuit

The mousepad uses the Azoteq IQS550 ProxSense Module

- This functions based off of pressure sensors on the mousepad itself
- This data is then transferred to main keyboard circuit

https://www.azoteq.com/product/iqs550-b000/



Conclusion

- What have we learned?
  - Over the process of disassembling and analyzing the individual components of the keyboard, we learned how to make use of a very important skill in engineering: reverse engineering to find out how something works!
  - Reverse engineering an electronic device gives us new insight into the construction and function of the product that just can’t be replicated through studying documentation. The physical process of deconstructing the keyboard complemented the online research we completed.