

Engineering Notebook

56448B

Team Number

"Laptop Deconstruction" - Kaydence Chandler - Sarah Sanders

Team Name

Hartselle High School

School

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Start Date

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End Date

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Book #

of 1

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Introduction : Part I

For the 2022 Reverse Engineering Challenge, we chose to deconstruct an old laptop. The laptop we picked is a **HP 2000 Notebook** that has been well used. We selected this particular device as it is no longer fully functioning, and would only go to waste. My teammate and I both share a love for computers, and wanted to use this opportunity to further develop our understanding of how they work.

Deconstruction Process : Part II



- We began by turning the laptop over and taking the **battery** out.

The battery serves to power the device, and is a vital piece of hardware.

There are three types of batteries, NiMH, NiCad, and **Lithium Ion (Li-ion)**. Our battery is a Li-ion type.

- Lithium-ion batteries are of the most common, but have many **advantages**.
- - energy density of 150 watt hours per kg.
- - they have no memory effect, which means they can always fully charge.
- - they lose the least power when idle.

- they have a 10% per month discharge rate while they have advantages, they also have disadvantages.

- they have a volatile chemistry, which means they must have its own electronic protection circuit that protects against over-charging. ("TechRepublic: Understanding and Maintaining Laptop Batteries").

- Next, we took the screws out of the bottom of the laptop, which allowed us to pry open the bottom of the laptop, like the keyboard.

• To take apart the keyboard we first took all the keys off, which revealed a keyboard membrane.

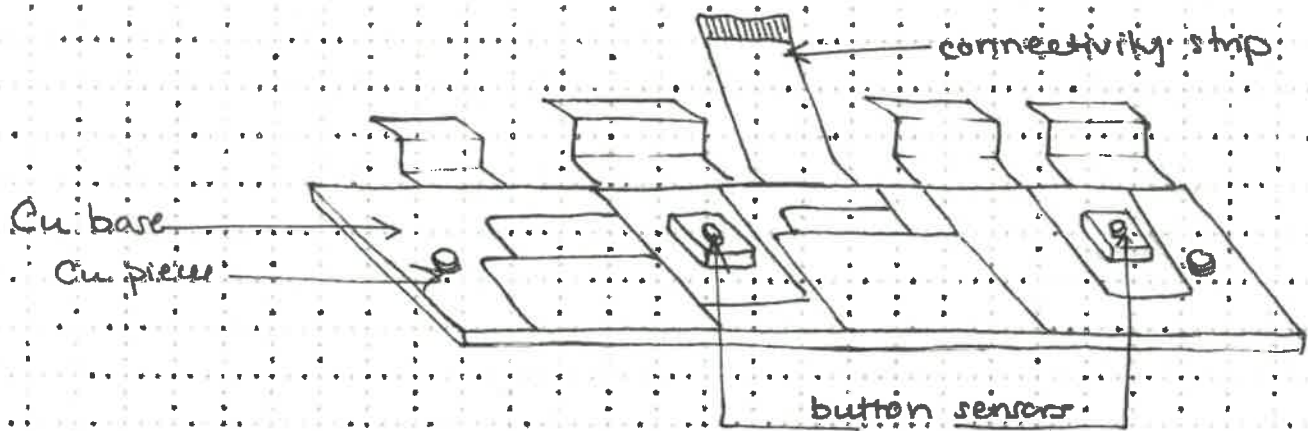


- There are two parts to the membrane. The top layer has soft rubber "pointing sticks", which the keys press down onto. Under that is a circuit board sheet that is designed to sense when a key is pressed, and then send that information to the computer.

- Below the actual keyboard section, there is a plastic covering for the mousepad.

• Upon taking the plastic off, the mechanism for the mousepad is revealed. Where the actual buttons rested before there are two buttons on a long copper rectangle piece. The buttons sense when they are pressed, and the copper it is on helps the electricity conduct easier.

- Branching out from the rectangle piece is a plastic connectivity piece. This allows for the mousepad to communicate with the keyboard and the rest of the screen.



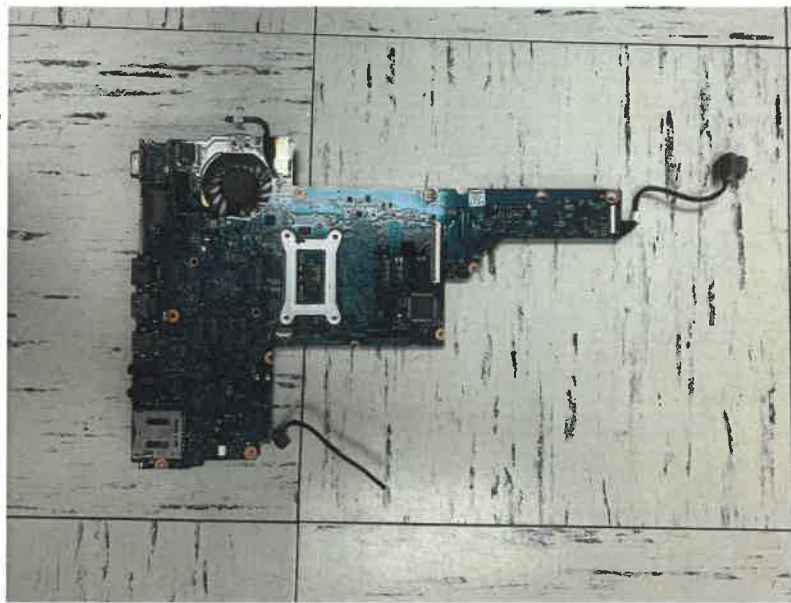
- When we were completely finished with the keyboard, we then removed screws from the last piece, revealing the blue circuit board underneath.
- After that, we removed the entire screen from the computer.
- When we tried opening up the screen completely, there were many difficulties in getting it open. We believe this is designed specifically to prevent reverse engineering, so other companies can't steal ideas.
- After we eventually pried the boarder off of the device, we began taking the screws out of the thin metal boarder to isolate the screen.
- On the back of the screen, there was a thin layer of plastic to protect the circuit board.
- On the plastic behind the screen, there is a silver plastic film. We discovered that this is aluminum, which conducts the electricity within the computer, and also grounds it.
- By the aluminum touching the back of the computer and "grounding" it, it allows for you to walk around and carry it without the static from outside objects interfering.
- There was a similar material behind the circuit board, which also ground and conducts it.



- We then began further deconstructing the screen, with the hope of completely isolating the glass.
- We took off the LED's surrounding the screen first, followed by the LED screen. These work to light the computer up and show colors. There is also a polarization screen, which allows you to see the things projected onto the screen.



- Our next challenge was separating the individual parts in the bottom of the laptop, like the circuit board.
- After lifting the circuit board from the bottom of the laptop, mostly metal and plastic is left.
- The most noticeable thing on the circuit board is the fan.
- A fan's purpose on a computer is to keep it cool, and prevent overheating. Without a fan, the computer can be subject to combustion.



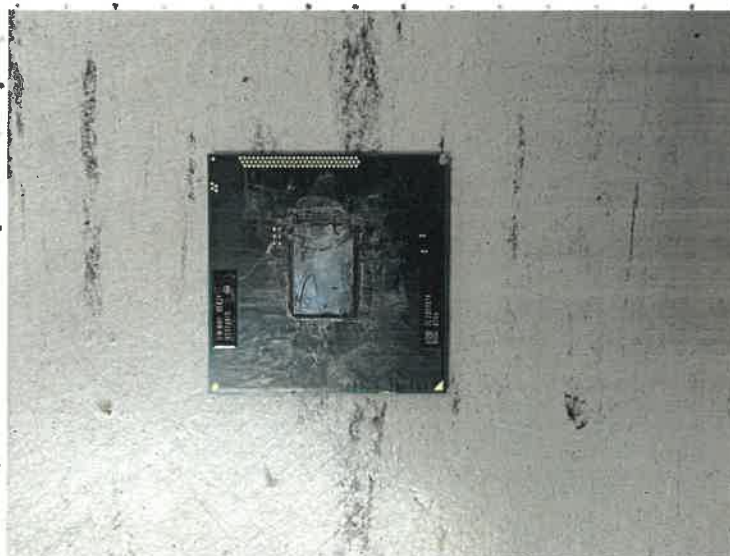
Under the thin black sheet on the circuit board is the memory card and serial number.

- 4GB memory.
- S/N: R.C.S.EBCSPK3U3MT.
- manufactured in: 2012

There was also an additional battery on the board. It is a smaller Li-ion battery used for backup in case the main one dies. It stays there in case it dies so the memory isn't lost, as it is stored.

Attached to the fan through a copper wire is a metal "container" which holds the intel chip.

- the intel chip heats up really fast, so the copper in the container, as well as the copper on the wire, is there to absorb heat. Once the card heats up beyond that, the fan activates to cool it down the rest of the way.



We began to take the memory card (4GB) out, and noticed it came out very easy. This is so it is easy to upgrade the memory in the future, since it is the most expendable.

Summary - Part III

Upon completely deconstructing a HP 2000 Notebook Laptop, we discovered many components, most of which were new to us.

The components found in the device are:

- 15.6 in. HD screen display
- Keyboard
- Cover for trackpad
- System Board
- RTC Li-ion battery
- Intel Core i5 processor
- Fan/Heat sink assembly
- Screen display cover
- LED'S
- Keyboard membrane
- circuit board
- USB
- memory card (4GB)

Conclusion; Part IV

Throughout this project, we have learned several things about computers, and electronics in general, that we did not understand before. While reverse engineering the laptop, we gained a new appreciation for the smaller details that mainly go unnoticed inside a computer. It has further developed our knowledge on electronics, and also expanded our interest and appreciation for them.

