# EGGN1110
# The Engineering Profession
# Laboratory

Mouse Disassembly

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on

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**Objective:**

To disassemble a computer mouse to understand better how it is constructed, how it works, so as to better understand the purpose and ingenuity. Also to document the design, implementation, and testing.

**Abstract:**

In this report, I will detail the procedure my partners and I went through in disassembling, examine the intricacies, and reassembling a computer mouse. The entire procedure took less than thirty minutes. Figures were drawn and are shown in the Procedure section of this document. Analytical items, including Tables, are shown in the Analysis and Conclusions section of this document.

**Procedure:**

In the lab, my partners and I initially sketched the overall look of the mouse we were going to take apart. We had only one tool to assist us, but that was all we needed: A screwdriver. A diagram of the mouse is shown in Figure 1.

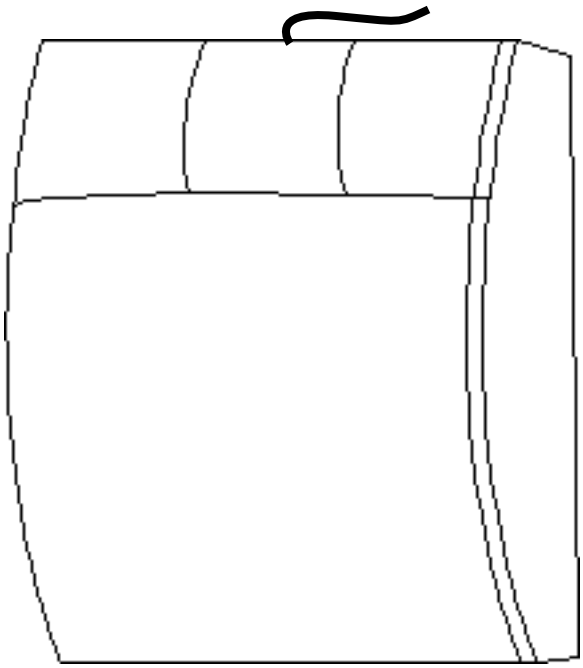

Figure 1: Assembled Mouse

We unscrewed the screws on the bottom of the mouse casing and the top easily came off. The inside of the top of the casing resembled the diagram shown in Figure 2. The inside of the bottom of the casing resembled the diagram shown in Figure 3.

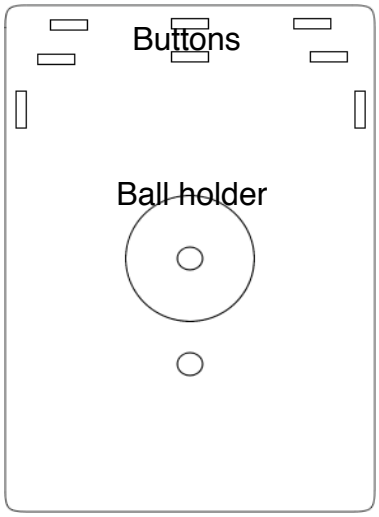


Figure 2: Top Inside

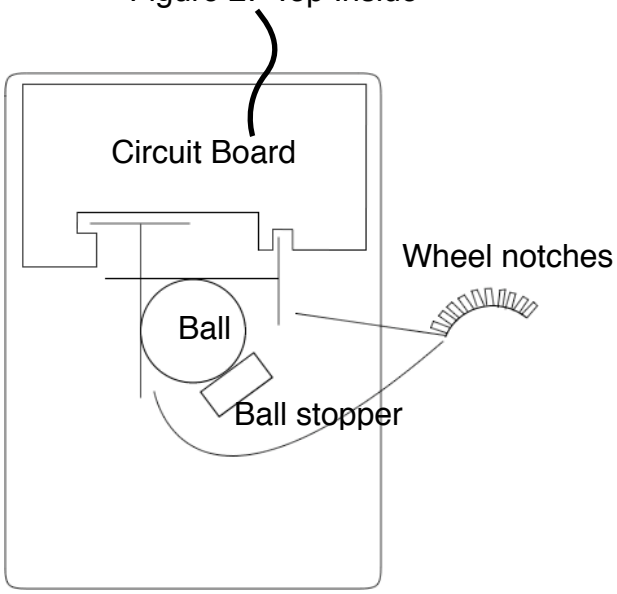


Figure 3: Bottom Inside

At this point, the ball fell freely from the casing. We removed the circuit board from the bottom casing of the mouse to examine it further. A more detailed diagram of the Circuit Board is shown in Figure 4.

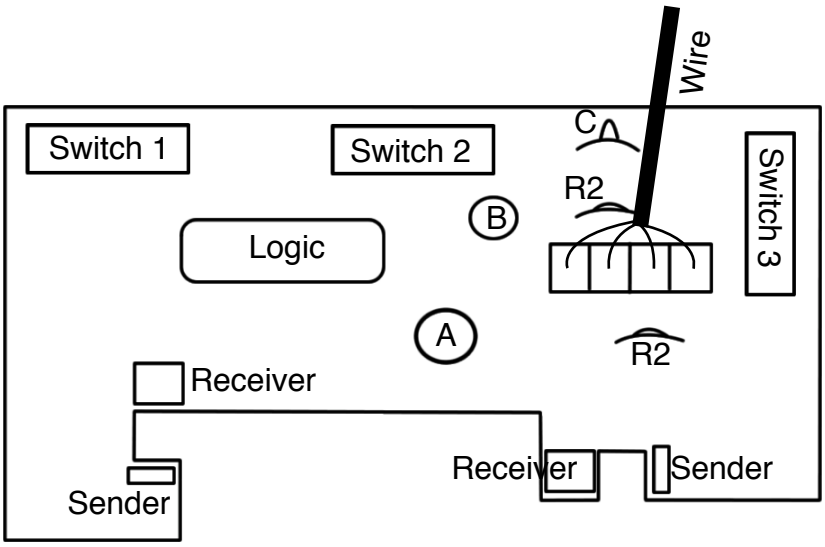


Figure 4: Circuit Board

My partners and I observed, after completely disassembling the mouse, that the two wheels in the bottom of the case of the mouse seemed to track x and you movements of the ball. The bottom on the bottom-right of the wheel as shown in Figure 3 seems to apply pressure to the ball when the top of the case is placed on the bottom of the case. The pressure that is applied presses the ball against the two wheels so that when the ball is rolled, the wheels turn.

Continuing from this, the end of each wheels seem to be fanned, having periodic openings. The Sender and Receiver, as shown in Figure 4 on the Circuit Board, send and receive light. The notches in the wheel provide an interruption for the light, since the wheel is stuck between these two components, and the speed and direction of the wheel. Notice that there are Sender and Receiver components for both the x and the y wheels. Through calculations, as on a graph plane, the Logic chip can interpret how the user is moving the mouse by how the ball is rolling, which is transferred into the wheels, which is transferred into the lights.

As seen in Figure 4, there are three Switch components. Each one of these corresponds to one of the mouse buttons and could actually be pushed on the Circuit Board itself. When the buttons from the inside of the top of the casing, as shown in Figure 2, are depressed, they apply pressure to these Switches on the Circuit Board. The logic again is transferred and interpreted in the Logic chip.

The Logic chip shown in Figure 4 is responsible for handing and interpreting the commands from the Sender and Receiver components as well as the three Switches.

Four wires are connected to the circuit board on one component, W, and are joined into one cable before leaving the front of the mouse casing, as shown in Figure 4, Figure 3, and Figure 1.

There were two resistors, R1 and R2, on the Circuit Board and three other rather simple components, A, B, and C, that we were not sure what they were.

The Circuit Board had fourty-eight (48) solder points. Each component needing soldering is shown in Table 1, along with the number of solder points and the number of that component, the count, on the Circuit Board.

| Component | Solder Points | Count |
|---|---|---|
| Switch | 3 | 3 |
| Logic Chip | 16 | 1 |
| Resistors | 2 | 2 |
| Sender | 3 | 2 |
| Receiver | 2 | 2 |
| A | 2 | 1 |
| B | 2 | 1 |
| C | 2 | 1 |

Table 1: Solder Points and Components

After making a full examination of the mouse, we placed the Circuit Board back in the bottom of the mouse casing as it is shown in Figure 3. We placed the ball back in it's holder as shown in, also in Figure 3. We put the top casing back down onto the bottom casing and screwed the pieces back together. The mouse was then fully functional again.

**Analysis and Conclusions:**

This mouse could be easily assembled in mass production with an assembly line machine. The circuits could be put on and soldered on rapidly, and the Circuit Board is simple enough to construct with simple parts. The casing could then be placed around it and screwed on, also by a machine, and the mouse would be ready to be packaged.

**Questions:**

1. Is it possible for one sensor to be in motion at a time? How is this possible, or why not?

   One sensor can be in motion if the mouse is moving completely horizontally or completely vertically, but not either way at the same time. If this is happening,

the ball will be rolling in only one direction and only rubbing one wheel in a direction, thus only one sensor will be receiving light interruptions.

2. How many parts (given the circuit board has been pre-soldered together) need to be assembled during final assembly? Do you think this mouse could be assembled by a machine?

   The ball is placed in the circular holder, the wheels are placed next to the ball, the component which applies pressure to the ball is placed into the bottom of the mouse casing, the Circuit Board is placed into the bottom of the mouse casing, and the top mouse casing is connected to the bottom mouse casing. Finally, they are screwed together. This requires seven separate parts: Top casing, bottom casing, ball stopper, ball, two wheels, and the Circuit Board.

   This being said, this product could easily be assembled by a machine in the way described in the Analysis section.