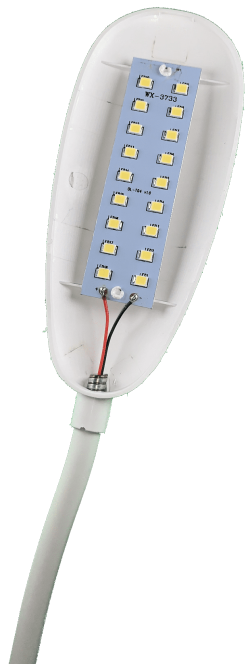


Reverse Engineering a Reading Lamp

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Team Number: 7432E

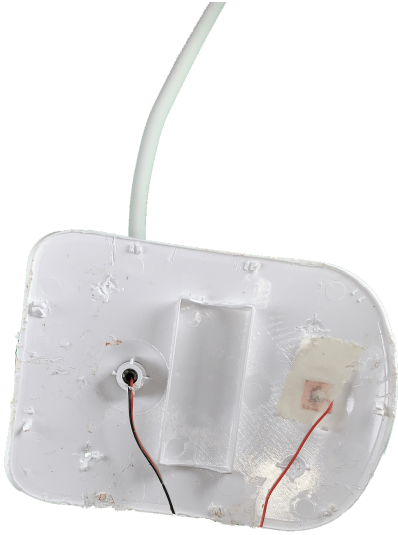
Material List:

1. A plastic body (made up of 3 parts)
2. A translucent plastic piece that covers the LED lights
3. A rechargeable battery and plastic that covers it
4. A computer part
5. A touch sensor
6. A bendy rubber lamp arm
7. Two red wires and a single black one
8. Tape strip



This is the reading lamp I reverse engineered. I chose this specific item because it was inexpensive and nobody minds it being taken apart. This lamp was designed to be sleek with no screws. Because of this, I had to break it open. While I was deconstructing this lamp, I found a rechargeable battery, LED lights, and a touch sensor. The touch sensor was under the circle in the base of the lamp. Touch Sensors are electronic sensors that detect touch. This specific sensor senses pressure from touch, and that creates a closed switch (completing the circuit). When it is not touched it creates an open switch (opening the circuit).

To take this lamp apart, I used a pocket knife to pry the plastic piece covering the LEDs. This revealed the LED lights, as shown to the left. This plastic piece is used to diffuse the light from the LEDs, and to protect the LEDs. I did some research on how LEDs work. According to a website called *Lamps Plus.com*, an LED creates light by electric currents going through the diode. The diode emits light by the principle of electroluminescence. LEDs do not create as much heat as incandescent light bulbs, and they can operate in an energy efficient way.

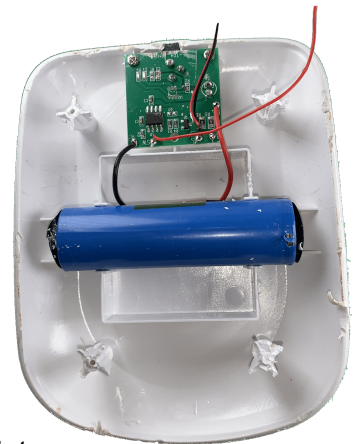


I did research on how batteries work and recharge. According to a website called *Study.com*, batteries are what is called electrochemical. These cells are made up of three main parts. The first is the anode. The anode is a negatively charged electrode. The anode usually is made up of a metal or alloy. The second part of the battery is the cathode. The cathode is, opposite of the anode, a positively charged electrode. The cathode is generally made up of a metallic oxide or maybe a sulfide. The third part is the electrolyte. The electrolyte is what is called an ionic conductor. An ionic conductor separates the two electrodes. The way a battery discharges energy is by first converting chemical energy into electrical energy. The electrical energy is what comes out of the battery to power the LED lights. The touch sensor is wired to a computer part that then controls if there is power going to the LEDs from the battery. The computer is shown in the image to the right, it is green with some wires going to and from it.

The body of the lamp is made of plastic. According to a website *this is plastics.com*, plastic is made through a process of turning natural gas, oil, or plants to ethane and propane. Ethane and propane then are treated by heat. This process is called “cracking”. Through “cracking” the ethane is turned into ethylene and the propane is turned into propylene. These two materials are then combined together to form different polymers, that creates plastic.

The arm of the lamp is made of rubber. According to *explain that stuff.com*, rubber is made latex, which comes from trees.

In conclusion, I learned about batteries, touch sensors and LED lights from reverse engineering the reading lamp.



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