LED Name Tag

How to Build It:

Materials:

- [ ] LED
- [ ] 1K Resistor
- [ ] 9V battery
- [ ] 9V battery snap
- [ ] Electrical tape
- [ ] Plexiglas
- [ ] Cardboard
- [ ] Hot glue
- [ ] Drill, x-acto knife, sandpaper or other scratching implement
- [ ] Sharpie marker
- [ ] Scissors
- [ ] Solder and soldering iron

Procedure:

1. Draw a design on the piece of plexiglas using the sharpie marker
2. Use a hand drill, x-acto knife, small piece of sandpaper or scissors to scratch the design into the surface of the plexiglas.
3. Solder the resistor onto the positive (long) leg of the LED.
4. Solder the other side of the resistor onto the positive (red) wire from the battery snap.
5. Solder the other side of the LED onto the negative (black) wire from the battery snap.
6. Use two pieces of electrical tape to secure the LED light to one edge of the plexiglas making sure the flat top of the LED is flush with the flat edge of the plexiglas.
7. Snap on the 9V battery to test. You can create a simple switch by leaving one side of the snap unconnected and swinging it back and forth to turn the light on and off.
8. Use hot glue to attach the plexiglas and battery to the cardboard or other material to create a base.
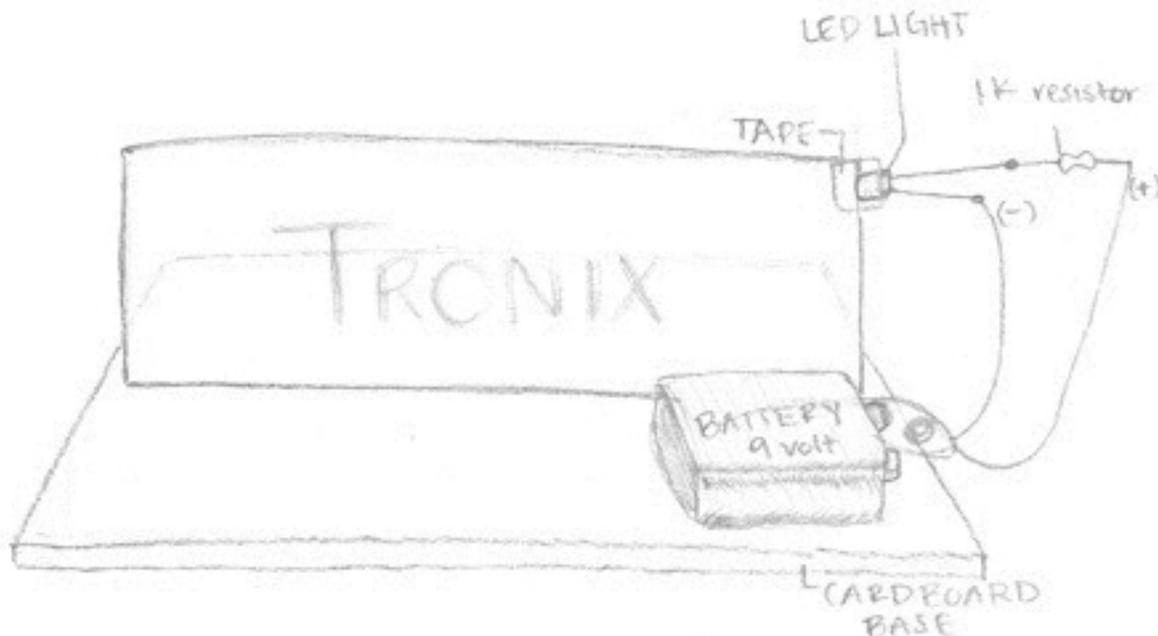
How it Works:

LEDs emit a more specific wavelength of light at certain directions, when compared to regular incandescent bulbs like a Christmas light. When a flat top LED is pressed up to a flat edge of a piece of plexiglas, the light enters through the side. The top and bottom surface of a smooth, unscratched surface of plexiglas act as mirrors. The light that strikes the top and bottom surface on the inside of the plexiglas is reflected back and forth, just like a mirror. The light is trapped inside the plexiglas like it would be in between two smooth mirrors. However, if we scratch or mark up one of the sides of the plexiglas, the uneven surface makes a place where the light reflects differently. We see the result of this uneven reflection as the light shining out the top surface.

Experiment!

Do different colors of LED light show up differently?

What happens if you put a hole through the piece of plexiglas?

What happens to light shining through materials other than plexiglas?

What is the result with an incandescent bulb (Christmas light)?