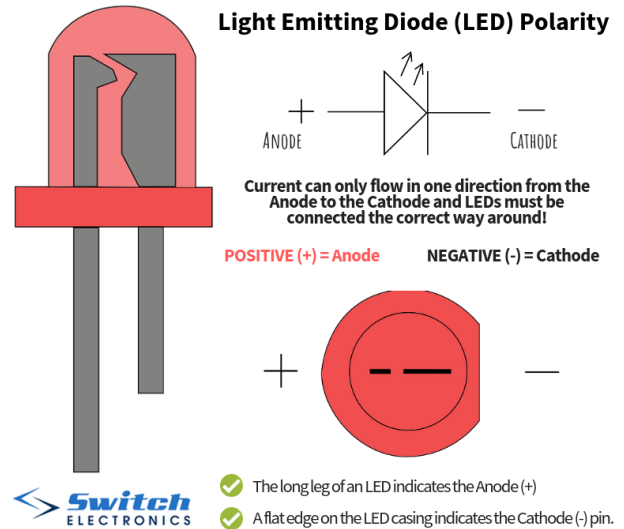
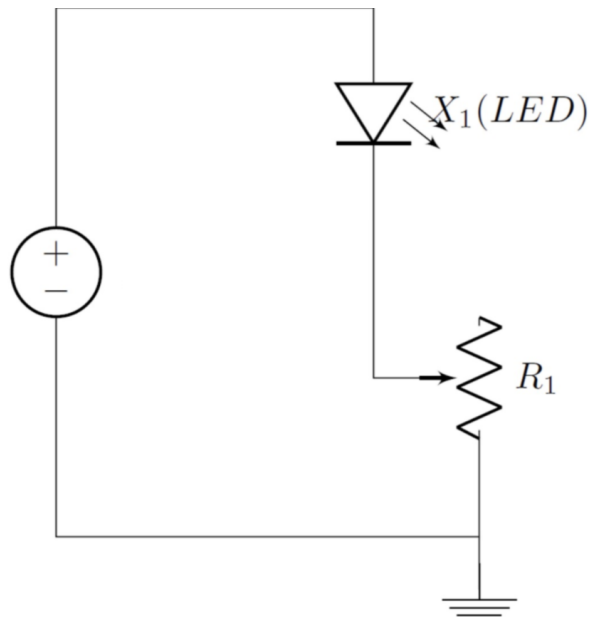


# Instructions

1. You will be given **35 minutes** (scaled appropriately in case you have accommodations) to implement the following circuit diagram on the LED Fader PCB in your lab kit (for upto full credit) or on a breadboard (for upto half credit).
2. Please put your **initials** and the **last 4 digits of your SID** on your PCB/breadboard using a **permanent marker**.
3. You are only allowed to leave once your demonstration has been graded.
4. You are not allowed to access any other resources except for this document.
5. You are not allowed to converse with other test-takers during the test.
6. You are not allowed to work on your circuit after time.
7. Failure to comply with 4, 5, and 6 will be considered academic dishonesty and result in failure on the test.
8. Please let lab staff know in case the equipment you're using is faulty. If lab staff determines this is the case, you will be given new equipment and 12 minutes additional time (scaled appropriately in case you have accommodations). You will not be given any extra time in case lab staff determines the equipment is fine but is being used incorrectly.

# LED Fader Circuit



A potentiometer is a variable resistor with 3 terminals and a knob. As we turn the knob, the resistance between the middle terminal and either of the end terminals changes; as the resistance to one end terminal increases, the resistance to the other decreases. However, the resistance between the end terminals stays constant.



## Materials Required

- Lab Kit
  - PCB/Breadboard x1
  - LED x1
  - Potentiometer x1
- Lab Station
  - Squeeze Bottle (shared)
  - Tip Tinner (shared)
  - Permanent Marker (shared)
  - Alligator Clip x1
  - Solder
  - Power Supply Cables x2
  - Breadboarding Wires x2

You should be able to **demonstrate** a functional circuit powered by a **3.3V** voltage source limited at **0.1A** of current where **the LED fades as you turn the potentiometer**. You should ensure that your circuit aligns completely with the provided circuit diagram.

Please **tin the tip of the soldering iron** (shared tape tinner should be available near your station - feel free to ask a lab staff member for it) and **turn it off as soon as you're done** soldering.

# Rubric

- 5 points: **breadboarded** circuit demonstrated by student that works completely and matches circuit diagram
- 5 points: functional soldered circuit that cannot be demonstrated by student
- 8 points: soldered circuit demonstrated by student that works completely but does not match circuit diagram
- 10 points: soldered circuit demonstrated by student that works completely and matches circuit diagram

## Appendix

This test uses a pre-fabricated printed circuit board (PCB) designed for the LED circuit. PCBs often have line traces that act as wires connecting different components. This means that you only need to solder single components into their respective holes on the PCB.

### Example

Let us consider the (blue) ground node of the following circuit.



The image on the right shows how this node would be connected on a PCB.

