PAT 451/551 INTERACTIVE MEDIA DESIGN I

ELECTRONICS_PART2

PROF. MICHAEL GUREVICH
UNIVERSITY OF MICHIGAN
PERFORMING ARTS TECHNOLOGY

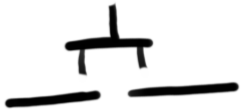
CIRCUIT NOTATION SYMBOLS

DC Power Supply

Ground

Battery

Node



Switch

Resistor

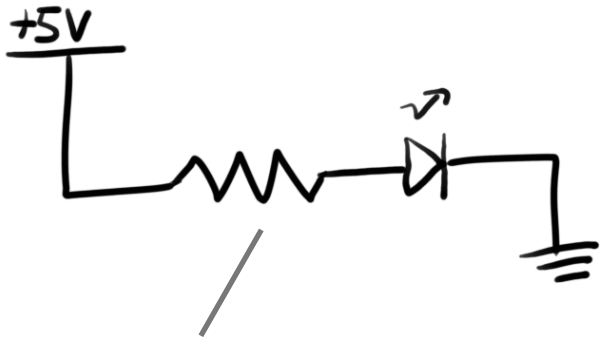
Capacitor
(we'll see these later)

Diode

Light emitting Diode (LED)

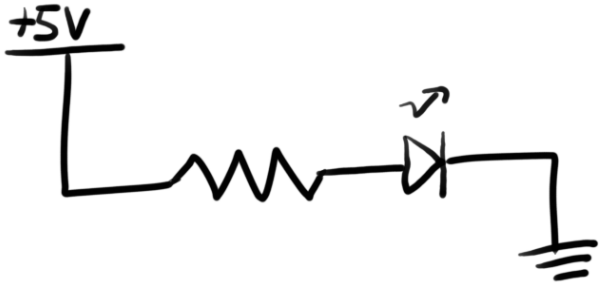
(technically the triangle should be filled on LED symbol too, but we often leave it white when drawing by hand)

LED CIRCUIT



Resistance determines current and brightness of LED.

LED CURRENT



We often need to limit how much current is being drawn in this circuit, and calculate an appropriate resistor value to use. Current is given by:

$$I = \frac{V_{power} - V_{LED}}{R}$$

Where V_{power} is 5V in this case, and V_{LED} is the voltage drop across the LED.

So for an LED with a 1.8V forward voltage, if we want to draw 5mA:

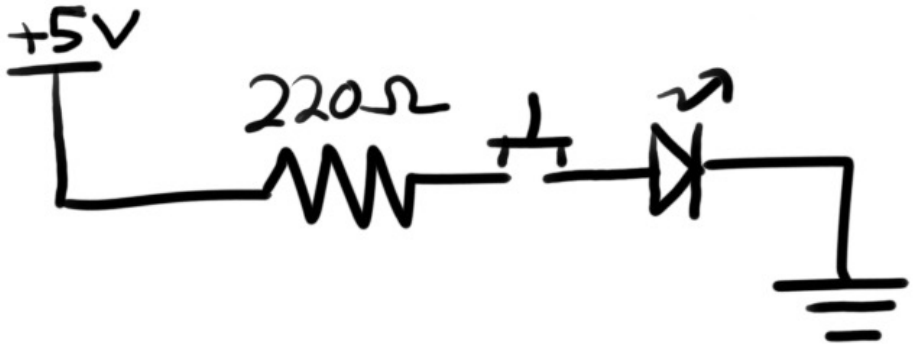
$$R = \frac{V_{power} - V_{LED}}{I}$$

$$R = \frac{5V - 1.8V}{0.005A}$$

$$R = 640\Omega$$

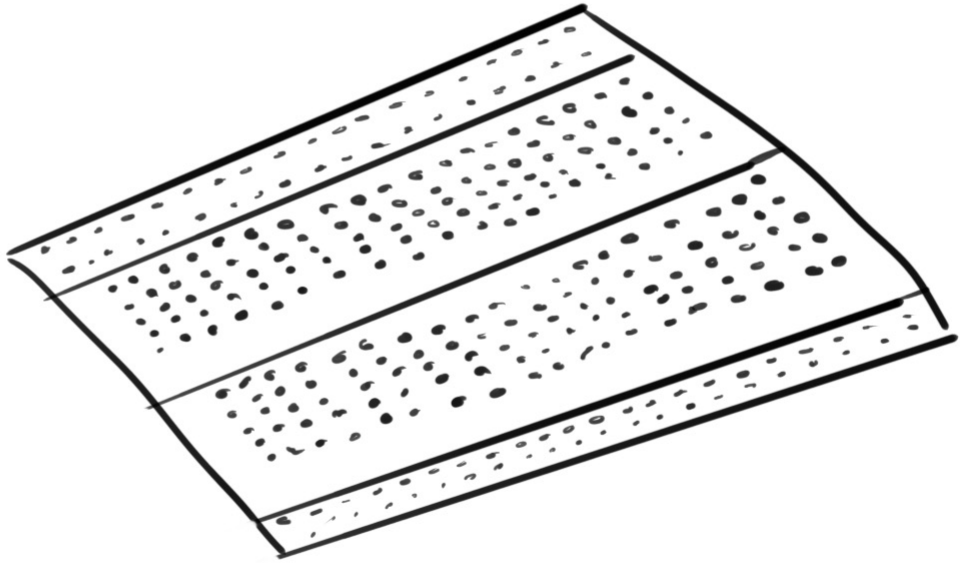
If we don't have an exact resistor, we would round up to the next closest value.

LED CIRCUIT WITH BUTTON

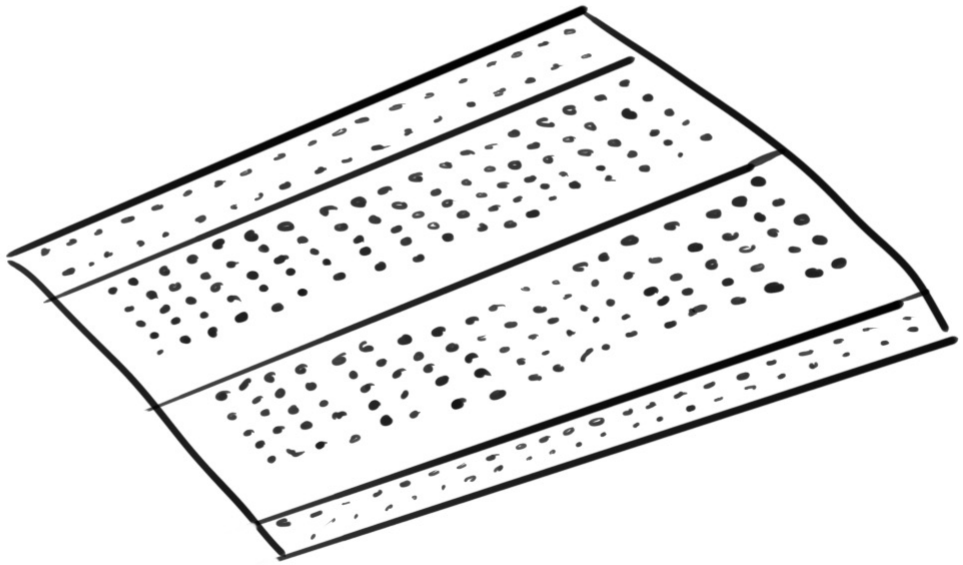


BREADBOARD

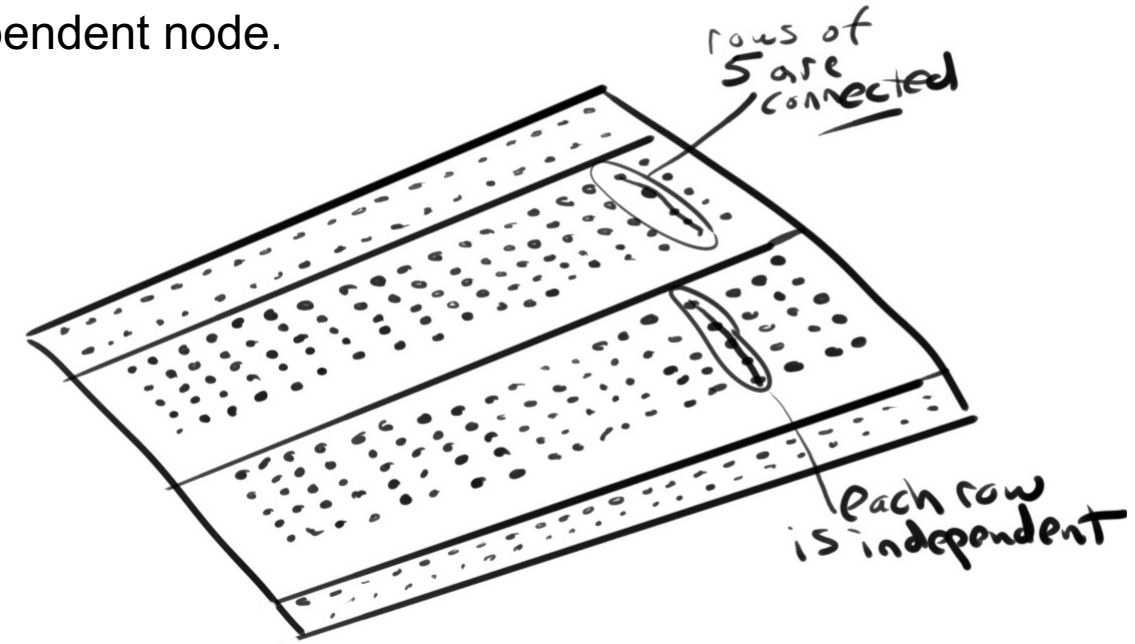
This is a solderless **breadboard**.
It is used to make and test circuits that can be easily set up and taken apart.
It is useful for **sketching** an interactive design.



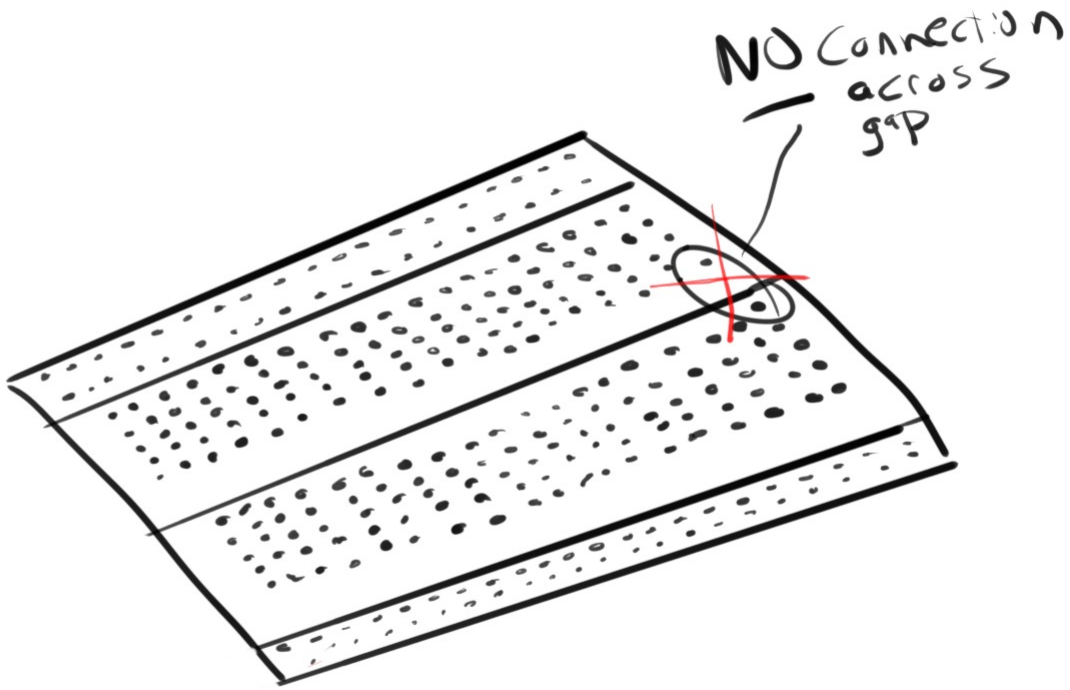
The breadboard uses a common standard spacing or "**pitch**" of the sockets: They are 0.1" or 2.54mm apart.
This allows many common components to easily be plugged in.



In the center sections, the rows of 5 pins are all connected to each other.
The are a **node**.
So any 2 pins plugged into the same row will be connected.
Each set of 5 is an independent node.

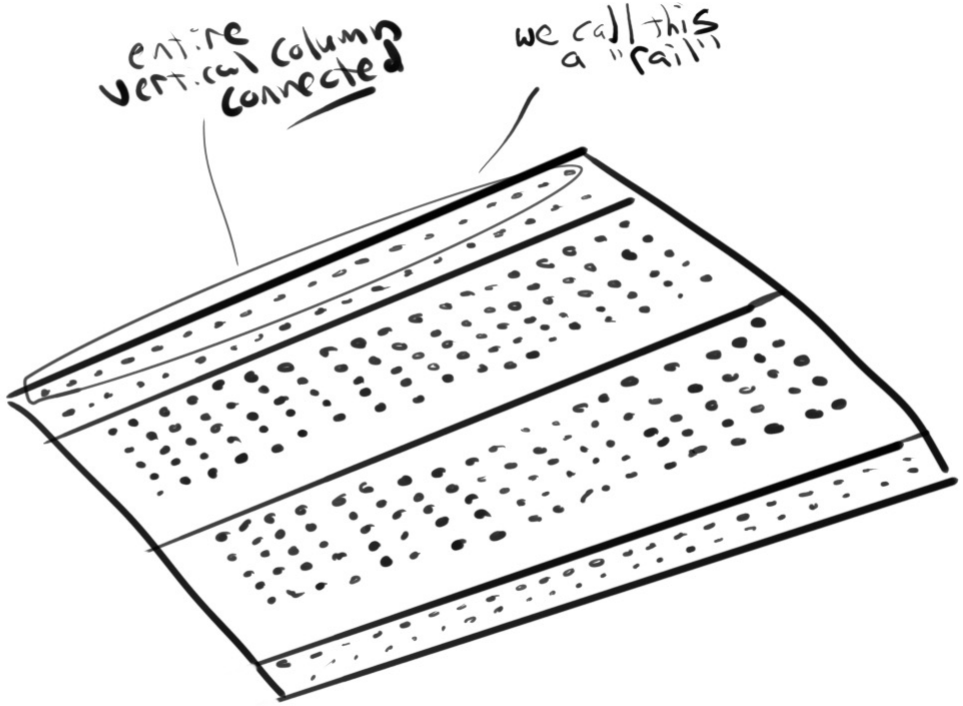


There is a gap down the center of the breadboard.
The rows on either side of the gap are **NOT** connected.



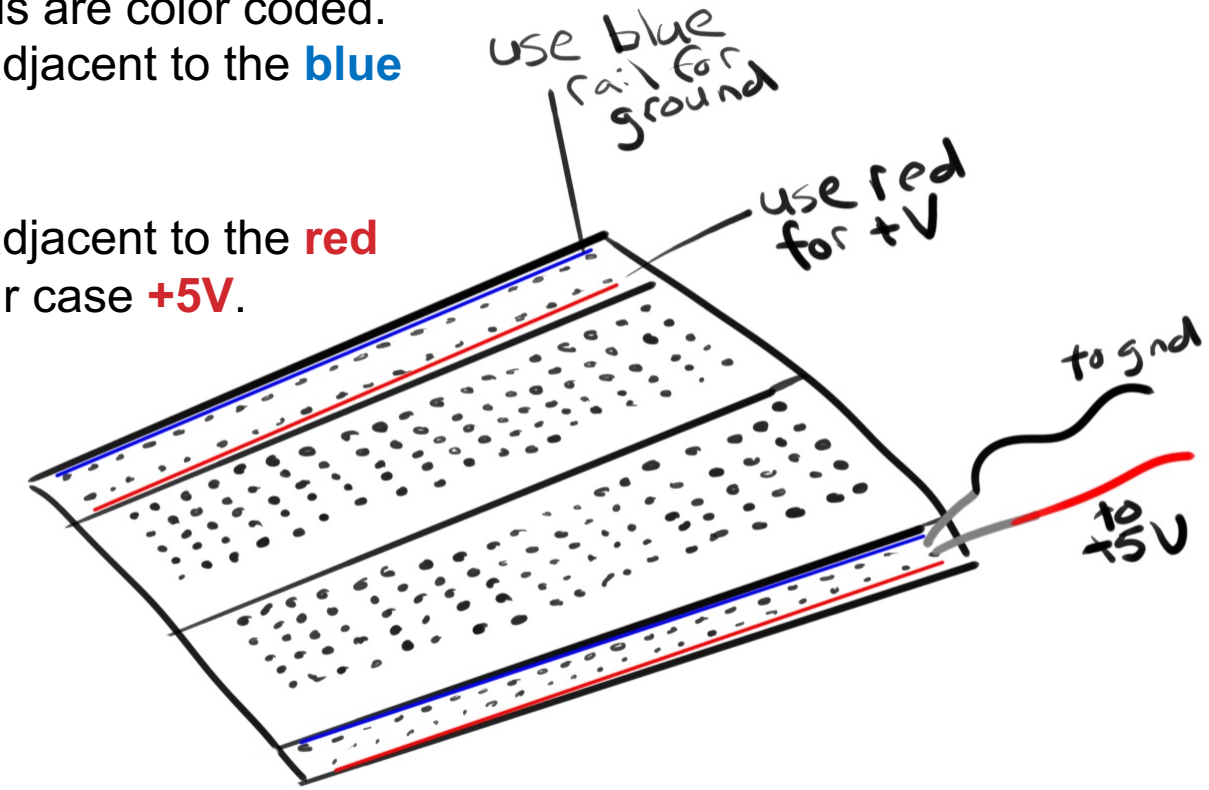
On the outer sections, all sockets on each of the two vertical columns are connected. We sometimes call these “rails.”

The rails are all independent.

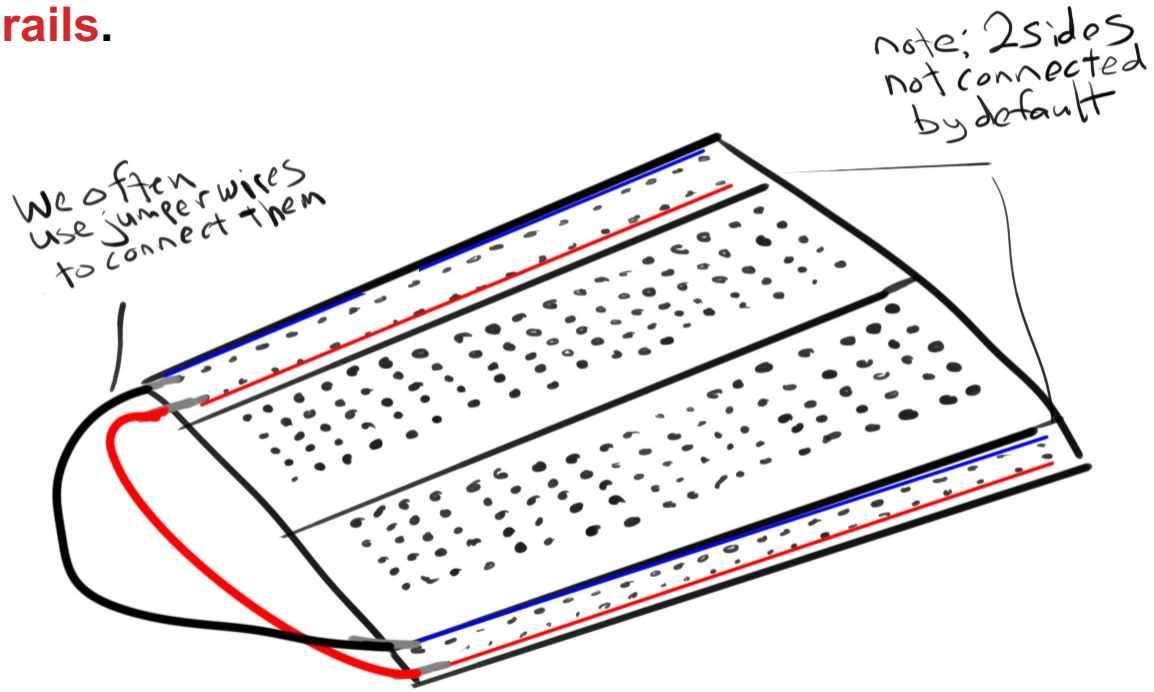


On some breadboards, the rails are color coded. We normally connect the rail adjacent to the **blue** stripe to **ground.**

We normally connect the rail adjacent to the **red** stripe to positive voltage, in our case **+5V**.

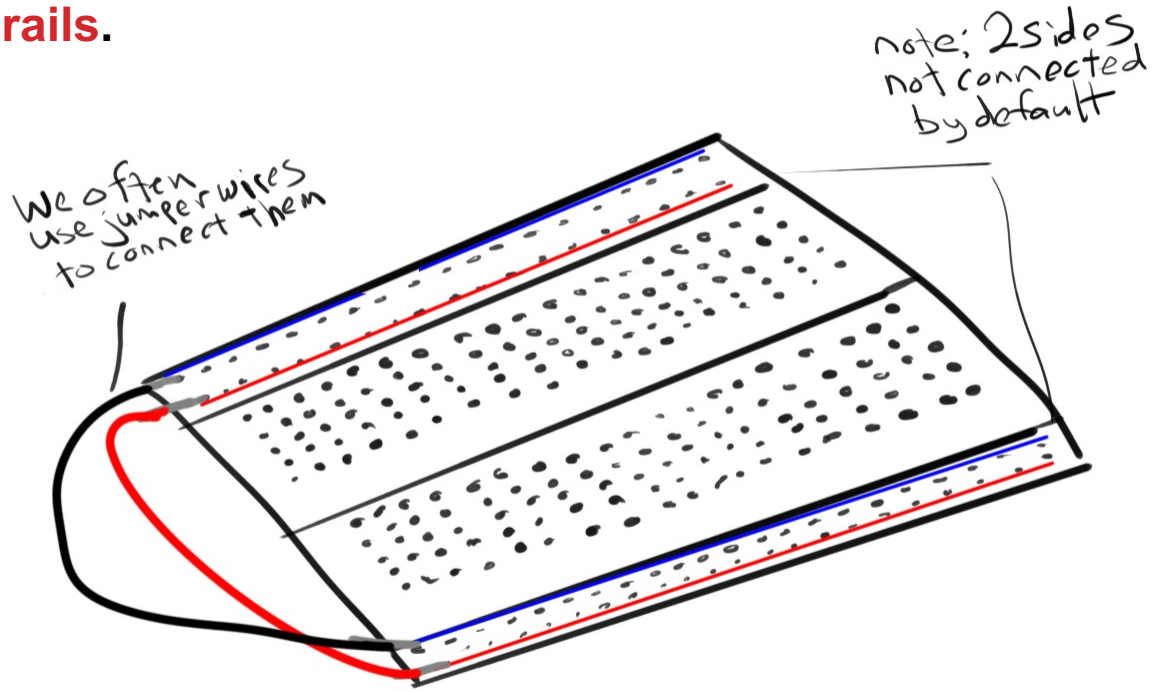


The two outer sections are not normally connected to each other.
We often use **jumper wires** to connect the two **blue ground rails** and the two **red voltage rails**.



Sometimes we may want to work with 2 different positive supply voltages, in which case we'll disconnect the two red rails (and double check which is which).

The two outer sections are not normally connected to each other.
We often use **jumper wires** to connect the two **blue ground rails** and the two **red voltage rails**.



Sometimes we may want to work with 2 different positive supply voltages, in which case we'll disconnect the two red rails (and double check which is which).

https://learn.adafruit.com/multimeters/resistance

AC VS DC

- We're talking about DC circuits (direct current)
- With AC circuits (alternating current), things change.
  - E.g., resistance has a frequency-dependent component, so we talk about "impedance."
  - DC is frequency 0Hz, so we have the benefit of thinking about resistance as being not frequency dependent
  - Even though voltage may change in our circuits, it happens relatively slowly