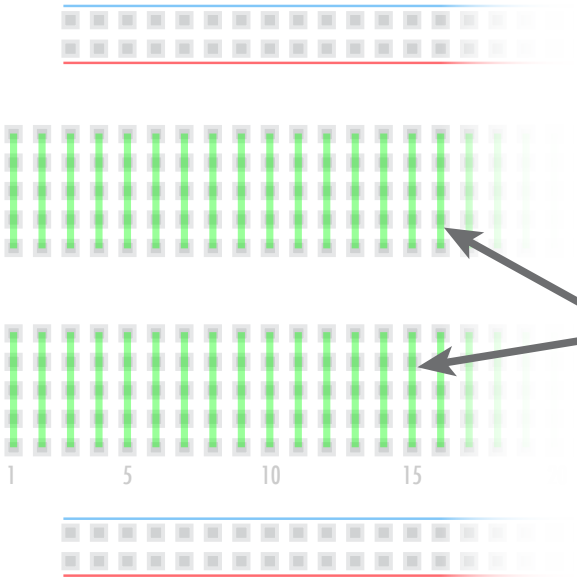
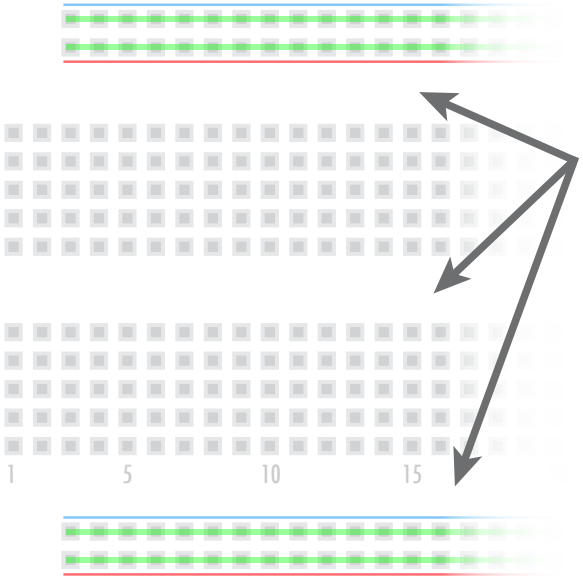


Breadboards make it easy to assemble and change electronic circuits without soldering them together.

The holes on a breadboard are connected in two different ways.

The vertical columns on either side of the central gap are connected in groups of five. If you put a part or wire in one hole it will be connected to another part or wire above or below it in that column.

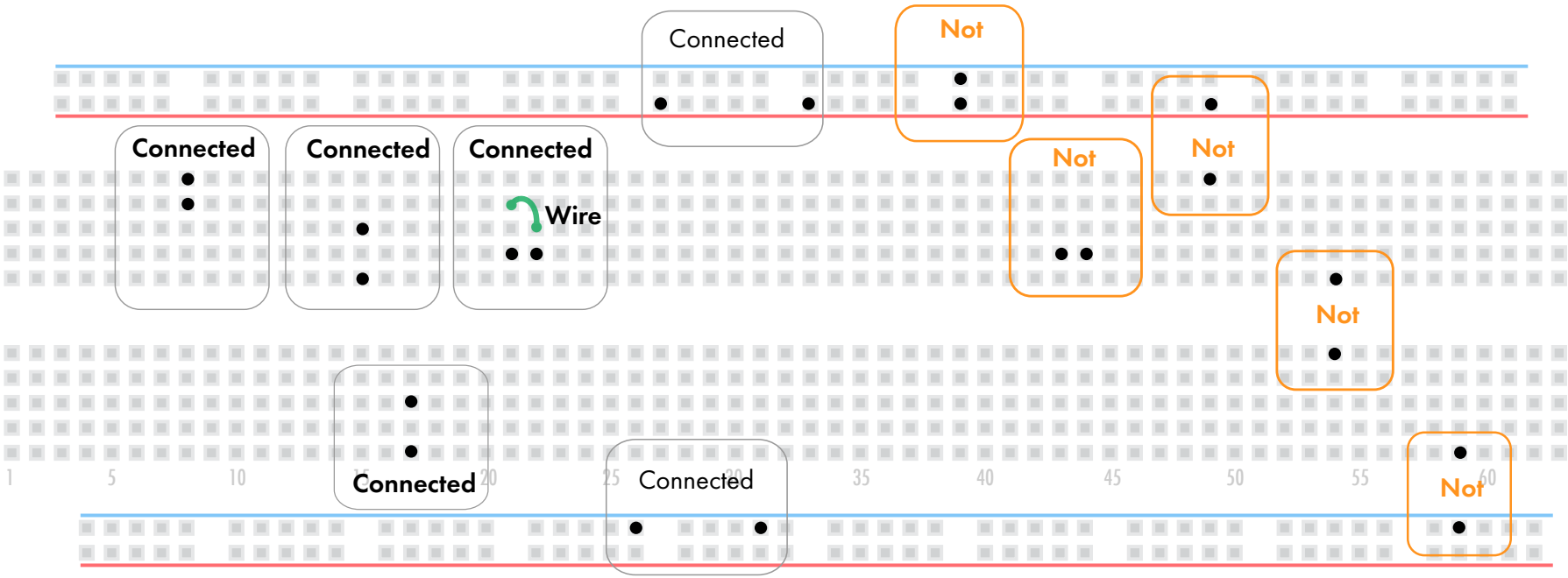


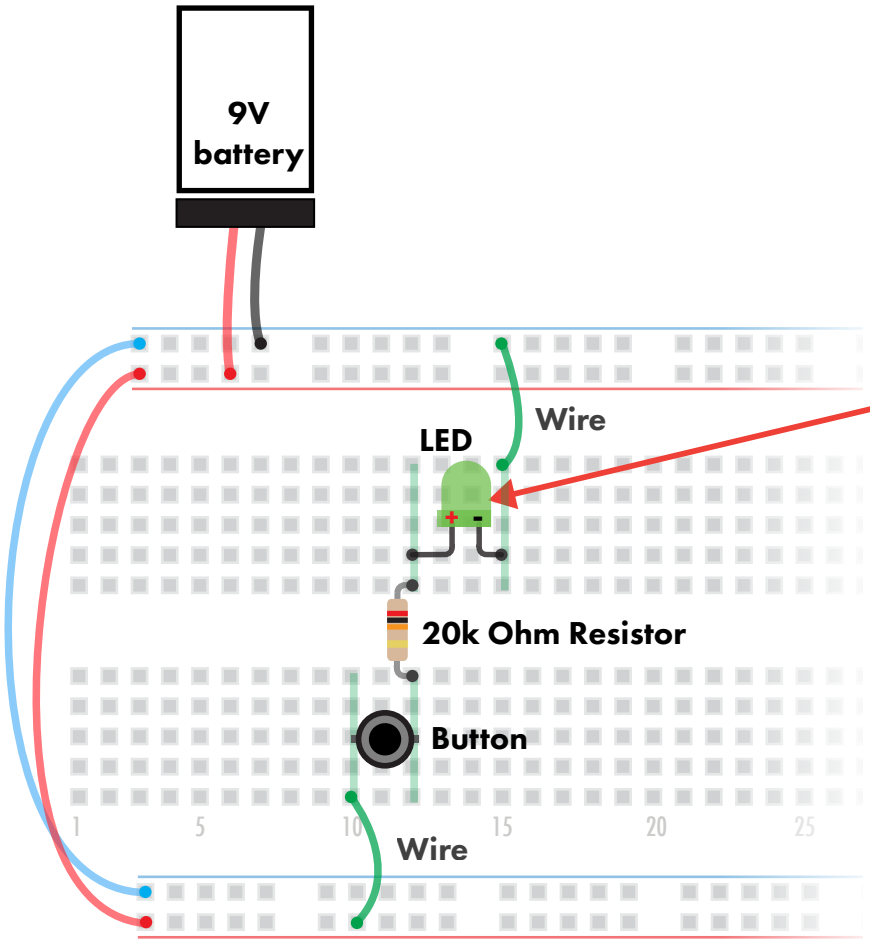
The red and blue lines are connected all the way across the board.

The horizontal gaps seperate the differenet areas.

These dots could be any electronics part. An LED, a wire, a chip, or anything else.

Making a circuit is all about having the correct things connected. If something is connected that shouldn't be, the device won't work and someone could break.





Your first circuit

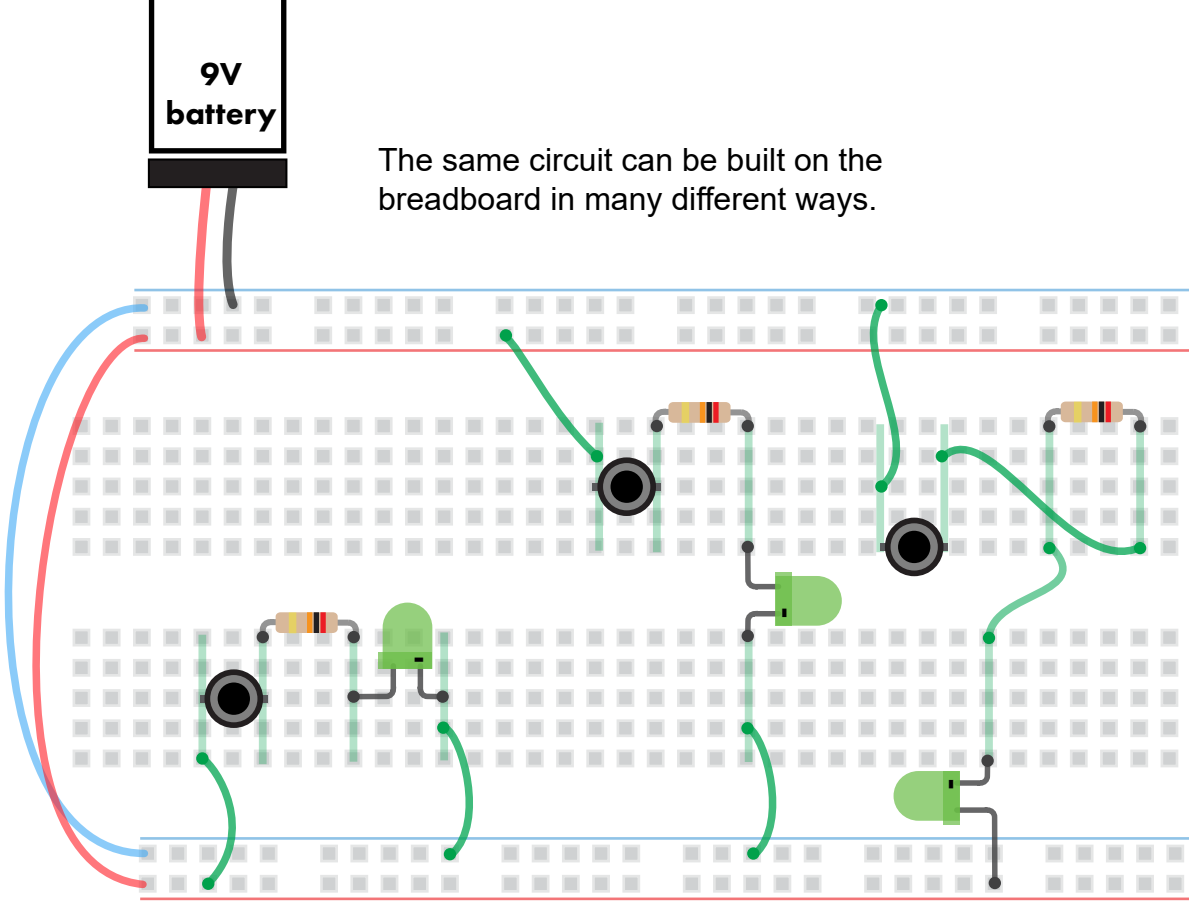
Here we will use the button to turn the LED (Light Emitting Diode) on.

The button and resistor are non-polar meaning so they can be put in either direction.

LEDs are polar. Notice the notch on the right side of the LED. It corresponds to the notch on the LED itself. This negative “cathode” leg of the LED is shorter than the “anode” one.

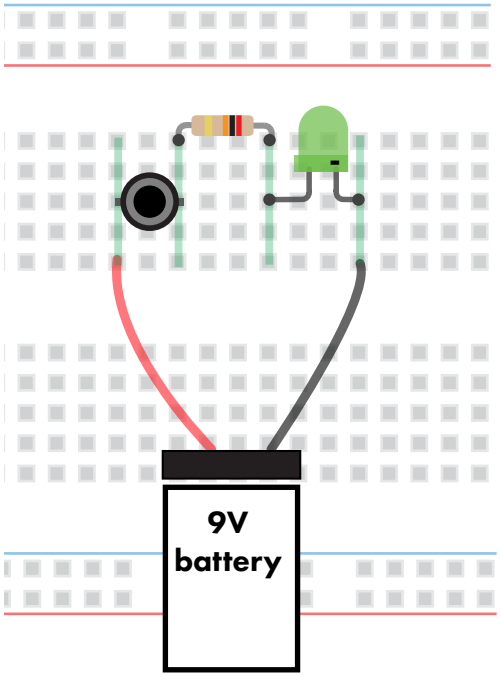
When you push the button the circuit will be complete so electricity can flow through the resistor to the LED.
If the resistor was not there or if it was too low of a value there might be too much voltage for the LED and it would burn out.

Take care to never “short out” the battery buy directly connect the black and red wires together. This will make the battery get hot and damage it.

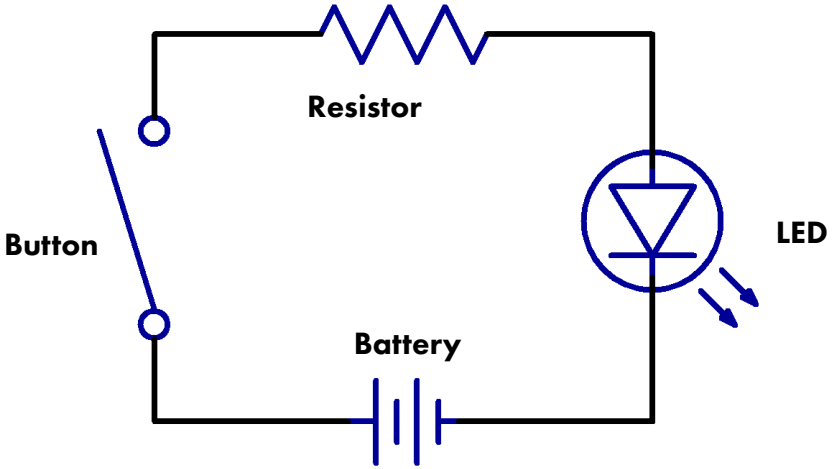


The same circuit can be built on the breadboard in many different ways.

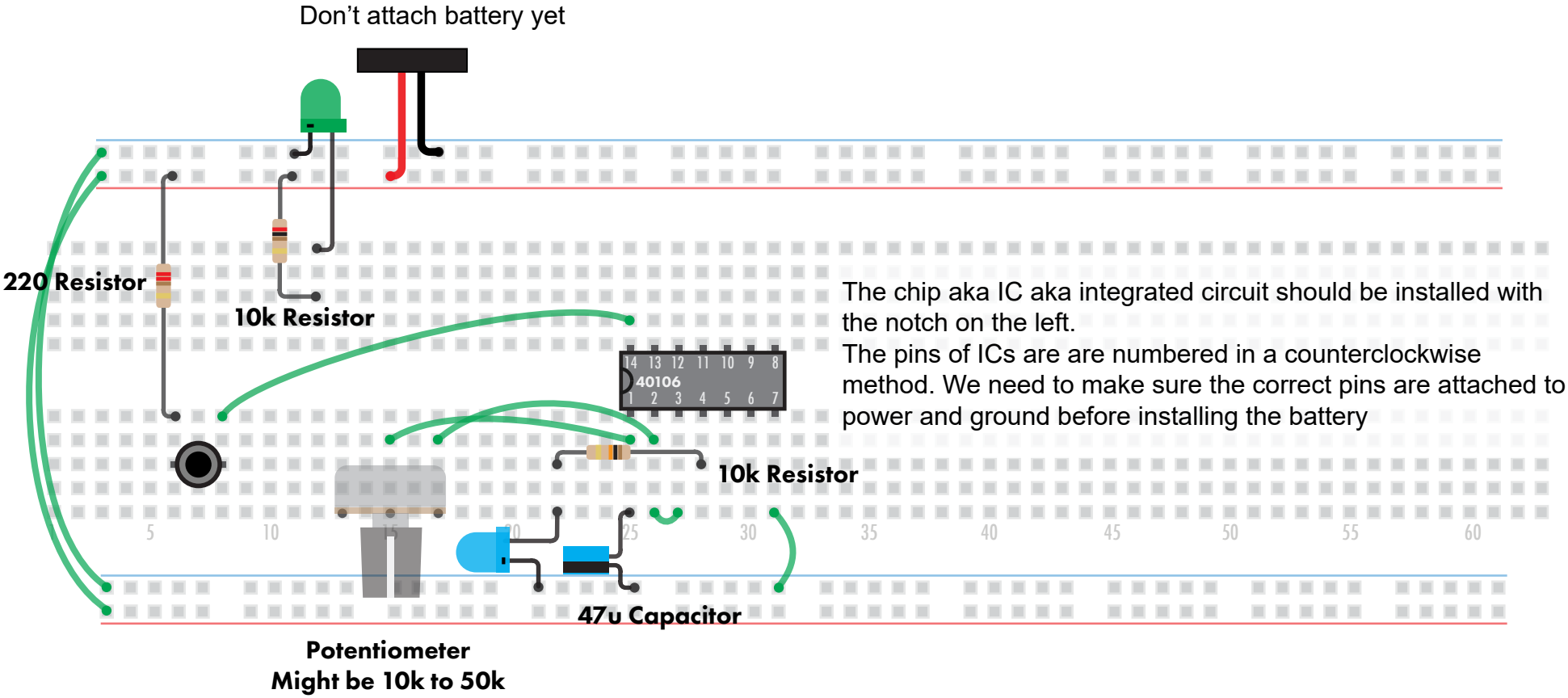
It can also be built without use of the horizonallty conencted red and blue “bus” lines on the top and bottom



All of these differnt ways of making the circuit can be expressed with the same schematic.



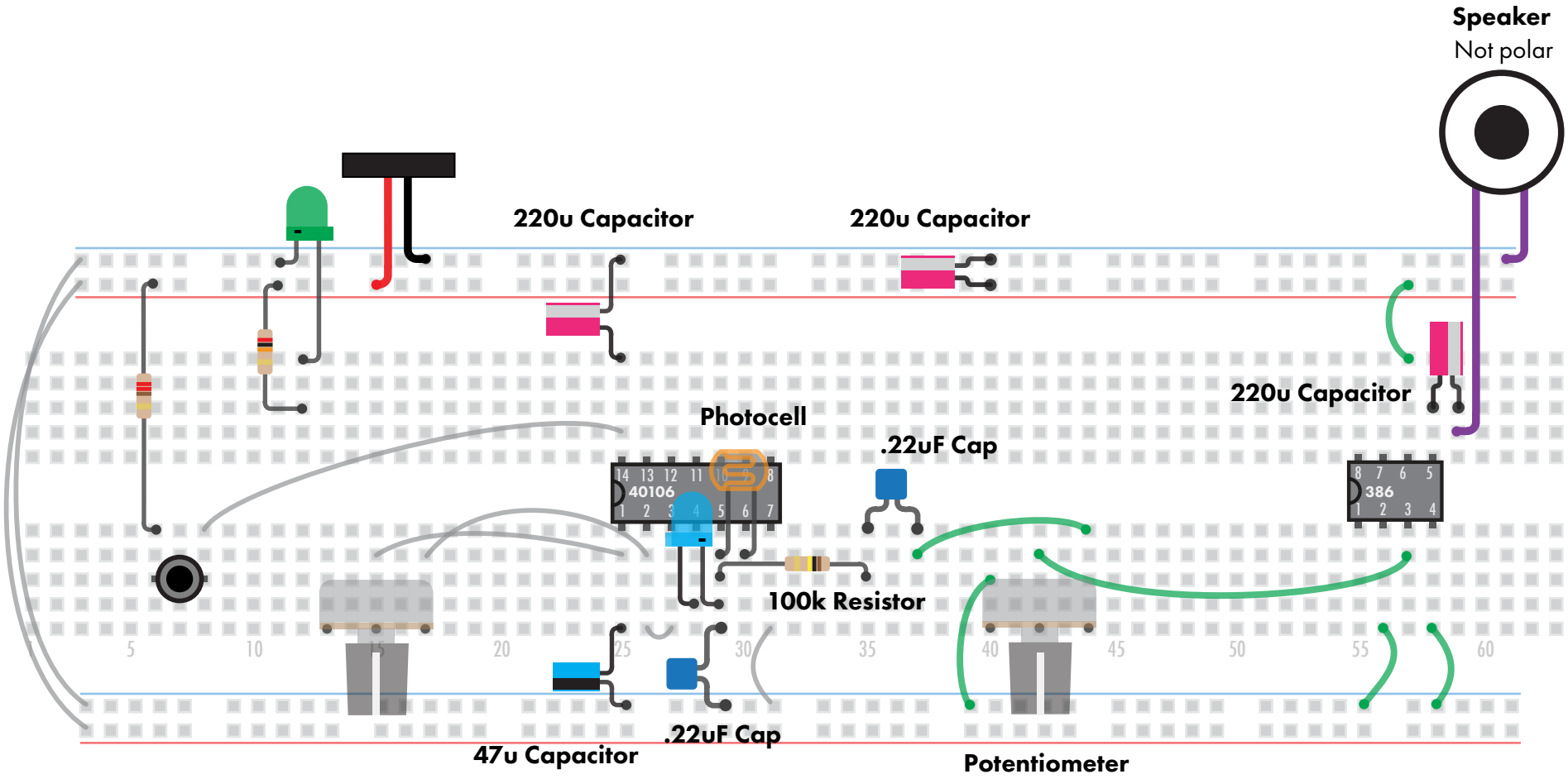
Step 1 - Blinking



The chip aka IC aka integrated circuit should be installed with the notch on the left.
The pins of ICs are are numbered in a counterclockwise method. We need to make sure the correct pins are attached to power and ground before installing the battery

The large capacitors are polar
The leg with the black stripe on the side is shorter than the other leg, like on the LED. Connect this leg to the blue bus.

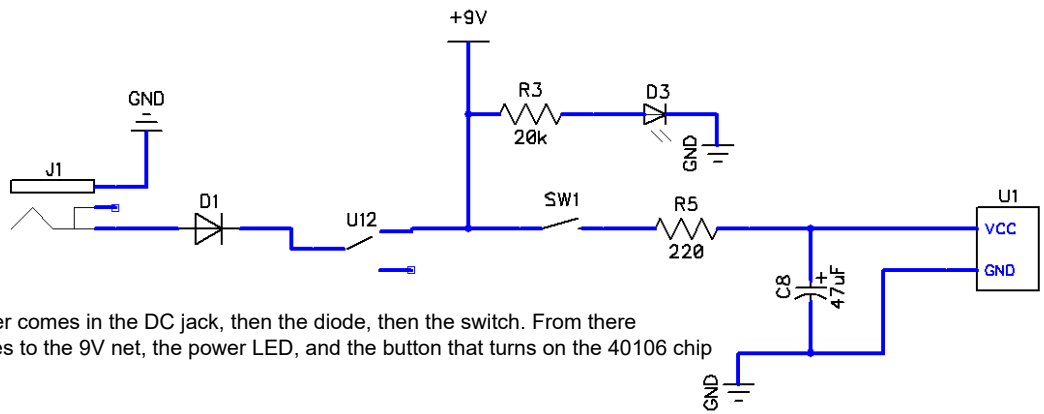
Step 2 - Beeping



Remove the 10k resistor and move the blue LED

The tiny .22 uF caps and the photcell are not polar

Schematic for PCB v7



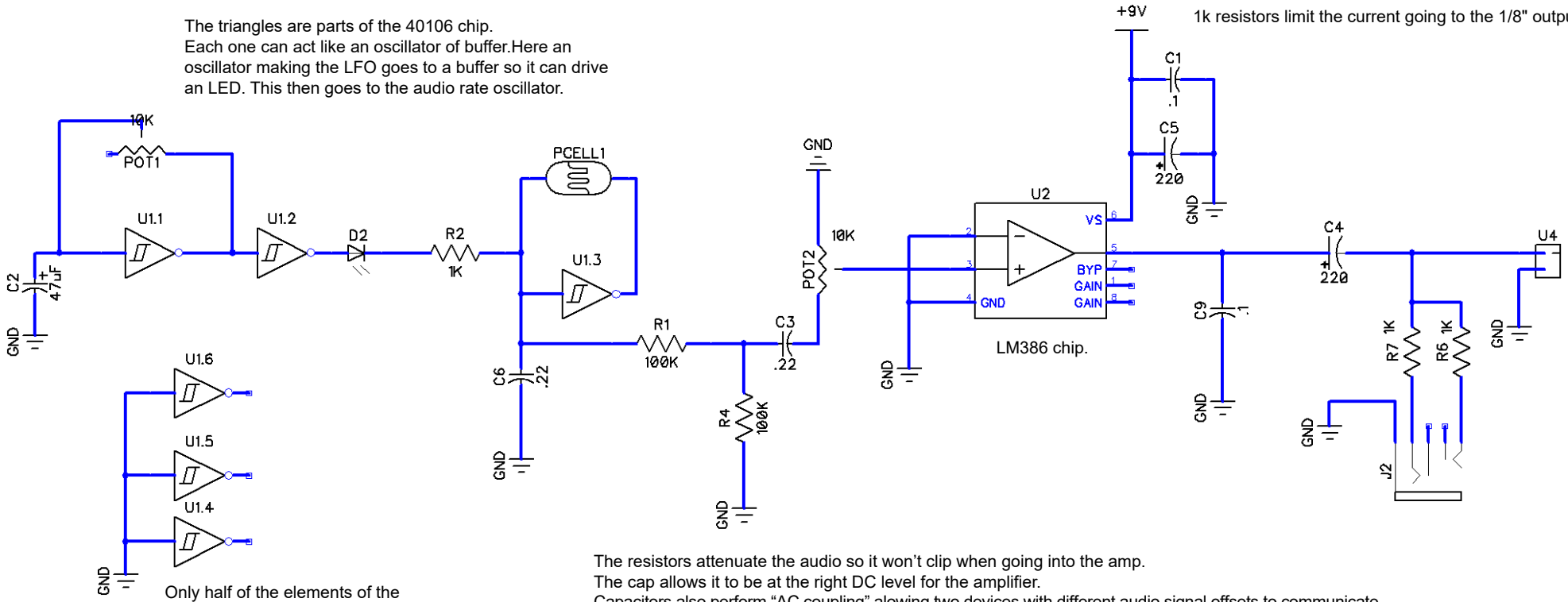
Power comes in the DC jack, then the diode, then the switch. From there it goes to the 9V net, the power LED, and the button that turns on the 40106 chip

C1 and C5 help the LM386 operate.
They are both reservoirs but the small one can react more quickly than the large one, removing different frequencies of noise.

C9 filters out very high frequencies in the final output.
C4 is AC coupling the amp to the speaker.

1k resistors limit the current going to the 1/8" output.

The triangles are parts of the 40106 chip.
Each one can act like an oscillator of buffer.Here an oscillator making the LFO goes to a buffer so it can drive an LED. This then goes to the audio rate oscillator.



Only half of the elements of the 40106 are used. The rest are connected to ground so they won't use power or make noise..

The resistors attenuate the audio so it won't clip when going into the amp.
The cap allows it to be at the right DC level for the amplifier.
Capacitors also perform "AC coupling" alowing two devices with different audio signal offsets to communicate.
POT2 is the volume control.