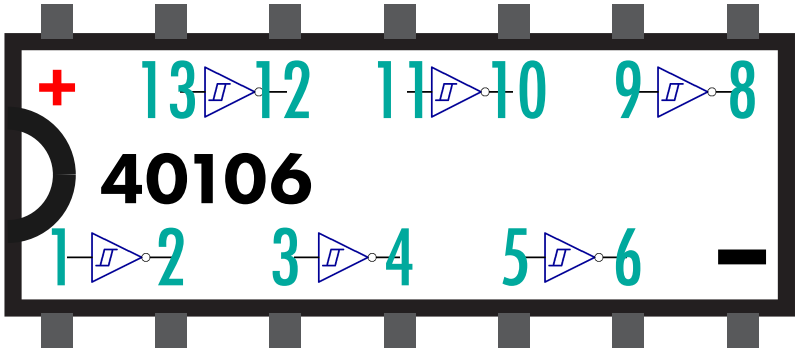
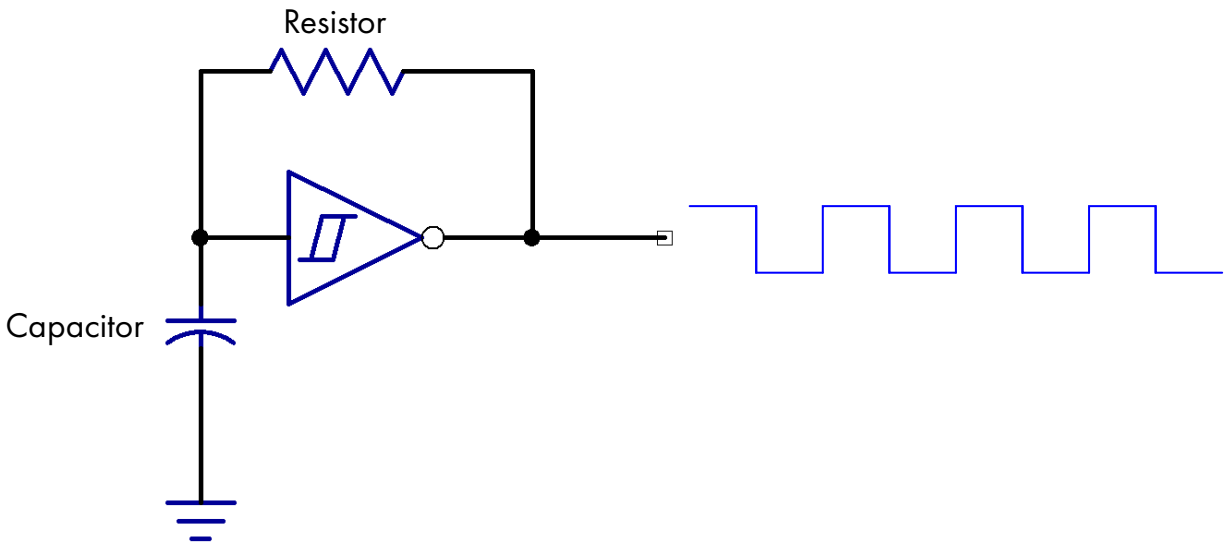
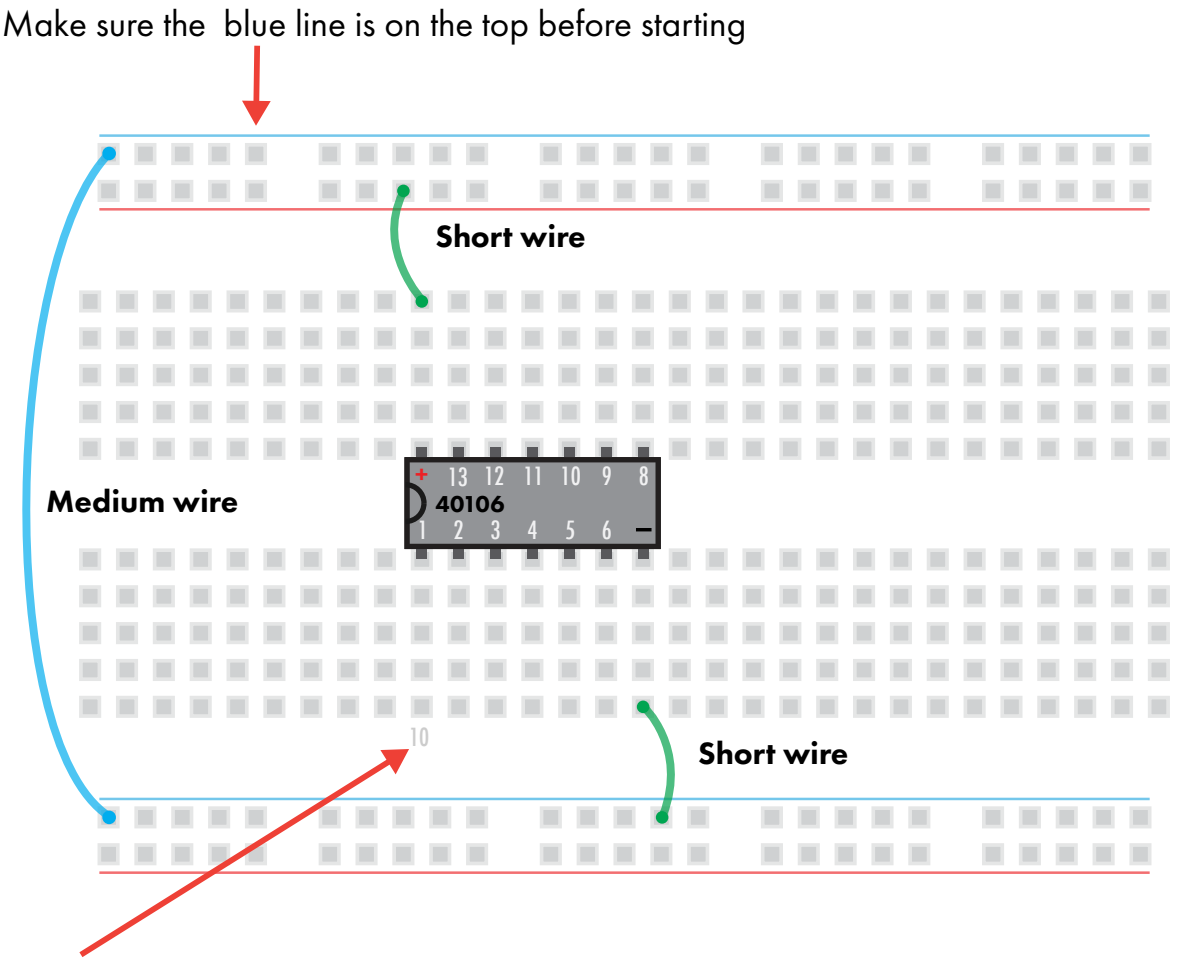


The “Intergrated Circuit”, or IC, we’ll be using for this workshop is the 40106 (aka 74HC14) hex schmitt trigger.
All that means for us is that there are six seperate devices in it that can all be turned into oscillators with just a resistor and capacitor.

This is not a “computer chip”. You cannot program it.
It is analog and more like plumbing. It is set up to do a specific thing and does it very well but is not very flexible.
Chips like these were first used in the 1960s but still find uses in electronic devices today.



Step 1
Chip and Power Wires



We have several colors and lengths of wire in the kit.

Here we're using the short green ones and a medium blue one

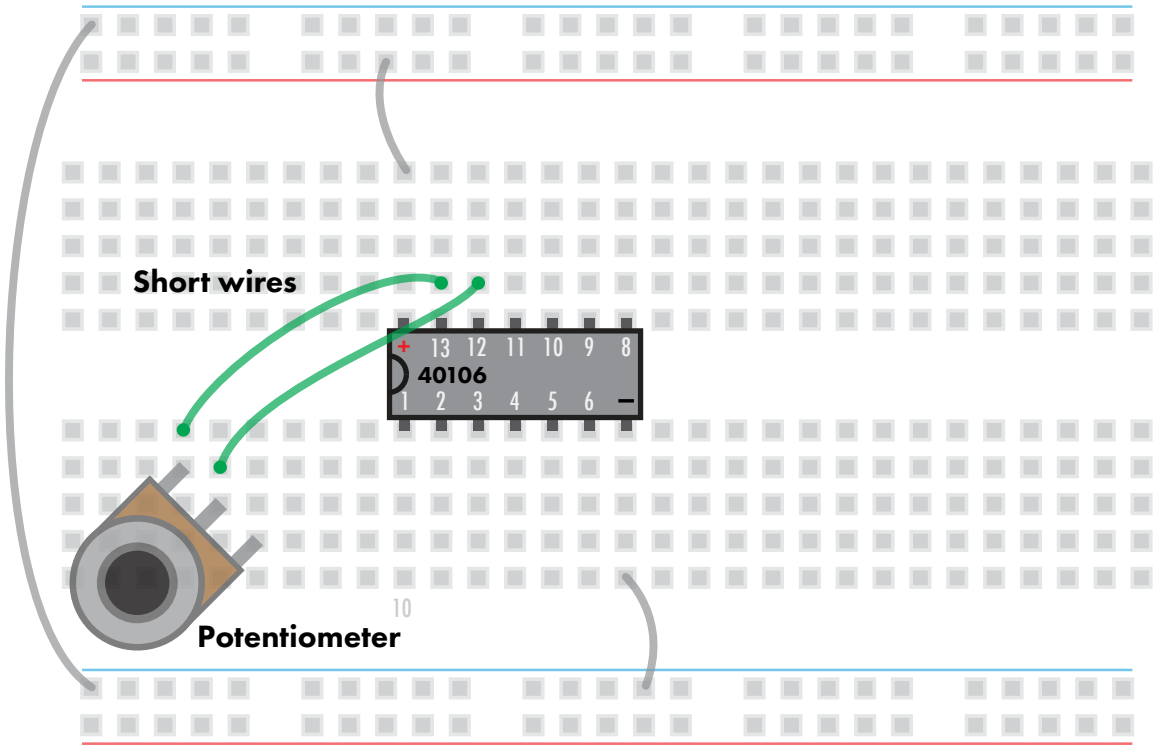
Put the chip in so the first pin on the left is in the column marked "10".
We could put it anywhere but this makes sure we'll have enough space for the other parts.

The chip has a half circle notch on one side. Make sure it is on the left.
If the chip is in backwards we might damage it.

Step 2
Potentiometer

Colored wires are new.

Wires already installed are grey



The potentiometer goes in at an angle as shown. It will not fit in the breadboard otherwise.

A potentiometer or “pot” is a variable resistor. It will allow us to change how fast the circuit is oscillating.

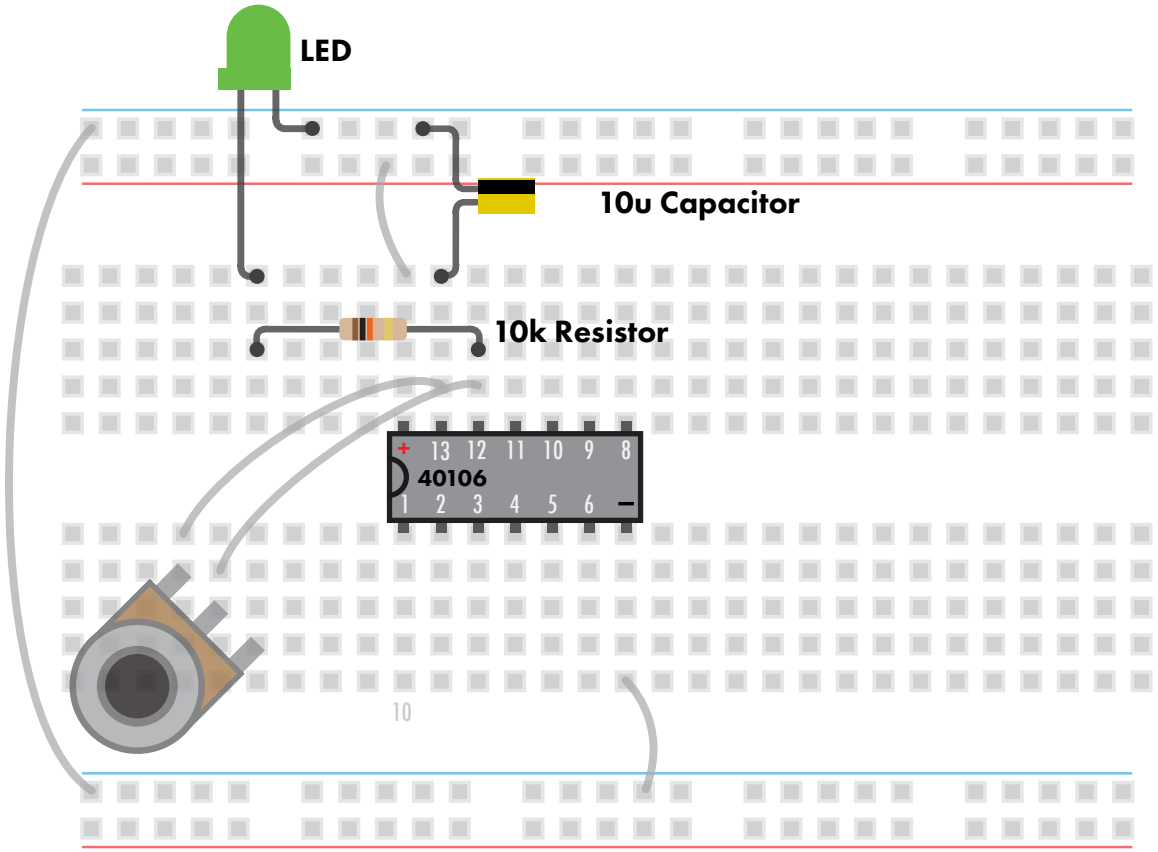
Step 3

LED, Resistor, Capacitor

The LED and capacitor are polar and need to be installed in the correct direction.
LEDs have a notch on one side. This side also has a shorter leg that should go in the blue row.

The capacitor has a black stripe on one side that goes into the blue row. This side also has a shorter leg.

The resistor does not have a direction and can go in either direction

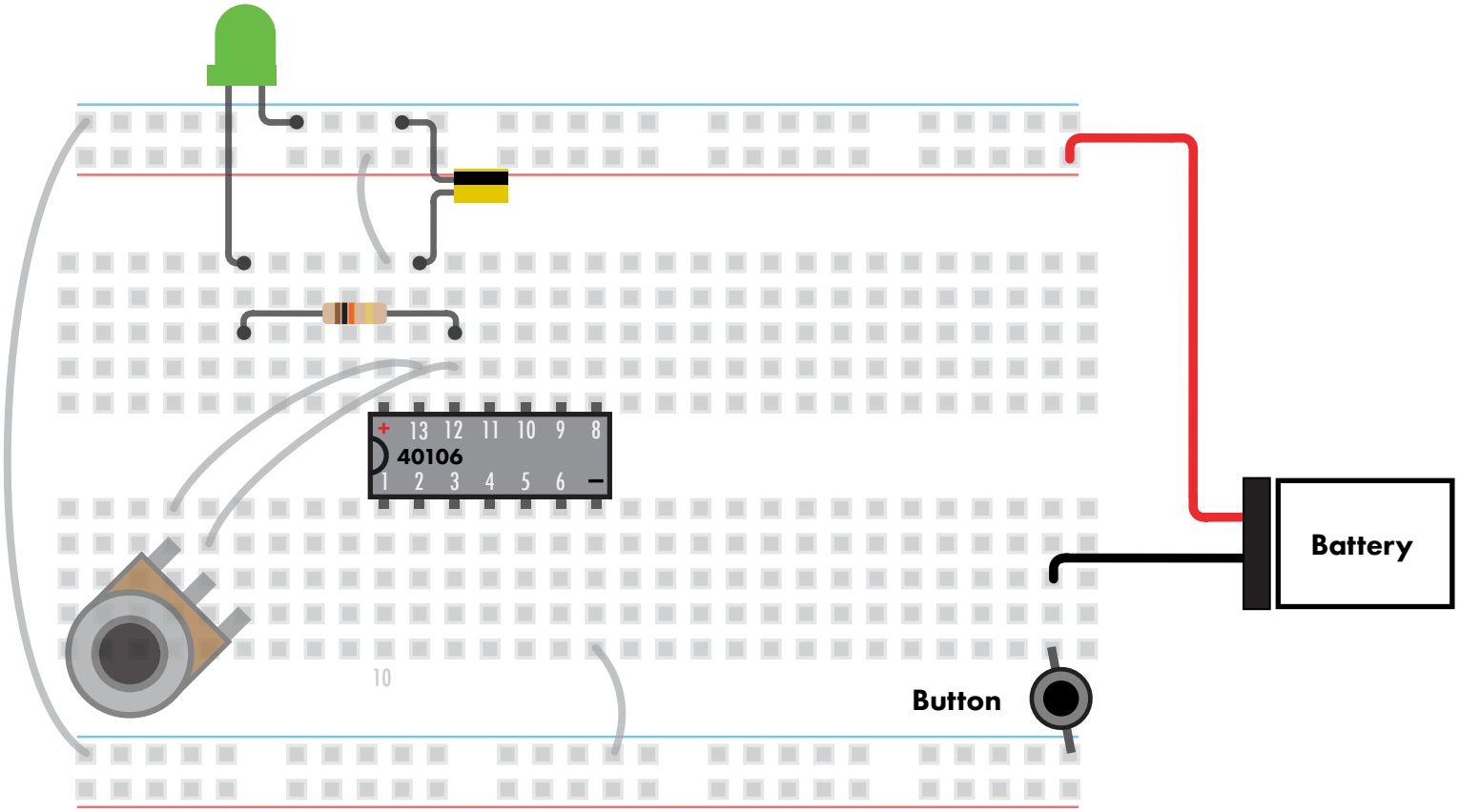


Step 4
Battery and blinking

The red wire from the battery goes into the top red row.

The black battery wire connects to a button that then goes to the bottom blue row.

When the button is pressed the LED will blink at a speed determined by the potentiometer.



Next we'll use the same kind of circuit to make sound instead of blinking a light.

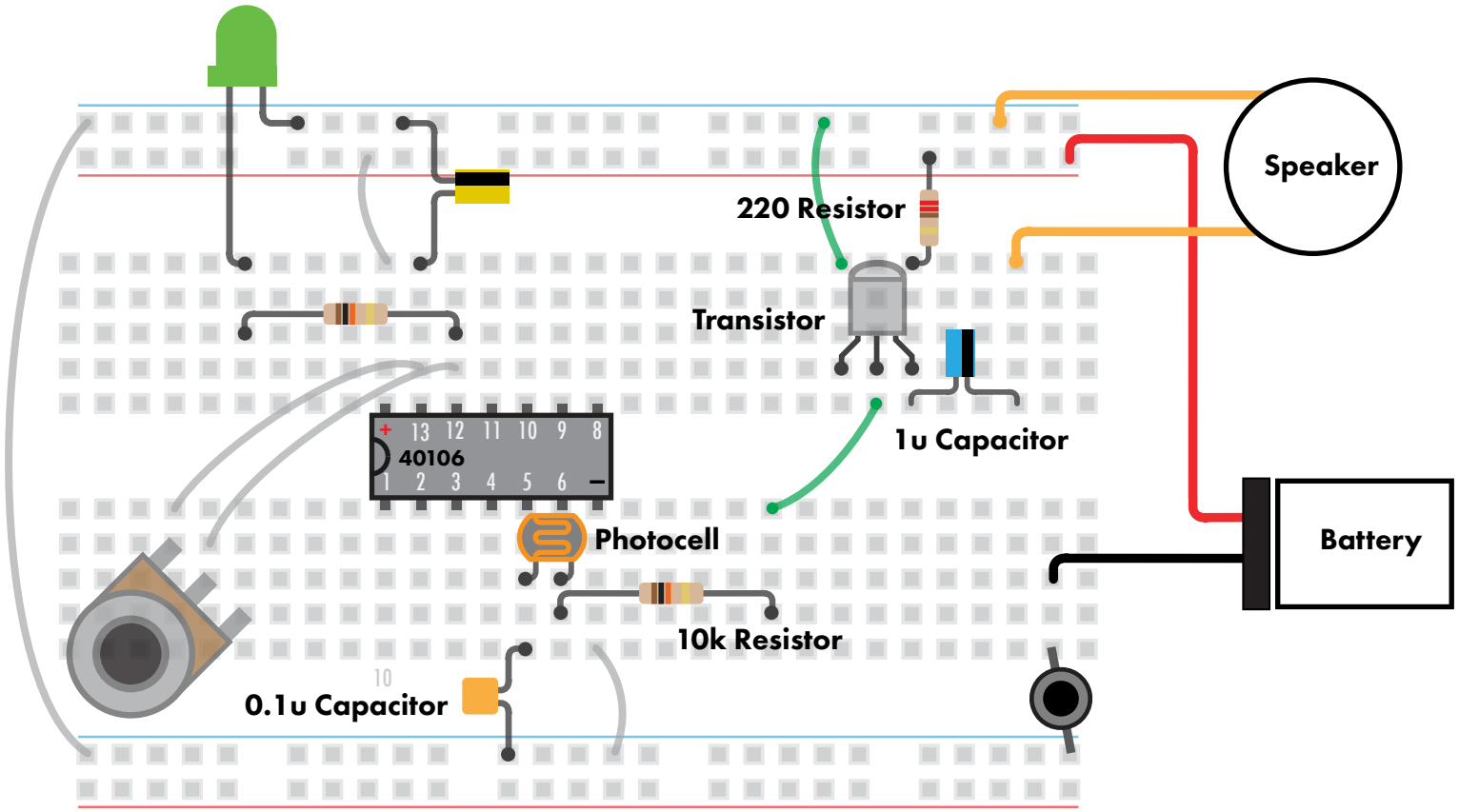
Step 5
Photocell and Sound

The photocell is another type of variable resistor. The more light hitting it the lower the resistance. It does not have a direction.

The 0.1u capacitor does not have a direction but the 1u capacitor does.

The transistor needs to installed so that the flat side is facing you.
It acts like a simple amplifier for the speaker.

Press the button and you'll hear a tone controlled by how much light is hitting the photocell.
What happens if you point the LED at the photocell?

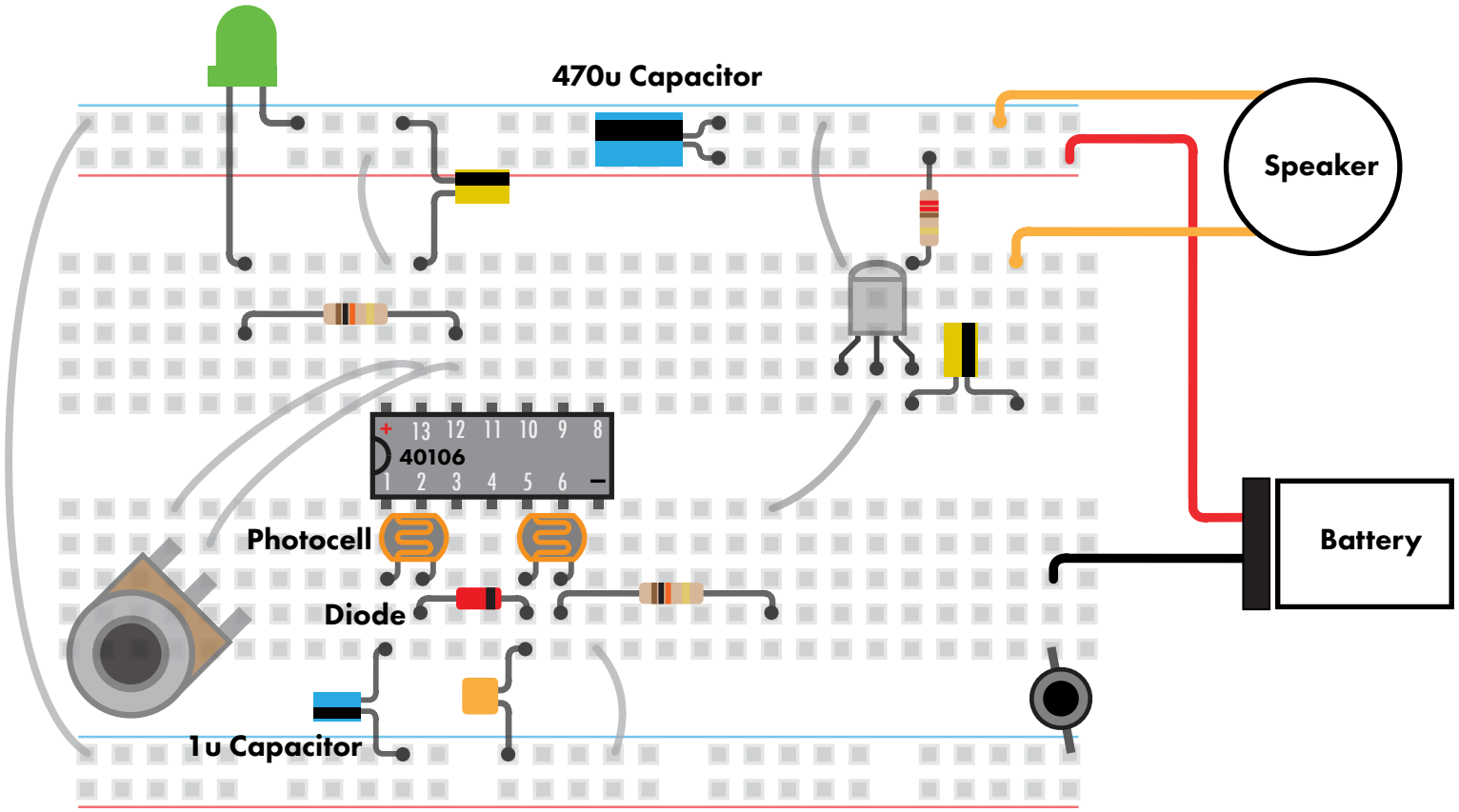


Step 6
Modulation

Let's add another photocell controlled oscillator that affects the first one.

The diode is polar. Make sure the black like on it is on the right.
It allows the new oscillator you built on the left to control the one on the right.
The left oscillator is turning the one on the right on and off very quickly, creating a new sound.

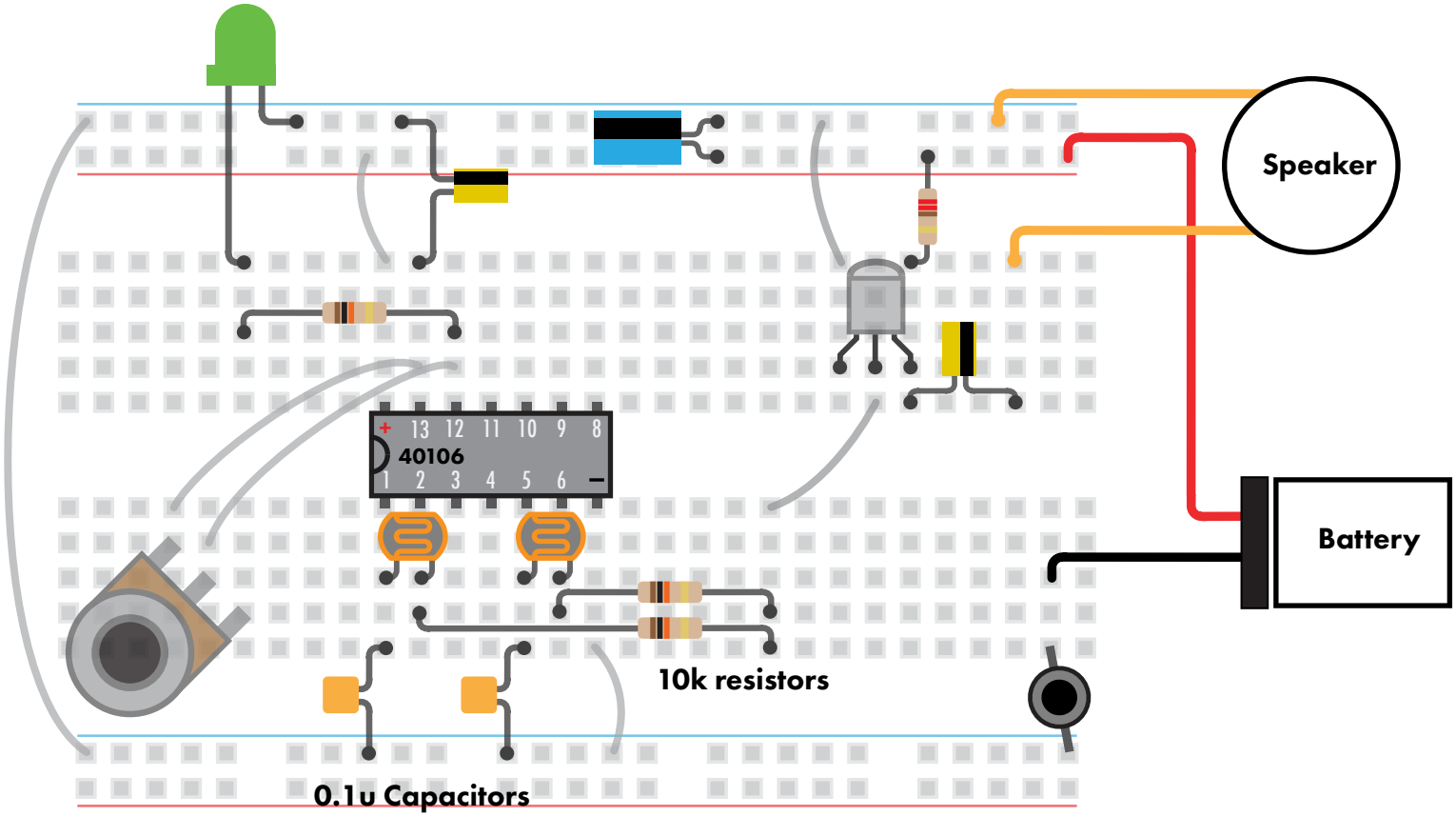
The large 470u cap at the top changes how the buttons works. Now the the sounds will trail off after the button is released. This is because the capacitor acts like a kind of reservoir for the power.
When the button is pressed it quickly fills up. When it's released the battery is disconnected but there's still power in the capacitor. It's then quickly used up by the circuit and gives us a little fade out sound.



Step 7
Modify

You can remove the diode, add a second 10k resistor, and change the 1uf for 0.1 uf to to hear both photocell oscilaltors at the same time.

Also try using some wires to connect the LED to the breadboard so it can be more easily pointed at the photocells.



Thanks for coming to the workshop!
You can learn more about this circuit and more at
bleeplabs.com/AustinWeek