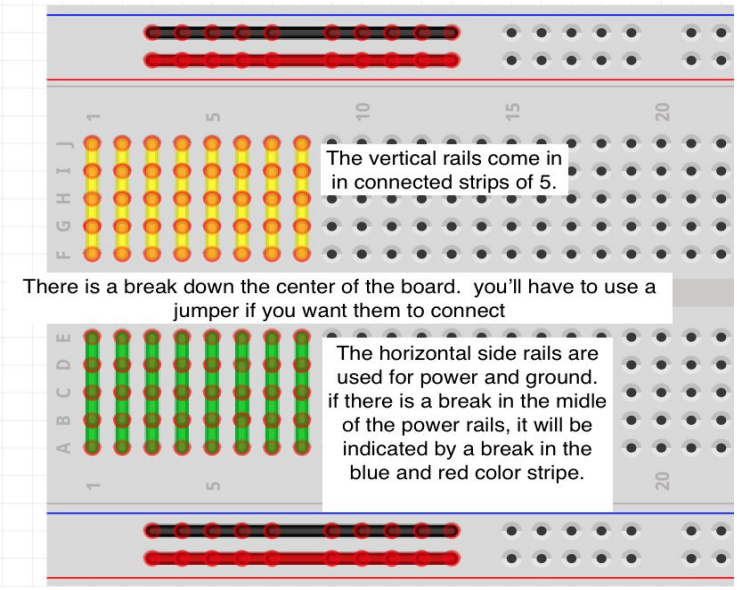
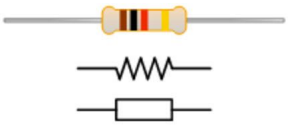
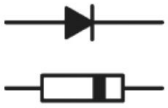
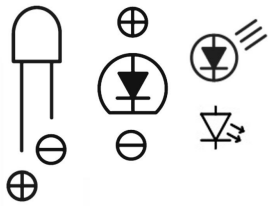
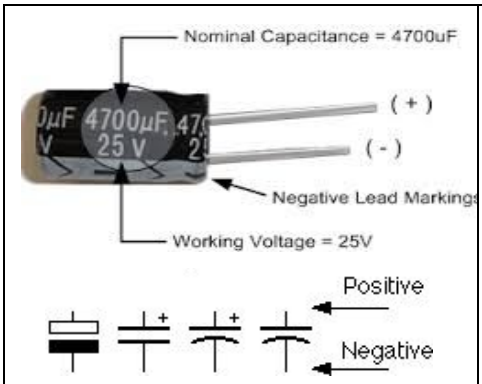
These are all things you should know in order to build your first synth.

Bbreadboards are meant for prototyping! Practice building different circuits, and trying different configurations. The different rows are connected internally by a metal clip. This is how you make electrical connections between different components to build schematics, which is the visual language of electronics.

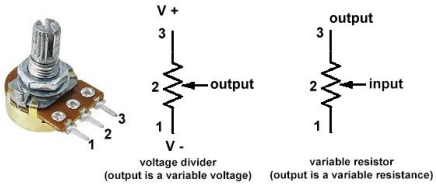


These are examples of some of the most common schematic symbols that you may encounter. Some components are can be hooked up in either direction, while other components are polarized, which means it can only be hooked up in one direction. (more on this later)

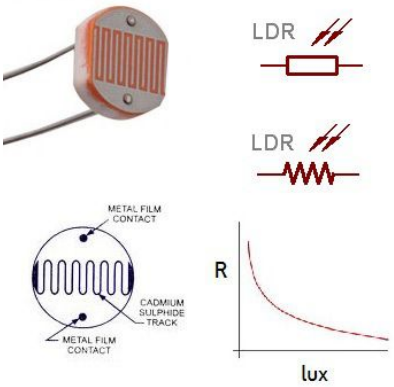
		
Resistors are like valves that only let a certain amount of voltage through. They can be used to protect some parts that can only handle so much voltage, like LEDs.	Diode Symbols (polarized) a one way valve, and can be used to help direct the flow of electricity, and can help ensure that electricity doesn't accidentally get directed in the wrong direction.	LED stands for Light Emitting Diodes, and are polarized. The Negative Side is indicated by the shorter leg, and the LED might have a flat side, which also indicates the negative side of the LED. The positive side is usually the longer lead.



Capacitors can be thought of as ‘buckets’ that ‘fill up’ with electricity up to its rated capacitance, and then dump out once its full, which it will continue to do over and over again. It can be used to help buffer an incoming power supply as well, among other important things that are beyond the scope of this class.



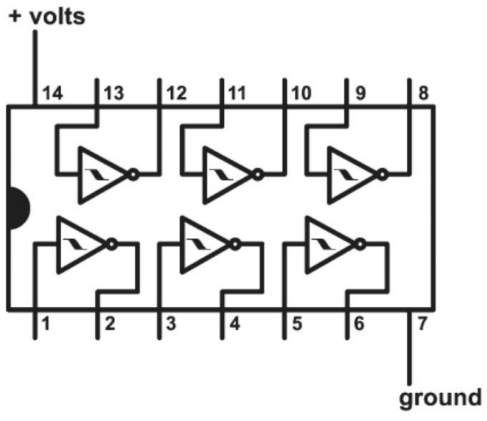
Potentiometers have a wiper on the center pin that deliver a variable resistance between the pins on either side. Potentiometers can be used to change the resistance on a circuit. They can be wired up just using two legs to change resistance, or can be have a positive and negative power connection on the outside legs so the center wiper can act as a voltage divider, delivering a varied voltage.

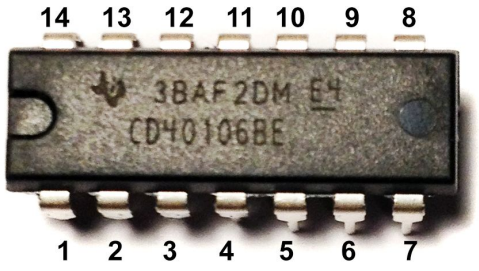


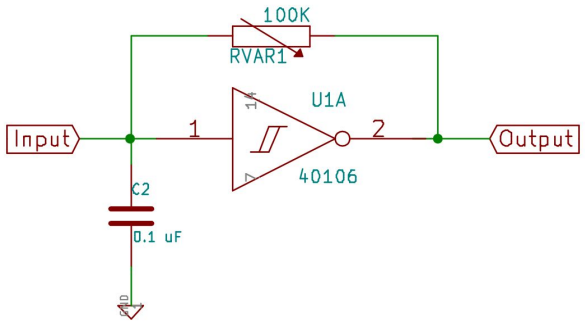
LDR’s (Light Dependent Resistors) act like a resistor, but the resistance changes due to a light-sensitive resistive compound. It shows lower resistance when exposed to light, and higher resistance when in the dark.

There are a variety of other sensors that can be used to change resistance, such as pressure sensors, conductive stretch fabric, flex sensors, magnetic analog tape such as VHS tape or cassette tape, and Graphite drawn onto a piece of paper will produce a good range of resistance.
You can use a multimeter to measure resistance and voltage, in order to help you better understand what the circuit is doing.

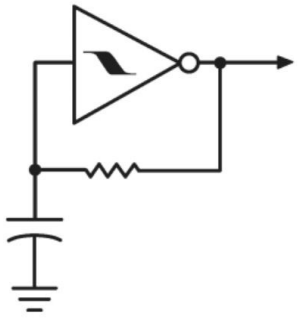
40106 IC Pinout and IC





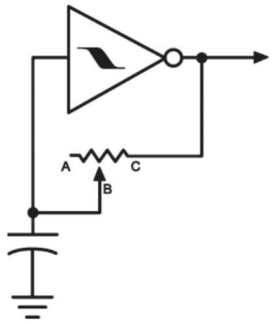


40106 oscillator schematic drawn with Kicad softw

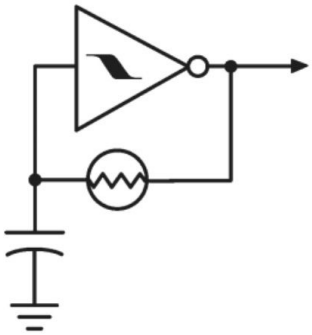


40106 oscillator schematic

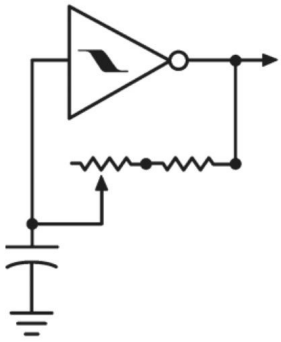
Wiring variations for the 40106



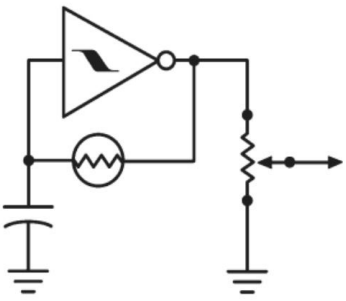
potentiometer controlled oscillator



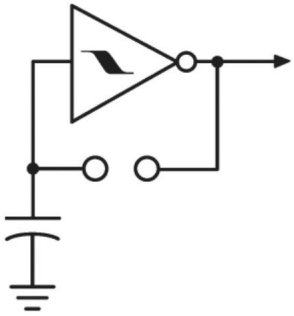
photocell controlled oscilla



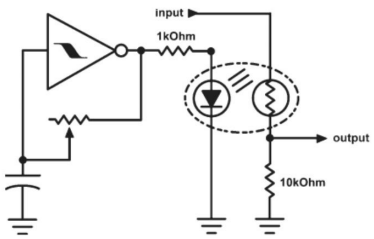
Fixed upper frequency limiter



output volume control

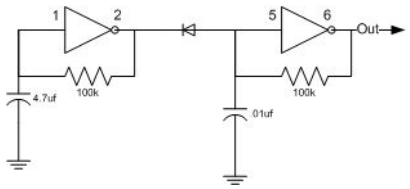


Touchpoints can produce a variety of resistance through your skin, using Electrode (touchpoint) controlled oscillator

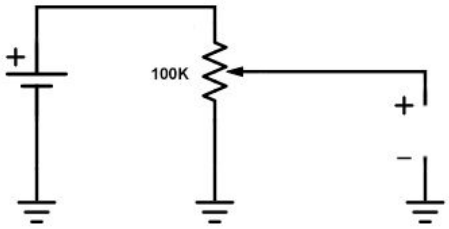


Potentiometer controlled LED flasher. (can be used to drive another circuit with an LDR)

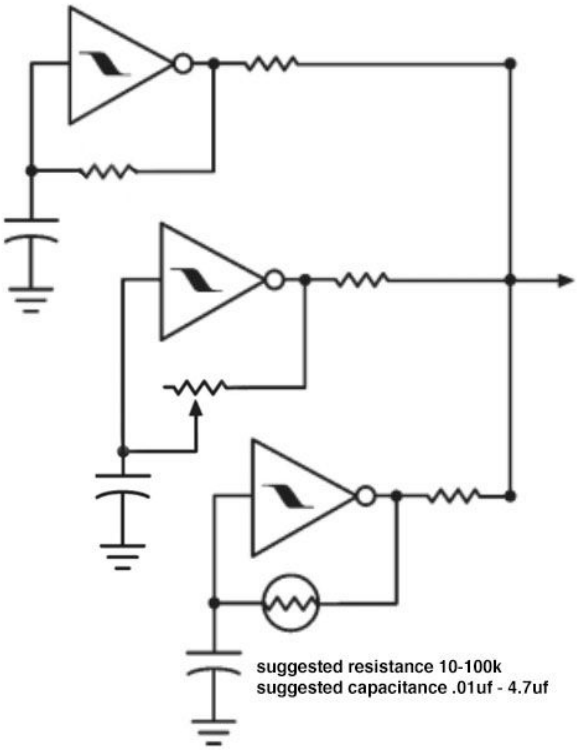
Experiment with different sensors! Some examples are flex sensors, pressure sensors, stretch sensors, graphite on paper, different metal objects as touch points, etc. Different resistive sensors will have 2 or 3 leads, and can be wired up similar to a potentiometer (3 leads) or a fixed resistor (2 leads)



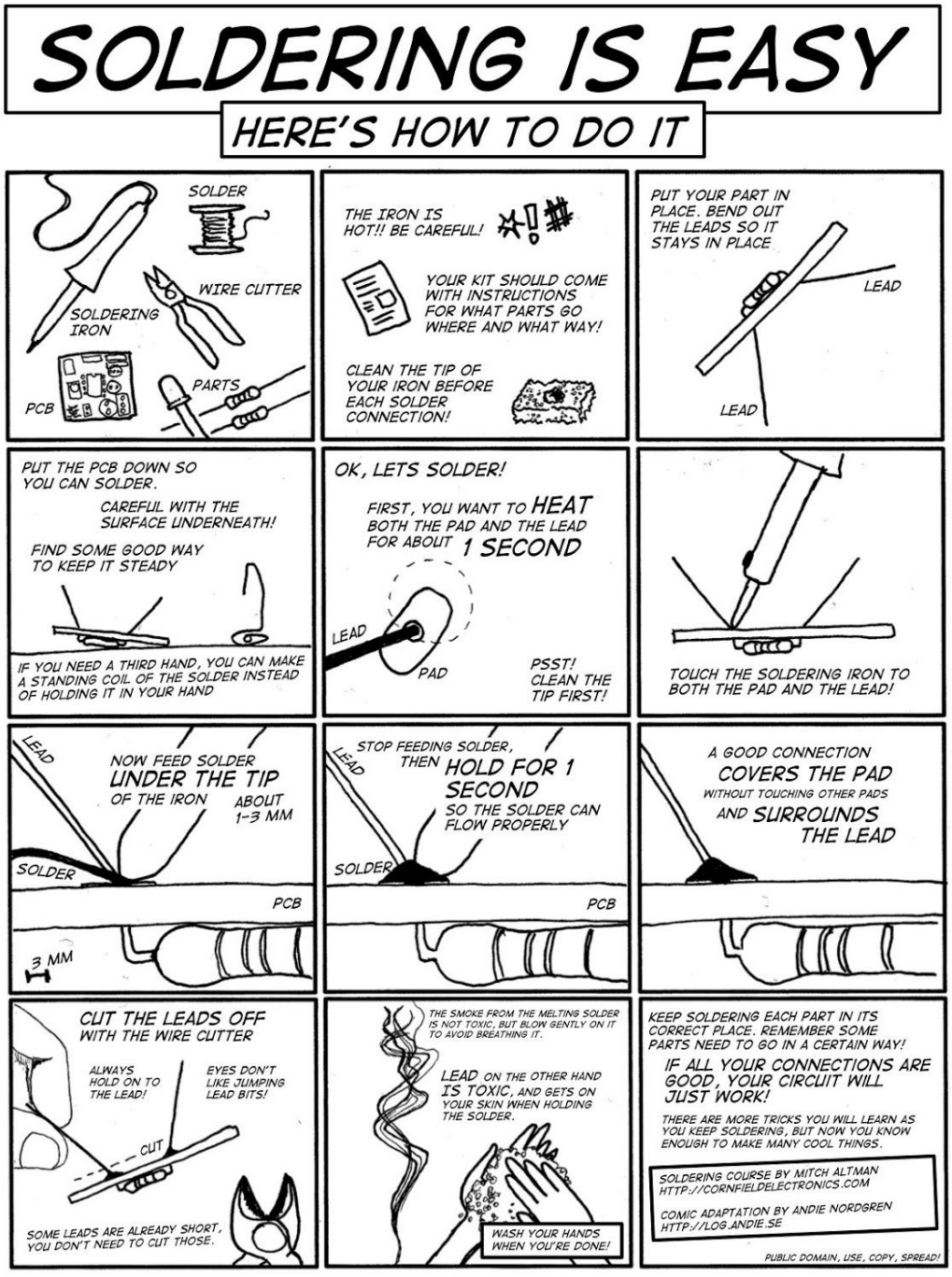
You can use a diode to drive one oscillator into another, causing Frequency Modulation



You can use a potentiometer to 'starve' the 40106 of power to induce strange sounds..



If you want to wire multiple oscillators together, try using 10k resistors or diodes to help prevent the signals from interfering with each other



Soldering comic from CornField Electronics.com
Most circuit diagram images from Nicolas Collins "Handmade Electronic Music"
Suggested Reading: Adafruit tutorials, Sparkfun tutorials, Make: Electronics: Learning Through Discovery by Charles Platt, "Handmade Electronic Music" by Nicolas Collins
Dallas Shoutouts: Thanks to the Dallas Makerspace, a 24 hr hackerspace with a fully functioning electronics lab, with lots of components available for free for artists to utilize. There is lots of help available there if you are looking for local electronic mentorship, and Tanner Electronics is a great resource for purchasing individual electronic components.