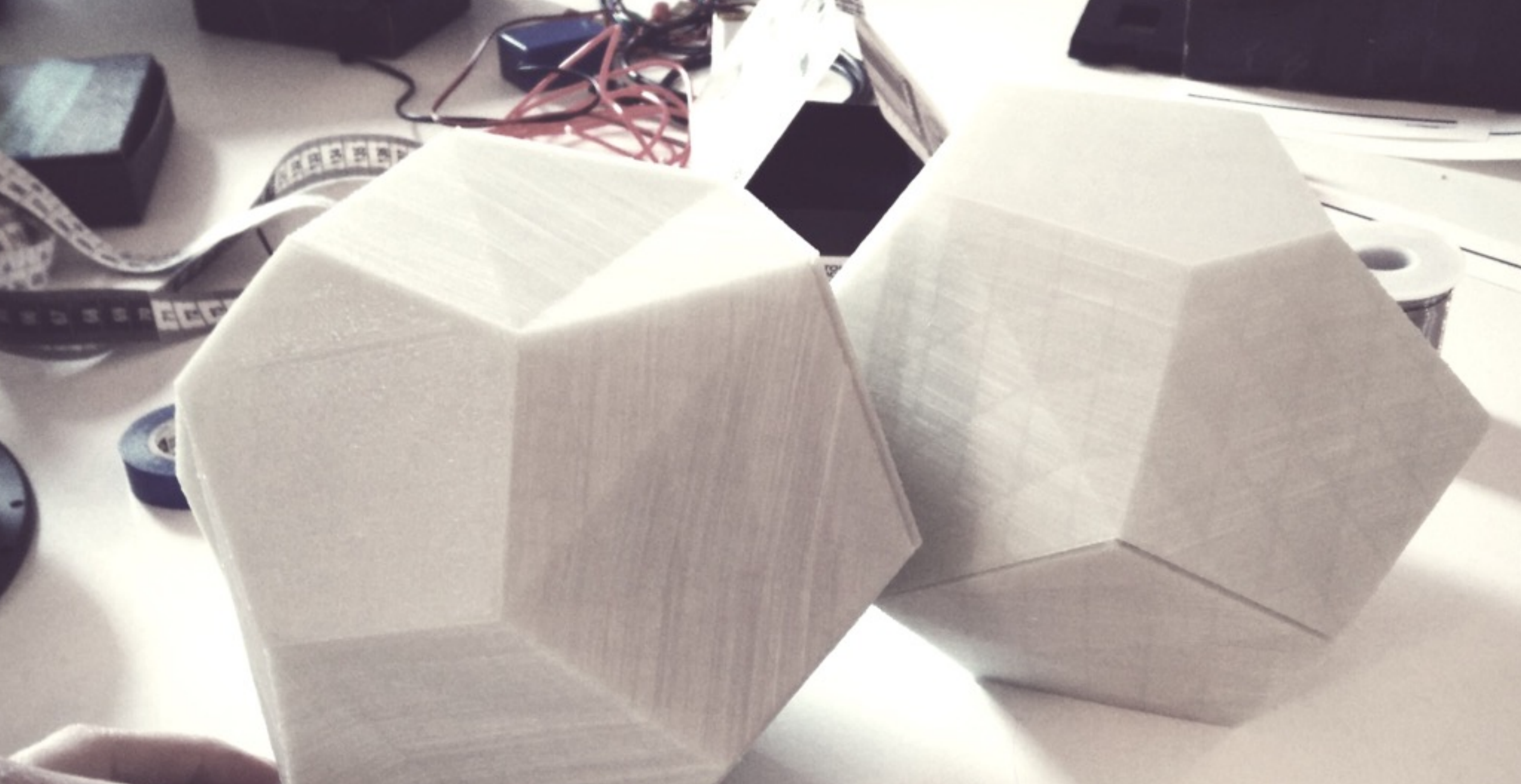


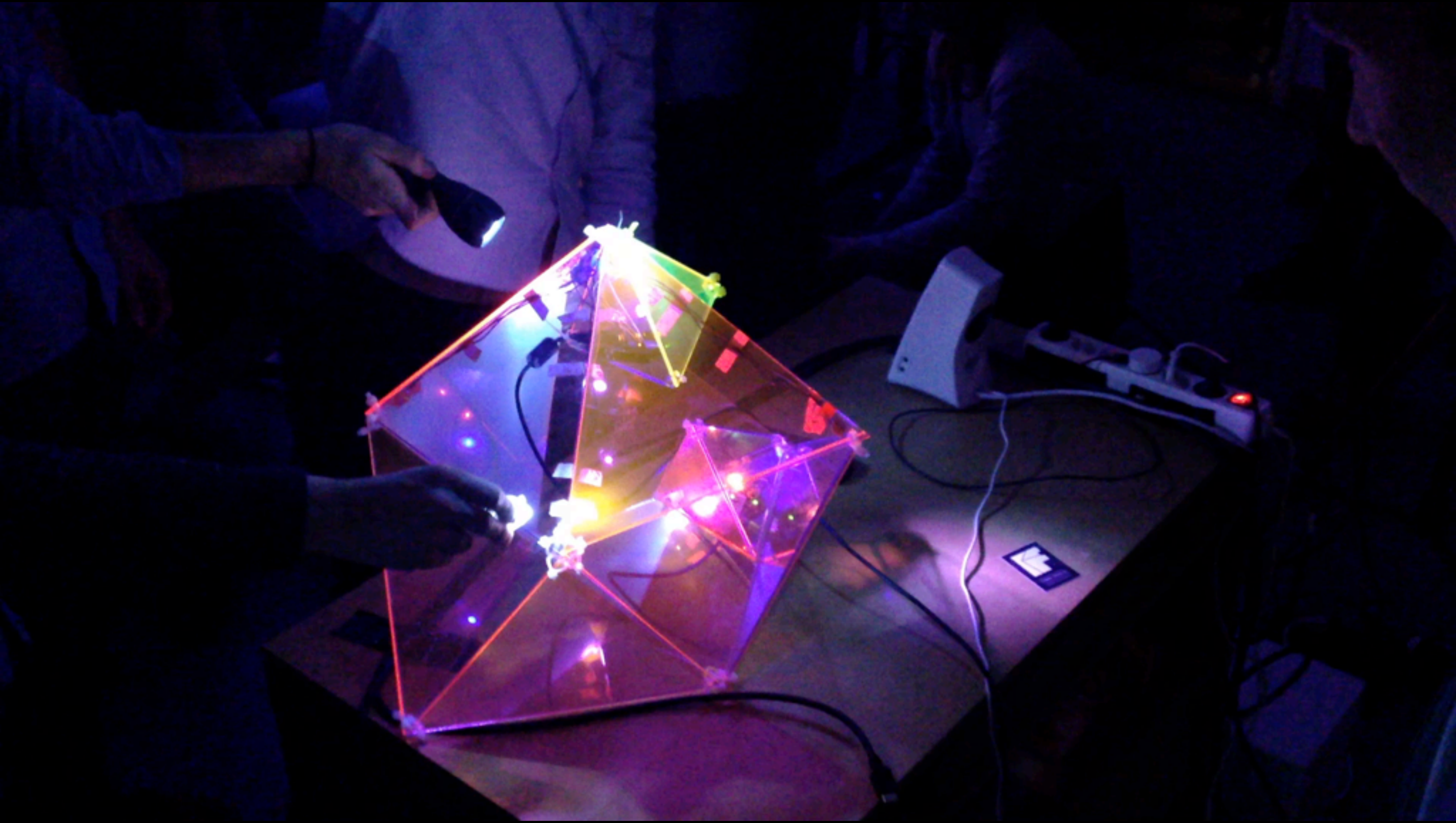
PHOENIX PERRY

@PHOENIXPERRY

Goldsmiths
UNIVERSITY OF LONDON

Dozen Eyes


DYING LIGHT



CODE LIBERATION
FOUNDATION

BOSSED UP JAM

HIGH SCHOOL CLASSES

CLF x BLACK GIRLS CODE

GAME DEVELOPMENT CLASSES


CIBELE

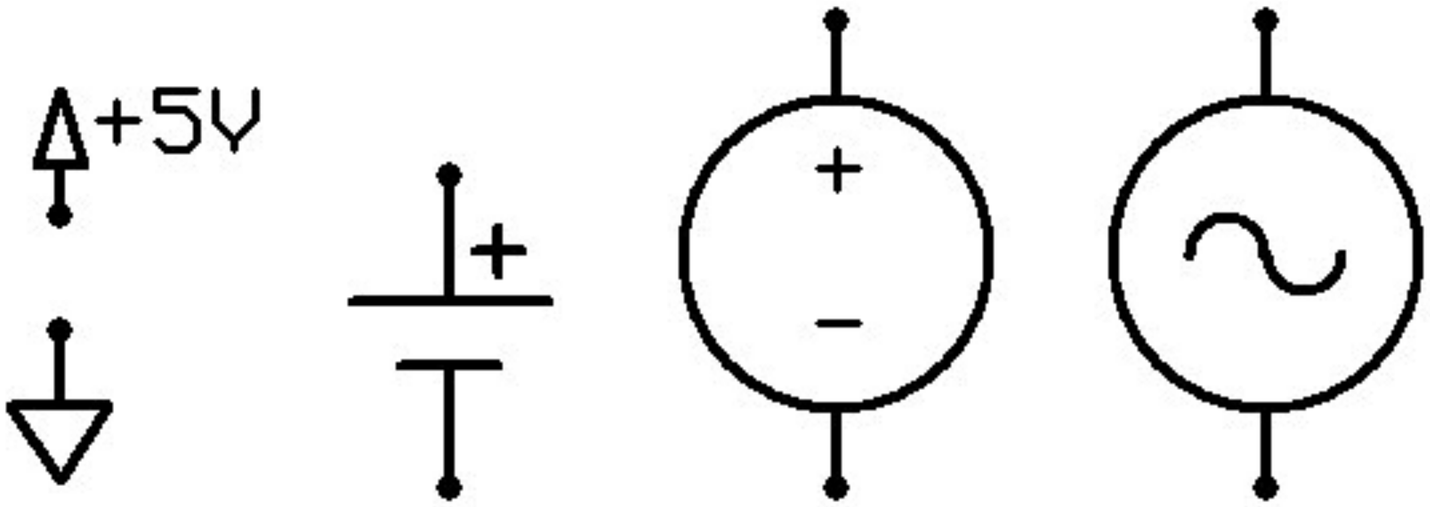

PRISM SHELL
プリズムシェール
TAP to play

SLAM CITY ORACLES


STELLAR
SMOOCH

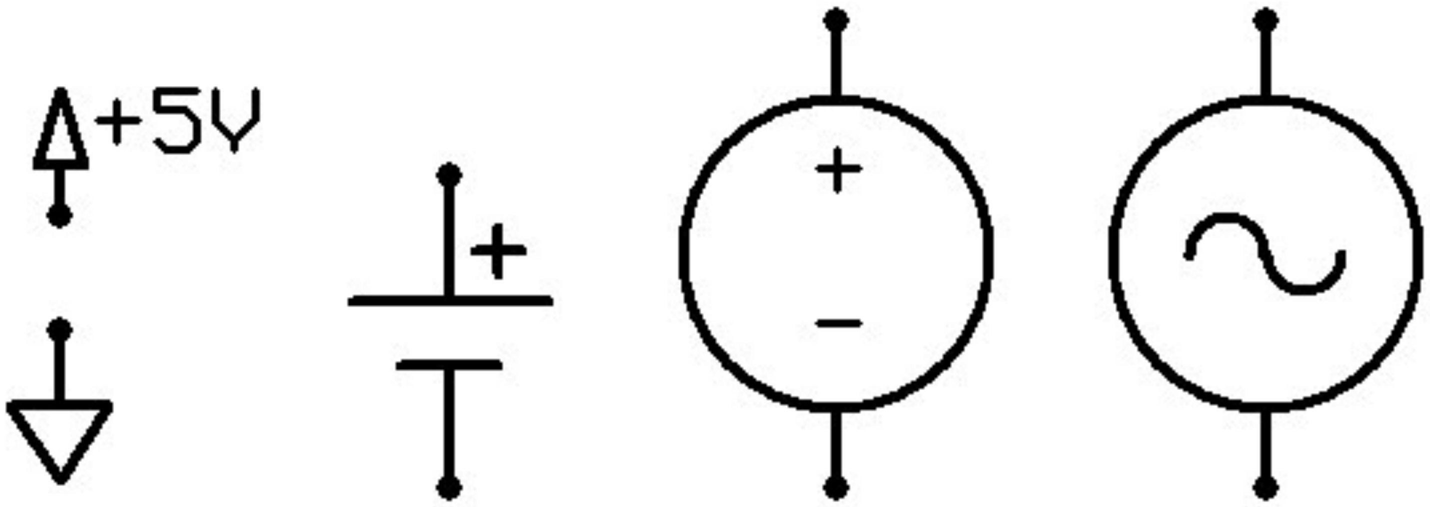
NYCRESISTOR

from: cats on synthesizers in space

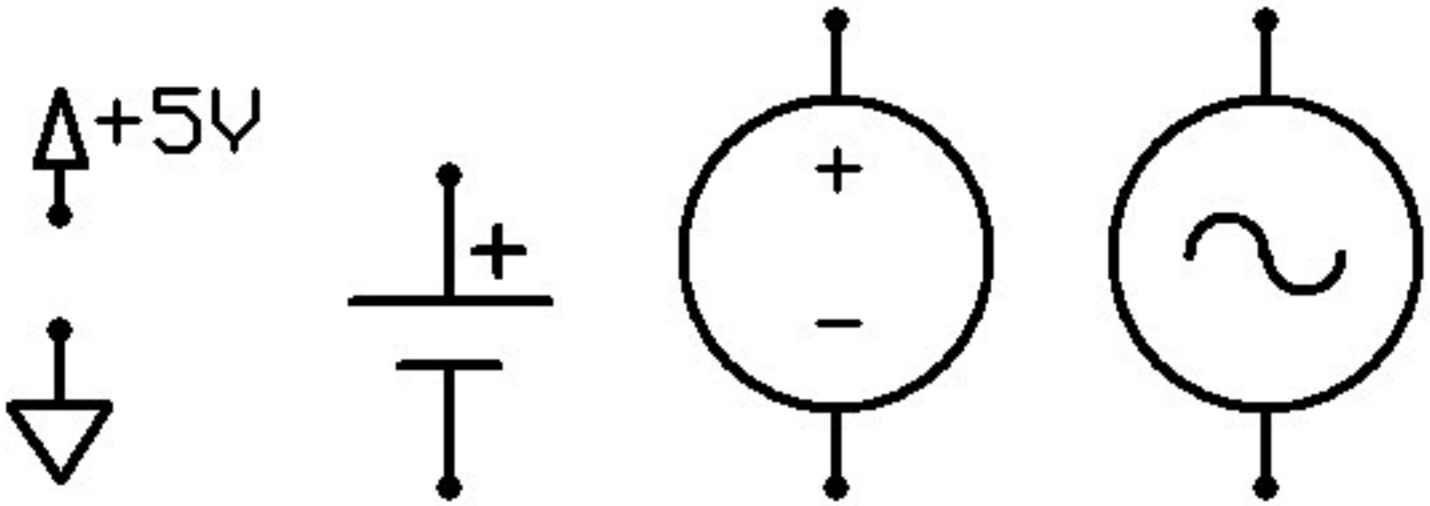


All electronics use

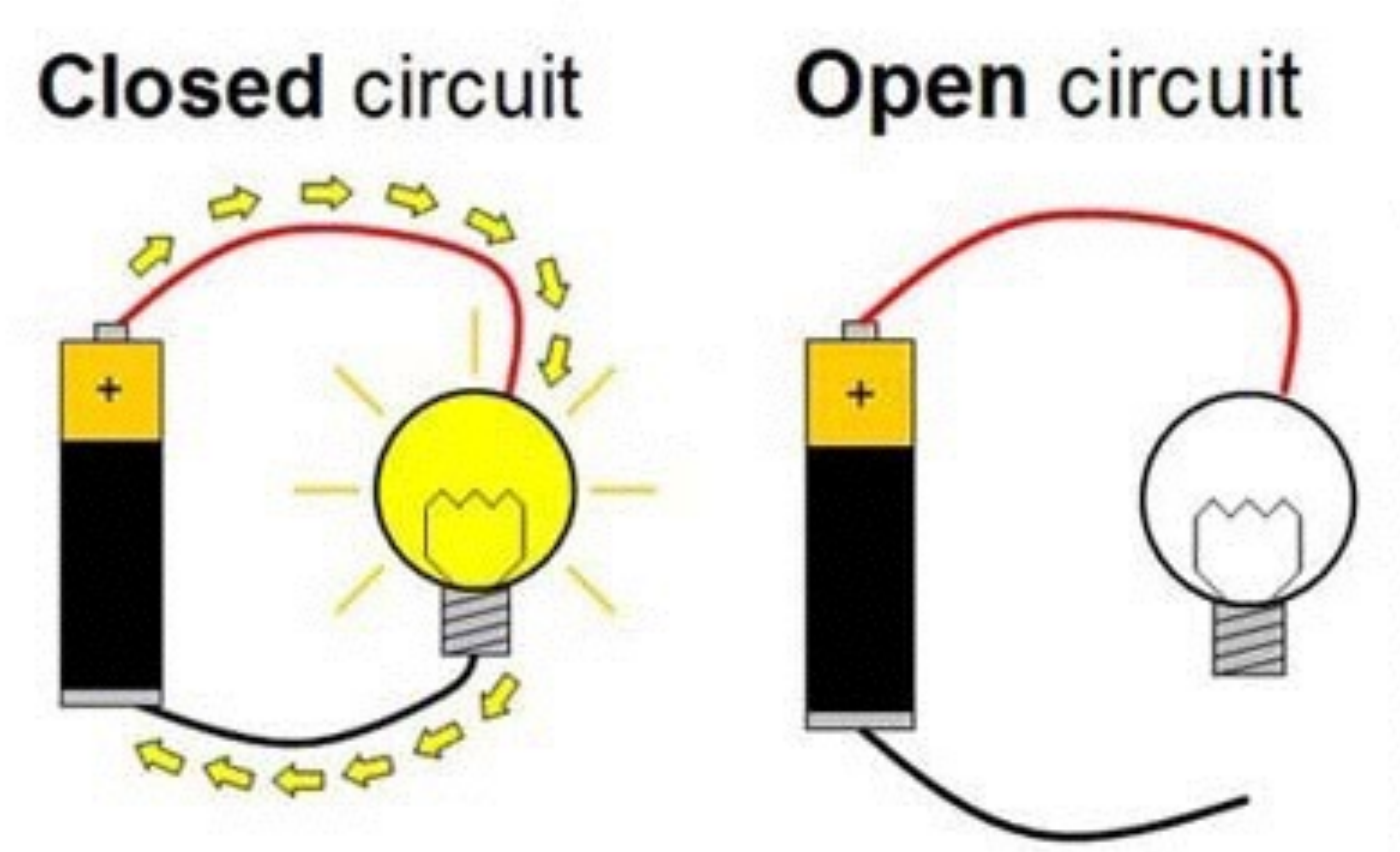
Power



and balance a relationship between
voltage (V), current(I) and resistance(R).



voltage = how much possible power we have to use
current = how fast we use it
resistance = how much power is burned up as we go around our circuit.

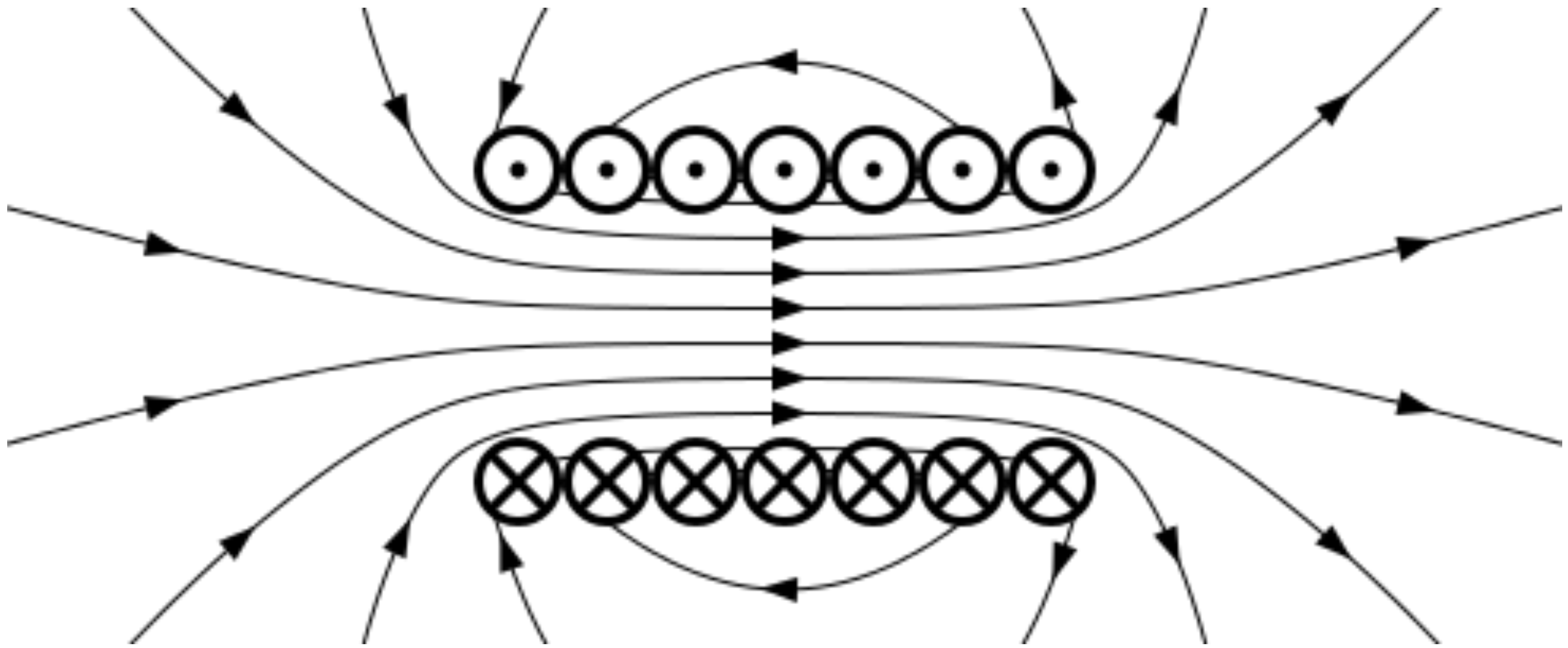


Voltage flows around a **circuit.**

Circuits are open or closed and are the loop from the positive side of your power source through your electronics to the ground side of the power source.

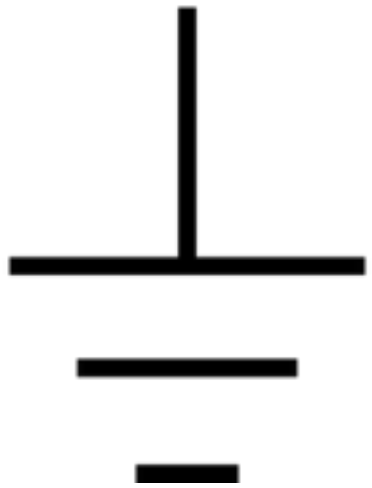
In an closed battery powered circuit, the **voltage** will flow from + to - sides of the battery. It gets used up.

Voltage is measured in **Volts**.



Voltage

difference in electric potential energy between two points per unit electric charge.



Ground

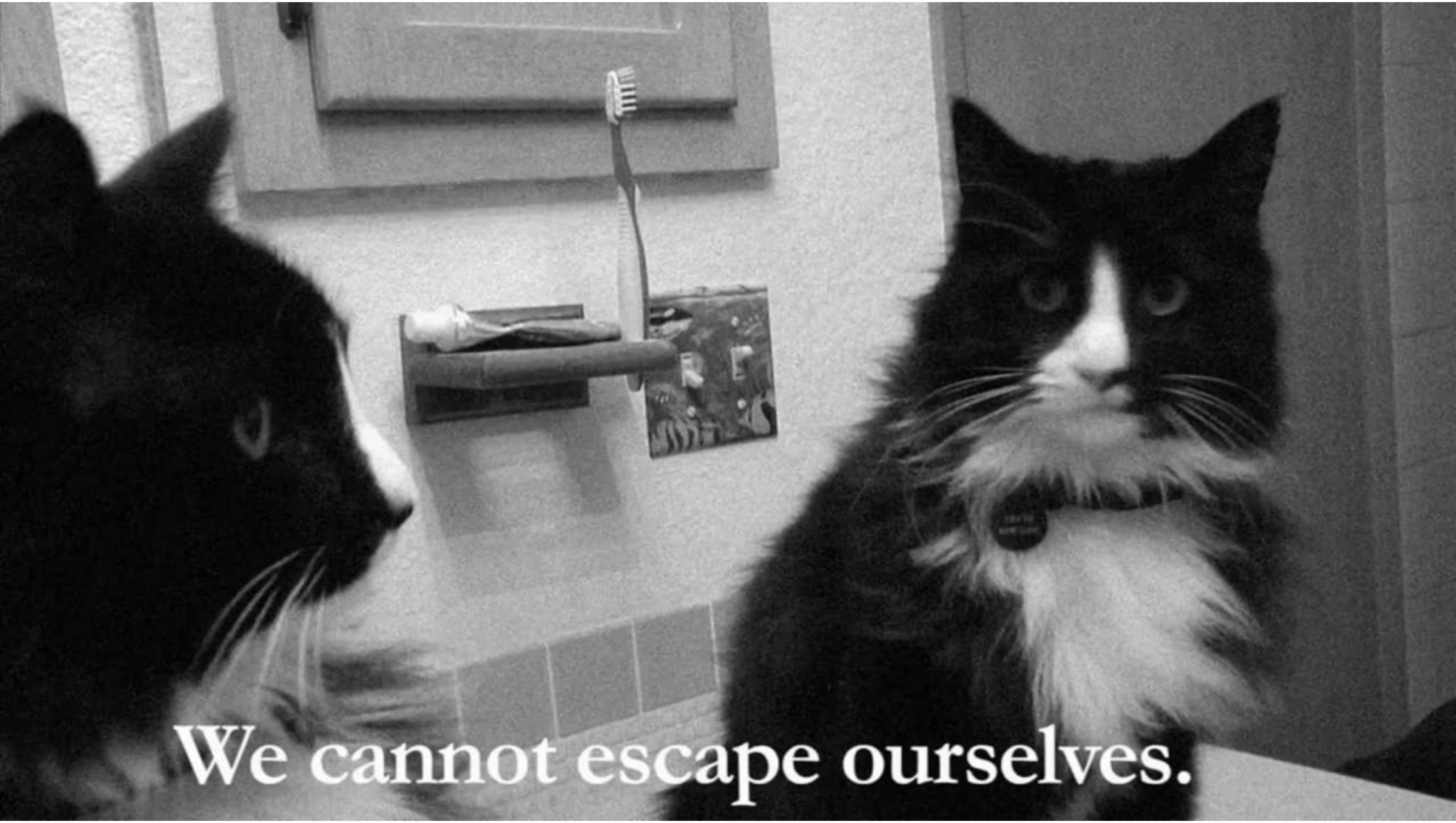
In electrical engineering, ground or earth is the reference point in an electrical circuit from which voltages are measured, a common return path for electric current, or a direct physical connection to the Earth.

Ω

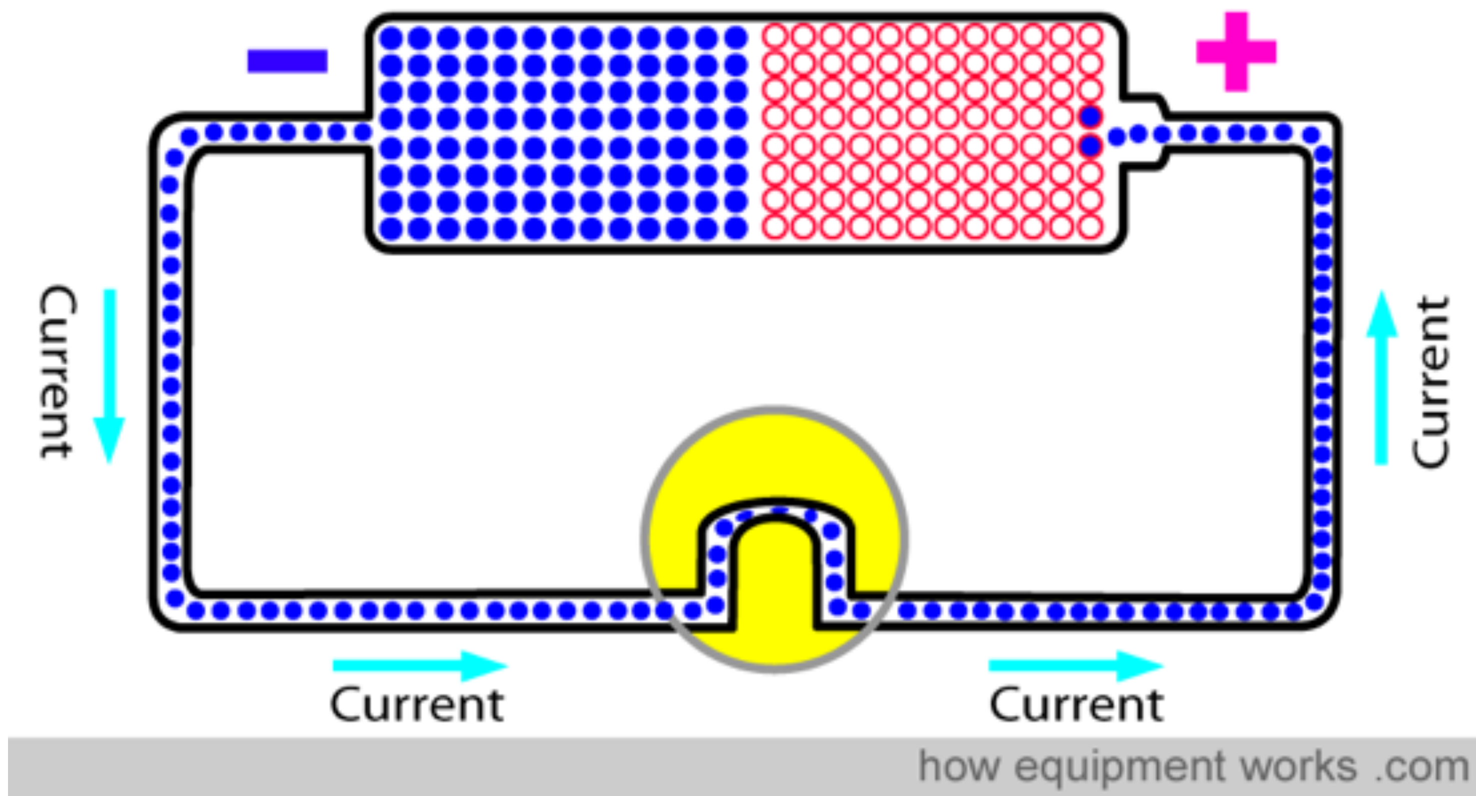
Current (I)

How fast is the voltage flowing

intensité de courant (I)



https://www.youtube.com/watch?v=Q34z5dCmC4M



Electronic Components need the voltage to be going at a specific speed, or **current** to be strong enough to power it.

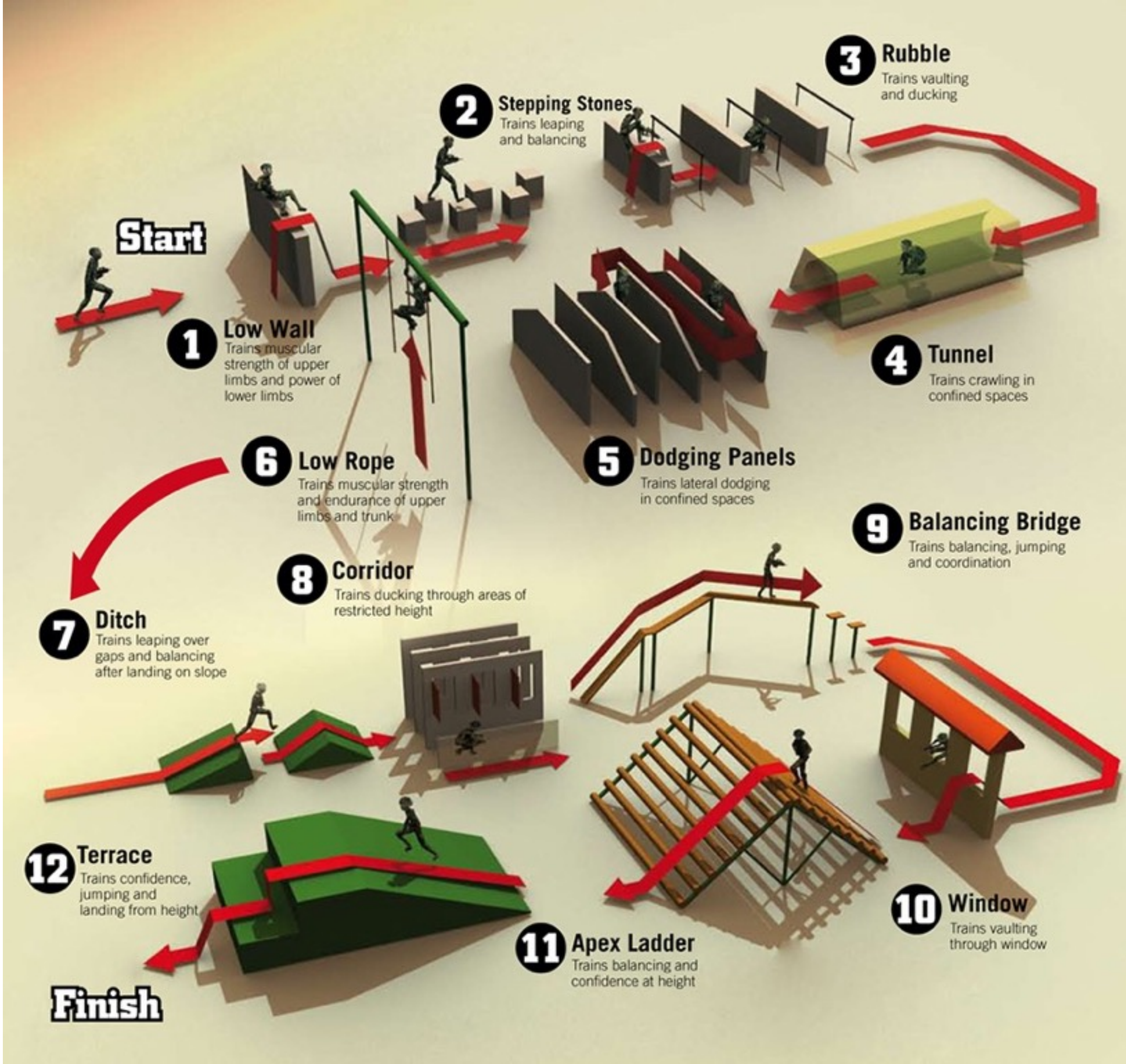
Current is measured in **Amps.** One amp is a good deal of current so often you'll see it measures in mA or milliamps

amp = milliamp / 1000

(this is similar to byes and megabytes in a computer)

Resistance (R)

How easily can the current flow?


Start
1 Low Wall
Trains muscular strength of upper limbs and power of lower limbs
2 Stepping Stones
Trains leaping and balancing
3 Rubble
Trains vaulting and ducking
4 Tunnel
Trains crawling in confined spaces
5 Dodging Panels
Trains lateral dodging in confined spaces
6 Low Rope
Trains muscular strength and endurance of upper limbs and trunk
7 Ditch
Trains leaping over gaps and balancing after landing on slope
8 Corridor
Trains ducking through areas of restricted height
9 Balancing Bridge
Trains balancing, jumping and coordination
10 Window
Trains vaulting through window
11 Apex Ladder
Trains balancing and confidence at height
12 Terrace
Trains confidence, jumping and landing from height
Finish

Ohm's law

- Ohm's law says *that the tension is equal to the product of the intensity and the resistance*

$$V = R \cdot I$$

- *This is equivalent to:*

$$I = V/R \leftrightarrow R = V/I$$

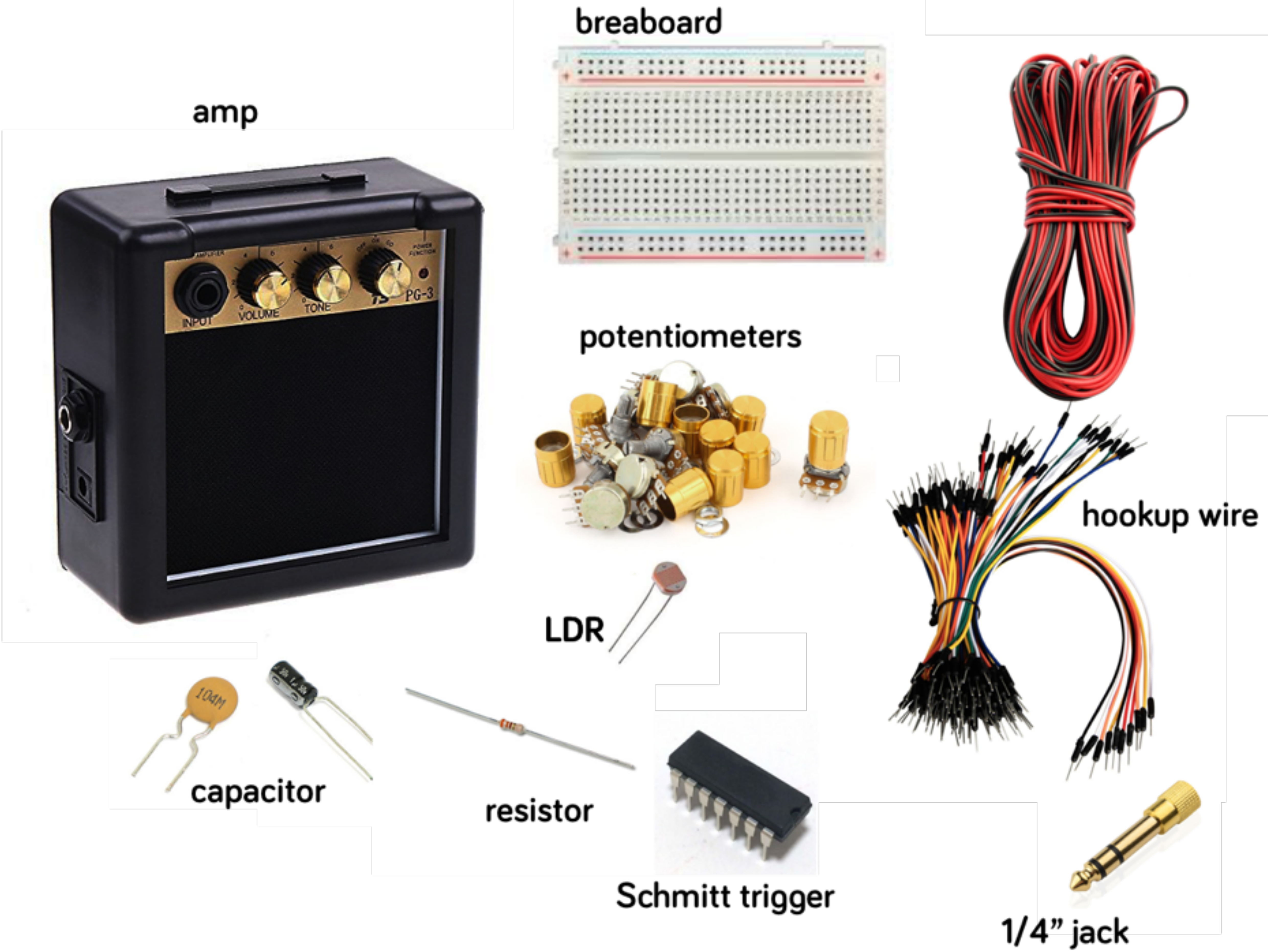
Index

Each component will use a certain amount of voltage and current

You can find out a part’s needs in its ***datasheet***

Google the name of the part, the part number written on it, and datasheet

For example: transistor 2n2222 datasheet

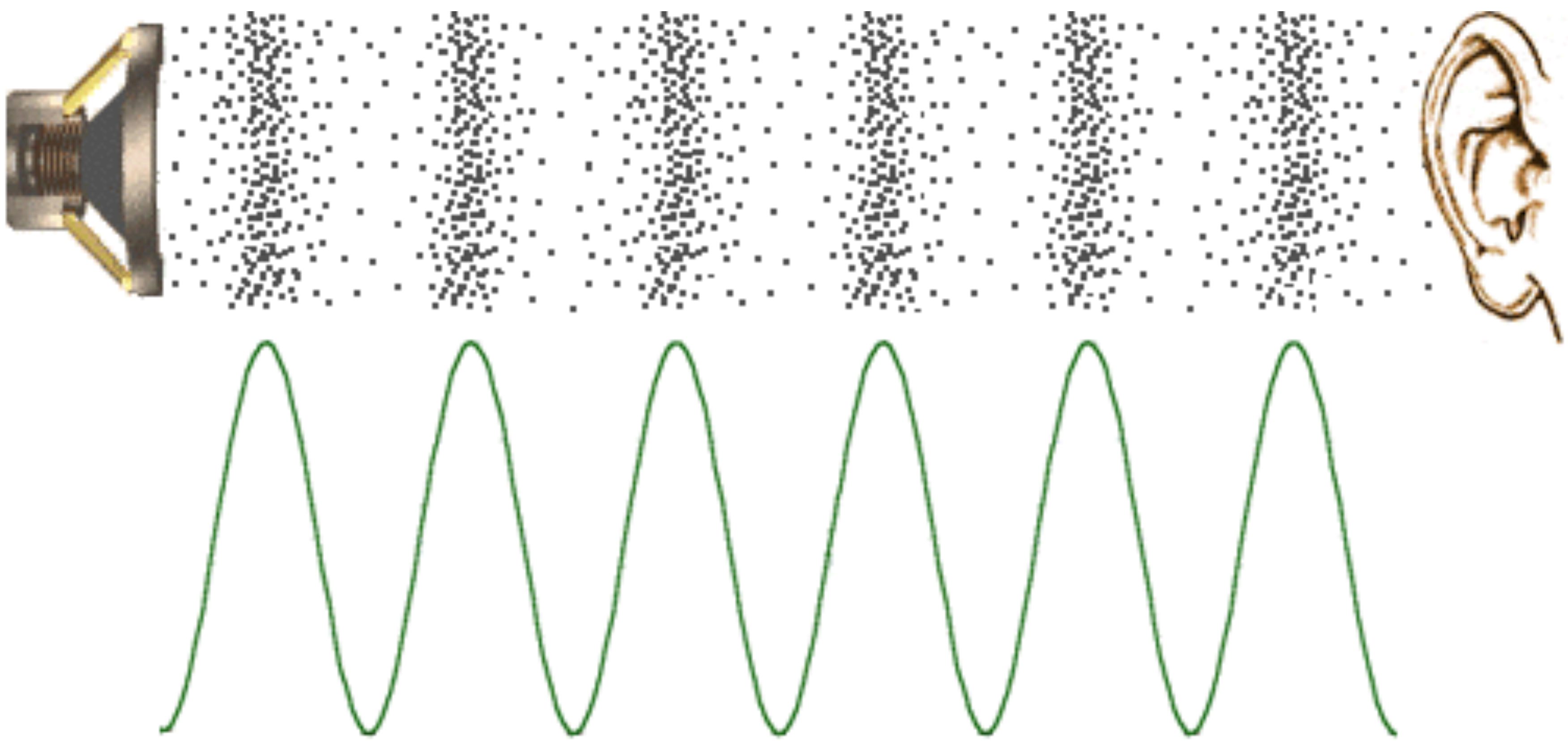

breaboard
amp
INPUT
VOLUME
TONE
PG-3
potentiometers
hookup wire
LDR
104M
capacitor
resistor
Schmitt trigger
1/4” jack

If you add electricity to a coper coil, you create a magnet field. (this is how we make motors)

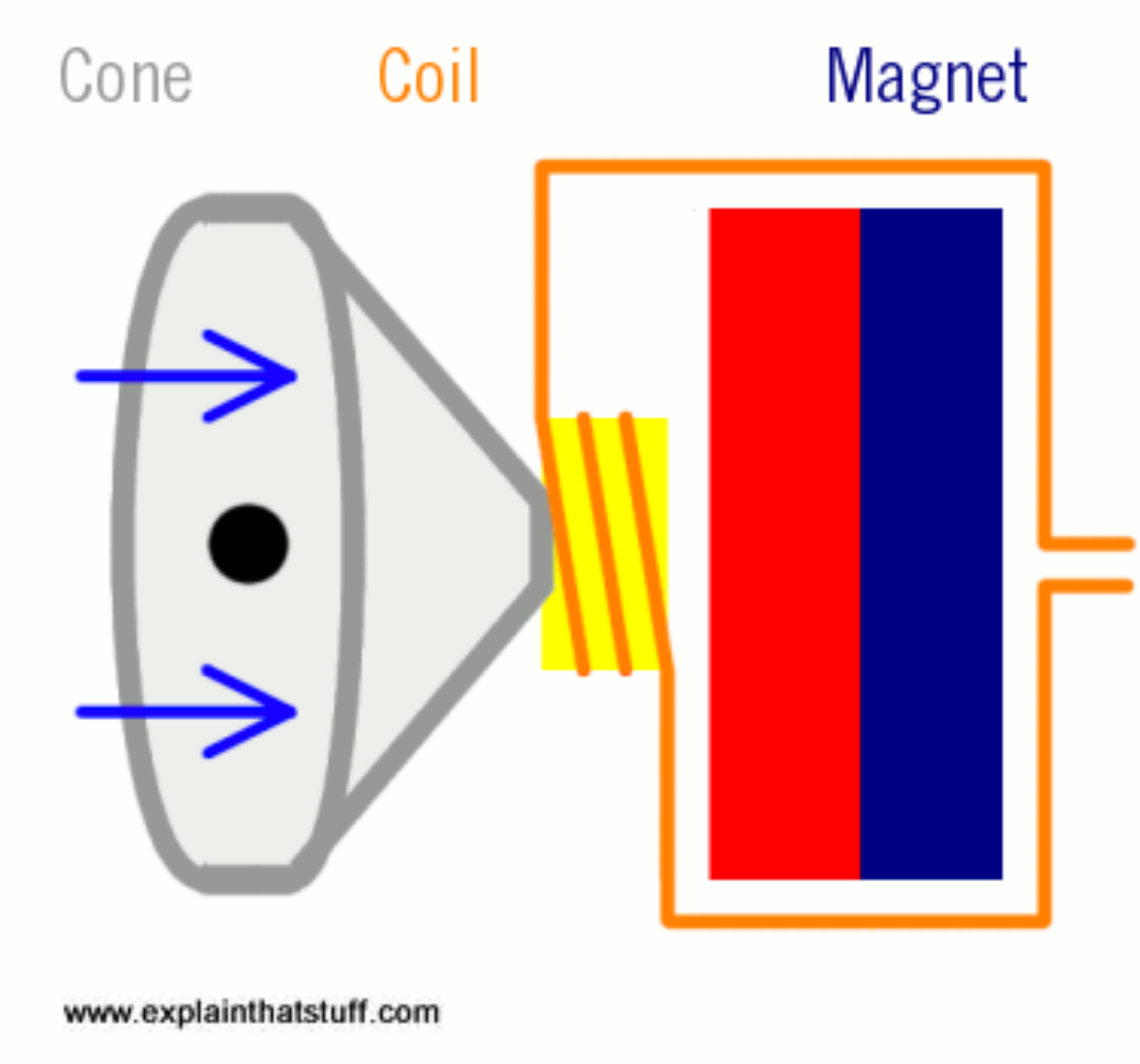
how does a speaker work?

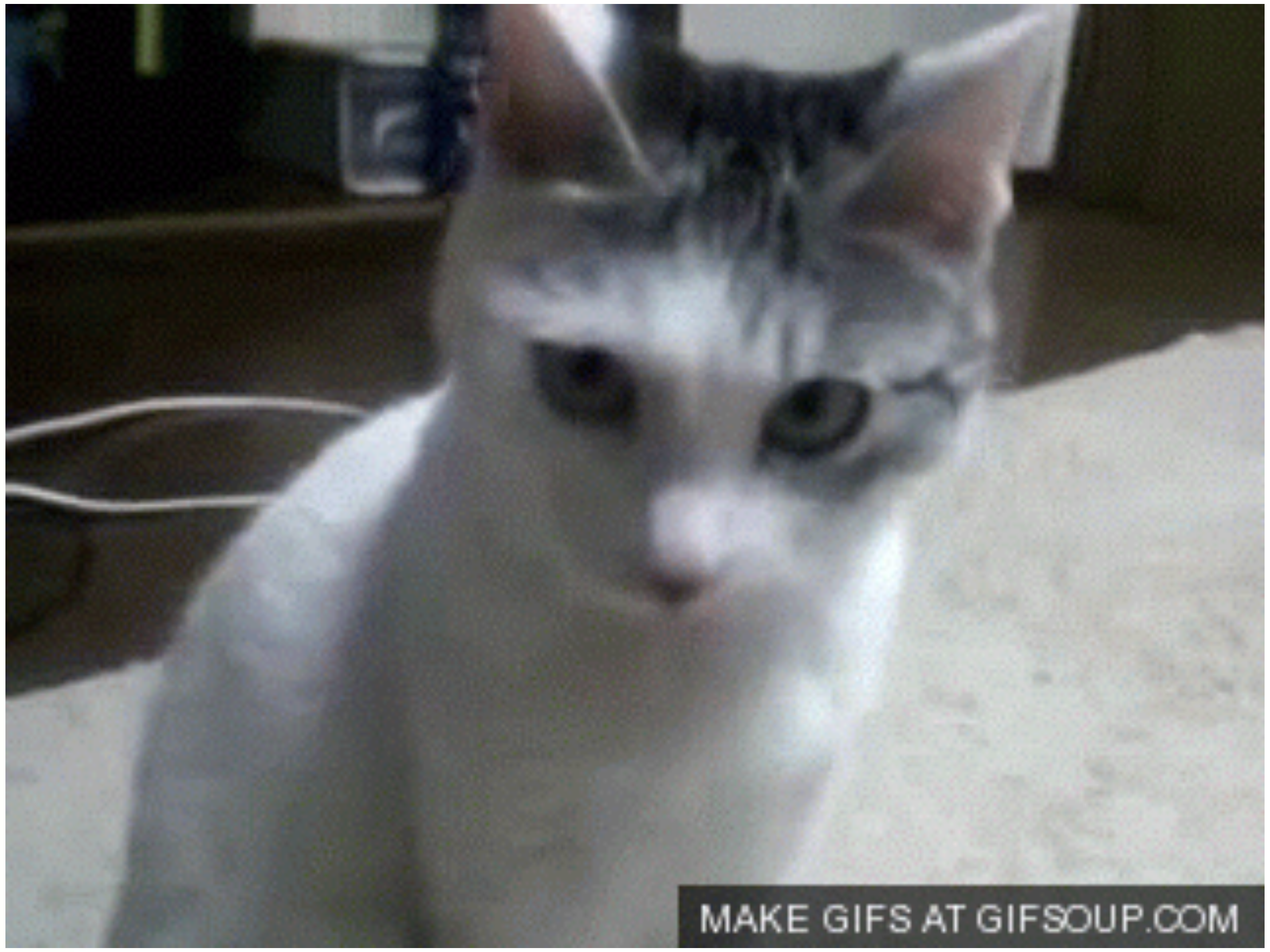
If you separate a coil and a magnet, they'll pull together when you apply current and snap out when you stop the current. This will push the air outward with a velocity.

We can hear that - we call it sound.



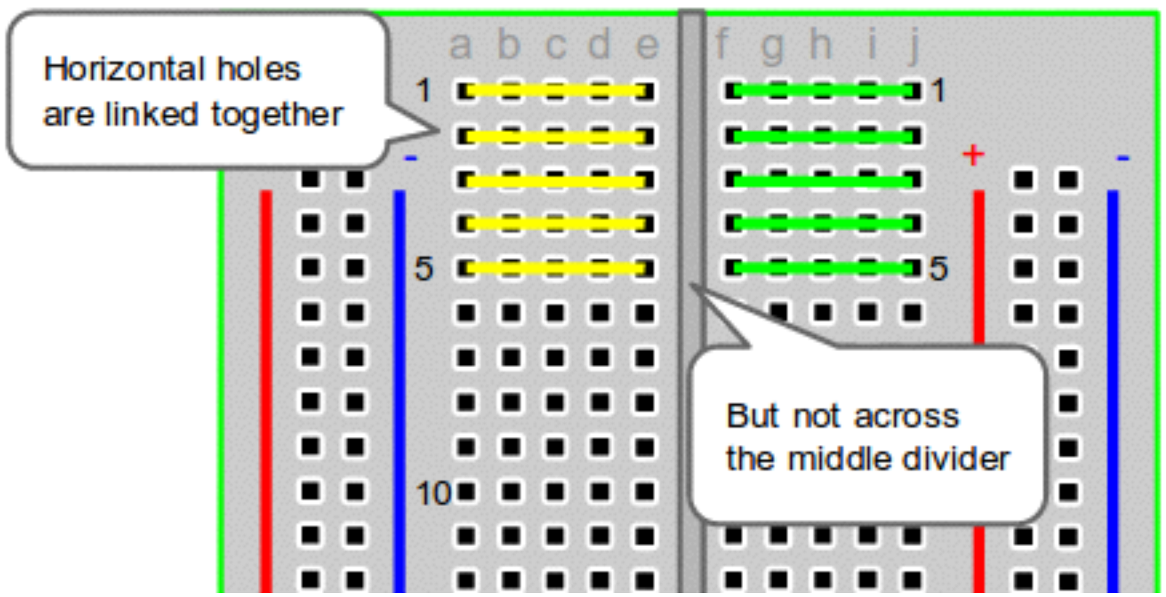
In this way we can control how fast the magnet contracts in and out using voltage. This lets us hear voltage as **sound**.

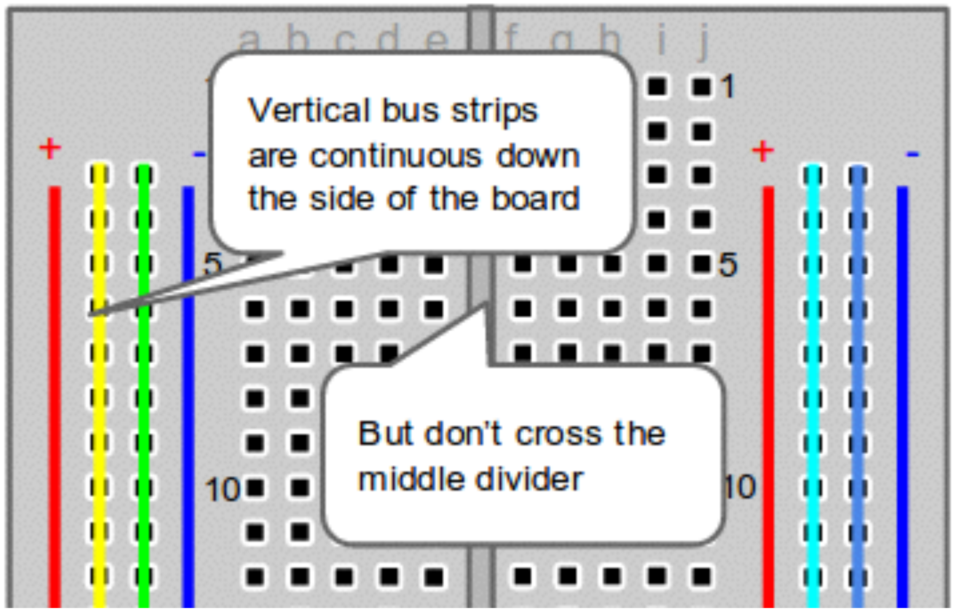




The Breadboard

linked together conductive metal strips

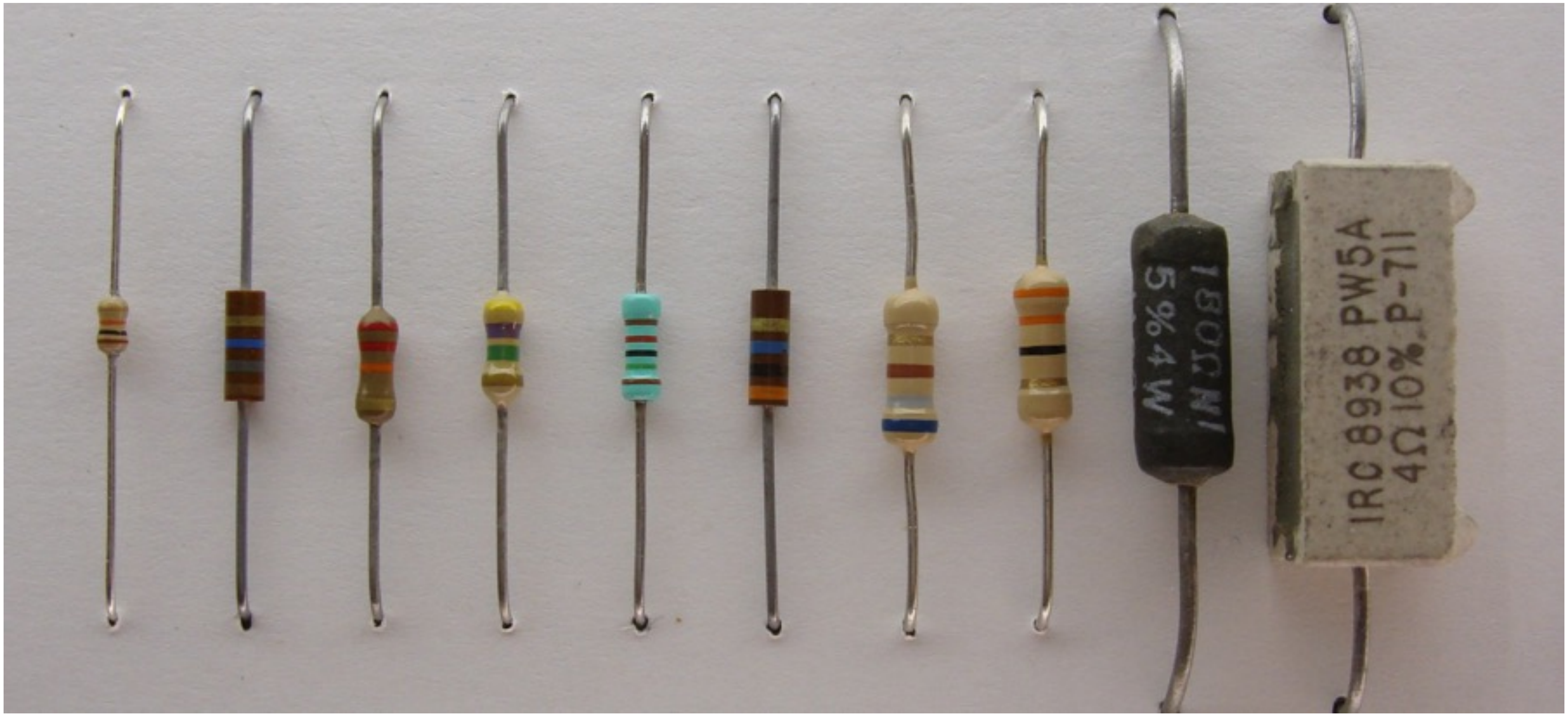




linked together conductive metal strips let the voltage flow

Resistors

dissipate voltage as heat to slow down your current and reduce your voltage.



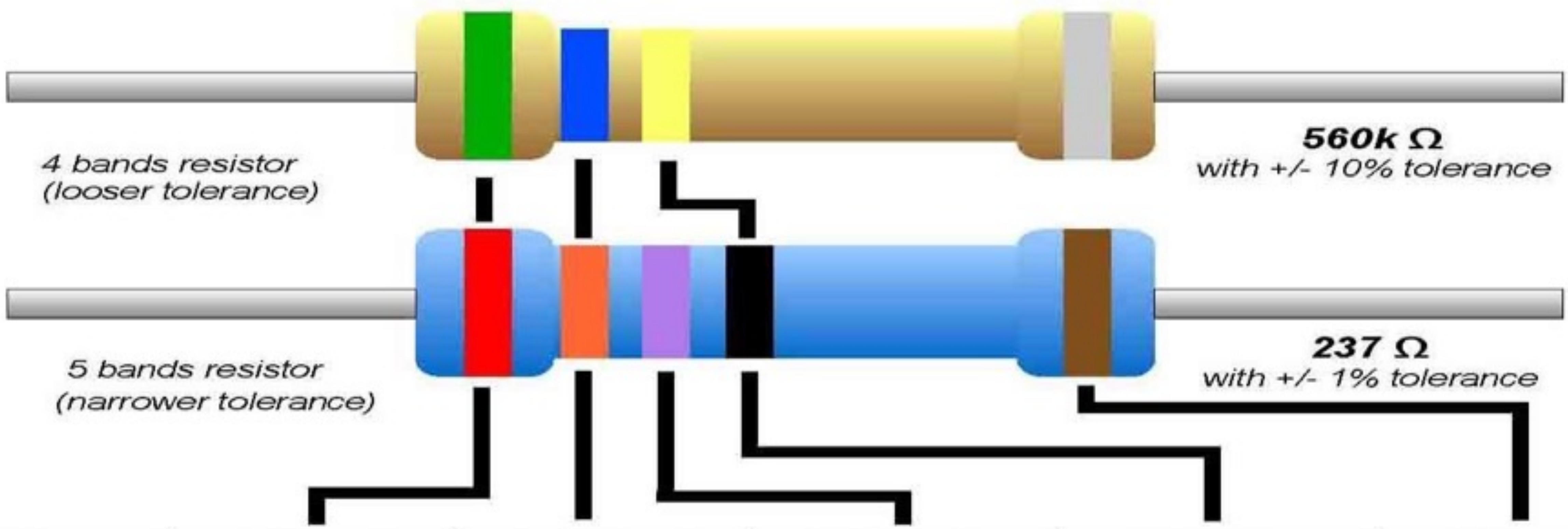
it is measured in **ohms.** Ω

Ohms

Ohms usually get a prefix

PREFIX	NAME	MEANING
T	tera	multiply by 1 000 000 000 000 (i.e. X 1012)
G	giga	multiply by 1 000 000 000 (i.e. X 109)
M	mega	multiply by 1000 000 (i.e. X 106)
k	kilo	multiply by 1 000 (i.e. X 103)
m	milli	divide by 1000 (i.e. X 10-3)
SI (μ)	micro	divide by 1 000 000 (i.e. X 10-6)
n	nano	divide by 1 000 000 000 (i.e. X10-9)
p	pico	divide by 1 000 000 000 000 (i.e. X 10-12)

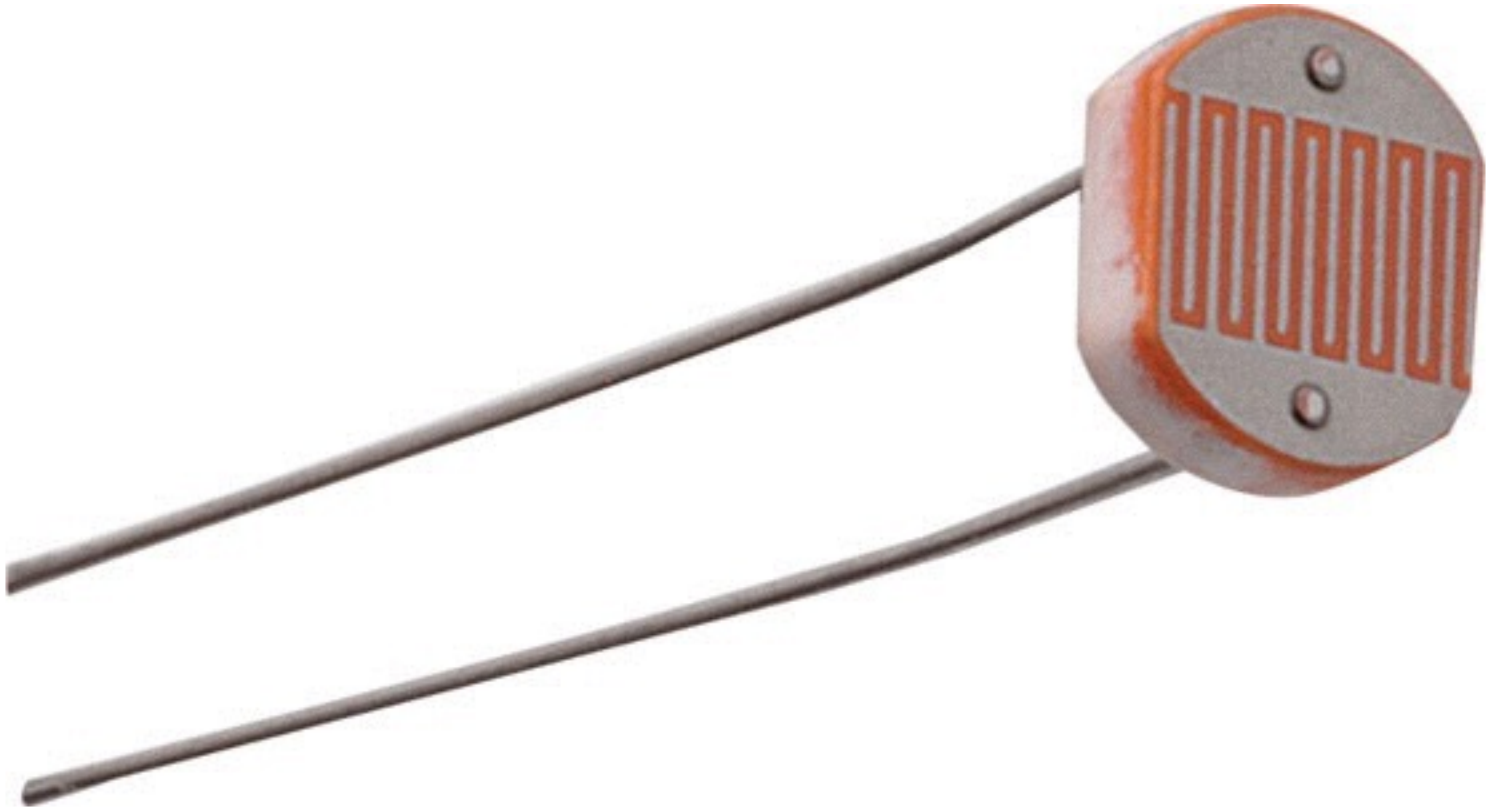
Resistor Color Code

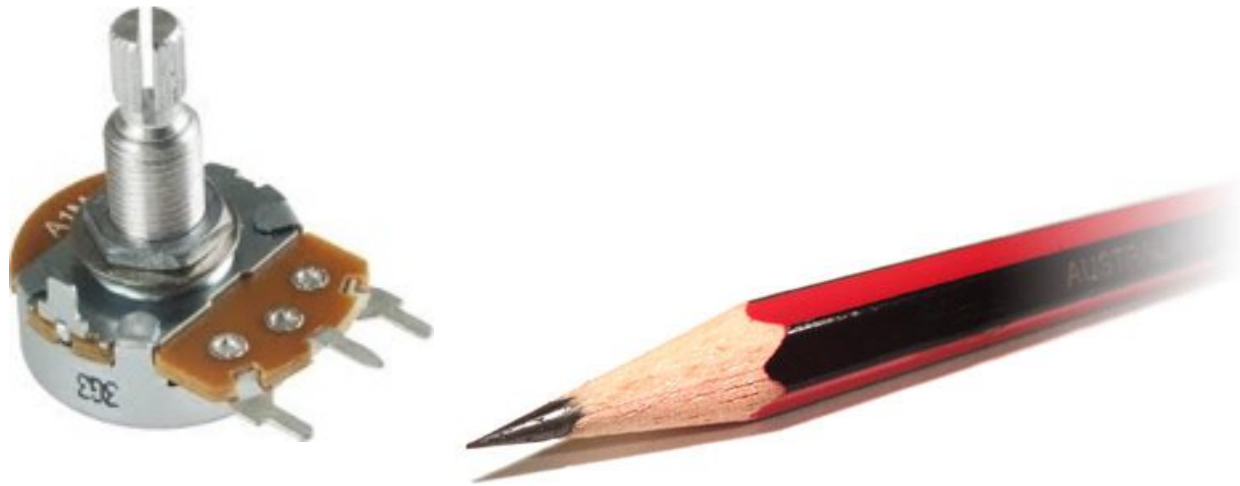


Color	1st Band	2nd Band	3rd Band	Multiplier	Tolerance
Black	0	0	0	x 1 Ω	
Brown	1	1	1	x 10 Ω	+/- 1%
Red	2	2	2	x 100 Ω	+/- 2%
Orange	3	3	3	x 1K Ω	
Yellow	4	4	4	x 10K Ω	
Green	5	5	5	x 100K Ω	+/- .5%
Blue	6	6	6	x 1M Ω	+/- .25%
Violet	7	7	7	x 10M Ω	+/- .1%
Grey	8	8	8		+/- .05%
White	9	9	9		
Gold				x .1 Ω	+/- 5%
Silver				x .01 Ω	+/- 10%

LDR (Light Dependant Resistors)

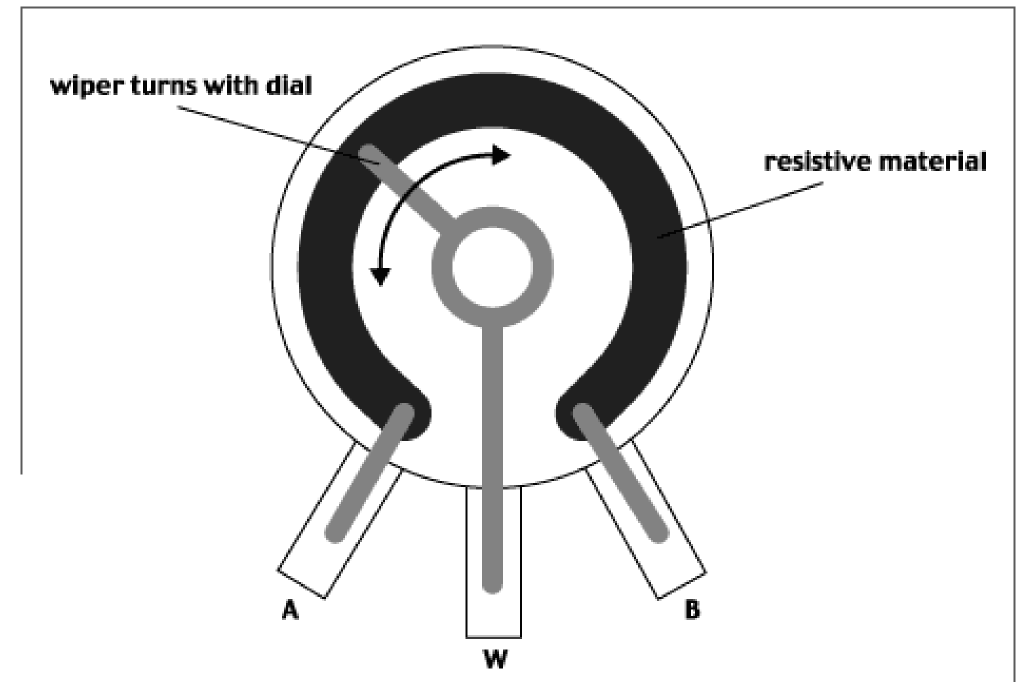
Light makes it more or less resistant, so resistance varies with light.

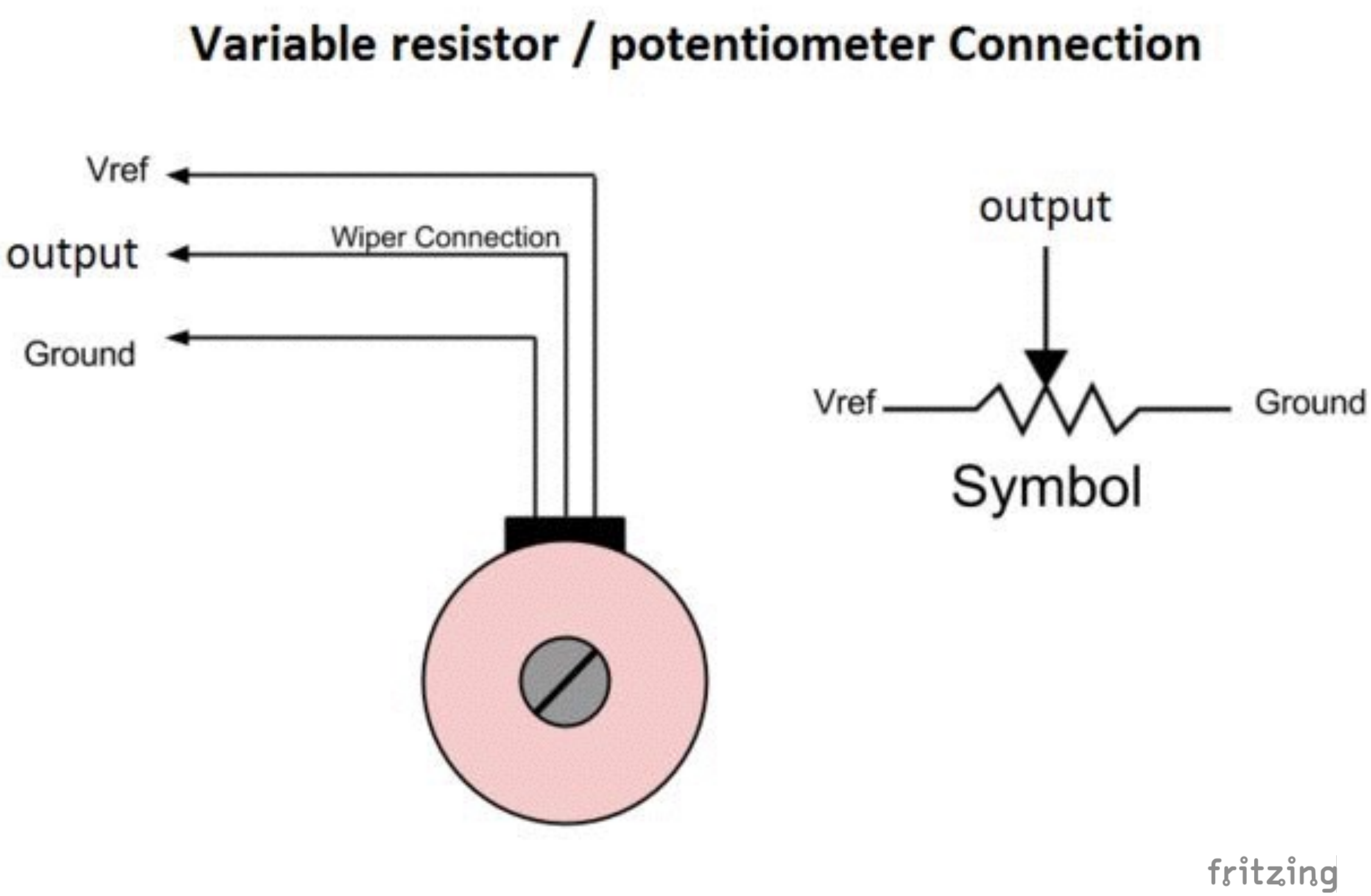


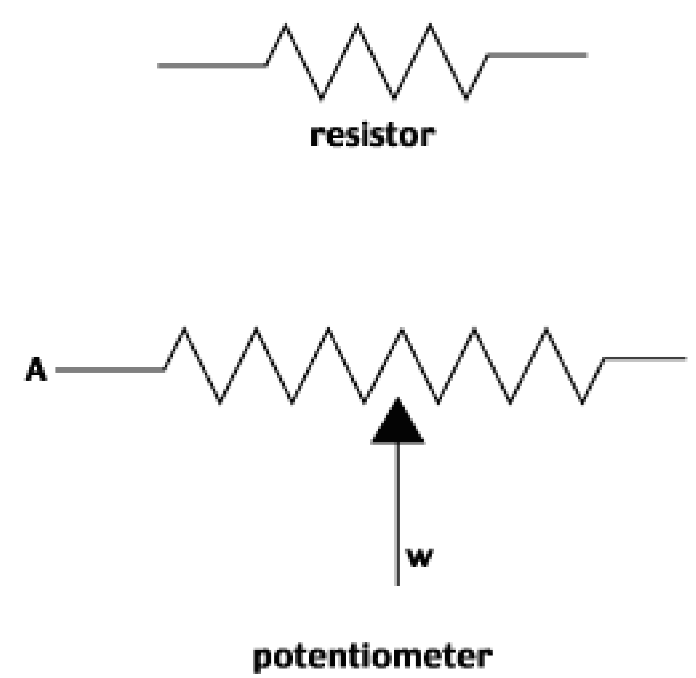


THE POTENTIOMETER

A variable resistor



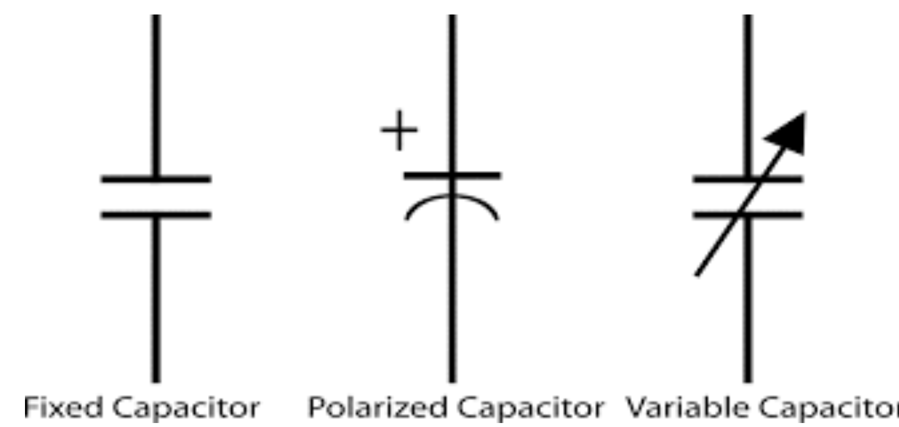




Capacitor

stores electronic current for use later.

Often used to smooth power spikes in a circuit. If it wasn't for capacitors, in your car when your speakers boomed, the car lights would dim. In our circuit, they'll smooth out the on / off square waves our oscillator makes.



Capacitors measure charge they store in farads

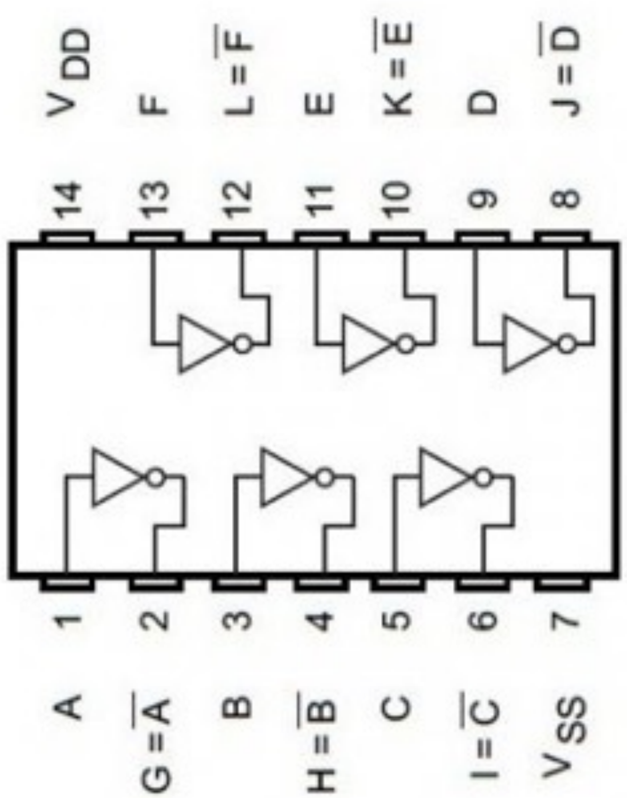
Pico Farads (pF)	Nano Farads (nF)	Micro Farads (µF)
1	0.001	0.000001
10	0.01	0.00001
100	0.1	0.0001
1000	1	0.001
10000	10	0.01
100000	100	0.1
1000000	1000	1
10000000	10000	10
100000000	100000	100

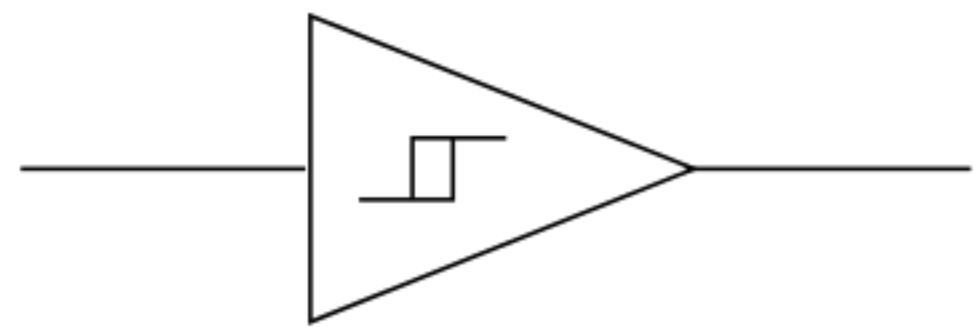
http://mechatrotutor.blogspot.com/

easy converter chart
http://www.convertunits.com/from/microfarad/to/picofarad

An Oscillator (Schmitt Trigger CD40106)

Basically when you apply voltage above a certain threshold, it flips state from off to on.





TRUTH TABLE

INPUTS	OUTPUTS
A, B, C, D,E, F	**G, H, I, J, K, L**
L	H
H	L

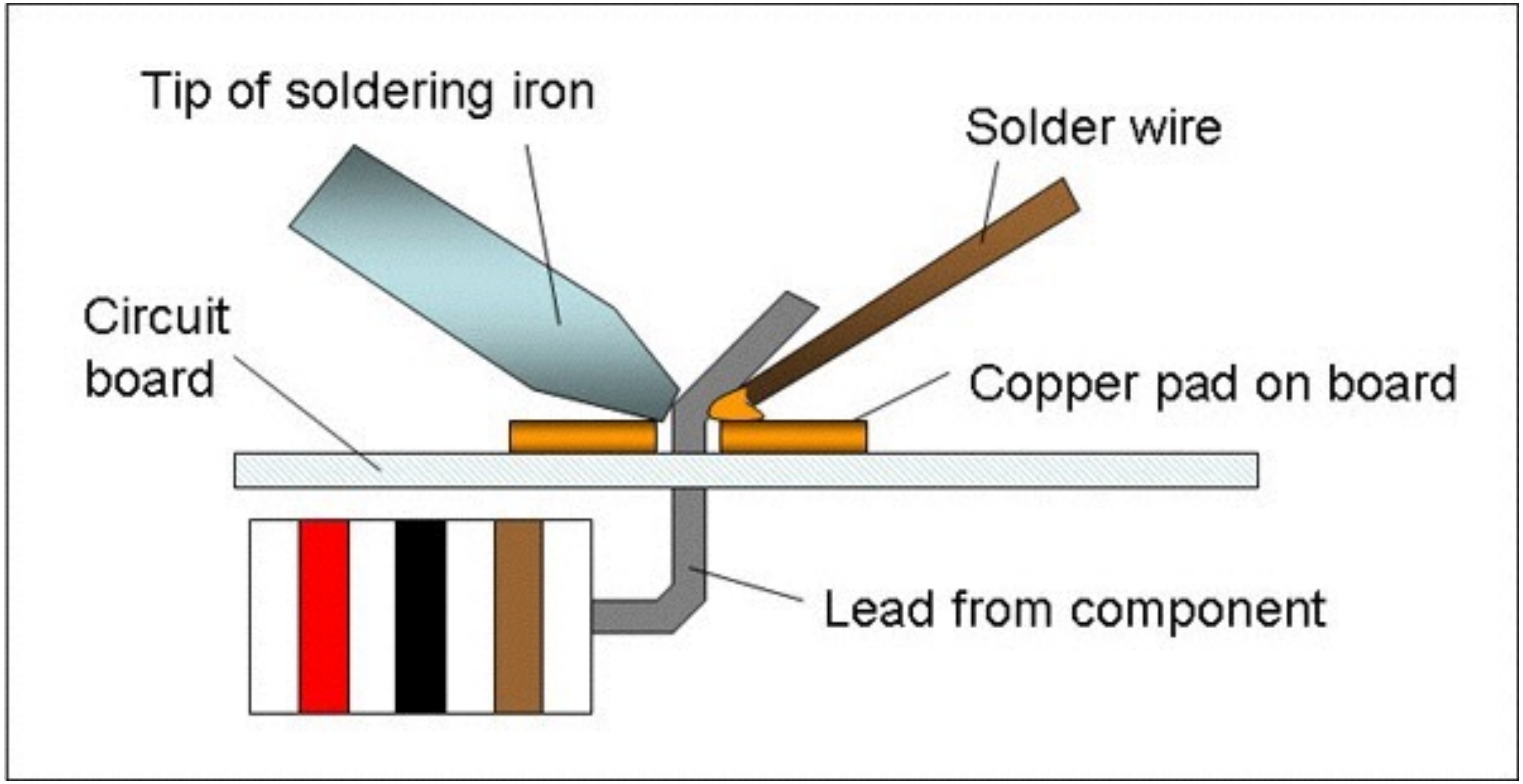
How does this make sound?

The frequency of the oscillator is controlled by the capacitor and resistor.
The **capacitor** sets the **pitch range**
The **resistor** changes the **frequency** within that range

Ranges

.1uf = high frequency
1uf = mid frequency
10uf = low frequency

How to solder



NOW SOUND!

MUSIC

"Nicolas Collins wants to tear apart your CD player."
—*WIRED* magazine

"Nic Collins' book passes the torch of home-brew electronics to the next generation of musical experimentalists. Providing practical and fun recipes for sonic adventures, it simultaneously introduces the reader to the past and present field of electronic sound art."
—**CHRIS BROWN**, Mills College Center for Contemporary Music

"This is a terrific, unique, and much needed book; I wish I had it fifteen years ago."
—**DAN TRUEMAN**, Princeton Laptop Orchestra, Princeton University

"The most radical music book I've read so far this year. This jargon-free text offers a fresh alternative to the usual instruments prized by the music business."
—**CHRISTOPHER DELAURENTI**, *The Stranger*, Seattle

Handmade Electronic Music: The Art of Hardware Hacking provides a long-needed, practical, and engaging introduction to the craft of making—as well as creatively cannibalizing—electronic circuits for artistic purposes. With a sense of adventure and no prior knowledge, the reader can subvert the intentions designed into devices such as radios and toys to discover a new sonic world. At a time when computers dominate music production, this book offers a rare glimpse into the core technology of early live electronic music, as well as more recent developments at the hands of emerging artists. In addition to advice on hacking found electronics, the reader learns how to make contact microphones, pickups for electromagnetic fields, oscillators, distortion boxes, and unusual signal processors cheaply and quickly.

This revised and expanded second edition is extensively illustrated and includes a DVD featuring 87 video clips and 20 audio tracks by over 100 hackers, benders, musicians, artists, and inventors from around the world, as well as 13 video tutorials demonstrating projects in the book. Further enhancements include additional projects, photographs, diagrams, and illustrations.

Nicolas Collins, an active composer and performer of electronic music, and has worked with John Cage, Alvin Lucier, David Tudor, and many other masters of modern music. Dr. Collins is Professor of Sound at The School of the Art Institute of Chicago, and has led hacking workshops around the world. He has been Visiting Artistic Director of STEIM (Amsterdam) and a DAAD composer-in-residence in Berlin. Since 1997 he has been editor-in-chief of Leonardo Music Journal.

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Cover photo: Three of 42 circuits from "Crash and Bloom," Douglas Irving Repetto. © Douglas Irving Repetto. Used by Permission.

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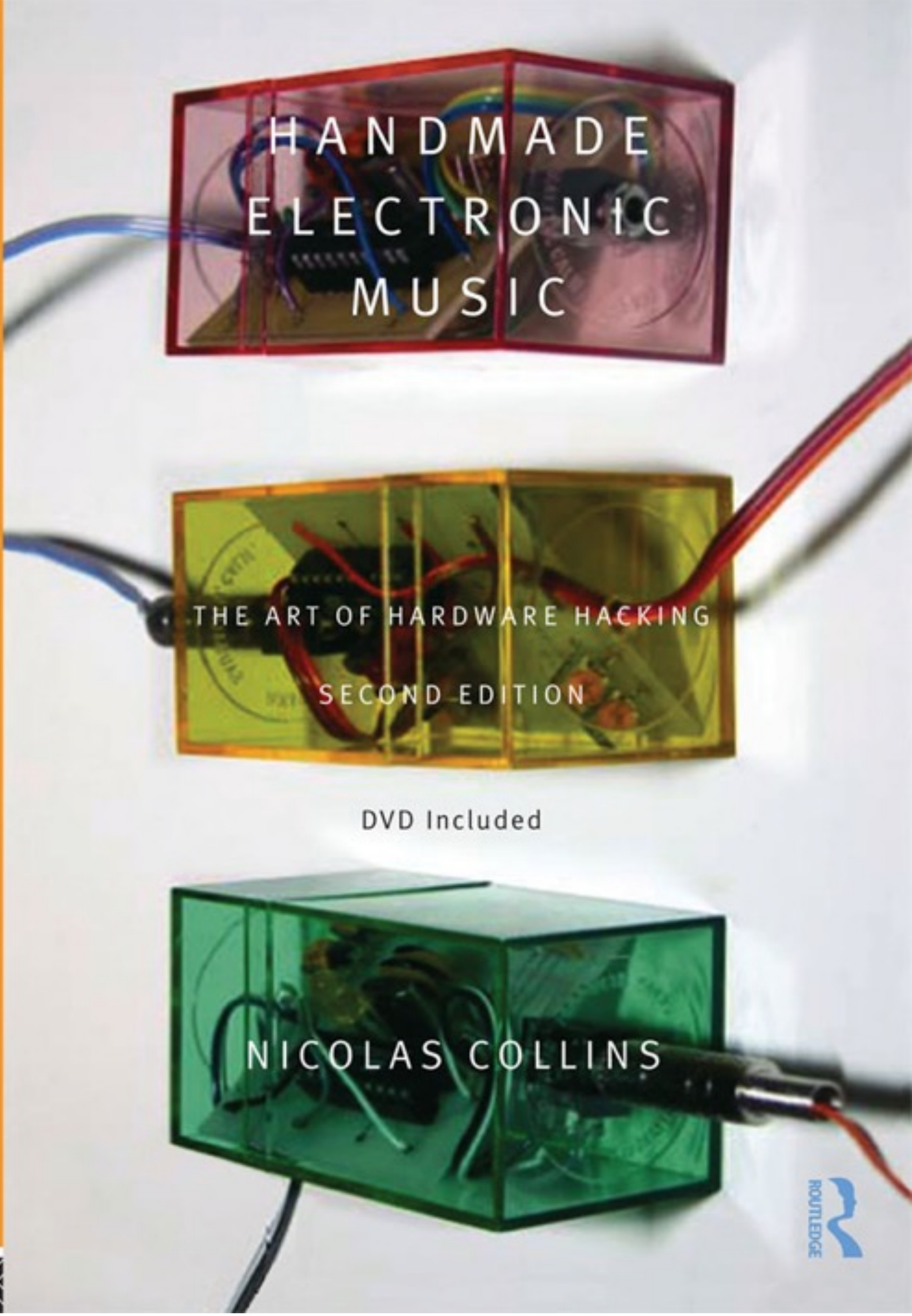
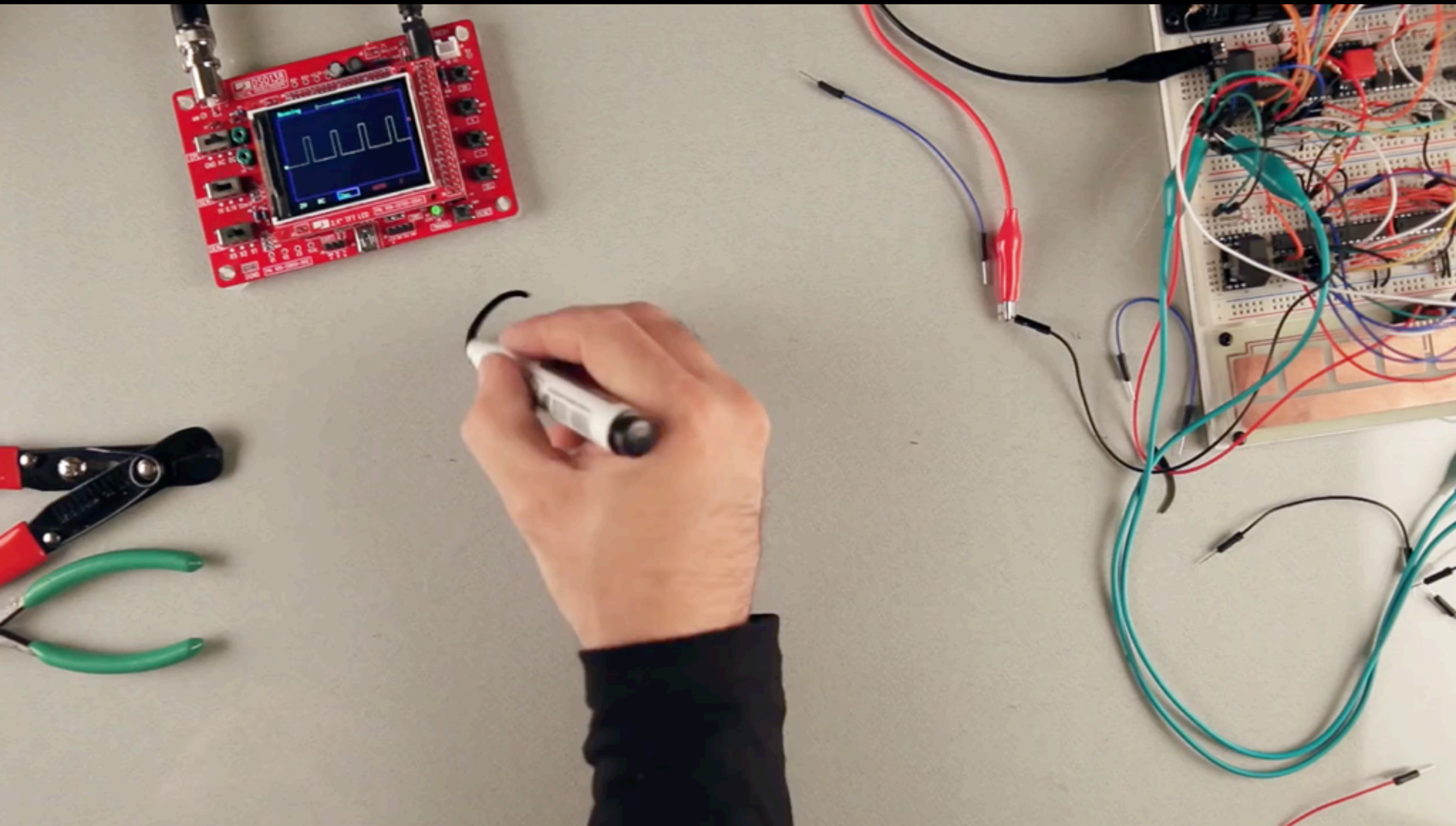
COLLINS HANDMADE ELECTRONIC MUSIC SECOND EDITION Routledge





https://www.youtube.com/watch?v=FaoJaLmZaL4

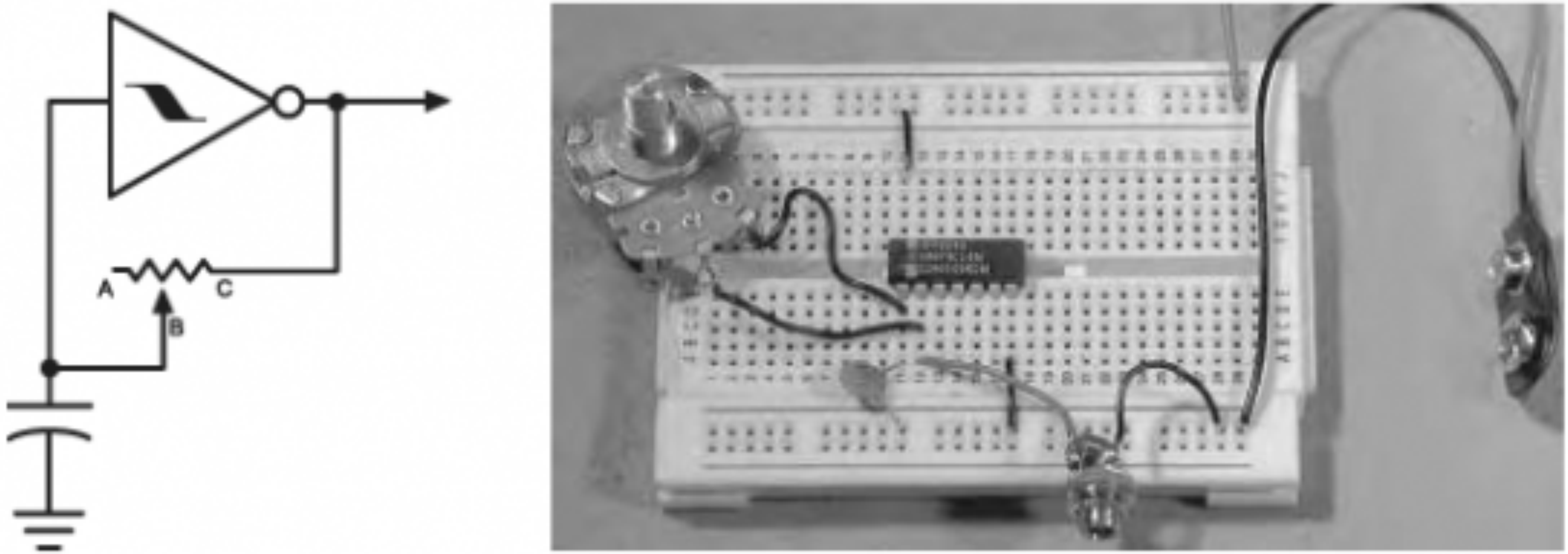
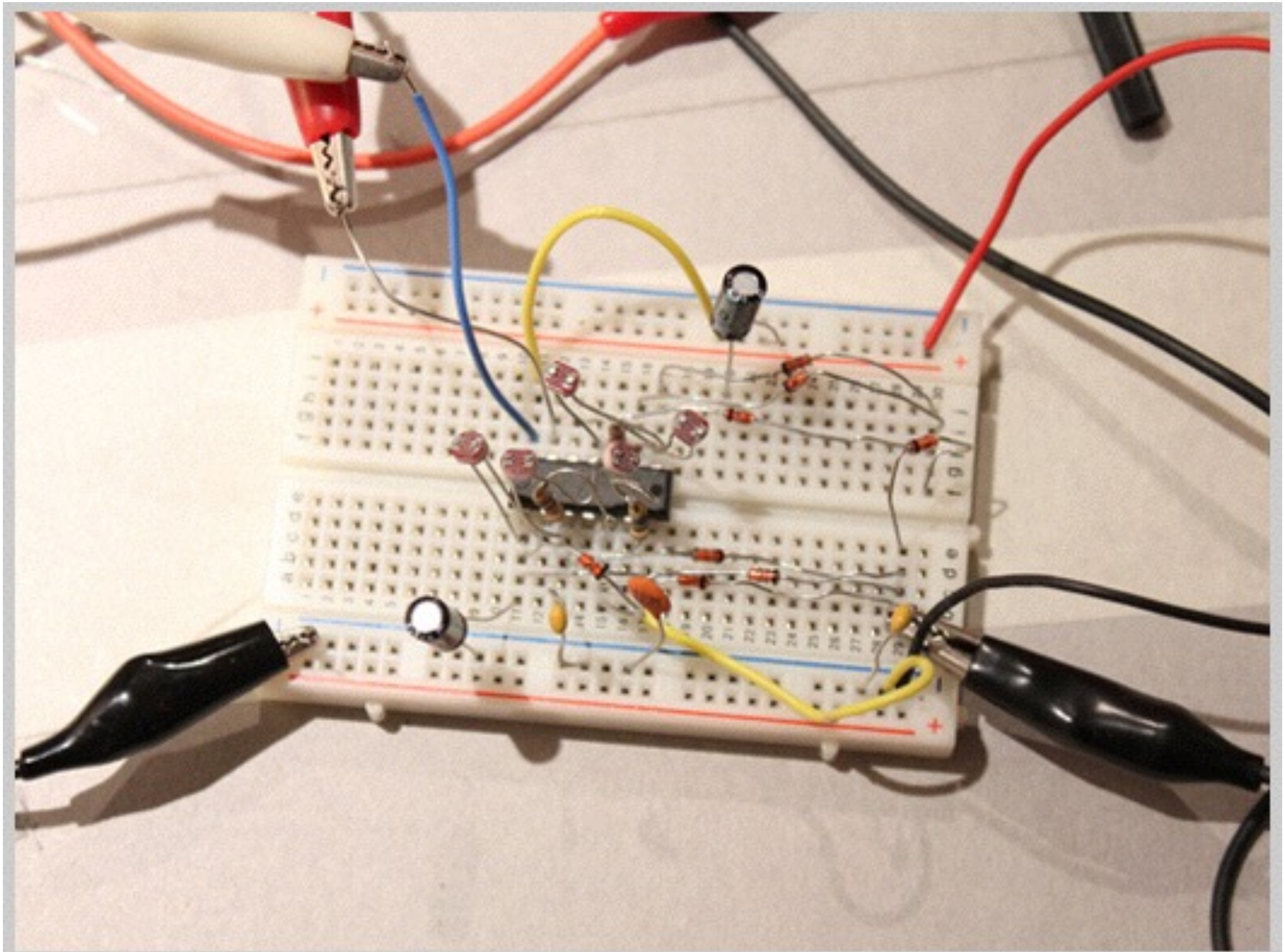
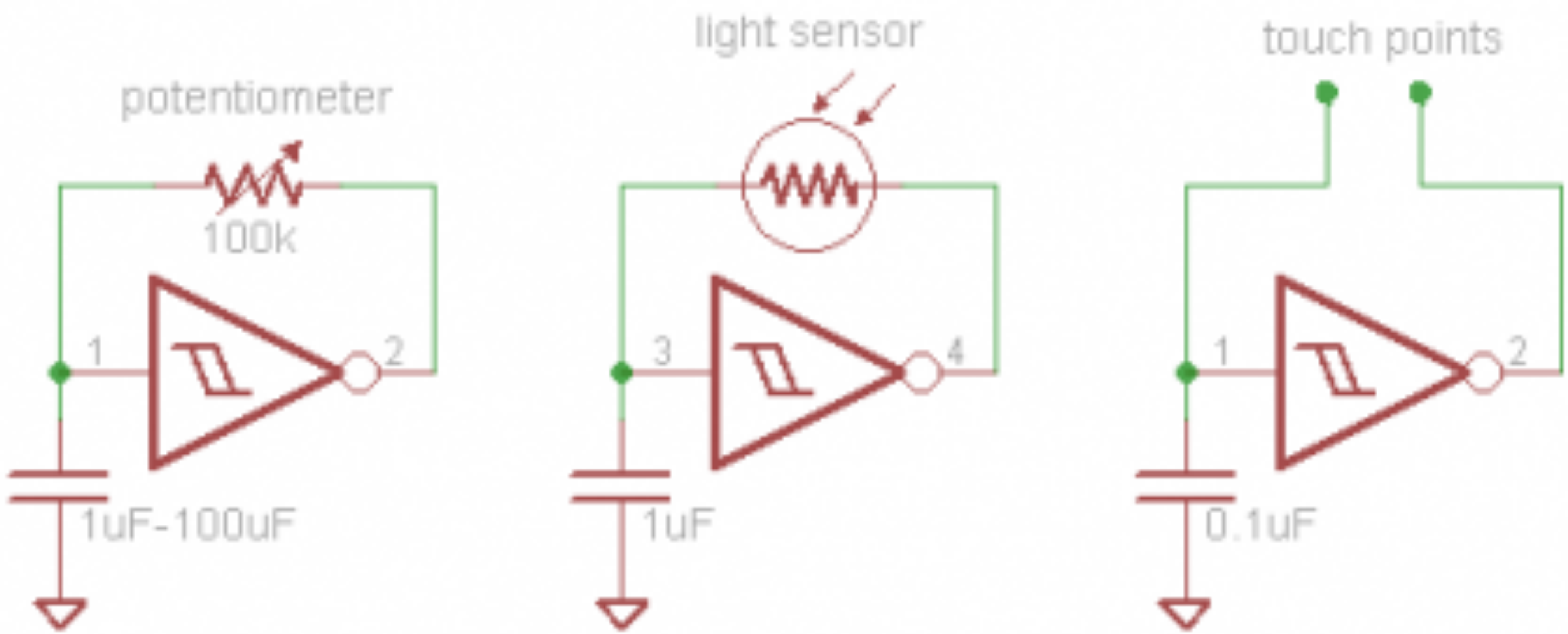


Figure 18.9 Potentiometer-controlled oscillator: schematic and photo.

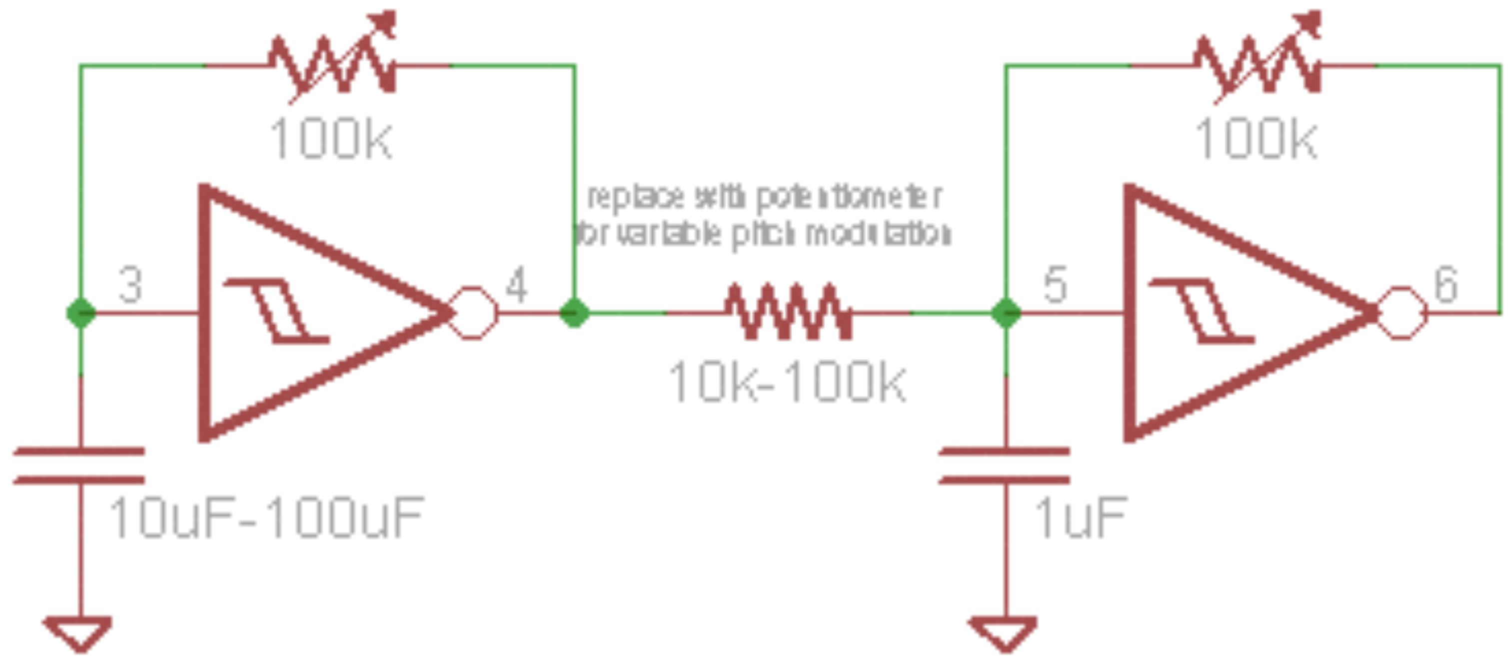


3 possible circuits

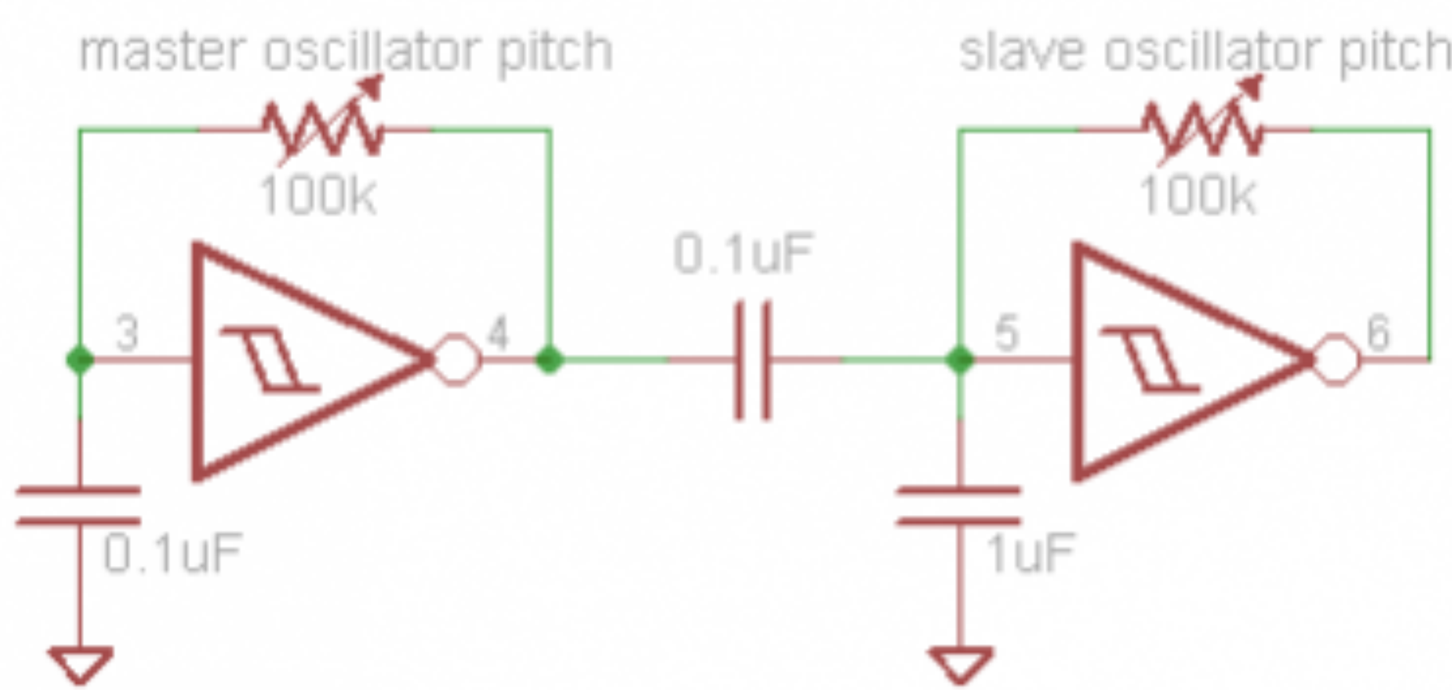


Circuits via Nicolas Collins & Casper Electronics

SIMPLE PITCH MODULATION



SYNCING OSCILLATORS



next steps

http://casperelectronics.com/finished-pieces/omsynth-minilab/omsynth-video-tutorials/video-1-oscillators/