Fundamentals of Physical Computing

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Plan for Today

- Documentation, Discussion List and Office Hours
- Imagined Physical Computing
- Electricity
- Electronics
- Programming
- Readings & Assignments

Documentation and Discussion List

- Documentation for each lab and project
  - describe what you did, how you did it, pictures, video, code
  - tell the story of the assignment, don't leave out what went wrong either
- Discussion List -> Sign Up!
  - http://groups.google.com/group/fun-of-pcomp-2010

~~Office~~ Lab Hours

- Tuesday 4 - 6 pm

  ...may change depending upon the week, let me know what you need

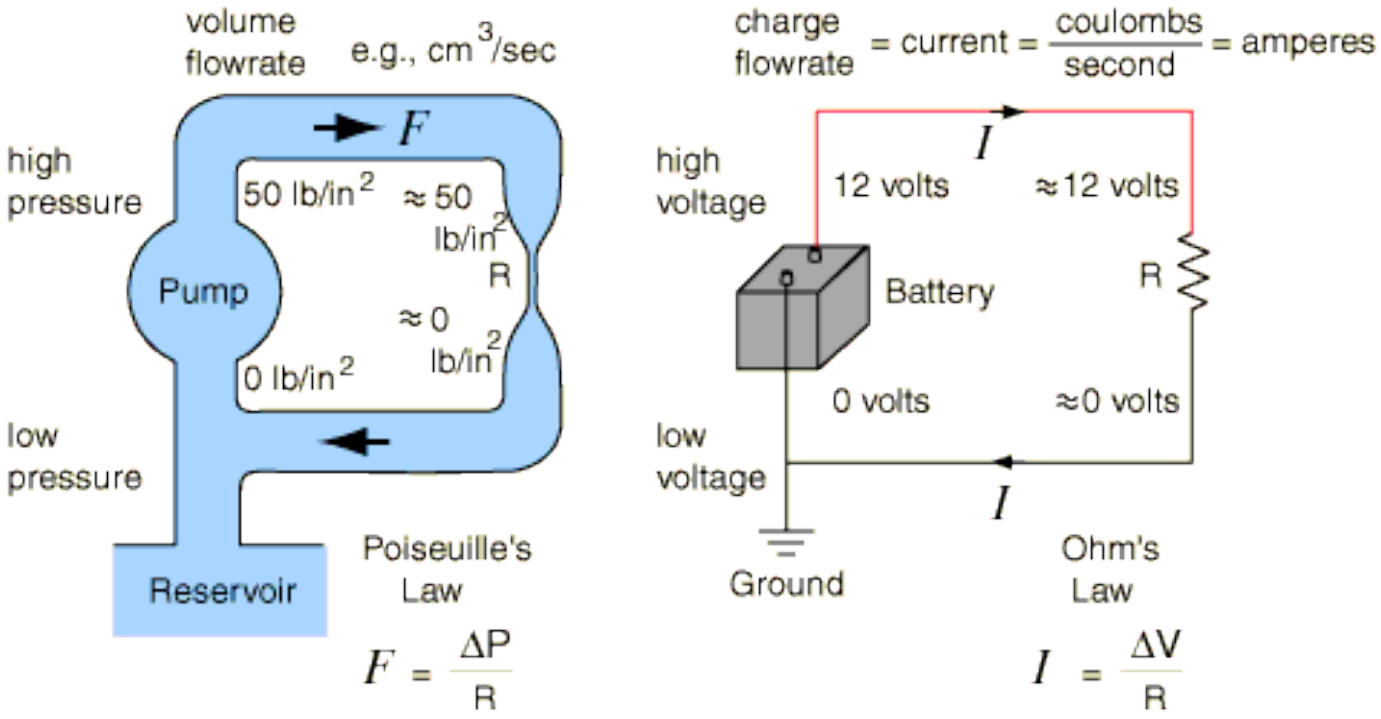
Imagined Physical Computing

Electricity

Electricity is:

- The flow of electrons through conductive material
- only recently known
- totally invisible
- pervasive throughout the universe

Water Analogy



Current

- magnitude of the flow of the electrons in the circuit

- think speed

Current

Voltage

- a measure of the electrical energy in a circuit

- think pressure

Voltage is like pressure

Resistance

- measure of a material's ability to oppose the flow of electricity

- think impediments

Resistance

Ohm’s Law

- The relationship between voltage, current and resistance

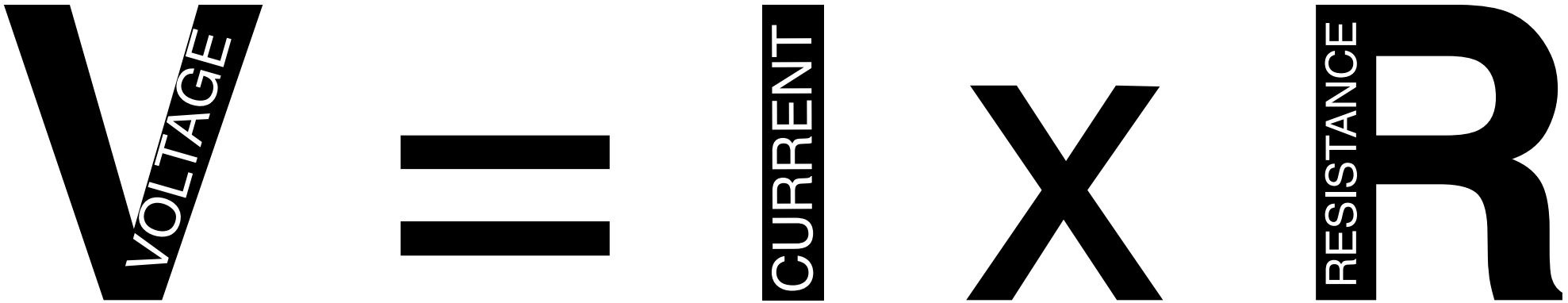
- know two to find the other

- I = V/R

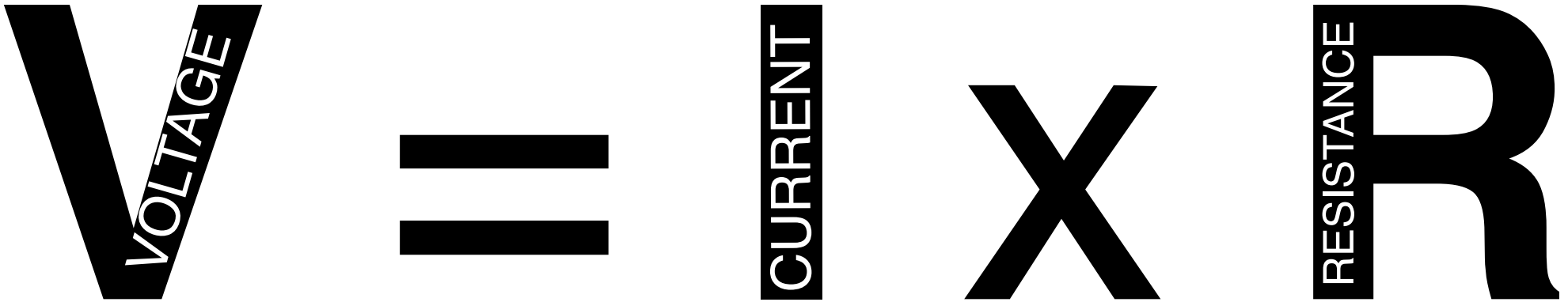
Ohm's Law

$$V = I \times R$$

Ohm's Law



Ohm's Law



$$I = V / R$$

$$R = V / I$$

Flow *
Resistance =
Pressure

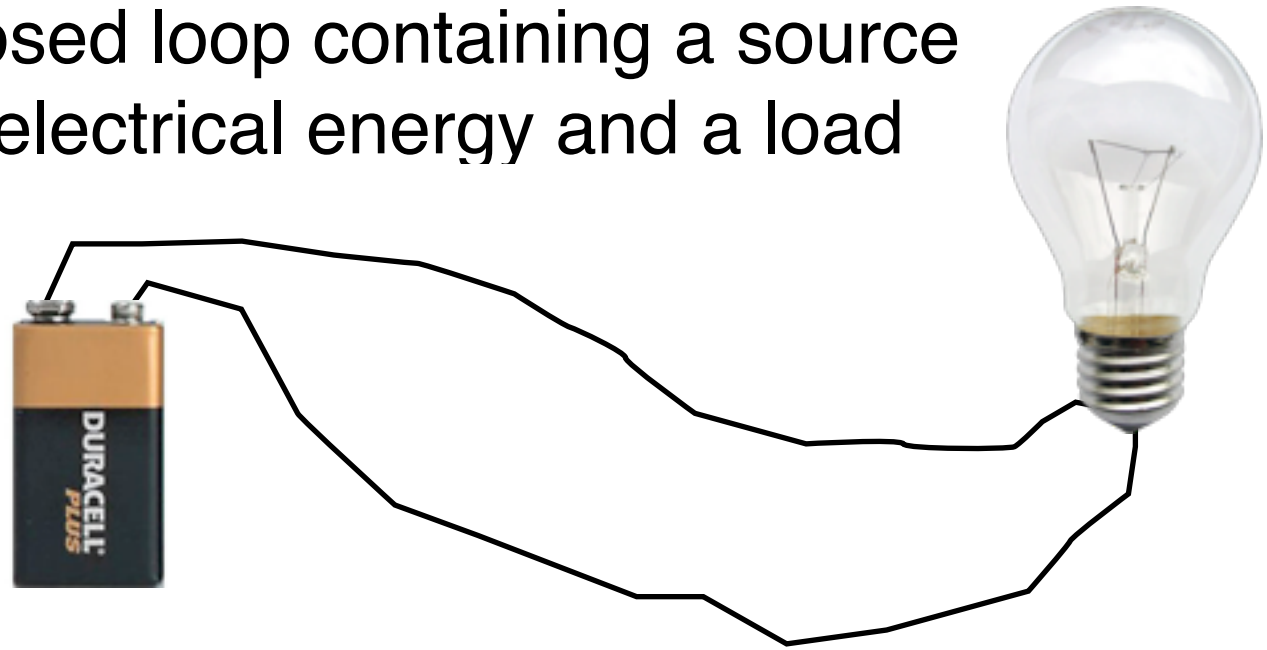
Circuit

Circuit

a closed loop containing a source
of electrical energy and a load

Circuit

a closed loop containing a source
of electrical energy and a load



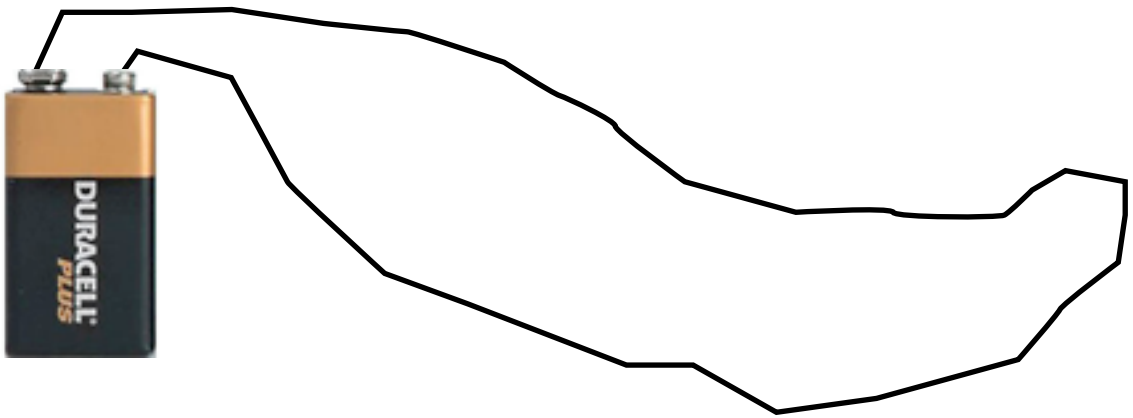

SHORT
Circuit

SHORT Circuit

a circuit with no load

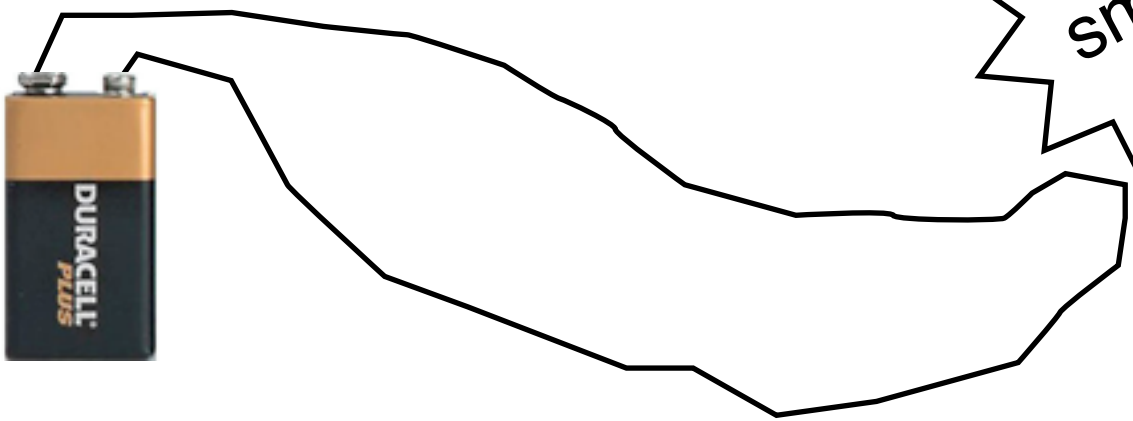
SHORT Circuit

a circuit with no load



SHORT Circuit

a circuit with no load



smoke!

exploding batteries!

melted wires!

Direct Current

- DC flows in one direction to get work done

Alternating Current

- AC flow is reversed in a regular cycle

Electronics

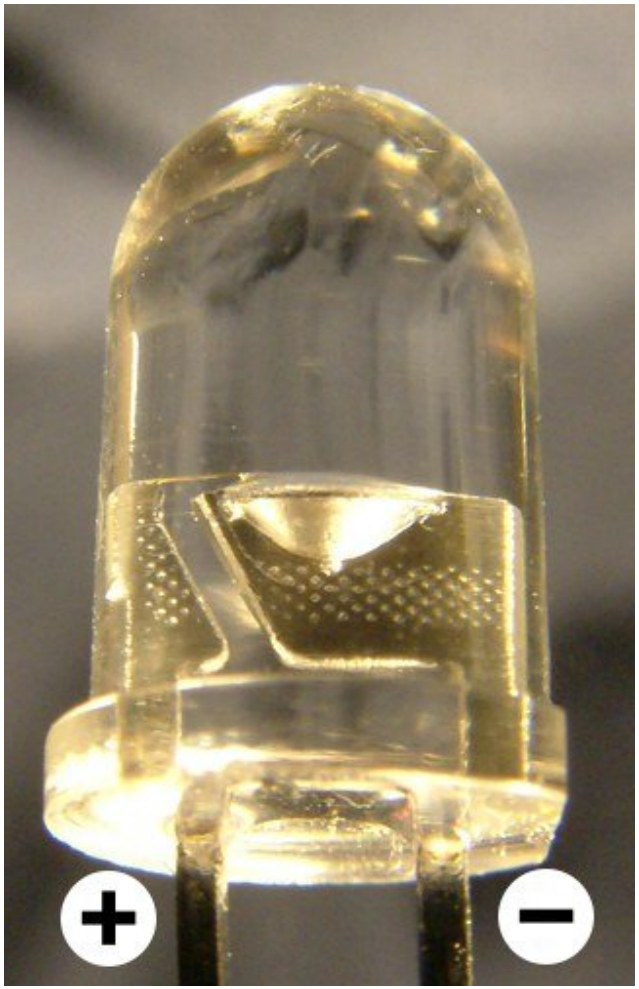
Electronics is:

- using changing electrical properties to convey information
- barely newer than our understanding of electricity
- pervasive throughout the modern world
- pervasive throughout our environments
- easy!

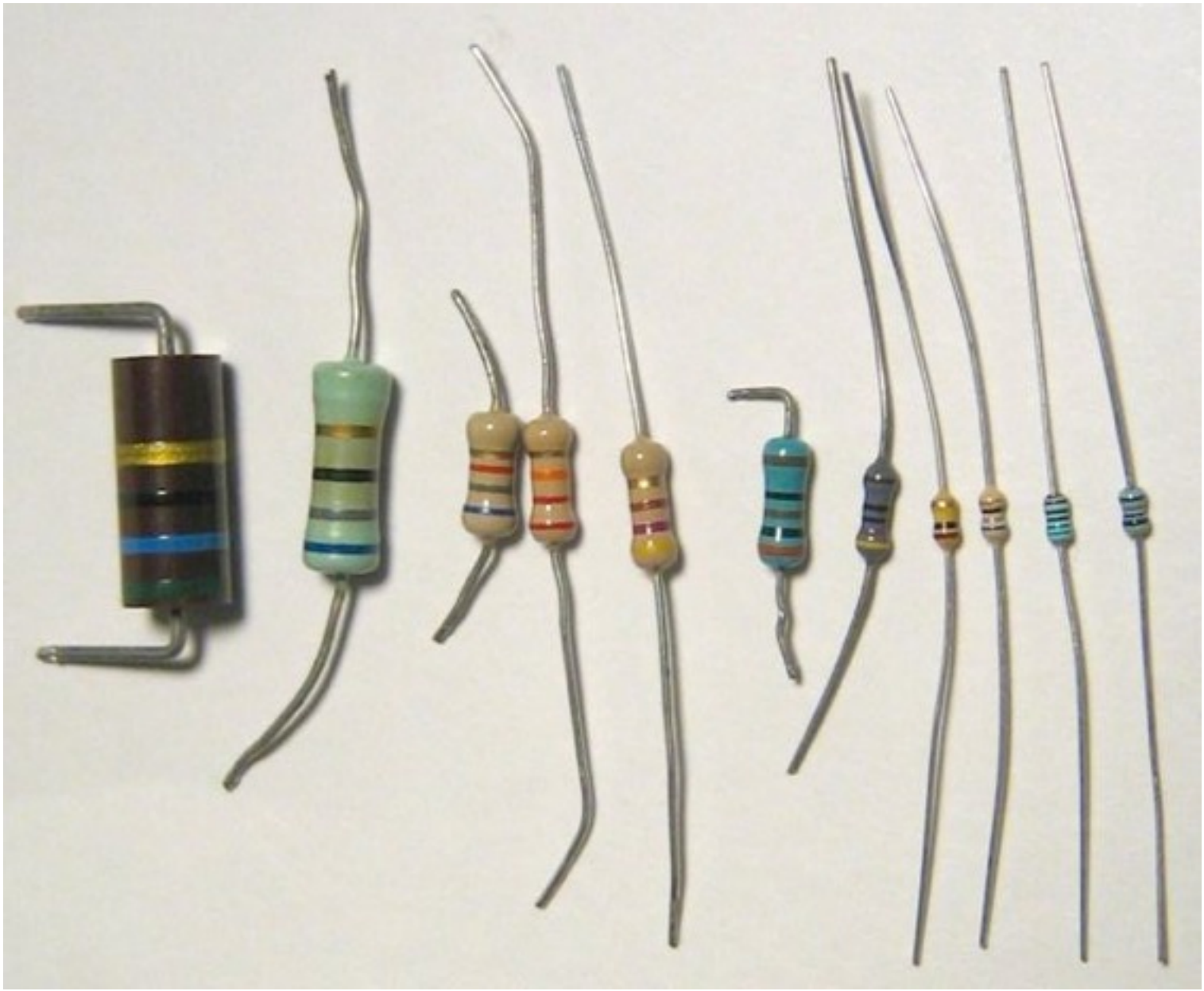
Transduction

- Light, Sound, Heat ---> electrical energy

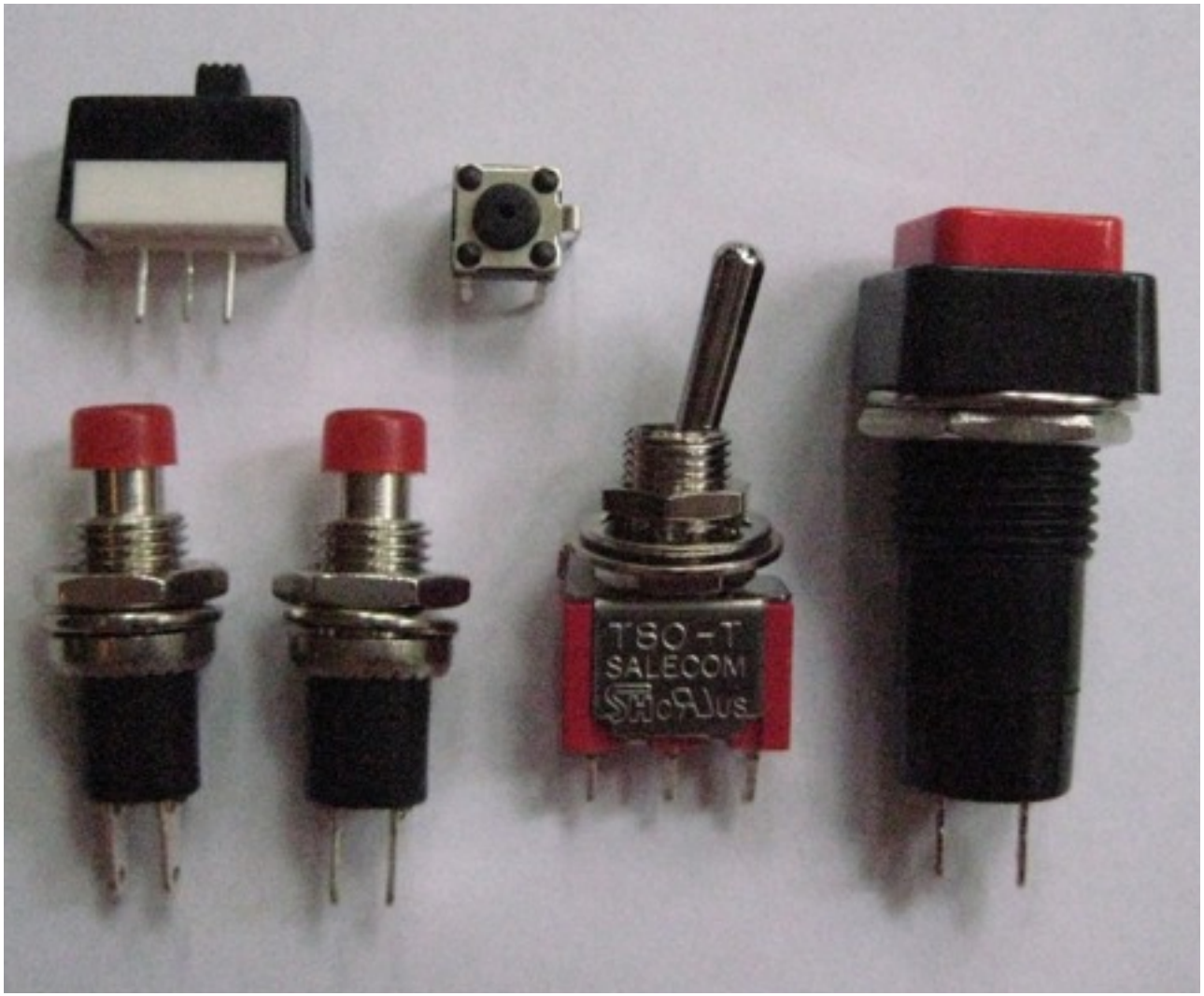
LEDs



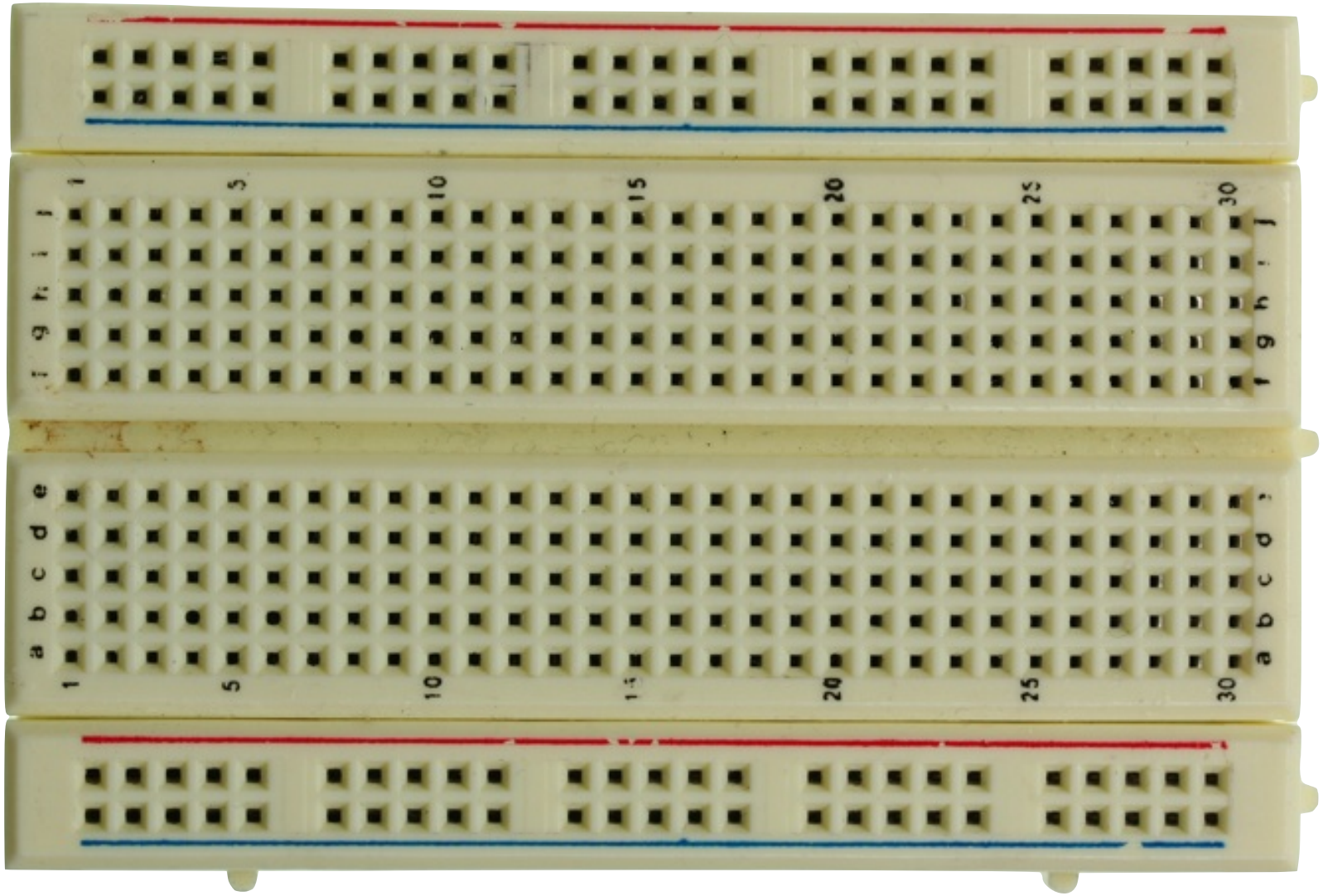
Resistors



Switches



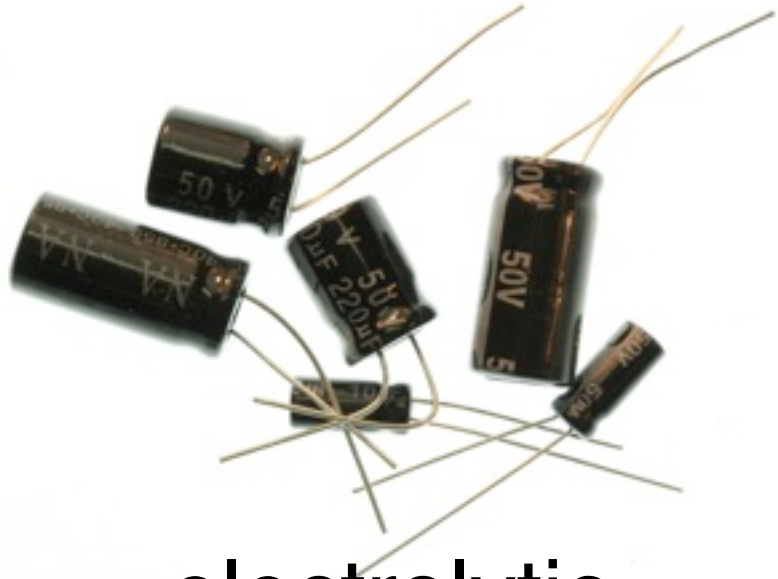
Breadboard



Power Supply

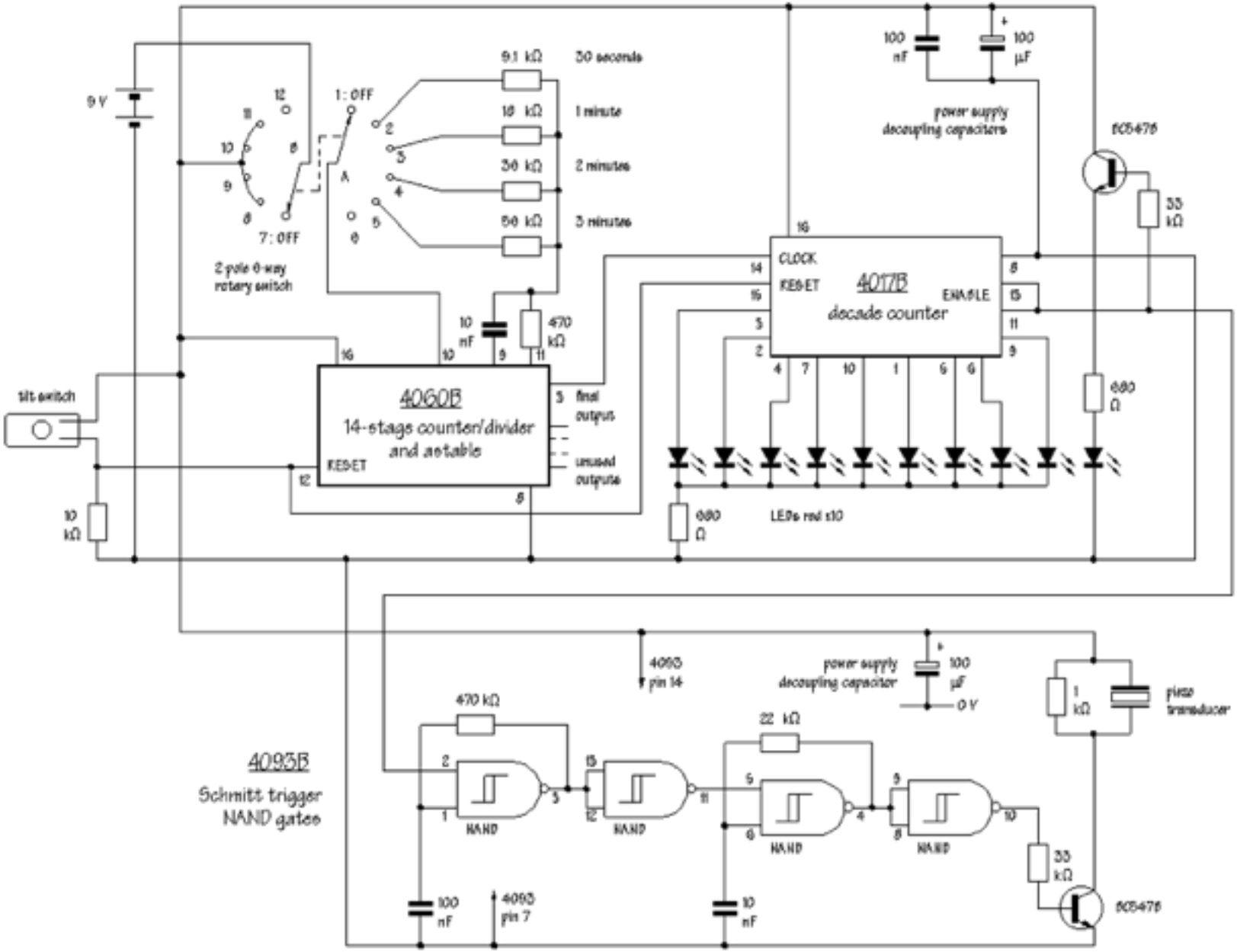
Capacitors

ceramic

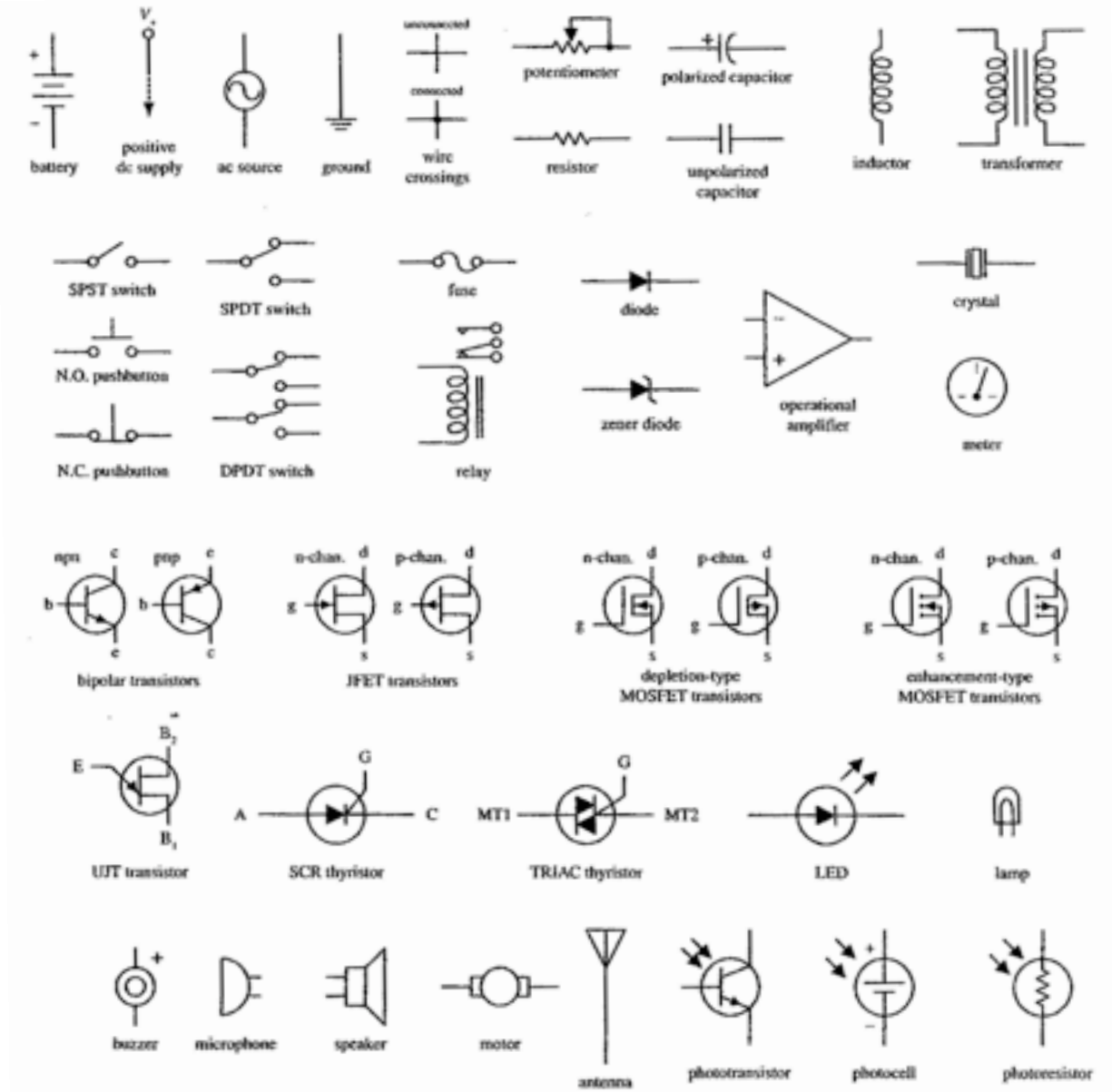


electrolytic

Circuit Diagrams

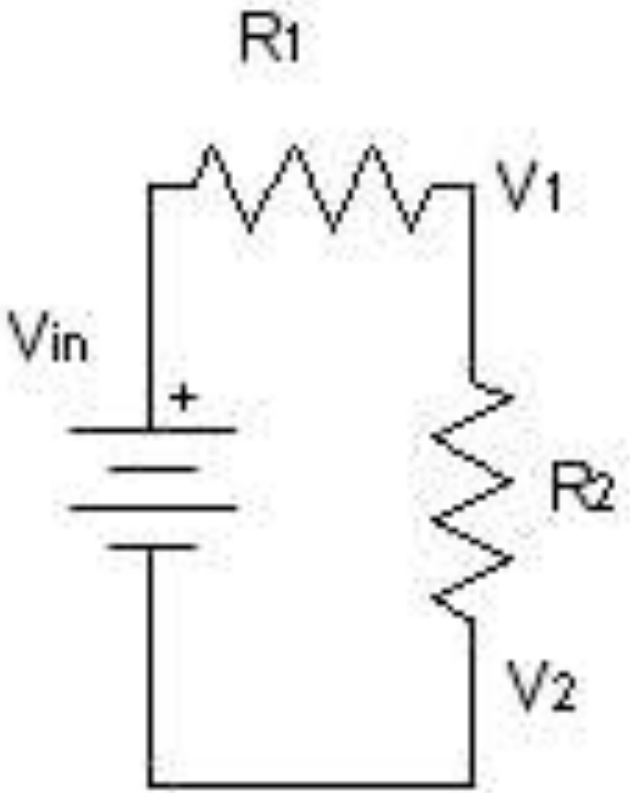


Symbols


battery
positive dc supply
ac source
ground
wire crossings
potentiometer
resistor
polarized capacitor
unpolarized capacitor
inductor
transformer
SPST switch
SPDT switch
N.O. pushbutton
N.C. pushbutton
DPDT switch
fuse
relay
diode
zener diode
operational amplifier
crystal
meter
npn
pnp
bipolar transistors
n-chan.
p-chan.
JFET transistors
depletion-type MOSFET transistors
enhancement-type MOSFET transistors
UJT transistor
SCR thyristor
TRIAC thyristor
LED
lamp
buzzer
microphone
speaker
motor
antenna
phototransistor
photocell
photoresistor

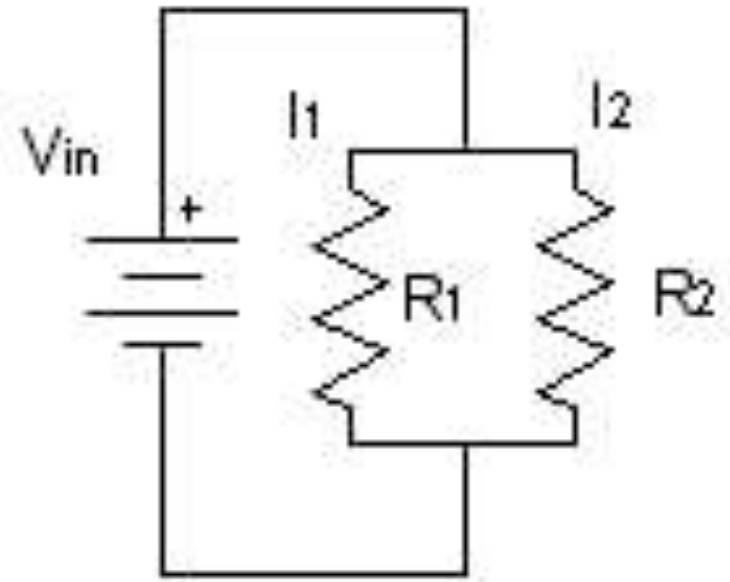
Series

- One after another



Parallel

- side-by-side



Programming

Variables

- int
- long
- unsigned long
- char
- boolean
- byte

Conditionals

- if statements
  - if (x == 3) {
    digitalWrite(ledPin, HIGH);
    }
- while statement
  - while (x == 0) { x = digitalRead(switchPin); }

Readings and Assignments

- Readings
    - Physical Computing, Chapter 1
- Assignment
    - Electronics Lab

Multimeters