

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-2012>

Office Lab Hours

- Friday 2 - 4 pm

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

Imagined Physical Computing

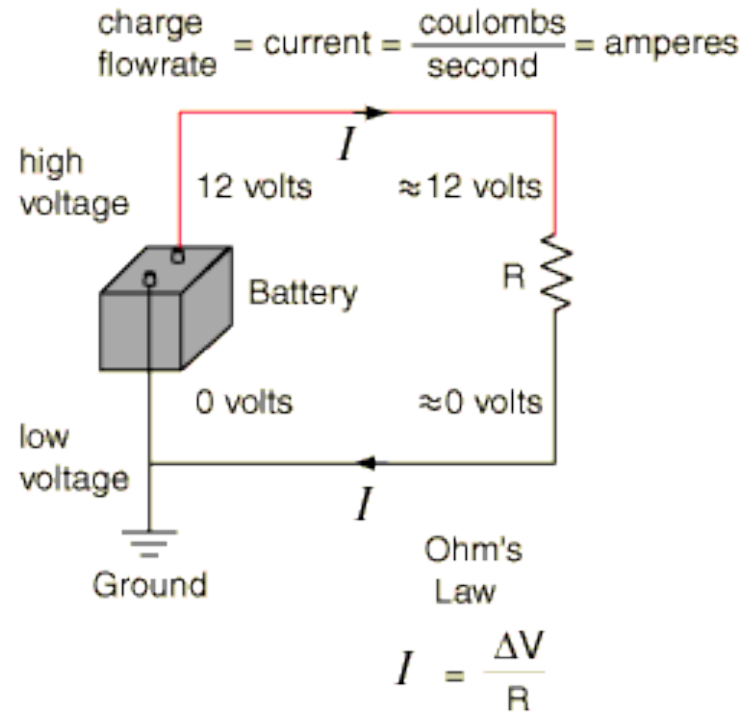
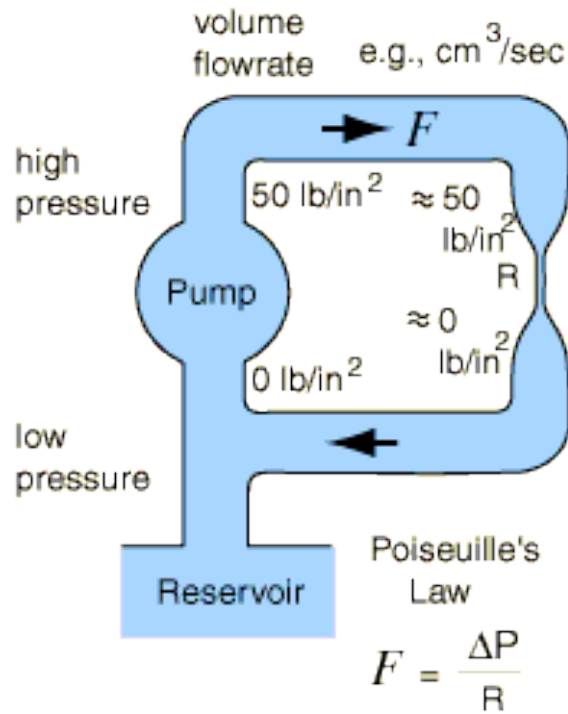
Electricity

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

$$\mathbf{V} = \mathbf{I} \times \mathbf{R}$$

V **VOLTAGE** **=** **I** **CURRENT** **X** **R** **RESISTANCE**

Ohm's Law

$$\mathbf{V} = \mathbf{I} \times \mathbf{R}$$

V VOLTAGE **=** **I** CURRENT **X** **R** RESISTANCE

$$I = V / R$$

$$R = V / I$$

Flow *
Resistance =
Pressure



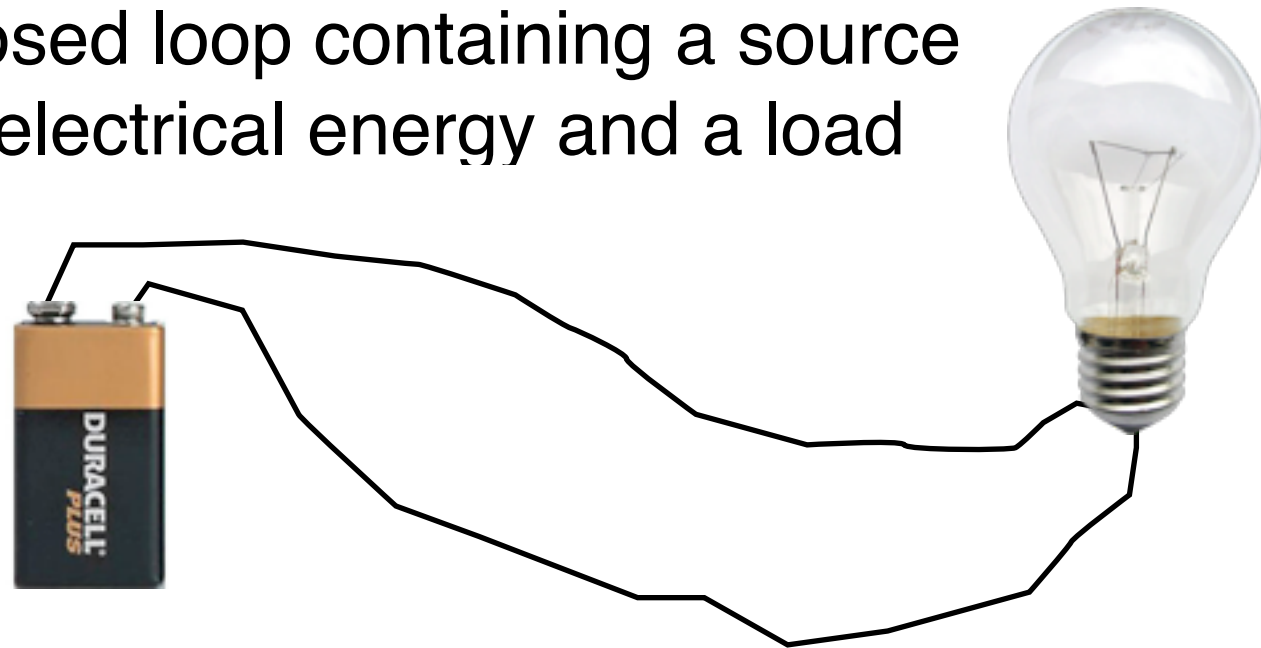
Circuit

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



Circuit. **SHORT**. **Circuit**

Circuit

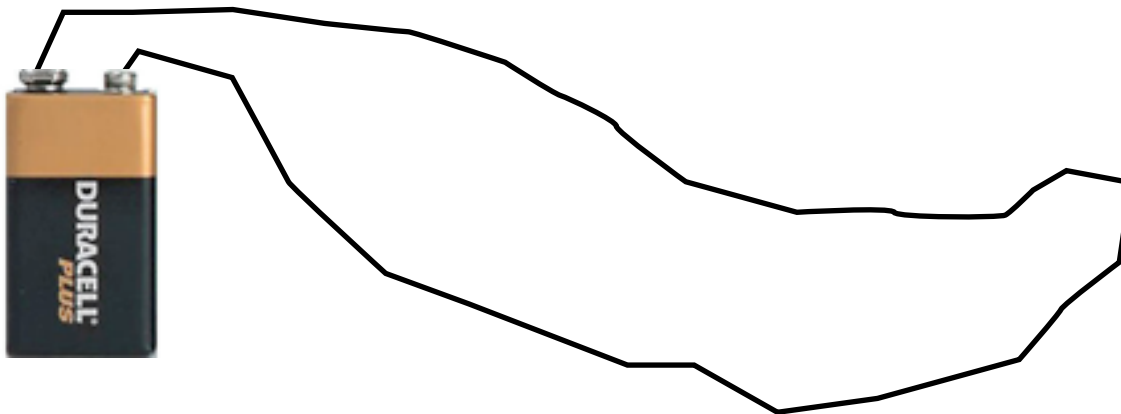
SHORT

a circuit with no load

Circuit

SHORT

a circuit with no load



Circuit **SHORT**

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!

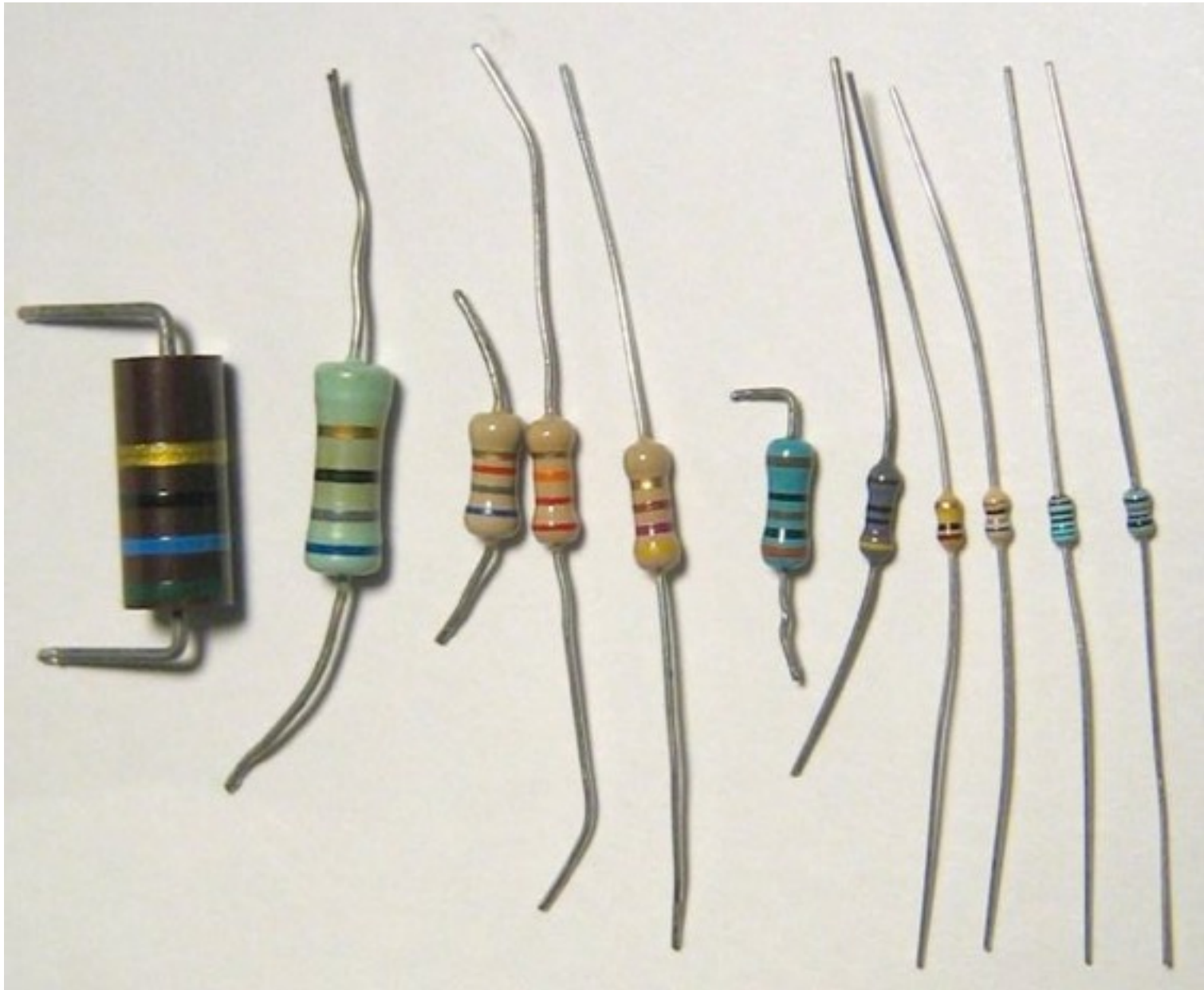
Transduction

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

LEDs



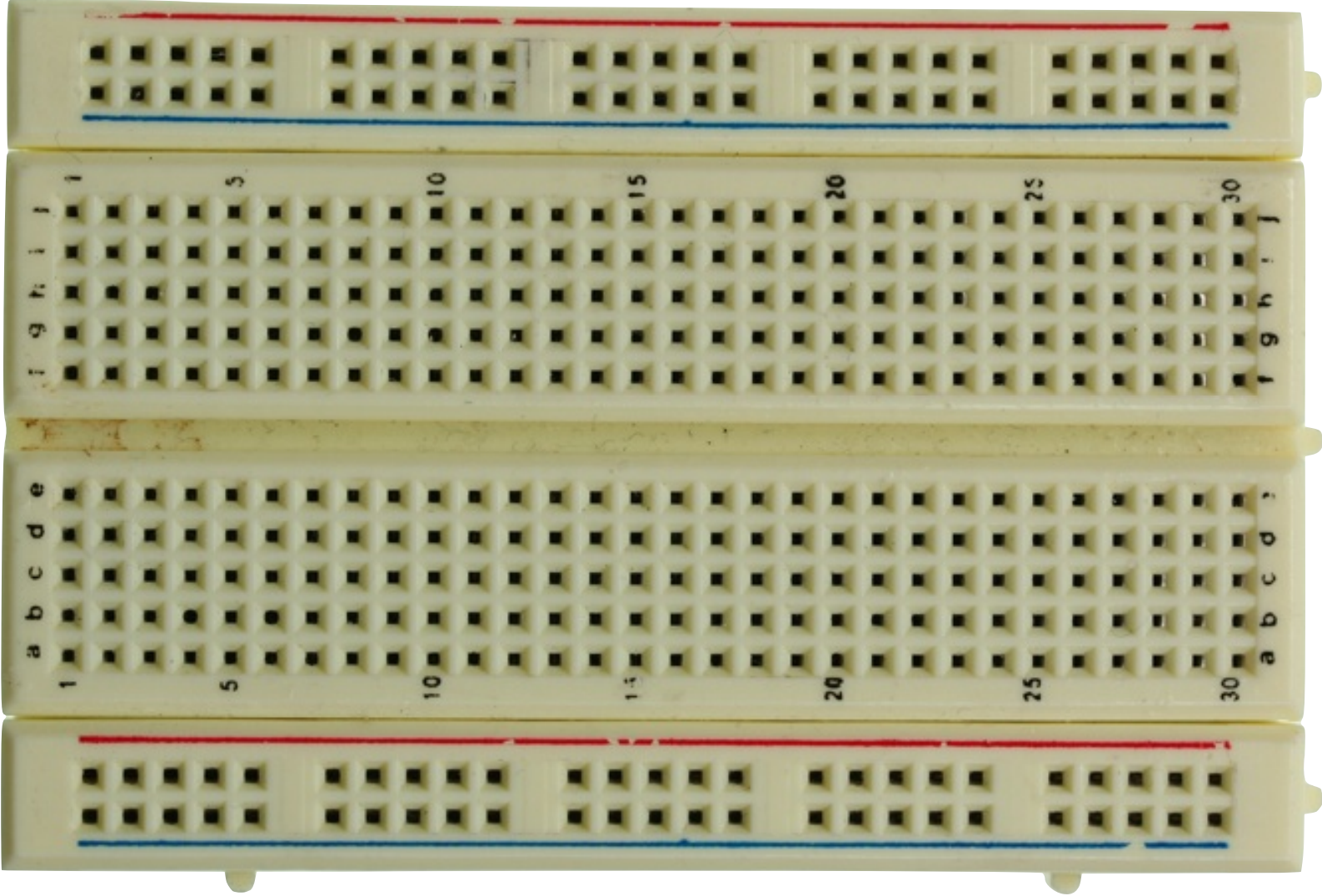
Resistors



Switches



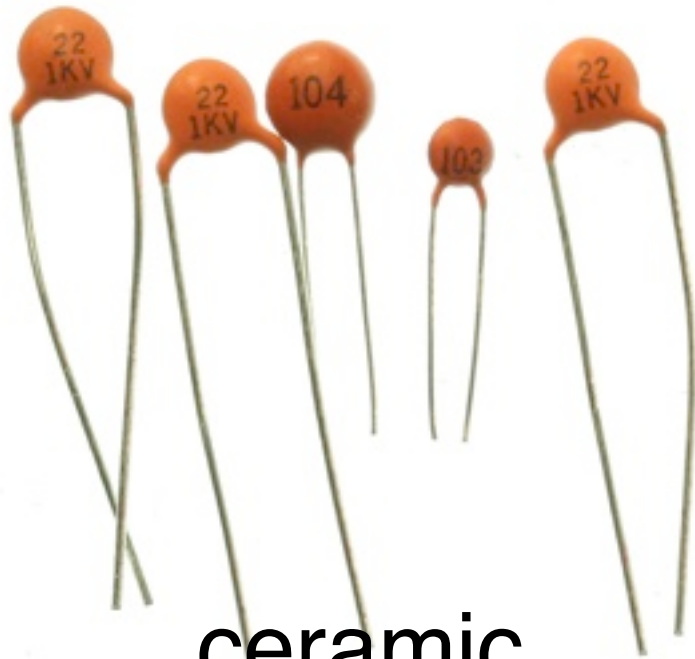
Breadboard



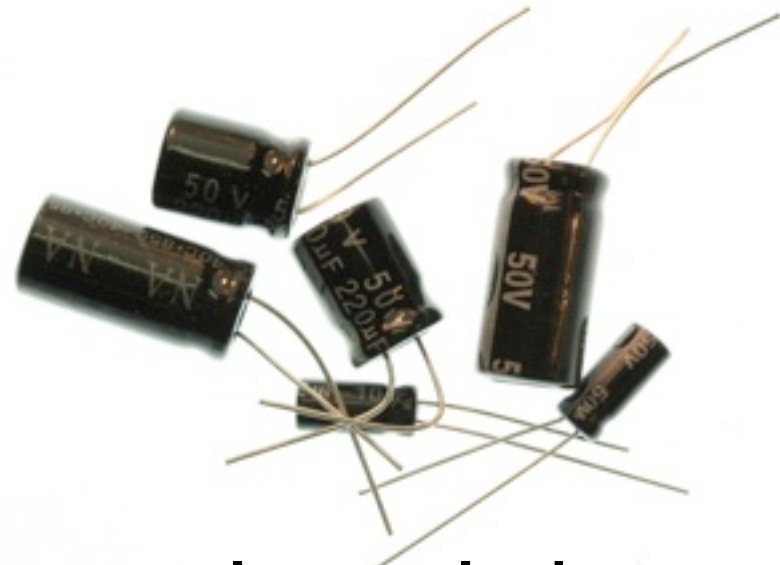
Power Supply



Capacitors

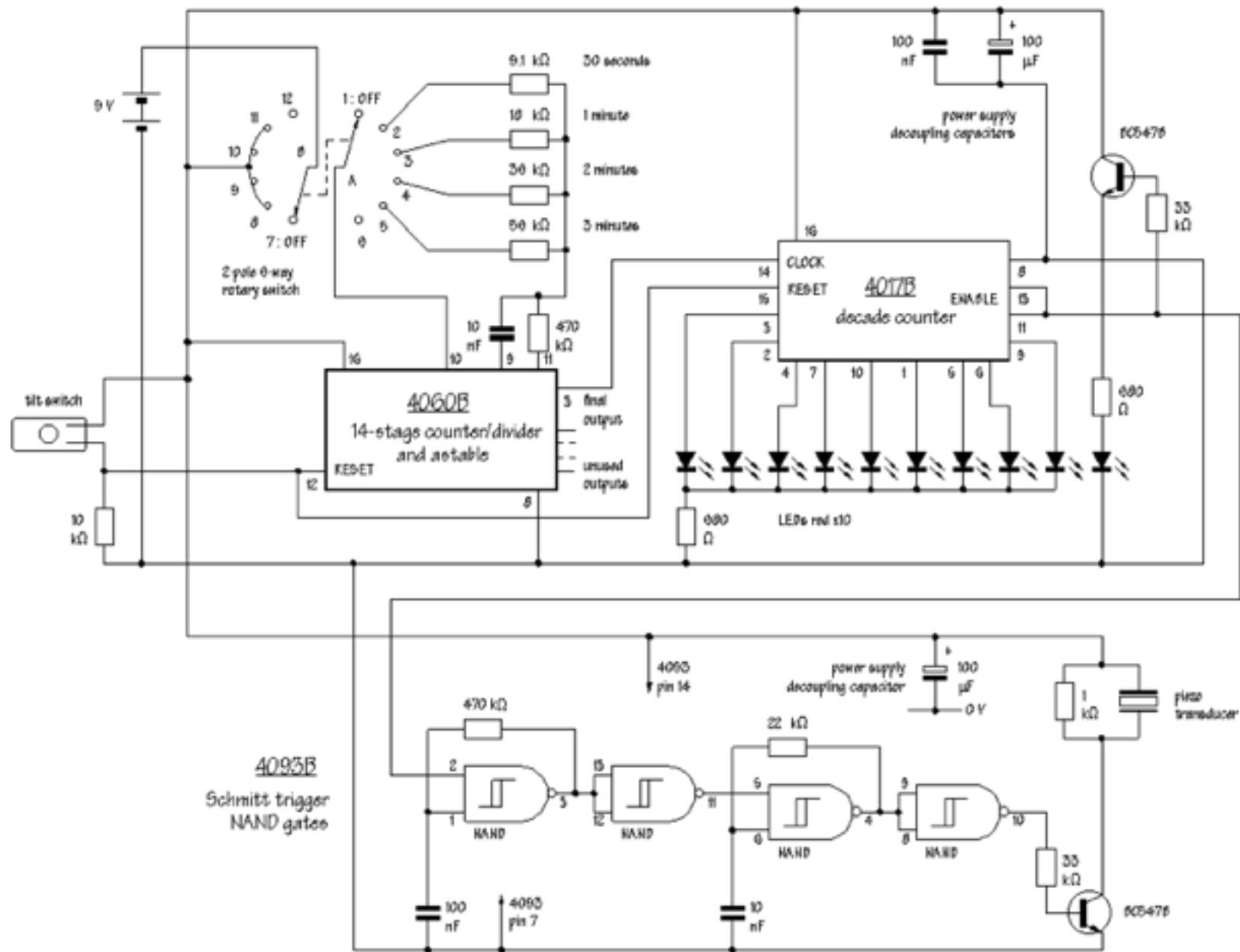


ceramic

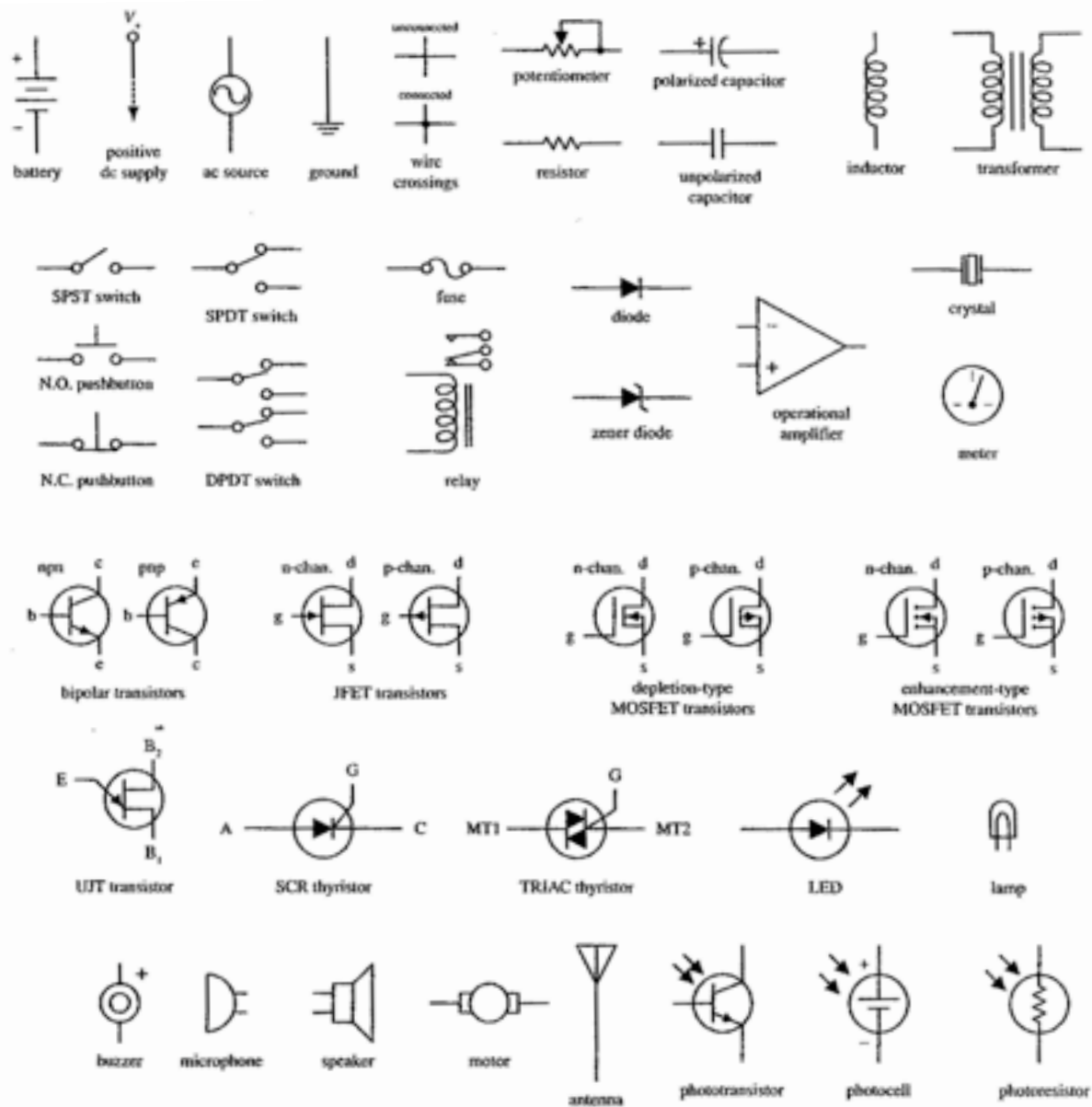


electrolytic

Circuit Diagrams

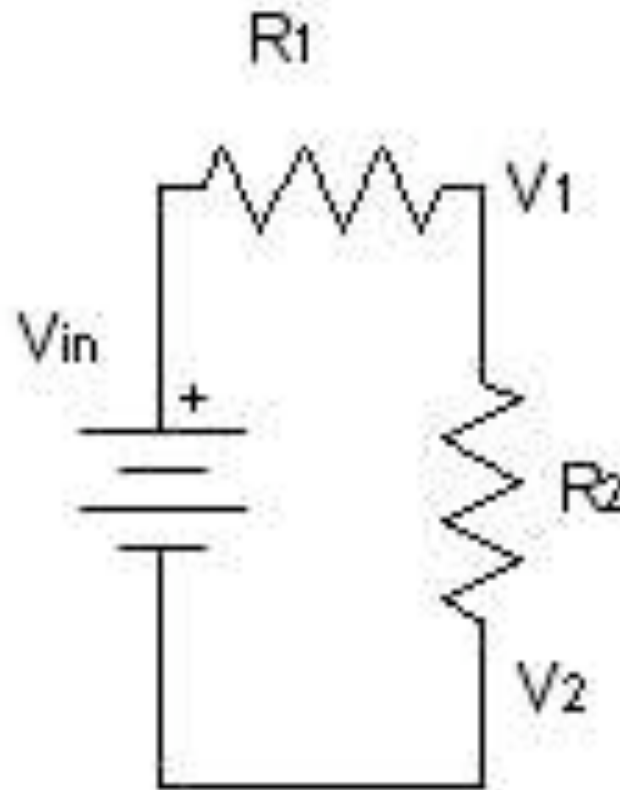


Symbols



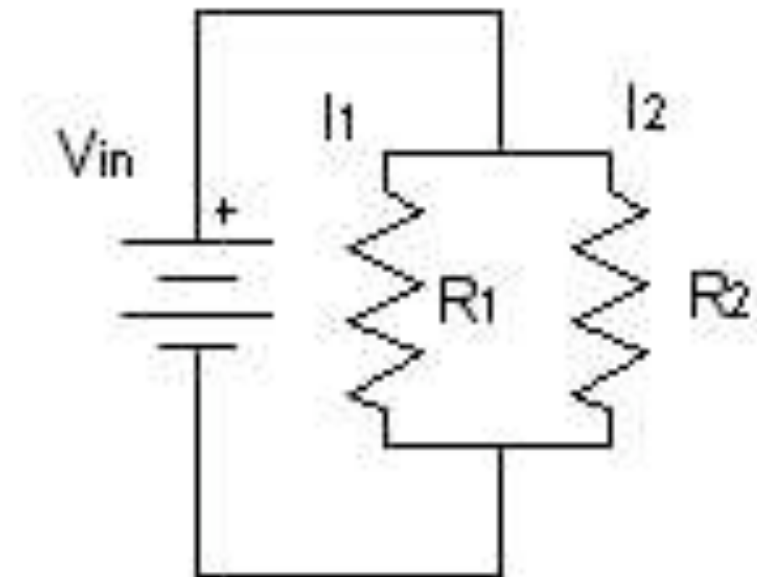
Series

- 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

