

Designing Interactions

**Intensive workshop**

## Schedule for the course

### Monday

- Programming on microcontrollers (Arduino)
- Controlling sensors and actuators

### Tuesday

- Communication with PC over Bluetooth
- Communication with Desktop applications (Adobe Flash, Processing, and Puredata)

### Wednesday

- Printed circuit board (PCB)

### Thursday

- Individual work

### Friday

- Individual work
- **Presentation at 13:00**

## The goal of the intensive workshop

This workshop gives you tools to prototype interactions. It is **NOT** aiming to **UNDERSTAND** technical tools **BUT USE THEM** in research projects and design practices of your own.

It requires your **CREATIVE MINDS** otherwise you cannot use them.

## My role in this workshop

I am an **INTERACTION DESIGNER**, not engineer. So I will not be able to instruct all technical details.

The workshop focuses on introducing the tools and giving instructions how to make **RAPID PROTOTYPES**.

## Your participations in this workshop

You don't need to prototype everything from scratch. By sharing knowledge and experiences, we can prototype things even more rapidly.

You can **SEARCH SNIPPETS** online. But please also **SHARE YOUR CODES AND SCHEMATICS** online.

## **Assignment 2**

**Create a simple interaction using Arduino.  
Presentations are scheduled on this Friday.**

**Create an account on [mlab.taik.fi/paja](http://mlab.taik.fi/paja) blog**

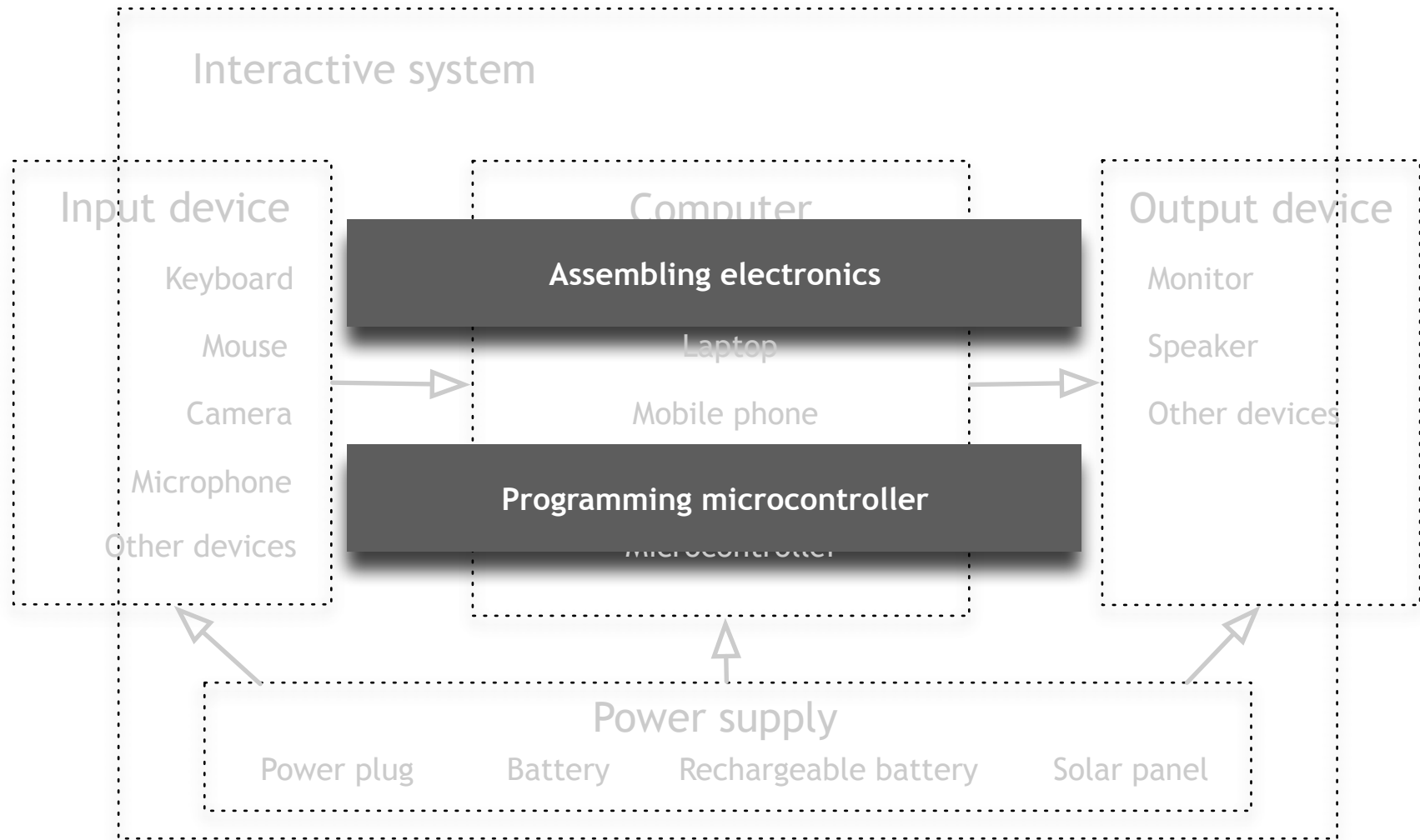
Please put your **FIRST AND FAMILY NAME** in your profile page  
otherwise I will not know who you are.

**Final demos from previous workshops**

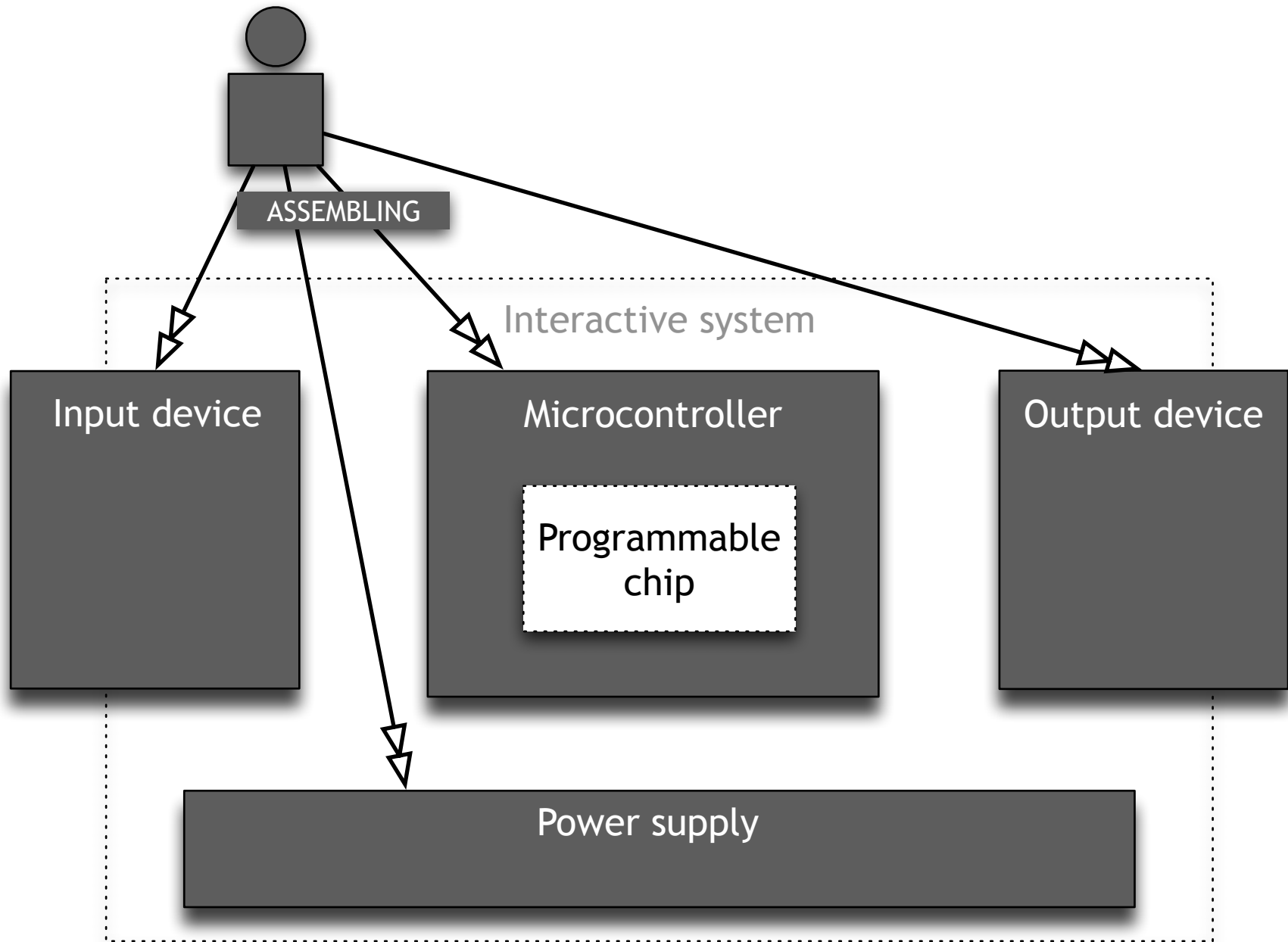


**What are we going to learn in this workshop?**

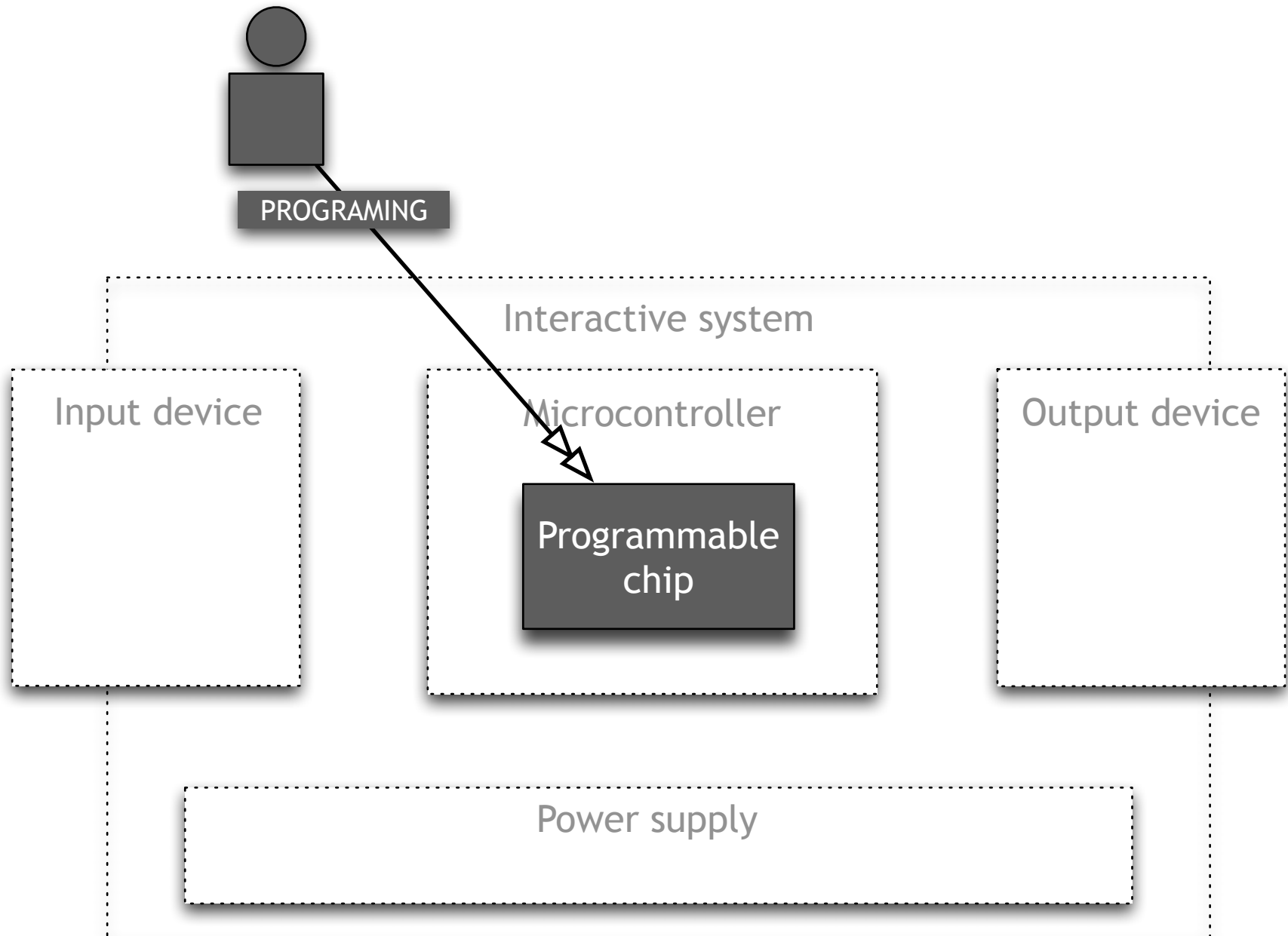
# What are we going to learn in this workshop?



# Assembling Electronics



# Programming Microcontroller (Arduino)





**Assembling electronics**

## **Tools and components**

# Arduino

Ground pin

Digital pins (2-13)

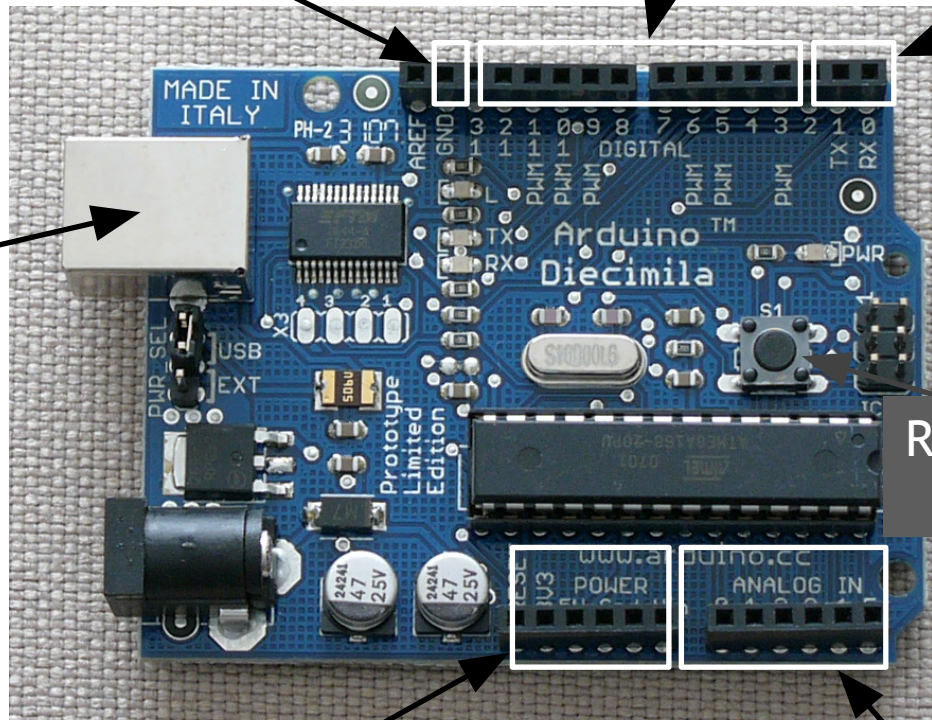
Digital pins (0-1)  
shared with USB

Plug a USB cable  
(5V is also supplied)

Reset button (click when  
you upload program)

5V output, Ground and 9V output pins  
(9V output is not in use)

Pins for analog in pins (0 - 5). These  
can used as digital pins (14 - 19)



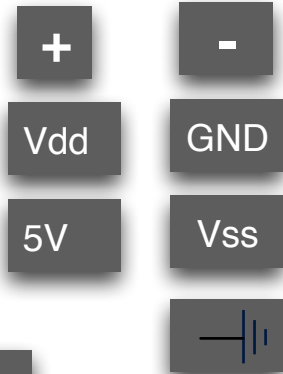


USB cable

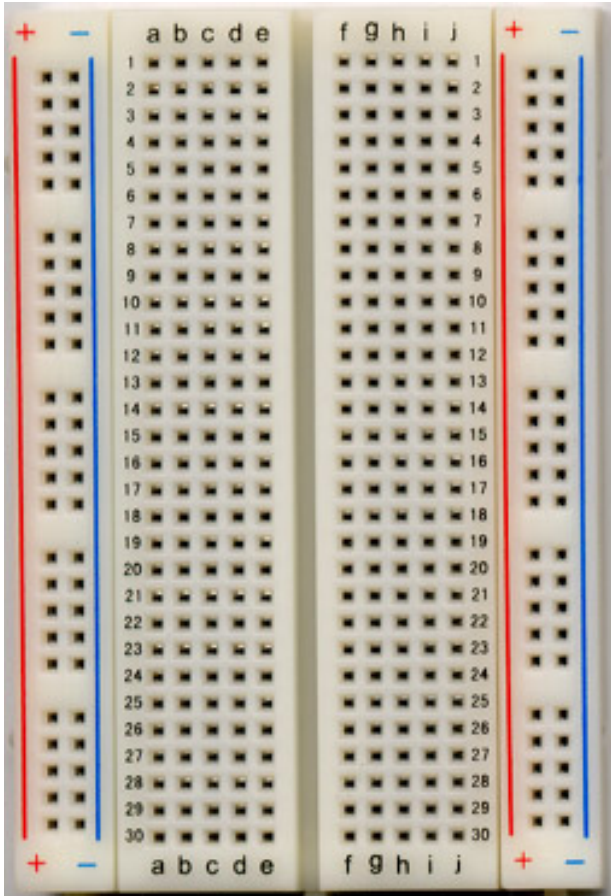


USB A-B cable

# Breadboard



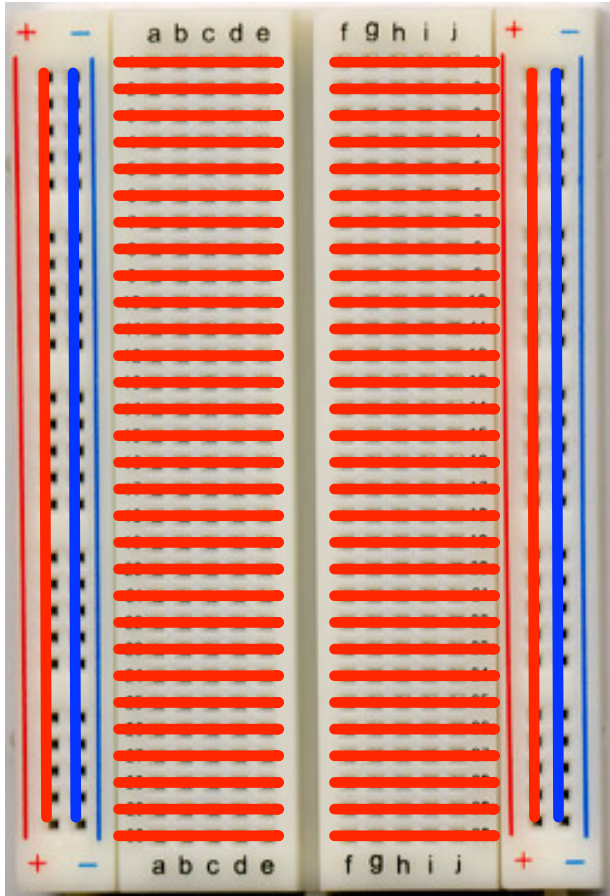
Breadboard (photo)



Video and Website © 2004 ClarkZapper.net

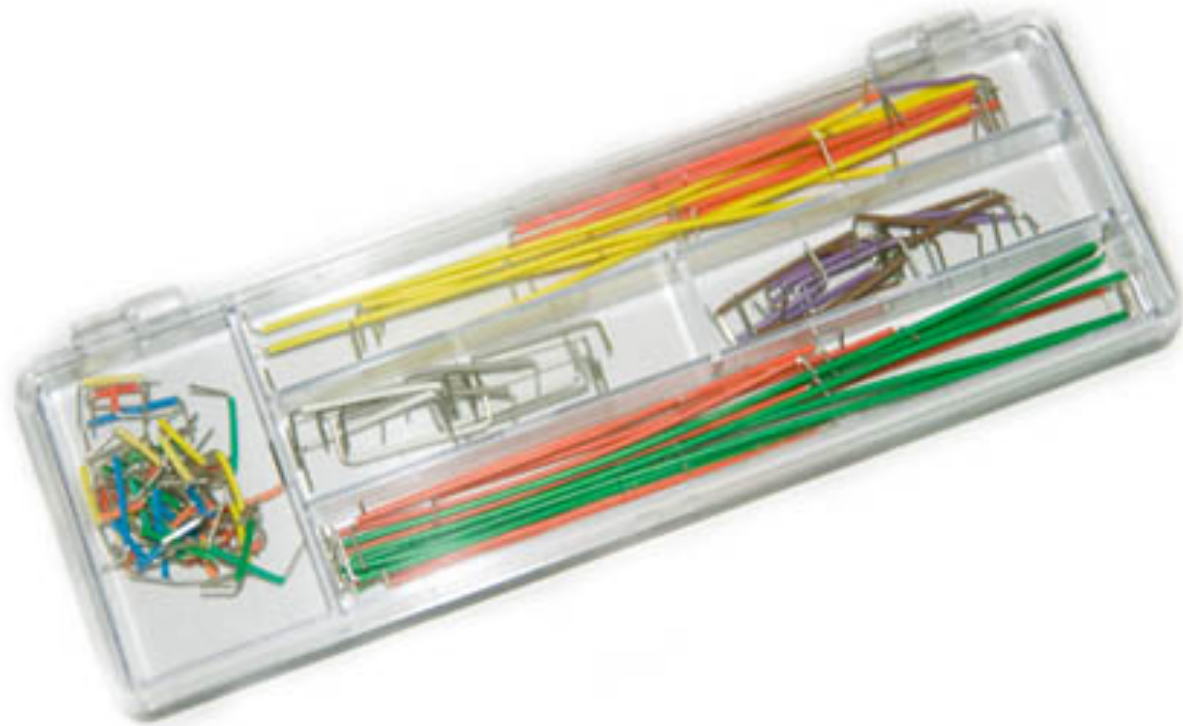
Breadboard (schematic)

5V GND 5V GND



Video and Website © 2004 ClarkZapper.net

# Jumper wires



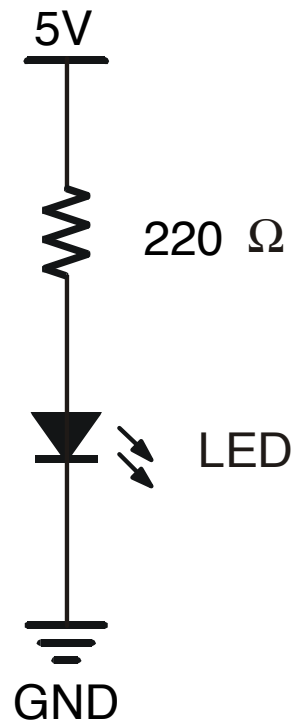
# Multimeter



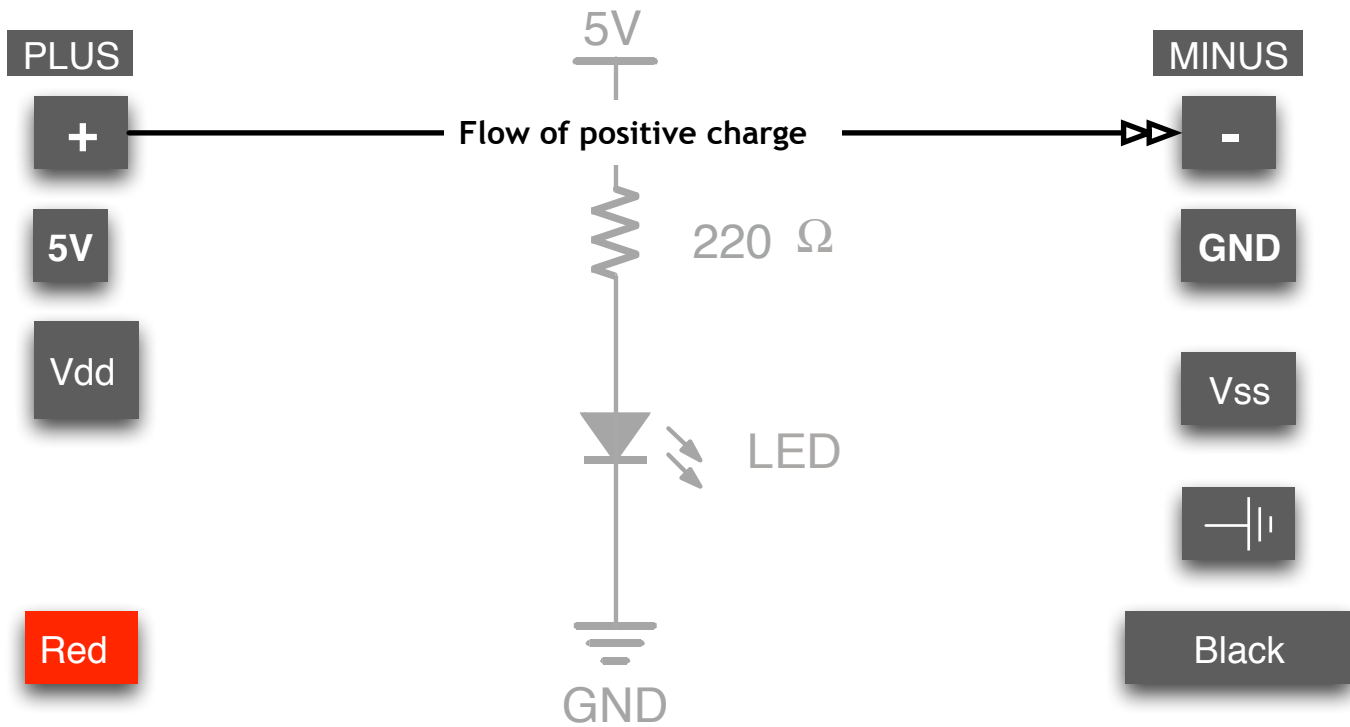


## Understanding schematics

What does this mean?



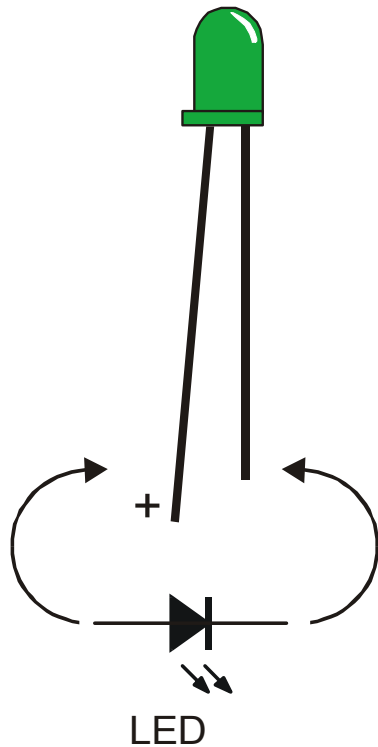
# Flow of positive charge





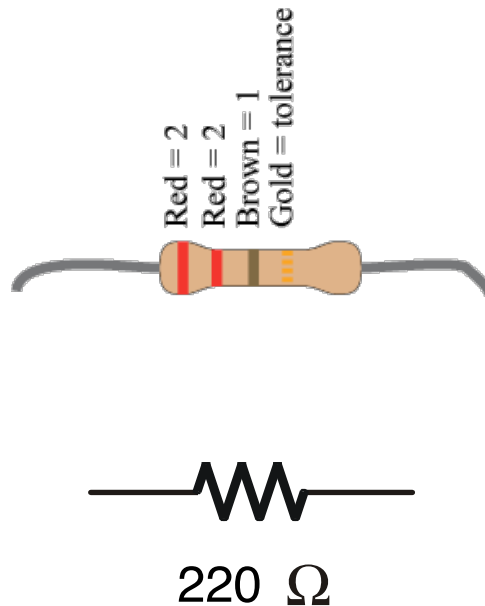
# Most Popular components

## LED (Light emitting diode)



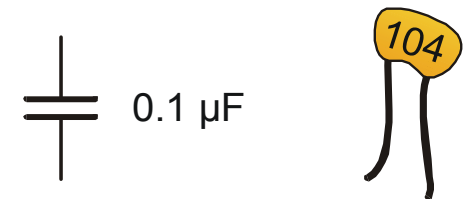
a semiconductor device with two terminals, typically allowing the flow of current in one direction only. LED has polarity

## Resistor



a device having a designed resistance to the passage of an electric current.

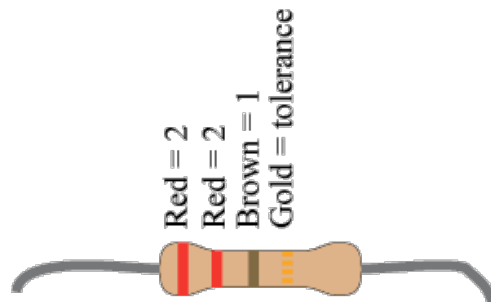
## Capacitor



a device used to store an electric charge

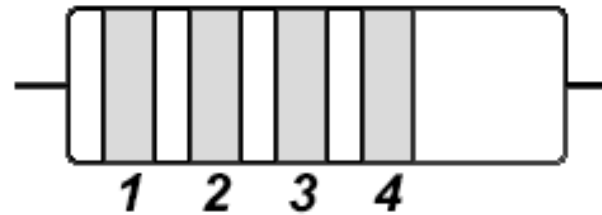
# Markings for resistors

## Resistor



220  $\Omega$

a device having a designed resistance to the passage of an electric current.

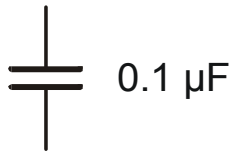


1, 2      3      4

Color	Number	Multiplier	Tolerance
Black	0	1	-
Brown	1	10	$\pm 1\%$
Red	2	$10^2$	$\pm 2\%$
Orange	3	$10^3$	$\pm 0.05\%$
Yellow	4	$10^4$	-
Green	5	$10^5$	$\pm 0.5\%$
Blue	6	$10^6$	$\pm 0.25\%$
Purple	7	$10^7$	$\pm 0.1\%$
Gray	8	$10^8$	-
White	9	$10^9$	-
Shiver	-	$10^{-2}$	$\pm 10\%$
Gold	-	$10^{-1}$	$\pm 5\%$
No color	-	-	$\pm 20\%$

# Markings for capacitors

## Capacitor



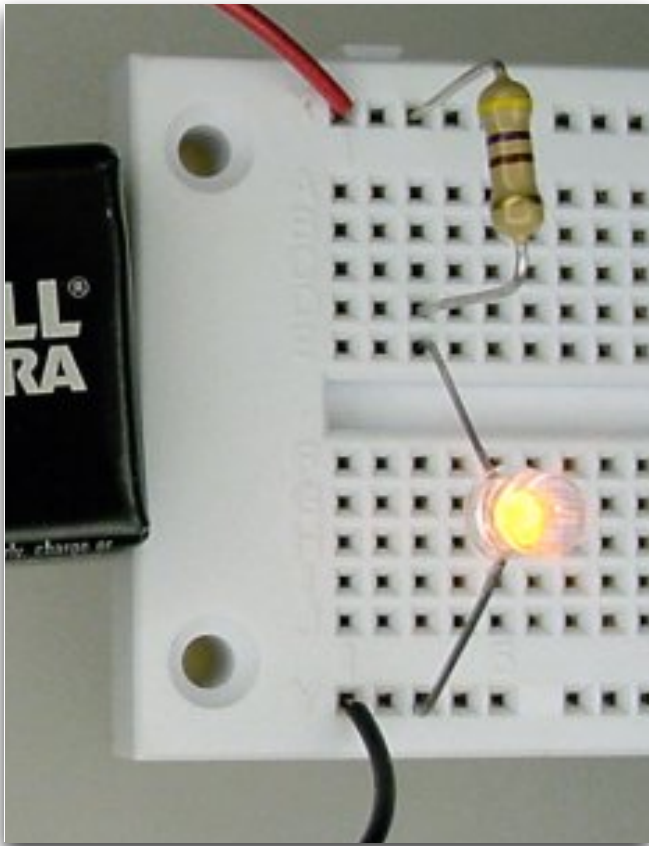
Capacitor three digit markings

CODE / Marking	$\mu\text{F}$ microfarads	nF nanofarads	pF picofarads
1R0	0.000001	0.001	1
100	0.00001	0.01	10
101	0.0001	0.1	100
102	0.001	1	1,000
103	0.01	10	10,000
104	0.1	100	100,000
105	1	1,000	1,000,000
106	10	10,000	10,000,000
107	100	100,000	100,000,000

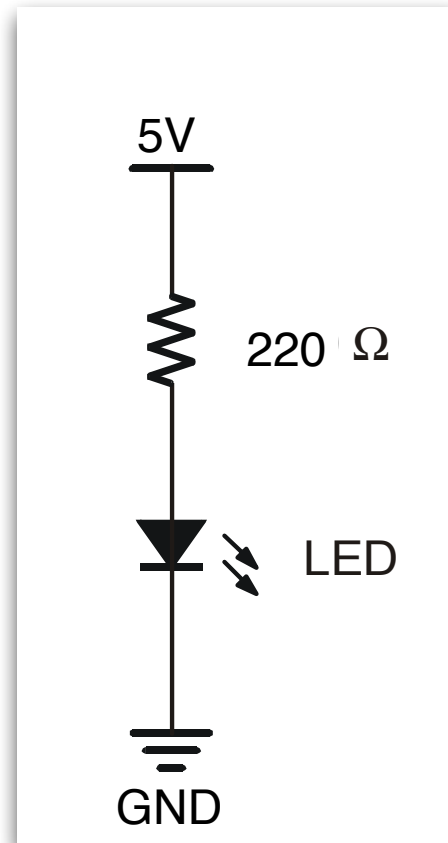
a device used to store an electric charge

# Assemble electronics

Breadboard (photo)

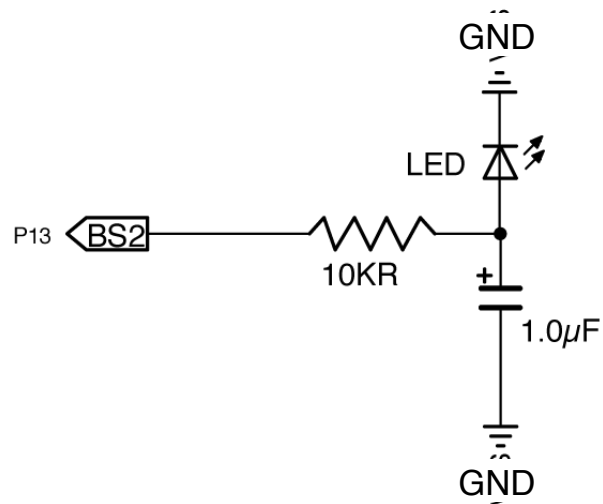
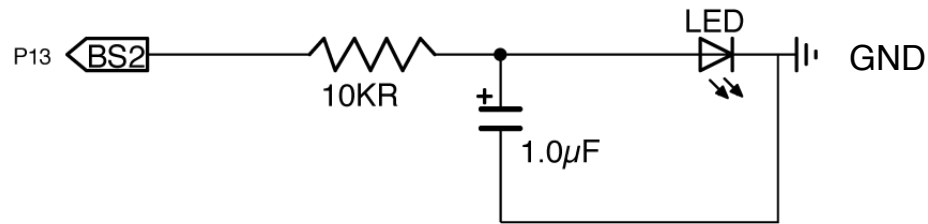
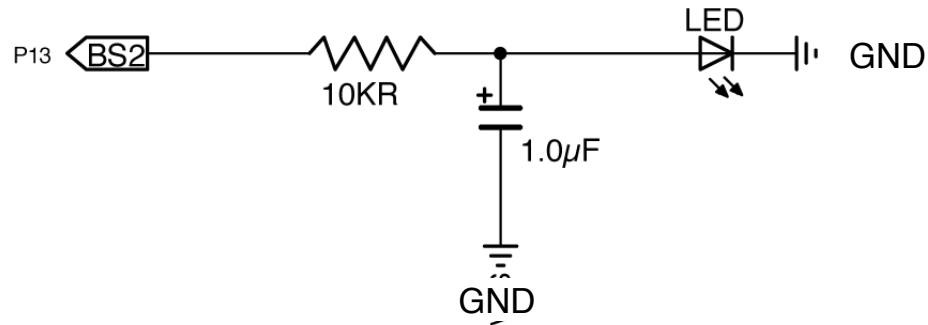


Breadboard (schematic)



# Schematic plans

These are all same schematics.



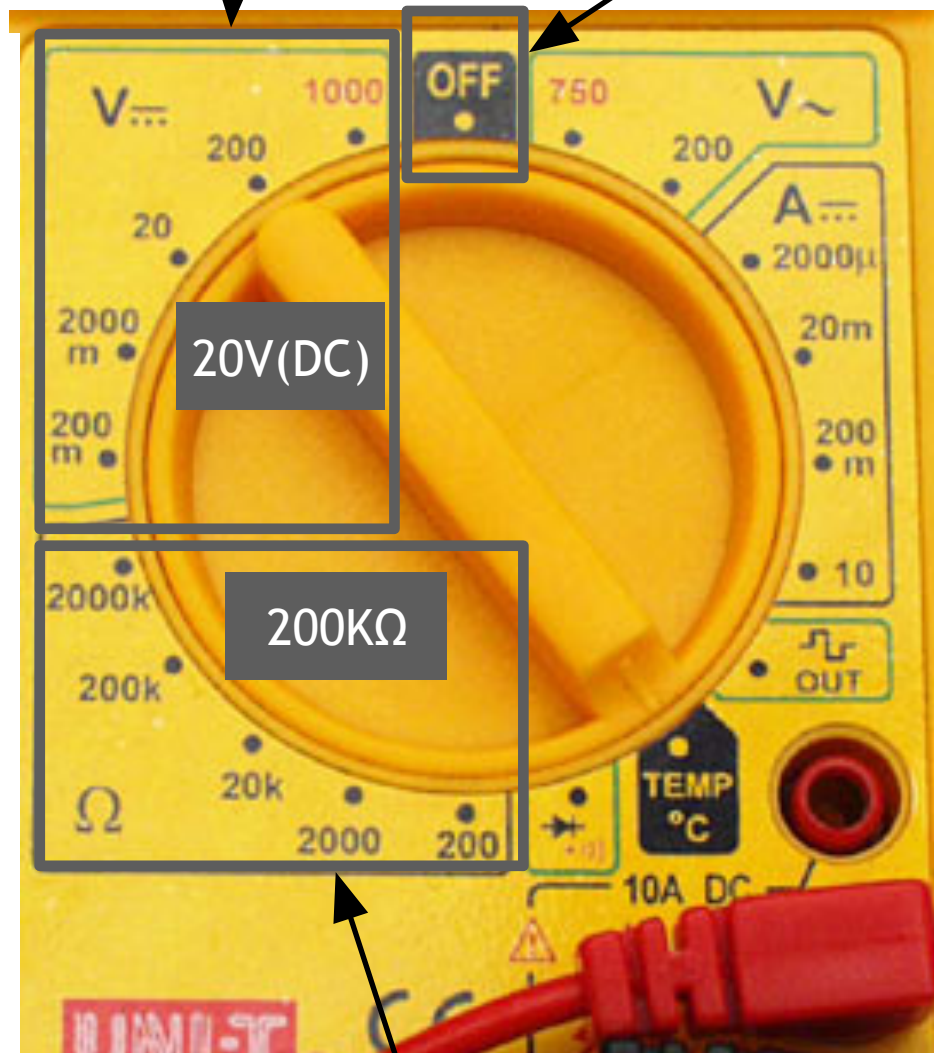
**Checking your circuit**

# Multimeter



Measuring voltages

Off switch



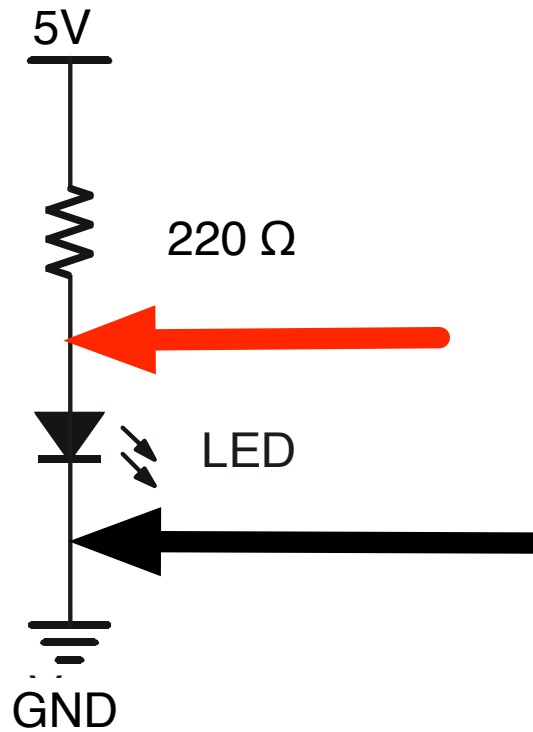
20V(DC)

200KΩ

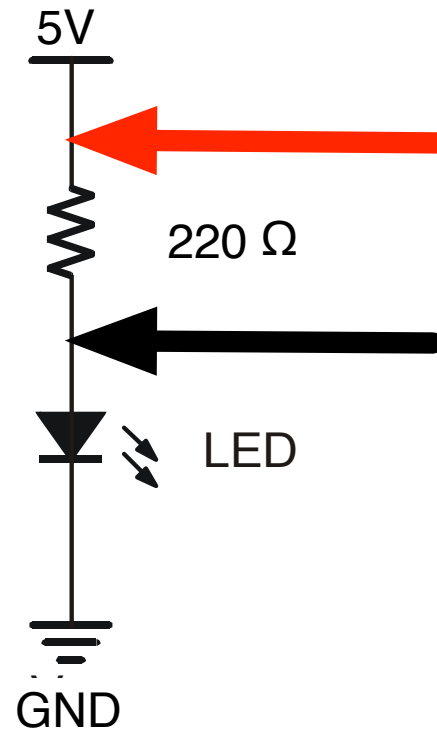
Measuring conductivity and resistance

# Measuring electricity with multimeter

Voltage

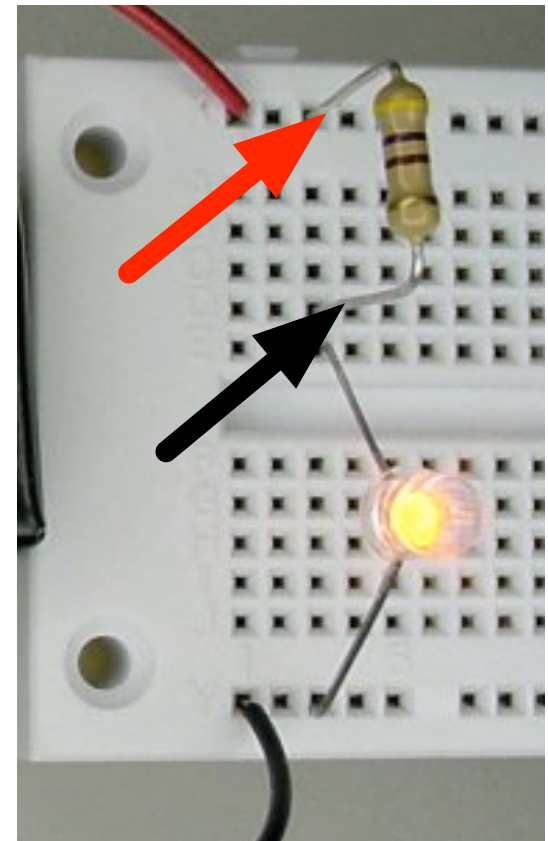


Resistance



Turn off power.

Conductivity



Turn off power.