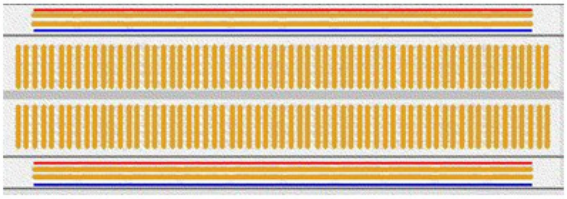
Breadboard Basics

LEDs and Switches

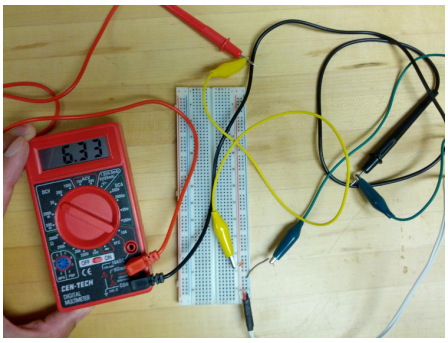
In-Class Day 2

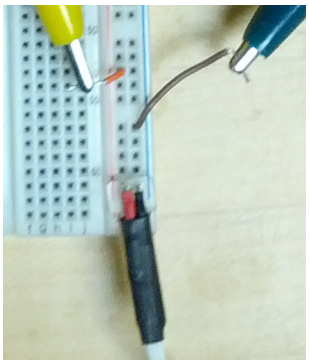
Breadboard internal connection



Power

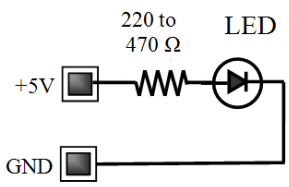
- Check the unregulated power with a DMM

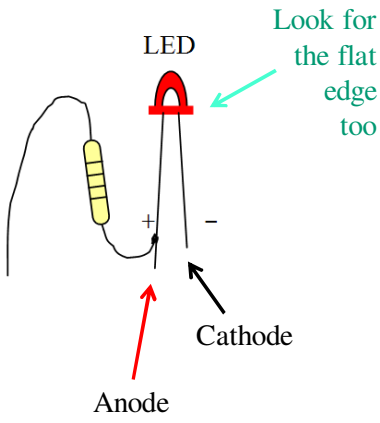




Board upright unregulated power on the right.

Light Emitting Diode (LED)





Two rules for LEDs

You MUST put in the LED in the correct direction!

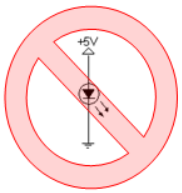
and

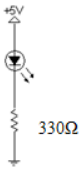
You MUST have a resistor in series with the LED!

Math behind forgetting the resistor

Connect an LED

BAD!
Forgot resistor



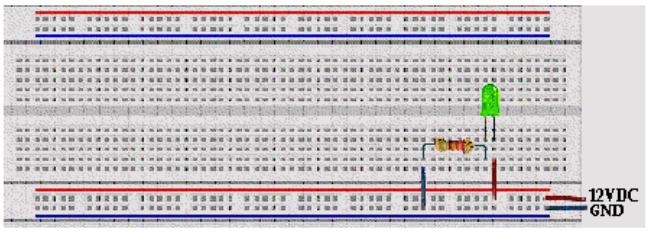


Forgetting the resistor causes

$$i = \frac{V_{LED}}{R_{LED}} = \frac{5V}{0\Omega} = \text{Large Current}$$

Your turn

The circuit below uses a 12V supply. So if the LED had a forward voltage drop of 1.9 volts and a maximum current rating of 20mA, what would be the absolute minimum size resistor? What size resistor might you use instead to reduce the current flow to half the max current value?



Space for solution

The circuit above uses a 12V supply. So if the LED had a forward voltage drop of 1.9 volts and a maximum current rating of 20mA, what would be the absolute minimum size resistor? What size resistor might you use instead to reduce the current flow to half the max current value?

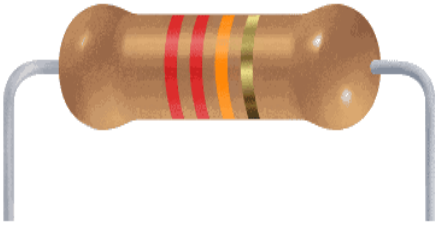
Resistor color codes

Color	1st band	2nd band	3rd band (multiplier)
Black	0	0	$\times 10^0$
Brown	1	1	$\times 10^1$
Red	2	2	$\times 10^2$
Orange	3	3	$\times 10^3$
Yellow	4	4	$\times 10^4$
Green	5	5	$\times 10^5$
Blue	6	6	$\times 10^6$
Violet	7	7	$\times 10^7$
Grey	8	8	$\times 10^8$
White	9	9	$\times 10^9$

Reading resistor values

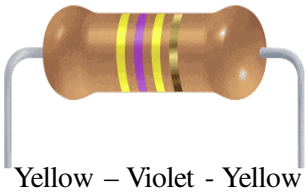
Ex. Red-Red-Orange
Red = 2
Red = 2
Orange = 3

Therefore 22000 which means that resistor is 22k ohms.



Your turn

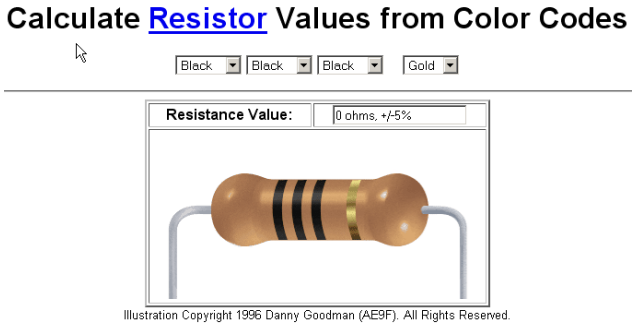
What is the value of this resistor?



Yellow – Violet - Yellow

Demo a web tool

http://www.dannyg.com/examples/res2/resistor.htm



Common resistor sizes

The first two bands are a certain % larger than the prior value

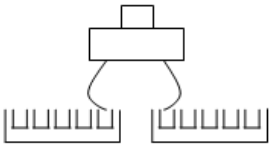
The third band can be anything

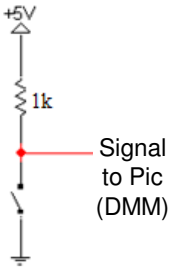
E6 (20%): 10 15 22 33 47 68

E12 (10%): 10 12 15 18 22 27 33 39 47 56 68 82

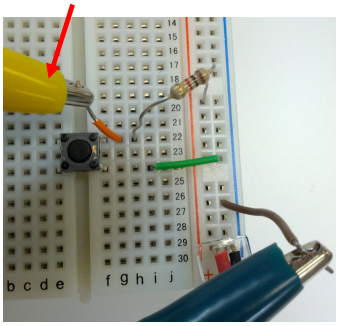
E24 (5%): 10 11 12 13 15 16 18 20 22 24 27 30
33 36 39 43 47 51 56 62 68 75 82 91

Creating a basic switch





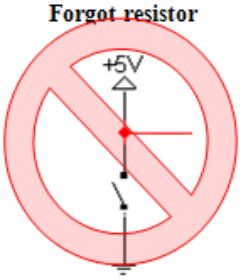
Signal to DMM (later to the PIC)

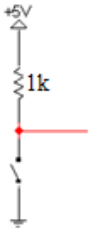


Forgetting resistors shorts the board

Making a switch

BAD!
Forgot resistor





Lab 1

Next start work on Lab 1