

Breadboard Basics

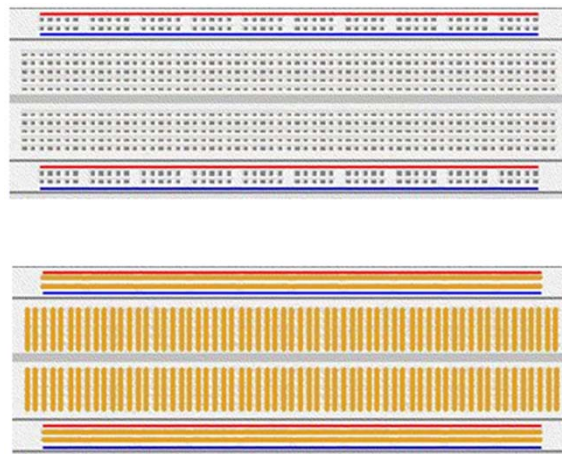
LEDs and Switches

In-Class Day 2



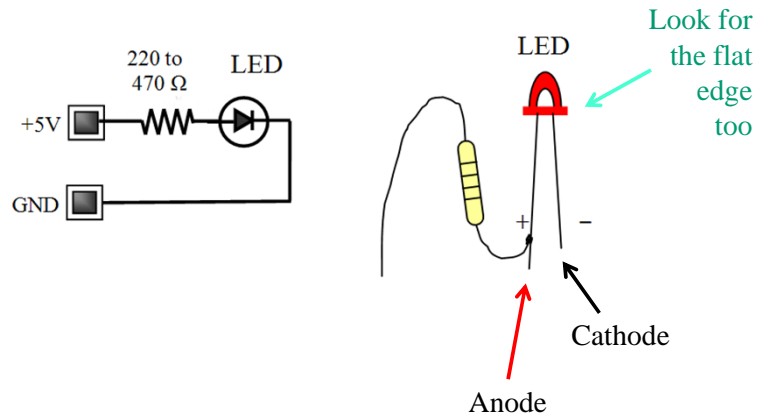
ME430: MECHATRONICS

Breadboard internal connection



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Light Emitting Diode (LED)



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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!

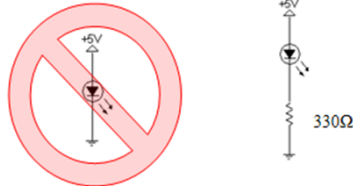


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Math behind forgetting the resistor

Connect an LED

BAD!
Forgot resistor



Forgetting the resistor causes

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



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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?



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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?



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Resistor color codes

Color	1 st band	2 nd band	3 rd 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	$\times 10^9$



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Reading resistor values

Ex. Red-Red-Orange

Red = 2

Red = 2

Orange = 3

Therefore 22000 which means that resistor is 22k ohms.



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Your turn

What is the value of this resistor?



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Demo a web tool

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

Calculate Resistor Values from Color Codes

Resistance Value:

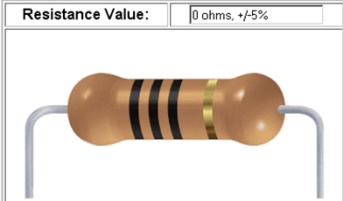


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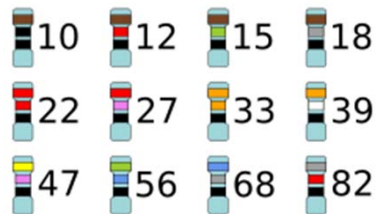


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Common resistor sizes

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

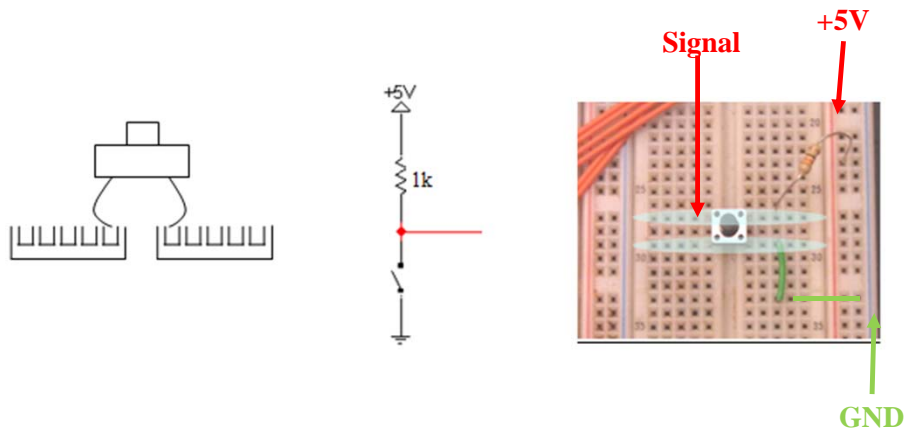
E12 (10%): 10 12 15 18 22 27 33 39 47 56 68 82

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



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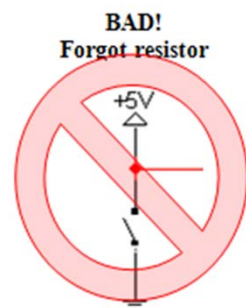
Creating a basic switch



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Forgetting resistors shorts the board

Making a switch



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