How To: Electronics Basics

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What we're covering:

- Ex1: on-board blink
- Ex2: Serial read with simple button
- Ex3: LED external
- Ex4: LED tied to button
- Ex5: LED control over serial
- Ex6: Servo wiring and control
    - All code found in event doc

Demo Device:

- Arduino Uno
- But any small microcontroller does the same stuff.

Terminology, Real Quickly

Digital vs Analog

- Digital = 0 or 1, on or off
- Analog = all values 0-255

Serial - a communication method over USB with the board

LED - Light Emitting Diode, used for example as an indicator

Resistor - impedes flow of electricity. Drops voltage.

Ohm’s Law - Voltage = Current * Resistance (V=IR)

Intro to Arduino:

USB A Connector

Power (9v)

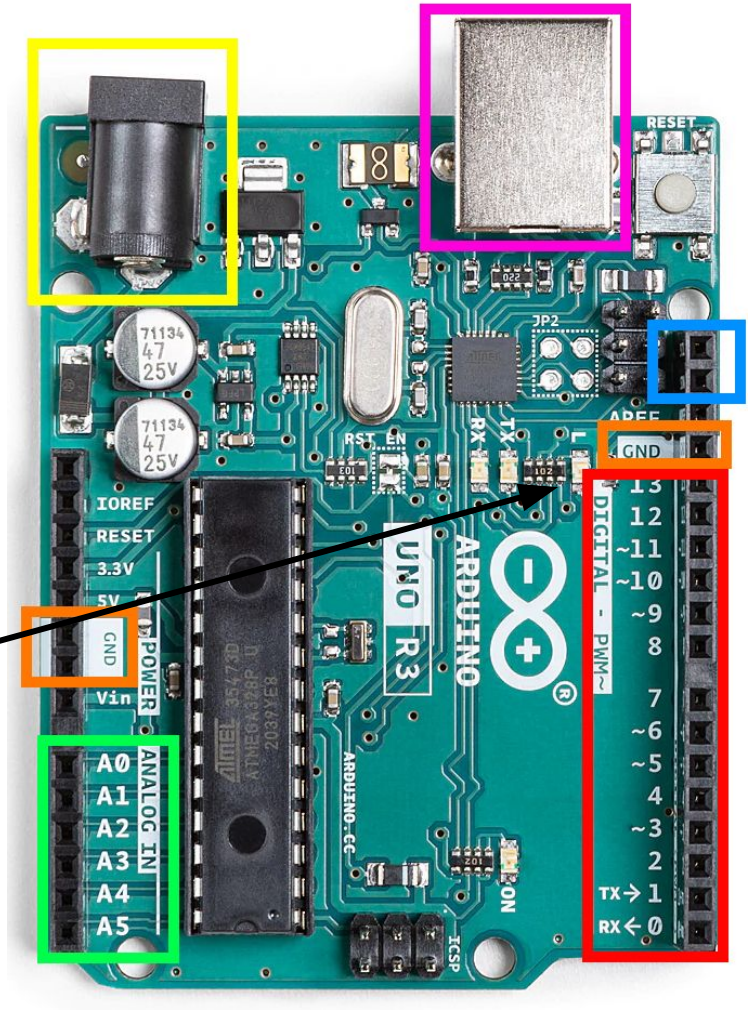
Ground Connection (put neg here)

Analog inputs - reads voltage 0-5v

Digital IO - input AND output of high/low

I2C pins - we're not using them, but some projects will for linking many devices.

On Board LED (pin 13)



Ex1: Blink

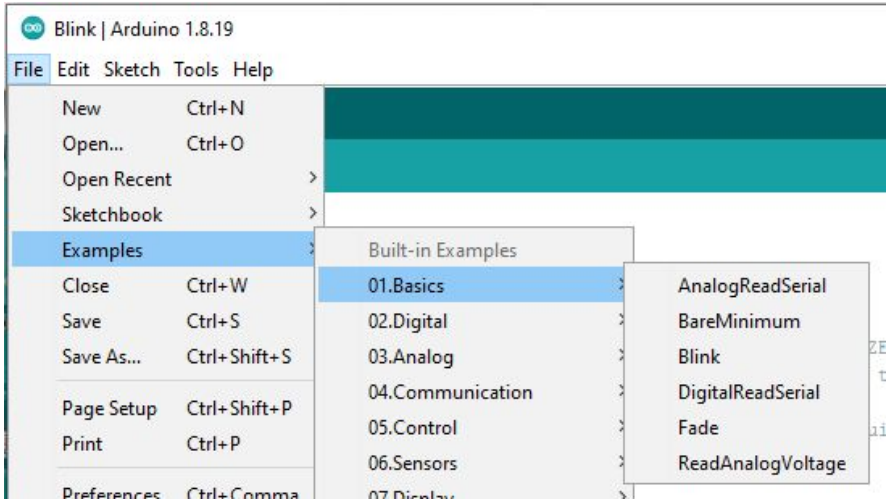
This is the basic test program to make sure all the stuff is working.

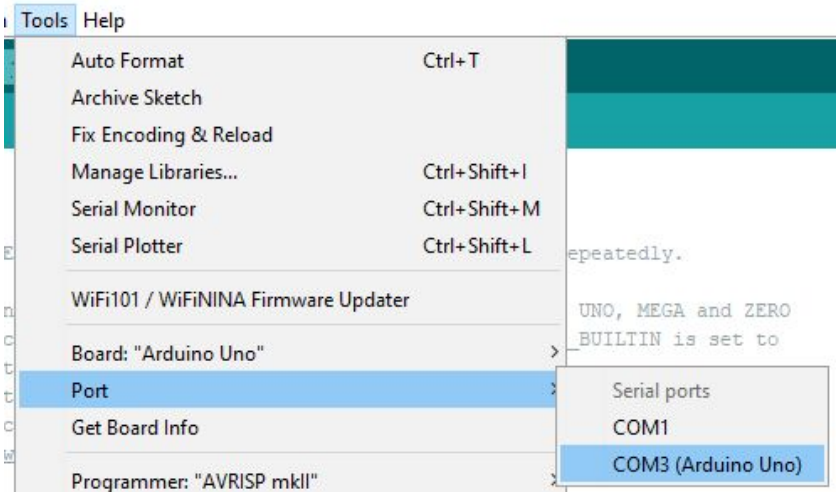
See where to find it on the right

Set your port

Upload! 

You should see the little LED blink.



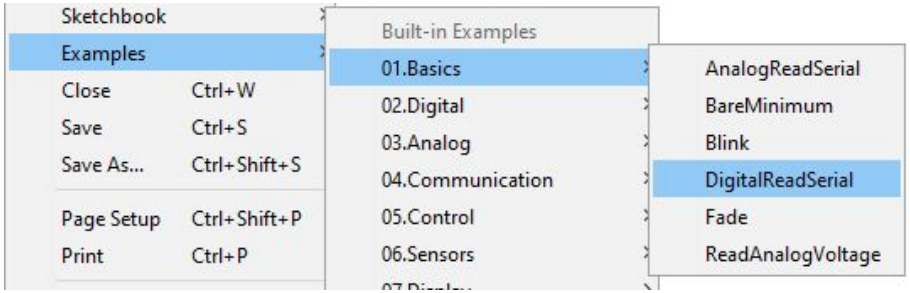


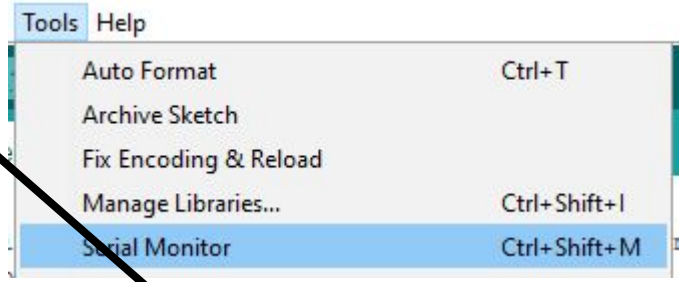
Ex2: Serial Read Button

Lazy man’s button is two wires (5v & pin)

Using the serial read functionality

Make sure code BAUD matches serial





Ex3: LED external

Back to Blink!

LEDs: worst case, you'll pop a couple.

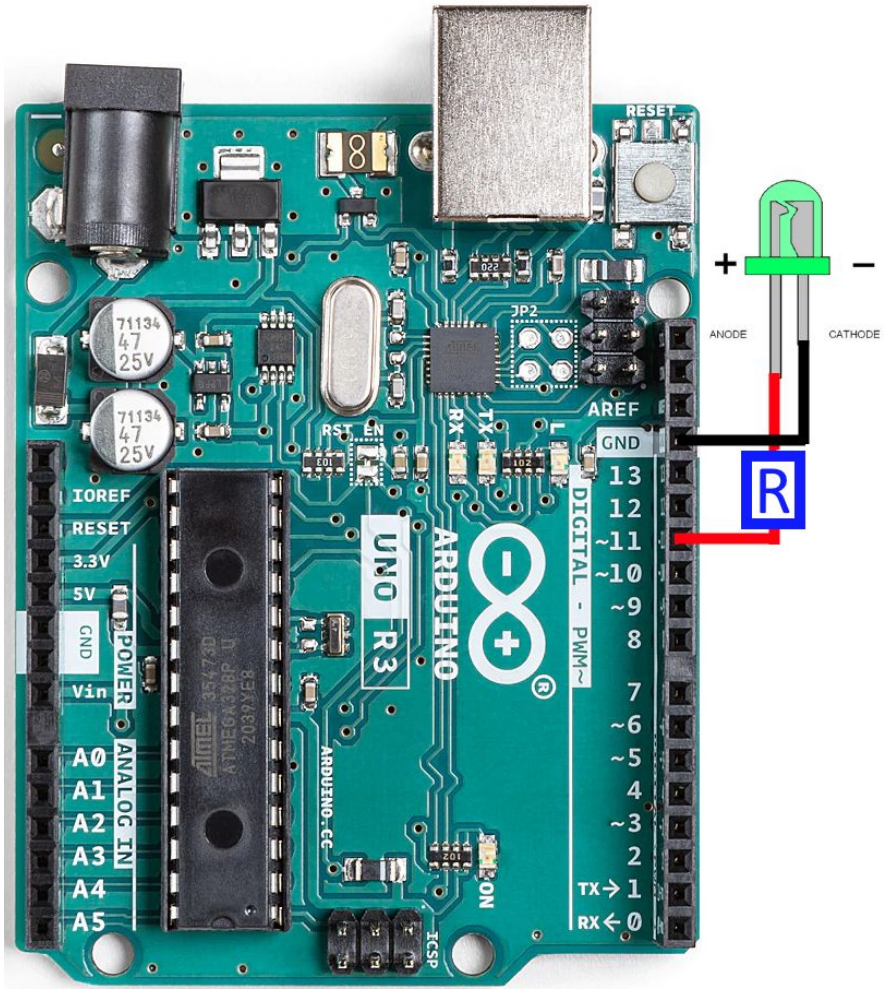
This and This are decent resources to learn more

The basic math is $V_{led} = I_{led} * R_{resistor}$

IE: 3v = 20mA * (0.15 kOhm = 150ohm)

- Closest I have is 220, which is fine

Picking the right resistor means your LED doesn't go pop.

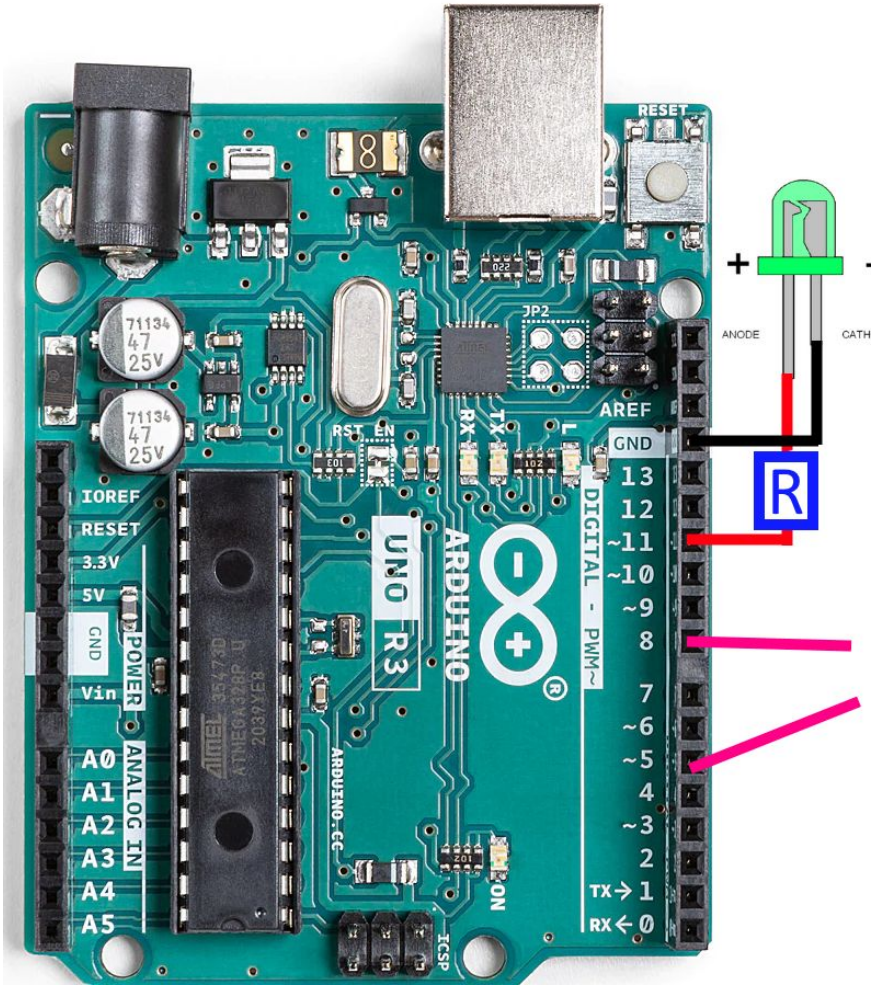


Ex4: LED tied to button

Same stuff as 3, but now two more wires to be a “button”

Using “if” statements!

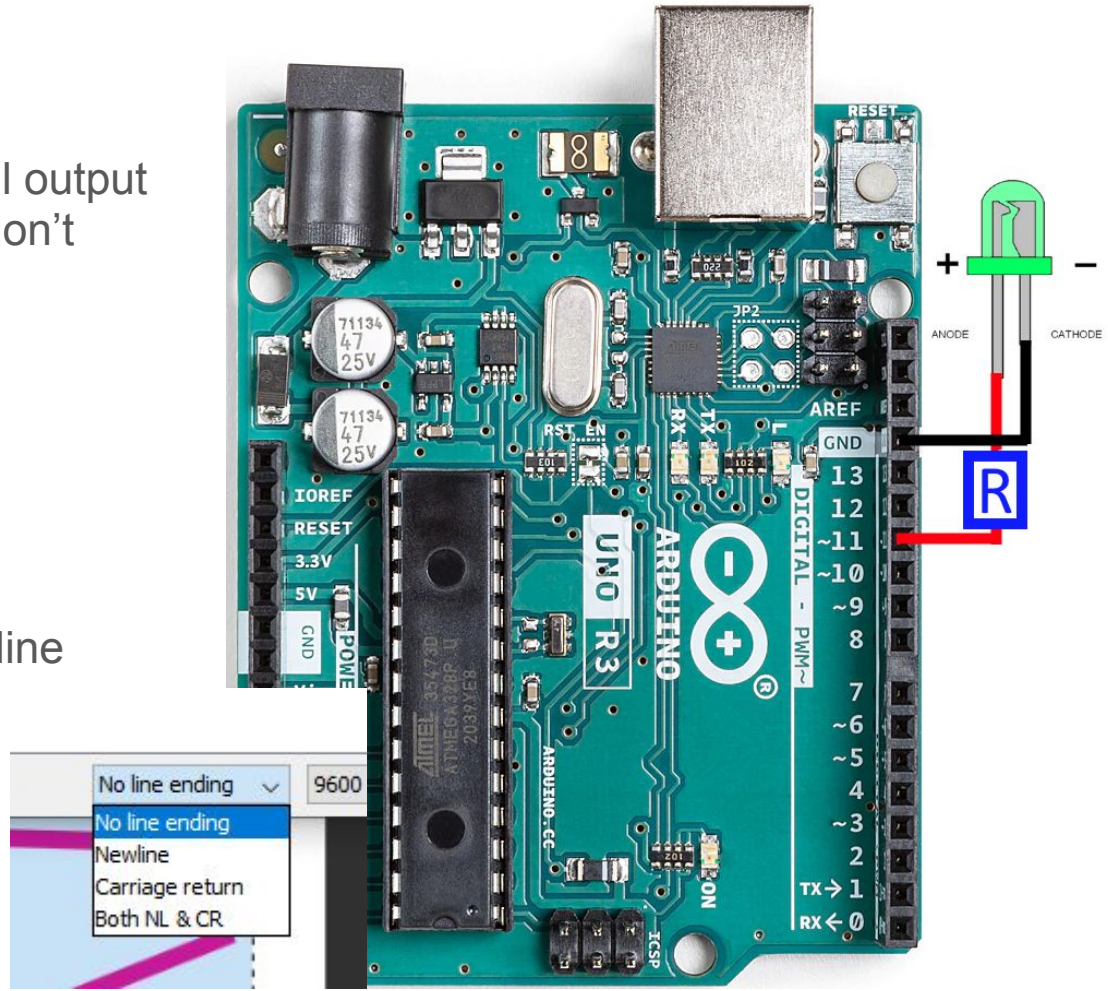
Note the behavior of button type pins - inverted.



Ex5: LED over Serial

- We'll be using one of our digital output pins to fake analog, since we don't have any true analog out pins.
- Via Analog-Write
- Thanks PWM!

- Serial, seen Ex2, is comms
- We can also write via this.'
- NOTE: toggle "newline" to "no line ending" on the serial terminal. Otherwise you get all kinds of unexpected inputs.



Ex6: Servo

- First off, make sure you have the servo library via Tools > library manager > search servo
- Using PWM to move the servo
- Running power on 5v
- Ground on GND
- NOTE: for more than one servo, you're going to want external power