

Lab 01 Preparation

Artificial Intelligence @ Allegheny College

Janyl Jumadinova

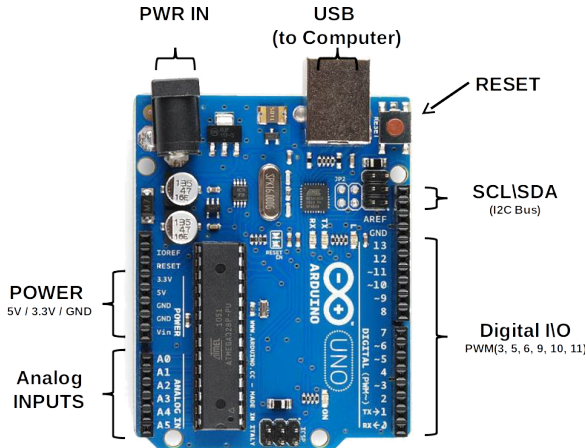
January 24, 2023

Arduino

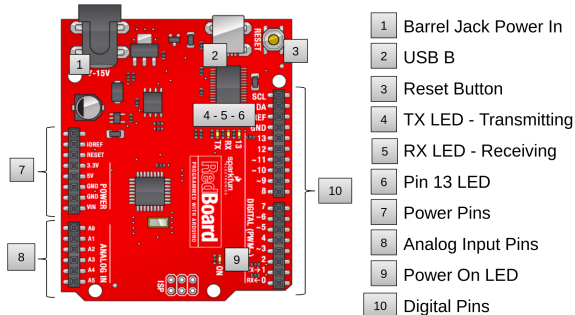
From an Arduino Website:

“Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. ”

Arduino



Arduino



Arduino:

- has two rows of connectors (the 'headers'), a power connector and a USB connector;
- the brain of the board is an Atmel microcontroller (has 32 KB of storage, 2 KB of RAM, and the 8-bit processor runs at 16 MHz);
- the pins of the processor connect to the headers, and you can connect them to virtually anything with some code to control them;
- the I/O pins can be used as input pins (to connect buttons or knobs, temperature or light sensors, or keyboards and mice) or they can be used as output pins (to connect LEDs, drive motors, connect to small displays or the Internet).

How you can damage an Arduino board:

- drawing more than 40mA from an output pin ($1 \text{ watt/volt} = 1000 \text{ milliampere}$);
- drawing more than 200mA from all output pins together;
- supplying more than 5v (3.3v) to an input pin;
- supplying more than 5v to the 5v pin;
- supplying more than 12v to the Vin pin;
- drawing more than 500mA from the 5v pin (when running off an external power supply);
- drawing more than 50mA from the 3.3v pin;
- reversing the polarity of the power supply;
- connecting a load to the Vin pin while using USB power;
- static electricity.

Basic Electronics

Ohm's Law: $V = I \cdot R$

describes the direct relationship between the Voltage(V), Current(I) and Resistance(R) of a circuit.

An Electrical Circuit must have a continuous LOOP from Power (V_{cc}) to Ground (GND).

Basic Electronics

Ohm's Law: $V = I \cdot R$

describes the direct relationship between the Voltage(V), Current(I) and Resistance(R) of a circuit.

An Electrical Circuit must have a continuous LOOP from Power (V_{cc}) to Ground (GND).

- **Voltage:** The amount of potential energy in a circuit (in Volts) (more energy = higher voltage).

Basic Electronics

Ohm's Law: $V = I \cdot R$

describes the direct relationship between the Voltage(V), Current(I) and Resistance(R) of a circuit.

An Electrical Circuit must have a continuous LOOP from Power (V_{cc}) to Ground (GND).

- **Voltage:** The amount of potential energy in a circuit (in Volts) (more energy = higher voltage).
- **Current:** The rate of charge flow in a circuit (in Amperes).

Basic Electronics

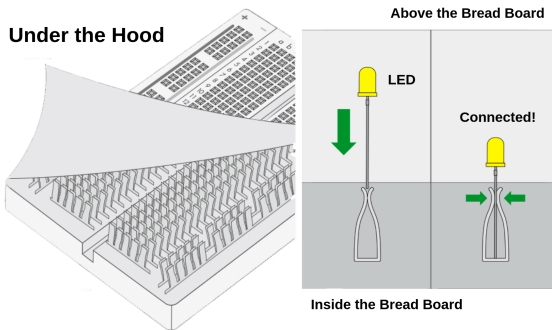
Ohm's Law: $V = I \cdot R$

describes the direct relationship between the Voltage(V), Current(I) and Resistance(R) of a circuit.

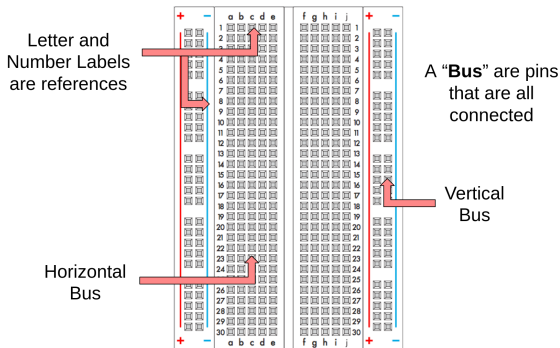
An Electrical Circuit must have a continuous LOOP from Power (Vcc) to Ground (GND).

- **Voltage:** The amount of potential energy in a circuit (in Volts) (more energy = higher voltage).
- **Current:** The rate of charge flow in a circuit (in Amperes).
- **Resistance:** The opposition to charge flow (in Ohms).

Solderless Breadboard



Solderless Breadboard



Basic Electronics

- **Capacitor:** is an electrical component that can store electrical charge (in the form of electrons).

Basic Electronics

- **Capacitor:** is an electrical component that can store electrical charge (in the form of electrons).
- **Transistor:** is a semiconductor device, that is used to switch or amplify a signal.

Basic Electronics

- **Capacitor:** is an electrical component that can store electrical charge (in the form of electrons).
- **Transistor:** is a semiconductor device, that is used to switch or amplify a signal.
- **Diode:** is a semiconductor device that can only conduct electricity in one direction.

Basic Electronics

- **Capacitor:** is an electrical component that can store electrical charge (in the form of electrons).
- **Transistor:** is a semiconductor device, that is used to switch or amplify a signal.
- **Diode:** is a semiconductor device that can only conduct electricity in one direction.
- **LED** (Light Emitting Diode): similar to a regular diode, but they emit the energy as light, instead of heat.

Arduino IDE

- Computer communicates with the Arduino microcontroller via a serial port through a USB-Serial adapter (Tools → Serial Port).
- Must ensure the proper board is selected (Tools → Board).

Arduino IDE

- Computer communicates with the Arduino microcontroller via a serial port through a USB-Serial adapter (Tools → Serial Port).
- Must ensure the proper board is selected (Tools → Board).
- Main programming concepts:
 - ① `digitalWrite()`
 - ② `analogWrite()`
 - ③ `digitalRead()`
 - ④ `if()` statements / Boolean
 - ⑤ `analogRead()`
 - ⑥ Serial communication