BASICS OF ELECTRONICS & INTRODUCTION ABOUT ARDUINO

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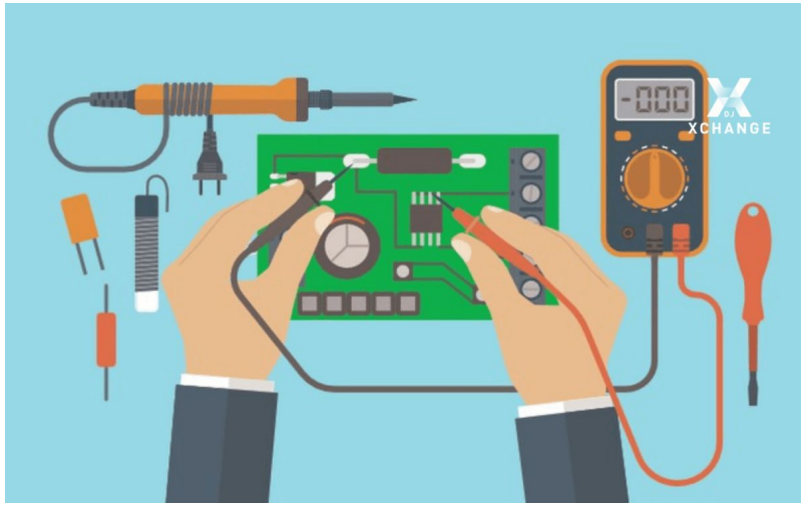

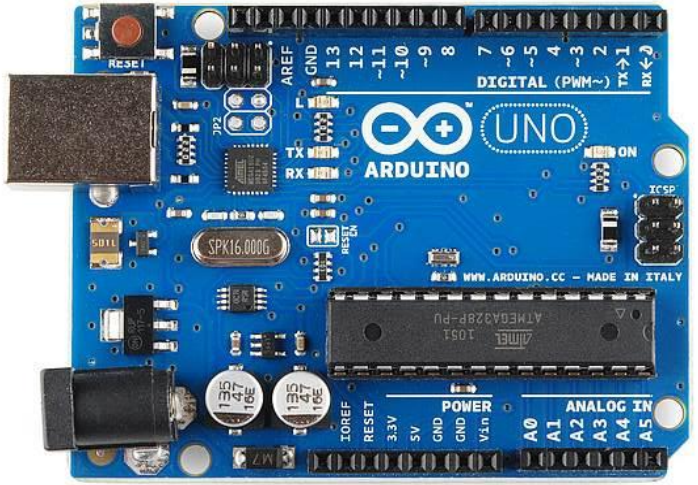

CONTENT

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- Voltage & Current
- Resistor
- LEDs
- Arduino
- Breadboard
- Motor
- IR Sensor
- Arduino UNO
- Arduino Programming Basics
- Q&A

WHAT IS ROBOT ?

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A robot is a mechanical device that can perform tasks automatically. It may – but need not – be humanoid in appearance. Some robots require some degree of guidance, which may be done using a remote control, or with a computer interface. A robot is usually an electro-mechanical machine that is guided by a program or circuitry.

WHAT IS ROBOTICS ?

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The branch of technology that deals with the design, construction, operation, and application of robots.

A255 robot

VOLTAGE & CURRENT

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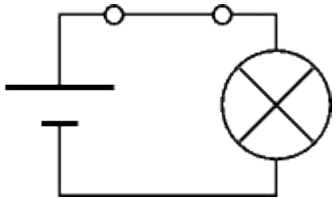
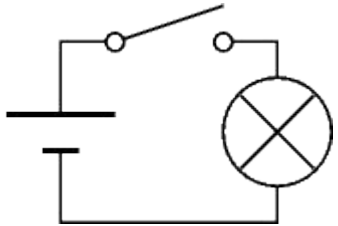
Voltage and Current are vital to understanding electronics, but they are quite hard to grasp because we can't see them directly.

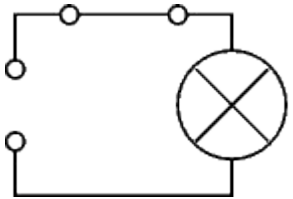
Voltage is the Cause, Current is the Effect



Voltage and Current
The switch is closed making a complete circuit so current can flow.



Voltage but No Current
The switch is open so the circuit is broken and current cannot flow.



No Voltage and No Current
Without the cell there is no source of voltage so current cannot flow

Direction of electron motion

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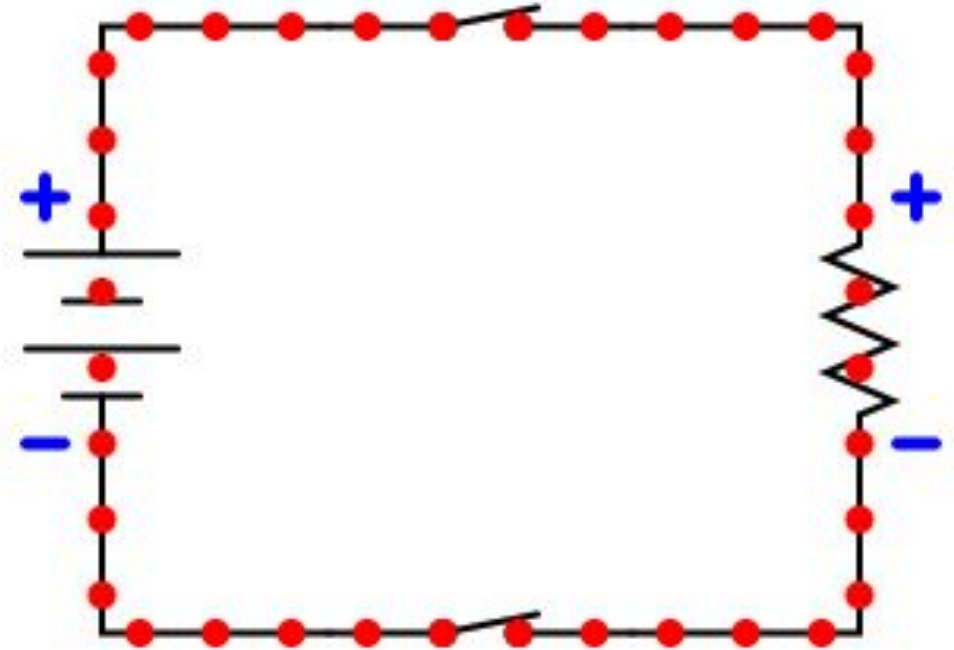

LED

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A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lighting.

Electronic Symbol

SENSORS

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- **Definition:** Sensor is an input device which provides an output (signal) with respect to a specific physical quantity (input).
- The term “input device” in the definition of a Sensor means that it is part of a bigger system which provides input to a main control system (like a Processor or a Microcontroller).
- We live in a World of Sensors. You can find different types of Sensors in our homes, offices, cars etc. working to make our lives easier by turning on the lights by detecting our presence, adjusting the room temperature, detect smoke or fire, make us delicious coffee, open garage doors as soon as our car is near the door and many other tasks.

RESISTORS

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A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

The current through a resistor is in direct proportion to the voltage across the resistor's terminals. According to Ohm’s Law

- I □ current through the conductor in units of Amperes (A)
- V□ Voltage measured across the conductor in units of Volts(V)
- R□ resistance of the conductor in units of Ohms (Ω).

$$I = \frac{V}{R}$$

RESISTORS COLORS

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Colour	1st band	2nd band	3rd band (multiplier)	4th band (tolerance)	Temp. Coefficient
Black	0	0	$\times 10^0$		
Brown	1	1	$\times 10^1$	±1% (F)	100 ppm
Red	2	2	$\times 10^2$	±2% (G)	50 ppm
Orange	3	3	$\times 10^3$		15 ppm
Yellow	4	4	$\times 10^4$		25 ppm
Green	5	5	$\times 10^5$	±0.5% (D)	
Blue	6	6	$\times 10^6$	±0.25% (C)	
Violet	7	7	$\times 10^7$	±0.1% (B)	
Gray	8	8	$\times 10^8$	±0.05% (A)	
White	9	9	$\times 10^9$		
Gold			×0.1	±5% (J)	
Silver			×0.01	±10% (K)	
None				±20% (M)	

IR SENSOR

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- IR Sensor is a detector which reacts to a infrared radiations.

IR Sensor Pair:

- Transmitter = LED (Light Emitting Diode)

It is similar to normal LEDs but emit infra-red light its glow can be seen with a digital camera or mobile phone camera.

- Receiver = Photodiode/IR Transistor. A photodiode is a diode that conducts only when light falls on it.

IR SENSOR WORKING

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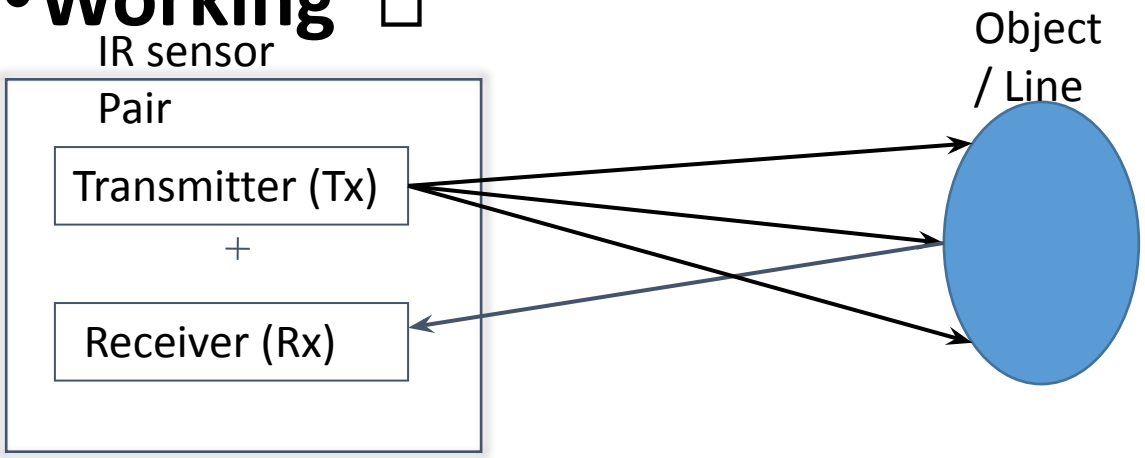
- **Working**



Transmitter = LED (Light Emitting Diode)

Receiver = Photodiode

MOTORS

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An electric motor is an electromechanical device that converts electrical energy into mechanical energy.

There are two types of motor:

- AC Motors (Run on AC Electric Power).
- DC Motors (Run on DC Electric Power).

AC Motor

DC Motor

MOTOR DRIVER (H-BRIDGE) L293D

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- Motor driver circuit (L293D) is used to drive the motor in Forward or Reverse Direction.

M_{1a}	M_{1b}	Motor State
0	0	Stop
1	0	Forward
0	1	Reverse
1	1	Stop

BREADBOARD

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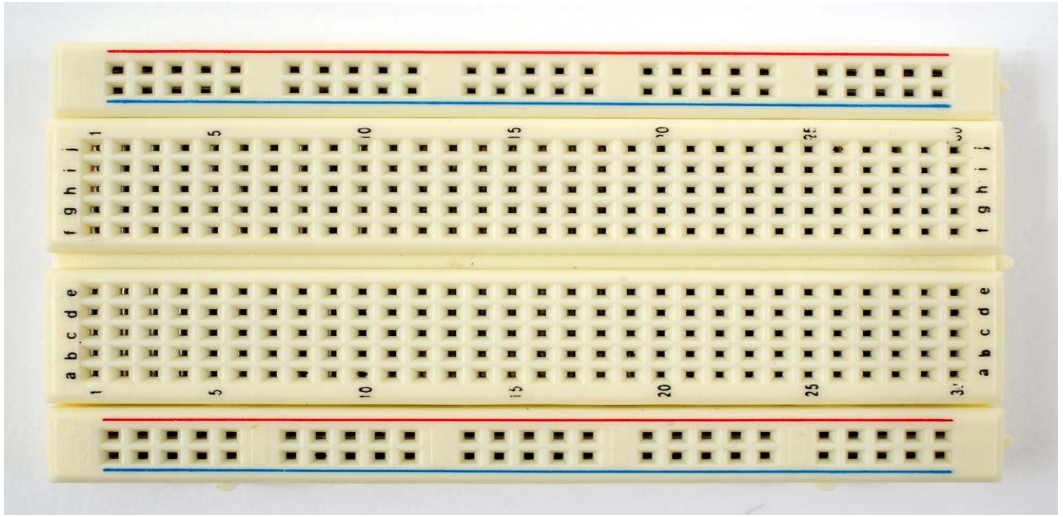
A breadboard (or protoboard) is usually a construction base for prototyping of electronics. The term "breadboard" is commonly used to refer to a solderless breadboard (plugboard).



INTERNAL DIAGRAM OF BREADBOARD

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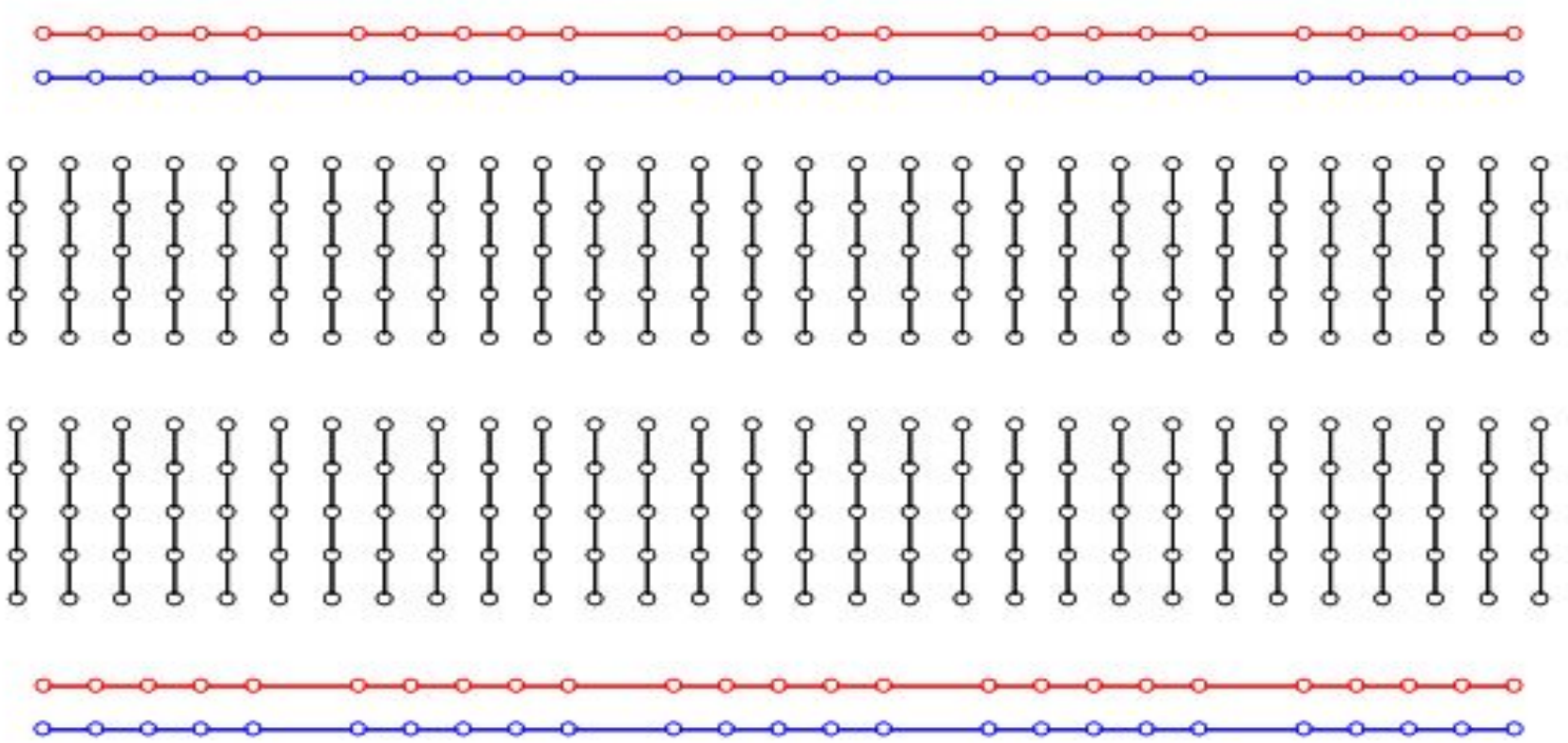

ARDUINO

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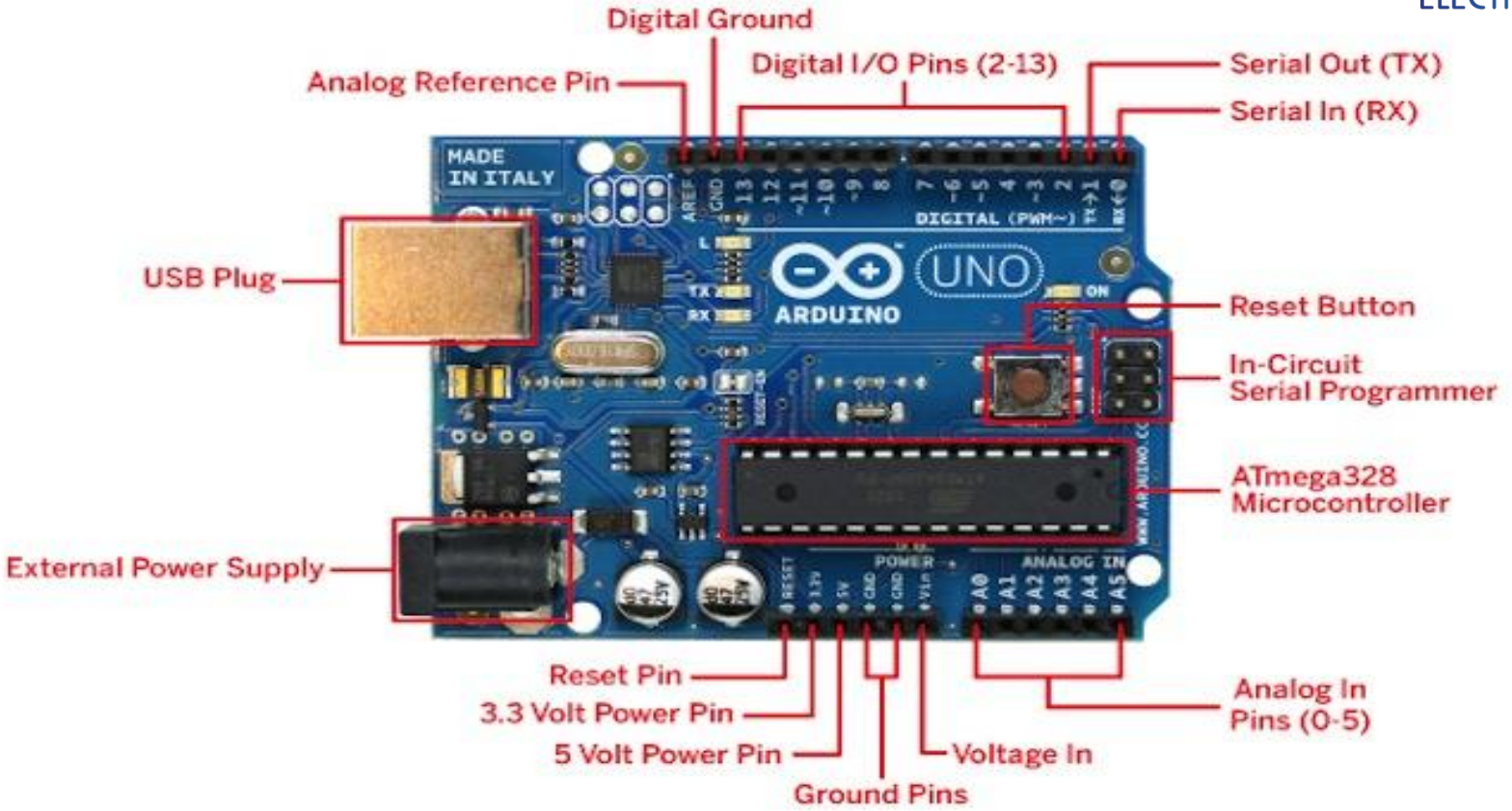
Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.


Digital Ground
Analog Reference Pin
Digital I/O Pins (2-13)
Serial Out (TX)
Serial In (RX)
USB Plug
Reset Button
In-Circuit
Serial Programmer
ATmega328
Microcontroller
External Power Supply
Reset Pin
3.3 Volt Power Pin
5 Volt Power Pin
Ground Pins
Voltage In
Analog In
Pins (0-5)
MADE
IN ITALY
UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN

ARDUINO PROGRAMMING BASICS

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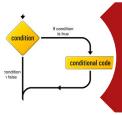
BIG 6 CONCEPTS

digitalWrite()

analogWrite()

digitalRead()



If() statements / Boolean

analogRead()

Serial communication

ARDUINO CONNECTION WITH COMPUTER

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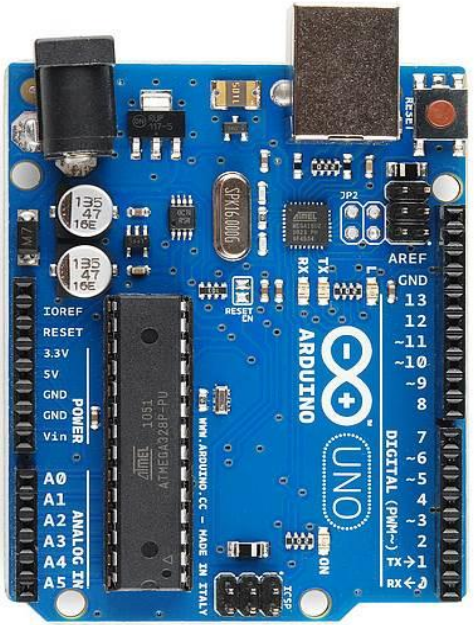

CONCEPTS: INPUT VS. OUTPUT

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Referenced from the perspective of the microcontroller (electrical board).

Inputs is a signal / information going into the board.

Output is any signal exiting the board.

Almost all systems that use physical computing will have some form of output

What are some examples of Outputs?

Examples: Buttons Switches, Light Sensors, Flex Sensors, Humidity Sensors,	Examples: LEDs, DC motor, servo motor, a piezo buzzer, relay, an RGB LED

CONCEPTS: ANALOG VS. DIGITAL

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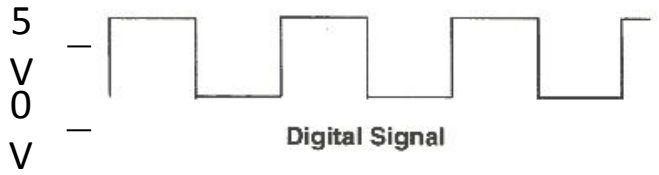
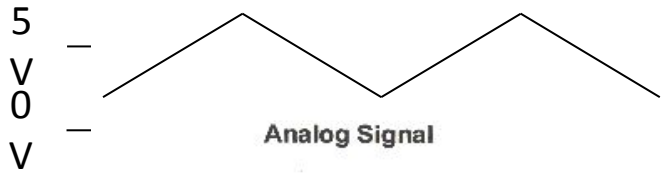
- Microcontrollers are **digital** devices – ON or OFF. Also called – discrete.

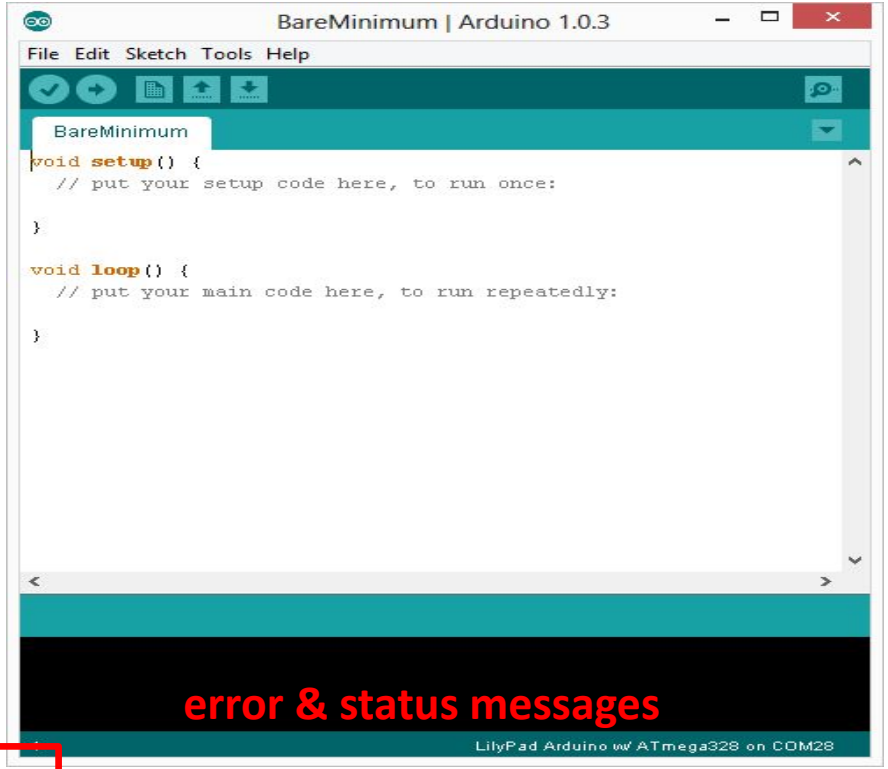
- **analog** signals are anything that can be a full range of values. What are some examples? More on this later…





ARDUINO

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)



Two required functions / methods / routines:

```
void setup()
{
    // runs once
}

void loop()
{
    // repeats
}
```

SETTINGS: TOOLS □ SERIAL PORT

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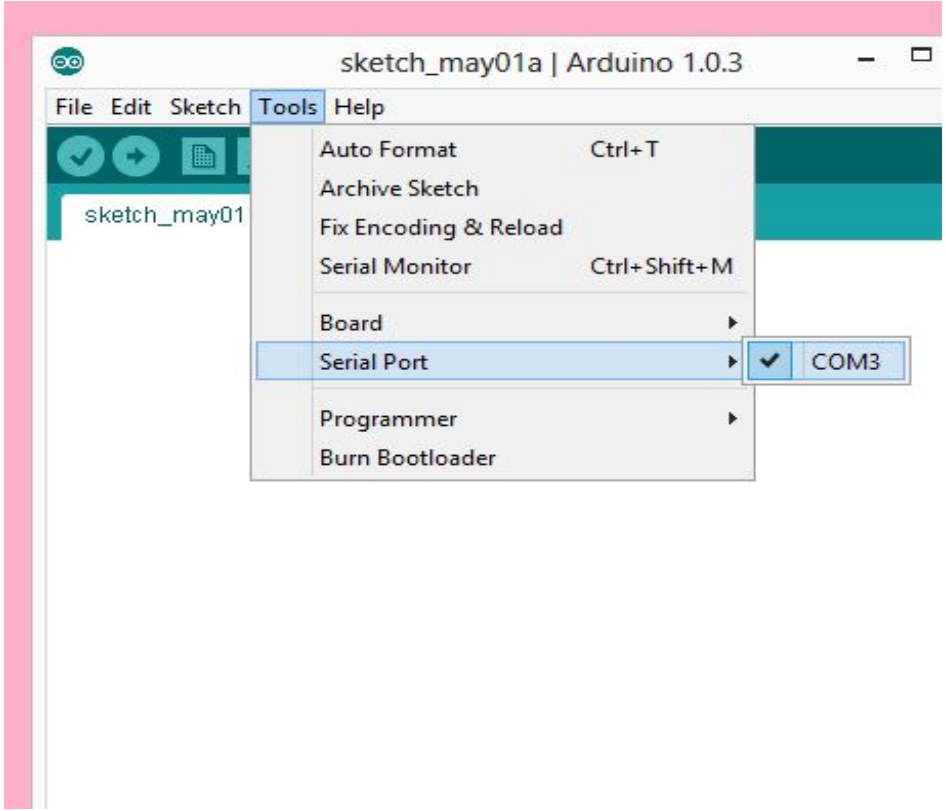

- Your computer communicates to the Arduino microcontroller via a serial port □ through a USB-Serial adapter.

- Check to make sure that the drivers are properly installed.

SETTINGS: TOOLS □ BOARD

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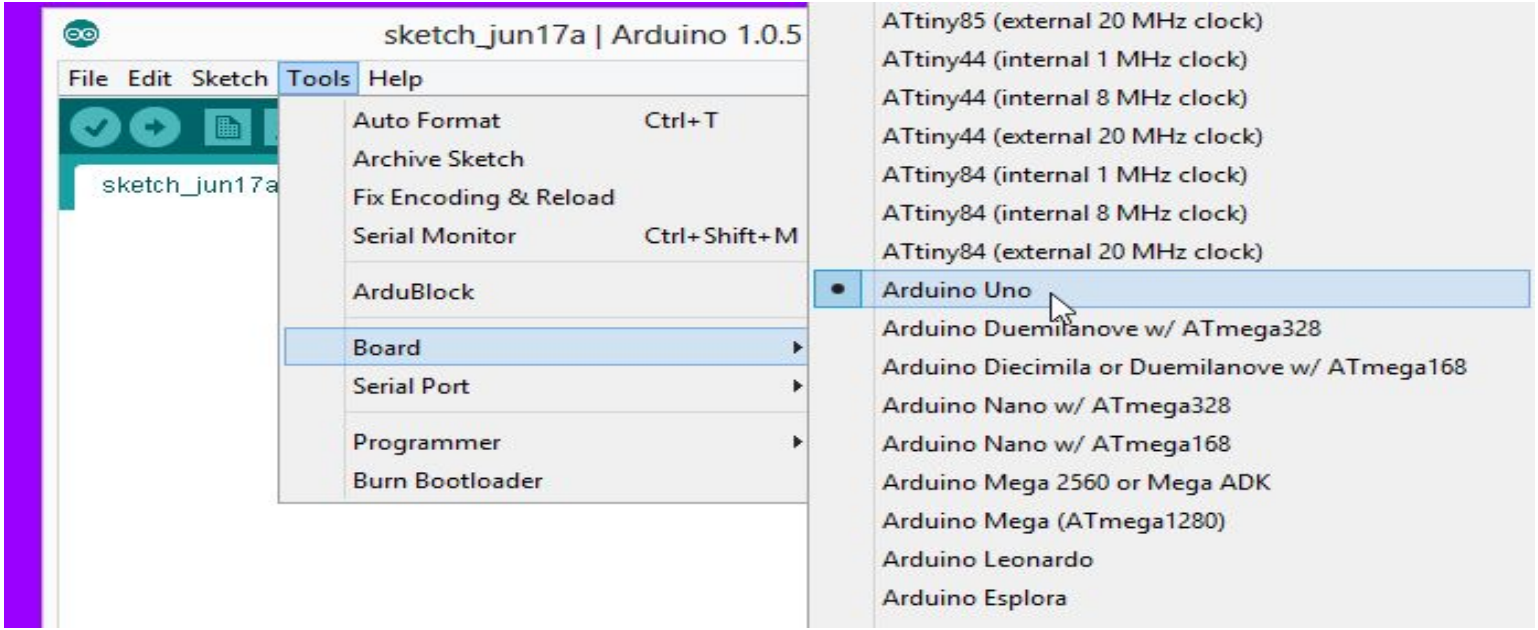

- Next, double-check that the proper board is selected under the Tools□Board menu.

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THANK YOU