ARDUINO STEAM ACADEMY

Art without Engineering is dreaming. Engineering without Art is calculating.

- Steven K. Roberts

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

STEAM CLOWN™ PRODUCTIONS

SEE APPENDIX A, FOR LICENSING & ATTRIBUTION INFORMATION

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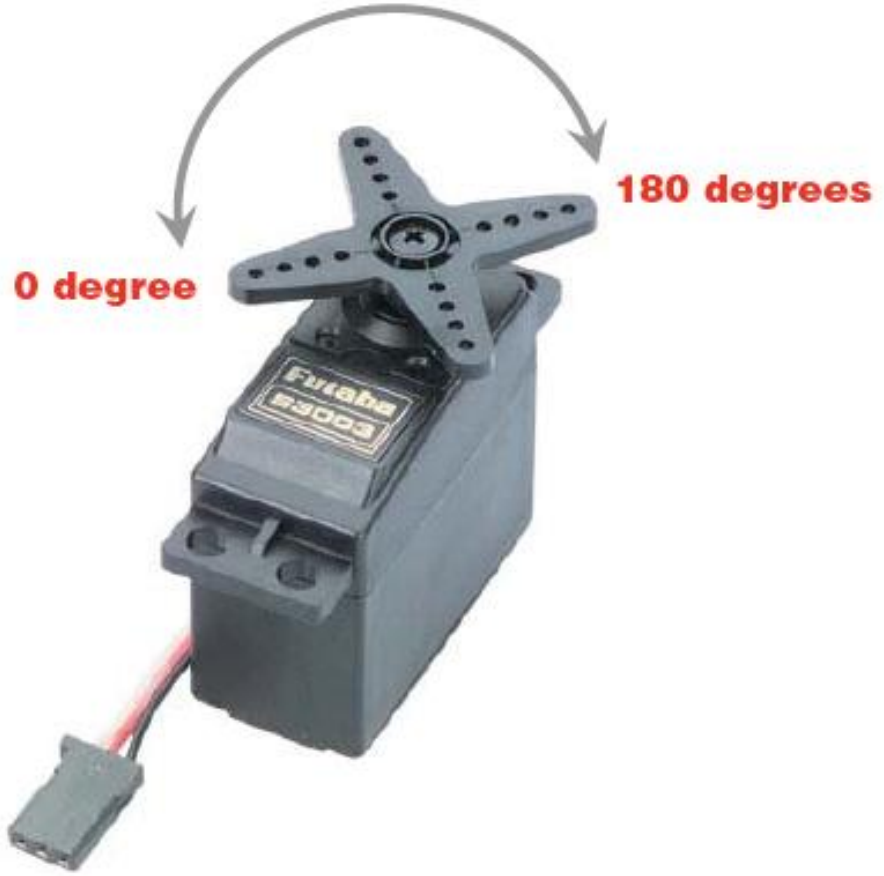
SERVO MOTORS

SERVO MOTOR INTRO

- A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position
- This means, it is a motor that we can precisely control the position



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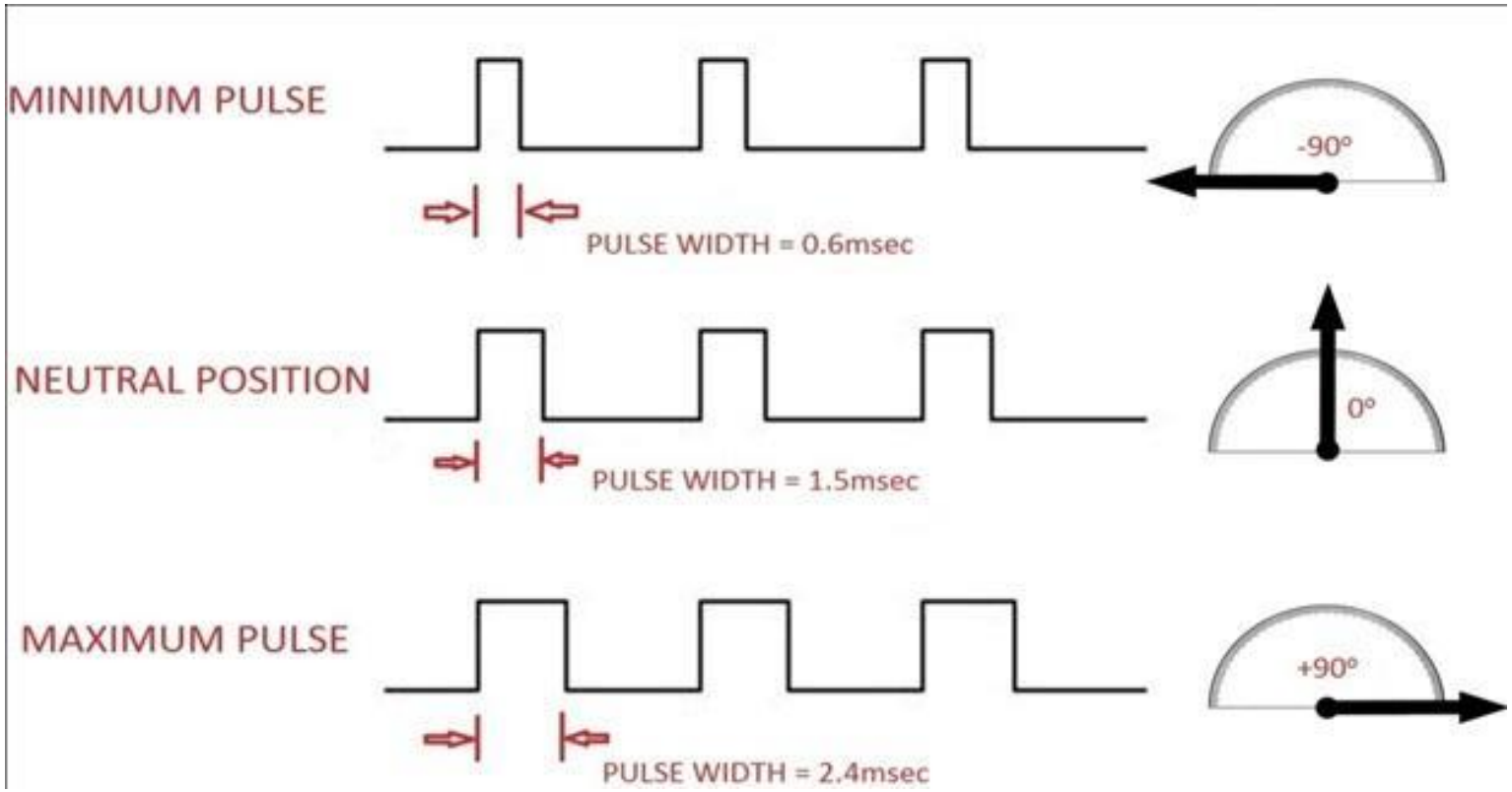
SERVO MOTOR INTRO

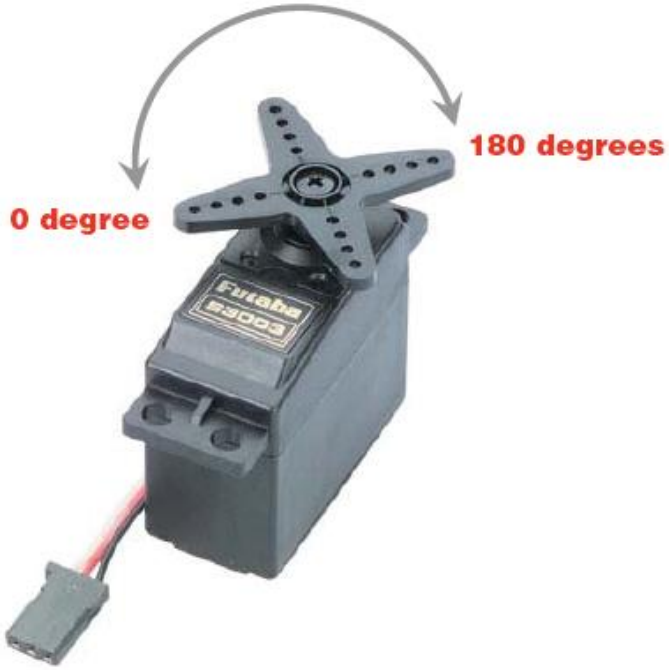
- A **servomotor** is a closed-loop servomechanism that uses position feedback to control its motion and final position
- This means, it compares it's current position to the target position and them have the motor turn to go there

https://upload.wikimedia.org/wikipedia/commons/e/ec/Exploded_Servo.jpg

MOVE A SERVO MOTOR

- PWM?
  - Pulse Width Modulation





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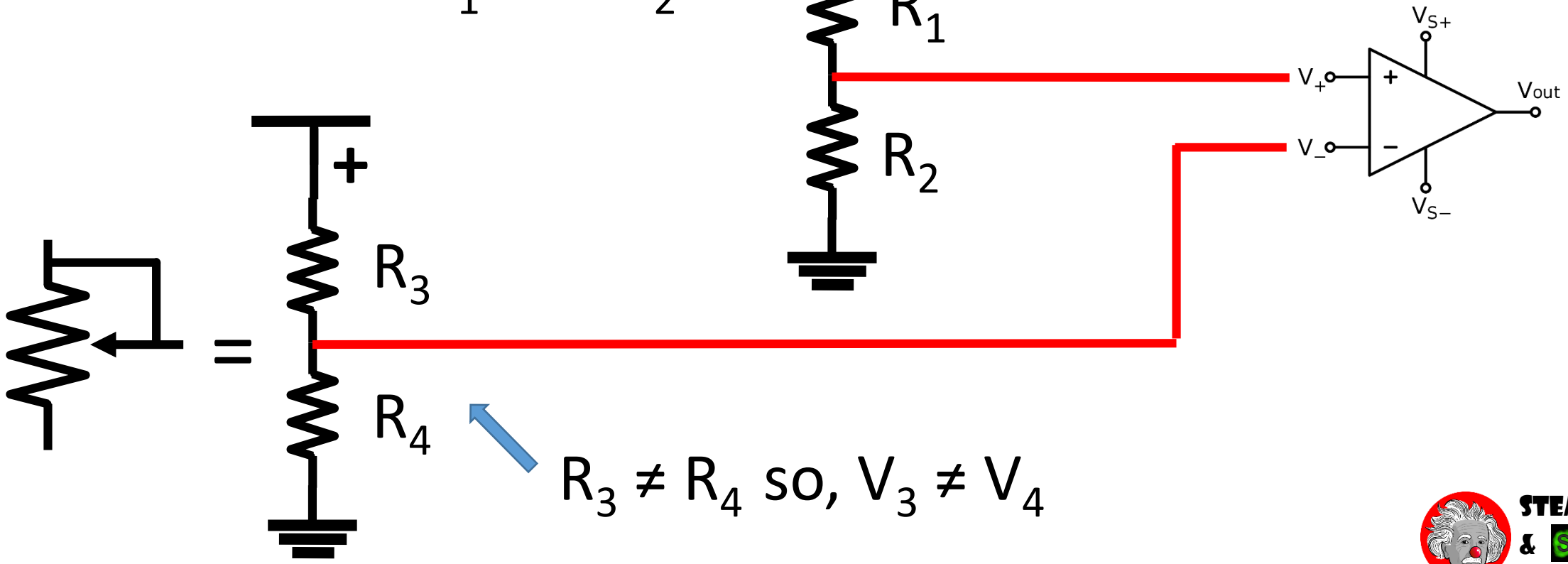
How a Differential Comparator Works

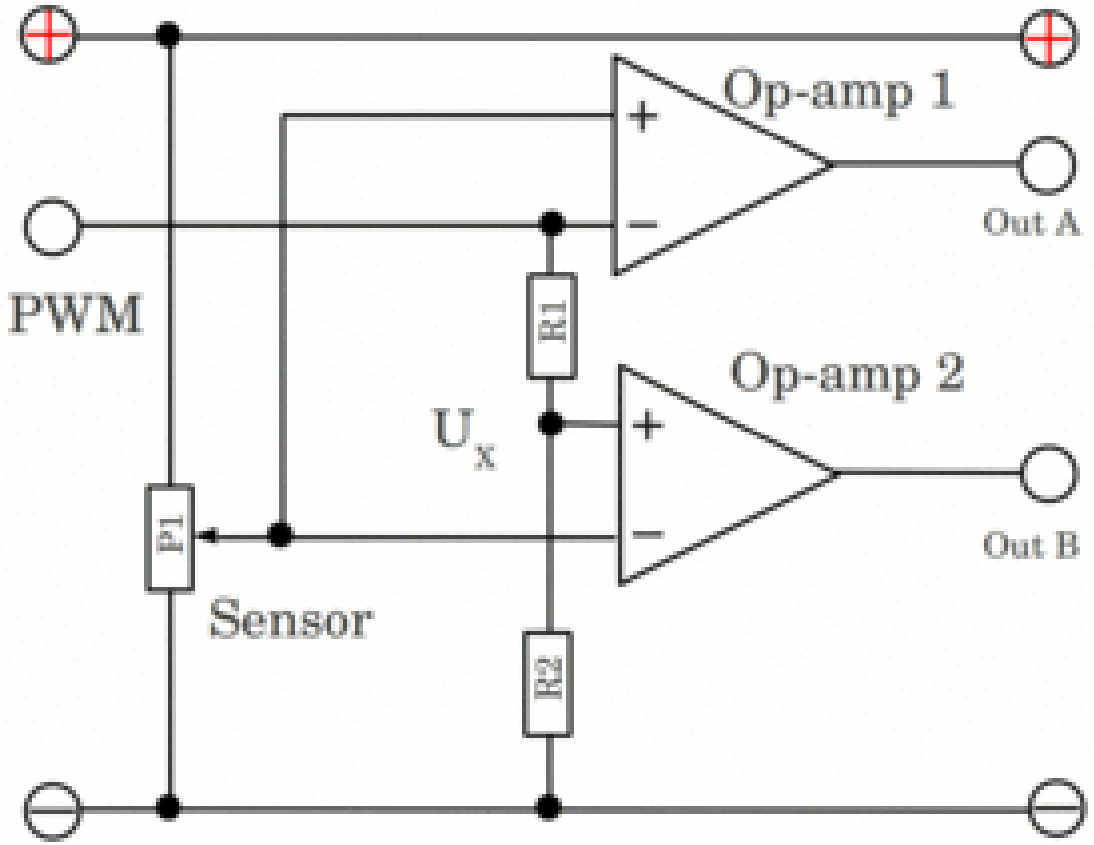
If V_{in} changes up or down so does V_1 and V_2

$R_1 = R_2$ so, $V_1 = V_2$



$R_3 \neq R_4$ so, $V_3 \neq V_4$

- A **servomotor** is a closed-loop servomechanism that uses position feedback to control its motion and final position
- This means, it compares it's current position to the target position and them have the motor turn to go there

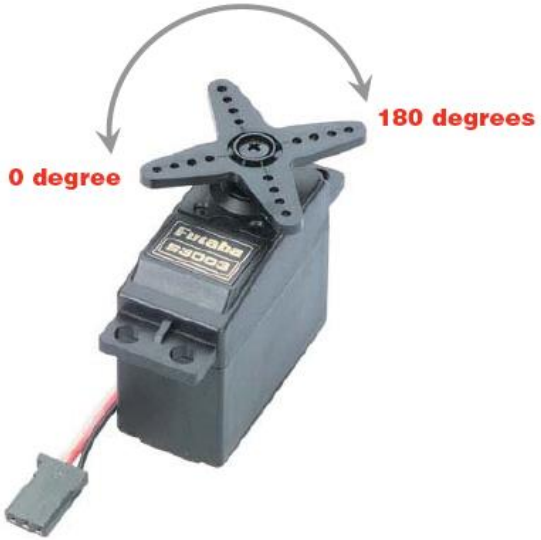


http://homofaciens.de/bilder/technik/servos_007_400x225.gif

VIDEOS ABOUT SERVO MOTORS

- Electronic Basics #25: Servos and how to use them
- How servo motors work by Phidgets
-

WRITING TO A SERVO MOTOR




```
#include <Servo.h>
Servo myservo;  // create servo object to control a servo
          // twelve servo objects can be created on most boards
 int pos = 0;    // variable to store the servo position
 void setup()
{
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
 //  myservo.write(pos);
 }
 void loop()
 {
   for(pos = 0; pos <= 92; pos += 1) // can goes from 0 degrees to 180 degrees
   {                          // in steps of 1 degree
      myservo.write(pos);           // tell servo to go to position in variable 'pos'
     delay(5);                  // waits 15ms for the servo to reach the position
   }
   for(pos = 92; pos>=0; pos-=1)     // can goes from 180 degrees to 0 degrees
   {
     myservo.write(pos);           // tell servo to go to position in variable 'pos'
     delay(5);                  // waits 15ms for the servo to reach the position
   }
}
```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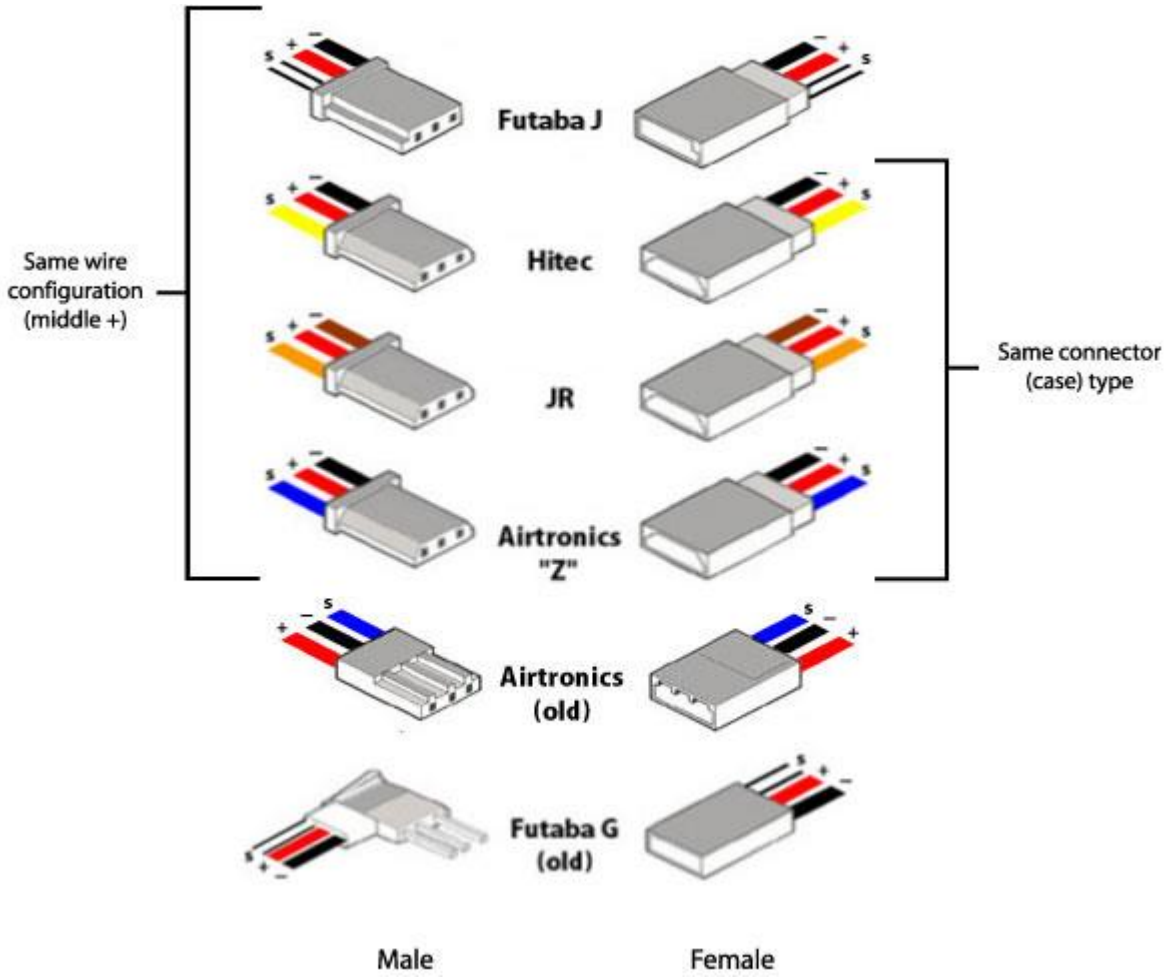
CODE PROJECTS

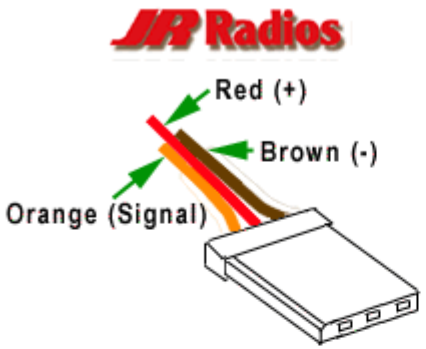
- Servo Control
  - Haunted Box
    - Read a Switch
    - Write to I servo
    - 2 LEDs
  - Wave Hello
    - Read a Switch
    - Write to 2 Servo

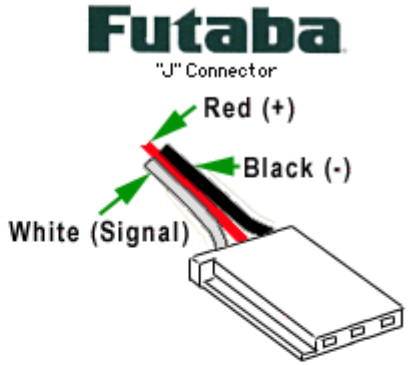
- Think about how
  - What to do when a switch is pushed. Delay?
  - What is the pattern you want?
  - What to do after the “Event” has happened? Reset?

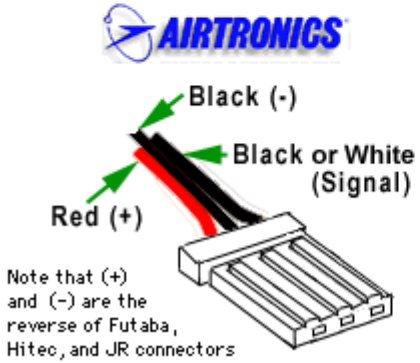
- Triggering a Pneumatic
  - Read Switch
  - Write to LED
  - Write to Sound board
  - Write to Pneumatic

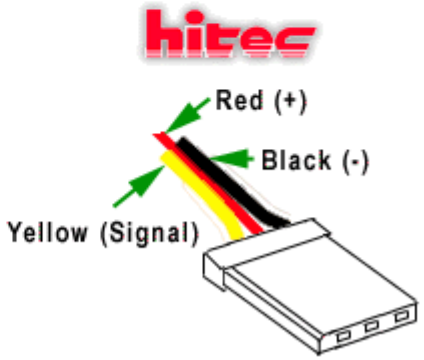
SERVO WIRING DIAGRAMS







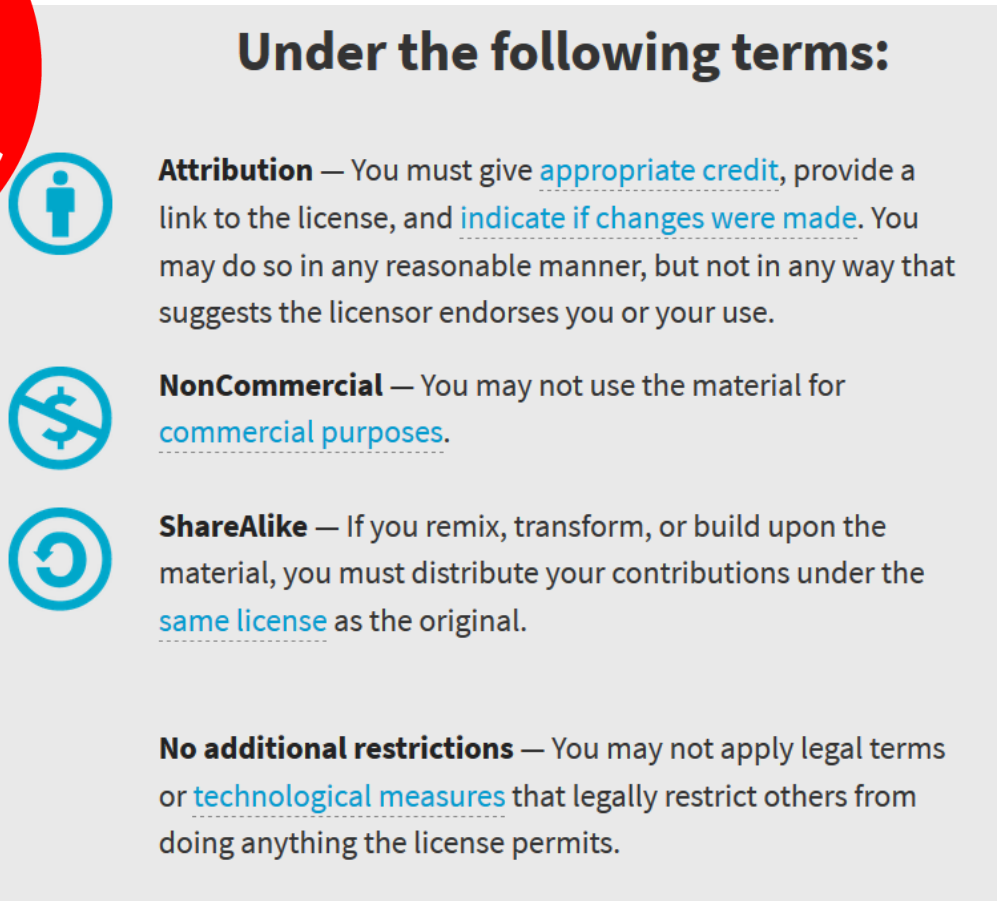




APPENDIX

APPENDIX A: LICENSE & ATTRIBUTION

- This content is primarily the Intellectual Property of Jim Burnham, Top STEAM Clown, at STEAMClown.org
- This presentation and content is distributed under the Creative Commons License CC-by-nc-sa-3.0
- My best attempt to properly attribute, or reference any other sources or work I have used are listed in Appendix B



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Appendix B: Attribution for Sources Used

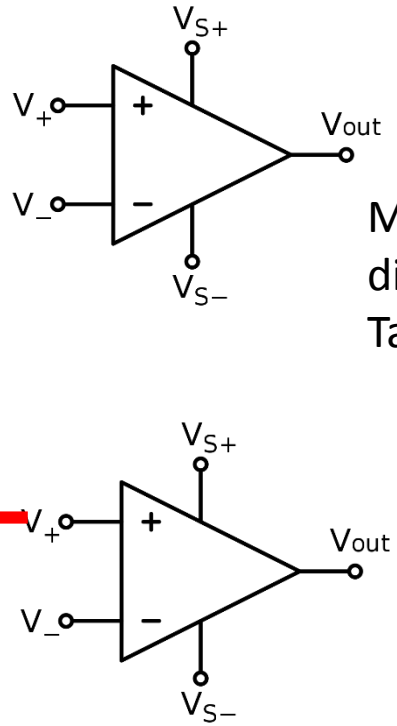
REFERENCE SLIDES

IS IT POSSIBLE TO GET HELP?

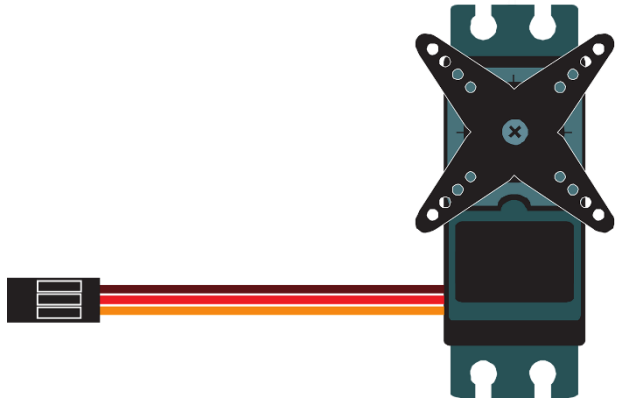
- Git Hub – See Steam Clown's Files
- http://www.arduino.cc/ ← Official Arduino Site
- http://www.arduinobook.com/
- Google Is Your Friend…
  - Google Arduino Getting Started
  - Google Arduino Tutorials
  - Google Arduino Sketches
- PDF books
  - Arduino Programmers Notebook
  - Arduino in a Nutshell
  - Introduction to Arduino - A piece of cake!
- YouTube
  - Arduino: Your First Arduino Sketch
  - Tutorial 01 for Arduino: Getting Acquainted with Arduino

Represents the new **Target** position

Represents the **Current** position



Motor turns to make the Current position differential voltage equal to the new Target position differential voltage



https://upload.wikimedia.org/wikipedia/commons/thumb/9/97/Op-amp_symbol.svg/1000px-Op-amp_symbol.svg.png

https://upload.wikimedia.org/wikipedia/commons/b/b5/Potentiometer.jpg

https://pixabay.com/p-950527/?no_redirect