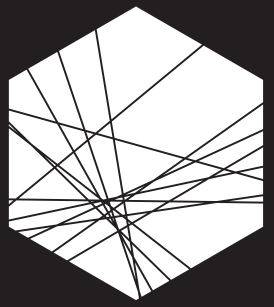
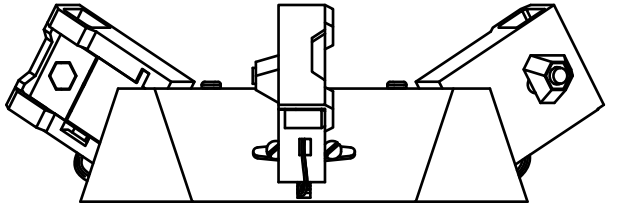


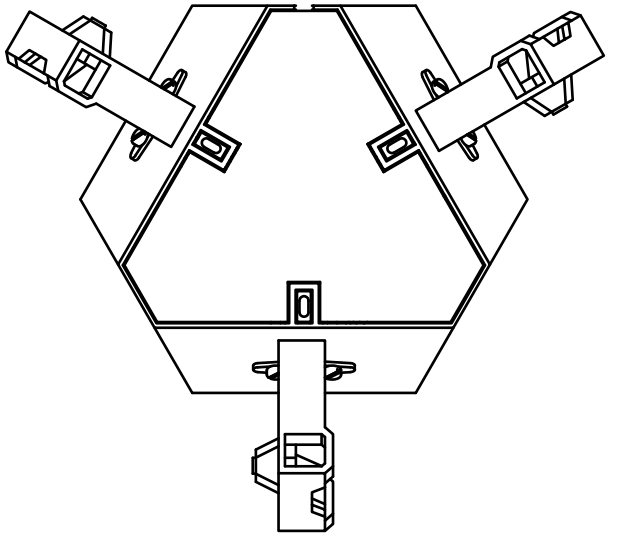
CHARLOTTE

What if you could download a Product?

The rise in popularity of 3D printing and the Internet becoming ubiquitous has prompted many speculations about how the democratization of manufacturing and the free sharing of information will affect our environments. Charlotte, as well as being a functional experience-focused robot, is one of those speculations. Being open sourced and transparent, it questions the binary relationship between manufacturer and consumer, encouraging modification over dictation.

Charlotte's movements are determined by light interpreted through three sensors located on top of its body. For legs, it has three pens that individually attach to form a tripod. Each light sensor controls the movement of one leg that marks the paper with every act.





TOOLS NEEDED

You Will Need:

A 3D Printer

B Screw Driver

C Hammer

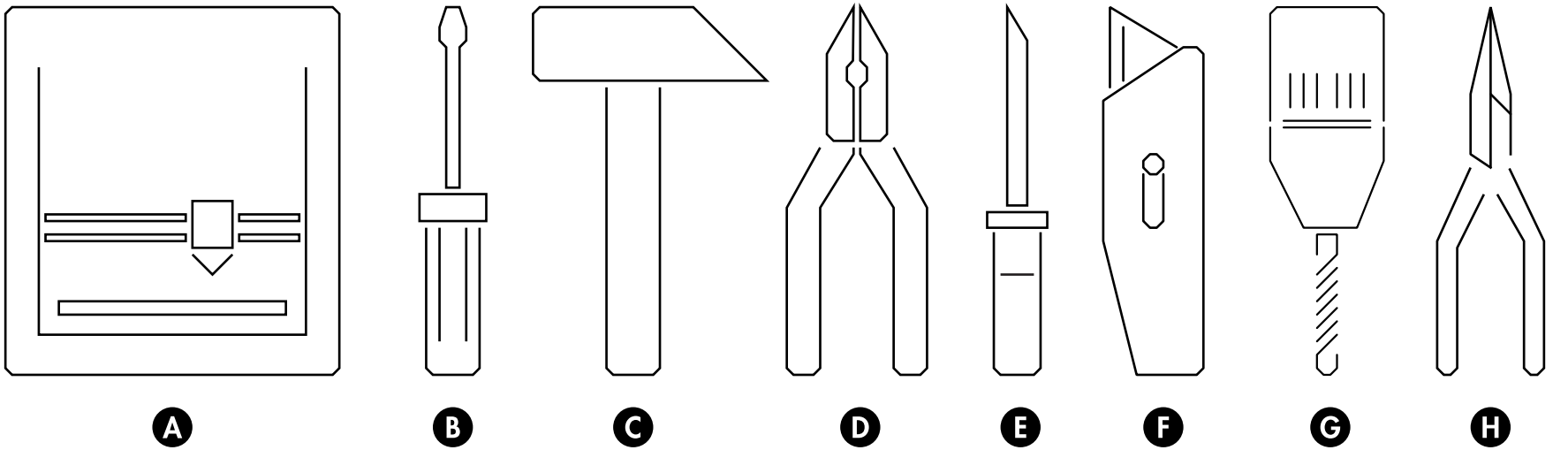
D Wire Cutters

E Soldiering Iront

F Stanly Knife

G Drill

H Lounge tounge Pliers



PARTS NEEDED

3D Printed Parts/Laser Cut

All parts have been designed to be 3D printable, but parts B and C may also be Laser Cut if you have access to one.

x1 **A** Main Body

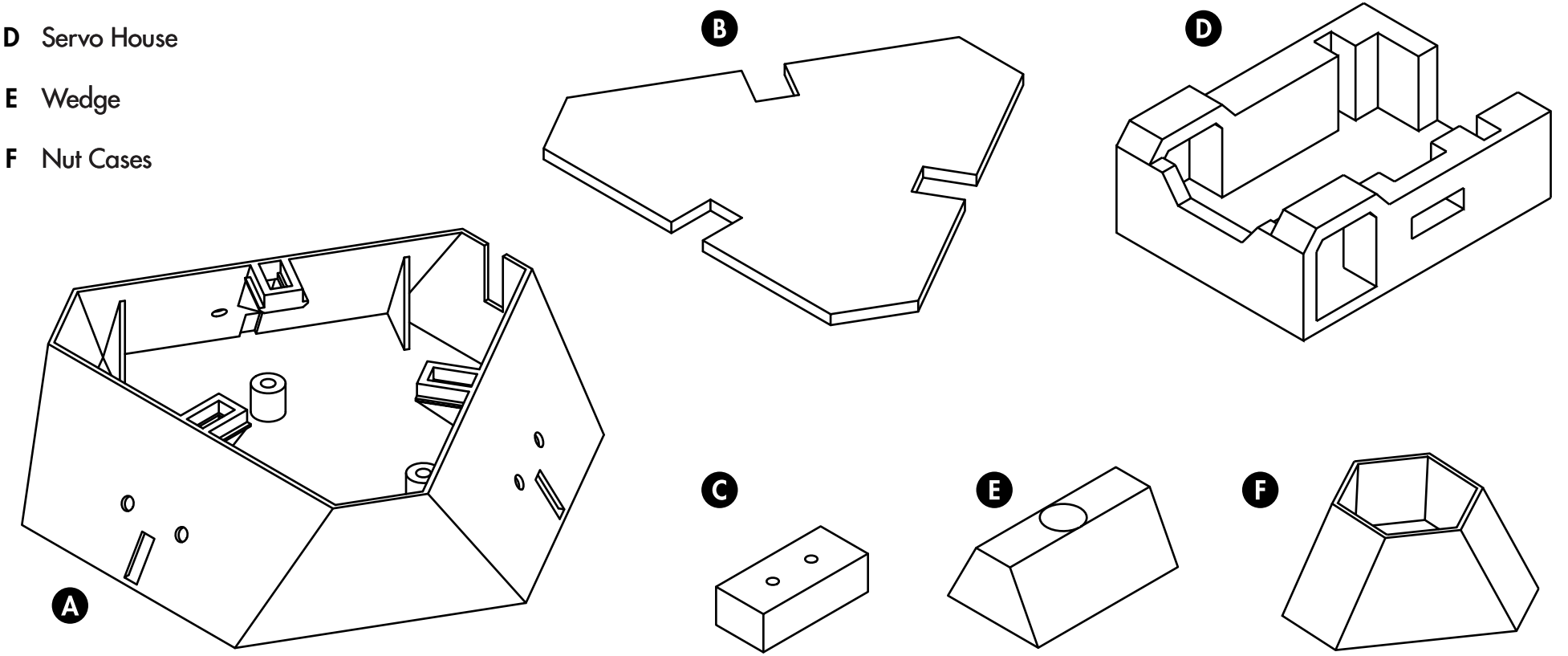
x1 **B** Lid

x3 **C** Sensor House

x3 **D** Servo House

x3 **E** Wedge

x3 **F** Nut Cases

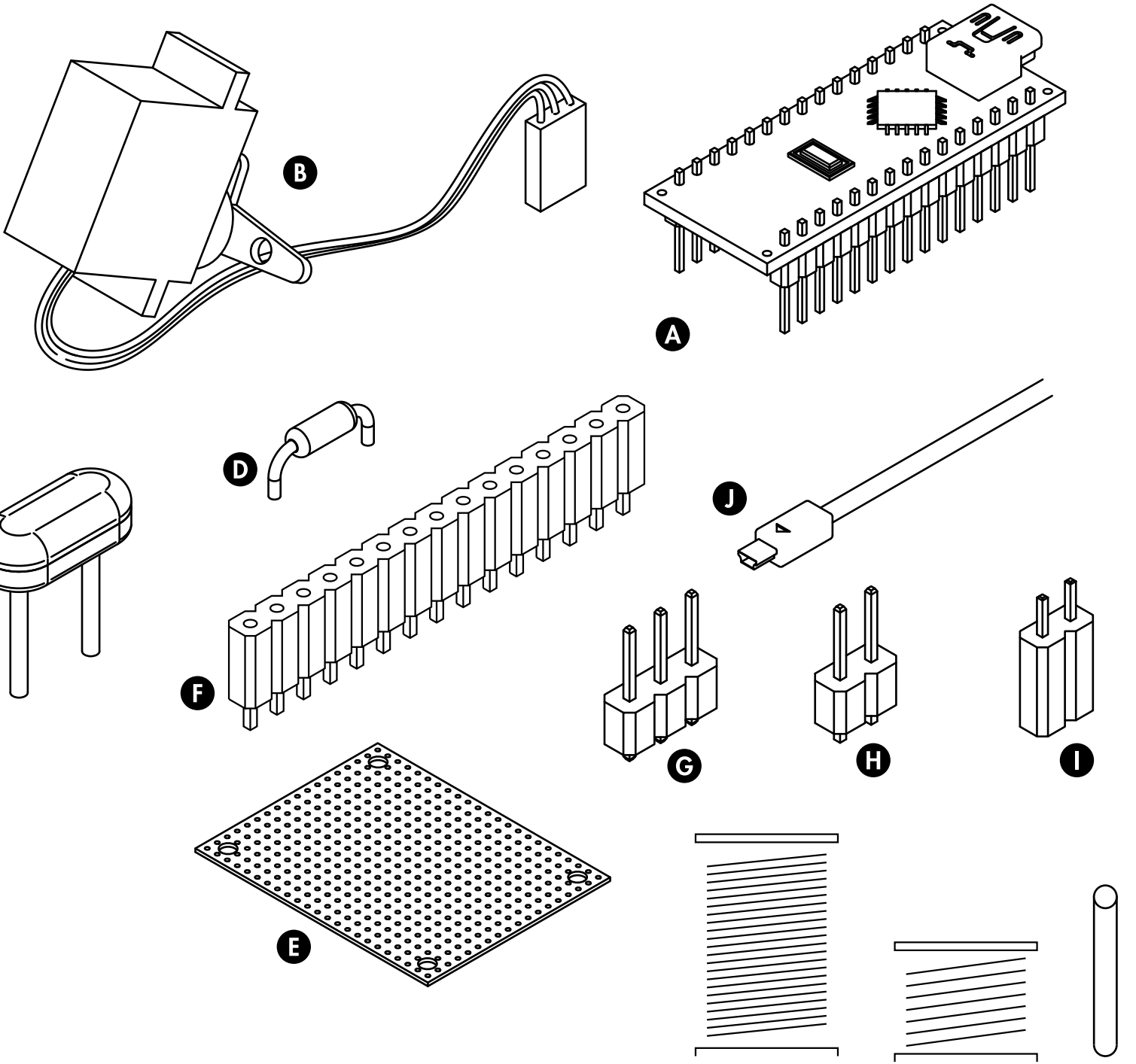


PARTS NEEDED

Electronic Parts

- x1 **A** Arduino Nano
- x3 **B** SG90 Servo
- x3 **C** Photoresistor
- x3 **D** Resistor
- x1 **E** Small Dot Martix Bread Board
- x2 **F** 12* Female Pin Heads
- x3 **G** 3* Female Pins Heads
- x3 **H** 2* Male Pins Heads
- x2 **I** 2* Female Pin Heads
- x1 **J** Extra Long USB mini Cable

- N/A Wires (Red, Black, +3 colours)
- N/A Shrink Wrap
- N/A Soldier



PARTS NEEDED

Nuts,Bolts & Washers

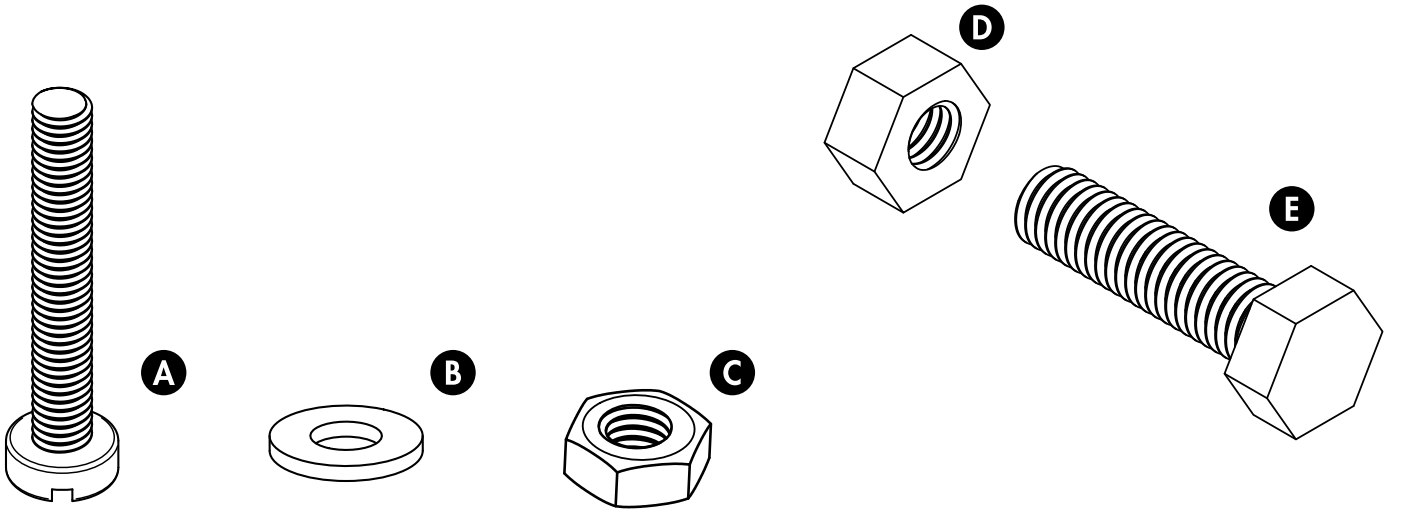
x10 **A** 3mm x 10mm Bolts

x6 **B** 3mm Washers

x10 **C** 3mm Nuts

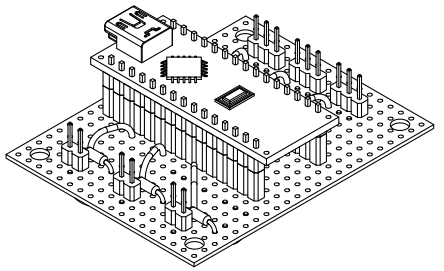
x6 **D** 5mm Bolts

x6 **E** 5mm x 20 Bolts



SECTION 1

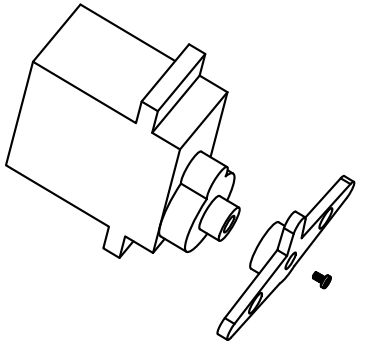
Solder



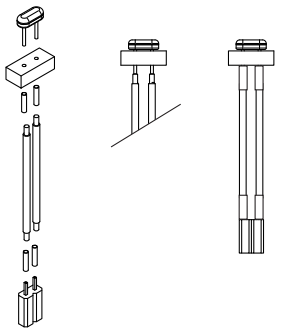
Bread Board Circuit Creation

SECTION 2

Callibrate



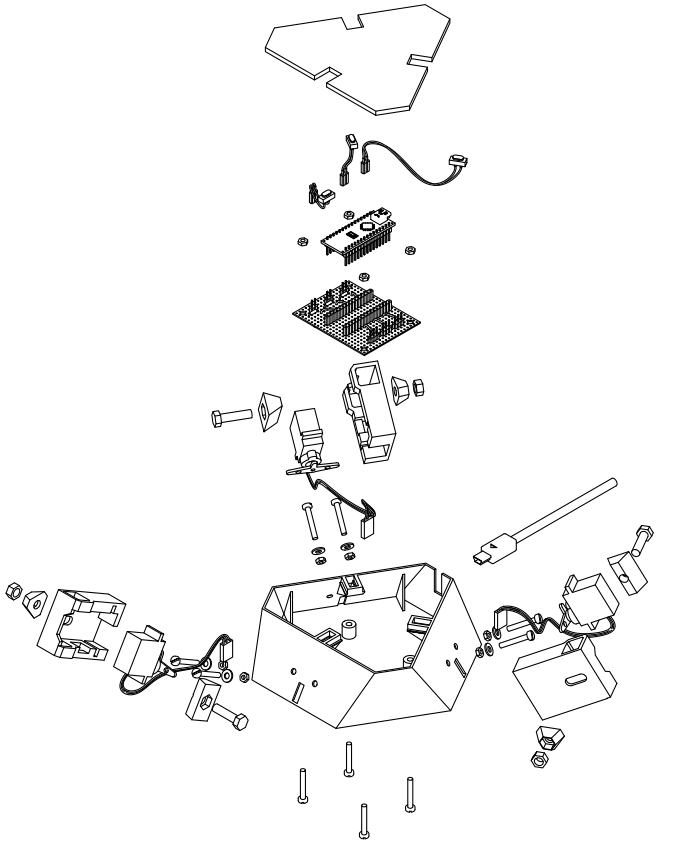
Calibrate & Secure Servos



Create Sensors

SECTION 3

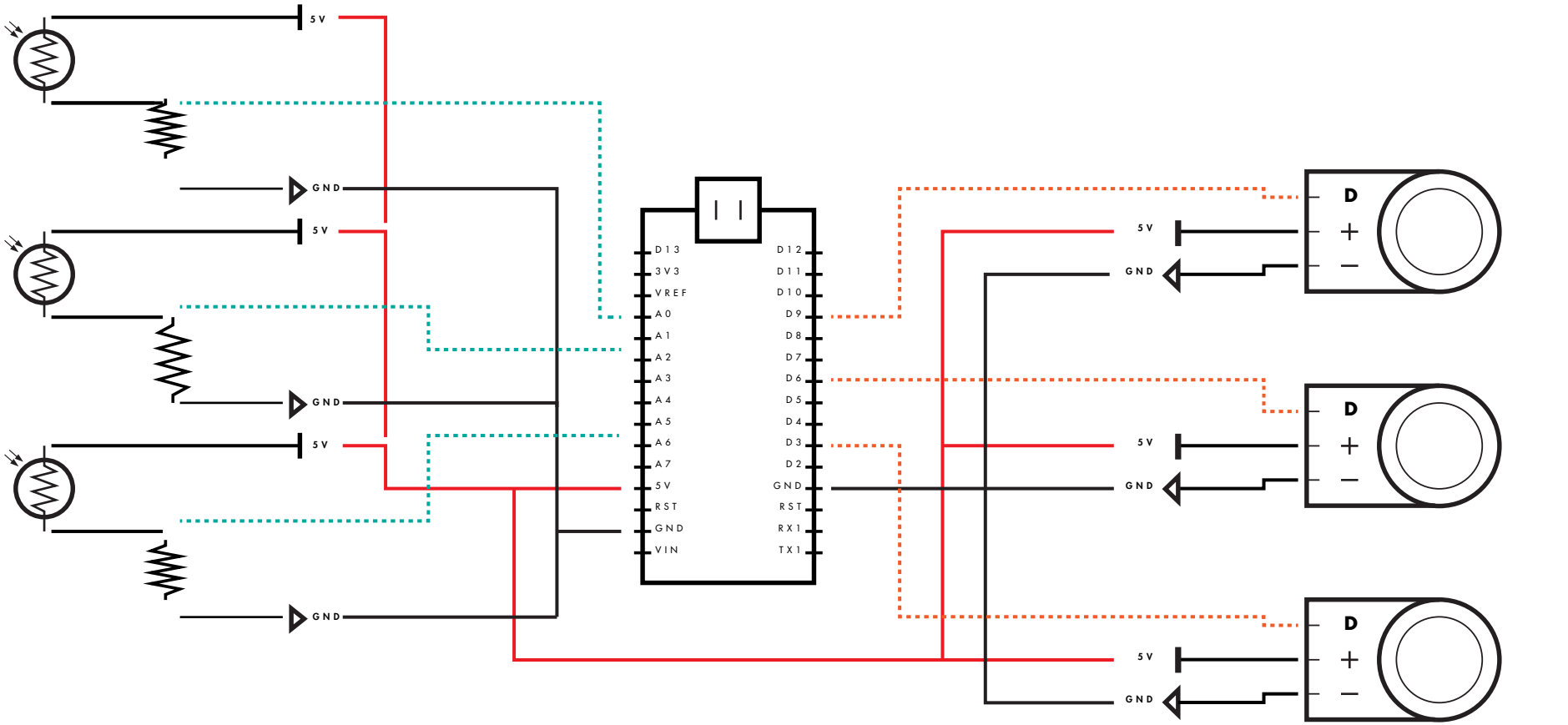
Assemble



Assemble Prefabricated & Pre-Made Parts

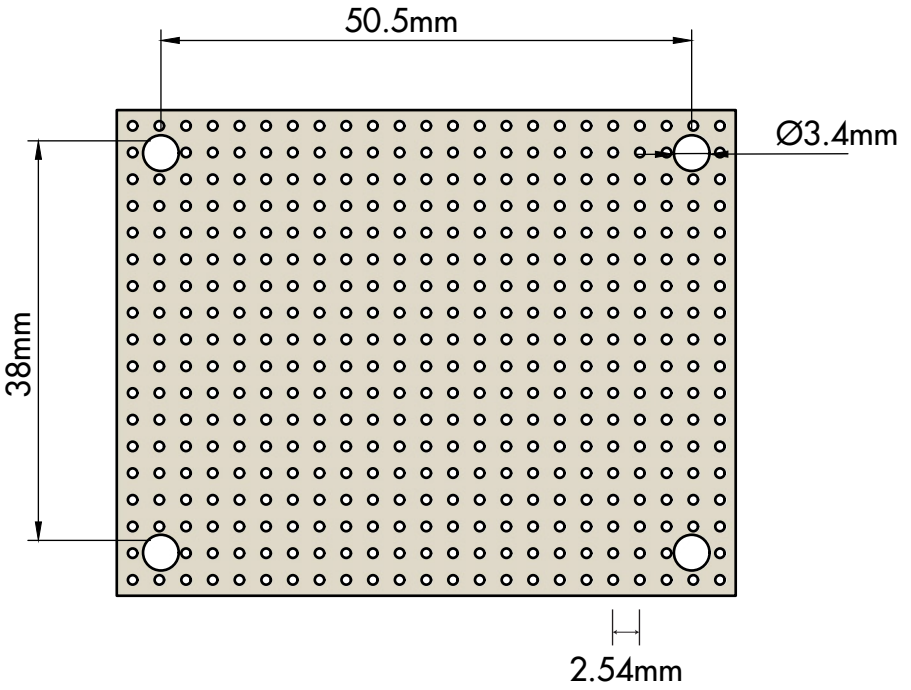
Schematic

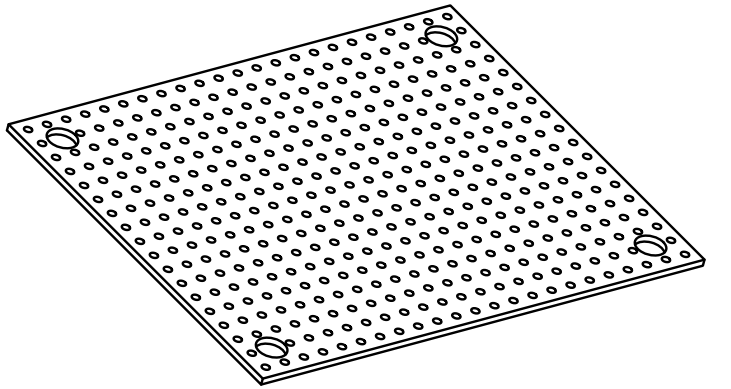
You are now going to assemble the bread board. You are going to do it by hand! This is the schematic; it might look complicated but the step by step instructions will help you get a working robot in no time.



Bread Board

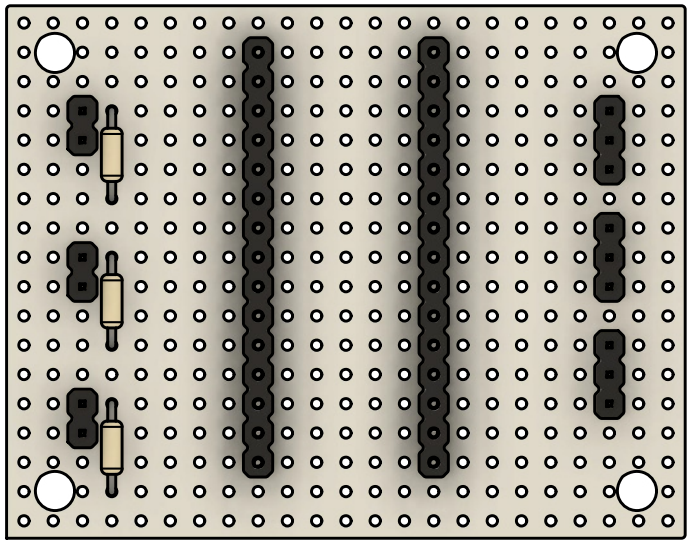
The first step is to prepare the bread board. You will need to cut the bread board down to size then drill the holes in the corners. An additional step would be to sand the corners. Make sure your bread board has 23 by 18 holes available.



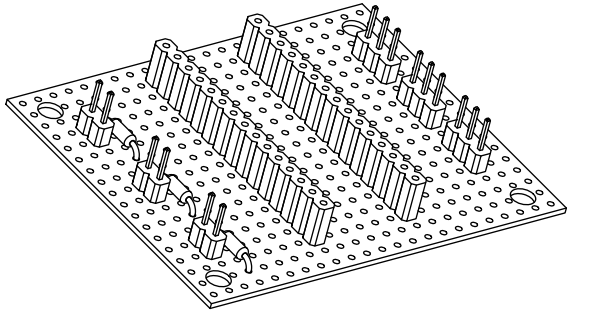


Pins and Resistors

In this step you will need to precisely lay the compents of the board into the correct position because they are the foundations of the circuit. You can solder the parts into the board once correctly placed.

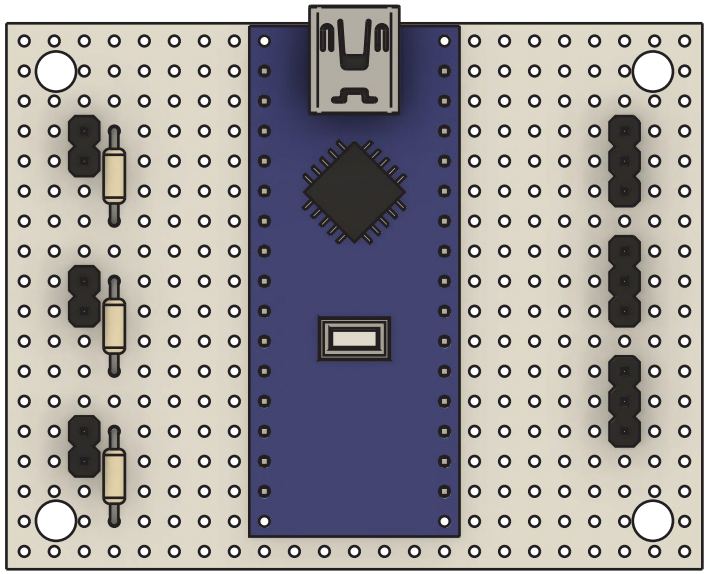


t o p

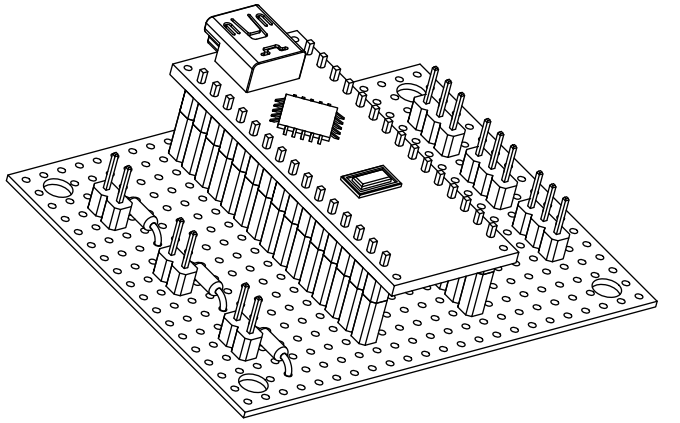


Arduino

Now slot the Arduino Nano into the female pins. Putting the Arduino in place will help you match the digital and analogue pins correctly.

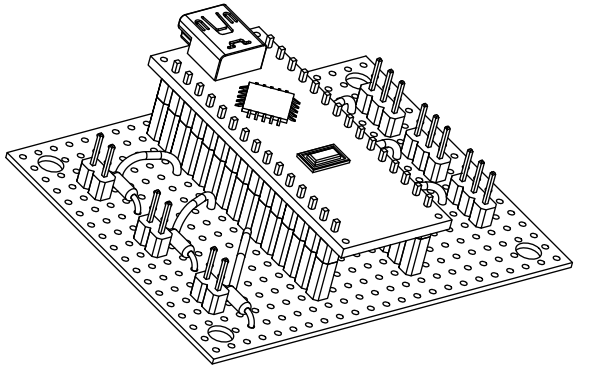


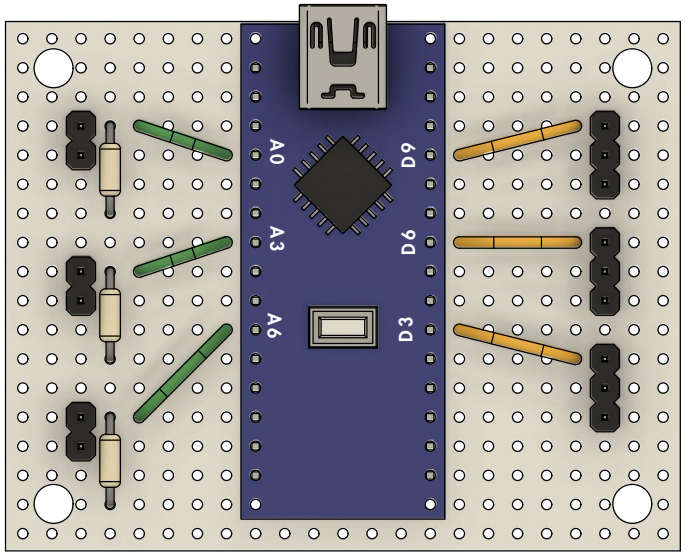
top



Top Wires

Now solder in the digital and analog wires. Make sure that you couple the digital pins D3, D6 and D9 and analog pins A0, A3 and A6 for they will be specifically referenced in the code that you upload later.





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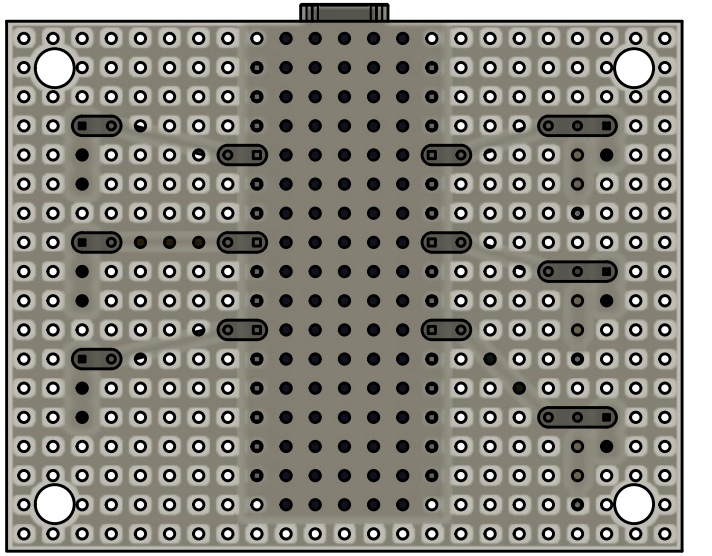
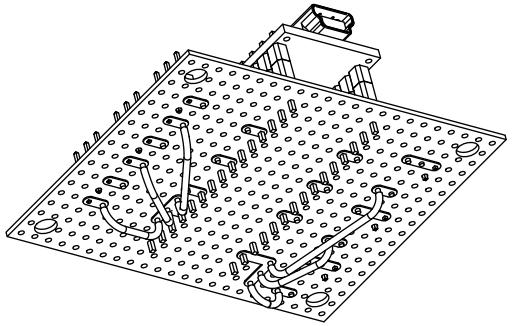
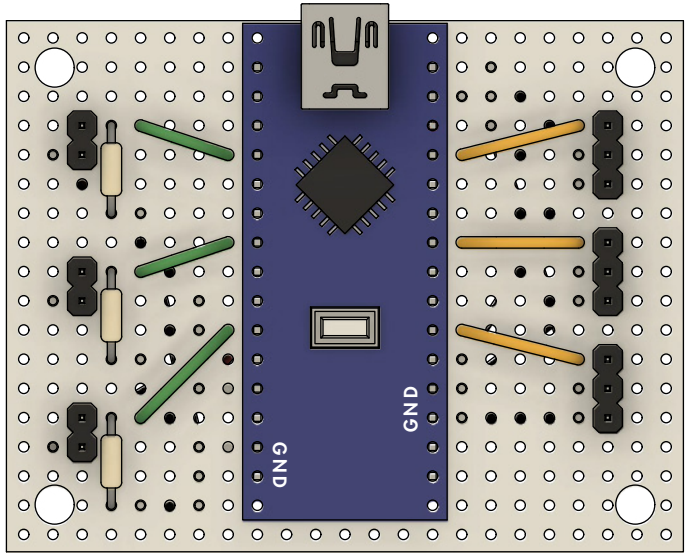


bottom

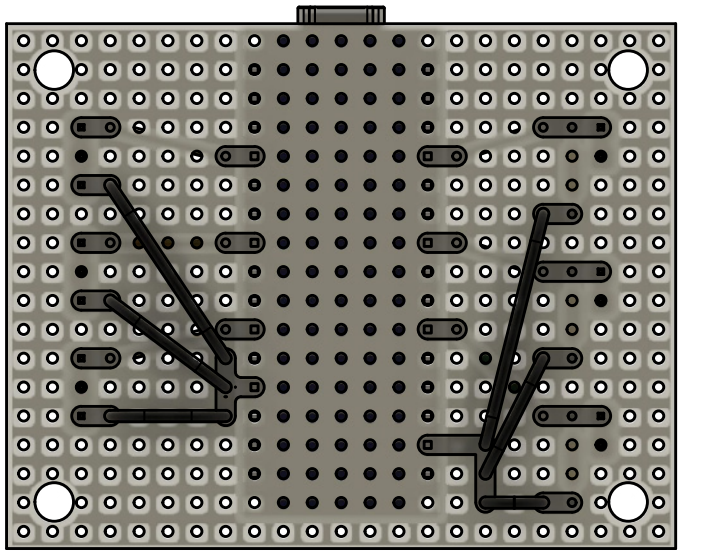
Connect Ground

It is now time to soldier in the digital and analogue wires in order to connect the sensors and servos to the Arduino.





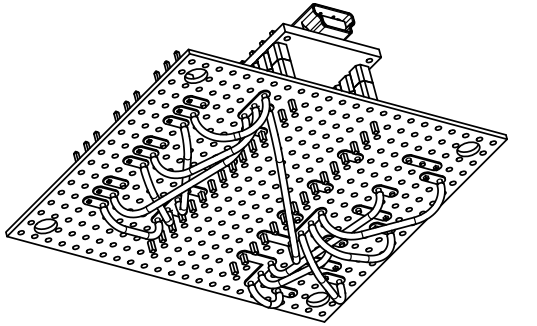
t o p

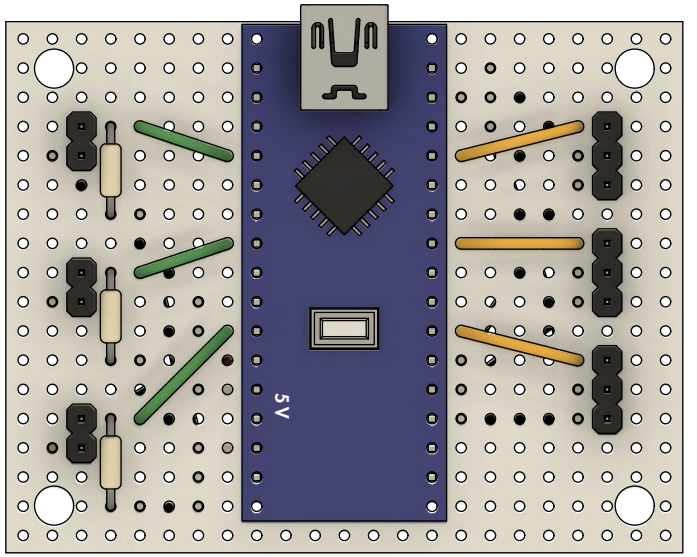


b o t t o m

Connect Power

After connecting the ground, it is time to connect the power. Because there is only one 5v out pin, it is necessary to use a wire as a bridge; this is so that both sides have power and a connection.





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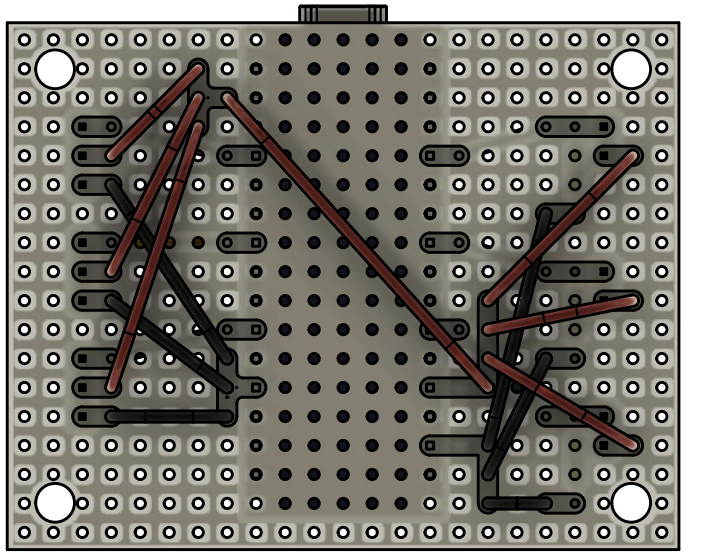
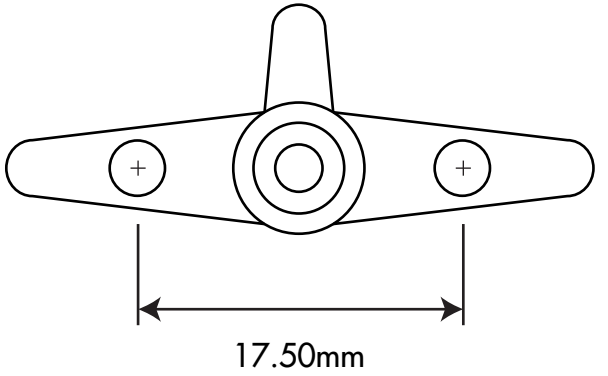


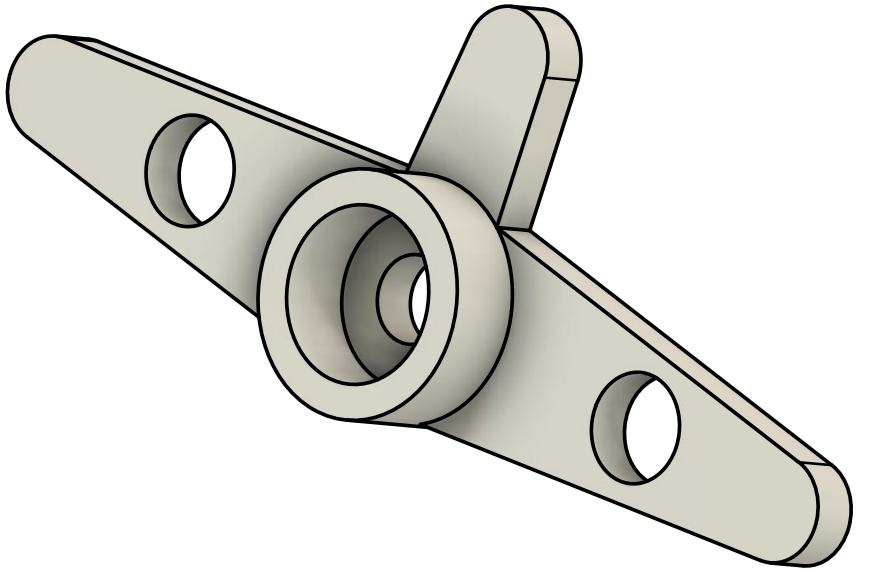
bottom

Servo Drill

Drill two wholes into the Servo Horn, exactly 7.5 mm apart from each other. Use a 3mm drill piece. Use the plastic dots on the Servo Horn as reference.

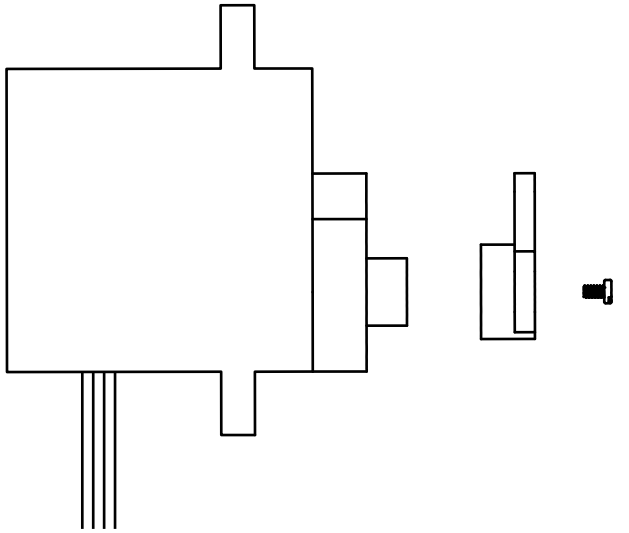
Suggestion
Use double sided tape to stick Servo Horn to cardboard/MDF before drilling. Practice drilling on the spare Servo Horns that comes with all SG90 servos.

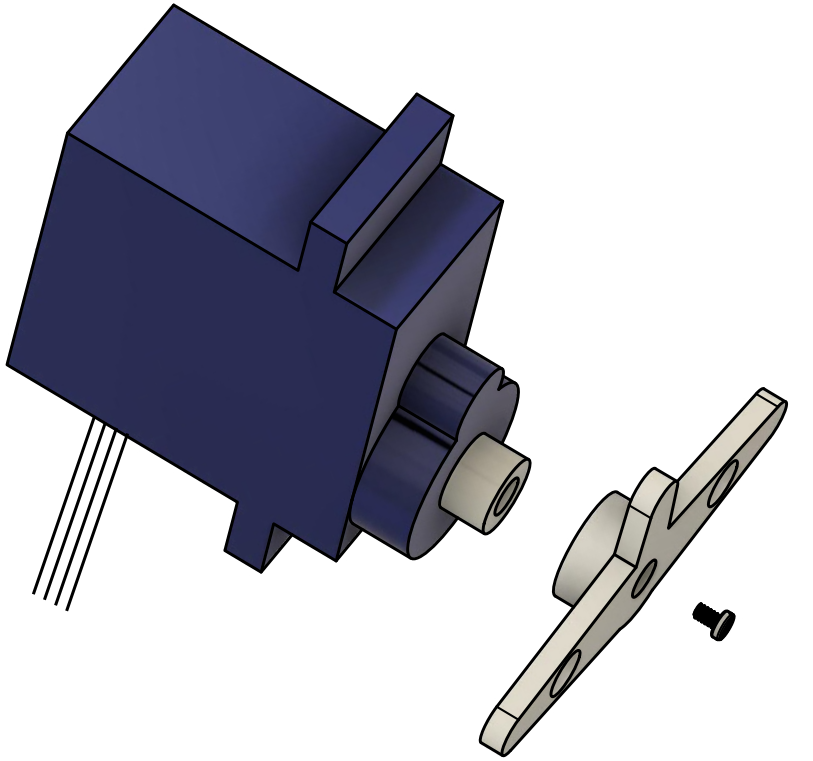




Callibrate Servos

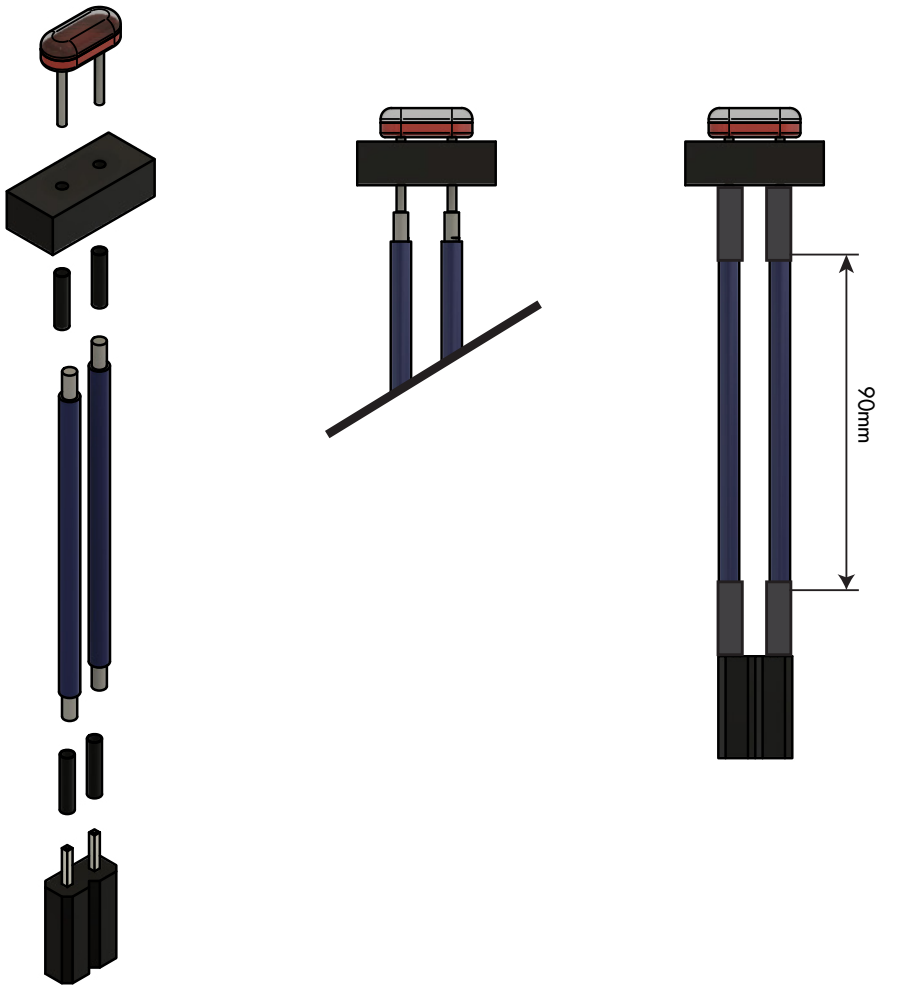
In order to guarantee that your servos are at exactly 90 degrees before secureing them into position, you will need to upload the servo callibration code into the Arduino. After you have completed this you can add the screw to secure it in position.





Create Sensors

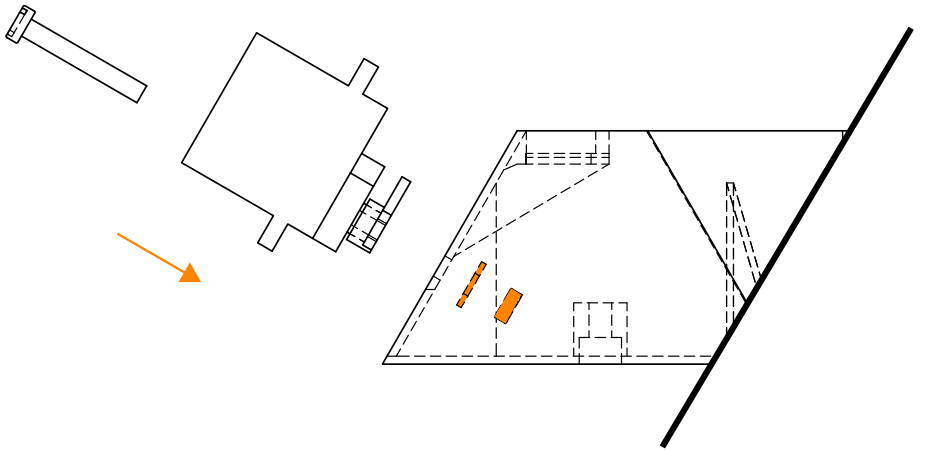
In order to attach the photoresistors to the body in a secure fashion, a custom solution has been designed. Thred the photo-resistor through the ‘Sensor Mount’ then solder it to the wire. Secure it in place by pushing the shrink wrap up into the print-ed part when you’re heating it.

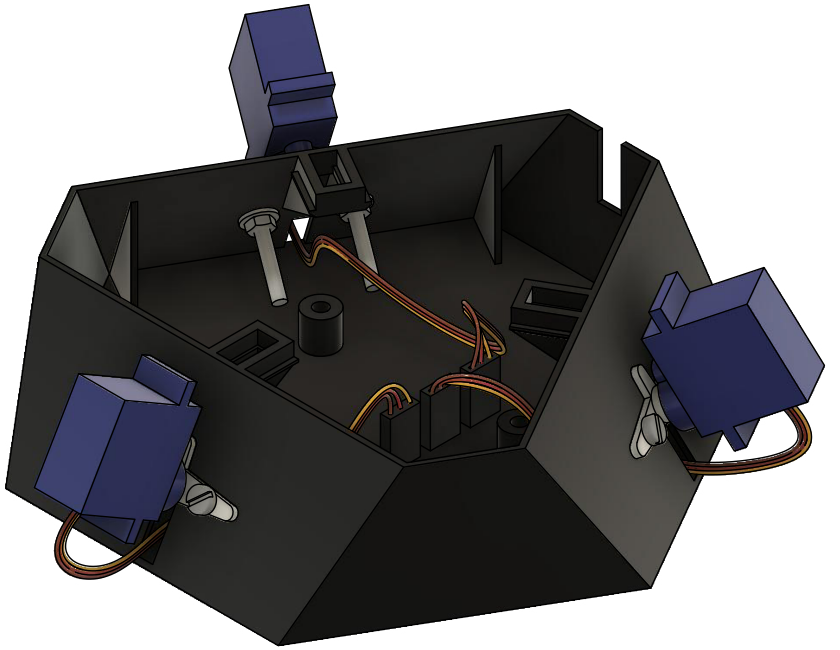


NOT TO SCALE

Attatch Servos

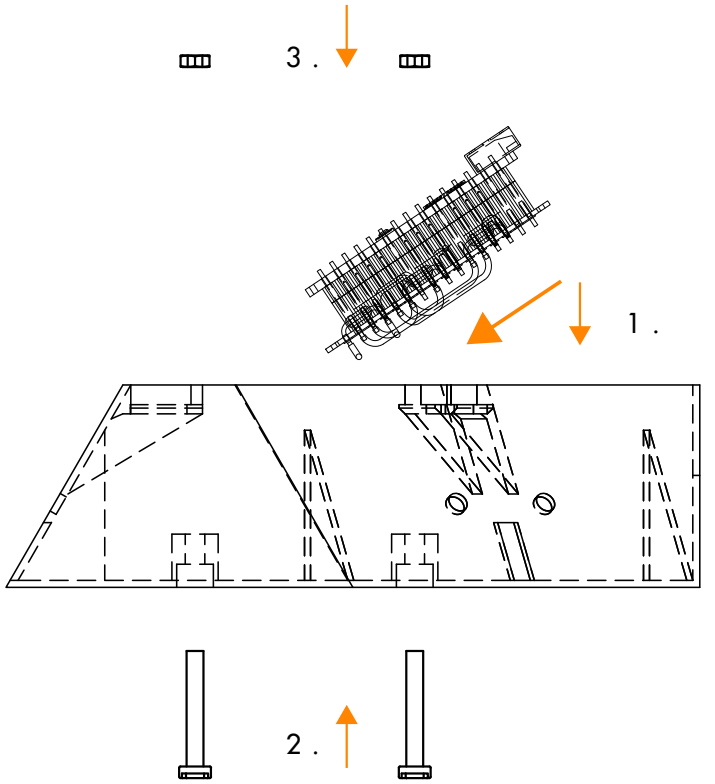
Now attatch the servos that have already been assembled to the main body. Repeat this step three times on each side.

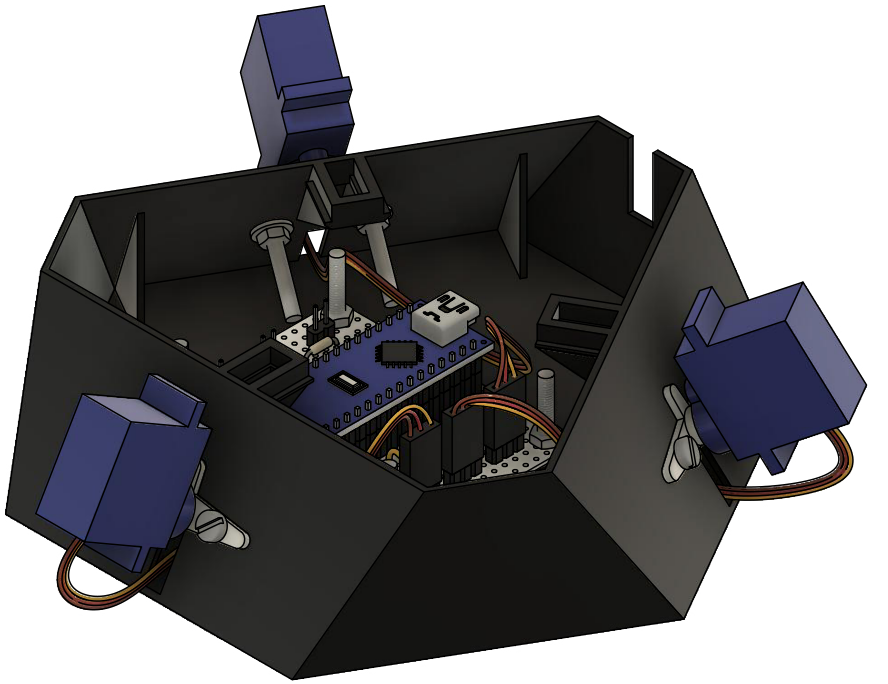




Mount Electronics

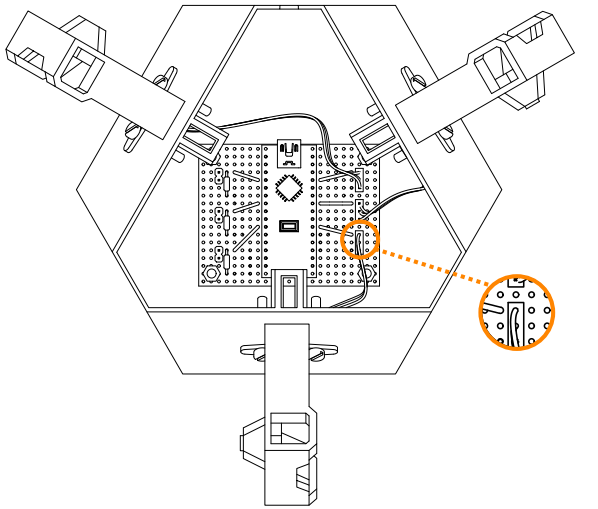
Now the Electronicss must be secured to the body of the robot. To do this, you will need to slide the electronics into the cavity of the body at an angle. After this slide the screws into place.

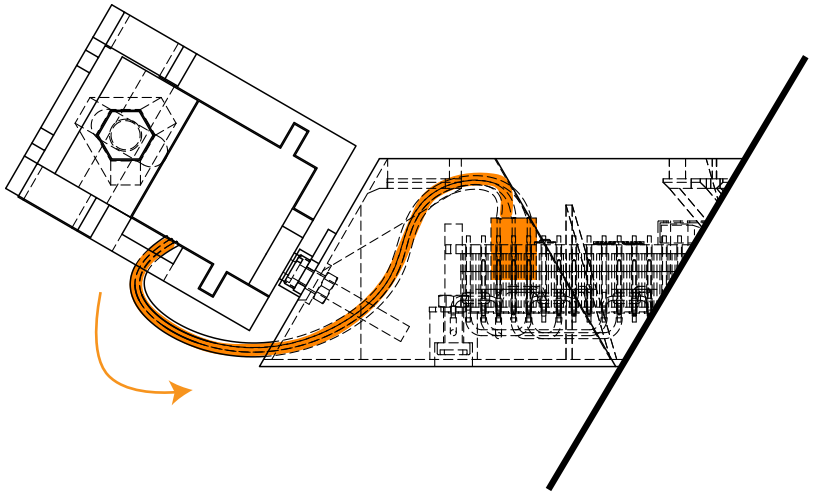


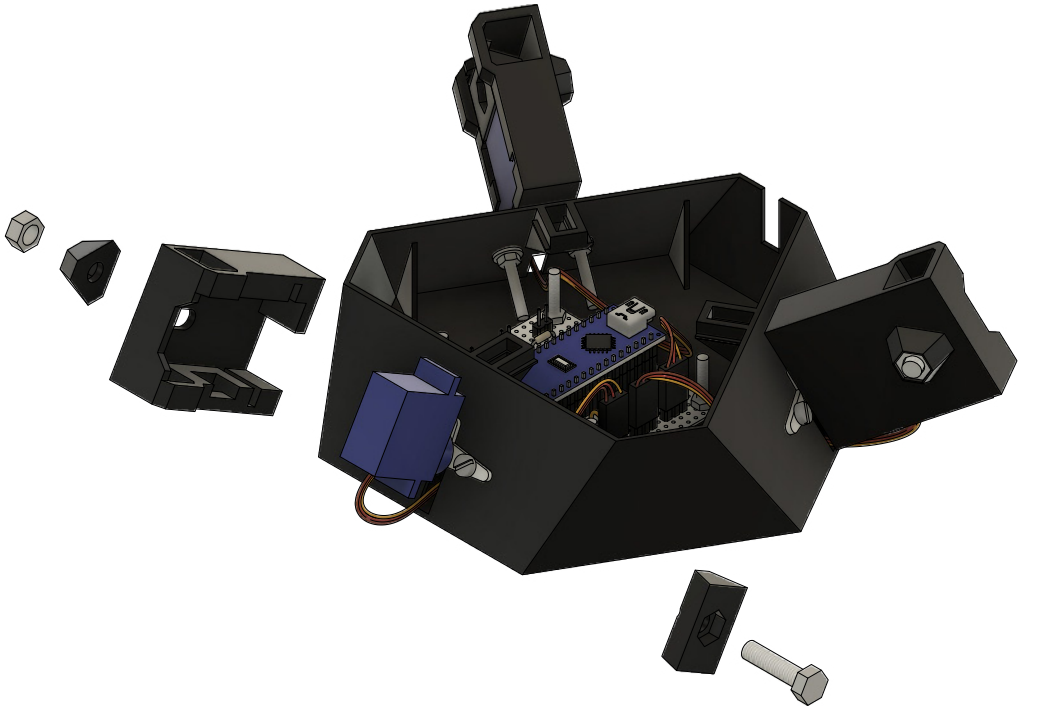


Attatch Servo Housing

The first step is to thread the plastic female Pins through the hole in the bottom of the 'Servo Housing.' Now thread through the hole on the side of the body of the robot. You will then be able to plug the servo into its corrosponding male pins. Make sure you marry the digital pin on the servo with the digital pin on the bread board. After this you will be able to press the Servo housing onto the servo (do not worry if it appears loose because everything will be tightened when the pen is inserted and wedge tightend). Then you can attatch the rest of the parts as displayed in the diagram.

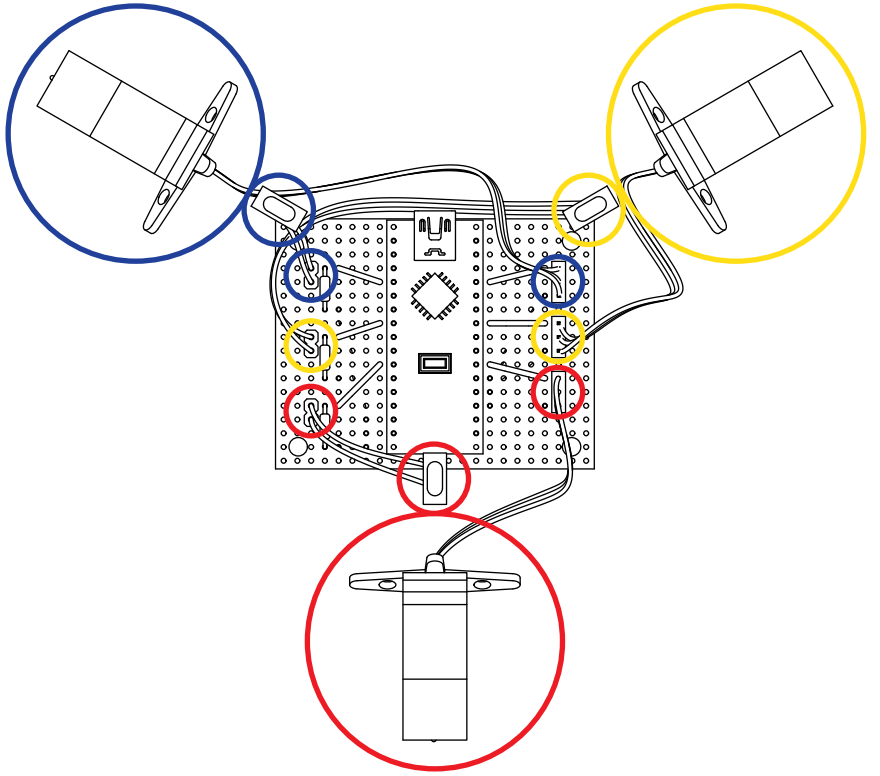


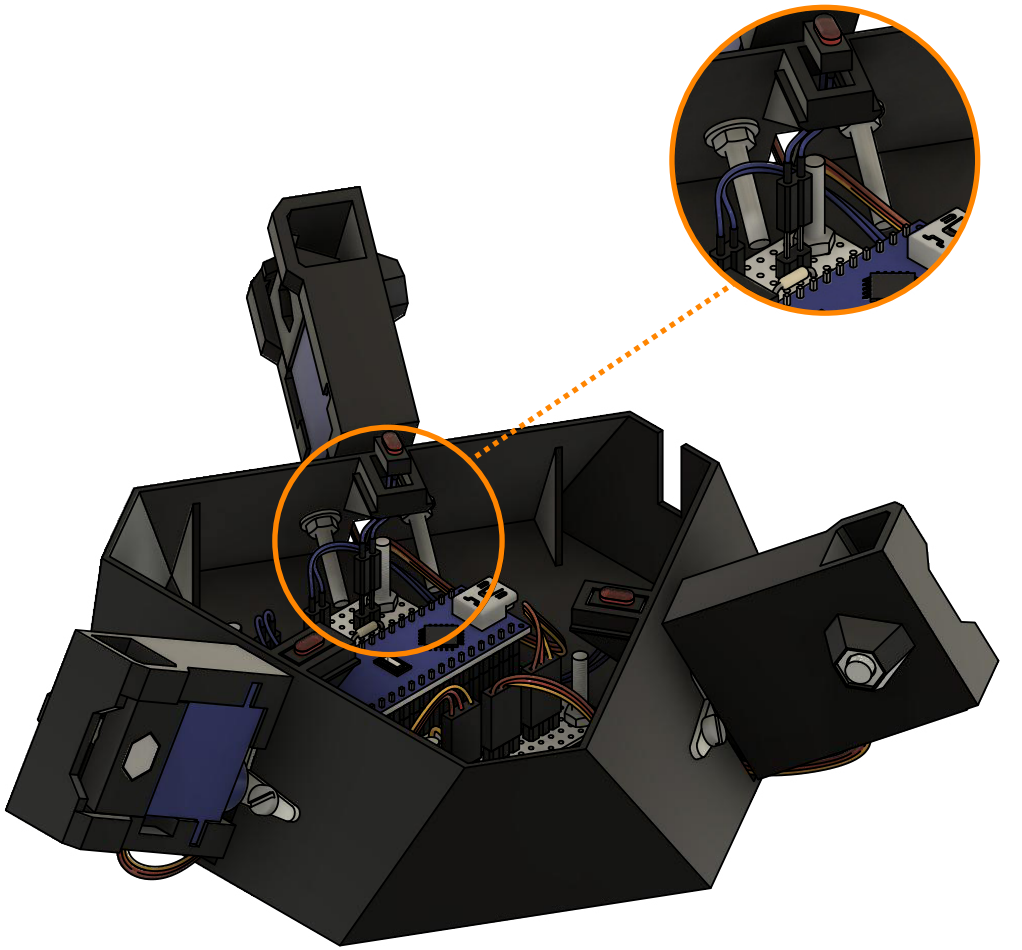




Insert Sensors

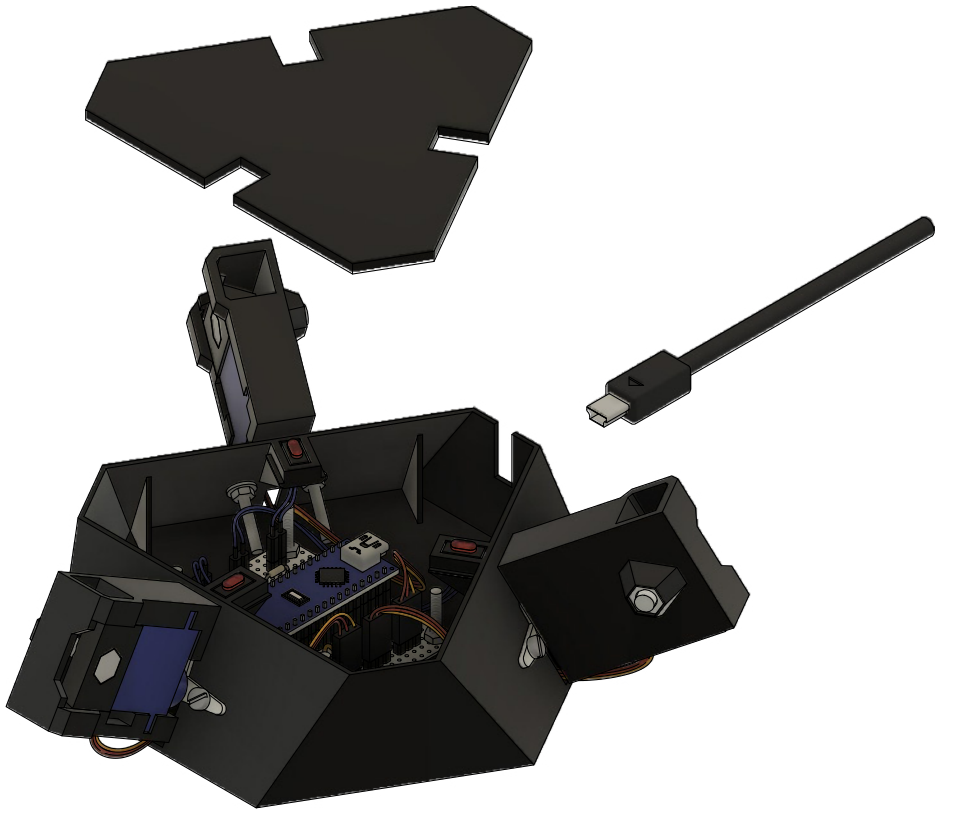
Thred the sensor through the hole in the side of the ‘main body’ and gently pull the wire through from the other side untill the mounted block is in place. Use this diagram below to ensure that the sensors and servos are plugged in correctly.





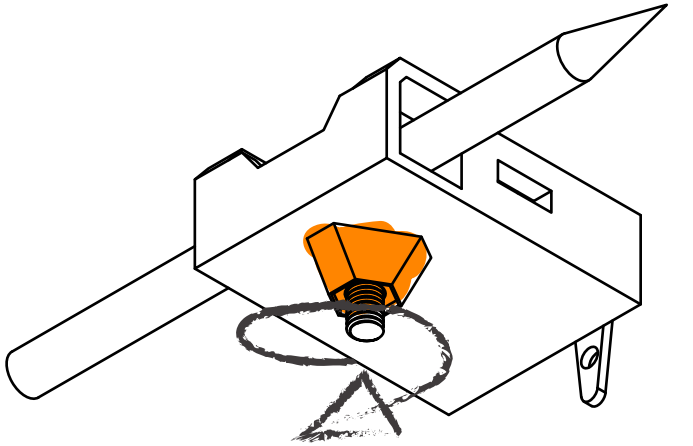
Lid + Power supply

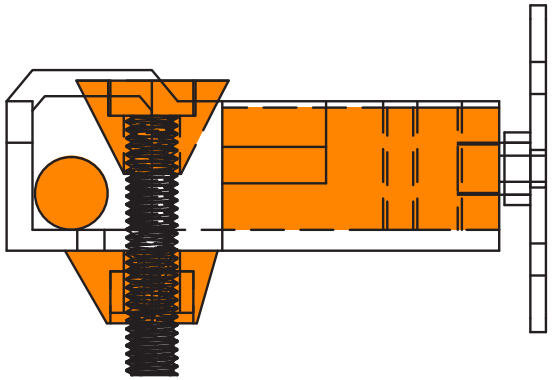
Attach the power supply and lid to the robot. The USB mini cable also doubles up as a power supple and attatches to you computer. Now you can upload the **behavioral code** into the Arduino.

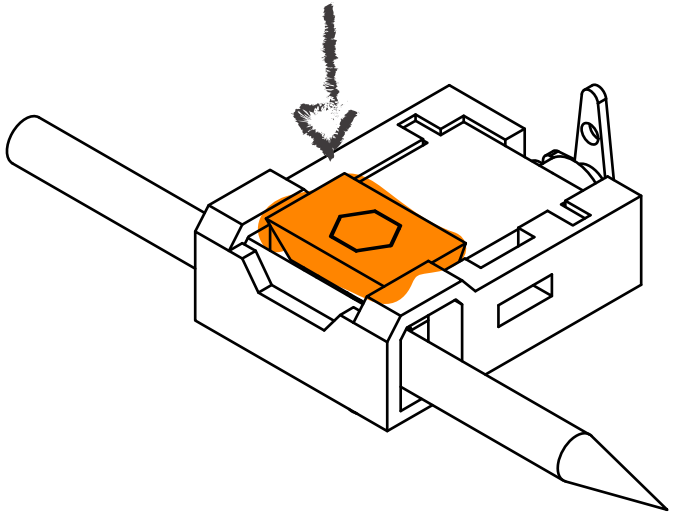


Insert Pens for Legs

To give the robot legs that draw, insert the pen into the cavity. Then once inside simply twist the ‘nut case’ in a clockwise rotation. This will pull the wedge down forcing it into the pen and the servo at the same time, creating a solid unit.







Insert Pens + **Explore!**