

# Assembly Instructions

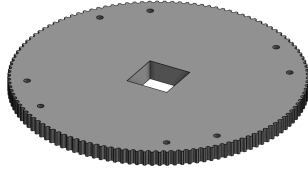
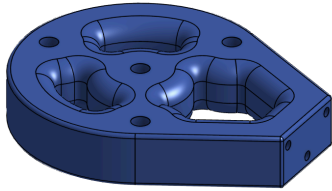
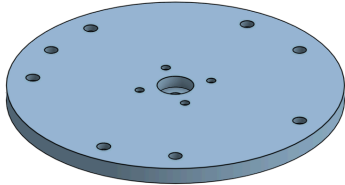
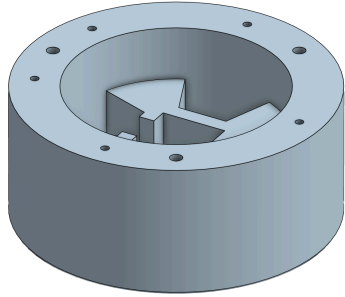
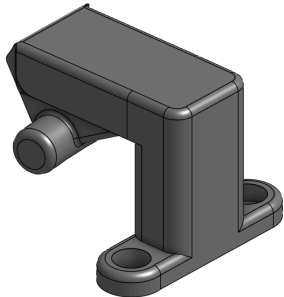
## Tools required

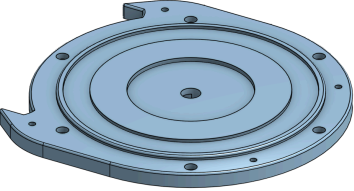
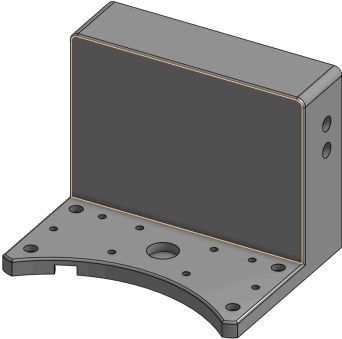
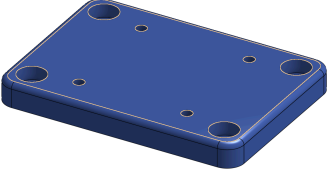
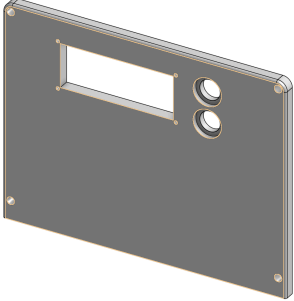
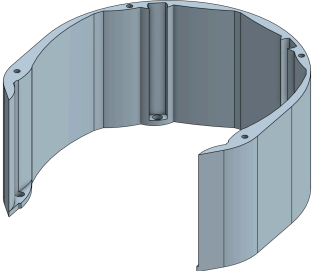
- m4 hex driver
- M2 hex driver
- 3d printer
- Strong glue

## Materials required

- 2 5mm to 8mm shaft adapter
- 2 nema 17 stepper motors 40mm height
- 1 nema 17 pancake stepper motor 23mm height
- 4 flanged linear bearings
- 1 8mm lead screw shaft 400mm length
- 1 8mm ball screw nut
- 3 8mm rod 200mm length
- 3 8mm rod 17mm length
- 1 8mm rod 40mm length
- 3 8mm rod 400mm length
- 6 8mm ball bearings 6082RS
- Needle-Roller Thrust Bearing for 70 mm Shaft Diameter, 95 mm OD
- 21 m4 brass heat set inserts
- 20 Teeth 8mm Bore 5mm Pitch Timing Belt Pulley for 15mm Belt
- 5 kg of pla
- 8 m4 20mm length brass standoffs
- 4 m4 10mm length brass standoffs
- 3 a4988 stepper motor controllers
- Assorted wires
- 1 Arduino Nano
- 6, 4 pin jst socket pairs
- 1, 5 pin jst socket pair
- 1 12v to 5v buck convertor
- 4 m2 bolts x length
- 4 m2 standoff 5mm length
- Trs jack to terminal buck
- Spark Fun LCD
- 2 17mm od buttons
- 4 8mm shaft collars
- 1 140 tooth hdt 5 belt 9mm width

## 3D printed parts

Part Name	Part Image
Base Sprocket Qty: 1	
Arm Carriage Qty: 1	
Base Cap Qty: 1	
Base Center Qty: 1	
Limit Switch Trigger Qty: 1	

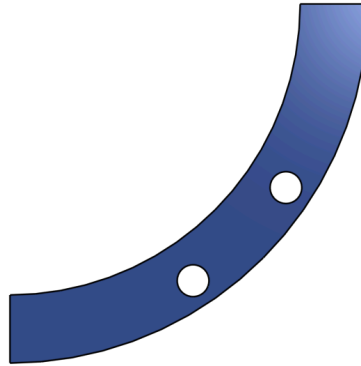
<p>Pivot Base Qty: 1</p>	
<p>Electronics Control Box Qty: 1</p>	
<p>Sweep Motor Mount Qty: 1</p>	
<p>Control Box Cover Qty: 1</p>	
<p>Arm Base Shroud Qty: 1</p>	

Arm Retention Cap  
Qty: 1



Spacer Base Plate Bottom  
Qty: 4

(this is better made out of nylon or other self-lubricating materials but 3d printing works)

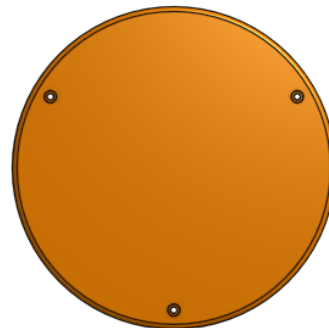


Spacer Base Plate Top  
Qty: 4

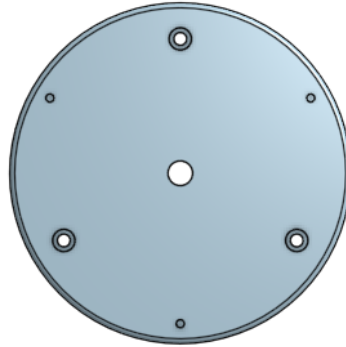
(this is better made out of nylon or other self lubricating materials but 3d printing works)



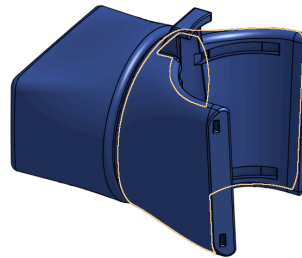
Lift Cover  
Qty: 1



Lift Bearing Holder  
Qty: 1

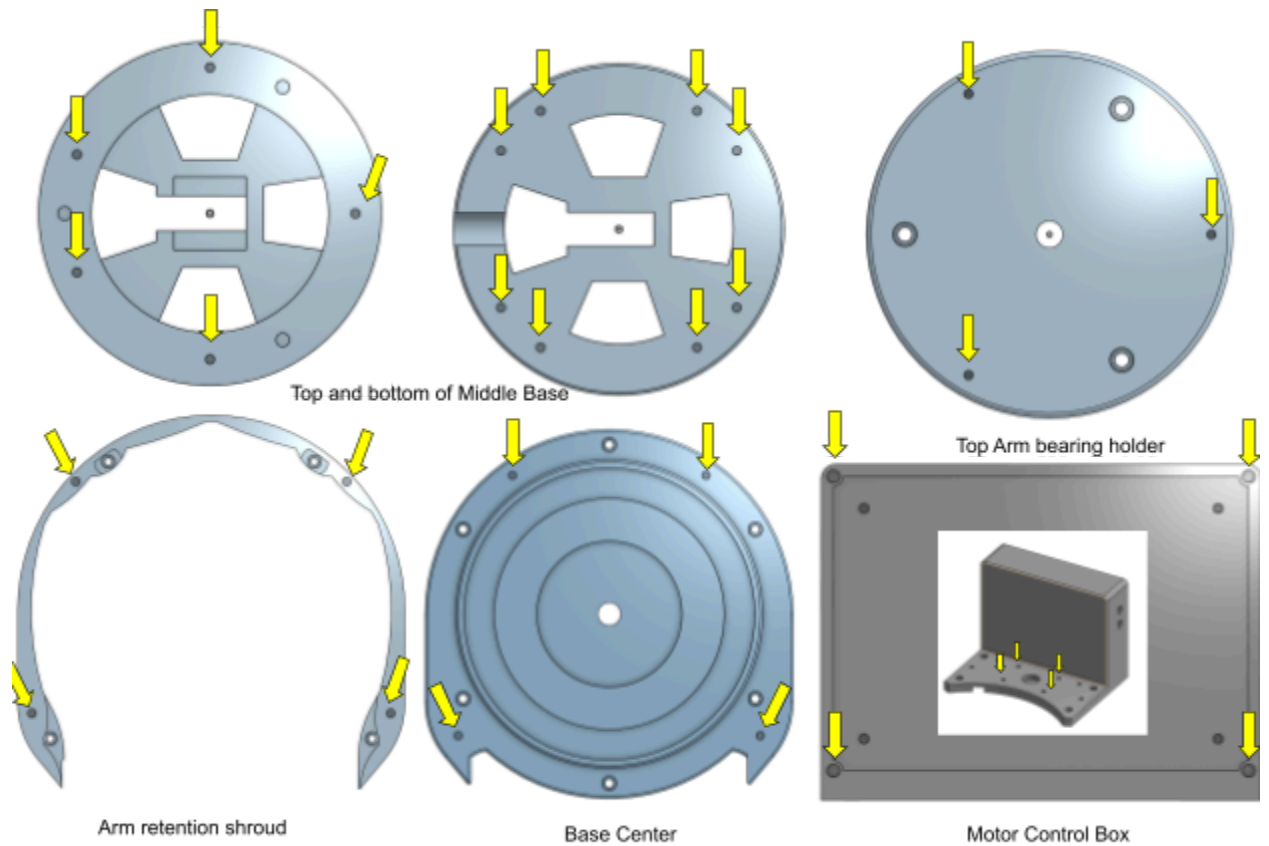


End Effector Mount  
Qty: 1

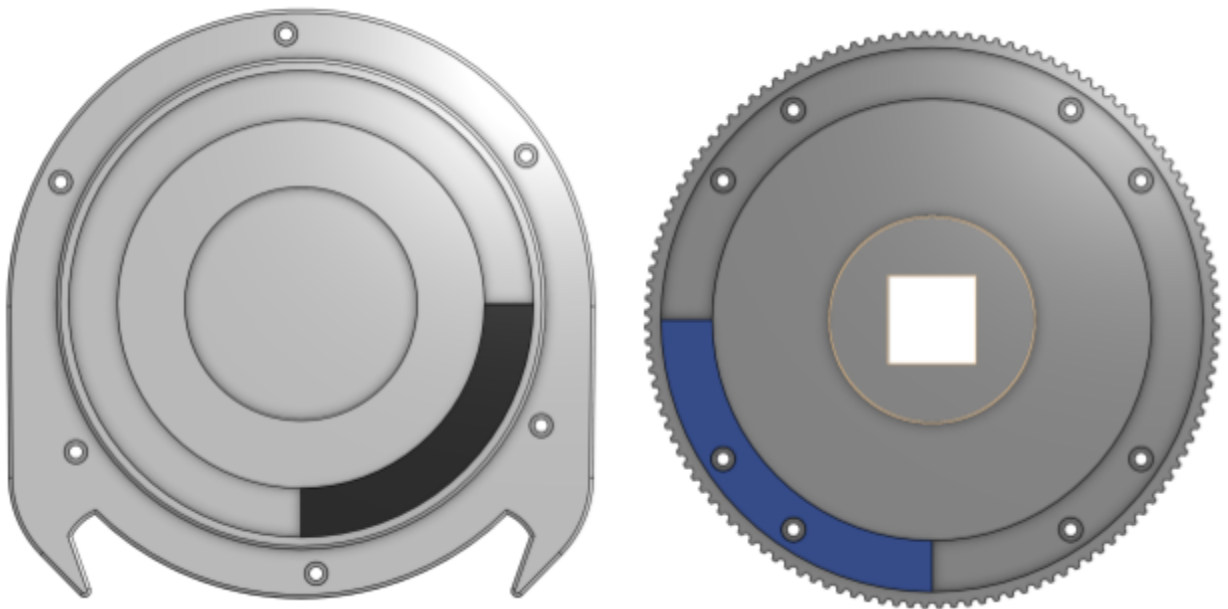


## Instructions

1. Print all printed parts
2. Insert M4 brass heat set insert in these locations

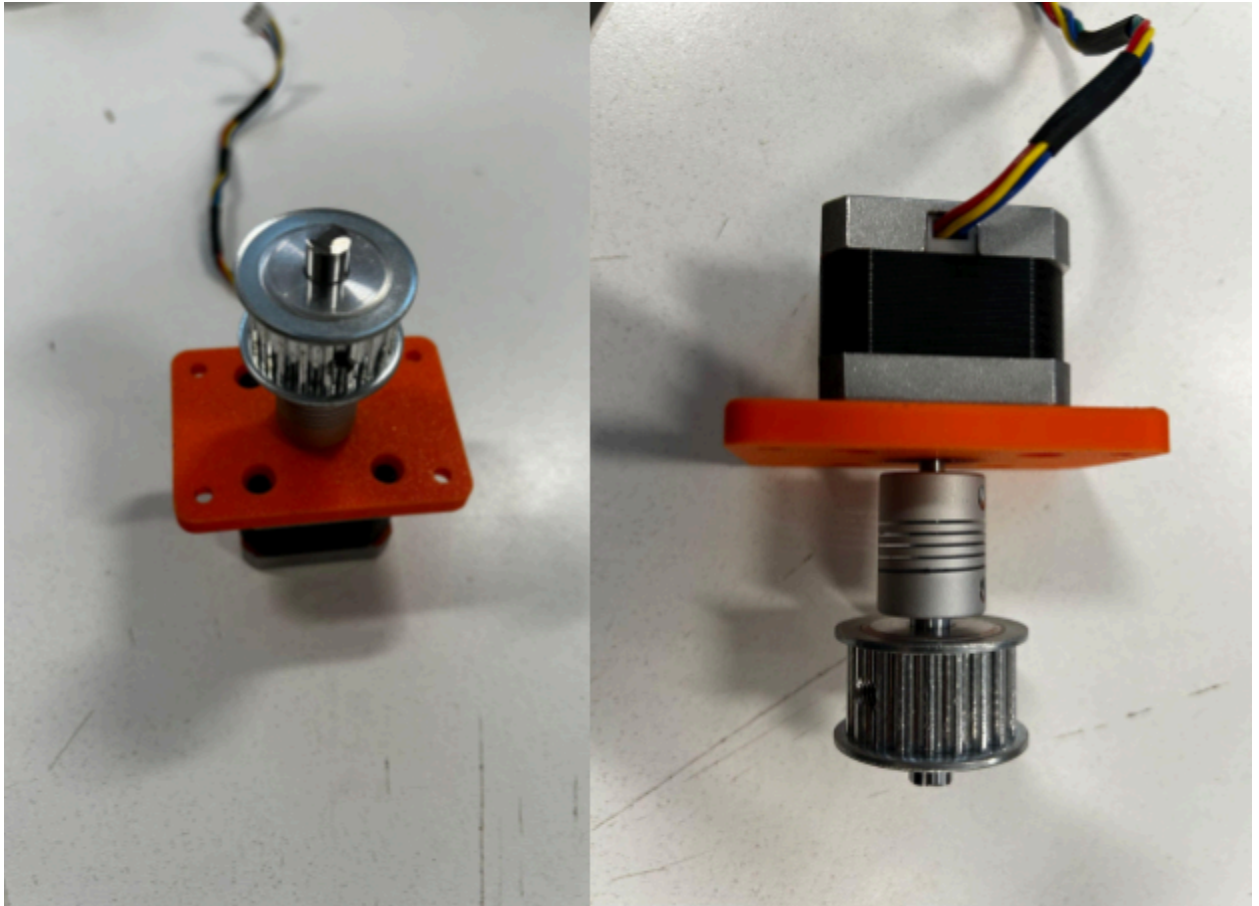


- 3.
4. Insert all nylon pieces into the Sweep Sprocket and Base center as shown

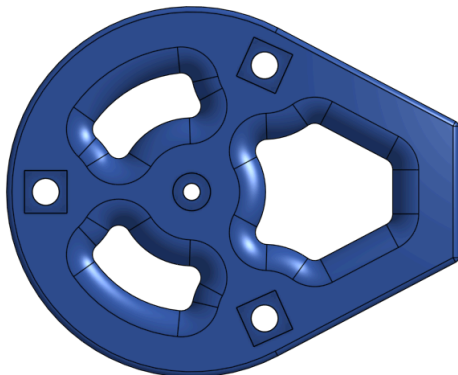


- 5.

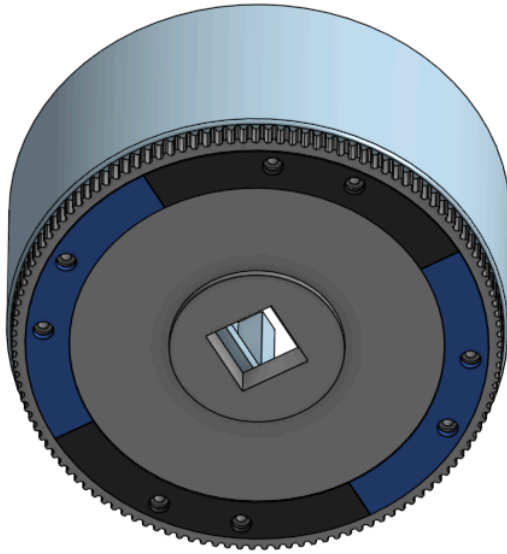
6. Insert 8mm bearing into center of Base Cap
7. Create this assembly with a Nema 17 40mm stepper motor, the Sweep motor mounting plate 4, 4 m3 bolts 1 5mm to 8mm shaft coupler, the 20 tooth pulley and the 40mm shaft.
- 8.



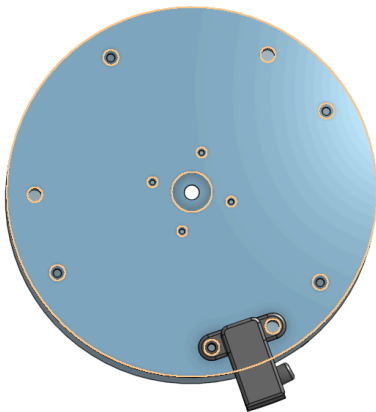
9. Insert 8mm bearing into Sweep motor control box
10. Insert 8 20mm standoffs and 4 10mm standoffs into the Sweep motor control box and attach the assembly to the base with m4 bolts



- 11.
12. Insert the 8mm ball screw nut into the center hole and 3 linear bearings into the side holes. (you may need to use glue)

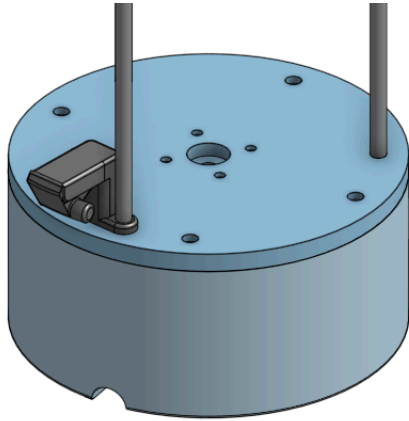


- 13.
14. Screw sweep sprocket into the middle base using 8 m4 screws
15. Create this assembly using a nema 17 stepper motor, a 5mm to 8mm shaft coupler, a 8mm x 400mm lead screw and 8 20mm m3 standoffs
16. Insert the assembly into the middle base making sure it is aligned correctly to make sure it is not blocked
- 17.
18. Put the base cap onto the middle base with 5 m4 screws making sure the shaft collar on the previous assembly is not touching the base cap bearing also using one of the m4 screws to go through the Base cap button pusher like so.



19. Put 3 400 mm shafts through the base cap button pusher base cap and base middle like so

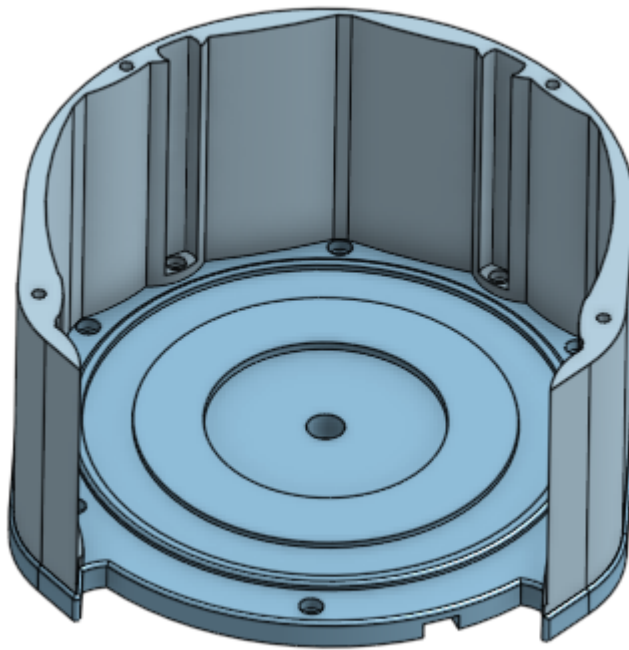




20.

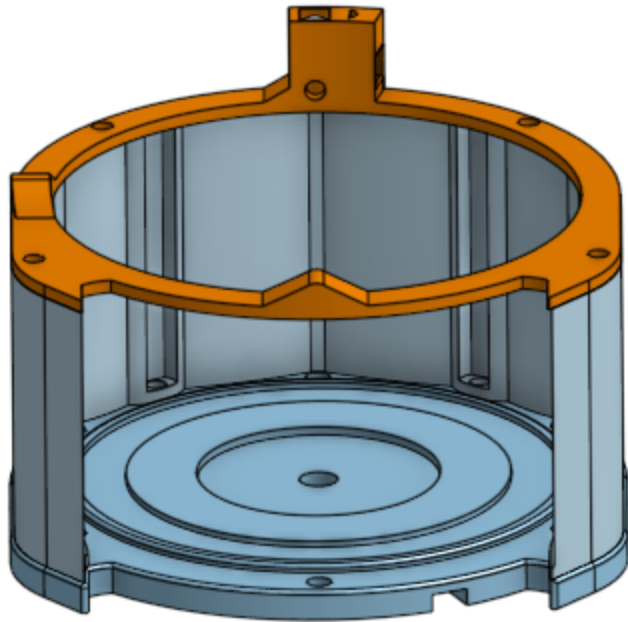
21. Put the needle roller into the base central and put this assembly onto it

22. Run the 140 tooth belt from the 20 tooth pulley to the



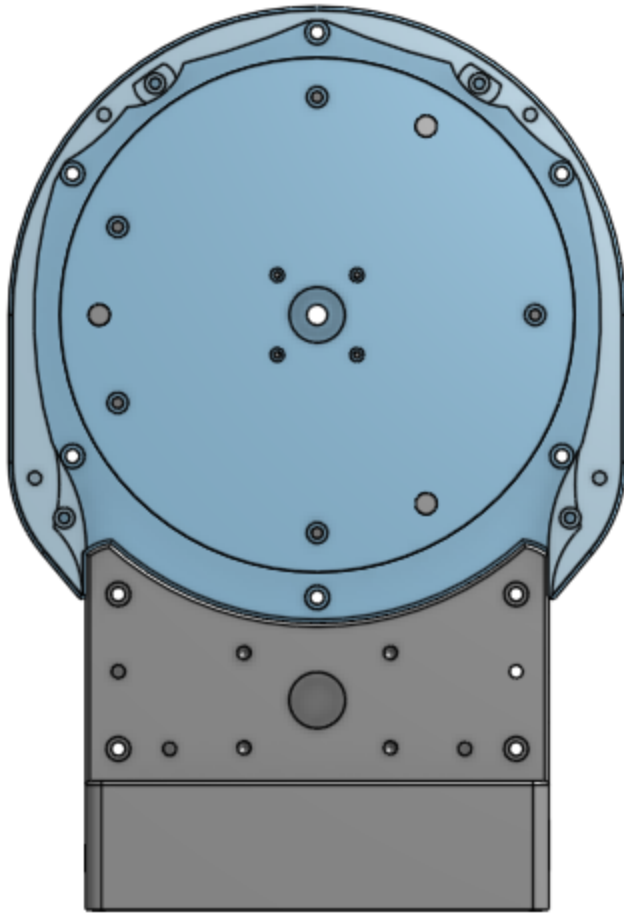
23.

24. Attach the Arm retention shroud to the base center using 4 m4 bolts



25.

26. Then attach the arm retention cap to the arm retention shroud using 4 m4 bolts



- 27.
28. Slide the sweep motor control box onto the base center
29. Slide buttons and attach the lcd display to the control box lid
30. Create the control board (insert the pictures)
31. Attach control board to the back of the base control box
32. Wire the control board to the lcd and the buttons
33. Attach the control box cover using 4 m4 bolts
34. slide main arm assembly onto the 3 8mm shafts and the 8mm lead screw
35. Slide arm bearing holder onto the shafts and then put the shaft collars on the top of each 8mm shaft making sure to tighten well
36. Put linear bearing into the square hole of the middle of the arm cap
37. Pull up the arm bearing holder and attach the arm cap to it with 3 m4 bolts.
38. Insert 3 8mm x 200mm shafts into the end of the arm
39. Create the wrist assembly using a nema 17 pancake stepper motor the wrist 3d printed parts the nylon bushing

