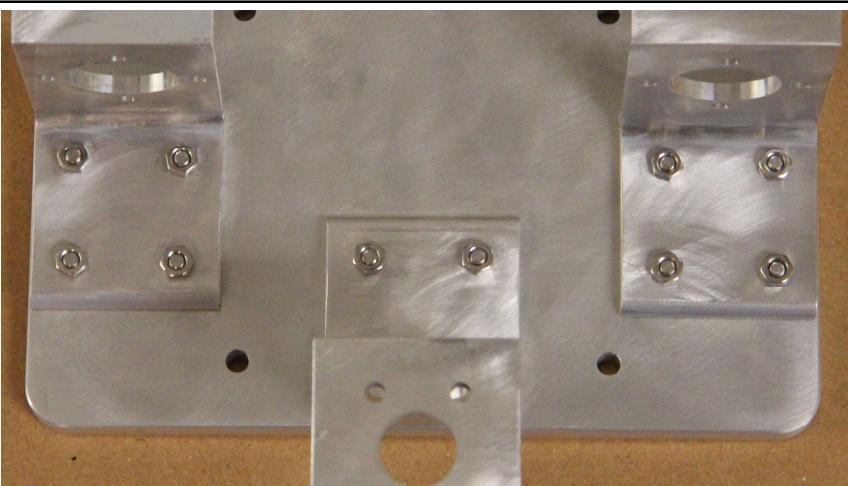
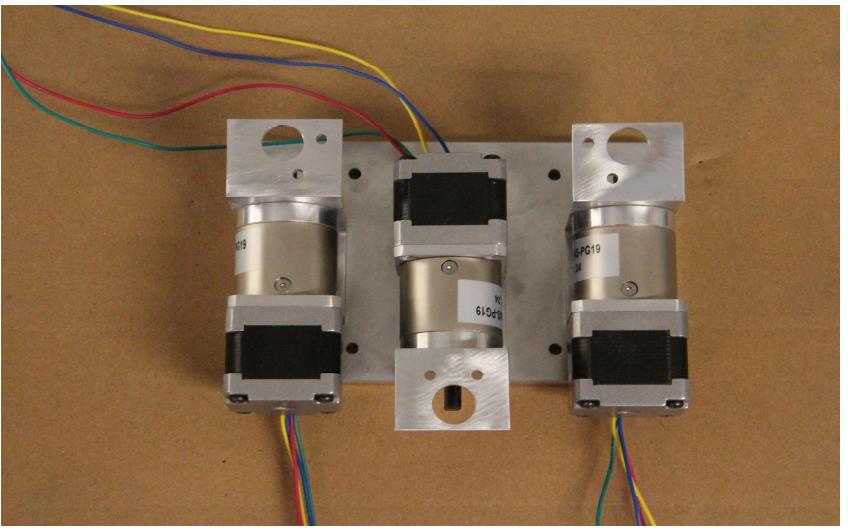
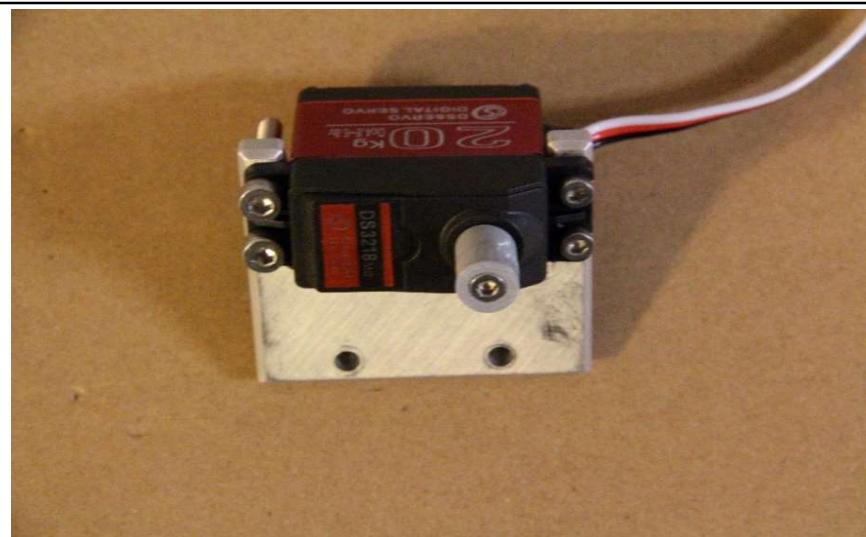


Neck Mechanism Assembly Instructions

| Steps: | Corresponding Picture: |
|--------|---|
| 1 | <p>Insert 4 Countersunk M3 10 mm bolts into the middle countersinks below the symmetrical Z-bracket, using M3 nuts to secure bracket. Ensure that bracket is oriented as shown and is flush against the plate chamfer.</p>  |
| 2 | <p>Perform step 1 twice more, ensuring that Z-brackets are in orientation as shown. Ensure both brackets are flush on their sides to the chamfer. Do not install stepper motors beforehand. Tighten bolts once each bracket is properly oriented.</p>  |
| 3 | <p>Insert 2 countersunk M2 6mm bolts into top and bottom countersinks and screw into stepper motor. Ensure that wires are facing bottom plate as shown in picture. Tighten bolts.</p>  |

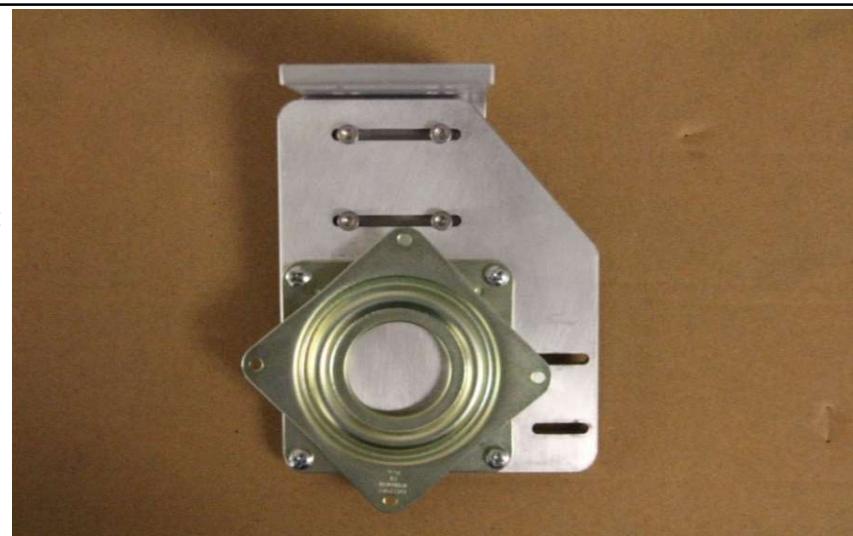
- 4 Place servo in servo mount with gearing on right side. Insert 2 Socket Cap M4 10 mm into left two holes and secure with M4 nuts. Insert 2 Socket Cap M3 10 mm and secure with M3 nuts. Hammer 3D-printed sleeve onto gearing and then use Socket Cap M3 10mm and screw in until flush with sleeve. Tighten all bolts.



- 5 Use 4 Pan Head M4 8mm bolts and M4 nuts to secure bearing in the following orientation. Tighten bolts.



- 6 Use 4 Socket Cap M4 10 mm and corresponding M4 nuts to secure the mounting L-bracket to the bottom plate. Tighten bolts. Ensure that the countersunk holes on the L-bracket are not used for this step.



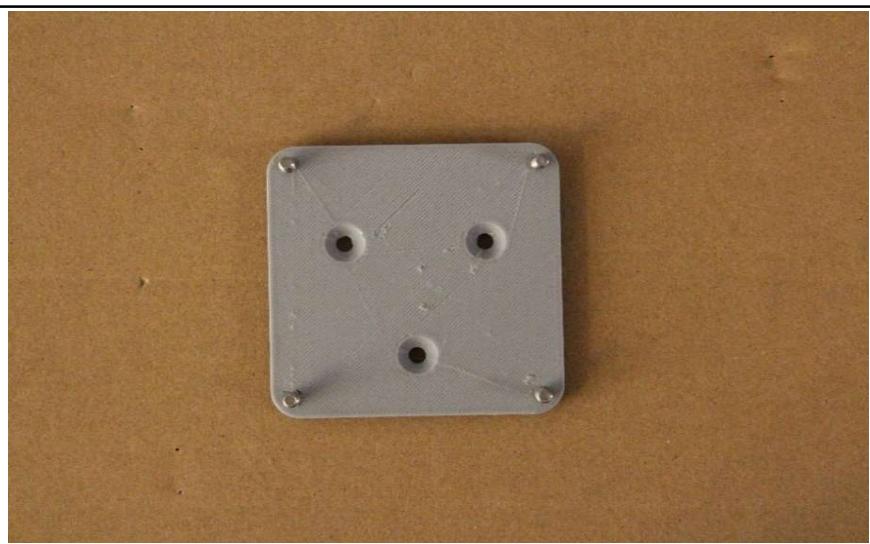
-
- 7 Use 3 Countersunk 10-24 1/2" bolts to secure a thicker gearing plate to the large gear.



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- 8 Use 4 Socket Cap M4 3 mm to secure large gear to bearing.
Ensure that screws are screwed from below, ending in the 3D-printed gearing plate.



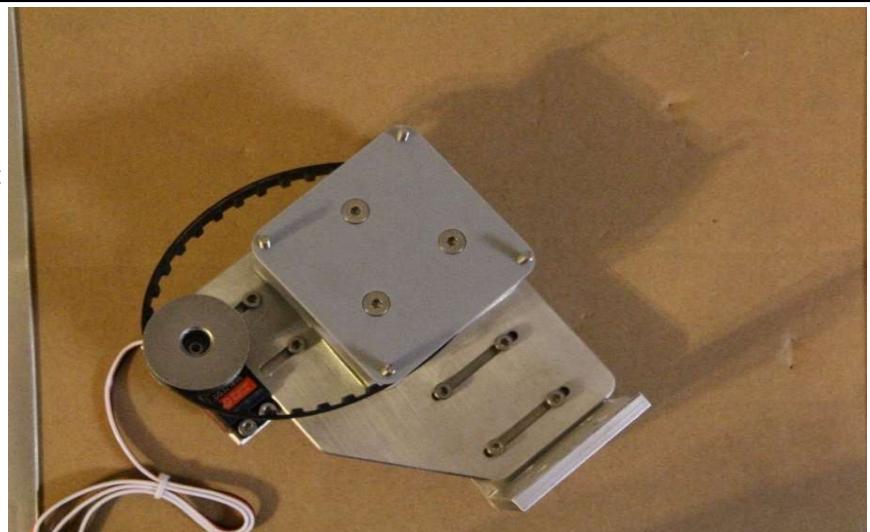
-
- 9 Insert 4 Countersunk M4 8mm screws into the 4 corner holes at the corners of the thinner gearing base plate.



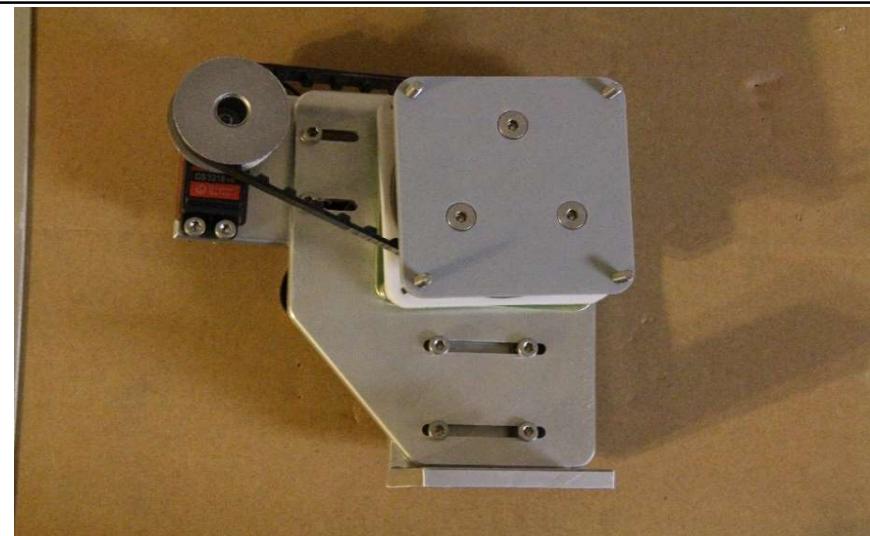
10 Repeat step 7 for the thinner gearing plate.



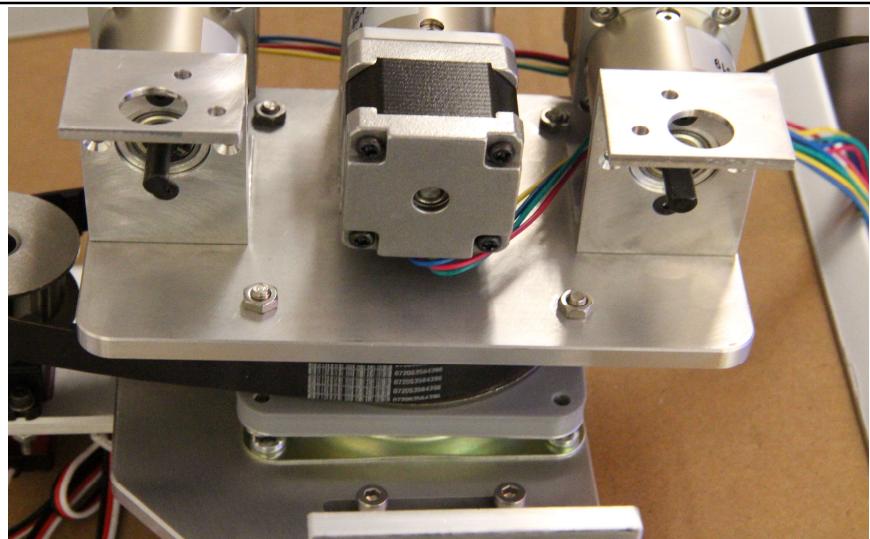
11 Place servo mount under bottom plate and insert Socket Cap M4 10mm bolts through bottom plate slots and through servo mount holes. Secure with M4 nuts, do not tighten. Place timing belt around gears.



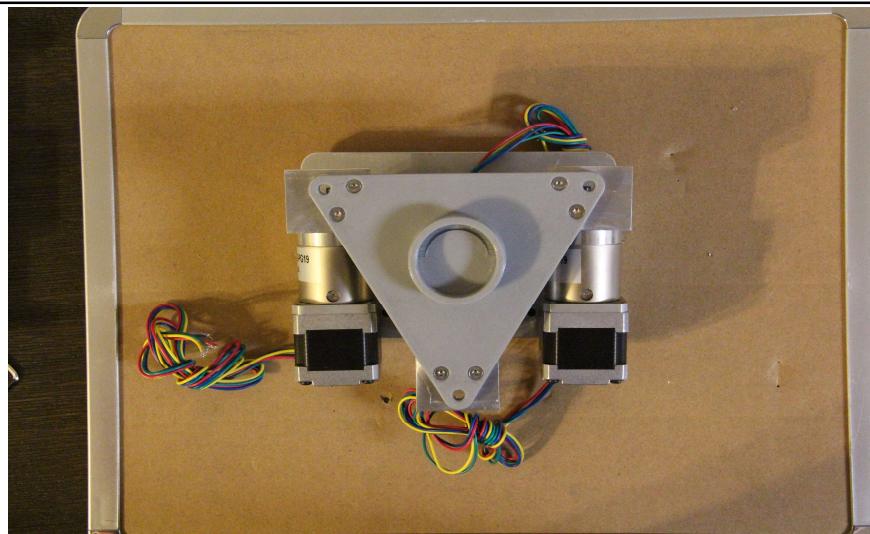
12 Pull servo tight and tighten bolts to tighten timing belt.



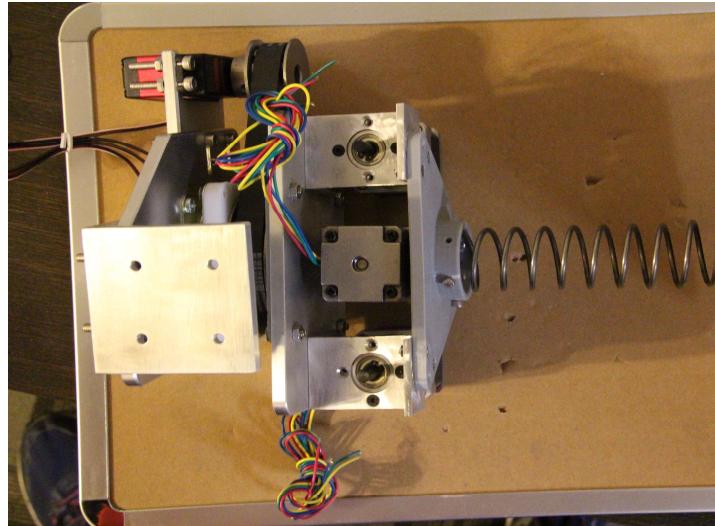
-
- 13 Align up-facing screws on top gearing plate to bottom plate of stepper holes and secure with M4 nuts.



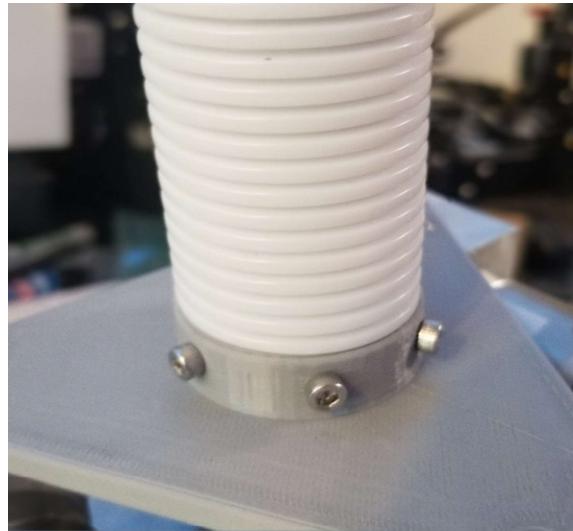
-
- 14 Afix bottom neck plate to top of the 3 Z-brackets with 6 Countersunk M3 8mm bolts and corresponding M3 nuts. Ensure that the lip in the neck plate is oriented facing in the direction of the two stepper motors.



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- 15 Install the spring using 4 Socket Cap M4 6mm bolts, threading through the plastic, allowing the threaded section of the bolt to fit over the ground of the screw. Multiple attempts at changing the angle of the spring may be necessary to ensure the spring is perpendicular to the bottom platform.



-
- 16 Attach bilge tubing of length of the spring over the spring.



-
- 17 Use 2 Button Cap M5 8mm bolts and corresponding nuts to secure Eye Mech. Base plate to top plate of neck. Ensure correct orientation.



-
- 18 Repeat step 13 for top portion of spring. May require multiple people to hold bilge tubing in compression.

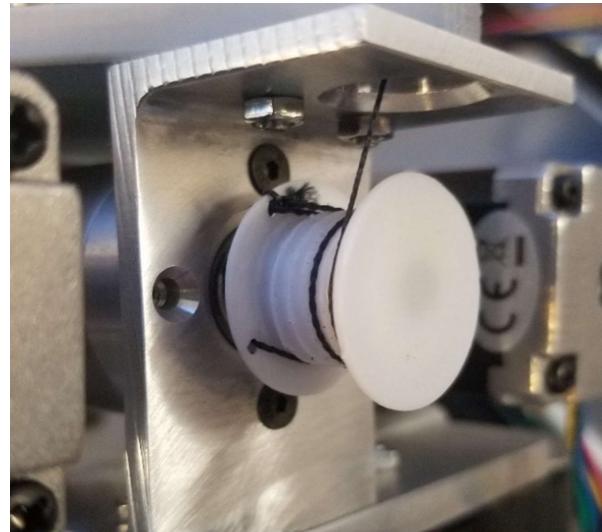


- 19 Use needle to thread Kevlar Kite Wire through all four holes of spindle. Tie down wire around one of the holes and spin wire around spindle 3-4 times and then leave .5 meters of extra wire.



- 20 Repeat step 16 for the remaining 2 spindles (see previous picture).

- 21 Push all 3 spindles onto the stepper motors. Ensure keying of stepper motors matches to spindle's keying.



- 22 Use needle to guide Kevlar Kite Wire through bottom plate holes and around top plate securing holes 3 times and tie to secure. Repeat for all spindles. Spin spindles until top plate is level.



- 23 Use 2 Round M2 6mm bolts to secure IMU to IMU mount.
Use 2 Round M2 12mm bolts and corresponding nuts.
Thread 12mm bolts through IMU mount and through top plate. Secure with nuts. Ensure that IMU is configured as in picture.

