

Marty Assembly Instructions

Please read through this document carefully

Hi Backers!

These are the instructions for assembly of the alpha version of 3D printable Marty. We've spent the last couple of months refining the designs to make them work across different printers, and worked hard to make them easier to assemble. There are lots of moving parts, and as with any 3D printing you'll need to do some manual finishing. All the parts print without support material, and all you should need to finish them is a craft knife and a drill.

The Marty you make with these parts won't be as nice as the injection molded ones we're preparing, but hopefully you'll have fun making your Marty!

These parts are not a finished product, so there will probably be some issues. If you find one, please send us an email and we'll do our best to get it fixed.

Lastly, please don't share these instructions or the part files themselves. In a couple of months (maybe sooner!) we'll be starting up our Marty community, where you're encouraged to modify parts and share what you make - both parts and code. Marty's not yet released as a commercial product, and for Robotical to work as a company, and for us to be able to continue to develop Marty, we need to make sure the designs are only used for personal use at the moment.

Thanks again for all your support!
Sandy

Disclaimer:

Early-access version of mechanical part designs and assembly instructions. By downloading the following document and relevant 3D part designs, you accept and agree to our Terms and Conditions. All Rights Reserved.

These parts are provided without warranty, Robotical Ltd. is not liable for any damage that may arise from misuse of what is provided. Part designs and visual style is protected under Copyright, Registered Design and other Intellectual Property laws.

Do not distribute!

Assembly notes:

- The order of instructions hereby presented is strongly recommended, since it will improve the ease of the assembly.
- Printed parts may differ from original designs due to differences between 3D-printers and their settings. If necessary, please clean and finish parts carefully before assembling Marty.
 - Holes for M2.5 screws can be cleaned with a 2.5mm drill
 - Holes for link shafts can be cleaned (carefully!) with a 5mm drill. Be careful here - too tight and there will be too much friction, overloading your motors; too loose, and you'll have a sloppy Marty.
- Several of the parts - e.g. links, servo mounts - have relatively thin shafts at the top of the prints. To make these print better, print several parts at a time, to give the face of the cylinder a chance to cool before the next layer, while the extruder makes another cylinder. We normally print four links or boxes at a time. Note that the shaft on the servo link is slightly taller off the printer bed than on the normal links. So print the four servo links together in one go.
- Servos should be moved to their zero position before attaching to the servo horns. When not instructed, servo horns may be connected after Marty's assembly is complete.
- We use the same screws (M2.5) pretty much everywhere. In most places a 6mm long screw will do, and normally having a longer screw won't get in the way. The only place you need a really long screw is in the hinge of the head
- The Twist Washer comes in three sizes, to allow for the tolerances on different printers. Use one which lets your knee joint twist freely, but not rock side to side.

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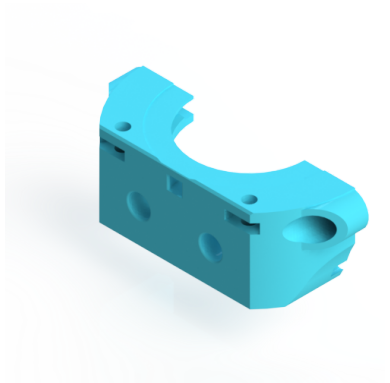
List of Parts:

3D Printed Parts

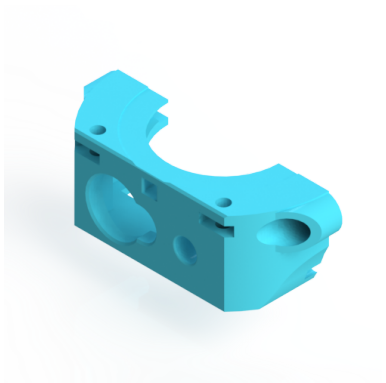
- 8 x Servo Holder (1a)
- 6 x Servo Mount (1a)
- 2 x Twist Shaft (2)
- 2 x Twist Washer (3)
- 12 x Link (4a)
- 4 x Servo Link (4b)
- 8 x Cross Brace (5)
- 2 x Foot (6)
- 1 x Head Base (7)
- 1 x Faceplate (8)
- 1 x Left Eye (9a)
- 1 x Right Eye (9b)
- 2 x Arm (10a)
- 2 x Hand (10b)
- 2 x Arm Gear (10c)
- 2 x Arm Pivot (11)
- 2 x Arm Servo Gear (12)
- 3 x Servo Plate (13)
- 4 x Standoff (14)

Off the shelf Components

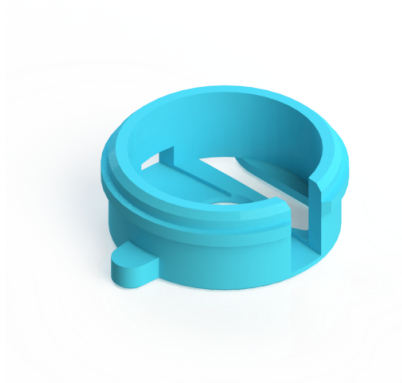
- 4 x Strong Micro Servo (e.g. Hobbyking HK939MG)
- 5 x Normal Micro Servo (e.g. Towerpro SG90)
- Servo Horns (Single/Double), these come with the servos
- 57 x M2.5 8mm Screws
- Self Tapping Screws (These come with the servos)
- 2 x M2.5 16mm Screws
- 59 x M2.5 Nuts



(1a) Servo Holder



(1b) Servo Mount



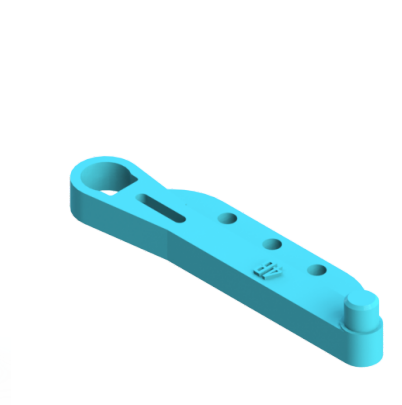
(2) Twist Shaft



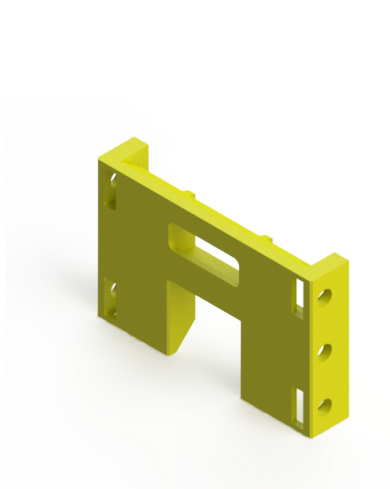
(3) Twist Washer



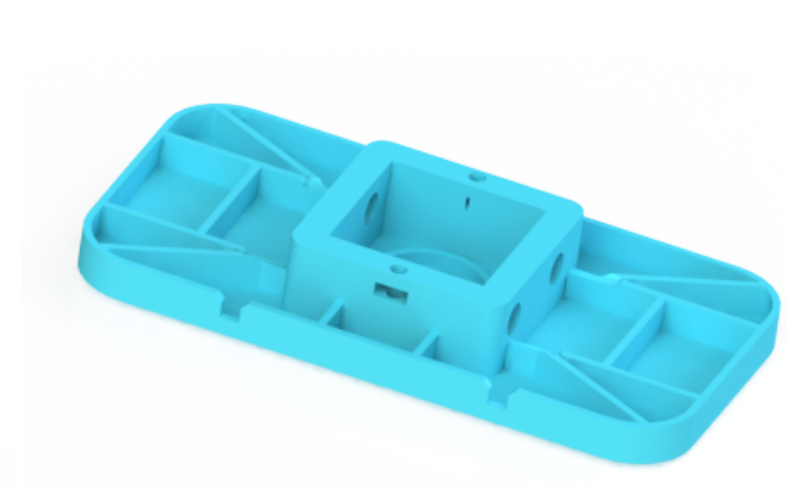
(4a) Link



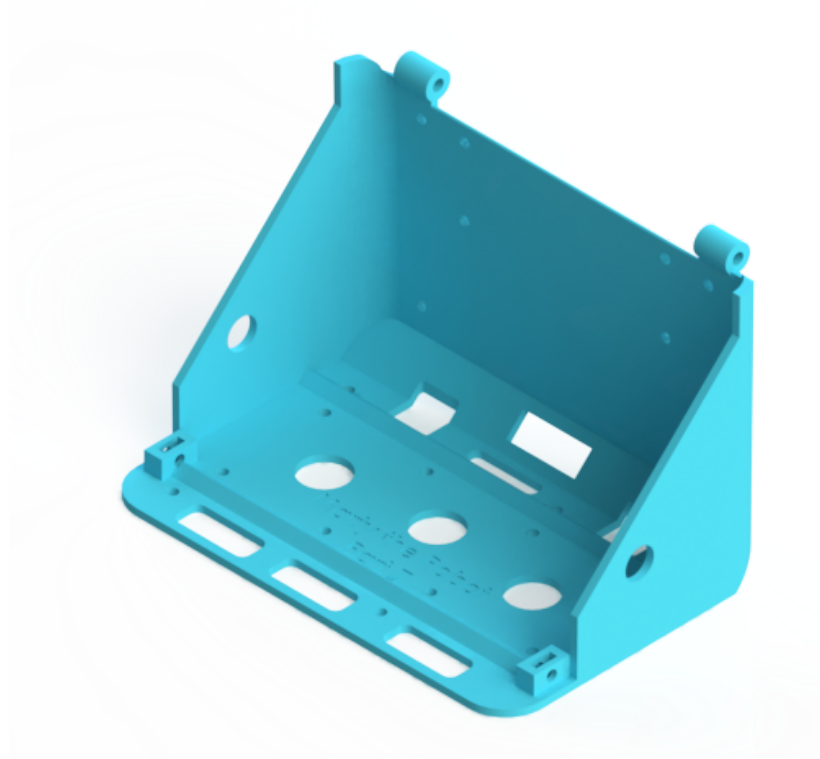
(4b) Servo Link



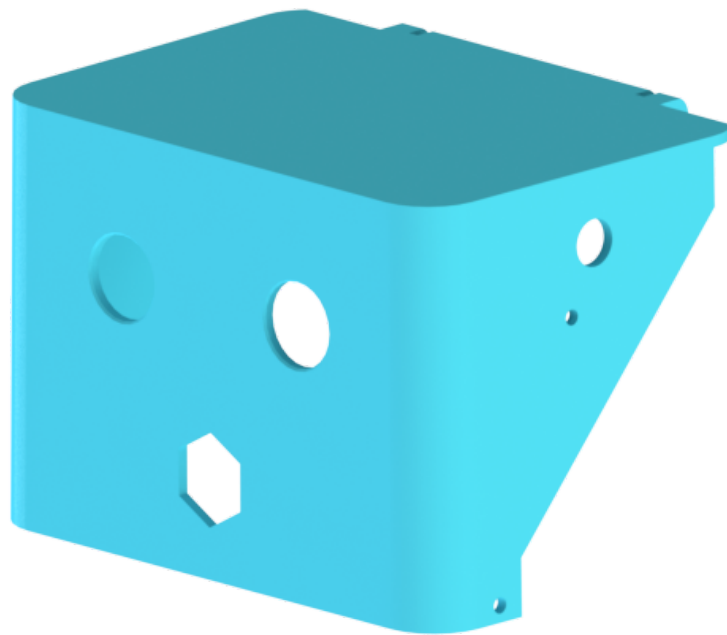
(5) Cross Brace



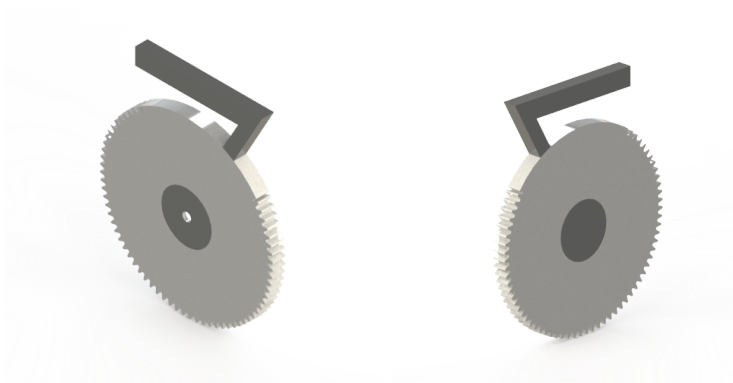
(6) Foot



(7) Head Base

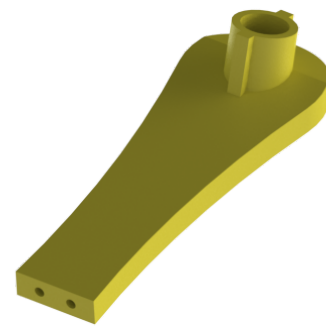


(8) Faceplate

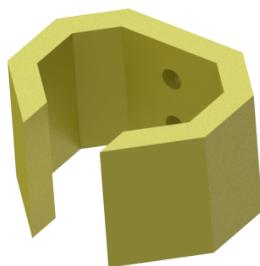


(9a) Left Eye

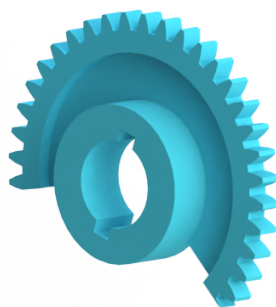
(9b) Right Eye



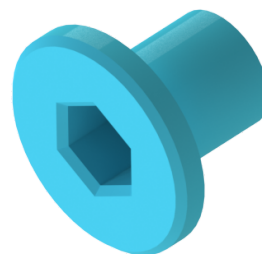
(10a) Arm



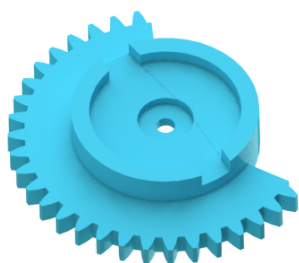
(10b) Hand



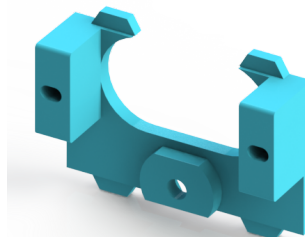
(10c) Arm Gear



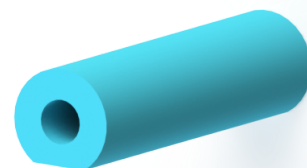
(11) Arm Pivot



(12) ArmServoGear

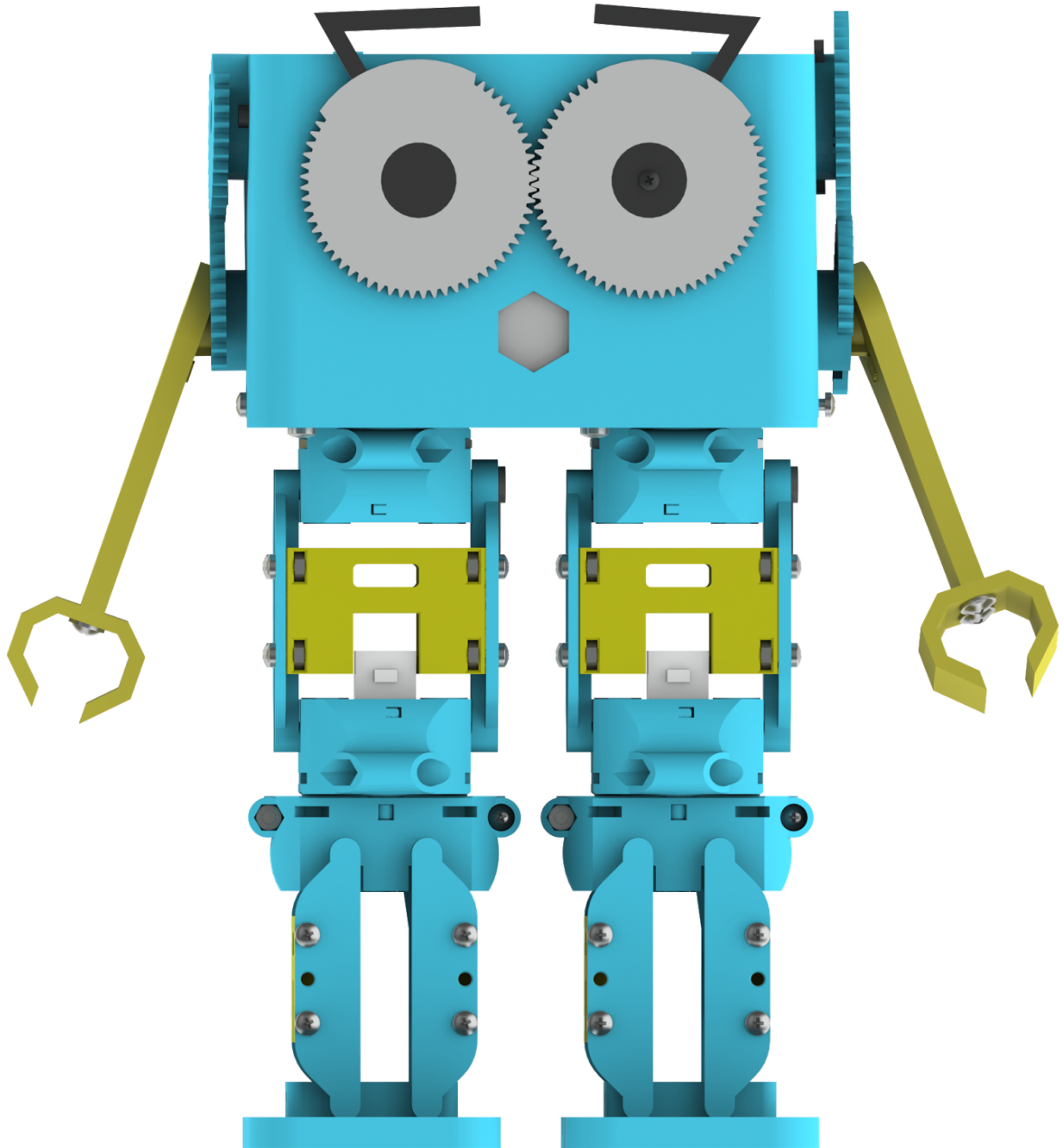


(13) ServoPlate

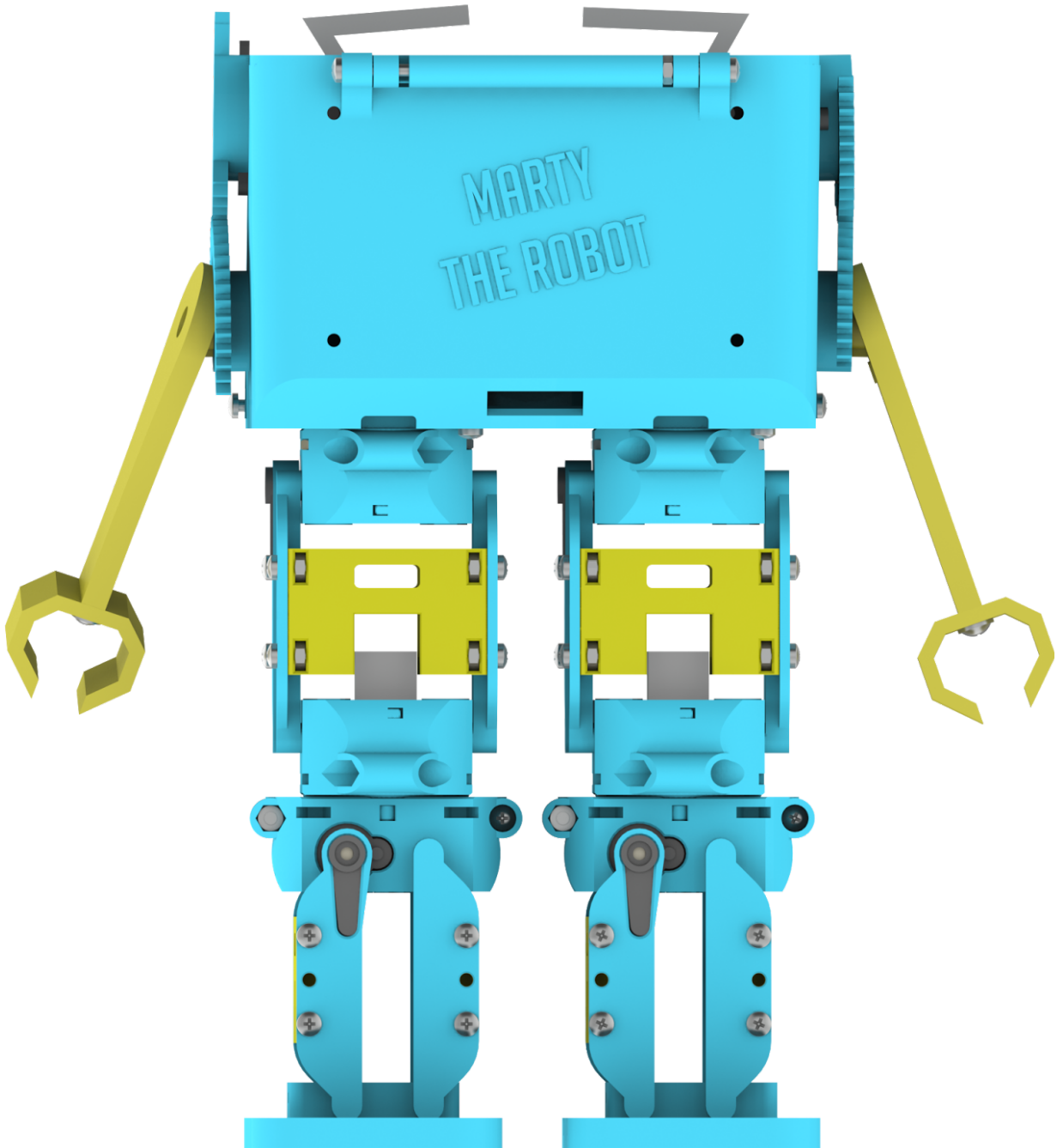


(14) Standoff

Assembled Marty Front View



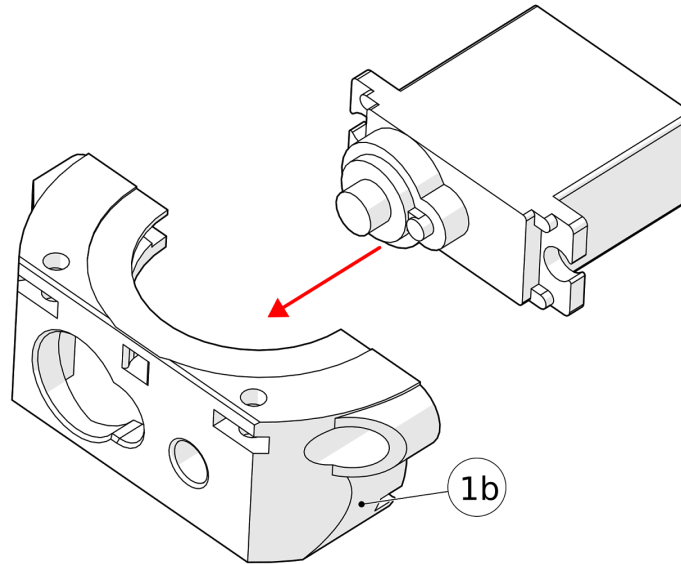
Assembled Marty Rear View



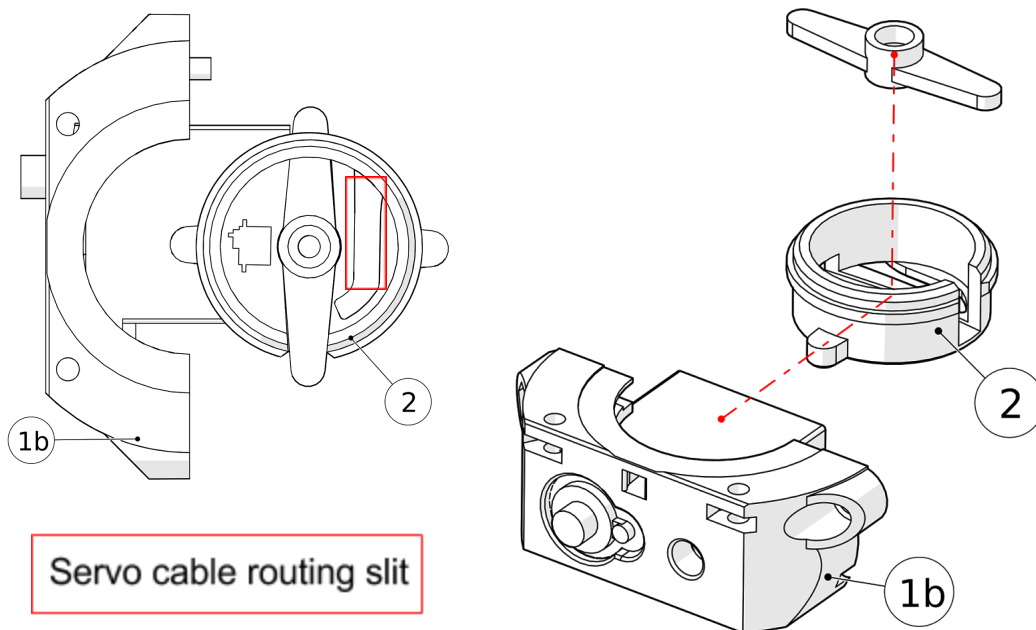
A. Knee Assembly

a. Knee Box

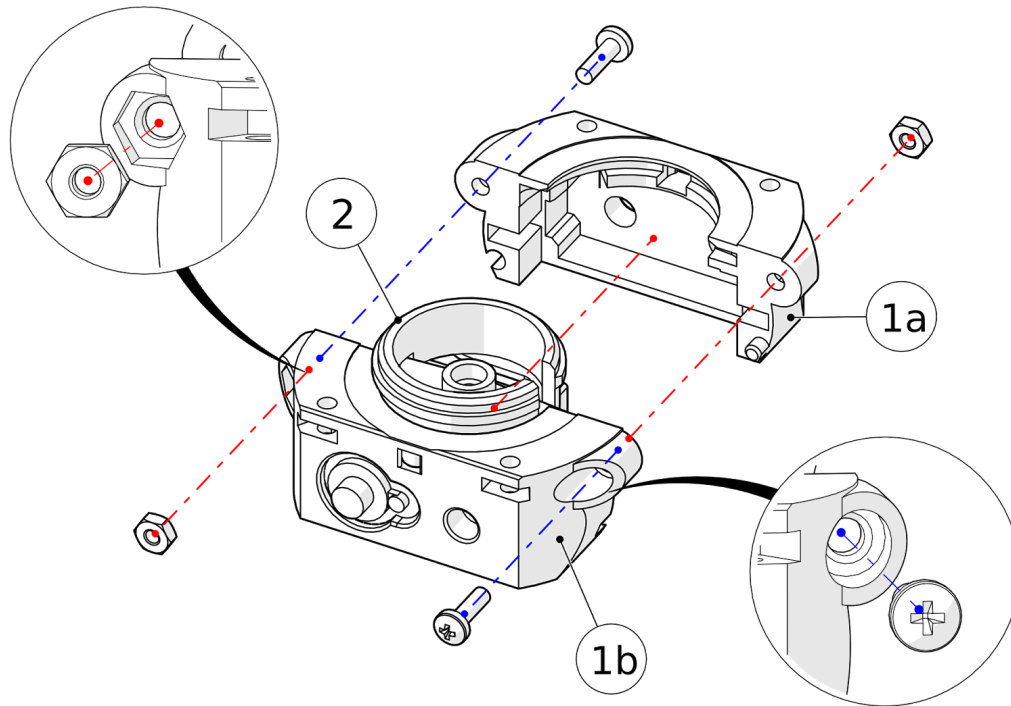
- To assemble a Knee Box, place a Strong Servo inside a Servo Mount (1b)



- Take a Twist Shaft (2) and route the servo cable through the slit
- Insert a Double-Sided Servo Horn into the Twist Shaft (2), ensuring the spline (knobby bit) faces up away from the servo

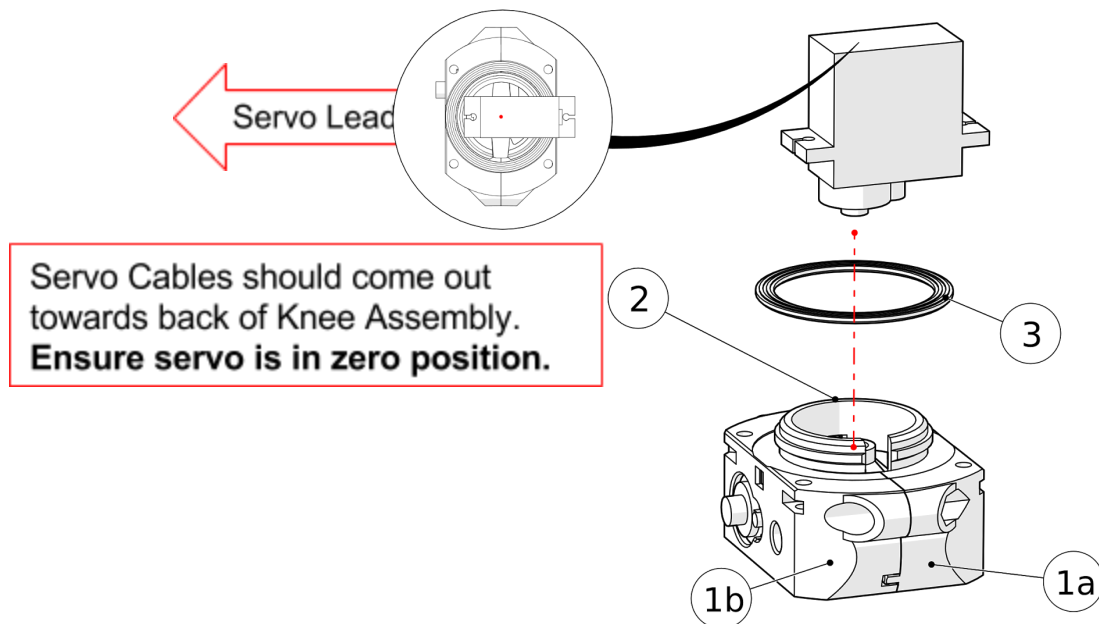


- Finish assembly by fitting the Servo Holder (**1a**) to the Servo Mount (**1b**), and secure with two M2.5 8mm Screws and two M2.5 Nuts

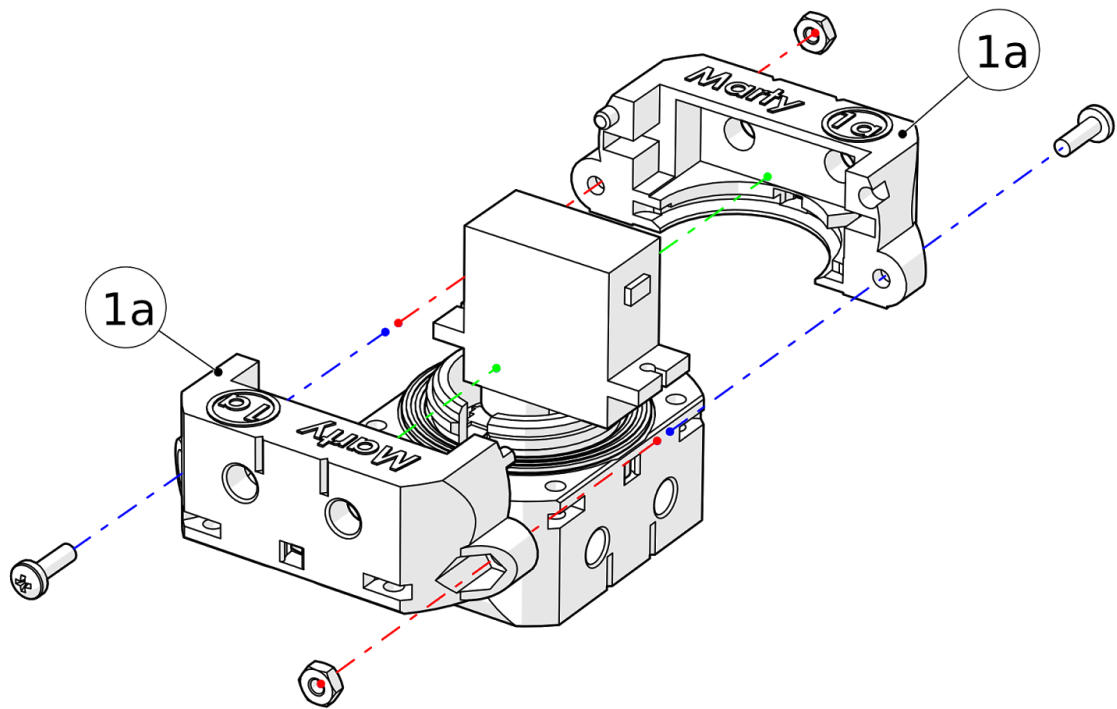


b. Twist Box

- Place a Twist Washer (**3**) around the Twist Shaft (**2**), and a Normal Servo on the Servo Horn.



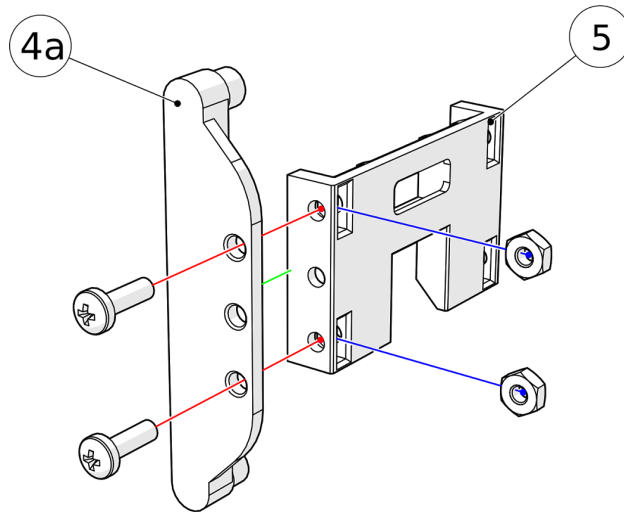
- **Tip:** Use the thickness of Twist Washer that lets the knee twist easily, without rocking side to side too much. Experiment before screwing the servo next servo holder together
- Enclose Servo with two Servo Holder (**1a**) parts, and secure with two M2.5 8mm Screws and two M2.5 Nuts



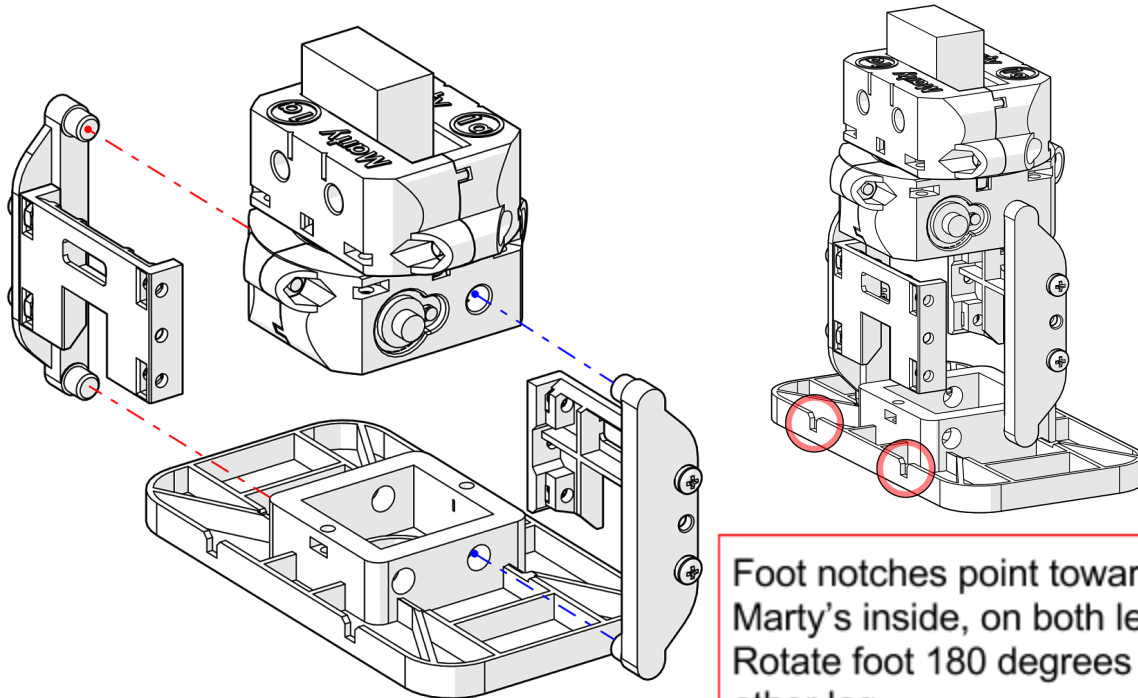
B. Foot Assembly

a. Foot Parallel Linkage

- Attach a Link (4a) to a Cross Brace (5) using two M2.5 8mm Screws and two M2.5 Nuts. Repeat to produce two Link assemblies

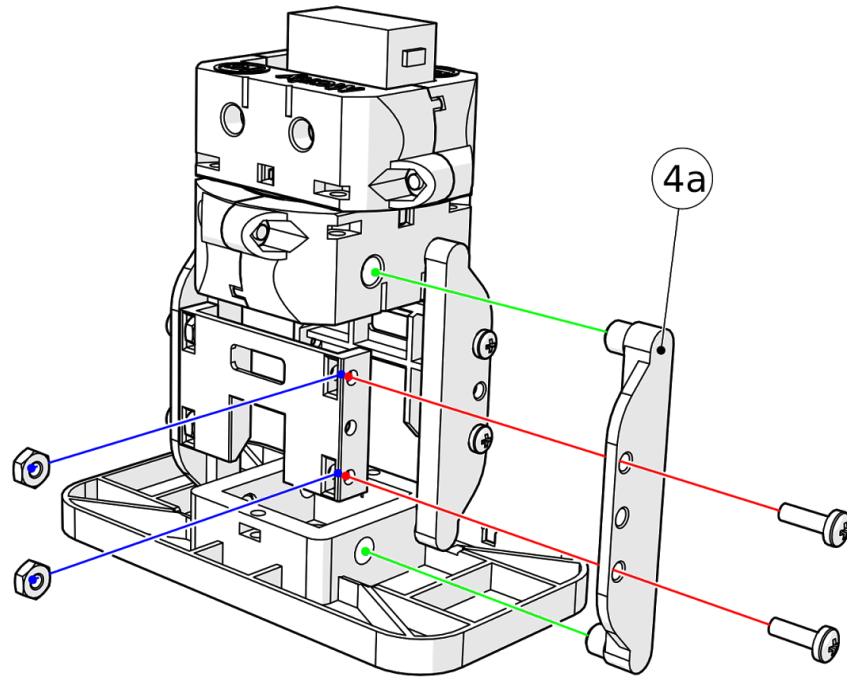


- Attach both Link assemblies to Knee assembly and Foot (6)

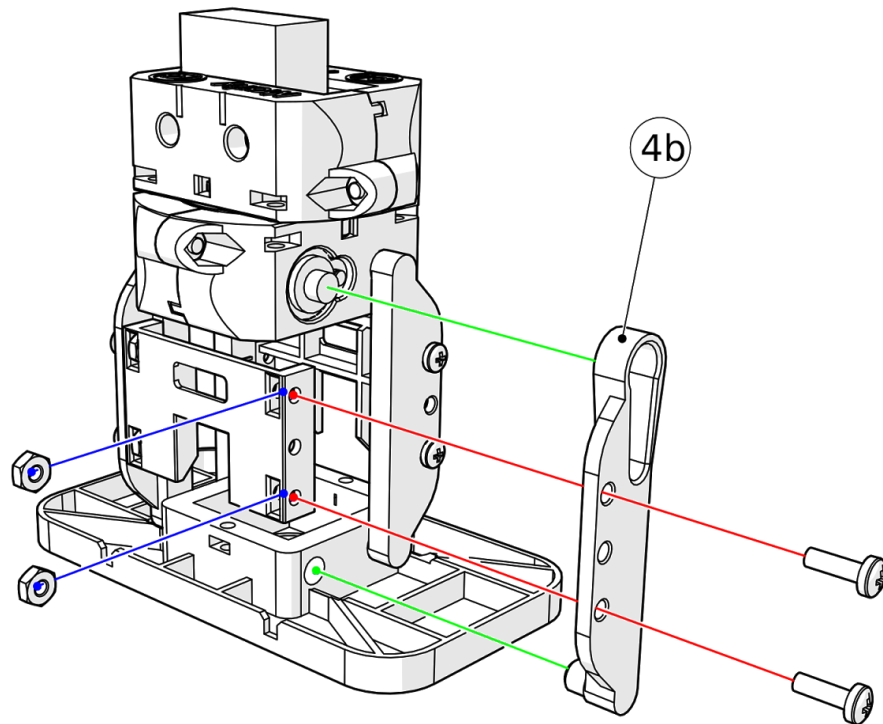


Foot notches point towards Marty's inside, on both legs. Rotate foot 180 degrees for other leg.

- Attach a Link **(4a)** to the Knee assembly using two M2.5 8mm Screws and two M2.5 Nuts



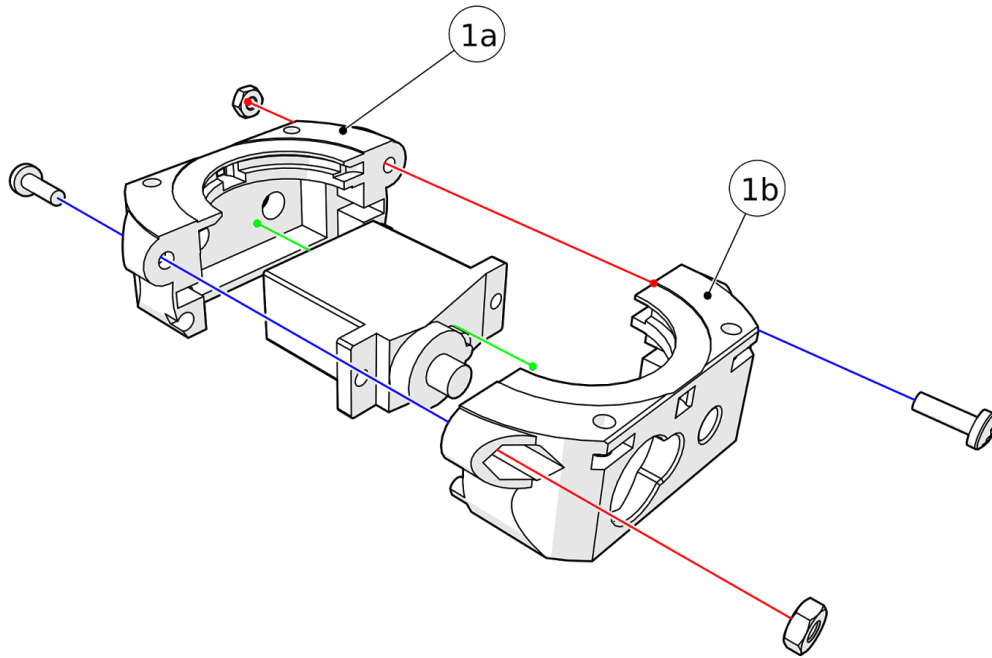
- Attach a Servo Link **(4b)** to the Knee assembly using two M2.5 8mm Screws and two M2.5 Nuts



C. Hip Assembly

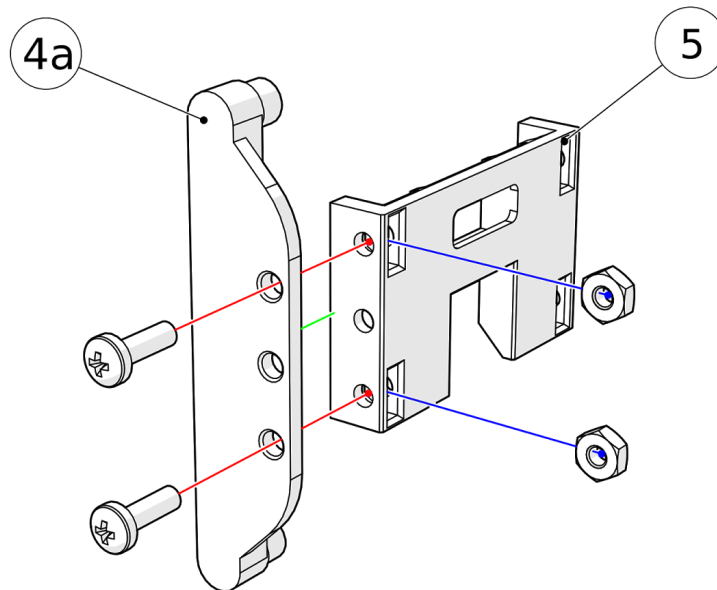
a. Hip Servo Box

- Place a Strong Servo inside a Servo Mount (**1b**) and Servo Holder (**1a**), secure with two M2.5 8mm Screws and two M2.5 Nuts

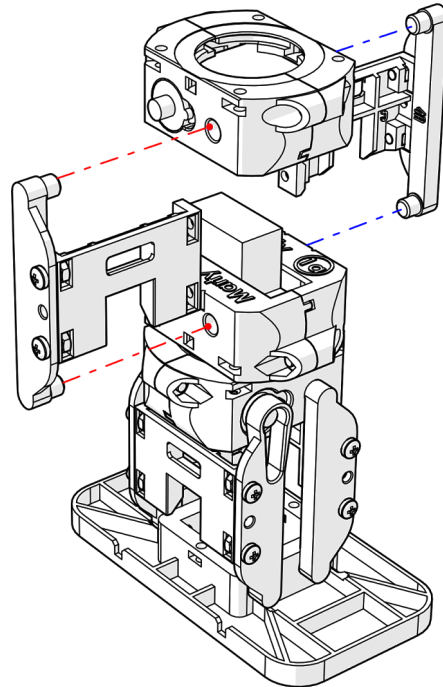


b. Hip Parallel Linkage

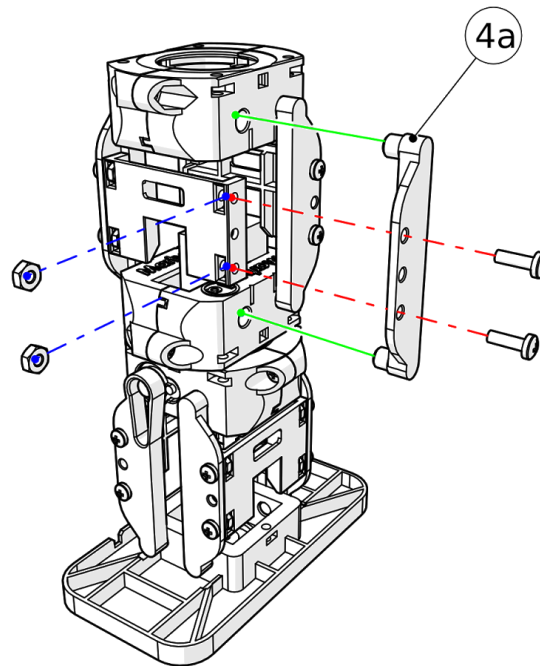
- Attach a Link (**4a**) to a Cross Brace (**5**) using two M2.5 8mm Screws and two M2.5 Nuts. Repeat to produce two Link assemblies



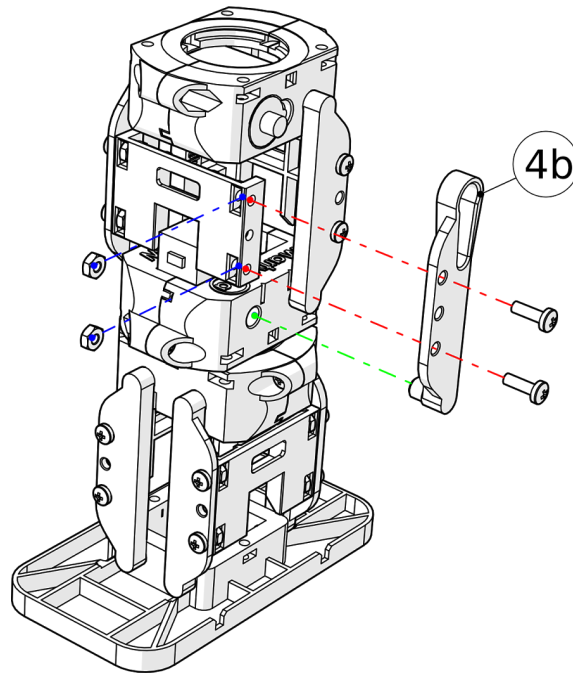
- Attach both Link assemblies to Knee joint and Hip Servo Box (6)



- **Tip:** This is the best time to feed servo cables from the knee through the slot in the back Cross Brace, and up through the hip servo holder
- Attach a Link (4a) to the Hip assembly using two M2.5 8mm Screws and two M2.5 Nuts

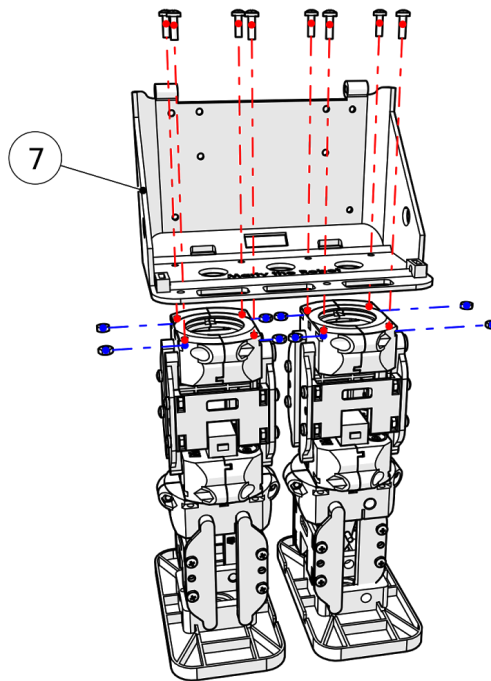


- Attach a Servo Link (**4b**) to the Hip assembly using two M2.5 8mm Screws and two M2.5 Nuts



c. Leg Attachment

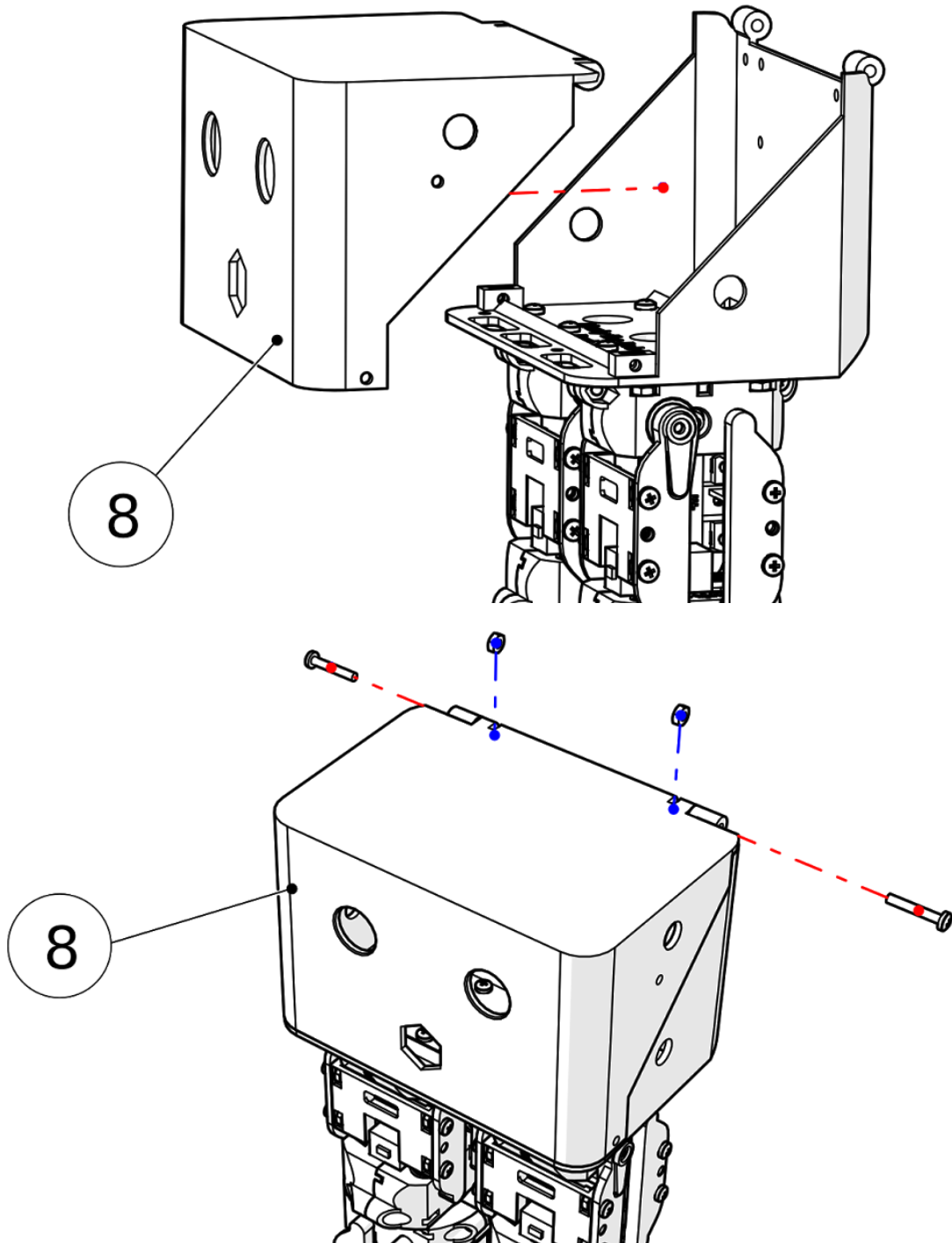
- Attach both Leg assemblies to the Head Base (**7**) using eight M2.5 8mm Screws and eight M2.5 Nuts.



D. Head Assembly

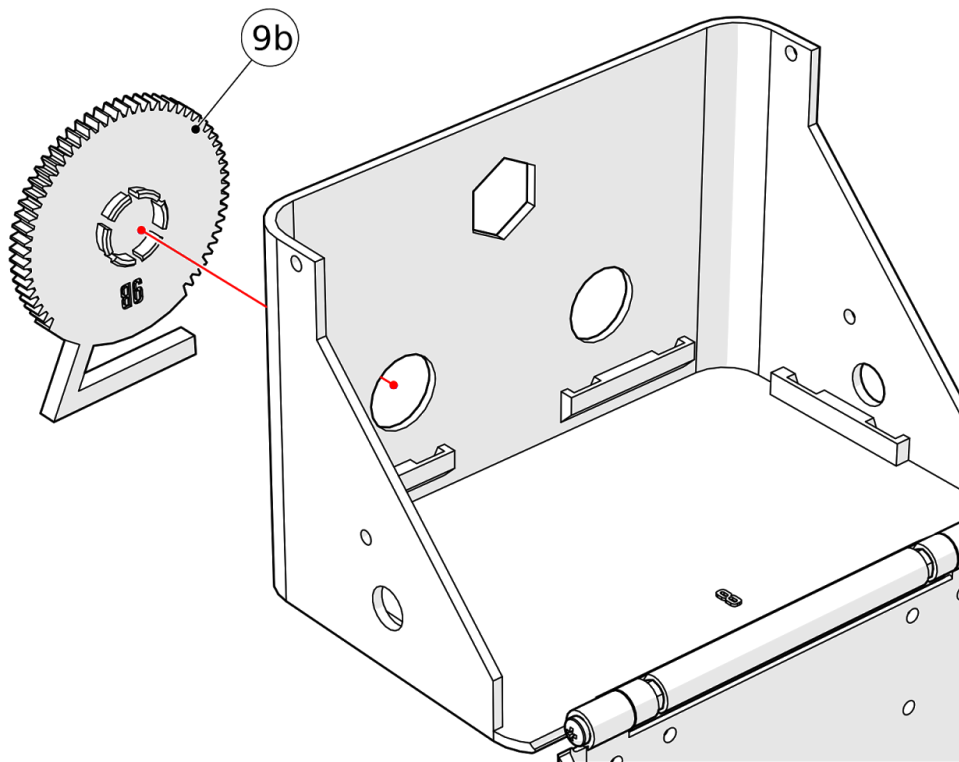
a. Face

- Attach Faceplate (8) to Head Base (7) using 2 M2.5 16mm Screws and two M2.5 Nuts

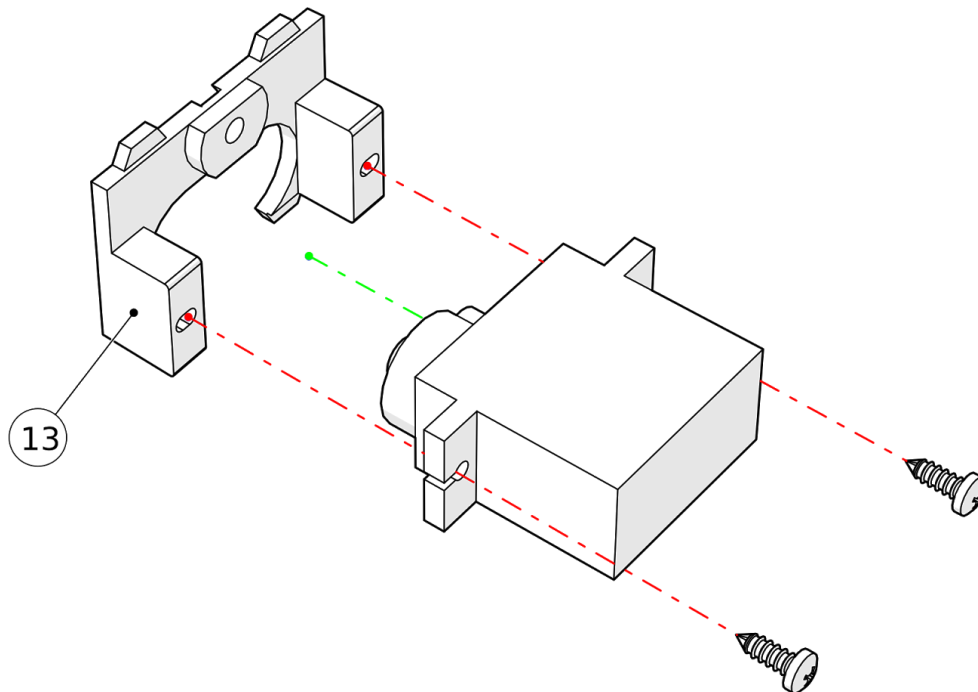


b. Eyes

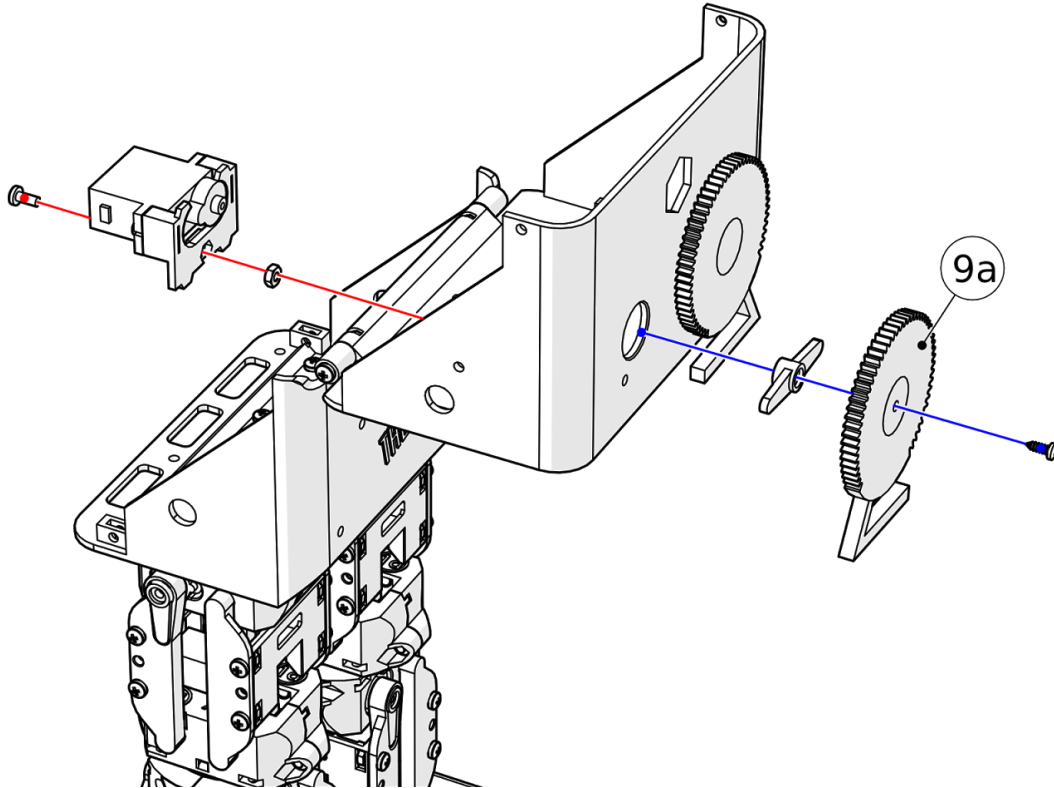
- Click Right Eye (**9b**) into Faceplate (**8**)



- Attach a Servo to a Servo Plate (**13**) using two Self Tapping Screws

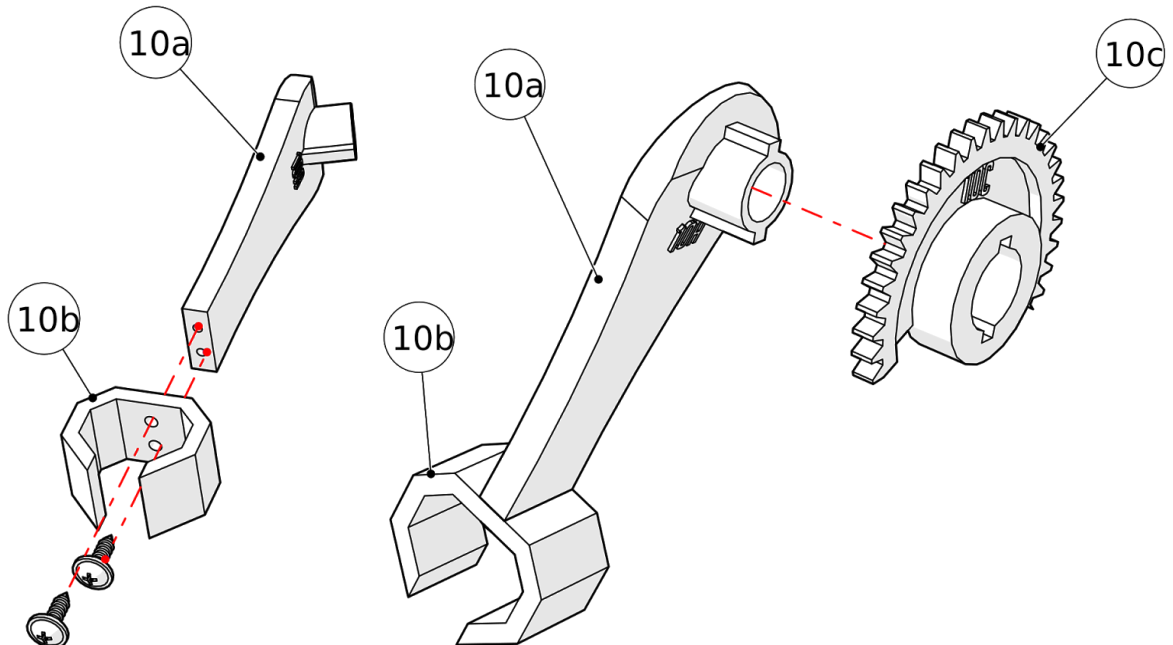


- Attach Servo assembly to Faceplate **(8)** with a Screw and a Nut, and connect a Double-Sided Servo Horn to a Right Eye **(9b)** using a Self Tapping Screw

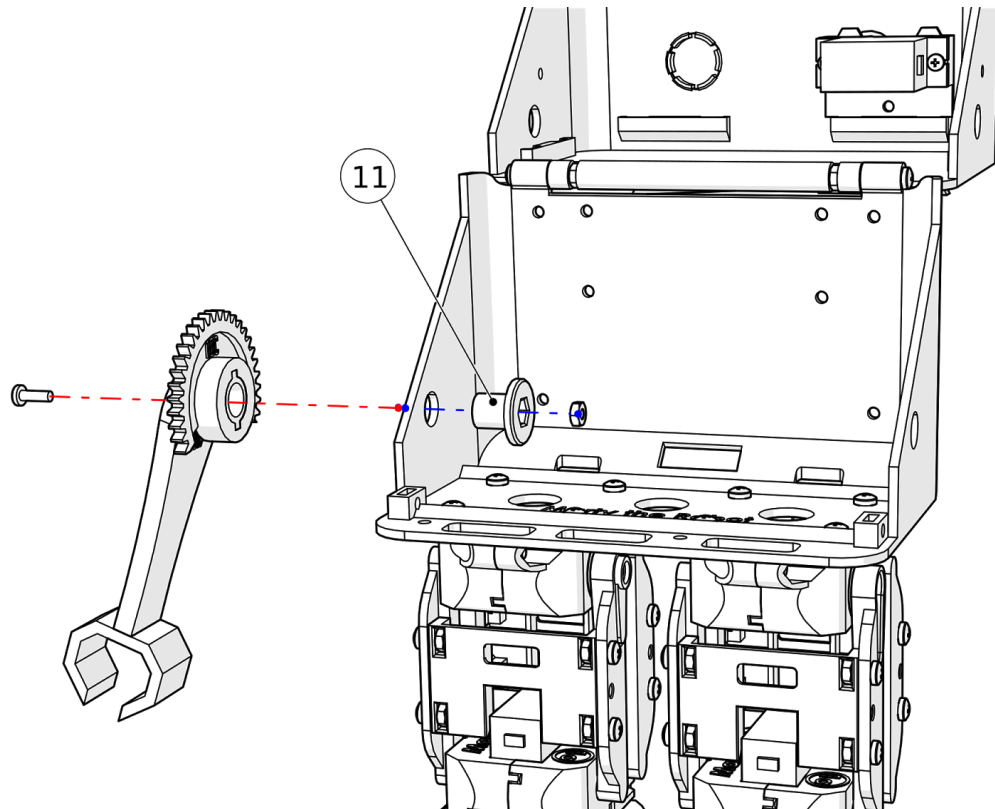


E. Arm Assembly

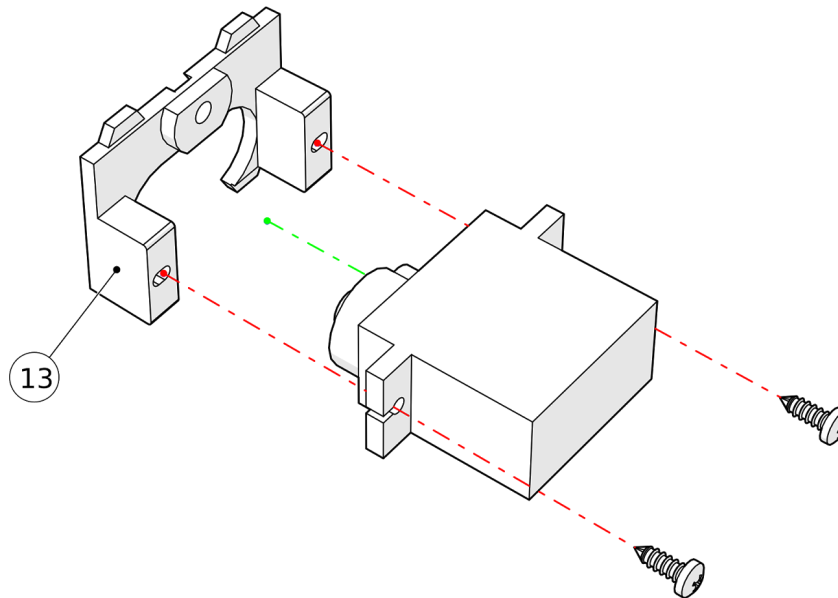
- Attach a Hand (**10b**) to an Arm (**10a**) using two Self Tapping Screws
- Slot the Arm assembly into an Arm Gear (**10c**)



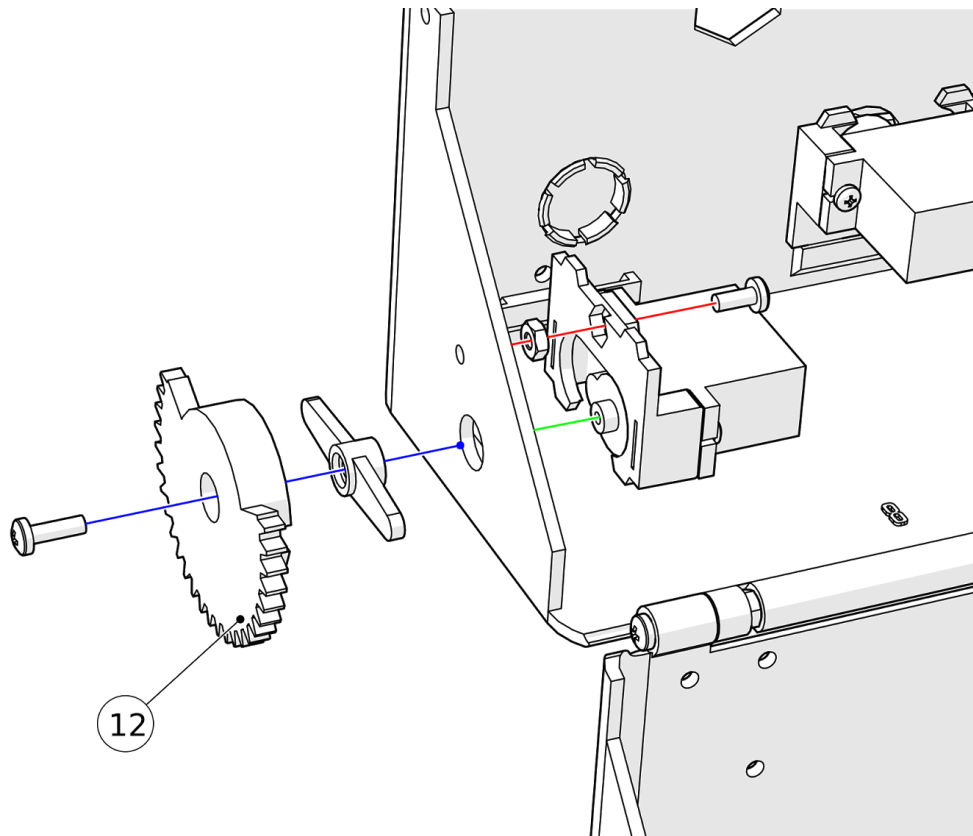
- Attach to Head with an Arm Pivot (**11**) using one Screw and one Nut



- Attach a Servo to a Servo Plate (**13**) using two Self Tapping Screws

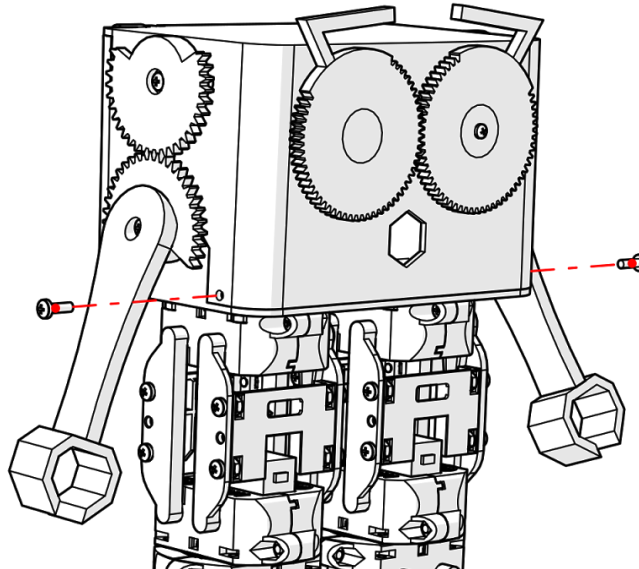


- Attach the Servo assembly to the Faceplate (**8**), and connect a Double-Sided Servo Horn to an Arm Servo Gear (**12**) using a Screw



F. Head Lock

- Lock the complete Head assembly with two M2.5 8mm Screws and two M2.5 Nuts



G. Standoffs

- For mounting a Raspberry Pi above the battery, connect up to four Standoff (14) parts to the Head Base (7)

