

ESRA[®] III
Expressive System for Robotic Animation

ESRA III Kit Contents

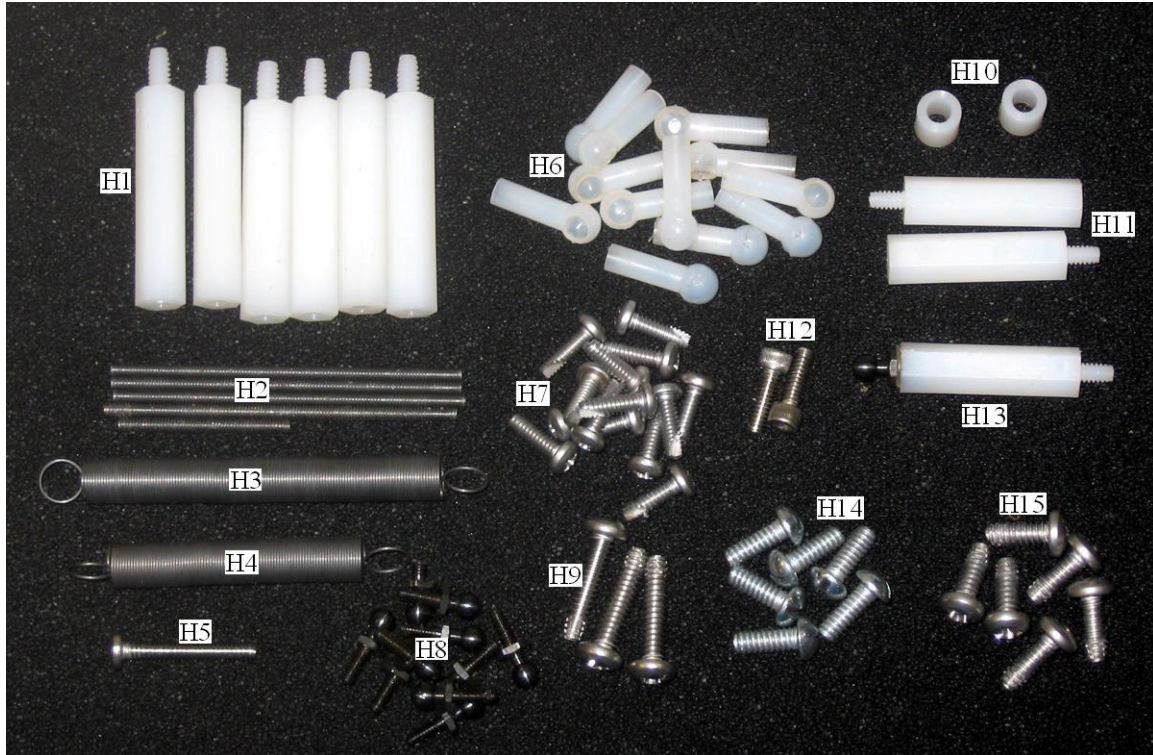


- 1 Hitec Servos
- 2 Dagu (New as of 7/12)
- 3 Eye Balls
- 4 Flat Servo Plate
- 5 Right Lower Jaw
- 6 Left Lower Jaw
- 7 Base

- 8 Upper Eye Support
- 9 Lower Eye Support
- 10 Main Support
- 11 Eye Pivots
- 12 Nose Plate
- 13 Lip Extenders
- 14 Nose

Hardware Bag

Hardware Bag Contents



- | | | | |
|----|-------------------------------|-----|-------------------------------|
| H1 | 1 1/4 6-28 Standoffs | H9 | 5/8" 6-28 self tapping screws |
| H2 | 2" and 1" 2-56 studs | H10 | 1/4" spacers |
| H3 | Long Spring | H11 | 1" 4-40 spacers |
| H4 | Short Spring | H12 | 3/8" 4-40 screws |
| H5 | 3/4" 4-40 Screw | H13 | Ball end extension |
| H6 | Female Ball Ends | H14 | 6-28 screws |
| H7 | 3/8" 4-40 Self Tapping Screws | H15 | 3/8" 6-28 Self Tapping Screws |
| H8 | Ball Ends | | |

Assembly Instructions

Assembly of the ESRA III kit will take you about 45 minutes. Be sure to look up the proper part for each step, indicated by the number next to the part name that corresponds to the pictures in "ESRA III Kit Contents."

Some Basic tool and supplies are required for assembly, including:

- Phillips Screwdriver
- Needle Nose Pliers
- Regular Screwdriver
- Allen Wrenches
- Glue Gun (optional)

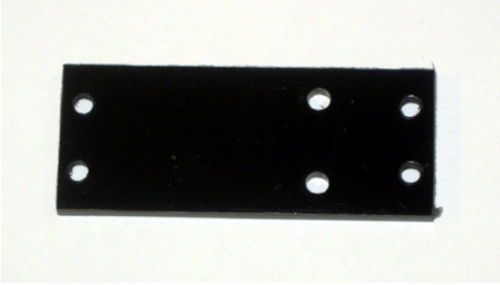


Figure 1

Locate the Flat Servo Plate. You will need to tap the outer 4 holes to a 6-28 thread.
Note: If your robot has the optional Ears, please follow using the ear plate.

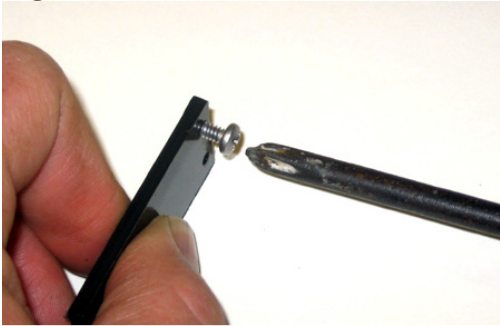


Figure 2

Simply screw a self-tapping 6-28 screw into each corner hole and then remove the screw.

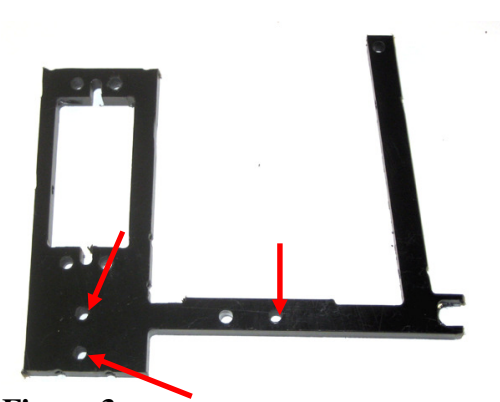


Figure 3

The same process must be repeated on the main support through the indicated holes in Figure 3

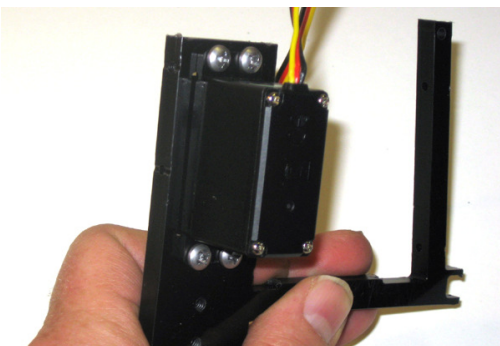


Figure 4

Now attach one of the larger servos to the Main Support using 4 self-tapping 6-28 screws. Please note that the servo casing does not get placed through the Mains Support. See below for further details

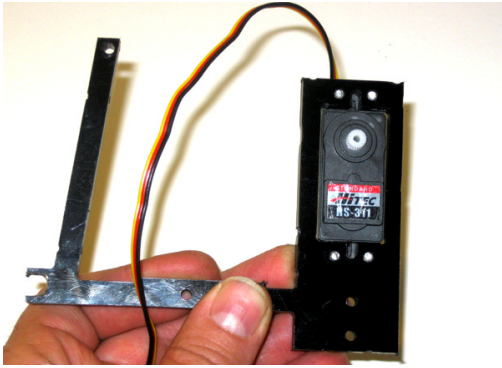


Figure 5

Notice that only the servo face shows through the servo cutout. The servo mounting holes are on the backside of the Main Support.

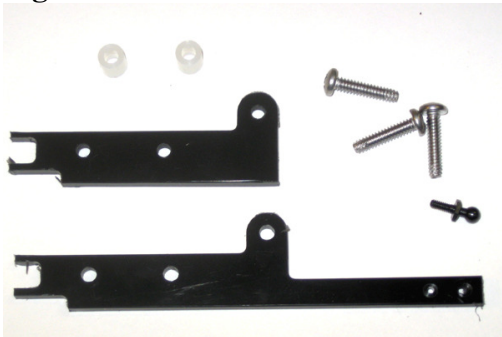


Figure 6

Locate the left and right jaw components, the two spacers, three $\frac{5}{8}$ " self-tapping 6-28 screws and one ball end.

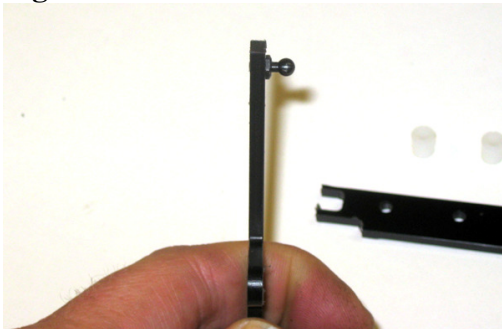


Figure 7

Screw the ball end onto the end of the Left Lower Jaw piece and flush cut off the remainder of the thread. See figure 7 on the left.

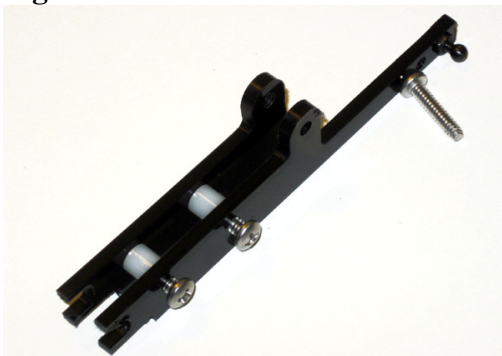


Figure 8

Use two of the $\frac{5}{8}$ " 6-28 self-tapping screws and the two spacers to attach the left and right lower jaw as shown in Figure 8

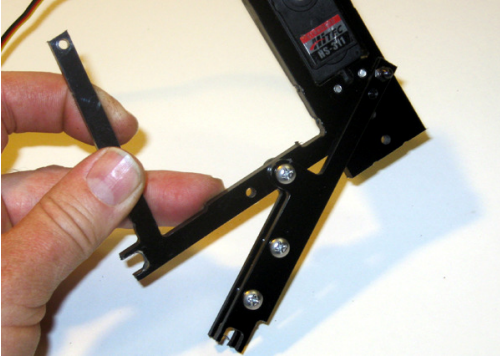


Figure 9

Use the remaining $\frac{5}{8}$ " 6-28 self-tapping screw to create a pivot as shown to the left.

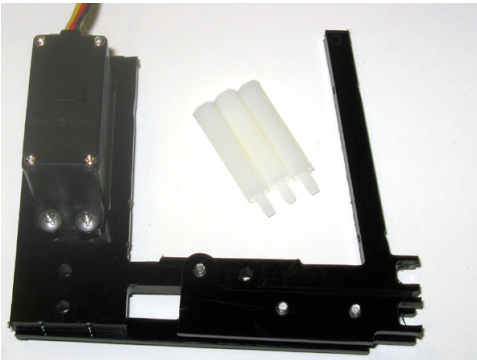


Figure 10

Locate three of the $1\frac{1}{4}$ " 6-28 standoffs.

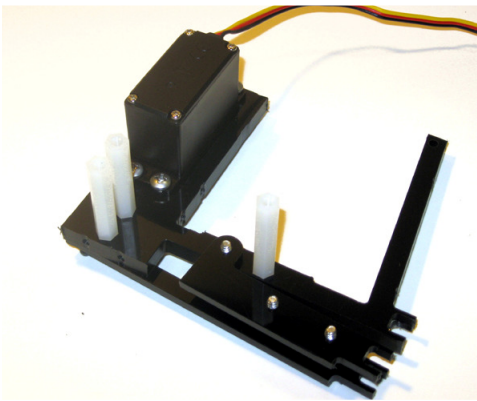


Figure 11

Screw them into the Main support frame as shown in Figure 11.

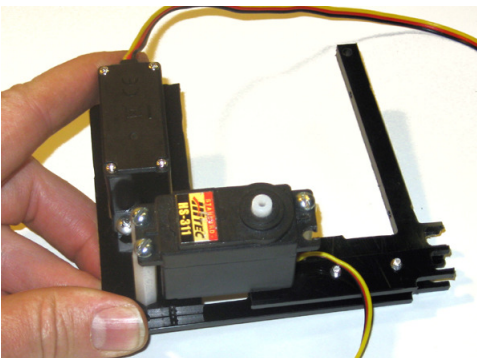


Figure 12

Using three $\frac{3}{8}$ " 6-28 machine screws, loosely attach the servo to the three newly installed standoffs.

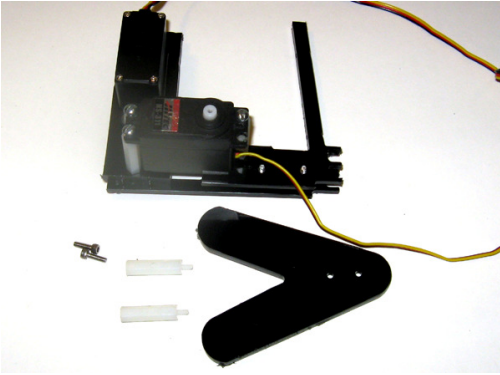


Figure 13

Locate the Base, two 1" 4-40 standoffs and two $\frac{3}{8}$ " 4-40 screws.

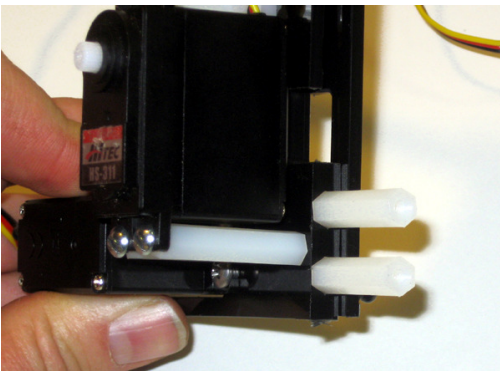


Figure 14

Screw the two standoffs into the bottom of the Main Support.

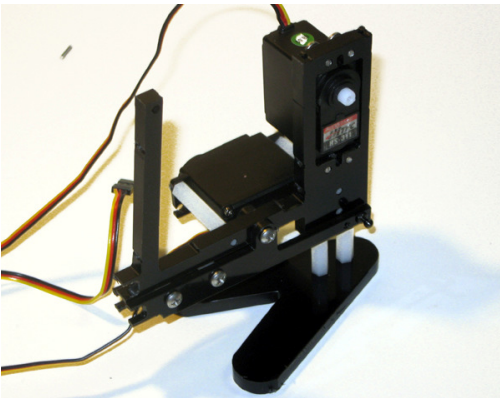


Figure 15

Using the two $\frac{3}{8}$ " 4-40 screws, attach the Base to the standoffs as shown in Figure 15

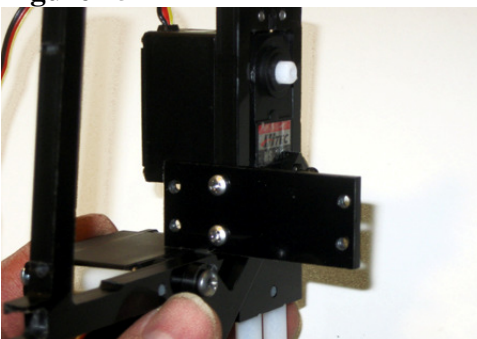


Figure 16

Locate the Flat Servo Plate and two 4-40 self-tapping screws. Attach the Flat Servo Plate to the Main Support as shown in Figure 16.

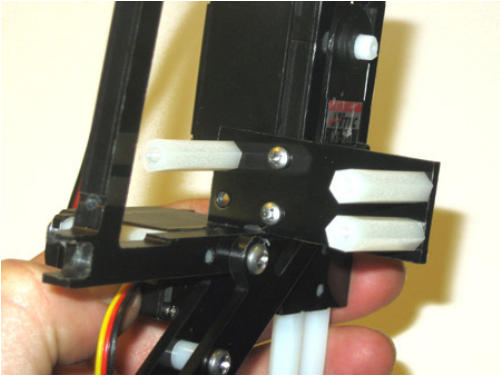


Figure 17

Locate the 3 remaining 6-28 standoffs and screw them into the Flat Servo Plate as shown in Figure 17.

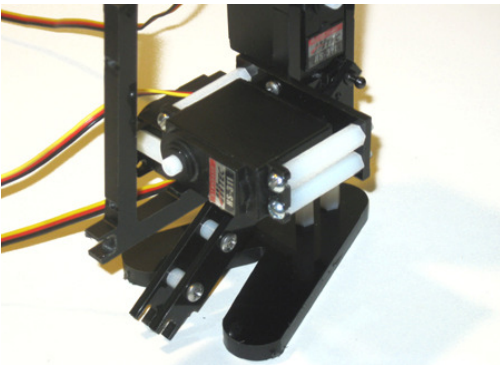


Figure 18

Use three 6-28 Machine Screws to attach a servo to the three newly attached standoffs.

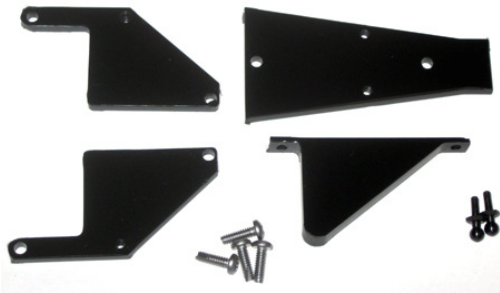


Figure 19

Locate the two Lip Extenders, Nose Plate, Nose, four $\frac{3}{8}$ " 4-40 self-tapping screws and two metal ball ends.

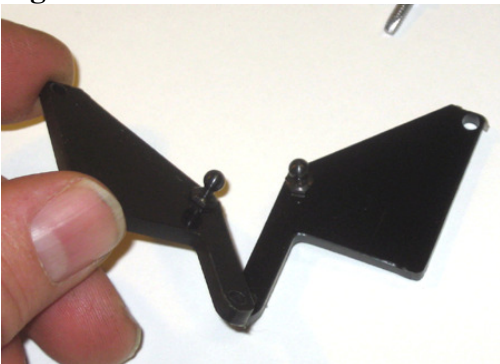


Figure 20

Screw the two Ball Ends into the holes shown in Figure 20.

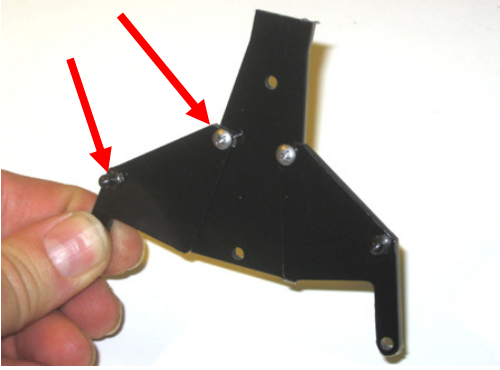


Figure 21

Attach the two Lip Extenders to the Nose plate with two $\frac{3}{8}$ " 4-40 self-tapping screws. Note: The screws are inserted on the same side as the ball ends with the screw first going through the Lip Extender and into the Nose Plate.

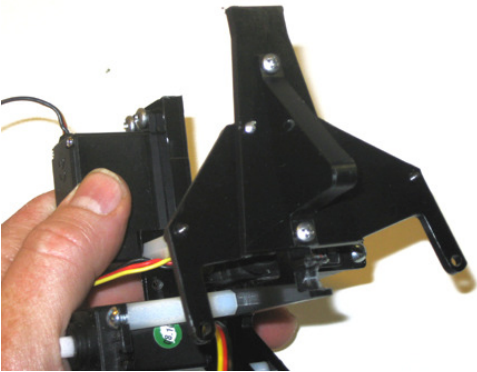


Figure 22

Attach the Nose and Nose Plate assembly onto the Main Support with two 4-40 Self Tapping screws.

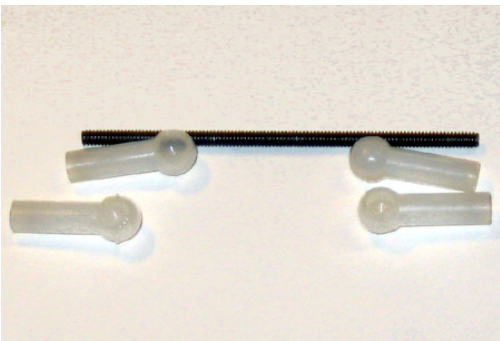


Figure 23

Locate 2 of the 1 inch 2-56 threaded studs and four female ball ends.

(Note: 2 inch shown)

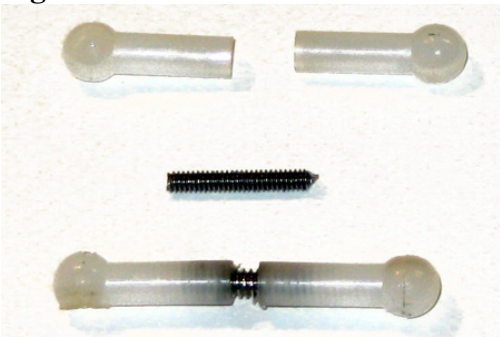


Figure 24

Using wire cutters, cut off two $\frac{5}{8}$ to $\frac{3}{4}$ " segments of threaded rod. File the end if needed. Screw two female ball ends onto each piece of cut threaded rod. Leave some gap for some fine adjustment.



Figure 25

When you are done you should have two links as shown in Figure 25



Figure 26

Screw two ball ends into a servo hub as shown in Figure 26.

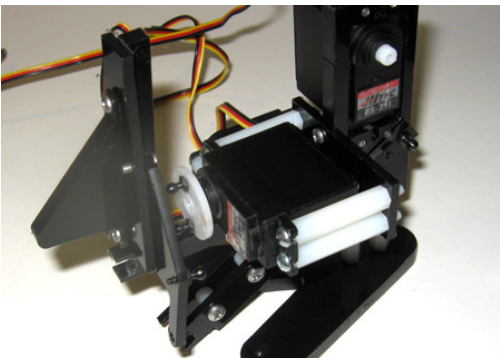


Figure 27

Slide the hub over the center servo with the ball ends perpendicular to the Base.

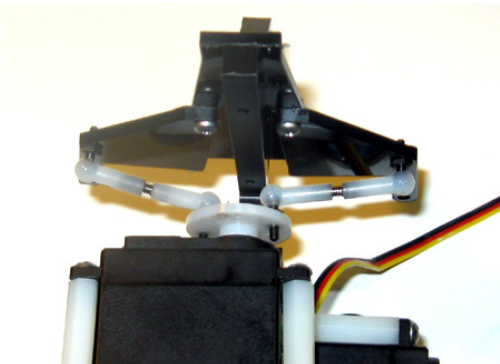


Figure 28

Snap the newly created links onto the ball ends as shown in Figure 28.

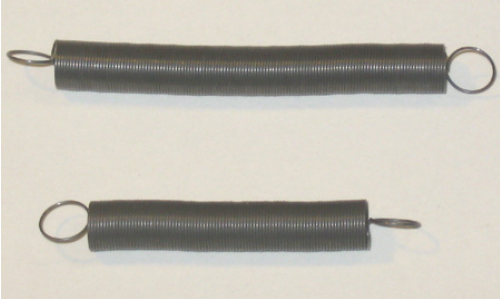


Figure 29

Locate the two Lip Springs

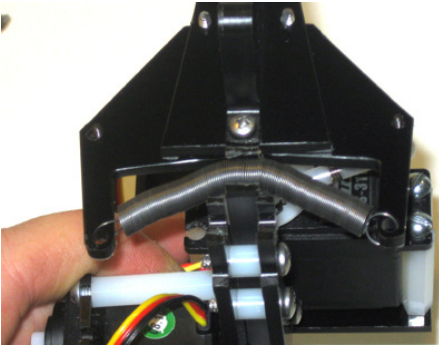


Figure 30

Attach the shorter spring to the Lip Extenders as shown.

Note: Long spring shown. It works both ways but more people prefer the short spring on top.

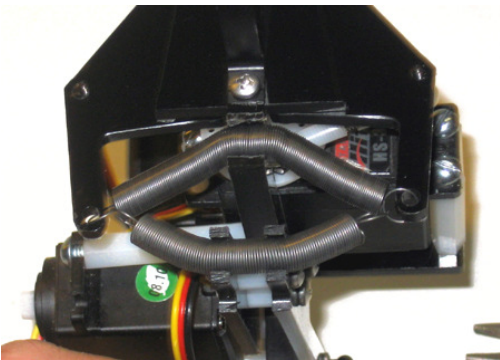


Figure 31

Carefully hook the longer spring to the larger spring, not on the lid extenders. See Figure 32 for a better view.

Note: I now prefer to have both springs go through the holes on the lip extenders



Figure 32

This figure shows how the springs are linked.

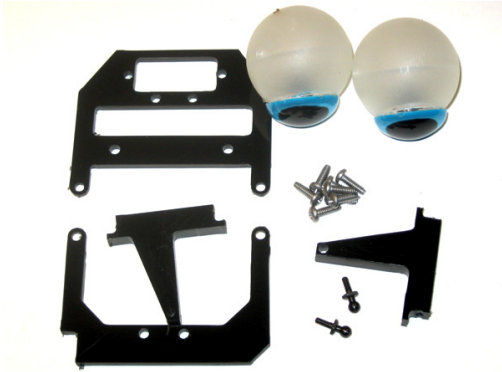


Figure 33

Locate the Upper and Lower Eye Supports, the two Eye Pivots, the eye balls, two ball ends and some $\frac{3}{8}$ " 4-40 self tapping screws.

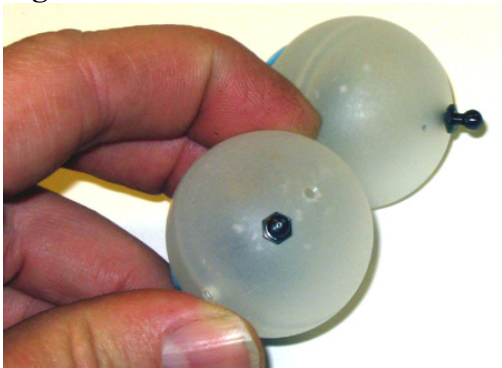


Figure 34

Screw the two Ball ends into the back of the Eye Balls as shown. They should screw into the holes just off center.

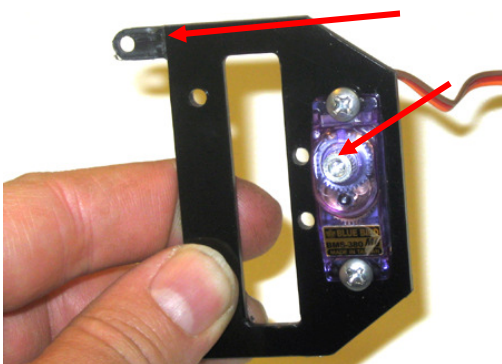


Figure 35

Attach the small servo to the Upper Eye Support with the two screws included with the Dagu Servo. Notice the orientation of the servo spline and the Upper Eye Support's cutouts.

Note: New ESRAs now ship with Dagu servos.

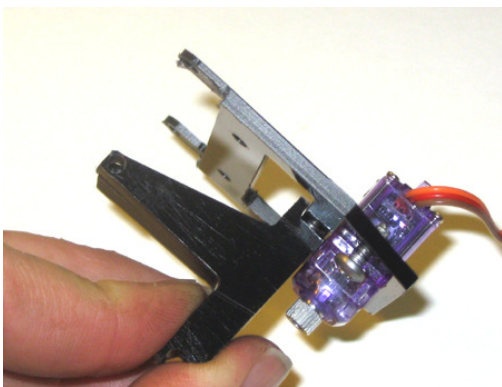


Figure 36

Loosely attach the two Eye Pivots to the Upper Eye Support with two $\frac{3}{8}$ " 4-40 self-tapping screws. Notice the angle sloping down away from the Servo. I also tend to place the Eye Pivot piece with the larger hole close to the robots left eye.

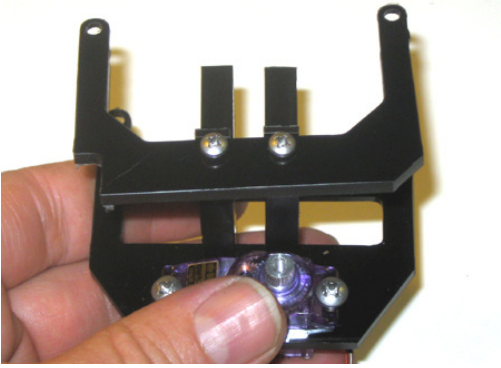


Figure 37

Now loosely attach the Lower Eye Support piece using two more $\frac{3}{8}$ " 4-40 self-tapping screws.

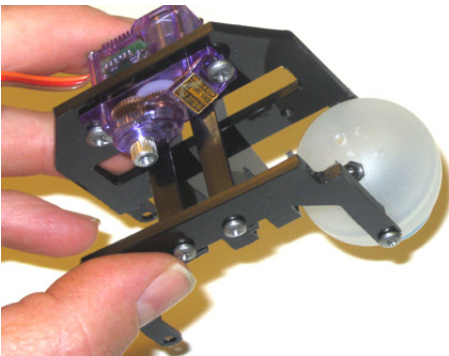


Figure 38

Attach one Eye Ball to the Upper and Lower Eye Support pieces using two $\frac{3}{8}$ " 4-40 self-tapping screws. Be sure the Ball end is closer to the Lower Eye Support frame than the Upper Eye Support frame.

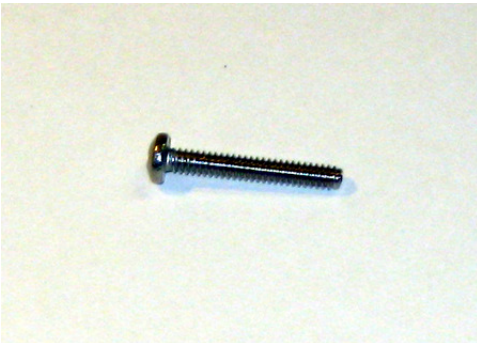


Figure 39

Locate the $\frac{3}{4}$ " 4-40 screw.

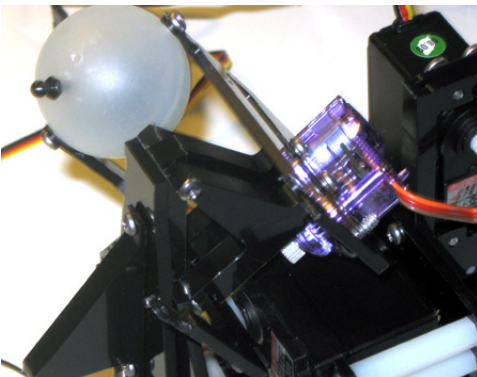


Figure 40

Insert the $\frac{3}{4}$ " screw through the Eye Pivot with the larger hole and screw it in to the opposite Eye Pivot through the hole in the Main Support.

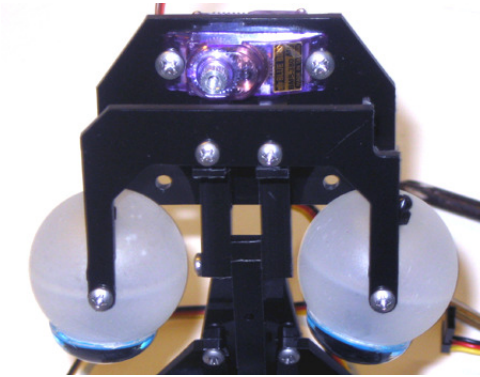


Figure 41

Attach the remaining Eye Ball with two more $\frac{3}{8}$ " 4-40 self-tapping screws. Tighten the remaining $\frac{3}{8}$ " 4-40 self-tapping screws throughout the assembly.

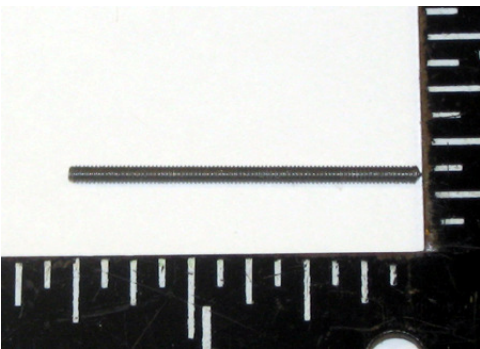


Figure 42

Locate and trim a 2-56 threaded rod to a little over $1\frac{1}{2}$ inch.

Note: a full 2 inch threaded rod works fine with the ball end sockets screwed in firmly.

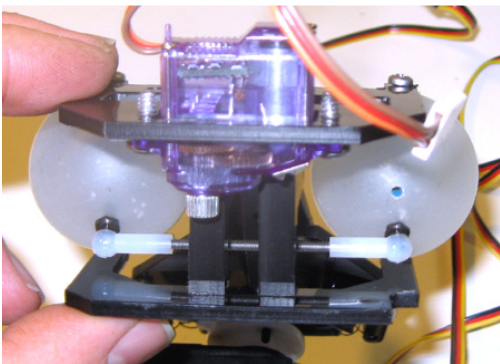


Figure 43

Screw two female ball ends onto the newly trimmed rod and attach to the two Ball Ends in the back of the Eye Balls.

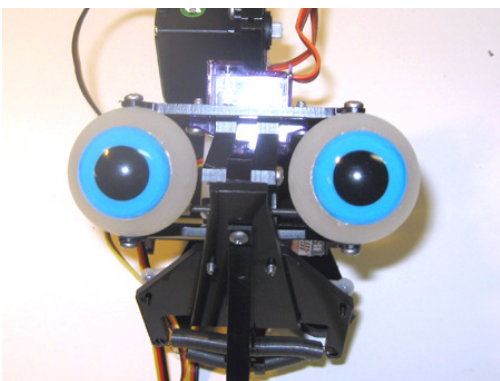


Figure 44

Adjust the length of the linkage until the eyes are aligned with each other and the robot shows no sign of Strabismus.

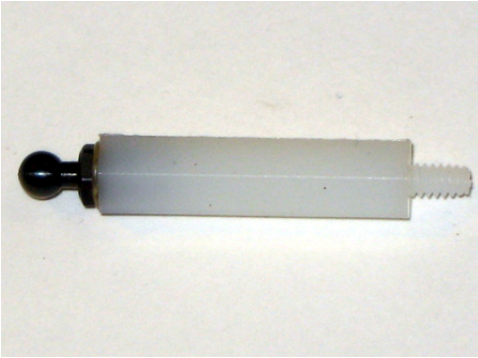


Figure 45

Locate the modified 4-40 threaded Ball End Extension as shown in figure 45.

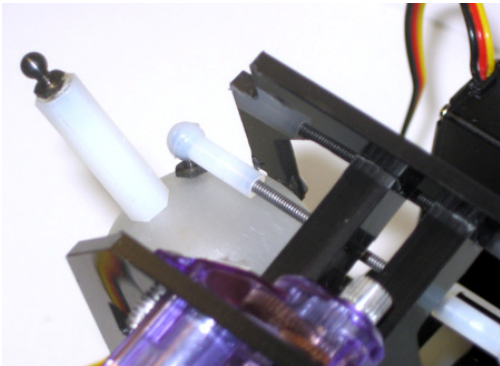


Figure 46

Screw the Ball End Extension into the right Eye Ball.

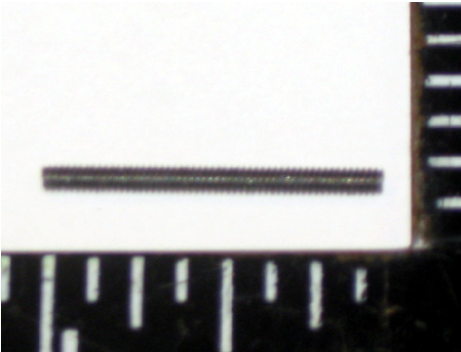


Figure 47

Locate the 1" 2-56 threaded rod.

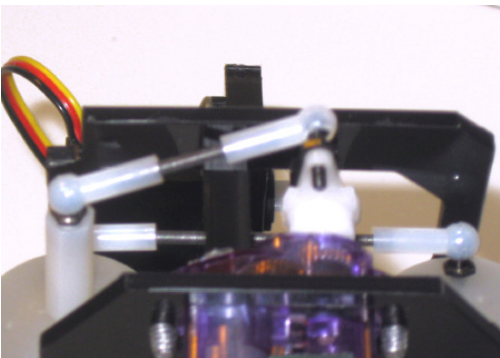


Figure 48

Using two female ball ends, create a link to connect the small servo to the Ball End Extension.

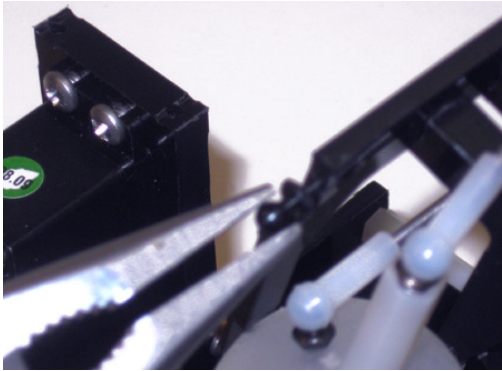


Figure 49

Carefully screw in a Ball End into the side of the Lower Eye Support.

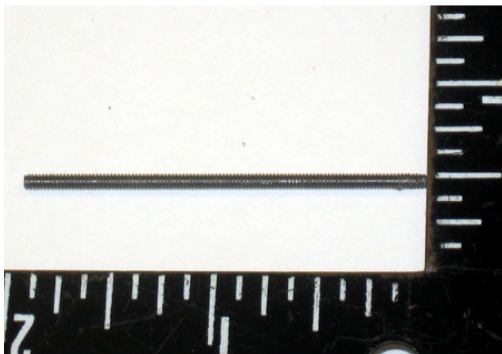


Figure 50

Locate a 2" 2-56 threaded rod.

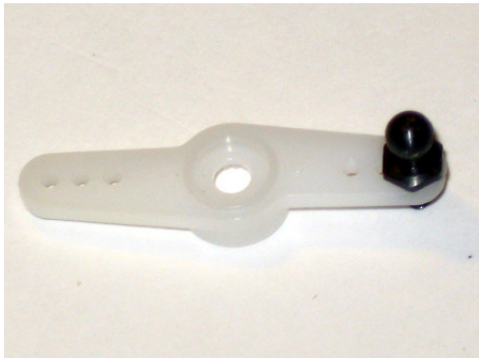


Figure 51

Locate a servo horn as shown in Figure 51 and screw in a Ball Joint.

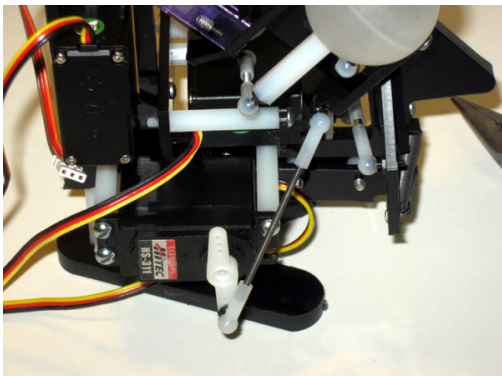


Figure 52

Using two female ball ends, create a link to connect the lower servo to the Ball End on the Lower Eye Support.



Figure 53

Locate a servo horn as shown in Figure 51 and screw in a Ball Joint.

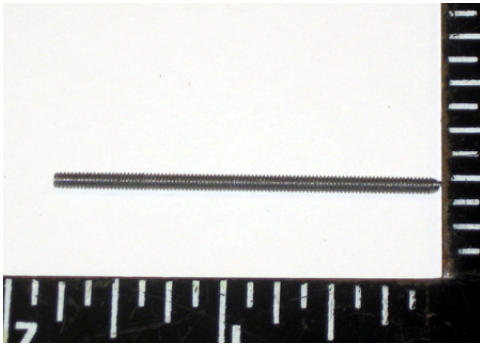


Figure 54

Locate a 2" 2-56 threaded rod and trim it to just over 1 3/4 "

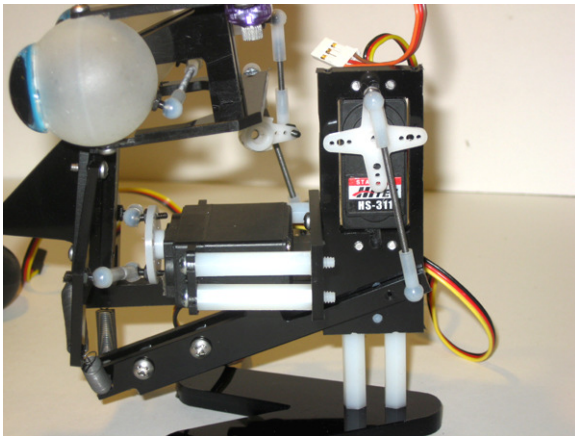
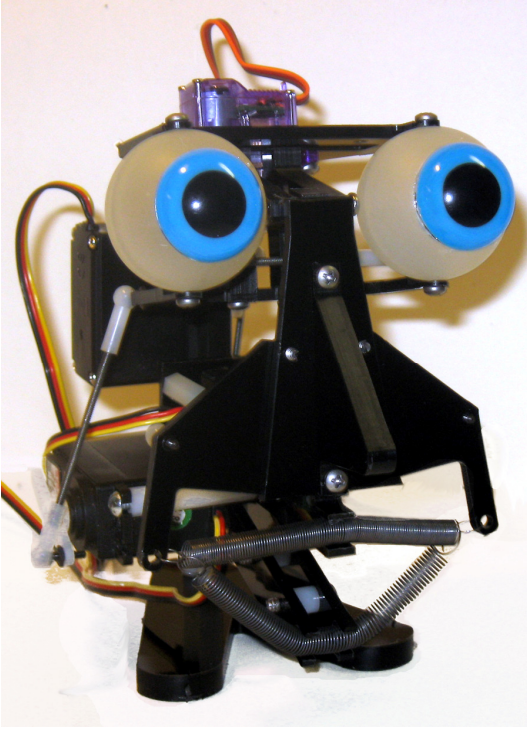


Figure 55

Using two female ball ends, create a link to connect the lower jaw servo to the Ball End on the Lower Eye Support.



YEA! Yer done!

If the upper lip pops out of place from time to time, simply dab some hot glue onto the Main Support and press the spring back in.