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## Patton Robotics ESRA<sup>®</sup> II

Expressive System for Robotic Animation

### Assembly and Operation Instructions

Version 1.0

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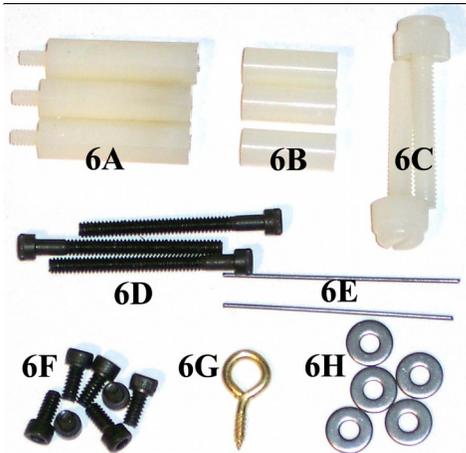
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# ESRA II Kit Contents



- |   |                 |    |              |
|---|-----------------|----|--------------|
| 1 | Face Plate      | 8  | Eyes         |
| 2 | Servo Plate     | 9  | Eyelids      |
| 3 | Back Plate      | 10 | Eyelid Arch  |
| 4 | Gears           | 11 | Cross Plate  |
| 5 | Servos (2)      | 12 | Lips         |
| 6 | Misc. Parts Bag | 13 | Velcro Strap |
| 7 | Small Servo     |    |              |



- |    |                   |
|----|-------------------|
| 6A | Nylon Standoffs   |
| 6B | Nylon Spacers     |
| 6C | #8 Nylon Screws   |
| 6D | 1 1/4 4-40 Screws |
| 6E | Wires             |
| 6F | 1/4 4-40 Screws   |
| 6G | Eye Hook          |
| 6H | Misc. Washers     |

# Assembly Instructions

Assembly of the ESRA II kit will take you about 30 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 II Kit Contents.”

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

- Phillips Screwdriver
- Needle Nose Pliers
- Regular Screwdriver
- Allen Wrenches



Locate the Face Plate (1) and the two Eyes (8).

Figure 1



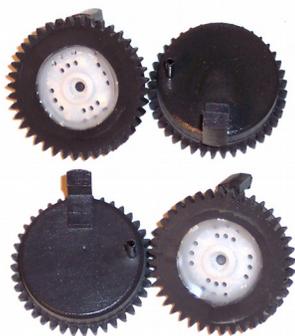
Snap the Eyes (8) into the Face Plate (1) as shown. The Face Plate (1) has no orientation. It is symmetrical on both its front and back.

Figure 2



**Figure 3**

**Locate the four Gears (4). Place them in a configuration as shown. Try to match up pin locations and lip hooks on each pair of gears. Advance to Figure 4 below for more information on gear placement.**



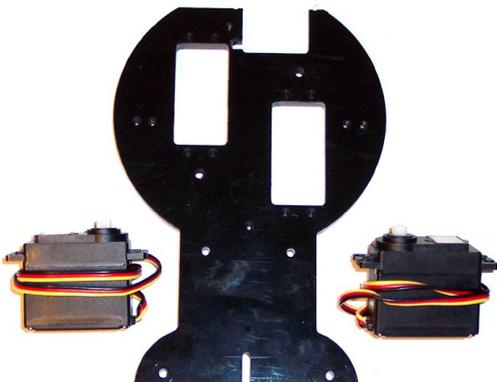
**Figure 4**

**The upper left and lower right of each gear pair needs to include a splined hub as shown in Figure 4.**



**Figure 5**

**Carefully place the Gears (4) into the Face Plate (1) as shown. It might be necessary to tilt the Gears (4) as they are placed.**



**Locate the two large Servos (5) and the Servo Plate (2) as shown.**

**Figure 6**



Now we need to check the alignment of our Servos (5). Normally, the servos come out of the box in “home” position. We should check it thought before we proceed.

A servo can turn only about 180 degrees. I will put a mark on this servo to more clearly show a servos range.

**Figure 7**



**Centered Servo.**  
Please be sure to leave you servo in this position.



**Servo rotated to the maximum position in a clockwise position.**

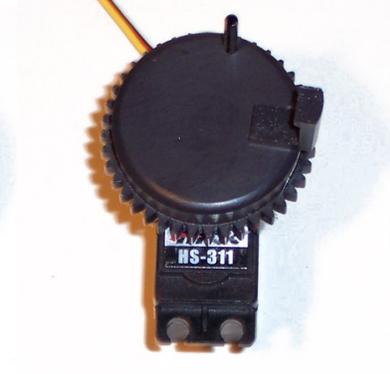


**Servo rotated to the maximum position in a counter-clockwise**

I will now show you the goal of how the travel will work once the Gears (4) are placed on the Servos (5)



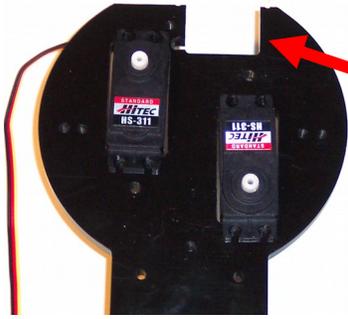
**Centered Servo.**



**Servo rotated to the maximum position in a clockwise position.**



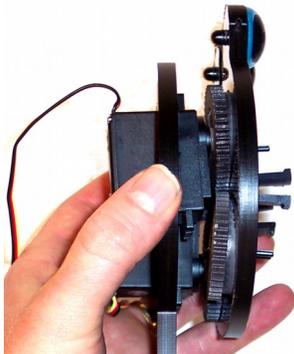
**Servo rotated to the maximum position in a counter-clockwise position.**



**Figure 8**

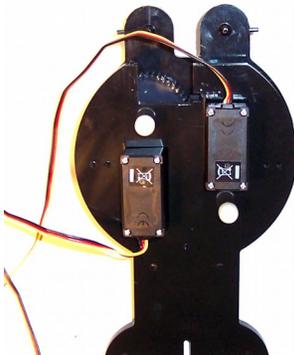
Place the Centered Servos (5) into the Servo Plate (2) as shown. Be sure to check that you are working with the front of the Servo Plate (2). See arrow.

Note the position of the small servo cutout. It should be on the right if the Servo Plate is facing forward.



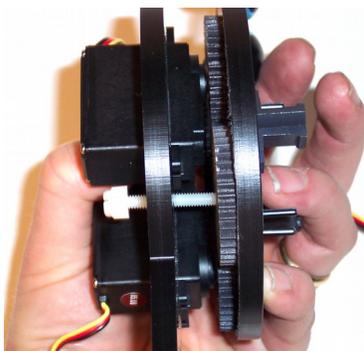
**Figure 9**

This part is a bit tricky. Place splines in the Face Plate assembly onto the Servos (5) mounted in the Servo Plate (2). Don't worry if the non-splined gears get out of alignment, we will be able to adjust them shortly. Be sure the Gears (4) are in the centered position as shown in Figure 5.



**Figure 10**

Partially insert the #8 Nylon Screws (6C) into the back of the Servo Plate (2).



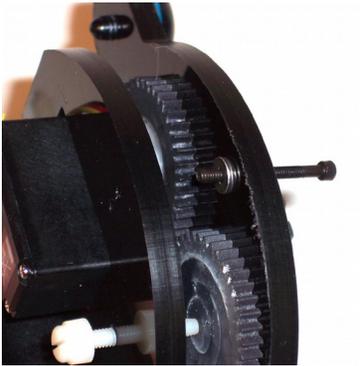
**Figure 11**

While loosely holding the assembly together, screw the #8 Nylon Screws (6C) gently against the two Gears (4) without the splined hubs.



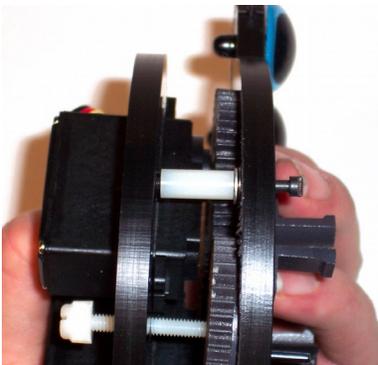
**Figure 12**

**Locate the 1 ¼ 4-40 Screws (6D), the Nylon Spacers (6B) and the Washers (6H) as shown.**



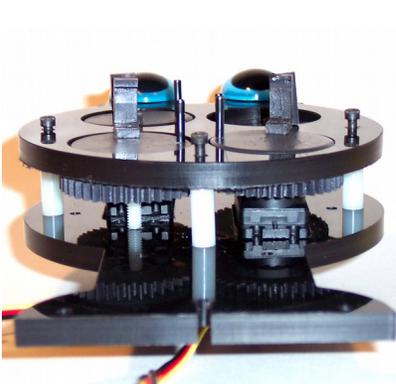
**Figure 13**

**Insert a 1 ¼ 4-40 Screw through the front of the Face Plate (1) as shown. Generally 2 washers are needed to provide spacing between the Face Plate (1) and the Servo Plate (2).**



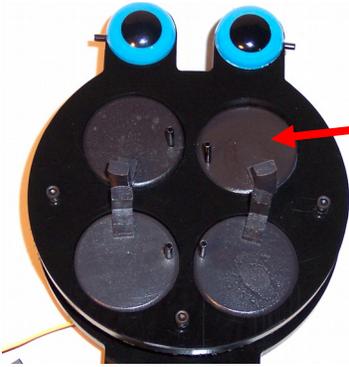
**Figure 14**

**Slide a Nylon Spacer (6B) over the 1 ¼ 4-40 Screw (6D) and loosely screw it into the Servo Plate (2).**



**Figure 15**

**Repeat the above process for the remaining two Face Plate (1) holes . When complete, the Gears (4) attached to the Servos (5) should be able to freely rotate in the Face Plate (1). If they appear to bind, it might be necessary to add additional washers or spacers over the 1 ¼ 4-40 Screws (6D). If the gears attached to the servos are too loose, you may need to remove a washers or spacers.**



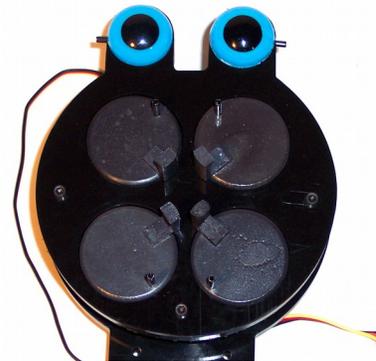
**Figure 16**

Notice in this picture the upper right Gear (4) does not align with the Gear (4) attached to the Servo (5) on the upper left. See arrow.



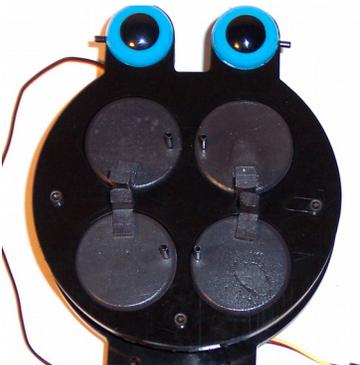
**Figure 17**

To re-align the Gear (4) simply loosen the 1 ¼ 4-40 Screw (6D) and finesse the Gear (4) back into alignment.



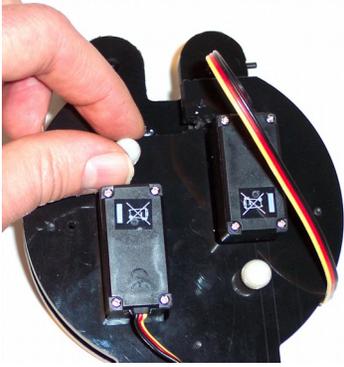
**Figure 18**

Check for center alignment by rotating the Gears (4) as shown.



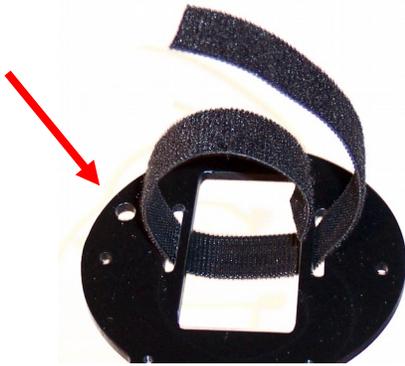
**Figure 19**

Check for pin alignment by rotating the Gears (4) as shown. If you are happy with your alignment, then proceed.



**Figure 20**

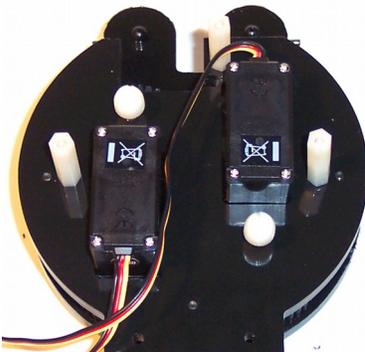
**Gently tighten the #8 Nylon Screws (6C) up against the back of the Gears (4). When done, the gears should be able to freely rotate.**



**Figure 21**

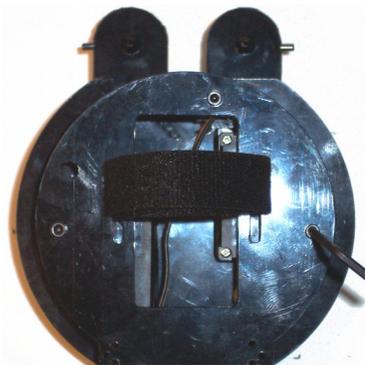
**If you have a controller kit, you should go to it's manual now for instructions on how to complete the assembly.**

**Weave the Velcro strap through the Back Plate (3) as shown. Pay close attention to the hole location as shown by the arrow.**



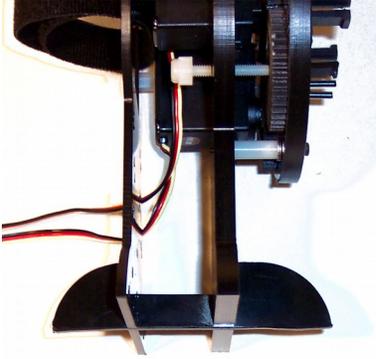
**Figure 22**

**Insert the three Nylon Standoffs (6A) into the Servo Plate (2) as shown.**



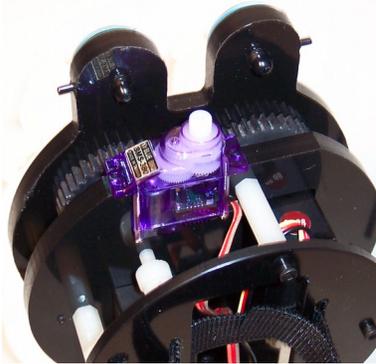
**Figure 23**

**Attach the Back Plate (3) to the StandOffs (6A) with three ¼ 4-40 Screws (6F) as shown.**



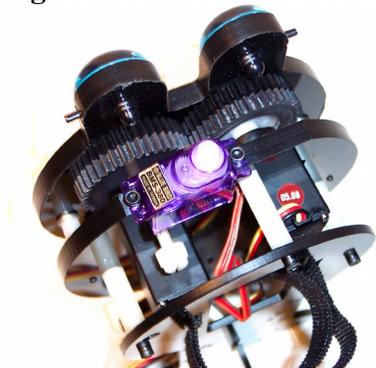
**Figure 24**

**Insert the Cross Plate (11) into the slots on the Servo Plate (2) and the Back Plate (3) as shown. Be sure the longer end of the Cross Plate (11) faces the front of the ESRA robot.**



**Figure 25**

**Place the Small Servo (7) into the servo cut-out on the Servo Plate (2) as shown. This time, carefully rotate the servo to a fully clockwise rotation.**



**Figure 26**

**Attach the Small Servo (7) to the Servo Plate (2) with two ¼ 4-40 Screws (6F).**



**Figure 27**

**Locate the Eyelids (9), the Eyelid Arch (10), the Eye Hook (6G), the Wires (6E) and two ¼ 4-40 Screws (6F).**



**Figure 28**

**Screw the Eye Hook (6G) into the back of the Eyelid Arch (10) as shown.**



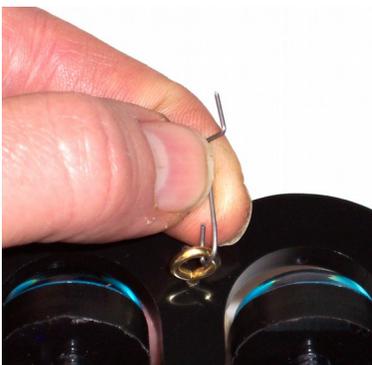
**Figure 29**

**Carefully snap the Eyelid Arch (10) over the pins protruding from the Face Plate (1) as shown.**



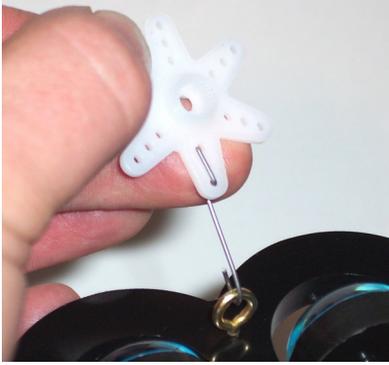
**Figure 30**

**Locate and bend the small Wire (6E) as shown. This is likely the most frustrating portion of this assembly process. You'll see why when you try to adjust the eyes just right. If you run out of wire, a bend paperclip will work great.**



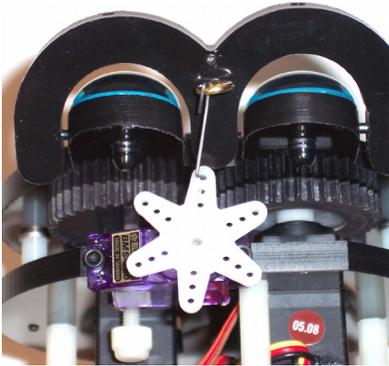
**Figure 31**

**Hook the wire over the Eye Hook (6G) as shown.**



**Figure 32**

**Slip the bend in the Wire (6E) through the outermost hole of the small Servo (7) hub.**



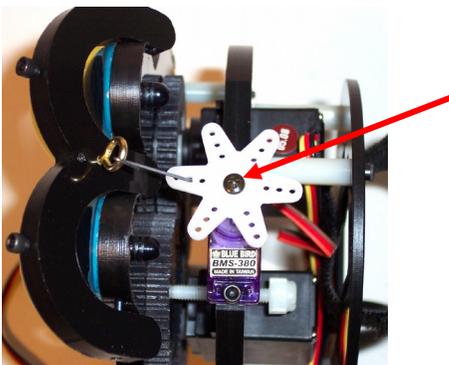
**Figure 33**

**Place the eyelids in a closed position and set the servo hub onto the Servo (7) with the servo hub arm pointing the Eye Hook (6G). Gently and slowly rotate the servo hub checking for desired opening and closing of the eyelids.**



**Figure 34**

**Place the Eyelids (9) into the grooves on the Eyelid Arch (10). Gently secure the Eyelids (9) with two ¼ 4-40 Screws (6F) as shown.**



**Figure 35**

**Place the small hub screw into the small Servo (7) as shown.**



**Figure 36**

**Place a Lip (12) over the attachment points.  
See Figure 33.**



**Figure 37**

**Whoo Hoo!! Yer Done!**

