Servos and Pivots

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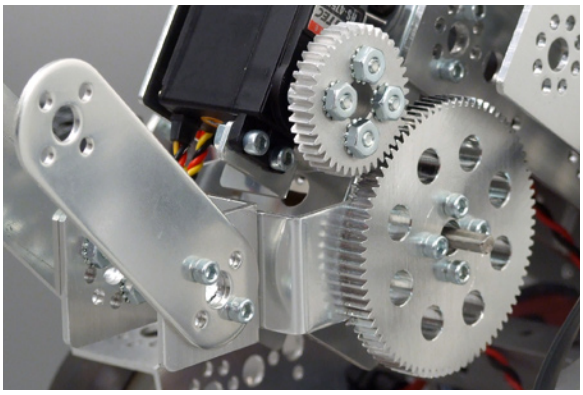
Servos can be used in many different ways, such as with robot parts that pivot. This section covers how to mount a basic servo and several ways to create a pivot. However, you should explore other ways to create a pivot as needed for your design.

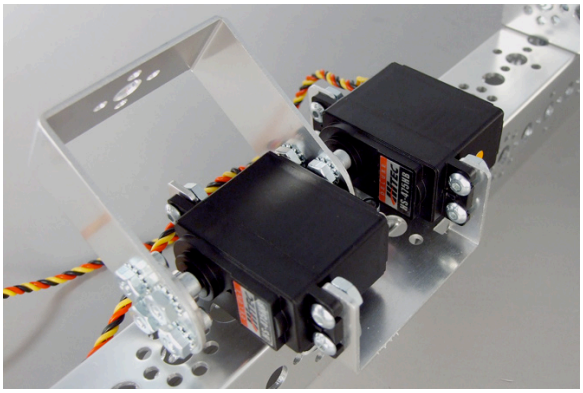
1. Range of Motion

Servos rotate to a specified position between 0° and 180°, and then hold that position. This ability makes servos a good choice for controlling an arm or gripper.

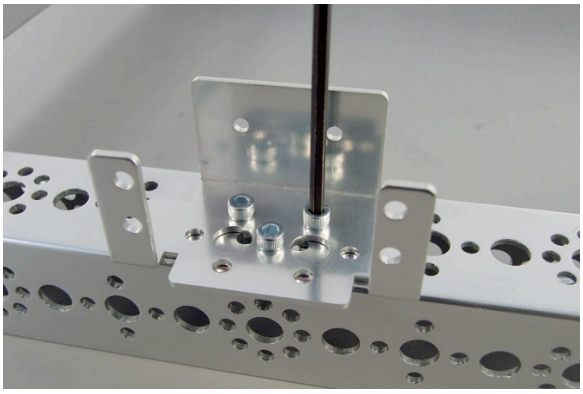


The range of motion provided by a servo can be increased or decreased through the use of gears. Attaching a large gear to the servo to drive a smaller gear will increase the range of motion, but decrease the overall torque and precision.

Attaching a small gear to the servo to drive a larger gear will decrease the range of motion, but increase the overall torque and precision.

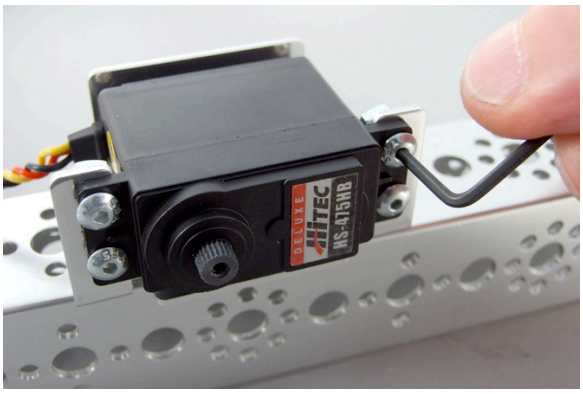


In situations where one servo is not powerful enough, and the range of motion cannot be decreased through gearing to increase torque, a second servo can be used. If you are using two servos, be sure they are synchronized.

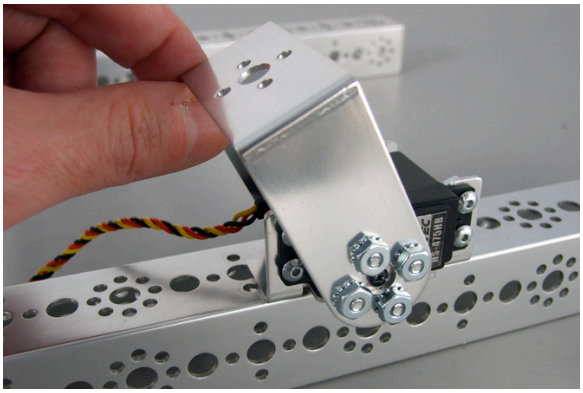


2. Single-Servo Mounts

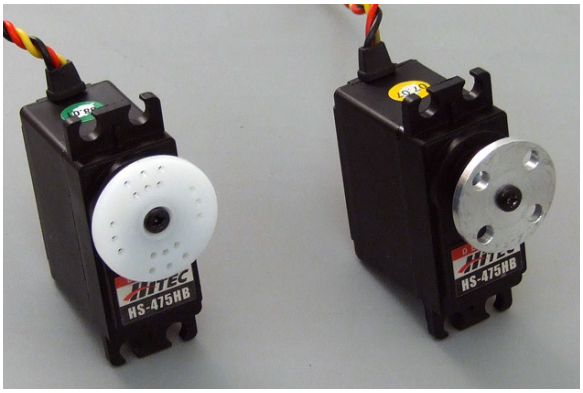
Determine where on the chassis you want to place the servo. Using 1/2” SHCSs and kep nuts, attach the single-servo motor bracket to the chassis. Note that the back of the servo will be positioned against the bracket’s larger, single, upright panel.



Slide the servo into the bracket. The flanged sides on the front of the servo should go on the outside of the two prongs of the bracket. Using 5/16” SHCSs and kep nuts, attach the servo to the mount.



At this point, it is possible to attach other pieces – such as channels, angles, and flat bars – directly to the servo horn. However, using a pivot bracket will create a stronger pivot.



Note: All the servos come with a plastic servo horn on them. Remove these plastic horns and replace them with the metal horns that come with the kit.

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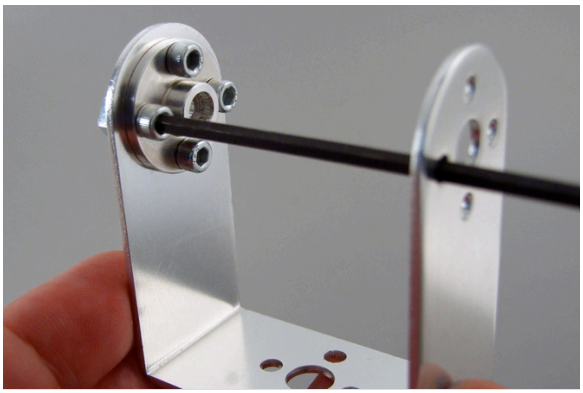
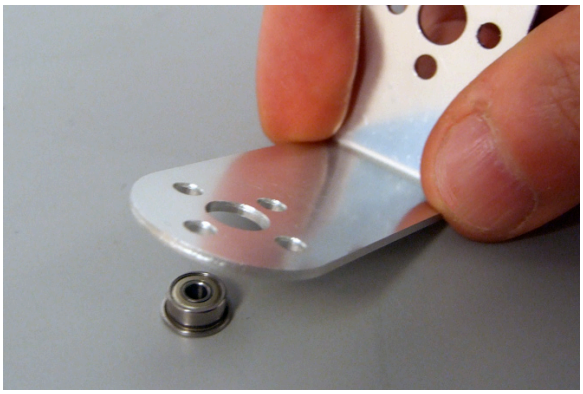
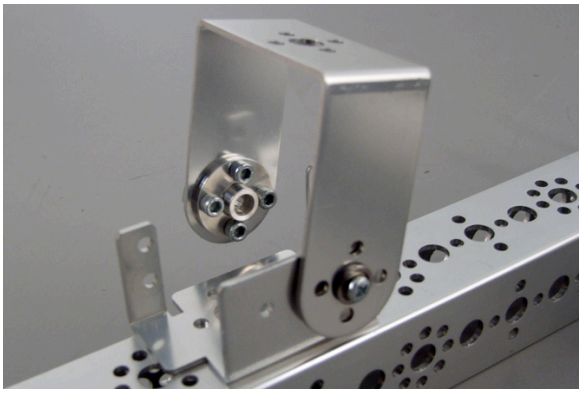


3. Single-Servo Mounts with Pivots

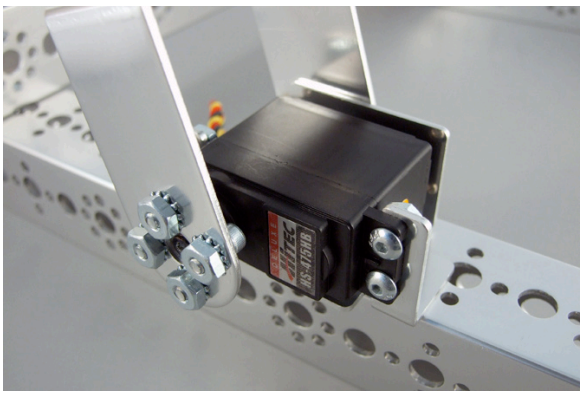
Remove the servo horn. Place the horn's flat side to the inside of one end of a joint pivot bracket. Using four 5/16" SHCSs, attach the horn to the pivot bracket and secure it with kep nuts. The kep nuts should be on the outside of the bracket. Set aside the servo horn screw.



Find the pivot bearing, screw, nut, and washer. Place the bearing flange-side down on a flat surface. Place the side of the pivot bracket opposite the horn over the bearing and align the bracket hole to it. Press down firmly to pop the bearing into the bracket hole.



Place the bearing screw through the bearing from the outside of the pivot bracket. Insert the screw into the back of the motor bracket. Secure the pieces together with the washer and nut – but do not overtighten.



Place the servo into the motor bracket, stretching the unattached side of the pivot bracket so the horn fits into the servo's motor shaft. Secure the servo to the motor bracket with 1/2" or 5/16" SHCSs.

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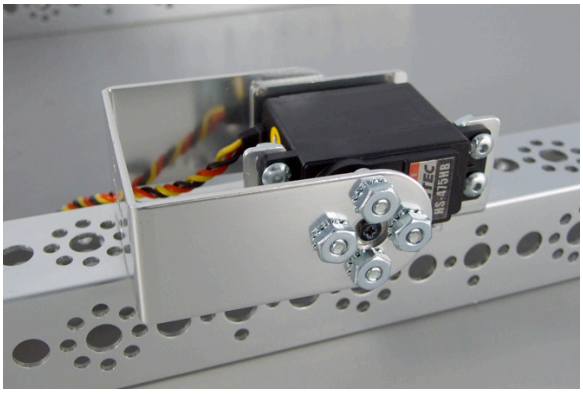
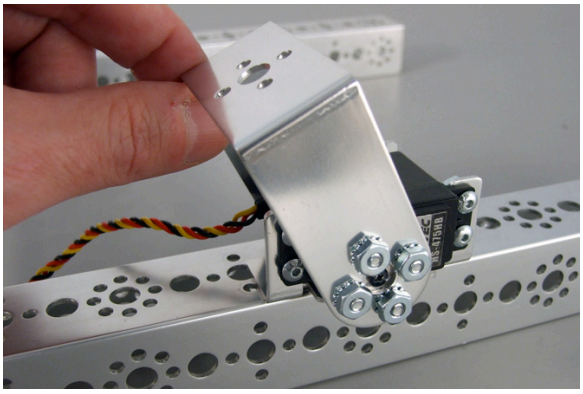
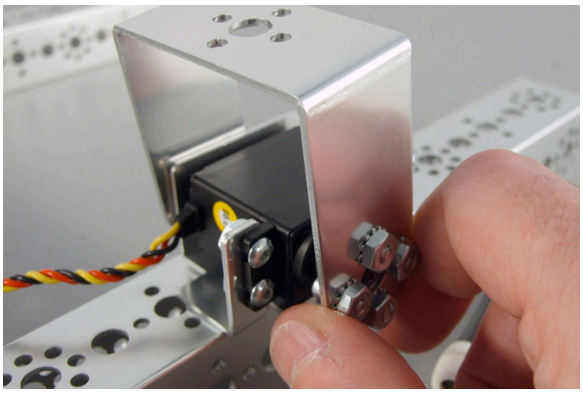


Adjust the servo's range of motion as needed.

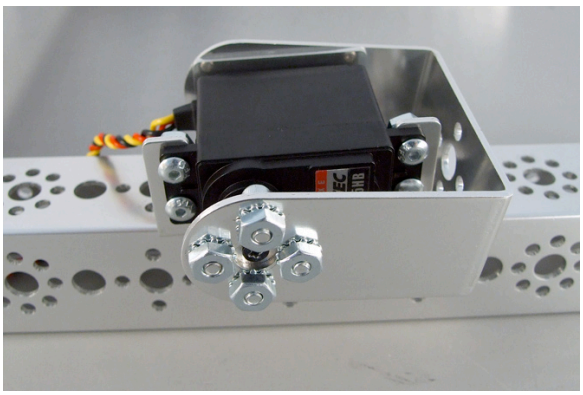
(To adjust a servo's range of motion, you must first find its mechanical stop.)



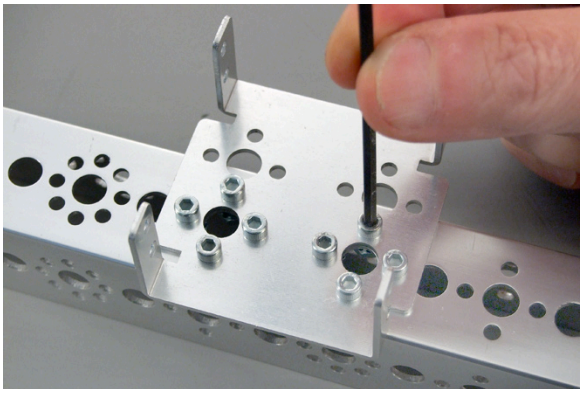
Push the bracket or structural elemet attached to the servo until it won't move any further (this is the mechanical stop).



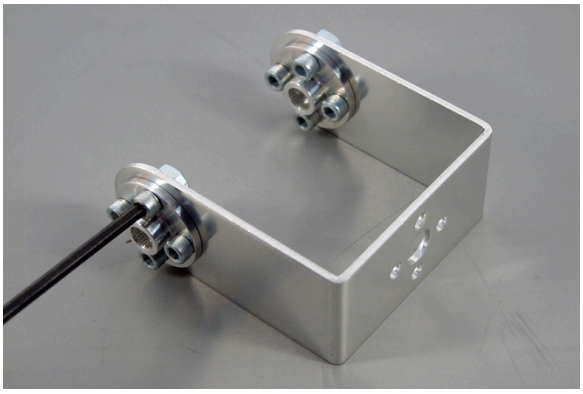
Without moving the servo motor shaft, detach the bracket or element and position it where you want it to stop.



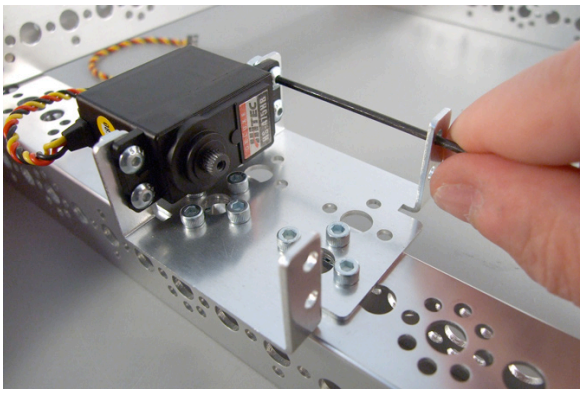
Re-attach it to the servo, taking care not to move the servo motor shaft. Secure the bracket or element to the servo with the servo horn screw.



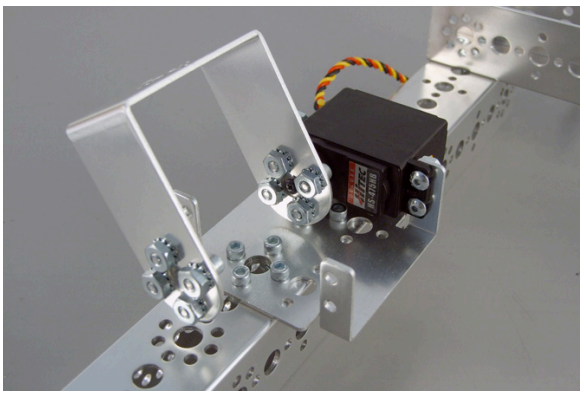
4. Double-Servo Mounts with Pivots
Determine where on the chassis you want to place the servos. Using 1/2” SHCSs and kep nuts, attach the double-servo motor bracket to the chassis.



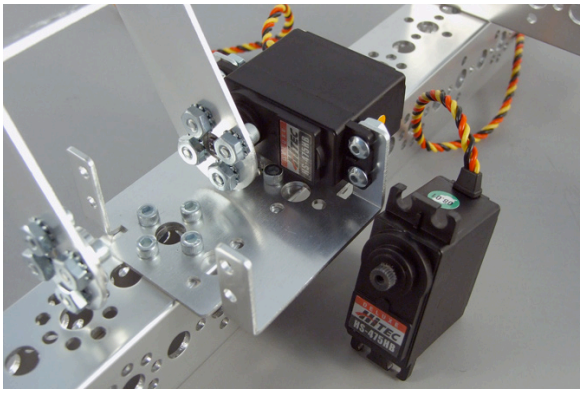
Remove servo horns from two servos. Attach these to a joint pivot bracket, each with two 5/16” SHCSs and kep nuts, so one is on the inside of the bracket and the other is on the outside and at the opposite end.



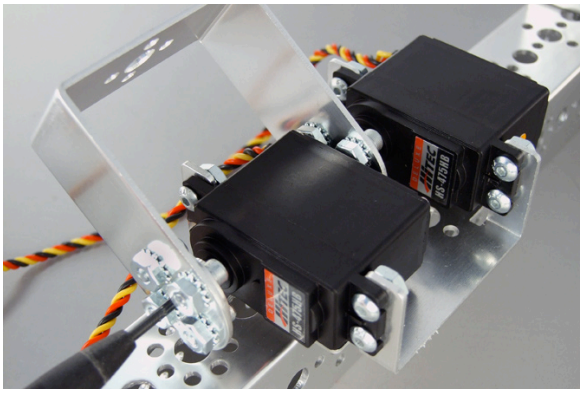
Place one servo into the double servo motor bracket so it faces into the bracket. Secure the servo in the bracket with four 5/16” SHCSs and kep nuts.



Place the pivot bracket so the horn on the outside of the pivot bracket connects with the servo on the motor bracket. Secure the servo horn to the servo with the servo horn screw.

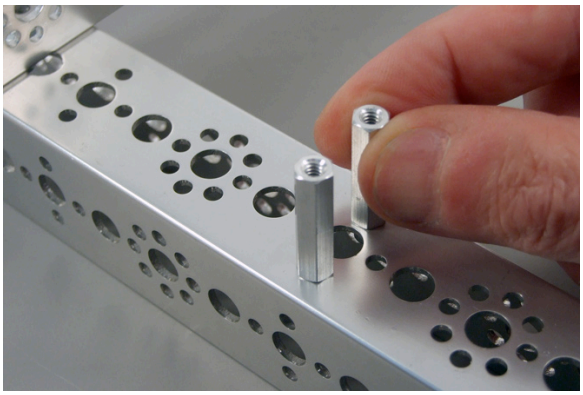


Set the servos' range of motion and center them together. This step ensures that the servos will not work against each other.



Place the second servo so it faces out of the motor bracket and is parallel to the other servo. Use four 5/16" SHCSs and kep nuts to secure the second servo to the bracket.

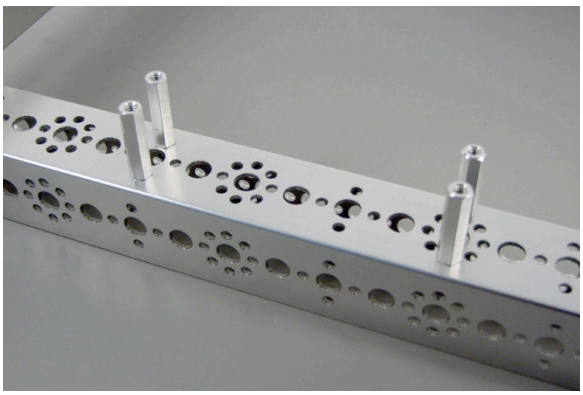
Using the other servo horn screw, secure the second servo to the other side of the bracket.



4. Pivots with Structural Elements

Strong pivots can be achieved using structural elements such as channels and axles. This section shows one way to make such a pivot.

Determine where you need to place the pivot. This will be the center of this pivot configuration. Count over three large holes to one side of the center. With two 5/16" SHCSs, attach two standoff posts on top of the chassis so they are parallel to each other.



Now, count three large holes to the other side of the center (totally five large holes between the posts). Attach two more stand-off posts of the same height as before. They should be in holes parallel to the first pair of posts.

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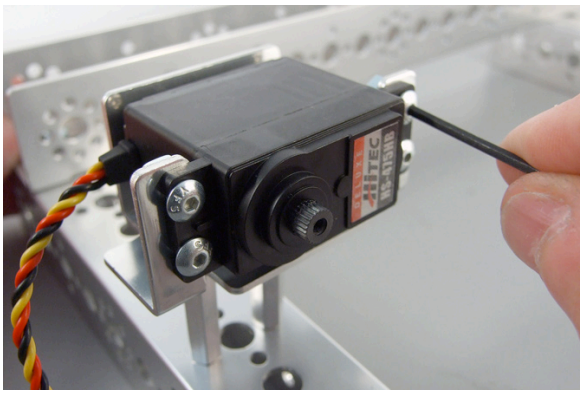
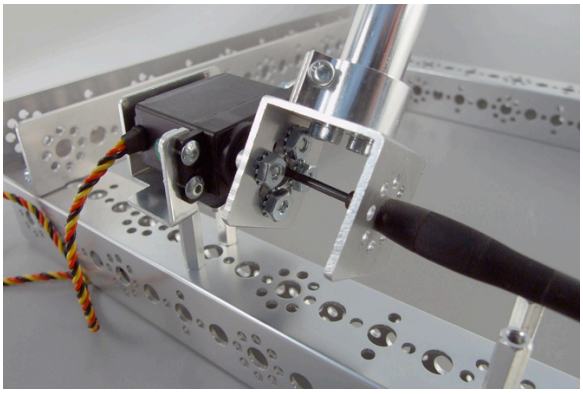


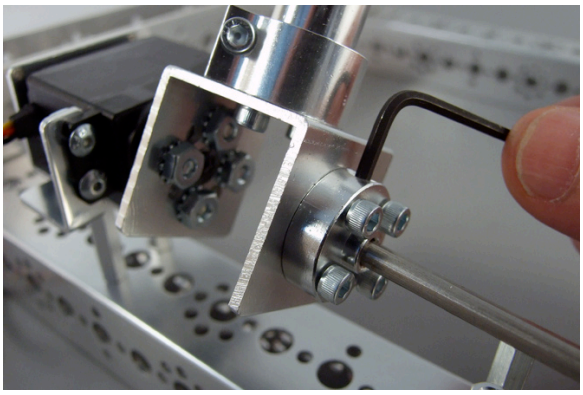
Mount a single-servo motor bracket on top of one set of stand-off posts with two SHCSs. Make sure the bracket is attached so the servo faces the center. Remove the horn from the servo.

Place the servo into the bracket so the servo shaft is centered with the channel piece on which the bracket is mounted. Secure the servo with four BHCSs and kep nuts.



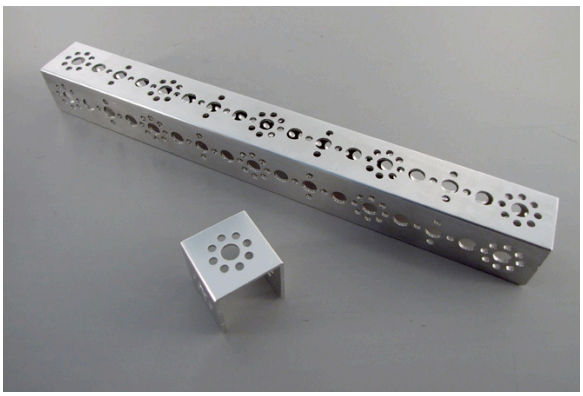
Attach the servo horn to the outside of one side of a 32 mm channel piece with four 5/16” SHCSs and kep nuts (you should already have attached any structural element such as a tube to the top of the 32 mm channel piece).

Attach the side with the horn to the servo on the bracket and secure with the servo screw.



Using 1/2” SHCSs, attach the set screw hub to the other side of the 32 mm channel piece, but do not tighten all the way.

Insert an axle into the split clamp so it is flush with the flat side and tighten the clamp screw. Take care not to push down on this piece as it is connected to the servo.



Find the second piece of channel you want to use. Another 32 mm piece is good if you don’t want it to extend over either side of the chassis channel.

Alternatively, a longer piece can be used to reach the other side of the chassis and be another part of the construction.

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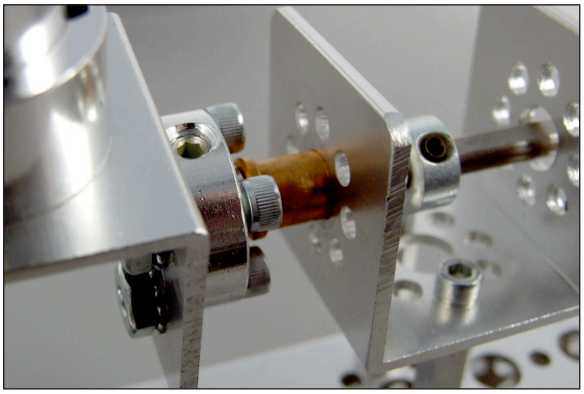
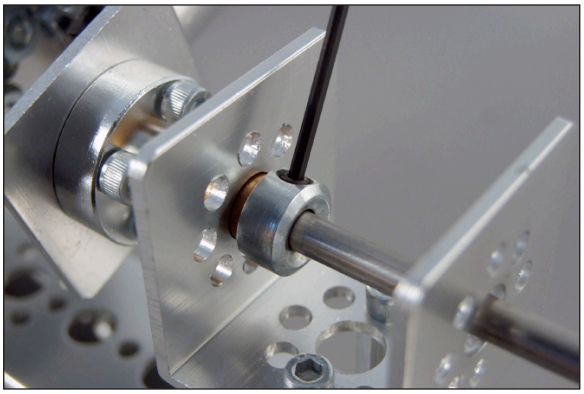


After finding the piece you want, place a bronze bushing into a large hole where you intend to place the axle. Slide a set collar on the axle.



Push this side onto the axle until the channel piece holes line up with the two stand-off posts beneath it. Use two 5/16” SHCSs to attach the channel to the posts. Push the set collar against the bushing and tighten the screw.