Robot Arm Instruction Guide

Created by E.T. Bryant

Date: May 17, 2019

Unpacking Your Robot Arm Kit:

I purchased the diymore® the black Robot Arm. Their kit comes in black or silver. When you receive your package of items it will come wrapped in bubble wrap. You should see in opening the package that you have 6 – MG 996 servos individually packaged and a packet of hardware which includes the instructions. In any project that is a kit you should immediately look at the instructions. Which in the recent kit comes as a single page double-sided sheet of paper.

In my kit I had the following items:

1 x Aluminum clamp claw

1 x L-Type servo bracket

3 x U-Type robot waist brackets

4 x Long U-Type servo brackets

4 x Miniature ball radial bearings with screws and nuts

5 x Multi-functional servo brackets

6 x MG996 55g servos

6 x Aluminum servo horns with screws

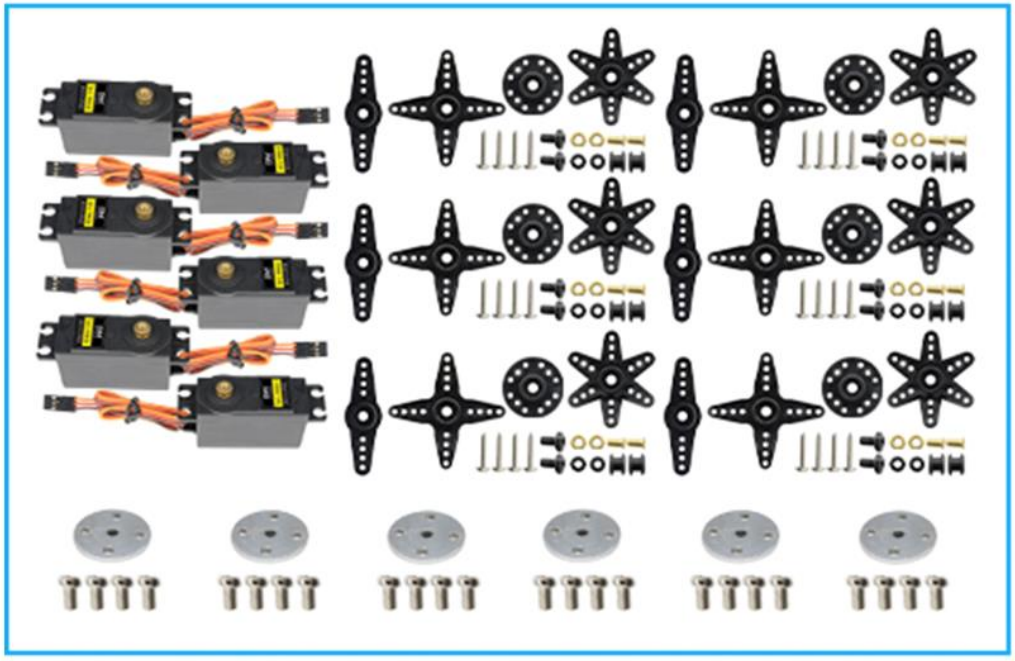
*4 x Round head M3*10 screws and M3 nuts (These are included with the bearings)*

*37 x Round head M3*8 screws and nuts. (Used for attaching brackets)*

*24 x Round head M4*10 screws and nuts (Used for mounting the servo motors) I Received only 21 as the screws needed to attach the servo to the claw use M3*8 screws.*

*30 x Round head M3*6 screws and nuts (There are no nuts included with the kit. They are to secure the servo horns to the brackets, but there are also screws that come with the horns and these might be extras)*

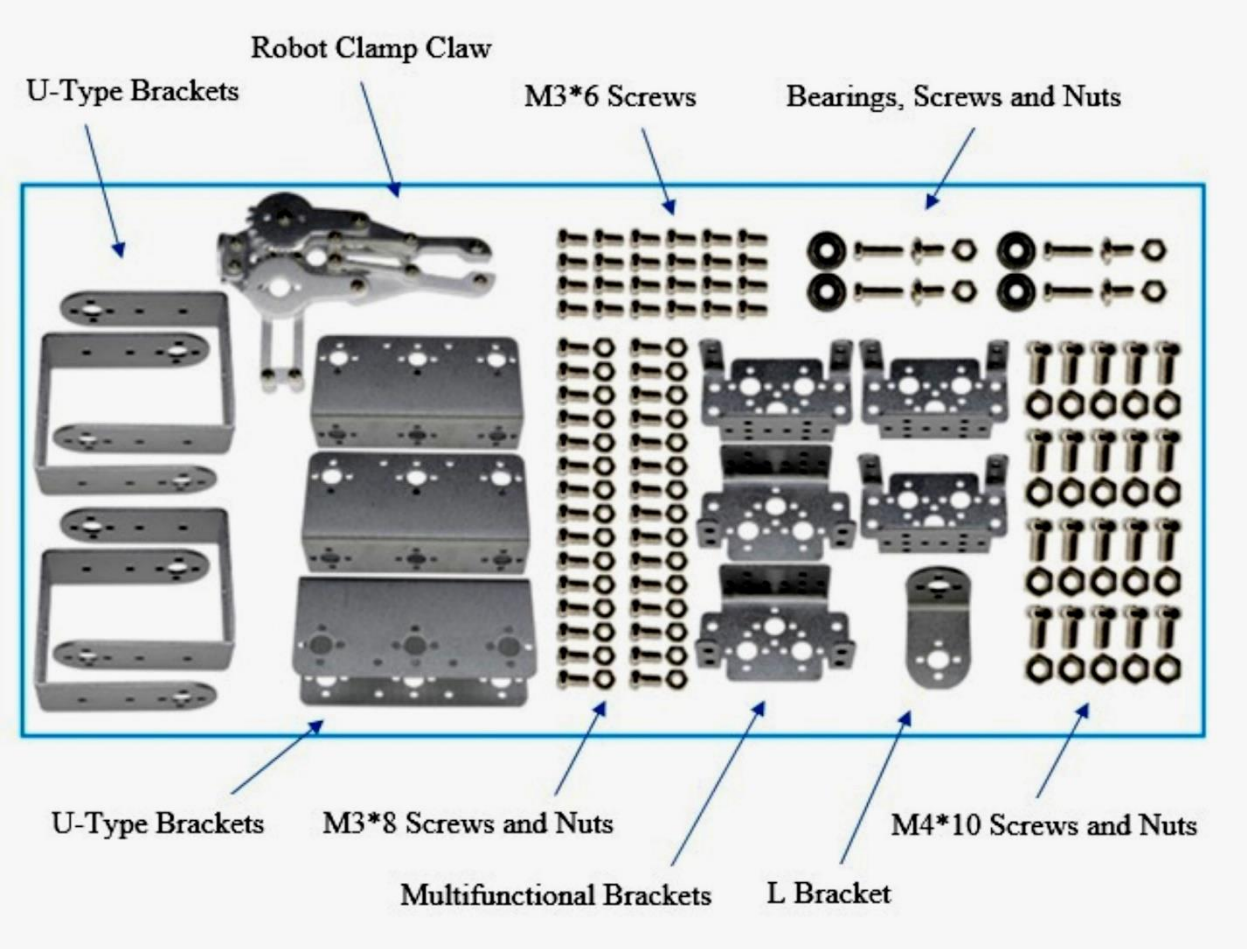
You can identify the screws by measuring them. The last number appears to be the total length including the head in millimeters. For example, M3*8 screws are 8 mm in length. I purchased some small plastic containers to put my screws in so they did not get lost. I labeled the containers to quickly identify them. Next you will want to lay out all your parts to make sure you have everything you need before starting.



When you unpack your servos you will have an assortment of actuator arms and screws.

You will not be using the actuator arms, except for the straight one to check the position of the servo when you install it. You will be using the servo horns, shown at the bottom of the picture, instead to attach to the brackets.

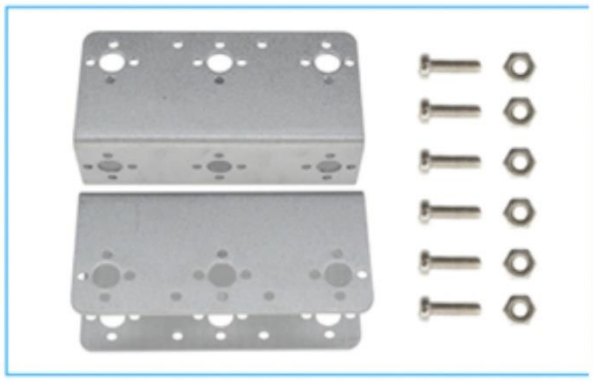
When you unpack the hardware, lay out everything so you can identify it. Depending on whether you get the silver or the black robot arm you should have the following parts. Shown in the picture below.



Assembly:

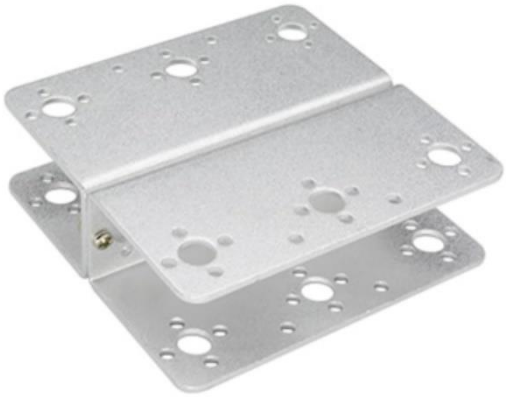
Assembling the Base

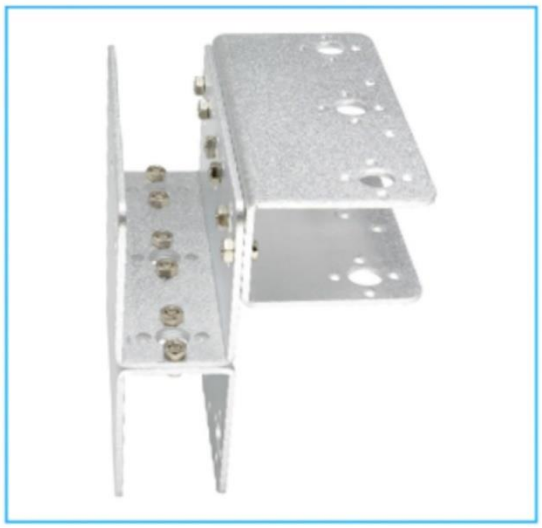
The pictures used for the assembly instructions are using the silver robot arm. The base is made up of the three U-Type robot waist brackets. Two are for the bottom. The instructions say to use 6 – M3*8 screws and nuts. I found that only 4 were needed. One on each of the outer most holes and two in the center holes.



However, if you want to use 6 screws and nuts it is your option.

Assembled base





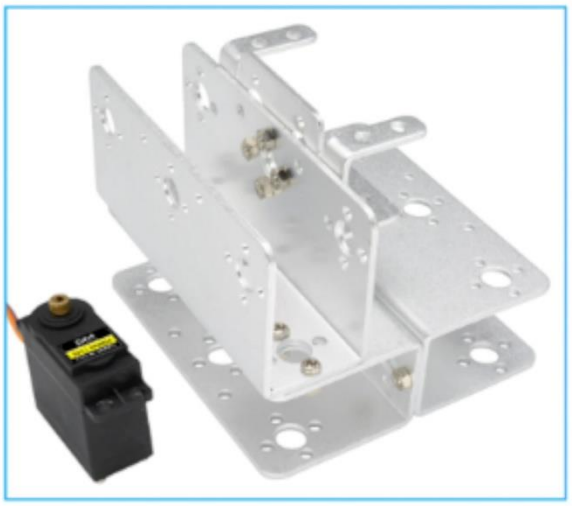
Step 2 – Attach the third U-Type robot waist bracket to one side or the other, of the base. This will be the backplane of your robot arm and can be used to mount your micro-controller and will be used to mount a multi-functional bracket. You will in the next step attach your first servo motor to this bracket. Again you can use 6 screws and nuts or 4 as I have.

Attaching the first servo motor

Step 3 – Before mounting the servo motor to the multi-functional bracket you will need to attach the bearing.

The M3*10 screws and nuts are included in the packet with the bearings. Place the screw through the hole in the position shown, and then insert the bearing on to the screw. Finally apply the nut tightening it with your 7/32 wrench or nut driver.

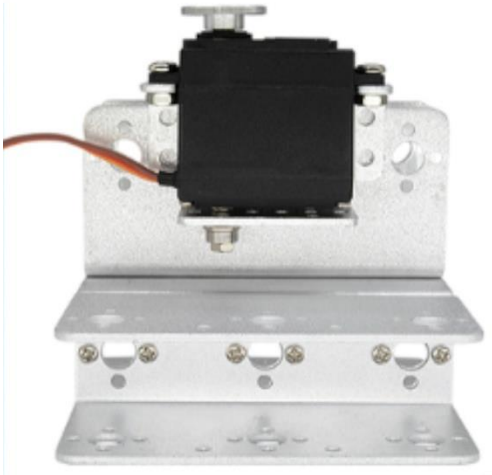
Step 4 – You can then attach the multi-functional bracket to the third U-Type bracket you just mounted to your base.



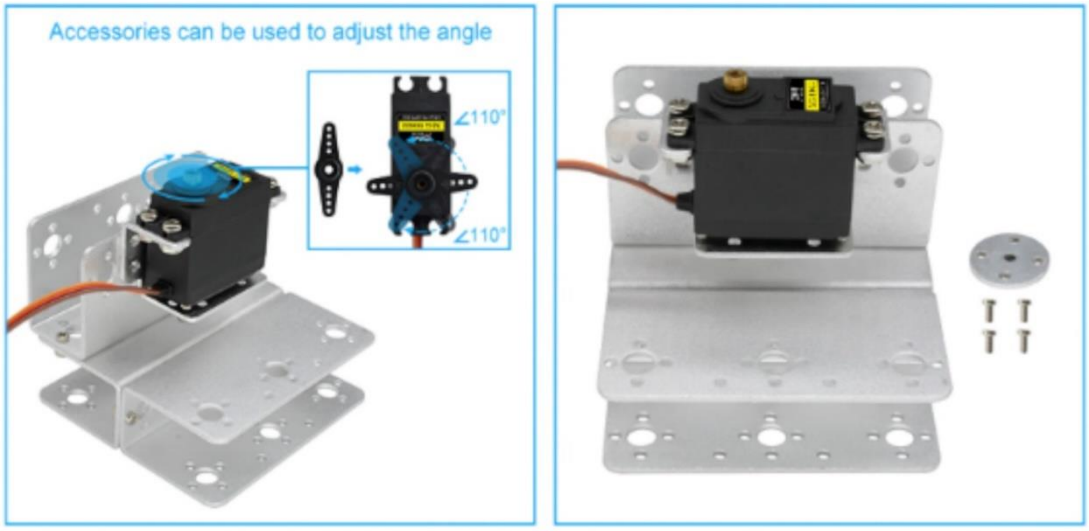
You can use 4 – M3*8 screws and nuts. I used two, but for more stability you might want to use 4 for this bracket.

Step 5 – Unpack one of your servo motors. It can be mounted over the two arms of the multi-functional bracket. Make sure you position it as in the picture below.

The servo motor axis will be to the left of the base and the servo horn when attached to the servo will be over the bearing.



Secure the servo motor with 4 – M4*10 screws and nuts. The servos come with 4 rubber grommets, but if you put them into the mounting holes of the servo your screws will not be long enough to attach to the nuts, so you must leave them off.

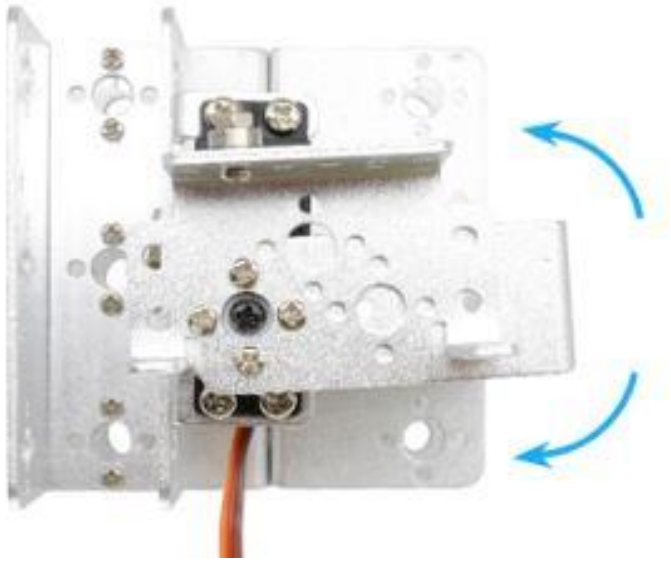


Step 6 – Place the straight plastic servo actuator on to the servo axis, so you can rotate the axis from one side to the other. You may have to reposition the actuator several times, until one end is approximately on one side or the other, and then it points forward at the halfway point. The picture above shows about 110 degrees in each direction of the halfway point.

Once you are sure the end is pointing straight toward the front at the halfway point carefully remove the actuator, and then place the servo horn on the servo axis with one of the holes pointing forward.

Place a screw in the center to secure the servo horn to the servo axis.

Step 7 – Slip one of the long U-Type bracket over the bearing and the servo horn. It is a little tricky, but it is best to put the bracket on the bearing first and then lifting up on the other end slide it over the servo horn. This is so you can attach the second servo motor multi-functional bracket on to the long U-Type bracket, which will be the next step. If you want to check the range of rotation by moving the U-Type bracket from side to side, you can temporarily put a couple servo horn screws into the bracket.



It will hit the edge of the third U-Type bracket you used for your backplane, but this is okay as long as it can touch each side.

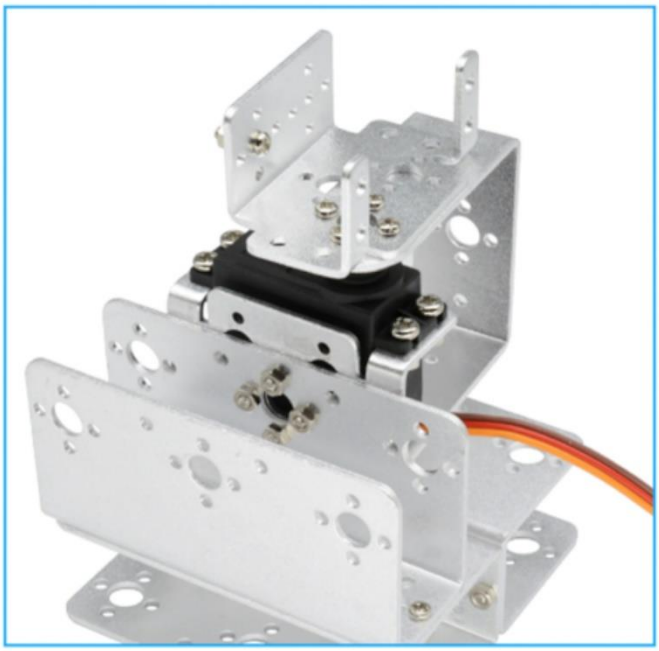
You can secure your servo cable to the top of the backplane with a tie-wrap to prevent the bracket from hitting the cable as it swings over.

Attaching the second servo motor

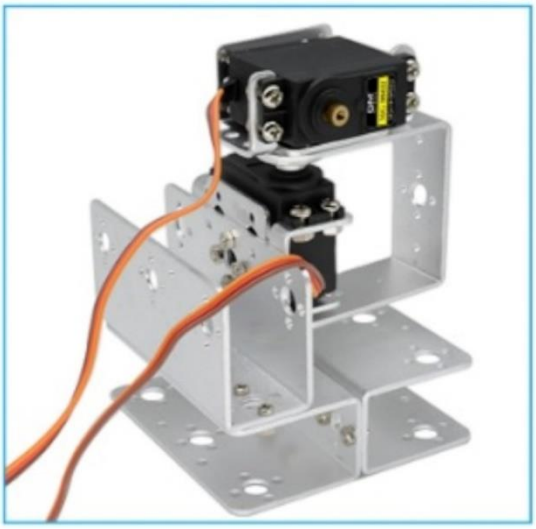
Step 8 – You will need to secure a bearing to the multi-functional with the screw and nut in the position shown above.

It should be on the side of the bracket with the arms facing toward you. The bracket is mounted on the long U-Type bracket using the M3*6 servo horn screws.

Remember, you need to put a center screw in the center of the horn, because if you don’t the horn can become lose after the arm is used for a while. Some of these screws, shown below, come with the servo horns.



Unpack a second servo and place it into the multi-functional bracket. Secure it with 4 – M4*10 screws and nuts.

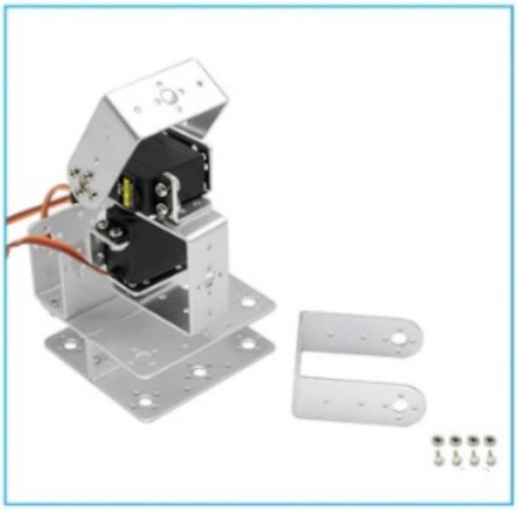


Make sure your servo cable is one the left side as you are facing the servo and the servo axis is directly over the bearing.

Step 9 – Again with the straight actuator arm check to see if you have the proper range of motion. The end that you pick should be pointing straight up, or down, when you are at the halfway point. Then put a servo horn on your servo axis.

Attaching the Arm brackets

Step 10 – Take two of the Long U-Type brackets and connect them together, or you can put one over the bearing and the servo horn and then connect the other one on as shown in the pictures below.



Secure the arm to the servo horn using 4 of the servo horn screws. Check the range of motion to make sure you had found the halfway point. If you have not then you will need to remove the arm and try finding the halfway point again. When the arm moves toward the front it will hit the U-Type bracket you installed with the first servo motor, that is also okay.

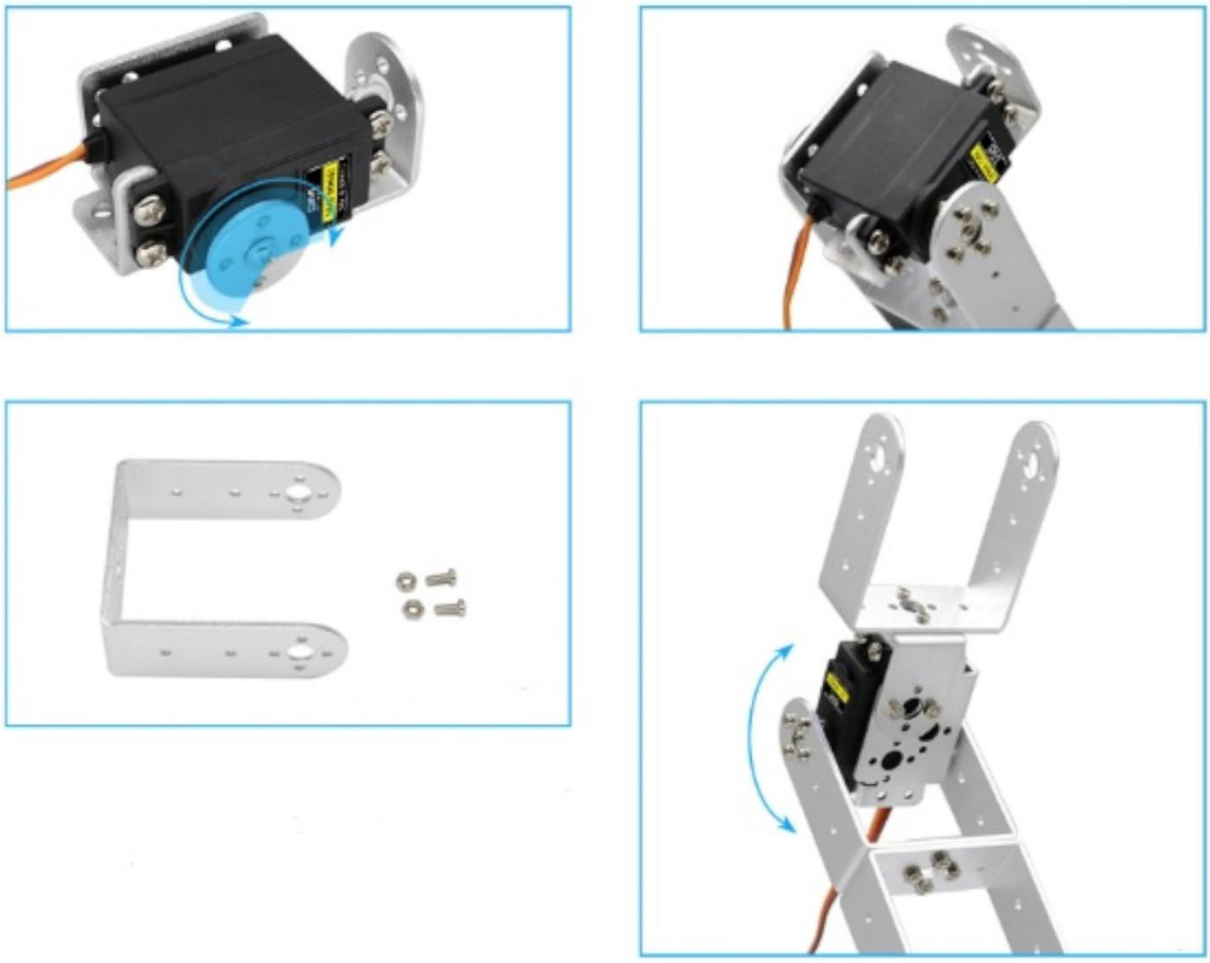
Of course if you want a fuller range of motion for both the first servo and the second one you can remove the first U-Type bracket and just put the multi-functional bracket on the first servo's horn.

Attaching the Elbow

Step 11 – Here you will attach the L-Type bracket to a multi-functional bracket. Use 2 – M3*8 screws and nuts. You will also need to add a bearing as shown in the picture below using a M3*10 screw and nut. When you have completed that you can install your third servo motor to the multi-functional bracket with 4 – M4*10 screws and nuts.

Step 12 – Now place the servo horn on the servo axis and check to find the halfway point. After you have found the halfway point you can slip the servo into the Arm and secure it with 4 of the servo horn screws.

Note: Check the tip below, before securing your servo motor to the multi-functional bracket.



Step 13 – Connect the last long U-Type bracket to the L-Type bracket with 2 M3*8 screws and nuts, as shown in the above picture.

Tip:

Attach the long U-Type bracket to the L-Type bracket before putting the servo on to the multi-functional bracket. It is much easier, because once you put the servo on, it is hard to get the screws into the holes and there is no way you can use a screwdriver there.

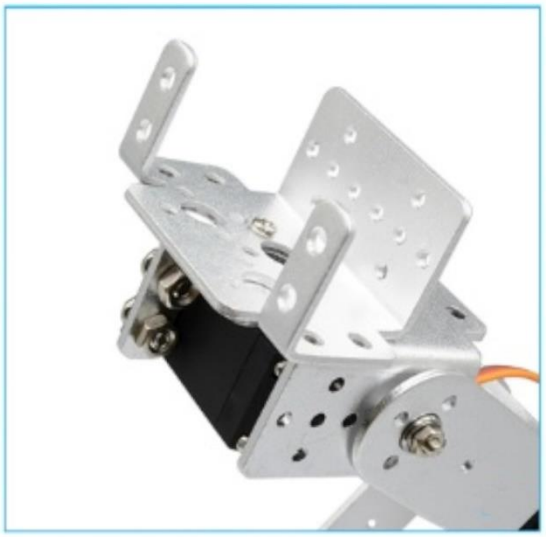
Attaching the wrist to the elbow

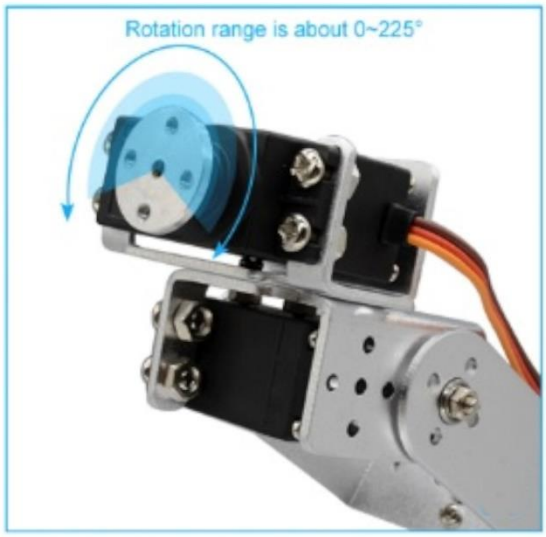
Step 14 – To create the wrist of the robot arm you will use two of the multi-functional brackets. Add a bearing to one of the brackets as shown in the picture below.

Use 2 – M3*8 screws and nuts to attach the one multi-functional bracket to the other as shown above.

Step 15 – You need to add the two servos to the brackets using 4 – M4*10 screws and nuts for each servo. Check the range of motion and when you are satisfied with the servo over the bearing slip it on to the long U-Type bracket and secure it with 4 of the servo horn screws.

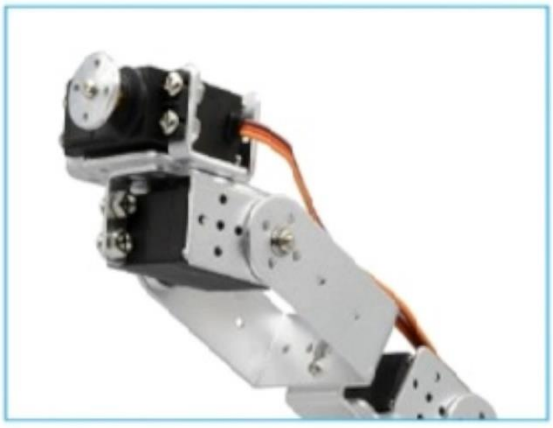
Next check the range of motion of the other servo.

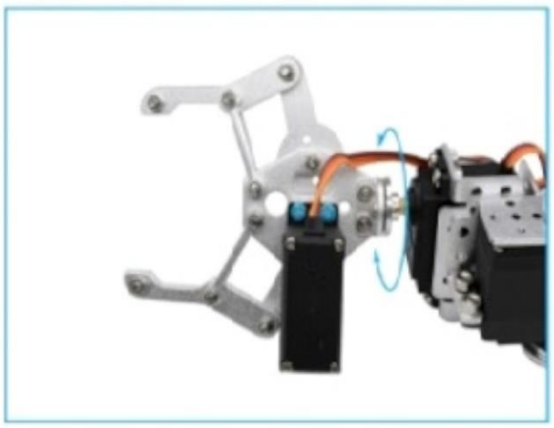




Attaching the claw

Step 16 – The instruction sheet next states to attach the last servo to the claw. But I found if you do that you have a difficult time attaching the claw to the wrist servo. I was able to do it but I needed a screwdriver with a long shaft. So my suggestion is that you attach the claw to the hand servo first. I call it the hand only because it hold the claw and will rotate the claw.





Use 2 servo horn screws to attach the claw to the hand servo as shown in the picture above.

Step 17 – Now secure the last servo motor to the claw with 4 – M3*8 screws. All the other servo motors needed the M4*10 screws, but they are too large in diameter to fit the screw holes in the claw. Note: Before attaching the servo motor check your range of motion with the straight actuator and find the halfway point.

As you can see in the bottom left picture above the servo horn goes on over the claw chassis. You cannot tight it down too tight with the center screw or it will bind the servo motor. Use the small screw that looks like it has a washer on it, and comes with the servo horns. Position the claw in the open position, as shown above. Secure the claw to the servo horn with two small black screws that come with the servo accessories. The reason for this is the servo horn screws appear to be a little too long. Check to see that you have full range of motion for opening and closing the claw.

Step 18 –You have now completed assembly of the robotic arm. You should try the motion of all the servo motors to see if you have the range you want. Also you may want to dress your cables with tie-wraps making sure you have enough slack for the joint to move as it should.

I have included test programs using an Arduino® Mega 2560 micro-controller and a Raspberry Pi® computer in my eBook Robot Arm Assembly a Student Guide. You can find the eBook and paperback at Amazon.com. It also includes information about tools needed, powering the arm, important information about Arduino® micro-controllers and Raspberry Pi® computers, and more. It is a handy guide to explore the world of using robots for automation.