

MeArm V1.1 - Tiny Open Source Robot Arm

by **phenoptix** on November 2, 2016

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Author:phenoptix Your Robot

A member of instructables since 2006 I'm currently cruising at an improving 0.875 instructables a year...

Intro: MeArm V1.1 - Tiny Open Source Robot Arm

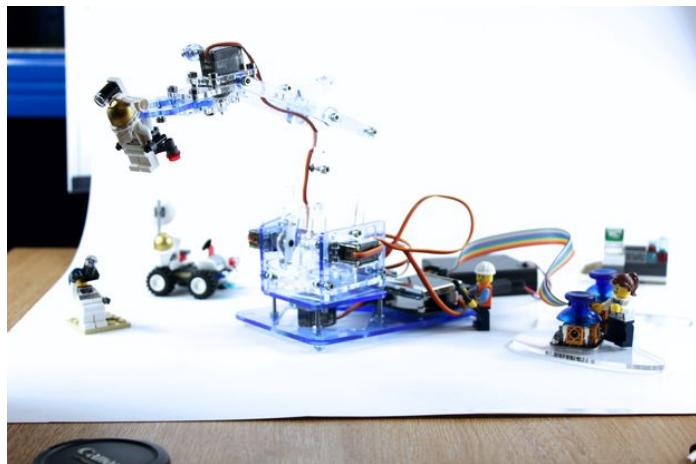
MeArm is a tiny robot arm that came to Instructables in 2014. Build instructions, cutting files and code for Arduino and Raspberry Pi are shared here, as ever, under a CC-BY-SA licence. Which means please use it, share it and love it but let people know where you got it from. The creators are now Mime Industries, a collaboration of MeArm and Mirobot. Prizes* for those who can tell how we came up with the name!

The MeArm is made up of a structure of acrylic (or wood, mdf or polycarbonate), a bunch of machine screws and nuts, servo motors (to make it move) and a controller (to make the servo motors move).

The servo motors and the controller are important to set up before you start the physical build, that way you'll only have to build it once.

(*The prize is a feeling of accomplishment).

Our story is one that started on Instructables and we're very proud to still be sharing our designs and instructions on here!



Step 1: If you're cutting your own...

Check out the files over on [thingiverse](#). The design is optimised for 3mm materials, it doesn't have to be too accurate. You can download the dxf file which should work with no messing on your laser cutter.

We use a laser cutter but we've seen these milled, water jetted and even cut by hand (impressive I know!!).



Step 2: Setting up your servos. Choose your weapon!

The thing you want to do most is build the MeArm. It's fun building things and it looks pretty when it's done but it's a couple of hours of effort and if you don't set up the servos properly you'll have to rebuild parts of it and that really isn't fun. We want the MeArm to be something you use, we all have enough shelfware! So please, let us first set up our servos and chose what we use to drive them.

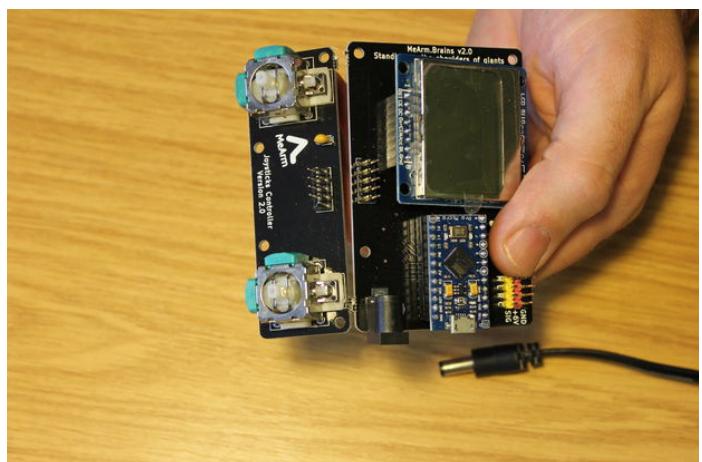
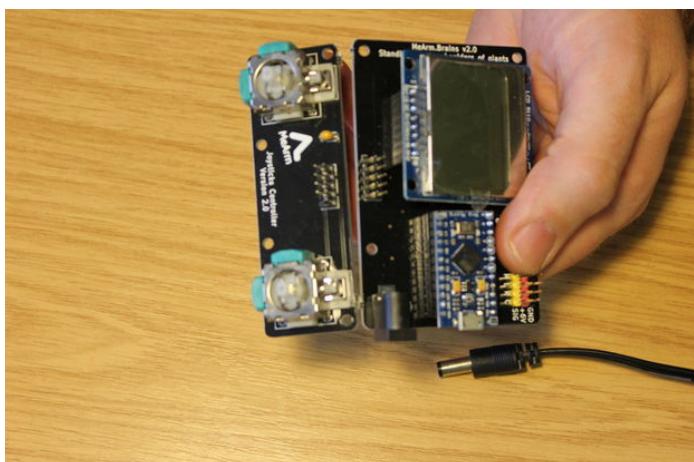
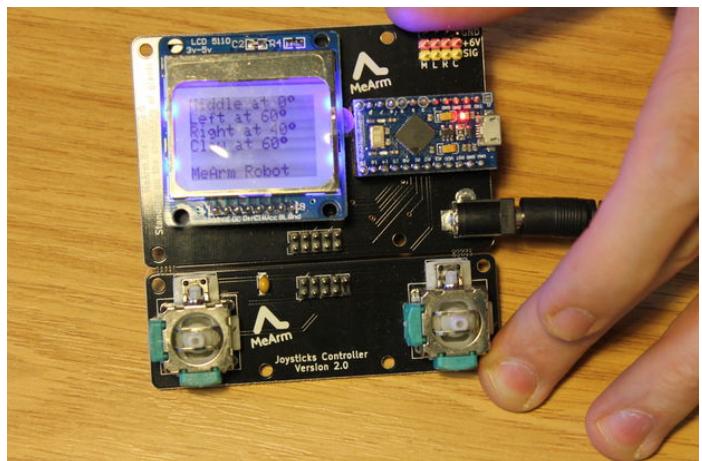
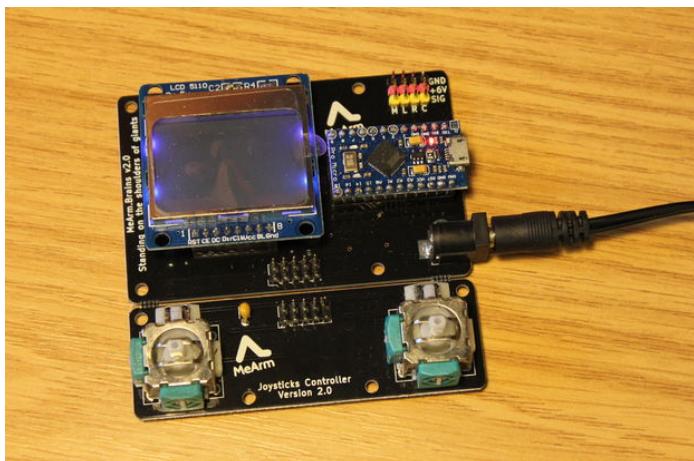
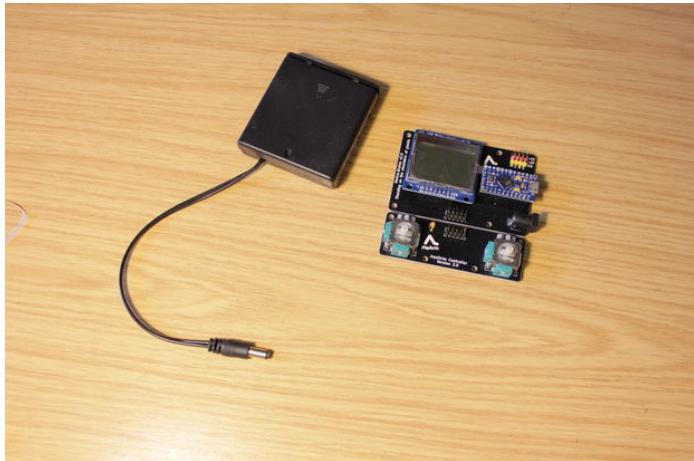
The MeArm can be driven by anything that can produce a PWM signal. This stands for Pulse Width Modulation, which means turning the signal off and on in a specific way, it's actually how you dim LEDs in lighting.

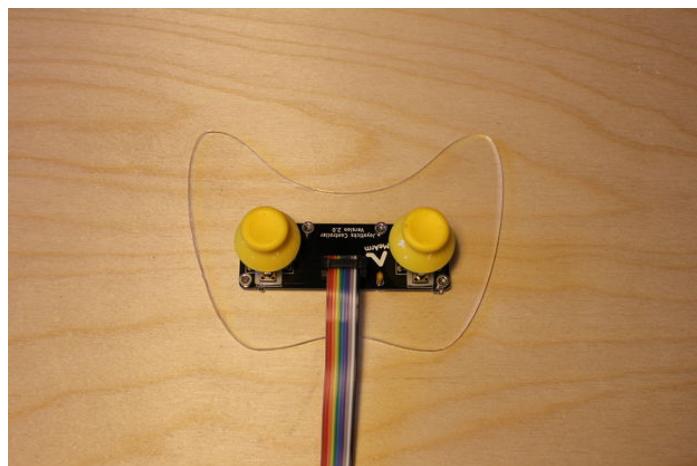
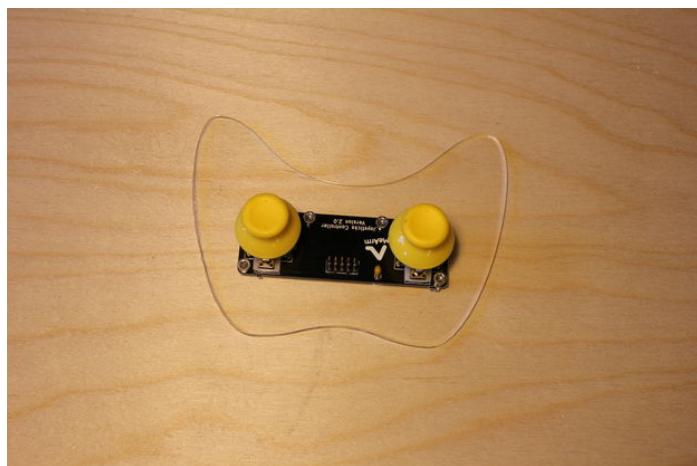
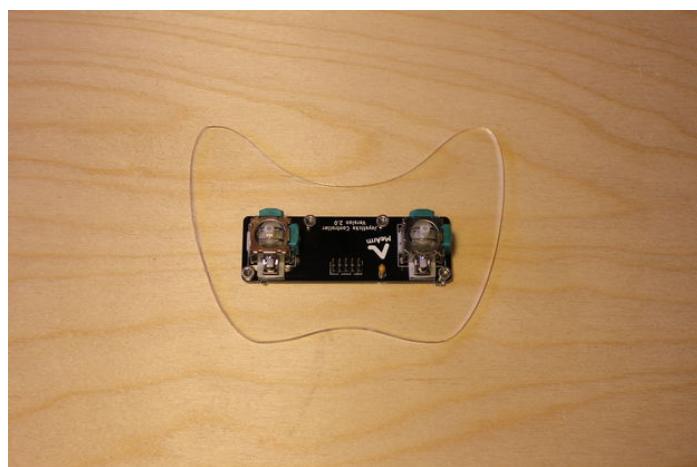
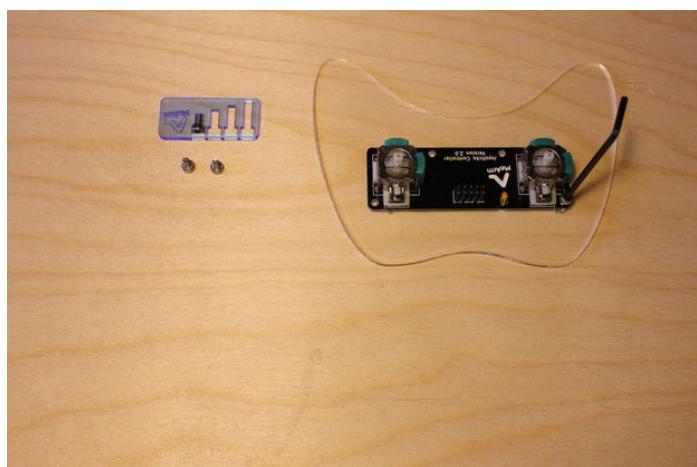
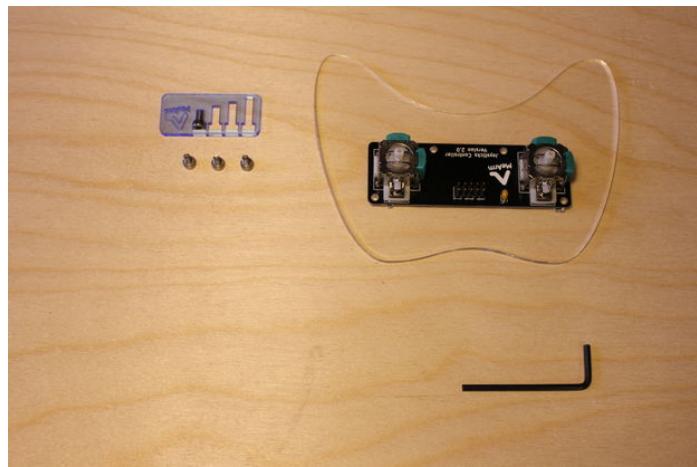
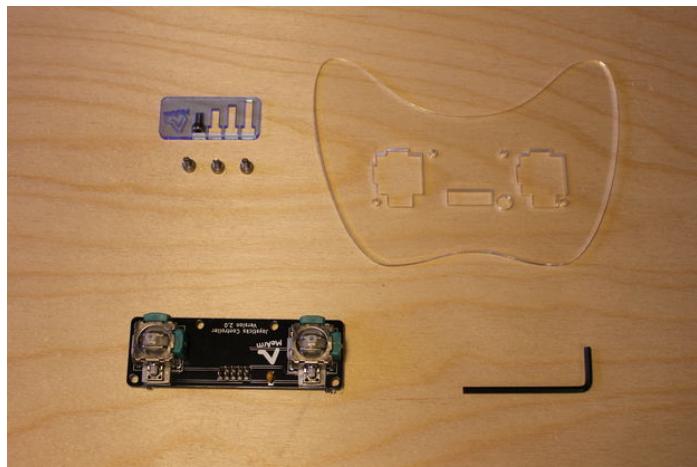
Popular ways to do this is with Arduino or Raspberry Pi, we'll go through those here. There's also code for Beaglebone Black, Spark Core and a bunch of other platforms.

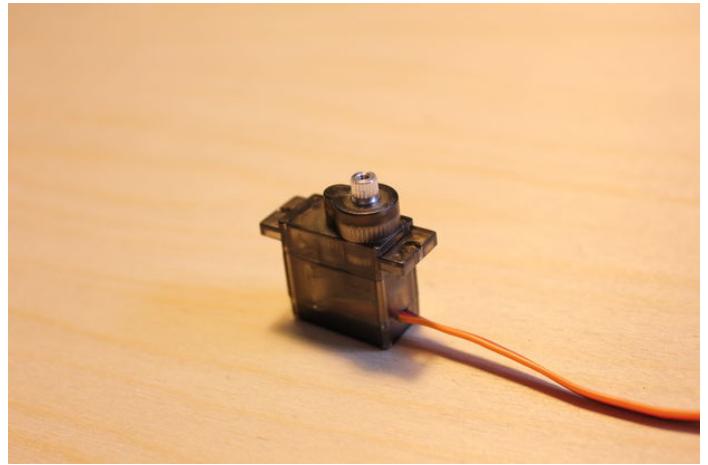
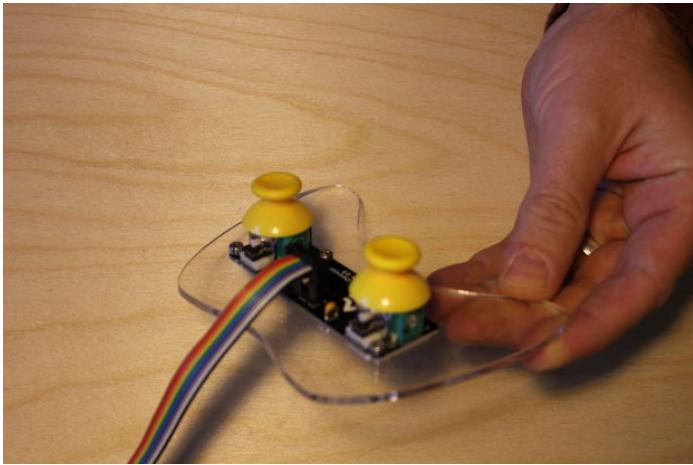
For simplicity, we'll also be using our Brains board, which is an Arduino compatible board that comes preprogrammed with the MeArm Deluxe kit. It has a joystick board with two joystick controllers, which are great for testing the ranges of the servo motors.

The images here show adding batteries, plugging it in and powering the board up, removing the Joystick board and connecting it to the Xbox controller shaped acrylic piece we provide.

The code we ship on the Arduino is provided here and will work on any Arduino with a couple of tweaks.





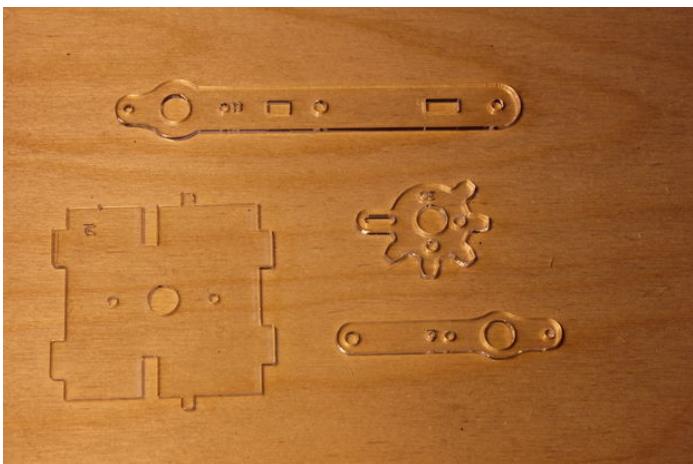


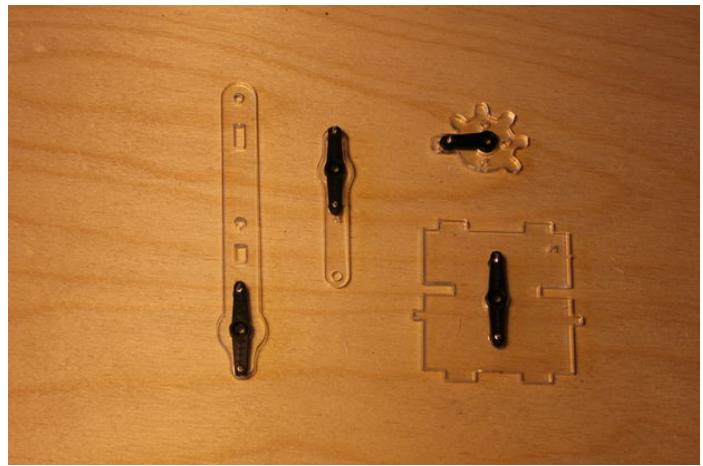
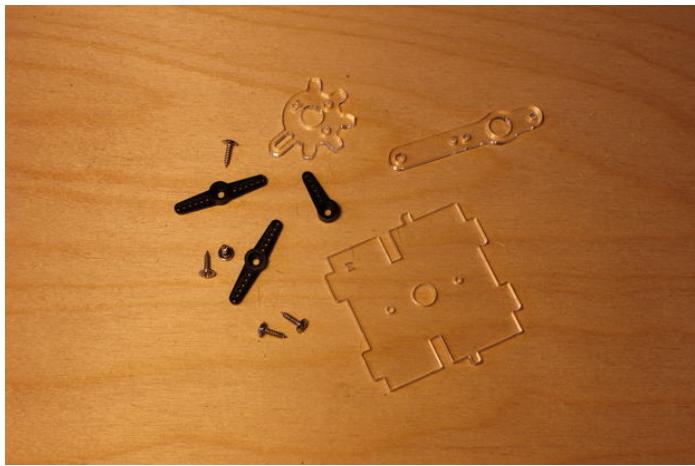
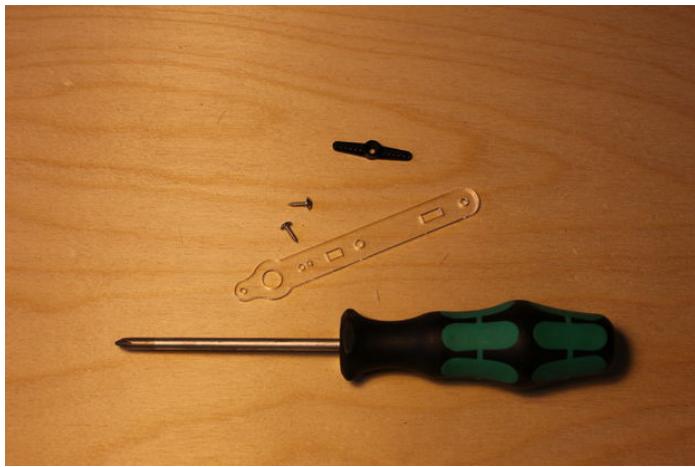
Step 3: Attach the servo horns to the appropriate levers!

The servo horns are the little plastic parts that fit to the end of your servo motors. Here they're black.

You'll need a small screw driver to attach them and if there is a part where it's good to get an adult to help this is it. Doing them in a single step means you can clear up the spare parts this generates.

Follow the images and attach the appropriate shaped horn using the small sharp silver screws. Put the small machine screws in a bag and put them aside, with your screwdriver, for later.







Step 4: Build your base!

This step is building the base. Follow the images through for the correct order.

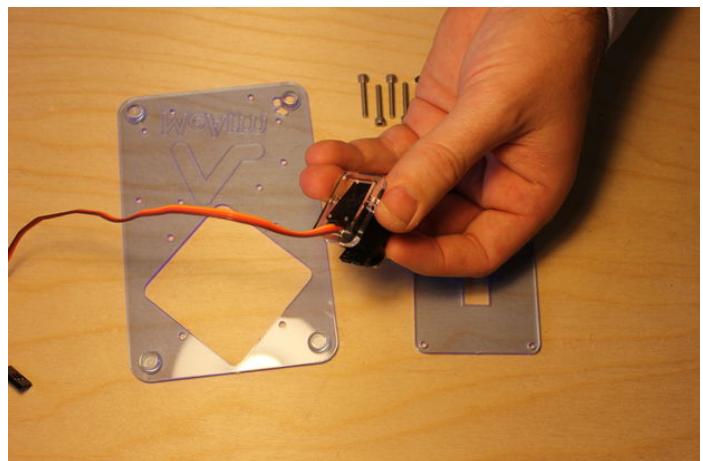
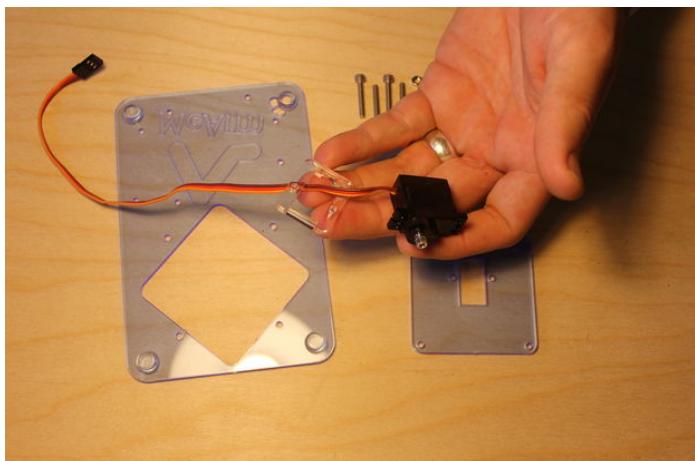
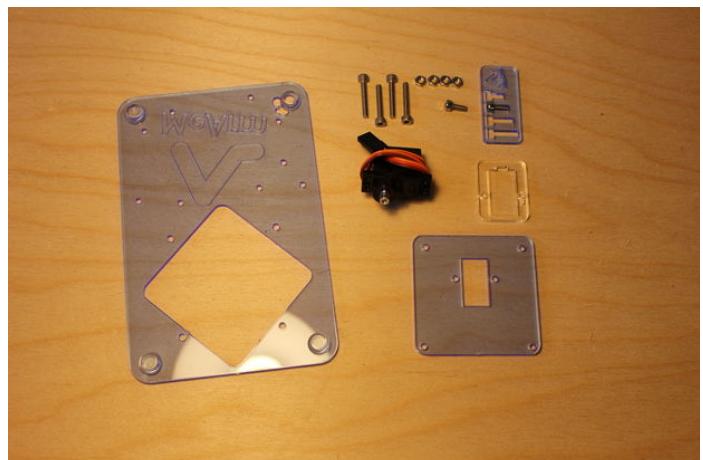
It is first putting the collar on the servo, attaching that to the small base board with 2 x 8mm screws (use the screw sorter).

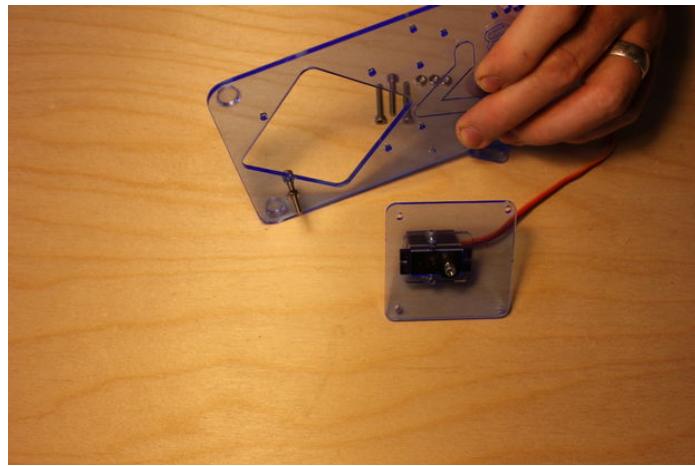
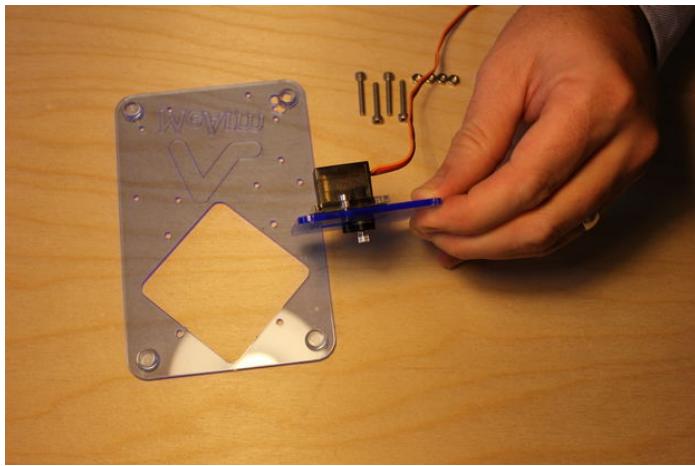
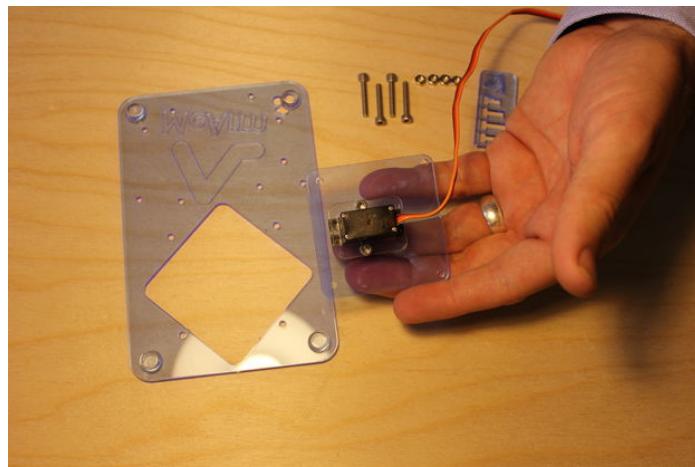
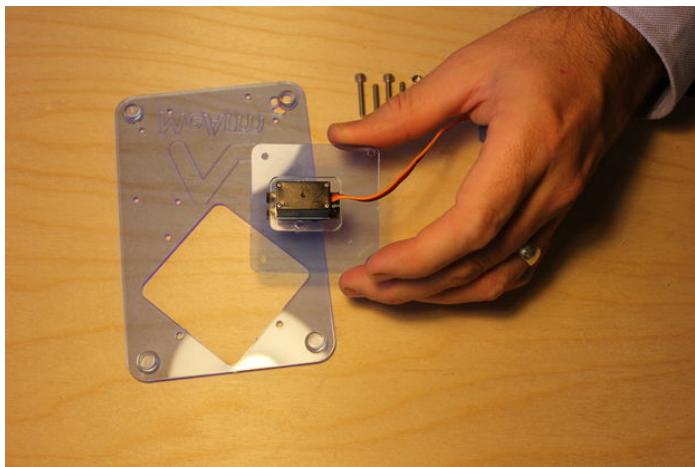
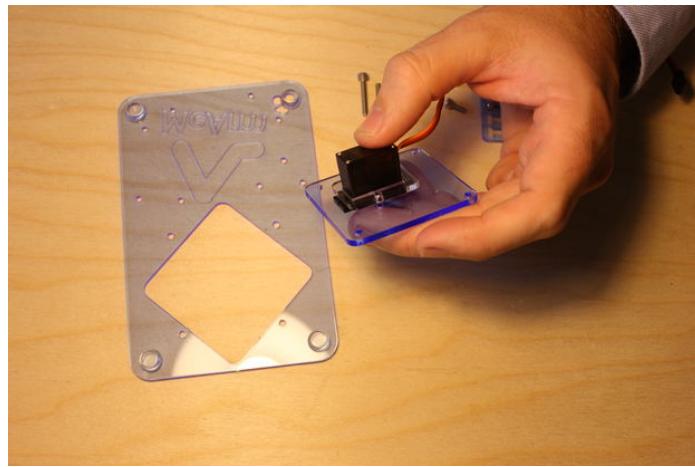
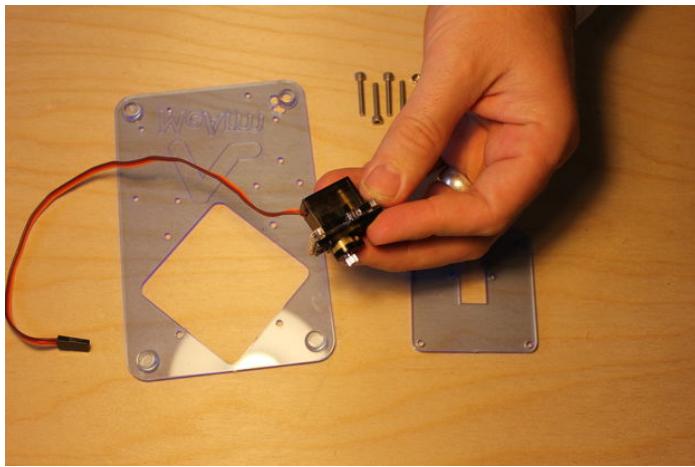
Second put the 20mm screws through the big base board and put the nuts on half way. This is so you can screw them into the small base board. Line up the small base board and screw the 20mm screws in until they are not quite flat with the top of the small base board.

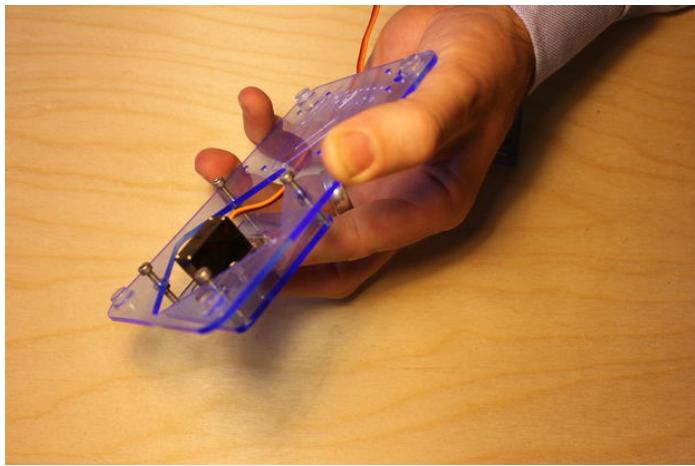
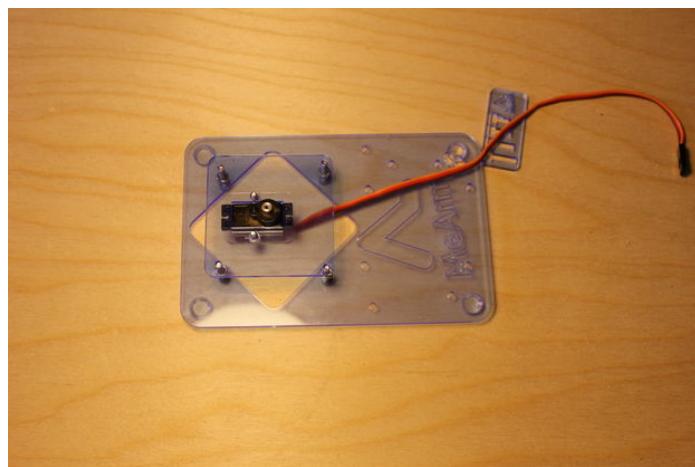
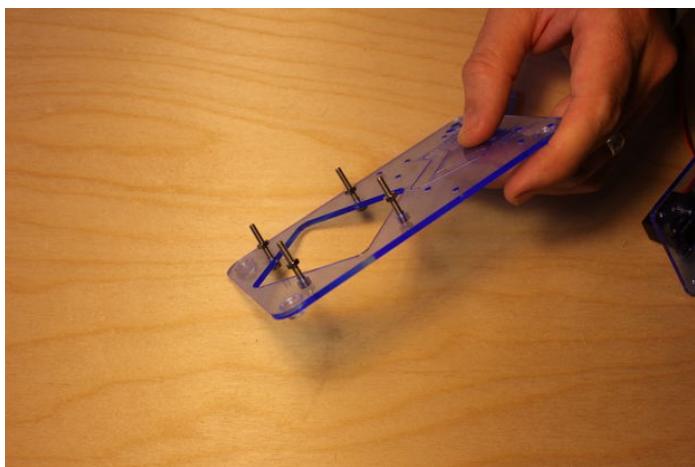
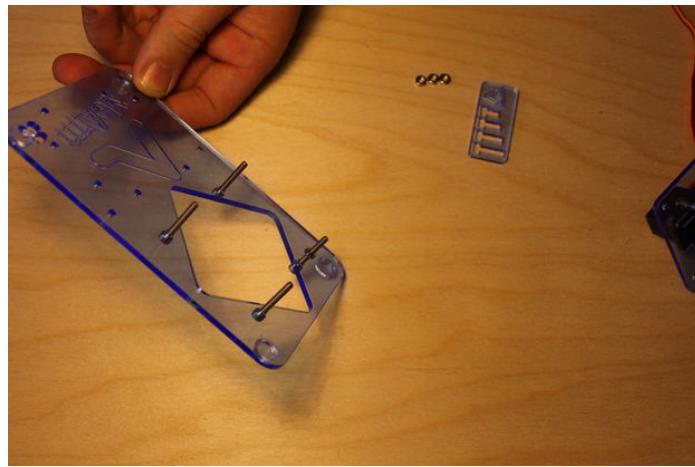
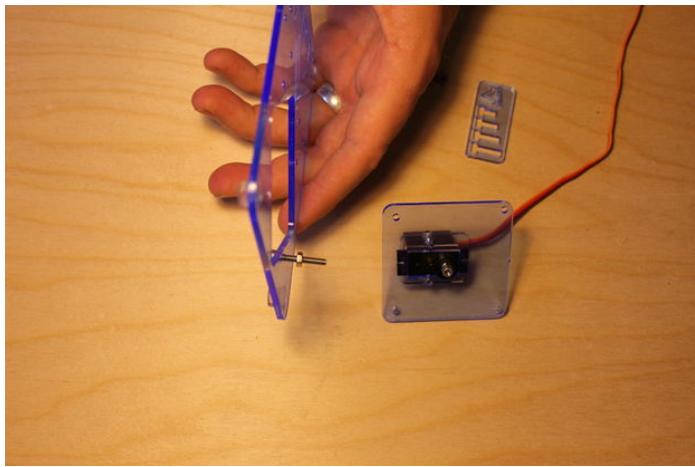
Once all the 20mm screws are screwed into the small base board you can tighten the nuts down to the big base board.

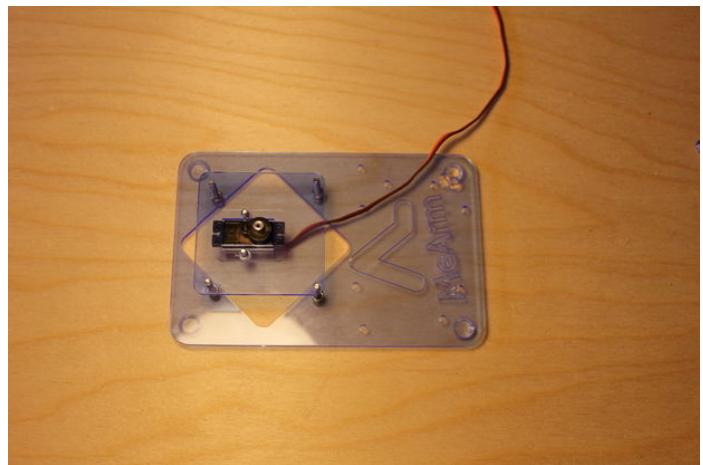
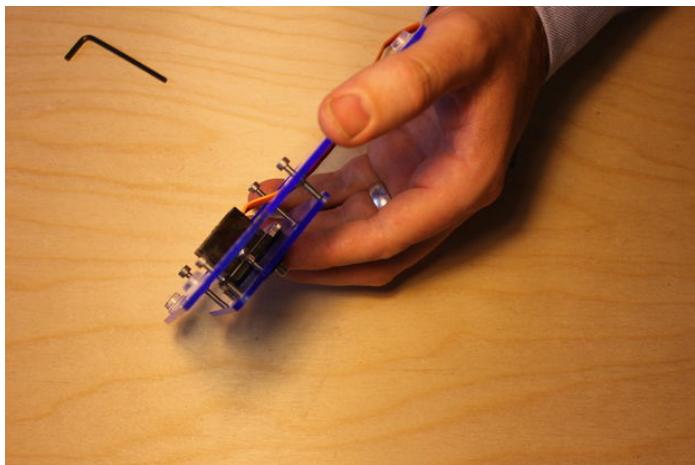
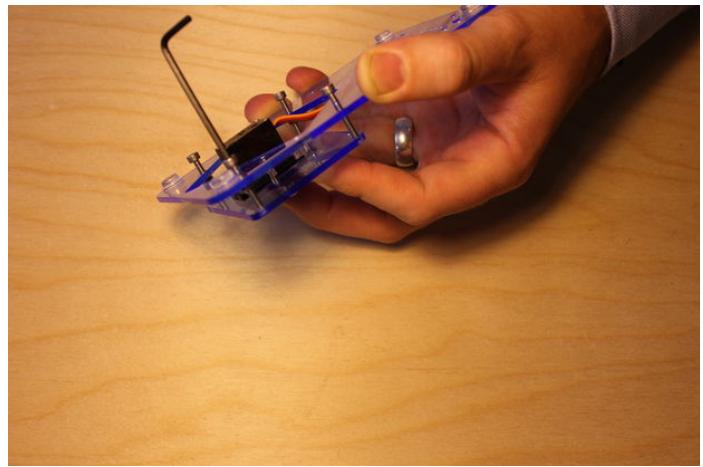
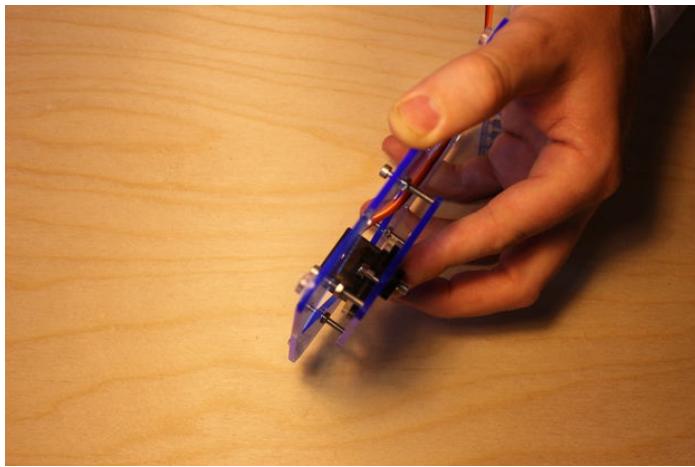
NOTE: The screws self tap into the board. This means they make their own thread, it can be a little tough to start.

ALSO NOTE: Nothing should break here, but if you have an official Mime Industries MeArm contact us and we'll replace any part that breaks during construction.







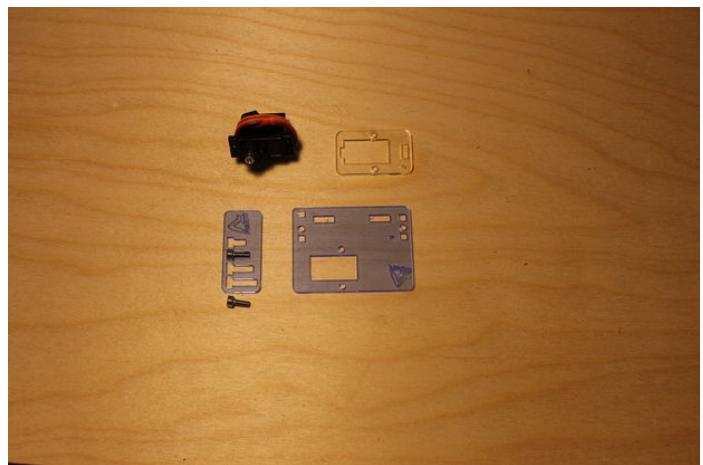


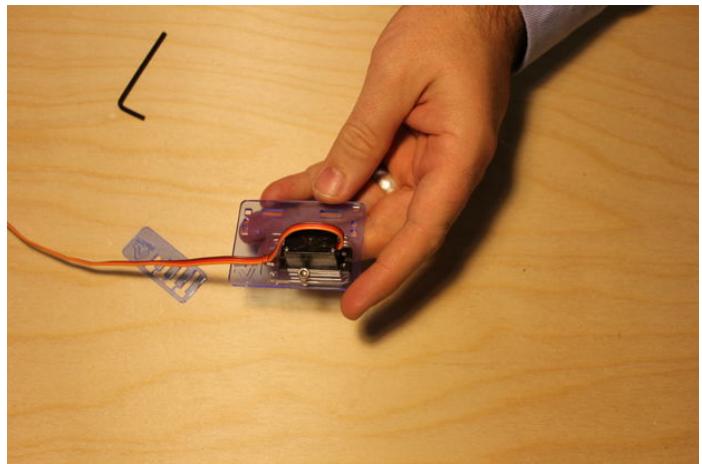
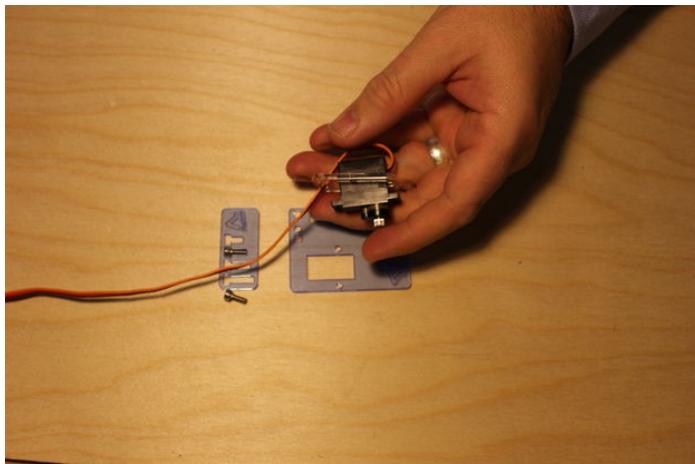
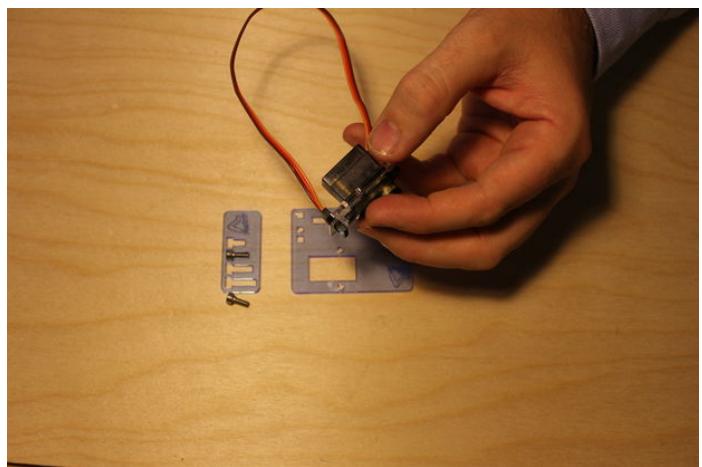
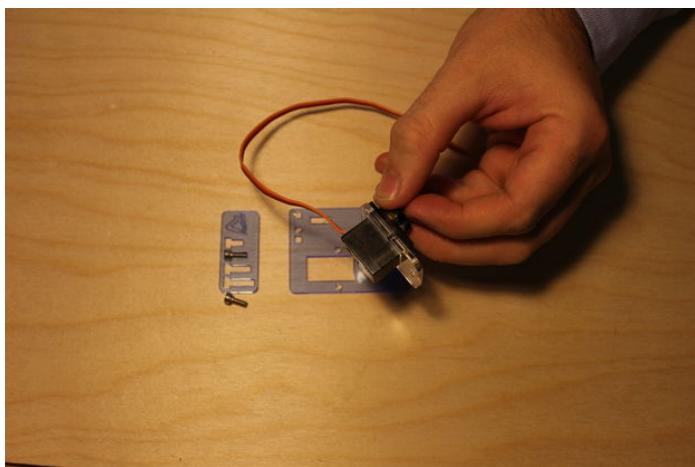
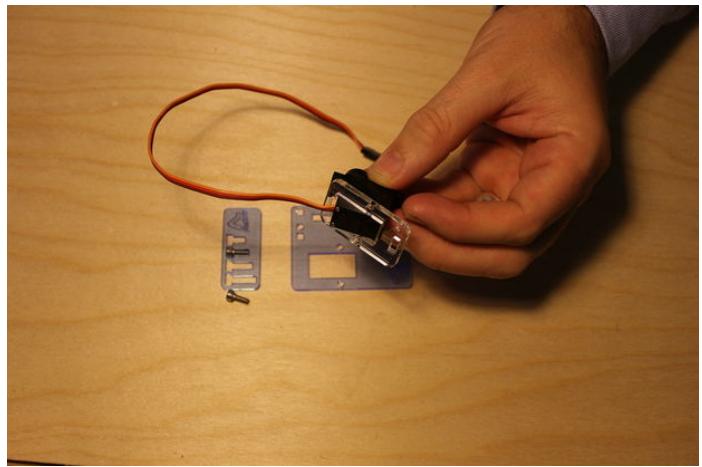
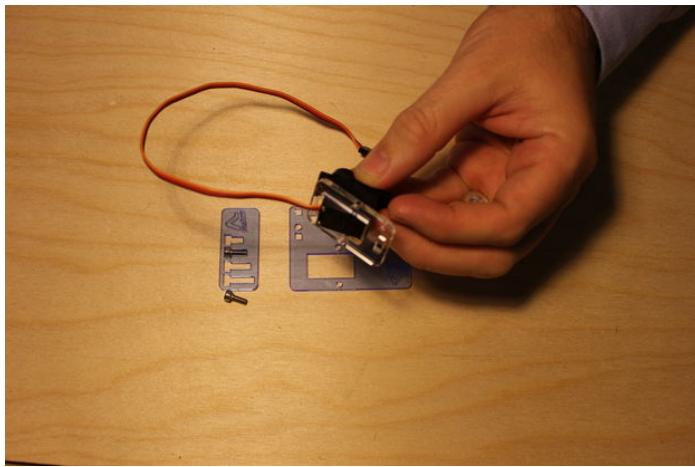
Step 5: Build the left side

Follow the images through.

You'll put the servo through the collar to help attach it. We've made a small video for this step and here it is

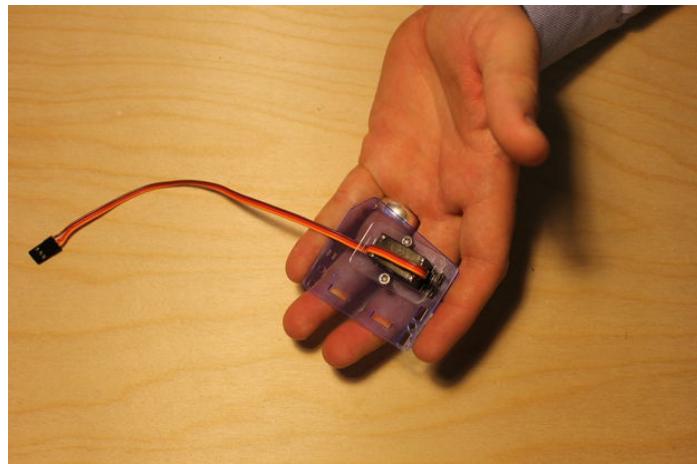
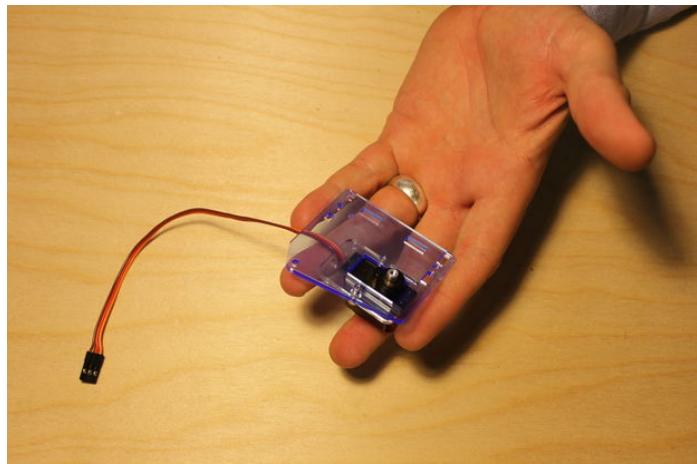
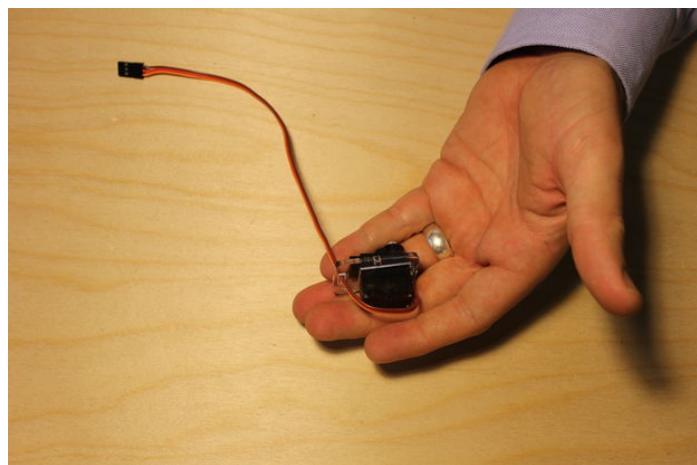
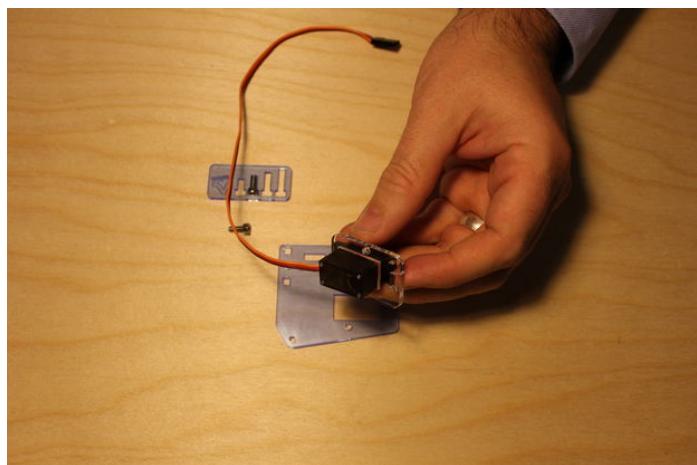
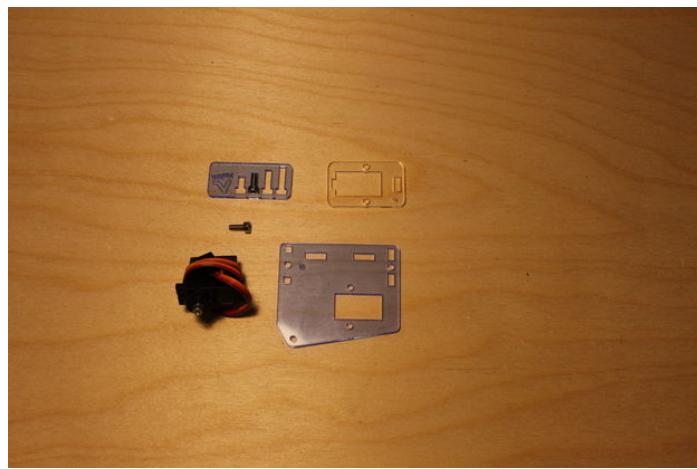
Attach the servo and collar to the left side plate with 2 x 8mm screws.

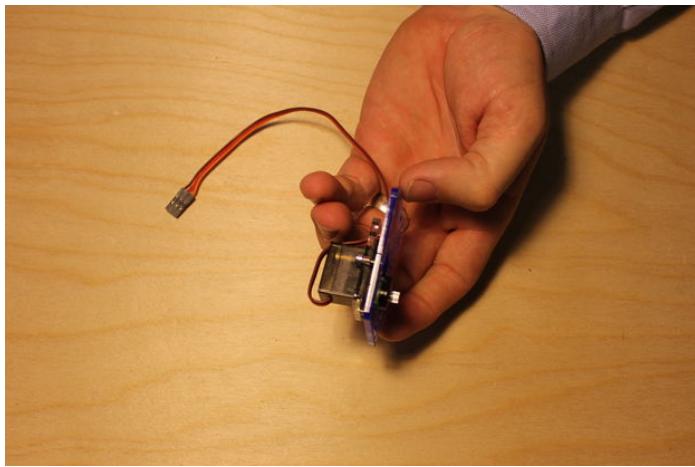




Step 6: Build the Right Side

Building the right side is very similar to the left. Make sure the servo is going onto the correct side. If you hold the left and right sides up the servos should both be on the outsides of the piece. If that doesn't make sense, have a look at the pictures of the completed arm. The servos bases face outwards, that's the correct way.





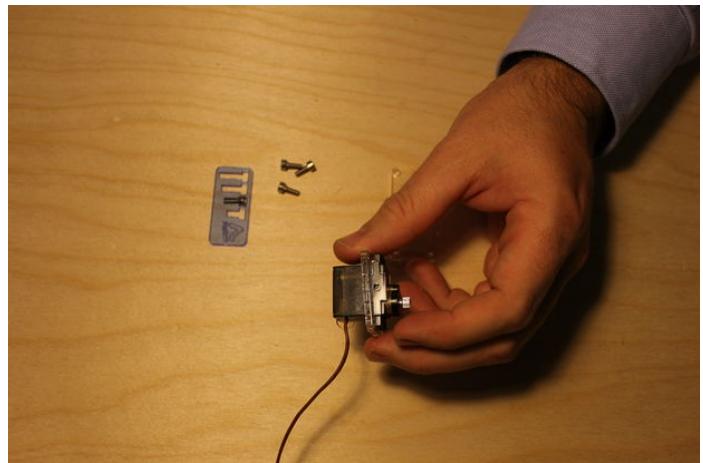
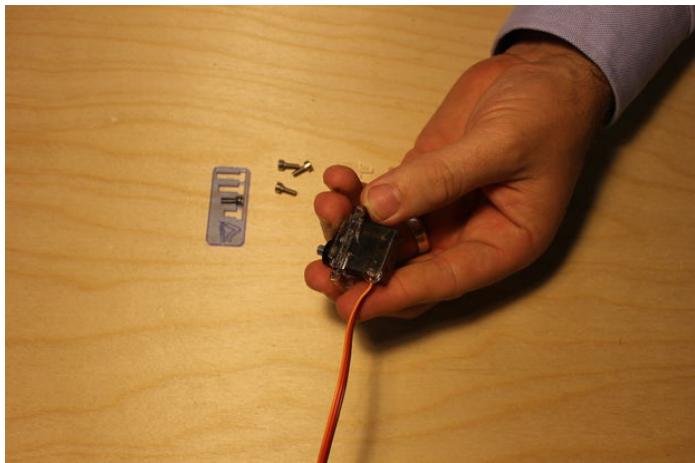
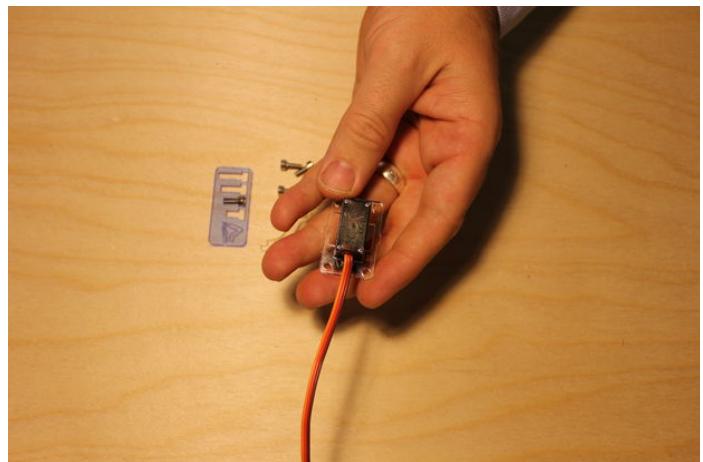
Step 7: Build the Claw - Step One

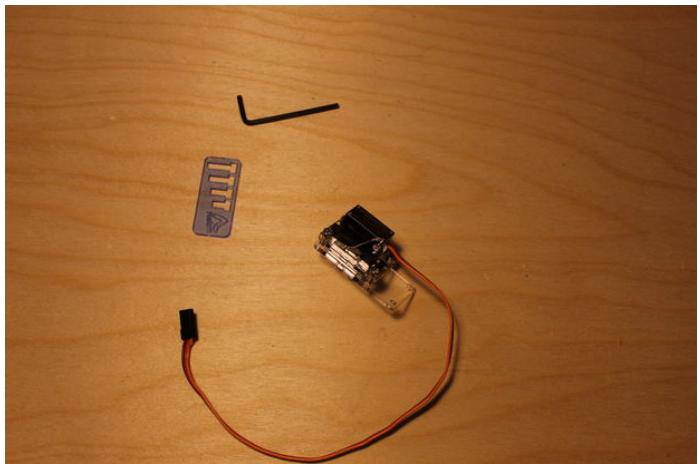
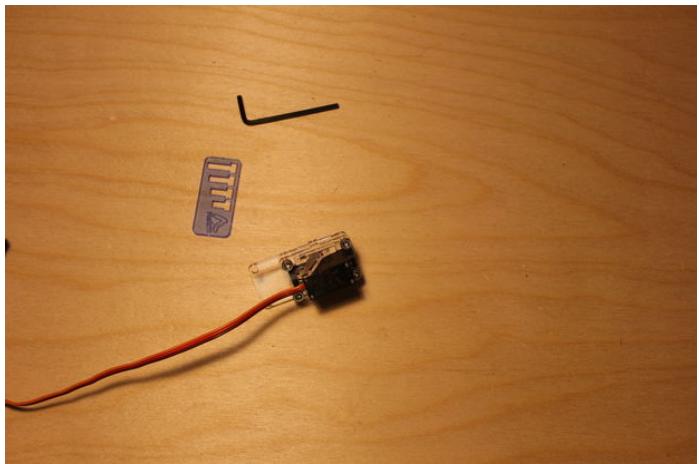
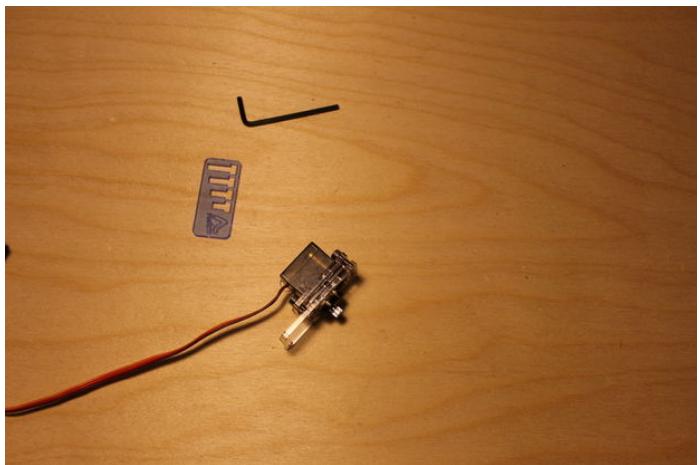
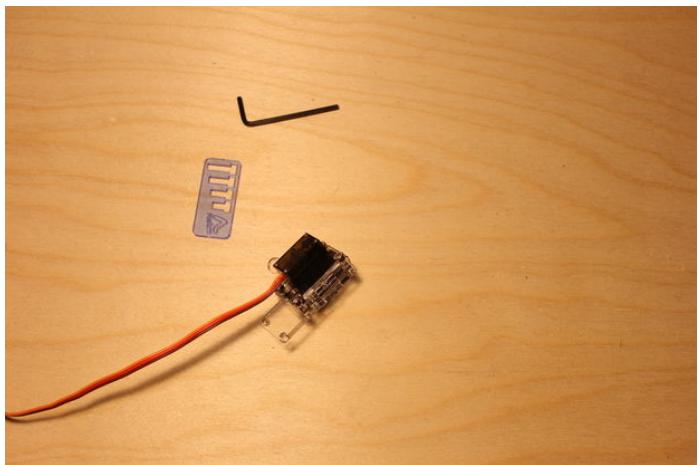
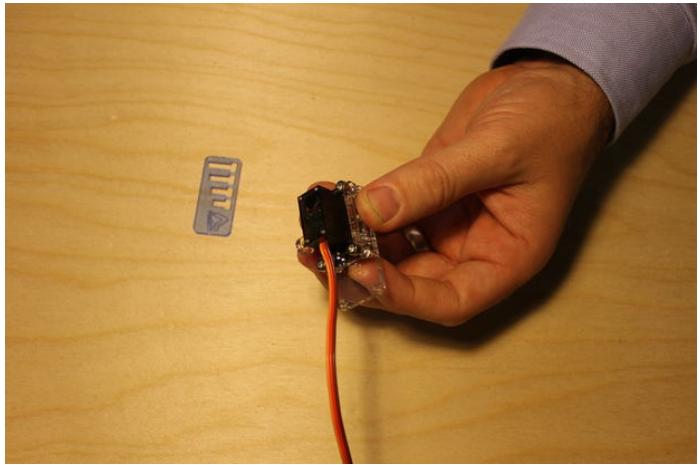
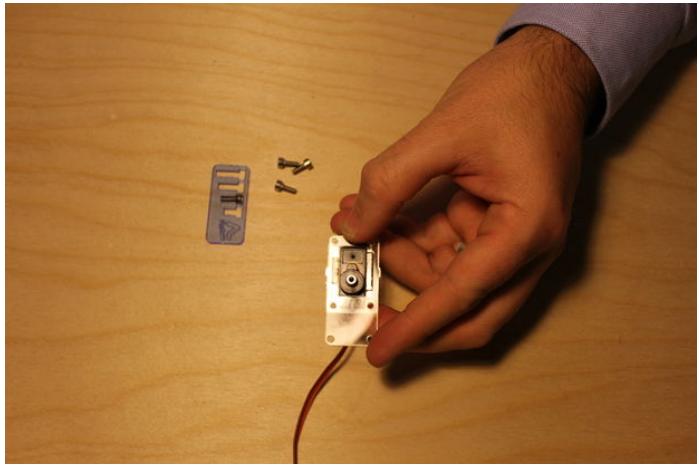
As before the images should guide you through.

Put the servo through the collar (similar to before).

Put the side parts on (it matters which way, check out the images, pay attention - but don't worry, you can remove screws if necessary).

Attach the base using 4 x 8mm screws.

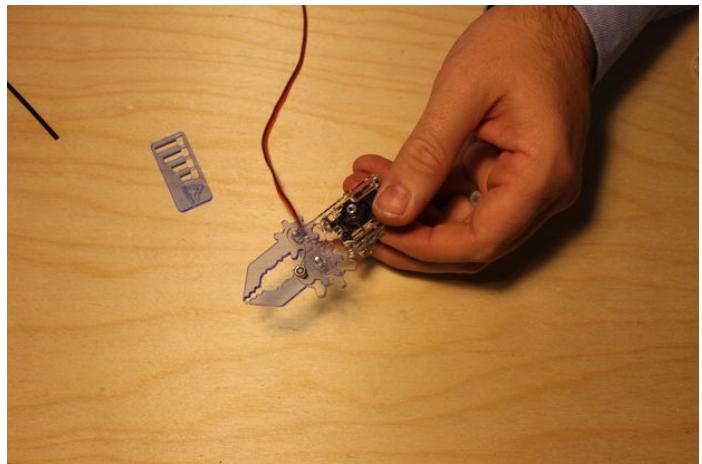
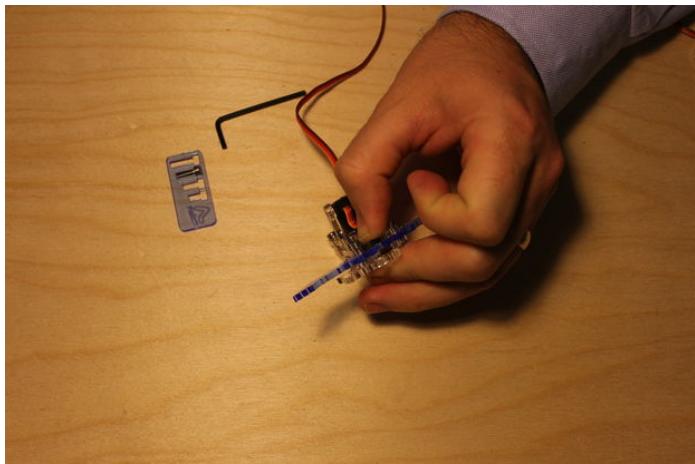
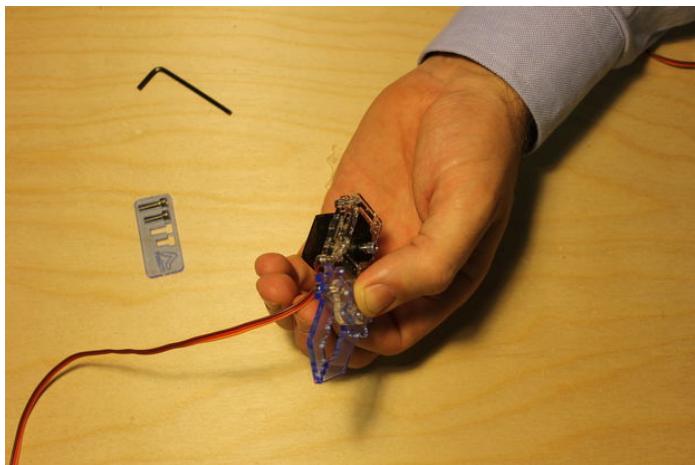
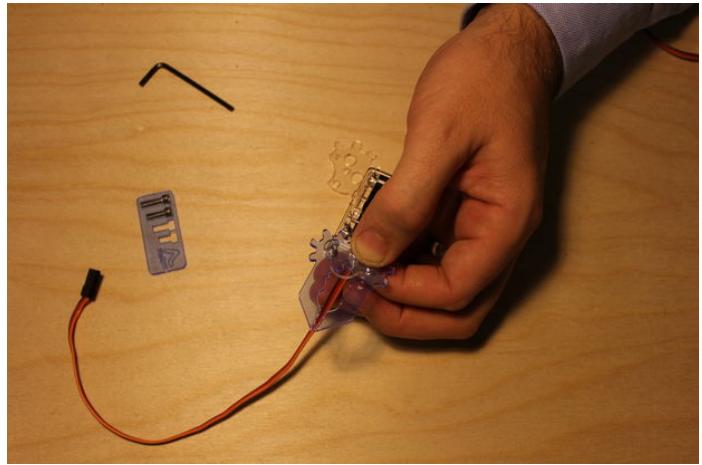
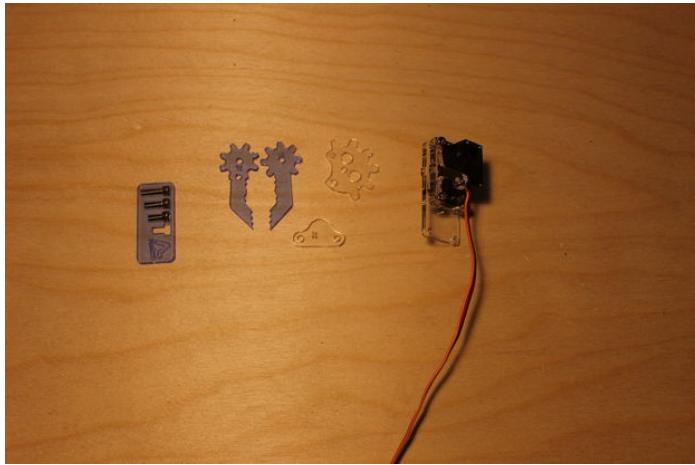




Step 8: Build the Claw - Part 2

Now you're going to attach the claws and gears.

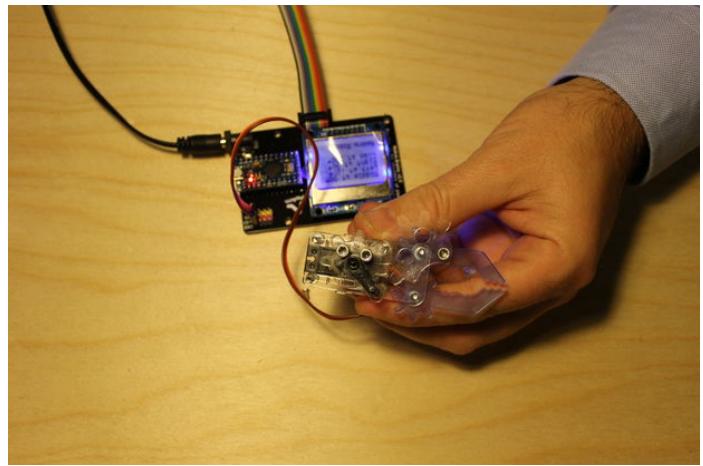
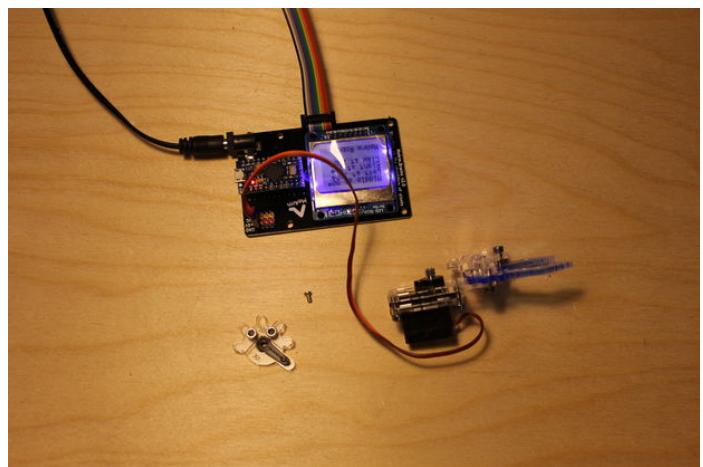
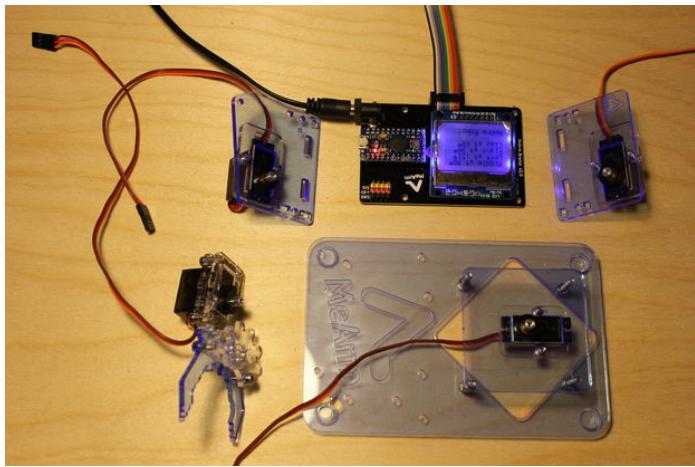
We'll use an 8mm, 10mm and 12mm screw. Follow the images through. If you need more detail here let me know!

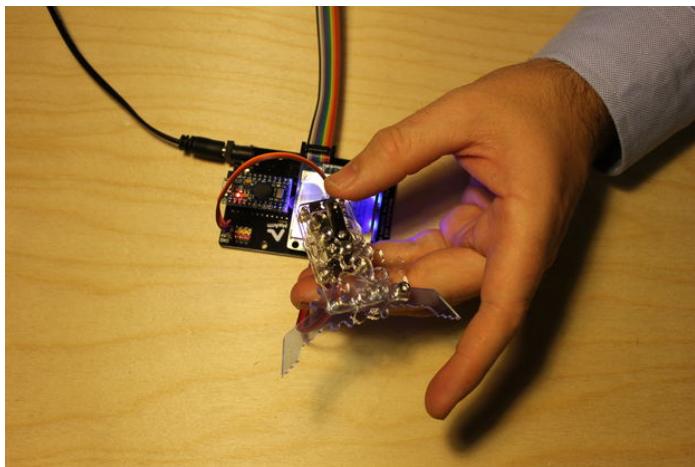
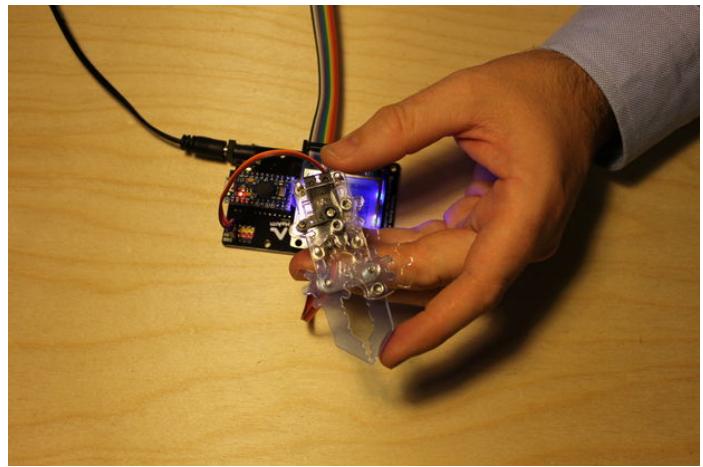
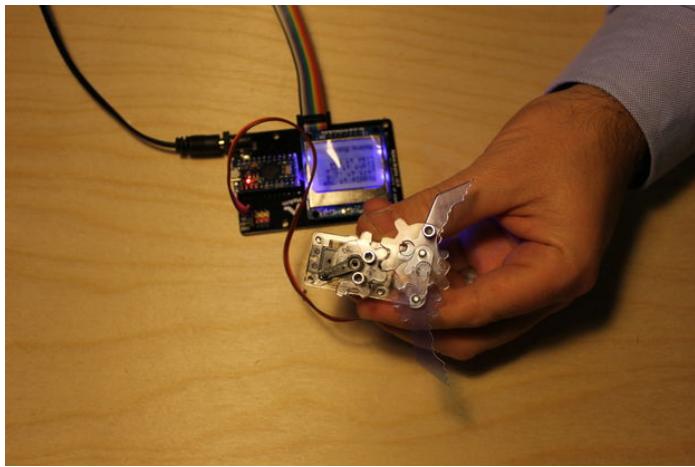


Step 9: Calibrate all the servos! Step one Claw

With your chosen controller get the horn assembly from earlier and one of the screws from your bag. Test the full range of your servo and put the horn assembly on loosely. Test the range again to see if the claw closes. When you're happy put the machine screw in.

Next!

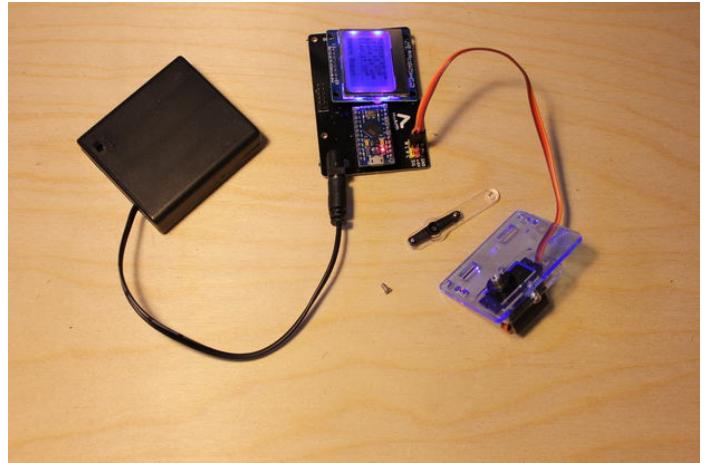
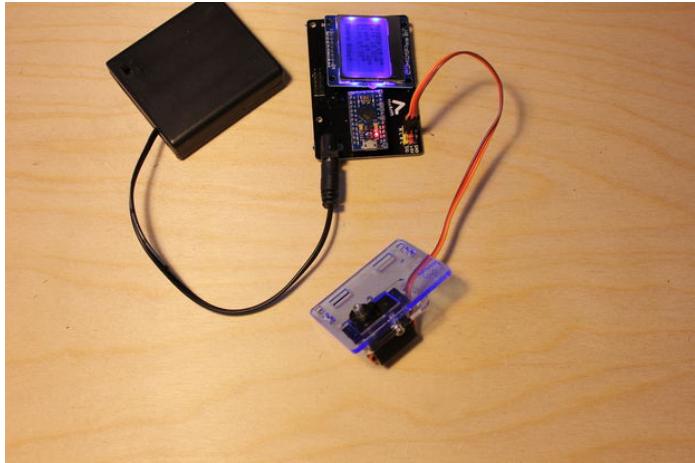




Step 10: Calibrate all the servos! Step Two Left

With your chosen controller get the horn assembly from earlier and one of the screws from your bag. Test the full range of your servo and put the horn assembly on loosely. Test the range again to check the lever doesn't go past where the base would be. When you're happy put the machine screw in.

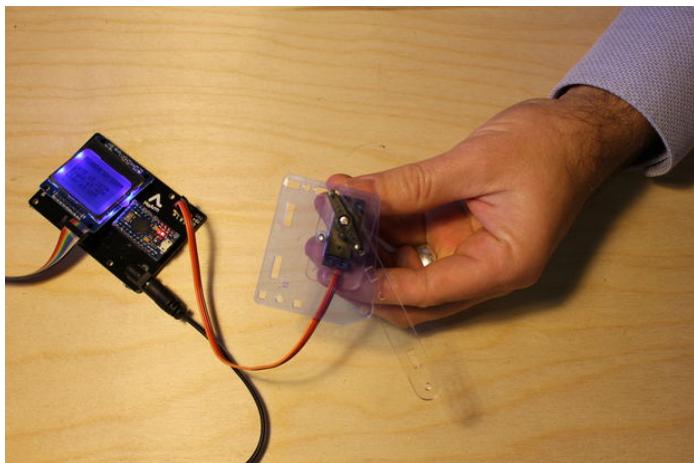
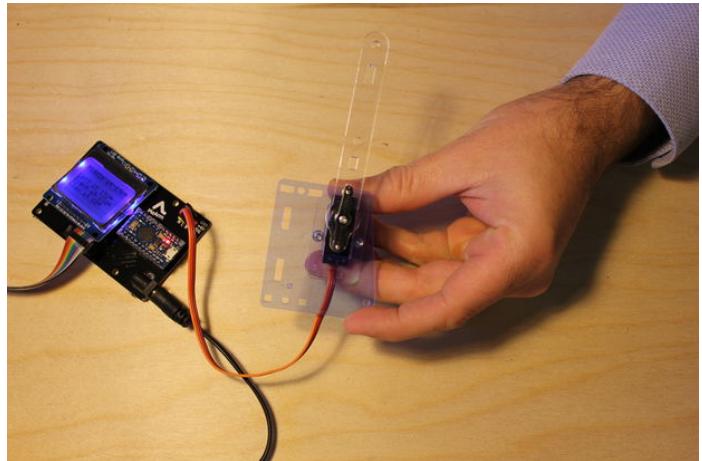
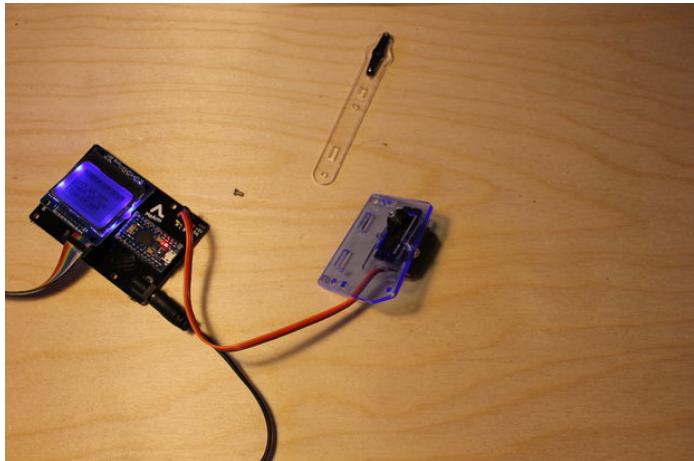
Next!



Step 11: Calibrate all the servos! Step 3 Right

With your chosen controller get the horn assembly from earlier and one of the screws from your bag. Test the full range of your servo and put the horn assembly on loosely. Test the range again to check the lever doesn't go past where the base would be. When you're happy put the machine screw in.

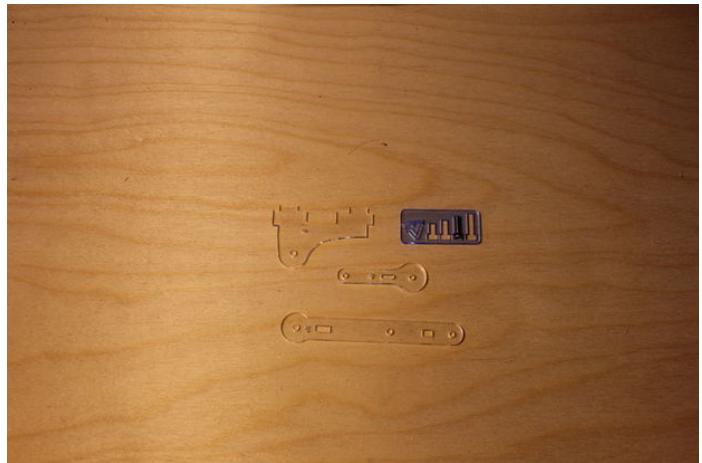
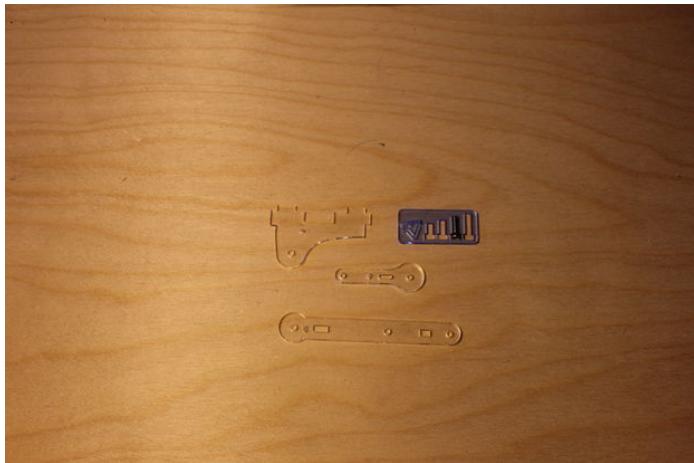
Next!

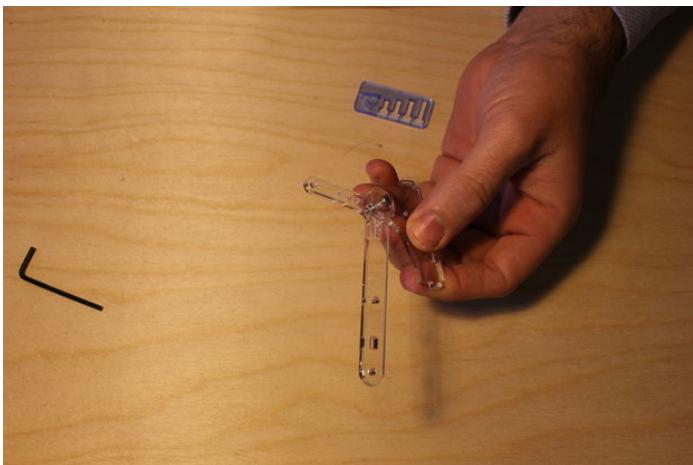
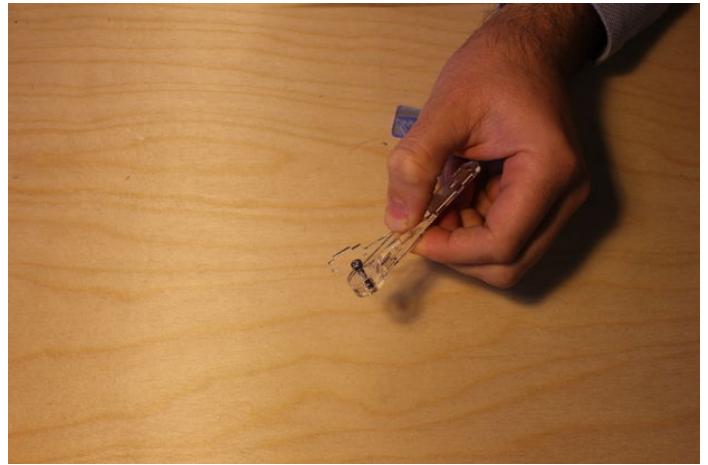


Step 12: Build the middle bit

Next we build the middle bit. What's important here is that the parts move in straight lines, and are loose like a marionette.

We've made some videos of the sort of looseness we're looking for. This is important for the whole structure. Loose parts so the servo has no force to work against.

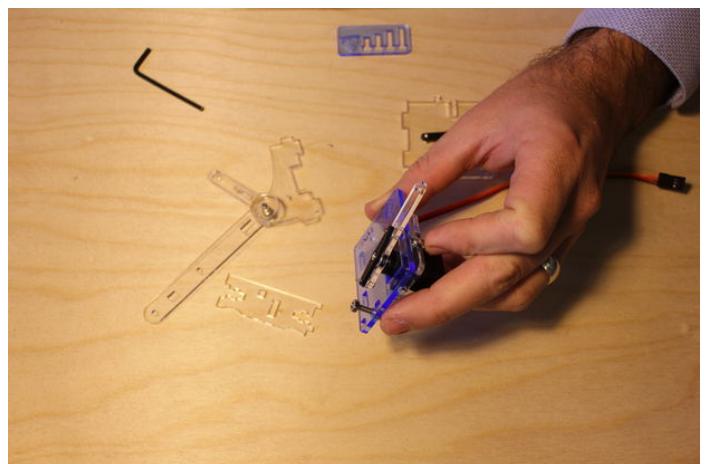
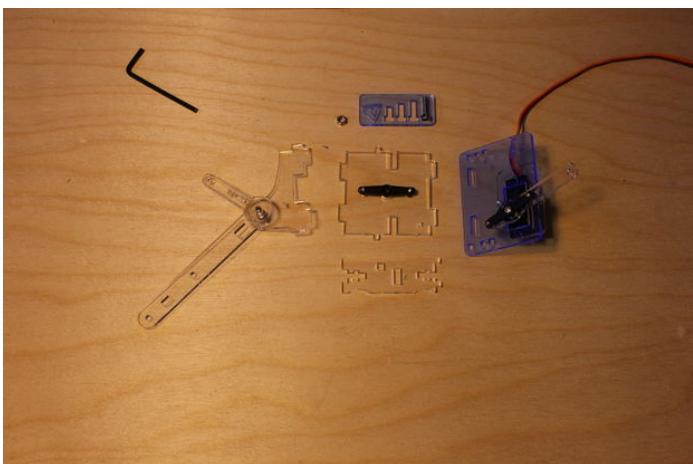


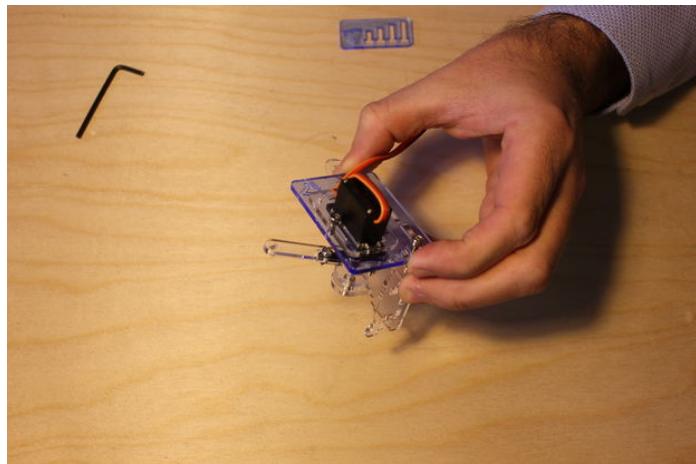
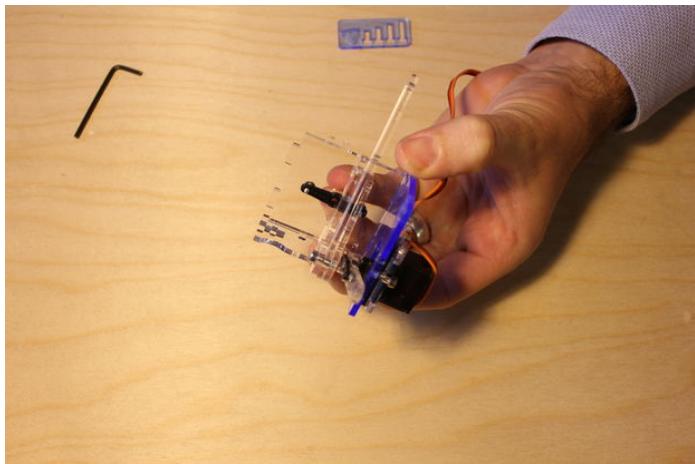
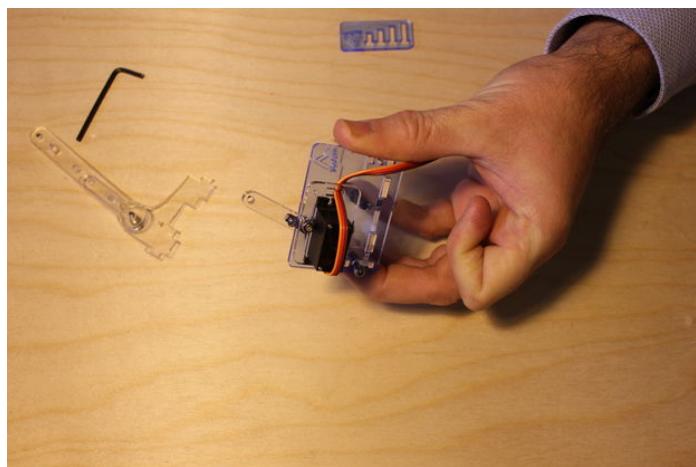
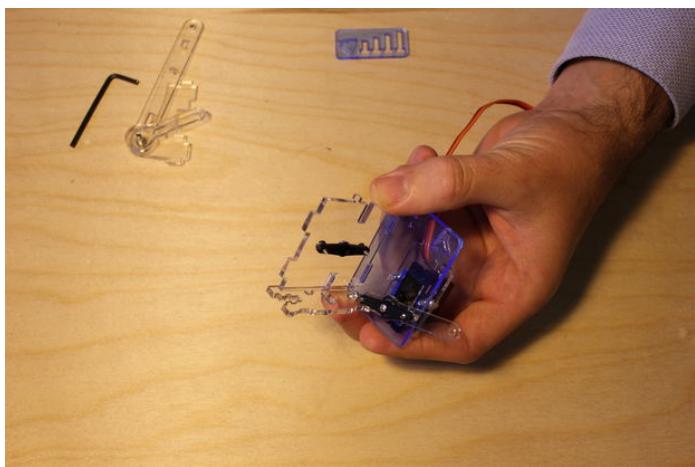
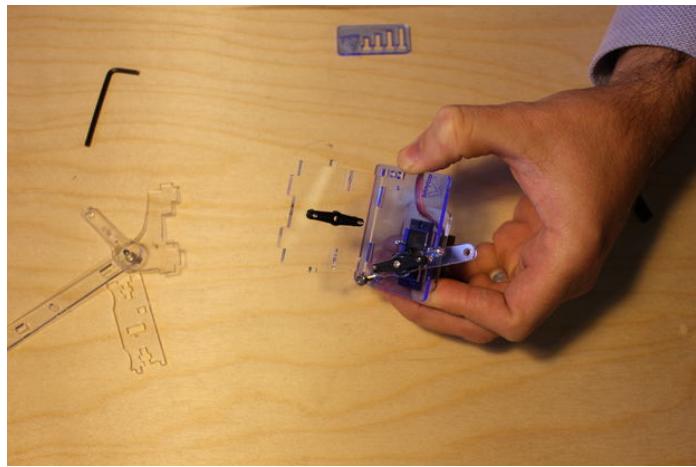
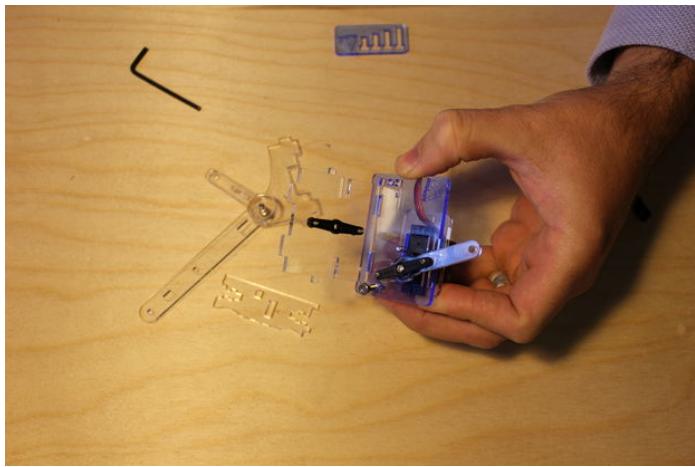


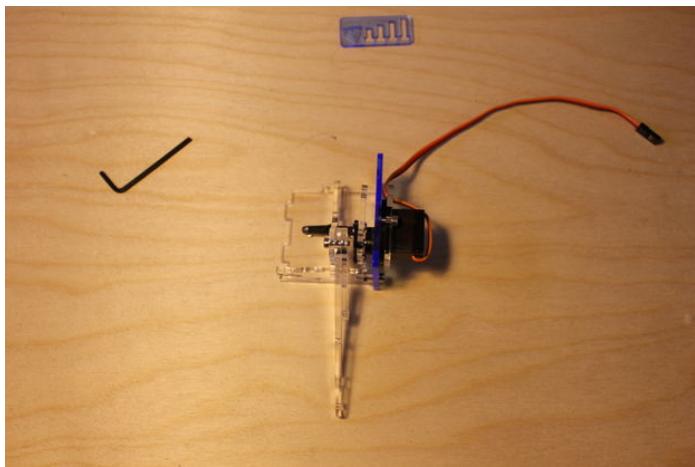
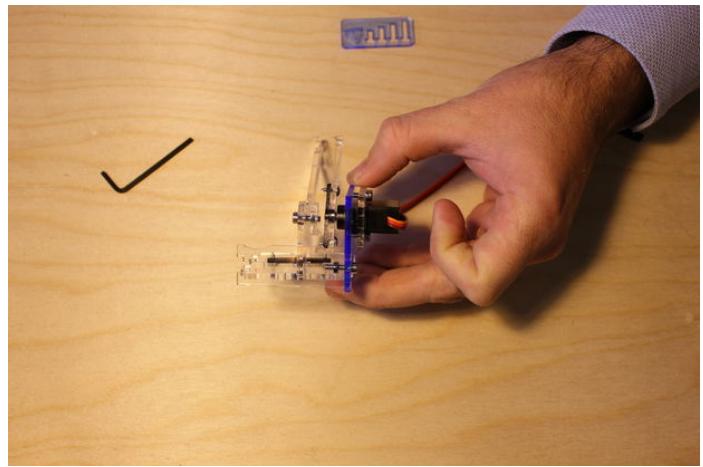
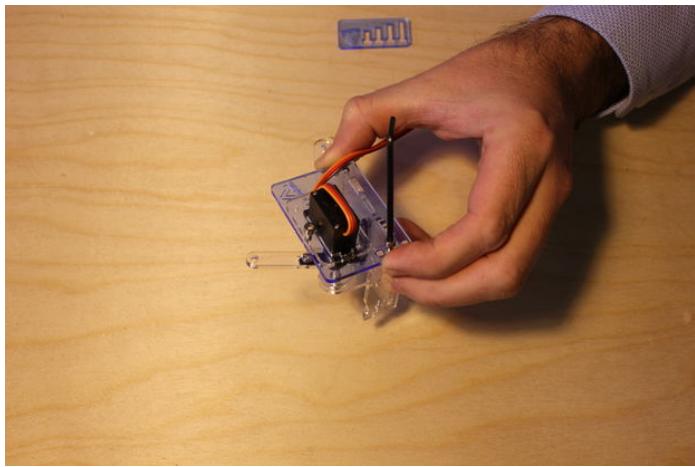
Step 13: Assemble the Base - Left Side (TRICKY)

We're entering the part of the build that is tricky, not like a crossword tricky, more like tying your shoes for the first time tricky.

We're putting together the left side, middle bit, front strut and centre plate. Check out the images, let us know if there's another image that would help.



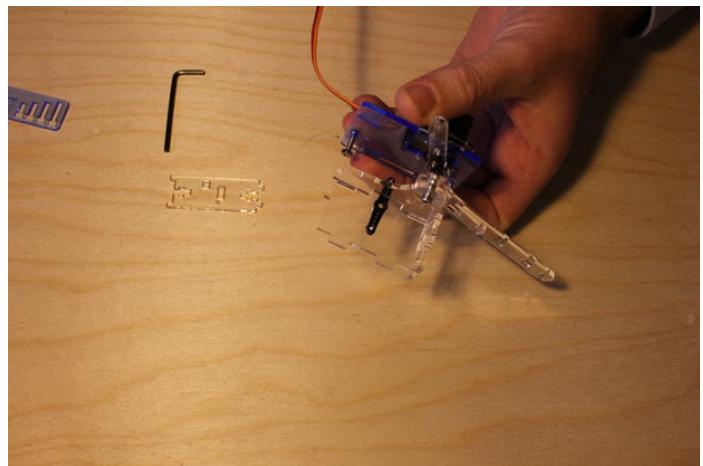
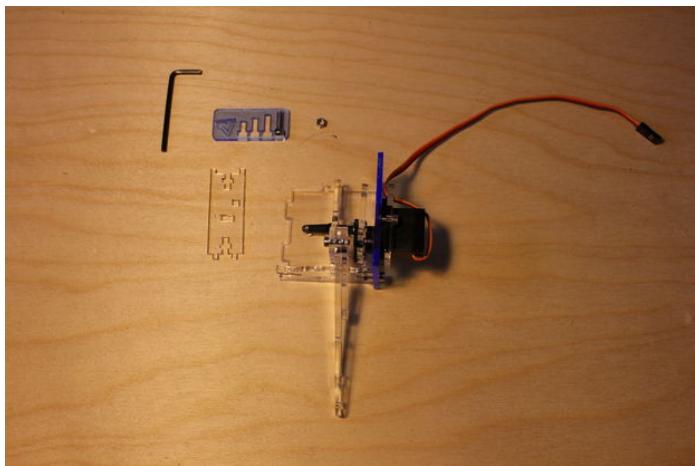


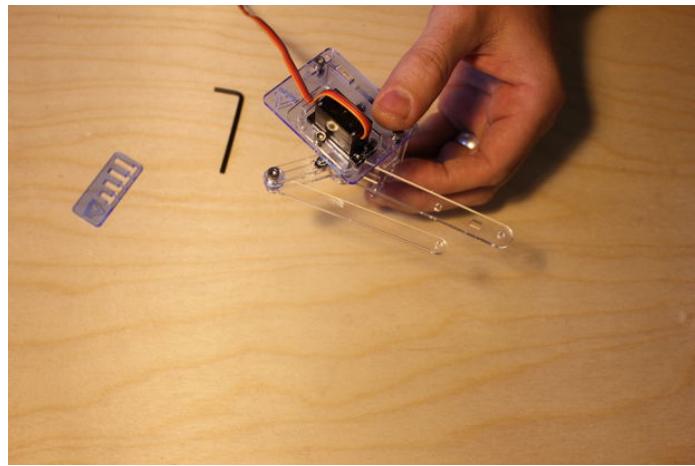
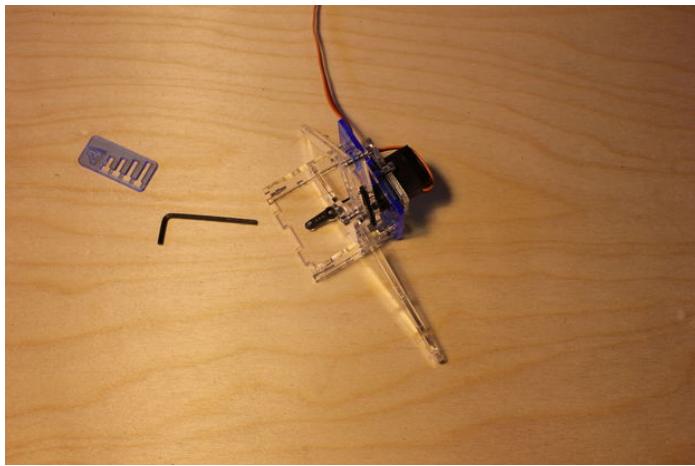
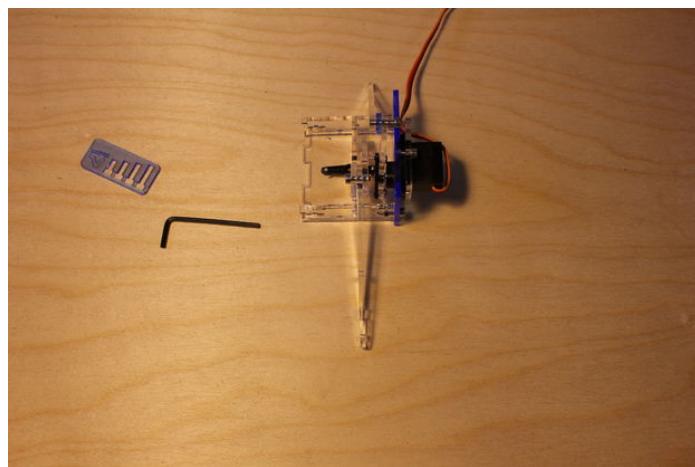
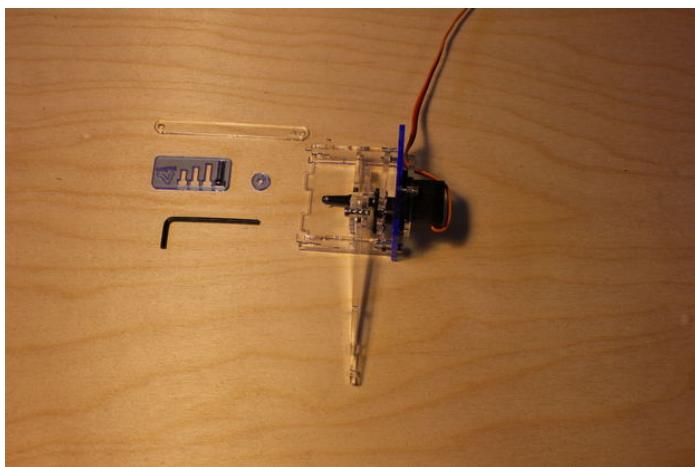
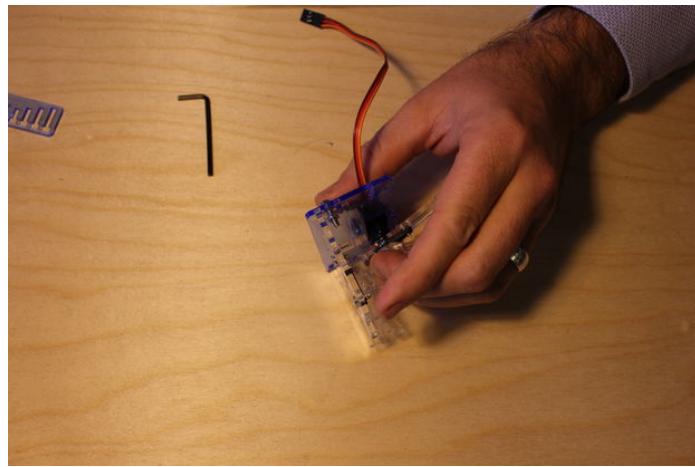
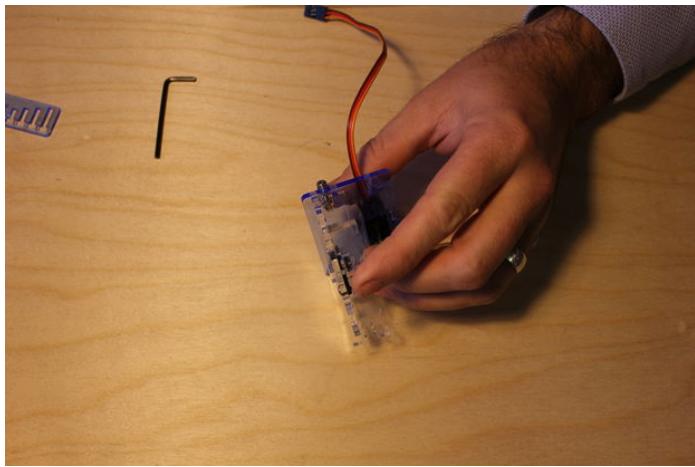


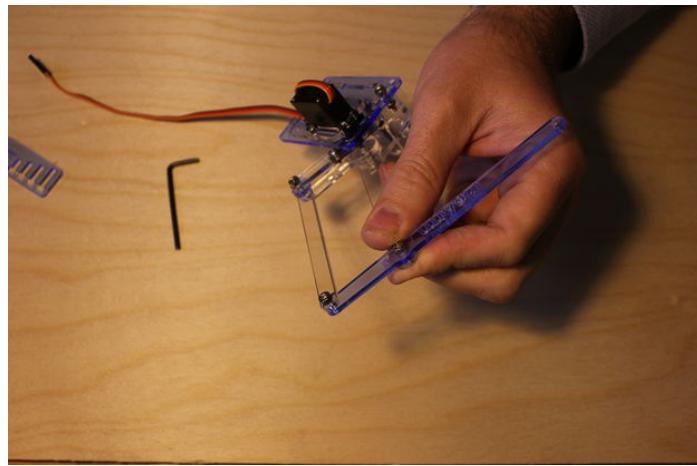
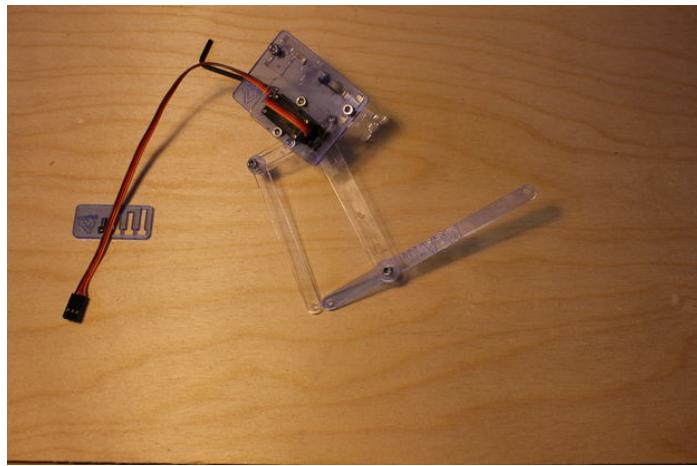
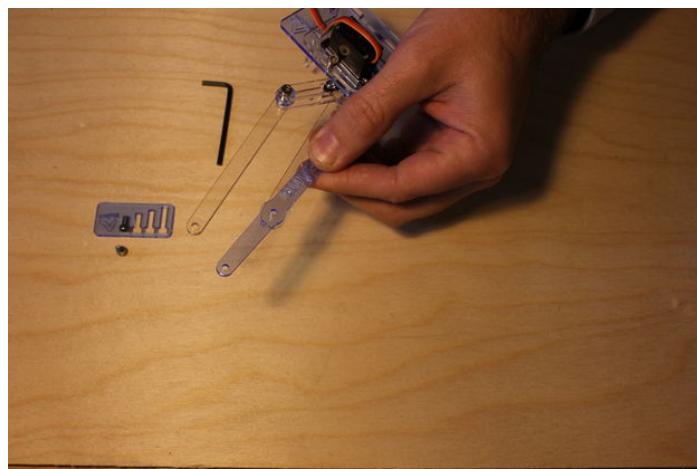
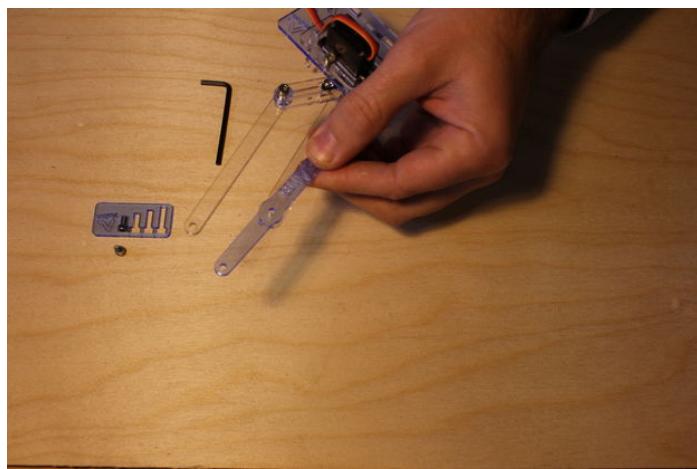
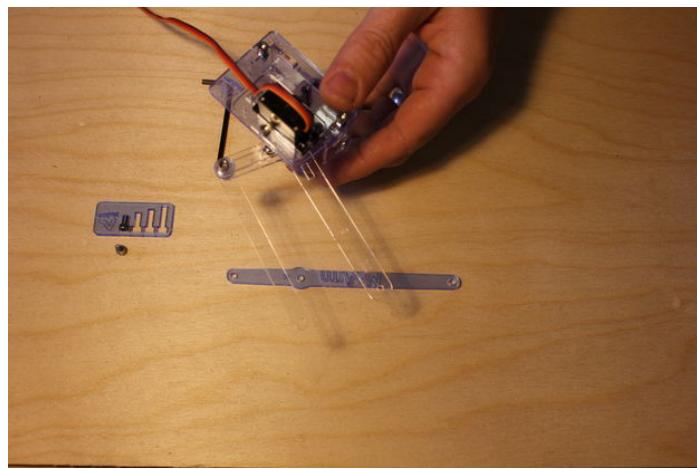
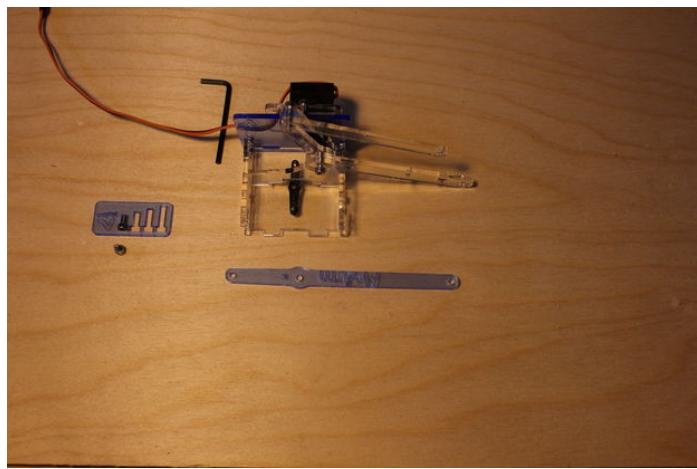
Step 14: Assemble the base - Left Side Levers

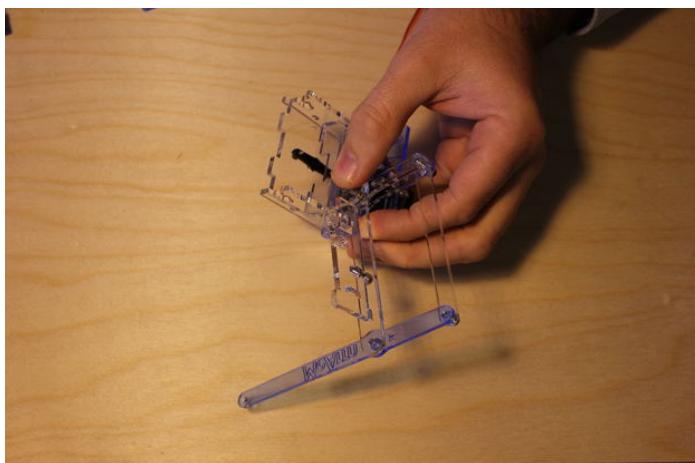
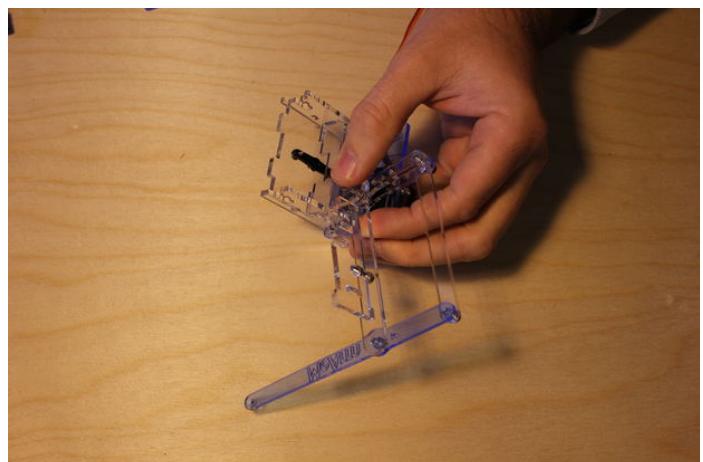
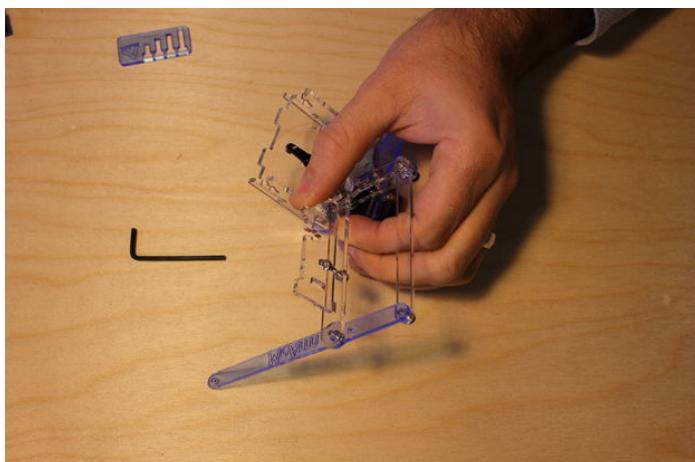
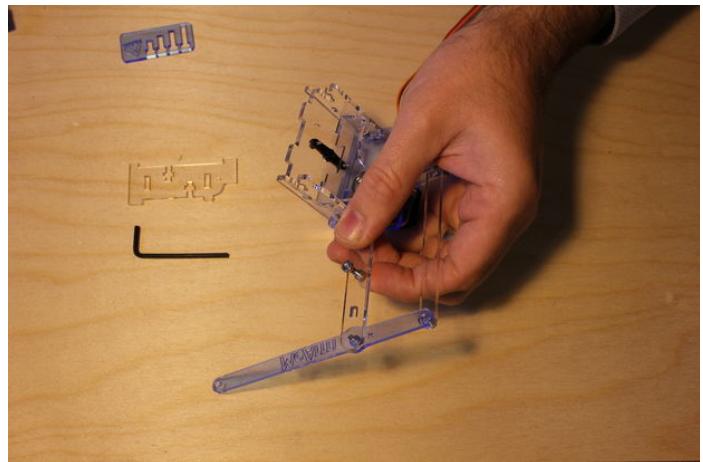
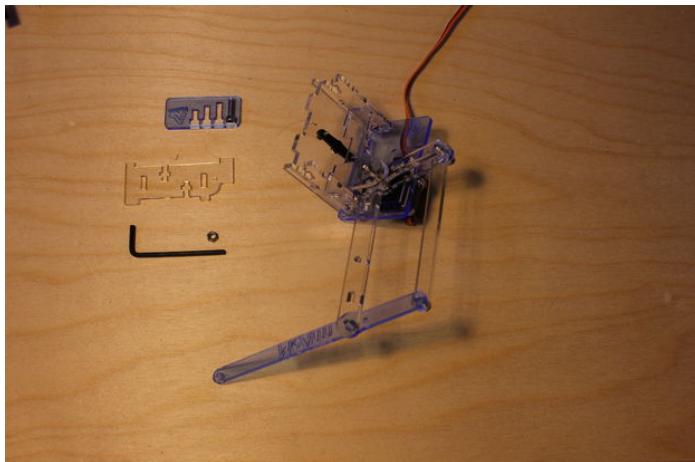
Now we add the back strut and levers on the left side.

Here again we want the joints to be loose! Check out the images, let us know if there's anything that's not clear.





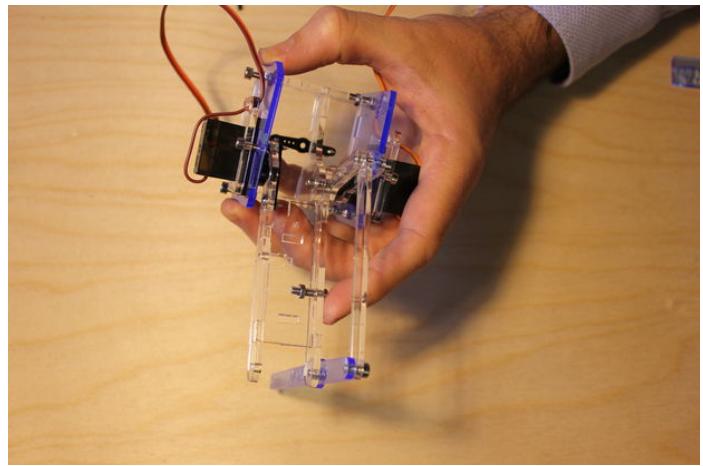
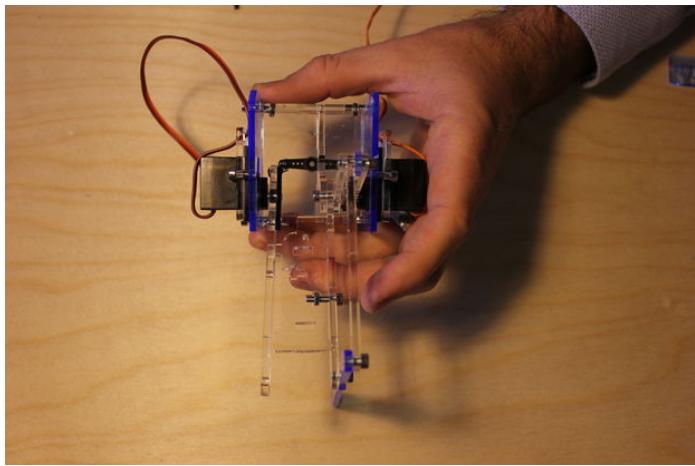
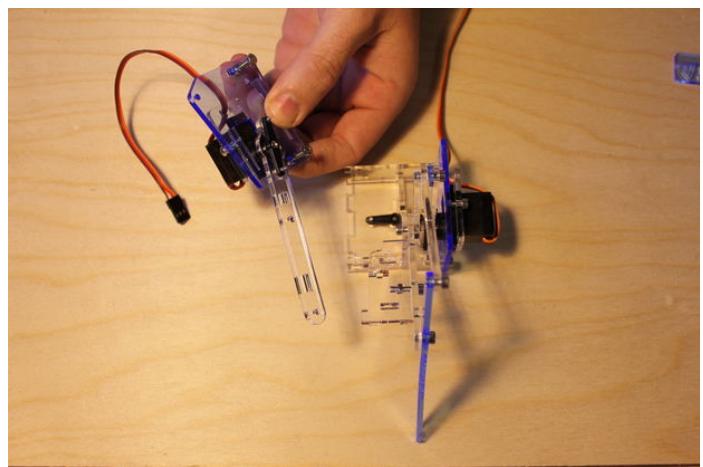
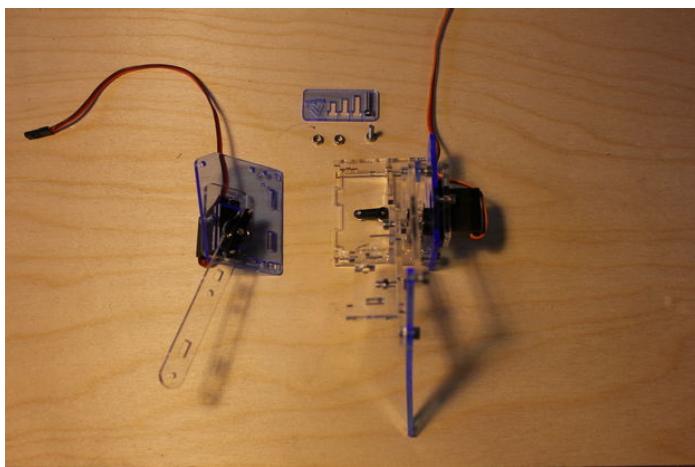
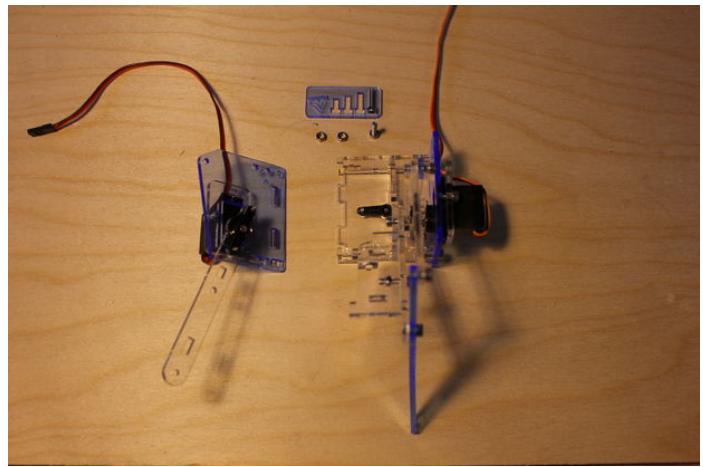
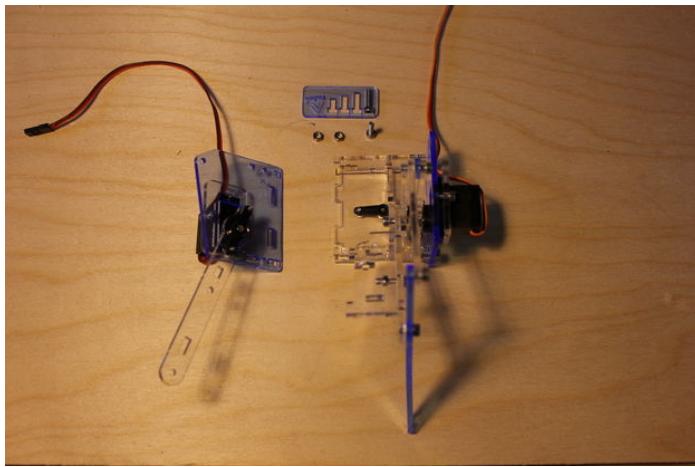


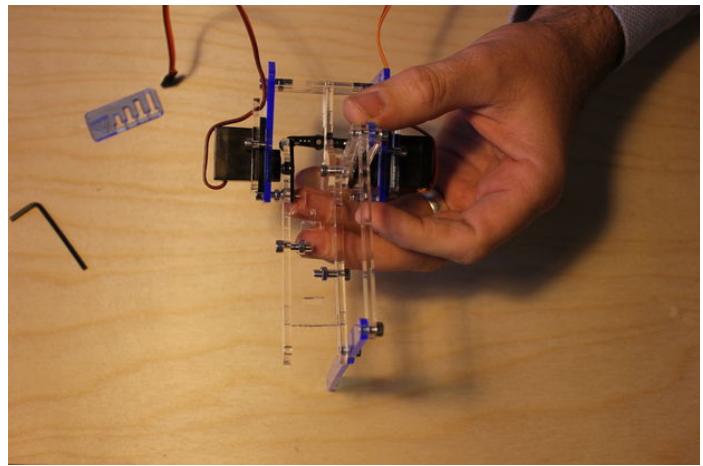
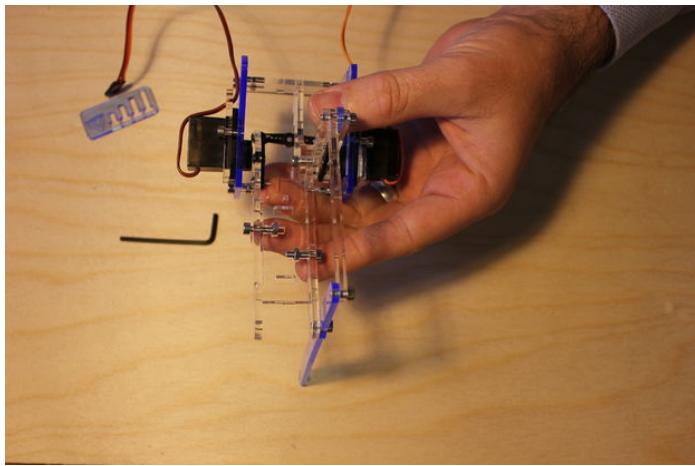
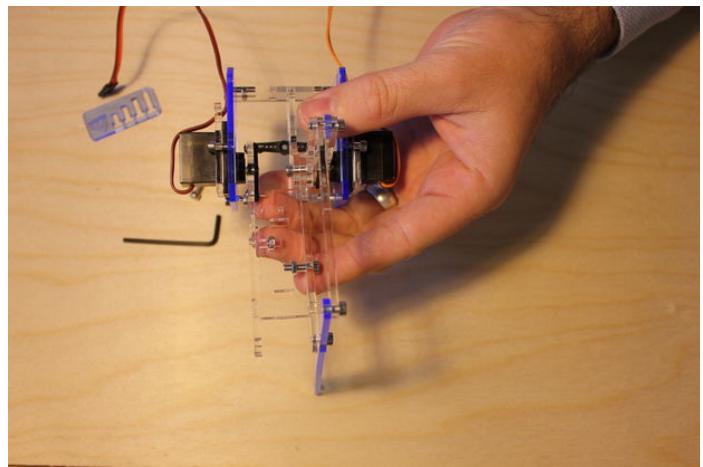
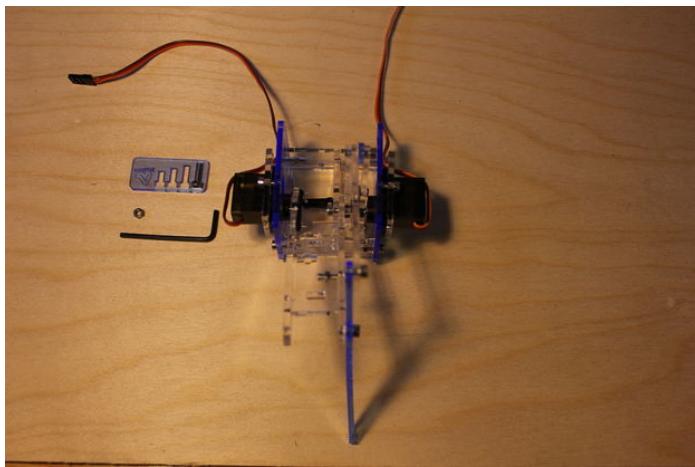
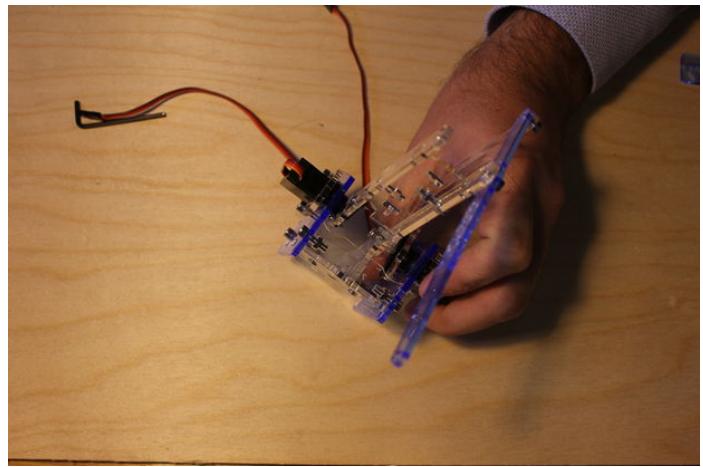
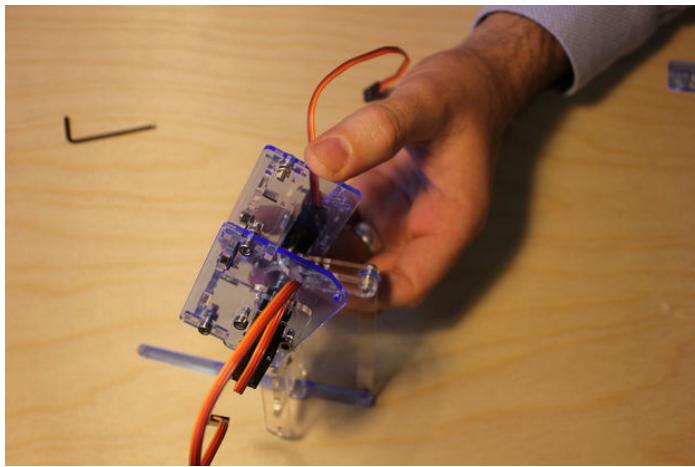


Step 15: Assemble the Base - Right Side and Centre Strut (you will hate me)

This is the part where you'll want extra hands. It's a little tricky to line everything up. Once this is done though it's easy. Please don't give up here. Feel free to swear at me.

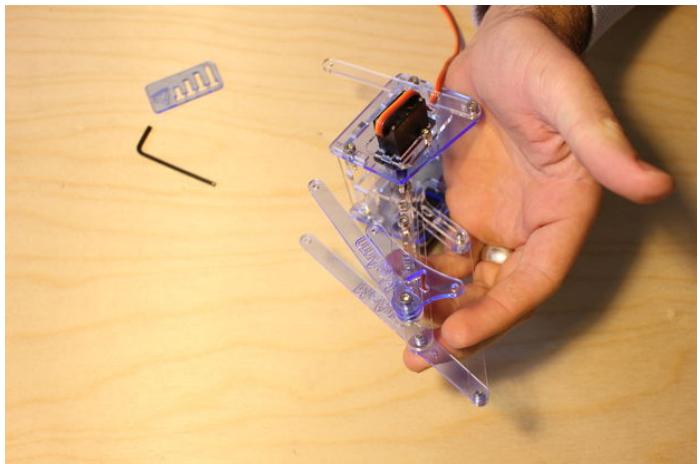
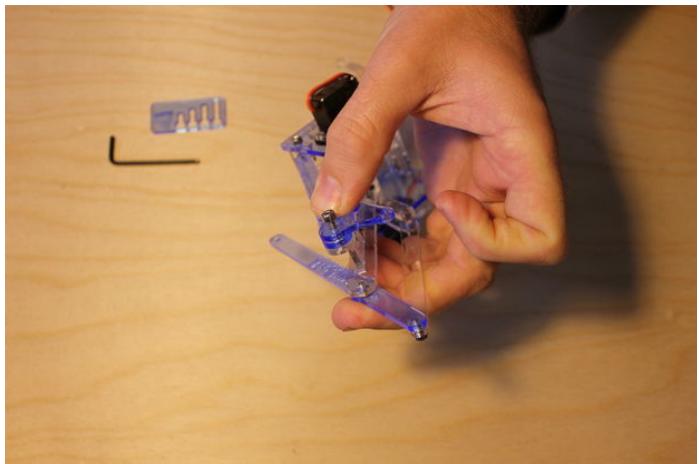
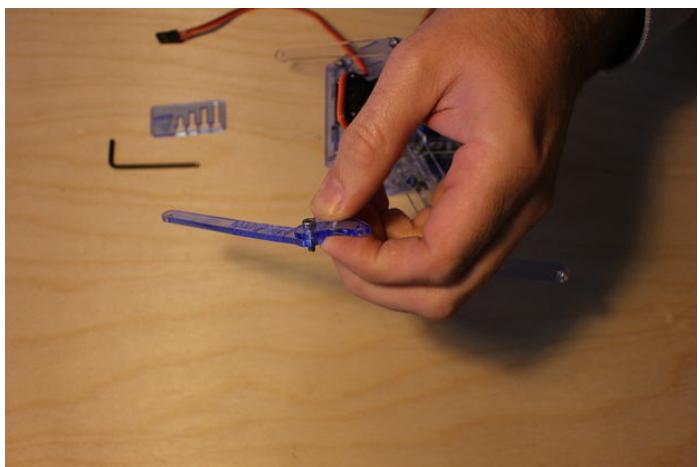
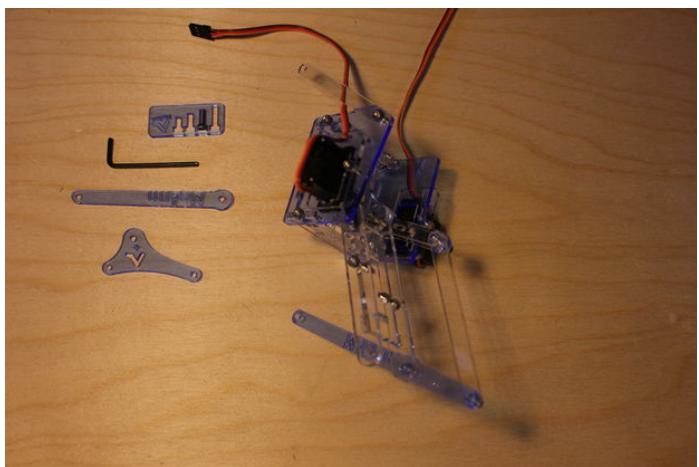
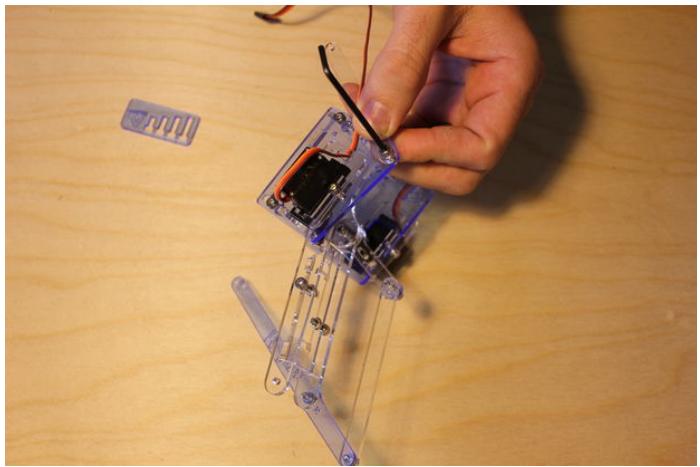
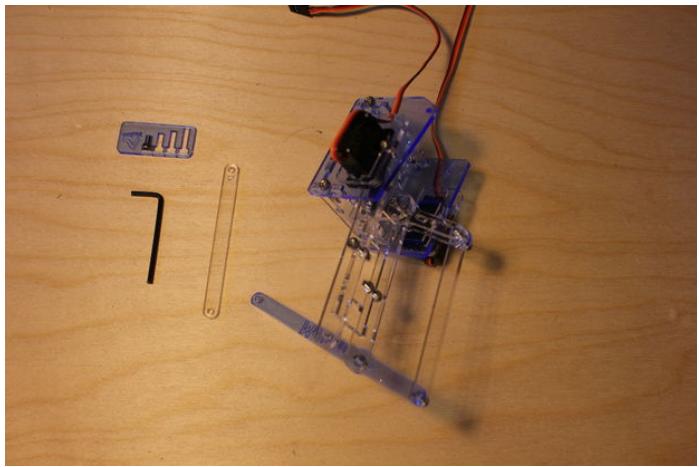
Follow the images and see how you get on, please let me know if anything else would help. Please keep it clean!

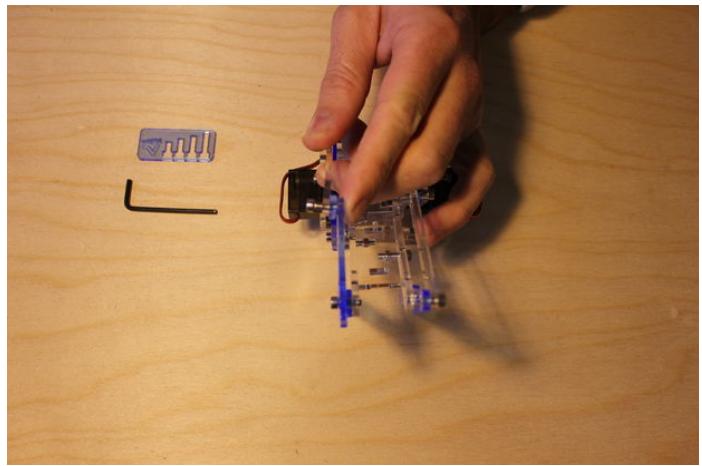
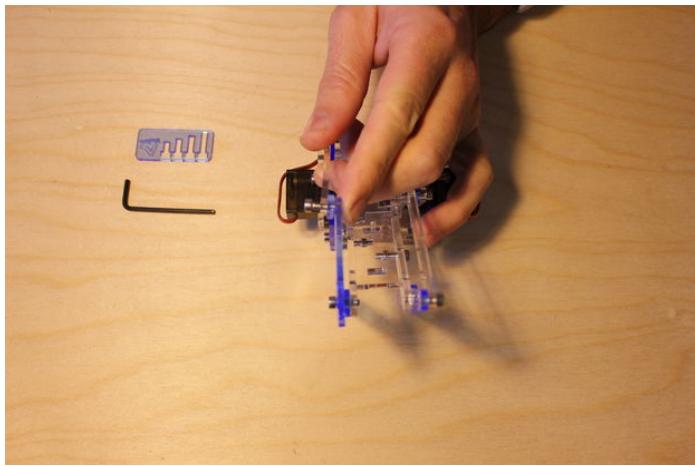
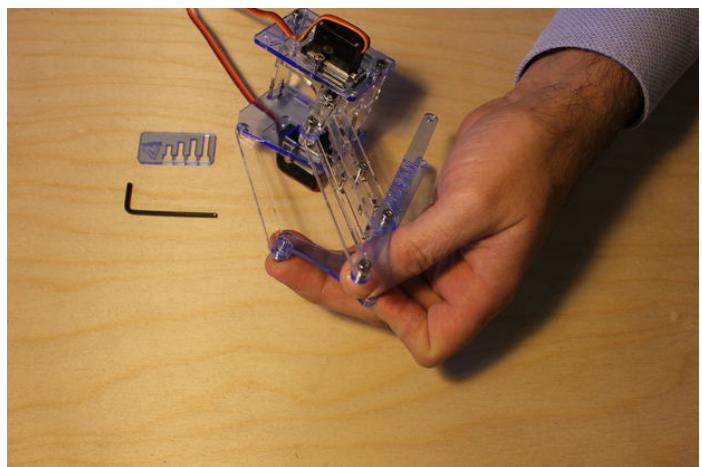
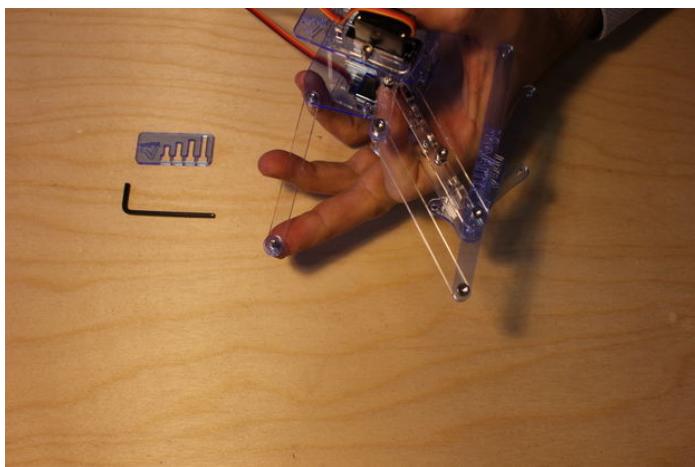
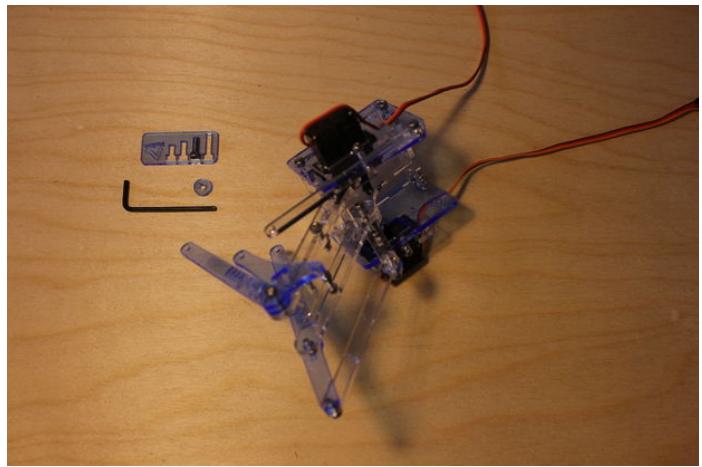
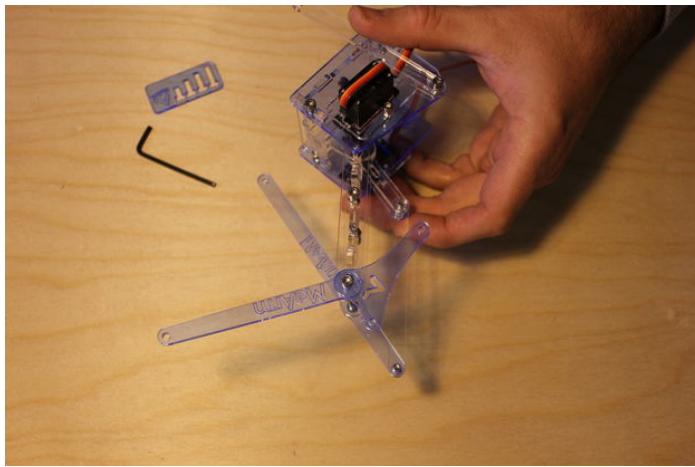


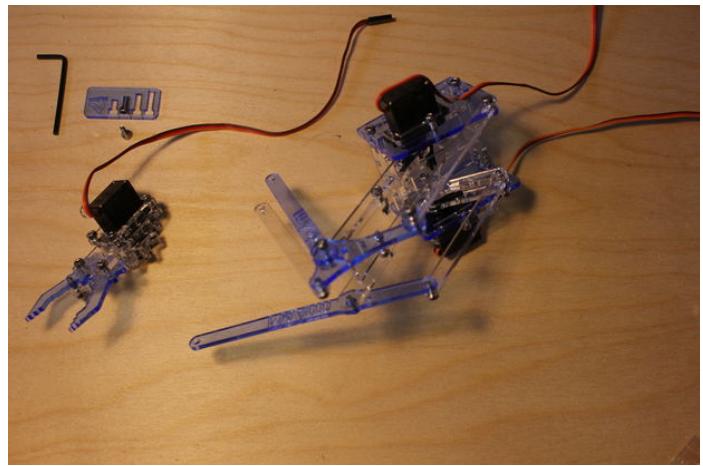
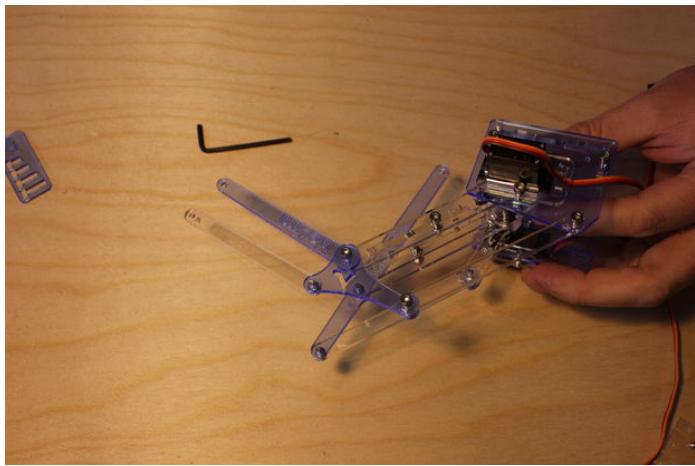
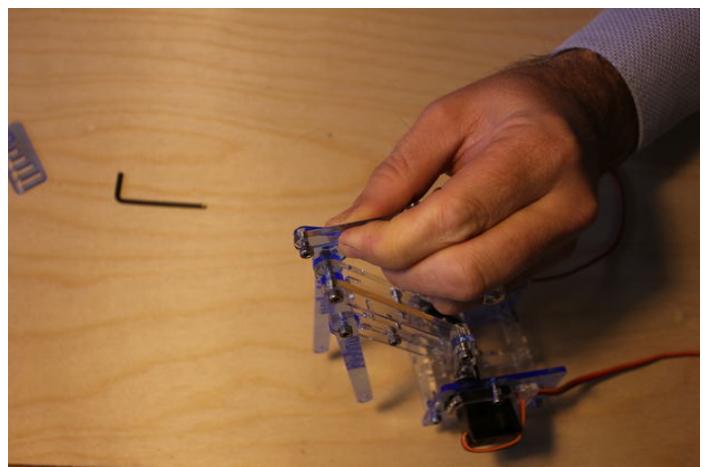
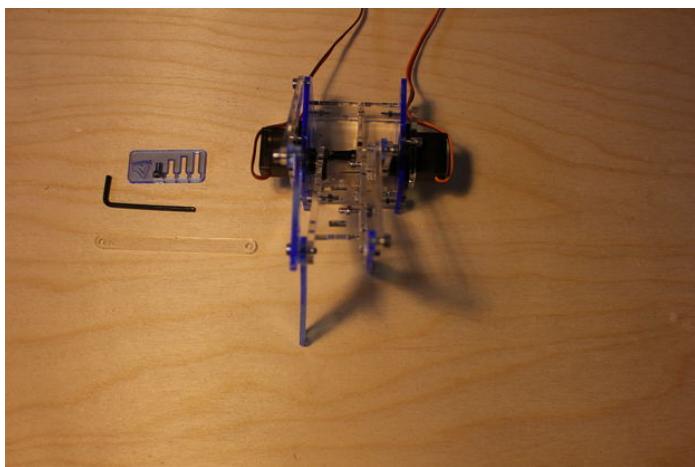
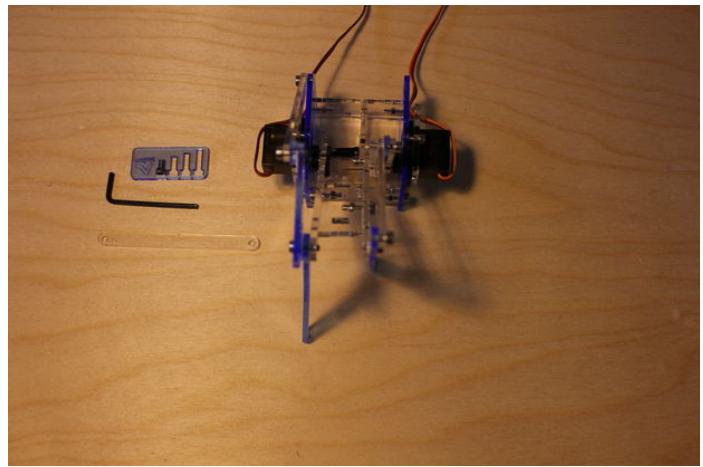
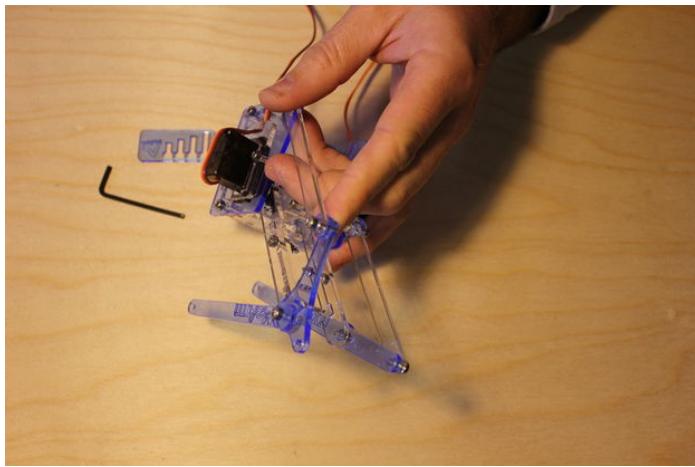


Step 16: Add the Right Side Levers

These are all nice and easy. Again keep it loose. Orientation of the Y shaped part is important.

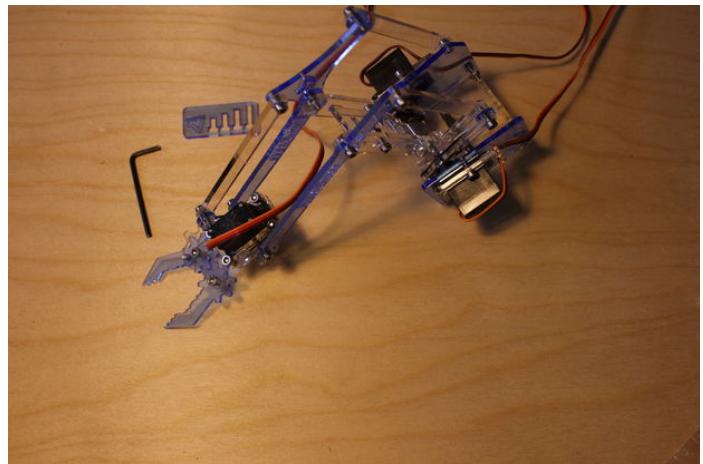
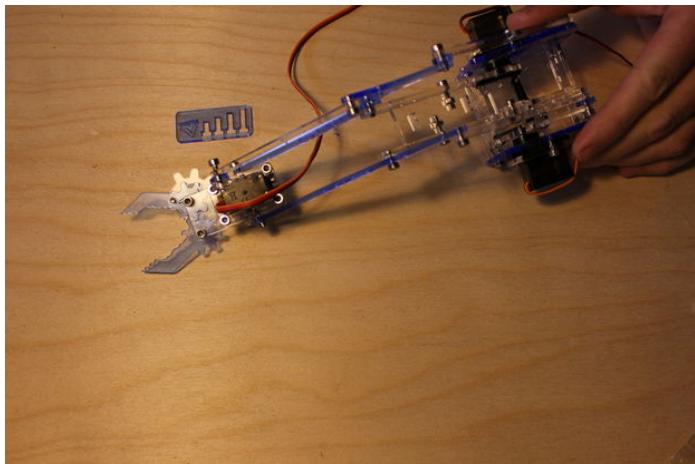
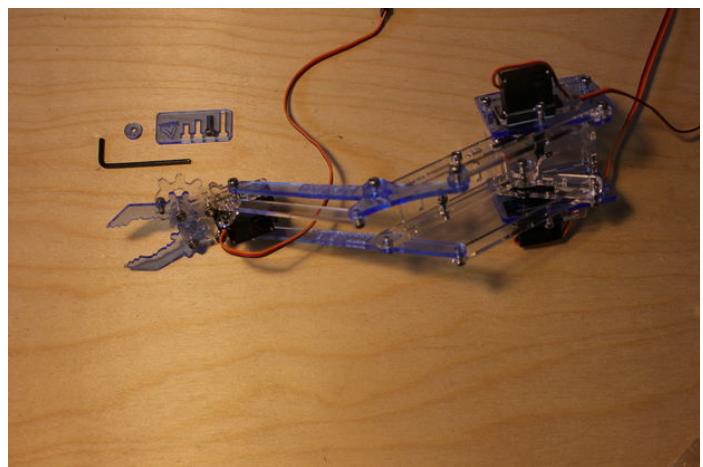
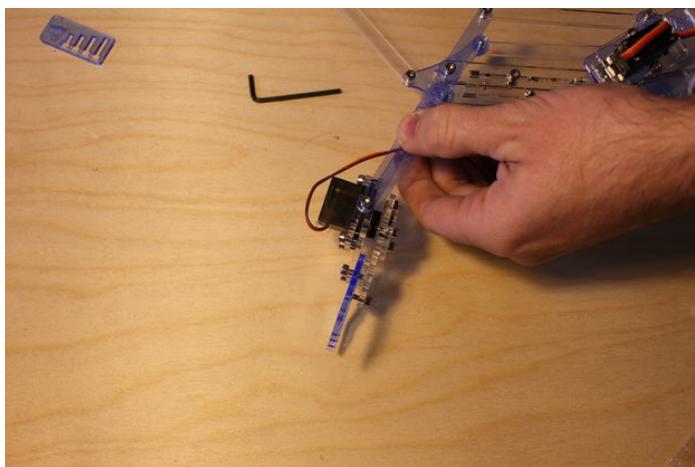
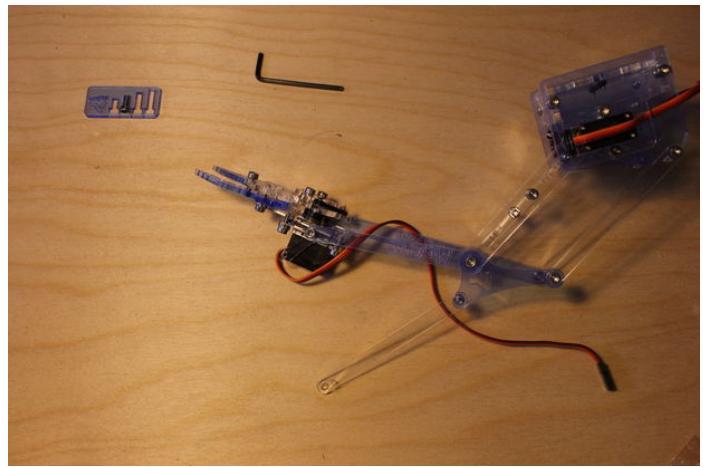
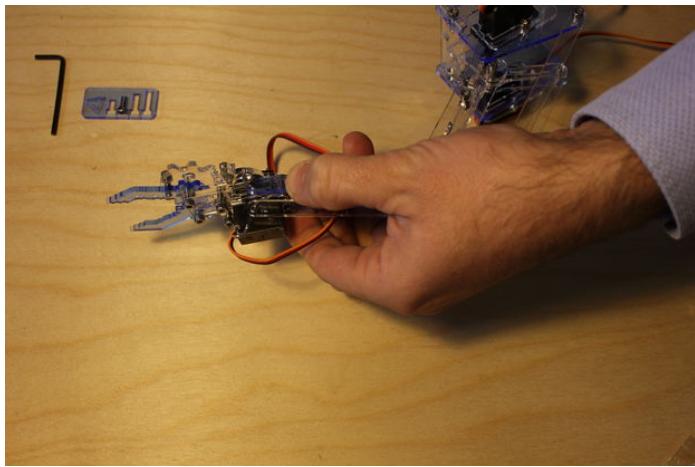






Step 17: Attach the Claw!

Almost there! Three screws for this bit.



Step 18: Attach to the base parts - Plug in Servos!

One screw to attach the base, you should have one machine screw remaining. You want it to turn 90 left and right from the centre. Attach the servos as shown, add batteries and you're oh so good to go!

