

Building the Robot

TEACHER'S
RESOURCE

Goals

- To get a robot built to complete the programming activities
- To learn to follow directions/schematics to construct the robot

Preparation

- Make sure if your robot is NOT already built to complete the Introductory Kit Overview Activity
- Using the guide, have the student build the Robot
- The teacher can build the robot ahead of time if desired

*HINT- The hardest part is mounting the caster as the bolts and nuts are very small take care to not lose these while attaching the caster.

Activity

- Using the slides, build the Robot

KIPR Robot

Please go ahead and follow the slides to complete the assembly of your robot

Write your name on your robot box

Open Your Box

Take out all of the following items
(on the following slides) and set to
the side to be prepared for the robot
build.

Once you have all the items set
aside you can put everything else
back into your box

1 KIPR Link robot controller

Remove it from the red bubble wrap bag.

1 KIPR Link robot controller charger

Remove it from the white box. You will need to find an outlet to plug this in



1 USB download cable

Remove it from the packaging and set aside.



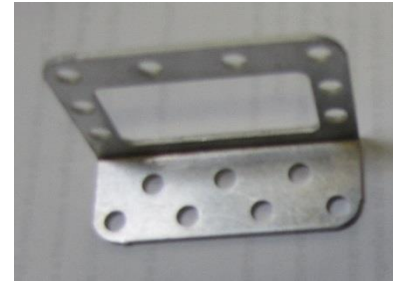
KIPR Metal Construction Pieces

1 Chassis

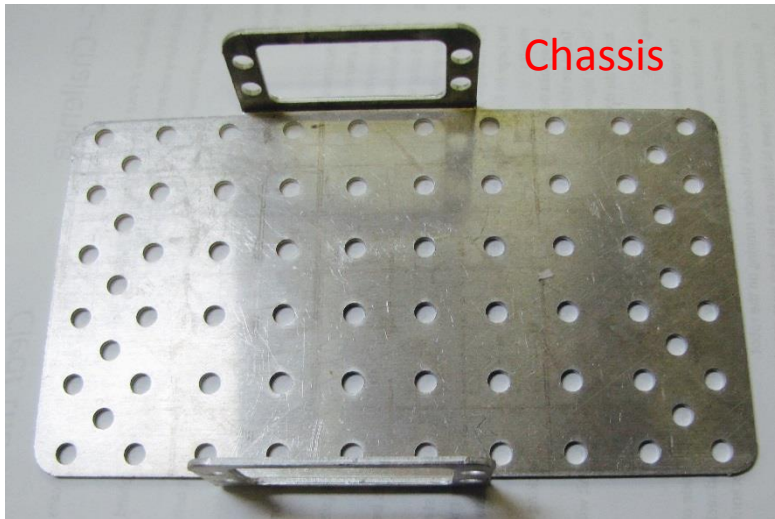
1 Motor Bracket

1 Angle Bracket

Motor Bracket



Chassis



Angle Bracket

1 Screwdriver

1 Bag of plastic Pop Rivets



Screwdriver



Pop Rivets

1 Caster (will be in a bag)



Caster

2 Motors with wheels

1 Servo motor

1 Servo Motors (leave the other plastic pieces and screws in the bag)



WE WILL COME BY AND REMOVE THE WHEELS AS YOU WILL BE USING THE LARGER WHEELS
(2 black wheels in a bag with two silver screws)

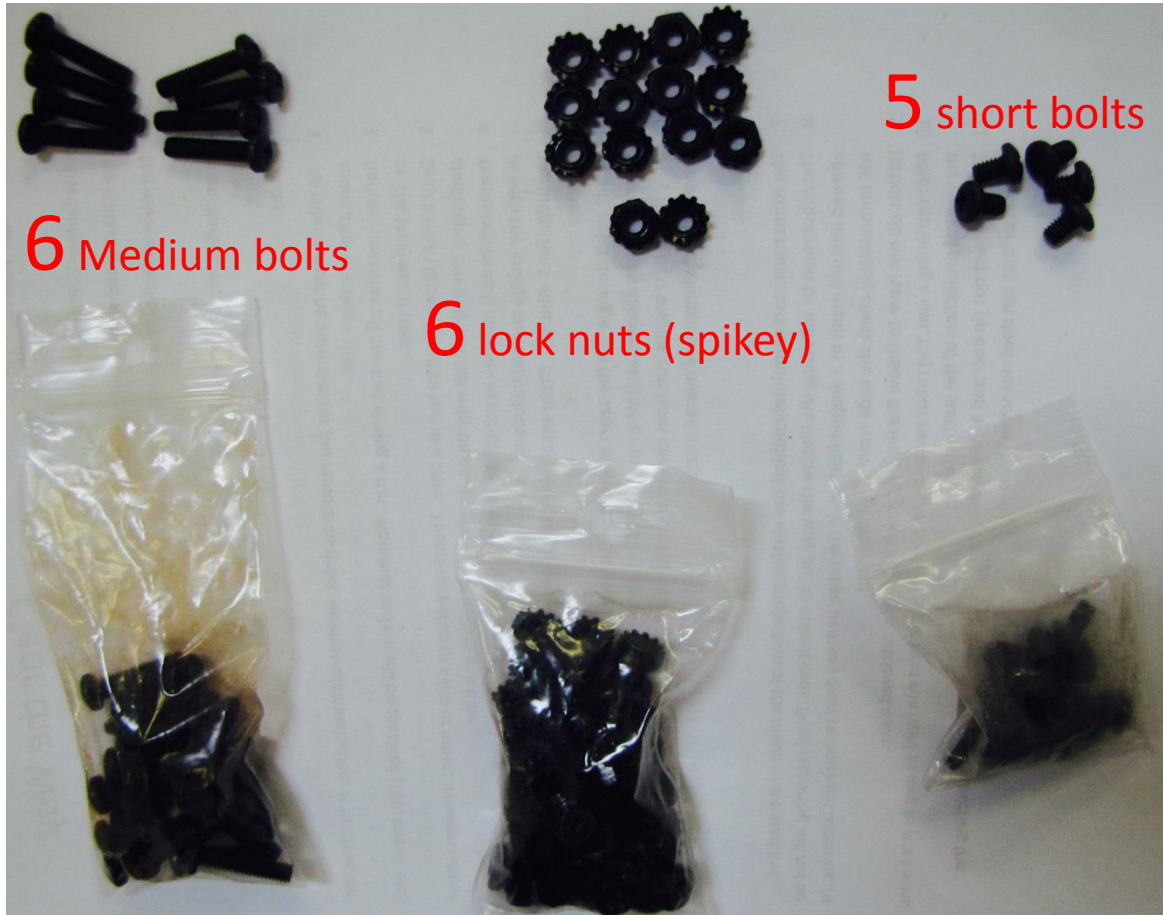
2 Motors with wheels (leave the other plastic pieces and screws in the bag)



Large Black Wheels

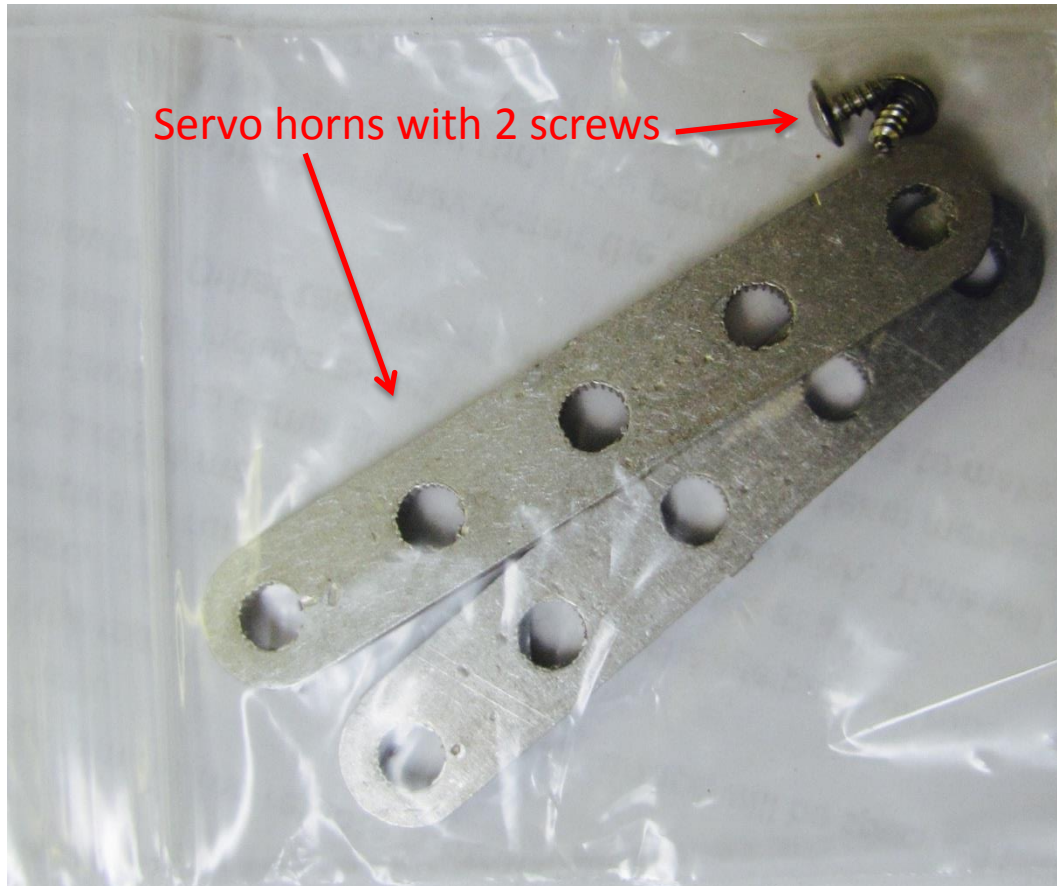


From large bag of bolts & nuts



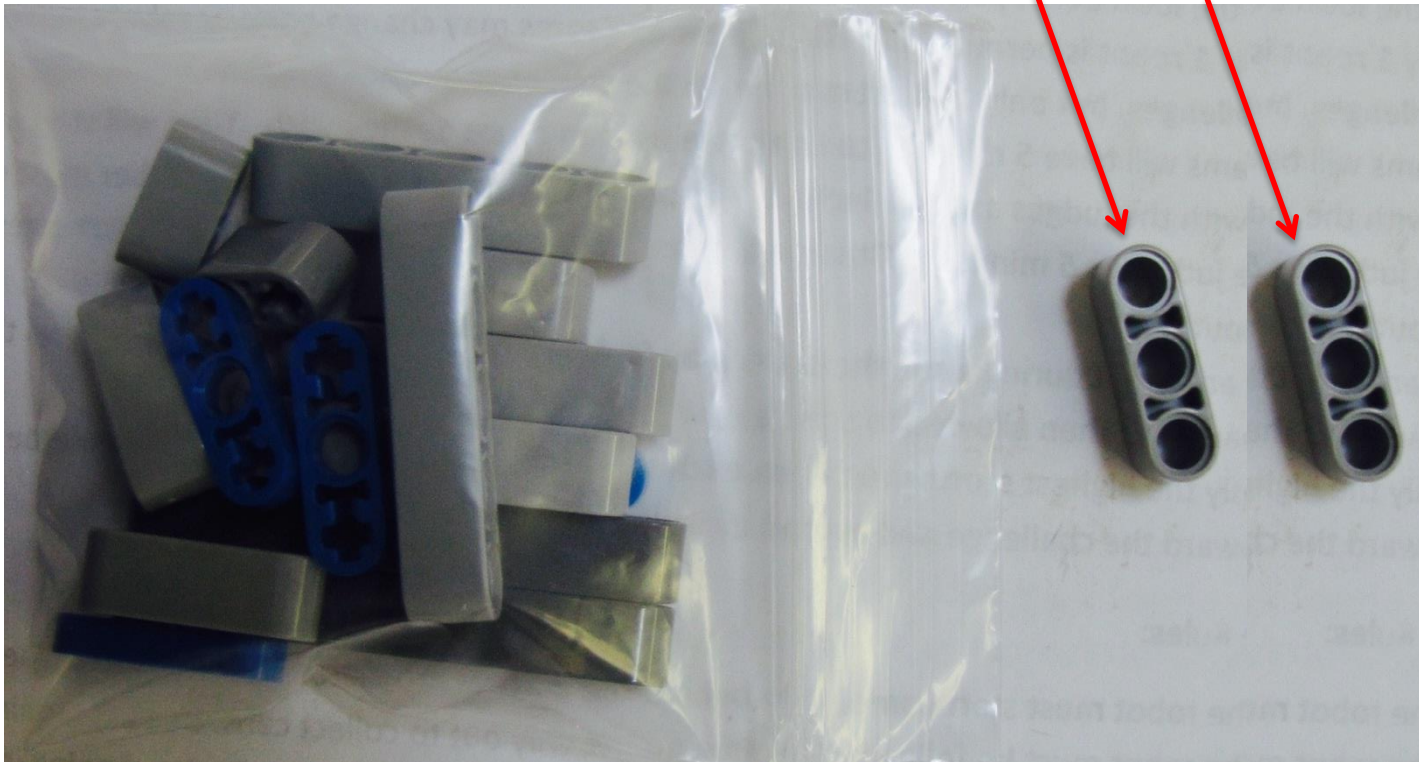
Bag with two metal servo horns & screws

Remove **one** metal horn and **one** screw



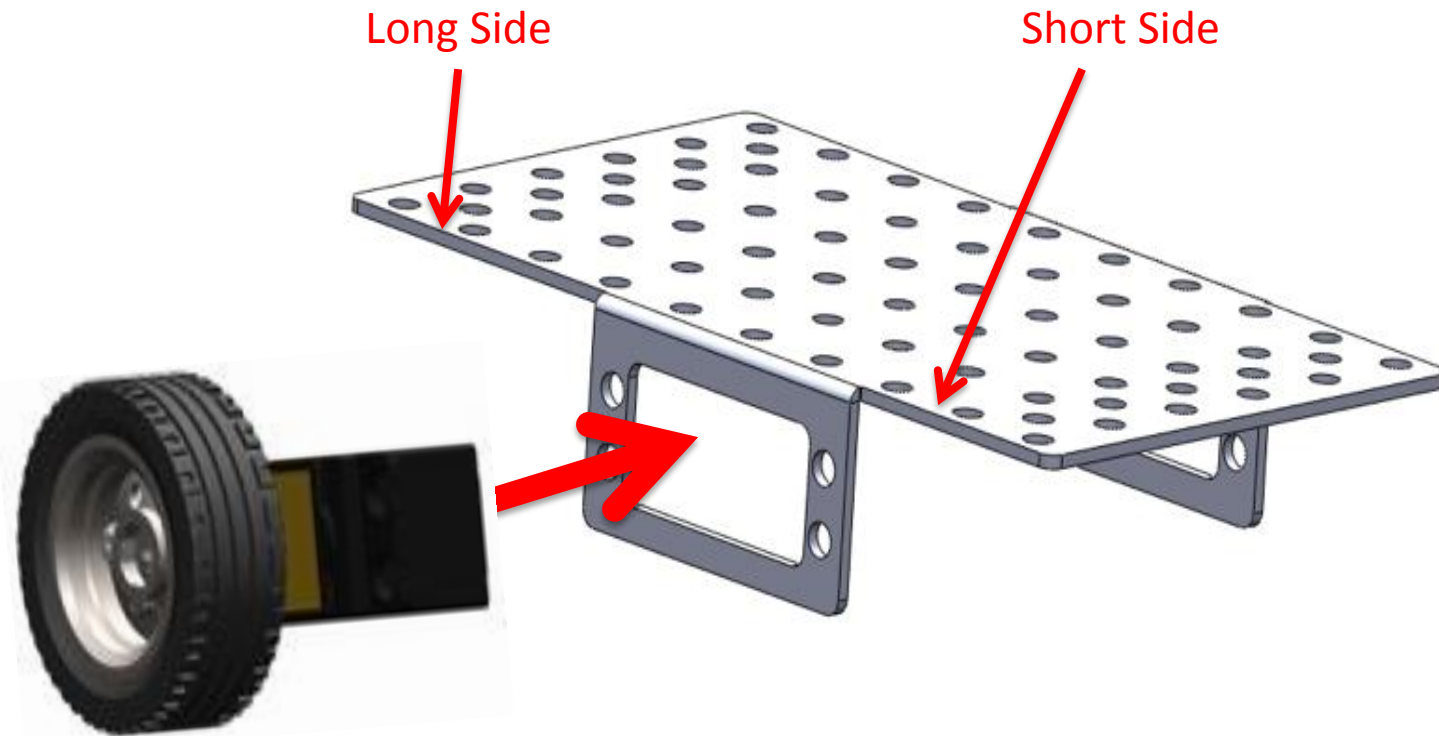
LEGO for the caster

2 -3 hole LEGO piece (color may vary)



Now that you have the parts set aside

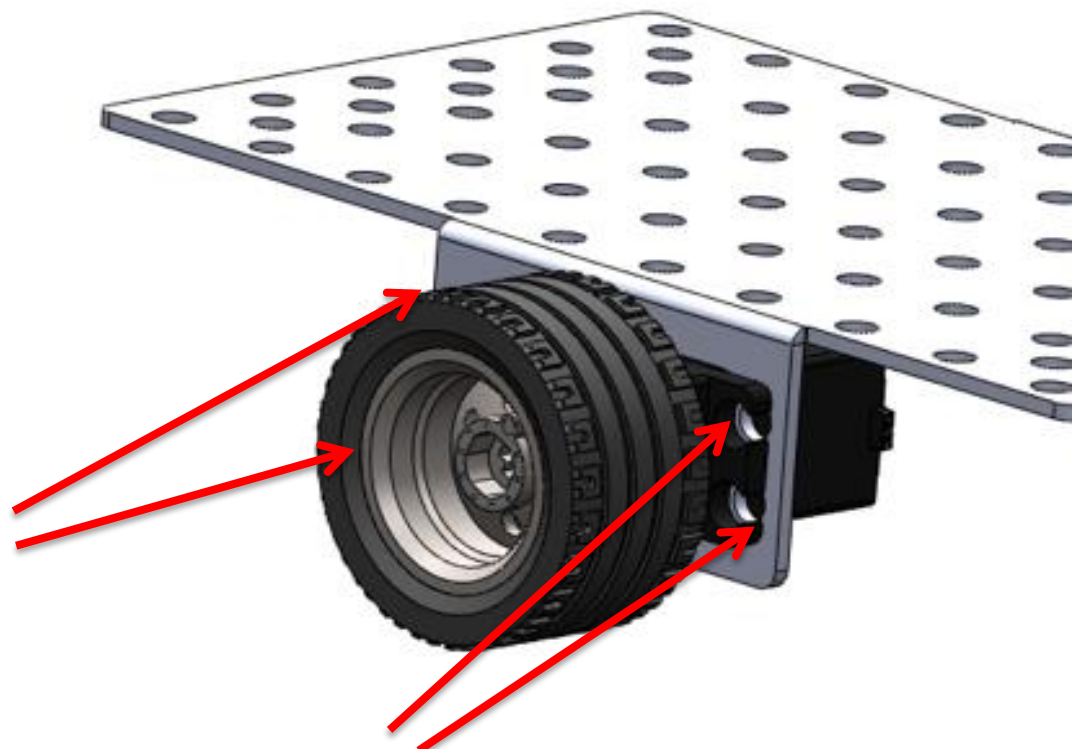
- Put everything else back into your robot box



Insert the motors into the chassis (put the wire through first).
WE WILL COME AROUND AND REMOVE THE WHEELS FROM THE
MOTOR-(Or you can remove them and set aside with the screw)

The wire should be next to the short side of the chassis.

Make sure and mount the motor with the wheel **closest** to the **shorter side** of the chassis.



Plastic Pop Rivets pushed
through from BACK of
motor

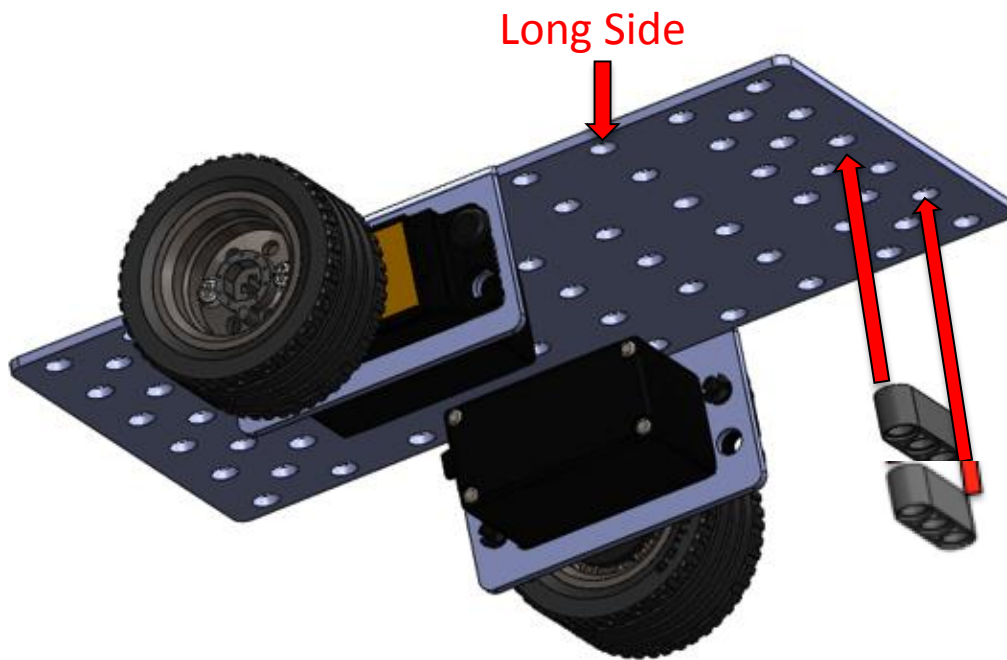
The diagram shows a top-down view of a motor assembly mounted on a white perforated metal chassis. A black motor with a tire-like tread is positioned in the center. Four red arrows point from the text labels to specific parts of the assembly: two arrows point to the back of the motor, and two arrows point to the mounting holes on the chassis.

Long Bolts, nut on back

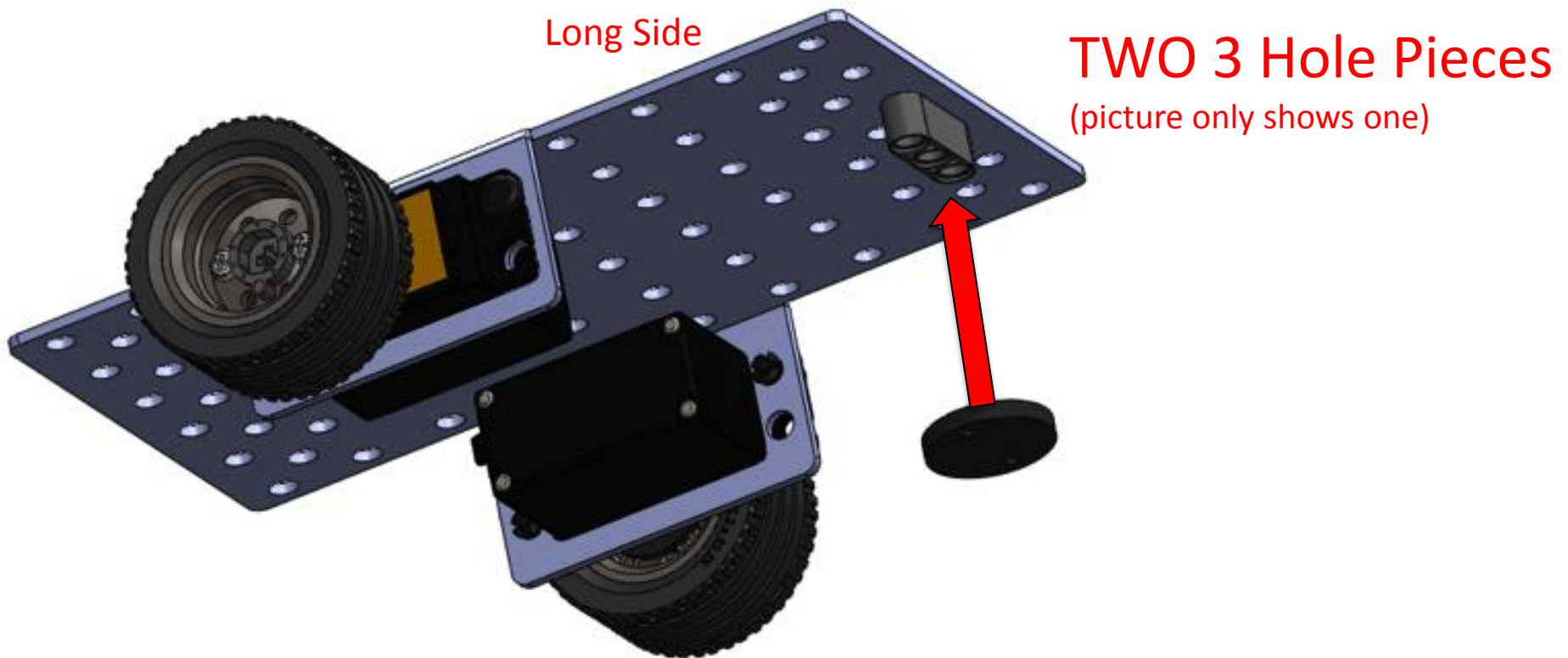
Use 2 plastic pop rivets to secure the motor to the chassis. These will be pushed in from the back side.

Using two bolts and nuts secure the motor to the chassis on the two holes that are easy to get to. You do not need the wrench, simply hold nut with your finger.

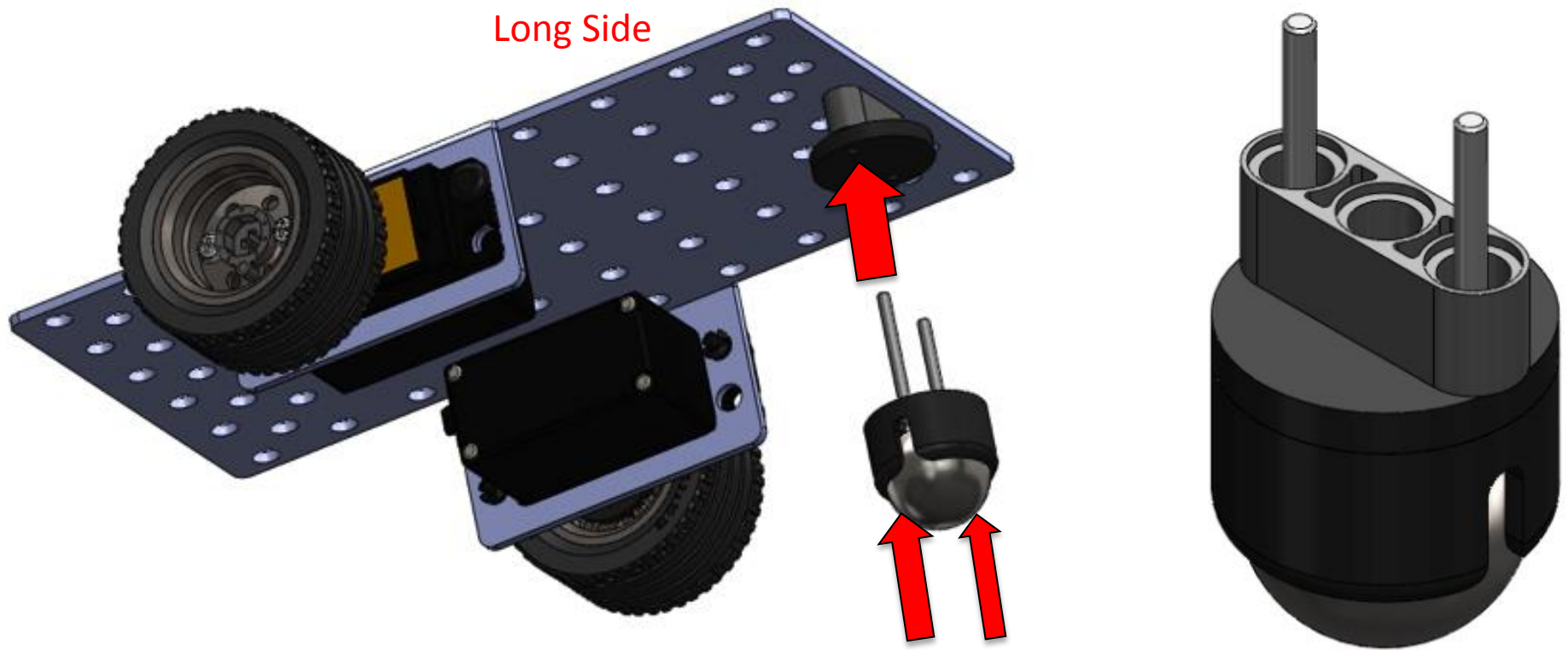
Repeat the process on the other side with the other motor.



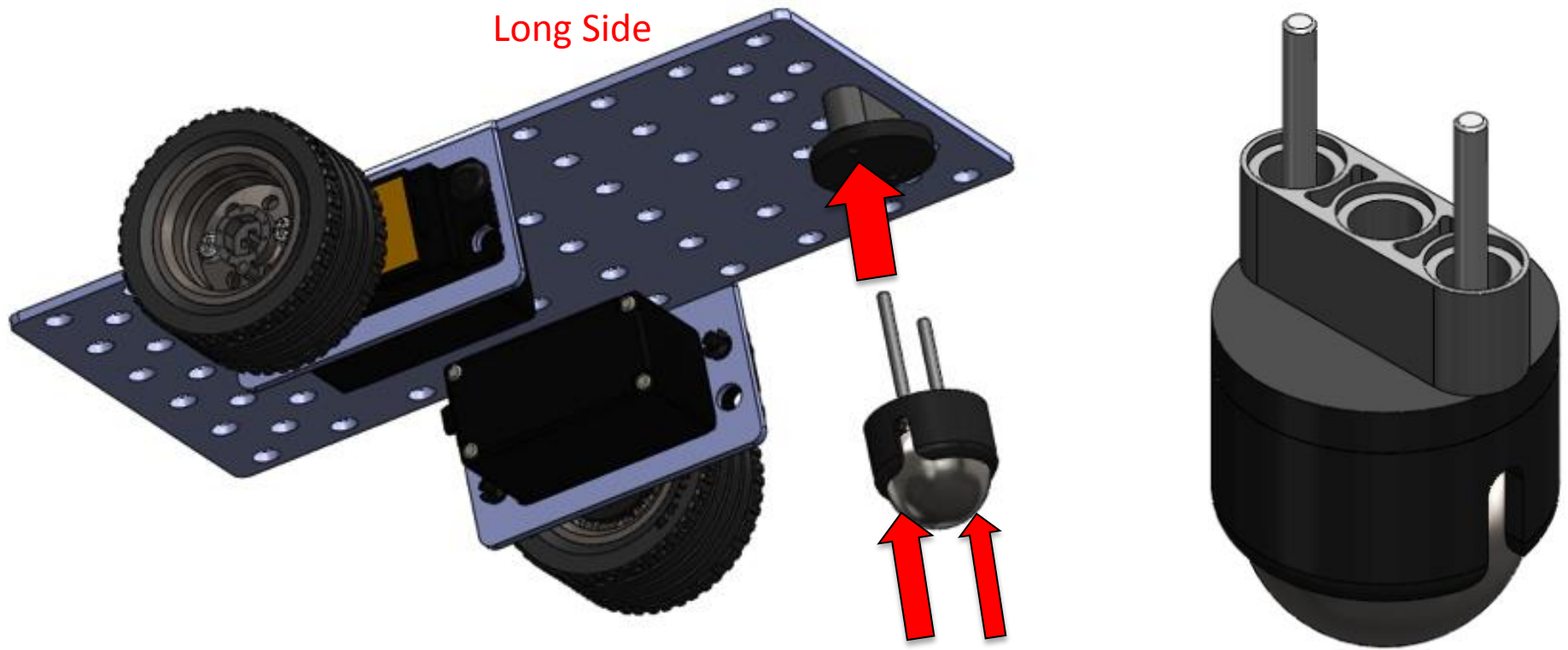
Take one (2) 3-Hole LEGO piece.
This shows the **position** (Caster on LONG side) that it will be mounted in the next few slides. YOU DO NOT WORRY ABOUT MOUNTING IT NOW



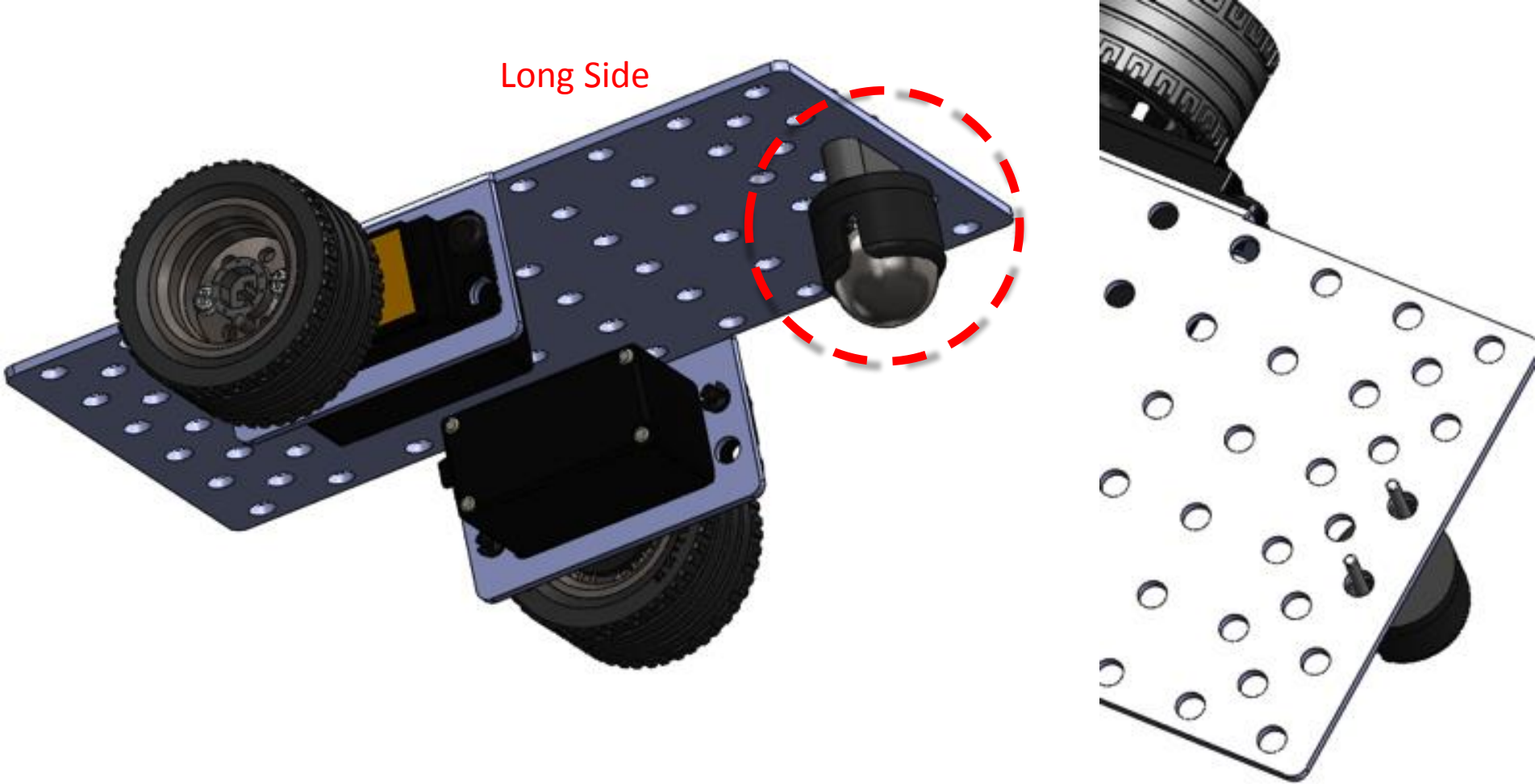
Get the “Pololu Ball Caster” bag.
It contains two plastic washers- one thick and one thin.
Take out the washer that is **THICK**. It is shown here for
position only (it will be attached in later slides).



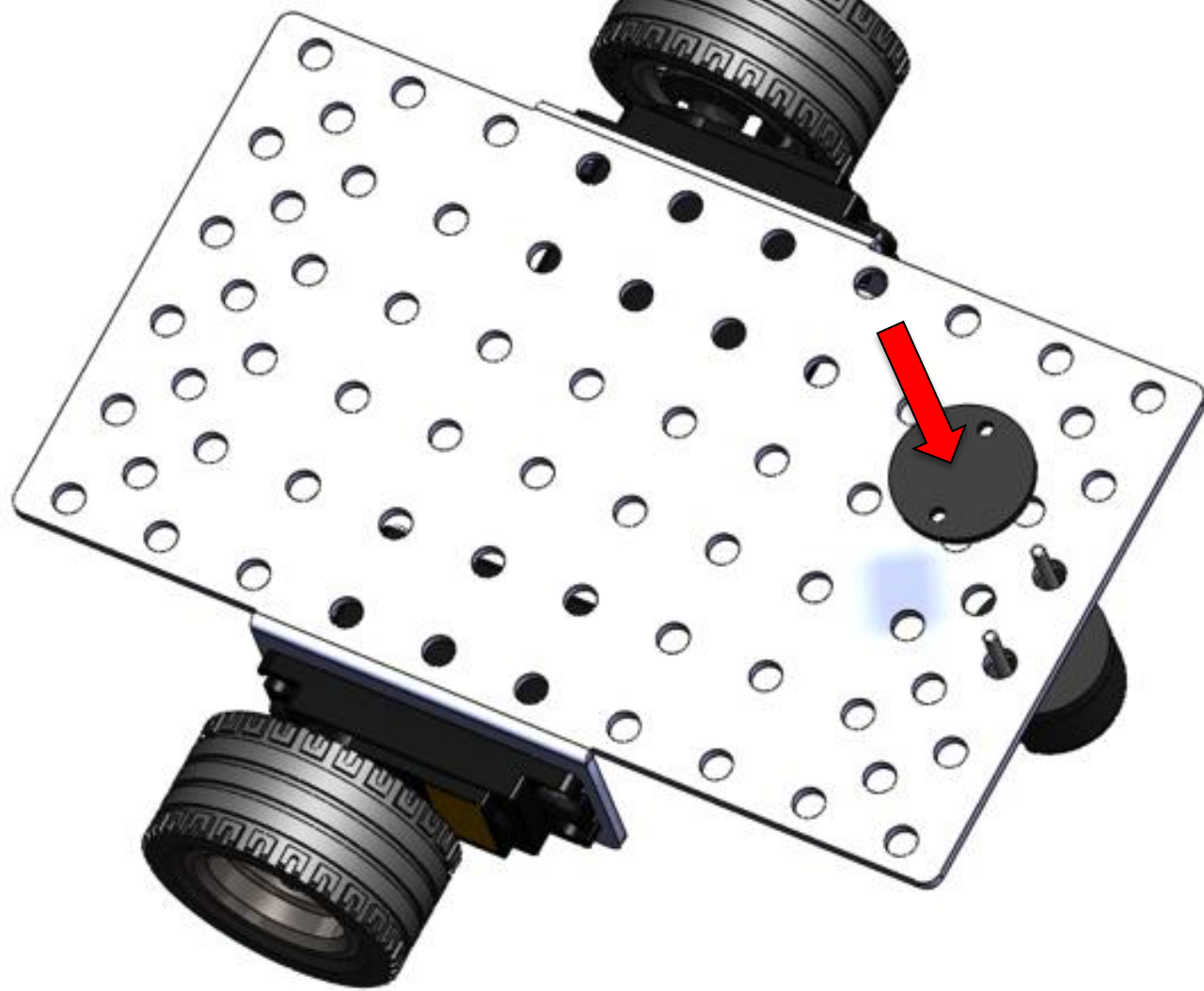
Take the ball bearing caster and the 2 long bolts from the “Pololu Ball Caster” bag. **Pop/Pry the ball out of the caster using the screwdriver.** Put the **LONG** bolts through the caster and then reinsert the ball (this will hold the bolts in place). NOTICE CASTER IS ON THE BOTTOM OF CHASSIS



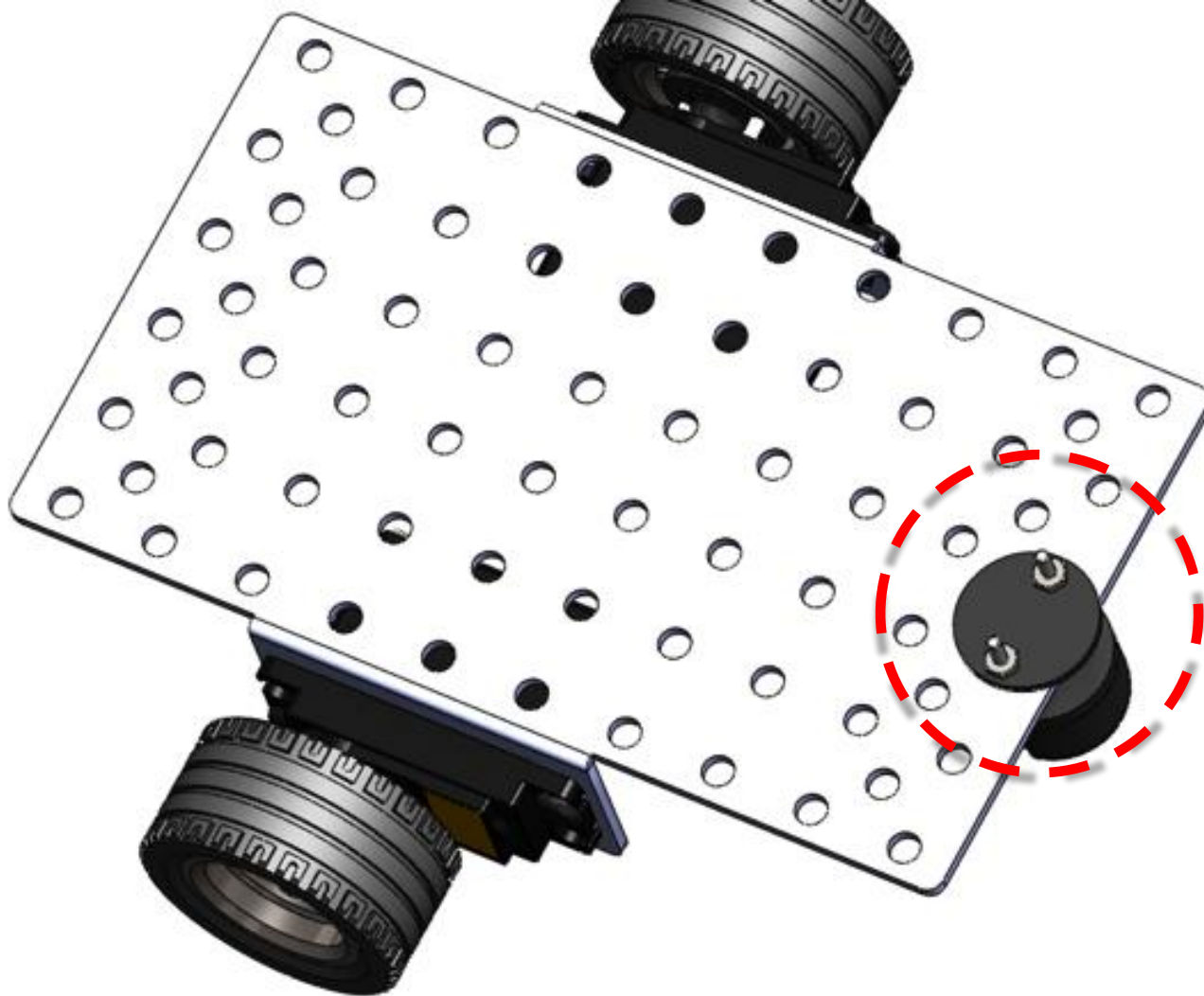
With the bolts held in place by the ball, place the bolts through the thick washer and the 3 hole LEGO as shown. The assembly is shown here for position only (it will be attached in later slides).



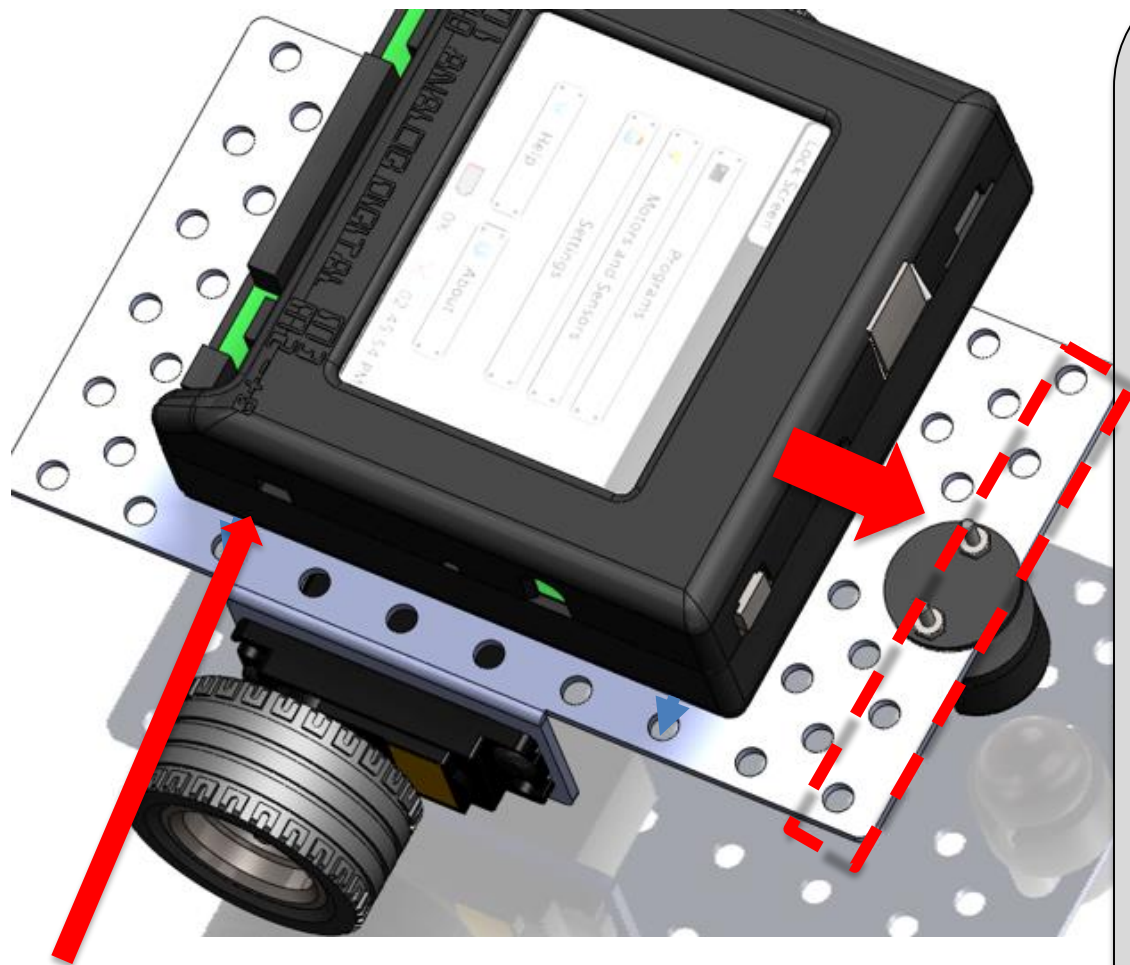
With everything in place (3 Hole LEGO, Thick Washer, Ball Bearing Caster with 2 long bolts) in position. You will have to hold this in place until it is secured in the next slide. Hint, if you set it on the table with the caster down against the table it will stay in place.



Take the thin washer from “Pololu Ball Caster” bag and place over bolts.



Take nuts out of “Pololu Ball Caster” bag and secure caster assembly to the chassis. Once the nuts have been started, you can remove the ball (use the screwdriver) and then tighten the bolts while holding the nut with your finger. Pop the ball back into the caster.

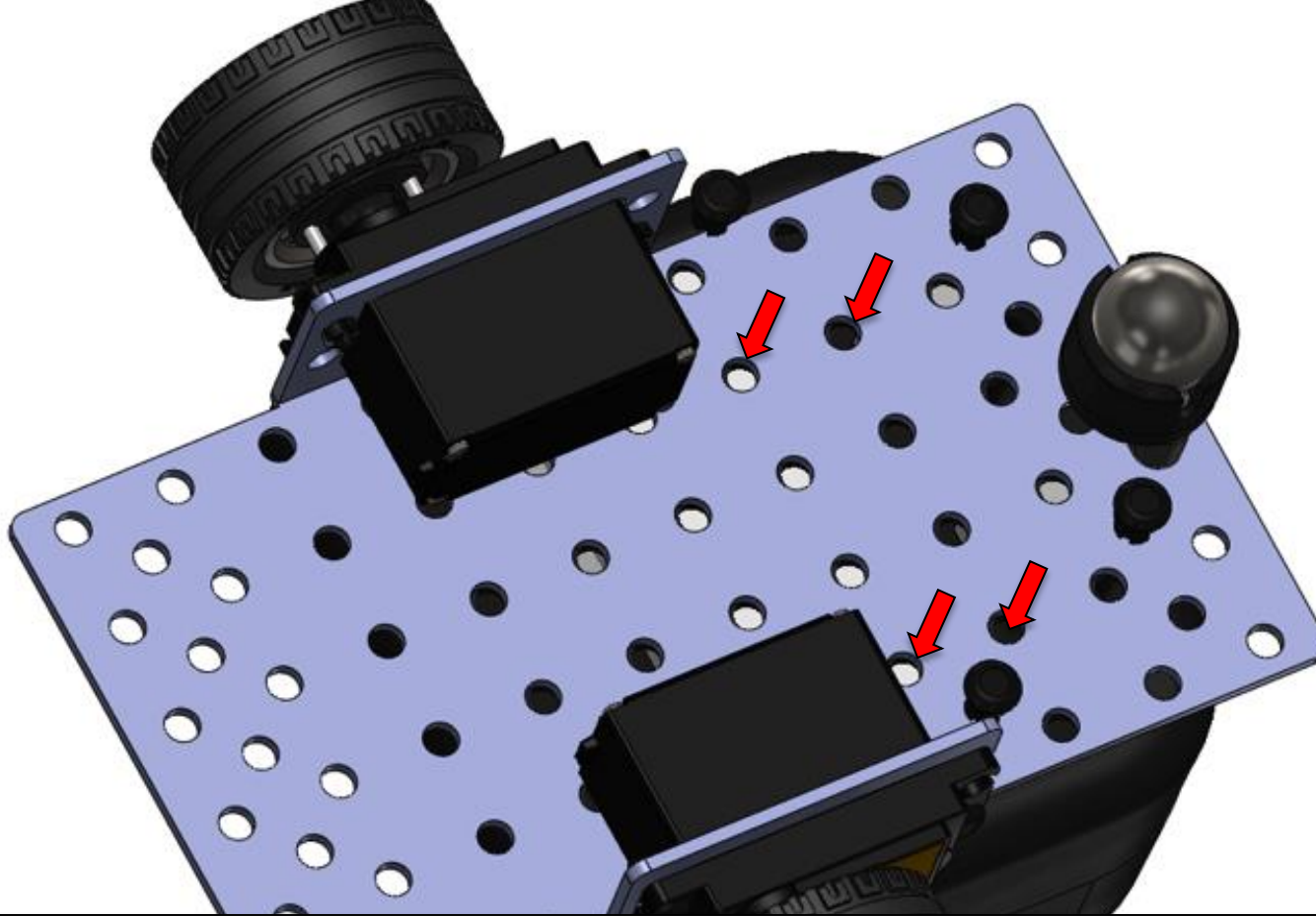


Power Switch

Set your KIPR Link onto the chassis in the orientation shown. Power switch located opposite from the ball bearing caster. Leave ONE ROW of holes uncovered on the chassis on the caster side. THE LINK WILL ACTUALLY SIT UP ON THE THIN WASHER USED TO MOUNT THE CASTER



CAREFULLY turn the chassis/KIPR Link upside down. REMEMBER it is NOT attached and will fall. You can hold it with your hand until we attach it in the next step or CAREFULLY set it upside down on the table.



Take Three or Four plastic pop rivets, identical to the ones you used to attach the motors to the chassis and attach the KIPR Link to the chassis by lining up the holes (as shown) and pushing them in until they lock. Once you have the KIPR Link locked into place you can turn your robot over and let it rest on the wheels and caster.



Second Row of Holes

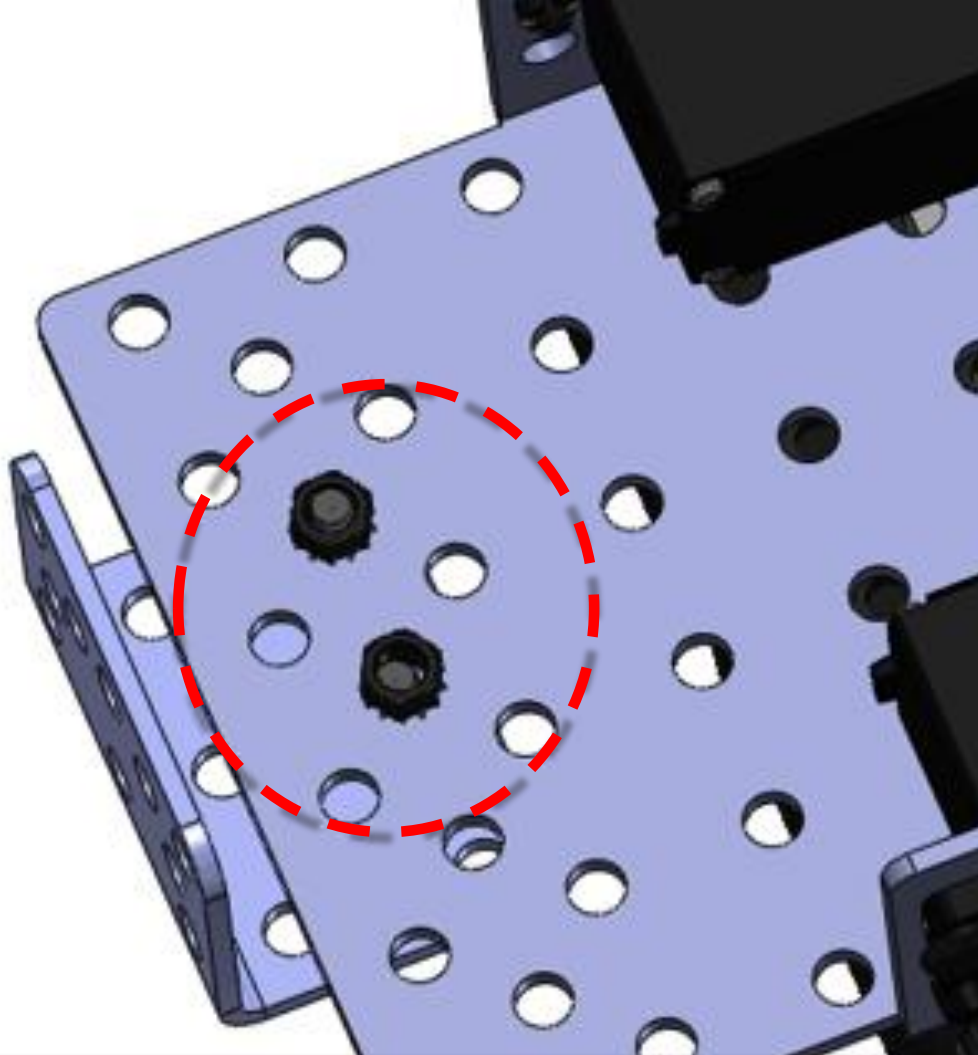
Take the KMP (KIPR Metal Part) Angle Bracket. You can identify it by the hole spacing that look like a smiley face. Line up the holes as shown in blue.



This is to show position only, it will be attached with bolts and nuts in the next slide. NOTICE the alignment on the chassis and the holes in the angle bracket that will be used.



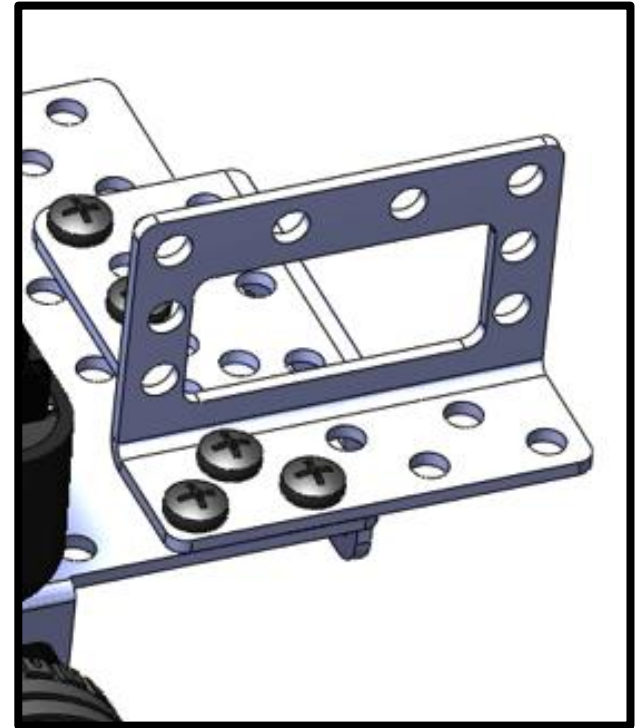
Place two (2) short black bolts as shown.



Using the lock nuts attach the angle bracket to the chassis and tighten using the screwdriver and your finger to hold the nut. This is shown upside down for clarity. You do not have to turn your robot upside down to attach the nuts.



Identify your KMP (KIPR Metal Part) Motor Bracket.
It is shown here for identification and will be attached in
the next slide.



Attach the motor bracket to the chassis using the short bolts and lock washer nuts. Tighten by holding the nut with your finger and tightening the bolt with the screwdriver.

Make sure white servo spindle is away from the robot controller



You will need one (1) servo.

You can distinguish servos from motors by the wiring.

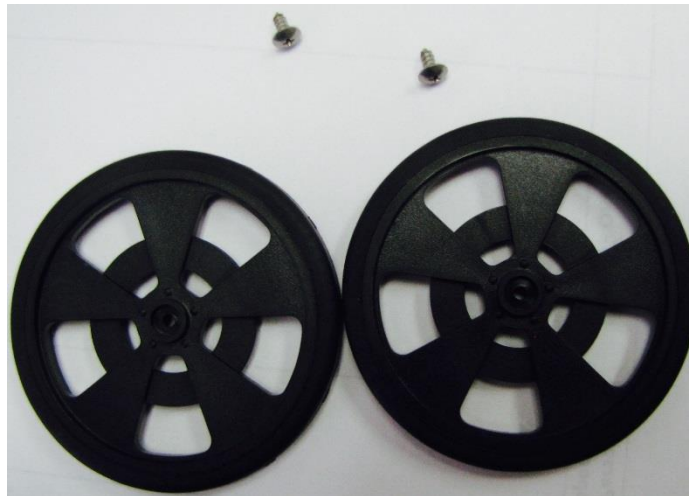
Motors have a double grey wire and servos have a **triple red, orange, brown wire**. Place servo in bracket and use two medium bolts/nuts and two pop rivets to hold in place

5-hole metal servo horn



Push one end of the servo horn over the white spindle on the servo (if it feels too small/tight, turn the horn over and try again). Using the silver screw in the bag and the screwdriver, screw the servo horn into the spindle.

NOW you can mount the two large black wheels onto the motors. One side of the wheel has splines (teeth) that match the splines (teeth/grooves) on the motor spindles. Use the silver screw to attach the wheel



STOP

Once everyone has their robot built
we will start learning to code.

We will build the claw later.

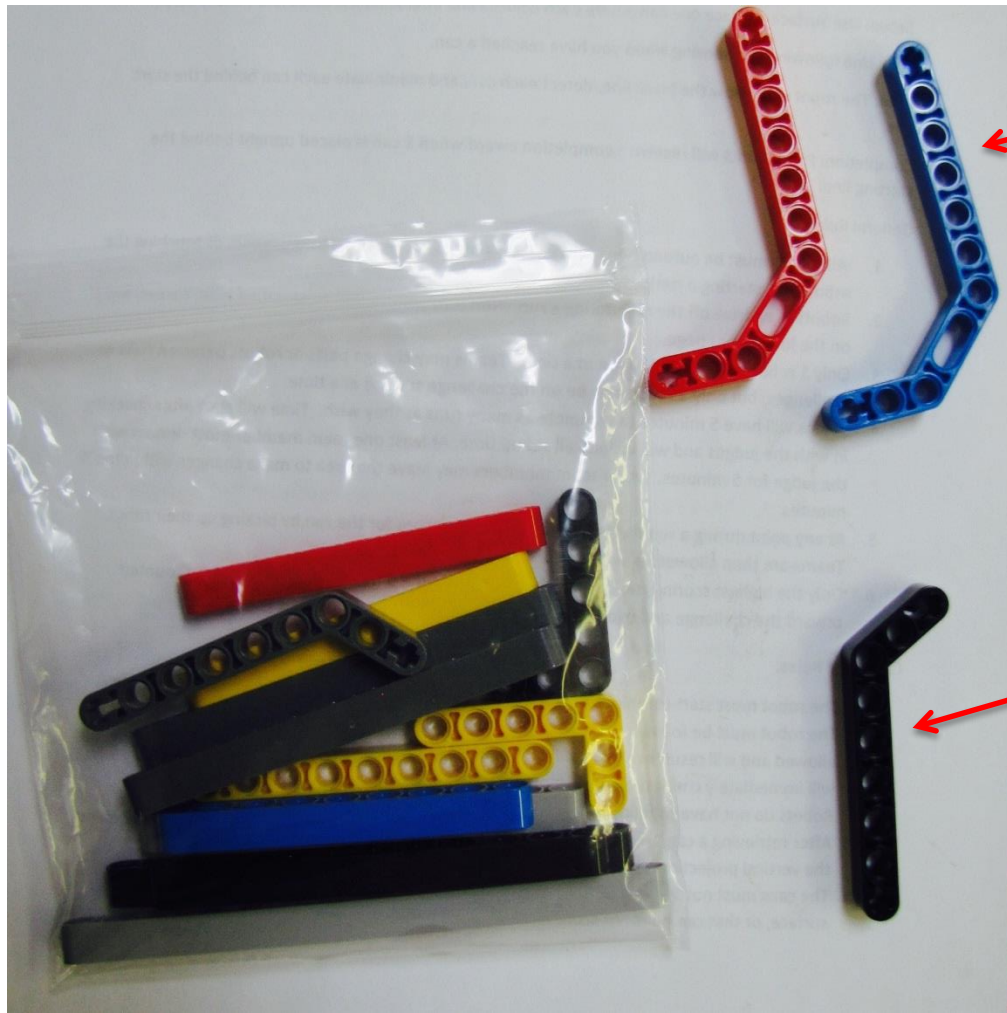
Claw Assembly

Set the following items aside out of your robot box, once they are out, put everything else back into your box

From you box of parts get out the
following:

LEGO for the claw

LEGO pieces (color may vary)



2 of the large curved

1 of the 45 degree bend

LEGO for the claw



2 connectors, one side is
round the other is a +

LEGO pieces (color may vary)



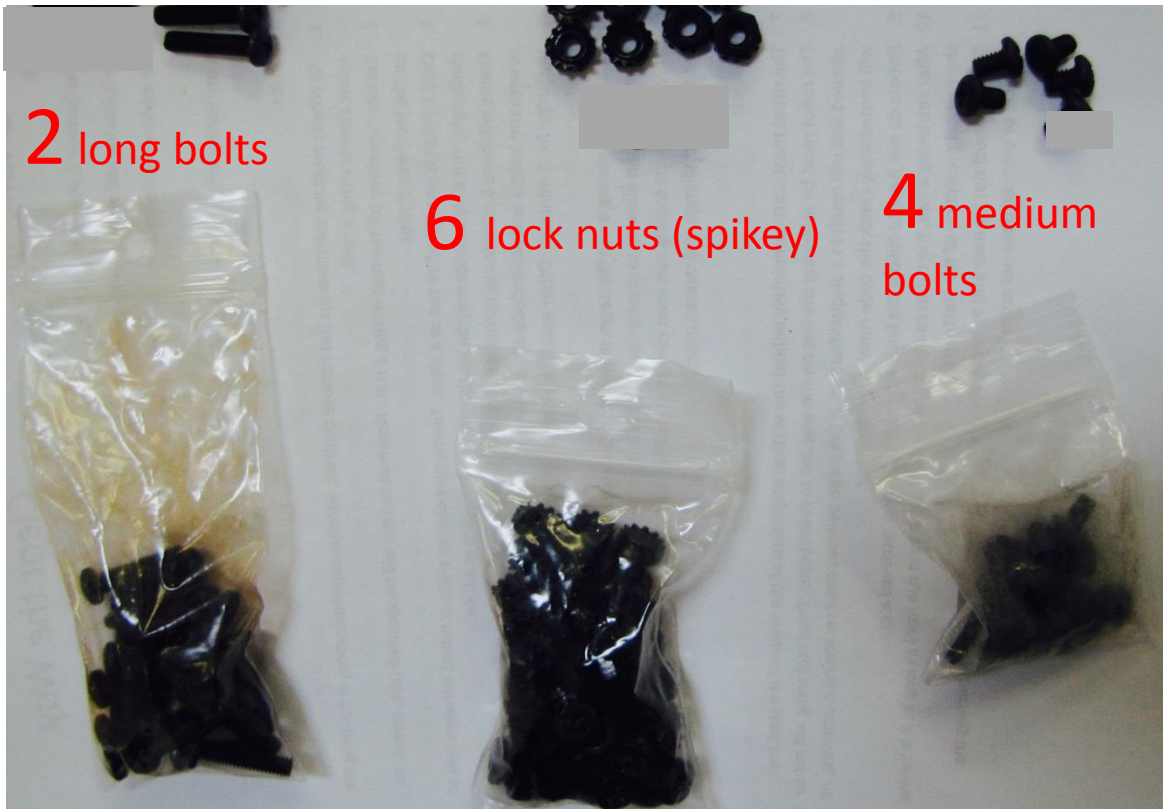
4 pins one side is round the
other is a +

1 Motor/servo bracket for the claw

Motor Bracket

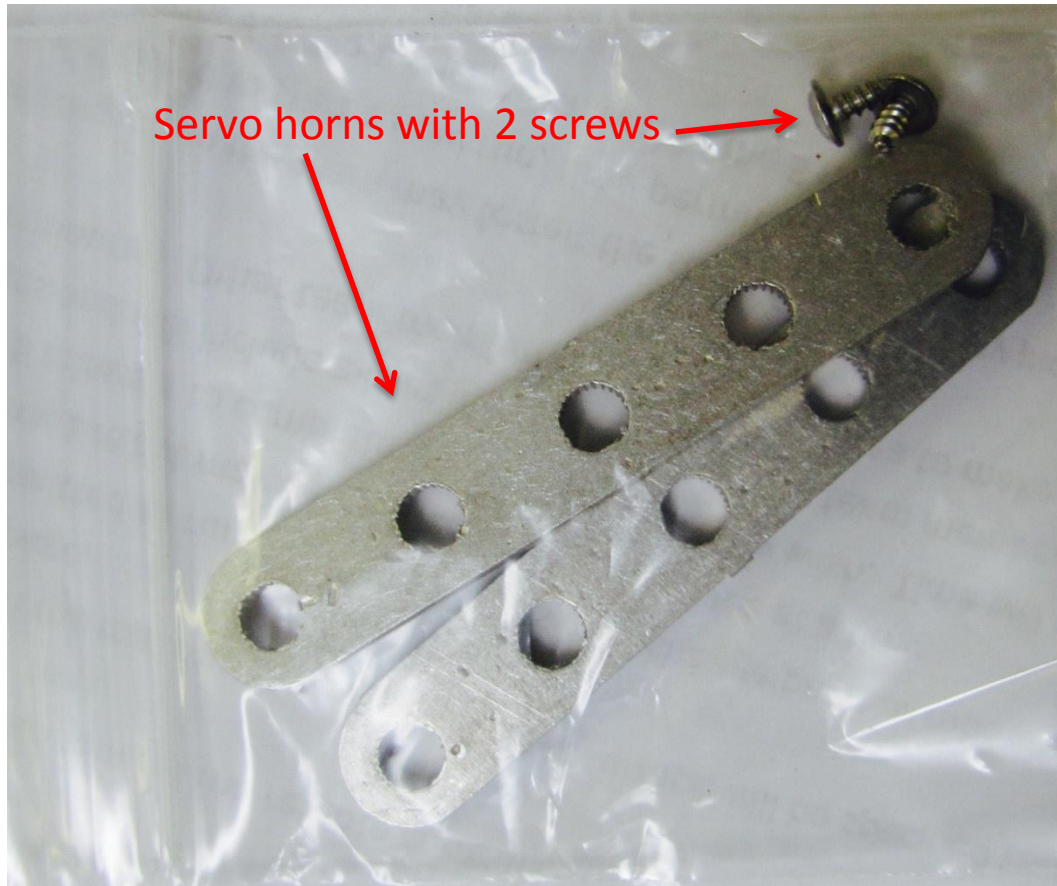


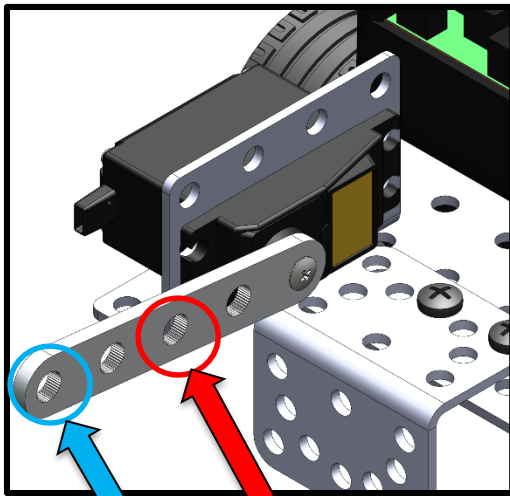
From large bag of bolts & nuts



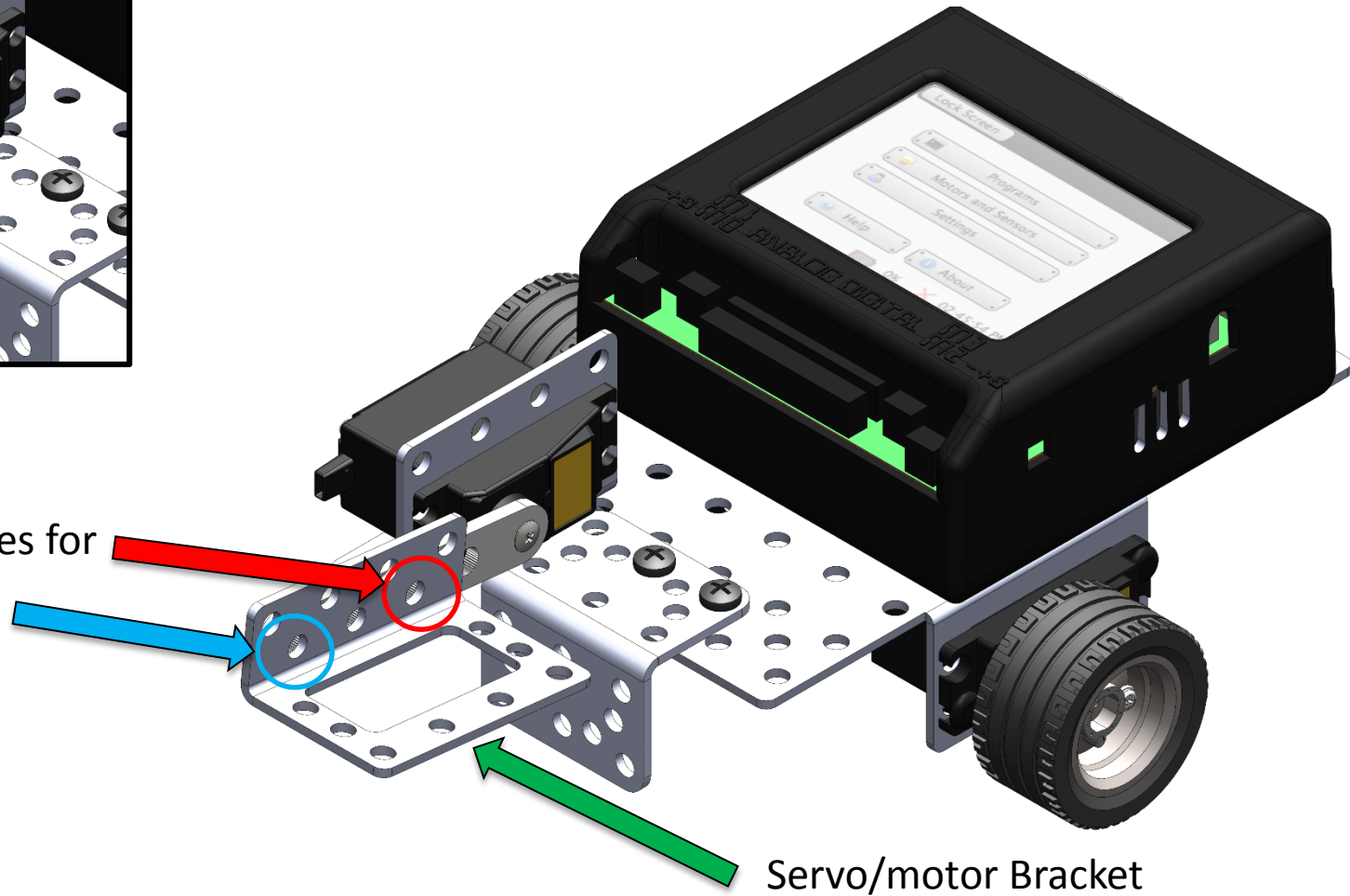
Bag with two metal servo horns & screws

Remove **one** metal horn and **one** screw

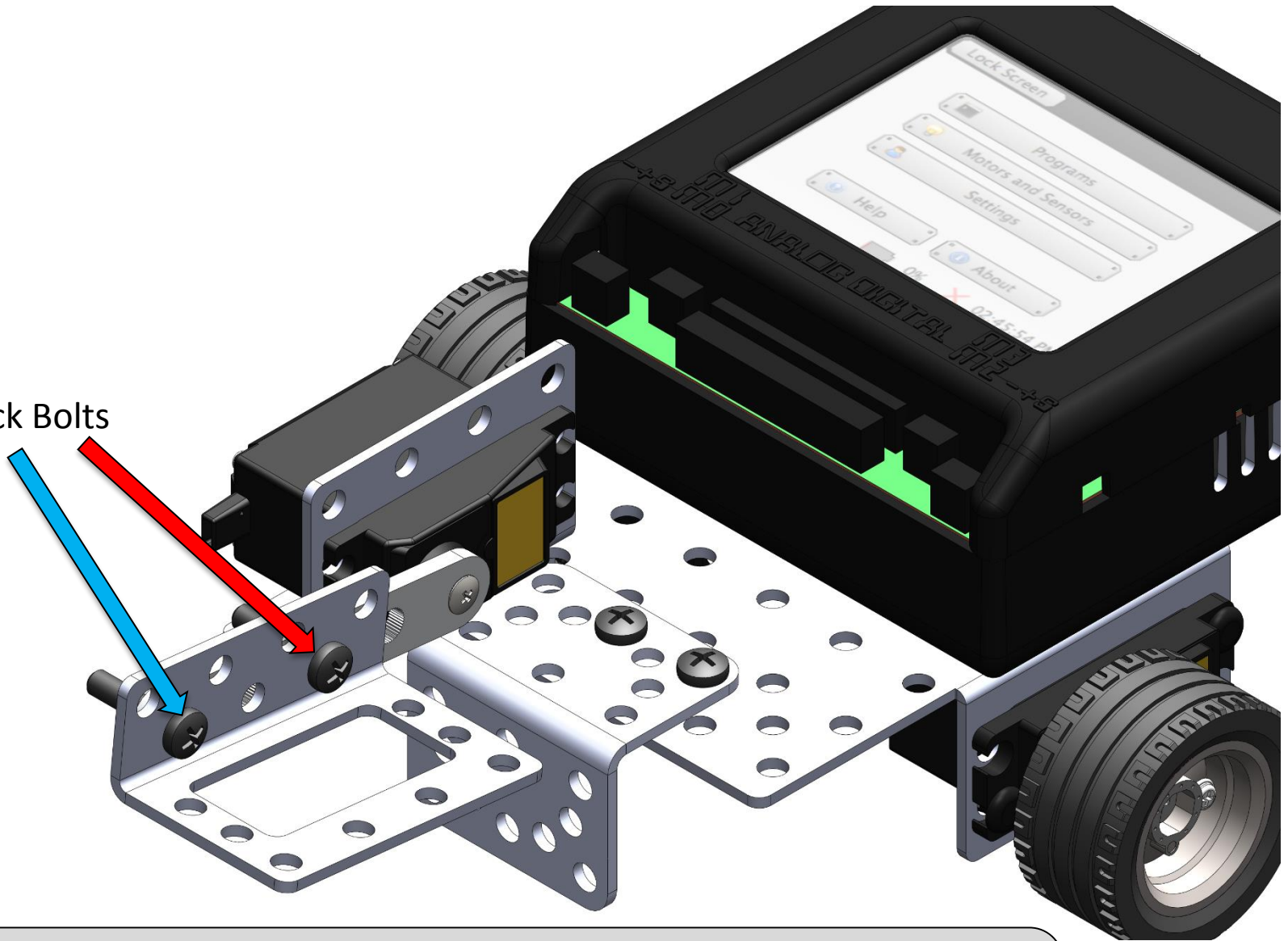




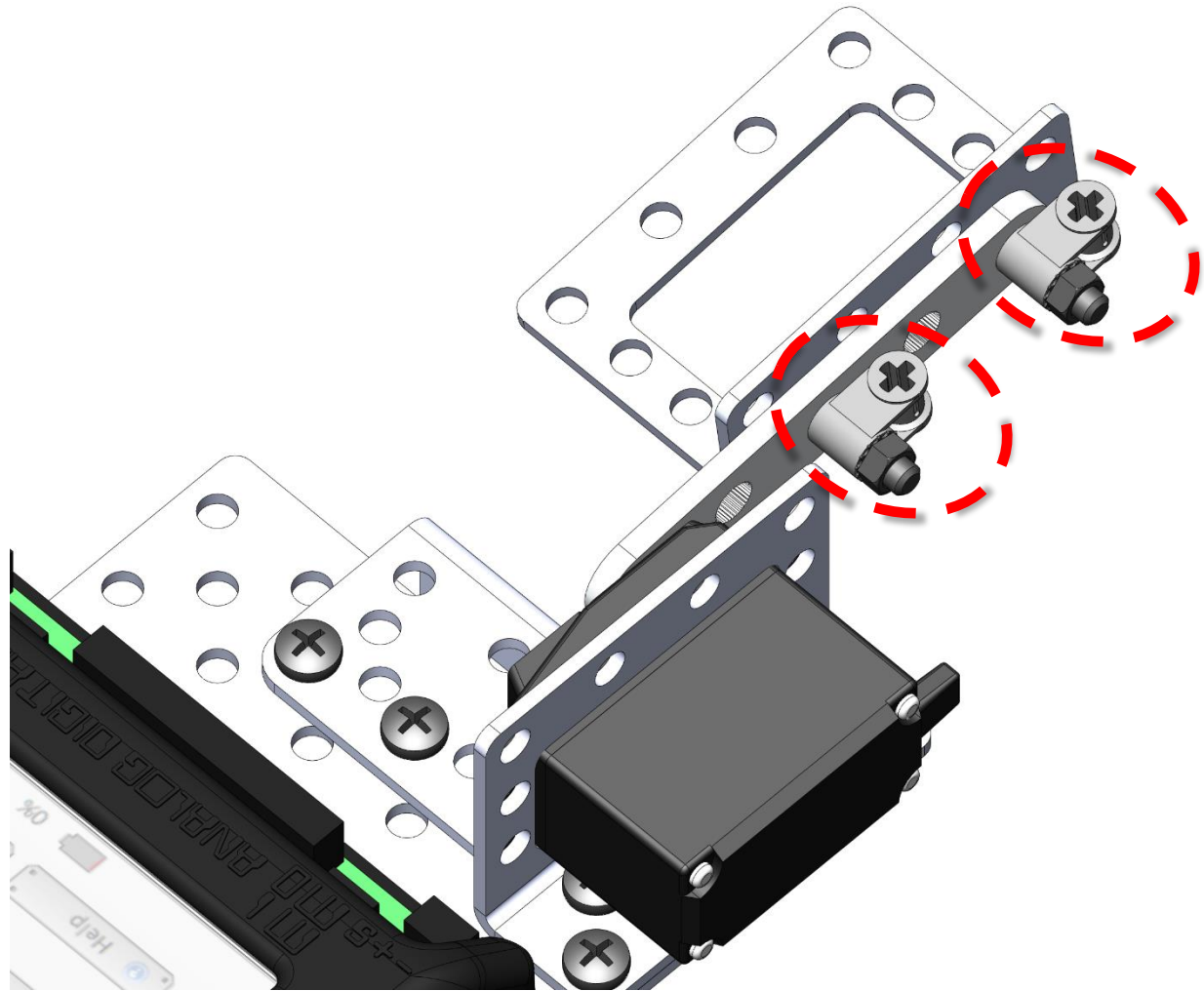
Match up holes for
next step



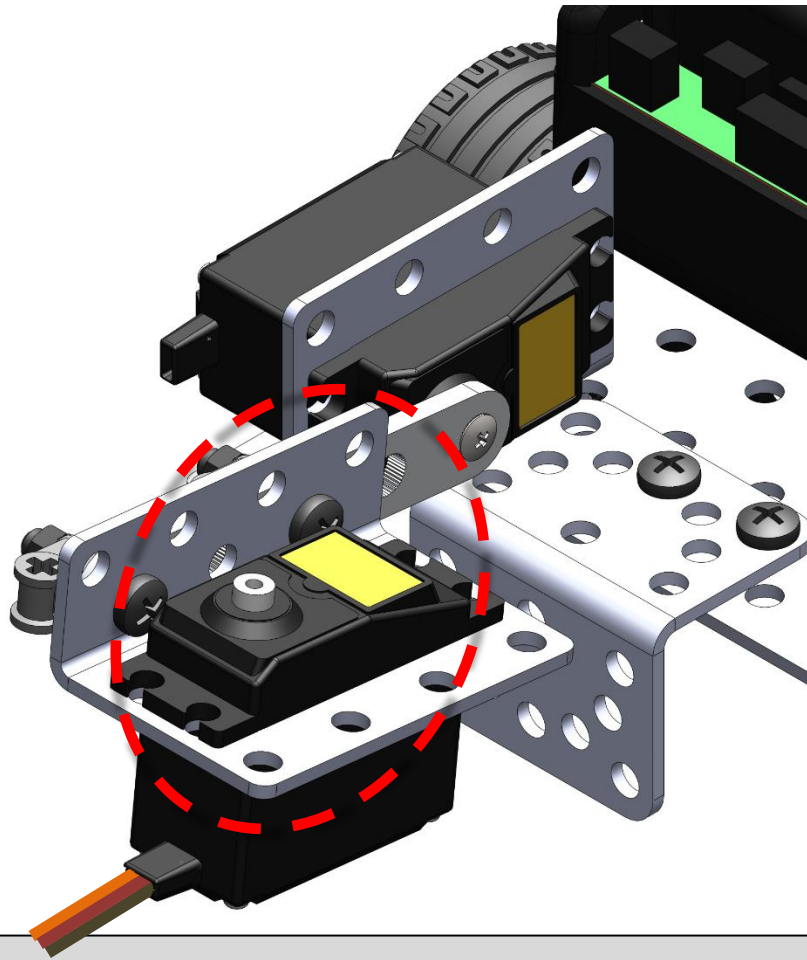
Long Black Bolts



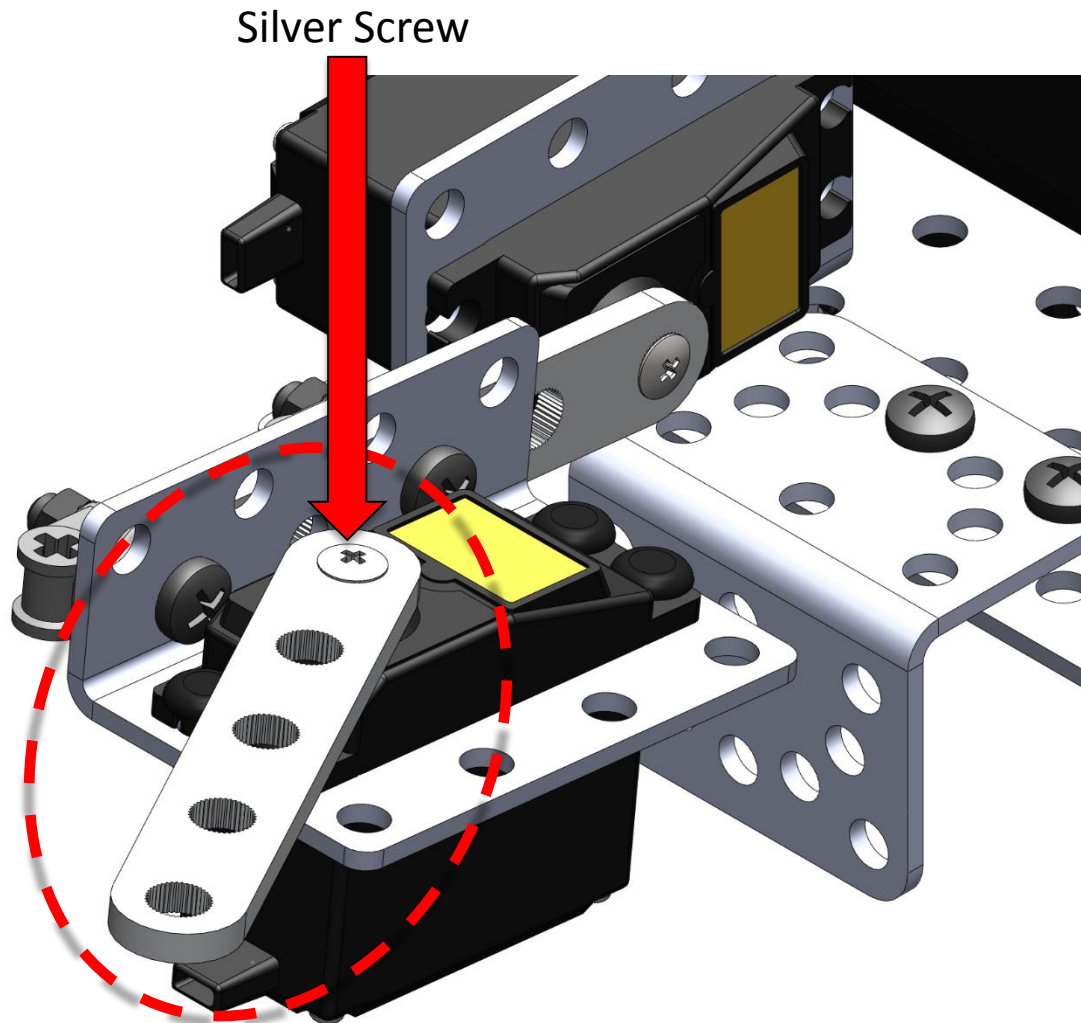
Use two long black bolts, insert them through the metal servo bracket and through the holes in the servo horn-
DO NOT SECURE WITH LOCK NUTS.



Slide the two LEGO pieces over the bolts and secure with a lock nut. Hold the nut with your finger and tighten with the screwdriver. Notice the orientation of the + on both

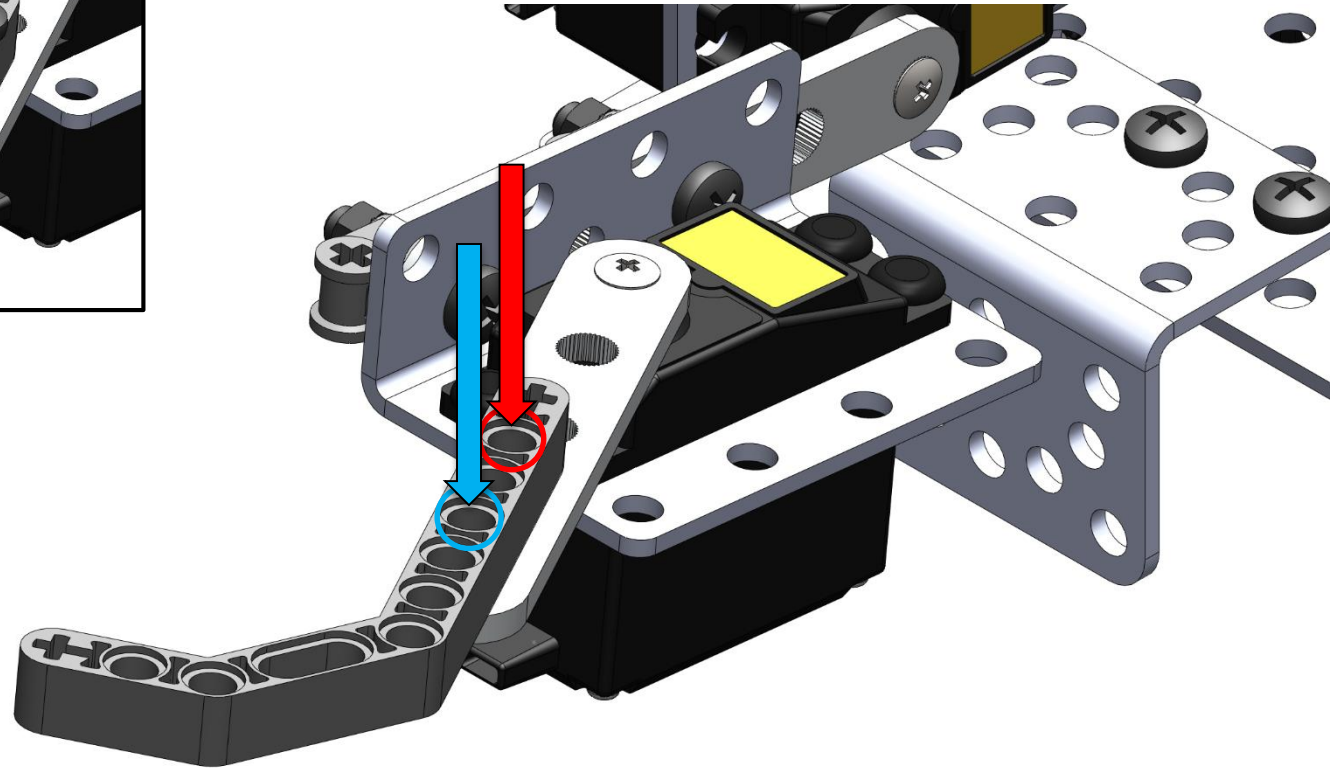
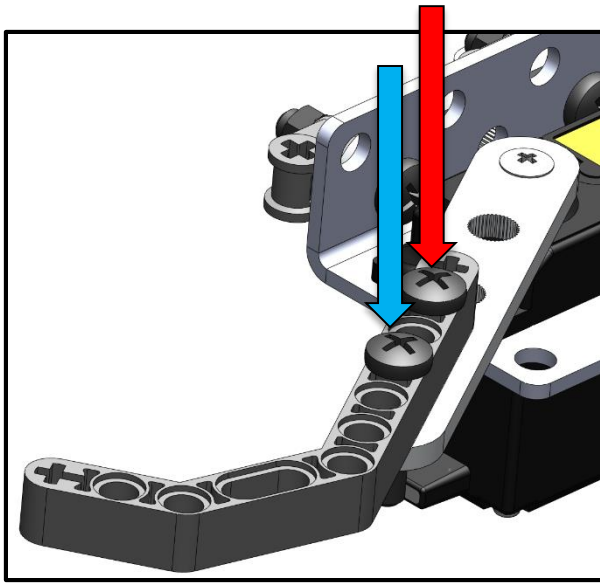


Place a servo motor (three colored wires) into the servo bracket (white spindle away from robot-wire away from robot) and **secure in place with two medium bolts**



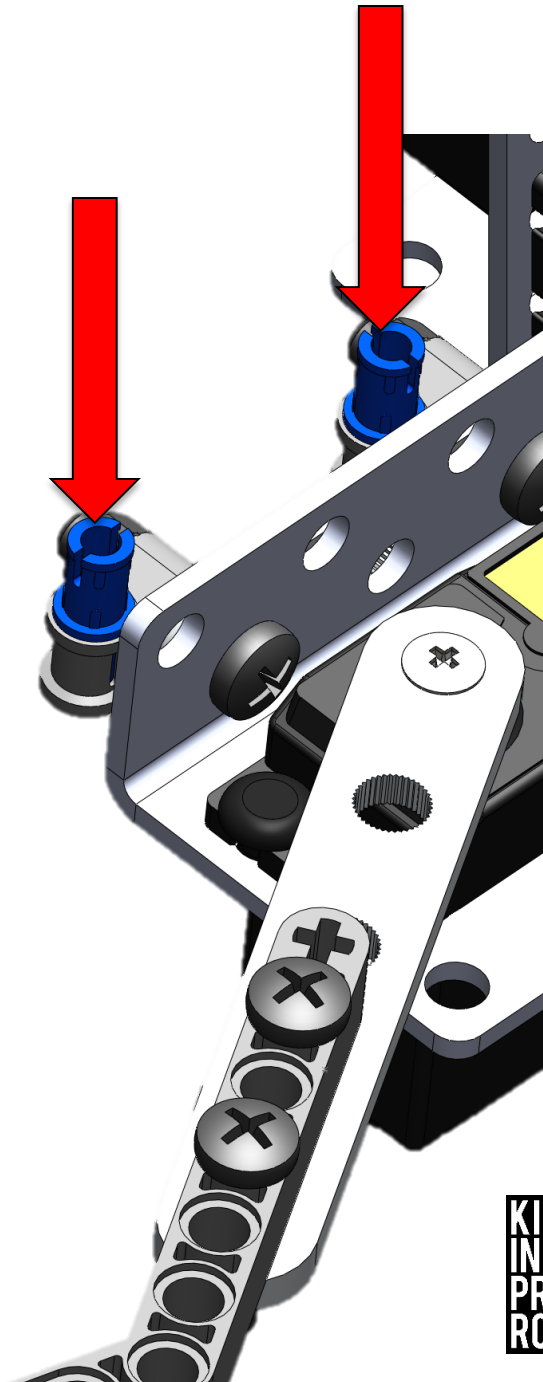
Silver Screw

Attach a five hole metal servo horn to the servo spindle and secure in place with a silver screw (found in bag with servo horns). If it is too tight, turn the horn over and try again

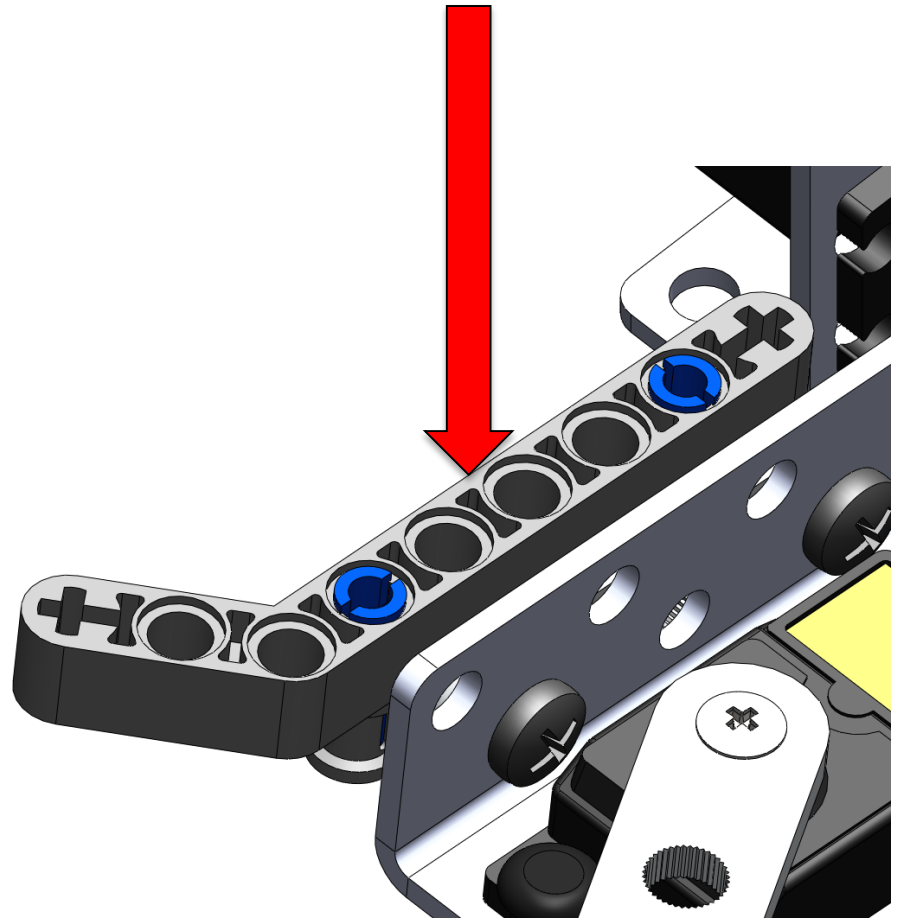


Attach a curved LEGO piece to the 5-hole metal servo horn using two medium bolts and nuts. Secure with screwdriver while holding the lock nut with your finger

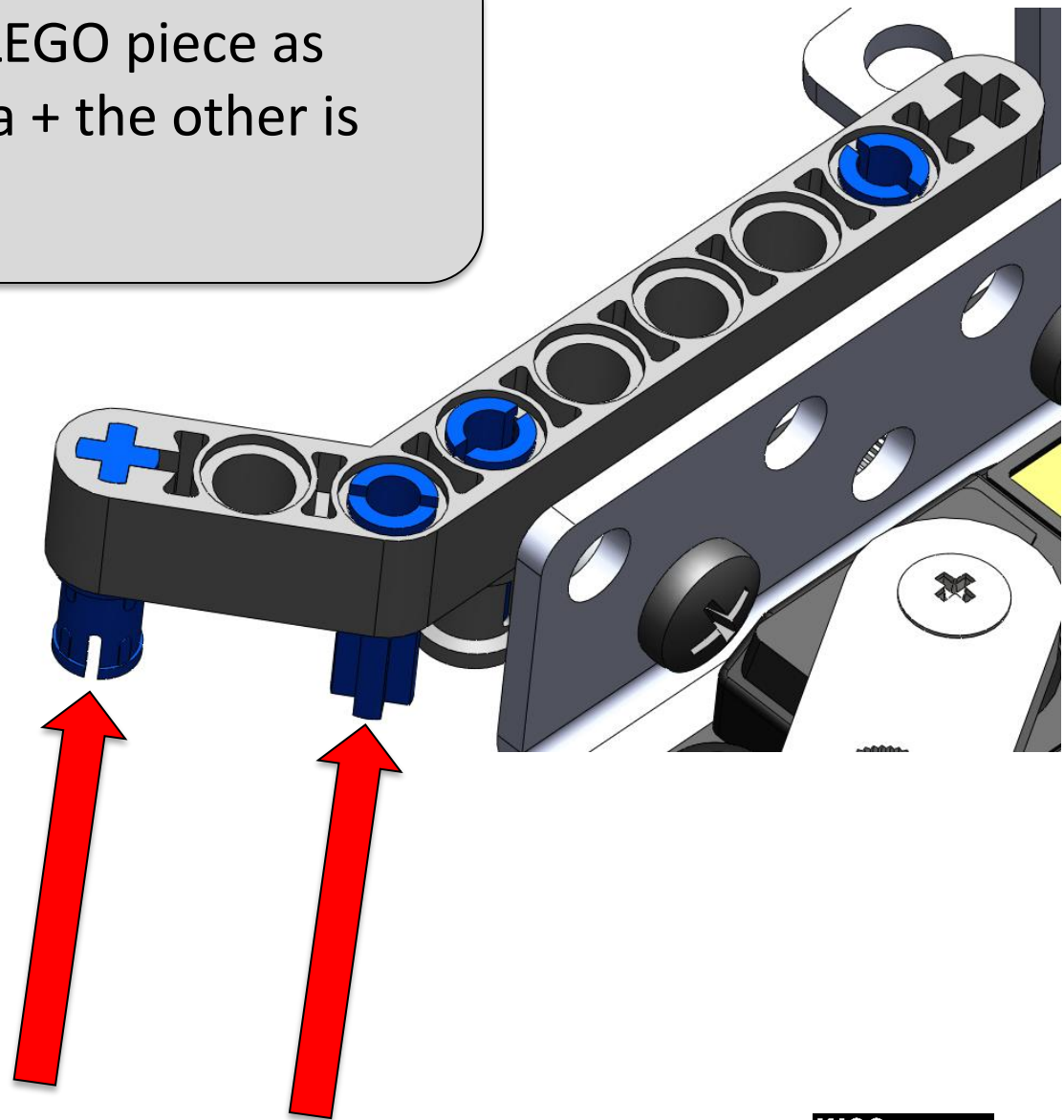
Place (push) two pins into the LEGO piece (The holes are keyed for a + (slotted pin)).



Place the pictured LEGO piece onto the two pins as shown



Push two pins through the LEGO piece as pictured (notice one end is a + the other is round)



Push the curved LEGO piece (matches other side of the claw) onto the pins. You now have a claw that can be raised and lowered and can also grasp/release something

