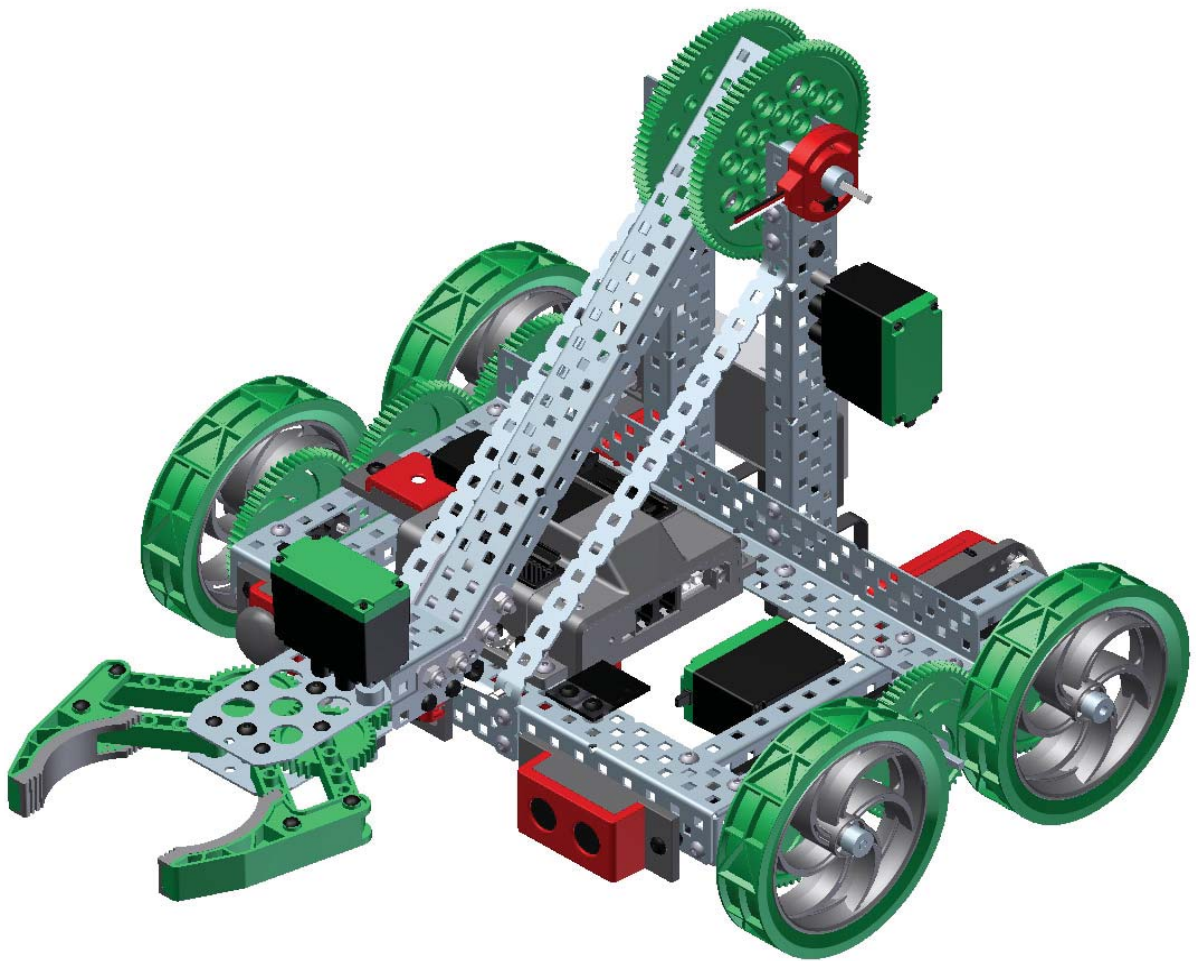# CLAWBOT WITH SENSORS BUILDING INSTRUCTIONS

USING THE VEX CORTEX

CLAWBOT BUILDING INSTRUCTIONS

1 Collect the parts and tools from the list below to attach the sensors:
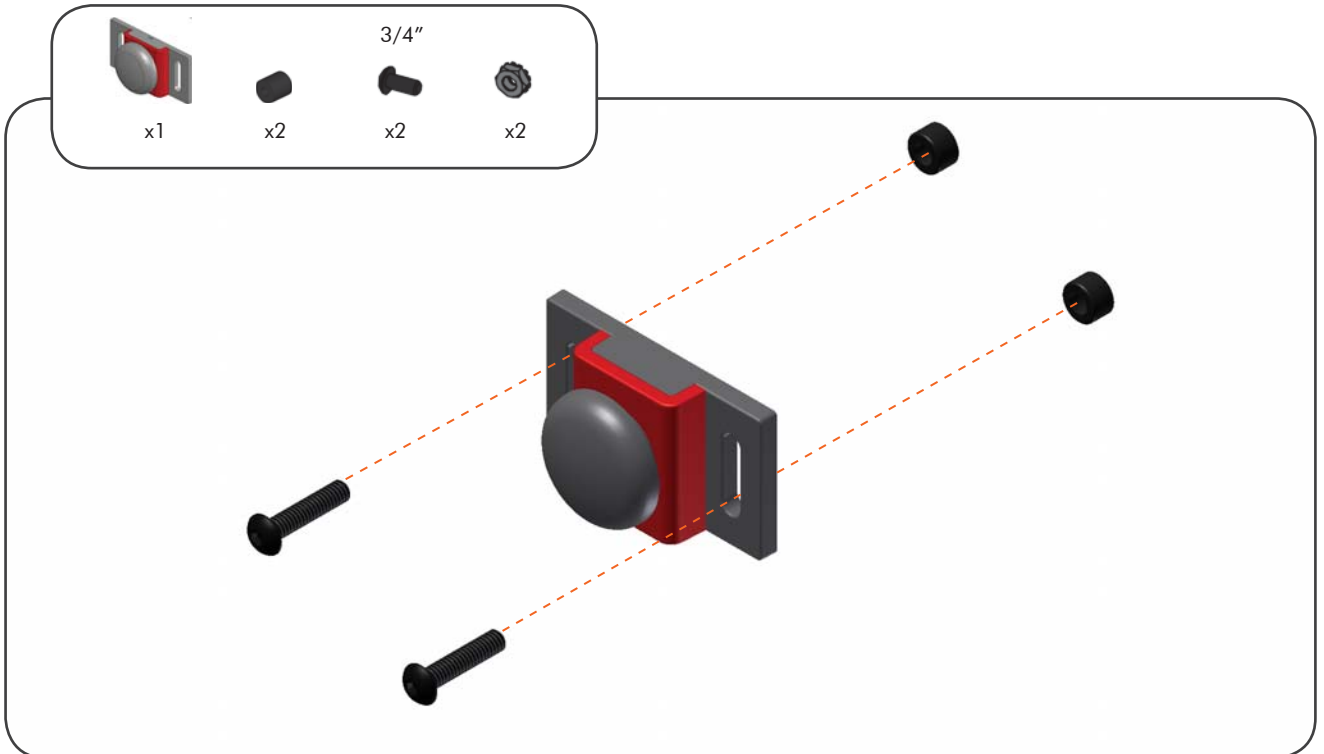
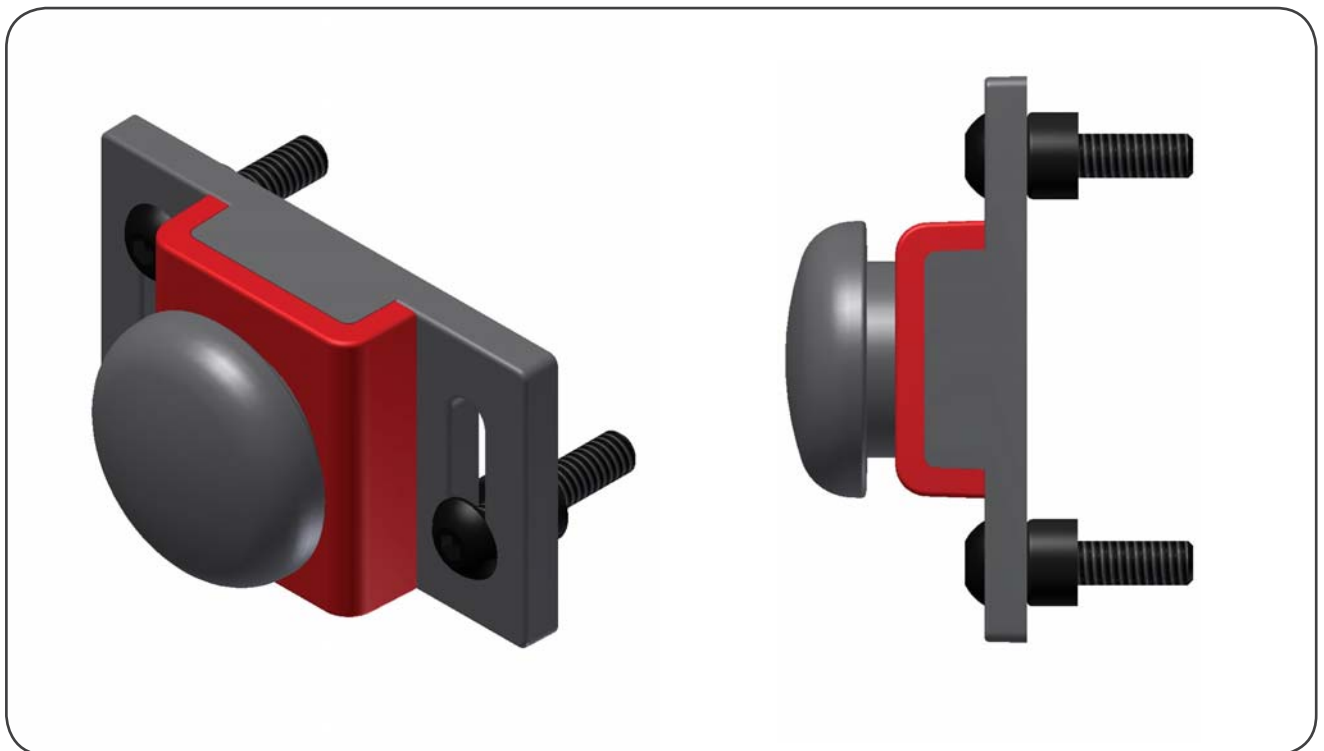| Materials	Quantity
Shaft, 4" Long	1
Shaft, 5" Long	2
Screw, 8-32 x 3/8" Long	9
Screw, 8-32 x 1/2" Long	2
Screw, 8-32 x 3/4" Long	12
Nut, 8-32 Keps	19
Shaft Spacer, Thin (4.6mm)	8
Shaft Spacer, Thick (8mm)	5
Standoff, 1" Long	1
Angle Gusset	2
Optical Shaft Encoder	2
Ultrasonic Rangefinder	1
Potentiometer	1
Bump Sensor	1
Limit Switch	1
Ambient Light Sensor	1
Yaw Rate Gyroscope	1
Line Tracker	3
LCD Display	1
Integrated Motor Encoder Kit	1
Allen Wrench 3/32"	1
Allen Wrench 5/64"	1
Open End Wrench 1/4"	1
#1 Phillips Screwdriver	1
Pliers	1
Hacksaw	1

! *Note that this robot can only be built if you have a standard Clawbot already assembled*

ROBOTC

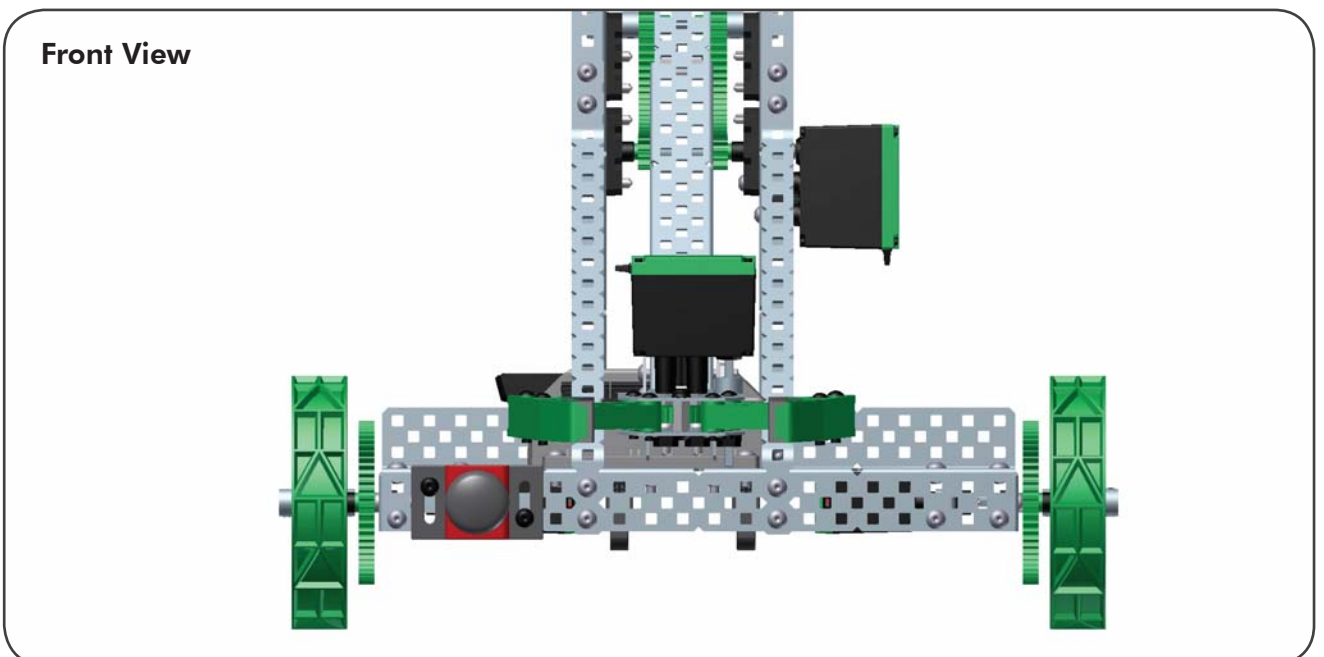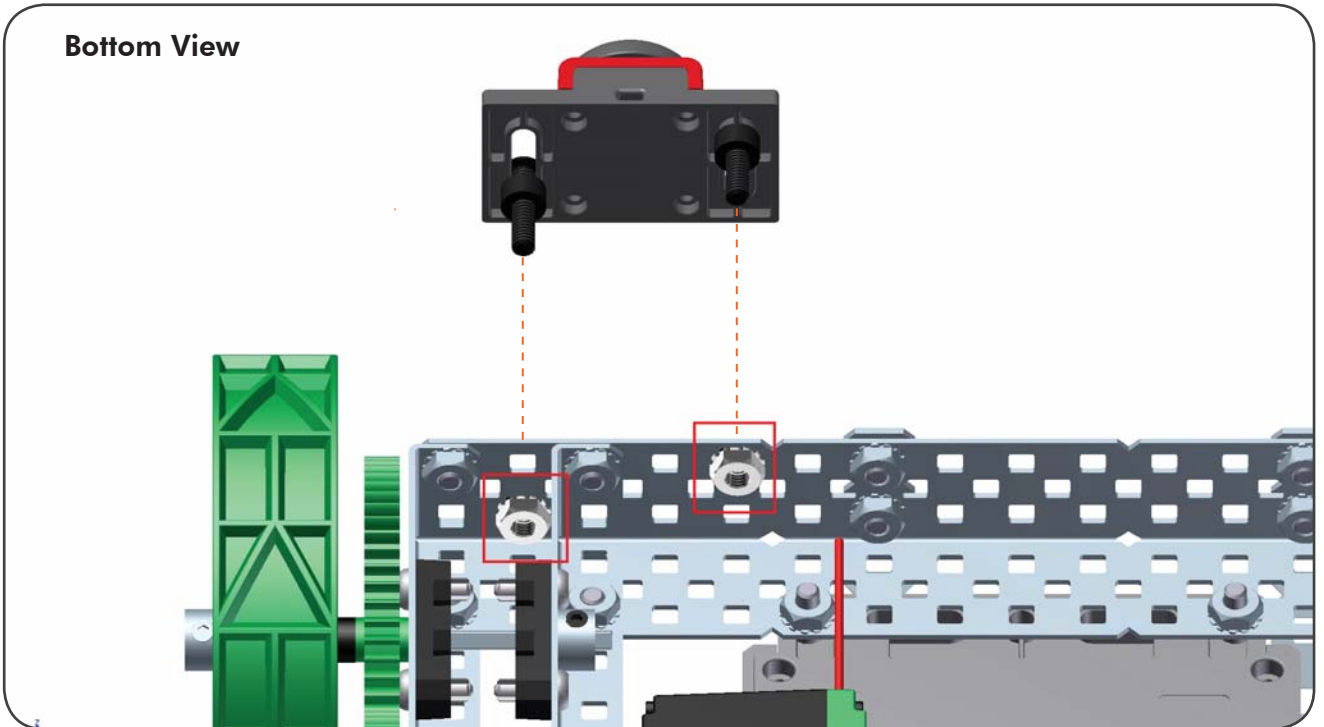# CLAWBOT BUILDING INSTRUCTIONS

2 Attaching the Bumper Sensor

3/4"

x1   x2   x2   x2

Place screws through the bump sensor and place thin spacers on the opposite side

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Clawbot 1.0 • 3

CLAWBOT BUILDING INSTRUCTIONS

2 **Attaching the Bumper Sensor** *(continued)*

Attach the bump sensor as shown below

Bottom View

Front View

CLAWBOT BUILDING INSTRUCTIONS

3 Attaching the Ambient Light Sensor

3/8"
x1   x1   x1

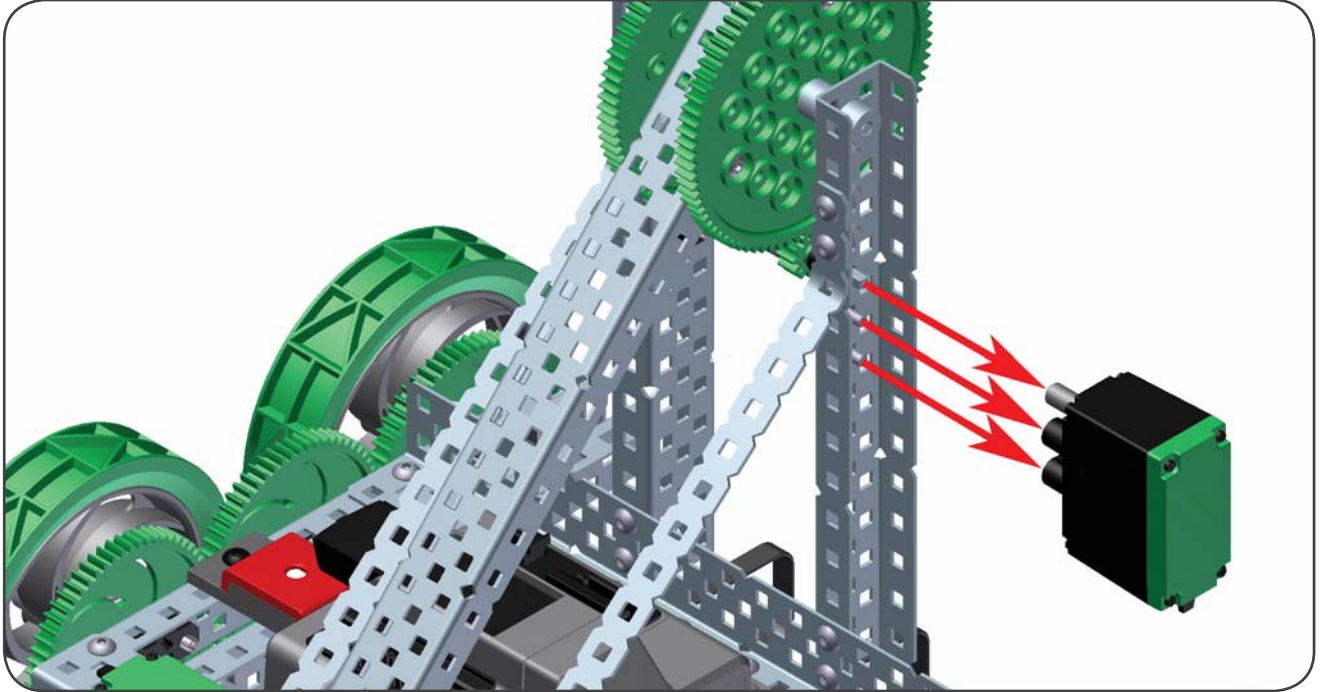> ! *Claw is hidden for visibility purposes*
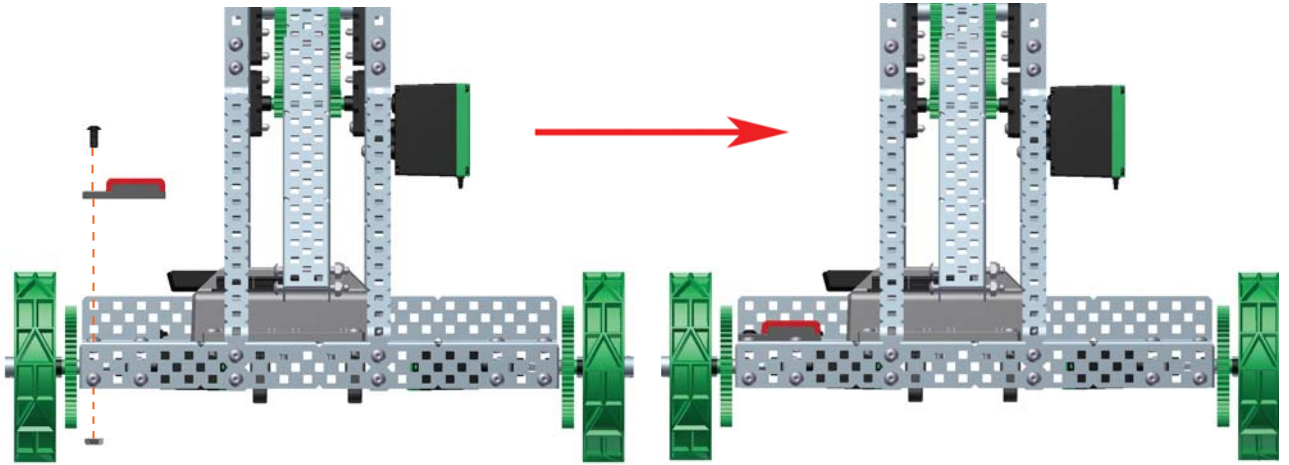
Front View

Top View
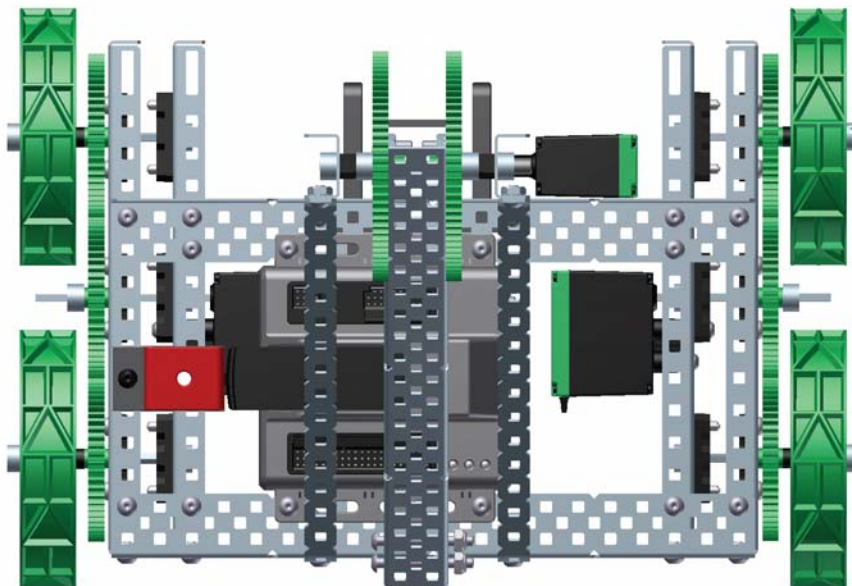
CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer**

> ⚠ *To attach the Potentiometer, we first need to reverse the left C-Channel holding the arm*

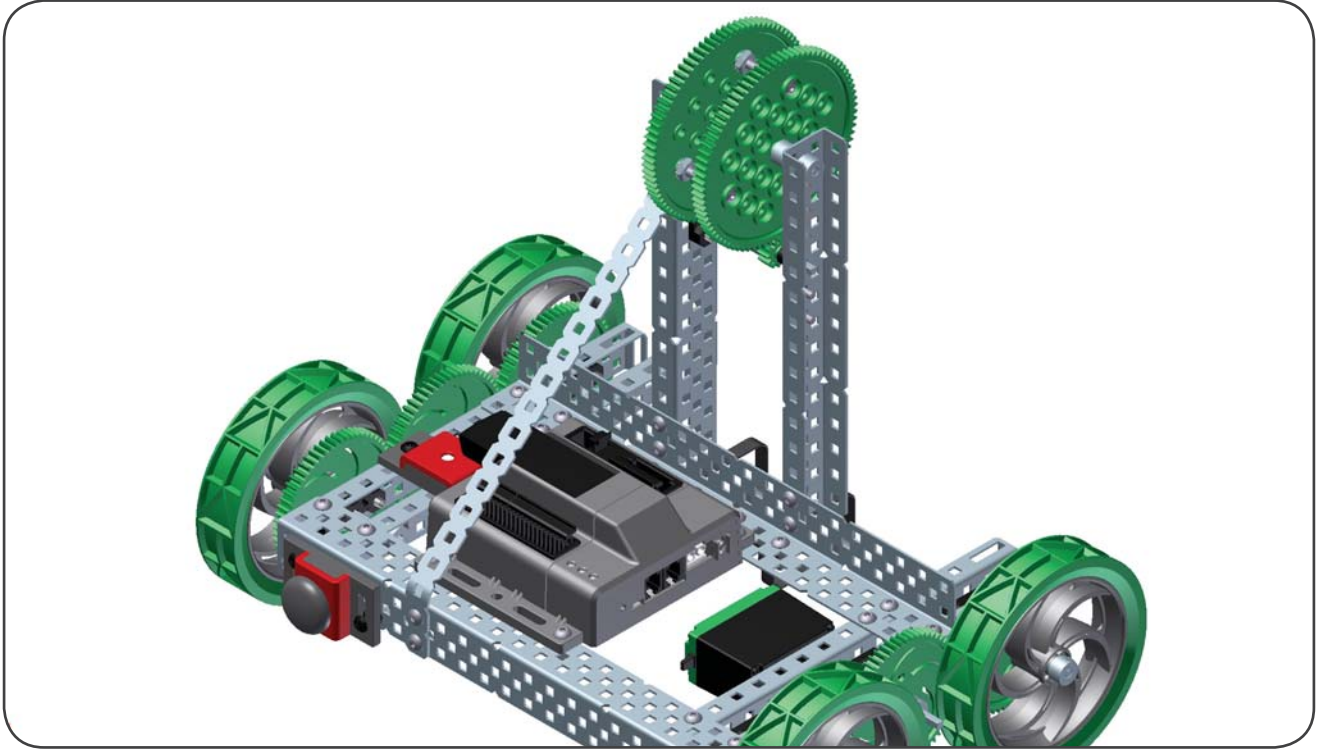**Remove the arm motor along with the clutch post and shaft coupler**
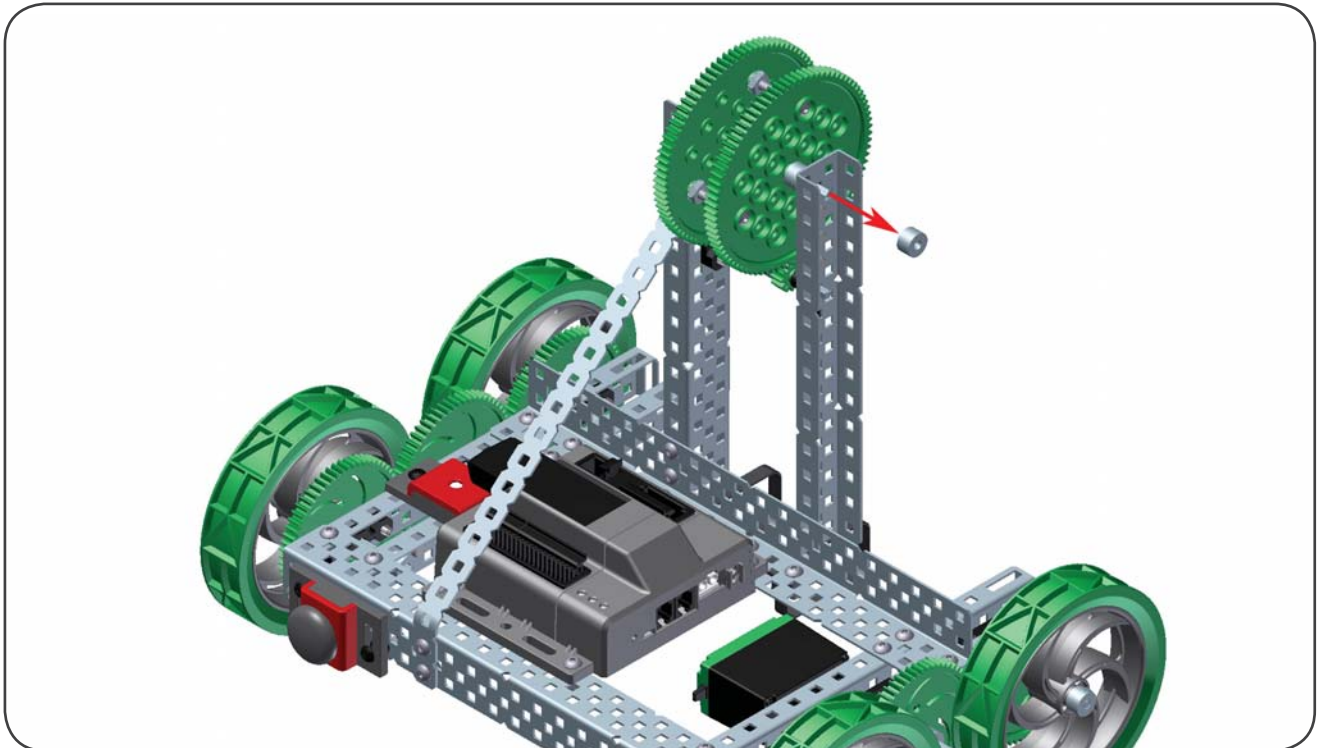

Next, remove the left, bent bar and its screws and nuts
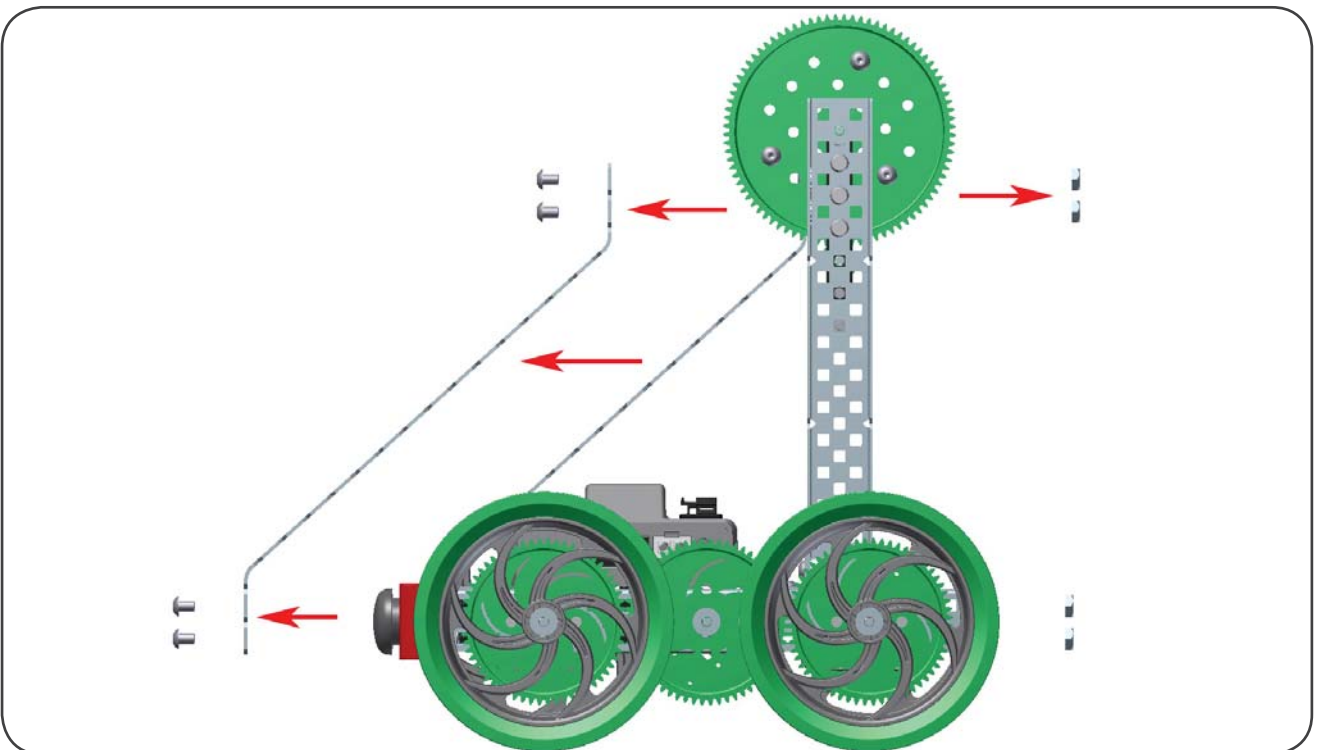
CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

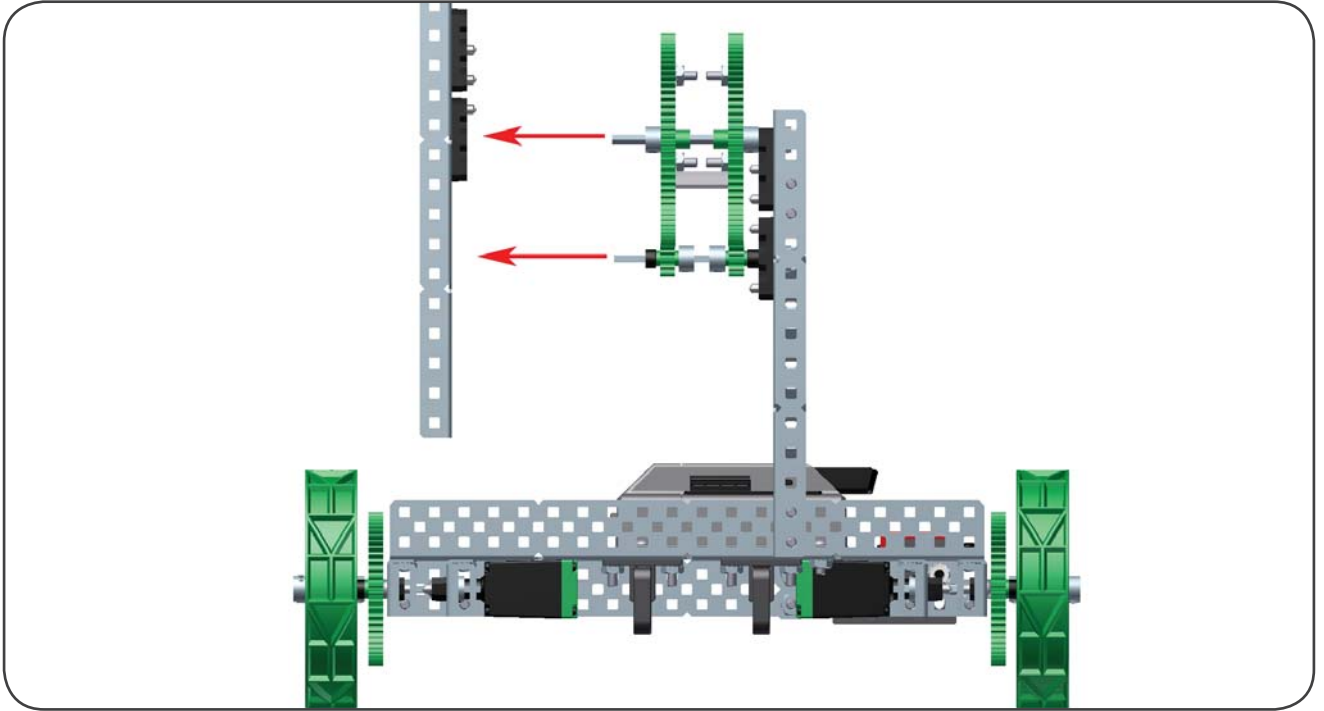### This is what the robot should look like after the bar is removed

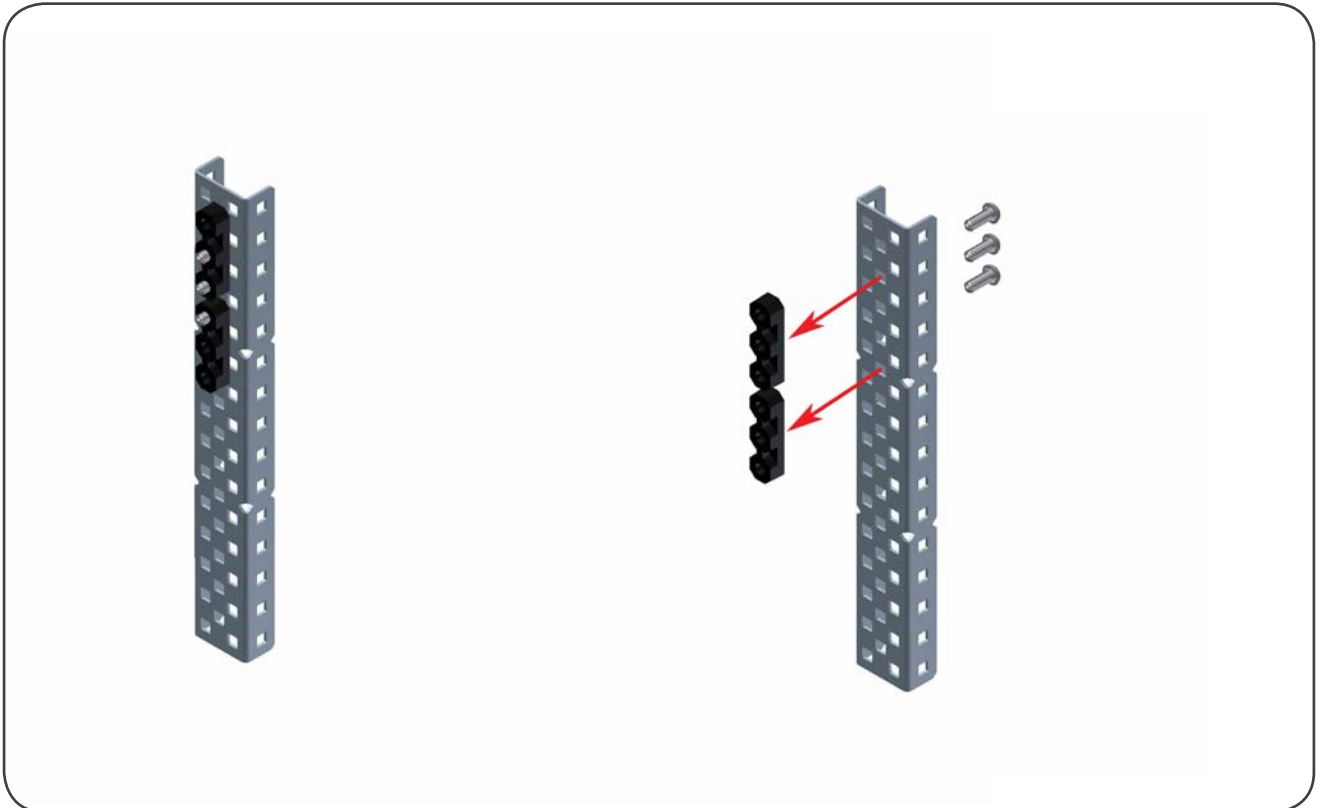### Remove the shaft collar below

CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

Carefully slide the C-Channel off the arm structure. Keep the bearing blocks intact.

Take the metal bar and remove the bearing blocks and rivets.

CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

Reattach the block on the opposite side of the metal bar

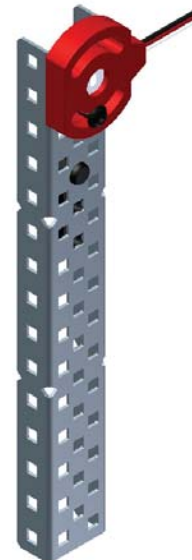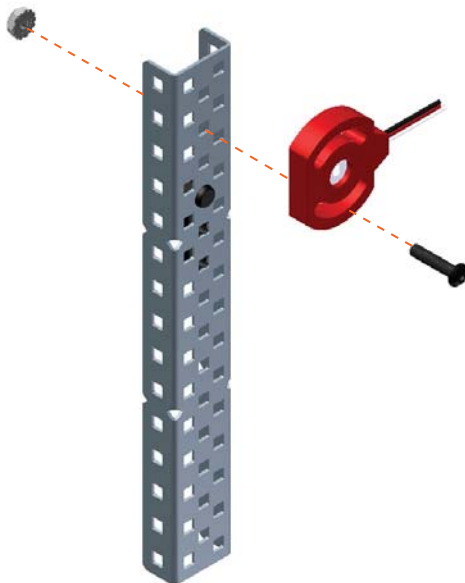⚠ *Keep the other flat, bearing block and 2 rivets. We will use it later for the limit switch.*
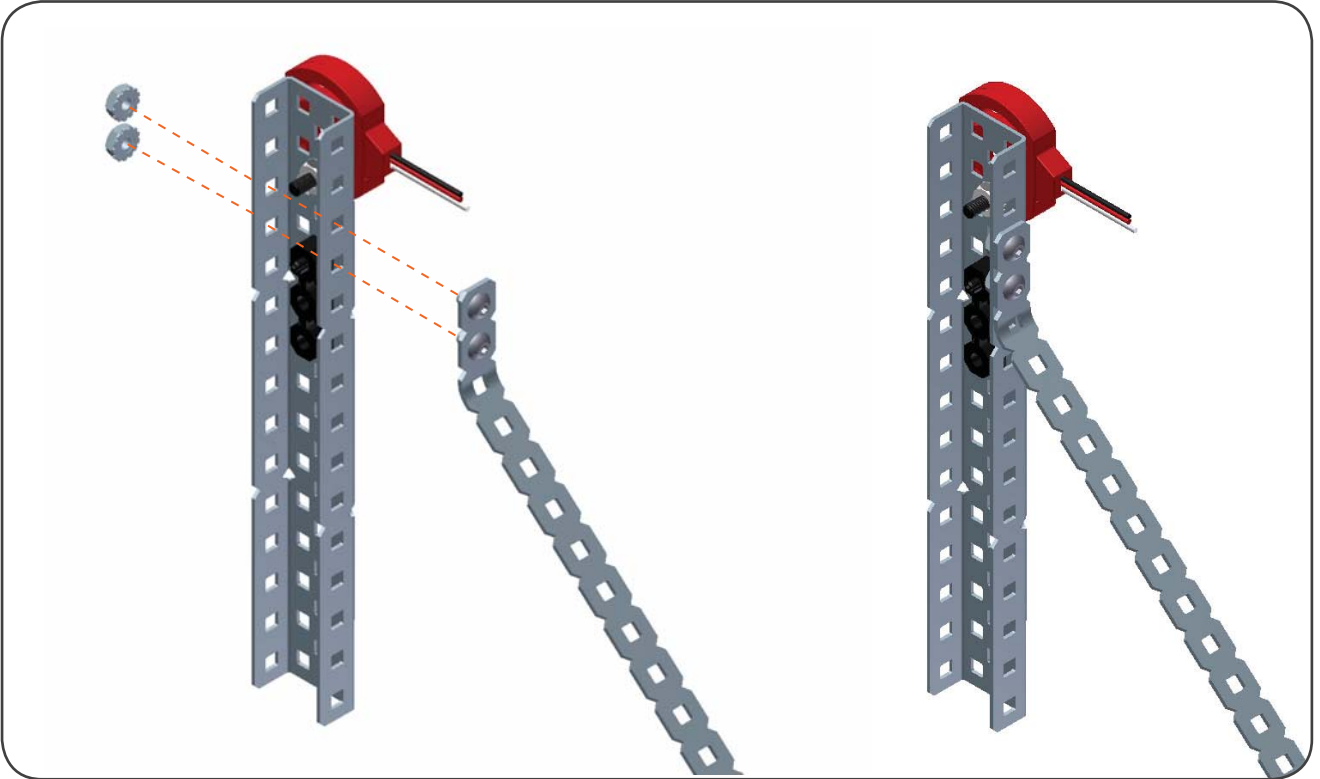
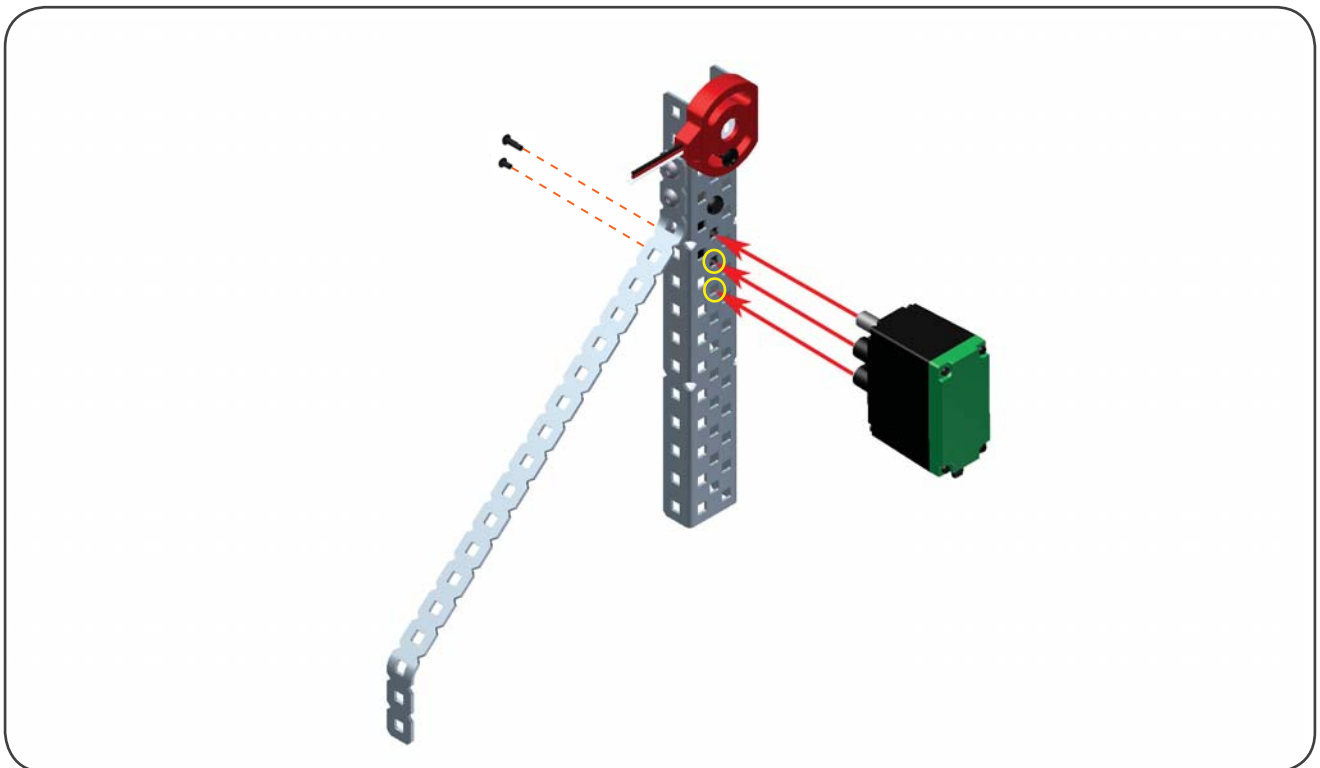3/4"

x1   x1   x1

Attach the Potentiometer

CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*
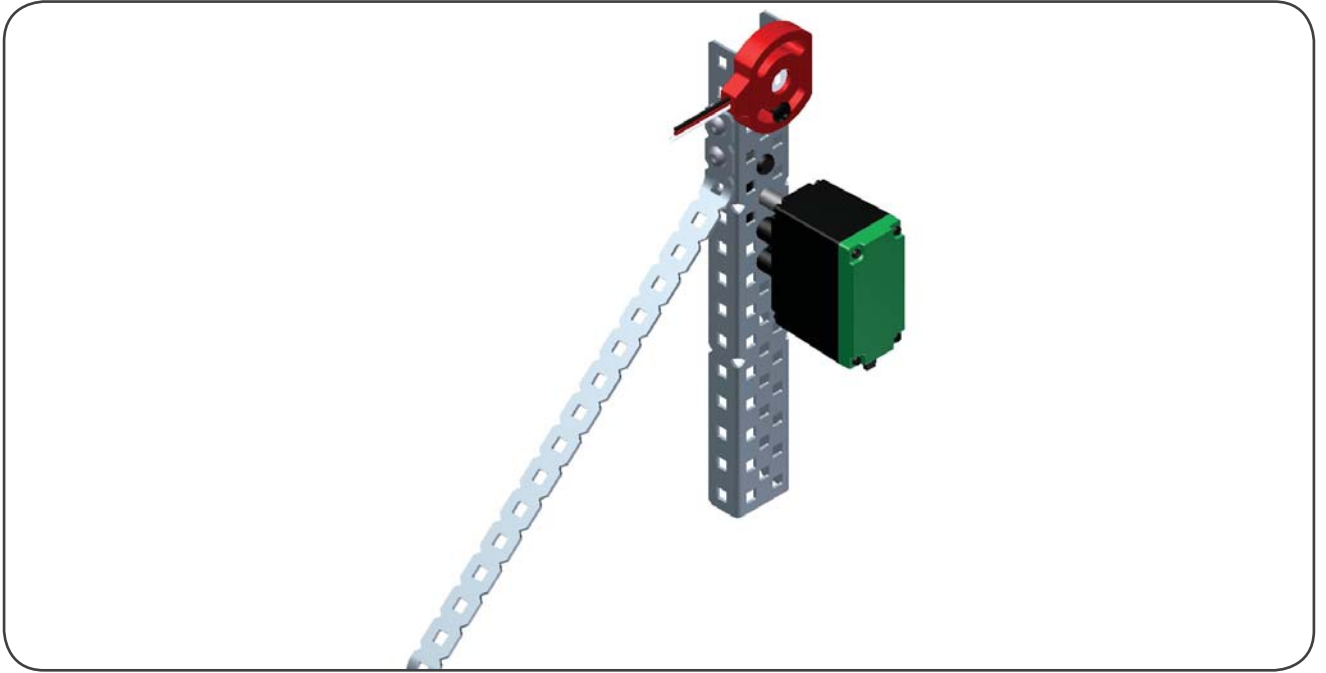
Reattach the bent bar we removed earlier

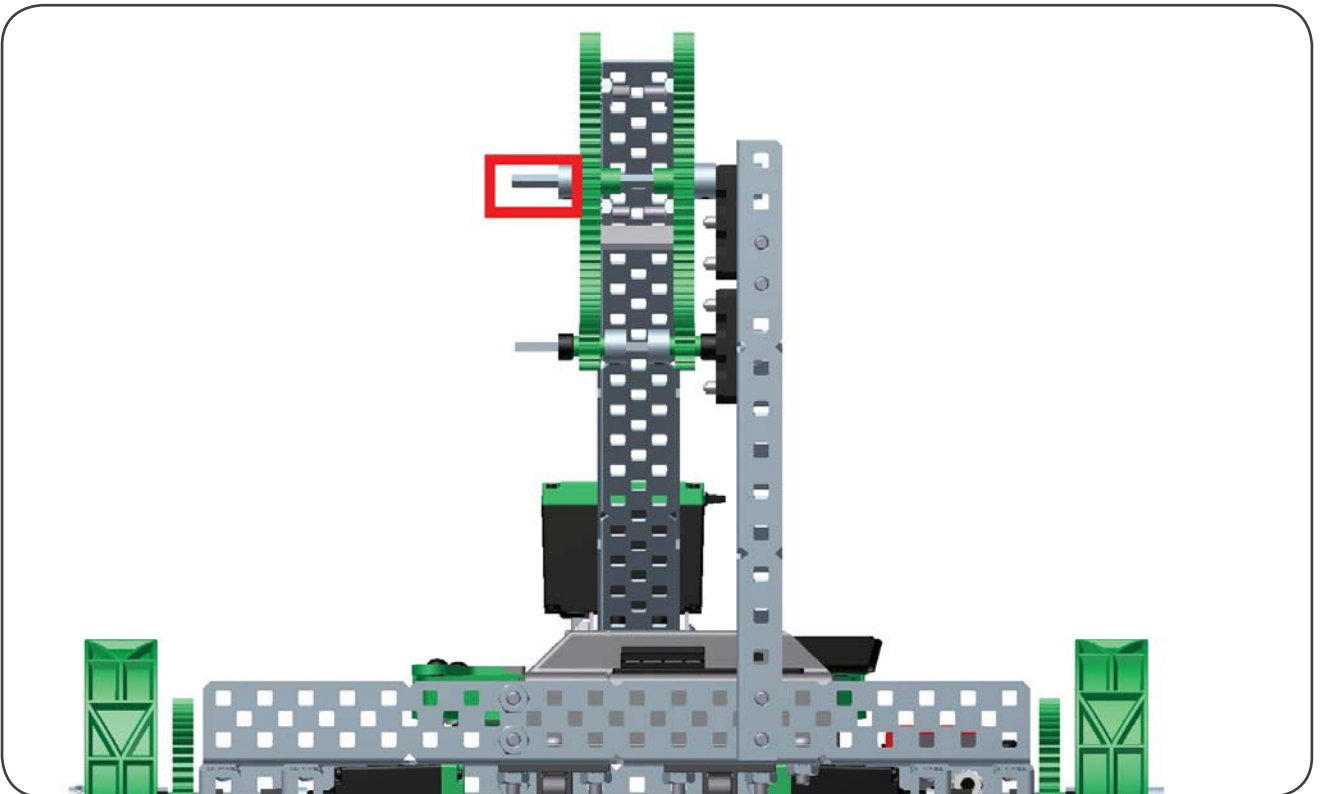### Re-attach the arm motor along with the clutch post and shaft coupler

CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*
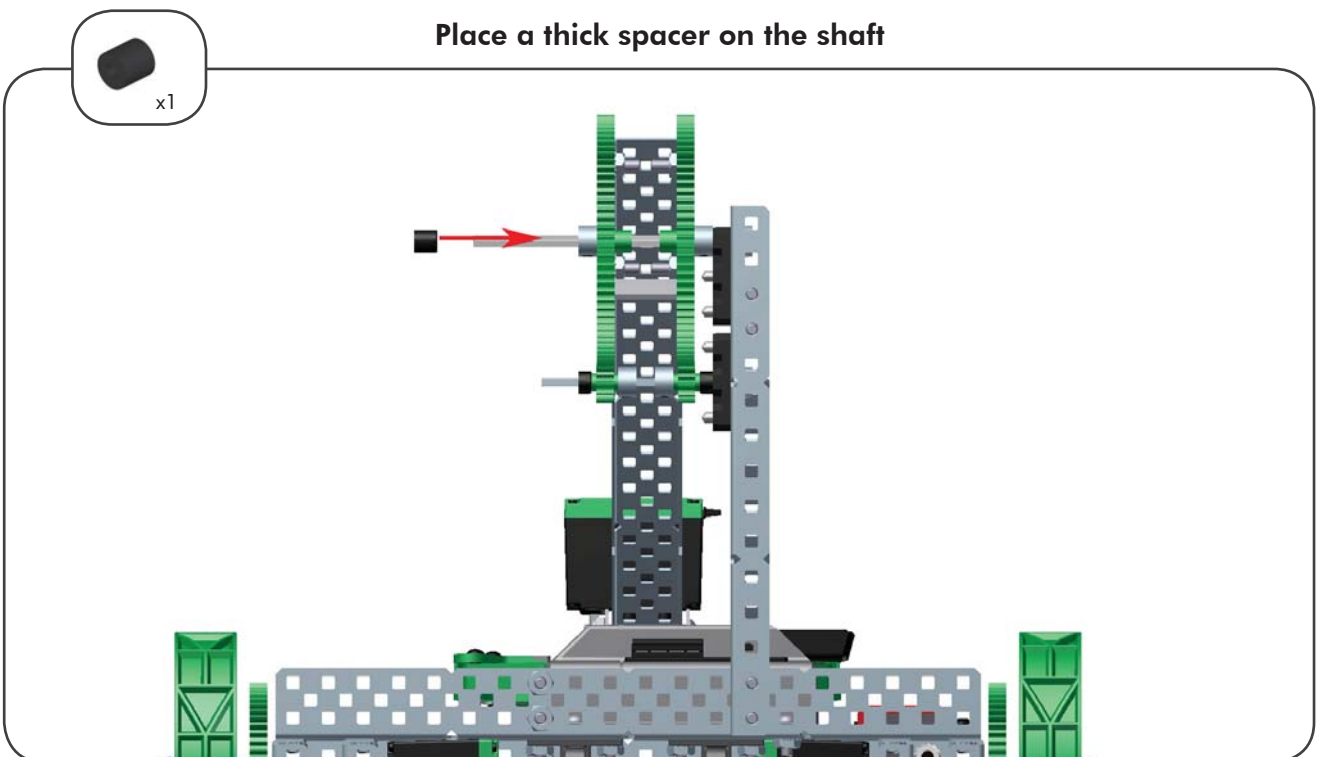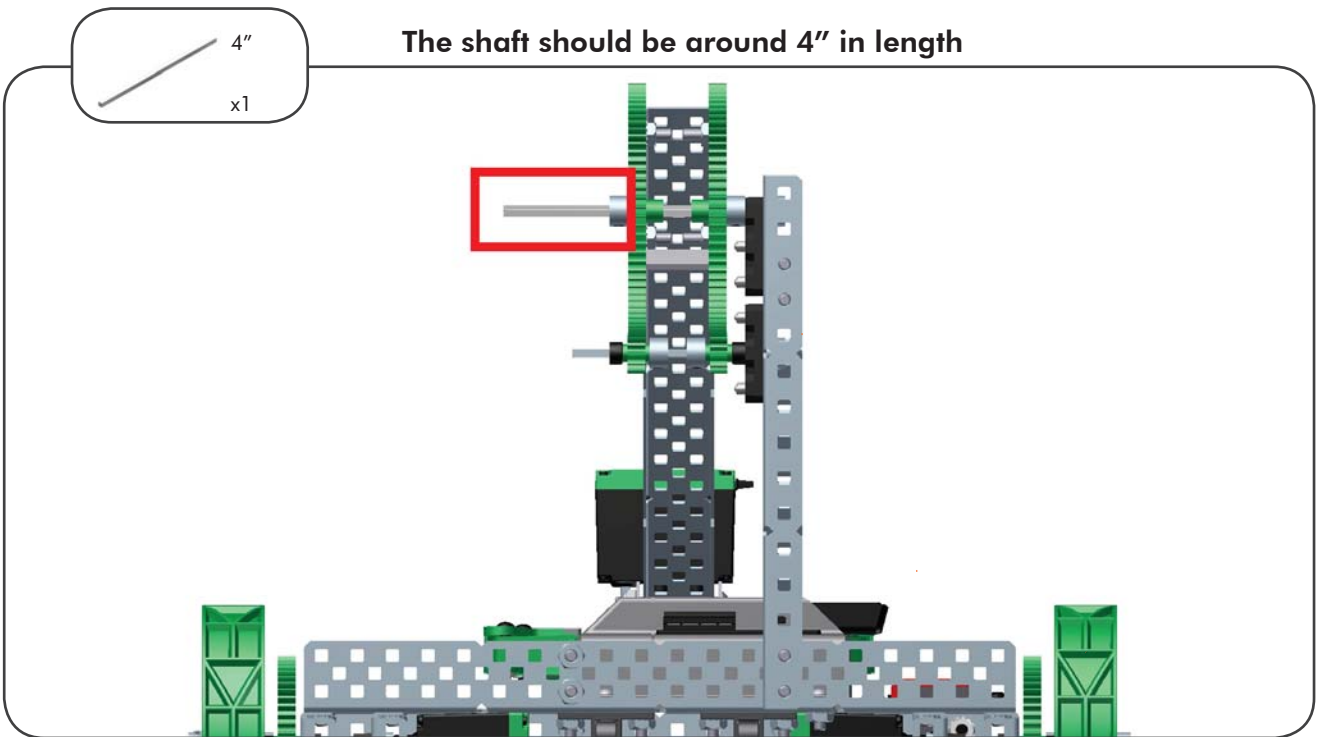
Make sure your structure looks like this before moving on

Replace the uppermost shaft of the arm with a longer shaft.
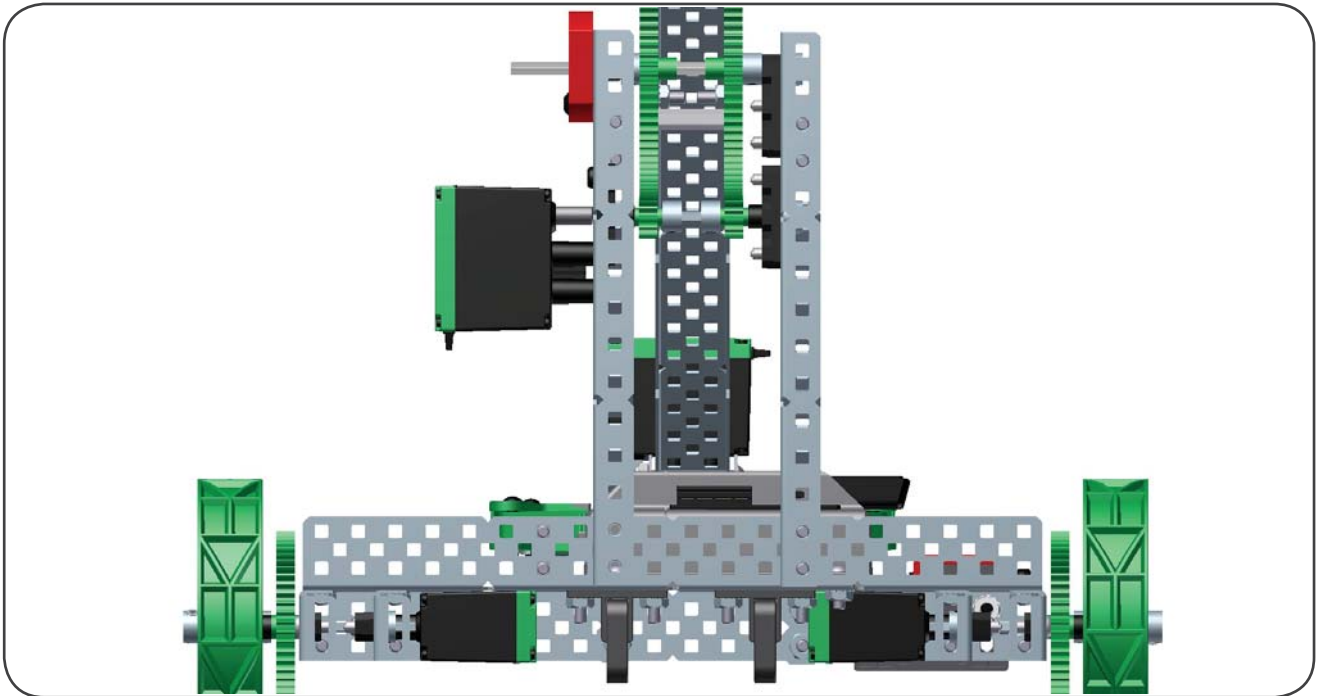
CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

4"
x1

The shaft should be around 4" in length

x1

Place a thick spacer on the shaft

CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

Slide the structure back in place. Both C-Channels should now open to the right.
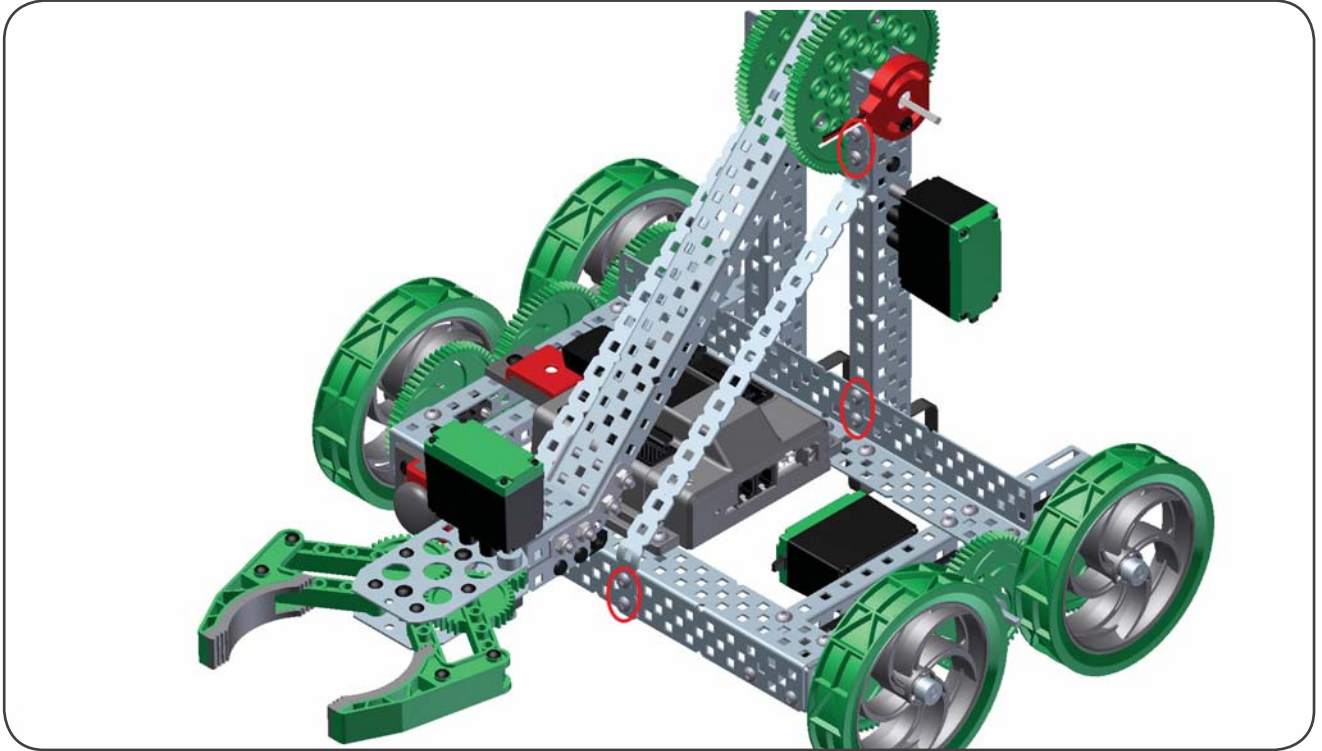

> ⚠️ *Building Tip - Potentiometer Range of Motion*
>
> *At this step, make sure the arm rotates within the potentiometer's range of motion.*
>
> *Forcing the potentiometer beyond its mechanical stops will damage the sensor.*
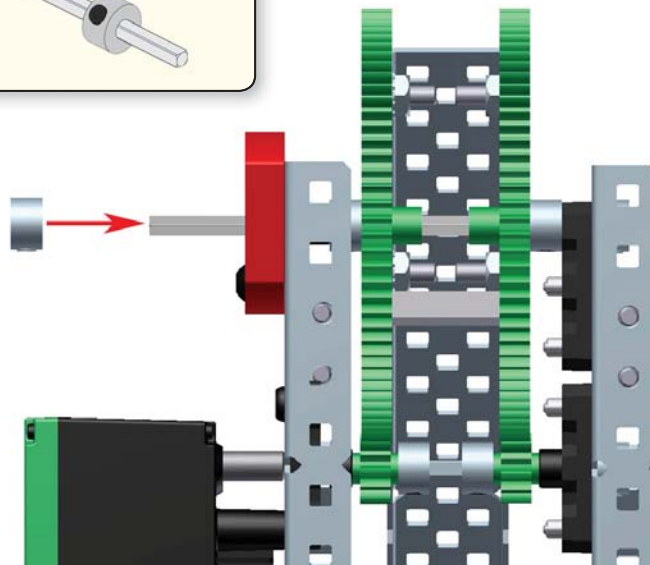
CLAWBOT BUILDING INSTRUCTIONS

4 **Attaching the Potentiometer** *(continued)*

Screw the screws and nuts shown below back into place

Finish by putting on the shaft collar we removed earlier
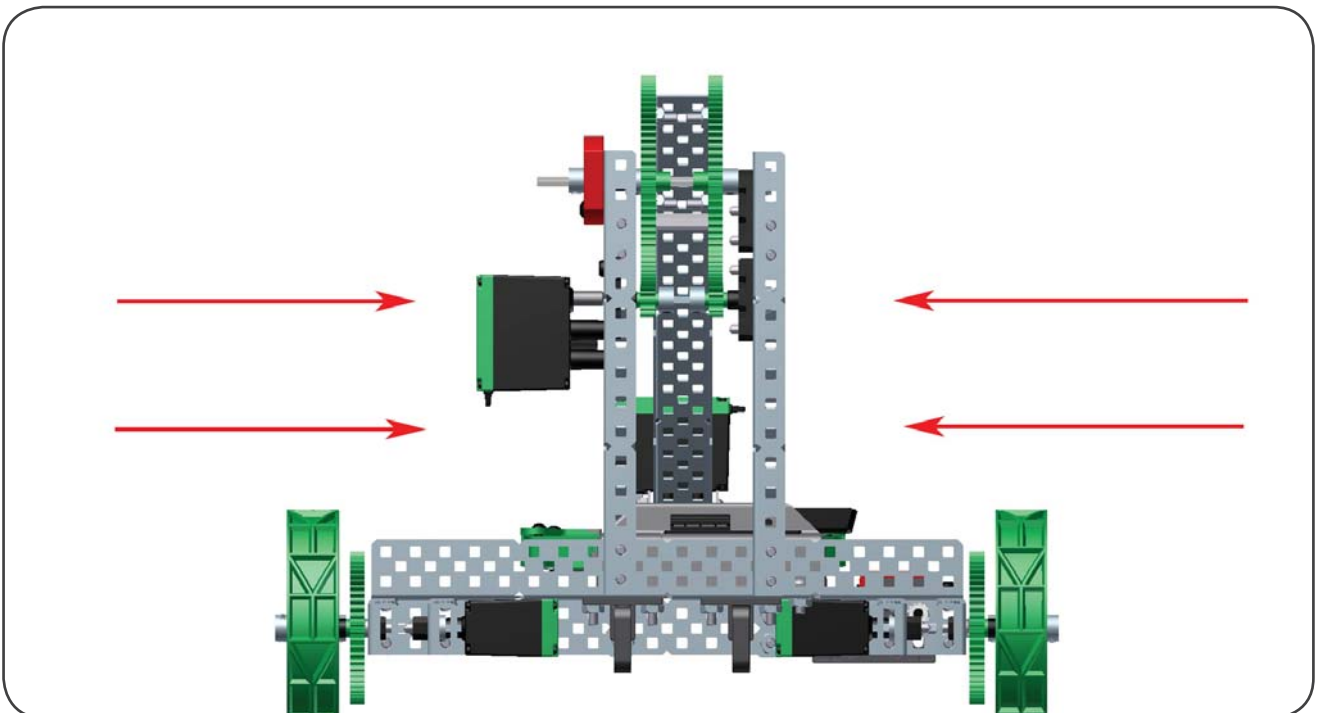
Building Tip - Using Shaft Collars

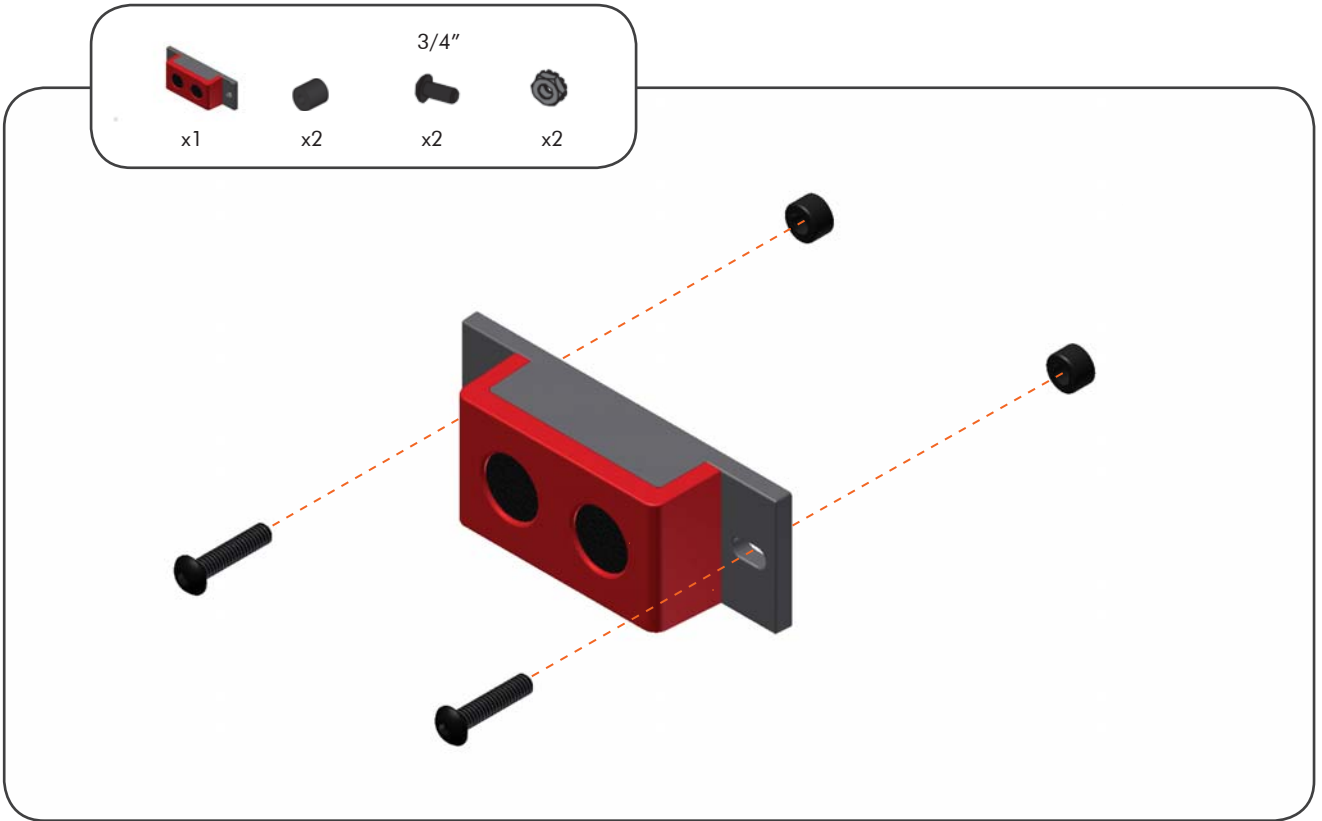**4** **Attaching the Potentiometer** *(continued)*
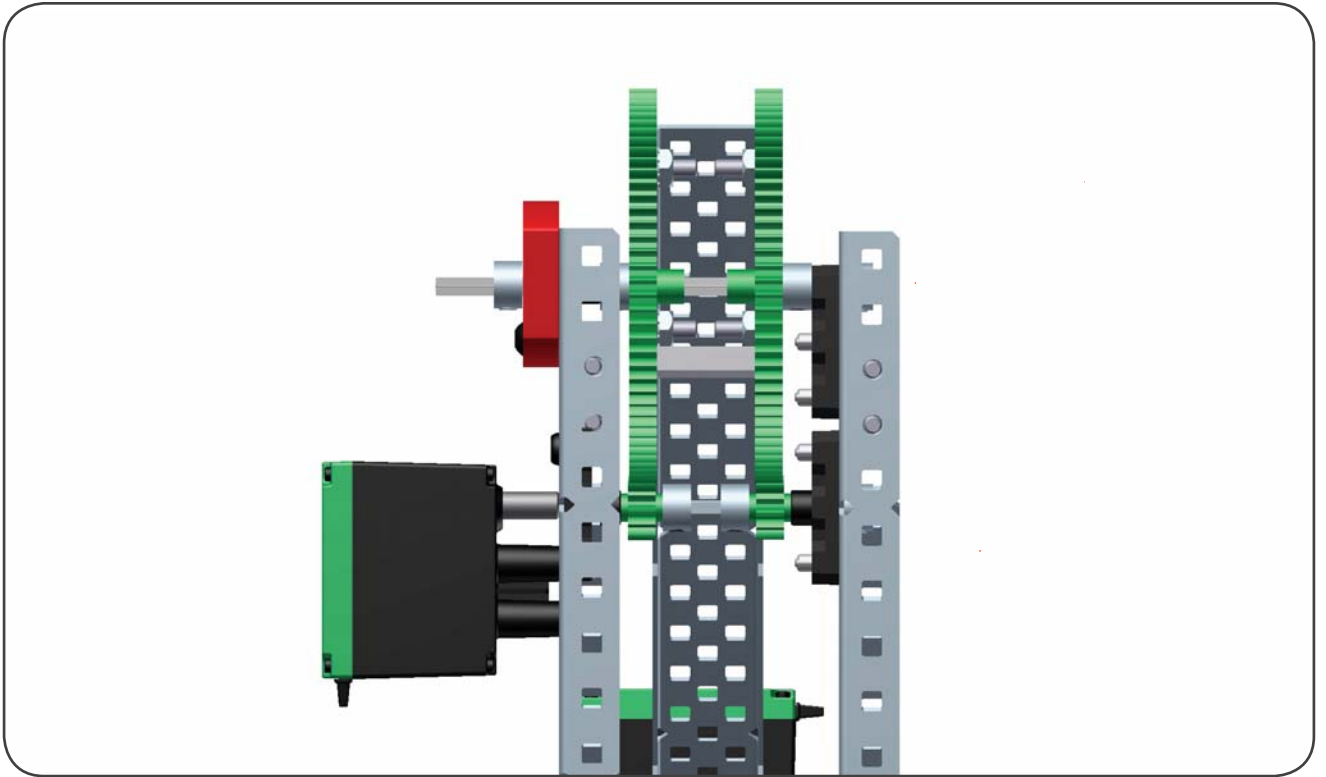
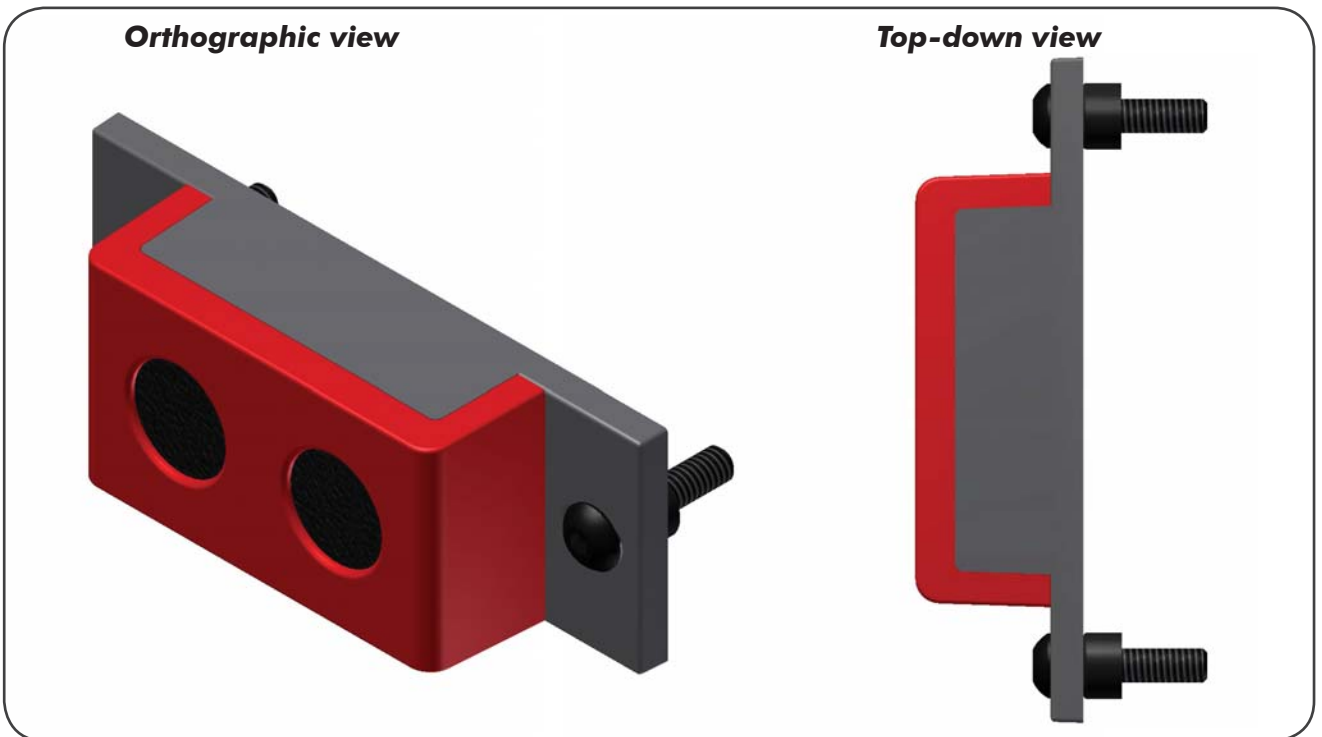**Push the arm structure inwards and make sure everything is tight**

Make sure the arm moves freely
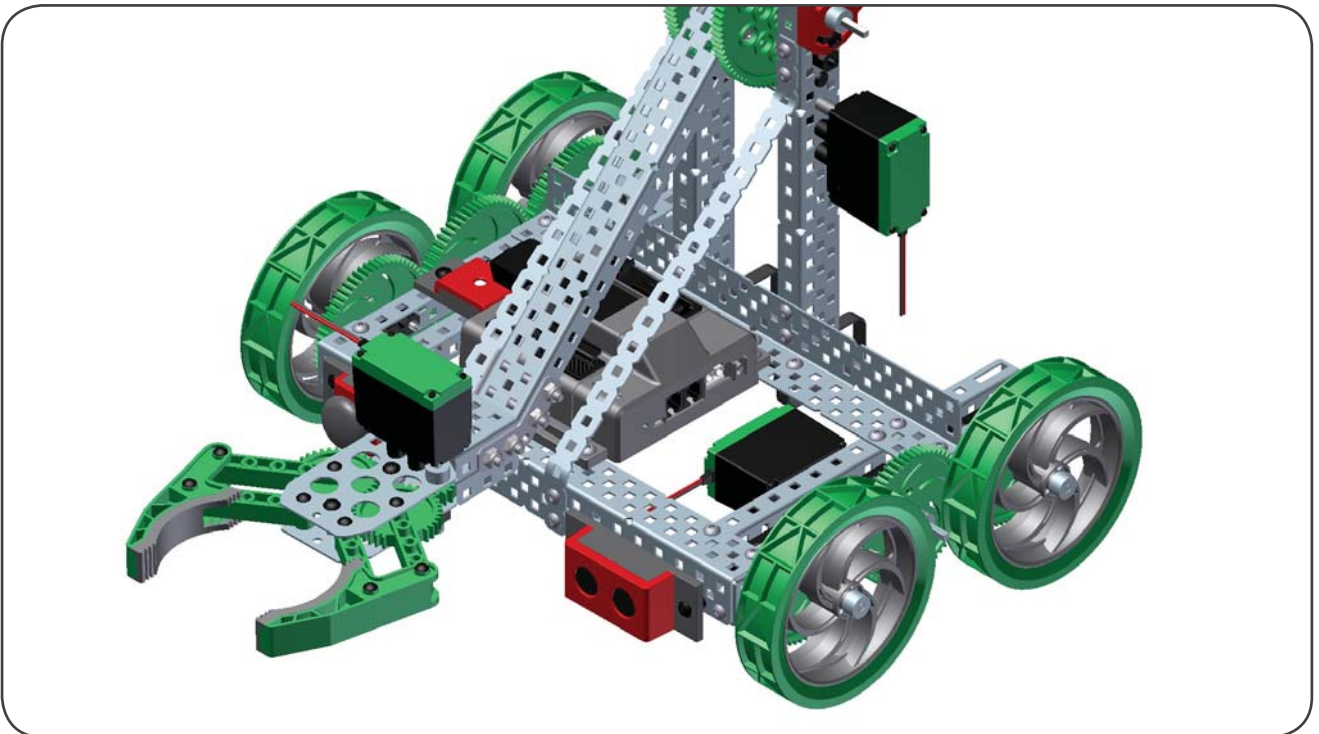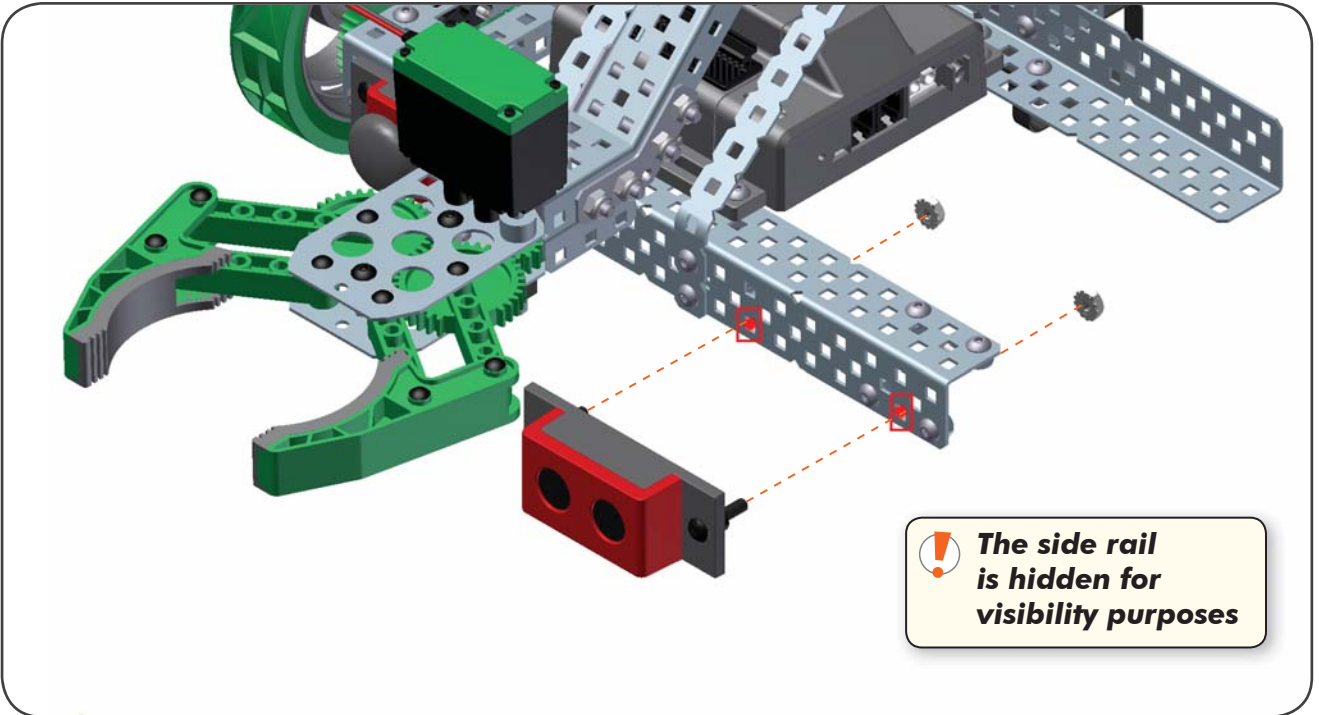
CLAWBOT BUILDING INSTRUCTIONS

5 **Attaching the Sonar Sensor**

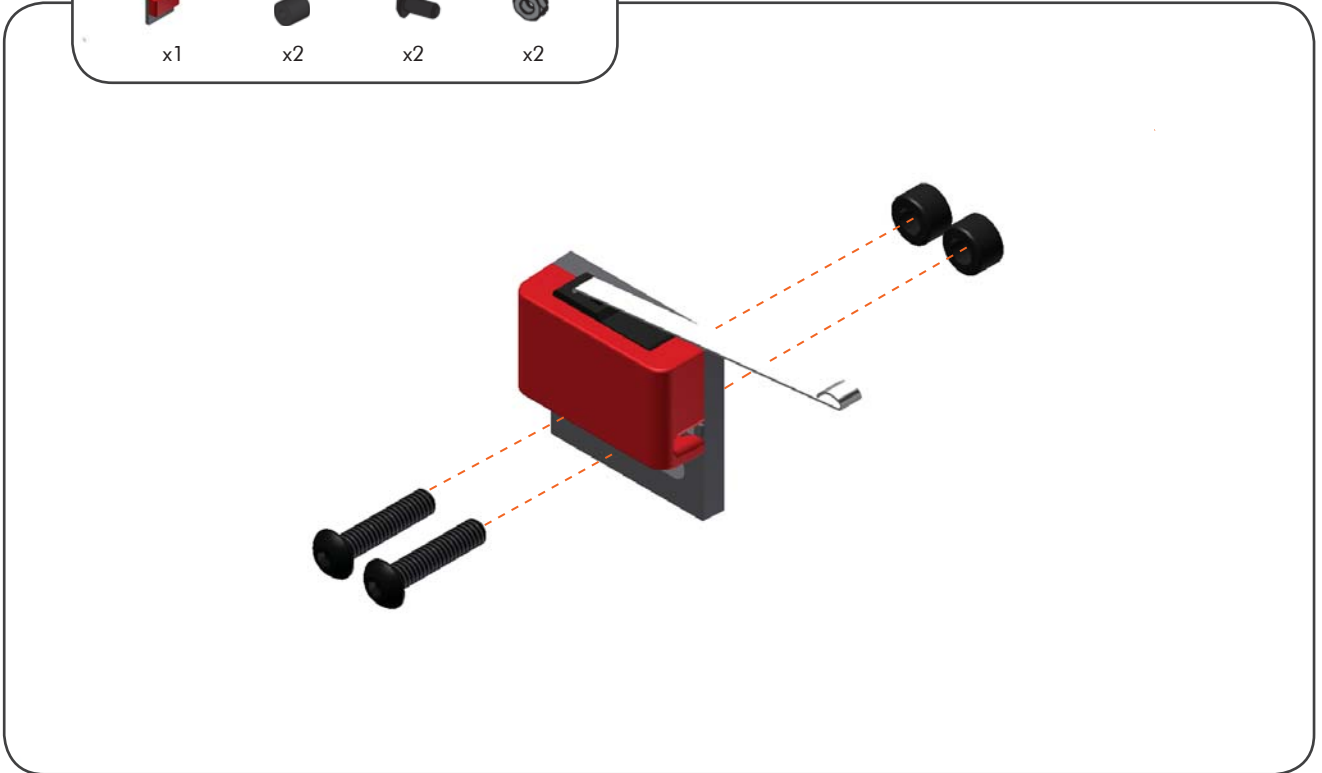**Much like the bumper sensor, start with 2 screws and a spacer**

Orthographic view   *Top-down view*

CLAWBOT BUILDING INSTRUCTIONS

5 **Attaching the Sonar Sensor** *(continued)*

Attach the sonar to the front of the robot

⚠️ **The side rail is hidden for visibility purposes**

CLAWBOT BUILDING INSTRUCTIONS

6 Attaching the Limit Switch

3/4"

x1   x2   x2   x2
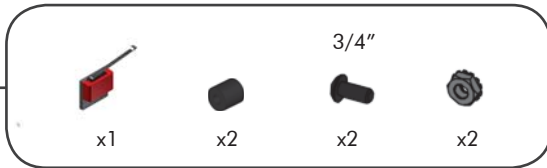
The limit switch is also attached using 2 screws and spacers
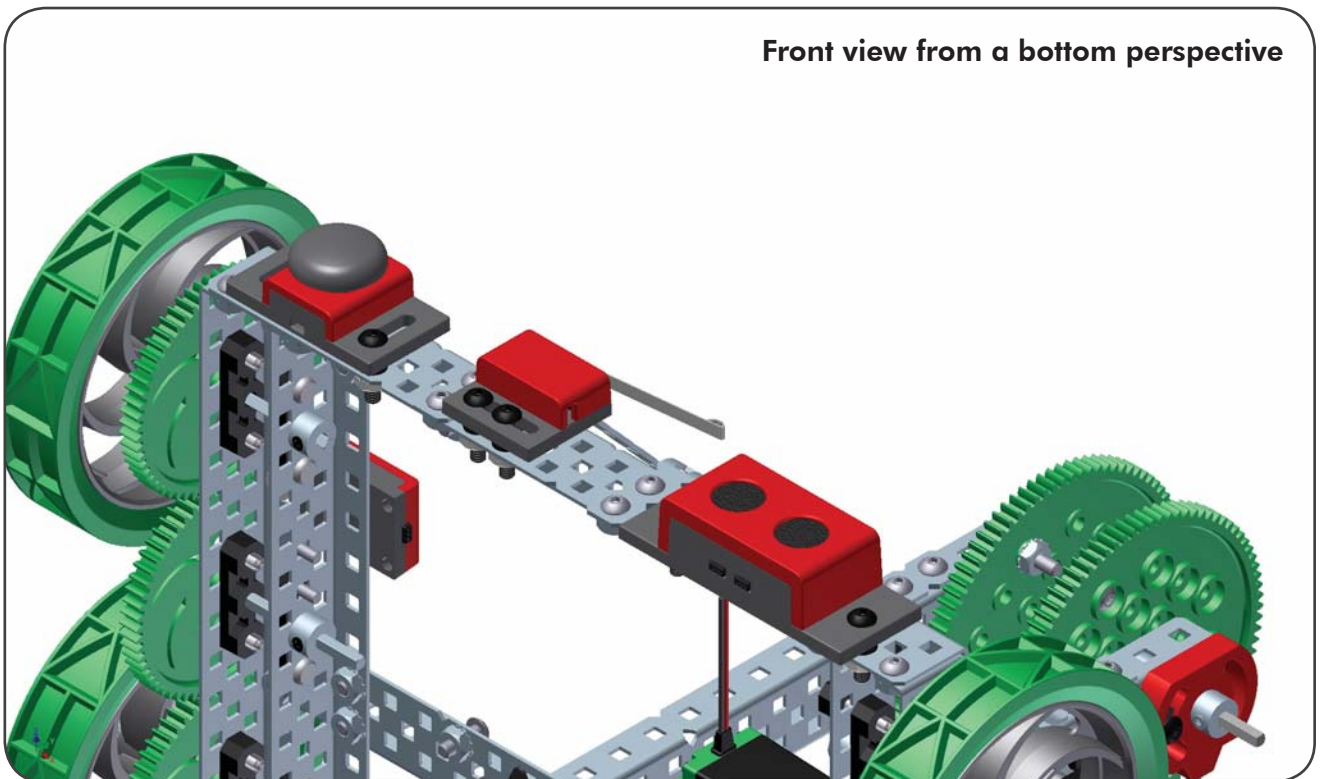
Orthographic view

Top-down view
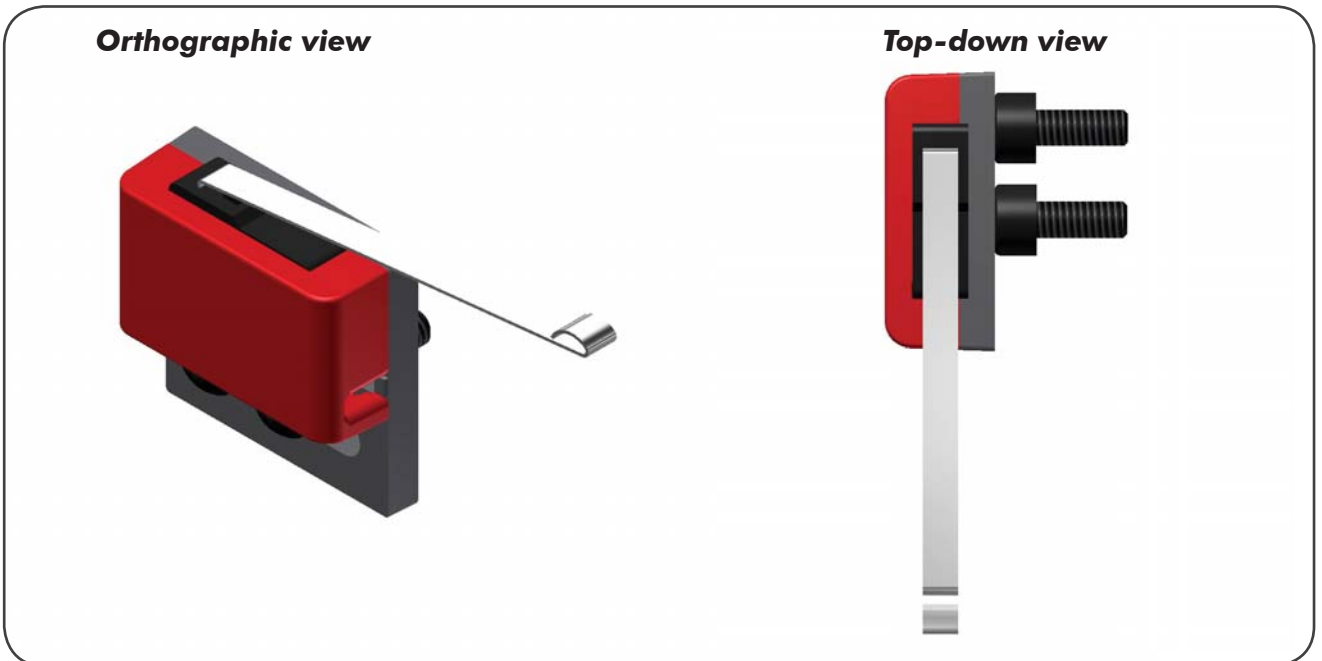
CLAWBOT BUILDING INSTRUCTIONS

6 **Attaching the Limit Switch** *(continued)*

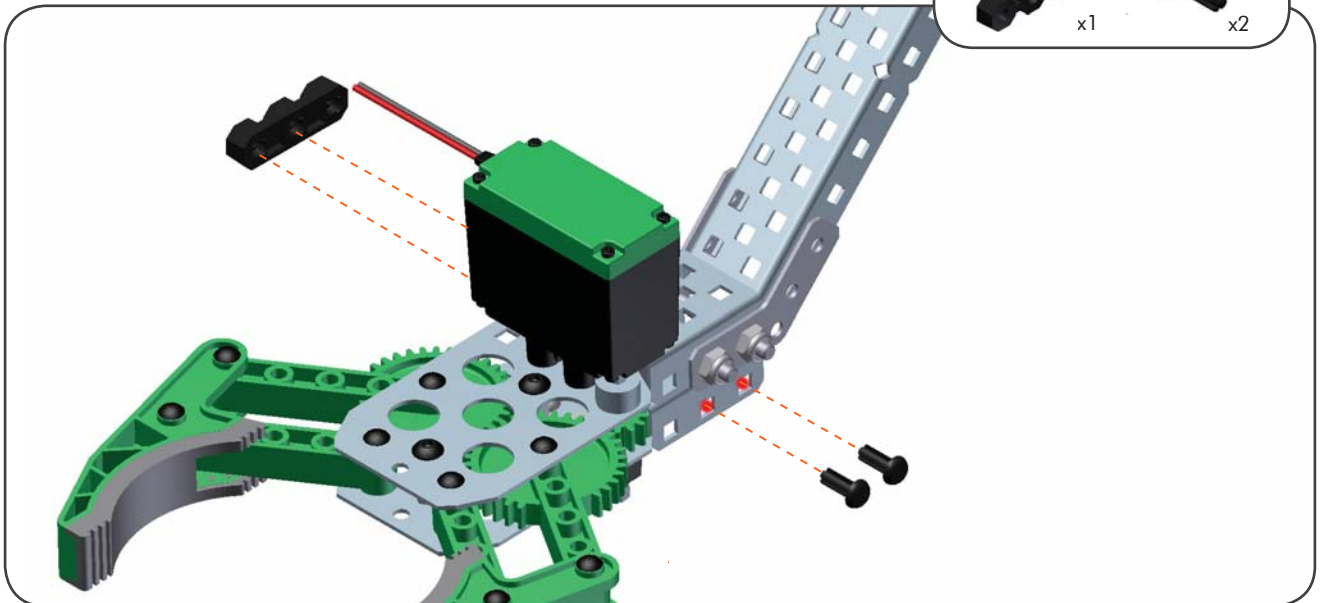**Place the sensor in between the bent bars on the front of the robot like such**
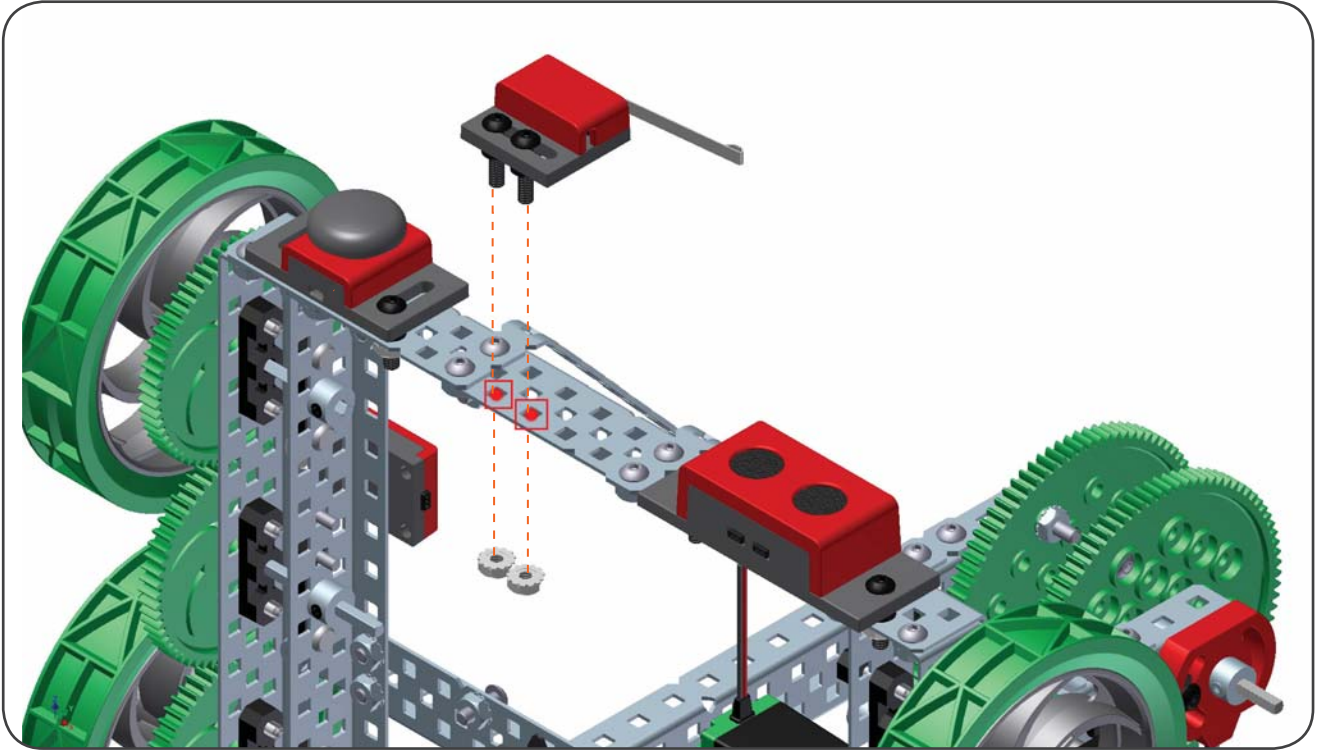
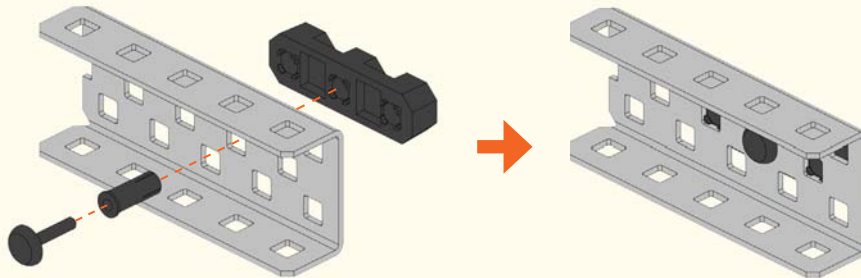

Front view from a bottom perspective
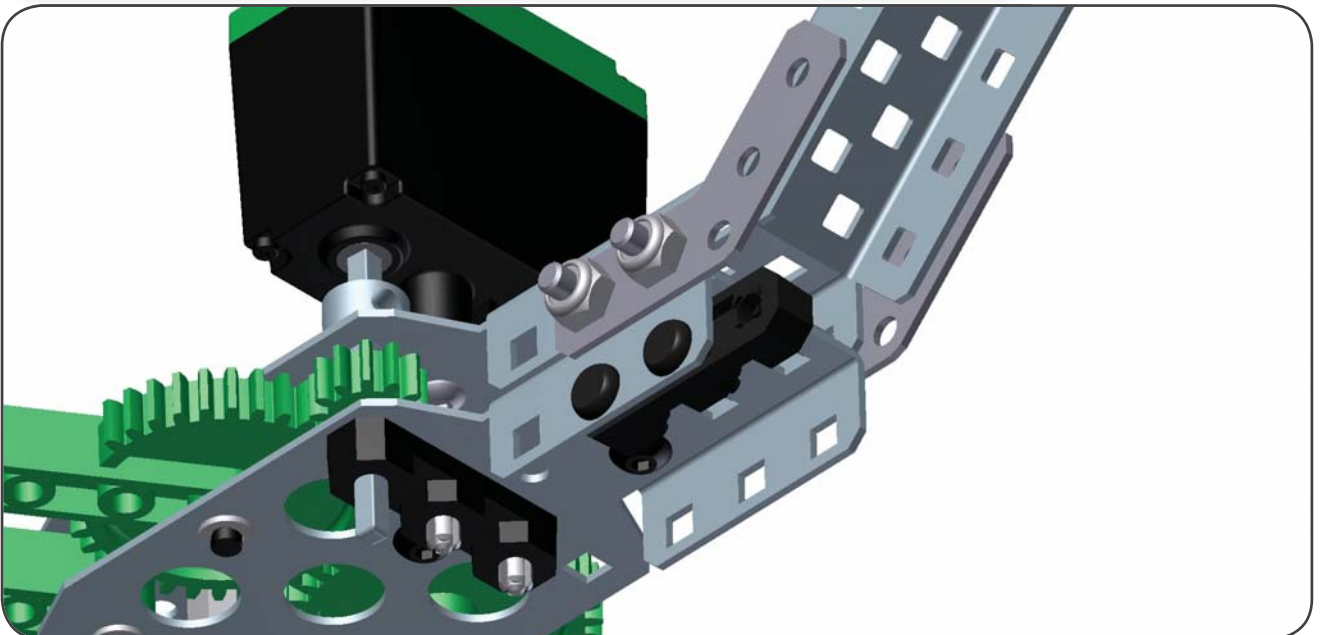
CLAWBOT BUILDING INSTRUCTIONS

6 **Attaching the Limit Switch** *(continued)*

x1   x2

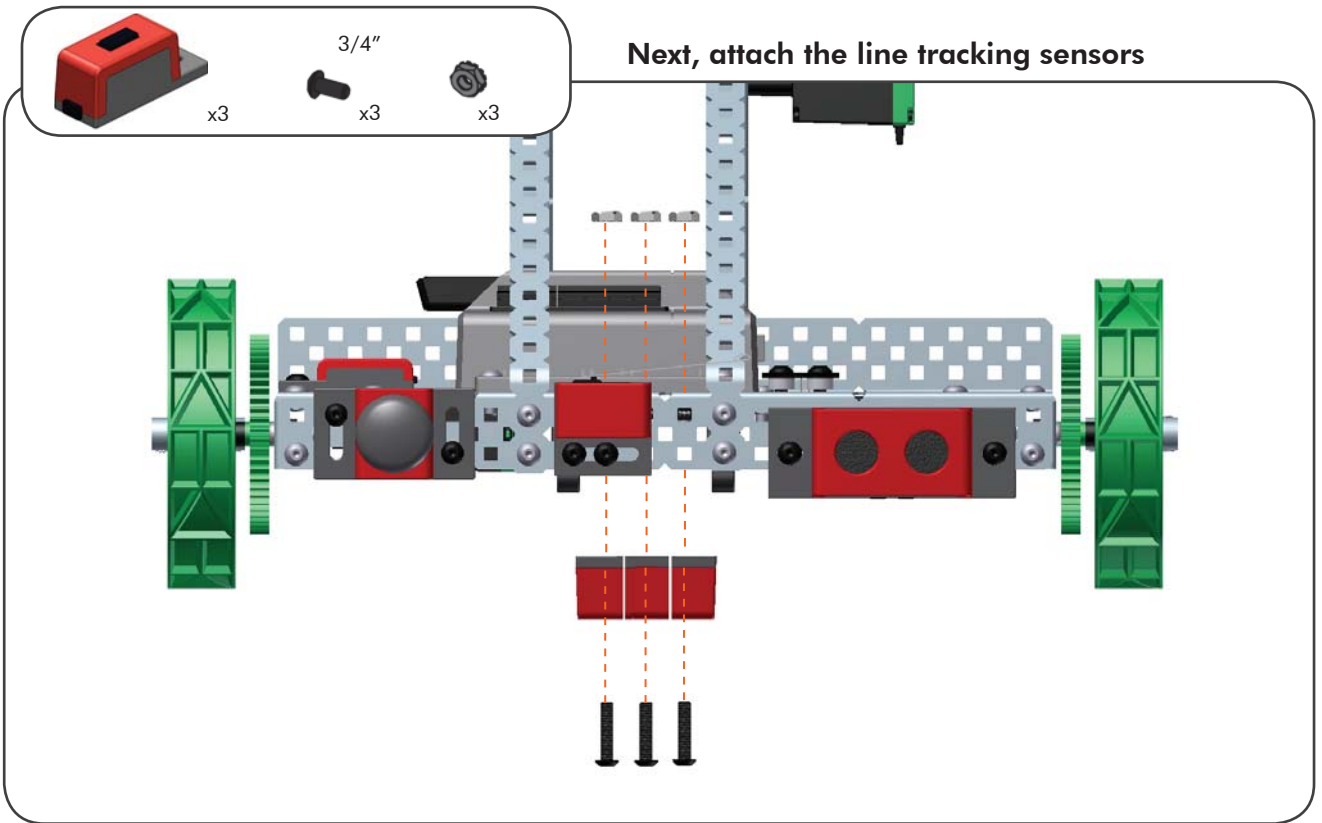**!** *Building Tip - Using Pop Rivets*

Recover the bearing block you saved earlier from the potentiometer build. Place it underneath the claw as shown below. This will help the claw activate the limit switch 100% of the time
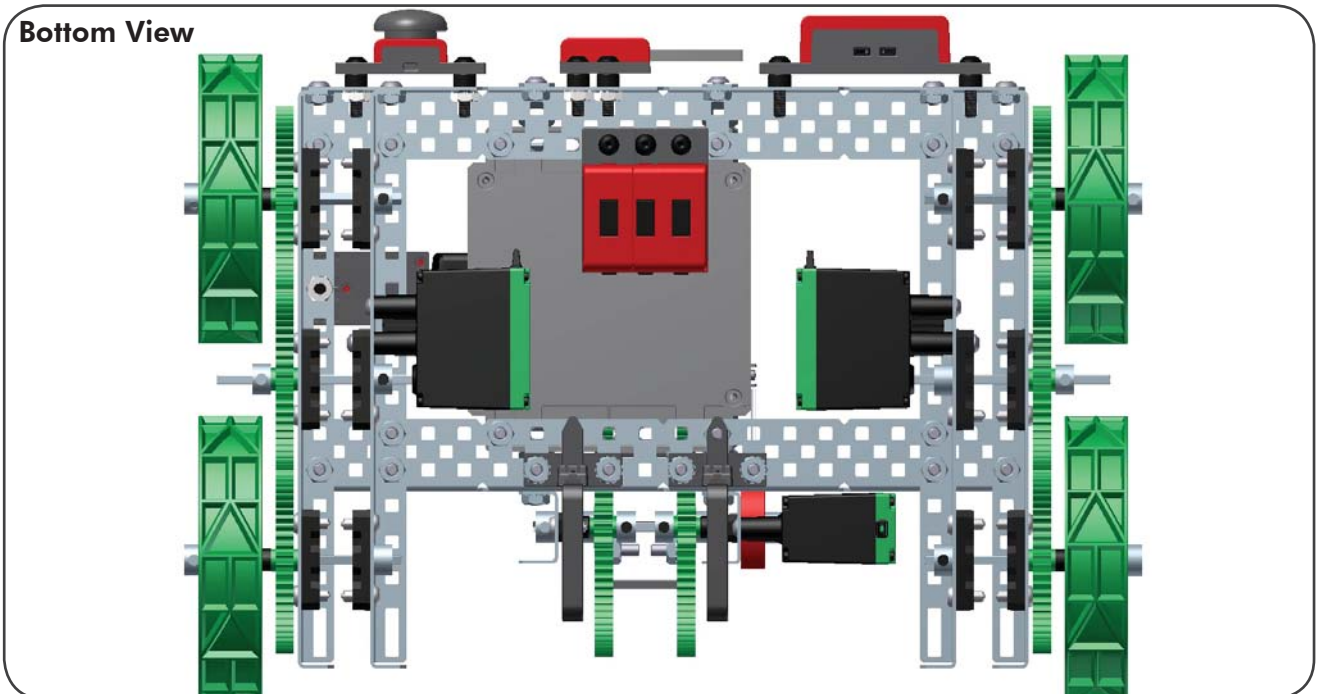
CLAWBOT BUILDING INSTRUCTIONS
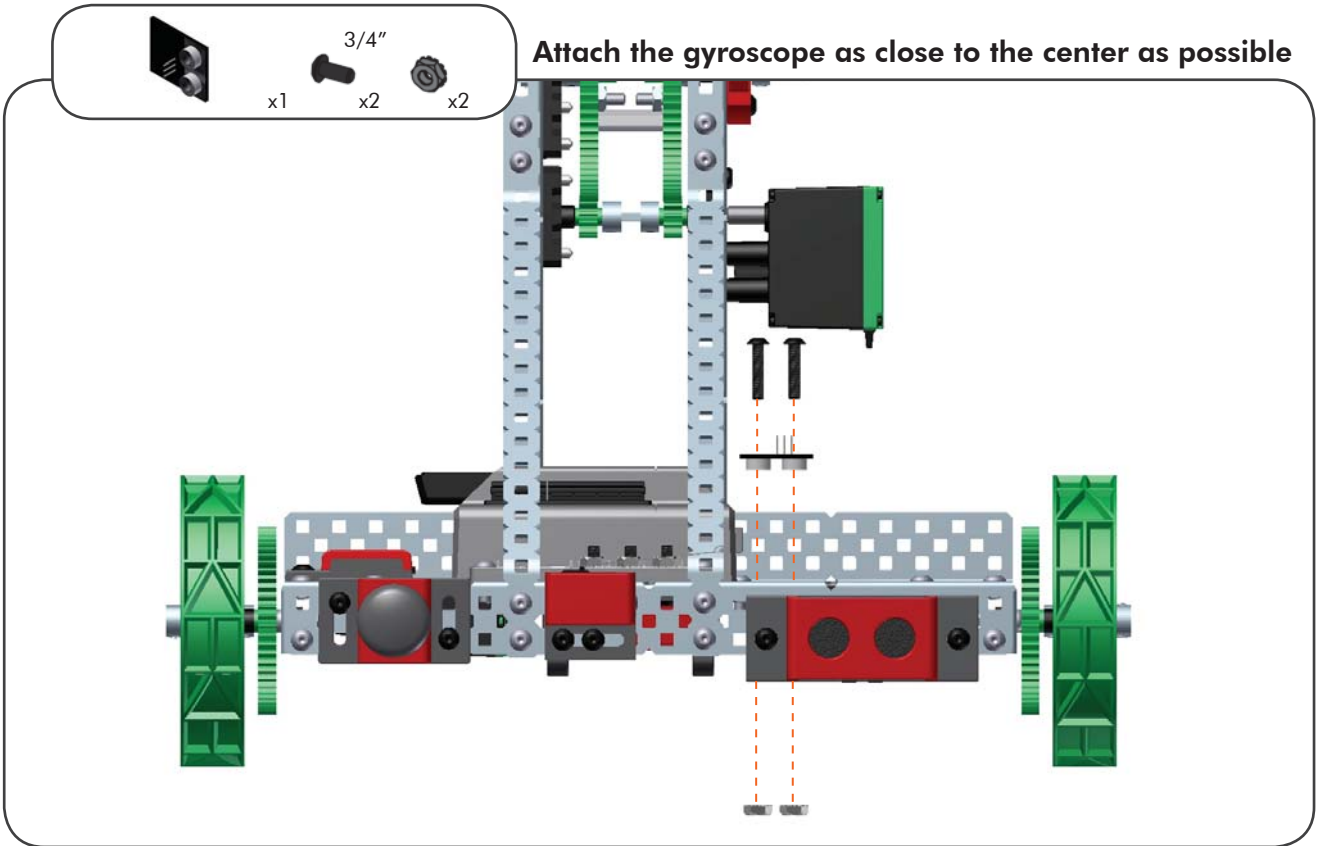
7 **Line Tracking Sensor Construction**

3/4"

x3   x3   x3

Next, attach the line tracking sensors

Make sure the line trackers are centered on the robot

Bottom View

CLAWBOT BUILDING INSTRUCTIONS

8 Attaching the Gyroscope

3/4"
x1   x2   x2

Attach the gyroscope as close to the center as possible

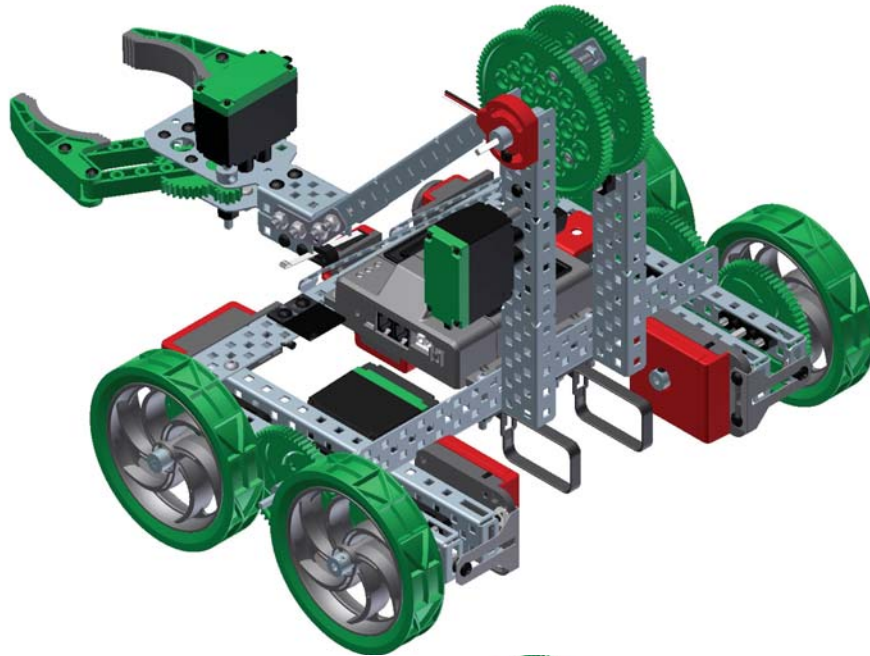**Below is the top view**
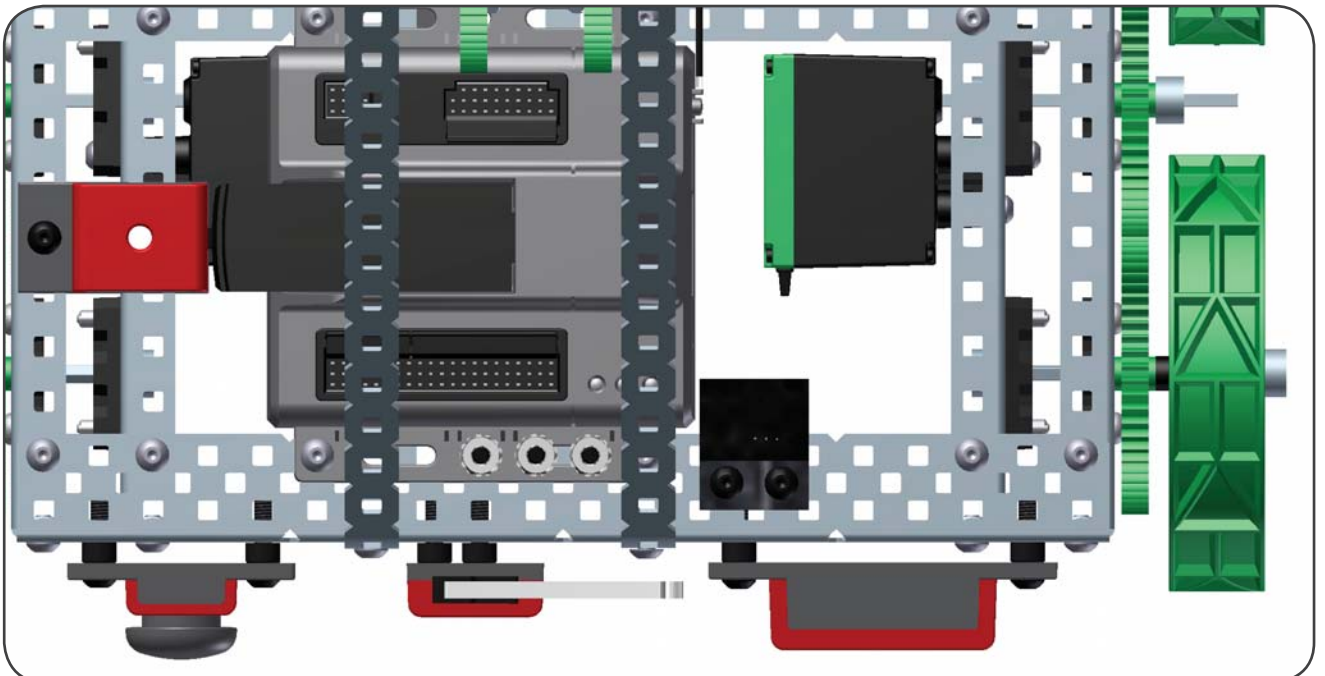
CLAWBOT BUILDING INSTRUCTIONS

> ⚠️ *This robot model features 2 options for motor encoder:.*
>
> *A.) Attaching the external VEX Quadrature Encoders to the shafts connecting the back wheels to the drive train.*
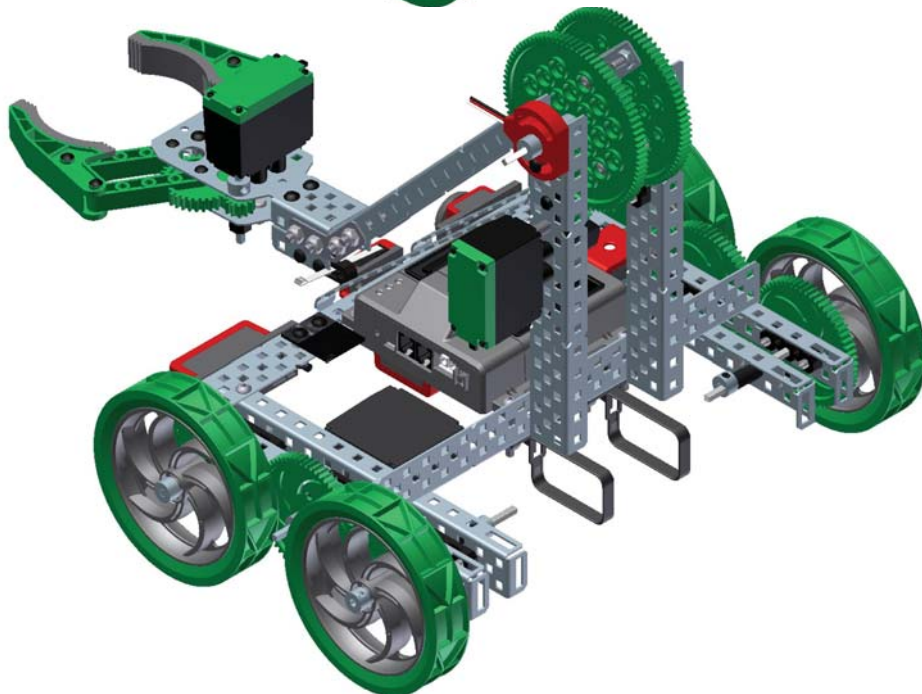>
> *B.) Using the Integrated Motor Encoders.*
>
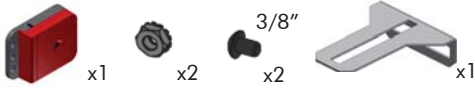> *This guide will show you how to build both.*

A.

B.

CLAWBOT BUILDING INSTRUCTIONS

9 Attaching the Left Encoder
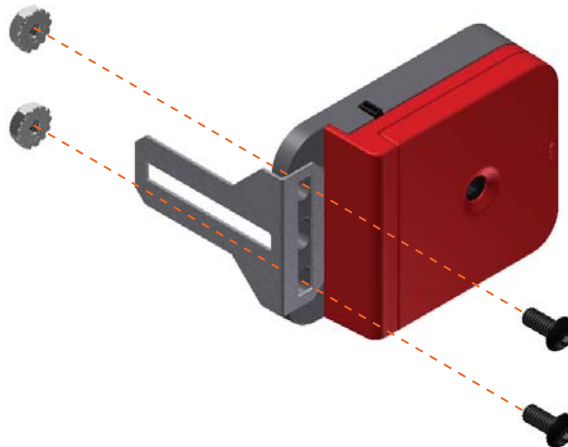
x1　x2　3/8"　x2　x1

Take an angle gusset and an encoder
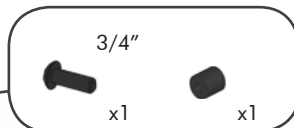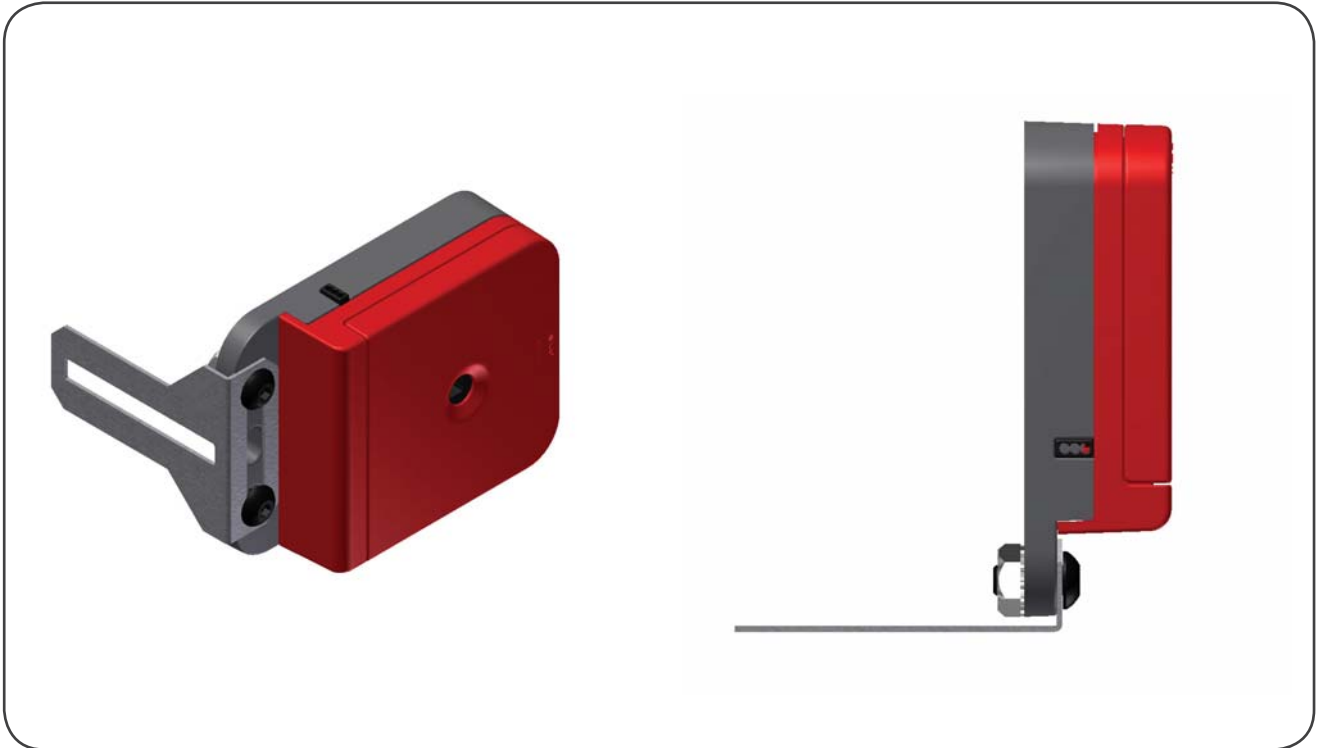

> ⚠️ **Option A:**
>
> **This section covers how to assemble the external Quadrature Encoders. If you would like to use the Integrated Motor Encoders, skip pages 24-31**
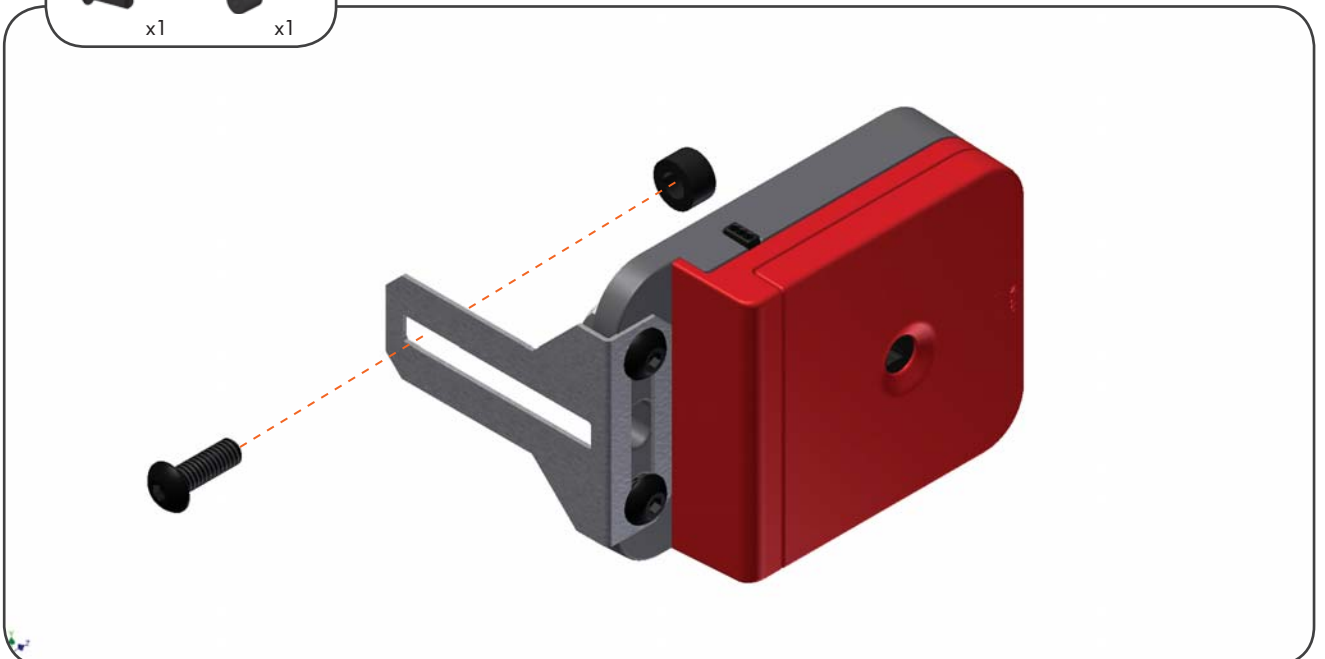
Connect them together

CLAWBOT BUILDING INSTRUCTIONS
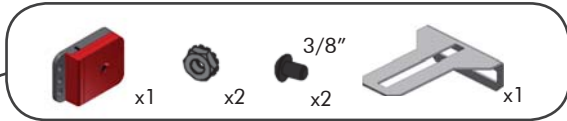
9 **Attaching the Left Encoder** *(continued)*

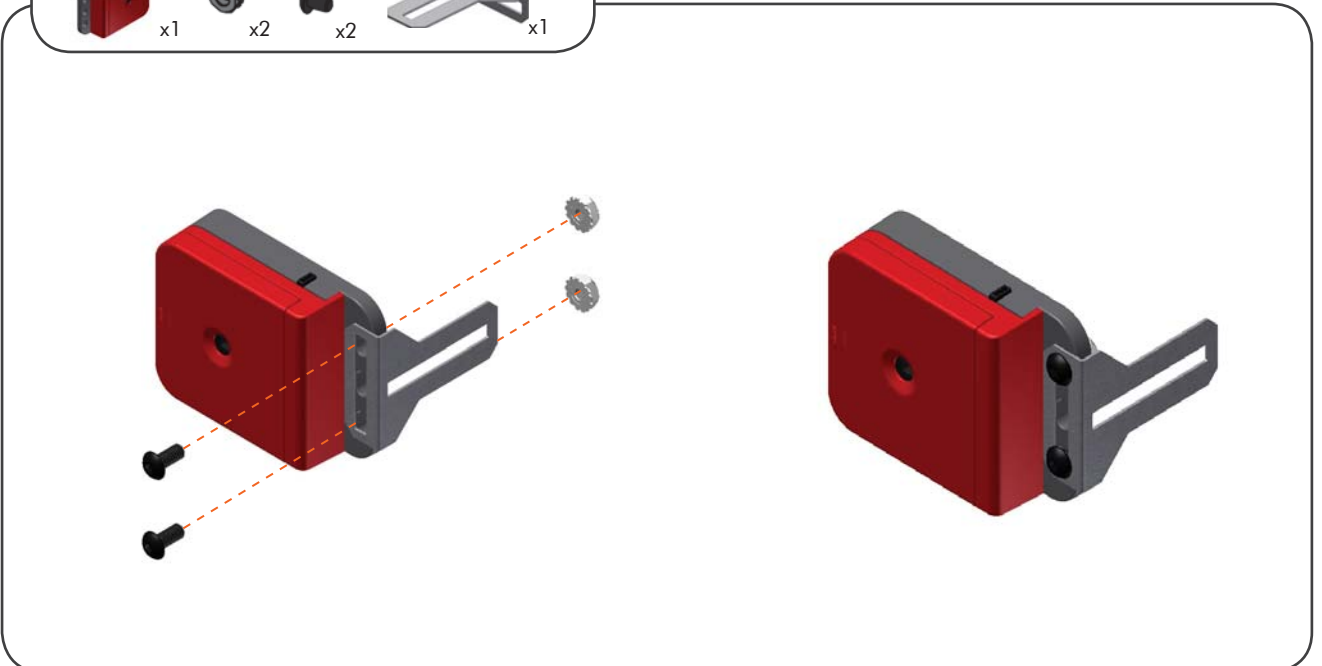**At the end of the gusset, place a screw and a thin spacer as shown below**

3/4"
x1   x1

CLAWBOT BUILDING INSTRUCTIONS

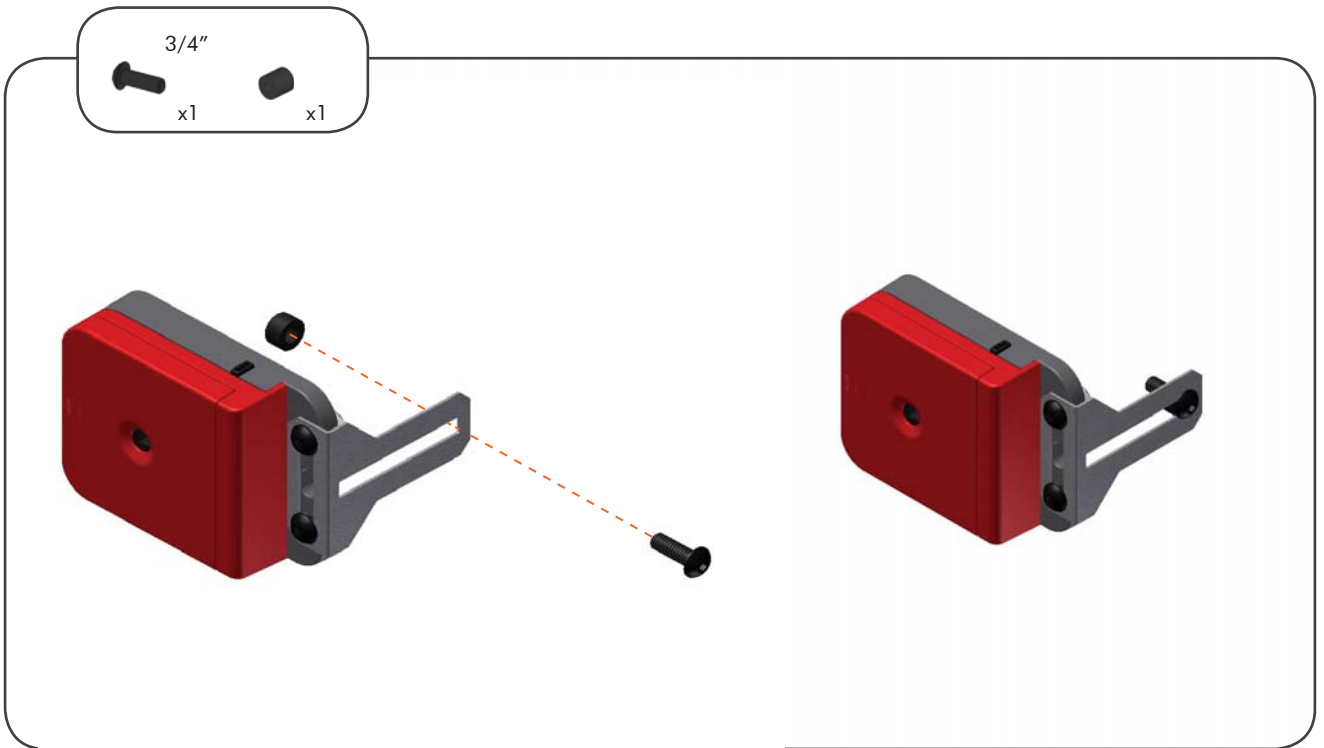**9** **Attaching the Left Encoder** *(continued)*

3/8"

x1   x2   x2   x1

Now do the same for the right encoder
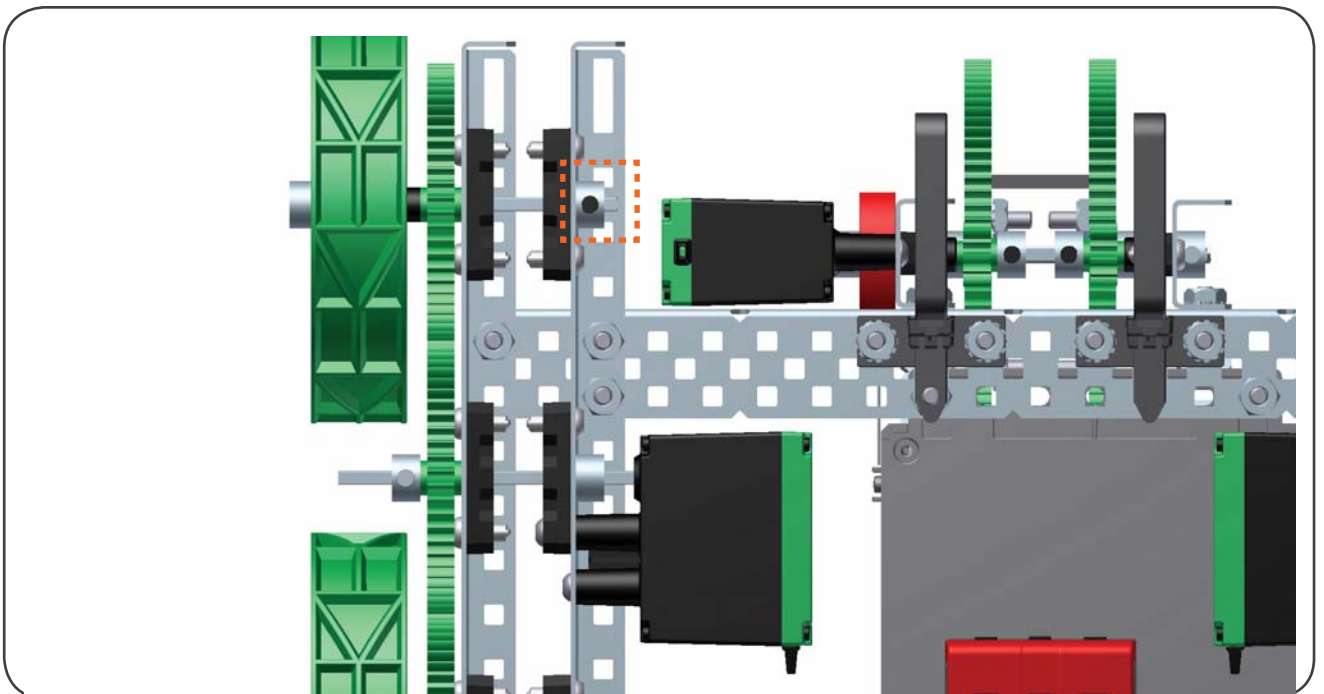
CLAWBOT BUILDING INSTRUCTIONS

9 **Attaching the Left Encoder** *(continued)*

3/4"
x1   x1

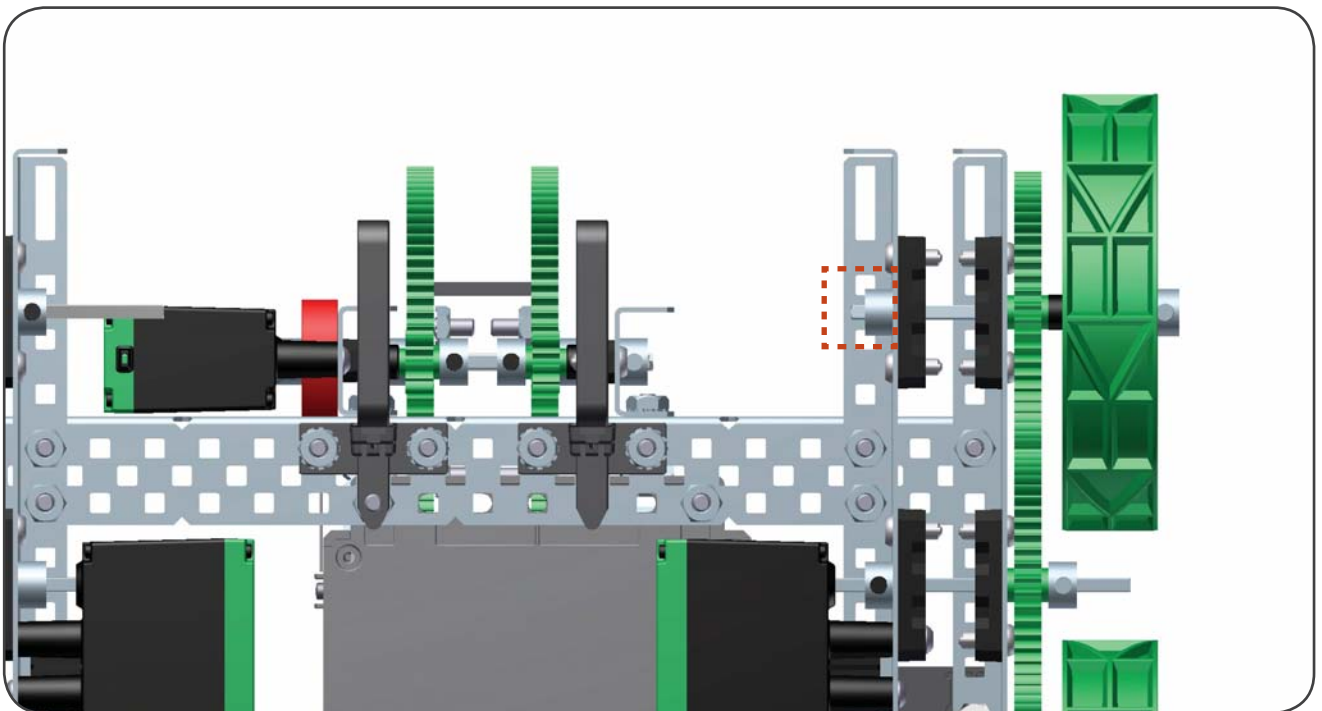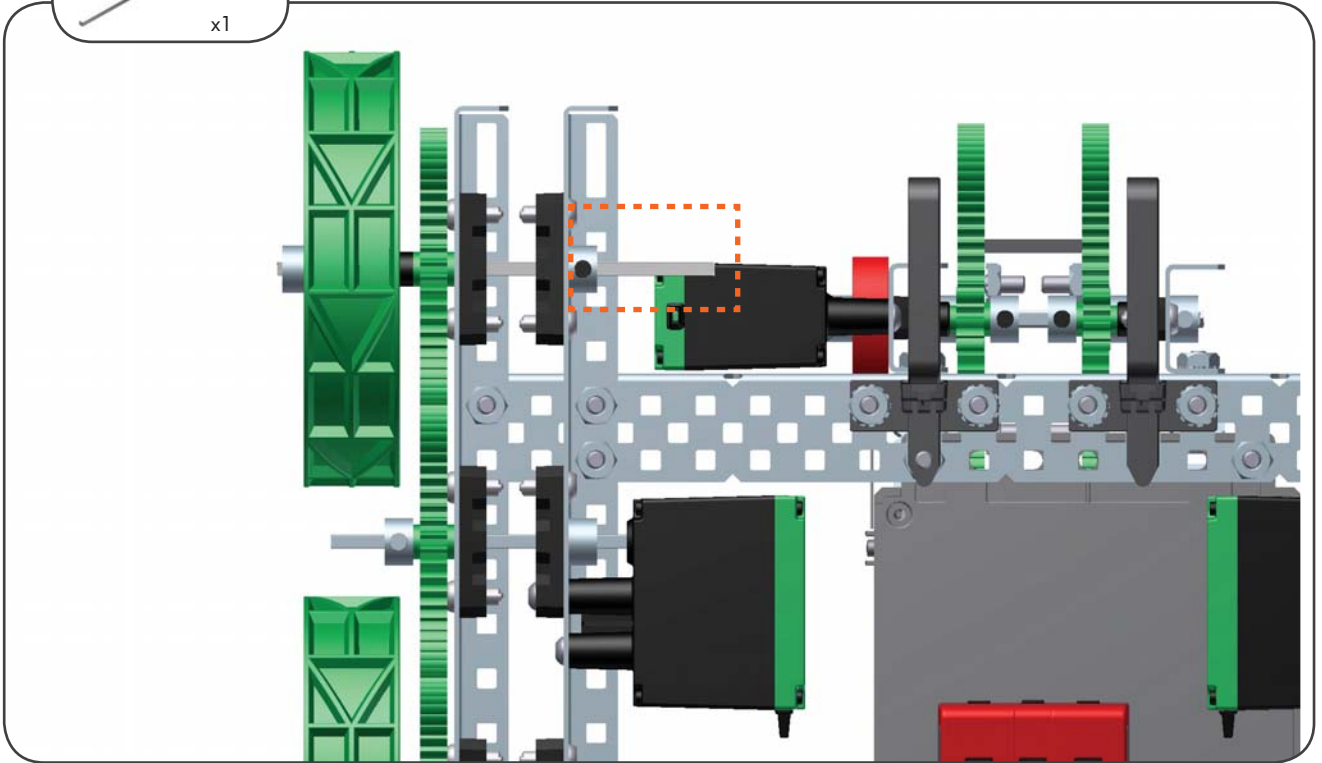**Just like the potentiometer, to build the encoders, we will need to lengthen the shaft**

9 **Attaching the Left Encoder** *(continued)*
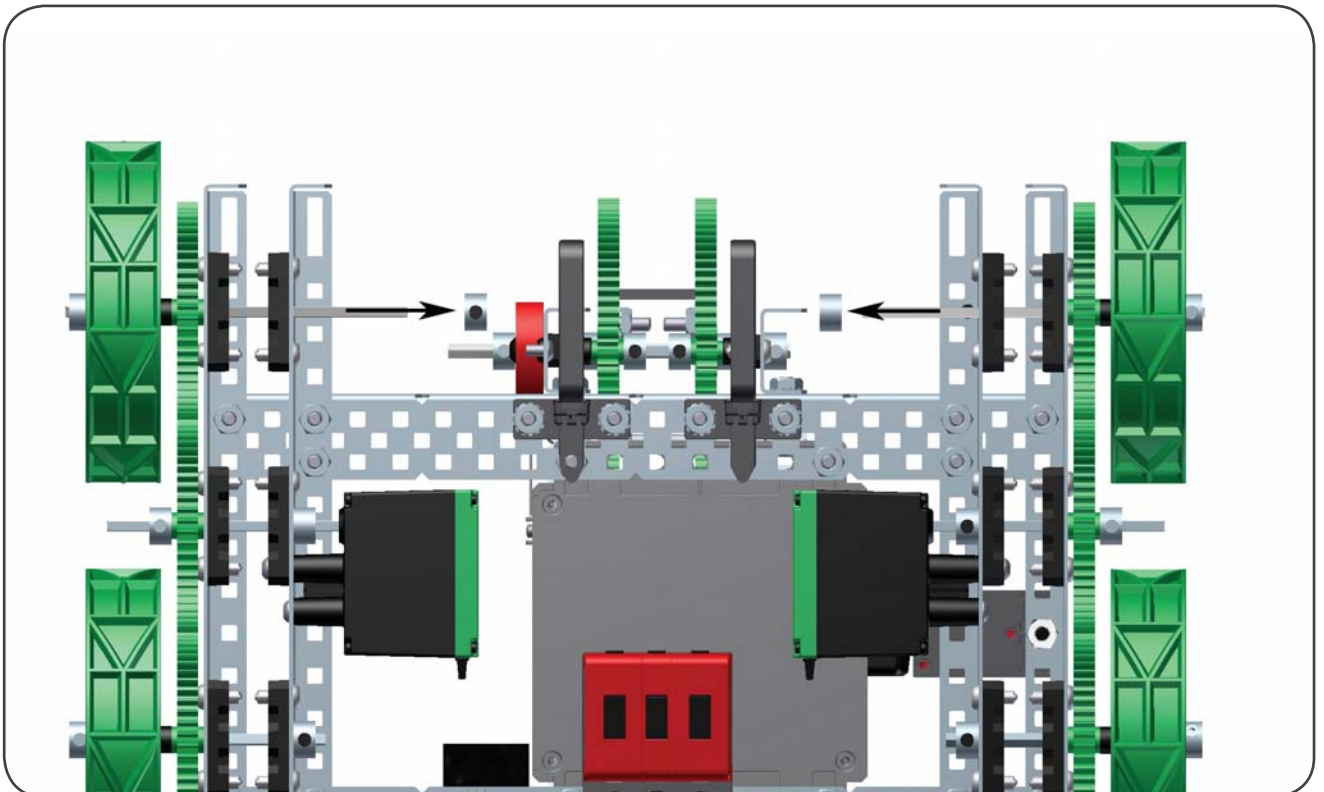
5"

x1

CLAWBOT BUILDING INSTRUCTIONS

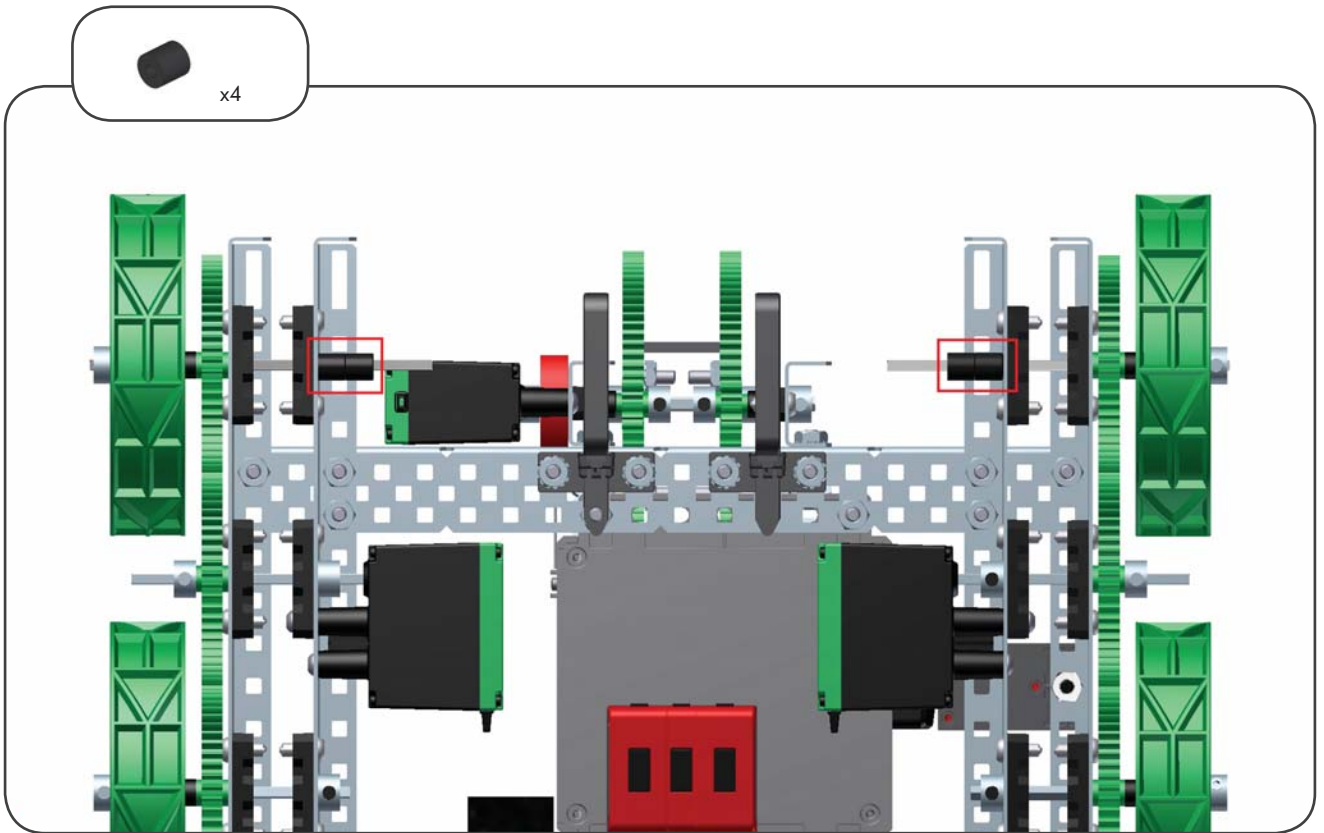**9** **Attaching the Left Encoder** *(continued)*

5"

x1
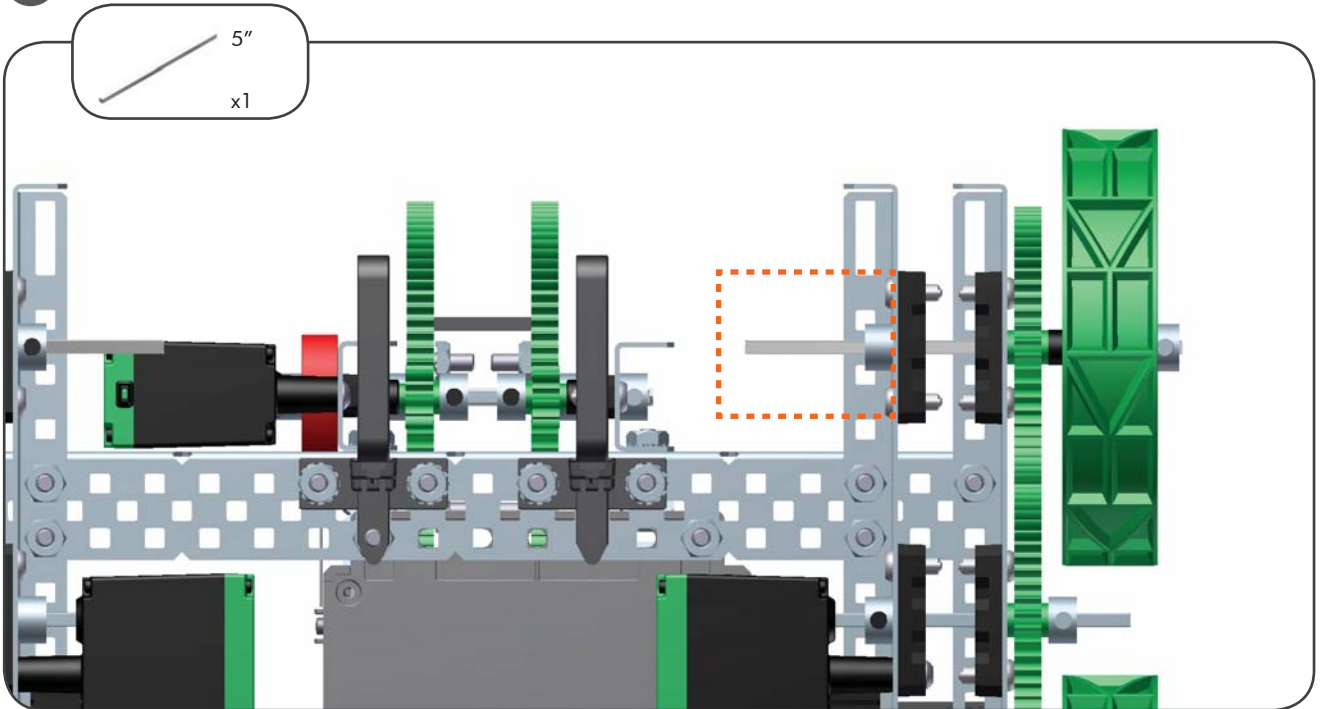
Remove these shaft collars and replace them with 2 thick spacers on each side
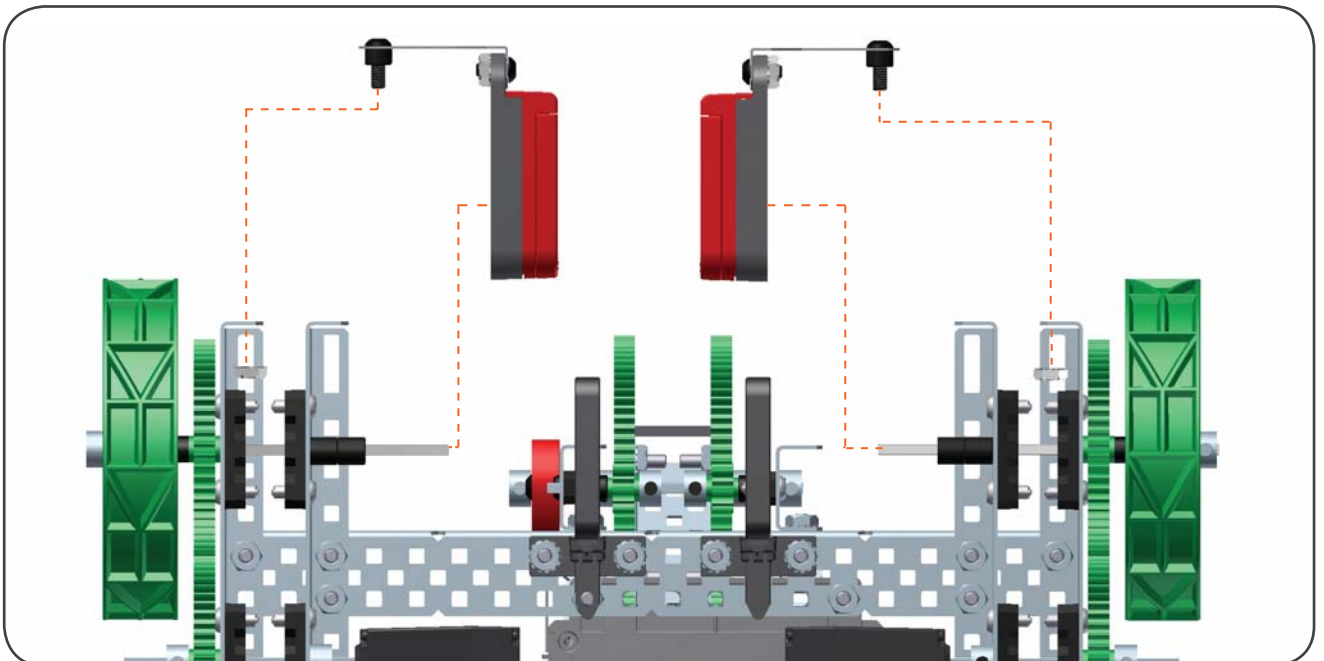
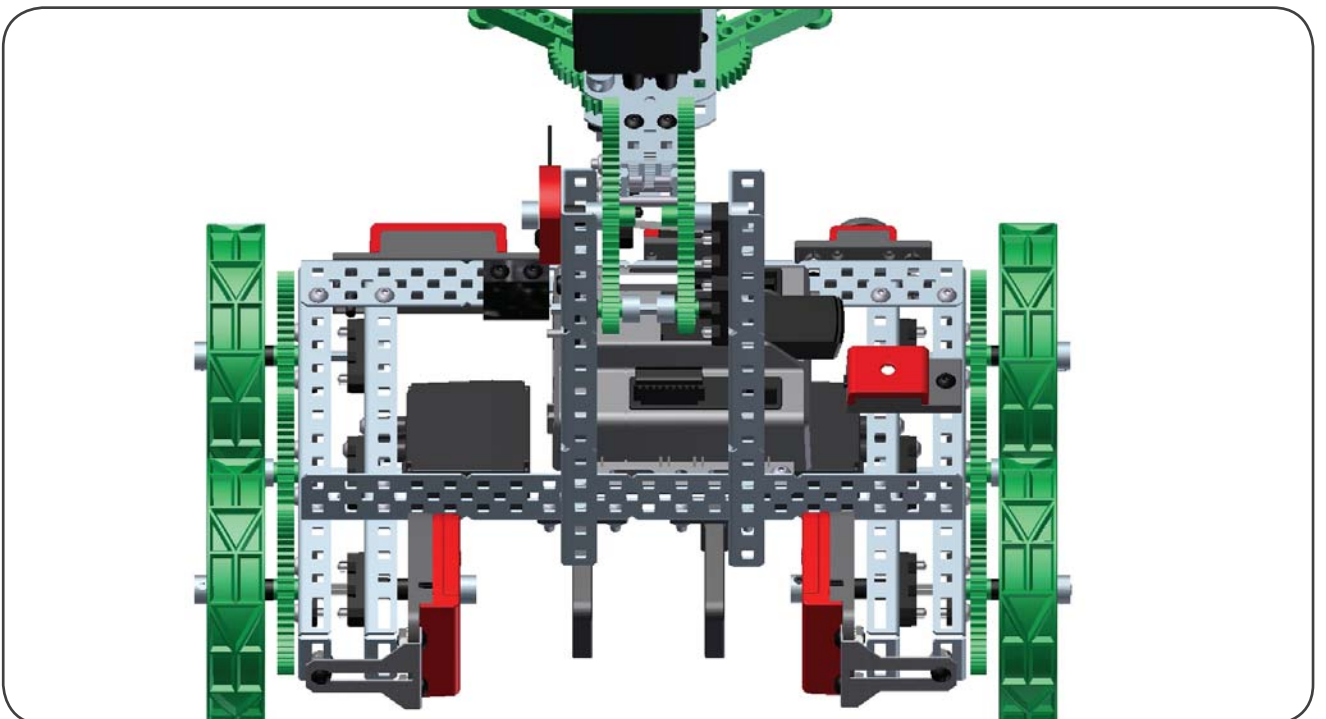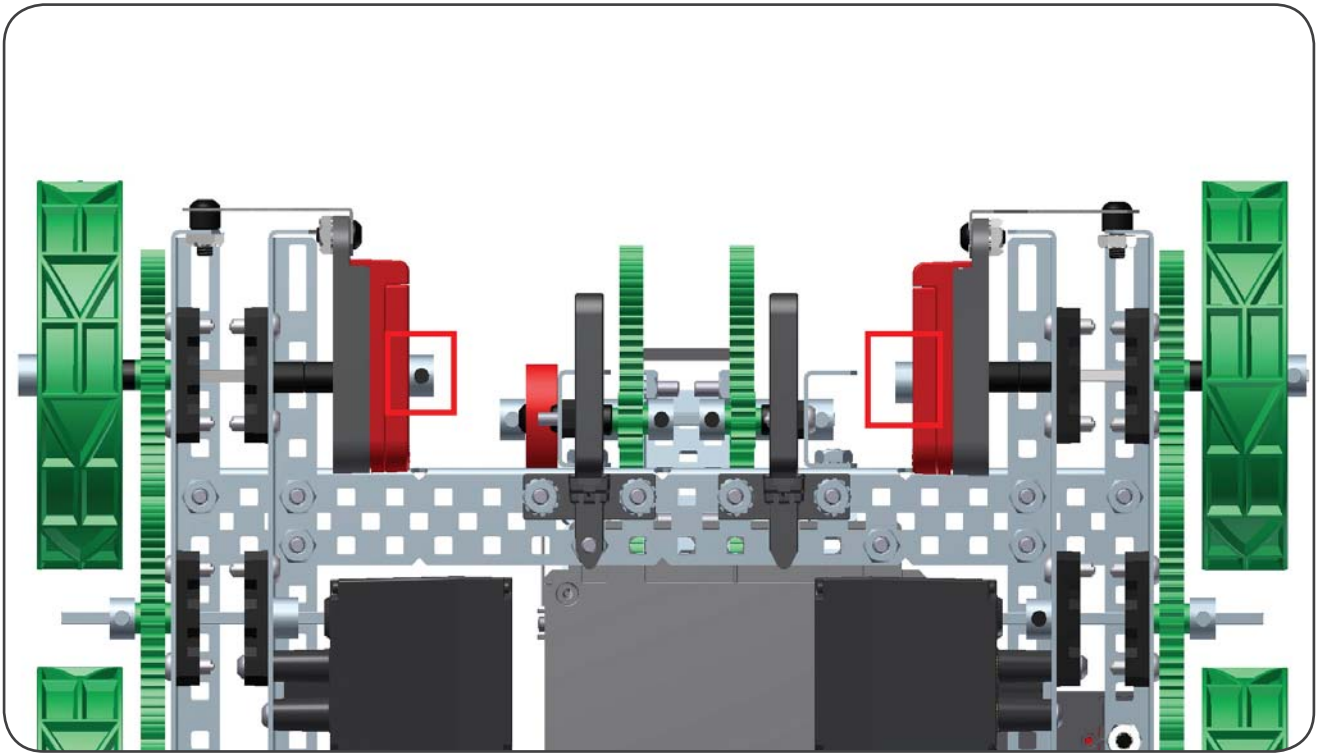# CLAWBOT BUILDING INSTRUCTIONS

9 **Attaching the Left Encoder** *(continued)*

x4

Slide the shaft through the encoder and then place the screws as shown below

CLAWBOT BUILDING INSTRUCTIONS

9 **Attaching the Left Encoder** *(continued)*

Place the shaft collar back in place

CLAWBOT BUILDING INSTRUCTIONS

10 Attaching the Integrated Motor Encoders

This set of instructions to build the 393 Motors with the Integrated Motor Encoder was designed by VEX Robotics
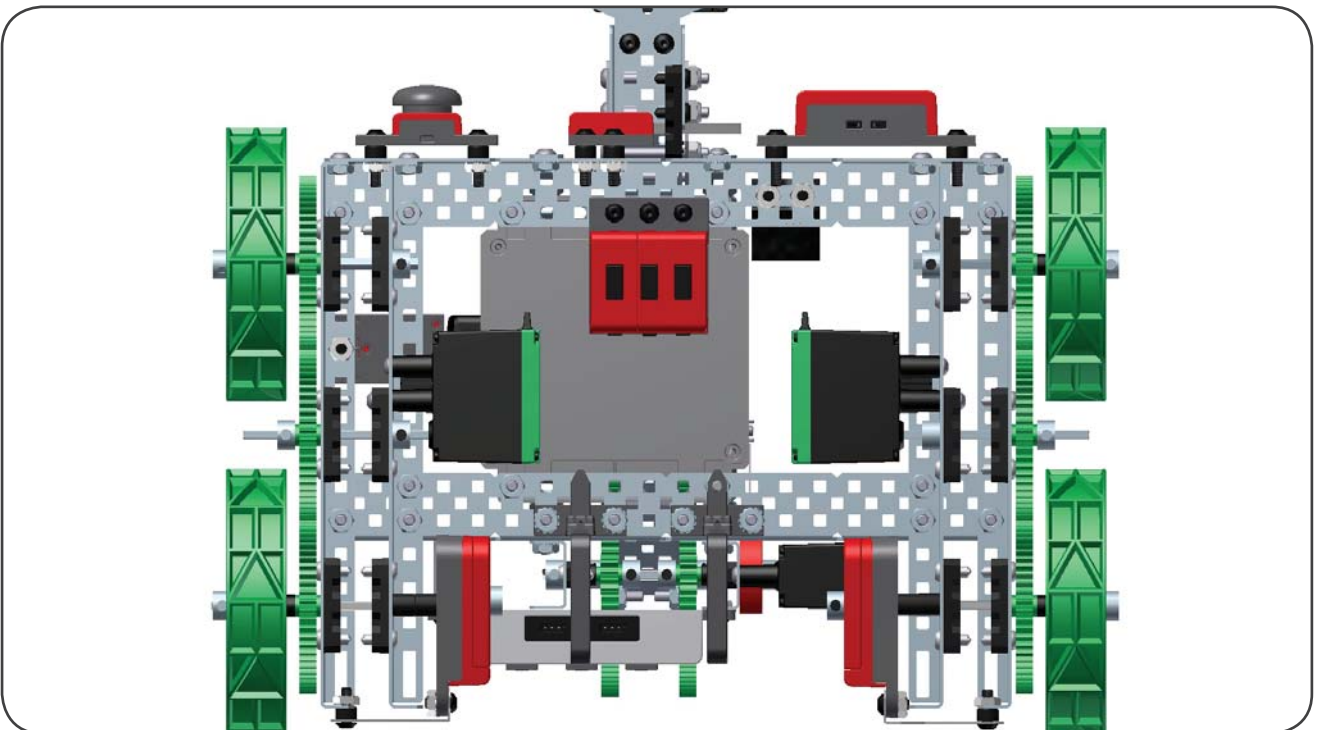
> **Option B:**
>
> **This section covers using the Integrated Motor Encoders. If you built the external Quadrature Encoders, then skip pages 32-34.**
>
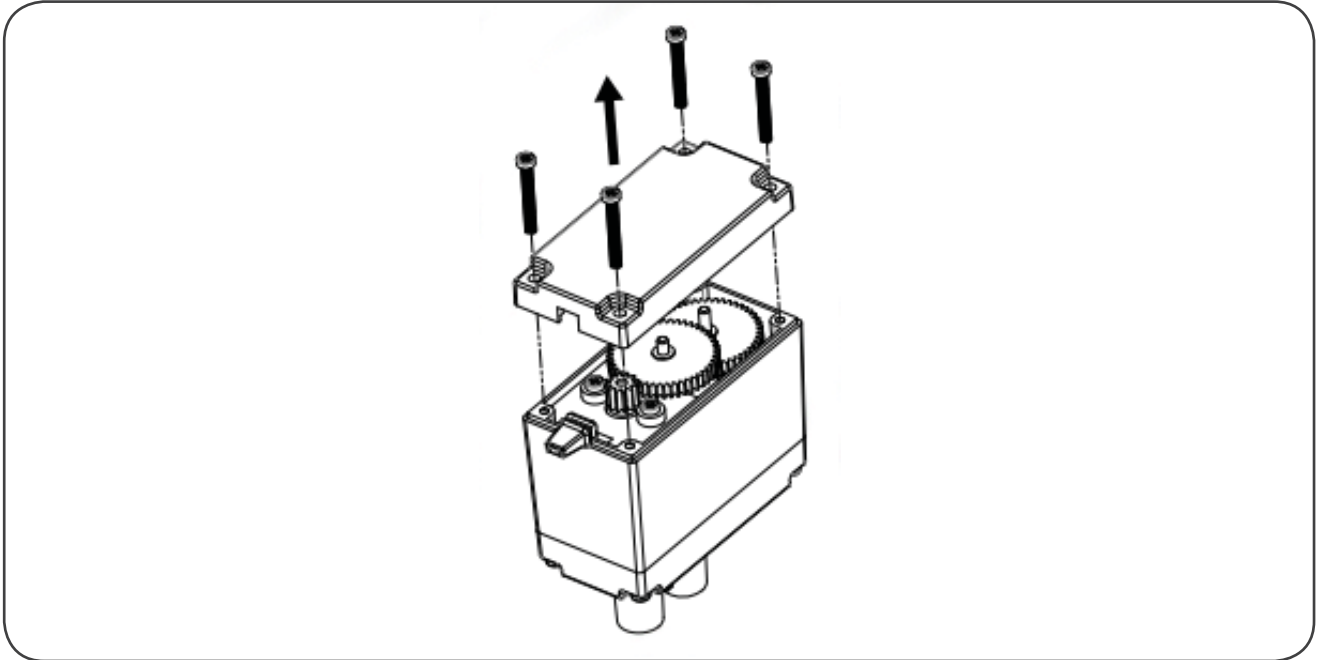> **Detailed instructions can be found at:**
> http://content.vexrobotics.com/docs/inventors-guide/276-1321-INST-0112.pdf

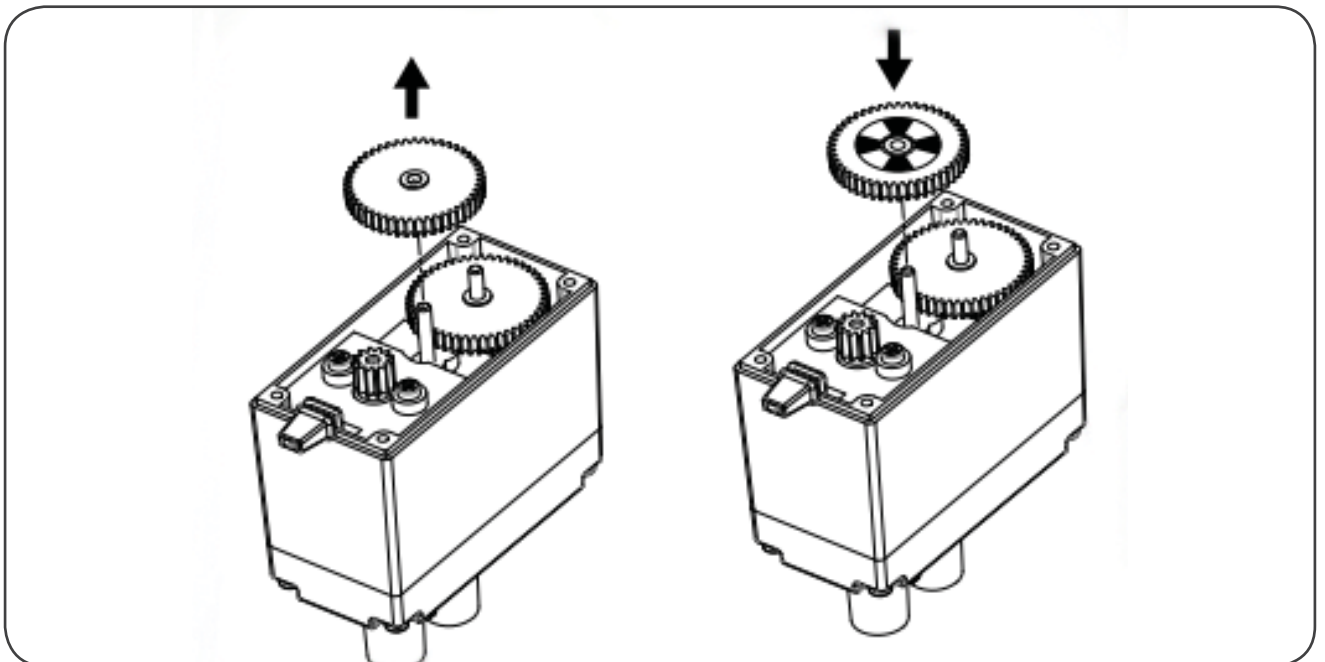**First, take out the two motors on the bottom of the robot's drive train**

CLAWBOT BUILDING INSTRUCTIONS

10 **Attaching the Integrated Motor Encoders** *(continued)*

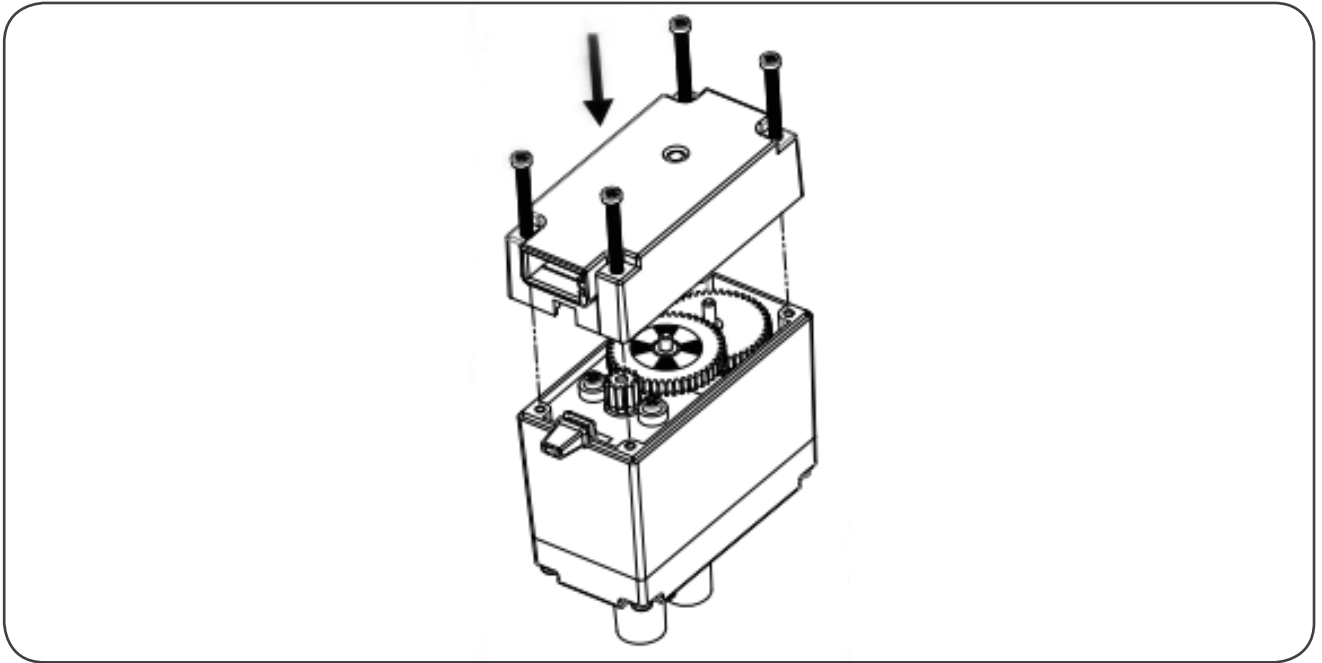**Remove the back casing with a #1 Phillips Screwdriver**

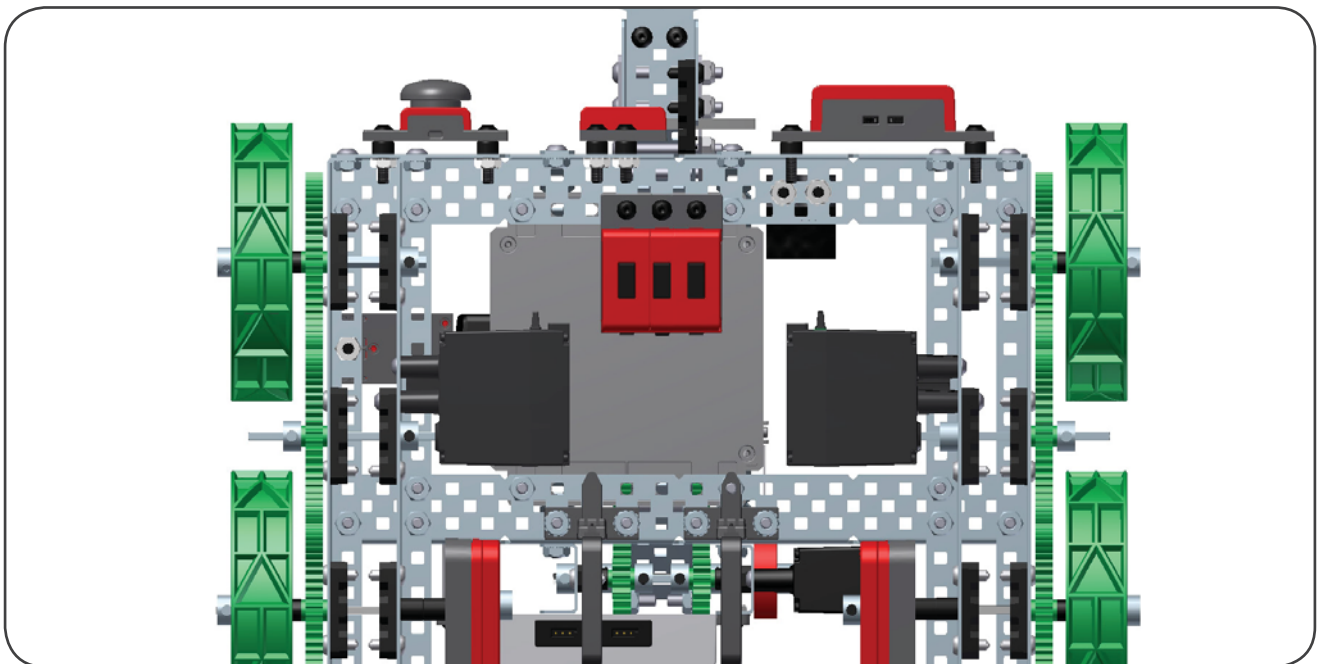**Remove the first cluster gear and replace it with the black/white encoder gear from the kit**

CLAWBOT BUILDING INSTRUCTIONS

10 **Attaching the Integrated Motor Encoders** *(continued)*

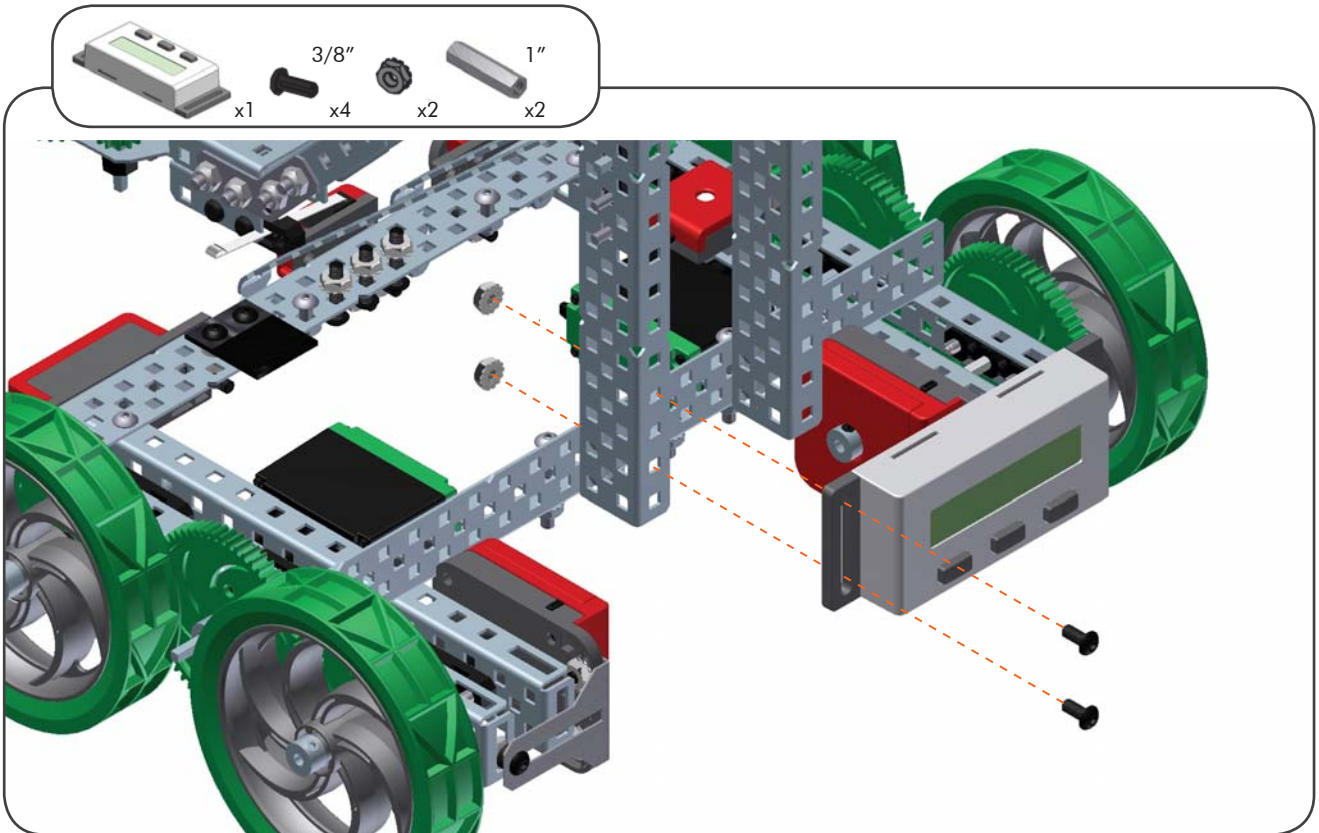**Place the new motor cap on to the 393 motor as shown**

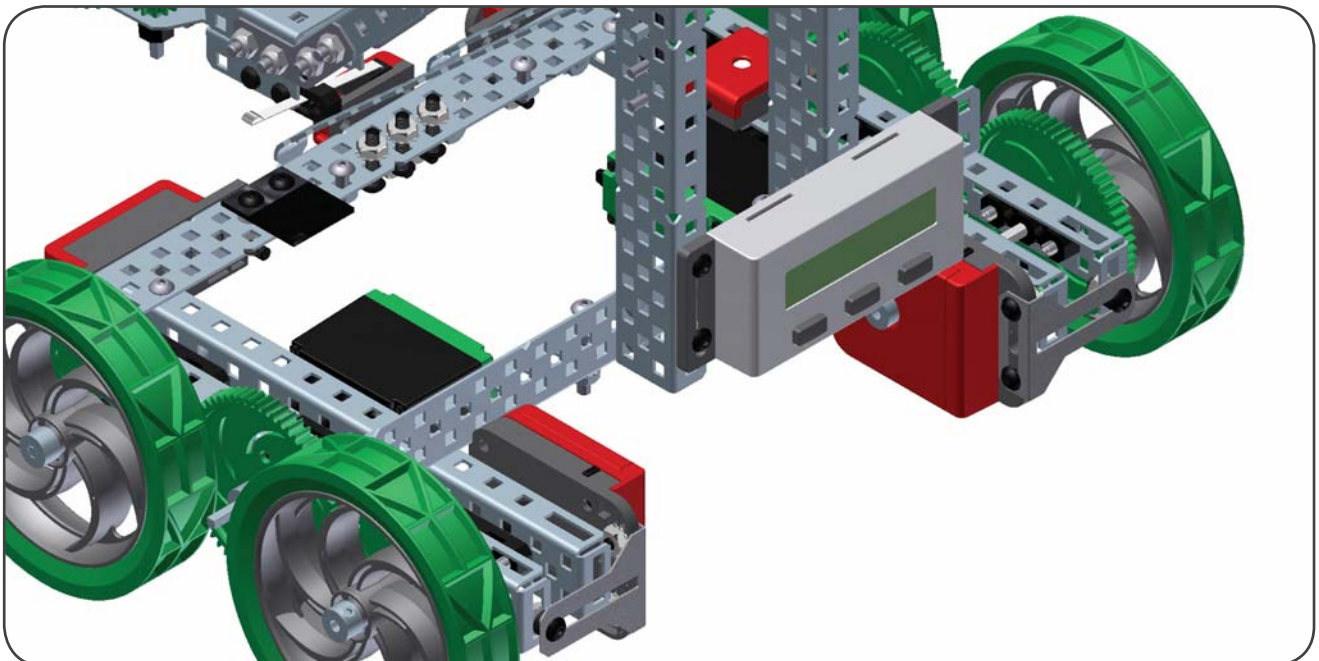**Reattach the motors to the drive train**
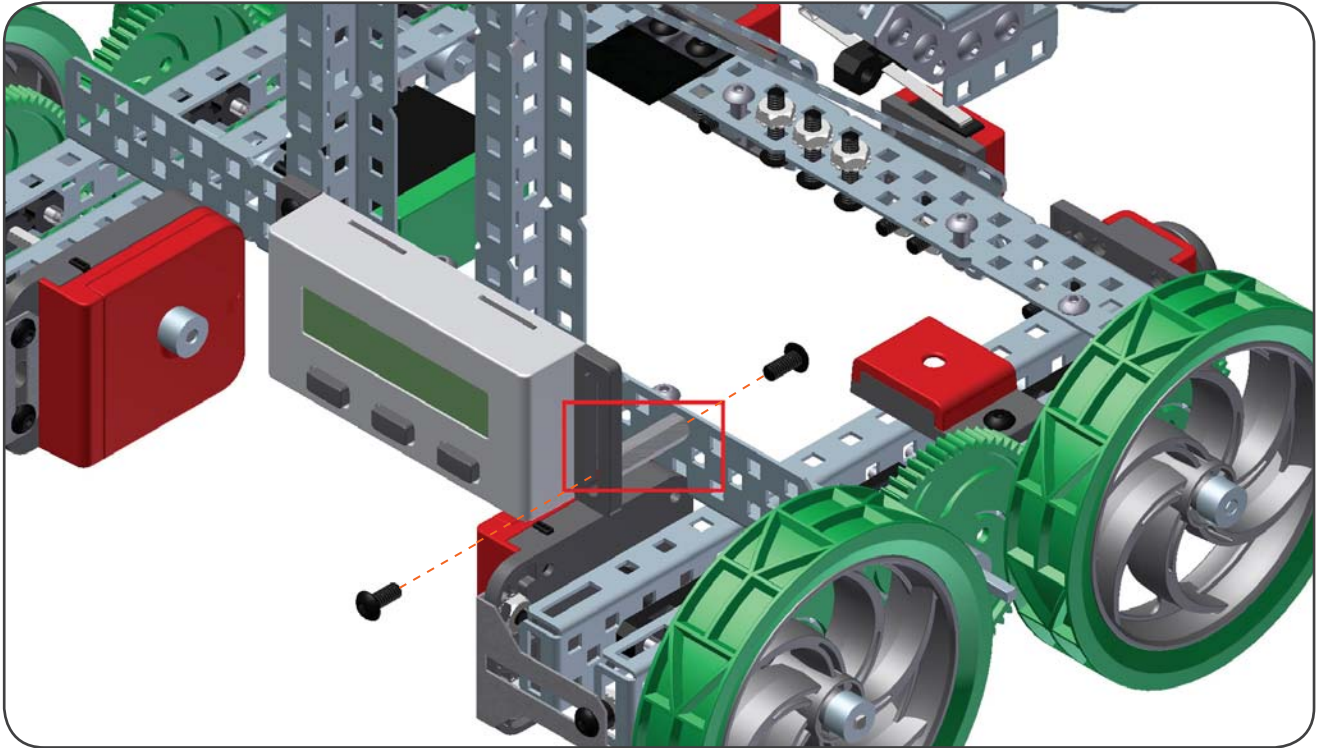
CLAWBOT BUILDING INSTRUCTIONS
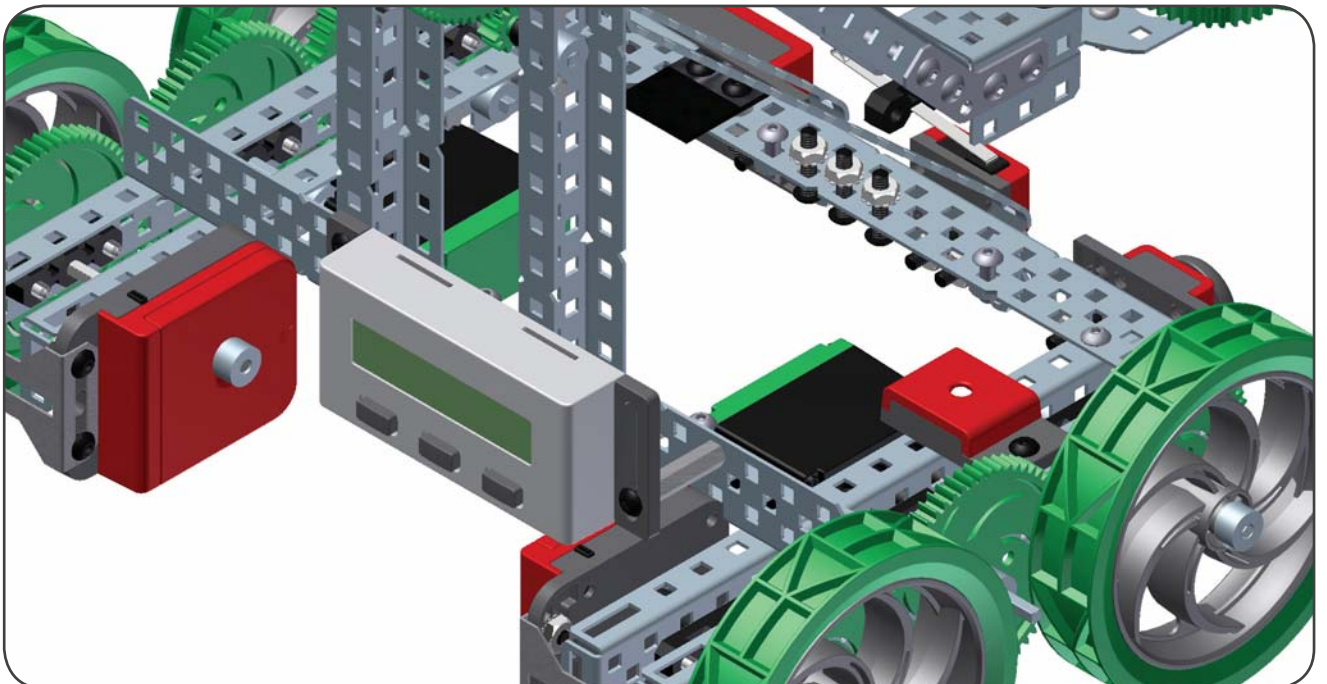
11 Attaching the LCD Display

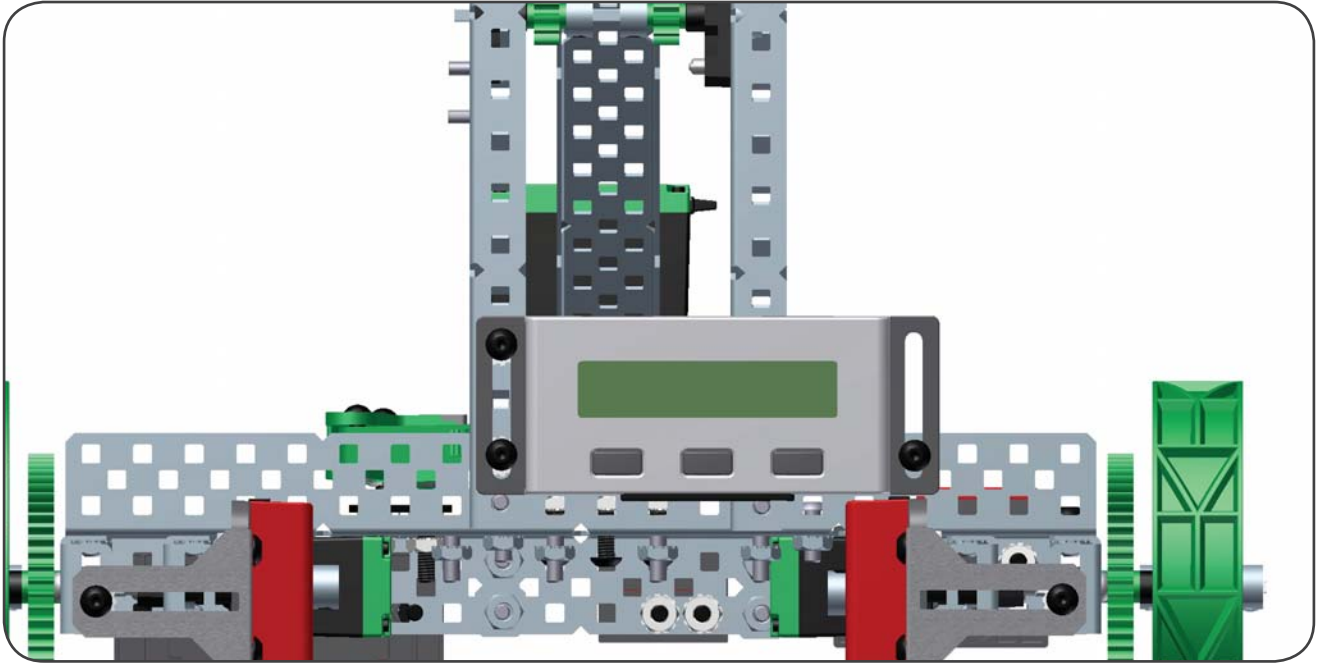Connect the left side of the LCD to the left C-Channel

CLAWBOT BUILDING INSTRUCTIONS

11 **Attaching the LCD Display** *(continued)*

Use a standoff to mount the display on the opposite side

CLAWBOT BUILDING INSTRUCTIONS

Your Clawbot with sensors is complete!