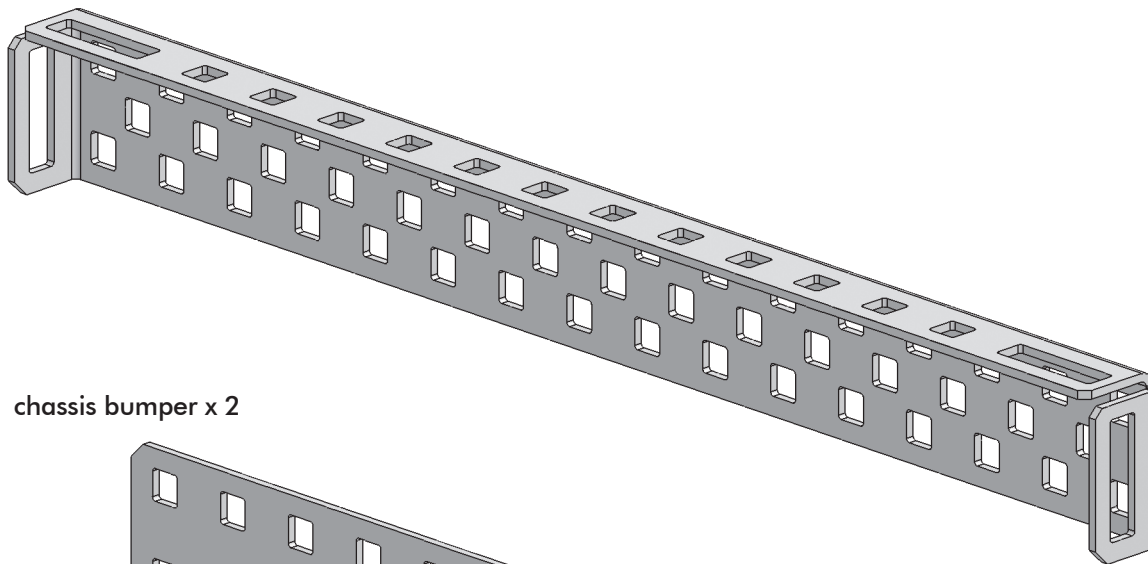# Squarebot 2.0 Building Instructions

1 **Collect and identify the parts from the list of materials below:**

| materials	qty
bearing flat	12
panel	1
chassis rail	4
chassis bumper	2
partially threaded beams, 2"	4
keps nut	38
8-32 hex screw, ¼"	26
8-32 hex screw, ½"	19
8-32 hex screw, ¾"	1
motor	2
2.75" removable tire	4
1.895" detachable hub	4
36-tooth gear	4
60-tooth gear	2
collar w/ threaded set screw	10
square bar, 2"	2
square bar, 3"	4
6-32 hex screw, ½"	4

Squarebot 2.0 Building Instructions *(cont.)*

chassis rail x 4

chassis bumper x 2
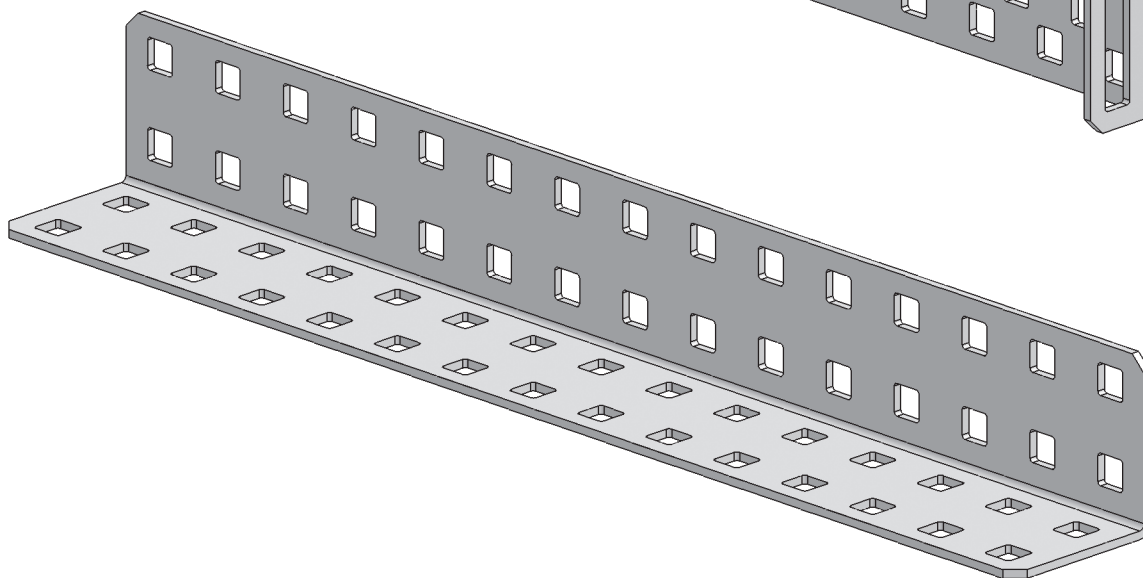
2" partially threaded beam x 4
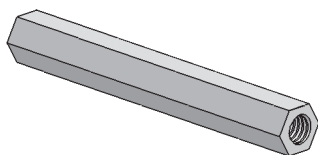
8-32 hex screw, $\frac{1}{4}$" x 26

keps nut x 38

8-32 hex screw, $\frac{1}{2}$" x 20
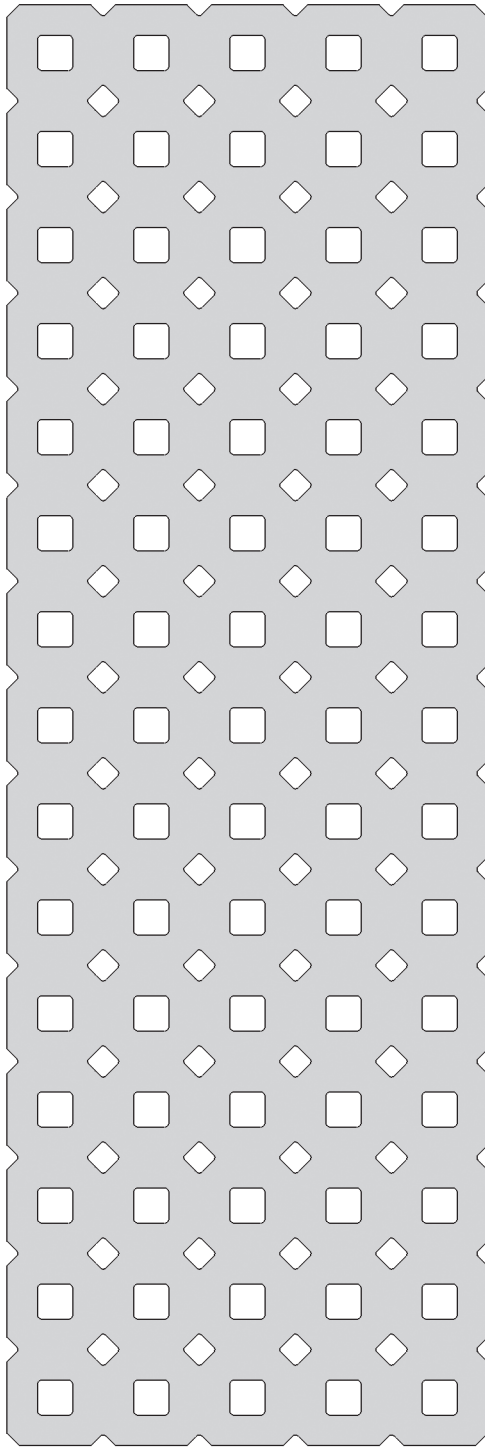
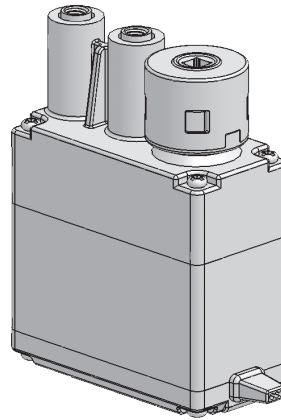8-32 hex screw, $\frac{3}{4}$" x1

6-32 hex screw, $\frac{1}{2}$" x 4

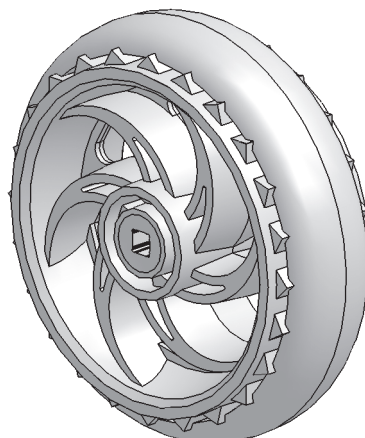# Squarebot 2.0 Building Instructions *(cont.)*
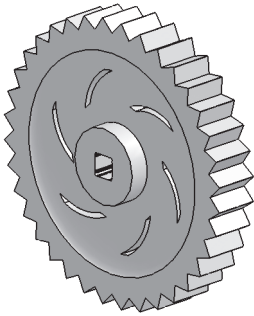
panel x 1

motor x 2

2.75" removable tire x 4

1.895" detachable hub x 4
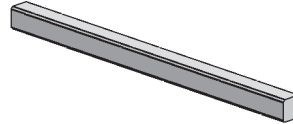
Squarebot 2.0 Building Instructions *(cont.)*

36 tooth gear x 4

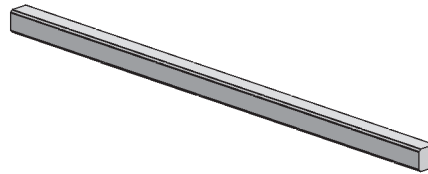collar w/threaded set screw x 10

square bar, 2" x 2
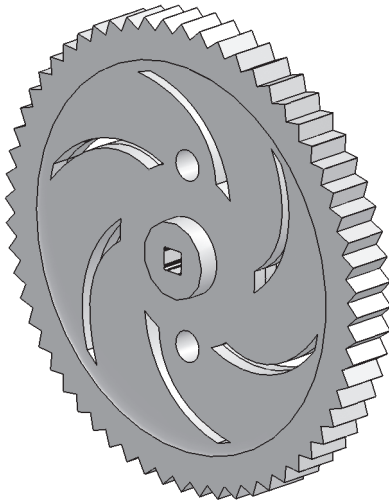
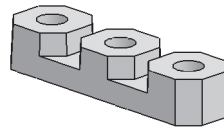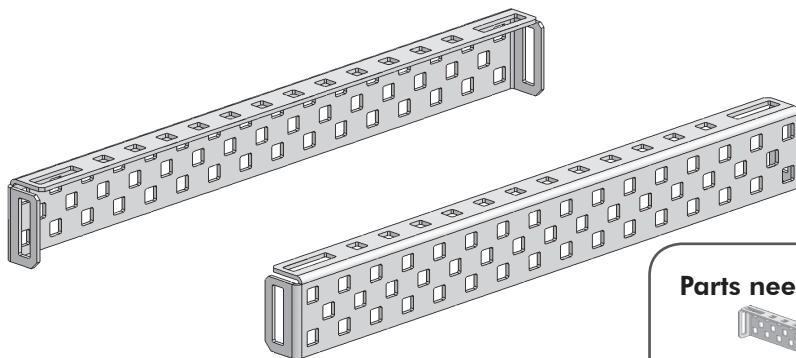60 tooth gear x 2

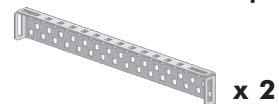square bar, 3" x 4

bearing flat x 12

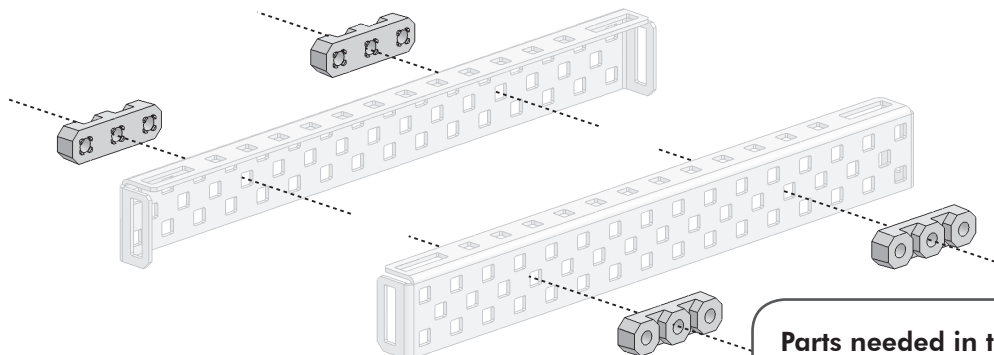# Squarebot 2.0 Building Instructions *(cont.)*

2 **Inner chassis rails**
You will need two chassis rails, one for the right side and one for the left side. Orient them as shown, so that the narrow face is pointing up and the "open" sides are facing each other.
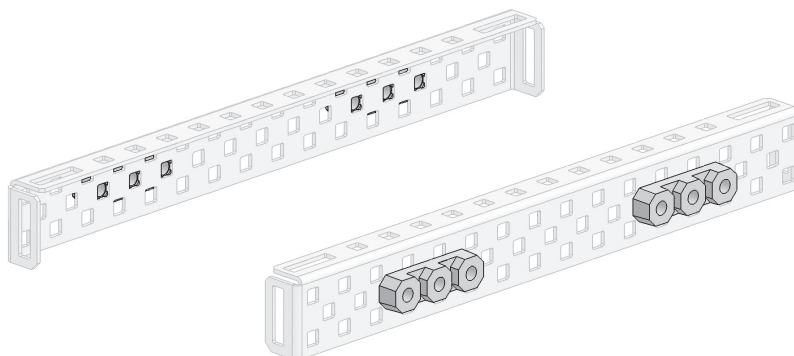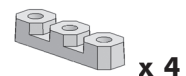
Parts needed in this step:

x 2

Add four bearing flats to the chassis rails (two per rail, on the outward-facing sides). Be sure to position the bearing flats such that the central hole of each bearing flat is aligned with the fourth hole from the respective end of the chassis rail, as shown.
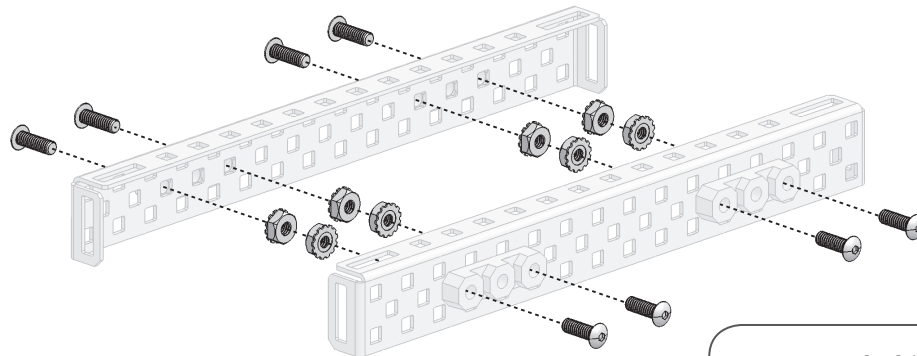
Parts needed in this step:

x 4

Squarebot 2.0 Building Instructions *(cont.)*
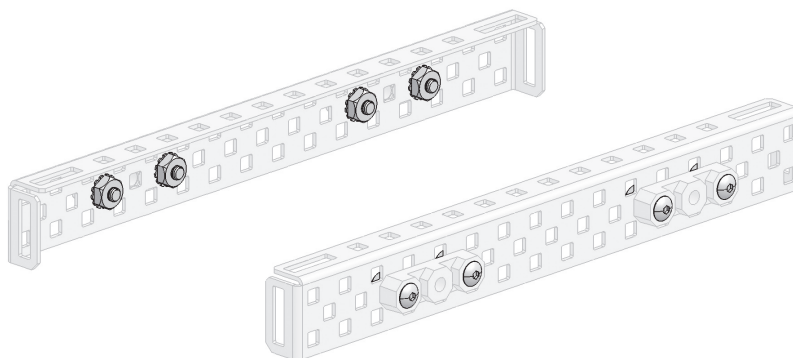
2 **Inner chassis rails (cont.)**
Secure the bearing flats to the chassis rails using two ½" 8-32 screws and two keps nuts per bearing flat, as shown.
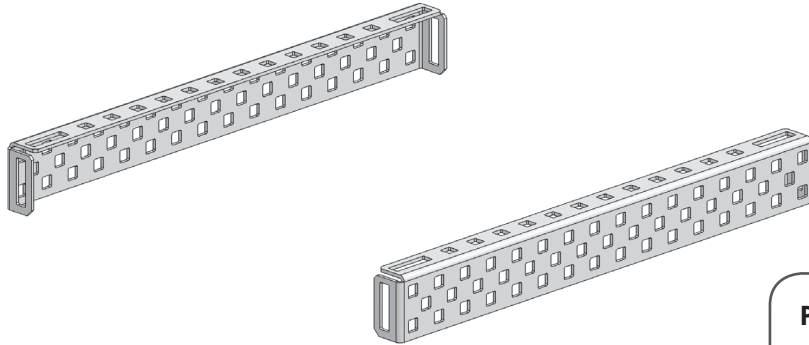
Parts needed in this step:

½"
x 8   x 8

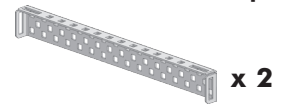Your completed inner chassis rails should look like this when you're done:

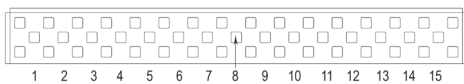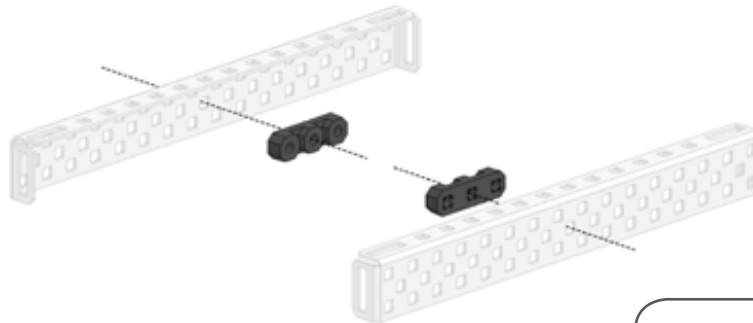# Squarebot 2.0 Building Instructions *(cont.)*

3 **Outer chassis rails**
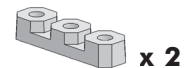Position two more chassis rails as shown, just as you did for the inner chassis rails.

Parts needed in this step:

x 2

Add bearing flats to the inner faces of the two chassis rails. The center hole of the bearing flat should be aligned with the eighth hole from the front end of the chassis rail, in the middle row of holes.

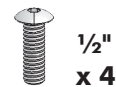| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

Parts needed in this step:

x 2

Squarebot 2.0 Building Instructions *(cont.)*

3 **Outer chassis rails (cont.)**
Secure each bearing flat with two ½" 8-32 screws and two keps nuts.
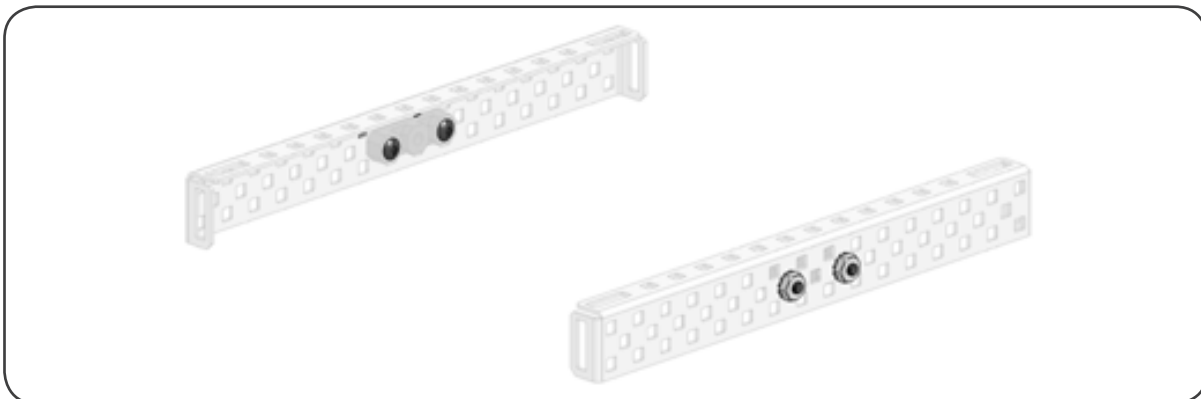

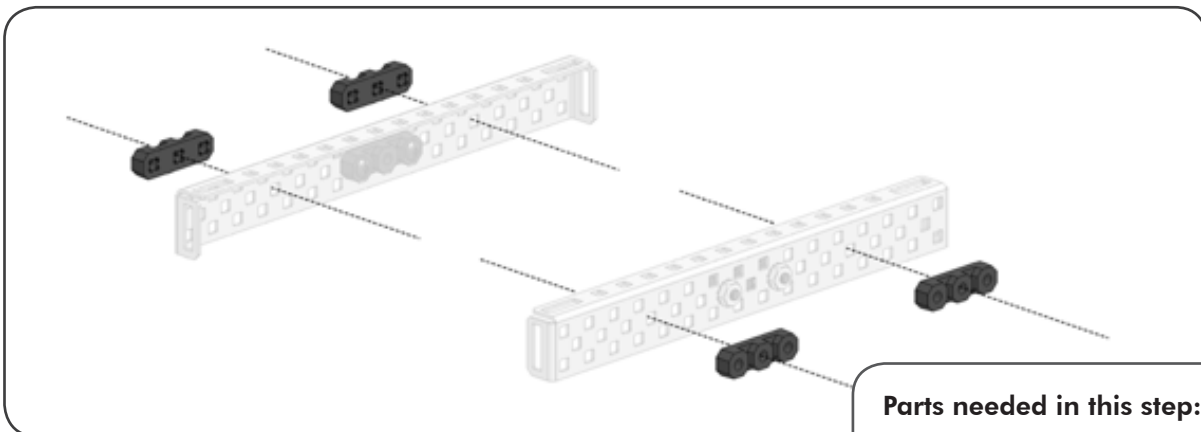**Parts needed in this step:**

½"
x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*

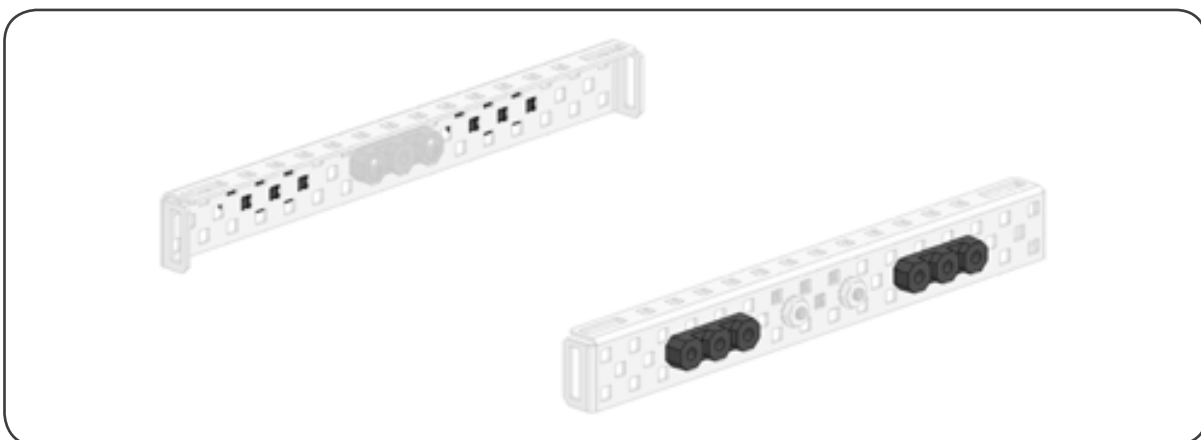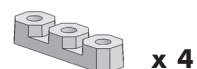**3** **Outer chassis rails (cont.)**
Your outer chassis rails should now look like this:

Now add two bearing flats to the outer surface of each chassis rail, so the center hole of each bearing flat is over the fourth hole from the respective end of the chassis rail, as shown. These are the same positions as the bearing flats you put on the inner chassis rails earlier.
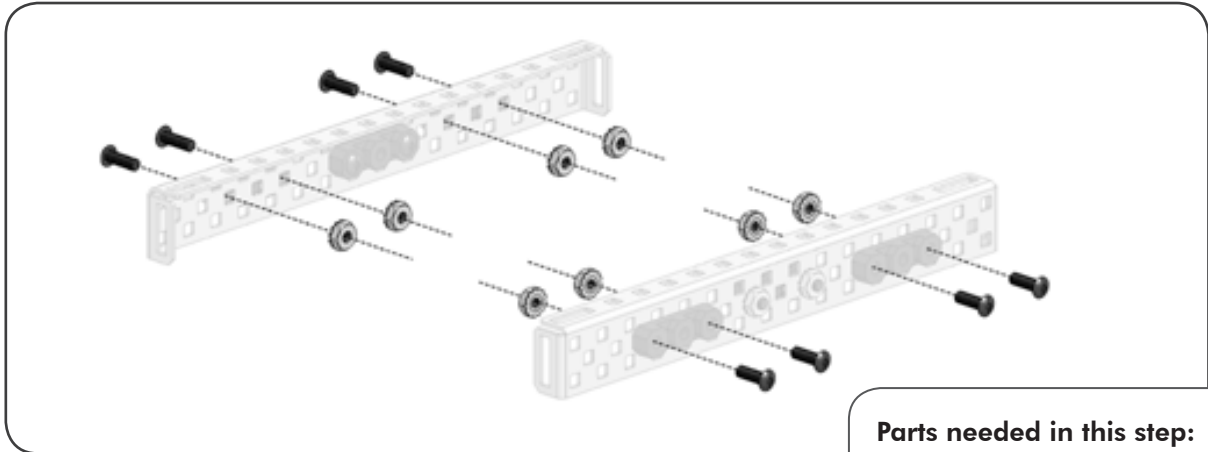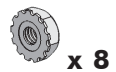

Parts needed in this step:

x 4

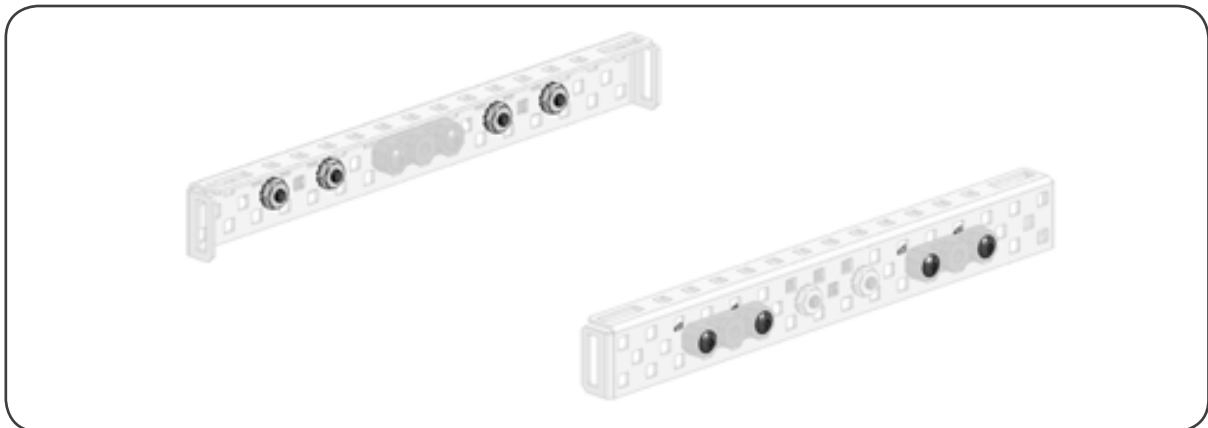# Squarebot 2.0 Building Instructions *(cont.)*

3 **Outer chassis rails (cont.)**
Secure the bearing flats to the chassis rails using two ½" 8-32 screws and two keps nuts per bearing flat.
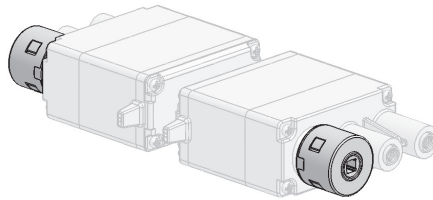
Parts needed in this step:

½"
x 8

x 8

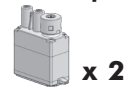Your outer chassis rails should now look like this:

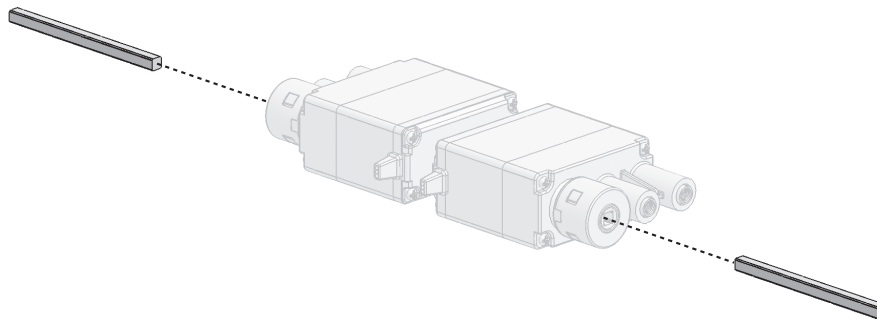# Squarebot 2.0 Building Instructions *(cont.)*

4 **Motor Subassembly**
Before starting on the motor subassembly, make sure that the clutch is installed in the motor, as shown.
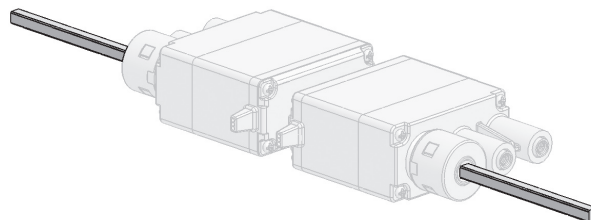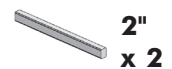
Parts needed in this step:

x 2

Insert a 2" square beam into each clutch, making sure that they seat firmly. The square bar will act as the motor's drive shaft.
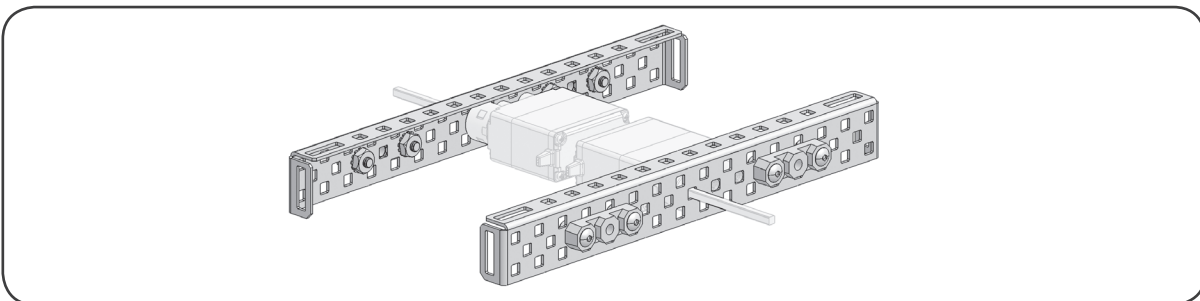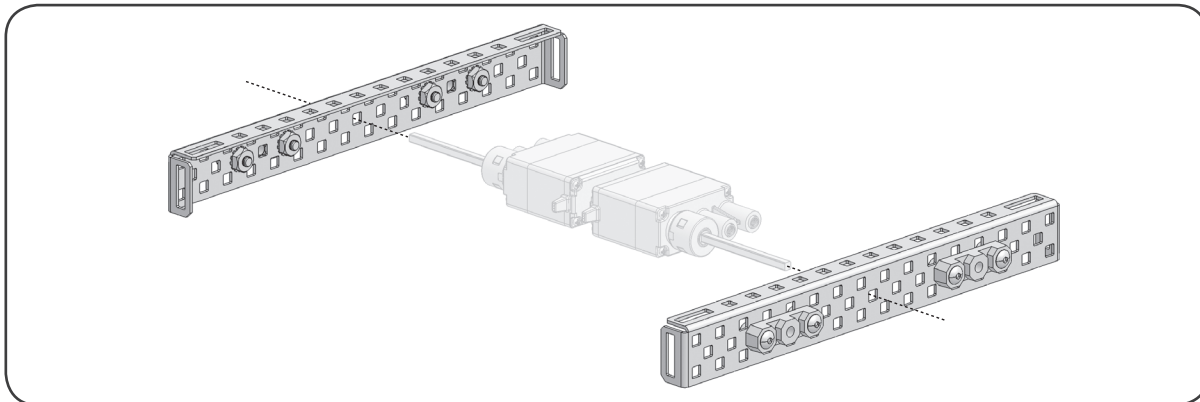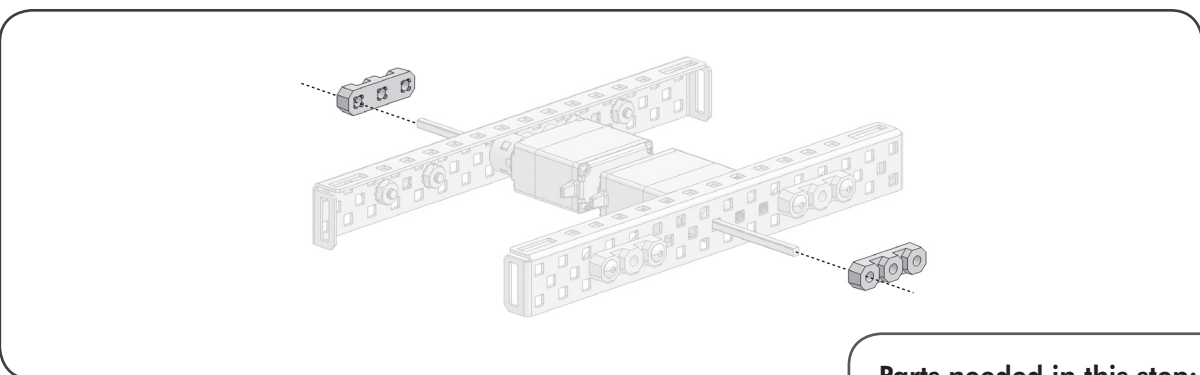
Parts needed in this step:

2"
x 2

Squarebot 2.0 Building Instructions *(cont.)*

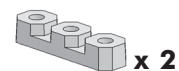**4** **Motor Subassembly (cont.)**
Slide the pre-assembled inner chassis rails onto the square bar motor shafts,
so that the shafts go through the middle hole in the middle row of each rail.

Install one bearing flat on the outward-facing side of each chassis rail, with the
front hole of the bearing flat sliding onto the motor shaft as shown.
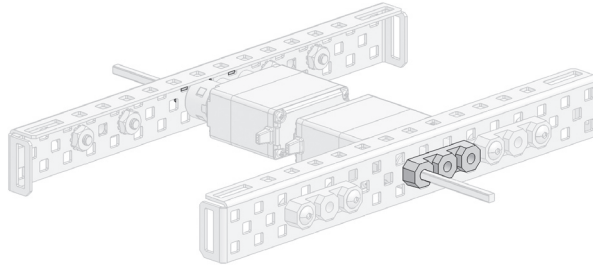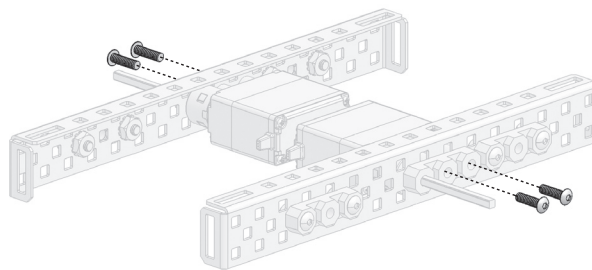
Parts needed in this step:

x 2

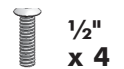# Squarebot 2.0 Building Instructions *(cont.)*

4 **Motor Subassembly (cont.)**
Your assembly should now look like this:
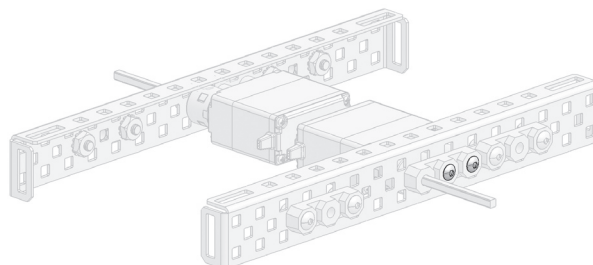
Secure the bearing flat to the inner chassis rail and motor using two ½" 6-32 screws per motor. Note that these are the thinner screws, not the usual 8-32 ones.

Parts needed in this step:
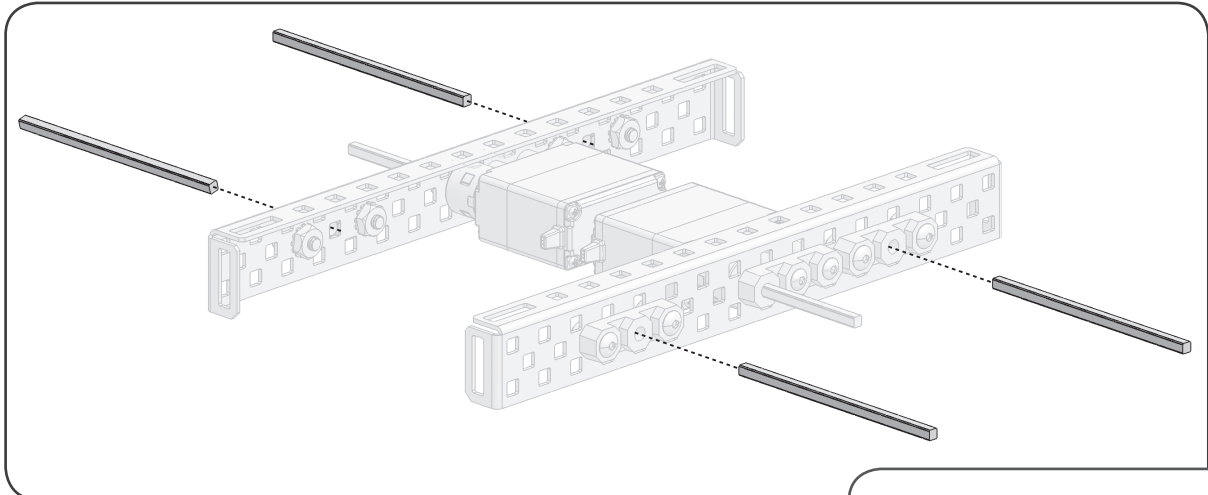
½"
x 4

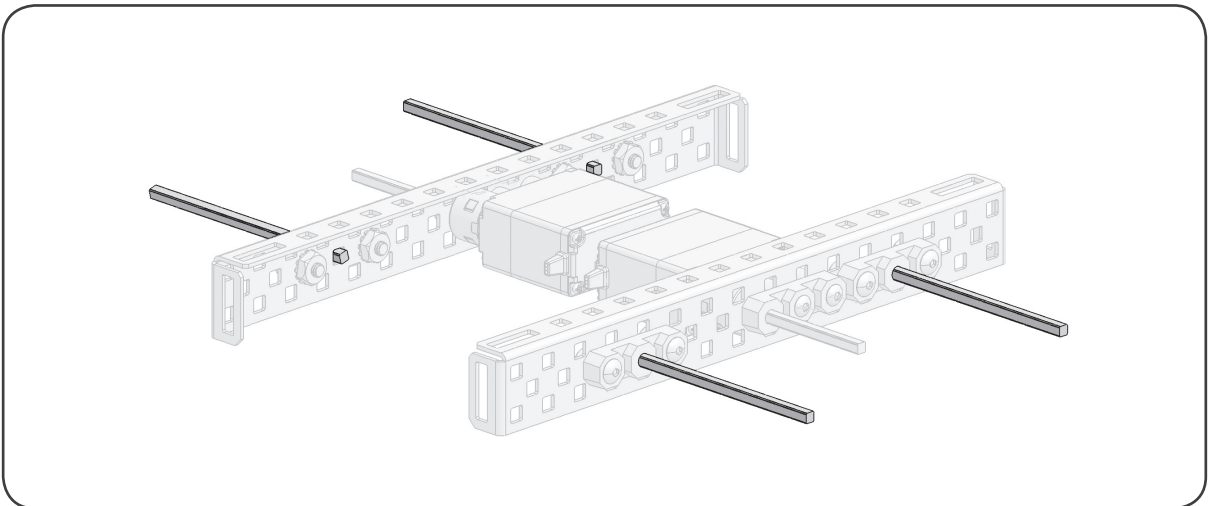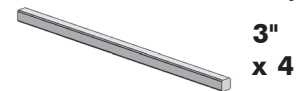Your assembly should now look like this:

Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly**

Insert a 3" square bar through the center hole of each unoccupied bearing flat, as shown. Do not push them all the way through. Push the end of the bar about ¼" through the rail.
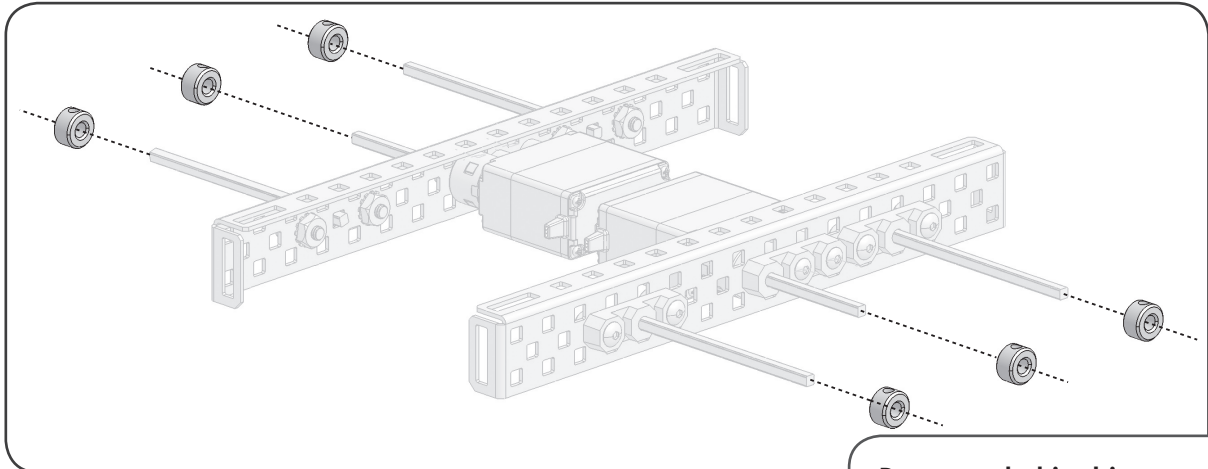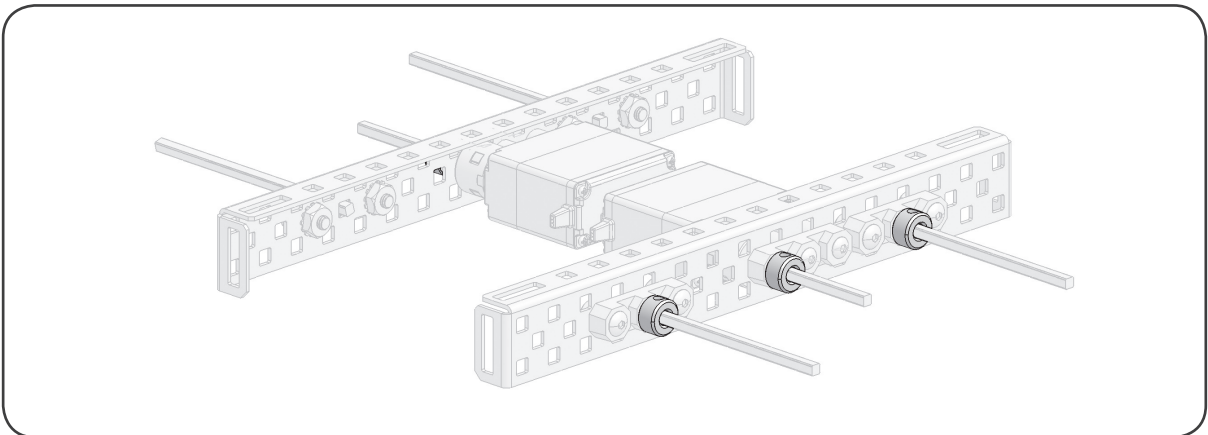
Parts needed in this step:

3"
x 4

Squarebot 2.0 Building Instructions *(cont.)*

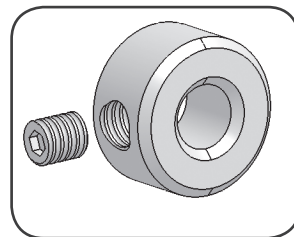**5** **Chassis Subassembly (cont.)**
Slide metal collars (with threaded screws) onto each of the 2" and 3" square bars, mounting them flush with the surface of the bearing flat against which they will sit. Be sure the square bars don't get pushed further in while you put the collars on.
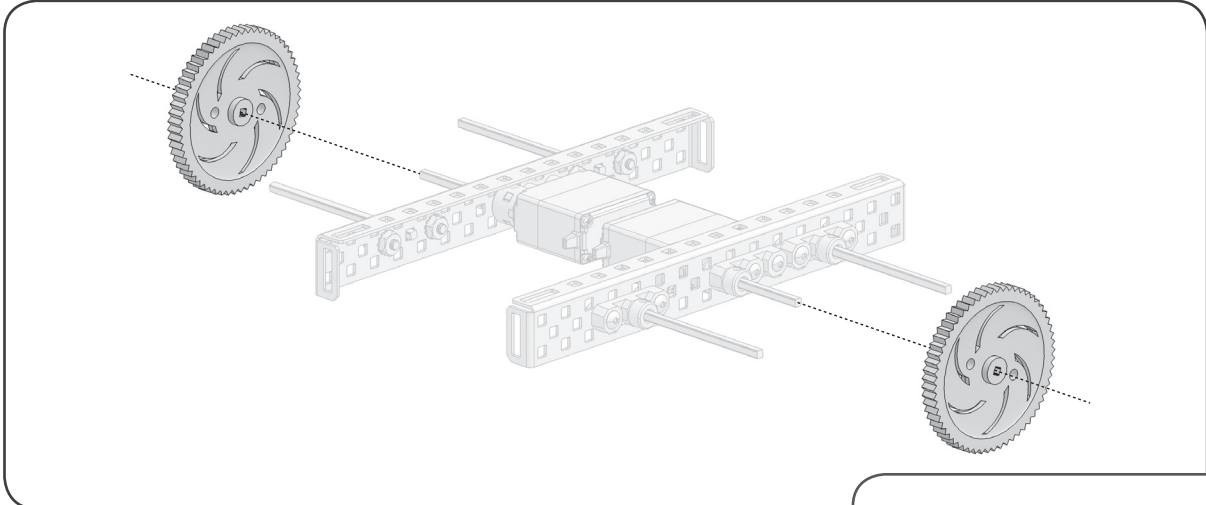

Parts needed in this step:

 x 6

Once the collars and bars are in position, tighten the threaded screws with the thinner allen wrench to keep the collars from sliding out of place.
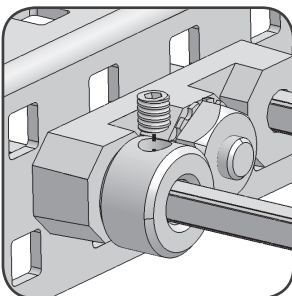
Squarebot 2.0 Building Instructions *(cont.)*

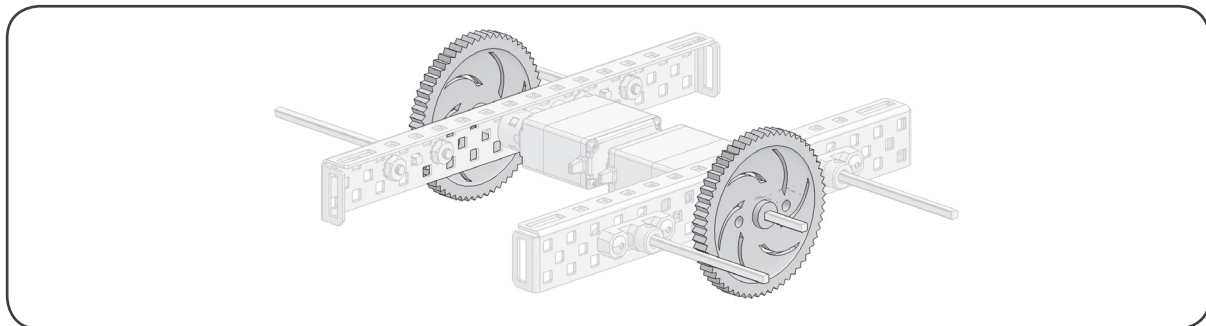**5** **Chassis Subassembly (cont.)**
Slide a 60-tooth gear onto the drive axle of each motor, pushing it flush against
the collar that you added in the previous step.

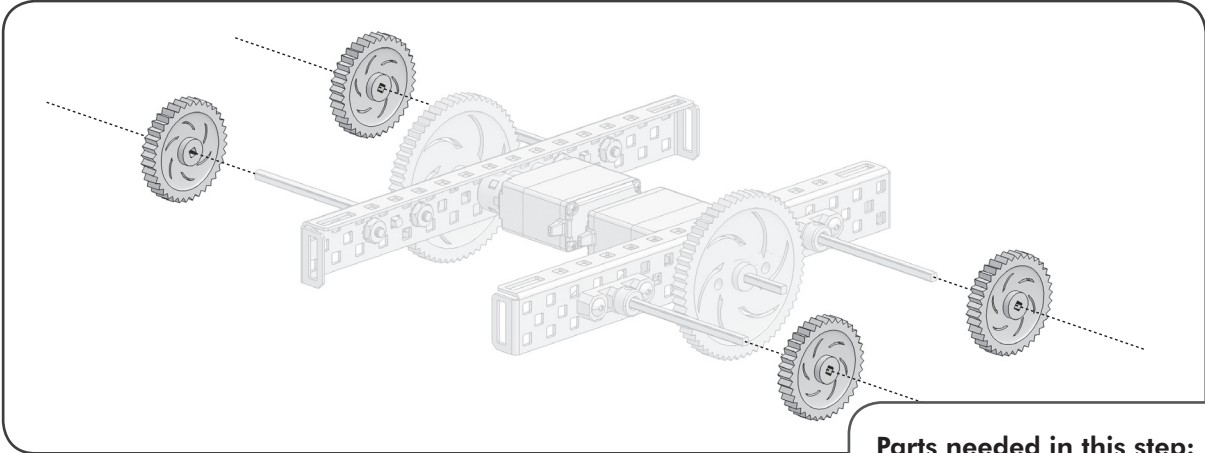**Parts needed in this step:**

**60-tooth
x 2**

Squarebot 2.0 Building Instructions *(cont.)*

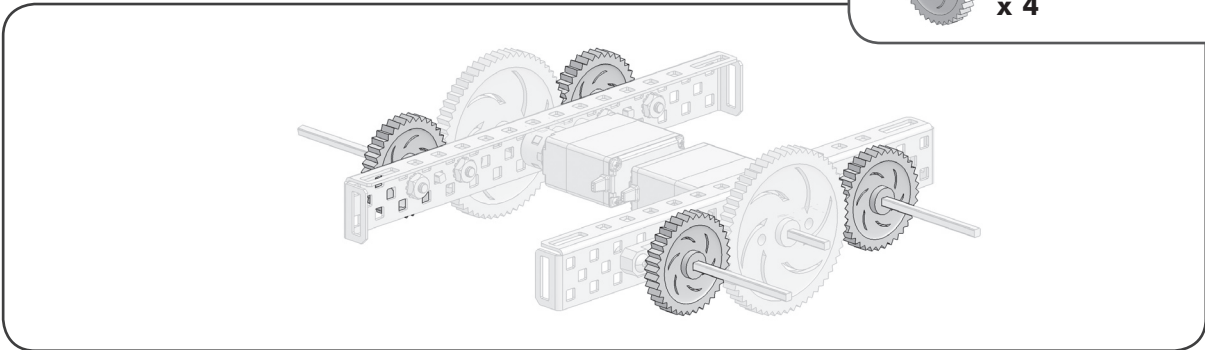**5** **Chassis Subassembly (cont.)**
Slide a 36-tooth gear onto each of the remaining square bars, pushing them flush against the collars.
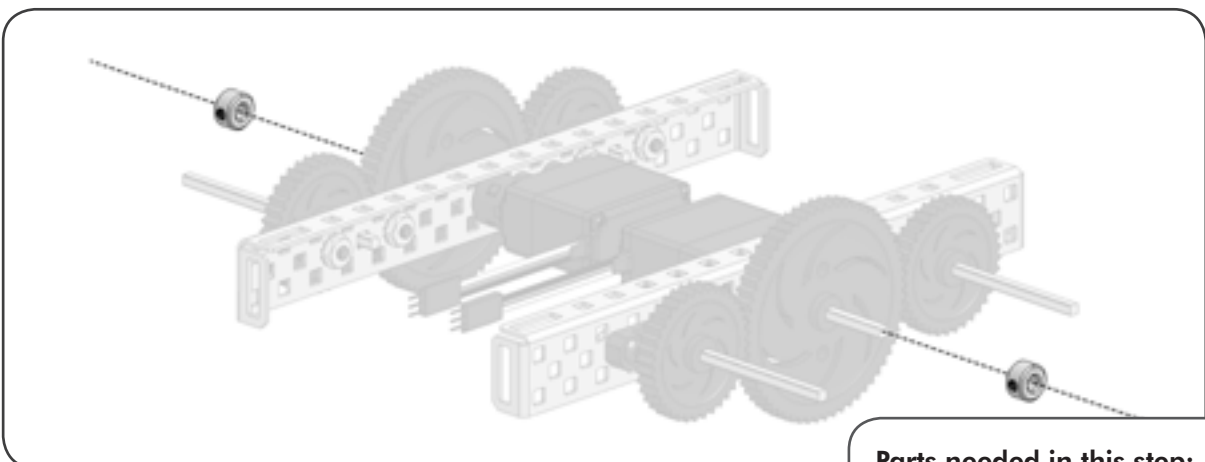

Parts needed in this step:

36-tooth
x 4

Add another collar to the end of the 2" shafts (the ones directly connected to the motor). Slide them down so that they are flush with the larger gear. Make sure they are tightened.
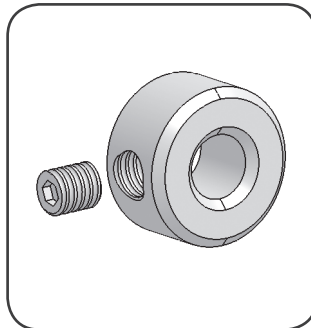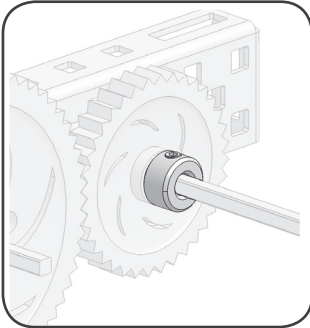

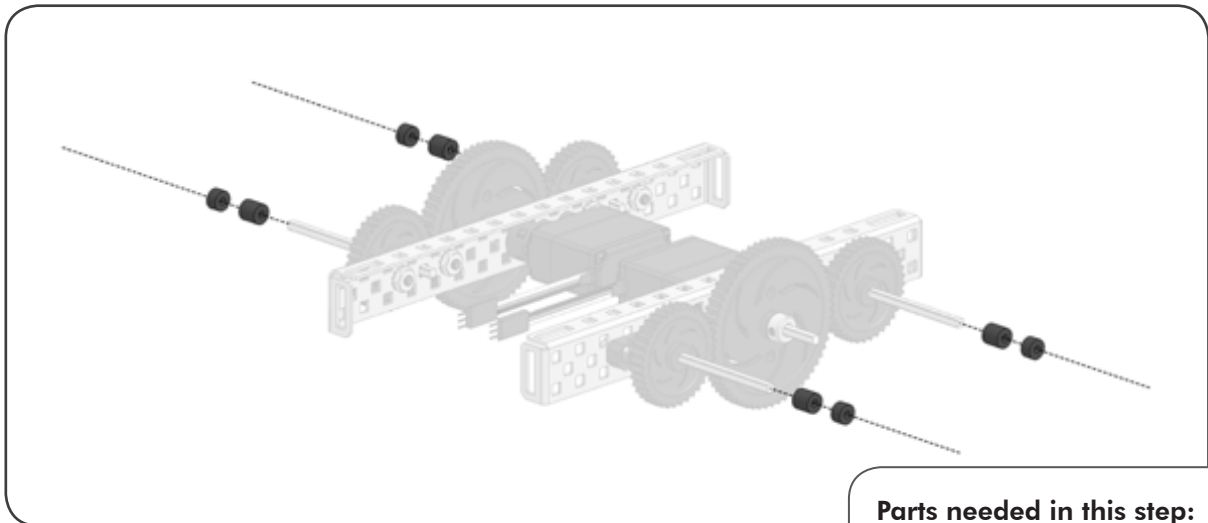**Parts needed in this step:**

x 2

Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**
Tighten the threaded screws with the thinner allen wrench.

Your kit includes two differently sized black spacers. Slide one of each onto the shafts with the smaller gears (those not directly connected to the motors), as shown.
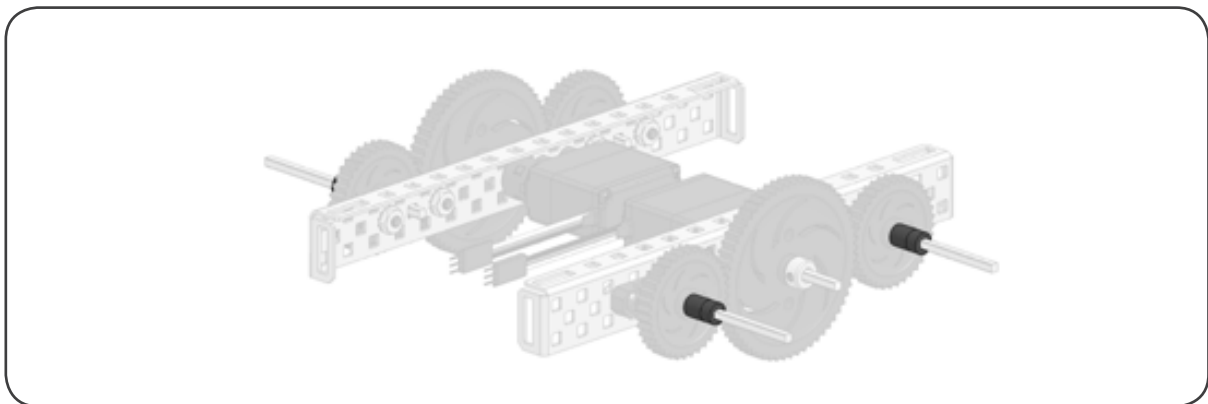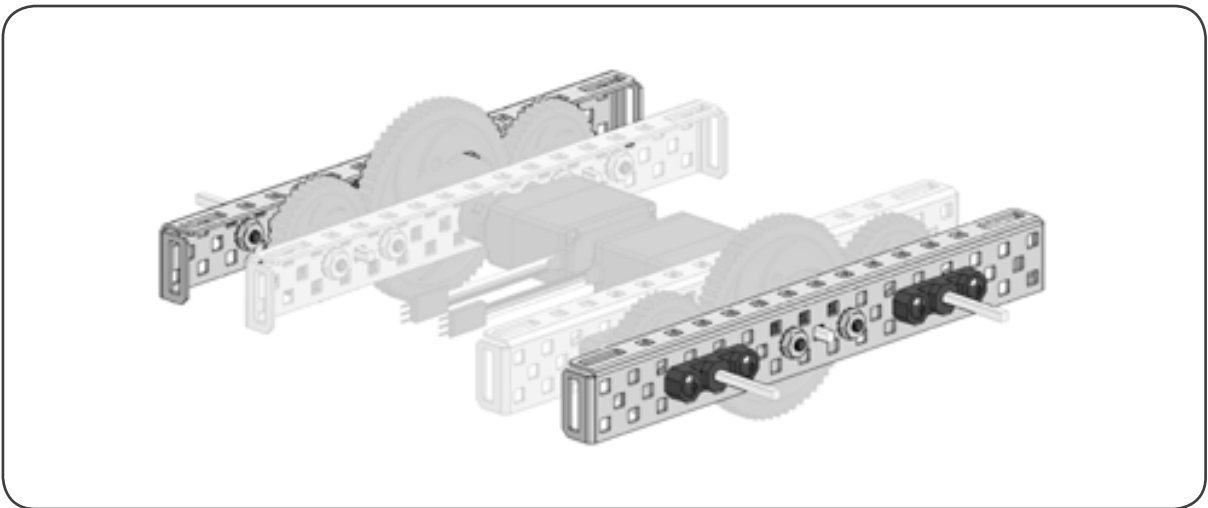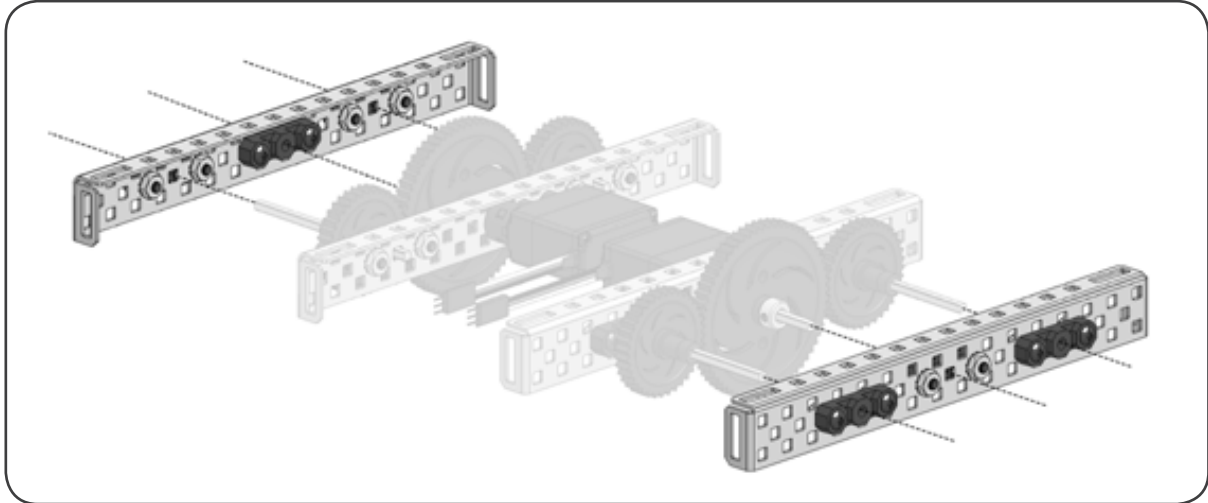
Parts needed in this step:

x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**
Install the pre-assembled outer chassis rails onto the current assembly. All three of the square bars sticking out of the inner rail should go through bearing flats on the outer rail.
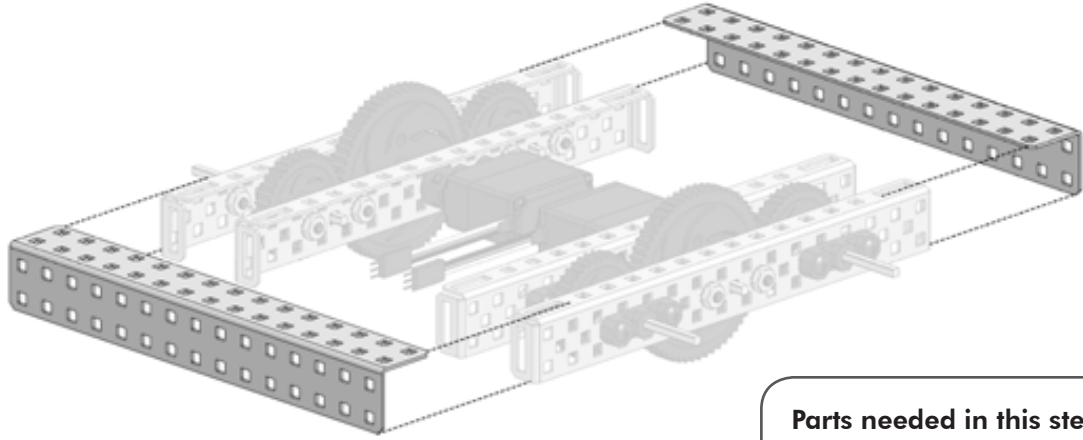
Note: If you find that your gears are sliding on the axles, you can insert the 0.182" and 0.318" plastic spacers included in the kit to block them into place.
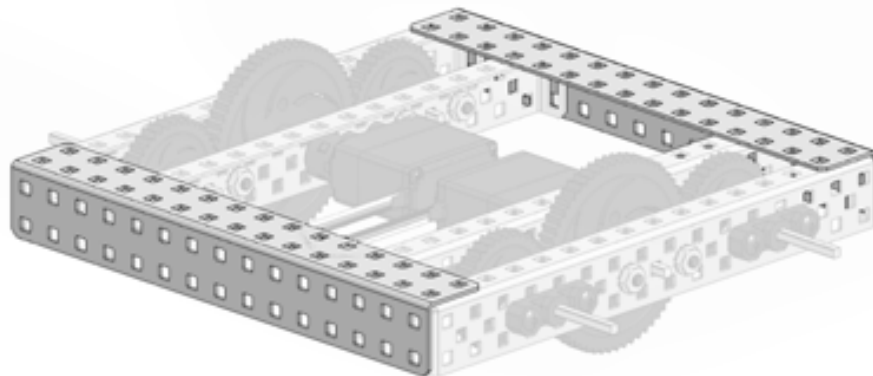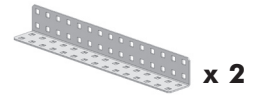
Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**
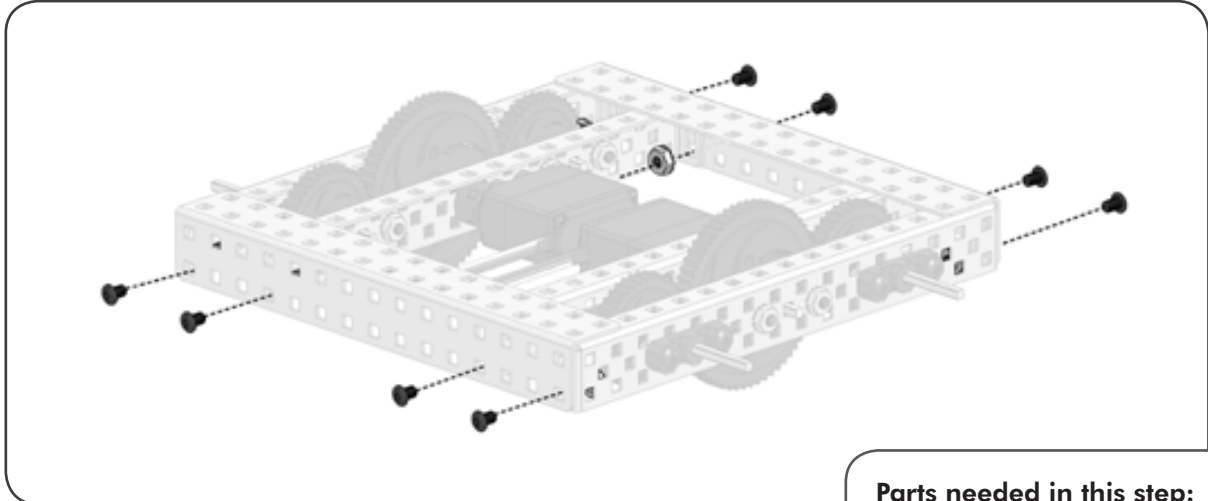Place chassis bumpers on the front and rear of the chassis rails, as shown.

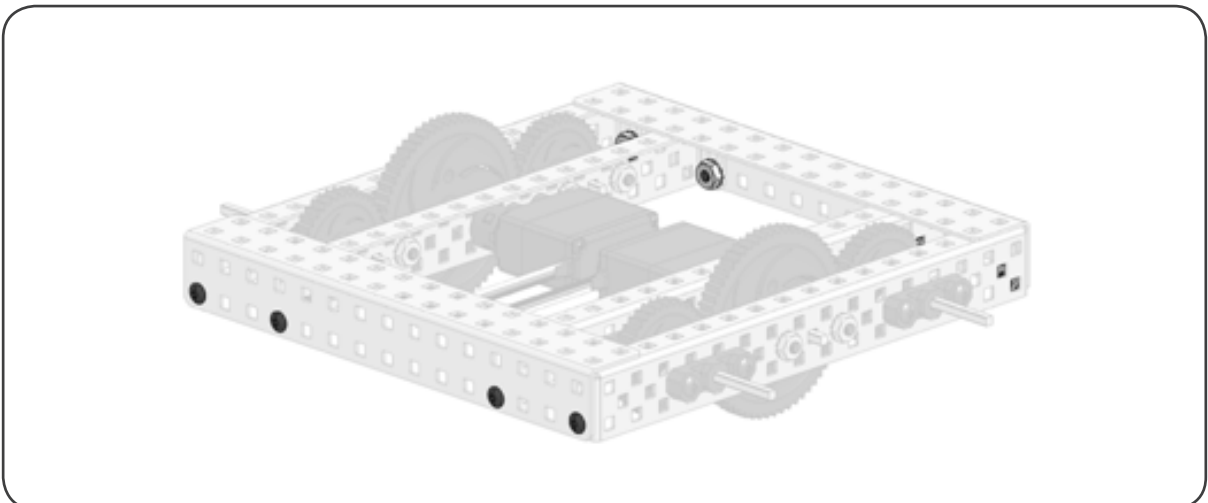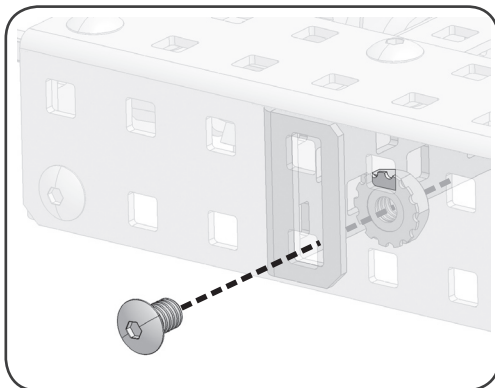**Parts needed in this step:**

x 2

Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**

Secure the vertical faces of the chassis bumpers to the end of the chassis rails
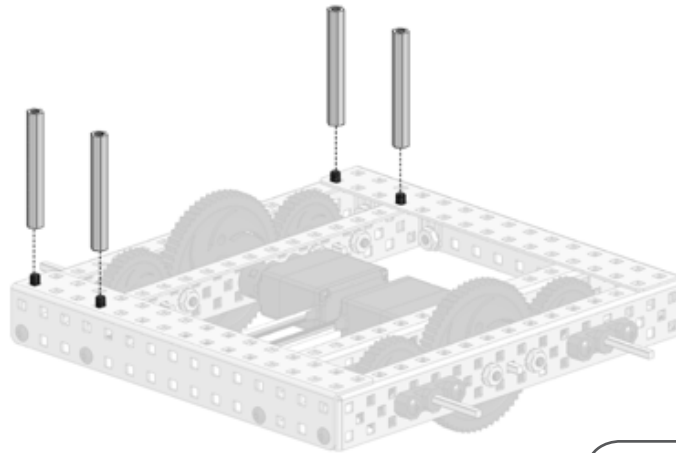using four ¼" 8-32 screws and keps nuts in the front, and four in the back.

Parts needed in this step:

¼"
x 8   x 8

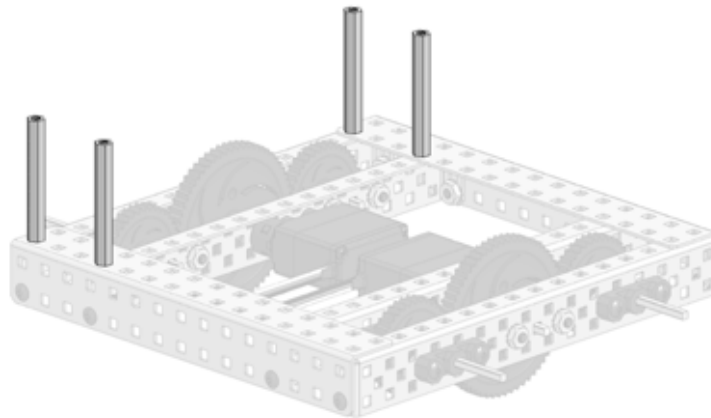# Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**
Connect four 2" standoffs using four ¼" 8-32 screws. Place them as shown and be sure to note that two of them are on the edge and two are one space away from the edge. Connect the parts using the thicker allen wrench while holding the standoff in place.
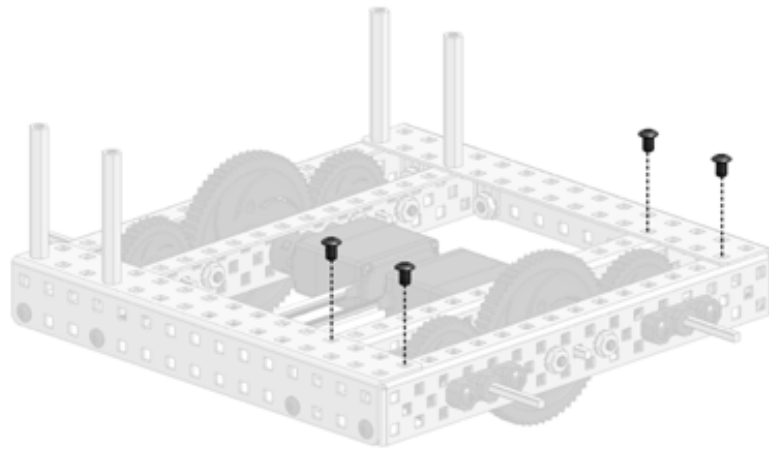
Parts needed in this step:

¼"
x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*

5 **Chassis Subassembly (cont.)**
Secure the horizontal faces of the chassis bumpers to the top of the chassis rails using four ¼" 8-32 screws and four keps nuts, two in the front and two in the back.
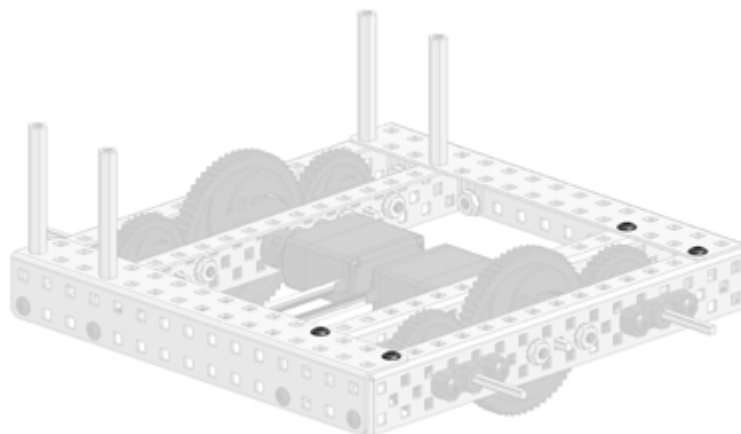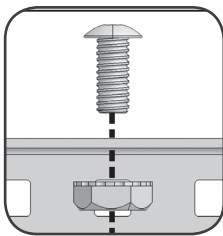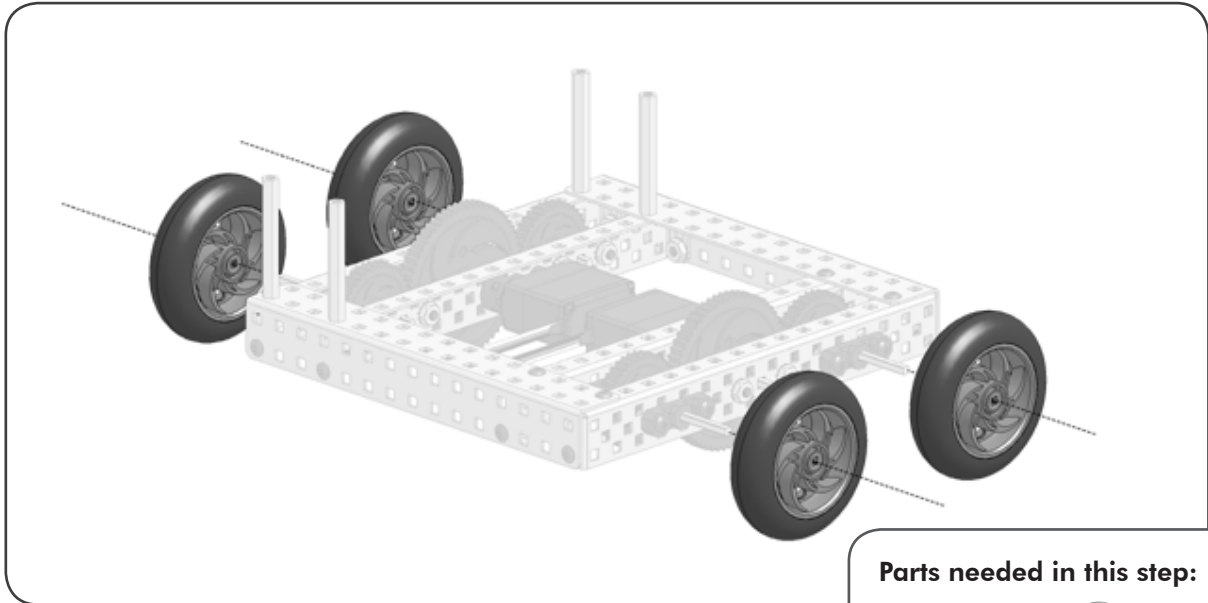
Parts needed in this step:

x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*
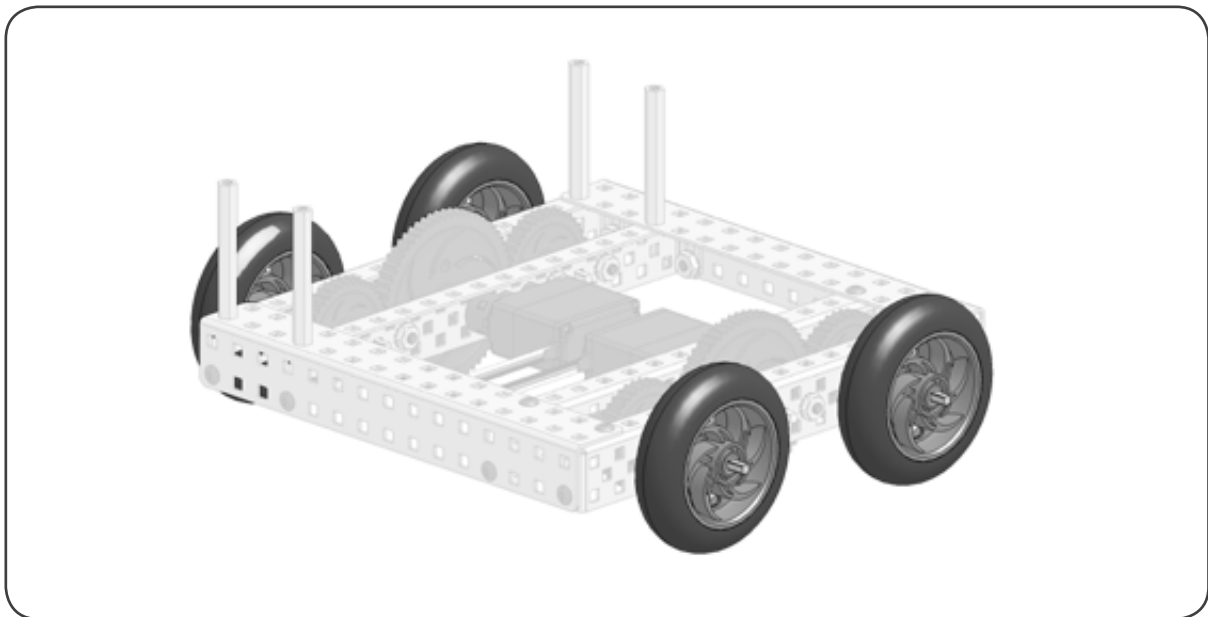
5 **Chassis Subassembly (cont.)**
Install the small green tires (2.75" Removable Tire and 1.895" Hub) on the 3" square beams, as shown. Slide them down so they are flush with the bearing flats.
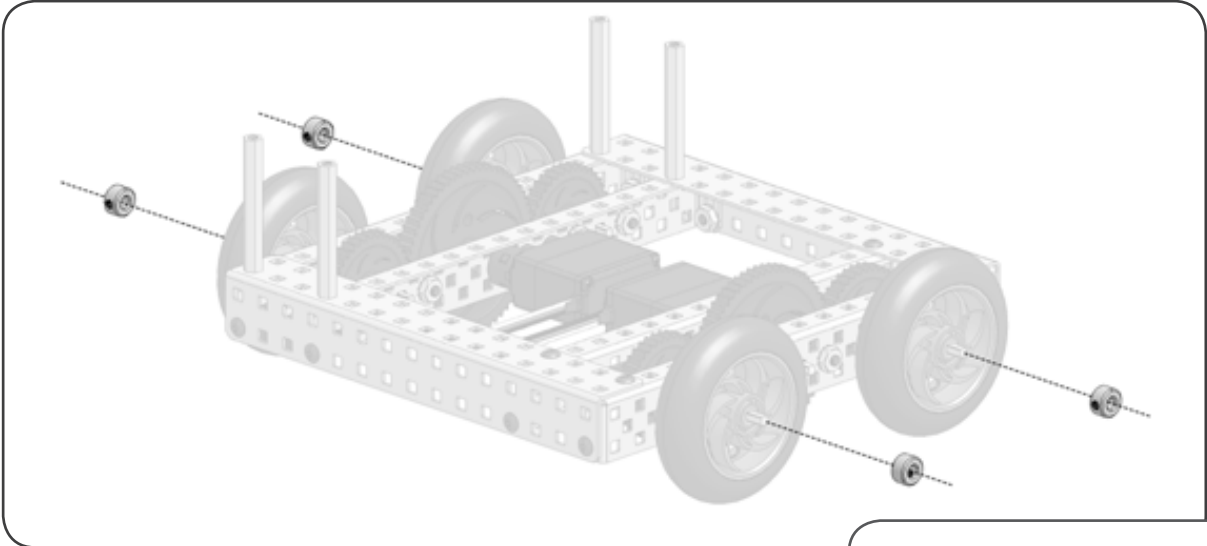

Parts needed in this step:

 x 4

Squarebot 2.0 Building Instructions *(cont.)*
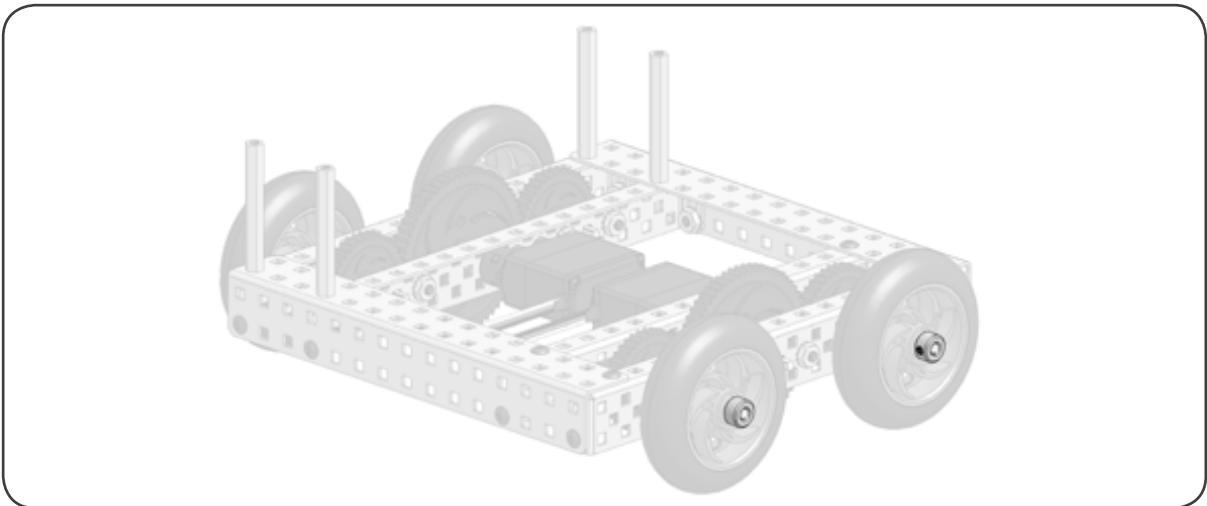
5 Chassis Subassembly (cont.)
Slide the collars onto the shafts such that they are flush against the wheels.
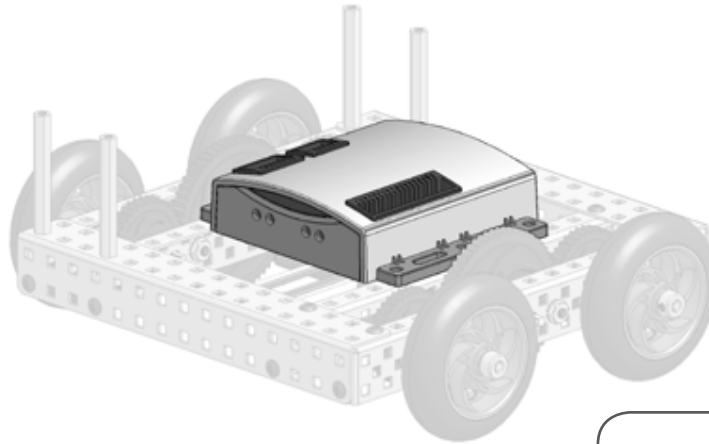Tighten the collars in place with the thinner allen wrench.

Parts needed in this step:
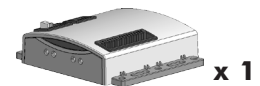
x 4

Squarebot 2.0 Building Instructions *(cont.)*

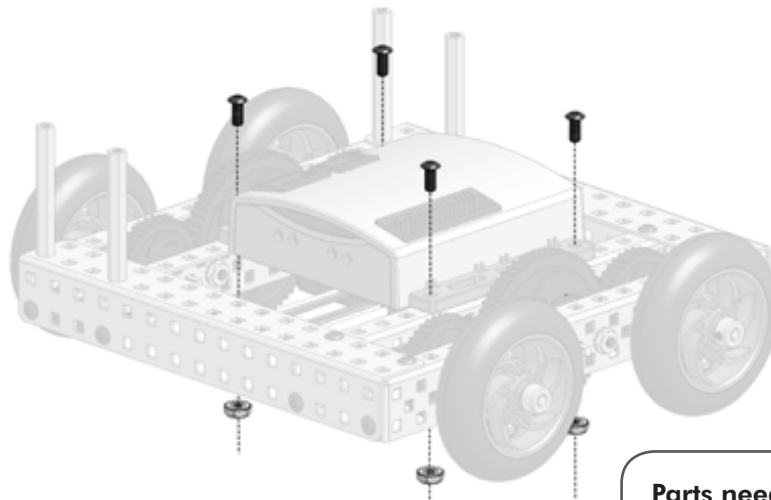**5** **Chassis Subassembly (cont.)**
Position the micro controller on your robot as shown.

Parts needed in this step:

x 1

Attach the micro controller to the chassis using four ½" 8-32 screws and keps nuts, as shown. Insert the screws into the small holes in the micro controller to hold it in position properly.
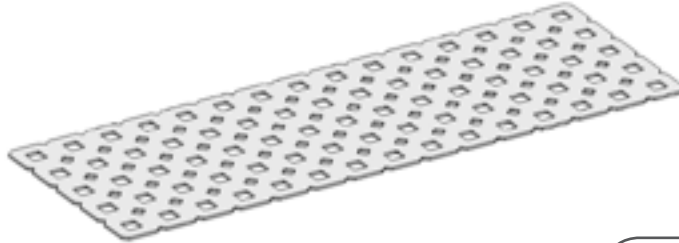
Parts needed in this step:

½"
x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*

6 **Canopy Assembly**
You will need a punched panel to begin constructing the canopy.
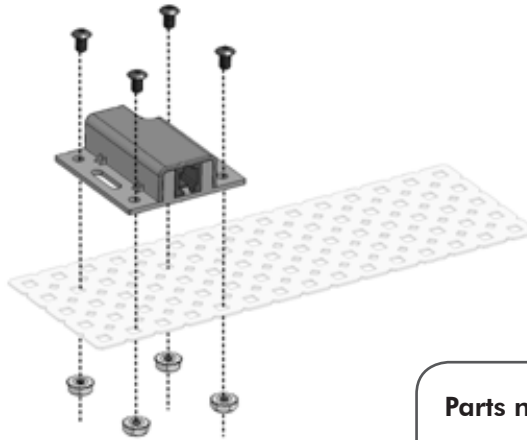
You are constructing a seperate part in this segment, which will later be attached to Squarebot.
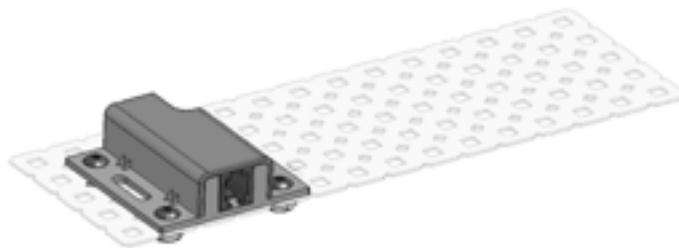
Parts needed in this step:

x 1

Attach the receiver to the punched panel using four ¼" 8-32 screws and four keps nuts as shown. Be sure to leave one empty row of holes on the left of the receiver.
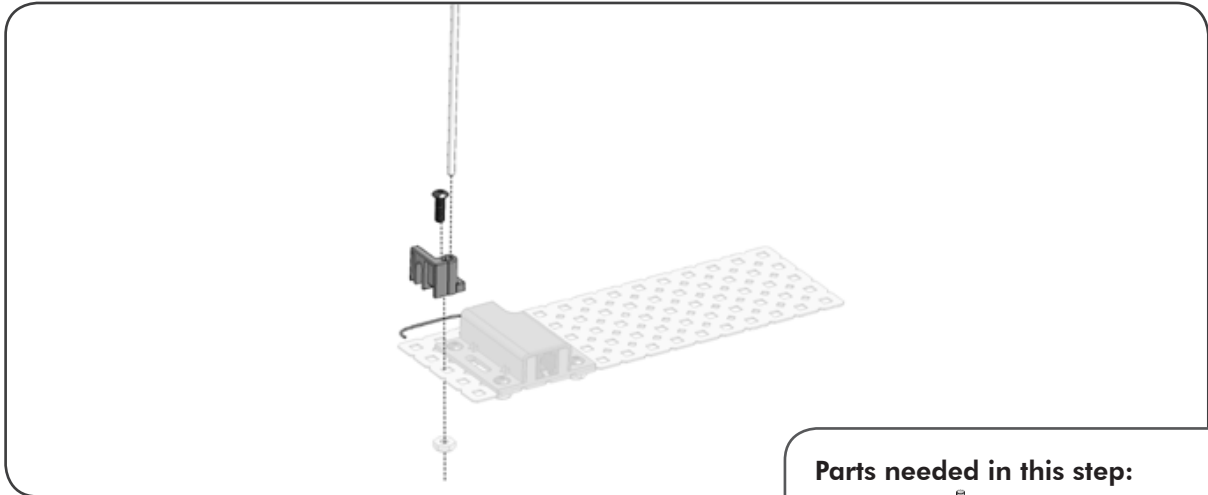
Parts needed in this step:

x 1   ¼"
x 4   x 4

Squarebot 2.0 Building Instructions *(cont.)*

6 Canopy Assembly (cont.)

Attach the antenna holder using a ³/₄" 8-32 screw and keps nut, securing the screw through the middle hole on the left edge of the canopy. Then, slide the yellow antenna wire from the receiver inside the antenna sleeve and place it into the antenna holder.
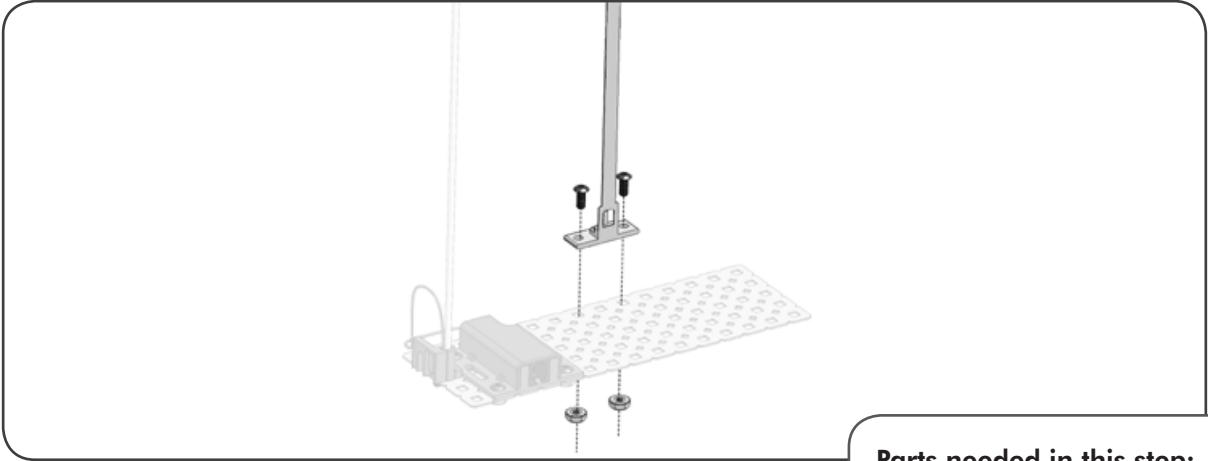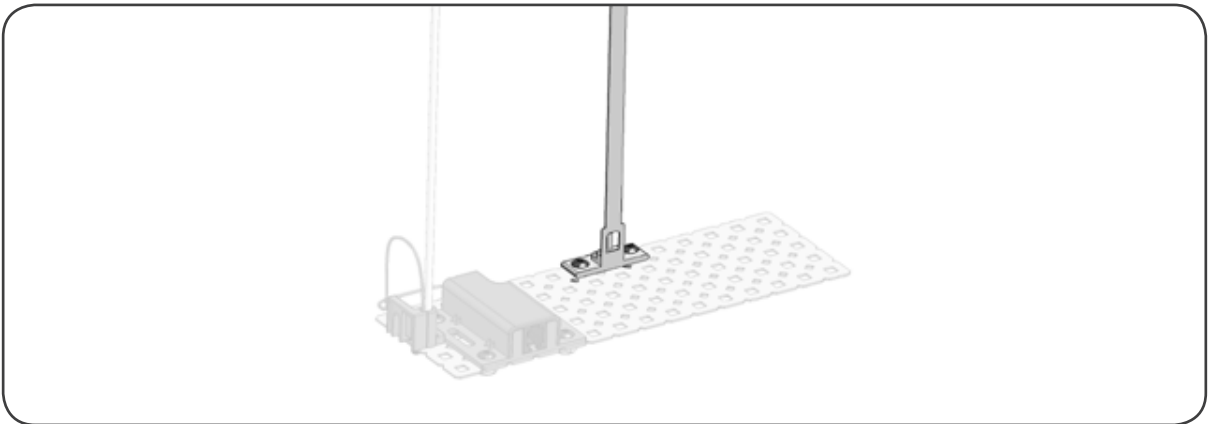
Parts needed in this step:

x 1   x 1   ³/₄" x 1   x 1
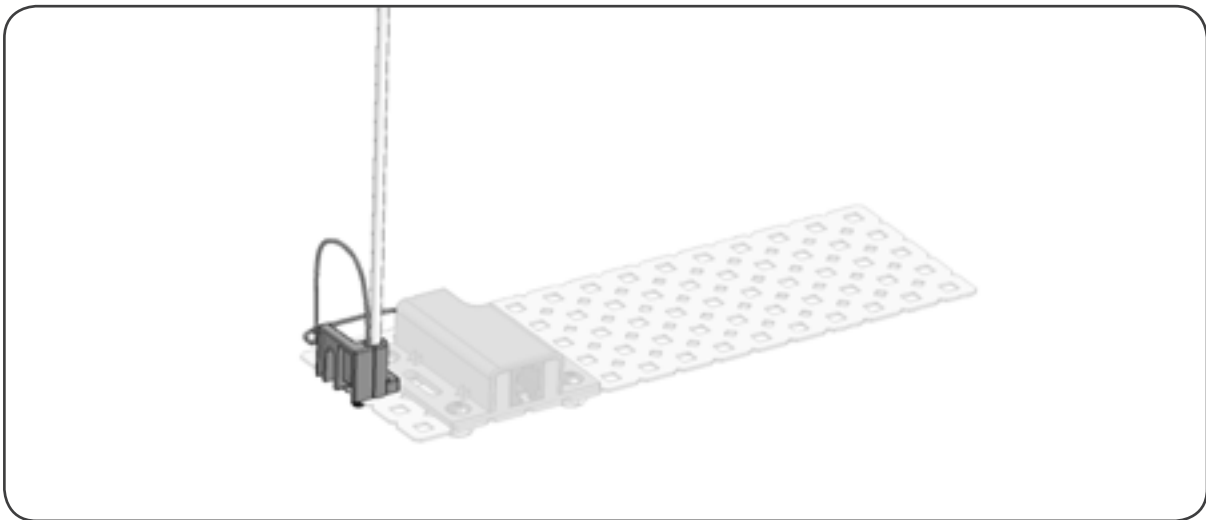
Squarebot 2.0 Building Instructions *(cont.)*

6 **Canopy Assembly (cont.)**

If you are using a VEX rechargable battery pack, attach the battery strap along the back row of the punched pannel using two ½" 8-32 screws. Be sure it is oriented properly.
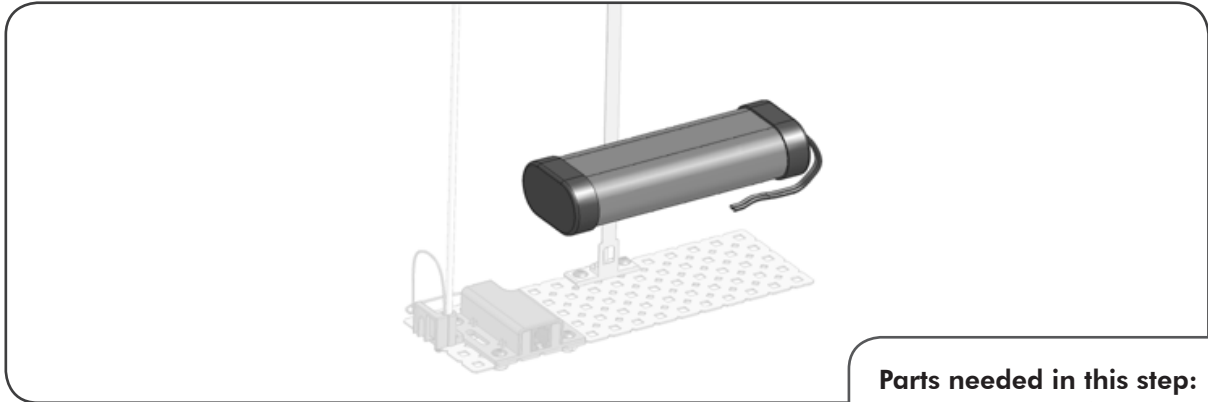
Parts needed in this step:
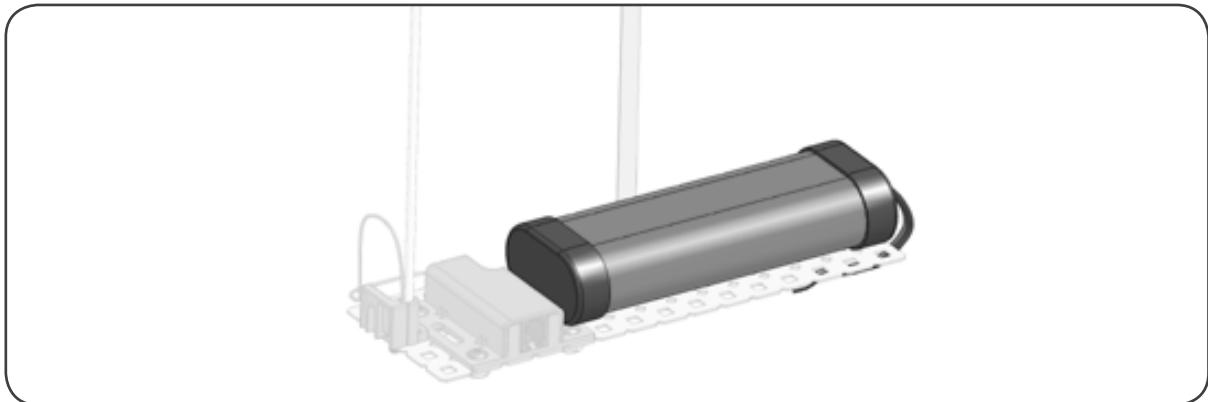
x 1   ½" x 2   x 2

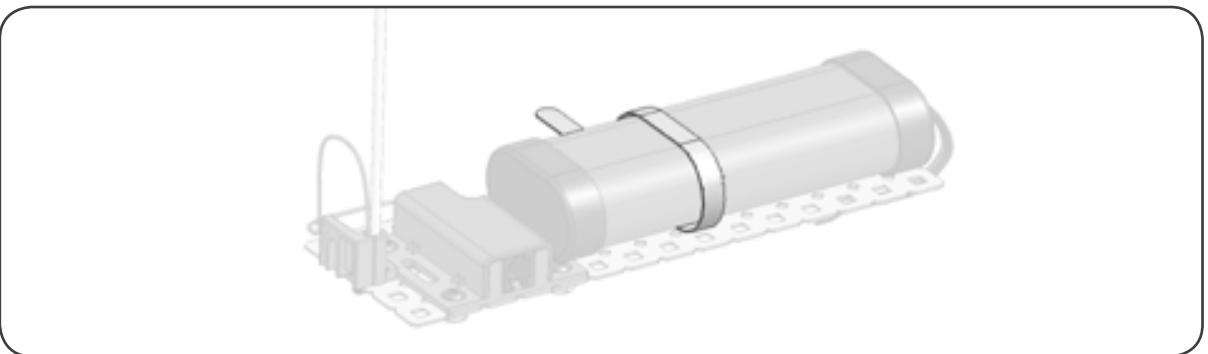# Squarebot 2.0 Building Instructions *(cont.)*

6 **Canopy Assembly (cont.)**
Take the blue rechargable Vex battery and orient it as shown. If you are using the blue VEX AA battery holder, simply attach it to the canopy in place of the battery pack.

Parts needed in this step:

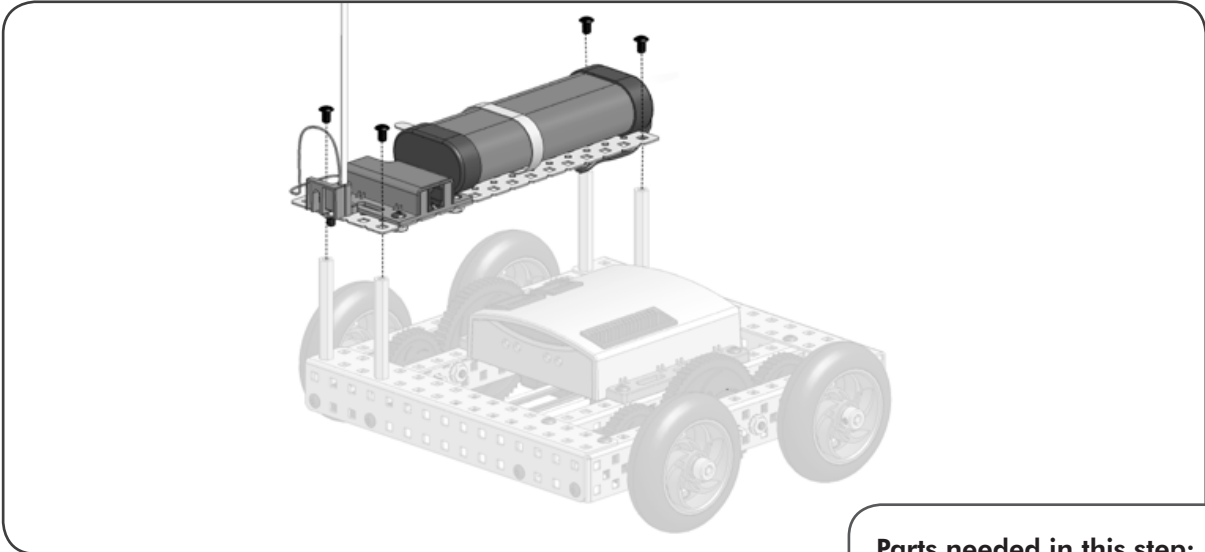x 1

Lock the battery into place using the battery strip.

Squarebot 2.0 Building Instructions *(cont.)*
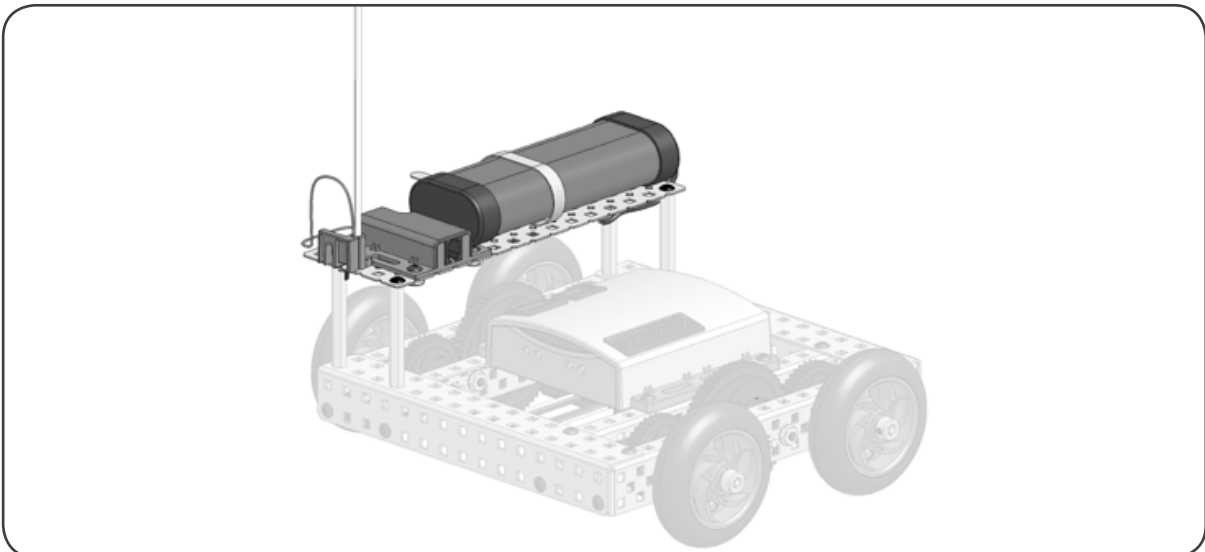
6 Canopy Assembly (cont.)
Attach the canopy to the robot. To do this, secure the canopy onto the four offsets you attached earlier using four ¼" 8-32 screws.

You will have to offset the canopy by one hole eiter to the left or the right.
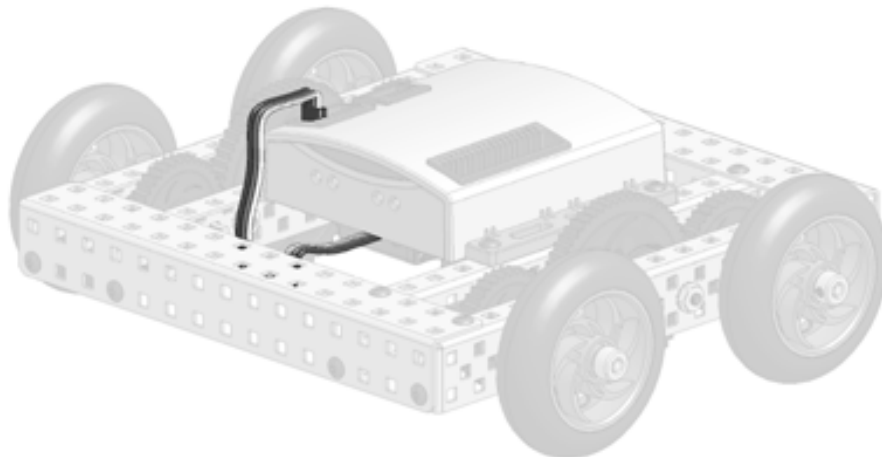
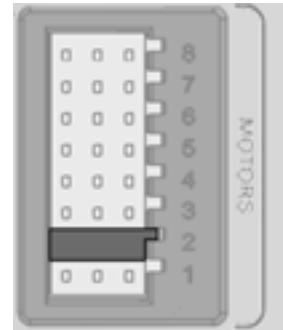**Parts needed in this step:**

¼"
x 4

Squarebot 2.0 Building Instructions *(cont.)*

7 **Wire Assembly**

Plug the wire coming from the robot's right motor into "MOTORS" port 2. The side of the controller with the LEDs is the front.

Be sure to plug in the wire correctly and gently. The wires should slide in easily when properly oriented.
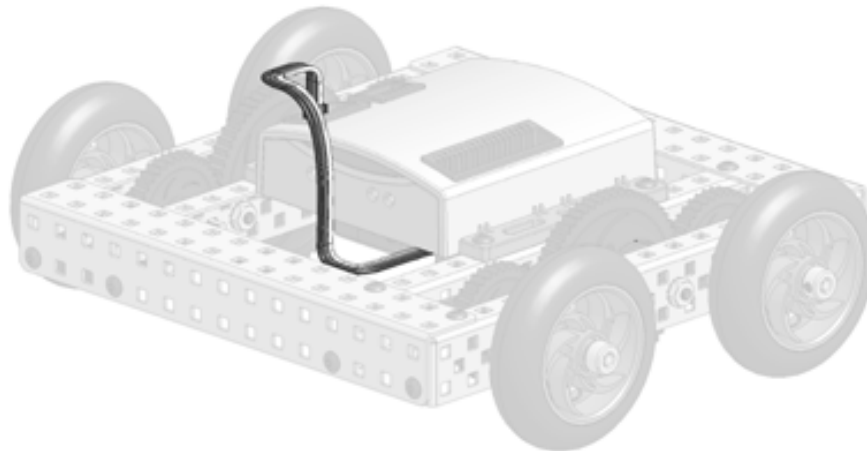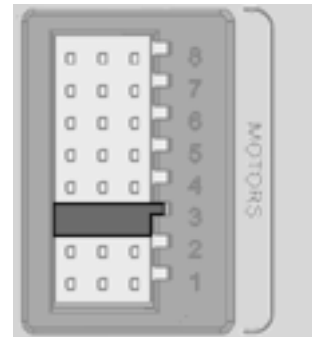
Squarebot 2.0 Building Instructions *(cont.)*

7 **Wire Assembly (cont.)**
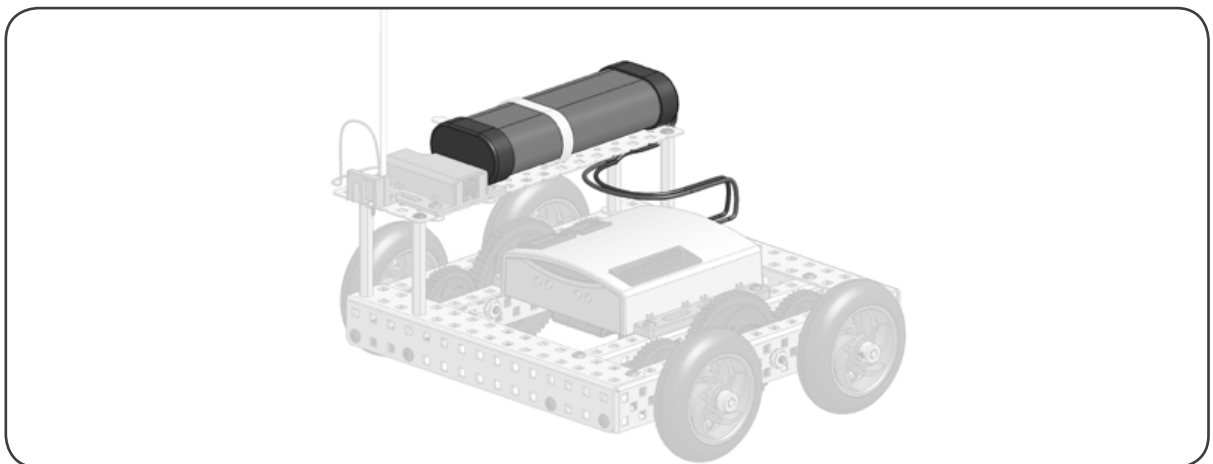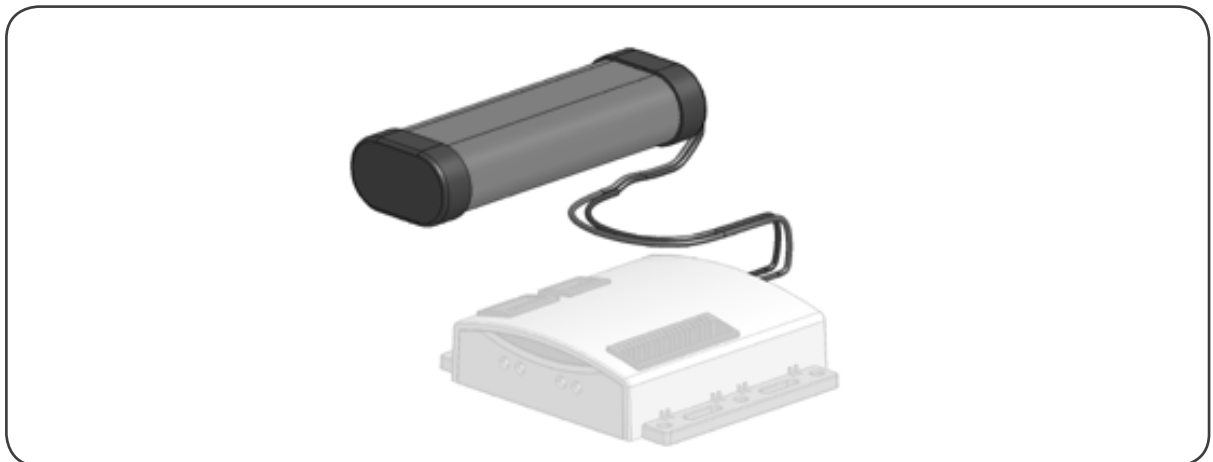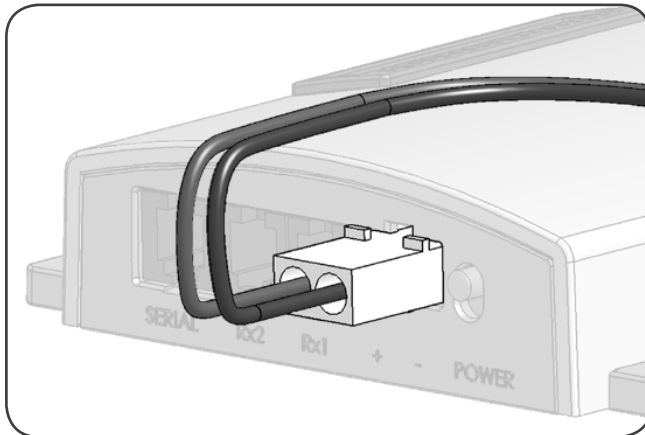Plug the wire that is attached to the left motor into "MOTORS" port 3 on the micro controller.

Squarebot 2.0 Building Instructions *(cont.)*
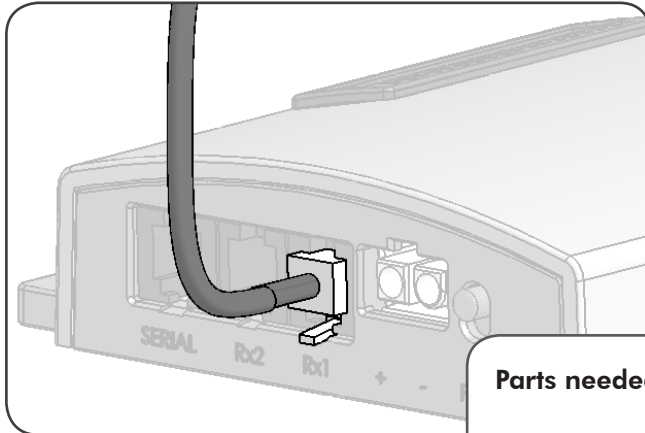
7 **Wire Assembly (cont.)**
Plug the battery into the back of the micro controller.

Squarebot 2.0 Building Instructions *(cont.)*

7 **Wire Assembly (cont.)**

Take the 9" RJ-10 wire (the yellow wire that looks like a phone cable) and plug one end into the back of the receiver module. Plug the other end into the port marked "Rx 1" on the back of the micro controller.

Parts needed in this step:

x 1