PITSCO

TETRIX® PRIME

Expansion Set Builder's Guide

PITSCO EDUCATION

42147

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Check Pitsco.com/TETRIX-PRIME-Expansion-Set#resources for PDF updates of this guide.

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Preface

Purpose:

The purpose of the expansion set is to provide additional components for use with the TETRIX® PRIME R/C Robotics Set and add not only functionality with new elements but allow for more complex and robust builds.

- A user experienced with the building technique learned from the R/C Robotics Set should find additional inspiration in the expansion models that expand his or her building skills.
- The goal of the models should be to show proper or best-use building practices for the new elements and new ways to use existing R/C Robotics Set elements.

Requirements:

The models included in these instructions assume that the user has both the PRIME R/C Robotics Set and the PRIME Expansion Set. It is expected that the user is familiar with the models from the R/C Robotics Set and is comfortable with the building skills used for those models. An appropriate age level is 12+.

Expected Outcomes:

The user will gain reinforced knowledge and comfort level with fundamentals of simple and complex machine principles. Users will gain added exposure to structural engineering and design theory, technology, math, science, and problem-solving skills in practical hands-on experiences.

Time Expectations:

The models in this guide are meant to be more advanced builds than what are in the *TETRIX PRIME Builder's Guide* included with the R/C Robotics Set. Please keep that in mind when planning for building time. Depending on user skill level and experience, each build should be able to be completed in one to two 45- to 50-minute class periods. Specific time expectations for each model are given in the model overview and are unique to that model.

Safety Information

Mechanical

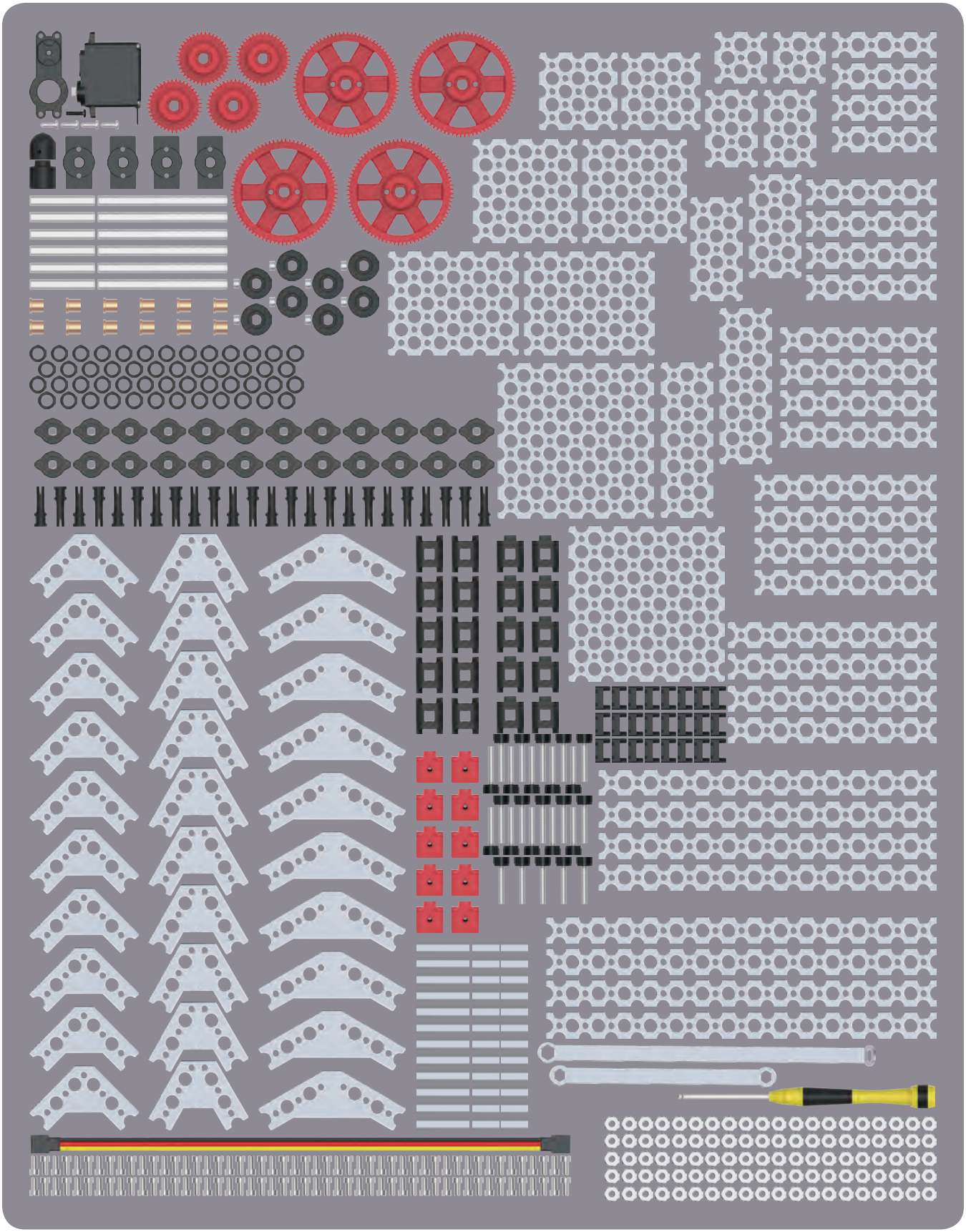
- Keep fingers, hair, and loose articles of clothing clear of gears and moving parts.
- Never pick up the robot while it is moving or the servo motors are running.
- Remove any burrs caused by cutting the metal beams.

Electrical

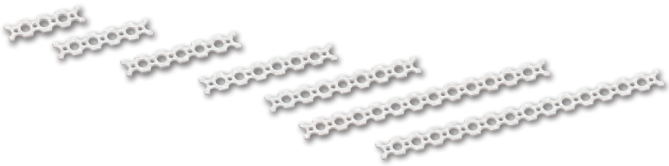
- Make sure the power is turned off when the robot is not in operation.
- Do not operate the robot in a wet environment.
- Always power down the robot before making any changes.
- Use caution when working with bare wires to avoid creating a short circuit situation.
- Route wires carefully and secure them if necessary to avoid damage to the wire or its insulation.
- Mount the battery pack and all electronic components securely.

PITSCO TETRIX PRIME

Expansion Set

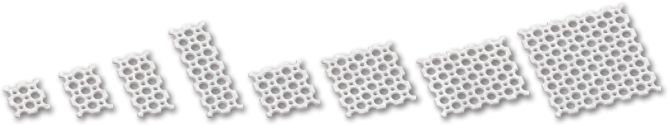


TETRIX PRIME Expansion Set Parts Index



TETRIX PRIME Aluminum Linkages

Part No.	Part Name	Quantity
41244	TETRIX PRIME 4-Hole Flat Linkage	4
41245	TETRIX PRIME 5-Hole Flat Linkage	4
41246	TETRIX PRIME 6-Hole Flat Linkage	4
41247	TETRIX PRIME 7-Hole Flat Linkage	4
41248	TETRIX PRIME 8-Hole Flat Linkage	4
41249	TETRIX PRIME 13-Hole Flat Linkage	4
41250	TETRIX PRIME 15-Hole Flat Linkage	4



TETRIX PRIME Aluminum Plates

Part No.	Part Name	Quantity
41251	TETRIX PRIME 2 x 2 Hole Plate	2
41254	TETRIX PRIME 2 x 3 Hole Plate	2
41255	TETRIX PRIME 2 x 4 Hole Plate	2
41256	TETRIX PRIME 2 x 6 Hole Plate	2
41257	TETRIX PRIME 3 x 3 Hole Plate	2
41261	TETRIX PRIME 4 x 4 Hole Plate	2
41262	TETRIX PRIME 4 x 5 Hole Plate	2
41263	TETRIX PRIME 6 x 6 Hole Plate	2

TETRIX PRIME Aluminum Gussets

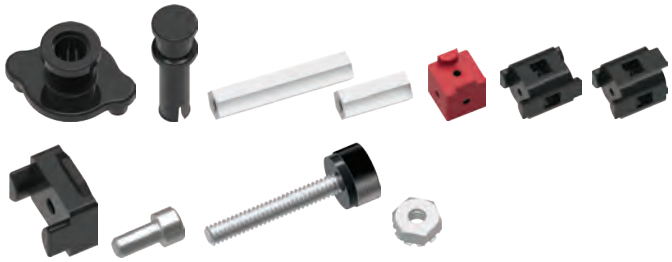
Part No.	Part Name	Quantity
41264	TETRIX PRIME 60-Degree Gusset	10
41265	TETRIX PRIME 90-Degree Gusset	10
41266	TETRIX PRIME 120-Degree Gusset	10

Gears and Motors

Part No.	Part Name	Quantity
40223	TETRIX PRIME 40-Tooth Plastic Gear	4
40224	TETRIX PRIME 80-Tooth Plastic Gear	16
40538	TETRIX Standard-Scale Servo Motor	1

Axle, Gear, & Servo Hardware

Part No.	Part Name	Quantity
40225	TETRIX PRIME 80 mm Steel Axle	6
40226	TETRIX PRIME 40 mm Steel Axle	6
40229	TETRIX PRIME D-Shaft Set Collar	8
40230	TETRIX PRIME Shaft Servo Hub	1
41260	TETRIX PRIME 16 mm Ball Skid Point	1
40227	TETRIX PRIME 8 mm x 6 mm Bronze Bushing	12
41665	TETRIX PRIME 6 mm Plastic Bushing Spacer	50
40232	TETRIX PRIME Servo Mounting Bracket	1
40228	TETRIX PRIME Beam Attachment Hub	4
39081	Servo Extension	1



Connecting Hardware

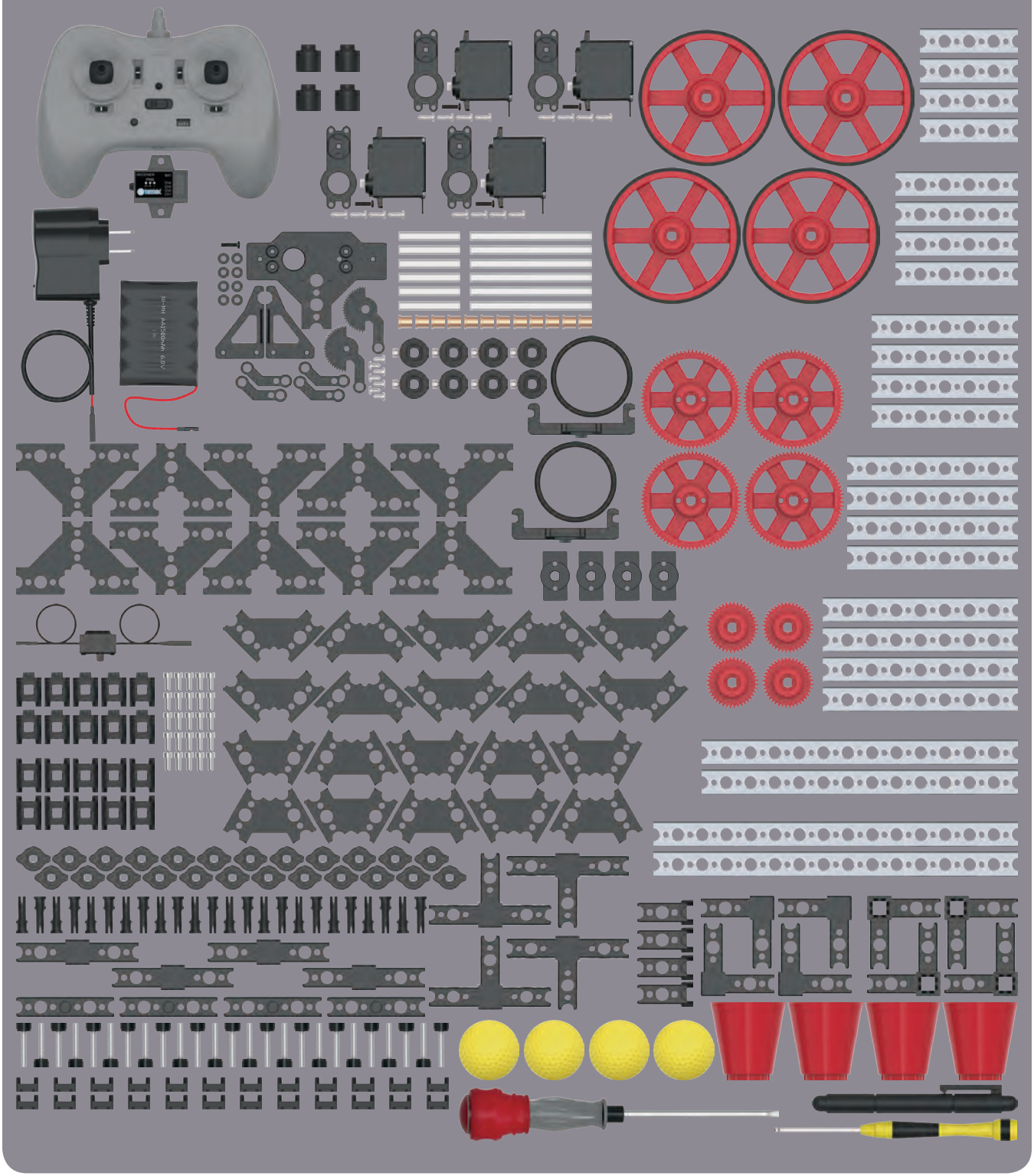
Part No.	Part Name	Quantity
40219	TETRIX PRIME Quick Rivet Connector	25
40220	TETRIX PRIME Quick Rivet Pegs	25
39107	TETRIX Stand-Off Posts 6-32 x 32 mm	12
41253	TETRIX Stand-Off Posts 6-32 x 16 mm	24
41267	TETRIX PRIME 16 mm Anchor Block	10
40216	TETRIX PRIME Straight Block Beam Connector	10
40217	TETRIX PRIME 90-Degree Cross Block Connector	10
40221	TETRIX PRIME Wing Nut	24
40516	Socket Head Cap Screw	100
40323	TETRIX PRIME Thumbscrew	25
39094	Kep Nuts	100

Tools & Accessories

Part No.	Part Name	Quantity
38001	TETRIX Wrench Set	2
40341	Miniature Ball-Point Hex Driver	1
42147	TETRIX PRIME Expansion Set Builder's Guide	1

R/C Robotics Set

Note: In order to complete the three builds shown in this book, you must have the TETRIX PRIME R/C Robotics Set. The TETRIX PRIME Expansion Set parts in this set (and shown on the previous spread) are an addition to the R/C Robotics Set.



TETRIX PRIME R/C Robotics Set Parts Index

Beams

Part No.	Part Name	Quantity
40201	TETRIX PRIME 4-Hole Square Beam	4
40202	TETRIX PRIME 5-Hole Square Beam	4
40203	TETRIX PRIME 6-Hole Square Beam	4
40204	TETRIX PRIME 7-Hole Square Beam	4
40205	TETRIX PRIME 8-Hole Square Beam	4
40206	TETRIX PRIME 13-Hole Square Beam	2
40207	TETRIX PRIME 15-Hole Square Beam	2

Internal Connectors

Part No.	Part Name	Quantity
40212	TETRIX PRIME 3-Way Beam Connector	4
40213	TETRIX PRIME Tee Beam Connector	4
40211	TETRIX PRIME 90-Degree Beam Connector	4
40214	TETRIX PRIME Beam End Connector	4
40322	TETRIX PRIME Beam Extension Connector	4
40215	TETRIX PRIME Beam Straight Connector	4

External Connectors

Part No.	Part Name	Quantity
40208	TETRIX PRIME 90-Degree Beam Bracket	10
40209	TETRIX PRIME 60-Degree Beam Bracket	10
40210	TETRIX PRIME Tee Beam Bracket	10
40216	TETRIX PRIME Straight Block Beam Connector	10
40217	TETRIX PRIME 90-Degree Cross Block Connector	10

Connecting Hardware

Part No.	Part Name	Quantity
40219	TETRIX PRIME Quick Rivet Connector	15
40220	TETRIX PRIME Quick Rivet Pegs	24
40221	TETRIX PRIME Wing Nut	24
40323	TETRIX PRIME Thumbscrew	24
40516	Socket Head Cap Screw	25

Wheels, Gears, & Servos

Part No.	Part Name	Quantity
40222	TETRIX PRIME Wheel with Tire	4
40223	TETRIX PRIME 40-Tooth Plastic Gear	4
40224	TETRIX PRIME 80-Tooth Plastic Gear	4
40538	TETRIX Standard-Scale Servo Motor	2
40379	TETRIX Continuous Rotation Servo Motor	2
40232	TETRIX PRIME Servo Mounting Bracket	4

Wheel, Gear, & Servo Hardware

Part No.	Part Name	Quantity
40230	TETRIX PRIME Shaft Servo Hub	4
40225	TETRIX PRIME 80 mm Steel Axle	6
40226	TETRIX PRIME 40 mm Steel Axle	6
40227	TETRIX PRIME 8 mm x 6 mm Bronze Bushing	12
40228	TETRIX PRIME Beam Attachment Hub	4
40229	TETRIX PRIME D-Shaft Set Collar	8

Gripper Assembly & Controllers

Part No.	Part Name	Quantity
40234	TETRIX PRIME Gripper Kit	1
40377	Wireless Joystick Gamepad System	1

Batteries & Hardware

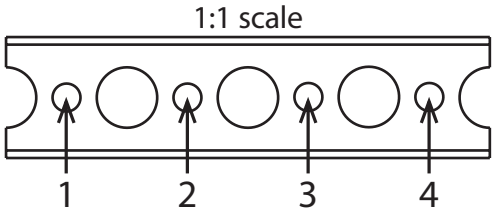
Part No.	Part Name	Quantity
40236	TETRIX PRIME Battery Mount Bracket	2
40235	TETRIX PRIME 6 V NiMH Battery Pack	1
40457	TETRIX PRIME Battery Pack On/Off Switch	1
40378	TETRIX PRIME 5-Cell NiMH Battery Pack Charger	1
36404	4-in-1 Screwdriver	1
40341	Miniature Ball-Point Hex Driver	1
42991	2-in-1 Screwdriver	1
40499	Plastic 2 oz Cups	4
14041	Golf Balls, Practice	4
60160	TETRIX PRIME Builder's Guide	1

TETRIX PRIME Hardware Components

The following mechanical parts overview includes elements from the TETRIX PRIME R/C Robotics Set that are not included in the TETRIX PRIME Expansion Set. Refer to pages 4-7 to see what parts come with each set.

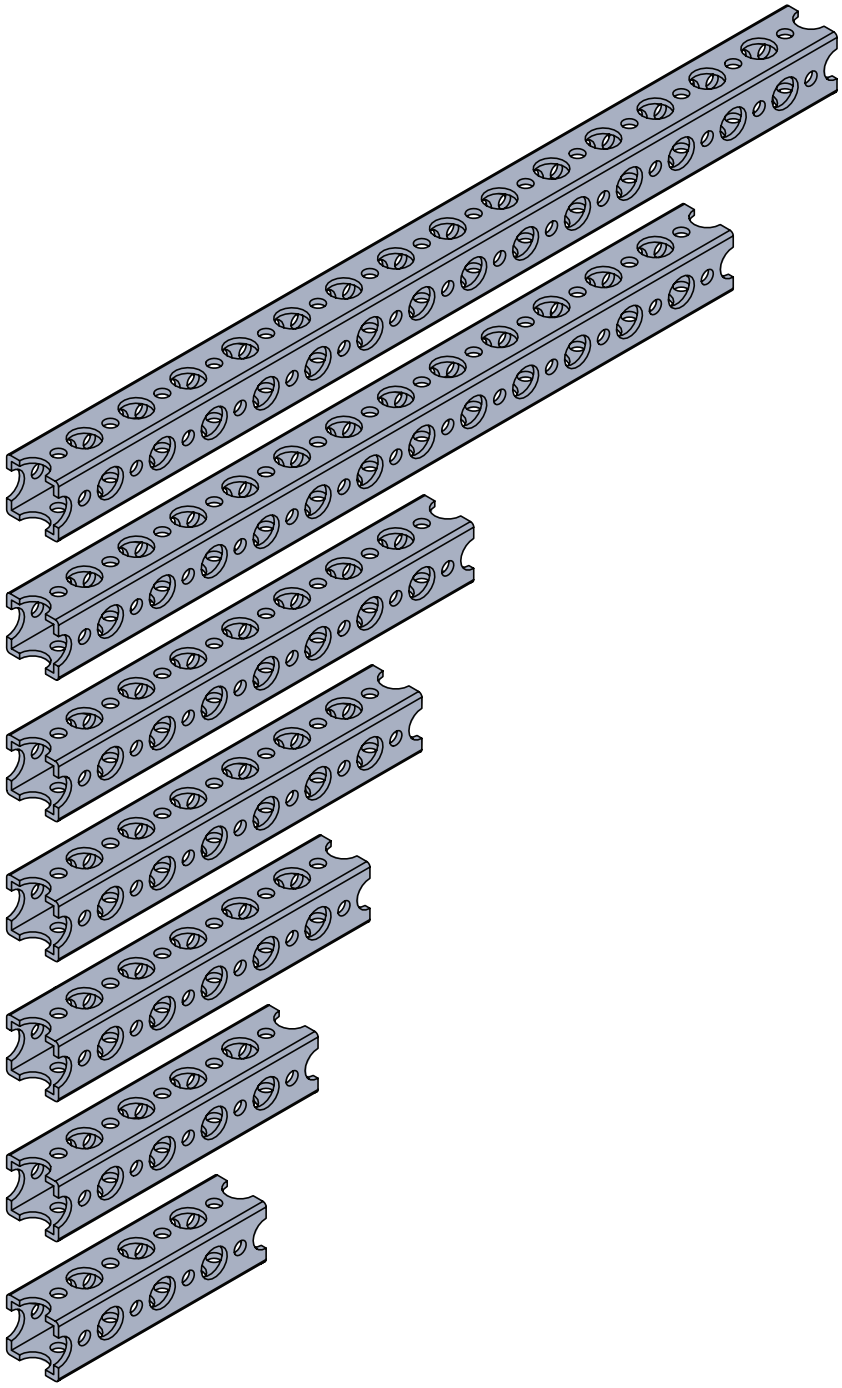
Beams

The beams are named by the number of small holes on one side of the beam. Do not select beams by counting the larger holes (see right).



To identify TETRIX PRIME Square Beams, count the small holes. The example above is a 4-Hole Square Beam.

Structural Elements



15-Hole Square Beam 40207

13-Hole Square Beam 40206

8-Hole Square Beam 40205

7-Hole Square Beam 40204

6-Hole Square Beam 40203

5-Hole Square Beam 40202

4-Hole Square Beam 40201

Structural Elements

15-Hole Flat Linkage 41250

13-Hole Flat Linkage 41249

8-Hole Flat Linkage 41248

7-Hole Flat Linkage 41247

6-Hole Flat Linkage 41246

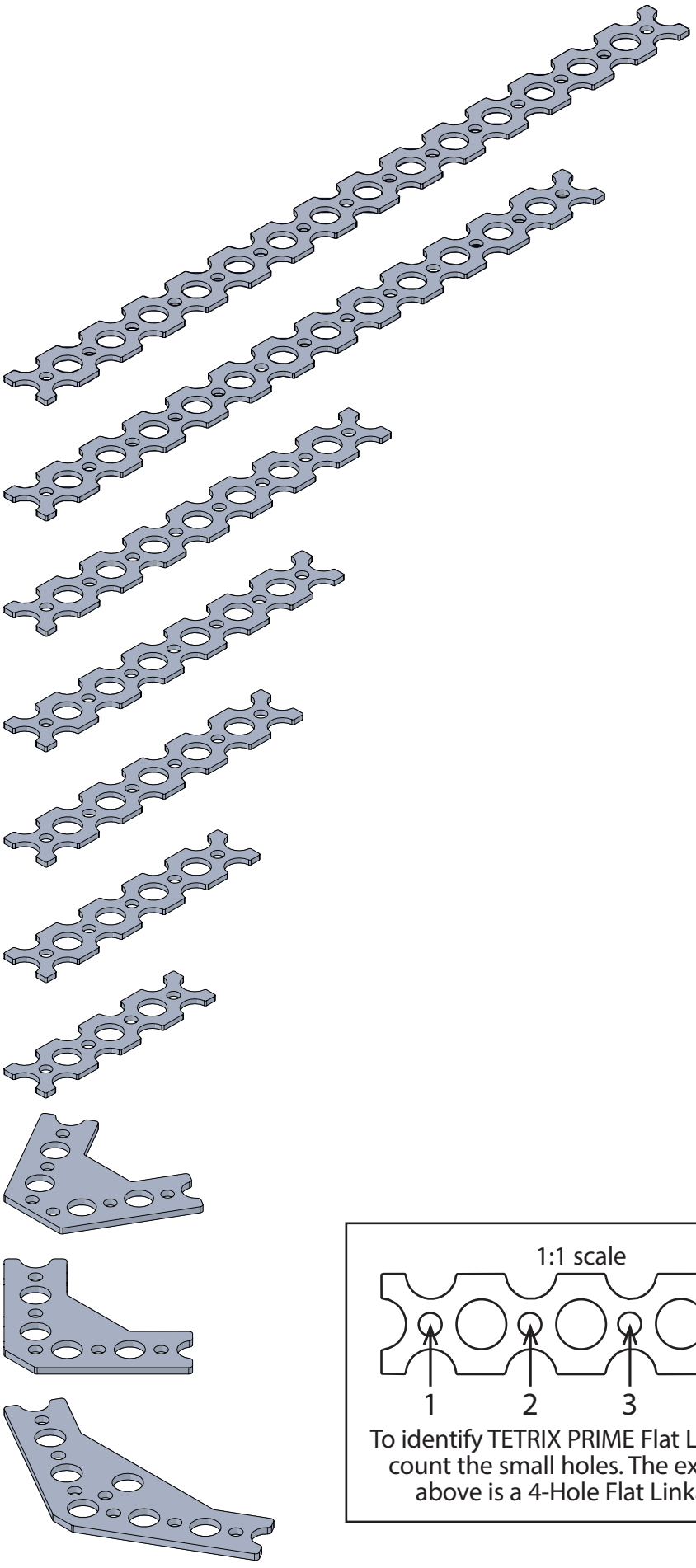
5-Hole Flat Linkage 41245

4-Hole Flat Linkage 41244

60-Degree Gusset 41264

90-Degree Gusset 41265

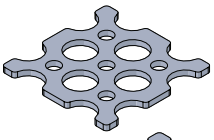
120-Degree Gusset 41266



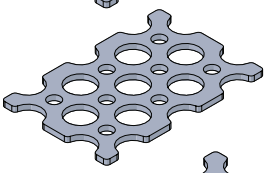
To identify TETRIX PRIME Flat Linkages, count the small holes. The example above is a 4-Hole Flat Linkage.

Structural Elements

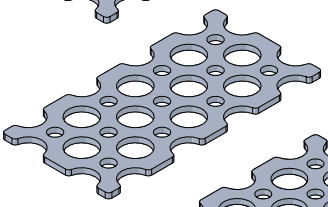
2 x 2 Hole Plate 41251



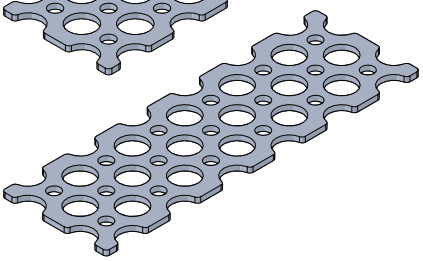
2 x 3 Hole Plate 41254



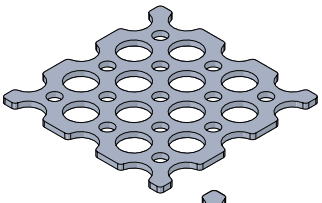
2 x 4 Hole Plate 41255



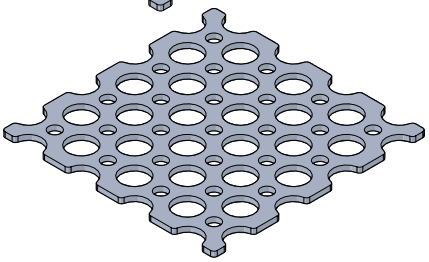
2 x 6 Hole Plate 41256



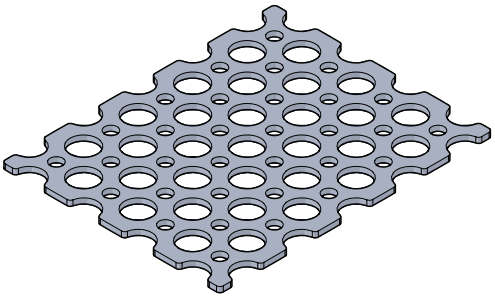
3 x 3 Hole Plate 41257



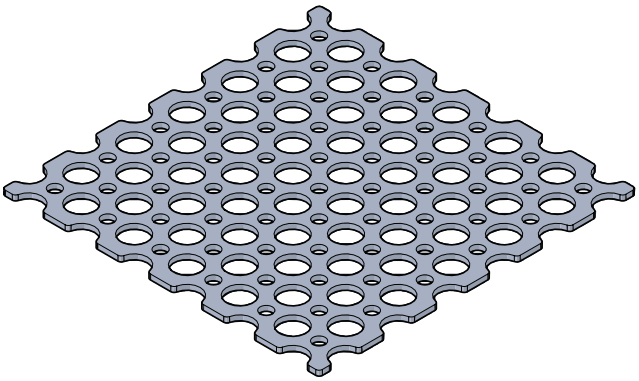
4 x 4 Hole Plate 41261



4 x 5 Hole Plate 41262

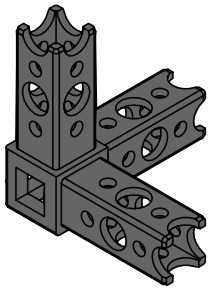


6 x 6 Hole Plate 41263

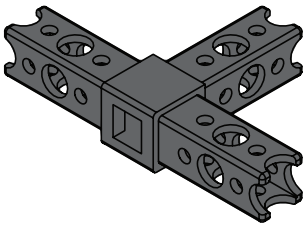


Structural Elements

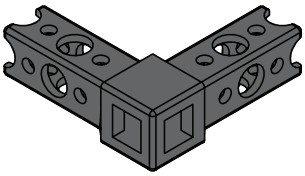
3-Way Beam Connector 40212



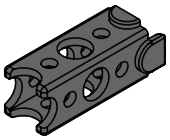
Tee Beam Connector 40213



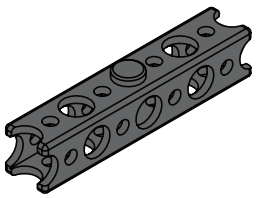
90-Degree Beam Connector 40211



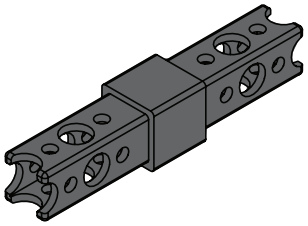
Beam End Connector 40214



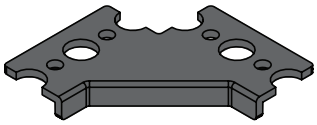
Beam Extension Connector 40322

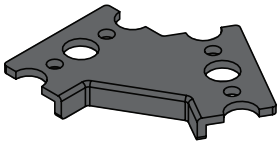


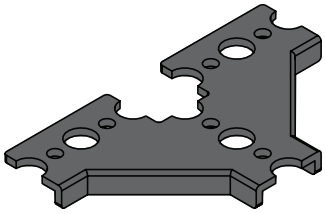
Beam Straight Connector 40215



Structural Elements

90-Degree Beam Bracket 40208 

60-Degree Beam Bracket 40209 

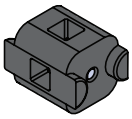
Tee Beam Bracket 40210 

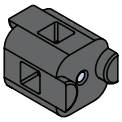
Quick Rivet Connector 40219 

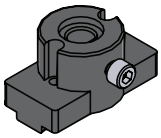
Quick Rivet Peg 40220 

Wing Nut 40221 

Thumbscrew 40323 

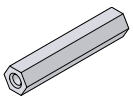
Straight Block Beam Connector 40216 

90-Degree Cross Block Connector 40217 

Beam Attachment Hub 40228 

16 mm Anchor Block 41267 

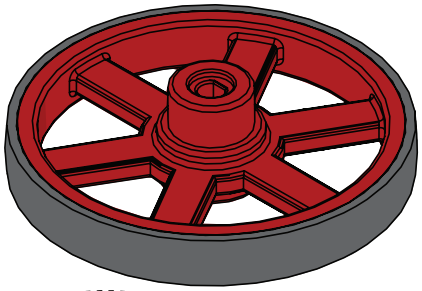
Stand-Off Post 6-32 x 16 mm 41253 

Stand-Off Post 6-32 x 32 mm 39107 

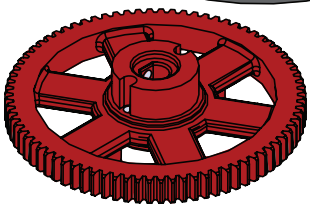
Tip: These two parts, the straight block beam connector and the 90-degree cross block connector, are very close in appearance and can be easily confused. Please double-check that you are using the one the directions call for.

Motion Elements

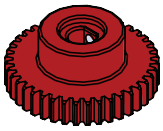
Wheel with Tire (90 mm) 40222



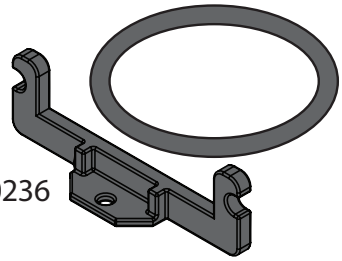
80-Tooth Plastic Gear 40224



40-Tooth Plastic Gear 40223



Battery Mount Bracket 40236

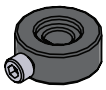


16 mm Ball Skid Point 41260

8 mm x 6 mm Bronze Bushing 40227

6 mm Plastic Bushing Spacer 41665

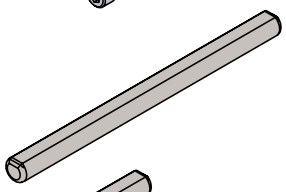
D-Shaft Set Collar 40229



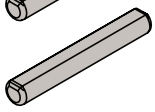
Socket Head Cap Screw 40516

Kep Nut 39094

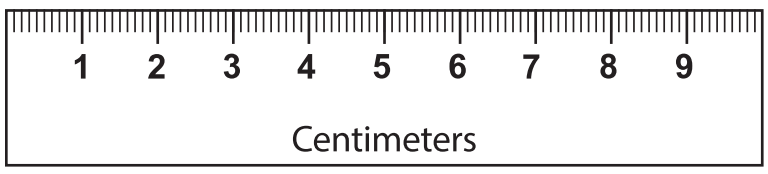
80 mm Steel Axle 40225



40 mm Steel Axle 40226

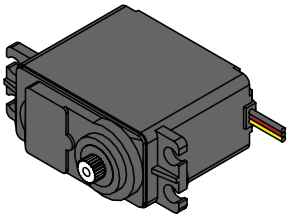


Measure 80 mm and 40 mm Steel Axles here.

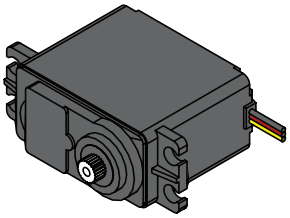


Motion Elements

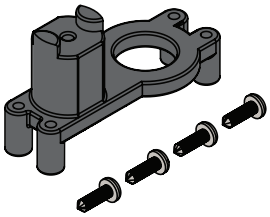
Standard-Scale Servo Motor 40538



Continuous Rotation Servo Motor 40379

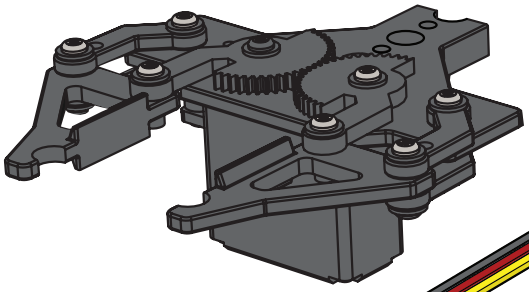


Servo Mounting Bracket 40232



Shaft Servo Hub 40230

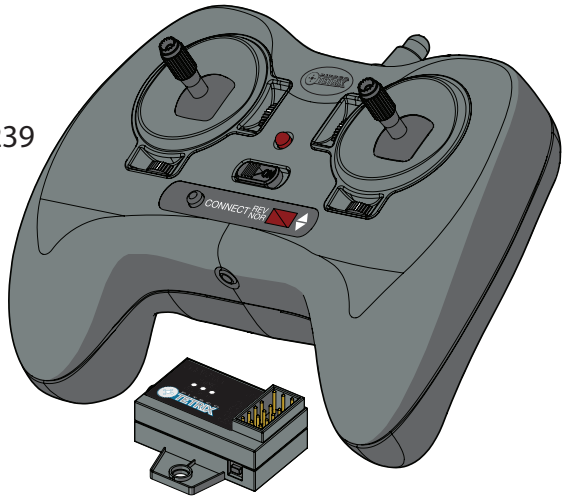
Gripper Kit 40234



Servo Extension 39081

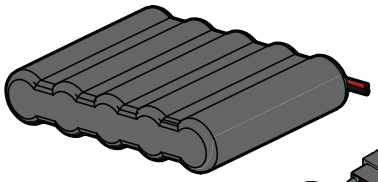
Control Elements

Wireless Joystick Gamepad System with Receiver 40239

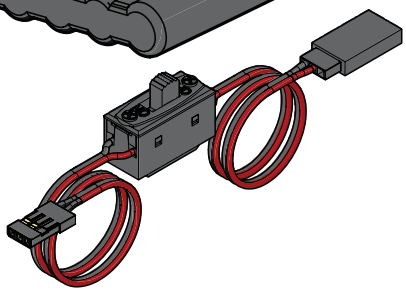


Power, Tools, and Accessories Elements

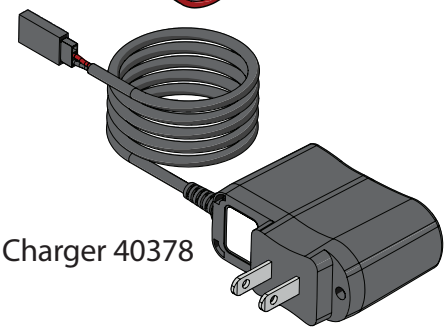
6 V NiMH Battery Pack 40235



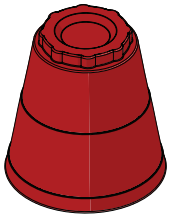
Battery Pack On/Off Switch 40457



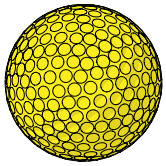
5-Cell NiMH Battery Pack Charger 40378



Plastic 2 oz Cups 40499

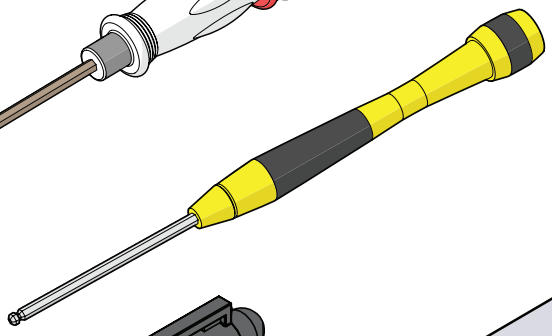


Golf Balls, Practice 14041

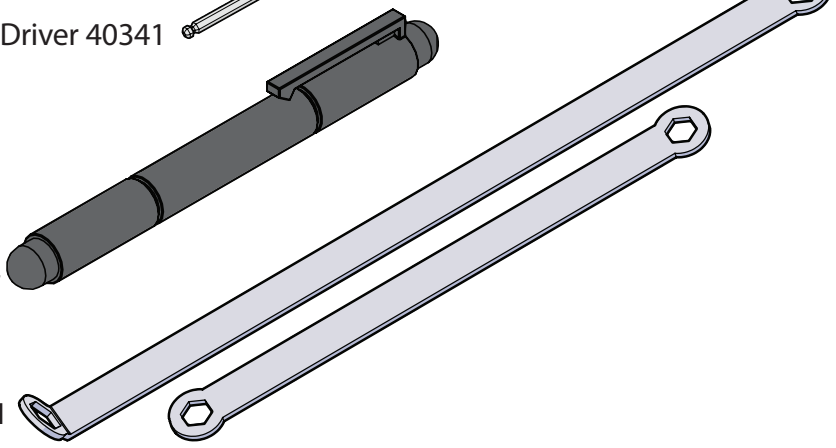


2-in-1 Screwdriver 42991

Miniature Ball-point Hex Driver 40341



4-in-1 Screwdriver 36404

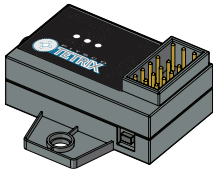


TETRIX Wrench Set 38001

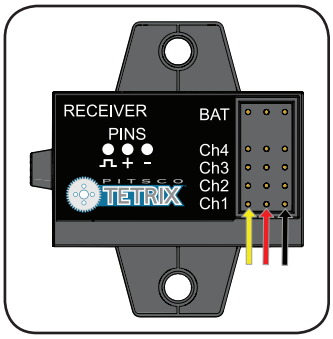
Set Up/Construction Tips
Remote Control Setup

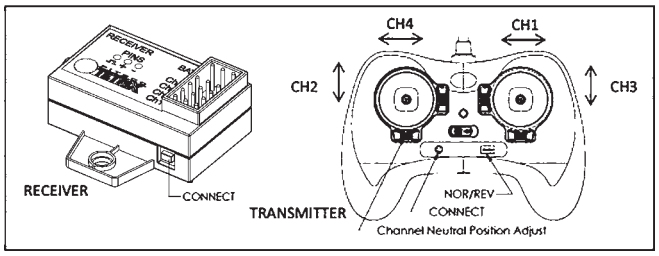
Your TETRIX MAX robot is controlled by a standard 2.4 GHz remote control and an accompanying receiver mounted to the robot. Transmitters are connected to specific receivers, allowing multiple transceiver combinations to be used in the same area.

Wireless Joystick Gamepad System with Receiver 40239



4-channel wireless receiver from Wireless Joystick Gamepad System 40239





Transmitter and Receiver Connection Procedure:

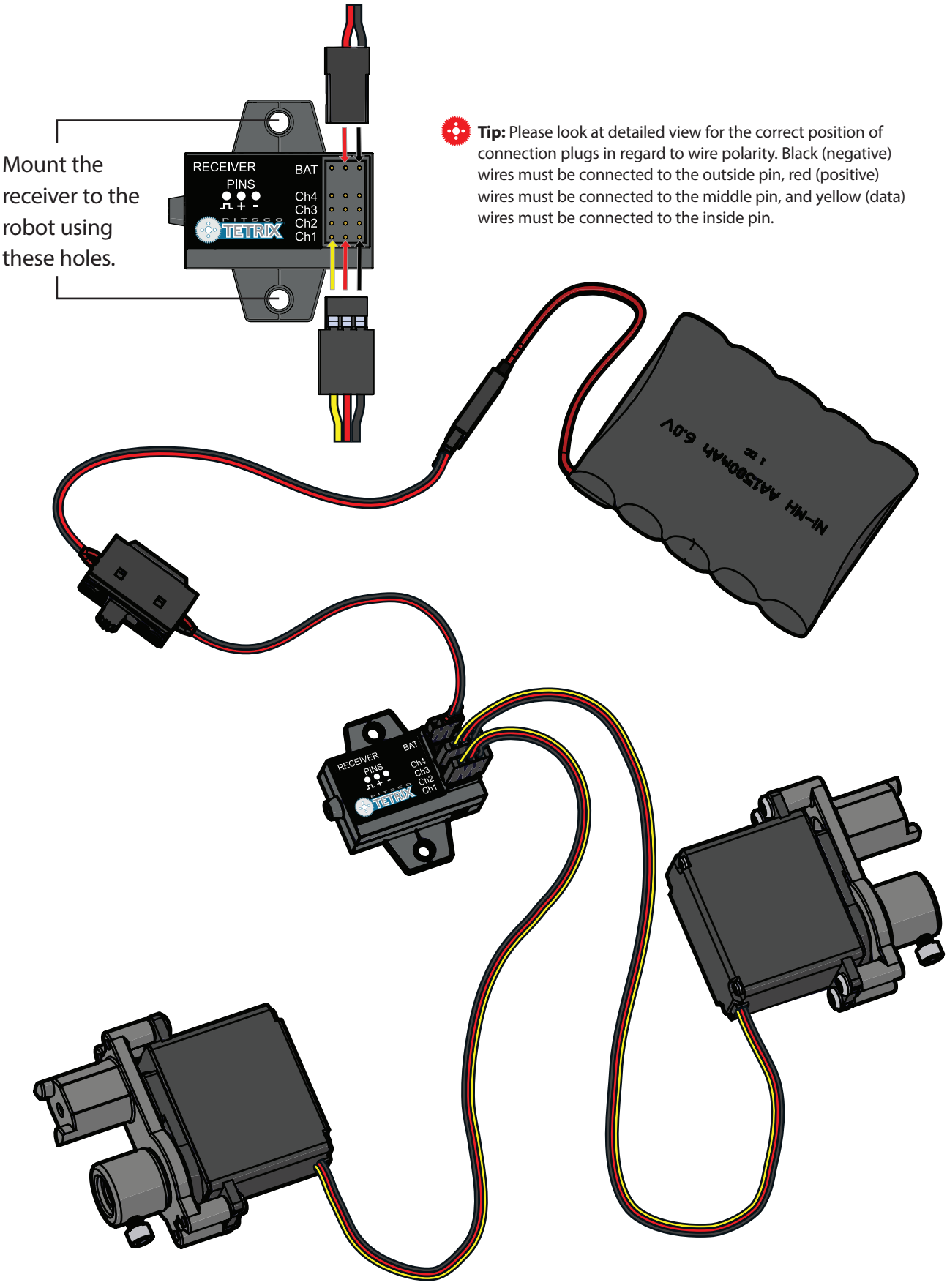
The wireless gamepad transmitter must be linked to the receiver with a unique ID code in order to function properly. To do this, follow these steps.

1. Make sure the transmitter is switched OFF.
2. Install four AA batteries in the transmitter. Connect the battery pack to the receiver; the red LED will be flashing.
3. Press the CONNECT button on the side of the receiver. The red LED will change to a rapid flashing rate.
4. Switch the power slide switch on the transmitter ON.
5. Press and hold down the transmitter's CONNECT push button.
6. The red LED on the receiver will stop flashing. Release the transmitter's CONNECT button.
7. The transmitter and receiver are now connected and ready for operation.

The transmitter might require periodic adjustment. Located next to each joystick are trimmer wheels used to adjust the neutral position of each channel. Trim each channel by moving the wheel until no movement of the servo occurs when the joystick is in the neutral position.

The direction of movement for servos might change due to servo positioning. To change the direction of movement, use a small screwdriver to change the position of the NOR/REV switches on the transmitter. **Caution:** Do not use a pencil to adjust the NOR/REV switch position. The material used for pencil lead conducts electricity and could damage your controller.

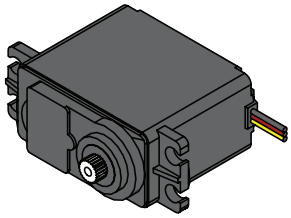
TETRIX PRIME Wiring Illustration



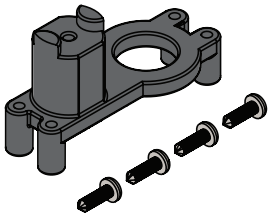
Standard Servo Assembly

You will need the standard-scale servo motor with screw, the Servo Mounting Bracket with screws, a Shaft Servo Hub, and a Socket Head Cap Screw. You will also need the 4-in-1 Screwdriver and the Miniature Ball-point Hex Driver. Remove the white plastic servo horn attached to the servo. Retain the screw for future use, but discard the white plastic servo horn. Attach the Standard Servo label to the servo. Assemble one of the standard servos as indicated in the illustrations. The other standard servo will be used for the gripper assembly.

Standard servo motors are used for proportional rotation and for grippers, steering, and positioning.



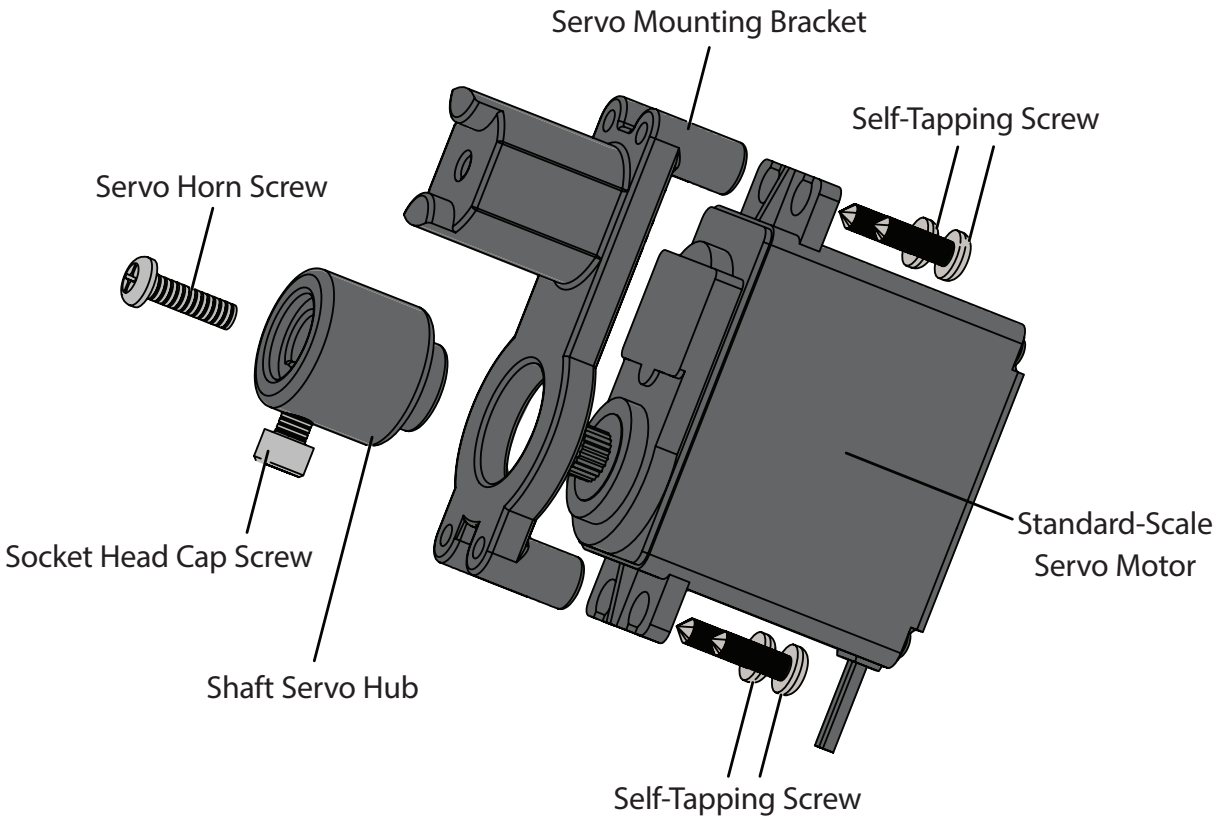
1x
Standard-Scale
Servo Motor 40538



1x
Servo Mounting
Bracket 40232

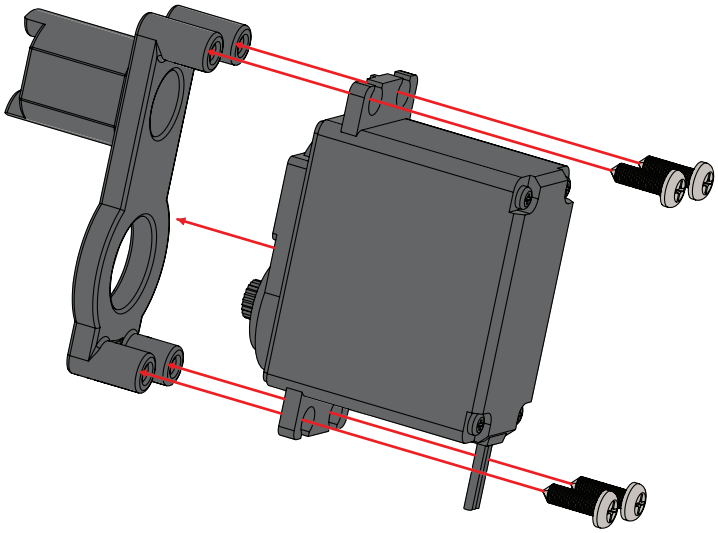
1x
Shaft Servo Hub
40230

1x
Socket Head Cap
Screw 40516

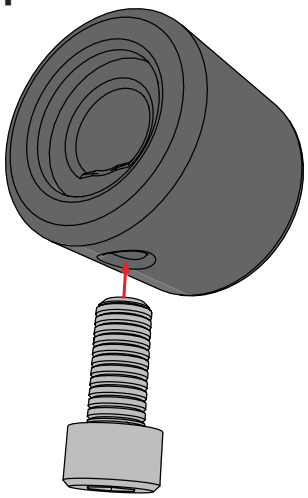


Tip: Keep in mind that the continuous rotation servo mounts in the servo mounting bracket the same way as the standard servo, but there is no need to center the servo horn.

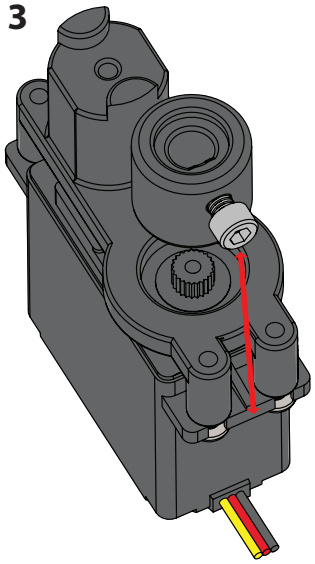
Step 1



Step 2

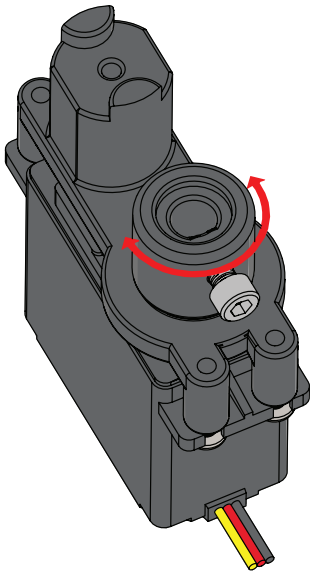


Step 3

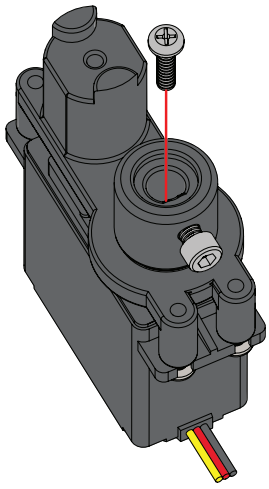


Step 4

Before attaching the servo hub, you must make sure the server is in the neutral position. To do this, connect both the servo and the battery to the receiver and turn on the power to the remote transmitter. Make sure both joysticks and trimmers are in the center, or neutral, position. The servo motor will move to its neutral position.



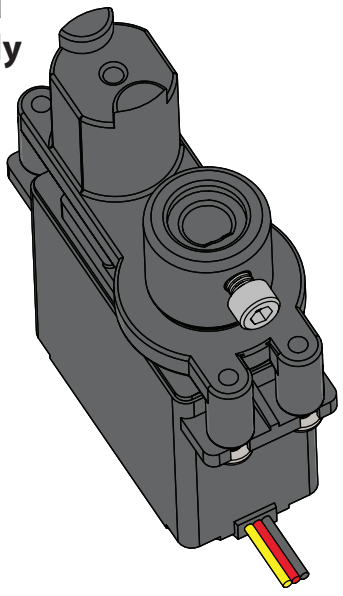
Step 5



Line up the splines on the hub with the splines on the servo and press the two parts together. The setscrew should line up as close as possible with the center of the servo case. Tighten the screw holding the hub in place.

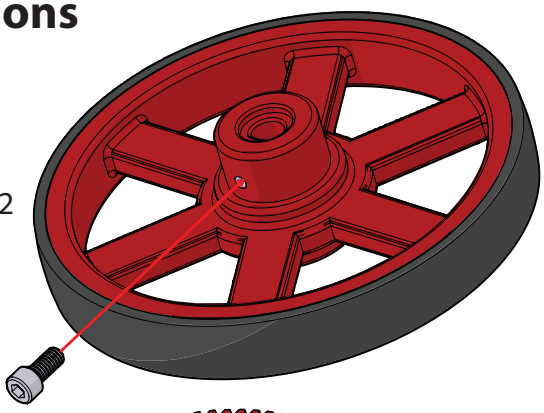
Using the remote transmitter, verify the operation of the servo. If the servo operates properly, disconnect the battery from the receiver and the servo. Your servos are ready for use.

Finished Assembly

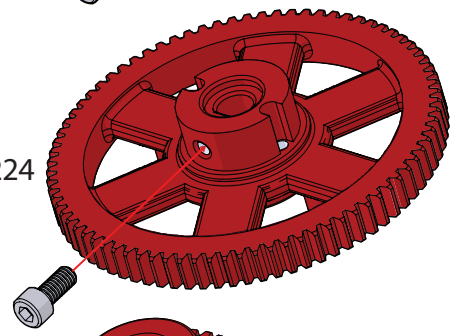


Setscrew Applications

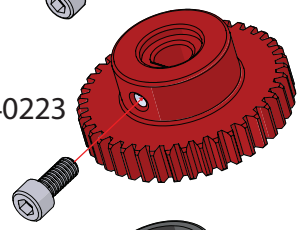
Wheel with Tire (90 mm) 40222



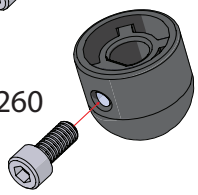
80-Tooth Plastic Gear 40224



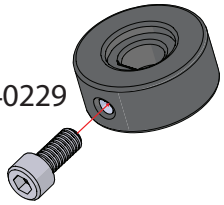
40-Tooth Plastic Gear 40223



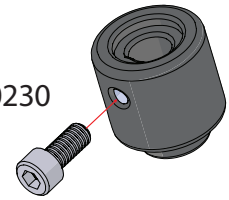
16 mm Ball Skid Point 41260



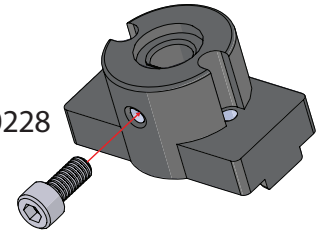
D-Shaft Set Collar 40229



Shaft Servo Hub 40230



Beam Attachment Hub 40228



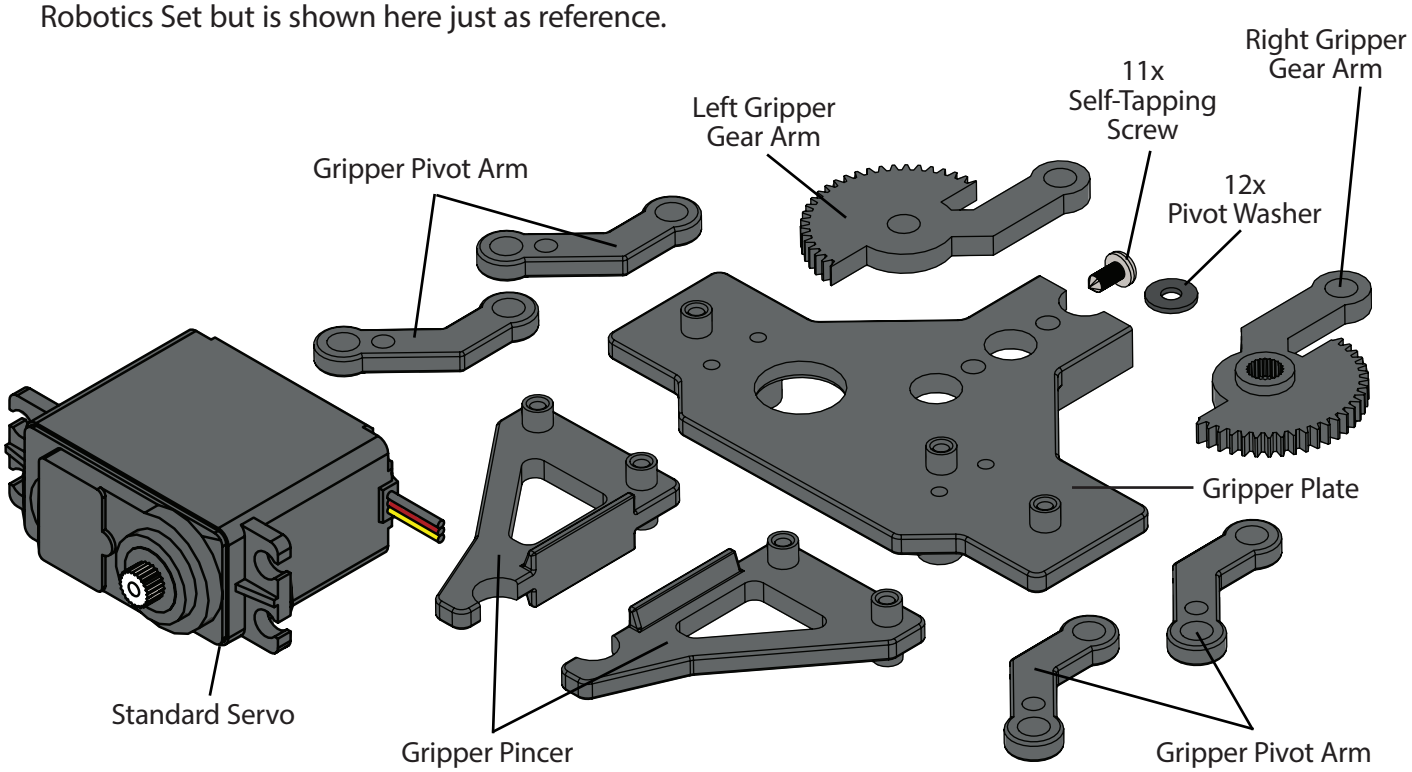
Tip: Please keep in mind that if your parts already have socket head cap screws installed and the directions call for that operation, you can skip to the next step.

Tip: Directions will show these types of parts in proper position. After the parts are in place, don't forget to tighten the socket head cap screws before moving on to the next step.

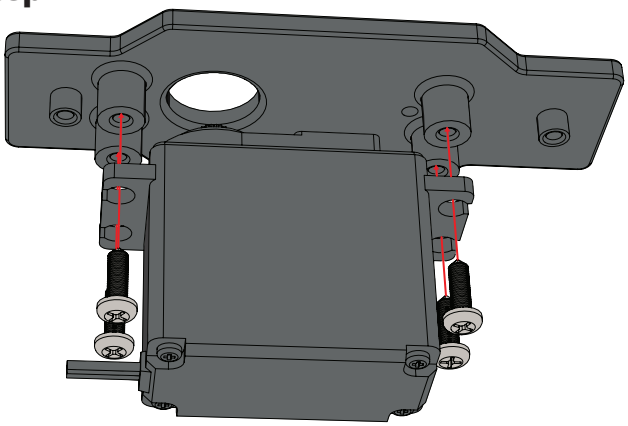
Tip: Socket head cap screws should be snug but not overtightened. Overtightening socket head cap screws can damage components.

Gripper Assembly

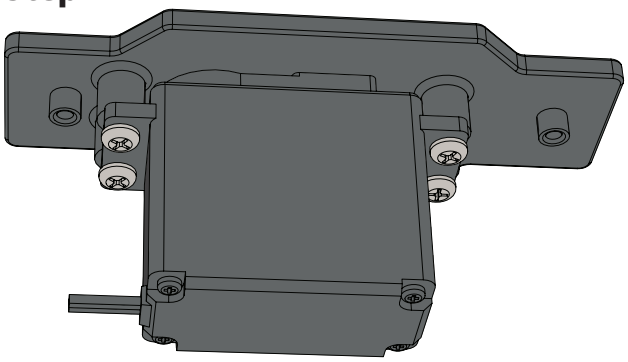
The Gripper Kit is included with the TETRIX PRIME R/C Robotics Set but is shown here just as reference.



Step 1

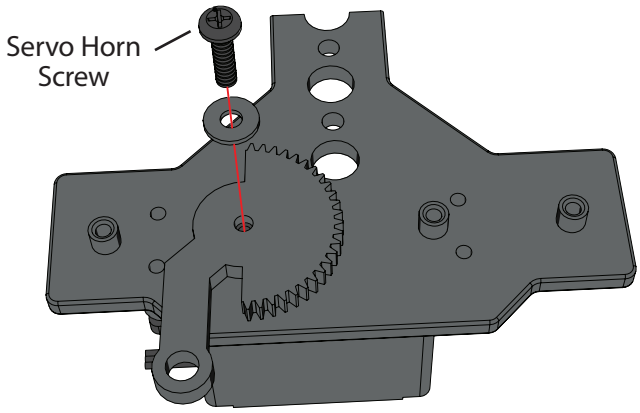


Step 2

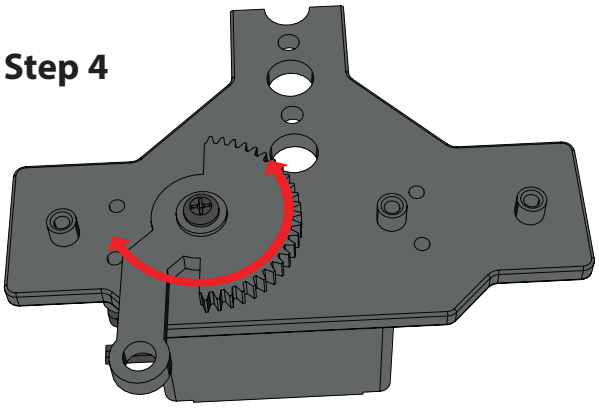


Important: Before attaching the right gripper gear arm to the standard servo, attach the standard servo to the gripper plate. Then, connect the standard servo to the wireless joystick gamepad system and position the servo motor to the neutral position (center joystick) for proper gear position alignment as shown in the following steps. Instructions on assembly of TETRIX PRIME parts can also be found at **Pitsco.com**.

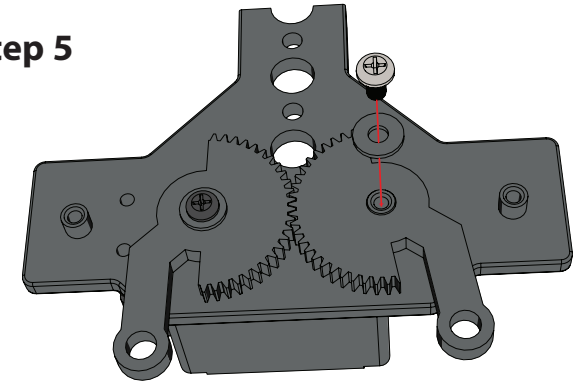
Step 3



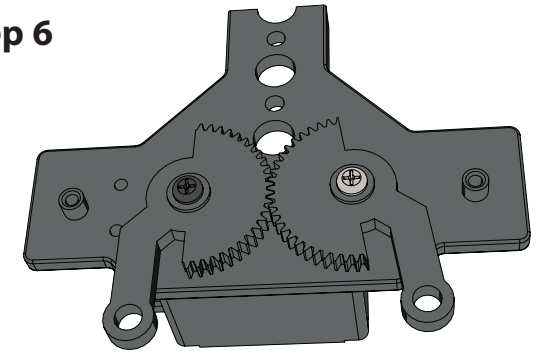
Step 4



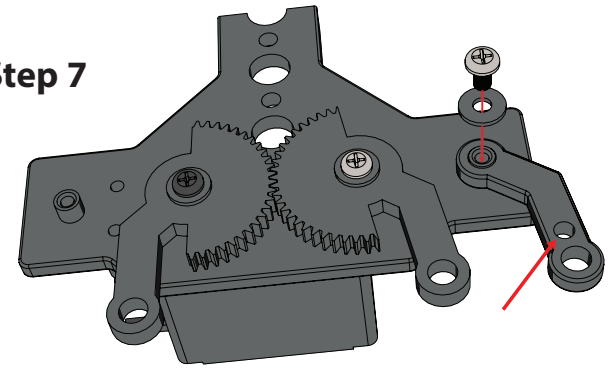
Step 5



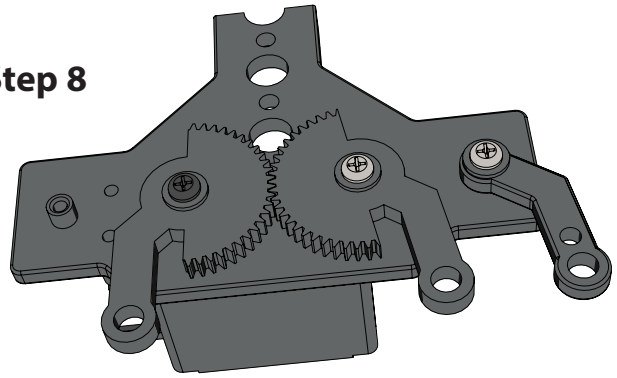
Step 6



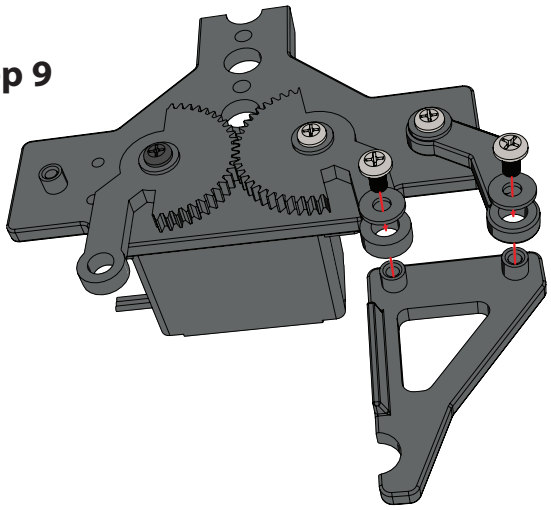
Step 7



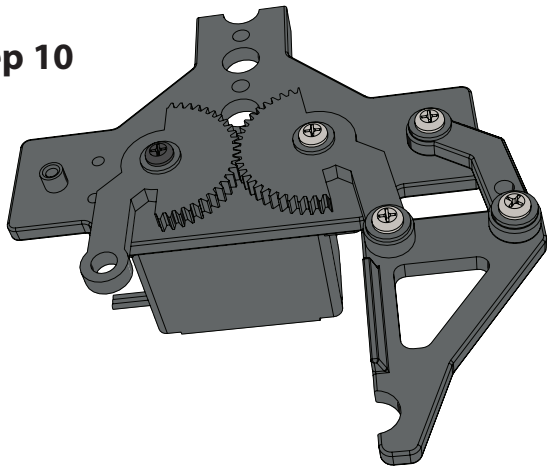
Step 8



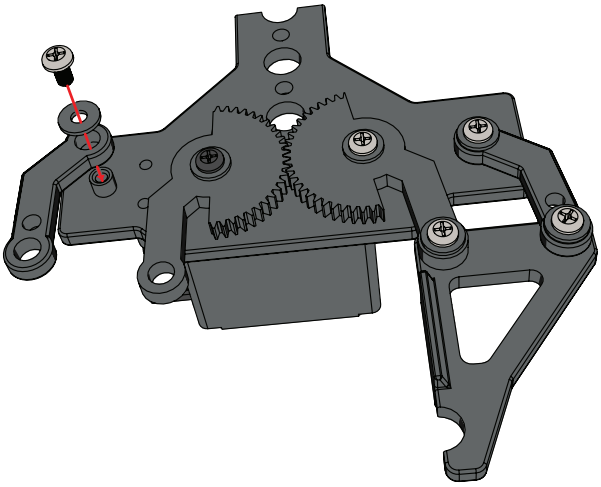
Step 9



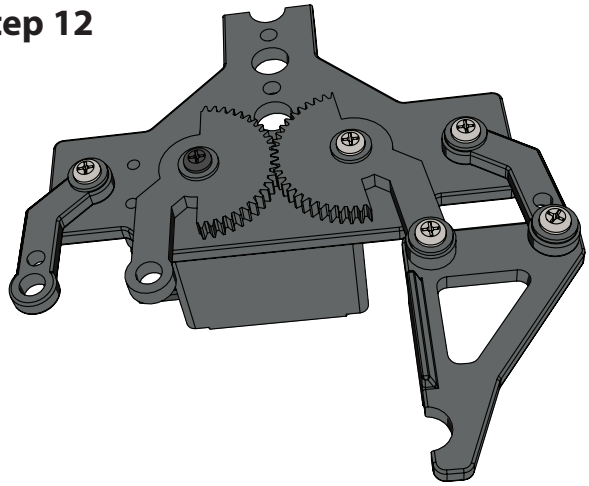
Step 10



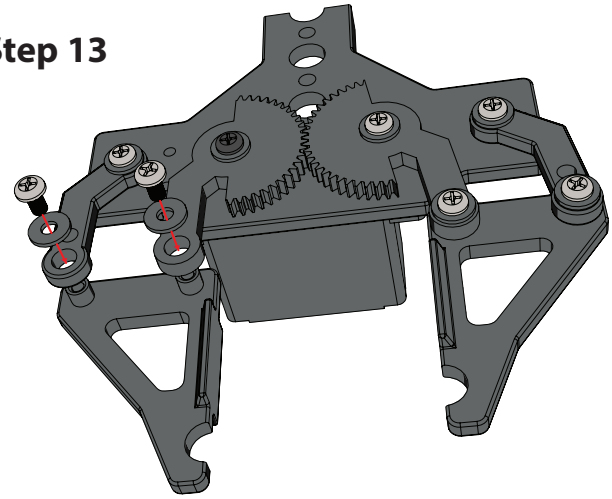
Step 11



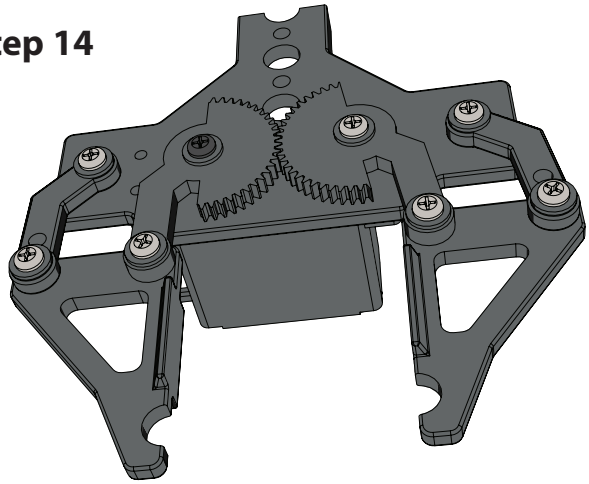
Step 12



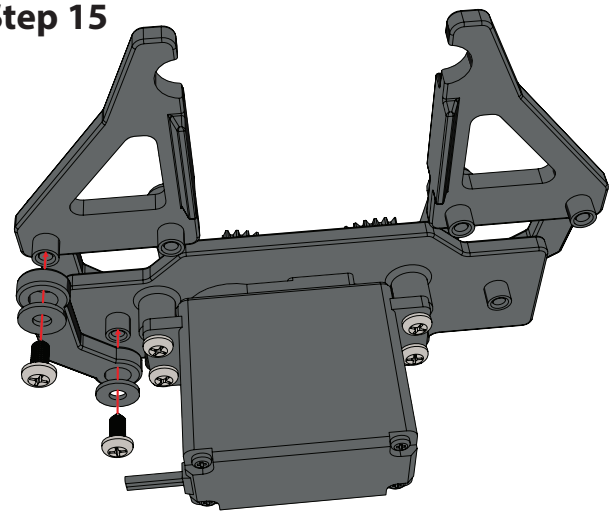
Step 13



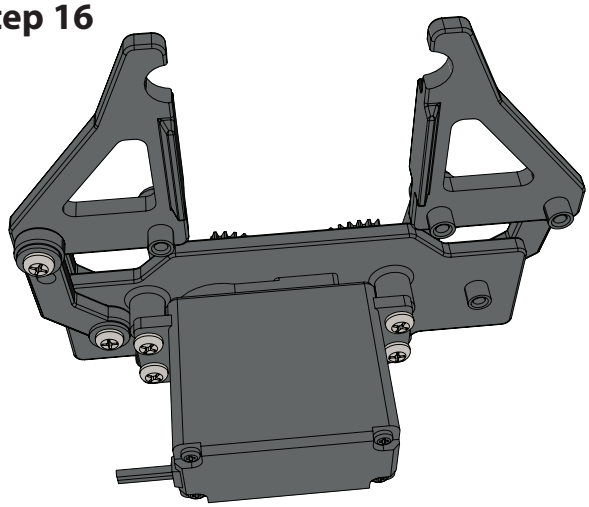
Step 14



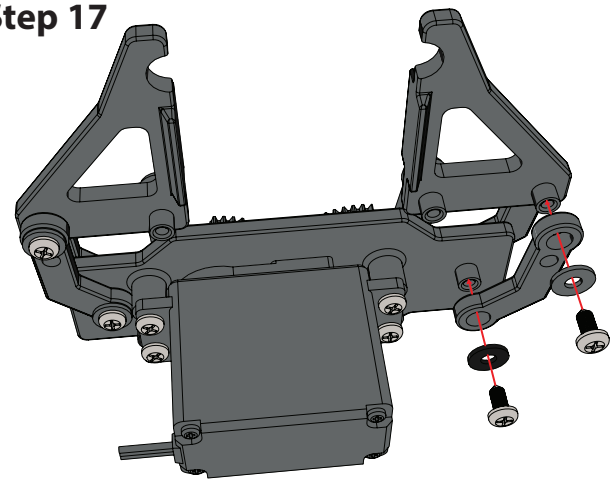
Step 15



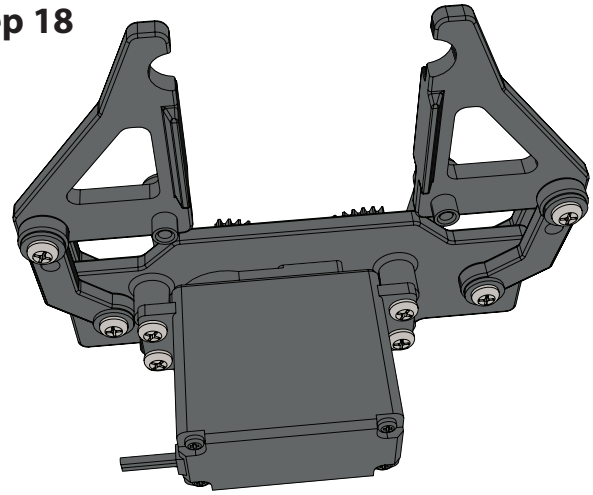
Step 16



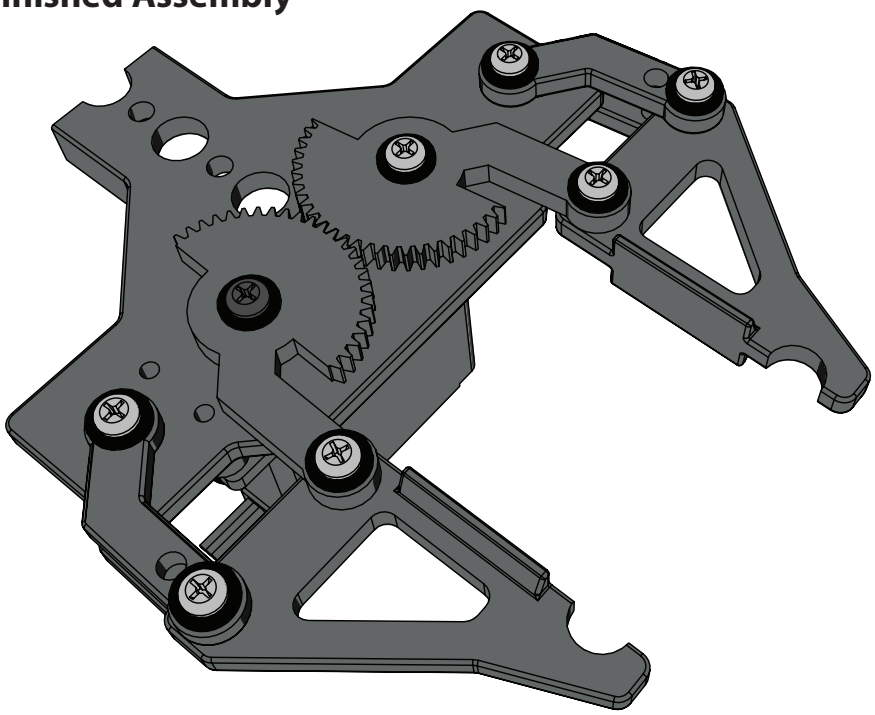
Step 17



Step 18

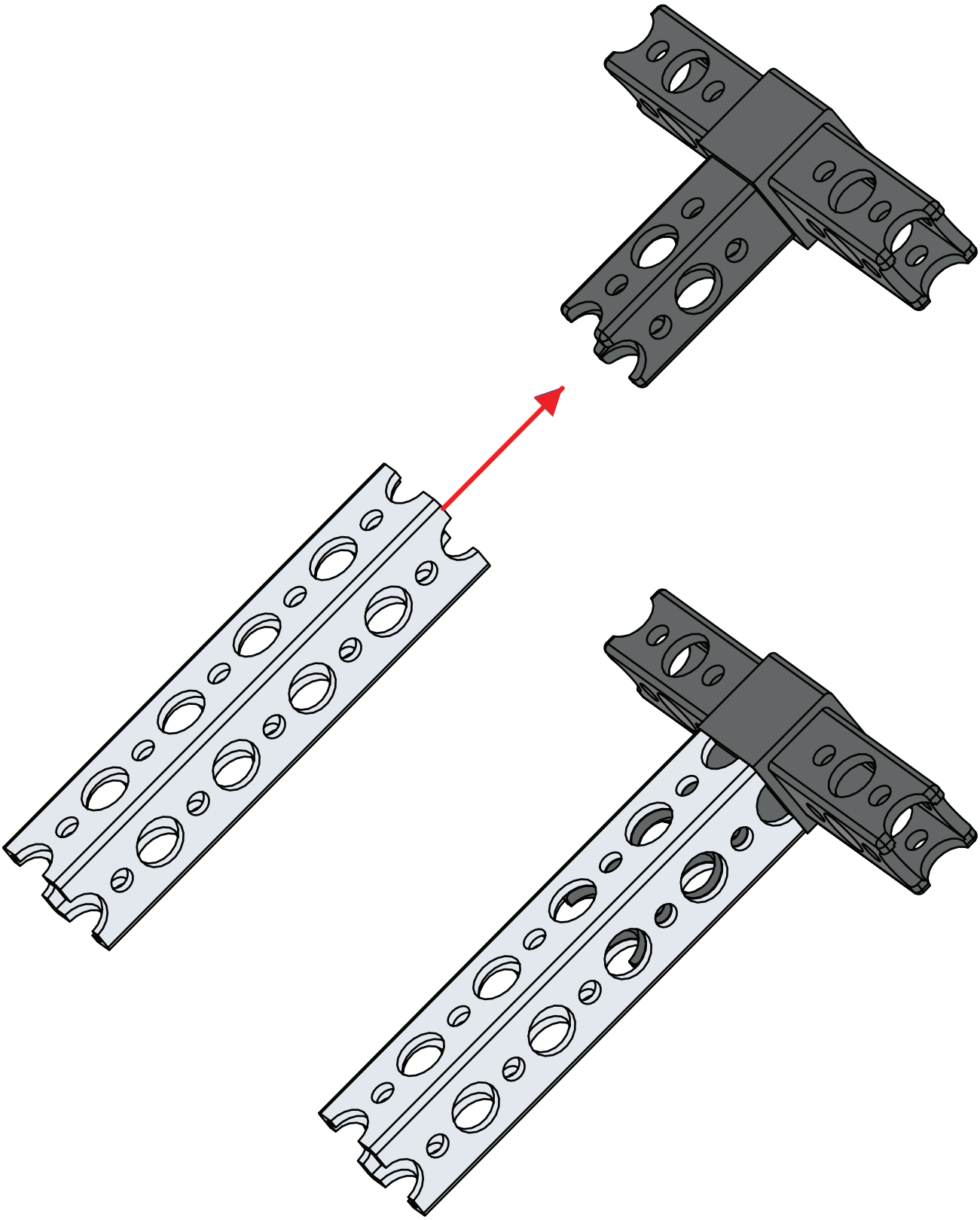


Finished Assembly

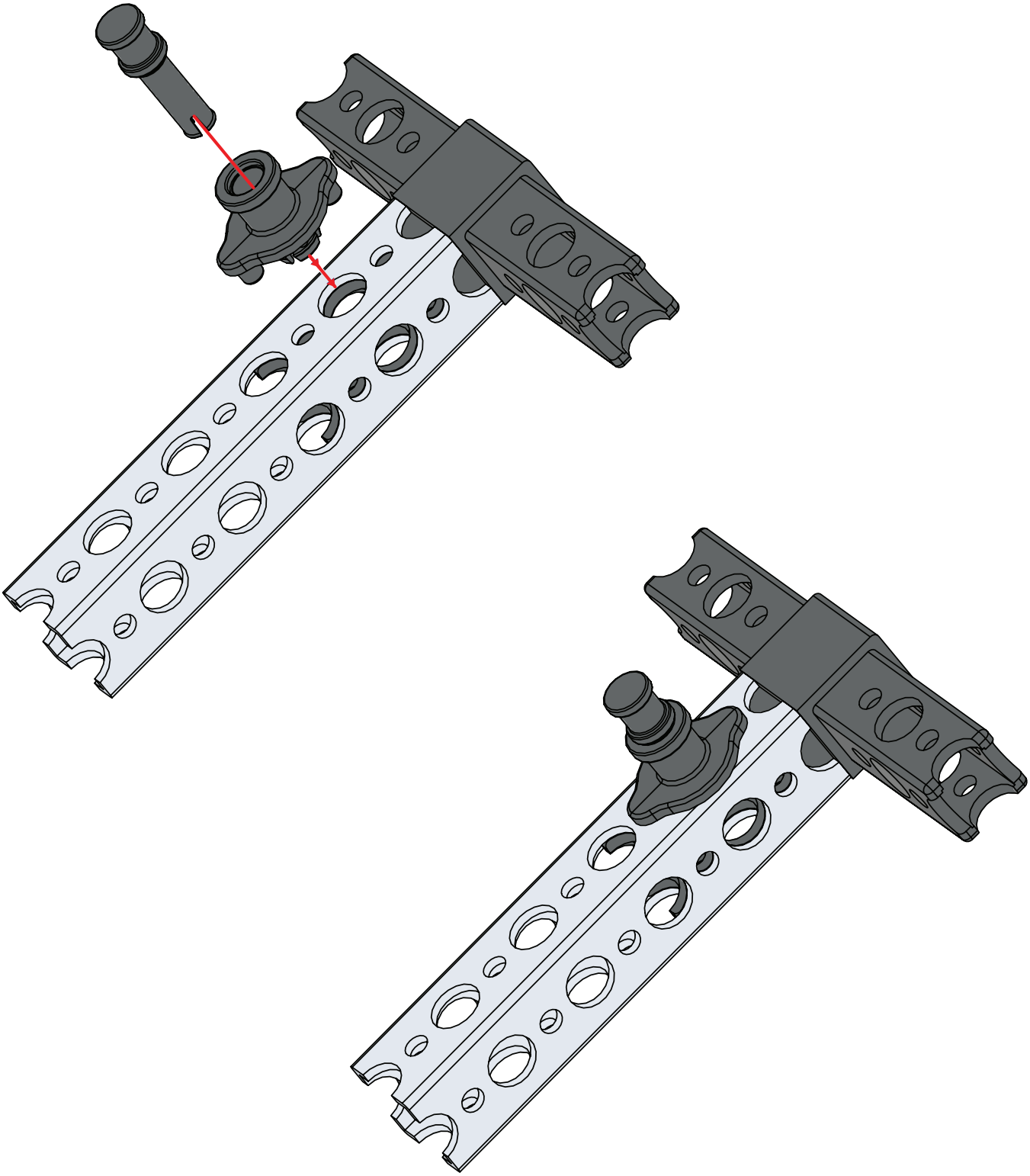


Construction Tips

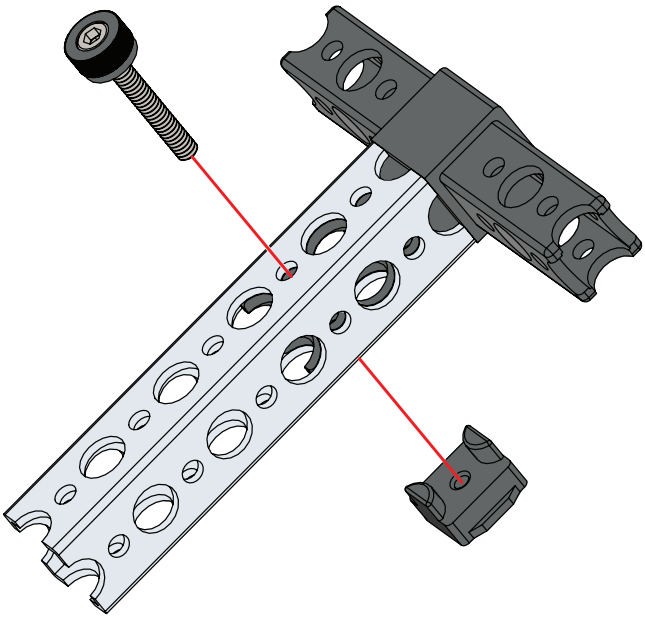
Connectors fit inside beams and come in 3-Way, Tee, 90-Degree, End, Extension, and Straight Beam Block Connector designs.



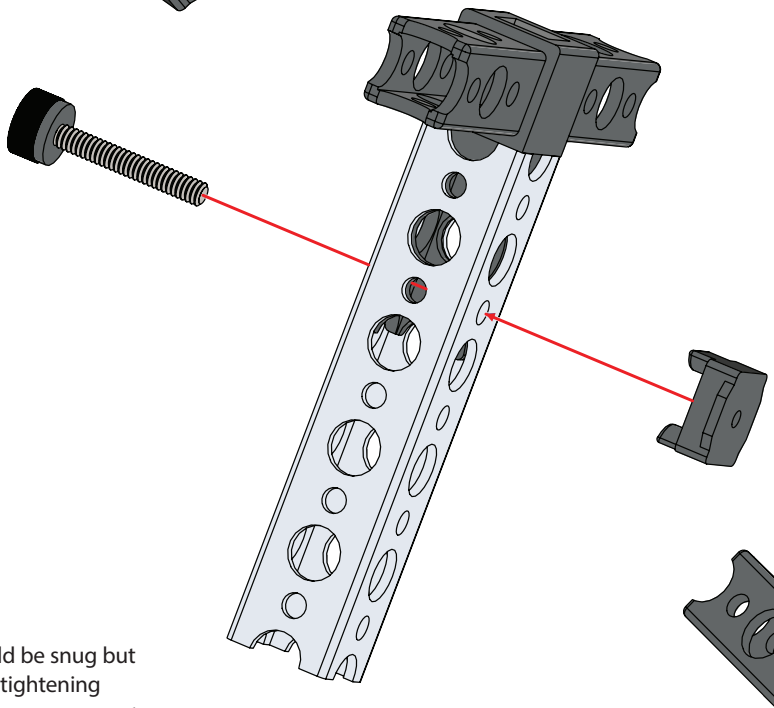
Quick Rivet Connectors and Pegs are a quick option for securing connectors. Press the rivet in place on the beam and use the peg to spread the rivet to secure the connection. Using rivets on two sides of the connection will make it more stable.



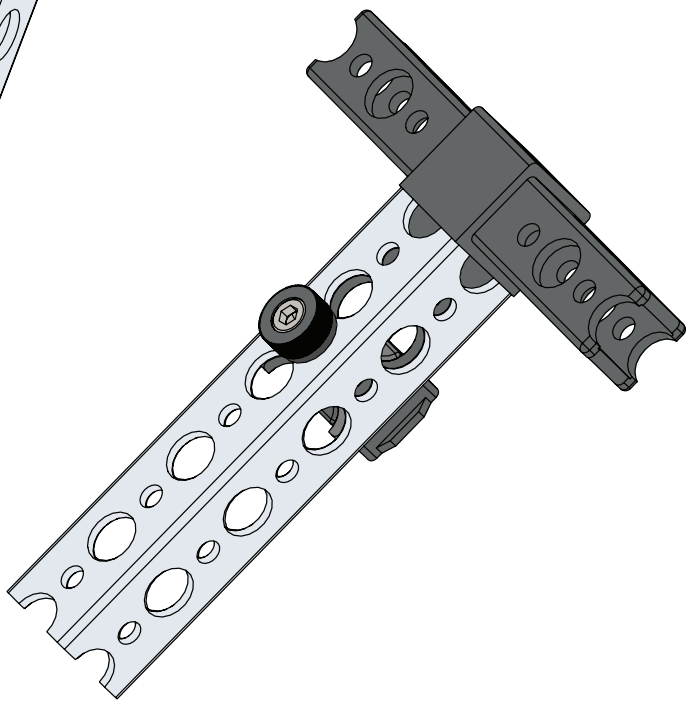
Joints can be made more permanent by using a Thumbscrew and Wing Nut to secure the beams and connectors.



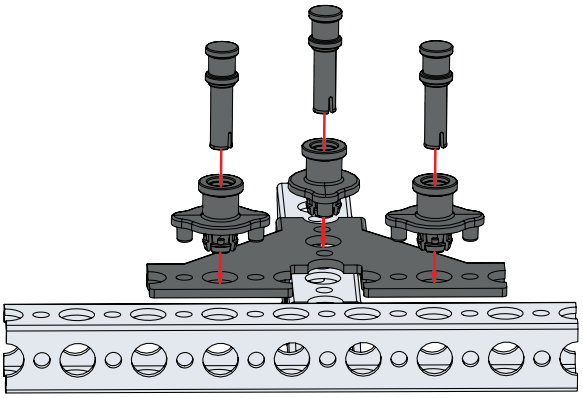
Tip: Wing nuts are placed in position first and thumbscrews are tightened into them. After wing nuts are placed and seated properly, they **cannot** be turned.

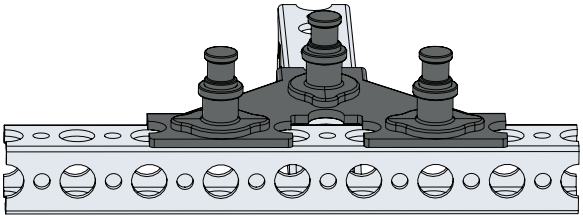


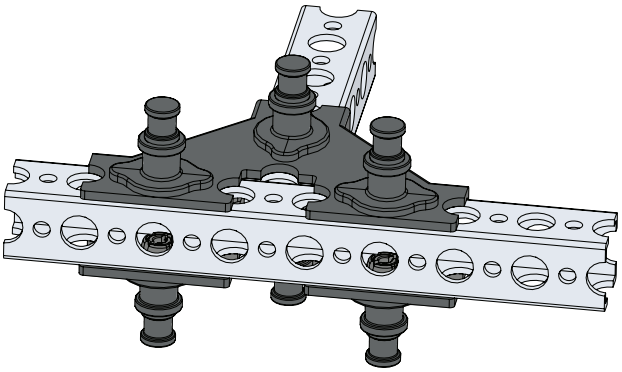
Tip: Thumbscrews should be snug but not overtightened. Overtightening thumbscrews can damage components.

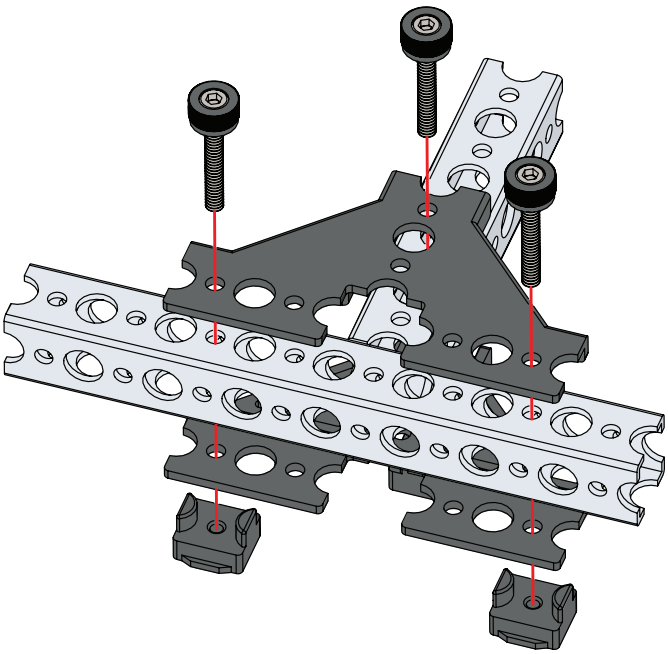


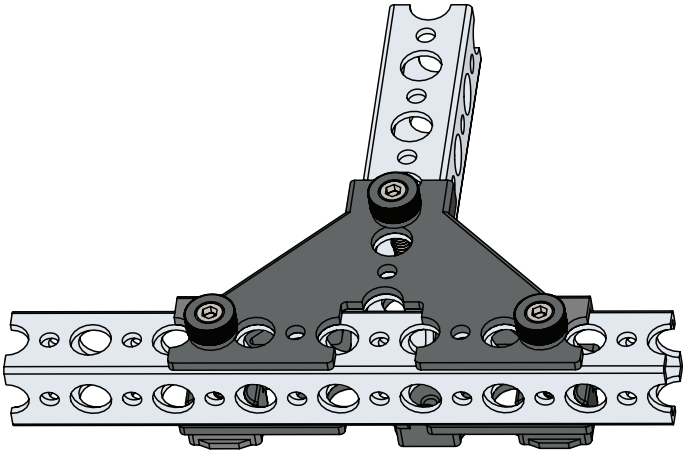
Brackets can also be used to connect beams. Brackets are available for a tee connection, 60-degree connection, or 90-degree connection. Brackets should be used in pairs, with two brackets on opposite sides of a beam. Brackets are secured using Quick Rivets and Pegs or Thumbscrews and Wing Nuts.



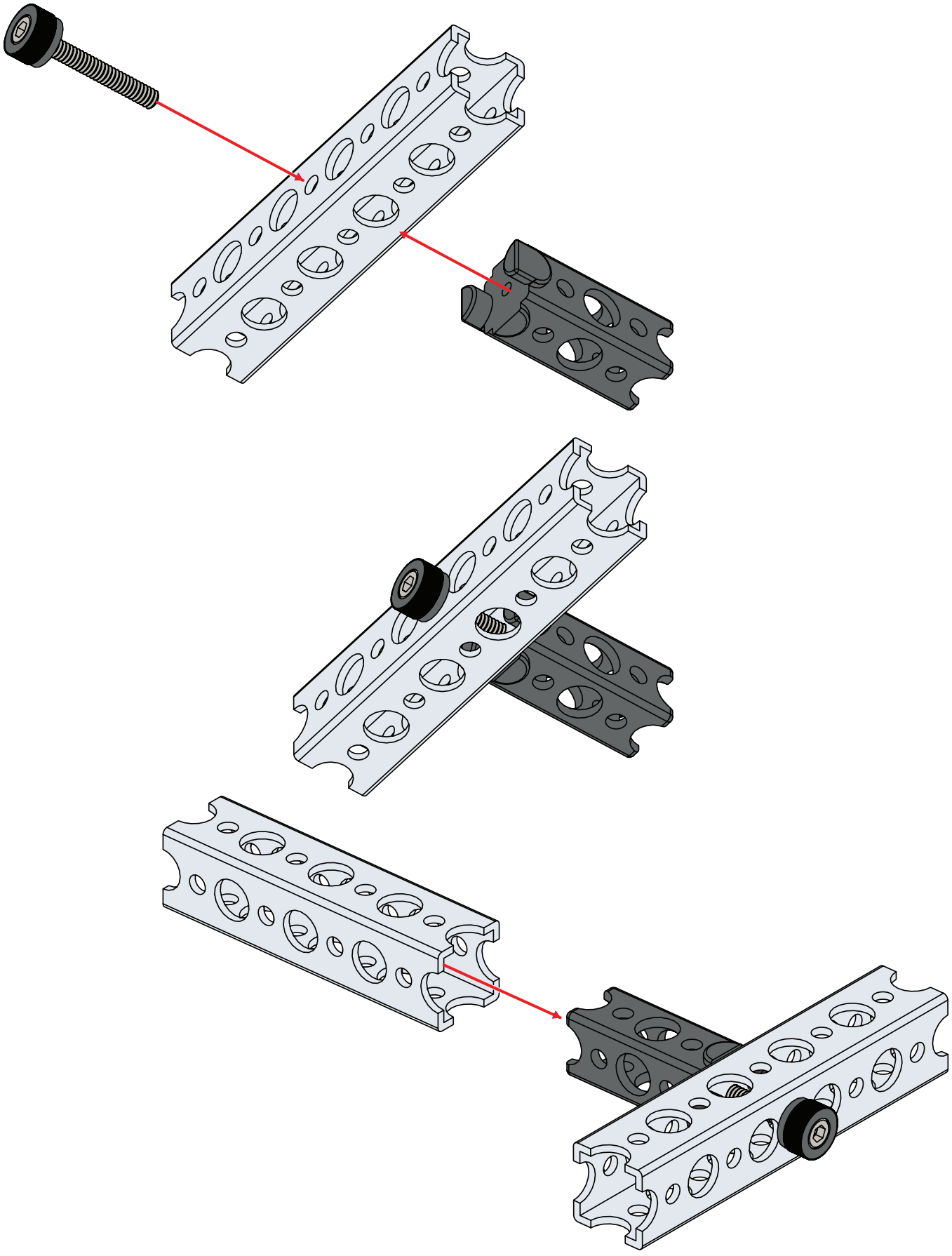




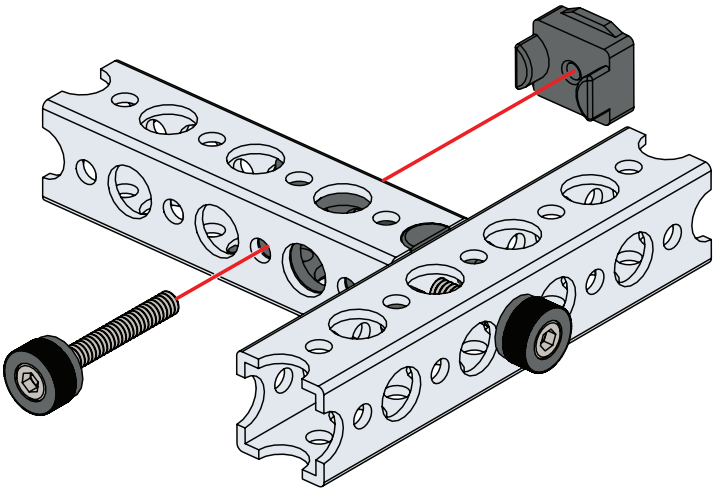


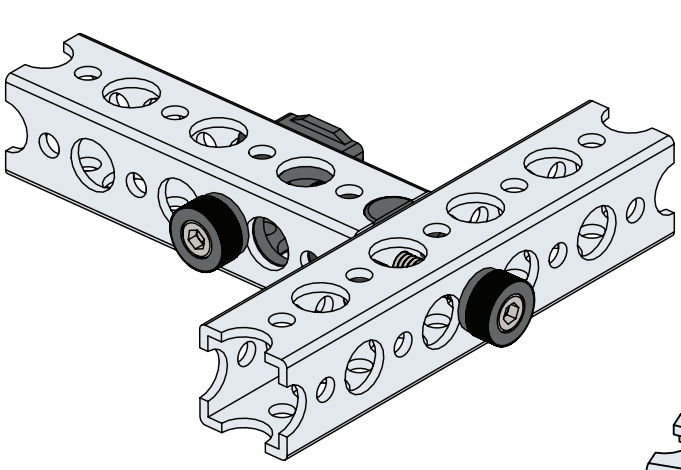


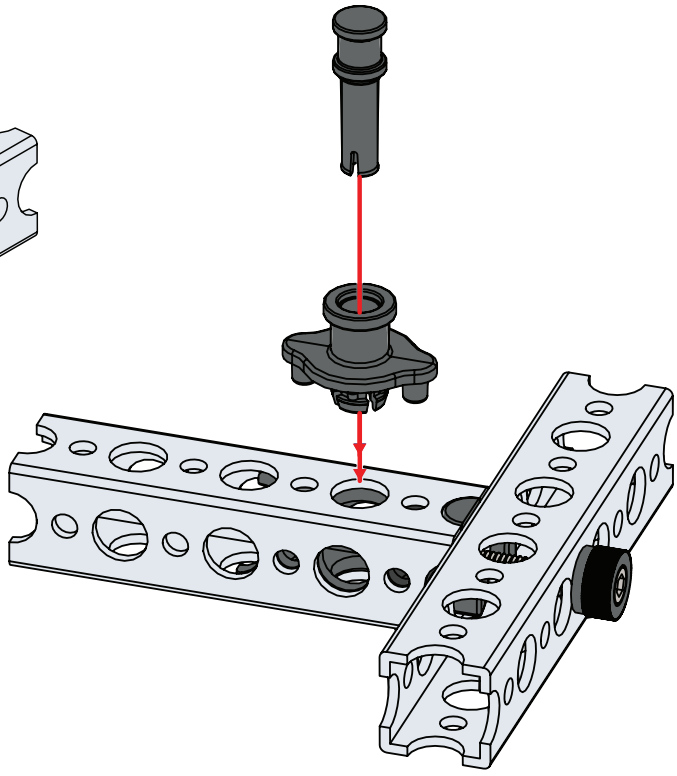
Beam End Connectors, Straight Block Beam Connectors, and 90-Degree Cross Block Connectors are secured using a Thumbscrew through the beam and into the connector.

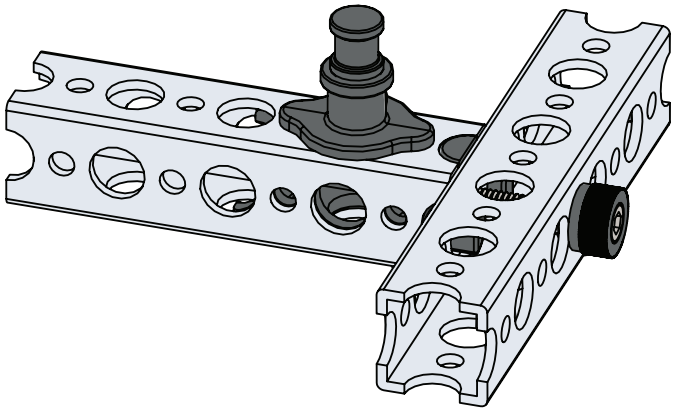


After the Thumbscrew is used to secure the end of the connector, a Quick Rivet and Peg or a Thumbscrew and Wing Nut are used to secure the intersecting beam.

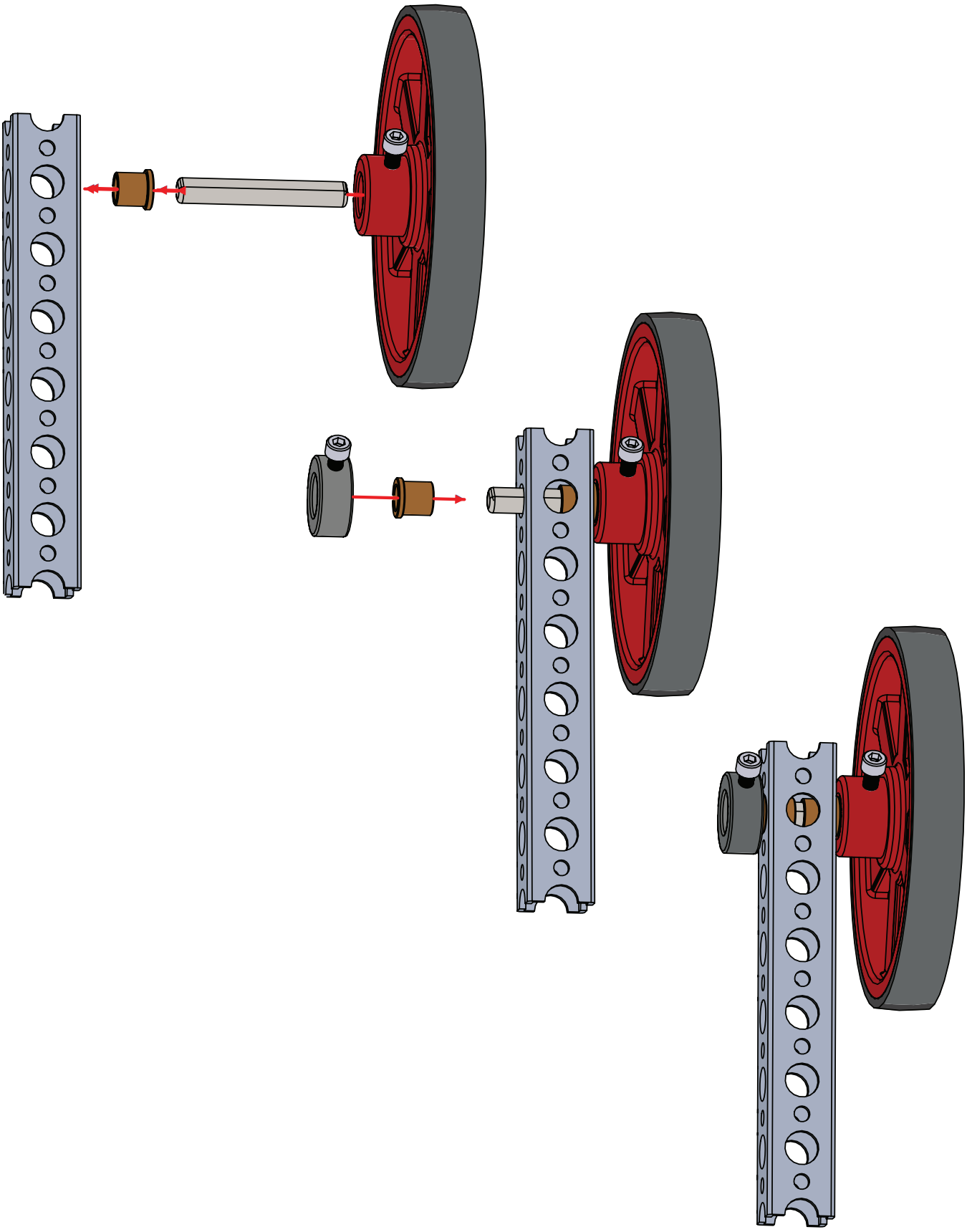




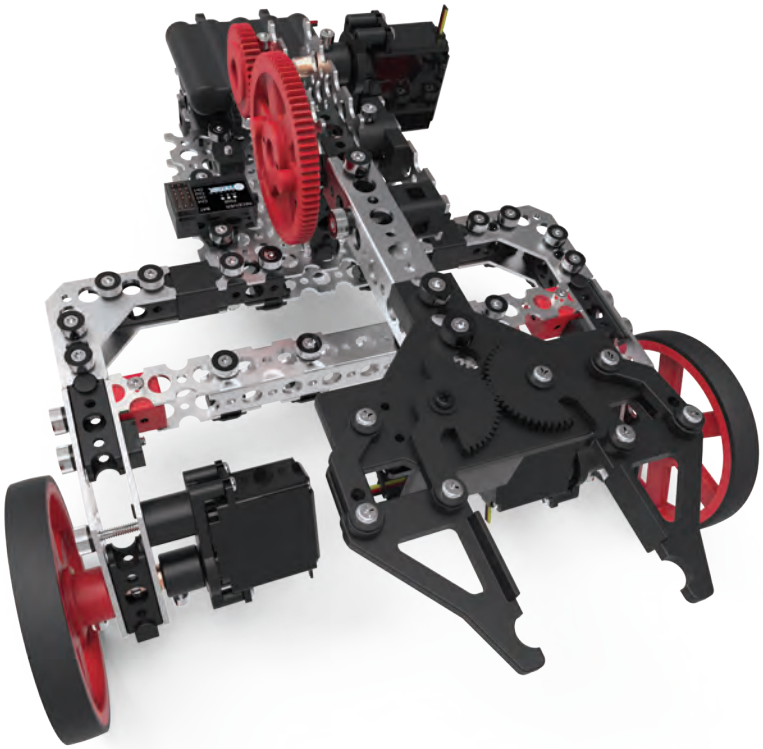




Anytime an axle is used, it should be supported at two points. Place a Bronze Bushing on opposite sides of a beam and place the axle through the bushings. Secure the axle to a D-Shaft Set Collar, wheel, gear, or hub.



TETRIX PRIME Expansion Rover Bot Assembly



Overview:

The TETRIX PRIME Expansion Rover Bot is an excellent starting point for learning how to incorporate the PRIME expansion elements with the elements found in the PRIME R/C Robotics Set. The Rover incorporates at least one example of each of the new elements included in the expansion set. The familiar starting point of a mobile robot highlights the advantages in structural rigidity the expansion elements bring to the PRIME system.

How It Works:

The TETRIX PRIME Expansion Rover Bot uses two continuous rotation servos mounted in opposition for a good example of a basic differential-drive robot. It also incorporates the new Ball Skid Point as the pivoting feature of this simple, proven tri-bot design. Users can explore the performance dynamic the skid point provides while using either a tank drive or single-stick interface from the Wireless Joystick Gamepad System. The model can be built either with or without the end effector for expanded user activities.

Getting Started:

- Refer to pages 34-80 for instructions on how to build the complete Rover Bot.
- See page 81 for suggested sample activities.

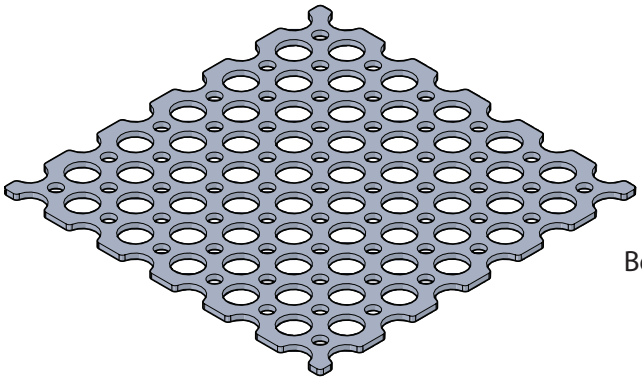
Time Expectations:

50-75 minutes

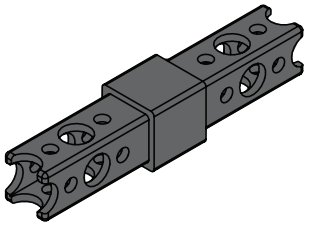
Note: Many factors can affect building time, including set organization and whether builders use a partner. The above time is an estimate only and based on a single builder of average experience who is comfortable with the product and has access to well-organized sets. Actual time might vary.

Step 1

Parts Needed



2x
6 x 6 Hole Plate 41263



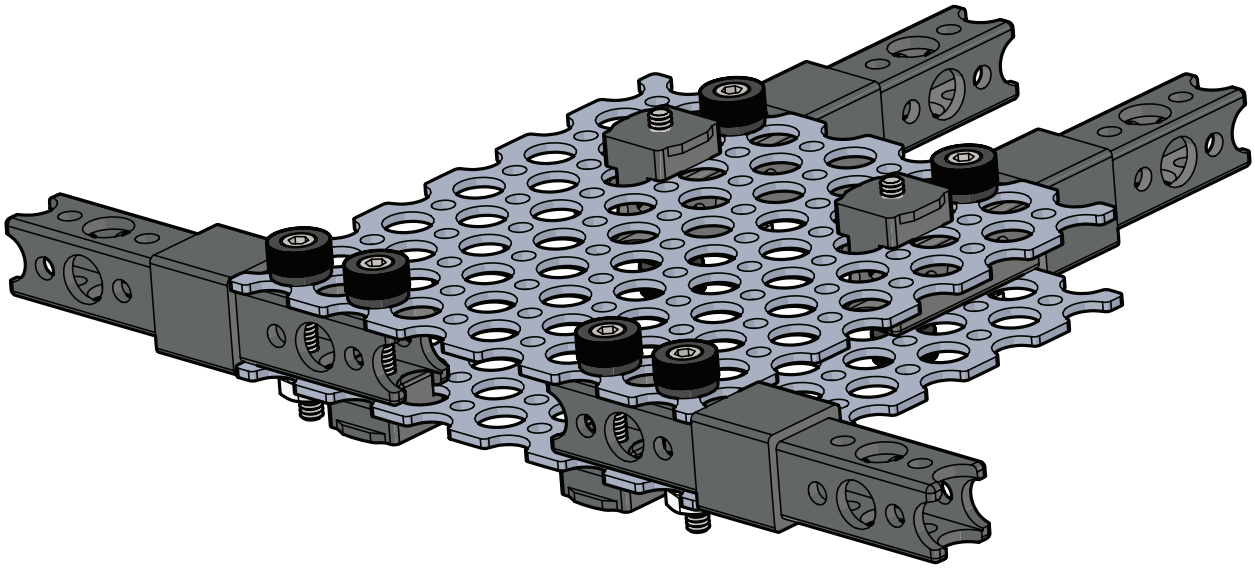
4x
Beam Straight Connector 40215

4x
Kep Nut 39094

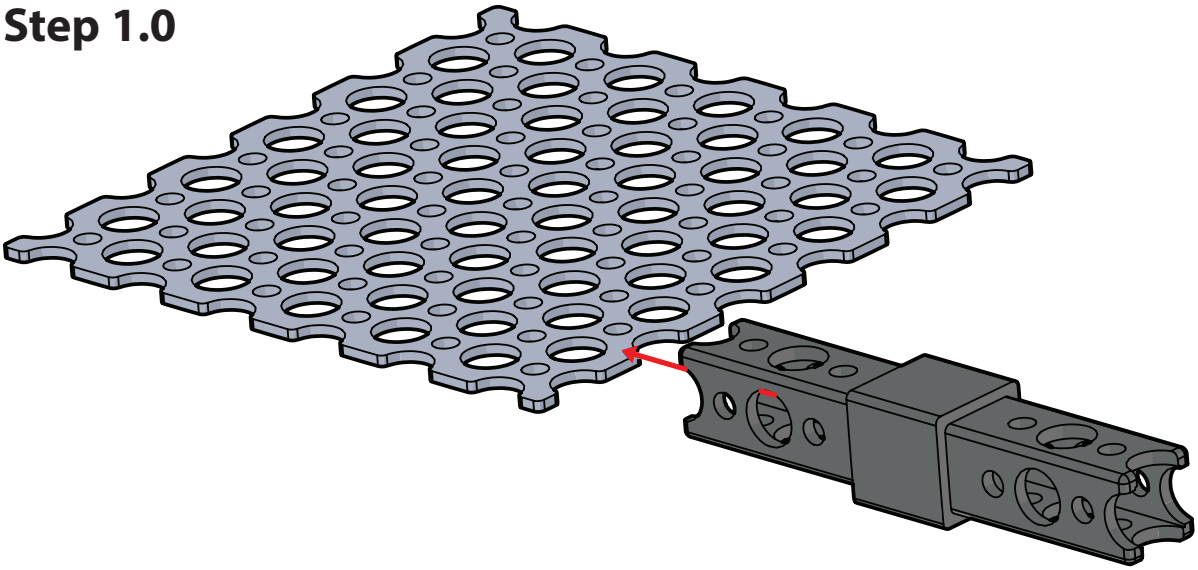
8x
Thumbscrew 40323

4x
Wing Nut 40221

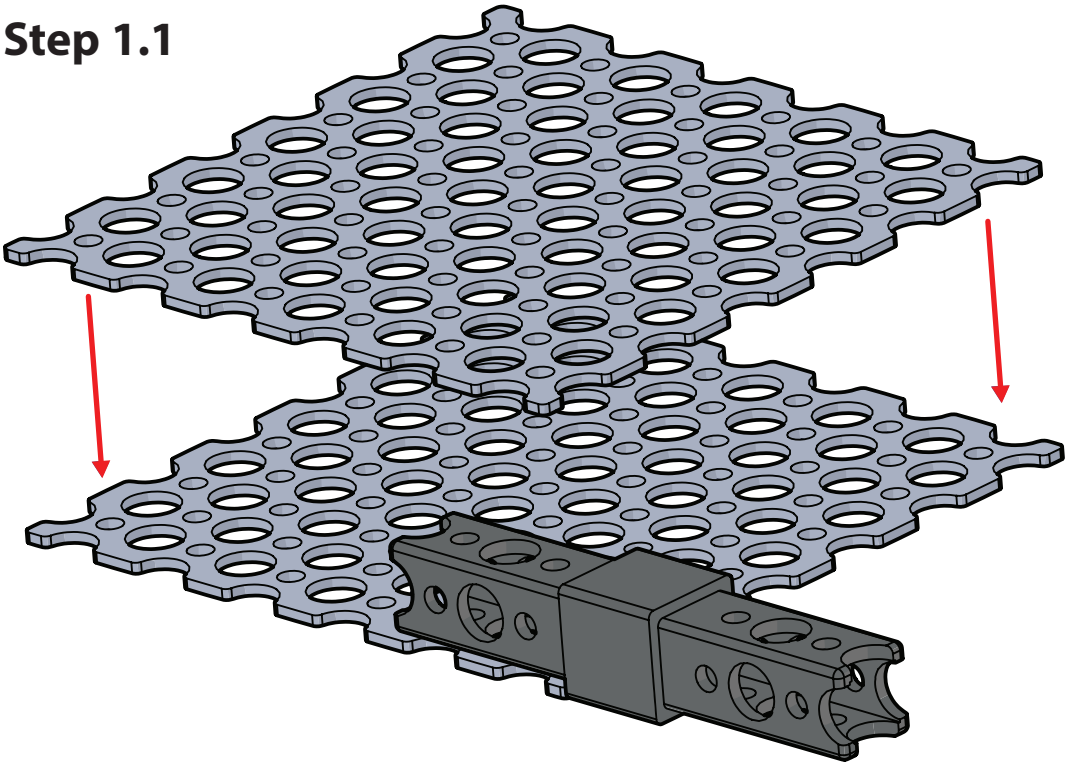
Partial assembly should look like this.



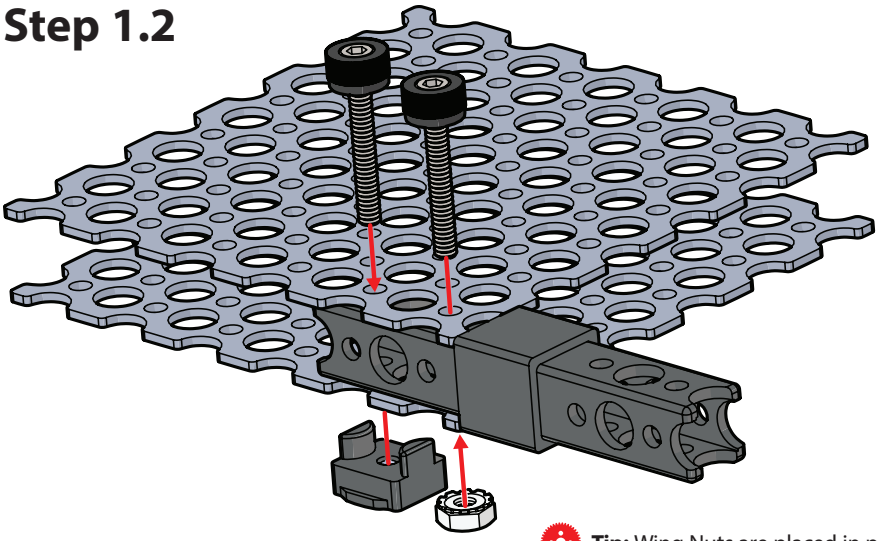
Step 1.0



Step 1.1

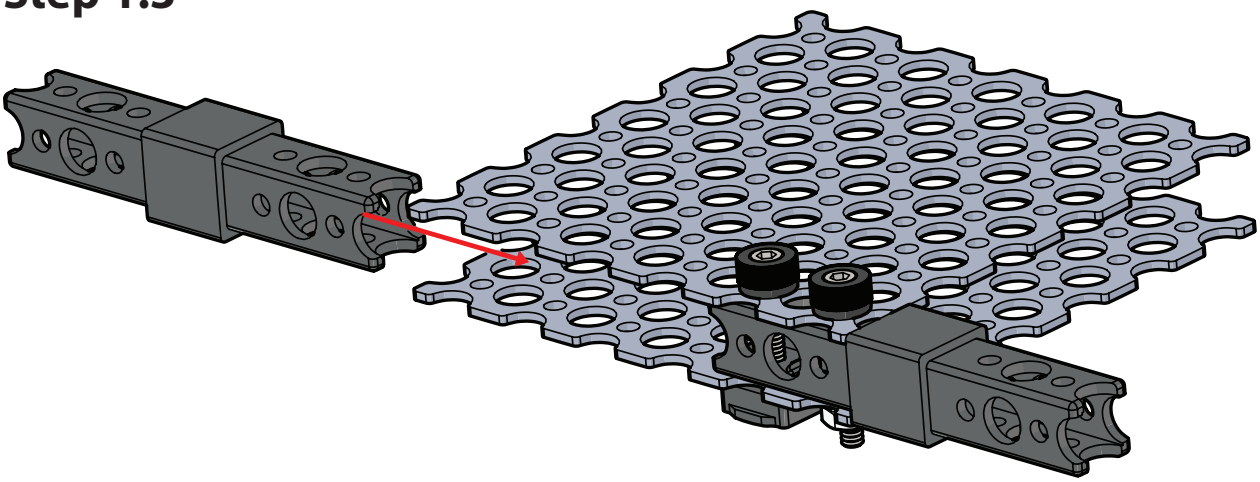


Step 1.2

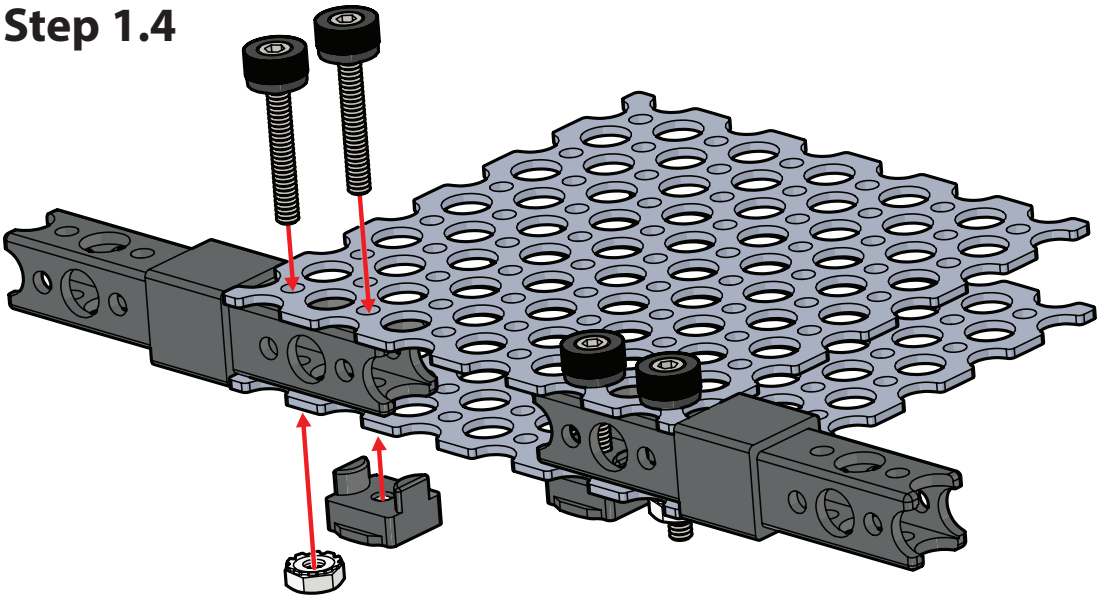


Tip: Wing Nuts are placed in position first and Thumbscrews are tightened into them. After Wing Nuts are placed and seated properly, they **cannot** be turned.

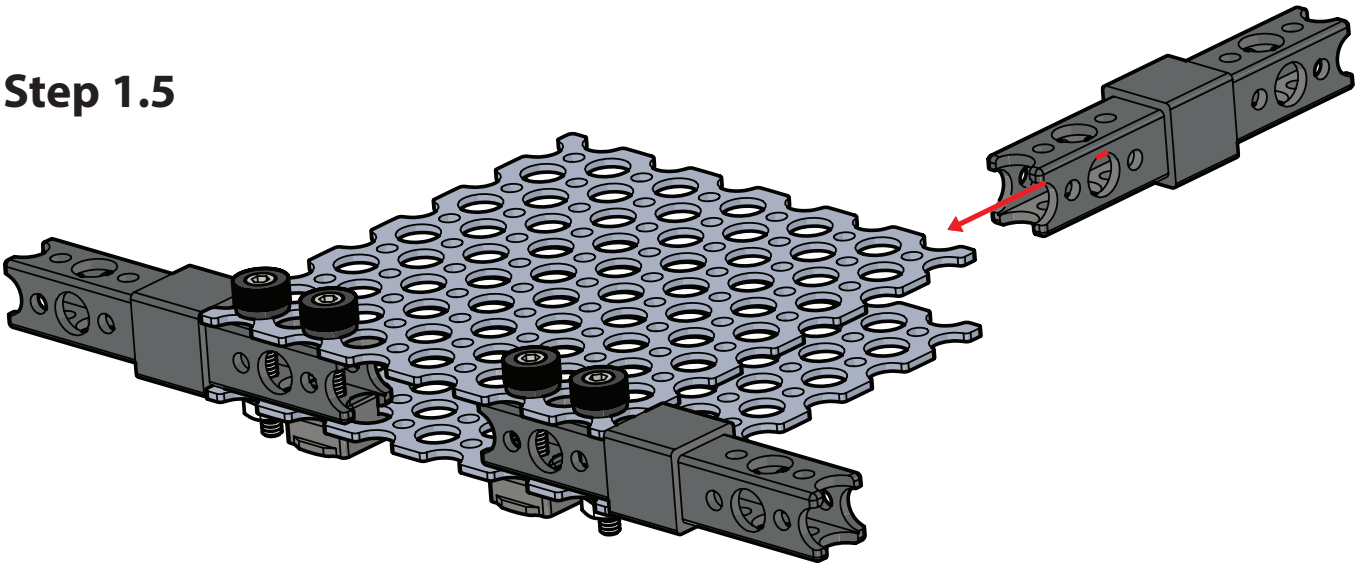
Step 1.3



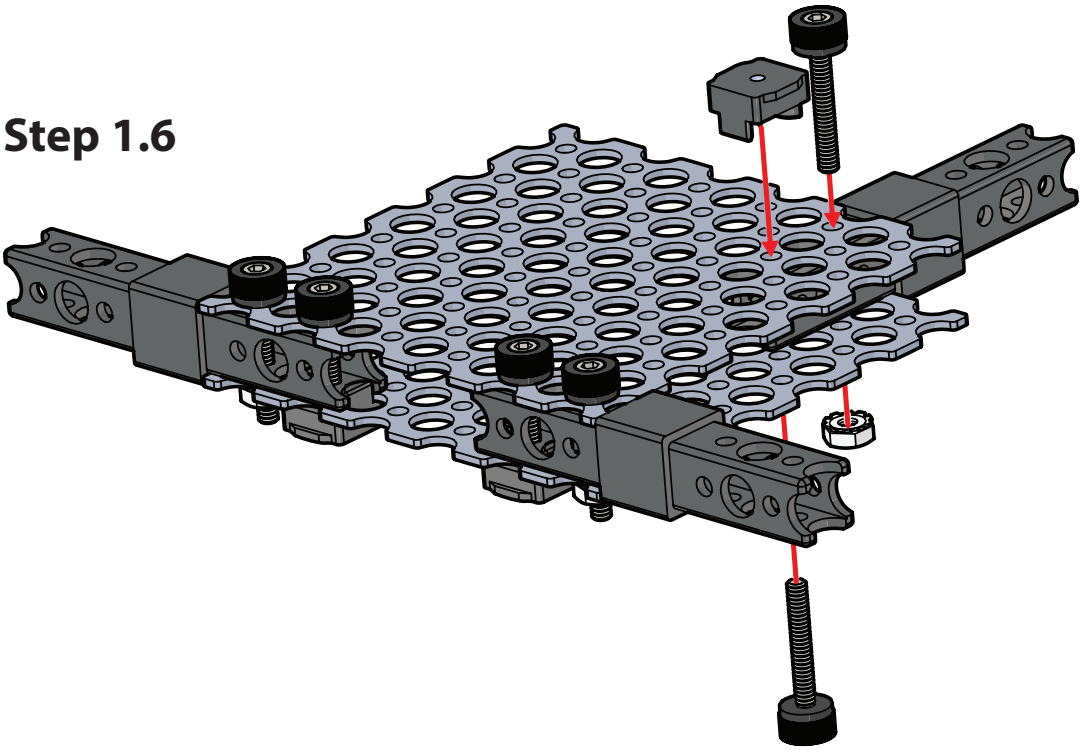
Step 1.4



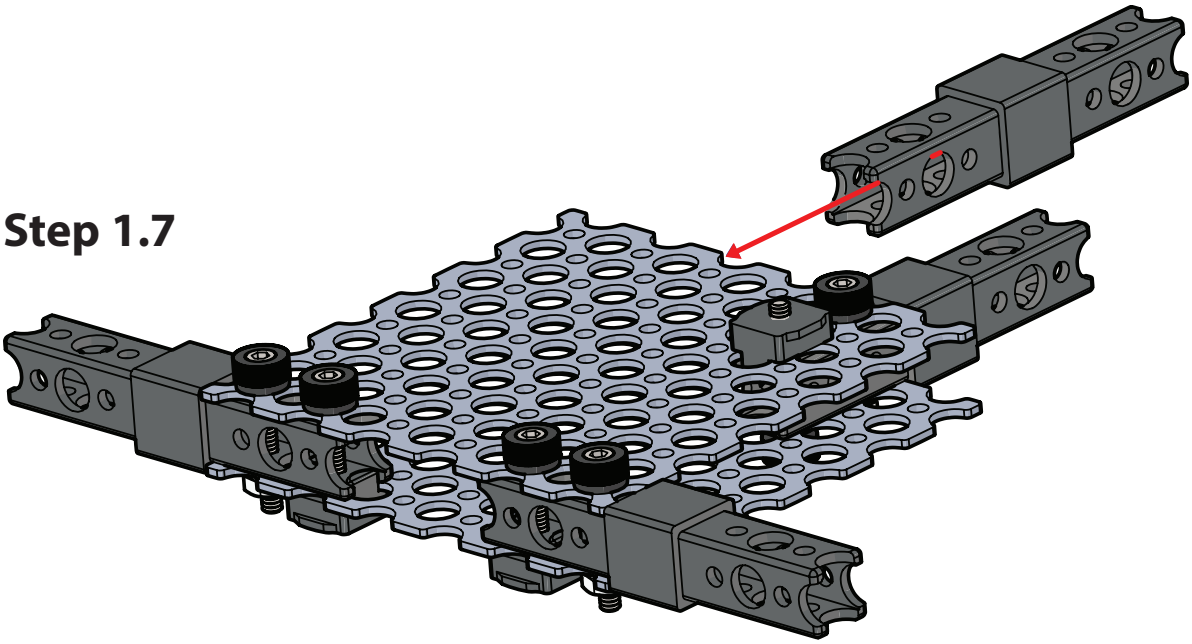
Step 1.5



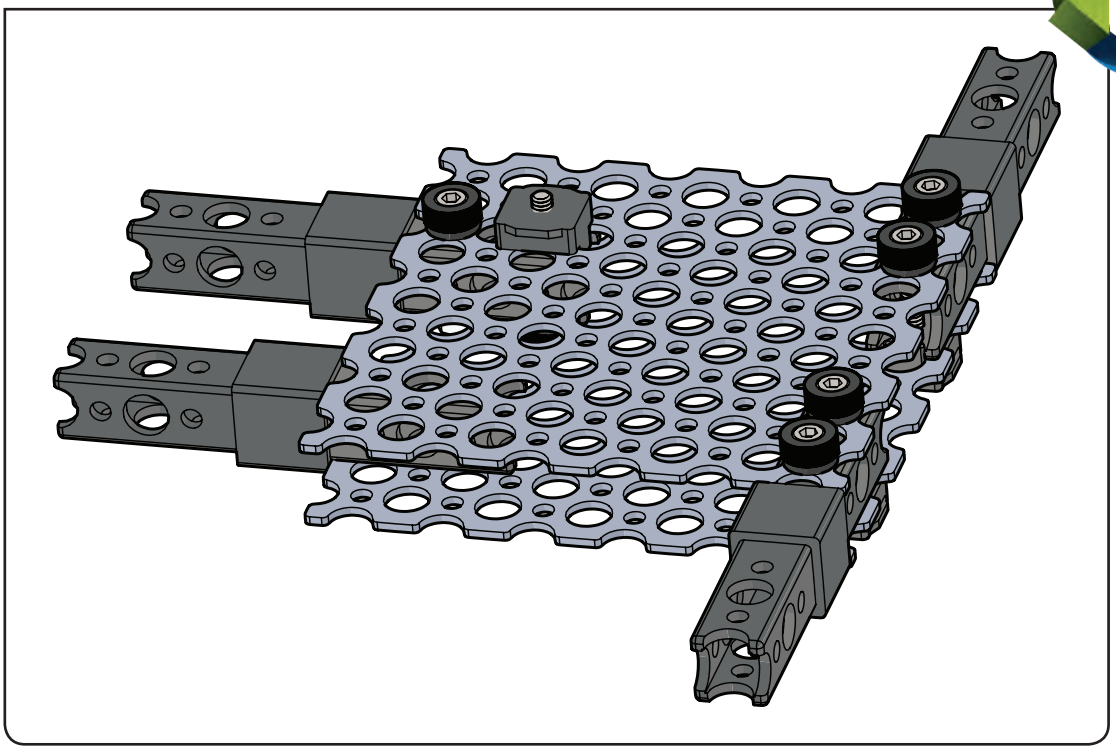
Step 1.6



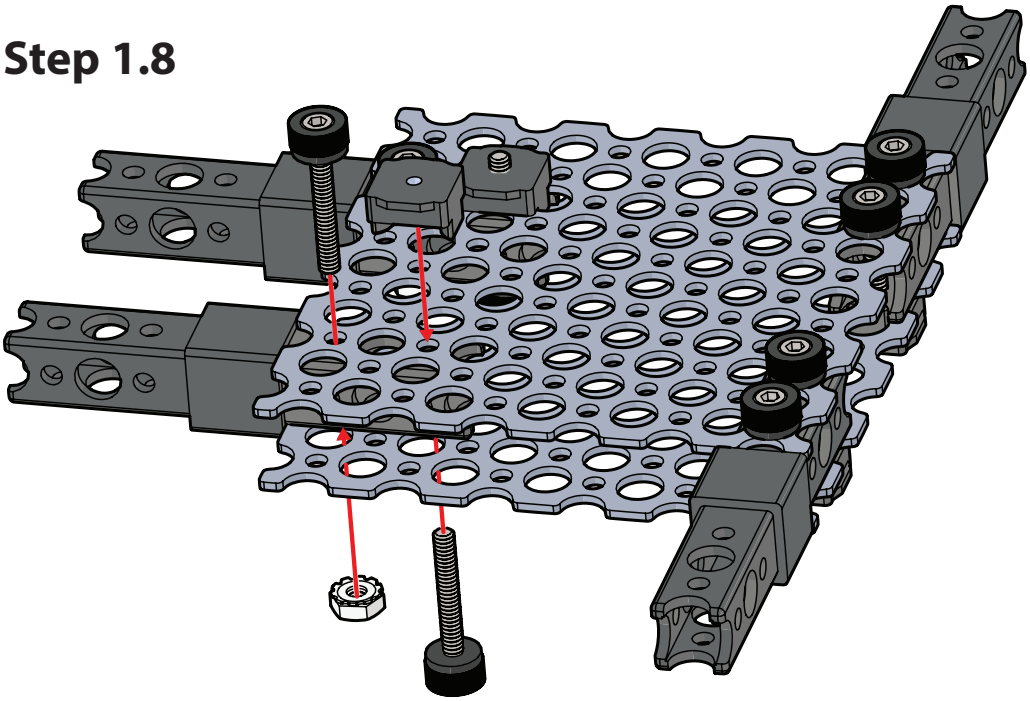
Step 1.7



Rotate build to match this view.

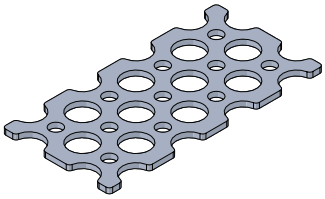


Step 1.8

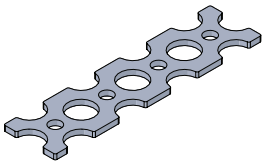


Step 2

Parts Needed

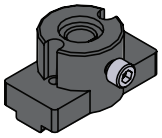


2x
2 x 4 Hole Plate 41255

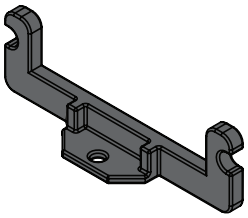


1x
4-Hole Flat Linkage 41244

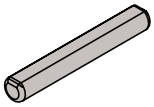
4x
Thumbscrew 40323



1x
Beam Attachment Hub 40228

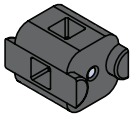


2x
Battery Mount Bracket 40236



1x
40 mm Steel Axle 40226

1x
16 mm Ball Skid Point 41260



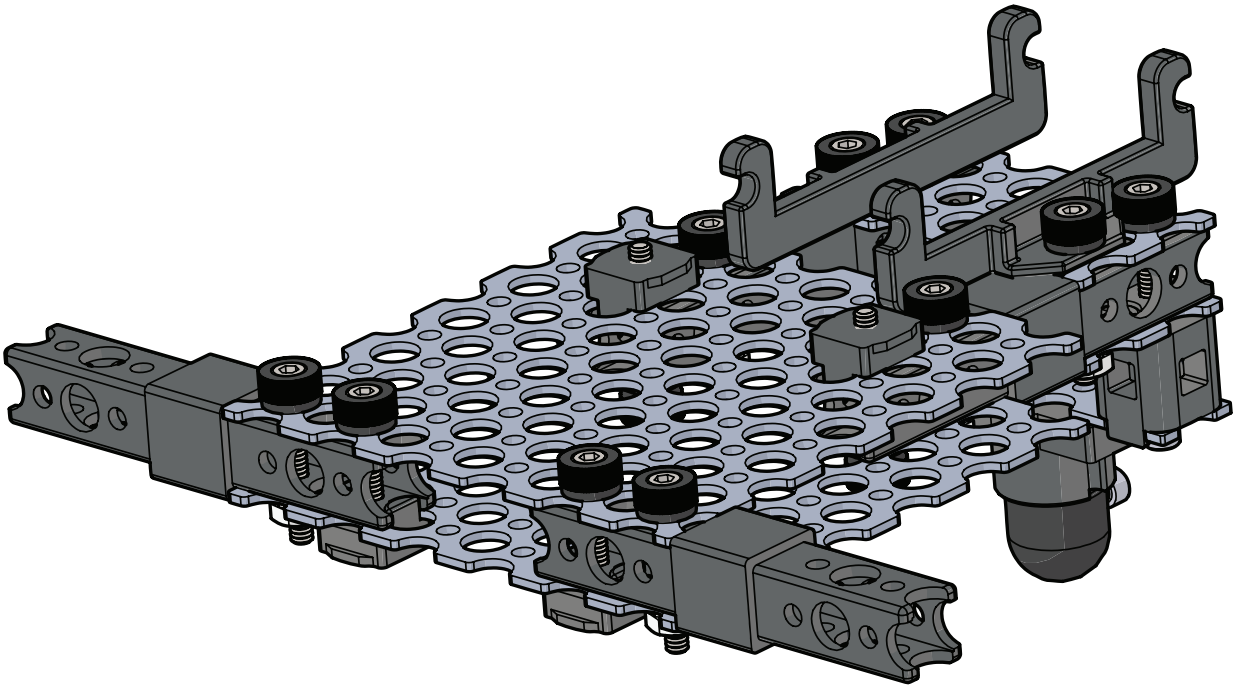
2x
Straight Block Beam Connector 40216

4x
Socket Head Cap Screw 40516

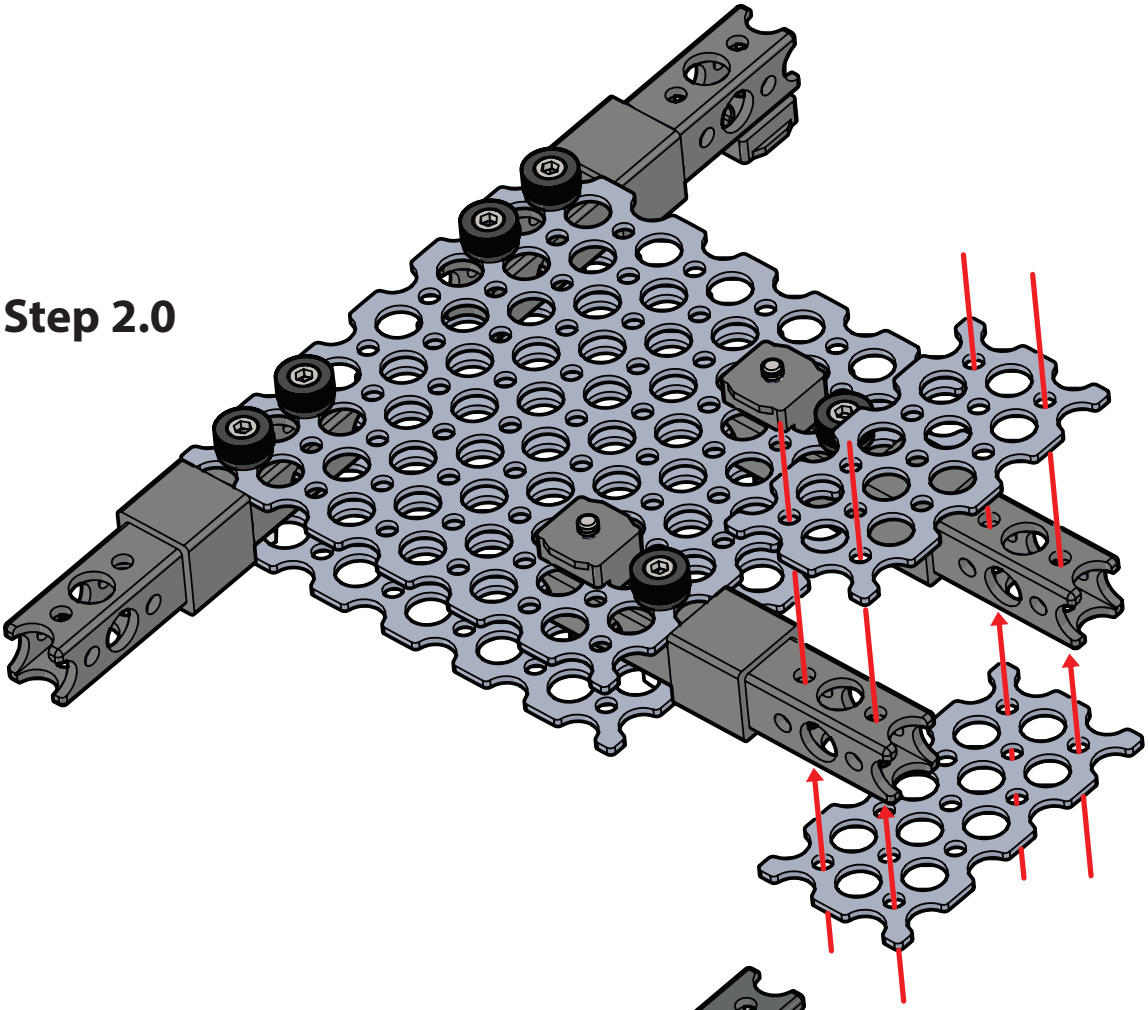
2x
Kep Nut 39094

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

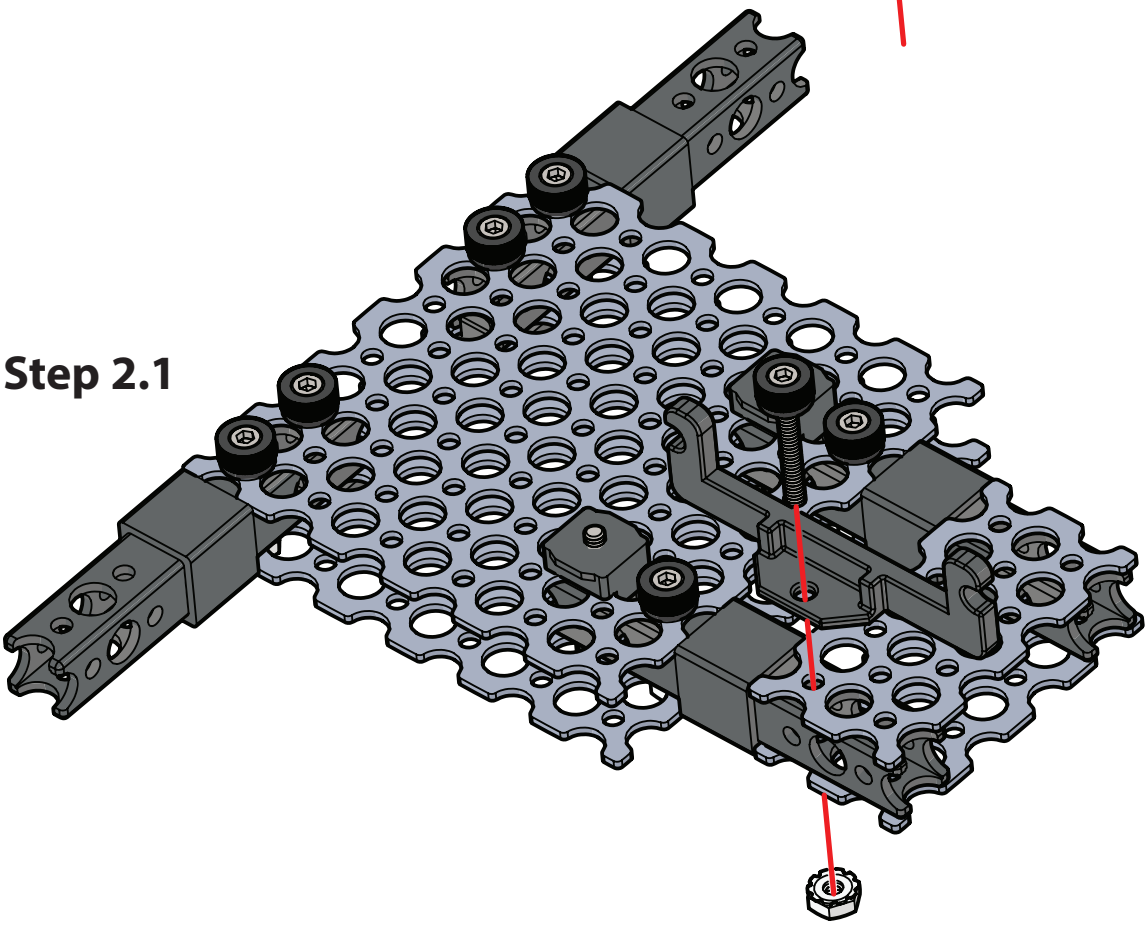
Partial assembly should look like this.



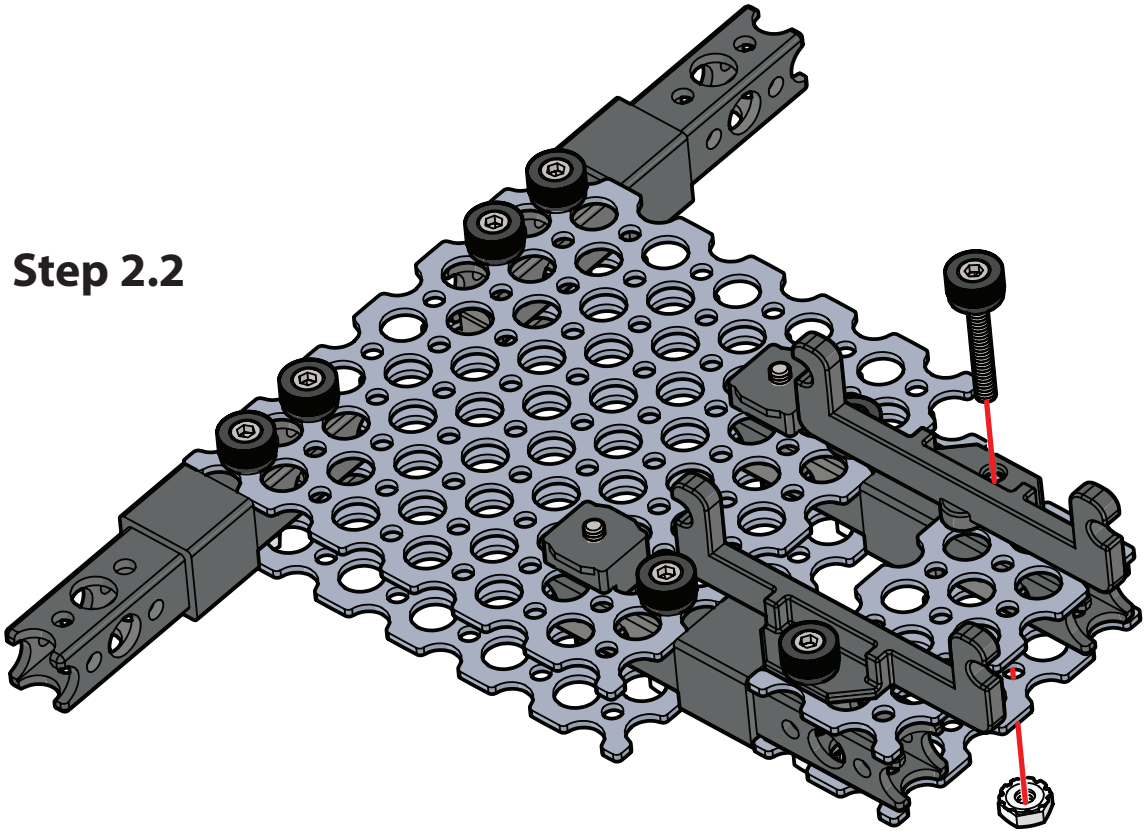
Step 2.0



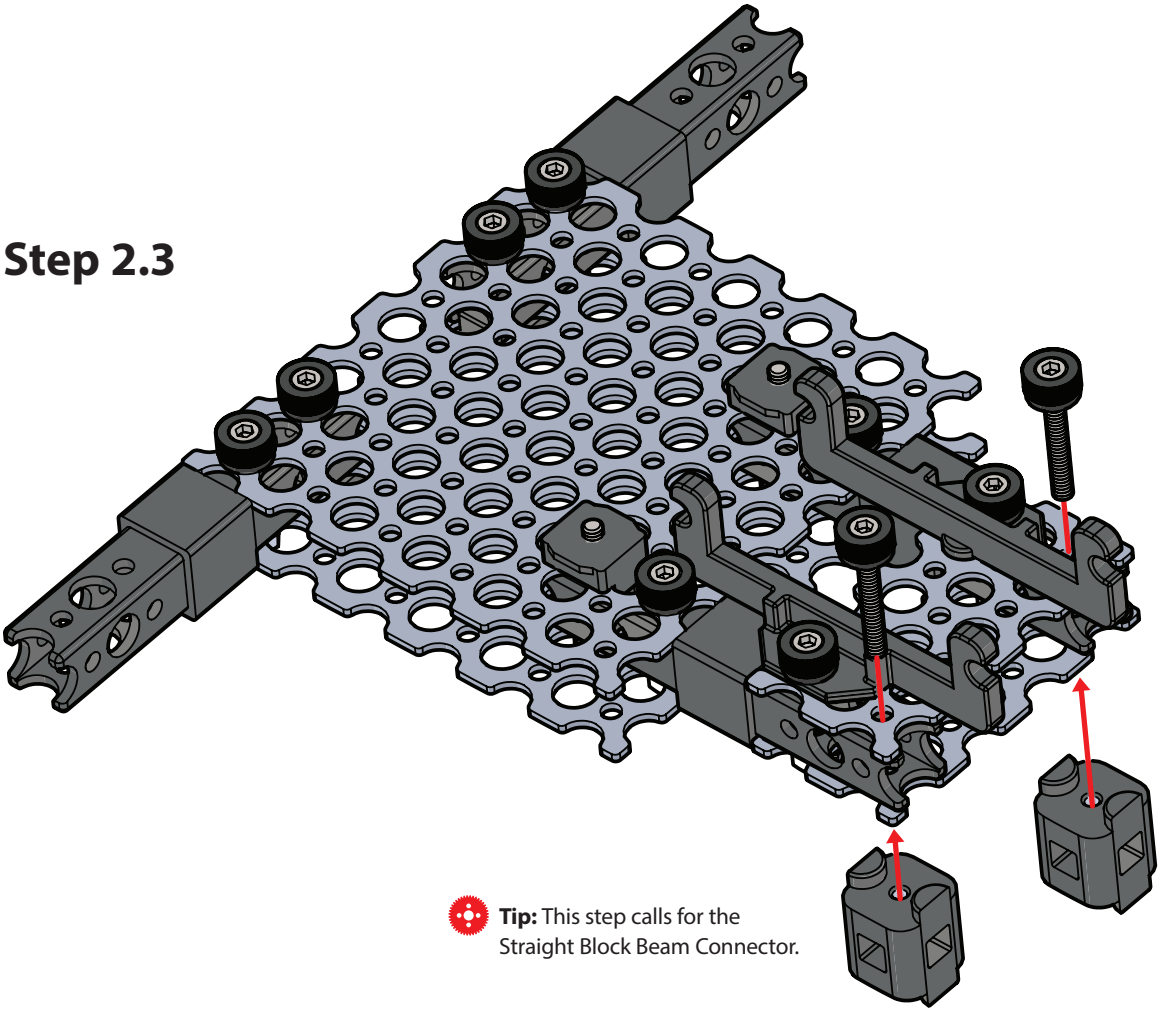
Step 2.1



Step 2.2

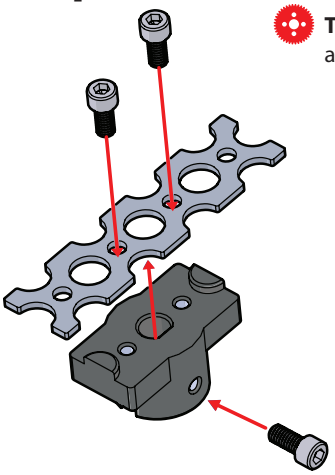


Step 2.3



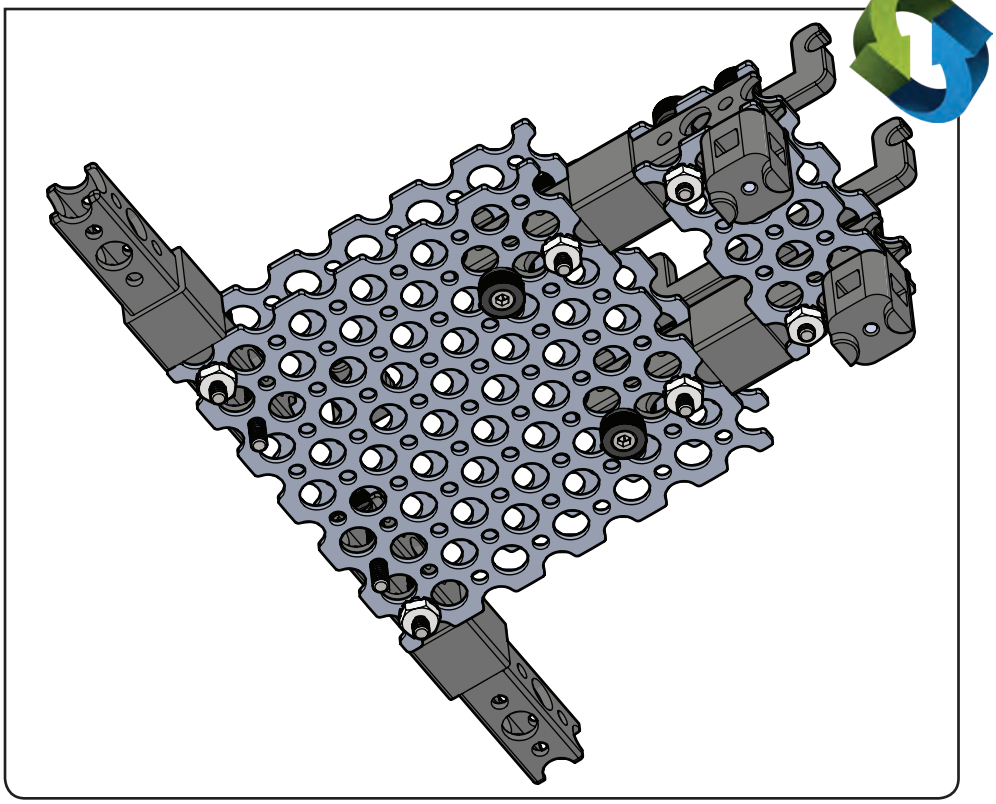
Tip: This step calls for the Straight Block Beam Connector.

Step 2.4

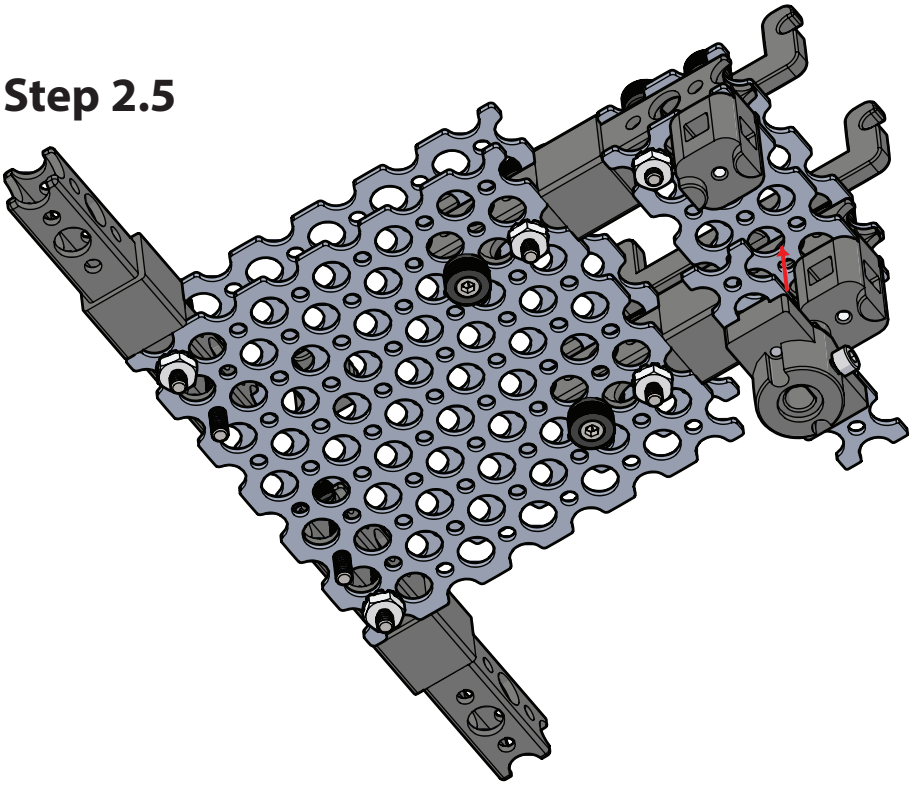


Tip: If the Socket Head Cap Screw is already installed, please skip to next step.

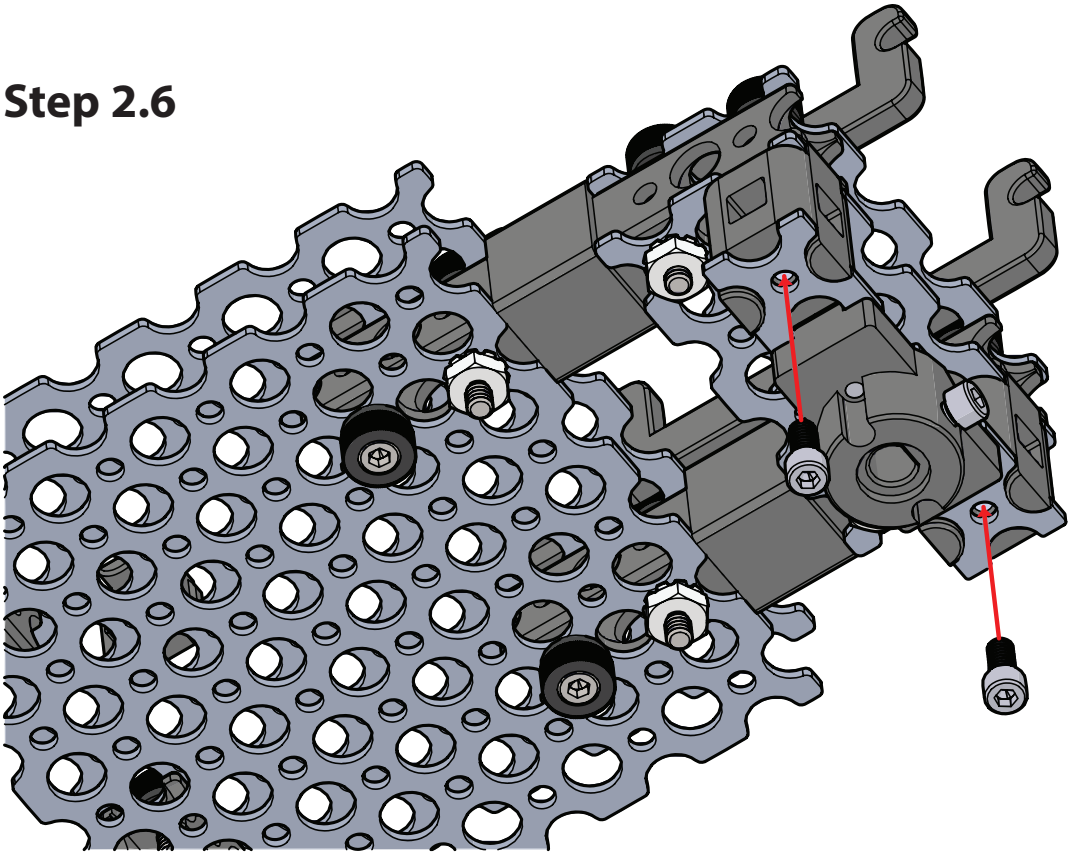
Rotate build to match this view.



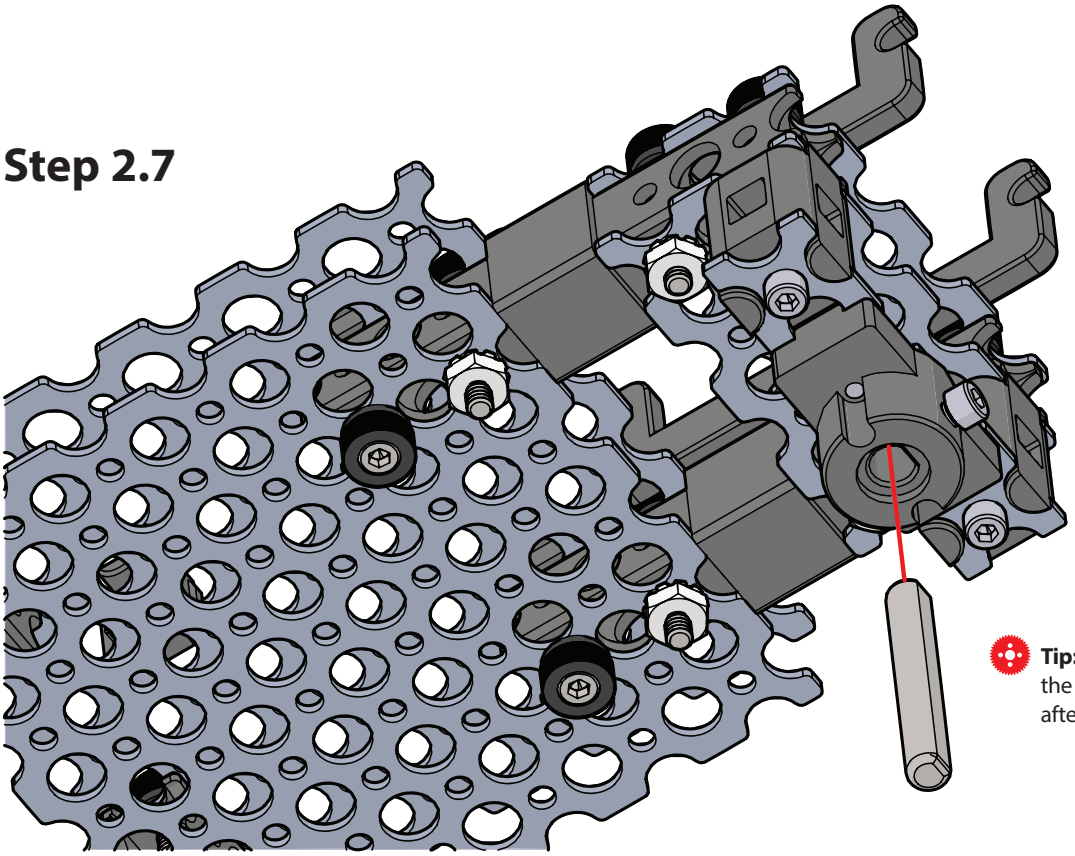
Step 2.5



Step 2.6



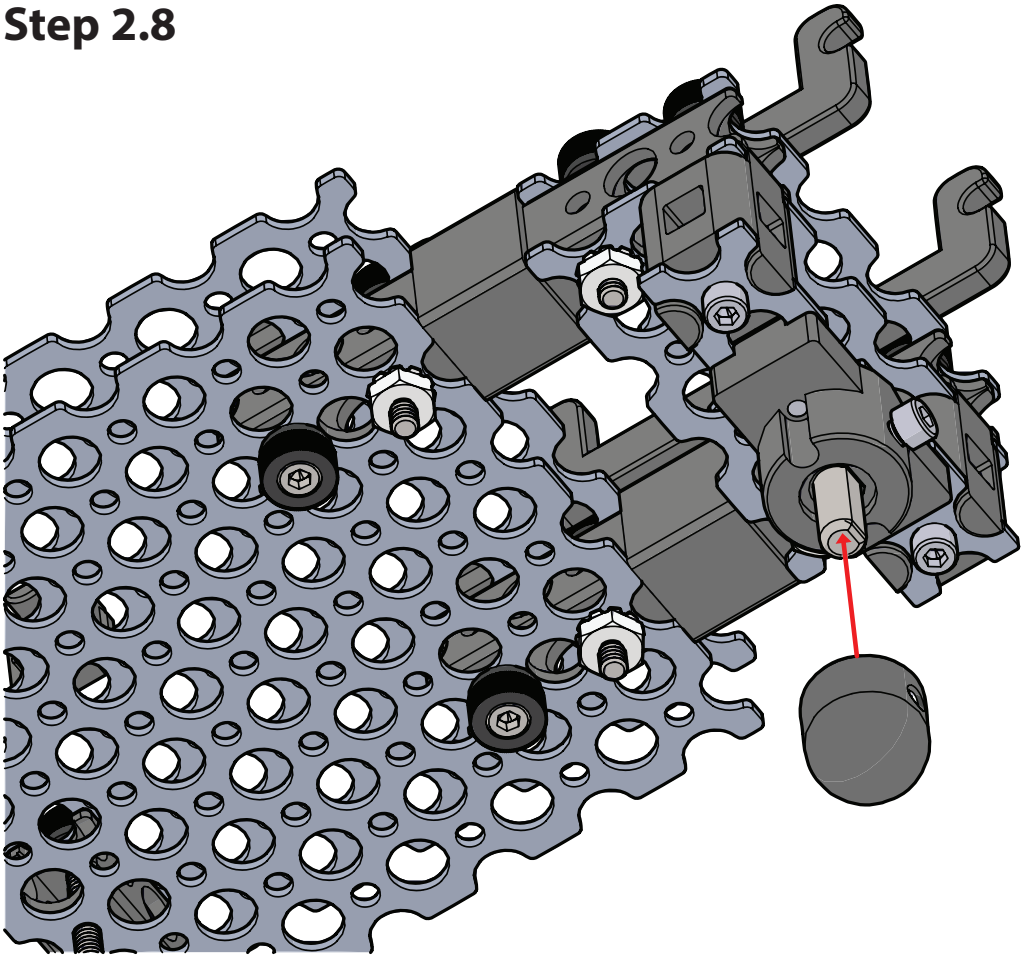
Step 2.7



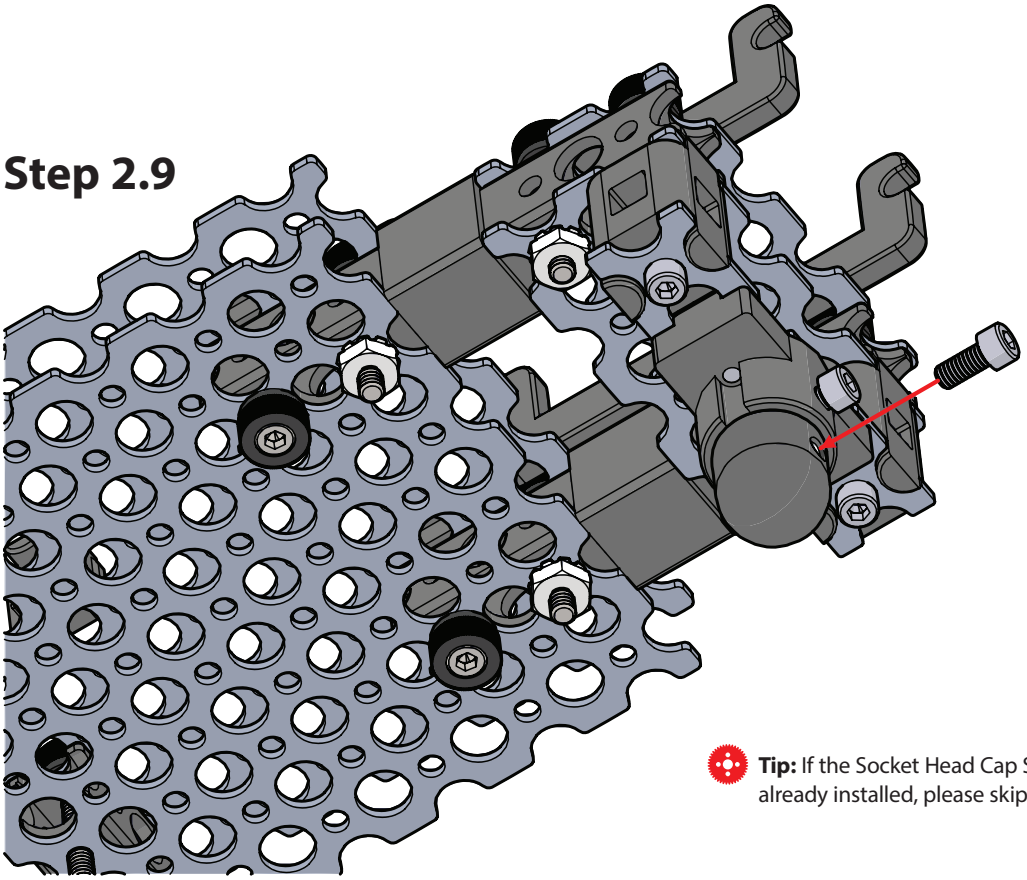
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Tip: How far this axle is inserted into the Beam Attachment Hub determines whether the Rover Bot will sit level when the wheels are attached. This might need to be adjusted after the wheels have been mounted.

Step 2.8



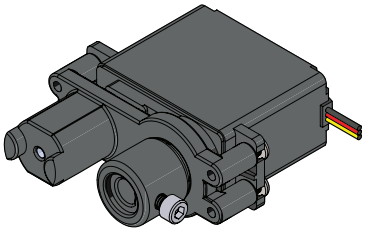
Step 2.9



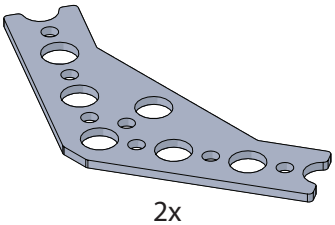
Tip: If the Socket Head Cap Screw is already installed, please skip to next step.

Step 3

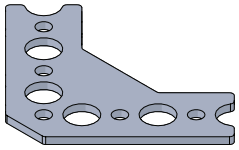
Parts Needed



1x
Continuous Rotation Servo Motor 40379
with Servo Mounting Bracket 40232
(Assembly instructions on pages 18-19.)

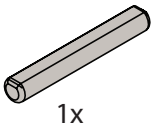


2x
120-Degree Gusset
41266

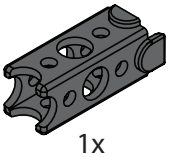


2x
90-Degree Gusset
41265

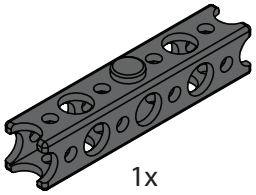
1x
Shaft Servo Hub
40230



1x
40 mm Steel Axle
40226



1x
Beam End
Connector 40214



1x
Beam Extension
Connector 40322

7x
Thumbscrew
40323

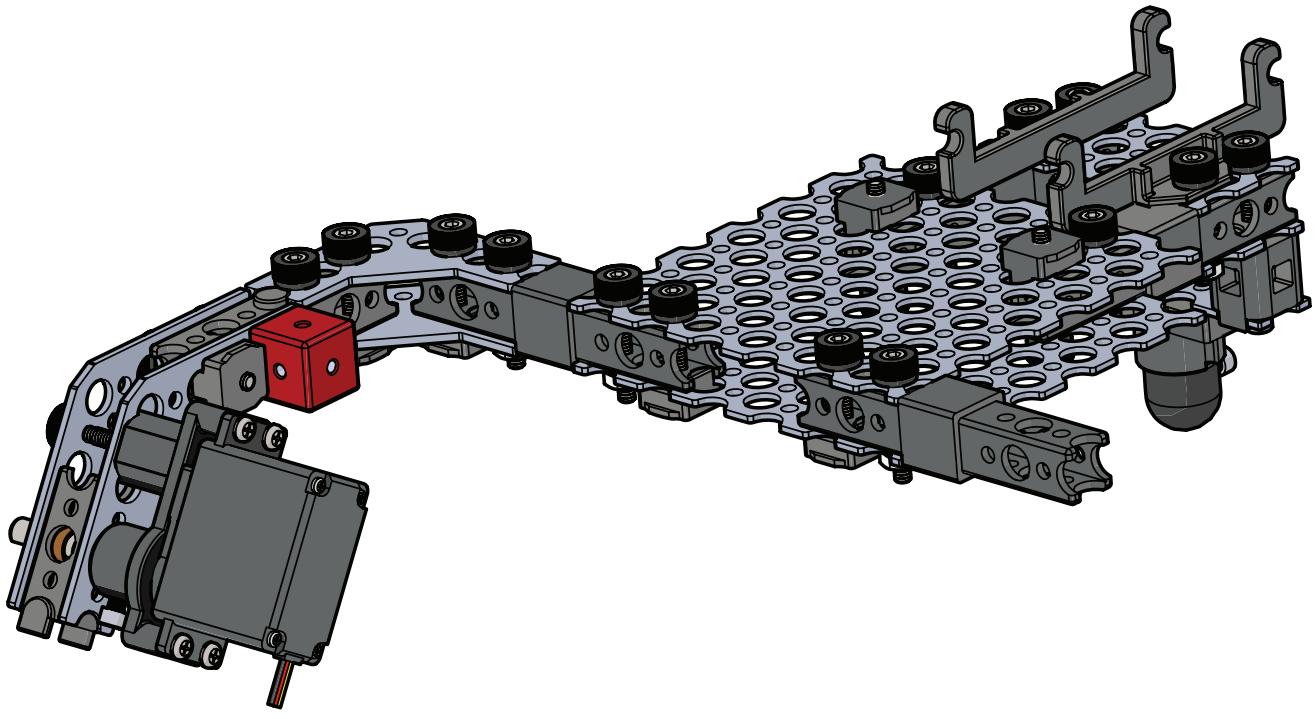
3x
Wing Nut
40221

1x
16 mm Anchor
Block 41267

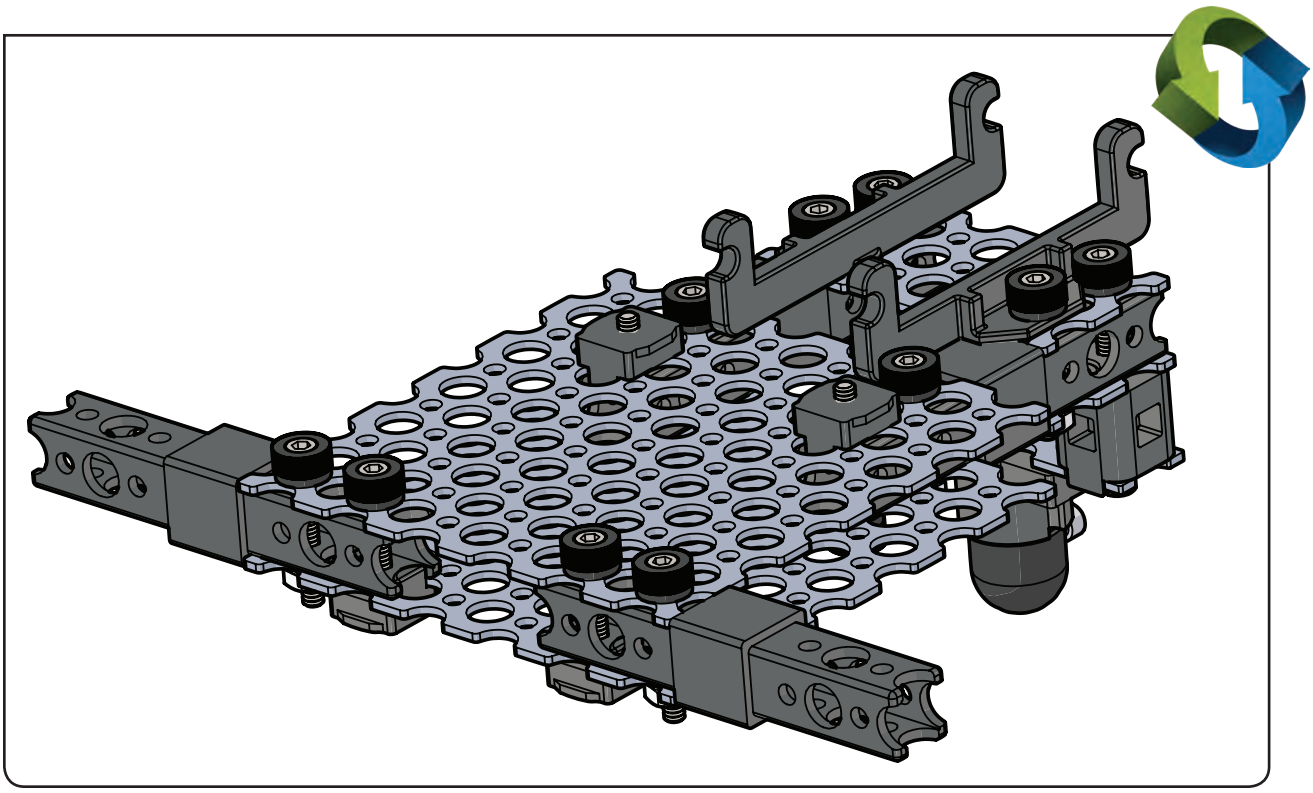
2x
Kep Nut 39094

2x
8 mm x 6 mm
Bronze Bushing
40227

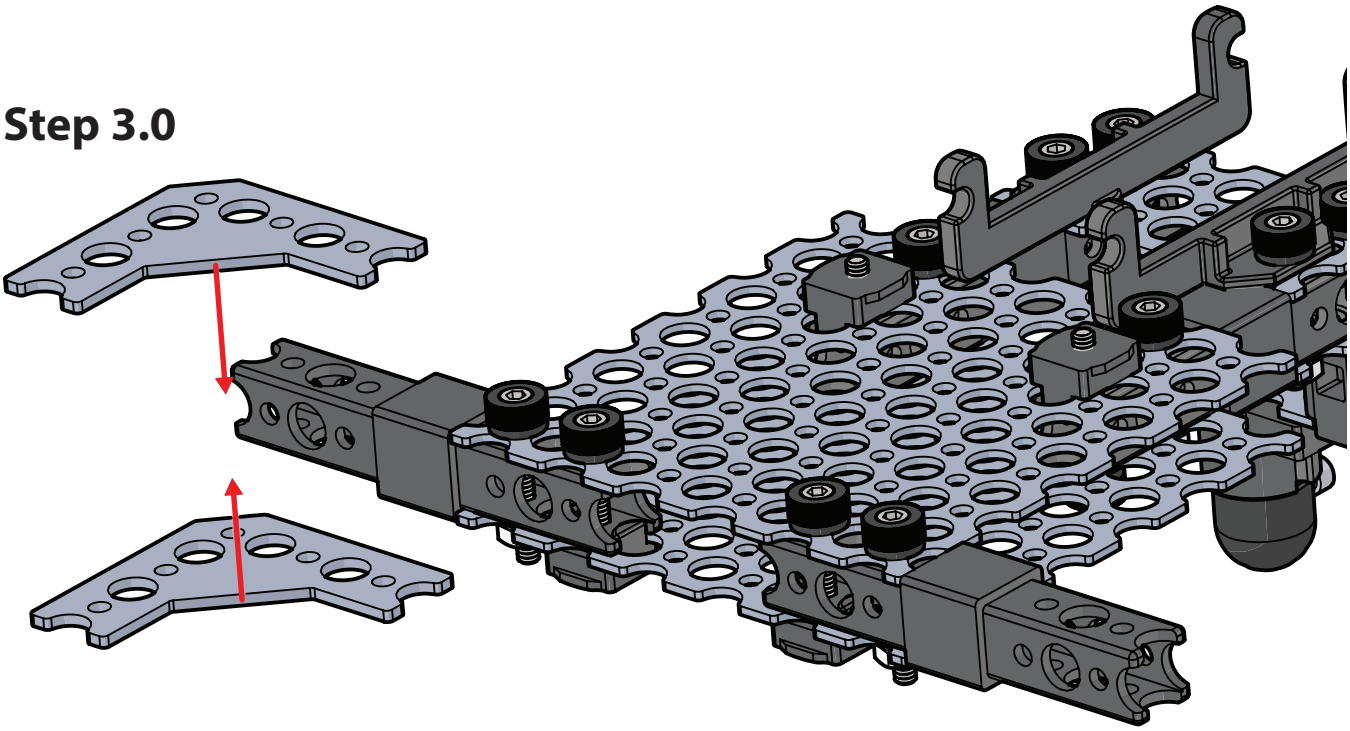
Partial assembly should look like this.



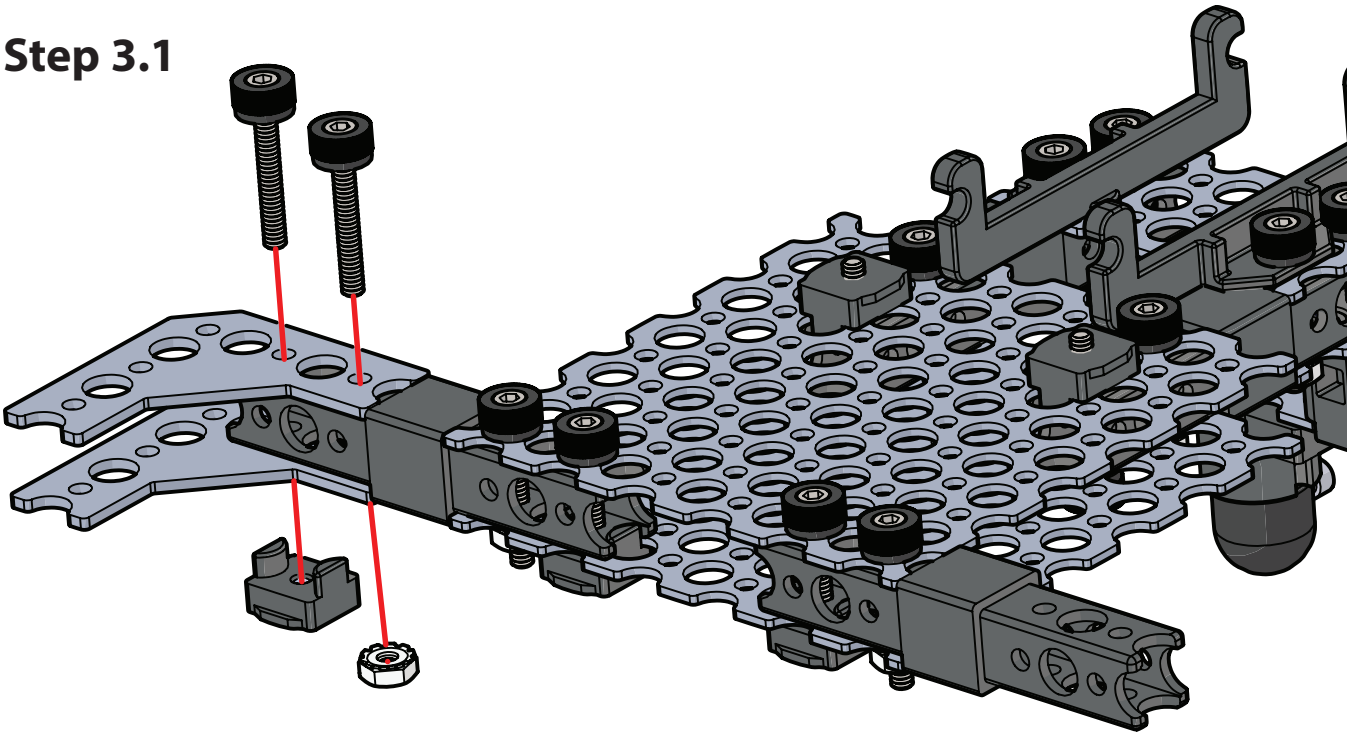
Rotate build to match this view.



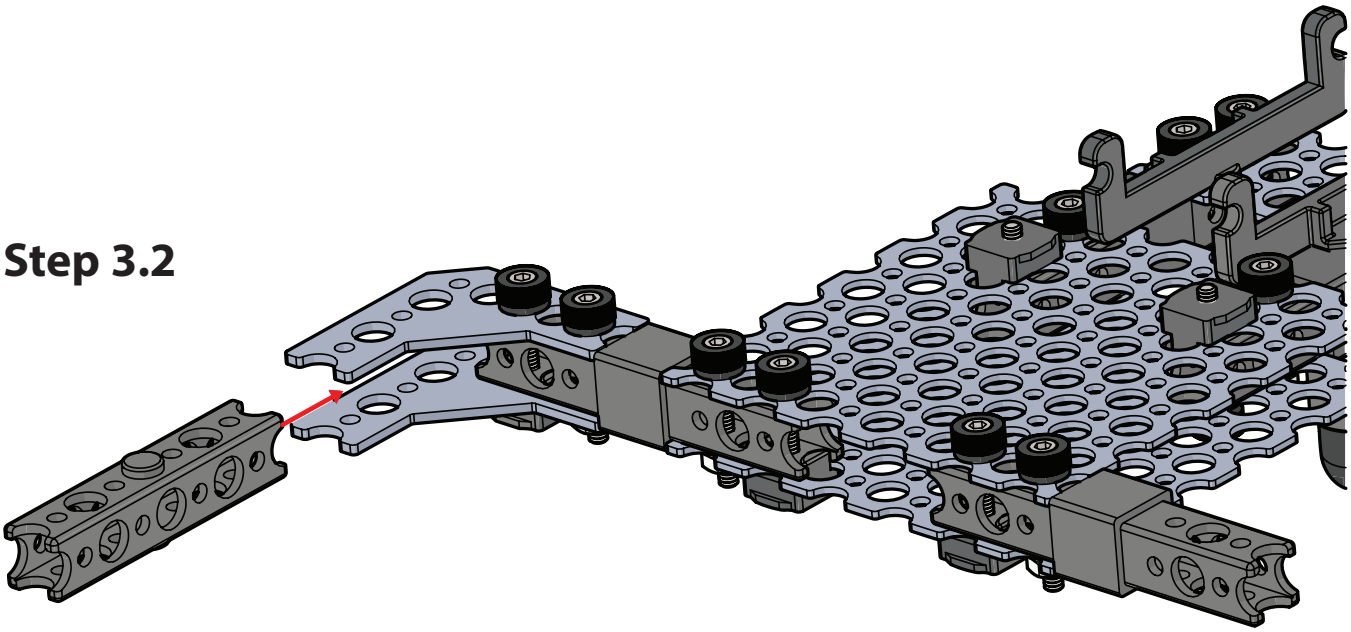
Step 3.0



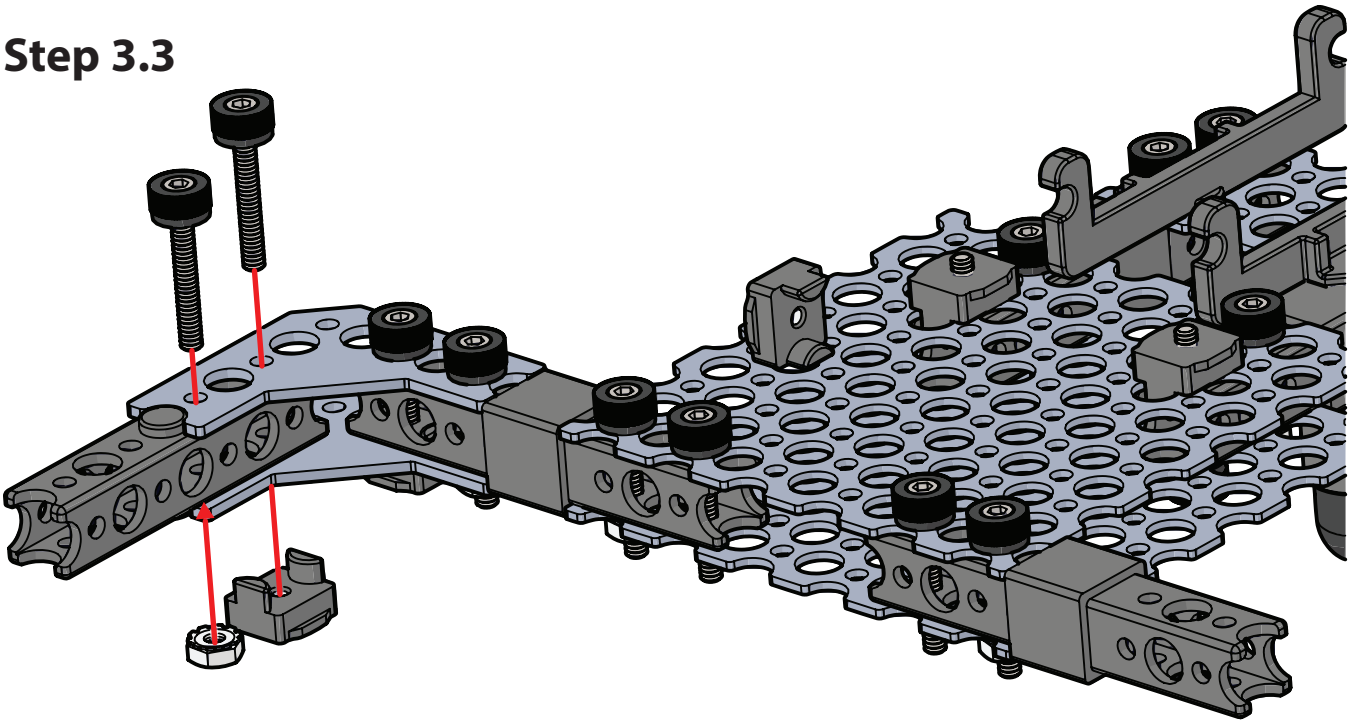
Step 3.1



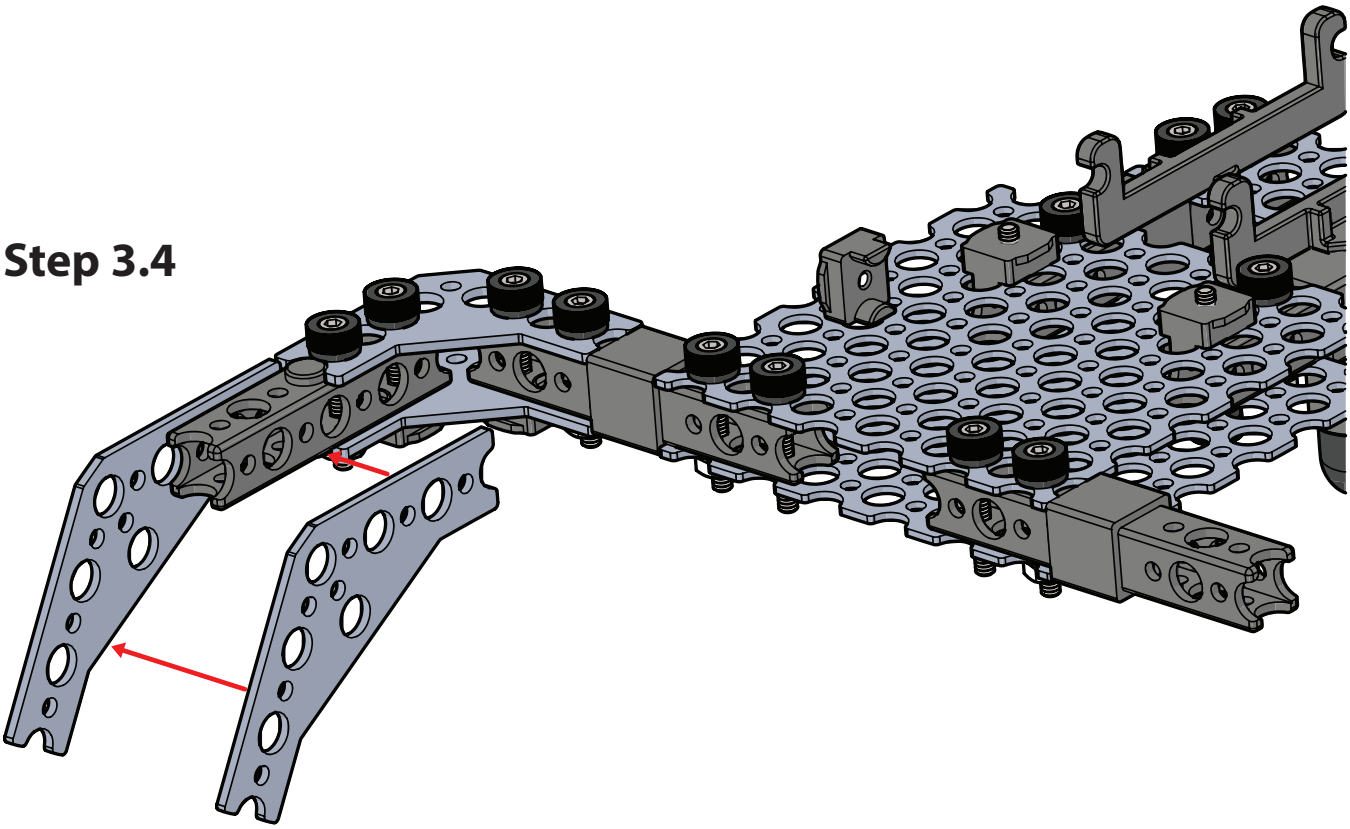
Step 3.2



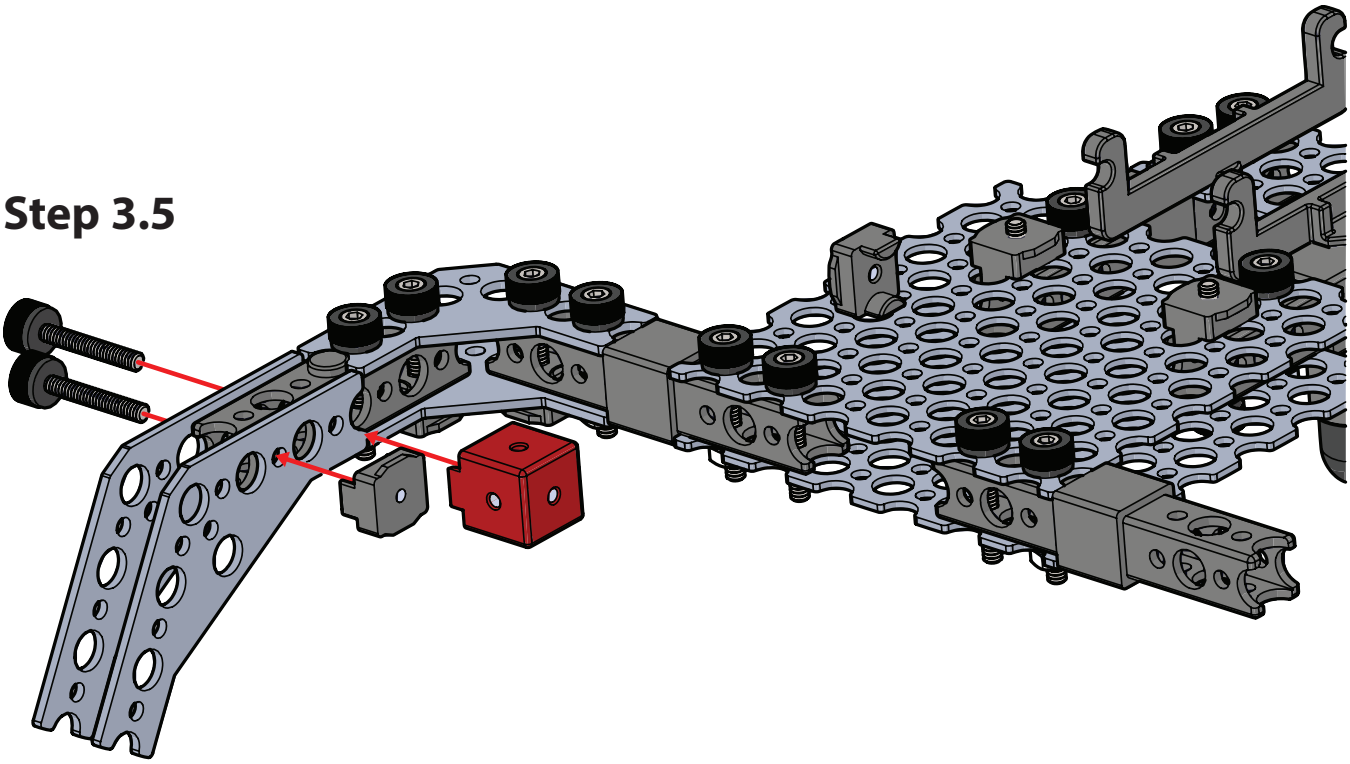
Step 3.3



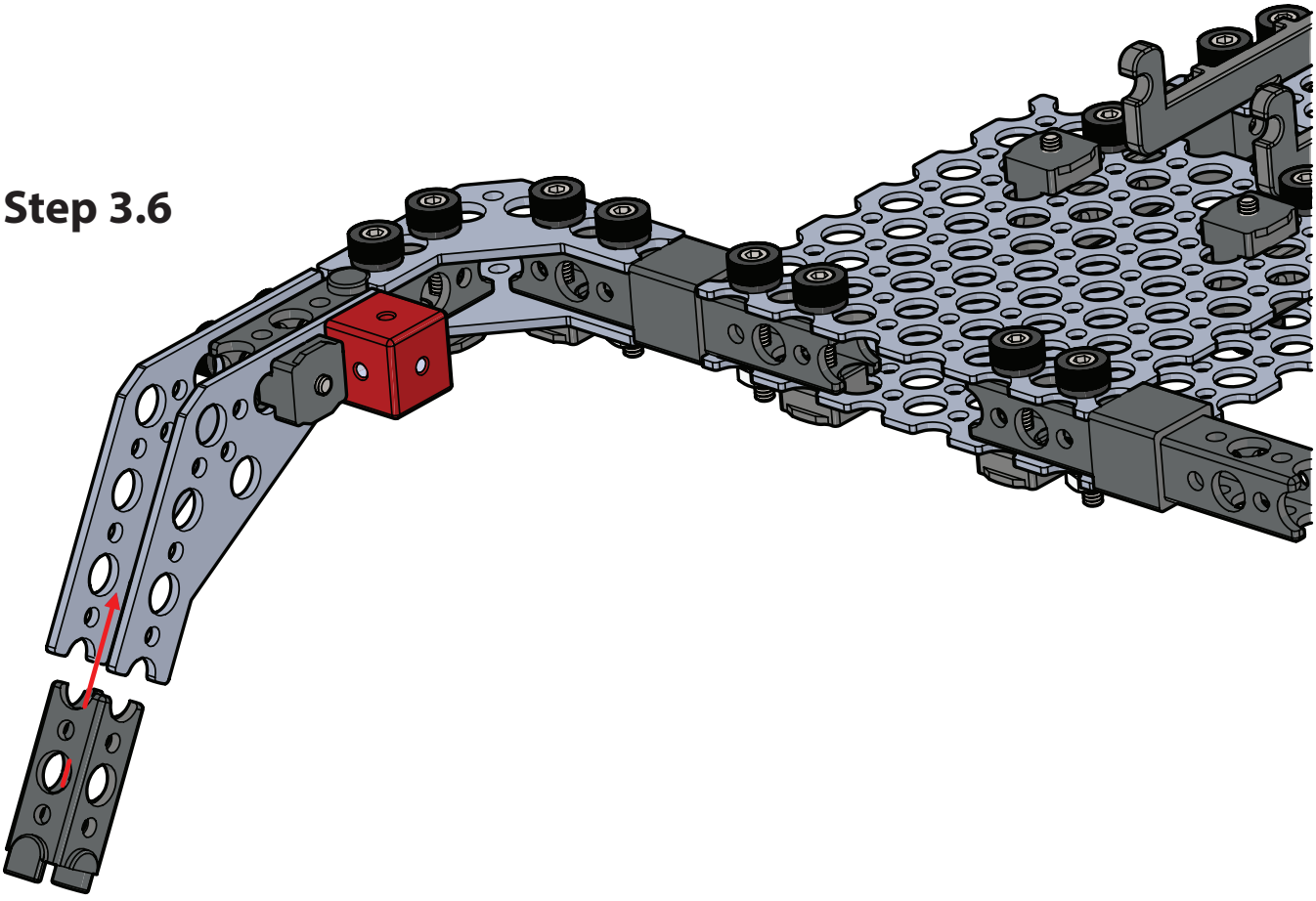
Step 3.4



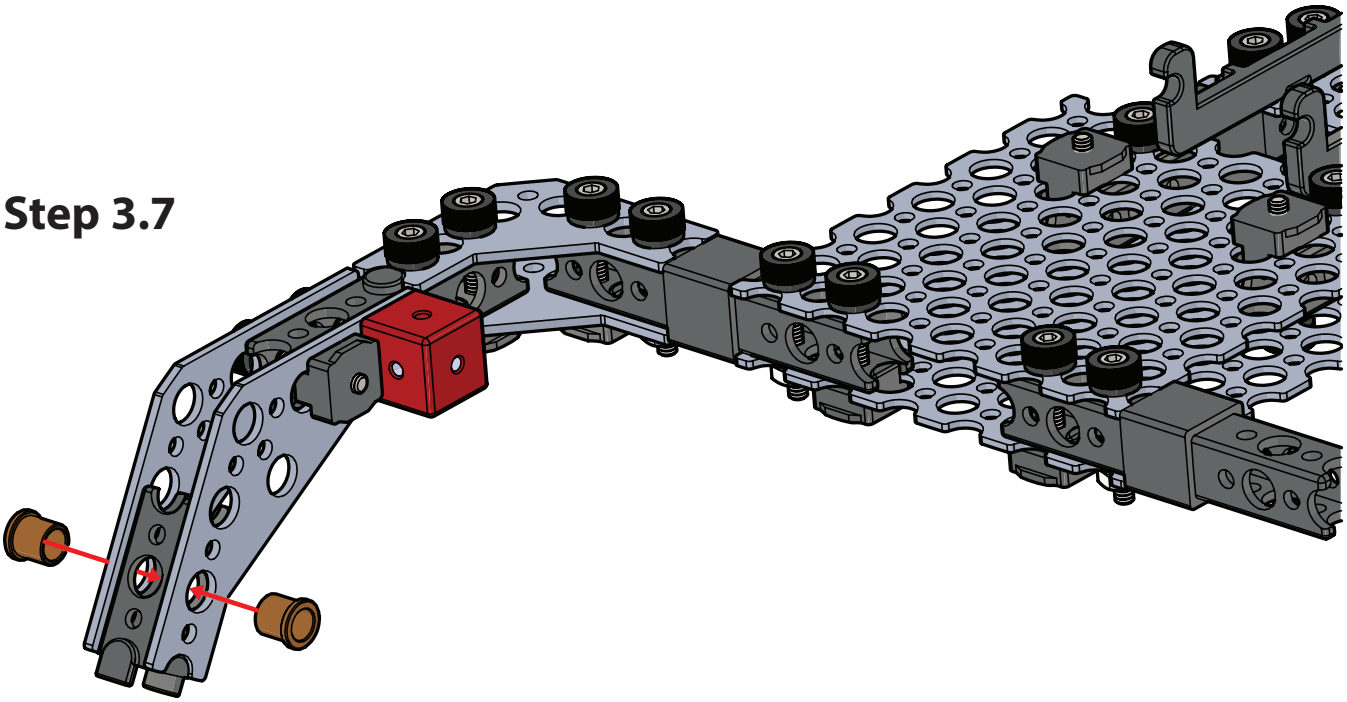
Step 3.5



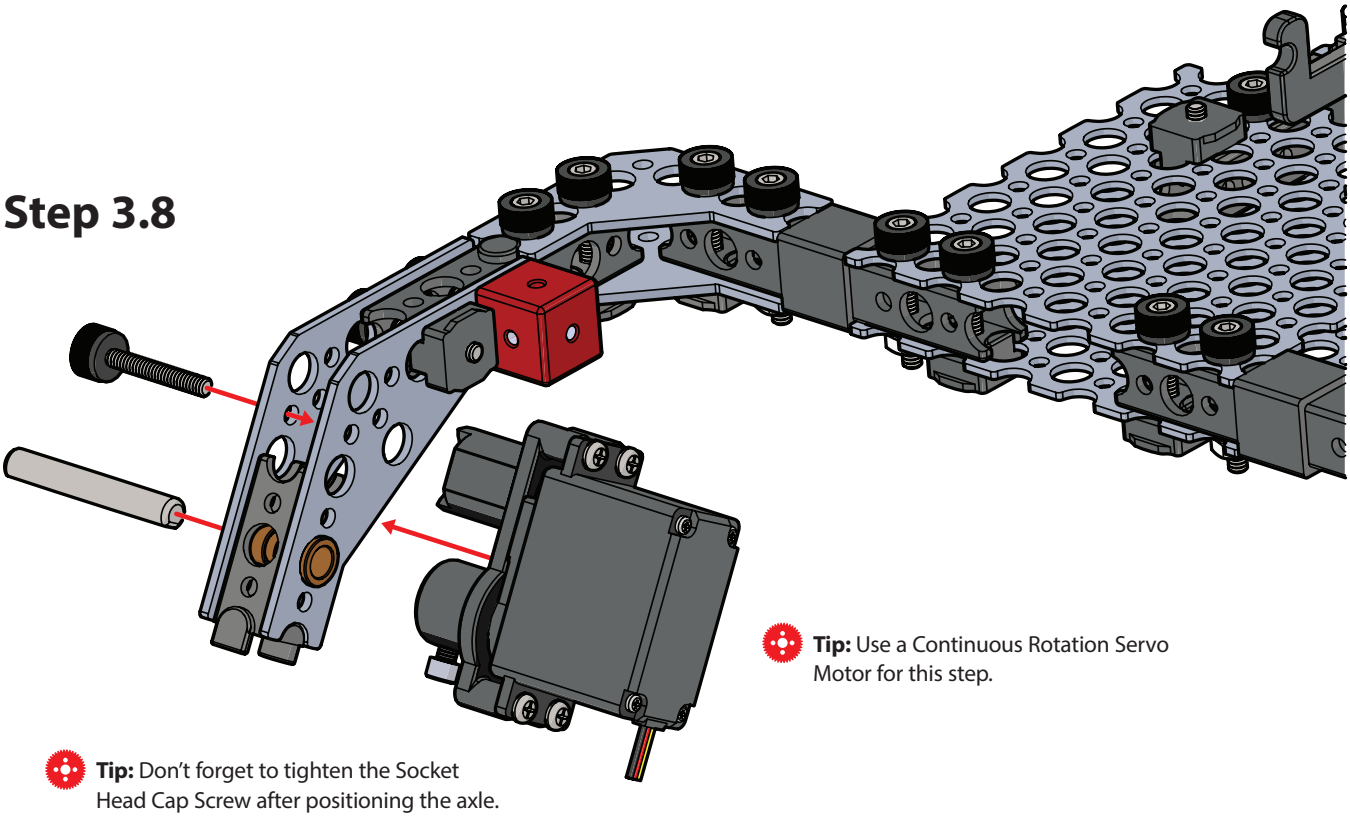
Step 3.6



Step 3.7



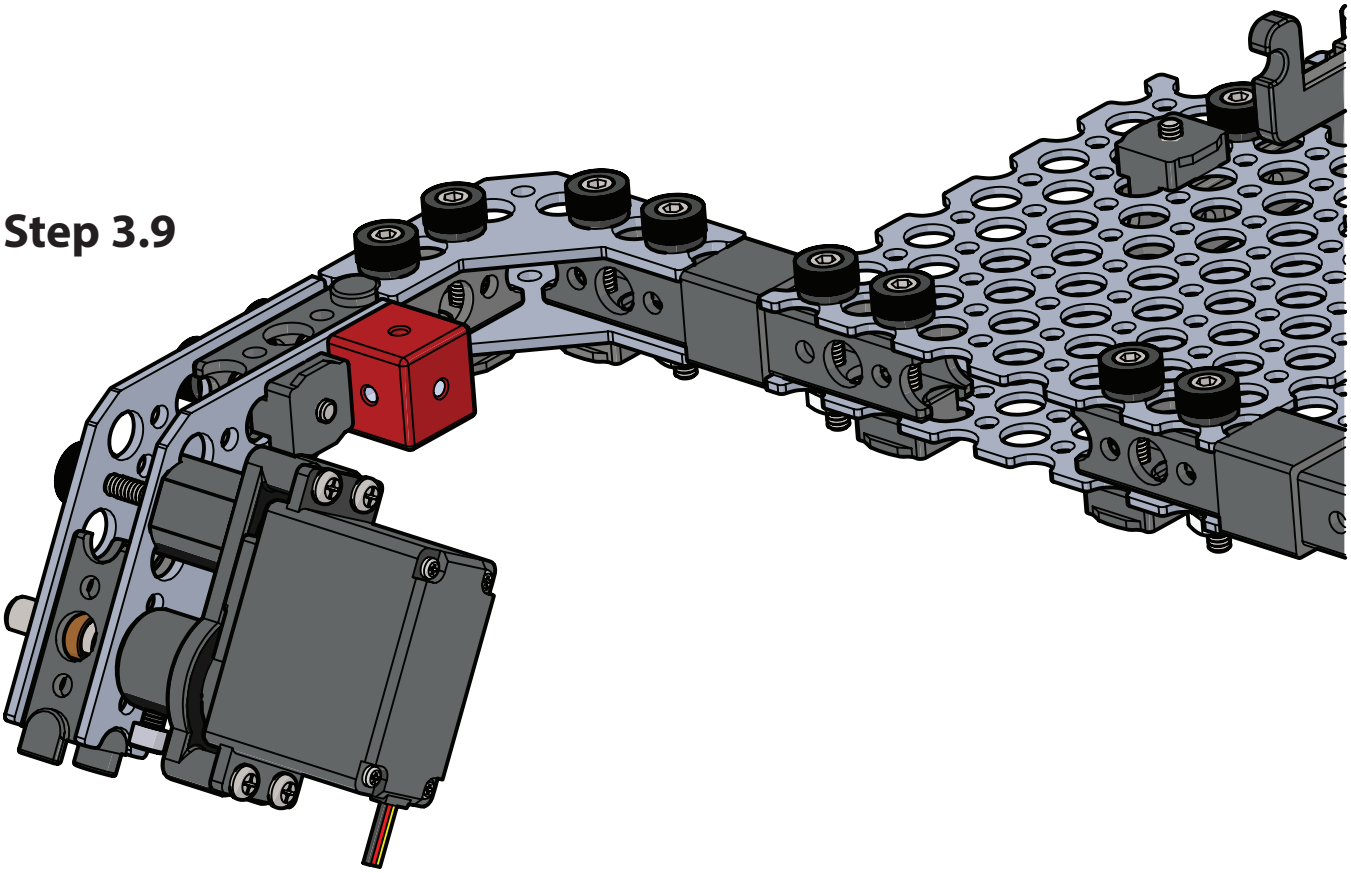
Step 3.8



Tip: Use a Continuous Rotation Servo Motor for this step.

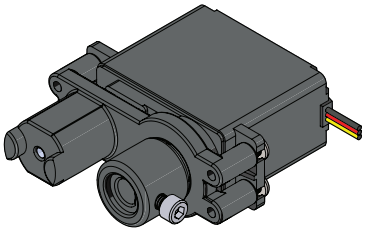
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 3.9

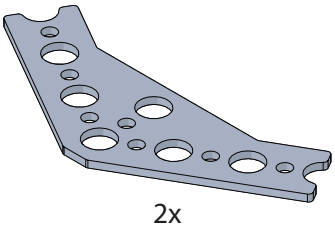


Step 4

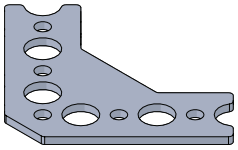
Parts Needed



1x
Continuous Rotation Servo Motor 40379
with Servo Mounting Bracket 40232
(Assembly instructions on pages 18-19.)

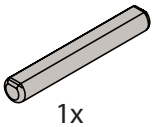


2x
120-Degree Gusset
41266

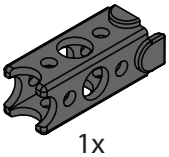


2x
90-Degree Gusset
41265

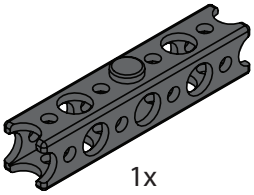
1x
Shaft Servo Hub
40230



1x
40 mm Steel Axle
40226



1x
Beam End
Connector 40214



1x
Beam Extension
Connector 40322

7x
Thumbscrew
40323

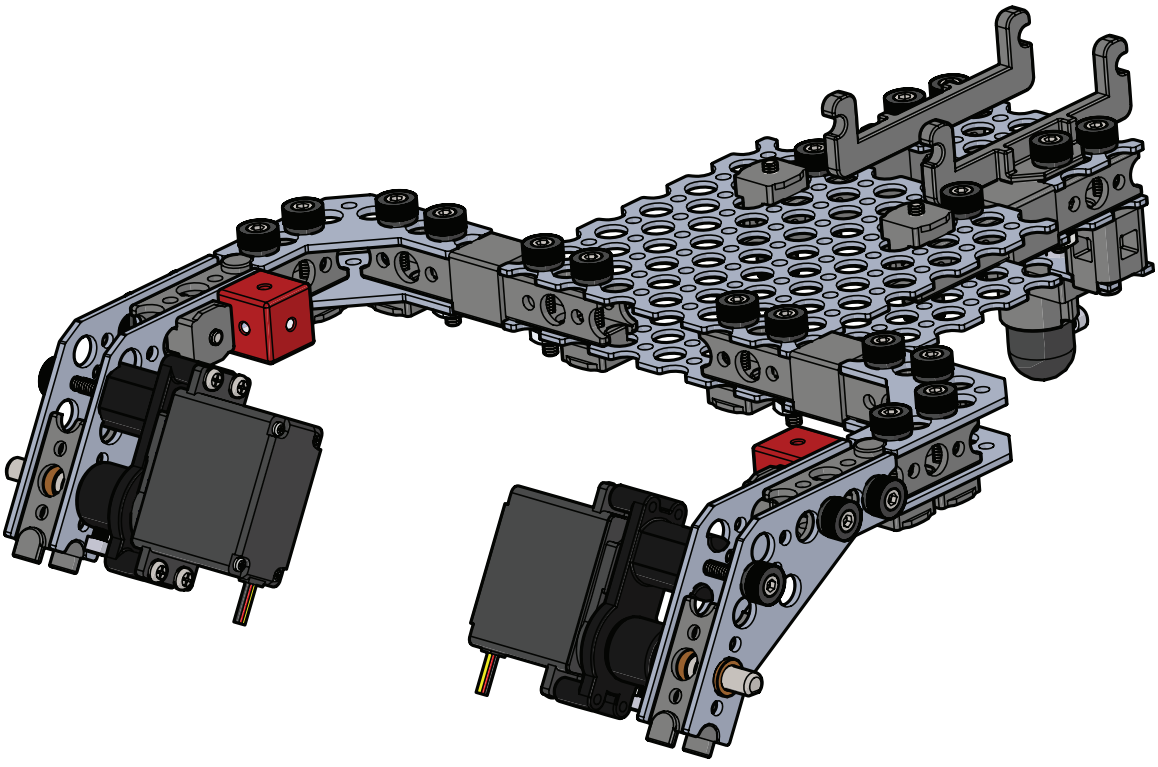
3x
Wing Nut
40221

1x
16 mm Anchor
Block 41267

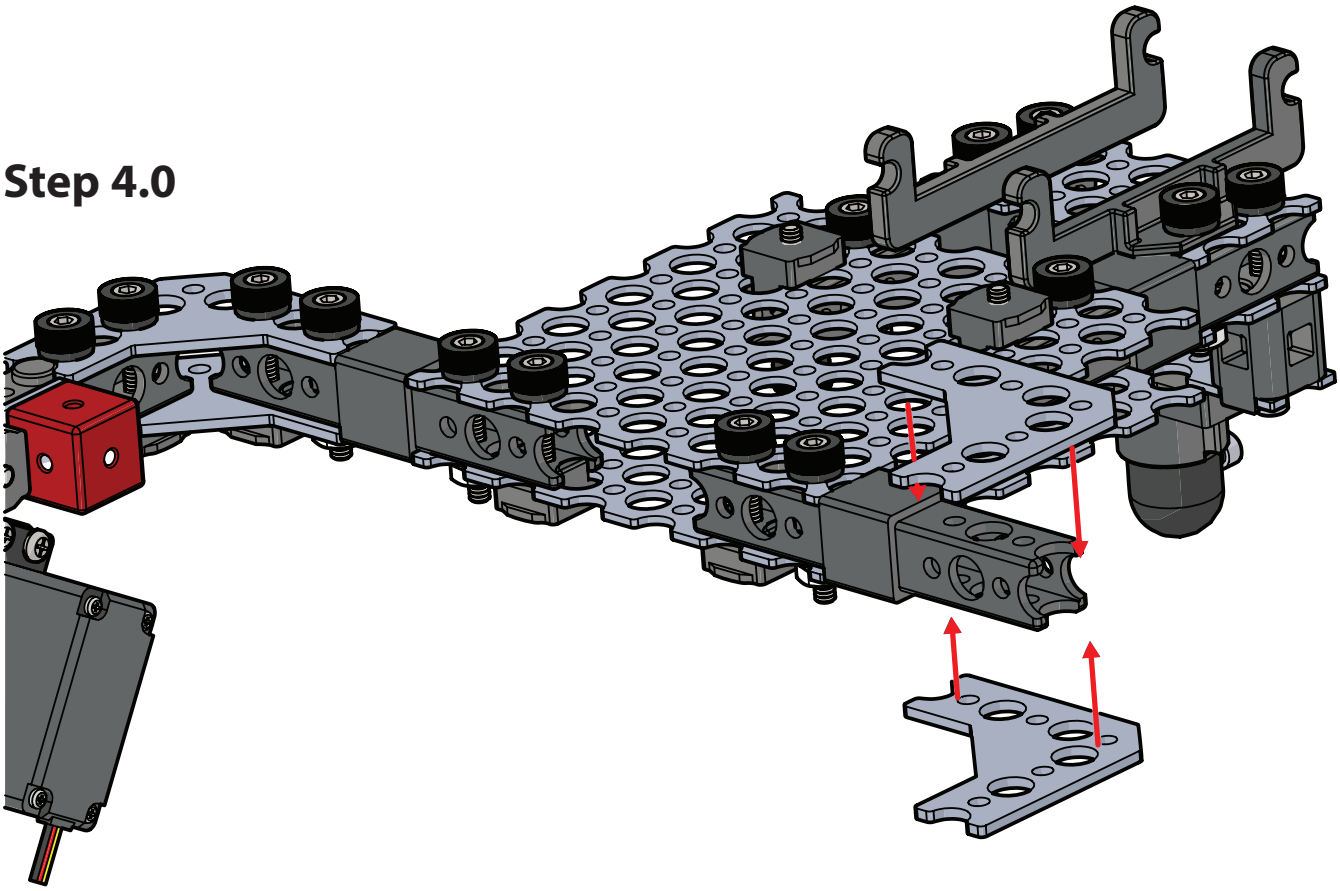
2x
Kep Nut 39094

2x
8 mm x 6 mm
Bronze Bushing
40227

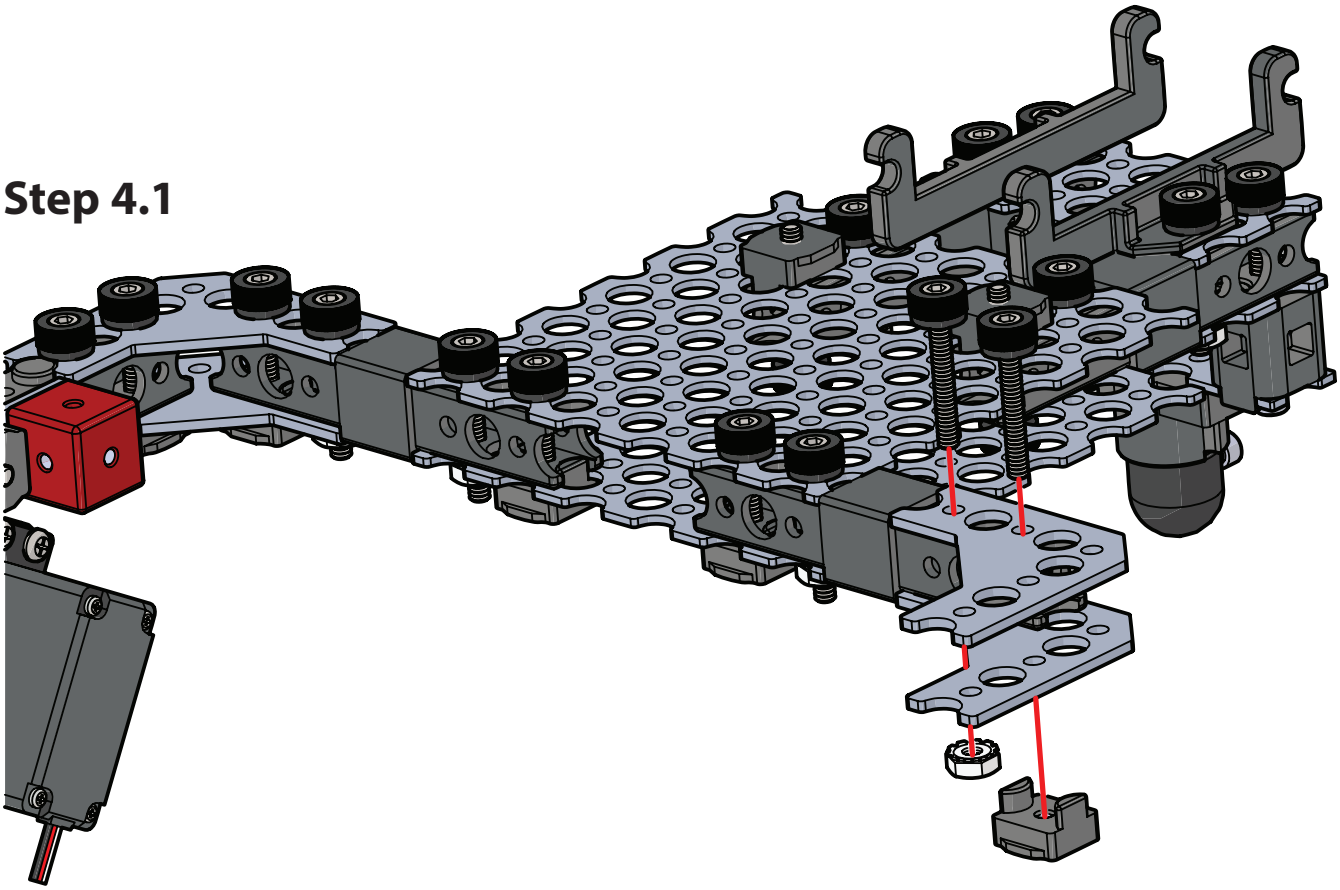
Partial assembly should look like this.



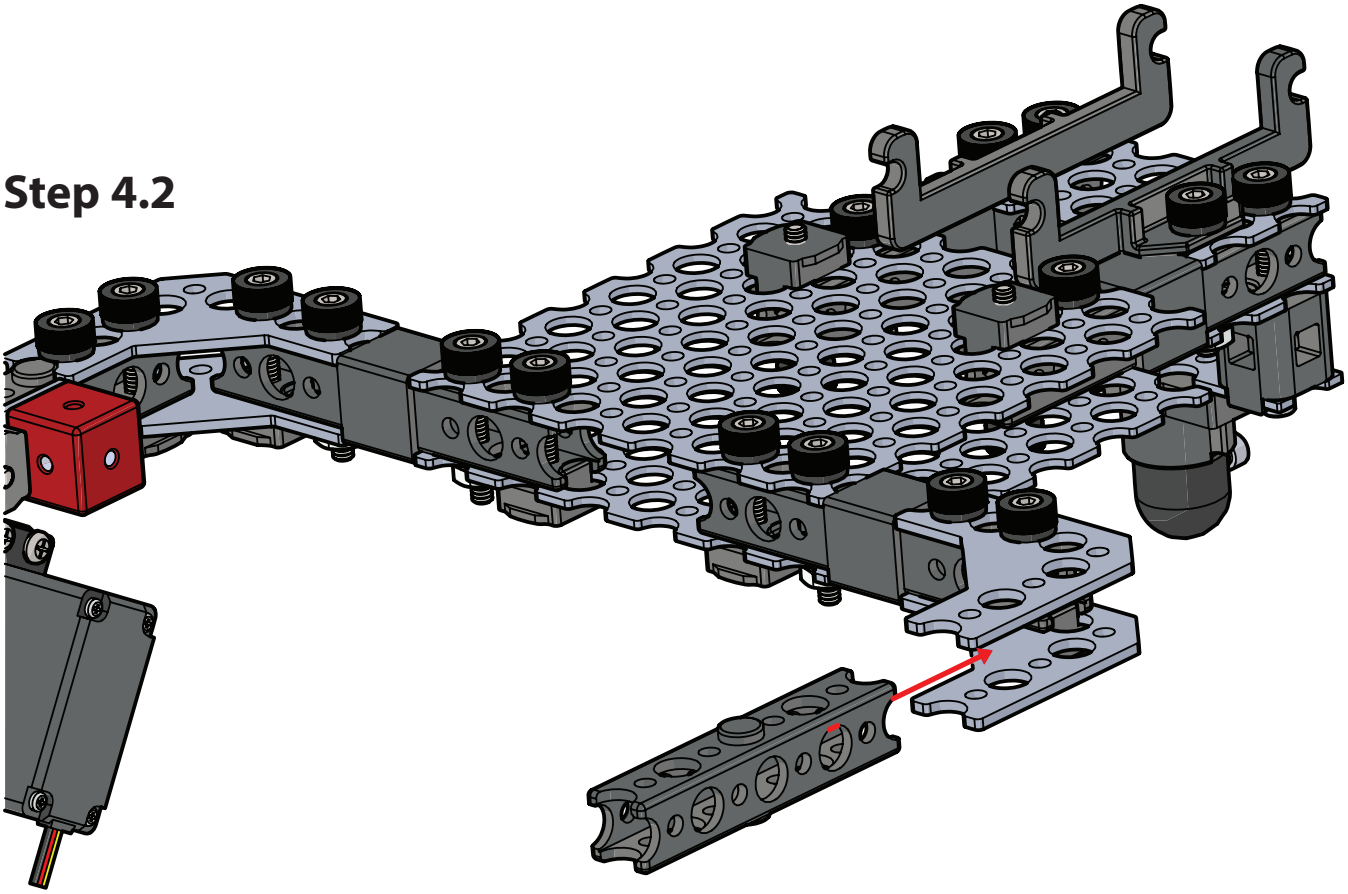
Step 4.0



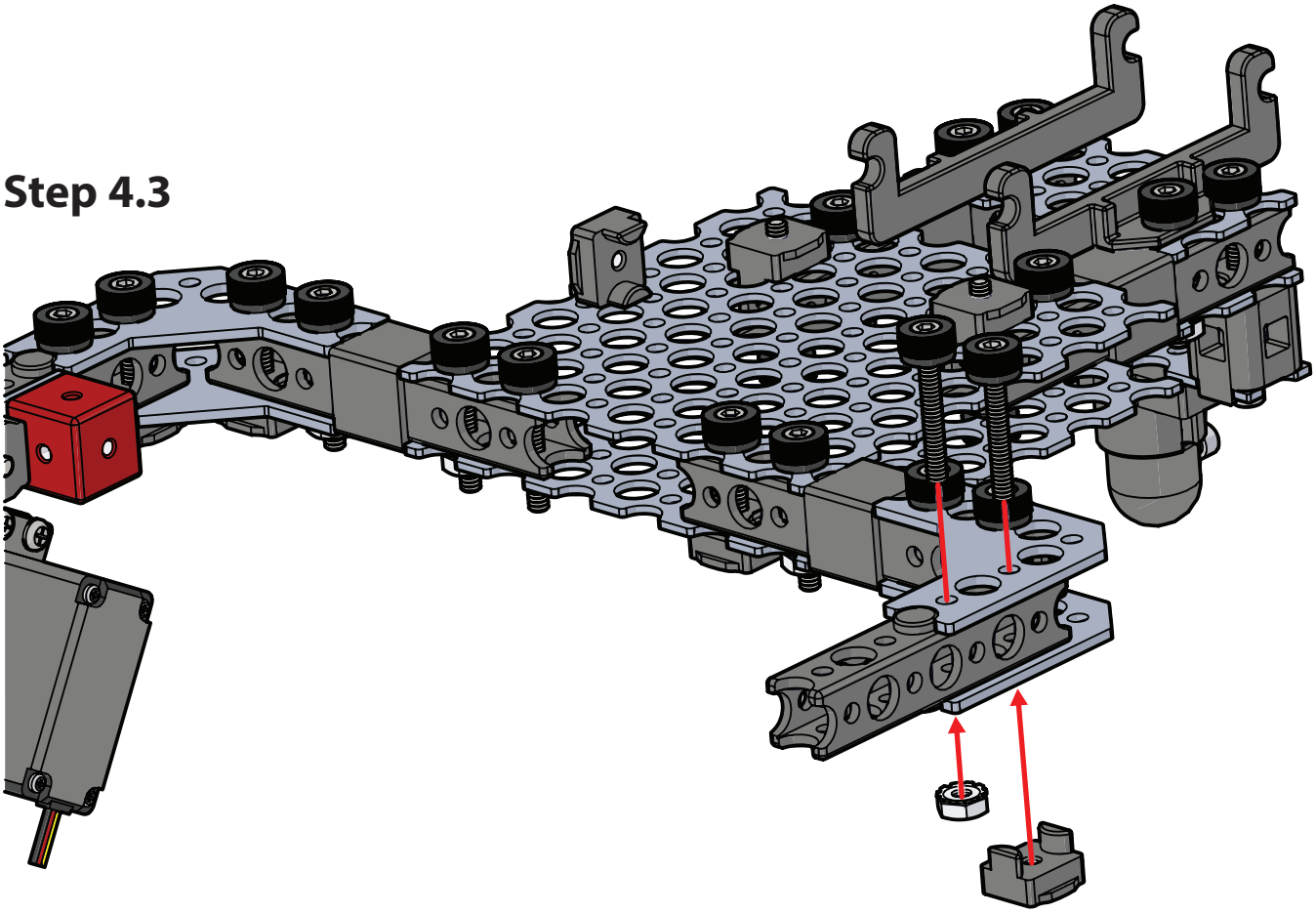
Step 4.1



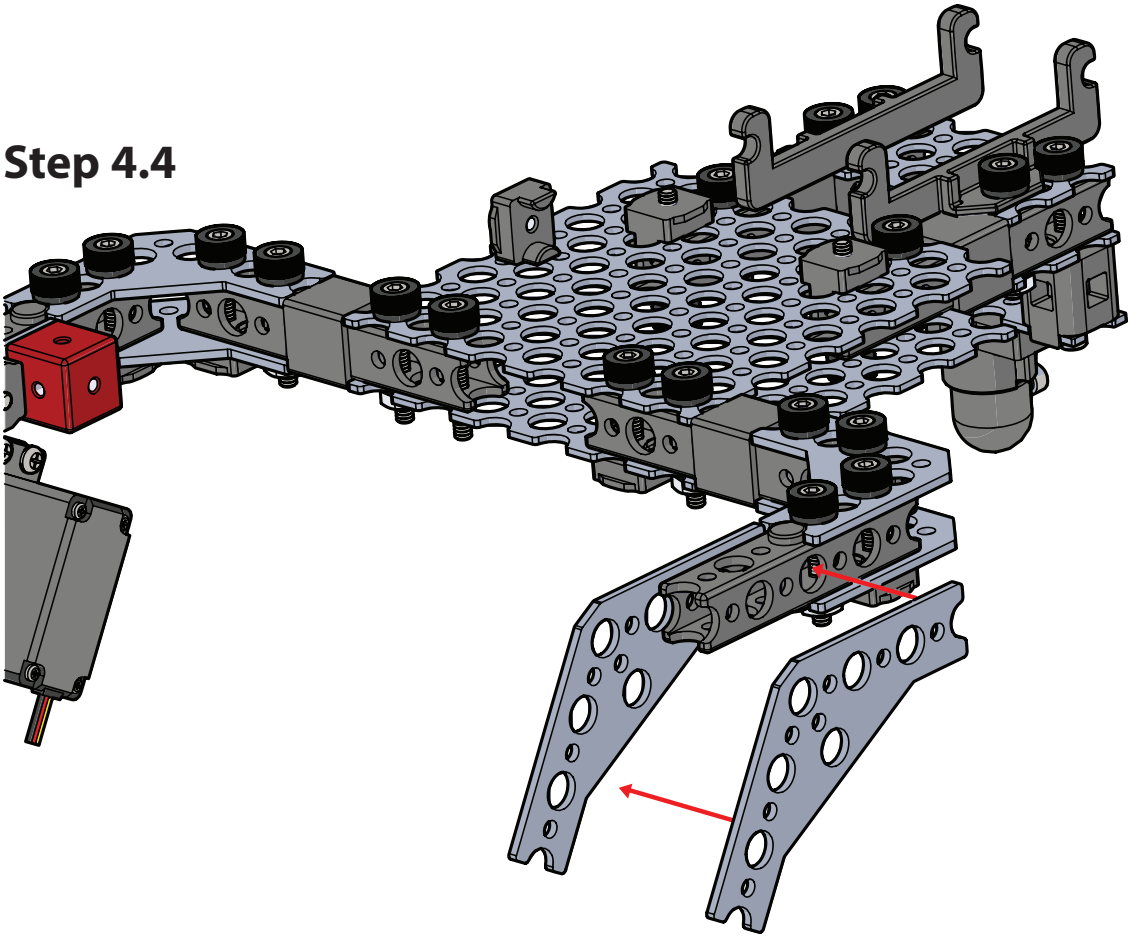
Step 4.2



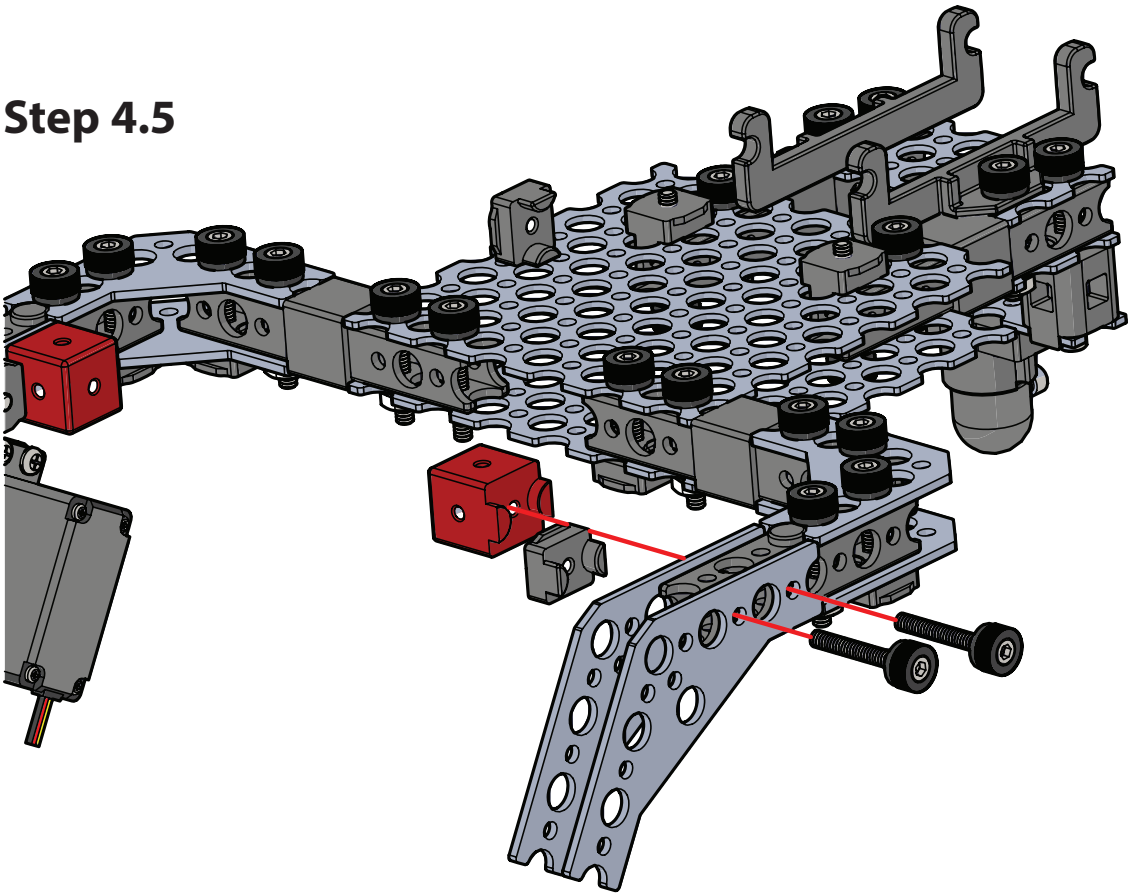
Step 4.3



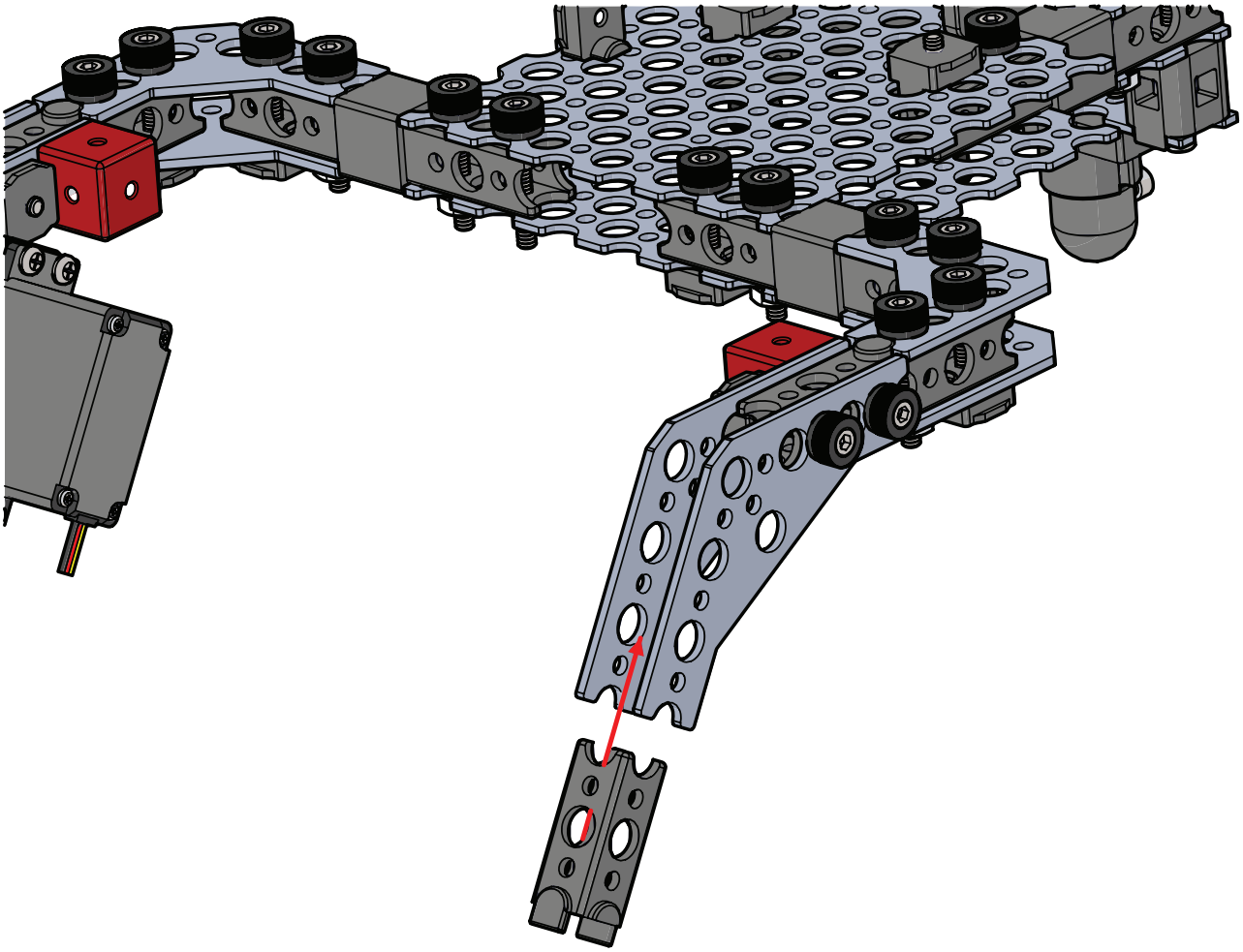
Step 4.4



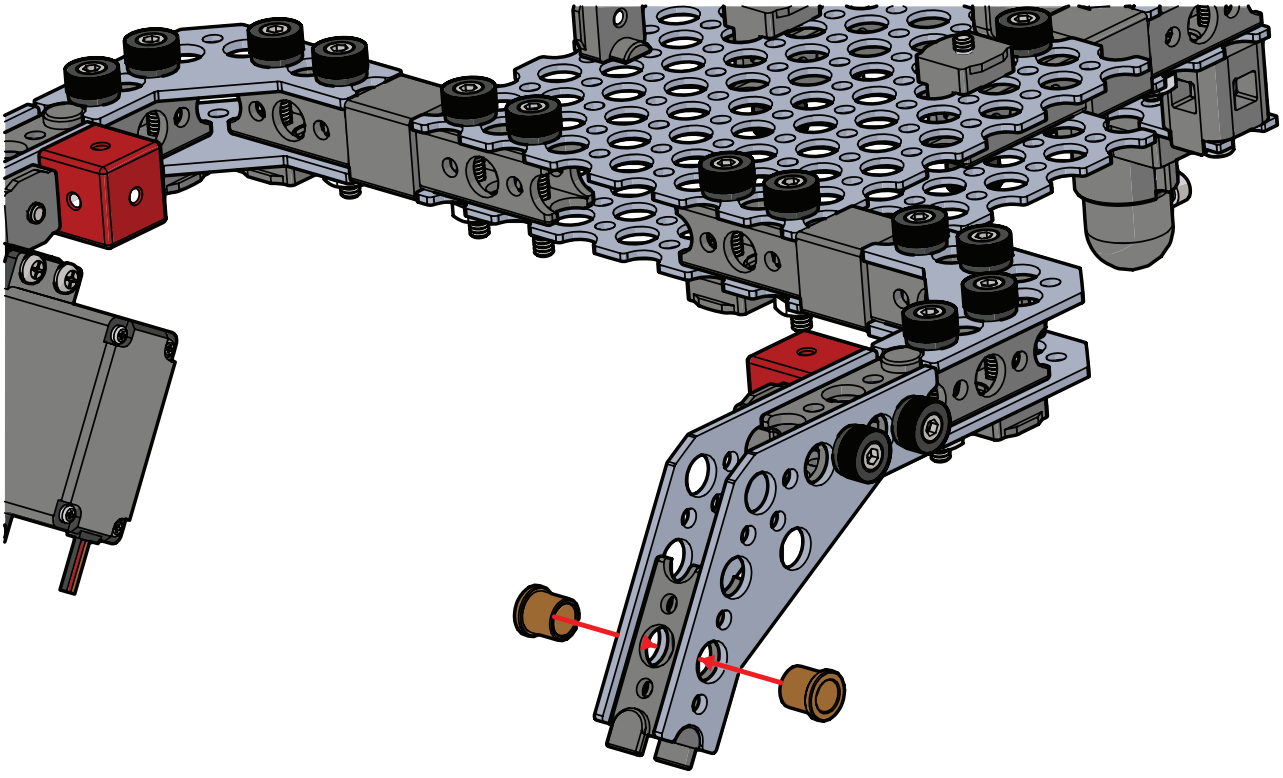
Step 4.5



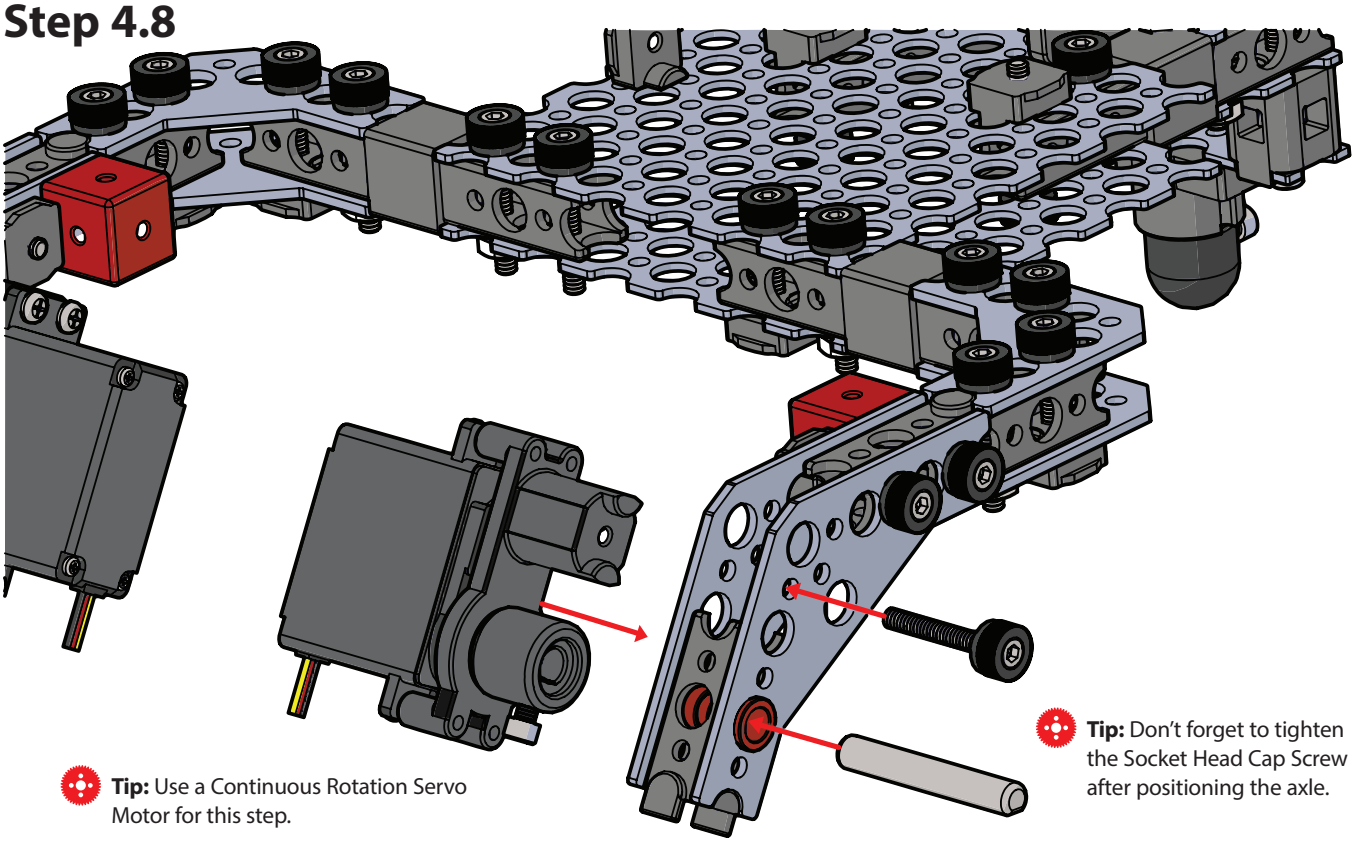
Step 4.6



Step 4.7



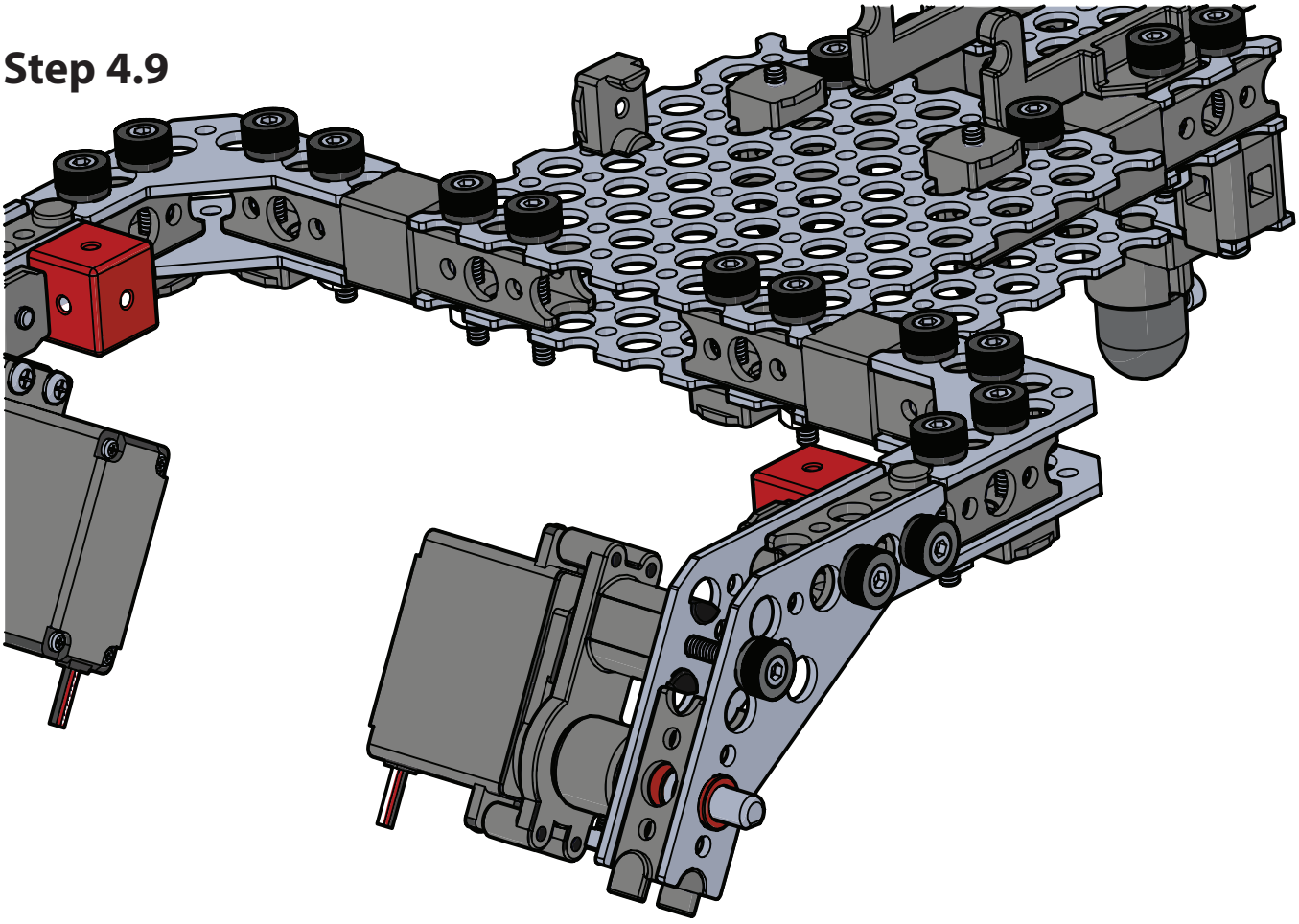
Step 4.8



Tip: Use a Continuous Rotation Servo Motor for this step.

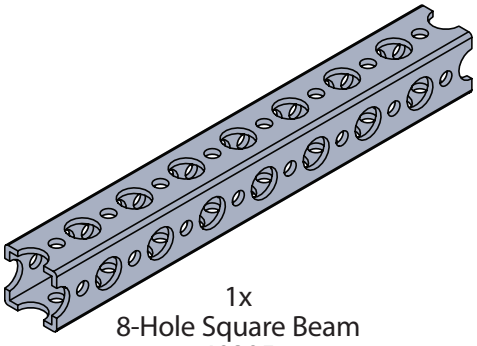
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 4.9

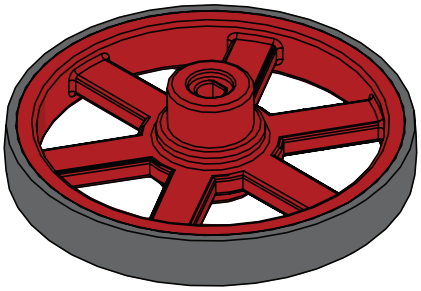


Step 5

Parts Needed



1x
8-Hole Square Beam
40205

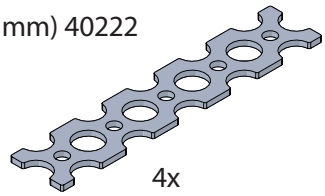


2x
Wheel with Tire (90 mm) 40222

4x
Thumbscrew
40323

4x
Wing Nut
40221

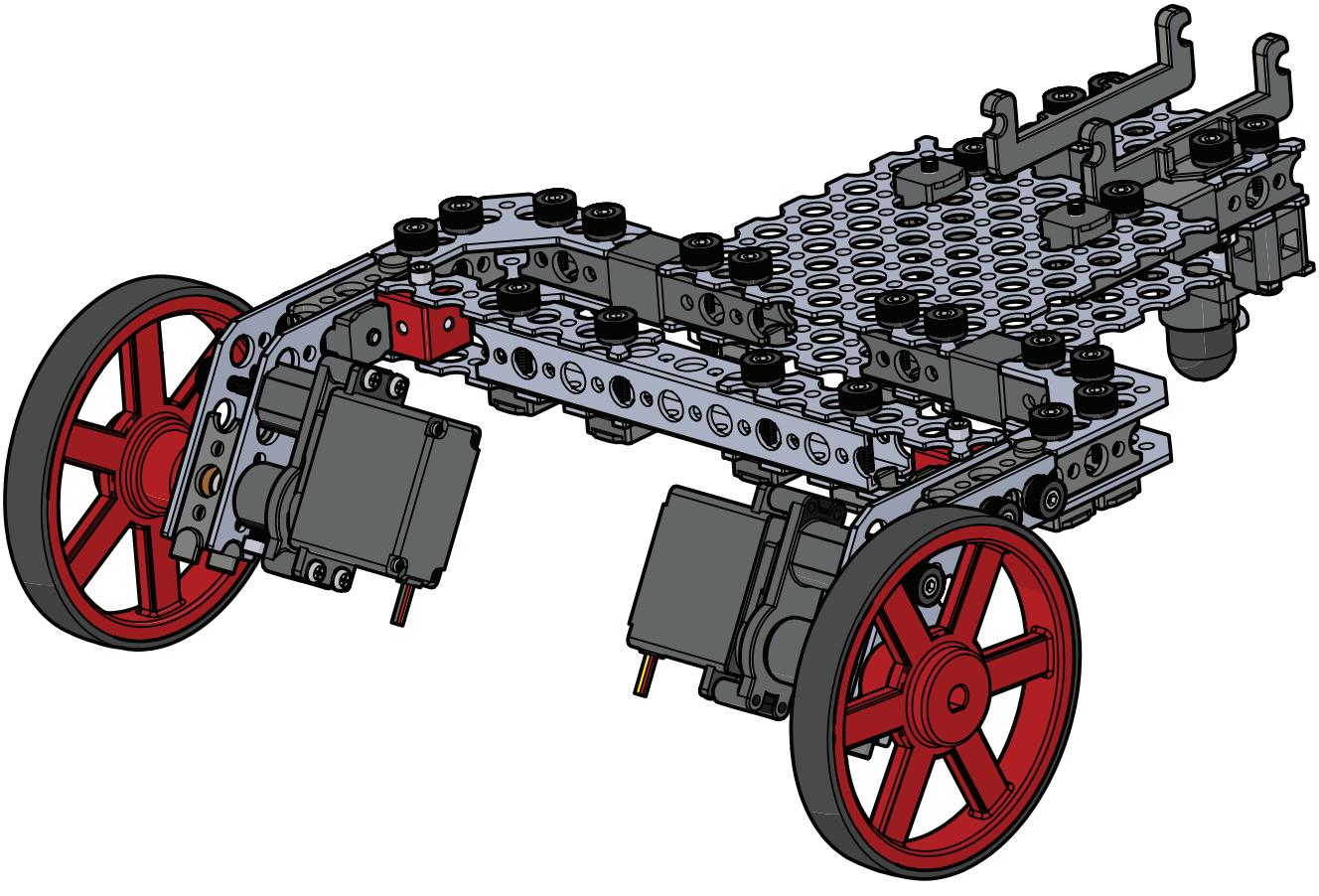
6x
Socket Head Cap
Screw 40516



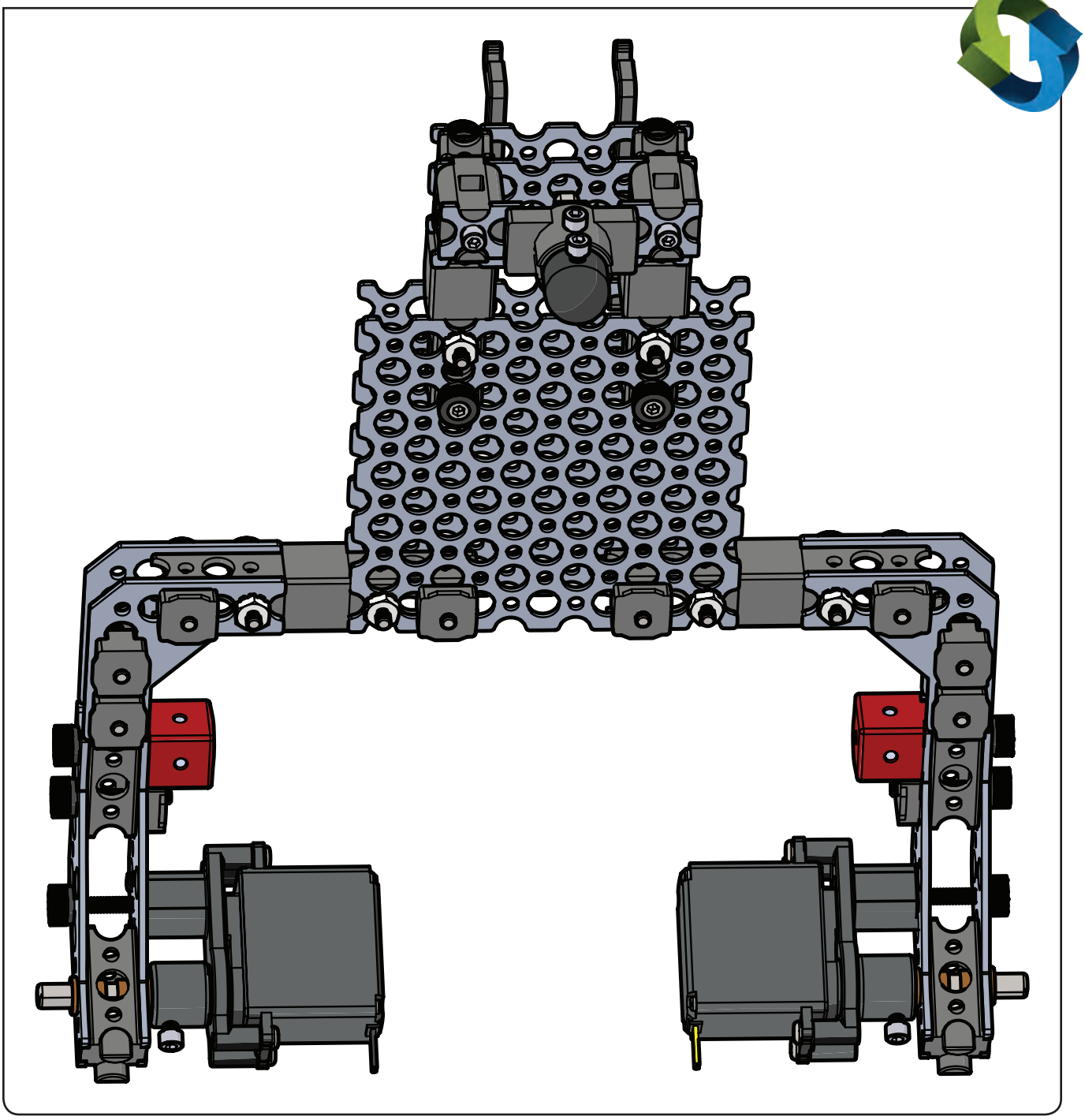
4x
5-Hole Flat Linkage
41245

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

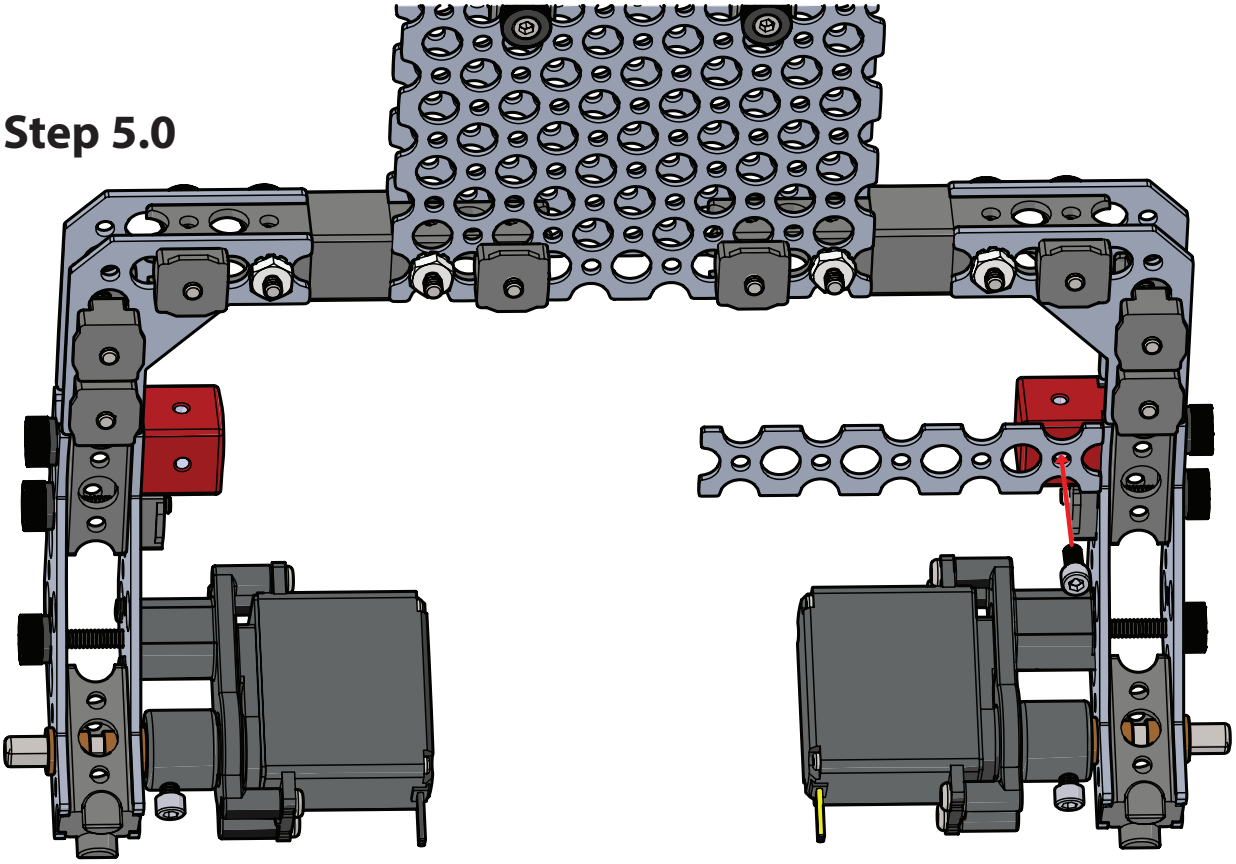
Partial assembly should look like this.



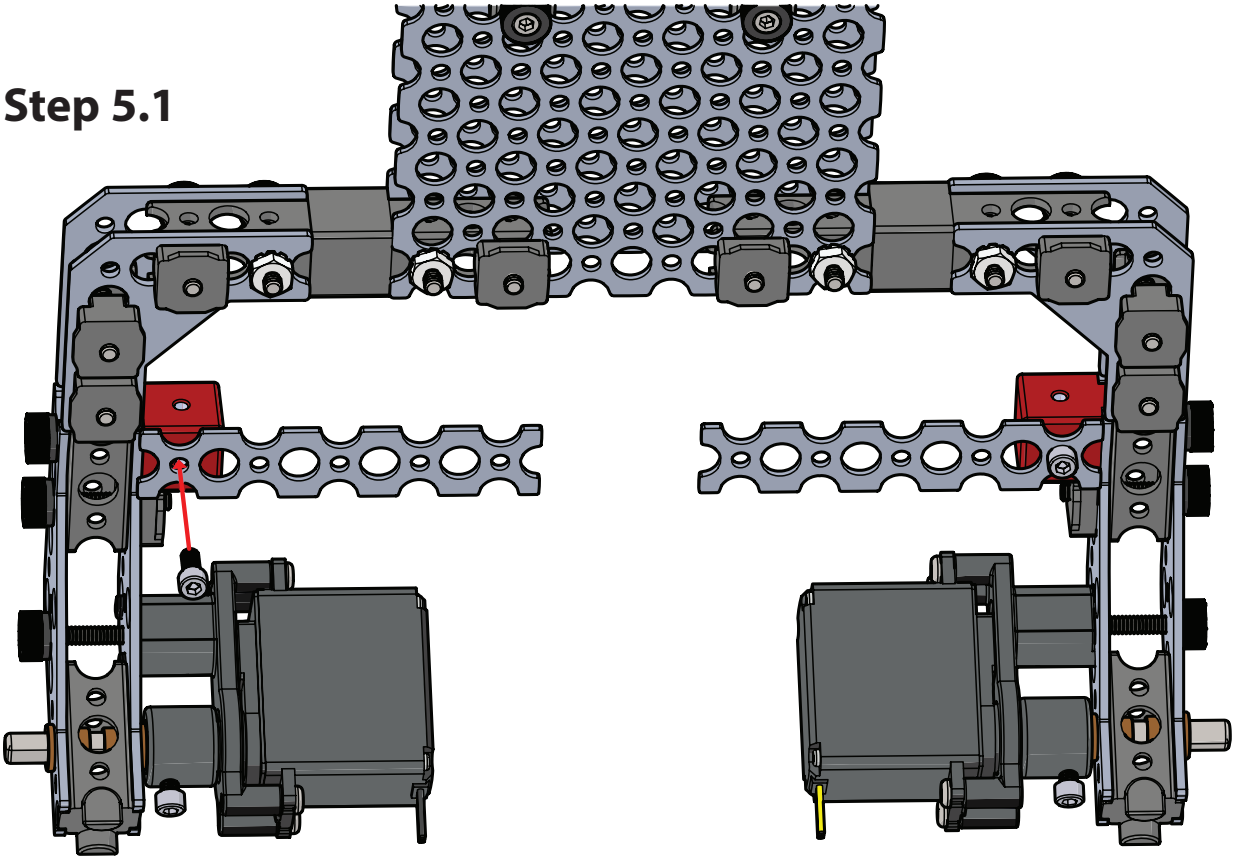
Rotate build to match this view.



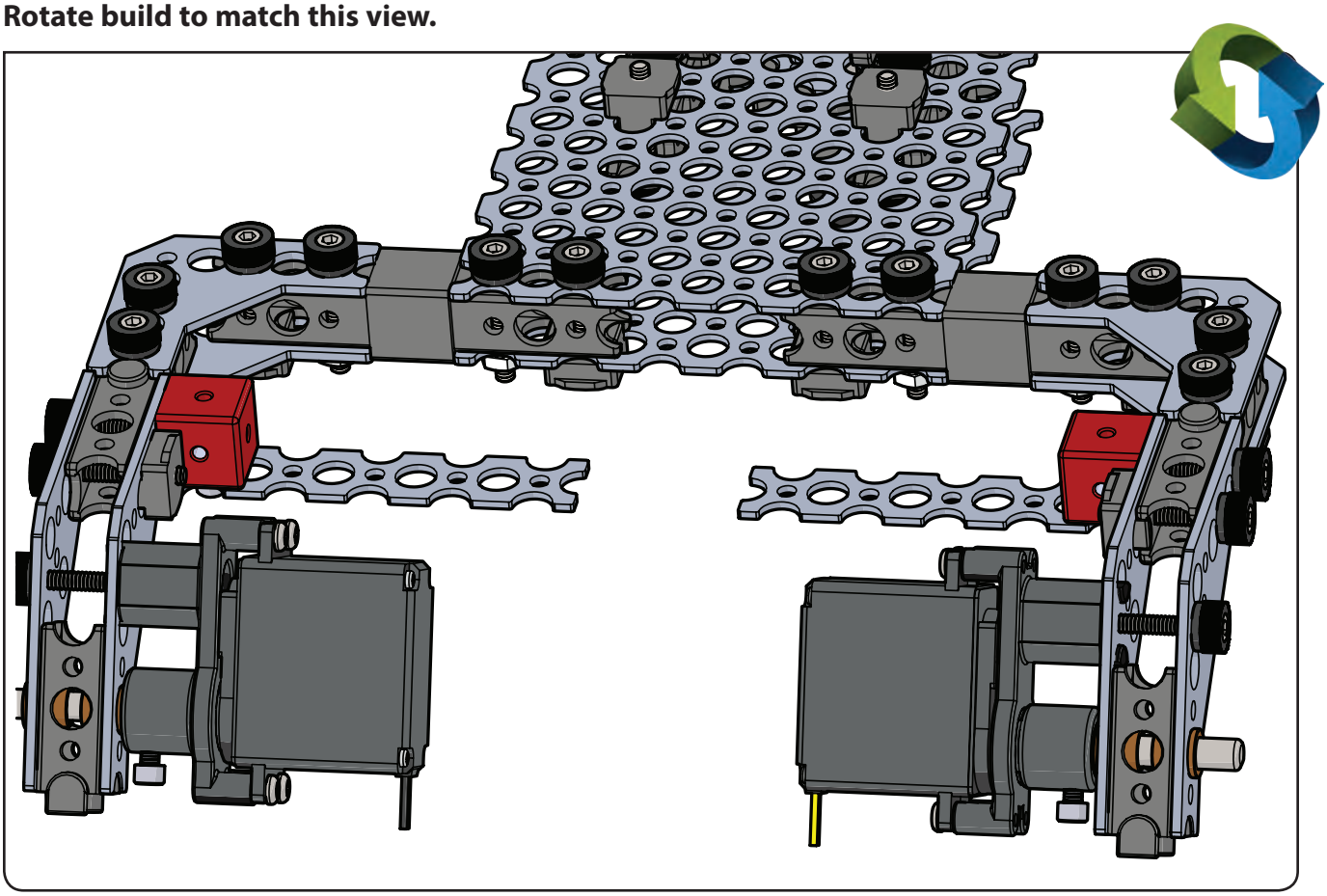
Step 5.0



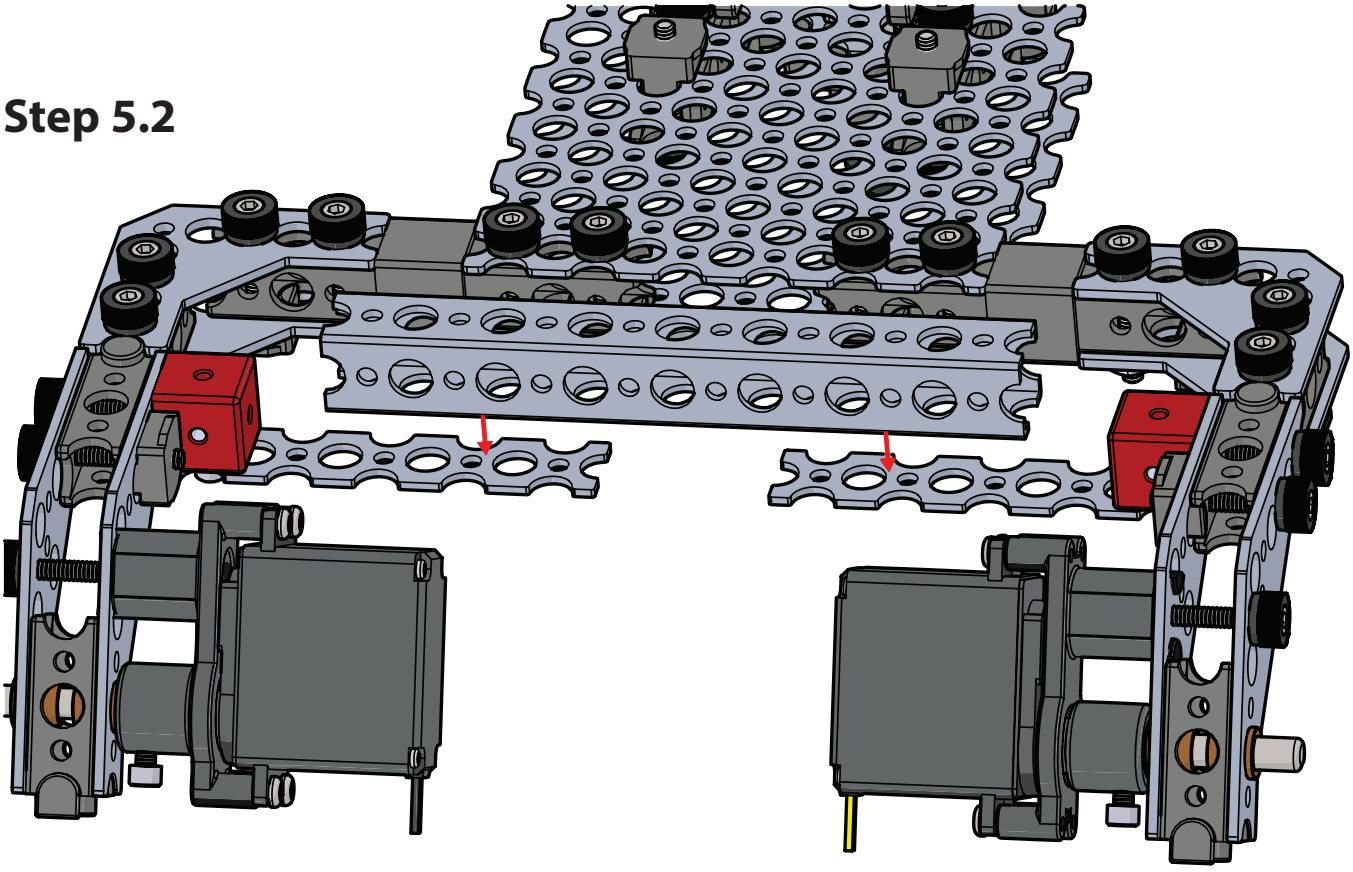
Step 5.1



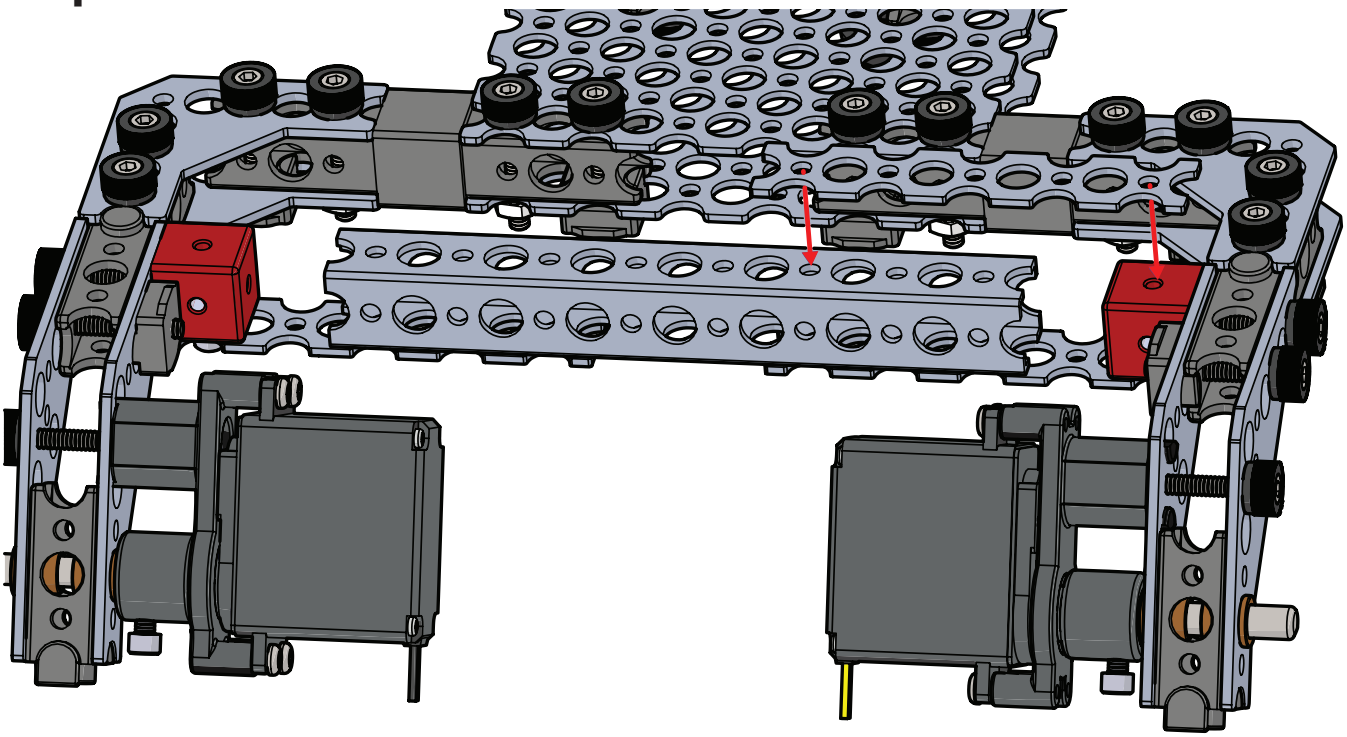
Rotate build to match this view.



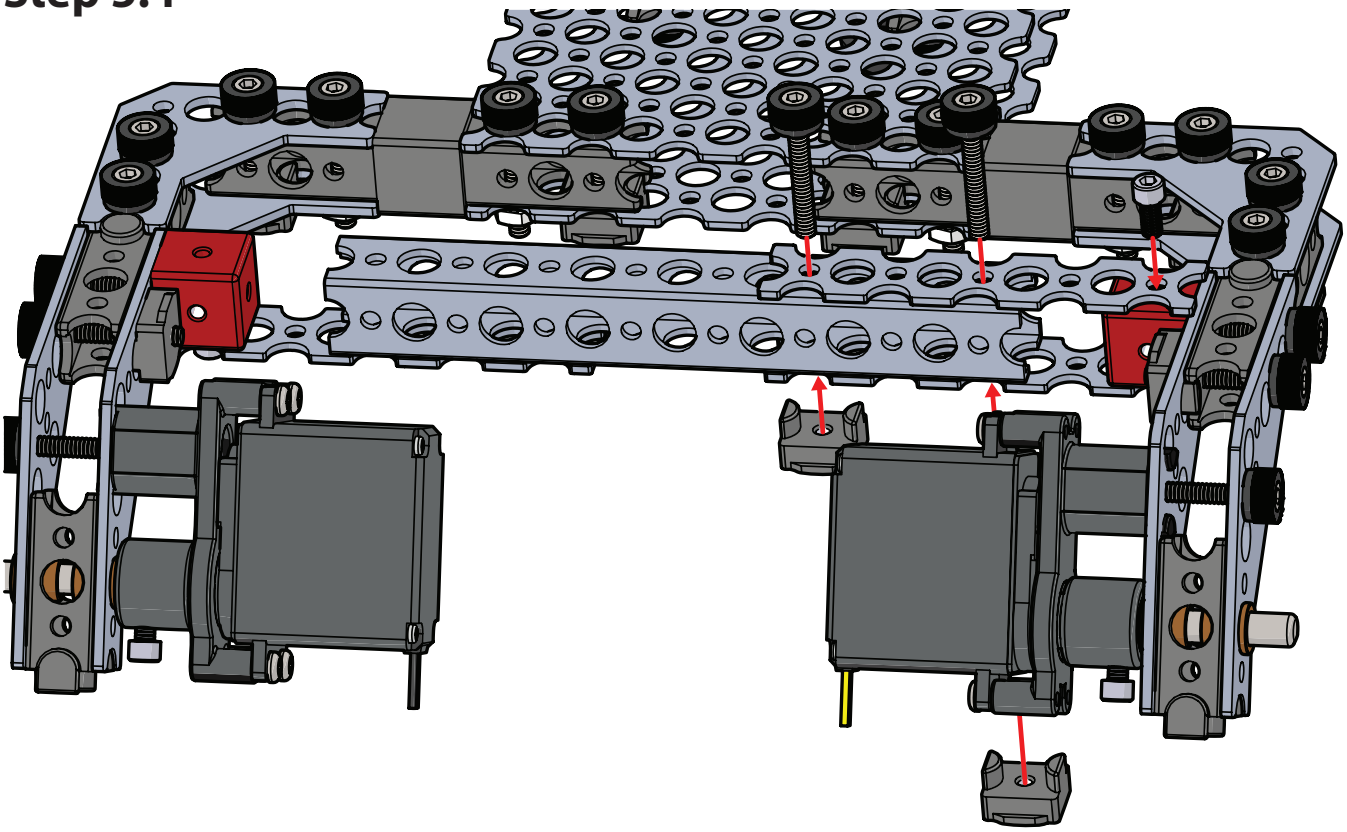
Step 5.2



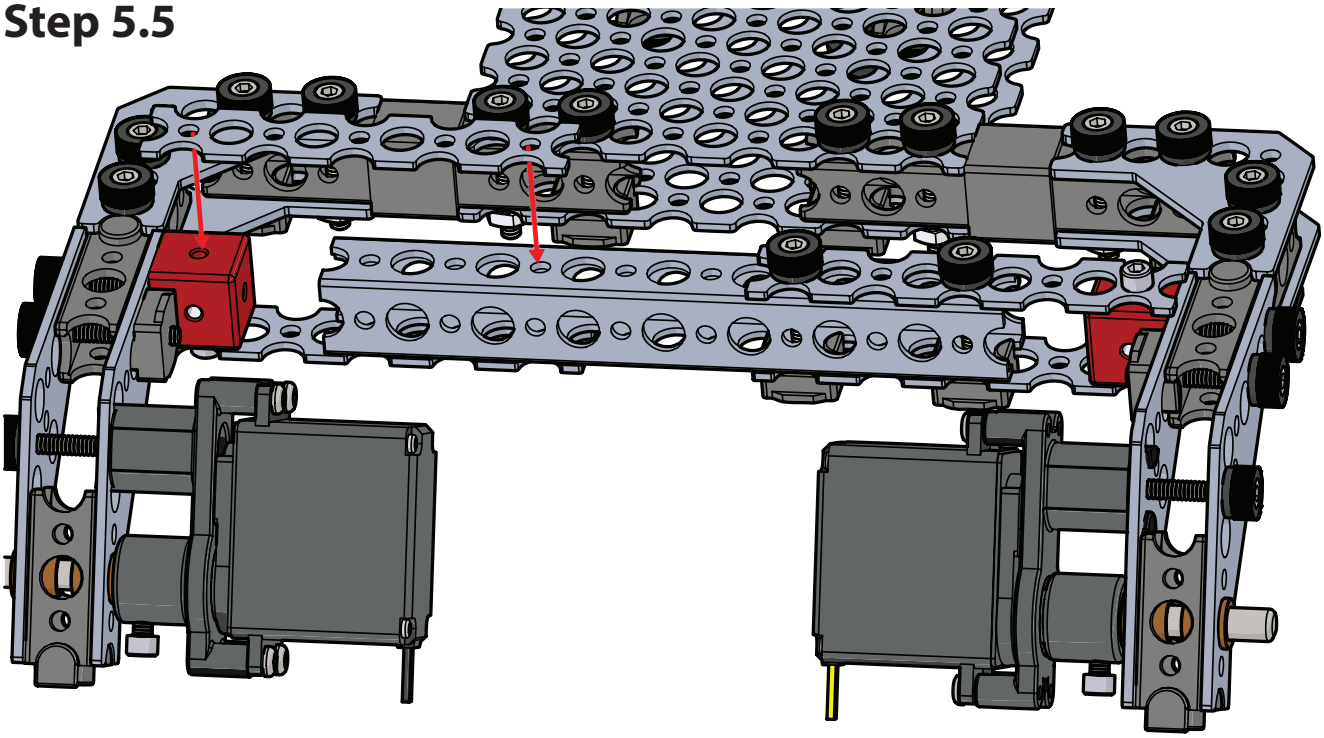
Step 5.3



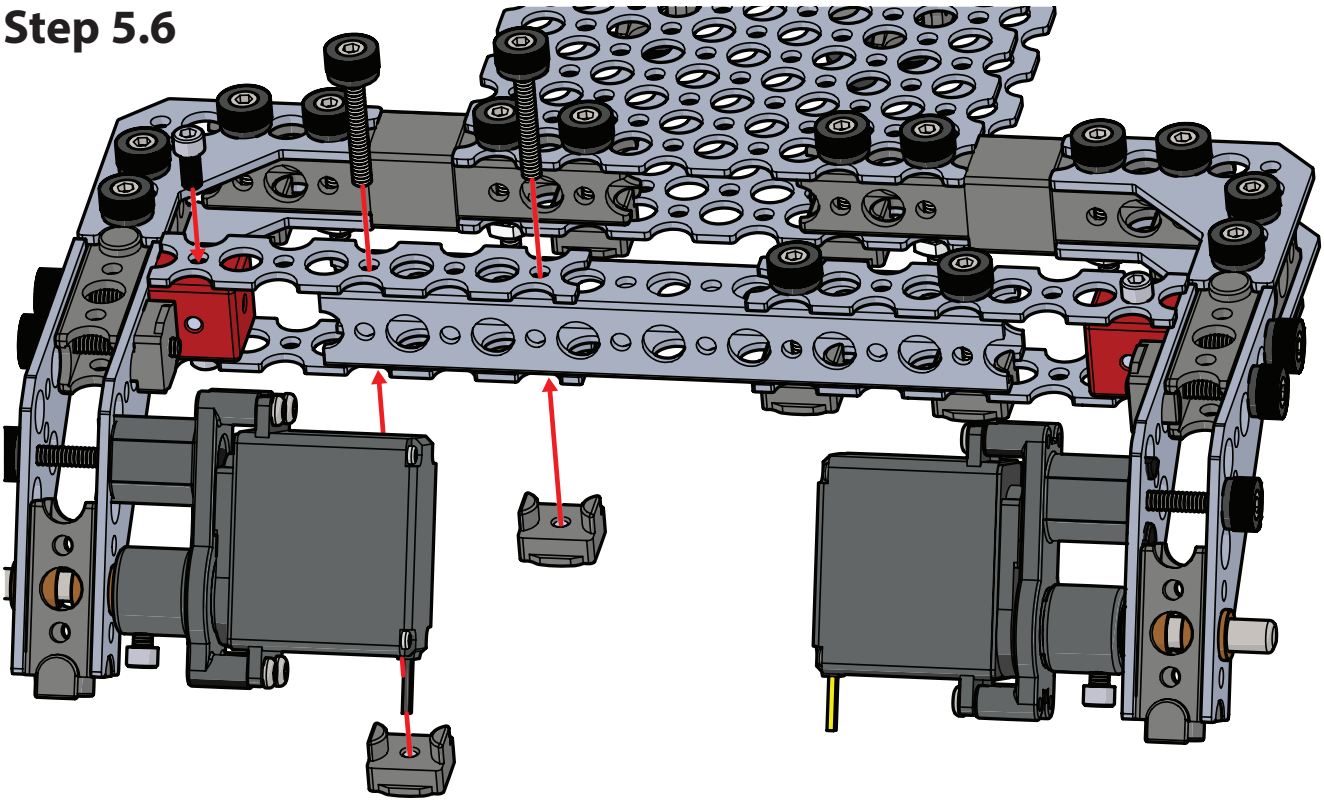
Step 5.4



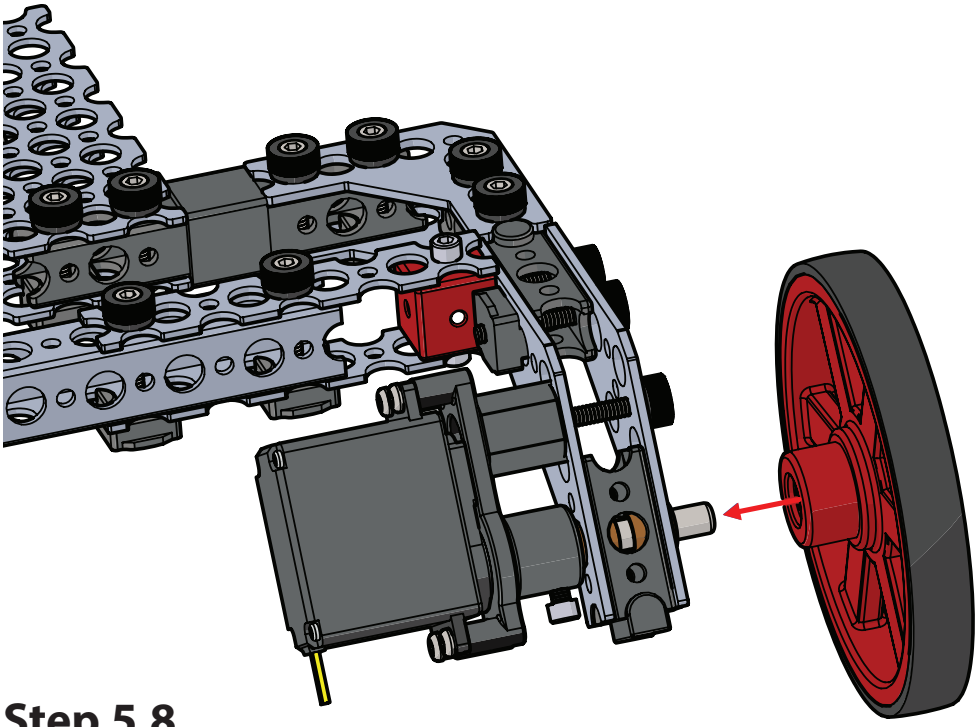
Step 5.5



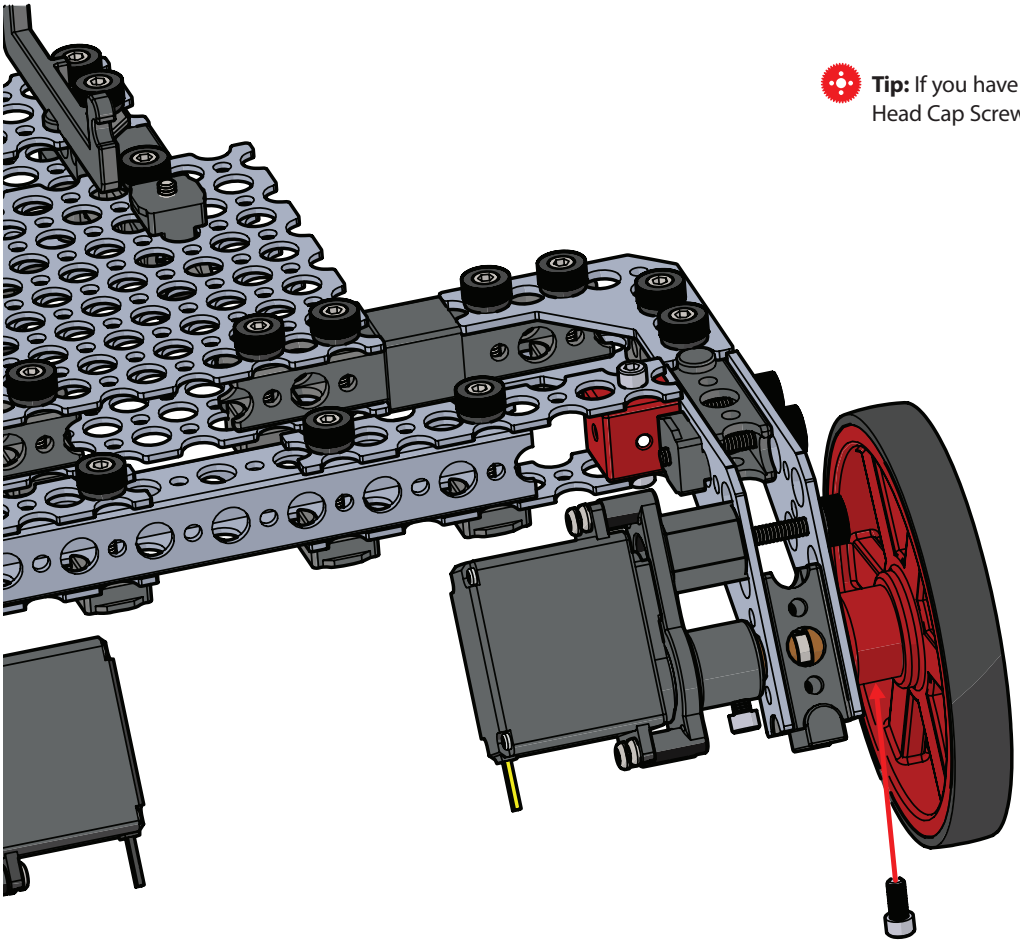
Step 5.6



Step 5.7

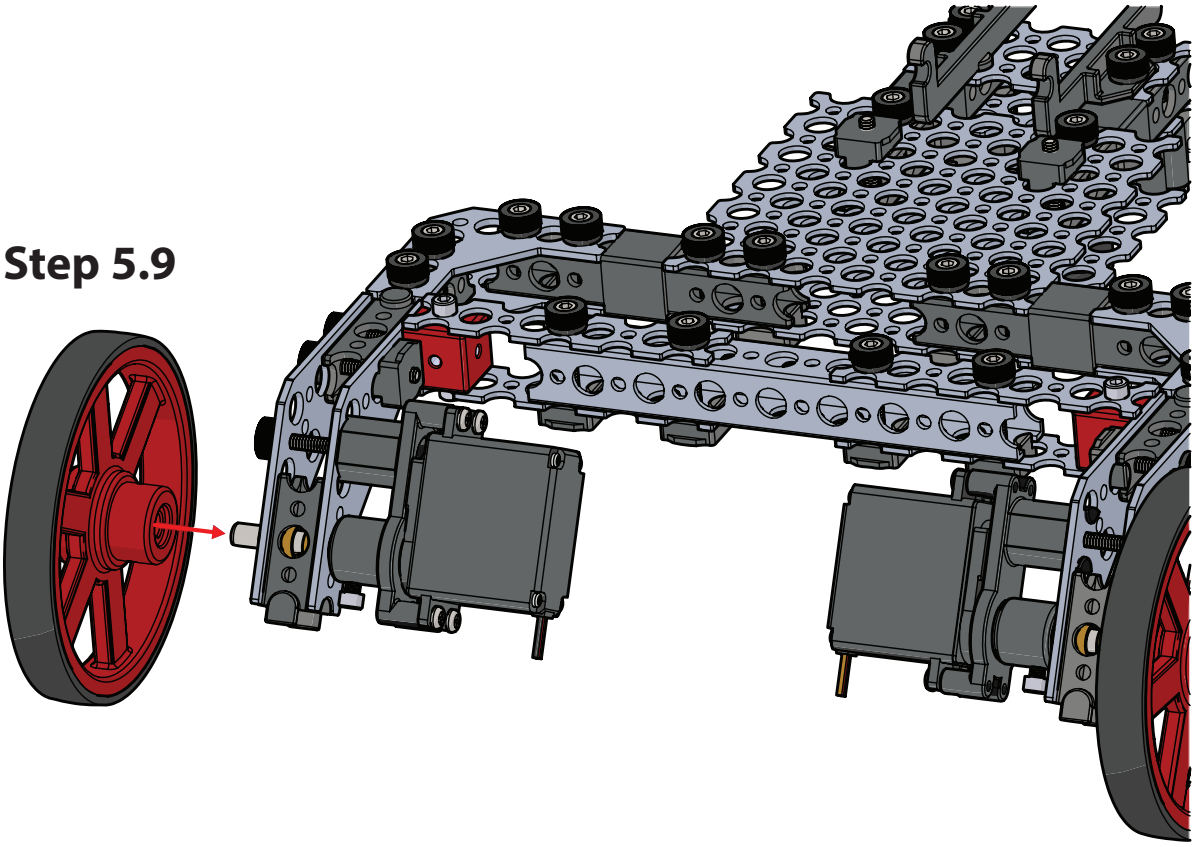


Step 5.8

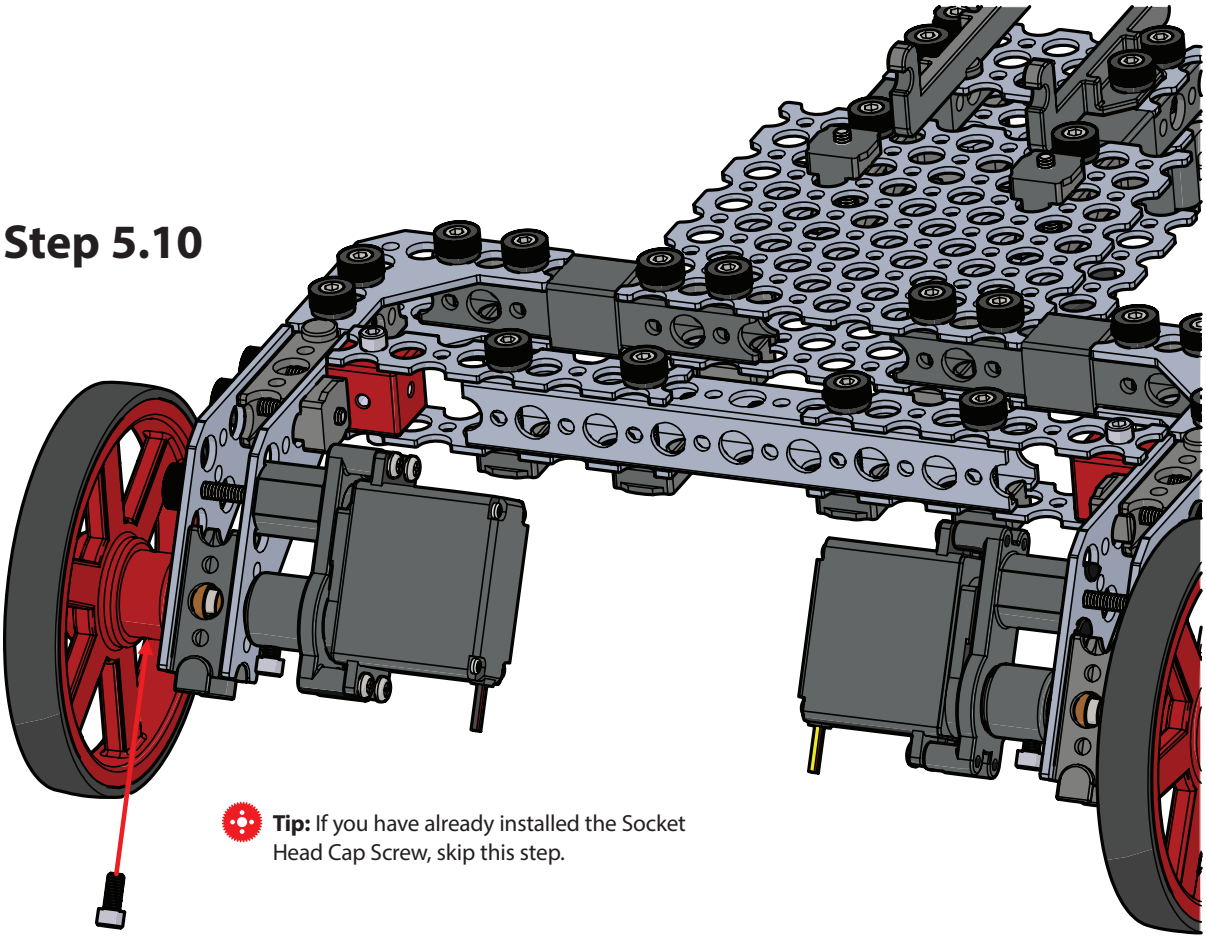


Tip: If you have already installed the Socket Head Cap Screw, skip this step.

Step 5.9



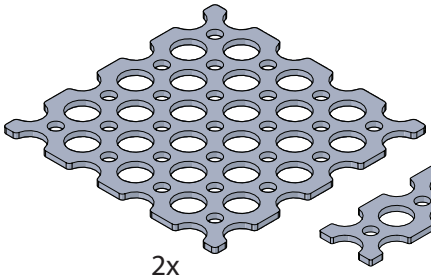
Step 5.10



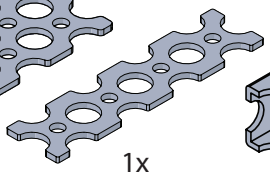
Tip: If you have already installed the Socket Head Cap Screw, skip this step.

Step 6

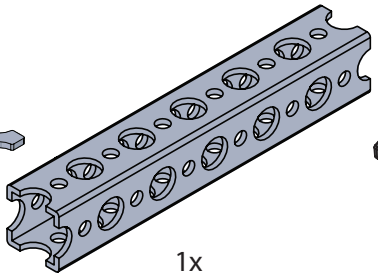
Parts Needed



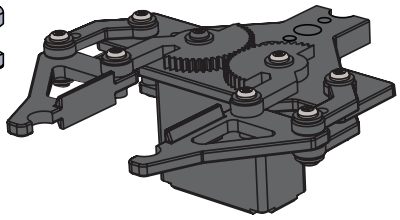
2x
4 x 4 Hole Plate
41261



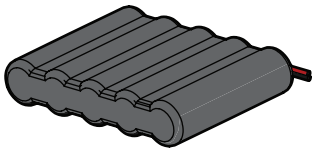
1x
4-Hole Flat Linkage
41244



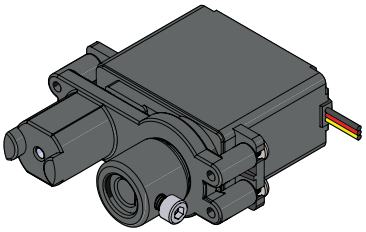
1x
6-Hole Square
Beam 40203



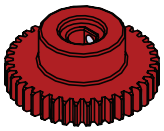
1x
Gripper Kit
40234



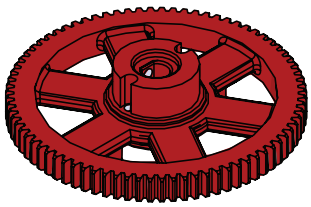
1x
6 V NiMH Battery
Pack 40235



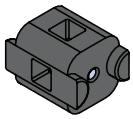
1x
Standard-Scale Servo Motor 40538
with Servo Mounting Bracket 40232
(Assembly instructions on pages 18-19.)



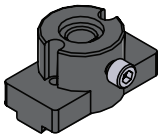
1x
40-Tooth Plastic
Gear 40223



1x
80-Tooth Plastic
Gear 40224

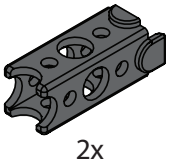


1x
Straight Block Beam
Connector 40216

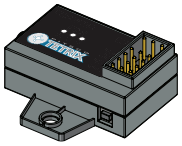


1x
Beam Attachment
Hub 40228

3x
Socket Head Cap
Screw 40516



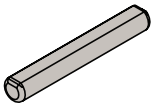
2x
Beam End
Connector 40214



1x
4-channel wireless
receiver from Wireless
Joystick Gamepad
System 40239

1x
Shaft Servo Hub
40230

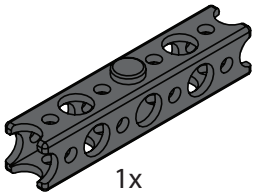
4x
8 mm x 6 mm
Bronze Bushing
40227



2x
40 mm Steel
Axle 40226

10x
Thumbscrew
40323

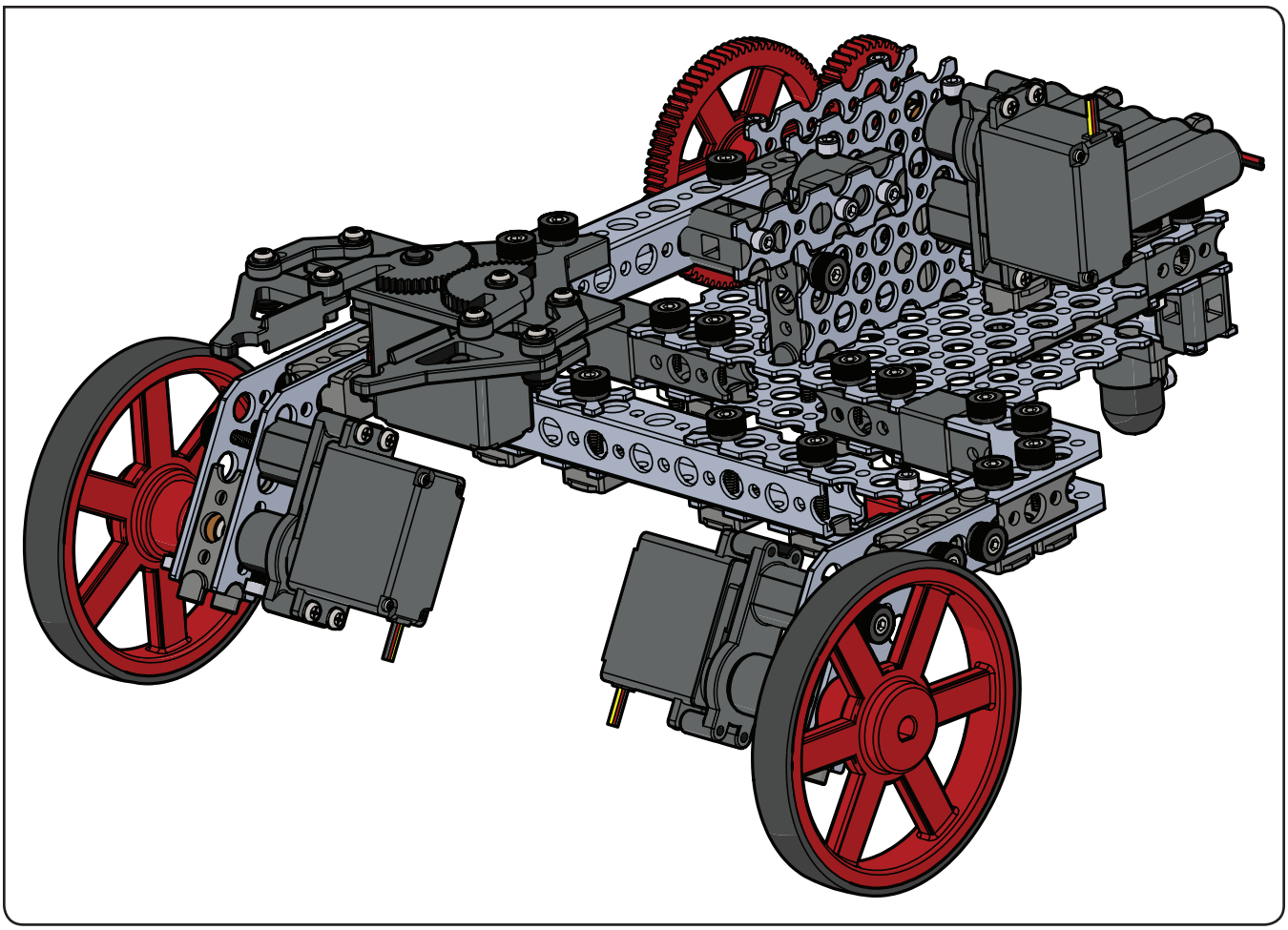
6x
Wing Nut
40221



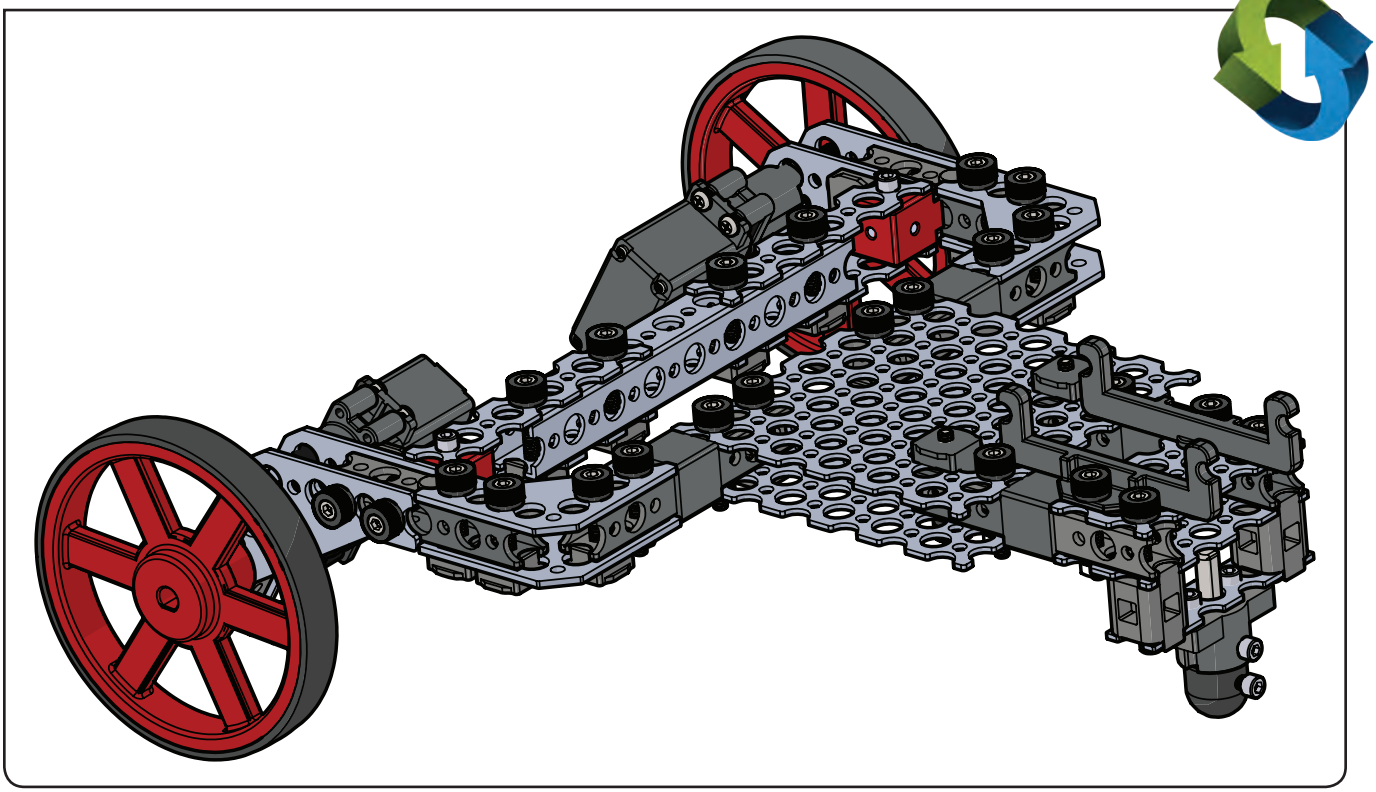
1x
Beam Extension
Connector 40322

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

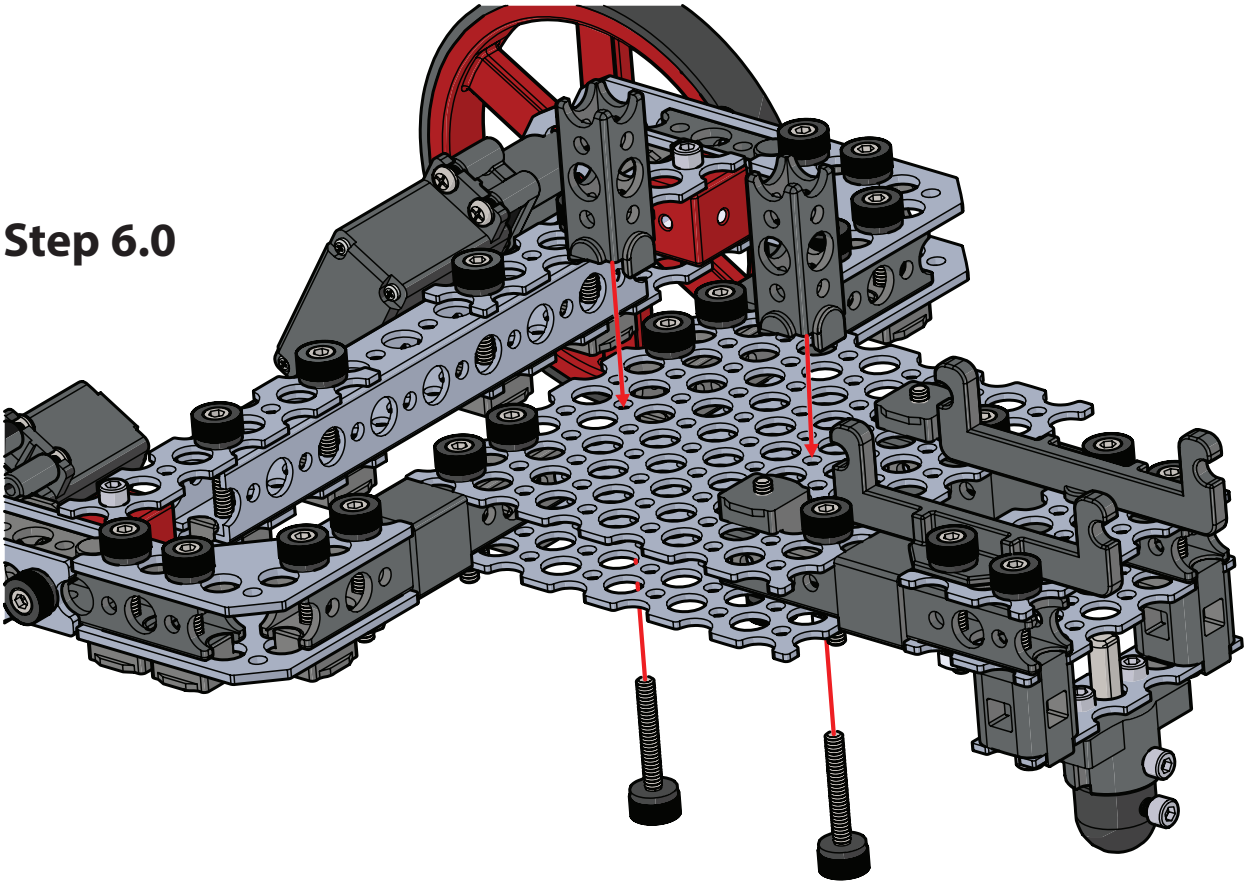
Finished assembly should look like this.



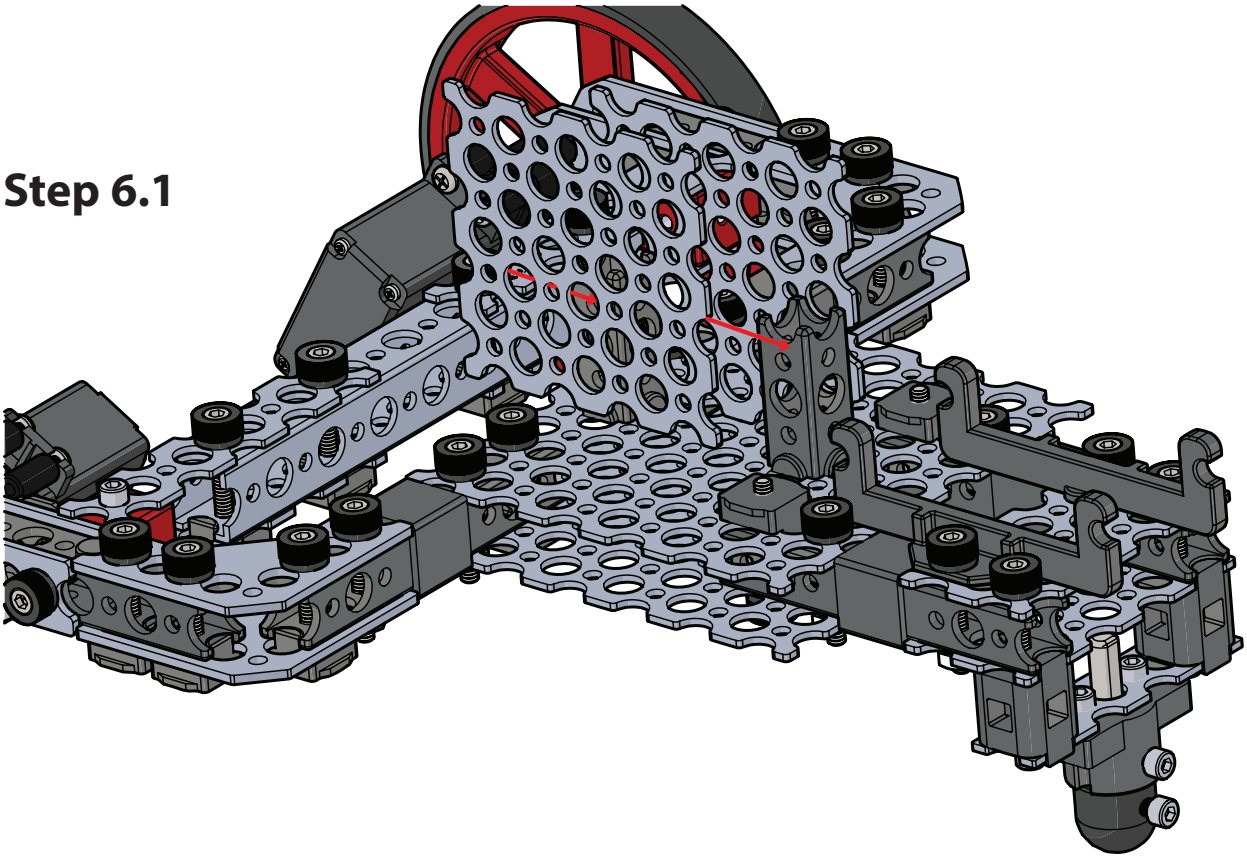
Rotate build to match this view.



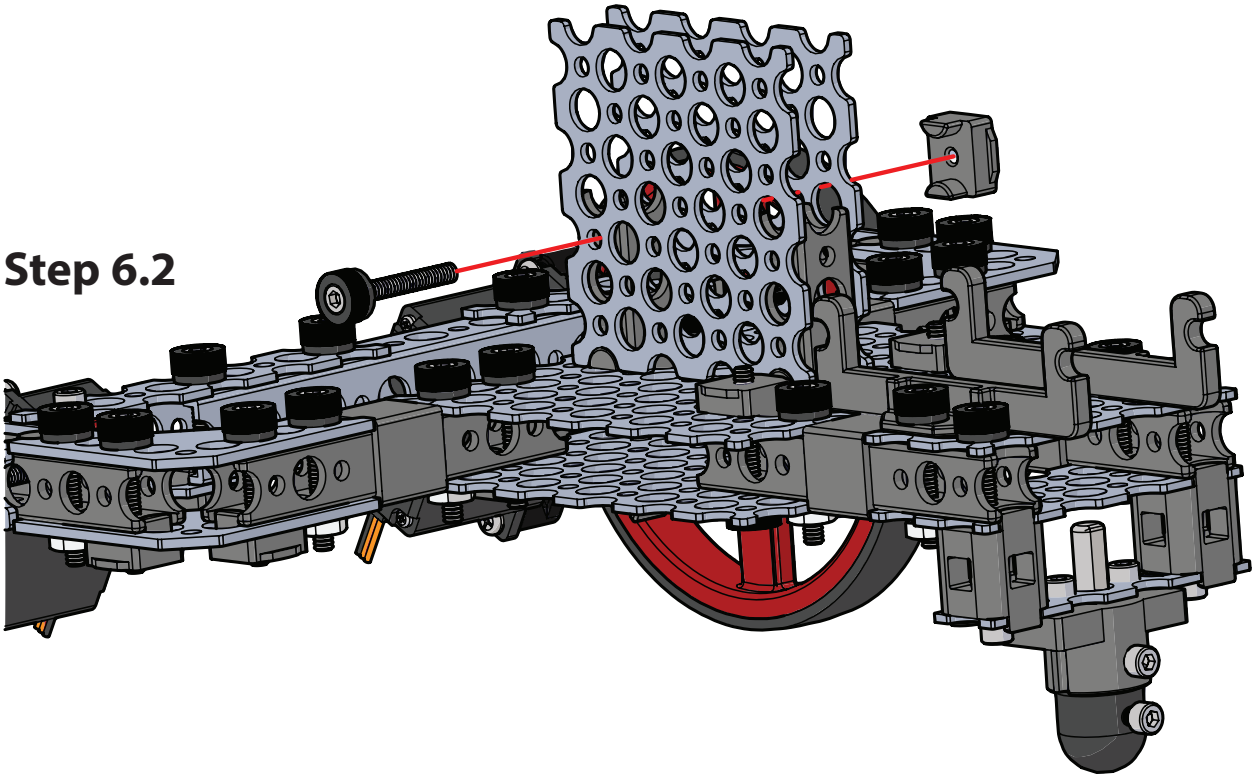
Step 6.0



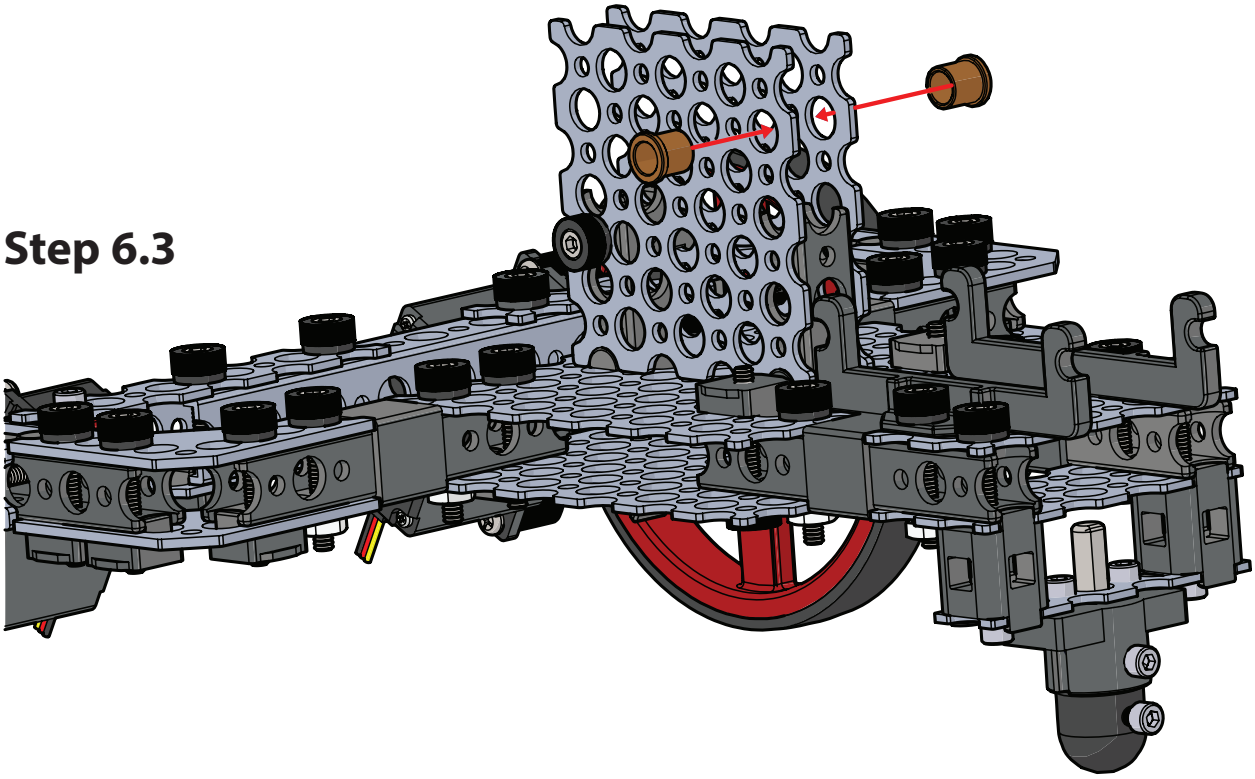
Step 6.1



Step 6.2

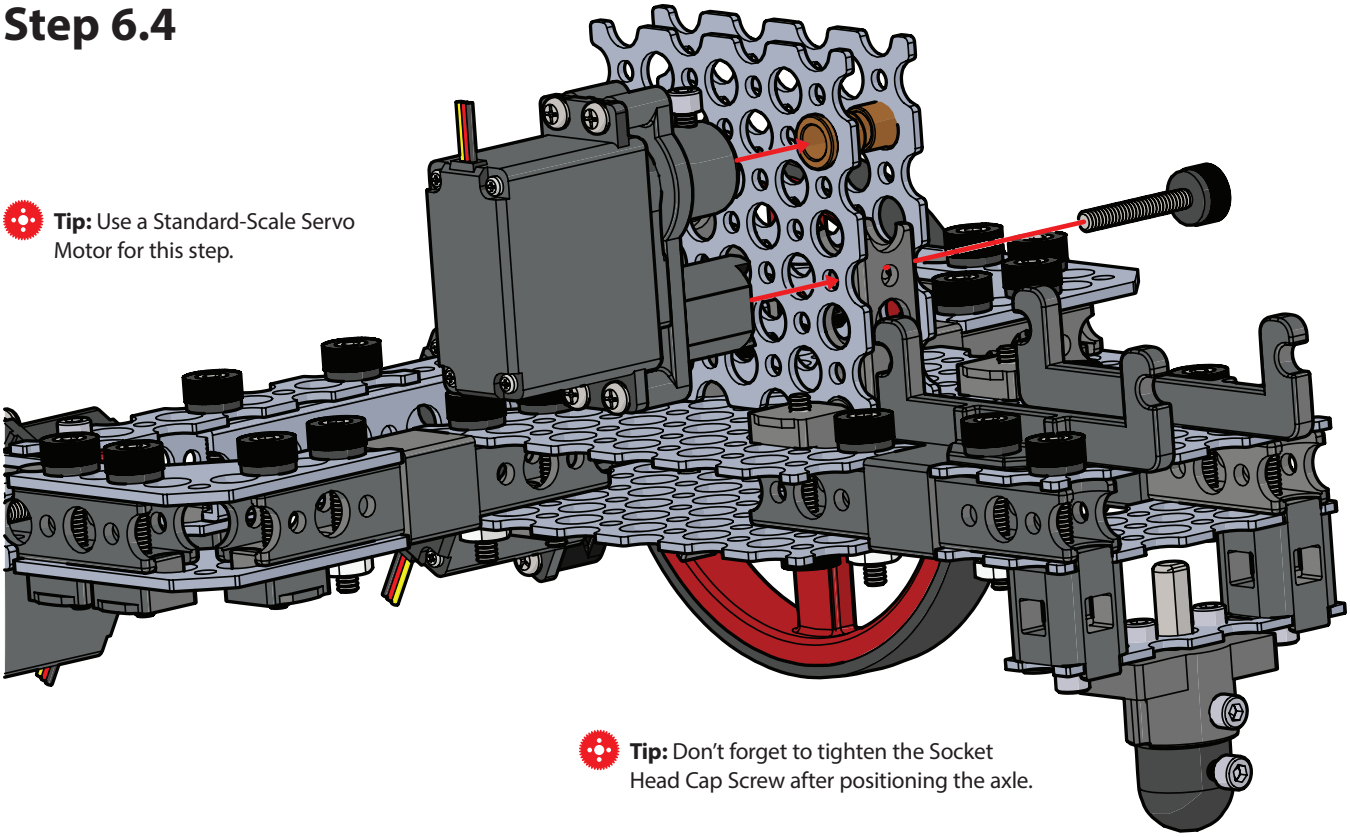


Step 6.3



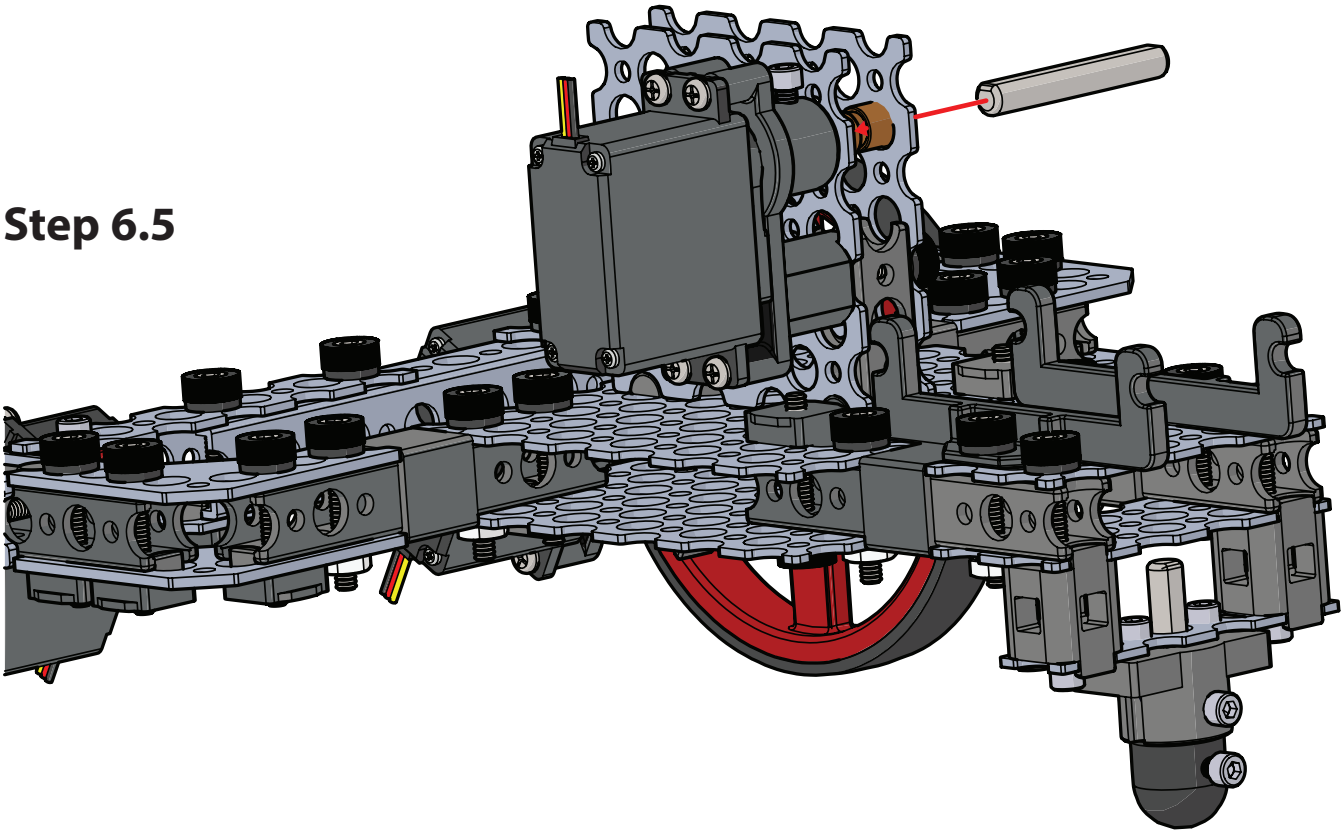
Step 6.4

Tip: Use a Standard-Scale Servo Motor for this step.



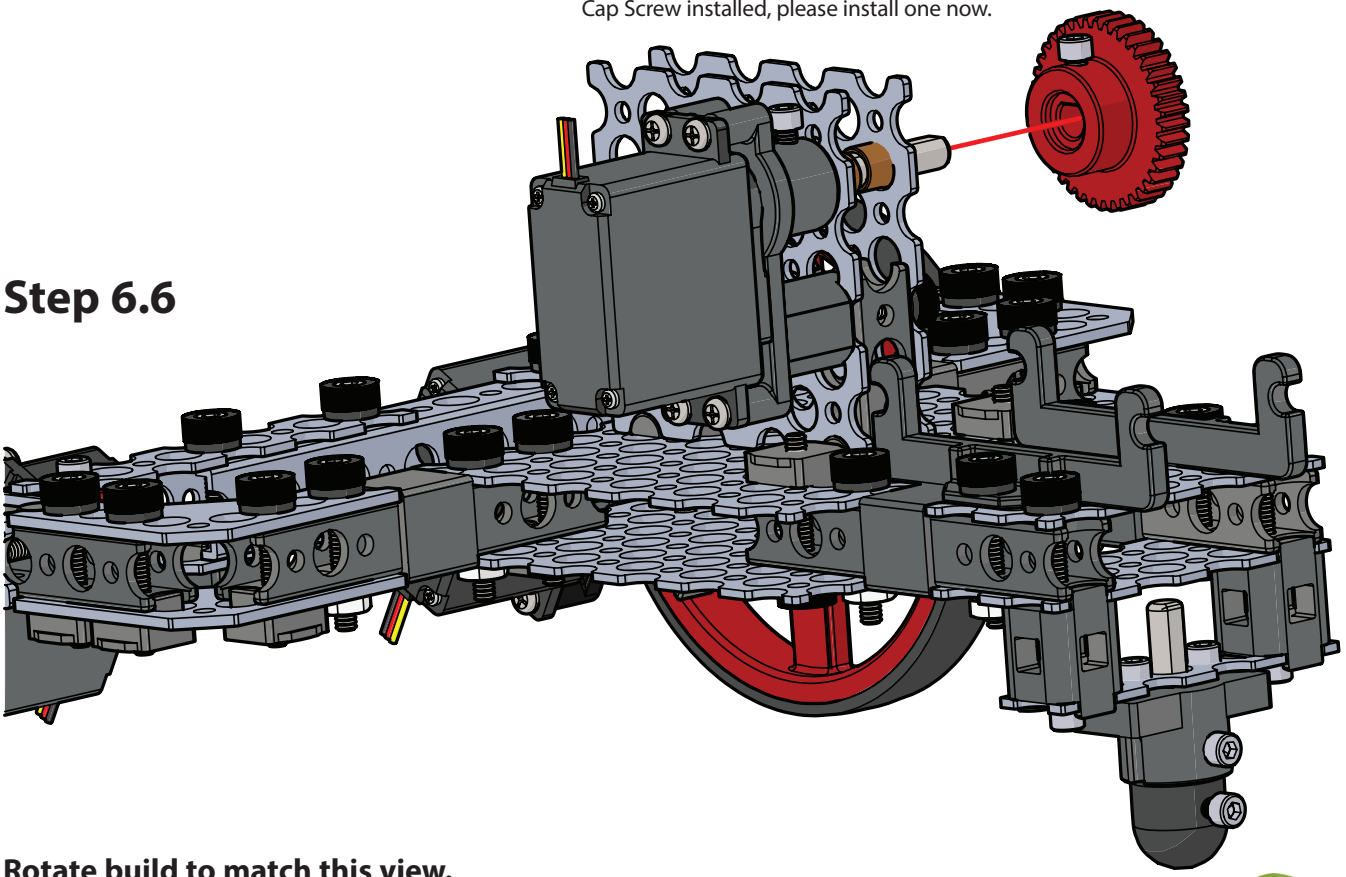
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 6.5

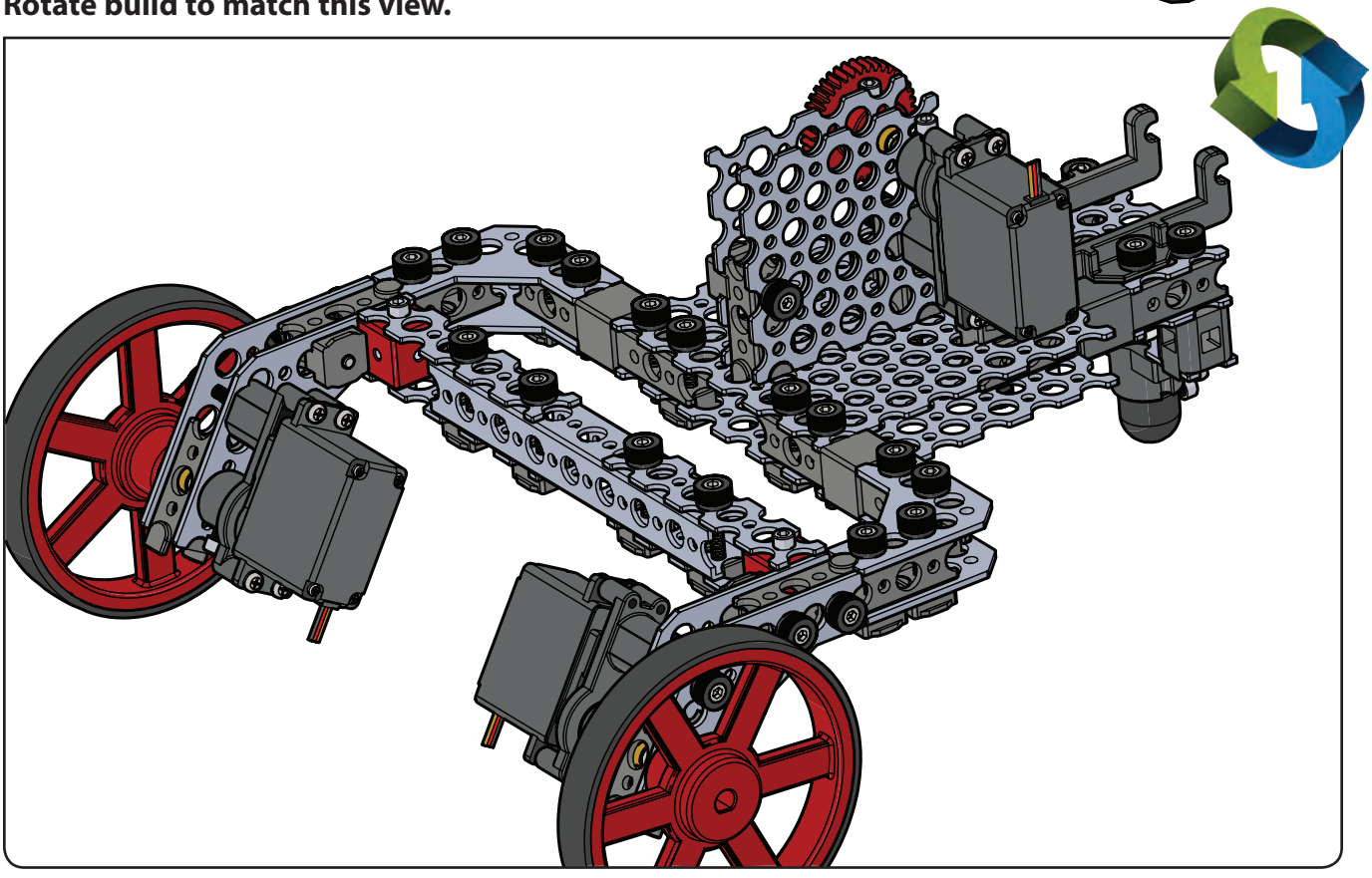


Tip: If the gear does not have a Socket Head Cap Screw installed, please install one now.

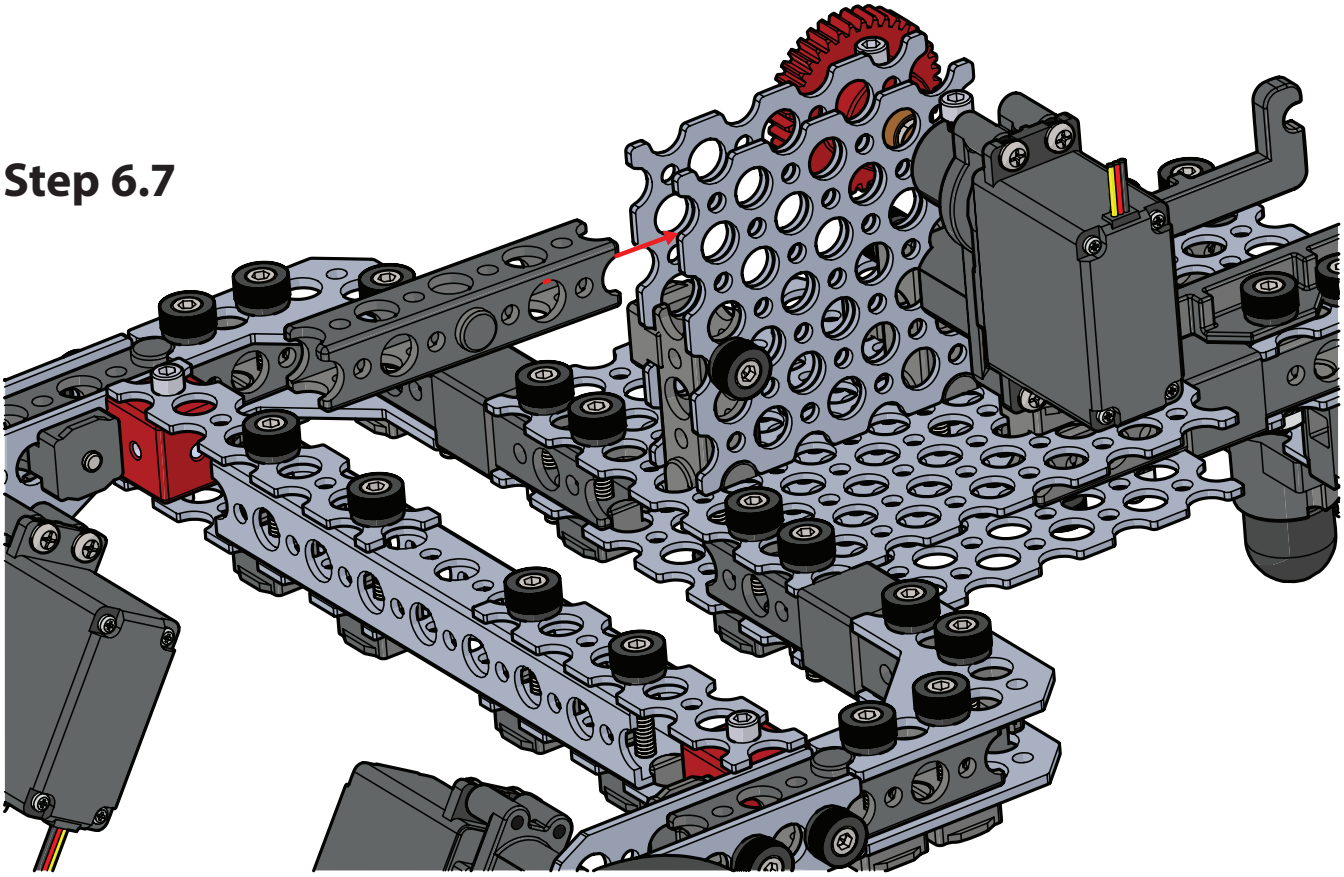
Step 6.6



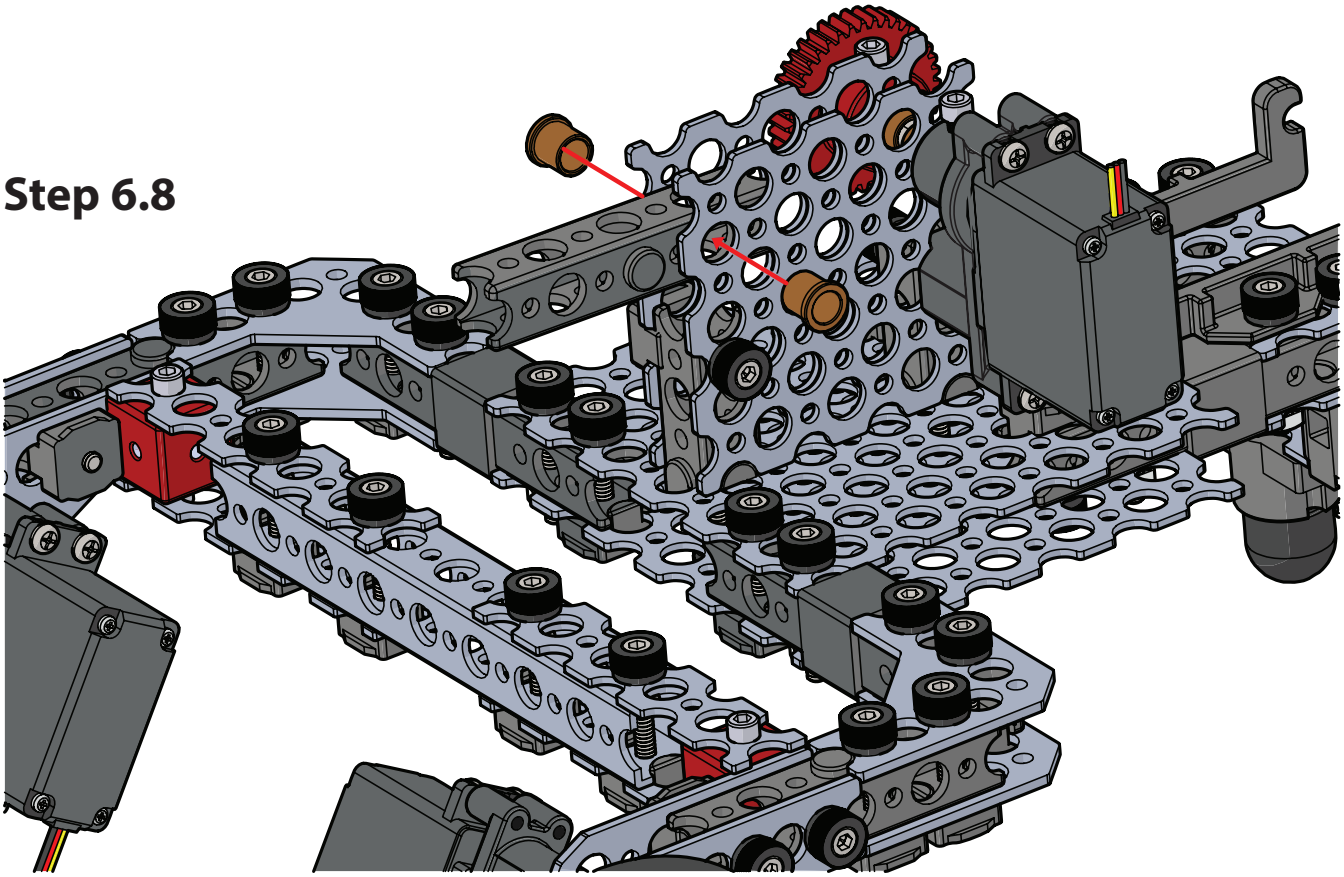
Rotate build to match this view.



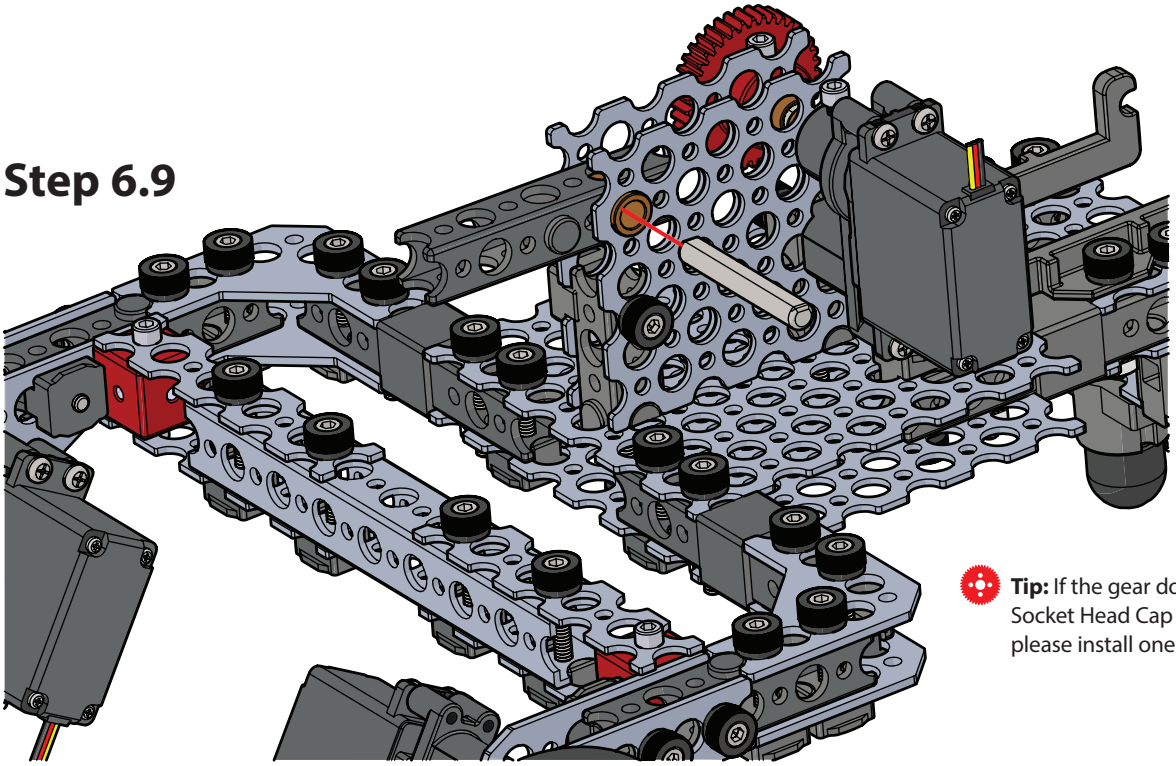
Step 6.7



Step 6.8



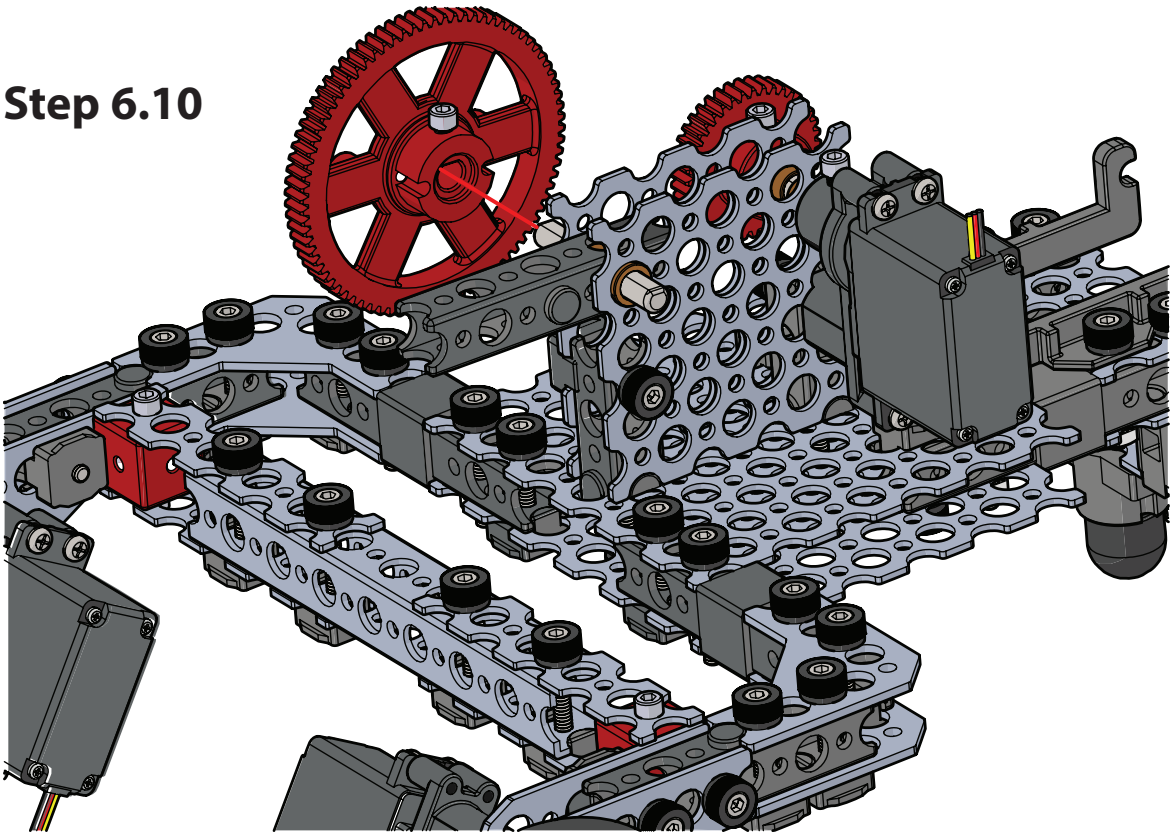
Step 6.9



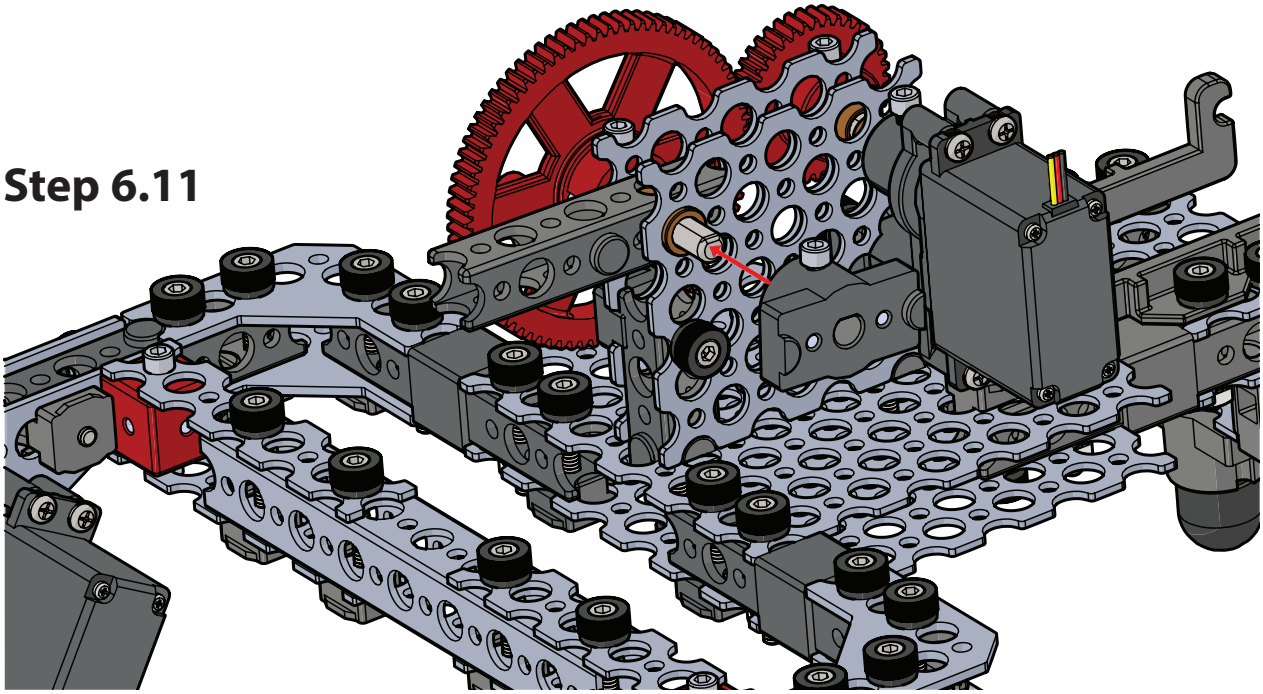
Tip: If the gear does not have a Socket Head Cap Screw installed, please install one now.

Tip: Please note position of Socket Head Cap Screws on both gears. If gears are engaged so that both Socket Head Cap Screws are in the 12 o'clock position, then the arm will have an average range of motion. Range of motion can be adjusted by changing gear position.

Step 6.10

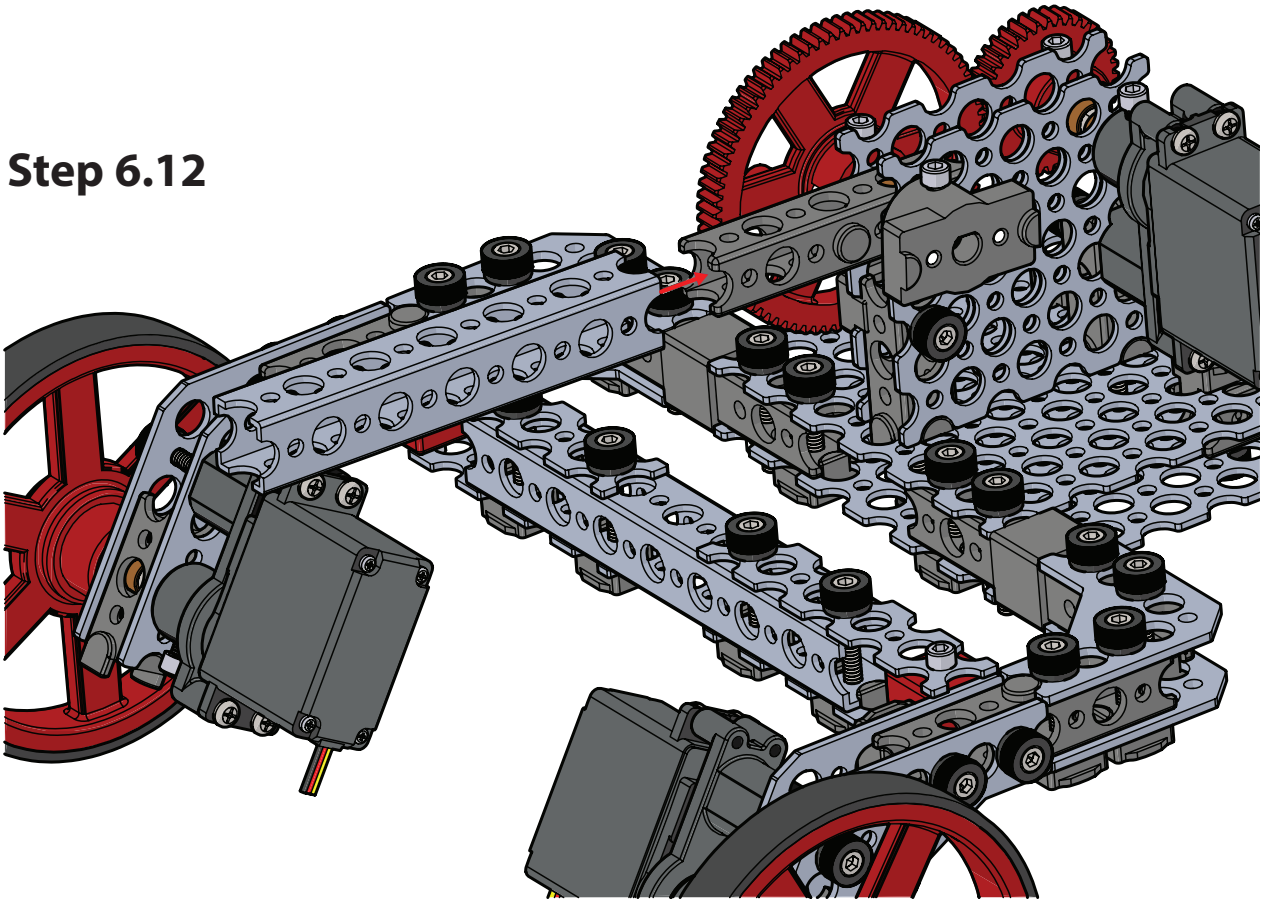


Step 6.11

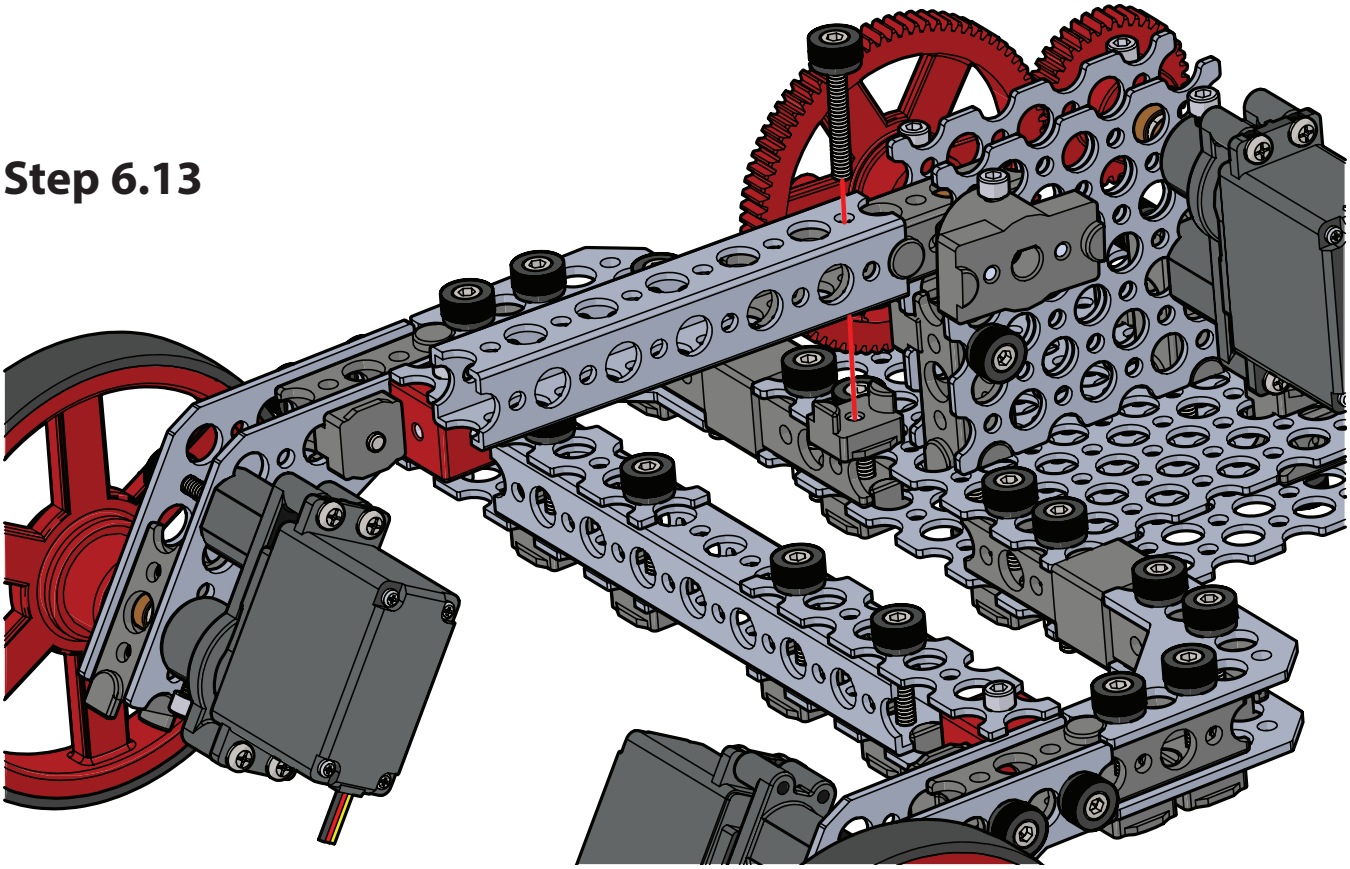


Tip: If the Beam Attachment Hub does not have the Socket Head Cap Screw installed, please install one now.

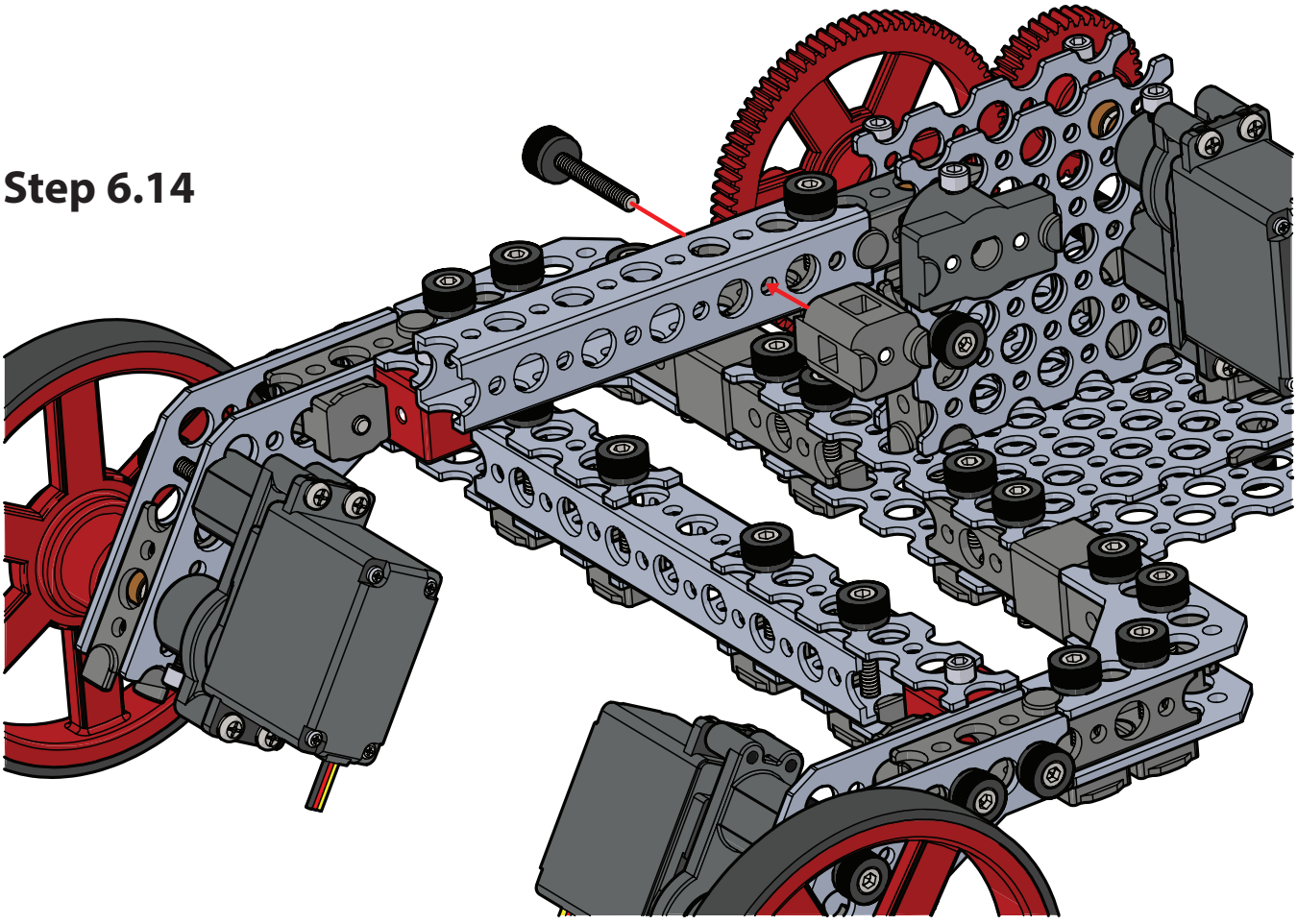
Step 6.12



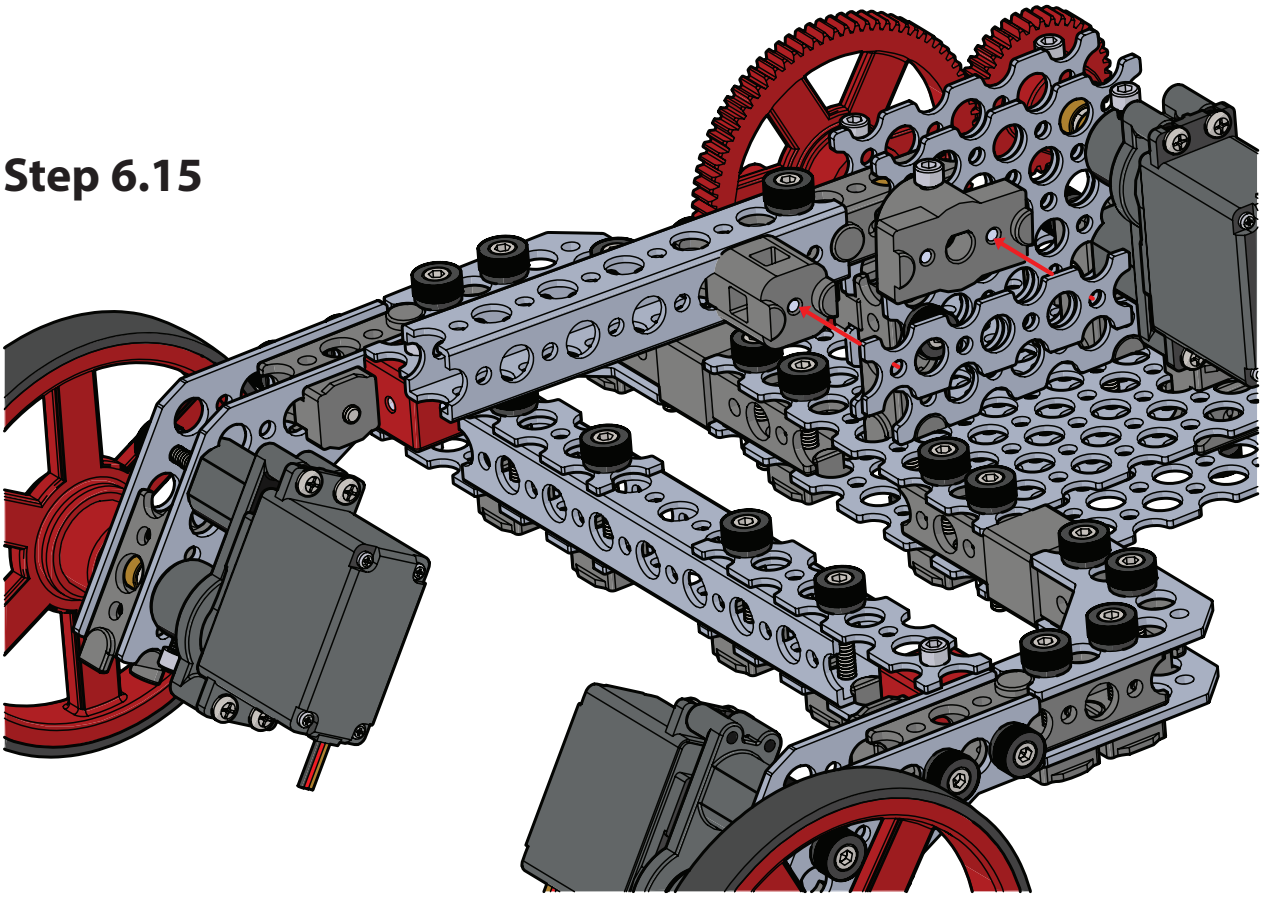
Step 6.13



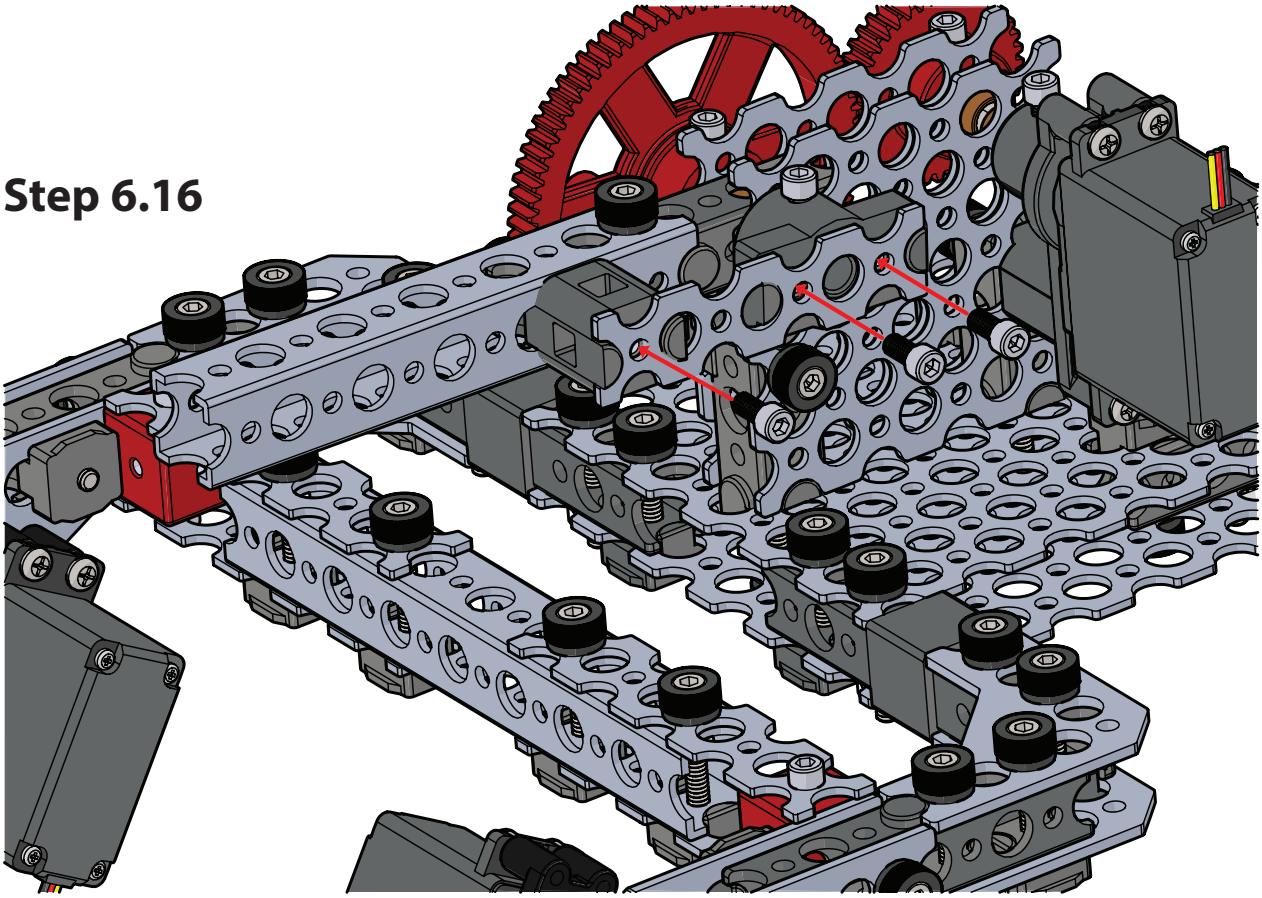
Step 6.14



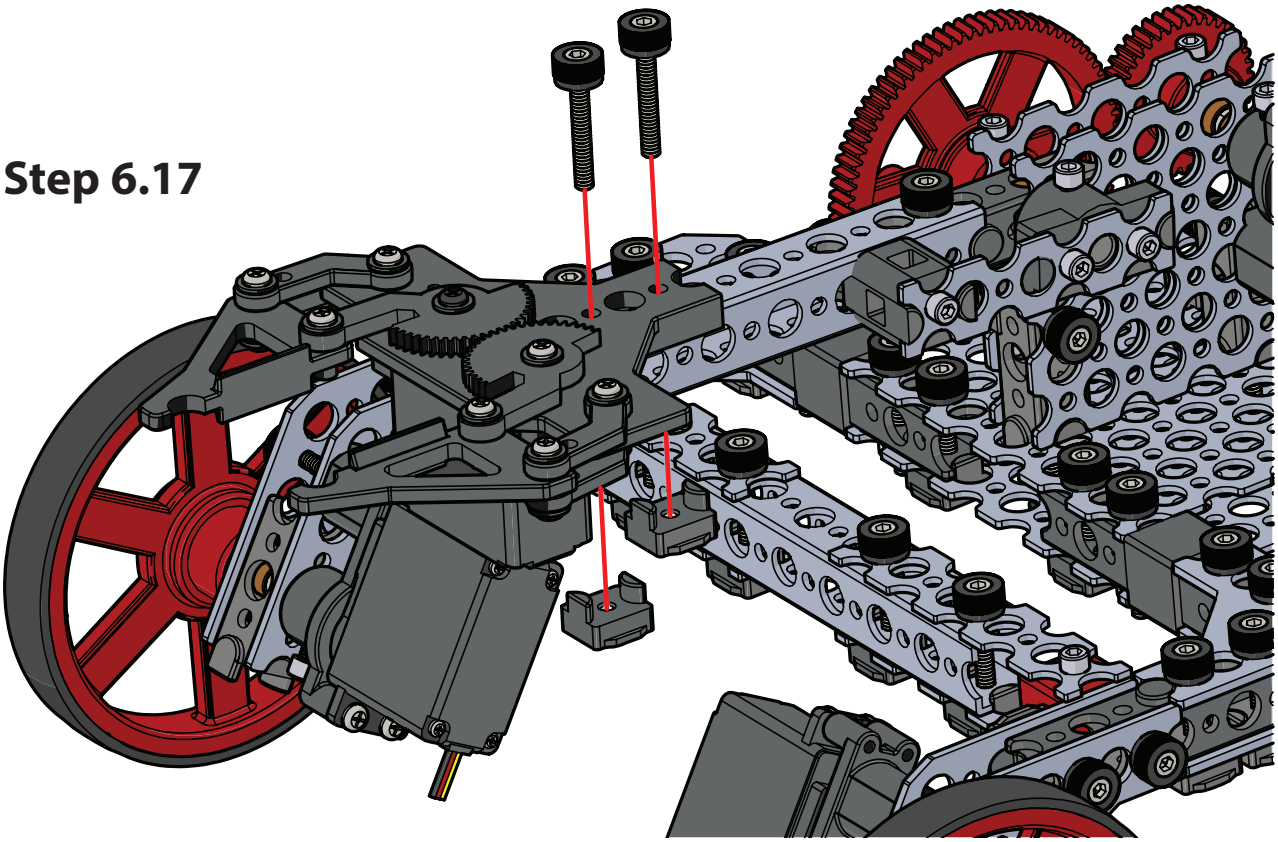
Step 6.15



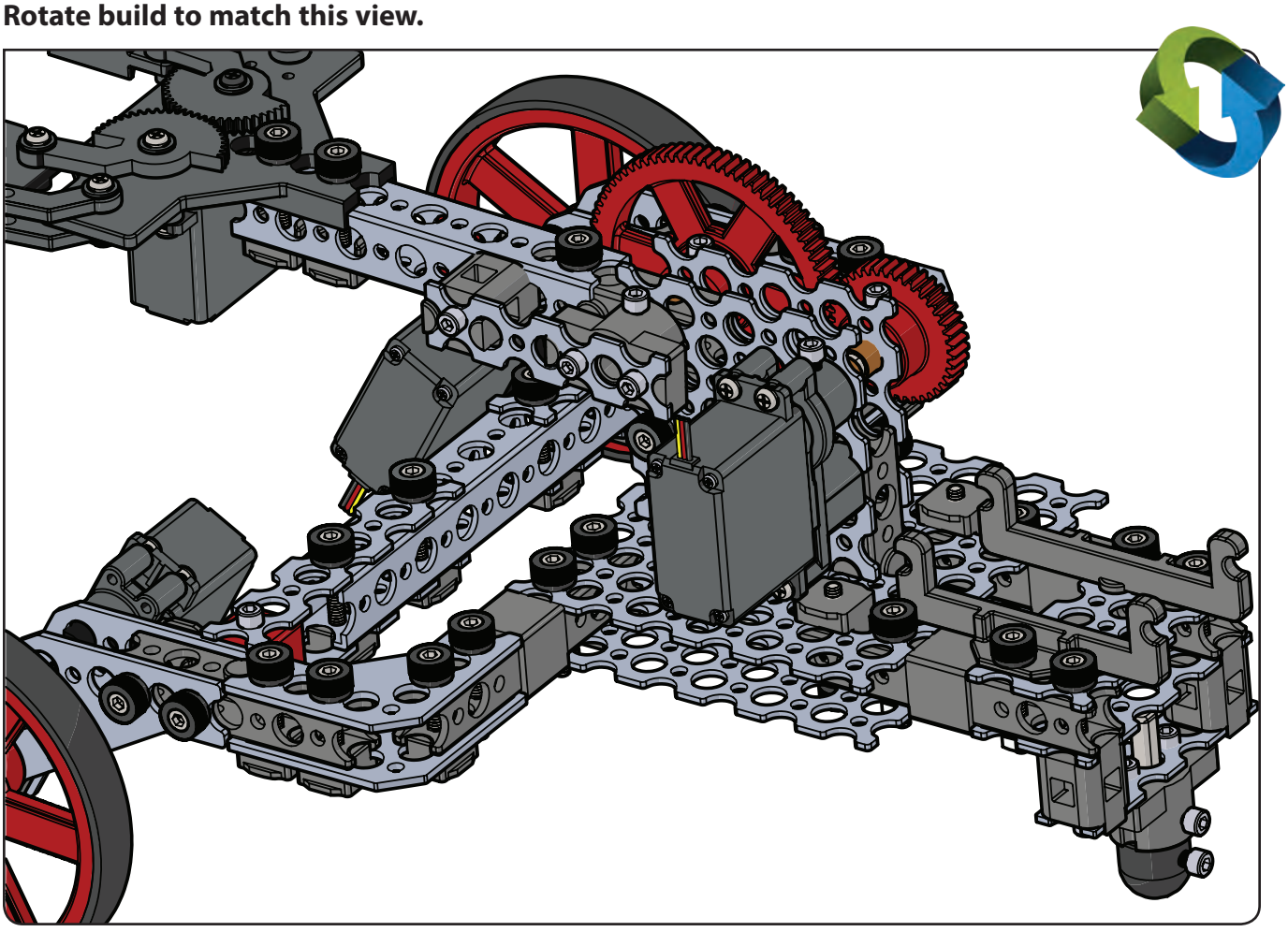
Step 6.16



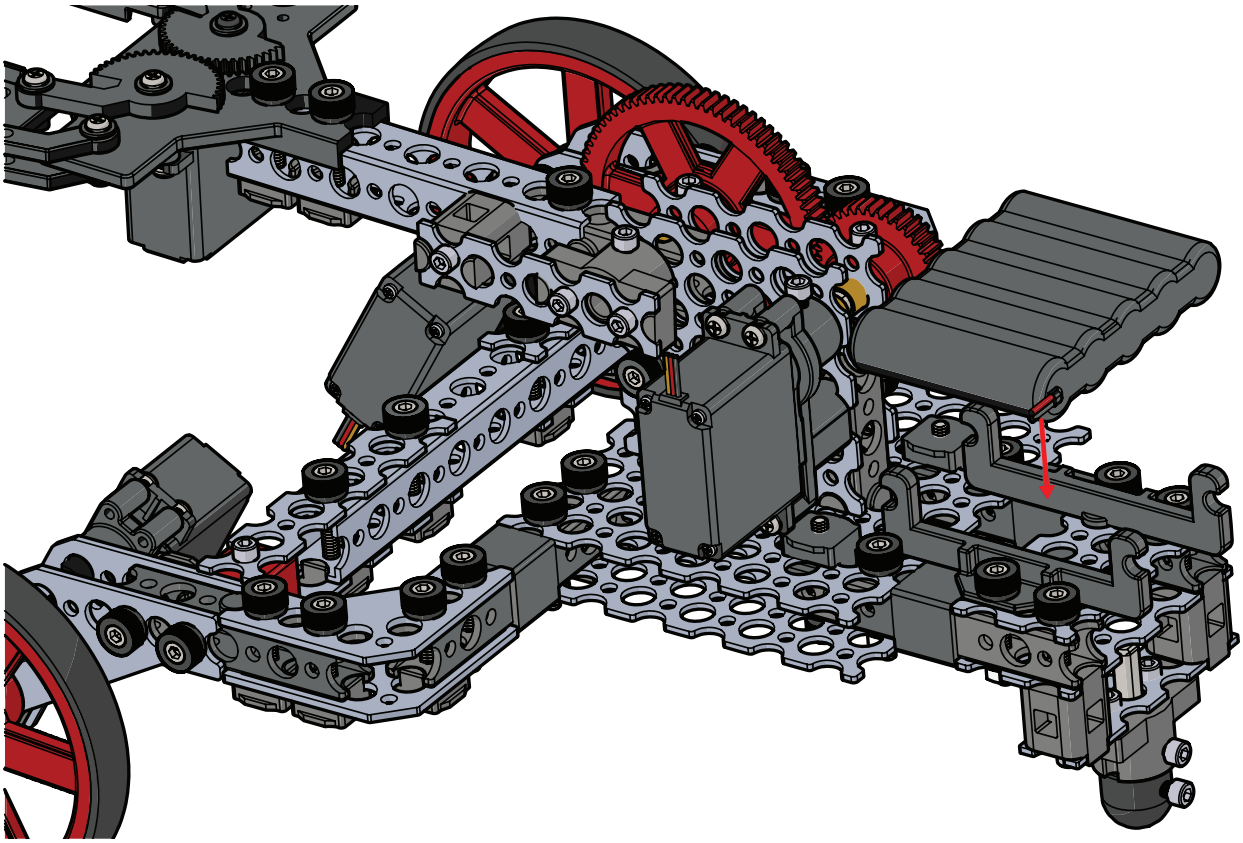
Step 6.17



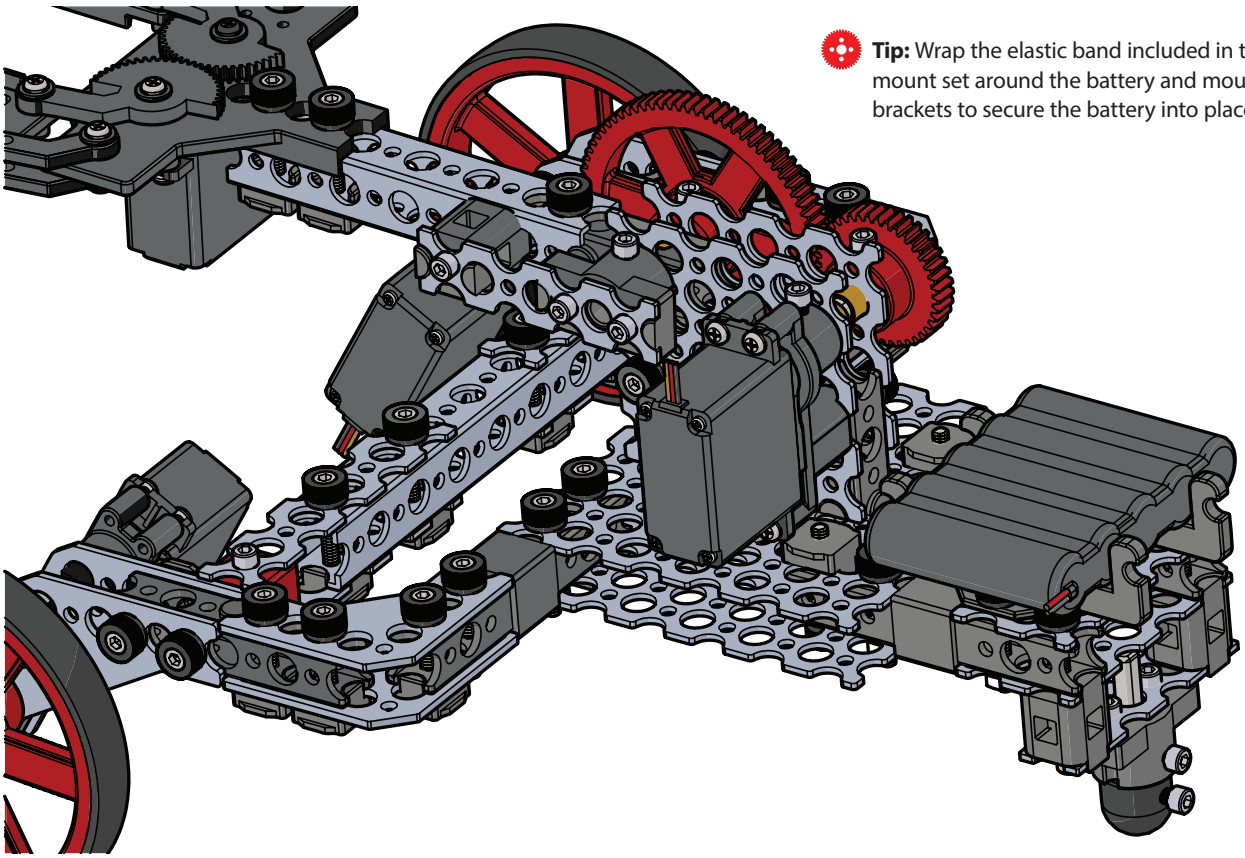
Rotate build to match this view.



Step 6.18

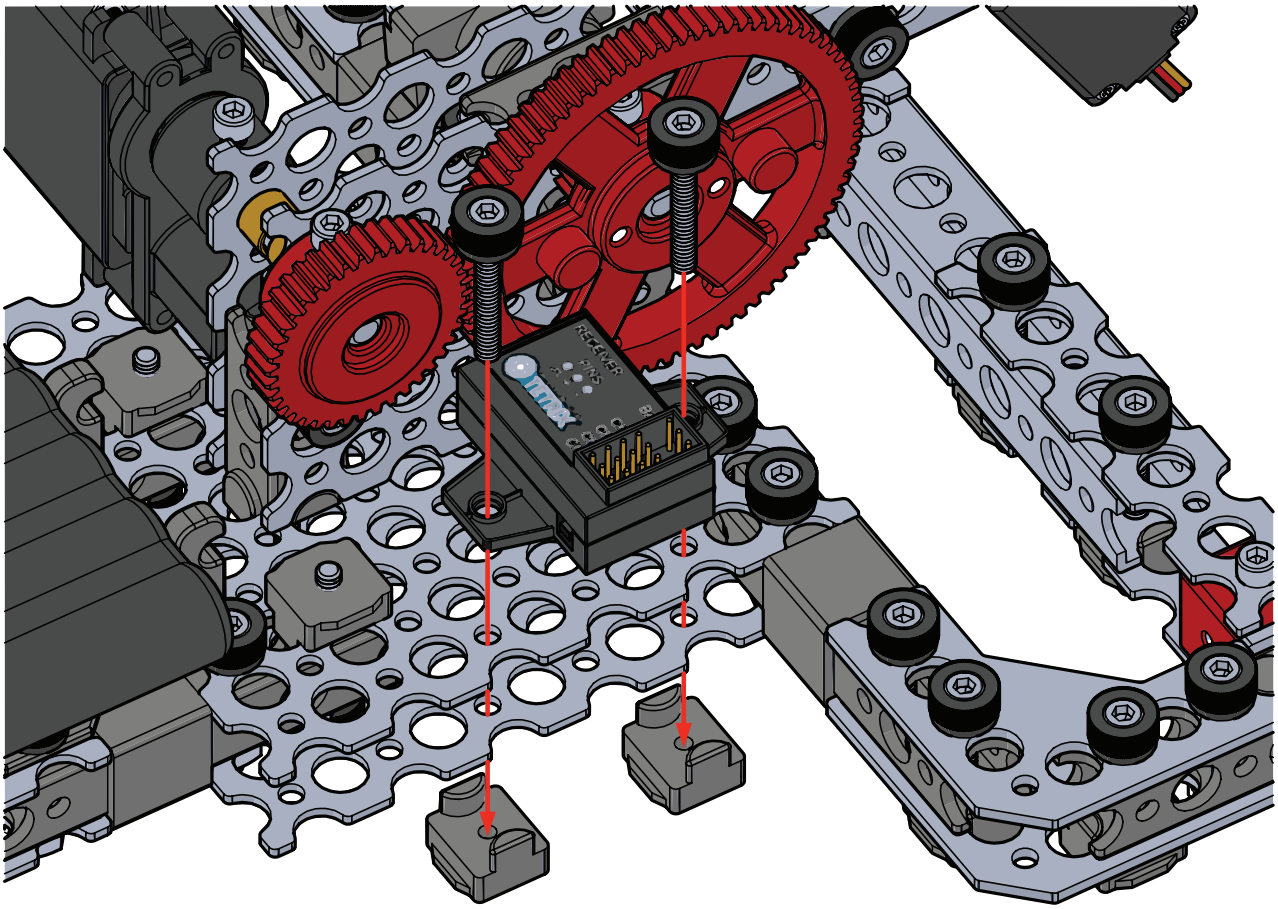


Step 6.19



Tip: Wrap the elastic band included in the battery mount set around the battery and mounting brackets to secure the battery into place.

Step 6.20



TETRIX PRIME Expansion Rover Bot Activities

Final Connections:

After you've installed the battery with the Battery Mount Bracket, you are ready to connect the servo motors to the wireless receiver.

Connect the battery to the BAT connection on the receiver. For a tank drive configuration, connect the two CR servos to Channels 2 and 3 of the wireless receiver. Be sure the CR servo on the left side of the robot is connected to Channel 2 and the CR servo on the right side of the robot is connected to Channel 3. The Standard-Scale Servo Motors on the lift arm and Gripper Kit can be connected to Channels 1 and 4. Secure the wires so they do not become entangled in any moving parts. Turn on the Wireless Joystick Gamepad System and test the operation of the Rover Bot. If the motion of the bot does not correspond to joystick input, either change channels for the servos or use the 4-in-1 Screwdriver to adjust the position of the DIP switches on the gamepad. If necessary, use the trimmer controls to adjust servo movement or position when the joysticks are in the neutral position.

Don't forget to reference page 16 for complete instructions on setting up the Wireless Joystick Gamepad System and configuring input to personal preferences.

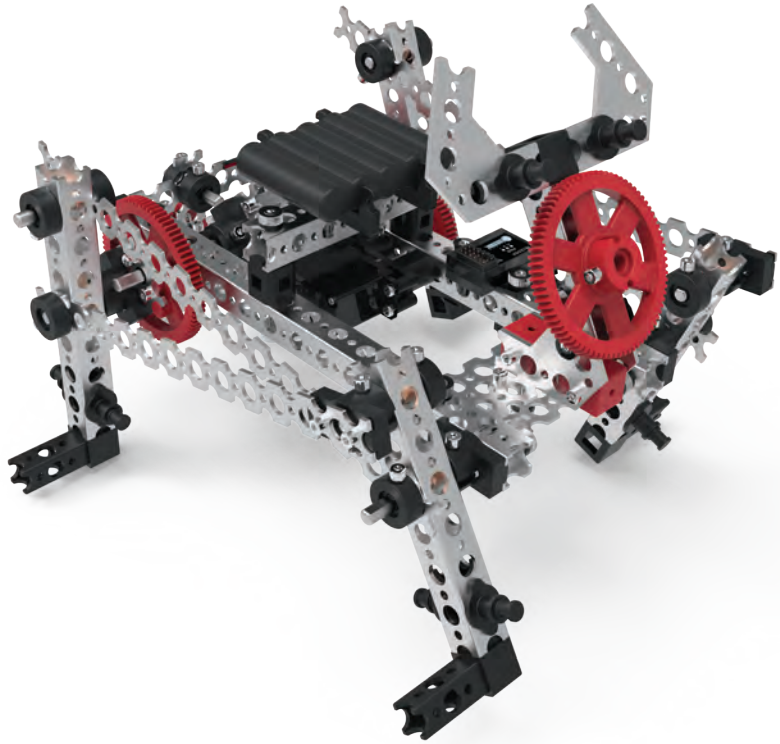
Sample Activities:

Construction is over. Now, it's time to practice driving the Rover Bot. Have some fun familiarizing yourself with how the Rover Bot performs.

- The Rover Bot is a mobile robot just like the Wheelee Bot or Buggee Bot builds from the PRIME R/C Robotics Set, but how does its performance compare? Activity 1 for the Wheelee Bot was driving a slalom course set up with the cups from the R/C Robotics Set. Set up the same course (see page 51 of the *TETRIX PRIME Builder's Guide*) and time yourself in order to create hard data for comparison. Remember the average of multiple data sets gives a better picture of realistic performance expectations. Activity 1 for the Buggee Bot has the robot driving in a figure eight (see page 89 of the *TETRIX PRIME Builder's Guide*). If you duplicate that course, how does the Rover Bot compare? It has a differential-drive like the Buggee Bot has, but the pivot point is different. Does it perform better or worse? Remember to time yourself for comparison data.
- The Rover Bot can use the gripping end effector that lifts up and down as well as opens and closes the jaws. How fine is your control? Can you complete a harvest (pick up an object), transport (move from one location to another without dropping the object), and deliver (release the object) challenge? You can reuse the gripper activities suggested with the Wheelee or Buggee Bots, or you can create one of your own. Can you pick up something besides a ball? How about a dry-erase marker or pencil? Can you put the ball into the cup and then move both at the same time without dumping the ball (think capping hazardous waste and then disposing of the waste and container)? Remote control operation of devices is becoming a larger career field every year. Who is best suited for a career in controlling robots in hazardous situations where humans can't go or doing microsurgery via a robotic arm?
- It's time for an open-ended building challenge. So far, we've based our comparisons on timed data, but we can also measure some physical performance characteristics such as minimum turning radius. We can measure the tightest turning radius possible with standard Wheelee Bot and Buggee Bot builds. How does the Rover Bot compare? What are some other physical performance characteristics we can measure? With permission from your instructor, show what you've learned and modify your bot so it performs even better. Can you modify the wheelbase so it turns even tighter? Can you adapt and adjust the arm so it can lift more or reach lower or higher? Do you have a real-life inspiration or real-world connection for your changes?

Don't forget to document your efforts, and remember the engineering design process.

TETRIX PRIME Expansion Walker Bot Assembly



Overview:

The TETRIX PRIME Expansion Walker Bot continues the exposure to the expansion elements, focusing on new ways to redirect and apply the source of power. Users are introduced to the concept of transferring rotational motion to linear motion. In addition, the model explores the idea of a single source of motion providing multiple complex motions via properly set-up linkages.

How It Works:

The TETRIX PRIME Expansion Walker Bot uses offset axles combined with the 80-tooth gears to change rotational motion to linear motion in what essentially is an example of what some call a Pitman drive. Introduced and patented in 1909 for use in railroad applications, a Pitman drive is a traditional but still very applicable concept used today for an easy-to-implement and relatively efficient way of transferring rotational motion into linear motion. When the offset axles of each gear are mounted 180 degrees out of sync with each other and linkages of unequal length are combined, a more complex motion is created that includes motion in the vertical plane as well as the horizontal plane.

Getting Started:

- Refer to pages 84-161 for instructions on how to build the complete Walker Bot.
- See page 162 for suggested sample activities.

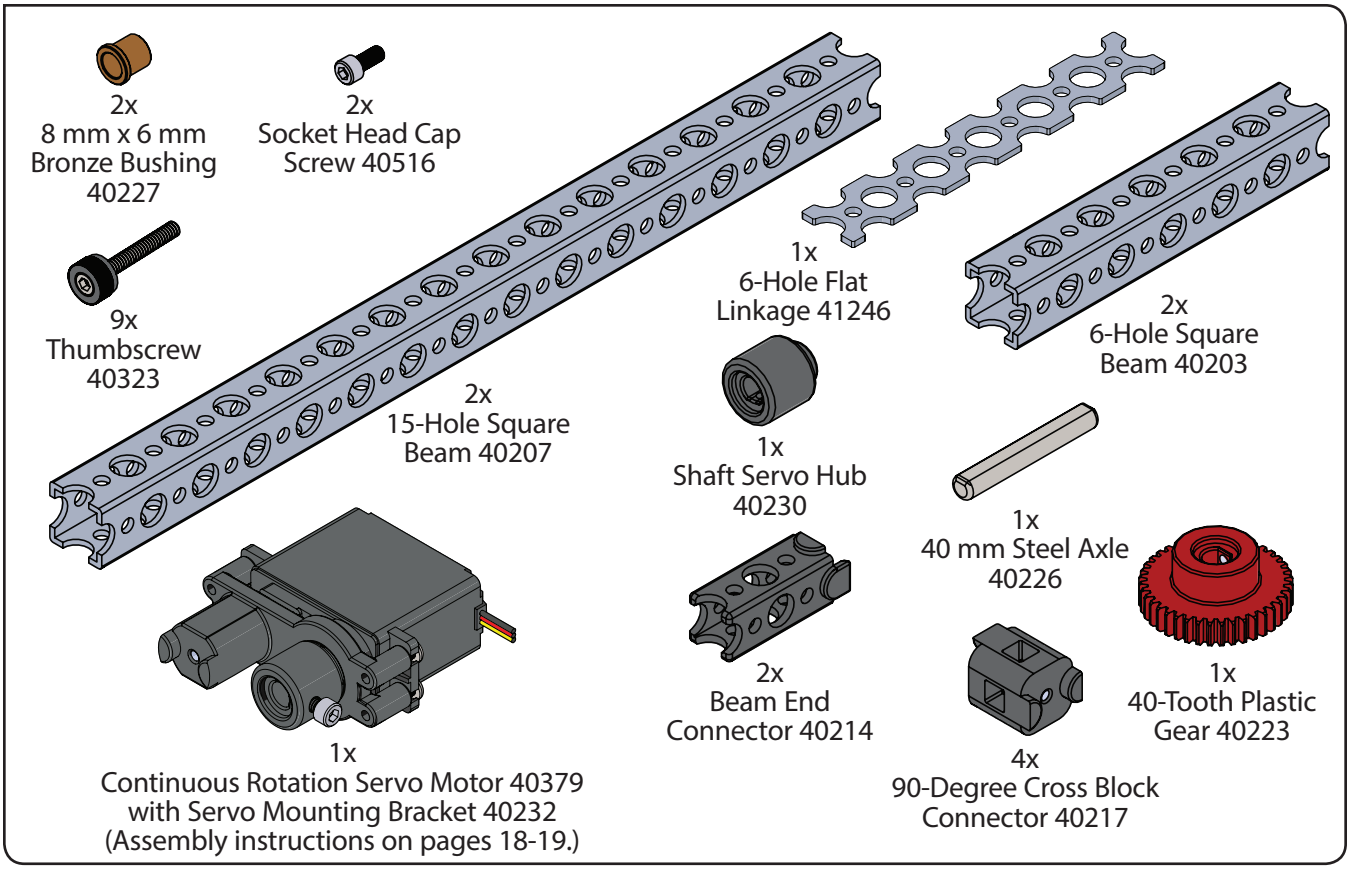
Time Expectations:

50-90 minutes

Note: Many factors can affect building time, including set organization and whether builders use a partner. The above time is an estimate only and based on a single builder of average experience who is comfortable with the product and has access to well-organized sets. Actual time might vary.

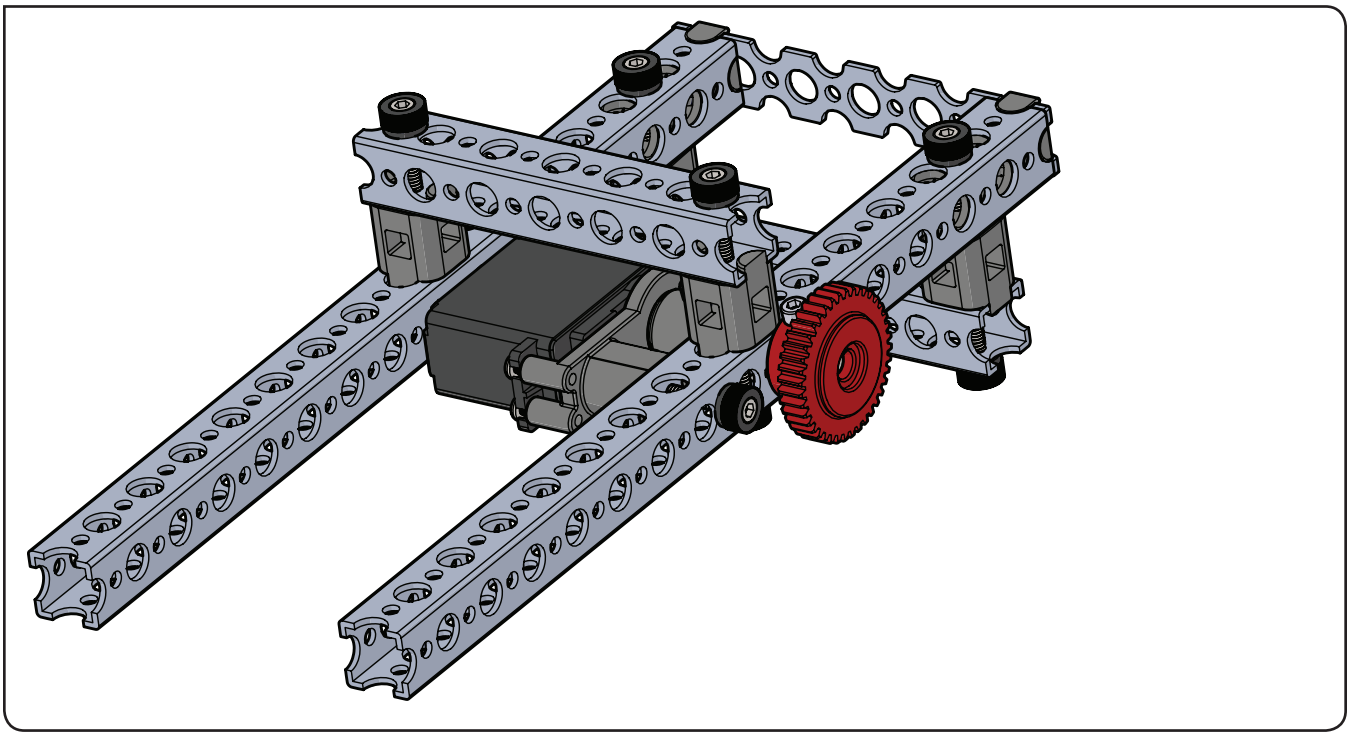
Step 1

Parts Needed

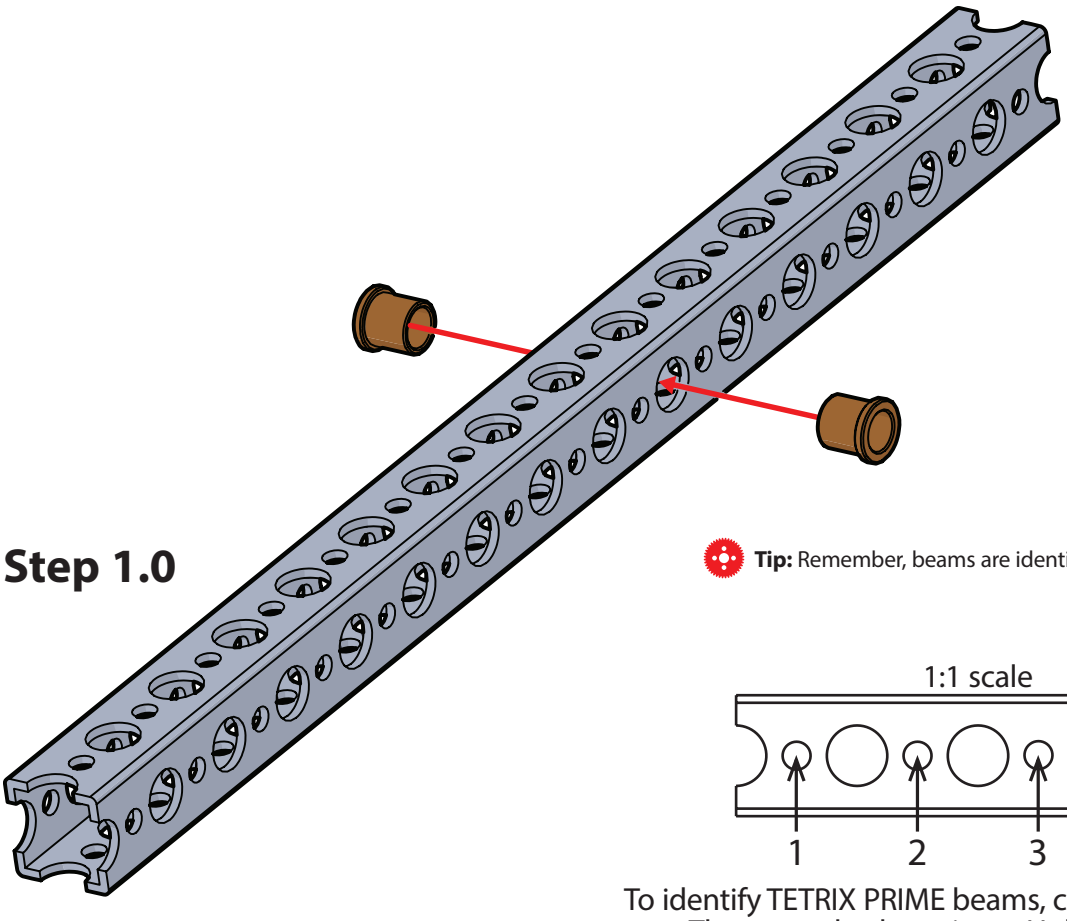


Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

Partial assembly should look like this.



Step 1.0

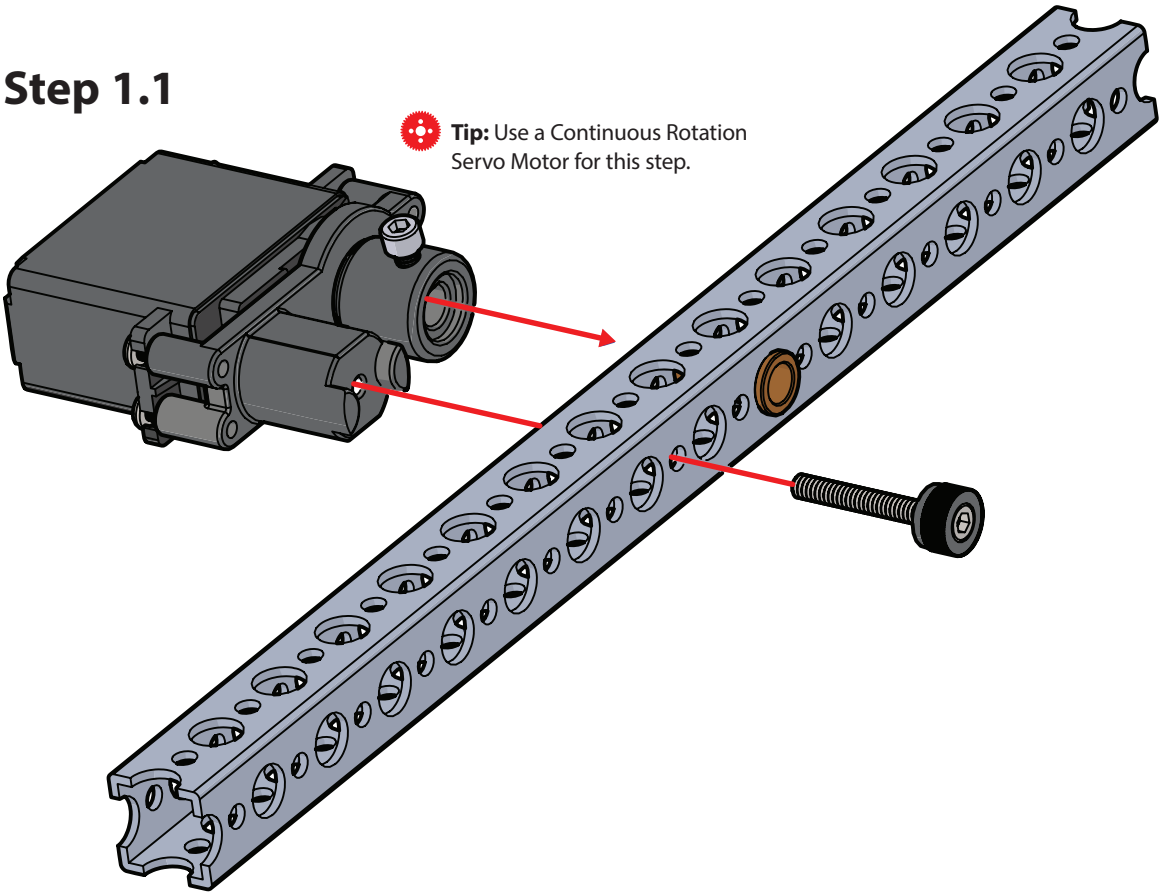


Tip: Remember, beams are identified by small holes, not large.

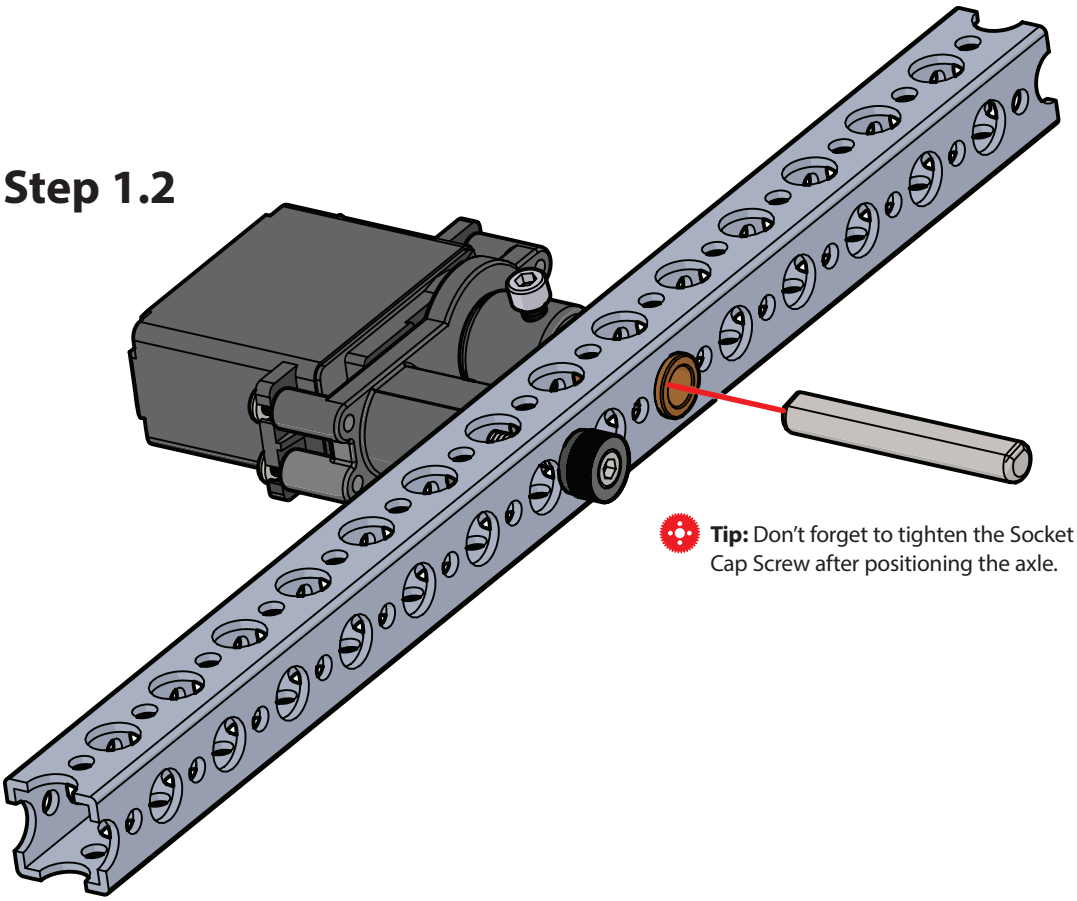
To identify TETRIX PRIME beams, count the small holes. The example above is a 4-Hole Square Beam.

Step 1.1

Tip: Use a Continuous Rotation Servo Motor for this step.

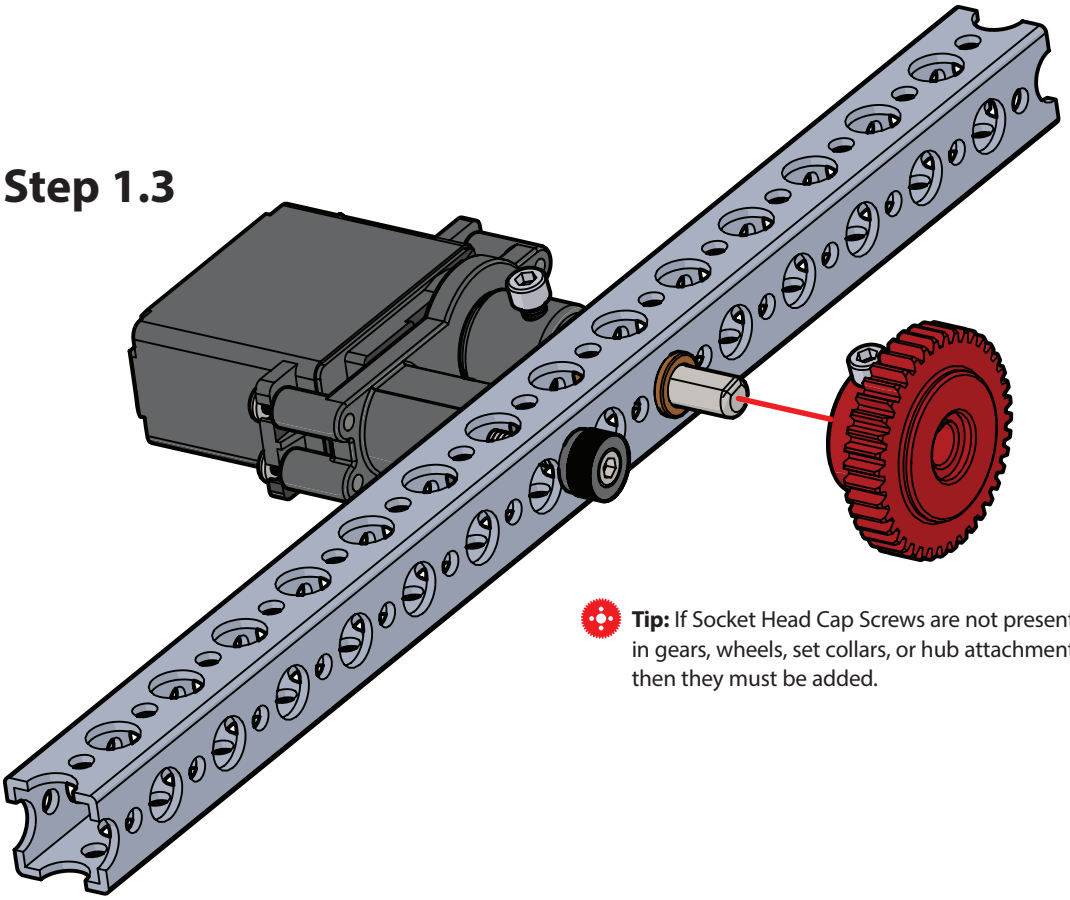


Step 1.2



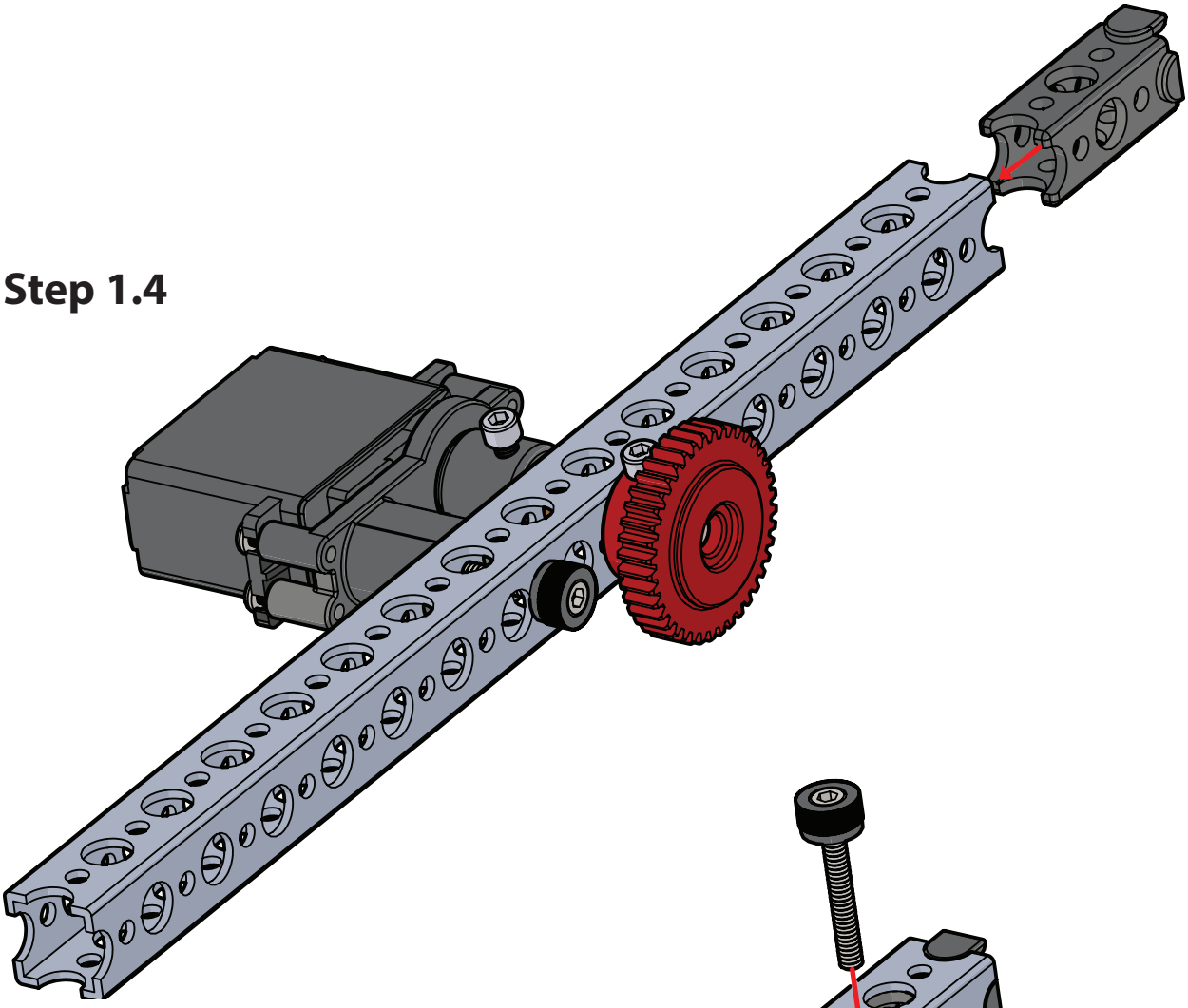
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 1.3

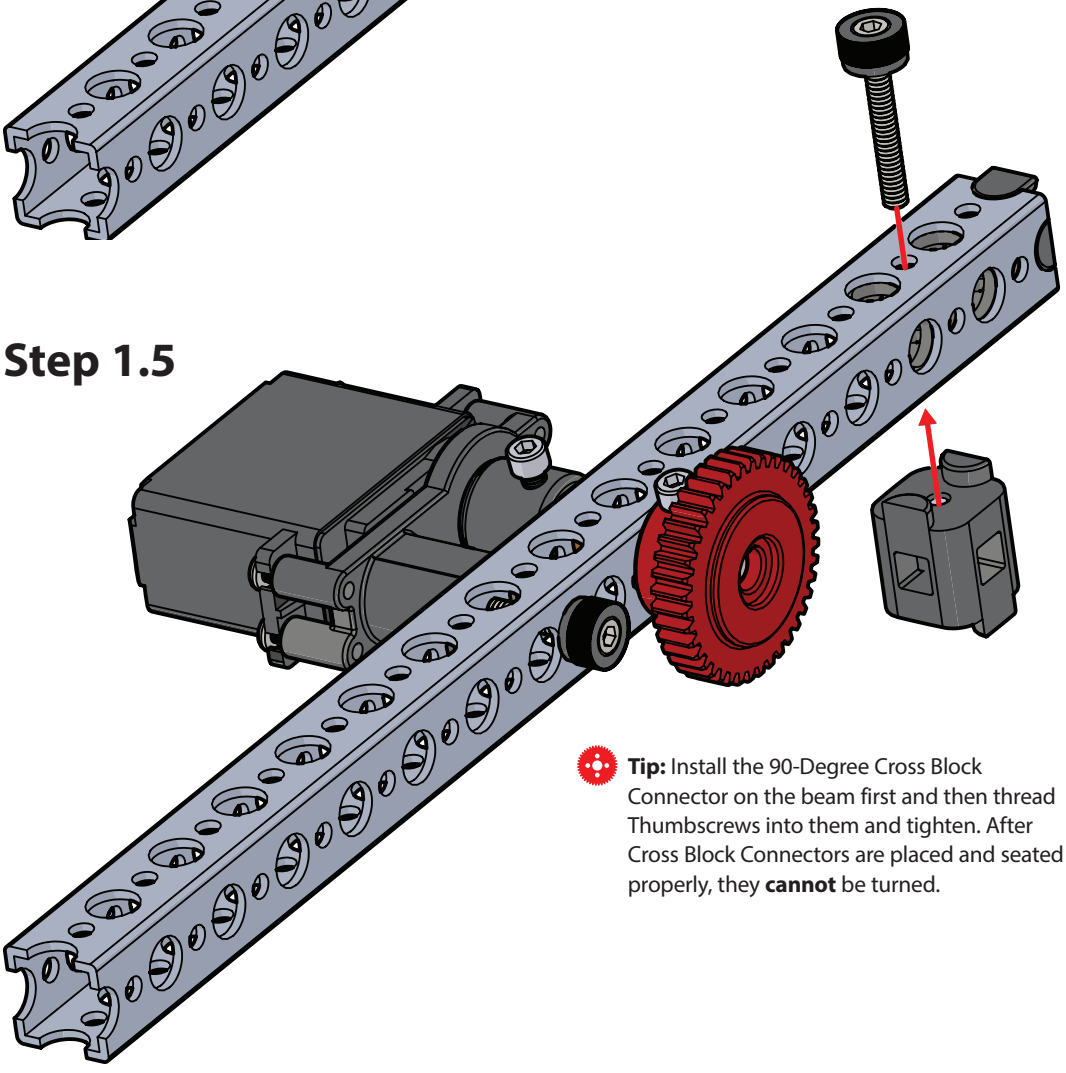


Tip: If Socket Head Cap Screws are not present in gears, wheels, set collars, or hub attachments, then they must be added.

Step 1.4

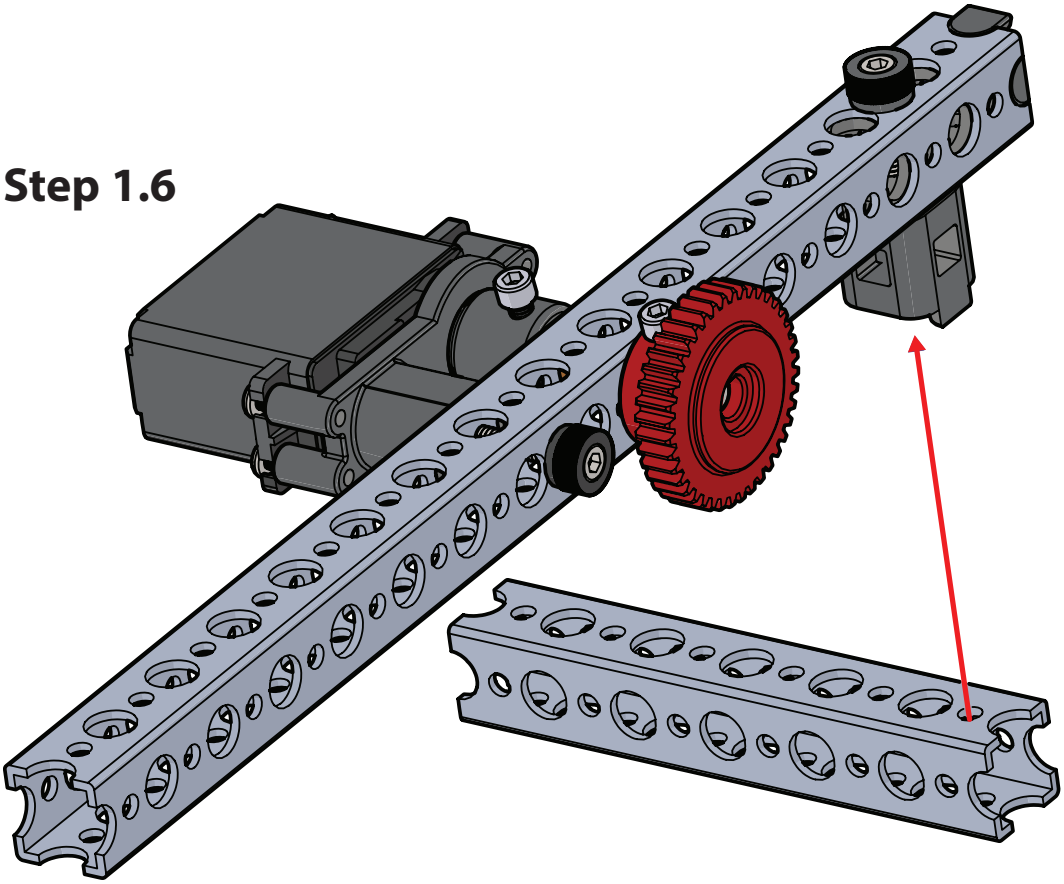


Step 1.5

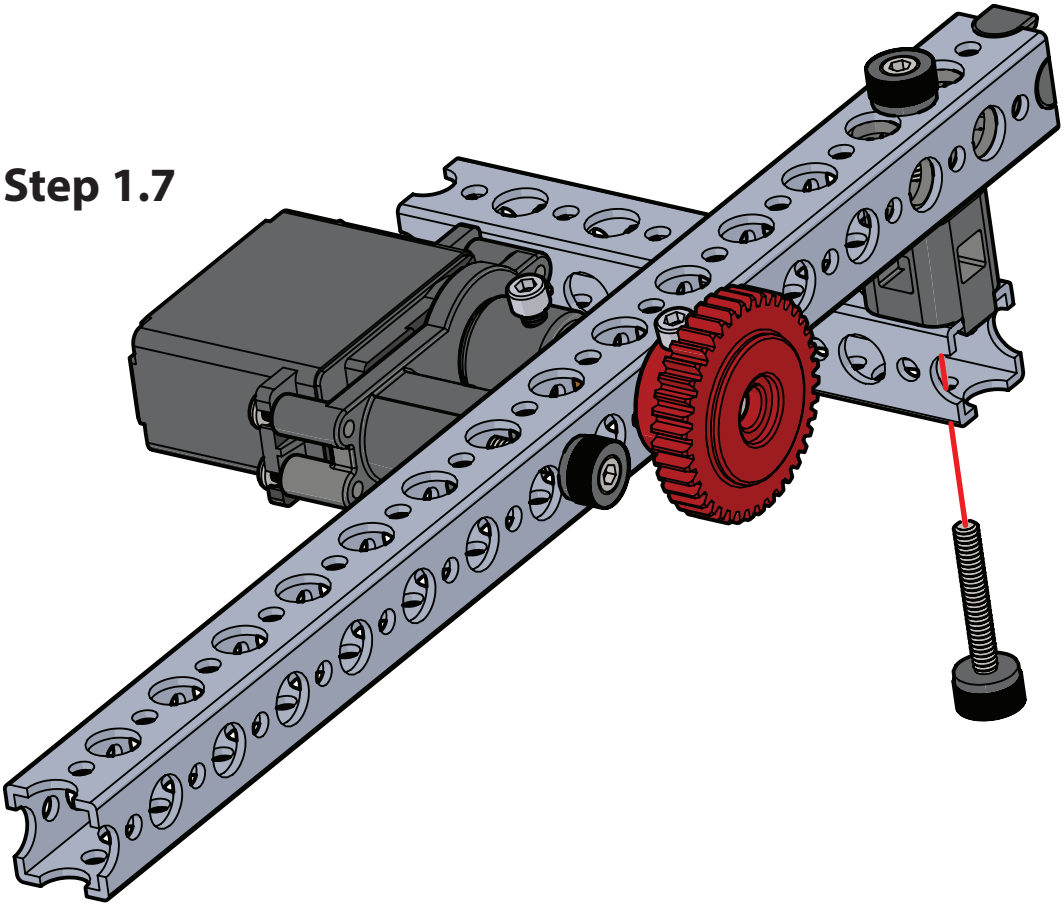


Tip: Install the 90-Degree Cross Block Connector on the beam first and then thread Thumbscrews into them and tighten. After Cross Block Connectors are placed and seated properly, they **cannot** be turned.

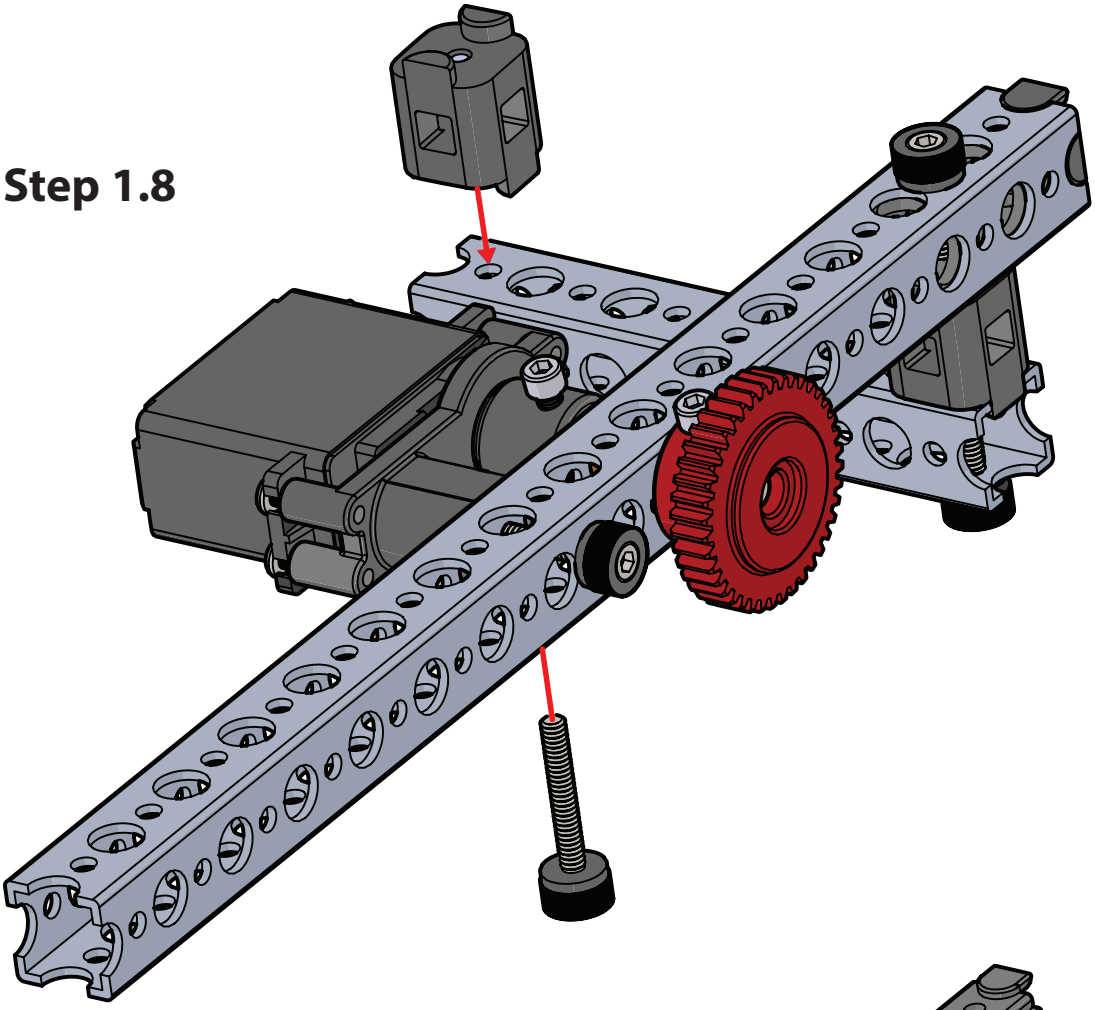
Step 1.6



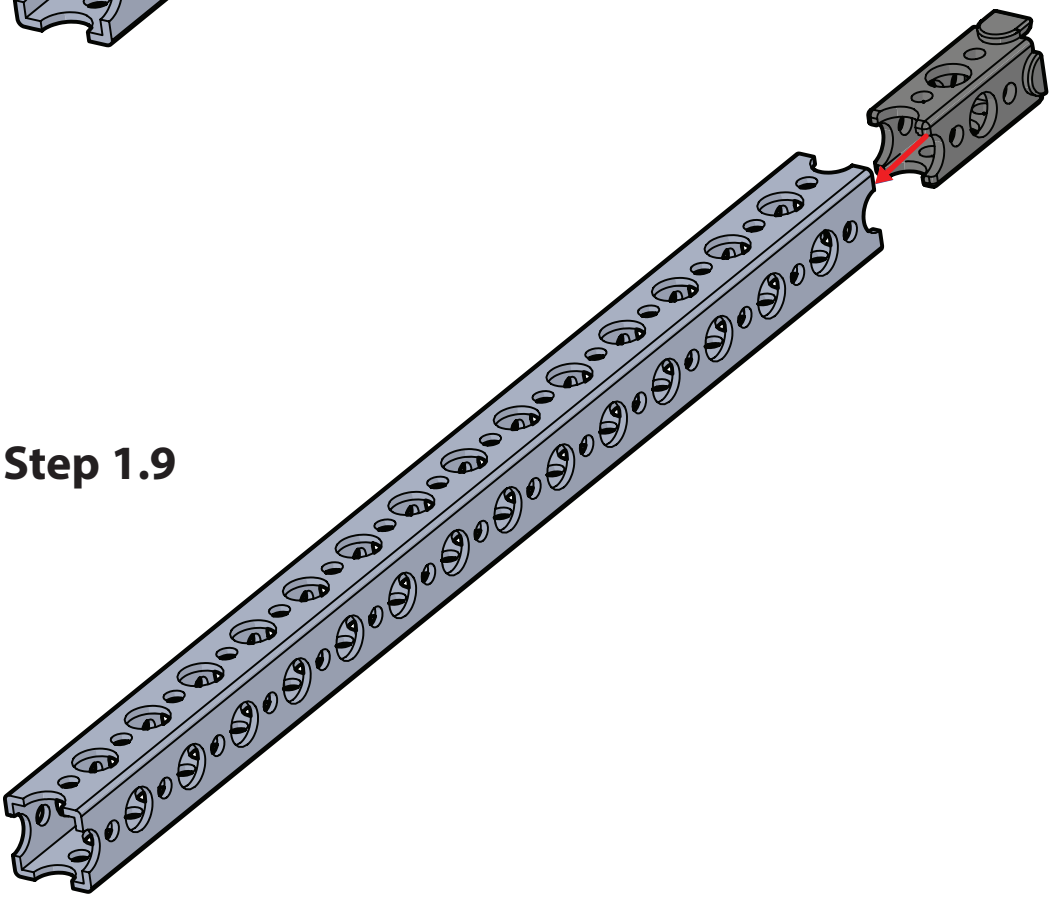
Step 1.7



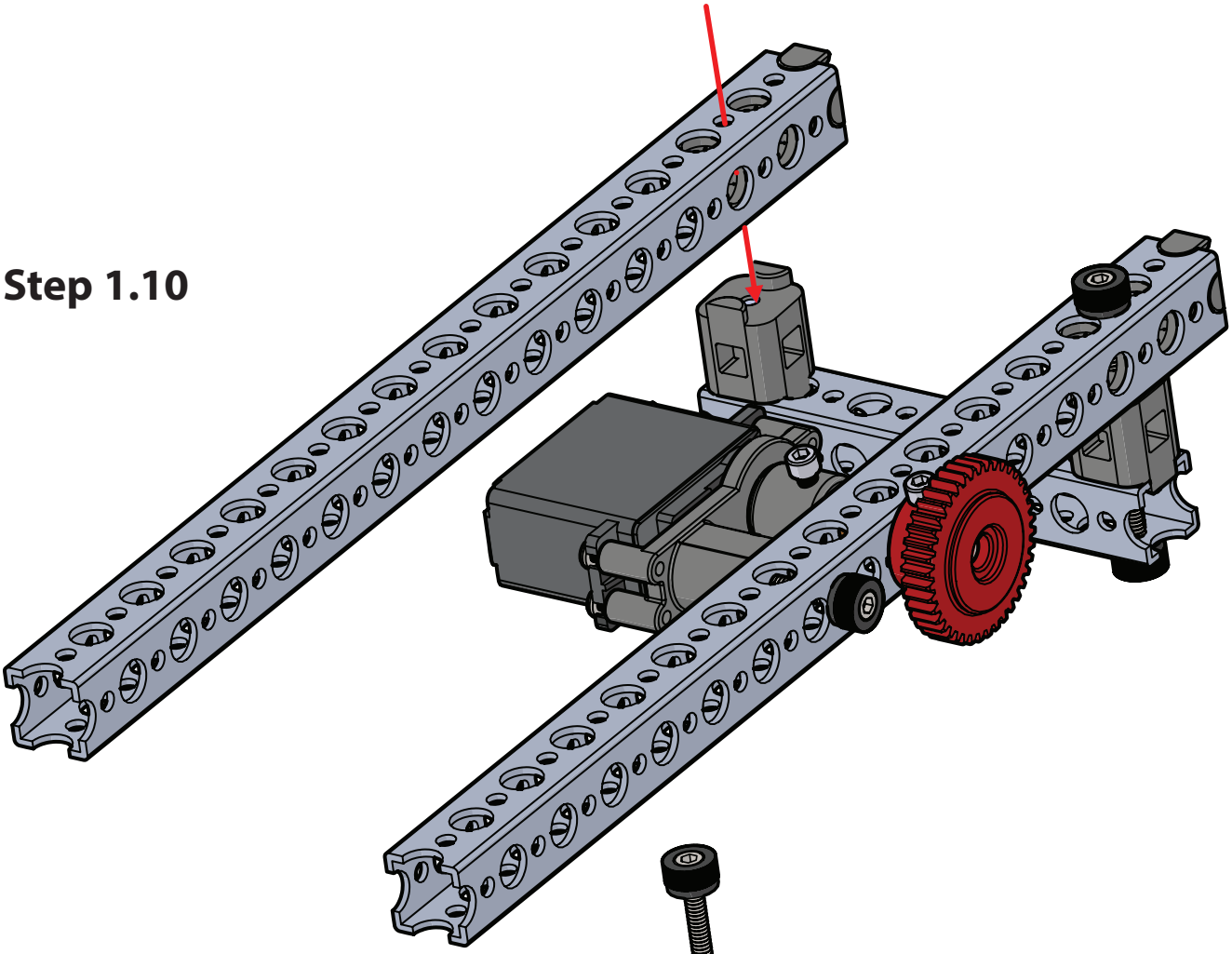
Step 1.8



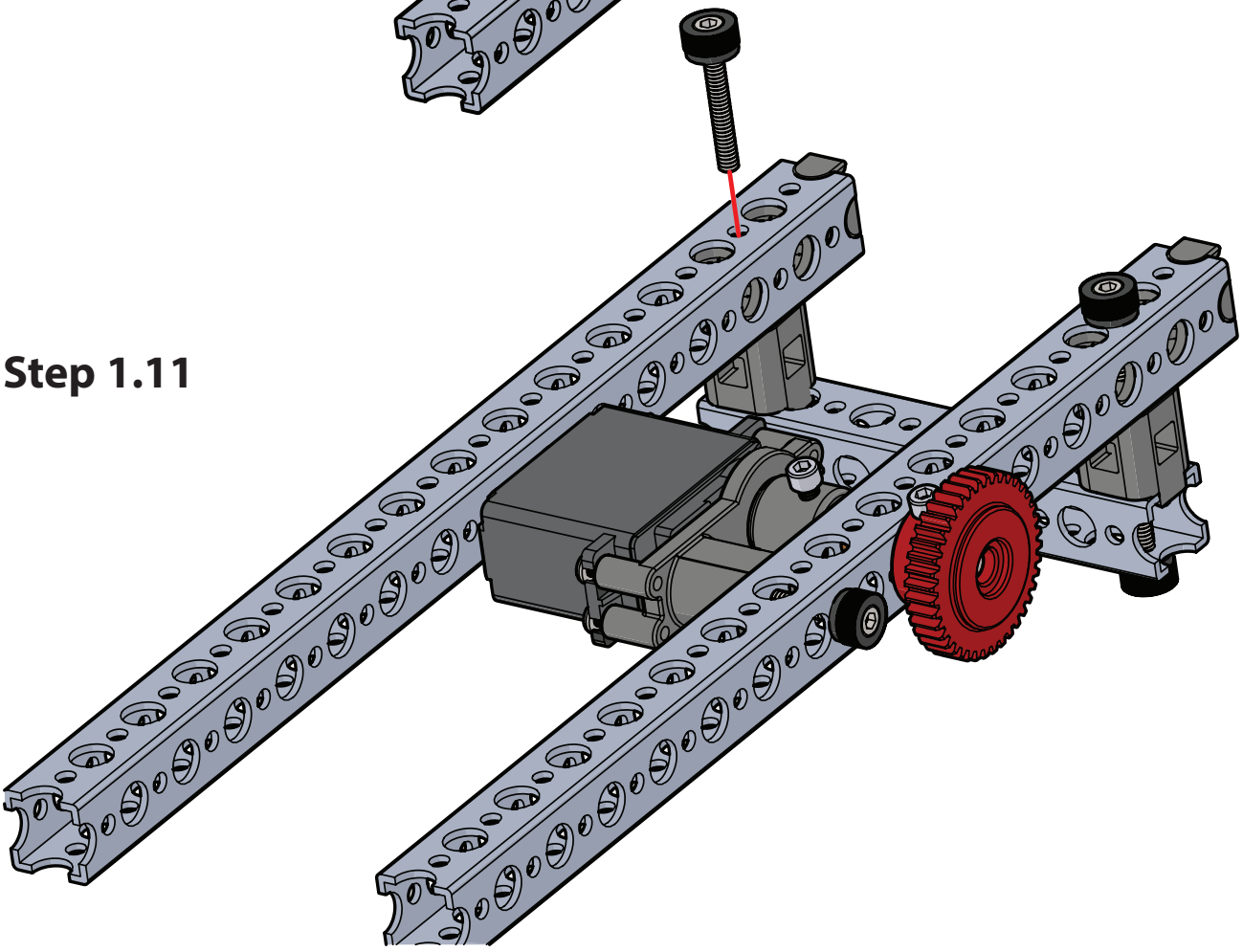
Step 1.9



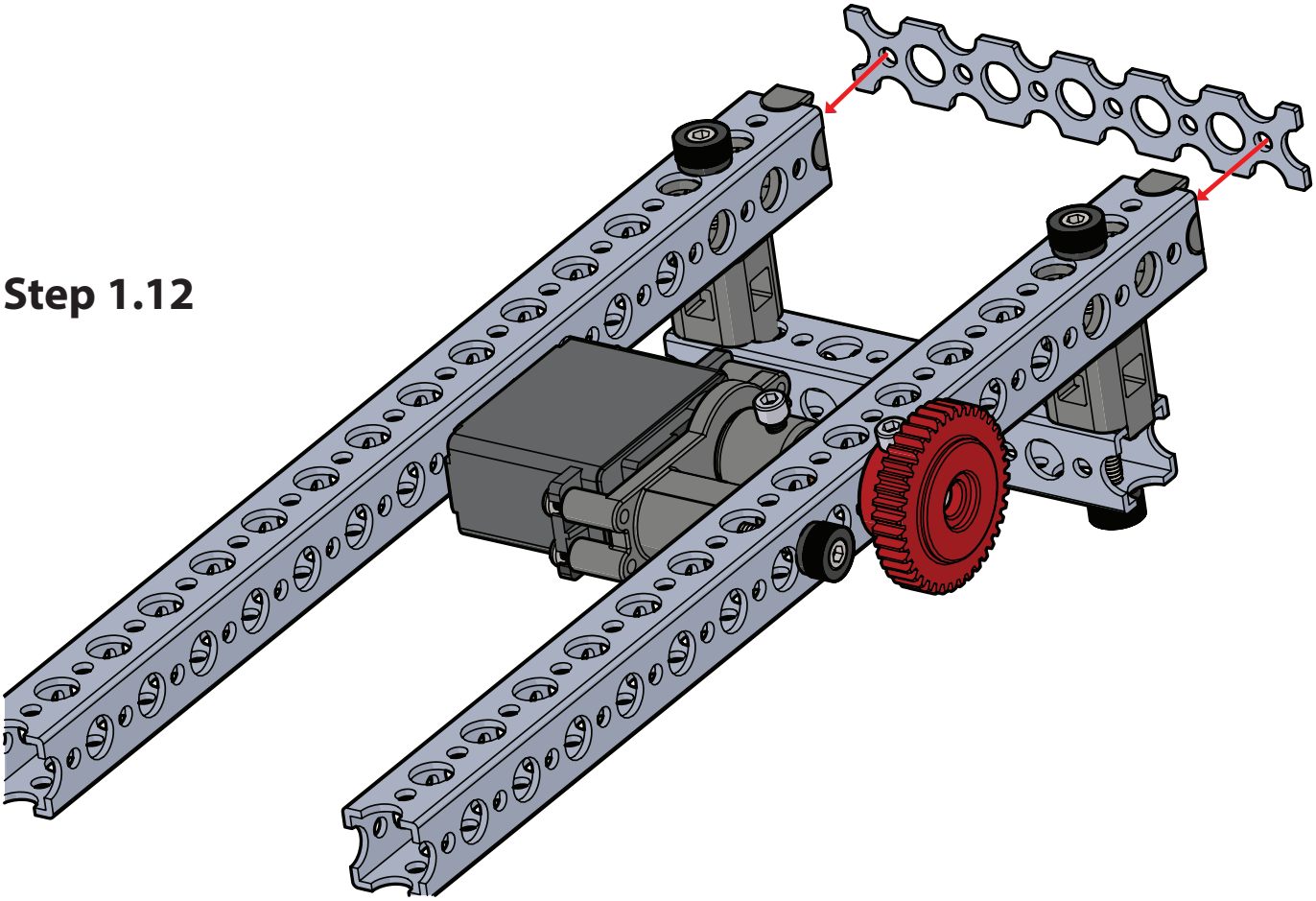
Step 1.10



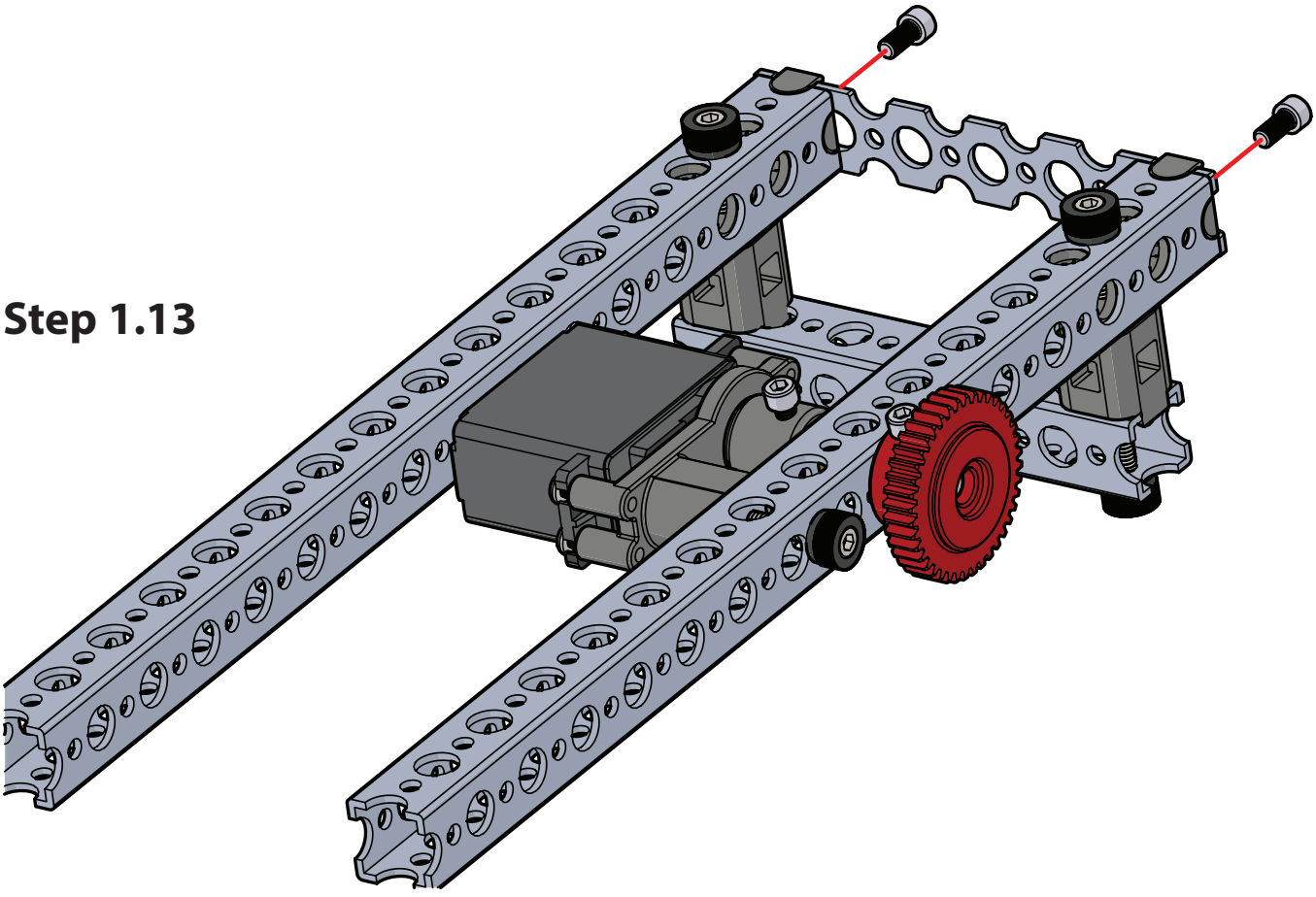
Step 1.11



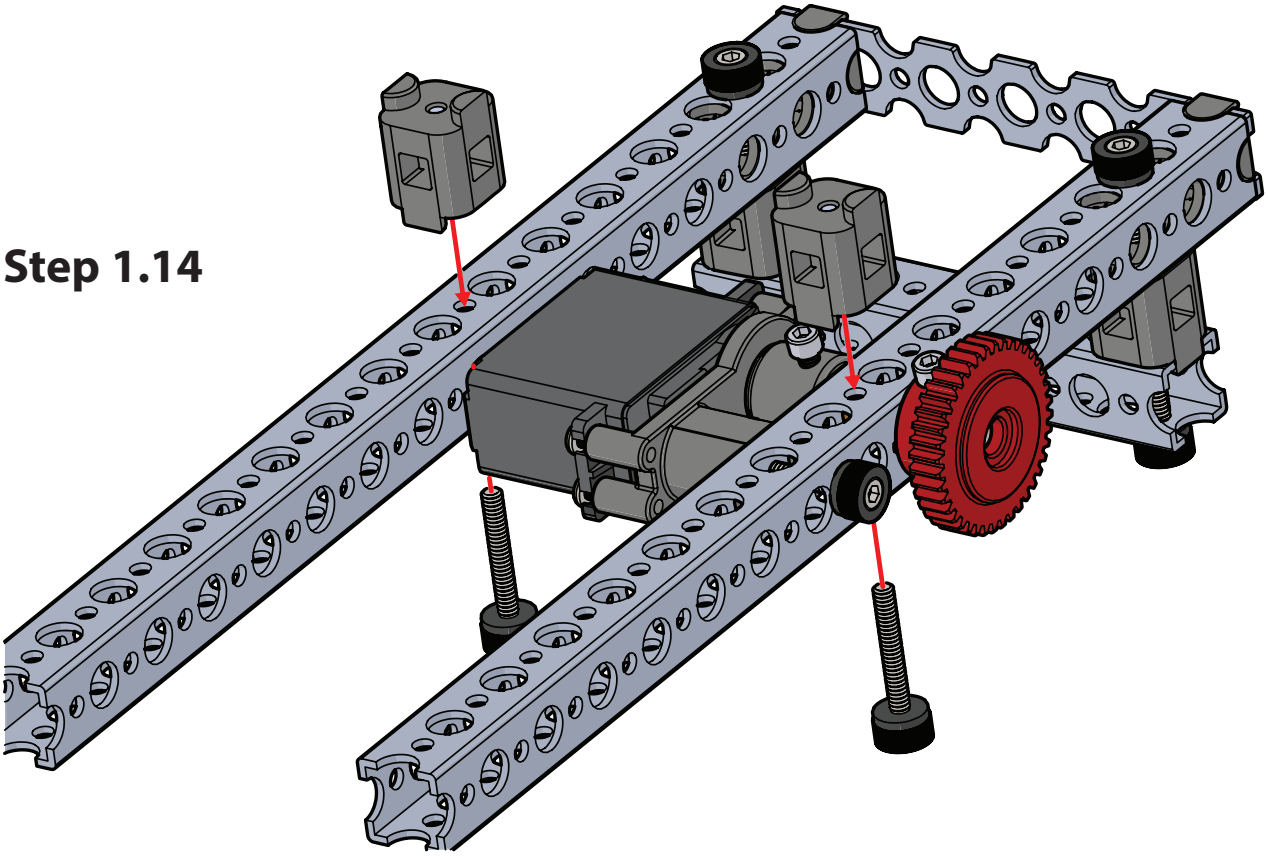
Step 1.12



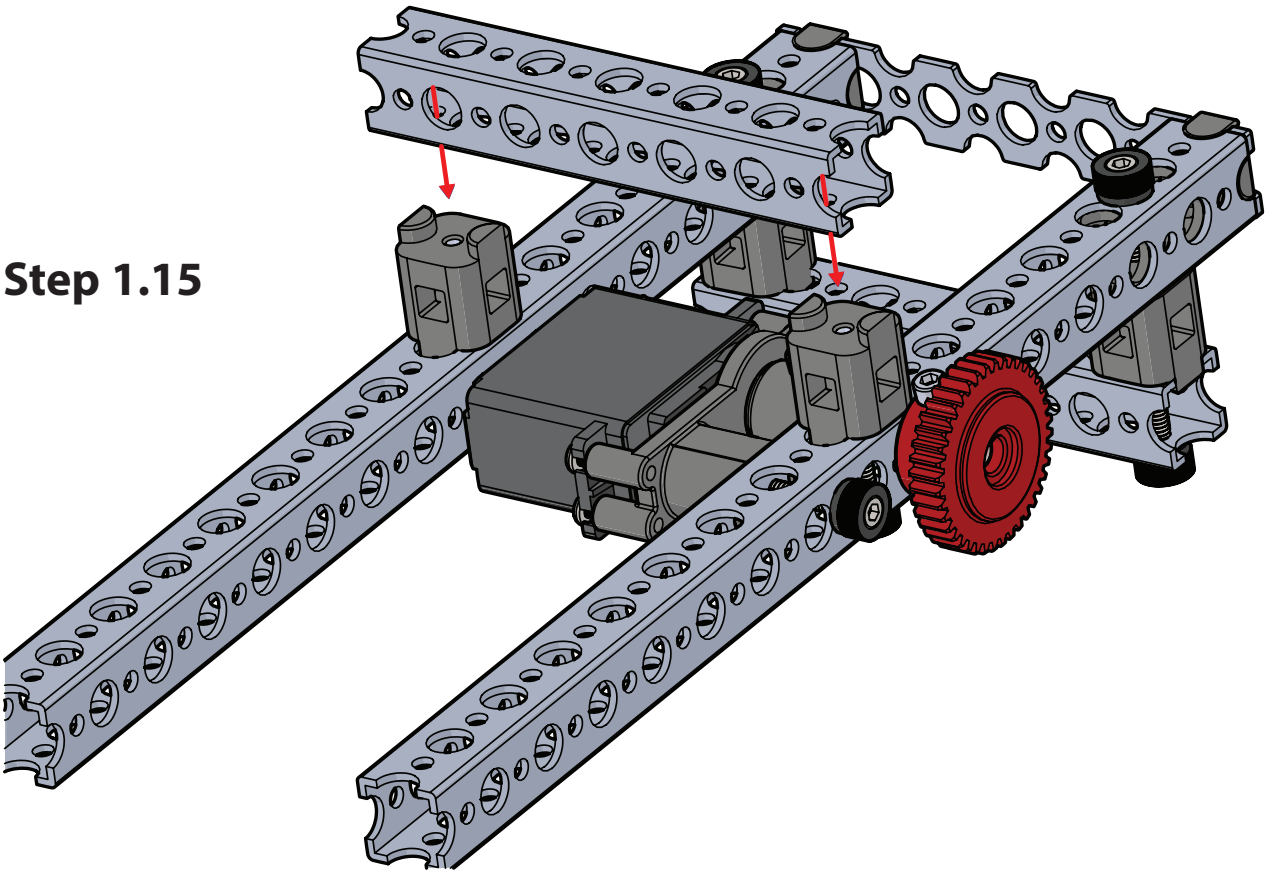
Step 1.13



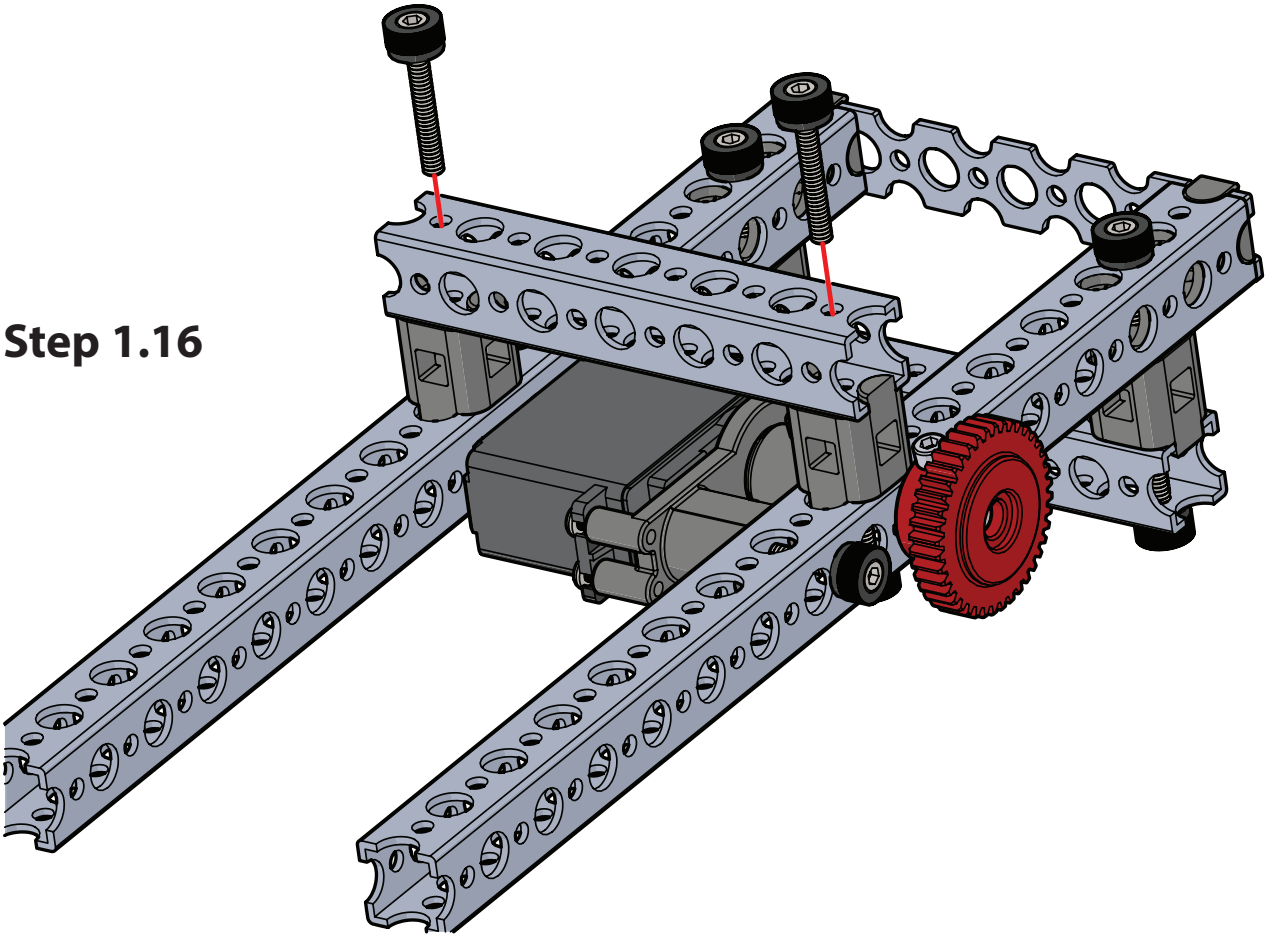
Step 1.14



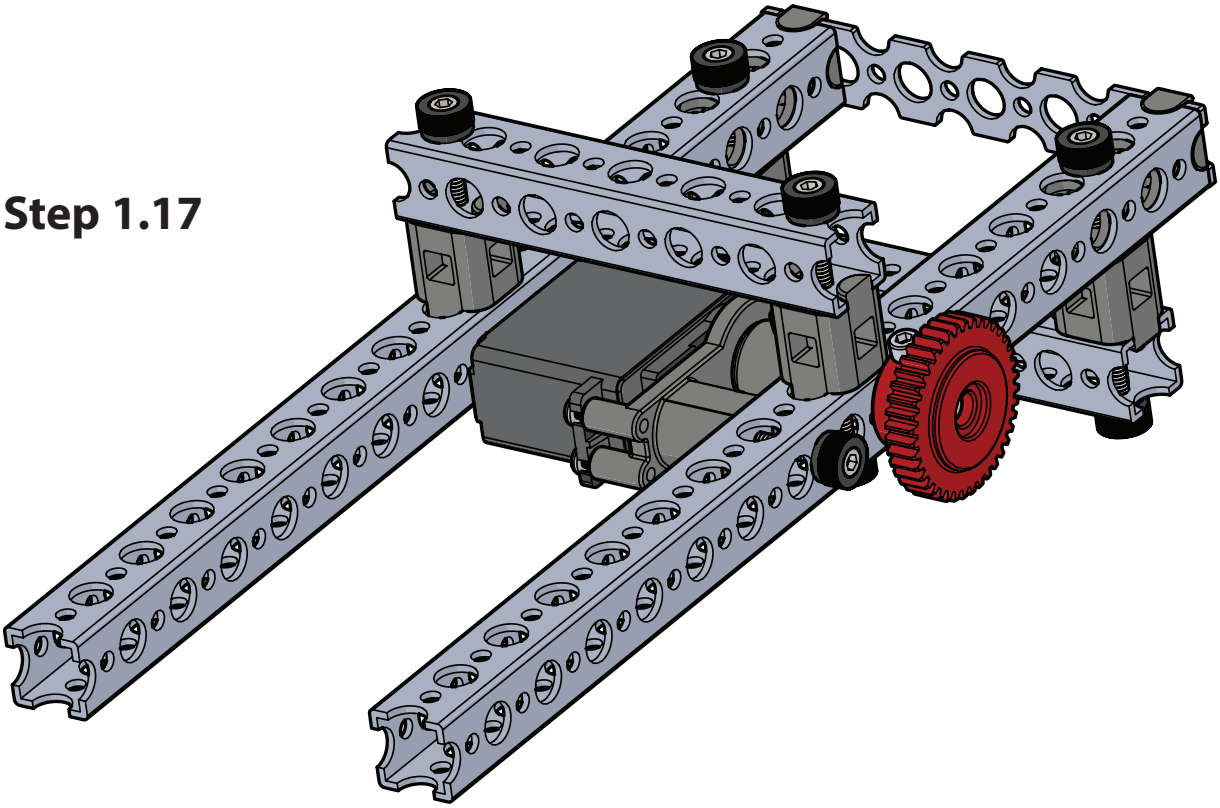
Step 1.15



Step 1.16

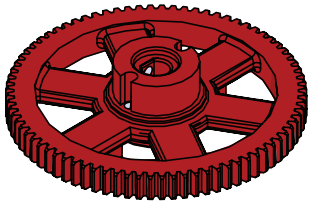


Step 1.17

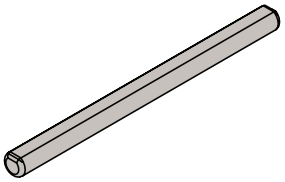


Step 2

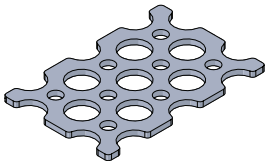
Parts Needed



2x
80-Tooth Plastic
Gear 40224

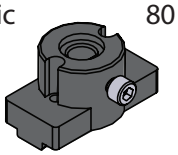


2x
80 mm Steel Axle
40225



2x
2 x 3 Hole Plate
41254

4x
Stand-Off Post 6-32 x
16 mm 41253



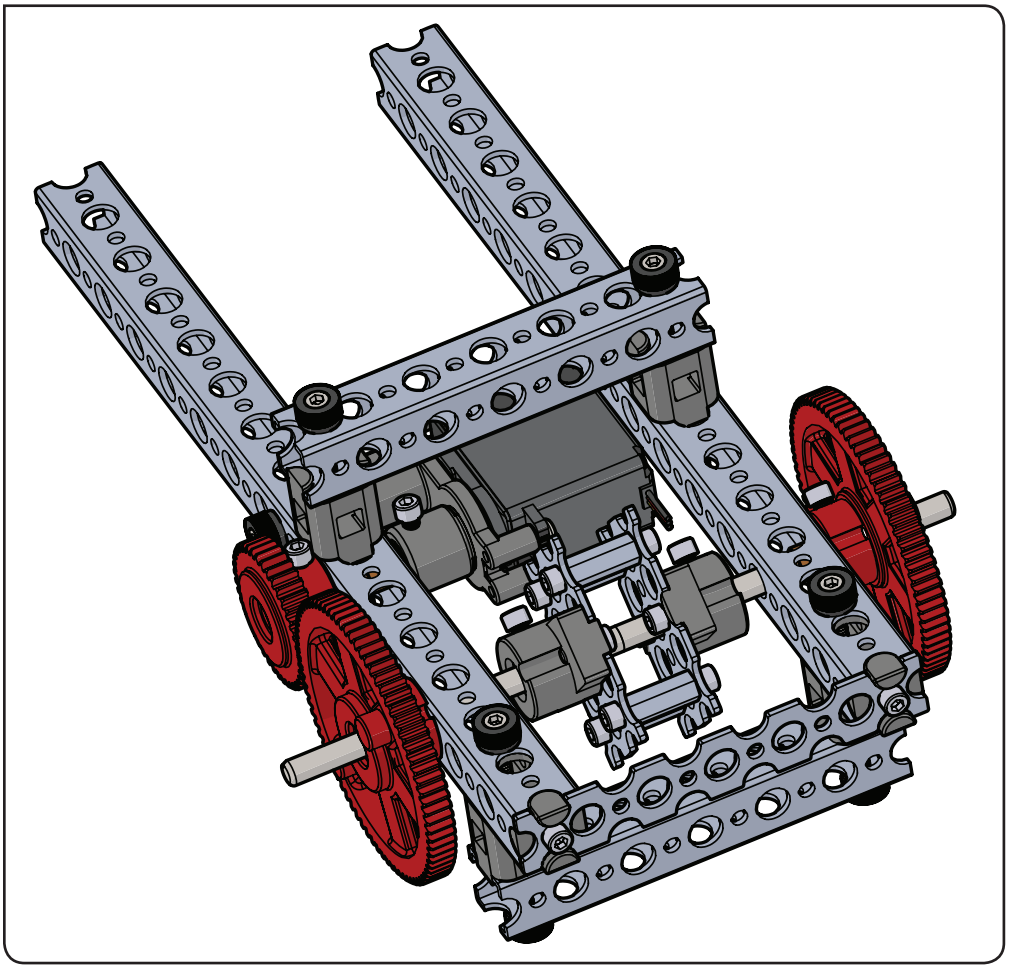
2x
Beam Attachment
Hub 40228

2x
8 mm x 6 mm
Bronze Bushing
40227

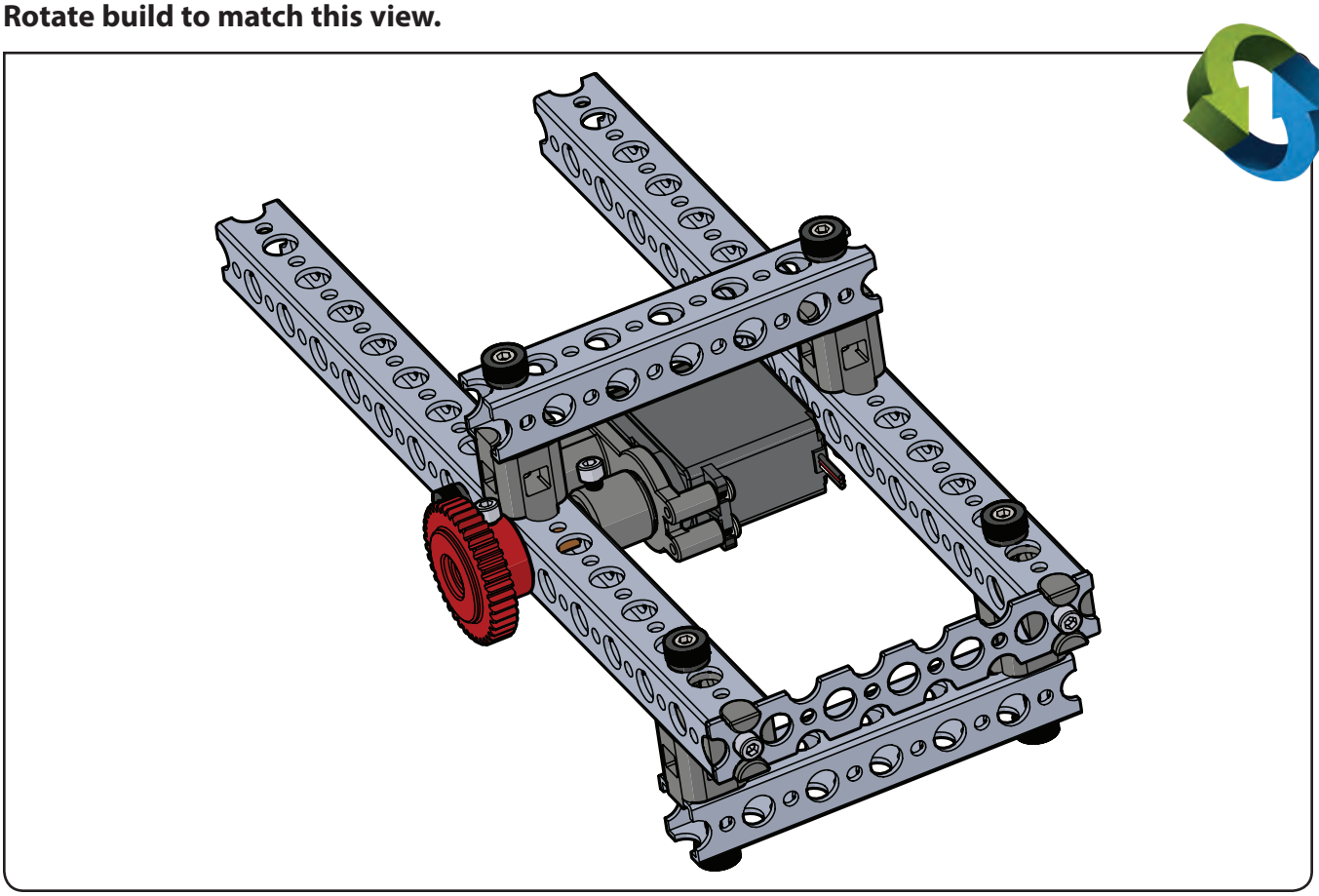
12x
Socket Head Cap
Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

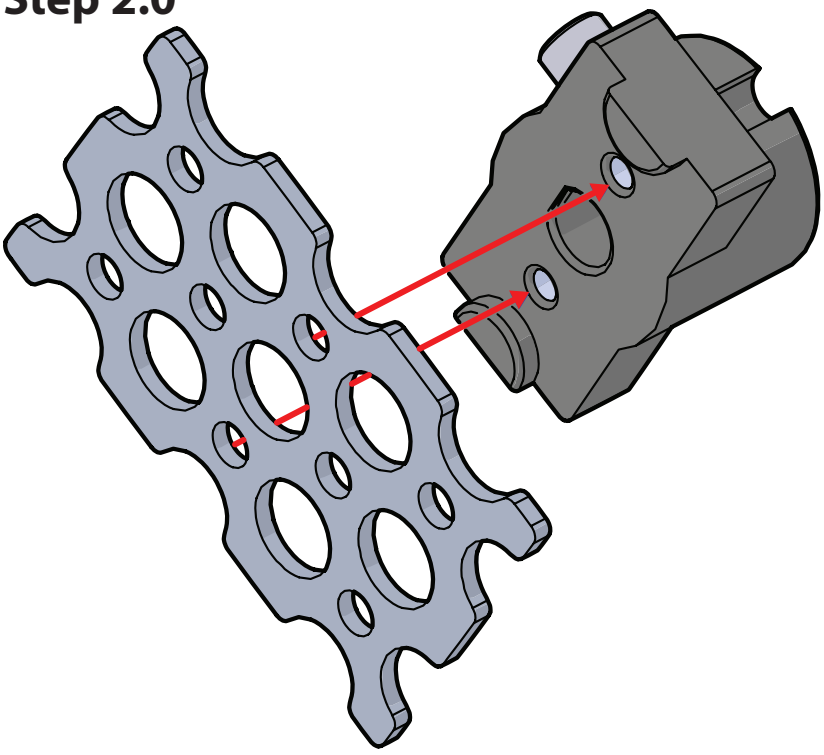
Partial assembly should look like this.



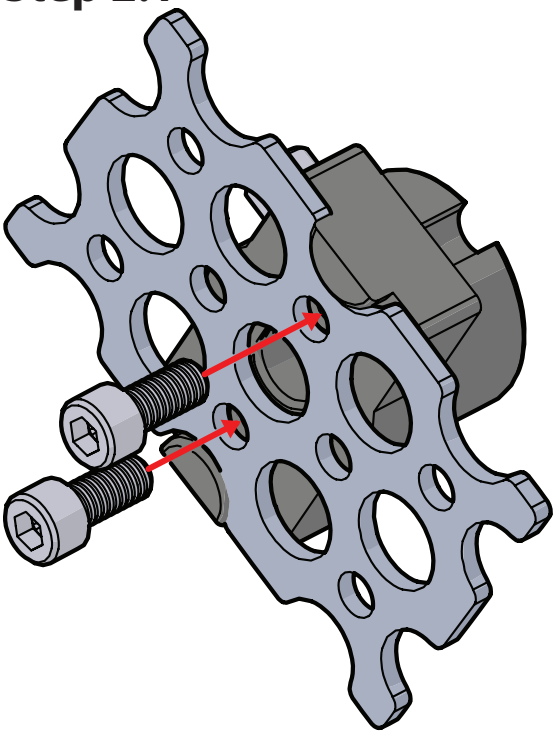
Rotate build to match this view.



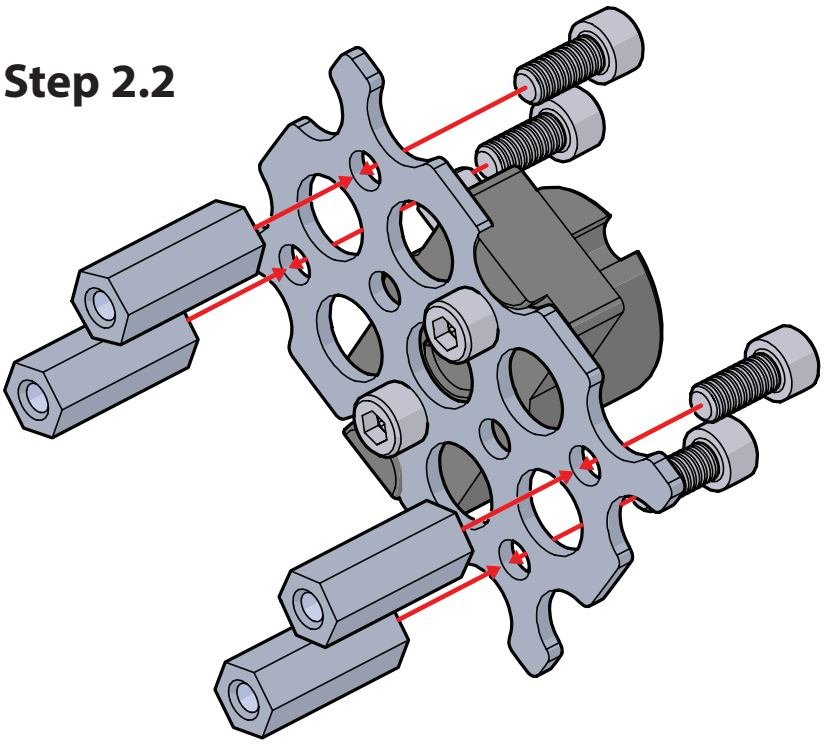
Step 2.0



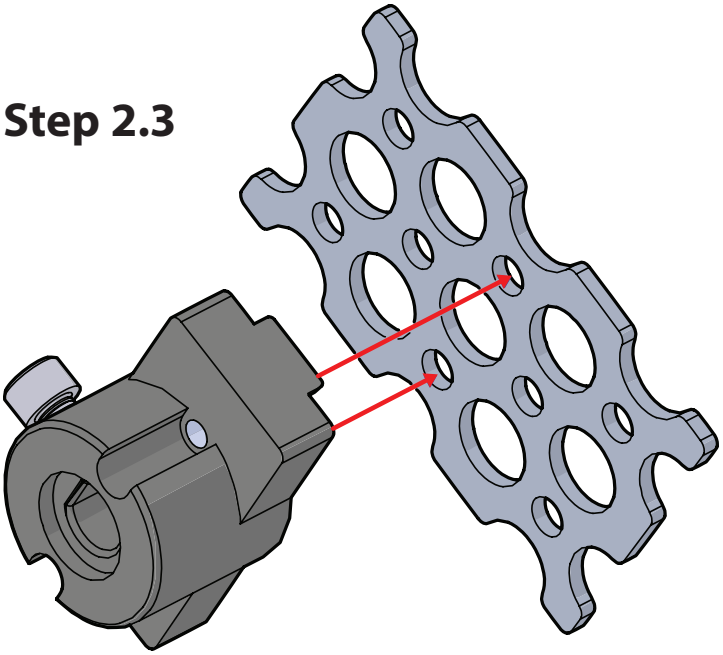
Step 2.1



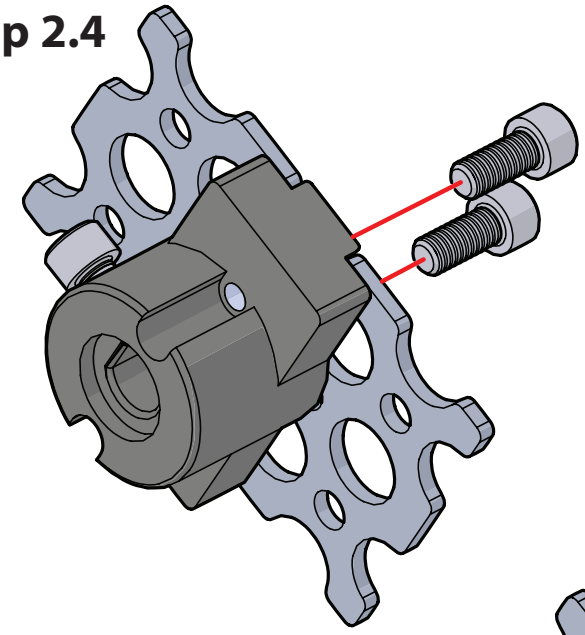
Step 2.2



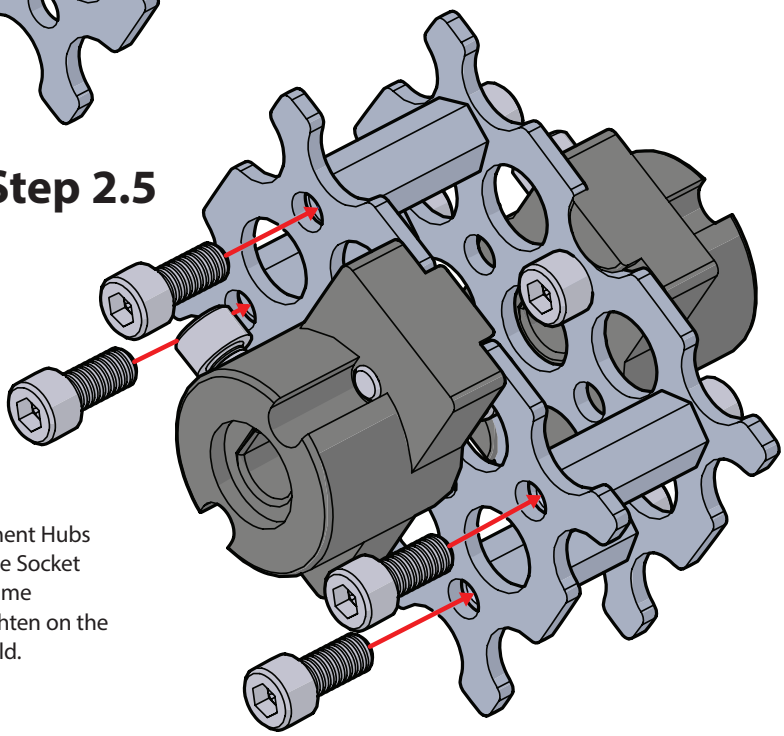
Step 2.3



Step 2.4

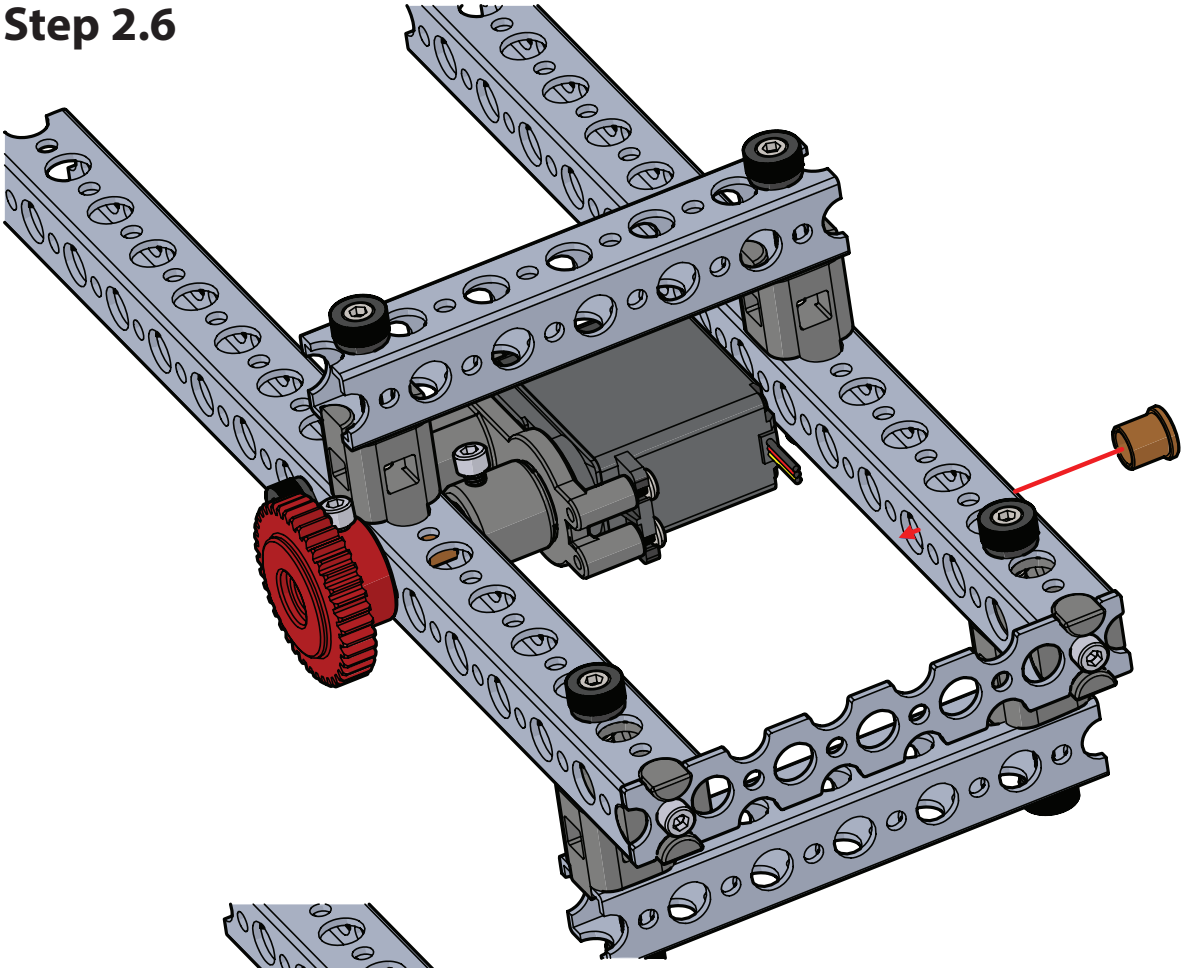


Step 2.5

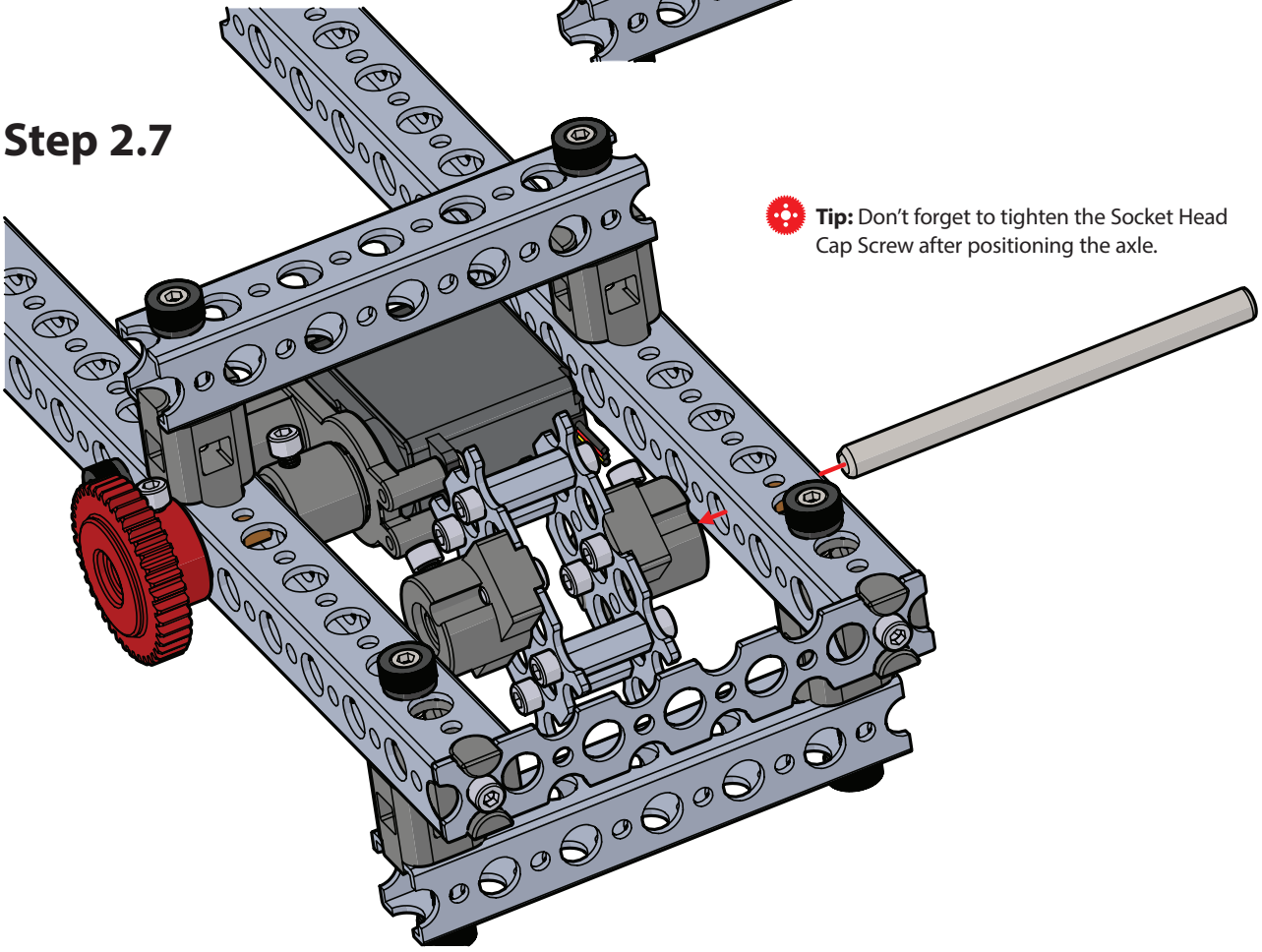


Tip: These two Beam Attachment Hubs should mirror each other. If the Socket Head Cap Screws are in the same position it will be easier to tighten on the axles without rotating the build.

Step 2.6

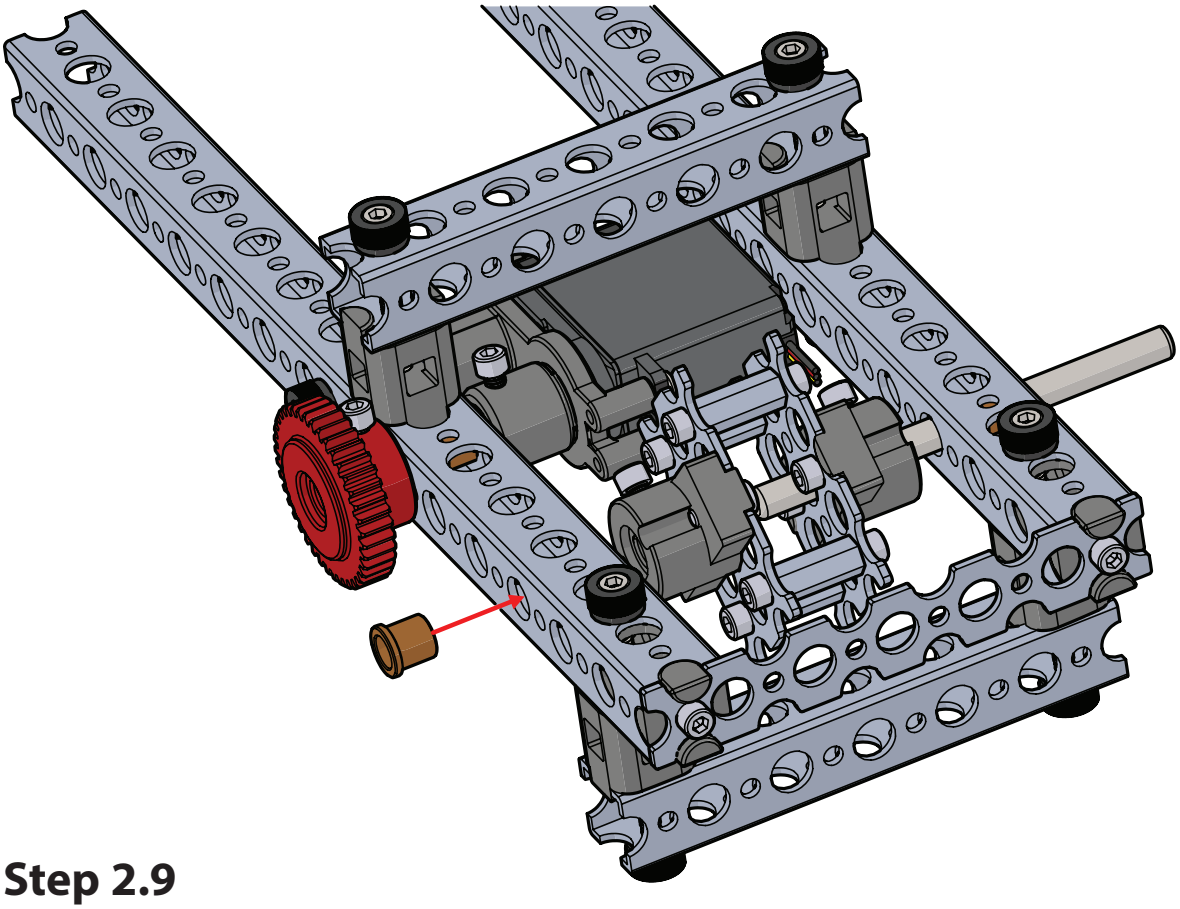


Step 2.7

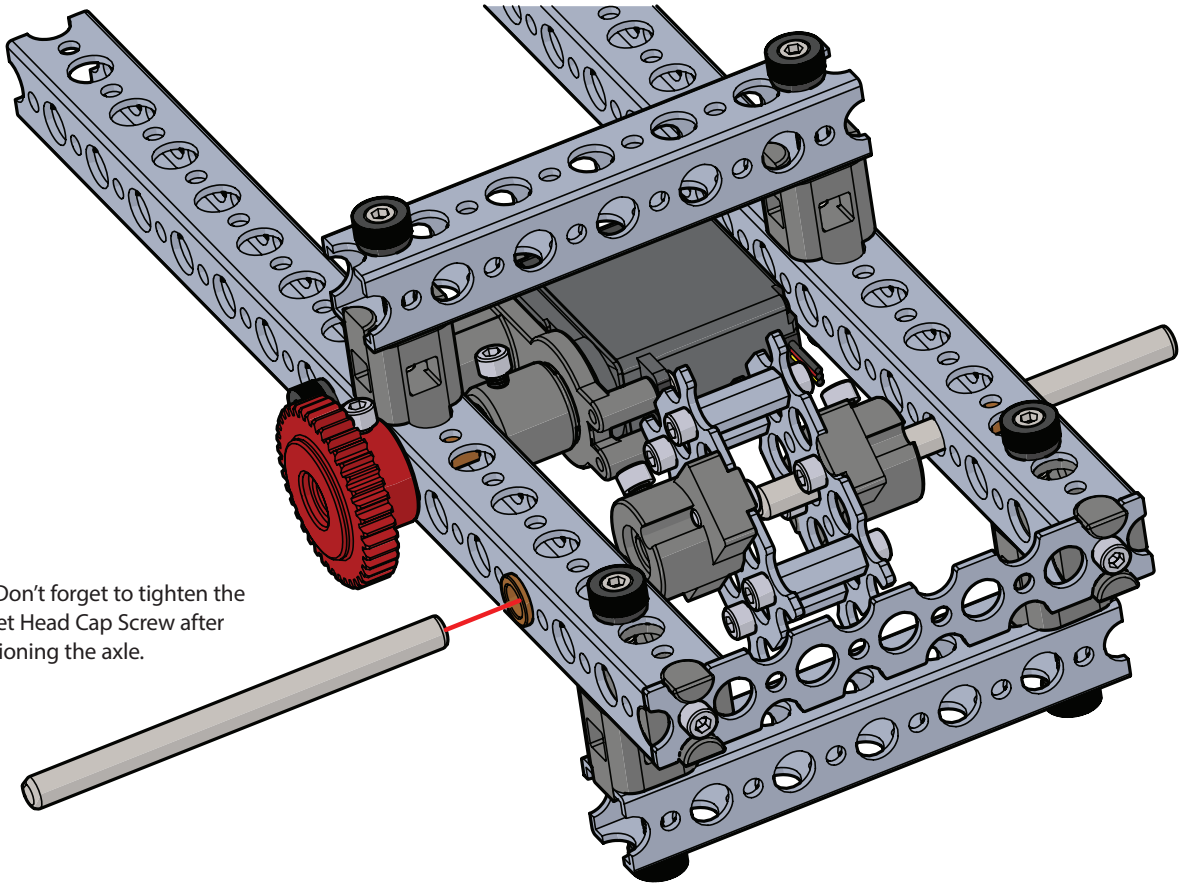


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.8

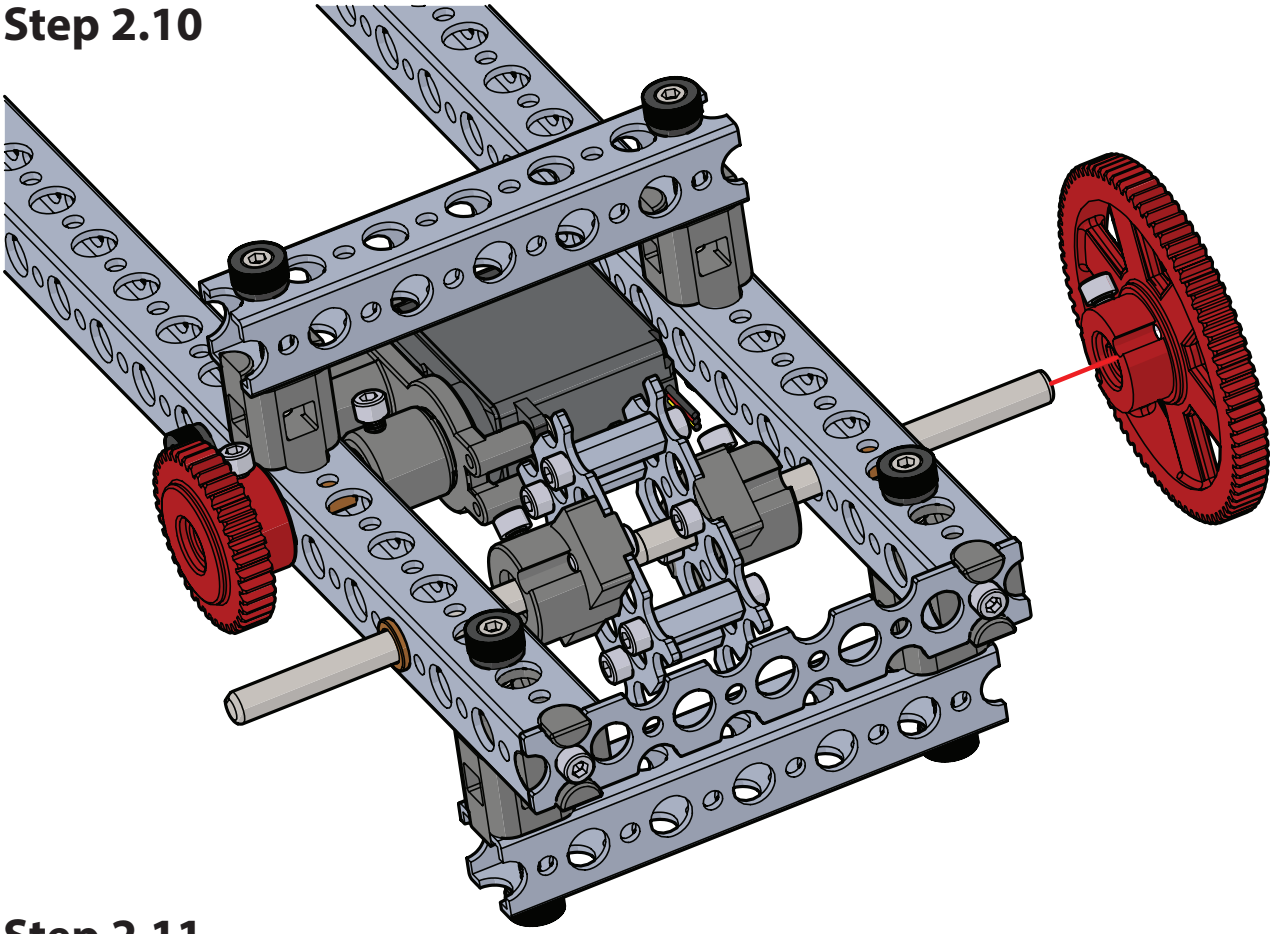


Step 2.9

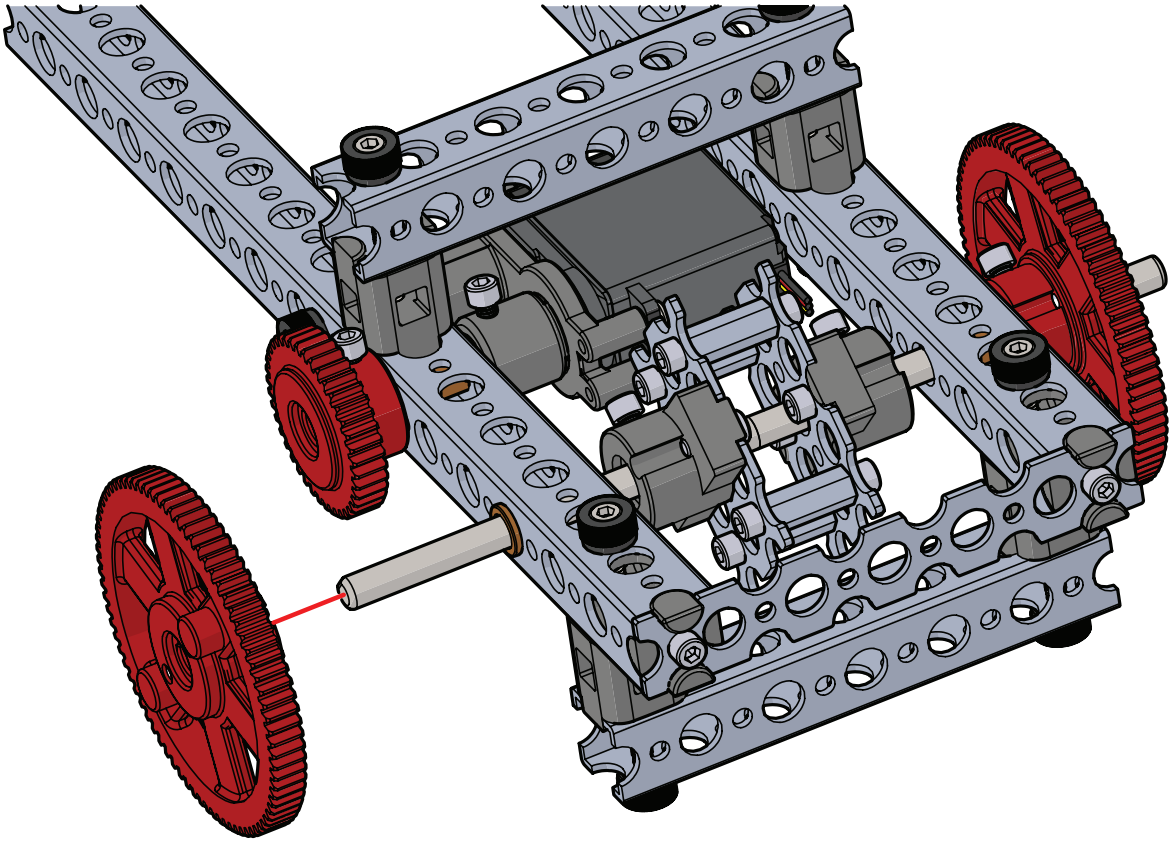


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.10

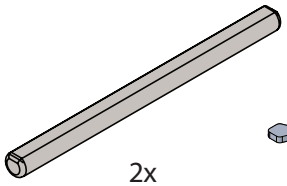


Step 2.11

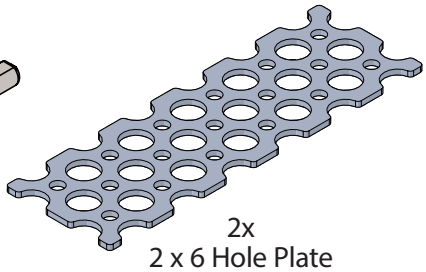


Step 3

Parts Needed



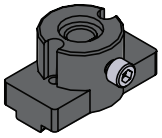
2x
80 mm Steel Axle
40225



2x
2 x 6 Hole Plate
41256

6x
Thumbscrew 40323

2x
Stand-Off Post 6-32 x
16 mm 41253



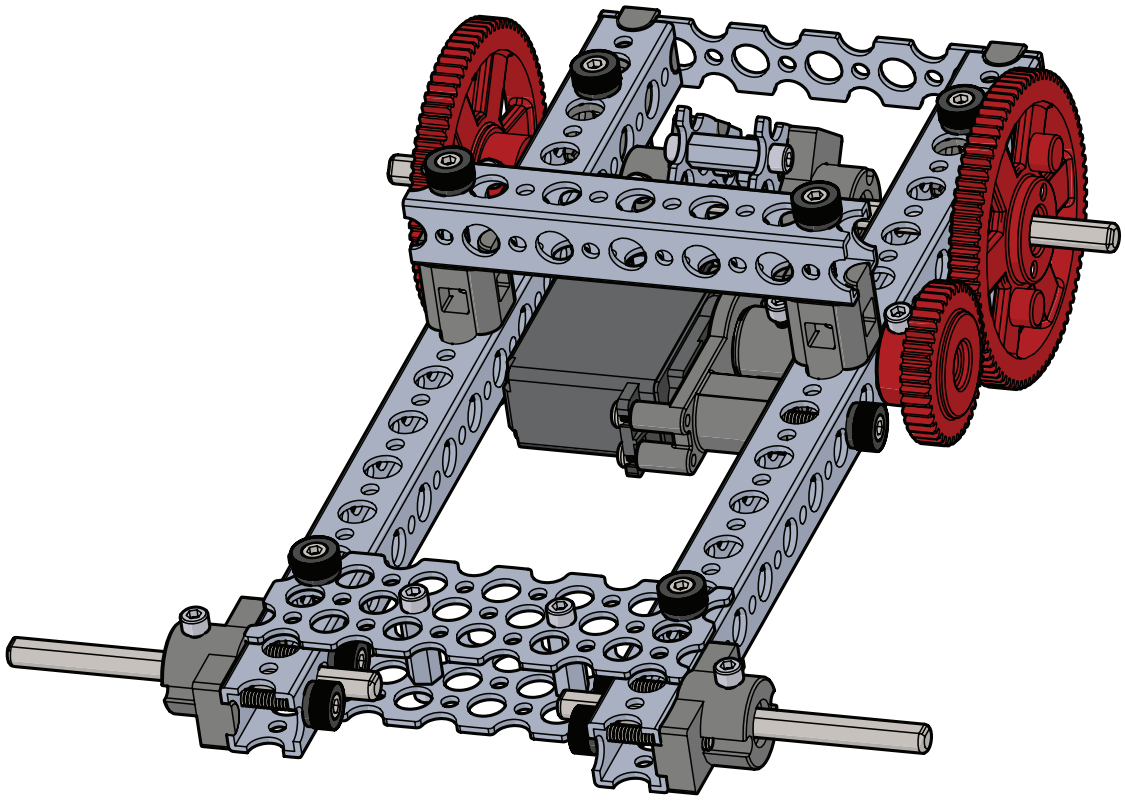
2x
Beam Attachment
Hub 40228

2x
Wing Nut
40221

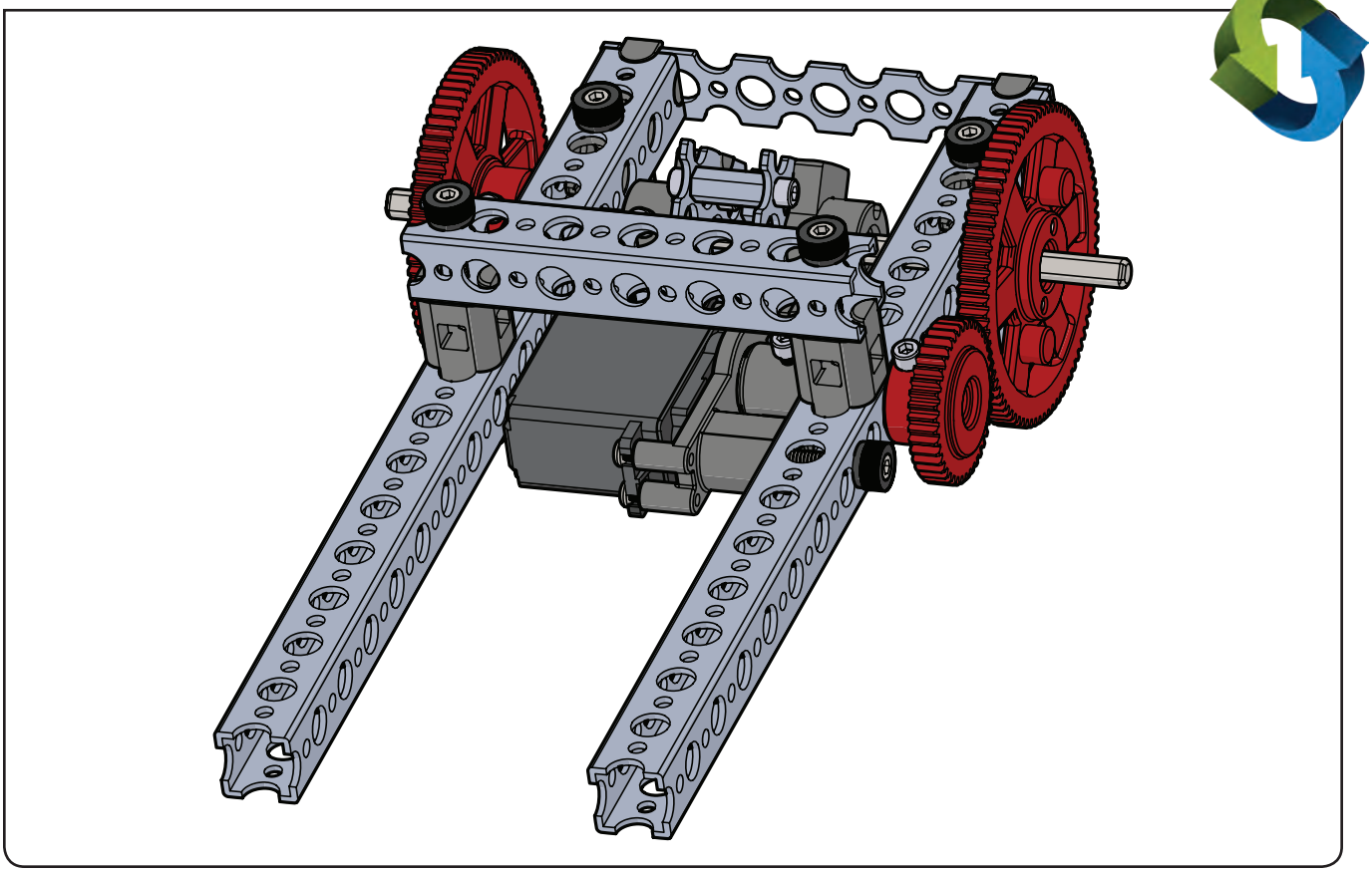
4x
Socket Head Cap
Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

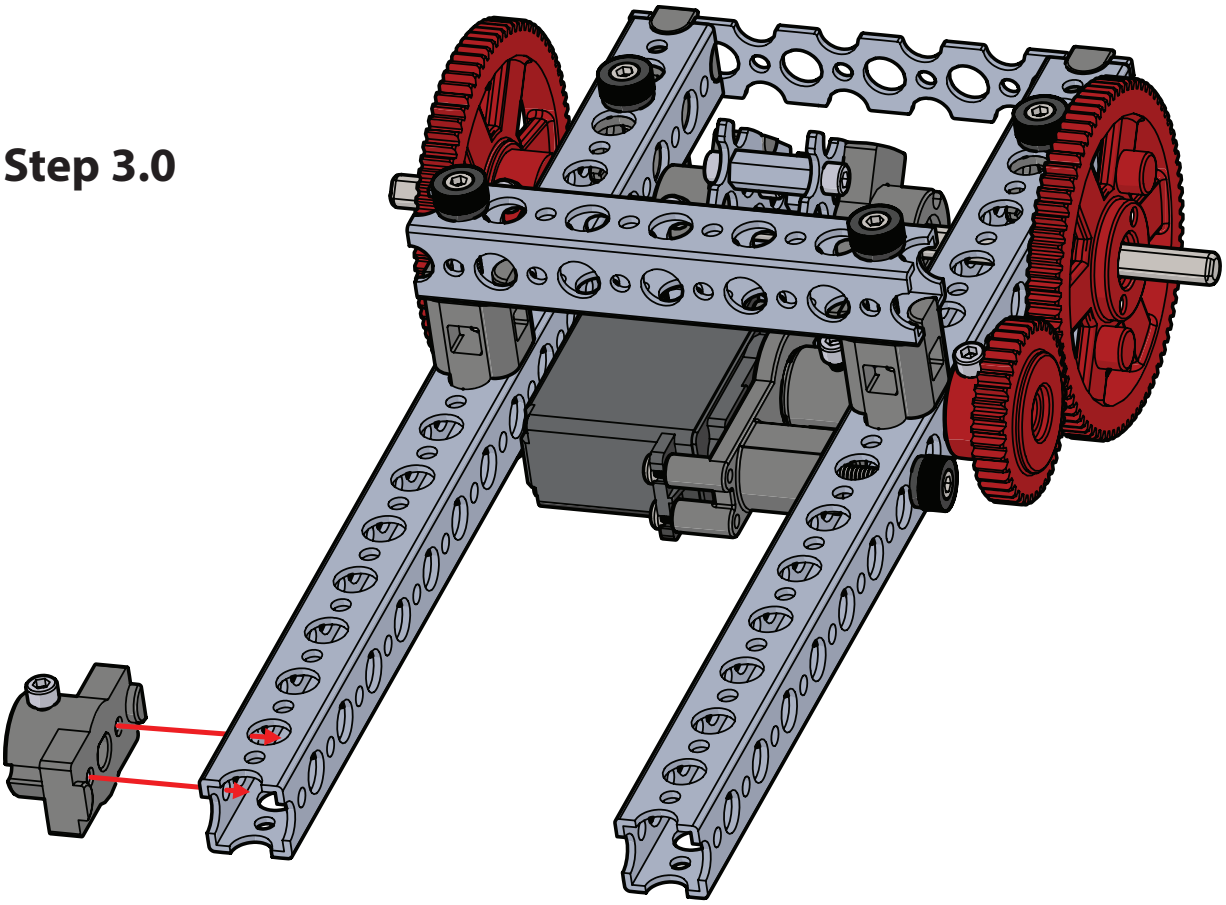
Partial assembly should look like this.



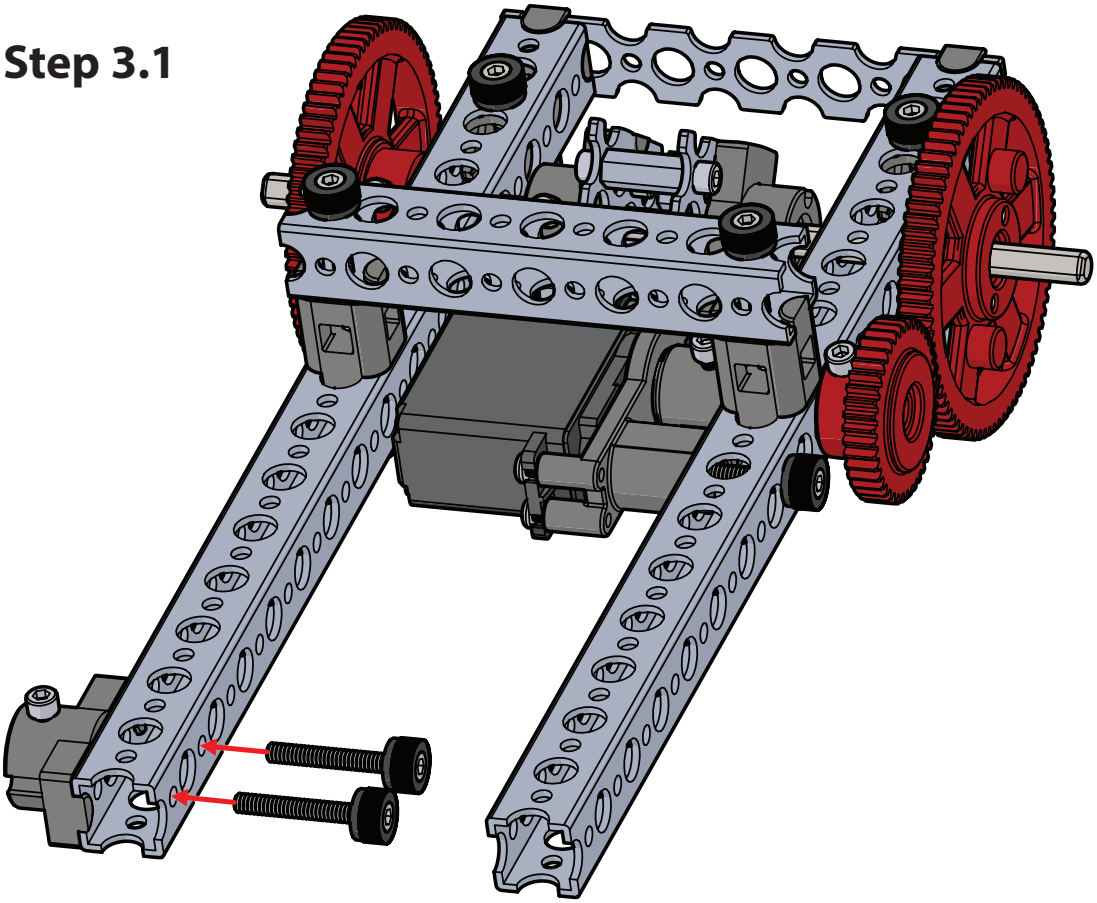
Rotate build to match this view.



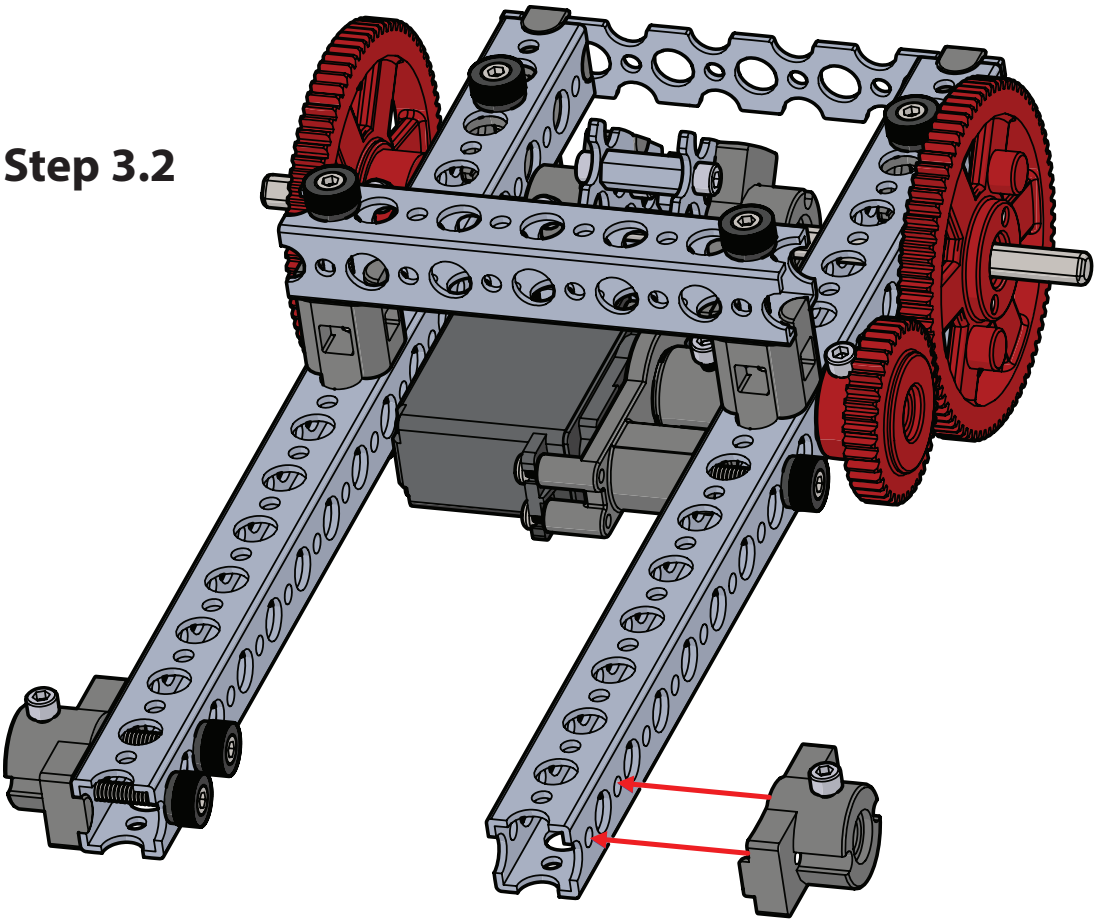
Step 3.0



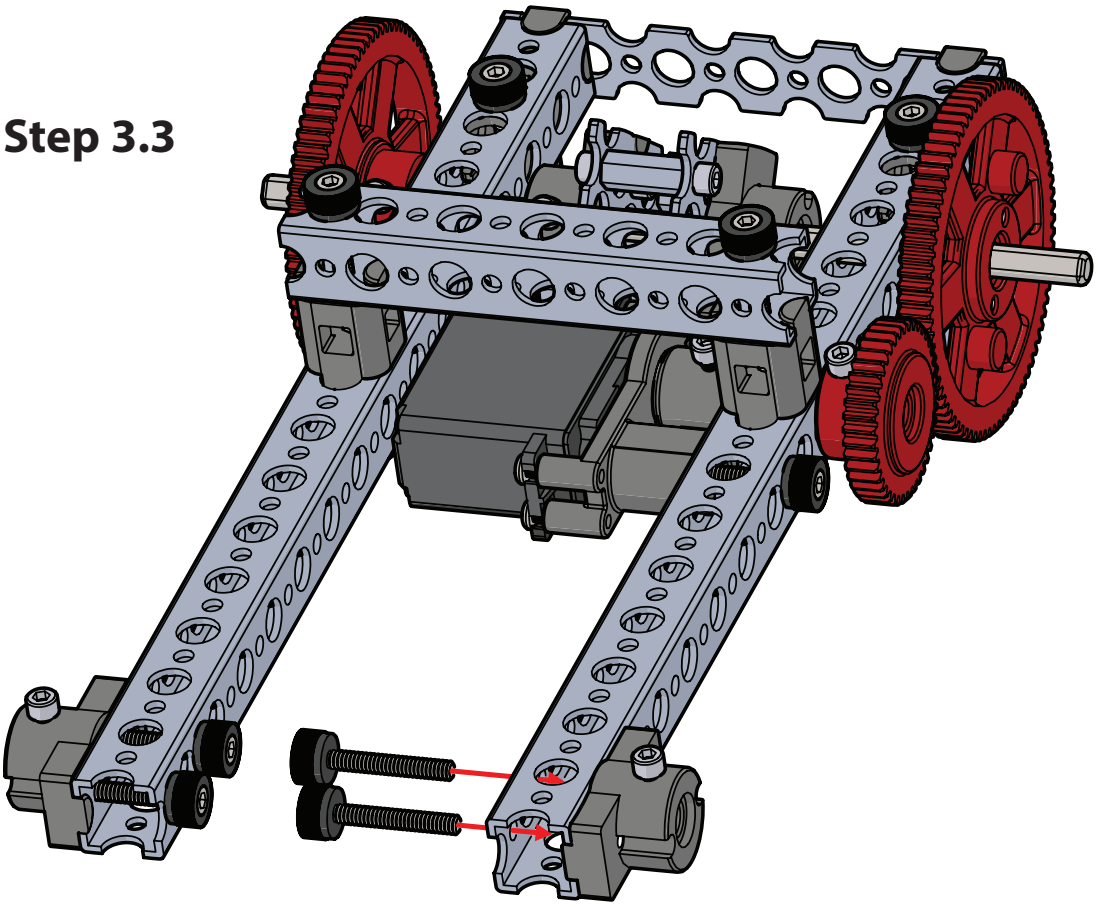
Step 3.1



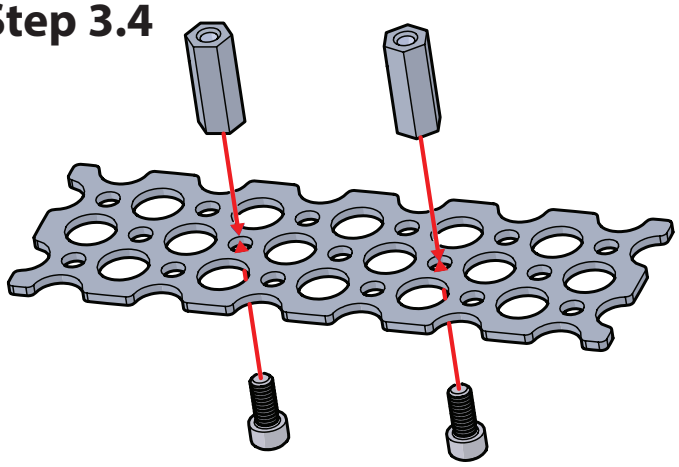
Step 3.2



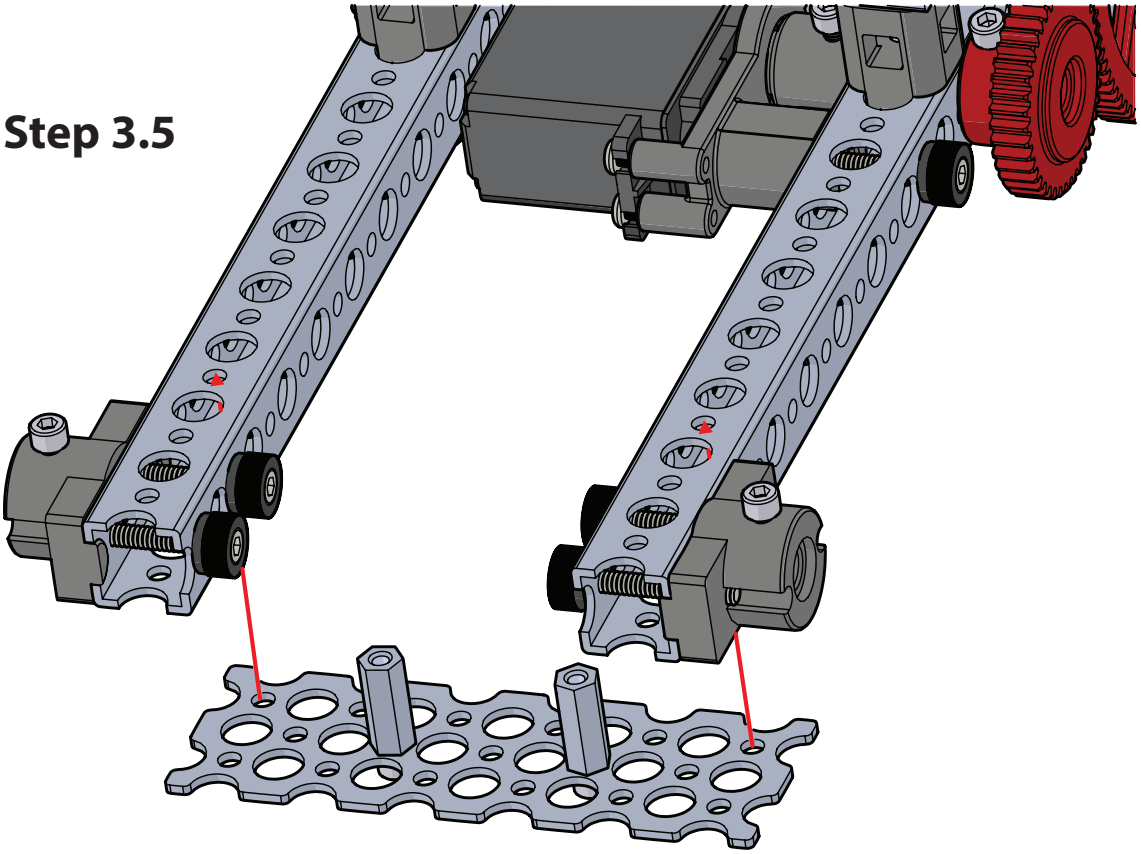
Step 3.3



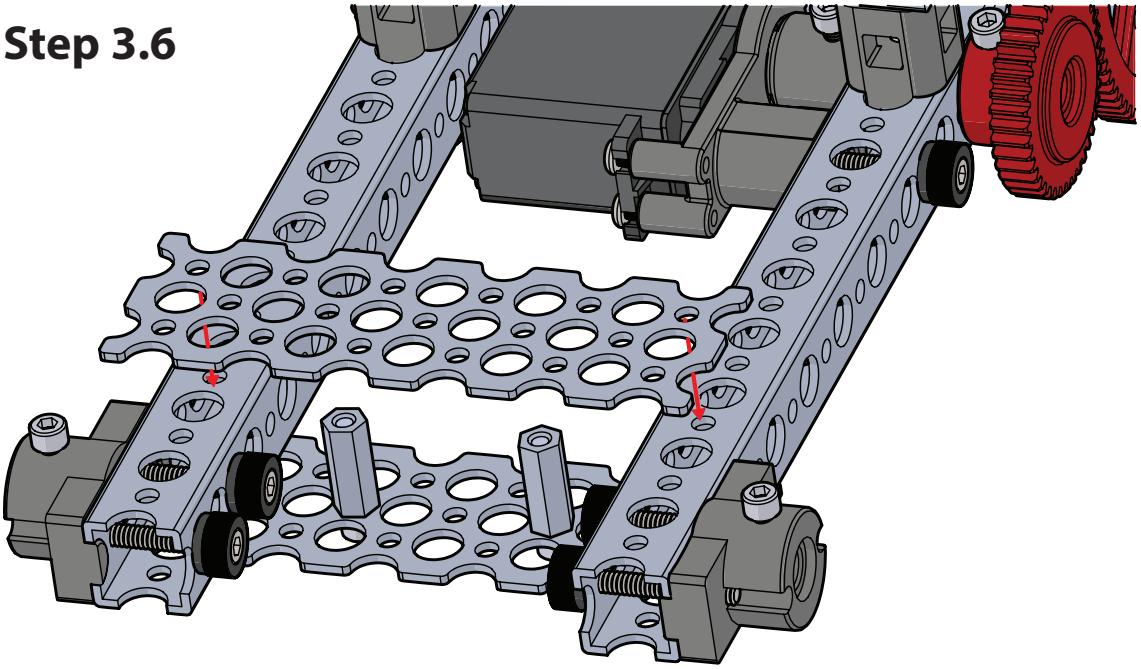
Step 3.4



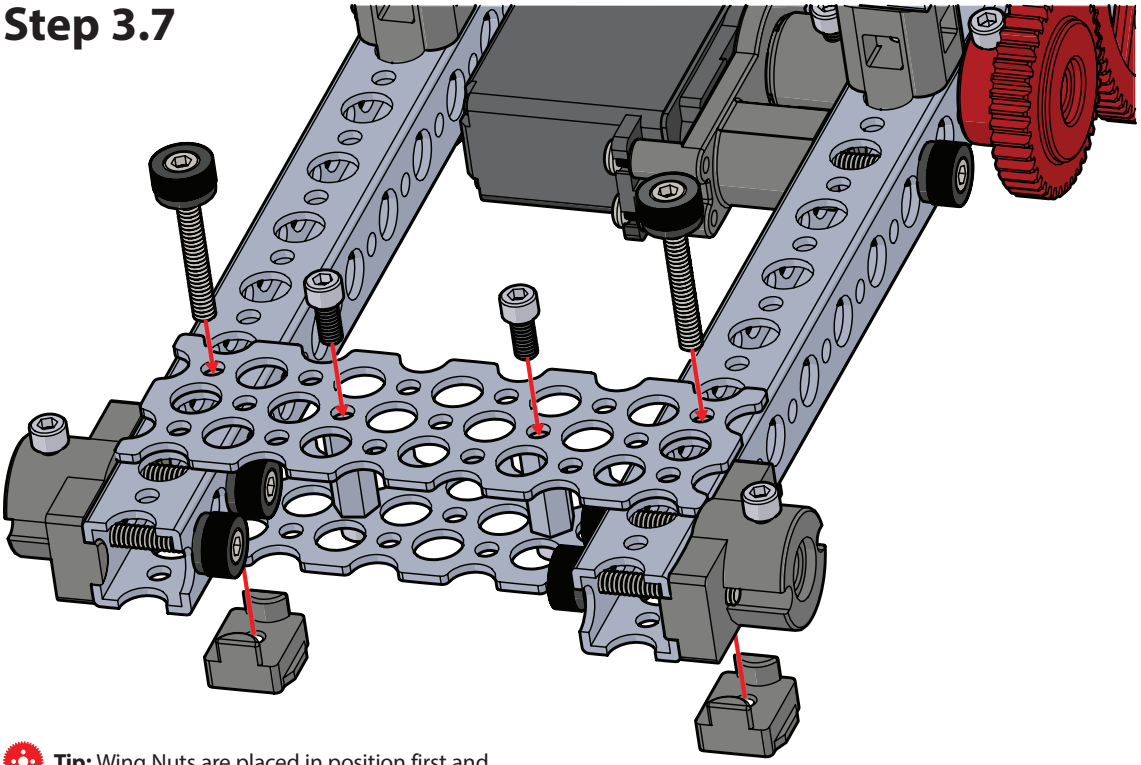
Step 3.5



Step 3.6

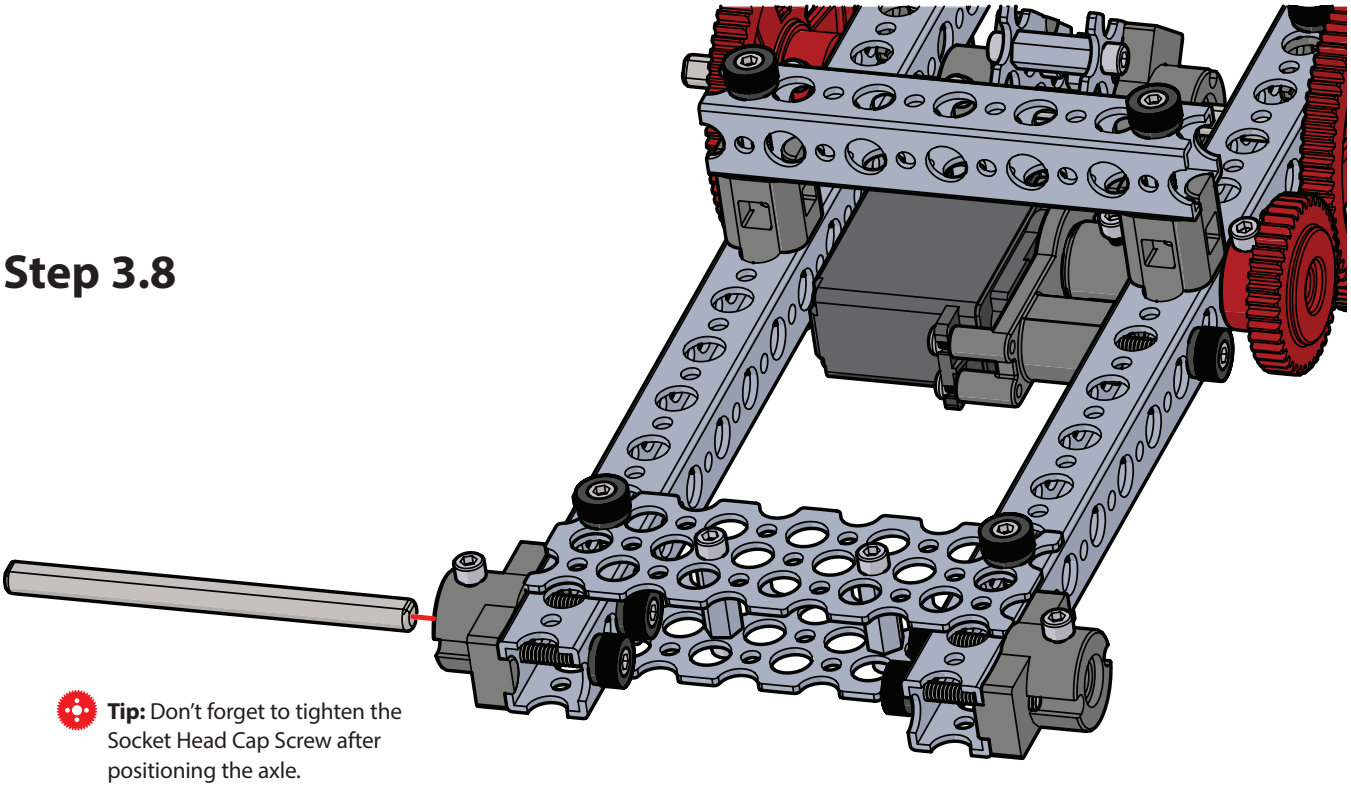


Step 3.7



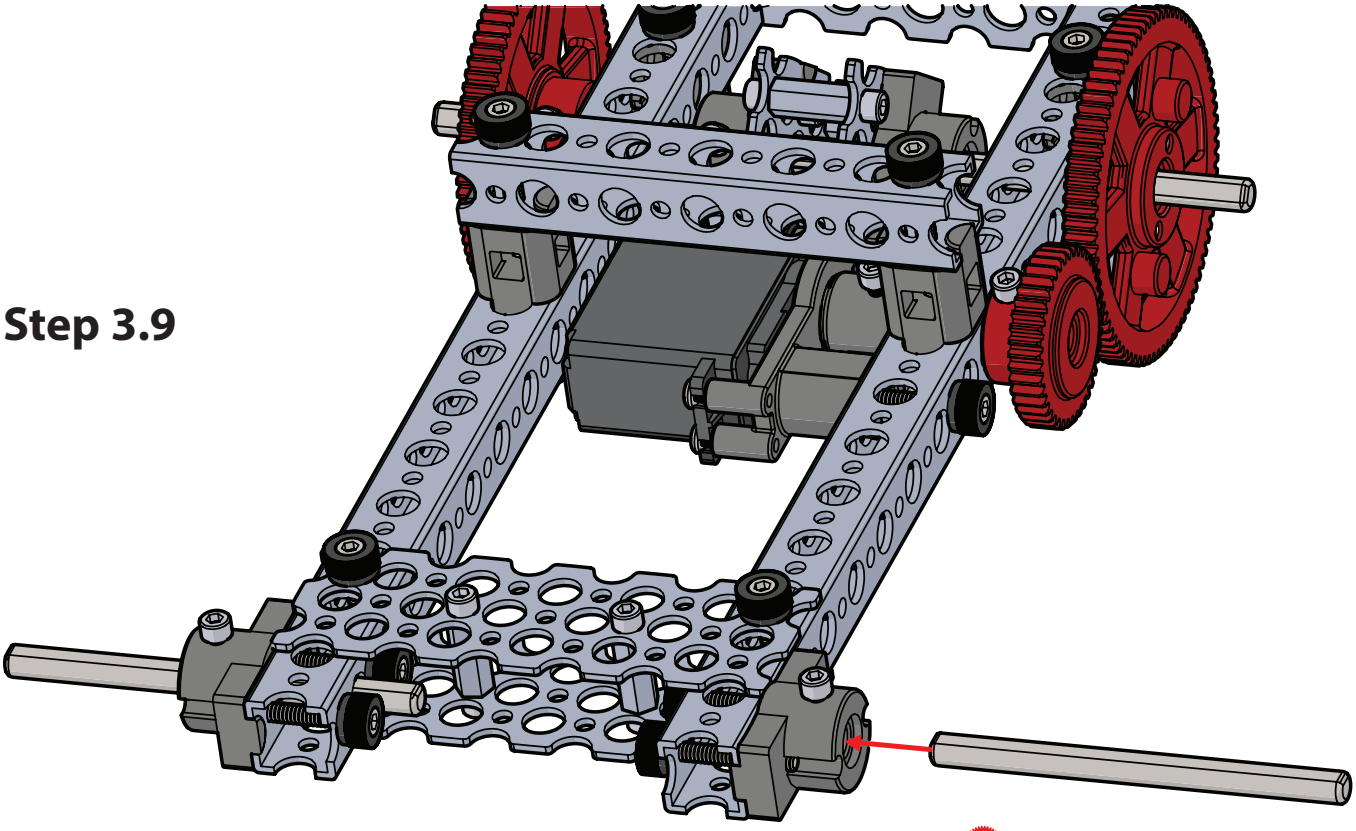
Tip: Wing Nuts are placed in position first and Thumbscrews are tightened into them. After Wing Nuts are placed and seated properly, they **cannot** be turned.

Step 3.8



Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

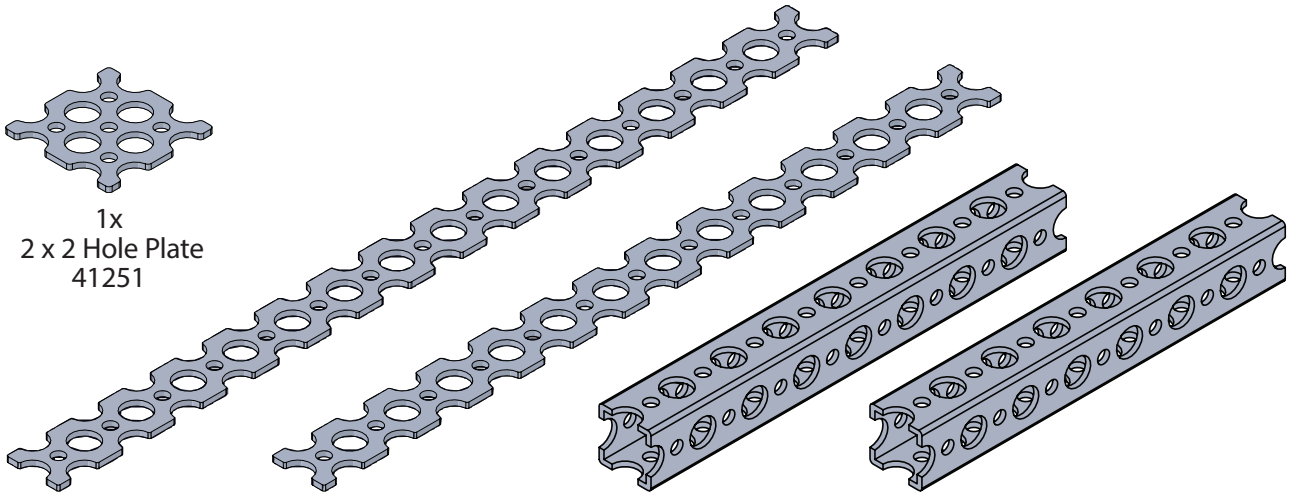
Step 3.9



Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 4

Parts Needed



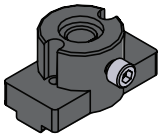
1x
2 x 2 Hole Plate
41251

1x
15-Hole Flat
Linkage 41250

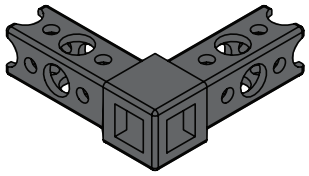
1x
13-Hole Flat
Linkage 41249

1x
8-Hole Square
Beam 40205

1x
7-Hole Square
Beam 40204



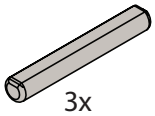
2x
Beam Attachment
Hub 40228



2x
90-Degree Beam
Connector 40211

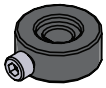
4x
Quick Rivet Peg
40220

4x
Quick Rivet
Connector 40219



3x
40 mm Steel Axle
40226

8x
8 mm x 6 mm Bronze
Bushing 40227

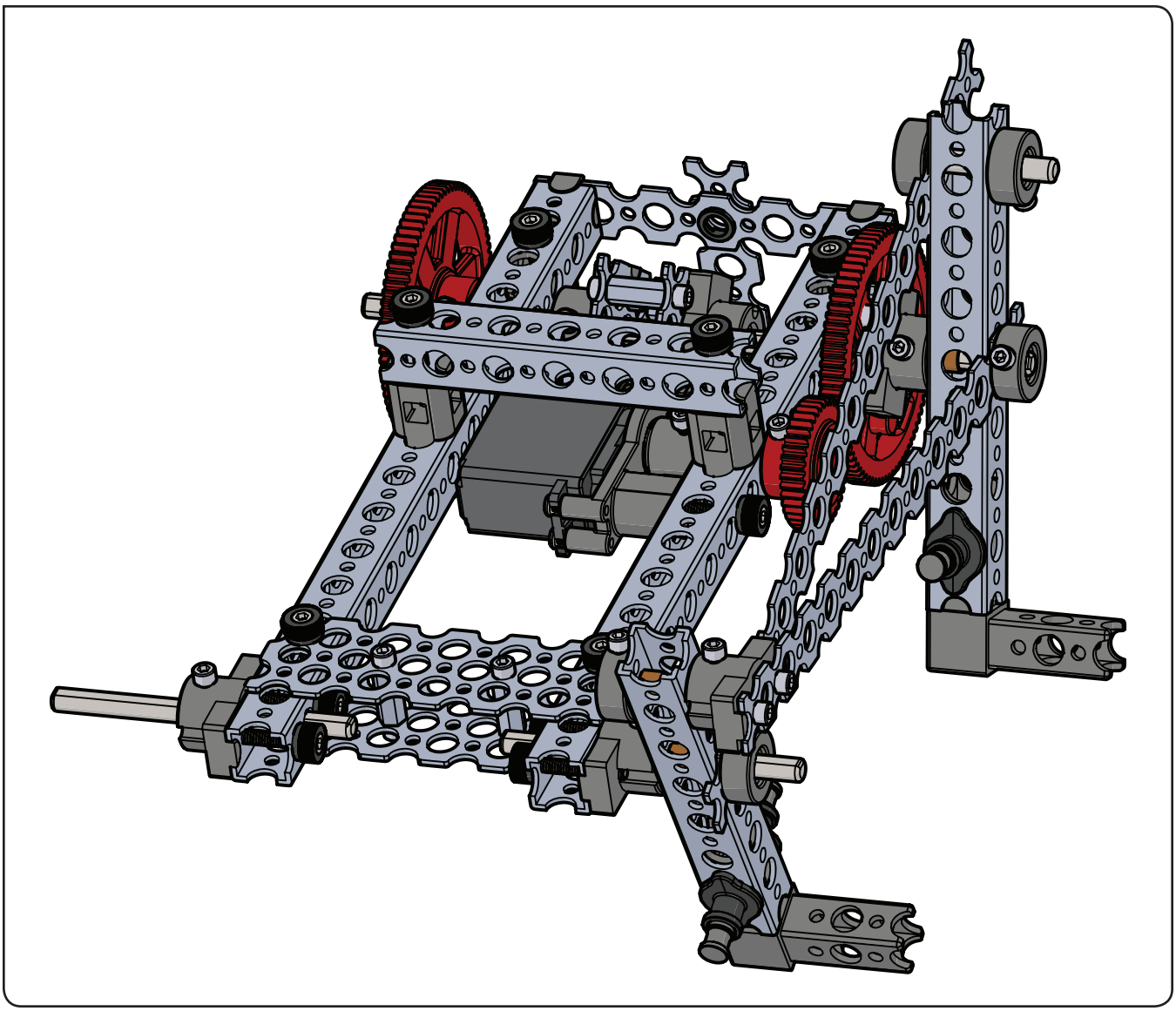


5x
D-Shaft Set Collar
40229

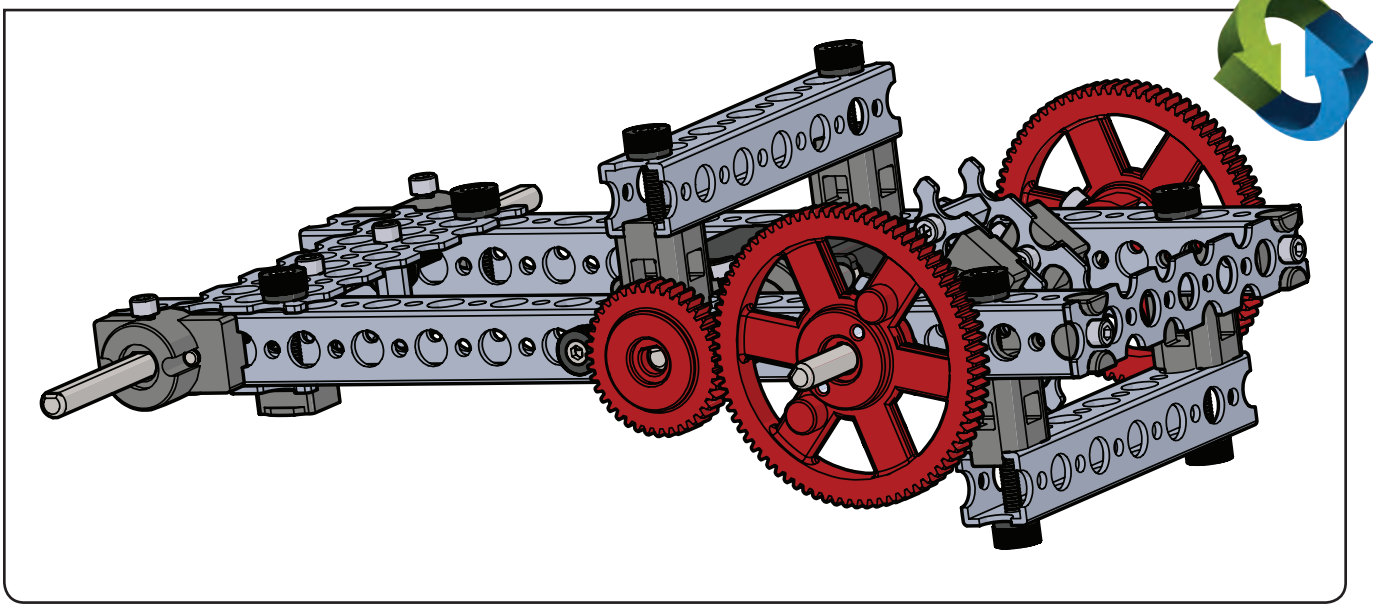
6x
Socket Head Cap
Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

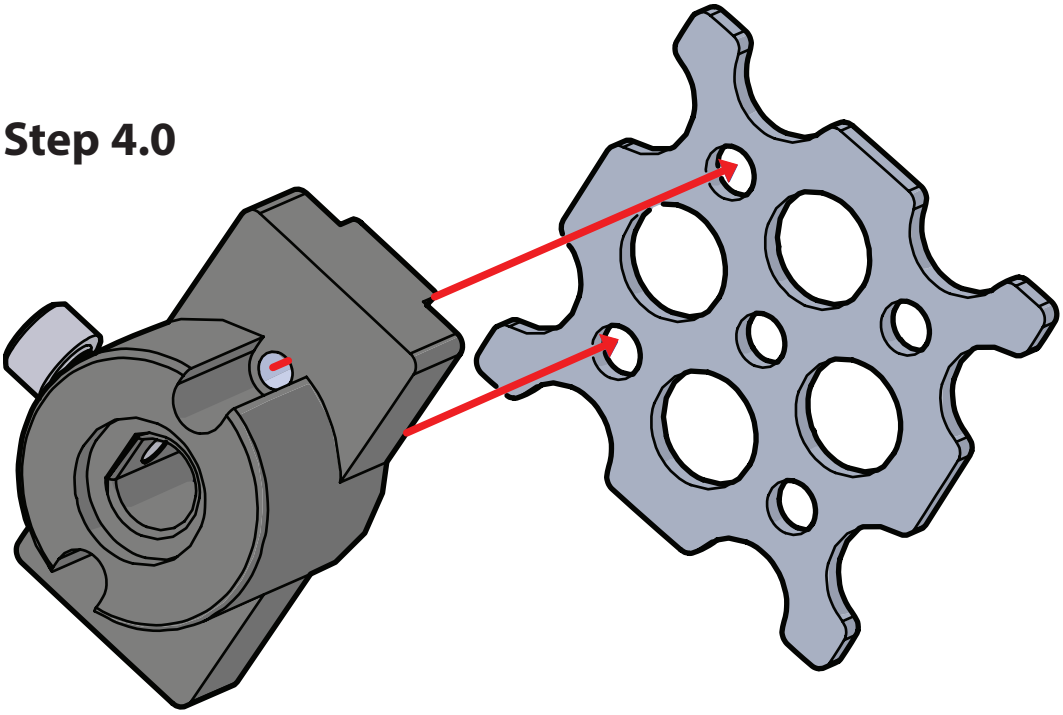
Partial assembly should look like this.



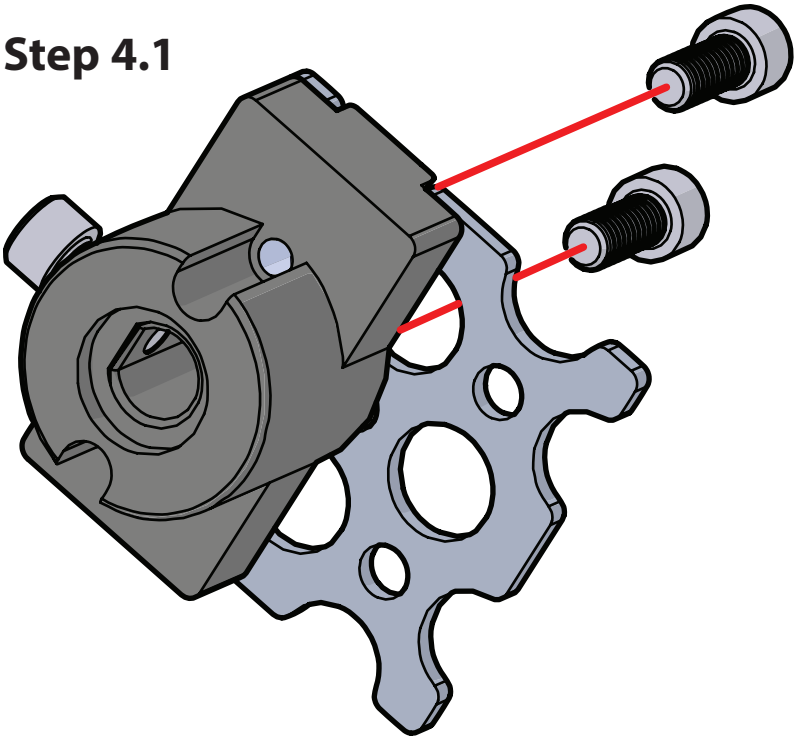
Rotate build to match this view.



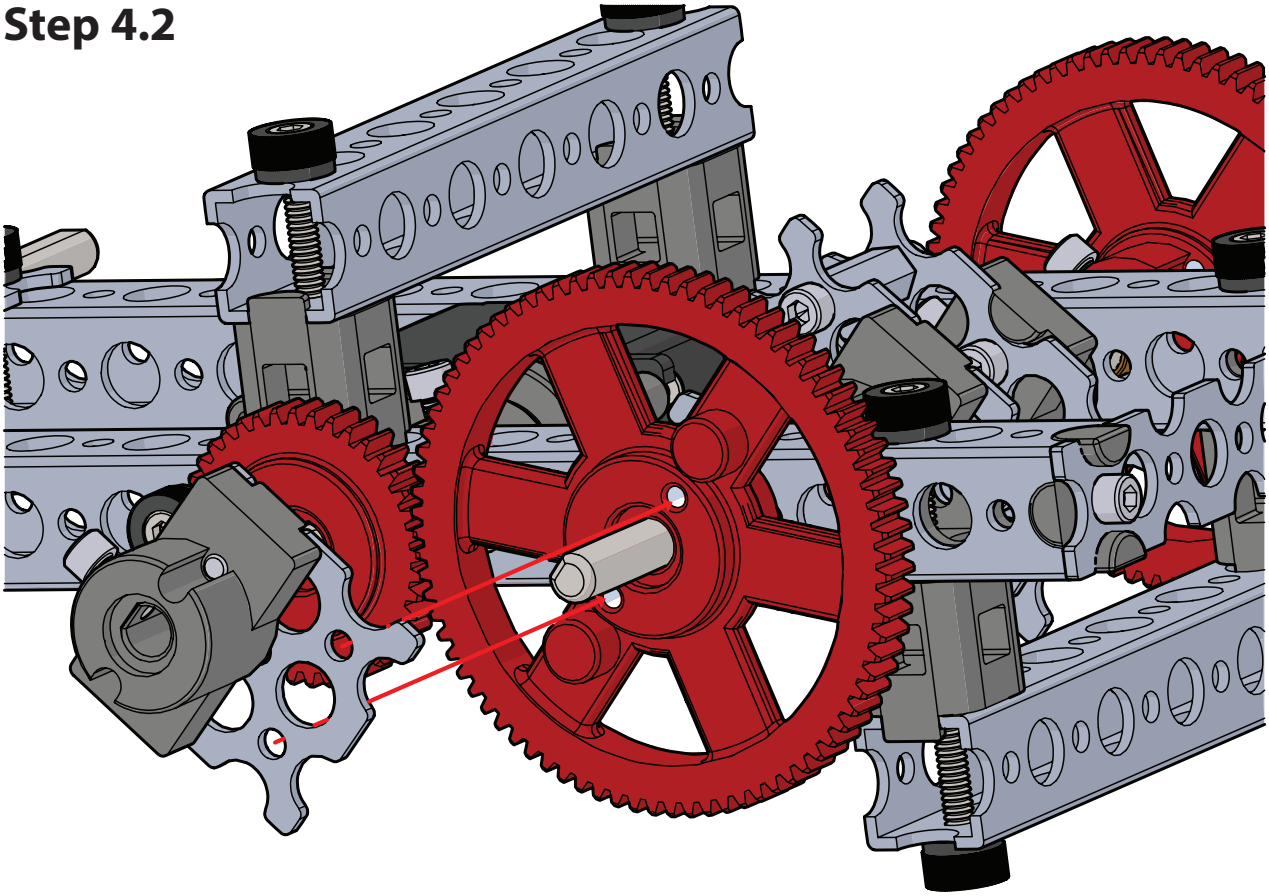
Step 4.0



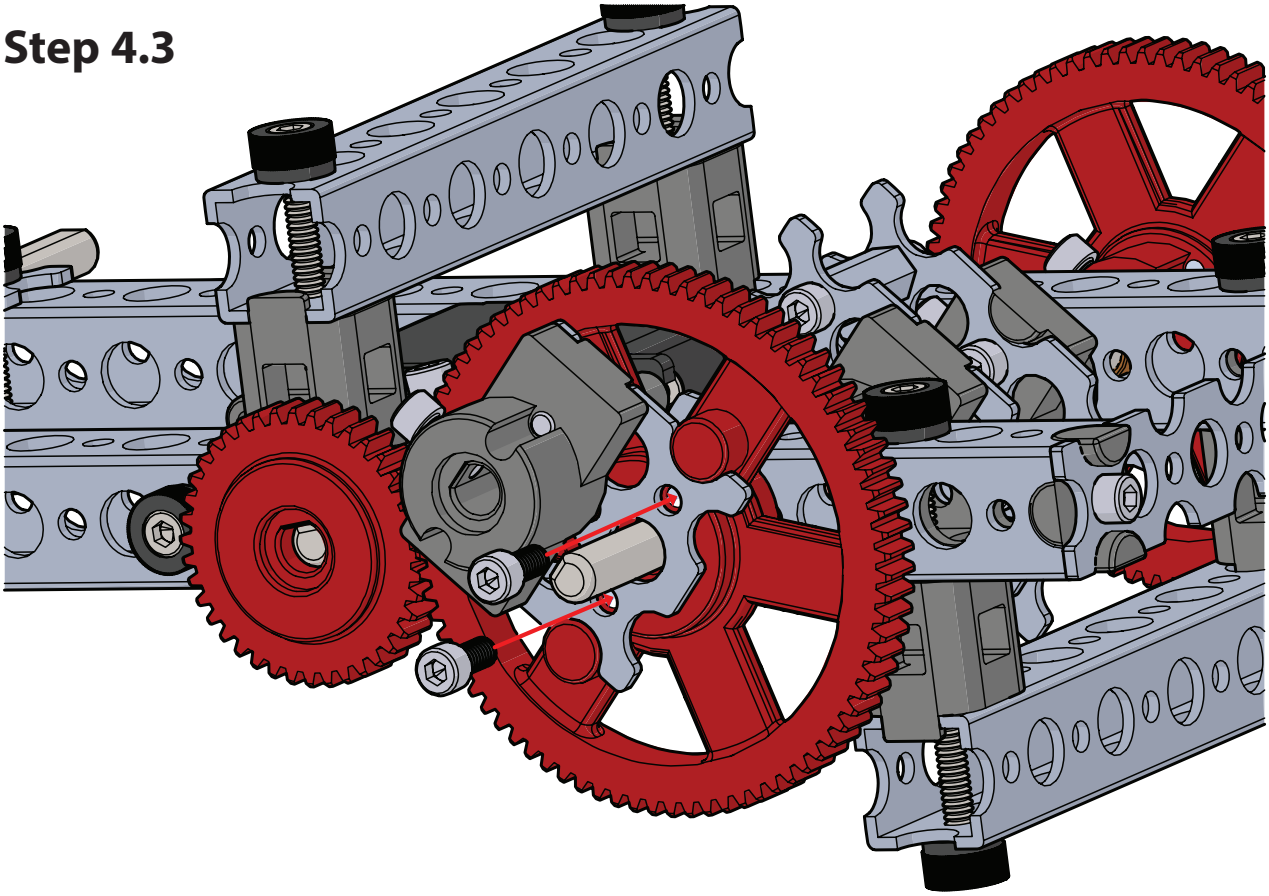
Step 4.1



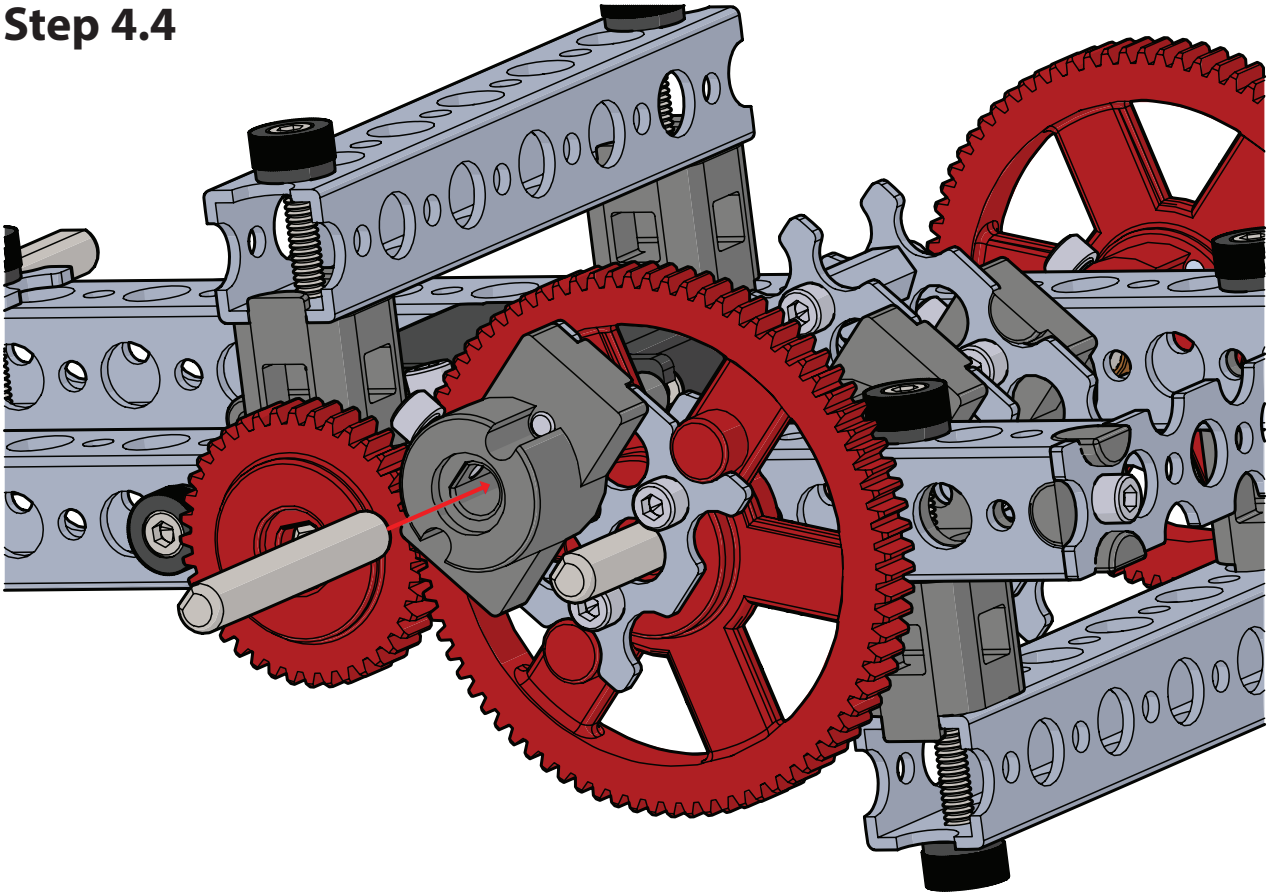
Step 4.2



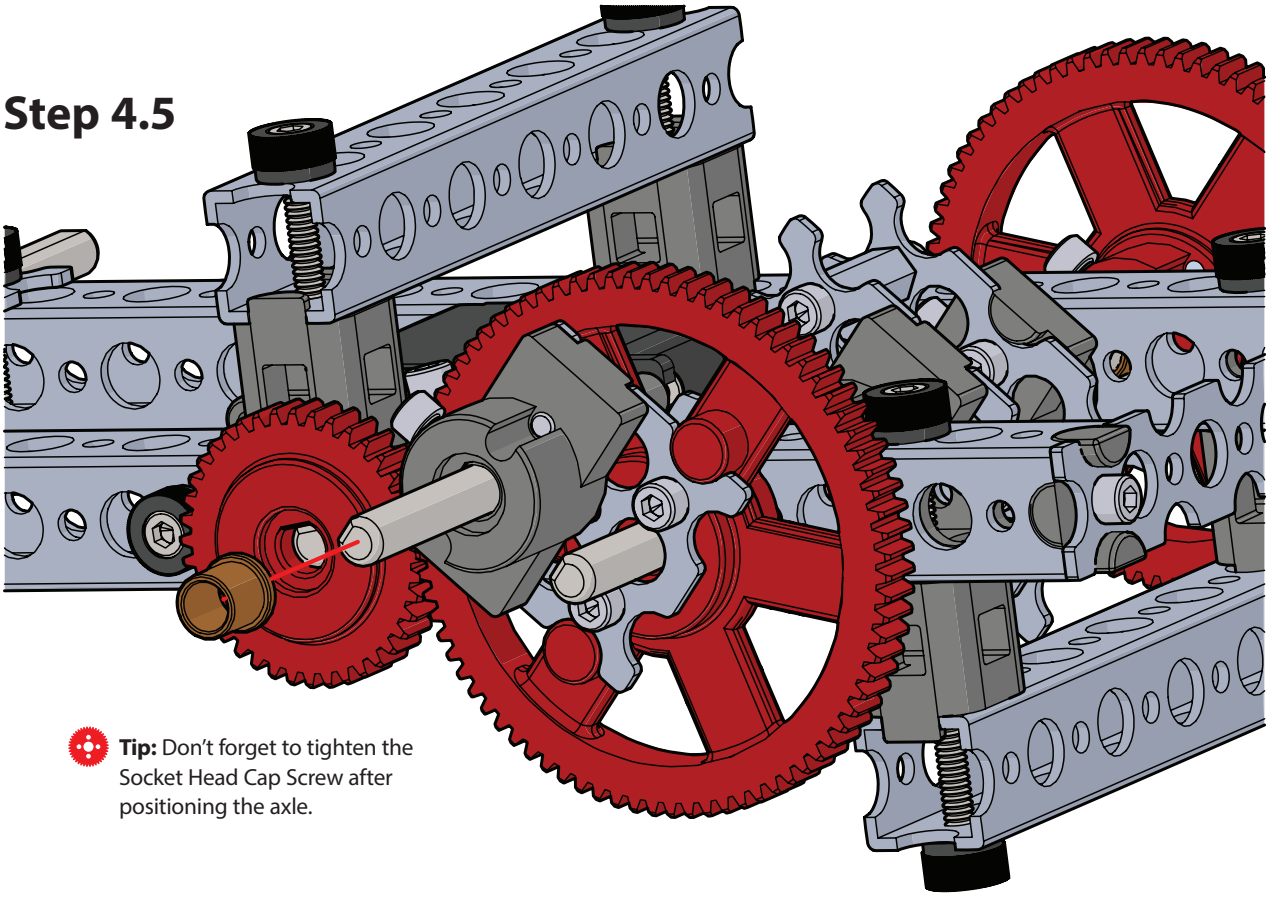
Step 4.3



Step 4.4

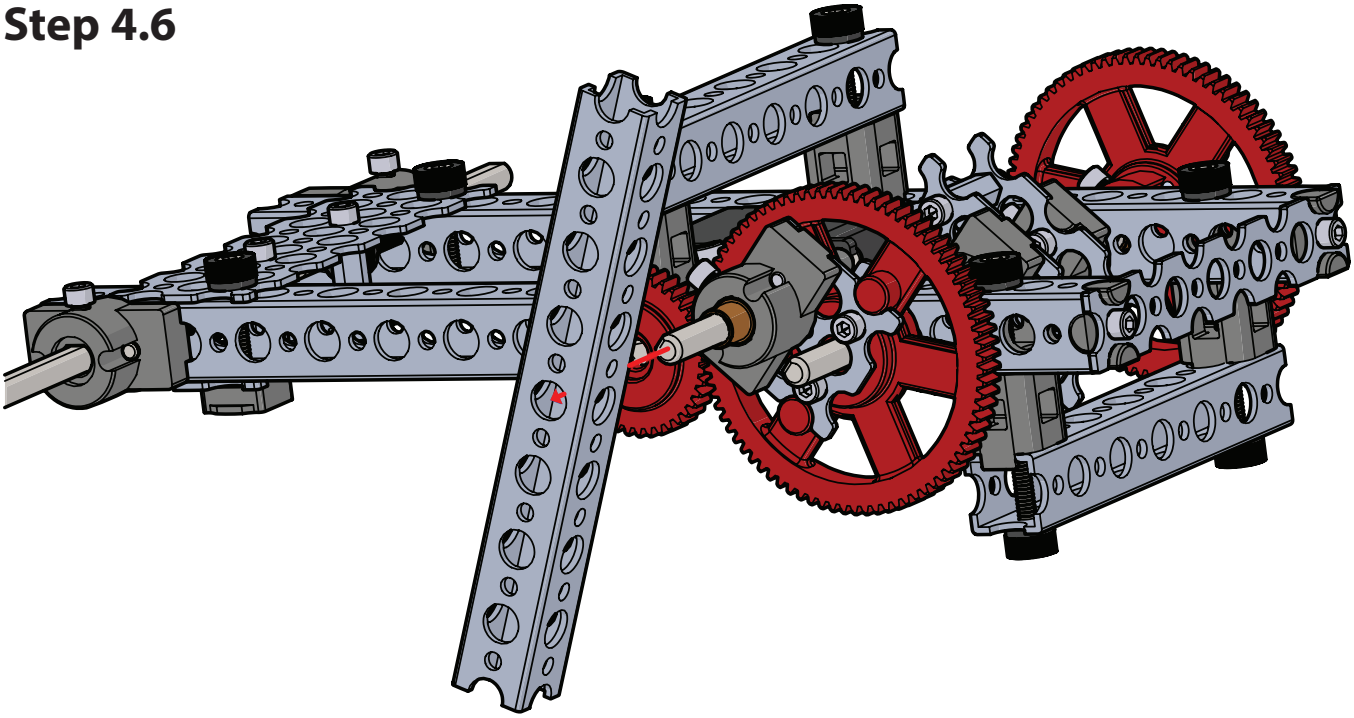


Step 4.5

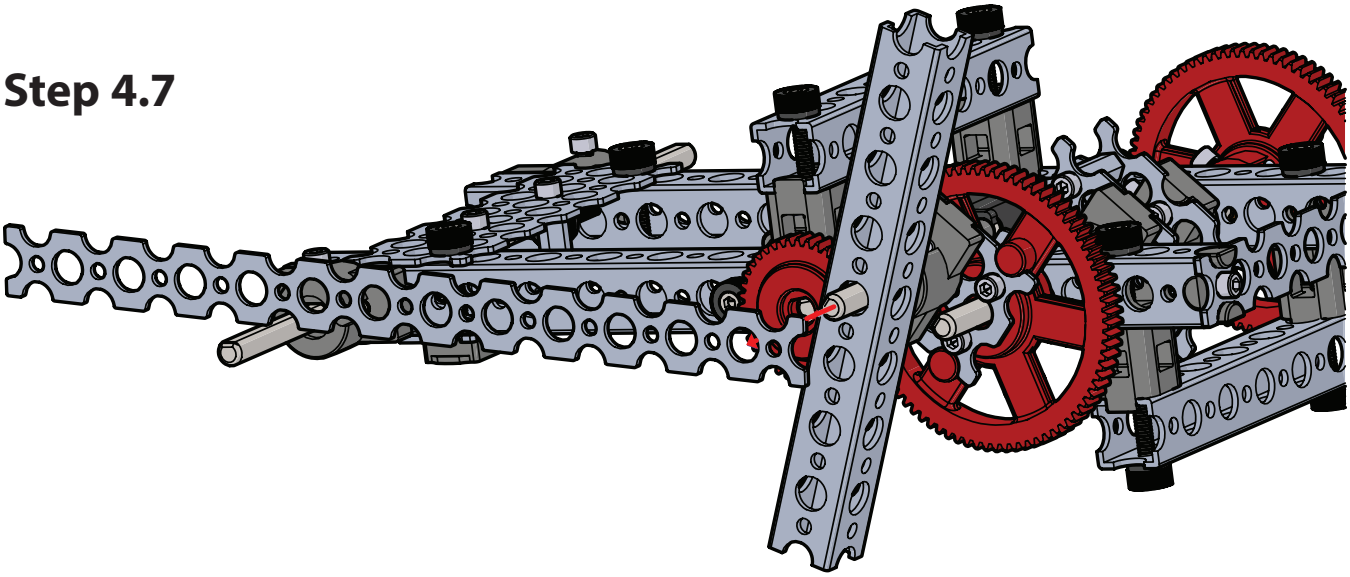


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

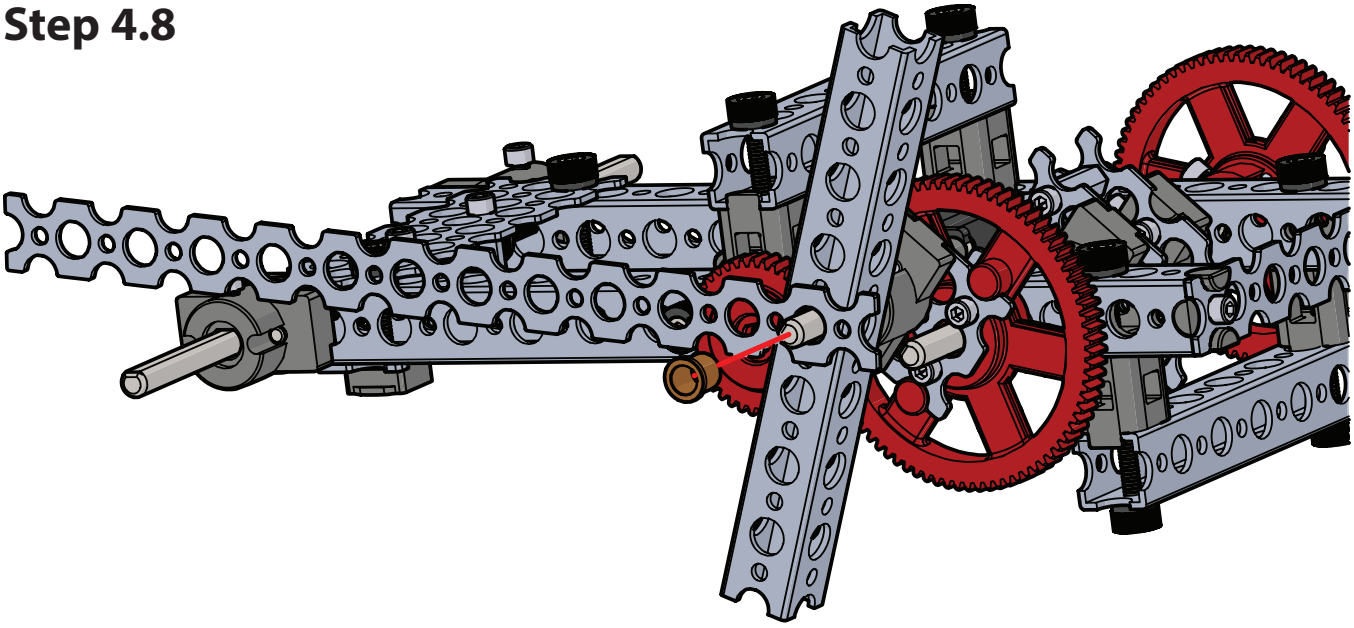
Step 4.6



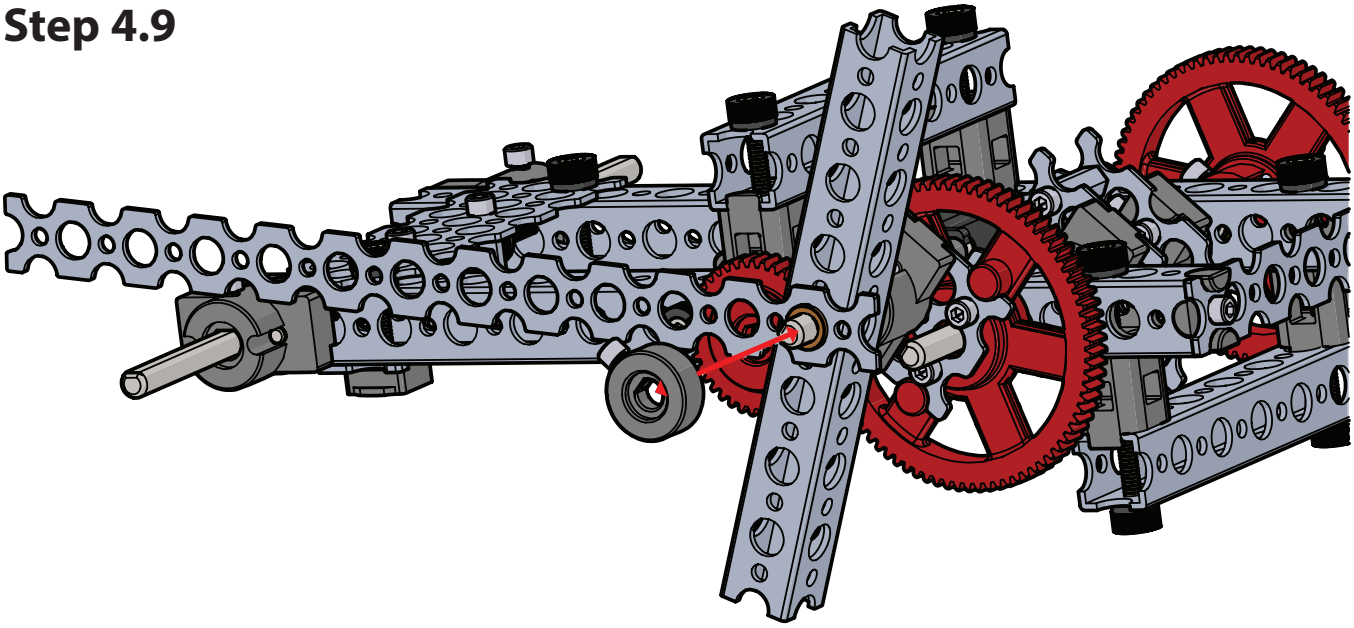
Step 4.7



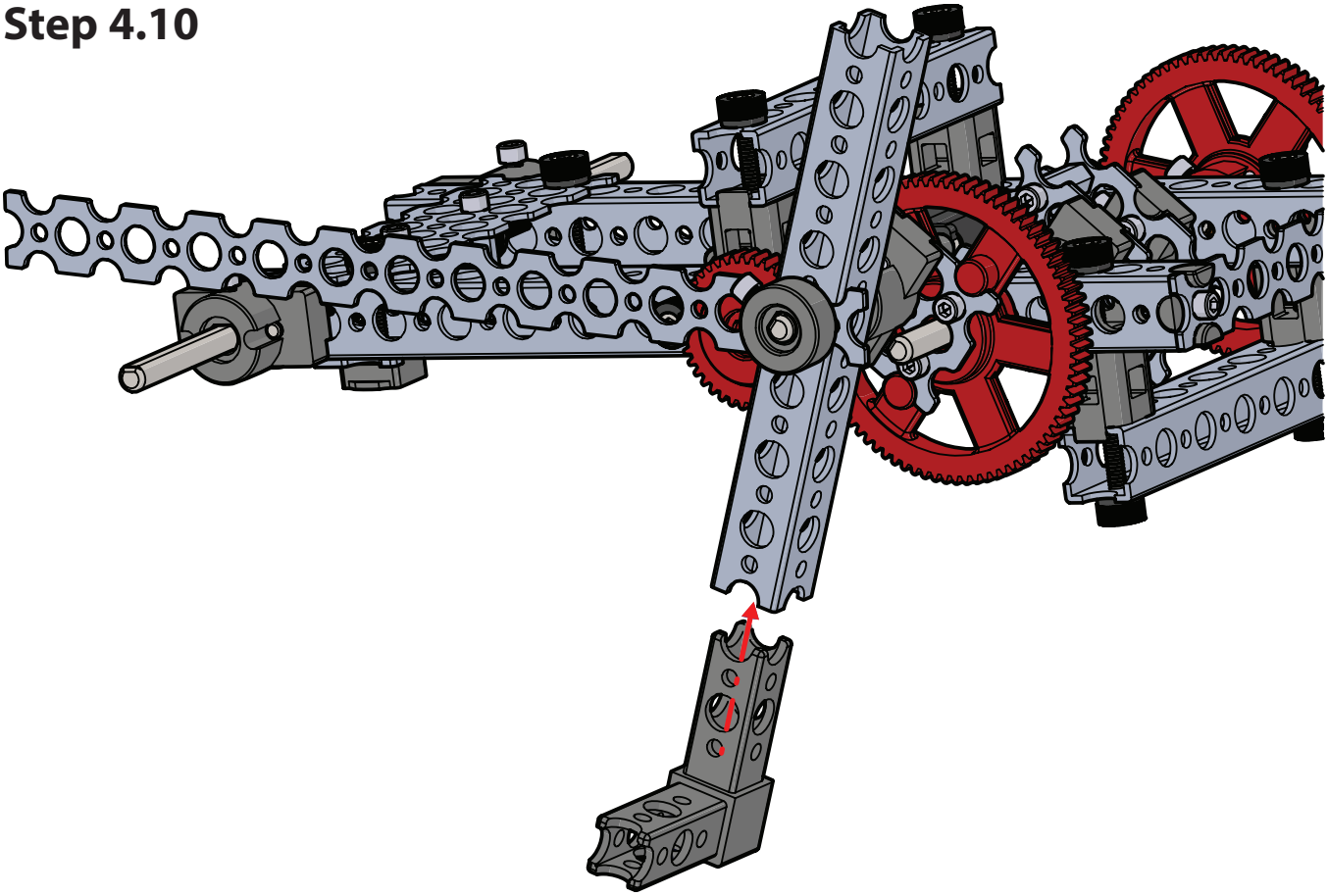
Step 4.8



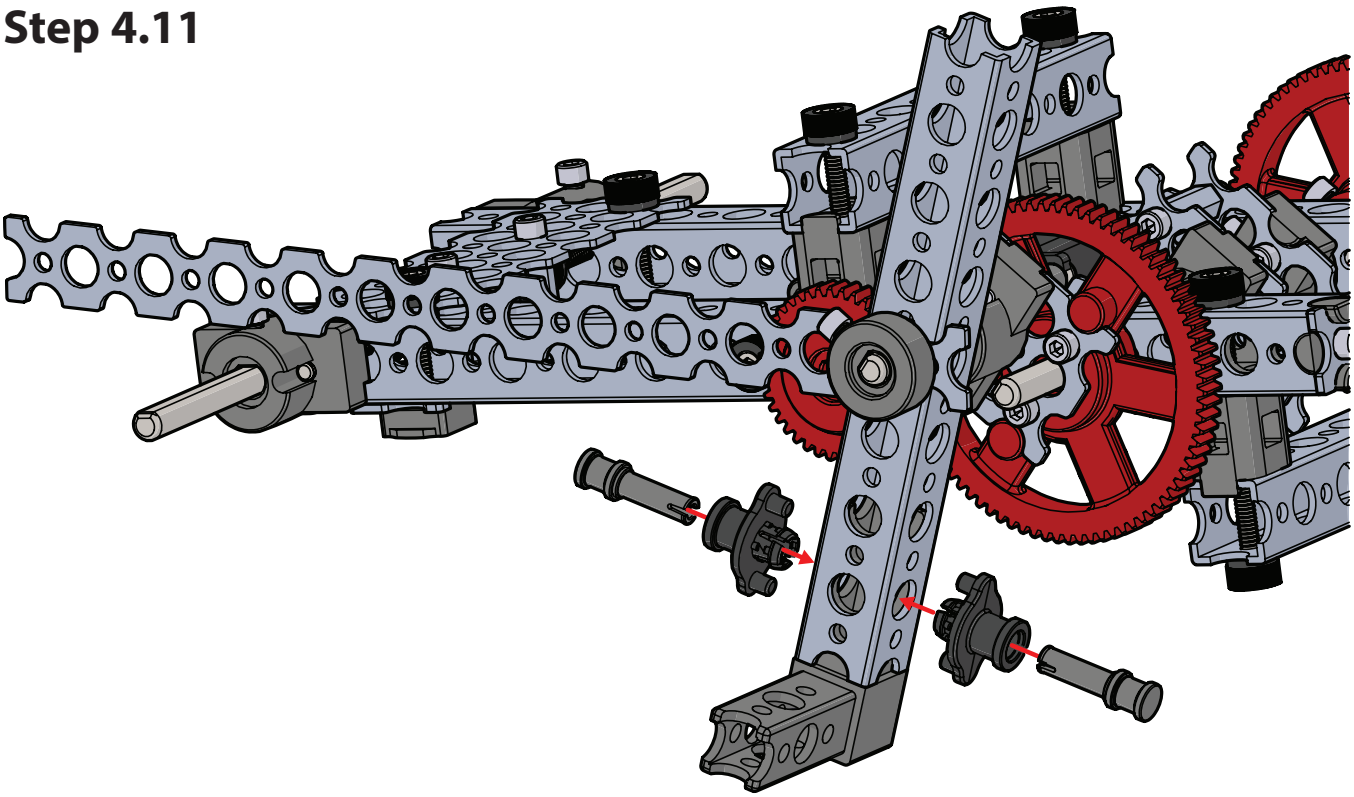
Step 4.9



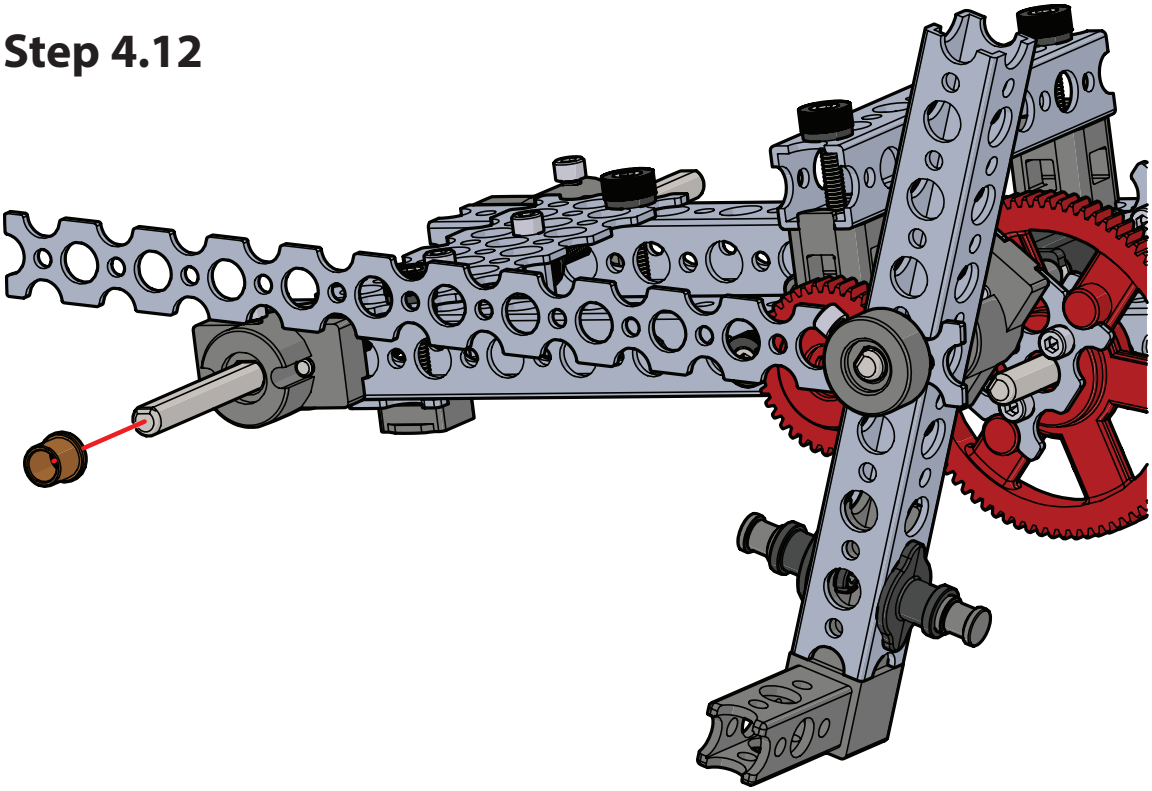
Step 4.10



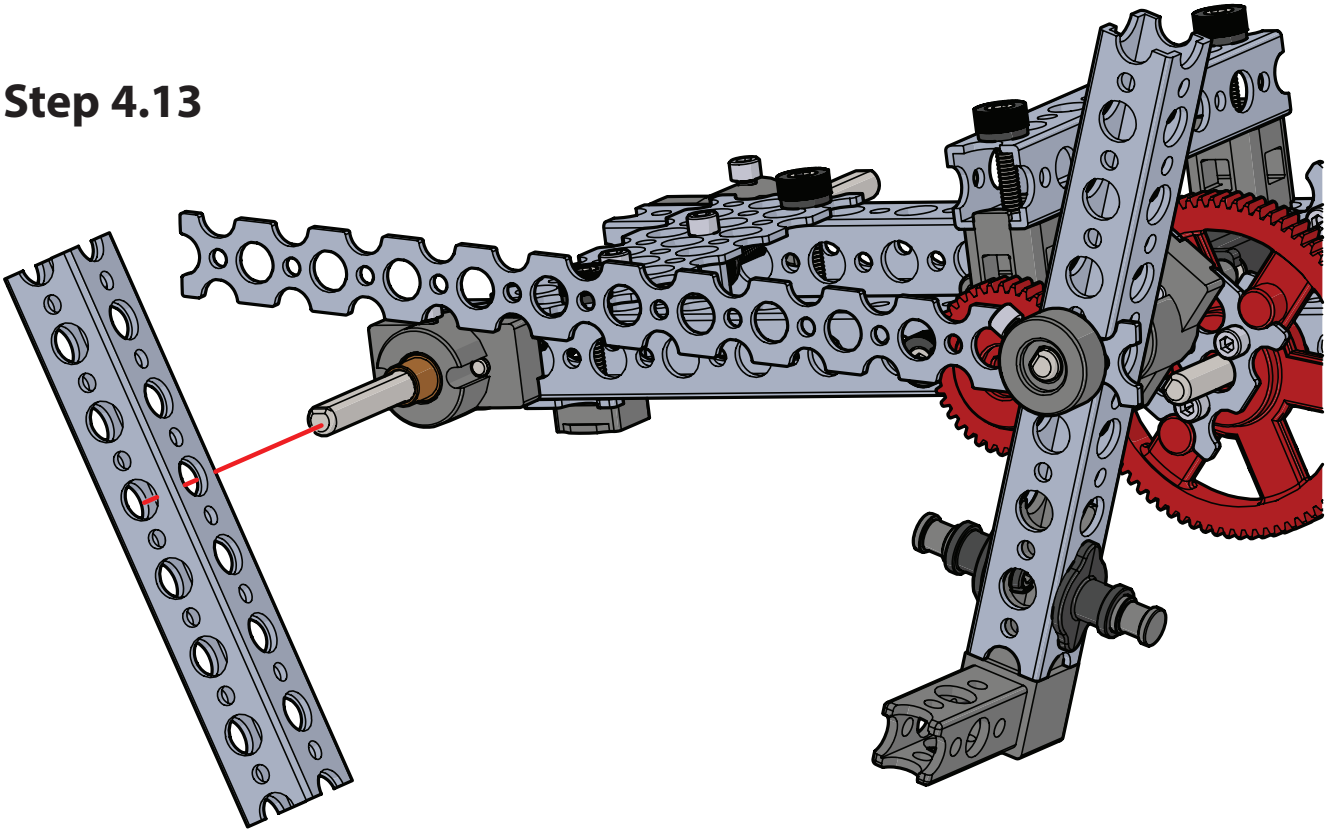
Step 4.11



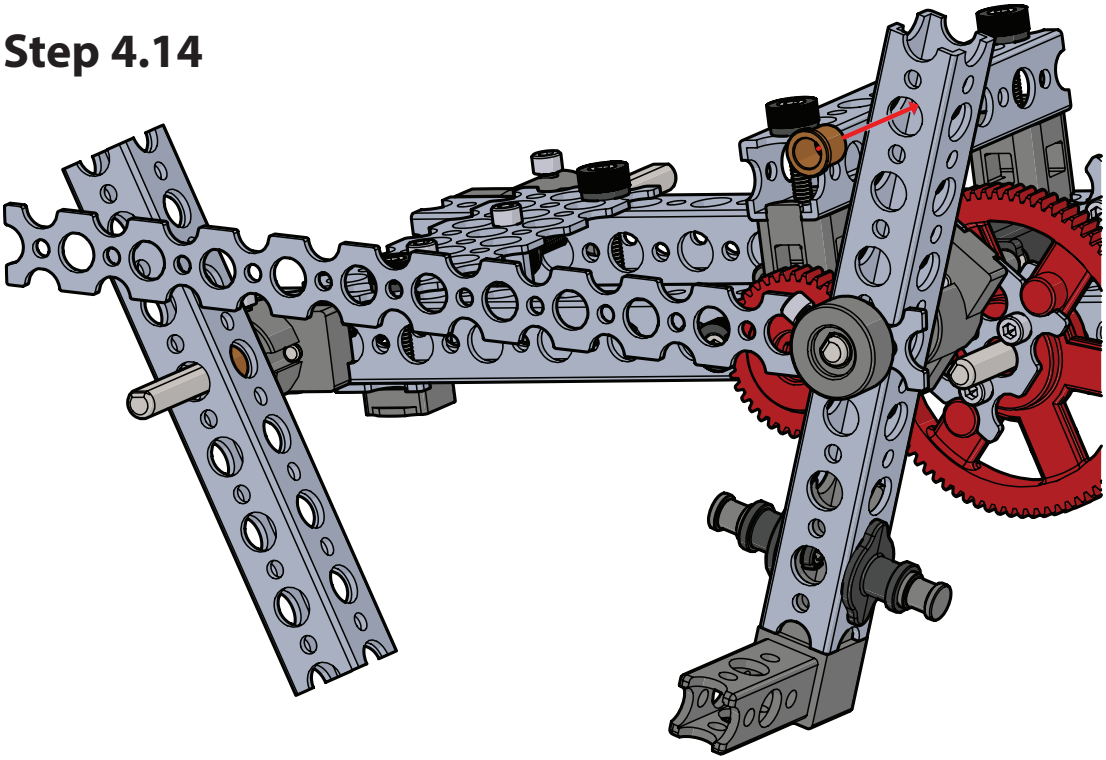
Step 4.12



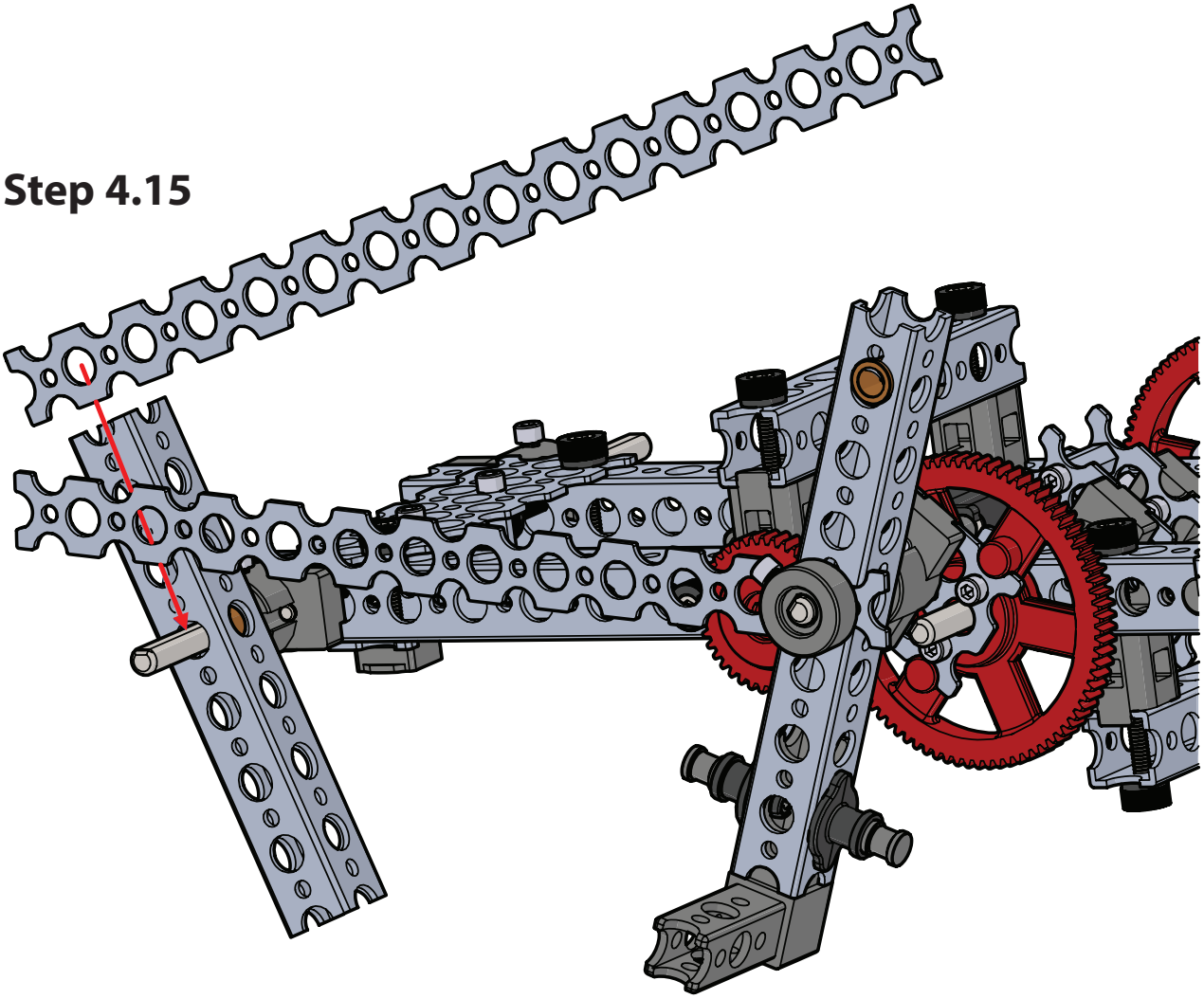
Step 4.13



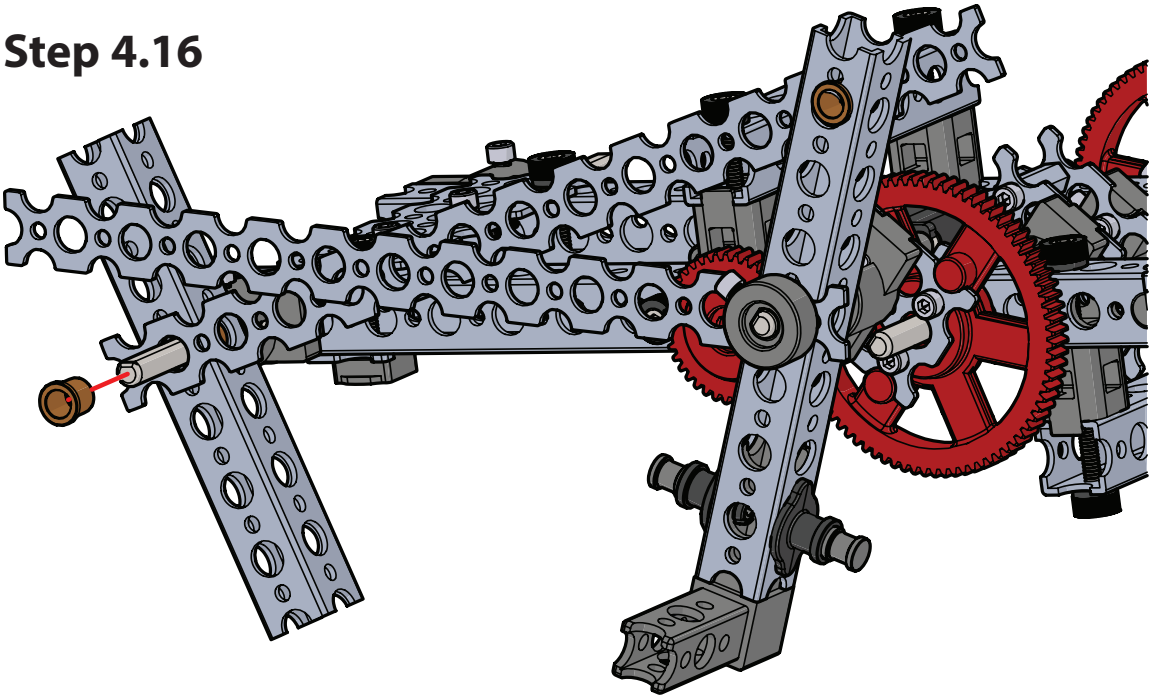
Step 4.14



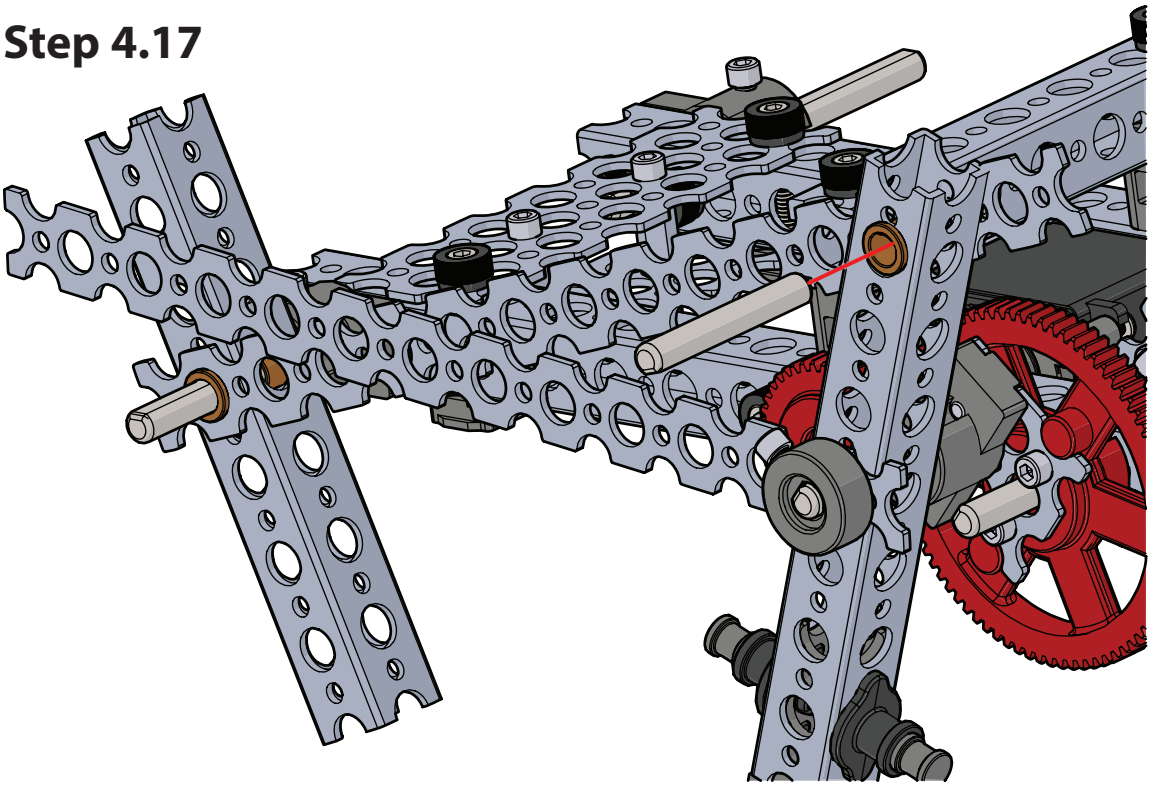
Step 4.15



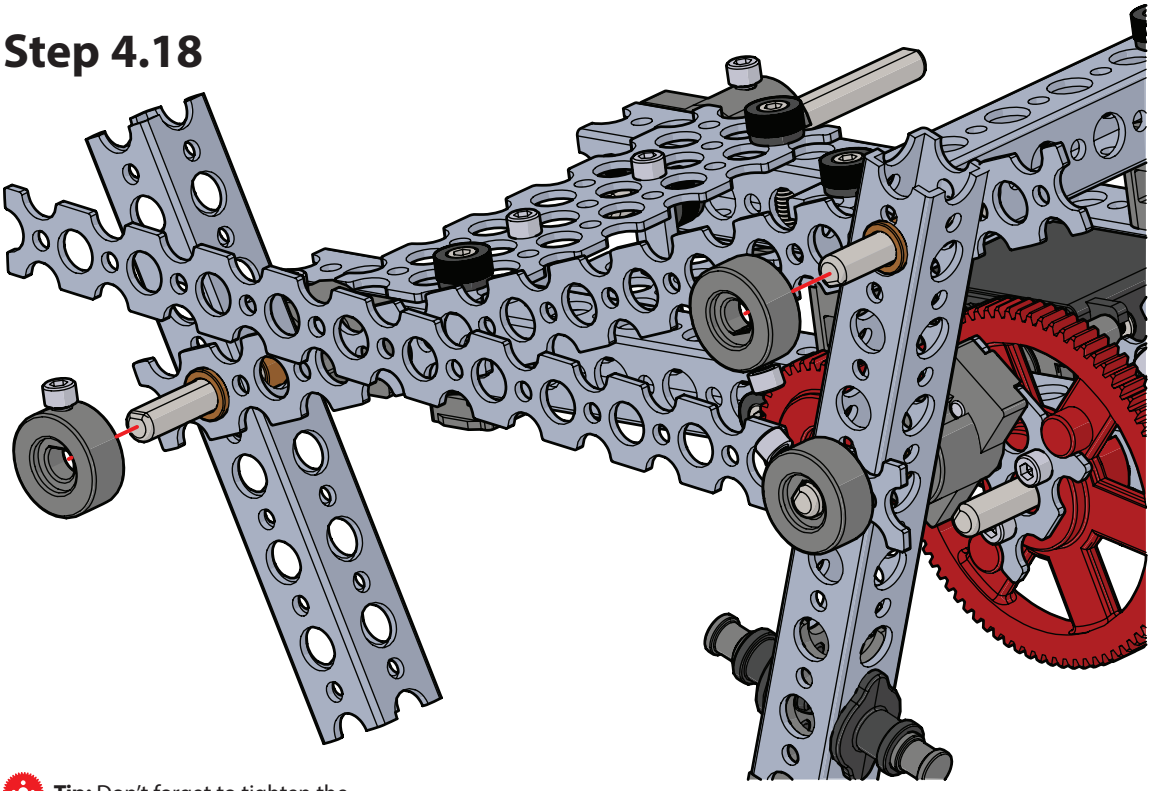
Step 4.16



Step 4.17

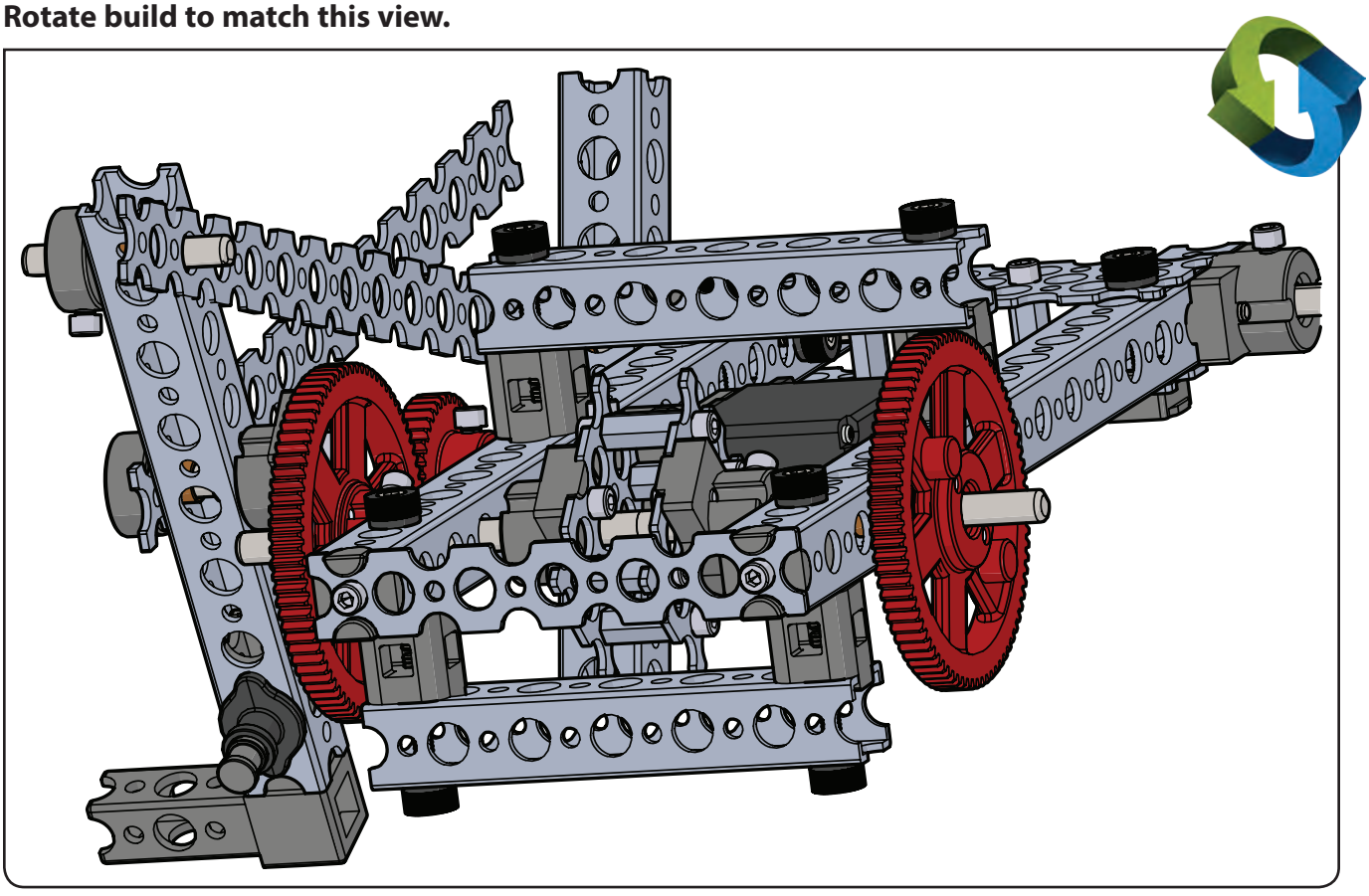


Step 4.18

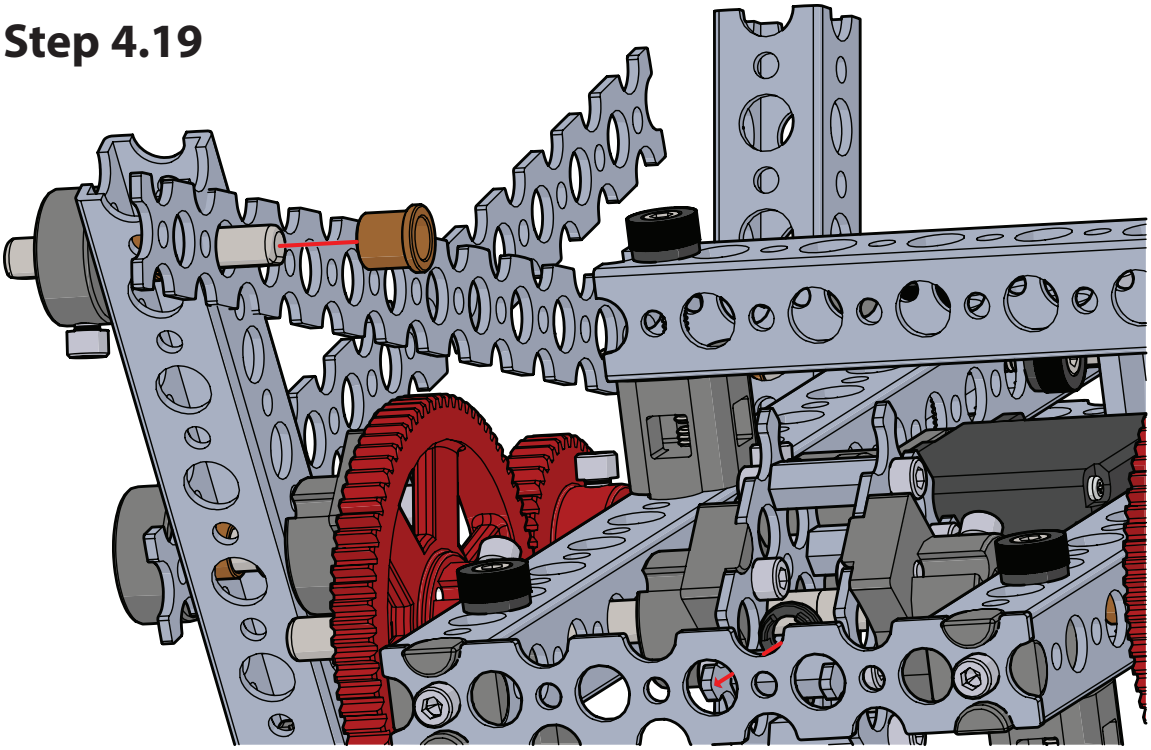


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Rotate build to match this view.

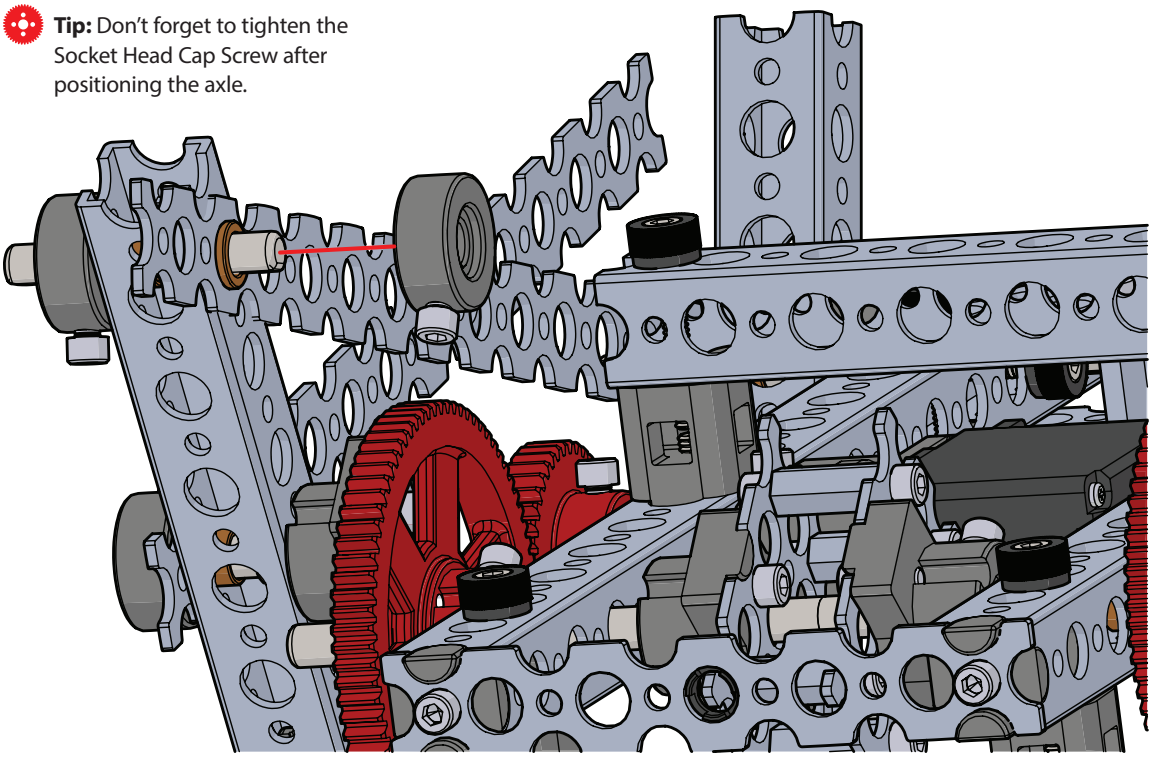


Step 4.19

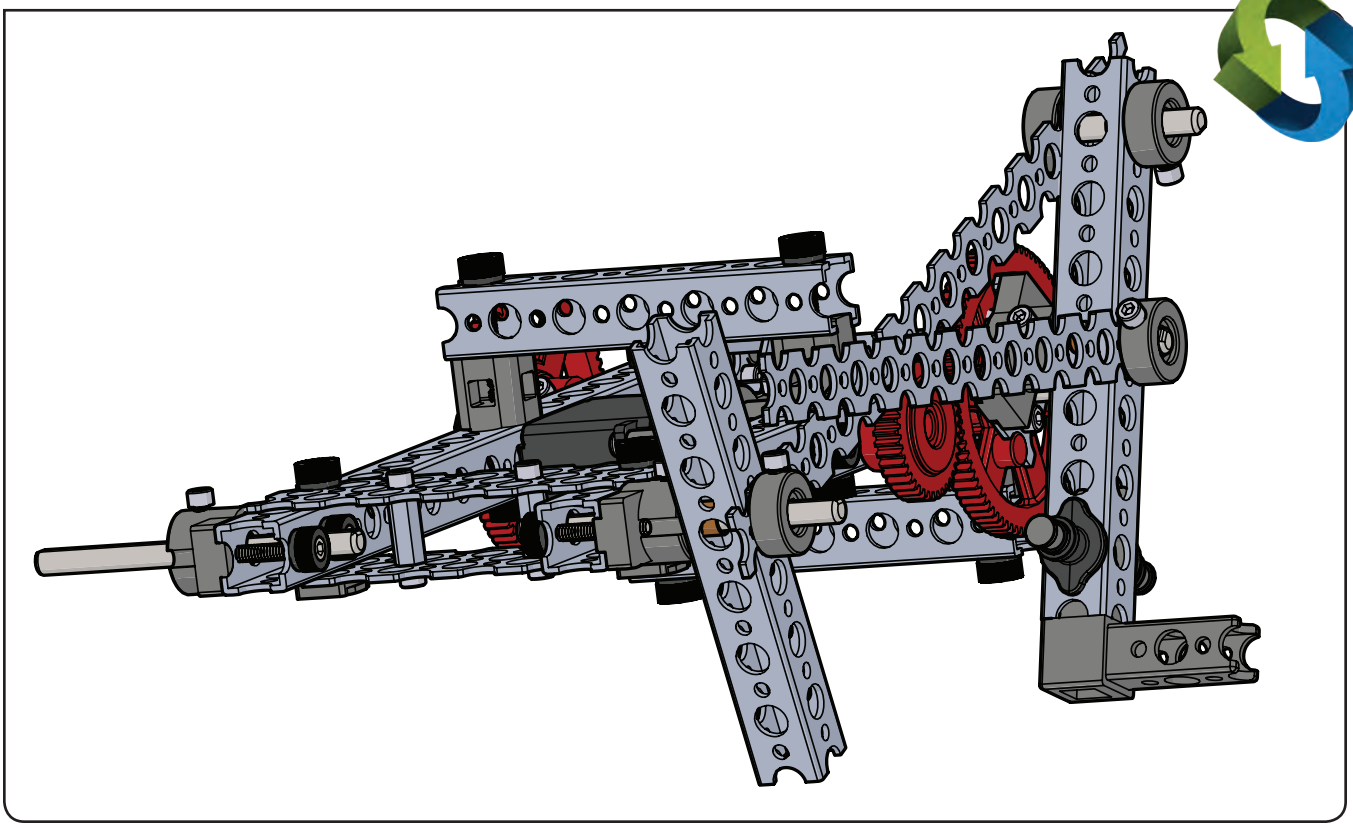


Step 4.20

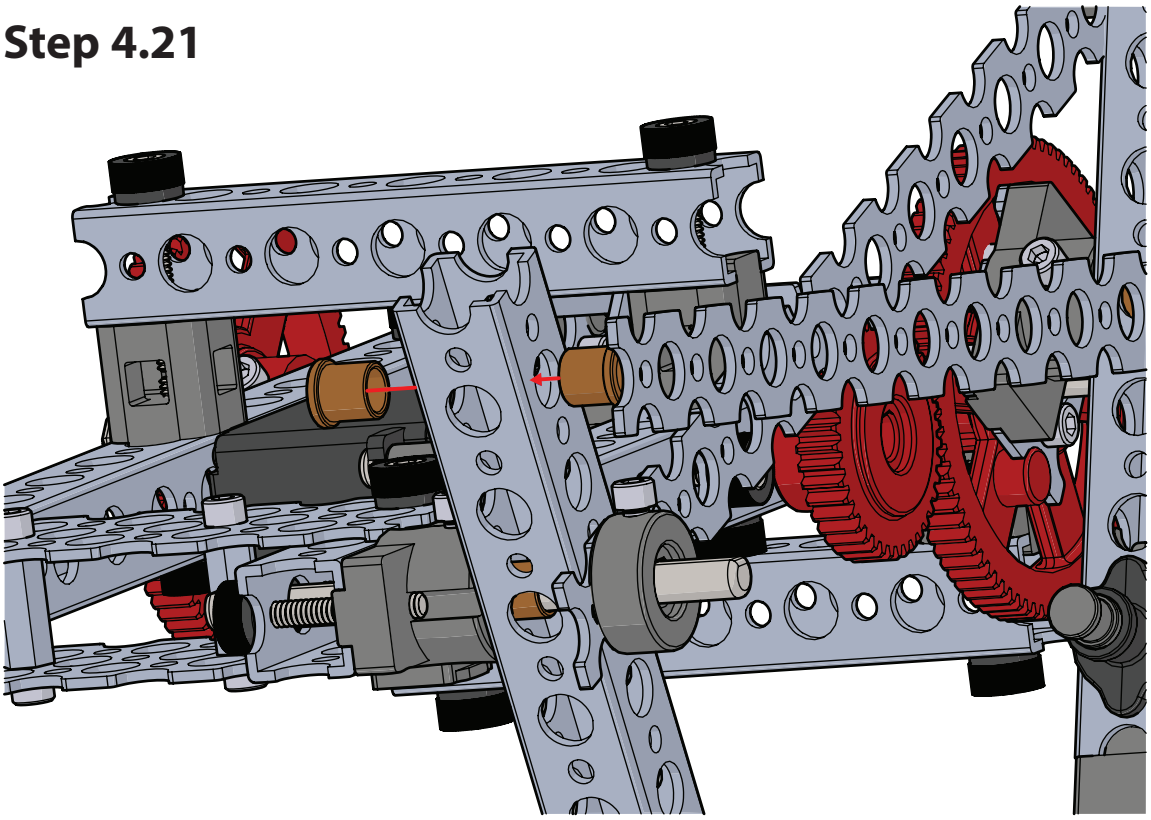
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.



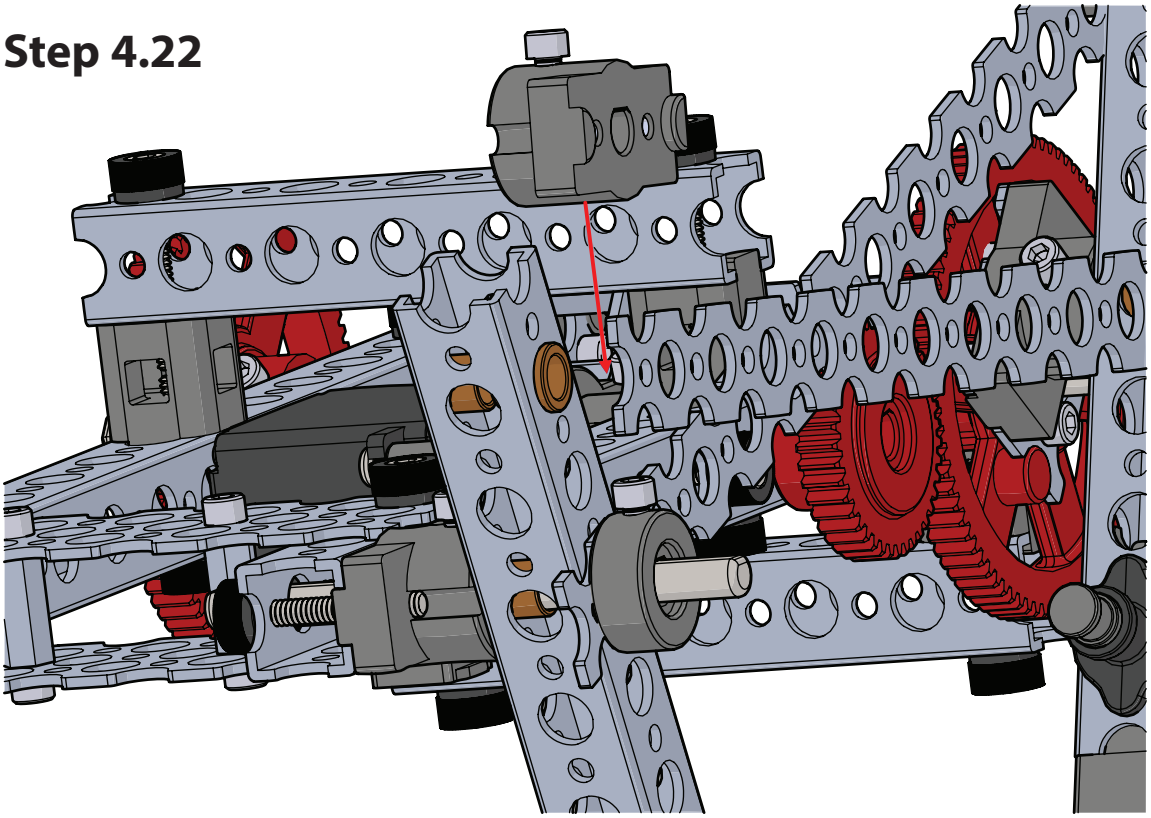
Rotate build to match this view.



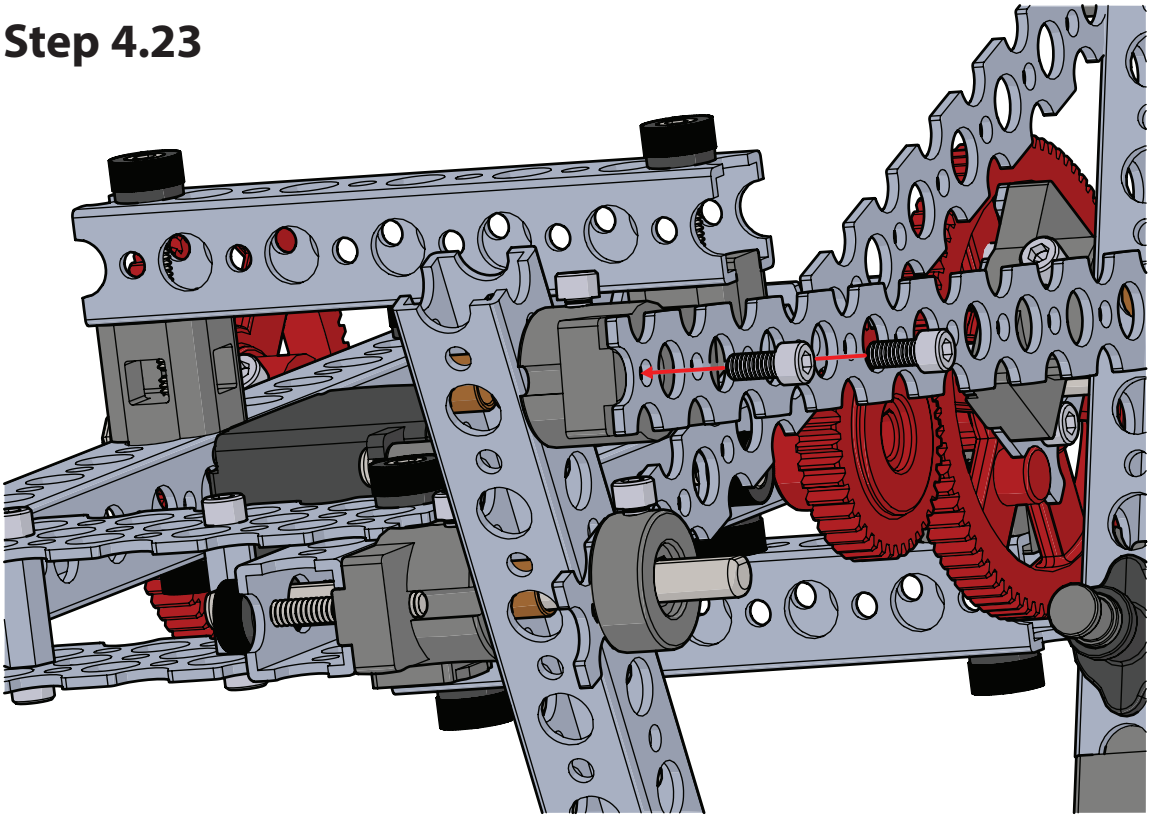
Step 4.21



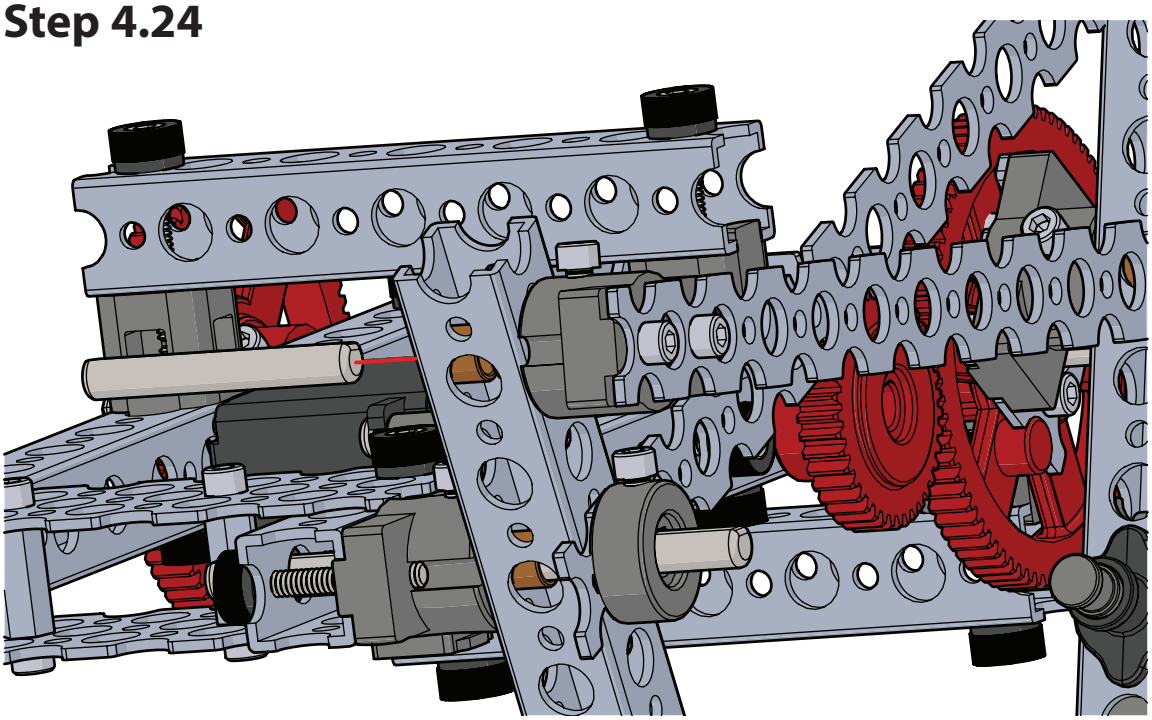
Step 4.22



Step 4.23

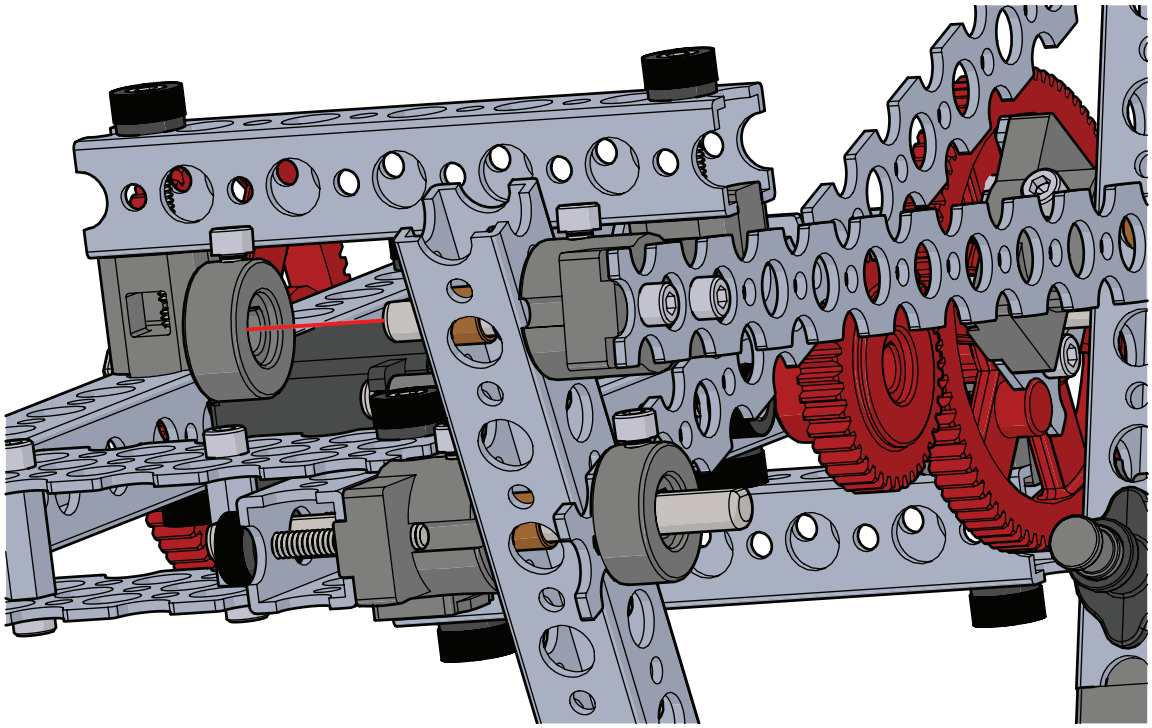


Step 4.24



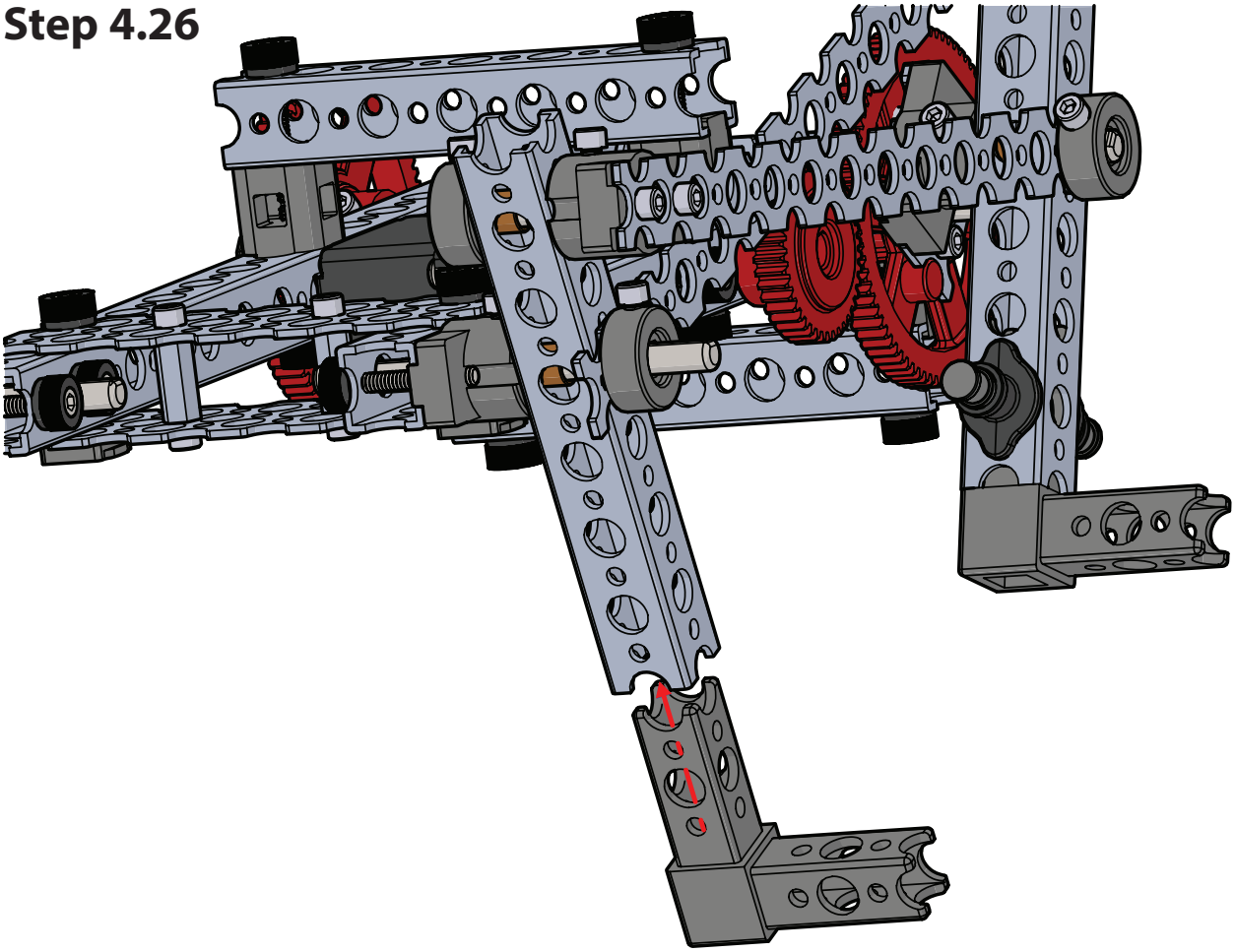
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 4.25

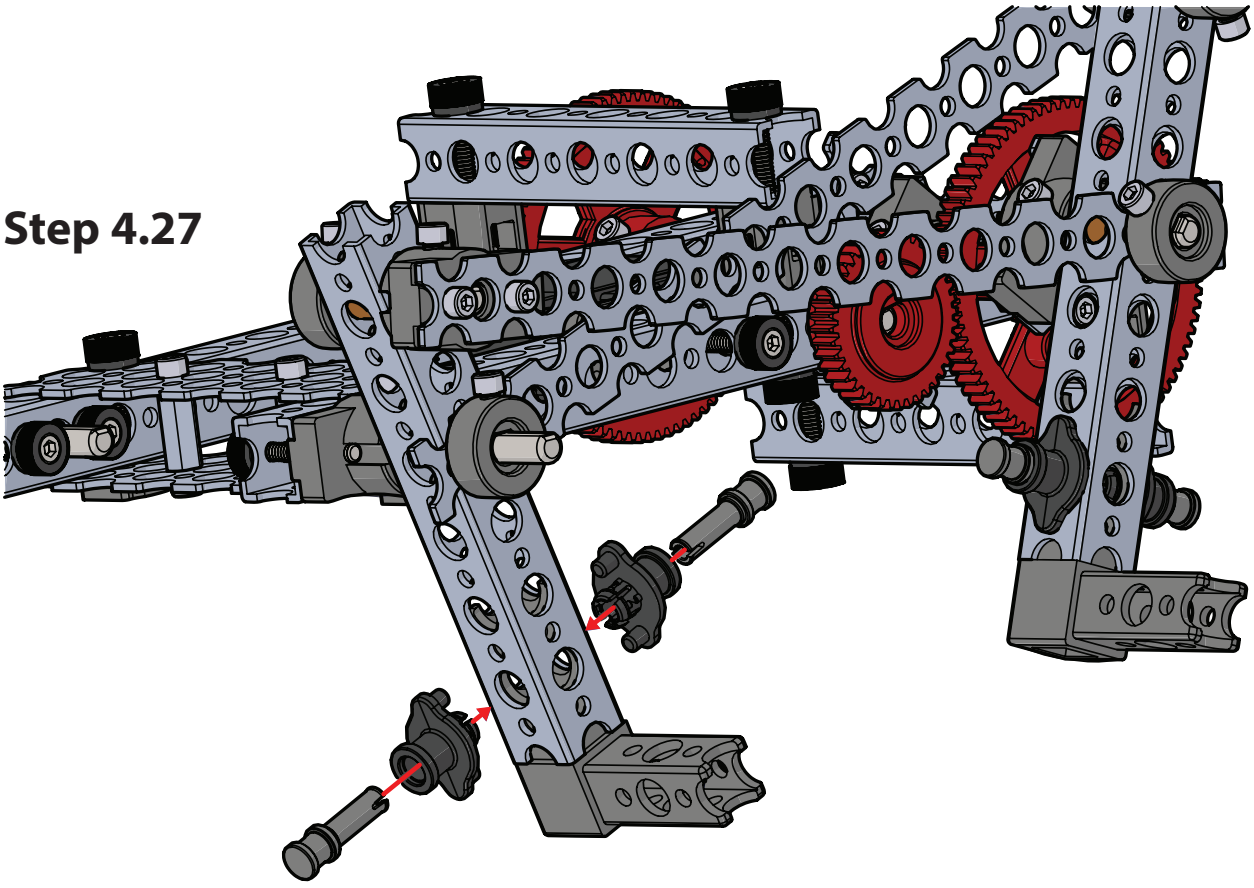


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 4.26

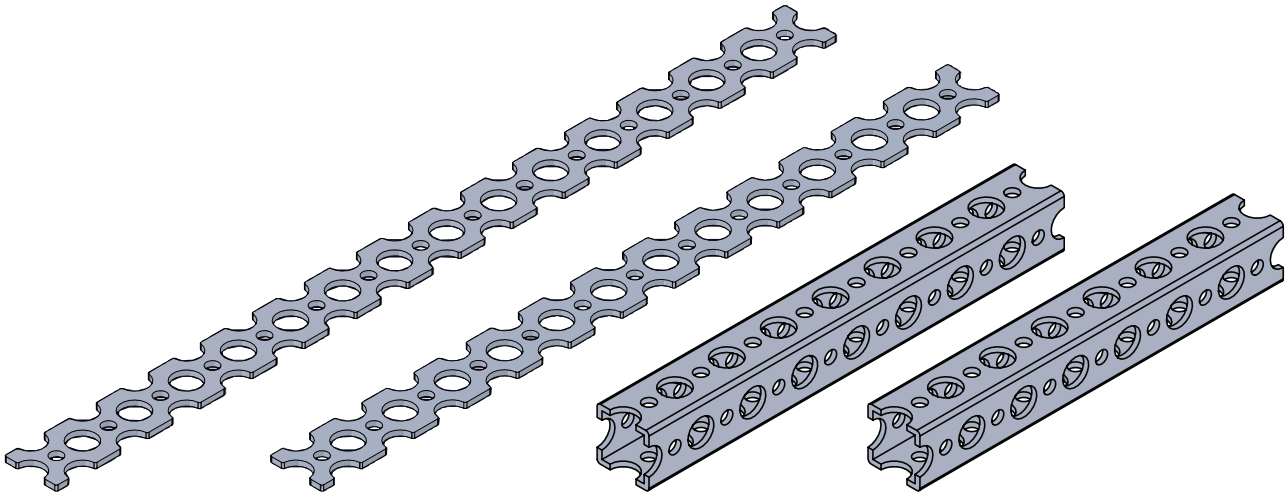


Step 4.27



Step 5

Parts Needed

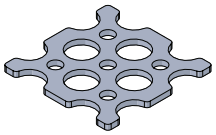


1x
15-Hole Flat
Linkage 41250

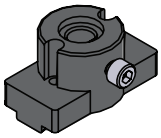
1x
13-Hole Flat
Linkage 41249

1x
8-Hole Square
Beam 40205

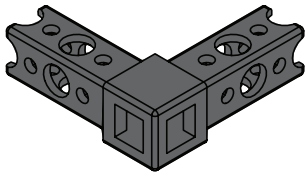
1x
7-Hole Square
Beam 40204



1x
2 x 2 Hole Plate
41251



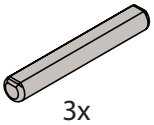
2x
Beam Attachment
Hub 40228



2x
90-Degree Beam
Connector 40211

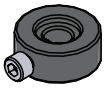
4x
Quick Rivet Peg
40220

4x
Quick Rivet
Connector 40219



3x
40 mm Steel Axle
40226

8x
8 mm x 6 mm Bronze
Bushing 40227

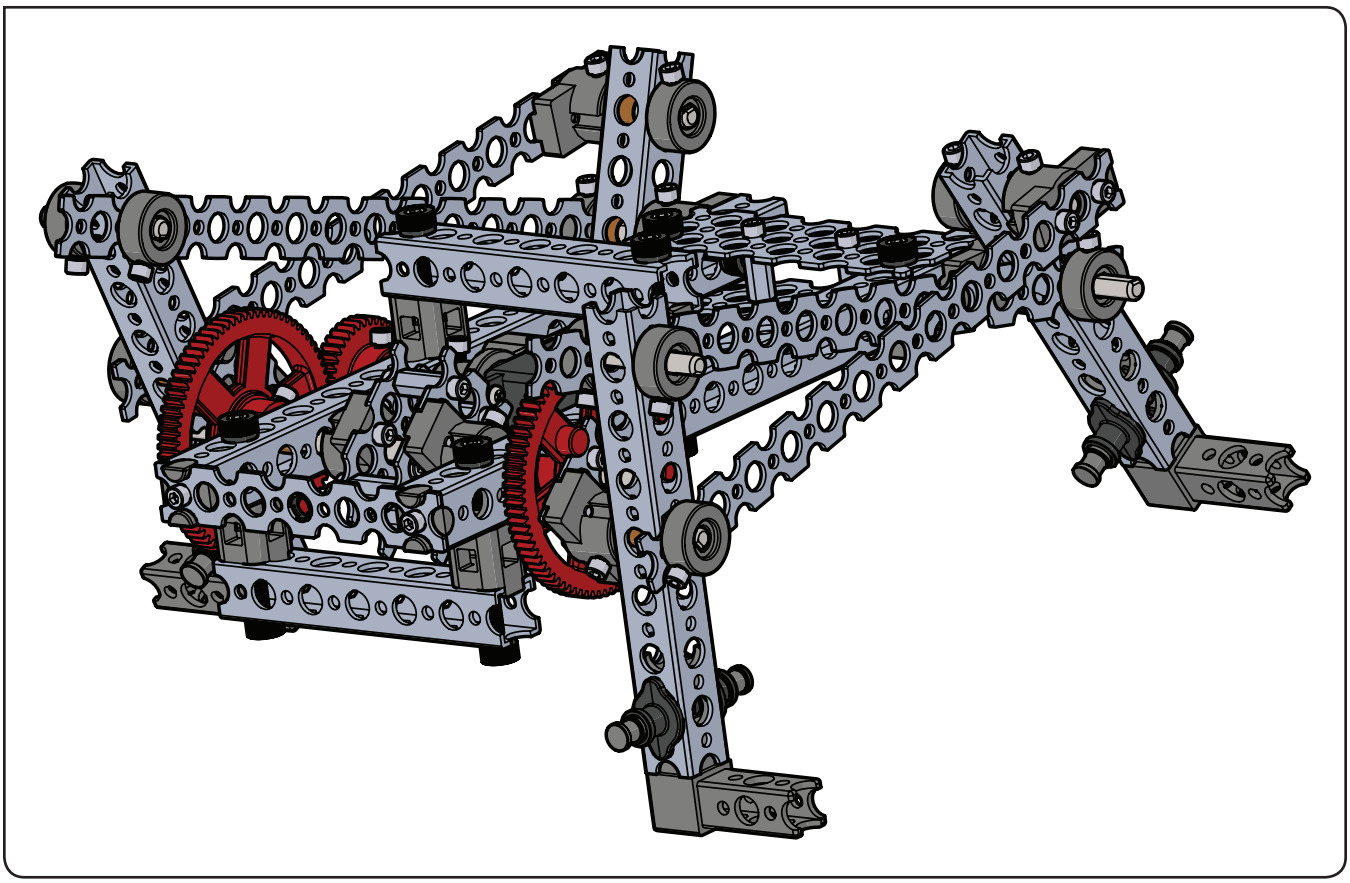


5x
D-Shaft Set Collar
40229

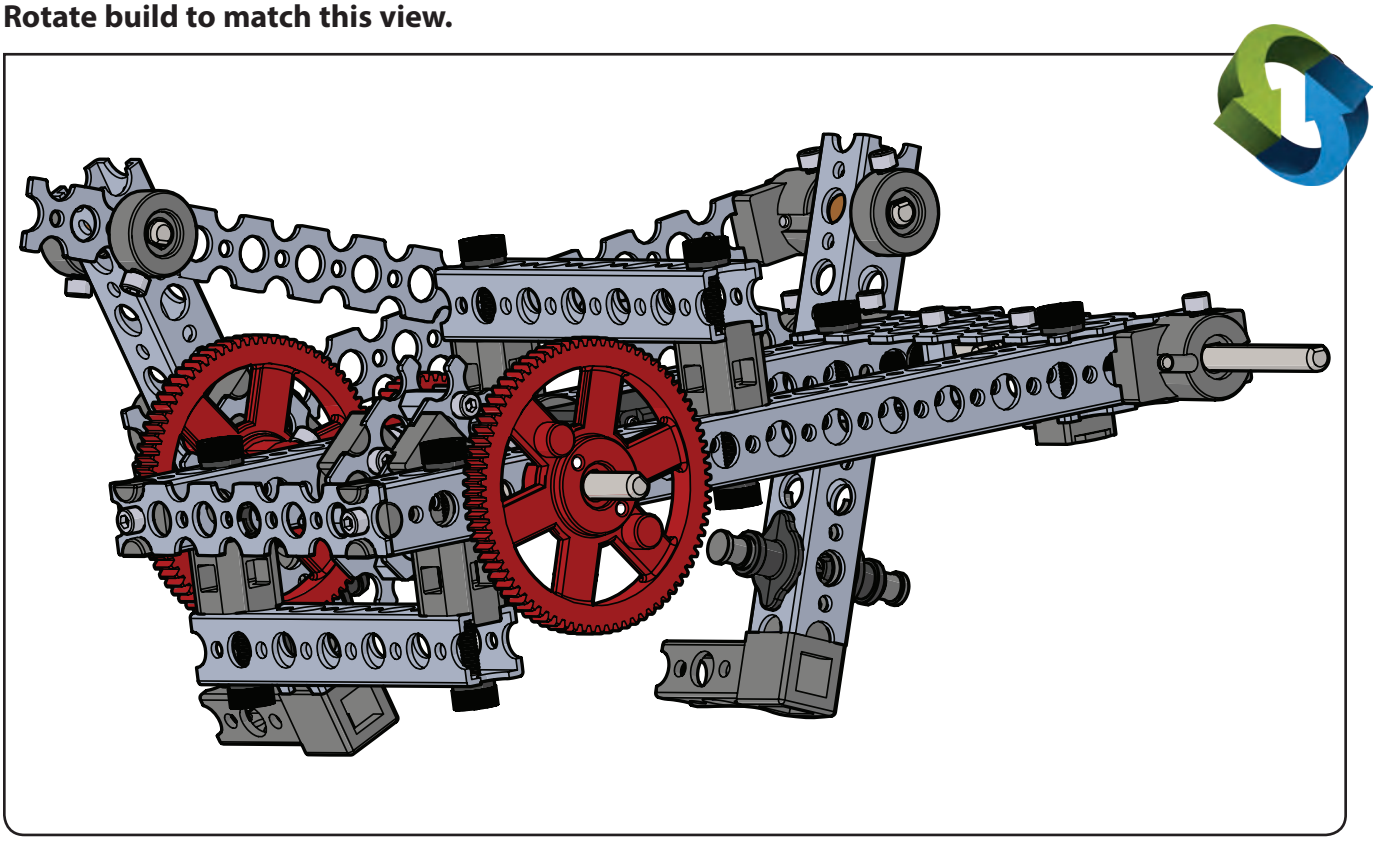
6x
Socket Head Cap
Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

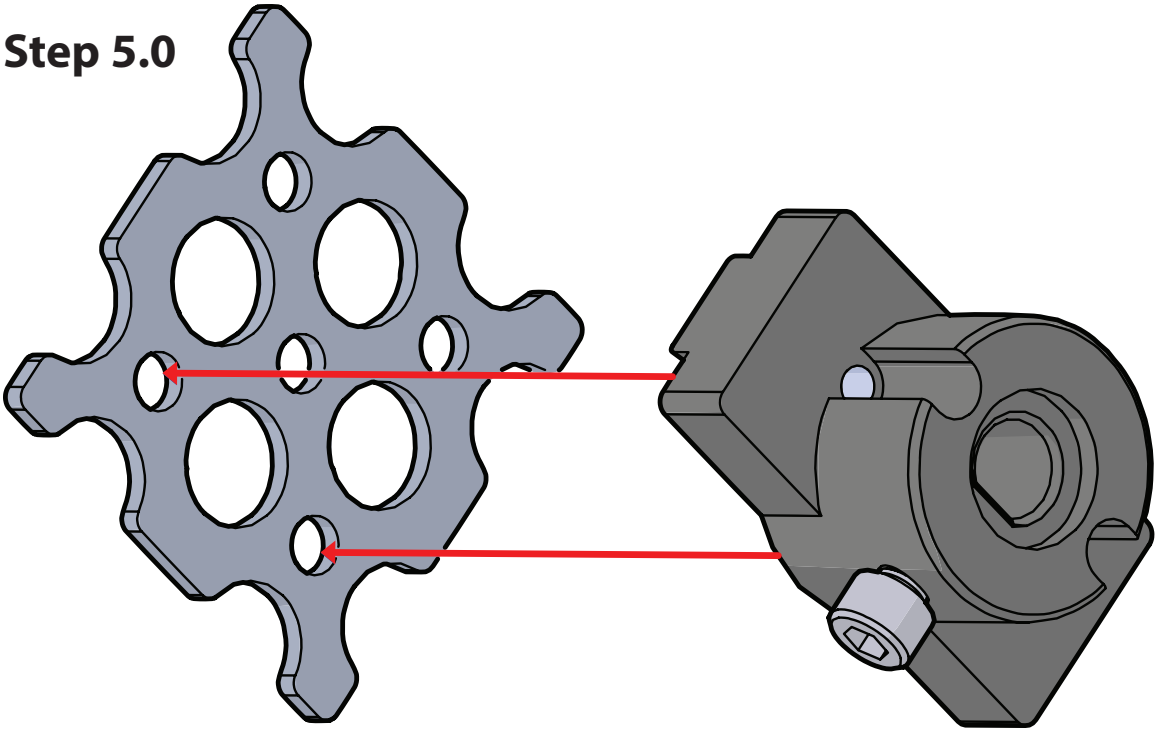
Partial assembly should look like this.



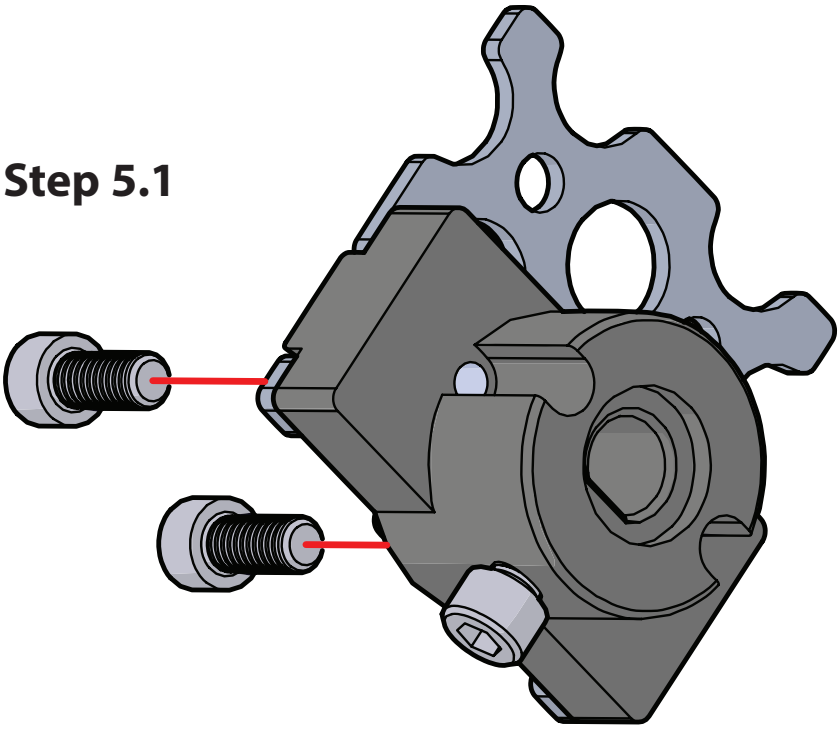
Rotate build to match this view.



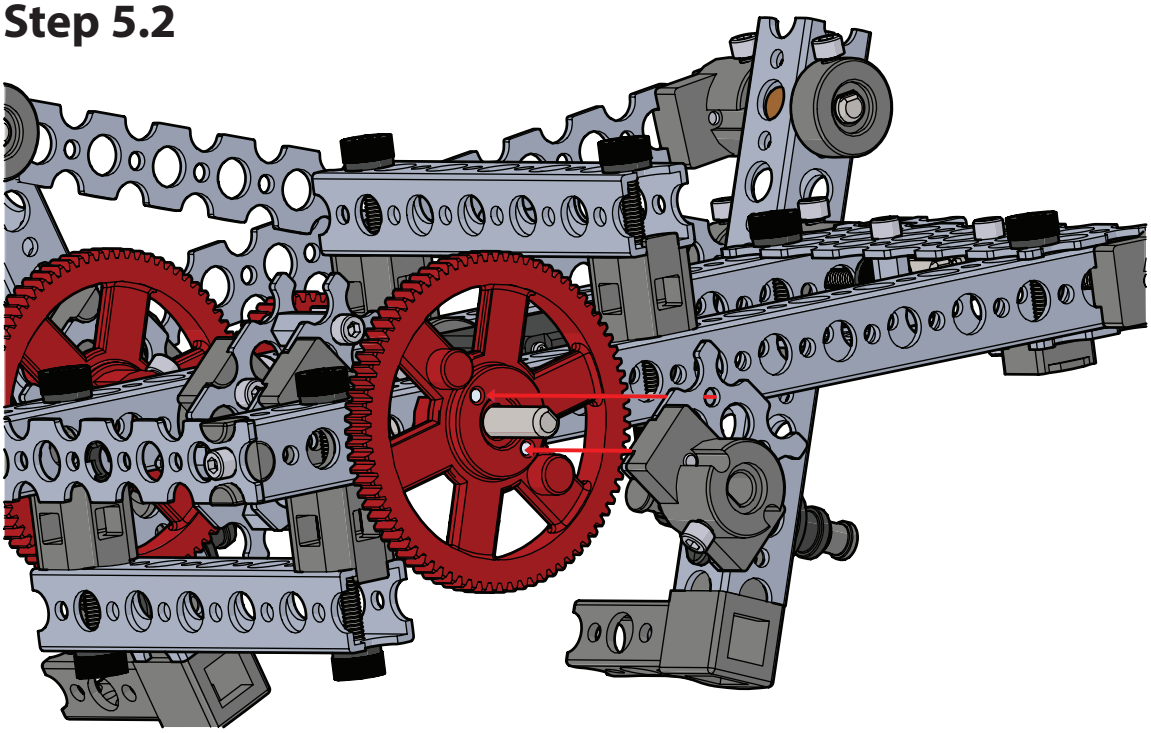
Step 5.0



Step 5.1

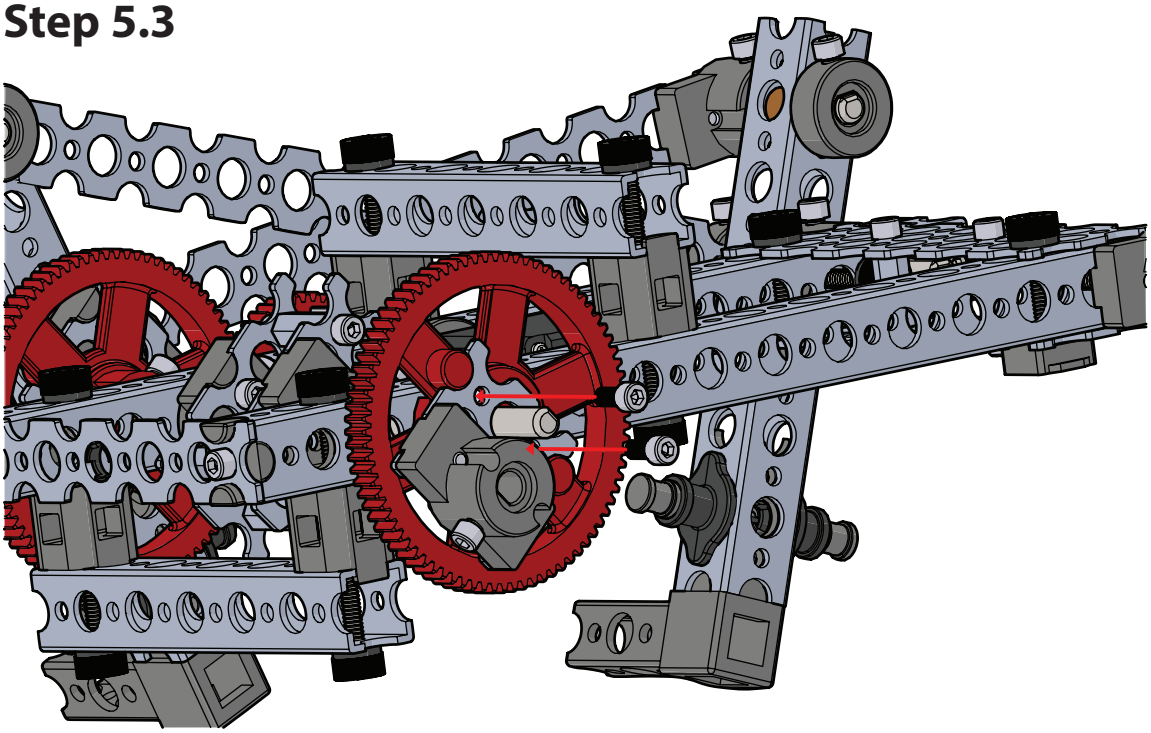


Step 5.2

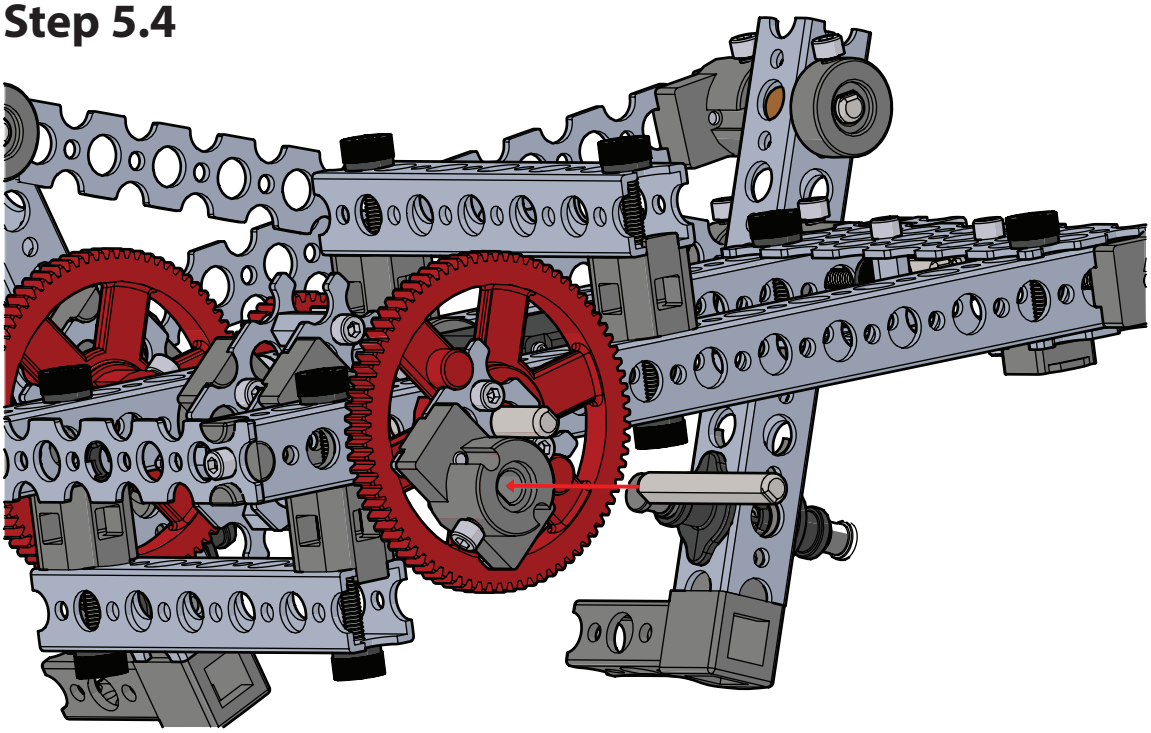


Important: For the robot to work properly, this hub attachment on the wheel should be 180° opposite from the other side. Visually confirm this before proceeding.

Step 5.3

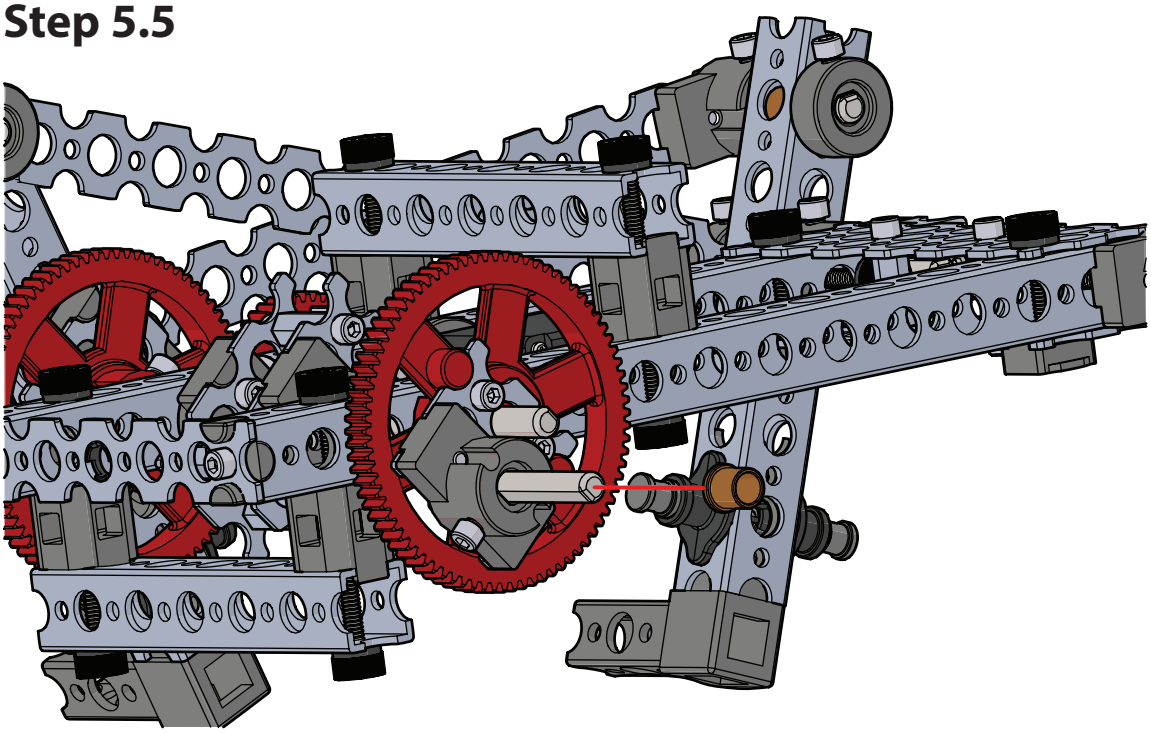


Step 5.4

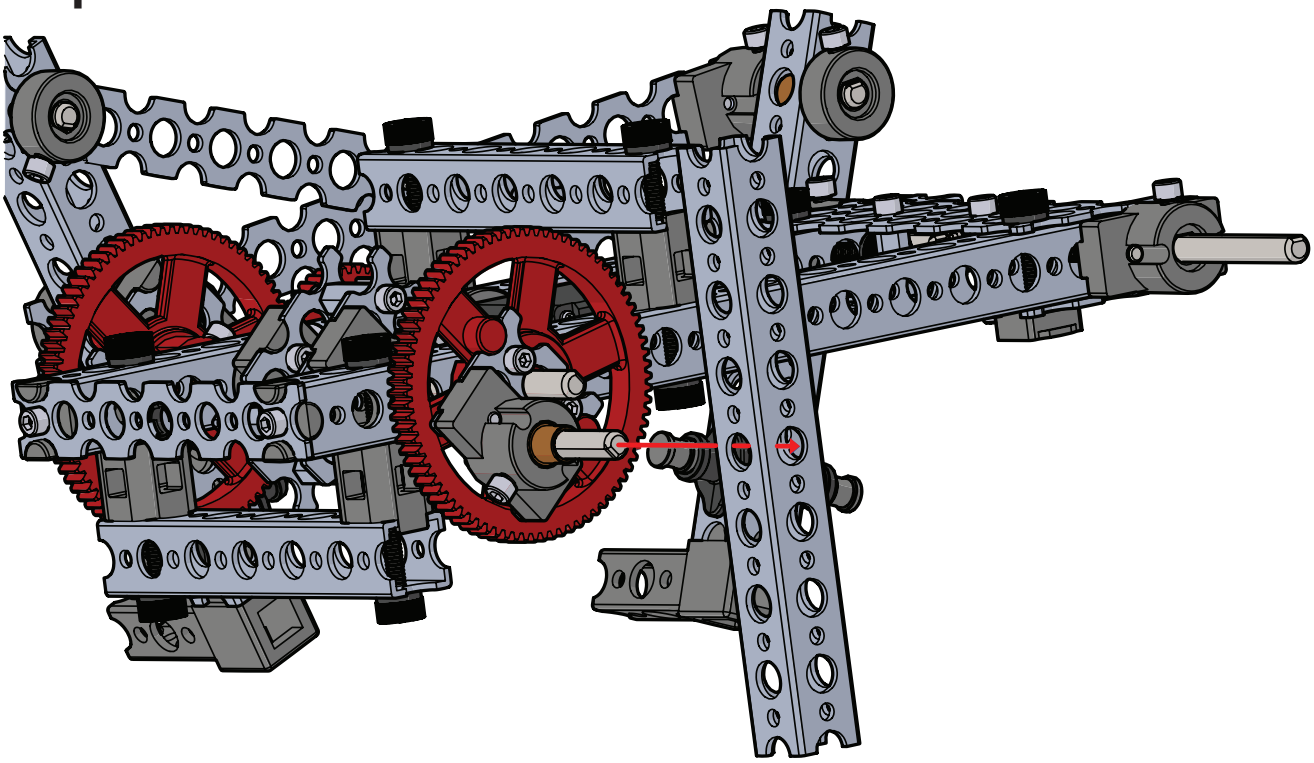


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

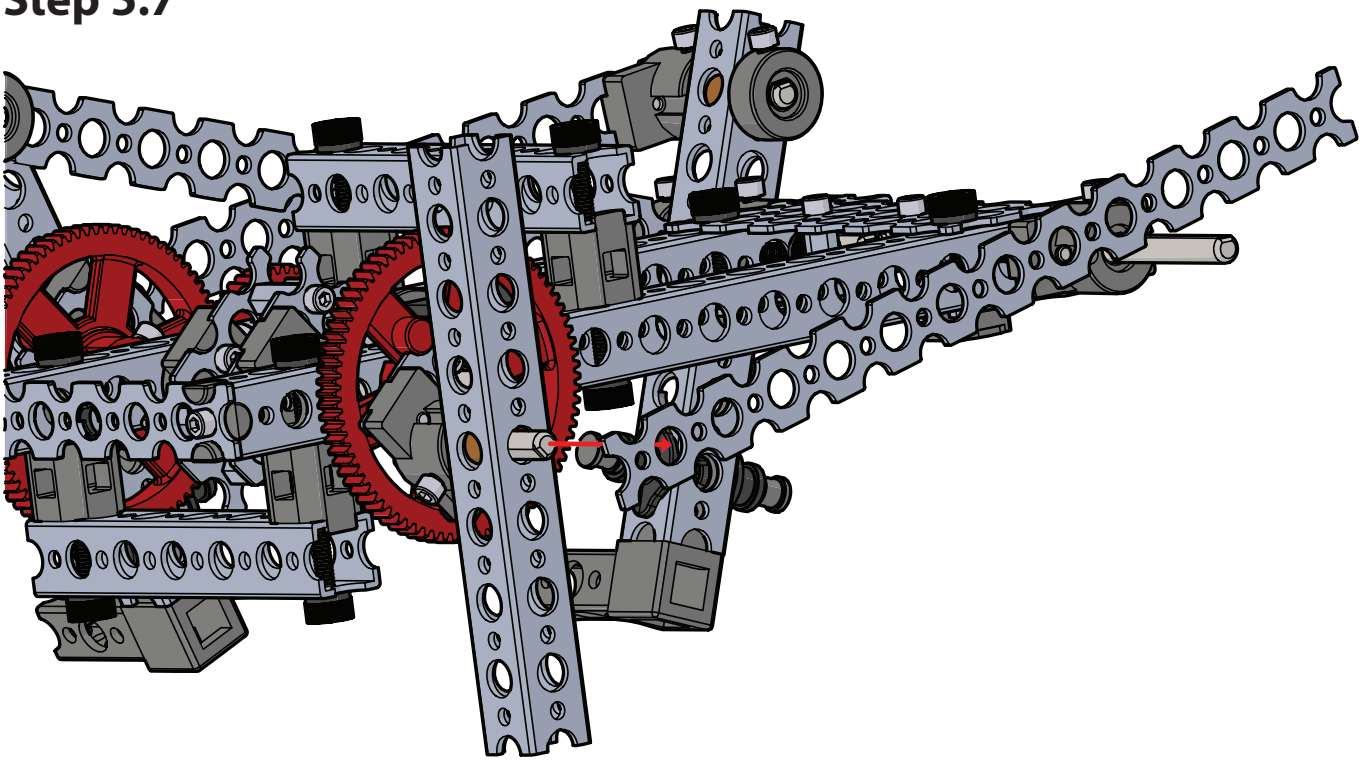
Step 5.5



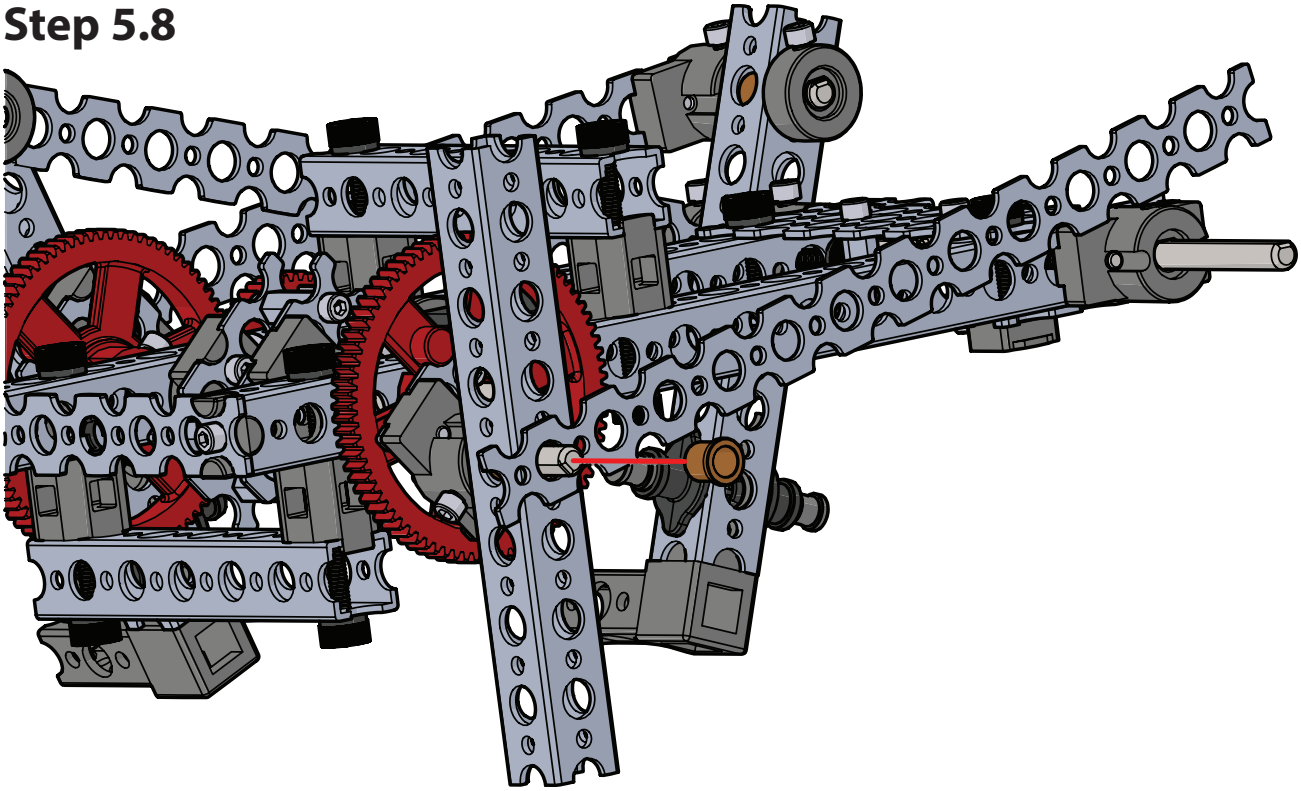
Step 5.6



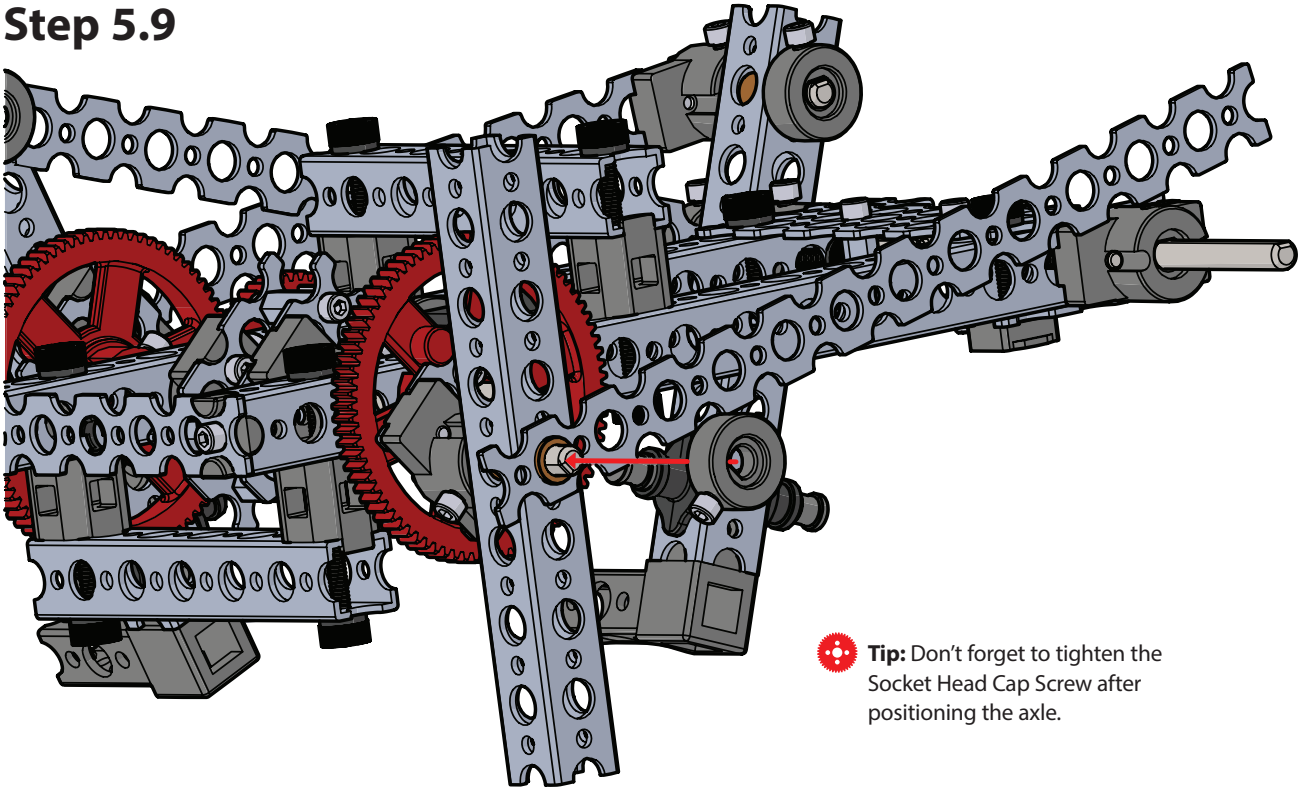
Step 5.7



Step 5.8

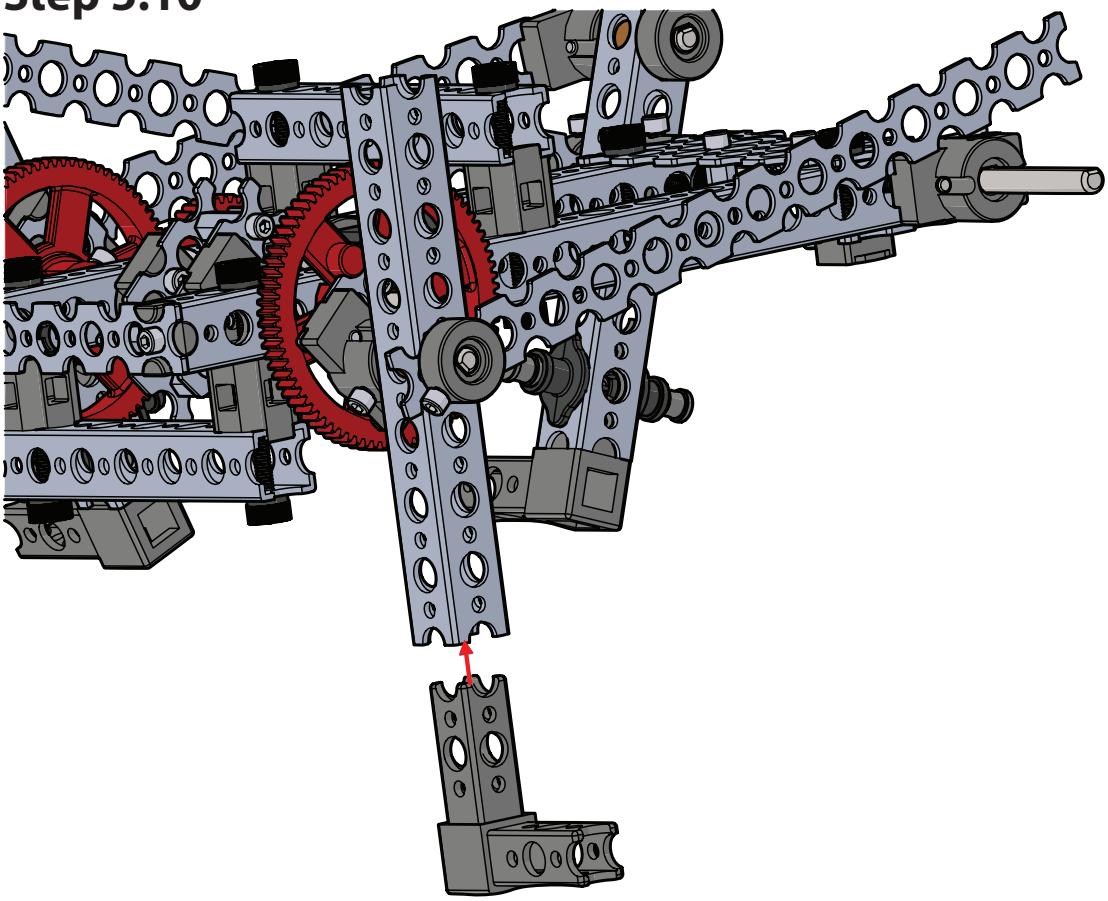


Step 5.9

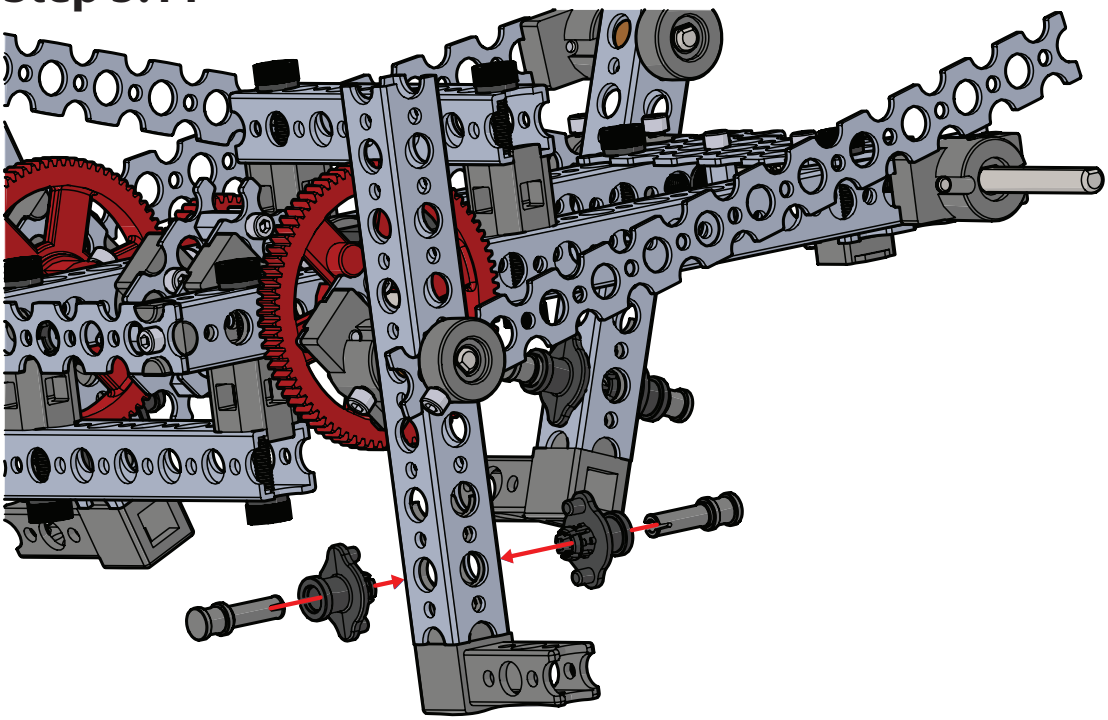


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

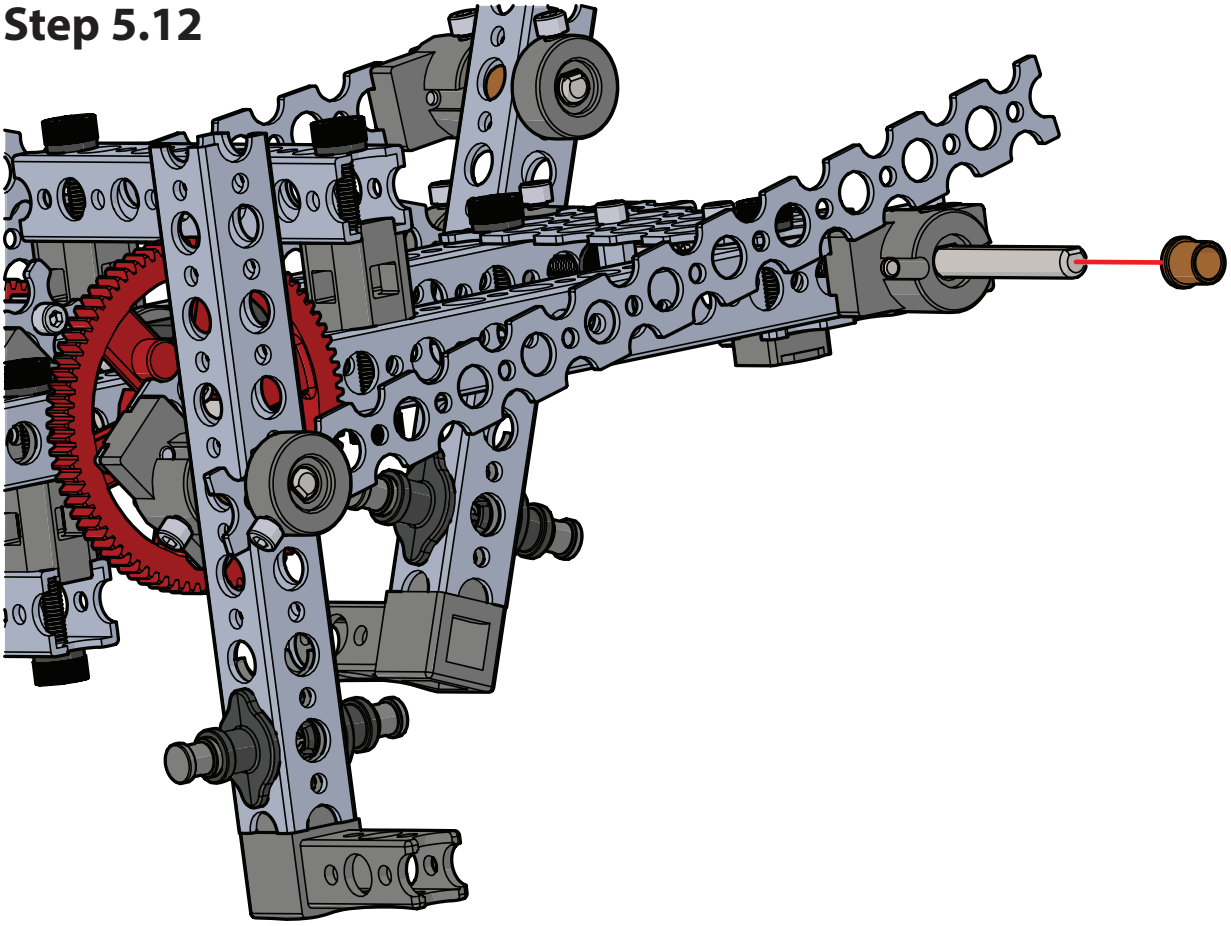
Step 5.10



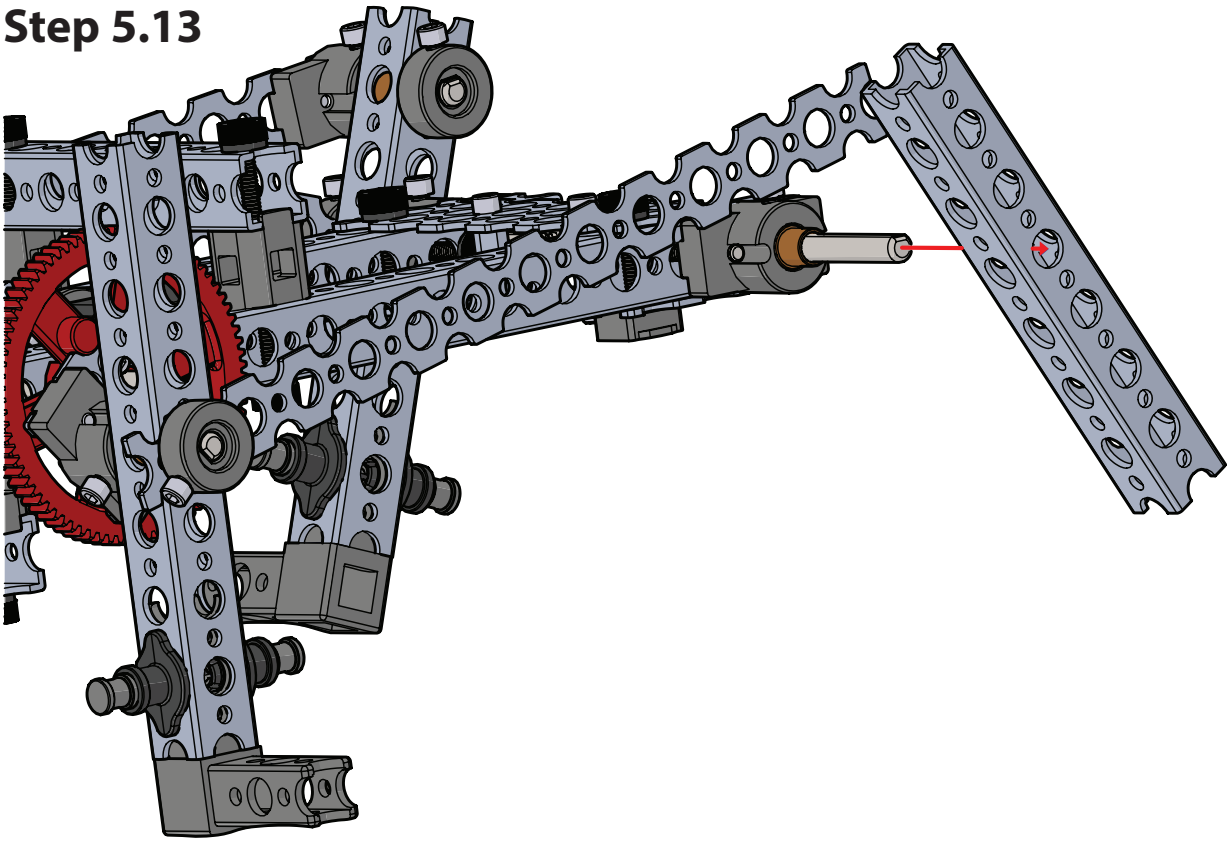
Step 5.11



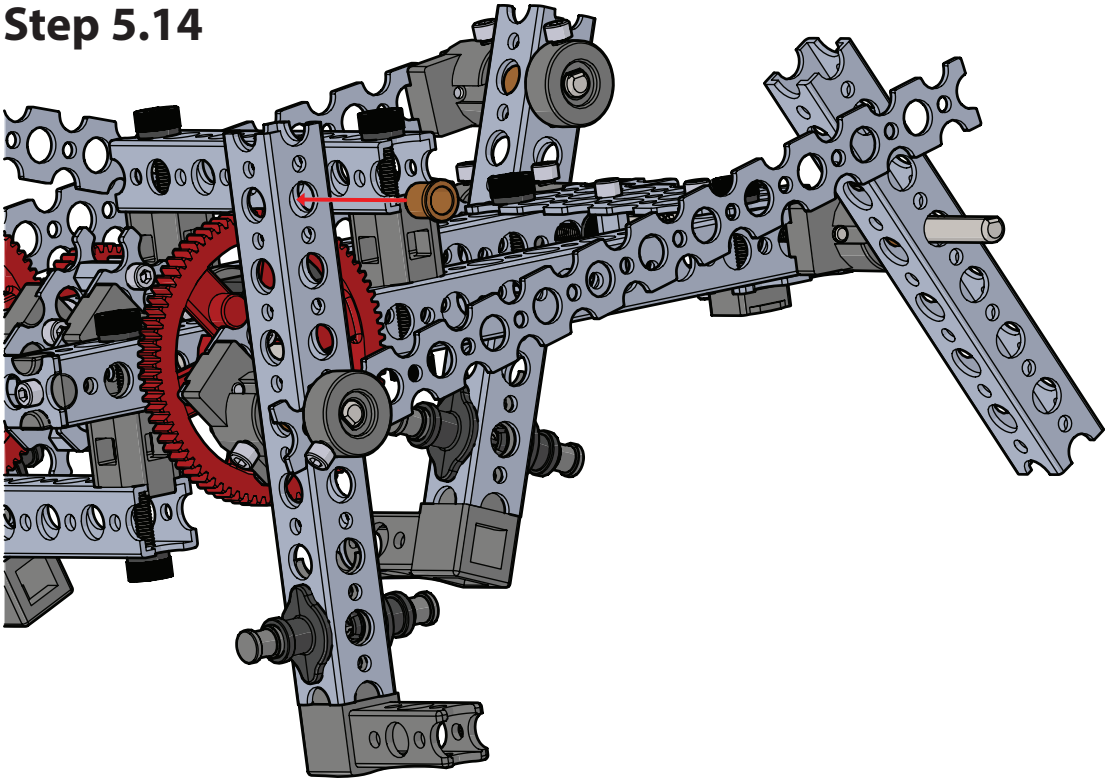
Step 5.12



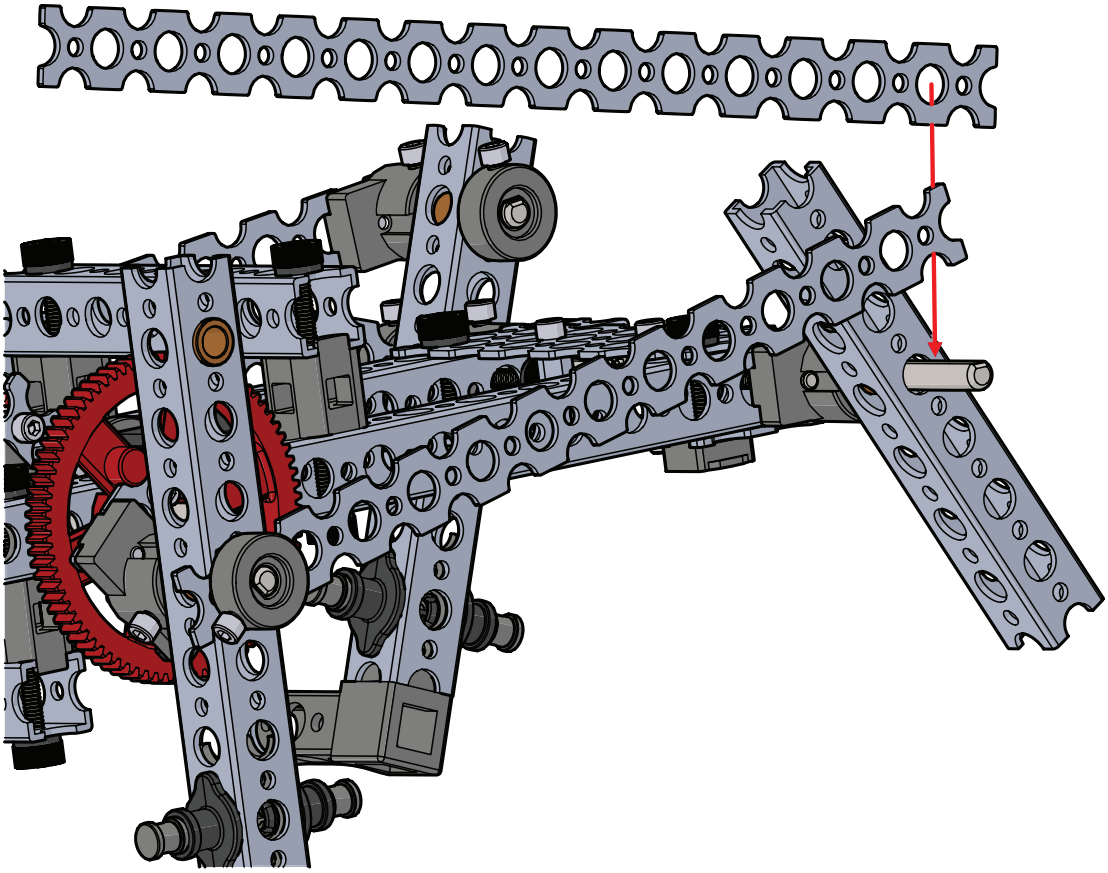
Step 5.13



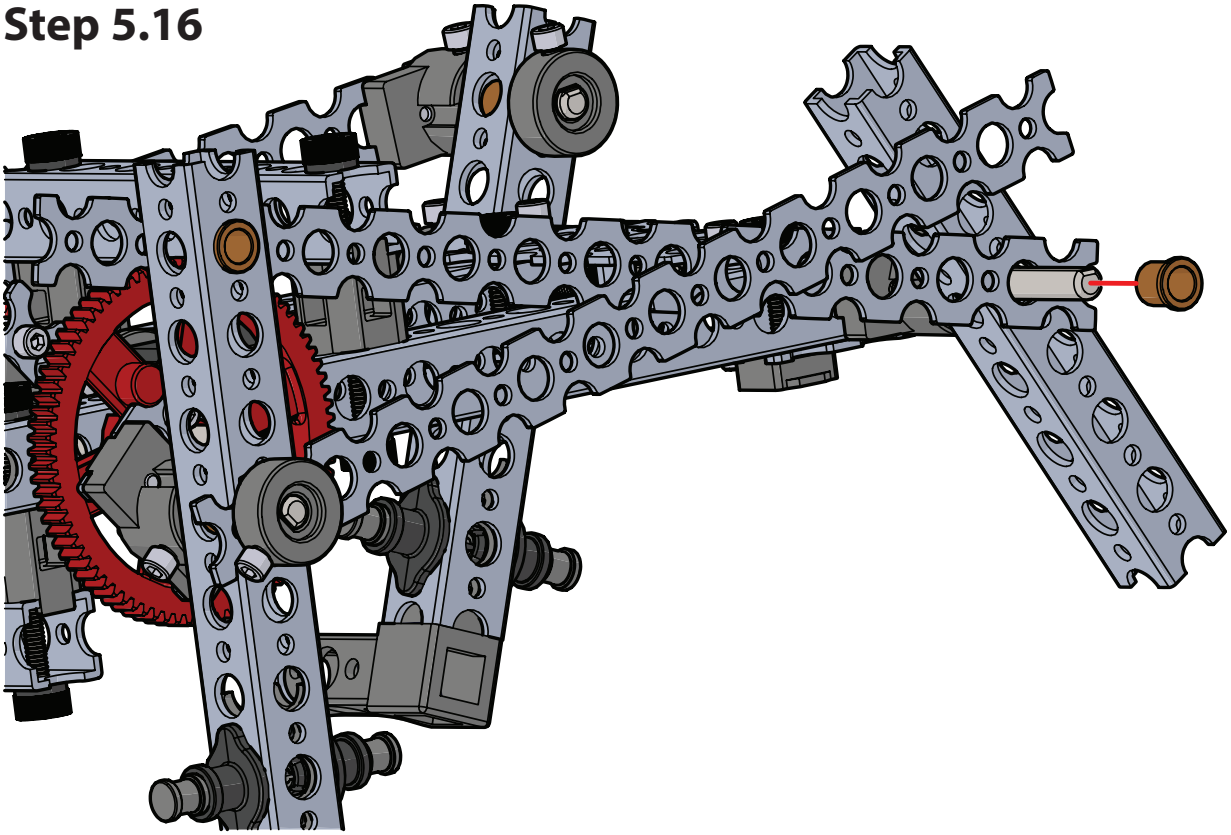
Step 5.14



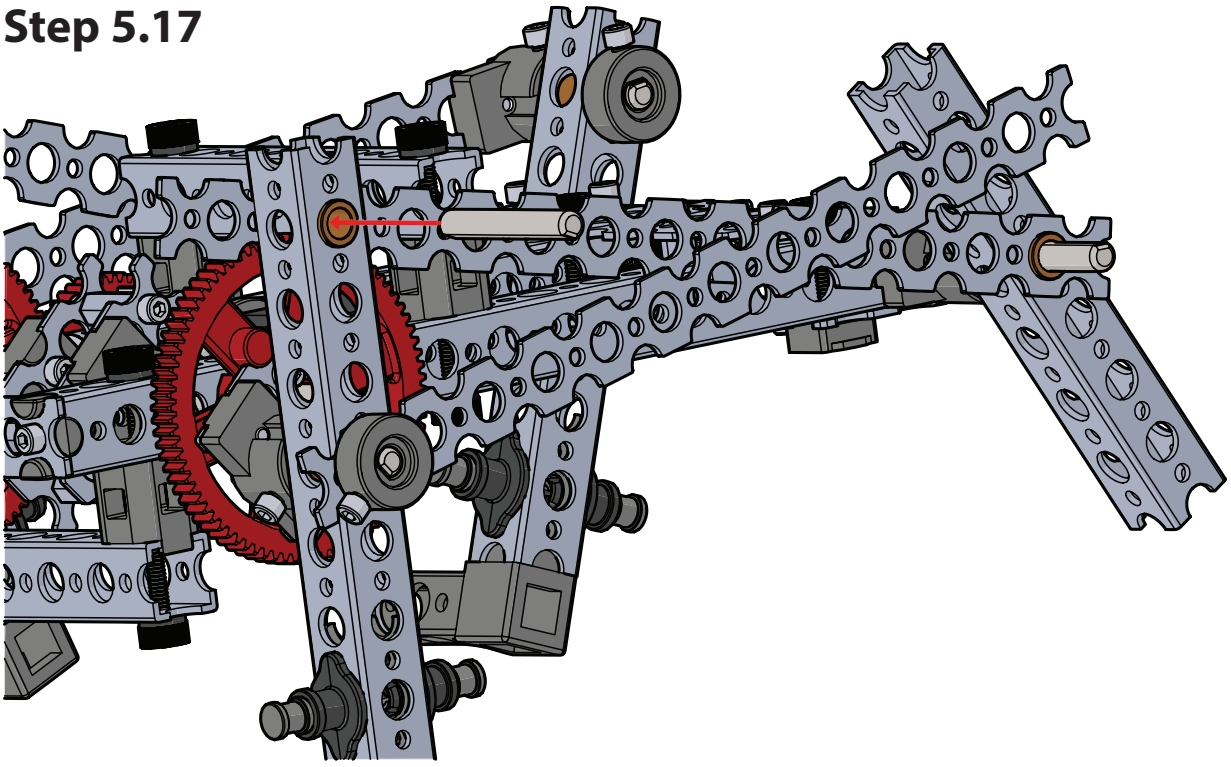
Step 5.15



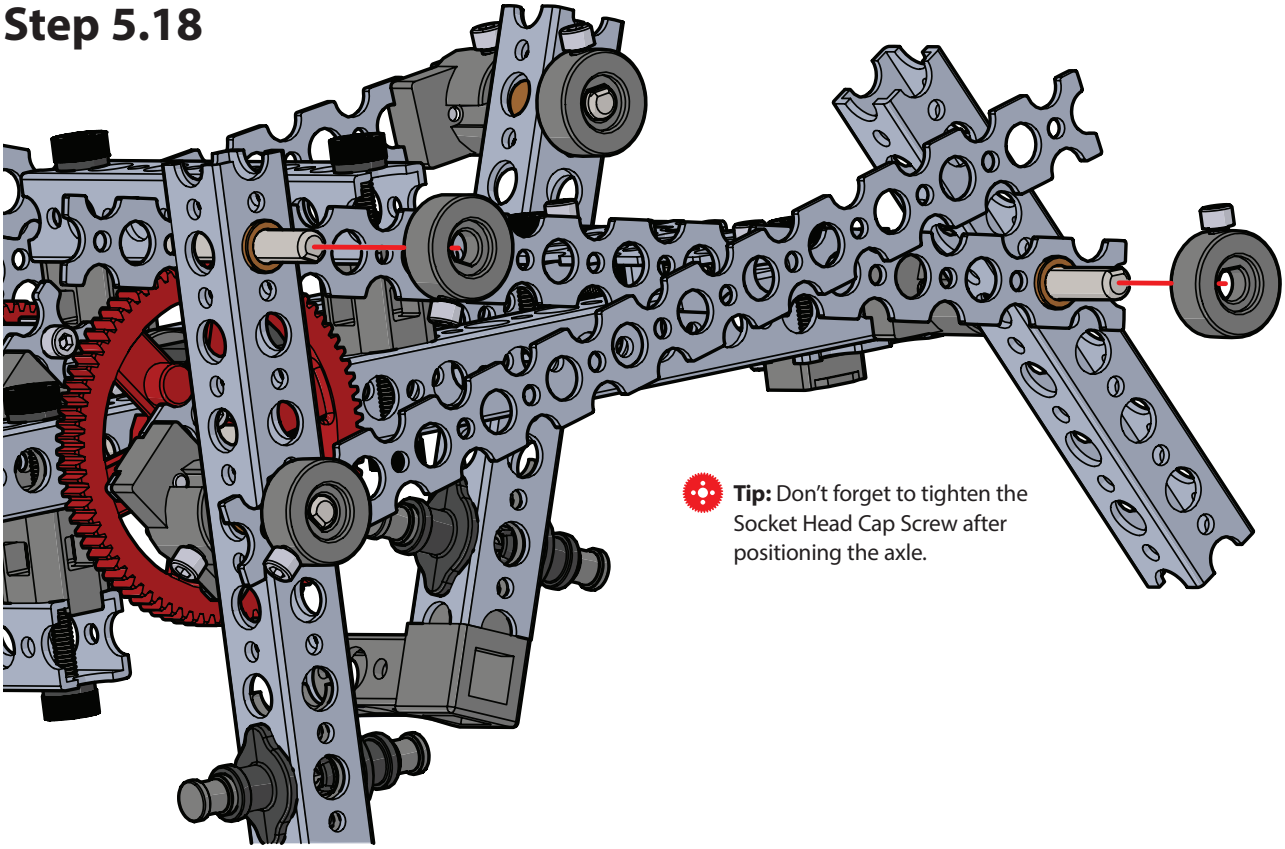
Step 5.16



Step 5.17

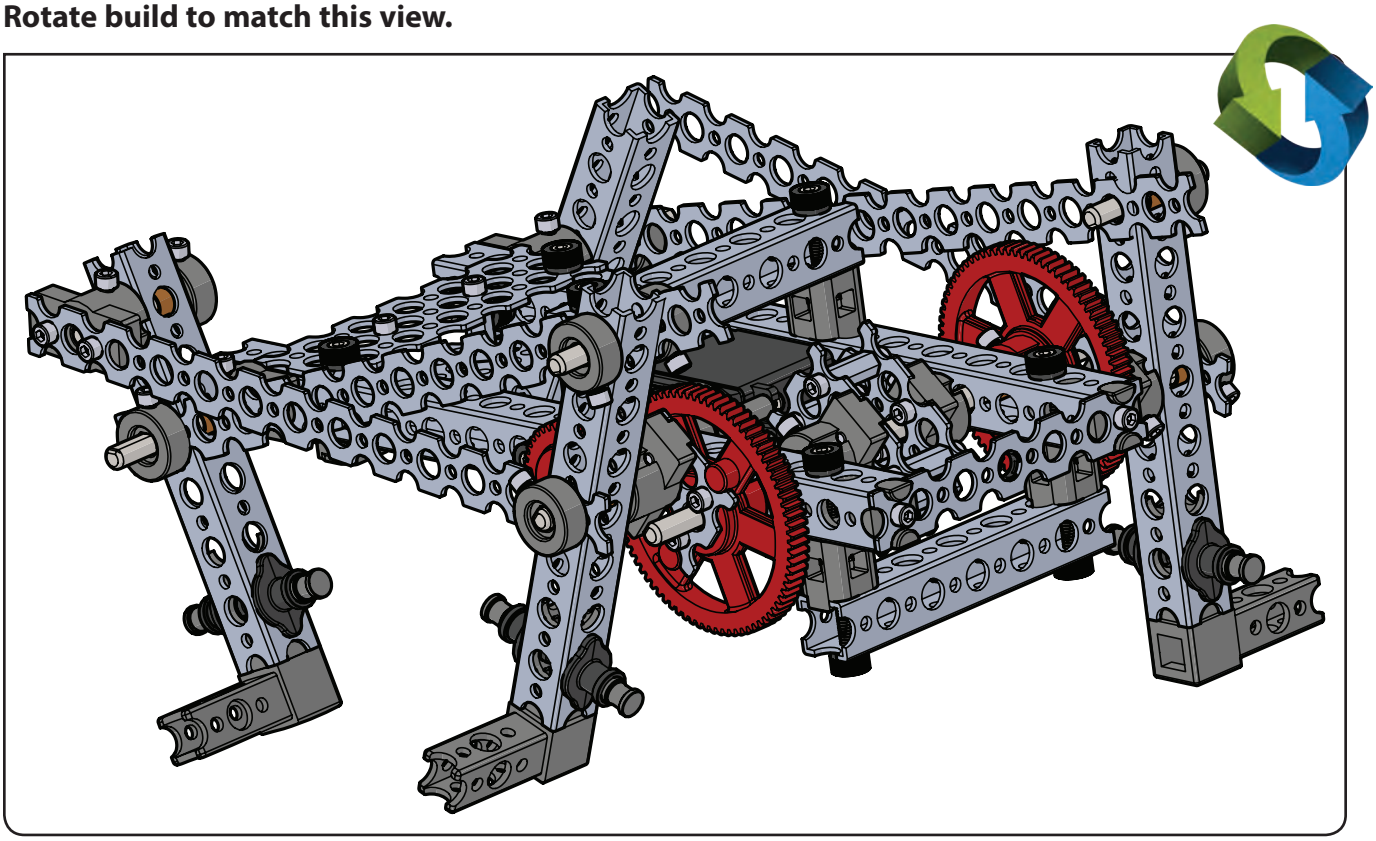


Step 5.18

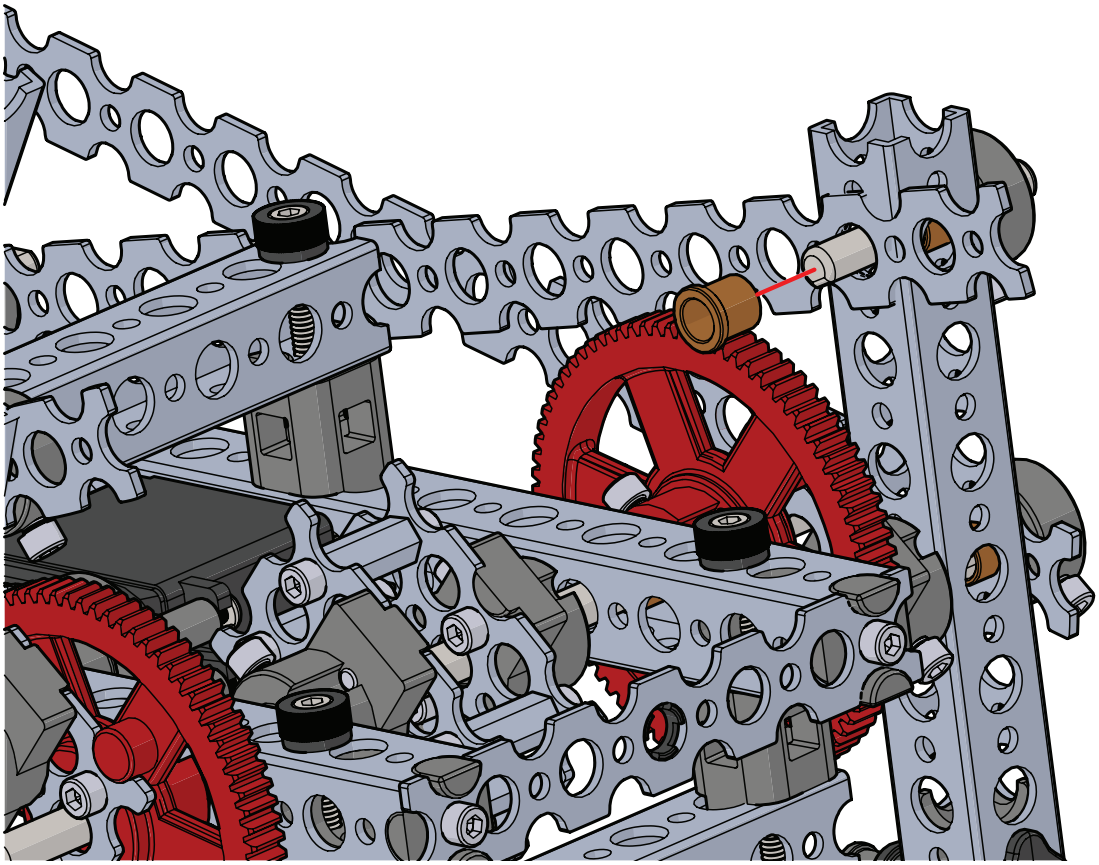


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Rotate build to match this view.

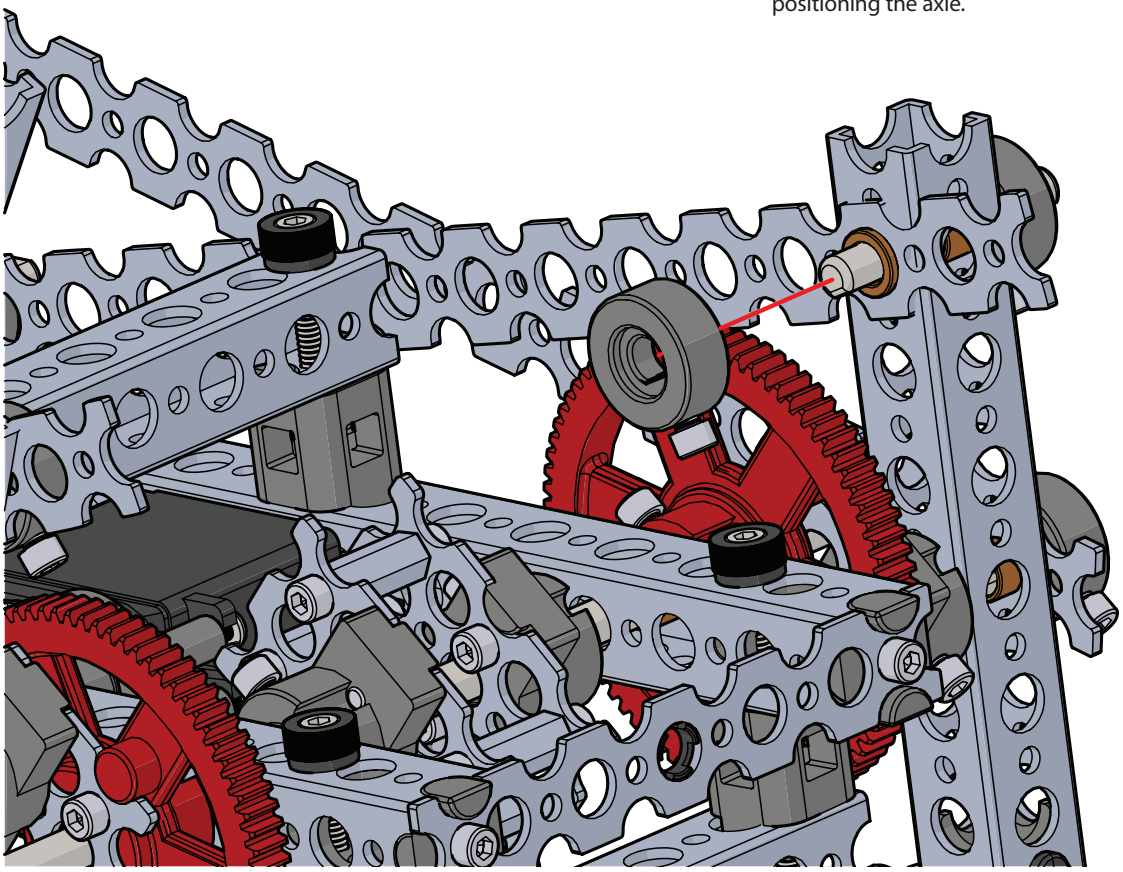


Step 5.19

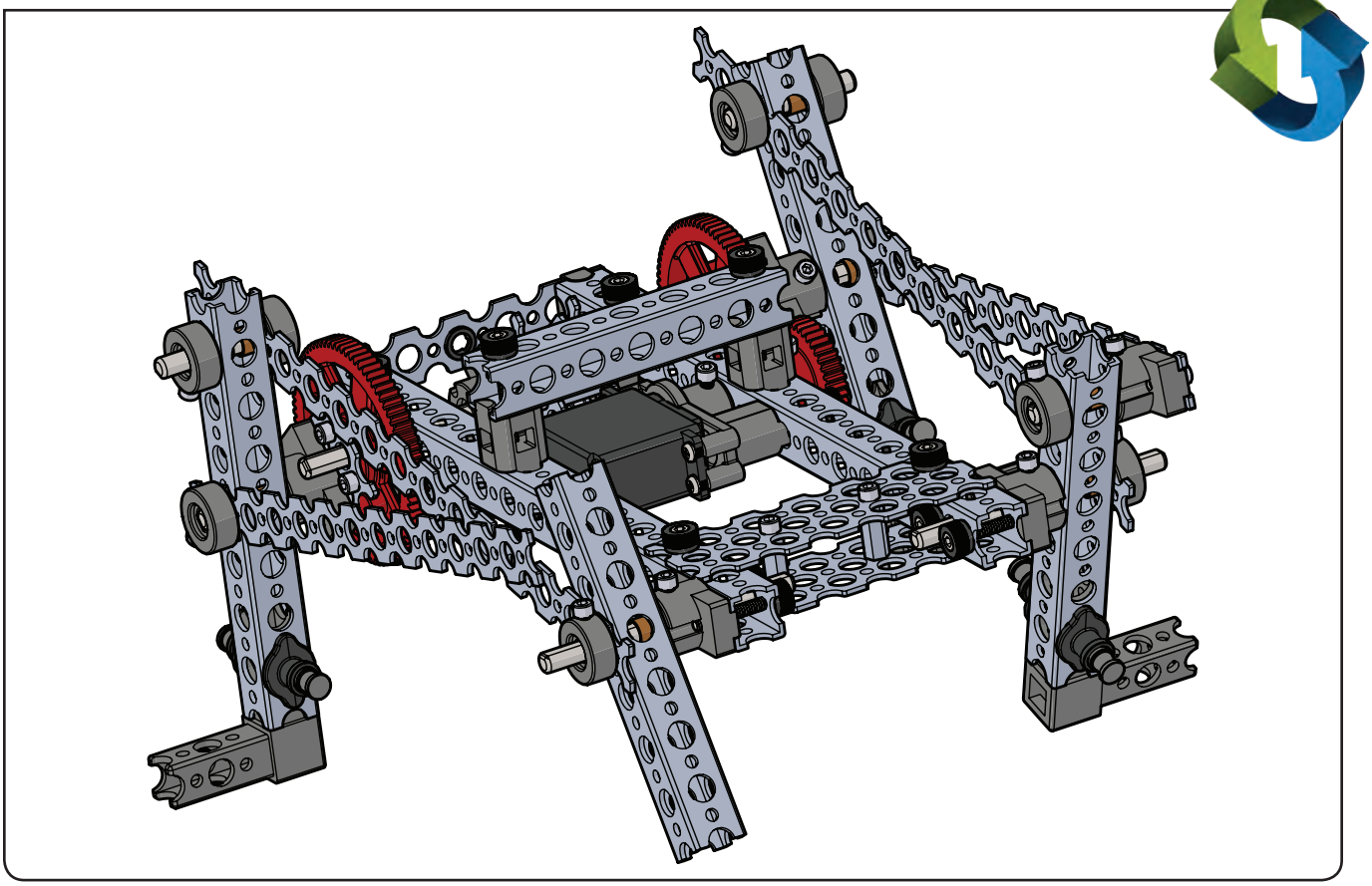


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

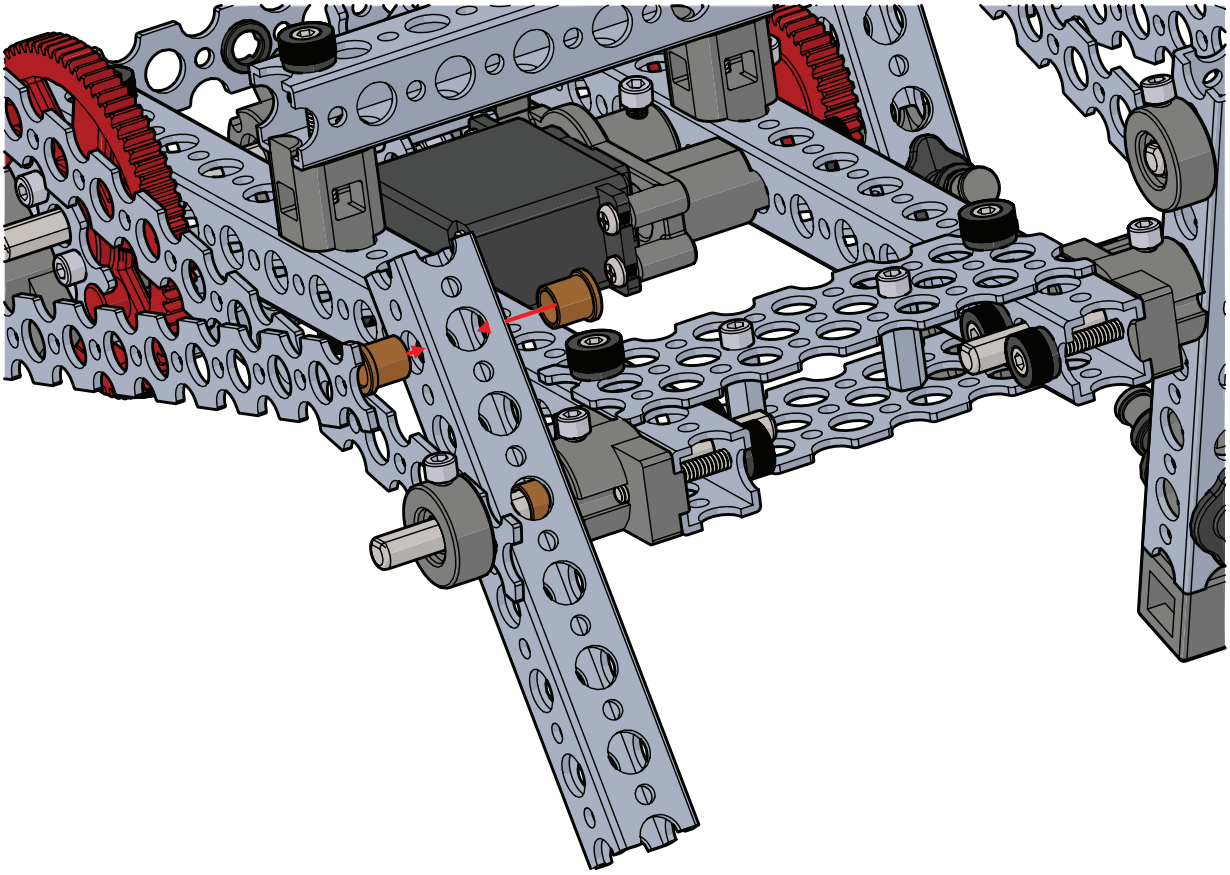
Step 5.20



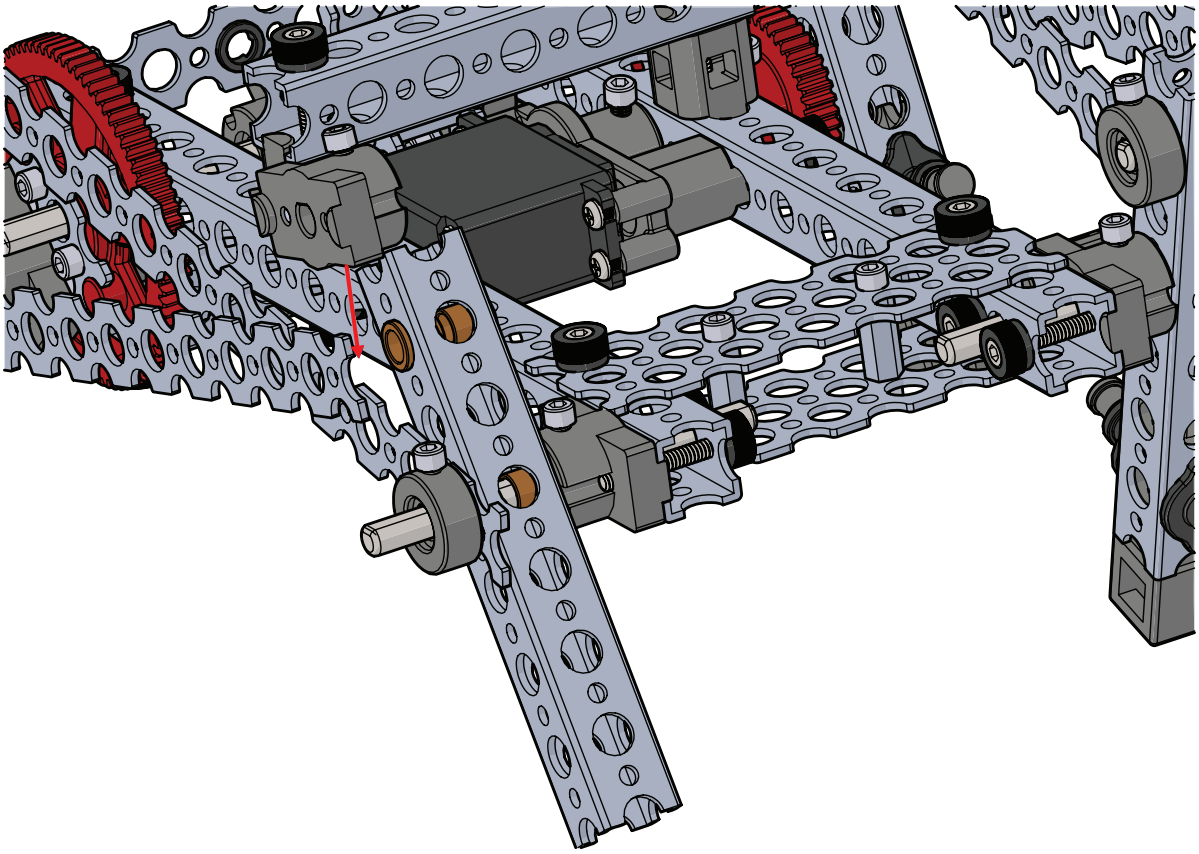
Rotate build to match this view.



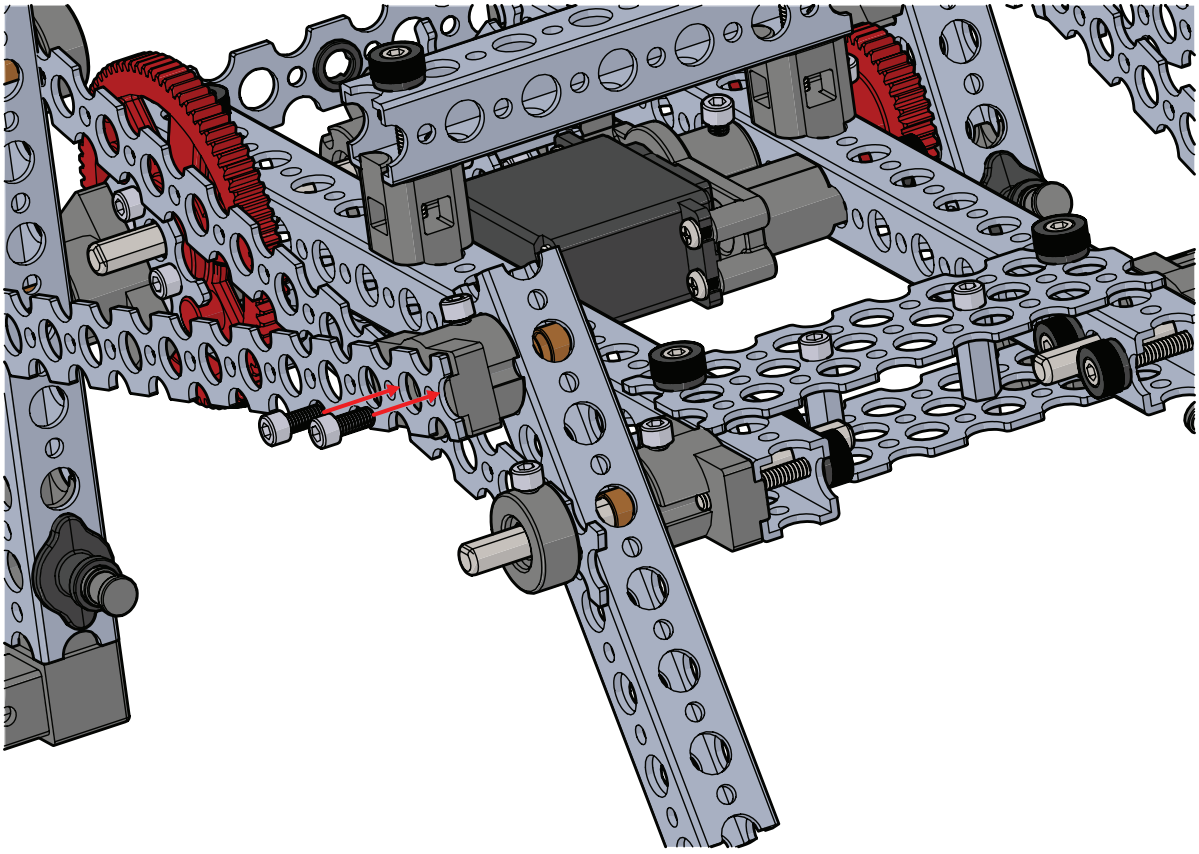
Step 5.21



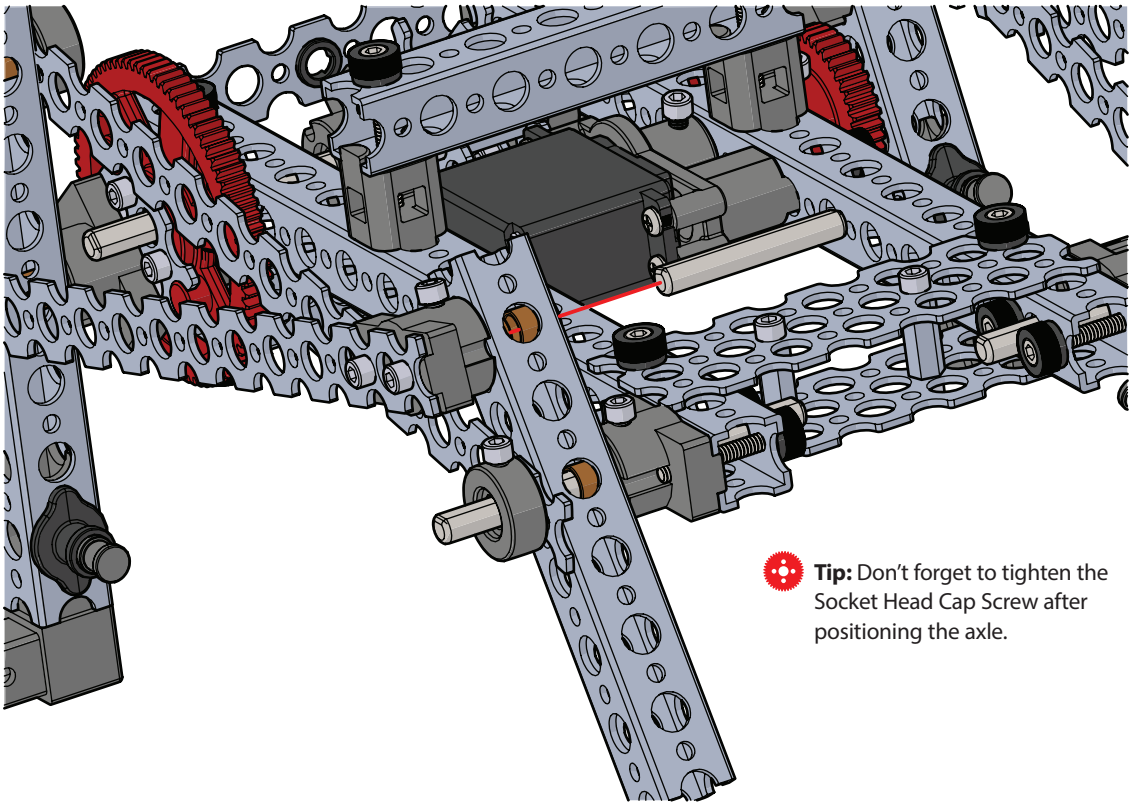
Step 5.22



Step 5.23

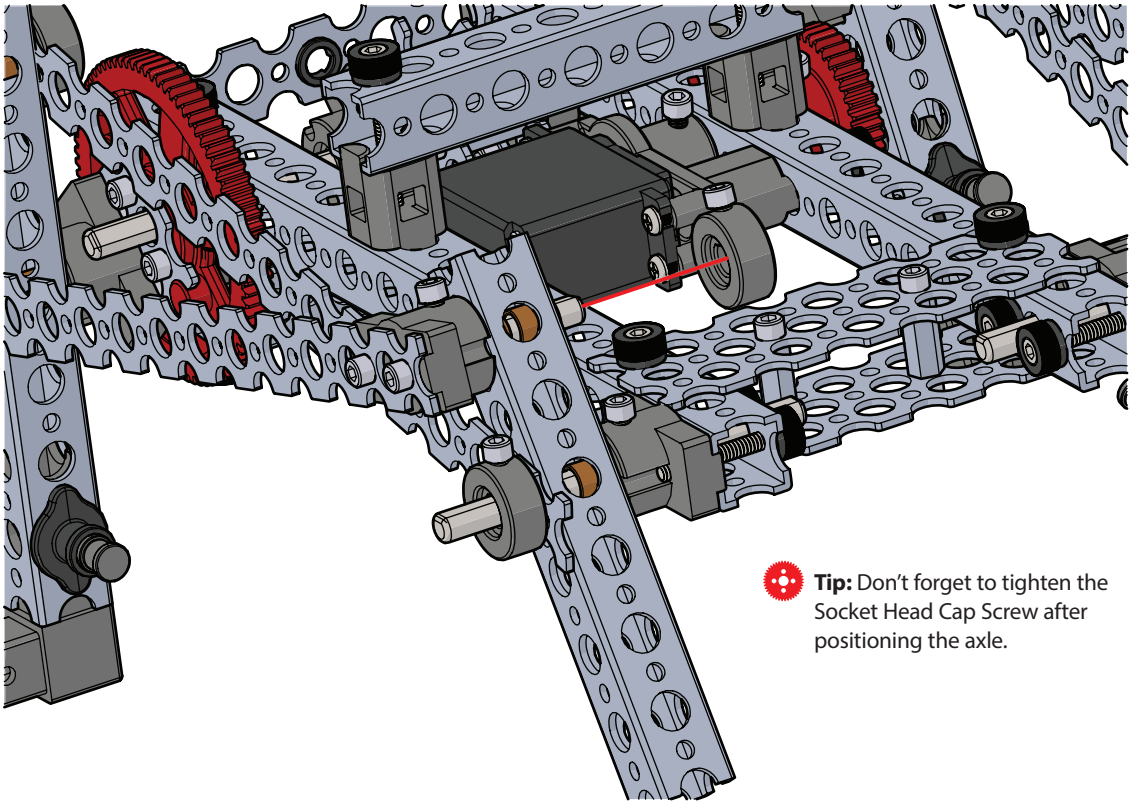


Step 5.24



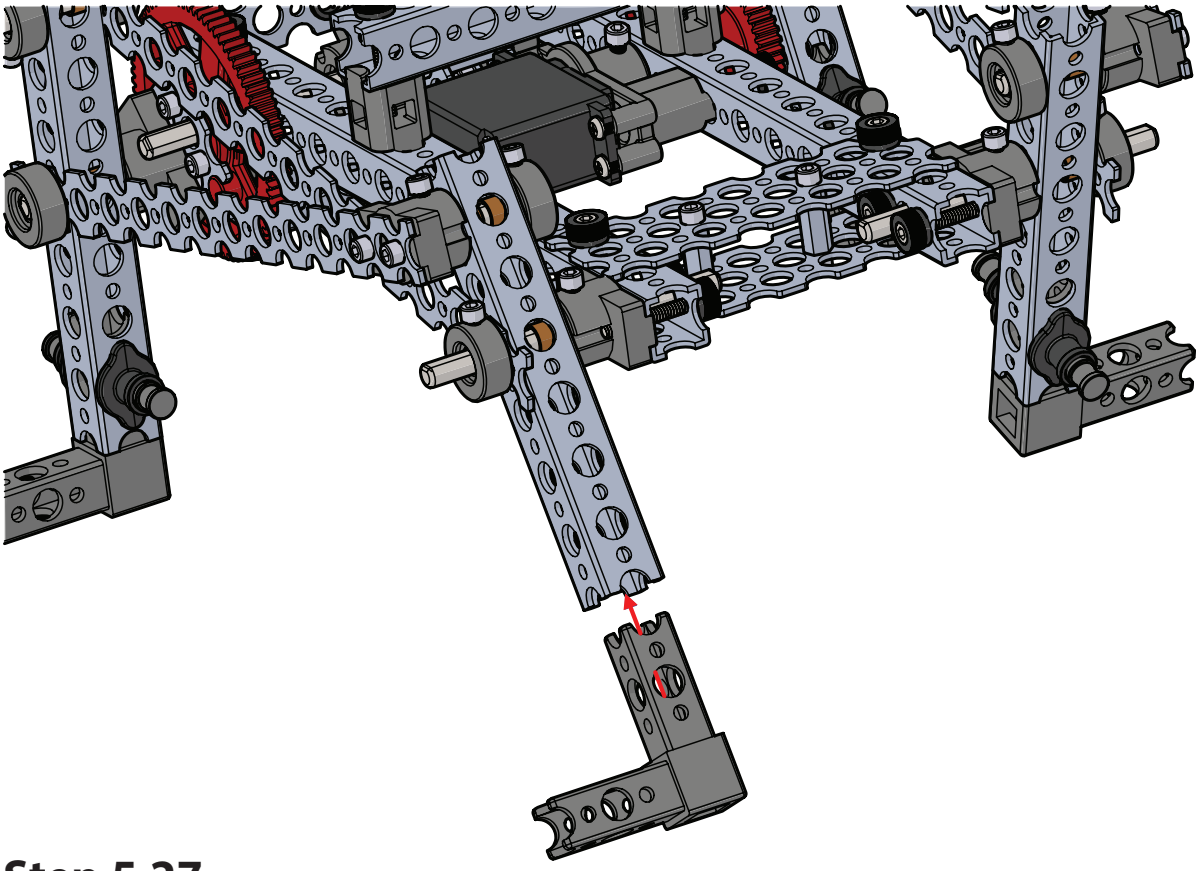
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 5.25

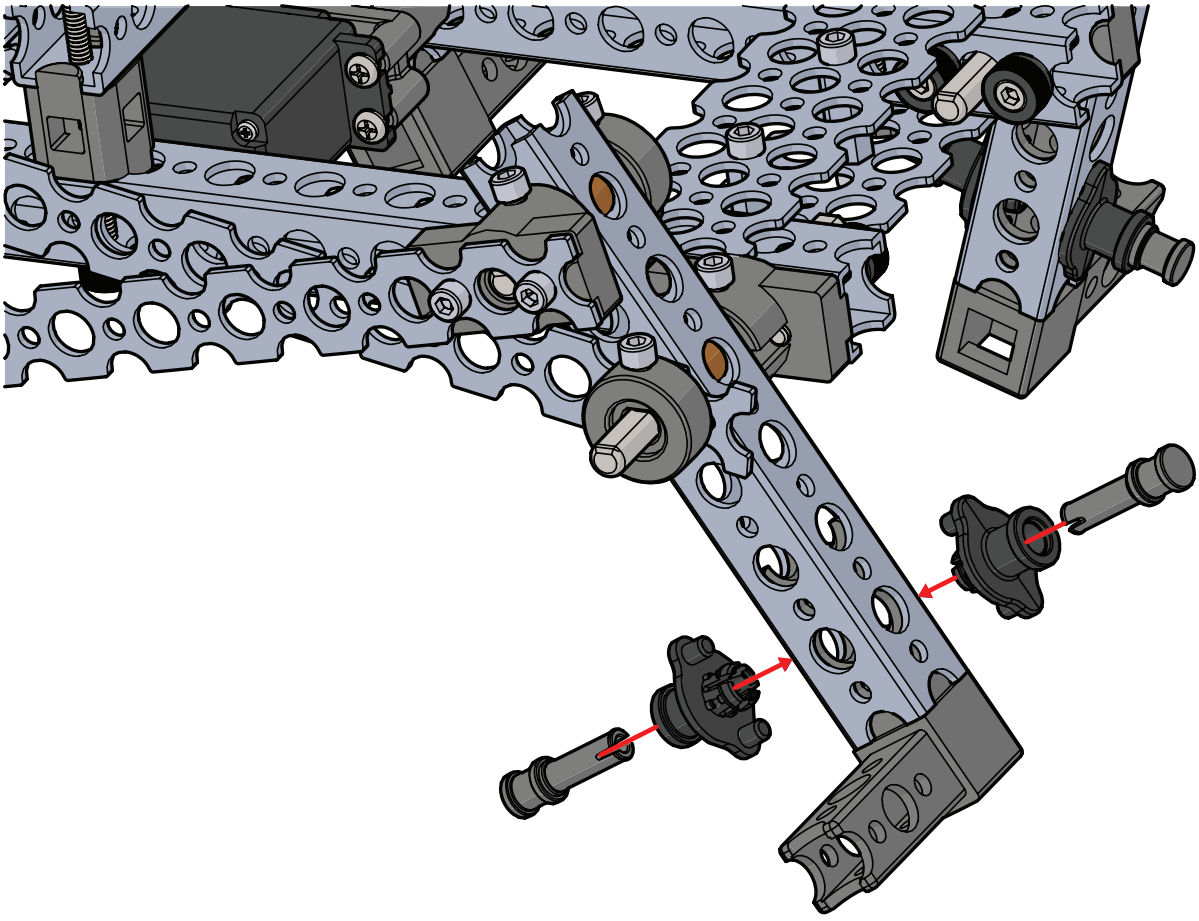


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 5.26

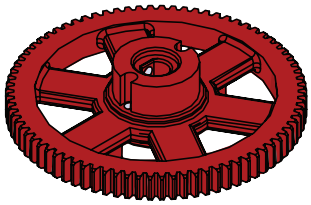


Step 5.27

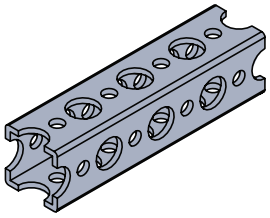


Step 6

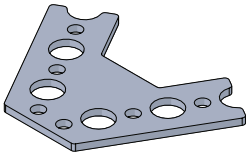
Parts Needed



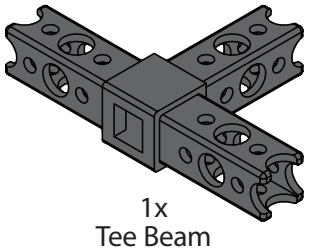
1x
80-Tooth Plastic
Gear 40224



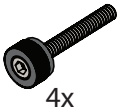
1x
4-Hole Square
Beam 40201



4x
60-Degree Gusset
41264



1x
Tee Beam
Connector 40213



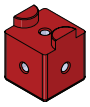
4x
Thumbscrew
40323

2x
Wing Nut
40221

2x
Quick Rivet Peg
40220

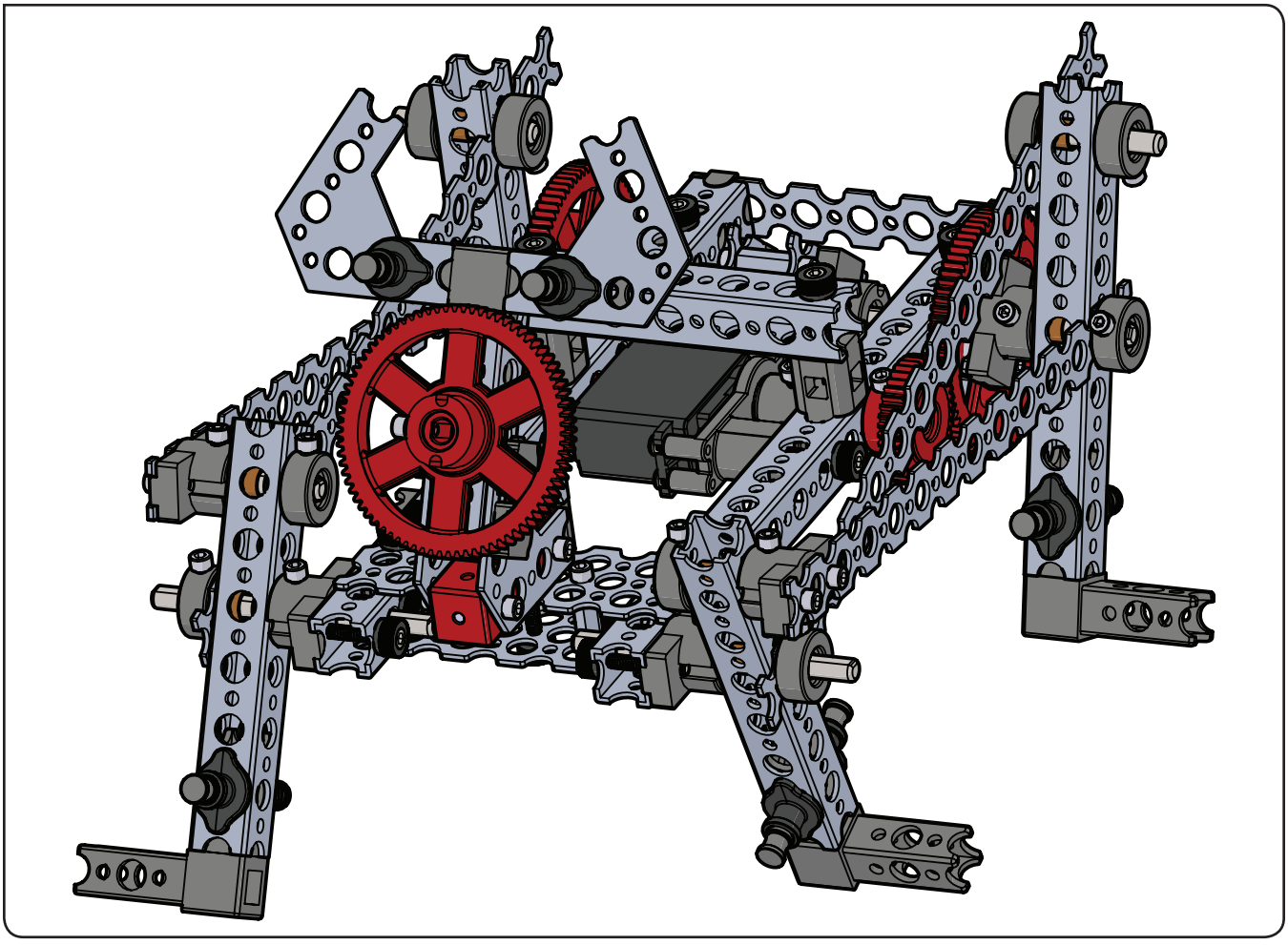
2x
Quick Rivet
Connector
40219

4x
Socket Head
Cap Screw
40516

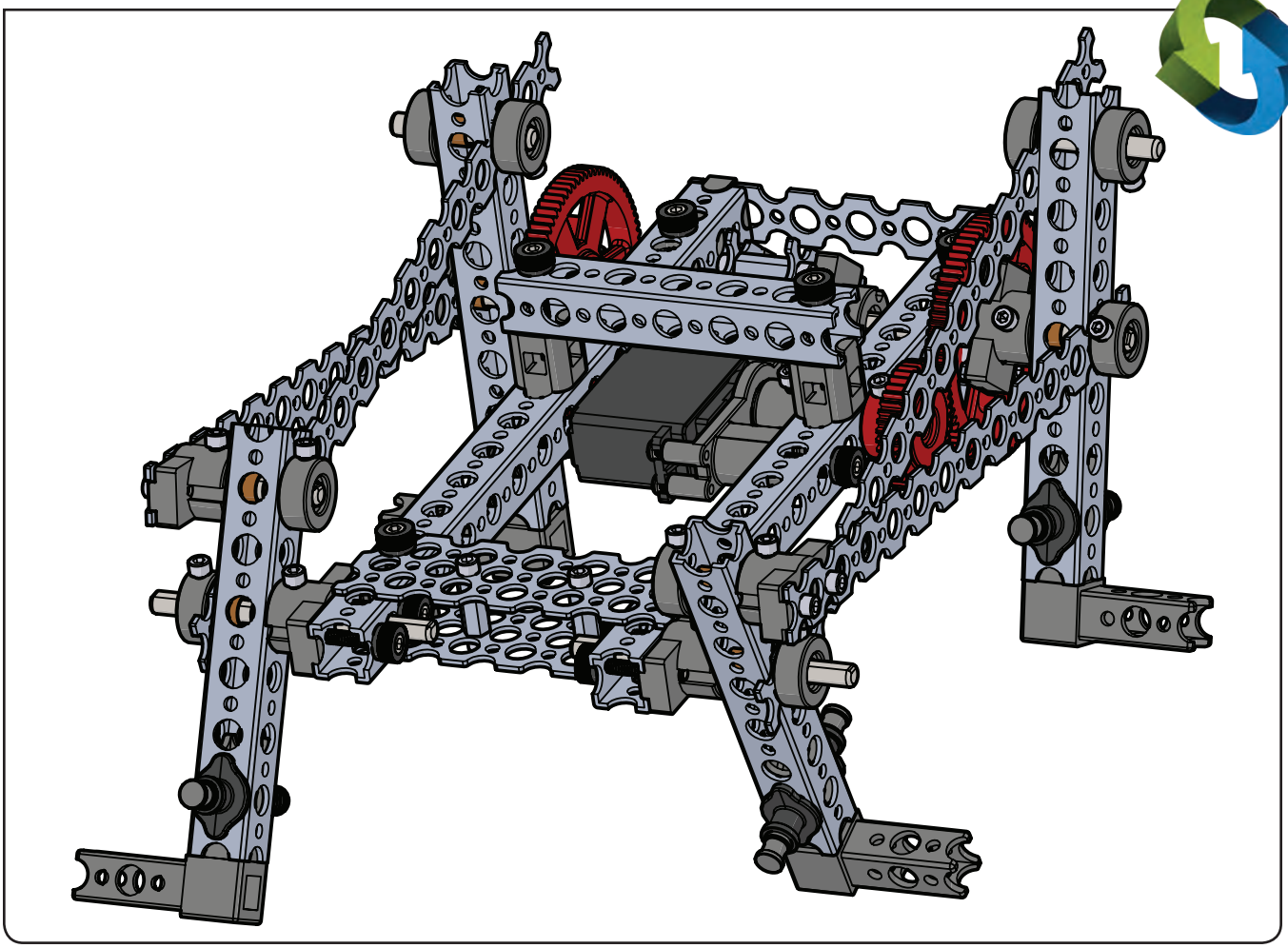


2x
16 mm Anchor
Block 41267

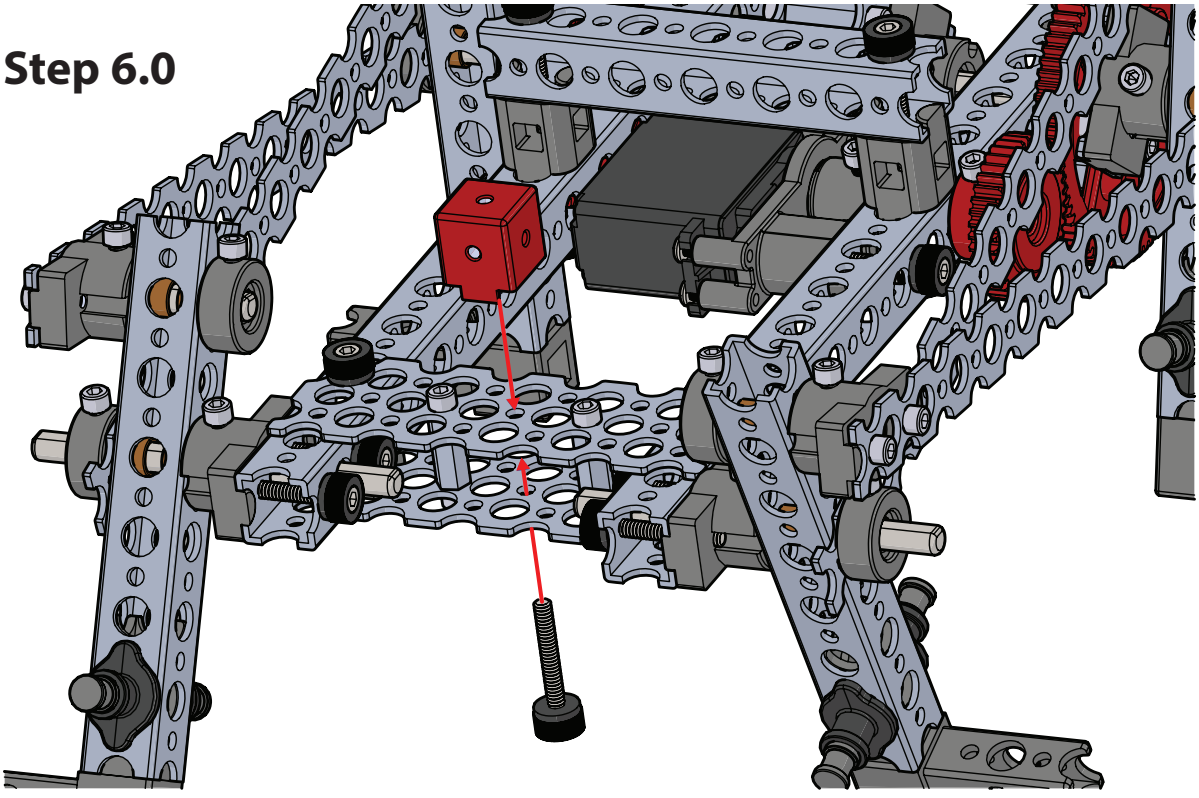
Partial assembly should look like this.



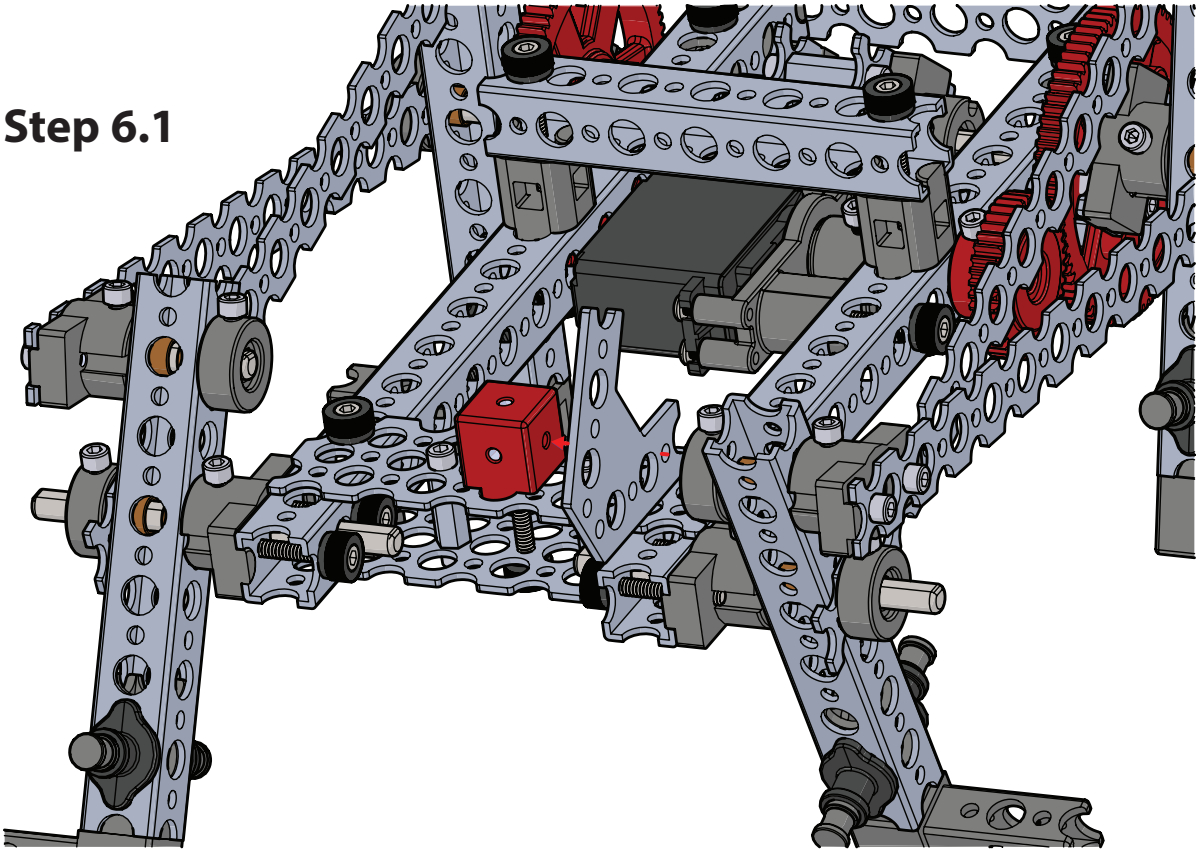
Rotate build to match this view.



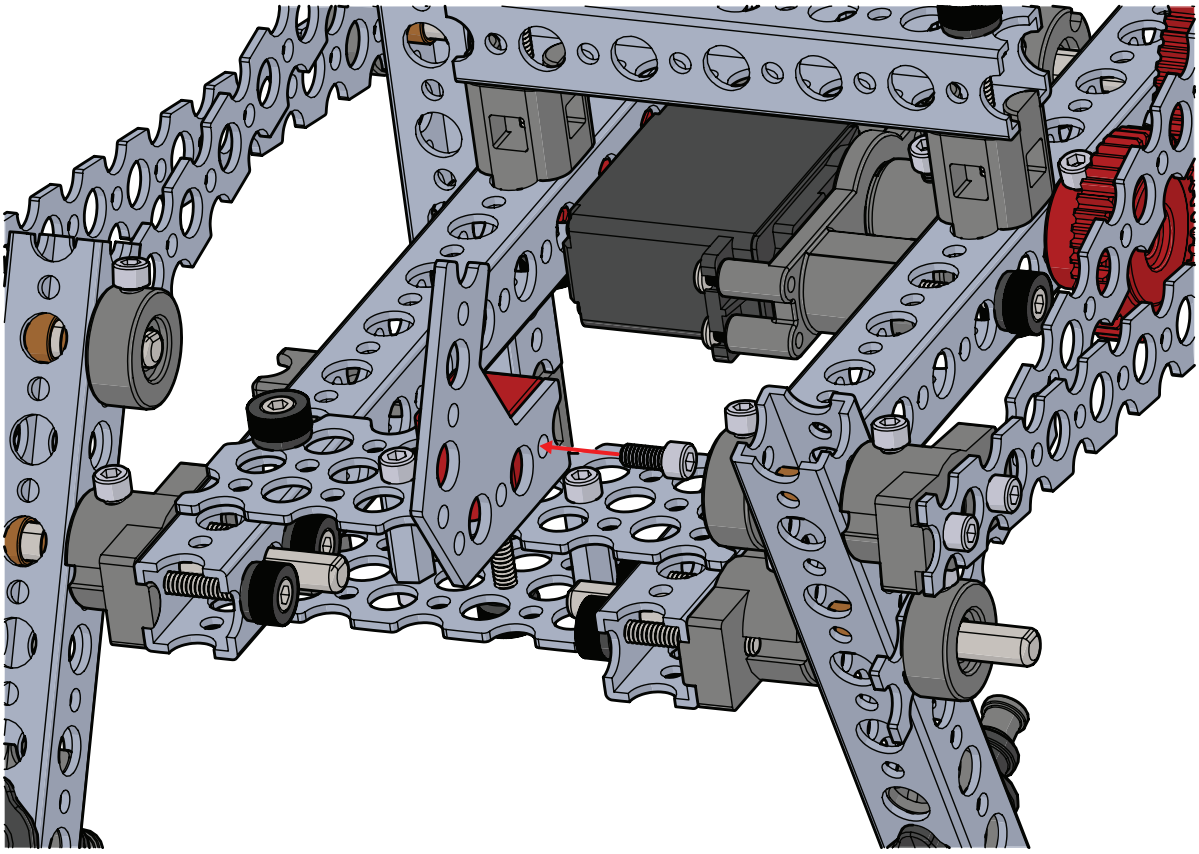
Step 6.0



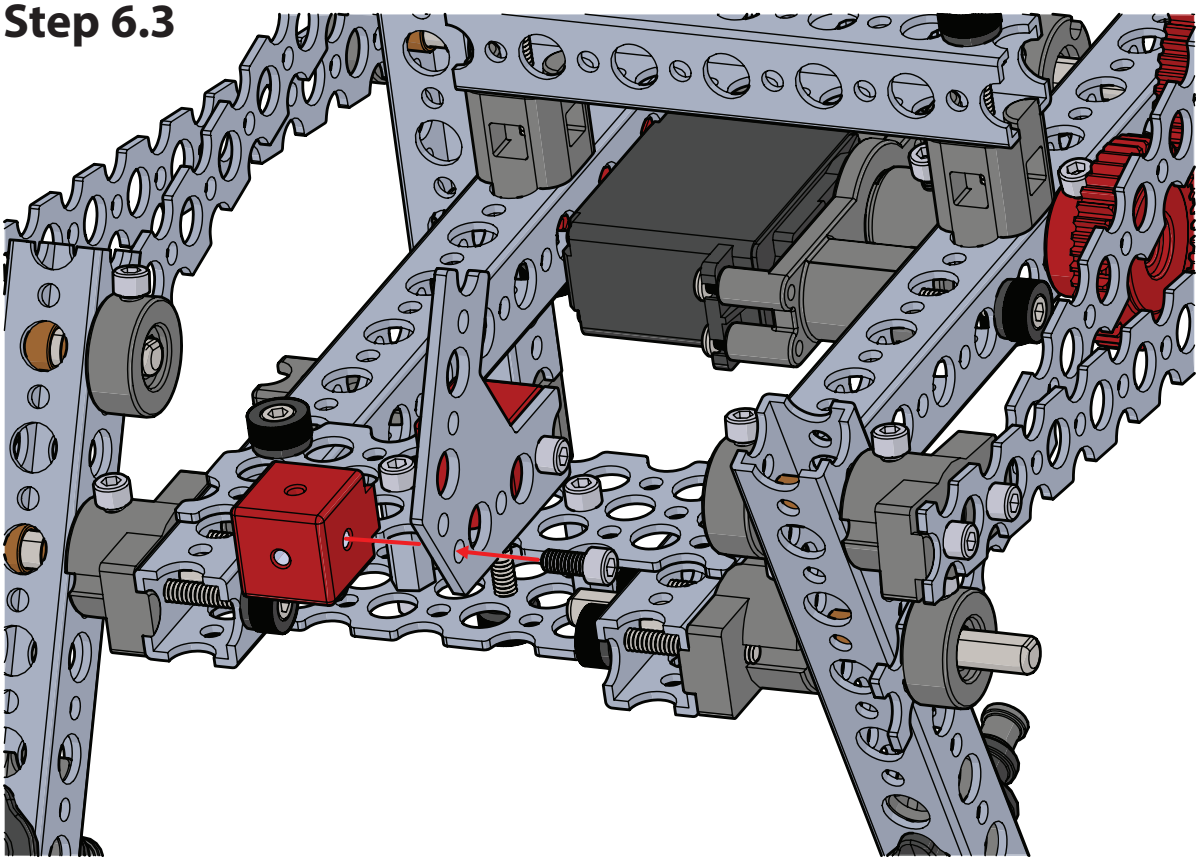
Step 6.1



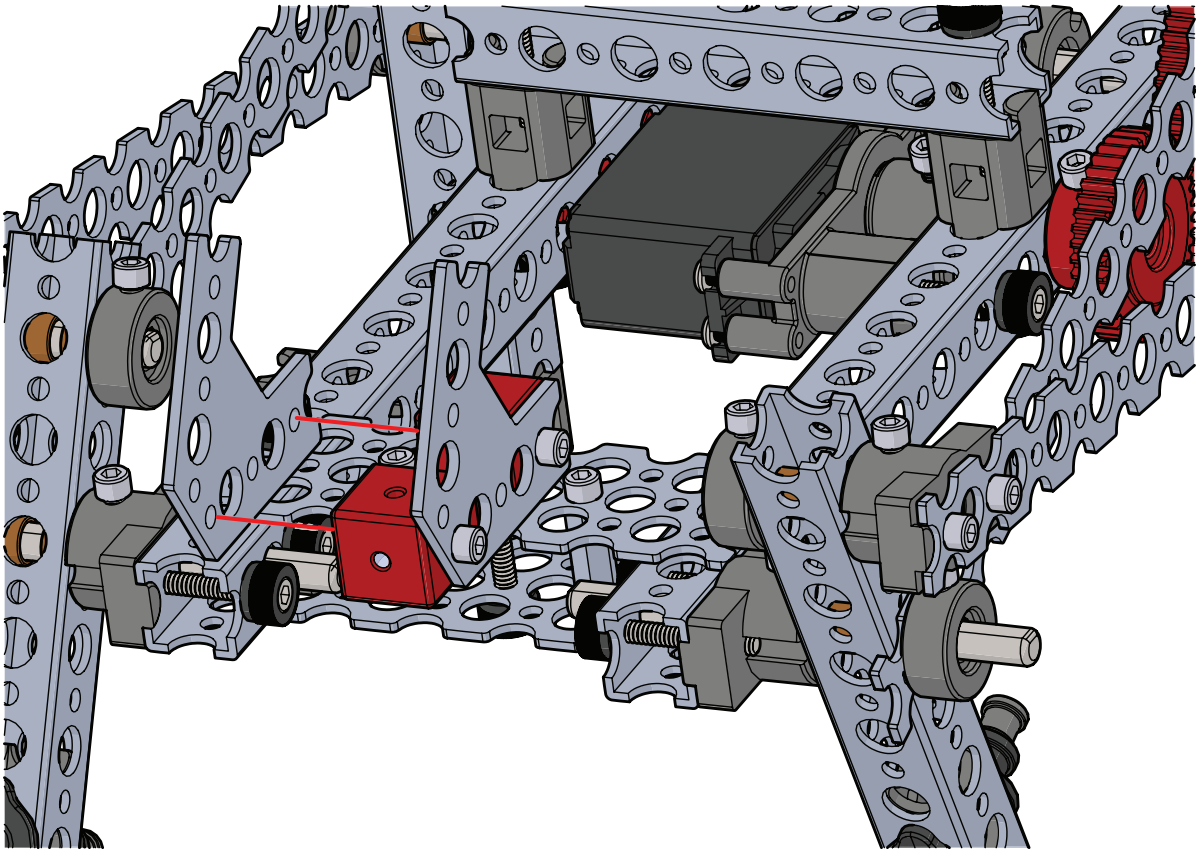
Step 6.2



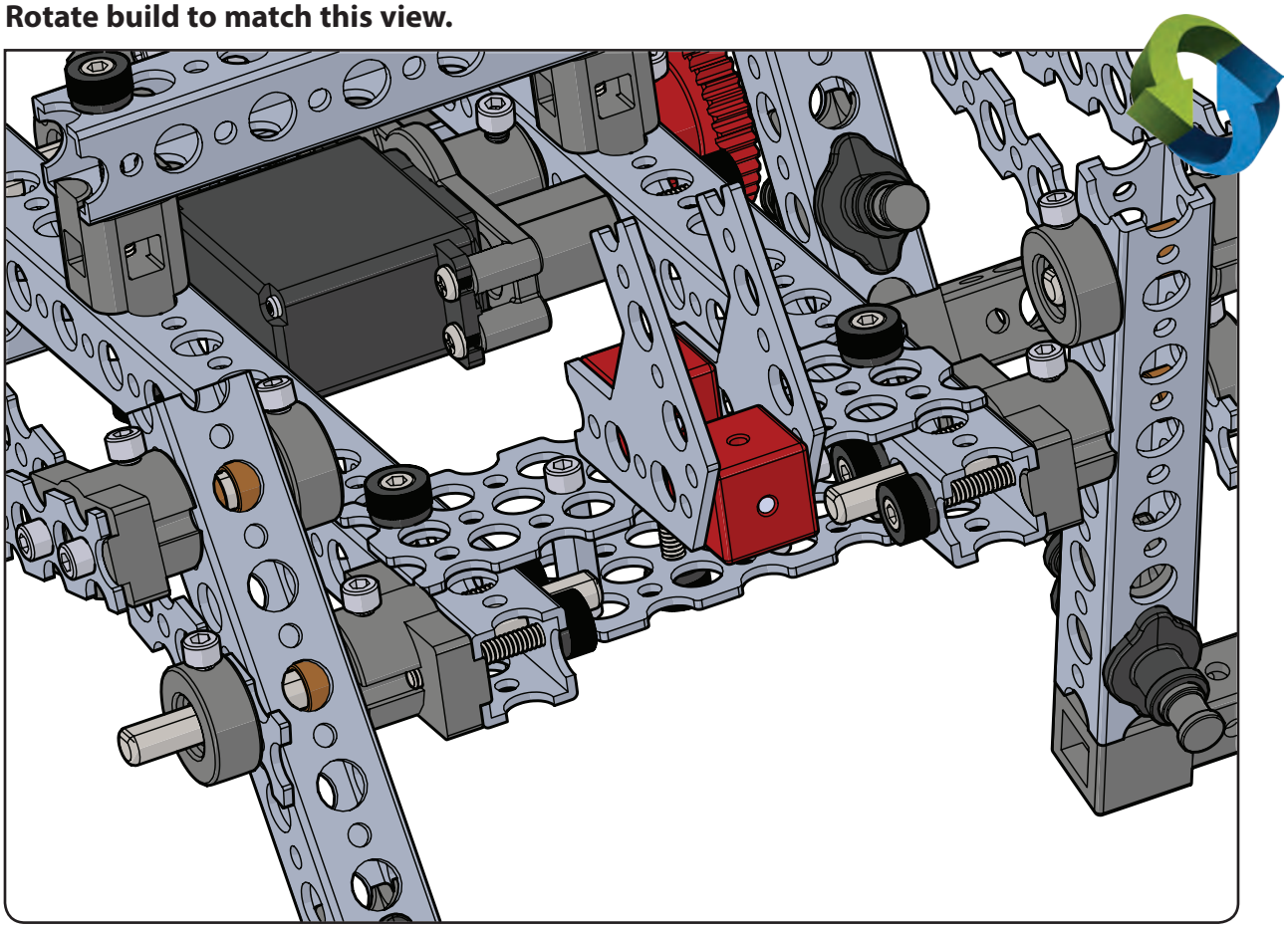
Step 6.3



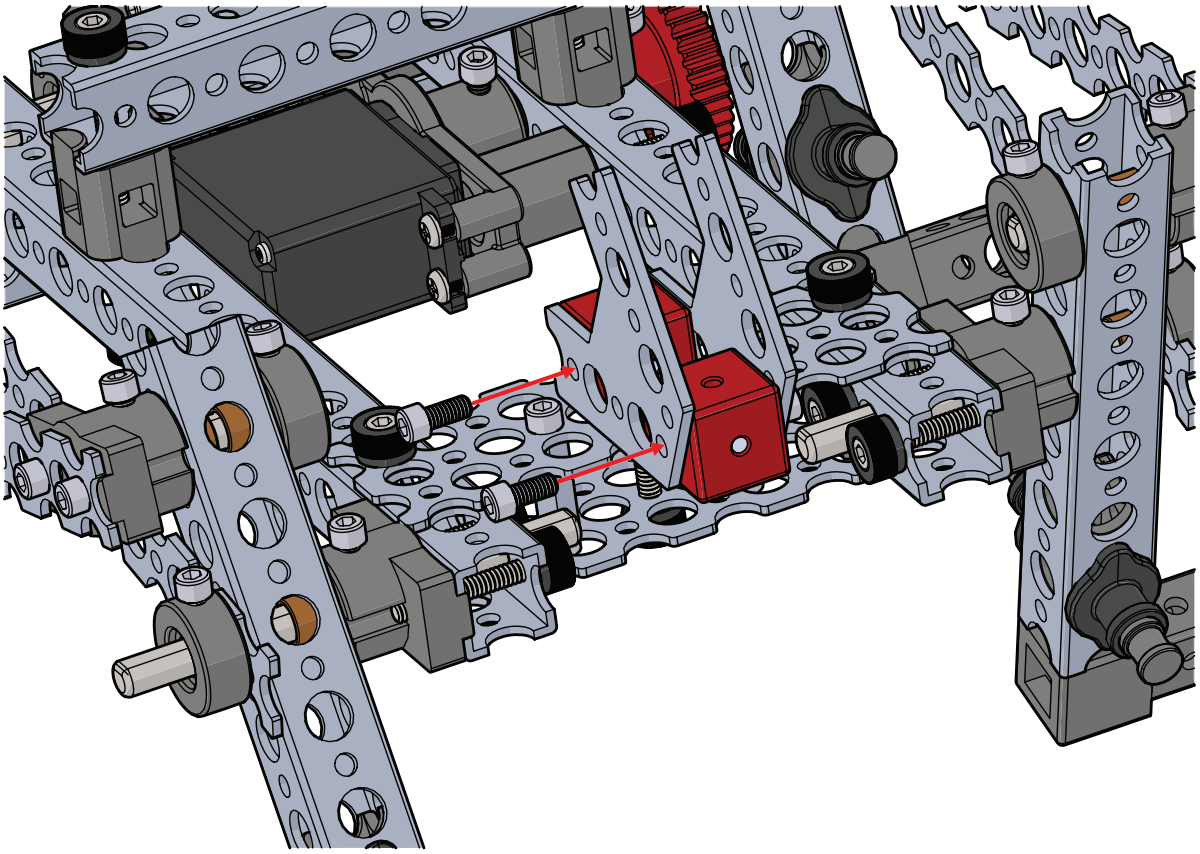
Step 6.4



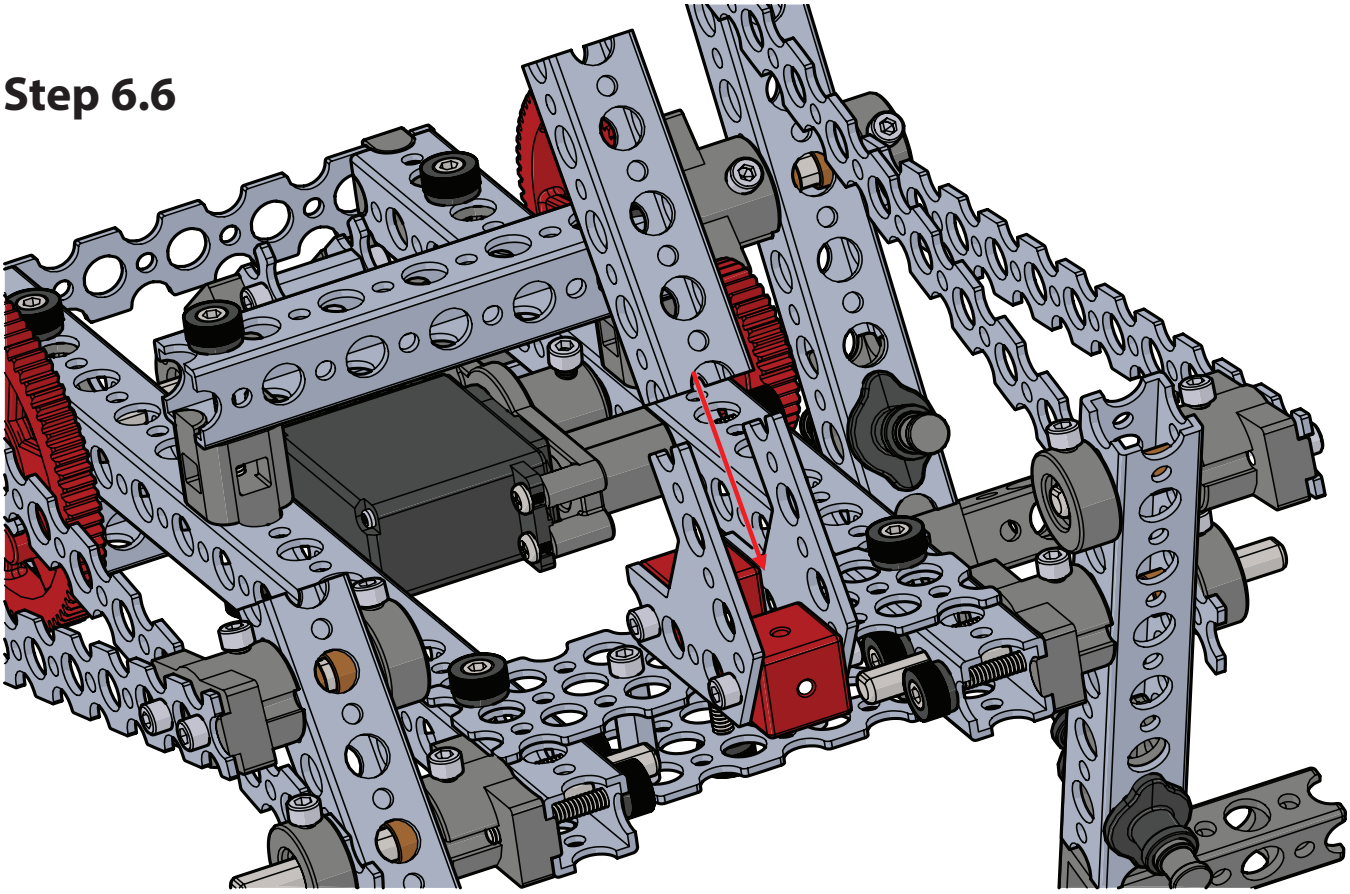
Rotate build to match this view.



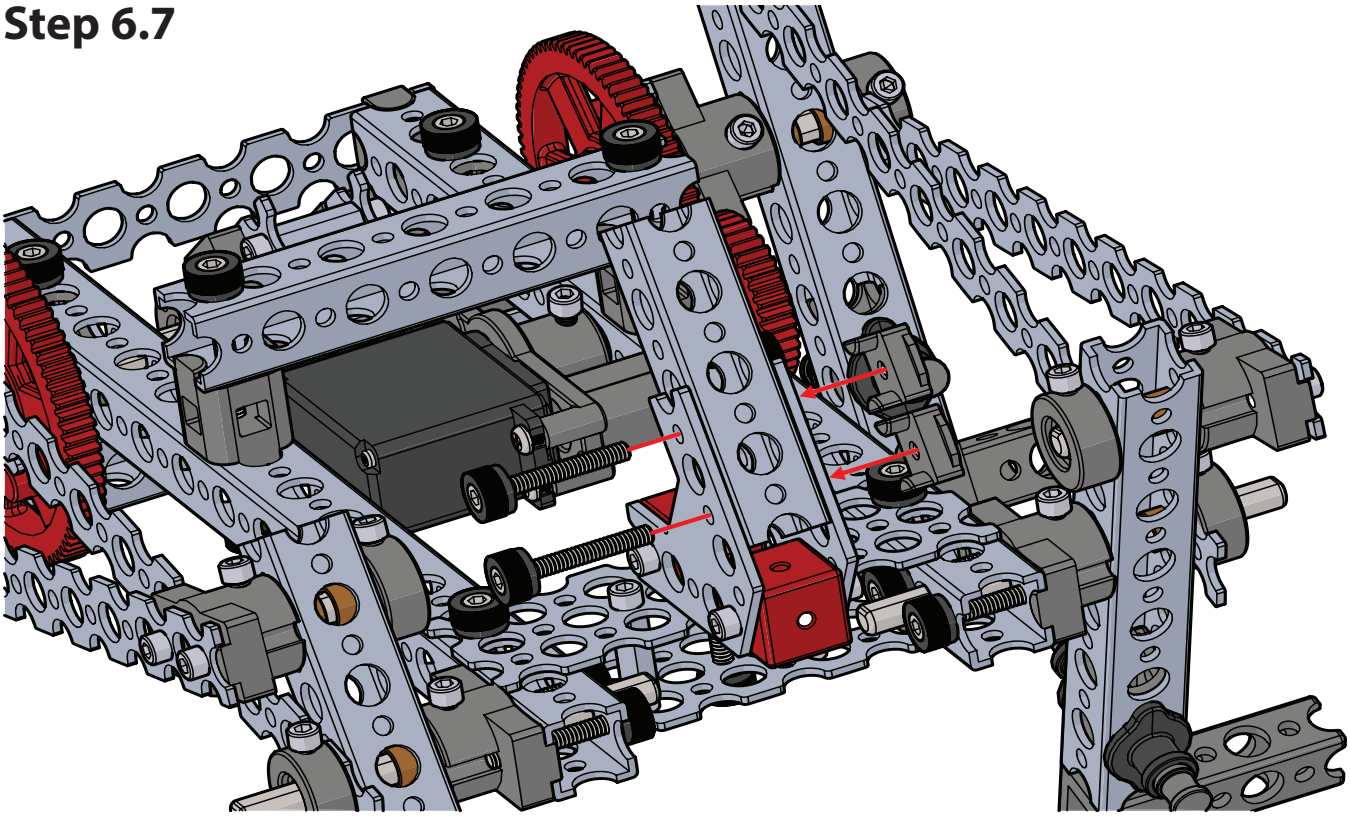
Step 6.5



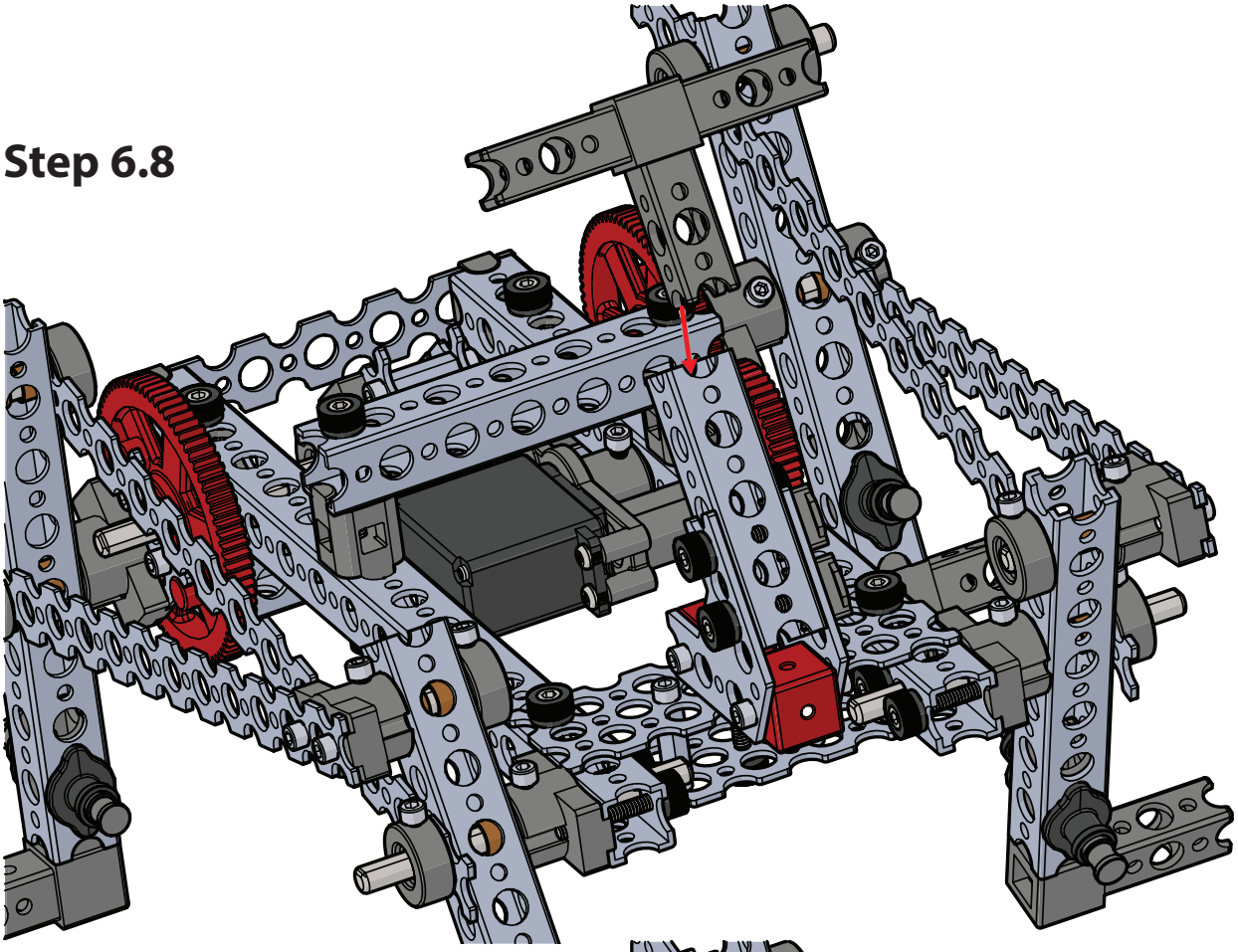
Step 6.6



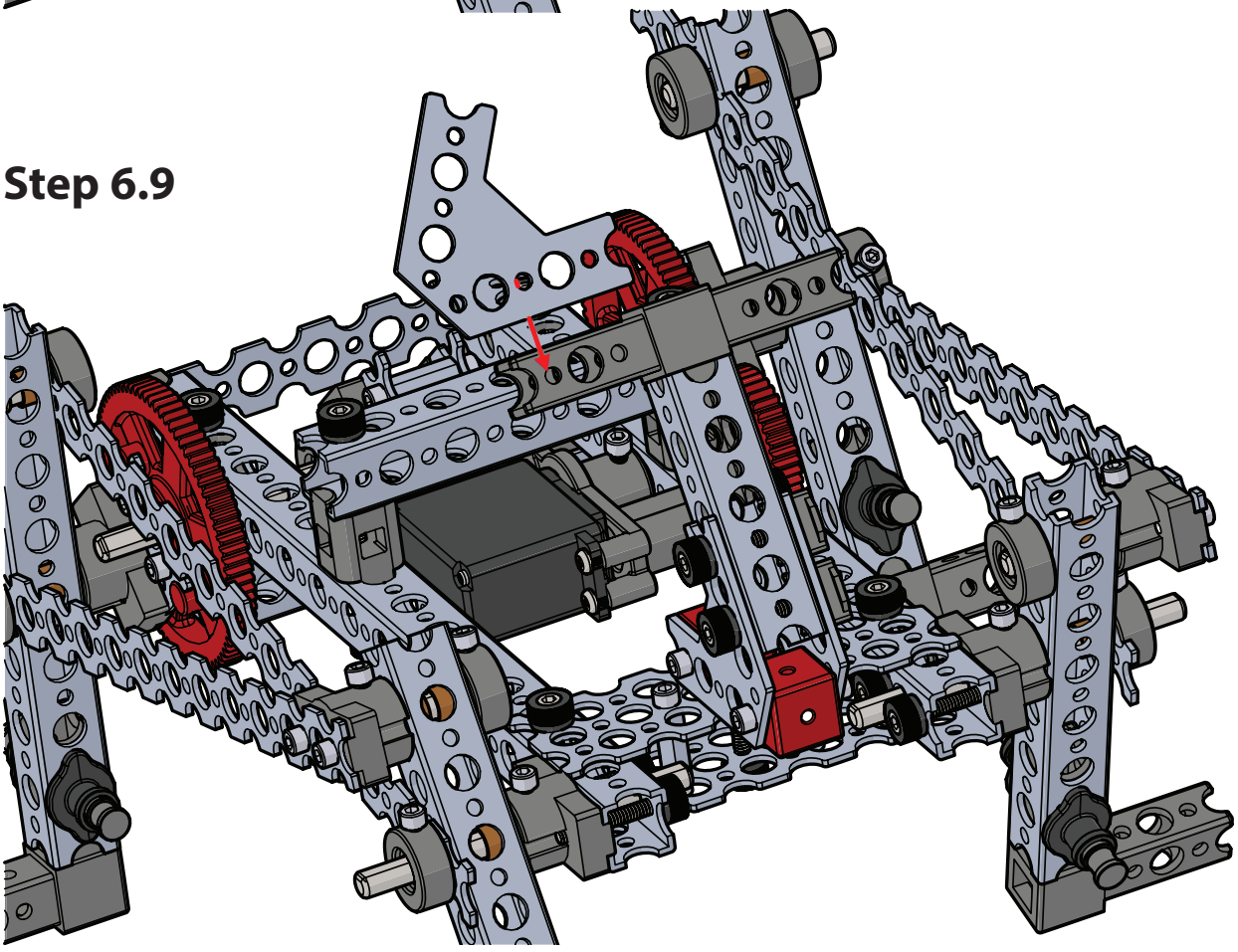
Step 6.7



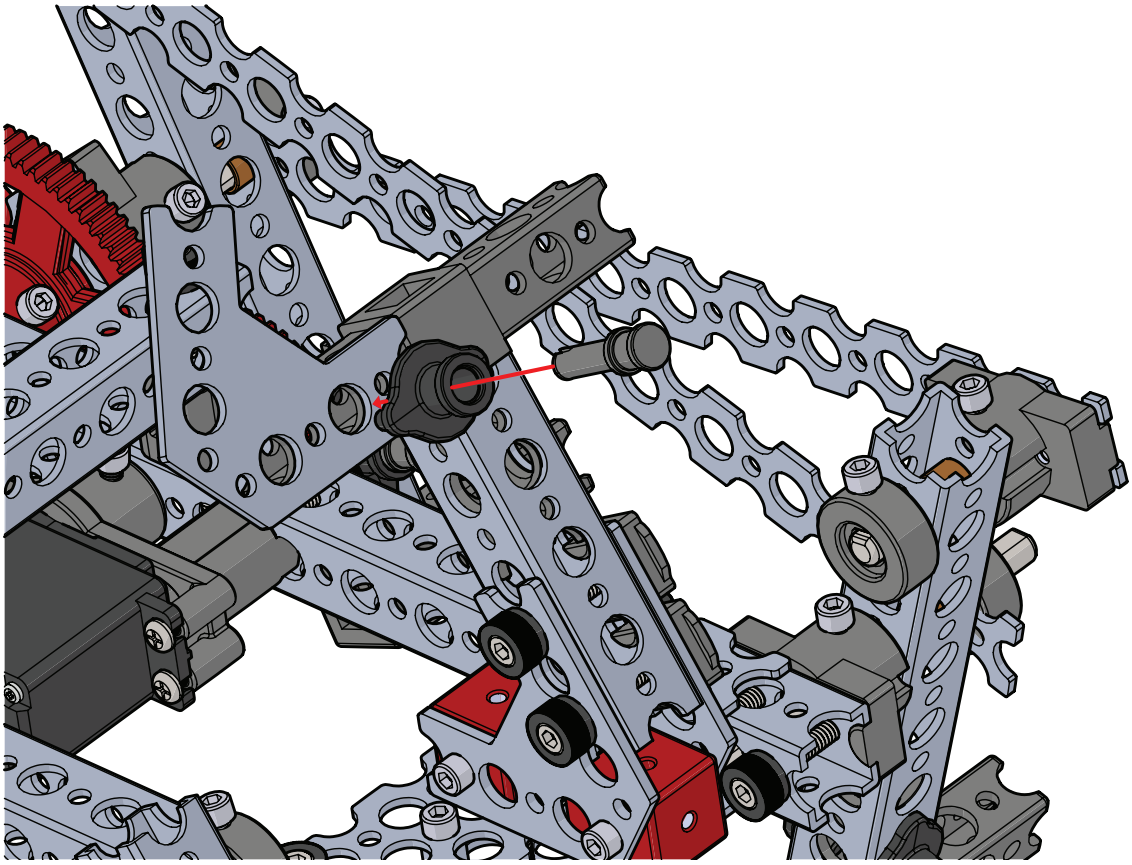
Step 6.8



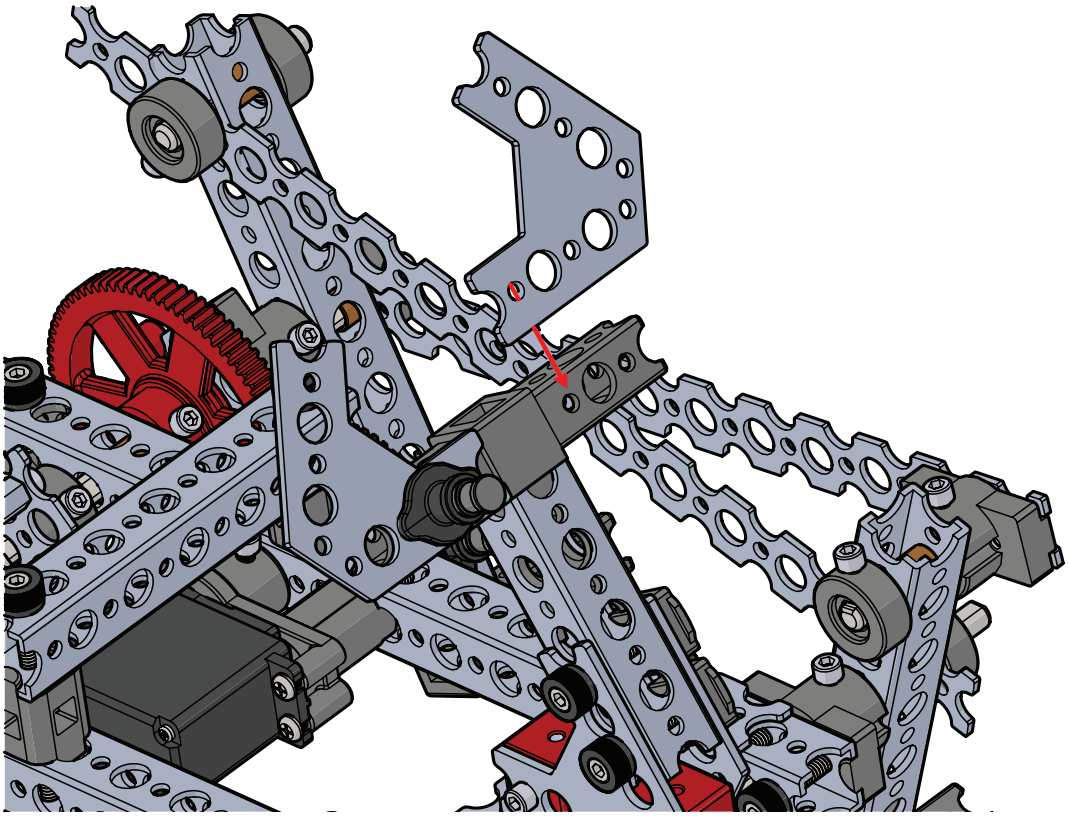
Step 6.9



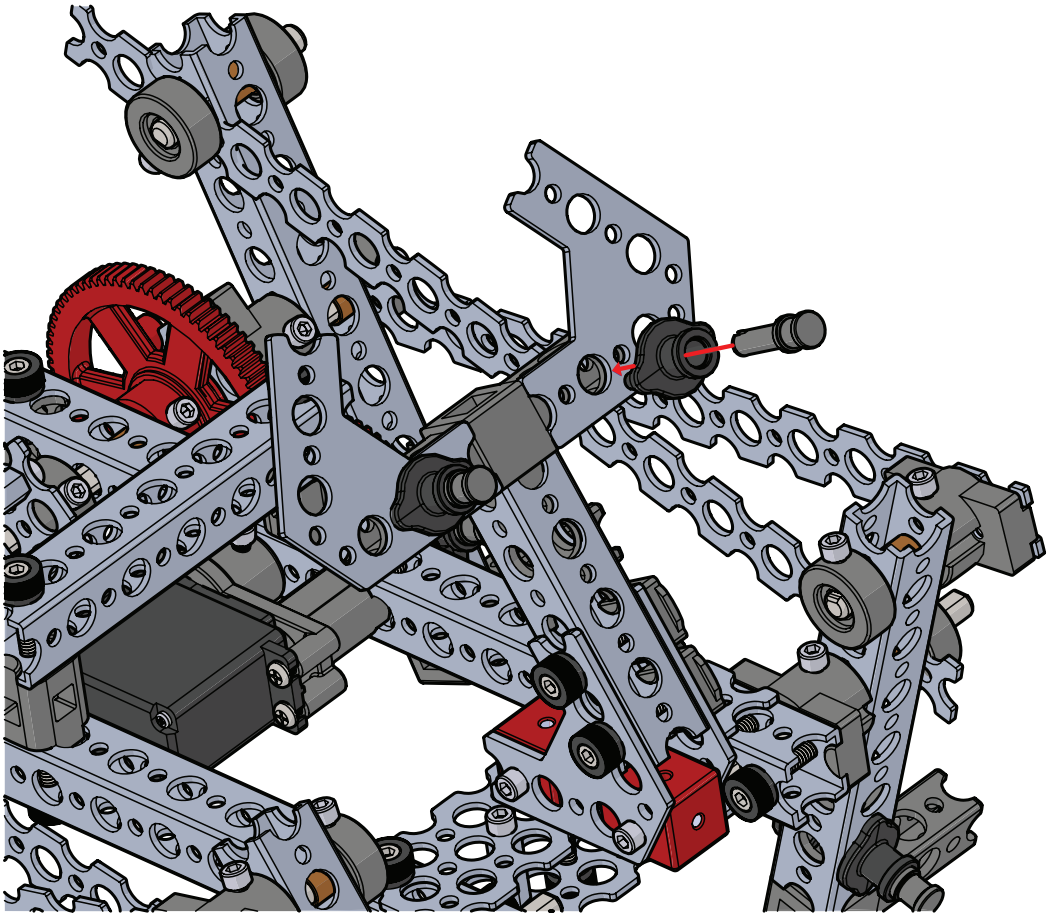
Step 6.10



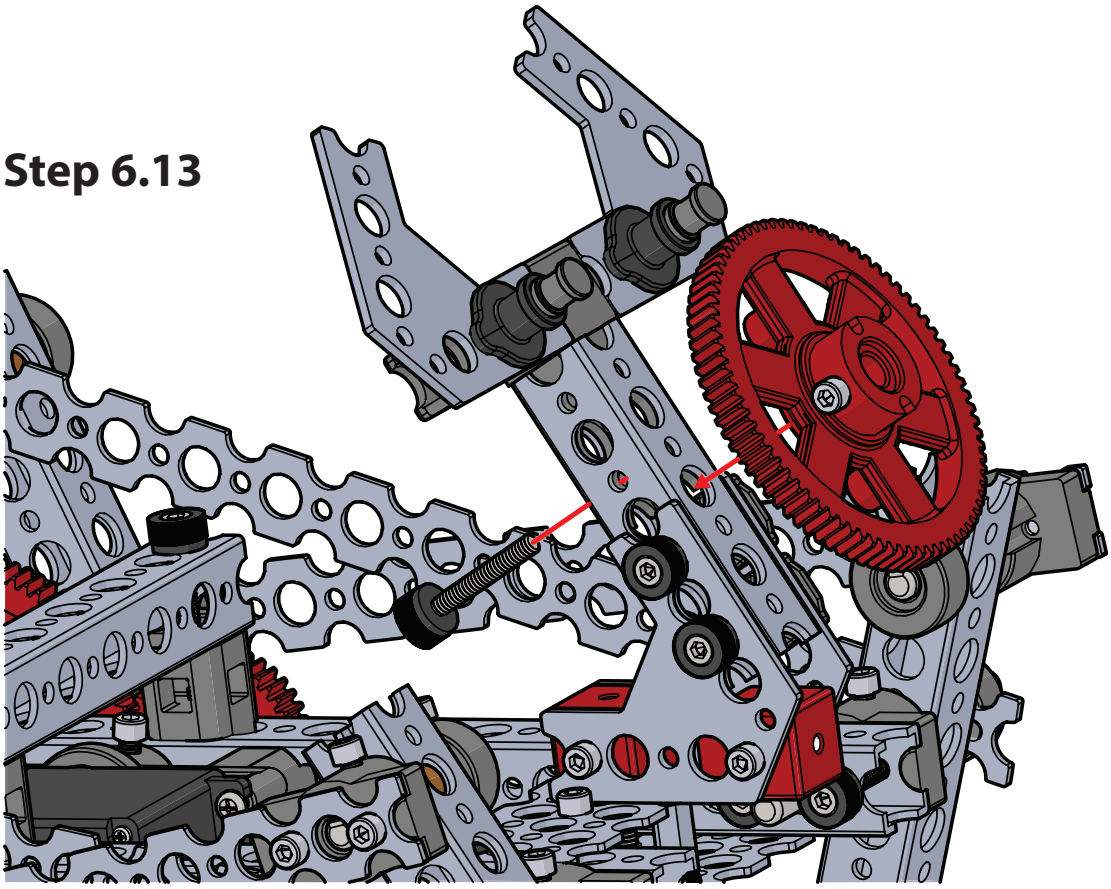
Step 6.11



Step 6.12

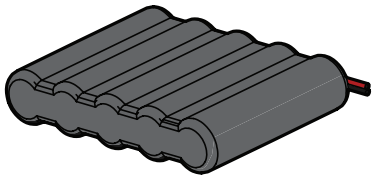


Step 6.13

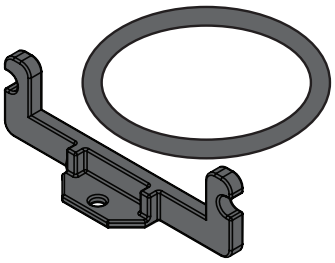


Step 7

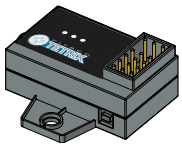
Parts Needed



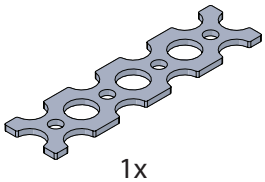
1x
6 V NiMH Battery Pack
40235



2x
Battery Mount Bracket
40236



1x
4-channel wireless receiver from Wireless Joystick Gamepad System 40239



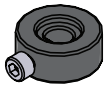
1x
4-Hole Flat Linkage
41244

1x
16 mm Ball Skid Point
41260

4x
Wing Nut 40221

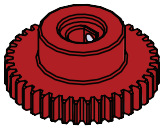
4x
Thumbscrew 40323

5x
6 mm Plastic Bushing Spacer 41665

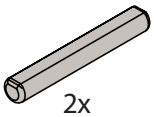


3x
D-Shaft Set Collar
40229

1x
Socket Head Cap Screw 40516



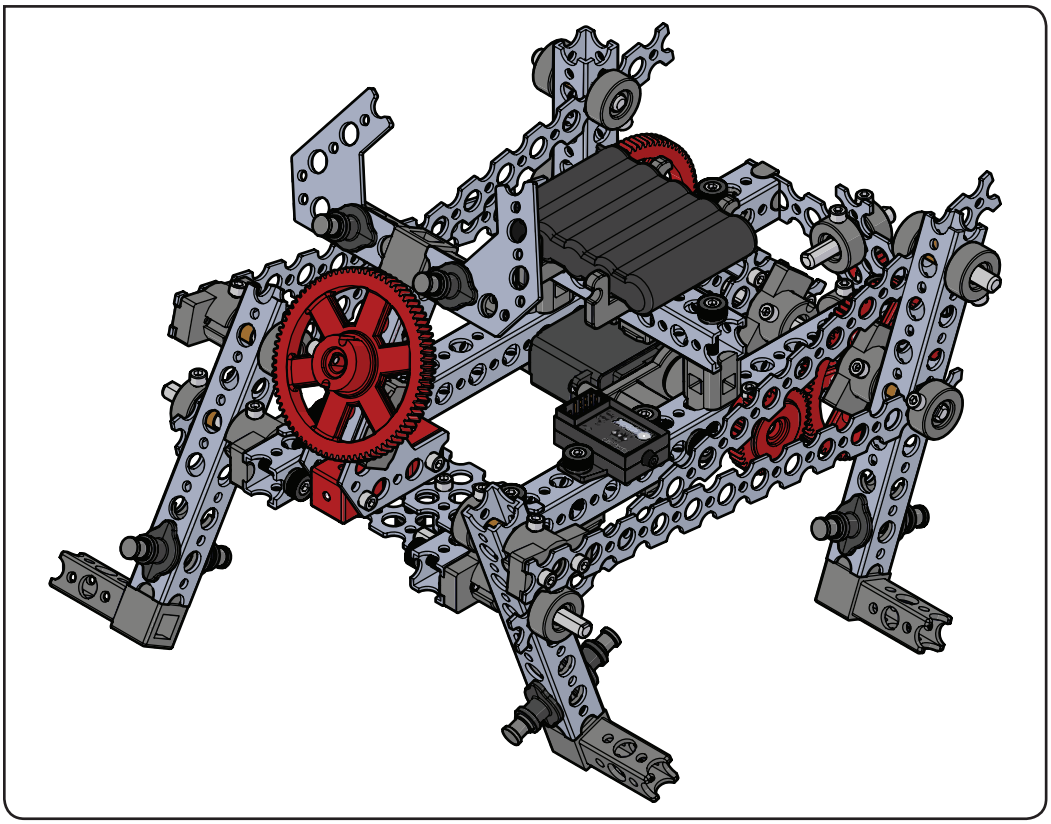
1x
40-Tooth Plastic Gear 40223



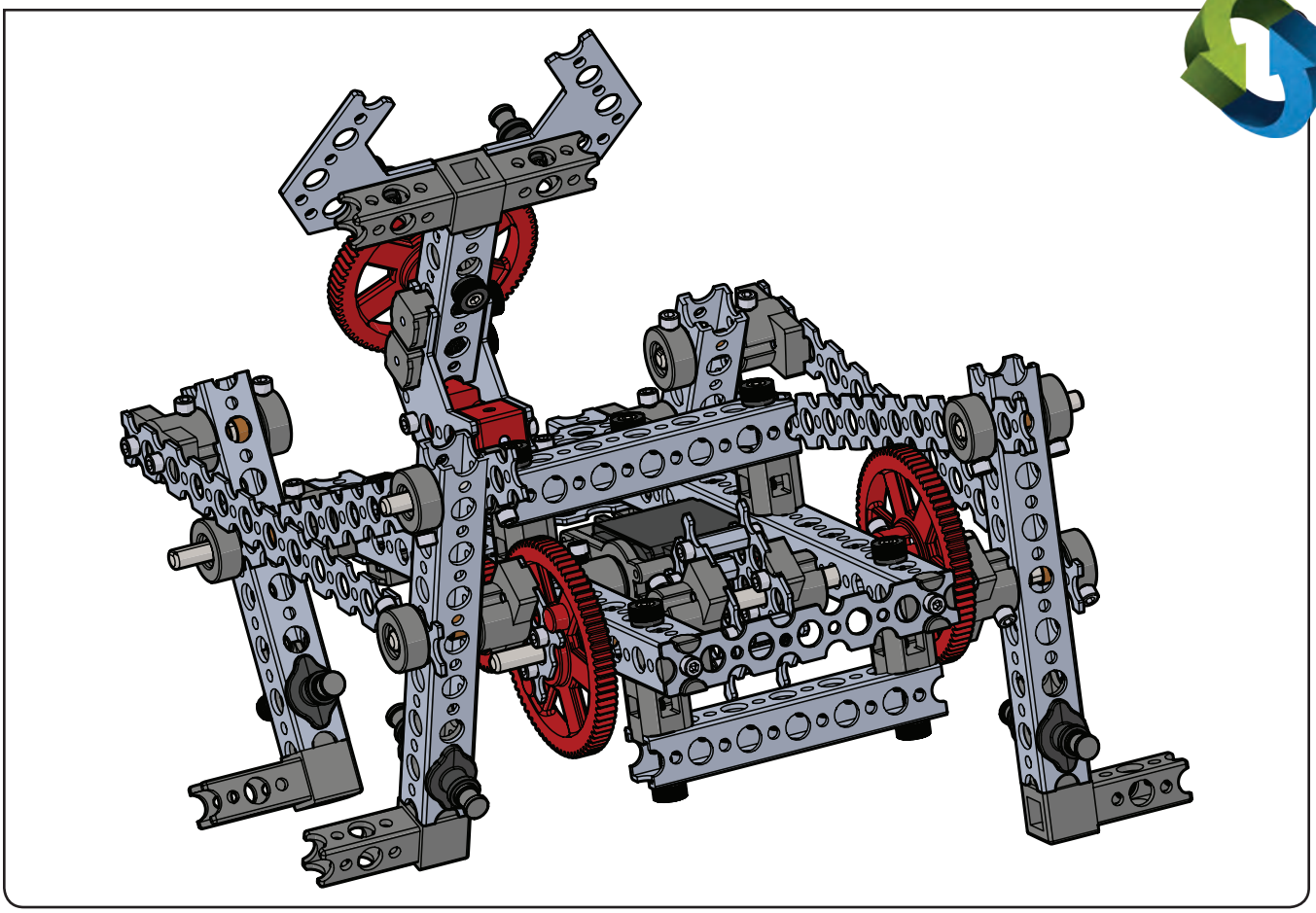
2x
40 mm Steel Axle
40226

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

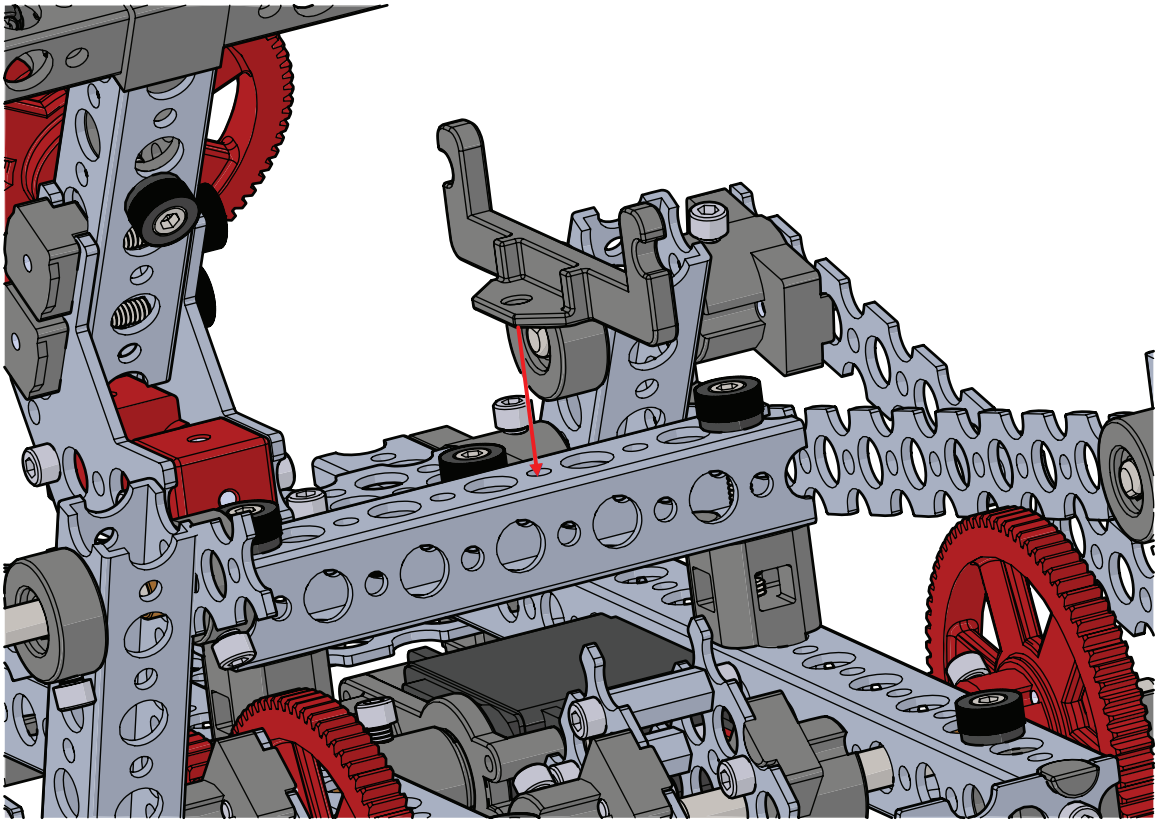
Finished assembly should look like this.



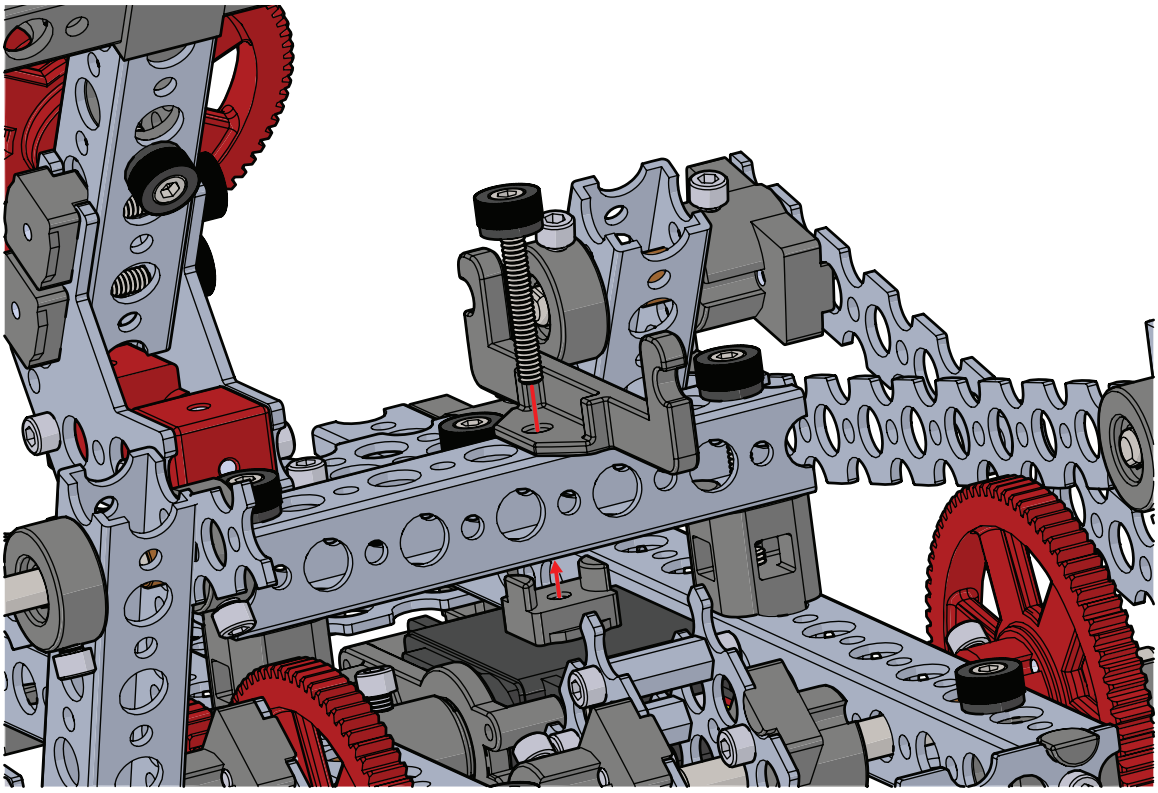
Rotate build to match this view.



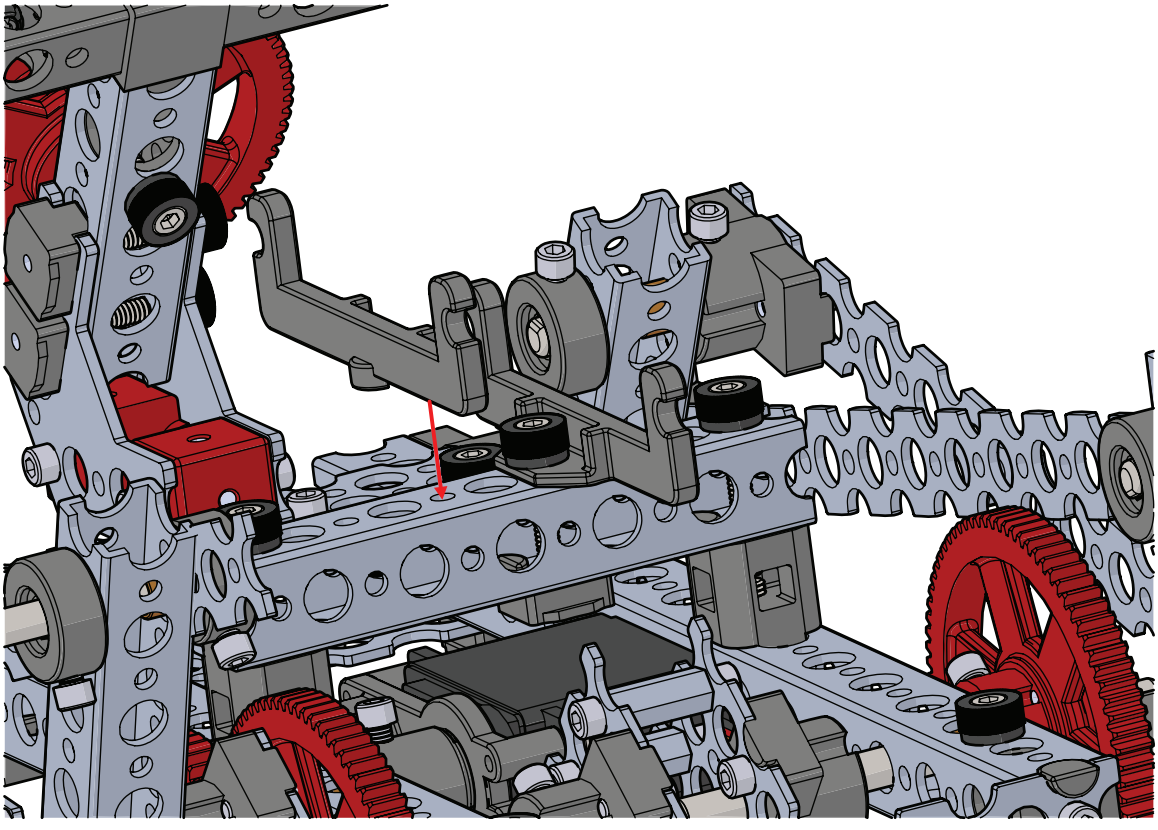
Step 7.0



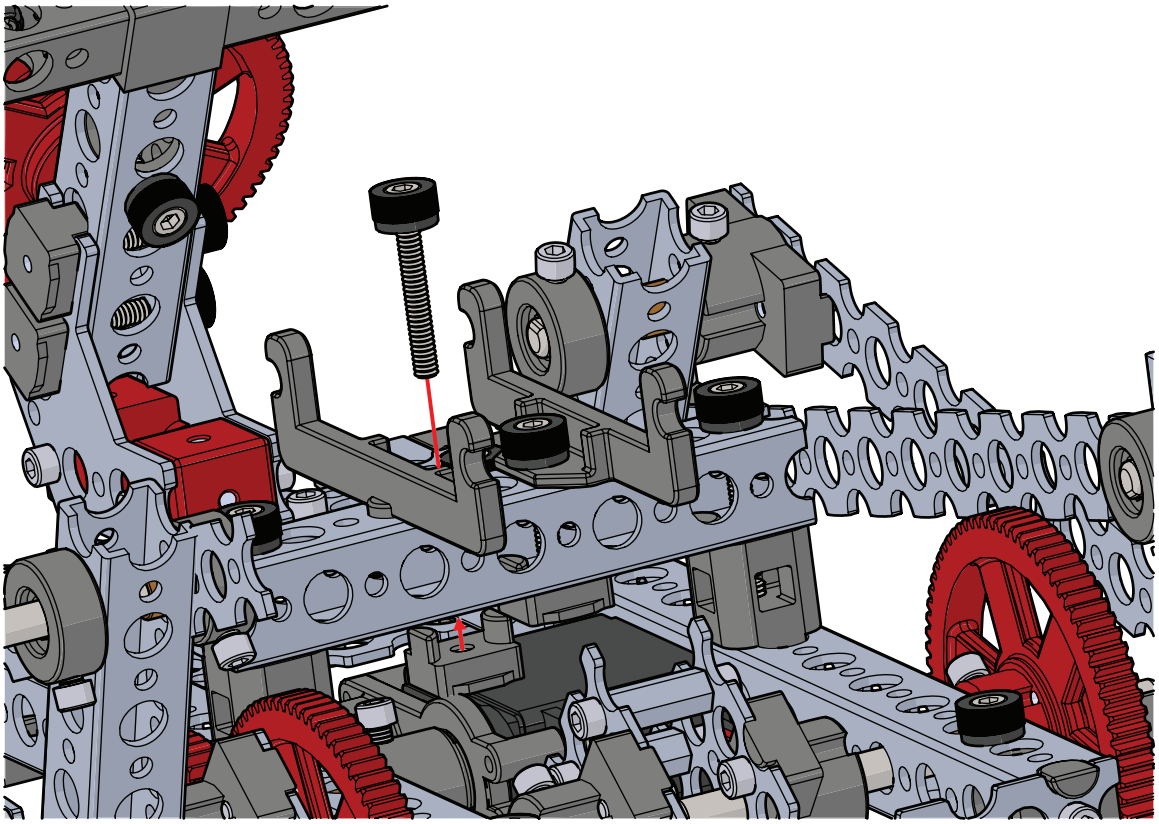
Step 7.1



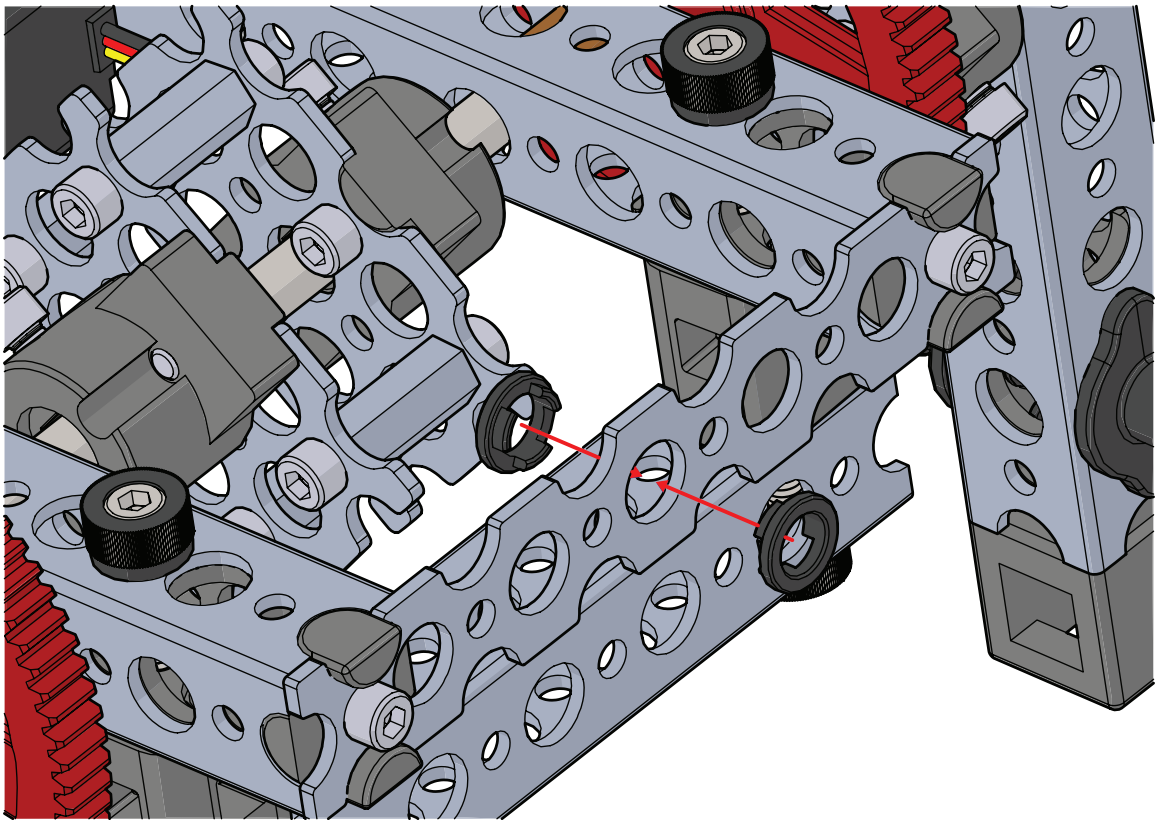
Step 7.2



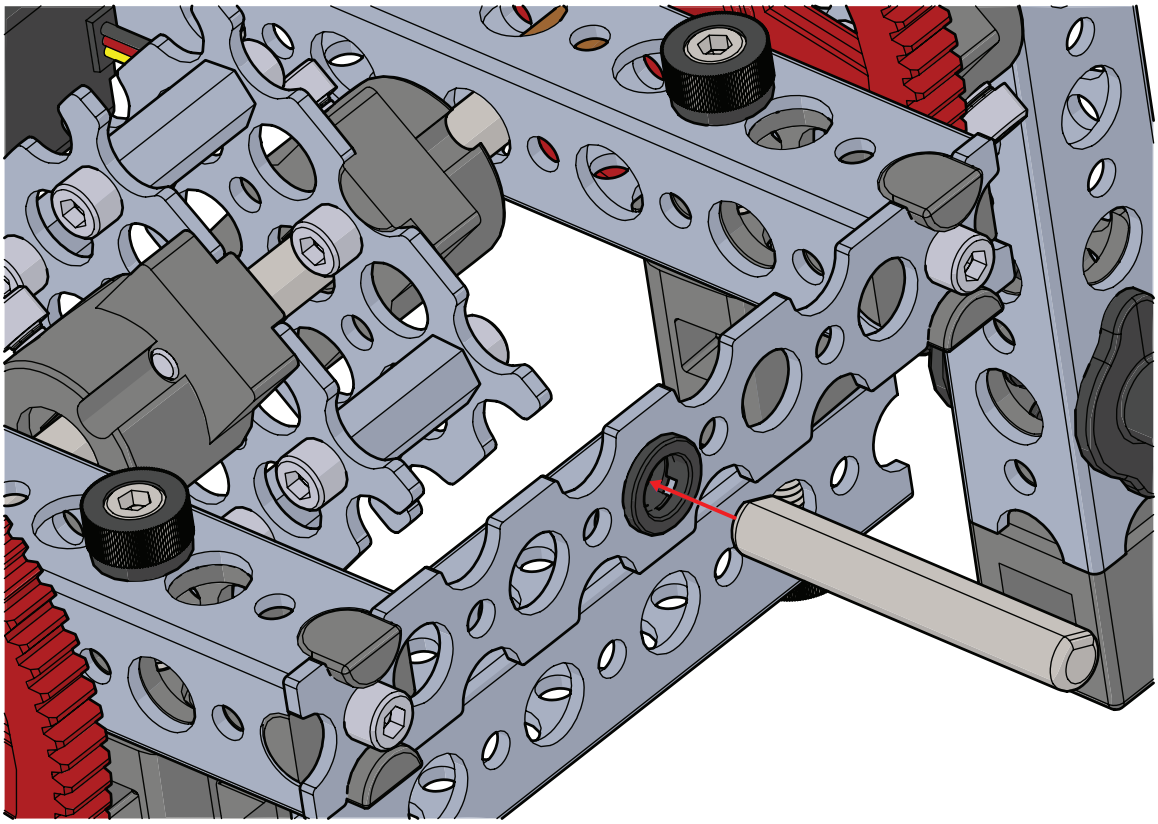
Step 7.3



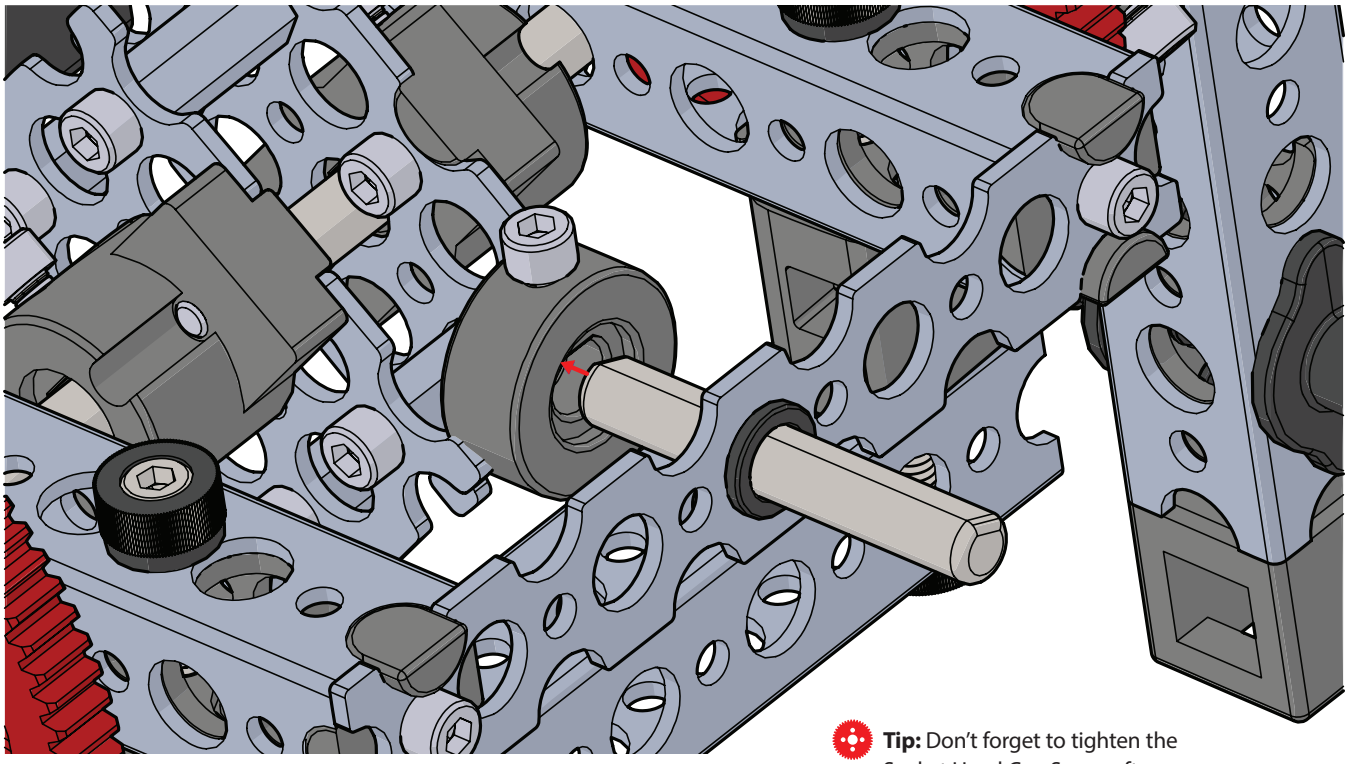
Step 7.4



Step 7.5

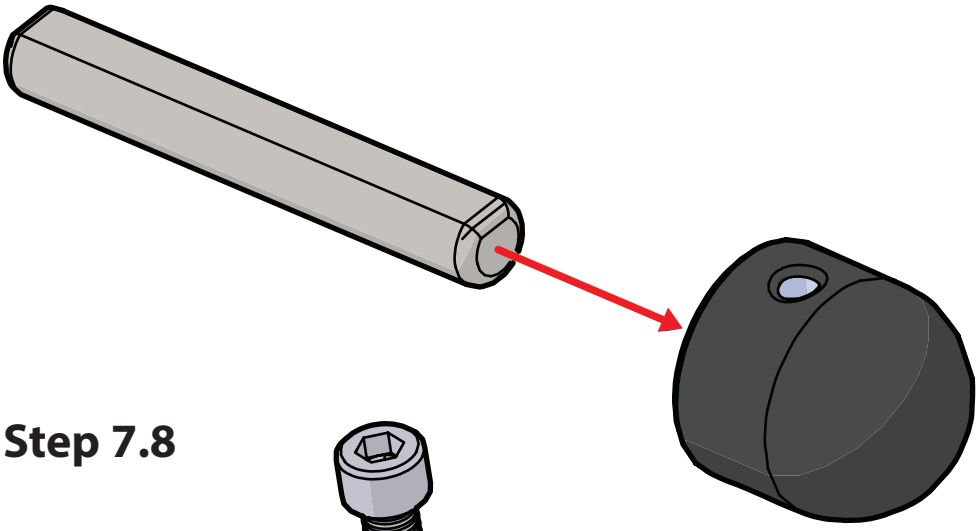


Step 7.6

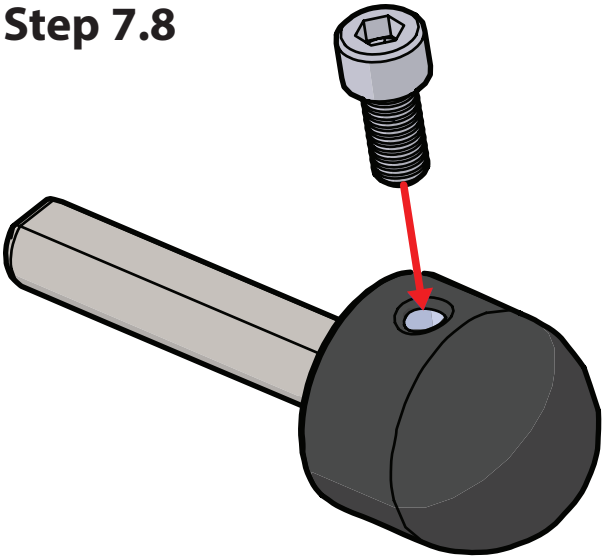


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

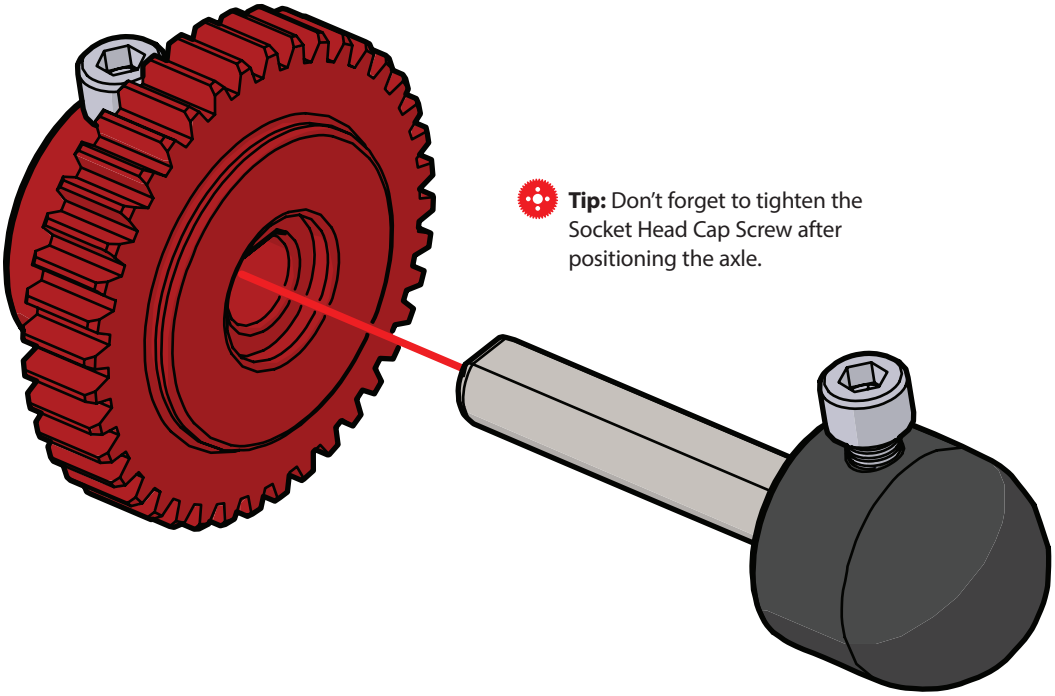
Step 7.7



Step 7.8

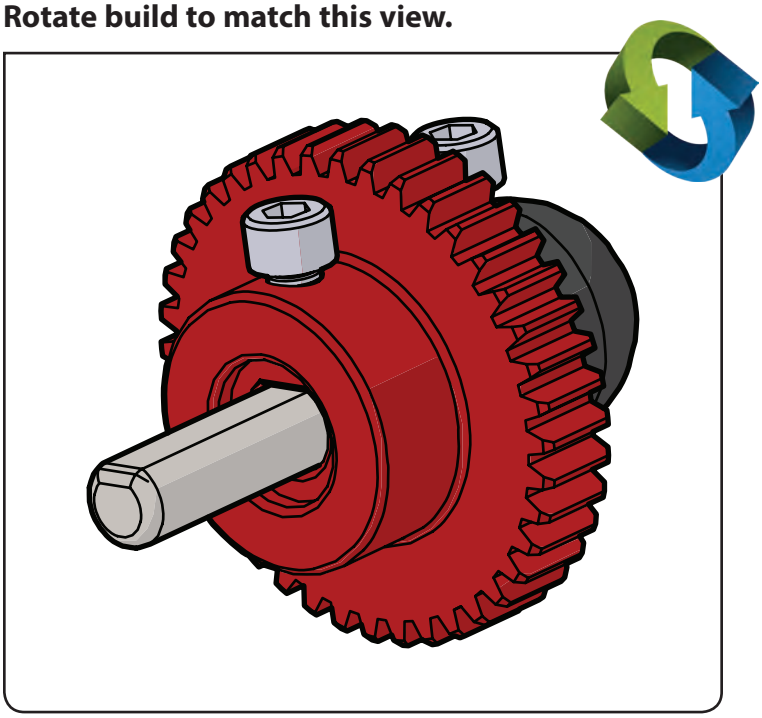


Step 7.9

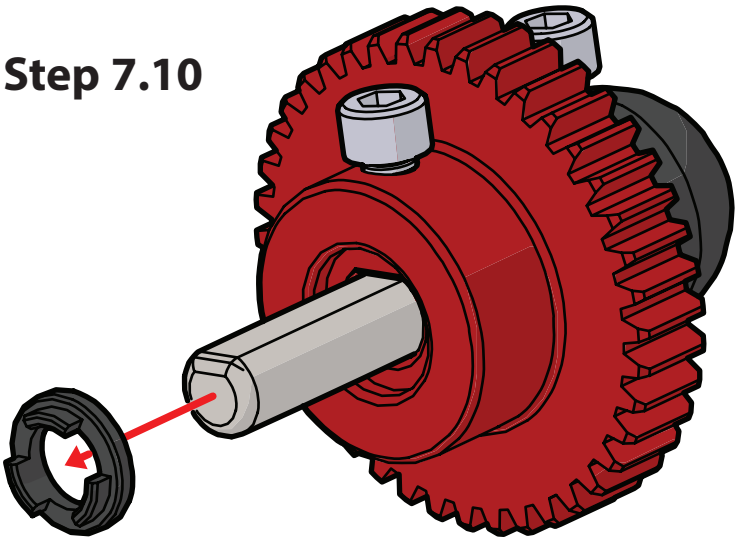


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

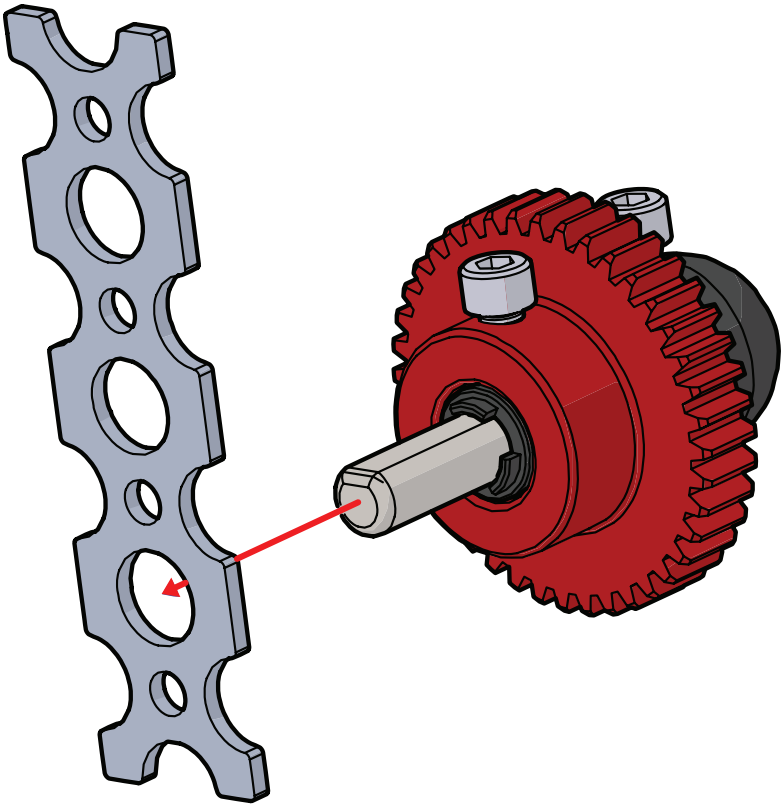
Rotate build to match this view.



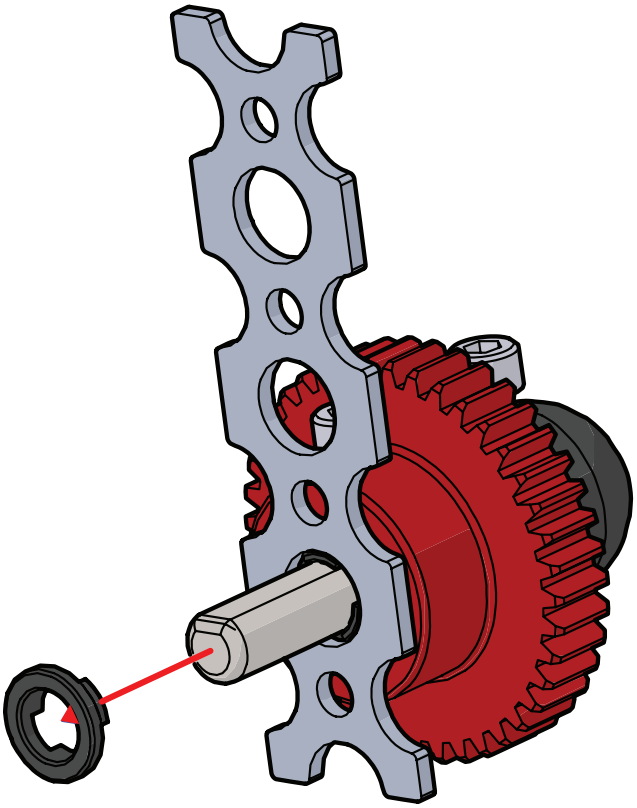
Step 7.10



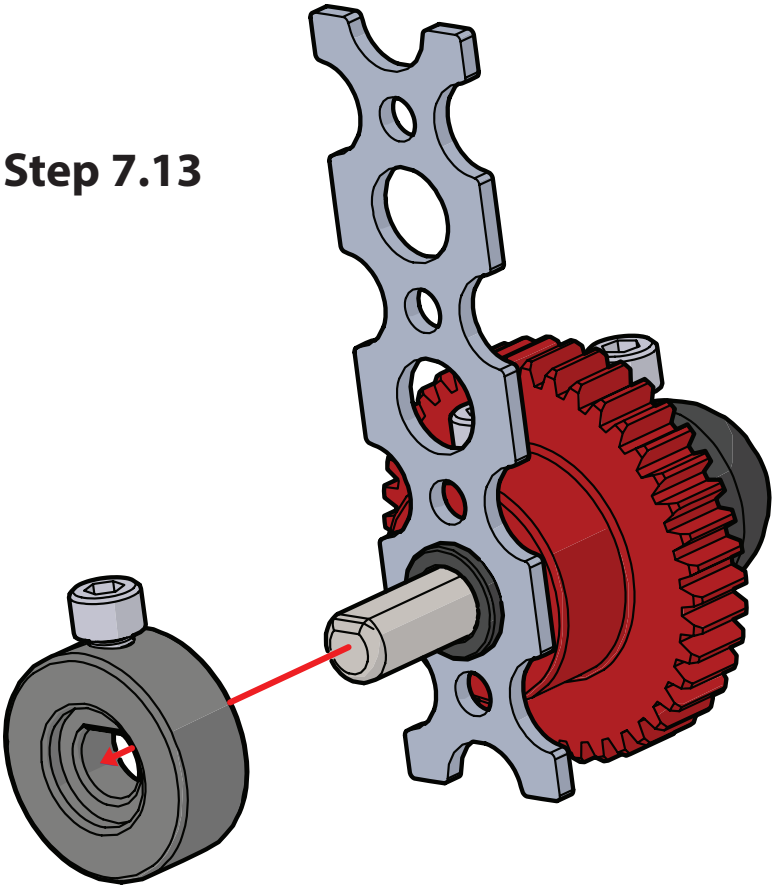
Step 7.11



Step 7.12

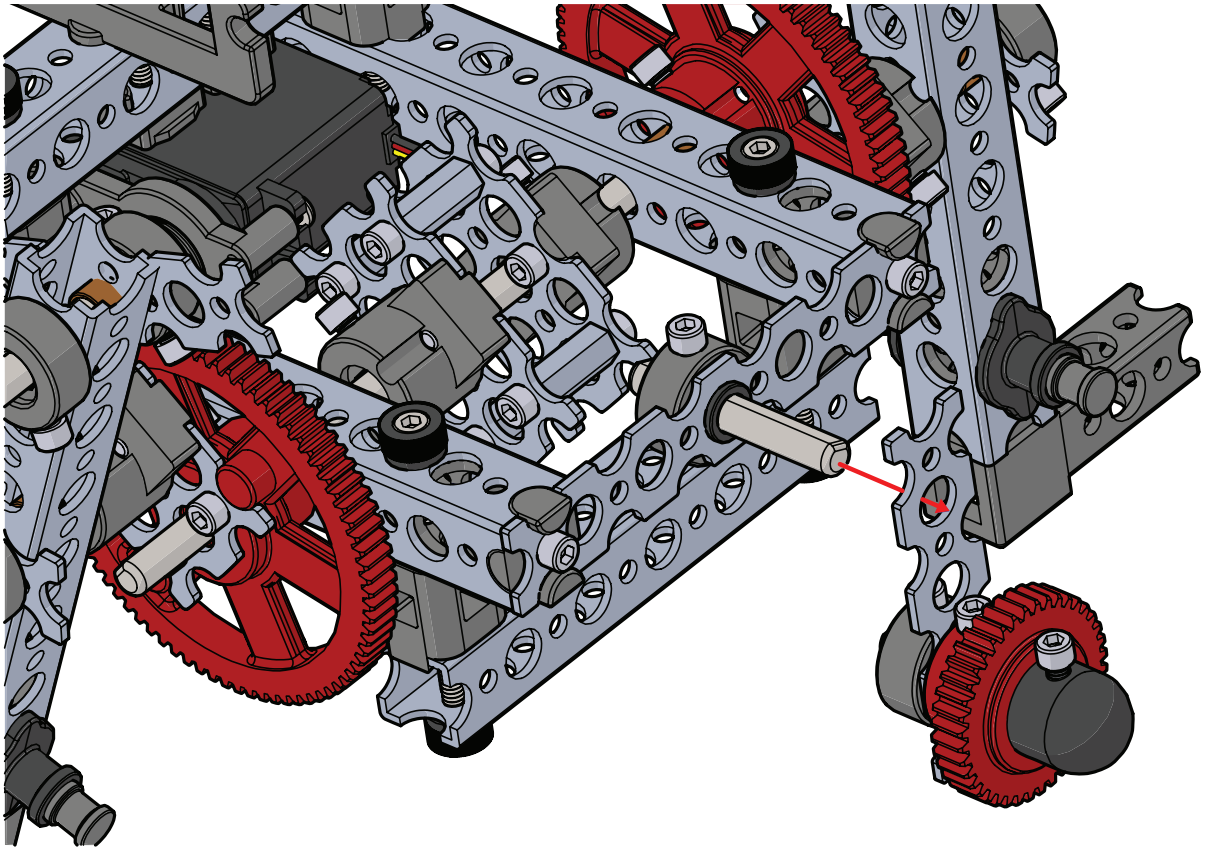


Step 7.13

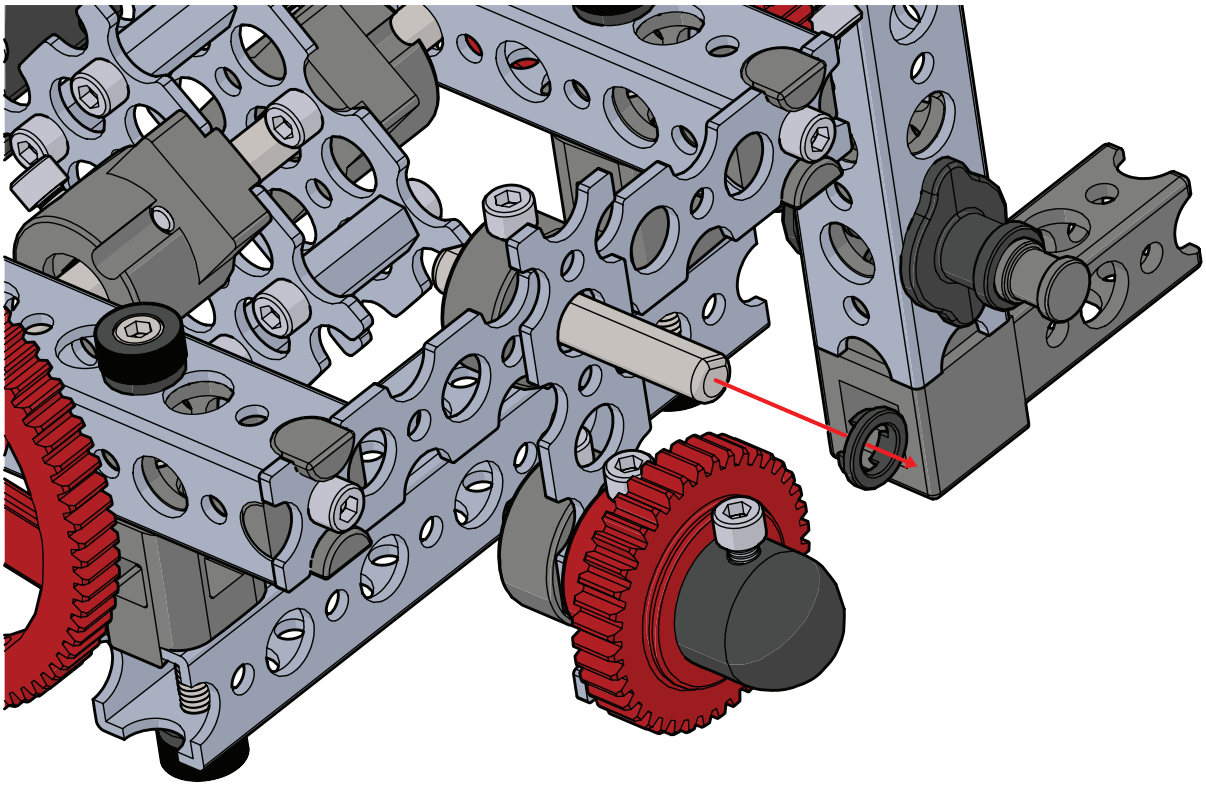


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

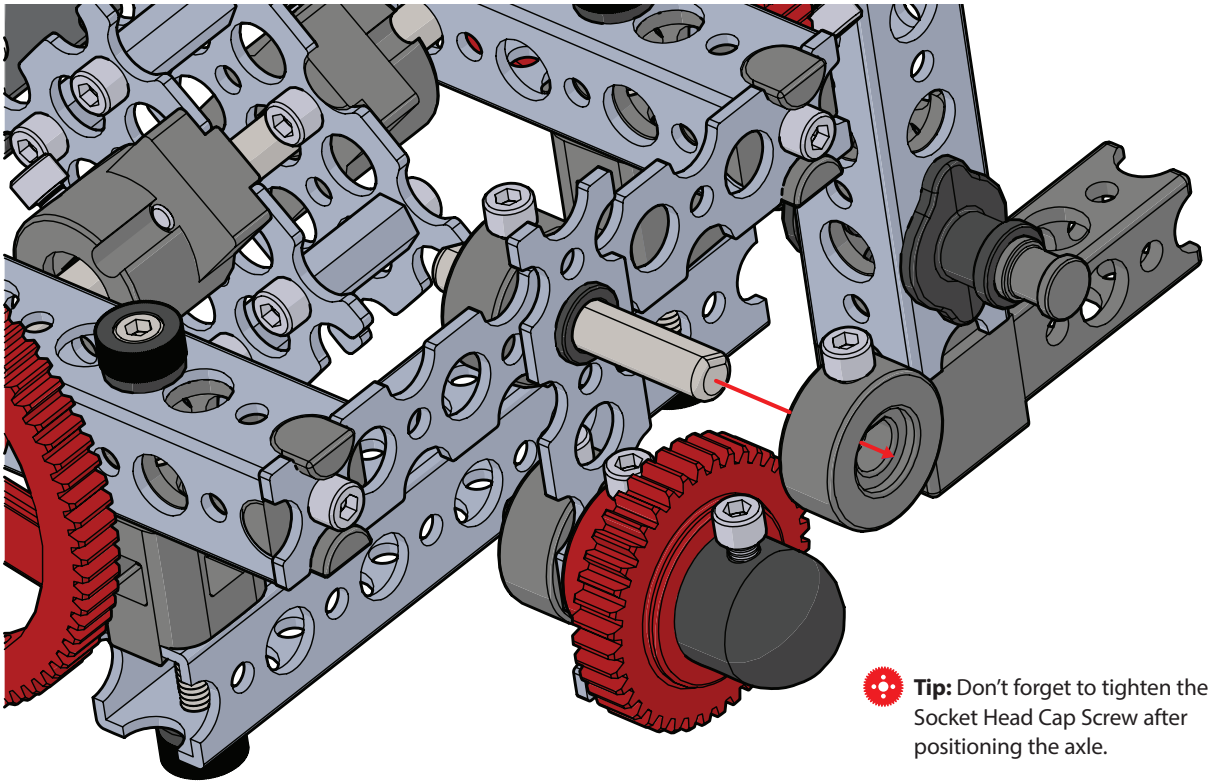
Step 7.14



Step 7.15

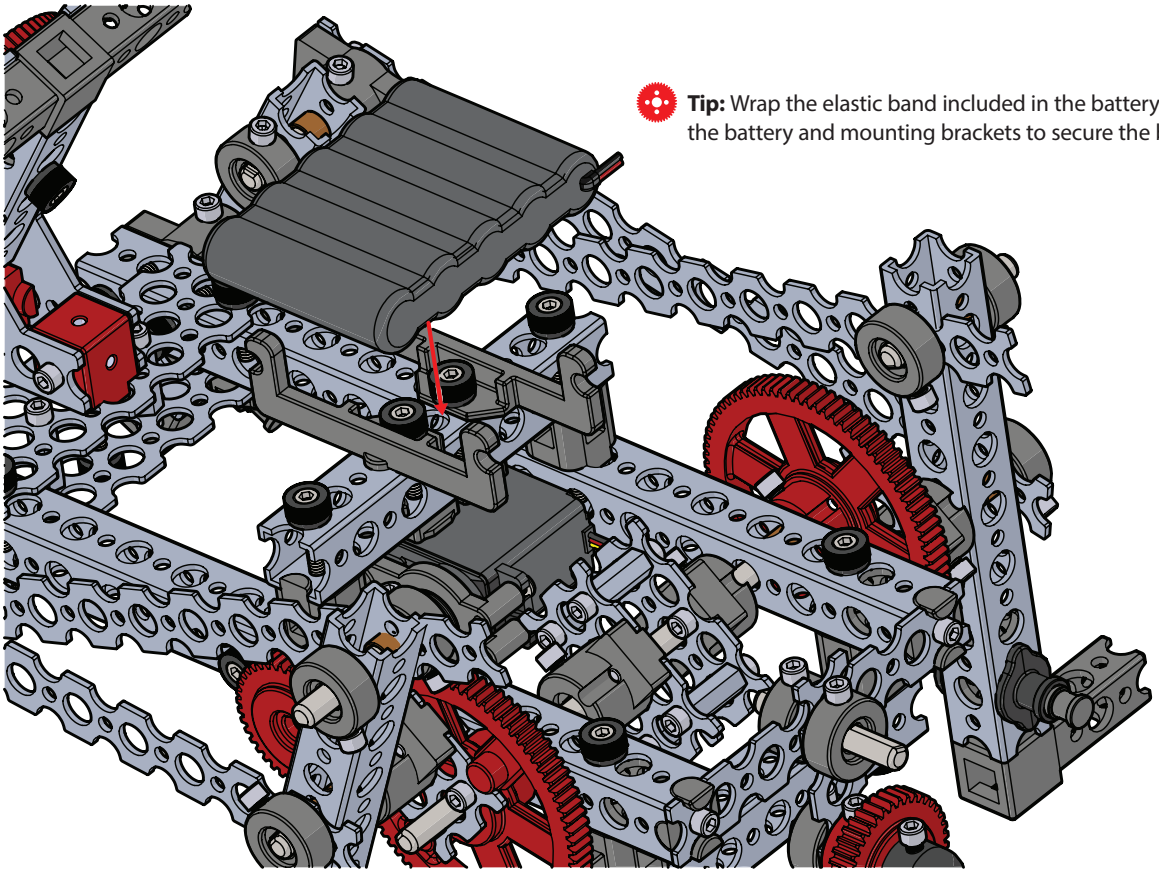


Step 7.16



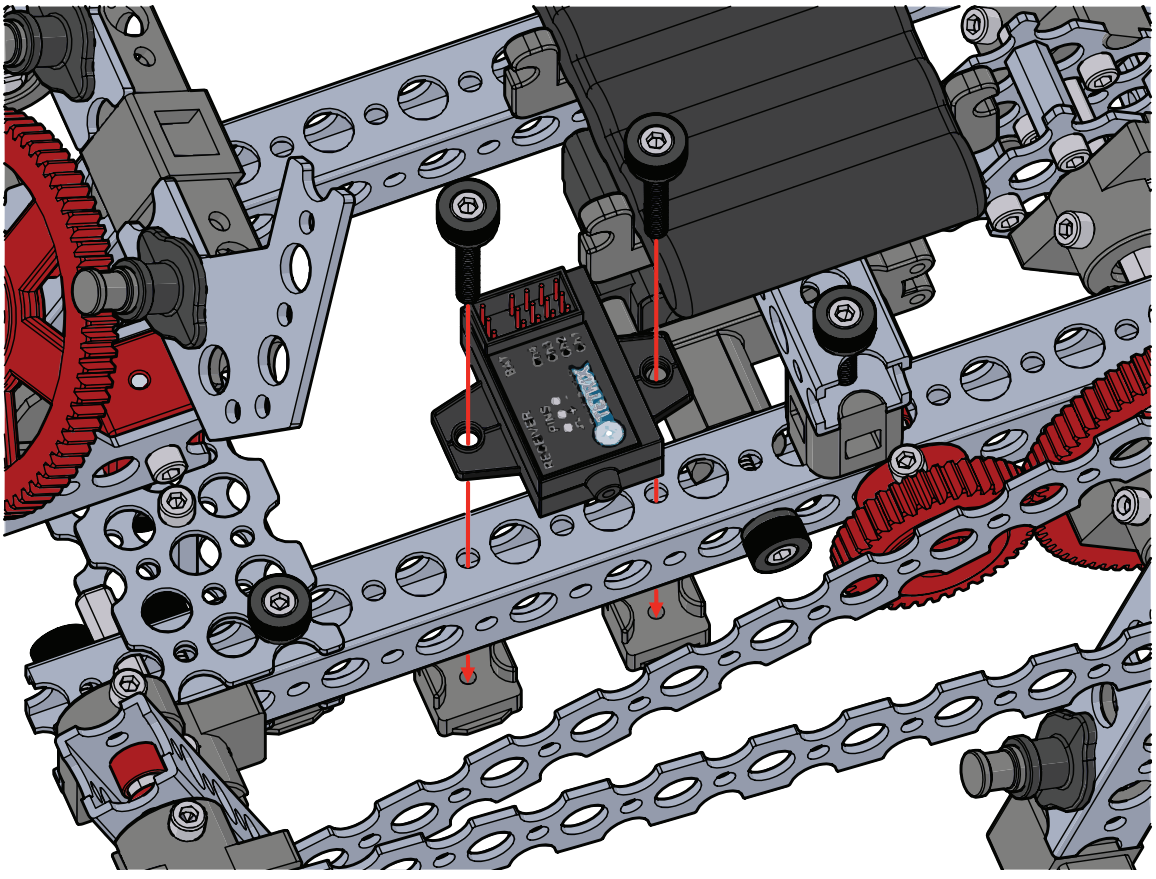
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 7.17



Tip: Wrap the elastic band included in the battery mount set around the battery and mounting brackets to secure the battery into place.

Step 7.18



TETRIX PRIME Expansion Walker Bot Activities

Final Connections:

After you've installed the battery with the Battery Mount Bracket, you are ready to connect the servo motors to the wireless receiver.

Connect the battery to the BAT connection on the receiver. Connect the CR servo to Channel 2 or 3 of the wireless receiver. Secure the wires so they do not become entangled in any moving parts. Turn on the Wireless Joystick Gamepad System and test the operation of the Walker Bot. Remember to keep fingers and wires away from all gears and levers while in motion. If the motion of the bot does not correspond to joystick input, either change channels for the servos or use the 4-in-1 Screwdriver to adjust the position of the DIP switches on the gamepad. If necessary, use the trimmer controls to adjust servo movement or position when the joysticks are in the neutral position.

Don't forget to reference page 16 for complete instructions on setting up the Wireless Joystick Gamepad System and configuring input to personal preferences.

Tip: Walking bots like this one perform better on smooth surfaces.

Sample Activities:

Construction is over. Now, it's time to operate the Walker Bot. Have some fun familiarizing yourself with how the Walker Bot performs.

- While the Walker Bot is a mobile robot with only one source of power, it doesn't have an obvious method of steering. Are there any changes you could engineer that would affect that? What would happen if you shortened the beams that make up one side of the robot? Would this affect the Walker Bot's ability to move in a straight line? With the permission of your instructor, modify your build to affect the direction the robot travels.
- The Walker Bot is a mobile robot, but unlike most wheeled bots, not all the contact points (legs) are touching the surface at the same time. As a result, the entire robot is very connected to the motion of the legs. The entire body of the robot moves up and down and back and forth, resulting in a constantly shifting center of gravity. How do biological organisms handle this type of walking motion? Do they shift weight as a counterbalance or put more legs on the ground at a time? With the permission of your instructor, research biological methods of locomotion and see if any of the methods biological organisms employ would apply to your robot. As an open-ended building challenge, can you build a more stable walking mechanism with a smoother motion or better balance?

Don't forget to document your efforts, and remember the engineering design process.

TETRIX PRIME Expansion Crane Bot Assembly

Overview:

The TETRIX PRIME Expansion Crane Bot moves the focus from the expansion elements to new and potentially unorthodox ways to use the starter elements in combination with the expansion elements. This model is a good example of applied simple machine principles in a complex machine that moves but not like the typical mobile robot build. Connections to real-life machines should be immediate and obvious. Properly using gearing and understanding the potential mechanical advantage of levers with the expansion elements are part of the expected outcomes from this build.

How It Works:

The TETRIX PRIME Expansion Crane Bot shows the contrast of the traditional to the nontraditional way of mounting the servos while still correctly engaging in a geared application of power. One servo supplies rotational motion to the whole machine while the other provides power for the lifting mechanism. The new Flat Building Plates, as well as the new Anchor Blocks, show versatility for new ways to mount and connect elements. The Flat Linkages are shown in combinations, highlighting the ability to use them as structural elements in addition to linkages managing applied forces and movement.

Getting Started:

- Refer to pages 164-254 for instructions on how to build the complete Crane Bot.
- See page 255 for suggested sample activities.

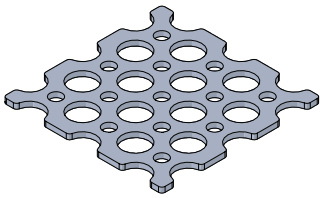
Time Expectations:

90-120 minutes

Note: Many factors can affect building time, including set organization and whether builders use a partner. The above time is an estimate only and based on a single builder of average experience who is comfortable with the product and has access to well-organized sets. Actual time might vary.

Step 1

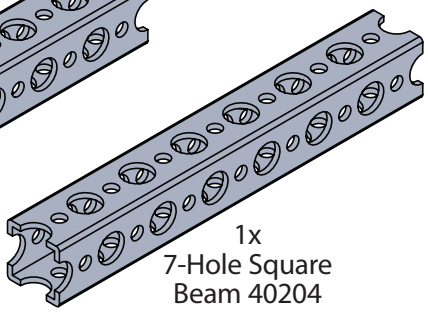
Parts Needed



1x
3 x 3 Hole Plate 41257

1x
15-Hole Square
Beam 40207

1x
8-Hole Square
Beam 40205

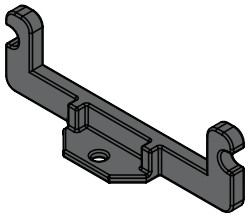


1x
7-Hole Square
Beam 40204

4x
90-Degree Beam
Bracket 40208

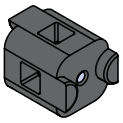
10x
Thumbscrew
40323

8x
Socket Head Cap
Screw 40516

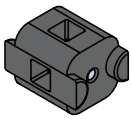


2x
Battery Mount Bracket
40236

6x
Wing Nut 40221



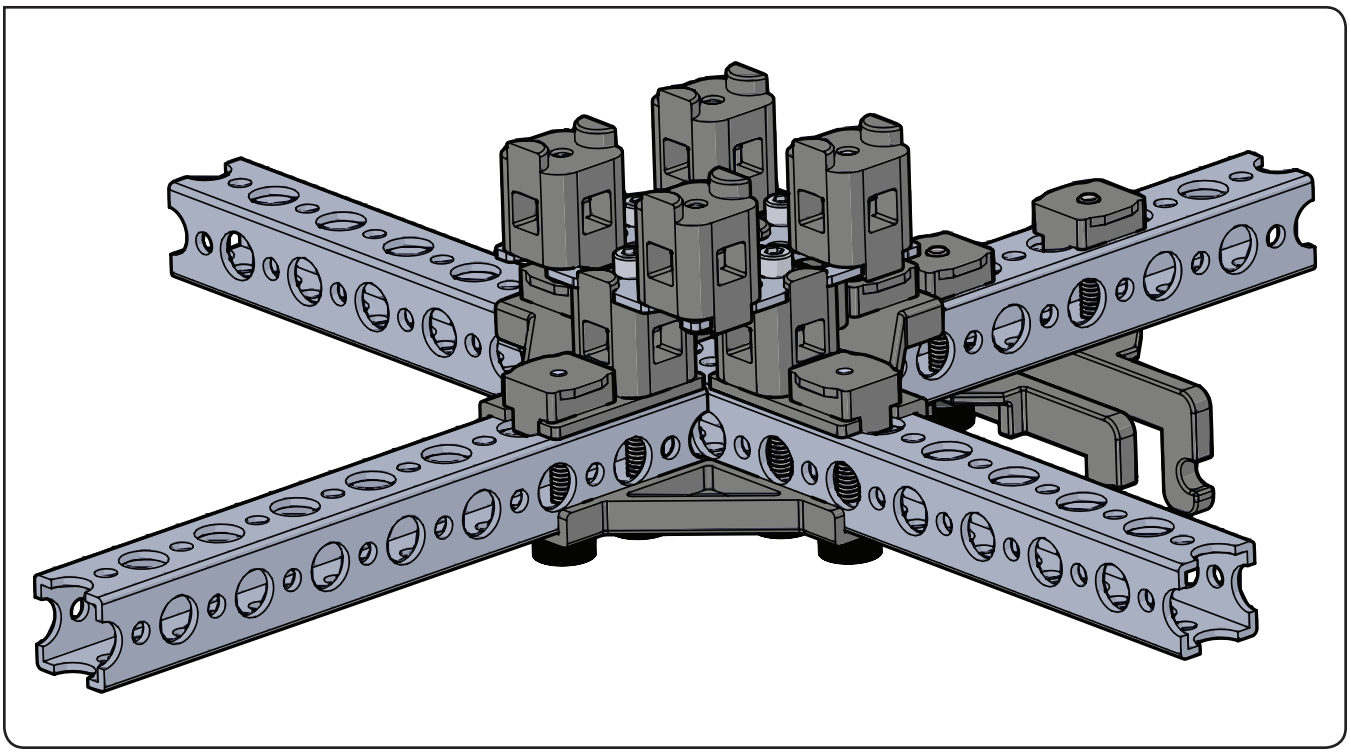
4x
90-Degree Cross Block
Connector 40217



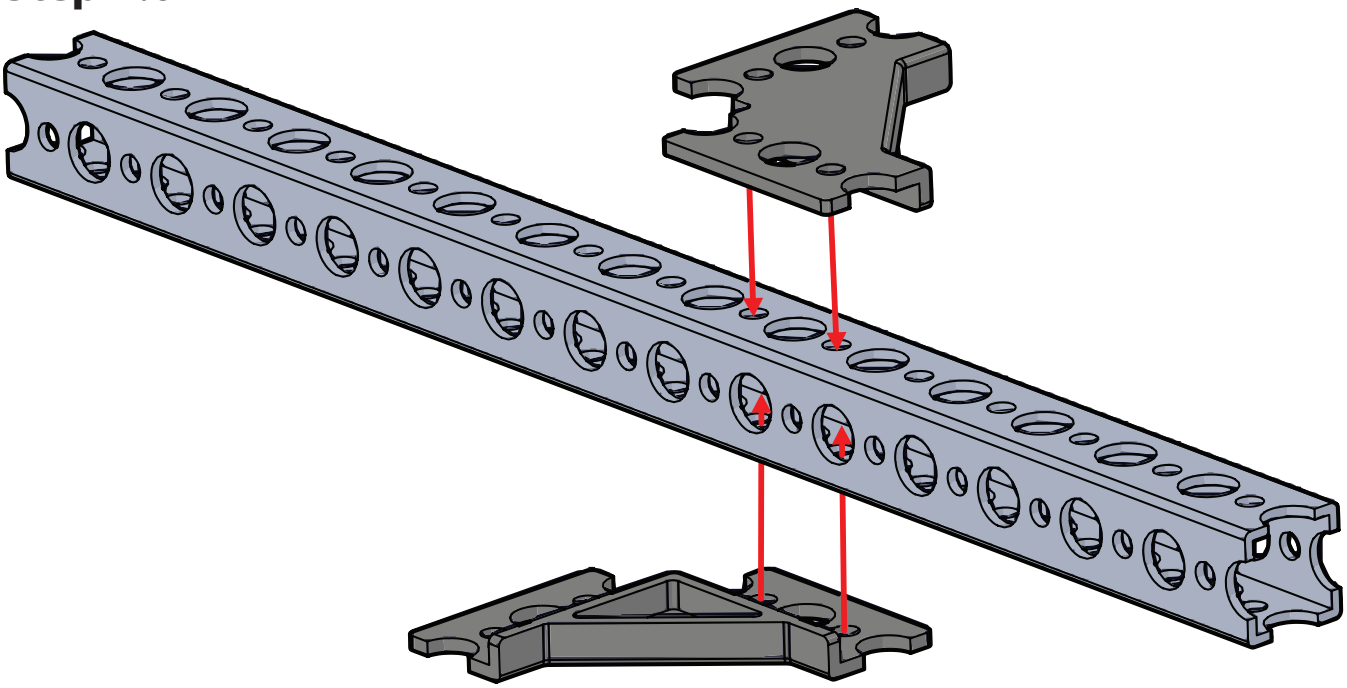
4x
Straight Block Beam
Connector 40216

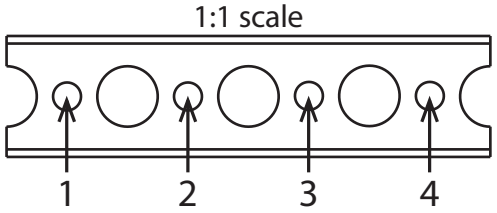
Tip: These two parts, the 90-Degree Cross Block Connector and the Straight Block Beam Connector, are very close in appearance and can be easily confused. Please double-check that you are using the one the directions call for.

Partial assembly should look like this.



Step 1.0



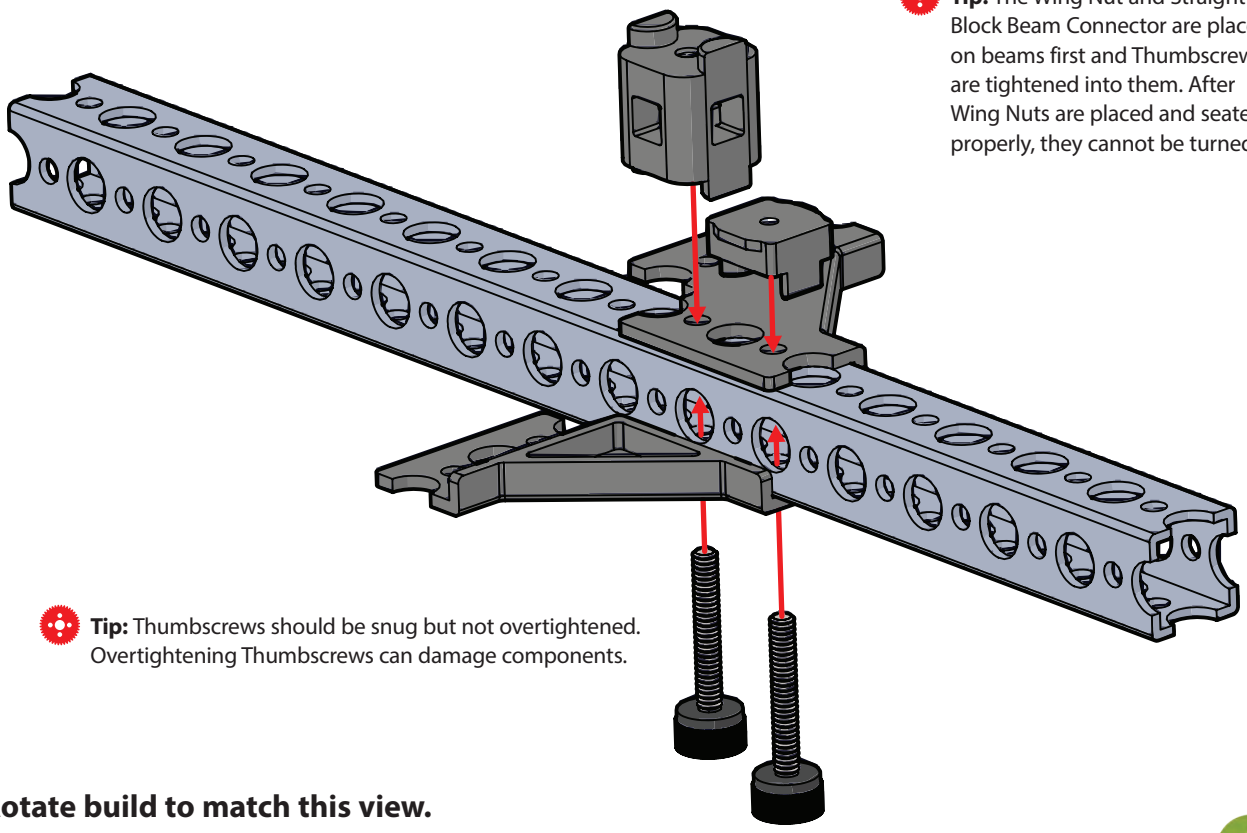


To identify TETRIX PRIME beams, count the small holes.
The example above is a 4-Hole Square Beam.

Tip: Remember, beams are identified by small holes, not large.

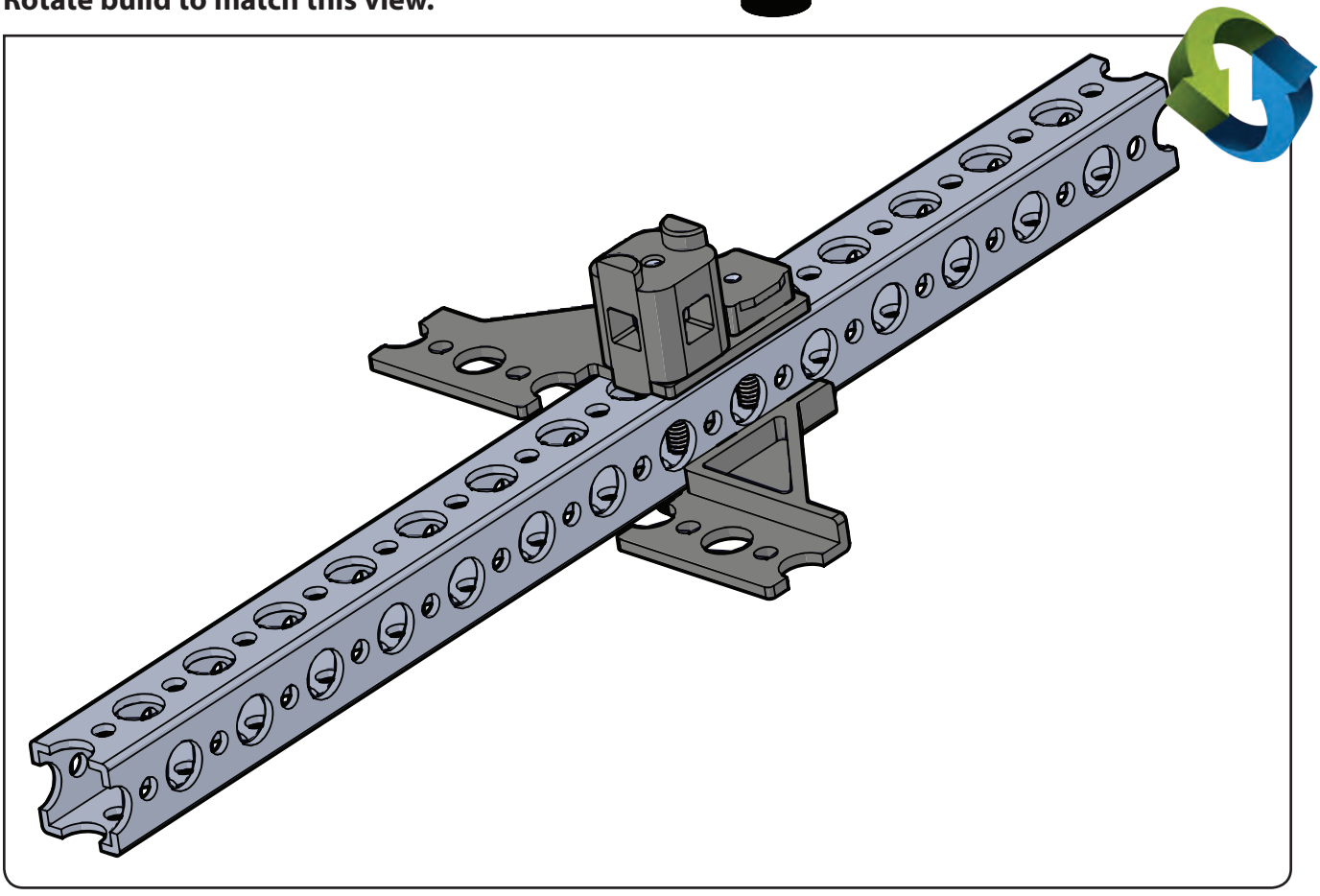
Step 1.1

Tip: The Wing Nut and Straight Block Beam Connector are placed on beams first and Thumbscrews are tightened into them. After Wing Nuts are placed and seated properly, they cannot be turned.

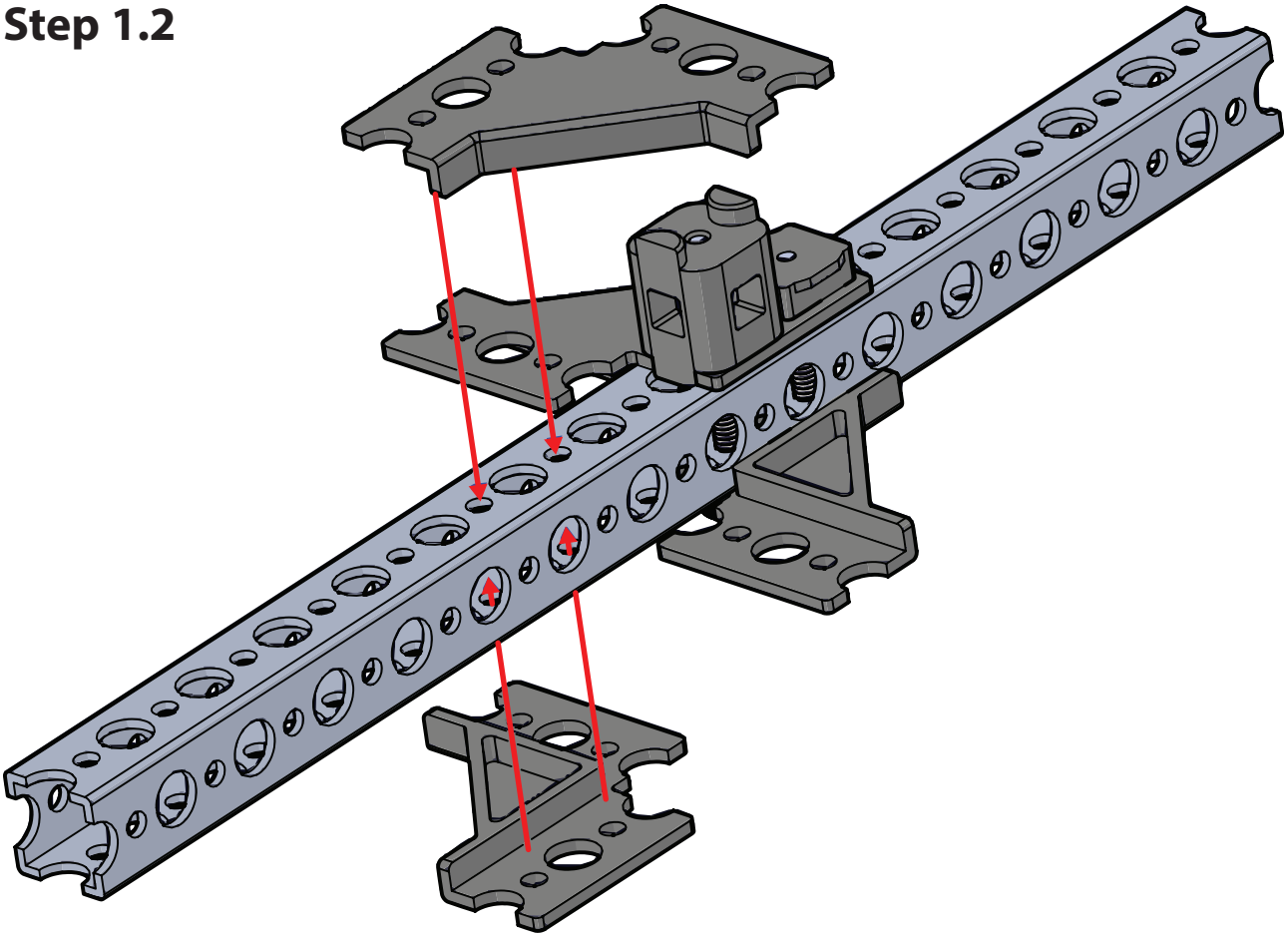


Tip: Thumbscrews should be snug but not overtightened. Overtightening Thumbscrews can damage components.

Rotate build to match this view.



Step 1.2



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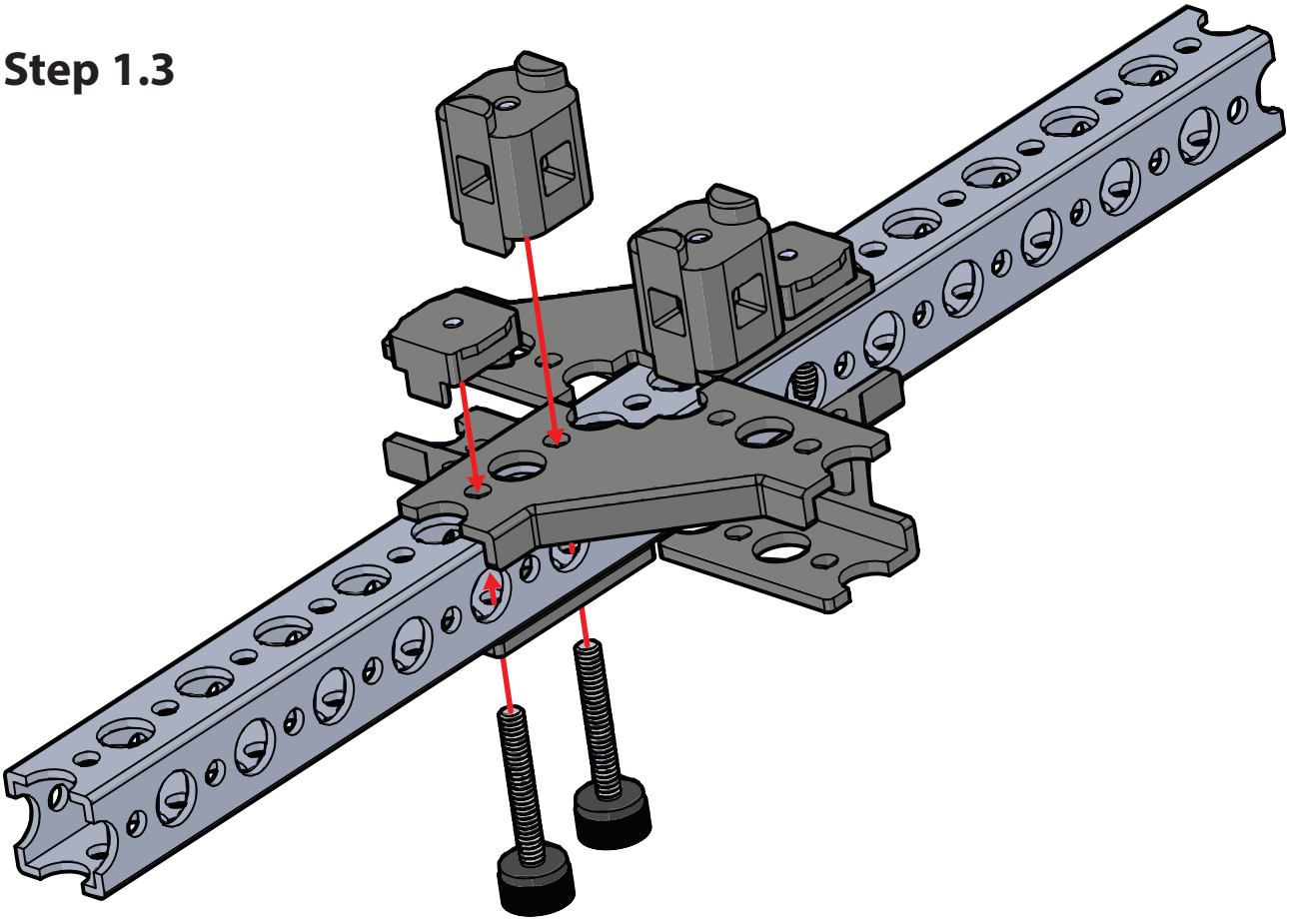
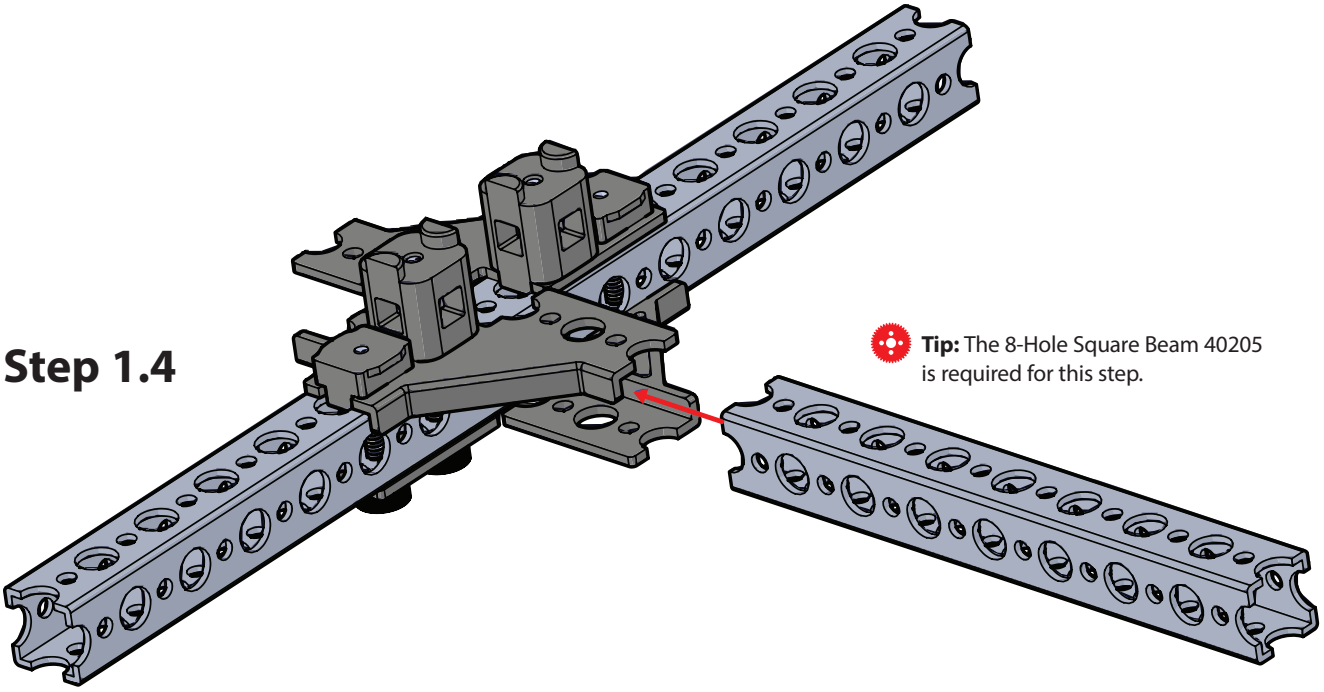
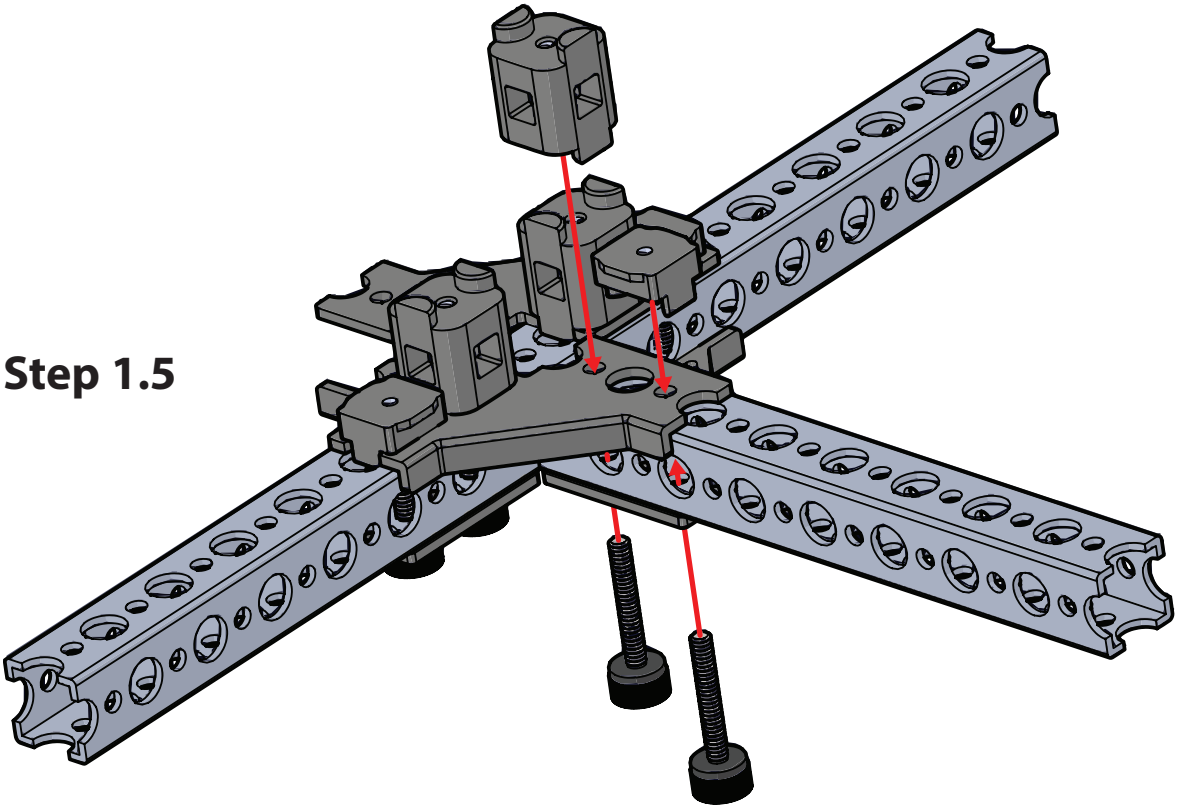


Step 1.4

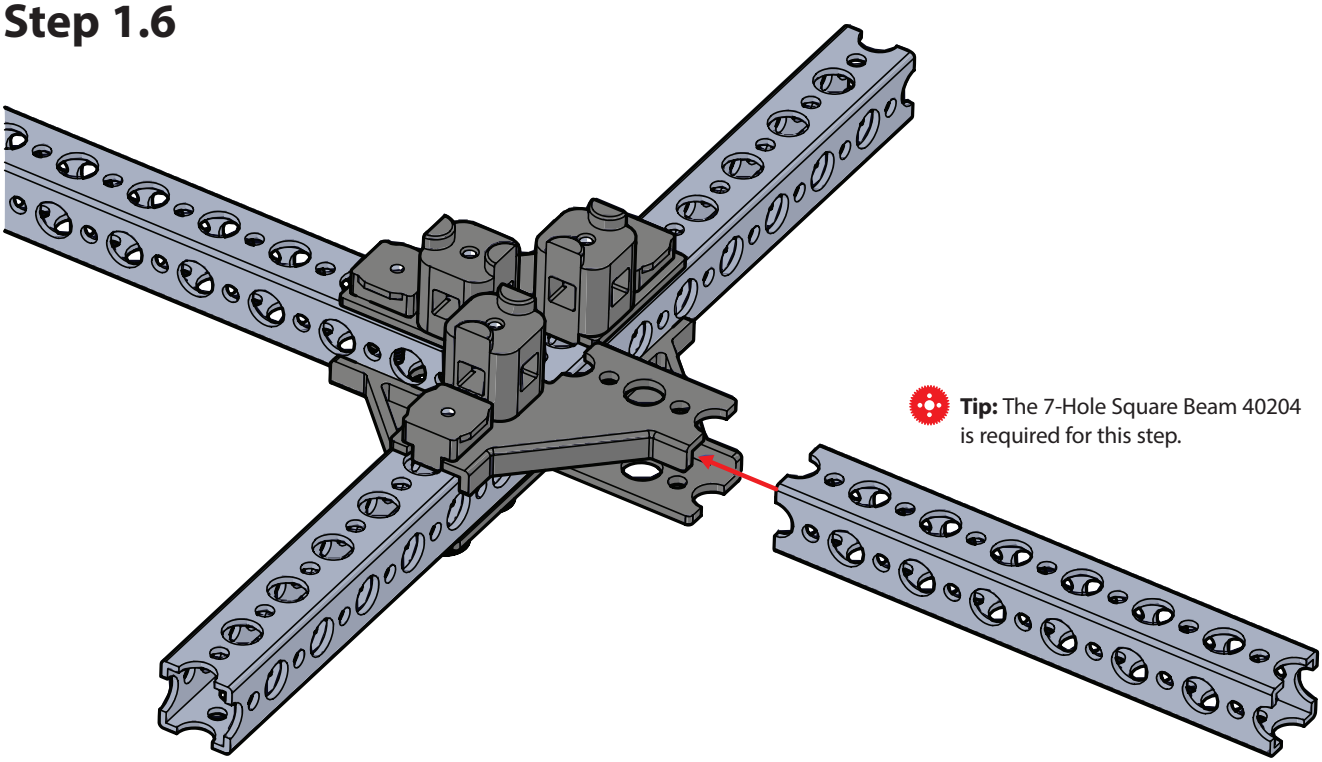


Tip: The 8-Hole Square Beam 40205 is required for this step.

Step 1.5

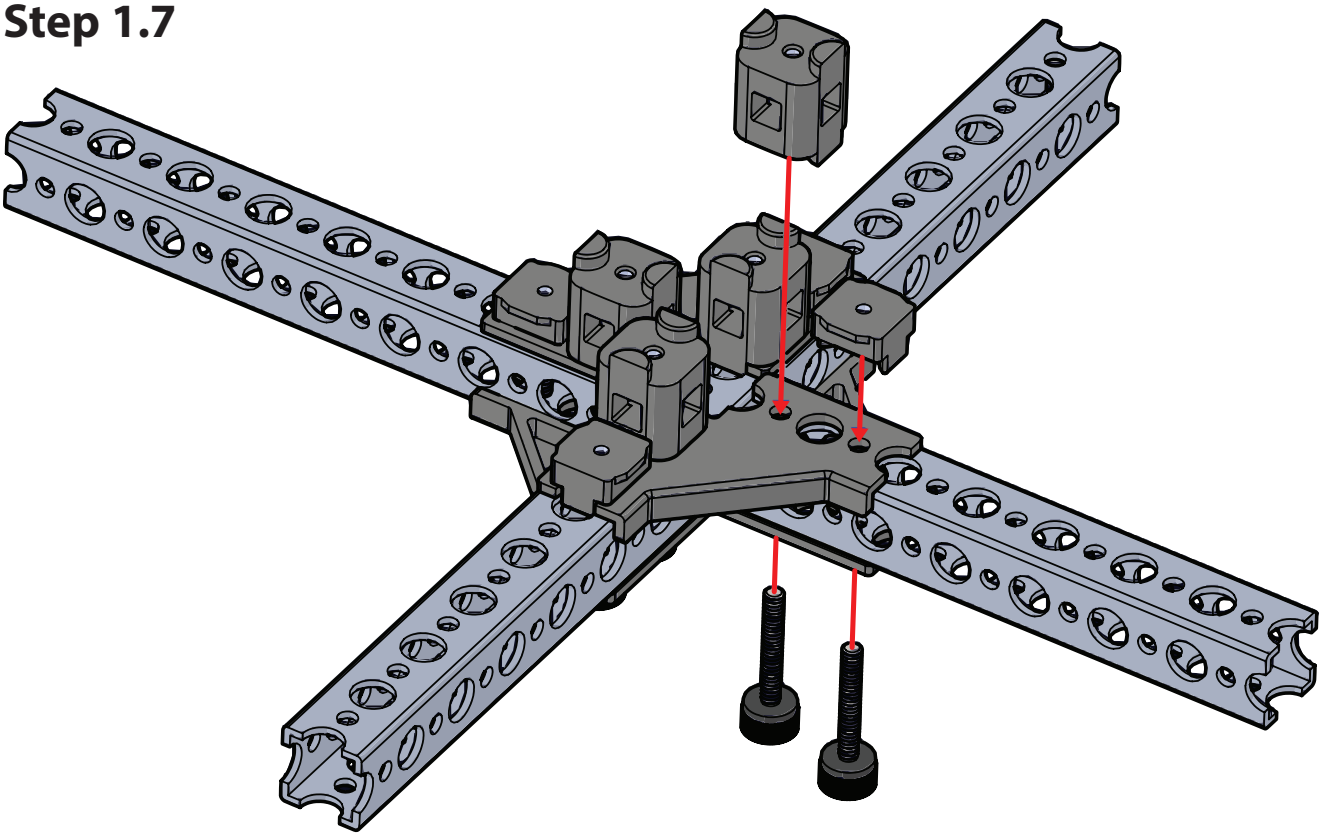


Step 1.6

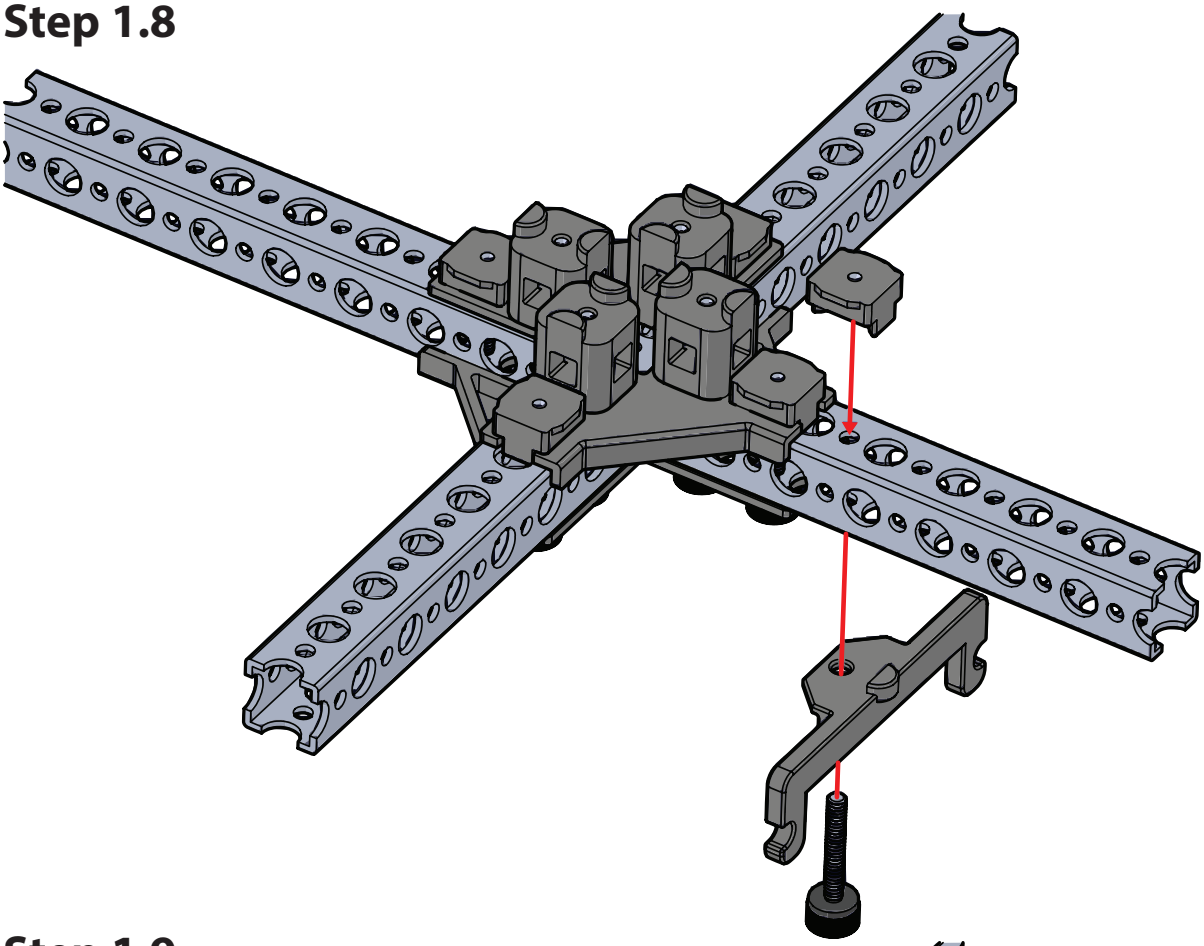


Tip: The 7-Hole Square Beam 40204 is required for this step.

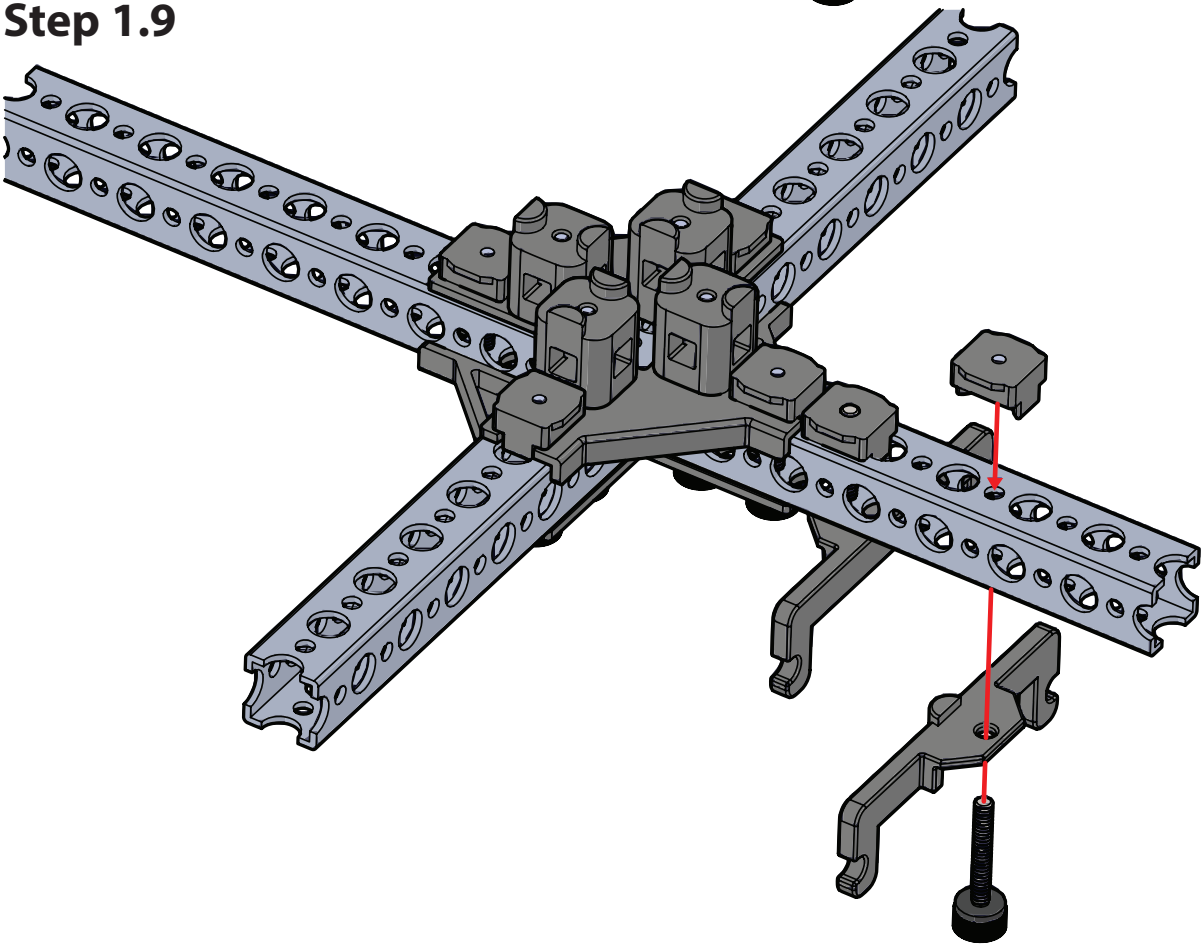
Step 1.7



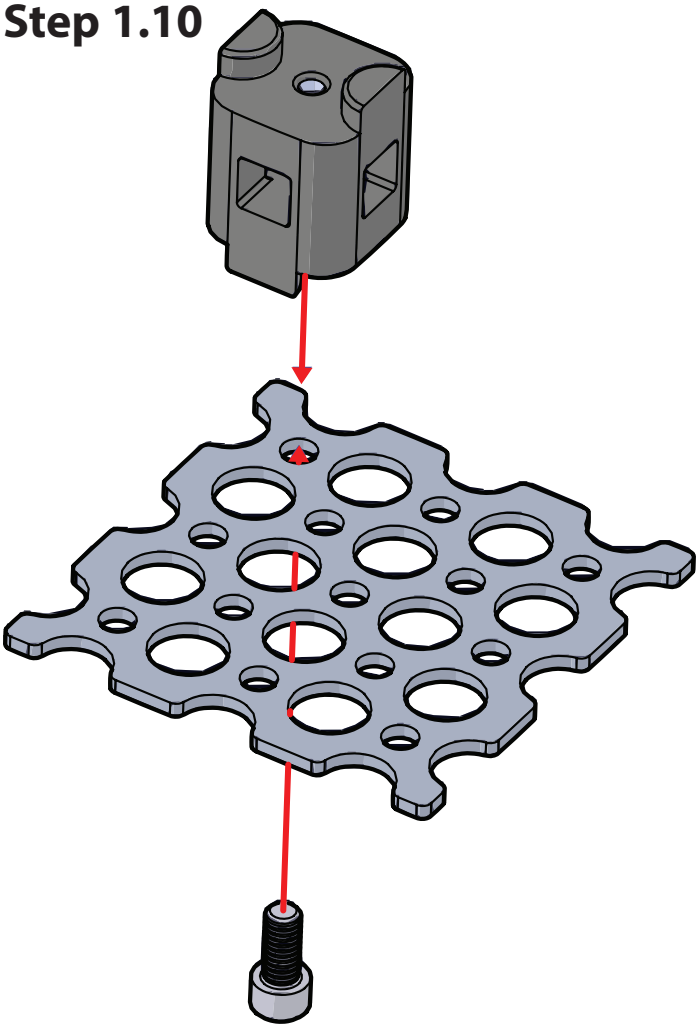
Step 1.8



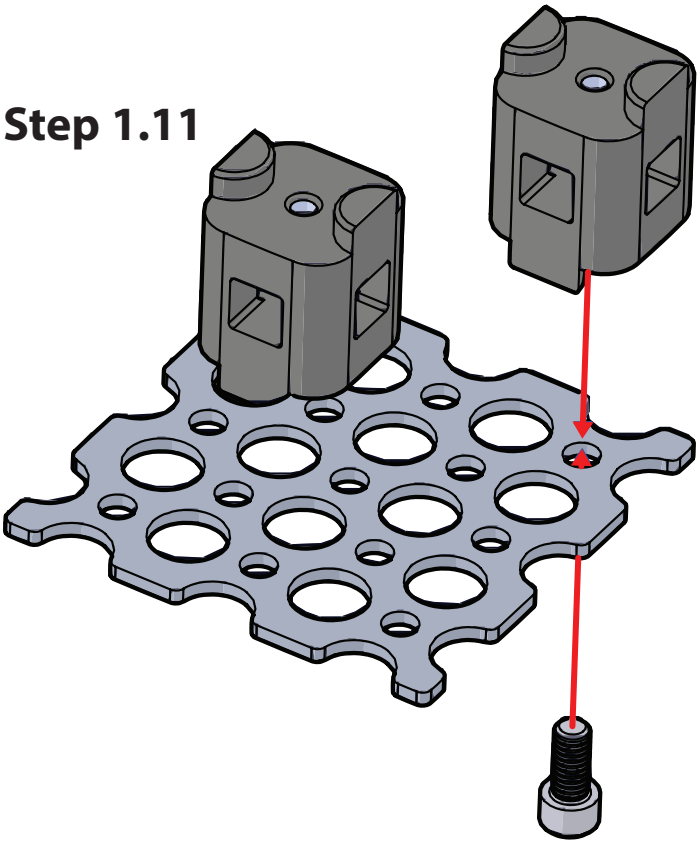
Step 1.9



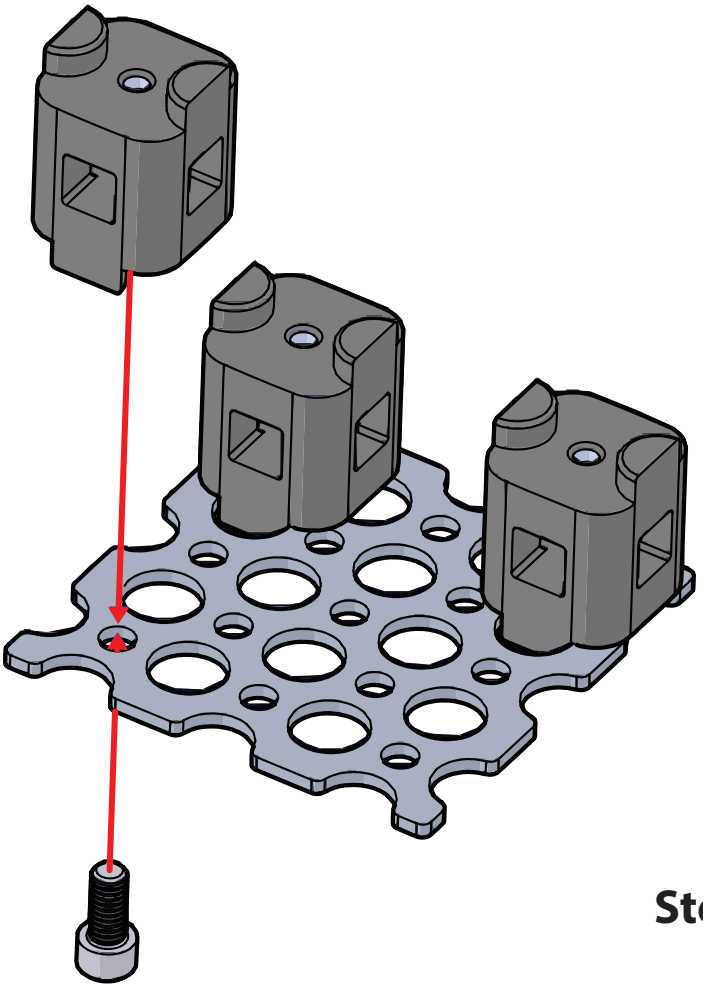
Step 1.10



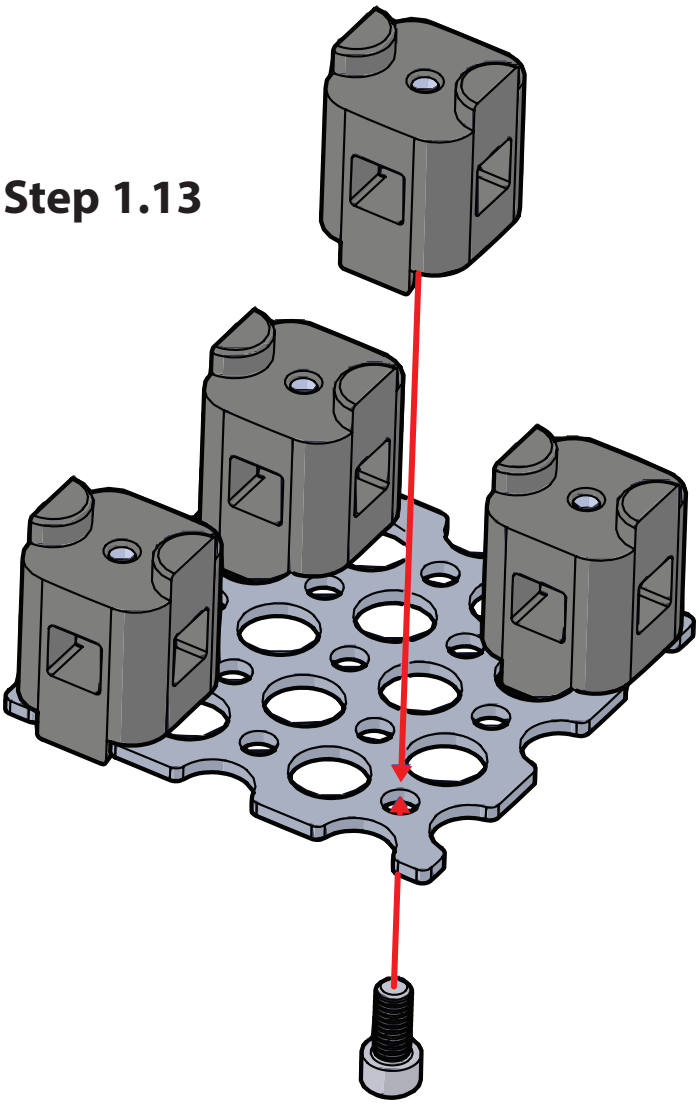
Step 1.11



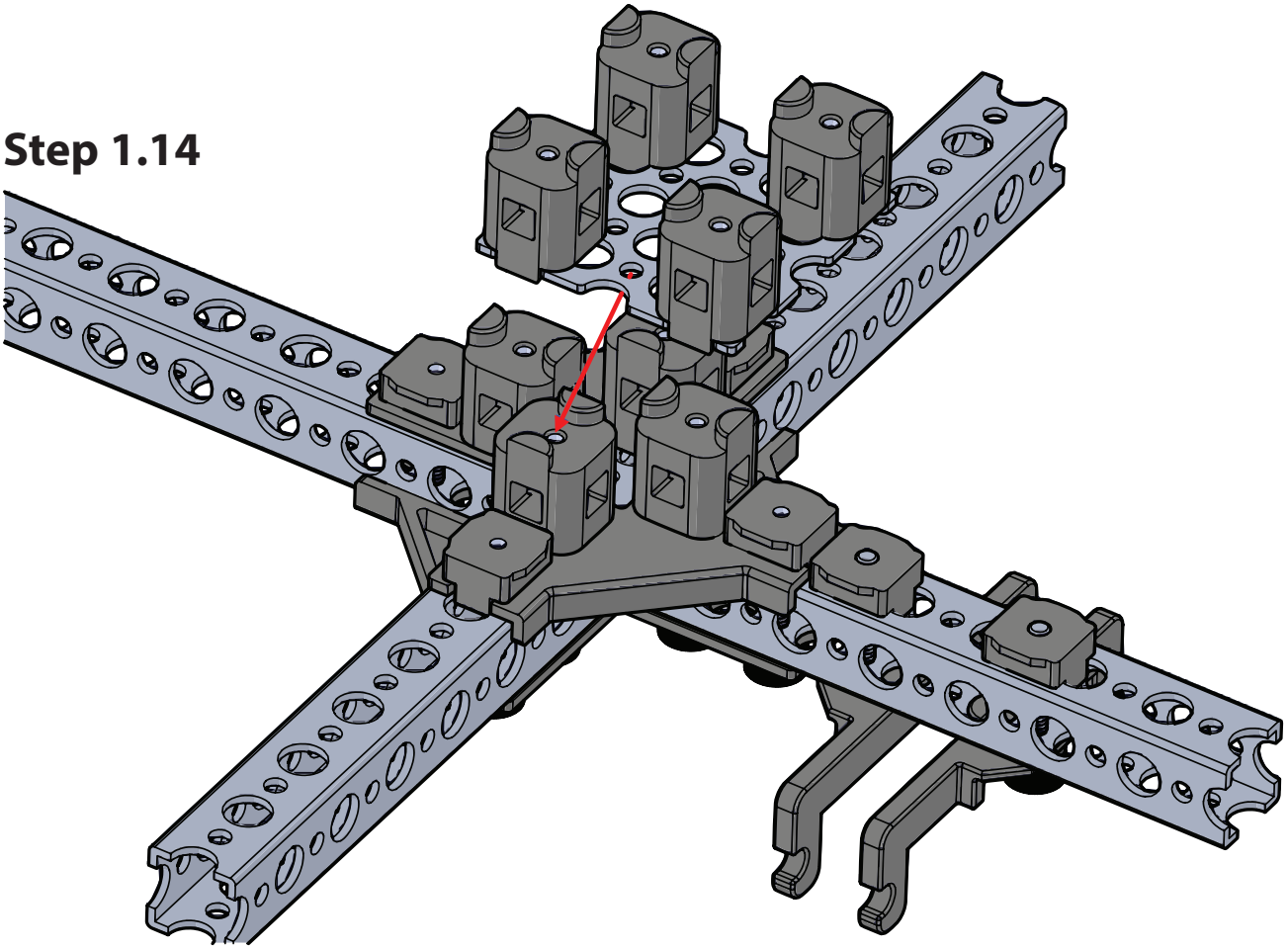
Step 1.12



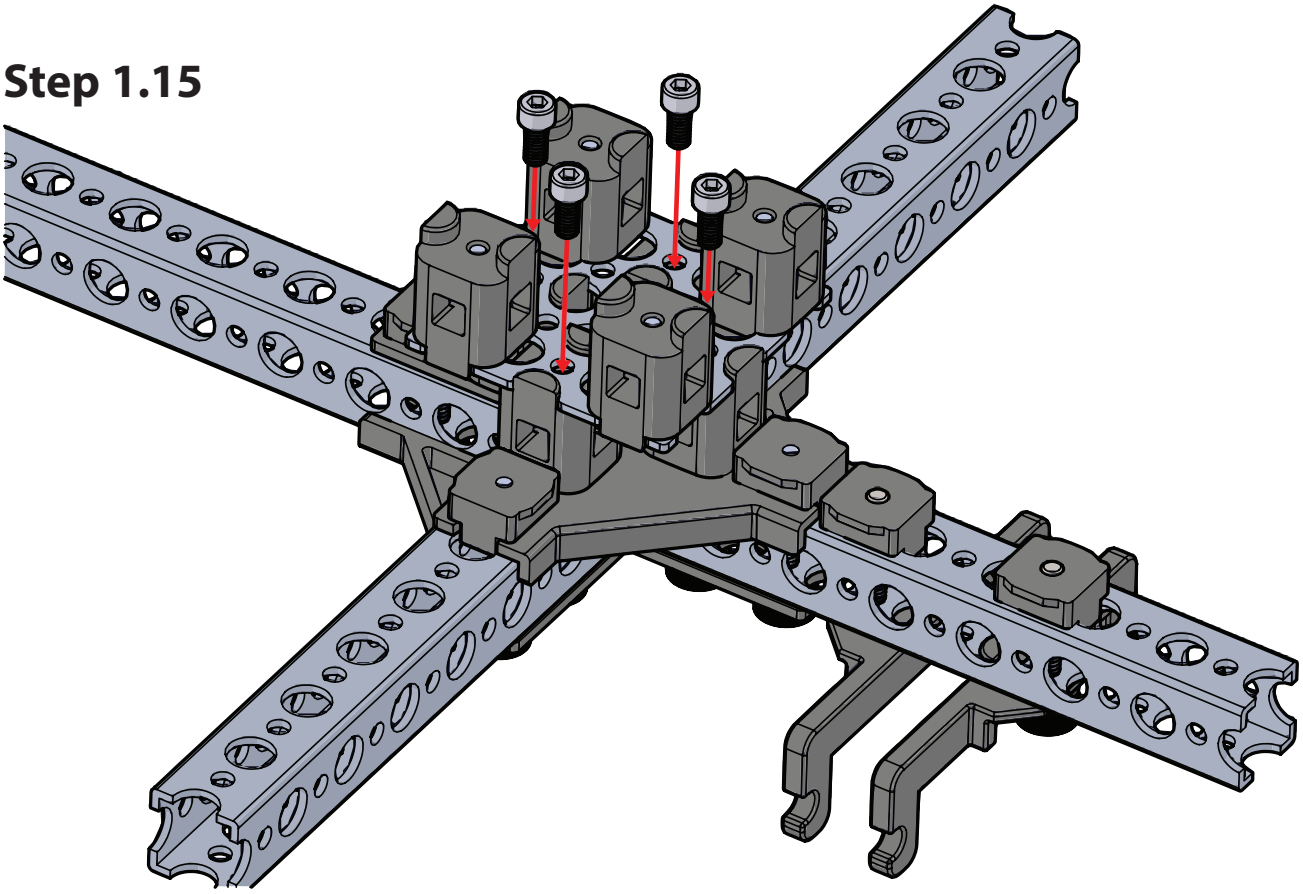
Step 1.13



Step 1.14

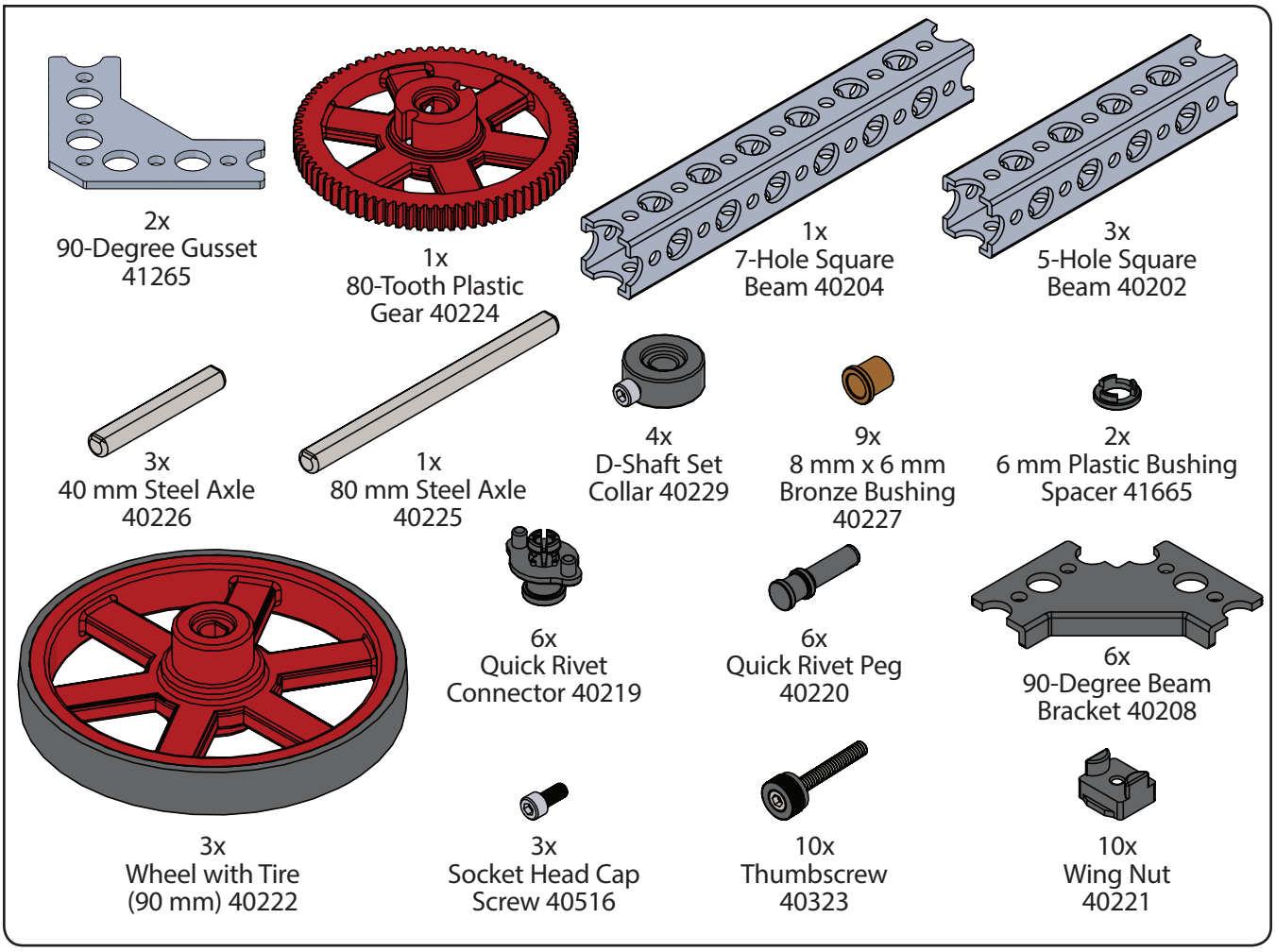


Step 1.15



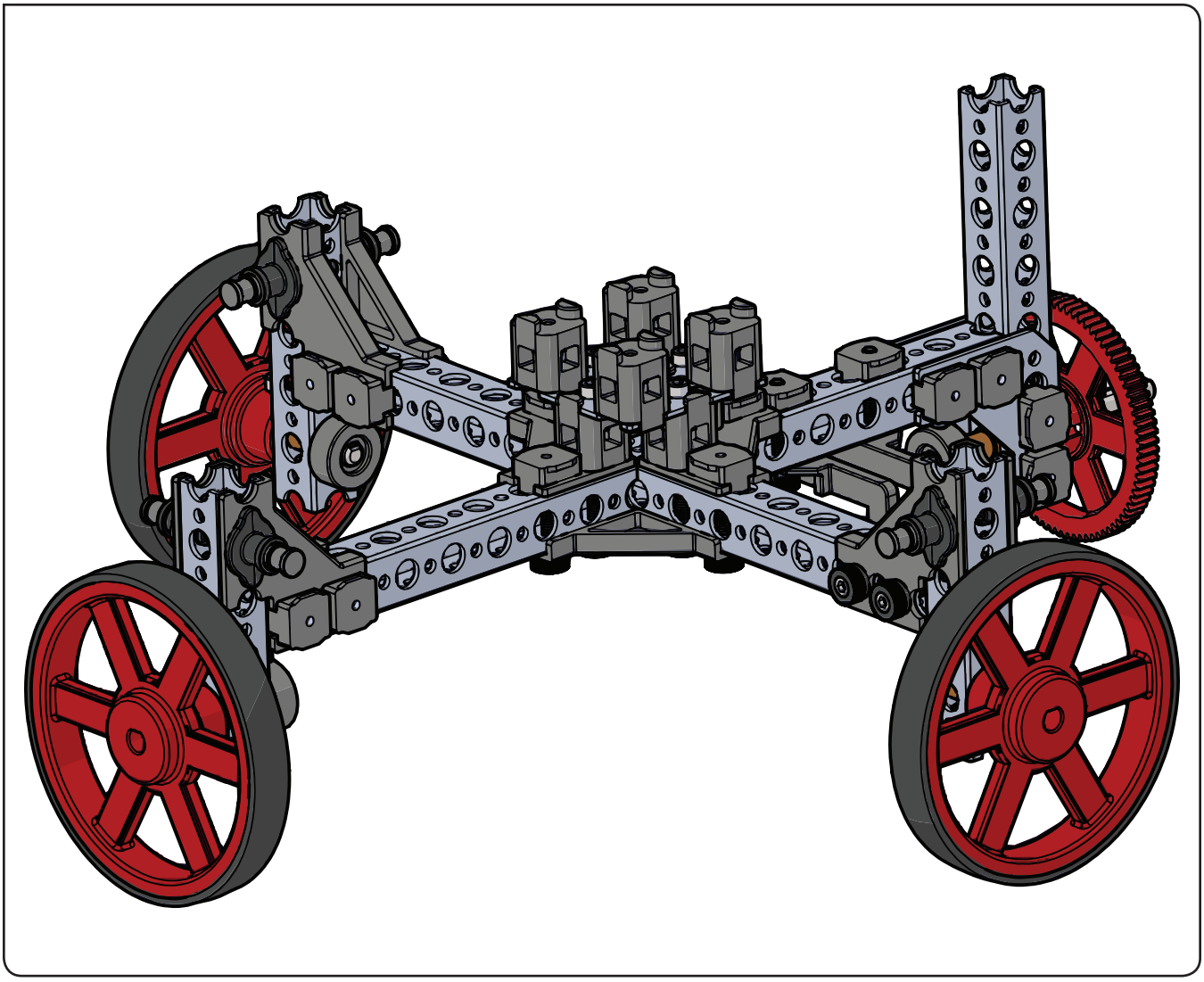
Step 2

Parts Needed

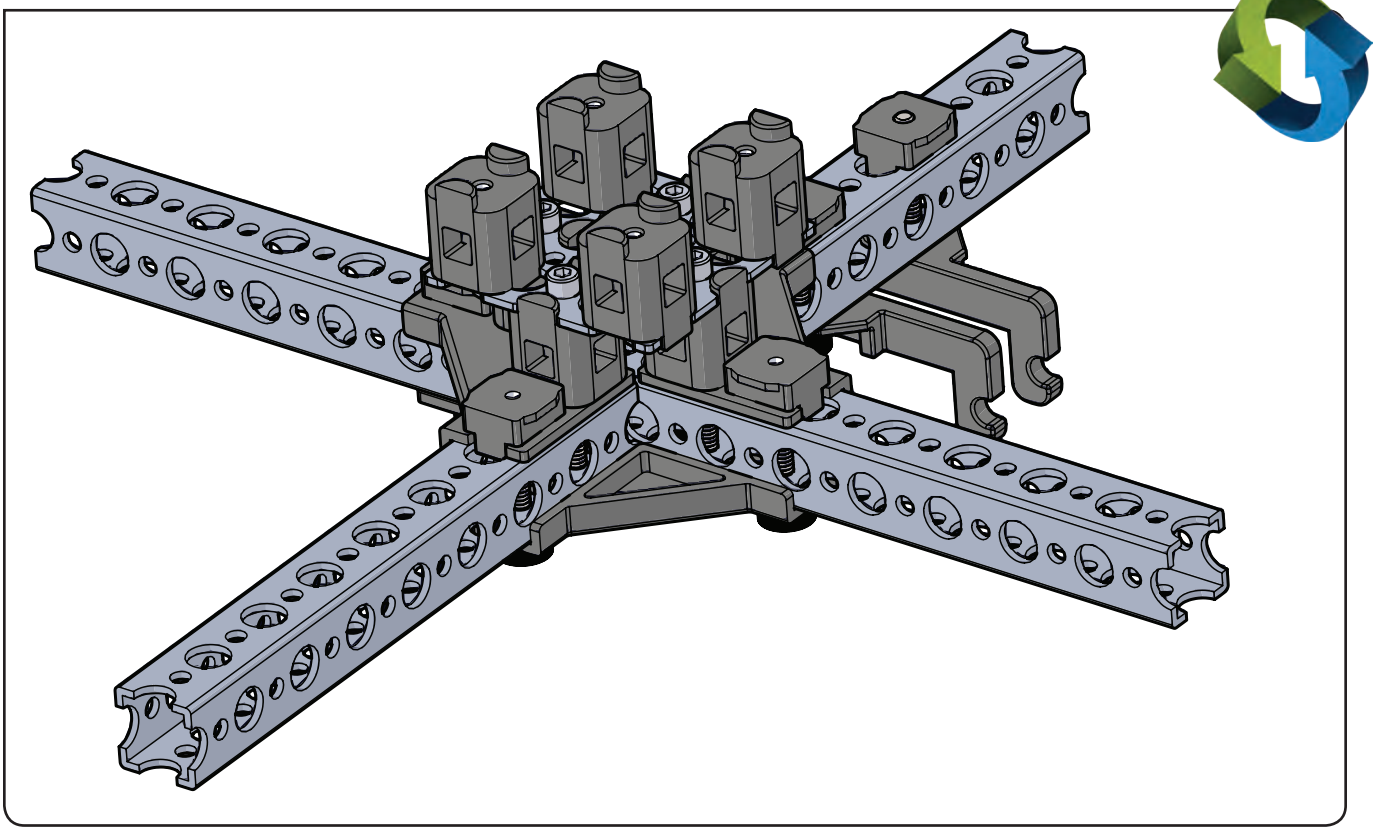


Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

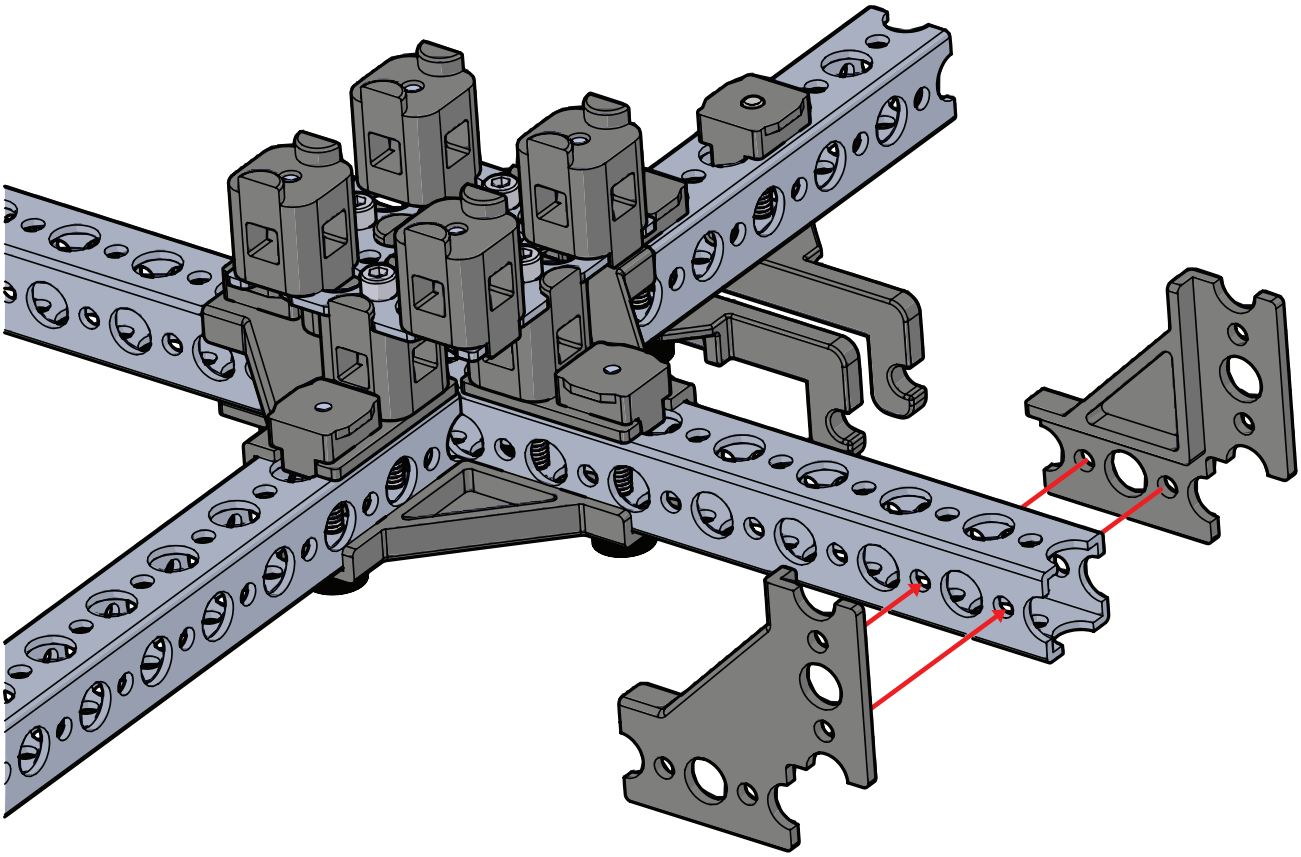
Partial assembly should look like this.



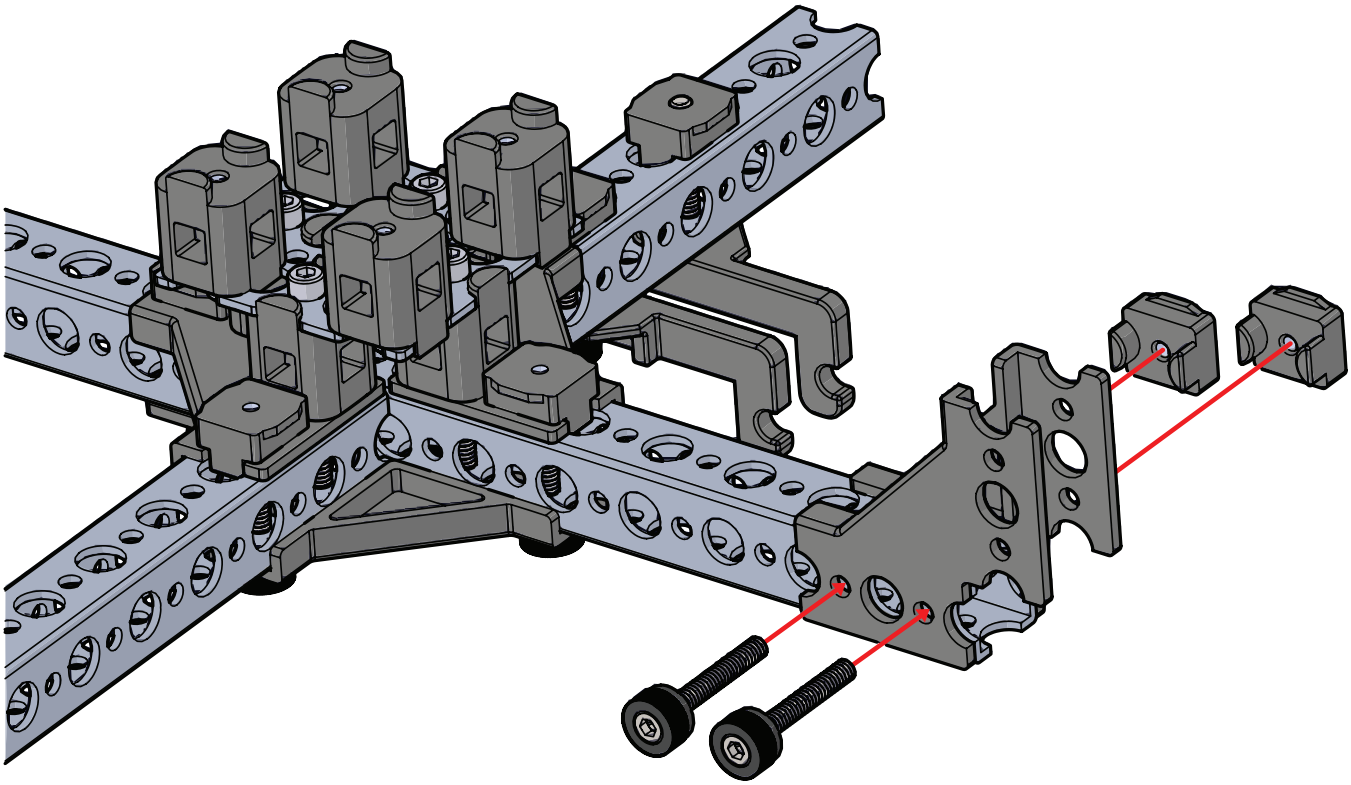
Rotate build to match this view.



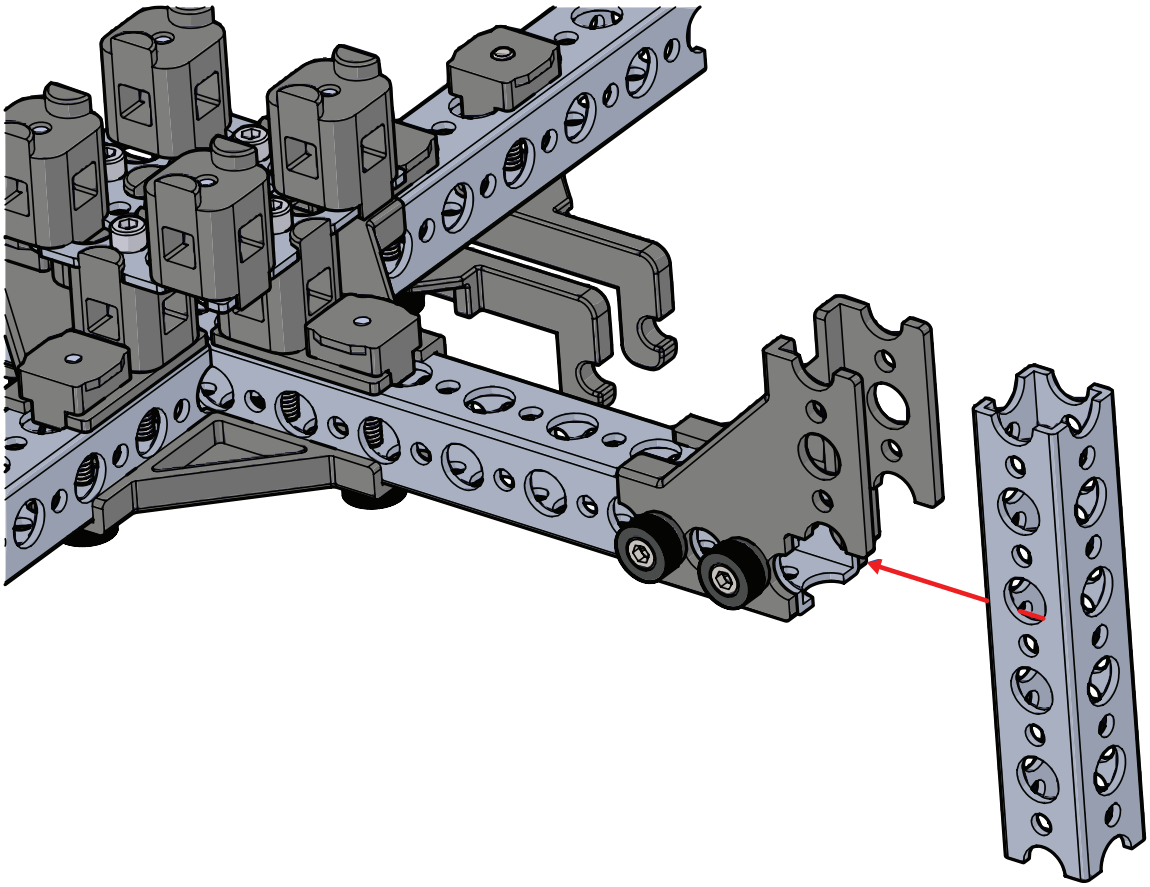
Step 2.0



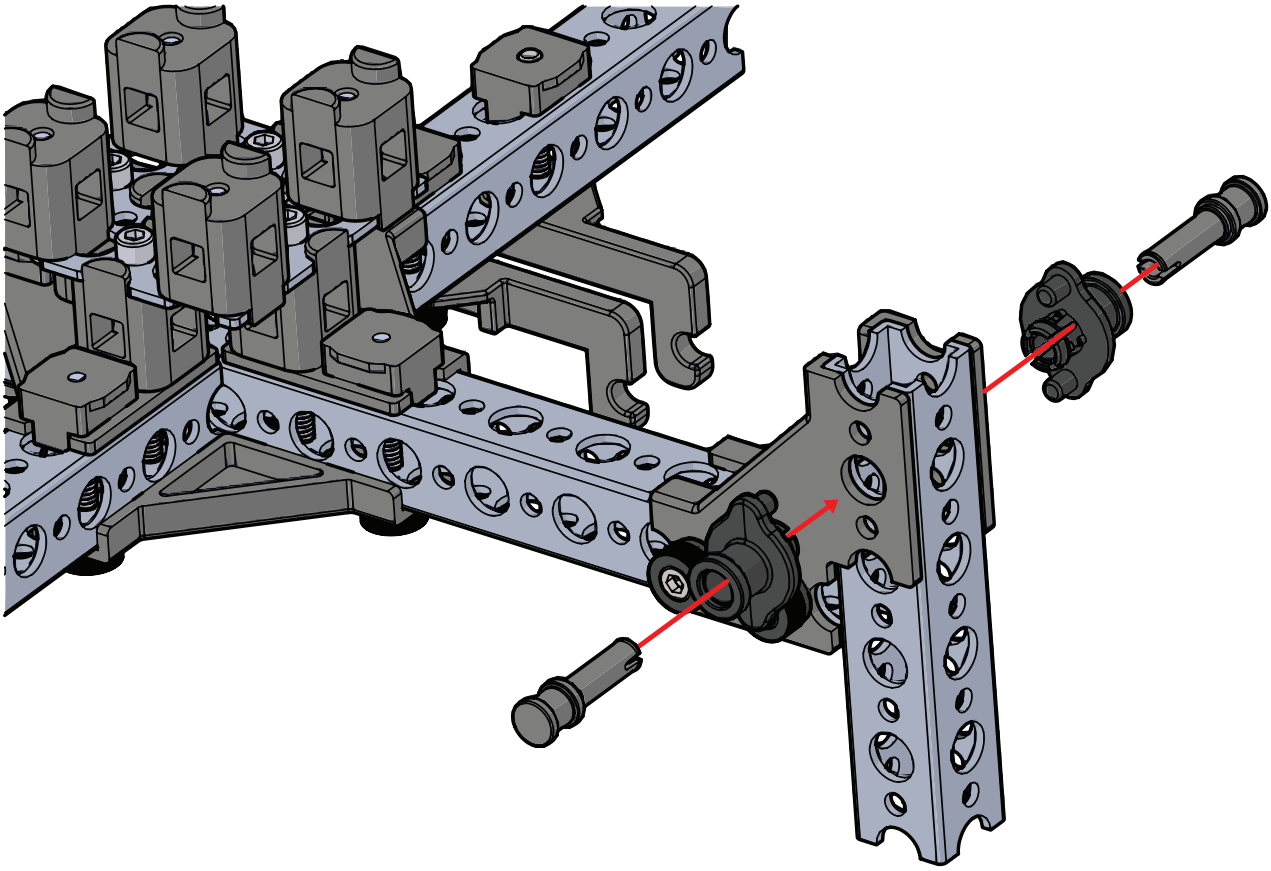
Step 2.1



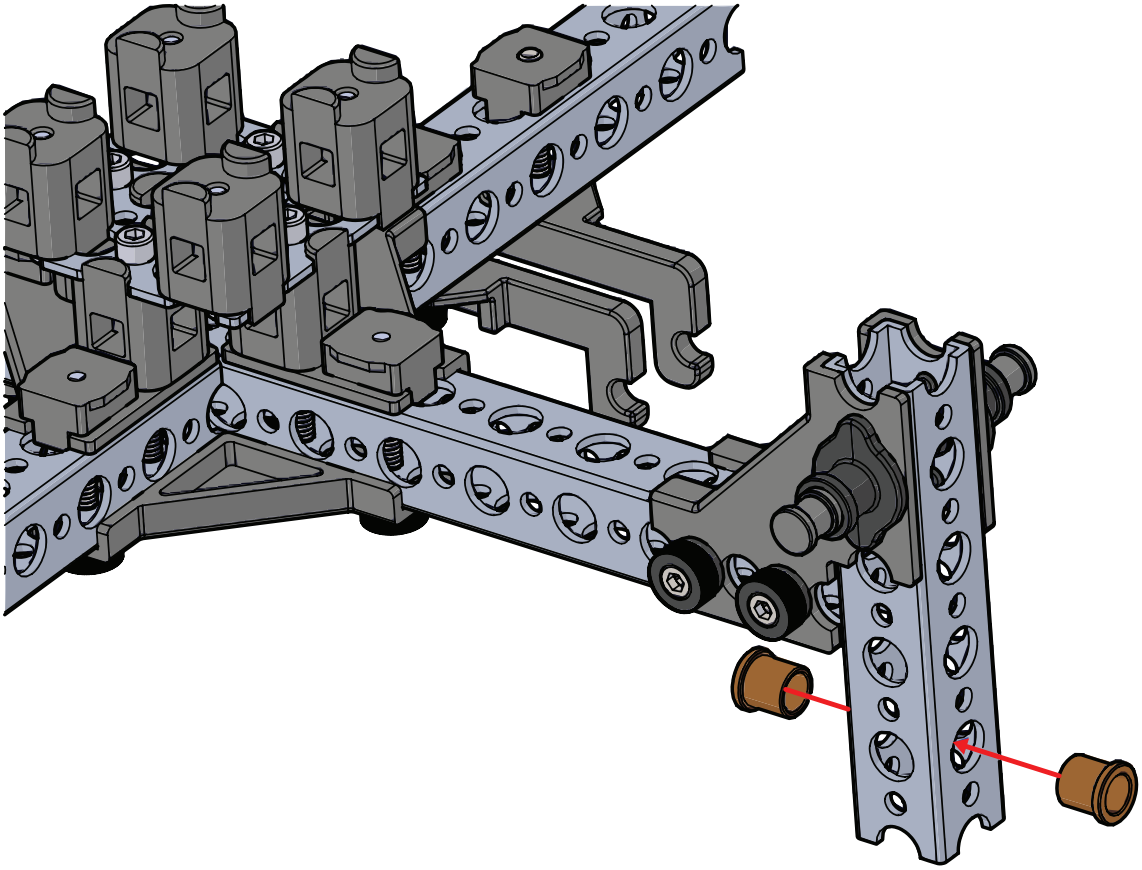
Step 2.2



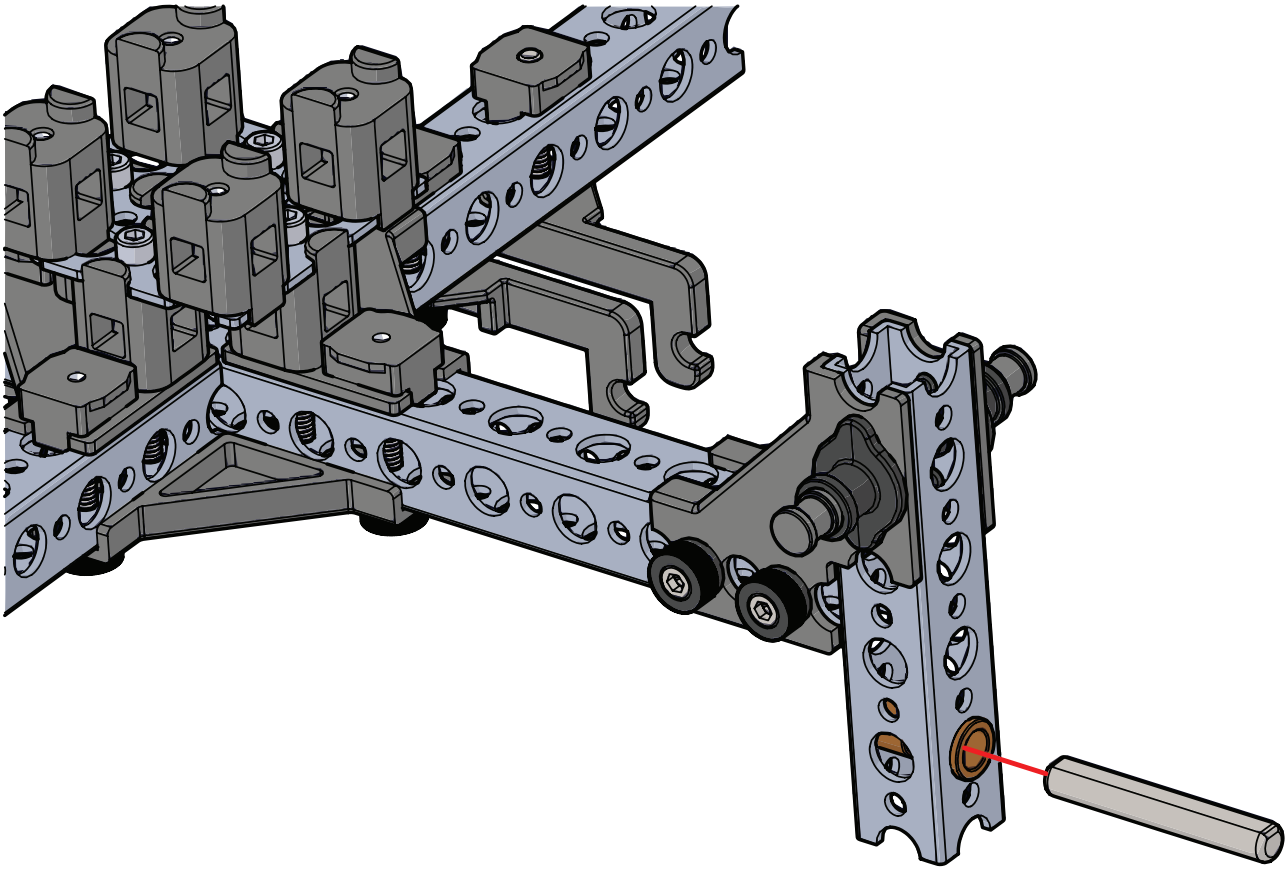
Step 2.3



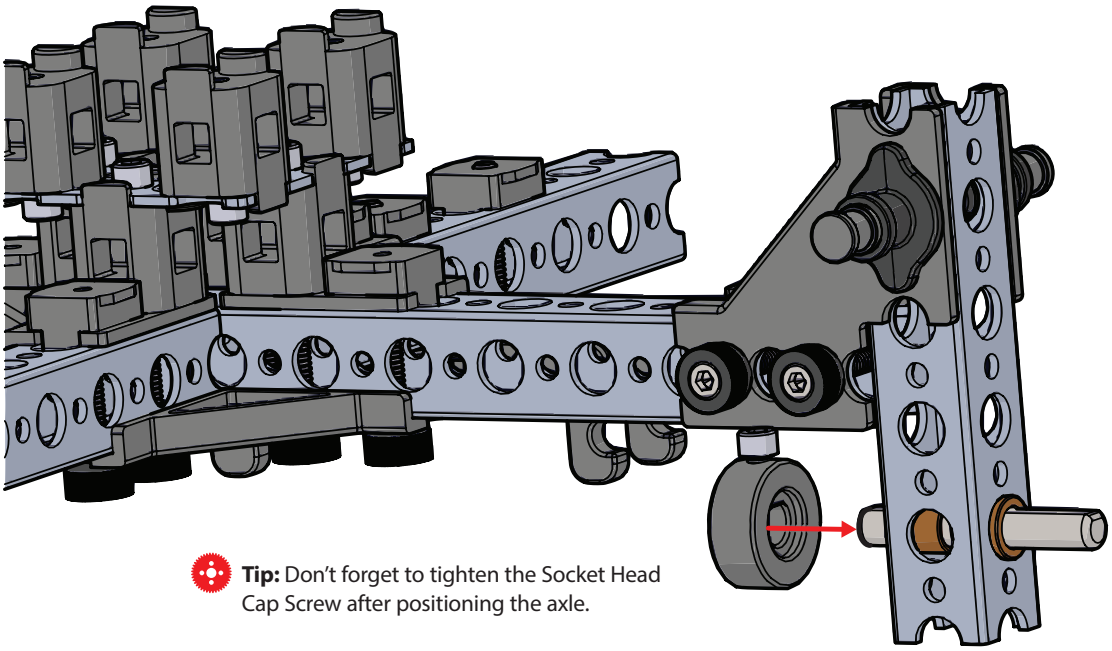
Step 2.4



Step 2.5

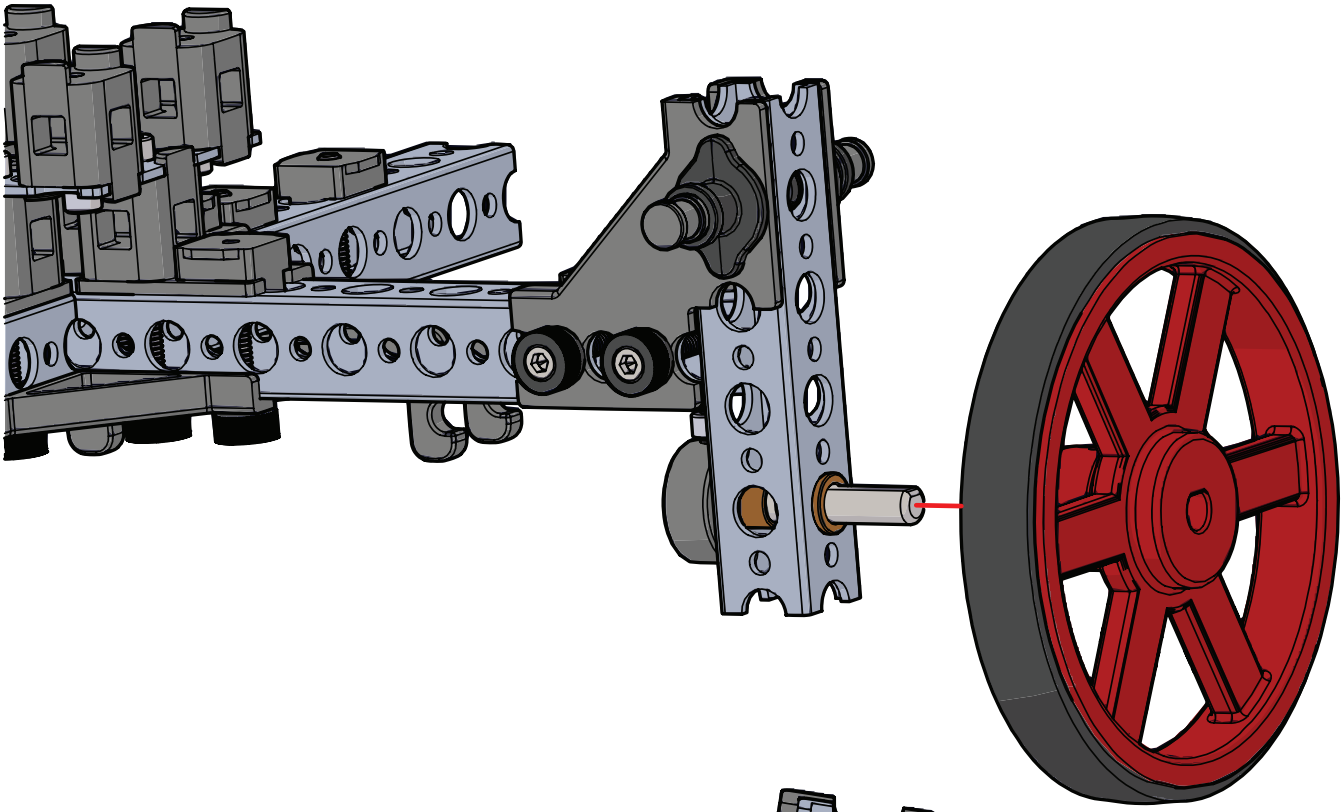


Step 2.6

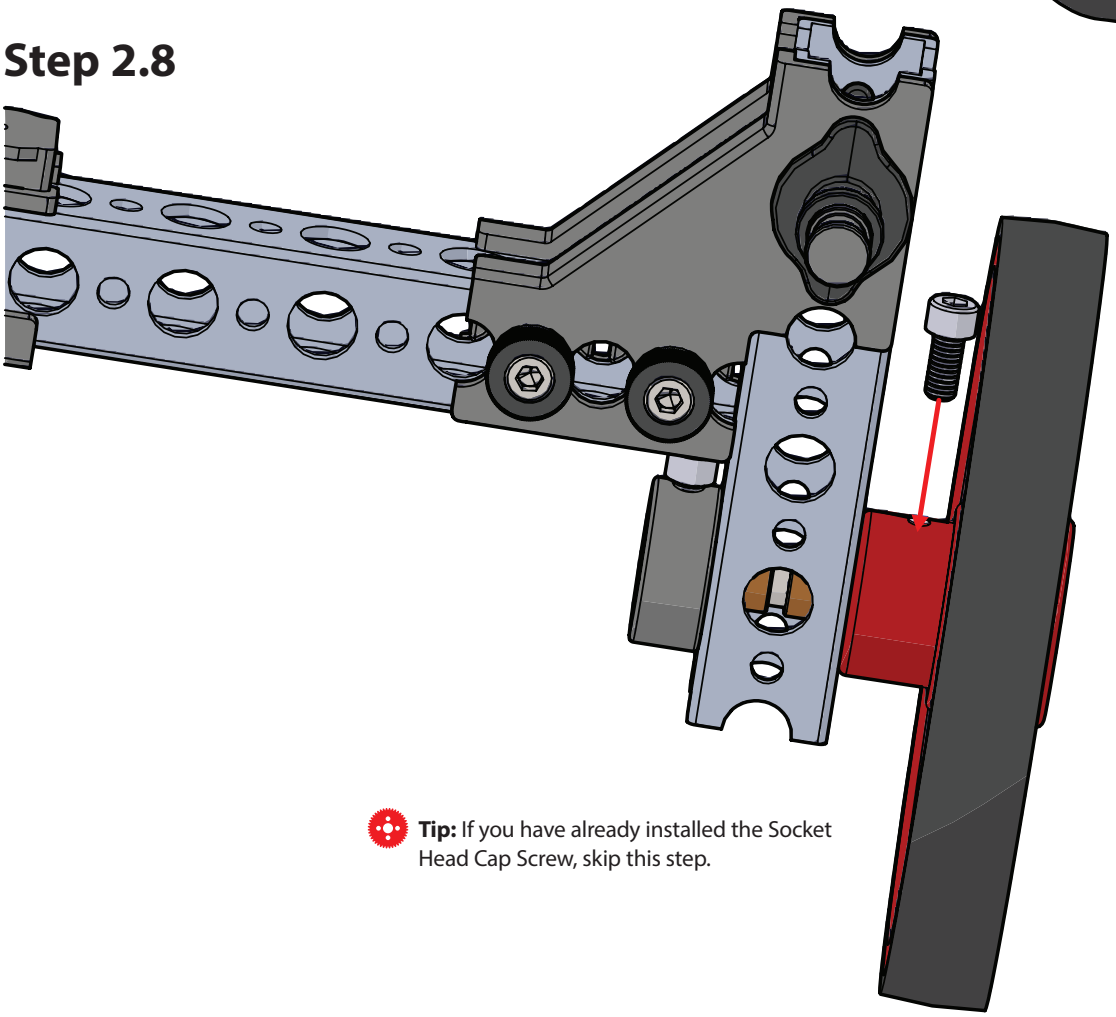


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.7

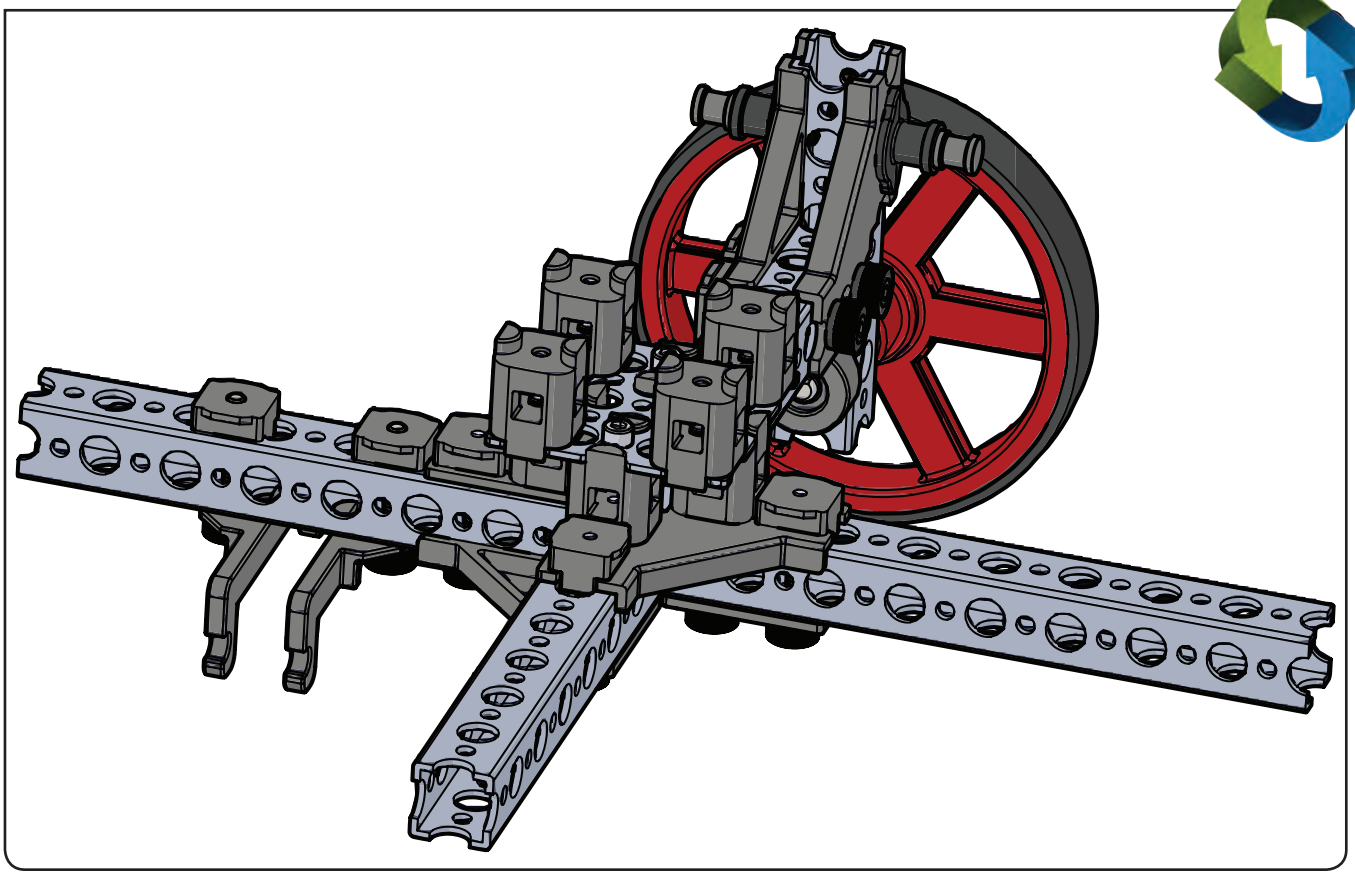


Step 2.8

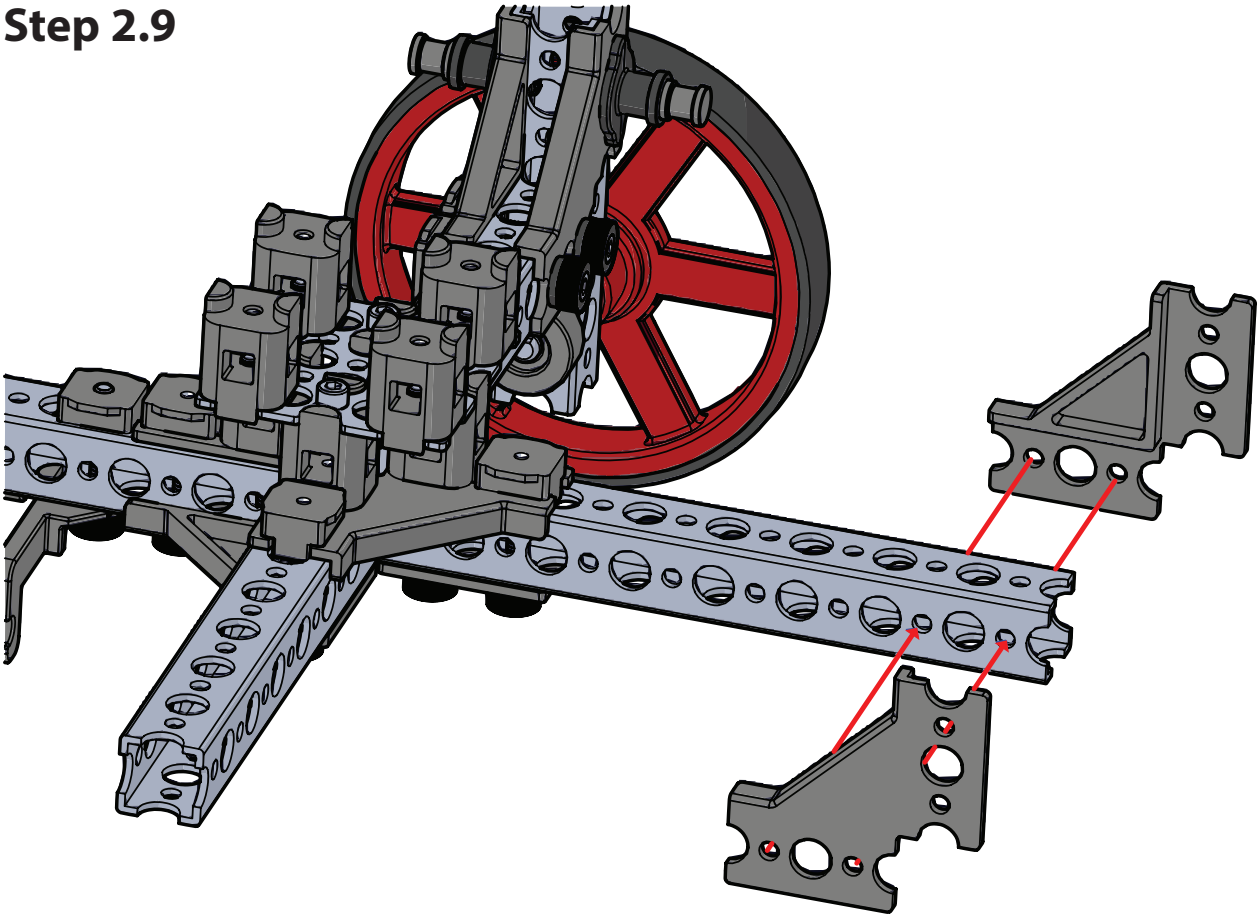


Tip: If you have already installed the Socket Head Cap Screw, skip this step.

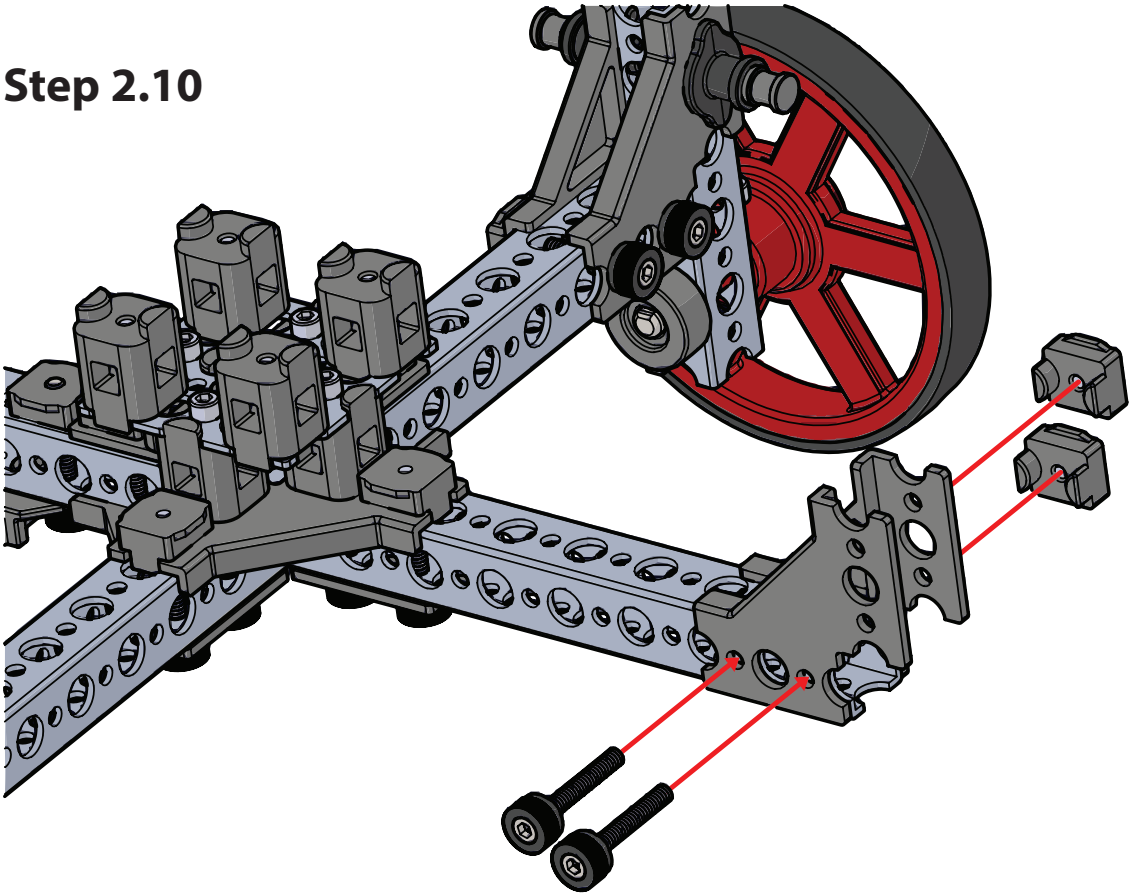
Rotate build to match this view.



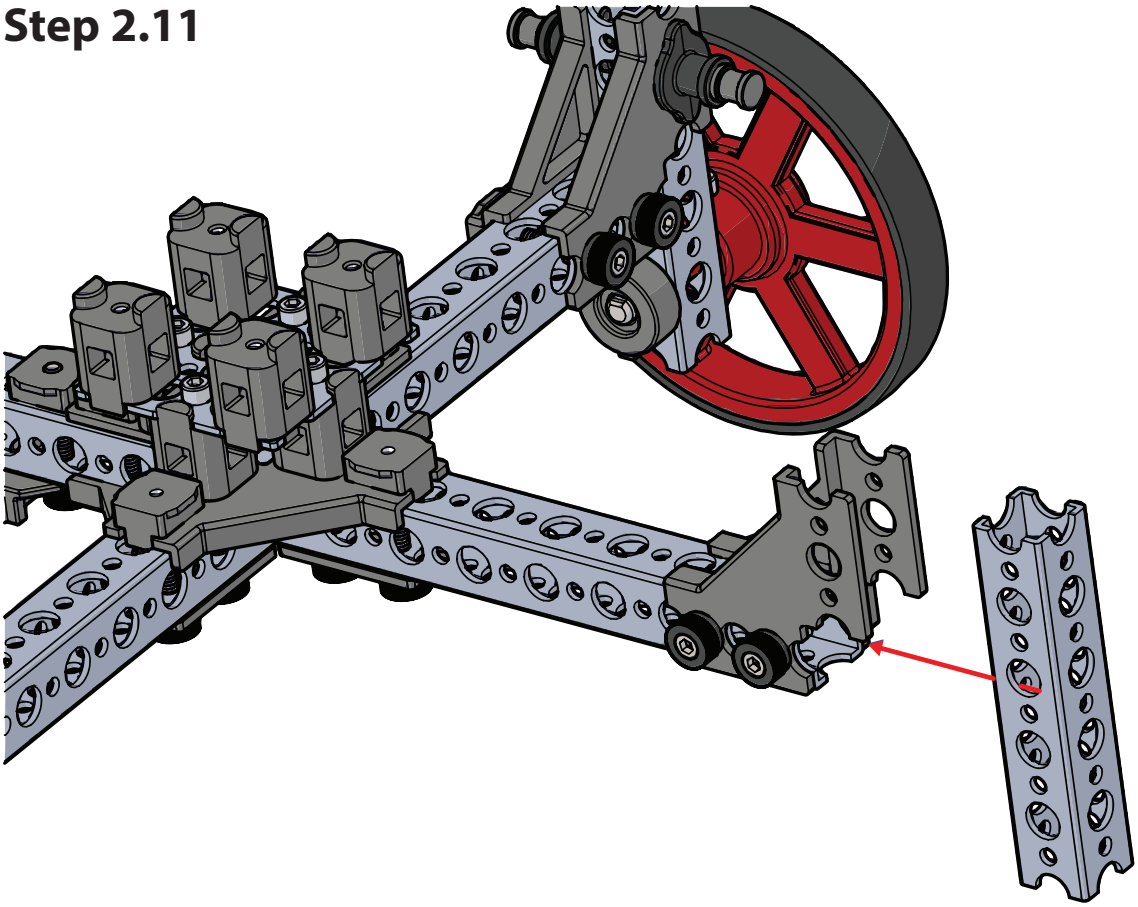
Step 2.9



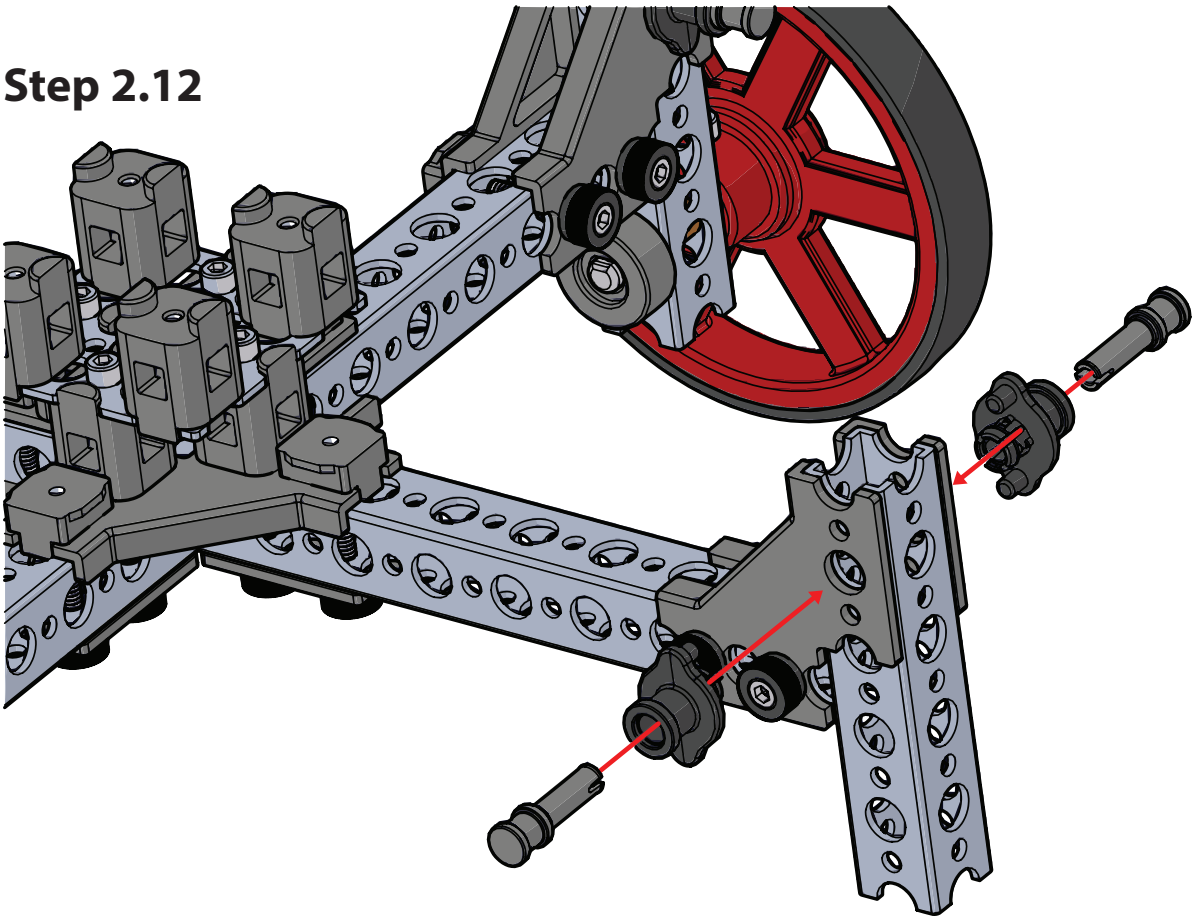
Step 2.10



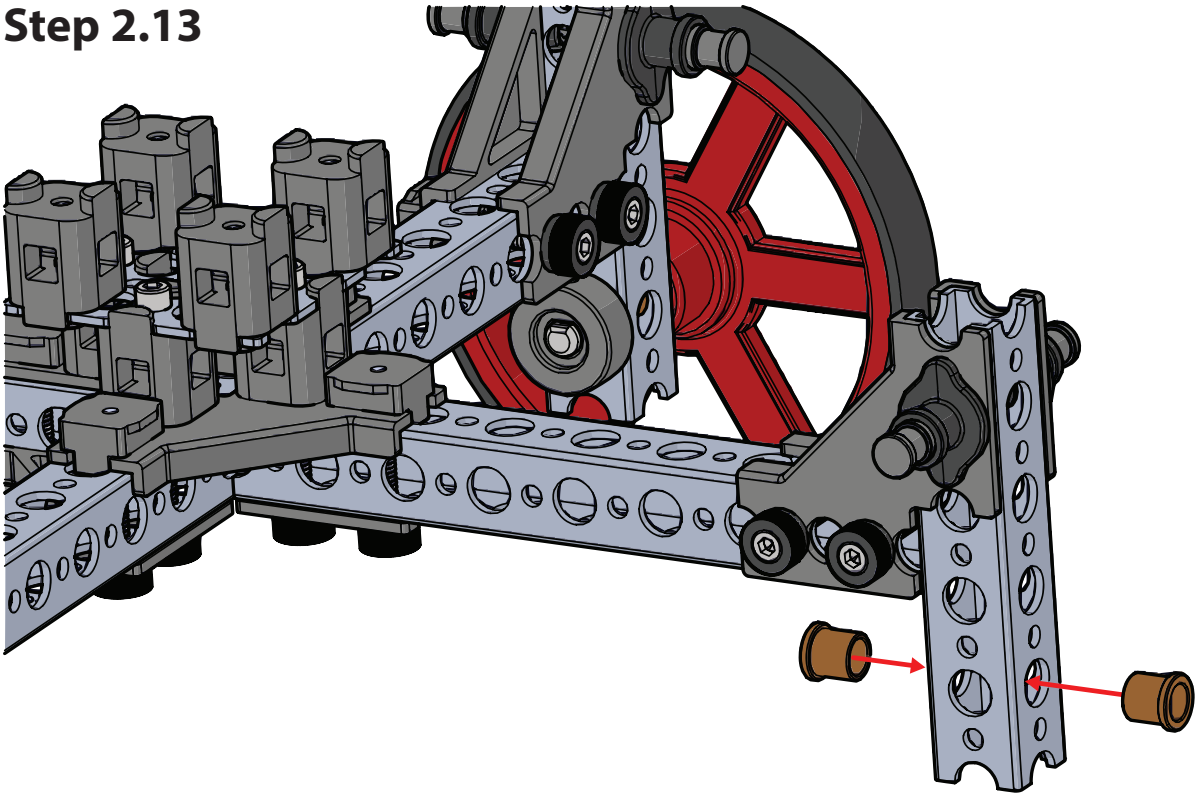
Step 2.11



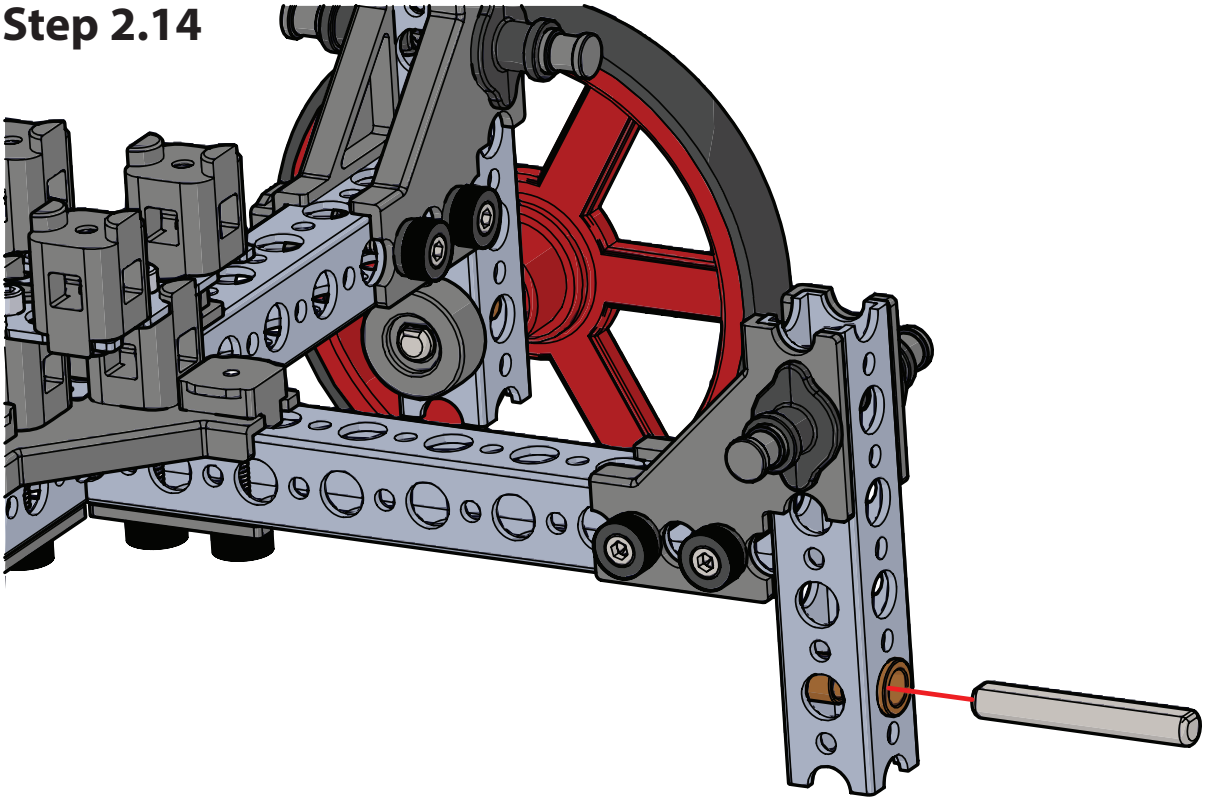
Step 2.12



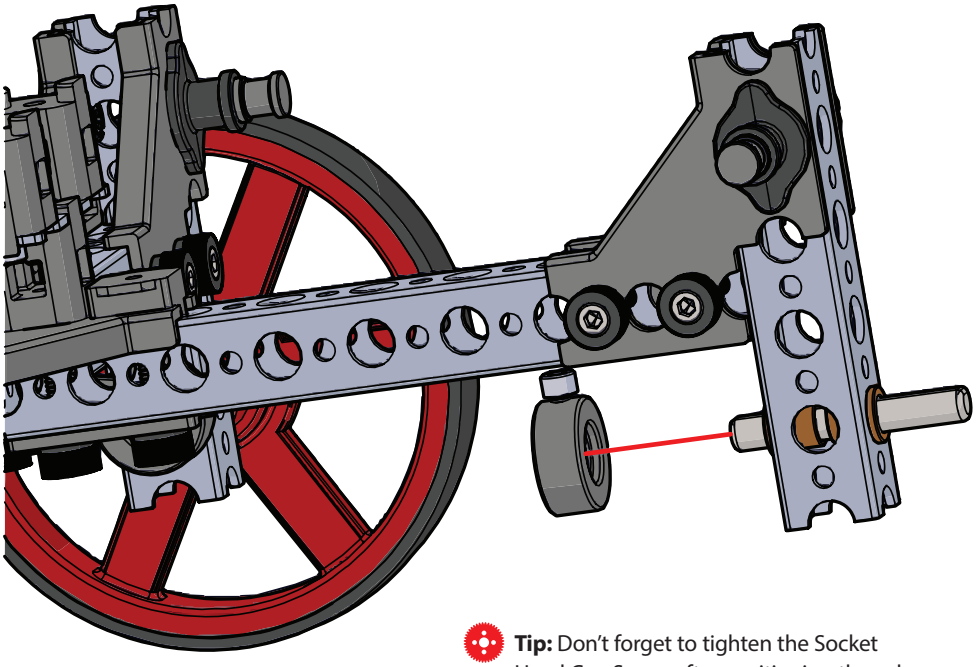
Step 2.13



Step 2.14

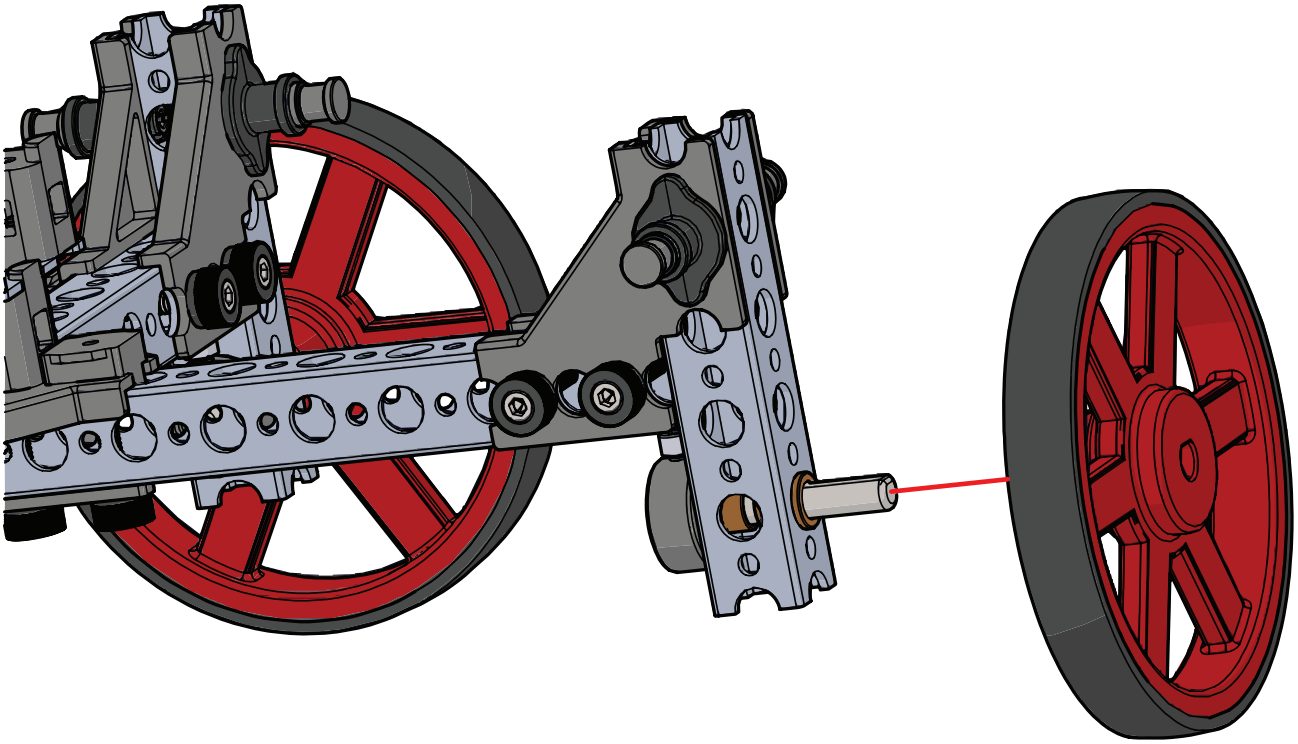


Step 2.15

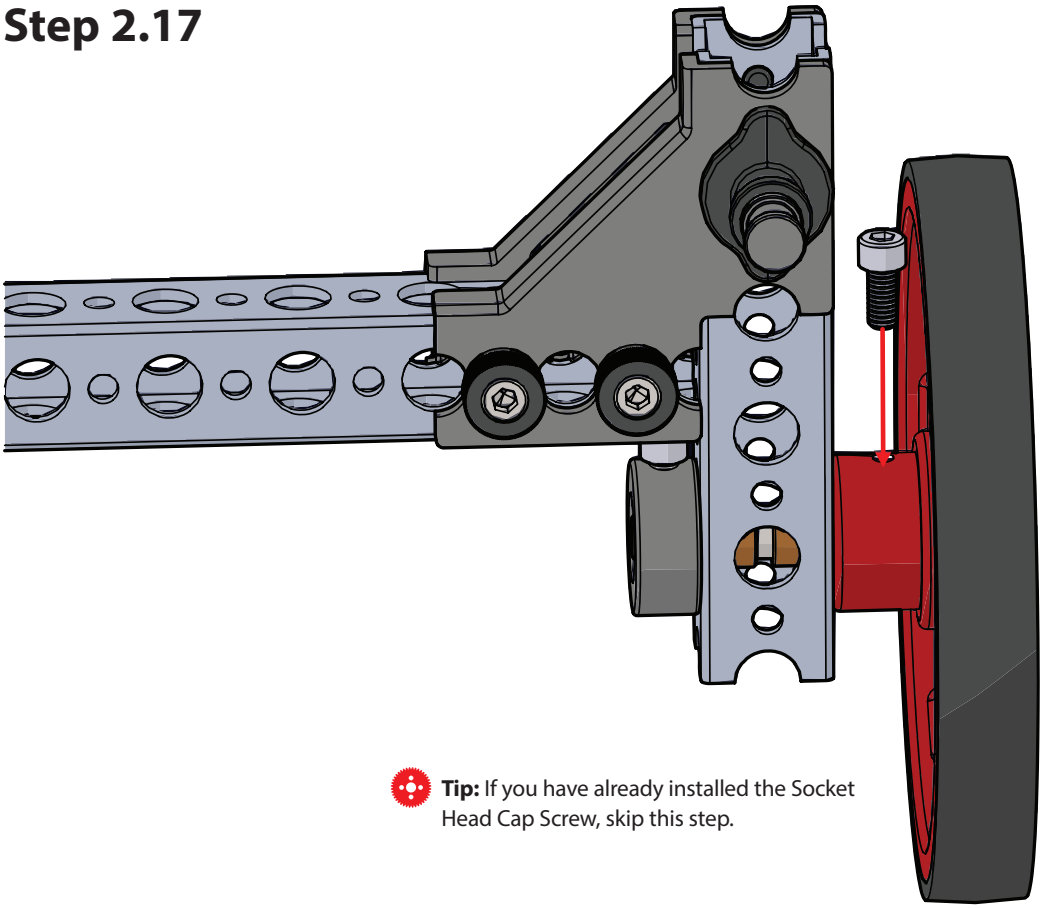


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.16

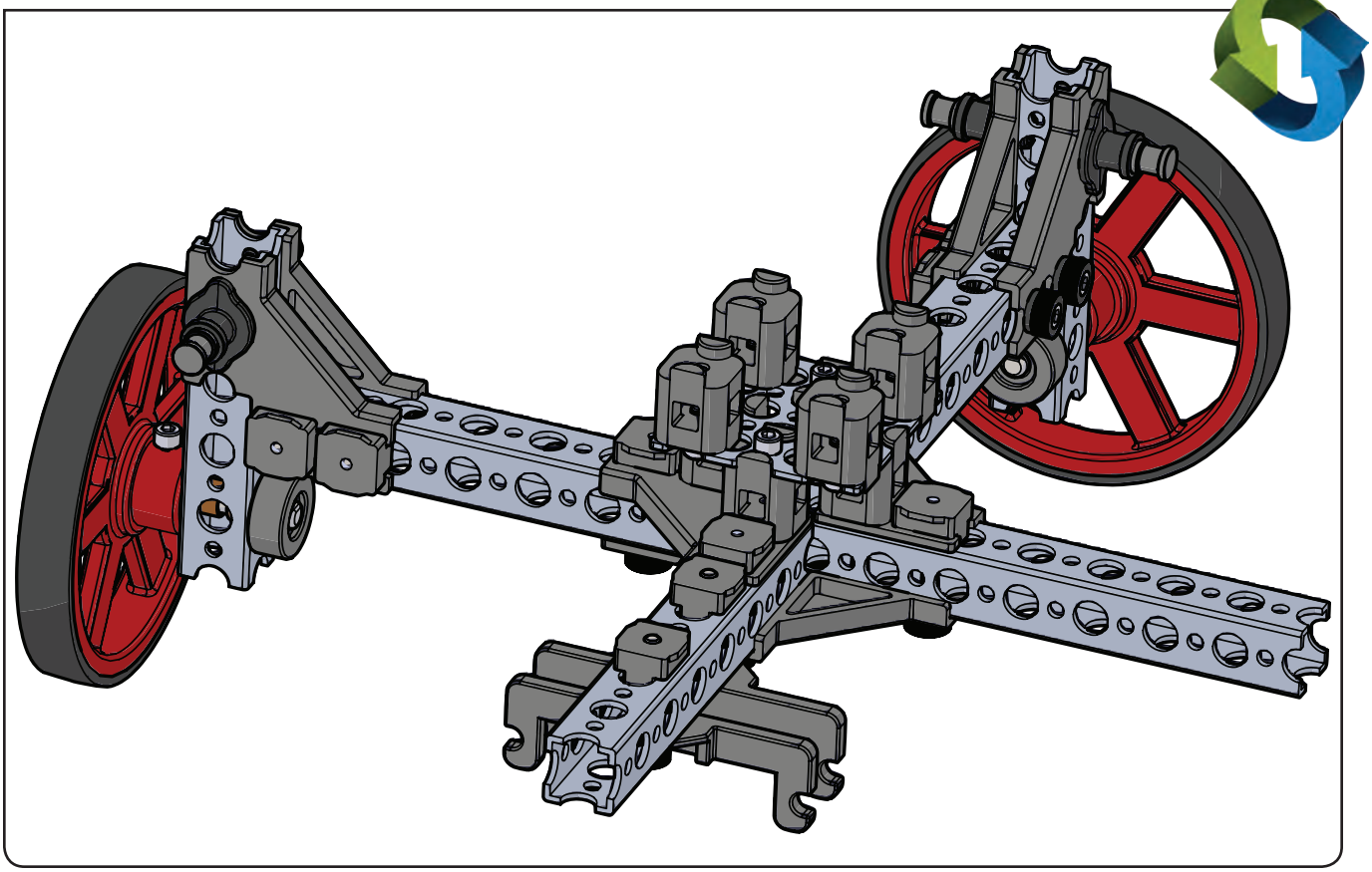


Step 2.17

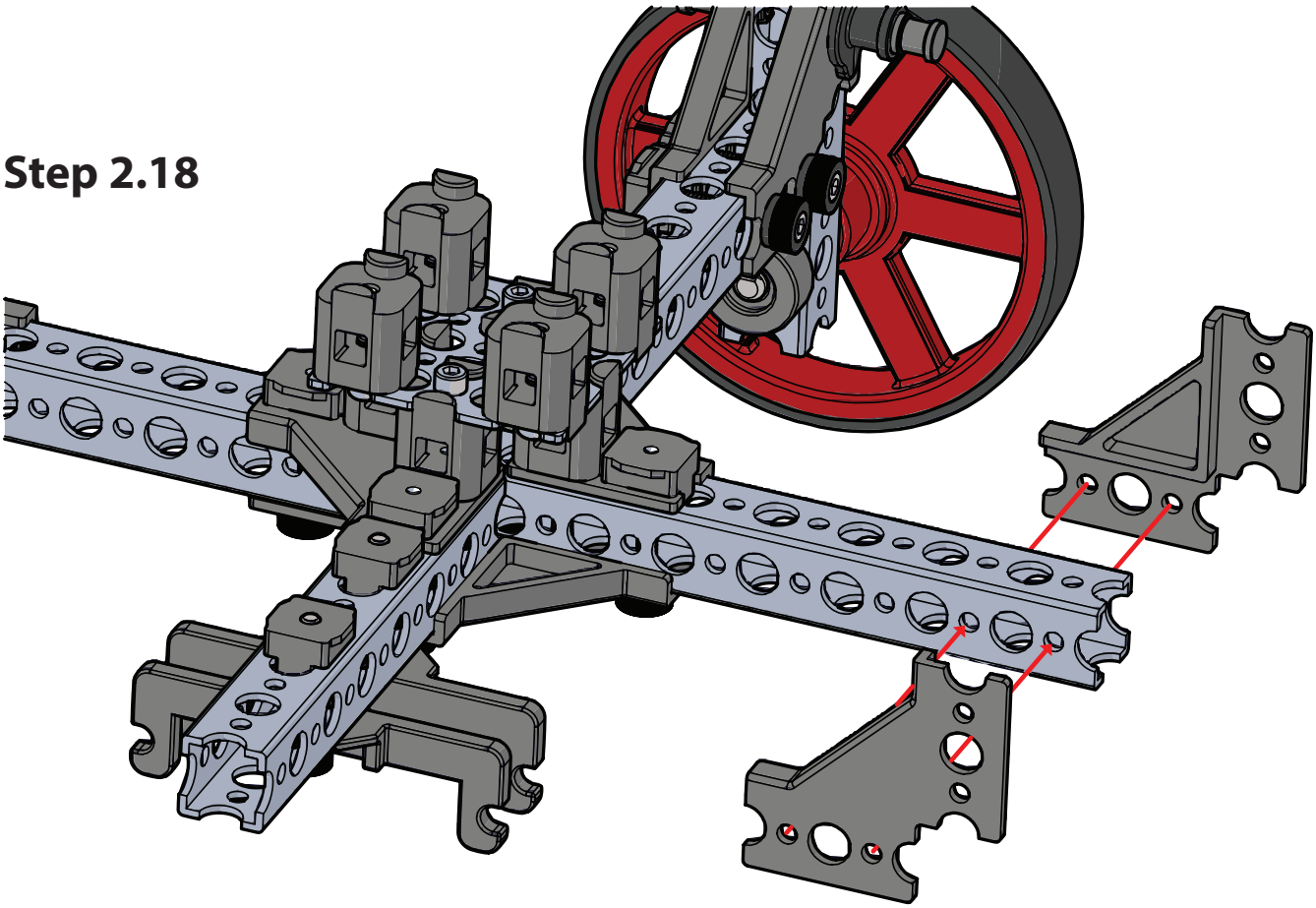


Tip: If you have already installed the Socket Head Cap Screw, skip this step.

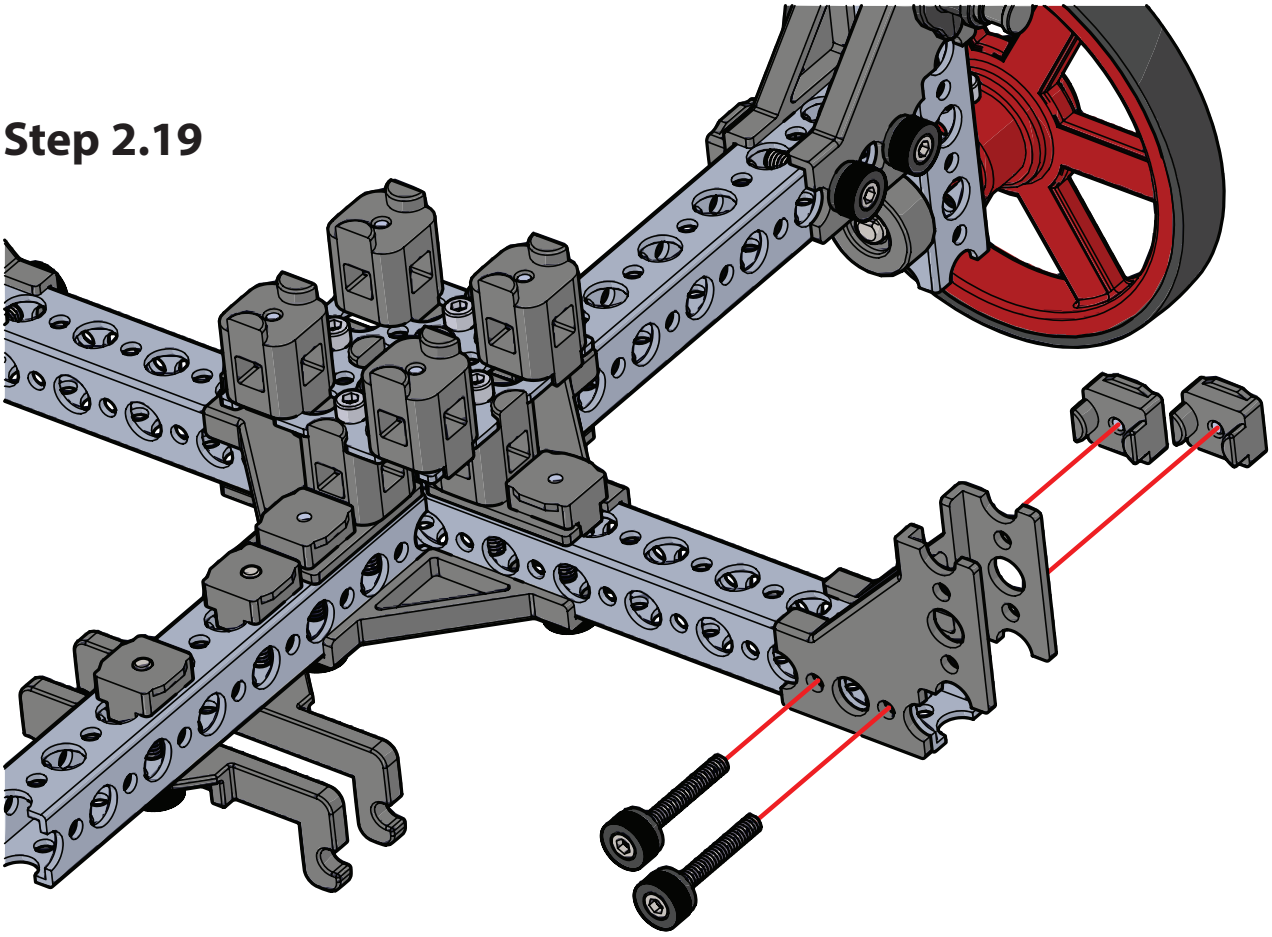
Rotate build to match this view.



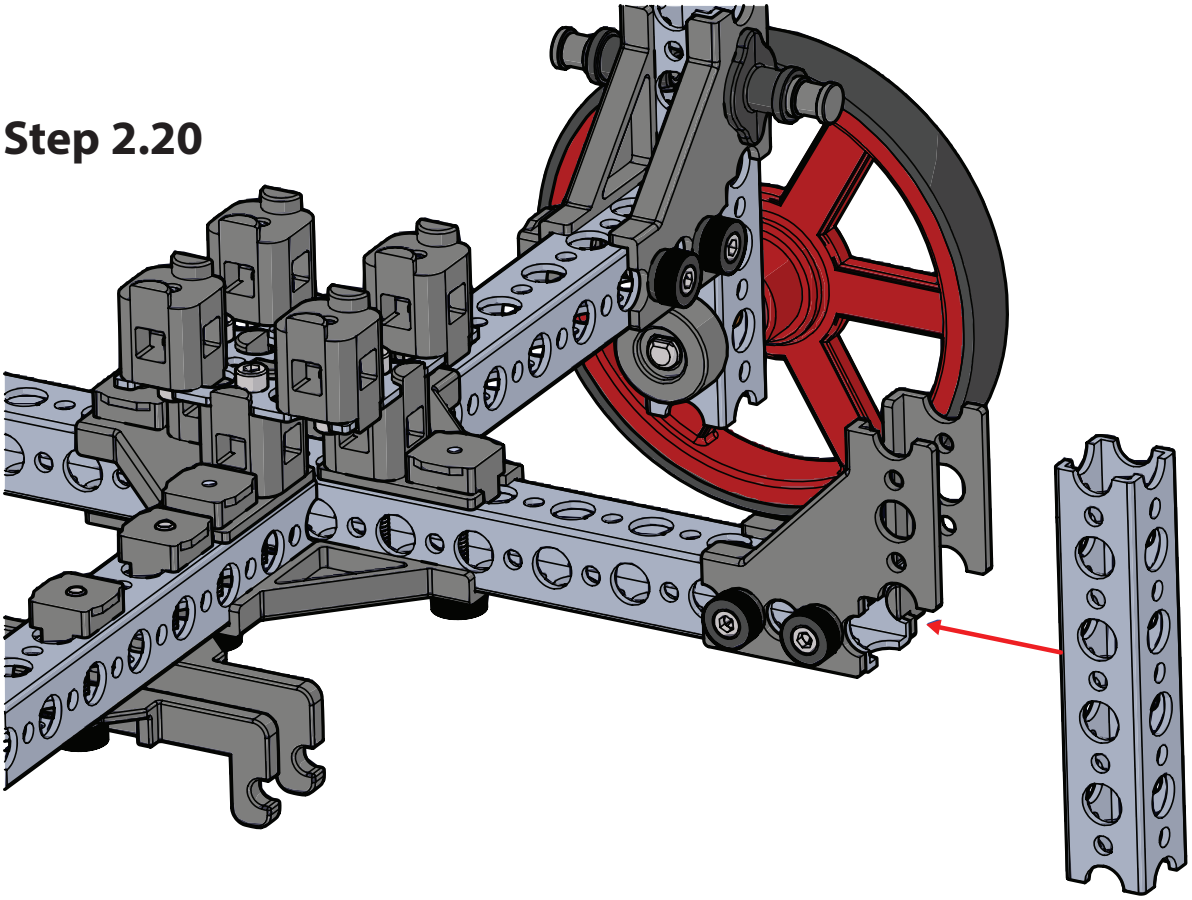
Step 2.18



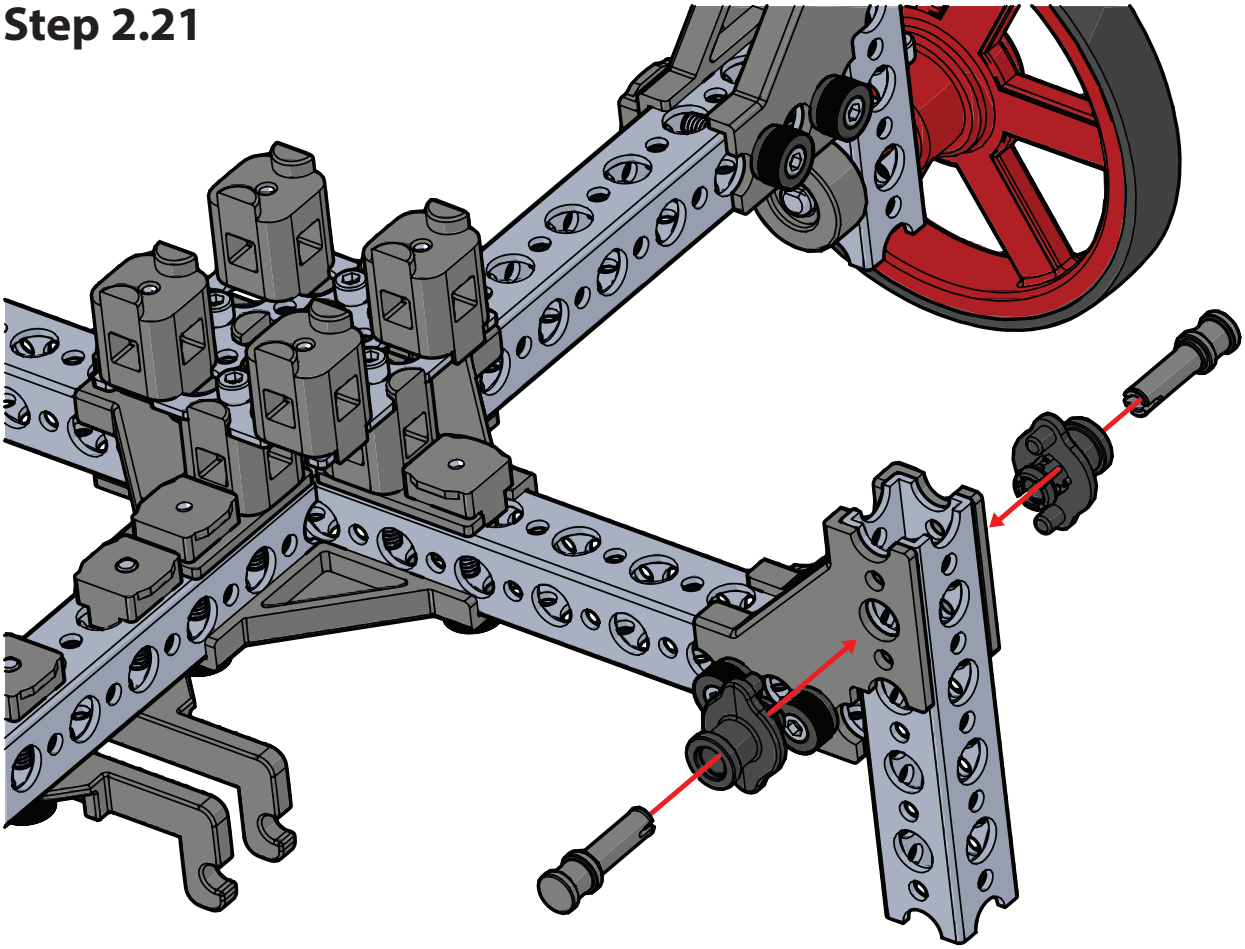
Step 2.19



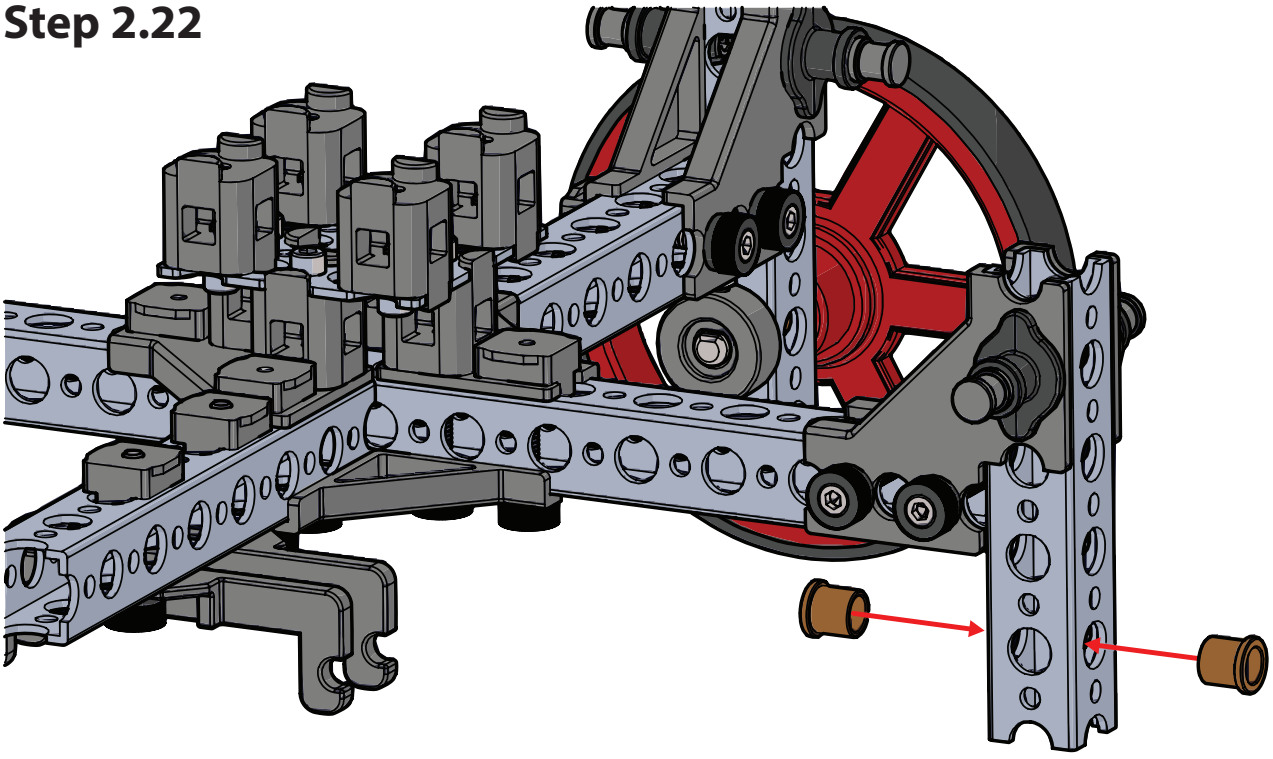
Step 2.20



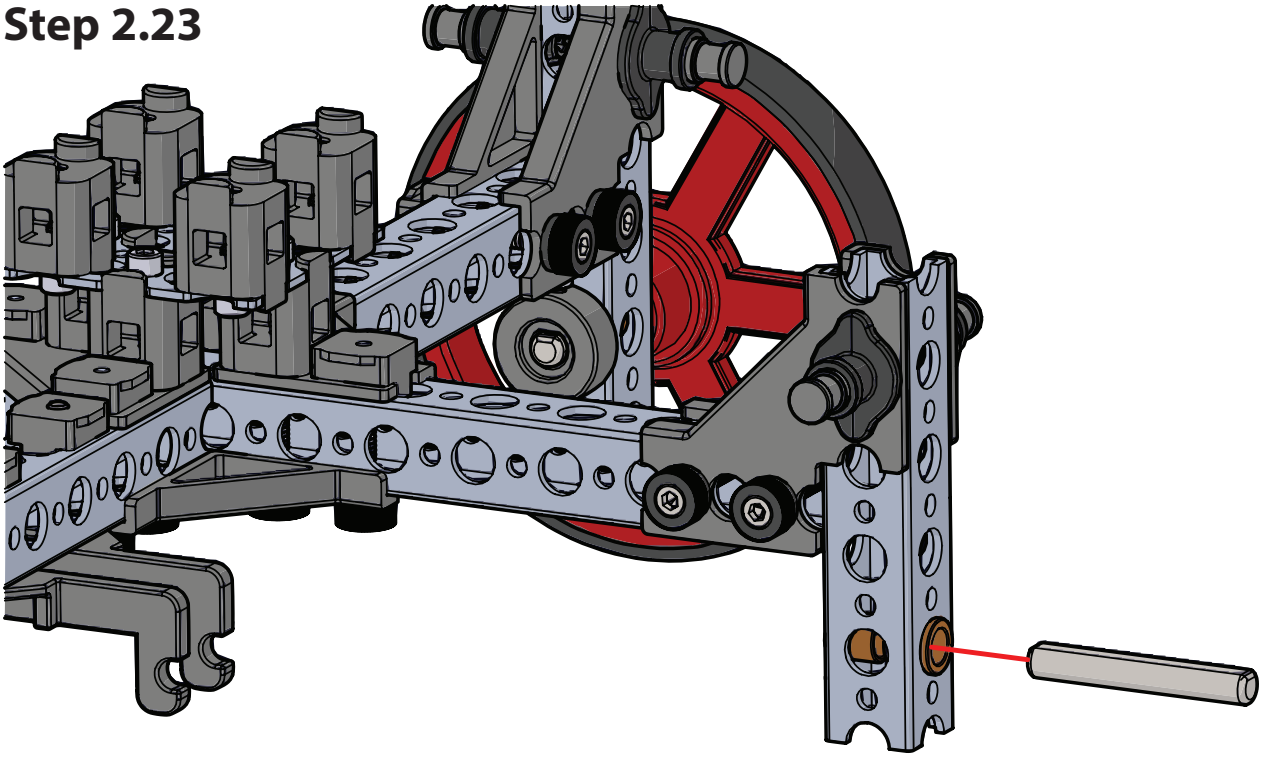
Step 2.21



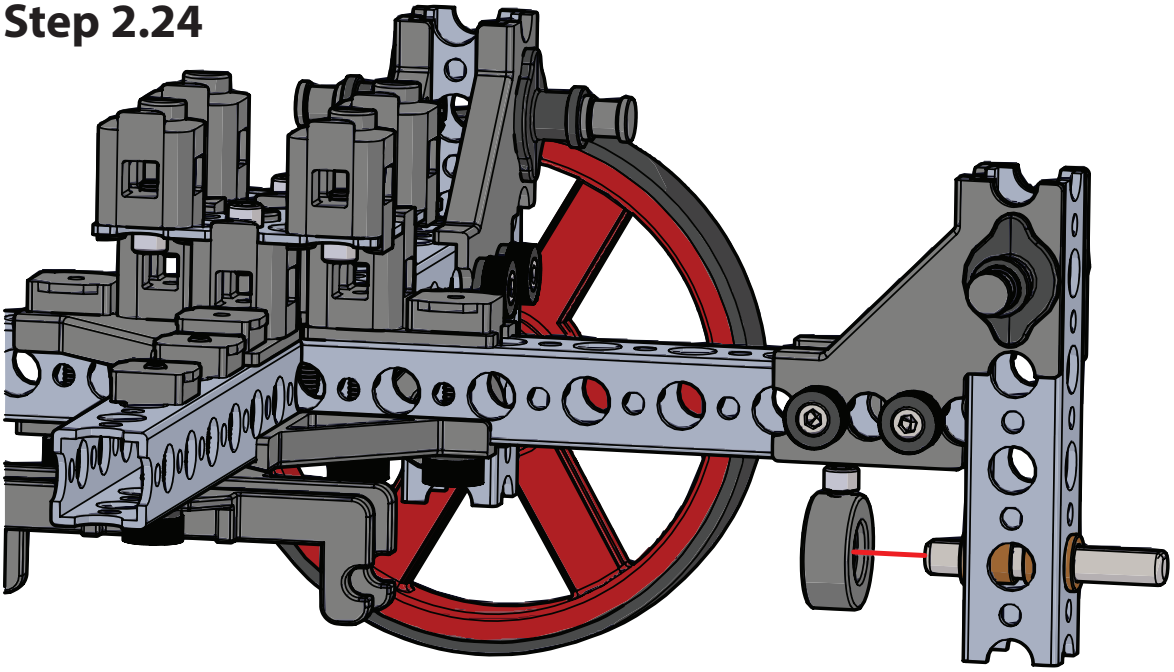
Step 2.22



Step 2.23

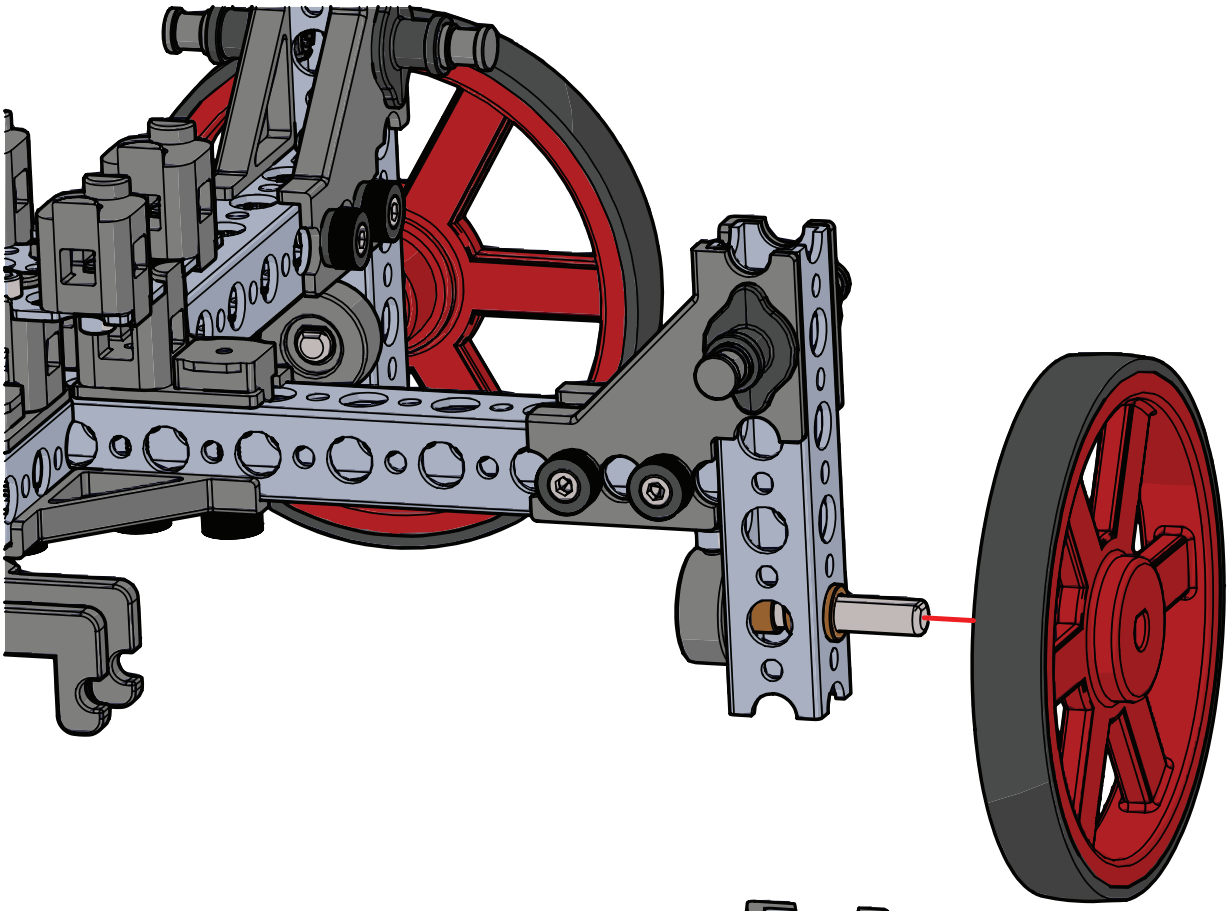


Step 2.24

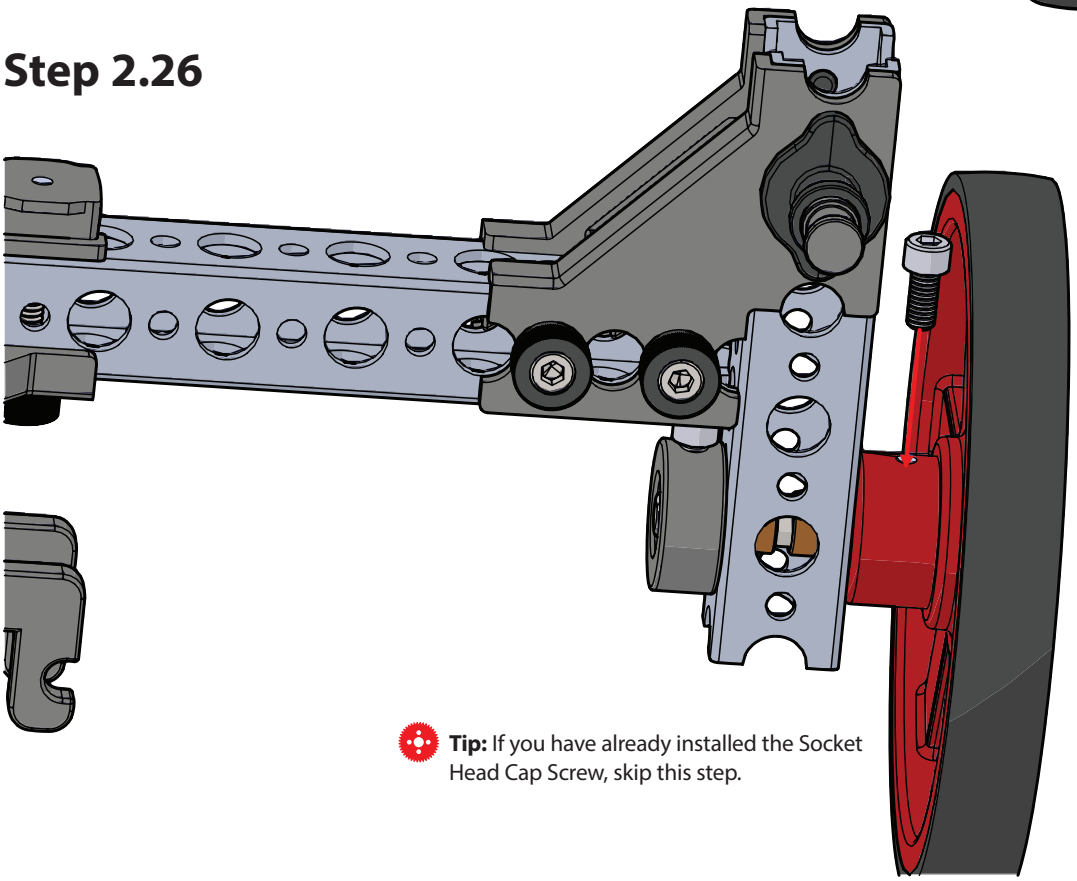


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.25

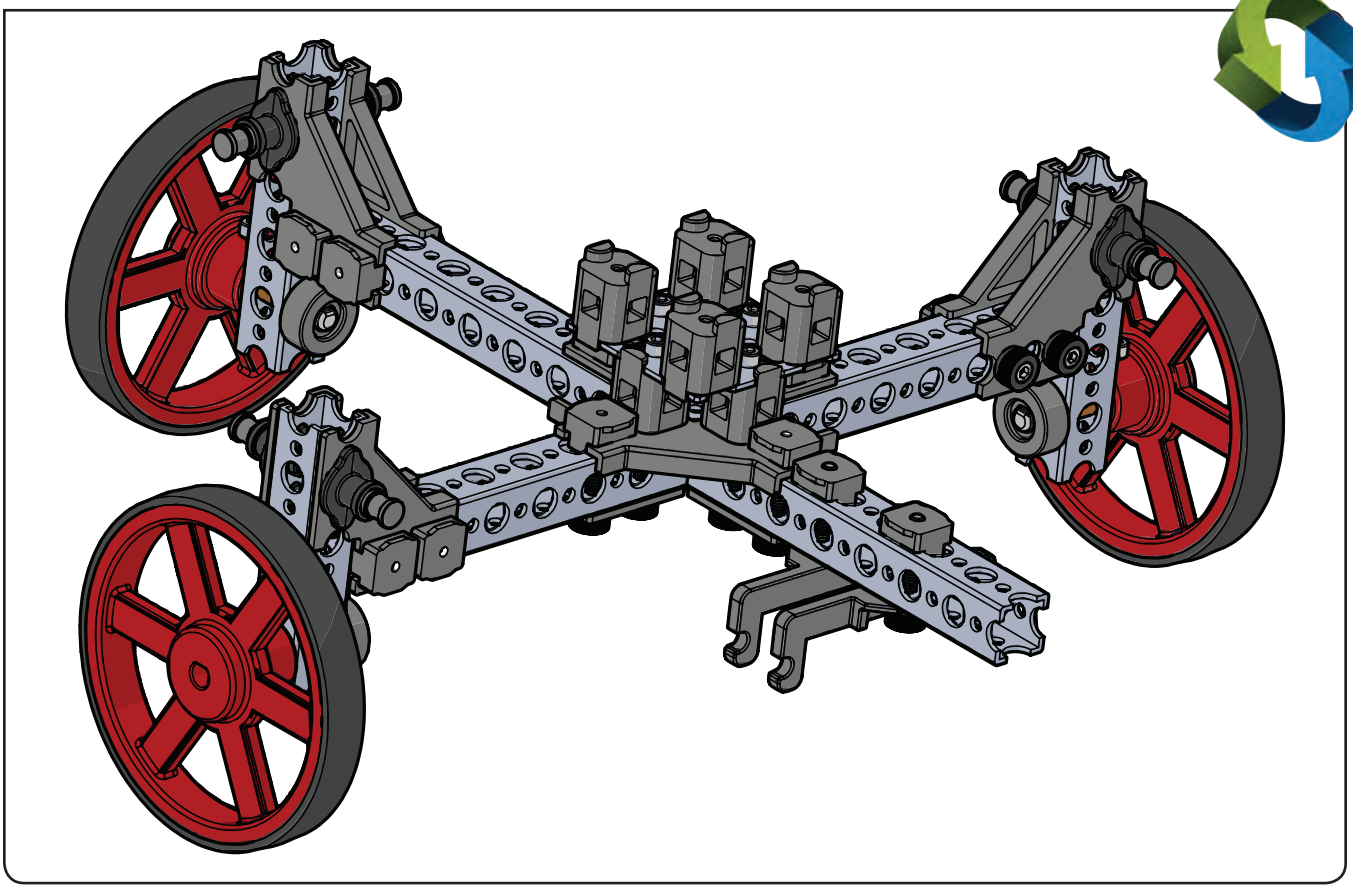


Step 2.26

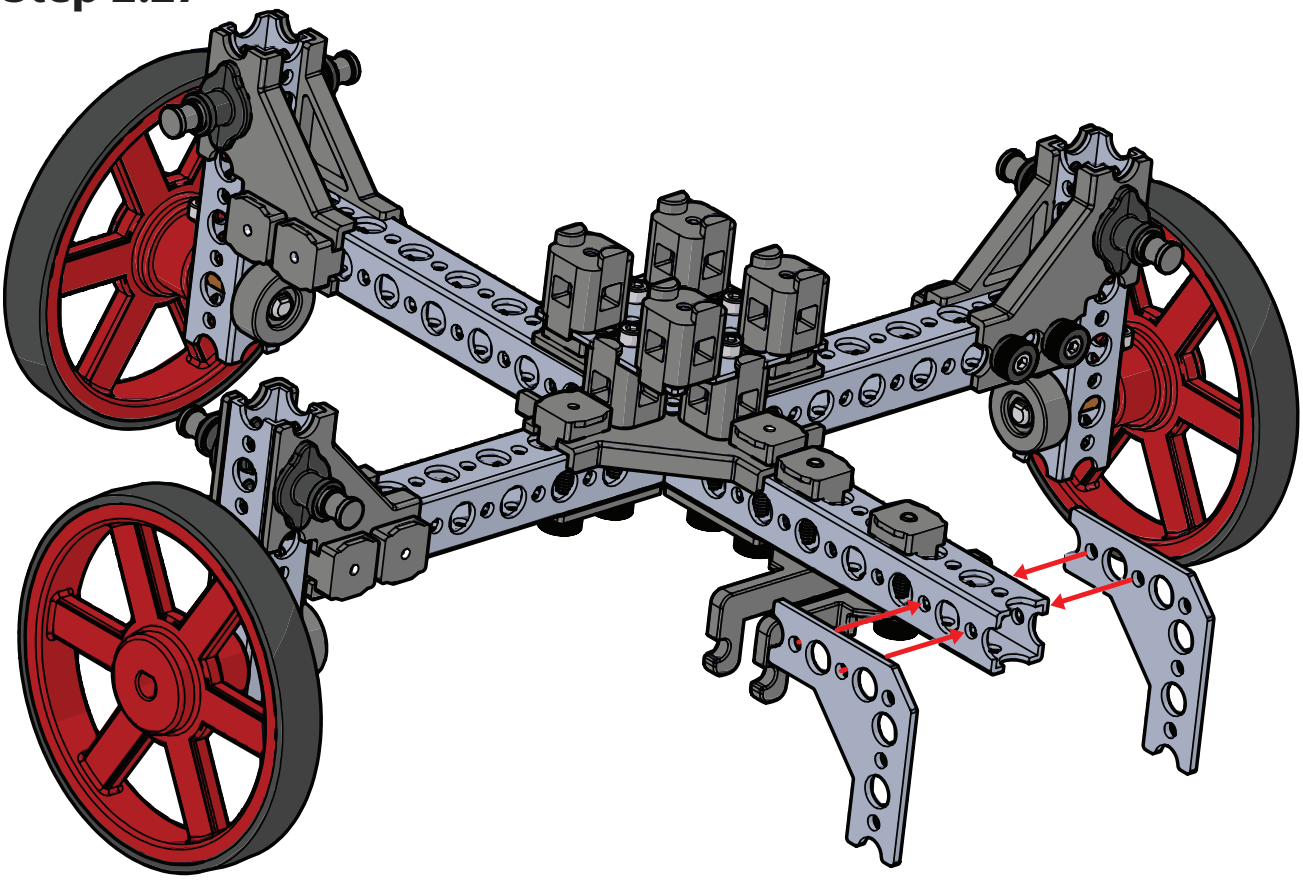


Tip: If you have already installed the Socket Head Cap Screw, skip this step.

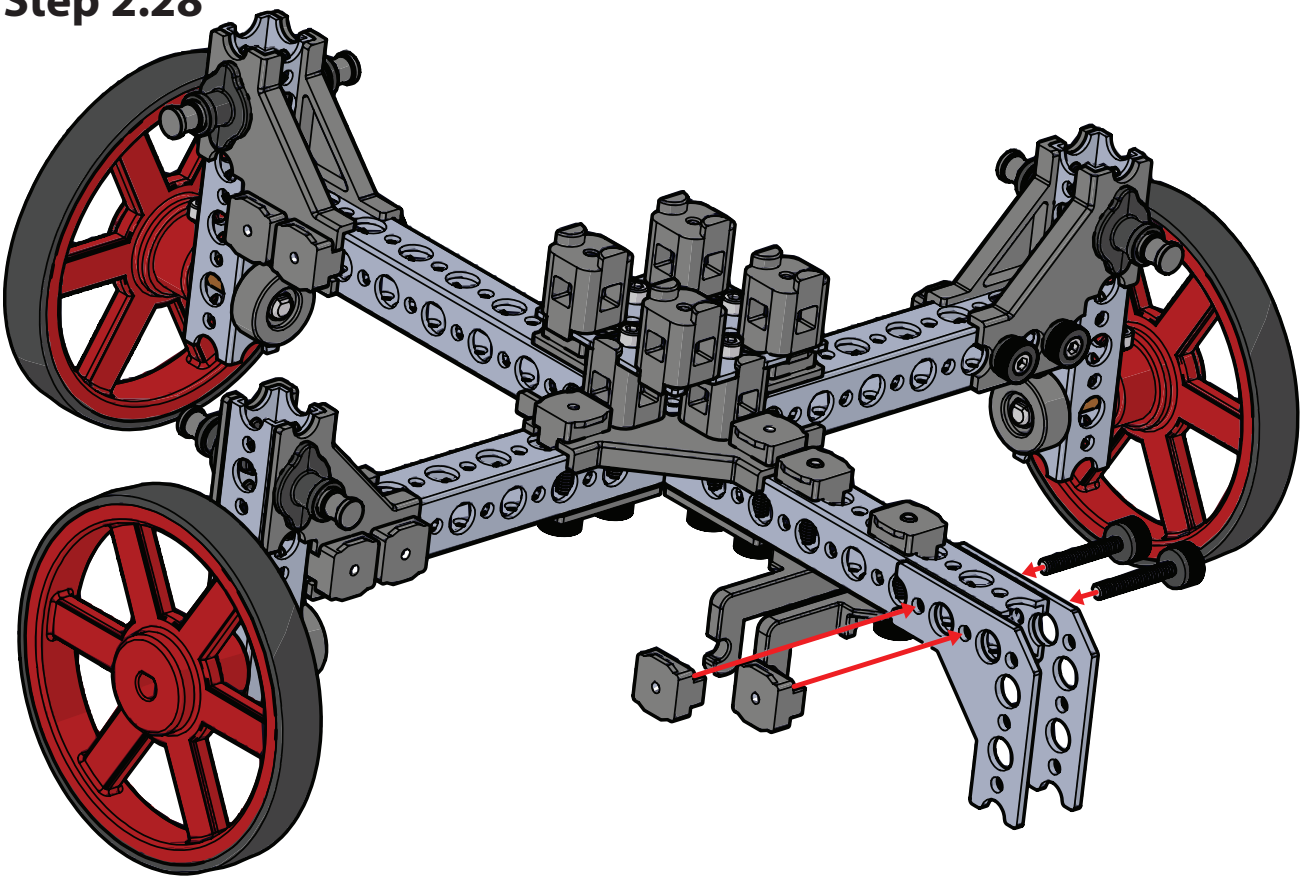
Rotate build to match this view.



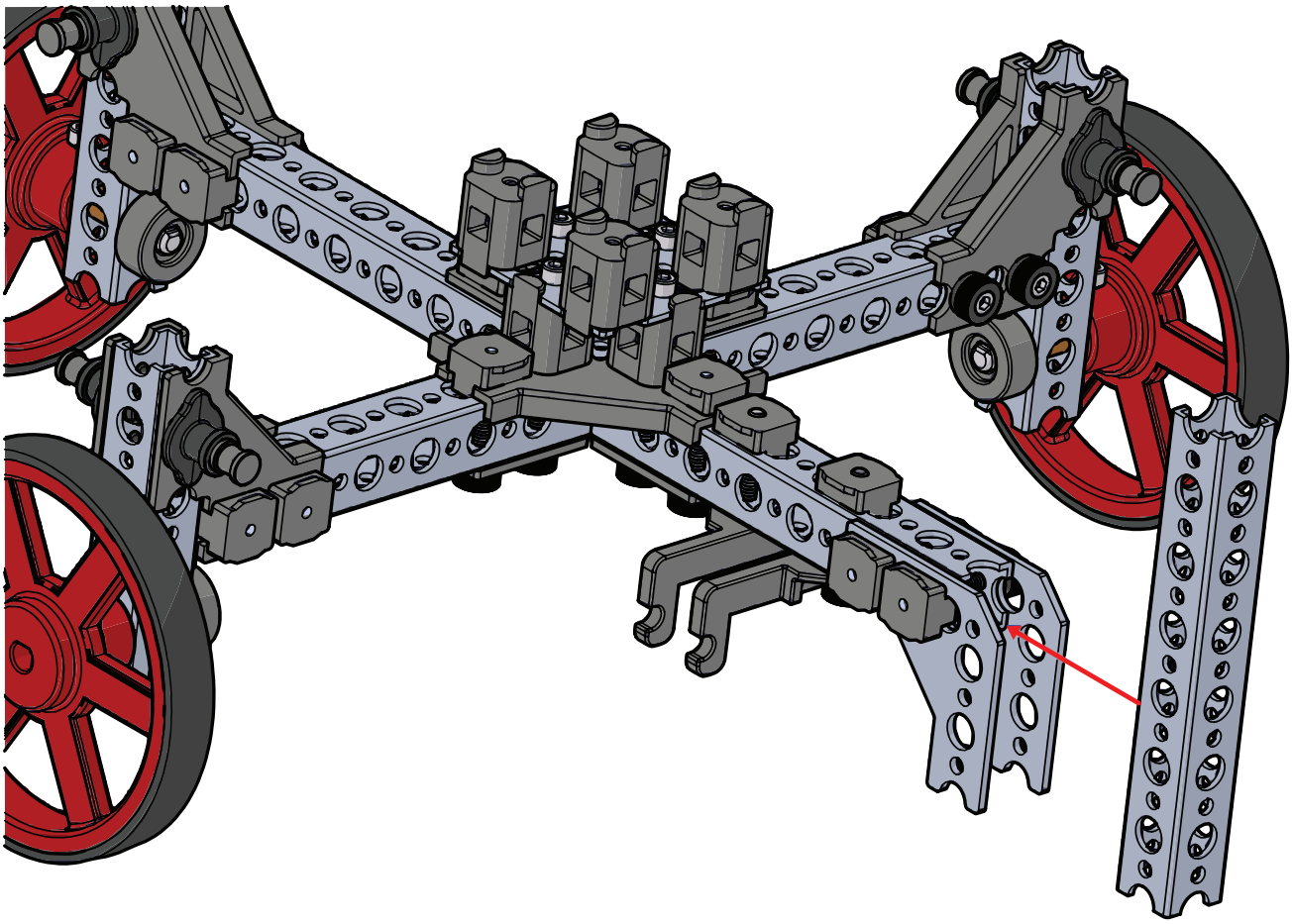
Step 2.27



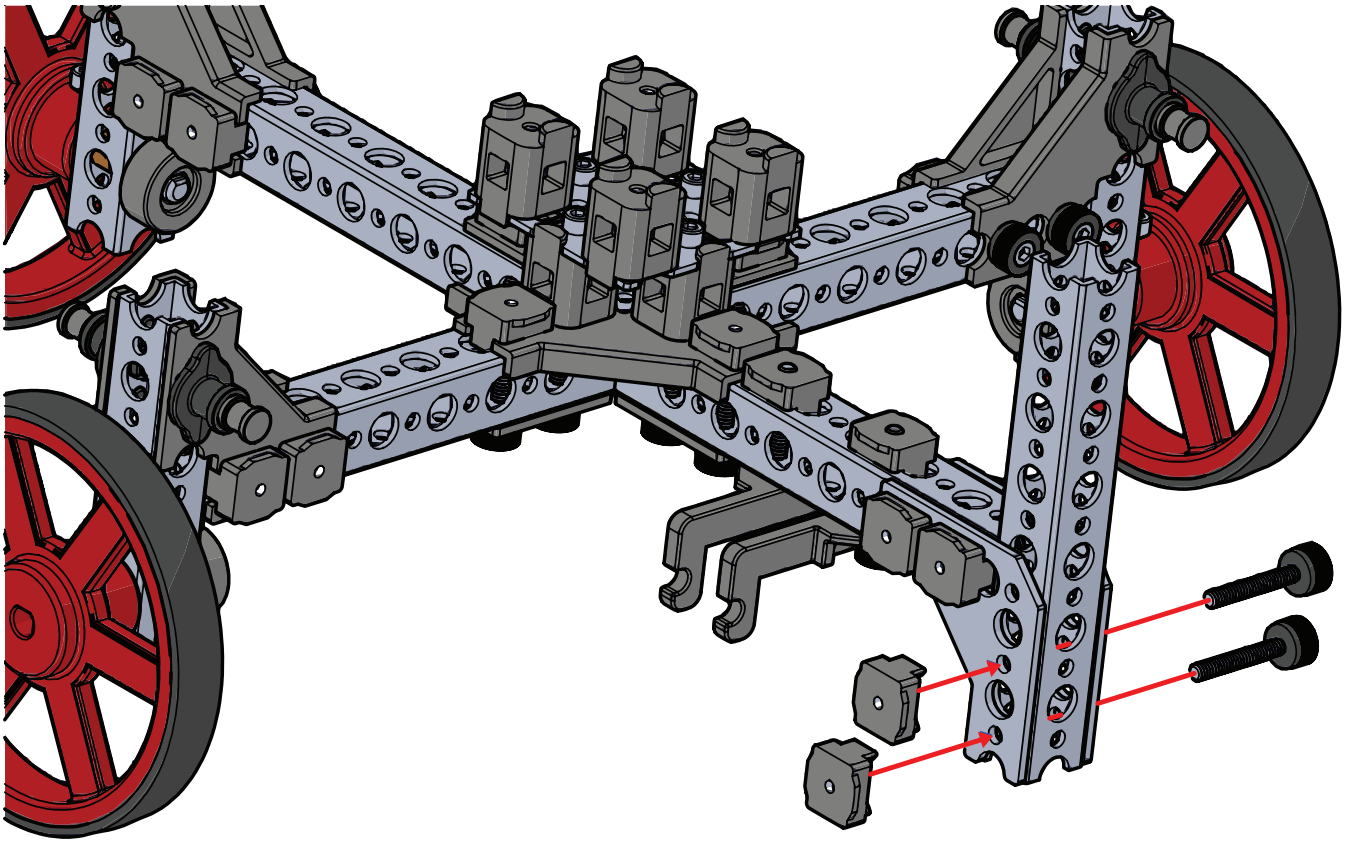
Step 2.28



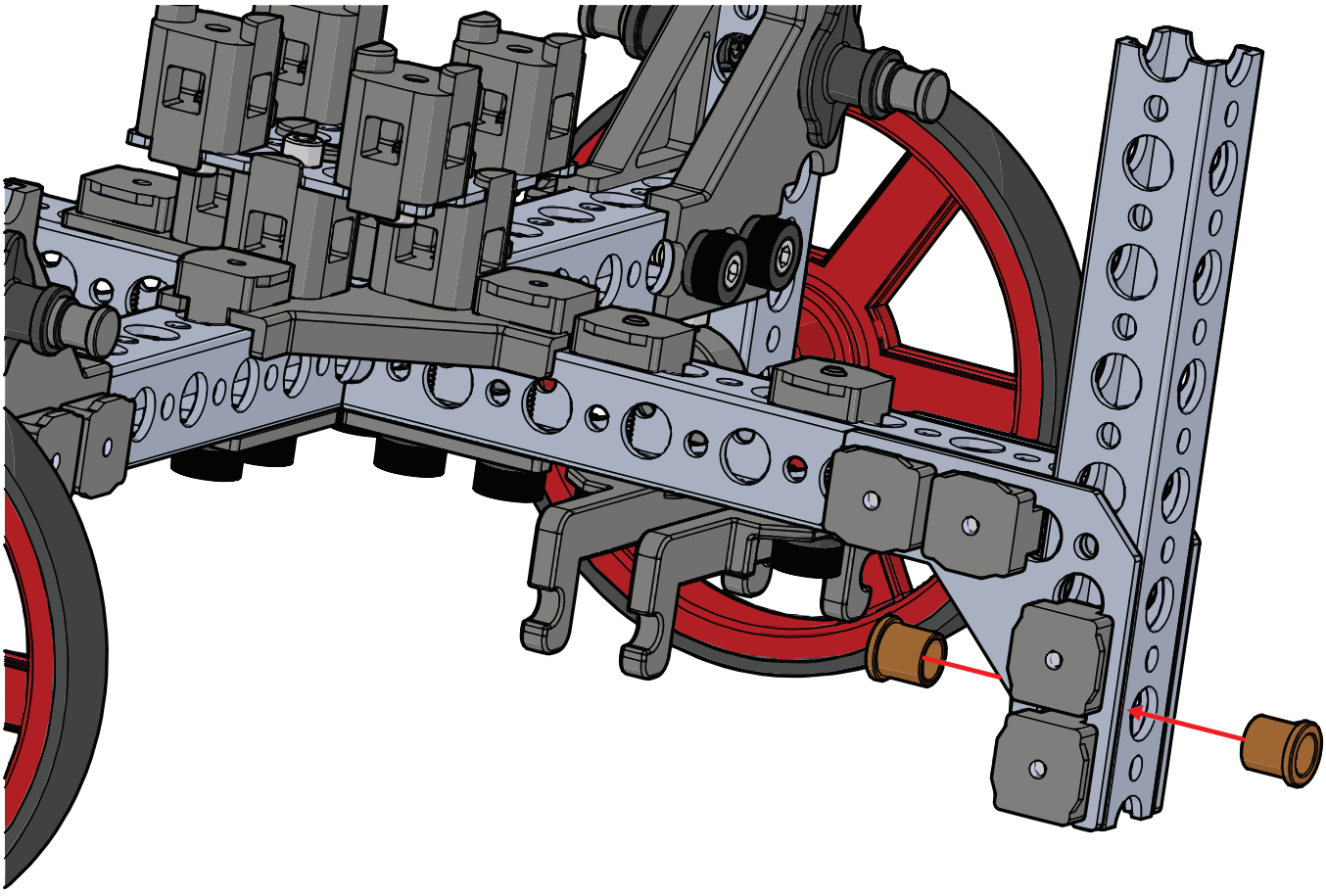
Step 2.29



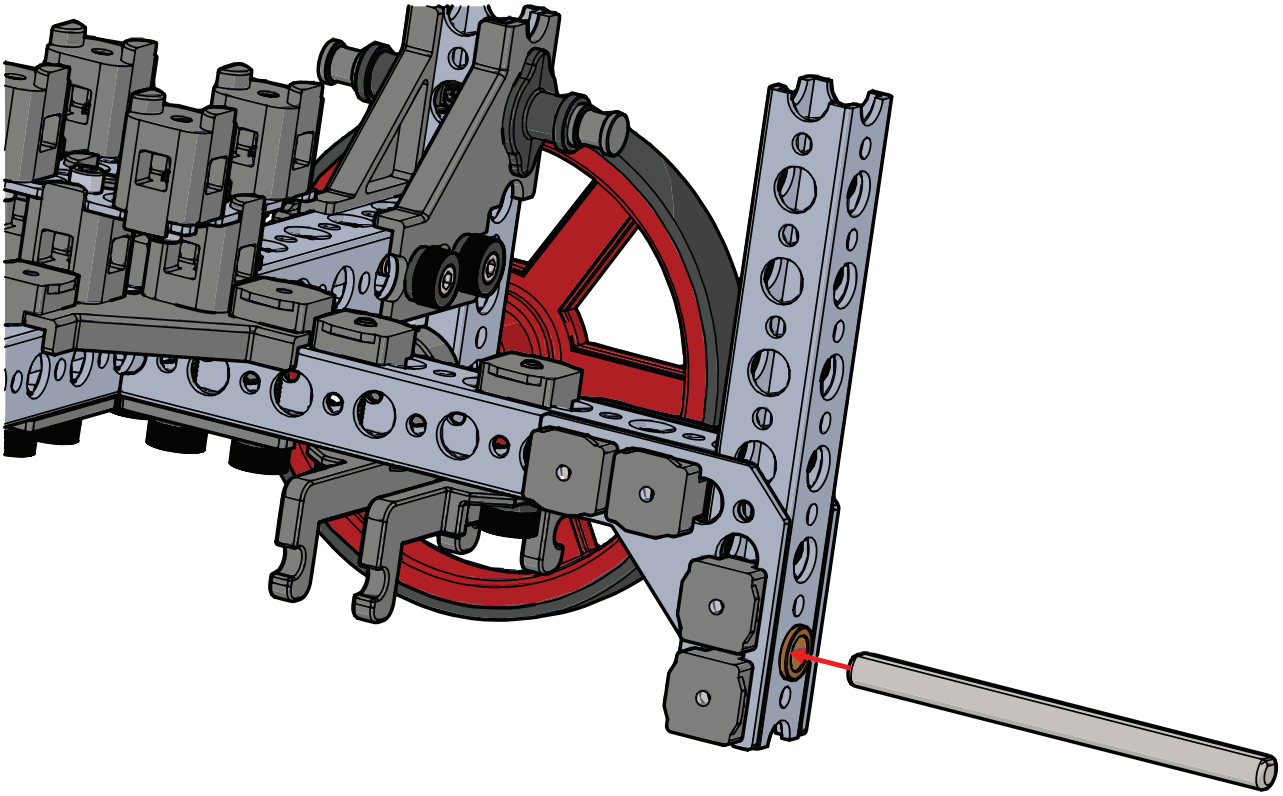
Step 2.30



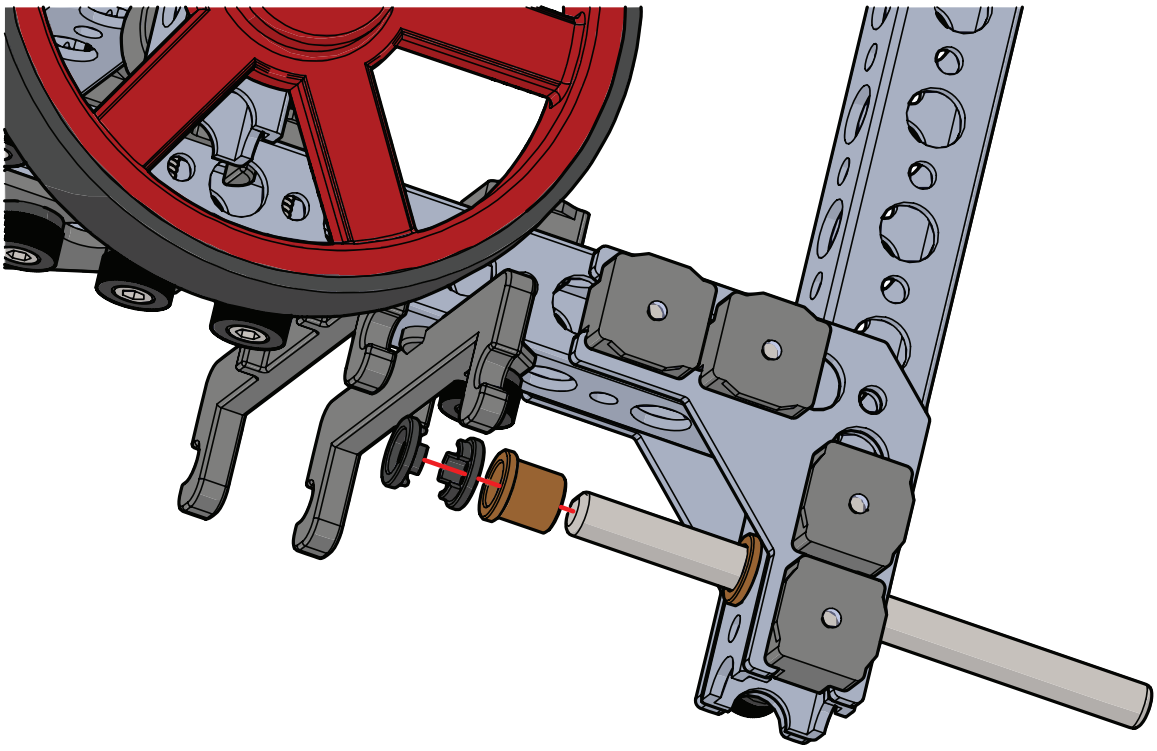
Step 2.31



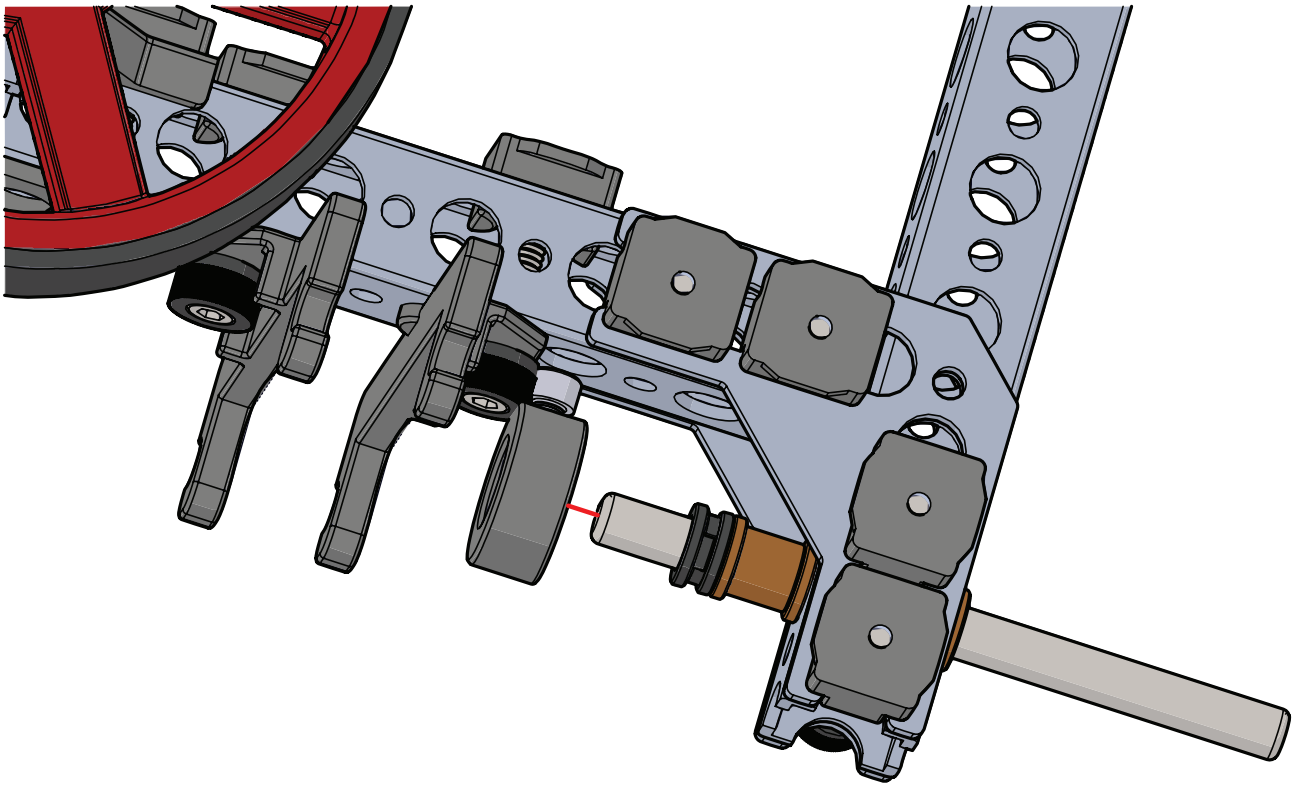
Step 2.32



Step 2.33

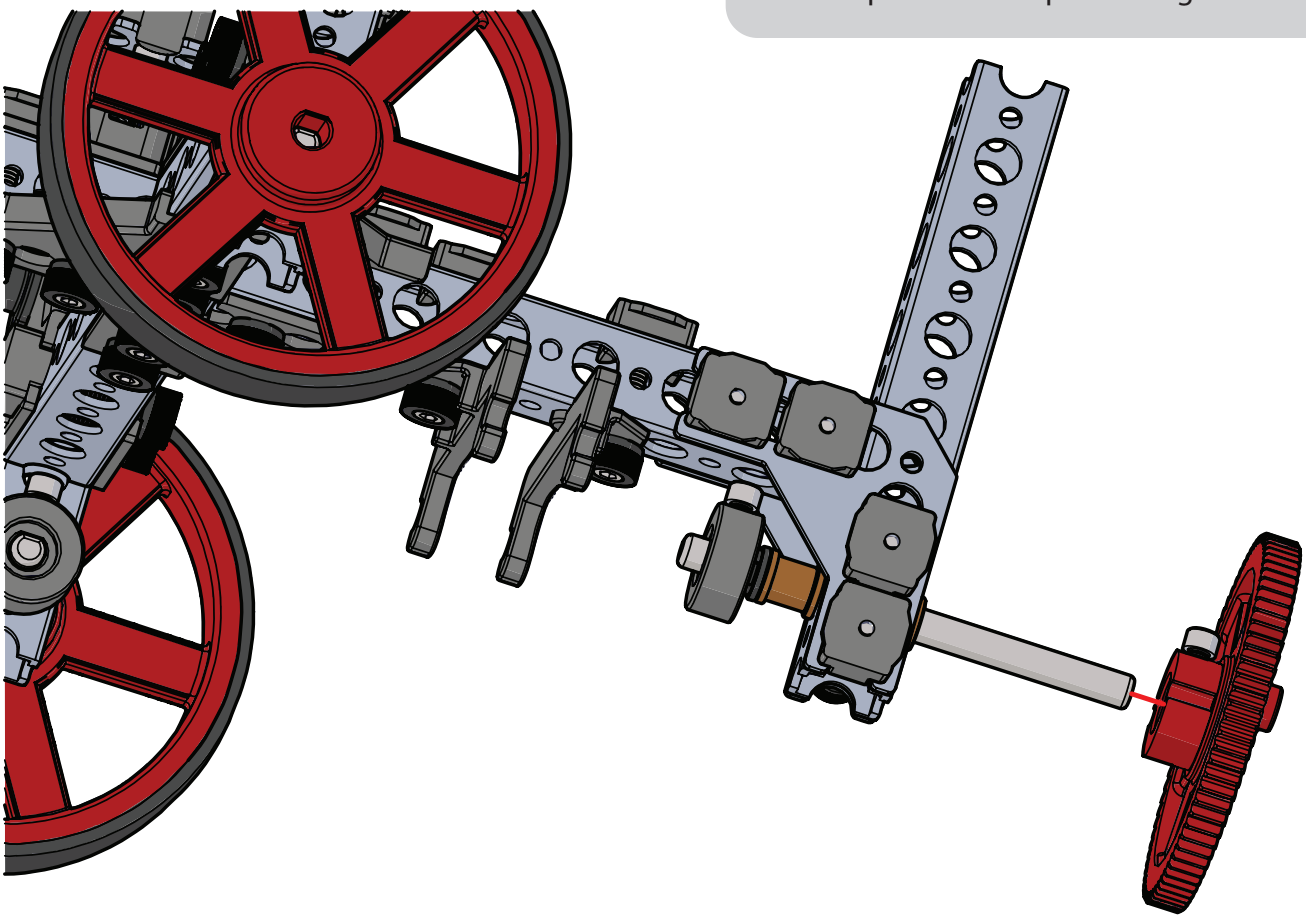


Step 2.34



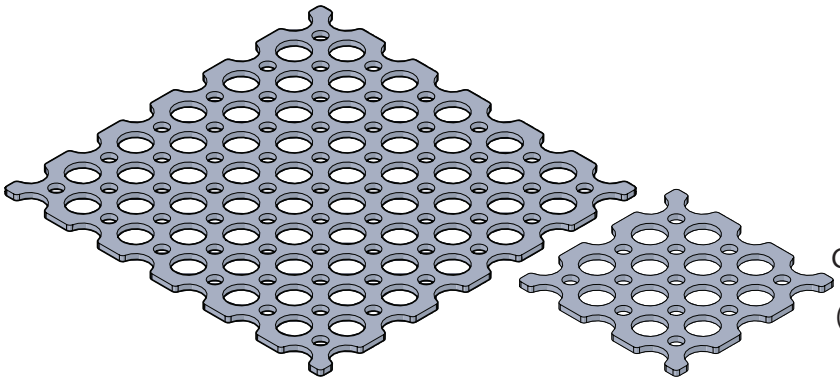
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 2.35



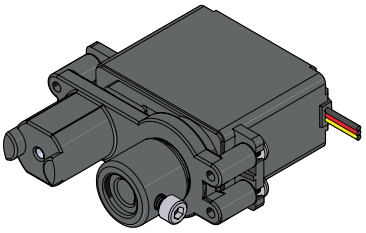
Step 3

Parts Needed



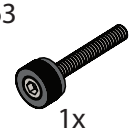
1x
6 x 6 Hole Plate
41263

1x
3 x 3 Hole Plate
41257



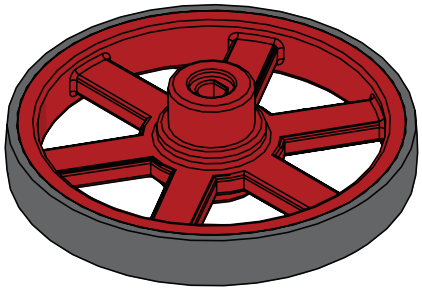
1x
Continuous Rotation Servo Motor 40379
with Servo Mounting Bracket 40232
(Assembly instructions on pages 18-19.)

1x
Wing Nut
40221

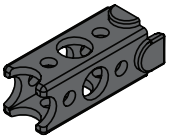


1x
Thumbscrew
40323

13x
Socket Head Cap
Screw 40516

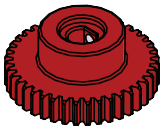


1x
Wheel with Tire (90 mm) 40222

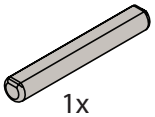


4x
Beam End
Connector 40214

4x
16 mm Anchor
Block 41267



1x
40-Tooth Plastic
Gear 40223

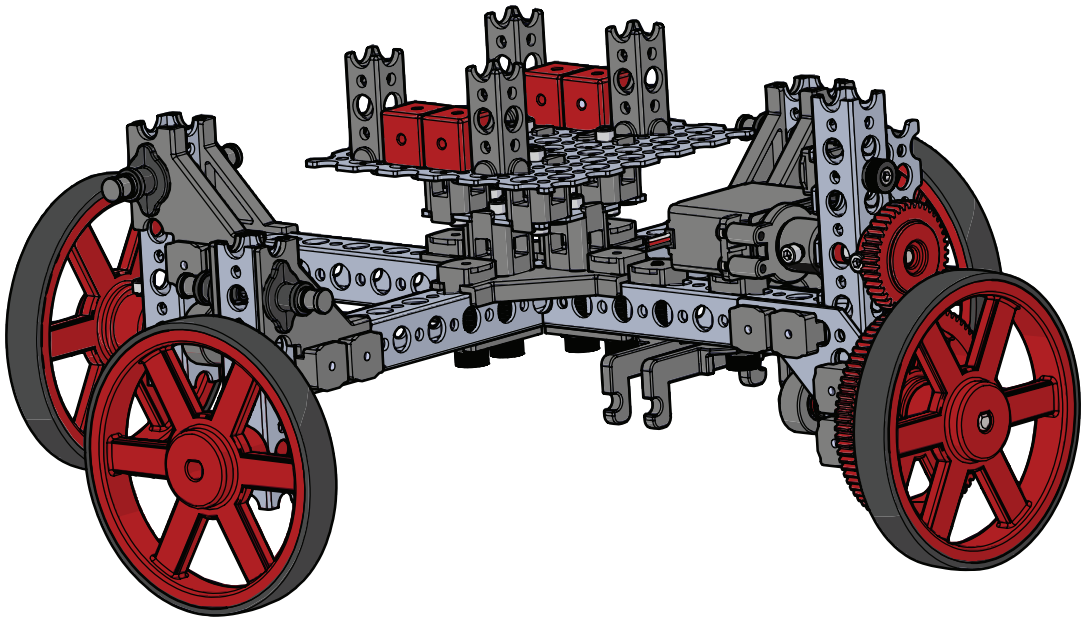


1x
40 mm Steel Axle
40226

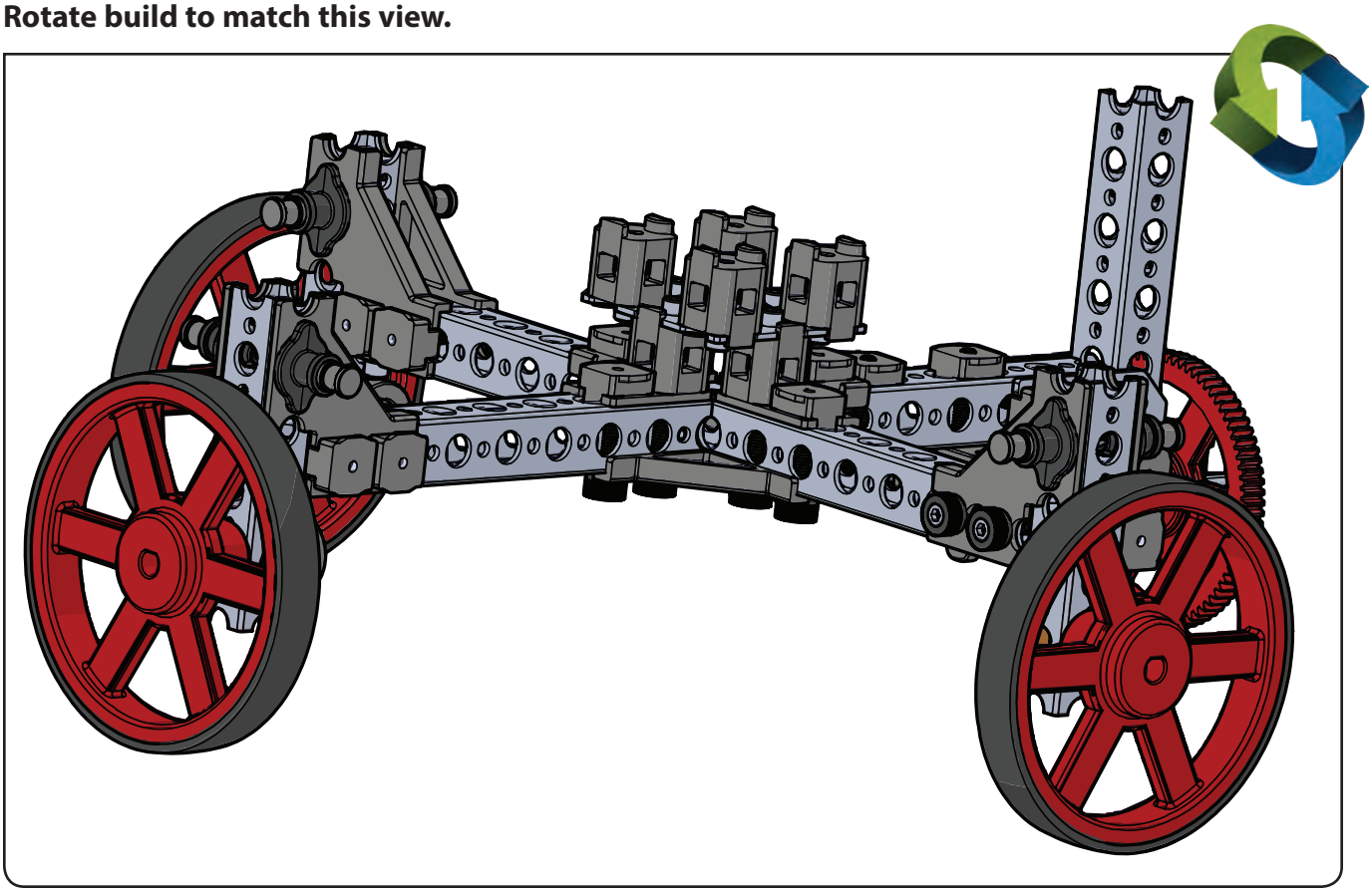
2x
8 mm x 6 mm
Bronze Bushing
40227

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

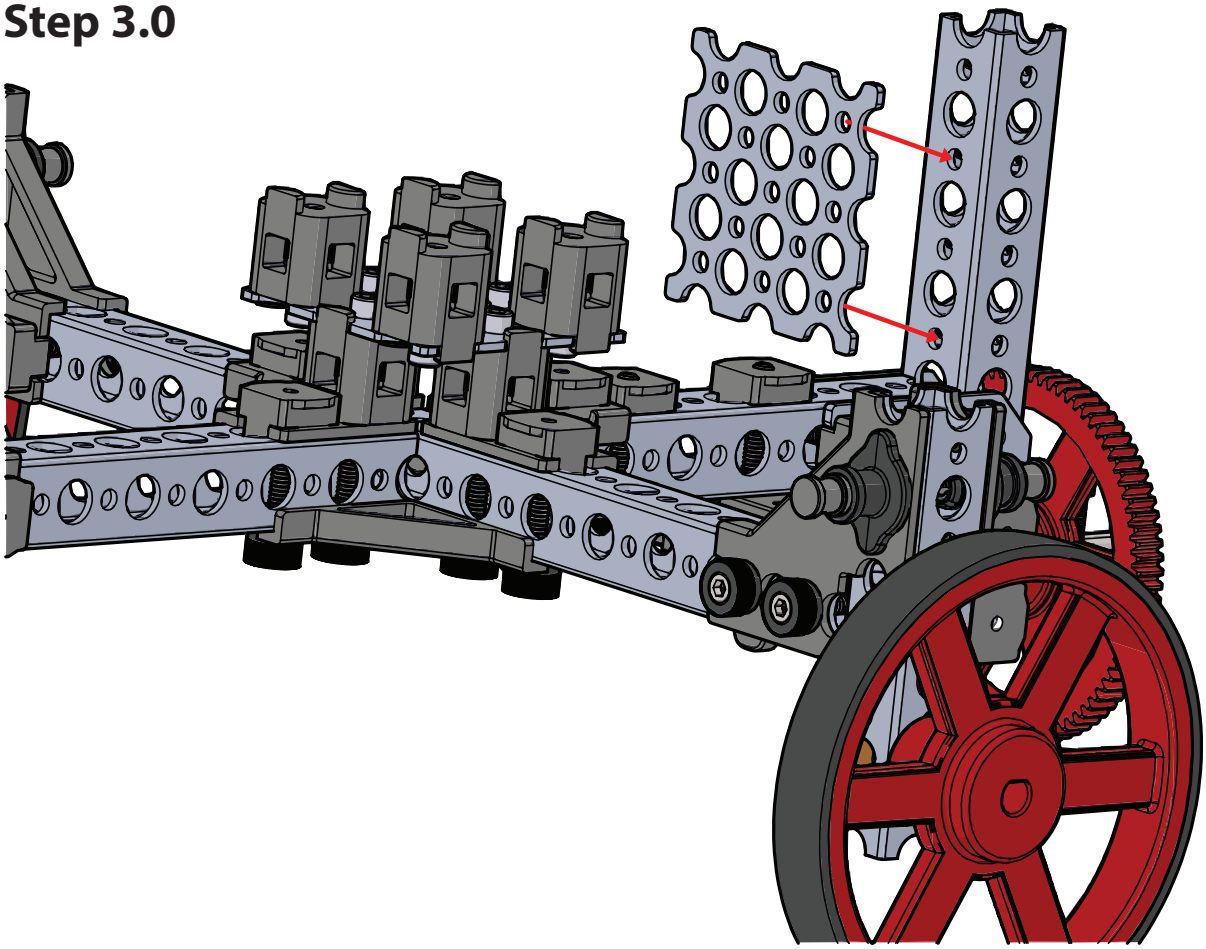
Partial assembly should look like this.



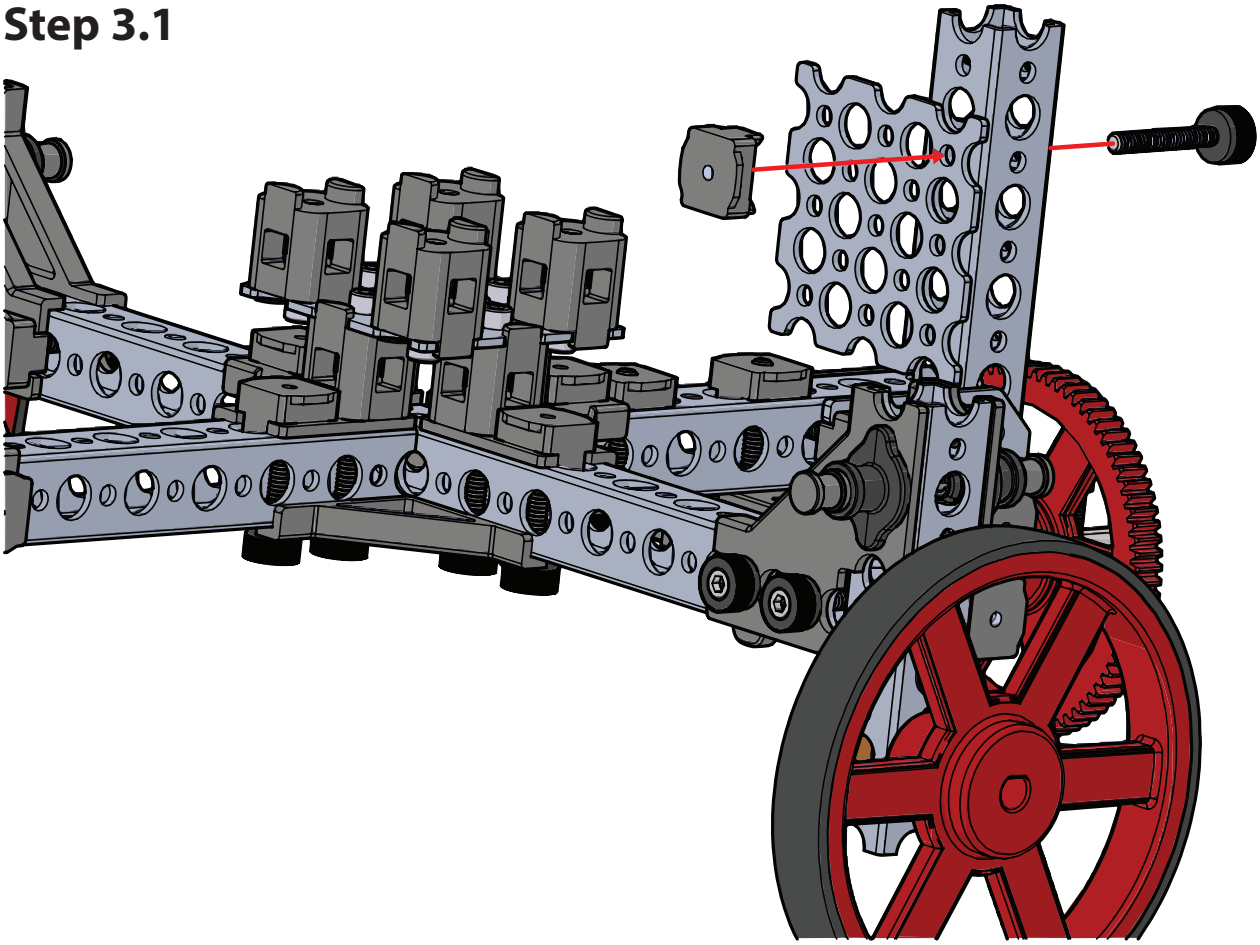
Rotate build to match this view.



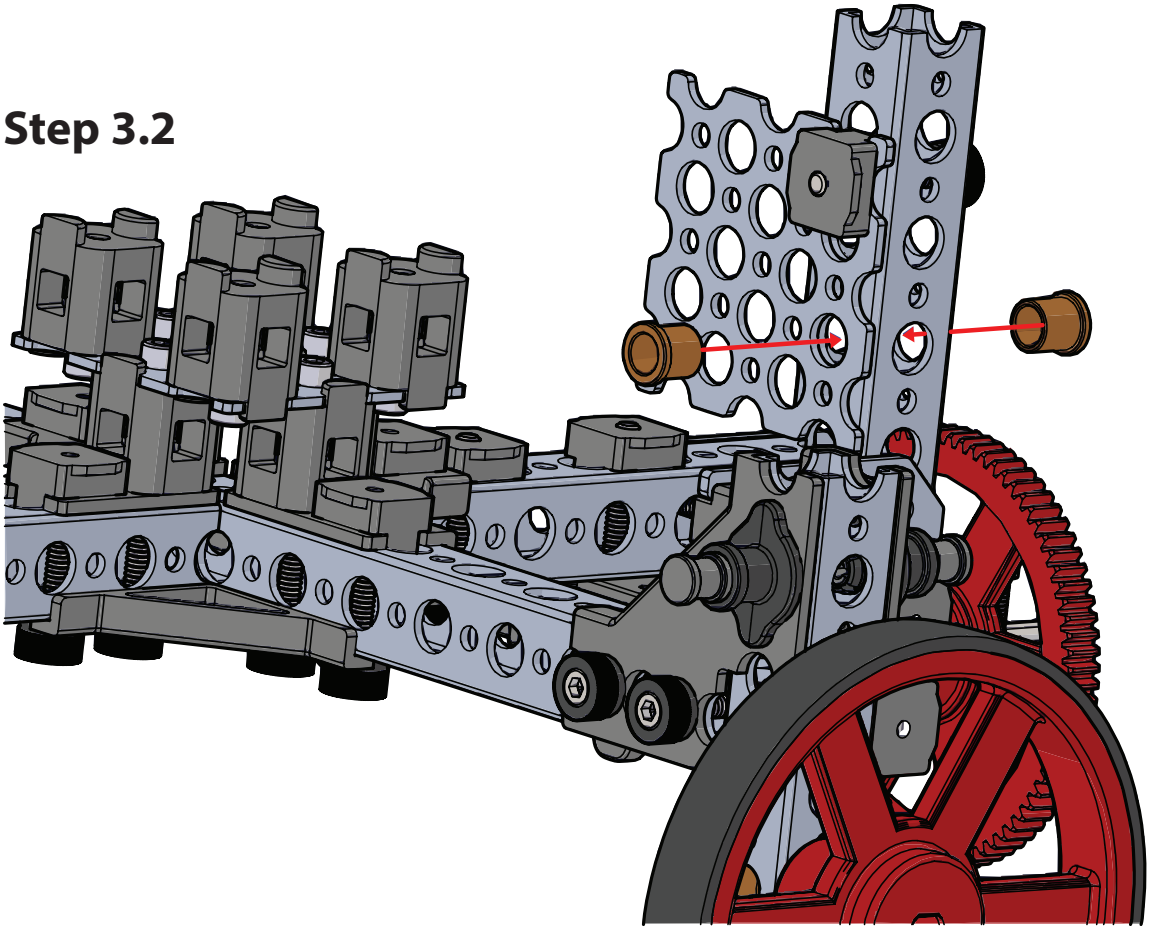
Step 3.0



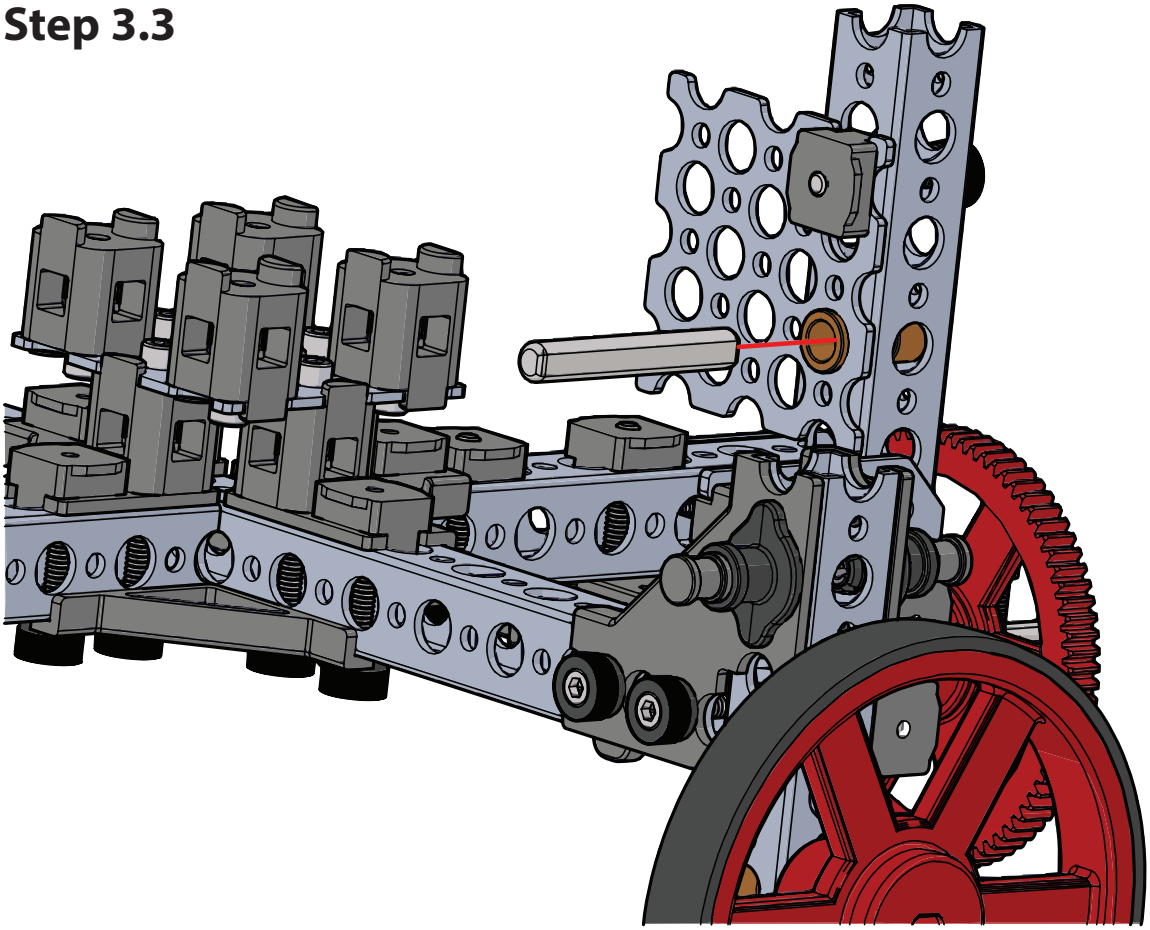
Step 3.1



Step 3.2

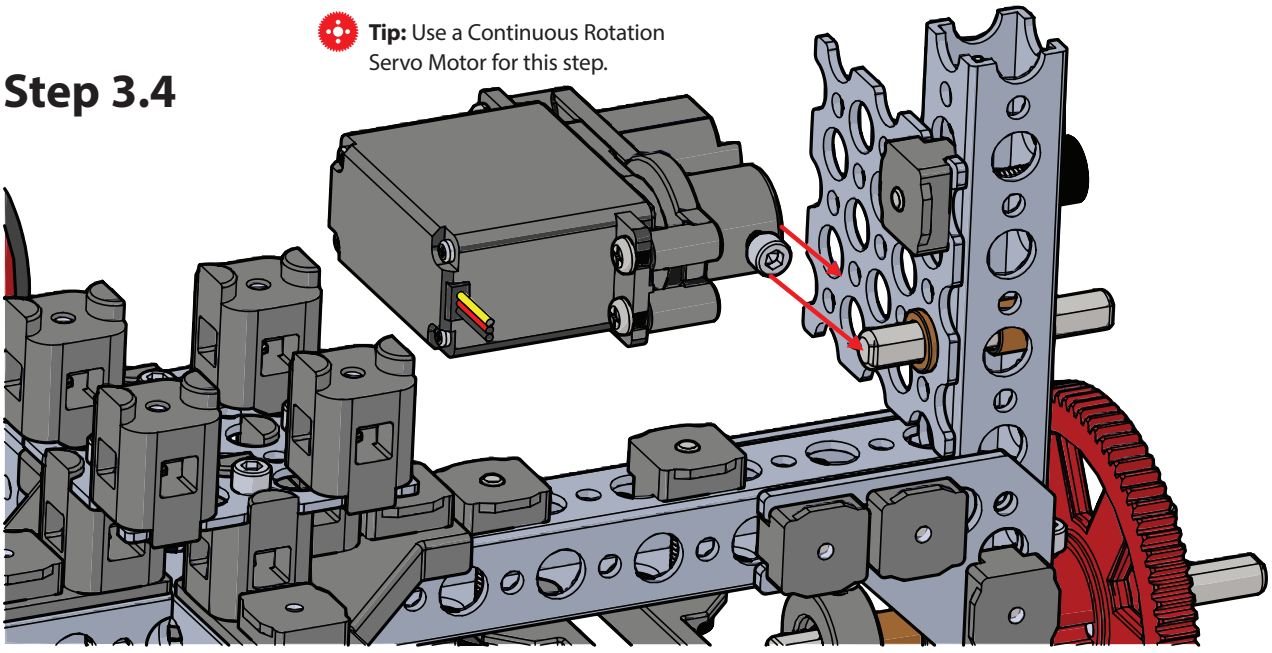


Step 3.3



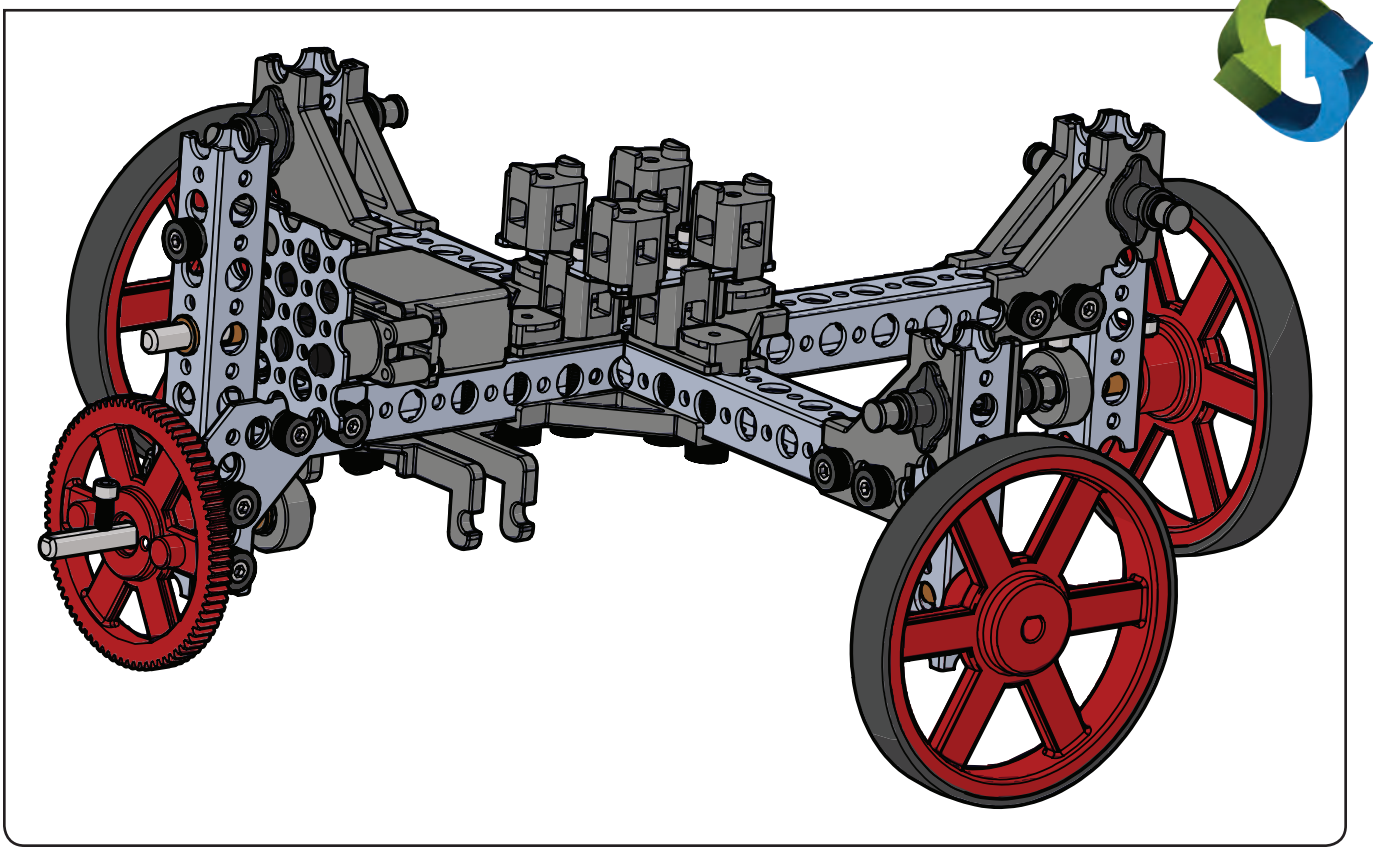
Step 3.4

Tip: Use a Continuous Rotation Servo Motor for this step.

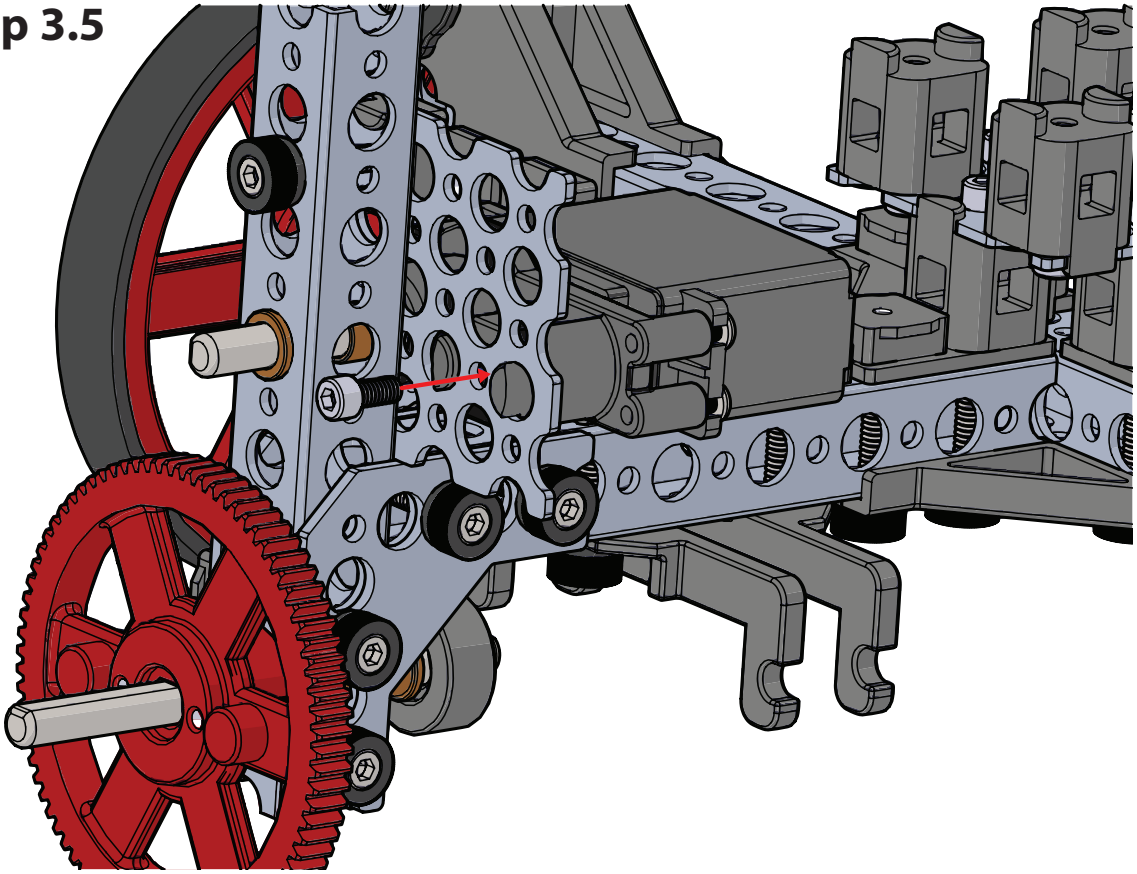


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

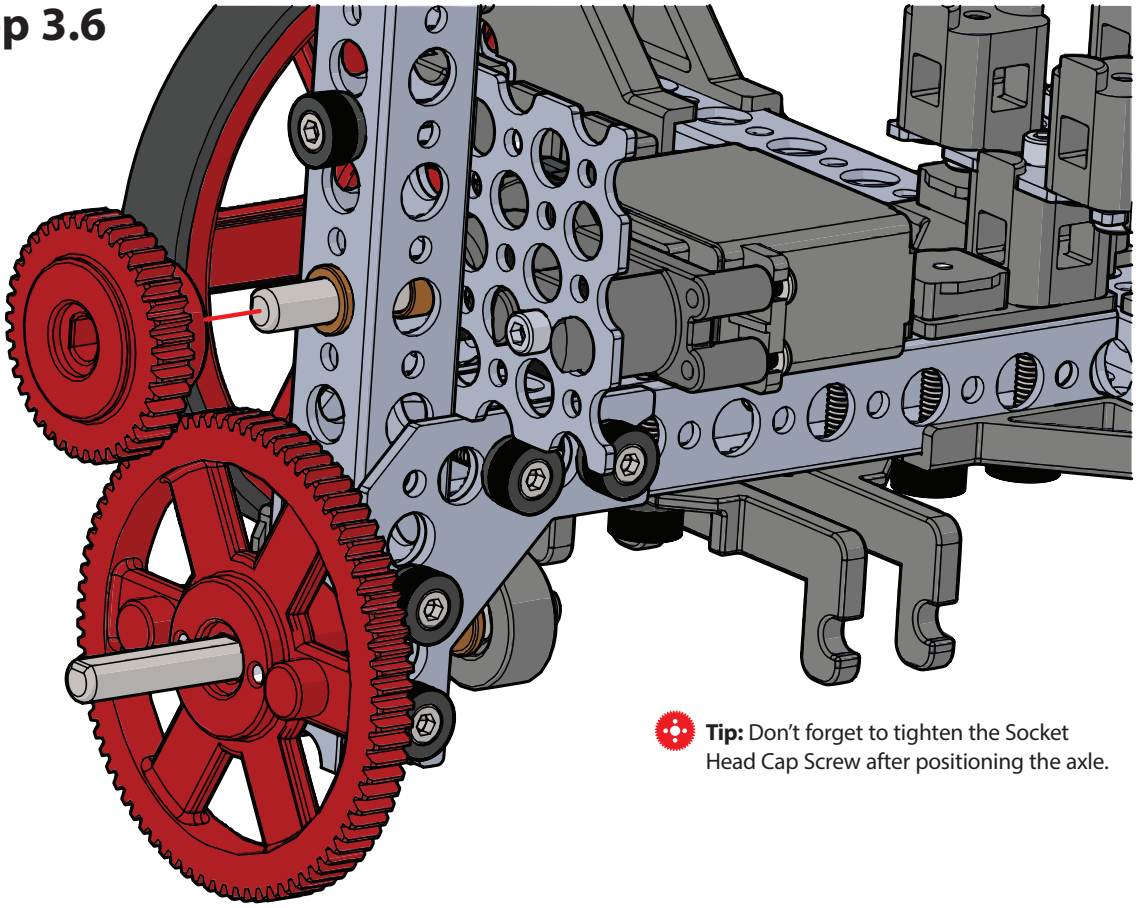
Rotate build to match this view.



Step 3.5

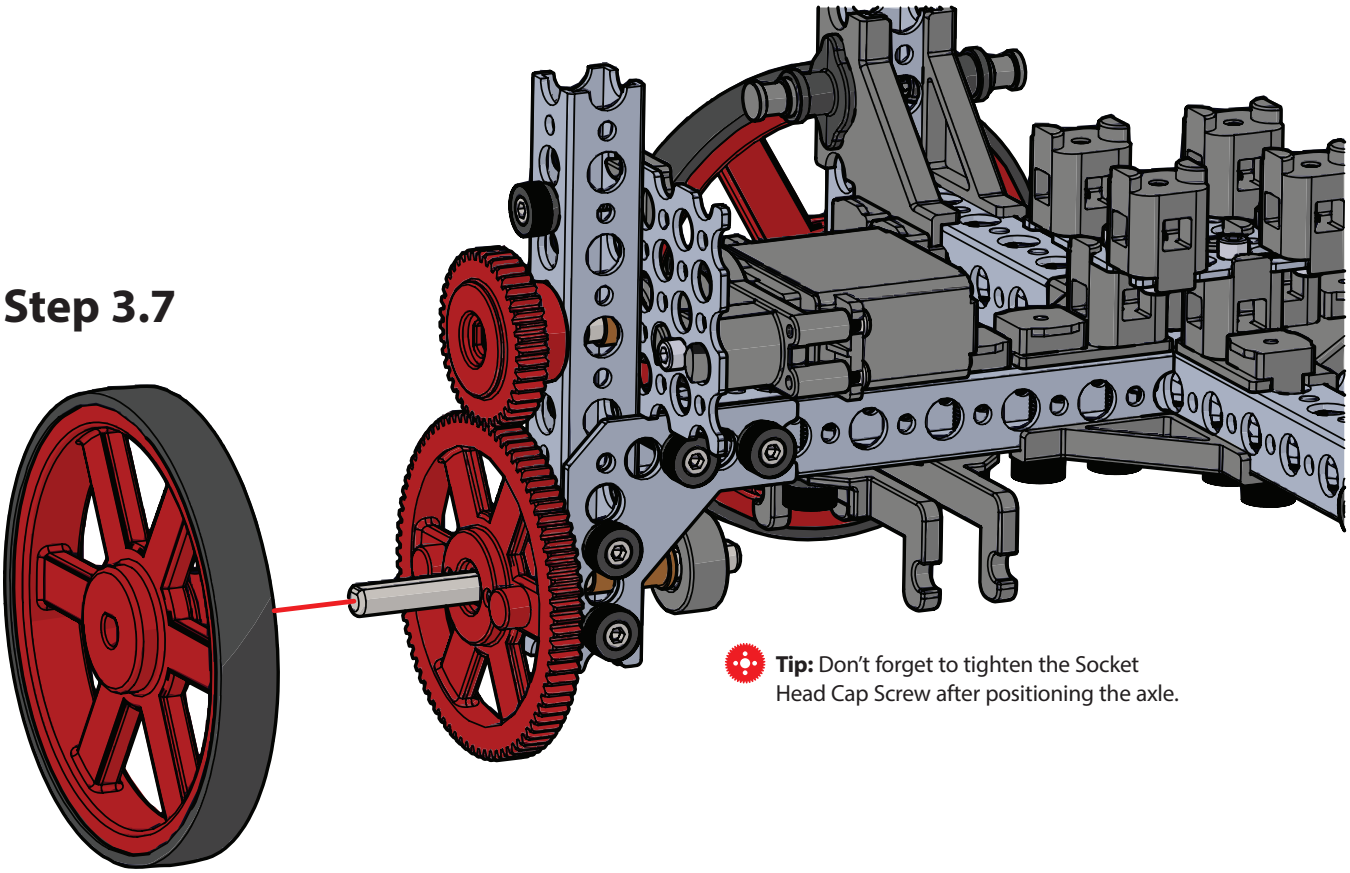


Step 3.6



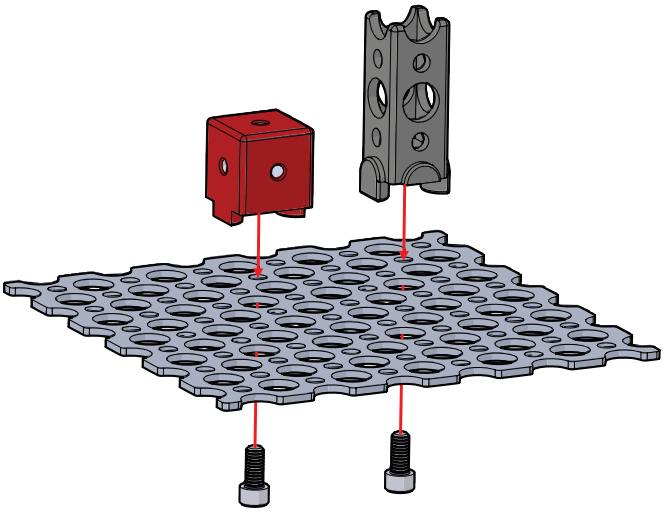
Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 3.7

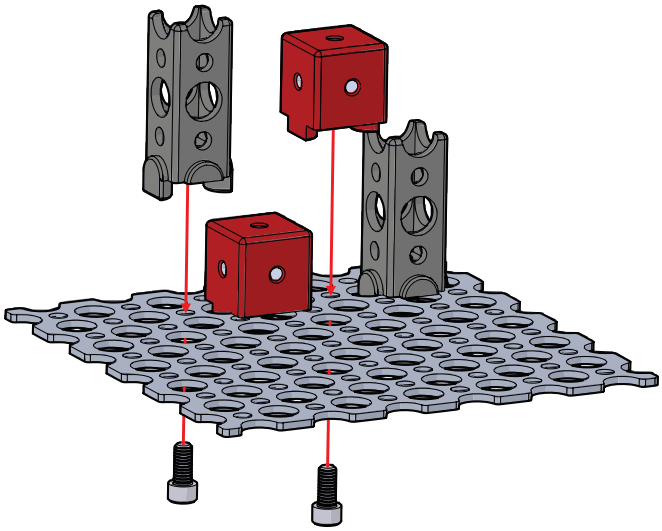


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

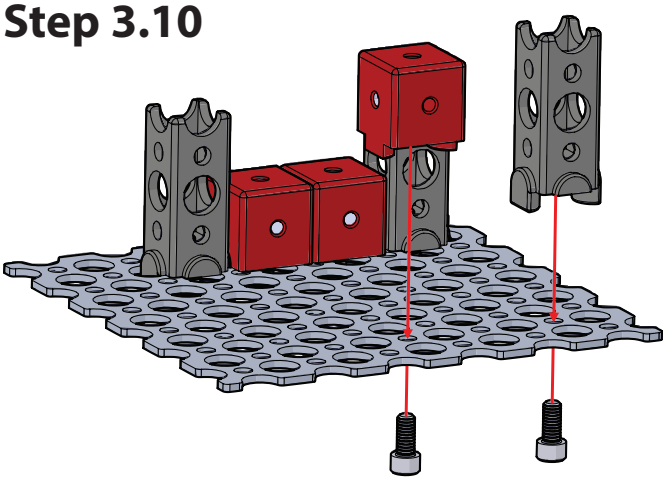
Step 3.8



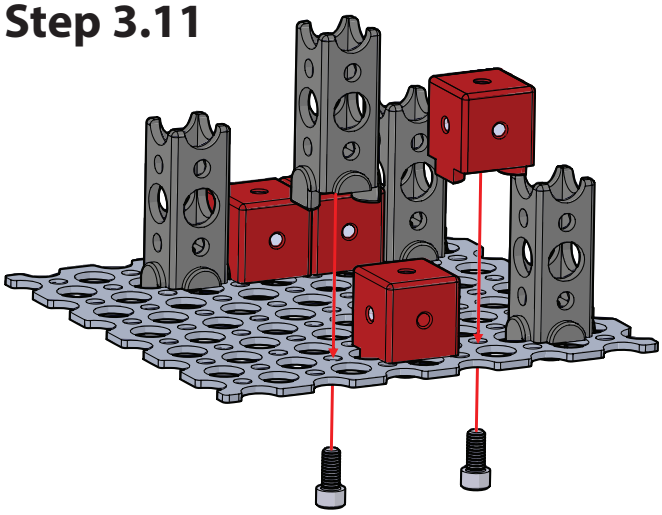
Step 3.9



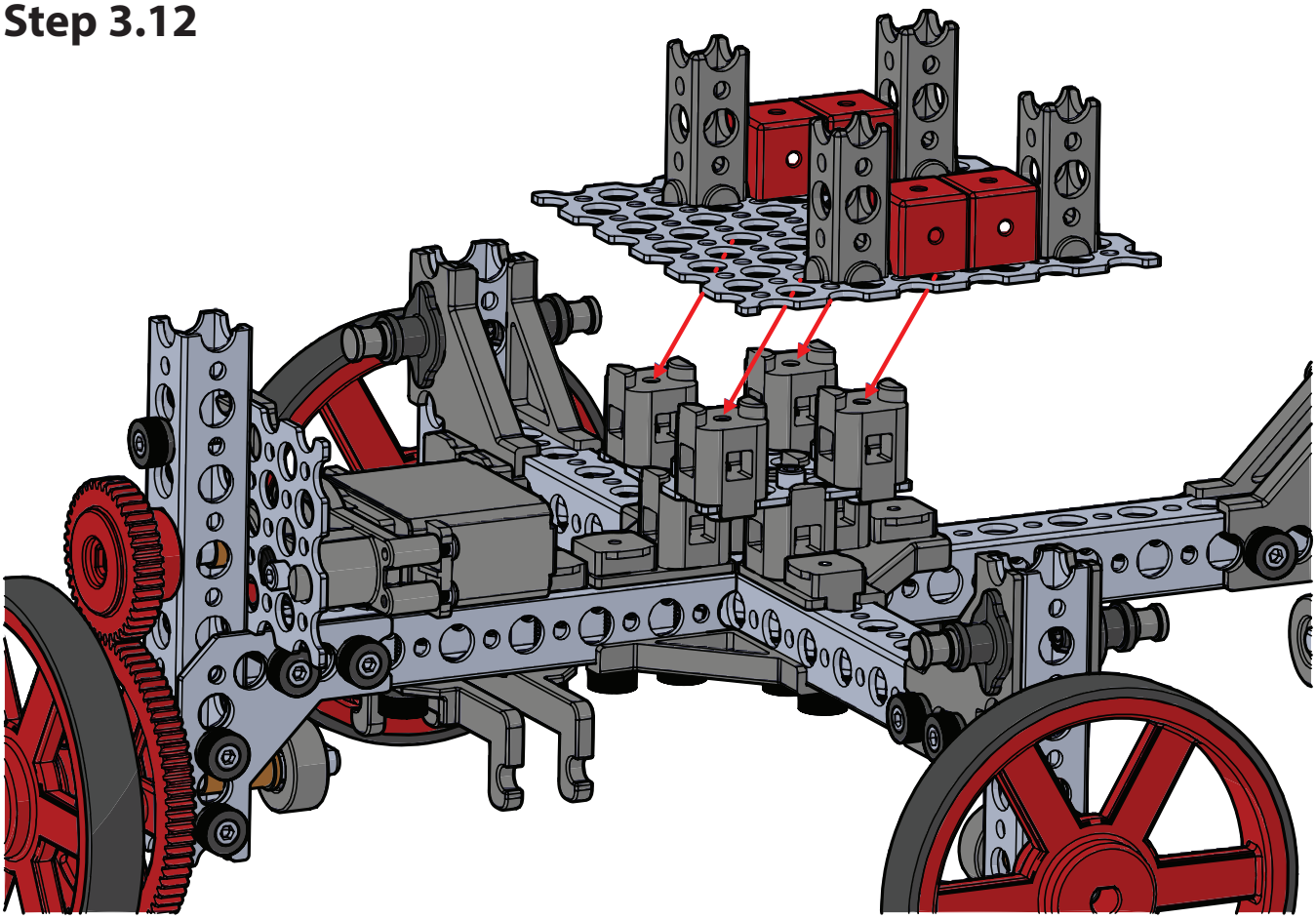
Step 3.10



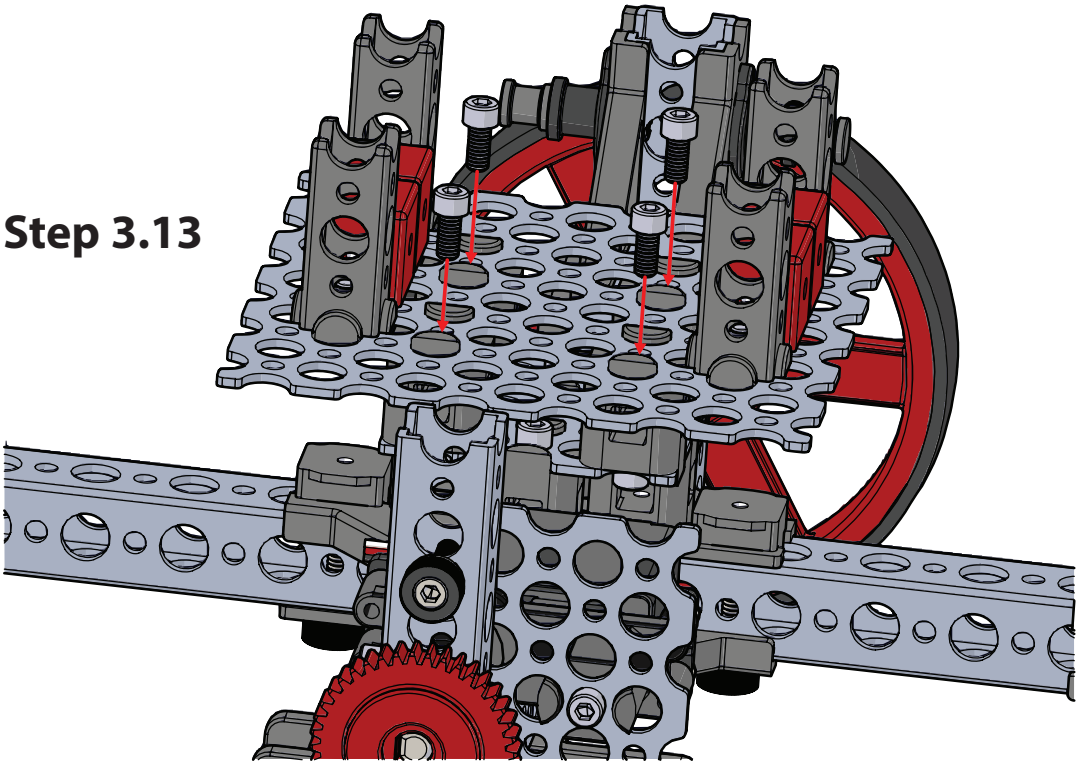
Step 3.11



Step 3.12

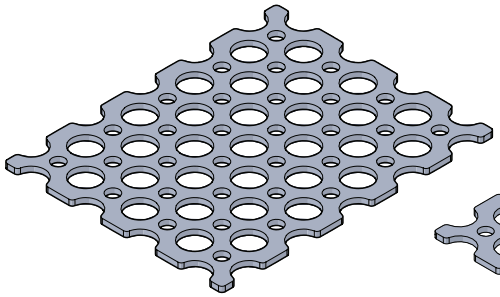


Step 3.13

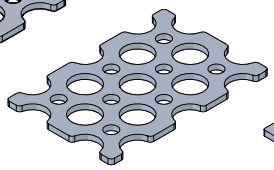


Step 4

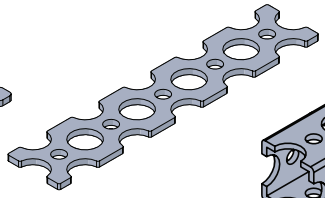
Parts Needed



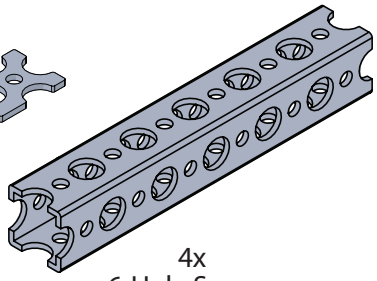
1x
4 x 5 Hole Plate
41262



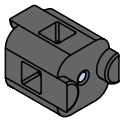
2x
2 x 3 Hole Plate
41254



1x
5-Hole Flat Linkage
41245



4x
6-Hole Square
Beam 40203

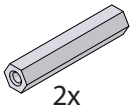


2x
90-Degree Cross
Block Connector
40217

4x
16 mm Anchor
Block 41267

16x
Thumbscrew
40323

2x
Wing Nut 40221

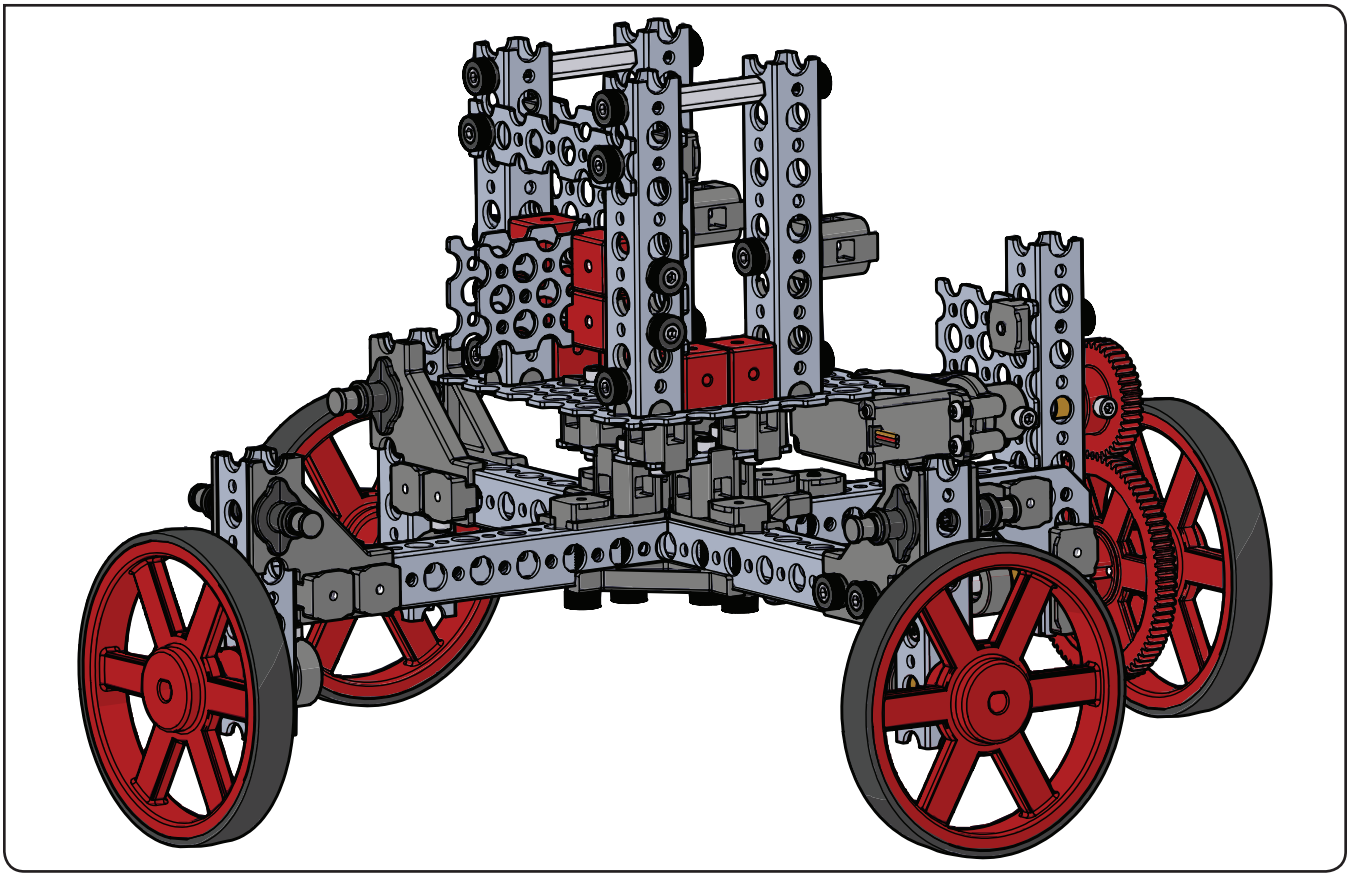


2x
Stand-Off Post 6-32 x 32 mm
39107

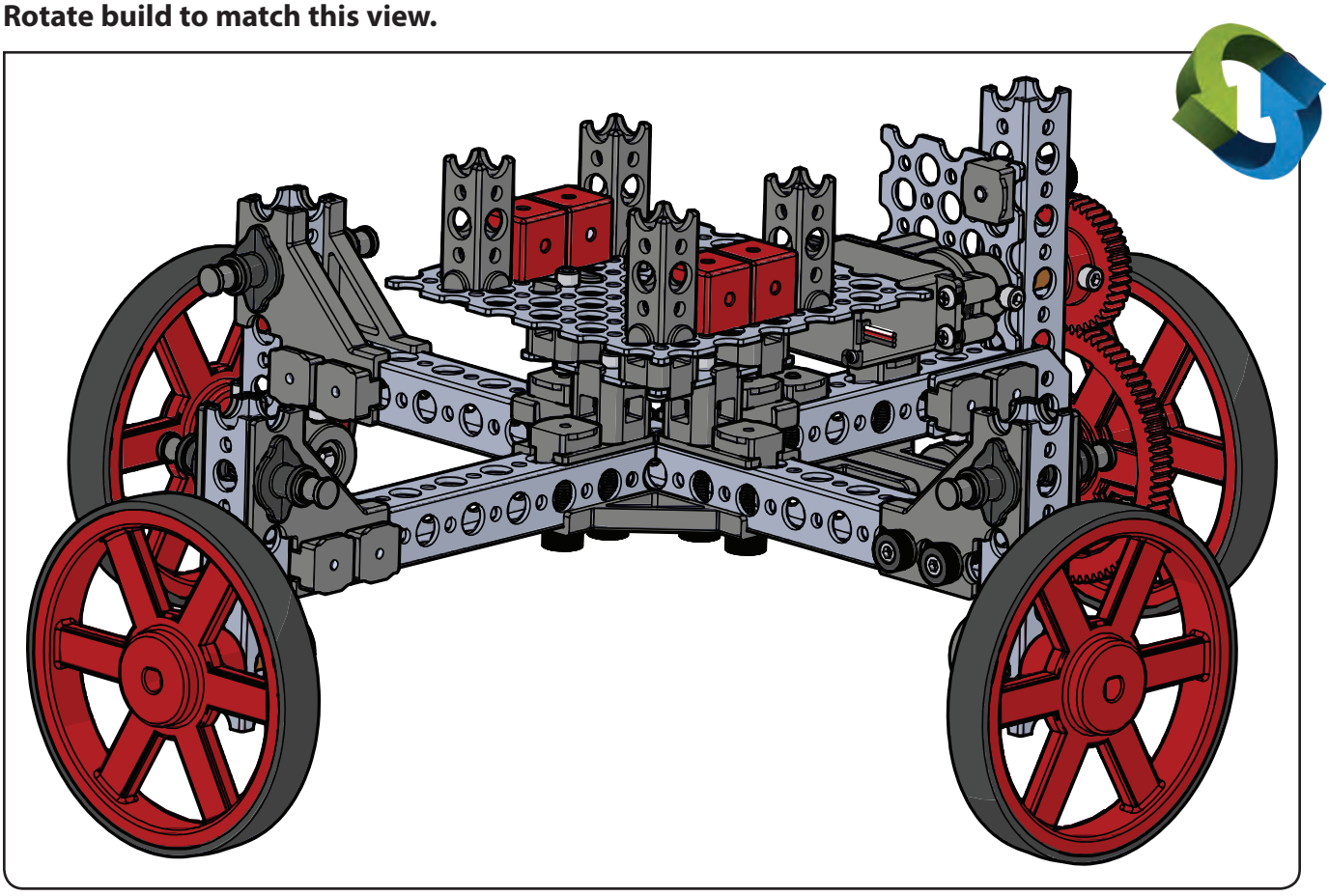
8x
Socket Head Cap
Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

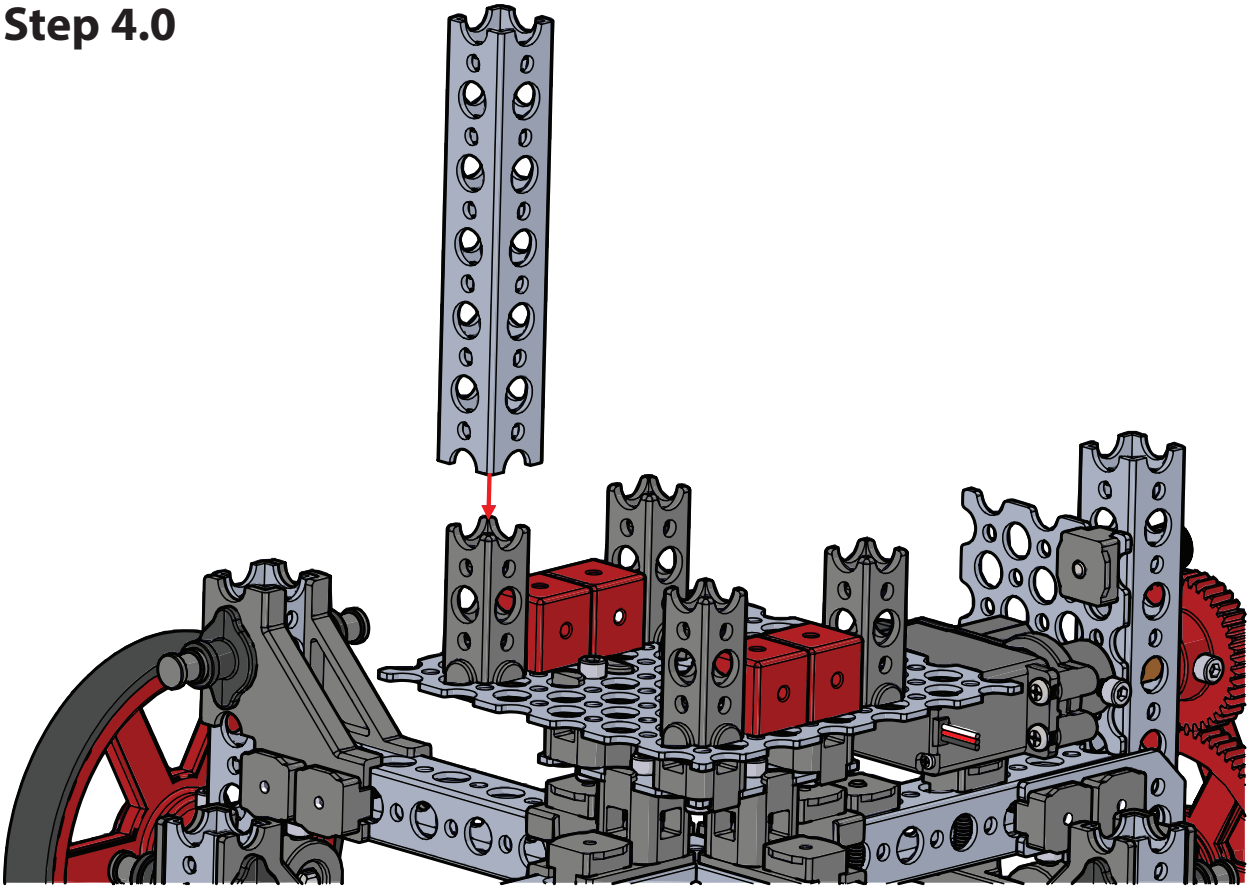
Partial assembly should look like this.



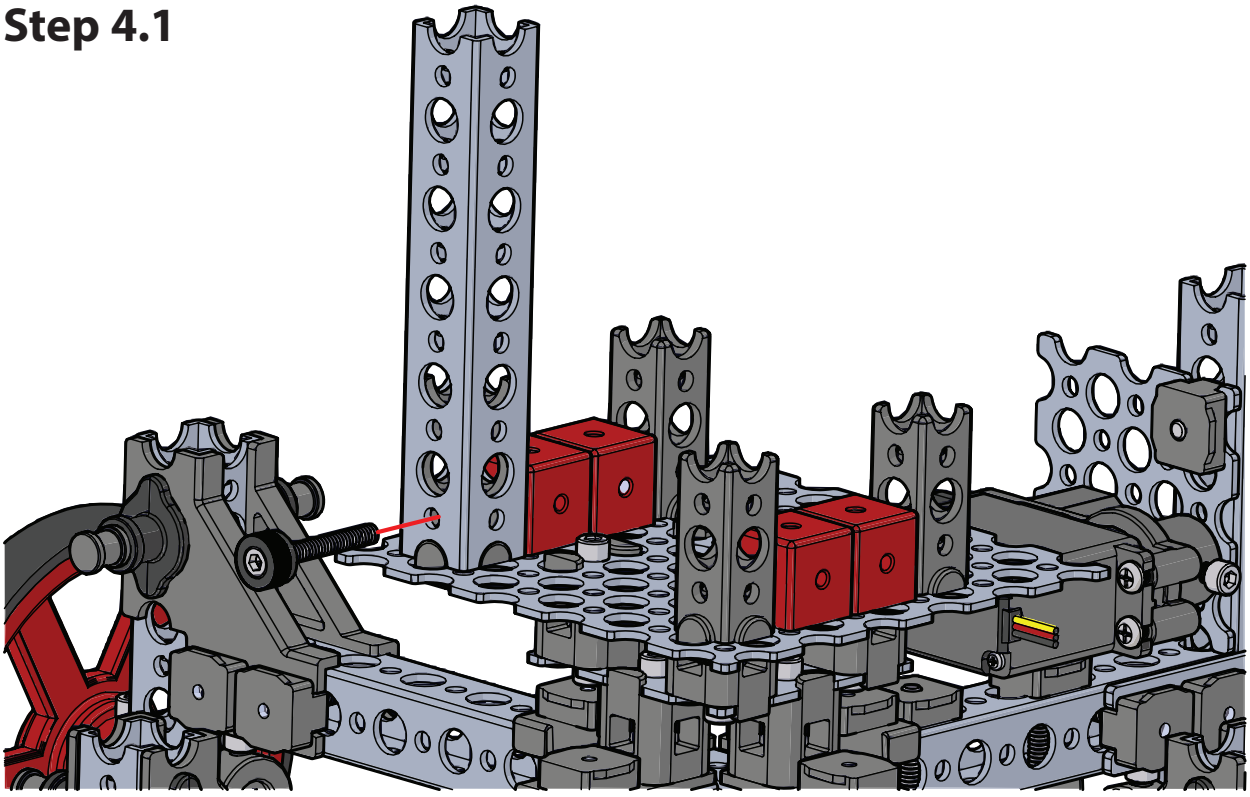
Rotate build to match this view.



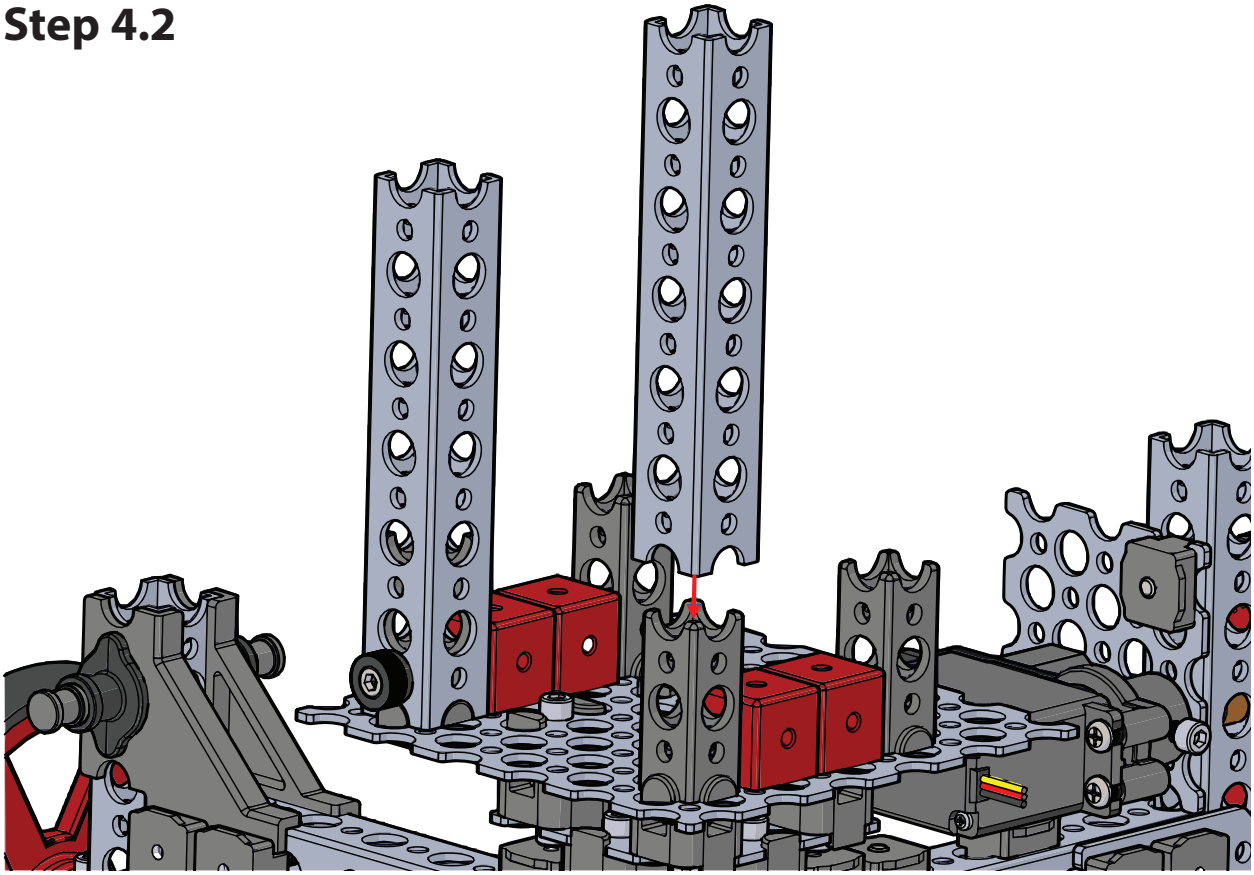
Step 4.0



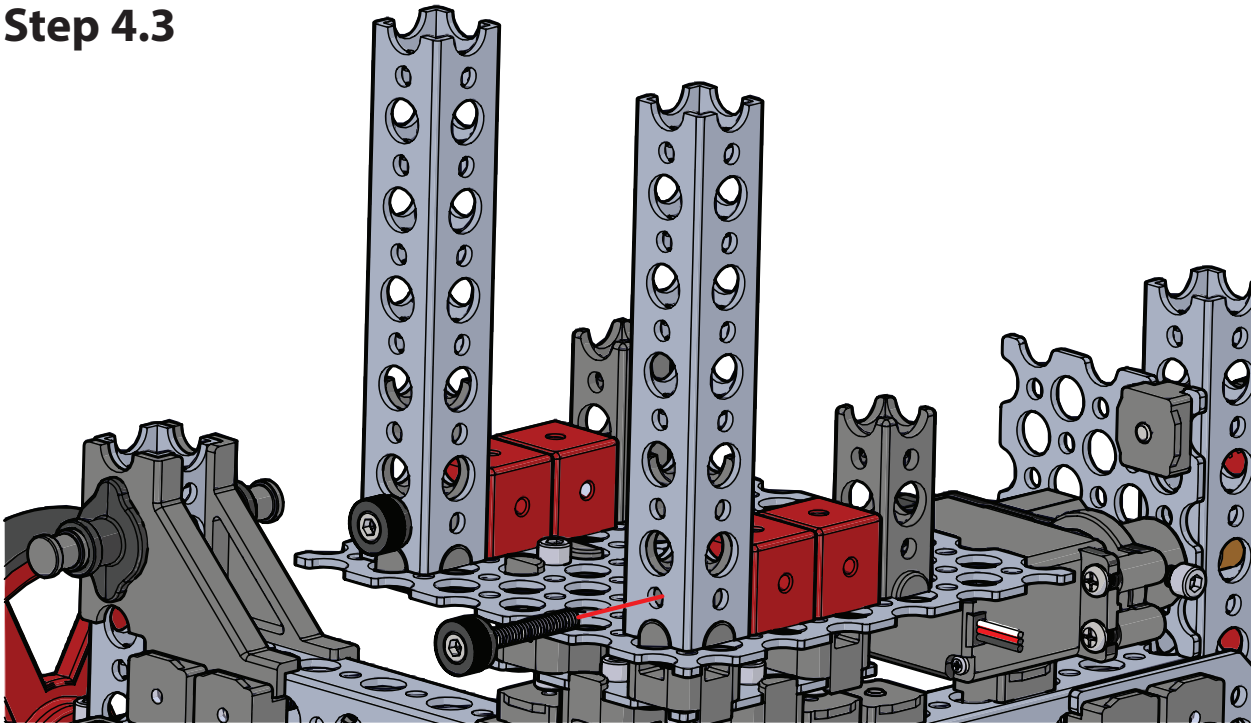
Step 4.1



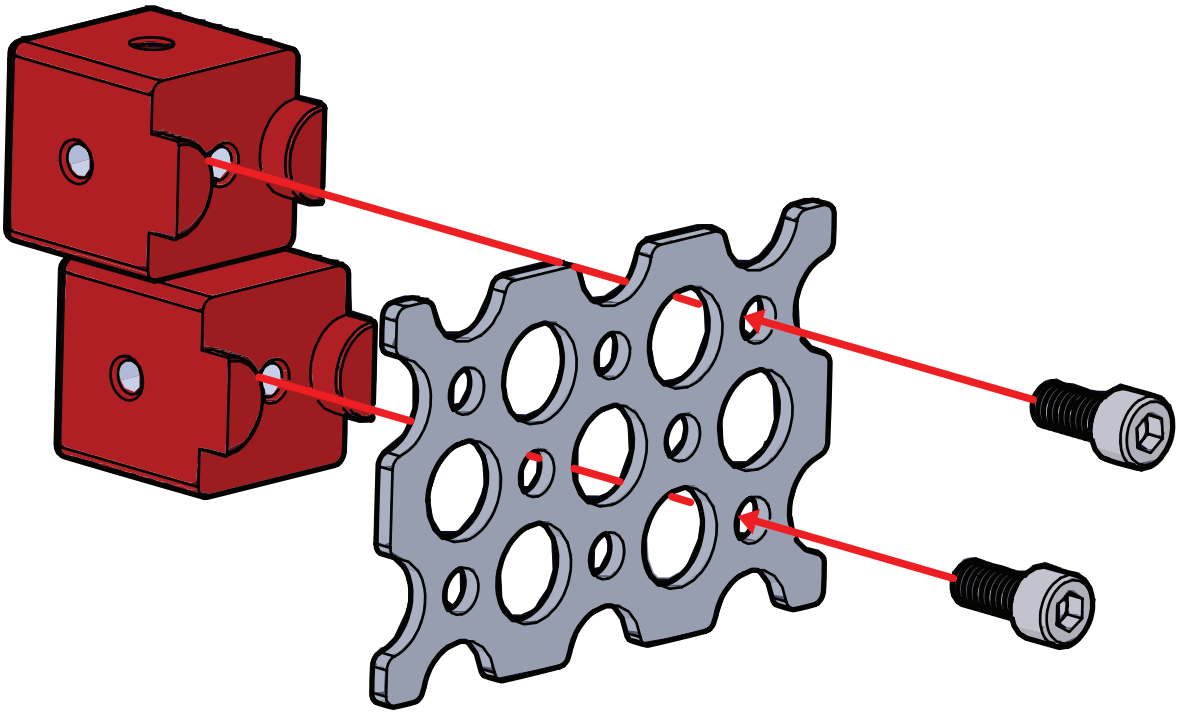
Step 4.2



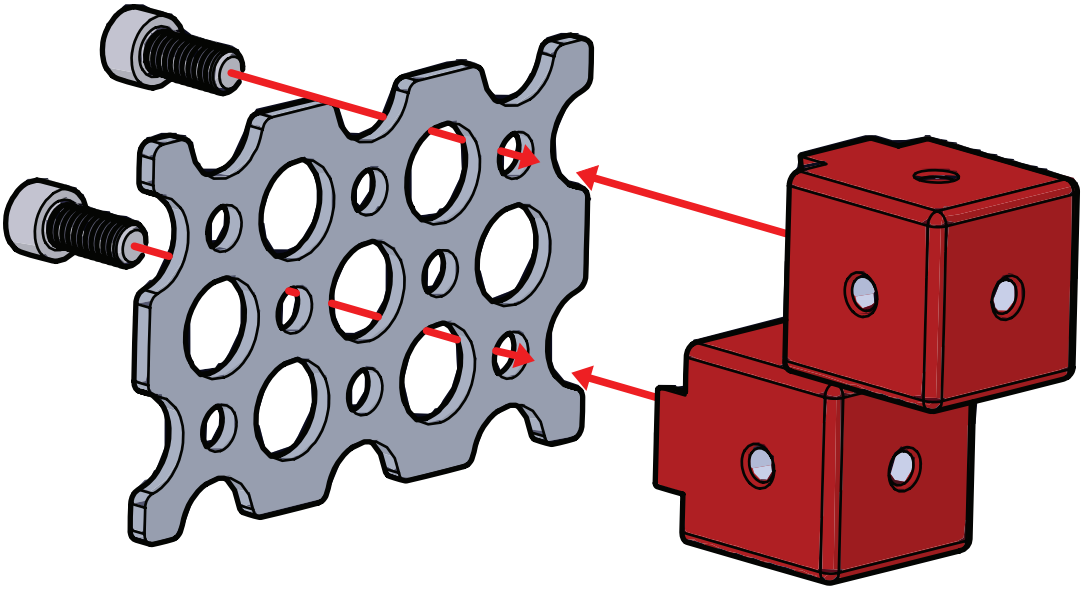
Step 4.3



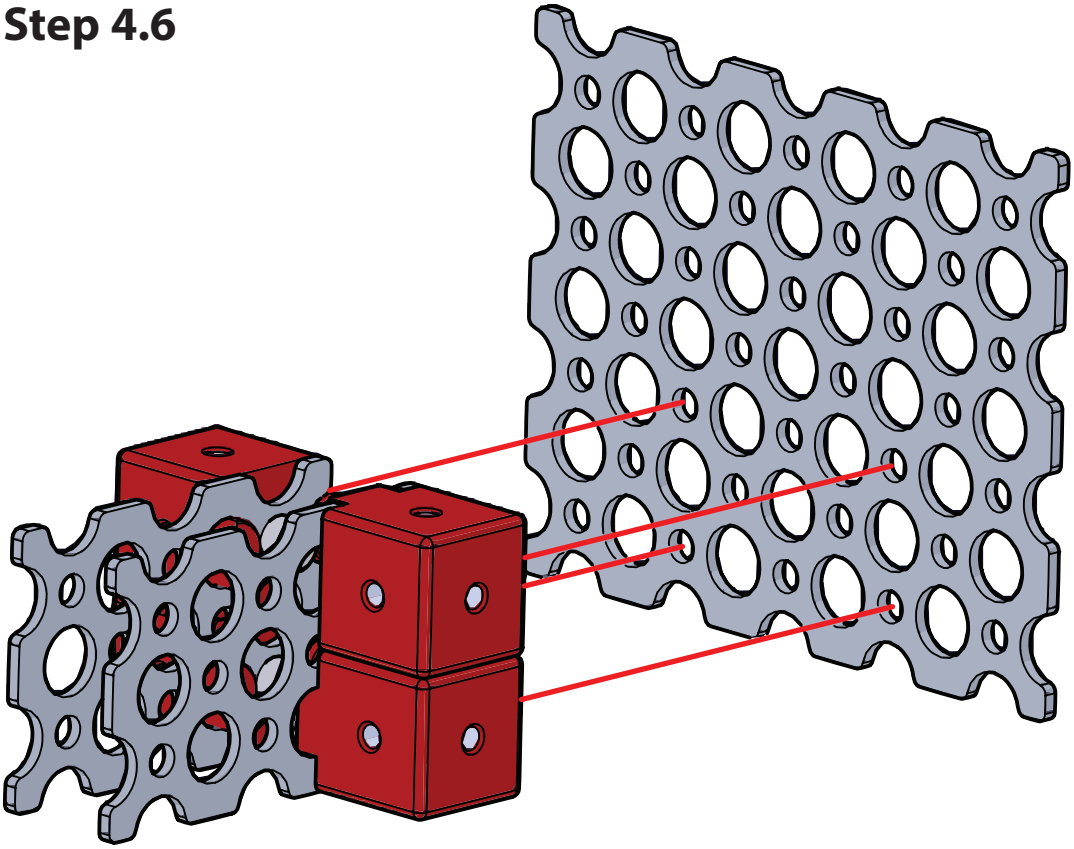
Step 4.4



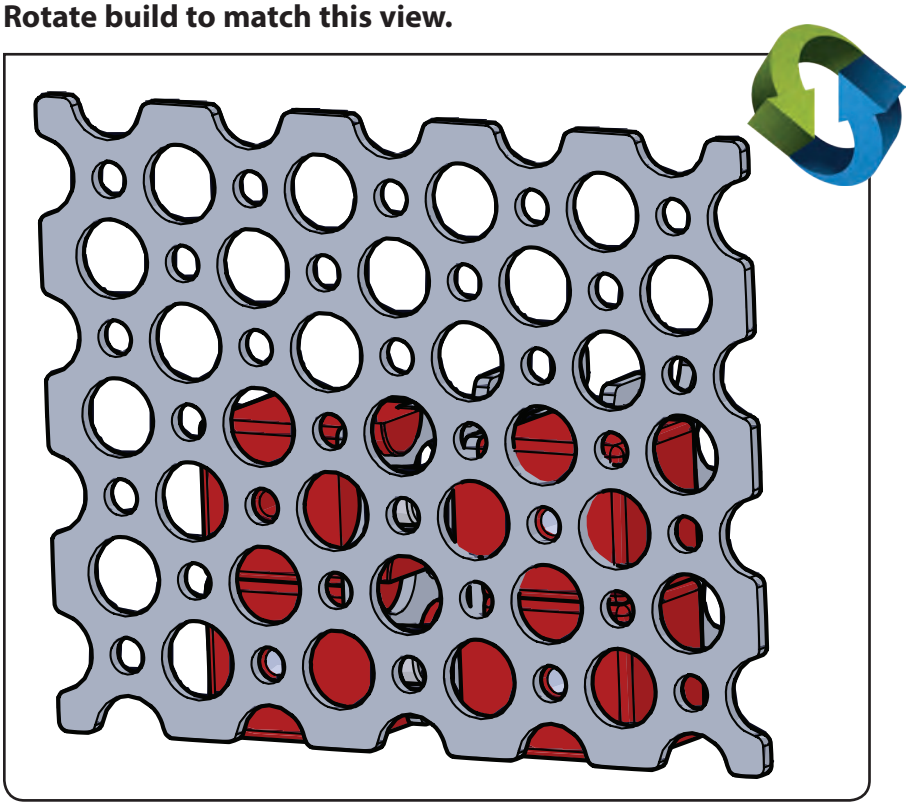
Step 4.5



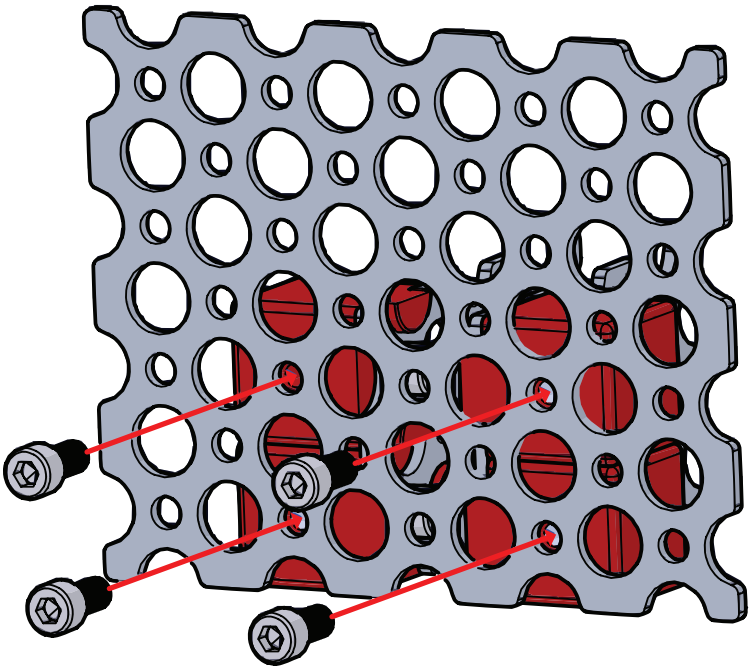
Step 4.6



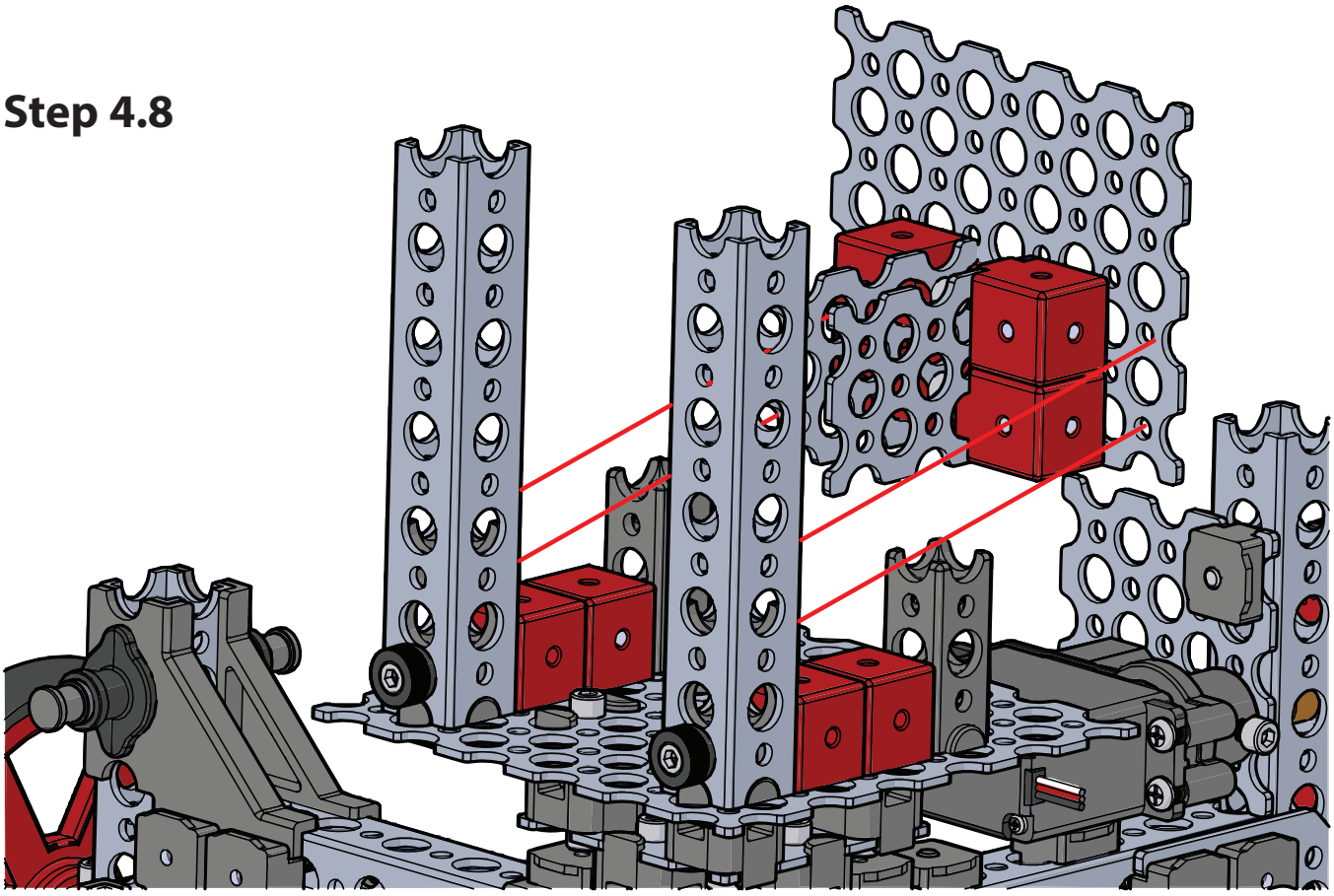
Rotate build to match this view.



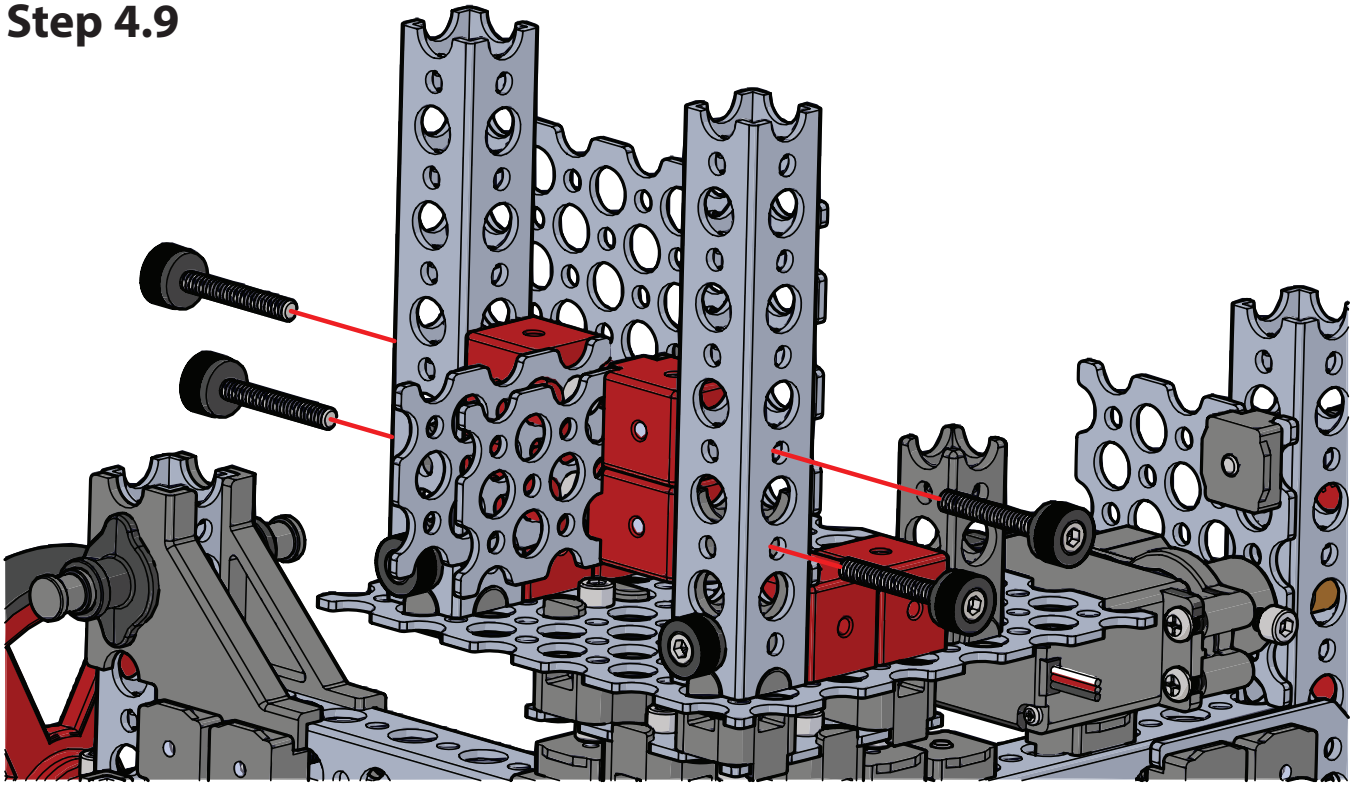
Step 4.7



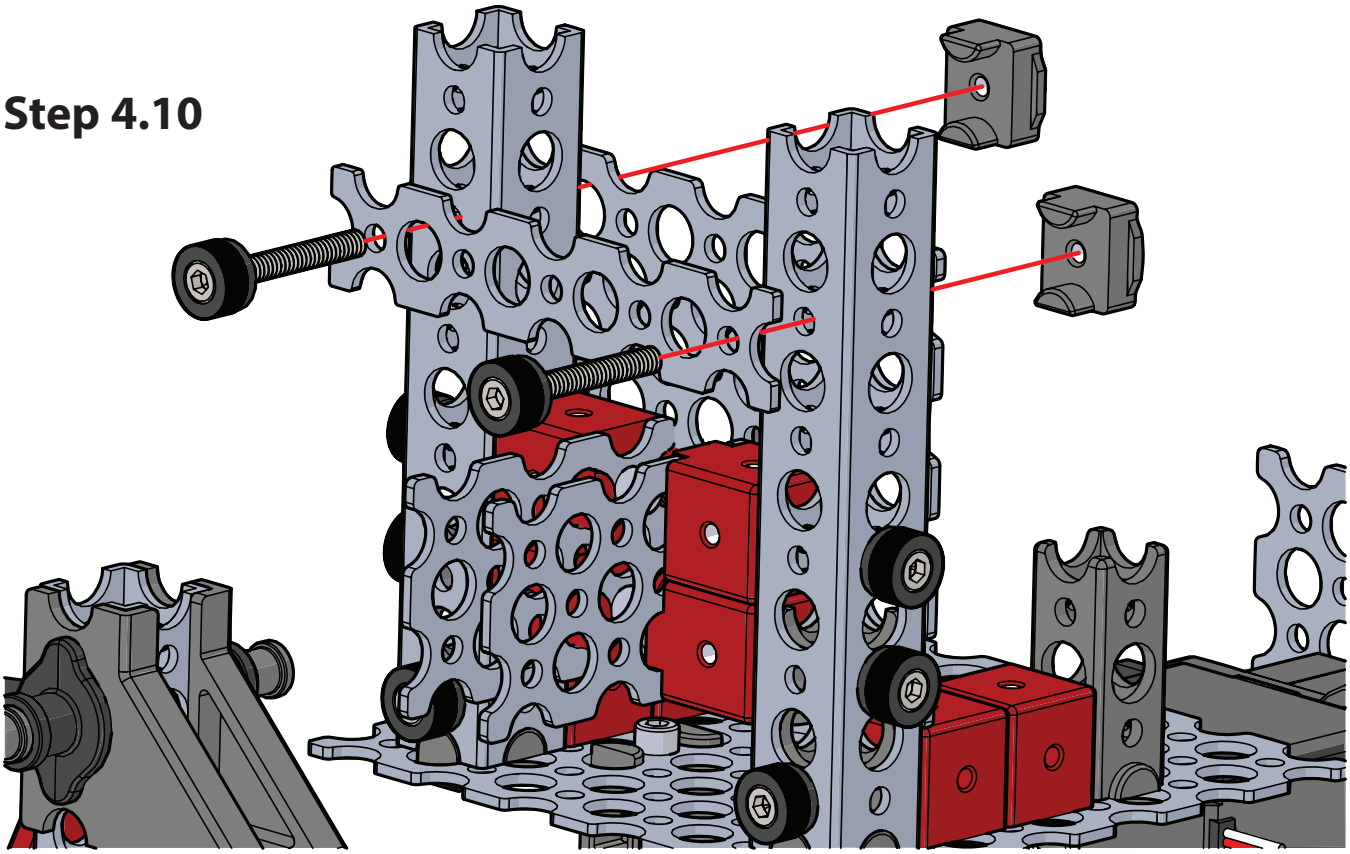
Step 4.8



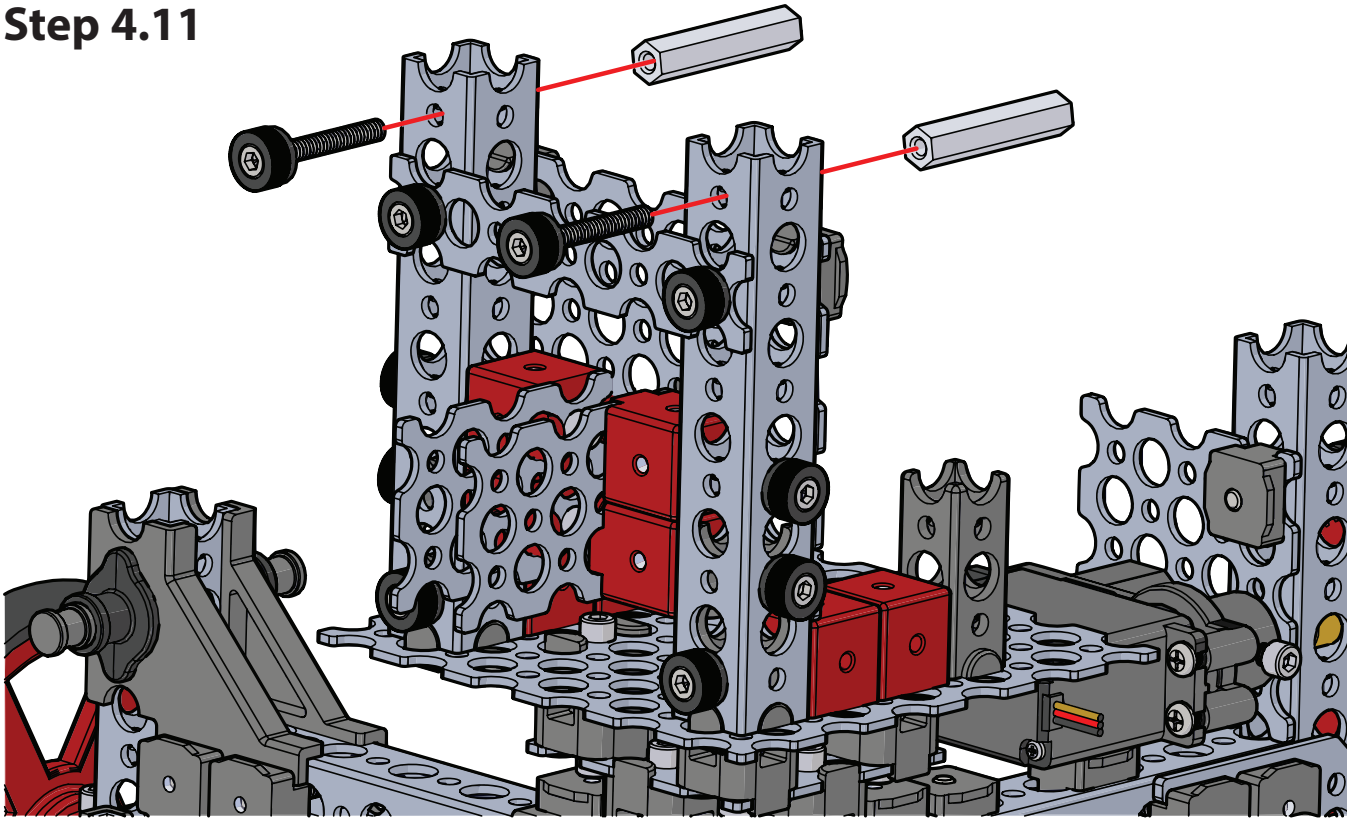
Step 4.9



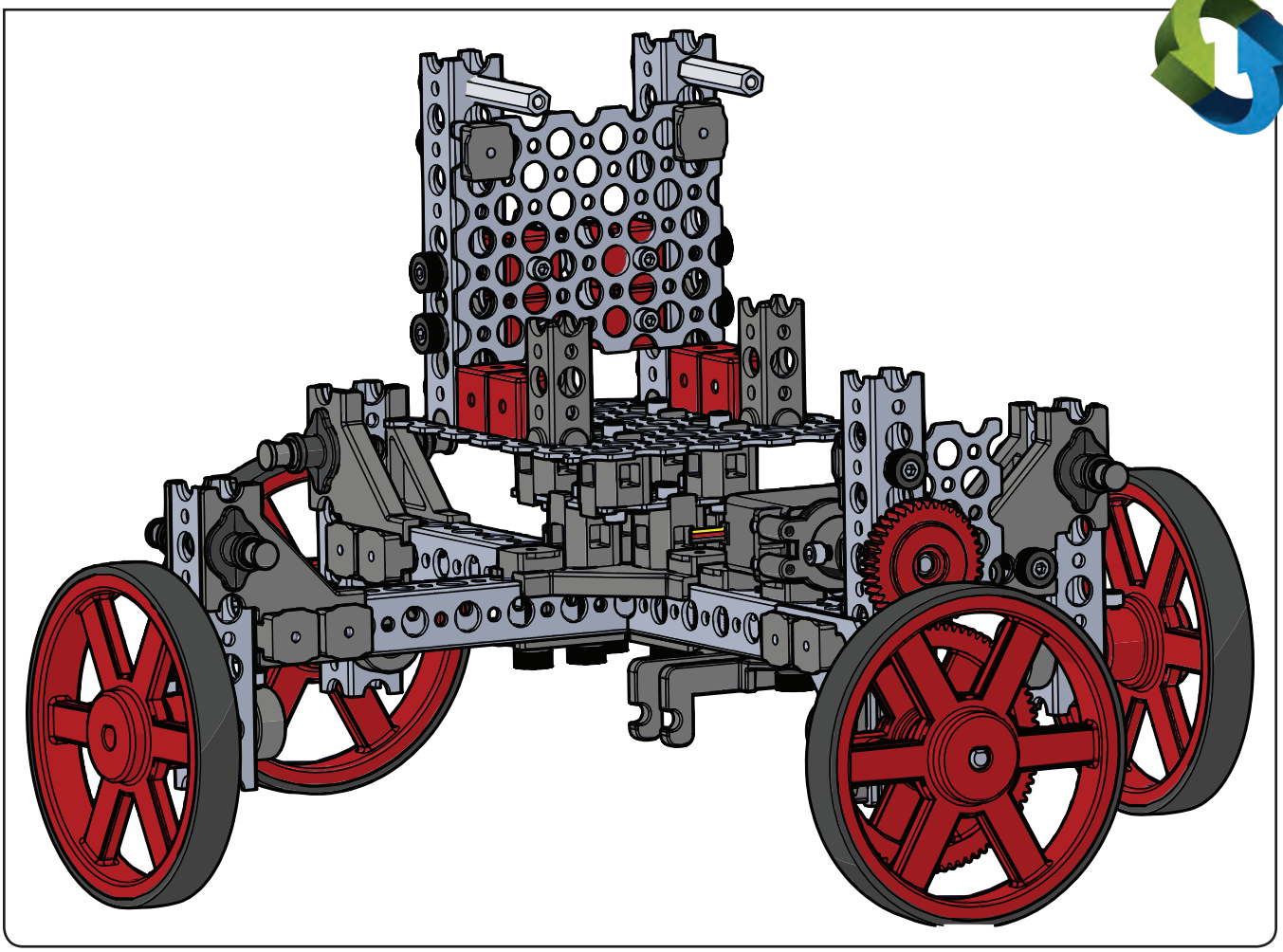
Step 4.10



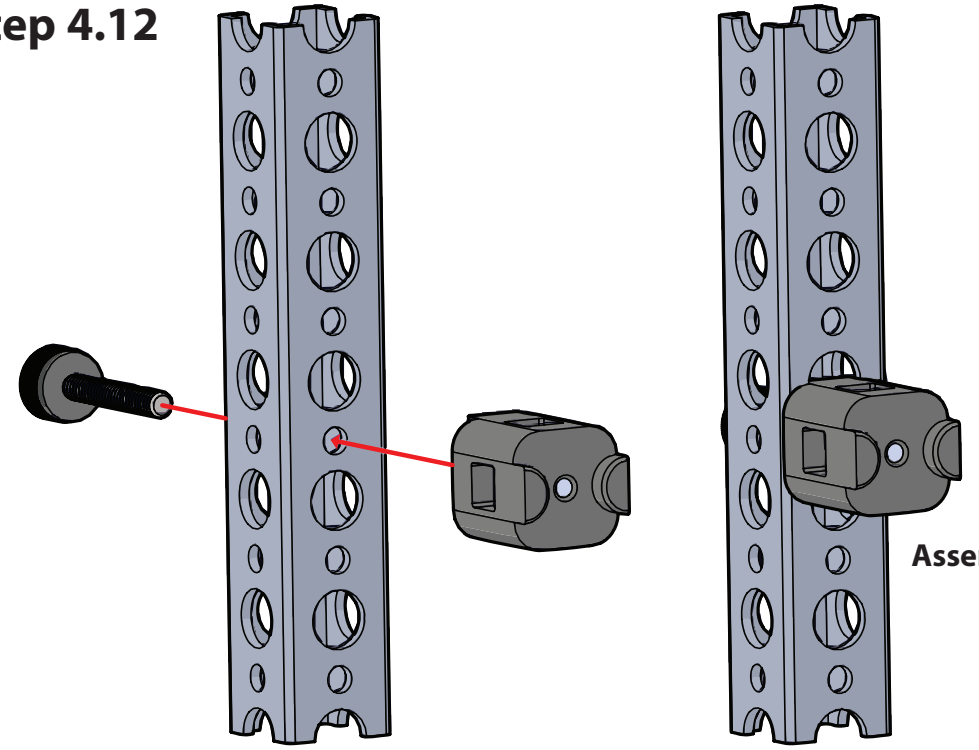
Step 4.11



Rotate build to match this view.

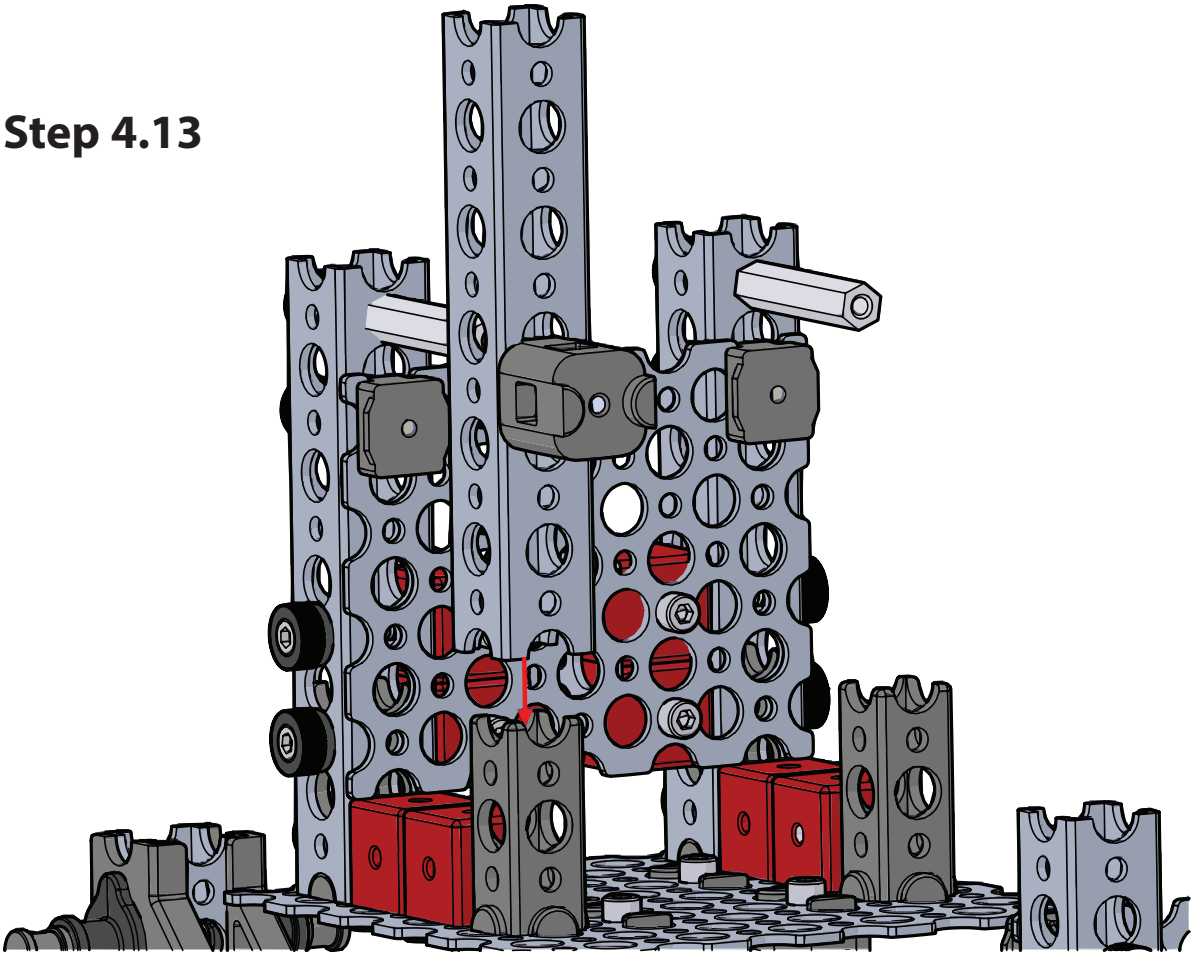


Step 4.12

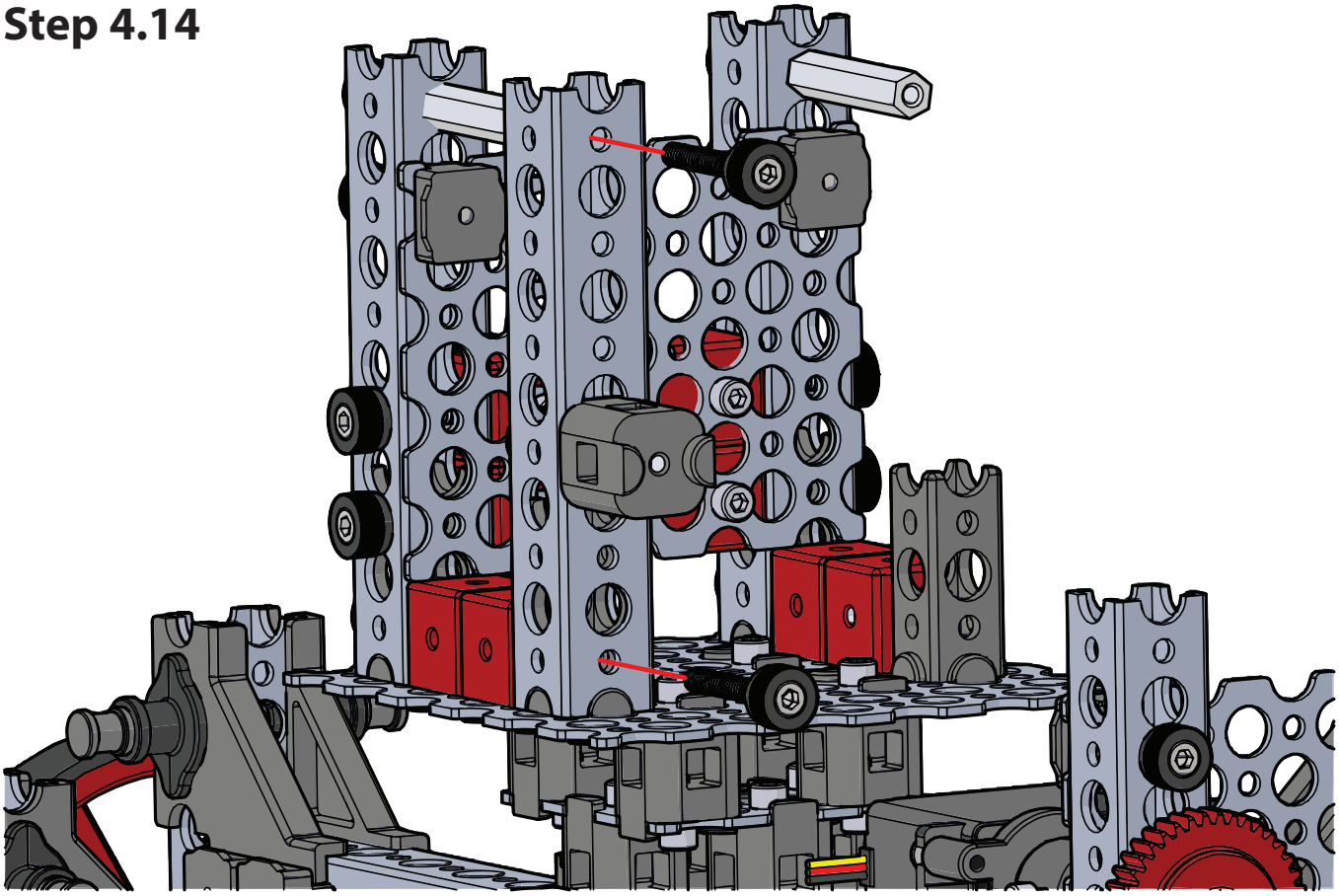


Assemble two like this.

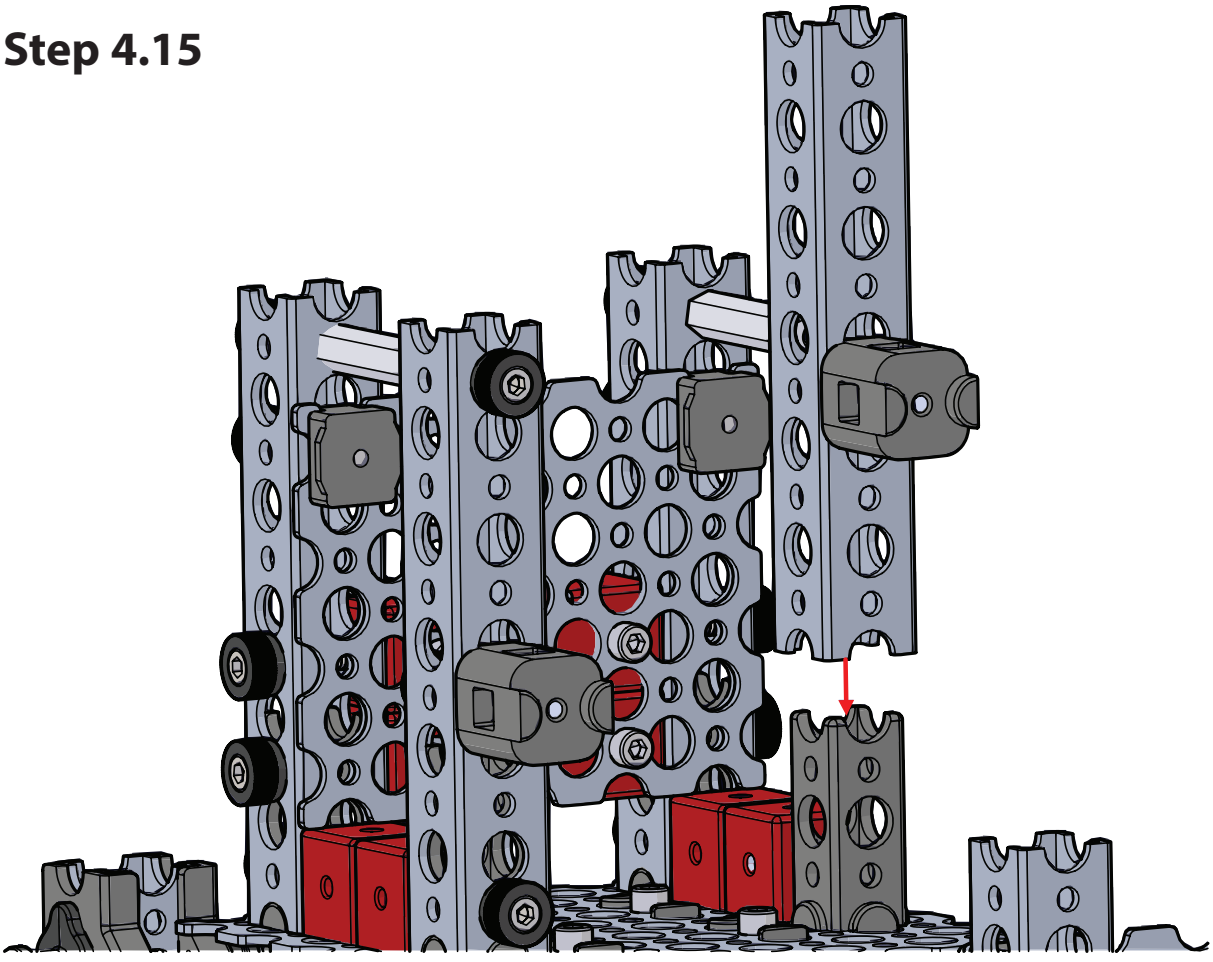
Step 4.13



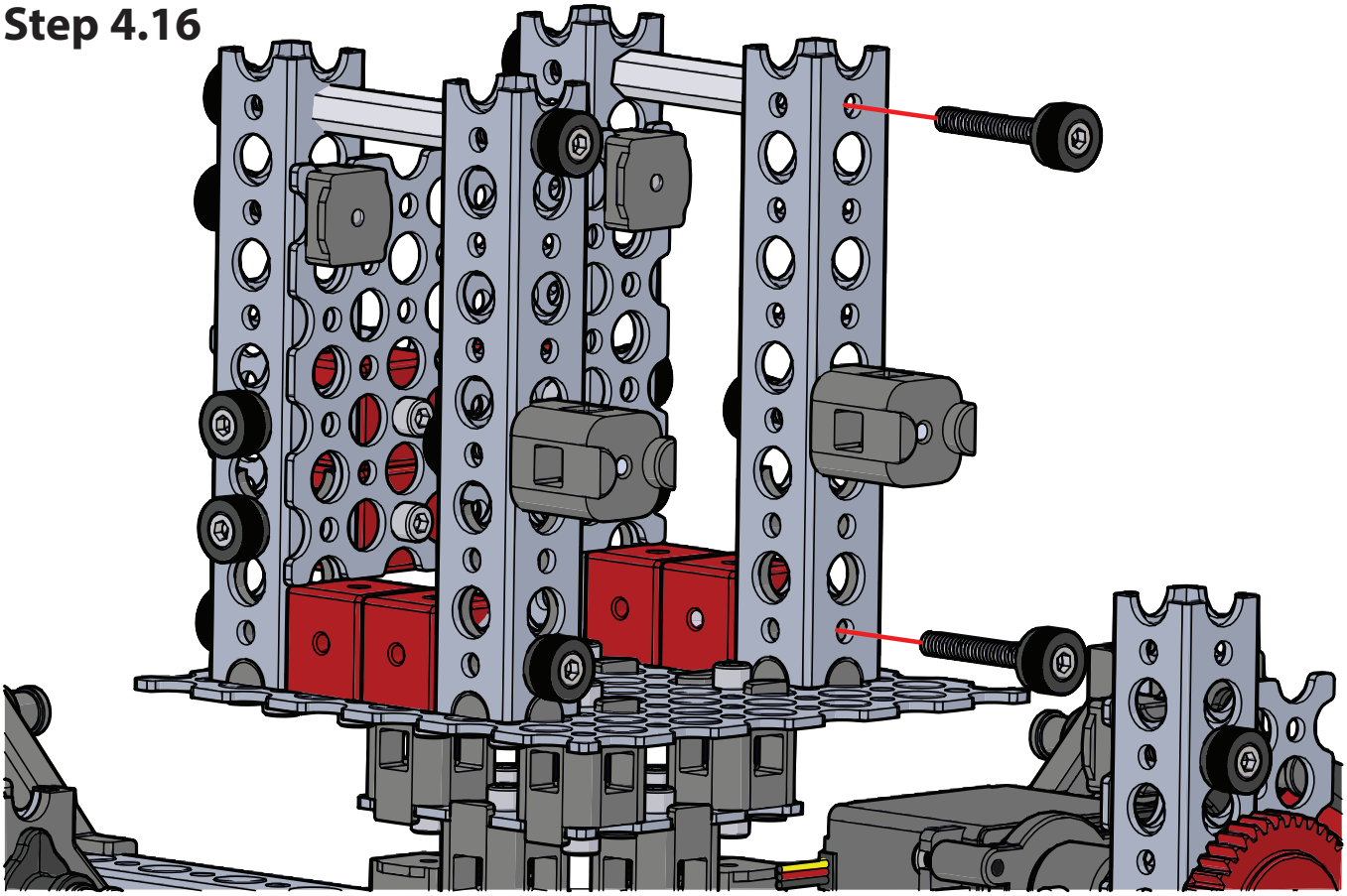
Step 4.14



Step 4.15

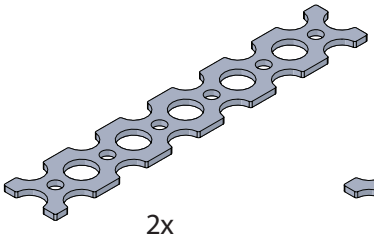


Step 4.16

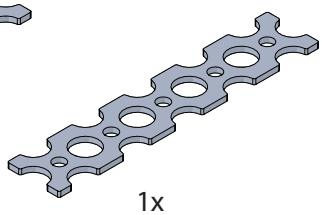


Step 5

Parts Needed

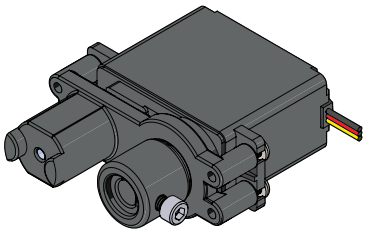


2x
6-Hole Flat Linkage
41246

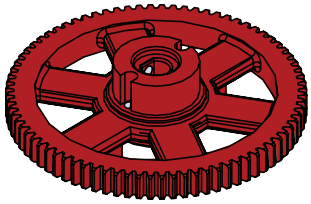


1x
5-Hole Flat Linkage
41245

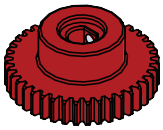
1x
Thumbscrew
40323



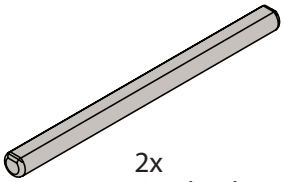
1x
Continuous Rotation Servo Motor 40379 with Servo Mounting Bracket 40232
(Assembly instructions on pages 18-19.)



2x
80-Tooth Plastic Gear 40224



2x
40-Tooth Plastic Gear 40223



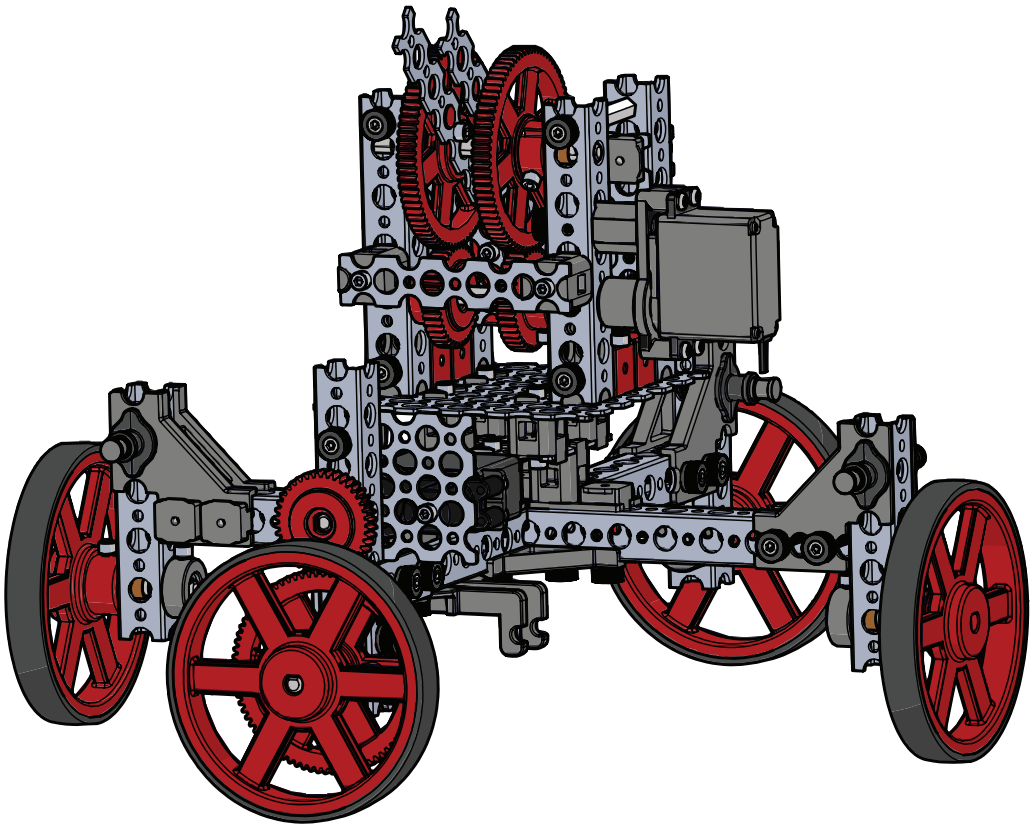
2x
80 mm Steel Axle
40225

5x
8 mm x 6 mm Bronze Bushing
40227

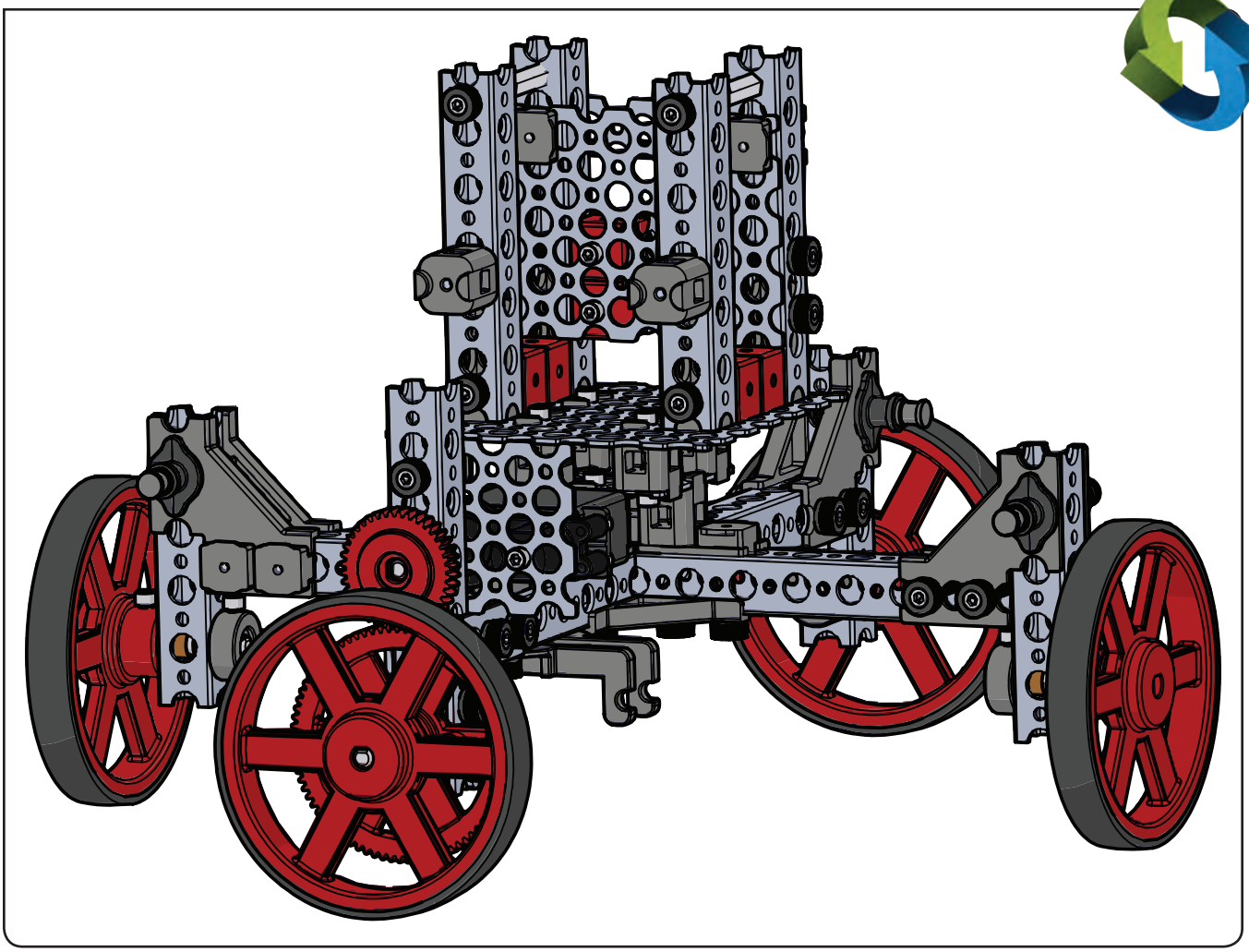
6x
Socket Head Cap Screw 40516

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

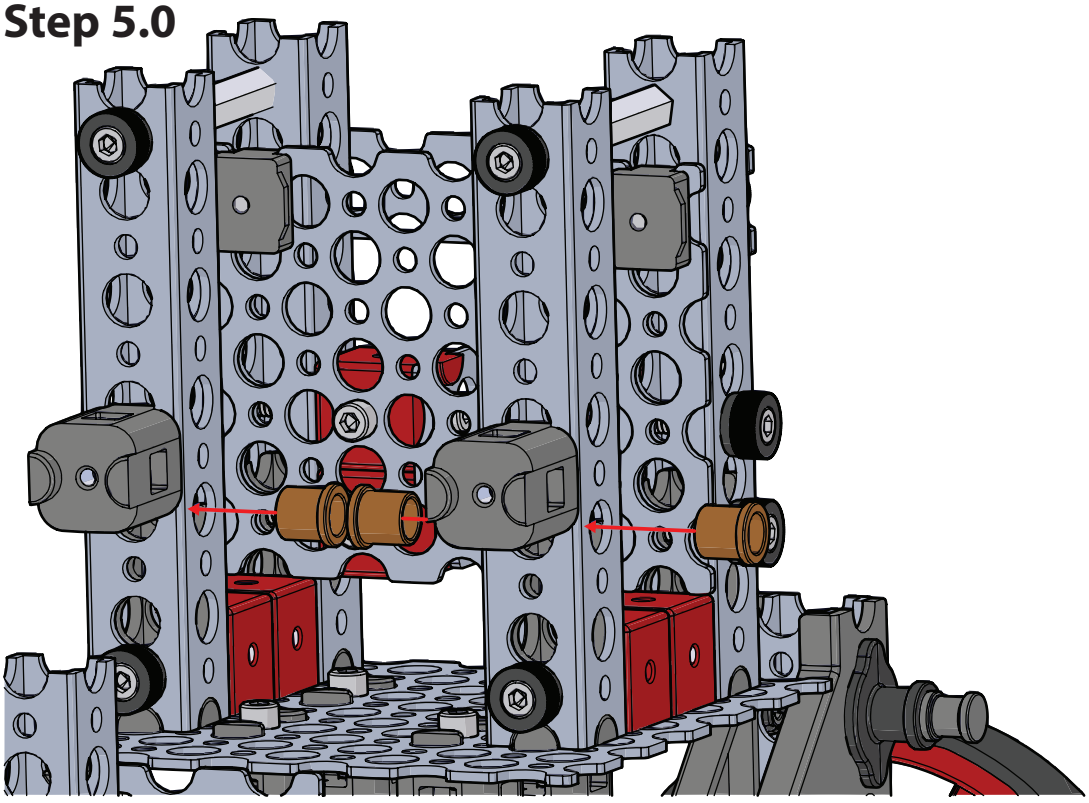
Partial assembly should look like this.



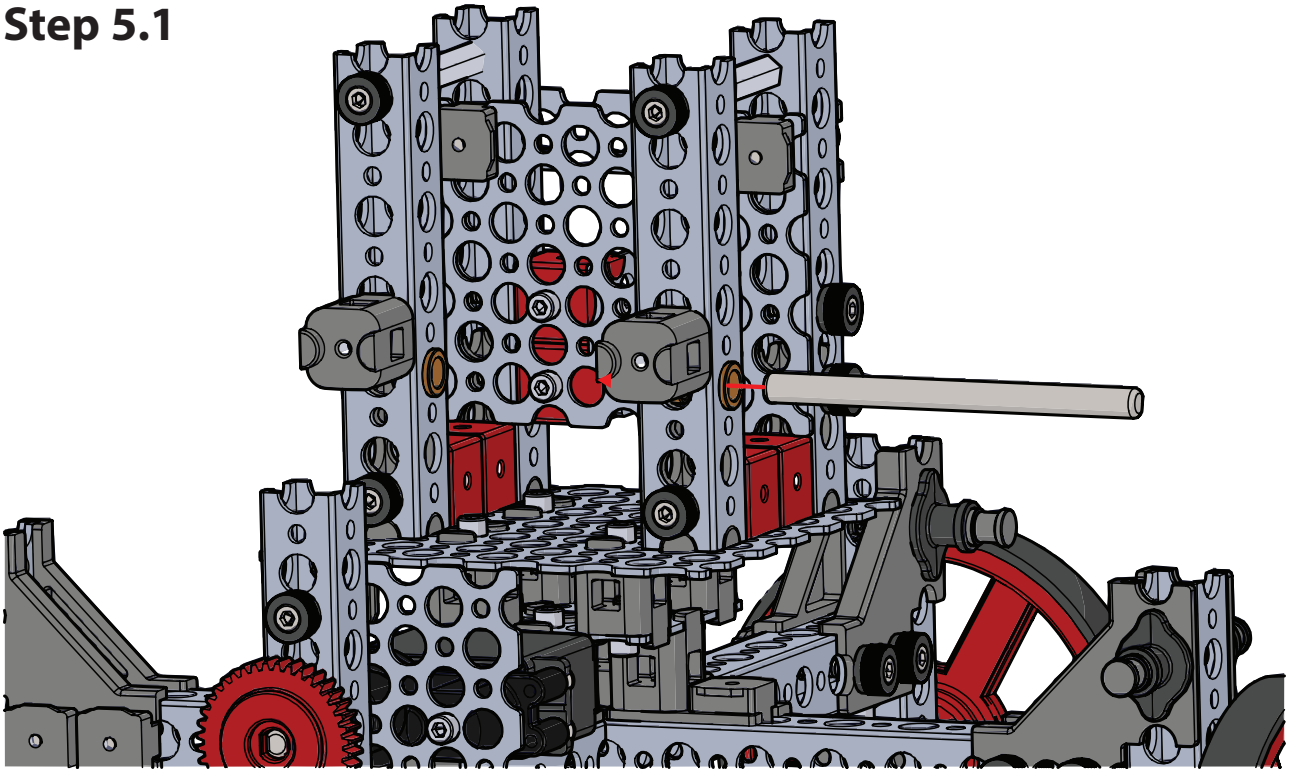
Rotate build to match this view.



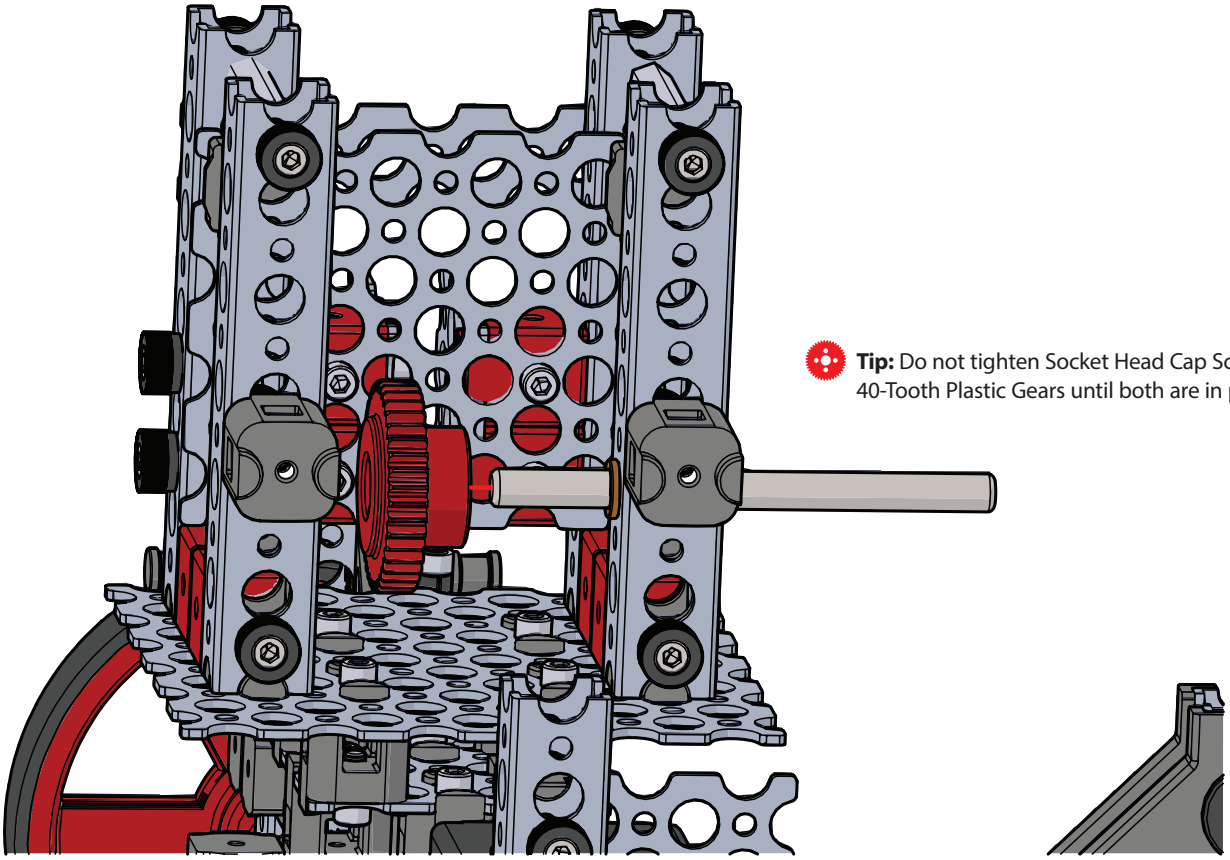
Step 5.0



Step 5.1

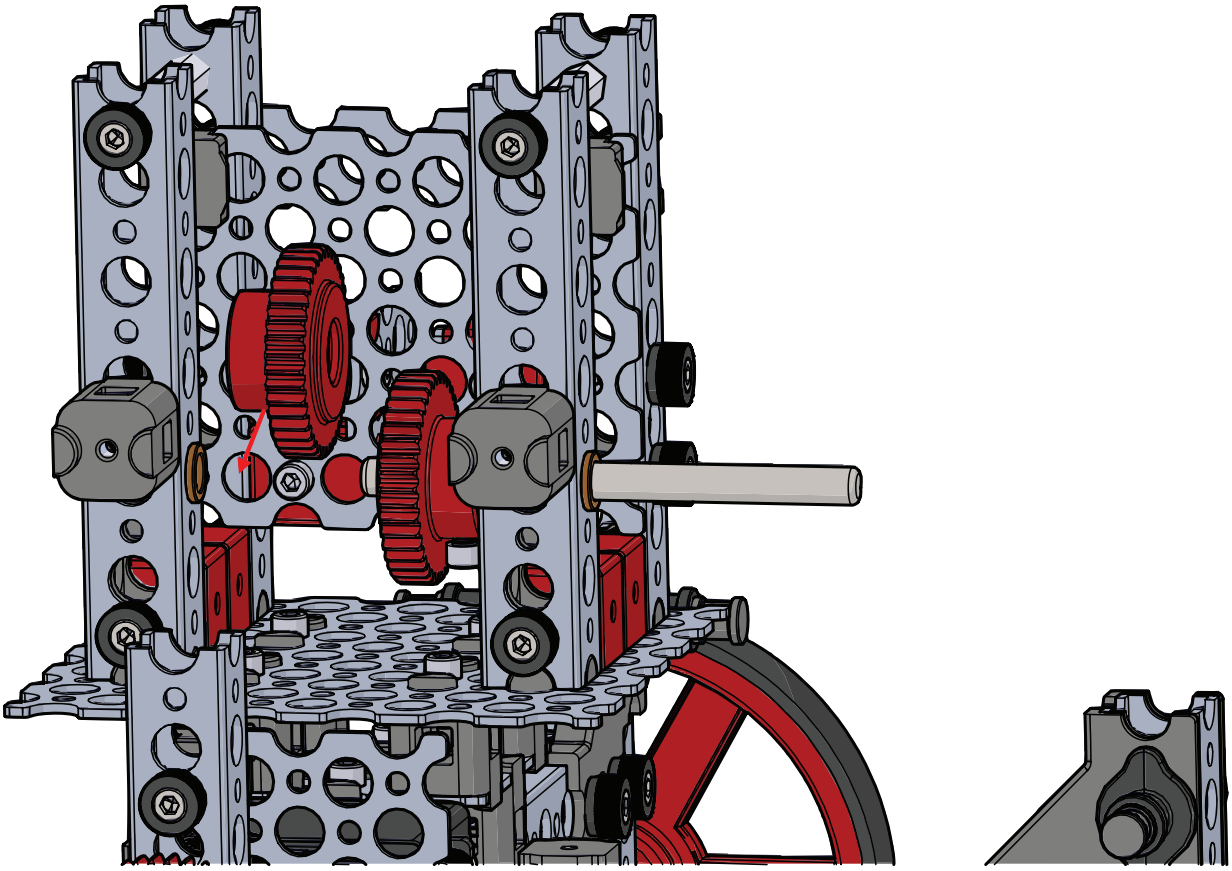


Step 5.2

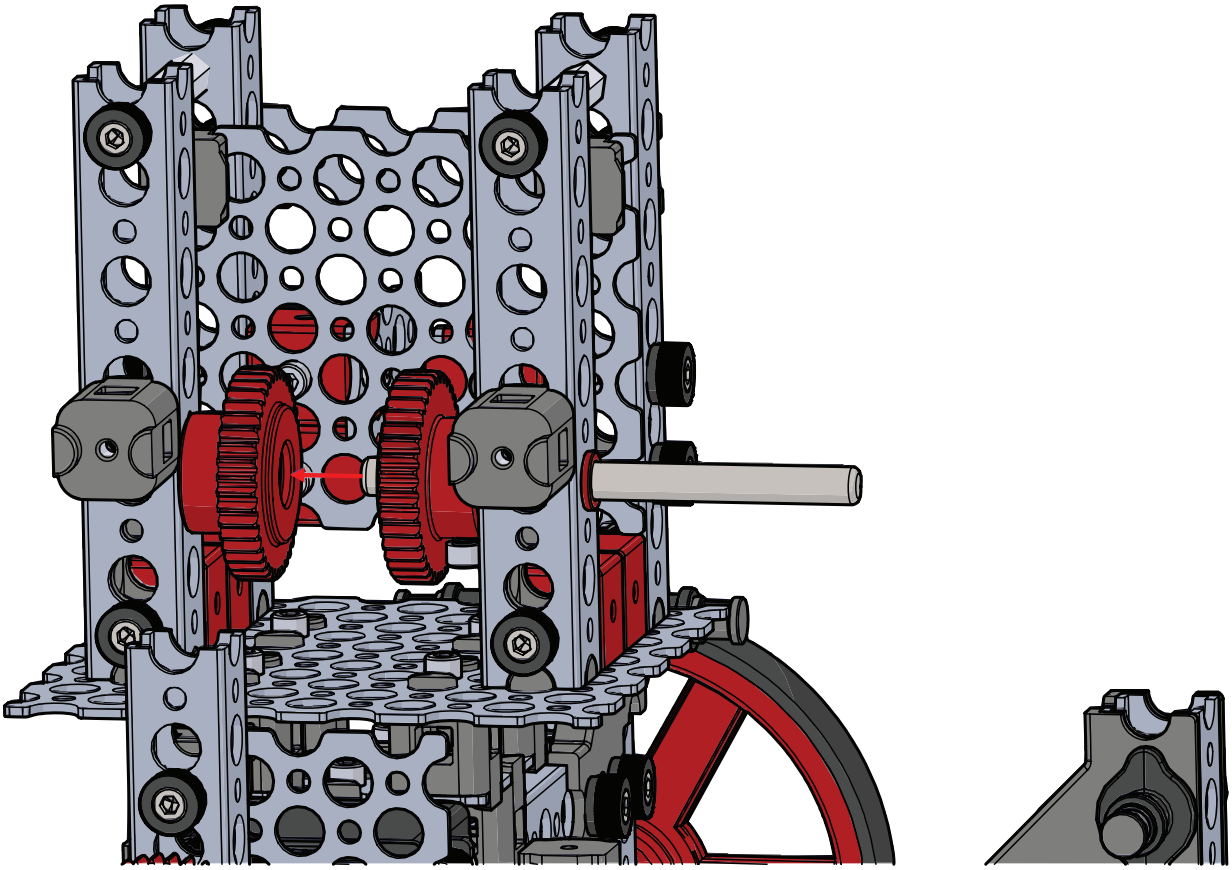


Tip: Do not tighten Socket Head Cap Screws on 40-Tooth Plastic Gears until both are in place.

Step 5.3



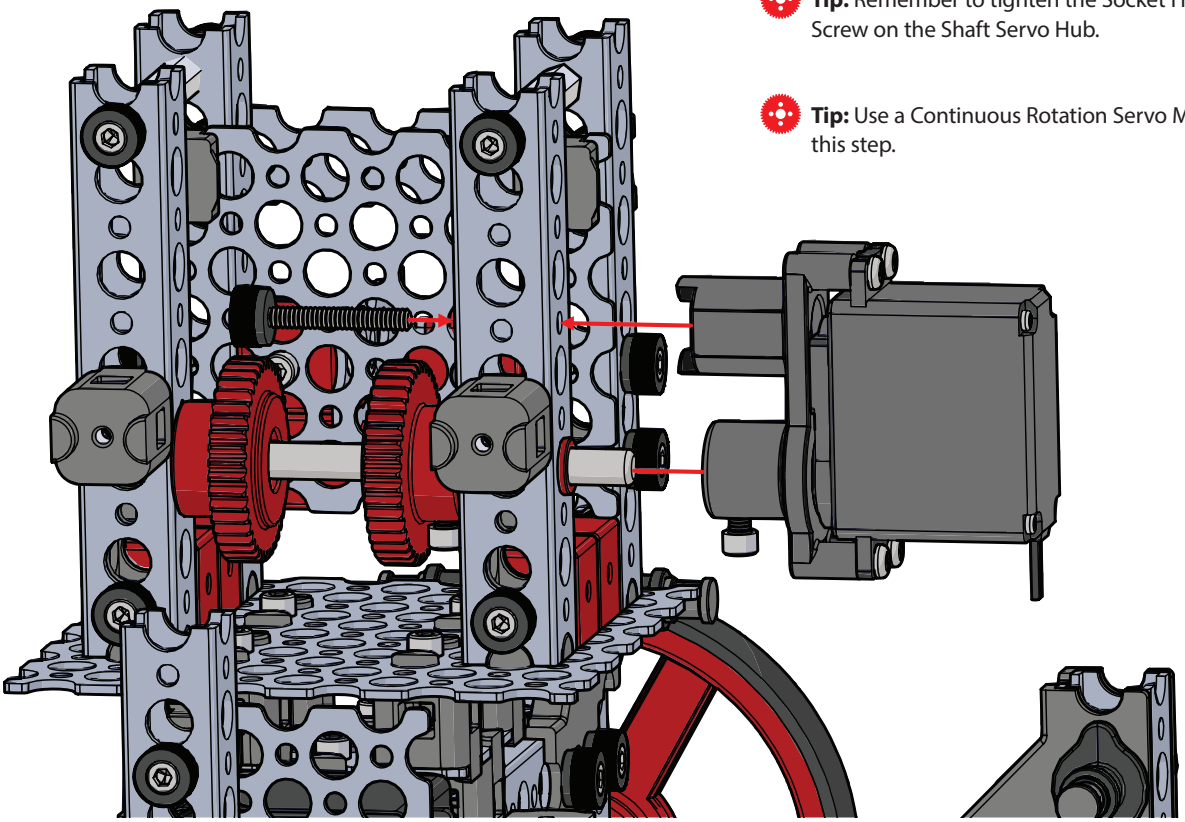
Step 5.4



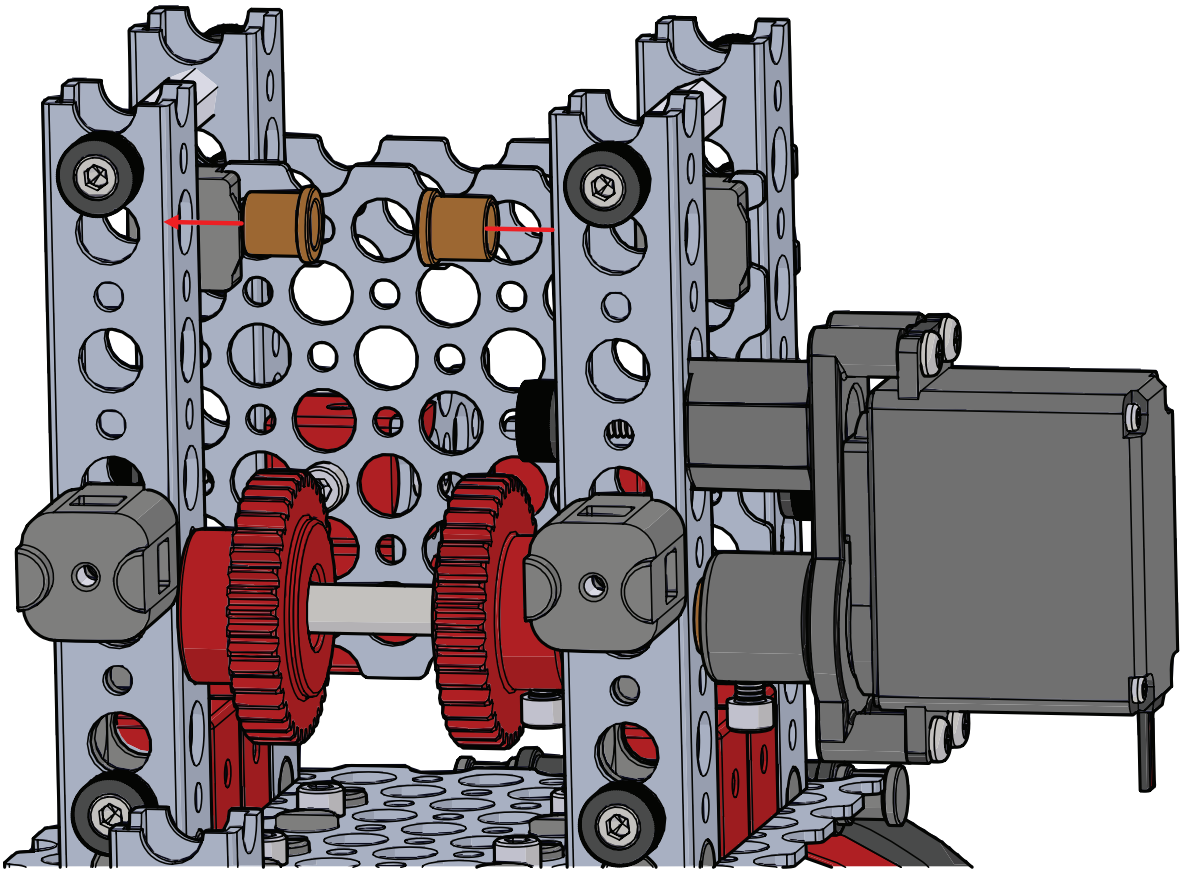
Step 5.5

Tip: Remember to tighten the Socket Head Cap Screw on the Shaft Servo Hub.

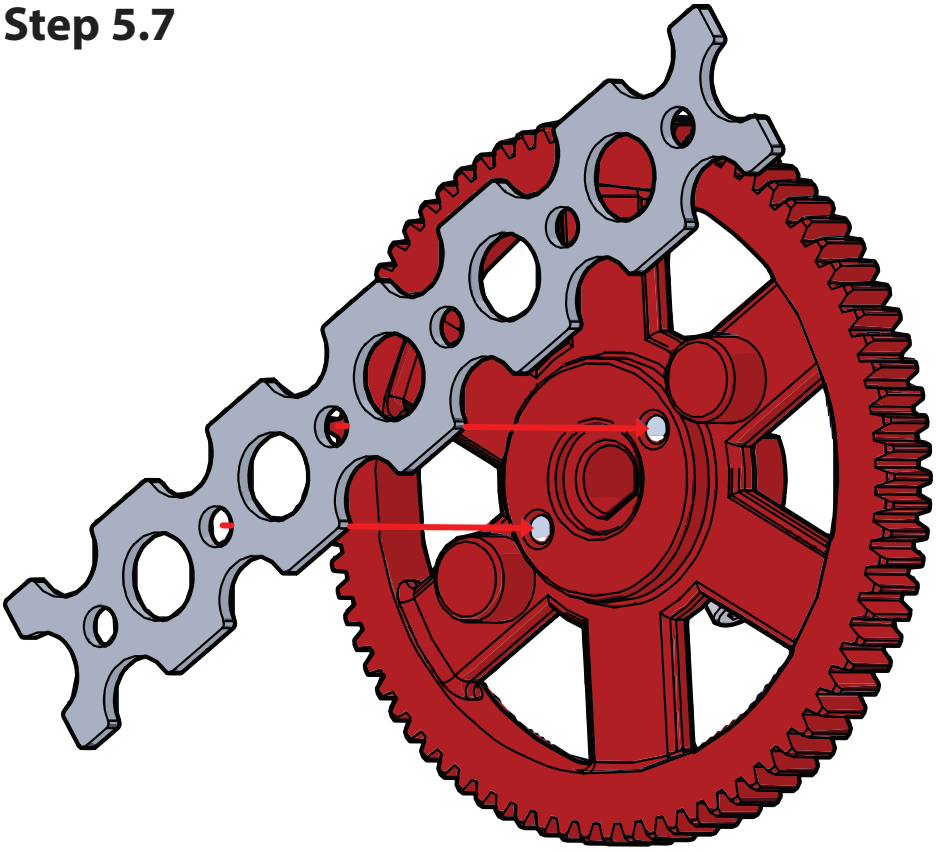
Tip: Use a Continuous Rotation Servo Motor for this step.



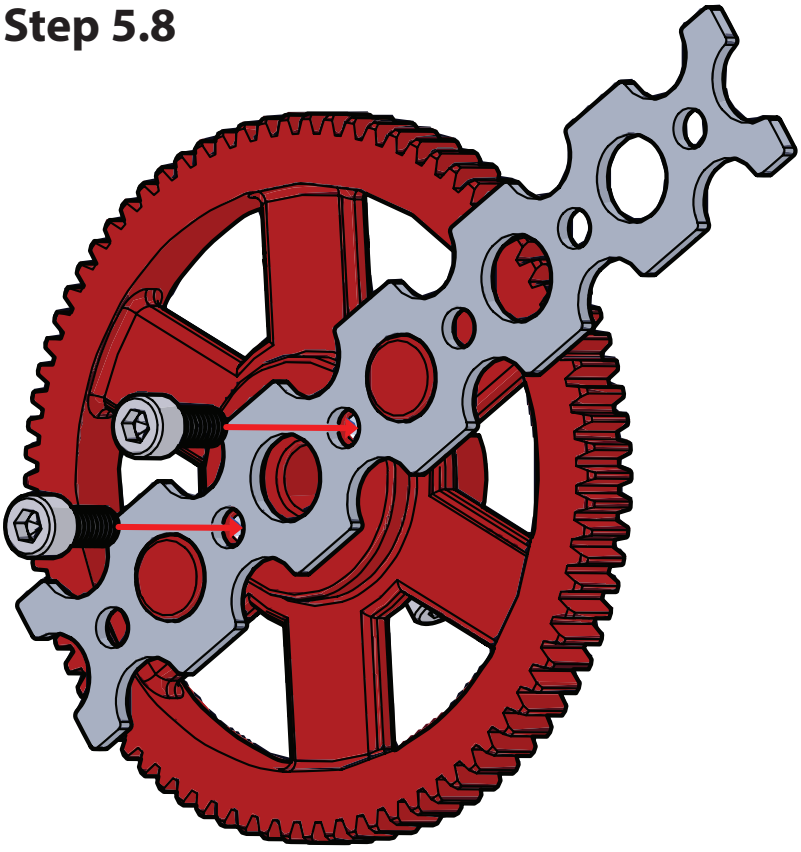
Step 5.6



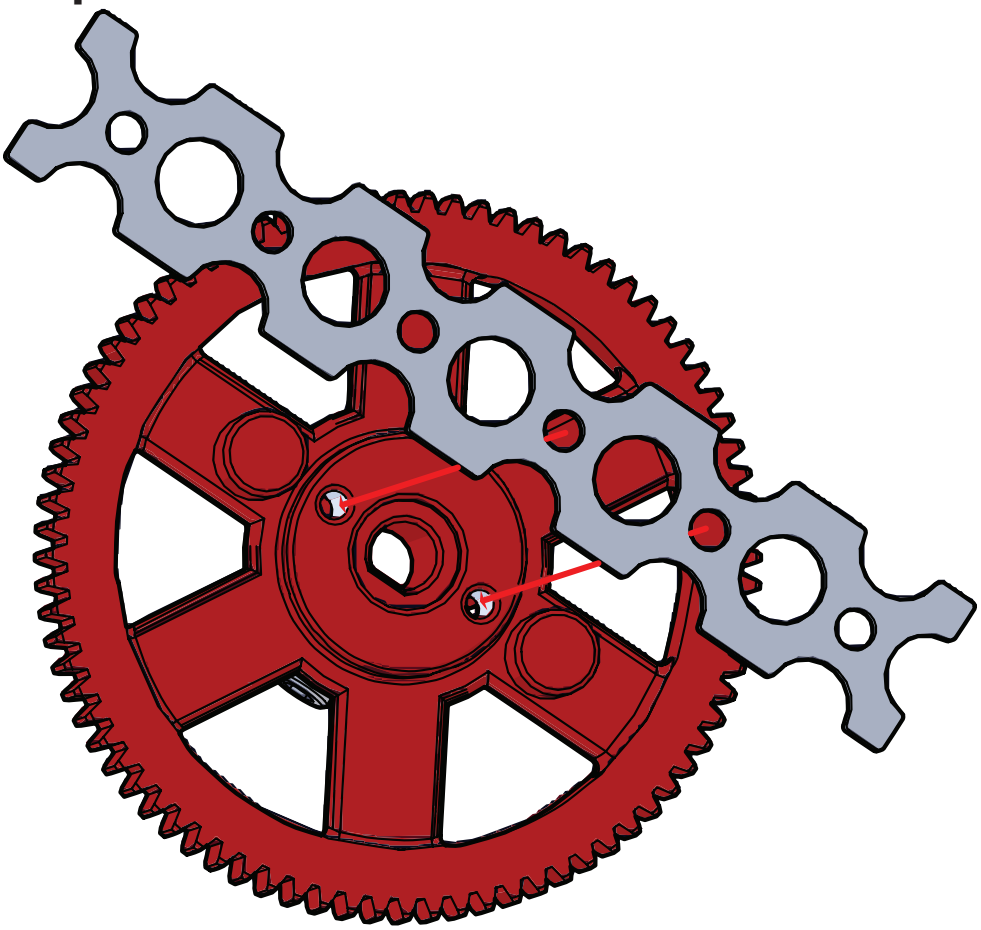
Step 5.7



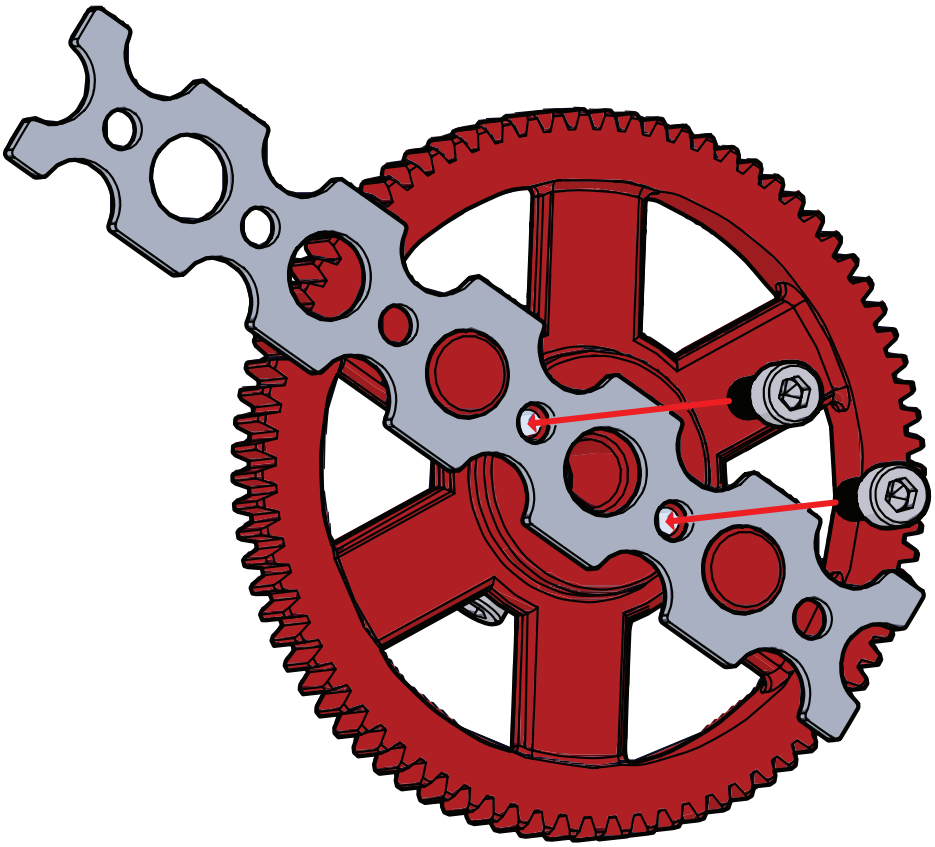
Step 5.8



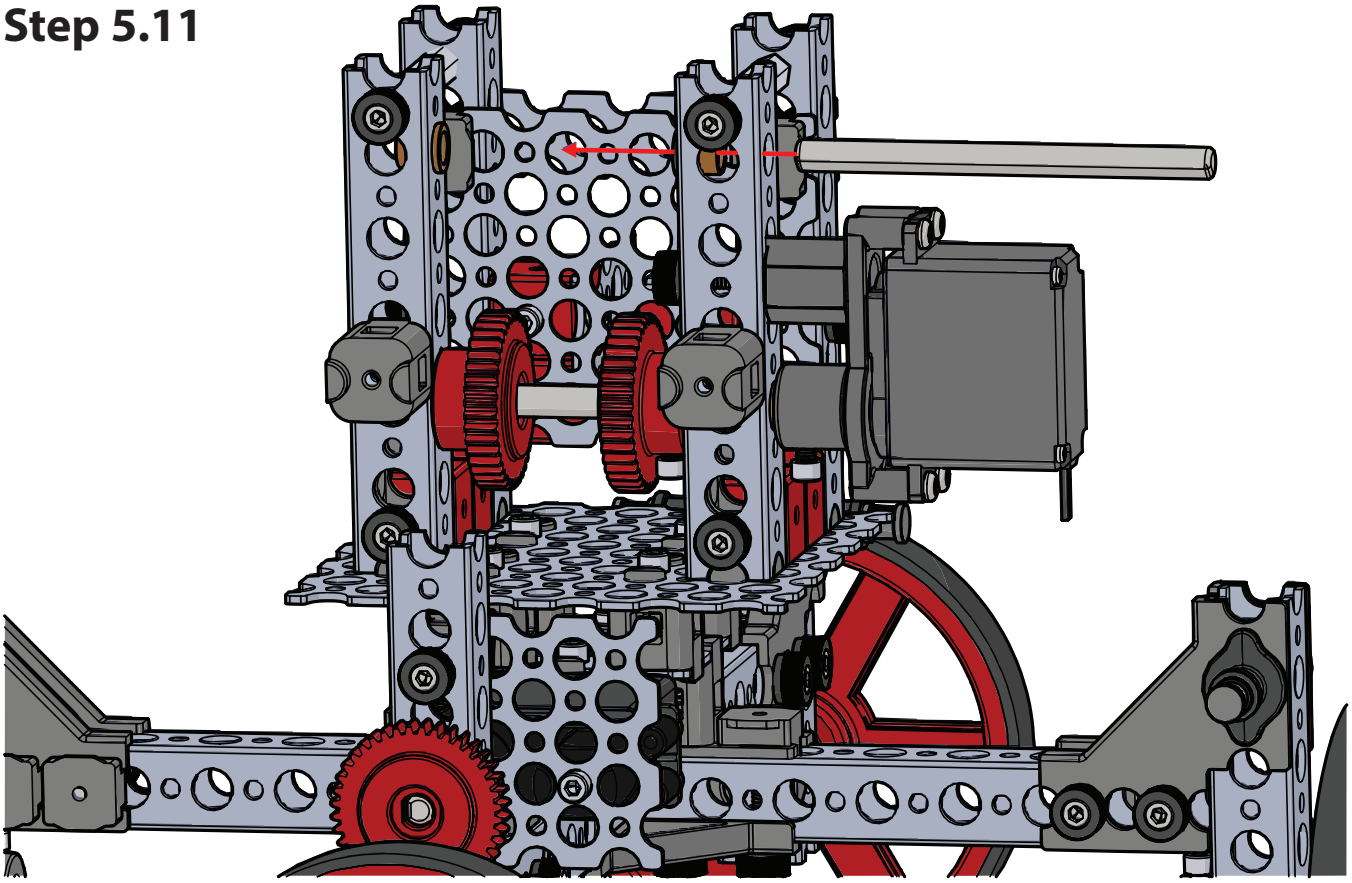
Step 5.9



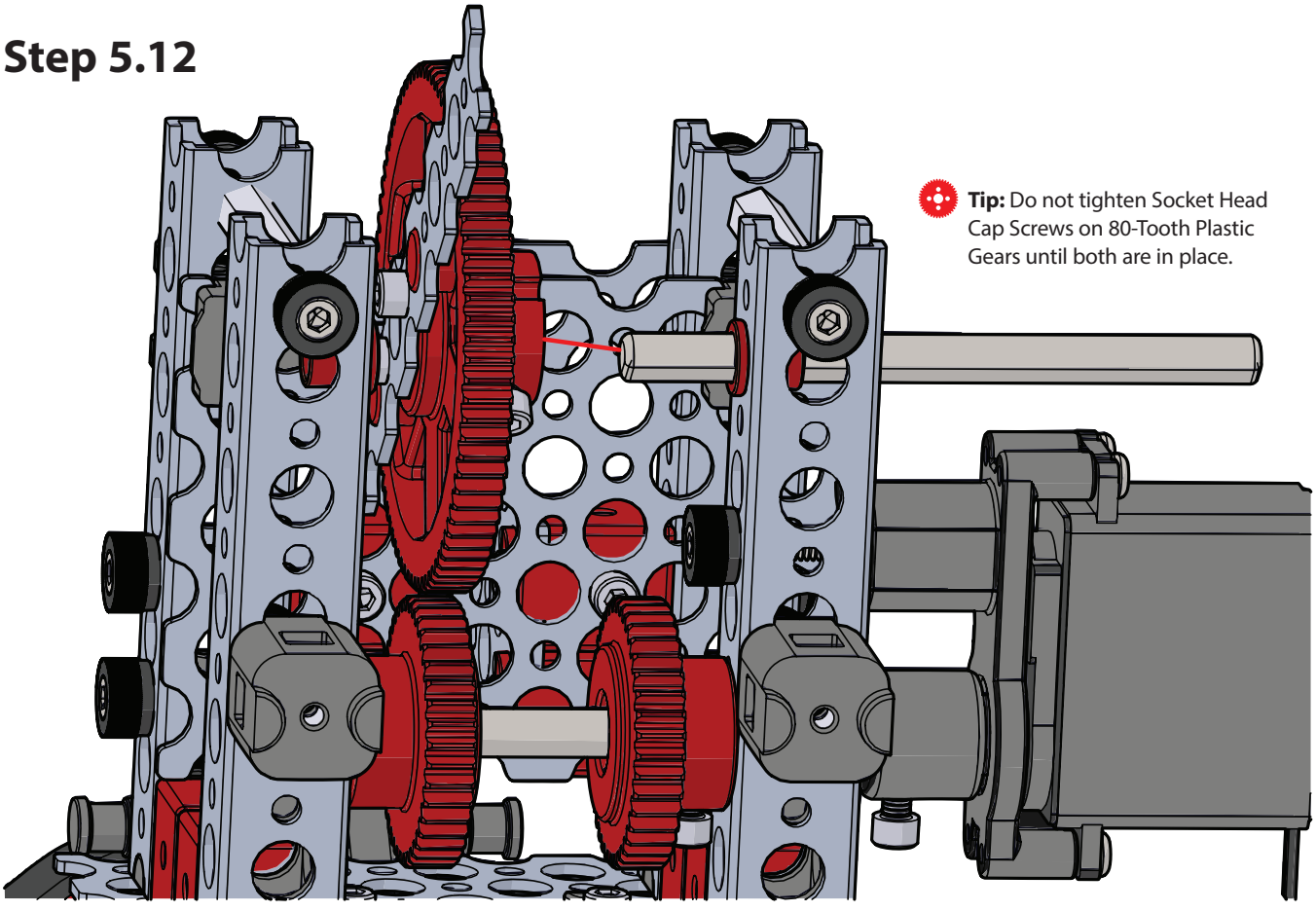
Step 5.10



Step 5.11

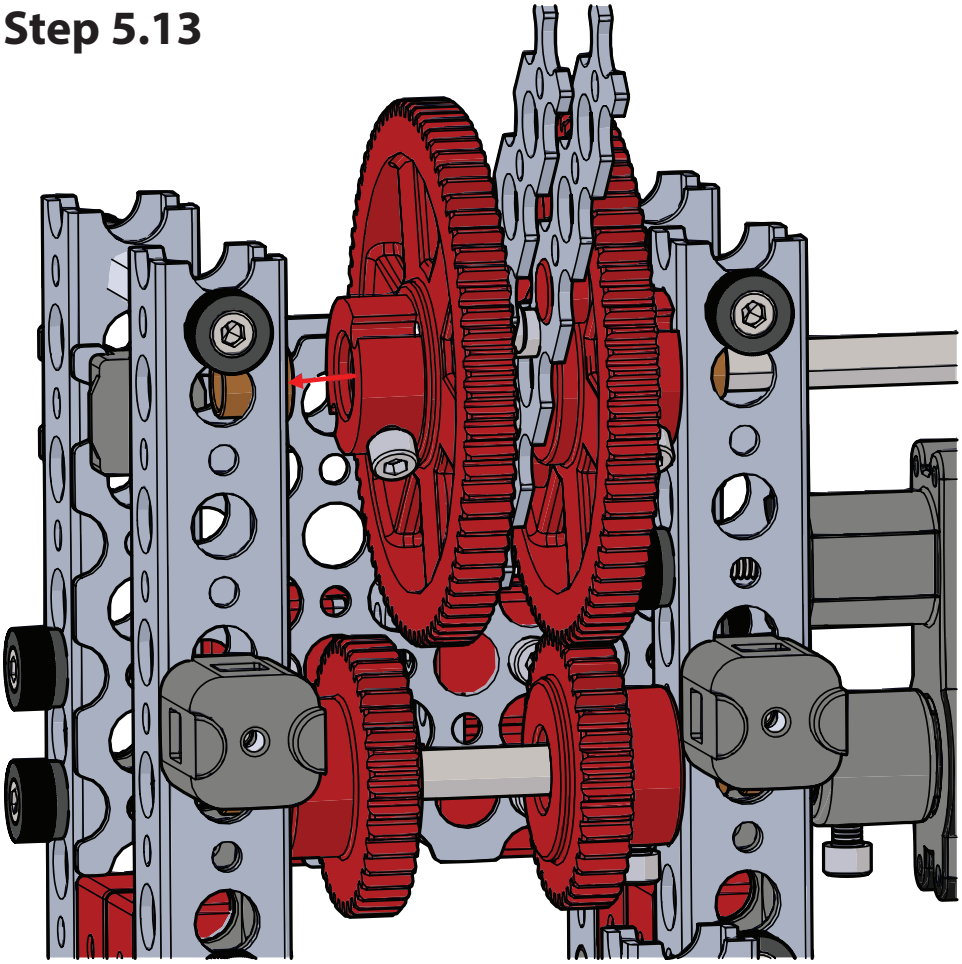


Step 5.12

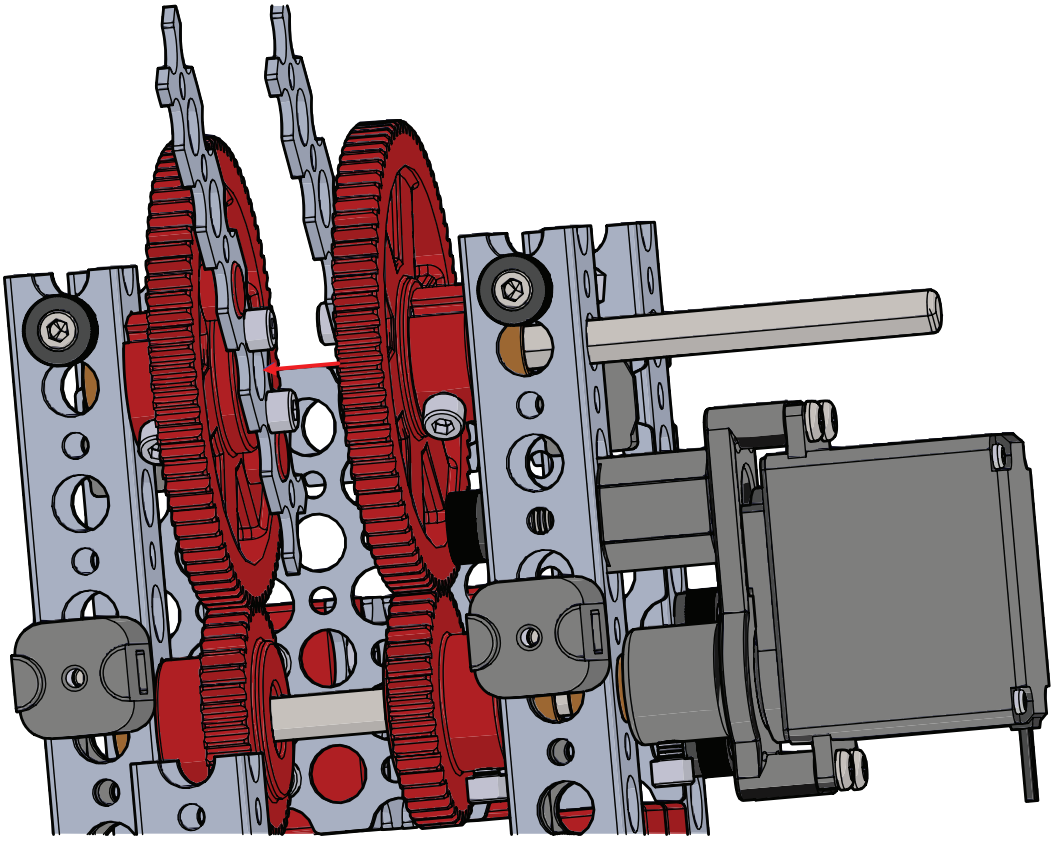


Tip: Do not tighten Socket Head Cap Screws on 80-Tooth Plastic Gears until both are in place.

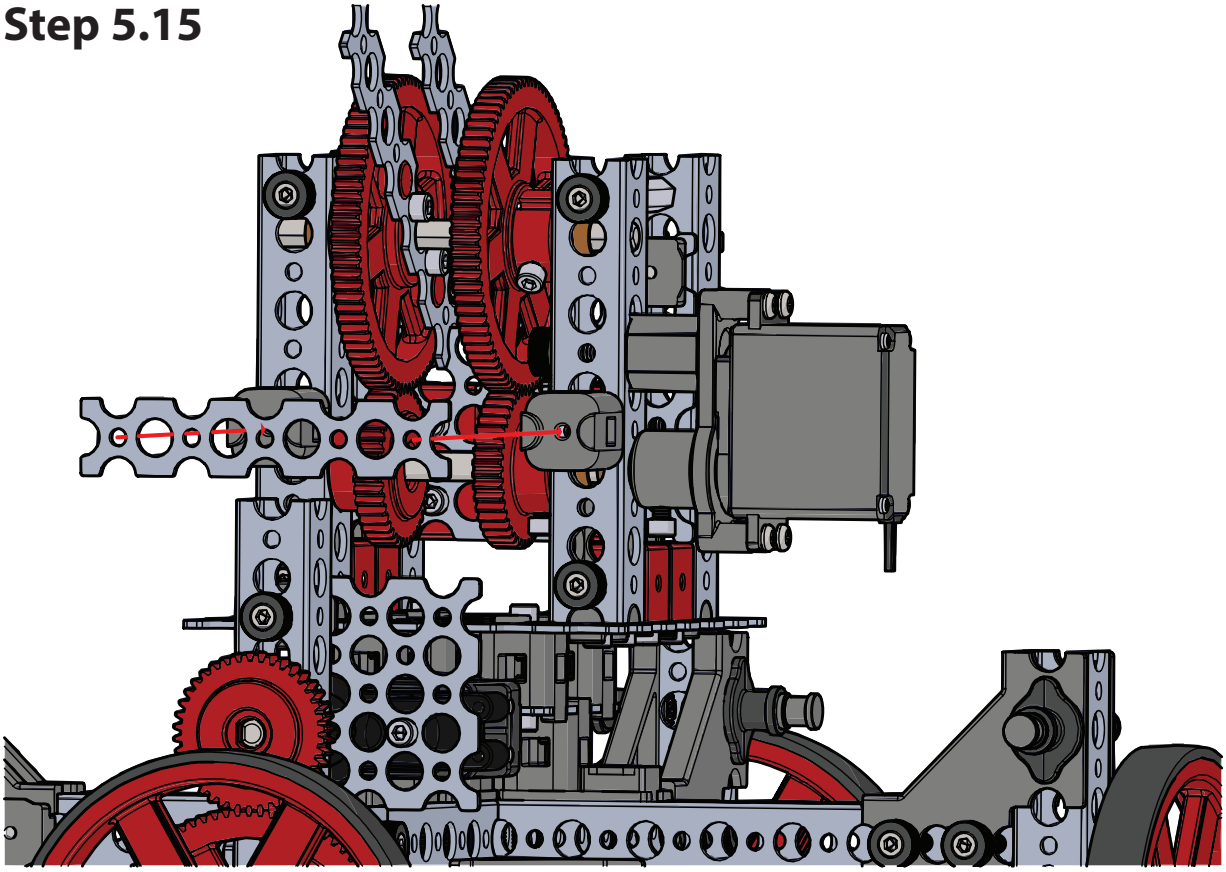
Step 5.13



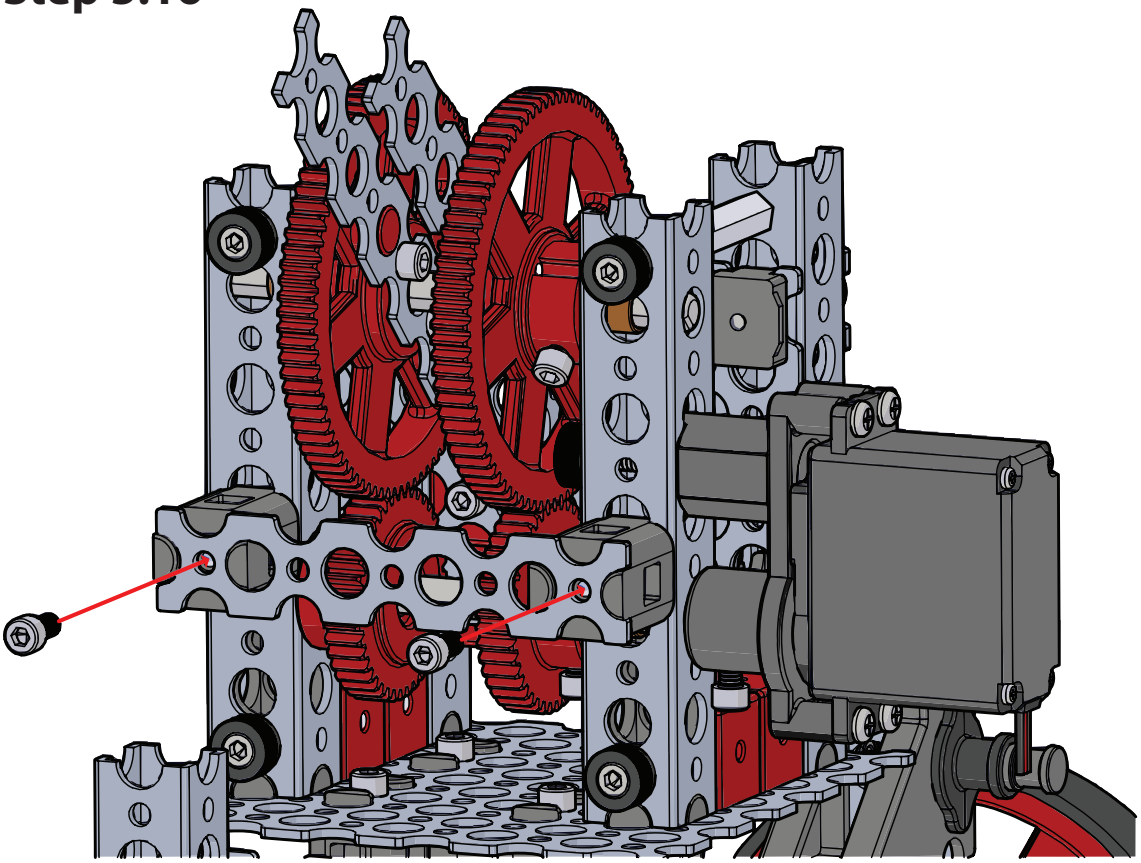
Step 5.14



Step 5.15

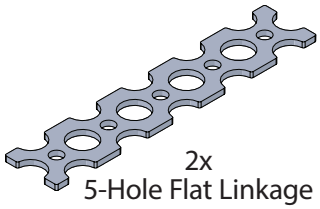


Step 5.16

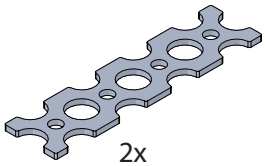


Step 6

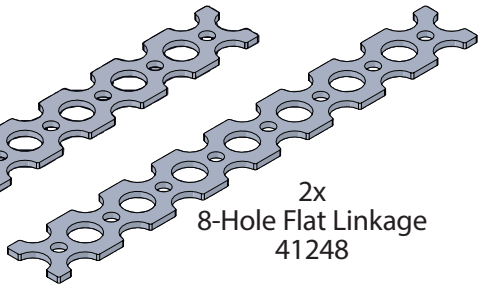
Parts Needed



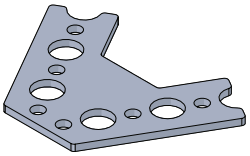
2x
5-Hole Flat Linkage
41245



2x
4-Hole Flat Linkage
41244

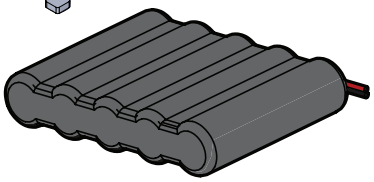


2x
8-Hole Flat Linkage
41248



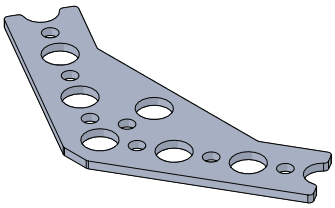
3x
60-Degree
Gusset 41264

2x
15-Hole Flat
Linkage 41250



1x
6 V NiMH Battery Pack 40235

1x
4-channel wireless
receiver from Wireless
Joystick Gamepad
System 40239



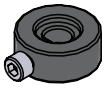
6x
120-Degree Gusset
41266

17x
6 mm Plastic Bushing
Spacer 41665

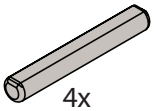
1x
8 mm x 6 mm Bronze
Bushing 40227

9x
Socket Head Cap
Screw 40516

1x
Kep Nut 39094



8x
D-Shaft Set
Collar 40229



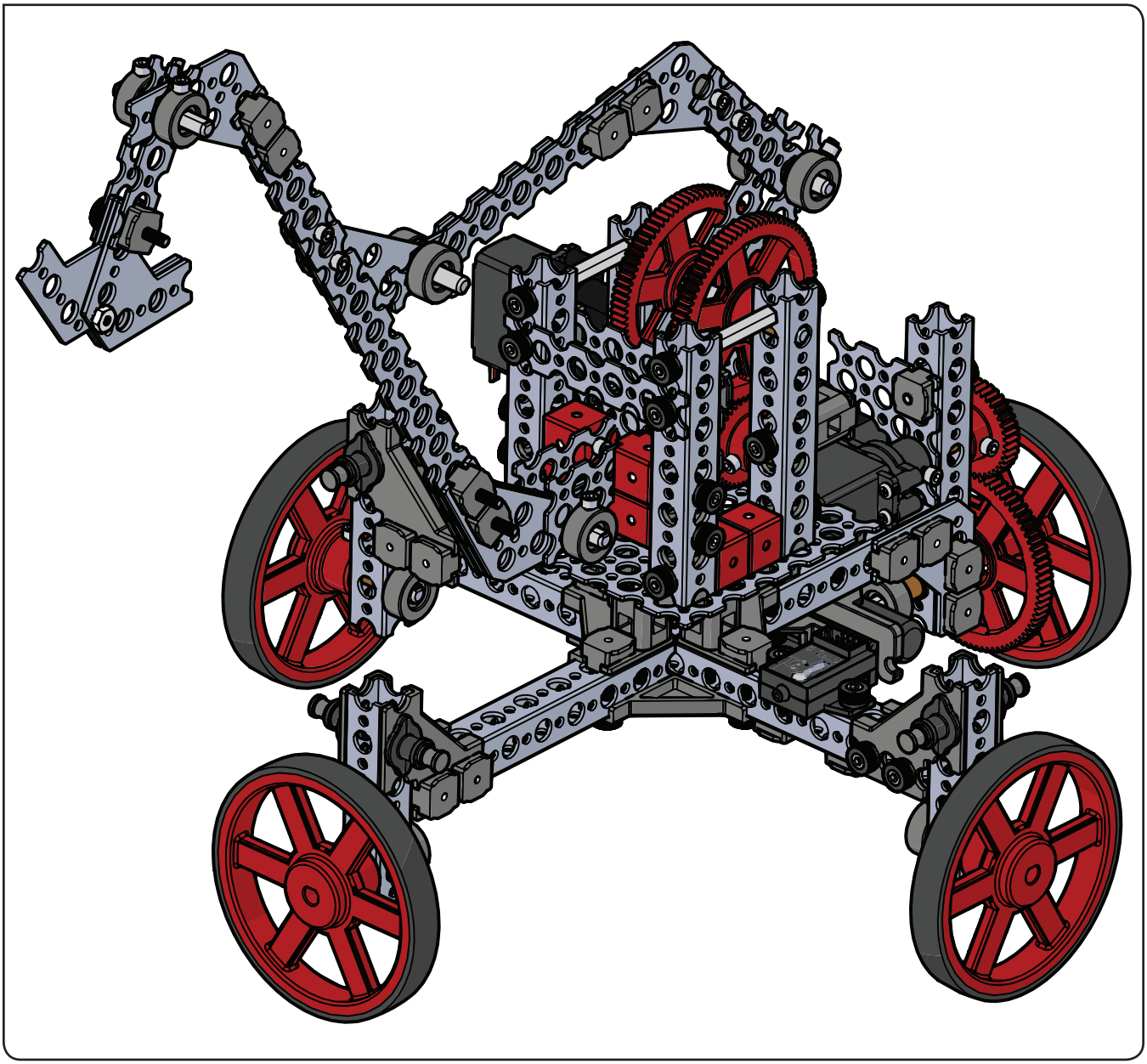
4x
40 mm Steel
Axle 40226

5x
Thumbscrew
40323

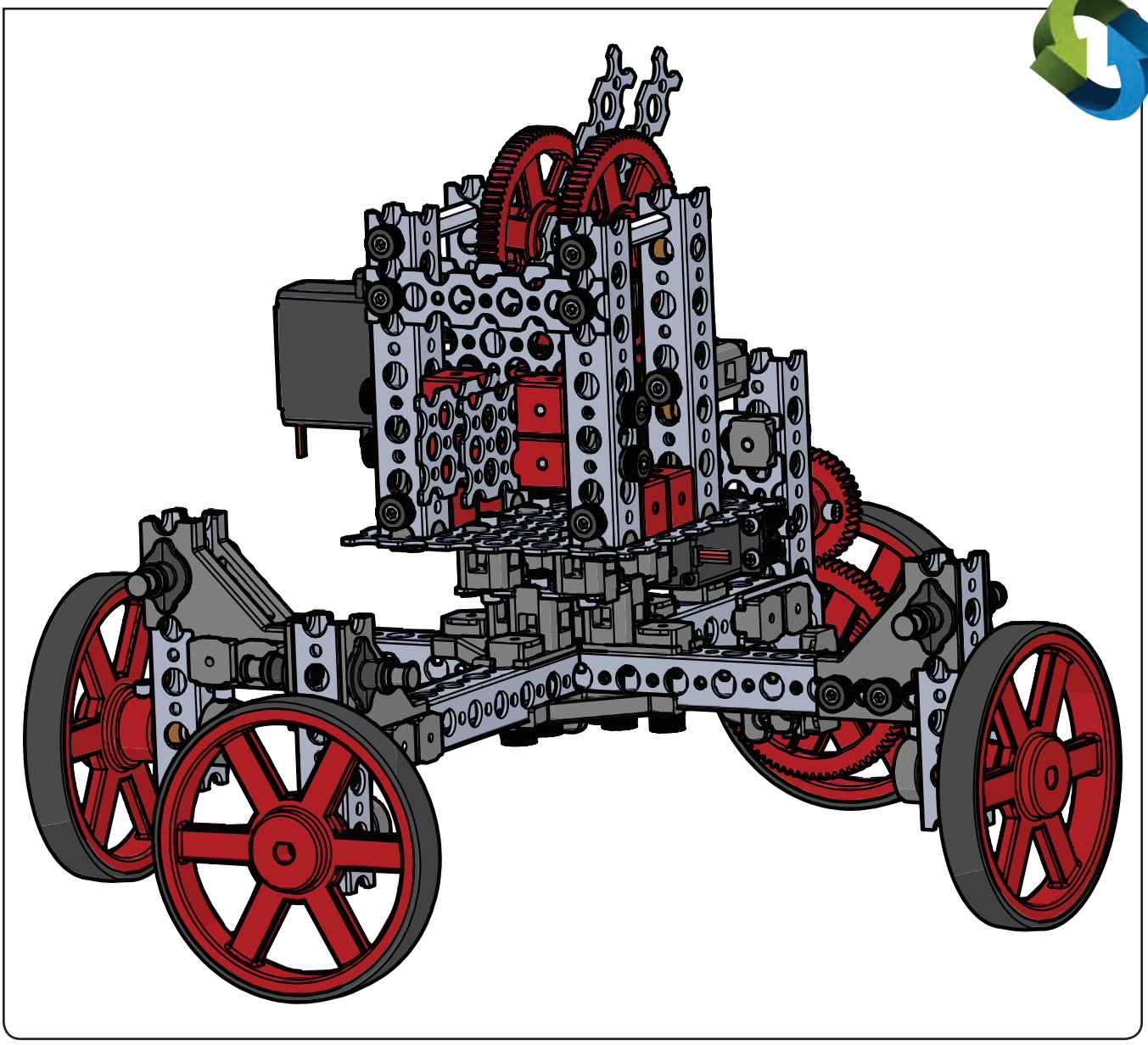
13x
Wing Nut
40221

Note: The quantity of Socket Head Cap Screws needed might vary if parts that utilize them as setscrews do not already have them installed.

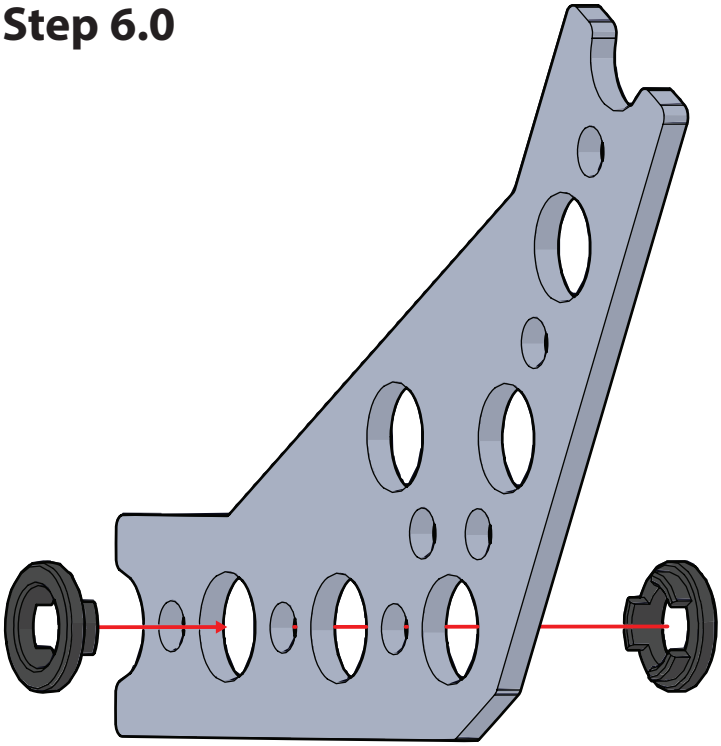
Finished assembly should look like this.



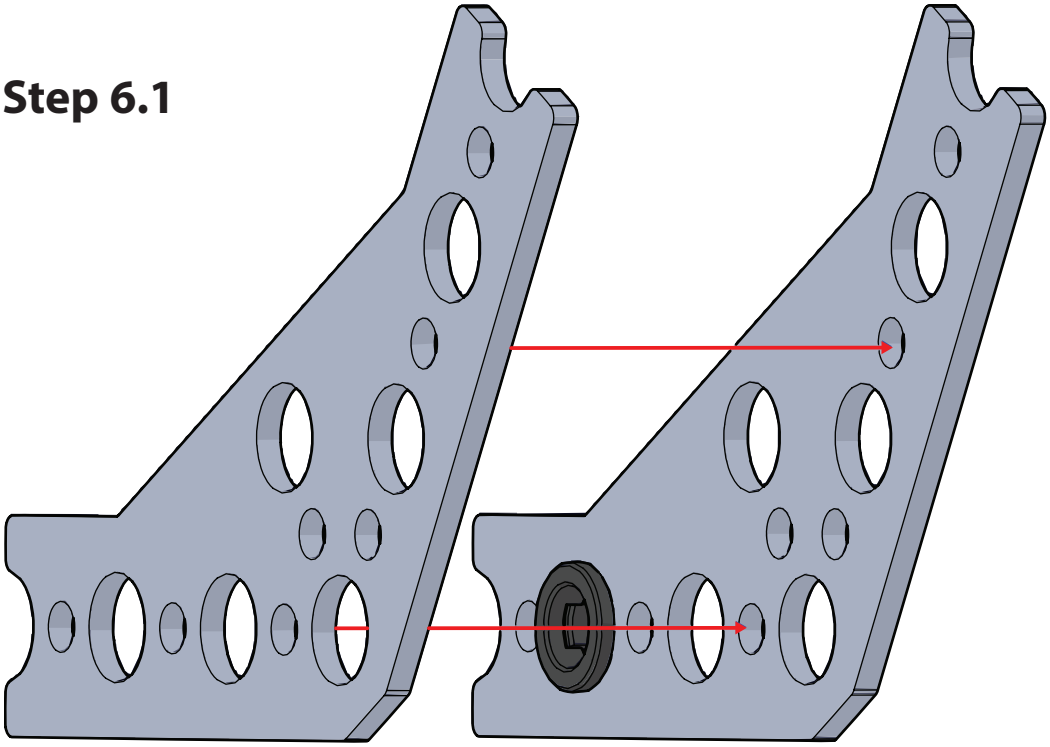
Rotate build to match this view.



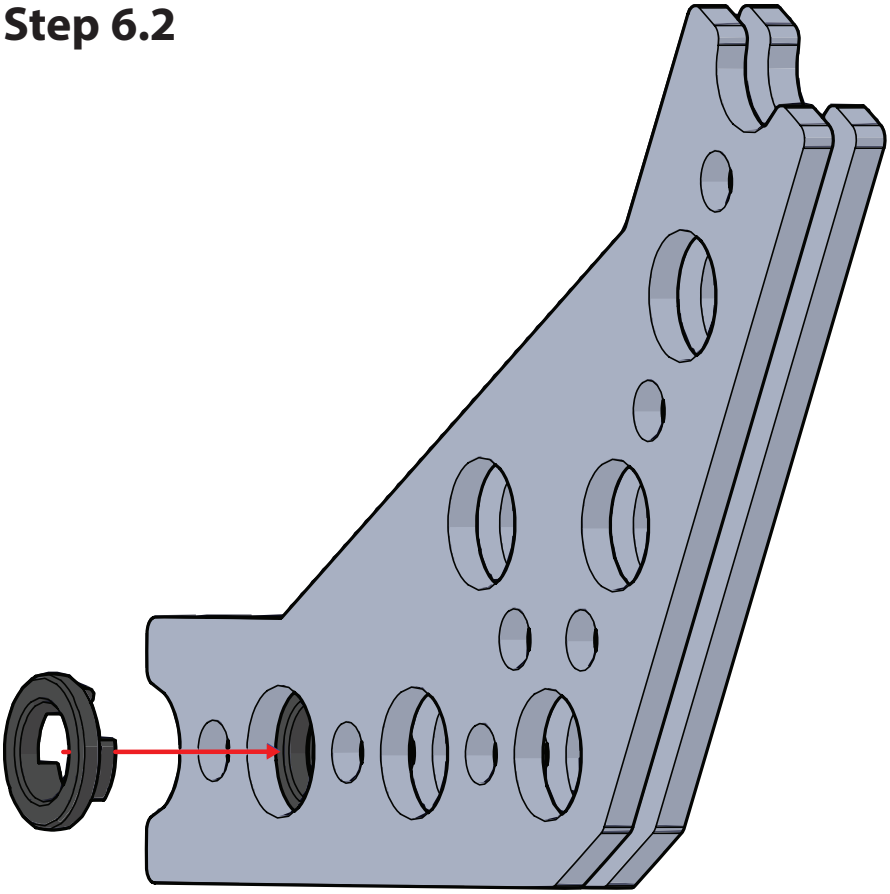
Step 6.0



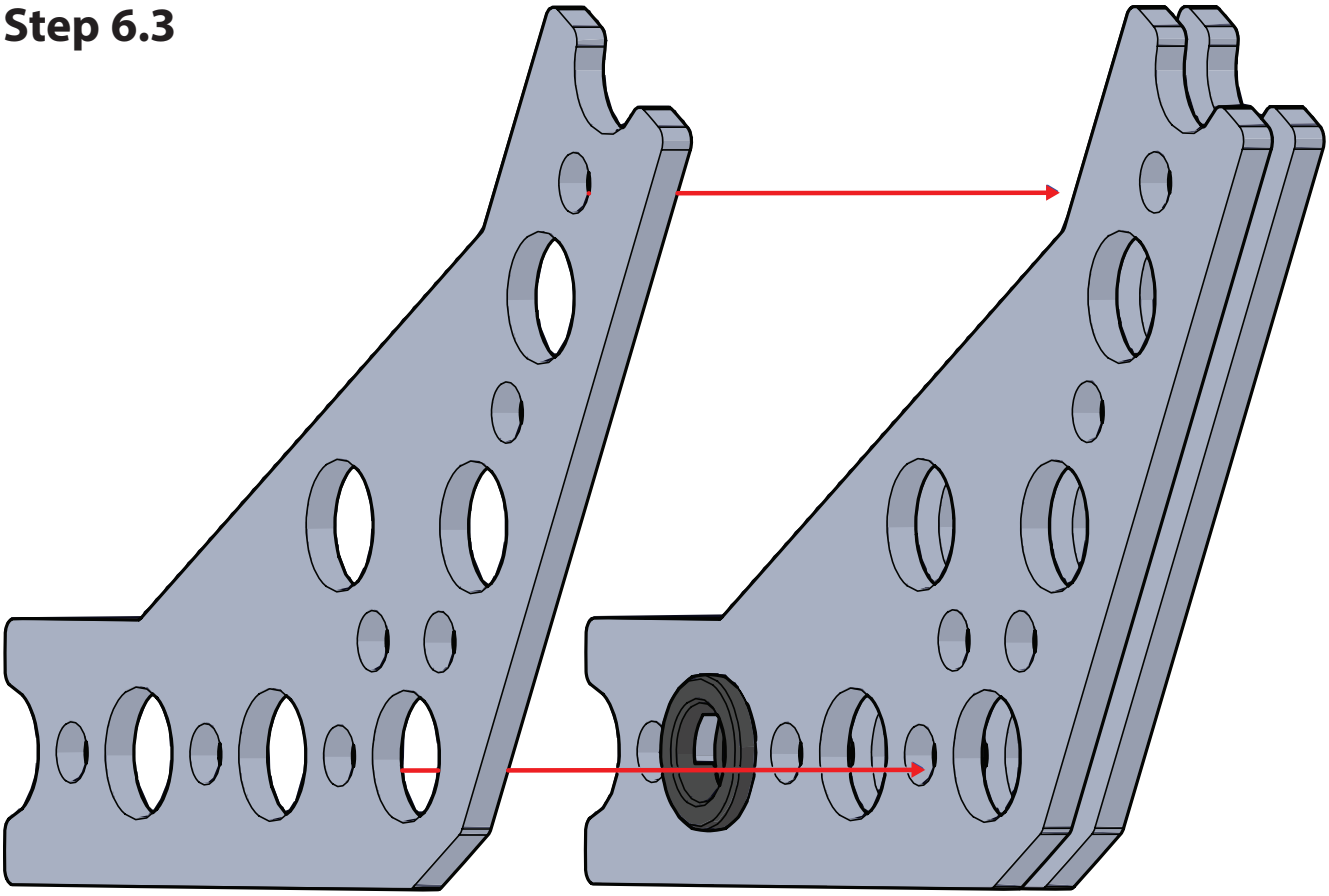
Step 6.1



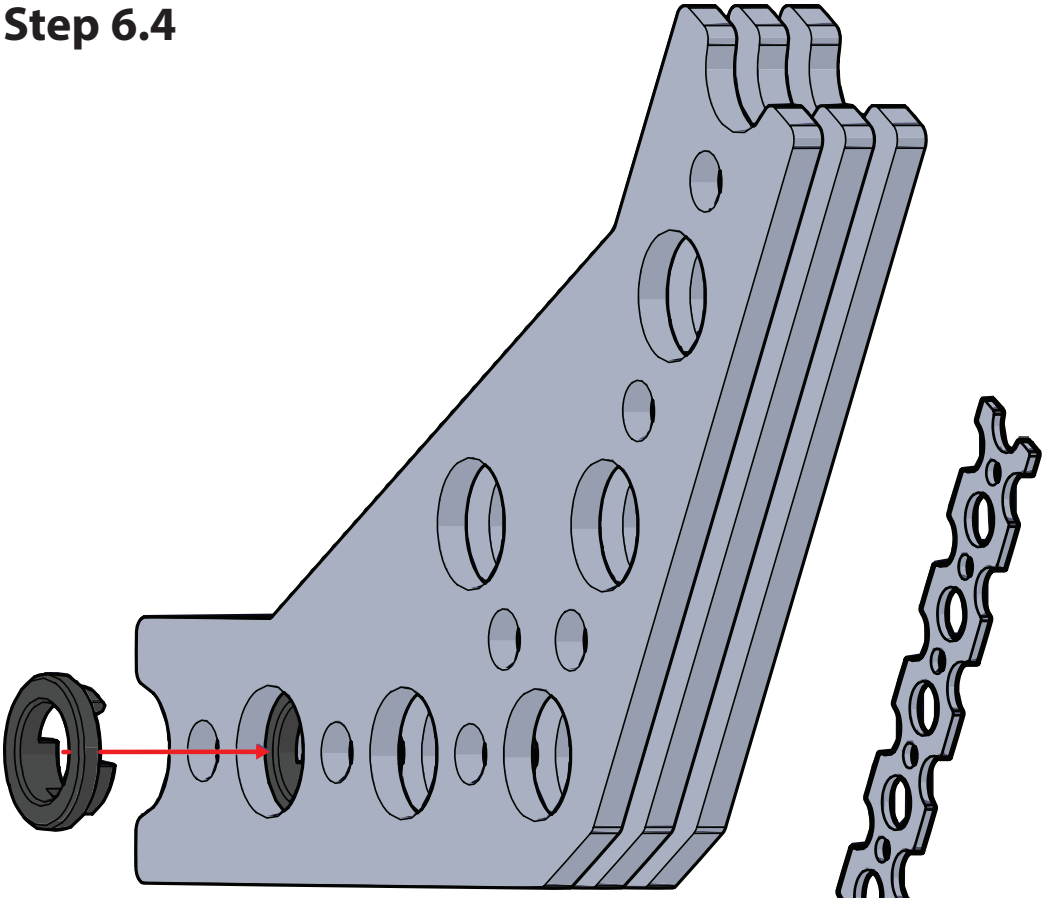
Step 6.2



Step 6.3

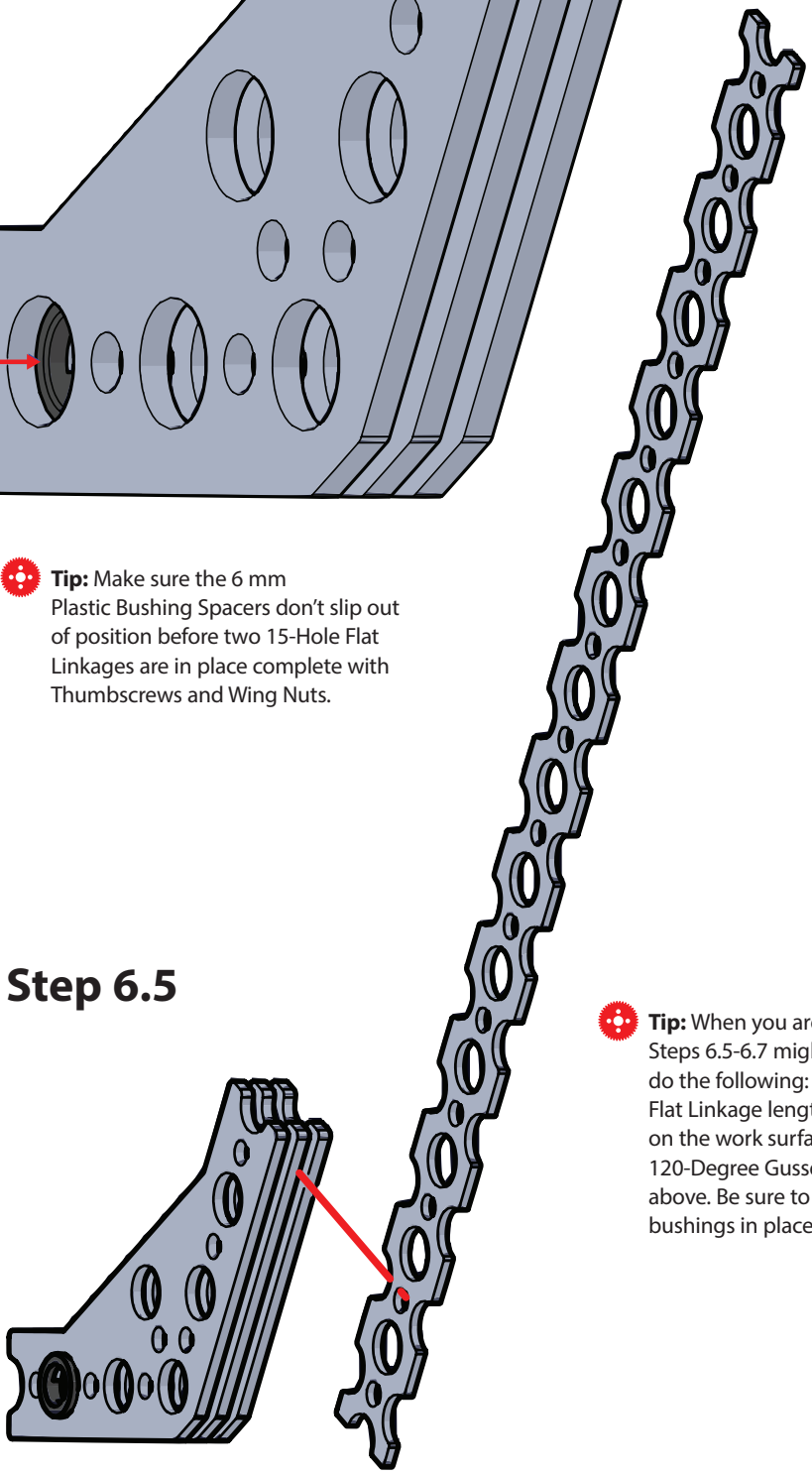


Step 6.4

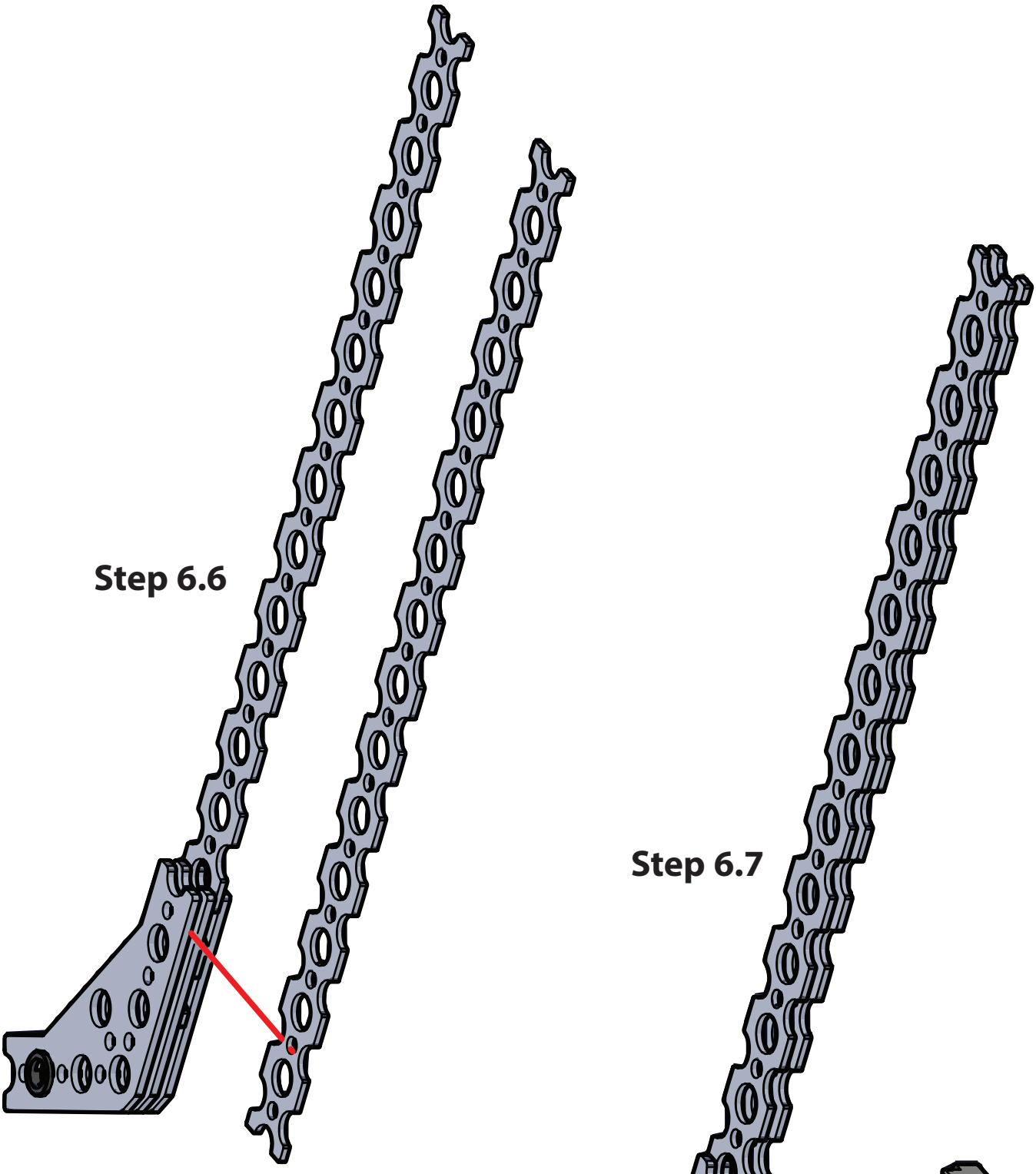


Tip: Make sure the 6 mm Plastic Bushing Spacers don't slip out of position before two 15-Hole Flat Linkages are in place complete with Thumbscrews and Wing Nuts.

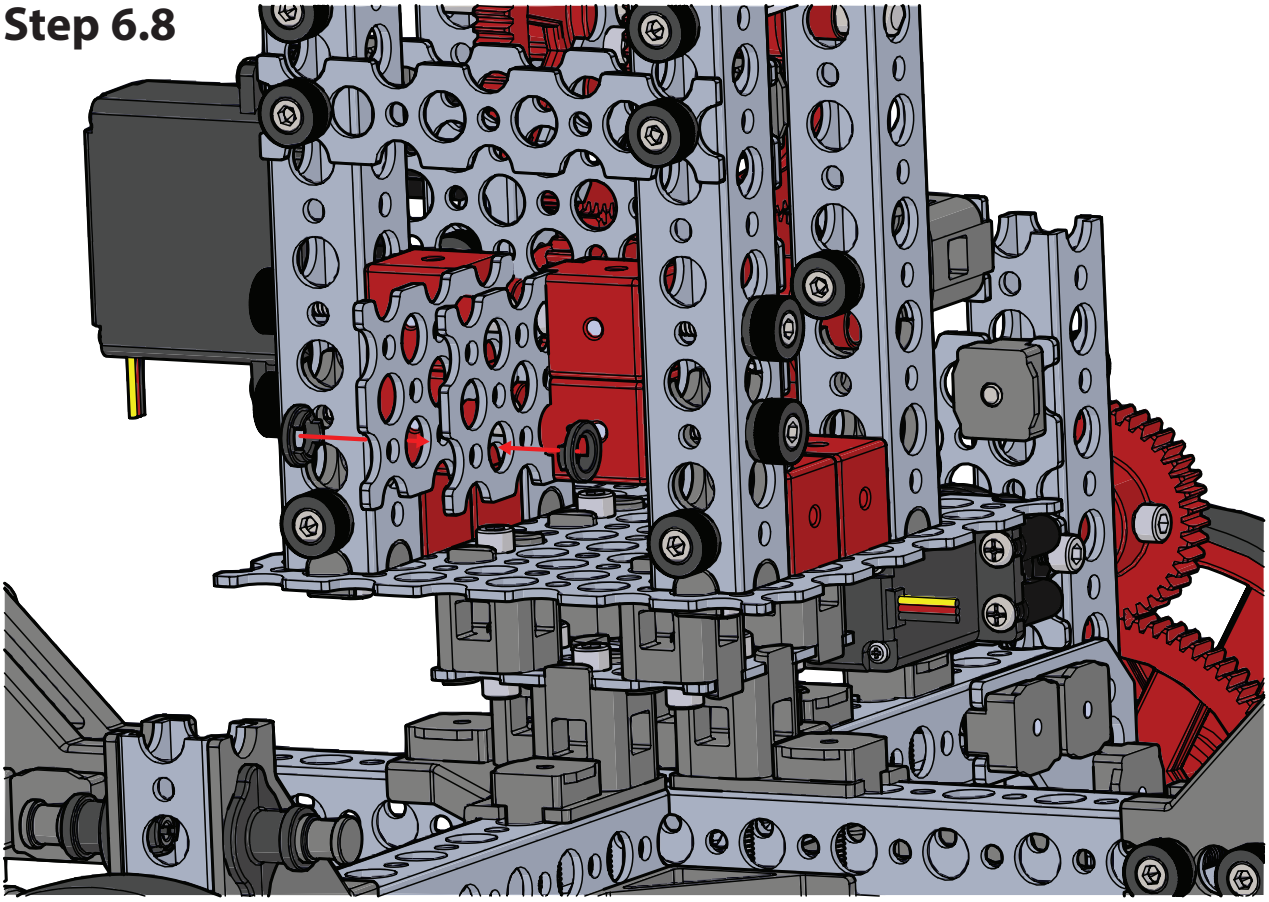
Step 6.5



Tip: When you are working by yourself, Steps 6.5-6.7 might be easier if you do the following: First, lay the 15-Hole Flat Linkage lengthwise on its edge on the work surface. Then, lower the 120-Degree Gusset assembly from above. Be sure to hold the plastic bushings in place with one hand.


Step 6.6
Step 6.7

Step 6.8



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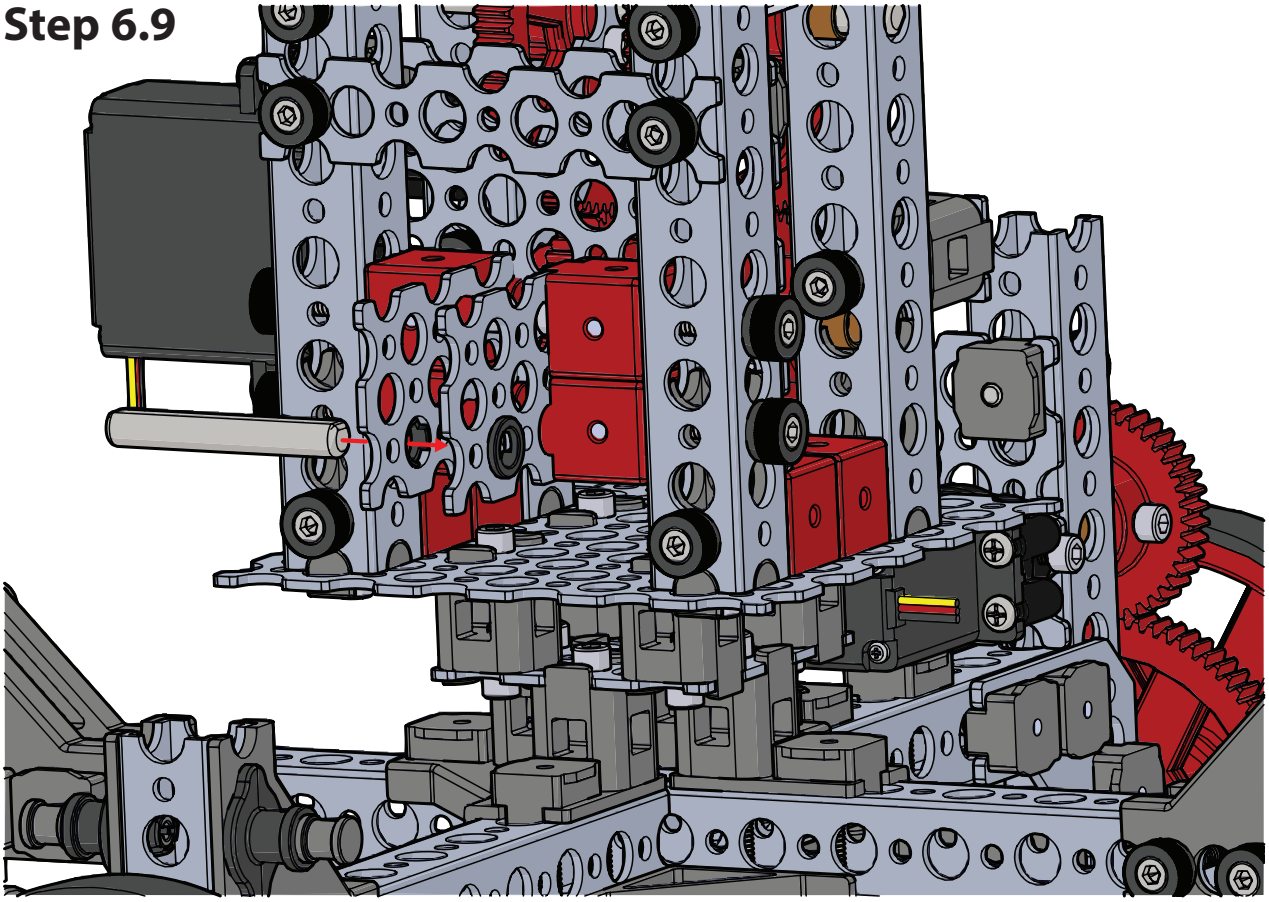

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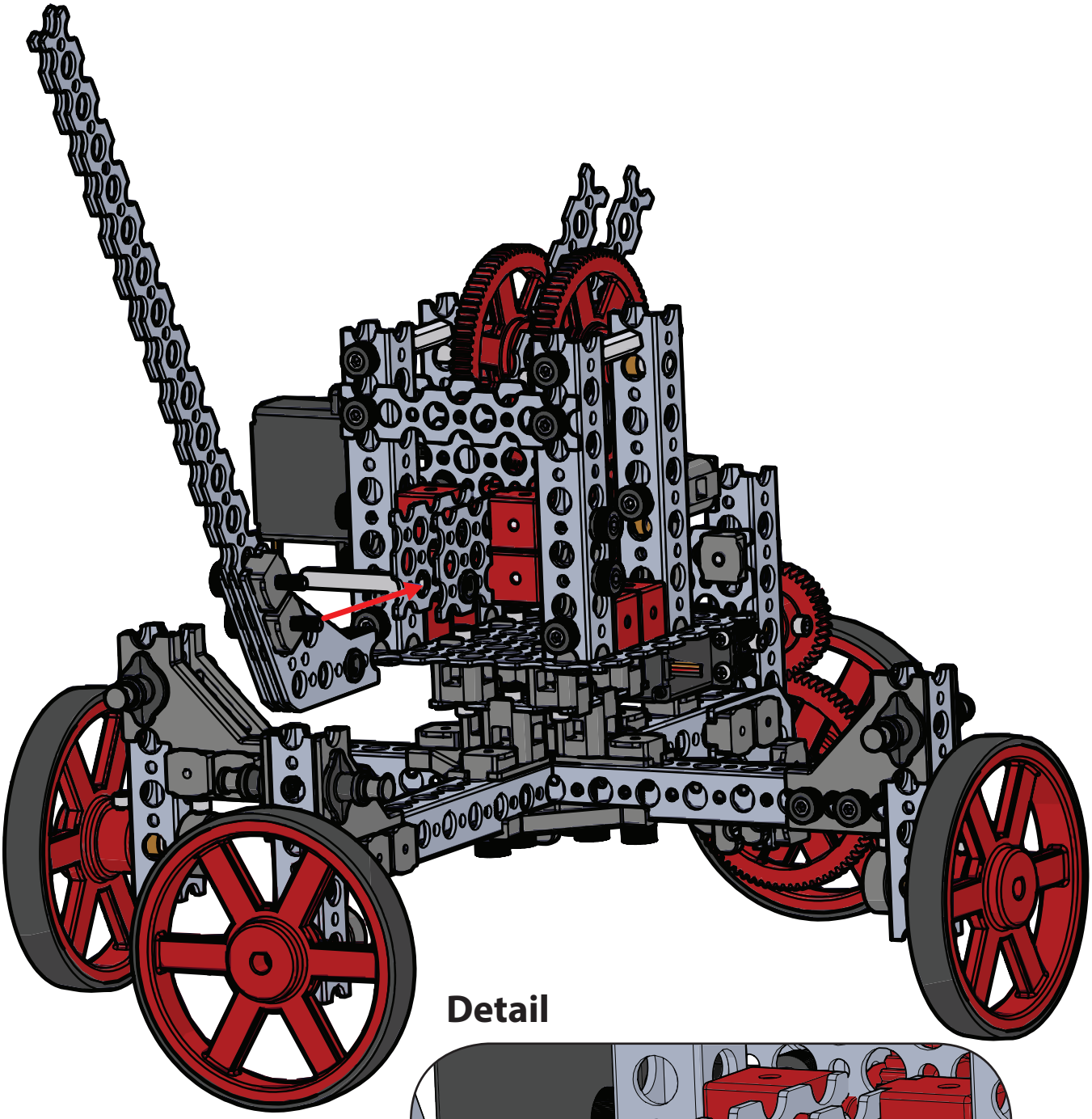
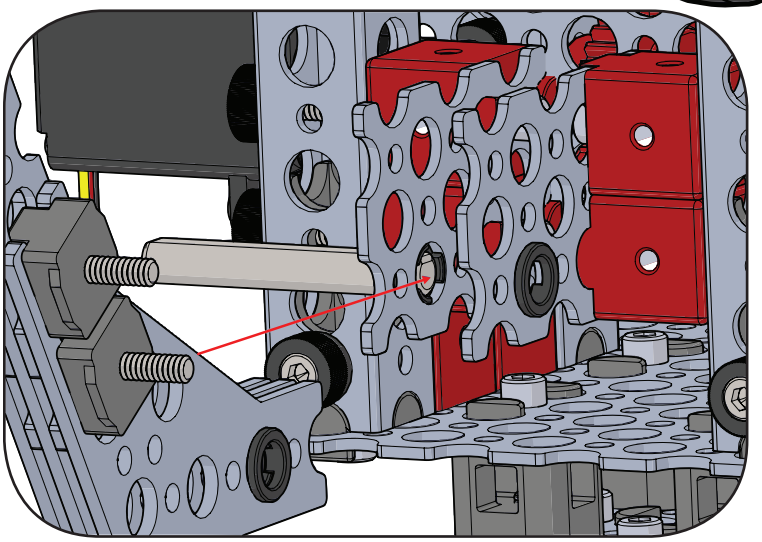


Detail



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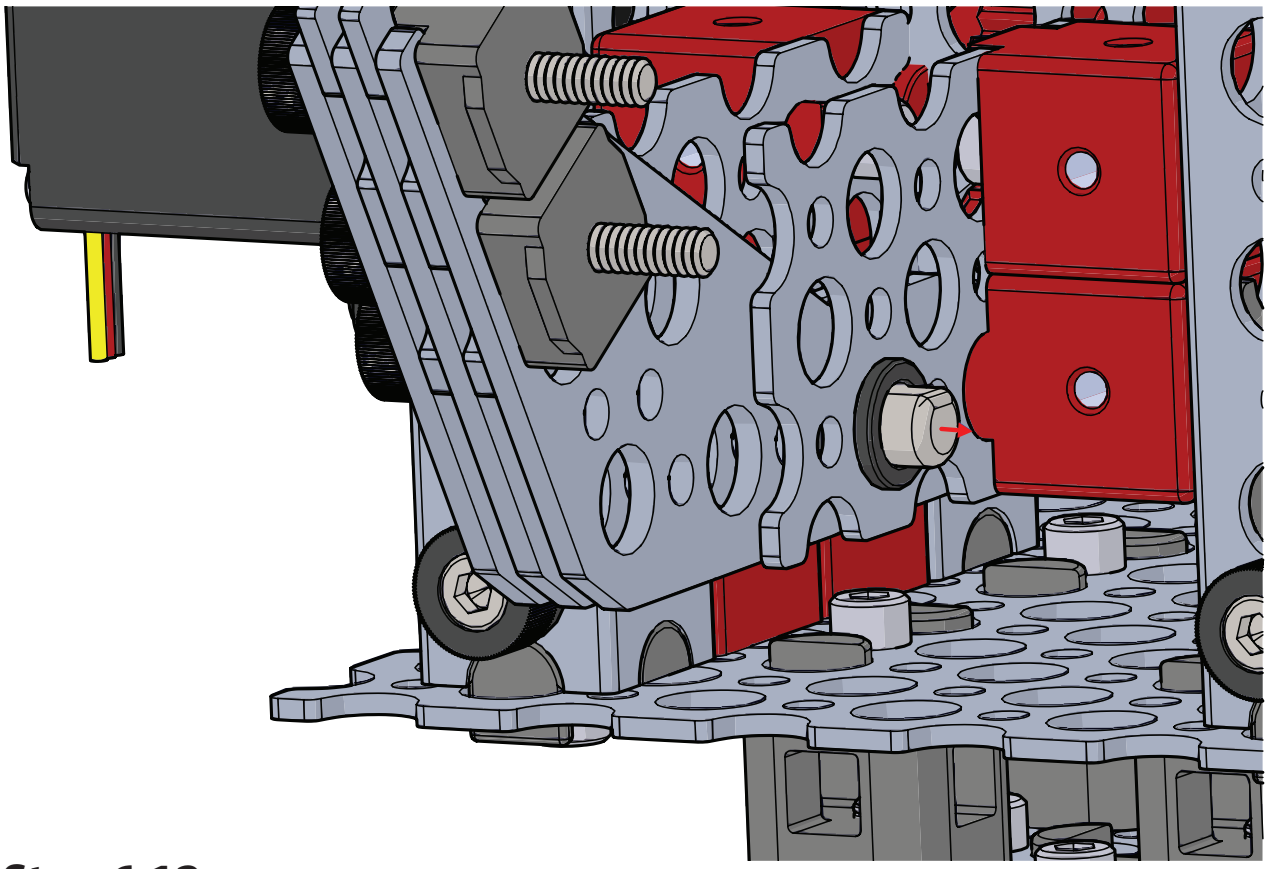
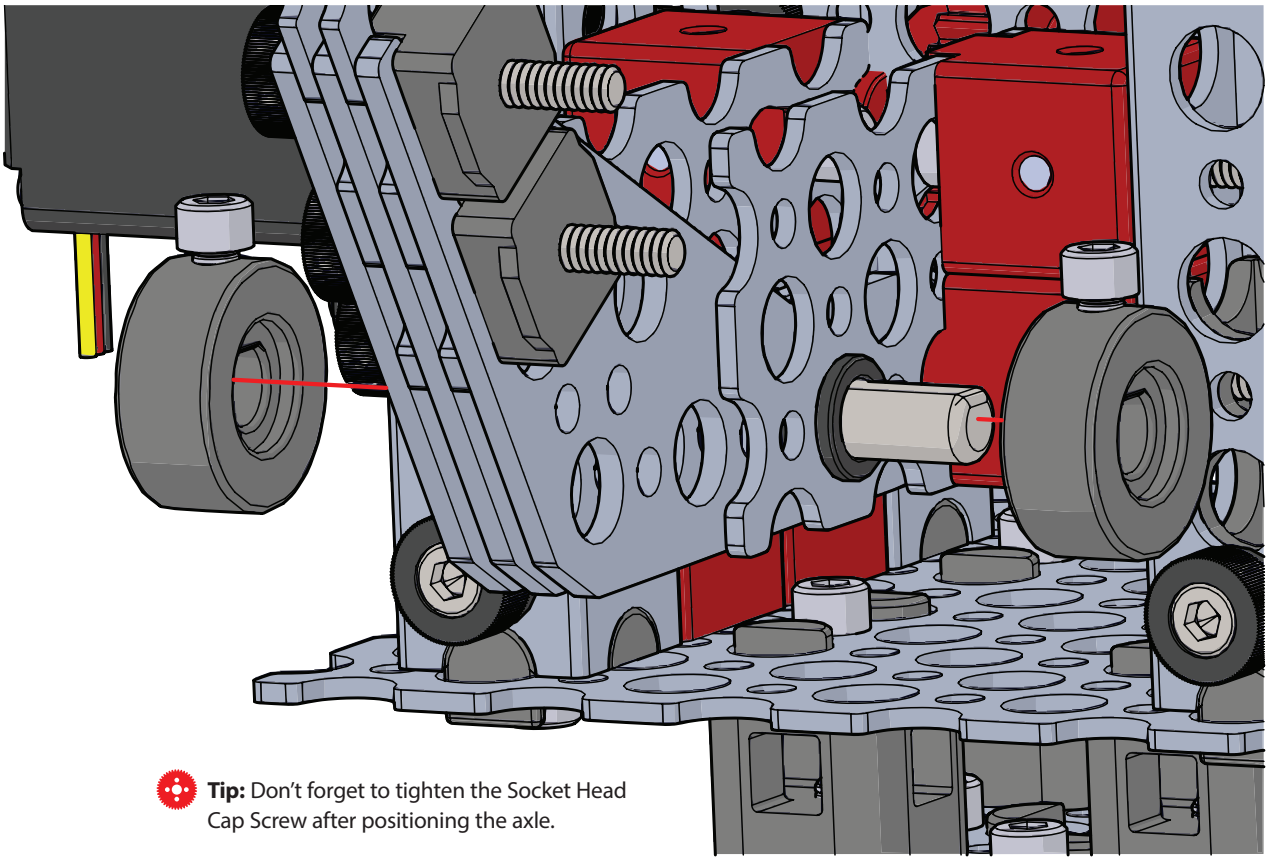
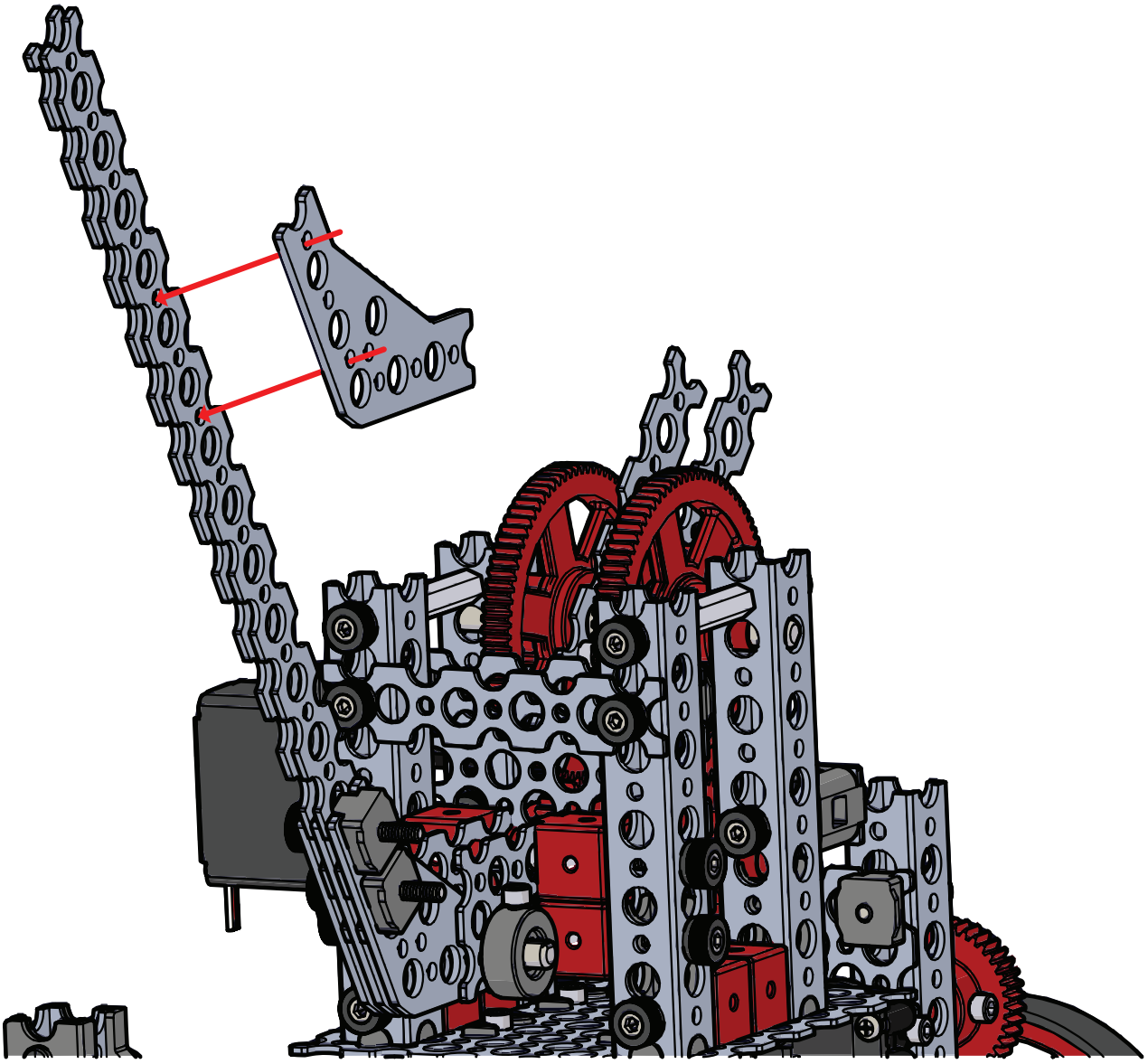


Step 6.12



Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Step 6.13



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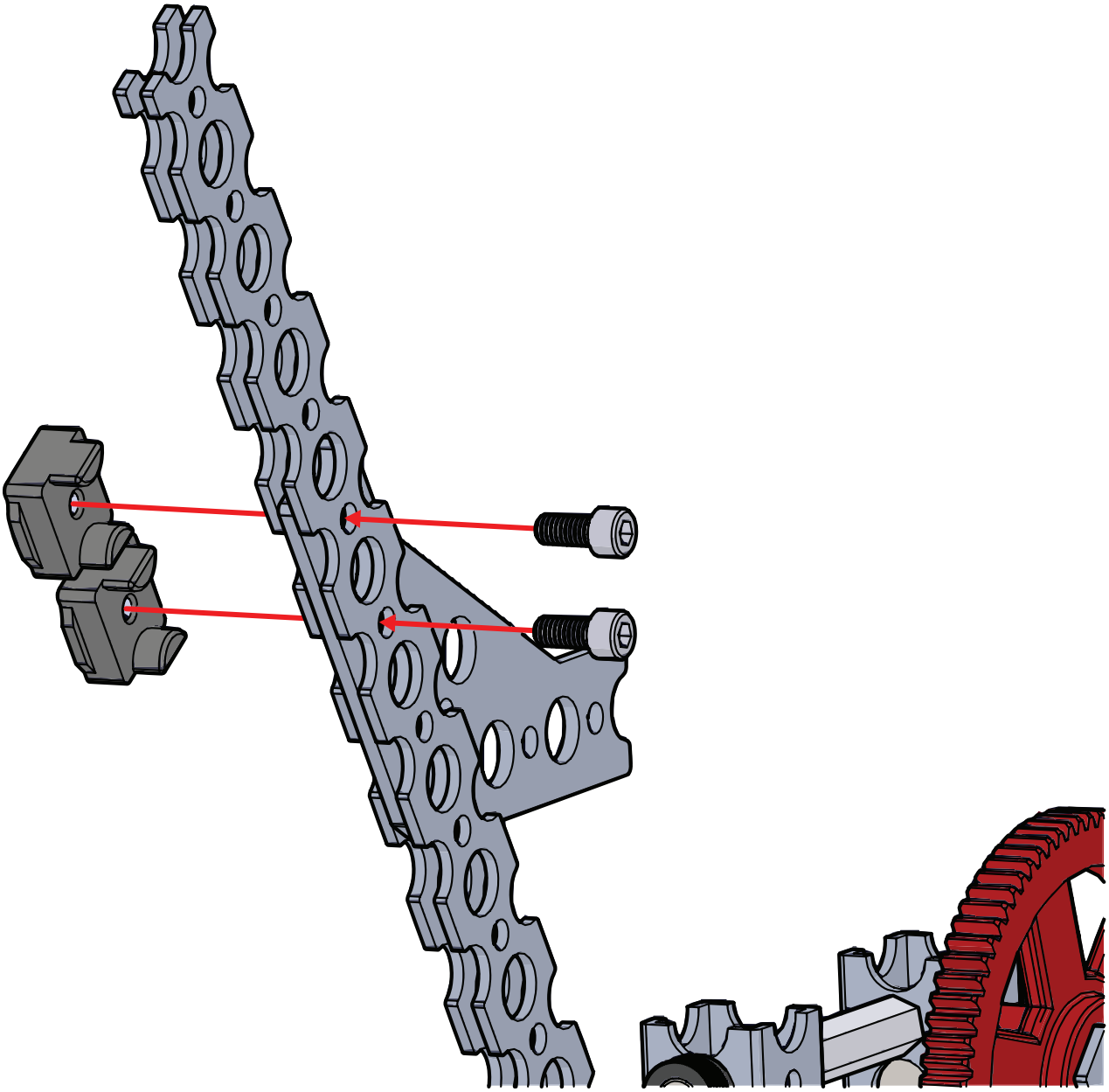

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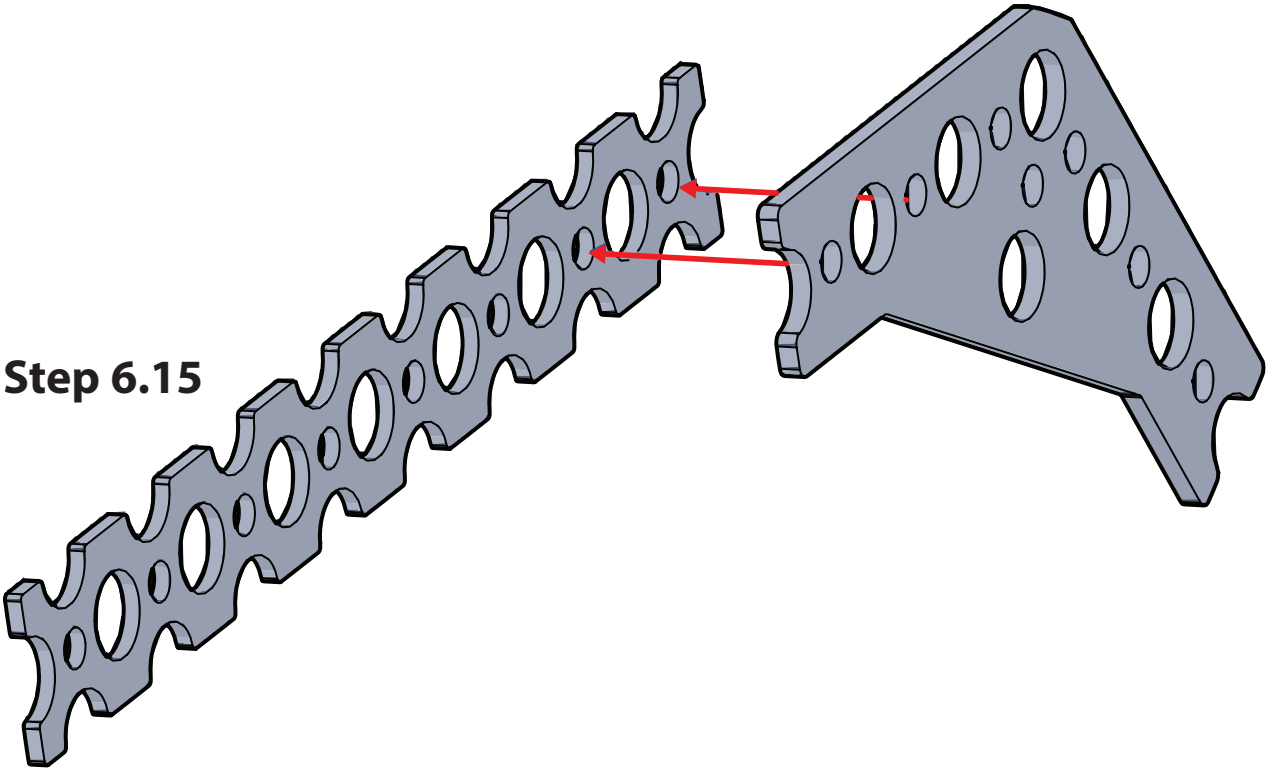

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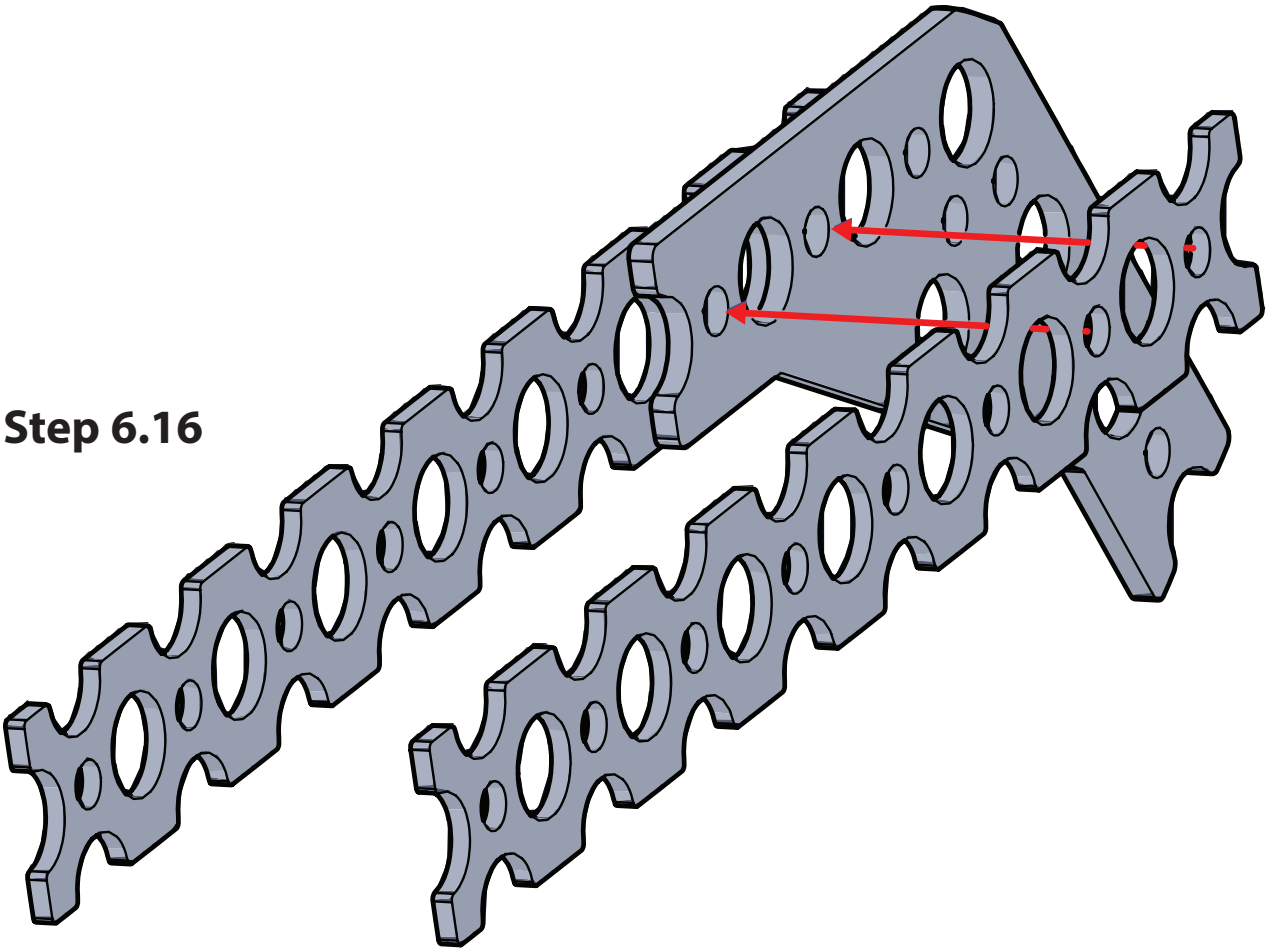

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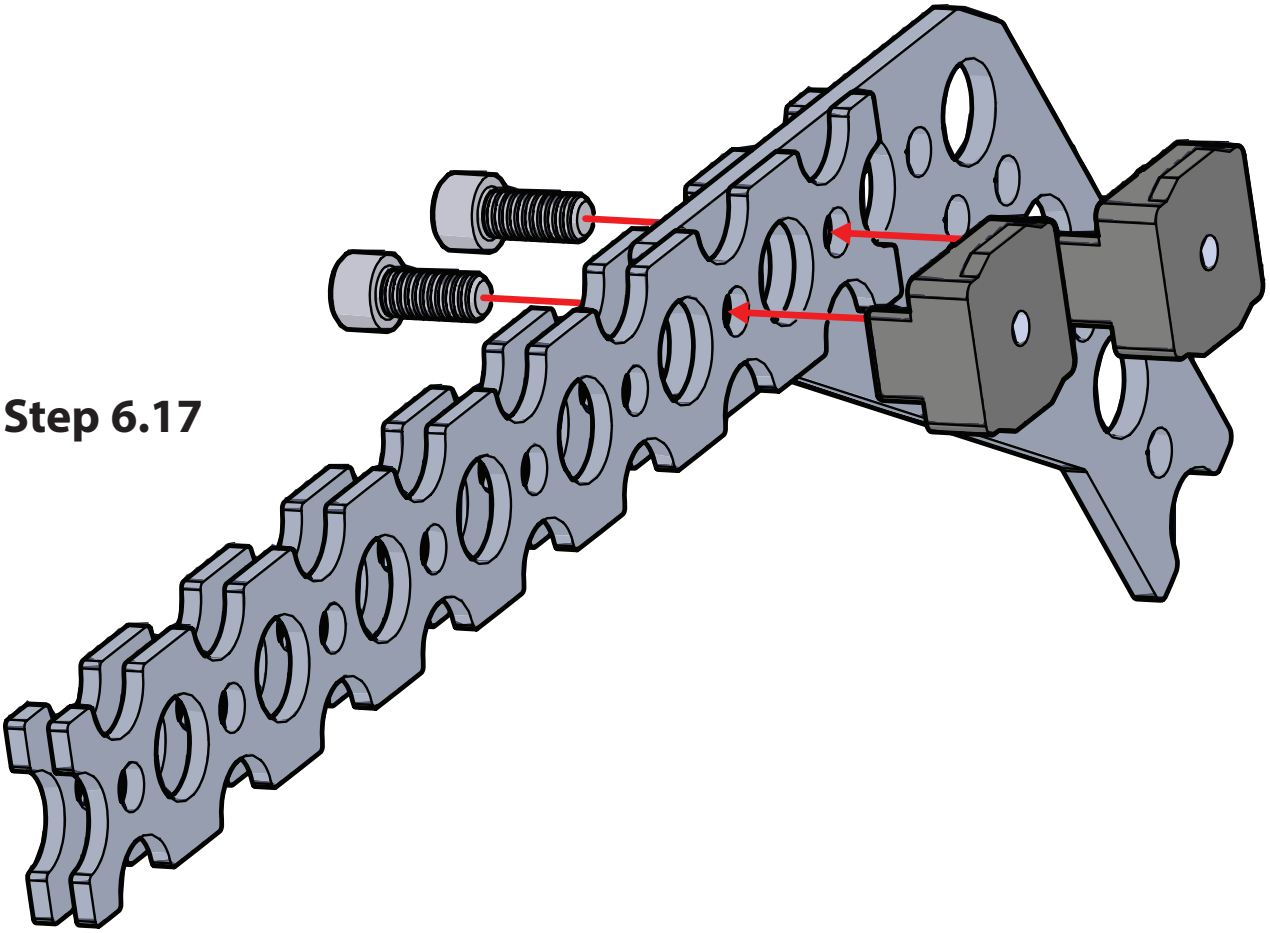
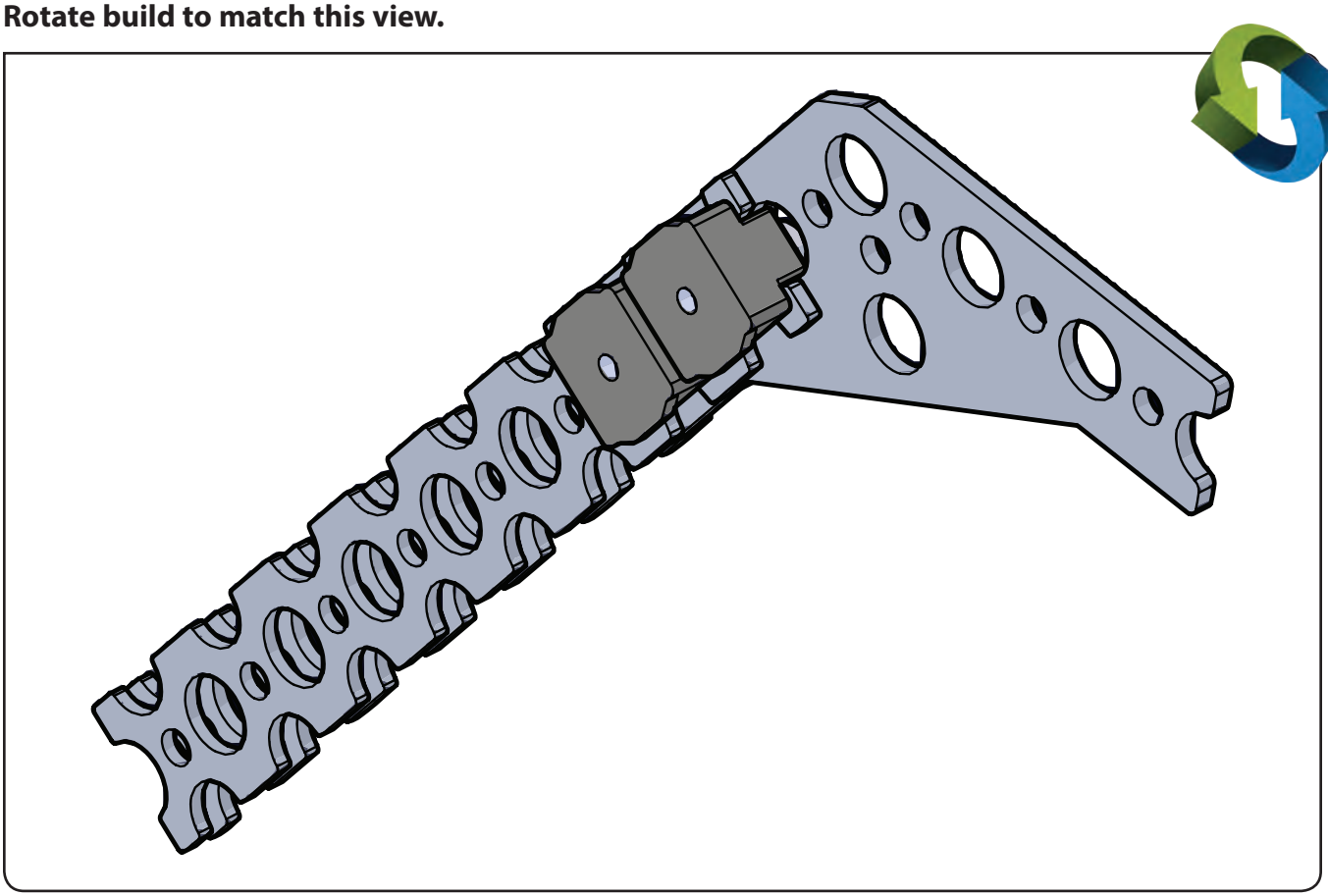


Rotate build to match this view.



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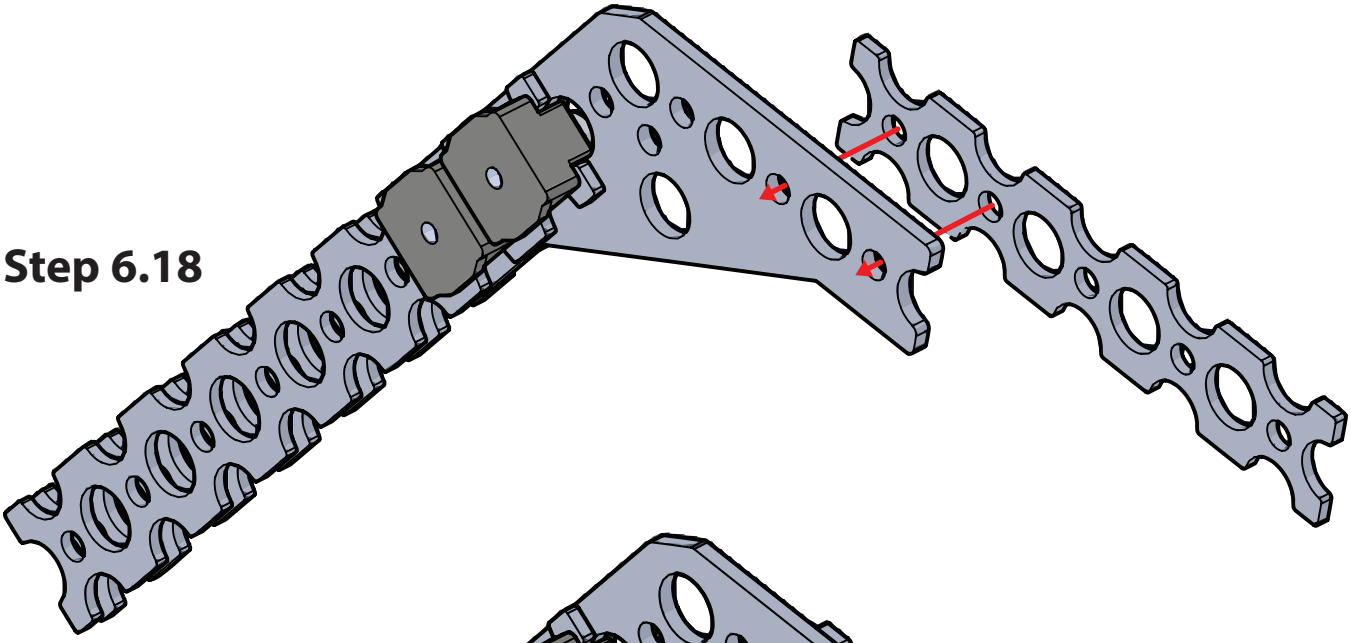

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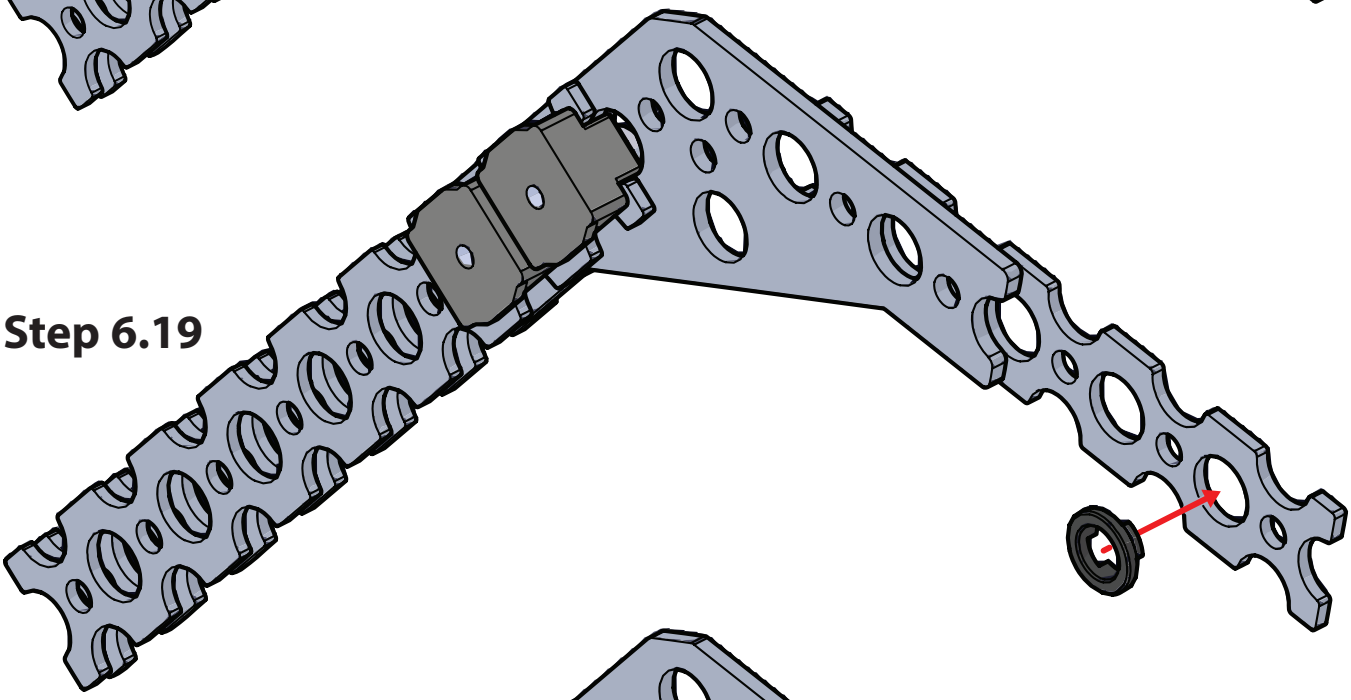

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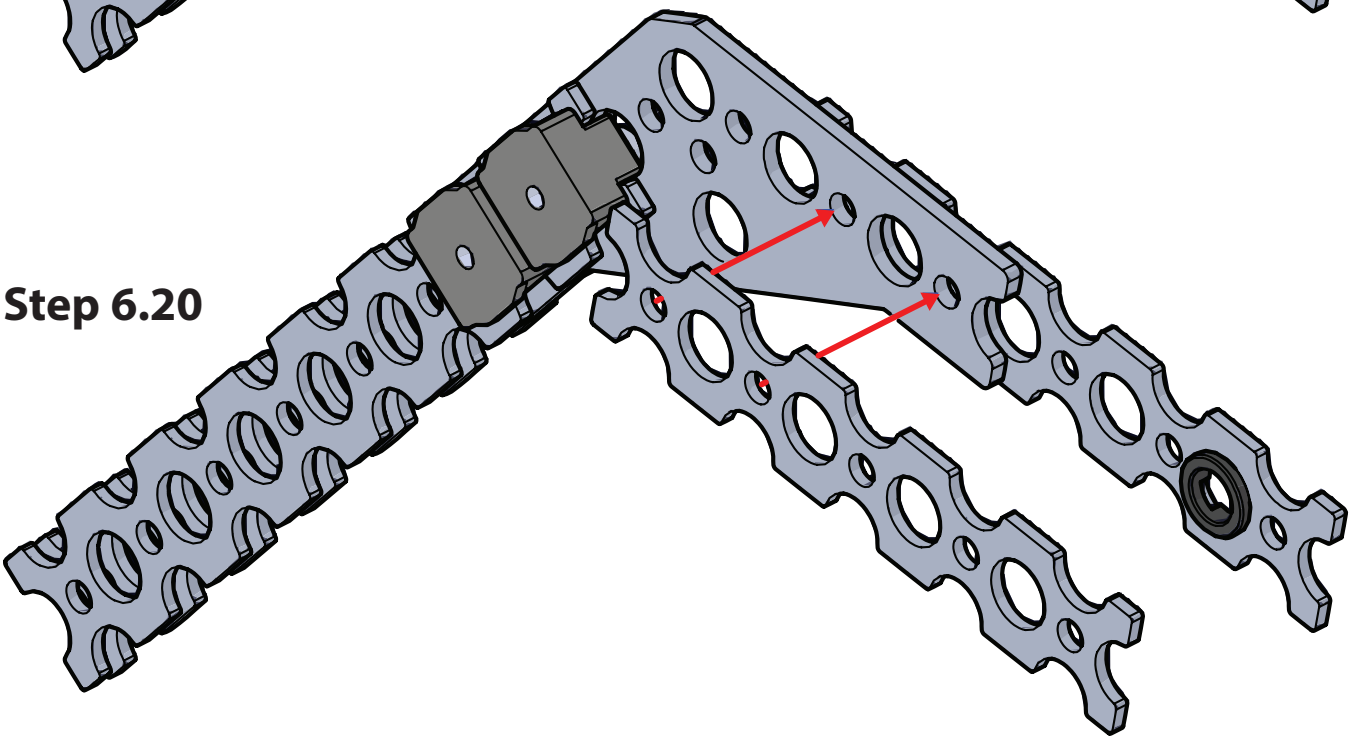

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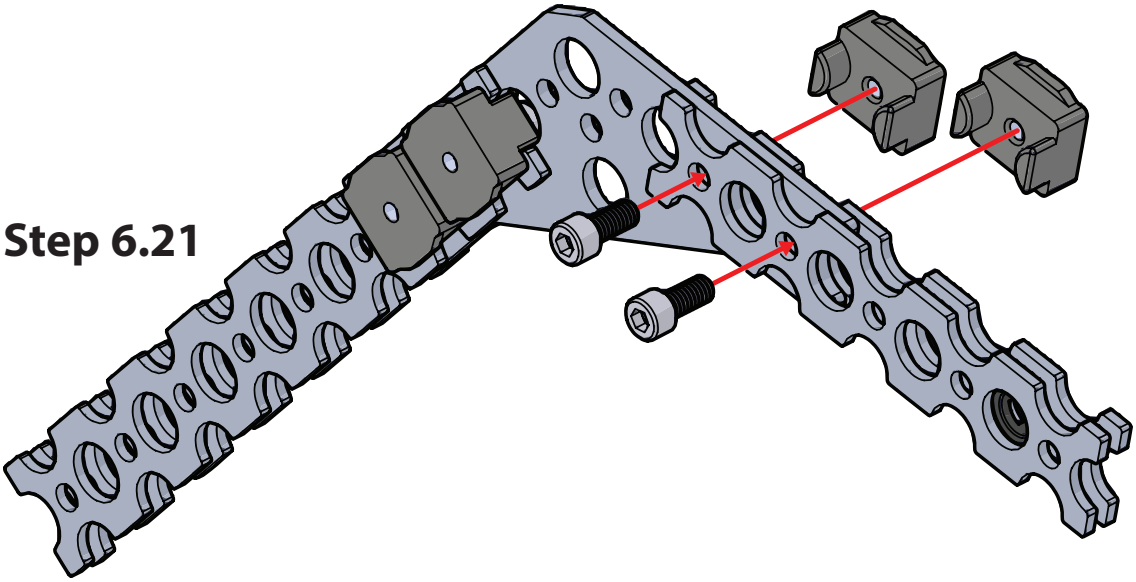

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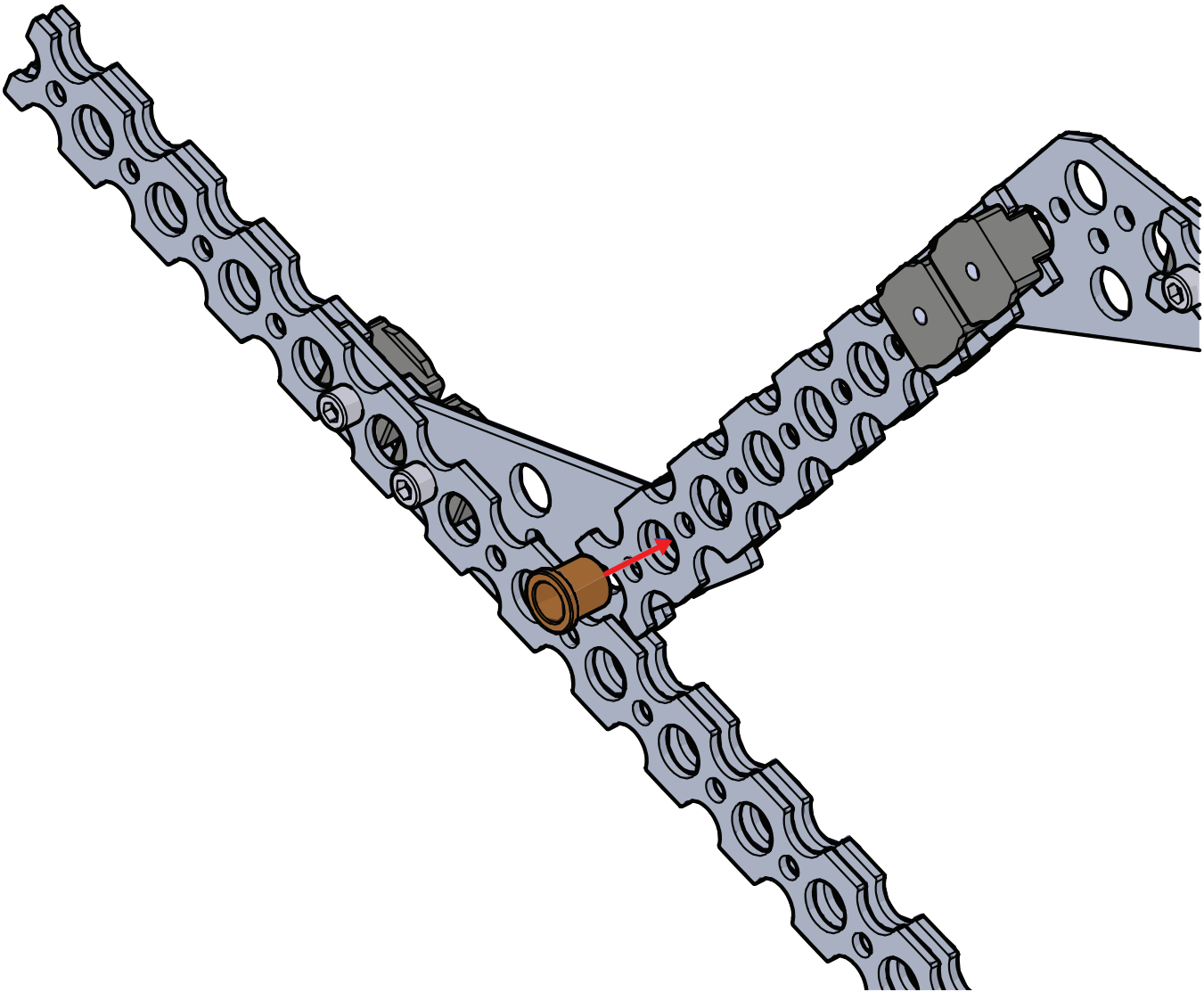

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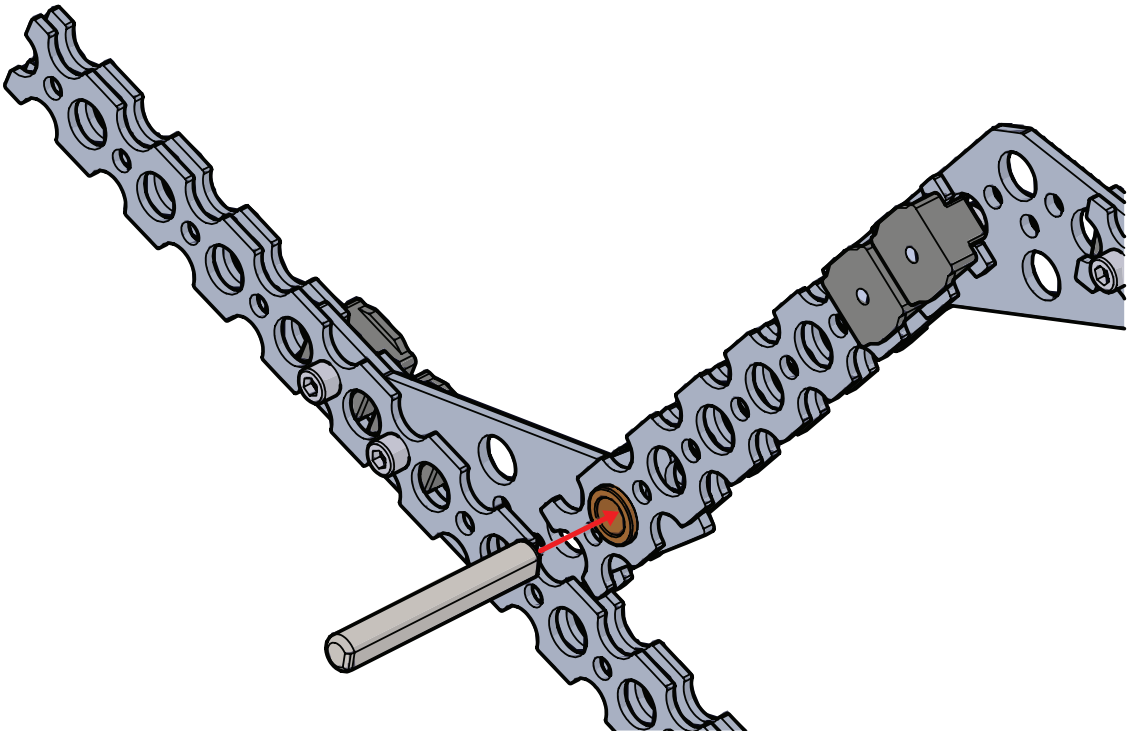

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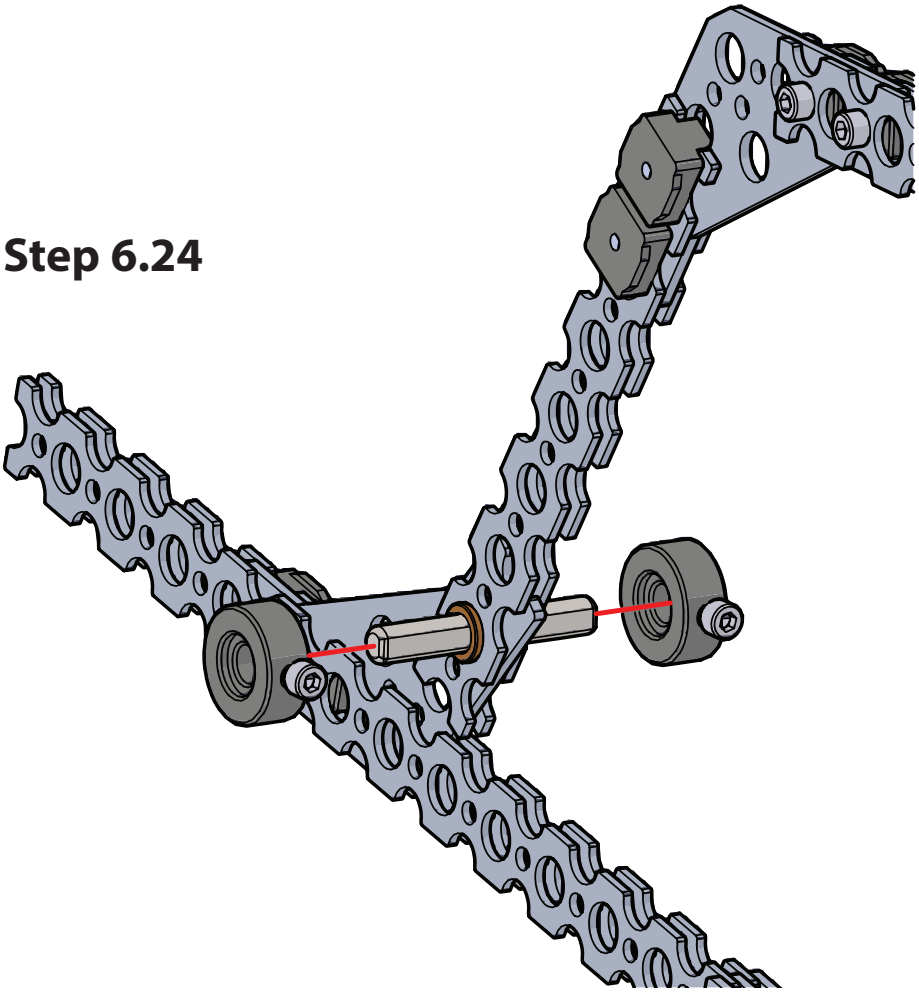

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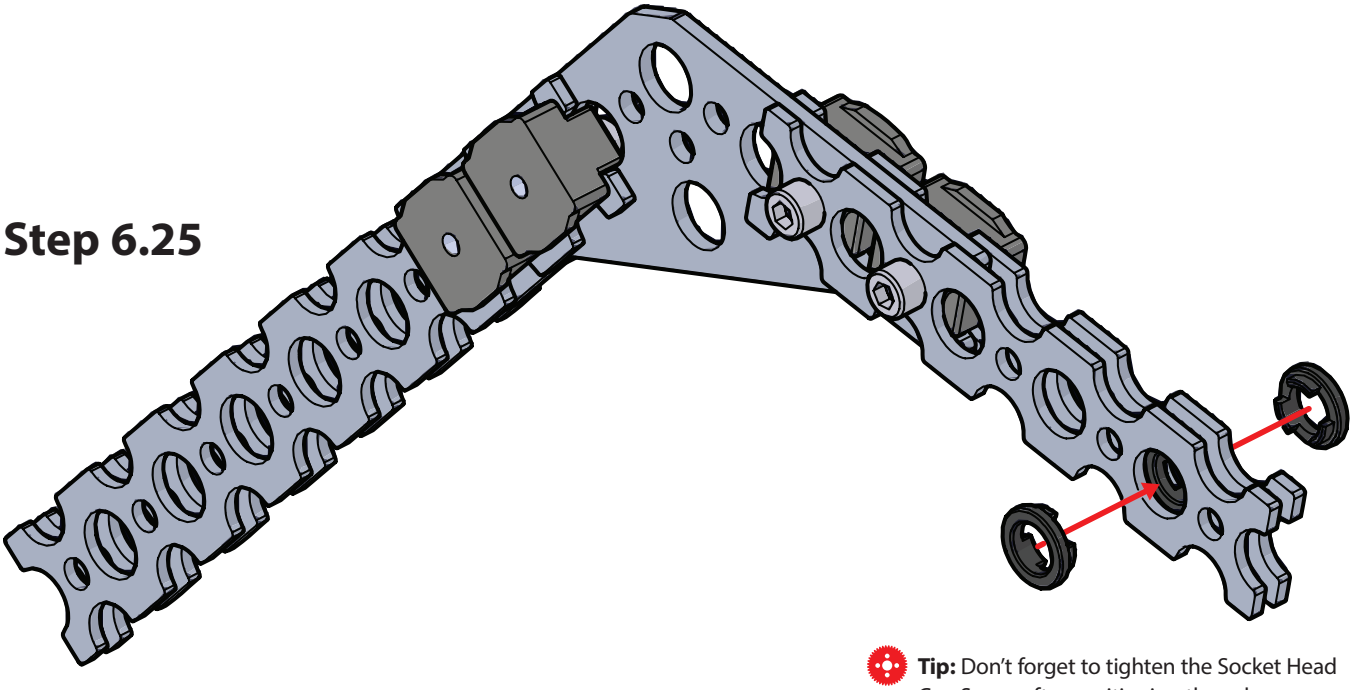
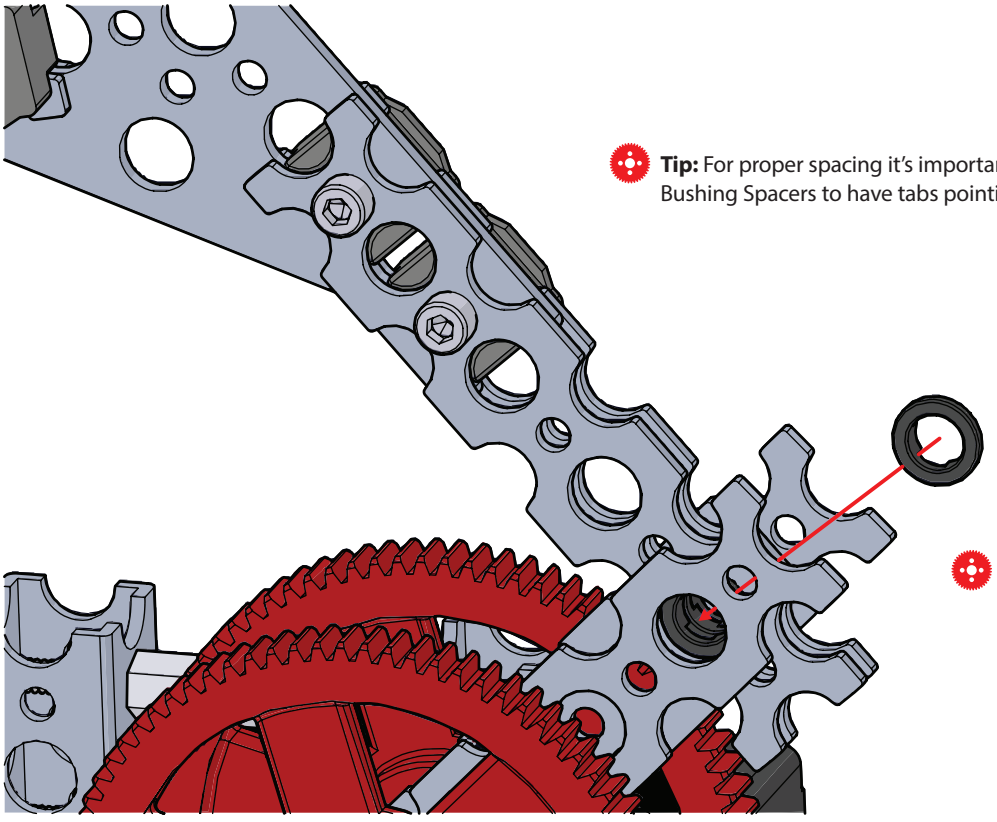


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

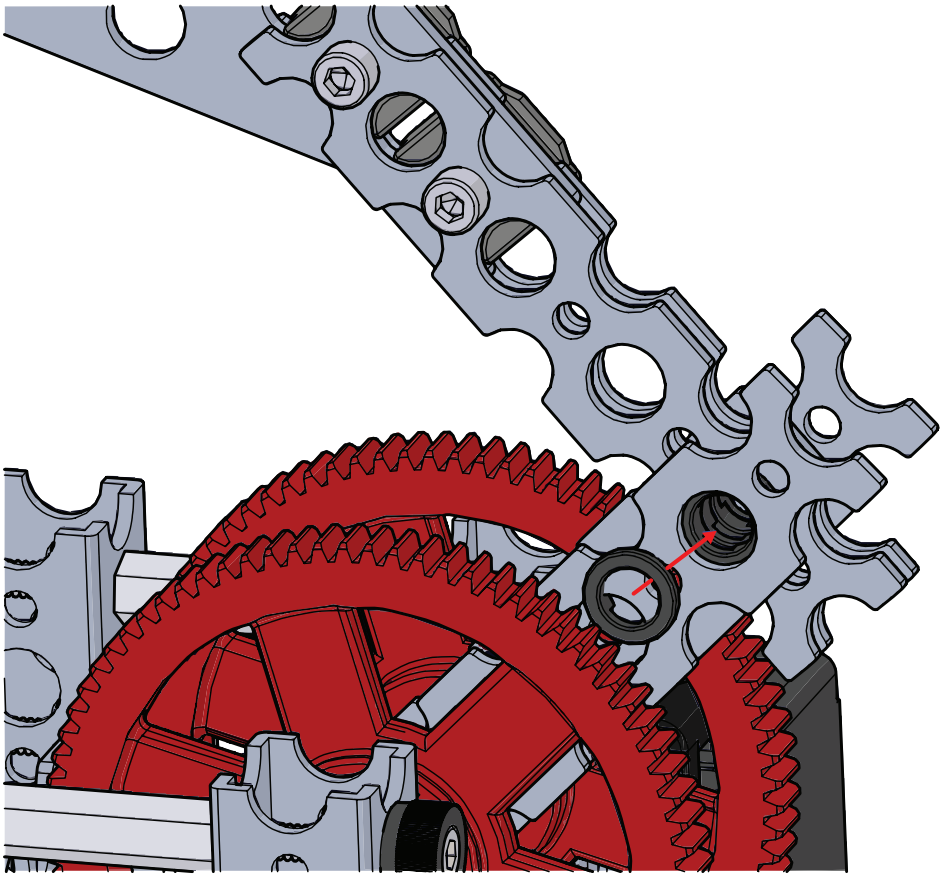
Step 6.26



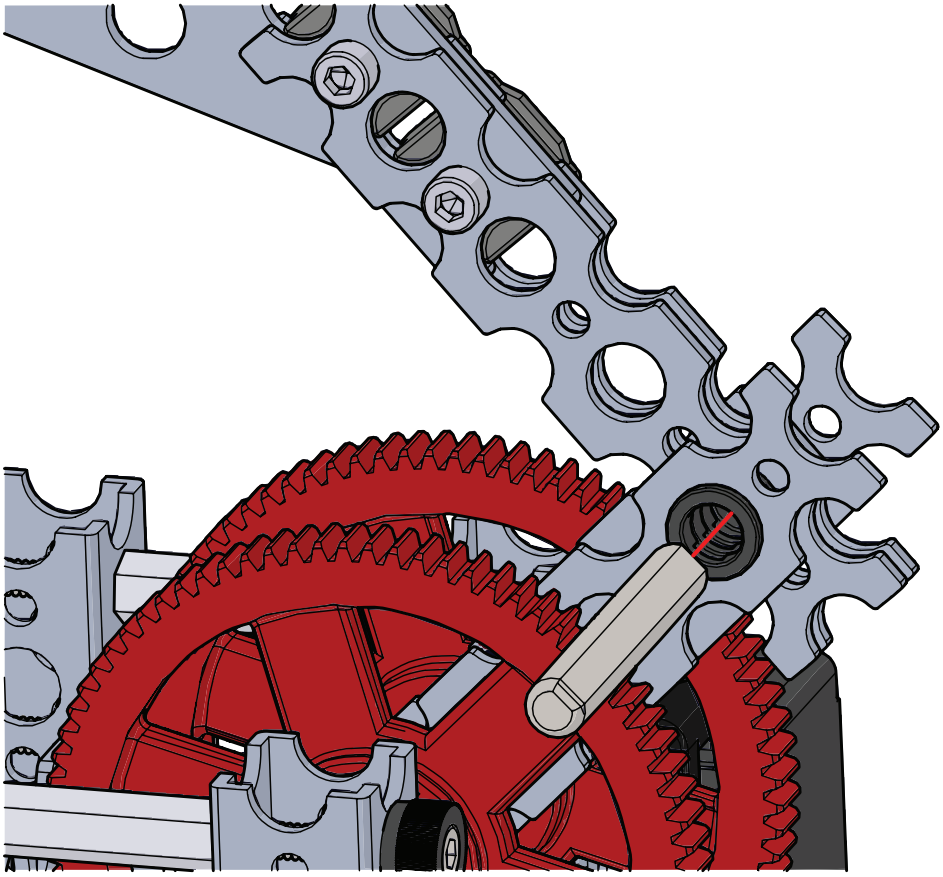
Tip: For proper spacing it's important for 6 mm Plastic Bushing Spacers to have tabs pointing to the center.

Tip: This 6 mm Plastic Bushing Spacer is a spacer only and might be difficult to put into place without help from a partner.

Step 6.27



Step 6.28



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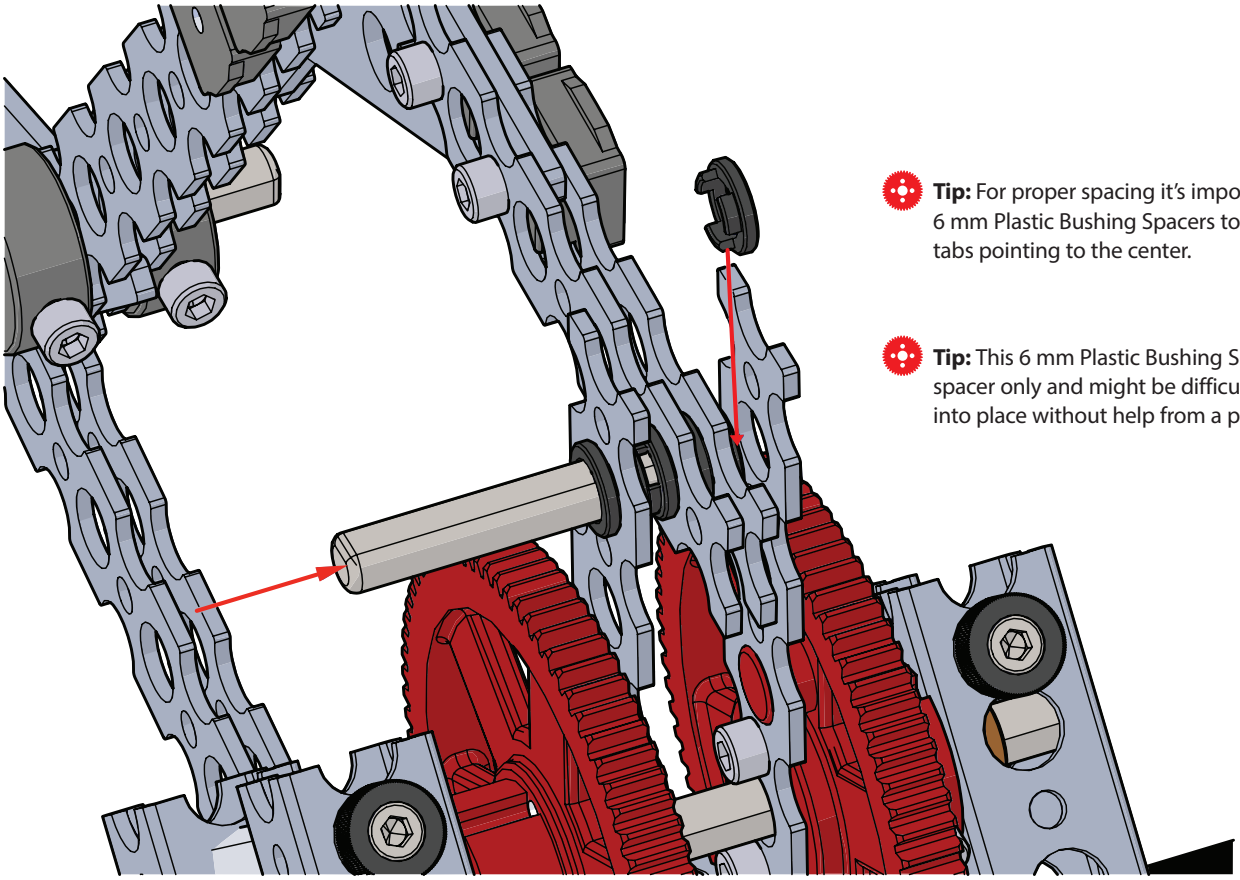
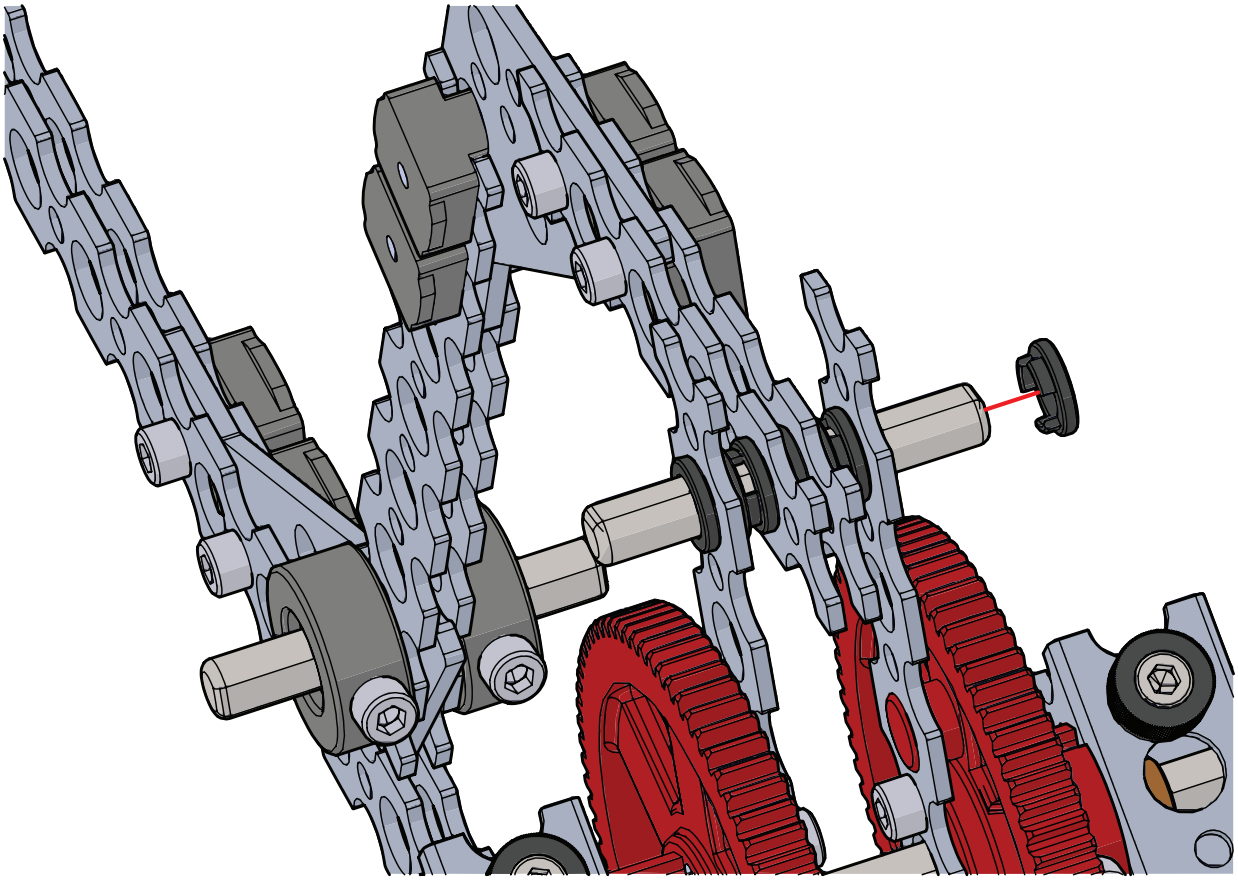


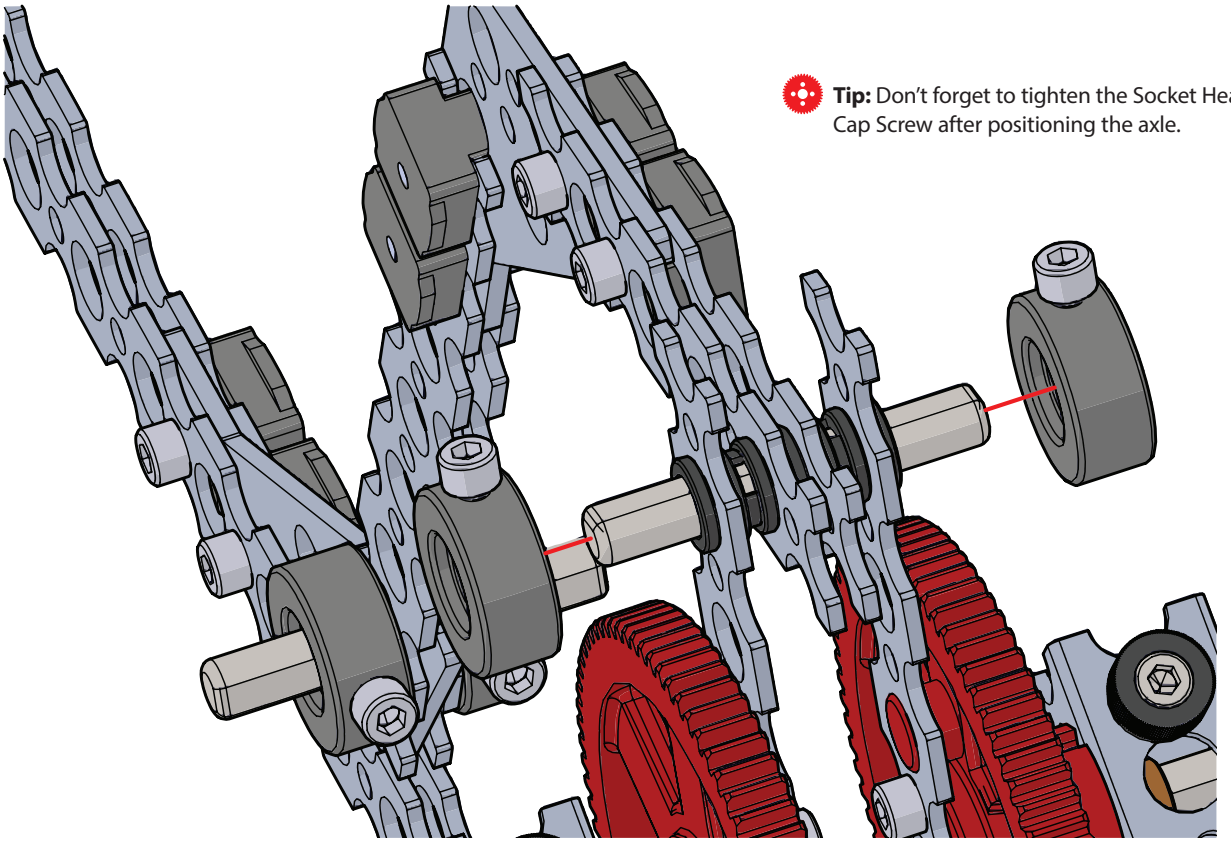
Tip: For proper spacing it's important for 6 mm Plastic Bushing Spacers to have tabs pointing to the center.

Tip: This 6 mm Plastic Bushing Spacer is a spacer only and might be difficult to put into place without help from a partner.

Step 6.30

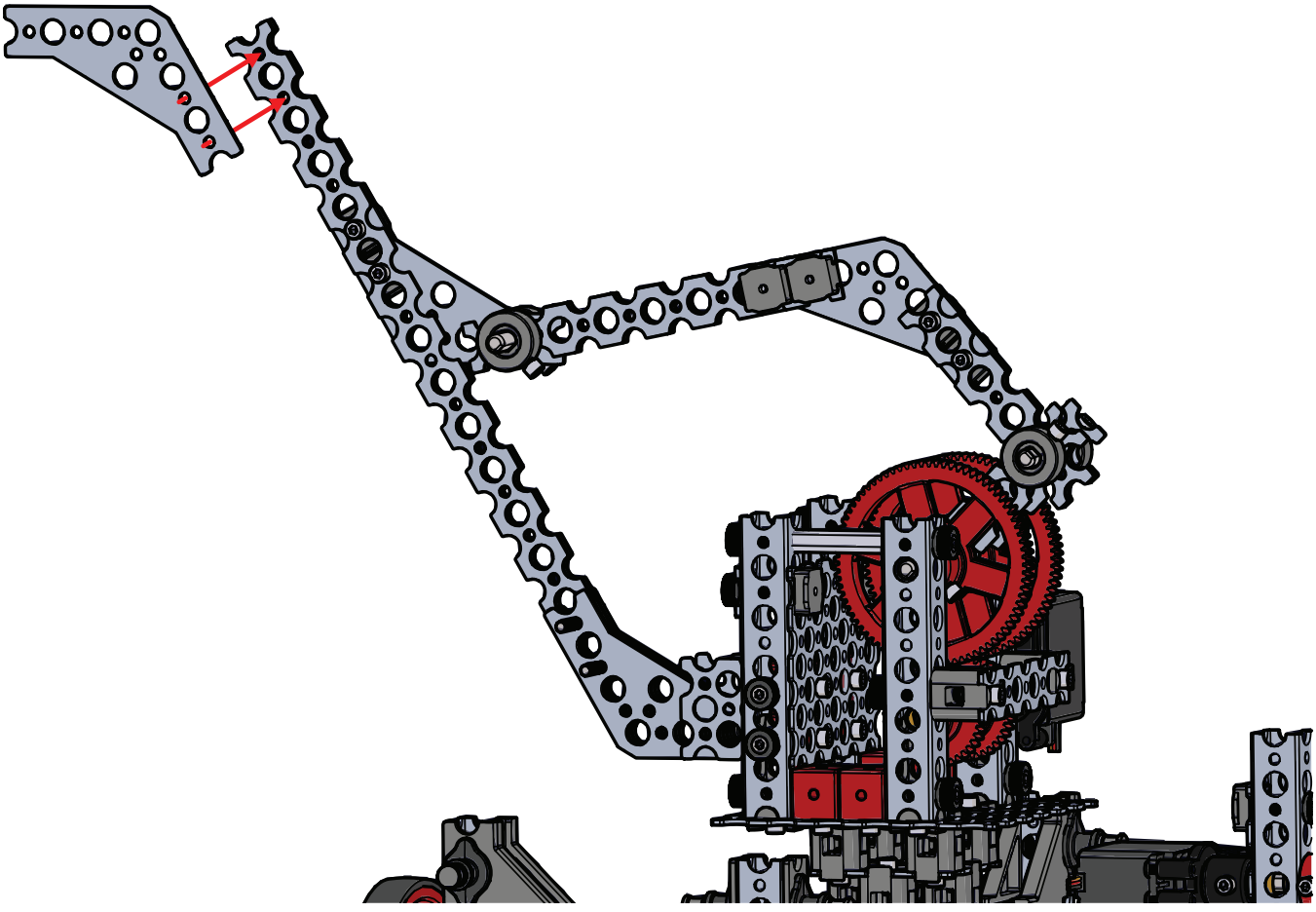


Step 6.31

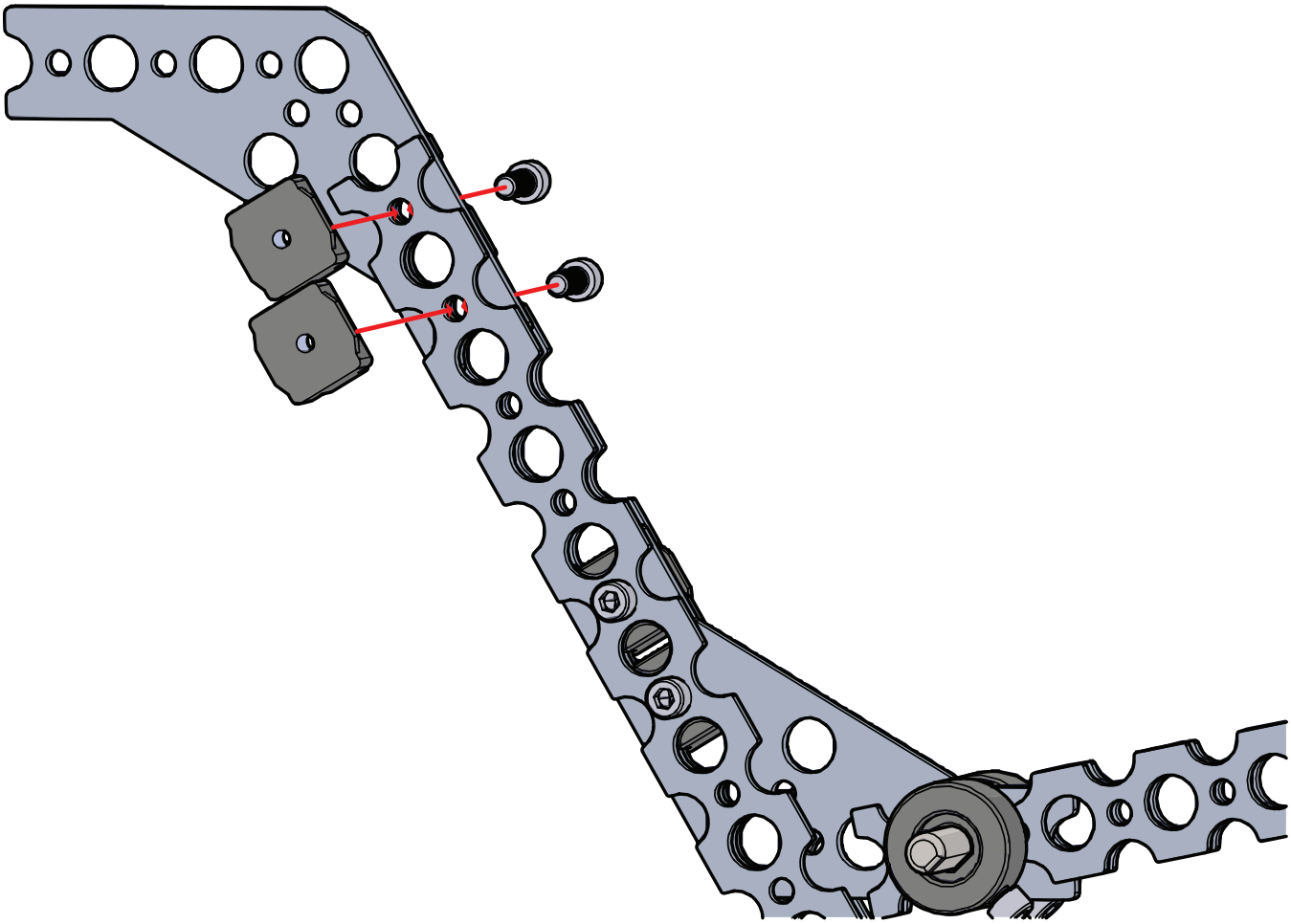


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

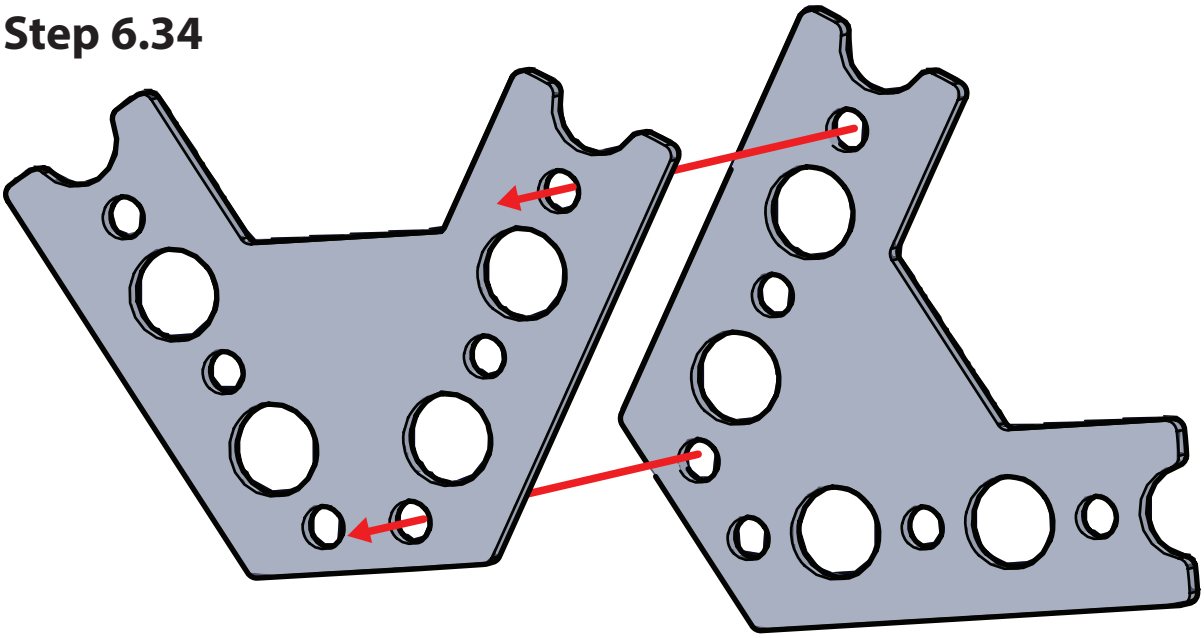
Step 6.32



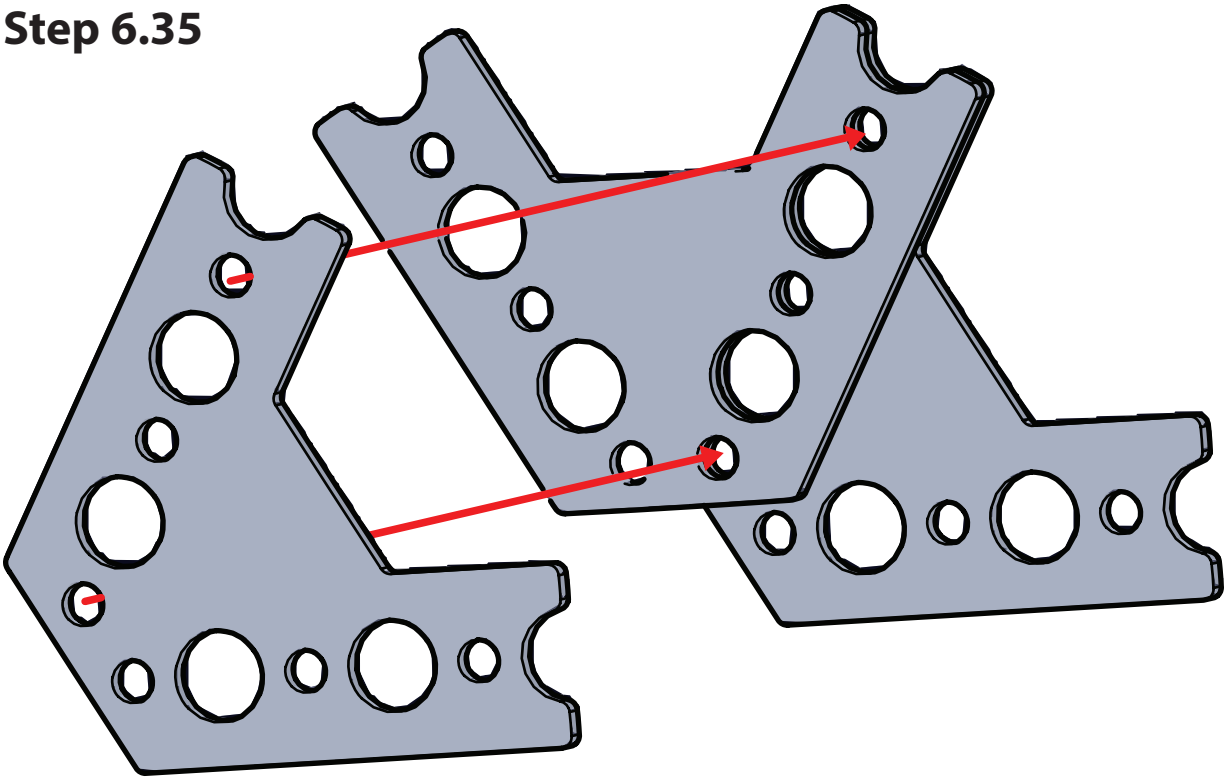
Step 6.33



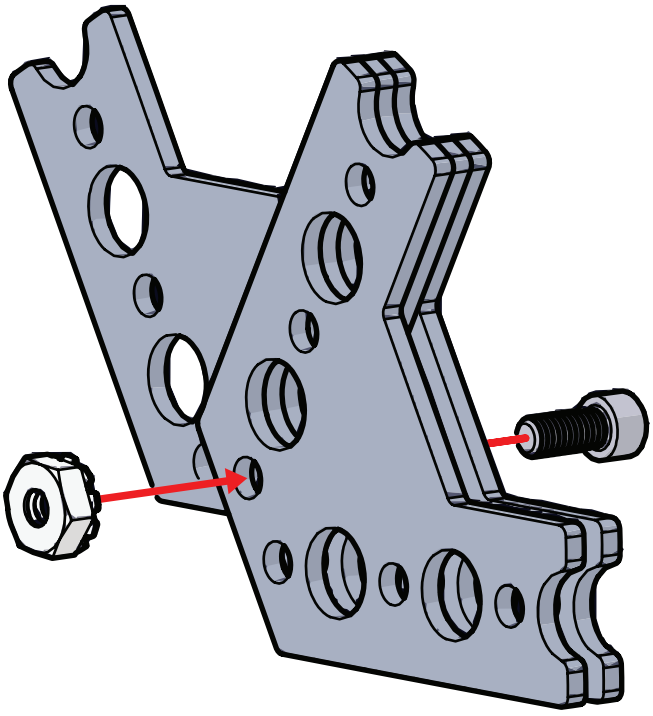
Step 6.34



Step 6.35



Step 6.36



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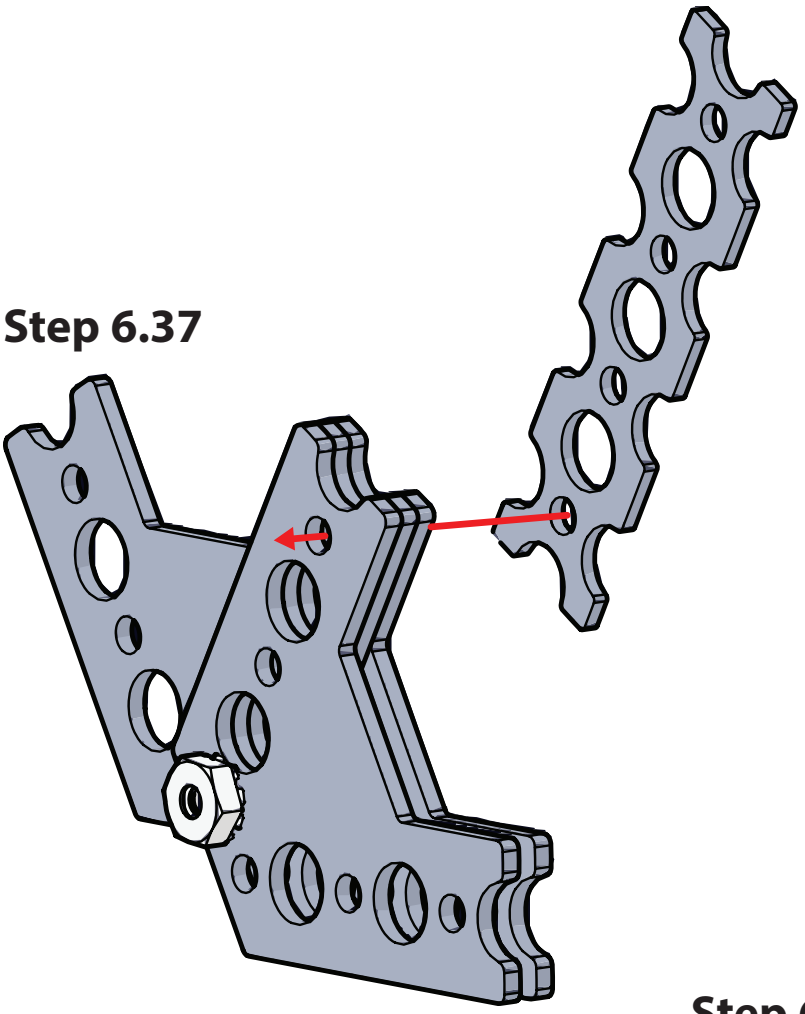

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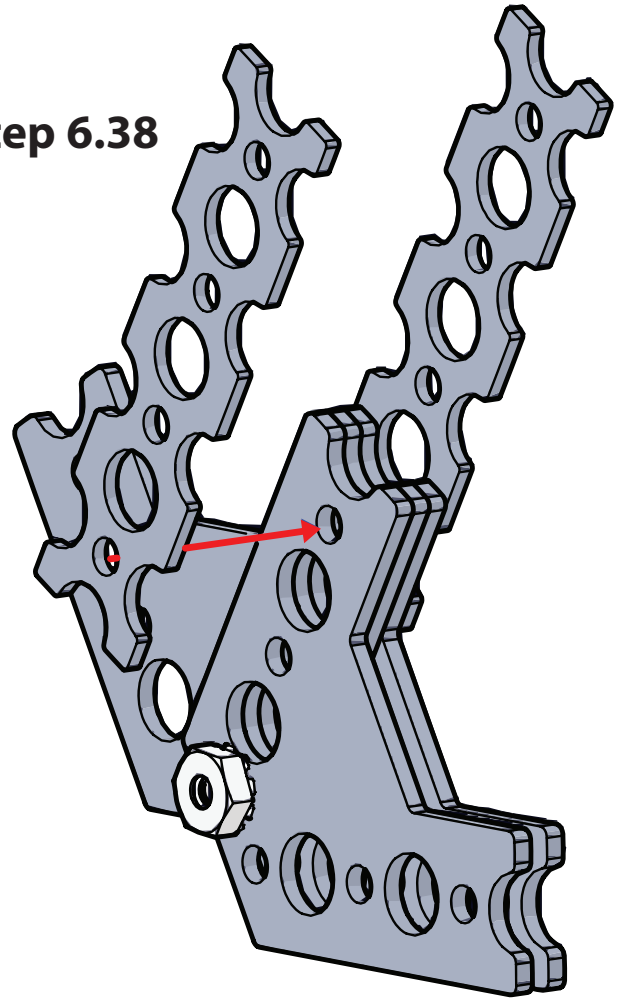
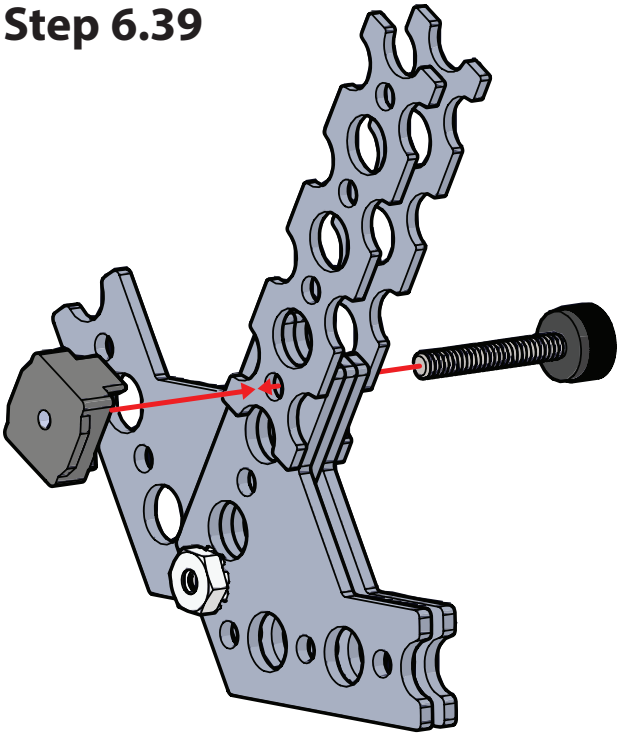
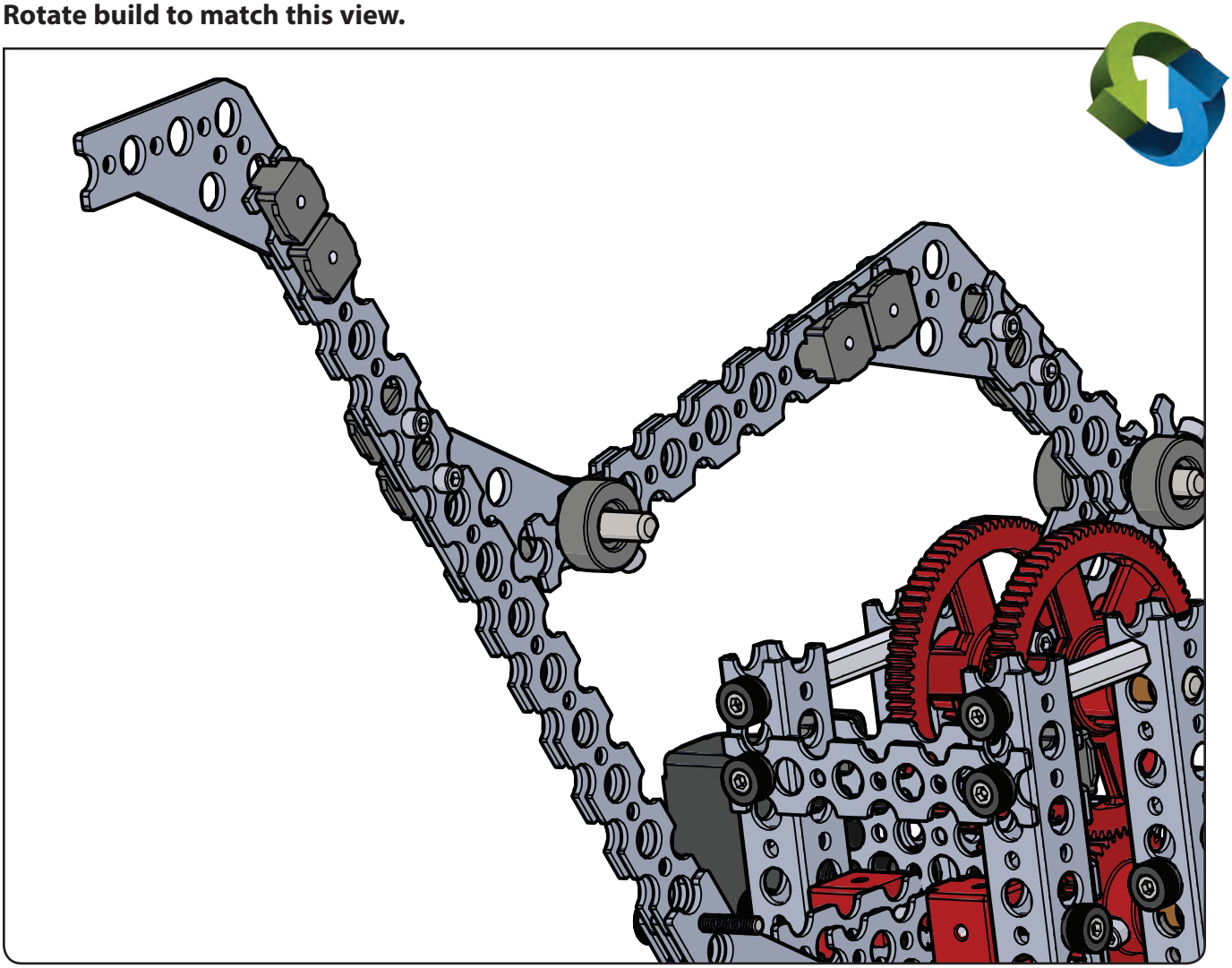


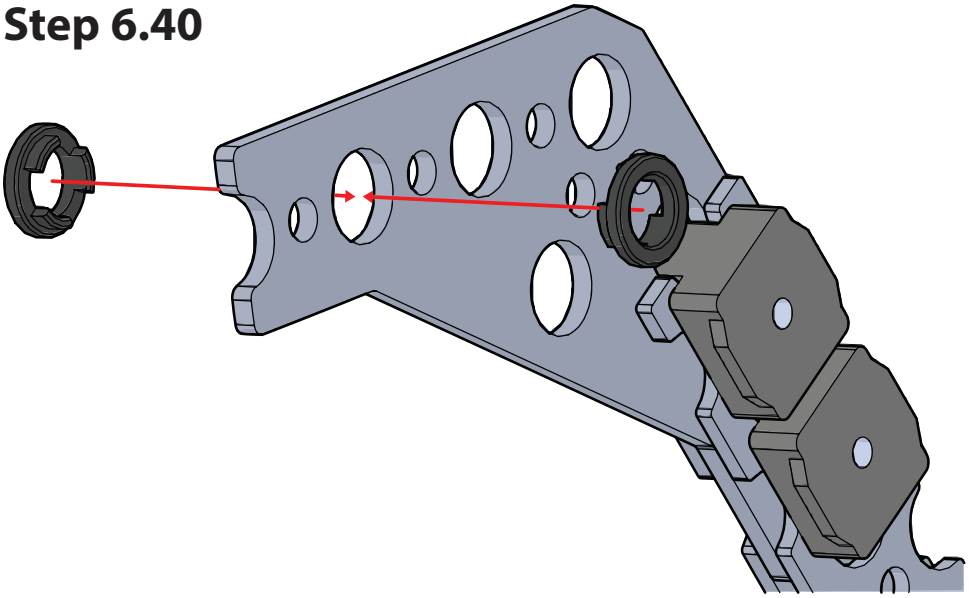
Step 6.39



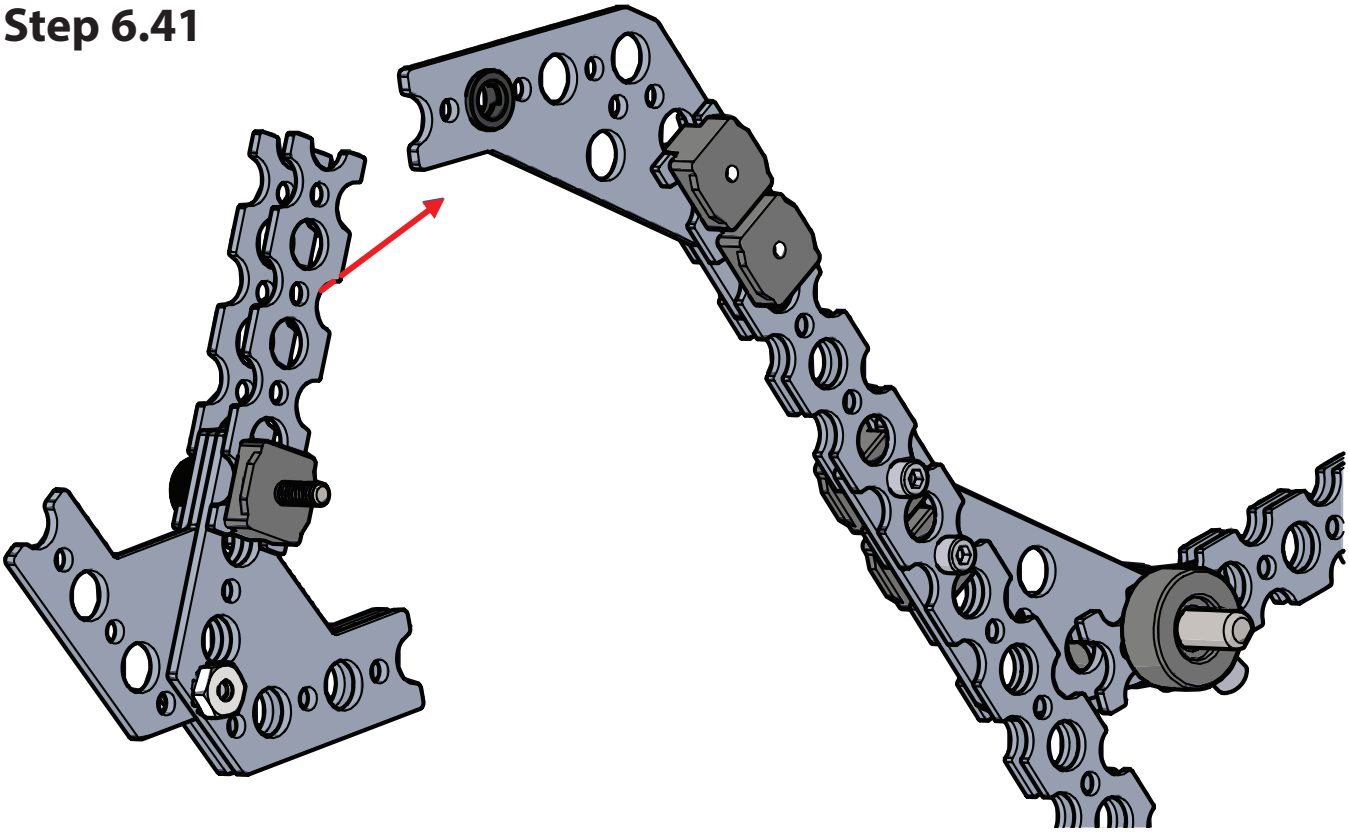
Rotate build to match this view.



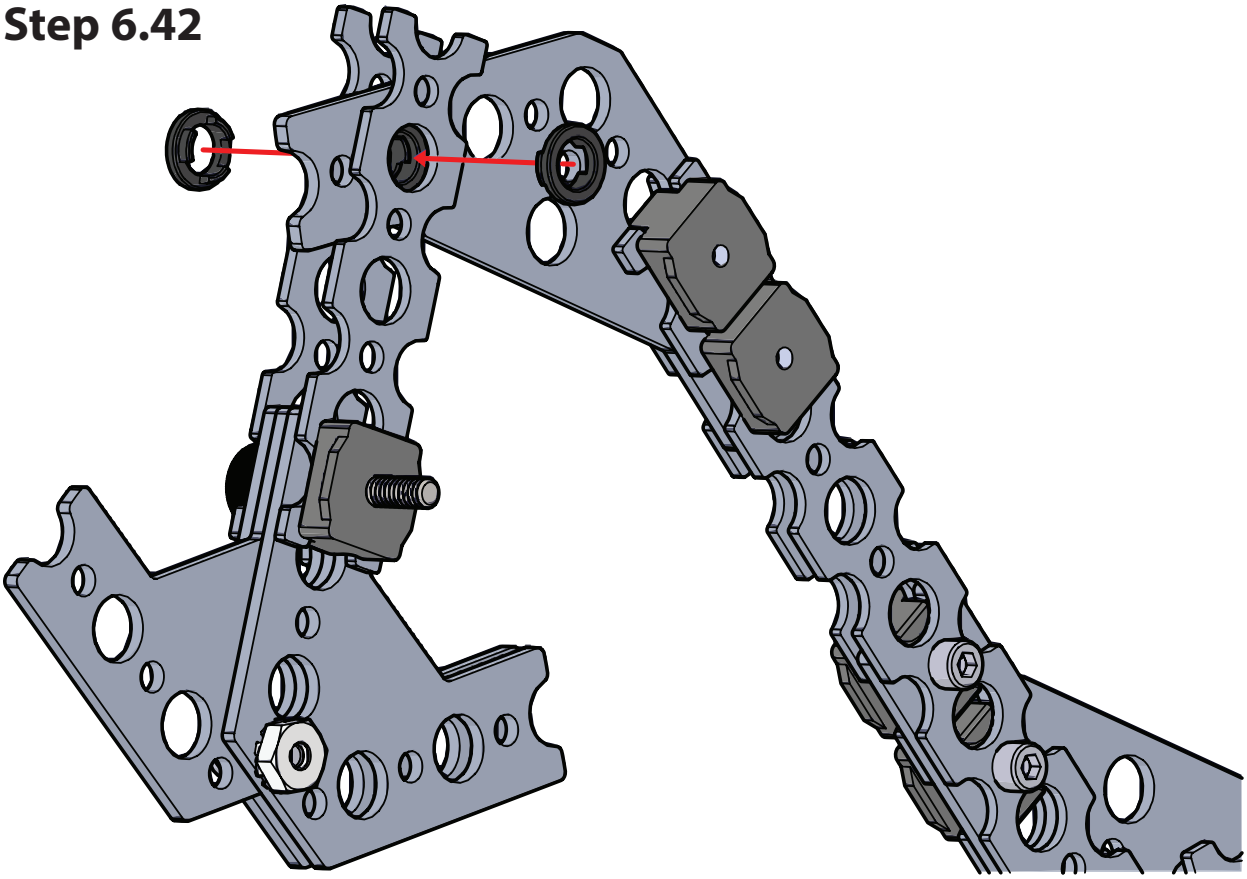
Step 6.40



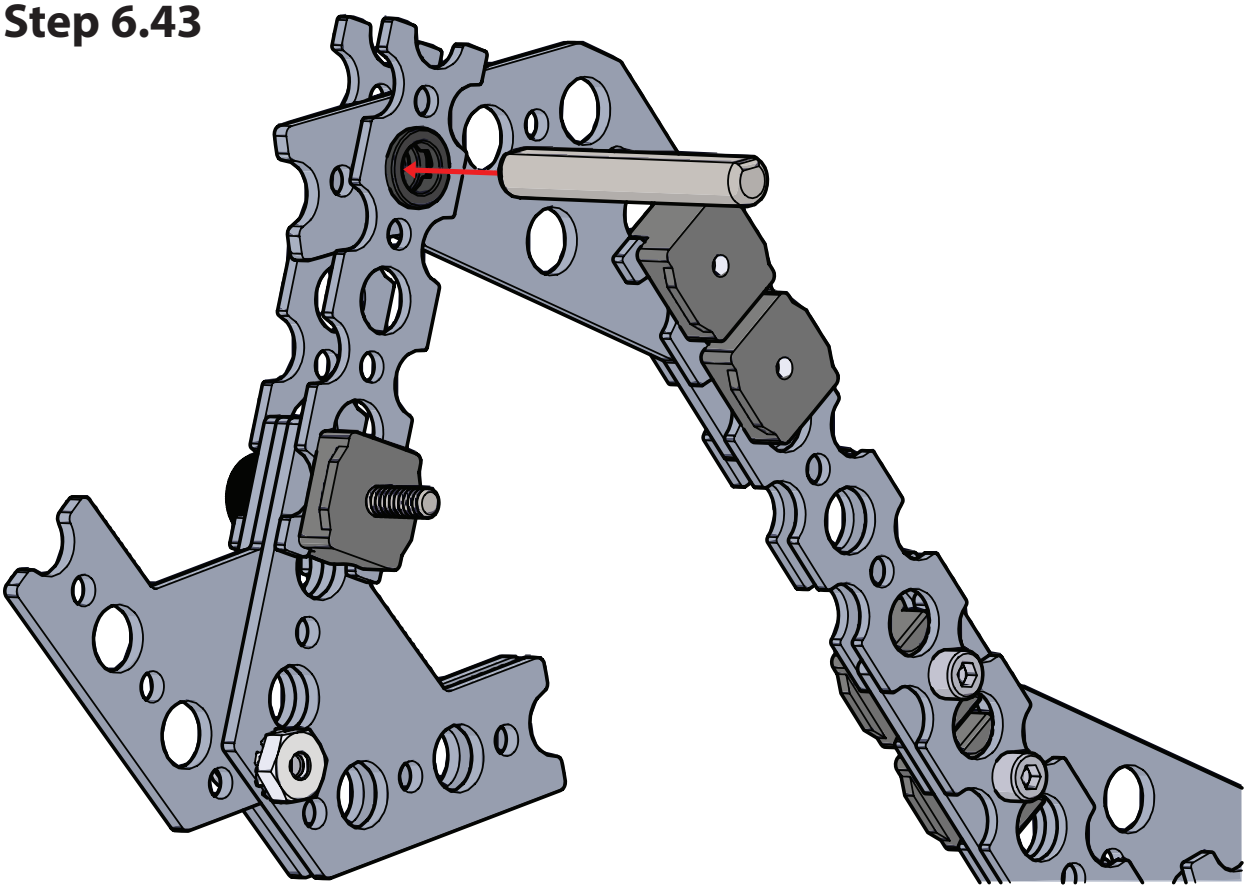
Step 6.41



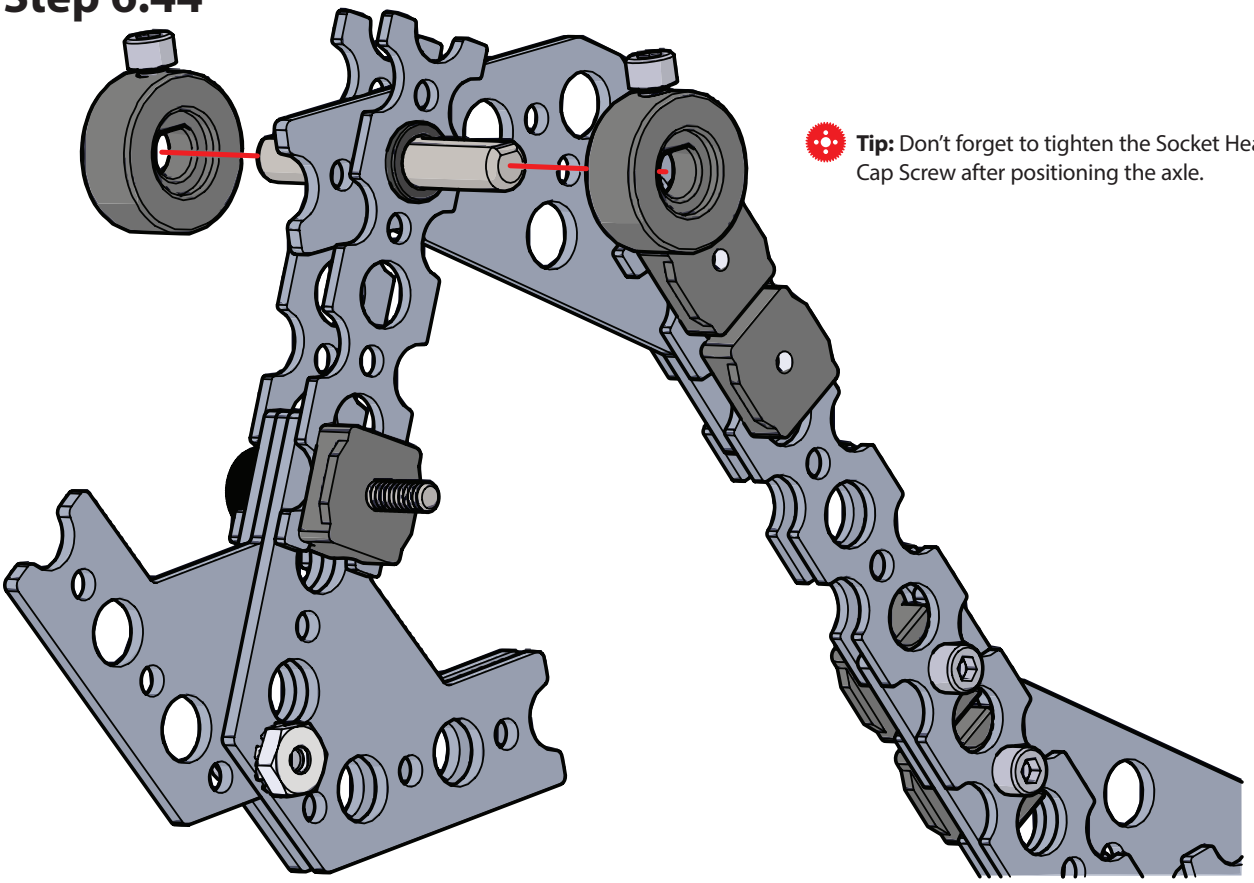
Step 6.42



Step 6.43

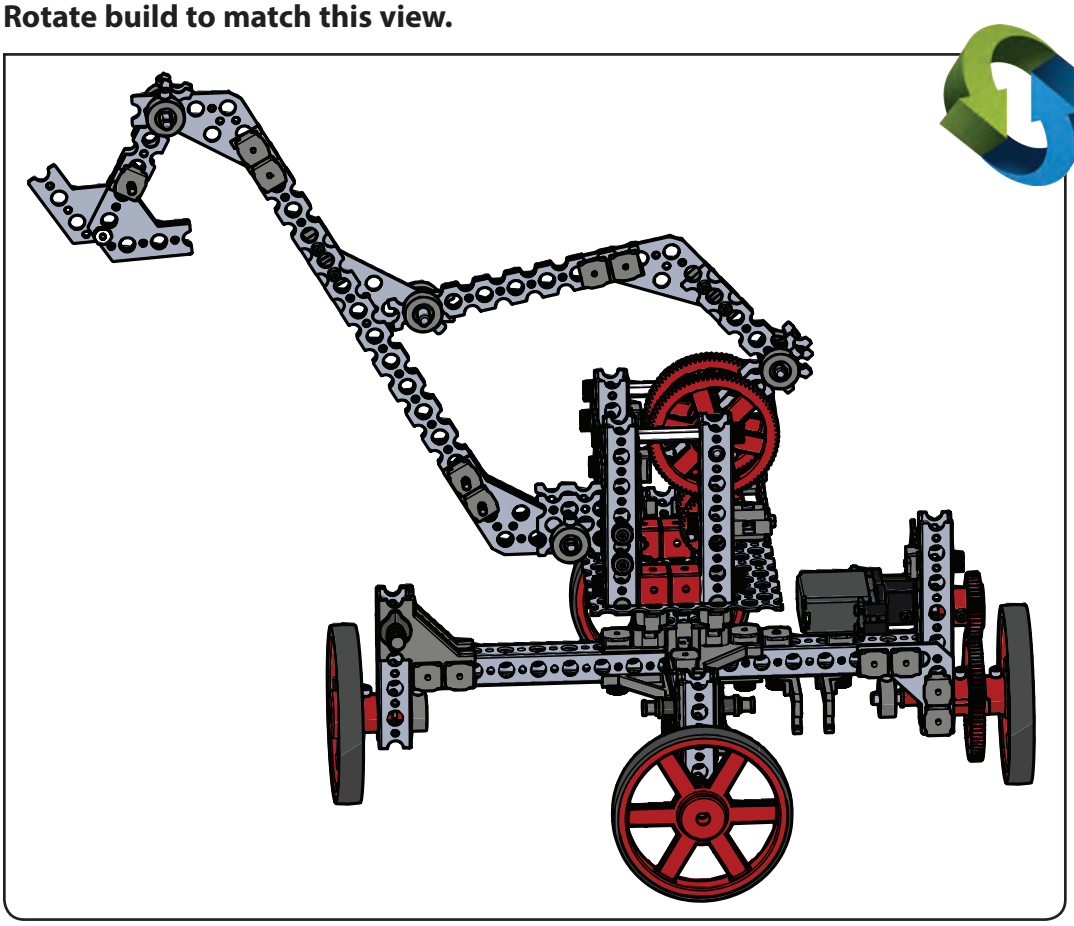


Step 6.44

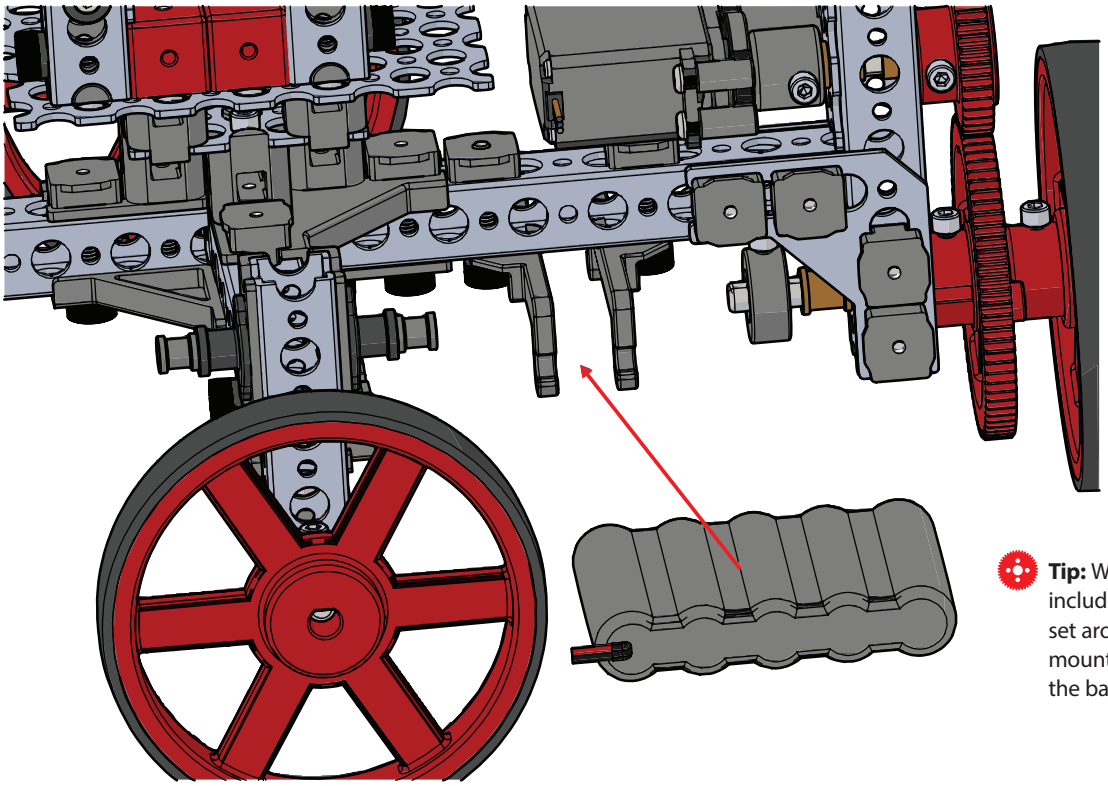


Tip: Don't forget to tighten the Socket Head Cap Screw after positioning the axle.

Rotate build to match this view.

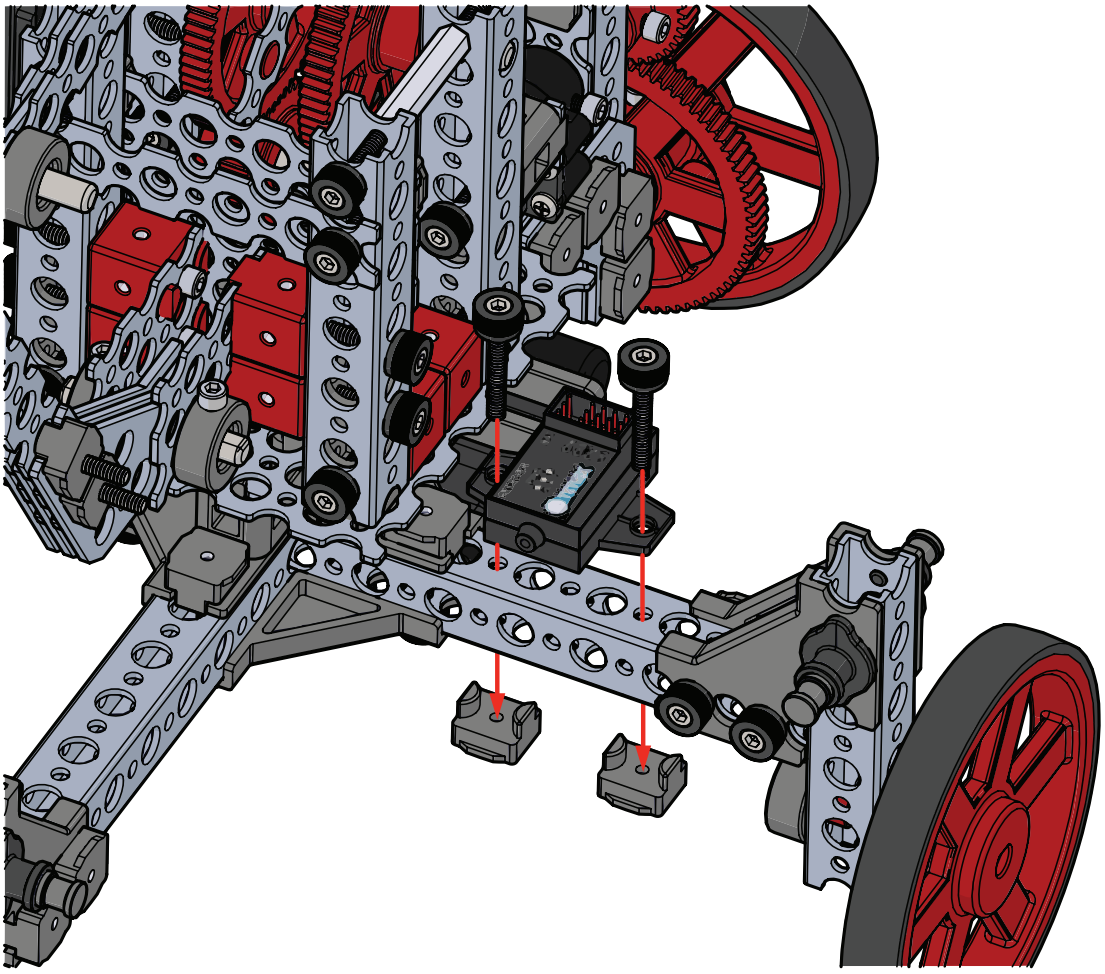


Step 6.45



Tip: Wrap the elastic band included in the battery mount set around the battery and mounting brackets to secure the battery into place.

Step 6.45



TETRIX PRIME Expansion Crane Bot Activities

Final Connections:

After you've installed the battery with the Battery Mount Bracket, you are ready to connect the servo motors to the wireless receiver.

Connect the battery to the BAT connection on the receiver. Connect the CR servo from the base wheel to Channel 4 of the wireless receiver. Connect the CR servo from the lift arm to Channel 3 of the wireless receiver. Secure the wires so they do not become entangled in any moving parts. Turn on the Wireless Joystick Gamepad System and test operation of the Crane Bot. Remember to keep fingers and wires away from all gears and levers while in motion. If the motion of the bot does not correspond to joystick input, either change channels for the servos or use the 4-in-1 Screwdriver to adjust the position of the DIP switches on the gamepad. If necessary, use the trimmer controls to adjust servo movement or position when the joysticks are in the neutral position.

Don't forget to reference page 16 for complete instructions on setting up the Wireless Joystick Gamepad System and configuring input to personal preferences.

Sample Activities:

Construction is over. Now, it's time to operate the Crane Bot. Have fun familiarizing yourself with how the Crane Bot performs.

- The Crane Bot is modeled after real-life crane mechanisms. One of the main jobs cranes perform for us is picking up and moving loads from one location to another. Create a pick-and-place activity by modifying the activity cups with pipe cleaner handles and practicing picking them up from one level and moving them to a different level within the field of influence of the Crane Bot arm. How large of a field of influence does the arm cover? Because the arm is a fixed length with a fixed hook mechanism, does the field of influence change at different heights?
- The lifting arm of the Crane Bot functions as a simple machine lever. Can you identify the parts of the lever that help classify which type of lever it is? Where is the fulcrum? Where is the load and where is the work being applied?
- Determine how much weight the Crane Bot can lift. We can use the pipe cleaner-modified activity cups as a changeable weight to test the lifting capacity. Start by weighing the empty cup to establish a baseline and then gradually add dry components to the cup, weighing each attempt until the Crane Bot can no longer lift the cup.

  Tip: The extra Steel Axles can make good incremental weights as long as they don't tip over the cup.

- After you've established the lifting capacity in the current configuration, discuss how the model can be modified to increase its lifting capacity without changing the class of lever. With the permission of the instructor, modify your model to test your ideas and see how much weight you can lift.
- Take inspiration from real life. What are some design concepts used in real life that you could implement on your crane to create a more efficient machine? With the permission of the instructor, begin an openended building challenge to create the most efficient crane-type lifting machine that you can.

Don't forget to document your efforts, and remember the engineering design process.

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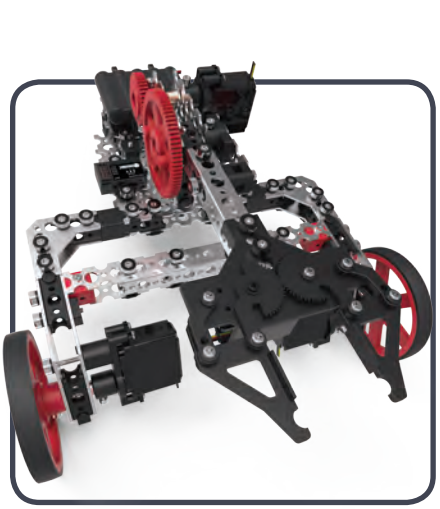
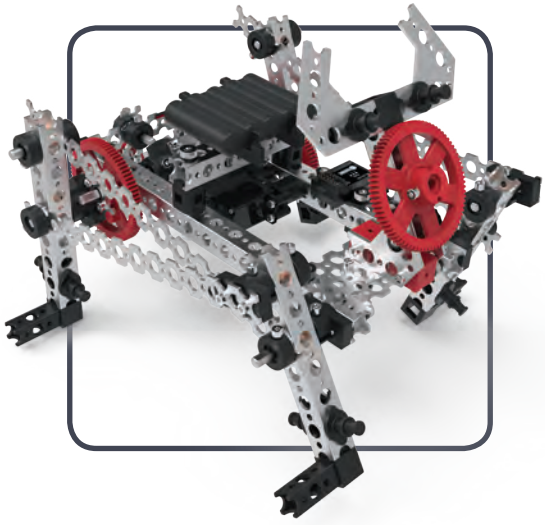
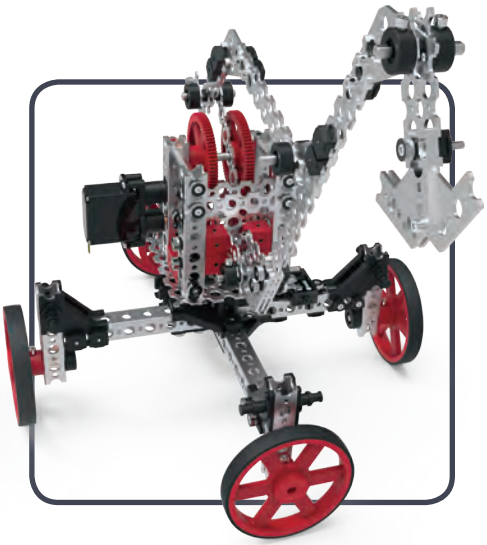
TETRIX® PRIME

Expansion Set Builder's Guide







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