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**TETRIX**



## Flex-Build Robot Chassis Build Instructions

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SolidWorks® Composer™ and KeyShot® renderings by Tim Lankford and Jason Redd.

Desktop publishing by Todd McGeorge.

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**Check <https://www.pitsco.com/TETRIX-Flex-Build-Robot-Chassis> for PDF updates of this guide.**

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# Introduction

## TETRIX® Flex-Build Robot Chassis

The TETRIX® Flex-Build Robot Chassis is an all-in-one kit that contains everything you need to create a fully-functioning base for your robot!

- Its TETRIX Robo-Rail structure, made from 6063 aluminum, provides a super strong and rigid frame construction.
- Four TorqueNADO® motors supply plenty of power for tough competition tasks.
- Two wheel styles are included: four Mecanum wheels and four 4" standard wheels, as well as motor mounts, attachment hubs, hardware, and tools.
- The chassis can be assembled in several configurations so you can adapt your robot to the demands of the competition.

## The TETRIX MAX Building System:

- Uses elements made from heavy-duty, aircraft-grade aluminum to maximize stability, durability, and reliability.
- Uses powerful drive motors and accurate servo motors to provide a perfect balance between power and control.
- Can be used with almost any programmable controller to create versatile, sophisticated robots able to handle complicated tasks.
- Offers flexibility in build design and can be expanded with additional materials.
- Gives users the opportunity to master the concepts of wiring, motor control, and much more.
- Fosters teamwork, creativity, ingenuity, and persistence among users, groups, and students of all experience and skill levels.
- Develops real-world engineering and problem-solving skills.

Additional parts, tools, and elements can be utilized to create larger or more complex robots. These, as well as other resources such as videos, technical information, alternative inspirational builds, subassemblies, and activities, can be found at [Pitsco.com](https://www.pitsco.com).

## Robo-Rail Features:

- The enclosed extrusion is stronger with less flex or bend than traditional channels. It makes for a much more rigid build.
- The eight-millimeter grid hole pattern allows for finer resolution than traditional channels.
- The ends have tapped holes allowing you to screw rails together at right angles without the need for corner brackets or kep nuts.
- Fewer hardware pieces (screws and support pieces) are needed, which reduces build time and complexity.
- The side rails allow you to easily create strong linear motion elements. Using v-rollers that roll along the side rails allows Robo-Rail pieces to glide past each other.

# 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.
- Eye protection is always recommended when modifying material by cutting, filing, or sanding or when operating mechanical devices with moving or rotating parts and assemblies.

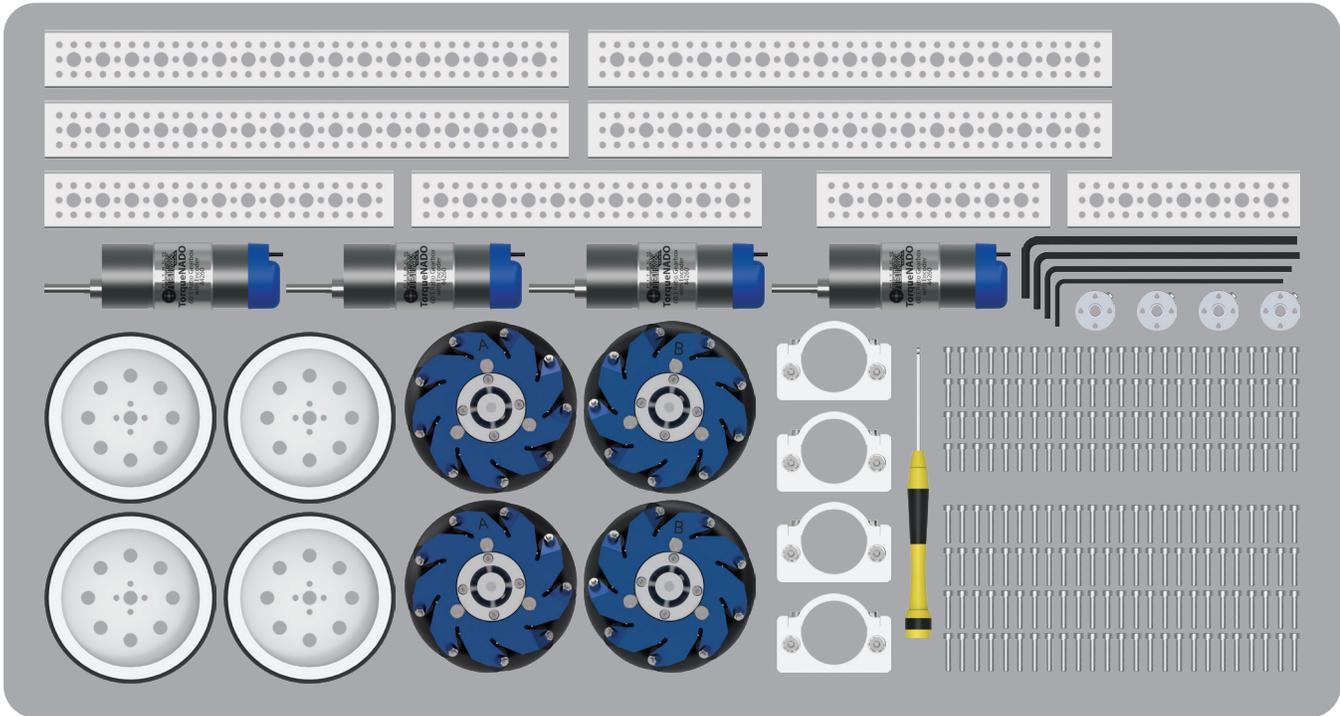
## Electrical

- 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.

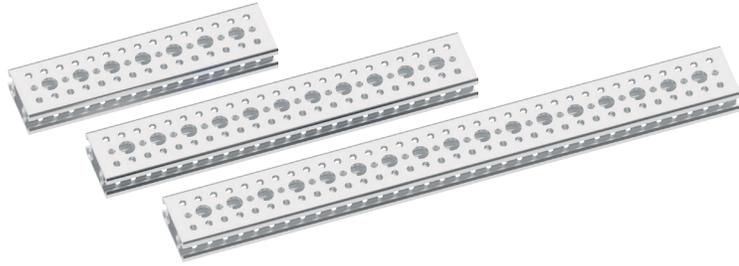


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# Flex-Build Robot Chassis



# Flex-Build Robot Chassis Parts Index



## Robo-Rails

92311	TETRIX® Robo-Rail (7-hole) (16 mm x 32 mm x 128 mm) .....	2
92313	TETRIX® Robo-Rail (11-hole) (16 mm x 32 mm x 192 mm) .....	2
92316	TETRIX® Robo-Rail (17-hole) (16 mm x 32 mm x 288 mm) .....	4



## DC Motors and Hardware

44260	TETRIX® MAX TorqueNADO® Motor .....	4
39376	TETRIX® MAX DC Motor Mount (37 mm) .....	4
39079	TETRIX® MAX Motor Hub (pkg of 2) .....	2



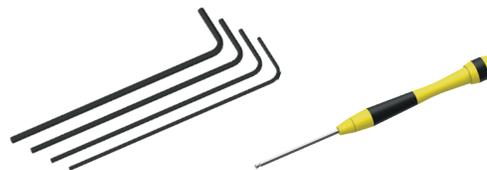
## Nuts, Screws, and Fasteners

92368	Socket Head Cap Screw (7/8") (pkg of 100) .....	1
39097	Socket Head Cap Screw (1/2") (pkg of 100) .....	1



## Tires and Wheels

39055	TETRIX® MAX Wheel (4") (pkg of 1) .....	4
45320	TETRIX® MAX Mecanum Wheel Set (4 wheels with hub) .....	1



## Tools and Accessories

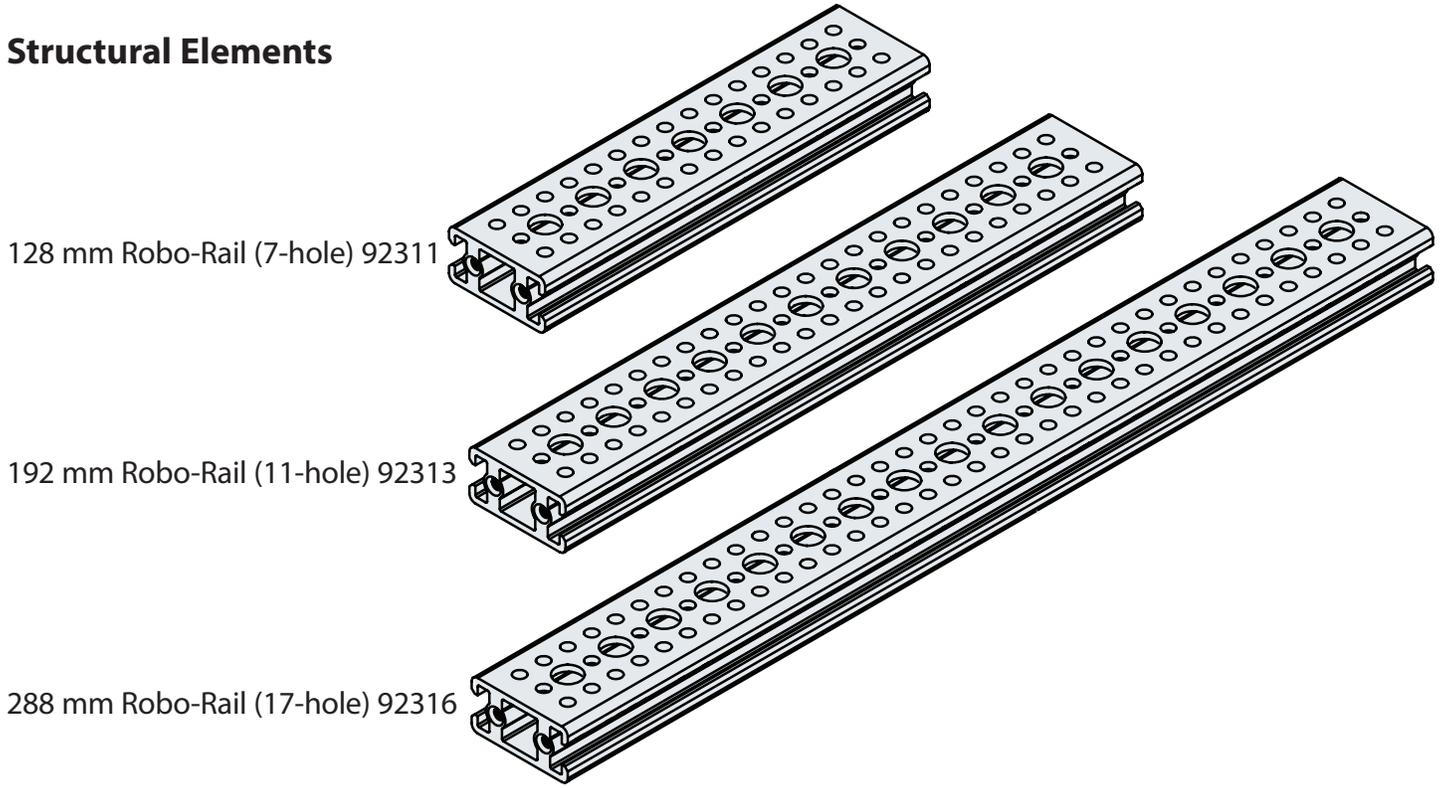
39104	Hex Keys .....	1
40341	Miniature Ball-Point Hex Driver .....	1

# Flex-Build Robot Chassis Hardware Components Overview

The following mechanical parts overview includes elements from the TETRIX Flex-Build Robot Chassis.

TETRIX MAX Robo-Rail elements are identified by length in millimeters or by the number of large holes down their face. For example, a 128 mm Robo-Rail has 7 large holes. Use the ruler at the bottom of this spread to measure part lengths.

## Structural Elements

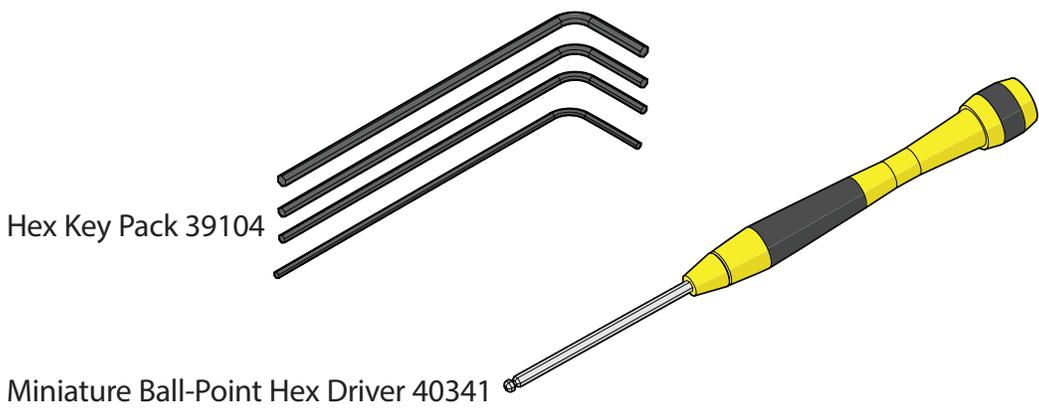


128 mm Robo-Rail (7-hole) 92311

192 mm Robo-Rail (11-hole) 92313

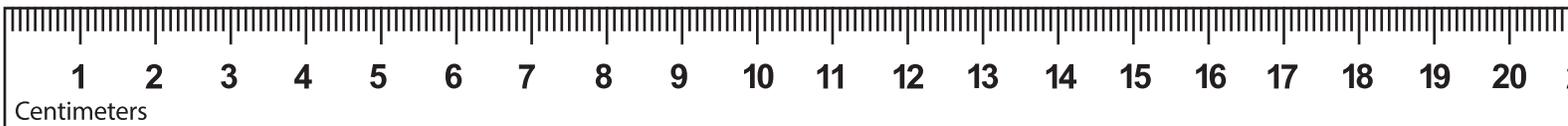
288 mm Robo-Rail (17-hole) 92316

## Power, Tools, and Accessories Elements



Hex Key Pack 39104

Miniature Ball-Point Hex Driver 40341

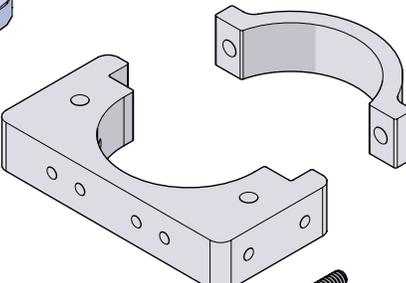


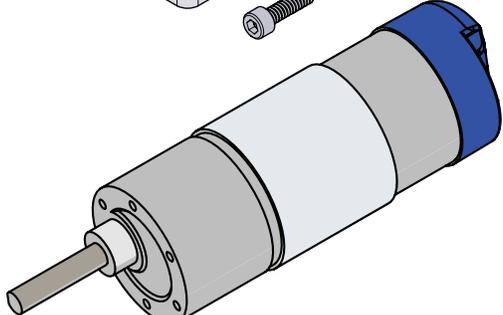
## Motion Elements

Socket Head Cap Screw 6-32 x 7/8" 92368 

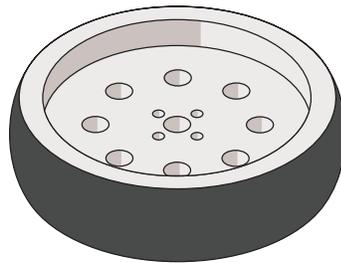
Socket Head Cap Screw 6-32 x 1/2" 39097 

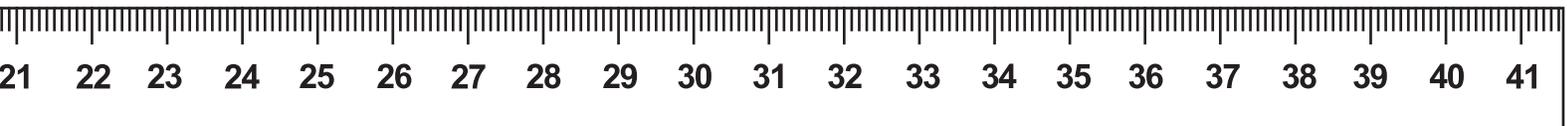
Motor Hub 39079 

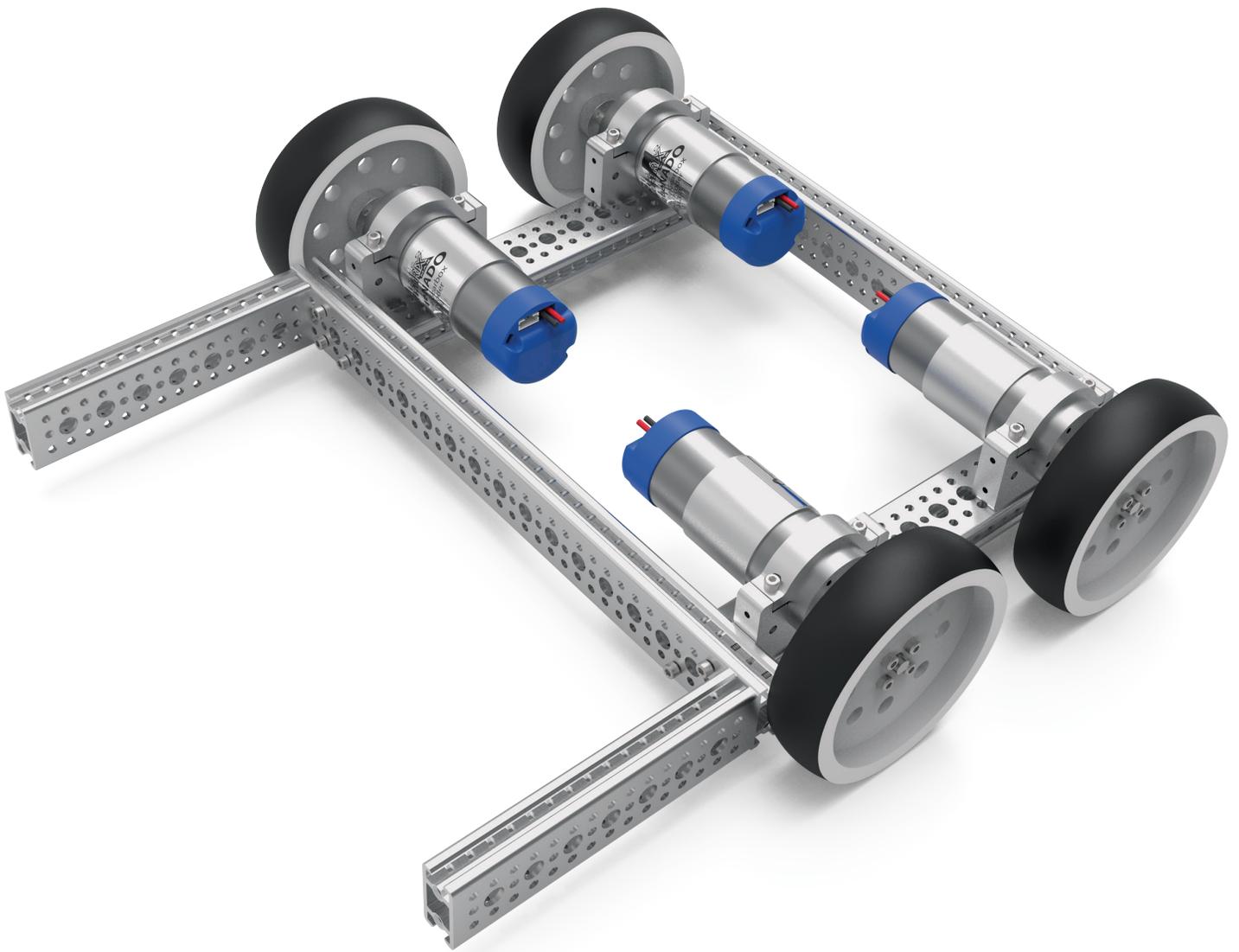
DC Motor Mount 39376 

TorqueNADO Motor 44260 

Mecanum Wheel Set (4 wheels with hub) 45320 

4" Wheel 39055 

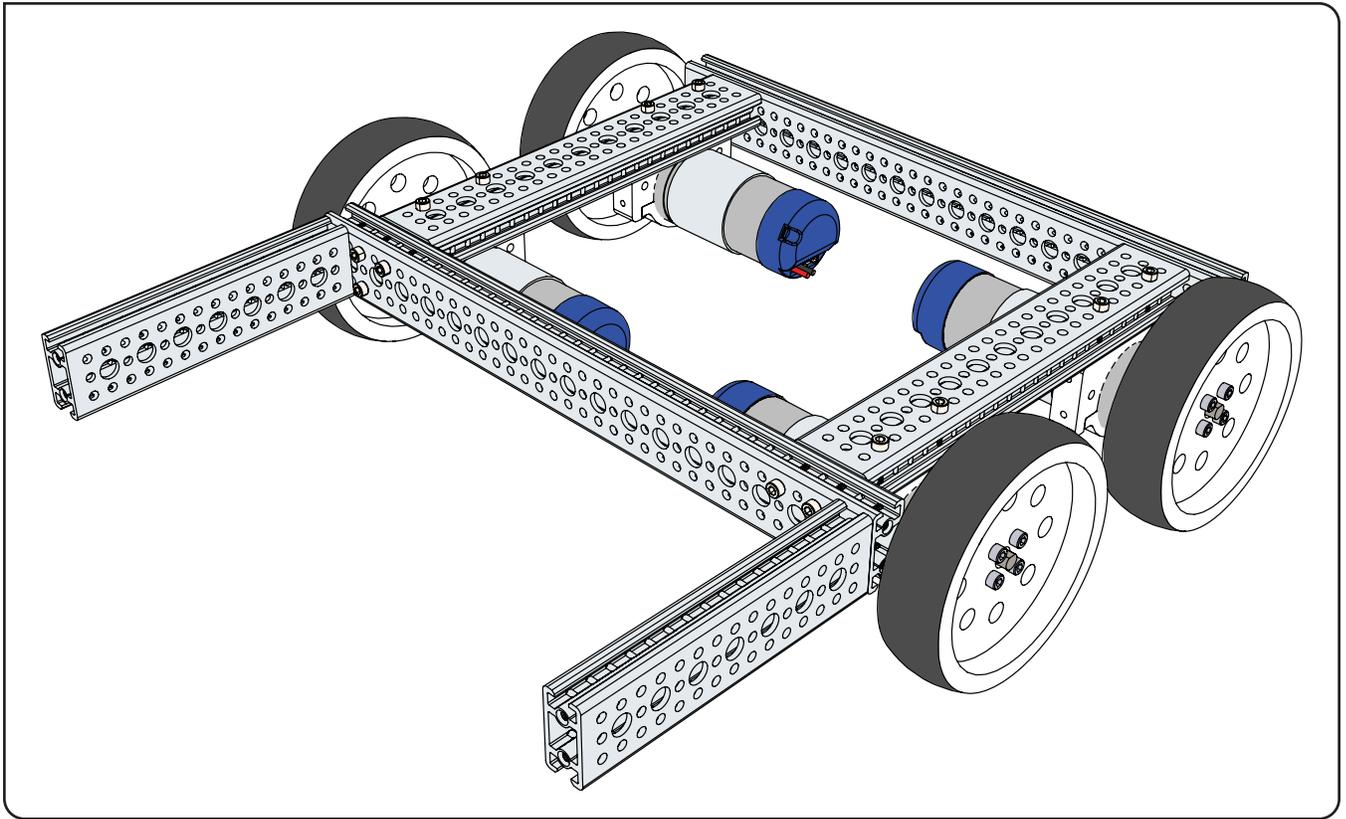




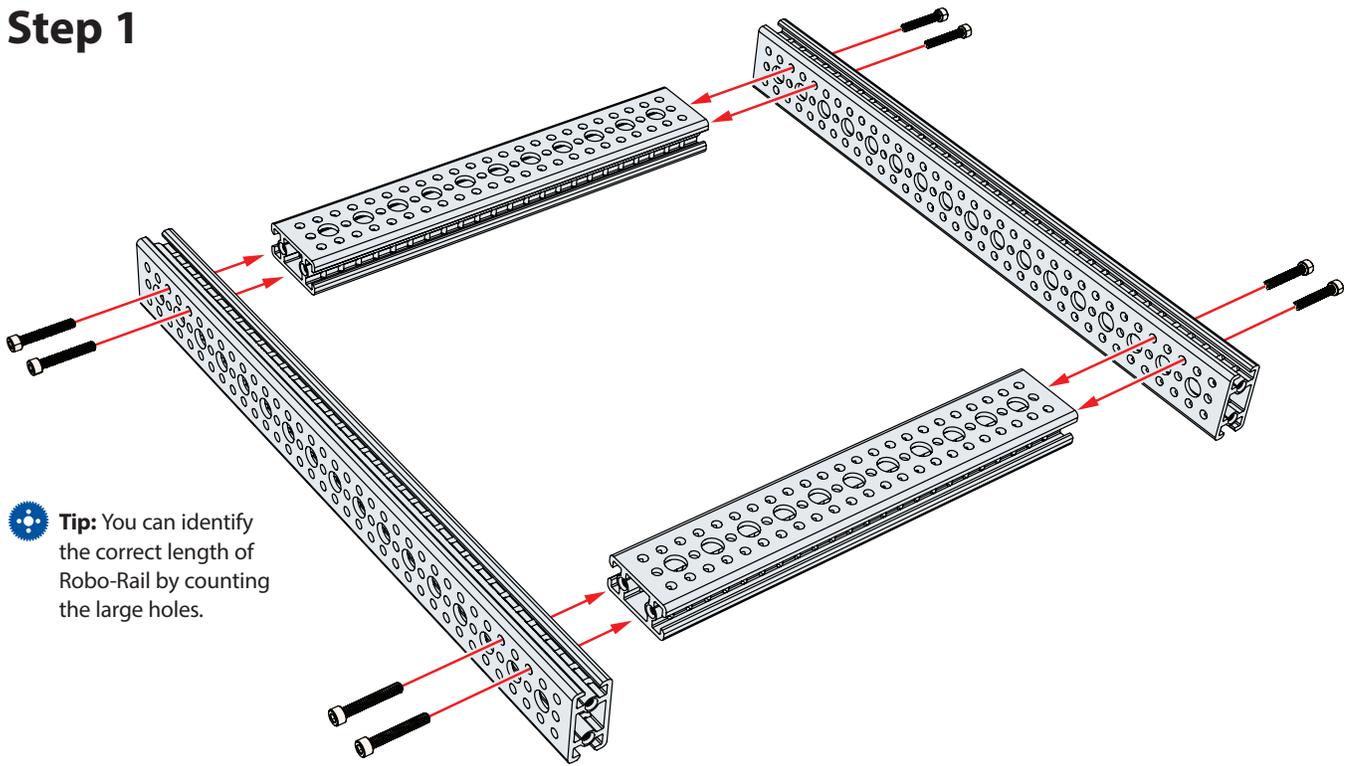
## Robot 1 – Standard TETRIX Wheels with short wheelbase

- The short wheelbase makes the robot more maneuverable with a tighter turning radius. Consider how a skid steer loader operates.
- Standard wheels provide more traction making it easier to get up ramps, navigate over uneven terrain, and help with weight management because they are lighter than other types of wheels such as mecanum wheels.
- The chassis orientation can be flipped either way. With the motors underneath the chassis, the robot has higher ground clearance to better navigate over uneven terrain. With the chassis flipped so the motors are on top of the chassis, the chassis is lowered bringing accumulators and pushing mechanisms closer to the ground.
- The shorter wheelbase allows for more up-front space for attaching other mechanisms.
- The standard wheels shown here can easily be swapped out for mecanum wheels to allow for more maneuverability.

**Finished chassis should look like this.**

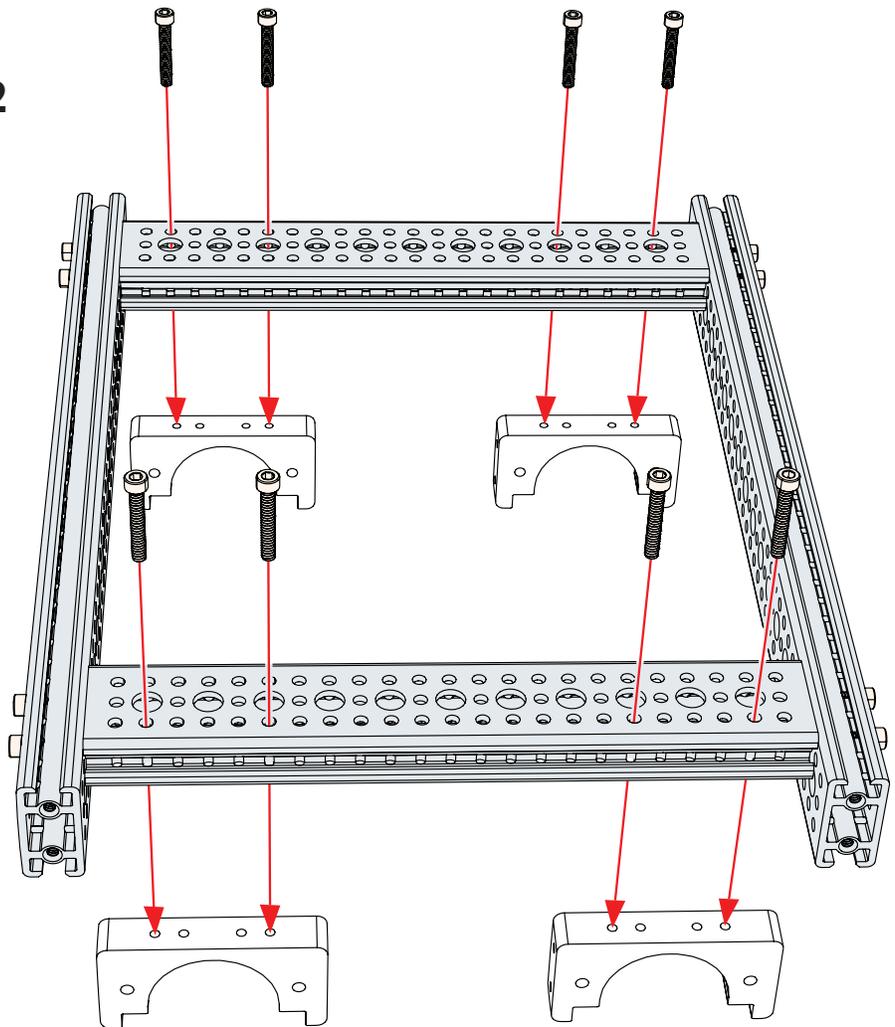


# Step 1

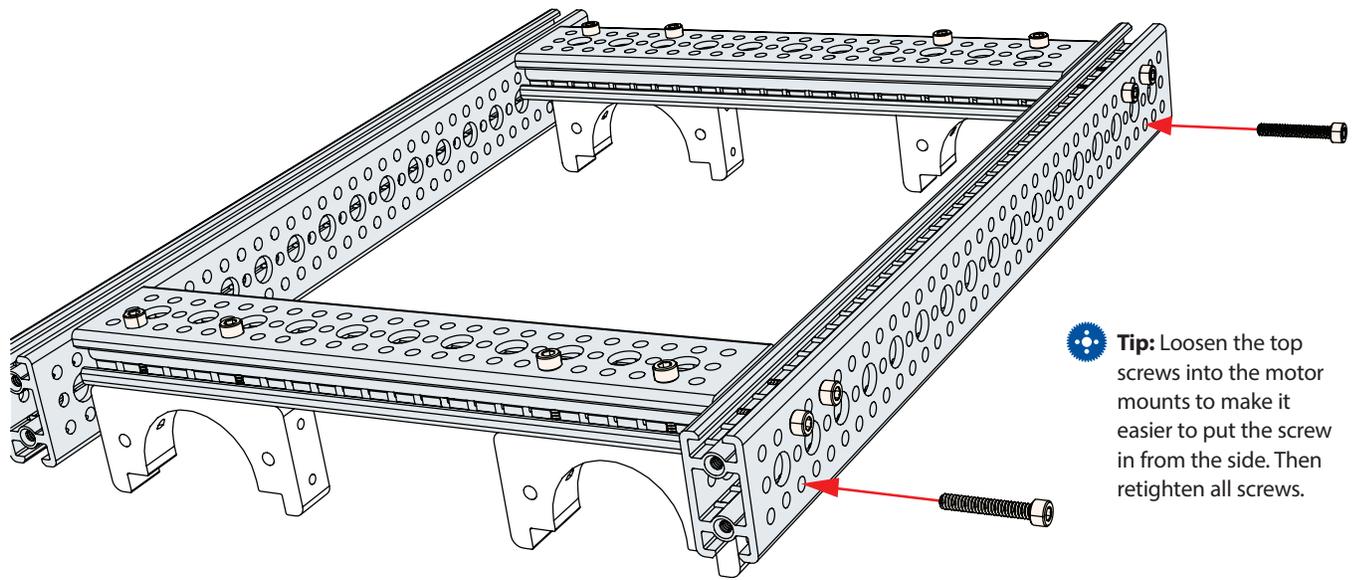


**Tip:** You can identify the correct length of Robo-Rail by counting the large holes.

# Step 2

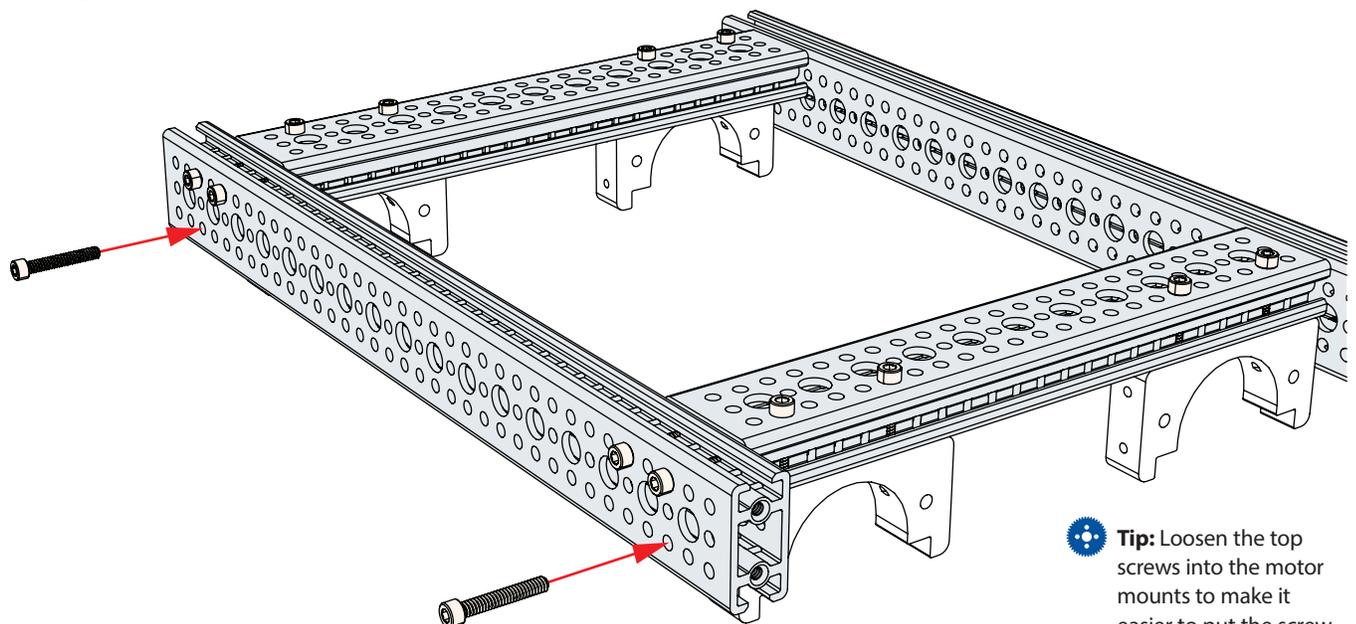


## Step 3



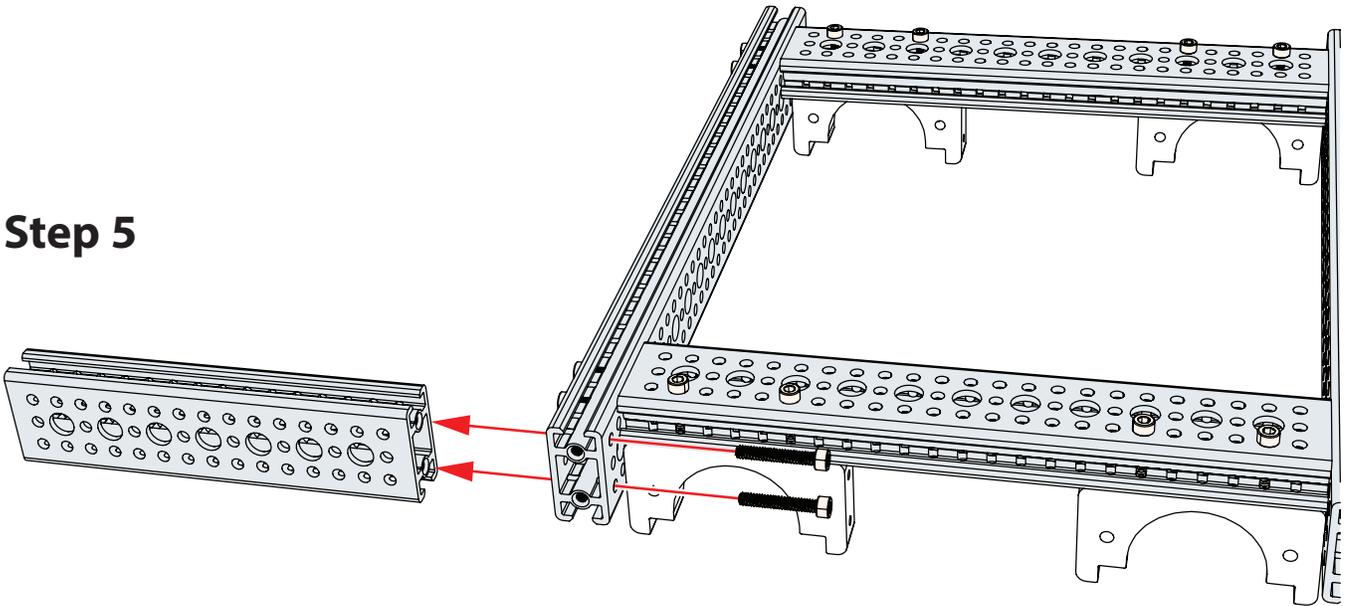
 **Tip:** Loosen the top screws into the motor mounts to make it easier to put the screw in from the side. Then retighten all screws.

## Step 4

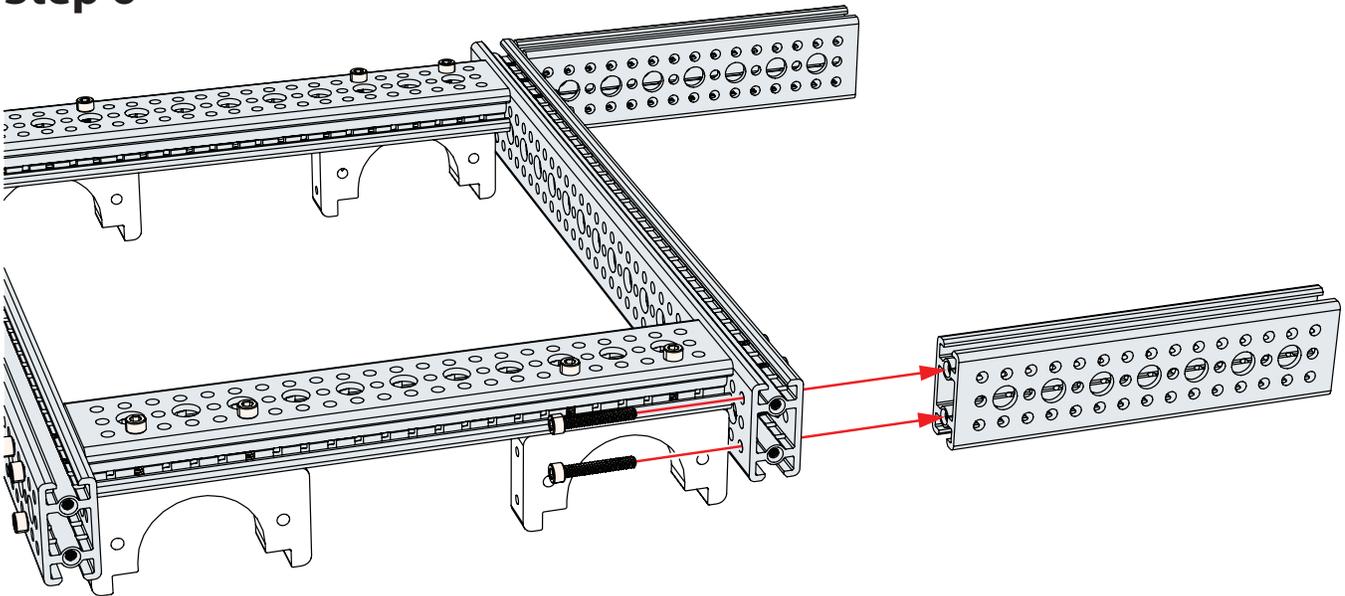


 **Tip:** Loosen the top screws into the motor mounts to make it easier to put the screw in from the side. Then retighten all screws.

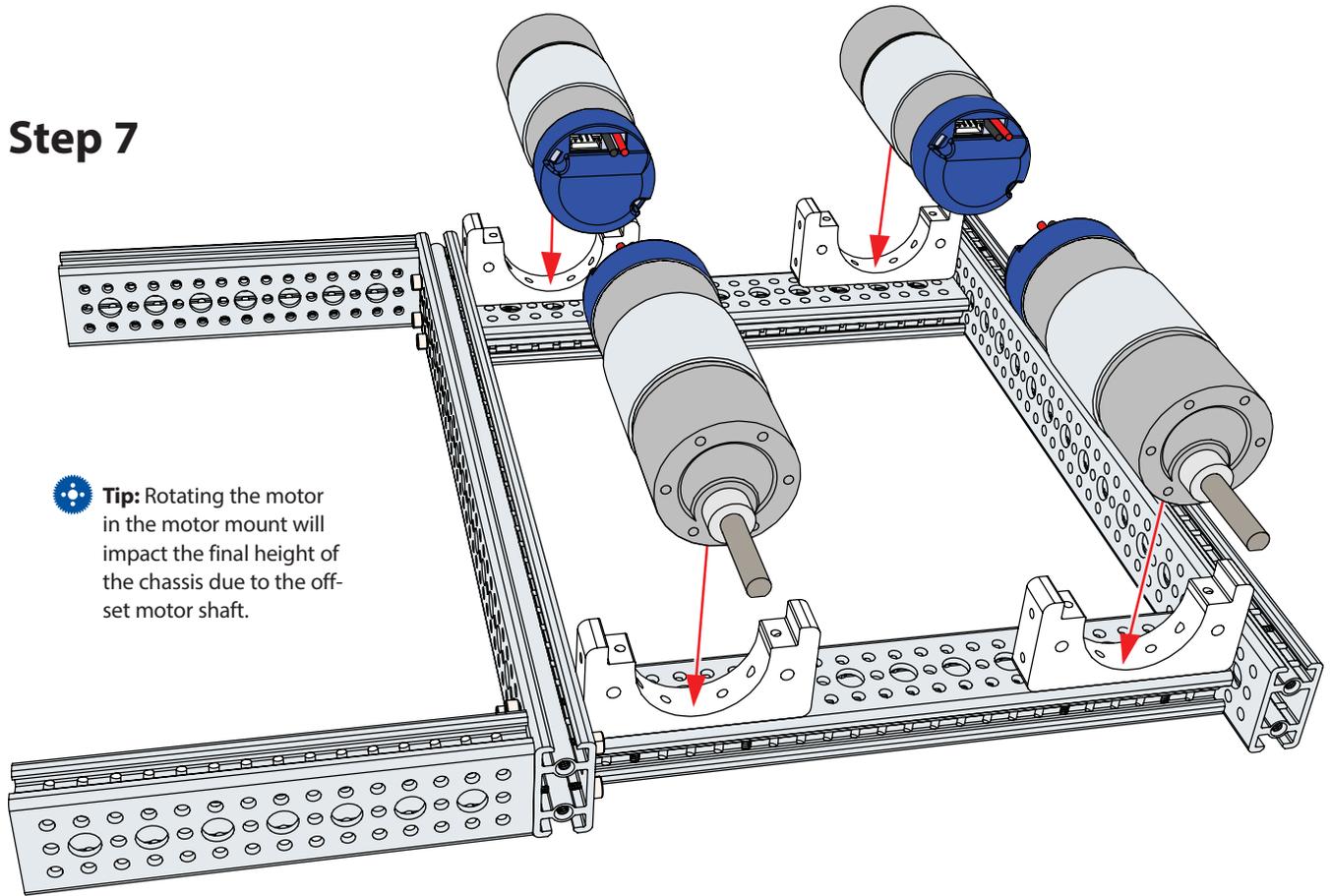
## Step 5



## Step 6

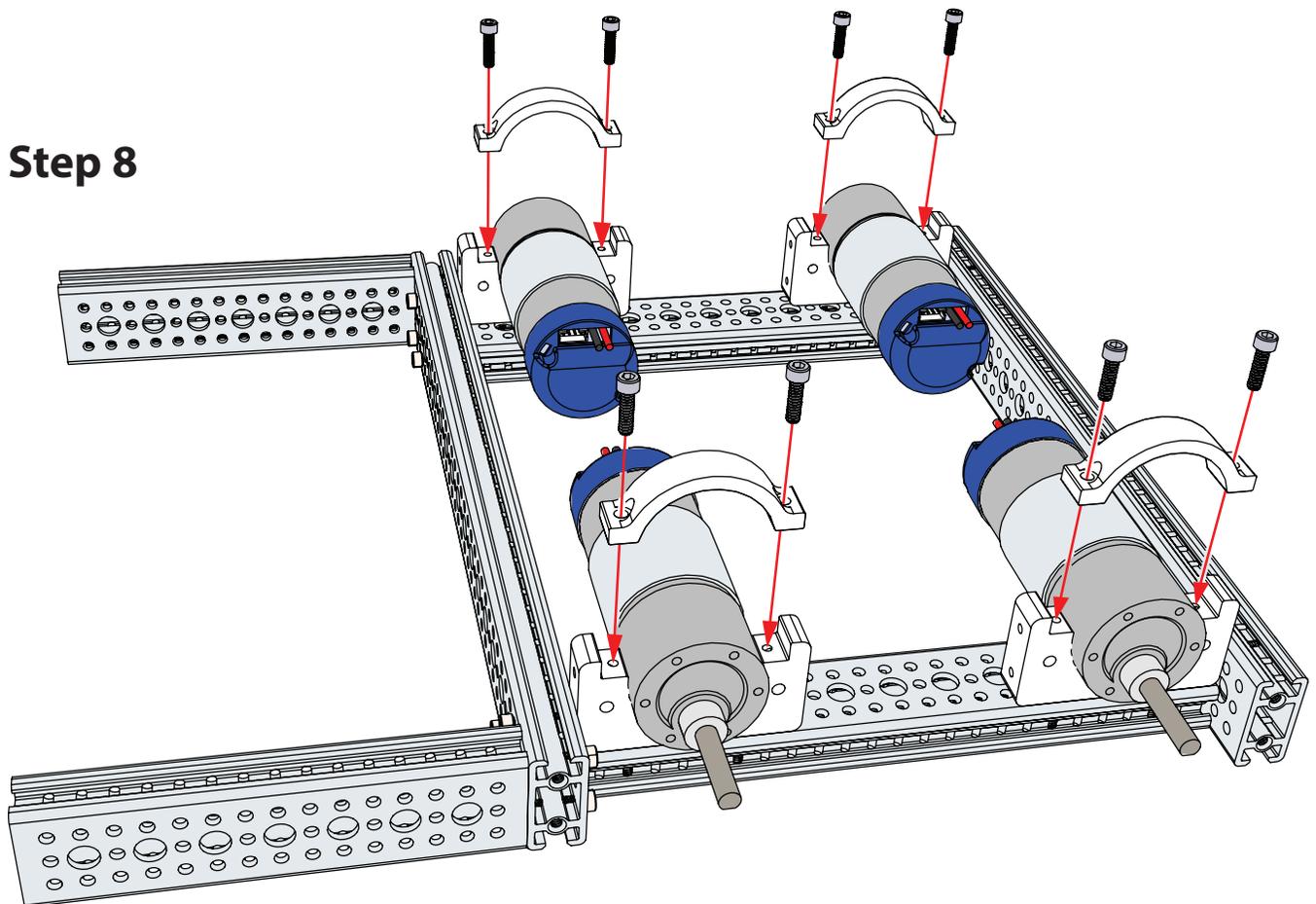


## Step 7

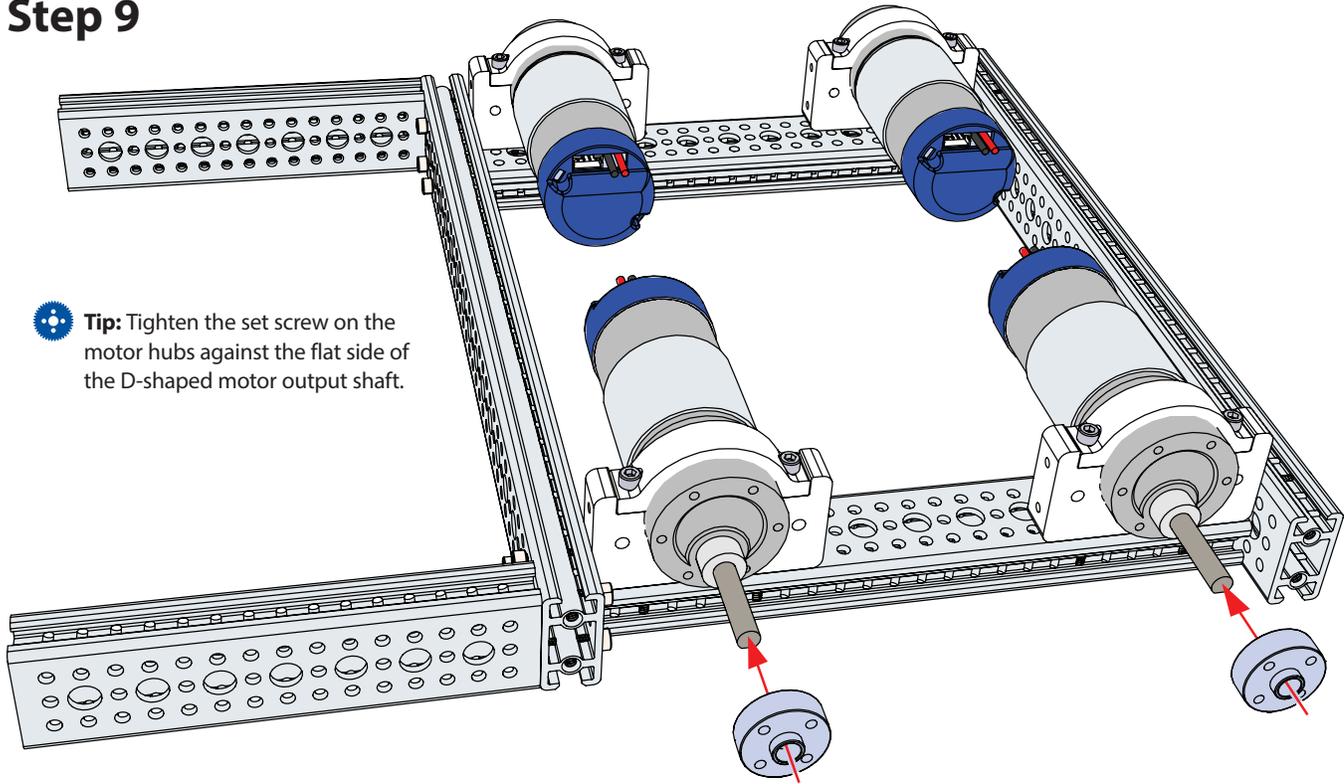


 **Tip:** Rotating the motor in the motor mount will impact the final height of the chassis due to the offset motor shaft.

## Step 8

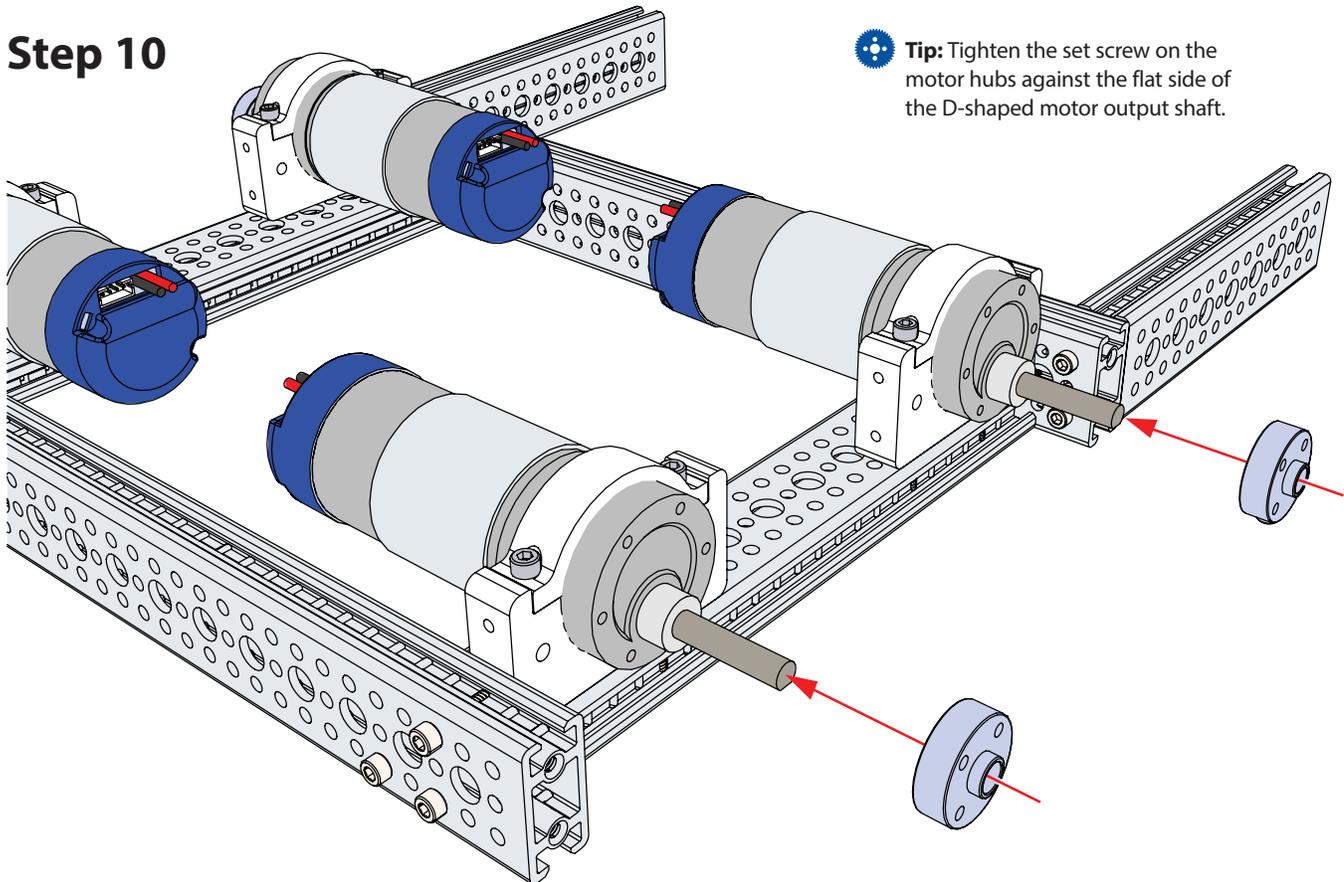


## Step 9



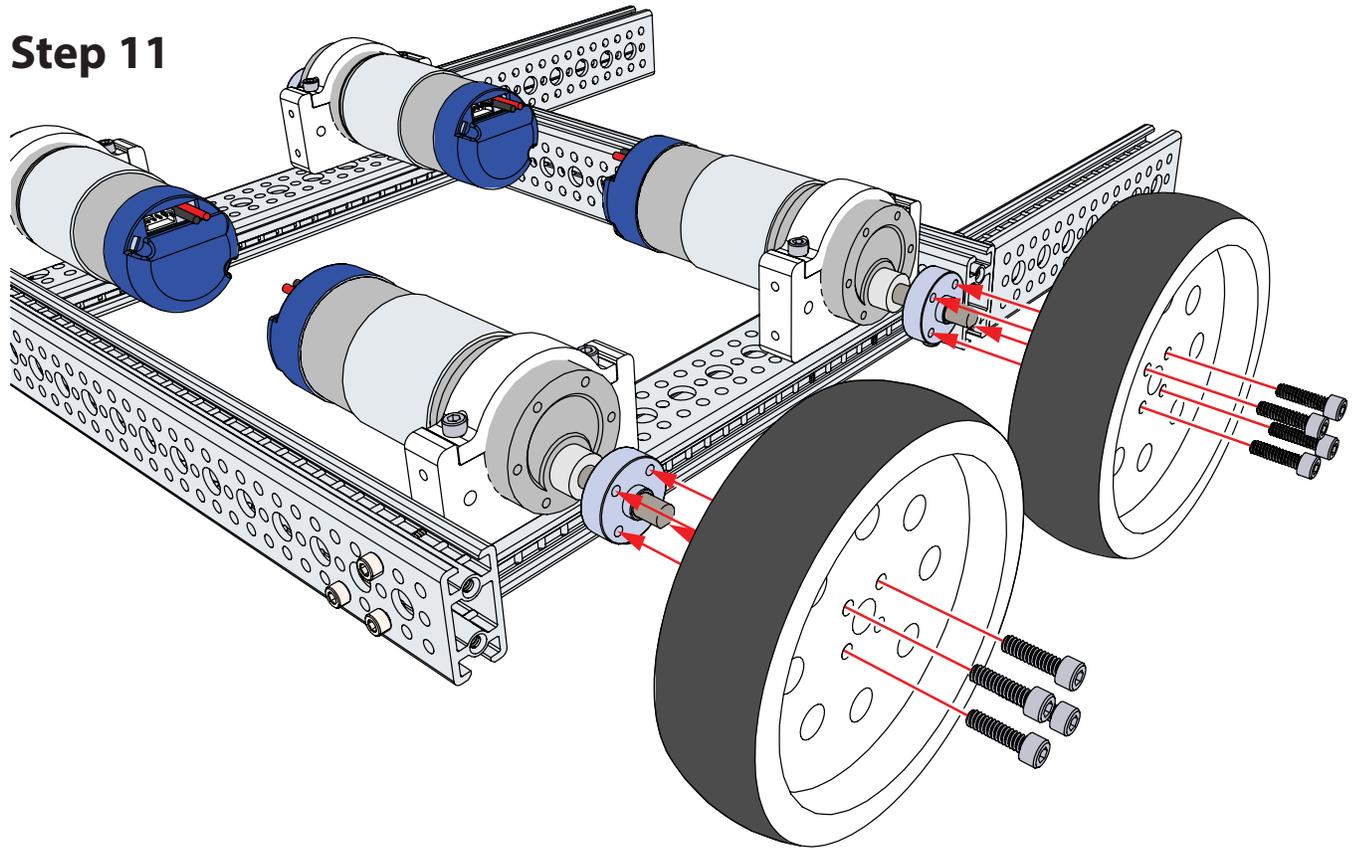
 **Tip:** Tighten the set screw on the motor hubs against the flat side of the D-shaped motor output shaft.

## Step 10

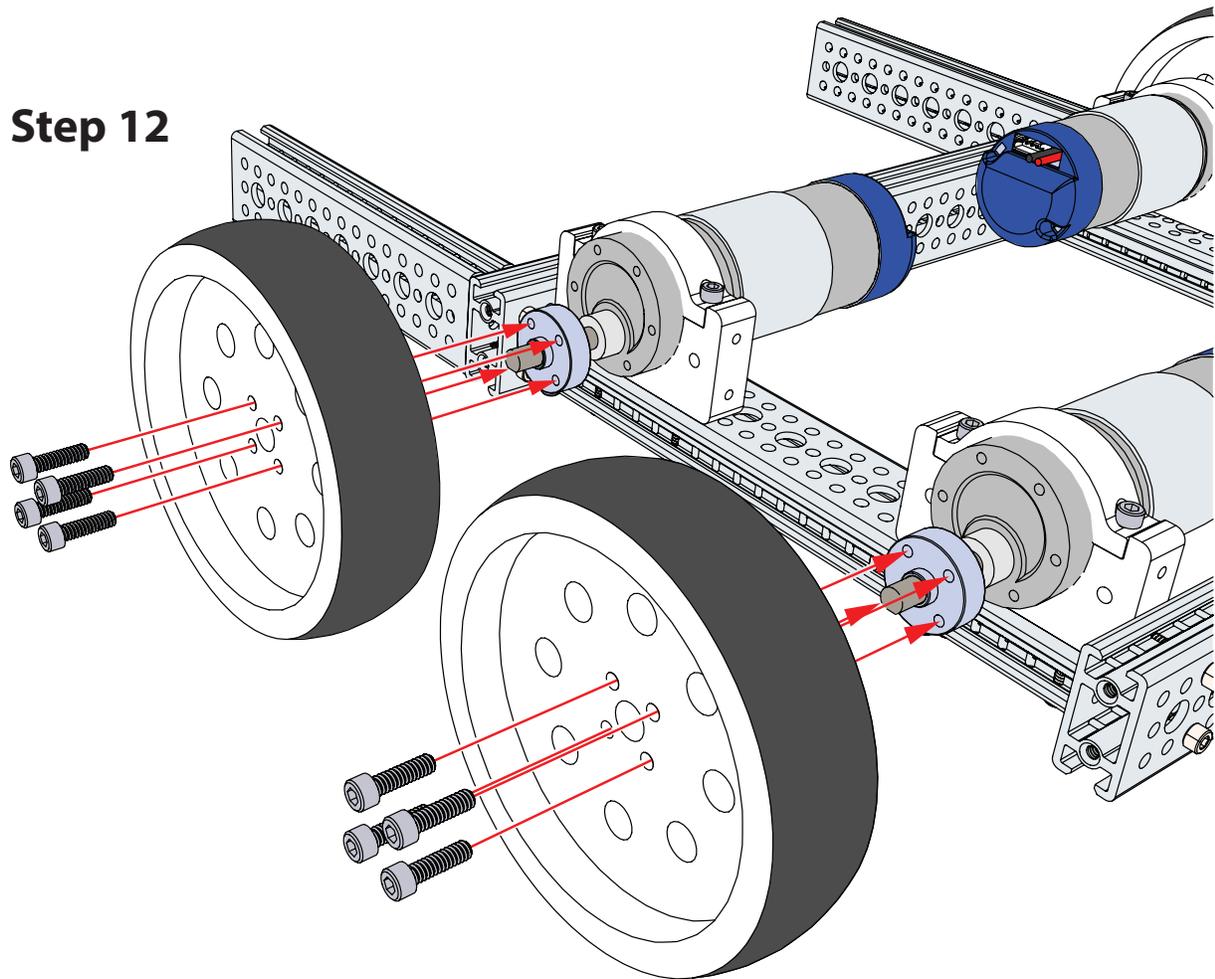


 **Tip:** Tighten the set screw on the motor hubs against the flat side of the D-shaped motor output shaft.

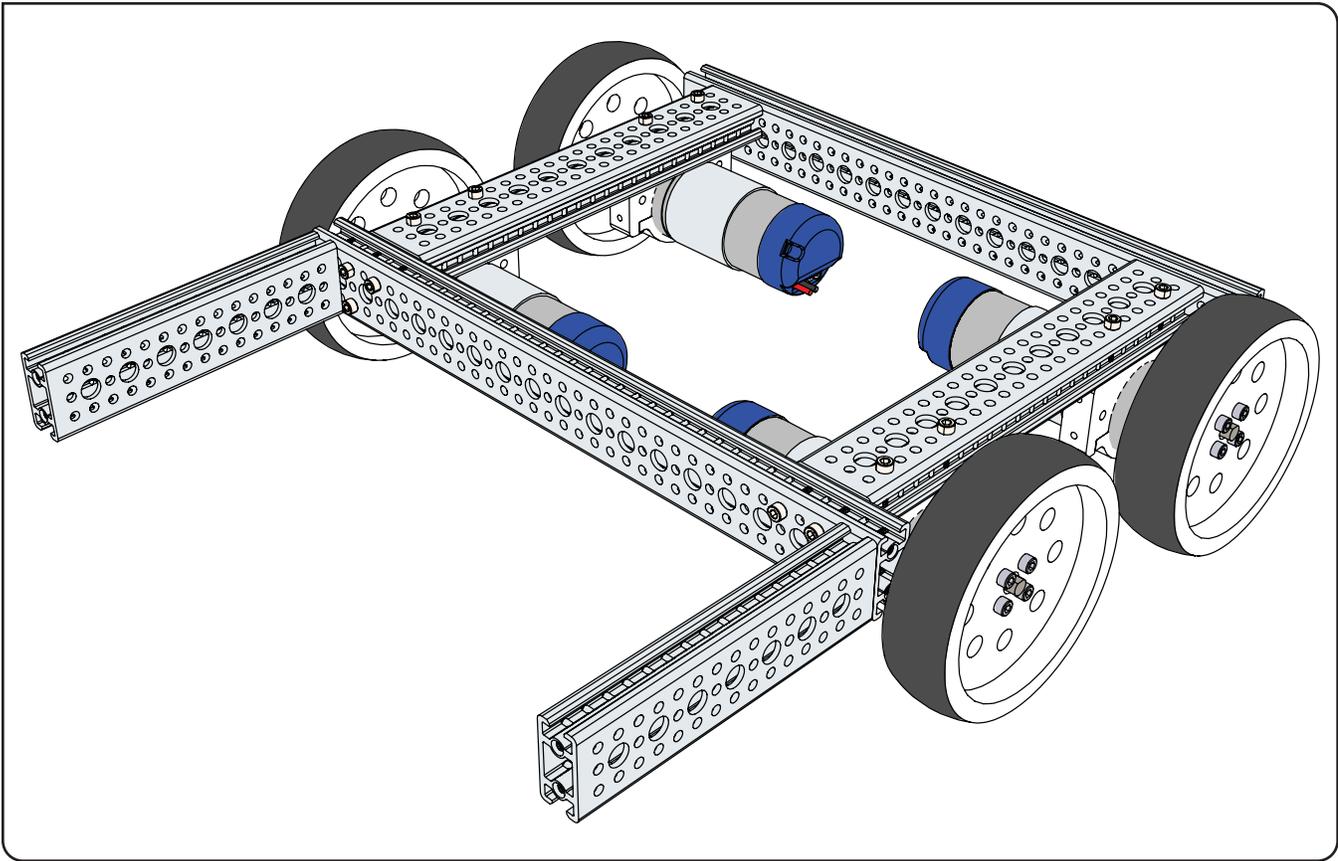
### Step 11



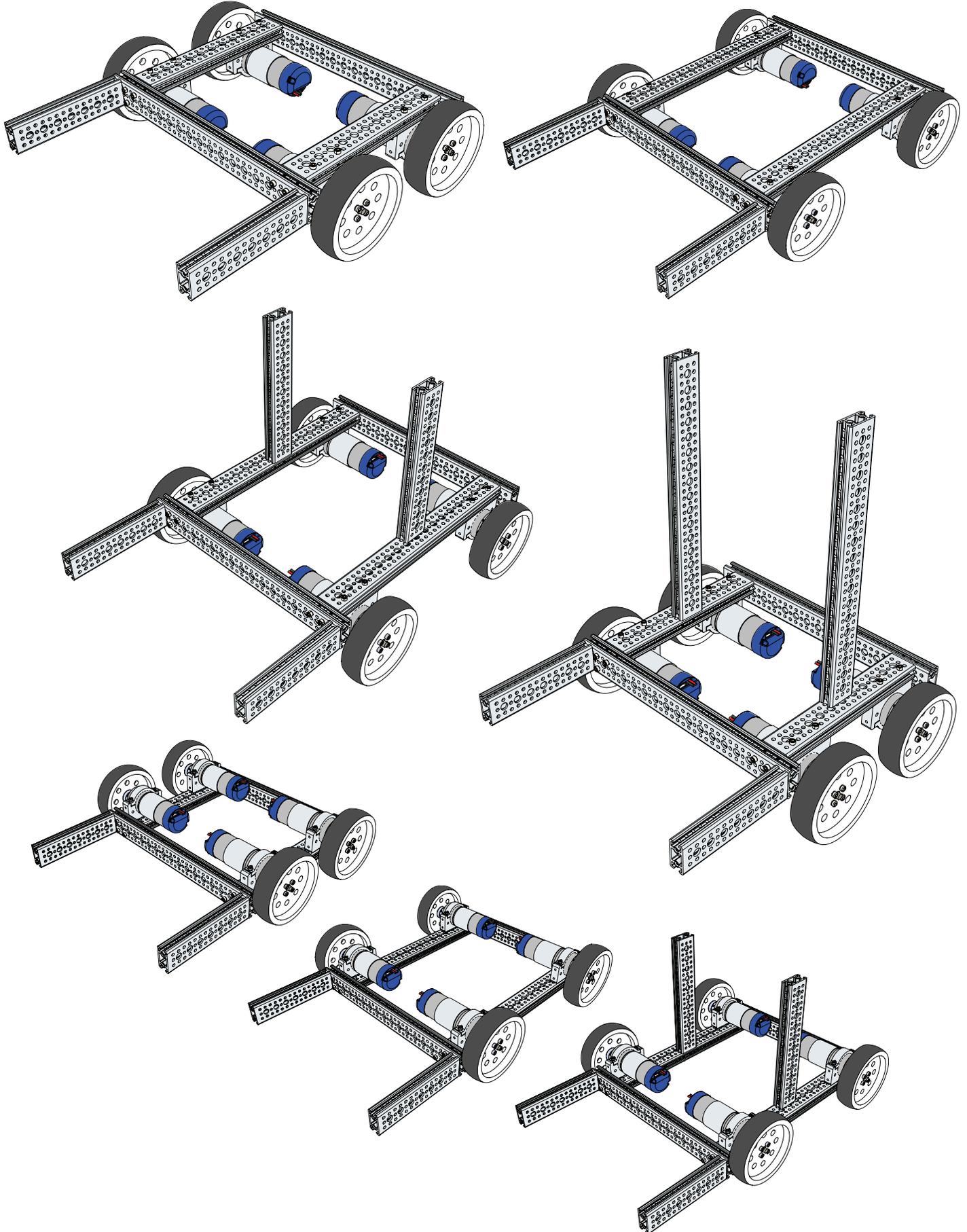
### Step 12

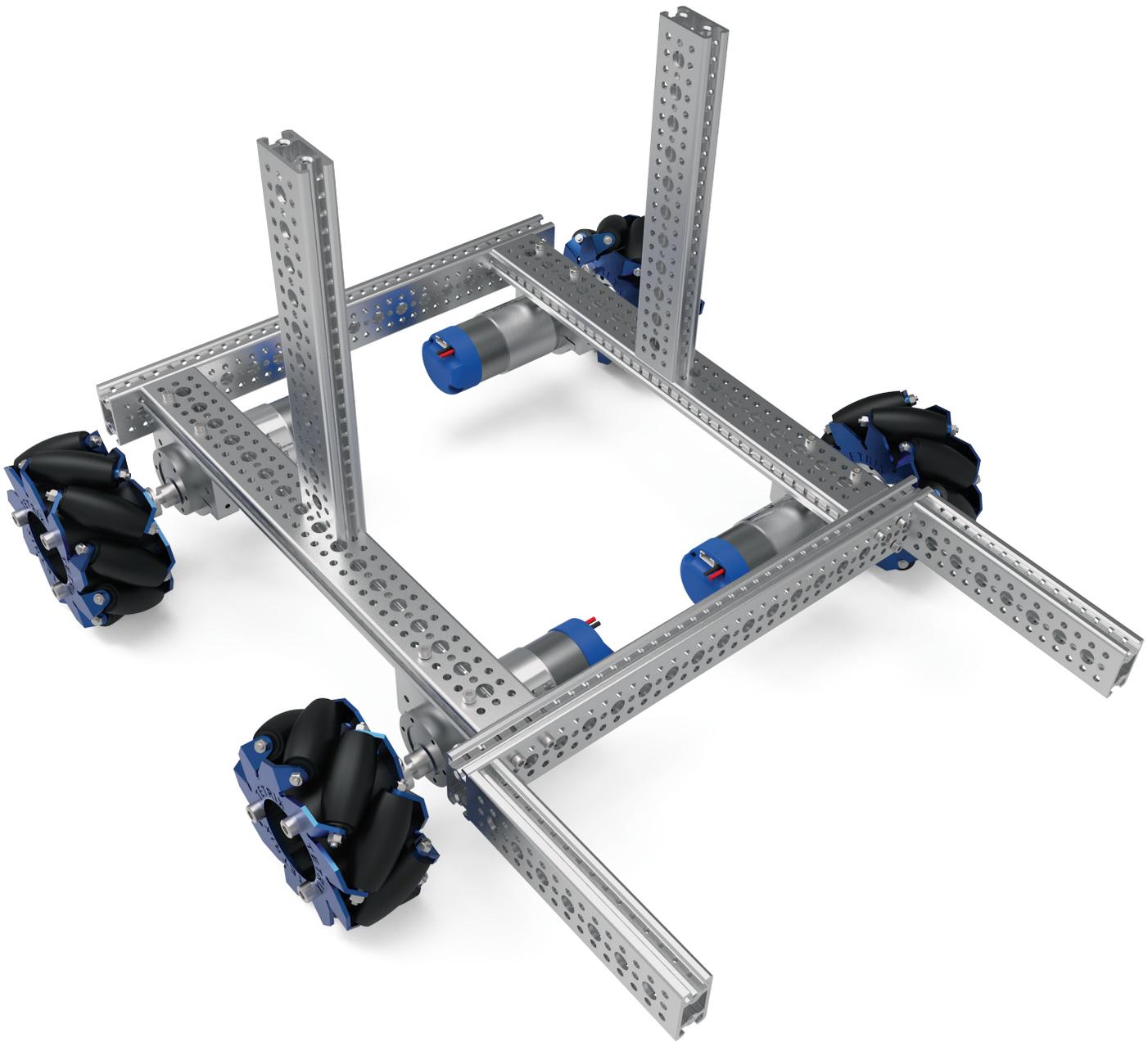


## Finished chassis.



### Variations on Robot 1 – Standard TETRIX Wheels long and short wheelbase

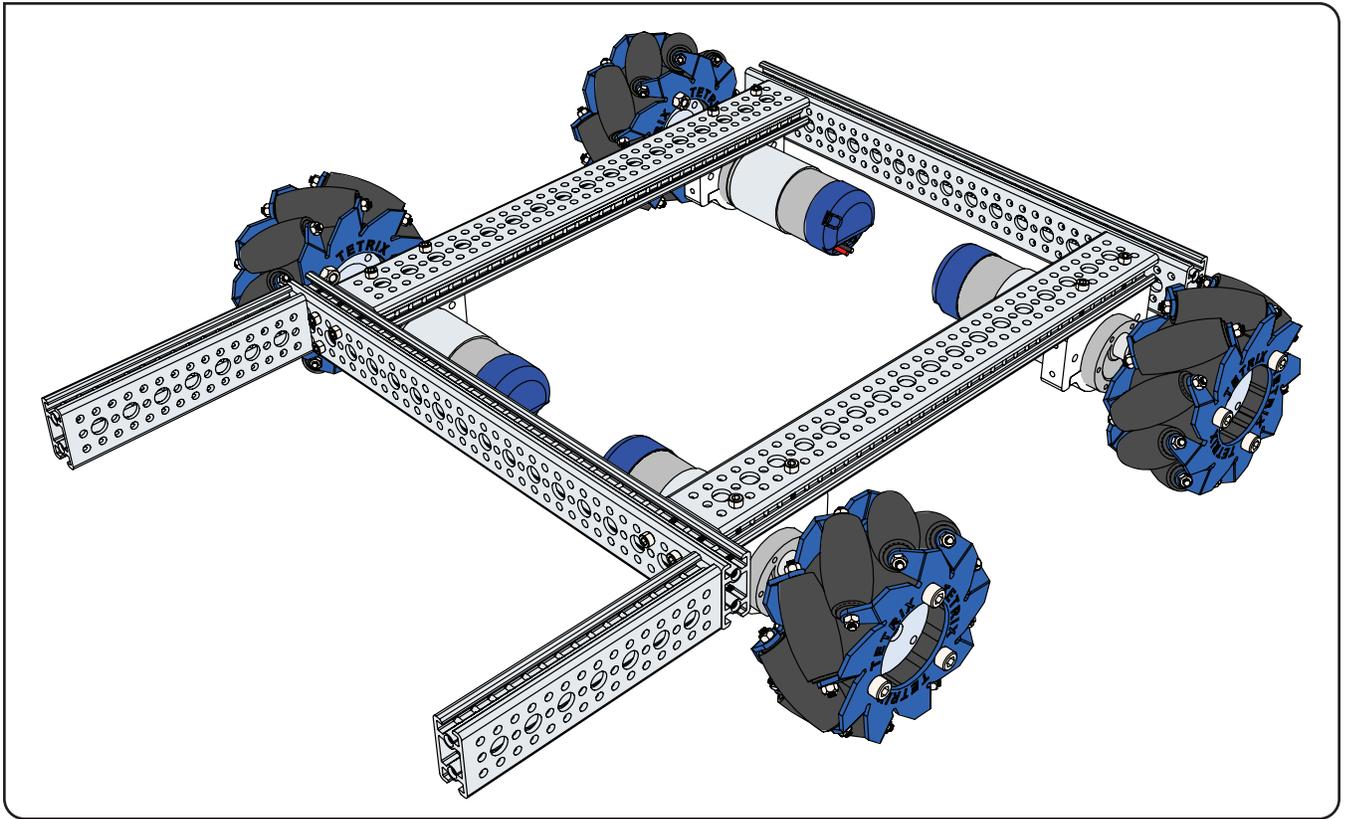




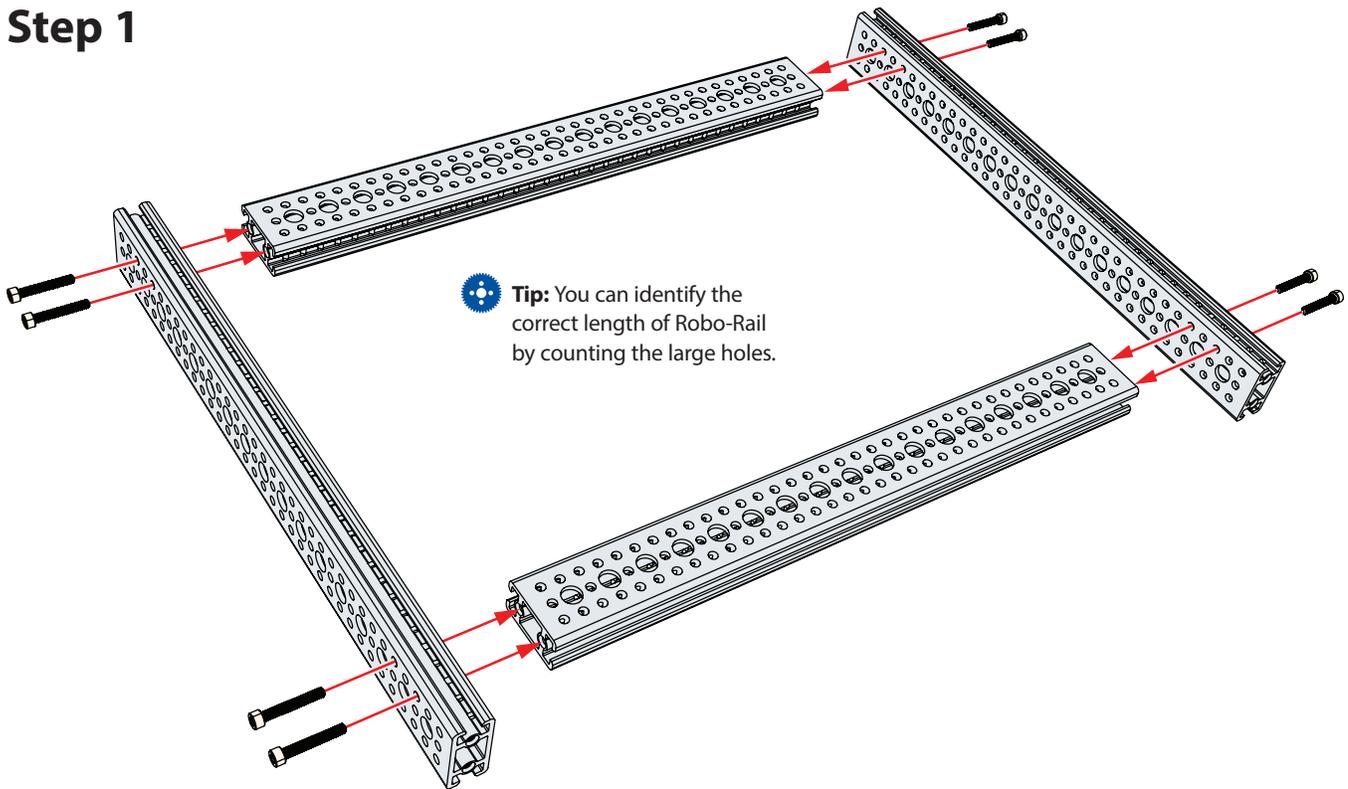
## Robot 2 – Mecanum Wheel Chassis

- The mecanum wheels allow for movement in any direction without changing the orientation of the robot (forward, backward, strafe left and right) making the robot more maneuverable. This makes it easier to line the robot up on a target, goal, or ordinance. The mecanum wheels work best on smooth flat surfaces.
- Like Robot 1, the chassis orientation can be flipped either way (the vertical rails just need to be attached to the other side). With the motors underneath the chassis, the robot has higher ground clearance to drive over obstacles. With the chassis flipped so the motors are on top of the chassis, the chassis is lowered bringing mechanisms closer to the ground.
- The mecanum wheels can be swapped out for standard wheels that provide better traction or for driving over uneven terrain.
- The longer wheelbase gives more balance and helps avoid tipping.

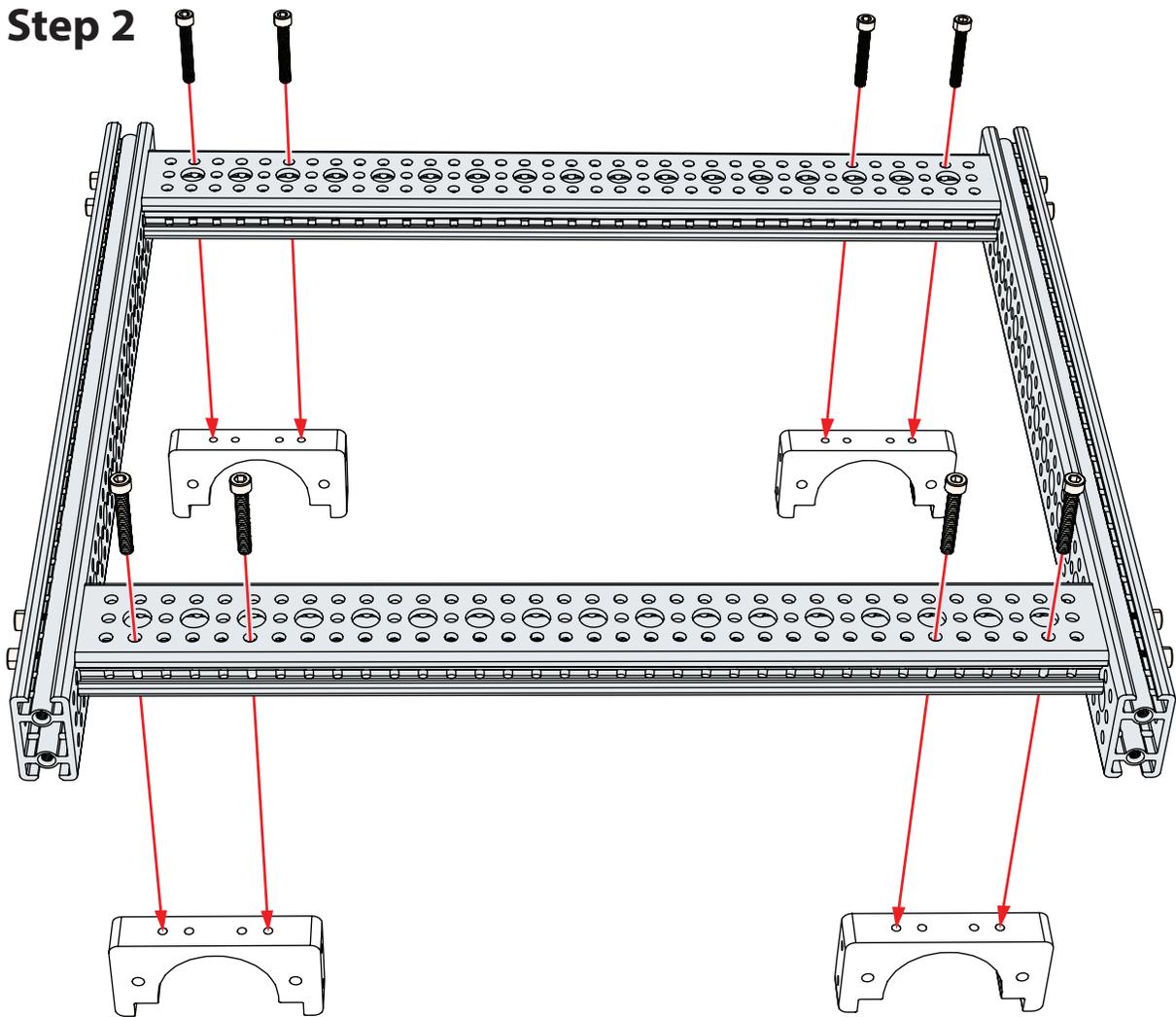
Finished chassis should look like this.



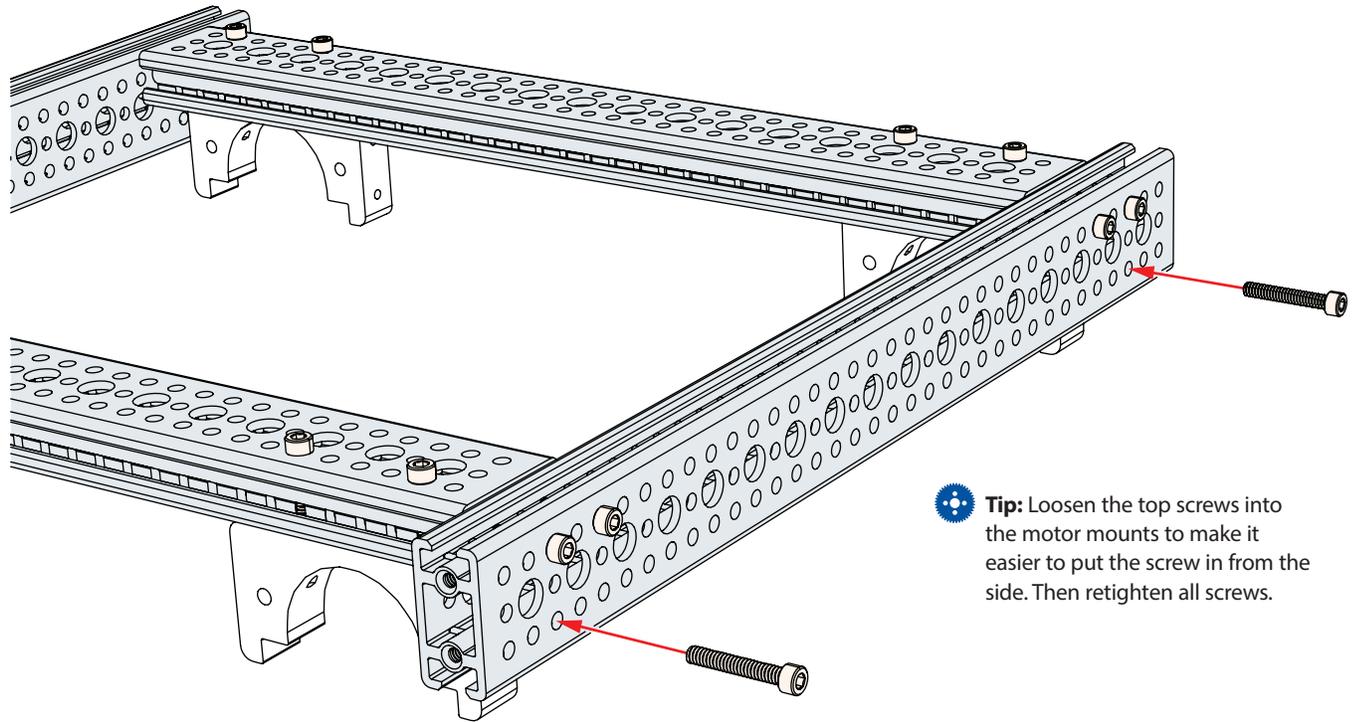
# Step 1



# Step 2

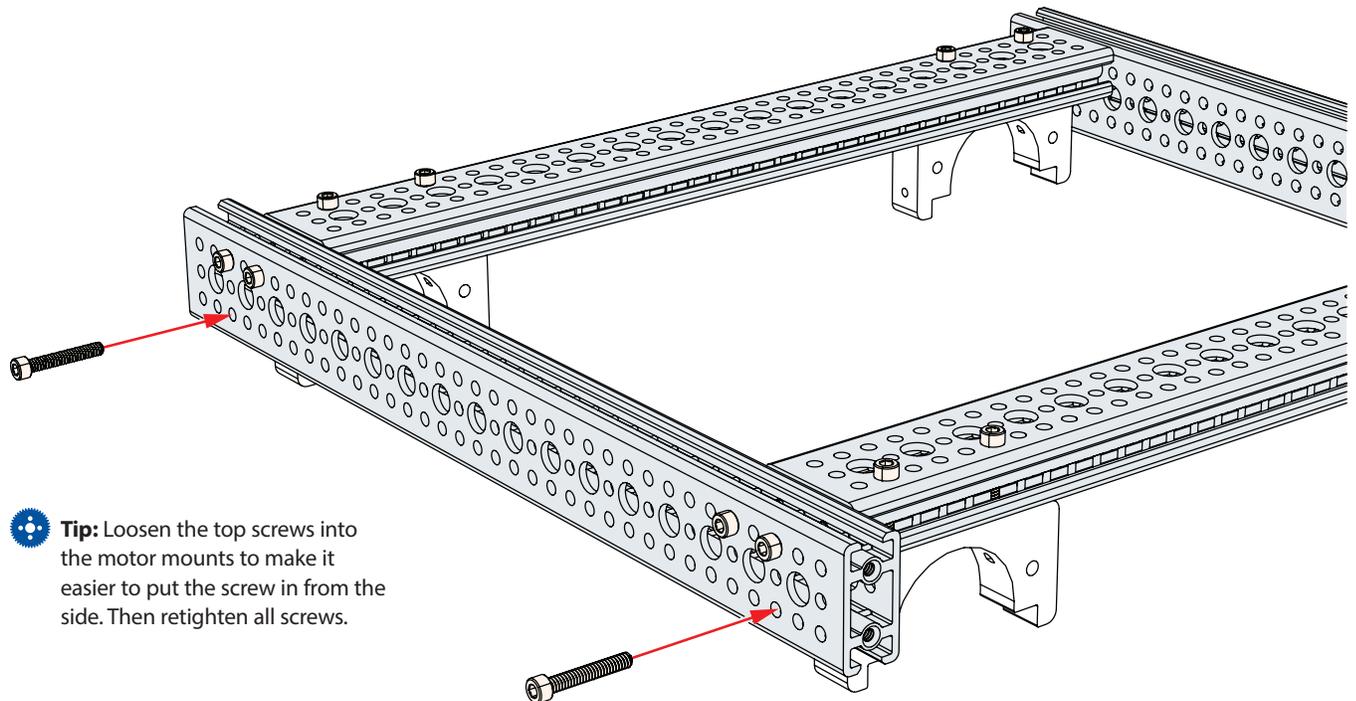


### Step 3



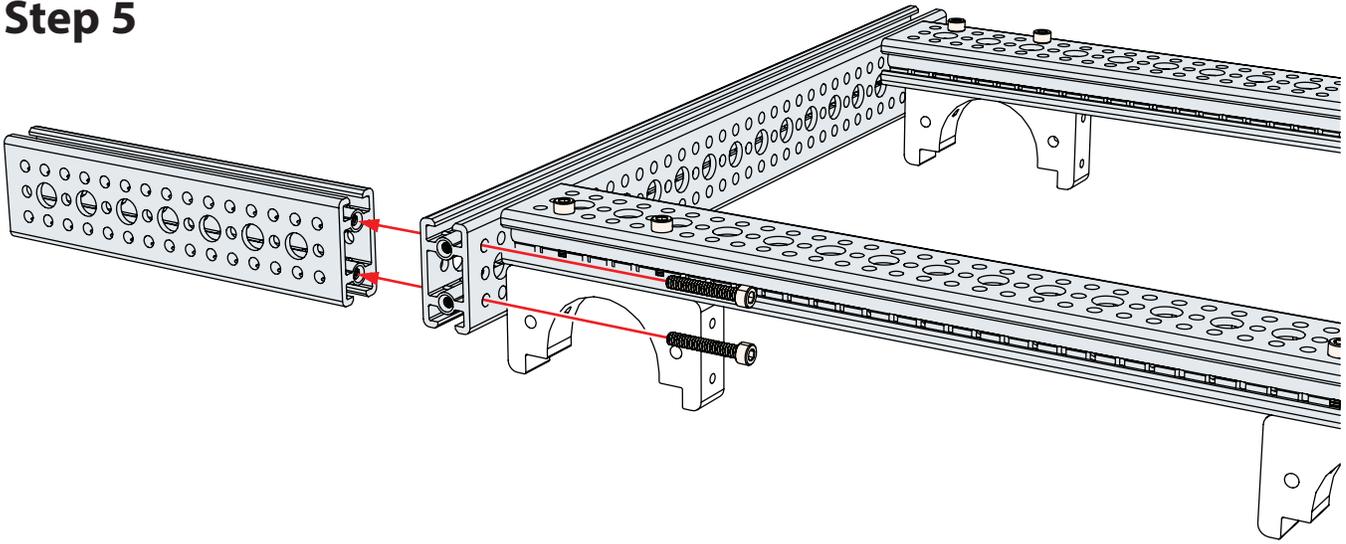
 **Tip:** Loosen the top screws into the motor mounts to make it easier to put the screw in from the side. Then retighten all screws.

### Step 4

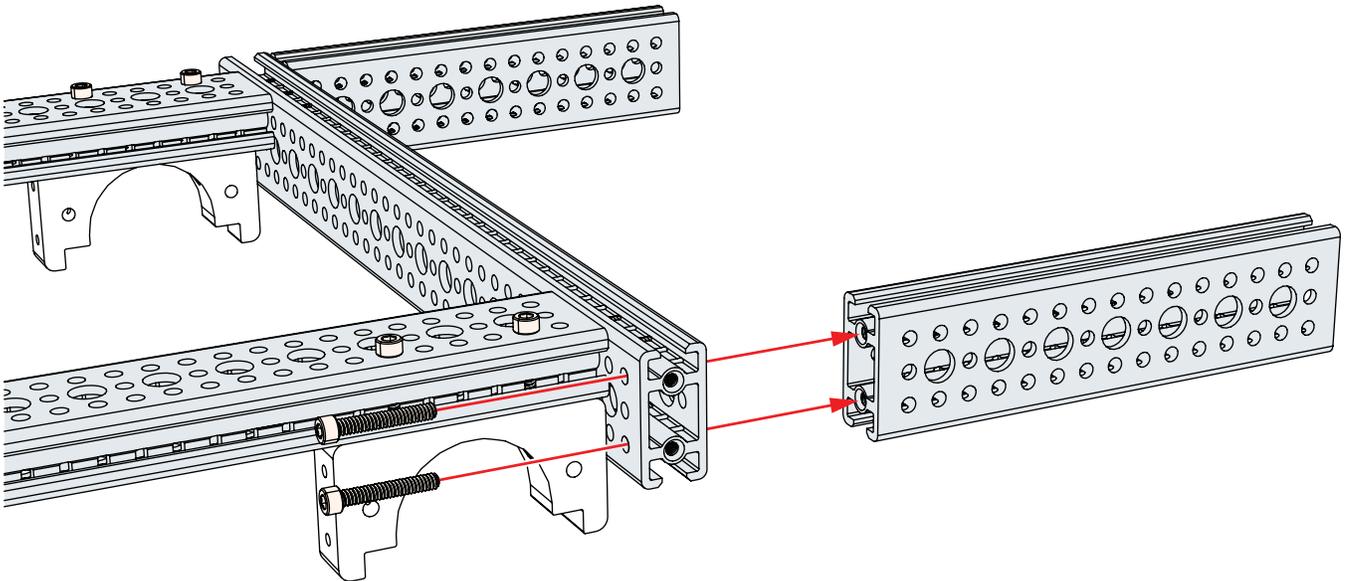


 **Tip:** Loosen the top screws into the motor mounts to make it easier to put the screw in from the side. Then retighten all screws.

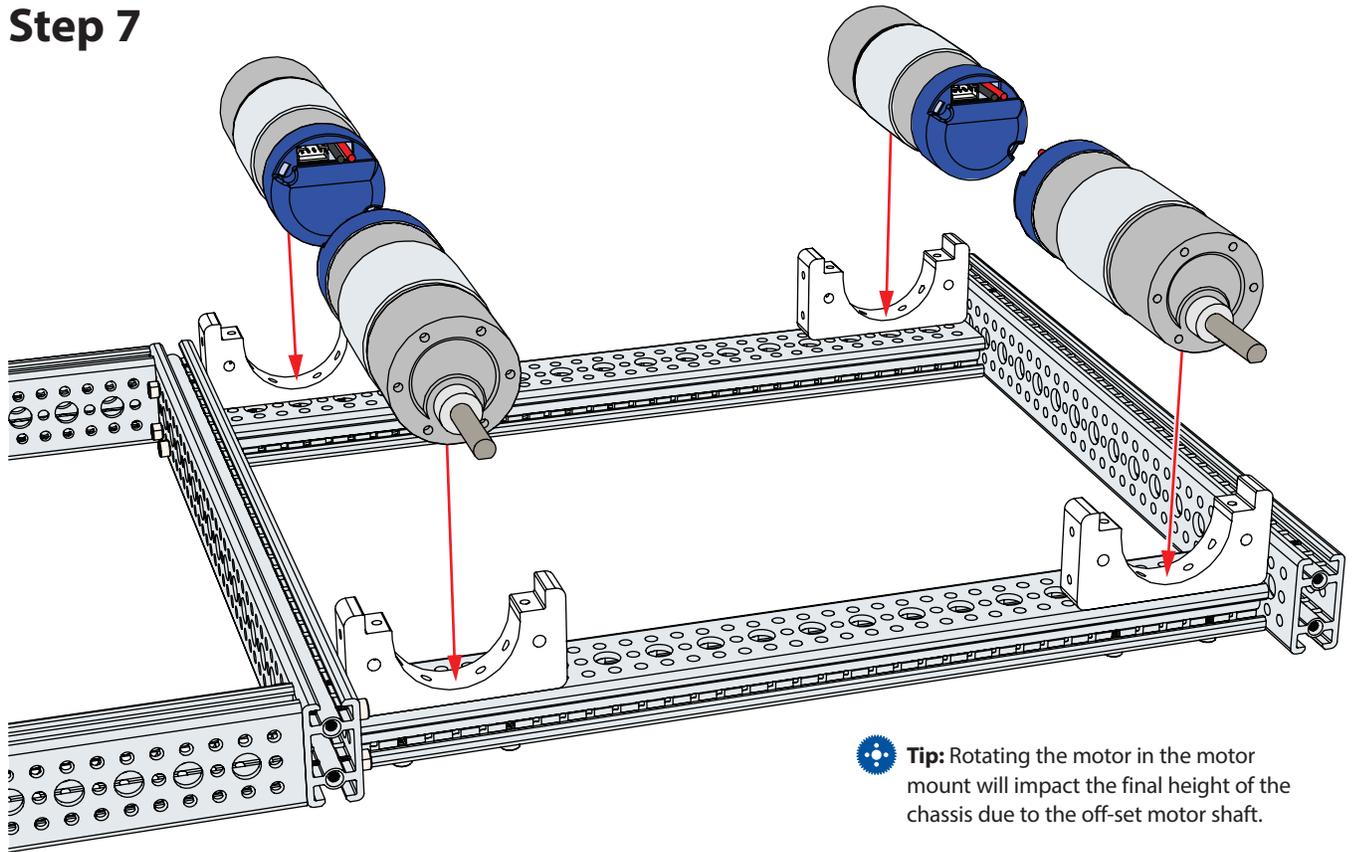
## Step 5



## Step 6

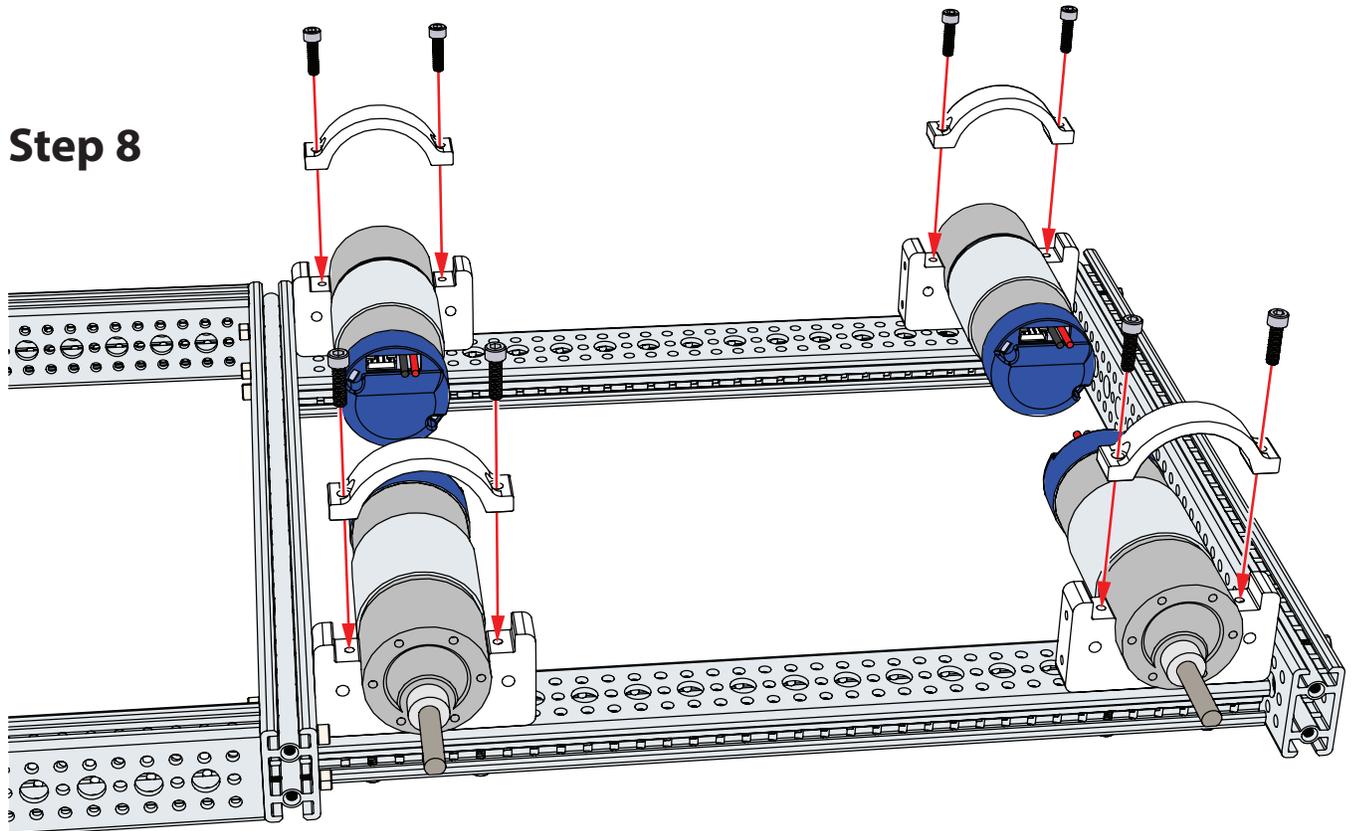


## Step 7

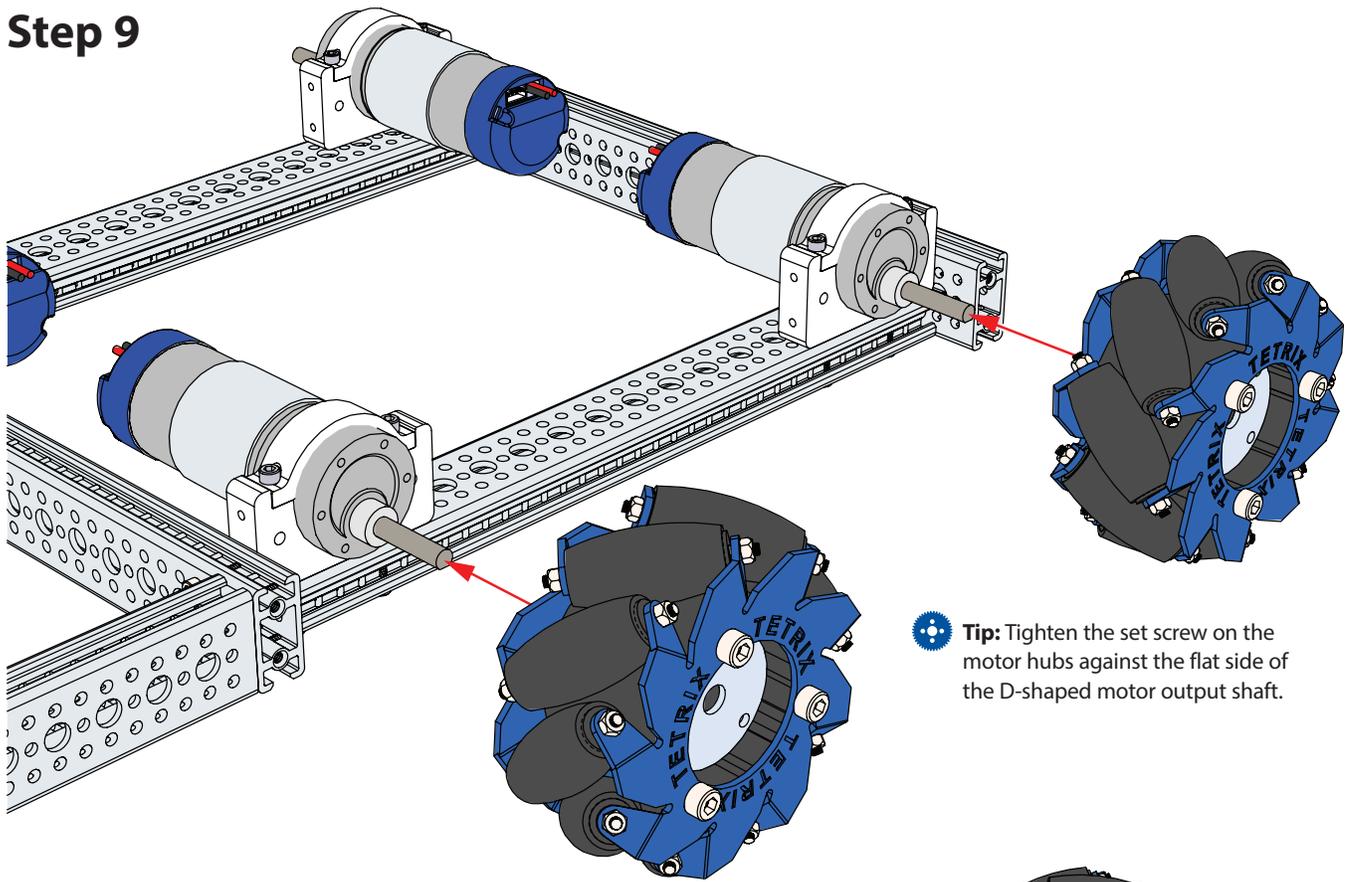


 **Tip:** Rotating the motor in the motor mount will impact the final height of the chassis due to the off-set motor shaft.

## Step 8

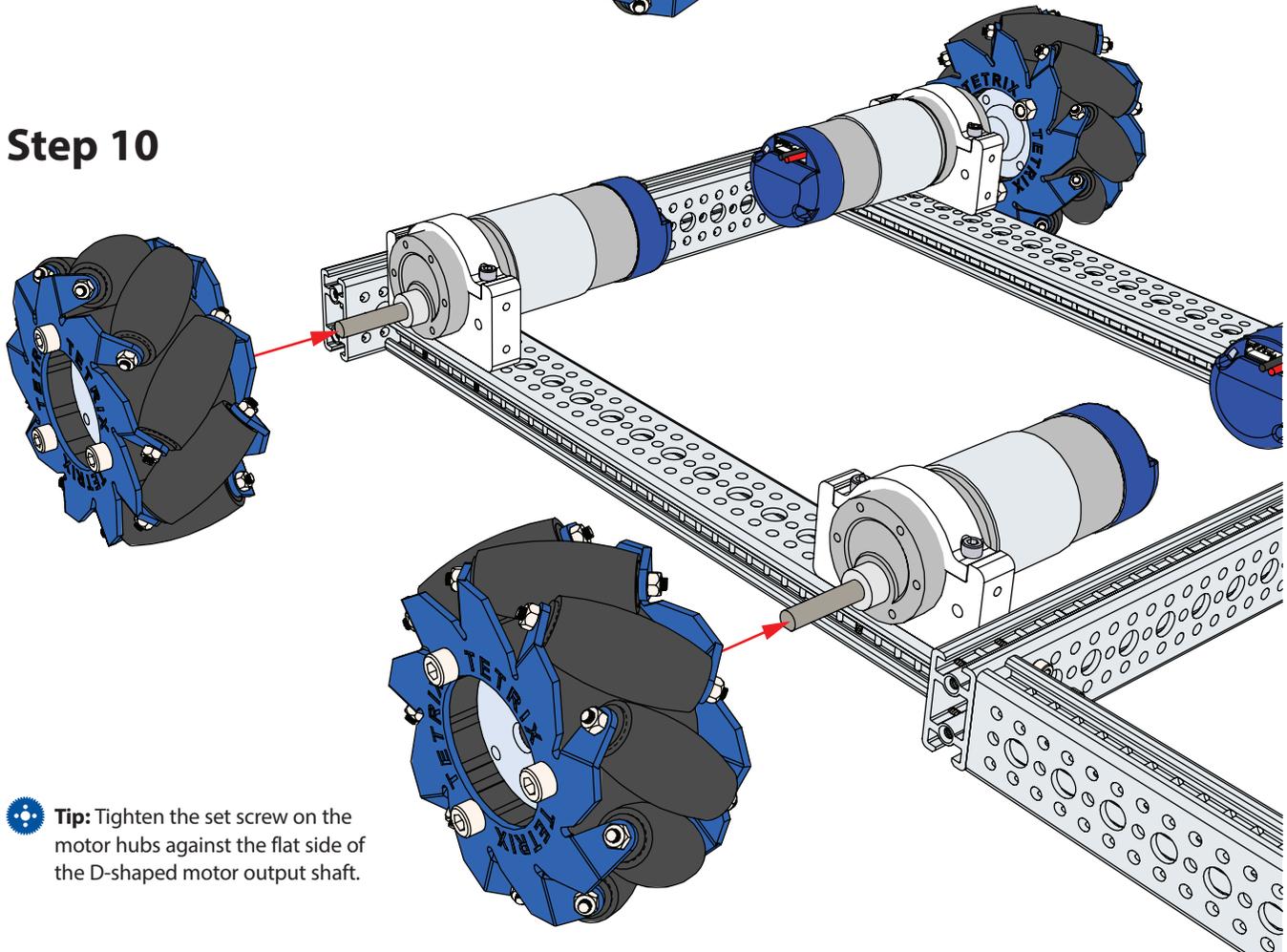


## Step 9



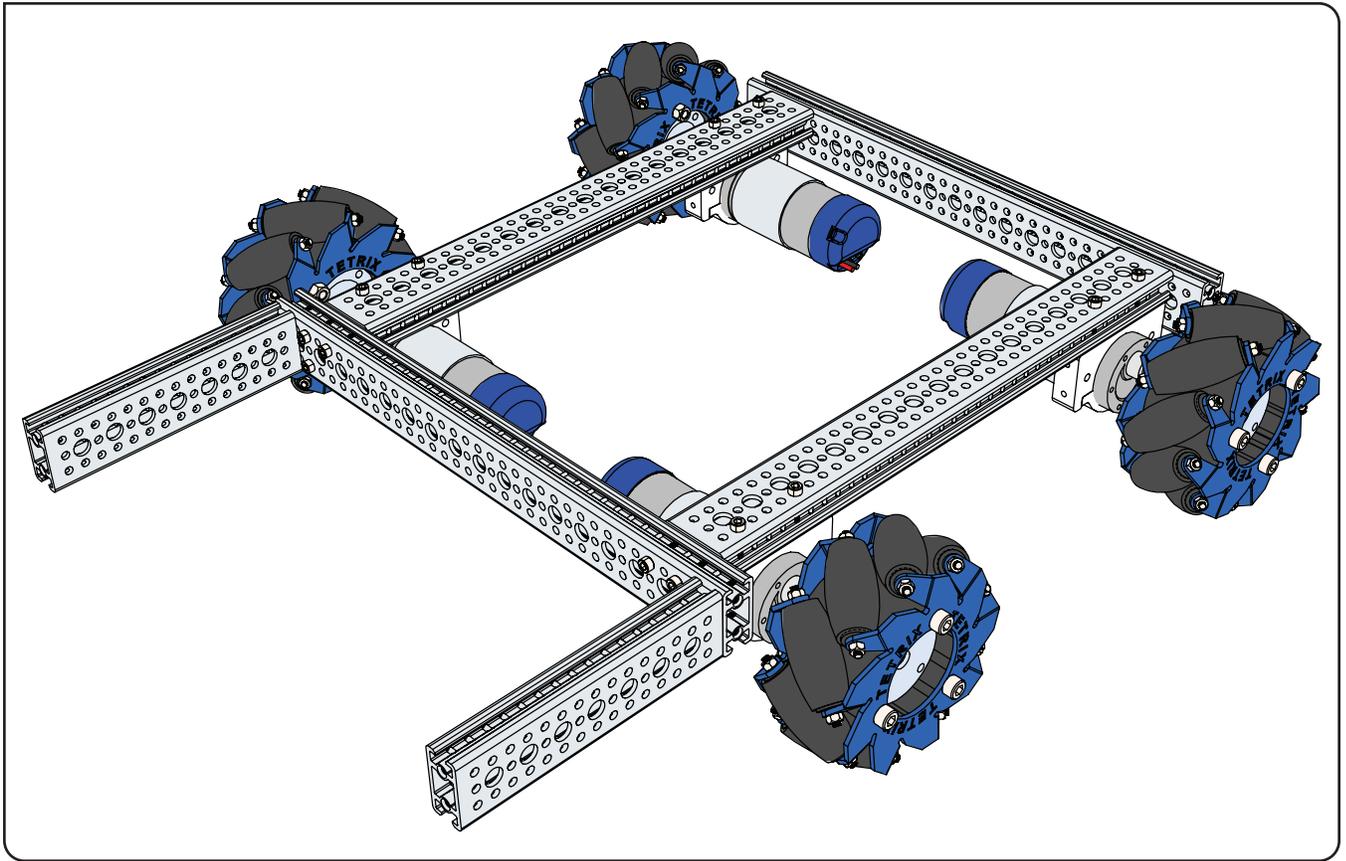
 **Tip:** Tighten the set screw on the motor hubs against the flat side of the D-shaped motor output shaft.

## Step 10

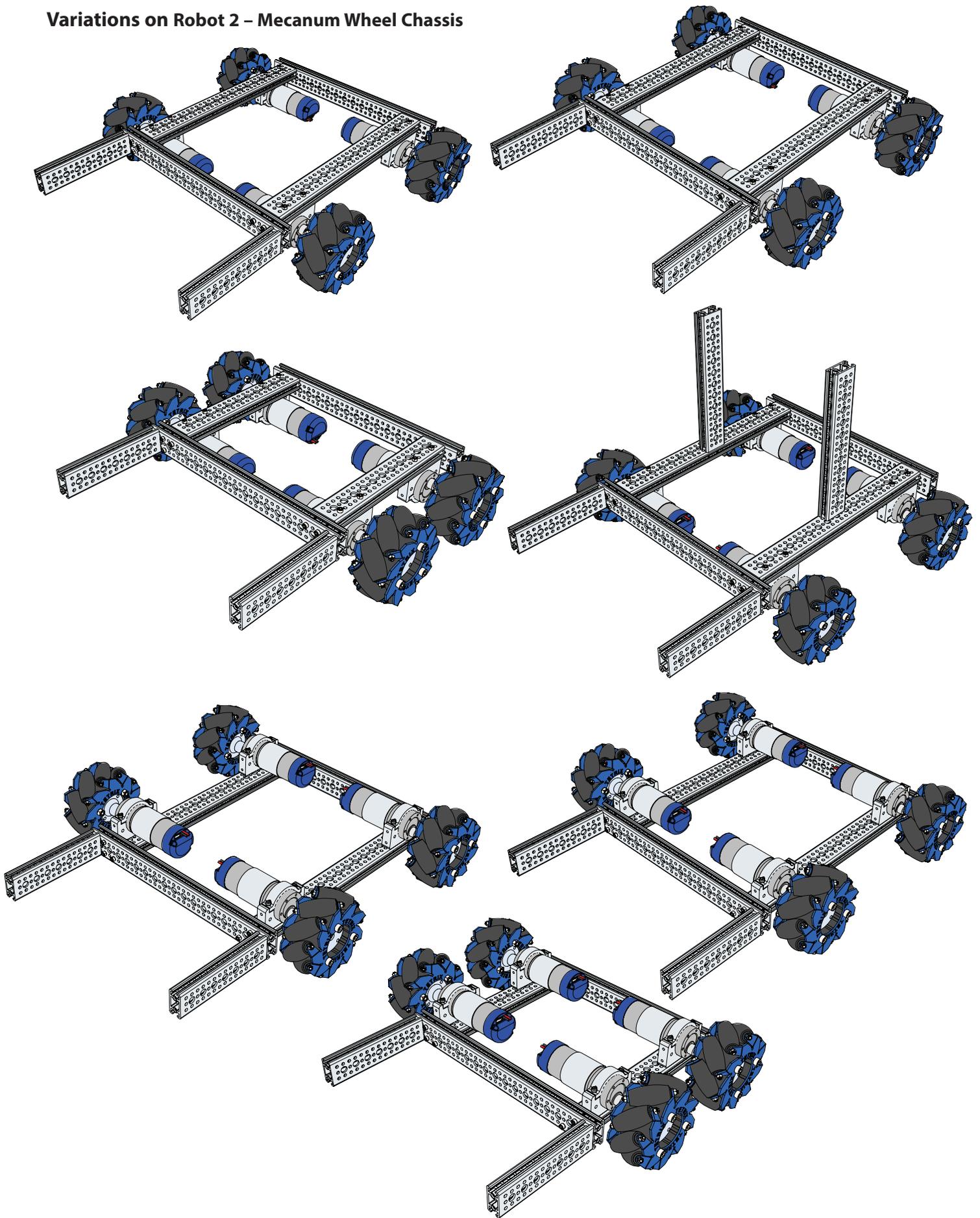


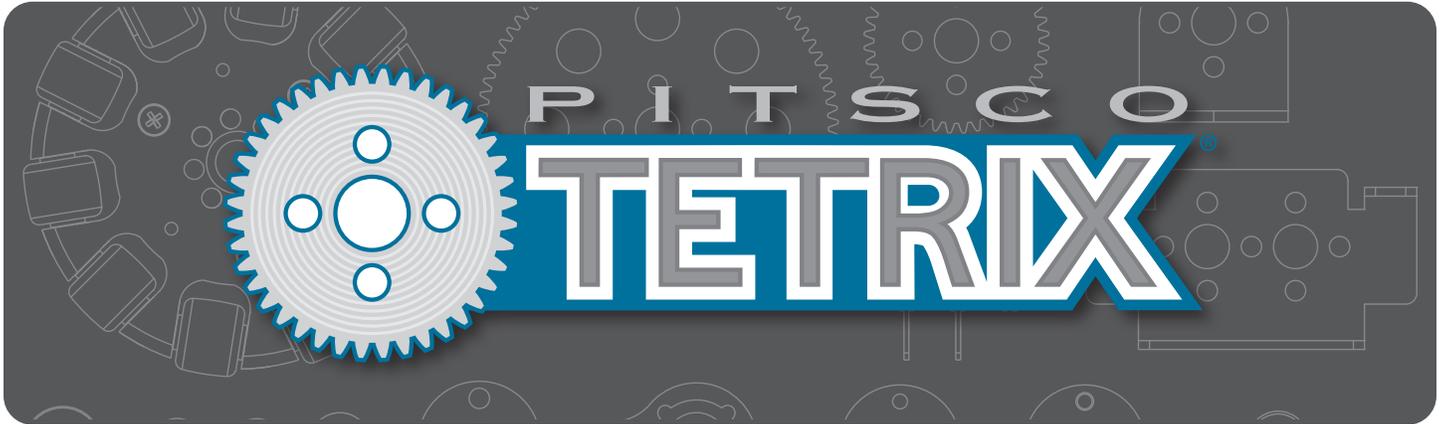
 **Tip:** Tighten the set screw on the motor hubs against the flat side of the D-shaped motor output shaft.

**Finished chassis.**

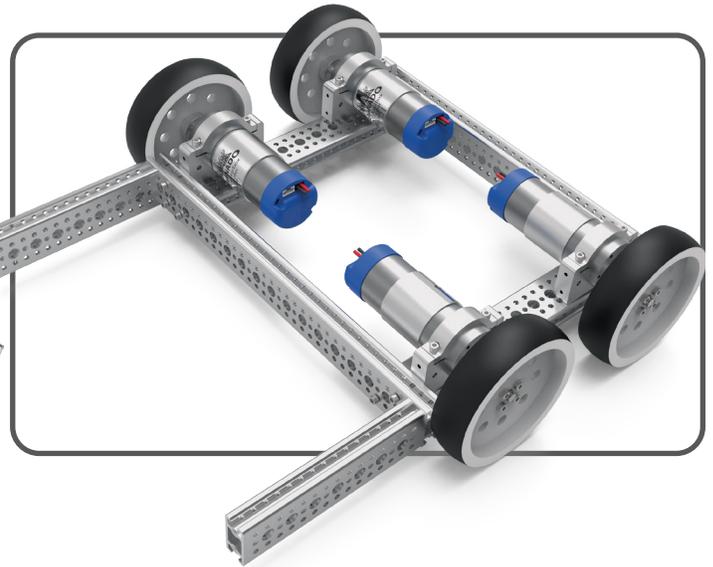
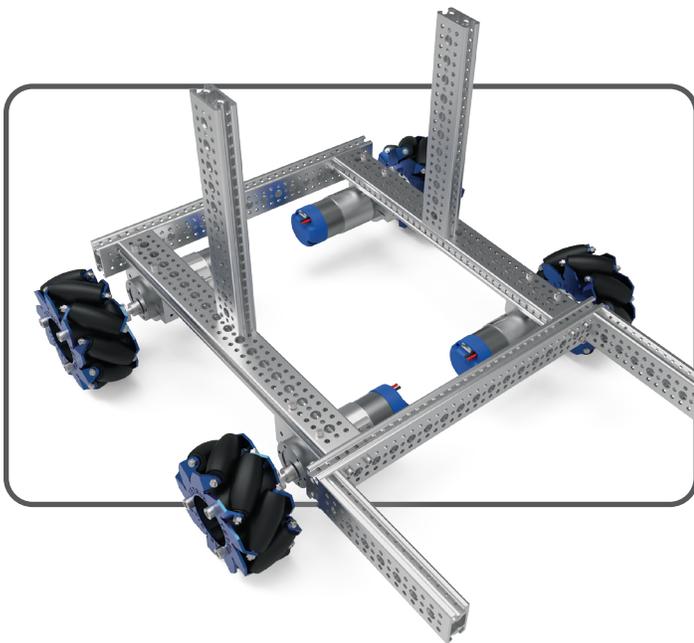


## Variations on Robot 2 – Mecanum Wheel Chassis





## Flex-Build Robot Chassis



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