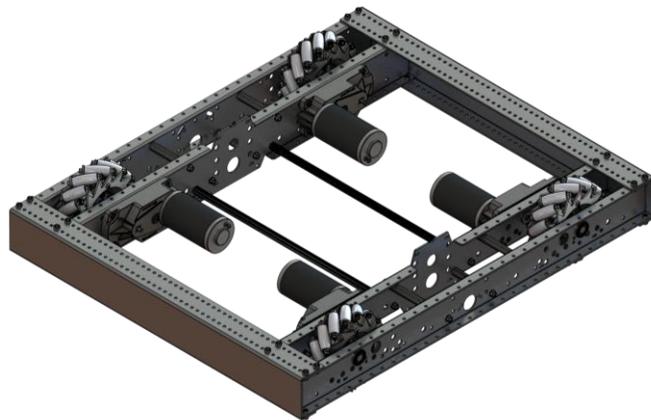


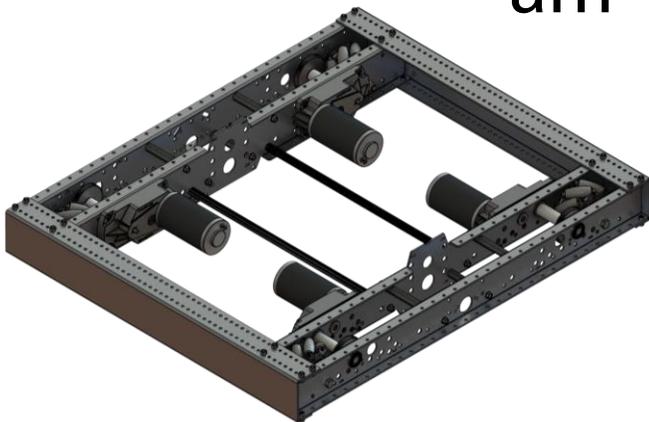


AM14U4/U5

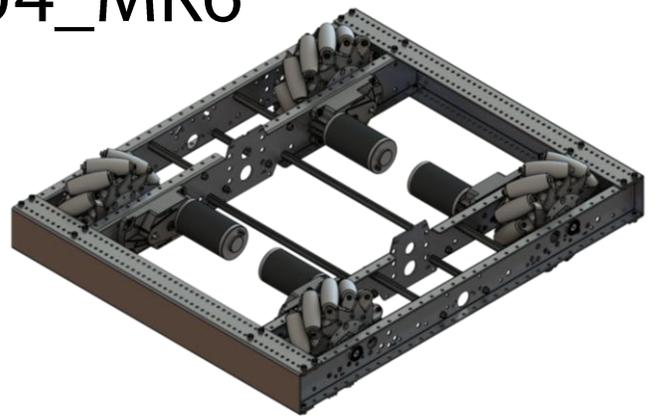
Mecanum Upgrade Assembly Directions



am-14U4_MK6



am-14U4_MK4



am-14U4_MK8

Revisions:

01/07/22 - Internal Release

Recommended Tool List			
Component	Used On	Product Number	Product Photo
Cordless Drill or Driver	Drivers	Not Available from AndyMark	
3/8 in. Magnetic Driver	1/4-20 Thread Forming Screws and 10-32 Nuts	am-2755	
1/4 in. Magnetic Driver	10-12 Self Piercing Screws	am-4607	
3/8 in. Socket	1/4-20 Thread Forming Screws and 10-32 Nuts	am-2740	
9/16 in. Socket*	3/8-16 Bolt Heads and Nuts	am-2743	
3/8 in. Drive Quick Release Ratchet	3/8 in. Drive Sockets	am-2753	
5/32 in. Hex Driver	10-32 Socked Head Cap Screws	am-2751	
1/2 in. - 9/16 in. Combo Wrench*	3/8-16 Bolt Heads/Nuts and 1/2 in. Churro	am-2746	

* 9/16 in. Tools are needed only for the 4 in. Mecanum Assembly

am-14U4_MK8 Components

Component	Product Number	Qty	Product Photo
8 in. MK Mecanum Wheel Left	am-3340L	2	
8 in. MK Mecanum Wheel Right	am-3340R	2	
Toughbox Micro with 12.75:1 Reduction and Long Output Shaft	am-3549_127	4	
1/2 in. Hex Hub	am-2568 OR am-4124	8	
0.500 in. Hex Bore 0.250 in. Long Molded Spacer	am-3948-250	4	
0.500 in. Hex Bore 0.500 in. Long Molded Spacer	am-3948-500	4	
0.5 in. Hex ID Shielded Flanged Bearing (FR8ZZ-HexHD)	am-2986	4	
0.5 in. Silver Churro 4.875 in. Long	Not Individually Available	8	
10-12 x 1.25 in. Long Self Piercing Hex Head Screw	am-1592	50	

am-14U4_MK6 Components

Component	Product Number	Qty	Product Photo
10-32 x 0.75 in. Long Socket Head Cap Screw	am-1047	25	
10-32 Nylock Jam Nut	am-1063	25	
0.5 in. Hex ID Shielded Flanged Bearing (FR8ZZ-HexHD)	am-2986	4	
Toughbox Micro with 10.71:1 Reduction	am-3232_107	4	
6 in. SR Mecanum Wheel Left	am-3479La	2	
6 in. SR Mecanum Wheel Right	am-3479Ra	2	
0.5 in. Hex Aluminum Spacer 1.2 in. Long	am-3896-1200	4	
0.500 in. Hex Bore 1.00 in. Long Molded Spacer	am-3948-1000	4	
1/2 in. Hex Hub	am-2568 OR am-4124	4	

am-14U4_MK4 Components

Component	Product Number	Qty	Product Photo
50 Tooth 20 DP 0.5 in. Hex Bore Steel Gear	am-0150	4	
3/8 in. Round ID Shielded Bearing (1614ZZ)	am-0209	4	
3/8 in. Round ID Shielded Flanged Bearing	am-0573	4	
10-12 x 1.25 in. Long Self Piercing Hex Head Screw	am-1592	50	
Nylon Spacer, 0.625 od, 0.385 id, 0.185 thick, white	am-2271	4	
0.5 in. Hex ID Shielded Flanged Bearing (FR8ZZ-HexHD)	am-2986	4	
4 in. HD Mecanum Bearing Bore Left Wheel	am-3026L	2	
4 in. HD Mecanum Bearing Bore Right Wheel	am-3026R	2	
50 Tooth 20 DP 1.125 in. Round Bore Steel Bolt Circle Bearing Gear	am-3209	4	
Toughbox Micro with 7.31:1 Reduction	am-3232_731	4	
PVC Spacer 2.42 in. x 0.6 Bore	am-3544	4	
0.375 in. Hex Bore 0.375 in. Long Molded Spacer	am-3947-0375	4	
0.375 in. Hex Bore 0.375 in. Long Molded Spacer	am-3948-0375	4	

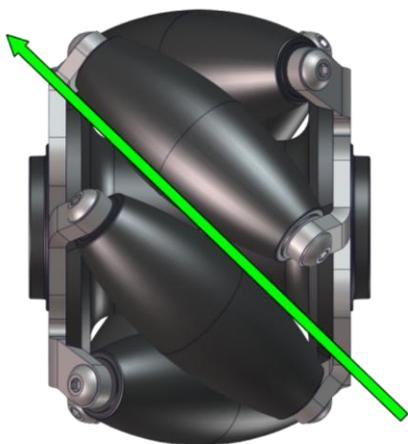
STOP AND READ BEFORE ASSEMBLY:

Mecanum drive systems function differently than typical six or eight wheel drives. Each wheel is driven independently with individual gearboxes and motors. Since the component make up is so different than a stock chassis, these upgrade kits are intended to be used with a Frame Only chassis. This is done to save you cost on un-needed parts. In addition to Mecanum upgrade kits you must also source CIM motors and acquire a Frame Only Kit.

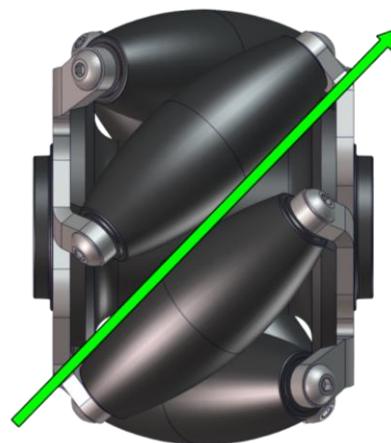
These wheels mount in different locations and take up different spaces than the stock AM14U4/U5. As such Churro locations and lengths may be different than you expect. The chassis typically ships with 22.25 inch long churros for use across the chassis and 3.375 inch long Churros for inside the channels. All three diameters' require the long churros to be cut down while only the eight inch Mecanum wheels will ship with and use wider versions of the small churros.

Six and eight inch Mecanum wheels are only supported in the Long configuration of the chassis. The four inch Mecanum wheels work in all three frame configurations of the chassis, however extra components outside the upgrade kit are required for usage in the Square and Wide configuration. In addition, serviceability is difficult in Square and Wide for four inch.

Mecanum drives operate by using wheels with independently moving rollers in an a 45 degree angle to normal rotation. Its important to note that when assembling your upgrade kit that there are "right" and "left" handed wheels. Each side of the frame will use one right and one left wheels. When looking at your assembled frame from above, the rollers should form an "X". You can tell right and left wheels apart by observing the direction of the rollers. If the rollers point up to the right, they're right. The inverse is true for left wheels.



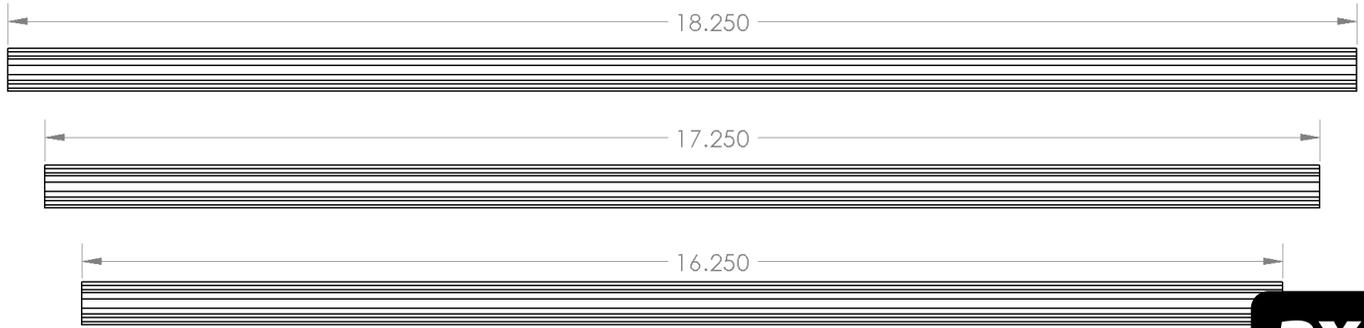
Left



Right

Cut Churro

Step 1: All chassis ship with 22.2 inch long churros for use inside the chassis. If using a four or six inch Mecanum wheel, cut these down to 18.25 inches long. If using an eight inch Mecanum wheel, cut them down to 16.25 inches.



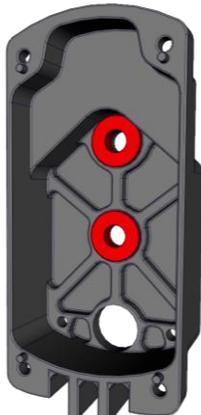
2X

ToughBox Micro Assembly

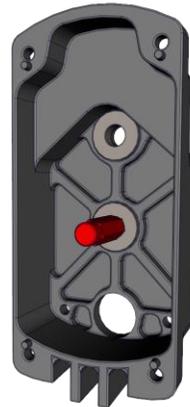
Gear Pairing Note: Each Mecanum Upgrade Kit uses different gear pairs in the ToughBox Micro. For this assembly section we'll refer to gears by their bore and position. These reductions can be changed if you choose by acquiring other gear pairs from AndyMark.com

Output Shaft Note: The 8 in. Mecanum wheel is wider and requires a longer hex output shaft. The below assembly steps show that shaft. The shaft included with the 6 and 4 inch kits, is shorter and does not have a hole at the end.

Step 1: Place two 3/8 in. Round ID Shielded Bearings (am-0516) into the small holes of the ToughBox Micro Housing.



Step 2: Insert the Small 3/8 in. ToughBox Shaft (am-0152) into the bearing in the middle of the housing.



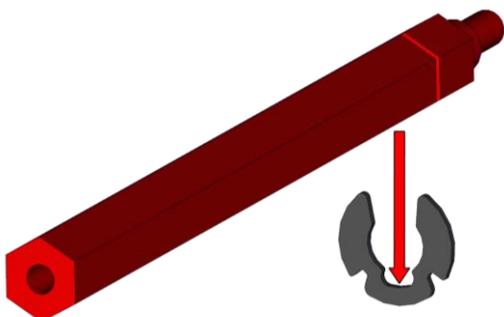
Step 3: Install the large gear with a 3/8 in. Hex Bore onto the shaft with the boss facing the bearing.



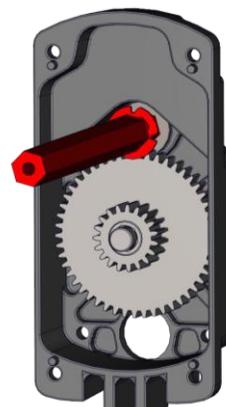
Step 4: Place the smaller 3/8 in. Bore Gear onto the shaft as well with the boss facing towards you.



Step 5: Place 1/2 in. E-Clip Ring (am-0206) on a hard surface with the open pointing up. Set the groove of the output shaft onto the E-Clip and force the Clip around the shaft. A soft hammer may be used.

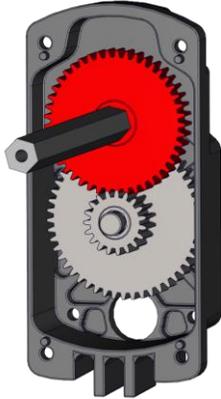


Step 6: Insert the Output Shaft-Clip Assembly into the unoccupied bearing hole.



Assembly Continued

Step 7: Place the 1/2 in. Hex Bore gear onto the output shaft with the boss facing towards you.



Step 8: Insert a CIM Motor Assembly* into the open hole, and secure it with two 10-32 x 0.625 in. Nylon Screws with Thread Patch (am-1120).



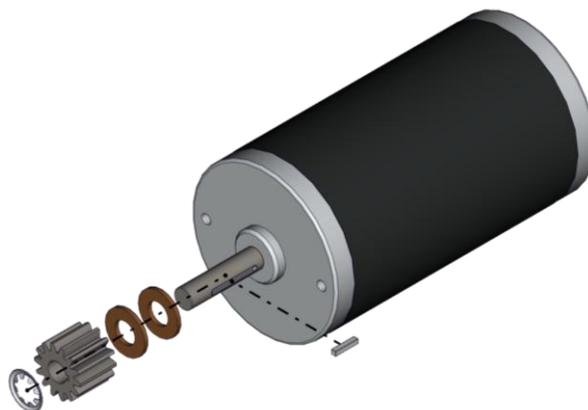
Step 9: It is generally recommended to run in the gearbox for a period of time prior to greasing. Grease all gears.



4X

*CIM Motors are the typical motor used in Toughbox Micro Gearboxes. NEO Brushless motors may also be used, however. The MK4, MK6, and MK8 upgrade kits include hardware for attaching four motors. The motor assembly shown below uses a CIM, but is the same for the NEO.

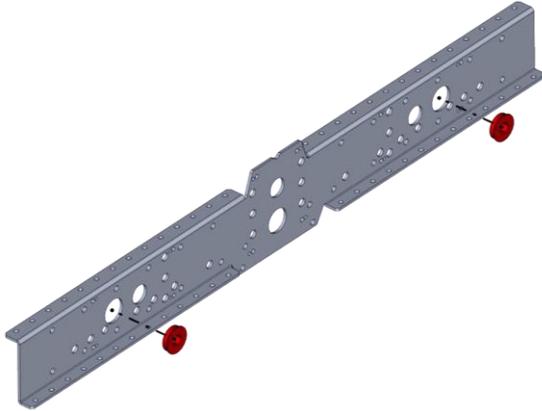
CIM Motor Assembly: Place two 5/6 washers over the CIM shaft, insert a key into the keyway, and then secure the CIM gear with the retaining ring. If using a different motor, you may need additional hardware.



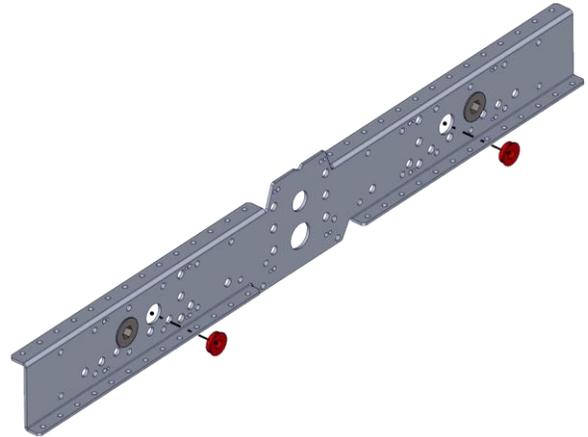
4X

Frame Assembly

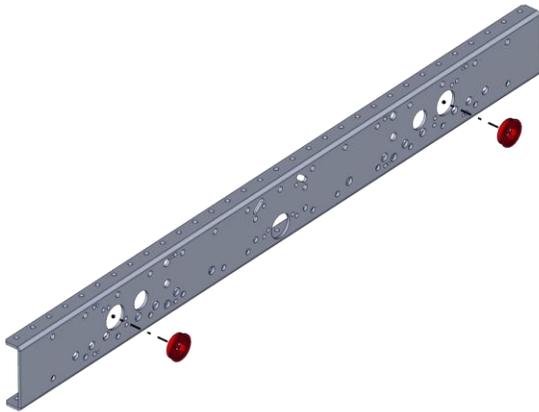
Step 1: With the small end of the trapezoid in the middle of the plate pointing up, and the top flange pointing away, insert two 0.5 in. HEX ID Shielded Flanged Bearings (am-2986) into the large outside holes of an Inside Plate (am-3922a.)



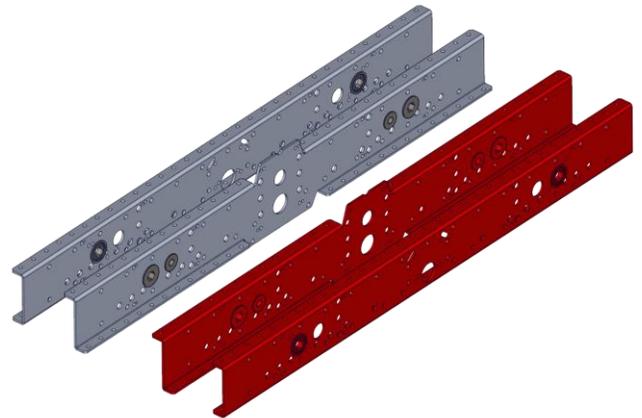
Step 2: Insert two of the 3/8 in. Round Shielded Bearings (am-0209) into the Inside Plate next to the hex bearings.



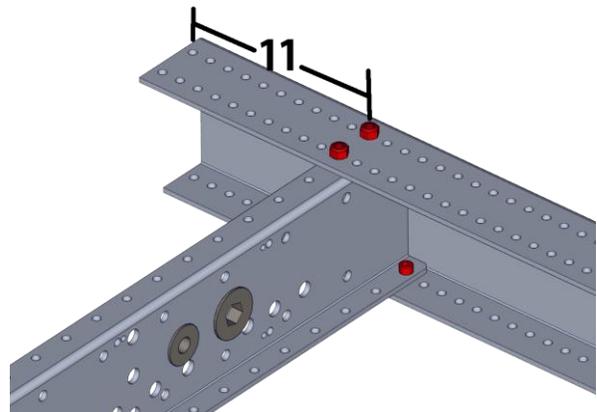
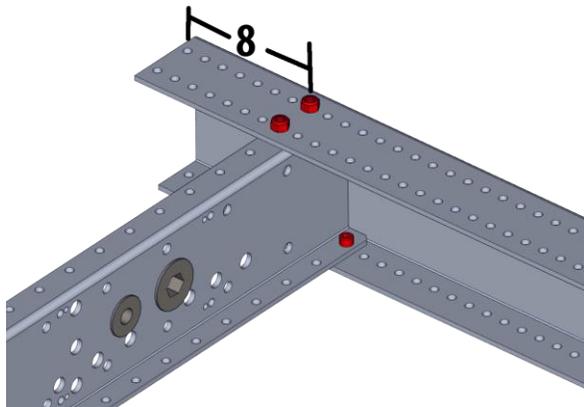
Step 3: With the flanges pointing away, insert two more two 0.5 in. Hex ID Shielded Flanged Bearings into the large outside holes of the Outside Plate (am-3921a.)



Step 4: Repeat these steps for the remaining Inside and Outside Plates.

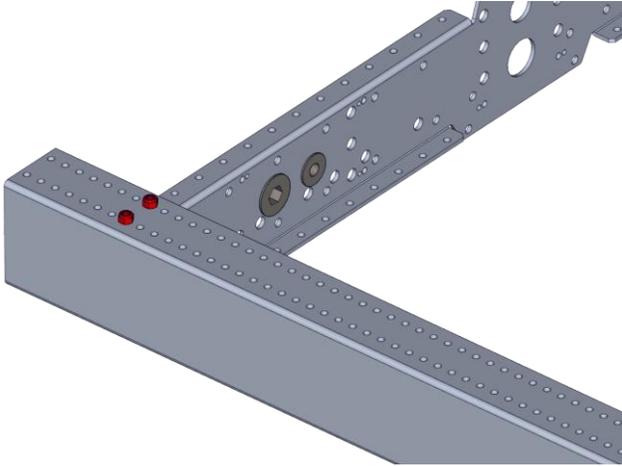


Step 5: Insert an Inside Plate into an End Plate (am-3920) and secure it with three 10-32 x 0.5 in. Socket Head Cap Screws and three 10-32 Nuts (am-1042). Note the face of the end plate with two rows of holes is the top. Four and six inch Mecanum wheel frames have the plates intersecting at the eighth hole in from the edge, while eight inch Mecanum wheel frames intersect at the eleventh hole from the edge.

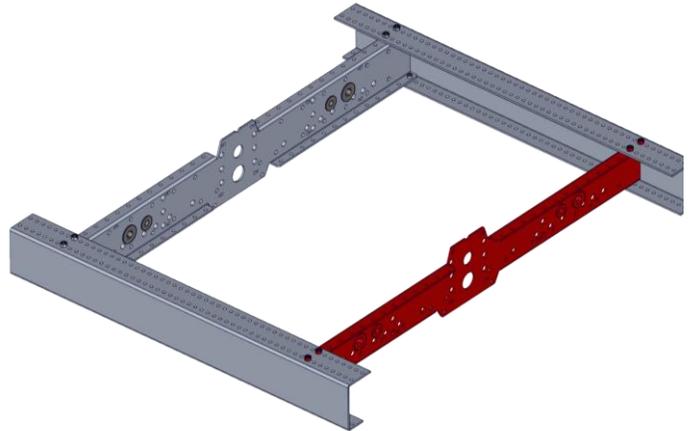


Frame Assembly

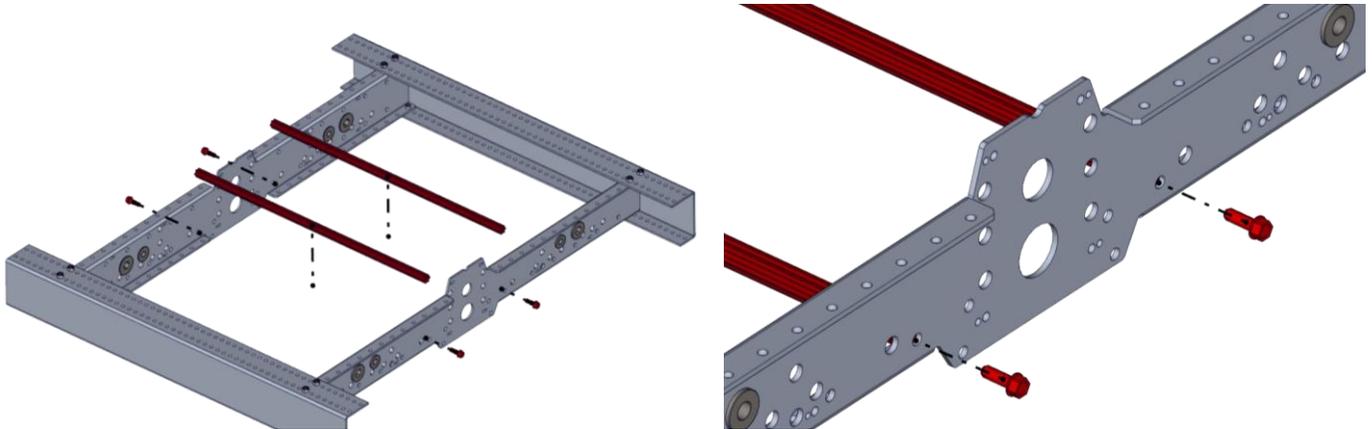
Step 6: Attach the second End Plate to the Inside Plate in the same manner as step one with three pairs of fasteners, using correct spacing for your wheel type.



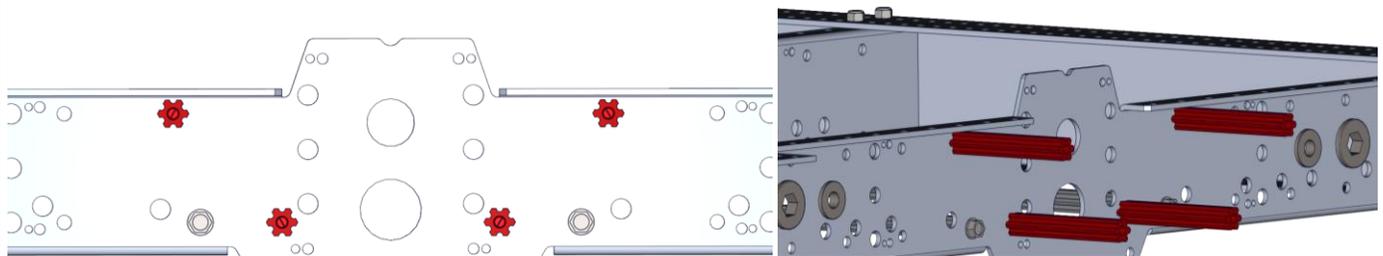
Step 7: Introduce and secure the second Inside Plate to the assembly as a mirror of the first.



Step 8: Install the cross chassis churros to the inside plates by securing them with four 1/2-20 x 0.75 in. Thread Forming Screws (am-1591). Utilize the hole location shown in the second image.

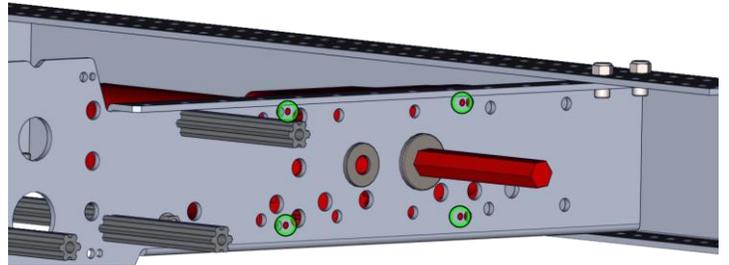
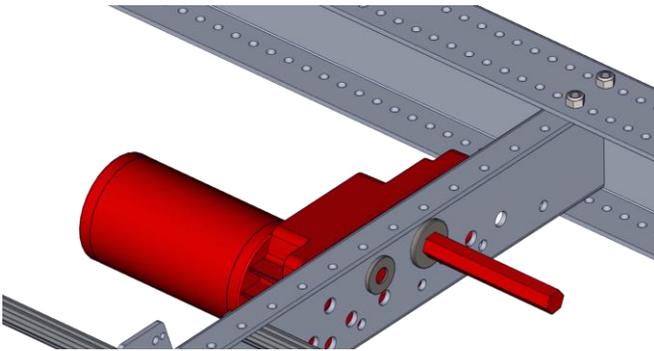


Step 9: Secure four short churros at the locations shown using four thread forming screws. Four and six inch diameter Mecanum wheel frames use 3.375 inch long Churros (am-2569) while eight inch diameter Mecanum wheel frames will use 4.875 inch long churros. The screws can be driven with a 3/8 inch driver or socket wrench and the churros can be held in place with a 1/2 inch wrench.

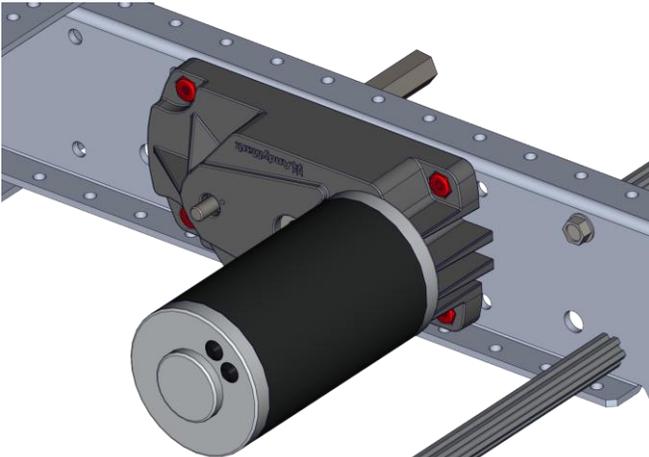


Frame Assembly

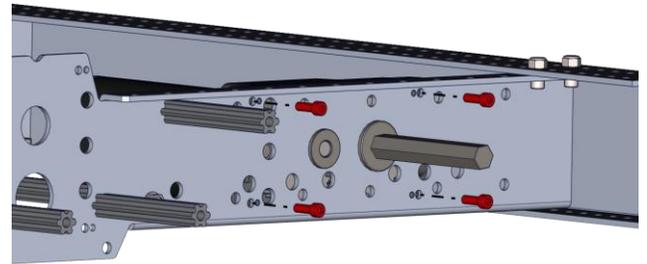
Step 10: Insert an assembled ToughBox Micro through the hex bearing of the Inside Plate. The 3/8 inch shaft of the gearbox will be supported by the 3/8 inch bearing as well. Four locating studs on the housing and four accompanying holes on the Inside Plate will aid correct alignment.



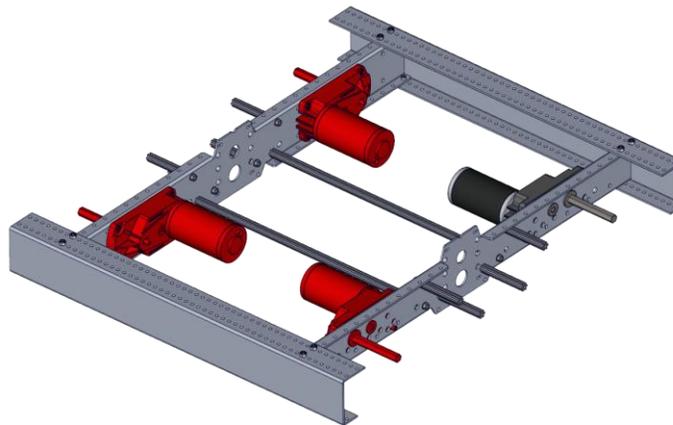
Step 11: Insert four 10-32 Nylock Nuts into the ToughBox Micro housing, one into each corner pocket.



Step 12: Secure the gearbox to the inside plate with four 10-32 x 0.75 in. Screws.

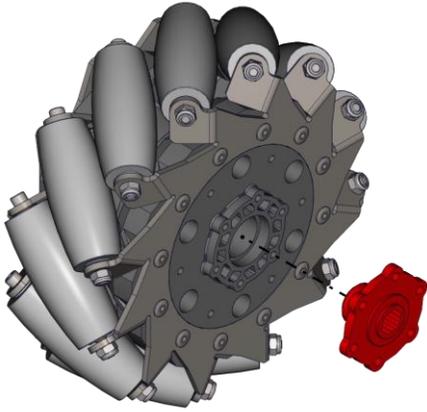


Step 13: Repeat steps six through eight to join three more gearboxes.

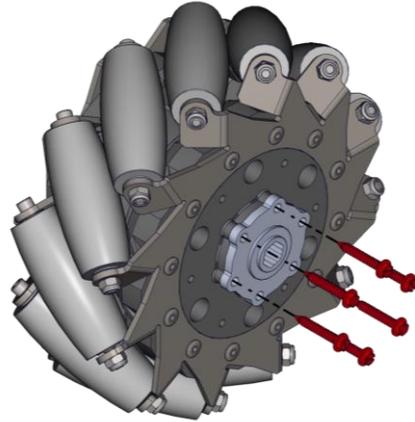


8 in. Wheel Assembly

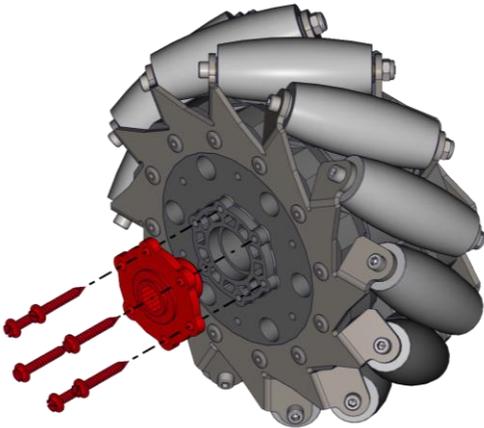
Step 1: Insert a 0.5 inch Hex Hub (am-2568) into the plastic core of the wheel, lining up the six holes.



Step 2: Secure the hub to the wheel with six 10-12 x 1.25 in. Long Self Piercing Hex Head Screws (am-1592.)



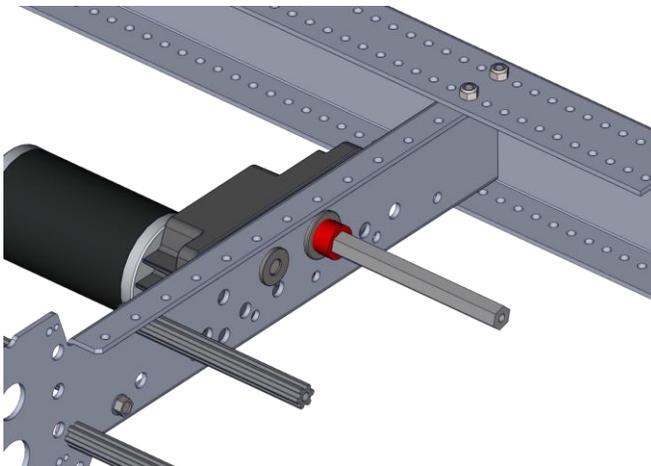
Step 3: Flip the wheel over and install a second hub with six more screws.



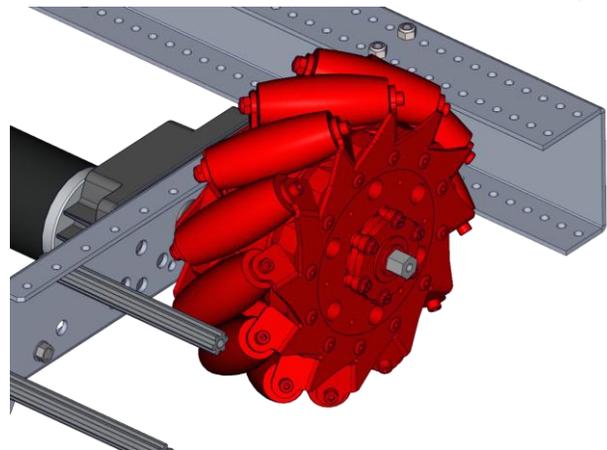
4X

8 in. Wheel Attachment

Step 1: Add one 0.50 in. Hex 0.375 in. Long spacer (am-3948-500) to the output shaft.

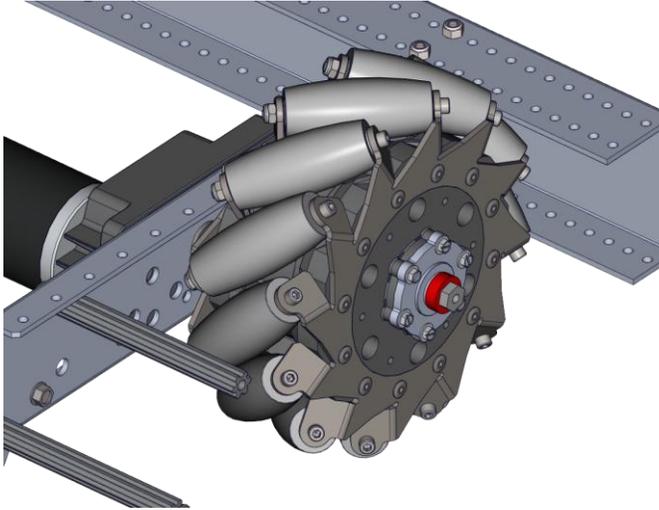


Step 2: Place a Right Wheel Assembly onto the shaft with the roller axle bolt heads away from the Inside Plate. This allows for easier serviceability later.

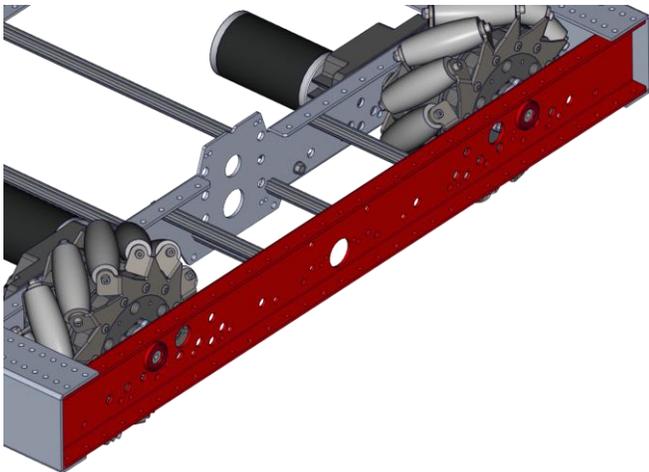


8 in. Wheel Attachment

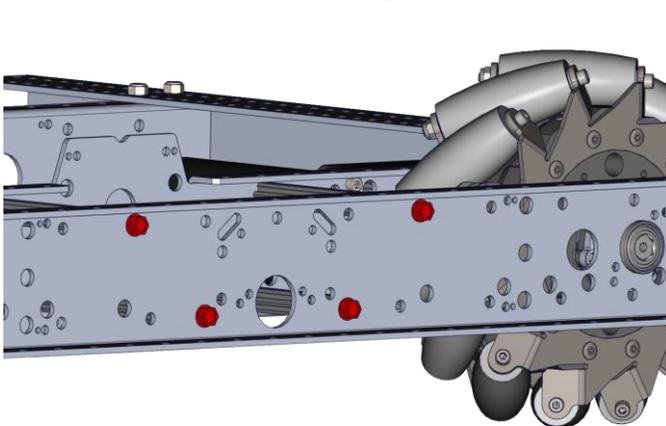
Step 3: The last item to add to the shaft is a 0.50 in. Hex 0.25 in. Long Spacer (am-3948-250.)



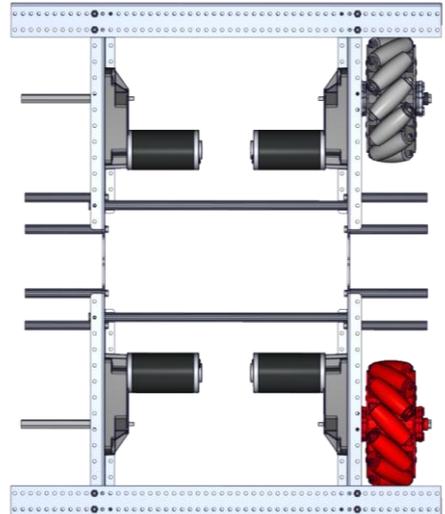
Step 5: Place an Outside Plate into the End Plates, lining the 1/2 in. hex bearings up with the 1/2 in. hex axles.



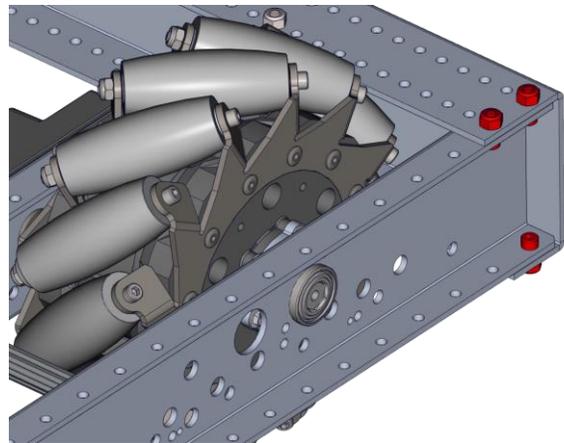
Step 7: Secure the Outside Plate to the small churros with four 1/4-20 Thread Forming Screws.



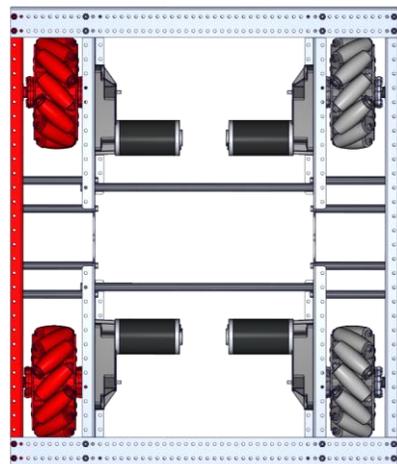
Step 4: Grab a Left Wheel Assembly and add it to the frame using steps one through three.



Step 6: Secure the Outside Plate to the end plates using six pairs of 10-32 x 0.50 in. Long SHCS and 10-32 Nylock Nuts.

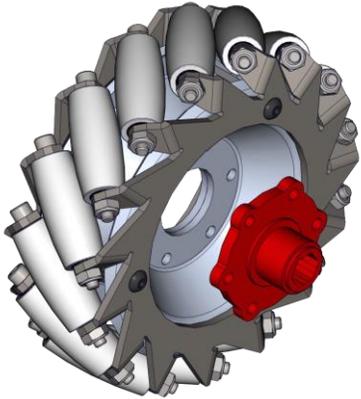


Step 8: Repeat steps one through seven on the opposite side of the frame to complete the chassis.

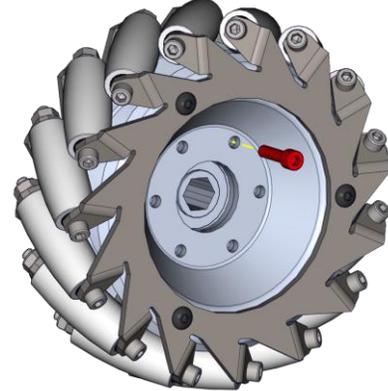


6 in. Wheel Assembly

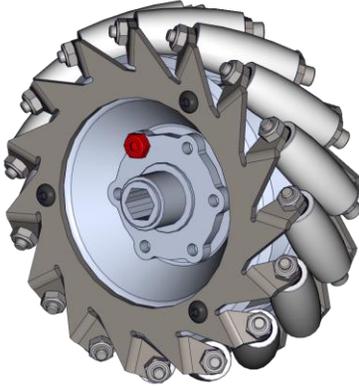
Step 1: Line the holes of a 0.5 in. Hex Hub (am-2568) up with the holes of a 6 in. Mecanum wheel. The long cylinder of the hub points away from the roller axle bolt heads.



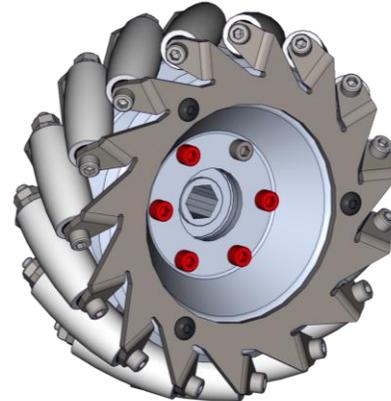
Step 2: Insert a 10-32 x 0.75 in. Long Socked Head Cap Screw (am-1047) through one of the six holes of the wheel into the hub.



Step 3: Loosely attach a 10-32 Nylock Jam (am-1063) nut to this screw.



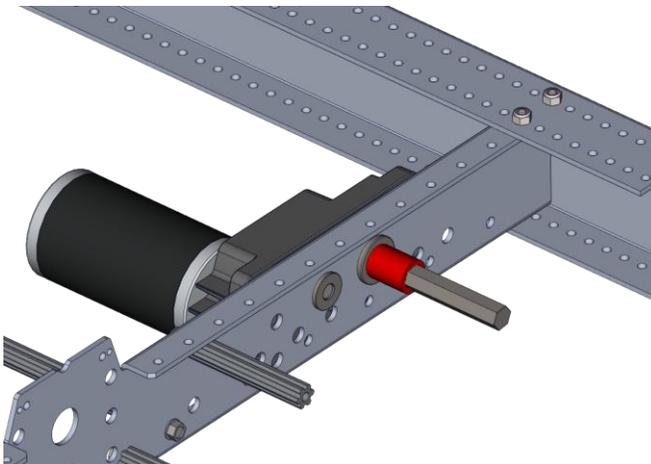
Step 4: Insert five more pairs of 10-32 screws and nuts loosely at first, then tightening in a star pattern.



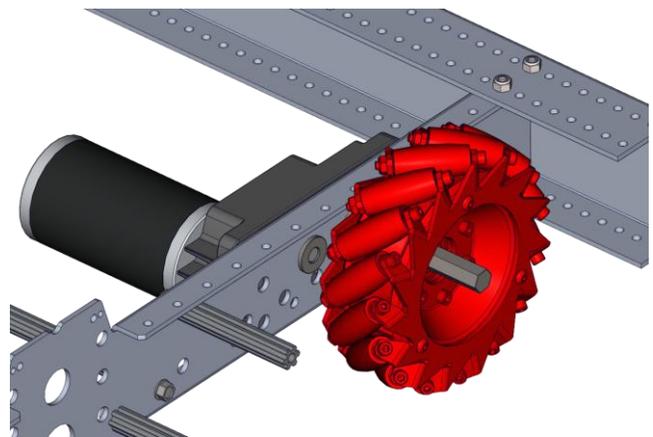
4X

6 in. Wheel Attachment

Step 1: Add one 0.50 in. Hex 1.00 in. Long Spacer (am-39481000) to the output shaft.

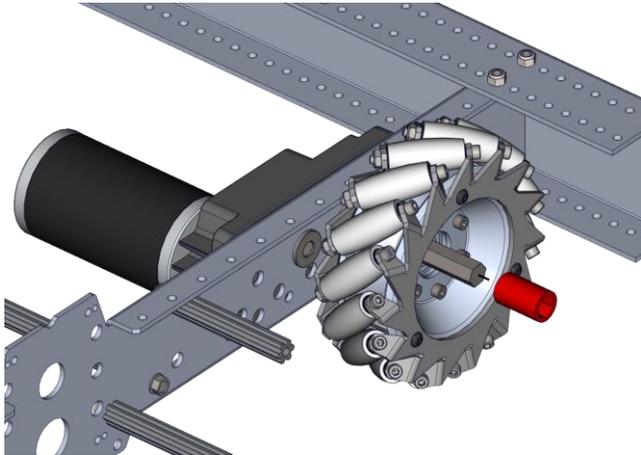


Step 2: Place a Right Wheel Assembly onto the shaft with the roller axle bolt heads away from the Inside Plate.

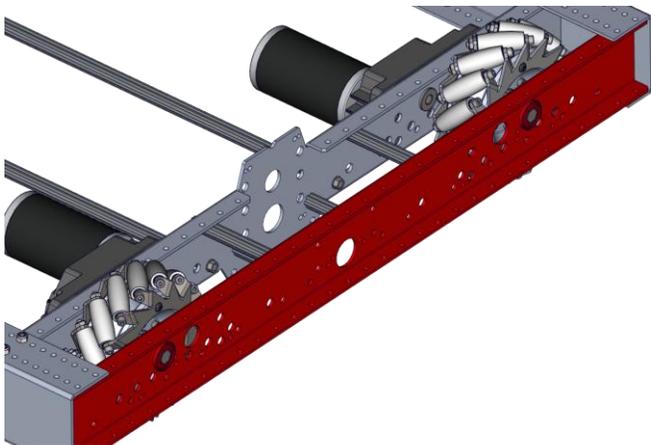


6 in. Wheel Attachment

Step 3: Place a 0.5 in. Hex 1.20 in. Long Aluminum Spacer onto the shaft behind the Mecanum Wheel.



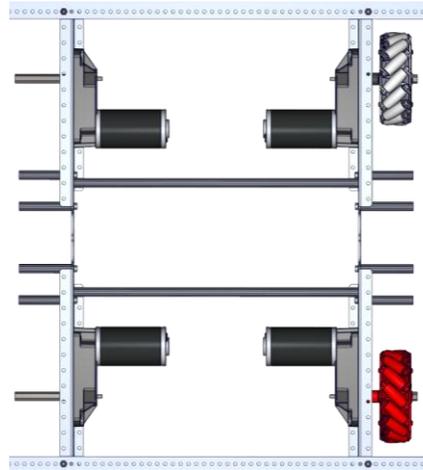
Step 5: Place an Outside Plate into the End Plates, lining the 1/2 in. hex bearings up with the 1/2 in. hex axles.



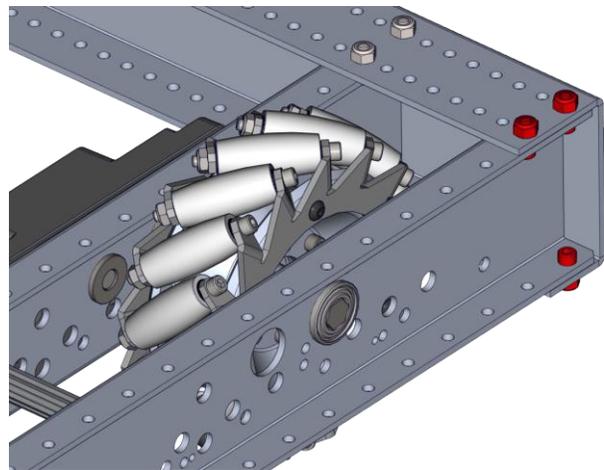
Step 7: Secure the Outside Plate to the small churros with four 1/4-20 Thread Forming Screws.



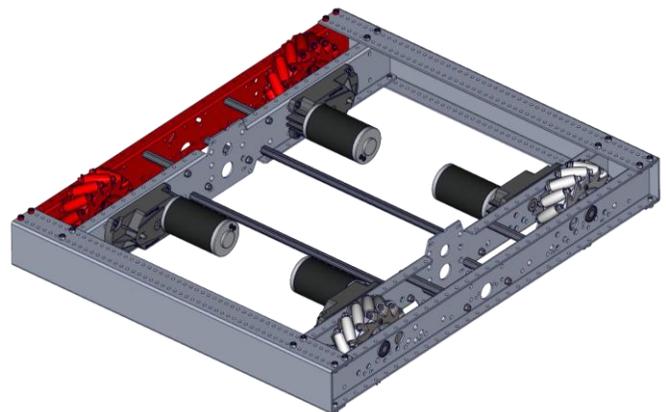
Step 4: Grab a Left Wheel Assembly and repeat steps one through three, for the second output shaft on the same side of the frame.



Step 6: Secure the Outside Plate to the end plates using six pairs of 10-32 x 0.50 in. Long SHCS and 10-32 Nylock Nuts.

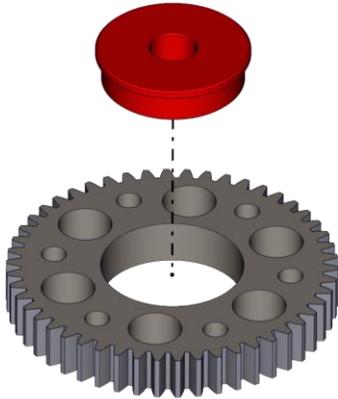


Step 8: Repeat steps one through seven on the opposite side of the frame to complete the chassis.

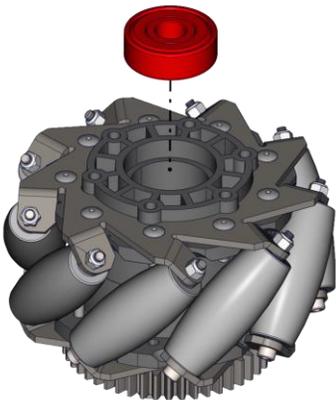


4 in. Wheel Assembly

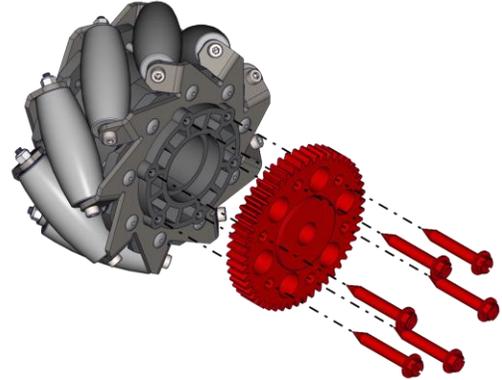
Step 1: Fully press one 0.375 in. Round ID Shielded Flanged Bearing (am-0573) into the 50 Tooth 1.125 in. Round Bore Bolt Circle Gear (am-3209.)



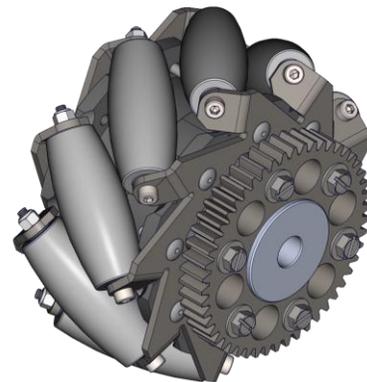
Step 3: Place the wheel flat on the Self Piercing Screw heads. Fully press a 0.375 in. Round ID Shielded Bearing (am-0209) into the plastic hub.



Step 2: Use six thread 10-12 x 1.25 in. Long Self Piercing Hex Head Screws to secure the Bearing-Gear-Assembly to the plastic hub of the 4 in. Mecanum wheel. We recommend attaching to the screw head side of the wheel for easier future serviceability.



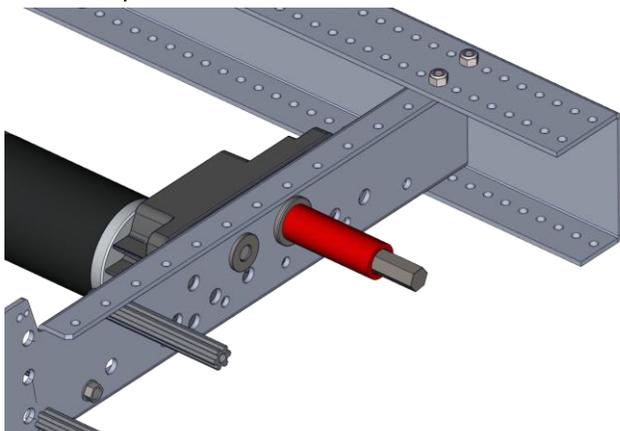
Step 4: One wheel is prepped for assembly!



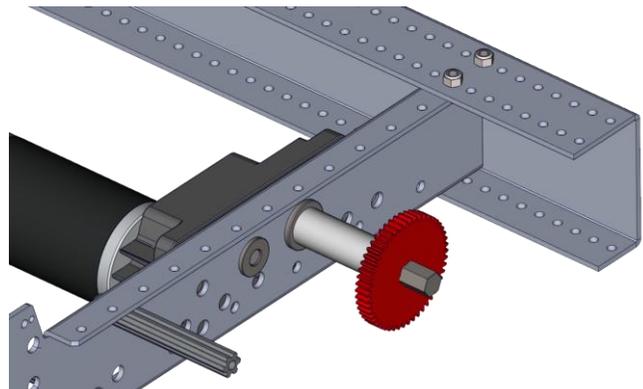
4X

4 in. Wheel Attachment

Step 1: Add one 2.42 in. Long PVC Spacer (am-3544) to the output shaft.

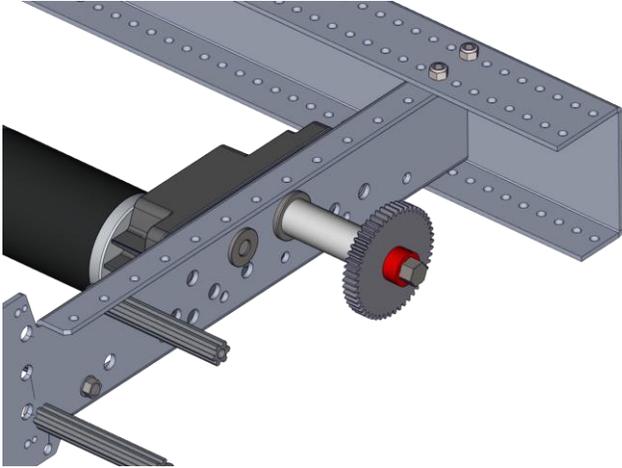


Step 2: After the spacer, place one 50 Tooth 20DP 0.5 in. Hex Bore Steel Gear (am-0150) onto the output shaft, with the boss facing the spacer.

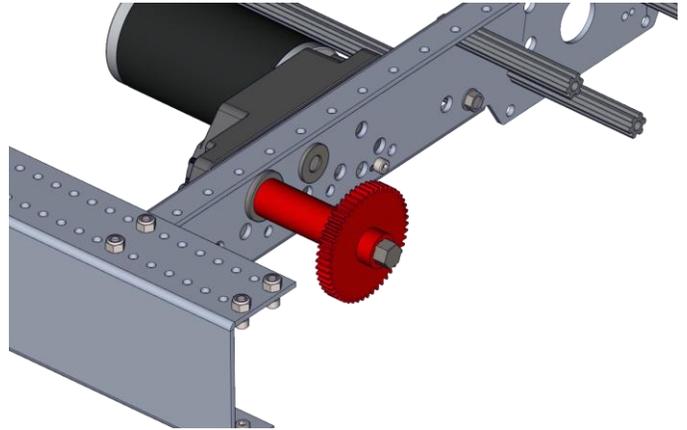


4 in. Wheel Attachment

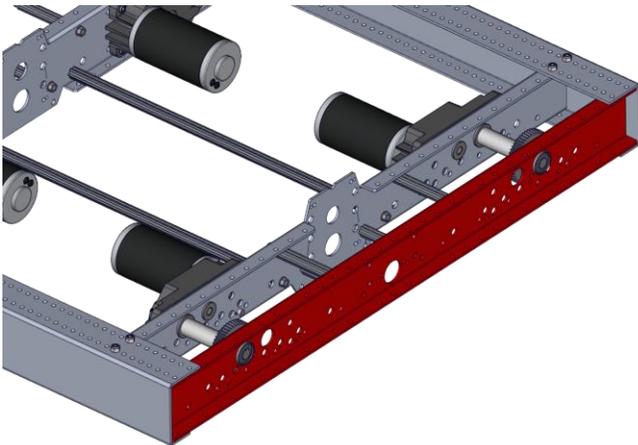
Step 3: Add one spacer to the output shaft.



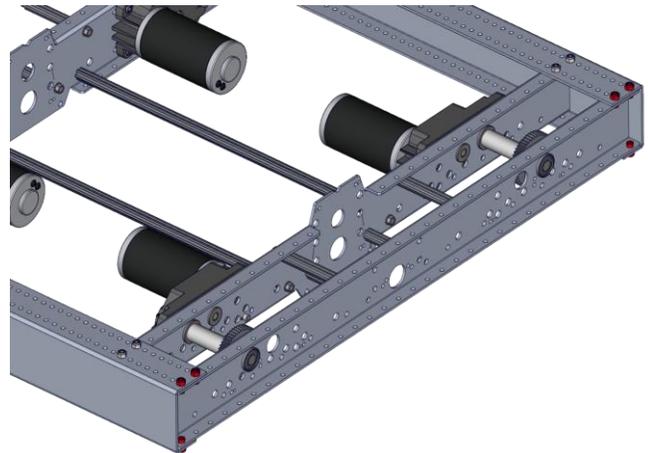
Step 4: Create the same Spacer-Gear-Spacer stack on the other gearbox axle for the same side of the frame.



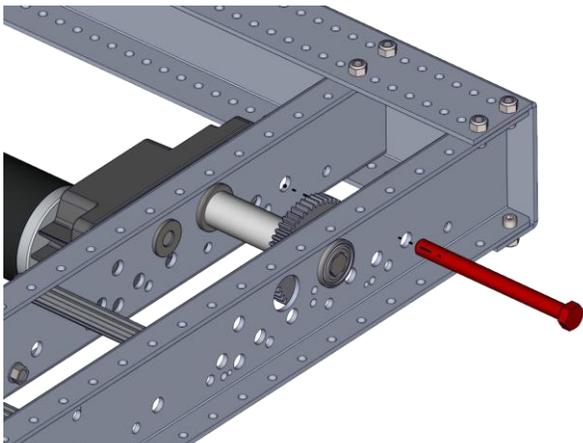
Step 5: Insert an Outside Plate in between both End Plates, aligning the Hex bearings of the Outside Plate with the Hex Output Shafts.



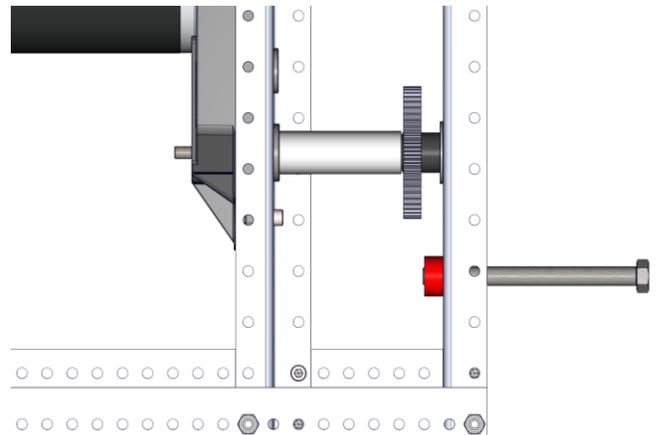
Step 6: Secure the Outside Plate to the end plates using six pairs of 10-32 x 0.50 in. Long SHCS and 10-32 Nylock Nuts.



Step 7: Set the frame on an End Plate providing access to the underside. Insert a 3/8-16 x 4.25 in. Long Hex Head Bolt (am-1297) through the bottom most 3/8 in. axle hole of the outside plate.

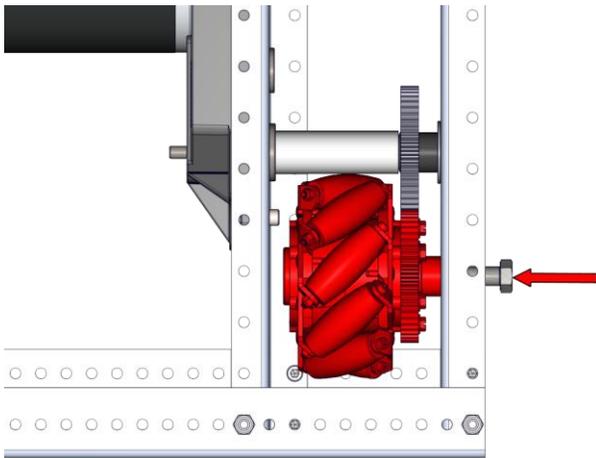


Step 8: Hold a 0.375 in. Hex 0.375 in. Long Spacer in front of the axle and push the axle through.

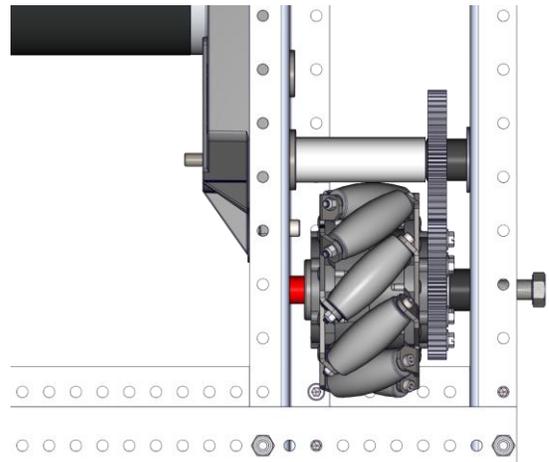


4 in. Wheel Attachment

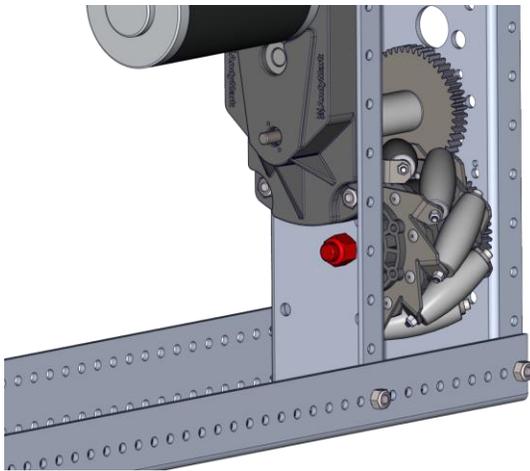
Step 9: Hold a Right Wheel Assembly in between the Inside and previously placed spacer. Mesh the gears together and push the axle through the Mecanum Wheel assembly.



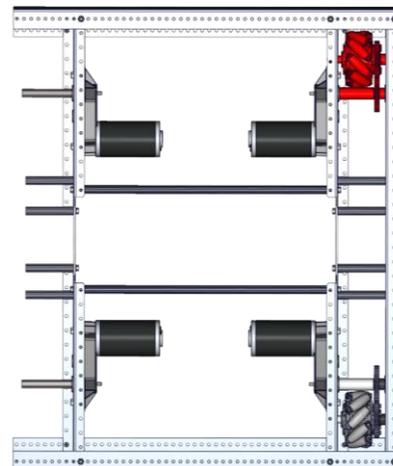
Step 10: Hold a 0.625 in. OD 0.385 in. ID 0.185 in. Long Nylon Spacer between the Inside Plate and the Mecanum Wheel Assembly, and push the axle flush against the Outside Plate.



Step 11: Secure the axle it with a 3/8-16 Nylock Nut (am-1054.)



Step 12: Grab a Left Wheel Assembly and repeat steps seven through eleven to add a left wheel to the same side of the frame.



Step 13: Secure the Outside Plate to the small churros with four 1/4-20 Thread Forming Screws.



Step 12: Repeat steps one through thirteen on the opposite side of the frame to complete the chassis.

