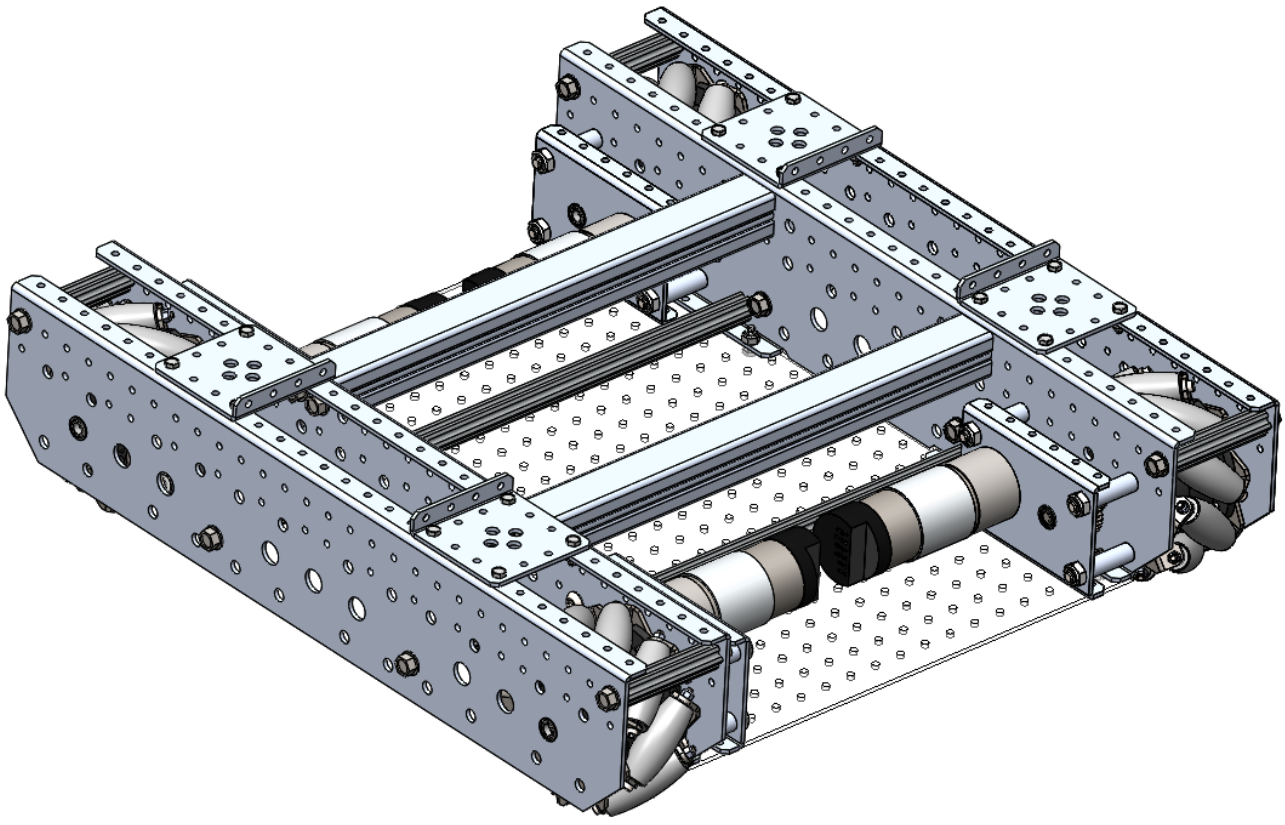
User Guide

TileRunner Mecanum



Popular Variants:
TileRunner SD Mecanum (BT4MS4E)
TileRunner HD Mecanum (BT4MH4E)

Additional Instructions Available

We encourage customers to seek product information at **AndyMark.com**, contact us via e-mail at **support@andymark.com**, or call Toll-Free **877-868-4770** with questions about any of our products.

2019 Updates

9-1-19: Updated instructions to match the new 6-32 Hex Head hardware. M3 NeveRest Mounting bolts are now 5mm long instead of 6mm. Added detail to help clarify build steps.

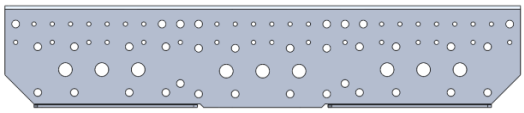
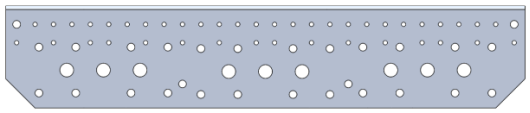
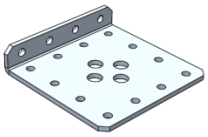
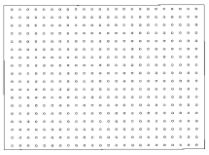
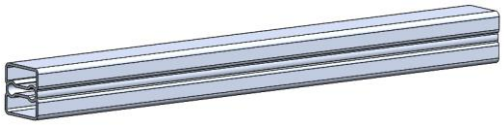
2020 Updates

10-19-20: Updated instructions for increased configurations

TileRunner Recommended Hand Tool List (not included)

Component	Part Number	QTY	Part Photo
3/32 in. Hex Driver	am-3173	1	
5/32 in. Hex Driver	am-2751	1	
2.5mm Allen Wrench	am-1288	1	
5/16 in. Nut Driver	am-1273	1	
1/4 in. Nut Driver	am-3677	1	
3/8 in. Nut Driver	am-3877	1	
1/4 in. – 5/16 in. Open End Wrench	am-3174	2	
1/2 in. - 9/16 in. Open End Wrench	am-2746	1	
3/8 in. - 7/16 in. Open End Wrench	am-2745	1	

TileRunner Frame Bill of Materials

Part Number	Component	Quantity	Part Photo
am-3392_Inside	Chassis Inside Plate	2	
am-3392_Outside	Chassis Outside Plate	2	
am-3393	4x4 Plate	4	
am-3394	Belly Pan	1	
am-3395	Peanut, 11.25"	2	
am-3398	Churro, 11.25"	2	
am-3399	Churro, 63mm	8	
am-1443	Socket Head Cap Screw, M3-0.5 x 5mm	24	
am-1310	Self-Tapping Screw, 1/4-20 x 0.75 in	28	
am-1563	Hex Head Thread Patch, 6-32 x 0.5 in	32	
am-1419	Nut, Nylock, 6-32	32	

TileRunner Common Drive Bill of Materials

Part Number	Component	Quantity	Part Photo
am-1102	Nut, Nylock Jam 1/4-20	8	
am-1420	Button Head Cap Screw, 1/4-20 x 1.75 in	8	
am-1563	Hex Head Thread Patch, 6-32 x 0.5 in	32	
am-3215a	6mm D Bore Double Boss Nub w/Set Screw	8	
am-3226-100	6mm D Shaft, 100mm, plated	2	
am-3377	6x12x4 Flanged Bearing	14	
am-2768	Grease Packet	1	

TileRunner Mecanum Bill of Materials

Part Number	Component	Quantity	Part Photo
am-1102	Nut, Nylock Jam, 1/4-20	8	
am-1420	Screw, BHCS, 1/4-20 x 1 3/4"	8	
am-3215a	6mm D Bore Double Boss Nub w/Set Screw	4	
am-3226-100	6mm D Shaft, 100mm, plated	4	
am-3424	Spacer, aluminum, 0.257 in ID x 5/16 in OD x 1/4 in long	8	

TileRunner Mecanum Wheel Options

Code	Part Number	Component	Quantity	Part Photo
MS	am-2538	4 in. Mecanum Wheel Single Wheel Kit	4	
	am-1290	Spacer, aluminum, 0.593 in. ID, 0.257 in. OD, 0.375 in. Long	4	
	am-3426	Spacer, aluminum, 12.7mm OD x 6.15mm ID x 9mm long	8	
	am-1437	6-32 x 1.25” Hex Head Machine Screw	16	
MH	am-3919L	4 in HD Mecanum, Left	2	
	am-3919R	4 in HD Mecanum, Right	2	
	am-3426	Spacer, aluminum, 12.7mm OD x 6.15mm ID x 9mm long	4	
	am-1499	6-32 x 2” Hex Head Cap Screw	16	

TileRunner Mecanum NeveRest Options

Code	Part Number	Component	Quantity	Part Photo
6	am-3103b	Gearmotor, NeveRest 60, with Encoder, and Female JST VH, 2-pin	4	
	am-2992	Hall Effect Encoder Cable with 4-pin Connector	4	
	am-3406	PicoBox Spacer	16	
	am-3426	Spacer, Aluminum, 0.242” id, 0.50” od x 0.354” Long	2	
	am-3423	PicoBox Uno Plate	4	
4	am-2964b	Gearmotor, NeveRest 40, with Encoder, and Female JST VH, 2-pin	4	
	am-2992	Hall Effect Encoder Cable with 4-pin Connector	4	
	am-3406	PicoBox Spacer	16	
	am-3426	Spacer, Aluminum, 0.242” id, 0.50” od x 0.354” Long	2	
	am-3423	PicoBox Uno Plate	4	

TileRunner Mecanum NeveRest Options

Code	Part Number	Component	Quantity	Part Photo
2	am-3637b	Gearmotor, NeveRest Orbital 20, with Encoder, and Female JST VH, 2-pin	4	
	am-2992	Hall Effect Encoder Cable with 4-pin Connector	4	
	am-3406	PicoBox Spacer	16	
	am-3426	Spacer, Aluminum, 0.242” id, 0.50” od x 0.354” Long	2	
	am-3475	PicoBox MEO Plate	4	
P	am-3476	PicoBox GEO Plate	2	
	am-3405	PicoBox Duo Plate	2	
	am-3475	PicoBox MEO Plate	4	
	am-3423	PicoBox Uno Plate	4	
	am-3406	PicoBox Spacer	16	
	am-3426	Spacer, Aluminum, 0.242” id, 0.50” od x 0.354” Long	8	

TileRunner Mecanum Gear Options

Code	Part Number	Component	Quantity	Part Photo
1	am-3407	40 Tooth PicoBox Gear	8	
A	am-3408	35 Tooth Gear for PicoBox	4	
	am-3409	45 Tooth Gear for PicoBox	4	
E	am-3407	40 Tooth PicoBox Gear	8	
	am-3408	35 Tooth Gear for PicoBox	4	
	am-3409	45 Tooth Gear for PicoBox	4	

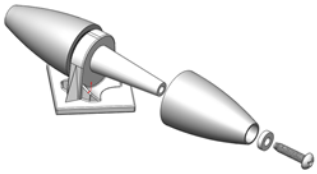
4 in. Standard Mecanum Wheel Bill of Materials

Part Number	Component	Quantity	Part Photo
am-2540_half	4 in Mecanum Wheel Body Half	8	
am-2541	4 in Mecanum Wheel Roller	48	
am-2610	4 in Mecanum Wheel Spindle	24	
am-1328	Nylon Flat Washer, 0.115 in ID x 0.25 in OD x 0.062 in Thick	48	
am-1317	Phillips Pan Head 4-40 x 0.5 in Self-Tapping Screw	48	
am-1247	Phillips Pan Head 4-40 x 1.0 in Self-Tapping Screw	24	

Standard Mecanum Wheel Assembly Instructions

NOTE: The following assembly instructions only apply if you have selected the Standard Mecanum wheel (MS) option.

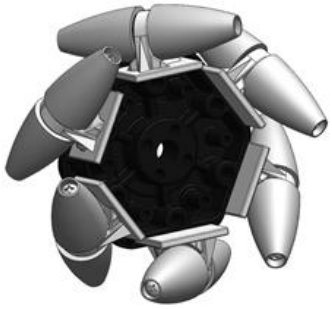
Step 1: Place the Roller (am-2541) onto the arm of the Spindle (am-2610), add a 0.25” Nylon Washer (am-1328) and secure with 4-40 x 0.5 in Pan Head Phillips Thread Forming Screw (am-1317).



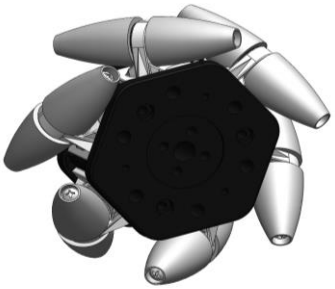
6X

NOTE: Be sure to tighten the screw until the roller can no longer wiggle along the axle but rolls freely

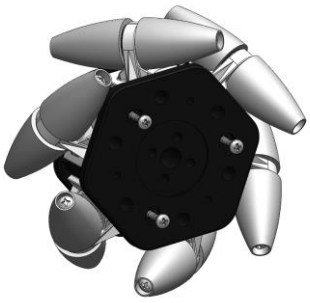
Step 2: With the assembled spindles, place into slots on one 4” Mecanum Wheel Body Half (am-2540_half).



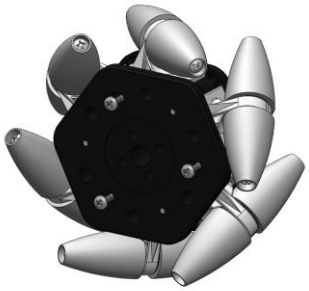
Step 3: Take another 4” Mecanum Wheel Body Half (am-2540_half) and press it into the bases of the spindles. The large clearance holes will line up with the smaller holes.



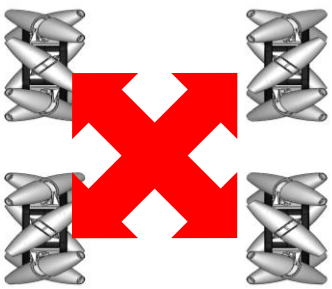
Step 4: Secure the two Wheel Body halves together with three 4-40 x 1 in Pan Head Phillips Thread Forming Screws (am-1247).



Step 5: Flip the wheel over and secure with three more 4-40 x 1 in Pan Head Phillips Thread Forming Screws (am-1247).



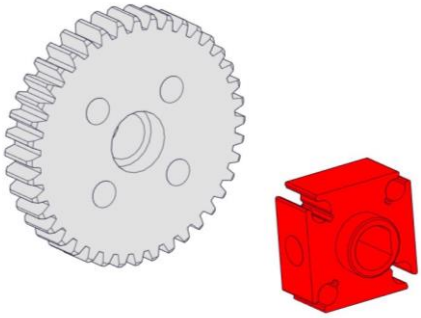
Step 6: Assemble 3 more Mecanum Wheels. One should be the same and two should be opposite to create two right and two left handed wheels. When looking at the robot from the top, the top most rollers should form an “X”.



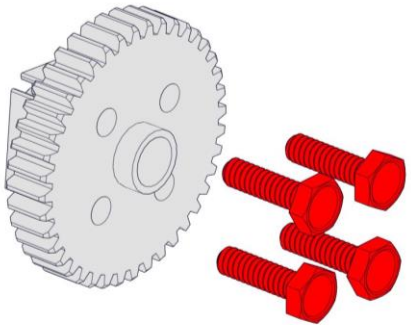
PicoBox Gear Assembly Instructions

NOTE: The following assembly instructions depict the 40 Tooth PicoBox Gear (am-3407) but also apply to the 35 Tooth Gear (am-3408) and/or the 45 Tooth Gear (am-3409) if you have selected to utilize the alternate gearset.

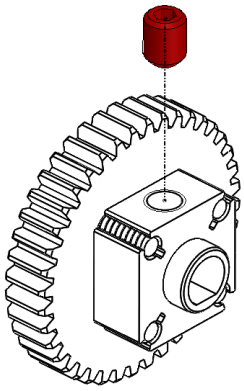
Step 1: Place a 6mm D-Bore Double Boss Nub (am-3215a) into the center bore of a PicoBox Gear and align the bolt circles of the Nub and the Gear.



Step 2: Flip the gear over and secure the Nub to the gear by threading four 6-32 x 0.5 in Hex Head Screws (am-1563) into the Nub. AndyMark suggests starting with a ¼" Nut Driver and finishing with a ¼" open wrench. Use Vice Grips, Pliers, or Channel Locks to hold the nub while tightening the screws.



Step 3: Ensure that a #10-32 Set Screw is partially threaded into the Nub.

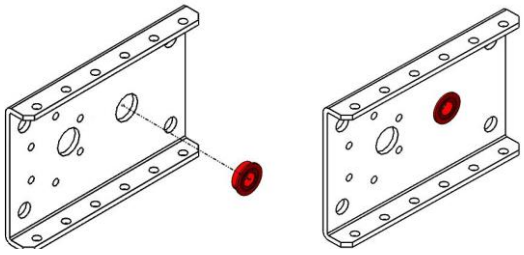


NOTE: If utilizing the 1:1 gear ratio using 40 Tooth gears, follow the above instructions a total of 8 times. If utilizing the alternate gearset for a 1.28:1 ratio, or a 1:0.78 ratio, affix nubs to all four 35 Tooth Gears and four 45 Tooth Gears.

Repeat steps 1-3 to make 8 total PicoBox Gear Assemblies. **8X**

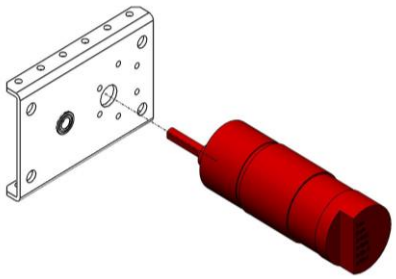
PicoBox Uno Assembly Instructions

Step 1: Press a 6x12x4 Flanged Bearing (am-3377) into the center 12mm hole of a PicoBox Uno gearbox plate (am-3423) or PicoBox MEO Gearbox Plate (am-3475). **NOTE: Use the Uno plate if using NeveRest Classic gearmotors and use the MEO plate if using NeveRest Orbital gearmotors.**

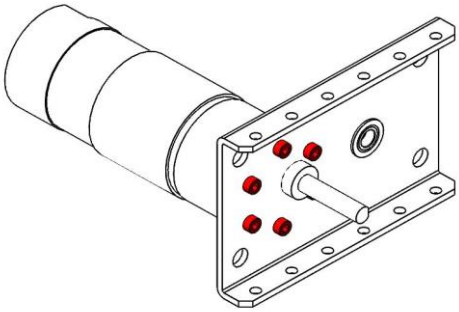


NOTE: Make sure the flange of the bearing is on the same side of the plate as the flanges, and is flush against the sheet metal of the gearbox plate.

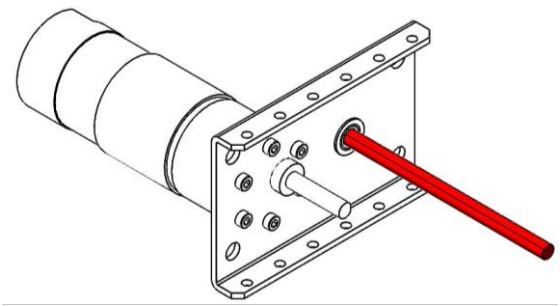
Step 2: Insert a NeveRest motor into the remaining 12mm hole of the PicoBox Uno gearbox plate or the 22mm holes of the PicoBox MEO plate, opposite of the flanges on the gearbox, and line up the threaded holes on the end of the motor with the bolt-circle holes of the gearbox plate.



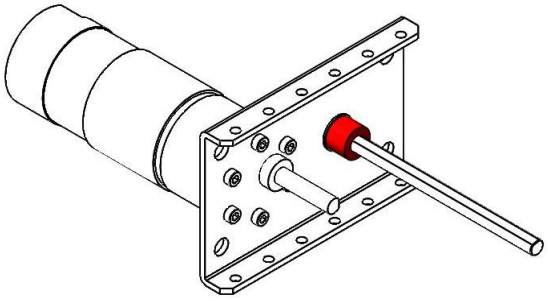
Step 3: Install six M3-0.5 x 5mm long socket head screws (am-1443) to secure the NeveRest motor to the gearbox plate. **Note: Only four screws are used per motor if using NeveRest Orbital gearmotors.**



Step 4: Install the 6mm D-Shaft (am-3226-100) into the bearing such that the end of the shaft is flush with the end of the bearing.

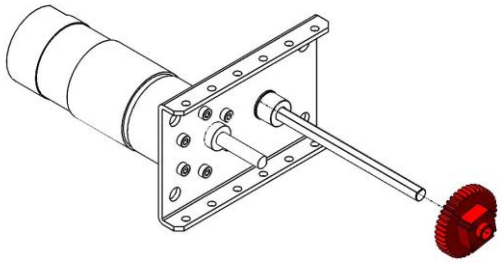


Step 5: Install the 9mm long Aluminum Spacer (am-3426) on the axle up against the previously installed bearing.

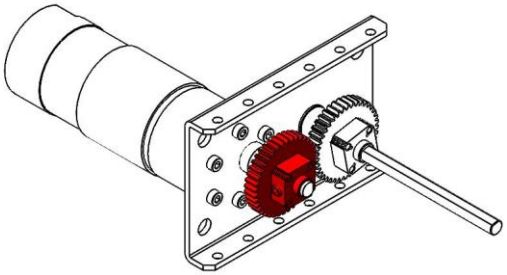


PicoBox Uno Assembly Instructions

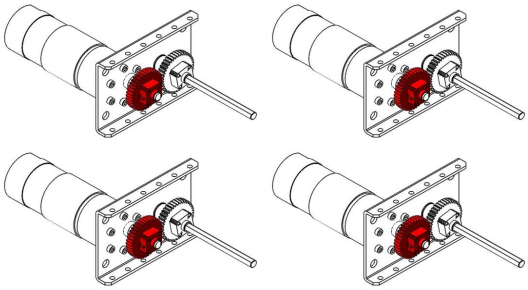
Step 6: Install one Gear Assembly onto the axle of the gearbox. Be sure to place the boss of the Gear against the spacer. Tighten the #10-32 set screw to lock the Gear Assembly in place. **Note: If using the 1.28:1 ratio, use the 35T gear here; if using the 1:0.78 ratio, use the 45T gear here.**



Step 7: Install a Gear Assembly onto the NeveRest Motor shaft such that is lined up with the Gear Assembly installed on the axle. Tighten the #10-32 set screw to lock the Gear Assembly in place. **Note: If using the 1.28:1 ratio, use the 45T gear here; if using the 1:0.78 ratio, use the 35T gear here.**

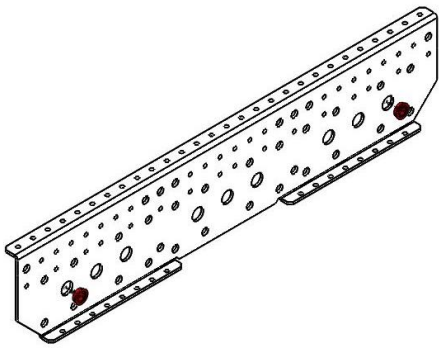


Step 8: Repeat 3 more times to make 4 total PicoBox Gearboxes for the drive train.

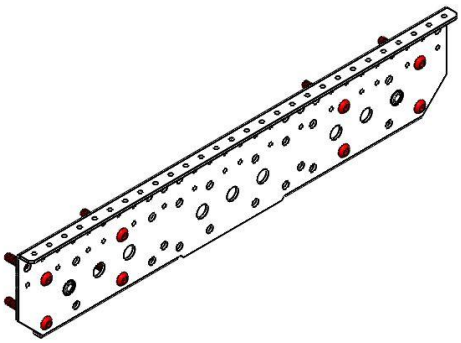


TileRunner Mecanum Chassis Assembly Instructions

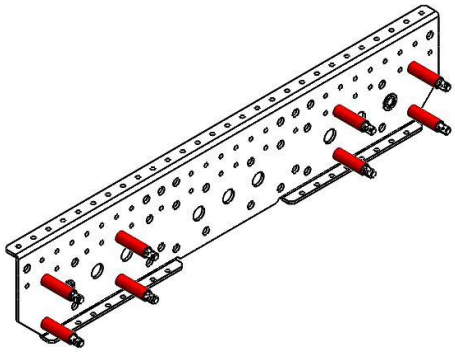
Step 1: Press two 6x12x4 Flanged Bearings (am-3377) into the outermost 12mm holes of the TileRunner Inside Plate (am-3392_Inside). Make sure the flanges of the bearings are flush against the side of the plate with two flanges



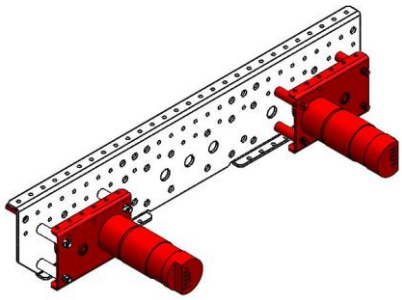
Step 2: Insert eight 1/4-20 x 1.75" Button Head Screws (am-1420) into the Inside Plate at the indicated locations. Make sure the head of the screws are on the side of the Inside Plate with a single solid flange.



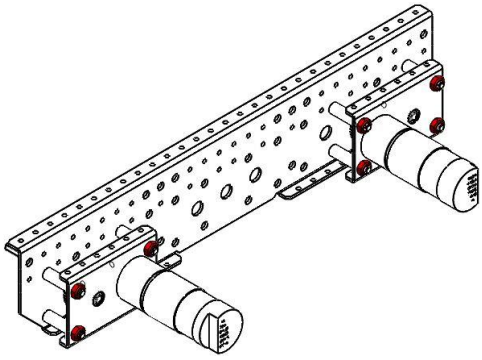
Step 3: Place a PicoBox Spacer (am-3406) over each of the 1/4-20 screws on the side of the Inside Plate with two flanges.



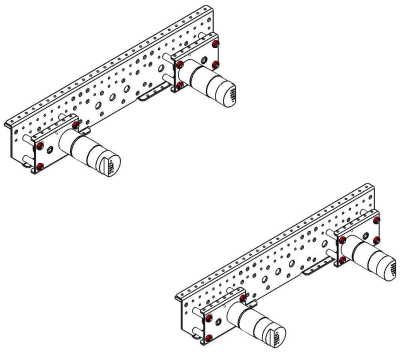
Step 4: Insert the Axles of two Gearbox Assemblies into the bearings on the TileRunner Inside Plate. Align the 1/4-20 screws with the ¼ in holes on each of the PicoBox Plates, and push the assemblies together.



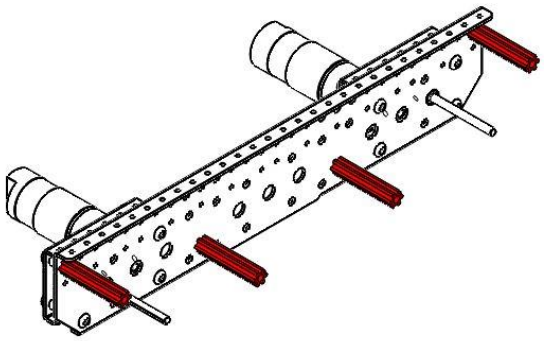
Step 5: : Secure the Gearbox Assemblies with 1/4-20 Nylock Jam Nuts (am-1102).



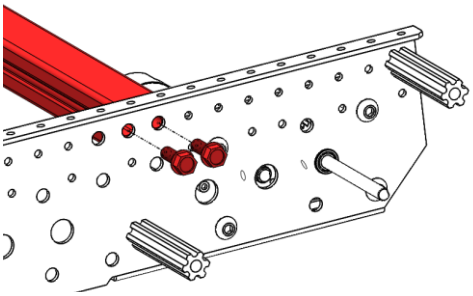
Step 6: Repeat Steps 1-5 to create two completed Inside Plate Assemblies.



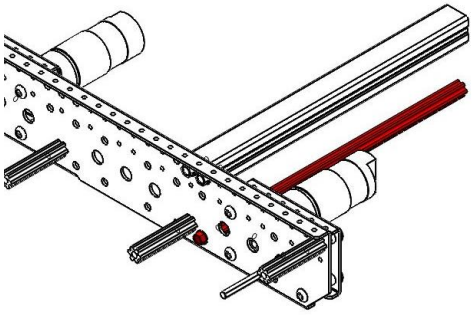
Step 7: Attach four 63mm Churro (am-3399) to one of the Inside Plates using 1/4-20 x 0.75 in Self Tapping Screws (am-1310). **Note: Do not fully tighten these screws yet!**



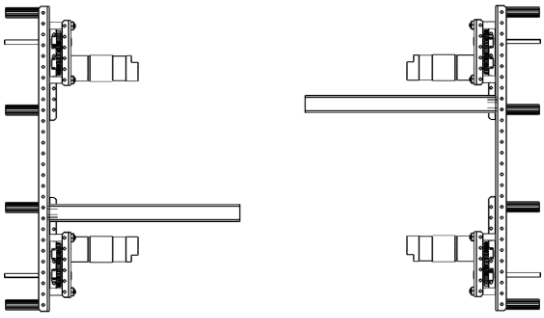
Step 8: Attach one 11.25” Peanut (am-3395) to one of the Inside Plates on the same side of the plate as the PicoBox using two 1/4-20 x 0.75 in Self Tapping Screws (am-1310). **Note: Do not fully tighten these screws yet!**



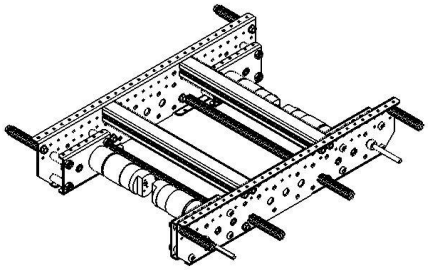
Step 9: Attach one 11.25” Churro Extrusion (am-3398) to the same Inside Plate on the same side of the plate as the PicoBox using one 1/4-20 x 0.75 in Self Tapping Screw (am-1310). **Note: Do not fully tighten this screw yet!**



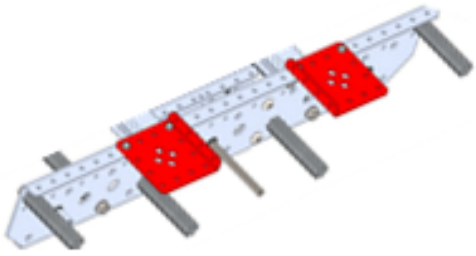
Step 10: Repeat steps 1-9 on the other Inside Plate Assembly. These should be identical, so that they can be rotated into their final orientation on the robot.



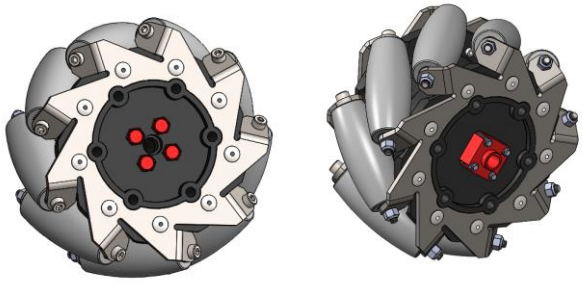
Step 11: Join the two assemblies together with six 1/4-20 x 0.75 in Self Tapping Screws (am-1310). **Note: Do not fully tighten these screws yet!**

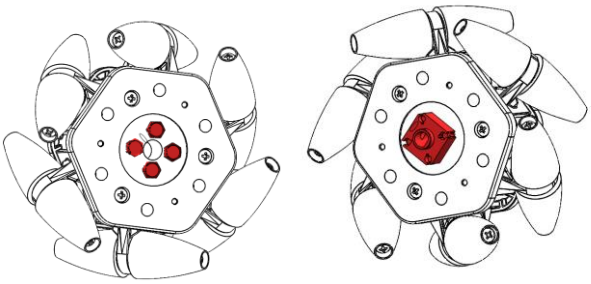


Step 12: Attach two 4x4 Plates (am-3393) to each Inside Plate using two 6-32 x 0.5" Hex Head Screws (am-1436) and two 6-32 Nylock Nuts (am-1419) on each 4x4 plate.

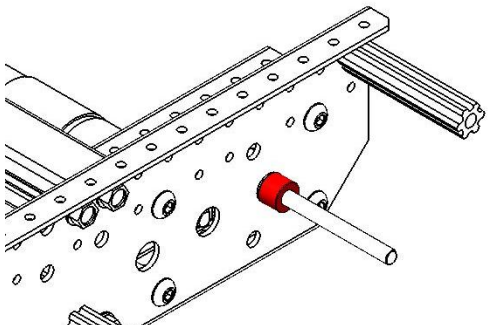


Step 13: On each of the four wheels, secure a 6mm D Bore Double Boss Nub (am-3215a) with four 6-32 x 2.0 in Hex Head Cap Screws (am-1499) if using the HD Mecanum Wheels or four 6-32 x 1.25in Hex Head Cap Screws (am-1437) if using the SD Mecanum Wheels.

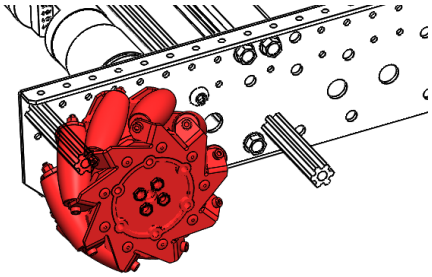




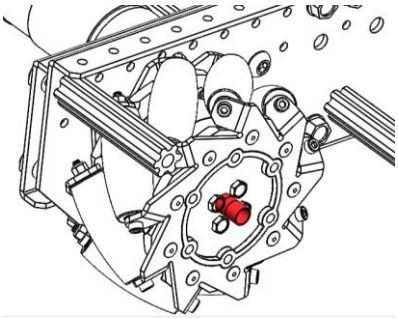
Step 14: **Note: Skip this step if using the HD Mecanum Wheels.** Install a 9mm long aluminum spacer (am-3426) onto each of the four 6mm Gearbox axles.



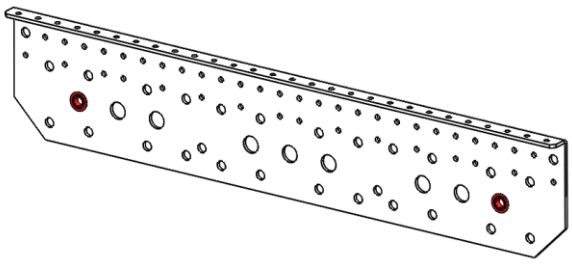
Step 15: **Note: When viewed from above, the rollers on the wheels should form an "X".** Slide a wheel onto each of the 6mm gearbox axles so that the nub is flush against the bearing or spacer. Tighten the set screw in the Nub.



Step 16: If using the HD Mecanum Wheels, Install two 0.25 in long aluminum spacers (am-3424) on to each of the 6mm axles on the outside of the Mecanum Wheel. If using the SD Mecanum Wheels, install one 0.594 in long aluminum spacer (am-1290) on the axle.

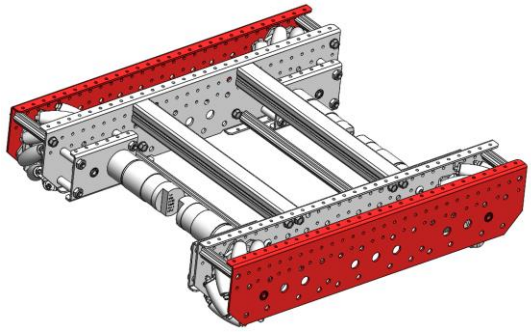


Step 17: Press two 6x12x4 Flanged Bearings (am-3377) into the outermost 12mm holes of the TileRunner Outside Plate (am-3392_Outside). Make sure the flanges of the bearings are flush against the side of the plate with a single solid flange. Repeat for a total of two Outside Plates.

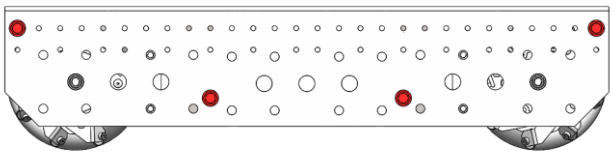


TileRunner Mecanum Chassis Assembly Instructions

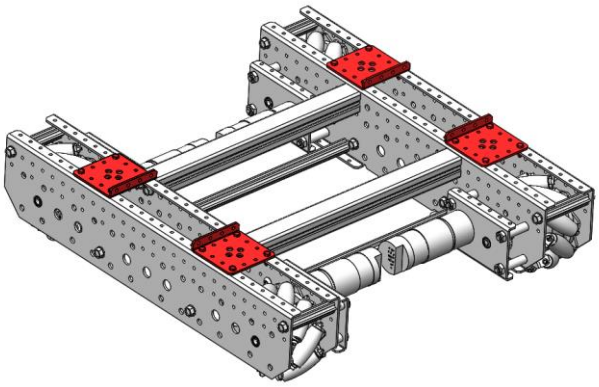
Step 18: Slide the 6mm gearbox axles into the bearings installed in the Outside Plates and make sure the flanges of the Outside Plates point towards the inside of the chassis.



Step 19: Secure the Outside Plates to the chassis by threading four 1/4-20 x 0.75 in Self Tapping Screws (am-1310) on both sides into the four 63mm Churro Extrusions installed in Step 7. **Note: Do not fully tighten these screws yet!**

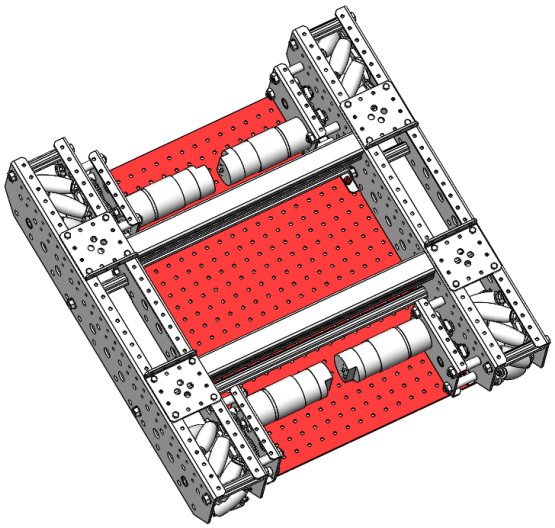


Step 20: Finish securing the 4x4 Brackets to the top of the drive modules. Use two additional 6-32 x 0.5 in Hex Head Screws (am-1436) and 6-32 Nylock Nuts (am-1419) at each plate.



NOTE: These can be placed anywhere along the module to help add strength and provide mounting options for additional systems

Step 21: Bolt the Belly Pan (am-3394) to the Inside Plates of the chassis using 6-32 x 0.5 in Hex Head Screws (am-1436) and 6-32 Nylock Nuts (am-1419).



Step 22: Fully tighten all screws that were previously left loose.