Rat Rig

01. Base Frame Assembly

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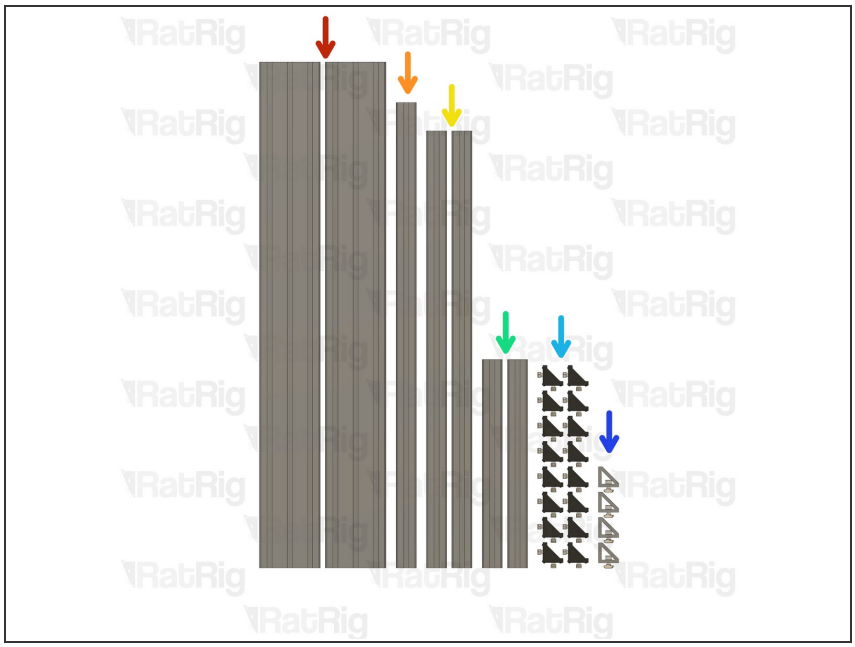
INTRODUCTION

Please note: This guide is based upon building a 750x750 StrongHold ONE CNC.

Measurements for the 750x1250 and 1250x1250 machine sizes are provided in the relevant steps.

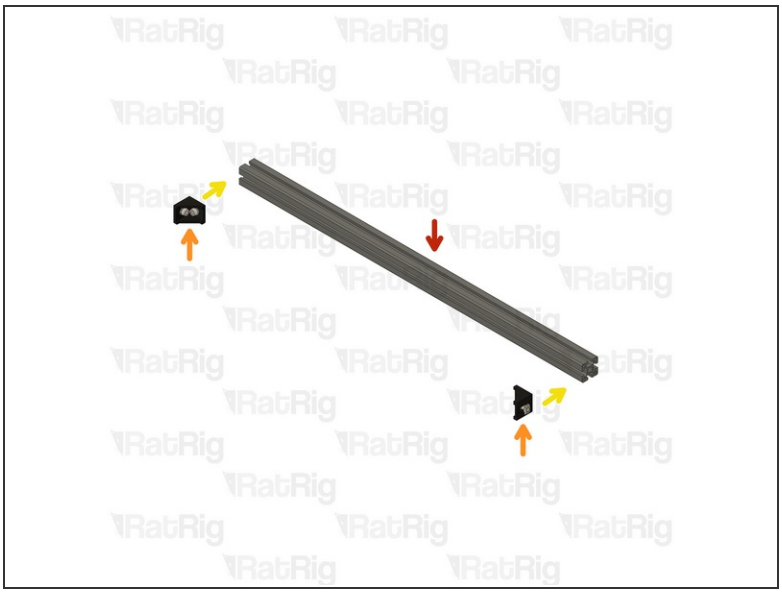
It is **strongly recommended** to assemble the base frame on a known flat surface (such as a solid table, work surface or similar). Assembling the frame on a carpeted floor, or other non-flat surface, can cause the finished frame to not be square. This can cause issues with quality and performance.

Step 1 — Prepare the machine base extrusions & brackets



- 2x 1000mm 40120 Extrusion [1500mm for the StrongHold ONE 750x1250 or 1250x1250]
- 920mm 4040 Extrusion [1420mm for the StrongHold ONE 750x1250 or 1250x1250]
- 2x 864mm 4040 Extrusion [1364mm for the StrongHold ONE 1250x1250]
- 2x 412mm 4040 Extrusion [662mm for the StrongHold ONE 1250x1250]
- 16x 4040 Cast Corner Assemblies
- 4x 4040 Extruded Corners Assemblies for the spoil board

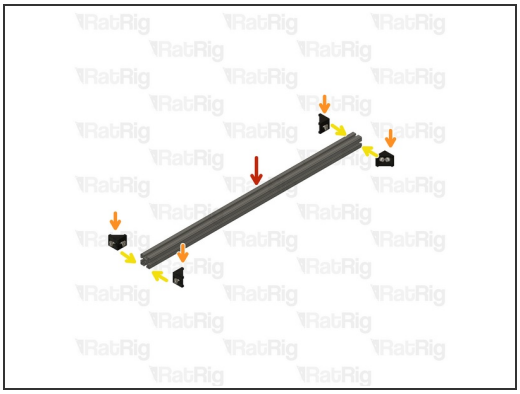
Step 2 — Assemble the front & rear 4040 extrusions



- 864mm 4040 Extrusion
- 4040 Cast Corner Assembly
- Install one corner assembly onto each end of the 4040 extrusion as shown. Tighten the M8x16 screw to secure them.
- Ensure the corner assemblies are flush and square with the ends of the extrusions after tightening the screws

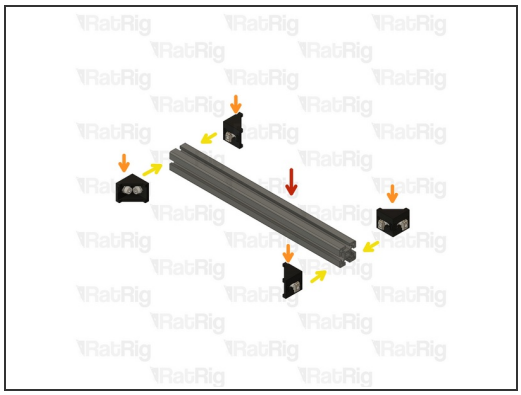
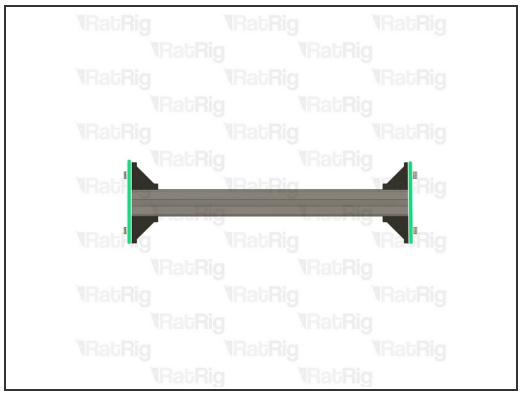
ⓘ Repeat these instructions for the second 864mm 4040 extrusion

Step 3 — Assemble the middle 4040 extrusion



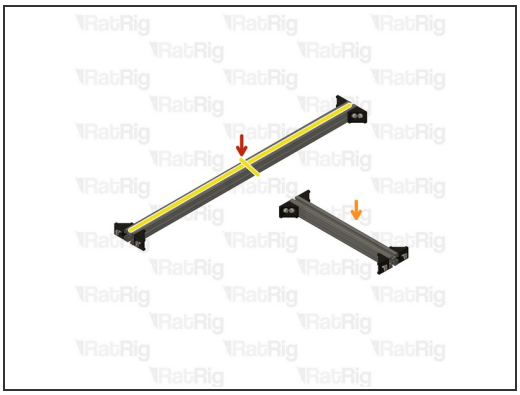
- 920mm 4040 Extrusion
- 4040 Cast Corner Assembly
- Install corner assemblies on to both sides of each end of the 4040 extrusions as shown. Tighten the M8x16 screw to secure them.
- Ensure the corner assemblies are flush and square with the ends of the extrusions after tightening the screws

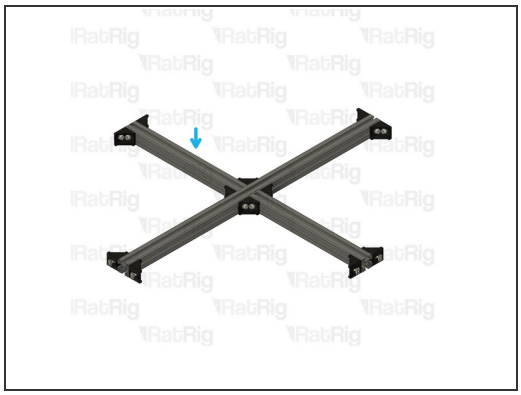
Step 4 — Assemble the central frame support (x2)


- 412mm 4040 Extrusion
- 4040 Cast Corner Assembly
- Install corner assemblies on to both sides of each end of the 4040 extrusions as shown. Tighten the M8x16 screw to secure them.
- Ensure the corner assemblies are flush and square with the ends of the extrusions after tightening the screws

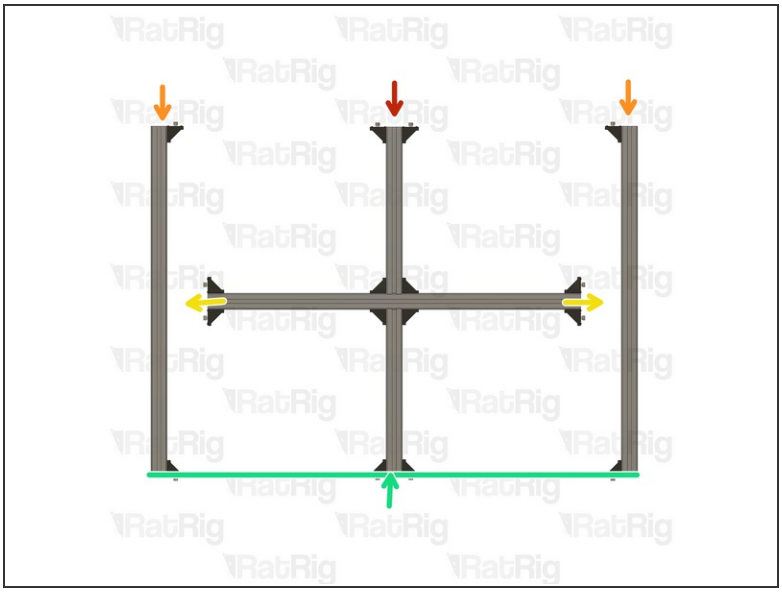
Step 5 — Assemble base frame ends (x2)

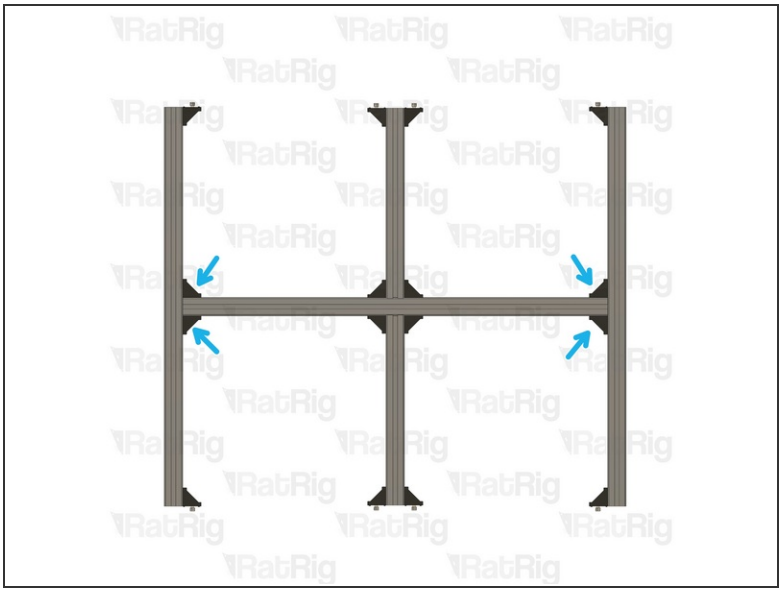




- Front / Back Assembly from Step 2
- Central Frame Support Assembly from Step 4
- Position the central frame support in the middle of the assembly from **Step 3**, as shown.
- Tighten the marked M8 cap head screws to secure the extrusions together
- Repeat these instructions for the second central frame support

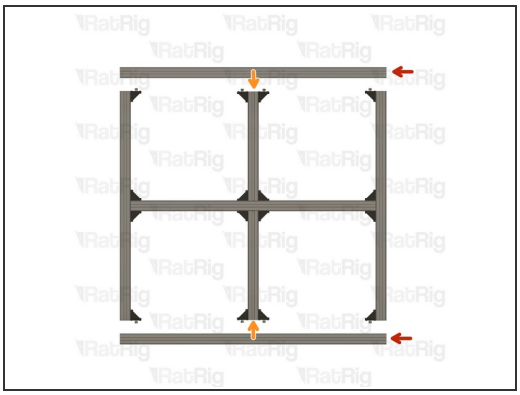
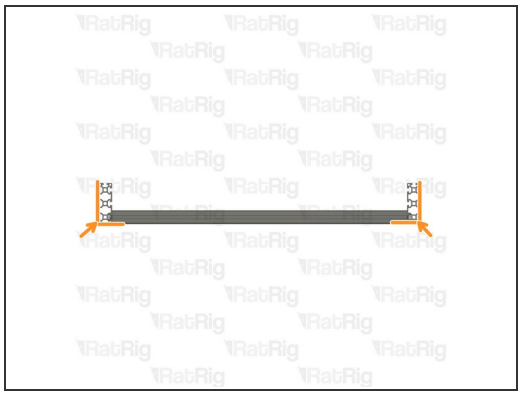
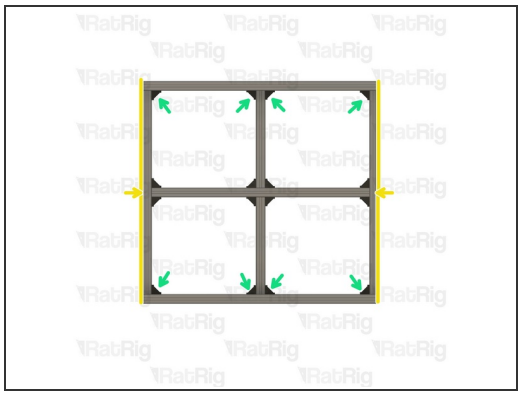
Step 6 — Assemble the base frame - Part 1





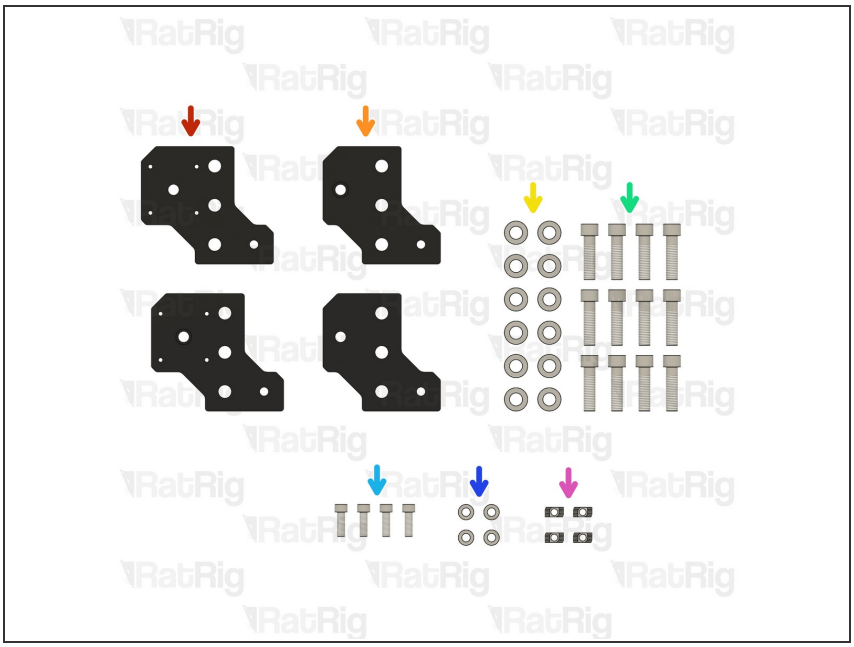
- Middle Assembly from the previous step
- Front & Rear Assemblies from **Step 2**
- Position the three assemblies as shown
- Ensure that the ends of all three 4080 extrusions are aligned
- Tighten the marked M8 cap head screws to secure the extrusions together

Step 7 — Assemble the base frame - Part 2

- 1000mm 40120 Extrusion
- Align each of the 40120 extrusions as shown
- Ensure that the ends of both 40120 extrusions are aligned with the ends of the frame
- Tighten the marked M8 Cap Head Screws to secure the base together

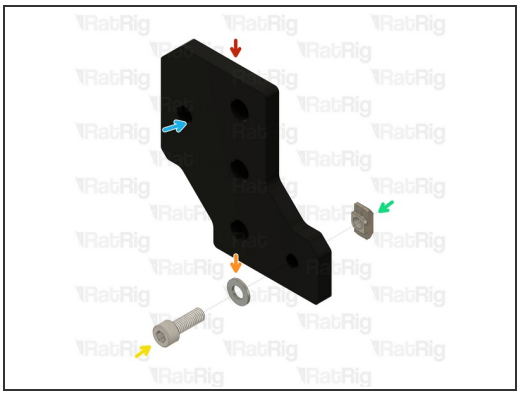
Step 8 — Prepare the base frame end plate parts

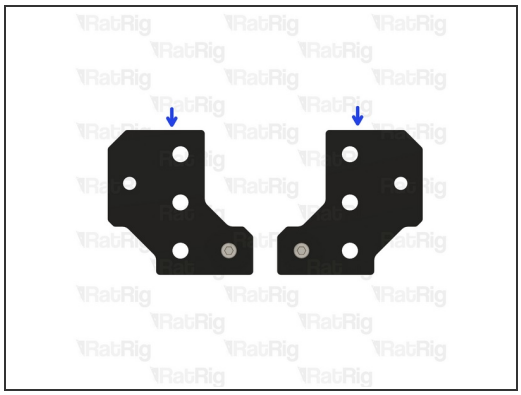


- 2x Rat Rig StrongHold ONE CNC - Motor Plate
- 2x Rat Rig StrongHold ONE CNC - Idler Plate
- 12x M12 Washer
- 12x M12x45 Cap Head Screw
- 4x M8x22 Cap Head Screw
- 4x M8 Washer
- 4x 4040 Drop-in T-Nut - M8

ⓘ The main difference between the motor and idler plates is the Stepper motor mount holes.

Step 9 — Assemble the front idler plates





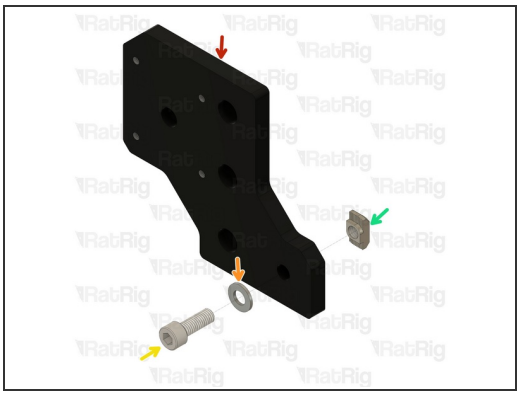
- Rat Rig StrongHold ONE CNC - Idler Plate
- M8 Washer
- M8x22 Cap Head Screw
- 4040 Drop-in T-Nut - M8
- Make sure the counterbore for the bearing is on the same side as the T-Nut.

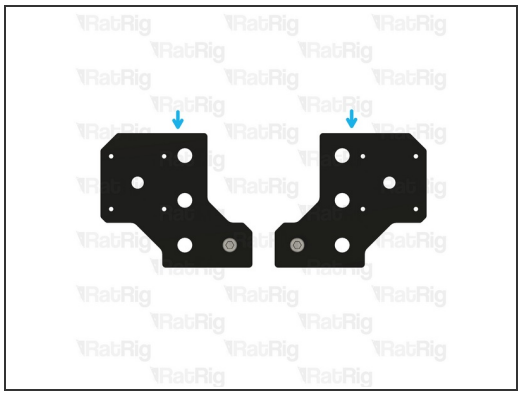
Loosely thread a 4040 T-Nut on to each of the M8x22 screws. Do not tighten them at this point.

- Repeat these instructions for the second idler plate.

Set these assemblies aside until **Steps 11 & 12**

Step 10 — Assemble the rear motor plates





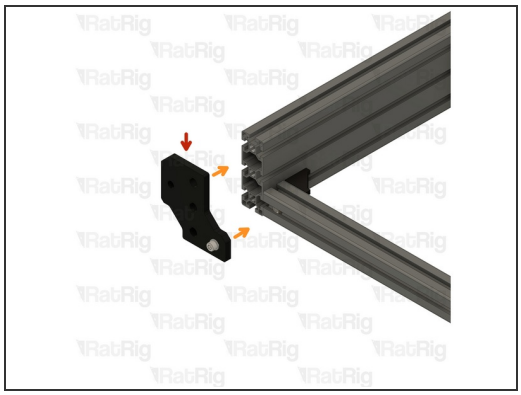
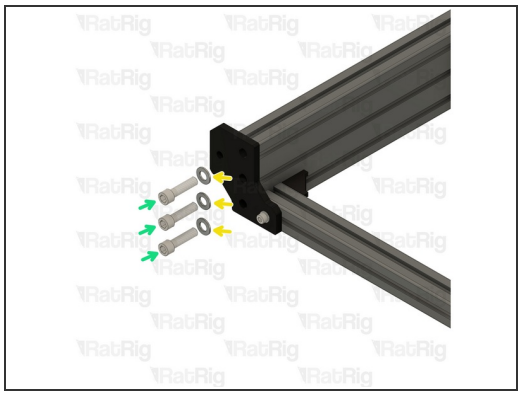
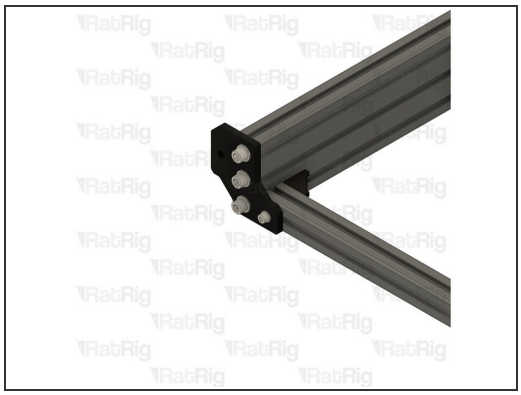
- Rat Rig StrongHold ONE CNC - Motor Plate
- M8 Washer
- M8x22 Cap Head Screw
- 4040 Drop-in T-Nut - M8

Loosely thread a 4040 T-Nut onto each of the M8x22 screws. Do not tighten them at this point.

- Repeat these instructions for the second motor plate.

Set these assemblies aside until **Steps 16 & 17**

Step 11 — Install the front left idler plate

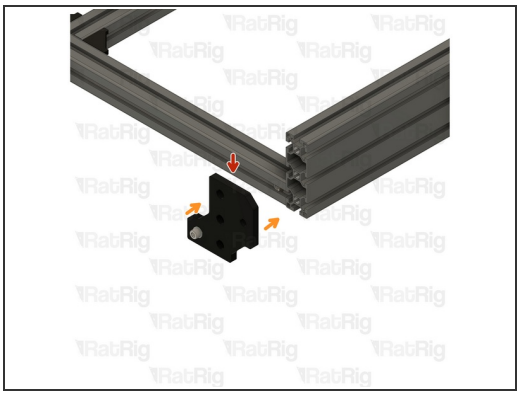
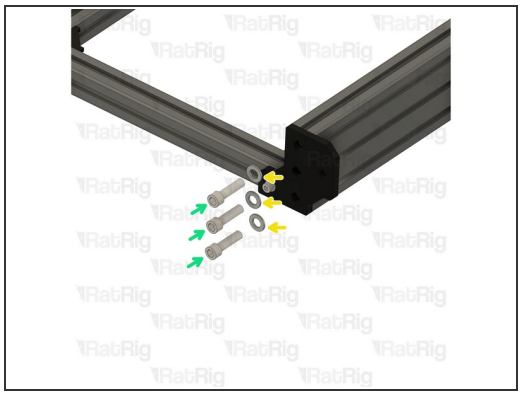




- Left idler plate Assembly from Step 9
- Align the idler plate assembly with the base frame as shown
- M12 Washer
- M12x45 Cap Head Screw

ⓘ Place an M12 Washer on to each M12x45 Cap Head screw and loosely screw them through the plate and in to the extrusion.

⚠ Do not fully tighten any of the M12 or M8 Cap Head Screws at this point

Step 12 — Install the front right idler plate

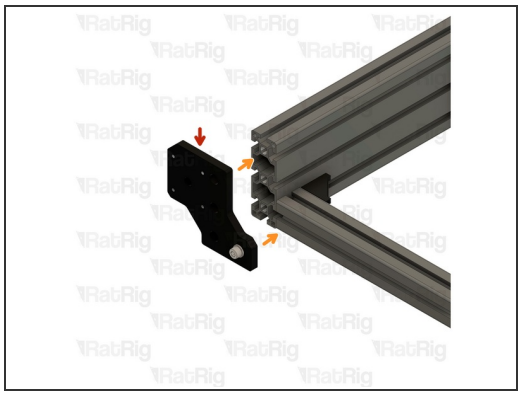
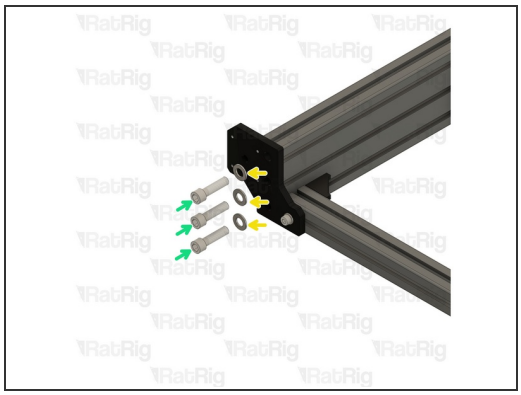




- Right idler plate assembly from Step 9
- Align the idler plate assembly with the base frame as shown
- M12 Washer
- M12x45 Cap Head Screw

Place an M12 Washer on to each M12x45 Cap Head screw and loosely screw them through the plate and in to the extrusion.

Do not fully tighten any of the M12 or M8 Cap Head Screws at this point

Step 13 — Install the rear right motor plate

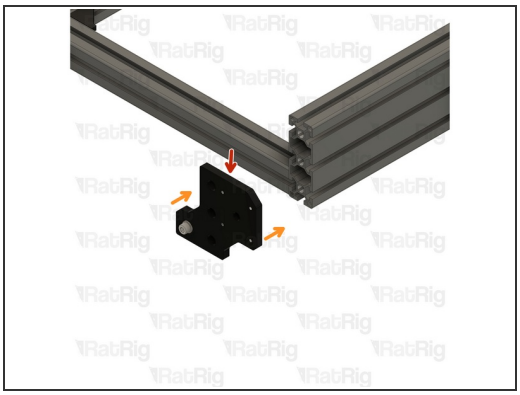
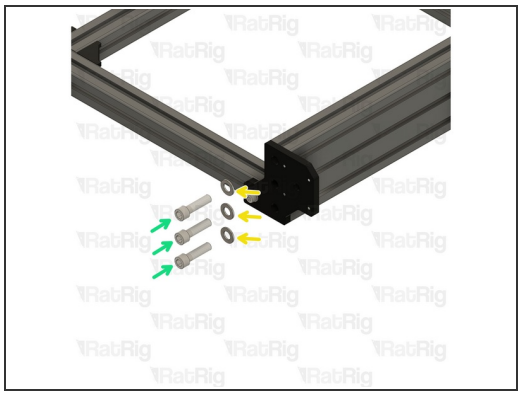




- Right motor plate assembly from Step 10
- Align the motor plate assembly with the base frame as shown
- M12 Washer
- M12x45 Cap Head Screw

Place an M12 Washer on to each M12x45 Cap Head screw and loosely screw them through the plate and in to the extrusion.

Do not fully tighten any of the M12 or M8 Cap Head Screws at this point

Step 14 — Install the rear left motor plate

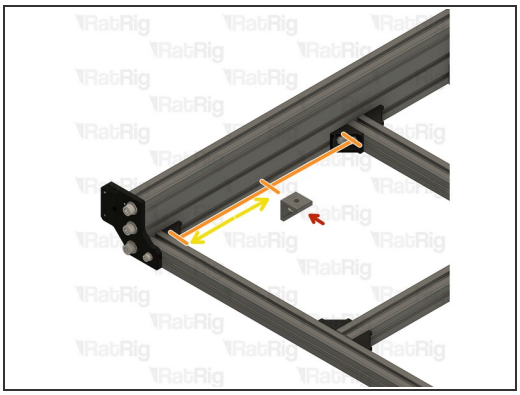
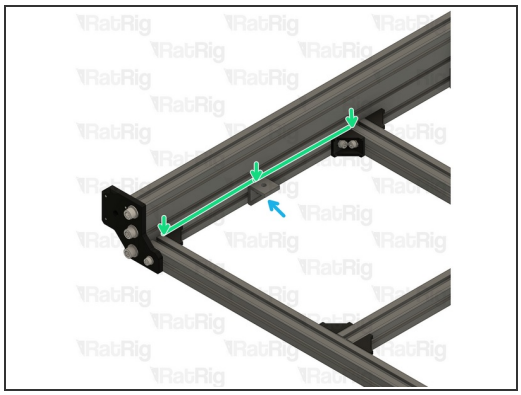
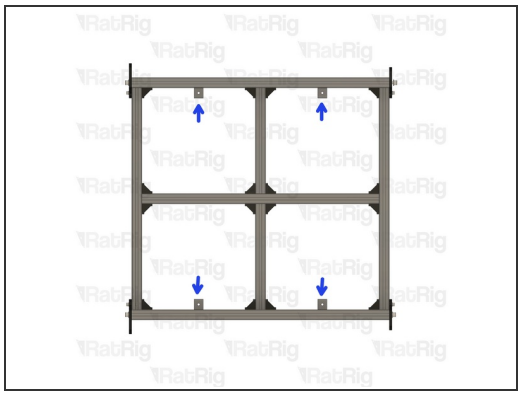




- Left motor plate assembly from Step 10
- Align the motor plate assembly with the base frame as shown
- M12 Washer
- M12x45 Cap Head Screw

ⓘ Place an M12 Washer on to each M12x45 Cap Head screw and loosely screw them through the plate and in to the extrusion.

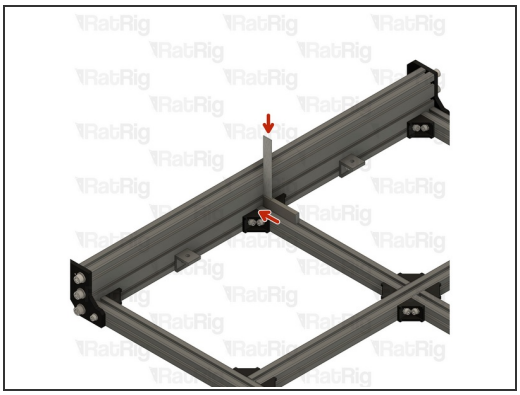
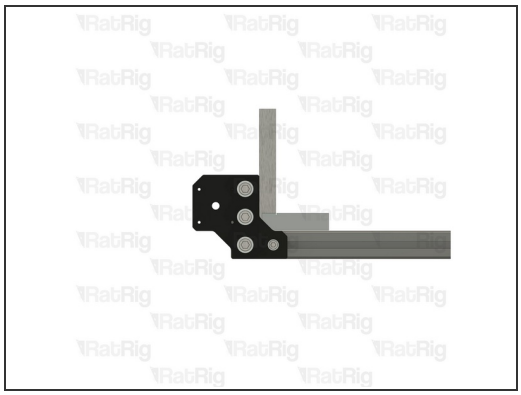
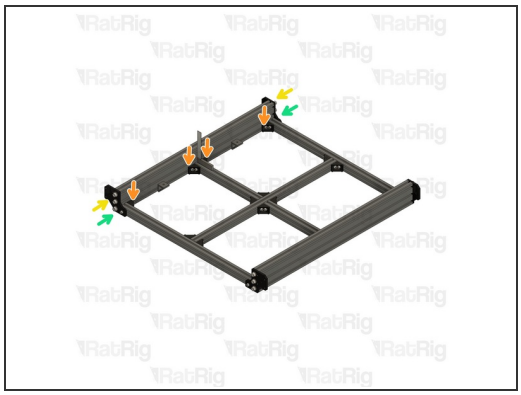
⚠ Do not fully tighten any of the M12 or M8 Cap Head Screws at this point

Step 15 — Install the spoil board brackets

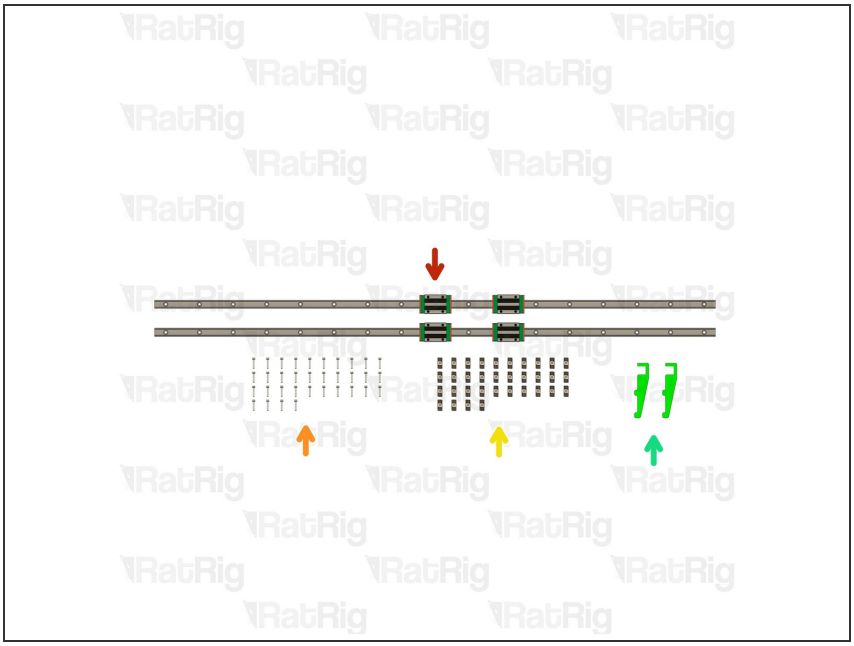
- 4040 extruded corner assembly (For the spoil board)
- Position the 4040 extruded corner assembly in the middle of the extrusion gap as shown
- The displayed measurement should be:
  - 220mm for StrongHold ONE 750x750
  - 345mm for StrongHold ONE 750x1250 or 1250x1250
- Ensure that the top of the extruded corner assembly is flush with the top of the 4040 extrusions.
- Fully tighten the M8 cap head screw to secure the extruded corner assembly to the frame
- Repeat the above instructions for the remaining 3 extruded corner assemblies

Step 16 — Ensure the base frame is square

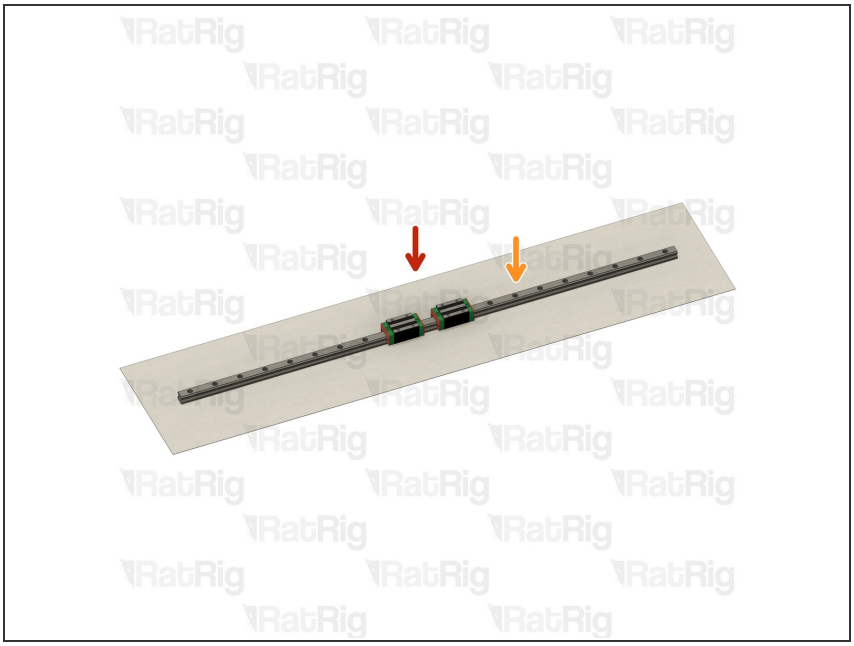
- Before continuing with the assembly, the frame must be squared and all screws full tightened
- Using an engineers square, check that the side 40120 extrusions are square to the extrusions forming the base
- On each side, tighten all of the following screws whilst continuing to check that the side extrusion remain square with the base:
  - 4x M8x16 within the cast corners connected to the base
  - 6x M12x45 on the motor and idler plates
  - 2x M8x22 on the motor and idler plates
- Once one side is fully secured and squared, proceed to repeat the process on the other side
- After tightening all screws, check the entire frame once more for squareness. Correcting any issues now is easier than once the assembly is complete!

Step 17 — Prepare the Y-axis linear rails



- 2x 1000mm HG15 Linear Rail with 2x Carriages
  - ⓘ 1500mm for a 750x1250 or 1250x1250 machine
- 34x M4x20 Cap Head Screw
  - ⓘ 50x for a 750x1250 or 1250x1250 machine
- 34x 4040 Drop-in T-Nut - M4
  - ⓘ 50x for a 750x1250 or 1250x1250 machine
- 2x align_40120_hg15 Printed Part

Step 18 — Unpack and prepare two HG15 linear rails



⚠ The linear rails are supplied with a protective oil coating on them. It is **strongly recommended** to prepare

your work surface with paper towels and to wear disposable gloves.

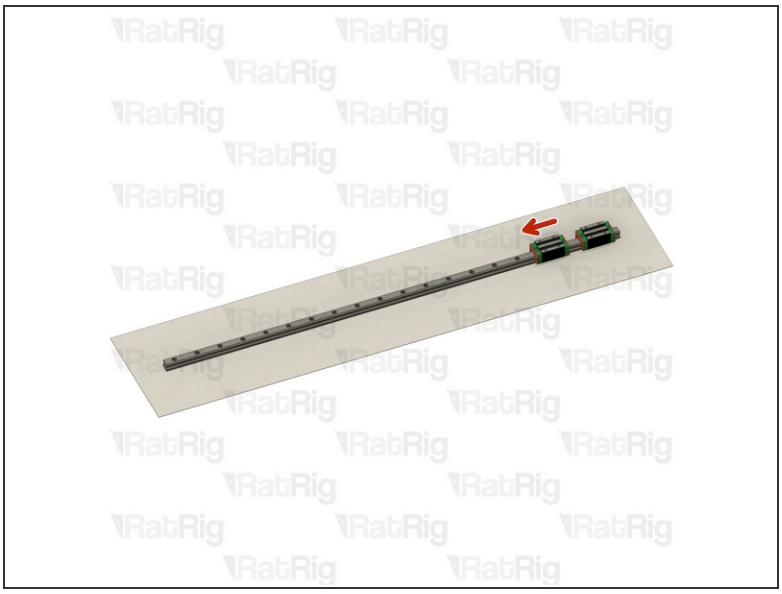
- Paper Towels
- Linear Rail

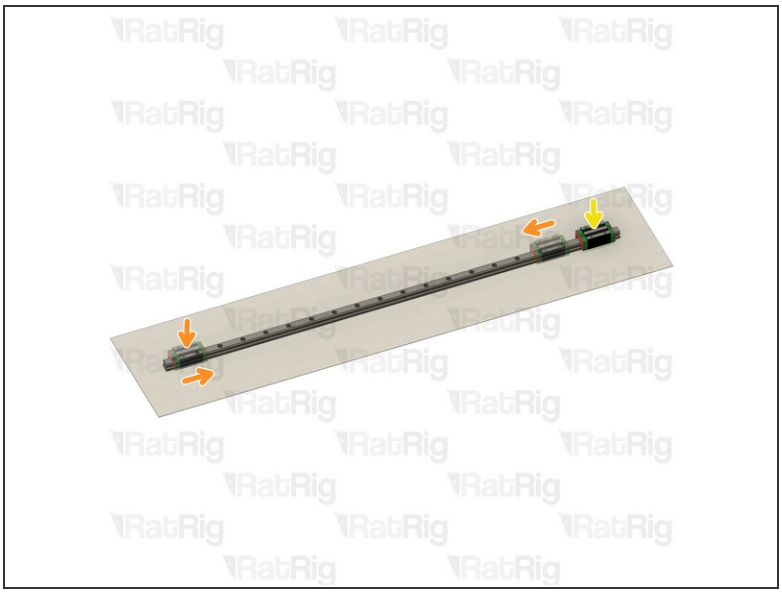
Carefully open one end of the linear rail packaging and remove the rail. Place the rail upon the paper towels and dispose of the packaging

The oil on the rails protects them from rusting. Make sure not to remove all of the original oil during preparation.

The linear rail carriages are not interchangeable. Do not try to use a carriage on a different linear rail than the one it was supplied with.

Step 19 — Inspect & test the HG15 linear rails

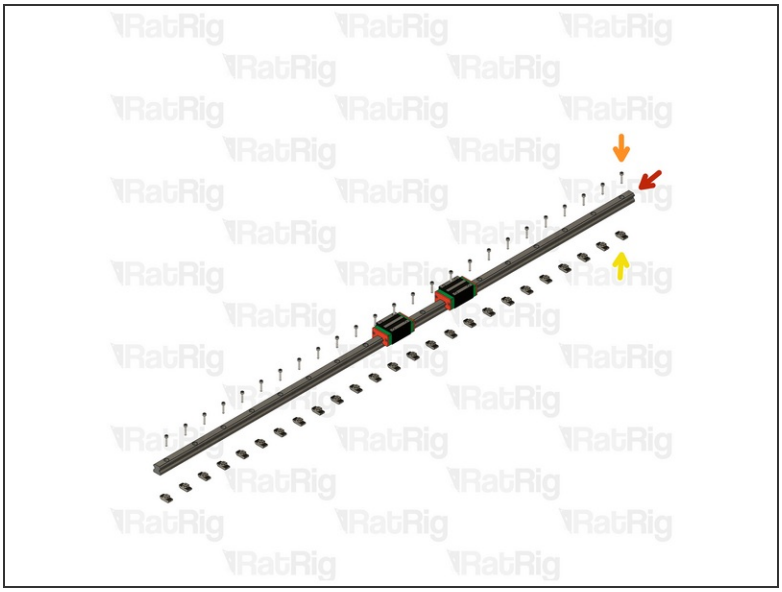




- With the rail still on the absorbent paper towels, carefully and slowly move the carriage from one end of the rail to the other
  - ⓘ Both carriages should move smoothly over the entire length of the rail
  - ⚠ Small changes in resistance are normal, but the carriage becoming very hard to push, or binding completely are not
- Repeat the previous test whilst applying a small amount of force downwards on the carriage
  - ⓘ The carriage will likely travel more smoothly when applying a downwards force, this is normal
- Repeat the process to check the second carriage on the rail

⚠ If the carriage does not move smoothly, or binds completely, refer to the Linear Rail Troubleshooting Guide

Step 20 — Assemble the HG15 linear rails

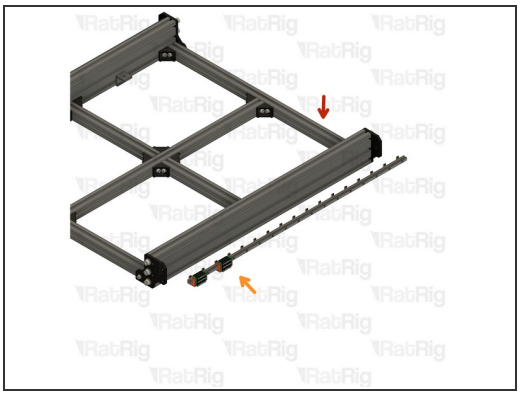
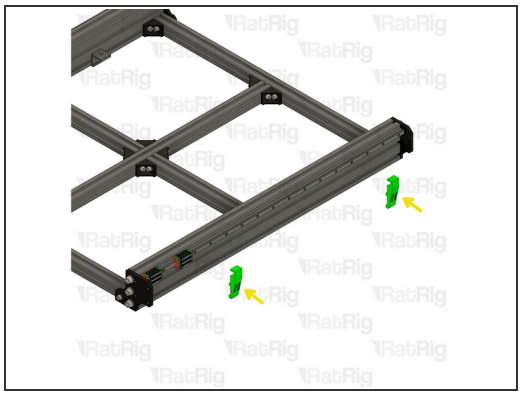
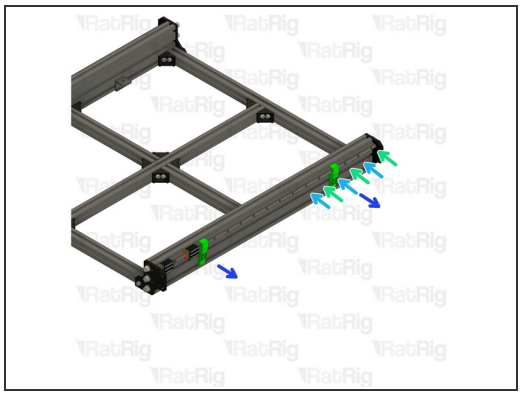


⚠ Do not allow the linear rail carriages to leave the end of the rail at any point

- HG15 Linear Rail
- Insert an M4x20 cap head screw into each of the holes on the linear rail
- Loosely thread a 4040 T-Nut on to each of the M4x20 screws

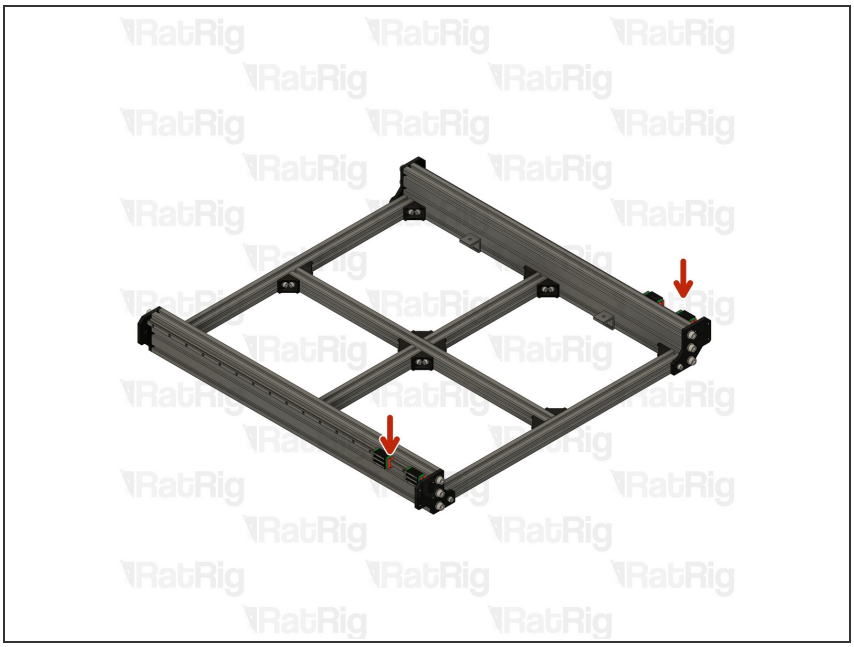
ⓘ Repeat these instructions for the second linear rail

Step 21 — Install the HG15 linear rails - Part 1

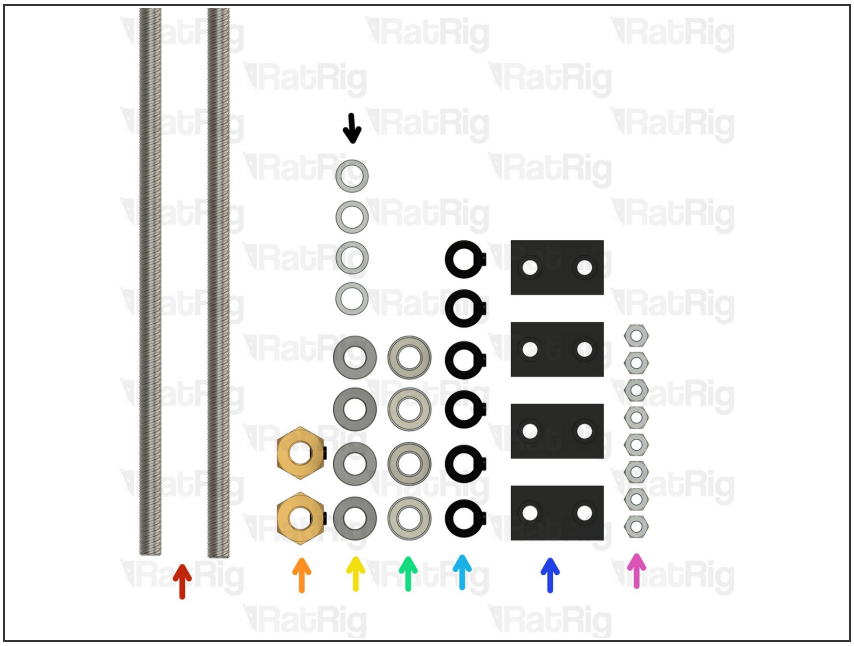
- StrongHold ONE base assembly from **Step 16**
- HG15 Linear Rail assembly from **Step 20**
- Install the two HG15 40120 alignment tools as shown, this will make sure the linear rail is positioned correctly
- Tighten every other M4x20 screw, starting from one end
- Tighten the remaining M4x20 screws, starting from the same end as before
- Remove the HG15 40120 alignment tools

Step 22 — Install the HG15 linear rails - Part 2



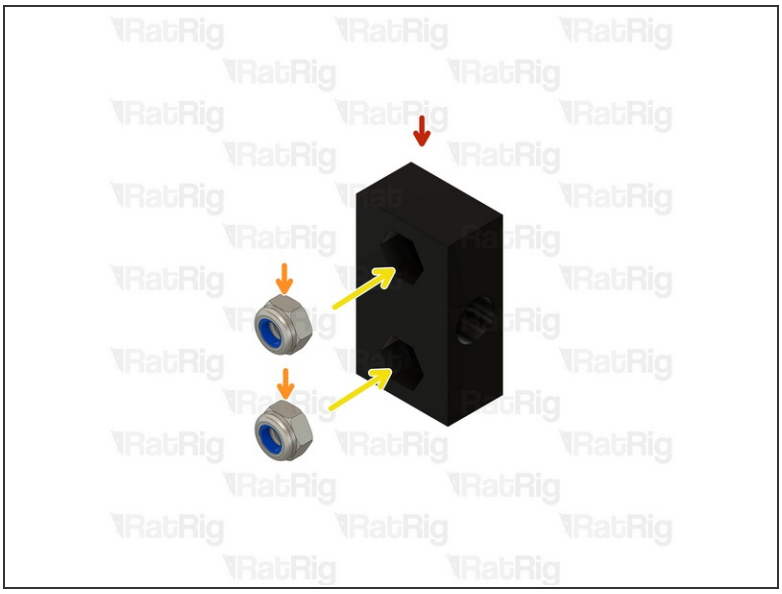
- Repeat the instructions in the previous step to install the second HG15 linear rail to the base assembly

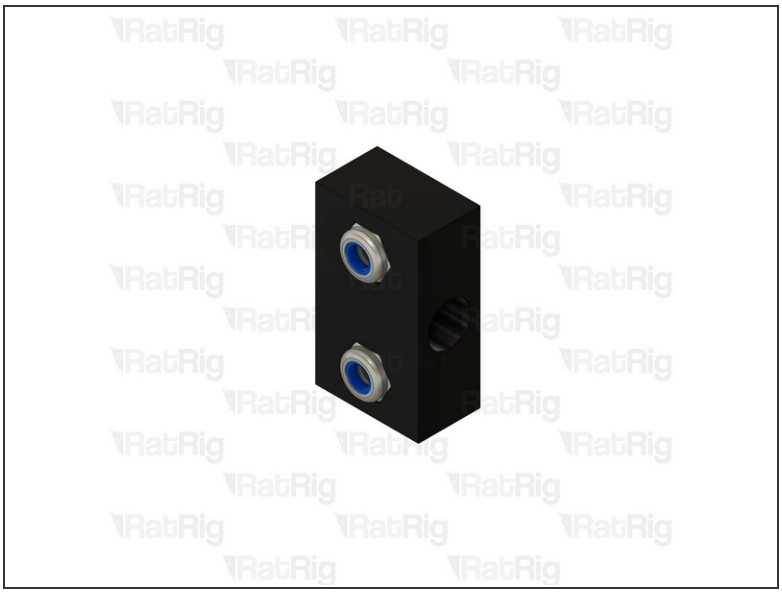
Step 23 — Prepare the Y - axis lead screw parts



- 2x 1057mm TR8x8 Lead Screw (1557mm for a 750x1250 or 1250x1250 machine)
- 2x Lead Screw Tensioning Nut
- 4x Thrust Bearing F8-16M
- 4x 688ZZ Ball Bearing
- 6x Lock Collar 8mm
- 4x Nut Block for TR8x8
- 8x M5 Nylon Locking Hex Nut
- 4x Precision Shim 12x8x1mm

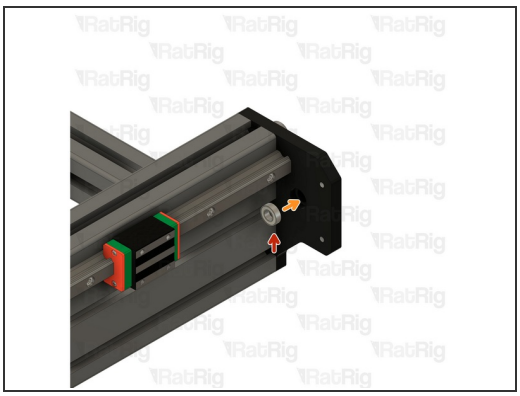
Step 24 — Prepare the nut blocks (x4)

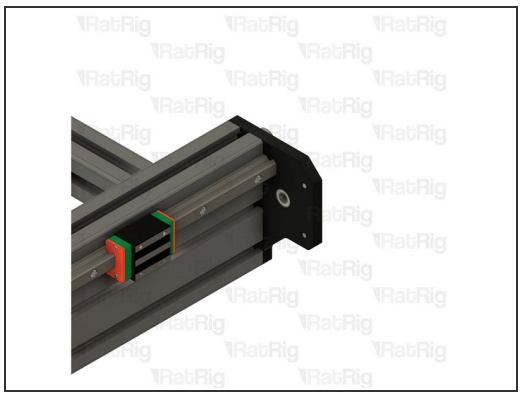


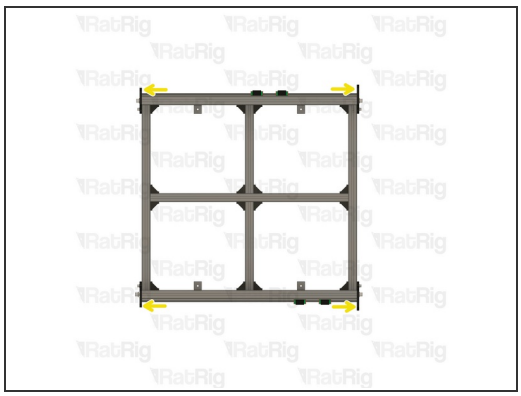


- Nut Block for TR8x8
- M5 Nylon Locking Hex Nut
- Insert the M5 Locking Hex Nut into the Nut Block

Step 25 — Install the rear right lead screw ball bearing

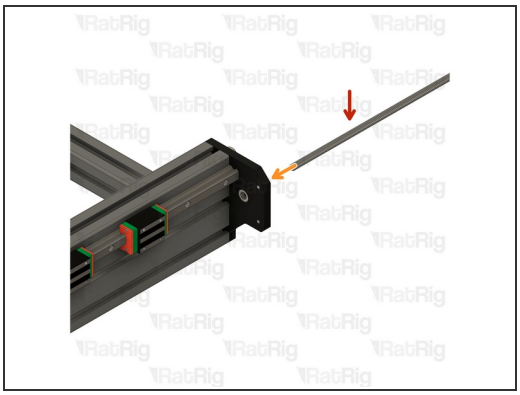
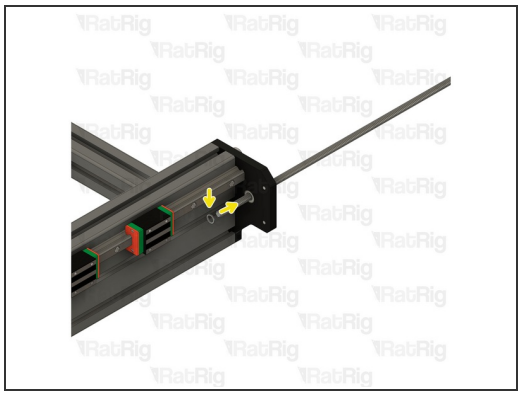
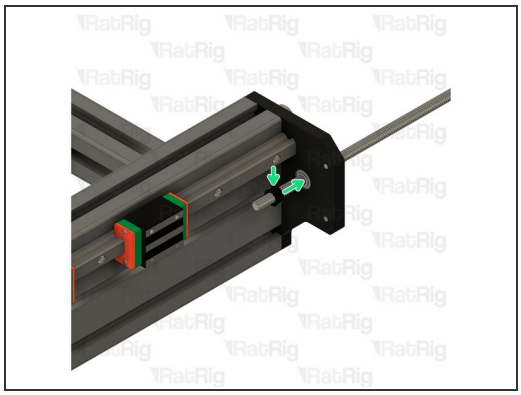






- 688ZZ Ball bearing
- Push the ball bearing against the slot on the inner side of the plate.
- Push the 688ZZ ball bearings against the slots on the inner sides of the plates.

Step 26 — Install the Y-Axis Lead Screw - Part 1

⚠ While performing this step, make sure to support the Lead Screw to prevent it from bending

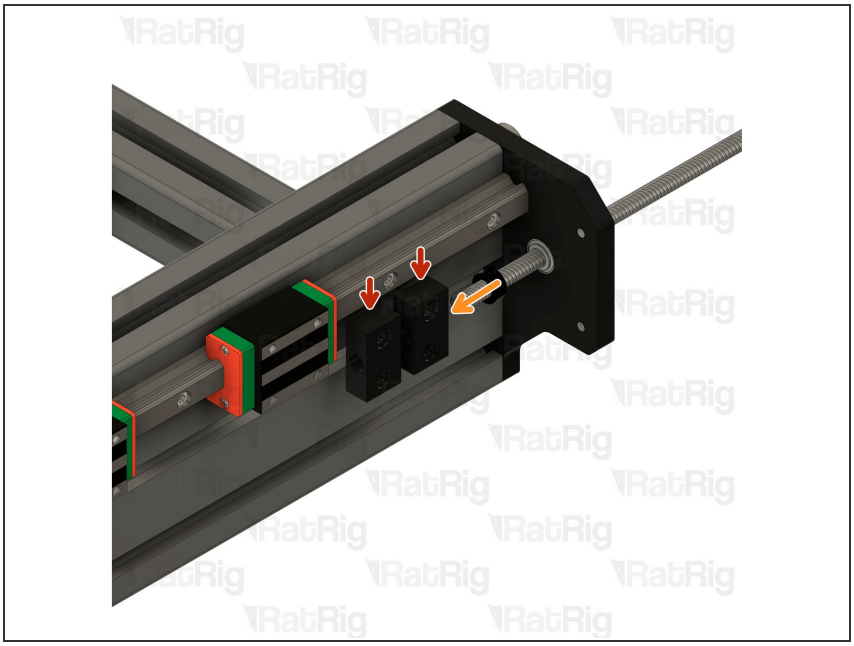
- Lead Screw
- Insert the Lead Screw from the back of the assembly through the hole in the ball bearing
- Precision Shim 12x8x1mm

  ⓘ Slide the Precision Shim on to the Lead Screw.
- Lock Collar

  ⓘ Slide the Lock Collar on to the Lead Screw.

  ⚠ Do not tighten the screw on the Lock Collar yet.

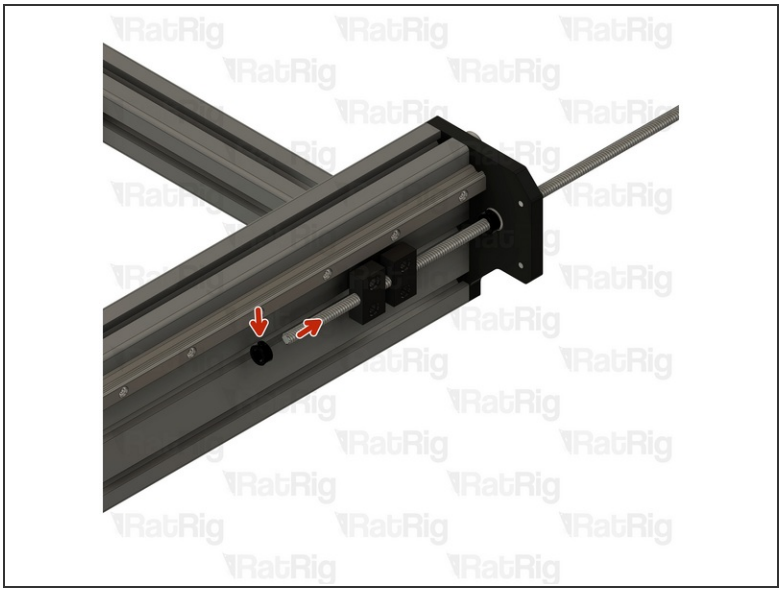
Step 27 — Install the Y-Axis Lead Screw - Part 2

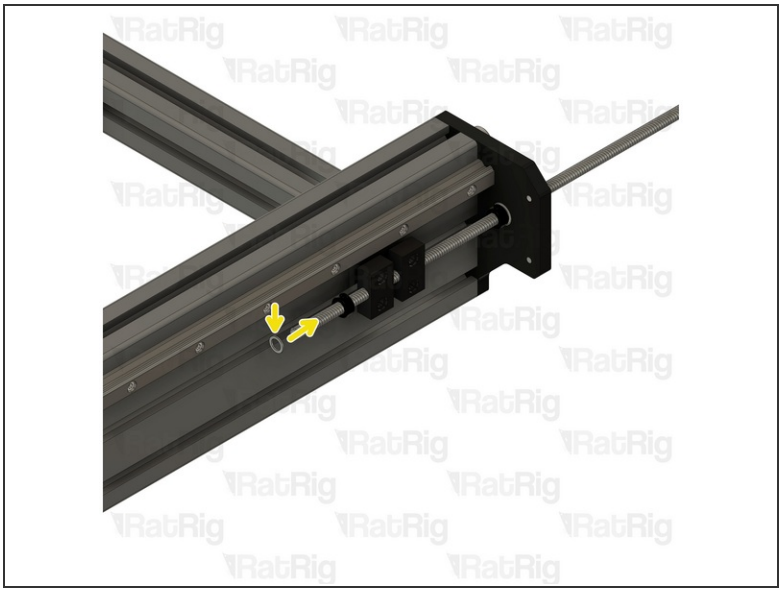


- Nut Block for TR8x8
- Screw the Lead Screw through both Nut Blocks.

Make sure the M5 Nylon Locking Hex Nuts on the Nut Blocks are facing the 40120 extrusion

Step 28 — Install the Y-Axis Lead Screw - Part 3



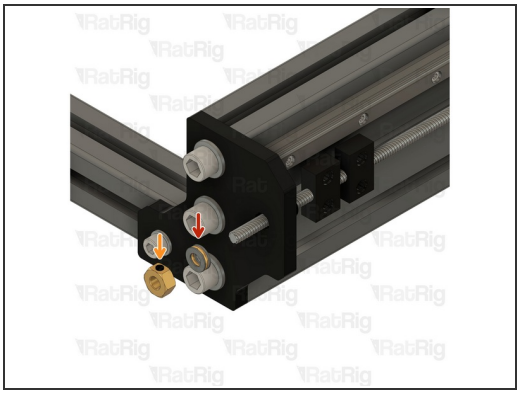


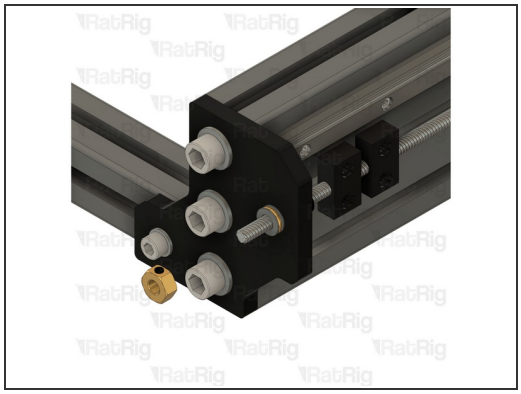
- Lock Collar 8mm
  - Slide the Lock Collar on to the Lead Screw
  - Do not tighten the screw on the Lock Collar yet.
- Precision Shim 12x8x1mm
  - Slide the Lock Collar on to the Lead Screw

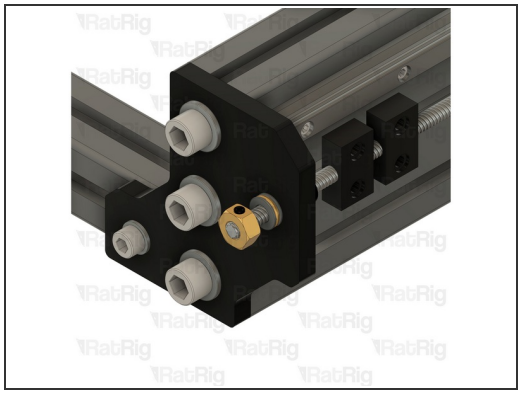
Step 29 — Install the Y-Axis Lead Screw - Part 4

- Pull the Lead screw through the ball bearing inserted on the idler plate.

Step 30 — Attach the Tensioner Nut







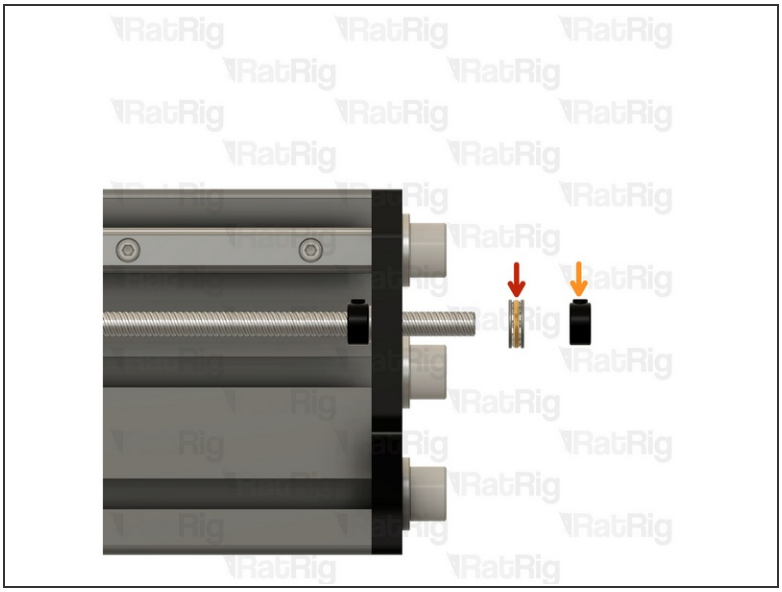
- Thrust Bearing F8-16M
- Tensioner Nut

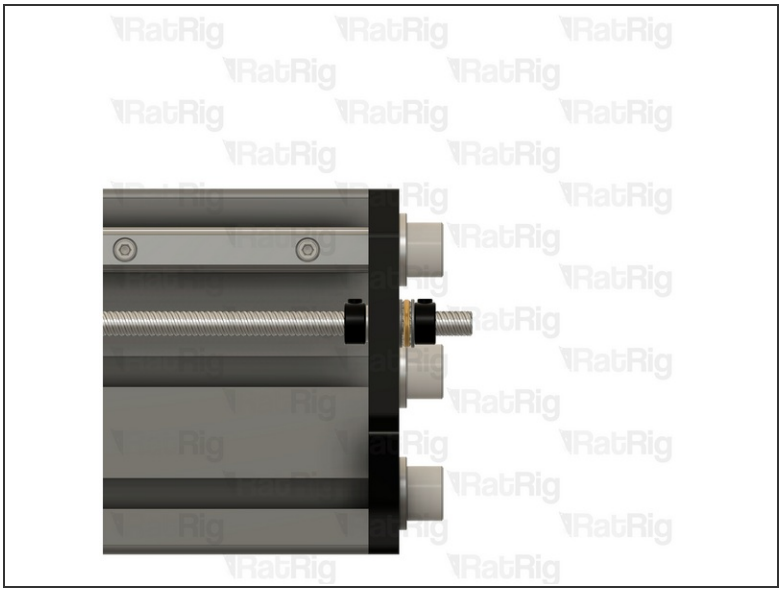
ⓘ Install the Thrust Bearing on to the exposed end of the Lead Screw as shown

ⓘ Screw the Tensioning Nut on to the end of the lead screw

⚠ Do not tighten the screw on the Tensioner Nut yet.

Step 31 — Install the remaining lead screw components





- Thrust Bearing F8-16M
- Lock Collar

⚠ Do not tighten the screw on the Lock Collar yet.

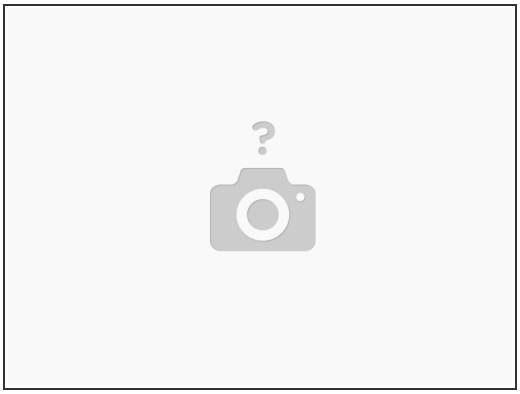
ⓘ Slide the Thrust Bearing and Lock Collar on to the Lead Screw as shown.

Step 32 — Assemble the other Y - axis Lead Screw

- Repeat **Steps 27 through 32** to assemble the remaining Lead Screw

The Lead Screws will be fully tensioned and adjusted later in the assembly process

Step 33 — Next guide



- Continue with the next guide: 02. X-Axis Gantry Assembly