Rat Rig

06. X-Axis Assembly

Written By: Simon Davie

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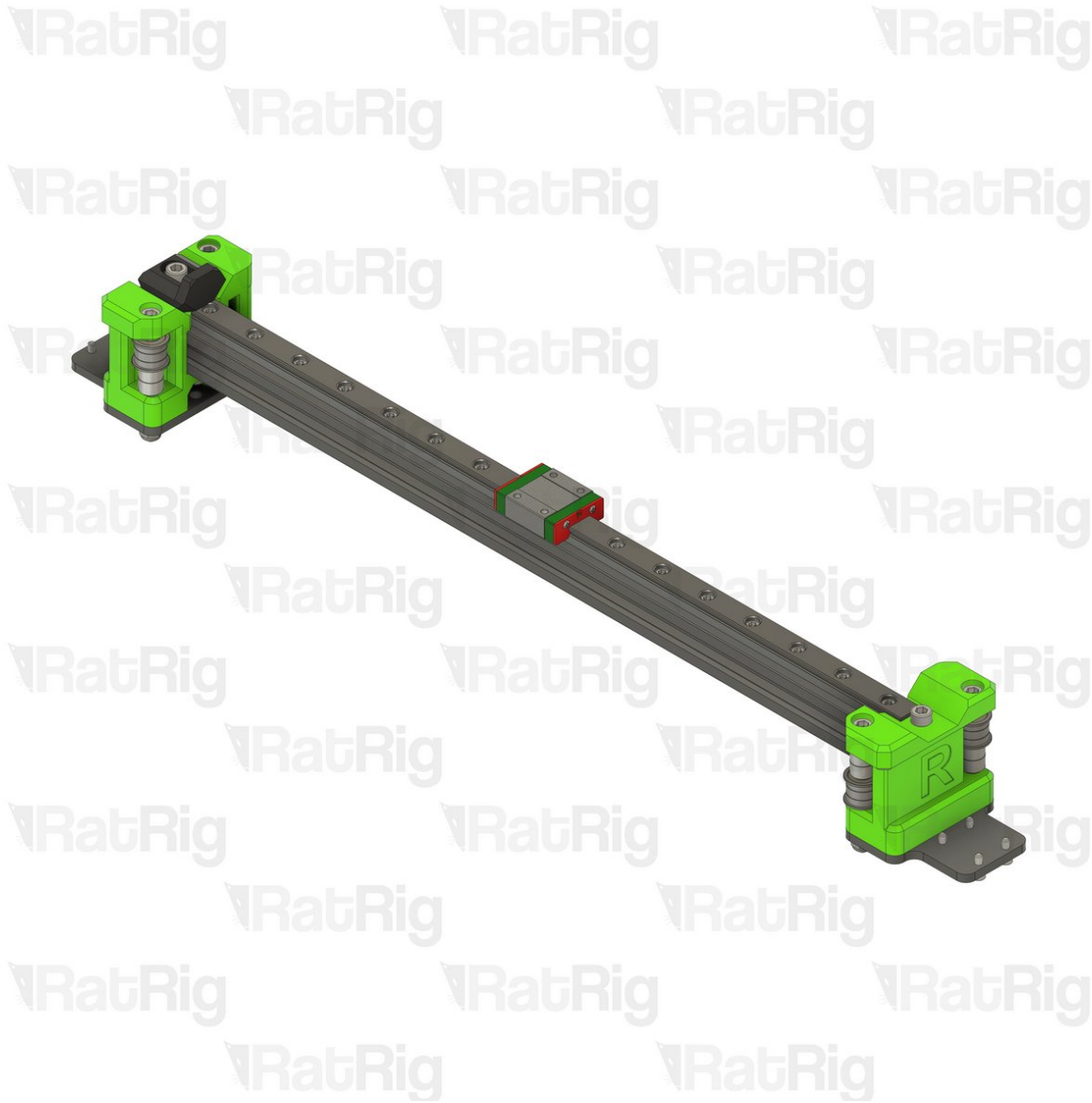
INTRODUCTION

Please note: All measurements and component counts provided in this guide are based upon building a 300x300 V-Core 3.
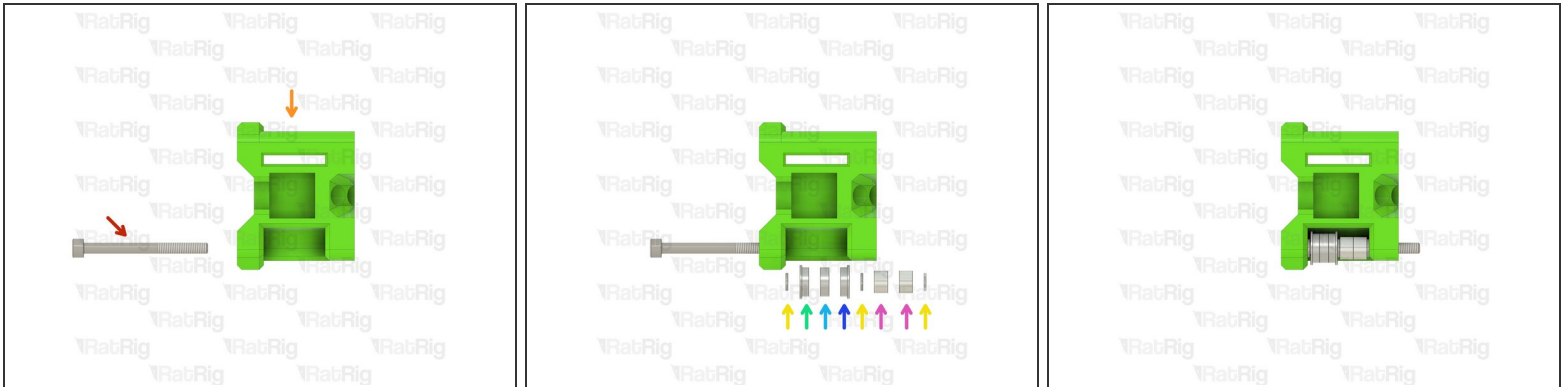
If you are building a machine of a different size, please refer to the following list for the linear rail length, 2020 extrusion length, and required number of fasteners:

- **200x200:** 300mm Linear Rail, 322mm 2020 Extrusion, 6x M3x8 Screw & 2020 T-Nuts
- **300x300:** 400mm Linear Rail, 422mm 2020 Extrusion, 8x M3x8 Screw & 2020 T-Nuts
- **400x400:** 500mm Linear Rail, 522mm 2020 Extrusion, 10x M3x8 Screw & 2020 T-Nuts
- **500x500:** 600mm Linear Rail, 622mm 2020 Extrusion, 12x M3x8 Screw & 2020 T-Nuts
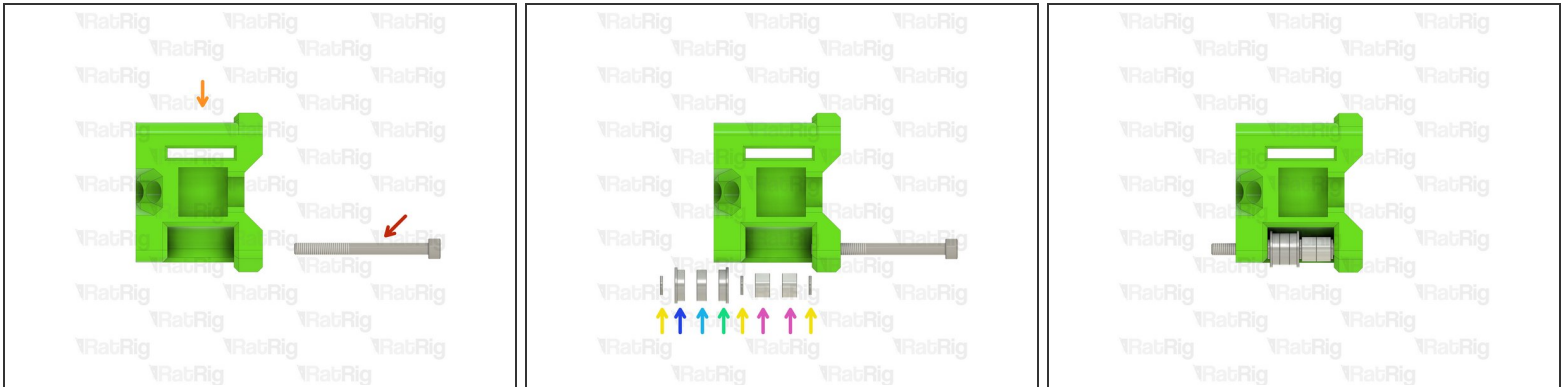
Step 1 — Prepare the x-axis end parts
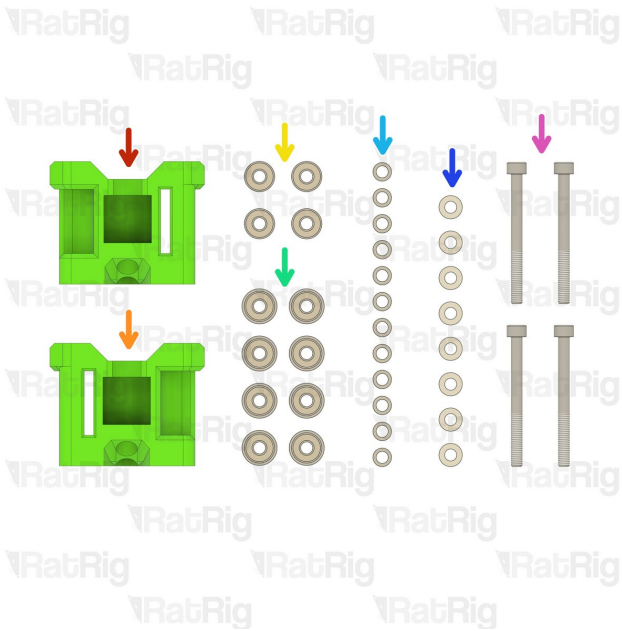
- 1x xy_joiner_left_3.1 Printed Part
- 1x xy_joiner_right_3.1 Printed Part
- 4x 695ZZ Ball Bearing
- 8x F695ZZ Ball Bearing
- 12x Mini Precision Shim
- 8x 6mm Aluminium Spacer
- 4x M5x55 Cap Head Screw

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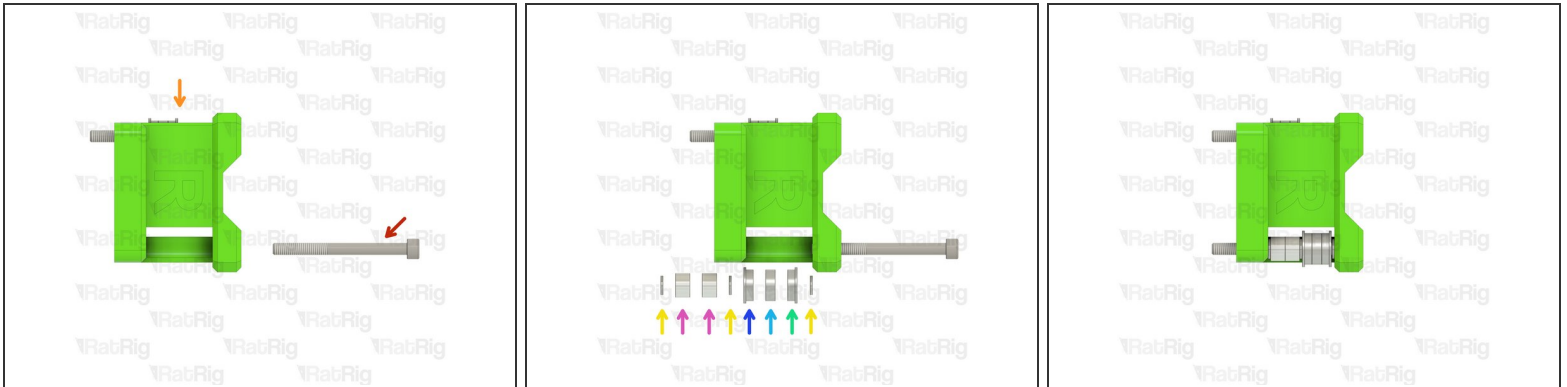## Step 2 — Assemble the left x-axis end - Part 1

- M5x55 Cap Head Screw

- xy_joiner_left_3.1 Printed Part

(i) Install the following components in the order shown in the image:

- Mini Precision Shim

- F695ZZ Ball Bearing (Flange at the top)

- 695ZZ Ball Bearing

- F695ZZ Ball Bearing (Flange at the bottom)

- 6mm Aluminium Spacer

Step 3 — Assemble the left x-axis end - Part 2
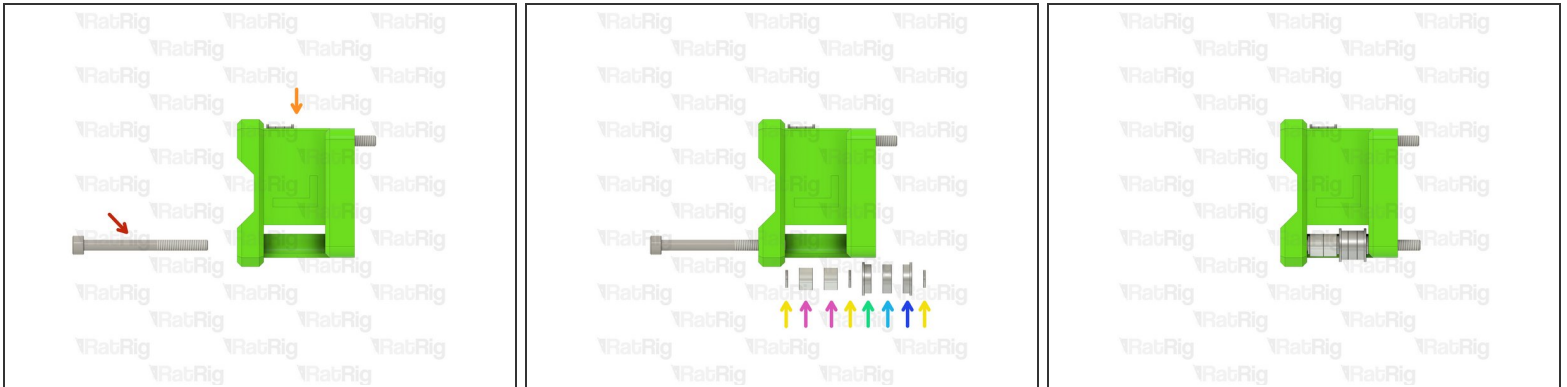
- M5x55 Cap Head Screw

- Assembly from the previous step

- ⓘ Install the following components in the order shown in the image:

  - Mini Precision Shim

  - F695ZZ Ball Bearing (Flange at the top)

  - 695ZZ Ball Bearing

  - F695ZZ Ball Bearing (Flange at the bottom)

  - 6mm Aluminium Spacer

Step 4 — Assemble the right x-axis end - Part 1

- M5x55 Cap Head Screw

- xy_joiner_right_3.1 Printed Part

(i) Install the following components in the order shown in the image:

- Mini Precision Shim

- F695ZZ Ball Bearing (Flange at the top)

- 695ZZ Ball Bearing

- F695ZZ Ball Bearing (Flange at the bottom)

- 6mm Aluminium Spacer

## Step 5 — Assemble the right x-axis end - Part 2

- M5x55 Cap Head Screw

- Assembly from the previous step

- (i) Install the following components in the order shown in the image:

  - Mini Precision Shim

  - F695ZZ Ball Bearing (Flange at the top)

  - 695ZZ Ball Bearing

  - F695ZZ Ball Bearing (Flange at the bottom)

  - 6mm Aluminium Spacer

Step 6 — Prepare the x-axis parts
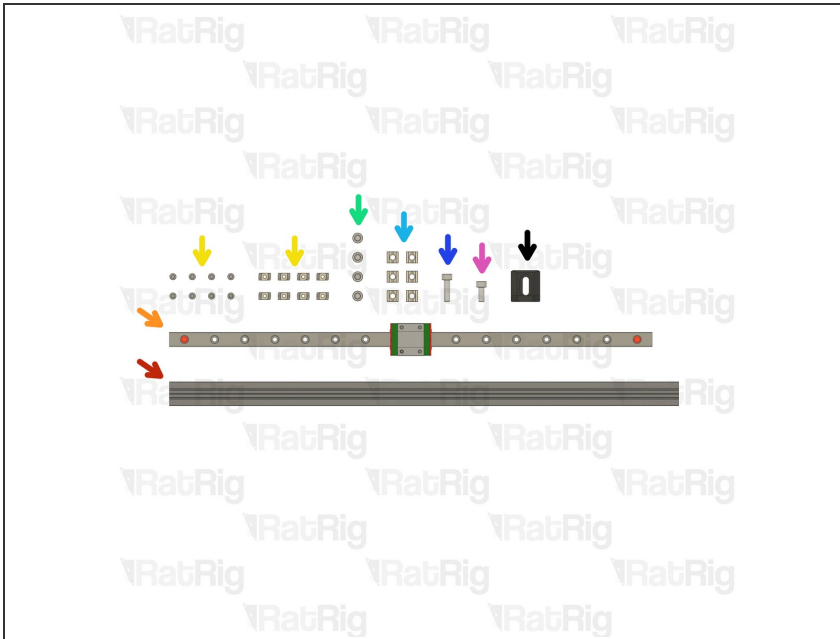
- 1x 422mm 2020 Extrusion

- 1x 400mm MGN12 Linear Rail

- 8x M3x8 Cap Head Screw & 2020 Drop-in T-Nut - M3

- 4x M5x10 Cap Head Screw

- 6x 2020 Square T-Nut - M5

- 1x M5x18 Cap Head Screw

- 1x M5x12 Cap Head Screw

- 1x x_endstop_block_3.1 Printed Part

Step 7 — Install the x-axis gantry fasteners
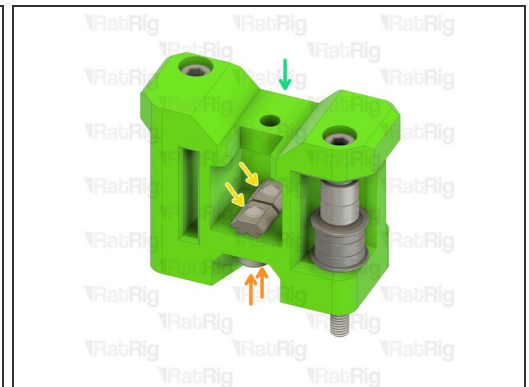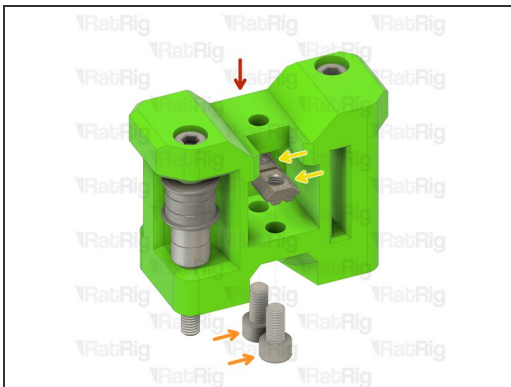
- Assembly from **Step 3**

- M5x10 Cap Head Screw

- 2020 Square T-Nut - M5

- (i) Loosely thread a 2020 Square T-Nut onto each of the M5x10 screws

- Assembly from **Step 5**

Step 8 — Assemble the x-axis gantry - Part 1
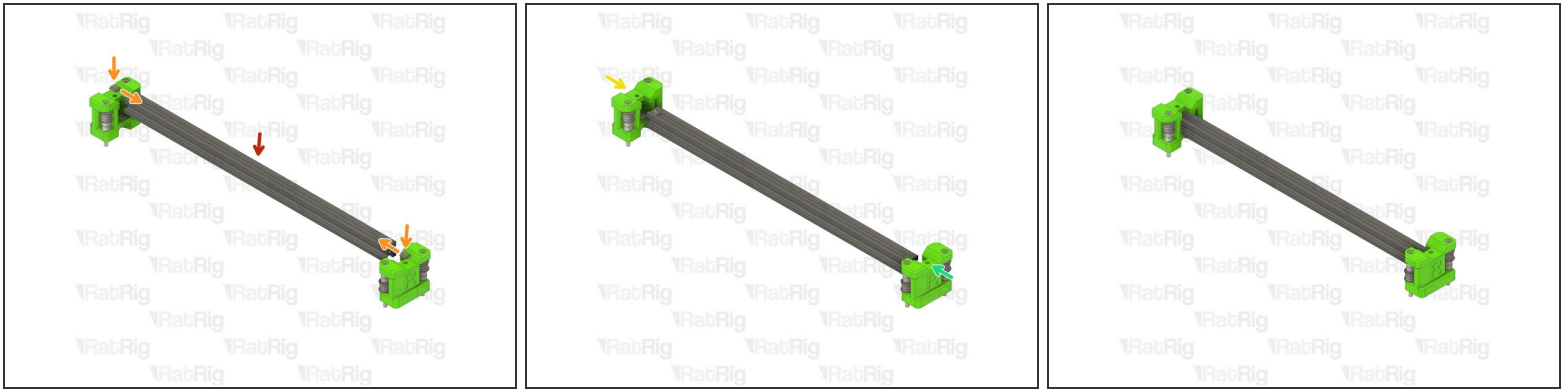
- 422mm 2020 Extrusion

- 2020 Square T-Nut - M5

  ⓘ Install one 2020 Square T-Nut into the top slot on each end of the 2020 extrusion

- Install the left x-axis end onto one end of the 2020 Extrusion

- Install the right x-axis end onto the other end of the 2020 Extrusion

⚠ Make sure the x-axis ends are fully installed on the 2020 extrusion before proceeding

## Step 9 — Assemble the x-axis gantry - Part 2
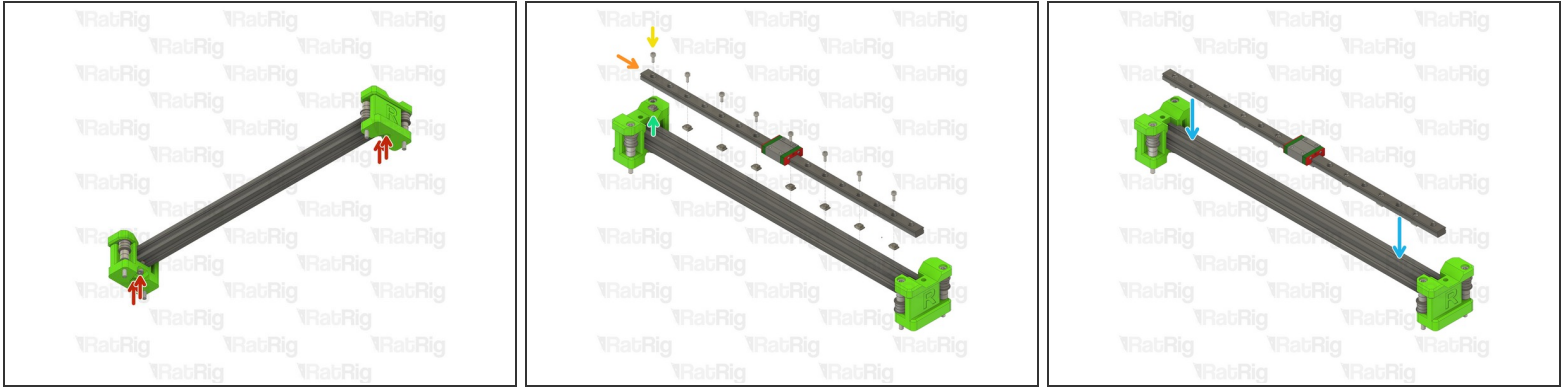
- Tighten the marked M5x10 screws to secure the x-axis ends to the 2020 extrusion

- 400mm MGN12 Linear Rail

- Insert an M3x8 screw into every other hole in the linear rail

- Loosely thread a 2020 T-Nut onto each of the M3x8 screws

- Install the linear rail into the 2020 extrusion as shown

Step 10 — Assemble the x-axis gantry - Part 3
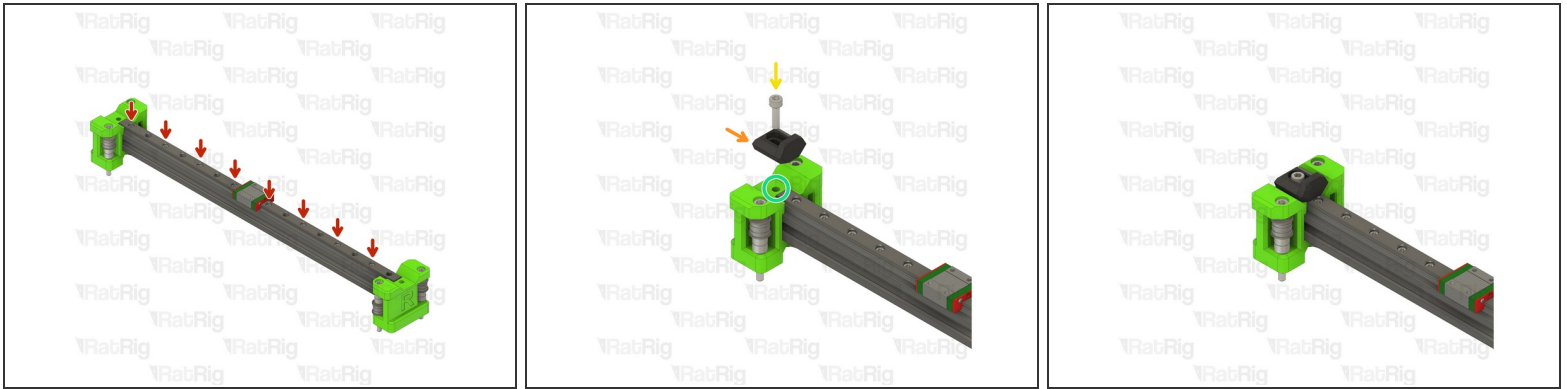
- Fasten the marked M3x8 screws, starting from the left

- x_endstop_block_3.1 Printed Part

- M5x18 Cap Head Screw

- Make sure the previously installed 2020 square T-Nut is aligned with the marked hole. A small screwdriver or hex key can be used to help position it correctly

- (i) The correct positioning for the x_endstop_block will be set when building the EVA3 assembly at a later point

- ⚠ Take care not to over tighten the M5x18 screw as you can damage the printed parts

Step 11 — Assemble the X-axis gantry - Part 4
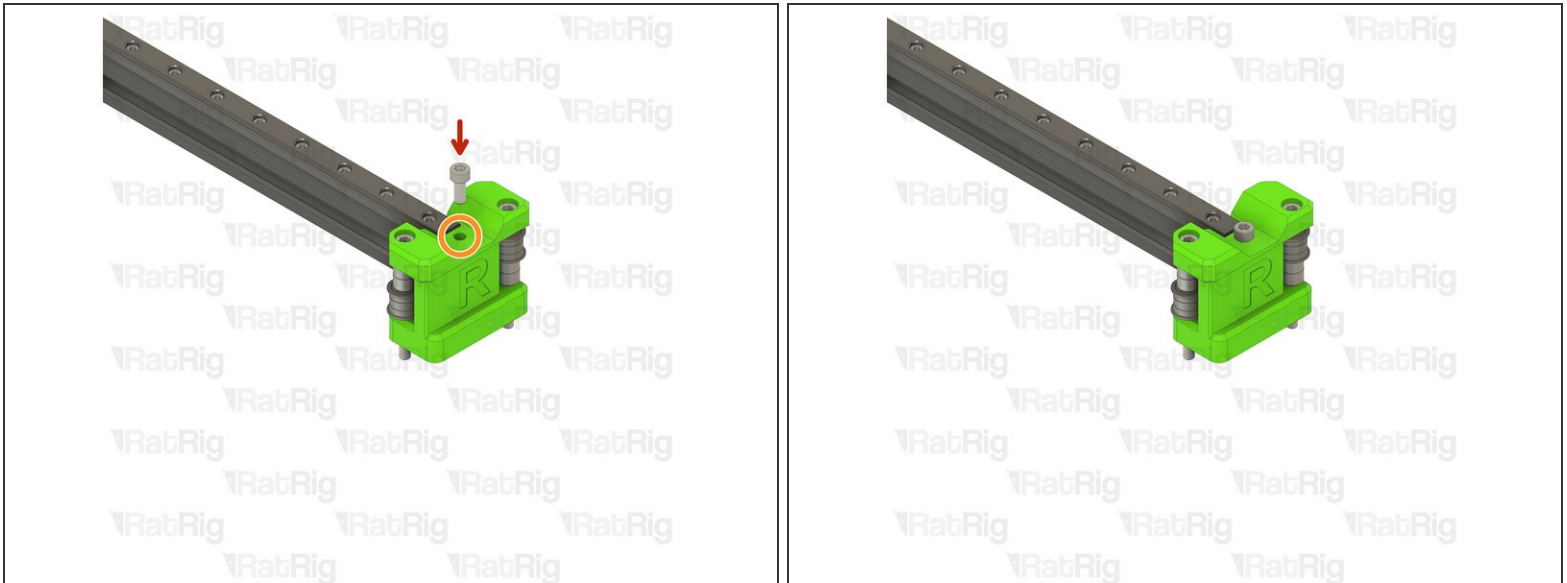
- M5x12 Cap Head Screw

- Make sure the previously installed 2020 square T-Nut is aligned with the marked hole. A small screwdriver or hex key can be used to help position it correctly

⚠️ Take care not to over tighten the M5x12 screw as you can damage the printed parts

Step 12 — Prepare the X-axis gantry plate parts
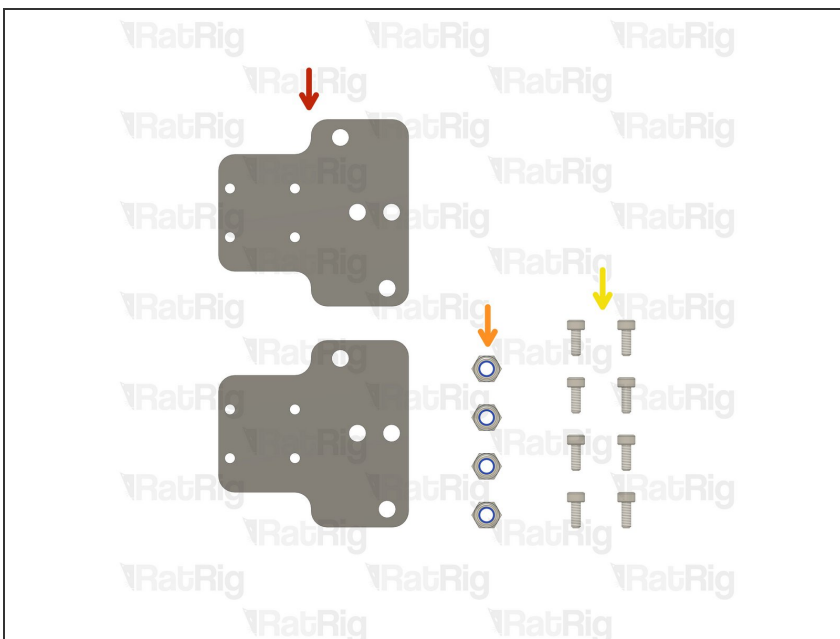
- 2x xy_joiner_plate

- 4x M5 Nylon Locking Hex Nut

- 8x M3x8 Cap Head Screw

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## Step 13 — Install the x-axis joiner plates

- xy_joiner_plate

  ⚠ Check that the xy_joiner_plate is installed in the correct orientation. It should be flush with the xy_joiner printed part. If it is not, flip the plate upside down and check again

- M5 Nylon Locking Hex Nut

ⓘ Tighten the M5x55 screws into the M5 nylon locking hex nuts to secure the plate to the printed part

ⓘ Repeat these steps for the right hand side

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Step 14 — Install the x-axis assembly
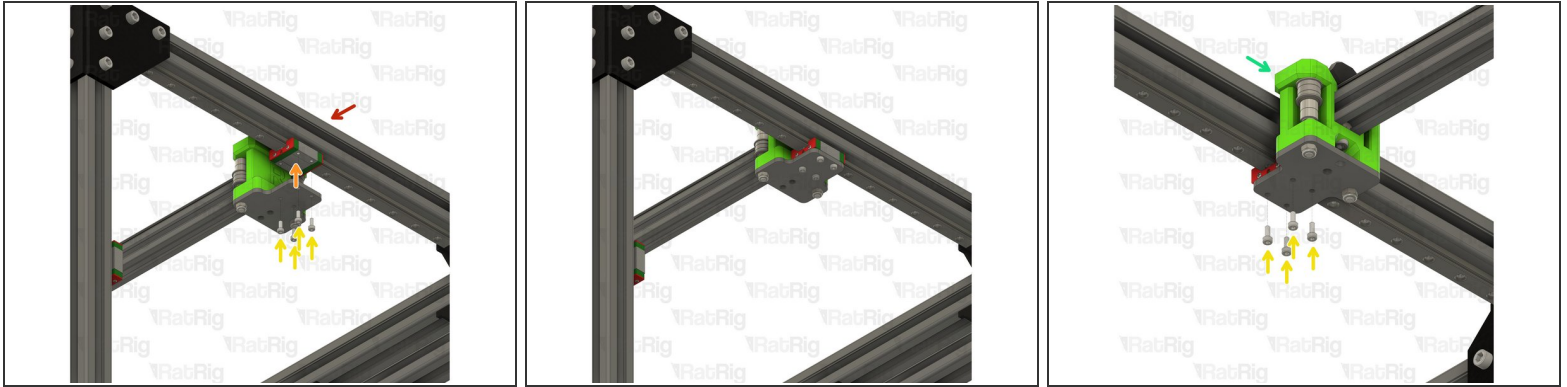
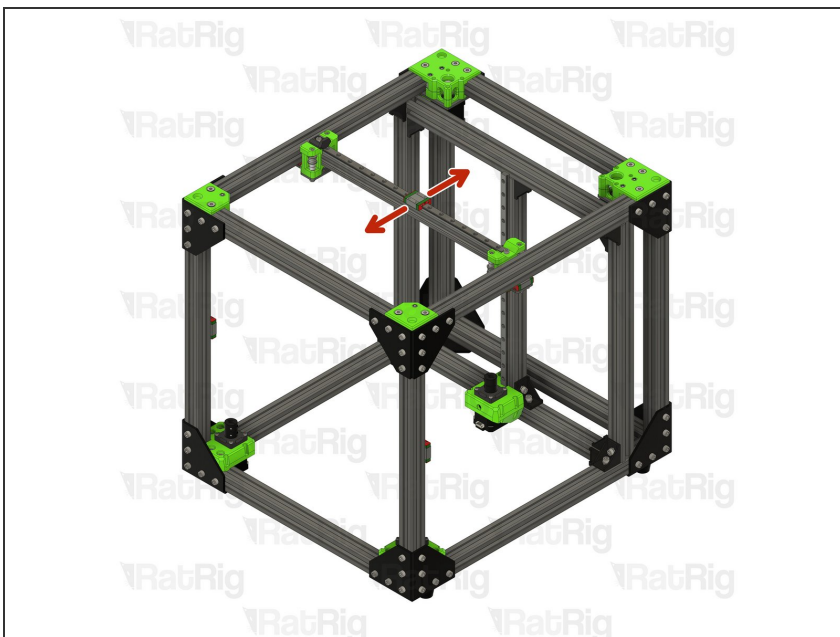- V-Core 3.1 Frame Assembly

- X-axis Assembly (Right side)

- M3x8 Cap Head Screw

- (i) Secure the right side of the x-axis to the right y-axis linear rail as shown

- X-axis Assembly (Left side)

- (i) Secure the left side of the x-axis to the left y-axis linear rail as shown
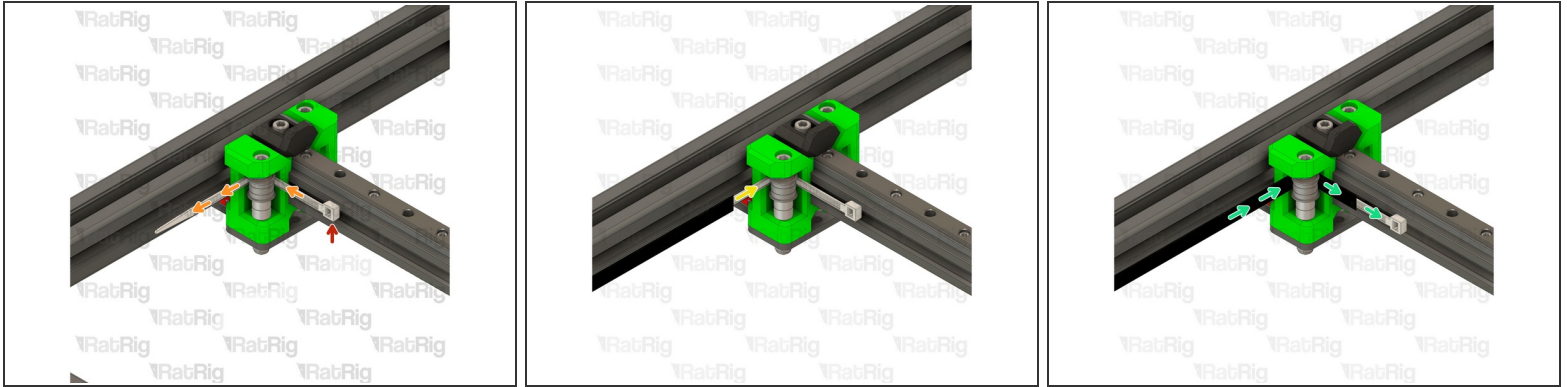
Step 15 — Test the y-axis movement

- Test the movement of the y-axis over the full travel distance

- ⚠ Small changes in resistance are normal, but becoming much harder to push, or binding completely are not

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Step 16 — How to easily insert the belts

📌 This step is not mandatory, it's just a Rat Rig tip on how to feed the belts on the idlers.

- Zip Tie

  ⓘ The wider the zip tie is, the easier the process will be

- Bend the tip of the zip tie a little bit and feed it between the printed part and the idler, as shown

- Insert the belt between the zip tie and the idler

- Slowly feed the belt and pull the zip tie at the same time
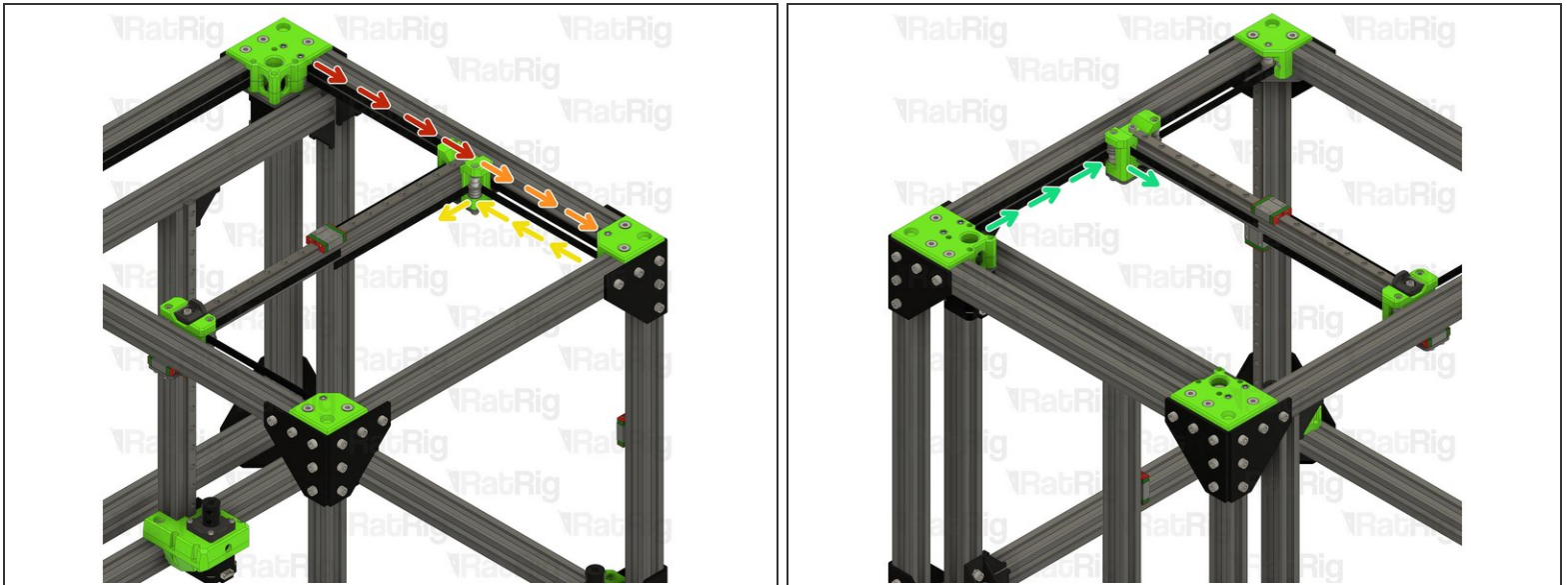
Step 17 — Route the CoreXY belts - Part 1

ⓘ Take the loose end of the **top** CoreXY belt on the left hand side:

- ● Feed the belt behind the left xy_joiner

- ● Down and around the front xy_idler

- ● Around the front bearing stack on the left xy_joiner

ⓘ Take the loose end of the **bottom** CoreXY belt on the left hand side:

- ● Feed the belt around the rear bearing stack on the xy_joiner

Step 18 — Route the CoreXY belts - Part 2

ⓘ Take the loose end of the **bottom** CoreXY belt on the **right** hand side:

- 🔴 Feed the belt behind the **right** xy_joiner

- 🟠 Down and around the **front** xy_idler

- 🟡 Around the **front** bearing stack on the **right** xy_joiner

ⓘ Take the loose end of the **top** CoreXY belt on the **right** hand side:

- 🟢 Feed the belt around the **rear** bearing stack on the xy_joiner

Step 19 — Next guide

- ⚫ Continue with the next guide: 07. Bed Arm Assemblies

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