



Advanced 3D Printing (A3DP) Gantry Upgrade Kit Installation Guide

Installation process overview

Introduction.

This guide covers the process of modifying your Troodon 300 or 400 printer with Advanced 3D Printing Gantry Upgrade Kit. The kit allows you to:

- Get rid of stock XY chain that causes rattling, collisions with other parts of printer's infrastructure and unnecessary pressure on the print head.
- Use of improved DDE extruder (the Ultimate Extruder), better XY kinematics and MGN12h rail.
- Redesigned print head, that allows installation of multiple hot ends (e.g. Dragon or Takoto).
- Optionally – optical end stops.

The guide covers:

- Kit content and preparation.
- Extruder assembly.
- Printhead assembly.
- Gantry upgrades.
- Wiring and cable chains.
- Belts tensioning.
- Klipper configuration.



Please note that gantry upgrade process requires sufficient knowledge, intermediate-to-advanced skill level and an assortment of tools, spares and fasteners. Your printer may become inoperable or even damaged if the installation goes wrong.

You acknowledge & accept this risk by proceeding with the upgrade.

Supported configurations.

By default, e.g. with no additional modifications, the kit supports:

- DDE extruder modified by A3DP aka Ultimate Extruder (in this document referred to as "Extruder"). You will need parts from the stock Videdino DDE extruder to assembly the A3DP extruder as described in **Step 2** "Assemble Extruder".
- Stock Troodon hot end (Dragon hot end), Takoto hot end or Mosquito hot end. This version of the guide covers Dragon and Takoto hot ends. Where appropriate, hot end-specific installation steps are highlighted with icons:



Dragon hot end



Takoto hot end



Takoto hot end is approximately 5mm taller than Dragon. If you are planning to use the Takoto hot end, please print appropriate version of BLTouch Mount (please refer to **Step 1.3** "Parts to print").



Some printers arrive with the E3D clone hot end instead of the Dragon. This configuration is not supported, please procure a supported hot end before proceeding.

1. Kit content.
2. What you need.
3. Parts to print.
4. Preparation.

Step 1. Preparation.

1. Stock DDE extruder.
2. Main housing.
3. Idler door.
4. Final assembly.

Step 2.
Assemble Extruder

1. Parts preparation.
2. hot end and hot end cooling.
3. Part cooling.
4. BLTouch.
5. Extruder.

Step 3.
Assemble Printhead

1. Wires preparation.
2. X rail.
3. Front idlers.

Step 4.
Upgrade Gantry Part 1

1. XY motors.
2. Cable chain brackets and end stops.
3. Cable chains and wiring.

Step 5.
Upgrade Gantry Part 2

1. Belts and gantry alignment.
2. Klipper configuration.
3. Wrapping up.

Step 6.
Belts and Configuration



Step 1. Preparation

1.1 Kit content

a. Check included parts

Check all parts are included and not damaged in transit (Diagrams 1.1a – 1.1k below). Printed parts are not included, **Step 1.3** “Part to print” contains the link to printable STLs required. Alternatively, please contact A3DP if you want the parts printed..

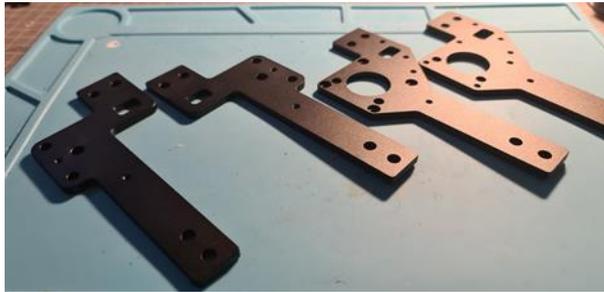


In this guide, parts from the kit are **highlighted** when referenced.



Please note that the kit requires certain parts from the stock printer to be reused.

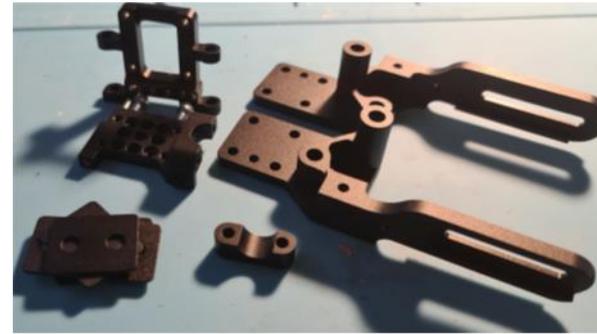
Machined Parts Set 1



- Lower Motor Mounts x 2
- Upper Motor Mounts x 2

Diagram 1.1a

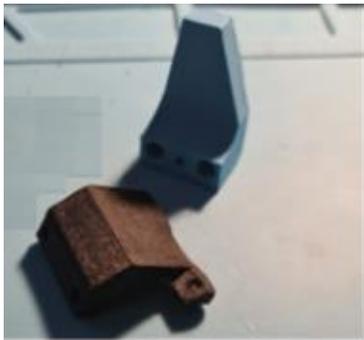
Machined Parts Set 2



- XY Mounts x 2
- X Carriage Mount Assembly x 1
- Second hot end clamp (for dual hot end install) x 1
- 1mm shim x 6

Diagram 1.1b

Printed Parts Set 1



- Mechanical Y end stop trigger (if not using 2nd optical end stop, not used in this guide) x 1
- Y optical end stop mount

Diagram 1.1c

Printed Parts Set 2



- XY cable chain bracket x 1
- X cable chain bracket x 1
- Extruder main housing x 1
- Extruder idler door x 1
- Optical Y end stop trigger.

Diagram 1.1d

1.1 Kit content (Cont.)

Bits Set 1



- Optical end stop. 1 optical end stop (to replace stock mechanical X end stop) is included. 2nd optical end stop shown needs to be requested when ordering the kit to optionally upgrade mechanical Y end stop. This guide uses 2 optical end stops for complete optical end stop upgrade.
- Set of washers and spacers, including steel washers and 1mm spacers.
- *(Image shown not representative of quantities)*

Diagram 1.1e

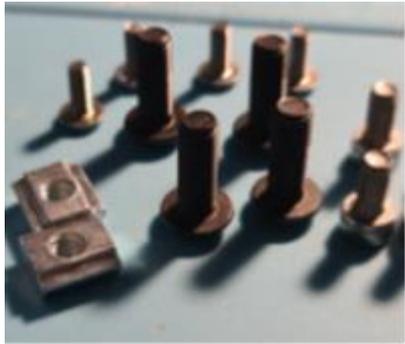
Bits Set 2



- Idlers x 6
- Idler Pins x 4
- 20mm shoulder bolts x 4
- 25mm shoulder bolts x 2 (need to be requested for older printers when ordering the kit, not used in this guide).
- Long M4 bolts x 2
- XY mount brackets x 2
- Pin retaining clips x 2

Diagram 1.1f

Bits Set 3



- Z bracket replacement bolts x 4
- Rear extrusion motor mount T nuts x 2
- M4 round hex bolts for T nuts x 2
- Button head bolts for carriage to rail mount x 4

Diagram 1.1g

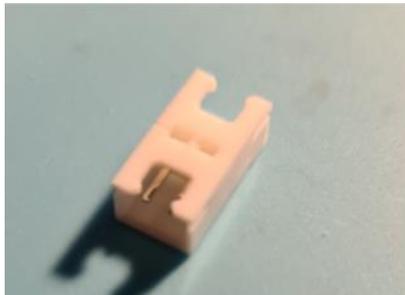
Linear Rail



- X Linear Rail x 1

Diagram 1.1h

Part Colling Fan Connector



- Optional - a female-to-female JST connector that allows plugging the 5015 part cooling fan. This part is being added to the kit in 2022 so older kits may not have this included. Please refer to **Step 3.3** "Part Cooling" for details.

Diagram 1.1k

1.2 What you will need

a. What you will need.

- **Operational Troodon 300 or 400 printer with DDE kit installed.** The “Assemble Extruder” step in this guide involves conversion of stock DDE extruder into the “Ultimate” extruder compatible with the kit and DDE wiring must already be in place. Please purchase and install the DDE upgrade kit from Vivedino if your printer is set up as a Bowden, or contact A3DP.
- **Workspace and tools.** You should be able to access the printer from all sides including the back side. Please use appropriate workbench arrangement. You will need a variety of tools such as hex and Philips's drivers, pliers, cutters, cable ties, lube etc. You will also need an assortment of bolts (M3 and M2.5) – you can always reuse matching bolts from the stock Troodon parts that will be removed during the upgrade, however it is advisable to procure one of the widely available fastener kits such as “assorted m3 bolts”.
- **For Troodon 400** you may also need extra wires, JST connectors and crimping tool to extend stock wiring. In most cases, this is not needed, but you must be careful with wires, so they won't be too short or too stretched. Run the wires as neatly as possible; you can also rotate the motherboard to avoid extending the wires.
- **Part Cooling Assembly.** Unless you plan to convert to Berd-Air (not covered in this manual), you will need a 24V 5015 blower fan with the JST connector.



You will also need to print parts (please see **Step 1.3** “Parts to print” for details).



30mm stock Troodon hot end fan is ok for the Dragon, however an upgraded fan (e.g. 40mm radial fan) can be beneficial for Takoto. Please print appropriate duct for the high-flow 25mm “mosquito” fan or a 30 or 40 mm axial or radial fan.



Unless you have a spare 3D printer it is advisable to print the parts and test fit the part cooling assembly upfront (please see **Step 3** “Assemble Printhead” for details).



Printers manufactured by Vivedino vary – sometimes they use different components, apply improvements or change the hardware. It may be possible that your printer is different to what is described in this guide. Please contact us if having trouble with the upgrade.



Optionally some 5mm inner diameter, 7mm outer diameter and 0.5mm thickness steel washers (if not provided with the kit) – as some printers come from factory without them. Please check **Step 4.2** for details.

- **Installed and operational Klipper.** This is an optional requirement the Gantry Upgrade Kit, however testing instructions and any changes to the printer configuration (BLTouch settings, end stop settings) described in the “Configuration and Testing” section are provided for Klipper/Mainsail only. We recommend A3DP Klipper kit to be installed before the gantry upgrade (please refer to *Klipper Kit Installation Guide* for details). Please contact A3DP if you want to use the stock (RepRap) firmware.

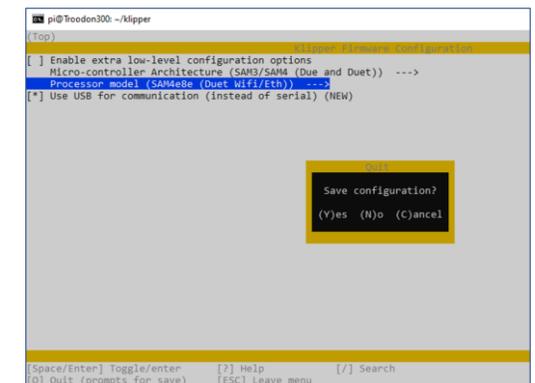
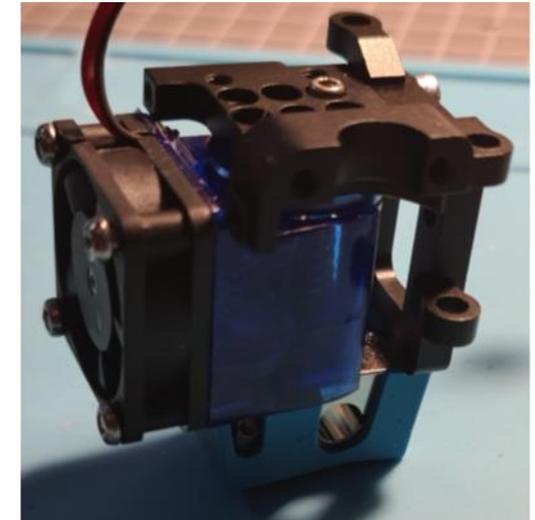


Diagram 1.2

1.3 Parts to print

a. Print required parts.

For the part cooling duct, please download and print the STL for 5015 blower fan from ([Diagram 1.3](#)). Note the slotted mount holes on the duct, these are used to adjust the height of the duct for Takoto or Dragon hot end. Look for “Adjustable 6mm 5015” STL in the “Parts Cooling” folder on the shared drive accessible from the link below.

For the cable management please download and print cable chain STLs. You will need to print X and Y chains. Each chain requires approximately 23 links and clips Troodon 300 and 27 for Troodon 400, one top and one bottom links. Alternatively, you may prefer to re-use stock Troodon cable chain for Y and or purchase a manufactured cable chain of appropriate style and size (approximately 15mm x 15mm internal dimensions) for the X chain - or both X and Y.



For Takoto hot end please download and print the hot end fan duct STL for the fan used ([Diagram 1.4](#)). Other fans configurations are also available on request.

You will also need to print a BLTouch mount. 2 STLs are available – shorter version for Dragon hot end and longer version for Takoto hot end. Please print the one that matches your hot end of choice.

All STLs listed above are available from:

<https://advanced3dprinting.com/gantry-install/>

https://www.thingiverse.com/search?qdsd=a3dp_gantry&type=things&sort=relevant



Optionally, you may consider downloading and printing a BLTouch dummy ([Diagram 1.5](#)) from <https://www.thingiverse.com/thing:2784911>. This will help with test fit assembly of the Printhead (**Step 3** “Assemble Printhead”) and prevent accidental damage to the stock BLTouch..

Print parts using a heat – resistant material such as Polycarbonate, ABS or ASA. BLTouch dummy can be printed using any filament, e.g. PLA, PETG, etc.



Diagram 1.3



Diagram 1.4



Diagram 1.5b

1.4 Preparation

a. Prepare your printer and the workspace

- Unload filament and set the printhead position above the build plate so it is convenient to work on.
- Power off the printer and disconnect from the power source.
- Place the printer on the workbench so you can access all sides of the printer (front, back, left and right).
- Remove left, right and back vertical acrylic panels. You may also consider removing the front door.
- Remove front and right electronics enclosure panels. ([Diagram 1.6](#))



You will need to temporary disconnect power switch wires in order to remove the back panel. Please take picture or note the wiring schema before disconnecting. **Consult certified electrician if required.**

- Remove the plastic panel surrounding the build plate – you will need to remove the bracket holding Z chain ([Diagram 1.7](#)) first.
- Disconnect all printhead wires and remove all components – hot end, fans, ducts, BLTouch and extruder ([Diagram 1.8](#))
- Remove stock XY Chain ([Diagram 1.9](#)). You will need to remove bolts and cut cable ties on both sides of the chain and unclip chain link covers to free up wires.



Store all the removed parts for further reuse.



Diagram 1.6

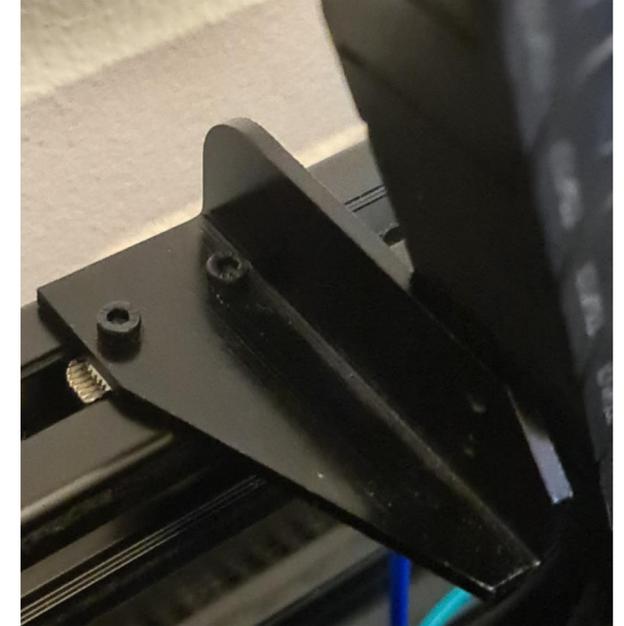


Diagram 1.7

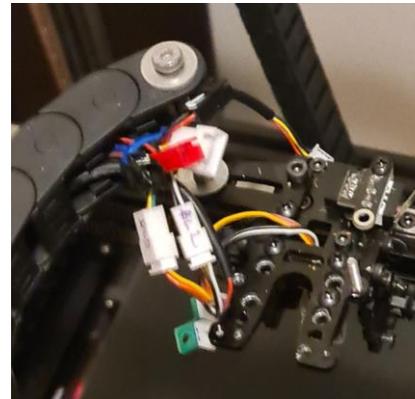


Diagram 1.8

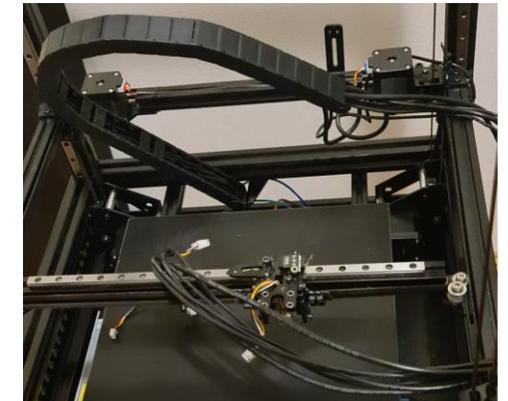


Diagram 1.9



Step 2. Assemble Extruder

2.1 Stock DDE extruder

a. Remove and disassemble stock DDE extruder

Disconnect stock DDE extruder from the wiring harness, unscrew two mounting bolts, remove the extruder and disassemble it to collect following parts ([Diagram 2.1](#)):

1. Extruder Motor and two motor retaining bolts.
2. Plastic gear housing plate.
3. Main gear assembly and three satellite gears.
4. Main gear ball bearing.
5. Idler gear.
6. Idler gear pin.
7. Idler door pin.
8. Tension thumb screw assembly (thumb screw, tension spring and plastic washer).



You will not need stock extruder main housing and idler door anymore.



Please note that Idler gear has a ball bearing inside which may fall off when disassembling. Please be careful and don't lose it.

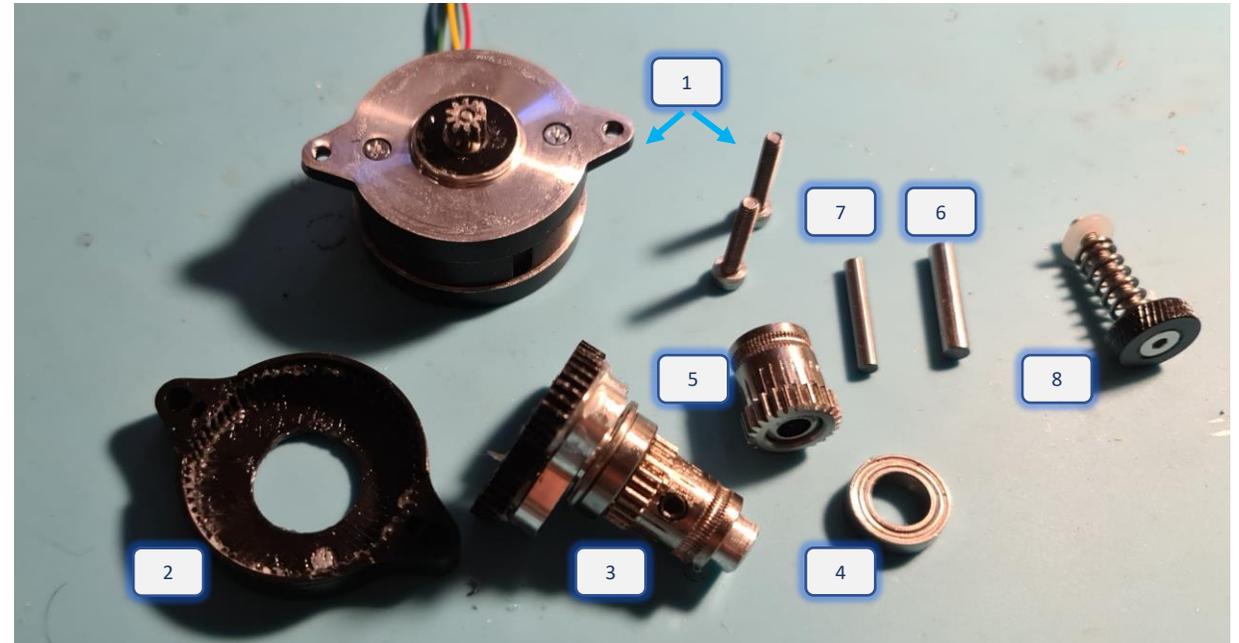


Diagram 2.1

2.2 Main housing

a. Assemble main housing

Insert main gear ball bearing into provided [Extruder main housing](#). ([Diagram 2.2](#)).



Extruder main housing is printed using resin and is somewhat fragile. Please avoid excessive force and/or any form of heating when placing the main gear ball bearing.

Insert the main gear assembly into the housing ensuring it connects with the ball bearing. Verify that three satellite gears are in place ([Diagram 2.3](#)). Rotate main gear assembly by hand and ensure it rotates freely and does not rub against the housing.



You may want to check the lubrication on gears and add some silicone lube as required. Use only high-end silicone as some materials can be sensitive to lubricants or swell. Do not mix different types of lube.

Place plastic gear housing plate on top of the main gear assembly and install the motor ([Diagram 2.4](#)). Please note that you may need to rotate the motor back and forward to ensure that the gear on the motor shaft is properly aligned with satellite gears. Secure the motor to the housing with two retaining bolts.



Avoid overtightening of bolts.

Thread a straight piece of filament through the extruder and ensure that it aligns with the filament guides inside the housing and with the groove on the main gear. ([Diagram 2.5](#)). If the main gear does not align, loosen the main gear grub screw and push the filament back and forward until it is aligned, then re-tighten the grub screw.



Ensure there is no excessive resistance or rubbing when you move the filament across the filament path. However, the filament path should feel slightly tighter comparing to the stock extruder.



Diagram 2.2

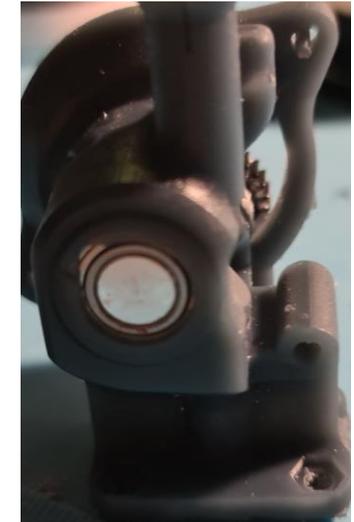


Diagram 2.3

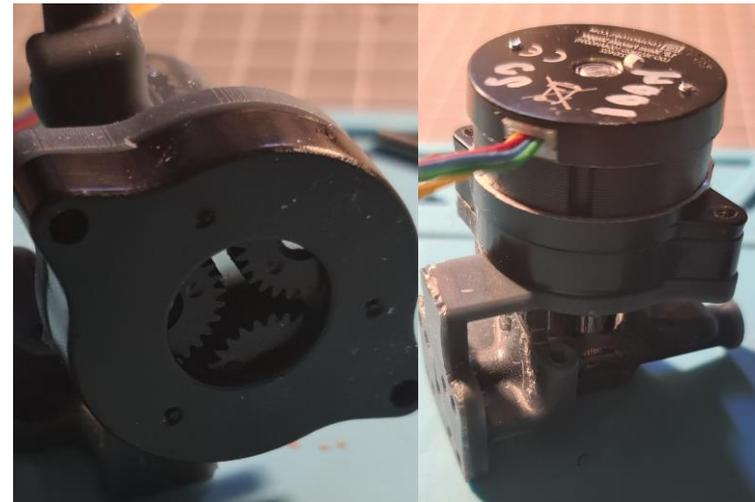


Diagram 2.4



Diagram 2.5

2.3 Idler door

a. Assemble and install idler door

Test fit idler gear pin to the idler door and the idler door pin to the idler door and main extruder housing (Diagram 2.6).



Idler door pin and idler gear pin have different diameters, please ensure you are using the right one as per the diagram.



Idler door pin and idler gear pin need to be inserted only from one side of the door, mounting holes on the other side of idler door are narrowed to secure the pins. Please ensure the pins are placed correctly as per the diagram.

Remove both pins, then place the idler gear into the idler door ensuring that the idler ball bearing stays inside the idler and secure it with the idler gear pin. Ensure that the idler rotates freely and does not rub against the arm even when light pressure is applied to it (Diagram 2.7).

Mount the idler door onto the extruder main housing and secure it with the idler door pin (Diagram 2.8).

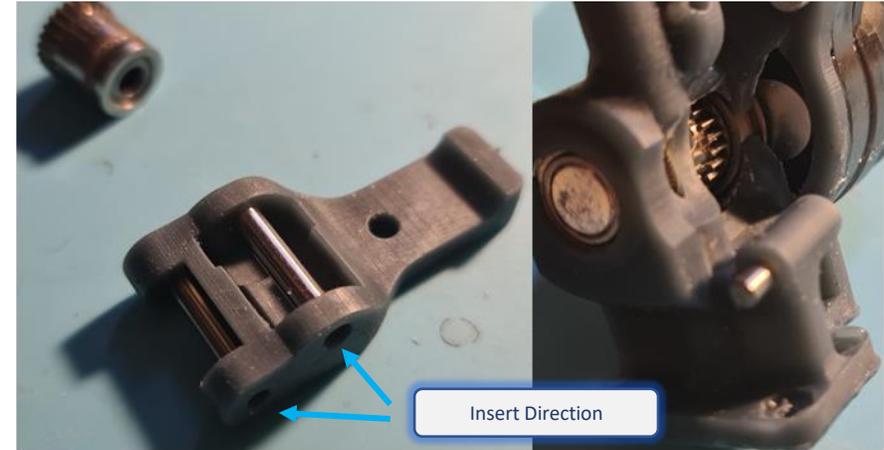


Diagram 2.6

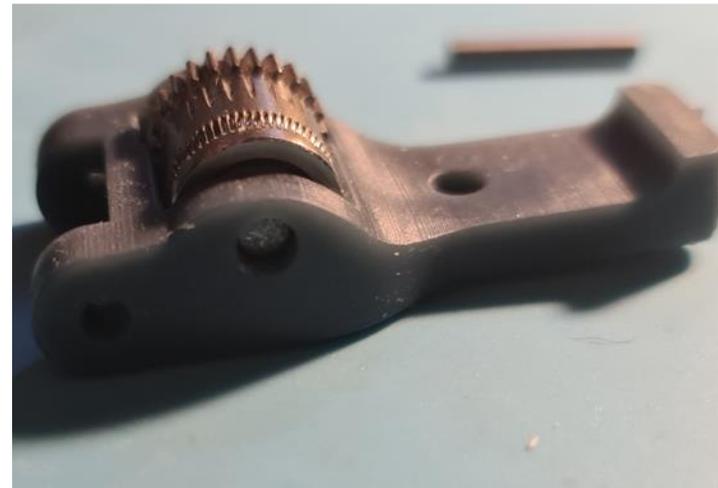


Diagram 2.7

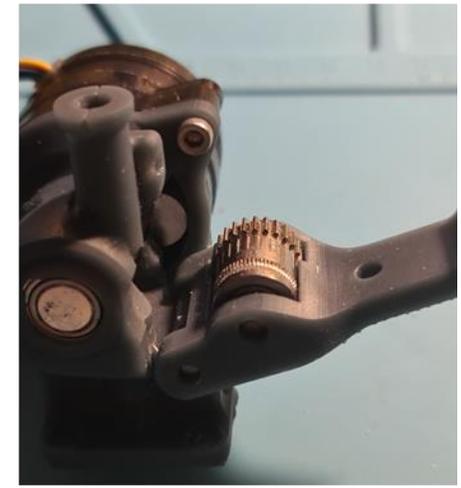


Diagram 2.8

2.4 Final assembly

a. Finalise assembly

Install the tension thumb screw assembly – the thumb screw, spring and plastic washer (**Diagram 2.9**). Please note that **main extruder housing** does not have a metal insert for the thumb screw, the thumb screw is supposed to be tightened against the body of the main housing.



Avoid overtightening of the thumb screw as it may damage the body of the main housing. If you find that the stock tension spring is too stiff you may replace it with a softer one, e.g., ballpen spring.

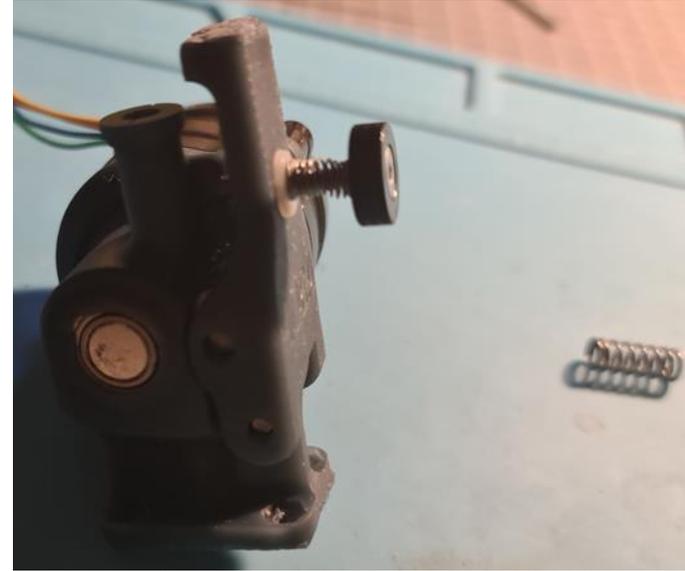
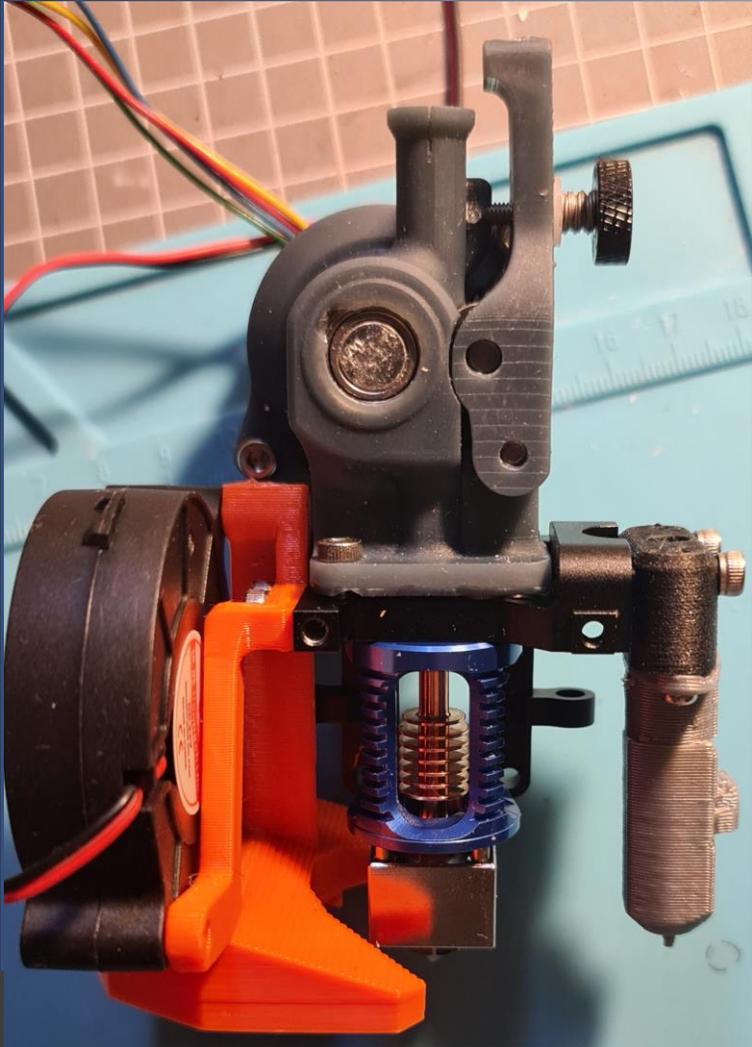


Diagram 2.9



Step 3. Assemble Printhead

3.1 Parts preparation

a. Prepare parts, components and hardware

Prepare following parts (([Diagram 3.1](#)):

- hot end of choice with hot end mounting hardware:



4xM2.5 bolts for the Dragon.



2xM2.5 bolts for Takoto.

- Part cooling assembly, containing part 5015 24V part cooling fan, printed part cooling fan duct and mounting hardware (a set of M3 bolts).
- hot end cooling fan, hot end fan duct and mounting hardware (set of screws and bolts depending on your setup):



Stock Troodon duct and fan for Dragon.



Printed duct and 40mm radial fan for Takoto.

- BLTouch - a stock BLTouch sensor or printed dummy and BLTouch mount.
- Short piece of PTFE tubing.
- Assembled extruder as described in **Step 2**.
- Assembled [X Carriage mount](#) – 2 plates that form the mount should be firmly attached "original kit is one piece carriage and rev 2 is 2 piece". If your mount arrived disassembled, attach [hot end mount plate](#) to the [rail mount plate](#) using provided [2xM3 bolts](#) and [2x1.5mm pins](#).
- Either the fan splitter board used in stock Troodon or – if provided in the kit – [female-to-female JST connector](#).



At this stage we are only test fitting the hot end to ensure that all parts are available and can fit together before we start disassembling the printer. After this section, assembled parts will be temporary removed to simplify further steps described in "Assemble Gantry" step.



Diagram 3.1

3.2 hot end and hot end cooling

a. Install hot end and hot end cooling fan assembly.

Secure the hot end to the [hot end mounting plate](#) of the provided [X Carriage mount](#) (**Diagram 3.2**). For the illustration/test fit purposes, only two out of four mounting bolts are installed for the Dragon, please use all four for the final installation.

 Note mounting bolt heads may not be flush with the [hot end mounting plate](#) – main extruder housing has corresponding grooves to accommodate that.

Attach hot end fan to the hot end fan duct and the hot end fan duct to the hot end (**Diagram 3.3**).

 **For test fitting purposes only** - remove hot end fan and hot end fan duct assembly from the hot end for the rest of the test fit process.

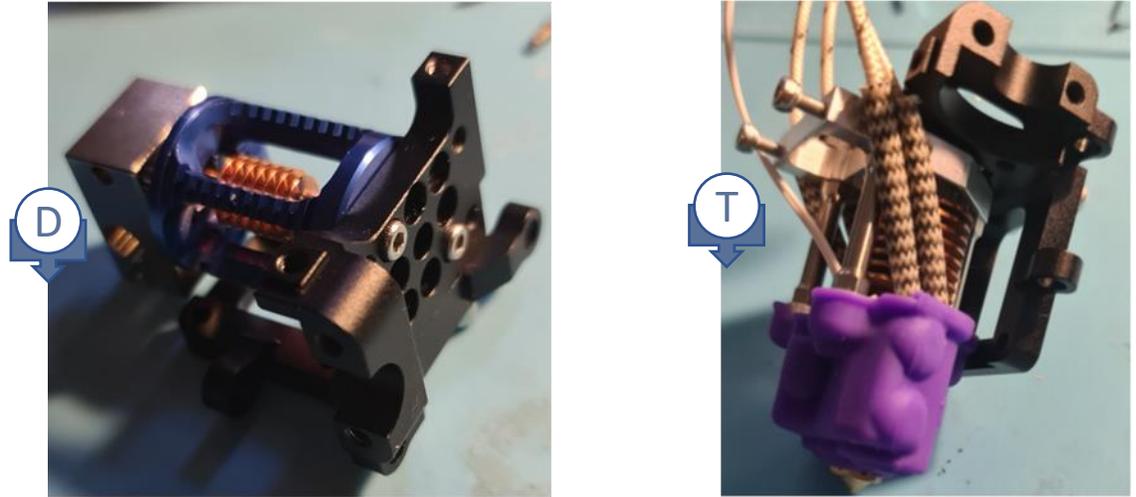


Diagram 3.2

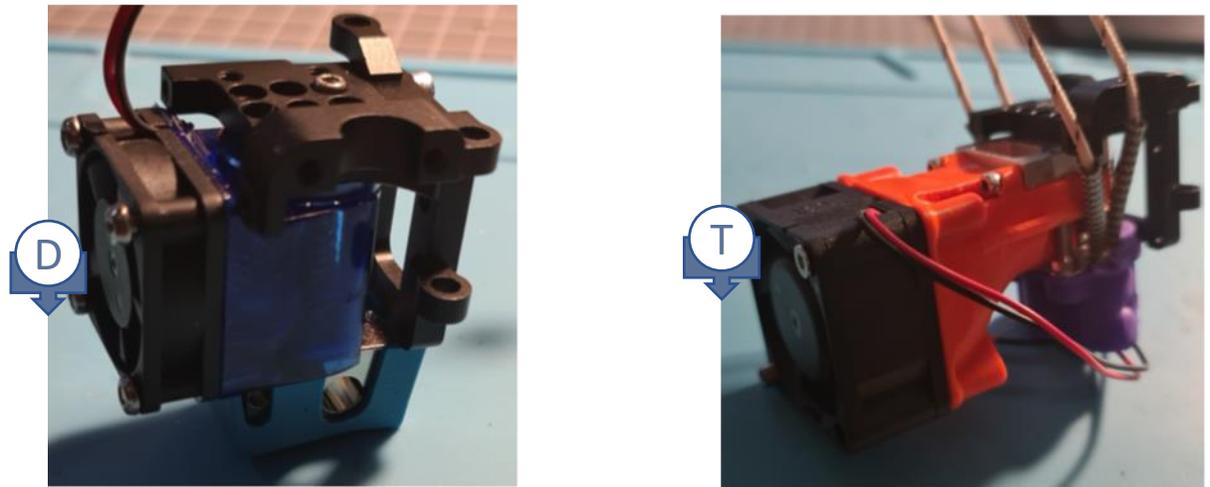


Diagram 3.3

3.3 Part cooling

a. Install part cooling assembly.

Secure the printed part cooling fan duct to the [hot end mounting plate](#) using appropriate mounting hardware – 2xM3 bolts ([Diagram 3.4](#)).



Check the height of the part cooling fan duct matched the height of the hot end with nozzle inserted ([Diagram 3.5d](#) and [Diagram 3.5t](#)). Use slotted mounting holes to adjust.

Attach 5051 24V blower fan to the part cooling fan duct as shown on [Diagram 3.6](#).



Depending on the dimensional accuracy of your print and/or the choice of material you may screw 2xM3 mounting bolts straight into the fan duct body or use retaining nuts.

Stock Troodon wire for the part cooling fan is terminated with a male JST connector – it uses a splitter board to connected two stock part cooling fans. As in most cases standard 5015 blower fan also comes with a male JST connector, there are 3 connection options available:

- Change 50515 fan male connector to female – you will need a spare 2 pin 2.54 JST XH connector housing, pins and a crimping tool.
- Use stock splitter board, leaving one fan connector on the board empty.
- If provided in your kit – use [female-to-female JST connector](#).

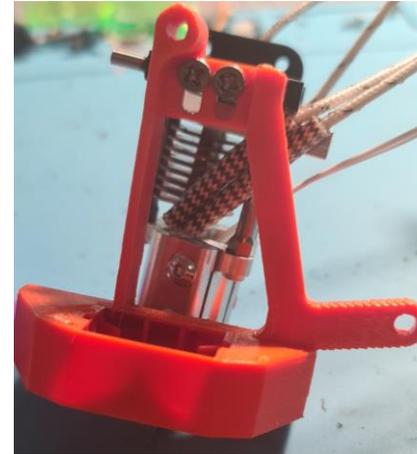


Diagram 3.4



Diagram 3.5d

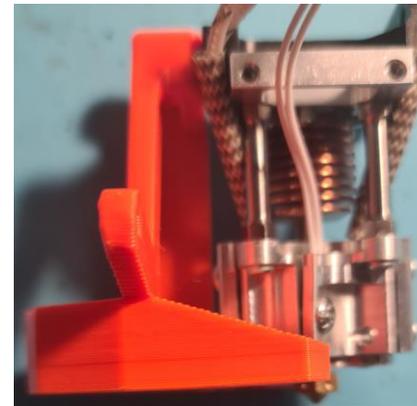


Diagram 3.5t

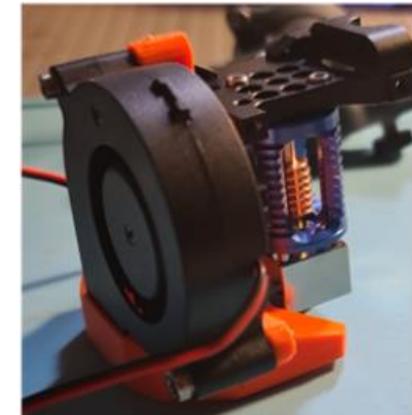


Diagram 3.6

3.4 BLTouch

a. Install BLTouch

Attach printed BLTouch mount to the right side of the [hot end mounting](#) plate using appropriate mounting hardware – 2xM3 bolts ([Diagram 3.7](#)).

Attach BLTouch sensor (or printed dummy used in this guide) to the BLTouch mount ([Diagram 3.8](#)).



Check the vertical distance between the nozzle and the BLTouch tip. Ensure you printed the right version of BLTouch mount to match the height of your hot end (e.g., Takoto or Dragon) and adjust as required. Please refer to BLTouch documentation for more information.

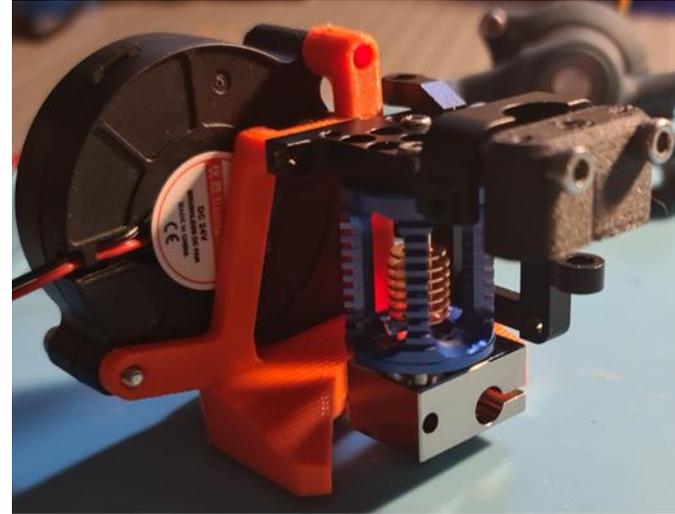


Diagram 3.7

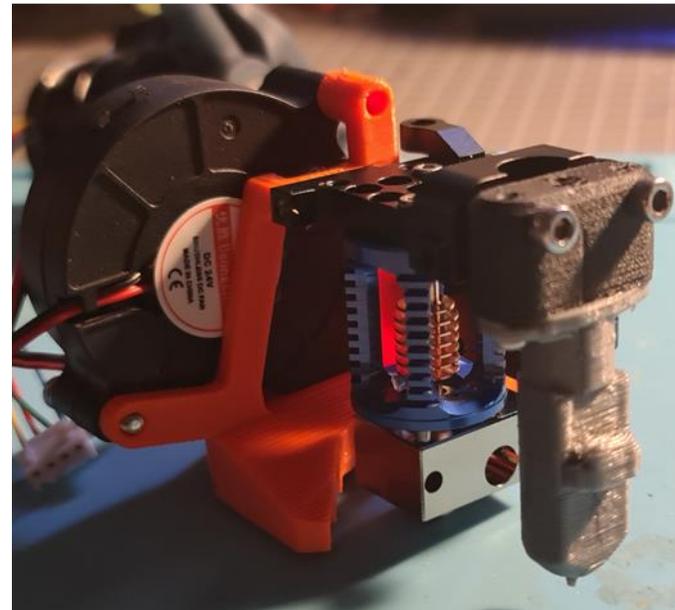


Diagram 3.8

3.5 Extruder

a. Install extruder

Insert a piece of PTFE tube into the PTFE tube channel of the [hot end mounting plate](#), push it all the way down (ensuring that it connects with the hot end) and test fit the extruder assembly as per the instructions in [Step 2](#). Cut PTFE tube to the required length ([Diagram 3.9](#)).

Mount the extruder on the top of the [hot end mounting plate](#), ensuring that the PTFE tube is seated against the filament channel of the extruder and the [main extruder housing](#) base is flat against the [hot end mounting plate](#) ([Diagram 3.10](#)). You may need to clean the grooves on the bottom of the [main extruder housing](#).



Use mounting bolts (4 x M3) of the appropriate length – e.g. short enough so they can be inserted into the extruder housing from the top. Avoid overtightening of the mounting screws.



You may want to temporarily remove the [idler door](#) to simplify access to the mounting bolts ([Diagram 3.11](#)).



Diagram 3.9

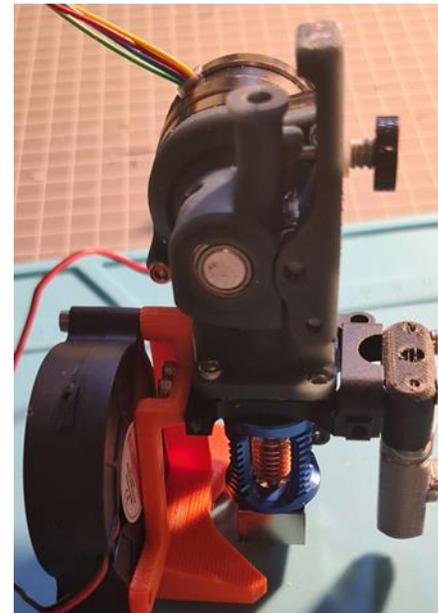


Diagram 3.10

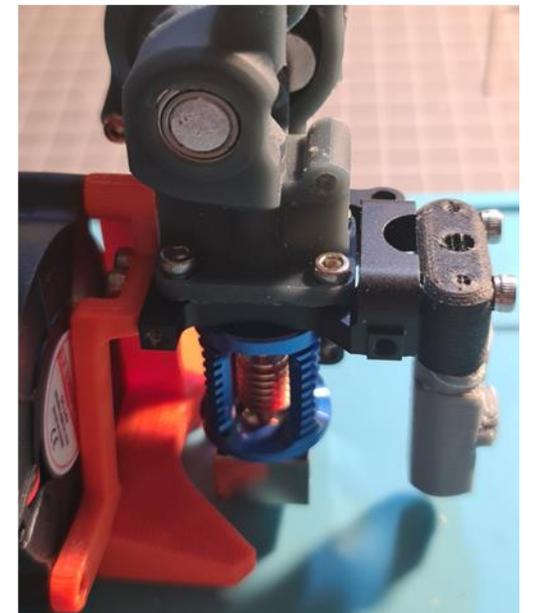


Diagram 3.11



Step 4. Upgrade Gantry Part 1

4.1 Wires preparation

a. Free up and extend wires

Reach out to the electronics enclosure, find a set of cables that go into the Z cable chain and remove any cable ties that may prevent them from being extended/pulled through Z cable chain (*Diagram 4.1*).

Remove the bolt, nut and the cable tie on the top end of Z cable chain (*Diagram 4.2*) and unclip some (or all) cable chain clips to free up wires.



The bolt and nut will need to be reinstalled later – please store it safely.

Identify printhead wires (extruder, BLTouch, thermistor, etc.) and carefully pull them through the Z chain while removing all the slack in the electronics enclosure until you have the sufficient length (*Diagram 4.3*).



The top end of the Z cable chain should be left free at this stage. We suggest temporarily securing it with cable ties for now (*Diagram 4.4*).



For Troodon 400 you may need to create cable extensions, unless you re-arrange the wires in the most efficient way. Please refer to **Step 1.2** “What you will need” for tips on rearranging wires.

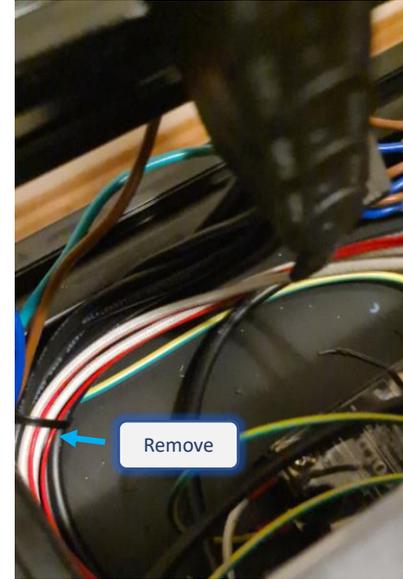


Diagram 4.1



Diagram 4.2



Diagram 4.3

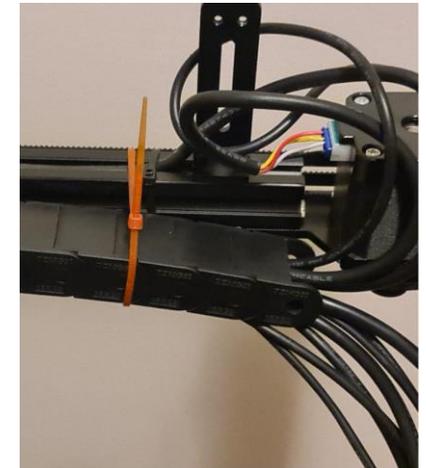


Diagram 4.4

4.2 X rail

a. Install XY Mounts

Prepare necessary hardware from the kit – 2 x machined XY Mounts, 4 x 20mm shoulder bolts, 4 x steel washers, 1 linear rail and 2 x XY mount brackets as shown on [Diagram 4.5](#).

 Be careful to not allow the carriage to slide off the rail. We suggest securing the carriage with cable ties as shown on [Diagram 4.5](#).

Remove cable ties that secure XY belts to the stock printhead assembly. Starting from one side of the printhead carriage remove the belts one at a time, taking note of the belt's path, then remove cable ties on the other side of the belt ([Diagram 4.6](#)).

On each side of the printer, remove 4 bolts that attach each side of the stock X rail assembly (the extrusion) to the Y rail carriages ([Diagram 4.7](#)) and store them safely as they are going to be reused. Remove stock X assembly from the printer and store it safely as some parts of it (e.g. idlers and mounting hardware) will be reused.

Attach each of the XY mounts to the Y linear rail carriage on each side of the printer using 4 bolts from the stock installation per side ([Diagram 4.8](#)).

 Observe the proper positioning of the mounts – on both sides, mounting arms and raised idler mounts should be facing towards the back of the printer.

 Don't tighten the bolts at this stage, for now keep them finger-tight only.



Diagram 4.5



Diagram 4.6

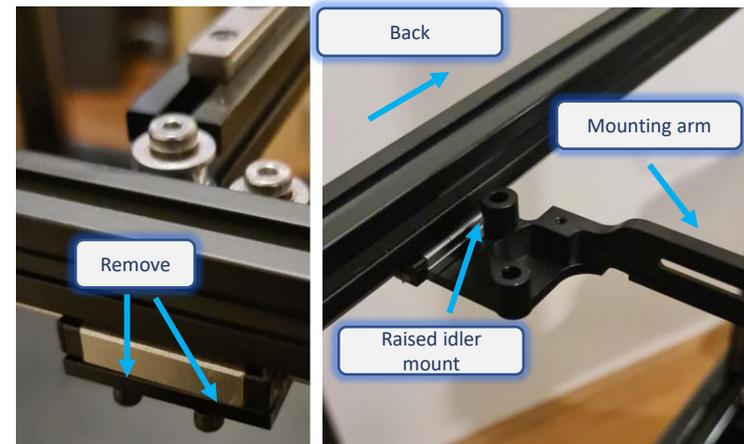


Diagram 4.7

Diagram 4.8

4.2 X rail (Cont.)

b. Install Idlers

From the stock X assembly, remove 4 idler assemblies (on both sides) – 2x toothed idlers and 2x smooth idlers. Each idler assembly should contain an idler (toothed or smooth), mounting bolt, steel washers and 2 x brass washers. One idler assembly on each side also contains a raiser ([Diagram 4.9](#)).



Sometimes there may be extra steel washers included in the assembly – please check that all of them are removed.

From the components above, only 4 brass washers, 4 idlers and 2 steel washers will be reused for the installation. Some printers may be factory assembled without steel washers. If this is the case, you may need provide your own – 5mm inner diameter, 7mm outer diameter and 0.5mm thickness. These will be added to the future versions of the kit, so please check the provided [Bits Set](#) before ordering.



The printer may temporarily function without the steel washers however it is highly recommended to install them.

Using [20mm shoulder bolts](#), assemble each of the new idlers in the following order ([Diagram 4.10](#)) – starting from the head of the bolt:

1. [20mm shoulder bolt](#) from the kit.
2. Brass washer.
3. Idler (toothed or smooth).
4. Steel washer

Install all 4 idler assemblies on [XY mounts](#) (One toothed and smooth idler pair on each side) as shown on the [Diagram 4.11](#). Observe the right placement of idlers: on the left side of the printer the **smooth** idler is towards the **back** of the printer and is **raised**. On the right side the **toothed** idler is towards the **front** of the printer and is **raised**.



Please note the bolts are not designed to overtighten the idler, there should be a small gap between the head of the bolt and the brass washer. Each idler should have some vertical play and should rotate freely.

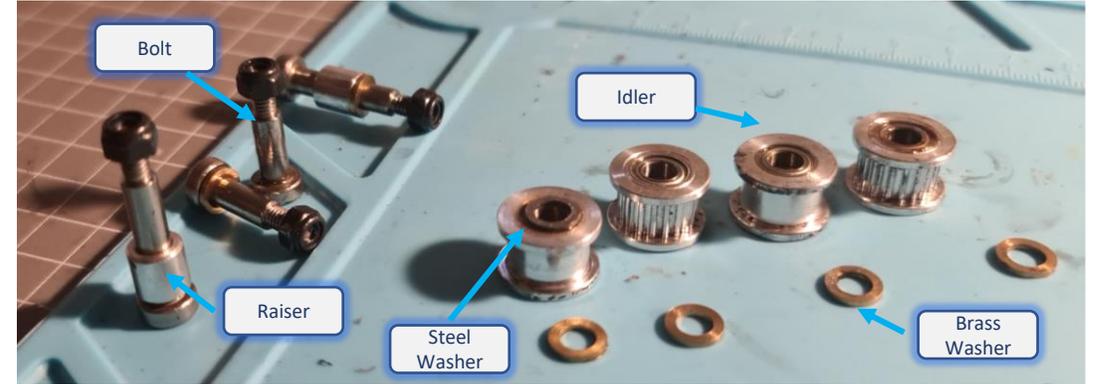


Diagram 4.9



Diagram 4.10

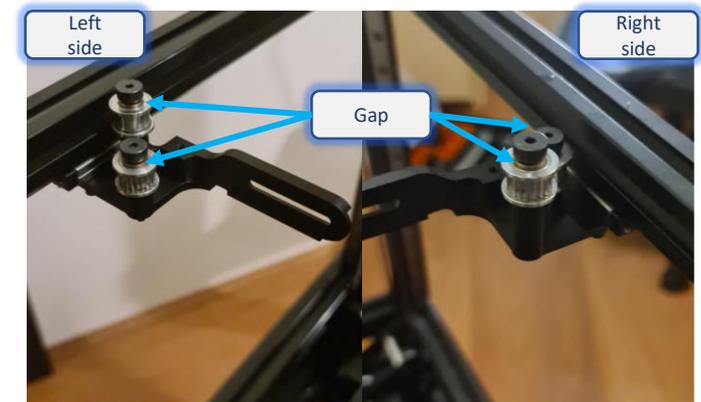


Diagram 4.11

4.2 X rail (Cont.)

c. Install X rail

From the stock X assembly, remove 2 bolts on each side that attach the stock mounts to the linear X rail ([Diagram 4.12](#)). Use these 4 bolts and 2 x [XY mount brackets](#) from the kit (diagram 4.13) to attach the [X rail](#) from the kit to the [XY mounts](#) ([Diagram 4.14](#)).



Don't tighten the bolts at this stage, for now keep them finger-tight only.

You can now remove cable ties used to secure the X rail carriage.



On Troodon 300 (depending on the assembly date of the printer and revision of the gantry kit) you may receive a rail that is too long for proper adjustment and installation. If this is the case, trim one side of the rail to the required length - usually, 10mm is sufficient and the latest revision of the kit have accommodated for this. Please contact A3DP when ordering the kit if you have a very early version of the printer so the correct rail length can be included in the kit.

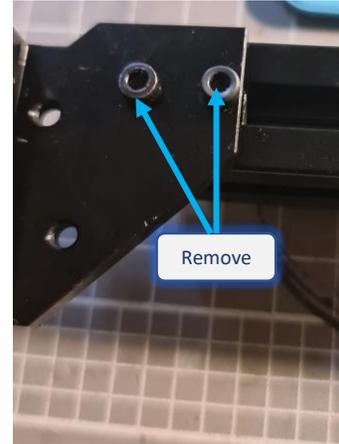


Diagram 4.12

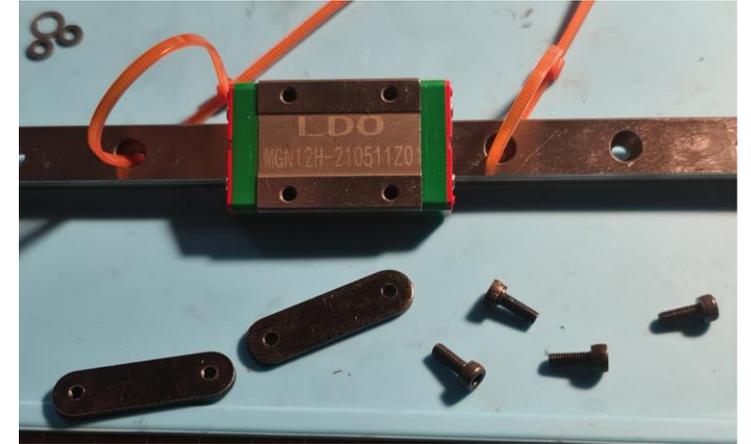


Diagram 4.13

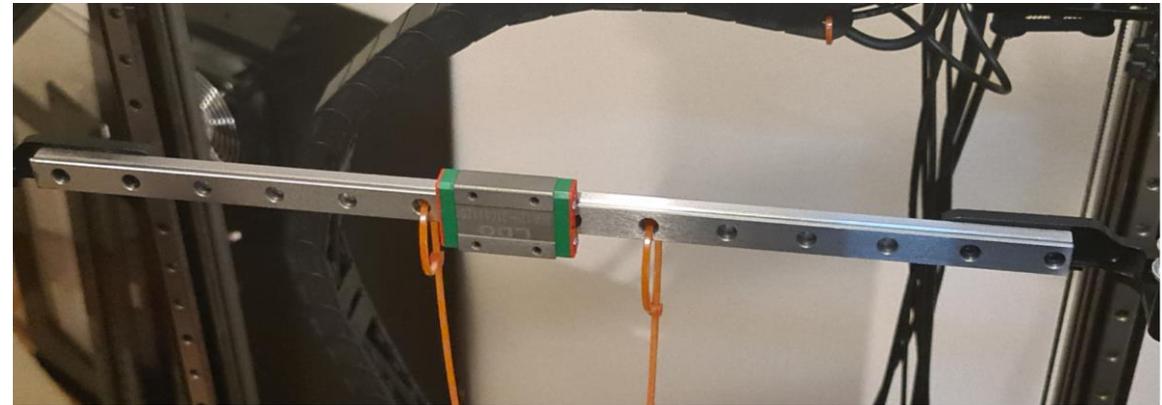


Diagram 4.14

4.3 Front idlers

a. Install front idlers.

Prepare necessary hardware from the kit – 2 x 1mm shims and 2 x round hex bolts “14mm”(Diagram 4.5).

Starting with either left or right front side of the printer:

- Remove the toothed idler that is further away from the front of the printer (Diagram 4.6). The idler will not be used and can be stored as a spare.
- Remove bottom 2 bolts that attach the belt clamp to the assembly (Diagram 4.7) and let the Z carriage to slide down the rail. Note that the one of the bolts may not be fully removed from the bracket as the head of the bolts attaching the bracket to the rail carriage interferes. Inspect that bolt (should be the one closer to the linear rail). If this bolt is longer than the other bolt (should be the case for newer printers) it may stay attached to the bracket and can be reused (in that case the round hex bolt from the kit is not required). Otherwise replace it with the bolt from the kit by temporary removing and reinstalling back the bolt attaching the bracket to the rail carriage.



Don't lose any washers.



Newer variants of Troodon have angle brackets and cable ties used to secure Z belts replaced with Voron – style clamps (Diagram 4.7a). This slightly changes the sequence of securing the end of Z belt described below, however the principle remains the same.

Now loosen (but not remove) :

- 2 x set screws at the top and at the bottom of the carriage plate (Diagram 4.8 shows the top one).
- 2 x Z belt tension screws on the top of the machine (Diagram 4.9).
- The standoff (Diagram 4.10).

Ensure you can freely rotate the remaining (smooth) idler back and forward.

Insert the 1mm shim between the bracket and the extrusion (as shown on Diagram 4.11) and reattach bottom 2 bolts that attach the belt clamp to the assembly, so the final assembly looks as shown on the Diagram 4.12. Torque all the bolts ensuring that you can freely rotate the remaining (smooth) idler back and forward.

Loop together the lose ends of Z belt and secure with 2 cable ties (Diagram 4.13). Don't worry about belt tension, it will be adjusted later in the process.

Repeat the steps above for the other side of the printer.



Diagram 4.5



Diagram 4.6

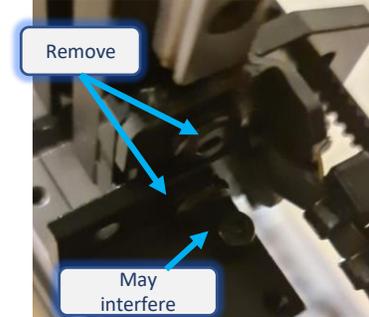


Diagram 4.7



Diagram 4.7a



Diagram 4.8

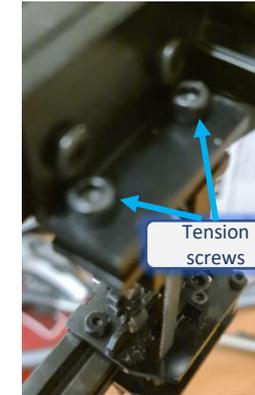


Diagram 4.9



Diagram 4.10



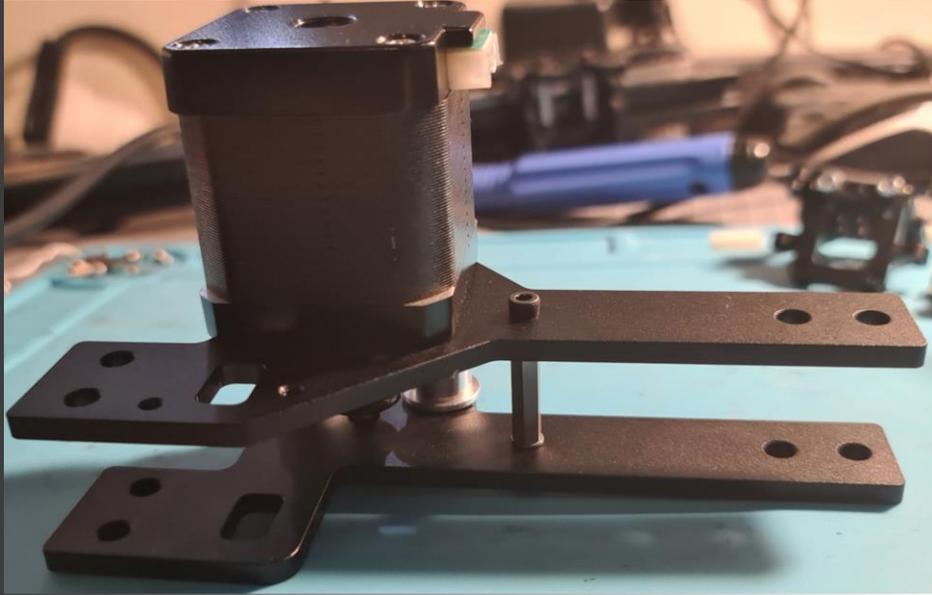
Diagram 4.11



Diagram 4.12



Diagram 4.13



Step 5. Upgrade Gantry Part 2

5.1 XY motors

a. Remove stock motor assembly.

Disconnect cables from both motors and disconnect and remove the mechanical Y end stop on the right side of the printer ([Diagram 5.1](#)).

Starting with either left or right rear side of the printer:

- Loosen 2 x Z belt tension screws on the top rear of the machine and cut and remove cable ties that secure rear Z belts above the bracket / Y extrusion ([Diagram 5.2](#)).



Ensure you are only removing cable ties **above** the bracket / Y extrusion.

- Remove bolts that secure stock rear motor assembly and upper Z belt bracket ([Diagram 5.3](#)). Store these bolts as they will be used to secure the updated assembly back.
- Remove stock motor assembly and place it on the working surface ([Diagram 5.4](#)).



Note this will also disconnect the lower Z belt bracket and allow the Z carriage to slide down the rail – similar to **Step 4.3**.



There are T nuts in the lower slots of Y and rear X extrusions that are going to be re-used when installing back the updated rear motor assembly. You may want to use painter tape or similar to prevent these T nuts from sliding off the extrusion. Don't forget to remove stock Z cable bracket from the right side of the printer if not removed earlier. ([Diagram 5.5](#)).

- Remove stock motor, 2 x motor retaining bolts and 1 x stand off assembly ([Diagram 5.6](#)). They will be used in the next step.

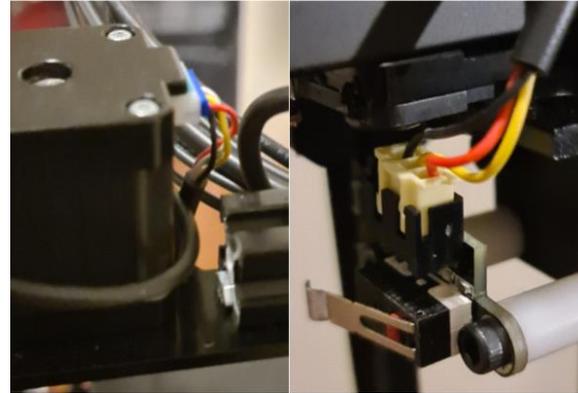


Diagram 5.1



Diagram 5.2



Diagram 5.3

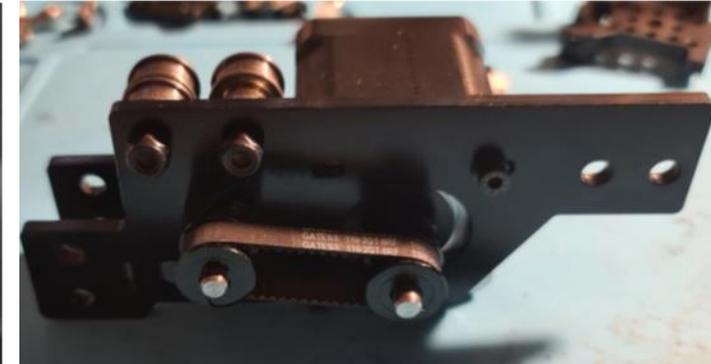


Diagram 5.4

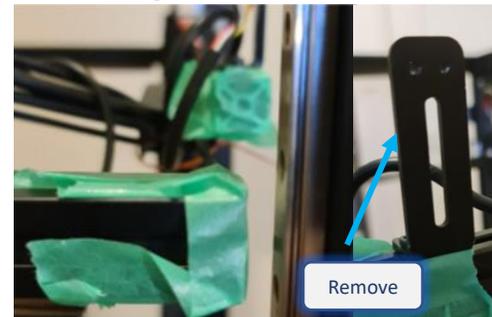


Diagram 5.5



Diagram 5.6

5.1 XY motors (Cont.)

b. Mount motor

Prepare necessary hardware from the kit – [Lower motor mount](#), [Upper motor mount](#), 3 x [smooth idlers](#), 2 x [idler pins](#), 1 x [1mm spacer](#), 3 x [steel washers](#), 1 x [pin retainer clip](#), 2 x [M4 hex bolts](#) and 2 x [T nuts](#). Also prepare the motor, 2 x motor retaining bolts and 1 x stand off assembly from the stock installation ([Diagram 5.7](#)).



From the factory, the motor is secured with 2x M3 bolts. We suggest adding the 3rd one - you will need to provide your own or re-use one from the stock X rail assembly. Future revisions to the kit will include 6 [button head screws](#) for this step; please check the content of your kit and use if provided. The 4th mounting hole on the motor and the mount should not be used and remain empty (see below).



Critical part of this step is to select the correct [upper motor mount](#) for the side of the printer you are working on and place the mounting bolts accordingly. Please note that recessed parts of the [upper motor mount](#) (counter bores) – they should be facing down when installed on the printer ([Diagram 5.7](#)).

Select one of the [upper motor mount](#) and place it on the side of the printer you are working on with recesses down as shown on [Diagram 5.9](#) (this diagram is for the right side of the printer when looking from the front). The hole marked with cross (the corner one) should remain empty (e.g. with no bolt) and the hole marked with circle should have an additional bolt as described above (with no washer).

Install the motor on the [upper motor mount](#) using 3 bolts as shown on [Diagram 5.10](#). Note the placement of the mounting bolts as described above.



Depending on the side of the printer you are working on, you will need to adjust the orientation of the gear on the motor axle. On the right side of the printer (when looking from the front), the toothed part of the gear should be closer to the motor (facing up); on the left side the toothed part of the gear should be further from the motor (facing down). Loosen 2 set screws on the gear to adjust (on [Diagram 5.10](#)) then tighten back. Ensure that one of the set screws is sitting on the flat part of the motor shaft.

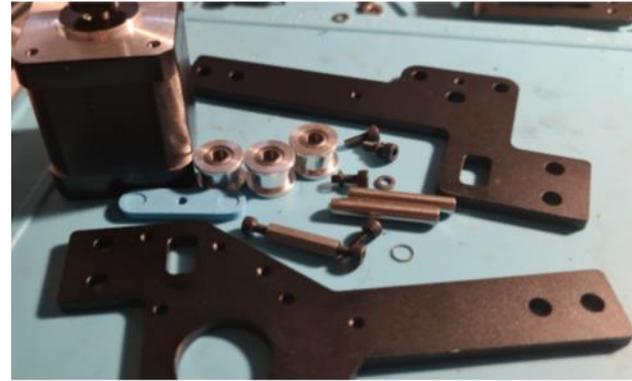


Diagram 5.7

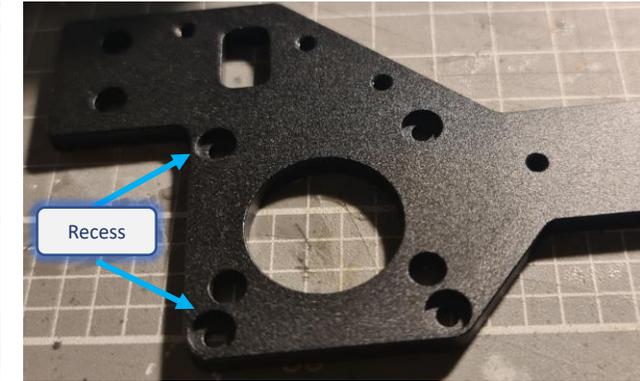


Diagram 5.8



Diagram 5.9

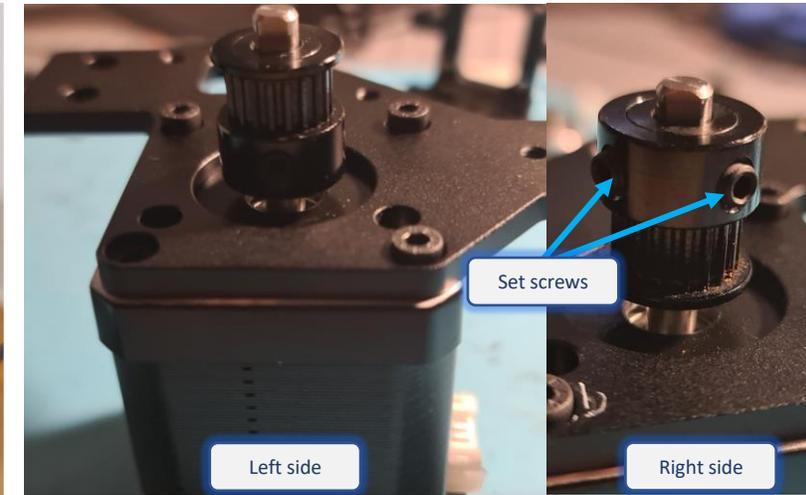


Diagram 5.10

5.1 XY motors (Cont.)

c. Install idlers and finalize motor assembly

Dismount the stock standoff assembly and use a **1mm spacer** from the kit to install the standoff on **the lower motor mount**. Then Install 2 x **idler pins** on the **lower motor mount** ([Diagram 5.11](#)).

Use M3 bolt to secure the printed **pin retainer clip** to the **lower motor mount** ([Diagram 5.12](#)).

Place 2 x **steel washers** from the kit on each **idler pin**. On the corner **idler pin** place one **idler** on top of the **steel washer** then place another **steel washer** followed by another **idler**. On the other **idler pin**, place one **idler** on top of the **steel washer** ([Diagram 5.13](#)).

Finalize the stand off assembly to attach the **lower motor mount** to the **upper motor mount** ([Diagram 5.14](#)).



Note the small gap between the standoff and the **upper motor mount** - this is normal and should not be attempted to “fix” by excessive tightening ([Diagram 5.15](#)).

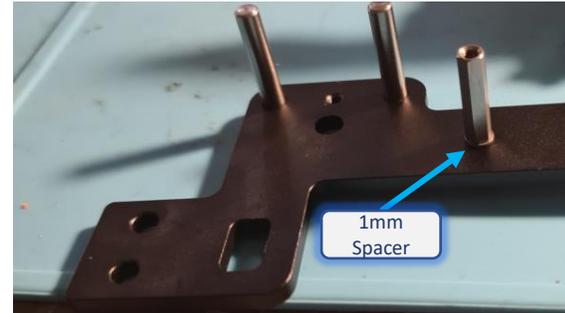


Diagram 5.11



Diagram 5.12



Diagram 5.13

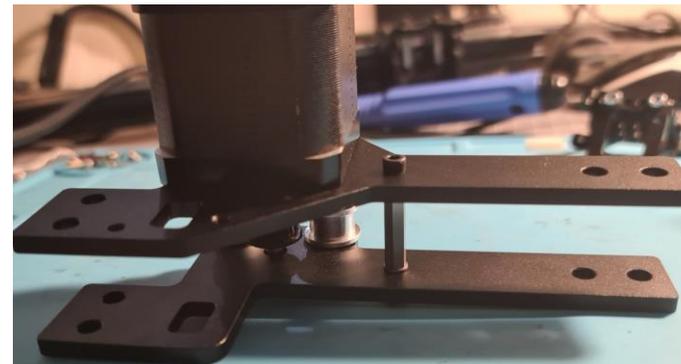


Diagram 5.14

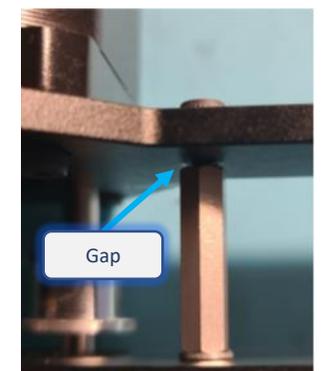


Diagram 5.15

5.1 XY motors (Cont.)

d. Install motor assembly

Remove painter tape (previously used to temporary secure T nuts) and place the motor assembly on the printer ([Diagram 5.16](#)).

Insert **1 mm shim** between the **lower motor mount** and rear X extrusion as shown on the [Diagram 5.17](#). Use 2 bolts with brass washer from the stock assembly to secure the **lower motor mount** to the lower slot of rear X extrusion ([Diagram 5.18](#)).

Use a **T nut** and **M4 hex bolt** from the kit to secure **lower motor mount** to the upper slot of rear X extrusion ([Diagram 5.19](#)). We suggest to use one pair of **T nut** and **M4 bolt** for now and add the second one at the end of the process.



Don't tighten the bolts at this stage, for now keep them finger-tight only.



Please consider the notes and the illustration from **Step 4.3** "Front idlers" if your printer came with Voron-style clamps that secure Z belts.

Use the bolts previously removed from the stock installation to secure the Y side of the motor assembly as well as upper and lower Z cable brackets to the Y extrusion ([Diagram 5.20](#)). This step also requires a **1 mm shim** to be inserted between the Y extrusion and the lower Z cable bracket.

Loop together the loose ends of Z belt and secure with 2 cable ties ([Diagram 5.21](#)). Don't worry about belt tension, it will be adjusted later in the process. Please refer to **Step 4.3** for details as the process is essentially the same.



Ensure that lower part of Z belt is properly aligned with Z motor gears in the electronics enclosure before applying cable ties or Z belt clamps ([Diagram 5.22](#)).

Repeat the steps above for the other side of the printer, being mindful of the differences between the left and right sides as described.



Ensure that all brackets, mounts and extrusions are properly aligned and tighten all XY motor assembly bolts.

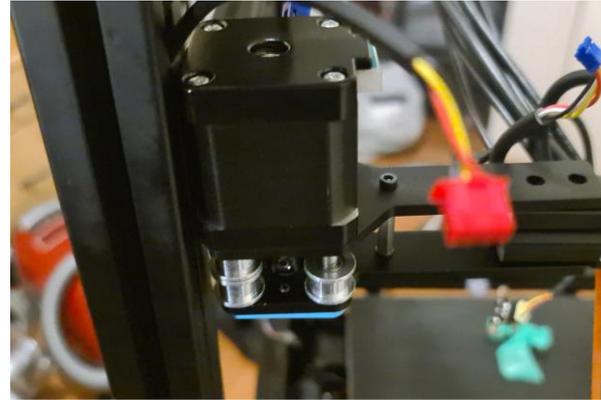


Diagram 5.16

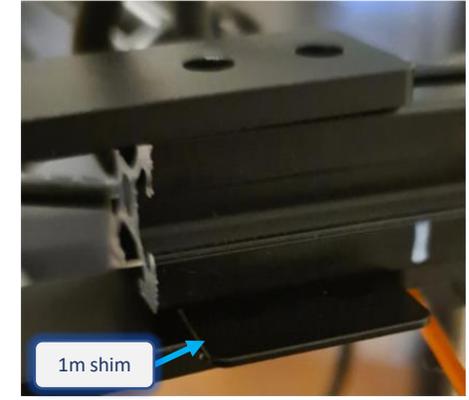


Diagram 5.17

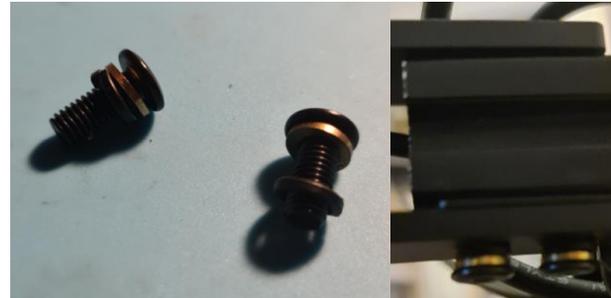


Diagram 5.18

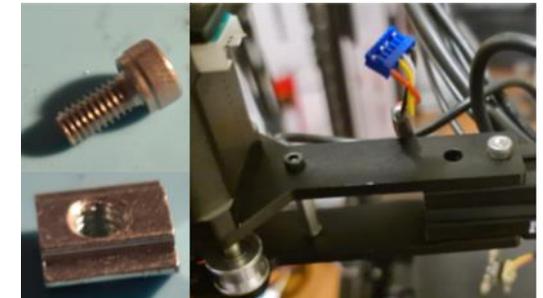


Diagram 5.19



Diagram 5.20

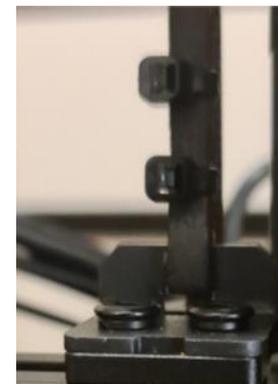


Diagram 5.21



Diagram 5.22

5.2 Cable chain brackets and end stops

a. Install X Carriage Mount and X cable chain bracket

Loop 2 x long M4 bolts provided in the kit through the corresponding X Carriage mount holes ([Diagram 5.23](#)).



You can use optional M4 nuts to secure the bolts.

Temporarily remove 2 x bolts mounting 2 plates of X Carriage mount together and attach the X cable chain bracket to the X Carriage mount as shown on [Diagram 5.24](#).



Don't lose 1.5mm retaining pins in the process.

Install X Carriage mount onto the X carriage of X rail using 4x M3 button head bolts ([Diagram 5.25](#)).

b. Install XY cable chain bracket and X optical end stop

Install X optical end stop on XY cable chain bracket using 2x M3 bolts and use another 2x M3 bolts to secure XY cable chain bracket to the right XY mount. Ensure that the trigger part of the the X cable chain bracket is aligned with the X optical end stop ([Diagram 5.26](#)).



Be careful and do not apply excessive force if working with resin-printed parts of the kit. You may want to run M3 tap down the threaded holes of the cable chain brackets to avoid damage.



Diagram 5.23



Diagram 5.24



Diagram 5.25

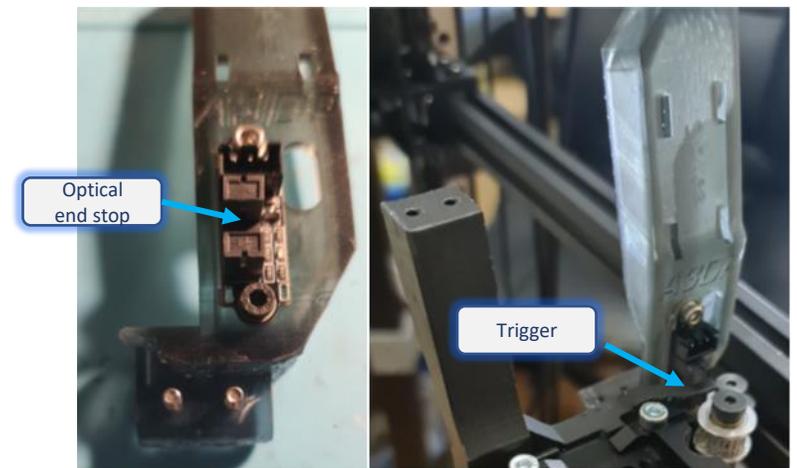


Diagram 5.26

5.2 Cable chain brackets and endstops (Cont.)

c. Cable Management – Install Y optical endstop.

Use M3 bolt to install [Y optical end stop trigger](#) onto the right Y rail carriage ([Diagram 5.27](#)). Install [Y optical end stop mount](#) to the rear right Z rail carriage using 2x M3 bolts and use 2x M3 bolts to install [Y optical end stop](#) onto the [Y optical end stop mount](#) ([Diagram 5.28](#)). Move the printhead and ensure that the [Y optical end stop trigger](#) is aligned with the [Y optical end stop](#) ([Diagram 5.29](#)).



Earlier versions of the kit had [Y optical end stop trigger](#) printed in clear resin, preventing optical end stop from triggering. Use coat of black paint or electrical tape to fix that.



Diagram 5.27

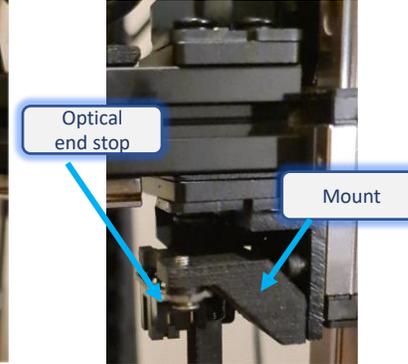


Diagram 5.28

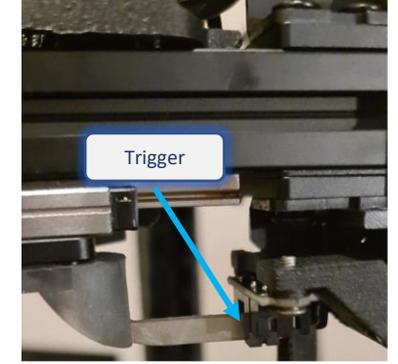


Diagram 5.29

5.3 Cable chains and wiring

a. General considerations

This step of the installation process involves some trial and error. Due to the differences in individual printers (cable thickness, available cable length, printer size, etc.) it is impossible to provide specific step-by-step instructions. In general, the objective of this step is to ensure the optimal routing of the cables from the electronics enclosure to the printhead, XY motors and end stops - to allow full and unrestricted movement of the printhead. This can be achieved – after you have freed up all the cable and wires to their maximum length as a part of **Step 4.1** “Wires preparation” – by:

- Adjusting the length of Z, Y and X chains (by adding or removing links). Stock Z cable chain can usually be shortened by 5 – 8 links before the movement gets restricted.
- Routing of the cables using optimal path.
- Using chains with larger inner space to simplify routing, and
- As a last resort – creating custom extension for printhead cables.

This guide assumes the re-use of stock Z cable chain. For the Y chain you have an option of re-using the stock XY chain (removed as a part of **Step 1.4**) or printing your own chain. For the X chain you have an option of printing your own chain or purchasing a pre-manufactured cable chain of appropriate size. Please refer to **Step 1.3** “Parts to print” for details.



Illustrations in this guide are based on printed cable chains option.

b. Z cable chain

Adjust stock Z cable chain to optimize the length of the cable by removing links. Ensure that all cables and wires are pulled through Z cable chain and are tight but not stretched, squeezed or jammed and secure the upper end of Z cable chain to the (stock) bracket on rear X extrusion with the stock bolt, nut and some extra washers. ([Diagram 5.30](#)).

You may want to relocate the stock bracket to ensure optimal and unrestricted mount ([Diagram 5.31](#)). Secure the cables and wires by placing Z cable chain clips back in place.

You may want to fit back the bracket holding Z chain to ensure proper alignment – refer to **Step 1.4** ([Diagram 1.7](#)).



Diagram 5.30



Diagram 5.31

5.3 Cable chains and wiring (Cont.)

c. Y cable chain

Mount an open end of the Y cable chain onto the top of right Y gantry extrusion (approximately above the [Y optical end stop](#)) using 2x M3 bolts and 2x T nuts as shown on [Diagram 5.32](#). Ensure the optimal Y cable chain length (e.g. the shortest one that allows unrestricted full movement of the printhead) and attach the last link of the Y cable chain to the top of the [XY cable chain bracket](#) using long M4 bolt and a washer ([Diagram 5.33](#)).

Route all cables (**except XY motor cables and Y end stop cable**) through the Y cable chain and secure them to the [XY cable chain bracket](#) using cable ties and shown on [Diagram 5.34](#). Ensure unrestricted movement of the printhead and secure the cables in the chain with clips.

Route the X optical end stop cable to the [X optical end stop](#) previously installed on the [XY cable chain bracket](#).



Please ensure that the cables transition from Z to Y cable chains is secure and compact. It should not prevent the printhead from freely reaching the rearmost position and triggering the [Y optical end stop](#). Use cable ties to secure the cables and wires that go into the Y cable chain, Y end stop cable and XY motor cables to the gantry ([Diagram 5.35](#)).



Be careful and do not apply excessive force when working with resin-printed parts of the kit.



Diagram 5.32

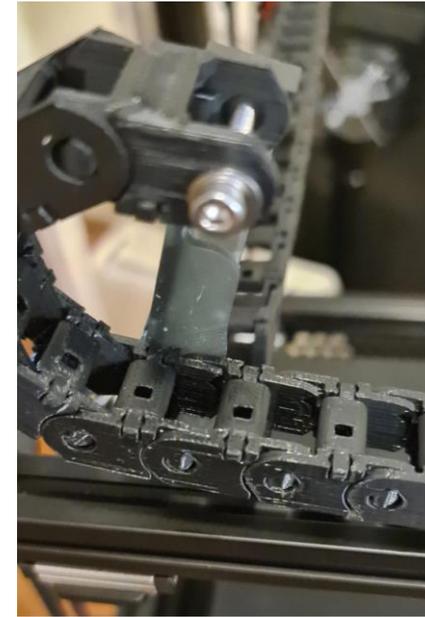


Diagram 5.33



Diagram 5.34

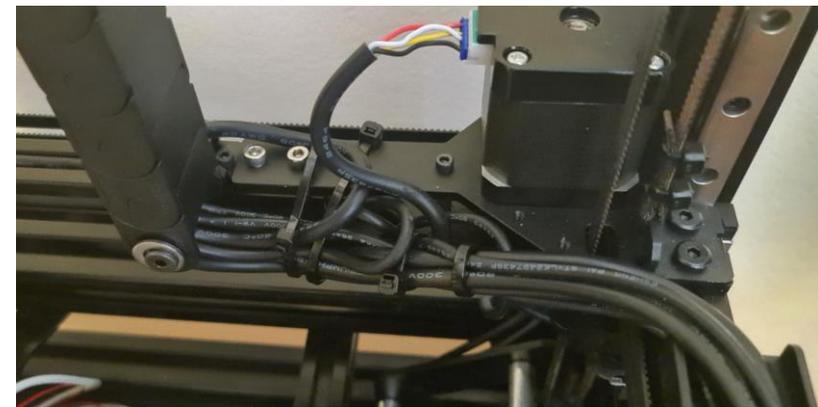


Diagram 5.35

5.3 Cable chains and wiring (Cont.)

d. X cable chain

Mount an open end of the X cable chain onto the [XY cable chain bracket](#) using 2x M3 bolts as shown on [Diagram 5.36](#). Ensure the optimal X cable chain length (e.g. the shortest one that allows unrestricted full of the printhead) and attach the other open end of the X cable chain to the top of the [X cable chain bracket](#) using 2x M3 bolts ([Diagram 5.37](#)).

Route all cables (**except X end stop cable**) from the [XY cable chain bracket](#) into and through the X cable chain and out of the X cable chain open end. Ensure that the cables have enough length to connect to the printhead components (fans, heater, extruder, etc.) as shown on [Diagram 5.38](#). Ensure unrestricted and full movement of the printhead and secure the cables in the chain with clips.



Please ensure that the cables transition from Y to X cable chains is secure and compact. It should not prevent the printhead from freely reaching the leftmost position and/or rightmost position and triggering the [X optical end stop](#). Use cable ties to secure the cables and wires that go into the X cable chain ([Diagram 5.39](#)).



Be careful and do not apply excessive force when working with resin-printed parts of the kit. You may want to run M3 tap down the threaded holes in the cable chain brackets to avoid damage.

e. Finalize and connect

Ensure that all cables, wires and cable chain links and clips are secure and do not restrict the full movement of the printhead. Connect XY motor and X and Y optical end stop cables to XY motors and optical end stops respectively. Secure with extra cable ties as required.



Diagram 5.36



Diagram 5.37

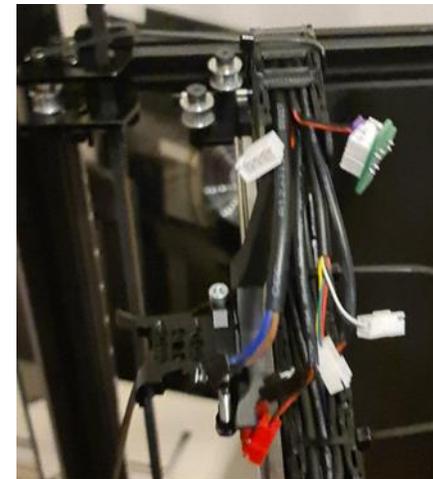


Diagram 5.38

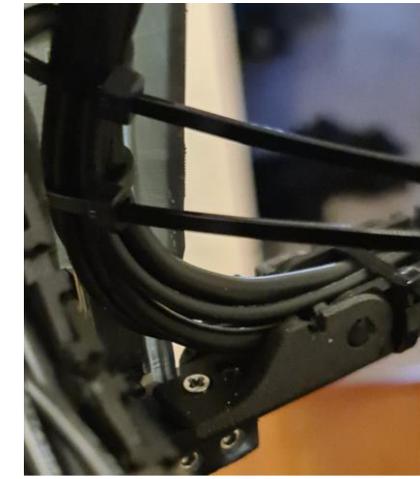
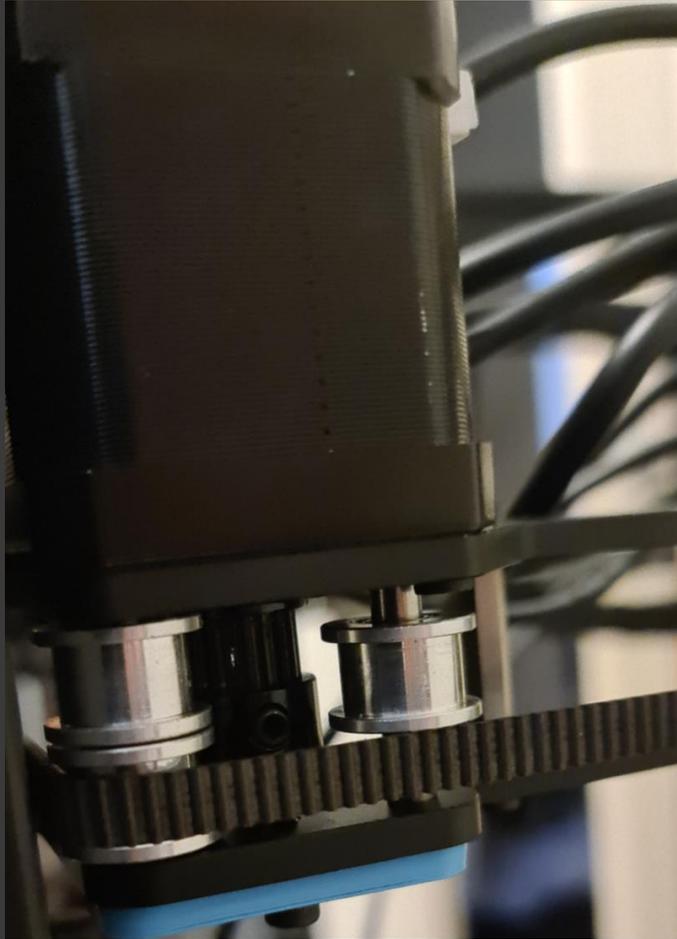


Diagram 5.39



Step 6. Belts and Configuration

6.1 Belts and gantry alignment

a. Secure belts to the X Carriage mount

Use 2 XY belts (removed as a part of **Step 4.2**). Starting from the right side of the X rail mount, loop each belt around the right mounting bolt of the **X Carriage mount** and secure with 2 Cable ties per loop. ([Diagram 6.1](#)).



It is critical to keep the belt loops as short as possible and to secure cable ties as close to the mounting bolt as possible. Please check that the loop ends and cable ties do not prevent the printhead from freely reaching the rightmost position and triggering the **X optical end stop** ([Diagram 6.2](#)).

b. Route belts

Starting with one belt at a time (either top or bottom) and going counterclockwise route the belts through the idlers and XY motor mounts until they reach the left side of the **X Carriage mount**. Temporarily secure loose ends of the belts to the left side mounting bolt with cable ties ([Diagram 6.3](#)).

The best source of information on how to route the belts properly is the CAD model viewer on A3DP website

<https://advanced3dprinting.com/2021/10/11/a3dp-troodon-300-cad-model-viewer/>

User Model Browser to hide unnecessary components then use navigation to trace each belt from the right side of the **X Carriage mount** to the left side ([Diagram 6.4](#)).

[Diagram 6.5](#) on the next page further illustrates the routing of the belts.

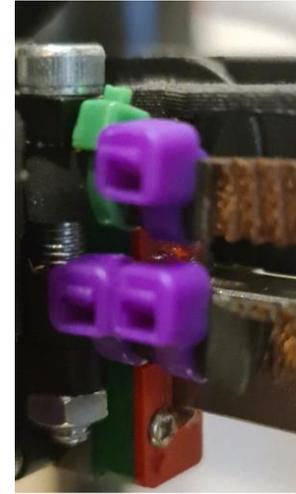


Diagram 6.1



Diagram 6.2

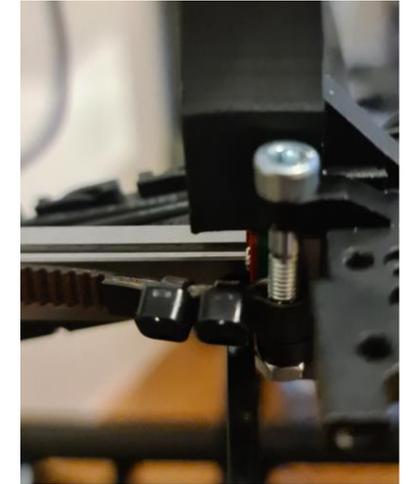


Diagram 6.3

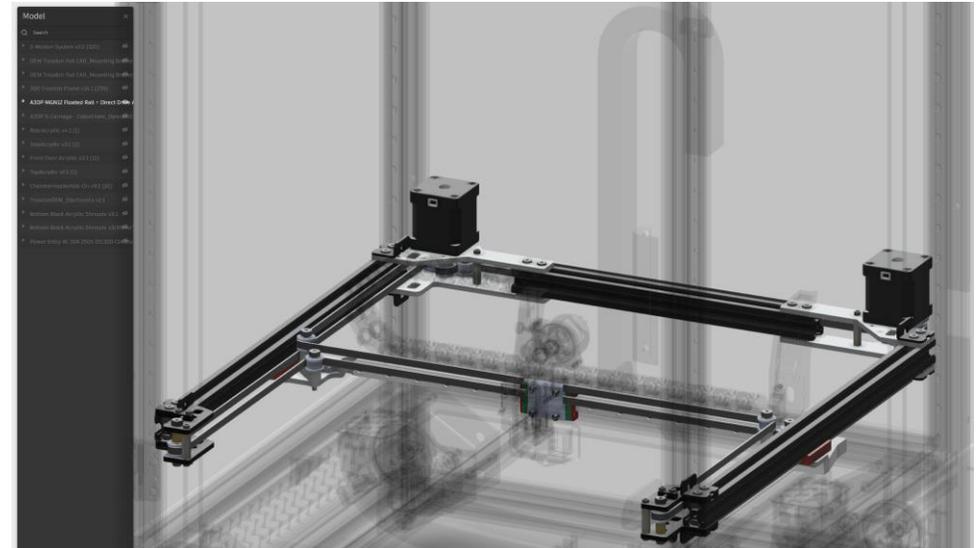


Diagram 6.4

6.1 Belts and gantry alignment (Cont.)

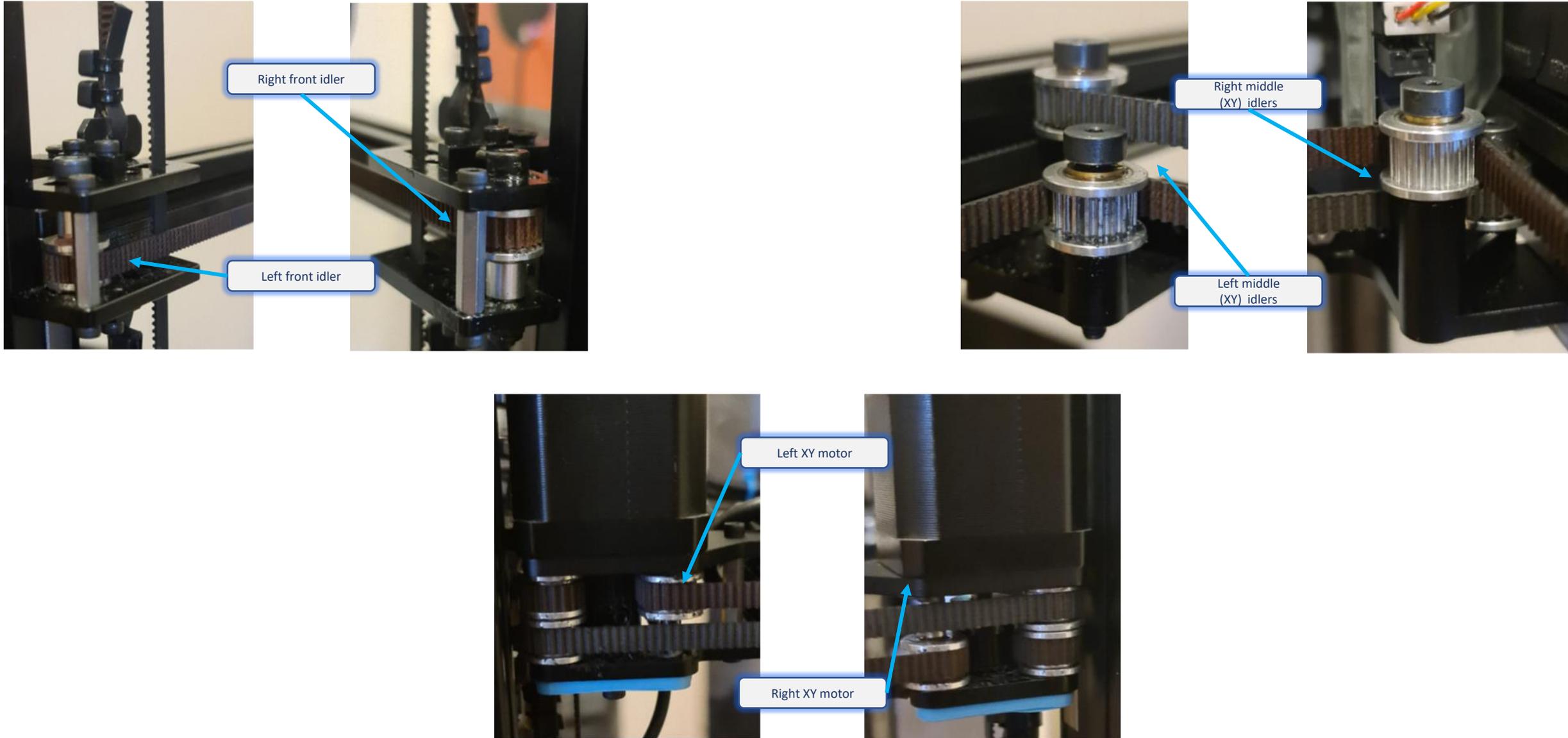


Diagram 6.5

6.1 Belts and gantry alignment (Cont.)

c. Tension Z belts

Use 4 sets of Z belt tension screws on the top of the printer to equally tension all 4 Z belts. ([Diagram 6.6](#)). You can use one of the free guitar tuning smartphone apps available to ensure that equal tension is applied to all 4 belts by checking the vibration frequency.



Ensure that both tension screws are equally adjusted on each belt.

d. Align gantry and tension XY belts

Move the [X Carriage mount](#) to the middle of the X rail, then move the [X rail](#) all the way forward until Y rail carriages touch Z cable brackets ([Diagram 6.7](#)). Ensure that both Y rail carriages touch Z cable brackets on the left and right side of the printer at the same time (adjust the [X rail](#) as required - all bolts that mount the X rail should not be tightened at this point).

Remove cable ties that were used to temporary secure the open end of the belts. Tension both belts by hand trying to apply equal pressure to both belts and secure with 2 cable ties per belt loop.

Use 2 sets of tension screws at the front of the printer to tension both belts equally by constantly checking that both Y rail carriages touch Z cable brackets on the left and right side of the printer at the same time ([Diagram 6.8](#)). Apply more tension to the side where the Y rail carriage does not touch Z cable bracket. Repeat until you achieve the required tension with X rail aligned.



Constantly check that the belts are seating on all idlers properly while tensioning. Double check at the end of the process.

When everything is aligned, tighten all the bolt that mount [X rail to XY mounts](#) and Y rail carriages ([Diagram 6.9](#)).



Diagram 6.6



Diagram 6.7

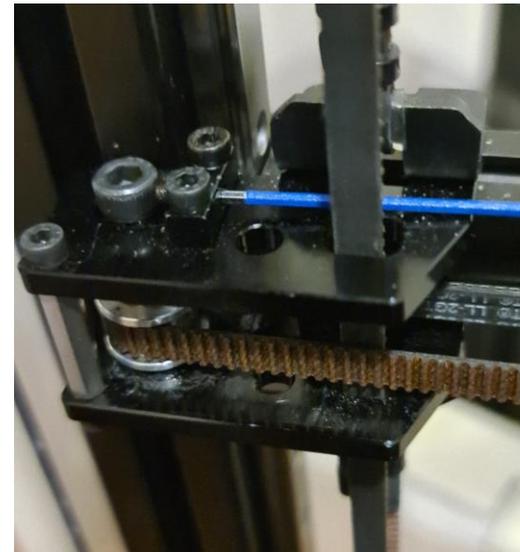


Diagram 6.8

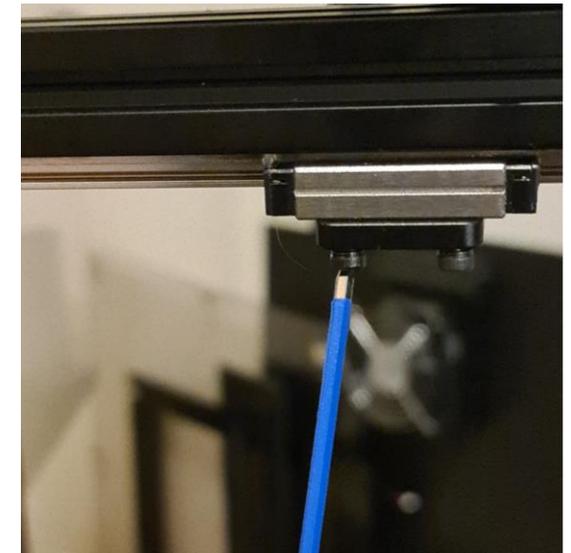


Diagram 6.9

6.2 Klipper configuration

a. Finalize assembly

Assemble and install the printhead components as described in **Step 3**. Connect all the cables and ensure that XY motors cables and end stop cables are also connected.

 At this point you may want to install and connect just the BLTouch and hot end thermistor (otherwise Klipper will throw an error) as shown on [Diagram 6.10](#).

Install back panel and reconnect the main power switch.

 Please connect the power wires carefully as per the wiring schema. **Consult certified electrician if required.**

Power on the printer. Ensure that BLTouch is working and Klipper is running with no errors. Check end stops are operational by manually moving the printhead to the X and Y triggering position and observing the green light indicator.

b. Configure Klipper (BLTouch and end stops).

Klipper configuration needs to be updated to reflect the new BLTouch location and end stop positions. The process varies depending on if you are running the generic Klipper configuration or A3DP modular image. For the A3DP modular image just comment/uncomment appropriate sections of your printer.cfg file under the **##### FRAME AND BED** section ([Diagram 6.11](#))

For the generic image, edit following sections of your printer.cfg file:

- **[bltouch]** – set **x_offset** to 28. Ensure **y_offset** is not present or set to 0 ([Diagram 6.12](#))
- **[stepper_x]** and **[stepper_y]** sections. Update **position_endstop**, **position_max** and **position_min** with the values from the table on [Diagram 6.13](#)
- **[stepper_y]** section. Reduce **position_max** value so that cable chain brackets will not collide with top extrusion, as shown on [Diagram 6.13](#).

Perform homing, quad gantry level and bed mesh calibration to ensure everything is operational.

Sometimes the coordinates for quad gantry level and bed mesh calibration points need to be adjusted to match new end stops and BLTouch location. Edit the **points** values under the **[quad_gantry_level]** section and **mesh_min** and **mesh_max** values under the **[bed_mesh]** section as required.

 Note the configuration steps above assume that both X and Y end stops are upgraded to optical. Adjust only the required parameters if only X end stop gets upgraded. **Values are provided as a guide only. Test and adjust as required to match the physical limits of your installation.**



Diagram 6.10

```
[bltouch]
sensor_pin: ^PC1
control_pin: !PA15
pin_move_time: 0.3
stow_on_each_sample: False
probe_with_touch_mode: False
#set_output_mode:5V
x_offset:28
speed: 16
lift_speed: 16
samples: 1
samples_result: median
sample_retract_dist: 5.0
#samples_tolerance: 0.006
samples_tolerance: 0.01
samples_tolerance_retries: 3
```

Diagram 6.12

```
##### FRAME AND BED
#[include components/troodon/300.cfg] #choose your bed and
[include components/troodon/300a3dp,optendstops]
#[include components/troodon/300a3dpmod.cfg.cfg]
#[include components/troodon/300a3dp,omc,optendstops.cfg]
#[include components/troodon/400.cfg]
#[include components/troodon/400Tm3dmod.cfg]
#[include components/troodon/400a3dpmod.cfg]
```

Diagram 6.11

```
[stepper_x]
step_pin: PD6
dir_pin: PD11
enable_pin: !PC6
rotation_distance :40
microsteps: 16
#full_steps_per_rotation: 400
endstop_pin: ^PC14
position_endstop: 303
position_max: 305
position_min: -2
homing_speed: 200

[stepper_y]
step_pin: PD7
dir_pin: PD12
enable_pin: !PC6
rotation_distance :40
microsteps: 16
#full_steps_per_rotation: 400 #
endstop_pin: ^PA2
position_endstop: 296
position_max: 302
position_min: -3
homing_speed: 200
```

```
[stepper_z]
step_pin: PD2
dir_pin: PD28
enable_pin: !PC6
full_steps_per_rotation: 200
rotation_distance :8
microsteps: 16
endstop_pin: probe:z_virtual_endstop
position_max: 365
position_min: -2
homing speed: 20
```

Printer	stepper_x	stepper_y	Stepper_z
Troodon 300	endstop: 303 max: 305 min:-2	endstop: 296 max: 302 min: -3	max: 365
Troodon 400	endstop: 403 max: 403 min: -2	endstop: 403 max: 403 min: -5	max: 465

Diagram 6.13

6.3 Wrapping up

a. Finalize installation

- Reinstall all panels. You may need to temporarily remove the bracket holding Z chain, then install it back – refer to **Step 1.4** [Diagram 1.7](#)).
- Perform Z Offset calibration and Input Shaper calibration as described in “*Advanced 3D Printing - Klipper Tuning Guide*”.

