



Advanced 3D Printing

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 (also referred as "hot end assembly").
- Use of improved DDE extruder (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 assemble the A3DP extruder as described in section 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.

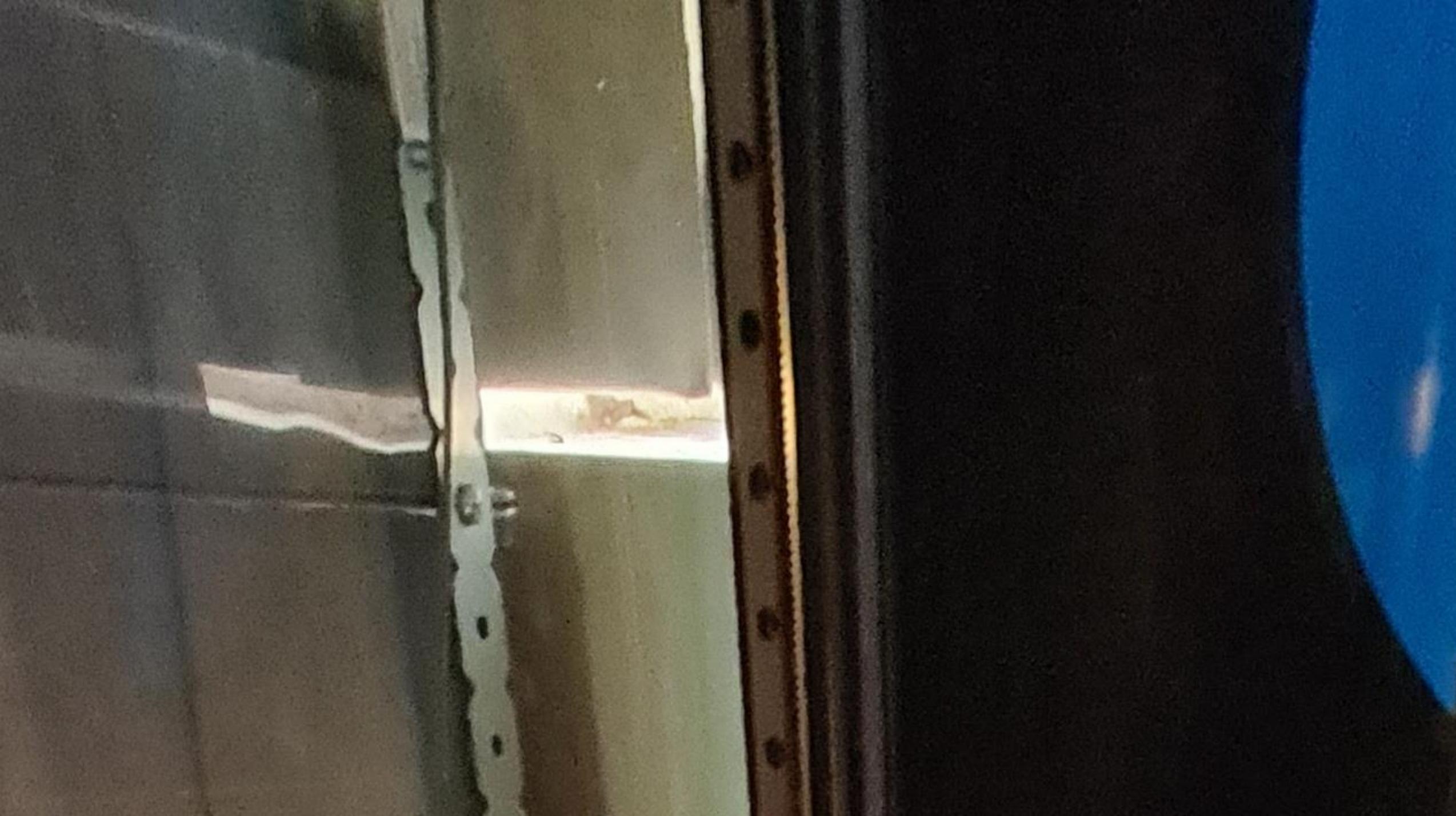
Step 4.
Upgrade Gantry Part 1

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



1.1 Kit content

a. Check included parts

Check all parts are included and not damaged in transit (Diagrams 1.1a – 1.1h below).



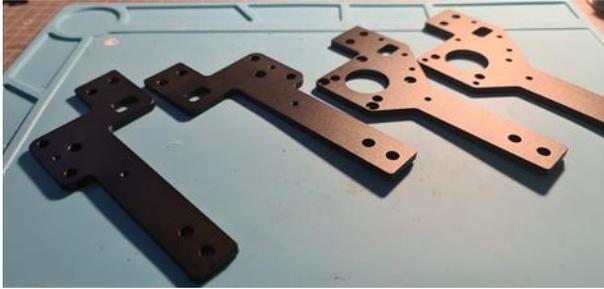
In this guide, parts from the kit are **highlighted** when referenced.

Printed parts are not included however if you need them please request and I will accommodate you. STLs are in link on [Advanced3dprinting.com](https://www.advanced3dprinting.com)



Please note that the kit requires some hardware from the stock printer to be reused.

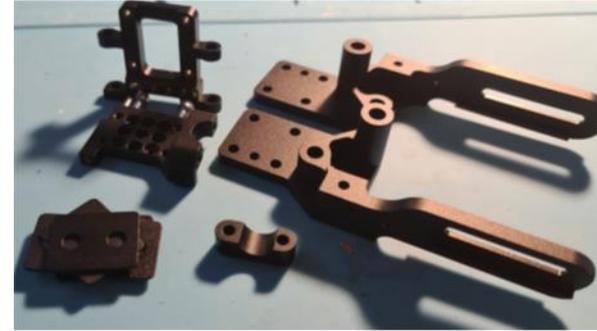
Machined Parts Set 1



- 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



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

Diagram 1.1c

Printed Parts Set 2



- Not included except for cable chain brackets
- 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

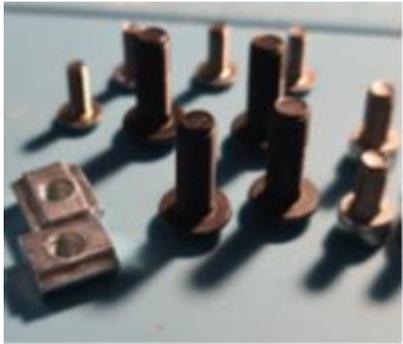
ent (Cont.)



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

Diagram 1.1e

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

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

Linear Rail

- X Linear Rail x 1

Diagram 1.1h

1.2 What you will need

a. What you will need.

- **Operational Troodon 300 or 400 printer with DDE kit installed.** The “Extruder assembly” section of this guide involves conversion of stock DDE extruder into the “Ultimate” extruder compatible with the kit and the “Wiring and Chains” section assumes that DDE wiring is already in place. Please purchase and install the DDE upgrade kit from Vivedino if your printer is set up as a Bowden or contact us.
- **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. “assorted m3 bolts”
- **For Troodon 400** you may also need extra wires, JST connectors and crimping tool to extend stock wiring.
- “this is not needed but if not very careful with wires you will run short. You can rotate the motherboard or just make sure to run the wires as neatly as possible and it will be long enough”
- **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 right JST connector.
- You will also need to print parts (please see **Step 1.3** “Parts to print” for details) – alternatively you can procure some of the generic parts (such as cable chains) on your own.
 -  30mm stock Troodon hot end fan is ok for the Dragon, however a upgraded fan (e.g. 40mm radial fan) can be beneficial for Takoto. Please print appropriate mount for 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.
- **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, endstop 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 us if you want to use the stock (RepRap) firmware.

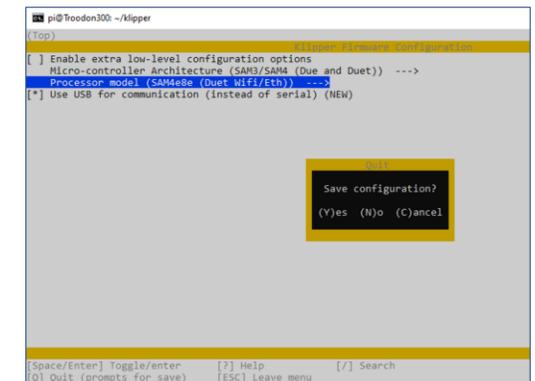
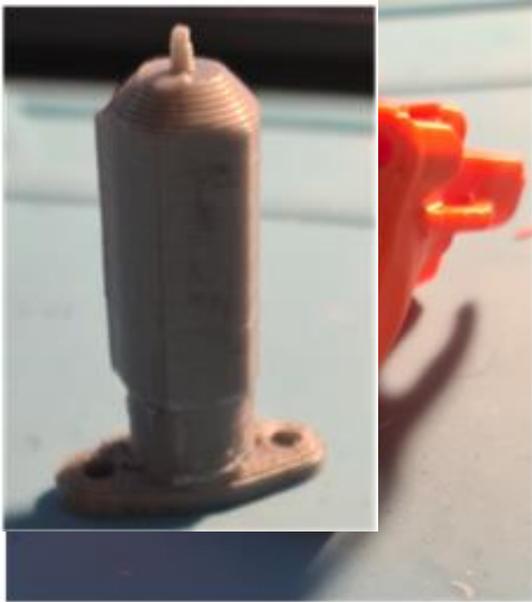


Diagram 1.2

to print



Print the STL for 5015 blower fan from ([Diagram 1.3](#)). Note the need to adjust the height of the duct for Takoto or Dragon hot end.

Print cable chain STLs. You will need to print X and Y chains, each "400" and one top and bottom link. Alternatively, you may buy (and/or purchase a manufactured cable chain of appropriate size (options) and style for the x or both.

Print the hot end fan duct STL for the fan used ([Diagram 1.4](#)). 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://www.thingiverse.com/search?qdsd=a3dp_gantry&type=things&sort=relevant

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

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 carriage / 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 temporarily 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](#)).
- 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 parts you remove for further reuse.



Diagram 1.6



Diagram 1.7

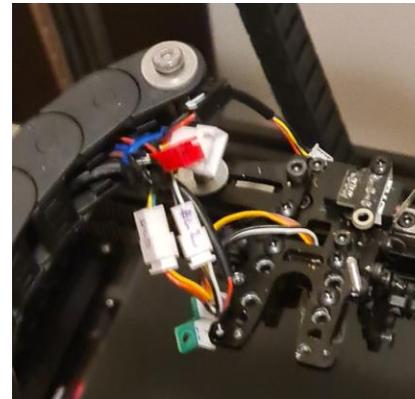


Diagram 1.8

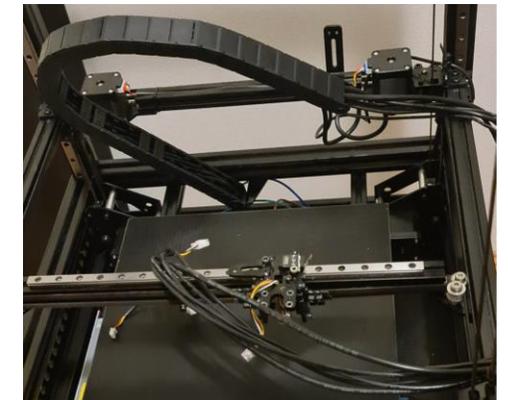


Diagram 1.9



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.

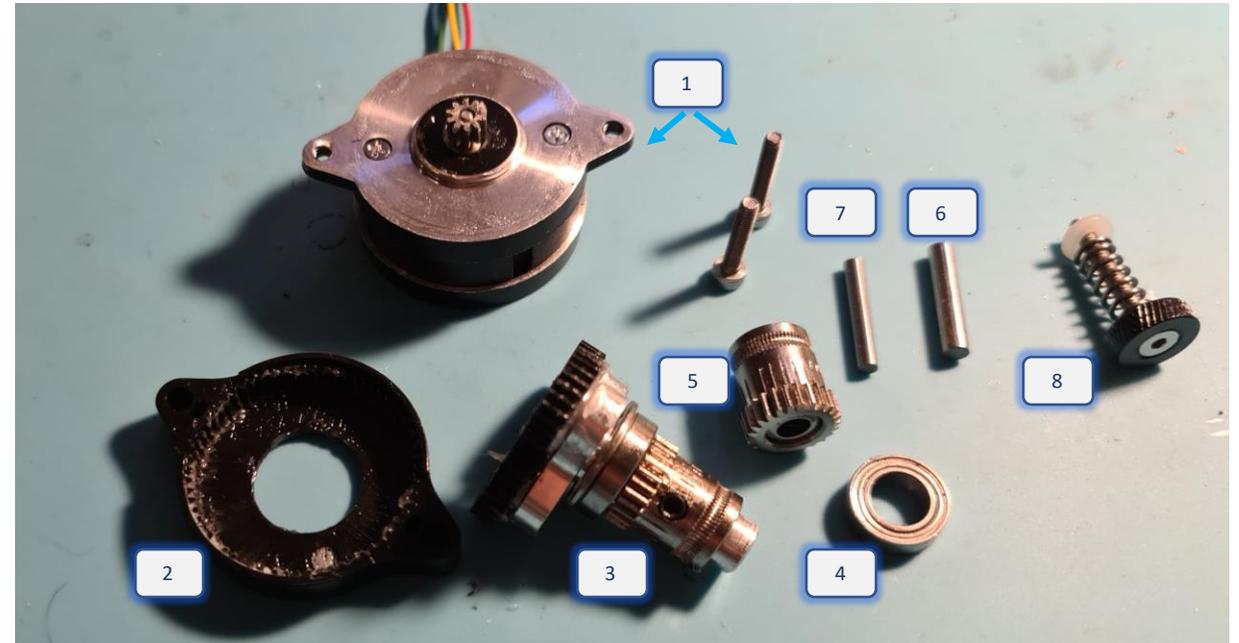


Diagram 2.1

2.2 Main housing

a. Assemble main housing

Use provided [Extruder main housing](#) and insert main gear ball bearing. ([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. Note that PC can be sensitive to lubricants and Nylon can swell so either use high end silicone or nothing.

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 motor 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 tighten the grub screw back.



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

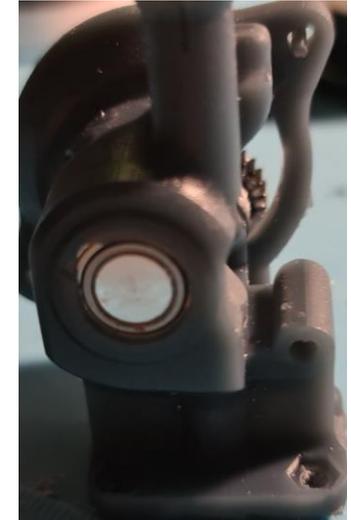


Diagram 2.3

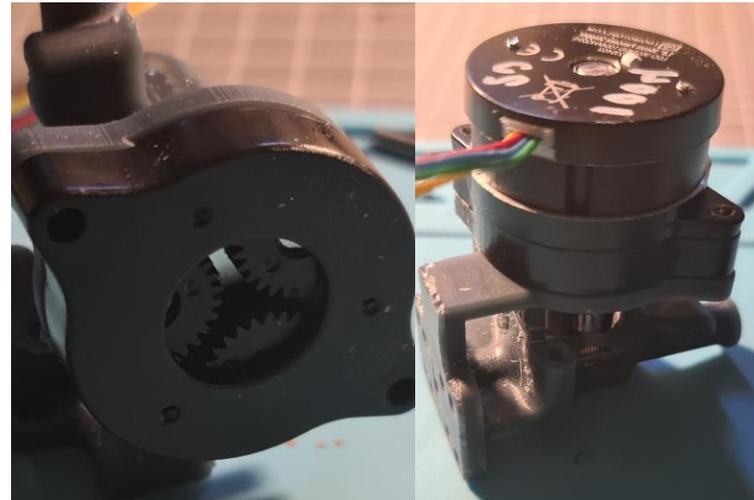


Diagram 2.4

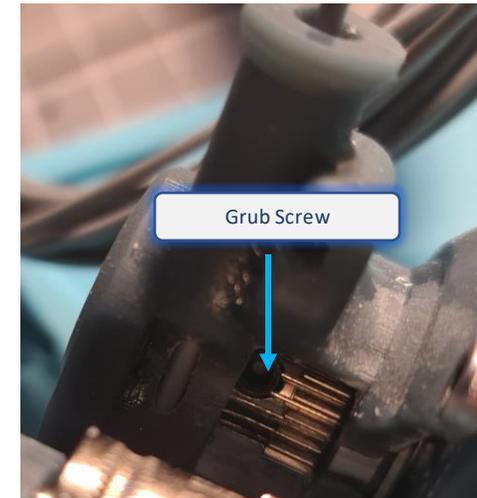


Diagram 2.5

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 prevent the pins from slipping through. 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](#)).

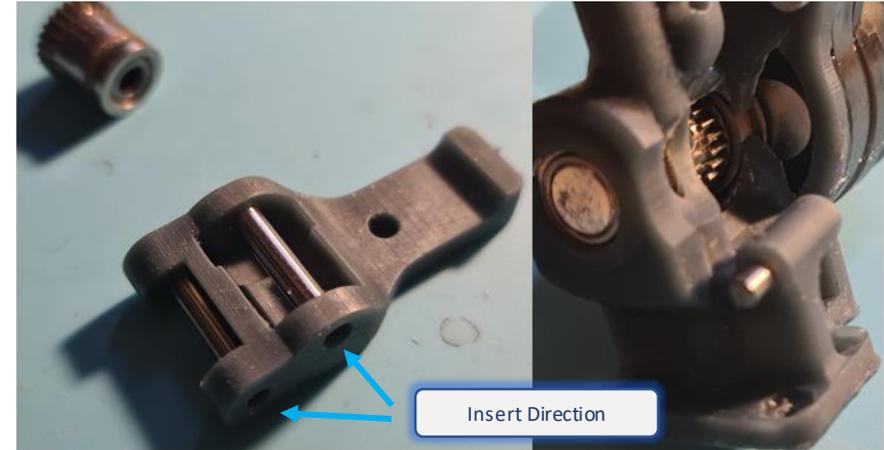


Diagram 2.6



Diagram 2.7

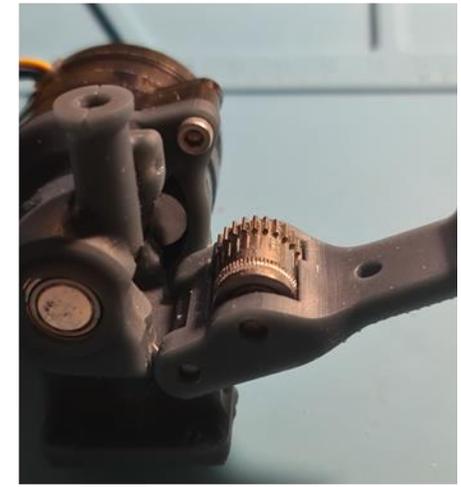


Diagram 2.8

2.4 Final assembly

a. Finalise assembly

Install the Tension thumb screw assembly - 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 resin 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.

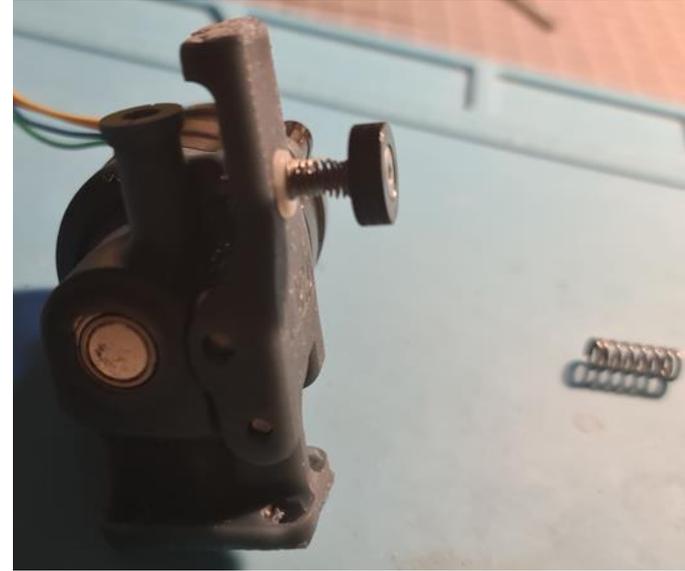
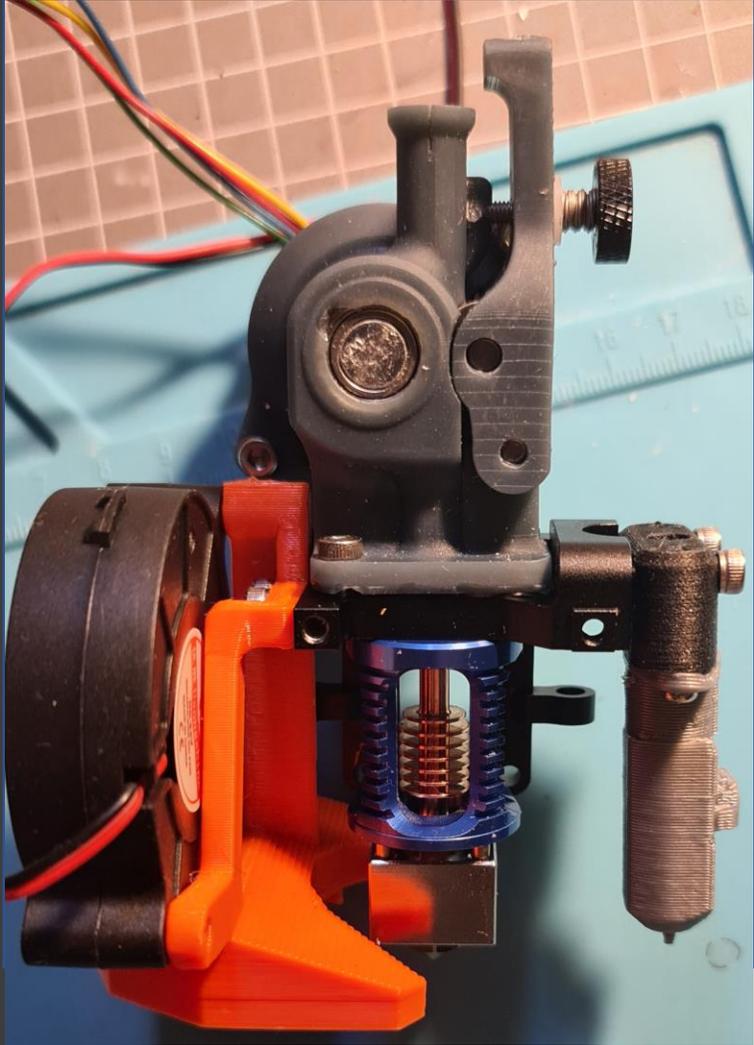


Diagram 2.9



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 Section 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](#).



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” section.



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](#) a ppropriate mounting hardware (**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 are not flush with the [hot end mounting plate](#) – [main extruder housing](#) has corresponding grooves to accommodate that.

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



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

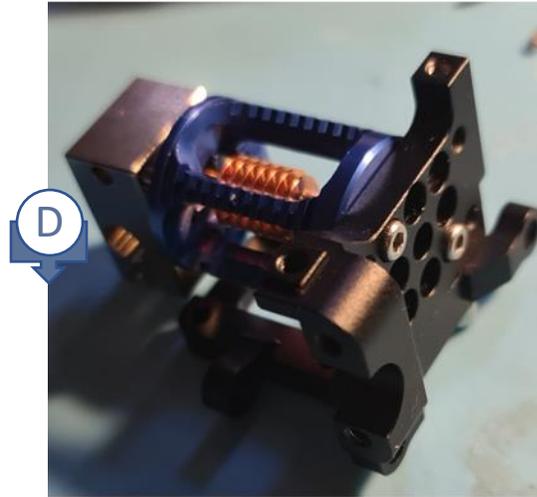


Diagram 3.2

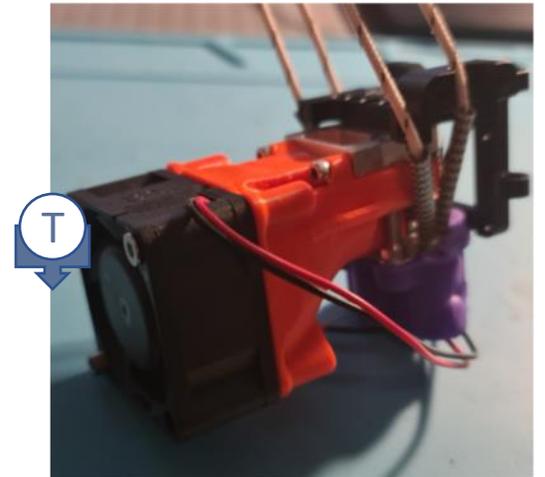
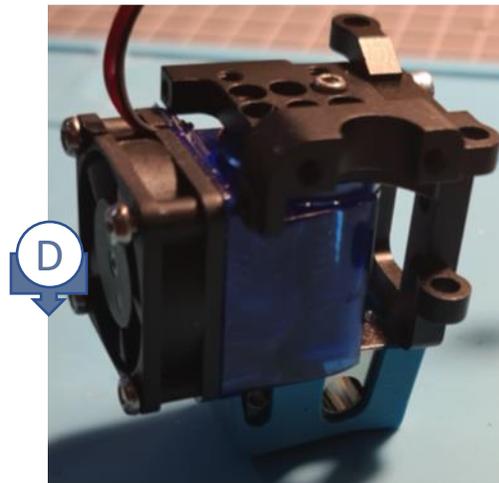


Diagram 3.3



ng

ng plate using appropriate mounting hardware –

d the height of the hot end with nozzle inserted
ng holes to adjust.

own on [Diagram 3.6](#).

c and/or the choice of material you may screw
or use retaining nuts.



Diagram 3.4



Diagram 3.5d

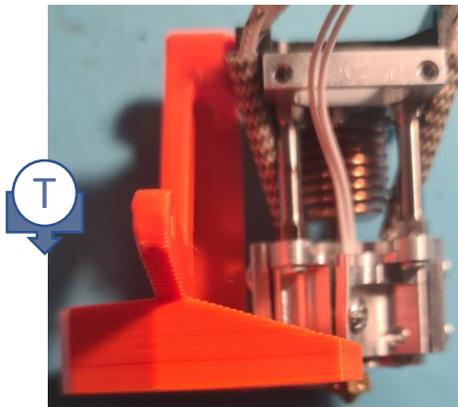


Diagram 3.5t

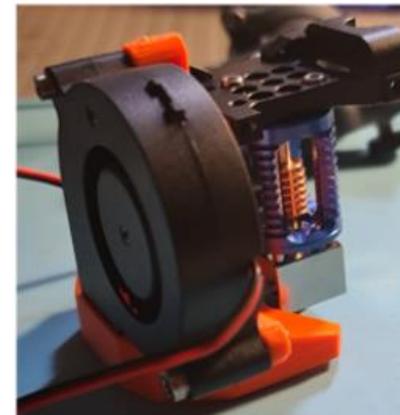


Diagram 3.6

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 suit the height of your hot end (e.g., Ta koto or Dragon).

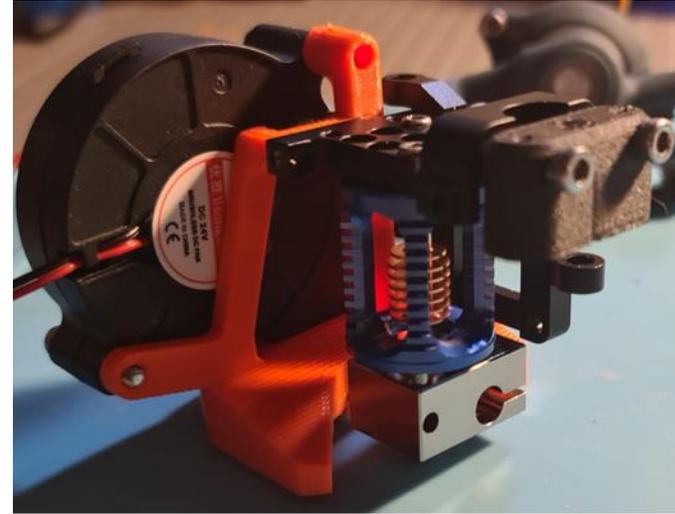


Diagram 3.7

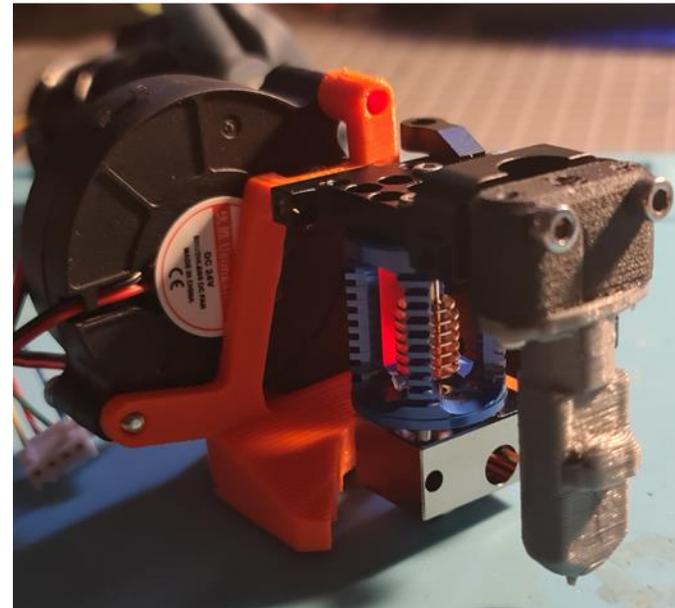


Diagram 3.8

3.5 Extruder

a. Install extruder

Insert a piece of PTFE tube into the PTFE tube hole of the [hot end mounting plate](#) of the [X Carriage mount](#), push it all the way down ensuring that it touches the hot end and test fit the extruder assembled as per the instructions in Section 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 in the filament channel of the extruder and the 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](#)).

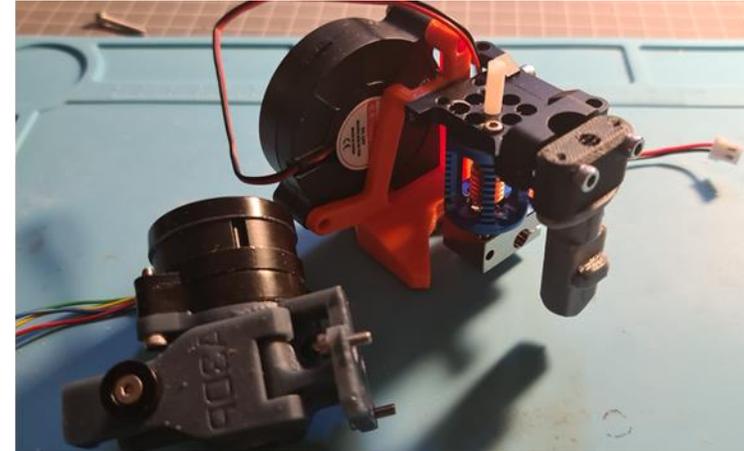


Diagram 3.9

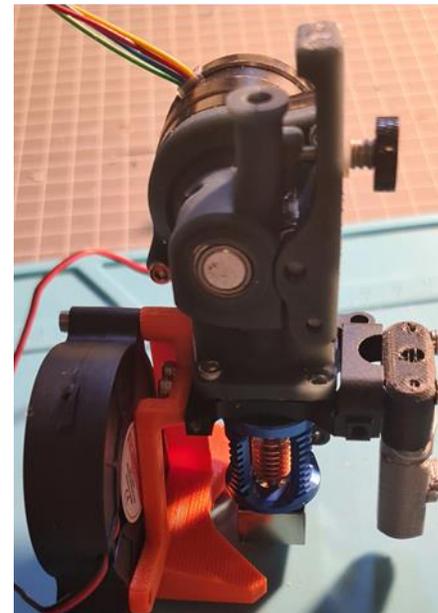


Diagram 3.10



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 be to be reinstalled later – please store it safely.

Carefully pull the wires – those that need to reach the printhead – through 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 ran perfectly", specifically for the extruder cable.

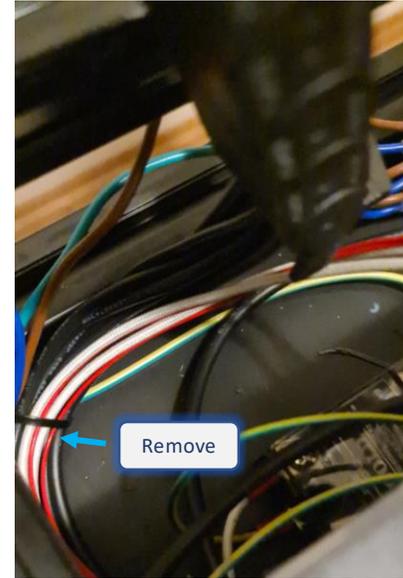


Diagram 4.1



Diagram 4.2

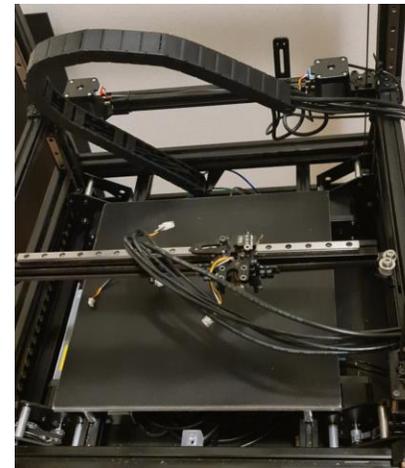


Diagram 4.3

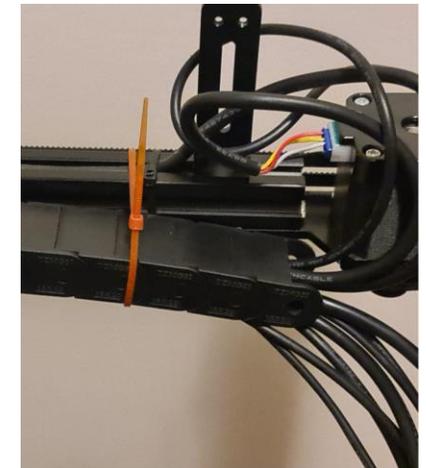


Diagram 4.4

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 which belt is on top, 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 machine 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 mount – on both sides, mounting arms and raised idler mounts should be facing towards the back of the printer.



Don't tighten the bolts – for now keep them finger tight only.



Diagram 4.5

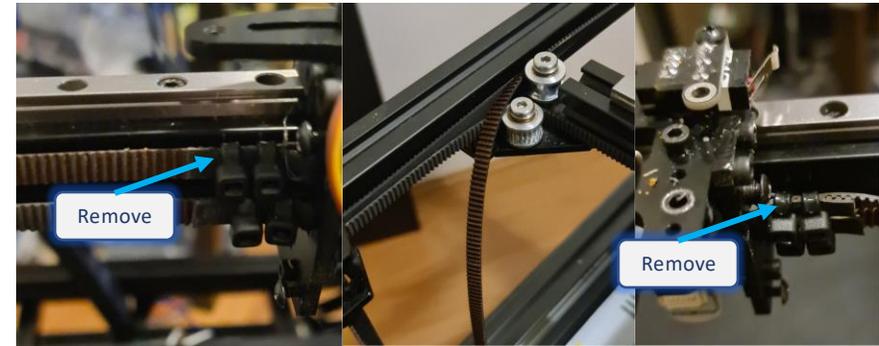


Diagram 4.6

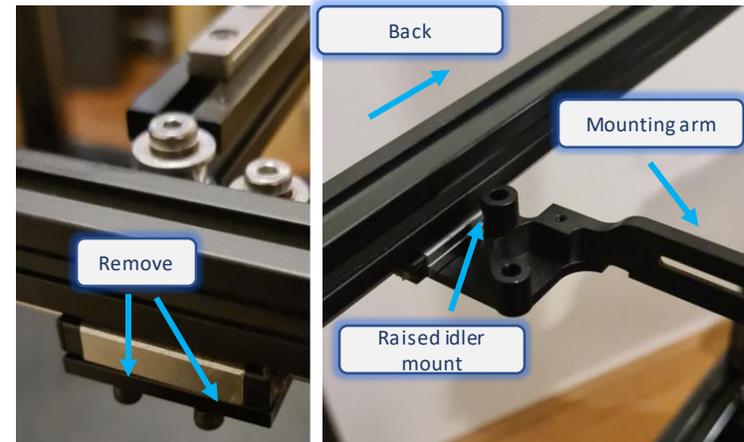


Diagram 4.7

Diagram 4.8

4.2 X rail (Cont.)

b. Install Idlers

From the stock X assembly, remove 4 idler assemblies (from both sides) – 2x toothed idlers and 2x smooth idlers. Each assembly should contain an idler (toothed or smooth), mounting bolt and 2x 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 all of them are removed.

From the components above only 4 brass washers and 4 idlers will be reused for the installation “some machines have not had steel washers here but they can be scavenged from other locations and are being added to future kits if needed can be ordered separate but printer will function temporarily without them they are “5mm id 7mm od .5mm thick”. 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](#) (toothed and smooth idler pairs on each side) as shown on the [Diagram 4.11](#). Observe the right order, on the left side 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 raised.



Please note the bolts are not designed to tighten 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

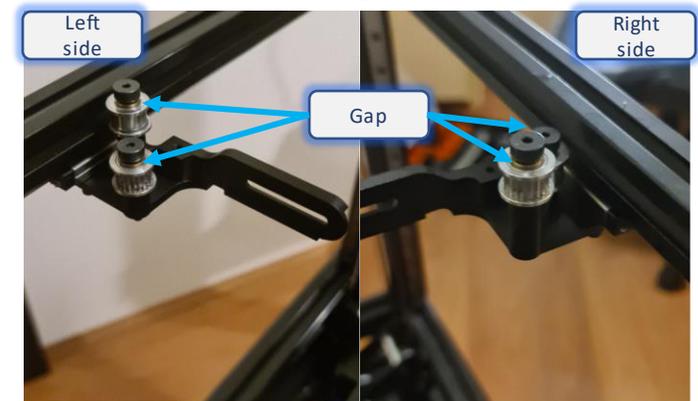


Diagram 4.11

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 – for now keep them finger tight only.

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



On the 300 depending on order date of machine and of 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 later revisions have accommodated for this if you have a very early machine please comment during order and this can be addressed ahead of time.

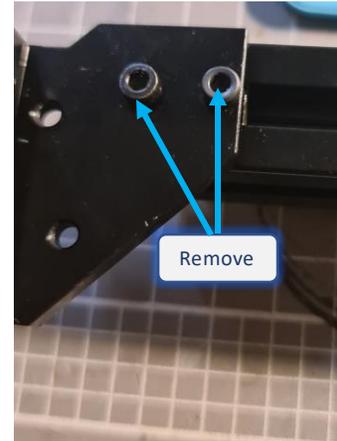


Diagram 4.12

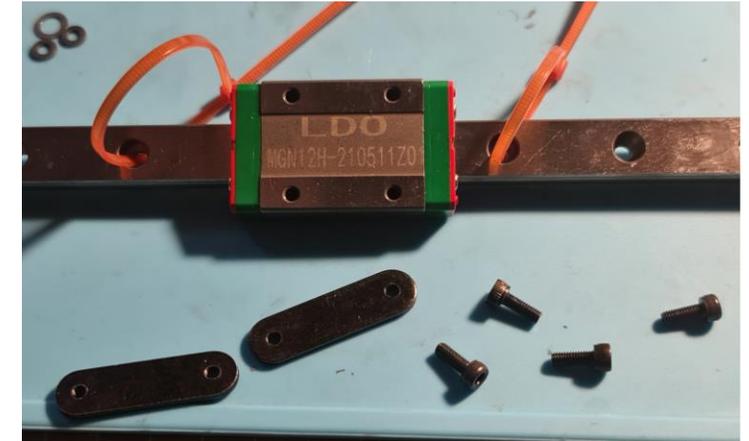


Diagram 4.13

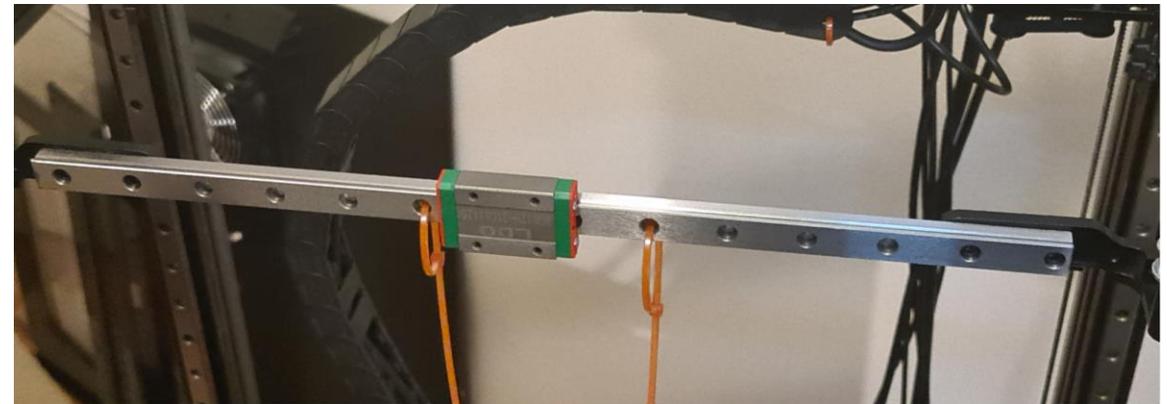


Diagram 4.14

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.

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 loose 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

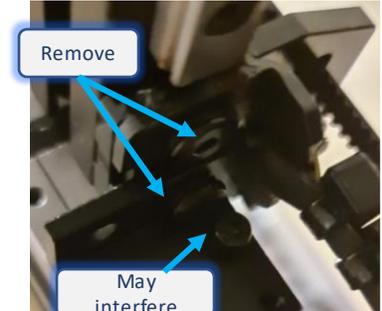


Diagram 4.7



Diagram 4.8

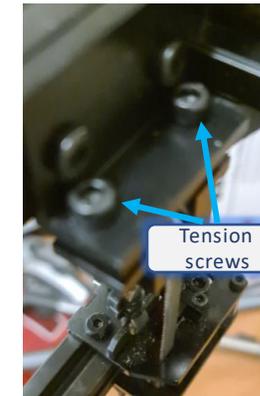


Diagram 4.9



Diagram 4.10



Diagram 4.11



Diagram 4.12

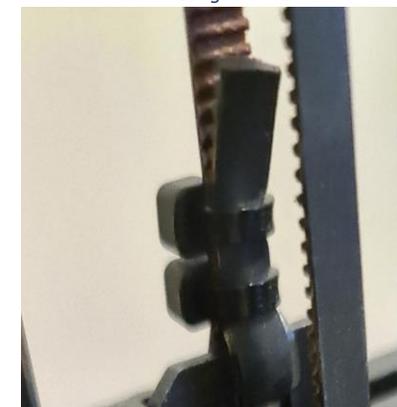
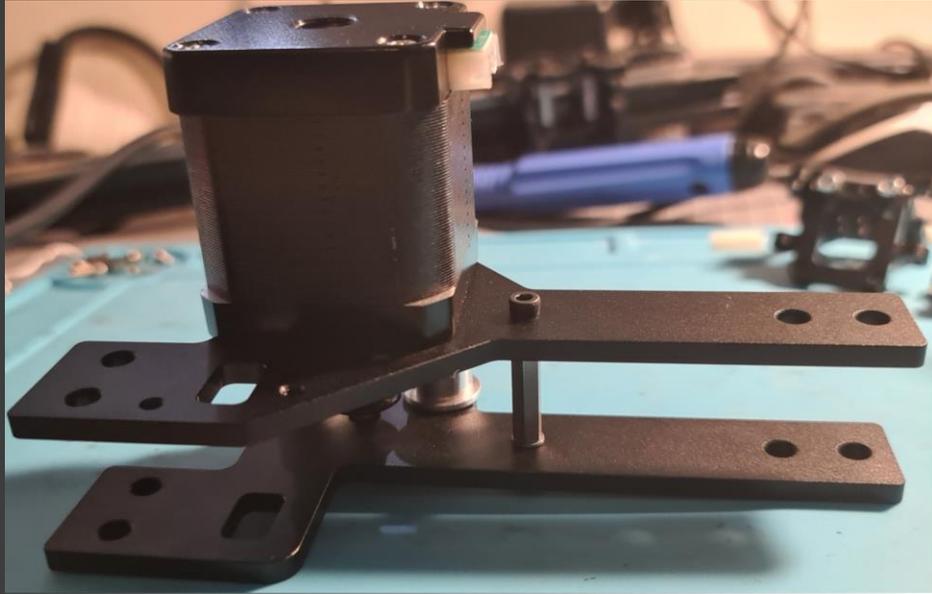


Diagram 4.13



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 let 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 to prevent these T nuts from sliding off the extrusion. Also 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](#)). There will be used in the next step.

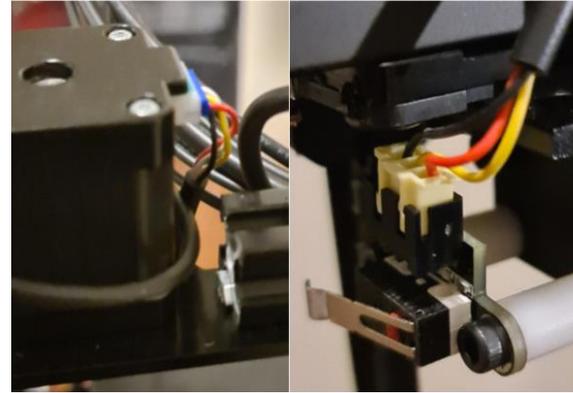


Diagram 5.1

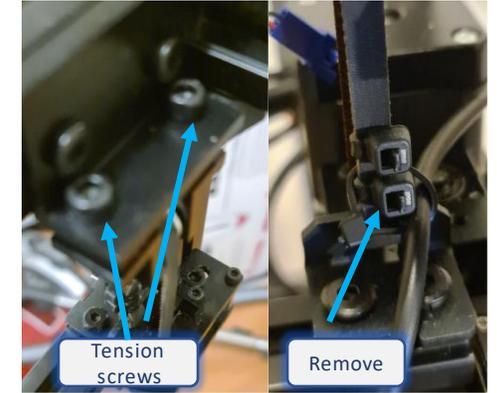


Diagram 5.2



Diagram 5.3

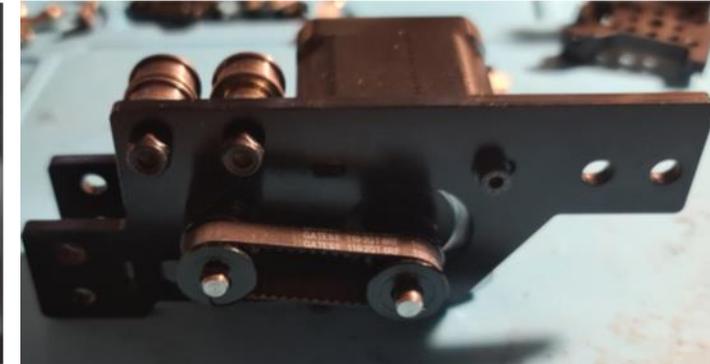


Diagram 5.4

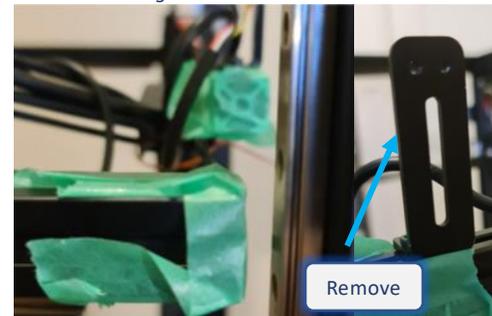


Diagram 5.5



Diagram 5.6



Diagram 5.2



Not used

Diagram 5.9



Set screws

Left side

Right side

Diagram 5.10

5.1 XY motors (Cont.)

c. Install idlers and finalize motor assembly

Dis mount 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 overcome by excessive tightening ([Diagram 5.15](#)).

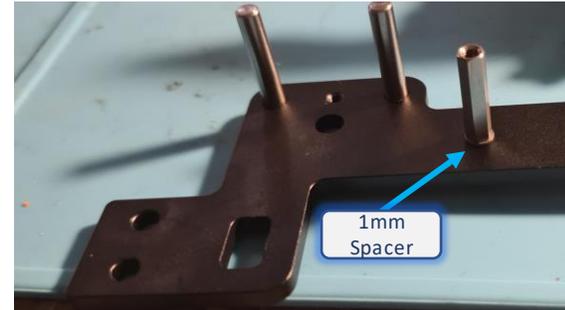


Diagram 5.11



Diagram 5.12



Diagram 5.13

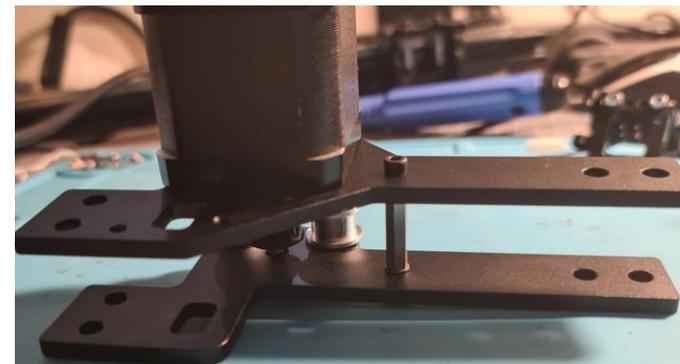


Diagram 5.14

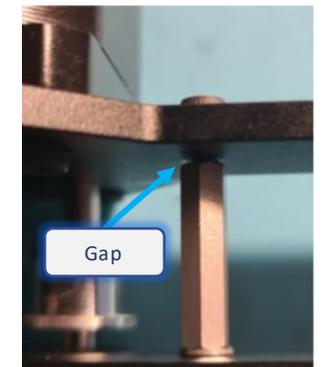


Diagram 5.15

5.1 XY motors (Cont.)

d. Install motor assembly

Remove painter tape (previously used to temporarily 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, keep them finger tight for now.

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 ([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.

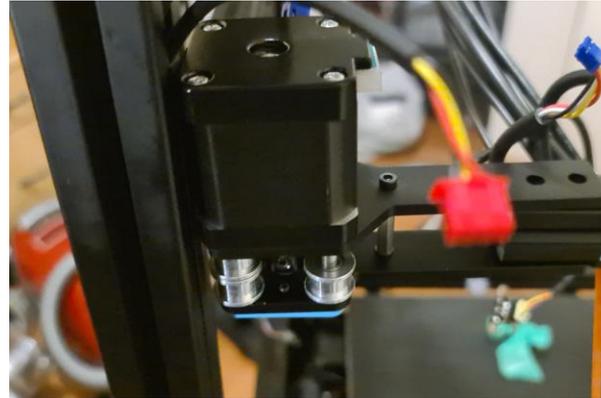


Diagram 5.16

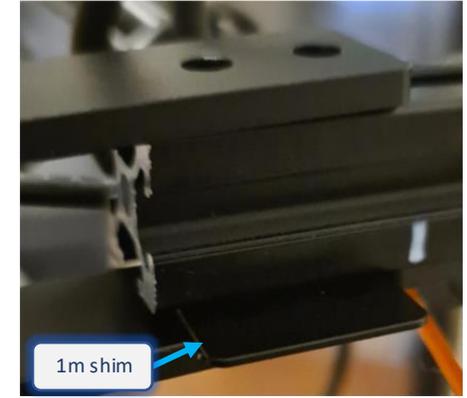


Diagram 5.17

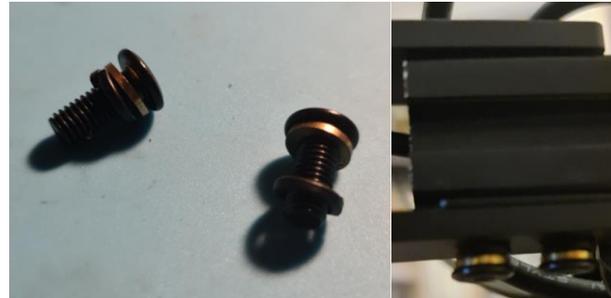


Diagram 5.18

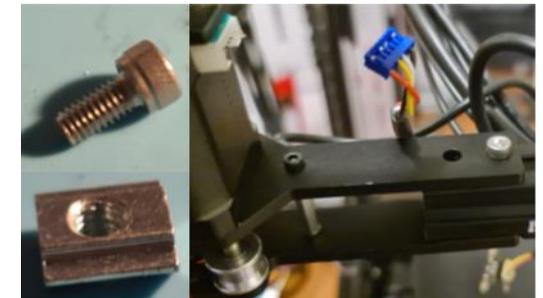


Diagram 5.19



Diagram 5.20

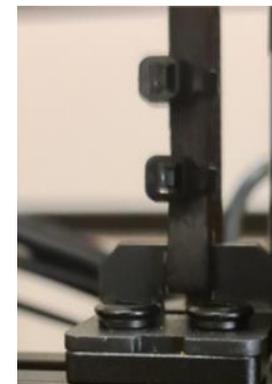


Diagram 5.21



Diagram 5.22

5.2 Cable chain brackets and endstops

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 endstop

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 in the cable chain brackets to avoid damage.



Diagram 5.23



Diagram 5.24

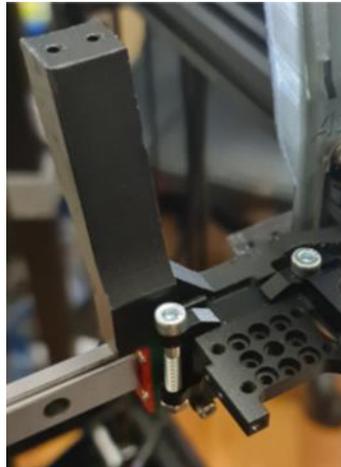


Diagram 5.25

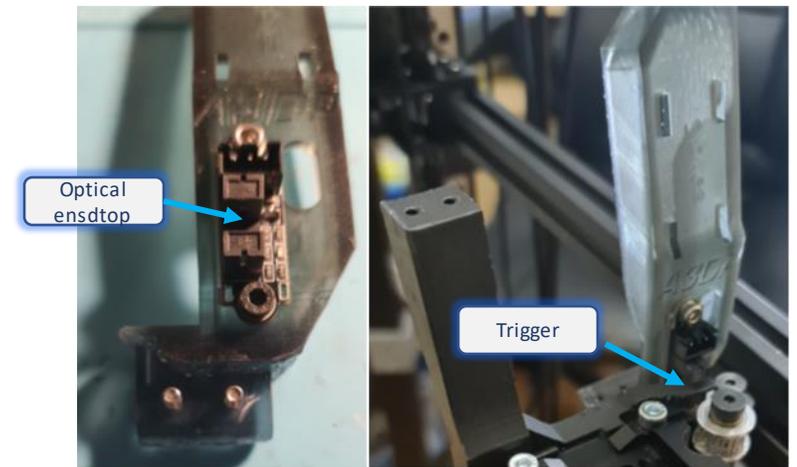


Diagram 5.26

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



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



Diagram 5.27

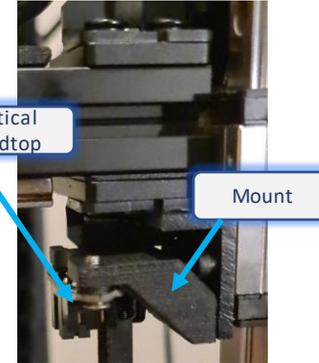


Diagram 5.28

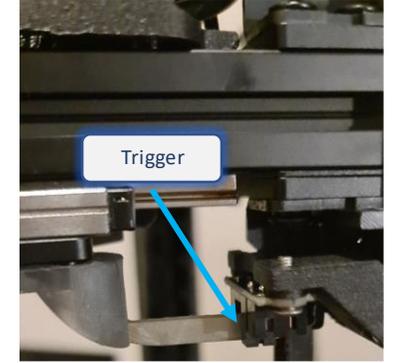


Diagram 5.29

5.3 Cable chains and wiring

a. General considerations

This step of the installation process is essentially based on 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 that allows the full and unrestricted movement of the printhead. This can be achieved – assuming that you have freed up all the cable and wires to their maximum length as a part of **Step 4.1** “Wires preparation” – by:

- Adjust the length of Z, Y and X chains (by adding or removing links). Z can lose 5-8 link if needed usually
- Routing of the cables using optimal path.
- Using chains with larger inner space to simplify cable routing, and
- As a last resort – creating custom extension for printhead cables (extruder, heater, etc.).

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 a 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 used by removing links (in most cases stock Z cable chain needs 3 to 4 extra links removed but can remove much more before restricting movement). Ensure that all cables and wires are pulled through Z cable chain and are tight but not squeezed or jammed and secure the upper end of Z cable chain to the (stock) bracket on rear X extrusion with the stock bolt, but add 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 clicking 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 endstop](#)) 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 endstop 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 endstop](#) 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 as well as Y end stop and XY motor cables to the gantry extrusions ([Diagram 5.35](#)).



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

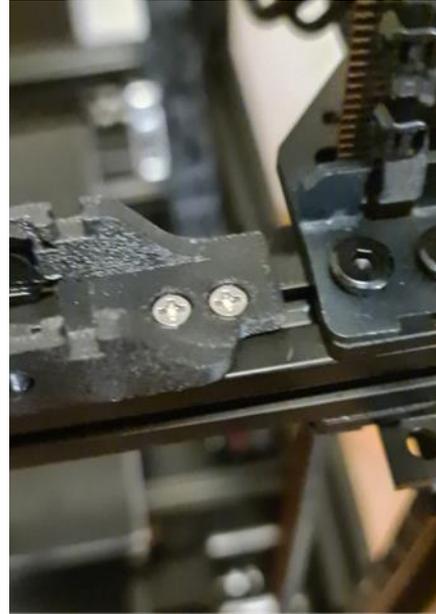


Diagram 5.32

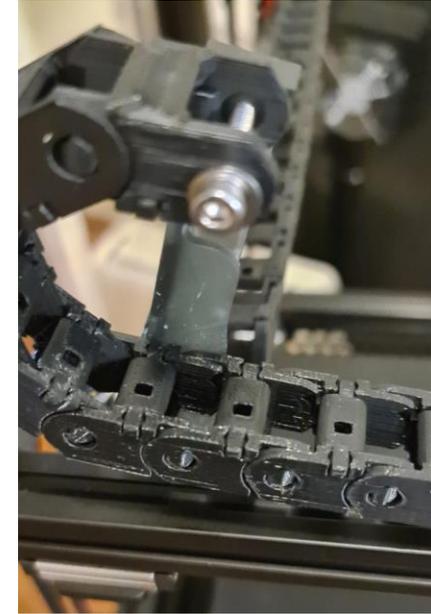


Diagram 5.33



Diagram 5.34

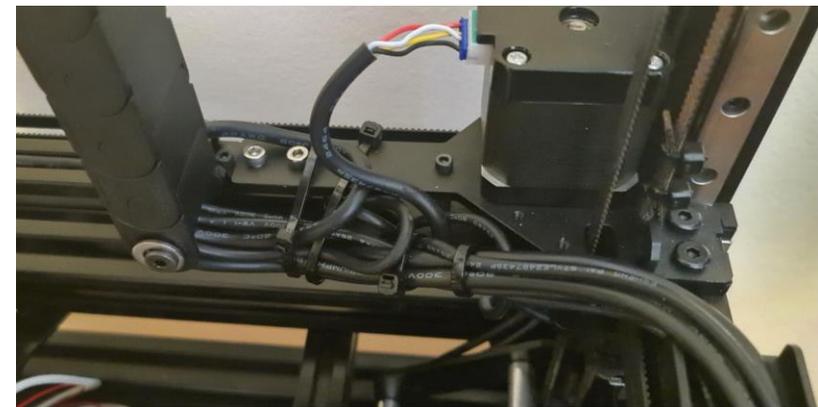


Diagram 5.35

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 endstops respectively. Secure with extra cable ties as required.



Diagram 5.36



Diagram 5.37

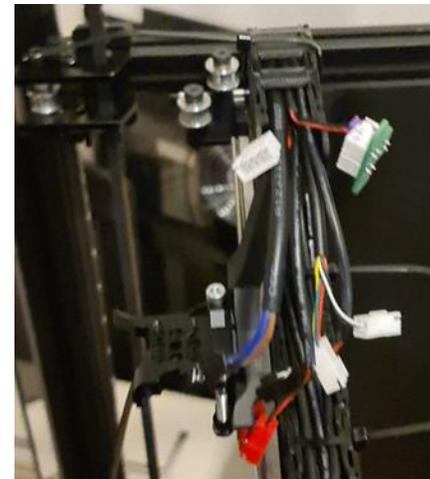


Diagram 5.38

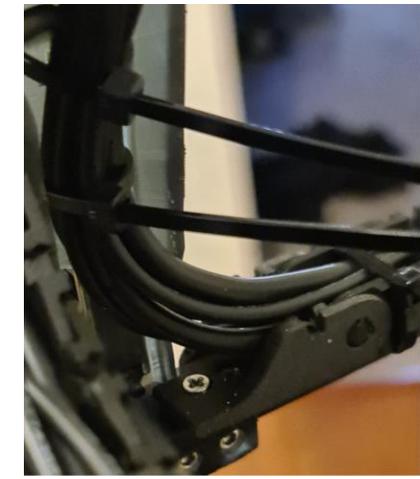


Diagram 5.39



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 the 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

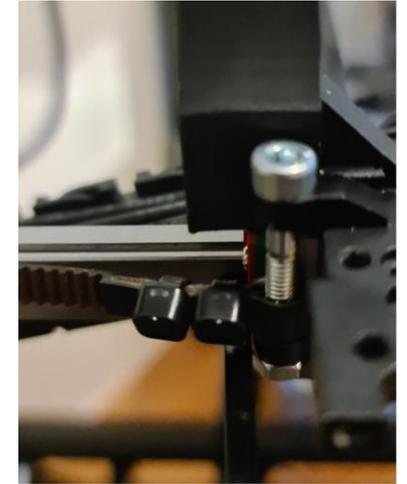


Diagram 6.3

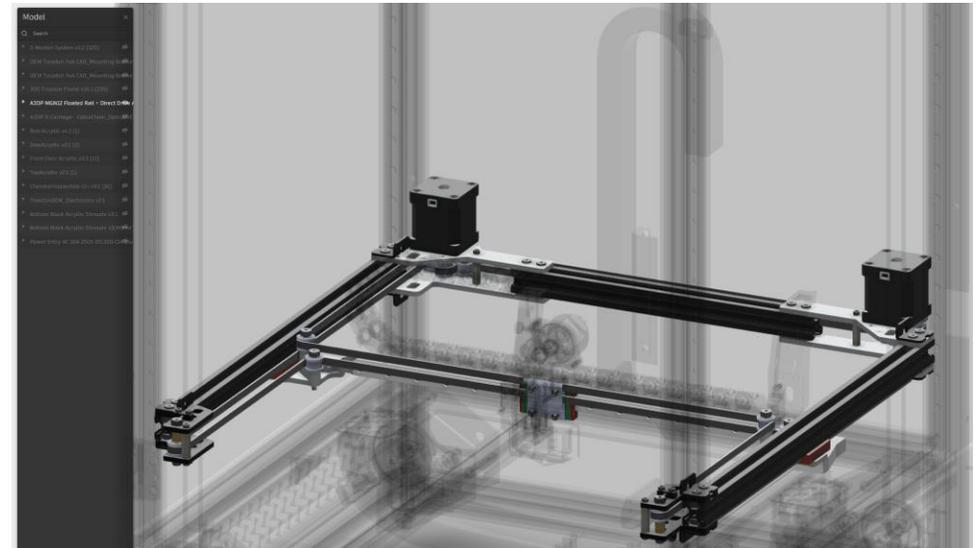


Diagram 6.4

6.1 Belts and gantry alignment (Cont.)

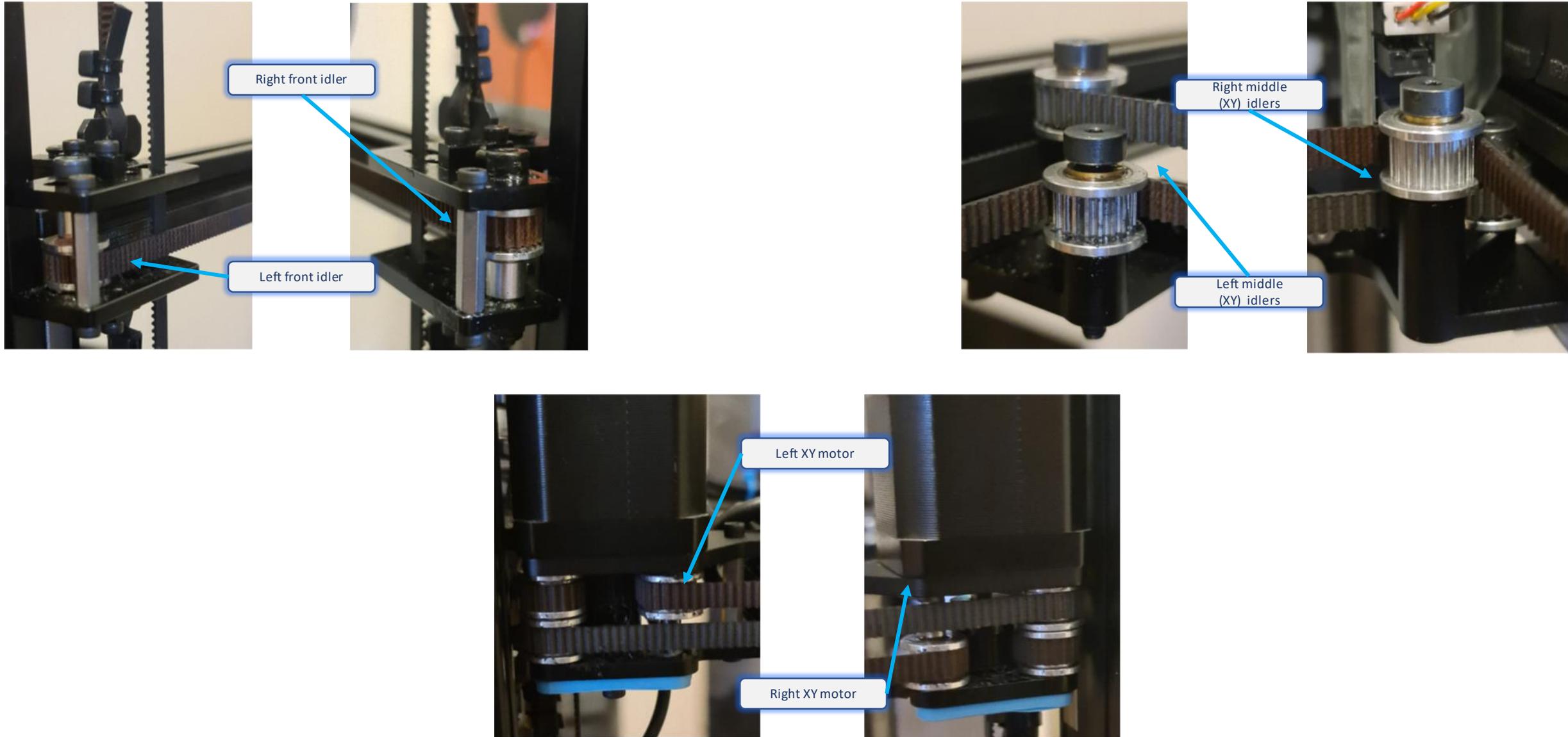


Diagram 6.5



Diagram 6.7

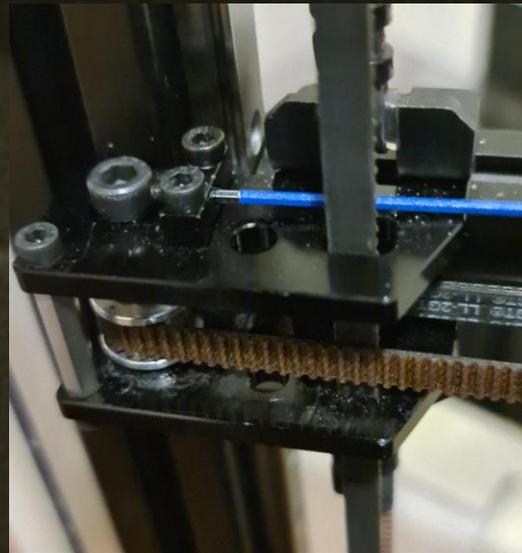


Diagram 6.8

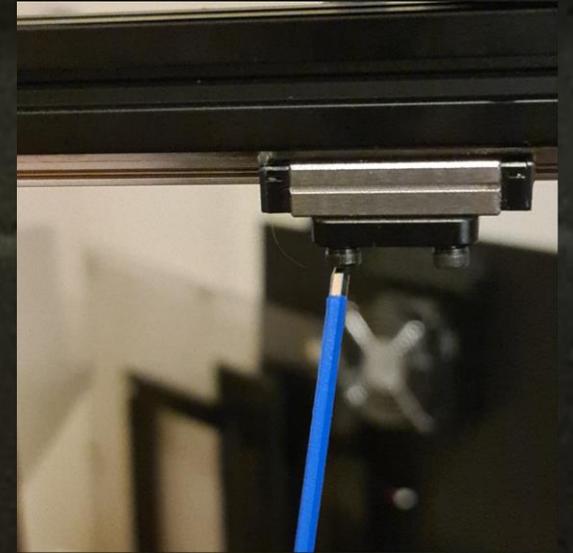


Diagram 6.9

6.2 Klipper configuration

a. Connect components

Assemble and install the printhead components as described in **Step 3**. Connect all the cables and ensure that XY motors cables and endstop 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 inline with 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 endstops 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 endstops).

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 endstops 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 endstops are upgraded to optical. Adjust only the required parameter if upgrading only X endstop. **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]
#[include components/troodon/300a3dp,omc,optendstops.cfg]
#[include components/troodon/400.cfg]
#[include components/troodon/400Tm3dmod.cfg]
#[include components/troodon/400a3dpmod.cfg]
```

For 300
For 400

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

- Power off the printer and Install and connect the remaining printhead components (hot end, fans, extruder, etc.) as described in **Step 3** “Assemble Printhead”.
- 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*”.

