ERCF BUILD GUIDE

v3.0 EDITION

Even the smallest one can change the world.
–Peter Rabbit

VERSION 2025-10-01

Before you begin on your journey, a word of caution.

This machine can potentially maim and electrocute you if you are not careful.

Please do not become the first ERCF fatality.
There is no special Discord flair for that.

Please, read the entire manual before you start assembly.

As you begin wrenching, please check our Discord channels for any tips and questions that may halt your progress.

Most of all, good luck!

The ERCF Team

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THANKS!

Thanks are in order to several groups of people:

Dr. Lorincz Robert for his work on stepper motors and his help understanding the physics of stepper motors. His help was integral to the design of the Direct Drive system.

Blamm! for the inspiration of the Disco Stick, **Shammy** for his work adapting it to an ERCF-friendly format, and **Fabreeko** for their work with **XR Bunker** co-producing the Carrot on a Stick and Carrot on a Twig boards. **Shammy** again for being a PCB design resource for other ideas!

TheRogueZeta for developing the Microswitch to JST-XH/PH PCB.

LDO, **SIBOOR**, and **BTT** for working with us to prototype kits and bespoke kit solutions for v2.0.

FizzyTech for giving us a dedicated online space to congregate and discuss ERCF while developing v2.0.

The ERCF Team

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WARNING

BEWARE

This project requires a well-tuned printer and ABS slicing profile, as there are many press fits and plastic on plastic mechanisms. **Before you print all of the parts**, you should first print the ERCF_Calibration_Tool.stl along with a Tophat_xN.stl, and test fit the parts as shown on page 24. You may need to tune your printer or printing profile before you print the rest of the parts!

Easily half of problems with this build that we see reported on Discord can be avoided by making sure that your printer is up to the task first.

If you haven't tuned your printer yet, please start by tuning:

-Your Extruder calibration

-Your Pressure Advance setting

-Your Extrusion Multiplier, and

-Your Cooling and Layer Time settings

We can't speak highly enough of the Tuning Guide that Andrew Ellis has put together. The other steps are optional. If you encounter problems, try his Troubleshooting Guide!

KEEP THE ERCF PROJECT GOING!

ERCF is an all-volunteer, open-source project under the Carrot Collective umbrella.

If you want to support the ERCF team, please donate to the Carrot Collective:

https://opencollective.com/carrot-collective

If you found this manual valuable, please consider donating to Miriax, the creator of the manual.

PayPal.me/MiriaxERCF

In the words of Marc, ERCF would be a dead brick of plastic without Happy Hare software.

Happy Hare is coded primarily by moggieuk, and Silverback_Attack wrote a lot of the documentation.

You can find Happy Hare here:

https://github.com/moggieuk/Happy-Hare

You can donate to support moggieuk and Happy Hare here:

PayPal.me/moggieuk

PRINT GUIDELINES

PART PRINTING GUIDELINES

The Voron Team has provided the following print guidelines. The ERCF Team have added our own recommendations atop their guidelines. Please follow them in order to have the best chance at success with your parts. There are often questions about substituting materials or changing printing standards, but we recommend you follow these.

FDM MATERIAL

The ERCF was developed for use only with ABS, so we strongly recommend you use ABS to build the ERCF. All reported community efforts to use different materials (PLA, PETG, resin) have failed for a variety of reasons.

Use only ABS. Not ASA, not ABS+, not EZ ABS, etc.
Use high quality filament, too, not bargain filament.

LAYER HEIGHT

Recommended : 0.2mm
First Layer: 0.25mm

LAYER HEIGHT EXCEPTIONS

(The [o]_Encoder_Wheel and Servo_Arms)
Recommended : 0.1mm or less if capable
First Layer: 0.2mm or less if capable

EXTRUSION WIDTH

Recommended: Slicer default width, or 0.4mm
Arachne is the preferred slicing engine.

SUPPORTS & PRINT ORIENTATION

All parts are oriented correctly for printing and include print in place supports where required.

INFILL TYPE

Rectilinear, Honeycomb, Triangle or Cubic.

Grid and Gyroid are specifically **not recommended**.

Grid infill creates high points that can catch the nozzle and cause inaccuracy. Gyroid subtly curls parts away from the build plate.

INFILL PERCENTAGE

Recommended: 40%

WALL COUNT

Recommended : 4

SOLID TOP/BOTTOM LAYERS

Recommended : 5 or more

STL FILE KEY

FILE NAMING

By this time you should have already downloaded our STL files from the ERCF GitHub. You might have noticed that we have used the Voron naming convention for the files. This is how to use them.

PRIMARY COLOR

Example End_Block.stl

These files will have nothing at the start of the filename.

ACCENT COLOR

Example [a]_End_Bypass.stl

These files have an "**[a]_**" prefix to denote that they should be printed with an **accent** color.

QUANTITY REQUIRED

Example Filament_Path_xN.stl

Files ending with "**_x#**" are telling you the **quantity** of that part required to build this system. For the ERCF, "N" means the number of channels.

COLOR REQUIRED

Example
[c]_Cover_Lens_xN.stl

These files have a "**[c]**"prefix to denote that they need to be printed in a **clear/transparent** material.

COLOR REQUIRED

Example
[o]_Encoder_Slotted_Wheel.stl

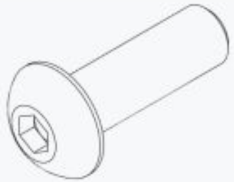
These files have an "**[o]**"prefix to denote that they need to be printed in an **opaque** material light can't penetrate, preferably black.

OPTIONAL MULTIMATERIAL

Example
[mm]_Selector_Door.3mf

These files have a "**[mm]**"prefix to denote that they should be printed in **multiple** colors. We always include single-color versions of these files too, for your first build.

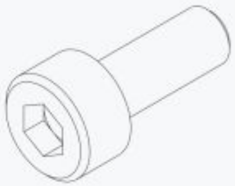
HARDWARE REFERENCE



BUTTON HEAD CAP SCREW (BHCS)

Metric fastener with a domed shape head and hex drive. Most commonly found in locations where M5 fasteners are used.

ISO 7380-1



SOCKET HEAD CAP SCREW (SHCS)

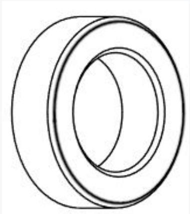
Metric fastener with a cylindrical head and hex drive. The most common fastener used on the ERCF.

ISO 4762

FLAT HEAD COUNTERSUNK SCREW (FHCS)

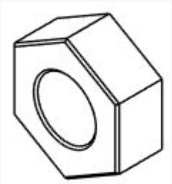
Metric fastener with a cone shaped head and a flat top.

ISO 10642



MR85 BEARING

Used to center the drive shaft, and as a filament sensor actuator.



HEX NUT

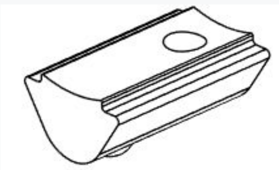
Hex nuts couple with bolts to create a tight, secure joint. You'll see these used in both M3 and M5 variants throughout this guide.

ISO 4032

MAGNETS

How do they work?

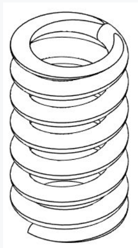
These are cylinders 6mm in diameter and 3 mm tall. Shorter ones are OK, down to 2.7 mm. N52 are preferred, but N48 can work.



POST INSTALL T-SLOT NUT (T-NUT)

Nut that can be inserted into the slot of an aluminium 2020 profile.

Often also called "roll-in t-nut."

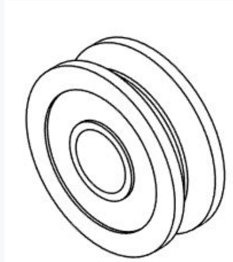


SPRINGS

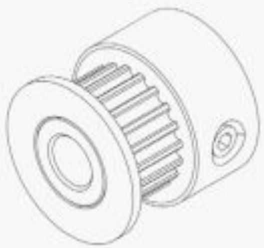
The main spring needed is for the Selector servo tensioner, which has a diameter of 6mm, length of 10-12mm, and uses 0.6-1.0mm thick wire.

HARDWARE REFERENCE

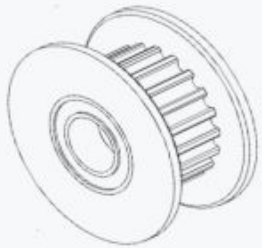
625 BEARING
Old ball bearing used in the Encoder.



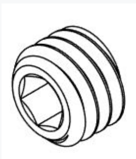
V623ZZ V GROOVE BEARING
A ball bearing used in the Encoder.



PULLEY
GT2 pulley used on the linear motion system of the ERCF.



IDLER
GT2 idler used in the linear motion system of the ERCF.

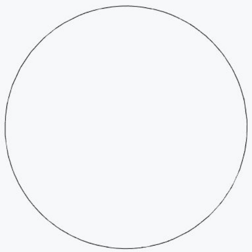


SET SCREW
Small headless screw with an internal drive. Used in pulleys and other gears. Also called a grub screw.

ISO 4026

WASHER
Plain metal stamped washer.

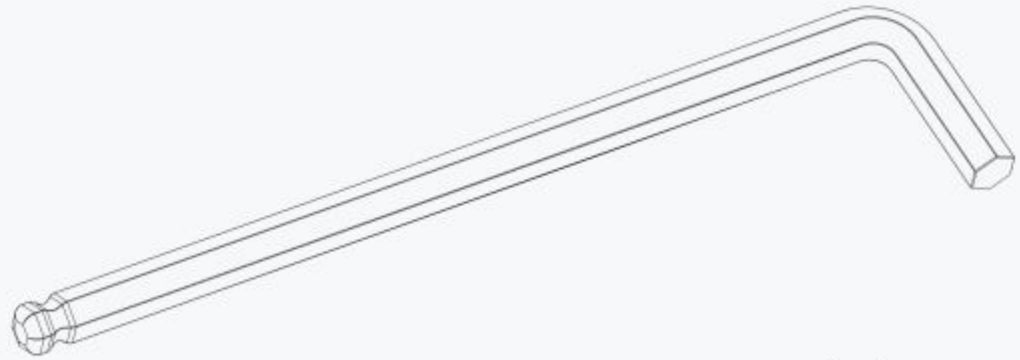
DIN 125



5.5MM BALL BEARING
A ball bearing used in the Filametrix toolhead sensors and / or CottonTail Buffer (both optional).

HEATSET INSERT
These are made of brass, threaded on the inside and and has ridges on the outside. Heat them up to approx 250C with a soldering iron and push them into the plastic. As the plastic cools, it solidifies around the knurls and ridges on the insert for excellent resistance to both torque and pull-out.

TOOLS



BALL-END DRIVER

Some parts of this design require the use of a 2.5mm ball-end hex driver for assembly.

STRAIGHT HEX DRIVER

Sometimes the extra grip from a straight hex driver helps with small or stubborn fasteners.

We need a 1.5mm driver for M2 fasteners,
a 2.0mm driver for clearing the filament pathway
and tightening M3 BHCS and FHCS bolts,
and a 3.0mm driver for the M5 fasteners.

Refer to the sourcing guide for suggestions.

ADDITIONAL TOOLS

The tools needed are similar to those used building a Voron. For recommendations, visit https://vorondesign.com/sourcing_guide and switch to the “Voron Tools” tab at the bottom of the page.

TOOLS

SOLDERING IRON
We use this for setting heat-set inserts into parts. Depending on your sensor choice, you might be soldering some wires together.

ANGLE GRINDER/DREMEL
If you need to cut your 8mm smooth rods, nothing less than an angle grinder is going to cut it, literally. Leave your grandfather's trusty hacksaw in the toolbox: rods are usually hardened steel.

VISE / HAND CLAMP
A vise is handy if you have to cut your 8mm rods. A vise or hand clamp may also be helpful when press-fitting bearings into the Selector.

WIRING CRIMPER
You'll need this to terminate your wiring. There are also turnkey wiring solutions out there you can buy, check Discord.

CAD SOFTWARE
ERCF_v3.0/CAD/ERCF_V3.0_v69.step
Software is a tool too! The CAD file for the ERCFv3.0 was designed to be used along with this manual as a supplement or reference, even if you aren't a CAD Pro. You can use the free edition of Fusion360, or your choice of CAD program such as TinkerCAD or FreeCAD.

SUPERGLUE
Yes, we consider this a tool. Superglue is useful as a plastic safe thread locker, and magnet glue. Cheap, single-use gel tubes are fine.

80T GEAR WHEEL GUIDE
ERCF_v3.0\Stls\Tools\80T_Cog_Guide.stl †
(Optional) This tool helps you align your printed 80T gear when you are assembling it.

SLOTTED WHEEL PUSH TOOL
ERCF_v3.0\Stls\Tools\Slotted_Wheel_Push_Tool.stl†
Helps you set the depth and align the Encoder slotted wheel without damaging it.

PRINTED PART TRACKER SPREADSHEET
There is a helpful interactive Printed Part Tracker for ERCFv3.0 here:

Printed Parts Tracker Google Sheet

GOOD FILAMENT
Not optional! You're never going to get consistently good results with the bargain bin $8 roll of ABS from five years ago. Get yourself some good, known quantity filament, and it has to be plain ABS, not EZ ABS, not ABS+, not High-Speed ABS. Plain ABS, preferably pure!
Names to look for in **North America:** Atomic Filament, Polymaker, Jessie, Push Plastic
Europe: ColorFabb, PolyMaker, Das Filament
Elsewhere: Esun, Sunlu, Overture

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CARROT COLLECTIVE PROJECTS

This project aims to bring multi material capabilities to 3D printers using a single Direct Drive toolhead. While this project is mainly designed to be used on VORON printers, it can also be used (or adapted) on any 3D printer that runs Klipper.

Find all the project information on the Github page : https://github.com/Carrot-collective/ERCF_v3/

The project is composed of 6 different components, some of which are optional:

- **Enraged Rabbit Carrot Feeder (ERCF).** The Carrot Feeder is the main unit and allows use of a high number of different filaments (up to 19 channels reported in the community) and feed them, one at a time, into the printer toolhead on an as-needed basis.
- **Enraged Rabbit CottonTail (ERCT)** is an integrated (but optional) filament buffer system to handle the filament when it is ejected from ERCF on a tool change. It can handle up to 1.5m bowden tube lengths. This has been specifically designed to minimize friction when setup, taking into account the natural filament memory. It has options for LED gate indicators and entry sensors.
- **Enraged Rabbit Filametrix (ERF):** This filament cutter is an optional toolhead modification to cleanly cut the tip of the ejected filament, so it can be loaded easily on next use. This option alleviates the frustrating job of tuning tip formation through movement of the filament within the extruder, which often still results in strings of filament causing clogs.
- **Toolhead Sensors**: These are a set of modifications for popular extruders that provides filament detection capability within the toolhead. Although optional, it is highly recommended, and makes filament change far more reliable.
- **Happy Hare Firmware**: This has become the go-to extension to Klipper for controlling various types of MMU. It is optimized to support ERCF. Moggieuk writes the software and much of the documentation for Happy Hare.
- **Filamentalist:** The Filamentalist is a bufferless solution for managing filament unloads. The design ingeniously uses the stiffness of the filament to drive the spool, making it rewind as the filament unloads. The choice between Filamentalist and ERCT is up to you; Filamentalist only works with stiff filaments, so no flexibles.

v2.0 ACKNOWLEDGEMENTS

This is the place to recognize the origins and evolution of this project. ERCF was originally envisioned and created by Ette and the v1.1 release credits Tircown, the Voron Dev team (special mention to Dunar), Benoit, Dustin Speed, Kageurufu and the HonHonHonBaguette people!

Over time and significant adoption the shortcomings of ERCF v1.1 design came to light, and that inspired a set of modifications to address them: SturdyBunny, TripleDecky, Springy, Binky and other strange names appeared. It was then that Moggieuk, the author of Happy Hare, rounded up these project authors and created the beginnings of the ERCF v2 community release. As the project developed, Kinematicdigit developed and contributed CottonTail, Sorted01 developed and contributed Filametrix and we were joined by some awesome talent that polished, tested and documented to complete the project.

Many hundreds of hours of volunteer effort have gone into this project and we hope it pays tribute to Ette's wonderful original design. **The BMW of MMU's!**

- @moggieuk V0.1503 | V2.4088 (Happy Hare Developer & Chief whip)
- @gneu V2.5345 (Filament Block Designer and Bling Innovator)
- @sneakytreesnake V2.3804 (Sturdy Bunny Designer)
- @mneuhaus VT.483 (Binky and Encoder Designer)
- @miriax (Manual Monster and Tester)
- @kinematicdigit (Cottontail Designer & Doc Illustrator)
- @ningpj (Tester, Breaker & Doc's)
- @fizzy (King of CAD)
- @gsx8299 (Test Builder Extraordinaire)
- @sorted (Filametrix "don't get enraged" filament cutting system Designer)
- @kierantheman (Thumper Designer)
- @silverback_attack (Videographer, Happy Hare Documenter)

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V3.0 DESIGNER ACKNOWLEDGEMENTS

With the release of ERCF v2.0, it quickly became apparent that the Gearbox was the weakest feature of the release. Kinematic Digit consulted with Dr. Róbert Lőrincz, a professor of stepper motor design, and determined that the optimal motor configuration for ERCF is a single NEMA17 in a direct drive configuration, with a phase resistance of less than 2 ohms.

With the knowledge that the Gearbox needed to be redesigned to be serviceable without total disassembly, and to accommodate new motor configurations, Miriax and Silverback_Attack took up this design task. Silverback_Attack made the new Gearbox Foot, End Block with Bypass, and Split Coupler. Miriax made the new Gearbox and Motor Mounts.

Along the way, several inadvertent design problems in the Filament Blocks became apparent, and so the Filament Blocks needed to be modified. Kinematic Digit took up this design task, and then Miriax made a new version from scratch, but based on Kinematic Digit's earlier work. Kinematic Digit also invented the Carrot Puller and Filament Brakes.

The Selector also became a problematic focus, so Miriax heavily modified it. He added a few more QoL and alignment features to the Linear Axis, invented the PTFE tool, printable 7x7 cablechain, new electronics mounts, and several User Mods.

Thousands of hours of volunteer effort have gone into making and documenting this project, and we hope it delivers on the promise of Ette's wonderful original design. **The BMW of MMU's!**

- @moggieuk V0.1503 | V2.4088 (Happy Hare Developer)
- @gneu V2.5345 (Filament Block C7 Designer and Bling Innovator)
- @sneakytreesnake V2.3804 (Sturdy Bunny Designer)
- @mneuhaus VT.483 (Binky and Encoder Designer)
- @miriax (Gearbox, Filament Block C10D, and Selector Redesigner, Printability Expert, Manual Monster)
- @kinematicdigit (Filament Block C10 designer, Cottontail Designer & Doc Illustrator)
- @ningpj (Tester, Breaker & Doc's)
- @gsx8299 (Test Builder Extraordinaire)
- @sorted (Filametrix "don't get enraged" filament cutting system Designer)
- @kierantheman (Thumper Designer)
- @silverback_attack (Gearbox Feet Redesigner, Coupler Designer, Videographer, Happy Hare Documenter)
- @skibikemake (Filamentalist Rewinder Buffer Designer)
- @.marknorris (ERCF Discord Moderator Supreme)

V2.5/V3.0 BETA TESTER ACKNOWLEDGEMENTS

Extra thanks to the Beta Bunnies who heavily participated and contributed to the development of v3.0:

batalhoti
Chodswick
Colten
ExMachina
Fastjack
FlyingLunatic
Ghost
Harshreality
Iamamaker
Igiannakas
iMartyn
Jacksky6
Justinr54321
KSummers
Lothos
Mark Norris
Mima2181
Nickiel
Rev
Saberjag
Sebi2120
SpaceEngineer
Spice_King
Tartle
TheLordBigRed
ThorUs
Sakoda さこだ

Thanks to the Beta Bunnies who helped test v2.5:
7lle
Draketech
Erogizer
Fritz
icecoldezio
Mayhem
Mocho7819
Mylastregret
NoName
Npa62
One Seat
ØysteinS
Projects in Dad's Garage
Strangehadron
VeteranFacts
Wolffy01
YourBuddyDinec

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HOW TO GET HELP

If you need assistance with your build you can head over the new ERCF Discord group. It is the primary medium to help people with their ERCF build and tuning! You can also check the Github page for the latest releases.

If you need help making ERCF work with your VORON printer, head to the VORON Discord group and post your questions in the **multimaterial_and_u** channel.

ERCF DISCORD https://discord.com/channels/1267663557999329371/

GitHub https://github.com/Carrot-collective/ERCF_v3/

VORON DISCORD https://discord.com/channels/460117602945990666/909743915475816458

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INTRODUCTION

Constructing and operating a multi-filament system can be a challenging endeavor, often more intricate than assembling the 3D printer itself. Approach this task patiently, addressing each issue methodically. Be aware that minor complications during assembly can accumulate, potentially leading to greater challenges later. If you encounter any uncertainties or roadblocks, feel free to seek guidance on Discord - remember, the only foolish question is the one left unasked!

You might have heard about the frequent challenges associated with multi-filament systems. Indeed, they can be demanding. However, the Carrot Collective aims to provide a system that is not only innovative and reliable but also user-friendly. Despite these efforts, encountering some difficulties is not uncommon. In such instances, consult the available documentation and guides, and don't hesitate to ask for help on Discord. Many common issues have likely been encountered and resolved before, so assistance is readily available.

Enjoy the process of building as much as utilizing your Enraged Rabbit Carrot Feeder!

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HEATSET INSERTS

This design relies heavily on heatset inserts. If you've never worked with heatset inserts before, watch this guide:

https://www.youtube.com/watch?v=cyof7fYFcuQ

Here is a list of all the pages of this manual where you need to add the heatset inserts into the 3D printed parts, so you can add the heatset inserts all at once if desired:

- Page 43 (Gearbox, 3 heatset inserts)
- Page 44 (Gearbox, 7 heatset inserts)
- Page 45 ([a]_Hatch, 2 heatset inserts)
- Page 106 ([a]_Selector_Cart, 3 heatset inserts)
- Page 109 (Drag_Chain_Anchor †, 2 heatset inserts)
- Page 121 (Encoder_Right, 3 heatset inserts)
- Page 132 (Linear_Axis_Selector_Motor_Support and [a]_Drag_Chain_Anchor_Bottom †, 4 and 2 heatset inserts)
- Page 152 (COAS_Holder_Female_x2 and COAS_Holder_Male_x2, 2 and 2 heatset inserts)
- Page 164 (Base.STL and MMB_mount_hinge, 6 and 1 heatset inserts)

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USING THE CAD FILE

We have provided the ERCFv3.0 CAD files (ERCFv3.0/CAD/ERCFv3.0_v69.STEP and ERCFv3.0_v69.F3D), so that you can follow along with the instructions in a 3D view, if you like.

If you see files with newer version numbers, you can assume there has been an improvement and you should use those files.

The CAD file is organized into folders / units based on the instructions in this manual. If you hide all of the units after the step you are on in this manual, the CAD should closely track what you are building. That's why you'll see titles like 3.1 INSTALL BONDTECH IDLER GEAR - the 3.1 denotes the folder / unit in the CAD.

We did our best to keep the CAD units and the manual steps in sync, but even so, sometimes we'll be doing units slightly out of numerical order, or repeating units (eg. 1.2, 1.3, 1.2, 1.3, 1.4, 1.3, 1.4...). *Don't worry about the unit order*, just follow along with the manual.

In summary, The unit numbers are just our way to link together the CAD and the manual. You can ignore them if you aren't looking at the CAD, and still successfully build the base ERCF with just this manual.

UPGRADING FROM EARLIER VERSIONS

If you are upgrading from ERCFv1.1 or v2.0, you can re-use some of the printed parts. These parts will have a dagger † every time we mention the file name, in case you want to re-use those parts. Here is a list of all the reusable parts:

ERCF_v3.0 / STLs / 0._Tools
- Pulley_Tool_NEMA14.stl †
- Pulley_Tool_NEMA17.stl †
- 80T_Cog_Guide.stl †
- LED_Soldering_Tool_24mm.stl †
- Slotted_Wheel_Push_Tool.stl †

ERCF_v3.0 / STLs / 2._Motor_Mounts_Drive_Shaft / 2.3_Drive_Shaft
- [a]_Bearing_Spacer_x2.stl †
- [a]_Knob.stl †
- [a]_M4_80T_Wheel.stl †
- [a]_Side_Latch_x2.stl †

ERCF_v3.0 / STLs / 4._Gear_Box_Part_2 / 4.3_Apron_Leds
- [c]_Cover_Lens_xN.stl †
- Cover_Body_xN.stl †
- Holder_COAS_x2.stl †

/ Options
- [c]_Cover_Lens_No_Support_xN.stl †
- Cover_Body_No_Support_xN.stl †
- Holder_PCB_LED_xN.stl †
- Holder_SIBOOR_LEDs.stl †
- Holder_Strip_Leds_xN.stl †

ERCF_v3.0 / STLs / 6._Selector
- Belt_Tensioner.stl †
- Drag_Chain_Anchor.stl †
- Selector_Door.stl †
- Selector_Spring_Cap.stl †

ERCF_v2 / STLs / Supports / Adjustable_Mount
- [a]_Screw_x3.stl †
- Junction_Plate_Flat_x2.stl †
- Junction_Plate_Gear_Box.stl †

ERCF_v2 / STLs / Supports / Adjustable_Mount / 2020
- 2020_Mount.stl †
- 2020_Mount_Mirrored.stl †

ERCF_v2 / STLs / Supports / Adjustable_Mount / 3030_(SW_with_panels)
- 3030_Flat_Mount.stl †
- 3030_Flat_Mount_Mirrored.stl †

ERCF_v2 / STLs / Supports / Adjustable_Mount / 3030_(SW_without_panels)
- 3030_Mount.stl †
- 3030_Mount_Mirrored.stl †

ERCF_v2 / STLs / Supports / Adjustable_Mount / Option
- ERCF_Easy_Brd_Bracket_Mount.stl †

ERCF_v2 / STLs / Supports / V1_V2
- [a]_Support_Feet_4mm_x4.stl †
- [a]_Support_Feet_5mm_x4.stl †

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OPTIONAL PARTS

There are optional printed parts that we have created in order to make ERCF v3.0 compatible with different components. We have made an interactive Printed Parts Tracker in order to help keep it straight, but here is a list for posterity:

ERCF_v3.0 / STLs / 2._Motor_Mounts_Drive_Shaft
- Motor_Mount_NEMA17_Direct_Drive_v81.stl
- *(used for the default Direct Drive motor configuration)*

ERCF_v3.0 / STLs / 2._Motor_Mounts_Drive_Shaft / Alternate_Motor_Mounts
- Motor_Mount_NEMA14_Metal_80T_v4.stl
- Motor_Mount_NEMA14_Printed_80T_v4.stl
- Motor_Mount_NEMA17_Metal_60T_v4.stl
- Motor_Mount_NEMA17_Metal_80T_v4.stl
- Motor_Mount_NEMA17_Pancake_Direct_Drive_v31.stl
- Motor_Mount_NEMA17_Printed_60T_v4.stl
- Motor_Mount_NEMA17_Printed_80T_v4.stl
- *(alternatives for other motor configurations)*

ERCF_v3.0 / STLs / 2._Motor_Mounts_Drive_Shaft / 2.3_Drive_Shaft
- [a]_Bearing_Spacer_x2.stl †
- [a]_Knob.stl †
- [a]_M4_60T_Wheel.stl
- [a]_M4_80T_Wheel_v2.stl
- [a]_Split_Coupler_A_isolated.stl
- [a]_Split_Coupler_B_isolated_v2.stl
- [a]_Customizable_Split_Coupler_B.3mf (see page 56)
- *(only used with Geared Drive motor configurations)*

ERCF_v3.0 / STLs / 6._Selector / Servo_Options
- Servo_Mount_DS041MG.Stl †
- Servo_Mount_General.stl
- Servo_Mount_Savox.stl †
- *(alternative Servo mounts)*

ERCF_v3.0 / STLs / 7._Encoder / V26B
- [o]_Encoder_slotted_Wheel_8T_V26B.stl
- Encoder_Left.stl
- Encoder_Right.stl
- *(Default 625 Bearing Encoder option)*

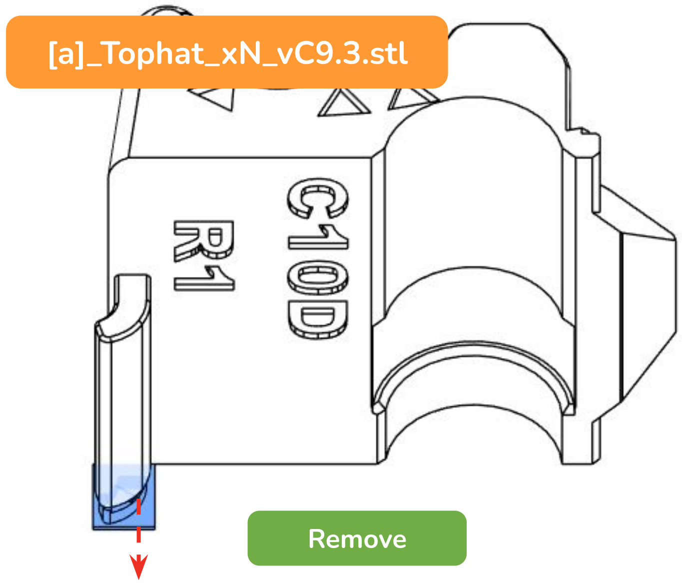
ERCF_v3.0 / STLs / 7._Encoder / 623_Bearing
- [o]_Encoder_Slotted_Wheel_8_tooth.stl
- 623_Encoder_Left.stl
- 623_Encoder_Right_v218.stl
- *(623 Bearing Encoder option)*

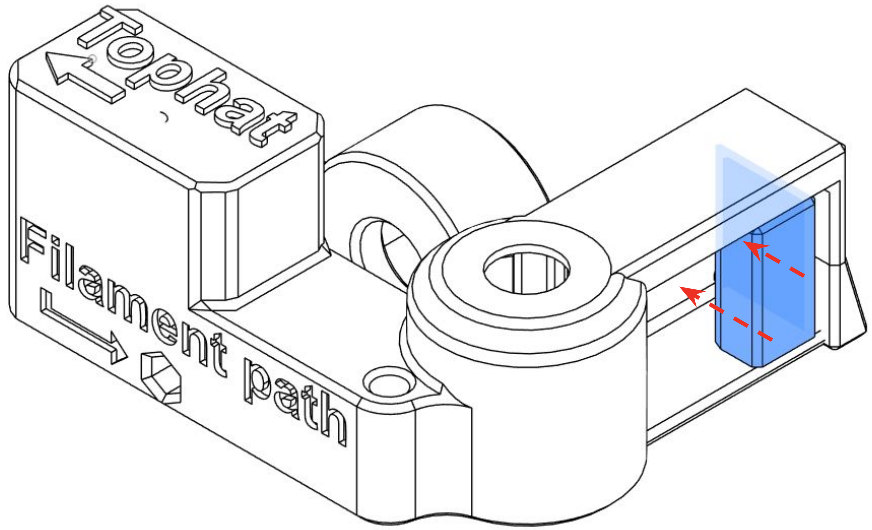
ERCF_v3.0 / STLs / 7._Encoder / v623zz_Bearing
- [o]_Encoder_Slotted_Wheel_8_tooth.stl
- V623zz_Encoder_Left.stl
- V623zz_Encoder_Right_v24V.stl
- *(V623zz Bearing Encoder option)*

ERCF_v3.0 / STLs / 8._Linear_Axis
- Linear_Axis_Selector_Motor_Support_v2.stl
- Linear_Axis_Selector_Motor_Support_Precise_v2.stl
- *(option for precisely-cut 8mm rods)*

INTRODUCTION

TOPHAT

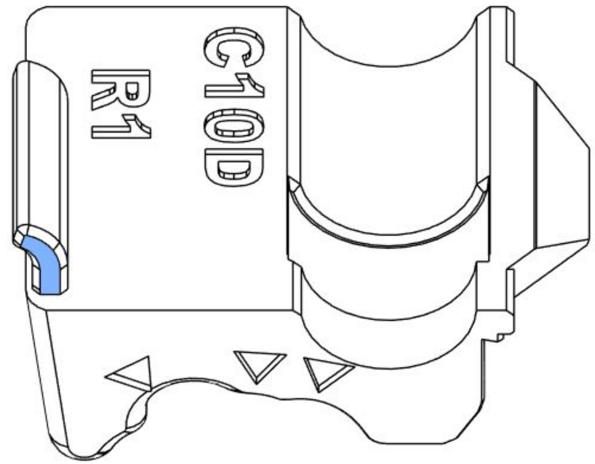




Print the calibration piece (Calib_test_For_C9_v2.stl) and a single Tophat to ensure your printer and slicing profile are tuned.

Before you begin you will need to remove the print-in-place support from both your Tophat and your calibration piece.

Using a hobby blade may help. Please take care that you don't accidentally damage the parts (or yourself!). Make sure that the bottom of the hook is clear of any stuck support.



The print-in-place support on the calibration piece doesn't do anything but test how easily the print-in-place support works. Secondarily, looking at the ceiling near the print-in-place support can tell you how well your bridging settings are dialed-in.

Take a picture or two of your calibration test with a crumpled piece of paper displaying your Discord username and the date. We may ask for these pictures as part of your support request on Discord.

Proceed to the next page to test your print calibration.

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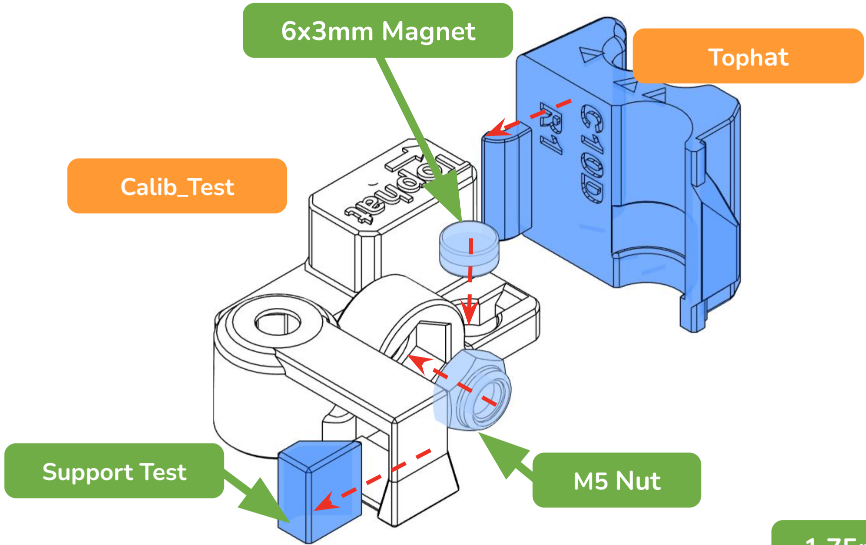
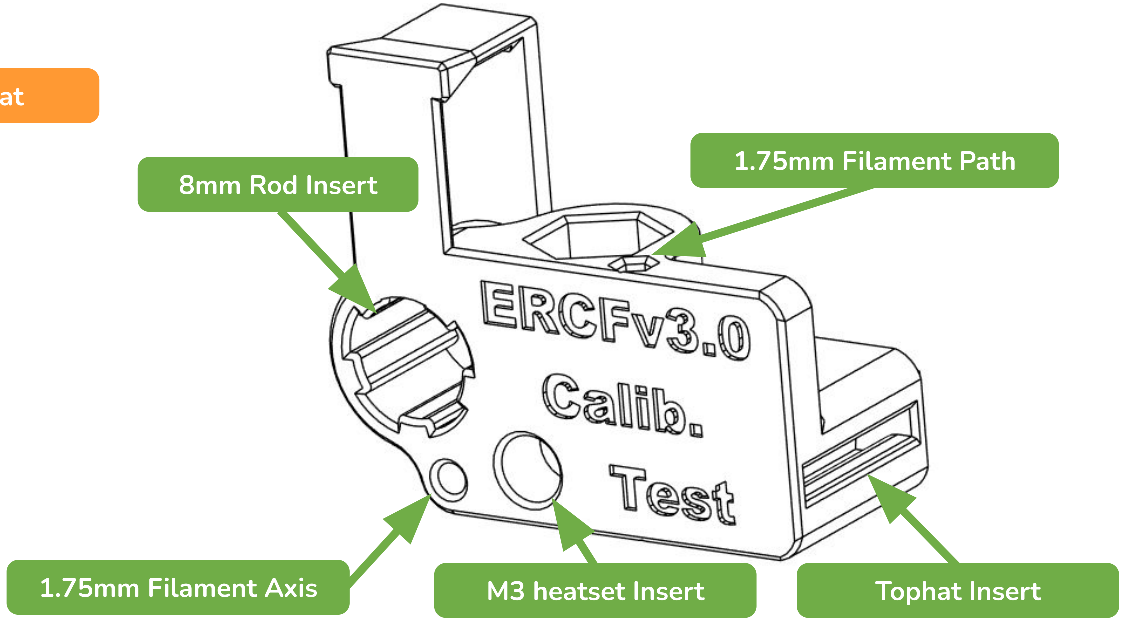
CALIBRATION TOOL

Print the calibration piece (Calib_test_For_C9.stl) and a single Tophat to ensure your printer and slicing profile are tuned.





CALIBRATION TESTS

Insert the different pieces of hardware in their dedicated slots: 6x3mm magnet, M5 nut, and 8mm rod. They should grip the hardware so that they don't fall out easily, but they should not be very difficult to insert or remove.

Test the heatset insert hole using a soldering iron and insert. There should not be any "squish out" around the insert.

Use the Filament Path to check that 1.75mm filament slides through without friction. The Filament Axis should have some light friction. It is normal for the horizontal hole not to be round, this is simply due to layer height / resolution.

To check the Tophat, insert the arm of a Tophat into the slot. It should insert without much force. Once inserted, the Tophat should be able to move up and down easily. To remove the Tophat, pull it up while rotating it.

If these tests fail, **stop and tune your filament profile**. 50%+ of issues we see on Discord are due to poorly printed parts.

PREPARING FASTENERS FOR THREADLOCKER

THREAD LOCKER PAGES

Thread locker compound is a pressure-based adhesive, not an air-curing adhesive. As such, we can treat the fasteners we want to have thread locker, and set them aside to dry for later. Then, when we go to use the fasteners, the thread locker will be ready to use, with no mess or risk of getting the liquid thread locker on ABS parts, which degrades them and makes them brittle.

Here is a list of pages where threadlocker is used. If you want to treat your fasteners in advance, please use this as a guide.
Page 85 - All the BMG gear M3x2 set screws need thread locker.
Page 149 - Both M3x12 SHCS for the 8mm rod tensioners need thread locker.
Page 150 - Both M3x3 grub screws for the GT2 pulley need thread locker.

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LOCAL MCU VS REMOTE MCU

LOCAL MCU VS REMOTE MCU

When we say “**local MCU**” we mean a “buddy board” or other dedicated MCU that will be mounted near the ERCF. Examples include the BTT MMBv2 (our preferred option) and the EASY BRD.

When we say “**remote MCU**” we mean the dedicated MCU(s) for your printer. It is unusual to have enough spare motor, servo, and endstop ports to run an ERCF unless you’re using a dual SKR setup or one of the “XL” mainboards like Octopus or Leviathan. If that’s you, then you can save some money on the buddy board by using this option.

Remote MCU setup has been moved to its’ own sub-manual to avoid confusion.

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WIRE PREP

WIRE PREP

Prep the following wires for a typical 8-channel ERCF. Optional wiring is indicated. **These values assume you are using the side-mounted electronics.** Other mounting positions may need different wire lengths.

Use 22-24awg silicone wire for all wiring. All wiring bundles include the colors black, and red except the Endstop.

Channels`	N	4	5	6	7	8	9	10	11	12	13	14	15	# Wires	Add'l Color to Black & Red	Connector 1	Connector 2
Pregate Sensors	150 + 25N	250	275	300	325	350	375	400	425	450	475	500	525	1	Just Blue	3-pin F JST-XH	Microswitch Or F JST-XH
Pregate Grounds	200	200mm pigtail from MMBv2 pregate bus connector, and N * 100mm piggyback wires.												1	Just Black		
Endstop	300 + 25N	400	425	450	475	500	525	550	575	600	625	650	675	2	Just Black, Blue	3-pin F JST-XH	Microswitch Or F JST-XH
Gear Motor*	300 + 25N	400	425	450	475	500	525	550	575	600	625	650	675	4	Green, Blue	4-pin F JST-XH	Motor*
Encoder	150 + 50N	350	400	450	500	550	600	650	700	750	800	850	900	3	Green	3-pin F JST-XH	3-pin F JST-XH
Servo	100 + 50N	300	350	400	450	500	550	600	650	700	750	800	850	3	Yellow	3-pin F JST-XH	Servo / MicroFit 3.0
Exit LEDs	100	100mm pigtail (3-pin JST XH Female to 3-pin Dupont Female for COAS). Optional.												3	Gray	3-pin F JST-XH	Neopixels
Gearbox LED	100	100mm pigtail from Exit LEDs (3-pin Dupont Male from COAS to Neopixel). Optional.												3	Gray	3-pin M Dupont 2.5	Neopixel
Gearbox LED (Direct)	175 + 25N	275	300	325	350	375	400	425	450	475	500	525	550	3	Gray	3-pin F JST-XH	Neopixel
Selector Motor*	200	200mm pigtail from Selector Motor to Local Mainboard.												4	Green, Blue	4-pin F JST-XH	Motor*
Entrance LEDs	200	Varies by placement - typically 200mm. Connectors vary by application. Optional.												3	Gray	3-pin F JST-XH	Neopixels

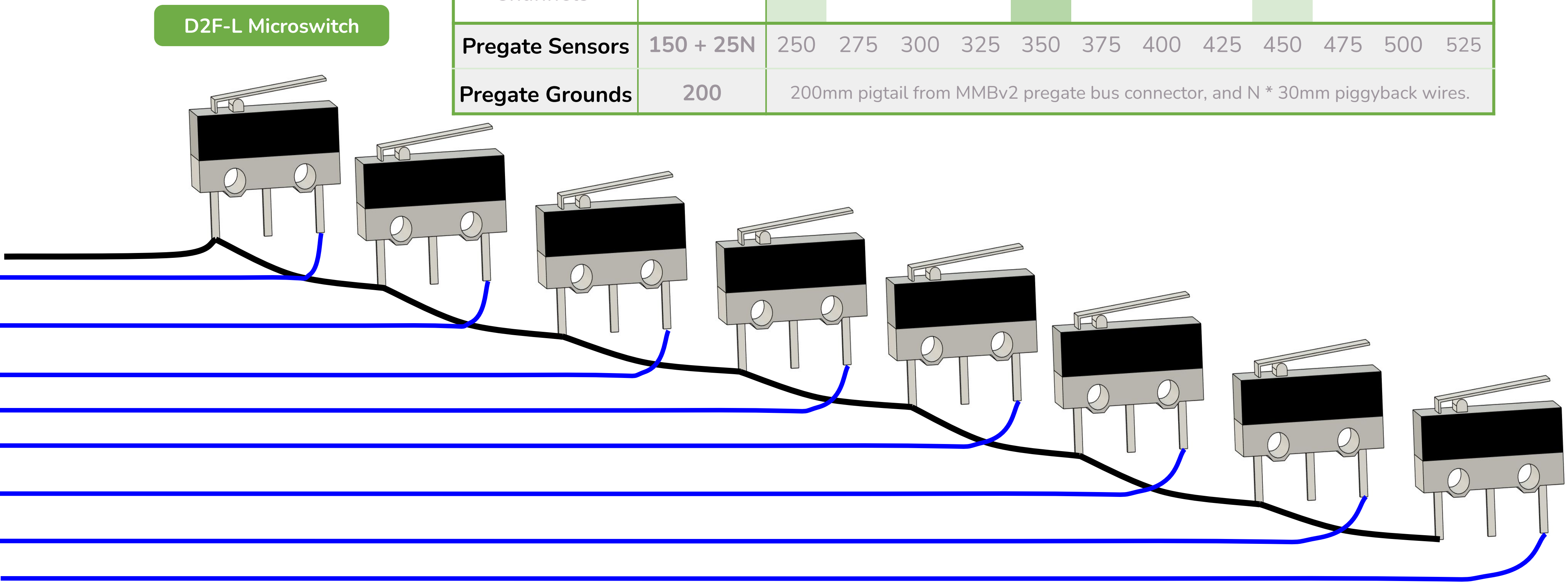
*Only needed if your motors are not hard-wired.

Pregate Sensors are technically optional, but if you can, you should use them,

WIRING (PREGATE SENSORS)

PREGATE SENSORS WIRING PREPARATION

Channels`	N	4	5	6	7	8	9	10	11	12	13	14	15
Pregate Sensors	150 + 25N	250	275	300	325	350	375	400	425	450	475	500	525
Pregate Grounds	200	200mm pigtail from MMBv2 pregate bus connector, and N * 30mm piggyback wires.											



WIRING OPTIONS

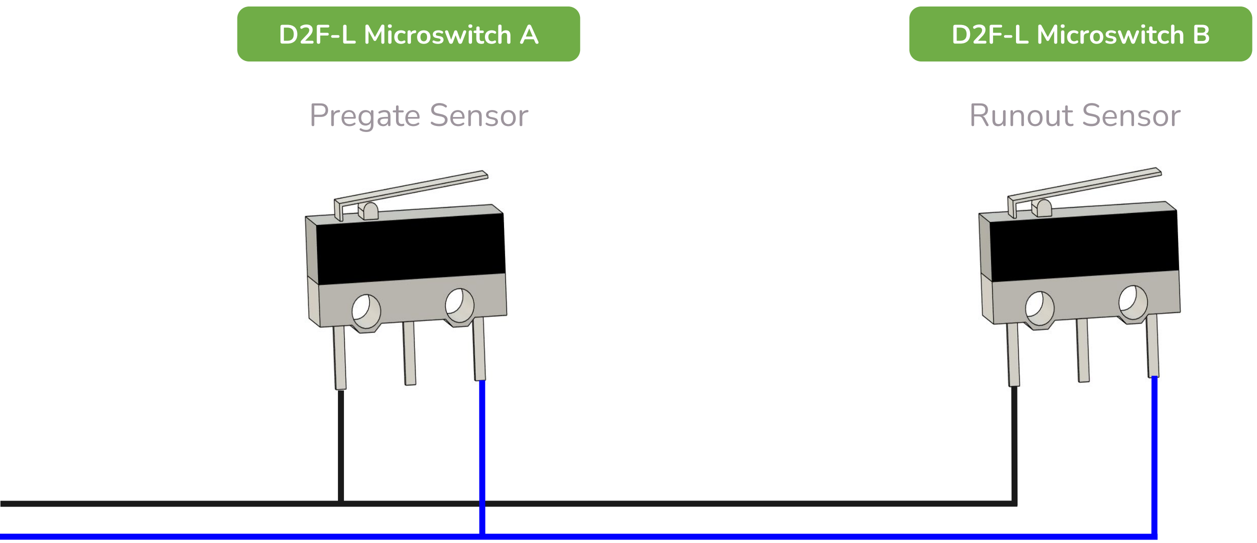
You have two main options for wiring your Pregate Sensors: Solder and JST Connectors.

If you have the one-piece PCBs that combine the microswitch with a JST XH connector, you may use those where the guide shows normal microswitches, and use JST connectors instead of soldering. Most people will need to solder their pregate sensors.

Each blue wire for the pregate sensor needs to be the length shown under its' channel number. The first black (Common / ground) for the pregate sensors needs to be 200mm. After that, you daisy-chain the grounds together to save wire. Use 30mm lengths of black wire between each Common / ground so they have plenty of room to pivot independently.

Termination depends on the board you are using - most boards use 3-pin JST-XH wired the same as the Selector Endstop on the page 30, but the MMBv2.0 uses a 14-pin Molex plug.

WIRING (DUAL SENSORS)



DUAL SENSOR SETUP

State	A	B	Output	Happy Hare
No Filament	1	1	1	0
Filament in Buffer, Not Pregate	0	1	1	0
Runout	1	0	1	0
Filament in Buffer, at Pregate	0	0	0	1

DUAL SENSOR WIRING OPTION

You can wire two sensors Normally Closed in parallel in order to gain the advantages of having a pregate sensor right next to the gate, as well as the advantages of having a runout sensor on the buffer (ie ERCT or Filamentalist),

This means that the system won't try to load while you're still pushing filament to the gate. This also means that runout should occur before the system loses its grip on the filament, in which case the system will require manual intervention. The cost is complexity in wiring - you may need a surprising amount of blue and black wire, as well as cable ties. This setup still only uses one endstop port, which is nice.

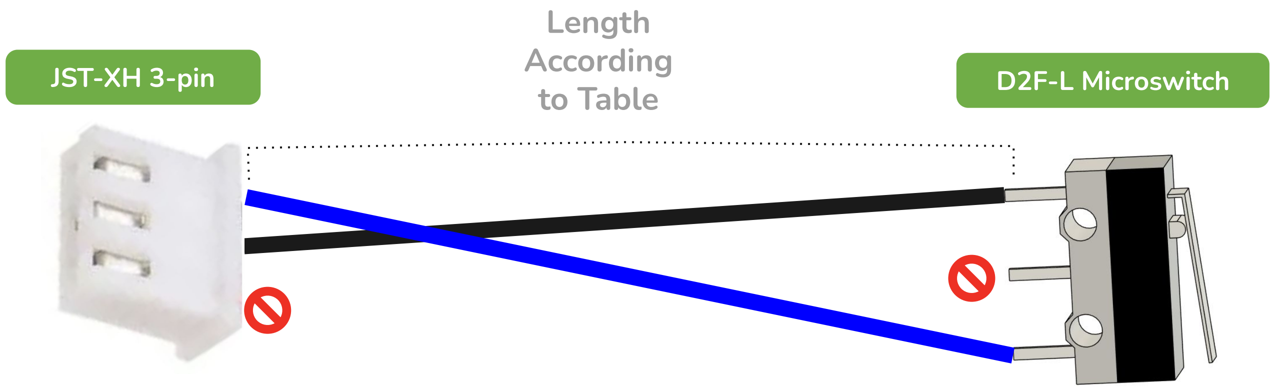
If you are daisy-chaining the ground for the pregate sensors as shown on the previous page, you can connect the ground leg up to the buffer sensor to the daisy-chain as well.

This is all made much simpler by the use of the one-piece PCBs that combine the microswitch with a JST XH connector. In that use case, you simply double the wires into the JST XH crimp, and add heatshrink if you're fancy.

Termination depends on the board you are using - most boards use 3-pin JST-XH wired the same as the Selector Endstop on the next page, but the MMBv2.0 uses a 14-pin Molex plug.

MICROSWITCH PREP

Channels	Selector Endstop Wire Length (mm)
N	300 + 25N
4	400
5	425
6	450
7	475
8	500
9	525
10	550
11	575
12	600
13	625
14	650
15	675



PREP THE MICROSWITCH

If you are using a kit, the microswitch should have come pre-wired.

Otherwise, solder one blue wire to the Normally Closed leg, and one black wire to the Common leg. Add a little heatshrink tubing if you're fancy. Then crimp the other end for JST-XH and put the wires into the connector as shown.

We wire switches Normally Closed so that if they fail, they fail in the triggered state, which makes solving the problem easy. If they failed in the untriggered state, we wouldn't know until a homing or other move crashed.

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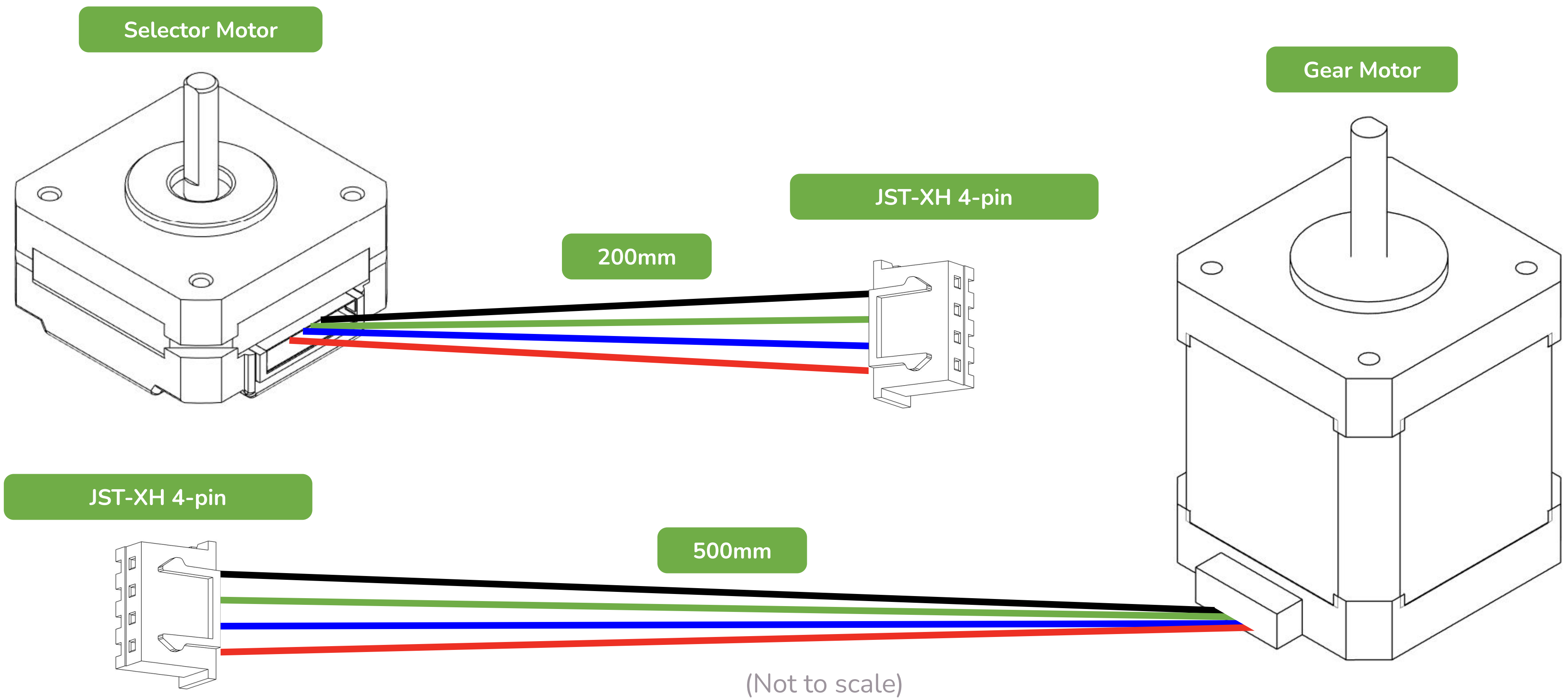
GEAR MOTOR WIRE

WIRING THE MOTORS

If your motors are directly wired, then you can trim them to length, if you desire. **These values assume you are using the side-mounted electronics.** Other mounting positions may need different wire lengths.

Trim Selector Motor wires to 200mm, then crimp and add a 4-pin JST-XH connector.

Trim Gear Motor wires to 500mm (for a typical 8-channel ERCF, see the previous page for other sizes), then crimp and add a 4-pin JST-XH connector.



(Not to scale)

SERVO AND ENCODER WIRING

PREP FOR WIRING THE LEDS

The Encoder and Servo wiring is relatively straightforward.

If you are using a closed cable chain, it will be easier to pull these wires through before crimping.

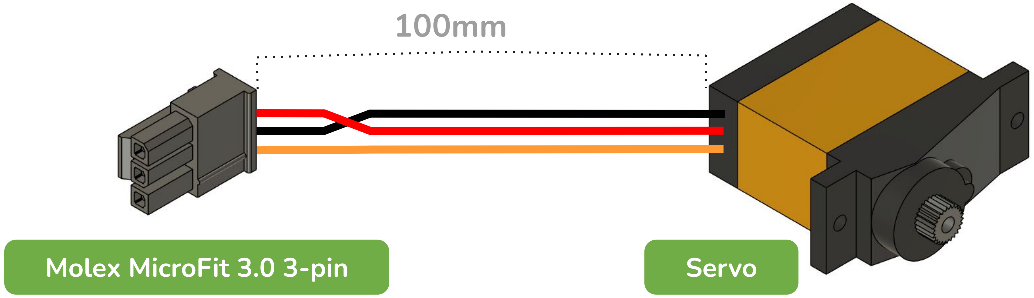
You will want to refit connector coming from the Servo itself with a MicroFit 3.0 3-Pin Male if it doesn't already have one. Note the wire colors.

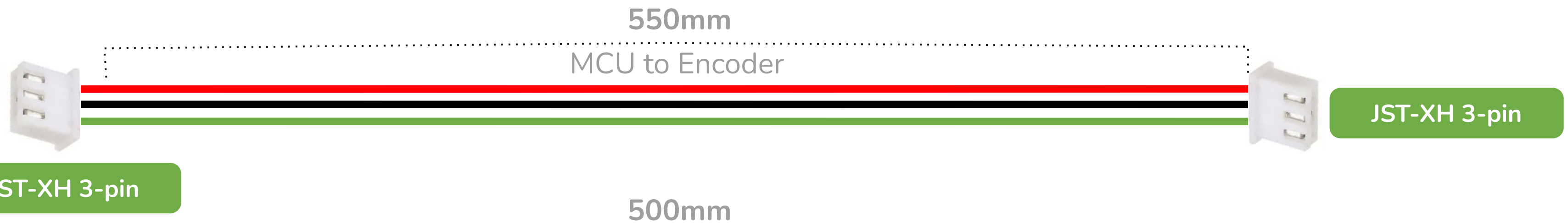
Strip back the ends of all of the wires between 1.5mm to prep for crimping.

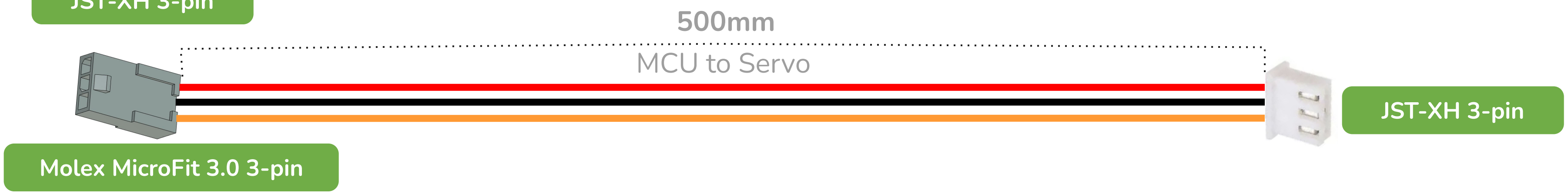
Crimp the Encoder to Local MCU wires for JST-XH and insert into the connectors.

Crimp the Servo to Local MCU wires for JST-XH and Microfit 3.0. Insert the wires into their respective connectors.

Channels	Encoder Wire Length (mm)	Servo Wire Length (mm)
N	150 + 50N	100 + 50N
4	350	300
5	400	350
6	450	400
7	500	450
8	550	500
9	600	550
10	650	600
11	700	650
12	750	700
13	800	750
14	850	800
15	900	850





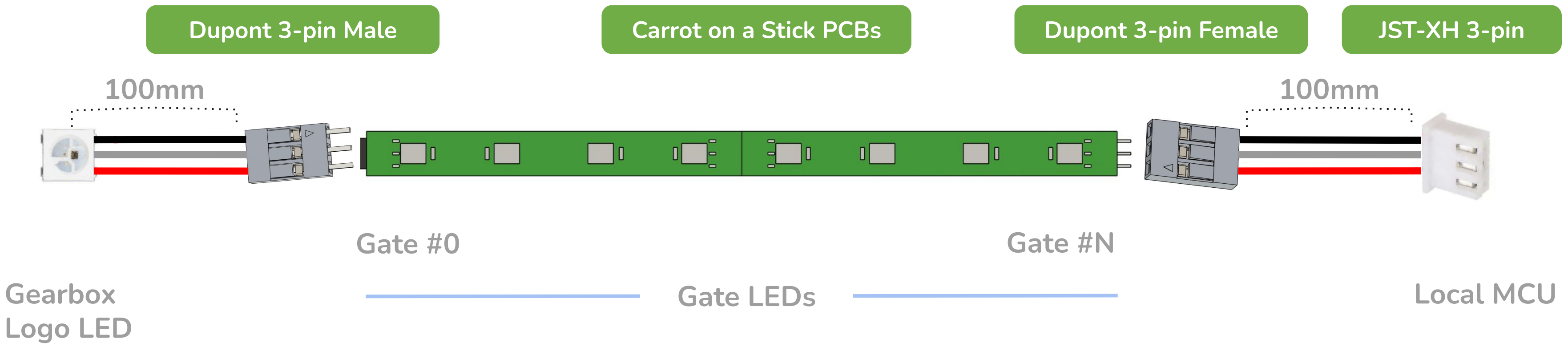


CARROT ON A STICK WIRING

CARROT ON A STICK

The new default LED option is the Carrot on a Stick LED PCB, which has perfect LED spacing with no soldering involved! Thanks to **Blamm** for letting us modify his Disco on a Stick design, **Shammy** for designing the modifications, and **XR Bunker** and **Fabreeko** for initial manufacturing of the Carrot on a Stick.

We still need one wiring pigtail to feed the Carrots on a Stick LEDx, and one pigtail for the optional Gearbox Logo LED.. If you bought a kit, the wiring should be pre-assembled and ready to use. If not, you will need to crimp and solder the pigtails as shown.



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LED WIRING

PREP FOR WIRING THE LEDS

If you are using NeoPixels or individual LED PCBs, we provide a wiring jig with instructions on the next page. 22-24ga silicone wire is recommended for this use, preferably in the colors: Red for +5v, gray for signal, black for ground.

To prep for the soldering step, make sure you have the 100mm lengths of wire for the connection between the Gearbox Logo LED and the Exit LEDs, as well as the 200mm lengths of wire for the connection from the end of the Exit LEDs to your local MCU.

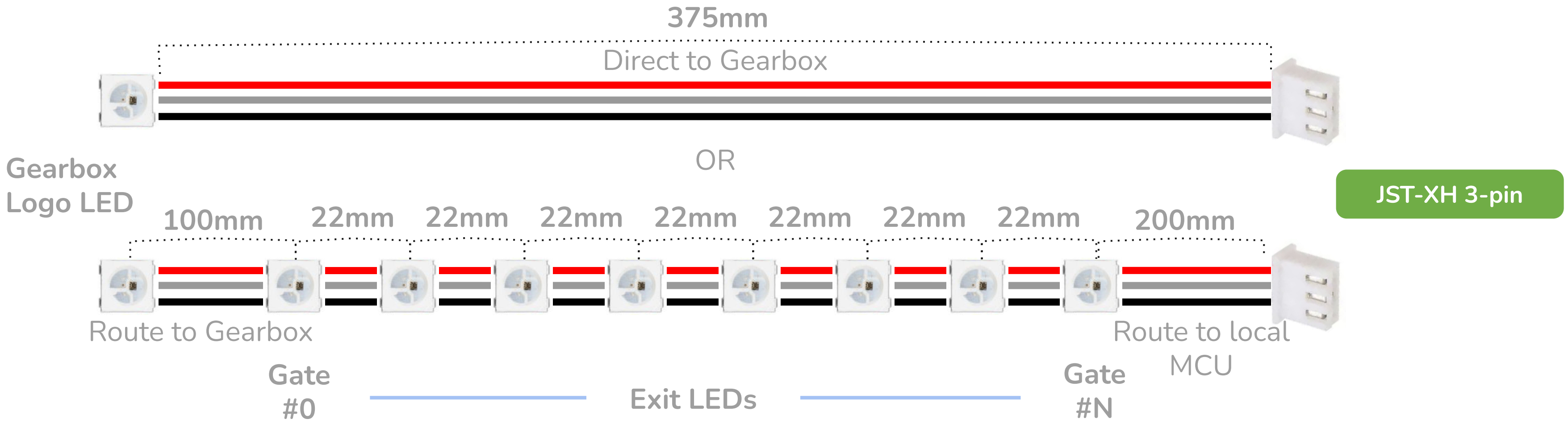
Next, cut your red Exit LED connection wires to 22mm +/- 1.5mm. You need the same number of inter-LED wires as your number of filament channels, minus one. That's seven wires for the standard 8-channel build.

Now repeat the Exit LED connection wire steps above in gray and black.

Strip back the ends of all of the wires between 1.5 and 3mm to prep for soldering.

Crimp the Exit LED to Local MCU wires for JST-XH and insert into the connector.

Channels	Direct to Gearbox Wire Length (mm)
N	175 + 25N
4	275
5	300
6	325
7	350
8	375
9	400
10	425
11	450
12	475
13	500
14	525
15	550



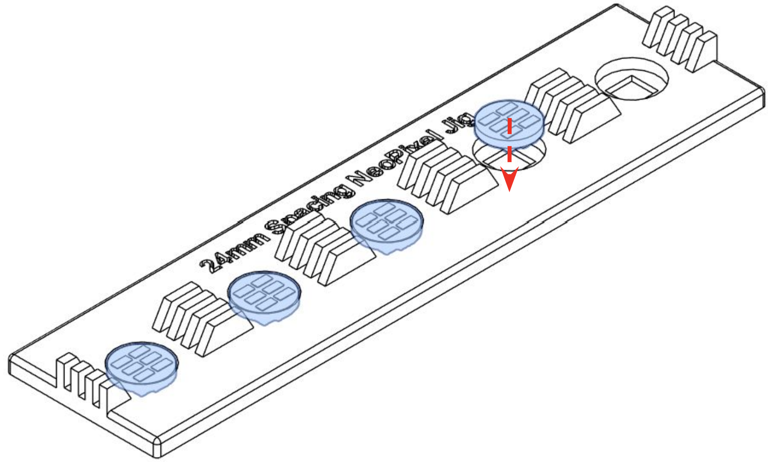
SOLDERING THE LEDS

WIRING UP THE LEDS

There is a jig for wiring the LED PCBs together in the Tools folder: /STLs/0._Tools/LED_Soldering_Tool_24mm.stl

It is spaced to 24mm instead of 23mm to allow for the wires to flex slightly.

22-26ga Silicone wire is the the recommended wire for this use case.



1. Place the Gearbox Logo LED into the first position on the jig. Make sure the LEDs are always positioned with the input (Din) on the left side.

2. Position your 100mm wire on the left of the LED. Flux and solder all three connections and unload the jig.

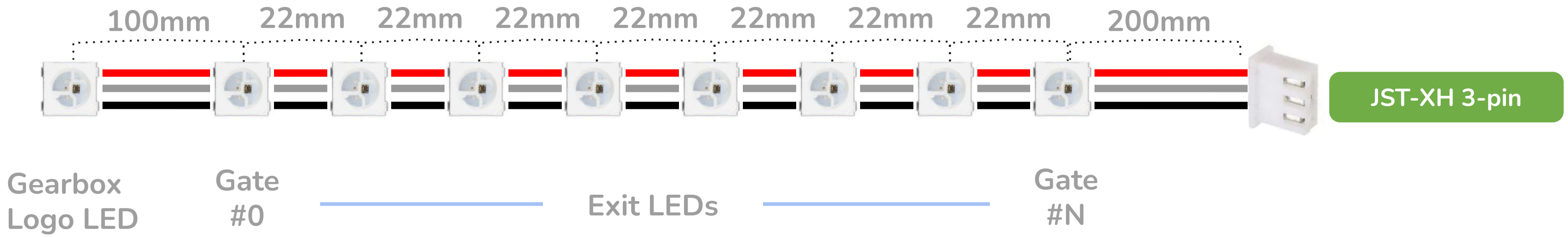
3. Load the jig with 4 LEDs and position the wires from previous steps on the right. Add the pre-cut 22mm wires between each LED. Flux and solder all the connections. Unload the jig.

4. Repeat Step 3. You should now have 9 LEDs wired in a chain.

5. Place the last LED in the chain into the first position on the jig.

Position the 200mm wire (with connector) on the left of the LED. Flux and solder all three connections and unload the jig.

The result should look like this:



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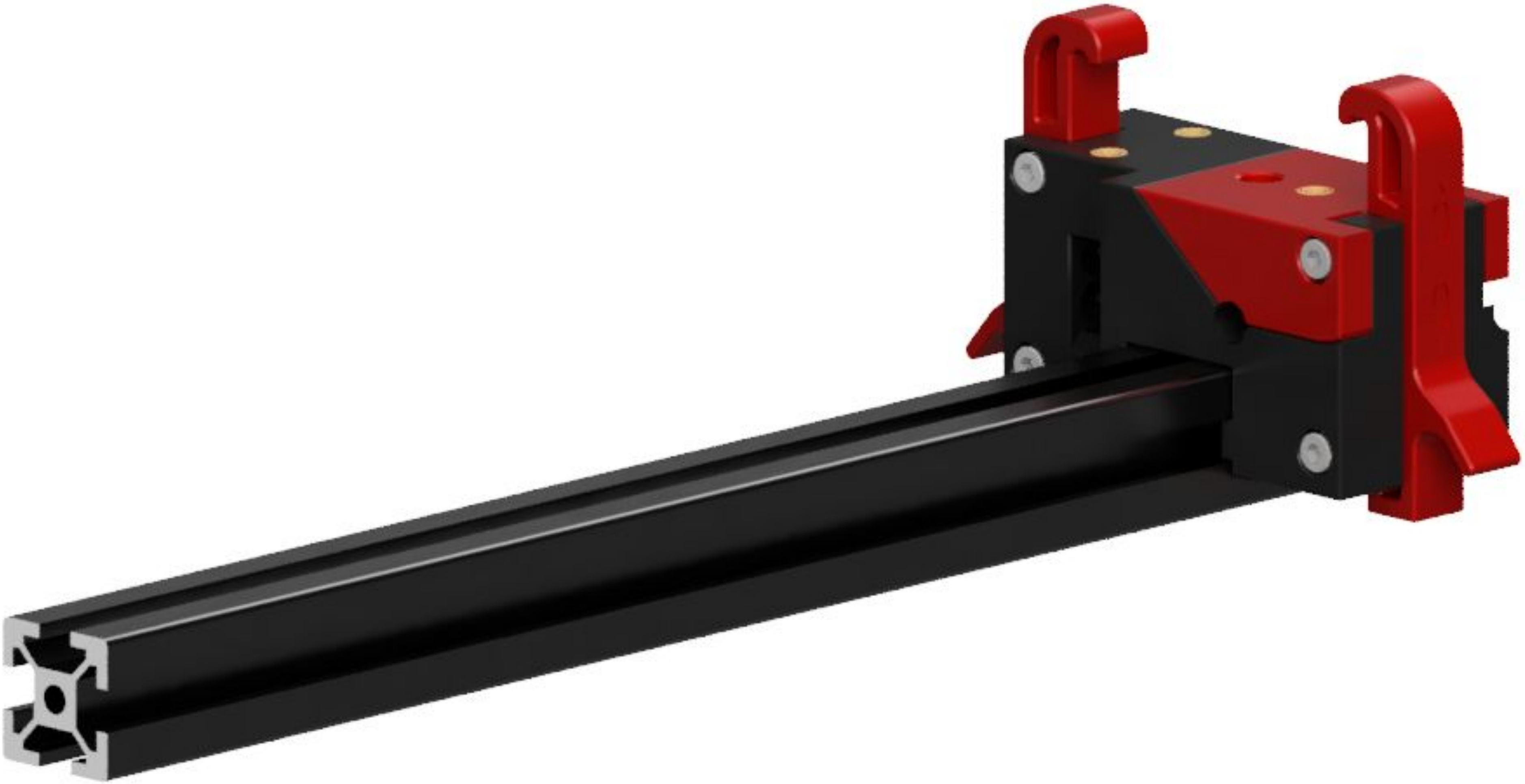
Consistent with the ethos of the Voron community, the ERCF is open-source. This means that it uses open-source Happy Hare software, and its designs are freely available for anyone to use, modify, and improve, fostering a collaborative and innovative environment.

OVERVIEW



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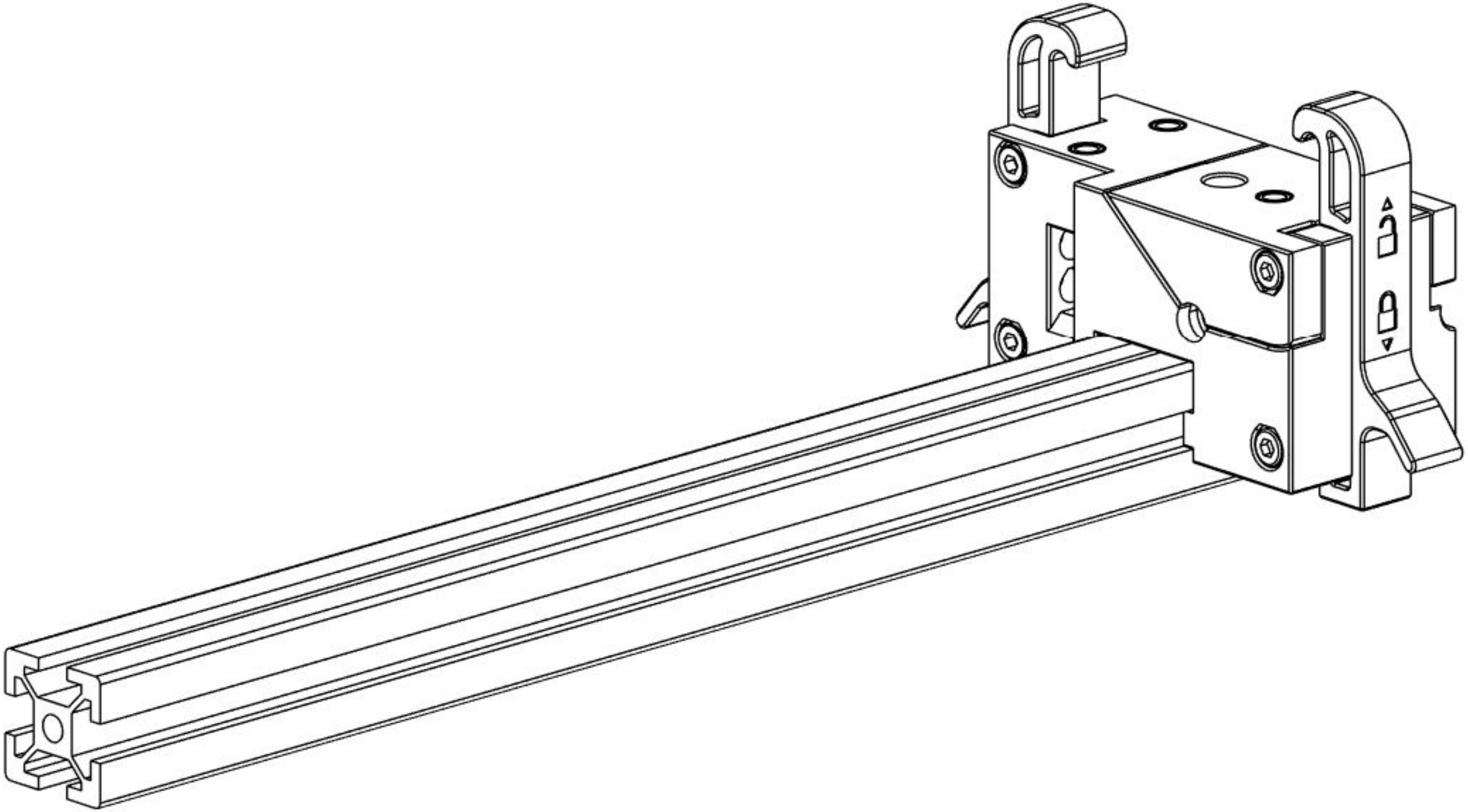
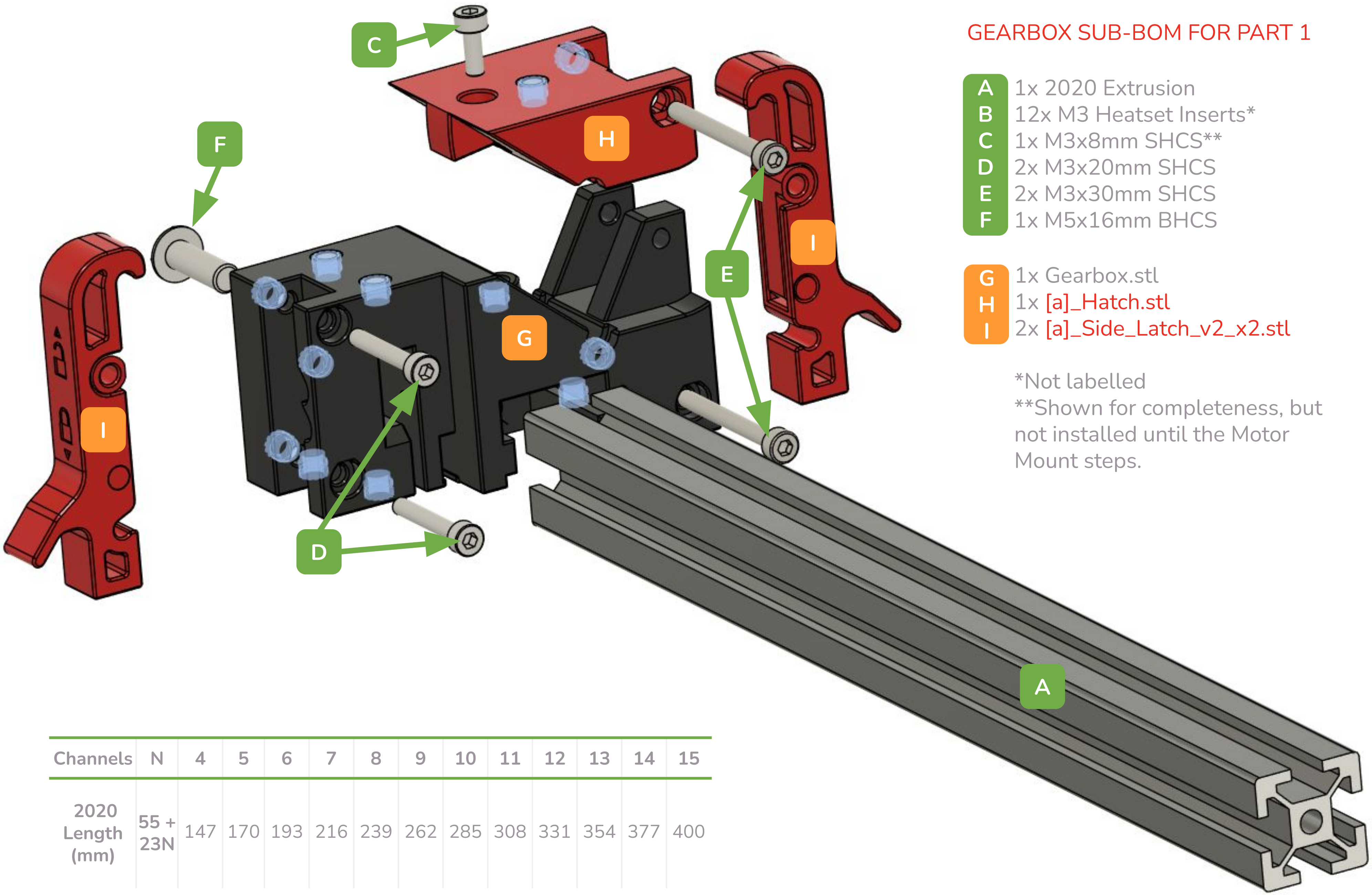
OVERVIEW



GEARBOX PART 1

EXPLODED VIEW



GEARBOX SUB-BOM FOR PART 1

- A 1x 2020 Extrusion
- B 12x M3 Heatset Inserts*
- C 1x M3x8mm SHCS**
- D 2x M3x20mm SHCS
- E 2x M3x30mm SHCS
- F 1x M5x16mm BHCS

- G 1x Gearbox.stl
- H 1x [a]_Hatch.stl
- I 2x [a]_Side_Latch_v2_x2.stl

*Not labelled
**Shown for completeness, but not installed until the Motor Mount steps.

Channels	N	4	5	6	7	8	9	10	11	12	13	14	15
2020 Length (mm)	55 + 23N	147	170	193	216	239	262	285	308	331	354	377	400

1.1 2020 EXTRUSION PREPARATION

If you bought a v3.0 kit, the 2020 should be pre-tapped.

If you are upgrading or self-sourcing, you will need to tap one end of your 2020 extrusion for M5x0.8mm threads to a depth of at least 10mm. An M5 taper tap is perfect for this. The hole in your 2020 must be 4.2-4.4mm in diameter. You may need to drill your 2020 hole larger, if it is too small.

Do not attempt to tap 2020 while there are things mounted to it, *especially not your old ERCF*. Take everything off first, or you will get tapping oil on your parts, and will have a hard time using the jig.

Use appropriate PPE such as gloves and safety glasses. *Use oil*, preferably a light oil. WD-40 works in a pinch. The primary purpose of the oil is to keep the aluminum from welding to the tap and ruining it!

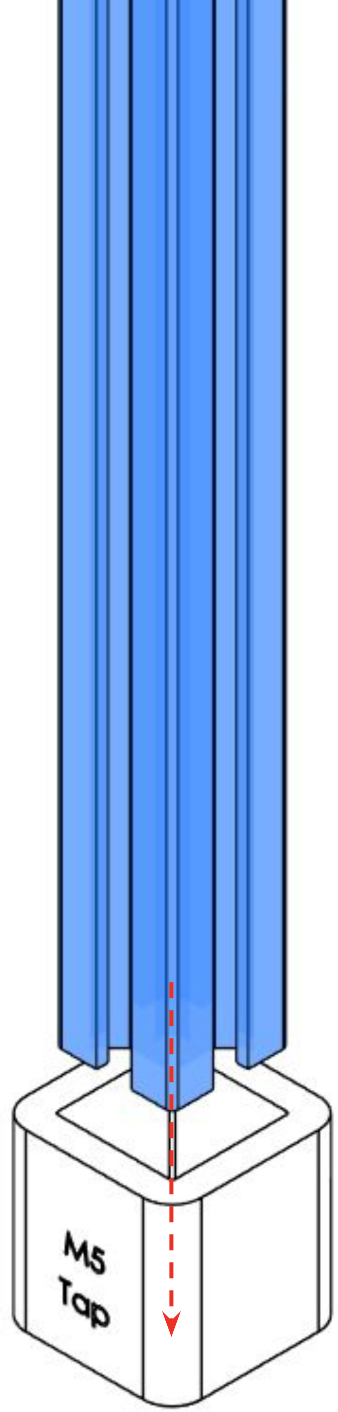
Take care to tap the start the threads straight, preferably using a hand tap and ***not*** a hand drill. Remember to stop and reverse direction to break the chip every turn or two. The first 5 minutes of this video are a good reference:

https://www.youtube.com/watch?v=2dvbn0rWA60

The supplied tap guide is here: ERCF_v3.0 / STLs / 0._Tools / M5_Tap_Guide.stl

There is a alternate jig to help keep your tap straight to the 2020, with thanks to 2nd Layer Printing Designs: https://www.printables.com/model/1008892

Remember, if you mess up the first hole, you can usually flip the 2020 and try the other side. Just don't break your tap!



2020 PREPARATION

1.1 V-SLOT AND EUROPEAN STANDARD EXTRUSION PREPARATION

If your extrusion already has a hole that is 5mm or more, you have two options. The first option is to use the M6 version of the Gearbox.

The M6 gearbox option in the User Mods-
ERCF_v3.0 / User_Mods / Miriax / Gearbox_for_M6 / Gearbox_v61_for_M6.stl

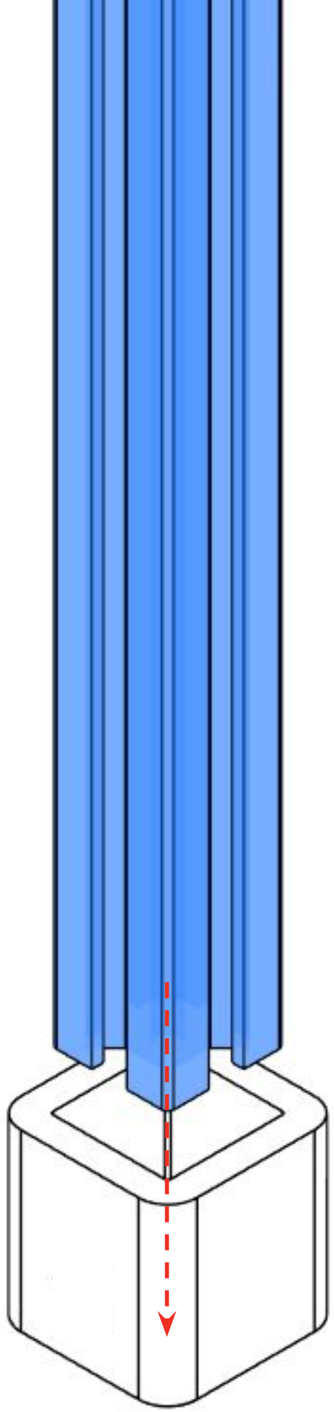
You will need to hand-tap your extrusion for M6, and use an M6x16mm BHCS instead of the M5 bolt in the BOM. Refer to the tapping instructions on the previous page.

THREADED INSERT OPTION

The second option is to buy a threaded insert kit (the most popular brand is Heli-Coil) which will enable you to add a steel threaded coil that will fit an M5 bolt.

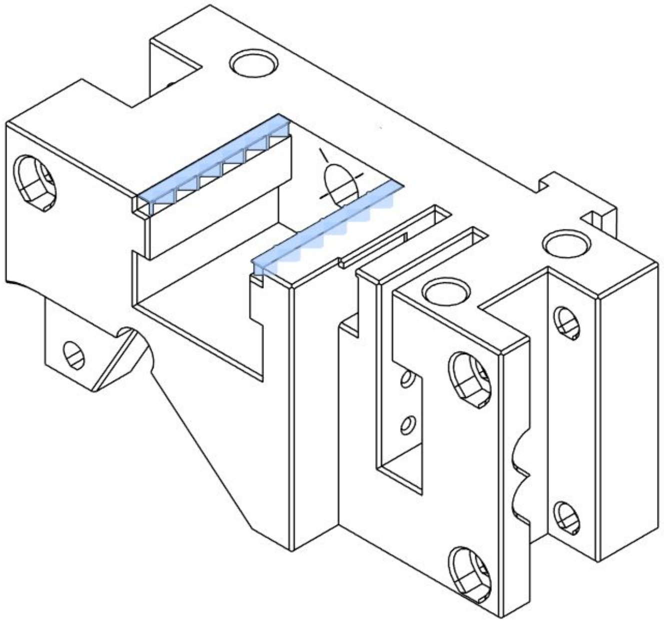
Here is a video on Heli-Coil: https://youtu.be/sQHRB2ElZJ0

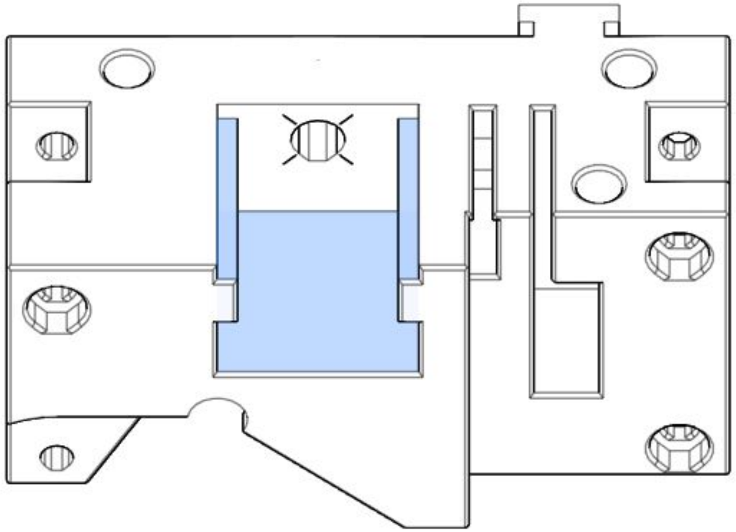
This is a good option for parts of the world where it is expensive to source extrusion - if 2020 extrusion is cheap where you live, it may make more sense to just buy new pre-tapped 2020 for $7-8!



GEARBOX PREPARATION

Gearbox





1.2 PRINT-IN-PLACE SUPPORTS

Remove the Print-In-Place supports from the Gearbox as shown. Carefully use a hobby knife, file, or a small flat-bladed screwdriver to remove any stuck pieces of support or loose bridges so that the Gearbox is ready to receive the 2020 extrusion.

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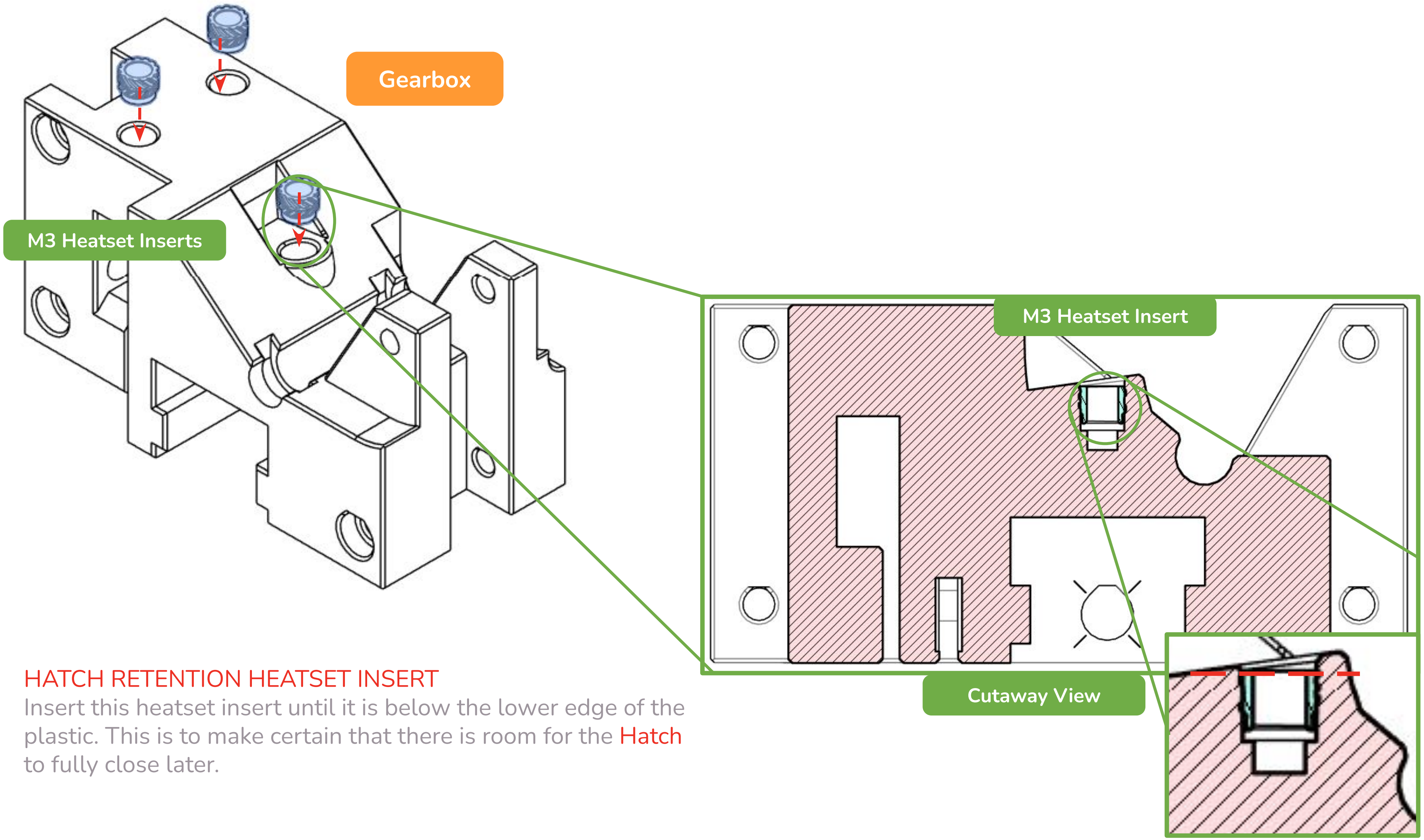
GEARBOX PREPARATION

1.2 HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.



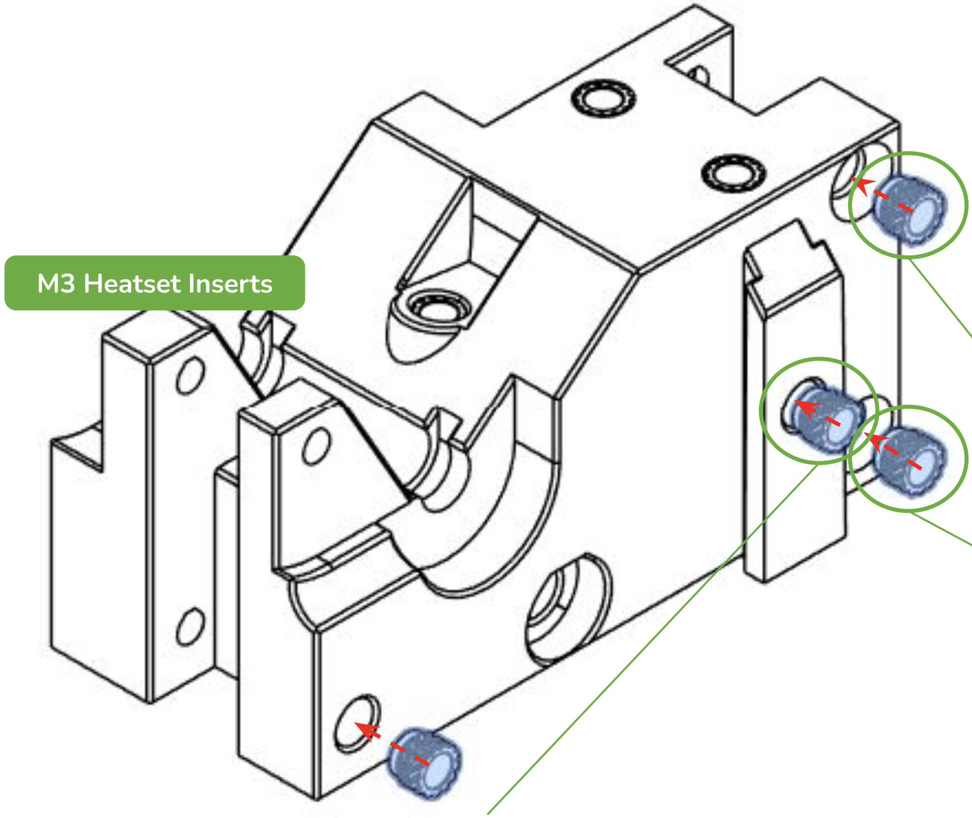
HATCH RETENTION HEATSET INSERT

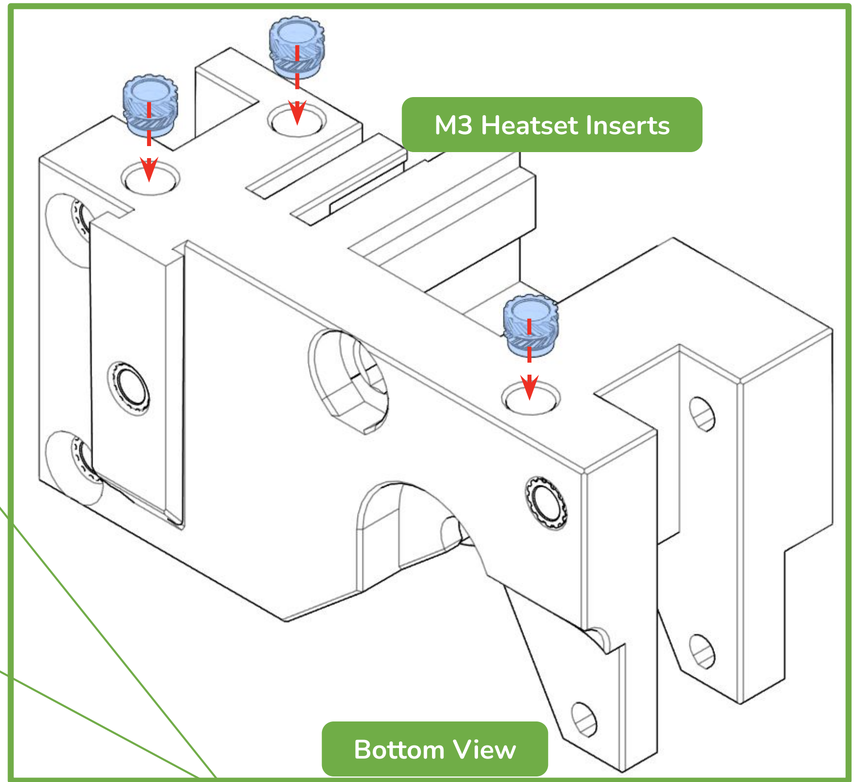
Insert this heatset insert until it is below the lower edge of the plastic. This is to make certain that there is room for the Hatch to fully close later.

GEARBOX PREPARATION

1.2 HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.



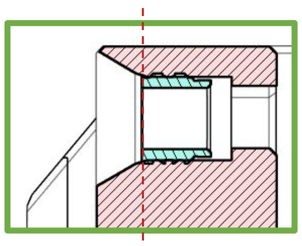


DOVETAIL HEATSET INSERT

Insert this heatset insert until it is just below the edge of the plastic. This is to make certain that the dovetail for the Motor Mount works smoothly and doesn't catch on the heatset insert.

DEEP HEATSET INSERTS

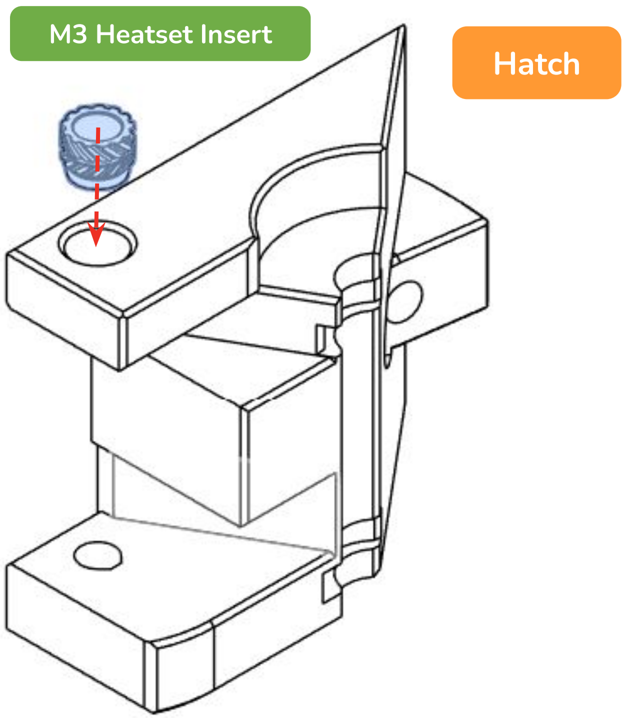
These inserts are set deeply into the Gearbox. This is so that we can re-use some screws from v2.0, and also so that there is plenty of clearance for the motor mount to slide past these heatsets. Don't sweat it, this isn't an area that needs high precision. There is built-in overtravel for the heatset insert.

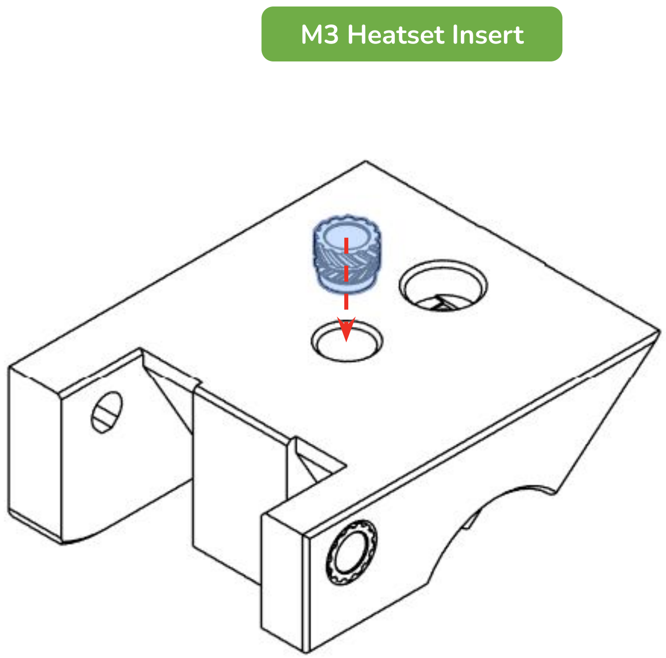


HATCH PREPARATION

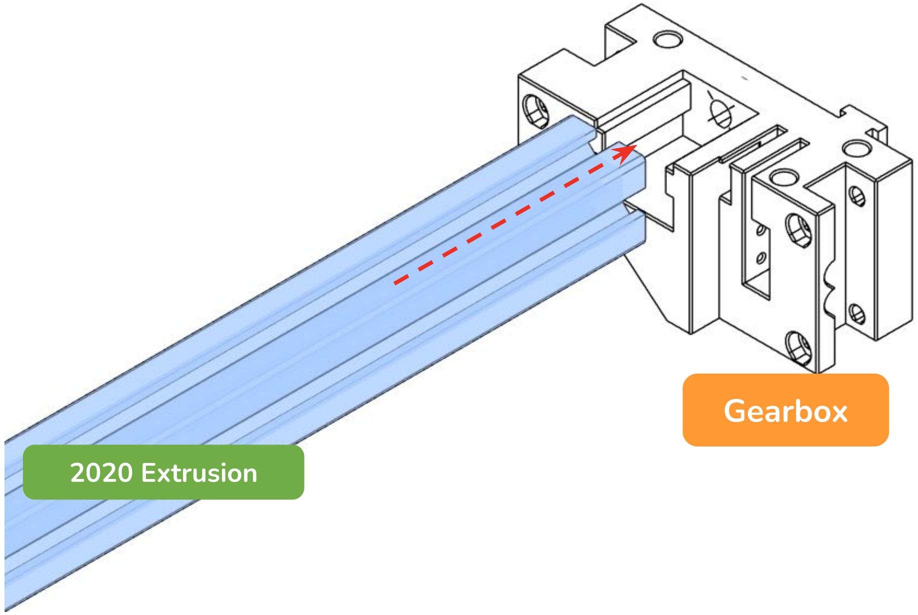
1.3 HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.



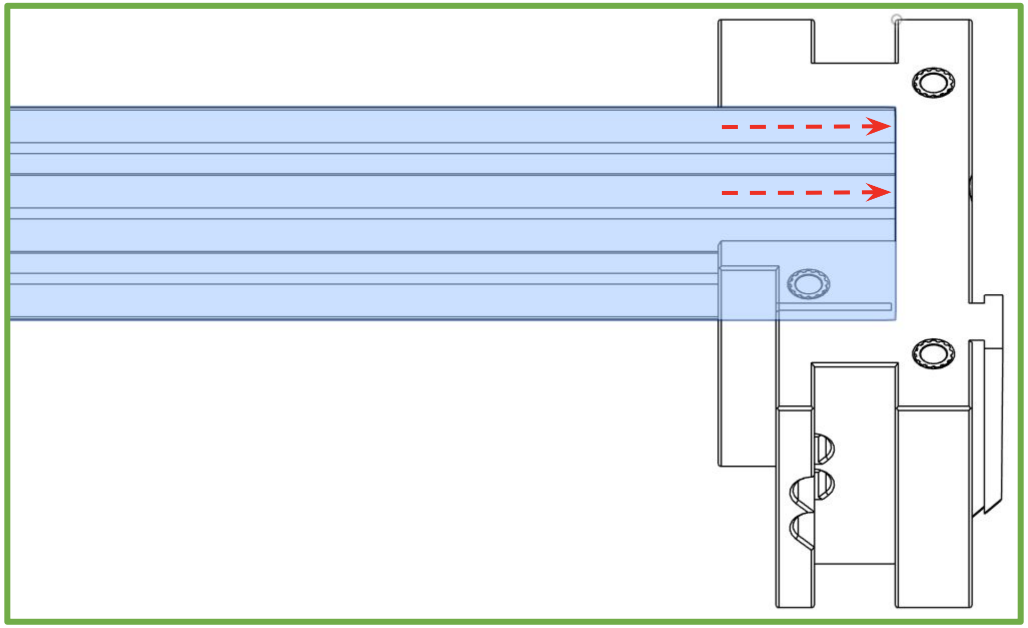


2020 INSTALLATION

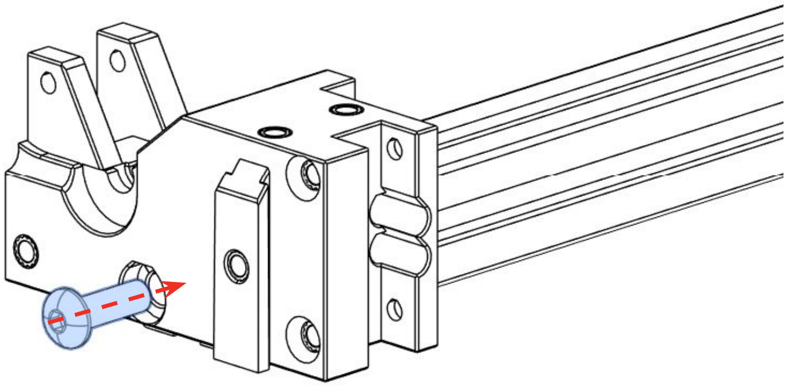


1.2 SEAT THE 2020

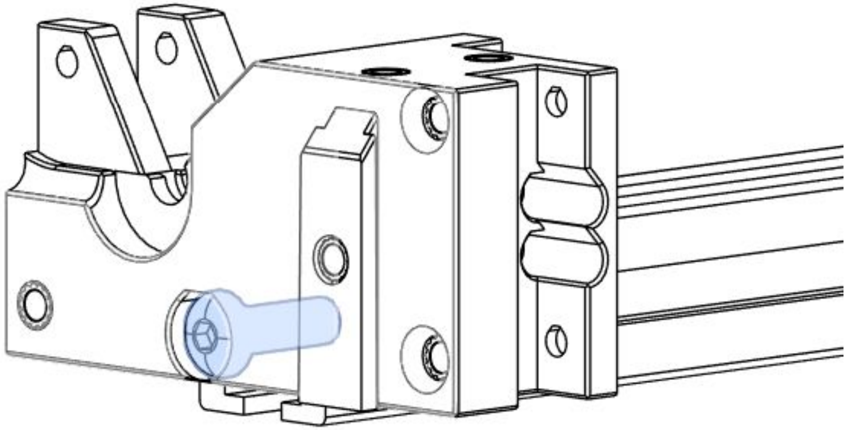
Align and fully seat the tapped side of the 2020 into the Gearbox. If it doesn't sit flush, remove the 2020 and check the Gearbox for loose plastic from failed bridging. You may need to remove the 2020 and clean up any plastic that the 2020 has shaved off during installation. It's a snug fit, and 2020 may have sharp cut edges, so be careful not to cut yourself on them.



2020 INSTALLATION



M5x16mm BHCS

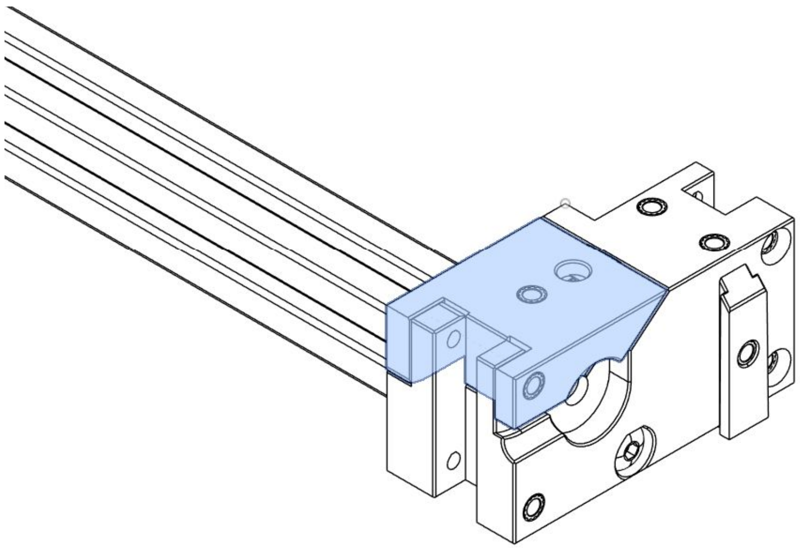


1.2 ADD M5x16mm BHCS

Add the M5x16mm BHCS. Tighten the 2020 to the Gearbox. Go ahead, hulk it down if you like, it's designed to take it! It only needs to be snug enough to pull the gearbox squarely into alignment.

There is a gearbox designed to take an M6x16mm BHCS here:

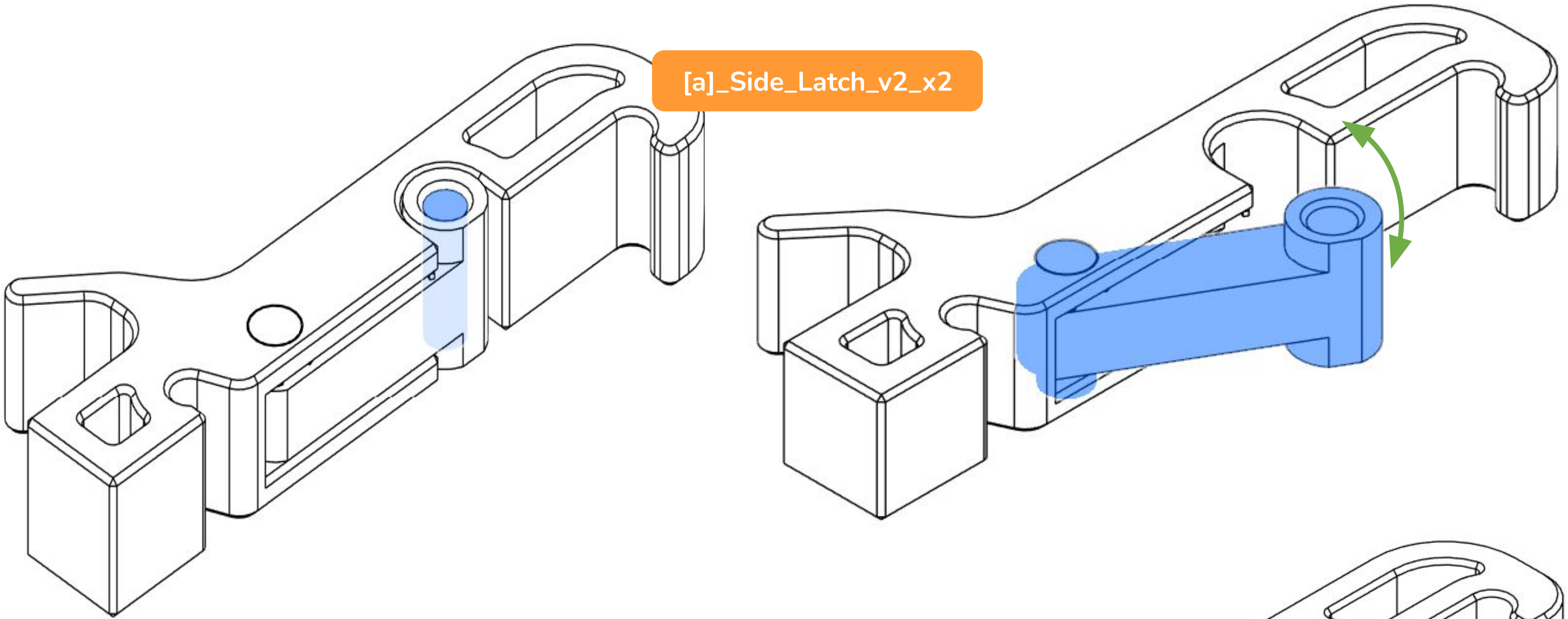
ERCF_v3.0 / User_Mods / Miriax / Gearbox_for_M6 / Gearbox_v61_for_M6.stl

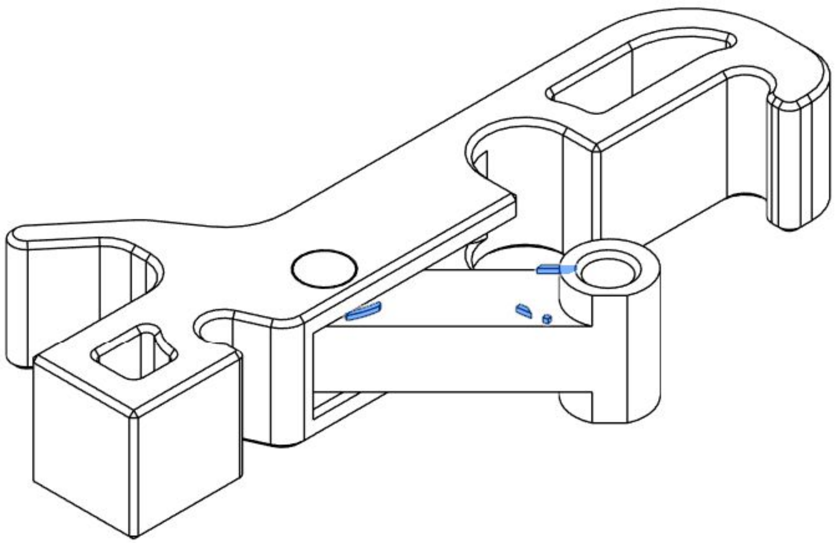


1.3 ADD THE HATCH

Dry fit the Hatch. We will attach it in the next steps.

LATCH PREPARATION





1.4 HINGE UNLOCK

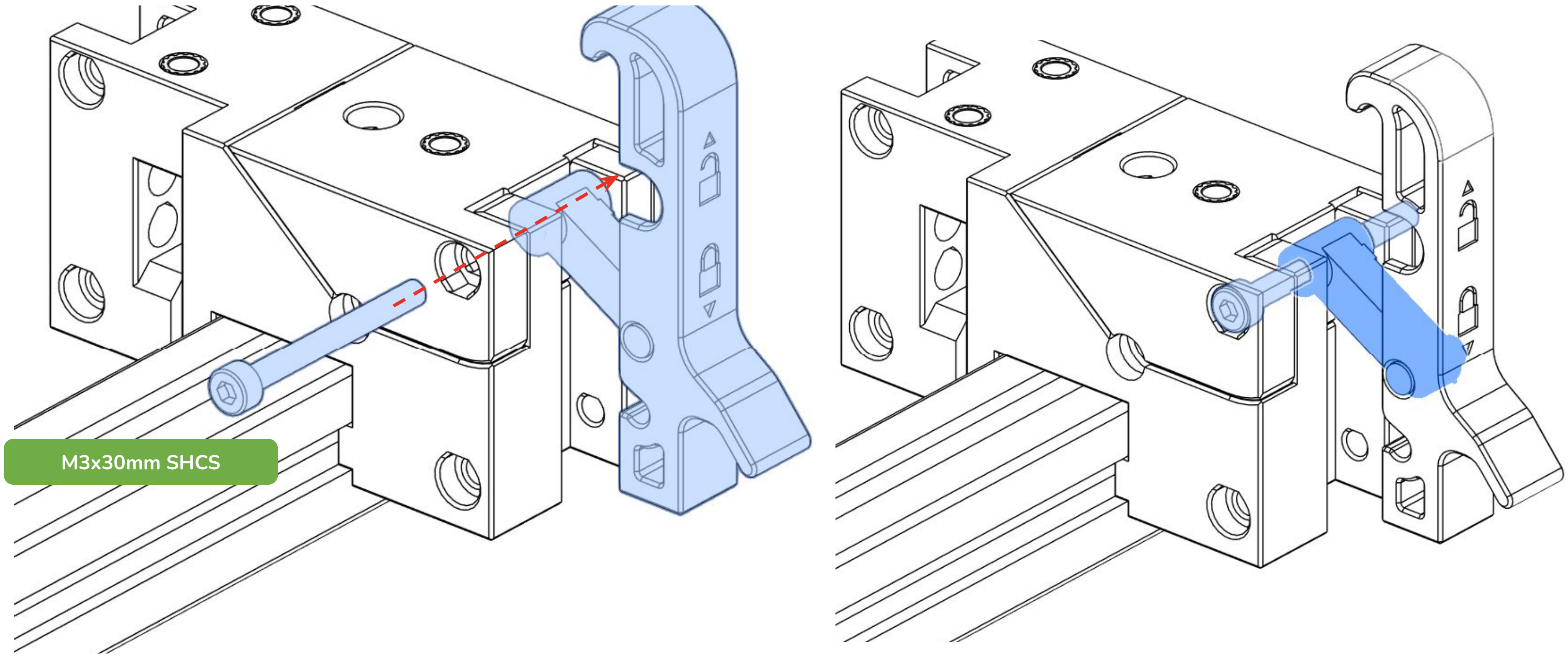
Use a small tool like an allen key or an M3x30mm SHCS inserted into the hinge hole to free the print-in-place mechanism and ensure it rotates freely. You may need to scrape the micro-supports off of the arm if the fit is too tight, but they are designed to either break off or be unobtrusive.

Do this for both of the Side_Latch_v2.

HATCH AND LATCH INSTALLATION

1.3 INSTALL M3x30mm SHCS

Slide the M3x30mm SHCS bolt through the hole in the arm of the Side_Latch_v2. Then snug the bolt. It doesn't need to be very tight - this bolt functions as a hinge for both the Hatch and the Side_Latch_v2.

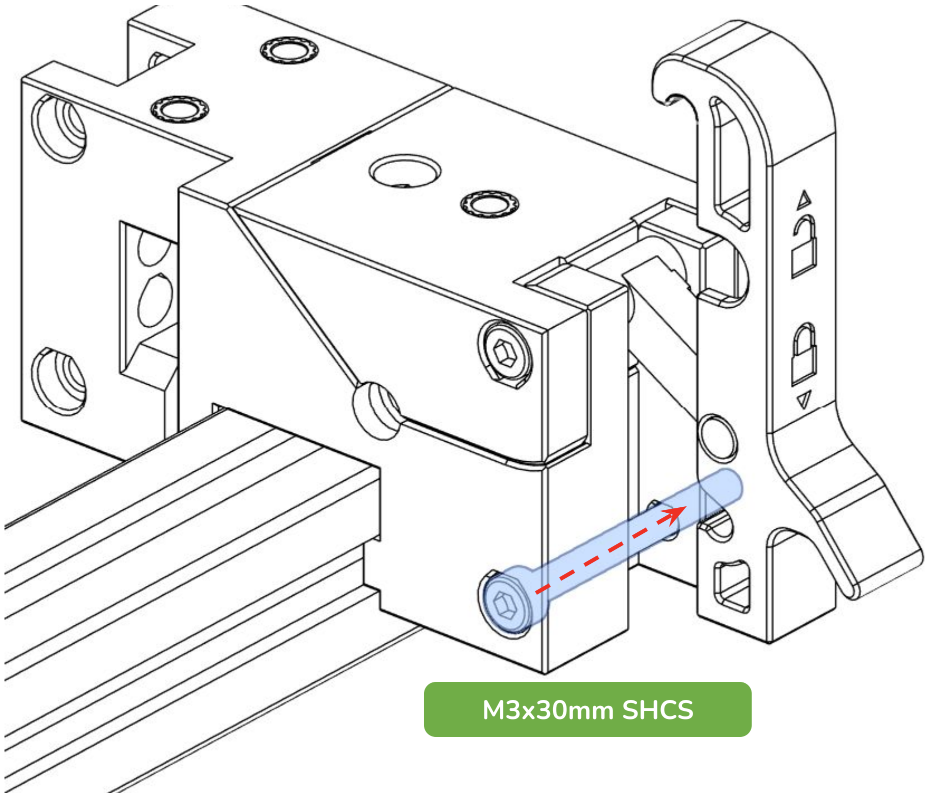


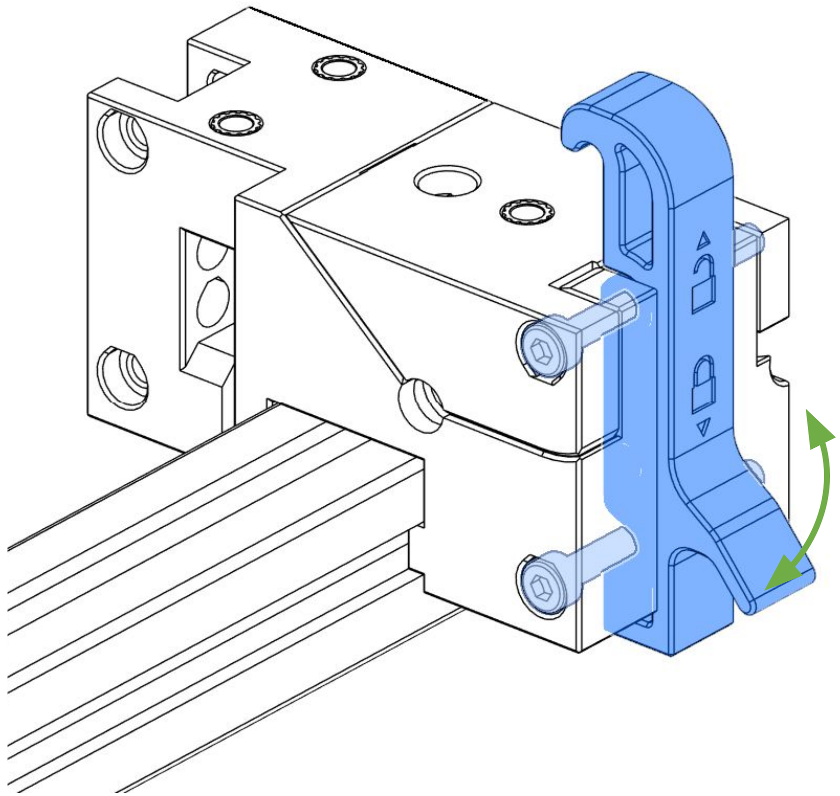
FINISH LATCH INSTALLATION

1.4 FINISH MOUNTING SIDE_LATCH_v2

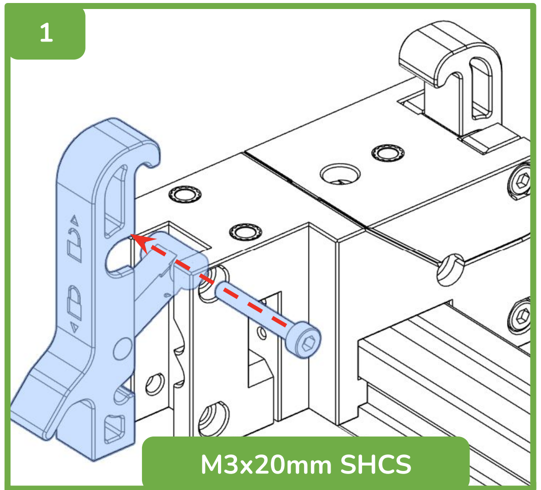
Line up another M3x30mm SHCS on the bottom hole and snug it into place.

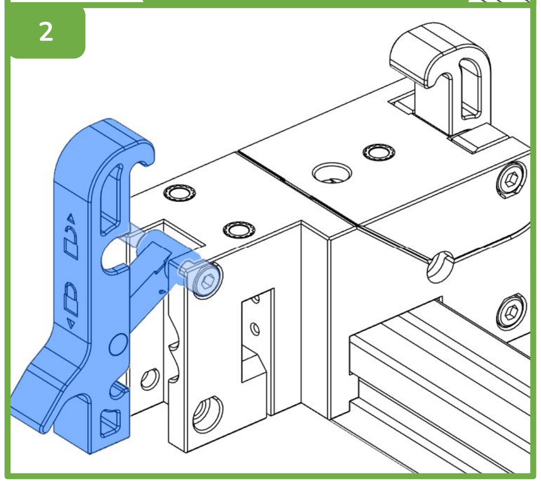
You should be able to swing the Side_Latch_v2 down and snap it into place. Practice opening it with the lever arm - If your bolts are too tight, or it's going to break, it's easier to fix now.





SECOND LATCH INSTALLATION





1.4 MOUNT THE SECOND SIDE_LATCH_v2

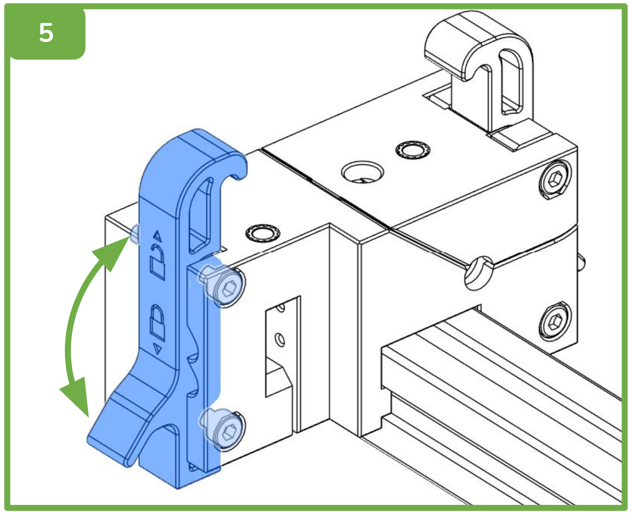
1. Line up an M3x20mm SHCS with the hole in the Side_Latch_v2 arm.

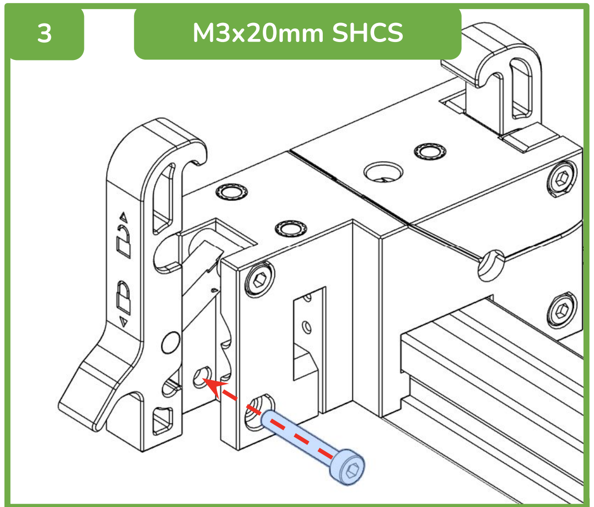
2. Snug the bolt into place. It doesn't need to be very tight - this bolt functions as a hinge for the Side_Latch_v2.

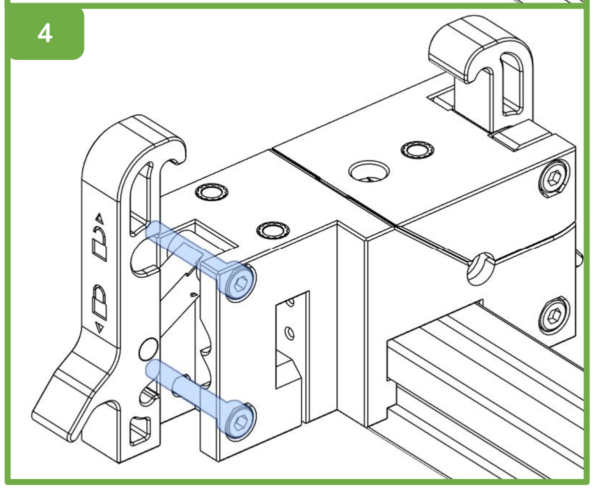
3. Line up another M3x20mm SHCS on the bottom hole

4. Snug it into place, the same as the first bolt.

5. You should be able to swing the Side_Latch_v2 down and snap it into place. Practice opening it with the lever arm - If your bolts are too tight, or it's going to break, you want to know now!







Remember to **always** make sure the latches are closed when running the machine, and especially for calibration!

The first 3D printer was invented in 1986 by Chuck Hull, who called the process "stereolithography".

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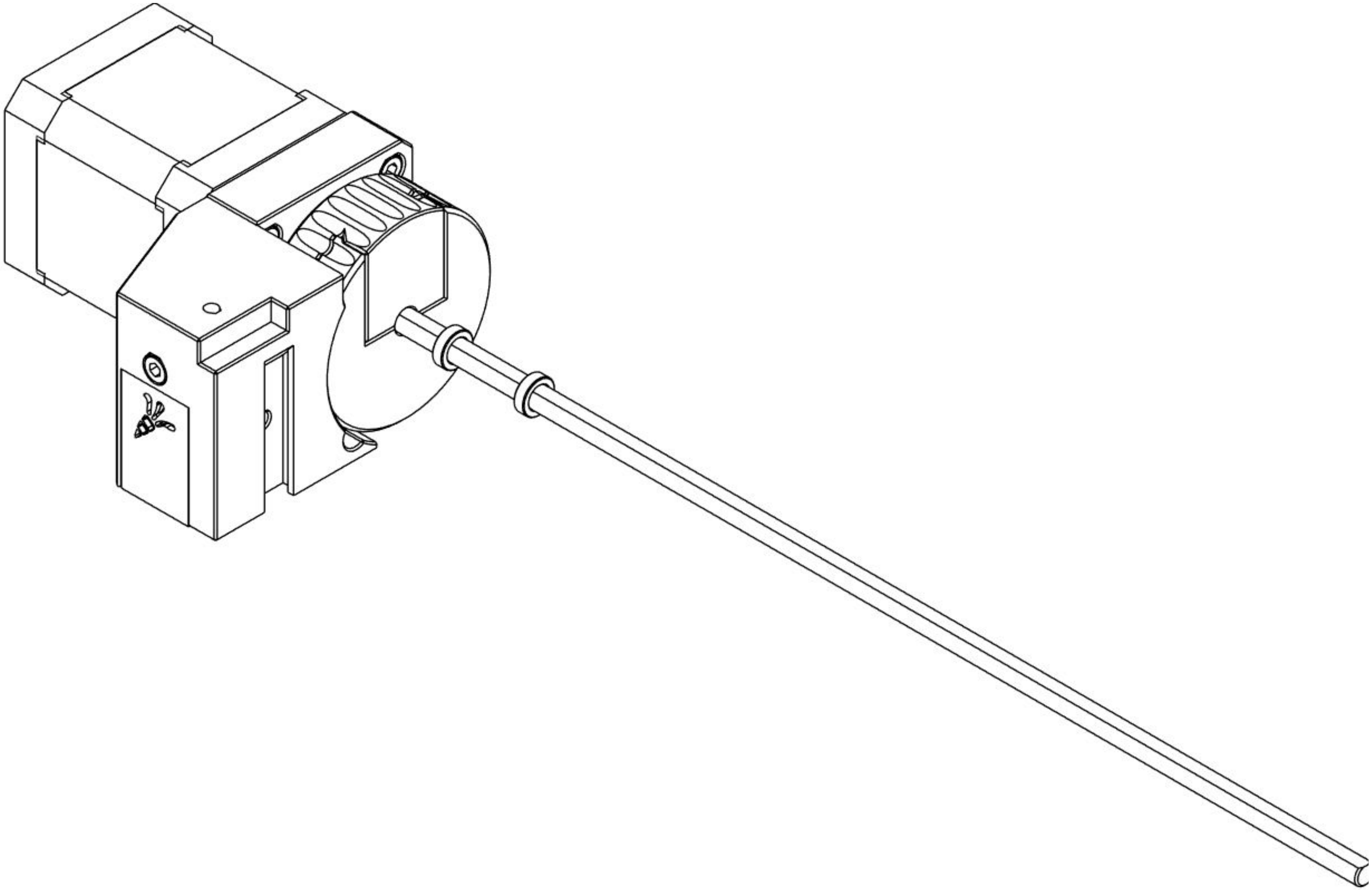
OVERVIEW

OVERVIEW



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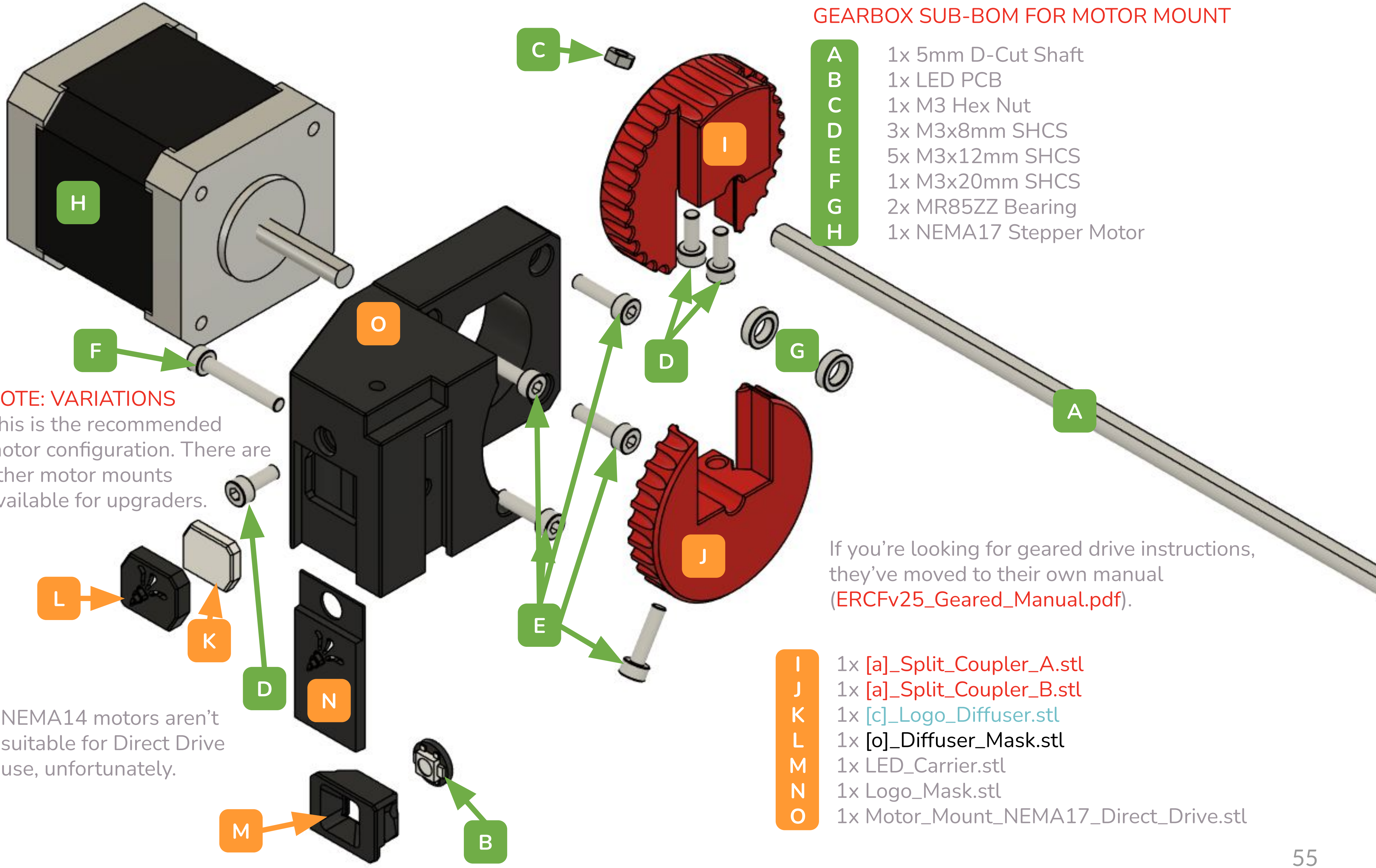
MOTOR MOUNT

EXPLODED VIEW



GEARBOX SUB-BOM FOR MOTOR MOUNT

A	1x 5mm D-Cut Shaft
B	1x LED PCB
C	1x M3 Hex Nut
D	3x M3x8mm SHCS
E	5x M3x12mm SHCS
F	1x M3x20mm SHCS
G	2x MR85ZZ Bearing
H	1x NEMA17 Stepper Motor

NOTE: VARIATIONS
This is the recommended motor configuration. There are other motor mounts available for upgraders.

NEMA14 motors aren't suitable for Direct Drive use, unfortunately.

If you're looking for geared drive instructions, they've moved to their own manual (ERCFv25_Geared_Manual.pdf).

I	1x [a]_Split_Coupler_A.stl
J	1x [a]_Split_Coupler_B.stl
K	1x [c]_Logo_Diffuser.stl
L	1x [o]_Diffuser_Mask.stl
M	1x LED_Carrier.stl
N	1x Logo_Mask.stl
O	1x Motor_Mount_NEMA17_Direct_Drive.stl

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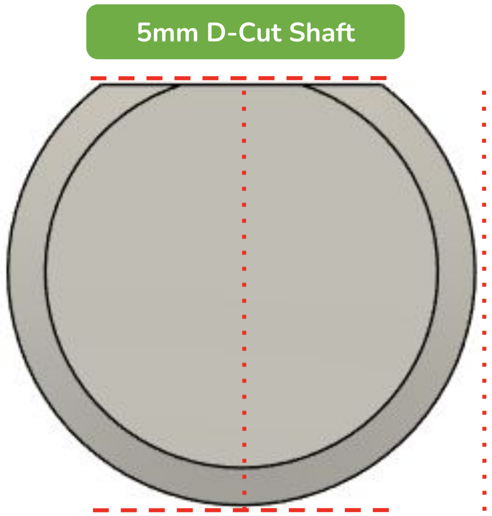
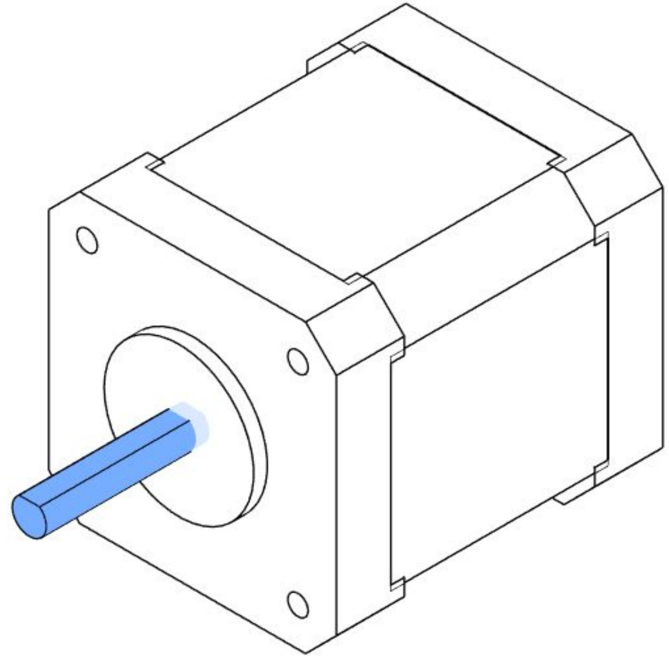
MOTOR MOUNT



4.45-4.50mm is optimal
4.0-4.45mm are usable

SHAFTS PREP



MEASURE YOUR SHAFTS

First, lay your drive shaft flat-side down against a very flat surface such as granite countertop. Check whether it is straight or not. If your drive shaft is not flat, you can try bending it back into shape very gently. A small amount (0-1mm) of deviation is normal, but a large amount of deviation (>1mm) will cause problems during operation.

Next take a micrometer, calipers, vernier, gauge, or your word for an accurate measuring device, and measure your D-cut shaft from the round side, across the flat. Do the same for the motor shaft flat. The desired reading is 4.50mm. If both of your shaft flats are 4.45-4.50mm, you can use the default Split_Coupler parts with no modification.

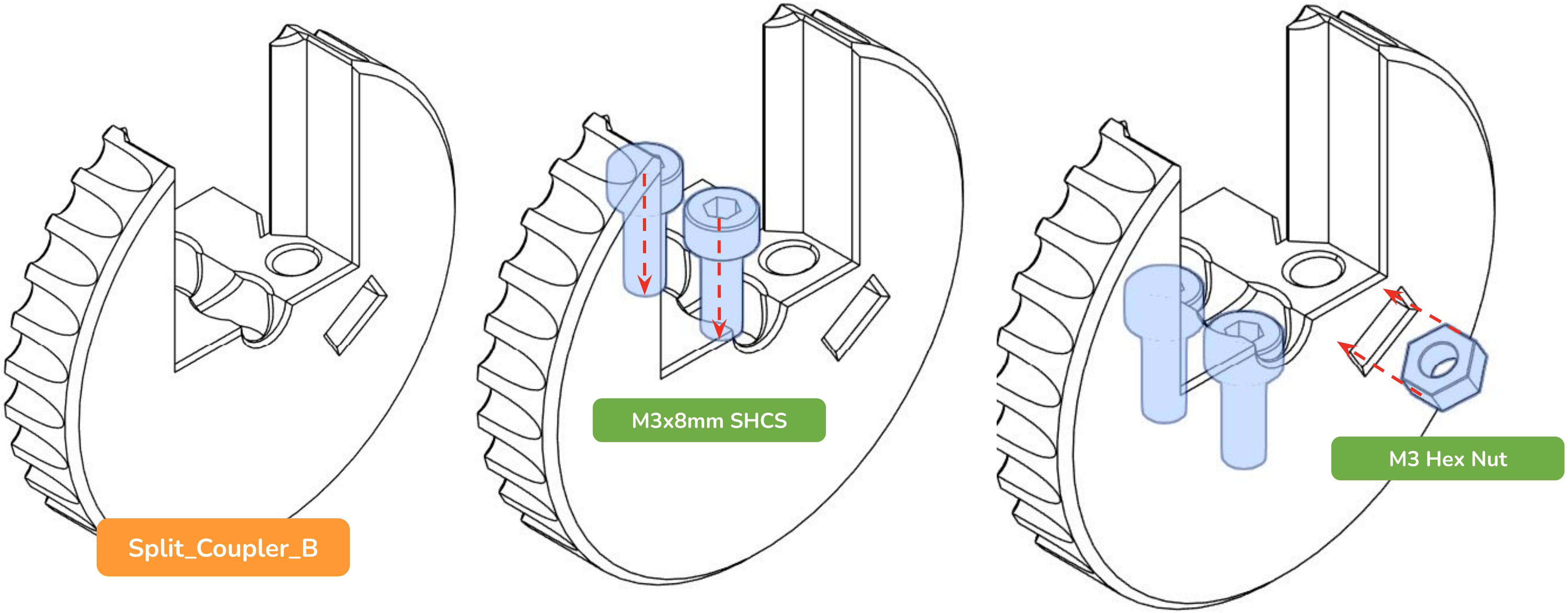
If your flats measure less than 4.50mm, for example a motor shaft reading of 4.26mm and a drive shaft reading of 4.44mm. Round the last digit up or down depending on whether it is equal to or less than 0.05mm. So in this example, round up the motor shaft to 4.30mm, and round down the drive shaft to 4.4mm.

Open the file Stls \ 2._Motor_Mounts_Drive_Shaft \ 2.3_Drive_Shaft \ [a]_Customizable_Split_Coupler_B.3mf In your slicer. Delete all of the options you don't need, so in this example, keep Motor_4.3mm and Drive_4.4mm.

Printing this customized Split_Coupler_B should give you a perfect fit.

If your flats measure significantly more than 4.50mm, contact your vendor for replacement, or break out your file.

PREP COUPLER



2.3 PREPARING THE COUPLER

Take two M3x8mm bolts and place them into the Split_Coupler_B. It should just barely grip the bolts with no threading necessary,

Using pliers, align an M3 hex nut point-first to the slot in the Split_Coupler_B. Carefully slide it into the slot. Next, switch to a small flathead screwdriver to push the nut all the way into the slot.

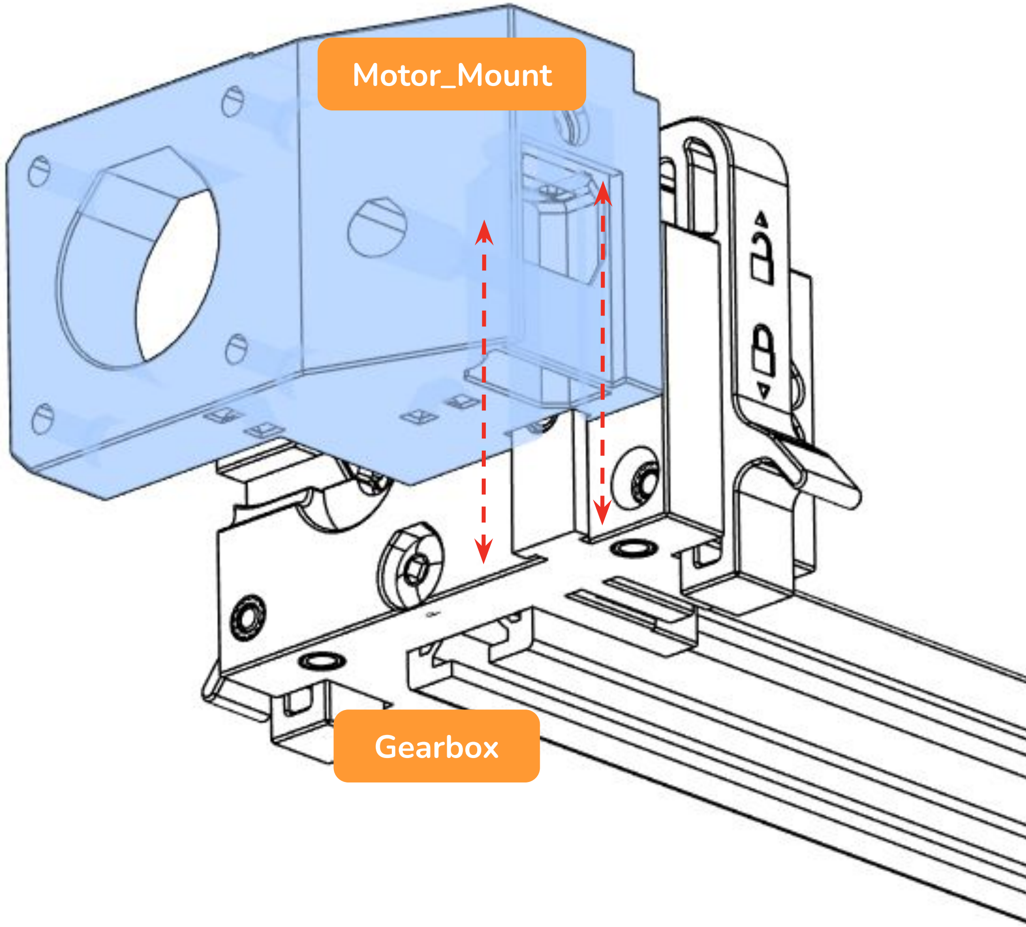
Set aside the Split_Coupler_B for now.

2.1 MOTOR MOUNT MESHING

Take your choice of Motor_Mount and carefully mate the dovetail on the Gearbox to the slot in the Motor_Mount. One face of this dovetail is a zero-tolerance fit, so print defects will matter here! If it is a very tight fit, take sandpaper, a file, or a hobby knife to the parts that are rubbing so that it meshes and unmeshes without too much force. We want this dovetail to mesh with only a little effort so that later assembly steps are easy. It should take both hands to put together and take apart, but it shouldn't hurt your hands or stick so much that it comes apart violently.

If the fit between these parts is too tight to put together or pull apart, it's a good sign that you either need to reprint the parts, or possibly tune your printer more, especially the Extrusion Multiplier. The parts are designed to fit together and come apart with your hands alone, and without straining. It is normal for the first 3-4 times fitting together to be "sticky," but simply meshing and remeshing the dovetail several times should smooth things out. It is also normal for the area around the dovetail to wear!

Unmesh and set aside the Motor_Mount for now.



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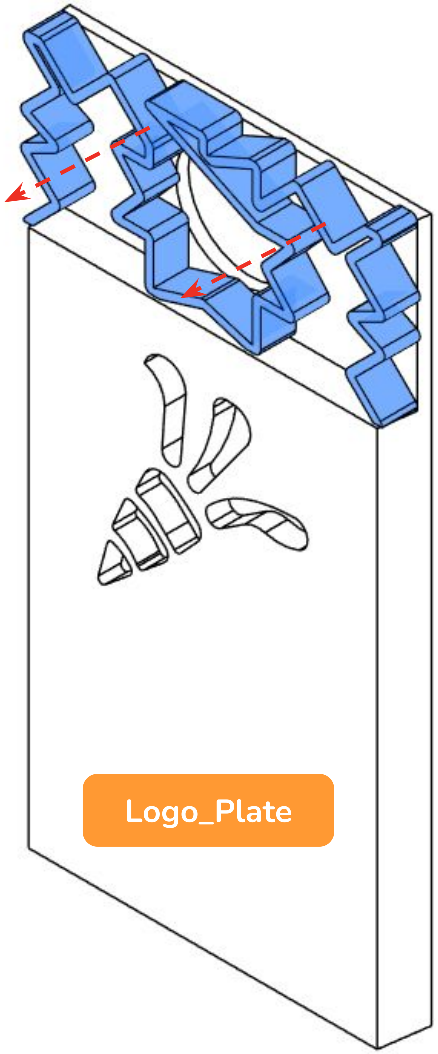
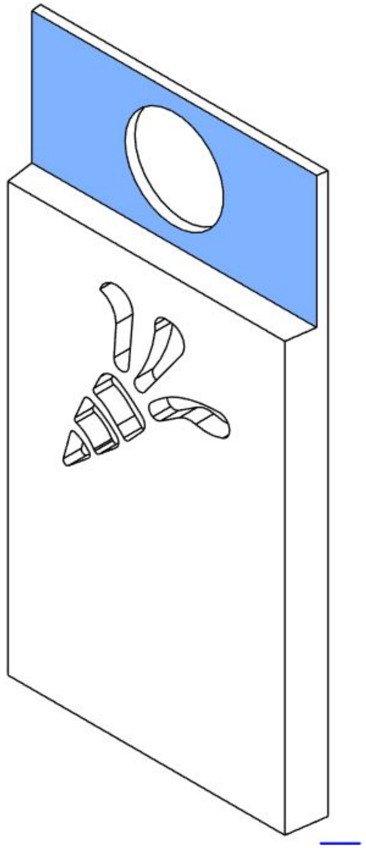
LOGO PLATE

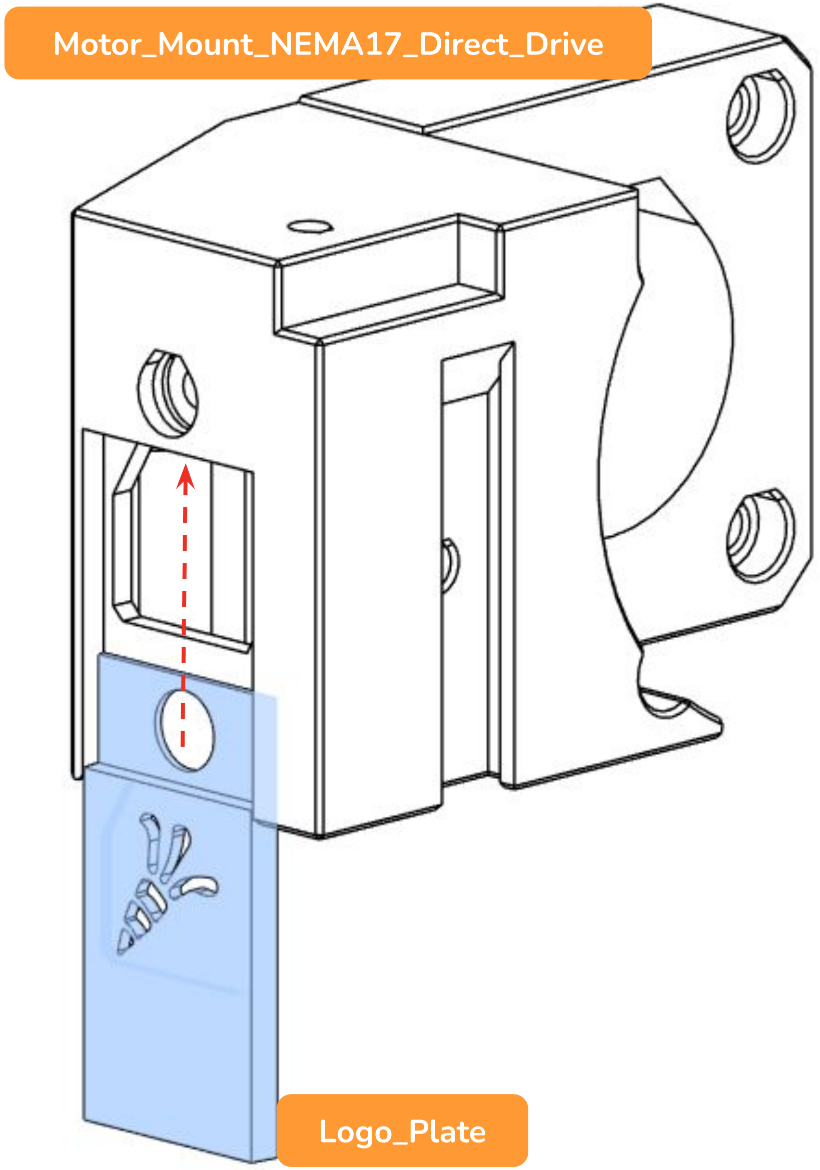


2.2 PREPARE THE LOGO MASK

Carefully remove the supports from the Logo_Mask. If needed, file or carve away any stuck support or bad bridges.

We need the locking tab surface to be clean so that it will seat in its' slot.





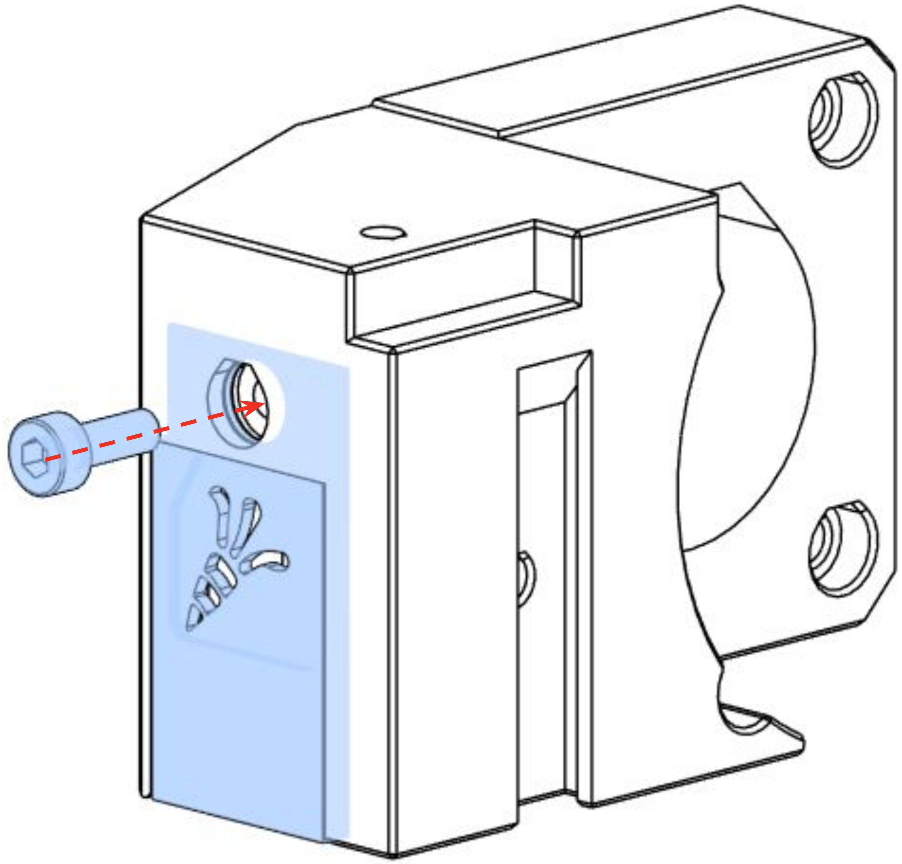
LOGO PLATE

2.2 INSTALLING THE LOGO PLATE

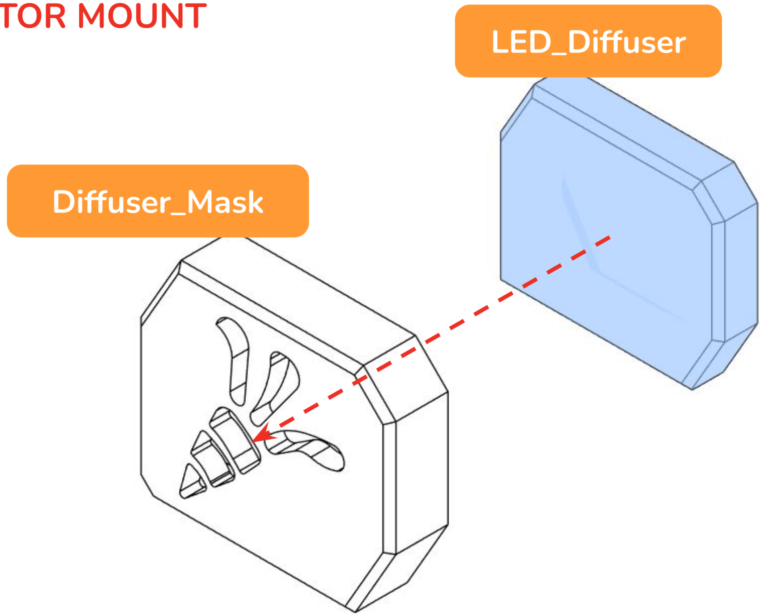
The Logo_Plate interlocks with the LED_Diffuser and Diffuser_Mask, so it must be installed first and uninstalled last.

Align the Logo_Plate with the slot in the bottom of the Motor_Mount, and slide it upwards until it is flush.

Fasten the Logo_Plate with an M3x8mm SHCS threaded into the Gearbox. Don’t overtighten, or it may strip.



MOTOR MOUNT

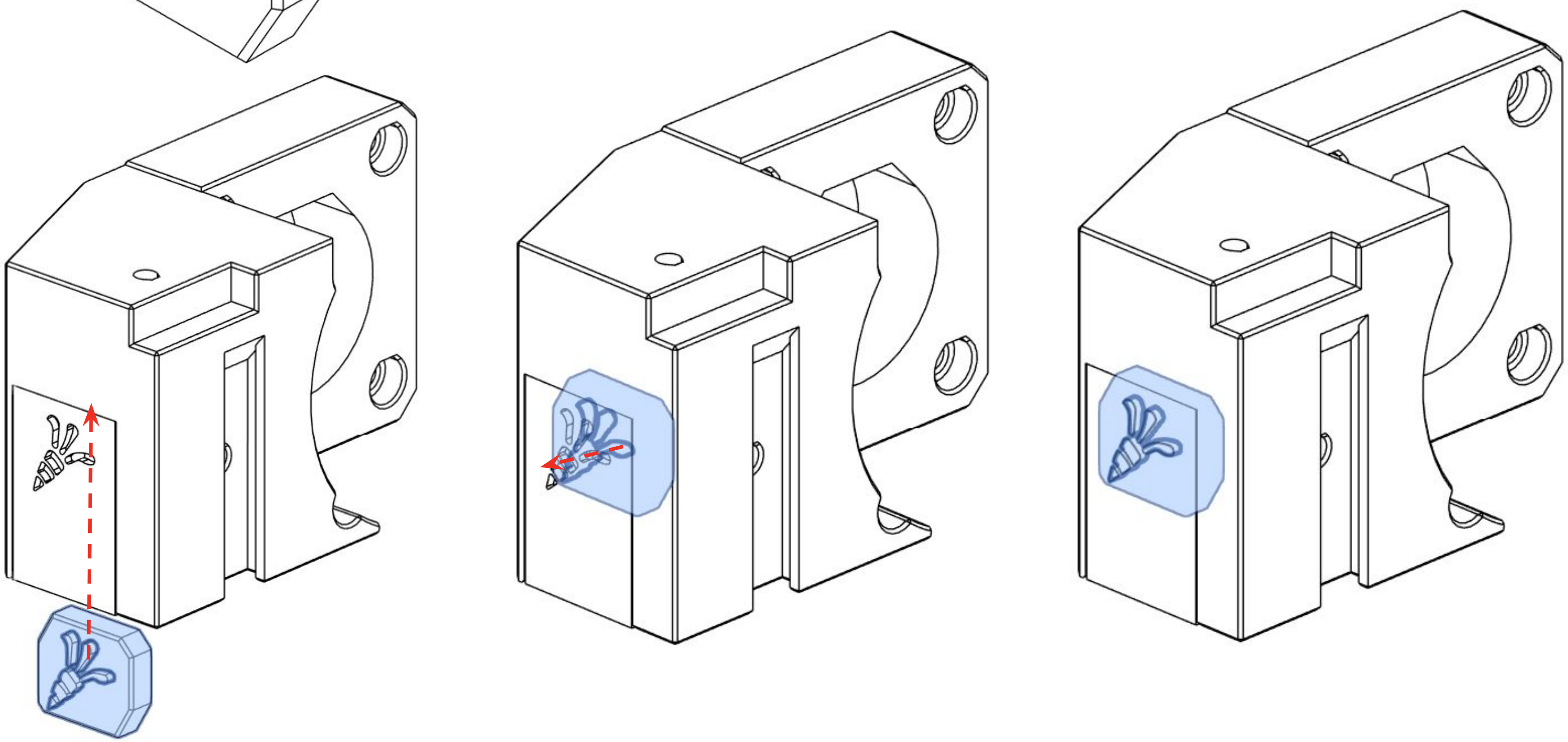


LED DIFFUSER

2.2 INSTALLING THE LED DIFFUSER

Insert the LED_Diffuser into the Diffuser_Mask.

Insert the combined part into the Motor_Mount from the bottom. Once the combined part is as far up as it can go, use an Allen key or screwdriver to push it sideways into the Logo_Plate.



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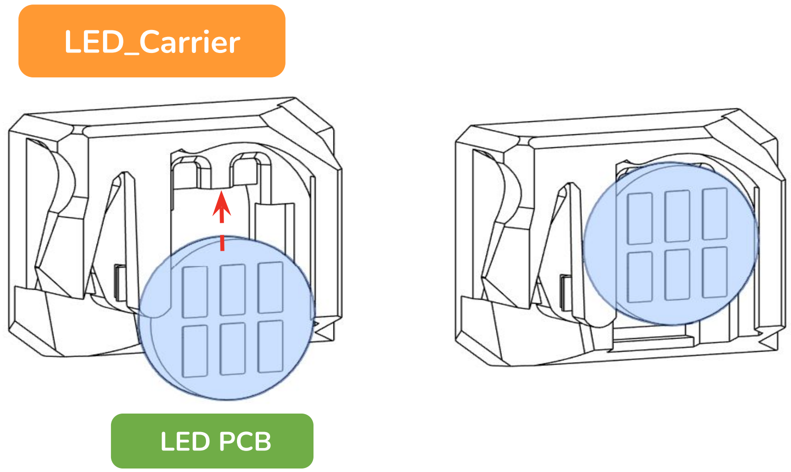
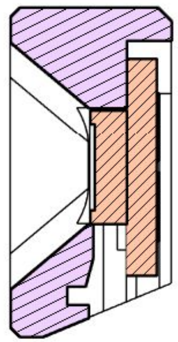
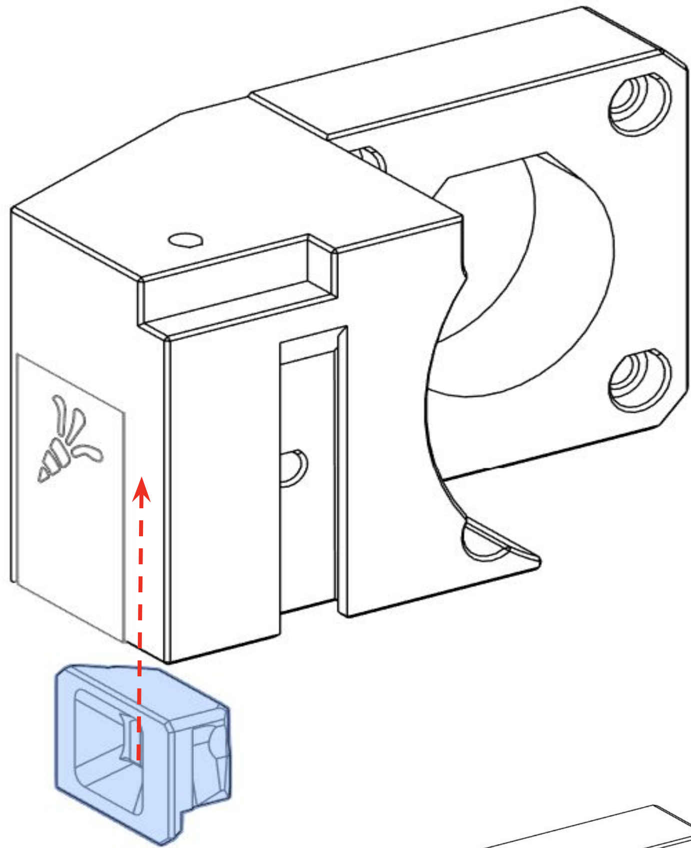
MOTOR MOUNT

LED CARRIER







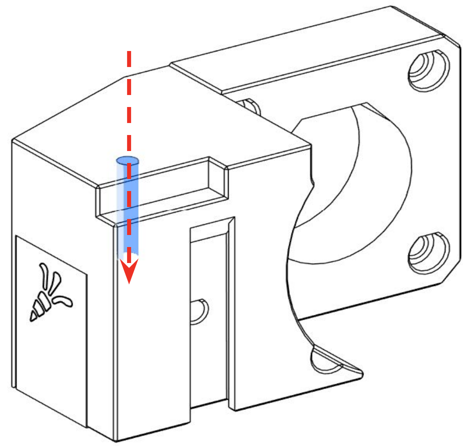
2.2 INSTALLING THE LED CARRIER

Insert the LED PCB into the LED_Carrier, so that the edges of the PCB clip into the LED_Carrier. Check the front of the LED_Carrier to make sure the LED is aligned with the window. The wires are omitted from the images for clarity.

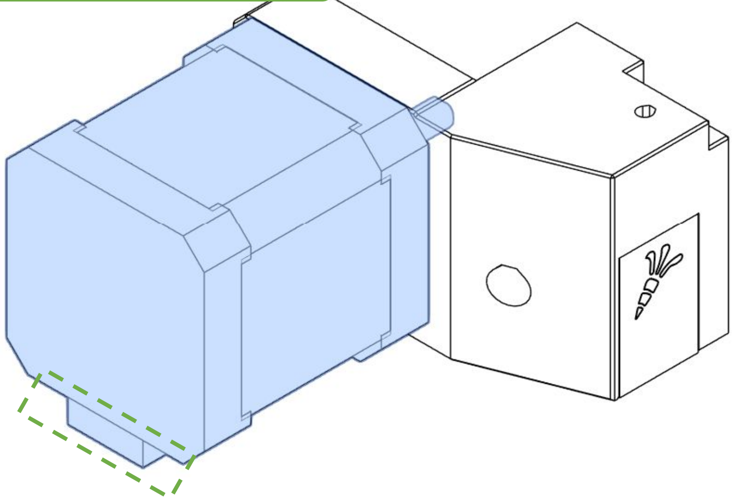
If you are using soldered Neopixels, skip this step for now.

Insert the combined part into the Motor_Mount from the bottom. Use an Allen key or screwdriver to push the combined part up as far as it can go.

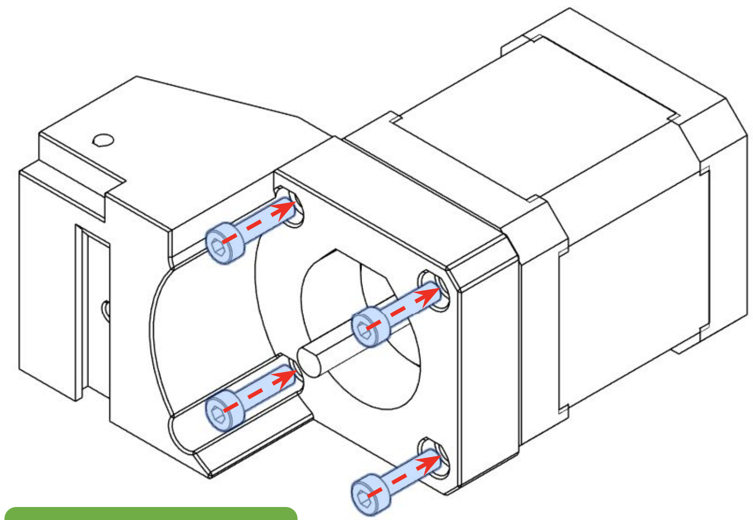
If you need to recover the LED for any reason, insert an Allen key into the hole in the roof of the Motor_Mount to push the LED_Carrier back out of the bottom.



MOTOR MOUNT



DRIVE MOTOR

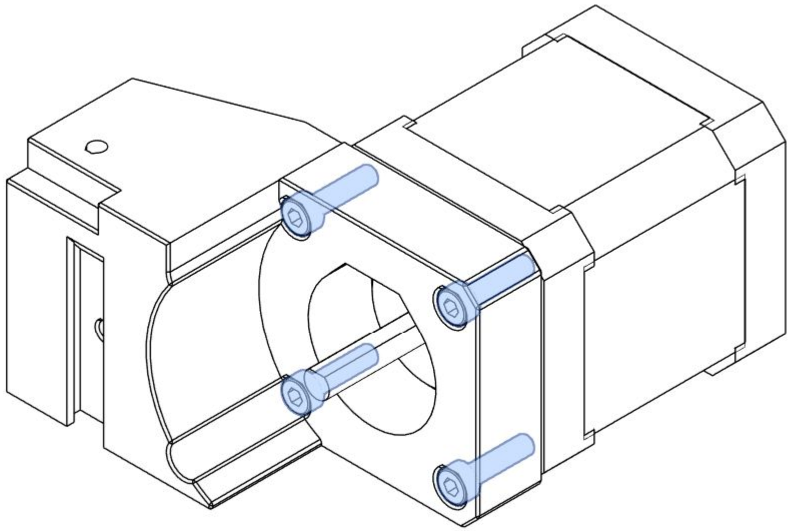


2.1 INSTALLING THE DRIVE MOTOR

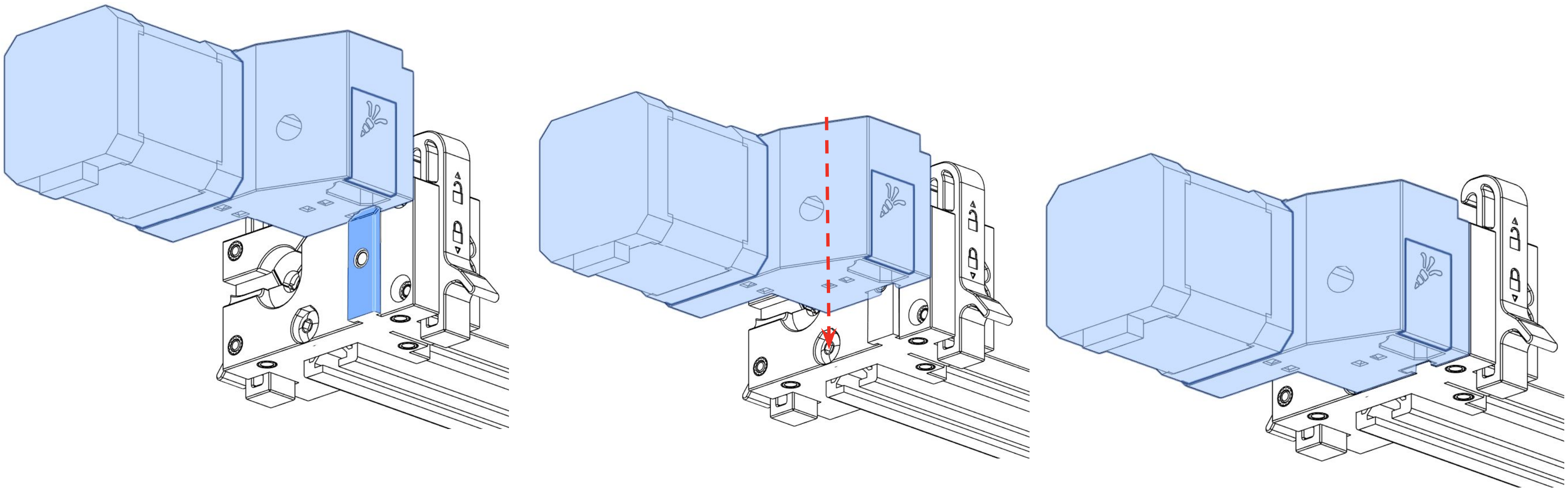
Align the NEMA17 Motor with the Motor_Mount so that the wires or connector is facing down.

Insert four M3x12mm bolts into the Motor_Mount and tighten them in an alternating pattern until they are all very snug.

If you are using an alternative 5mm shaft coupler, you should install it loosely onto the motor shaft now.



INSTALLING MOTOR MOUNT



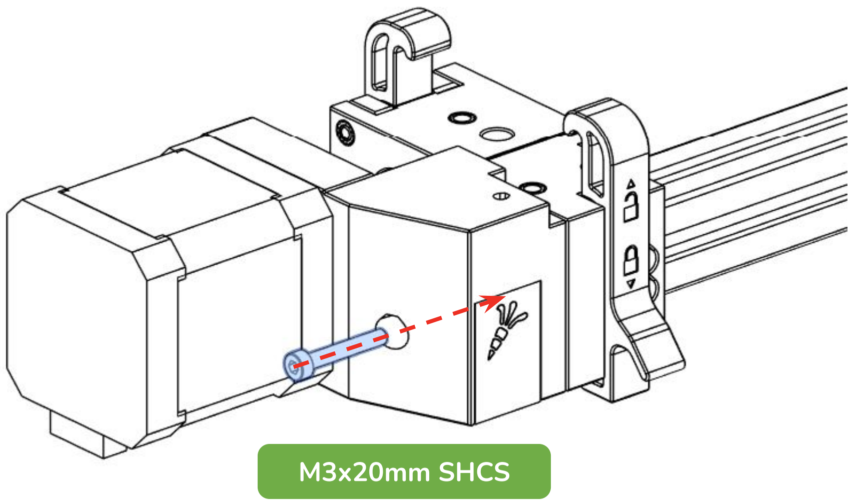
2.1 INSTALLING THE MOTOR MOUNT

Align the slot in the Motor_Mount with the dovetail on the Gearbox.

Press down on the Motor_Mount. It should be a snug fit. If it's too tight, take the pieces back apart and make sure the slot and dovetail are clear and smooth. If it's a really tight fit, you may need to take a file to the slot and/or dovetail, or reprint one or both of the pieces with more printer tuning.

Keep going until the bottom of the Motor_Mount is flush with the bottom of the Gearbox.

Install the M3x20mm screw to keep everything in place.



PREP DRIVE SHAFT

PREP THE DRIVE SHAFT

It is **critical** that the D-cut shaft is straight - check using a flat surface such as glass. If your shaft is not straight, you can either attempt to straighten it by hand, or contact your supplier for replacement. Some kit vendors supply a mild steel D-cut shaft which is too malleable!

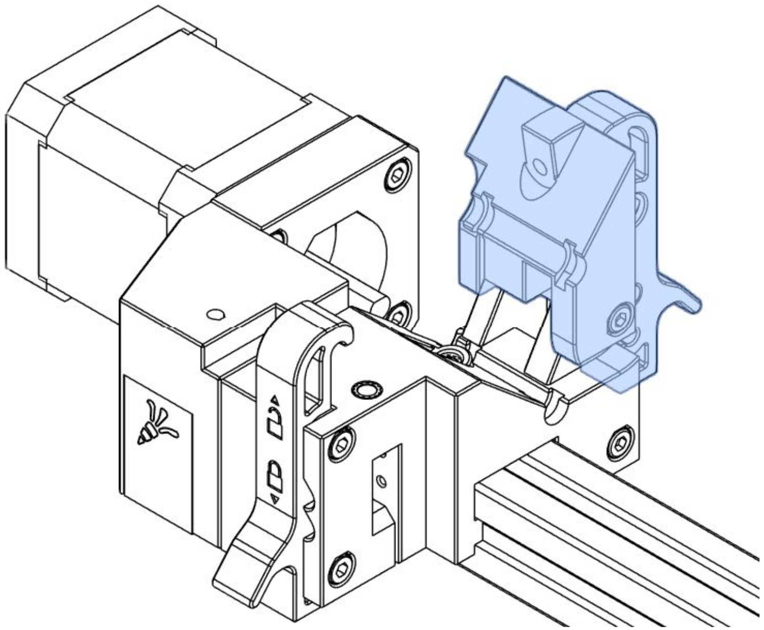
Take the Gearbox assembly and open the Side_Latch_v2 on the side that shares a hinge with the Hatch. Next, flip open the Hatch.

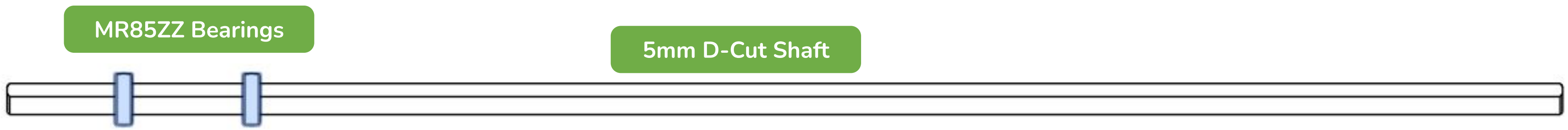
Take the 5mm D-Cut Shaft and insert it into two MR85ZZ bearings.

If your D-Cut Shaft is rough or at-spec (4.98-5.00mm), it will be difficult to insert and move the bearings. It is important that we be able to move the shaft along its axis during assembly, so if this is a problem for you, this must be addressed.

For many D-cut shafts, degreasing them with your favorite household cleaner (Simple Green is a top pick) can make the difference between a too-tight fit and a snug fit. If that doesn't work, follow up with a light-duty green abrasive pad.

If you still find that your D-Cut Shaft is too tight on the bearings, take a high-grit sandpaper (at least 300 grit, preferably 1000-1500) and sand the shaft. Use a light oil, wear gloves and take appropriate precautions while sanding. You barely want to take any material away at all.





Channels	N	4	5	6	7	8	9	10	11	12	13	14	15
D-Cut Rod Length (mm)	72 + 23N	164	187	210	233	256	279	302	325	348	371	394	417

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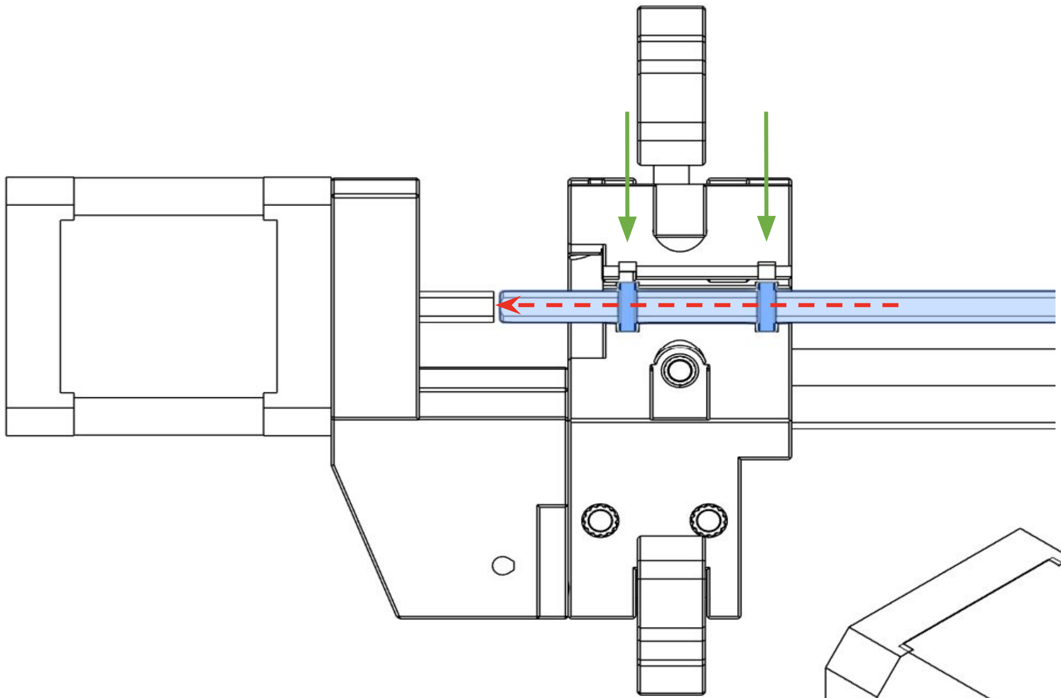
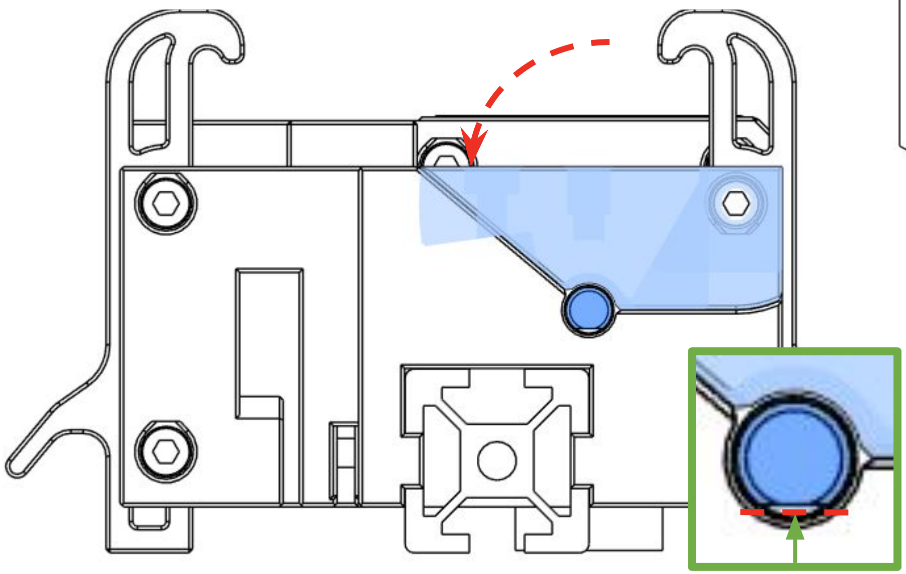
INSTALLING DRIVE SHAFT

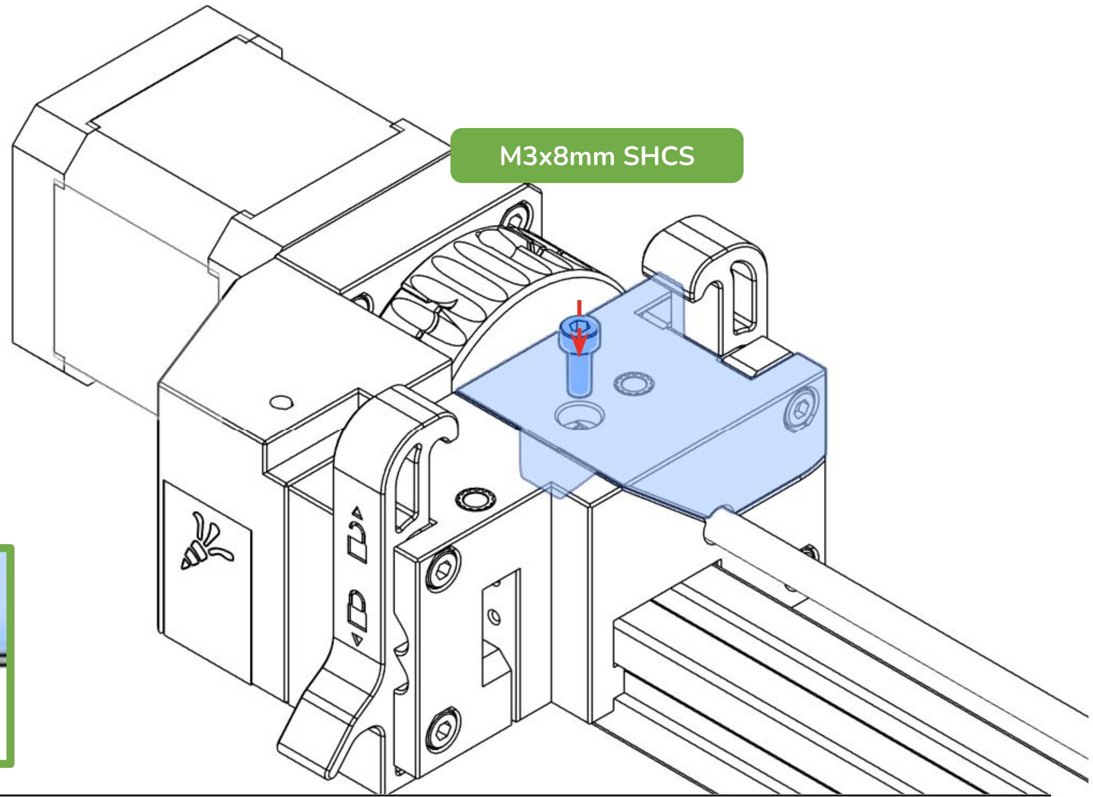


2.3 INSTALLING THE DRIVE SHAFT

Align the bearings and shaft with the slots in the Gearbox. Close the Hatch over the bearings, and close the Side_Latch_v2. Slide the Drive Shaft down until it meets the motor shaft. Align both the motor shaft and the drive shaft with the flat facing down for the next steps.

Install an M3x8mm bolt to hold the Hatch shut. It doesn't need to be super tight - it just holds the MR85ZZ bearings in place.





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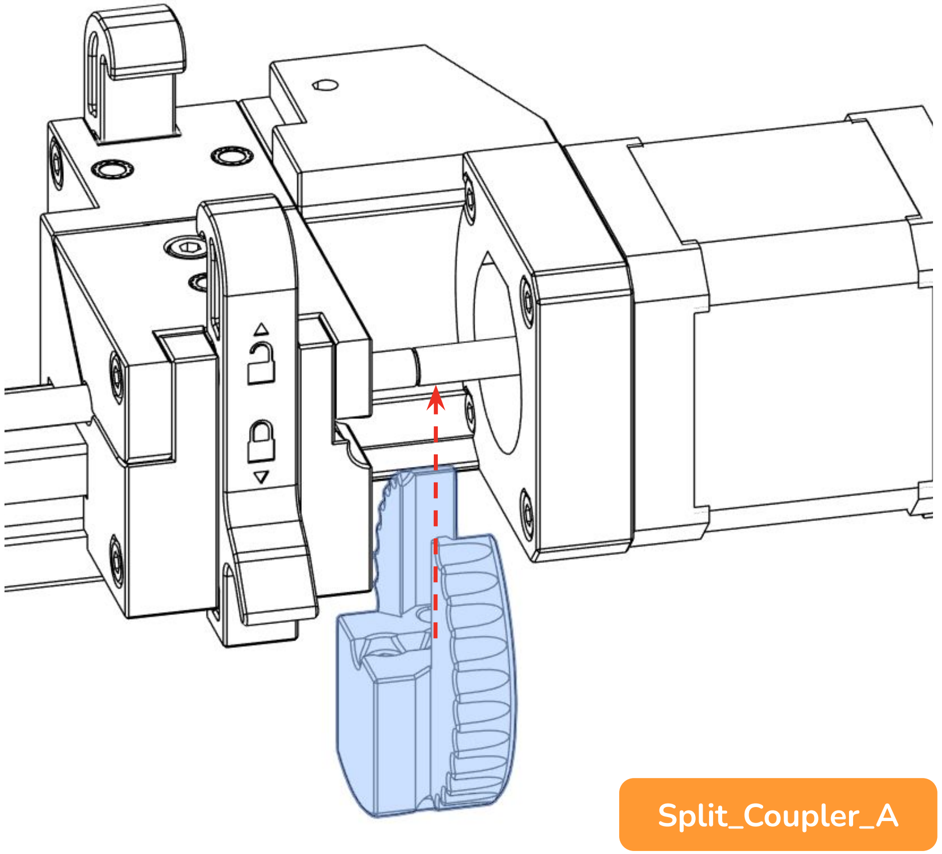
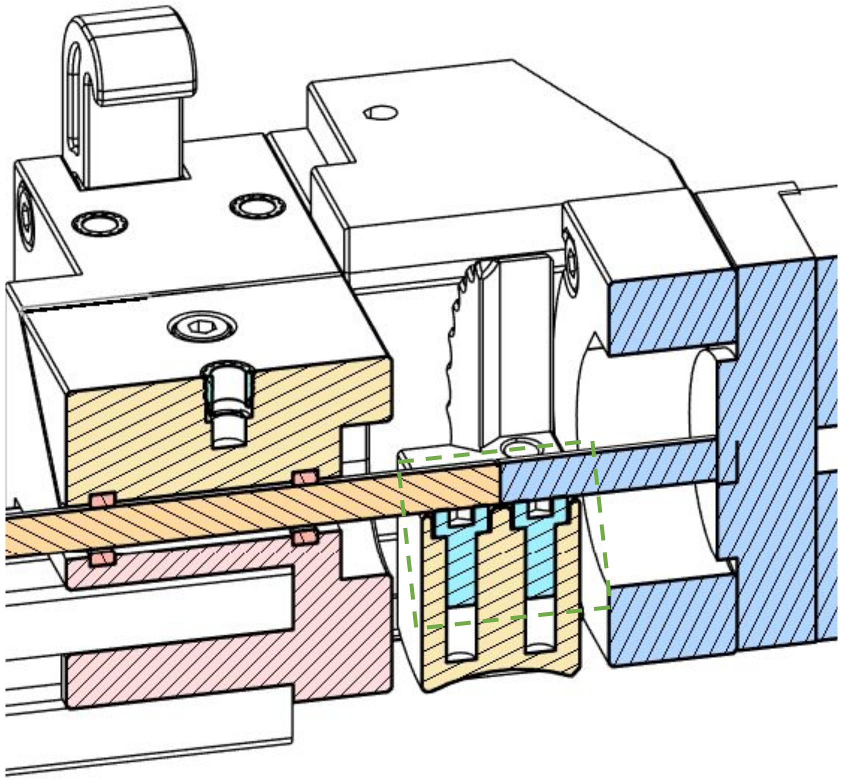
INSTALLING COUPLER

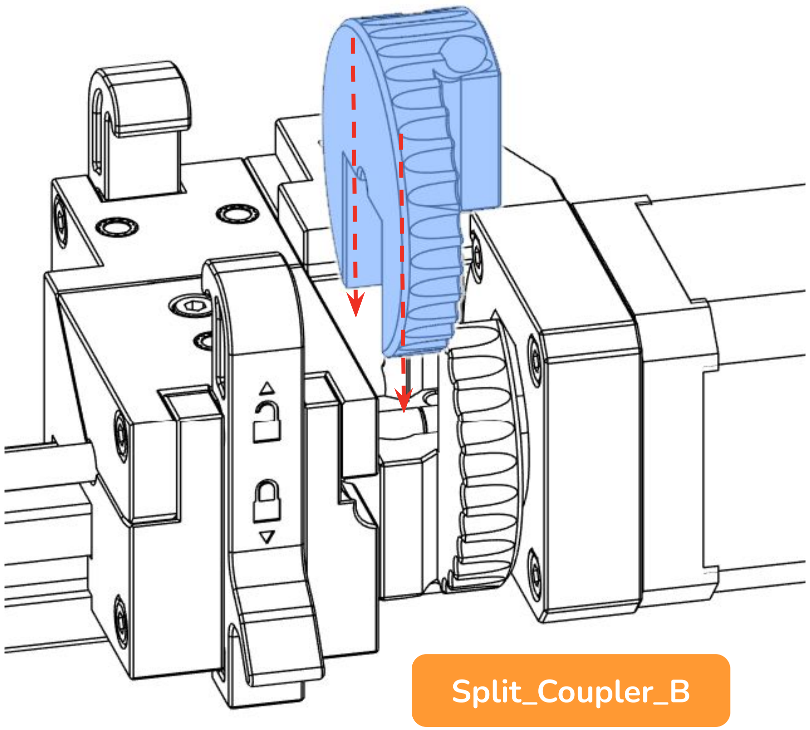


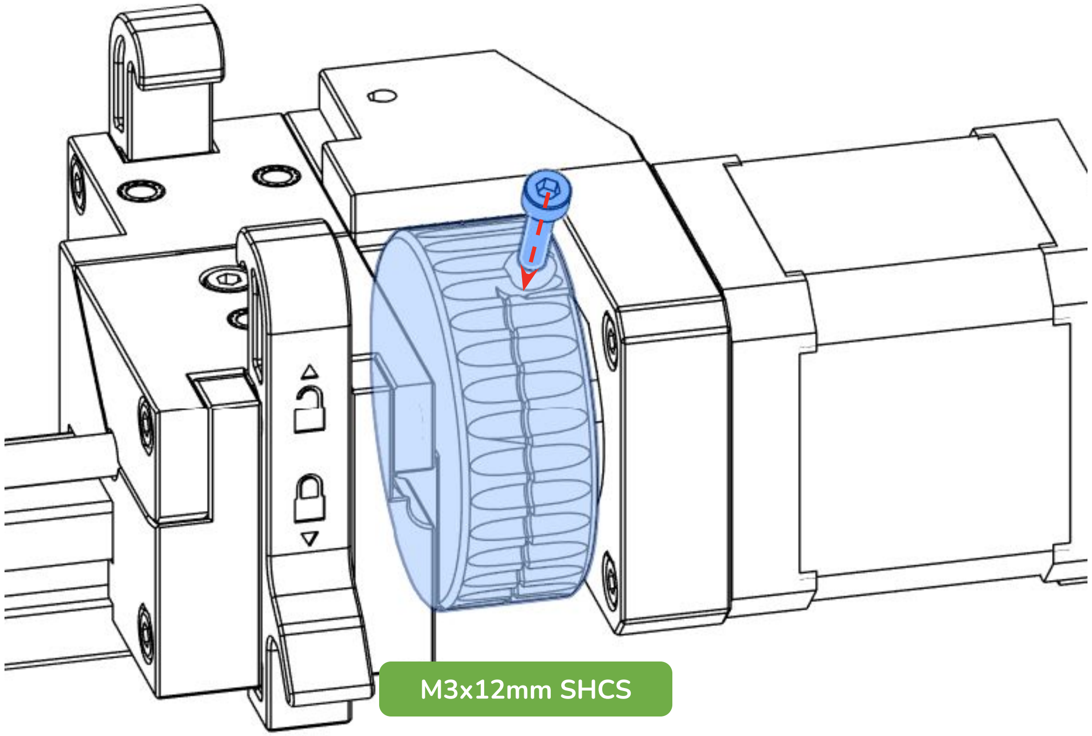


2.3 INSTALLING THE COUPLER

Lift up the main assembly and place the Split_Coupler_B that you prepared earlier onto the Drive Shaft with the circular face toward the motor. Align the screwheads in the Split_Coupler_B with the flats of the motor shaft and Drive Shaft.

INSTALLING COUPLER





2.3 INSTALLING THE COUPLER

Next, slide the Split_Coupler_A onto the Split_Coupler_B. Insert an M3x12mm bolt into the hole in the Split_Coupler_A. Tighten it down until it is fully mated. The Split_Coupler_A should fully align with the Split_Coupler_B. Make sure that the screwheads from the previous step stay pushed against the flats of both the motor shaft and the Drive Shaft.

The drive shaft should now be tightly coupled to the motor shaft. If there is still slop, tighten the M3x12mm bolt more. Give the Coupler a spin. The shaft should spin freely, and be nicely centered on the bearings in the Gearbox. If the Coupler needs to be adjusted or removed, loosen the M3x12mm.

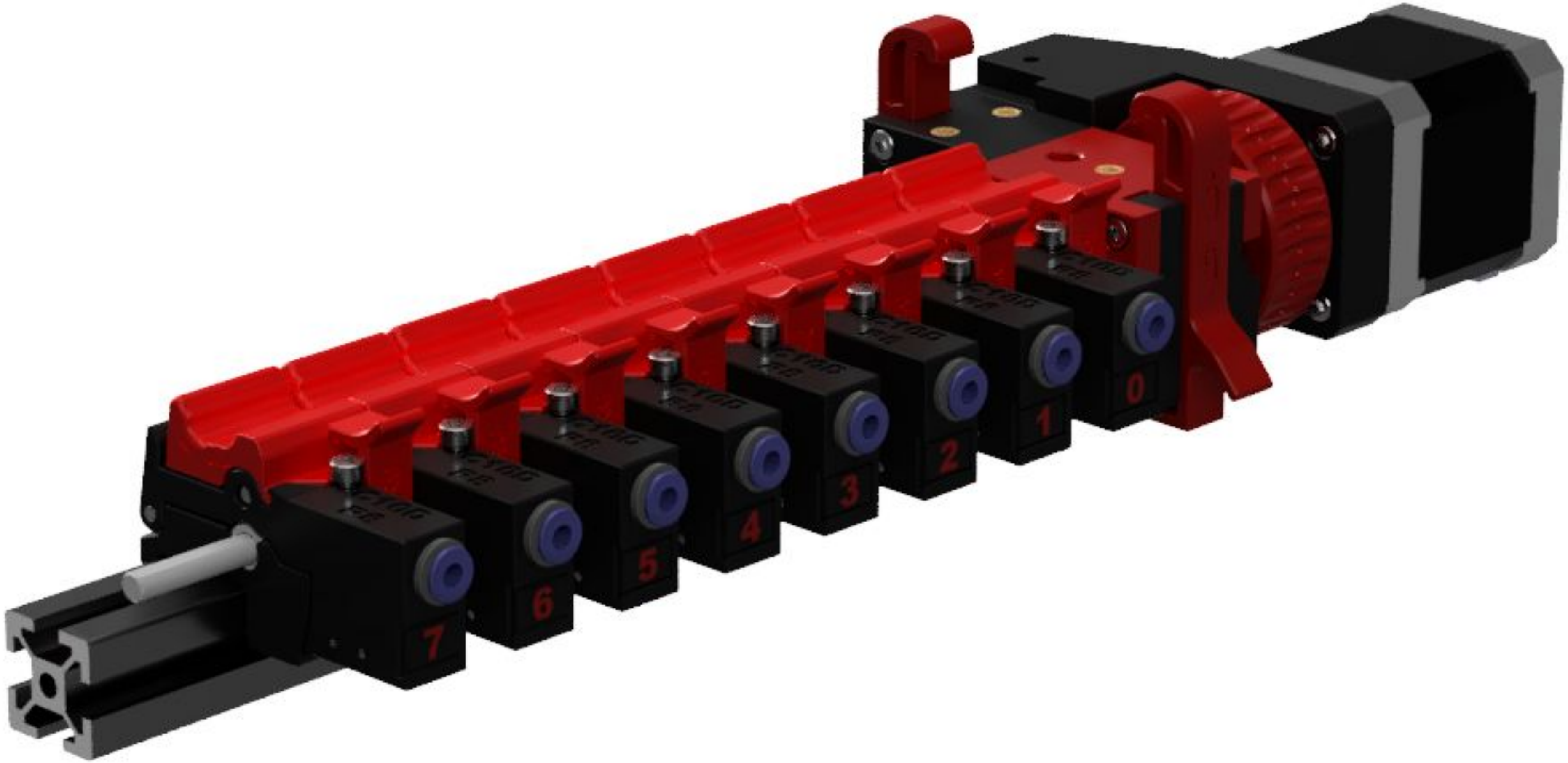
If you're using an alternative 5mm coupler to the Split Coupler (and you put it on the motor shaft on Page 63), you can simply slide it over onto the Drive Shaft and tighten it up.

Heft your mighty Rabbit Hammer to the sky and rejoice. You're done with motor mounting!

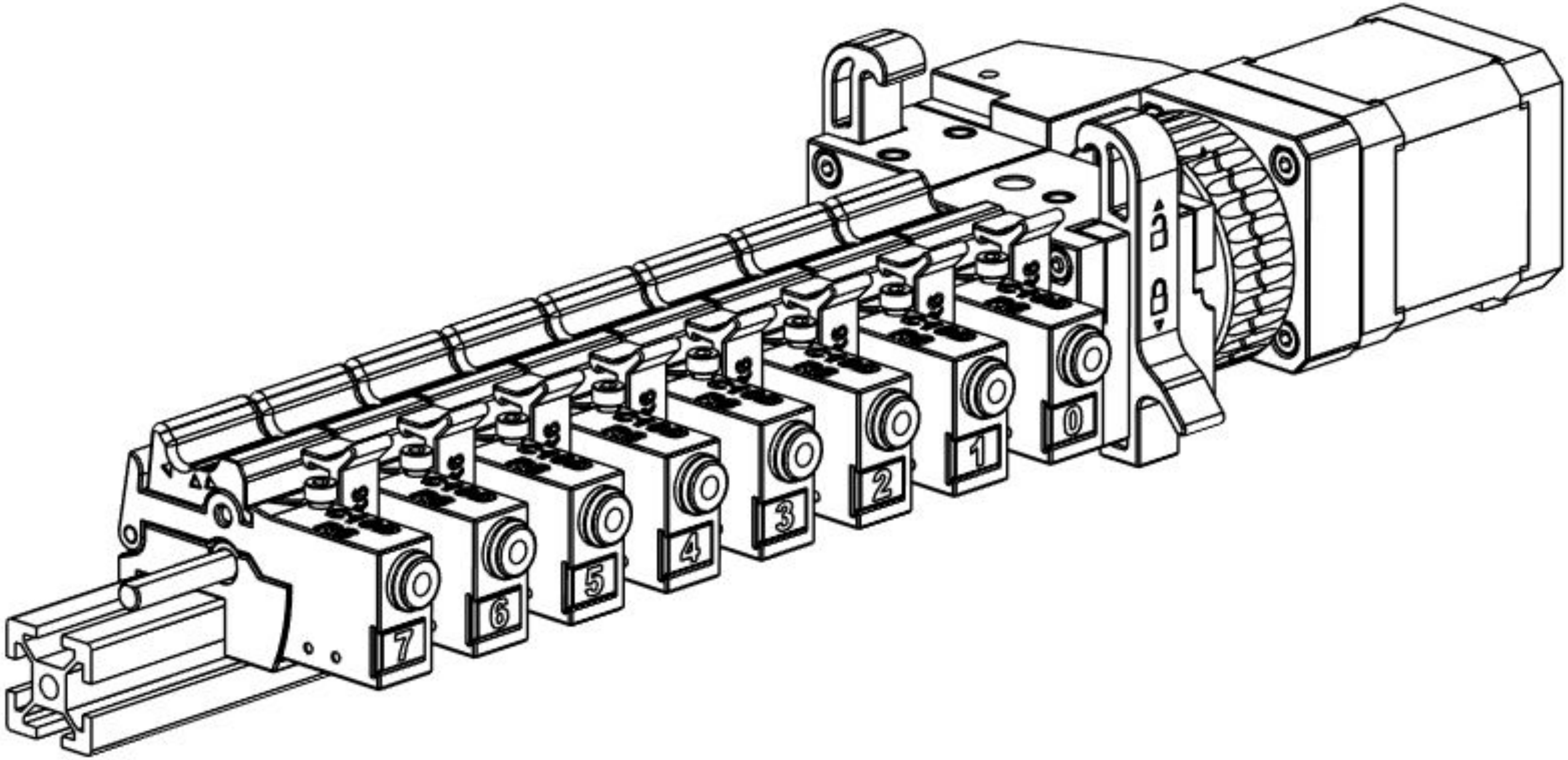
ERCF in space?

The first 3D printer in space was installed on the International Space Station in 2014 and used by astronauts to create tools and parts, demonstrating the potential of this technology for long-duration space missions and even interplanetary travel.

OVERVIEW



OVERVIEW



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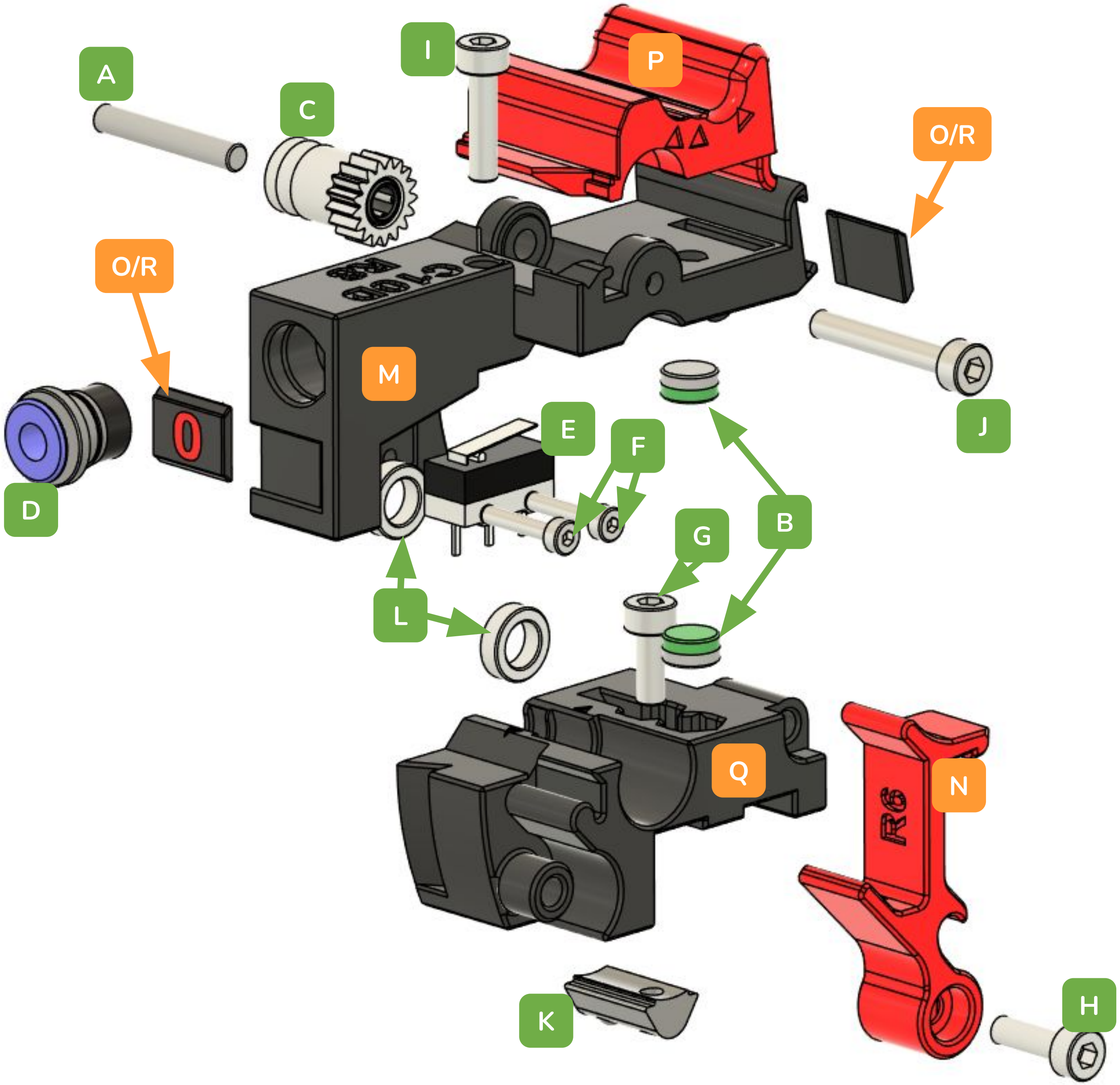
FILAMENT BLOCKS

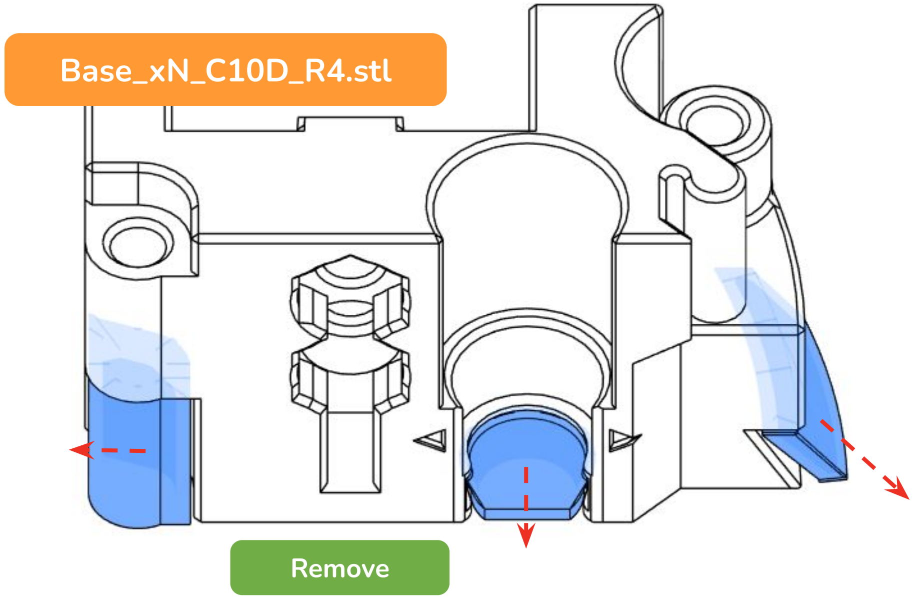
FILAMENT BLOCK SUB-BOM
(PER FILAMENT BLOCK)

A	1x 3mm x 20mm pin
B	2x 6x3mm Magnets
C	1x BMG Idler Gear & Bearings
D	1x ECAS Coupler (2 piece)
E	1x D2F-L Microswitch
F	2x M2x10mm SHCS
G	1x M3x8mm SHCS
H	1x M3x10mm SHCS
I	1x M3x12mm SHCS
J	1x M3x20mm SHCS
K	1x M3 Roll-In T-Nut
L	2x MR85ZZ Bearing

M	1x [a]_Filament_Path_xN.stl
N	1x [a]_Latch_xN.stl
O	2x [a]_Tag_plates_N_x2.stl
P	1x [a]_Tophat_xN.stl
Q	1x Base_xN.stl
R	2x Tag_plates_DigitN_x2.stl

EXPLODED VIEW



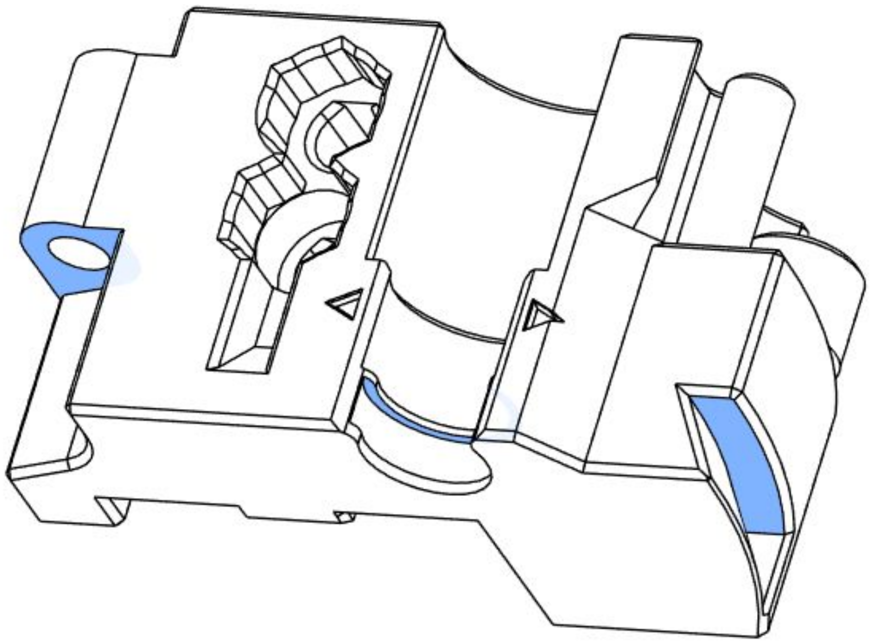


3.1 PRINT IN PLACE SUPPORTS

Before you begin you will need to remove all of the print-in-place supports from the Bases. They may look like either of the above.

Using a small screwdriver or a set of needle nose pliers may help to remove the supports. Take care not to hurt yourself while prying! Make sure that the supported surfaces are free of any stuck-on micro-supports.

Repeat this for all of the Bases.



LATCH

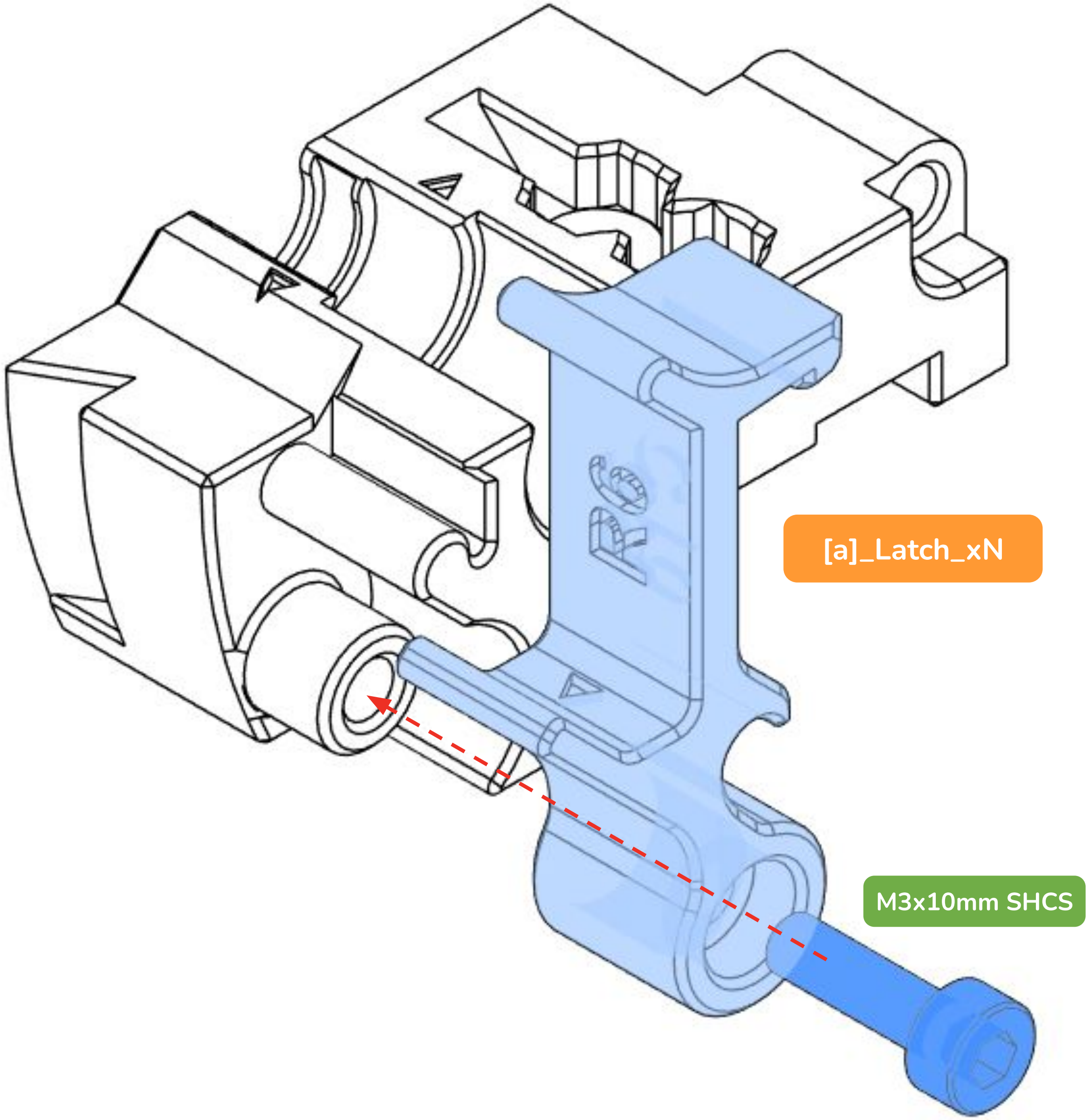
3.2 LATCH SCREW

Resist the urge to close the Latch before installing the screw. You might break the pivot off.

Drive the M3x10mm screw through the Latch into the Base. The screw taps directly into the plastic, so don't overtighten or it will strip! The screw should be loose enough that the Latch can pivot easily.

Once the screw is in, you can close the Latch with a satisfying click.

Repeat for all of the Bases.



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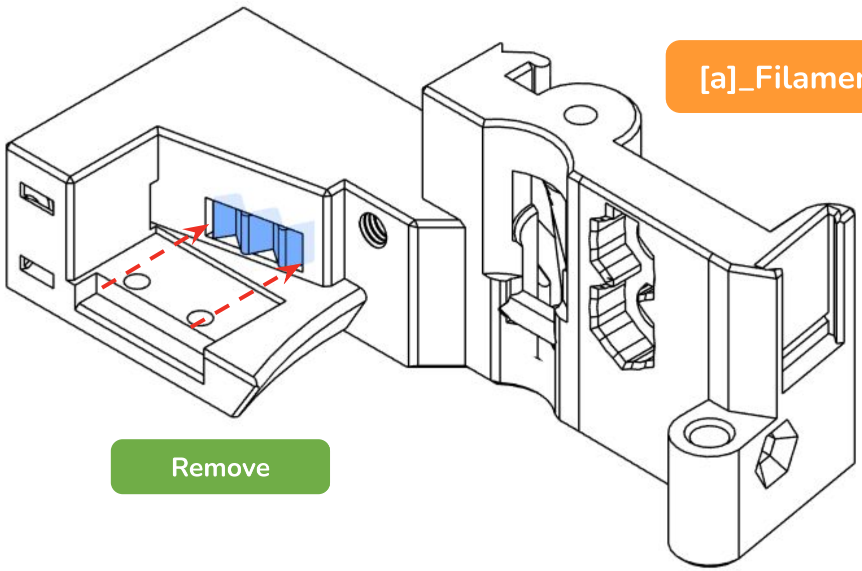
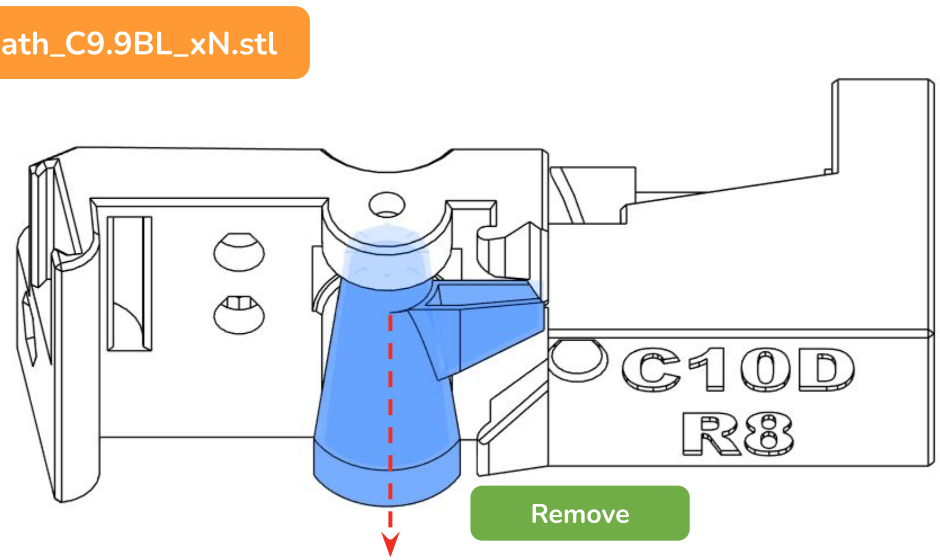
PREPARATION





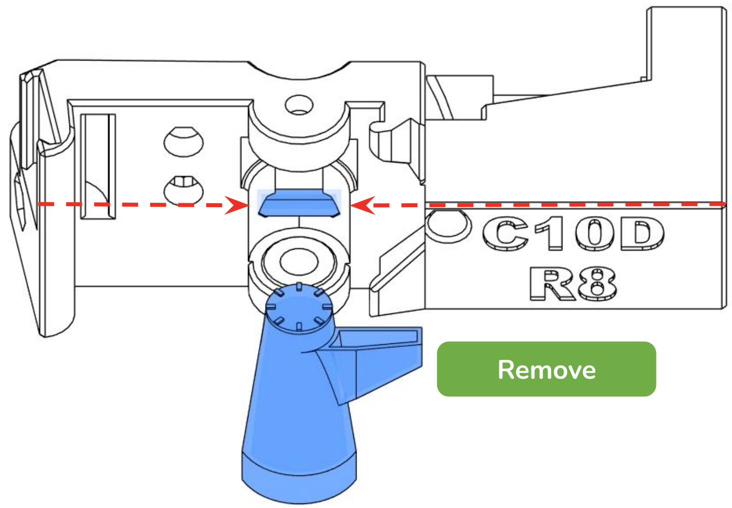
3.3 PRINT IN PLACE SUPPORTS

Before you begin you will need to remove all of the print-in-place supports from the Filament_Paths.

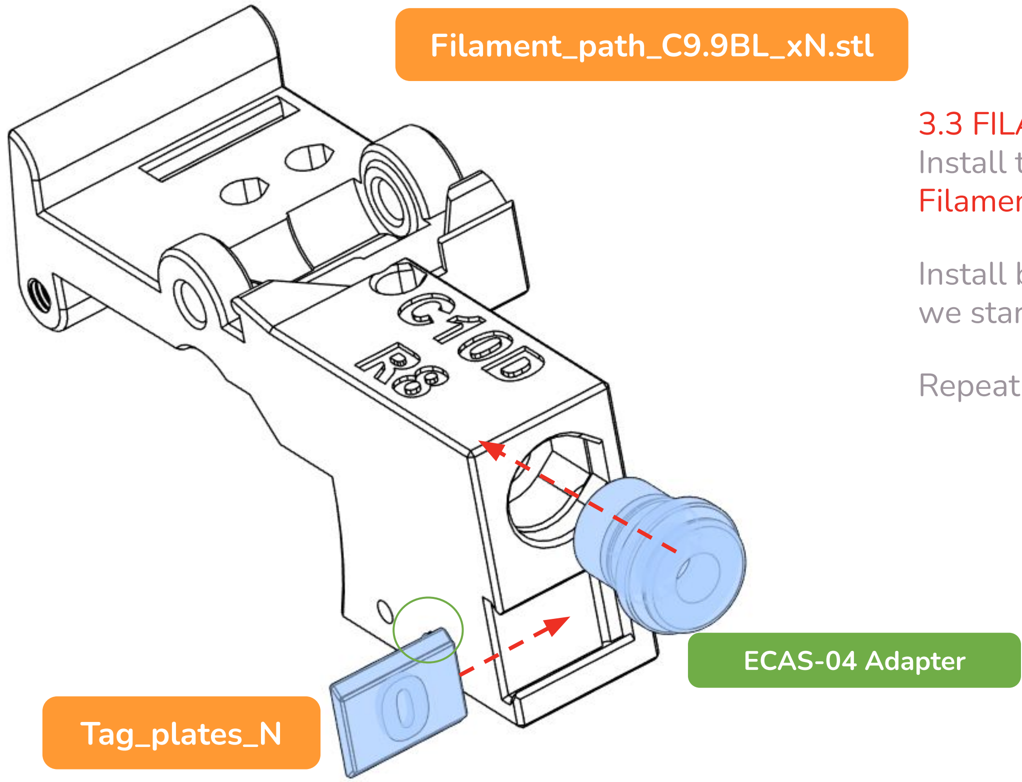
Using a small screwdriver or pliers may help. Please take care that you don’t accidentally damage the part (or yourself!). Check the roofs of each support feature for bad bridging or stuck support pieces.

For the filament path bridge, sticking a 2mm hex key into the filament path is a quick way to both ream the filament path, and remove the support.

Repeat this for all of the Filament_Paths.



ECAS AND TAG PLATES

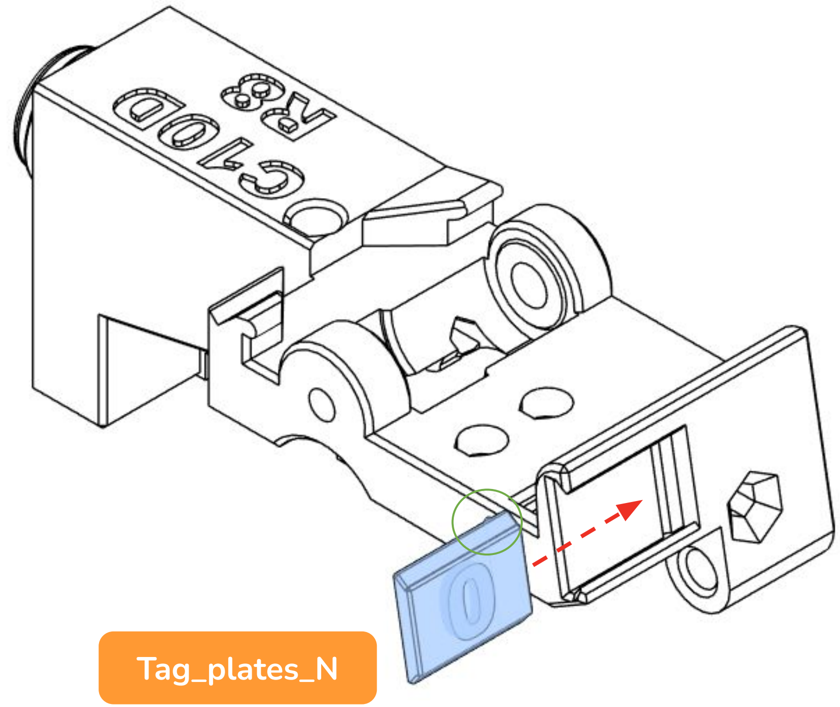


3.3 FILAMENT_PATH PREP

Install the ECAS fitting so that the collar is nearly flush with the Filament_Path. It is normal for there to be a very small gap.

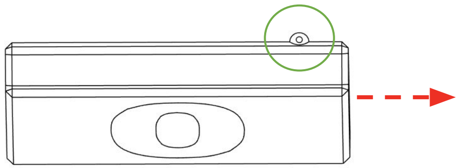
Install both the front and back Tag number plates. Remember, we start counting from 0 in this system!

Repeat for all of the Filament_Paths.



TAG PLATES

The side of the Tag_plates_N with the bump goes first for both tags.



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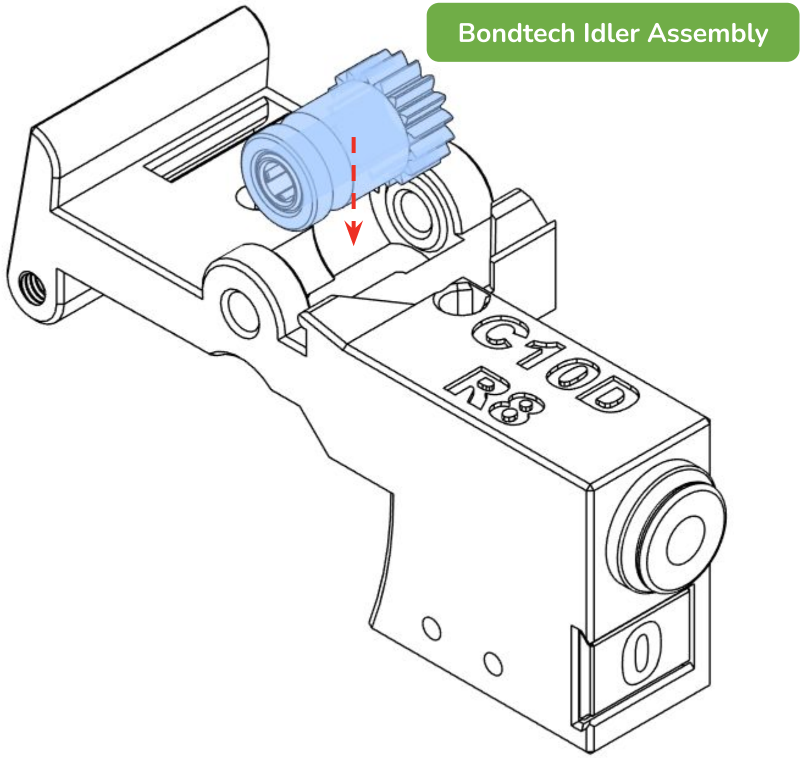
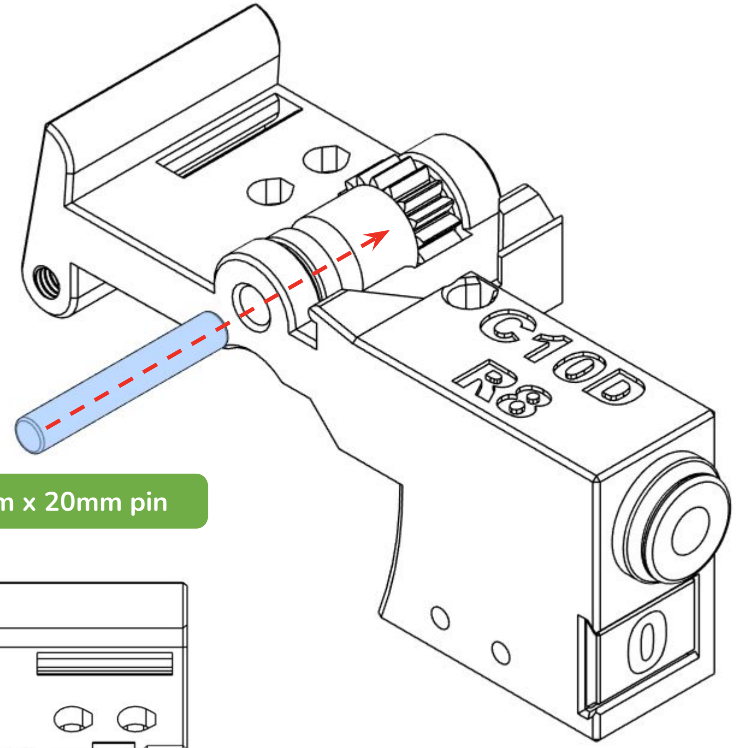
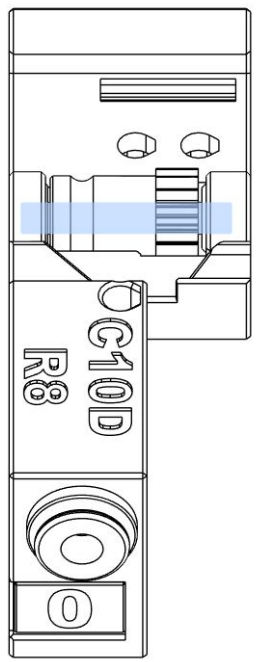
FILAMENT BLOCKS



BMG IDLER





3.3 INSTALL BONDTECH IDLER GEAR

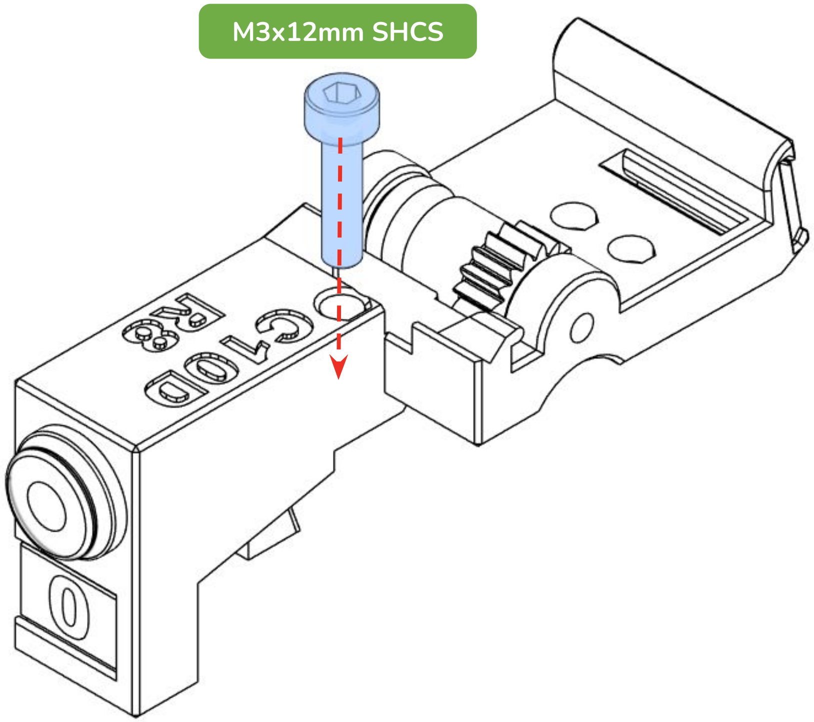
Insert the BMG Idler. Lightly grease the bearings with EP1/EP2 or Superlube before inserting the pin.

The pin should over-insert by about 1mm.

Once assembled, make sure the Bondtech Idler spins freely.

Repeat for all Filament_Paths.

FILAMENT BLOCKS



ANTISQUISH SCREW

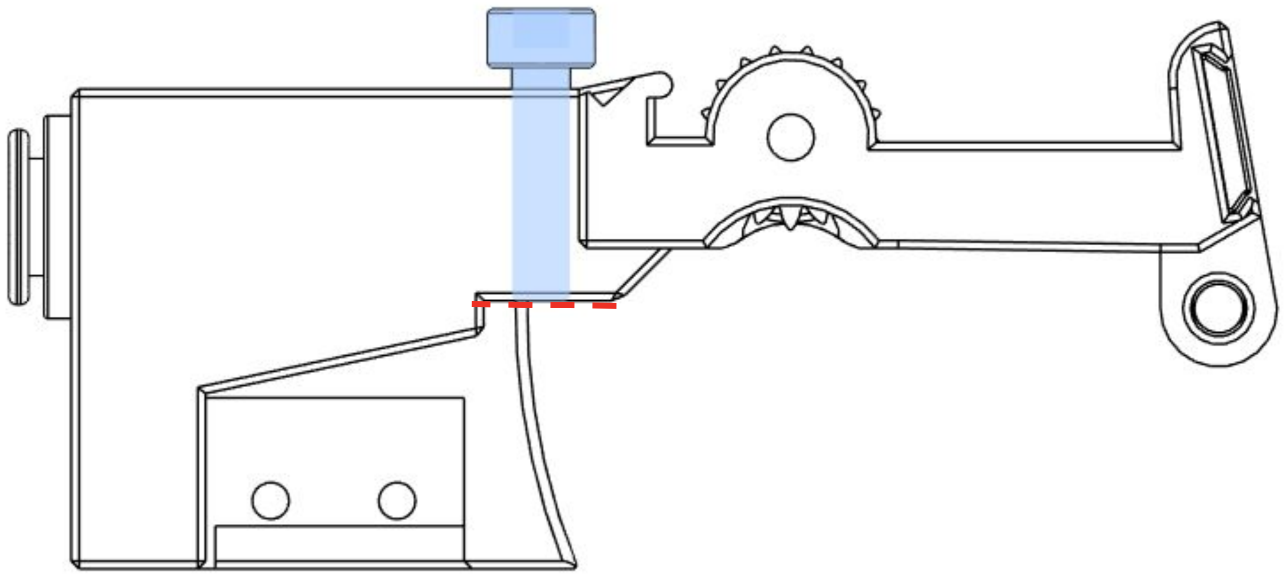
3.3 ANTISQUISH SCREW

This screw keeps softer filaments from being squished too much, and also prevents over-meshing of the BMG gears.

Drop the M3x12mm screw into the hole on the top of the Filament_Path.

Screw the SHCS into the base until it is flush with the bottom face of the Filament_Path. The height will be set during calibration, after assembly.

Repeat for all Filament_Paths.



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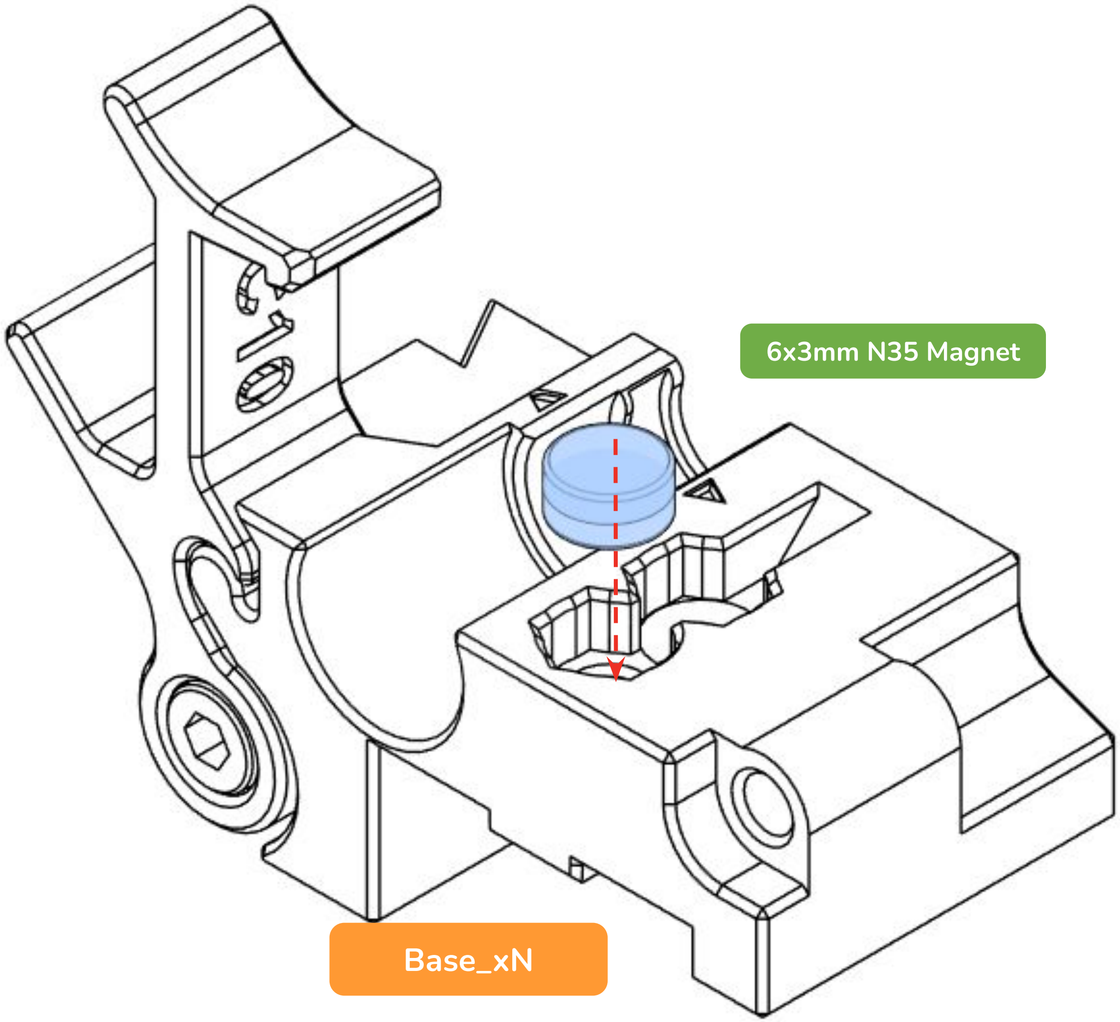
BASE MAGNET

3.1 MAGNET ORIENTATION

Polarity matters. Install the magnets in the outer recess so they repel against the magnets in the Filament_Path, e.g. same poles facing each other on both magnets. In case your magnets are a little loose, add a drop of CA glue to hold them in place.

If you want to use dual magnets, hold off on installing the second magnet into the other recess until you finish attaching all the Bases to the 2020, because we need access to the bolt hole.

Repeat for all of the Bases.



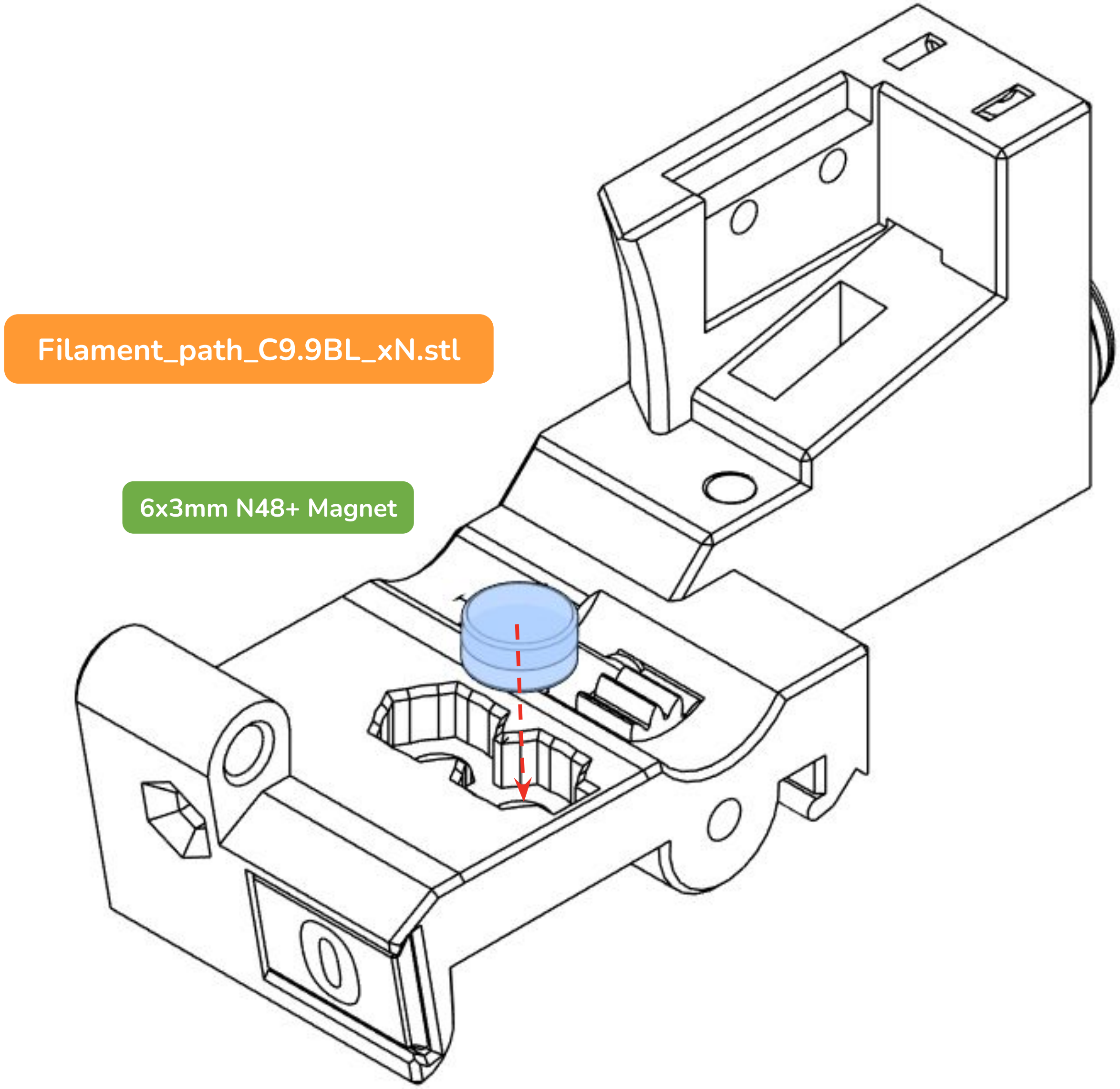
FILAMENT_PATH MAGNET

3.3 MAGNET ORIENTATION

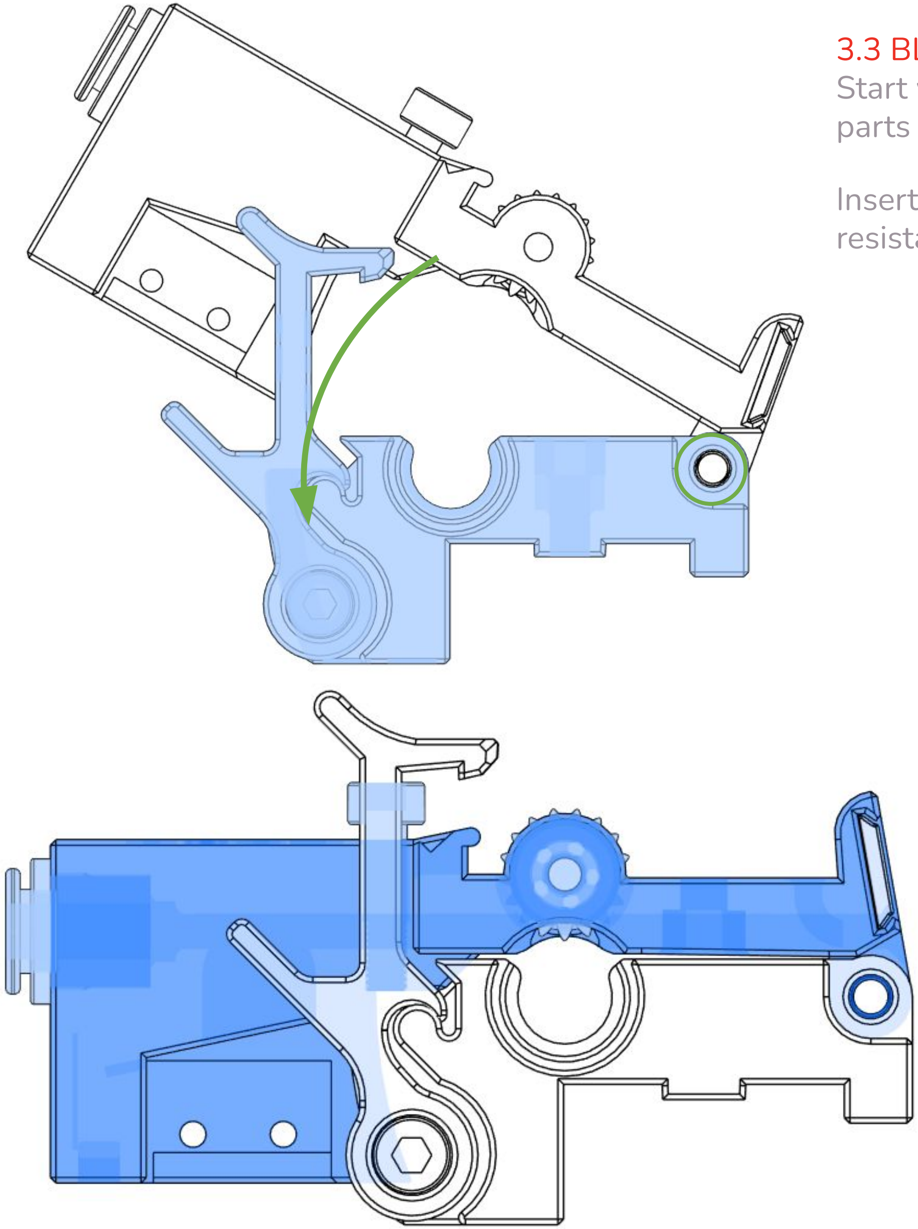
Polarity matters. Install the magnets in the outer recess so they repel against the magnets in the Base, e.g. same poles facing each other on both magnets. If your magnets are a little loose, add a drop of CA glue to hold them in place.

If you want to use dual magnets, you can install the second magnet now.

Repeat for all of the Filament_Paths.



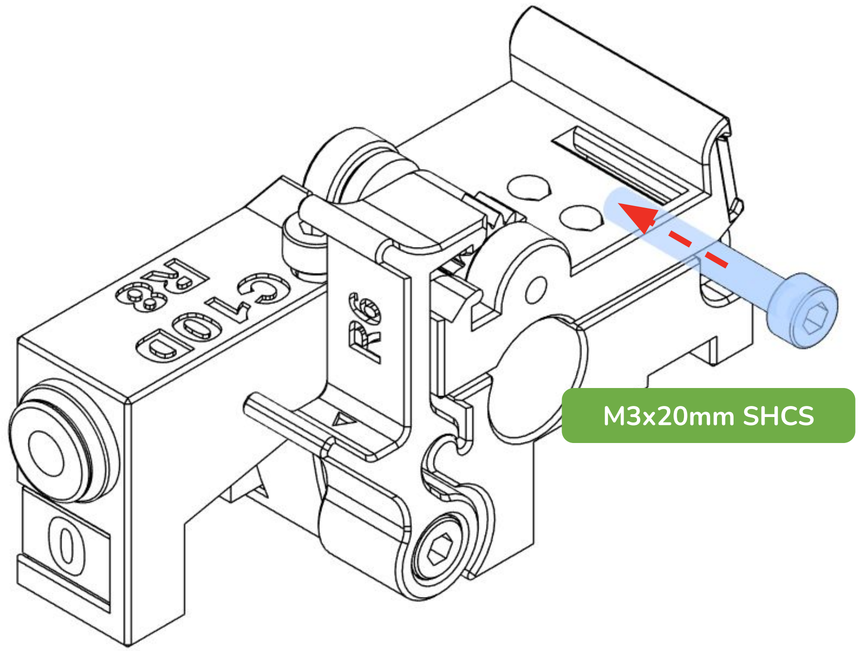
BLOCK ASSEMBLY



3.3 BLOCK ASSEMBLY

Start with the Filament_Path and Base aligned at the hinge. Close the parts together with the hinge so that they fit together.

Insert an M3x20mm screw into the hinge as far as it will go without resistance.

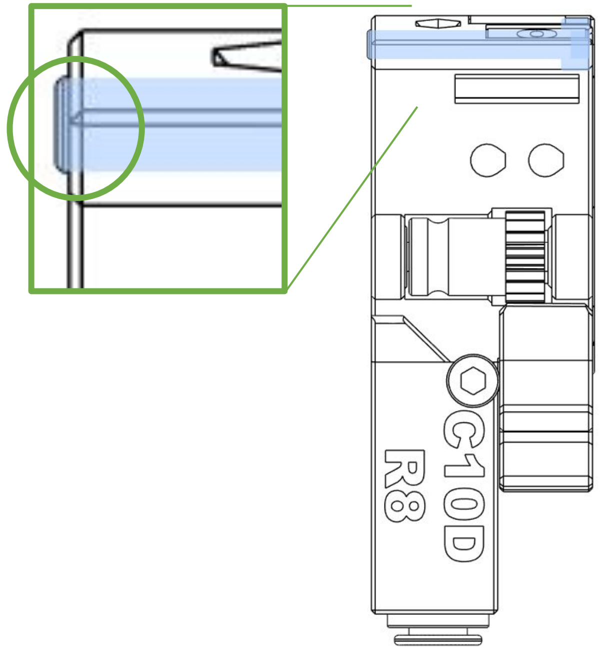


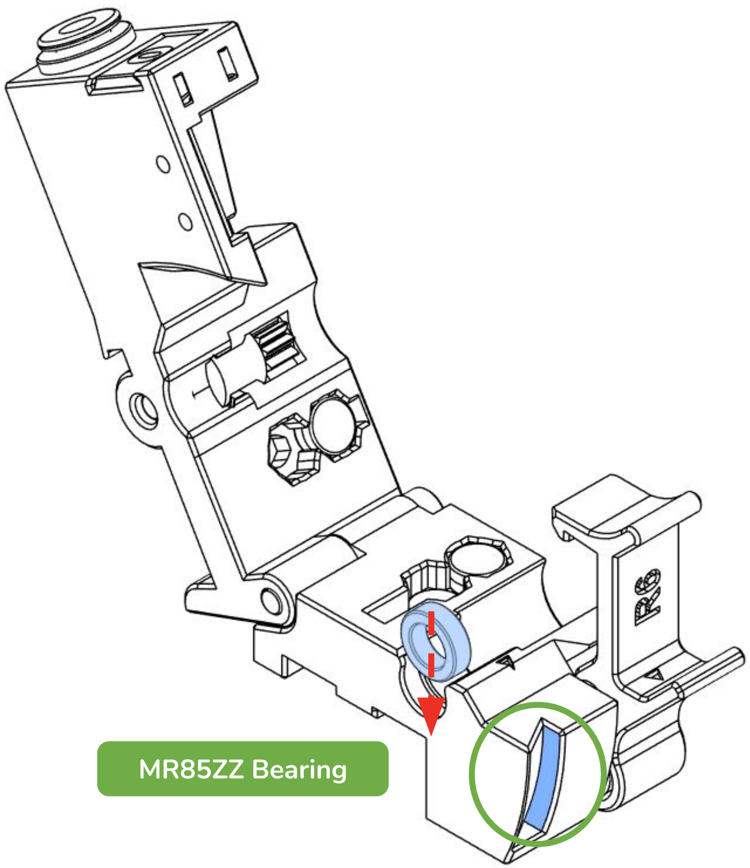
3.3 BLOCK ASSEMBLY

Screw the M3x20 bolt all the way flush. Then give it an extra ¾ of a turn, so that it is clamping the parts together and protruding from the side.

Work the hinge back and forth until it is smooth.

Unscrew the M3x20 bolt until it is flush again.





Use a screwdriver inserted through the MR85ZZ bearing to help install the MR85ZZ bearing into its slot, by pushing straight down.

The magnets should repel each other strongly enough that the Filament_Path springs open about 10 degrees before hitting the Latch. If the hinge isn't loose enough, unscrew the hinge bolt by two turns and then screw it back in so that the head is flush to the Base.

If the interlocking fin is rubbing or creating too much friction, try lightly sanding or filing the supported surface of the Base to smooth it.

The block should immediately spring open after being pushed shut. If it still sticks shut after following the directions here, you may need to reprint the parts, potentially with a lower extrusion multiplier.

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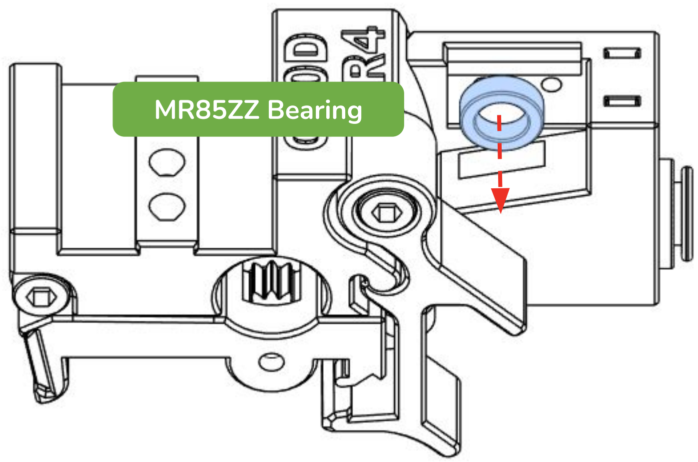
FILAMENT BLOCKS



SENSOR INSTALL

3.3 SENSOR INSTALLATION

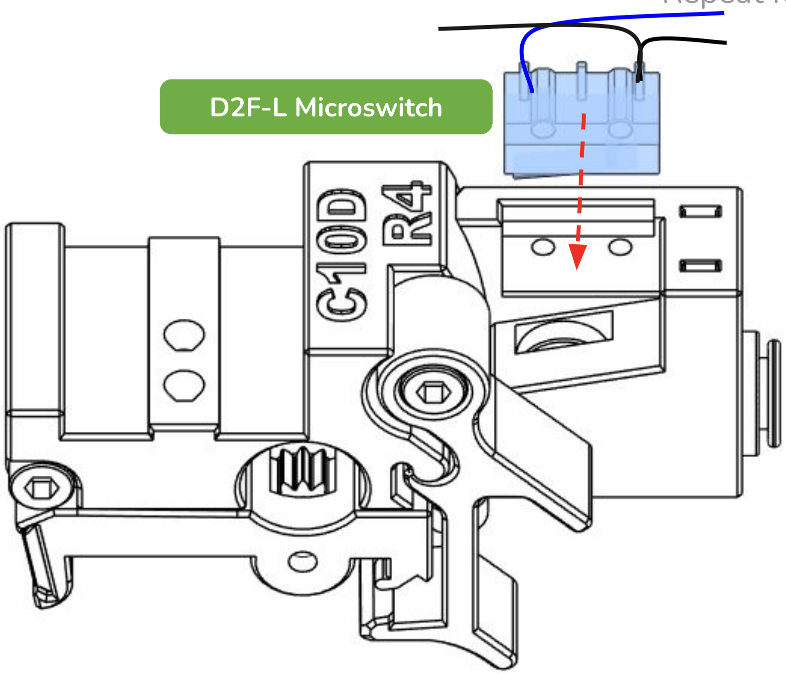
Drop an MR85ZZ bearing into the slot in the Filament_Path. If you are using the printed replacement lever (because your switches don't have them), install it now.

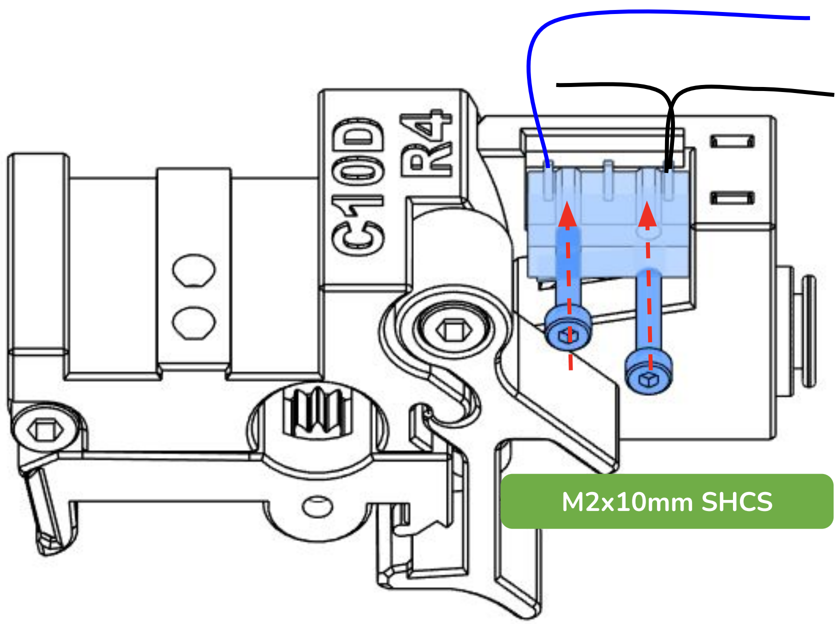
If you are using non-Omron microswitches, you may need to bend or trim the end of the lever arm to prevent it from catching on the Base during operation.

If you are using switches with directly soldered wires, you should wait to install them until the blocks are installed on the 2020 so that the wires aren't strained.

Align a D2F-L microswitch and install it into place using two M2x10mm screws tapped into the plastic. They only need to be tight enough to keep the microswitch in place.

Repeat for all of the Filament_Paths.

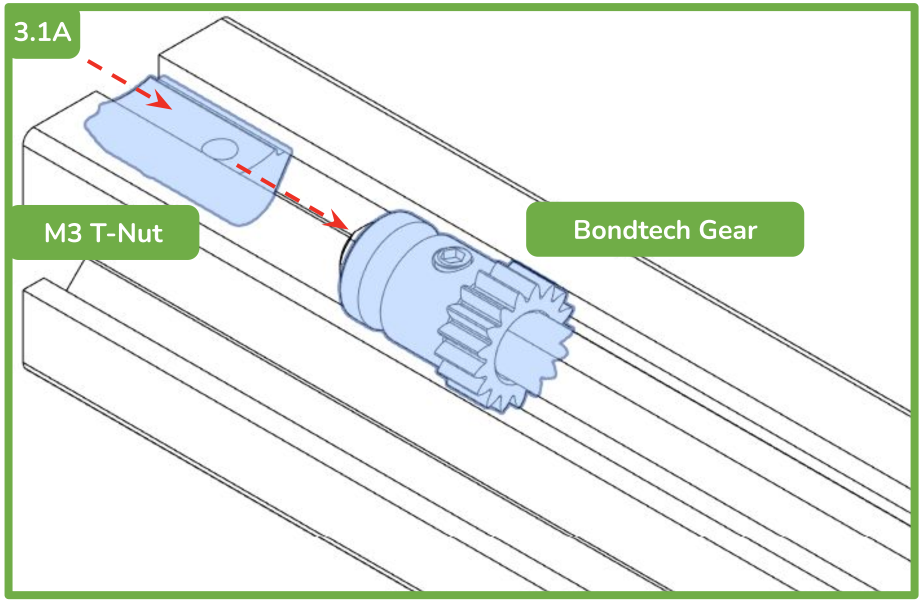




WIRING LENGTHS

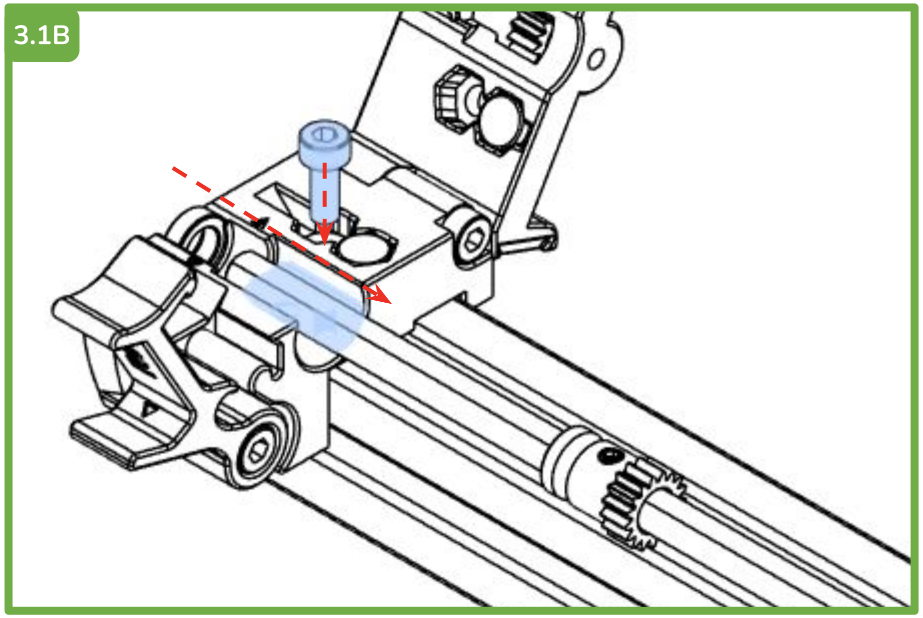
The list of pages with wiring lengths is on Page 27.

FILAMENT BLOCK ARRAY ASSEMBLY (METHOD 1)



3.1A PREPARATION

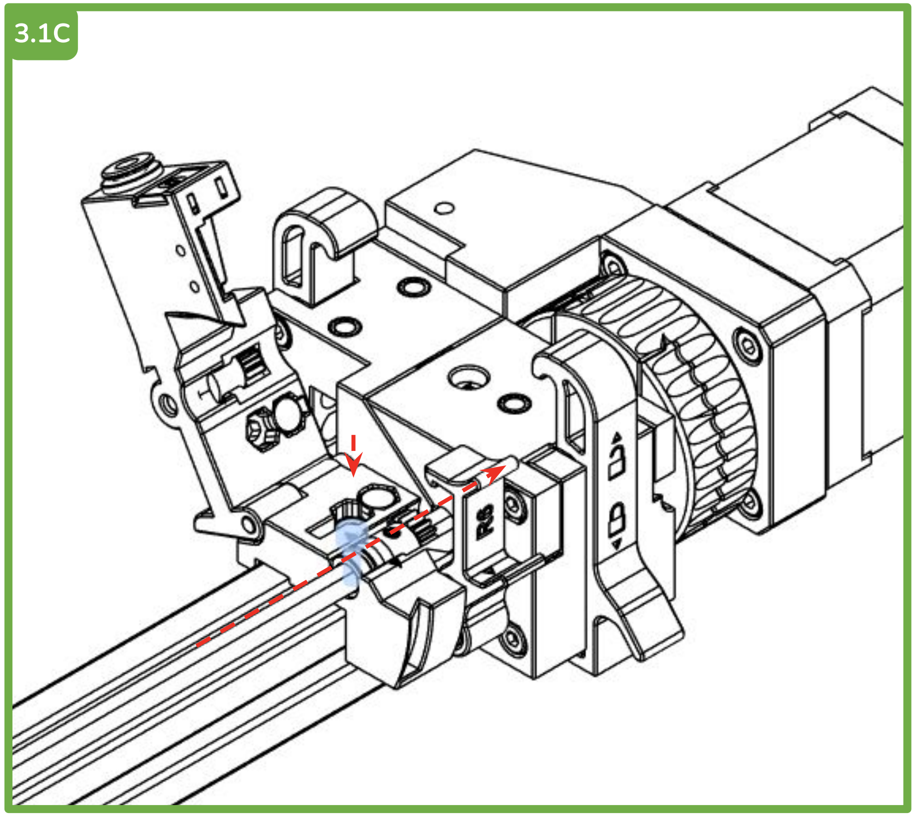
Slide a Bondtech gear onto the D-Cut shaft. Be aware of it's orientation, gear side first. Then slide a roll-in T Nut into the top channel of the 2020 extrusion, with the M3 mounting hole toward the Gearbox.

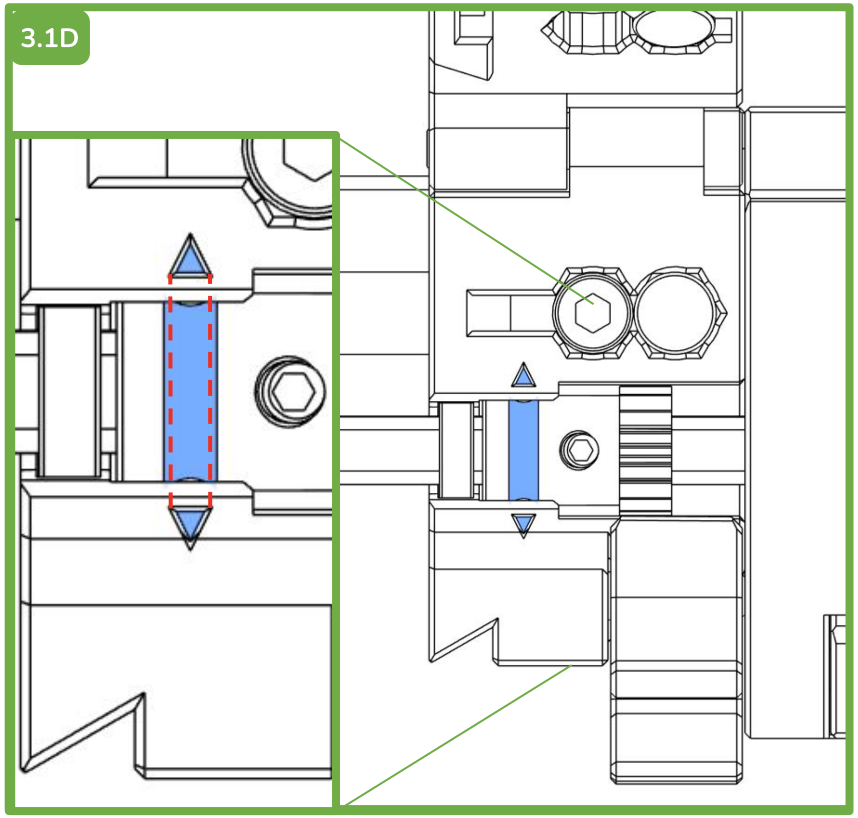


3.1B BLOCK INSTALLATION

Slide the assemble Block onto the 2020. Line the Drive Shaft up with the MR85ZZ bearing first, then align the roll-in nut with the mounting hole, and secure the block using an M3x8mm SHCS.

FILAMENT BLOCK ARRAY ASSEMBLY (METHOD 1)





3.1C BASE MOUNTING

Push the Bondtech gear and Base to the Gearbox. The Drive Shaft should be able to spin freely.
Push the block snugly against the Gearbox and tighten the M3x8mm mounting screw to secure it.

3.1D BMG GEAR POSITIONING

Carefully align the BMG gear with the markings on the Base. This is the only alignment step, so take care.

Use thread locker and snug the set screws on the BMG gear to secure them.

Repeat these 4 steps 3.1A-D for all of the Filament Blocks.

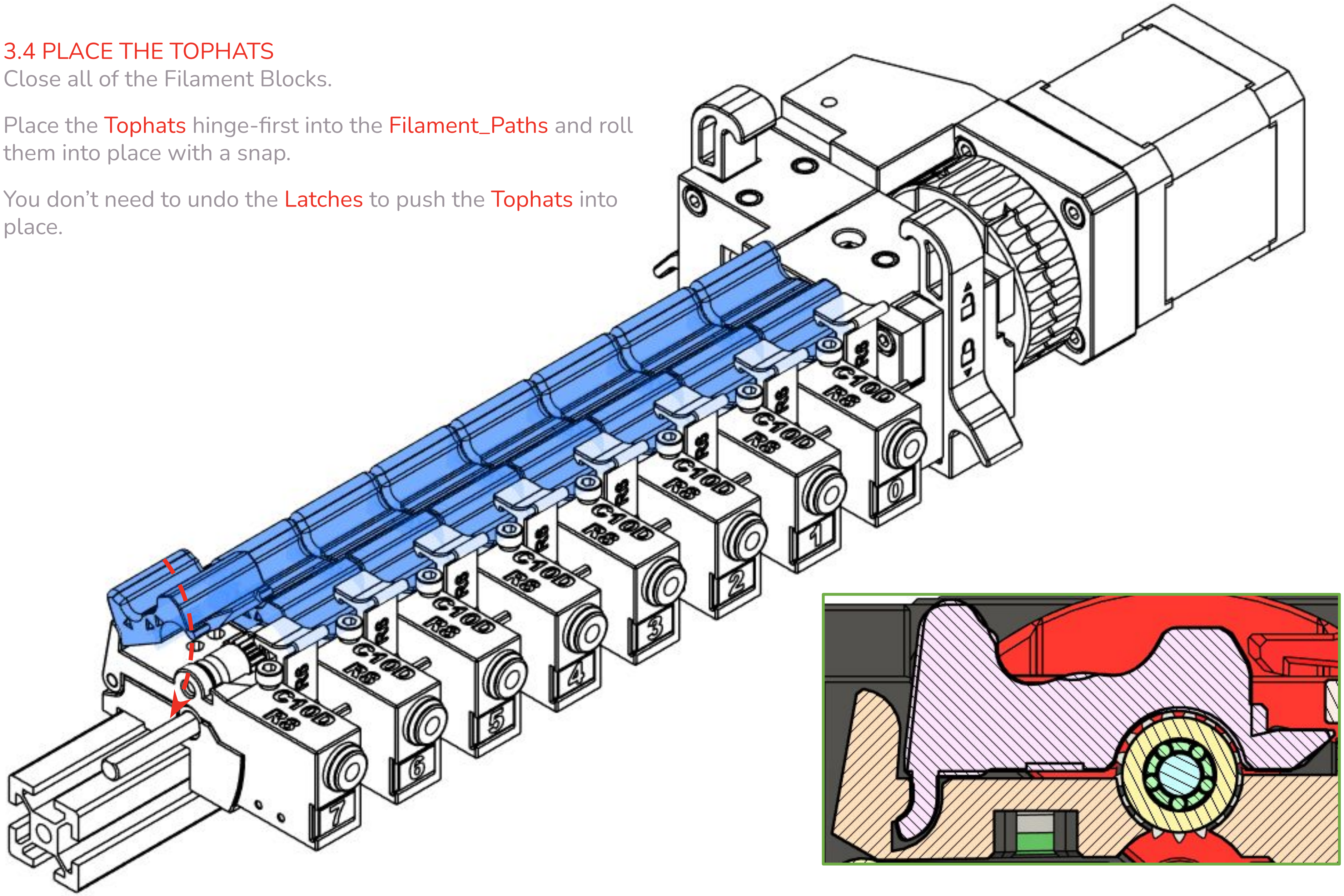
PLACE TOPHATS

3.4 PLACE THE TOPHATS

Close all of the Filament Blocks.

Place the Tophats hinge-first into the Filament_Paths and roll them into place with a snap.

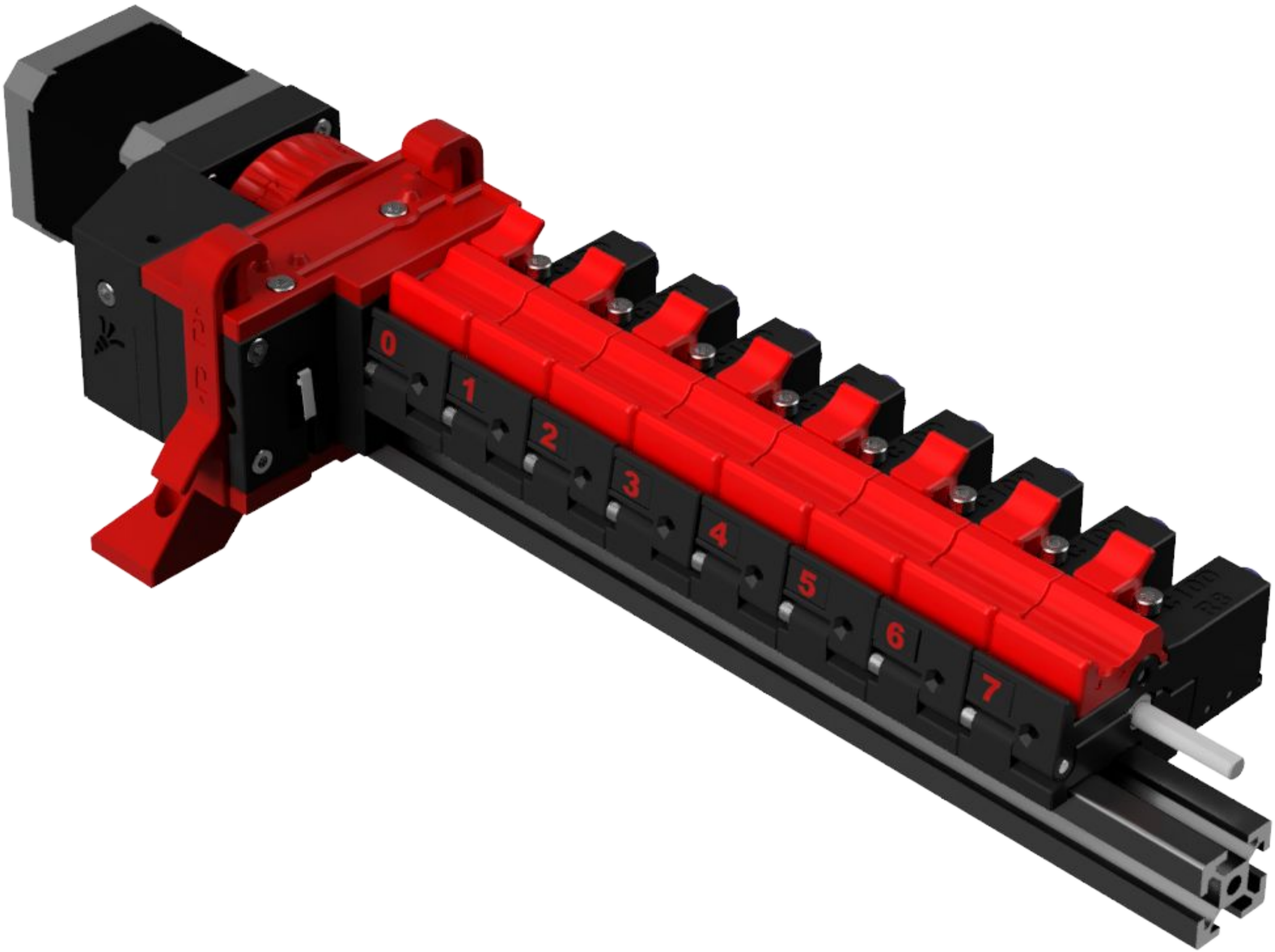
You don't need to undo the Latches to push the Tophats into place.



Surface finish can be improved by using multi-material techniques. Some materials are better suited for creating smooth, detailed surfaces, while others provide strength or flexibility. By mixing materials, the final product can have both an excellent surface finish and desirable mechanical properties.

One example of this is a part made out of glass-fiber reinforced ABS, with a cosmetic outer shell of red ABS.

OVERVIEW



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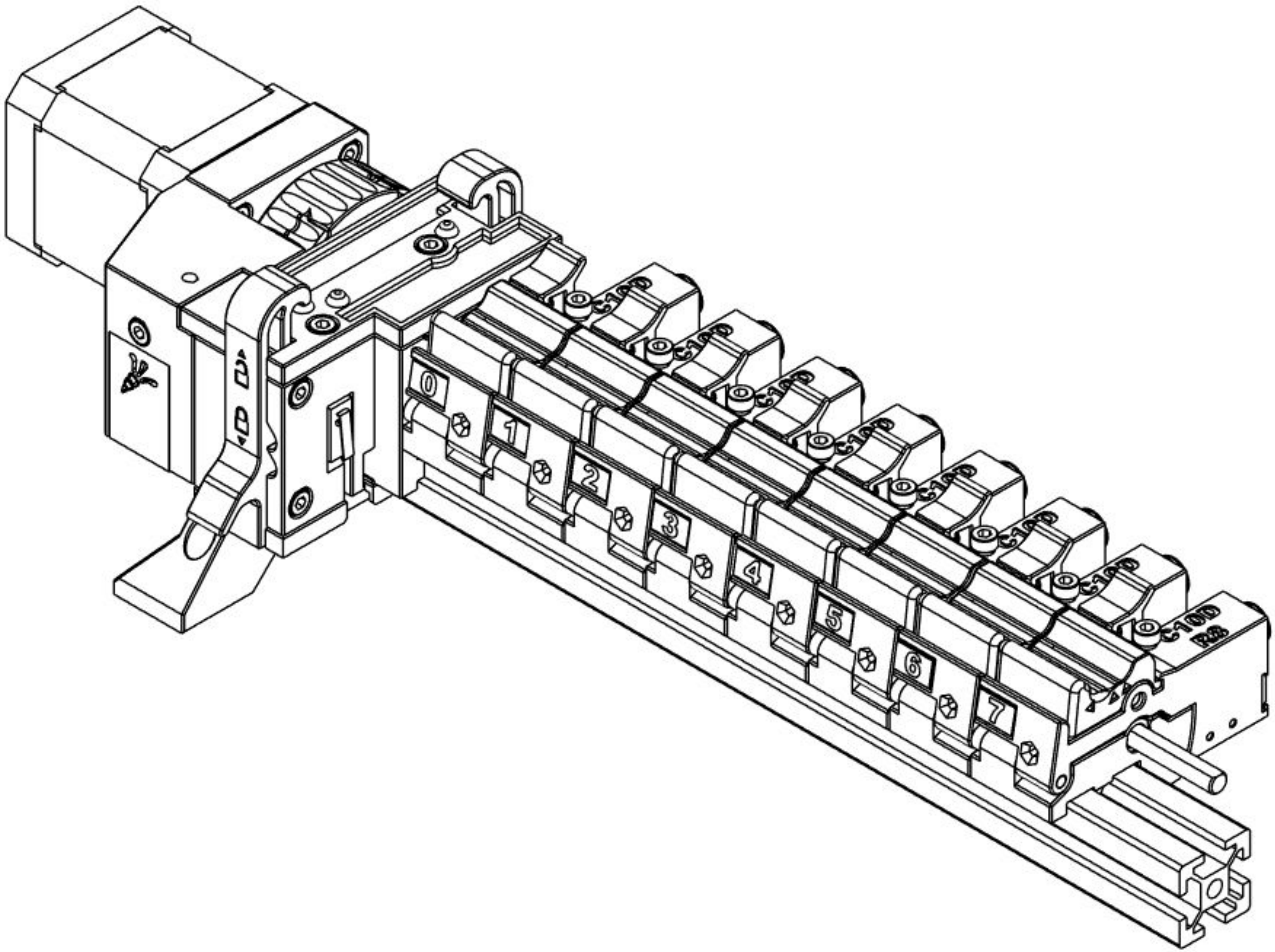
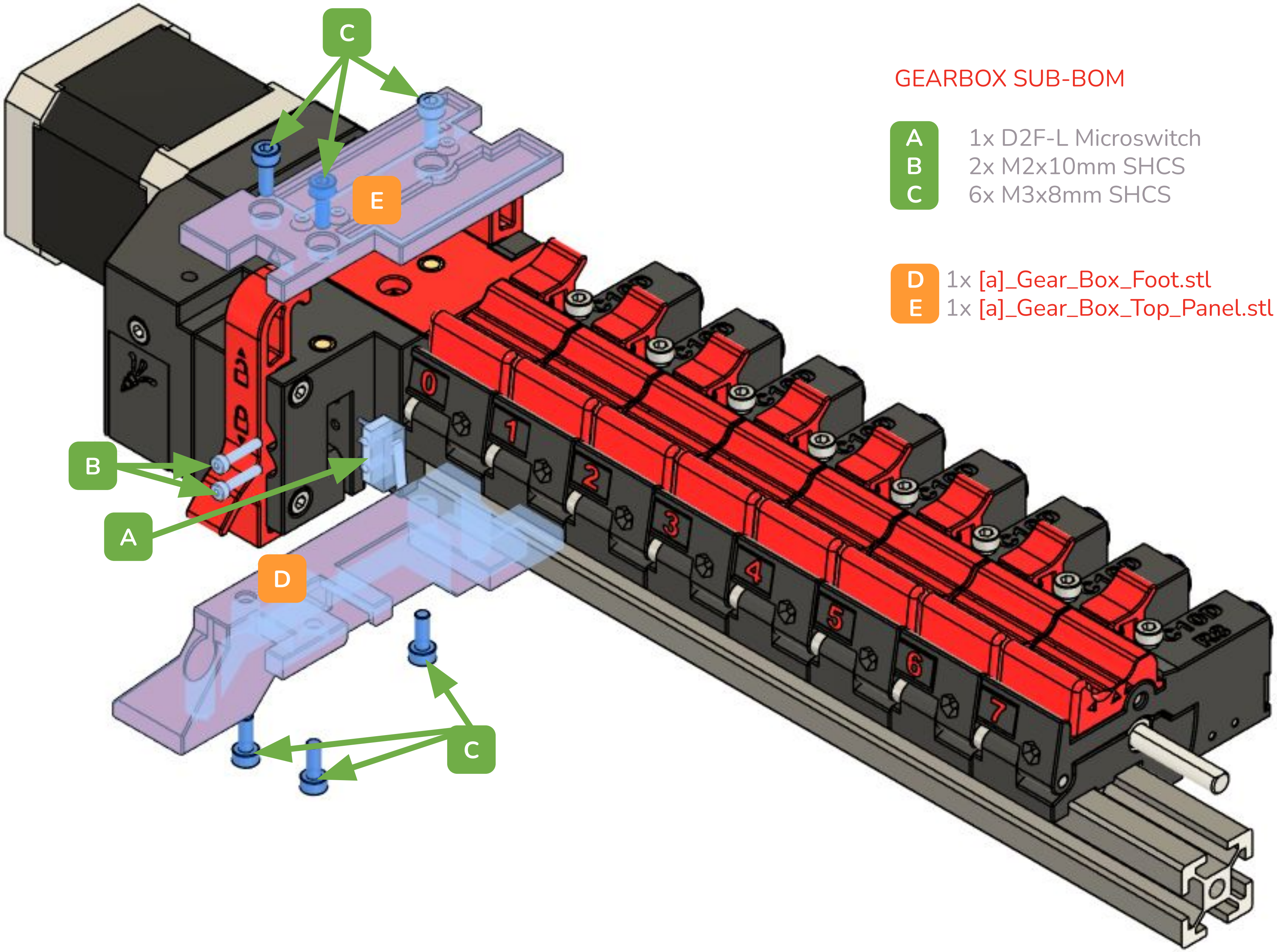
OVERVIEW



GEARBOX PART 2

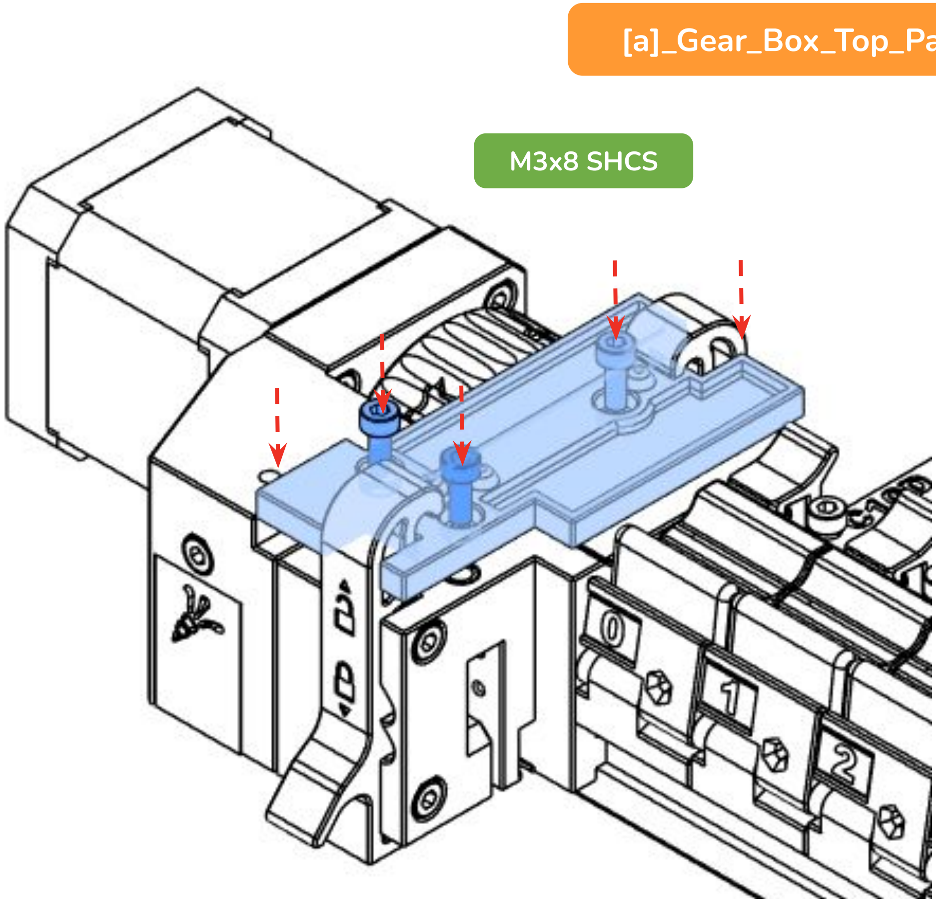
EXPLODED VIEW



GEARBOX SUB-BOM

A	1x D2F-L Microswitch
B	2x M2x10mm SHCS
C	6x M3x8mm SHCS
D	1x [a]_Gear_Box_Foot.stl
E	1x [a]_Gear_Box_Top_Panel.stl

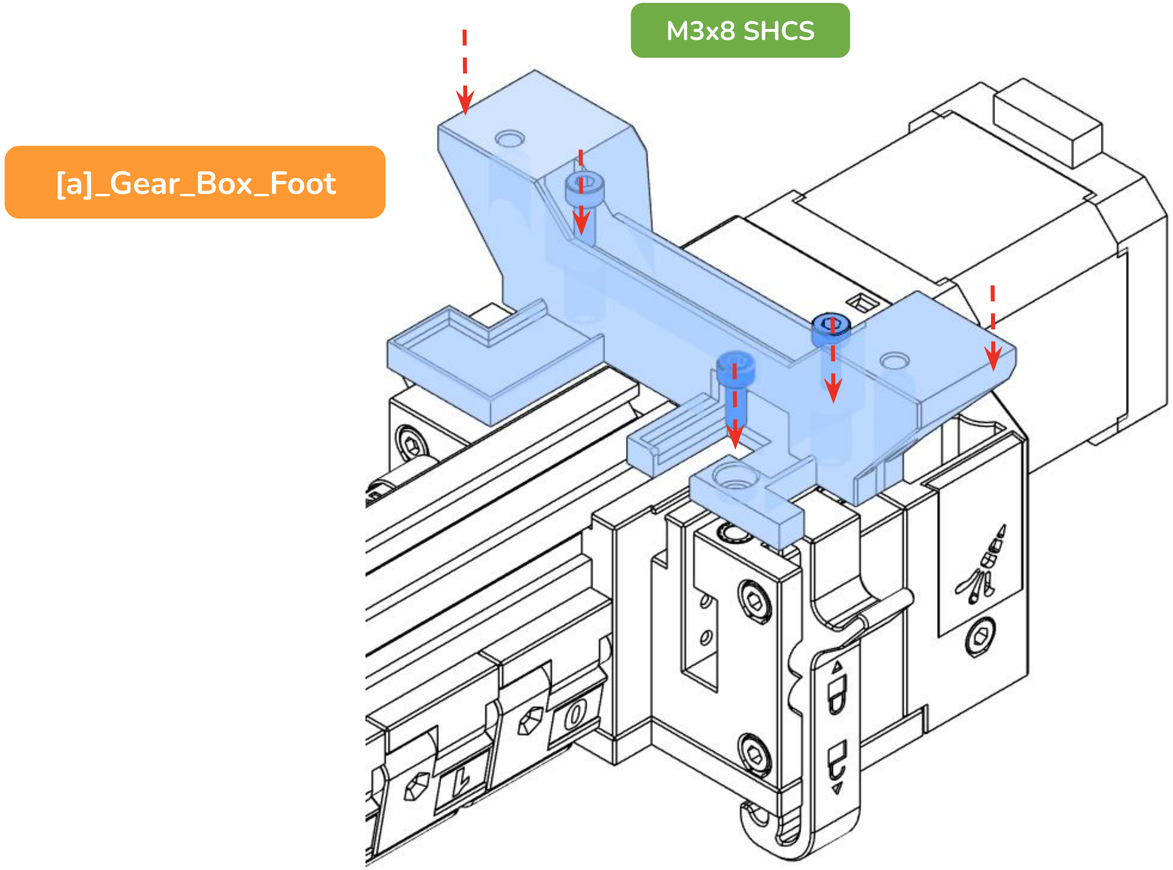
TOP PANEL



4.1 TOP PANEL

Install the Gear_Box_Top_Panel of the Gearbox using 3 M3x8mm screws.

FOOT



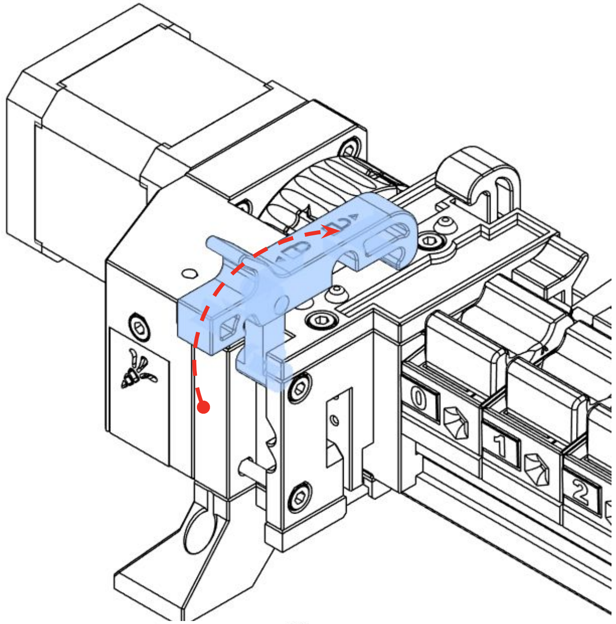
4.2 INSTALL THE FOOT

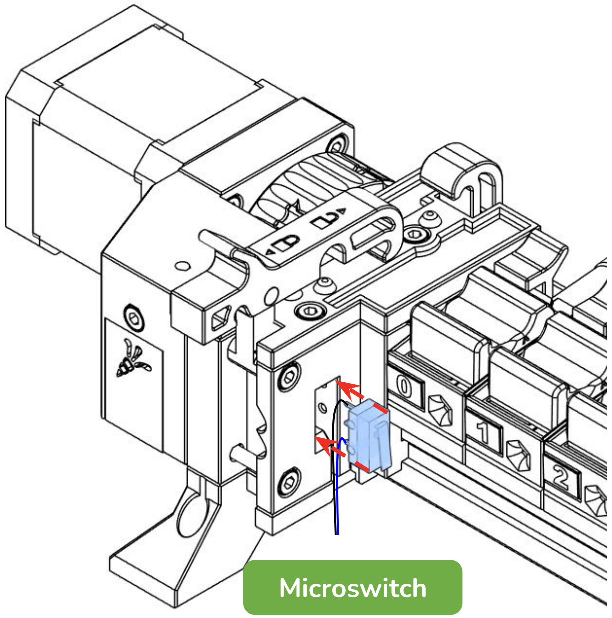
Align the Gear_Box_Foot with the Gearbox.

Use three M3x8mm bolts to secure the Gear_Box_Foot.

Wires are omitted from the diagrams for clarity.

GEARBOX PART 2





1.1 WIRING LENGTHS

The list of pages with wiring lengths is on Page 27.

ENDSTOP SWITCH

4.3 INSTALL THE ENDSTOP SWITCH

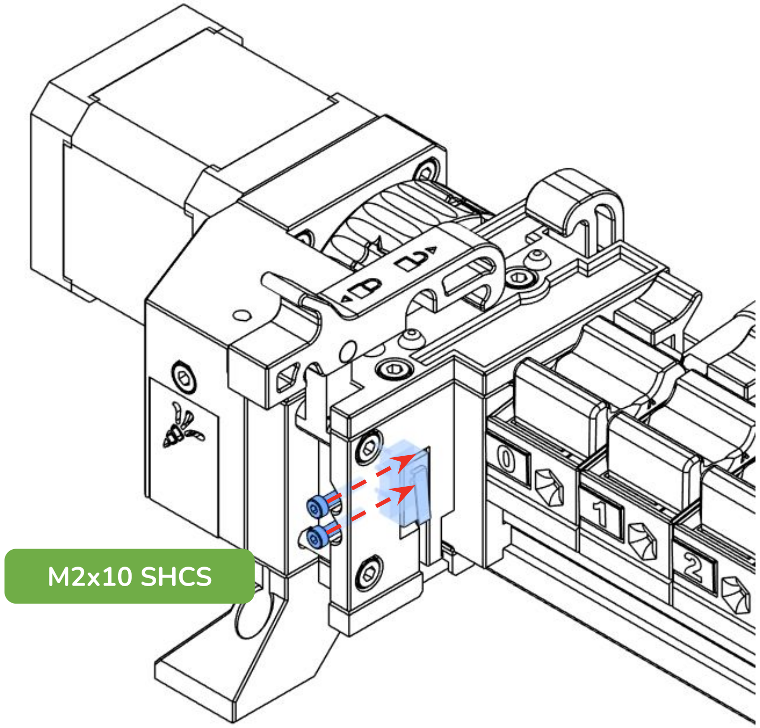
Open the Side_Latch and swing it up and out of the way.

There is a cutout in the Gearbox for the microswitch and its' wires. Line up the microswitch with the cutout as shown.

Push the microswitch into its cutout. Route the wires into the slot. The slot is sized to accept wires up to 16ga.

Insert two M2x10mm bolts and drive them through the microswitch into the Gearbox. They only need to be snug enough to hold the microswitch.

Close the Side_Latch.



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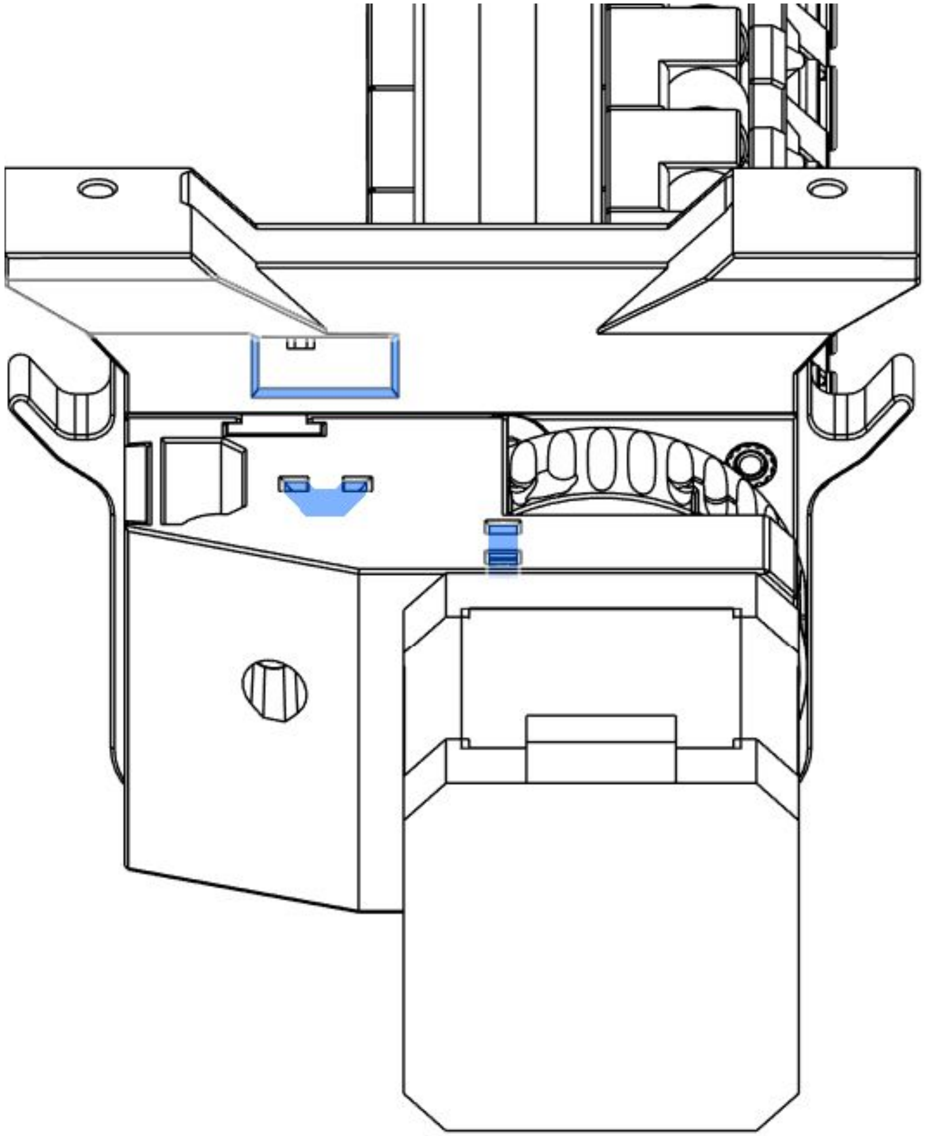
CABLE MANAGEMENT

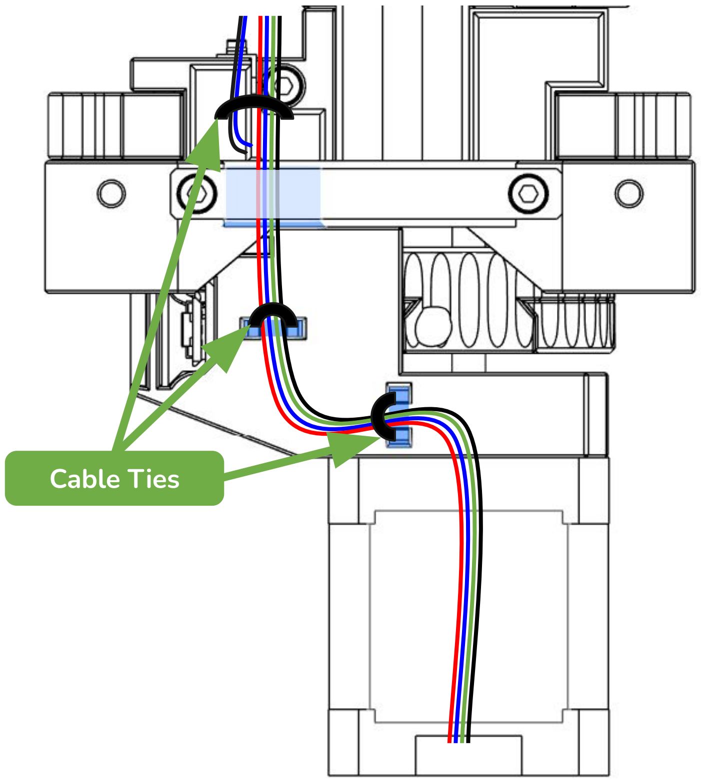


CABLE MANAGEMENT

There is a cutout in the Gear_Box_Foot for the motor wires to fit through. Start by feeding the motor wiring through that cutout.

There are two cable tie slots on the bottom of the Motor_Mount. Use cable ties to secure the motor wiring to both of the slots. Don't skip this step - this is to prevent the motor wiring from getting wrapped onto the Drive Shaft.

Optionally, use a cable tie to bundle together the Endstop wires with the motor wires. This is just for neatness.



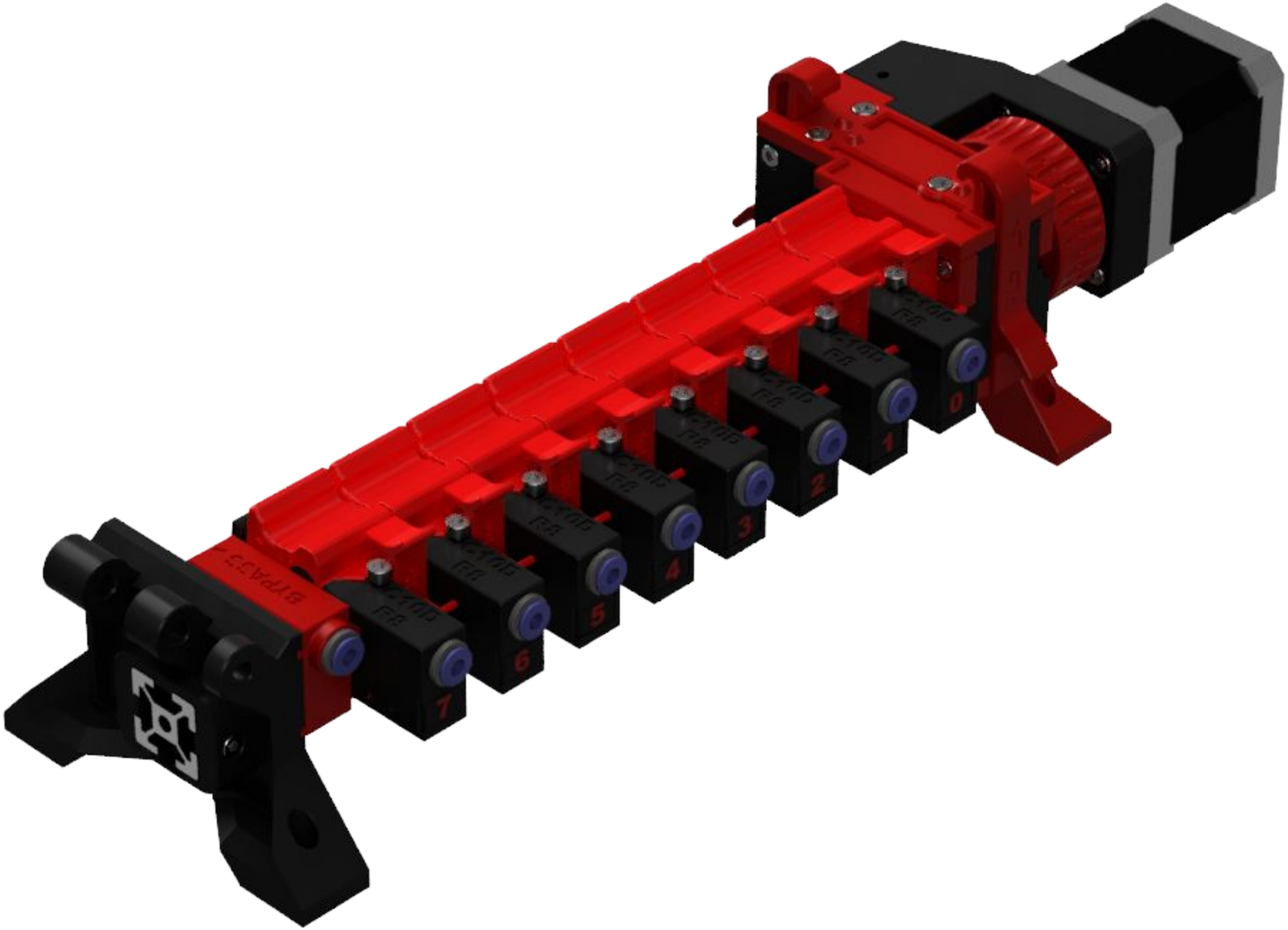
WIRING LENGTHS

The list of pages with wiring lengths is on Page 27.

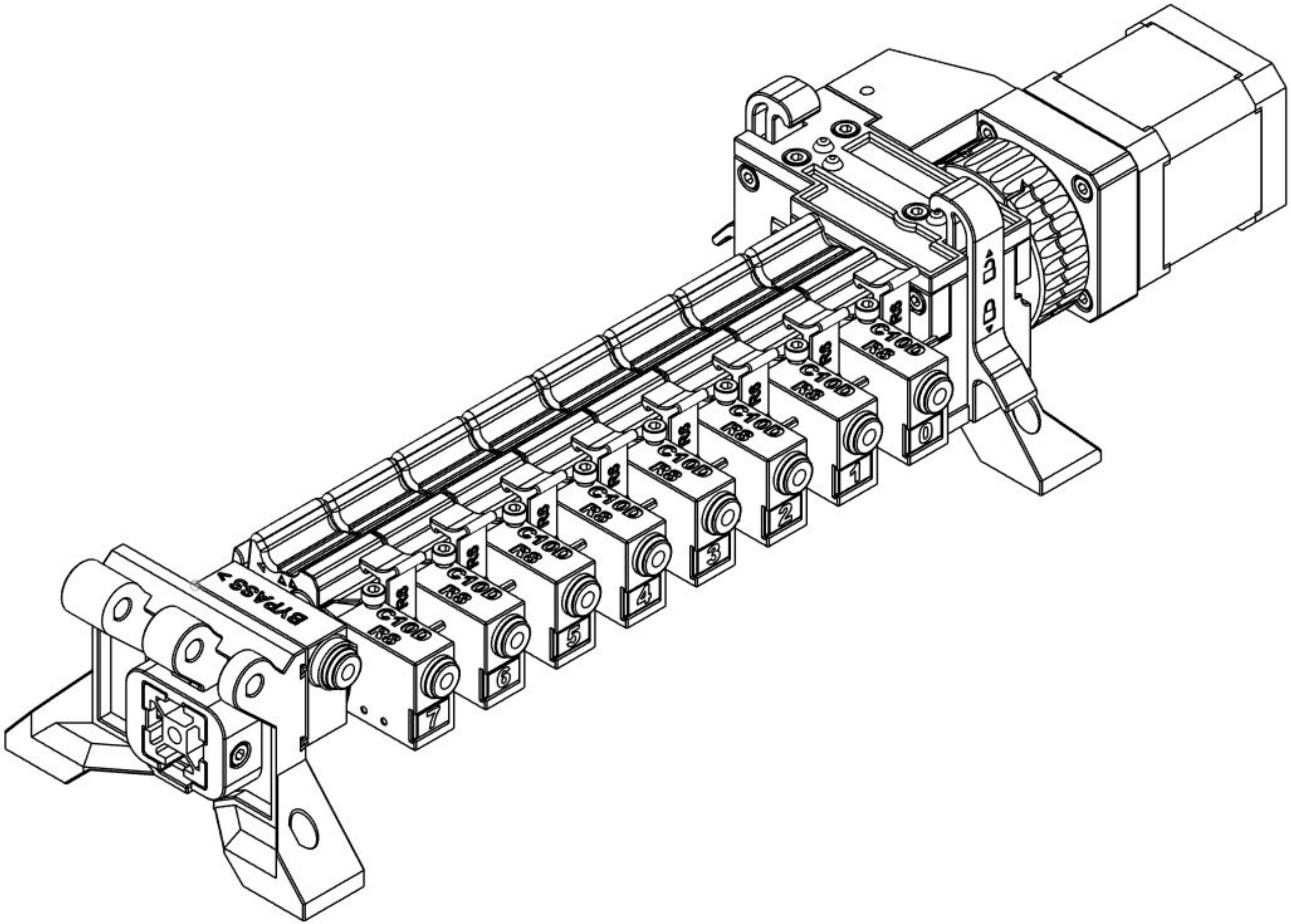
Support structures benefit from multi-material printing. In multi-material setups, one material can be used for the object itself and another for supports, such as water-soluble PVA, which can be dissolved away after printing, leaving cleaner results.

Another option is to use materials that do not bond together as supports, such as PLA supports with PETG objects.

OVERVIEW

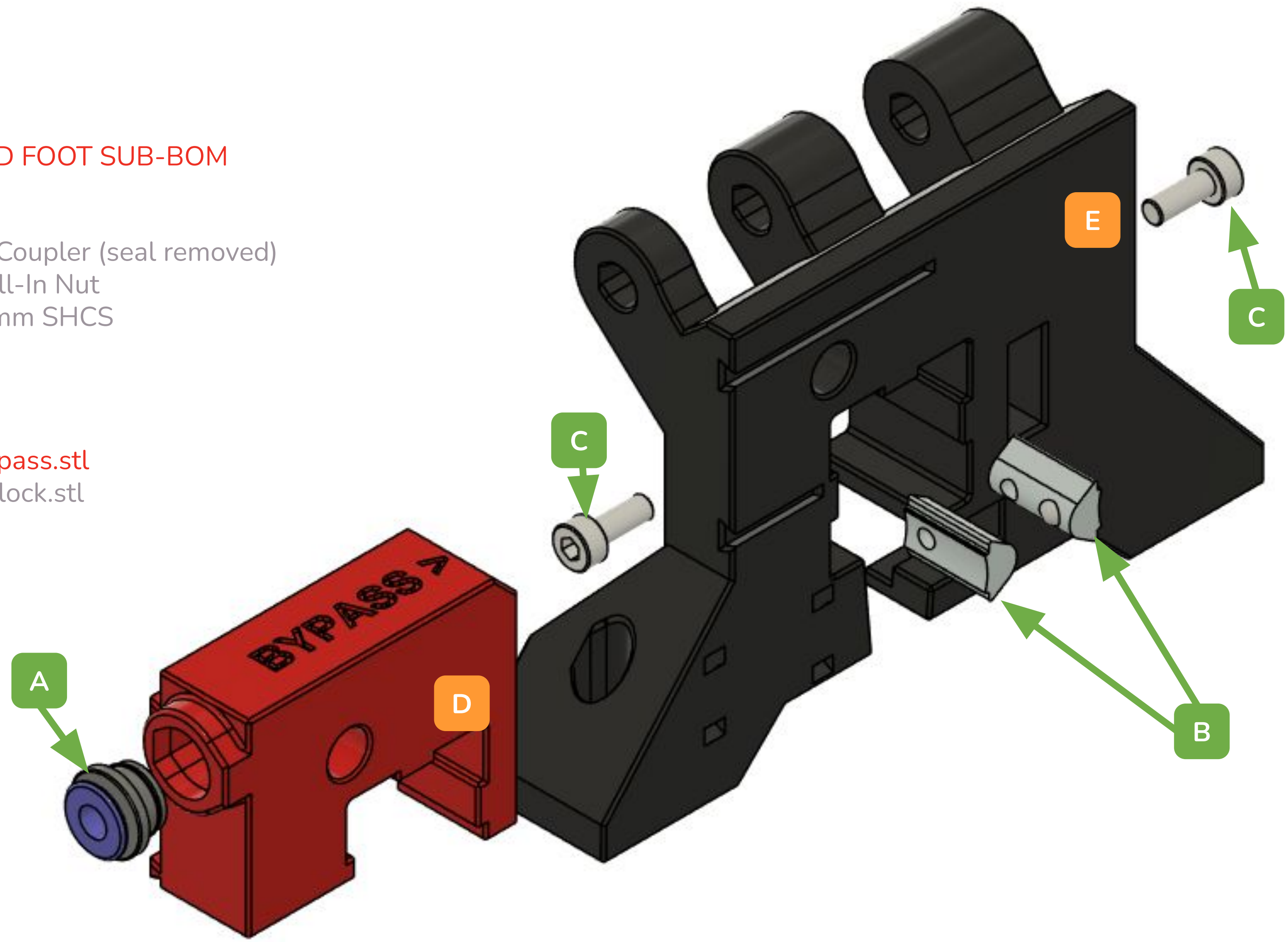


OVERVIEW



END BLOCK

EXPLODED VIEW

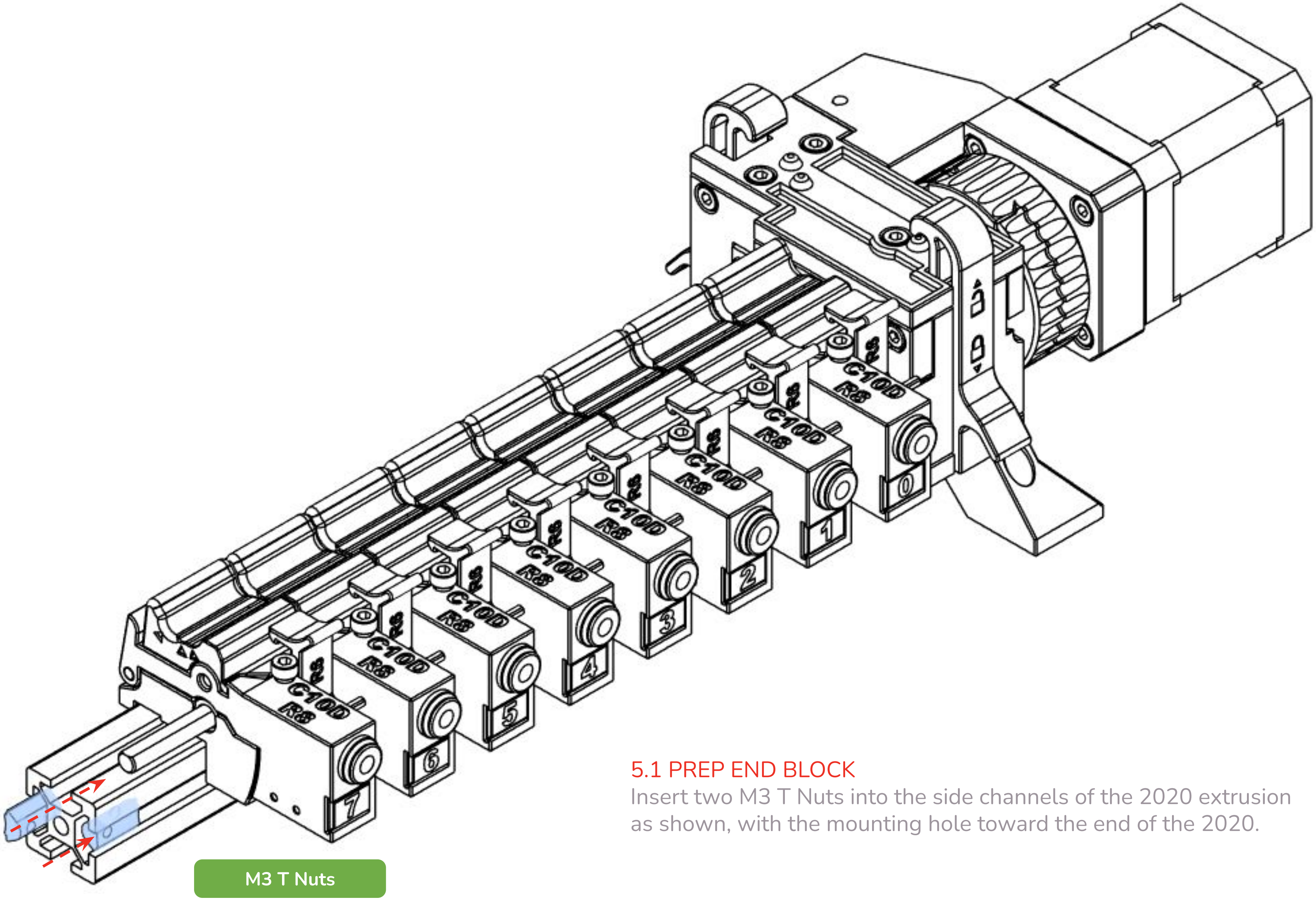


END BLOCK AND FOOT SUB-BOM

A	1x ECAS Coupler (seal removed)
B	2x M3 Roll-In Nut
C	2x M3x8mm SHCS

D	1x [a]_Bypass.stl
E	1x End_Block.stl

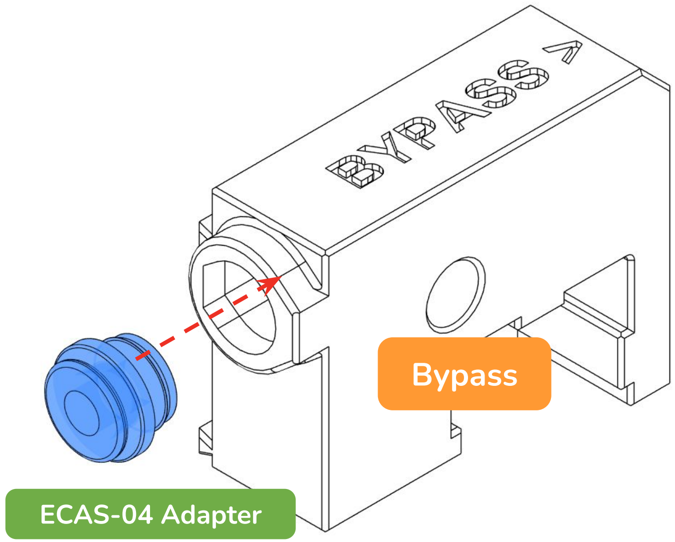
PREP END BLOCK



5.1 PREP END BLOCK

Insert two M3 T Nuts into the side channels of the 2020 extrusion as shown, with the mounting hole toward the end of the 2020.

INSTALL END BLOCK

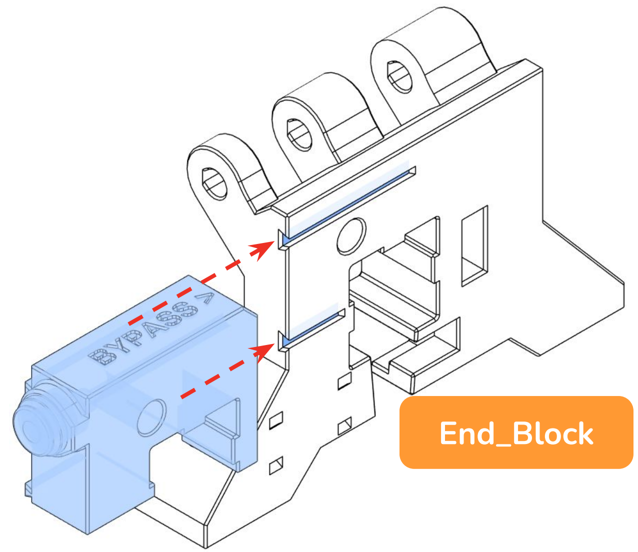


5.2 PREP BYPASS

Remove the rubber seal from the ECAS-04 adapter and then Insert it into the Bypass.

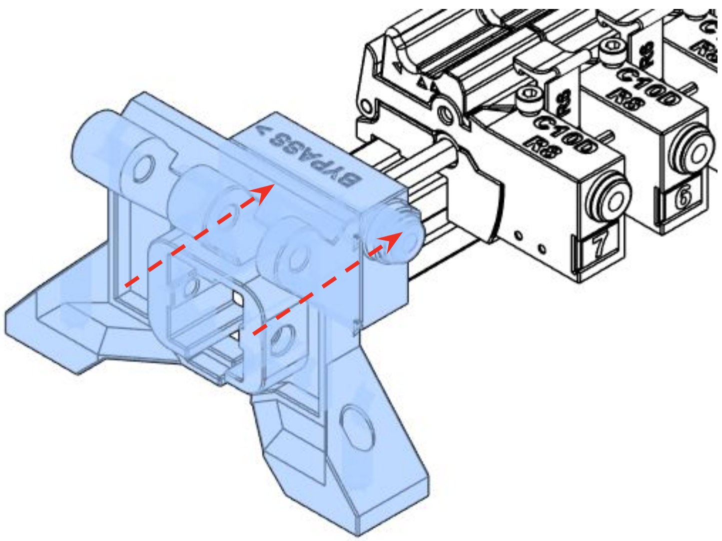
Slide the Bypass dovetails into the End_Block slots.

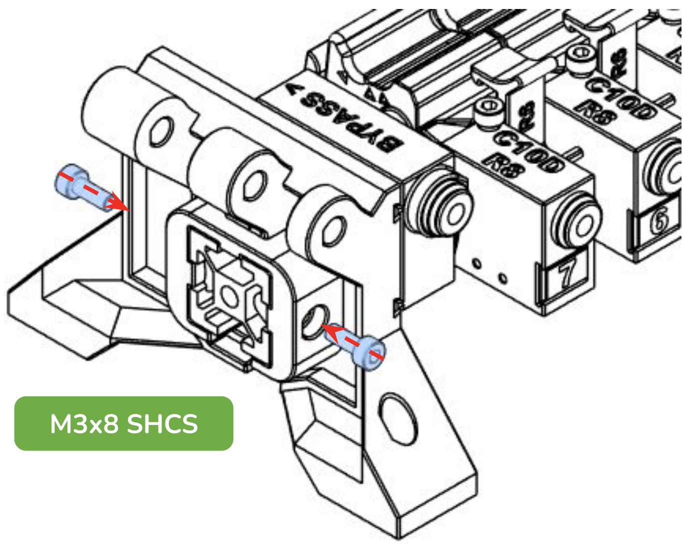
The Bypass dovetails are very sensitive to your printer's tuning, particularly the extrusion multiplier, and the layer cooling time / fan settings. If you are having trouble printing this part, start there.



5.2 INSTALL END BLOCK

Slide the End_Block assembly onto the 2020 and secure with 2 M3x8 SHCS screws.





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Different material properties can improve functionality in a single print. Combining rigid and flexible materials, for instance, allows for integrated hinges, gaskets, or soft-touch surfaces, reducing the need for assembly in complex mechanical parts.

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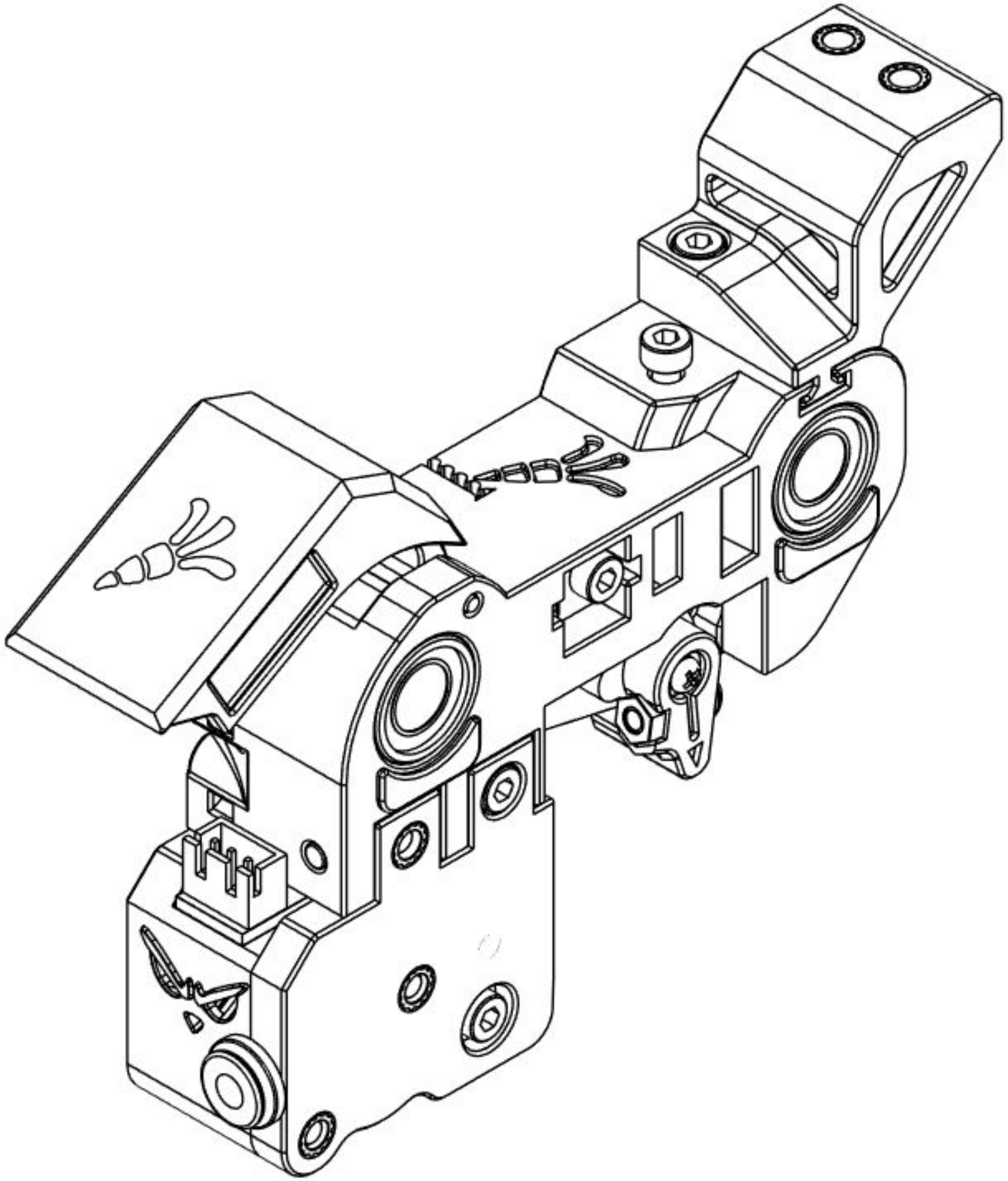
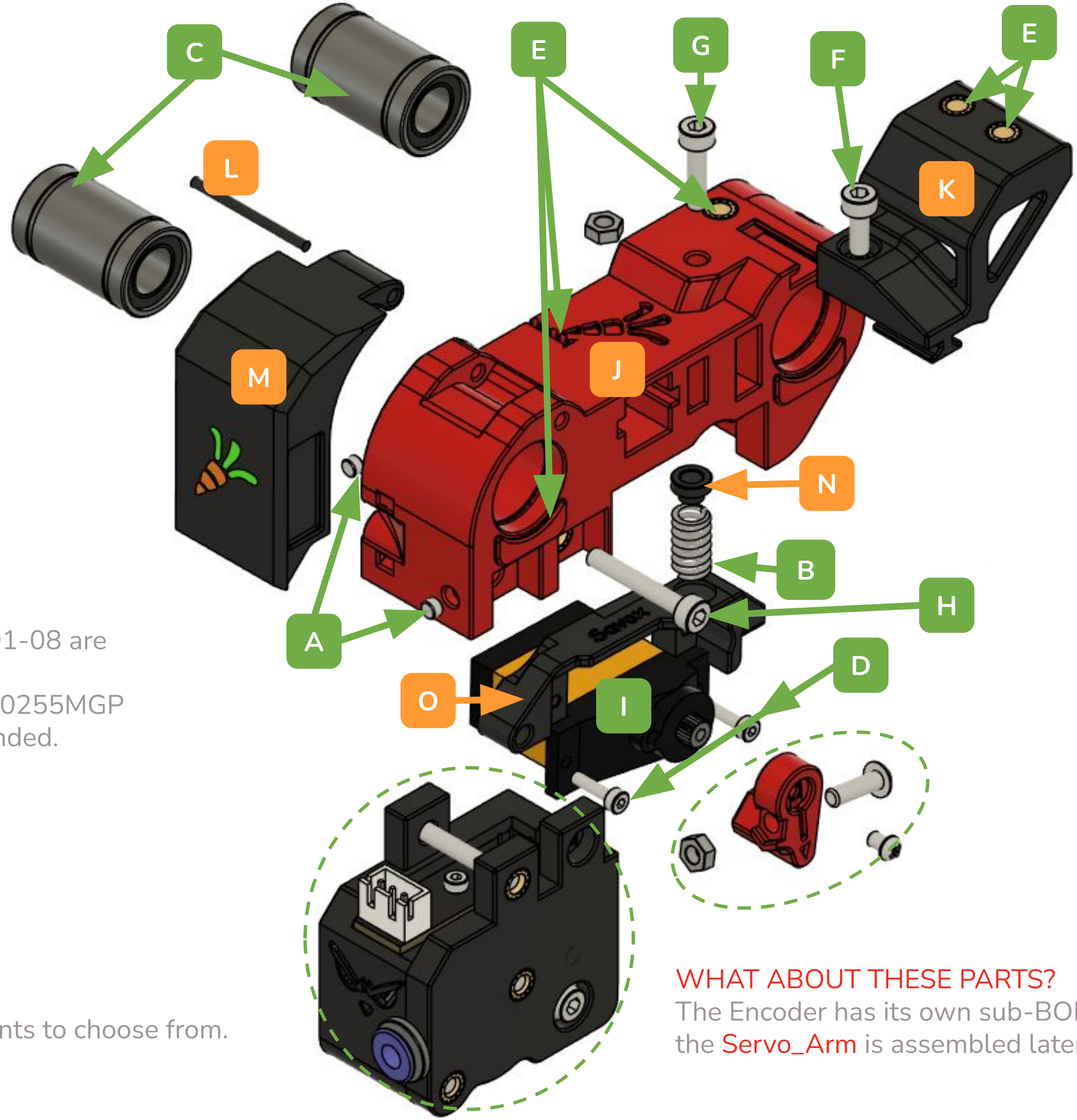
OVERVIEW

OVERVIEW



SELECTOR

EXPLODED VIEW



SELECTOR SUB-BOM

- A 2x 3x2mm Magnet
- B 1x 6x12x1mm Spring
- C 2x LM8UU*
- D 2x M2x8mm SHCS
- E 5x M3 Threaded Inserts
- F 1x M3x8mm SHCS
- G 1x M3x12mm SHCS
- H 1x M3x20mm SHCS
- I 1x Servo**

*Plastic bearings such as RJ4JP-01-08 are not suitable for this use.
**Do not use MG90S! SAVOX SH0255MGP or Guo Hua A0090 are recommended.

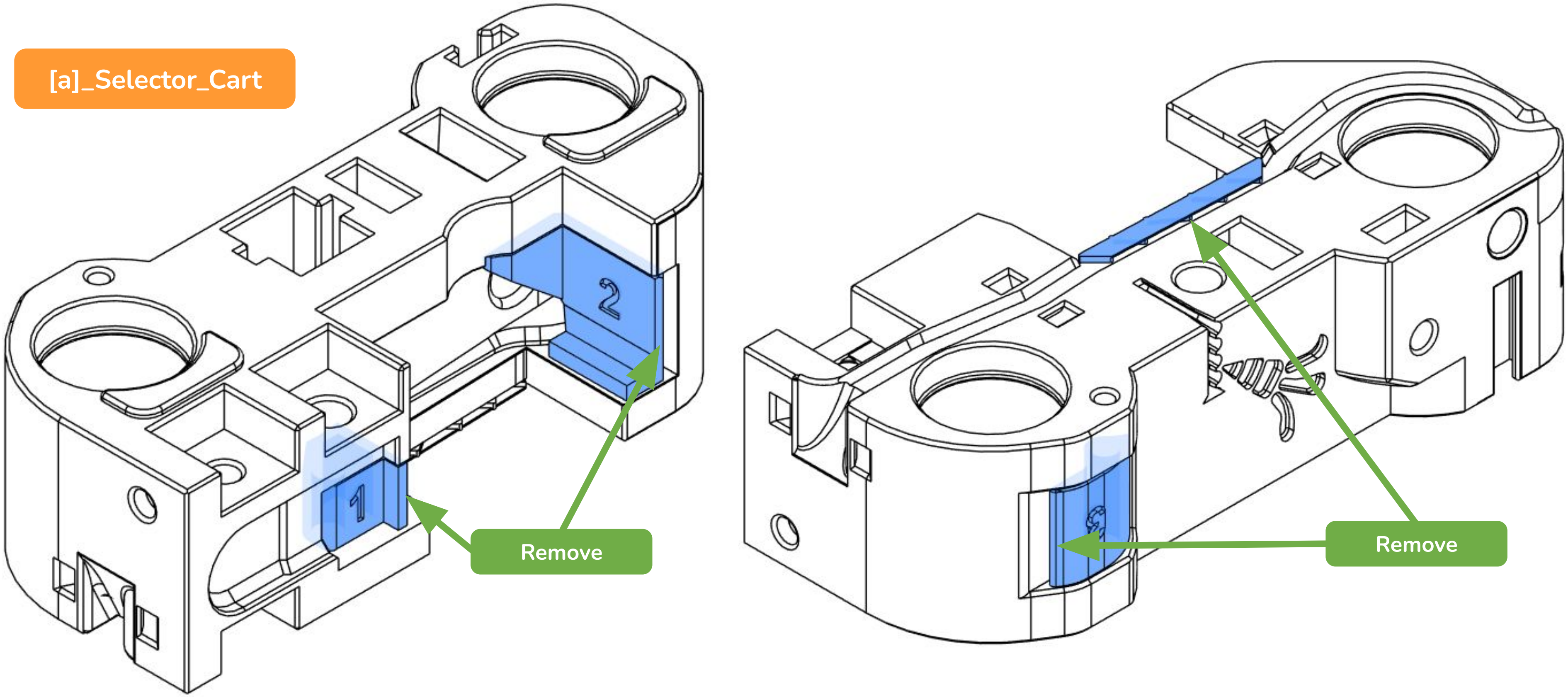
- J 1x [a]_Selector_Cart.stl
- K 1x Drag_Chain_Anchor.stl †
- L 1x Piece of Filament
- M 1x Selector_Door.stl
- N 1x Selector_Spring_Cap.stl
- O 1x Servo_Mount_XXX.stl***

***There are multiple servo mounts to choose from.

WHAT ABOUT THESE PARTS?

The Encoder has its own sub-BOM, and the Servo_Arm is assembled later.

SELECTOR CART PREPARATION



6.1 REMOVE BUILT-IN SUPPORTS

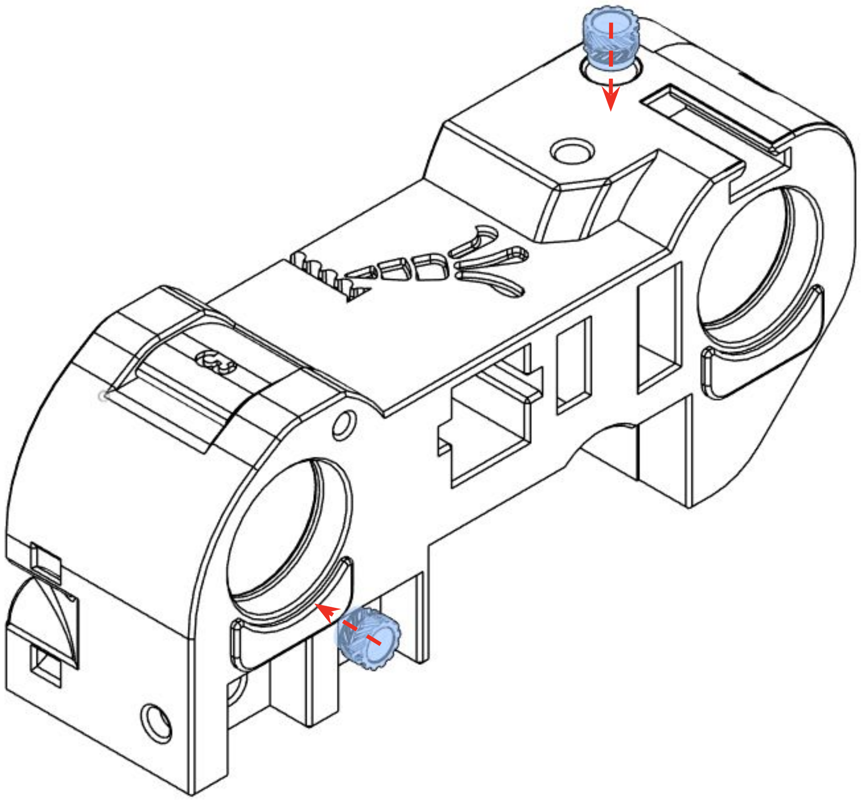
Use a small tool, like a small flathead screwdriver, to carefully remove the built-in supports. Be careful not to hurt yourself.

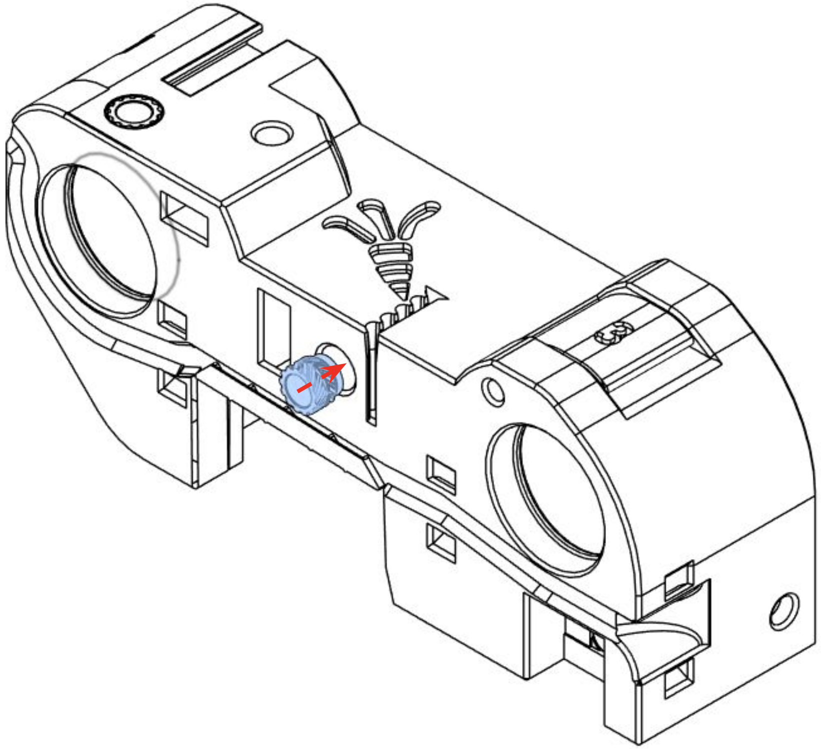
Check the supported surfaces for stuck support or loose bridges, and clean them up if needed.

SELECTOR CART HEATSETINSERTS

6.1 HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.





M3 Heatset Inserts

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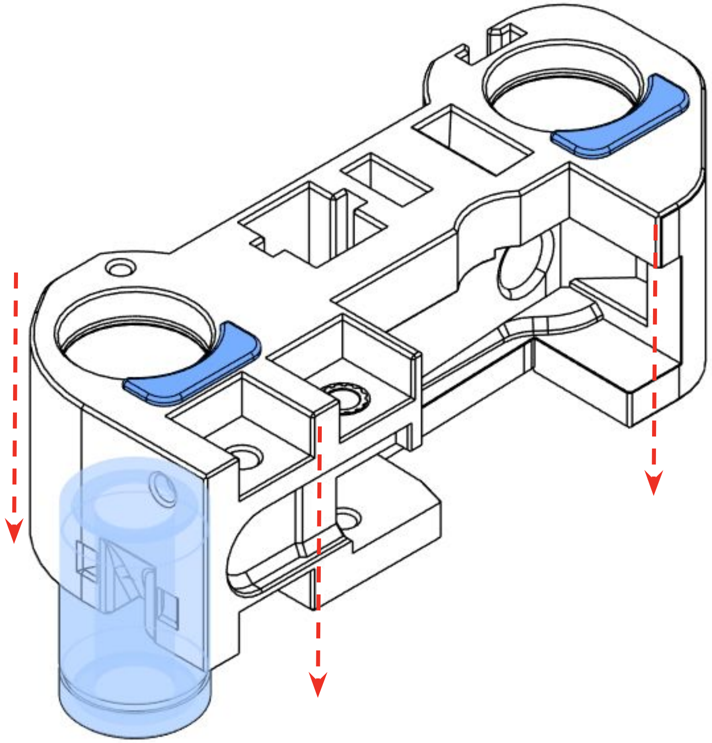
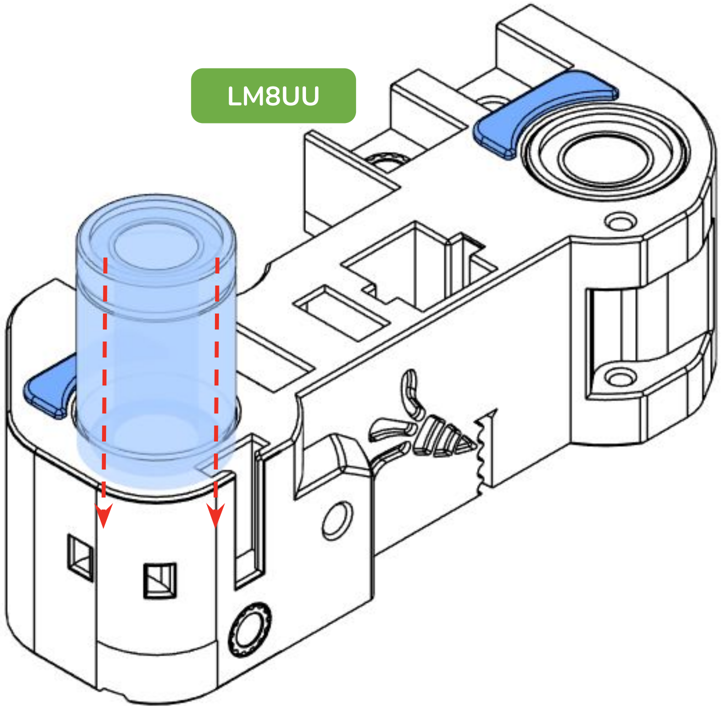
SELECTOR CART BEARINGS



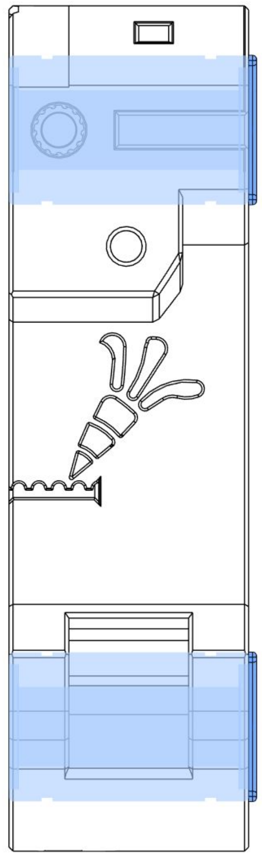
6.1 BEARING INSERTION

Using a soft jaw vice or flat object, carefully press-fit the bearings into their holes, starting from the print bed side of the Selector_Cart. They should be flush with the both sides of the Selector_Cart.

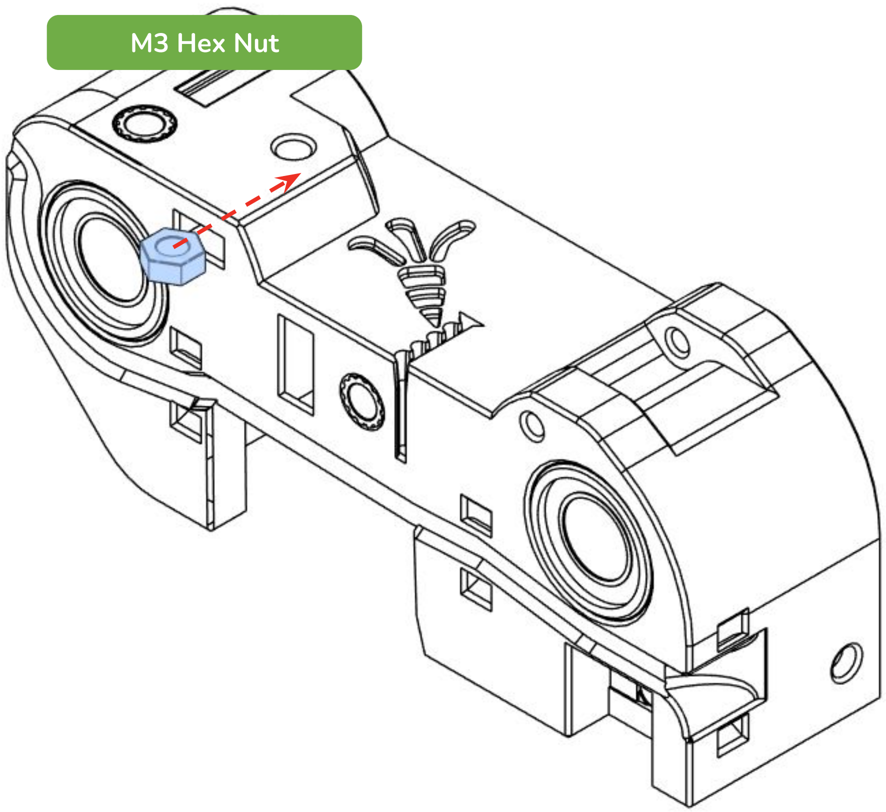


We specify a soft-jaw vice so that the bumper features are not marred. They are used to deliberately hit the end of travel, in order to automatically measure the Selector limits.

To remove the bearings, use a round, hard tool that is at or just under 15mm in diameter, such as a wrench socket, as a punch to ram out the bearings.



SELECTOR CART HEX NUT



6.1 HEX NUT INSERTION

Using a pair of pliers, insert the hex nut point-first. Once the nut is partially inserted, switch to an Allen wrench or small flathead screwdriver to fully insert the nut.

If the nut is resisting being fully inserted, use a 2.0 or 2.5mm hex driver, or small flathead screwdriver to carefully pry it into place. Once it is nearly seated, drive any M3 hardware into the nut to pull it into position.

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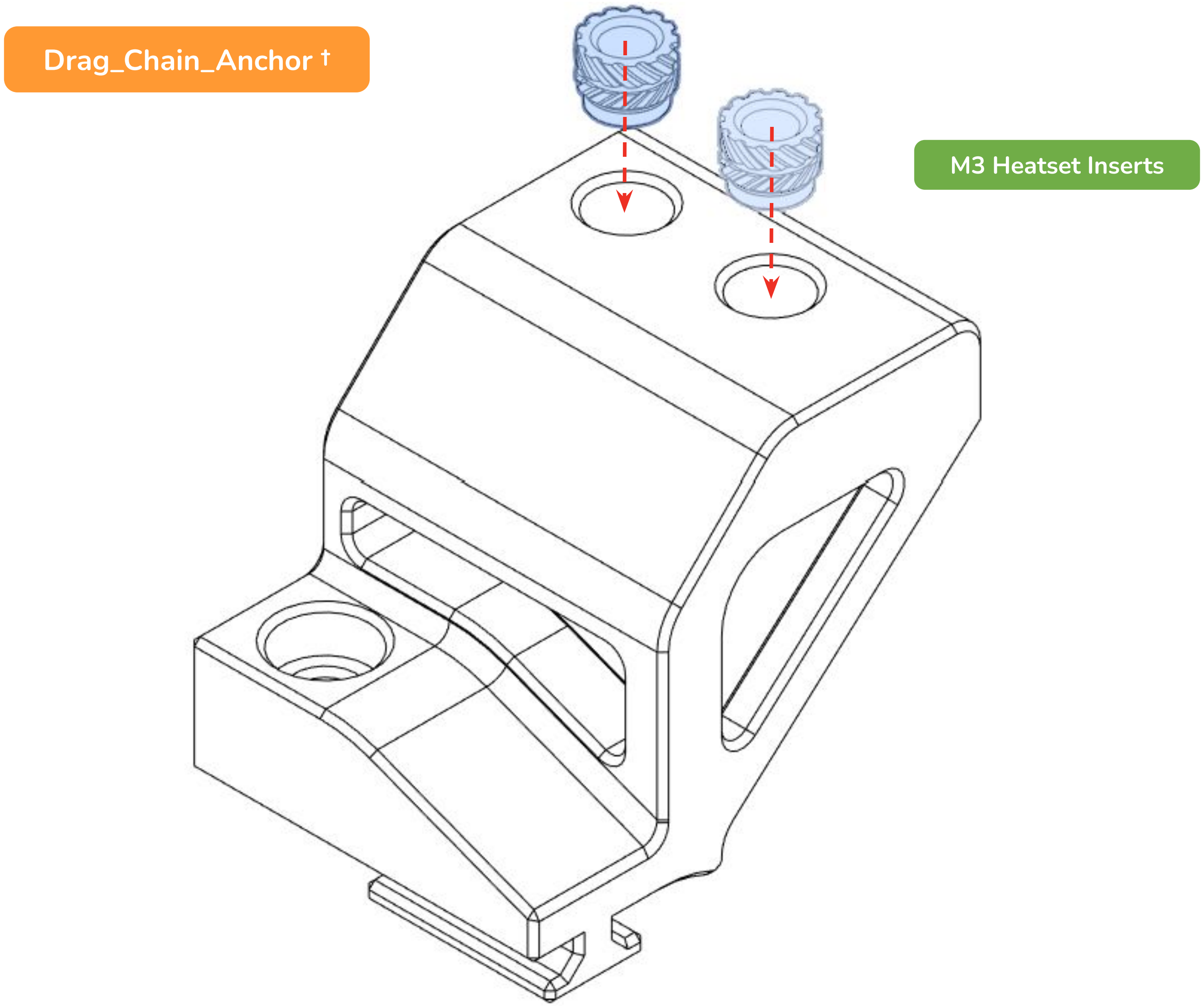
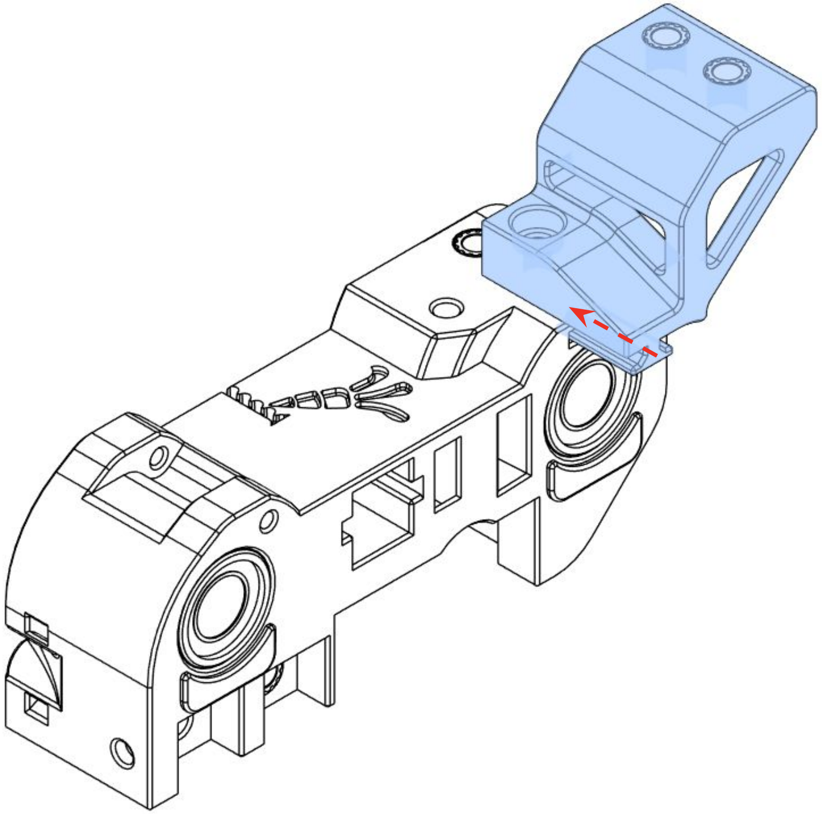
DRAG CHAIN ANCHOR HEATSET INSERTS

6.2 HEATSET INSERTS

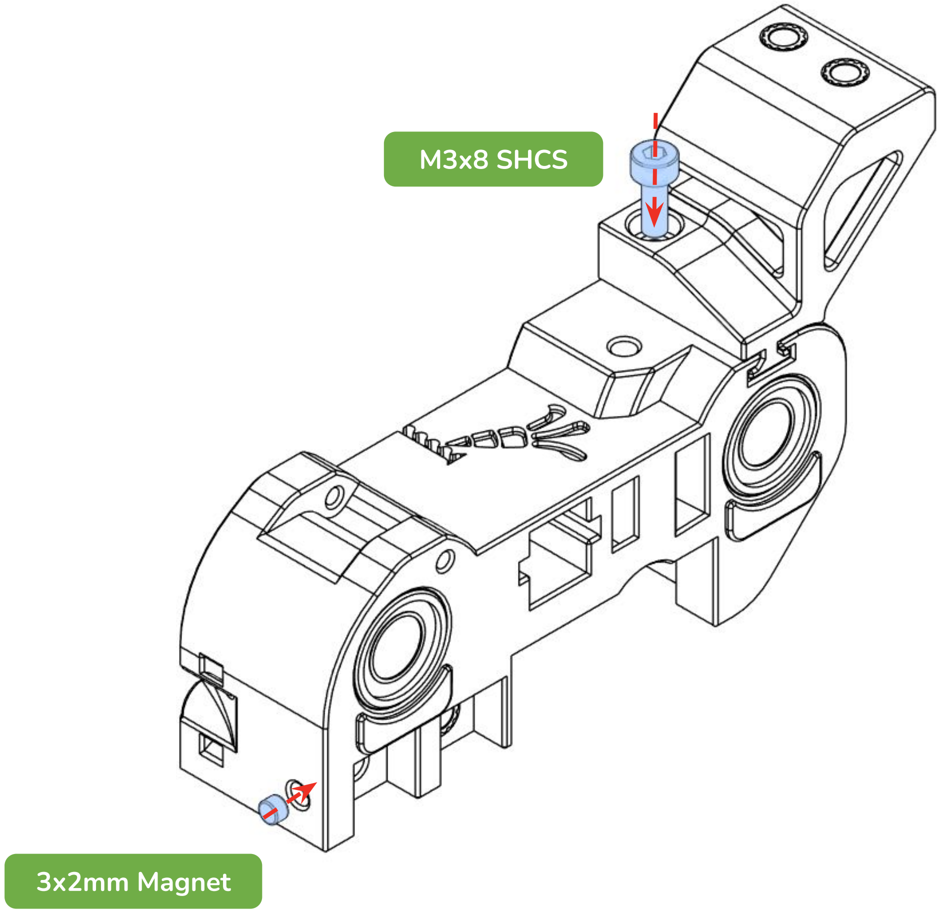
The list of pages with heatset inserts is on Page 19.



DRAG CHAIN ANCHOR



Drag_Chain_Anchor †

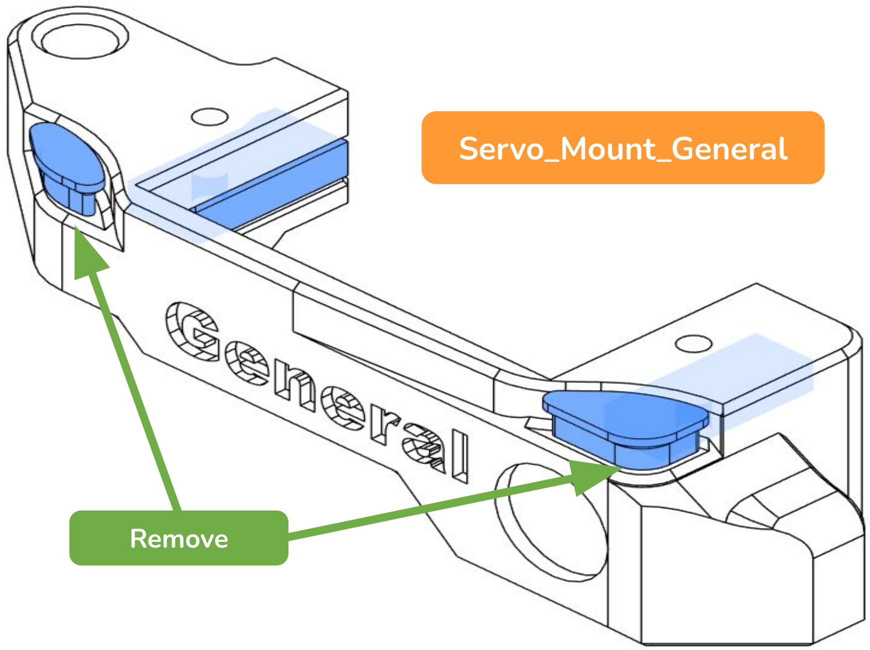


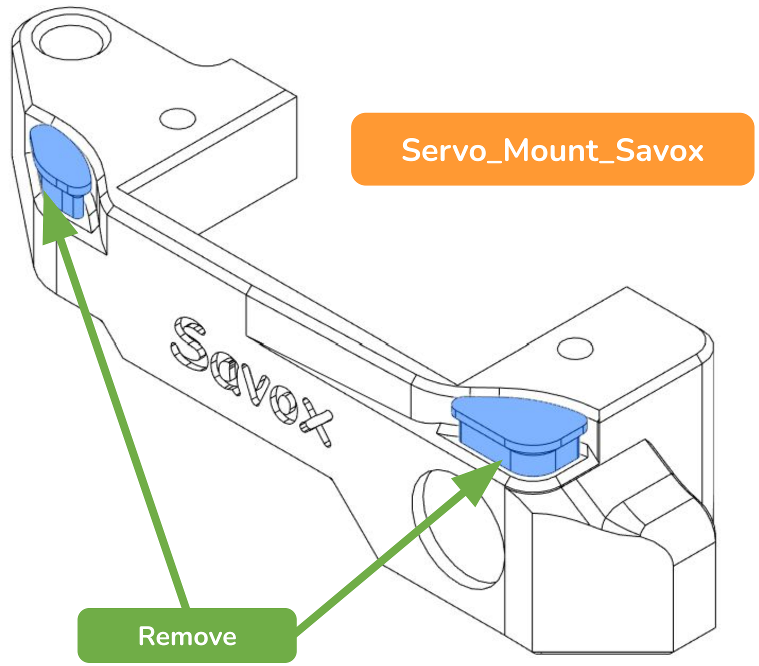
6.2 DRAG CHAIN AND MAGNET

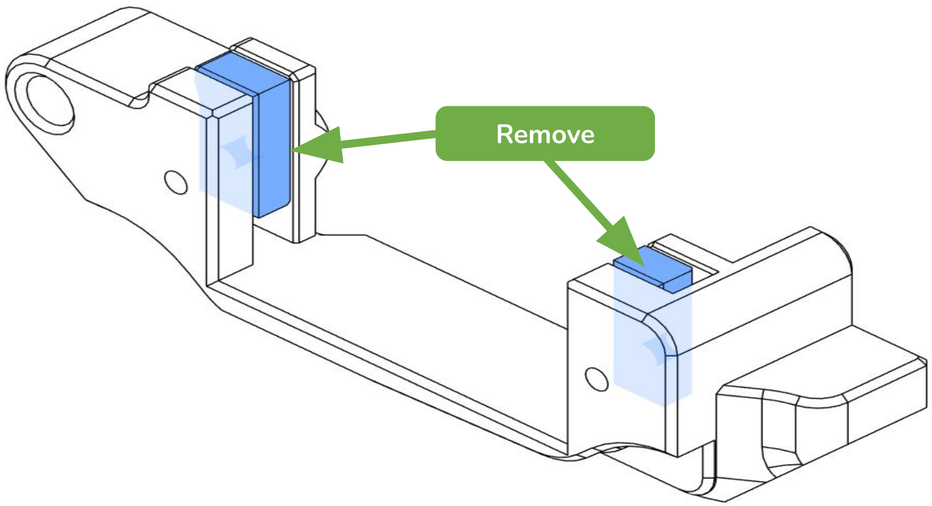
Slide the Drag_Chain_Anchor † into the dovetail groove on the Selector_Cart and install with an M3x8 SHCS screw.

Add a drop of CA glue and insert the 3x2mm magnet into its slot.

SERVO MOUNT PREPARATION







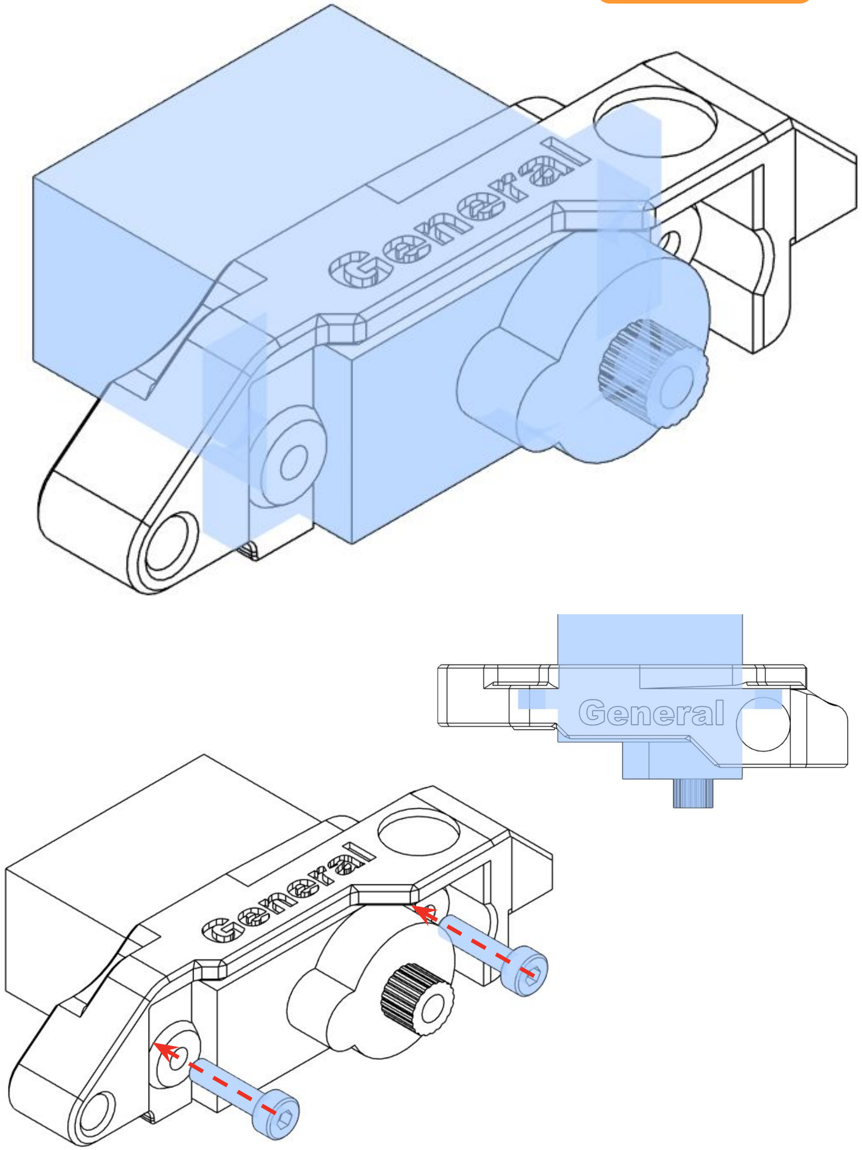
6.3 SERVO MOUNT PRINT IN PLACE SUPPORTS

Use a small tool, like a small flat-head screwdriver to remove the built-in supports.

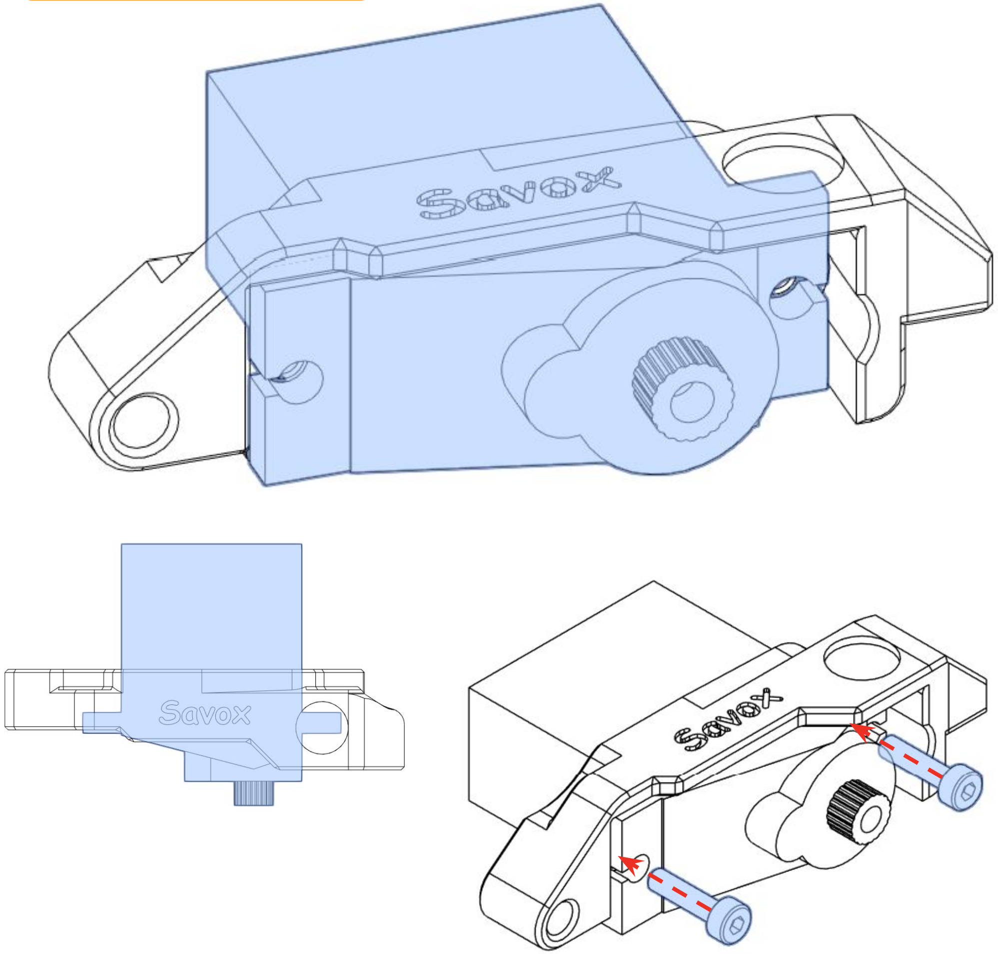
The General servo mount is designed to fit the “micro” form factor of servo. Both the General and DS041MG versions have 4 supports. If the inner supports don’t break out cleanly, you may need to clean up the slot with a file or hobby knife to get a good fit.

SERVO MOUNTING

General



Savox SH0255MGP



6.3 SERVO SCREWS

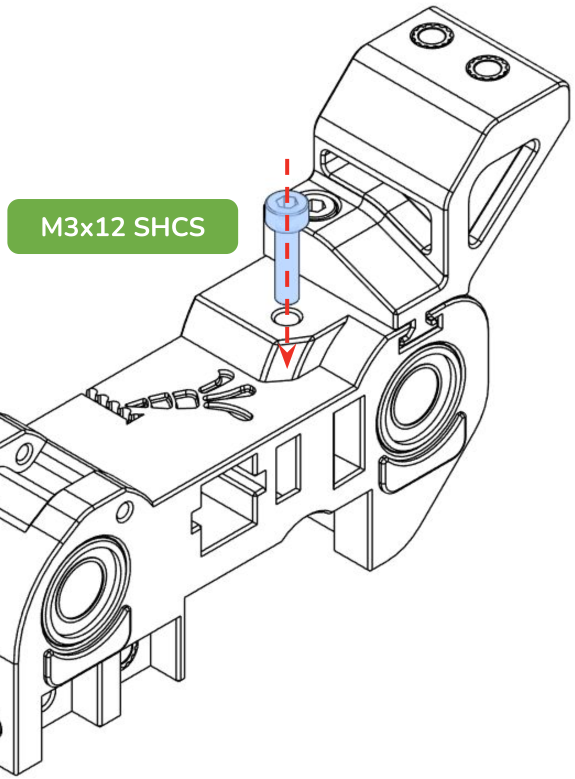
Use M2x8mm SHCS to attach the servo to its mount.

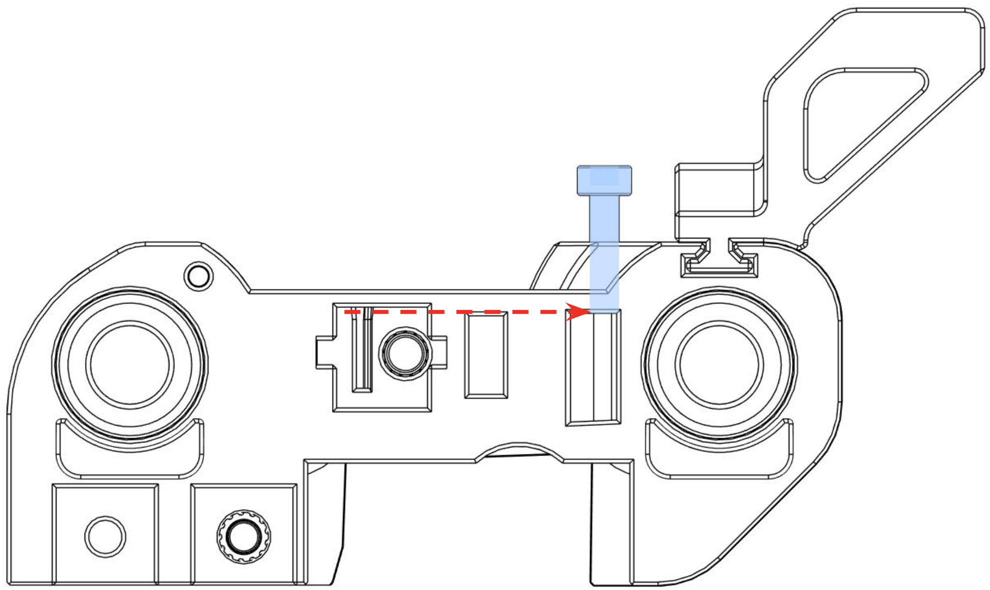
TENSION SCREW INSTALL

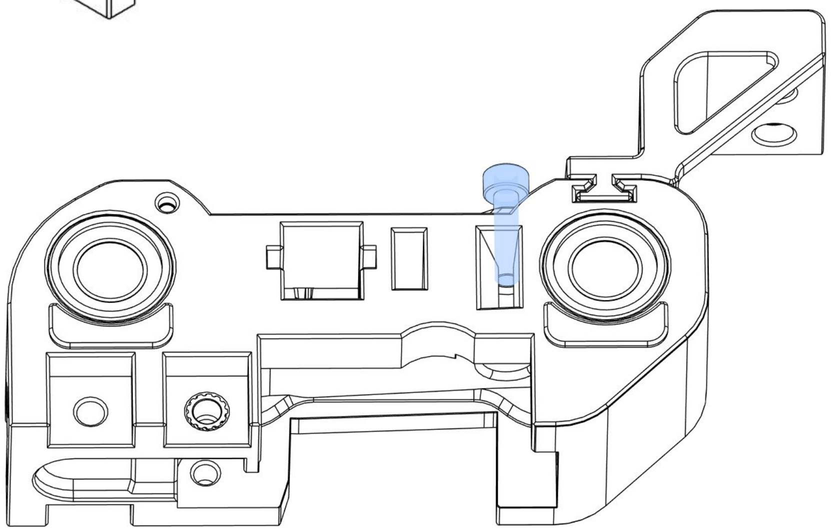
6.3 SPRING TENSION SCREW

Install the M3x12mm Spring Tension Screw.

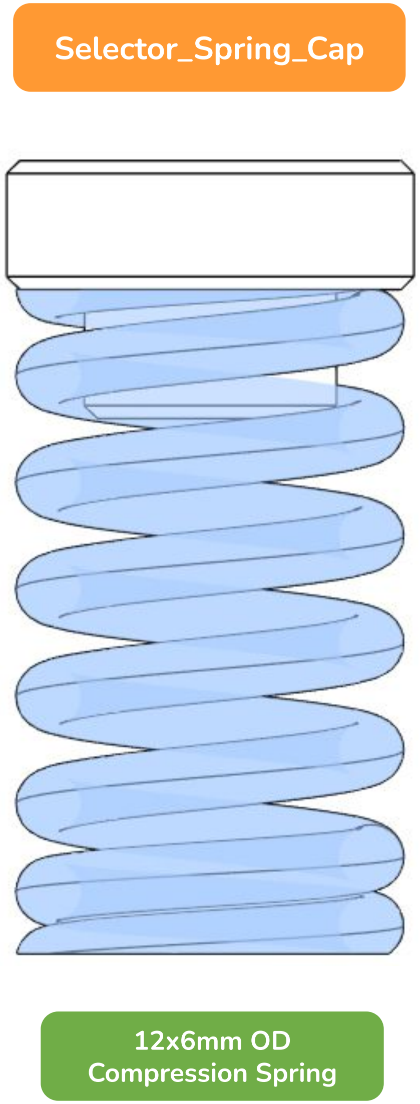
Insert the screw until it is flush with the roof of the spring cavity. You can check using the window in the side.







SPRING INSTALL

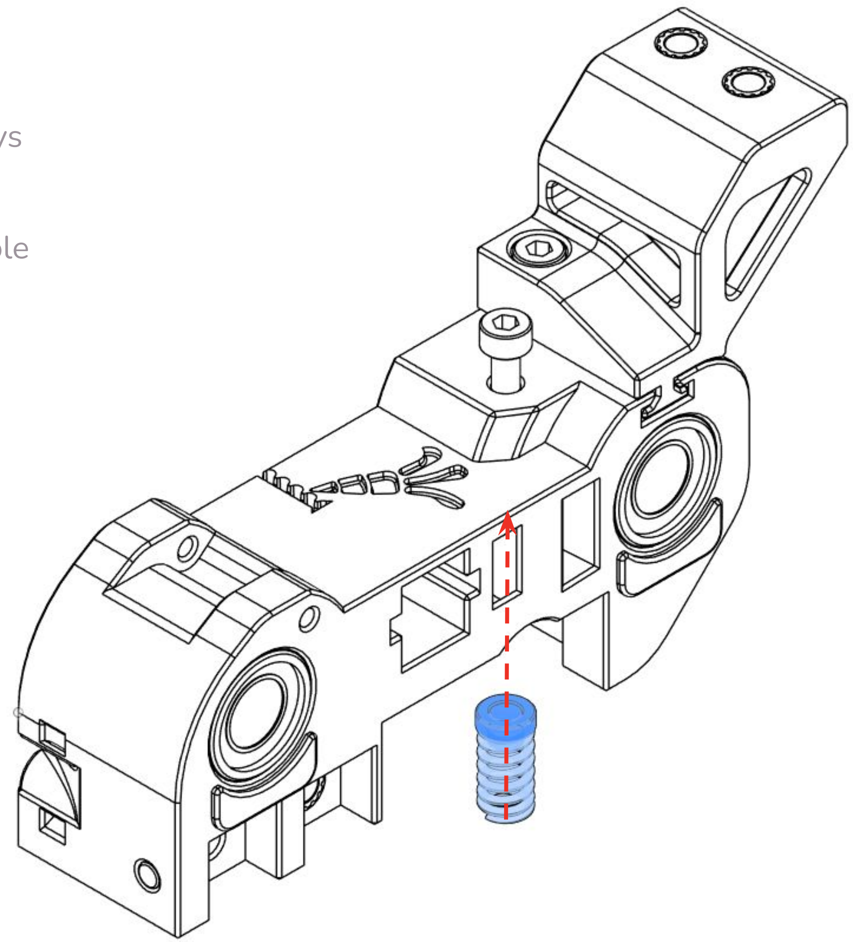


6.3 SPRING CAP

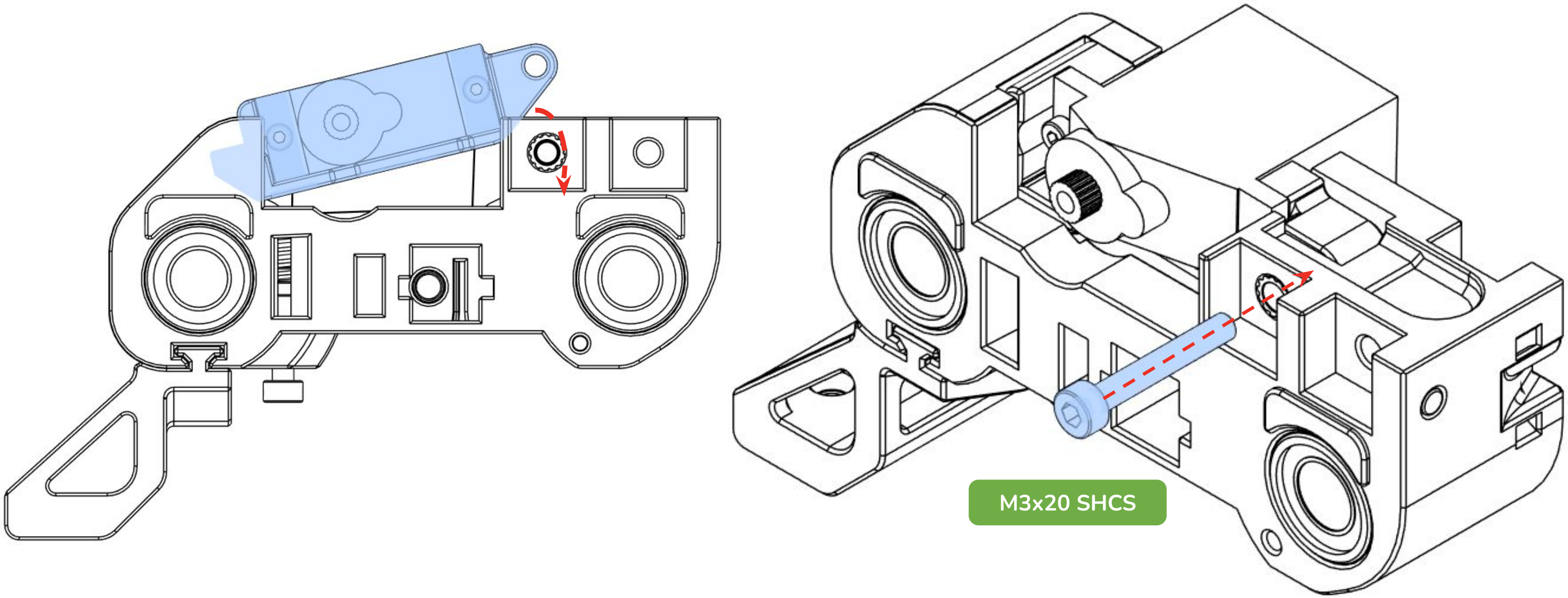
Twist the spring onto the Selector_Spring_Cap so the cap stays inserted into the spring.

Insert the spring and cap into the hole in the Selector

Shorter 10mm springs can be used as well with a longer 16mm screw.



SERVO INSTALLATION



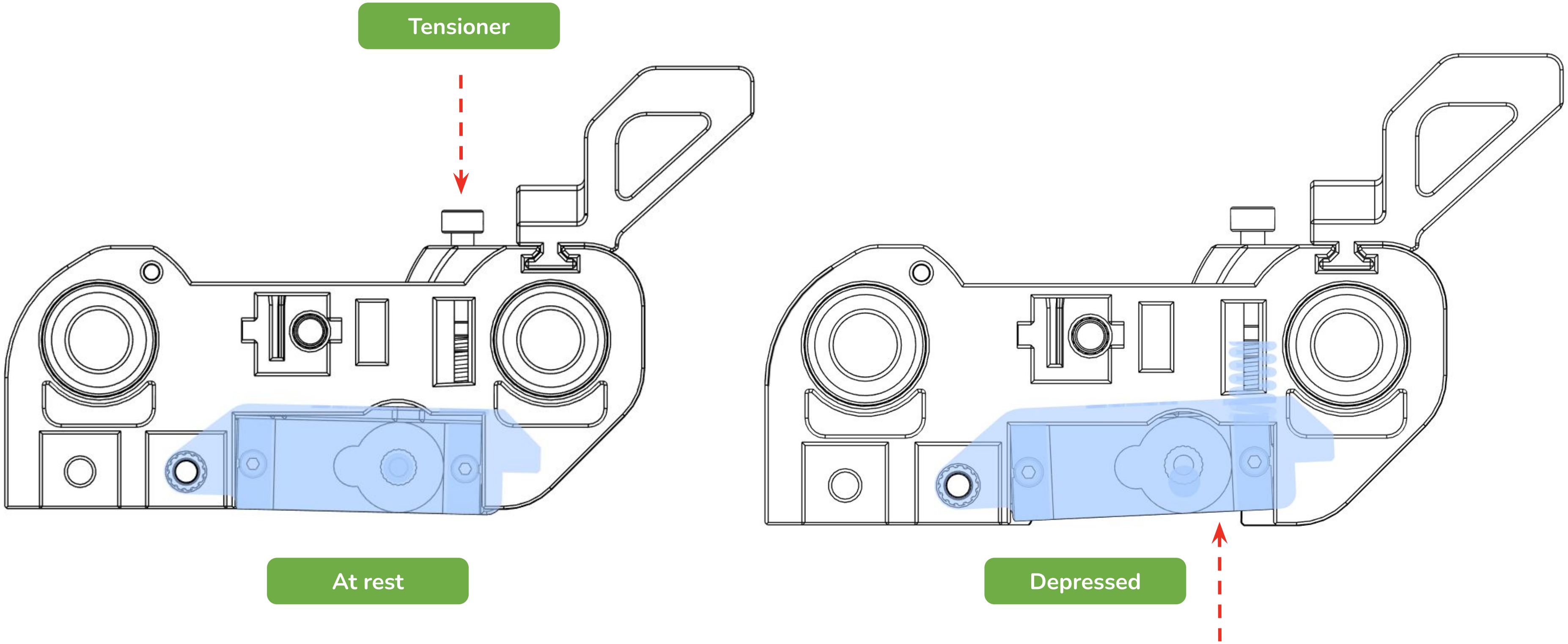
6.3 SERVO INSTALLATION

Angle the Servo_Mount, insert it into the captive channel in the Selector_Cart and press down into the pivot point. The spring should push lightly against the Servo_Mount, causing the to be sprung away from the fully seated position.

Push the Servo_Mount into place and temporarily secure it with an M3x20 screw used for mounting the encoder. **Do not tighten the screw all the way**, you will punch a hole in the Selector.

SAVOX SH-0255MGP servo option shown, installation is identical for the General servo and DS041MG.

SPRING TENSION CHECK



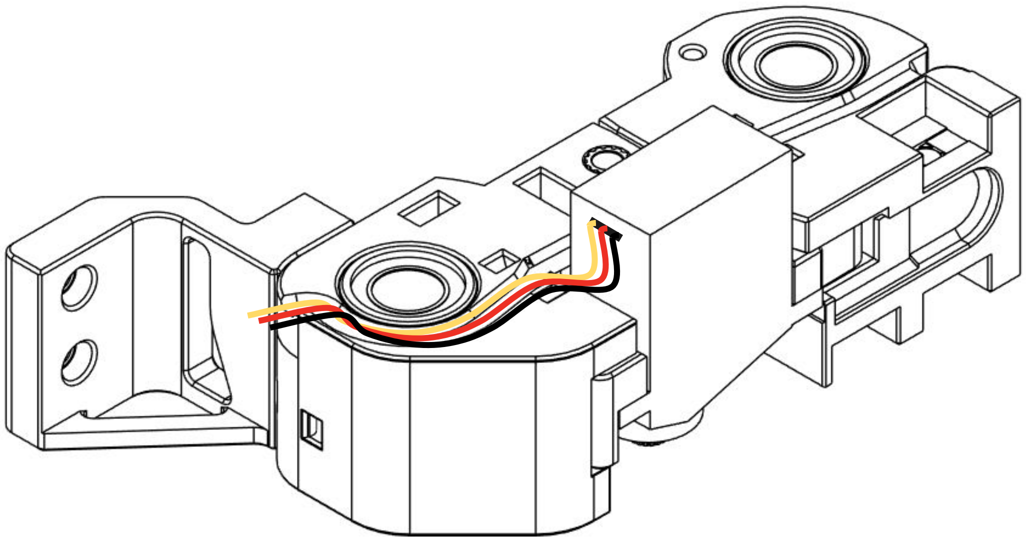
6.3 SPRING TENSION CHECK

With the screw hinge in place, we can check the Servo action to see how the spring tension is. You should be able to depress the Servo about 3mm into the Selector housing using just one finger. The tilt is only 4 degrees, see the pictures.

If it is too tight, you must replace your spring. If it is too loose, turn the tension bolt half a turn and test it again. You want it to take similar force to depress the Servo, as flipping a light switch.

The depicted tension is arbitrary and is not in any way a goal. Go by the feel test above.

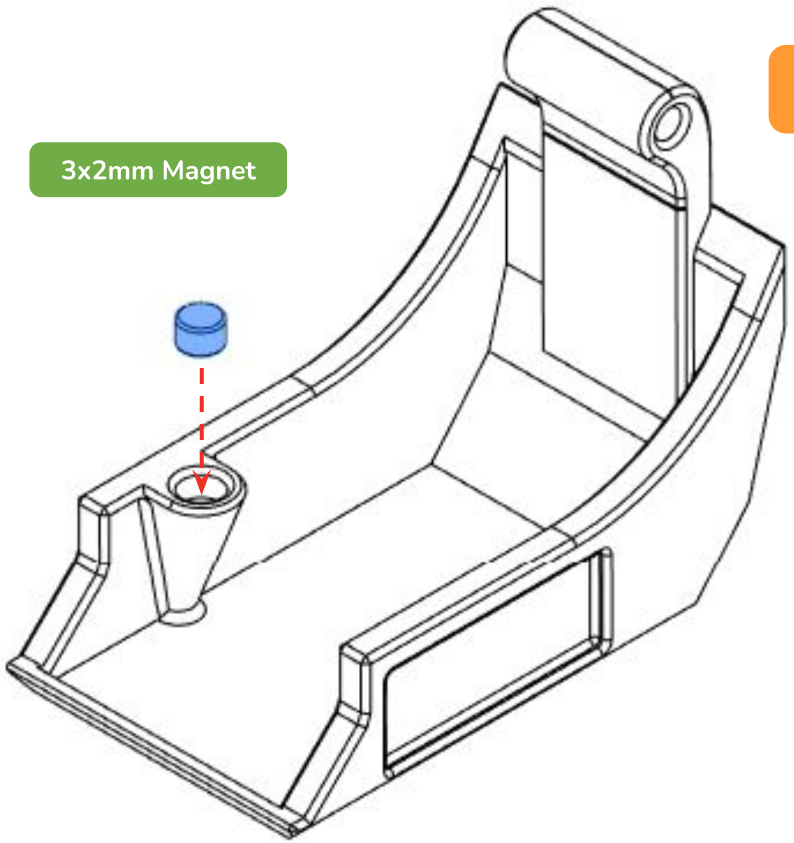
SERVO WIRES

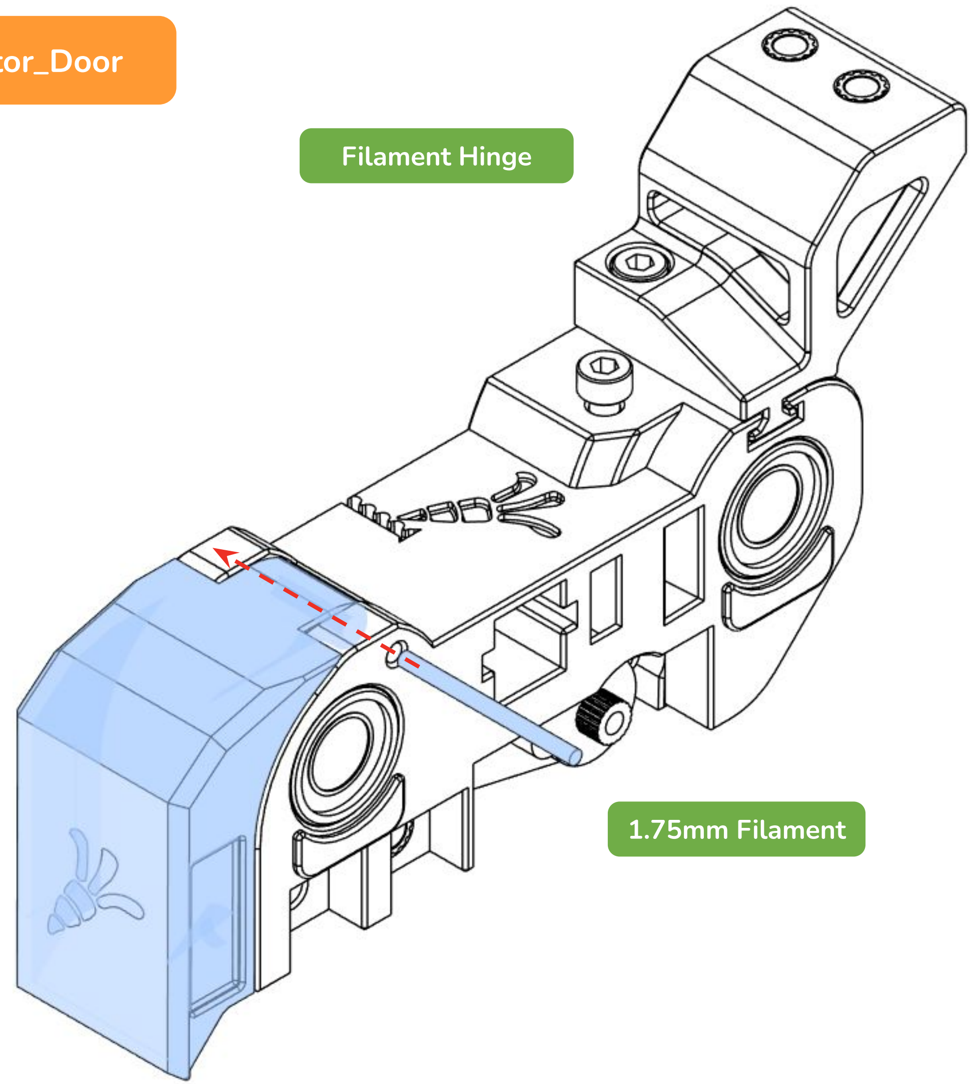


SERVO WIRES

Route the servo wires as shown. Don't cable tie the wires yet unless you're willing to redo it soon to add wires.

DOOR INSTALLATION





6.4 DOOR INSTALLATION

This part is cosmetic - you could leave it off and print it in multicolor after your ERCF is running.

Add a drop of CA glue and install the 3x2mm magnet into the door recess so that the Selector magnet attracts the door magnet as a magnetic latch.

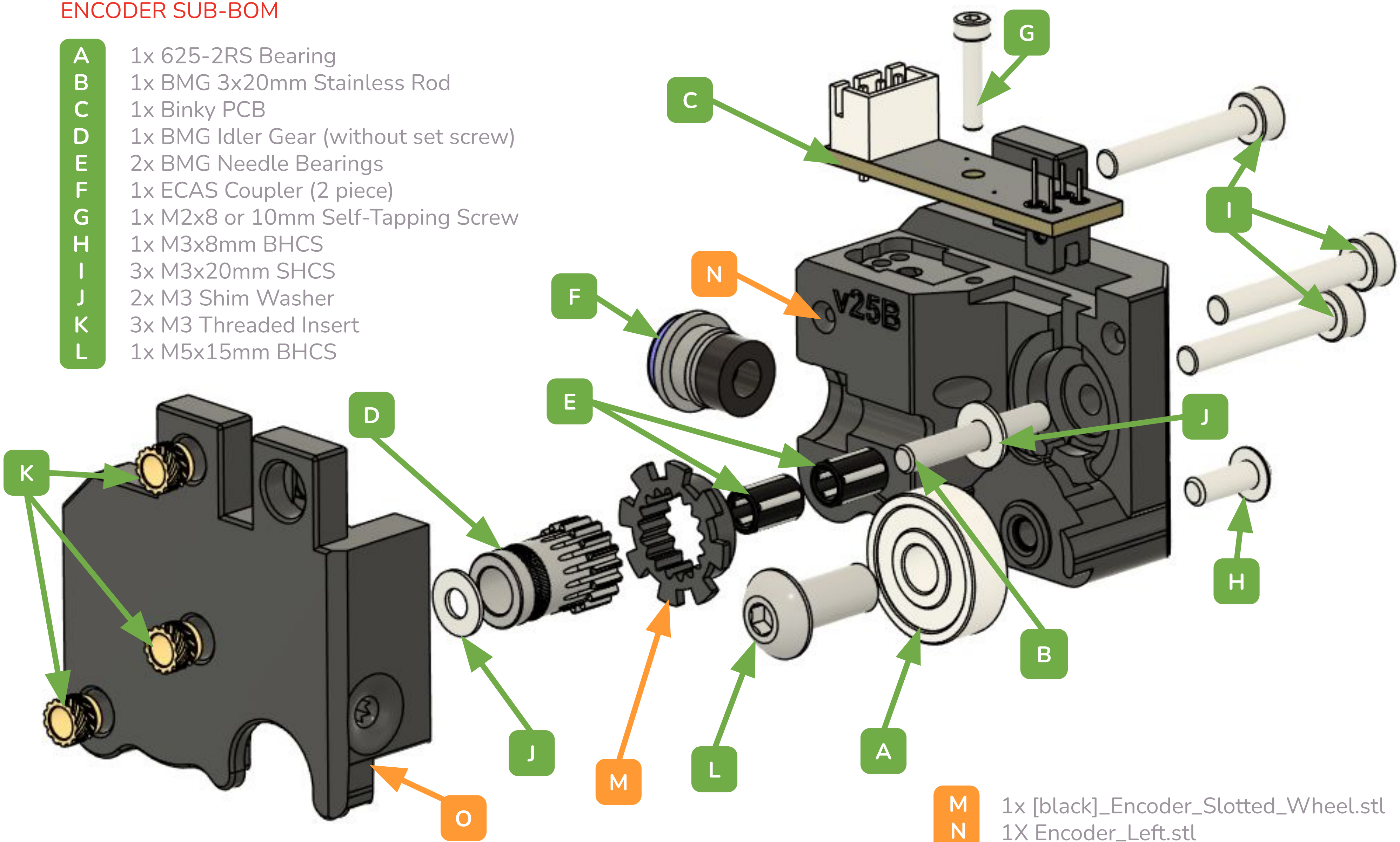
Attach the Selector_Door to the Selector_Cart using a piece of 1.75mm Accent filament & trim to length.

SELECTOR : ENCODER

ENCODER SUB-BOM

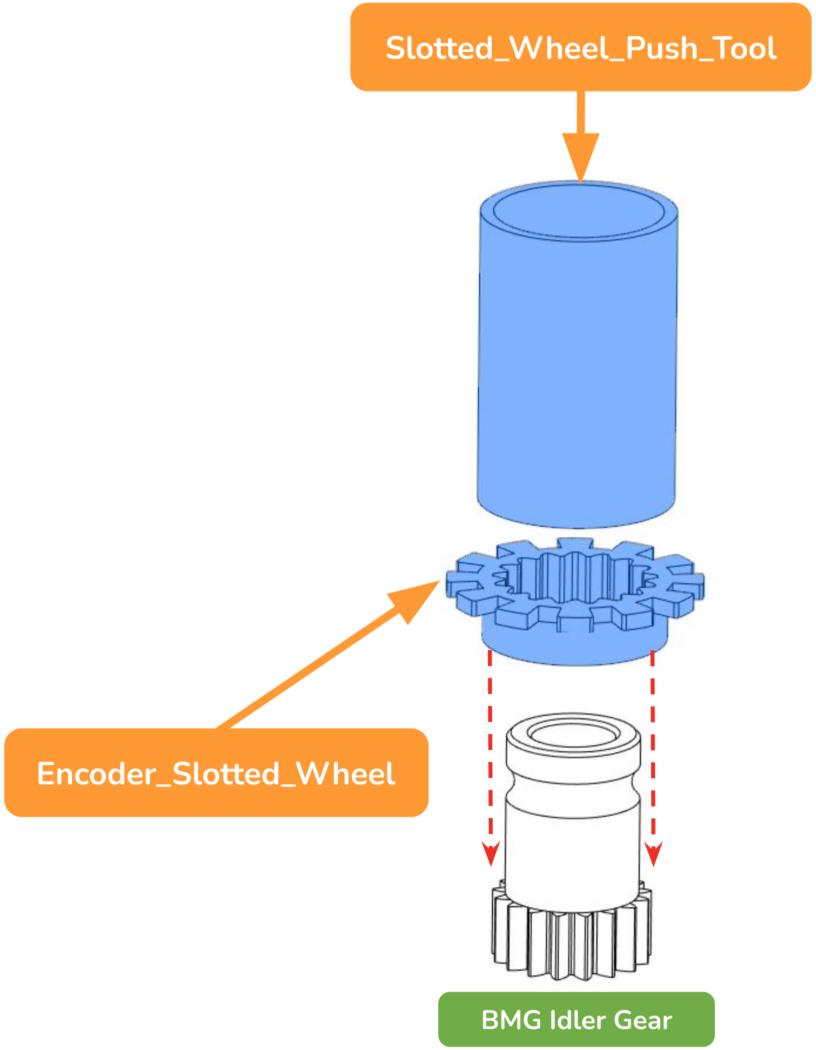
A	1x 625-2RS Bearing
B	1x BMG 3x20mm Stainless Rod
C	1x Binky PCB
D	1x BMG Idler Gear (without set screw)
E	2x BMG Needle Bearings
F	1x ECAS Coupler (2 piece)
G	1x M2x8 or 10mm Self-Tapping Screw
H	1x M3x8mm BHCS
I	3x M3x20mm SHCS
J	2x M3 Shim Washer
K	3x M3 Threaded Insert
L	1x M5x15mm BHCS

ENCODER EXPLODED VIEW



M	1x [black]_Encoder_Slotted_Wheel.stl
N	1X Encoder_Left.stl
O	1x Encoder_Right.stl

ENCODER PREPARATION



7.2 INSTALL ENCODER WHEEL

Before fitting the Encoder_Slotted_Wheel to the Bondtech gear, make sure the top surface of the wheel and its vanes are smooth and clean. If there are defects from printing, carefully sand or trim them so that they are flush.

Place the Bondtech gear as shown in the diagram on a hard surface and slide the Encoder_Slotted_Wheel onto the gear until it reaches the teeth.

Use the Slotted_Wheel_Push_Tool to **gently** push the Encoder_Slotted_Wheel into place until it is flush with the end of the gear. Gently use a hammer or soft jaw vise if necessary.

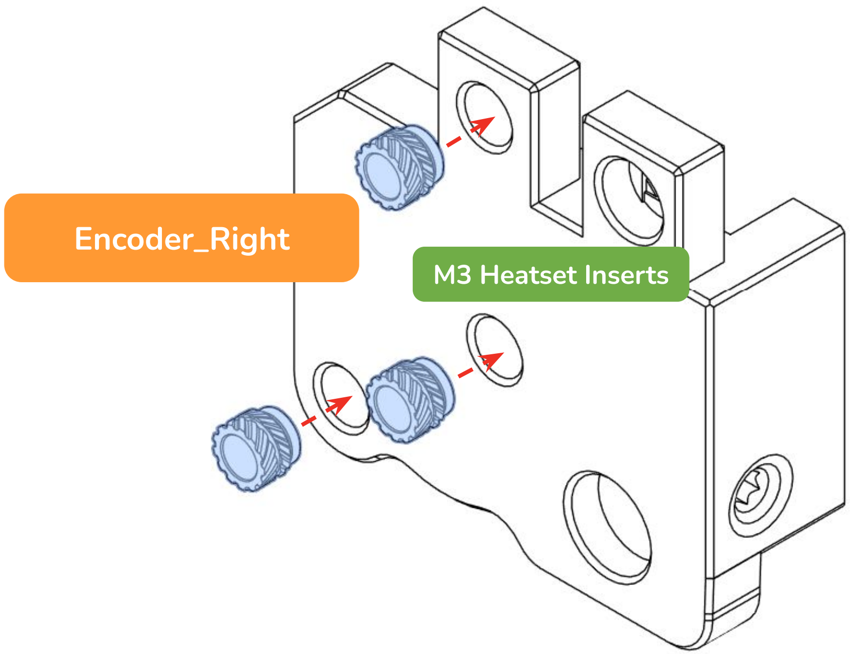
The Encoder_Slotted_Wheel should fit firmly on the Bondtech gear. Make sure it isn't damaged or cracked, and doesn't move easily.

NOTE The Encoder_Slotted_Wheel must be printed in 0.1mm or lower layers, in a black material to prevent light shining through the vanes of the wheel and causing false readings. Glossy materials can also cause problems with reflections.

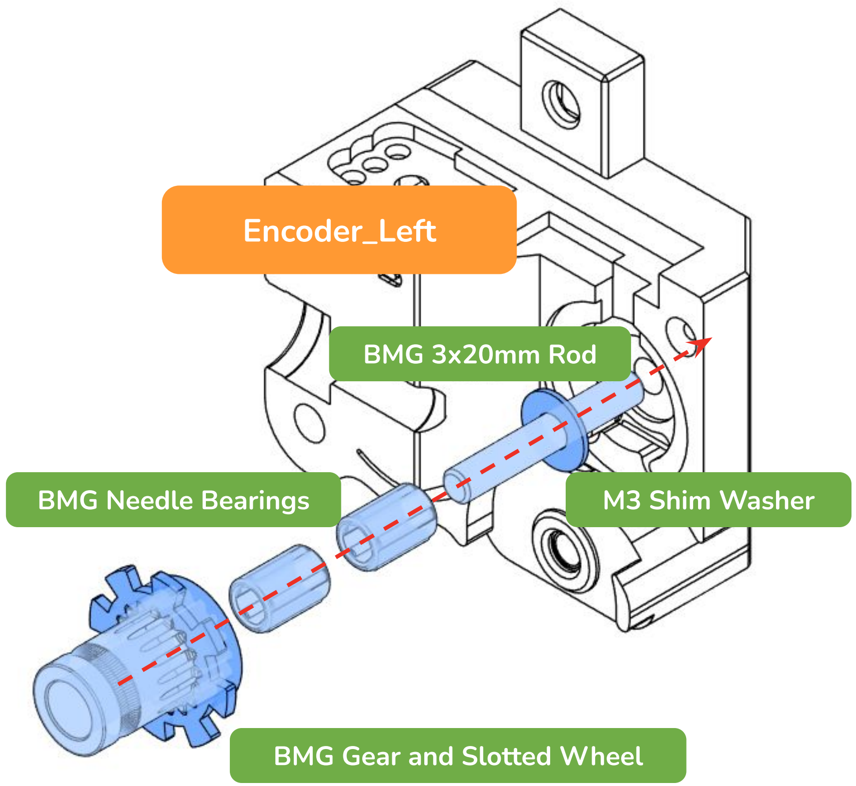
ENCODER PREPARATION

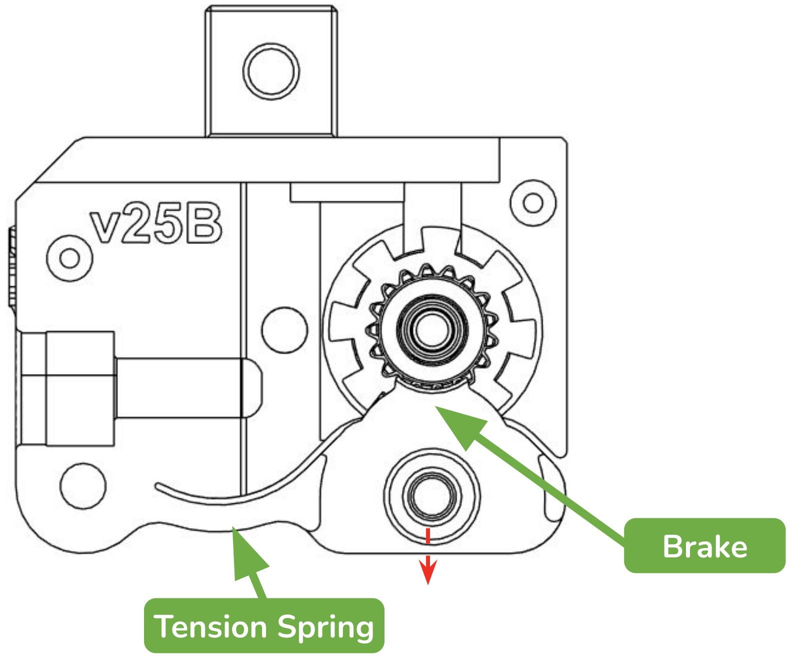
7.2 HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.



ENCODER ASSEMBLY





7.2 ENCODER ASSEMBLY

Start by fitting the 3x20mm rod into Encoder_Left. Next, slide on the M3 washer and needle bearings. Add a small dab of grease (EP1/EP2 or Superlube) on the bearings for lubrication.

Slide the BMG gear / slotted wheel assembly into place. You must pull the tension spring down 1-2mm in order for the slotted wheel assembly to clear the brake and seat correctly.

Gently pull down on the Brake to hold the Tension Spring open. It only needs to move 1-2mm. This will release the brake that prevents the encoder wheel from free spinning when filament is ejected.

With the Tension Spring open, the wheel should rotate easily and not rub on the Encoder housing or Binky optical sensor.

The slotted wheel should sit almost flush with the housing, but make sure it doesn't rub and cause friction.

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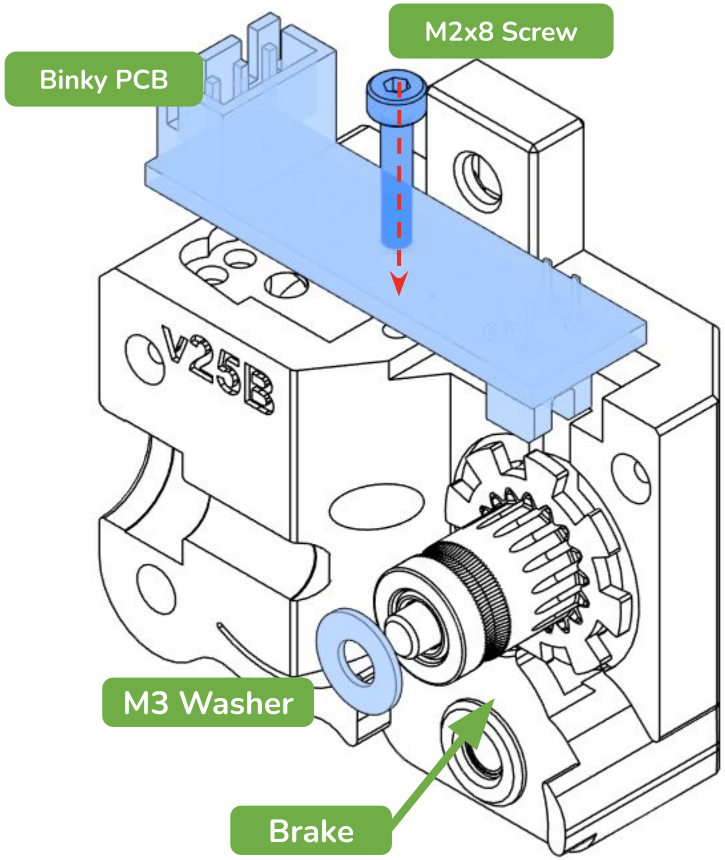
ENCODER ASSEMBLY

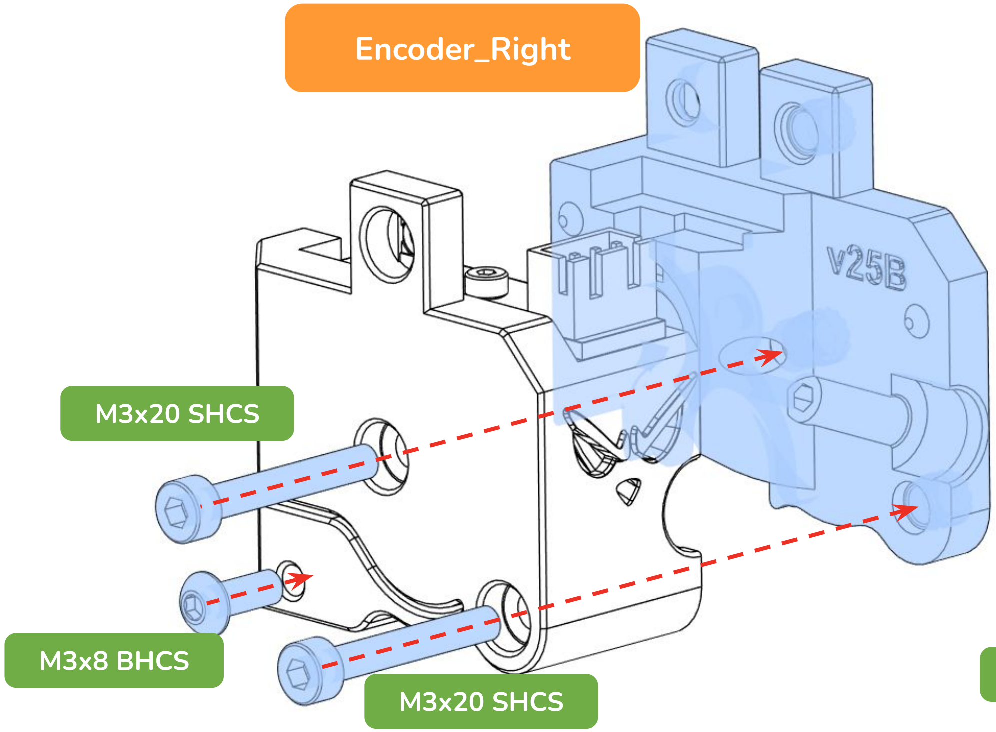


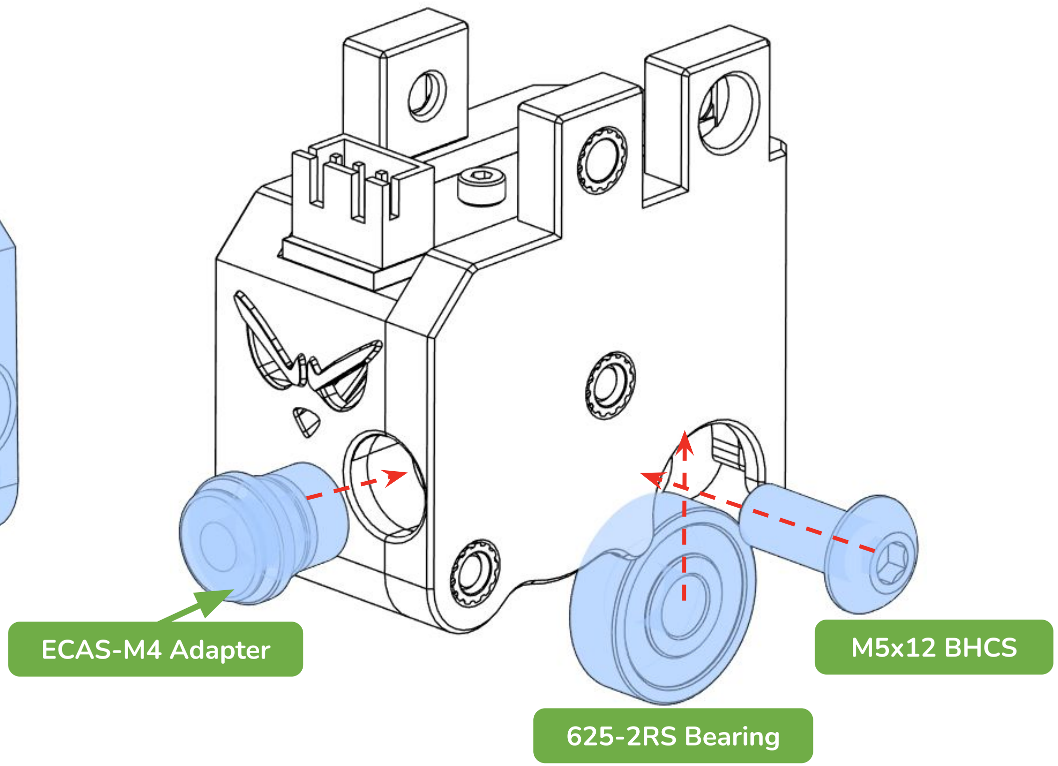
7.2 CHECK POINT

Next, Insert and secure the Binky PCB with either the provided Philips screw, or an M2x8 or 10mm SHCS. The sensor should fit snugly in the cutout provided.

Add the second M3 shim washer to the end of the BMG idler stack.

ENCODER ASSEMBLY





7.3 ENCODER ASSEMBLY

Align the two halves of the encoder and press them together. Attach the two sides together with two M3x20 SHCS screws. These screws don't need to be super tight, just flush with the surface of the Encoder, and may cause problems if overtightened.

Screw and self-tap the M3x8 BHCS into the plastic hole on the Tension Spring. This functions as the plunger for the endstop located in the gearbox housing. Tighten the screw all the way in, and then back it out about 2 turns. Later, during software setup, you can adjust the screw in or out to calibrate the home position. One full rotation of the screw will move it in or out 0.5mm.

Insert the ECAS Bowden Collet. If necessary, tighten the two M3x20 SHCS screws you inserted earlier. These screws do not need to be super tight, just flush with the surface of the Encoder. Finally, insert the 625-2RS bearing and fasten it with an M5x12mm bolt.

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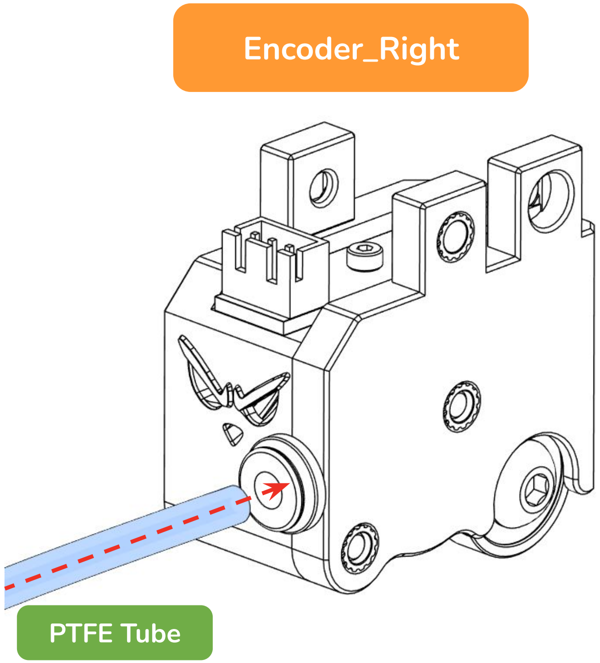
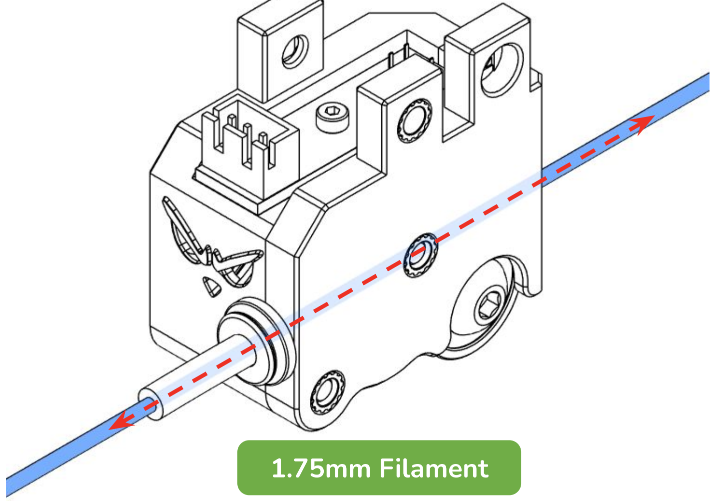
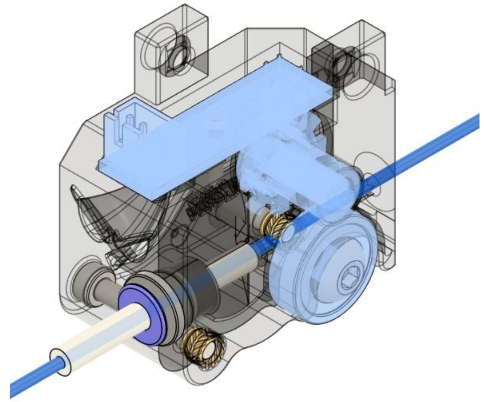
ENCODER PATH CALIBRATION







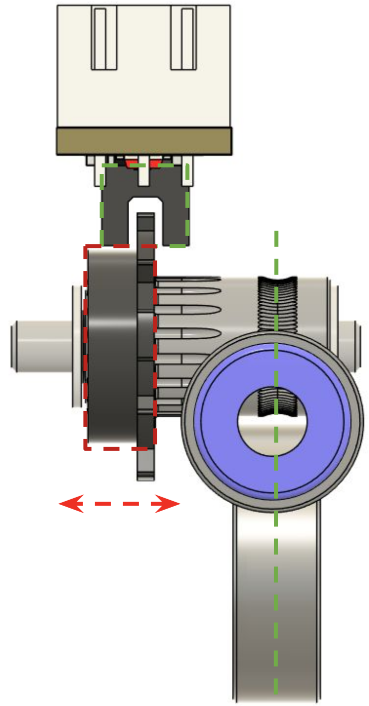
7.3 ENCODER FILAMENT PATH

Insert a short piece of PTFE tubing into the ECAS, ensuring that it is fully seated into the channel behind the ECAS fitting. Then use a length of filament to verify that the filament path of the Encoder runs smoothly and the Encoder_Slotted_Wheel doesn't rub on the Encoder body or Binky Optical Sensor.

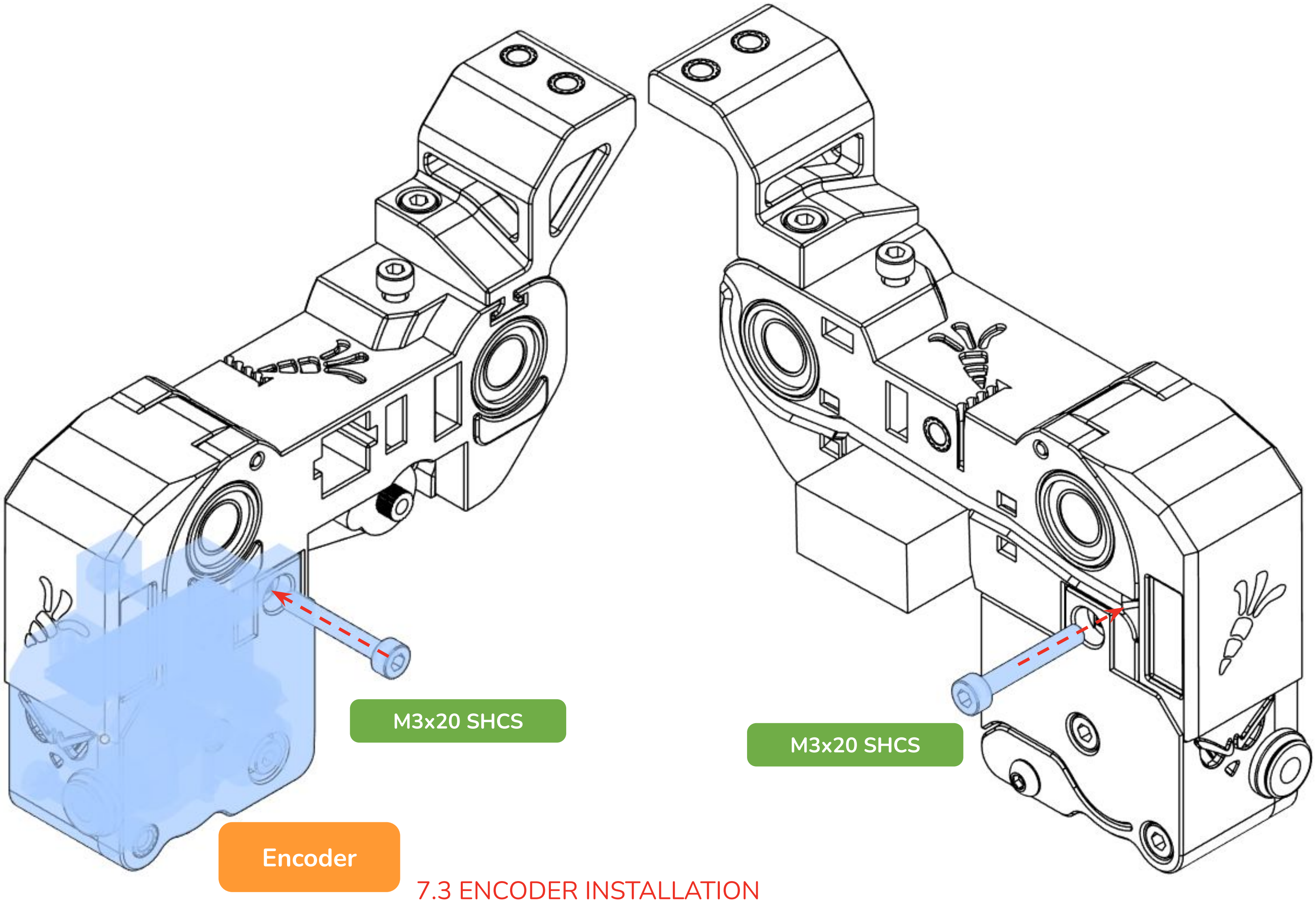
If you notice any issues, the first thing to check are overtightened M3x20 screws holding the Encoder together. If loosening the screws doesn't help, disassemble the Encoder. Adjust the position of the Encoder_Slotted_Wheel on the gear, being careful not to damage it or its vanes.

If the Encoder_Slotted_Wheer is centered but rubs against the ceiling of the Binky sensor, the Encoder_Slotted_Wheel must be reprinted - try a lower Extrusion Multiplier.

Once you have the Encoder running smoothly, it is ready to assemble it onto the Selector!



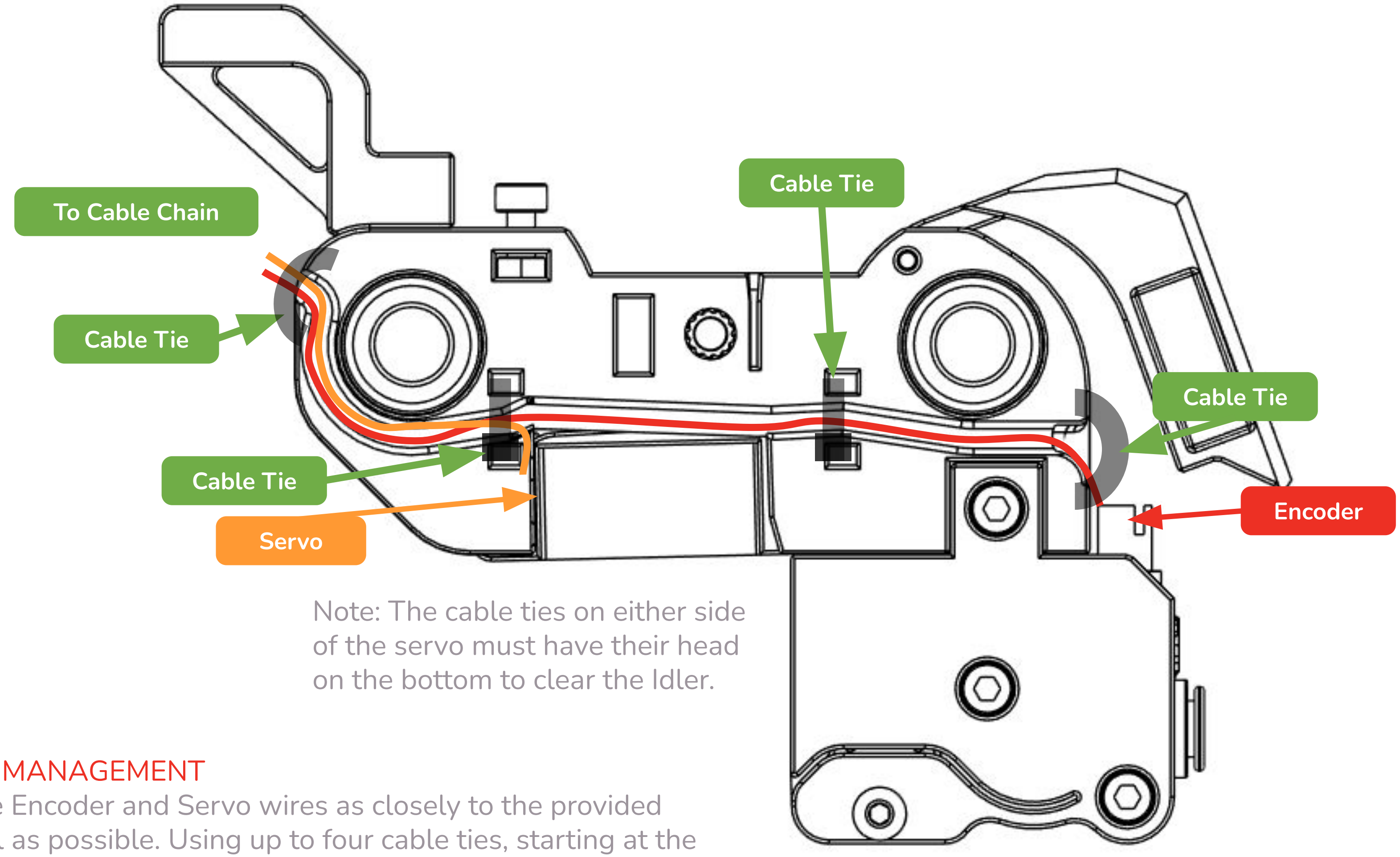
ENCODER INSTALLATION



7.3 ENCODER INSTALLATION

Remove the M3x20 SHCS that you inserted on page 125 to hold the servo mount. Then secure the Encoder to the Selector_Cart with two M3x20 SHCS screws The first screw is also the Servo pivot - do not overtighten it or the Servo may bind.

CABLE MANAGEMENT



Note: The cable ties on either side of the servo must have their head on the bottom to clear the Idler.

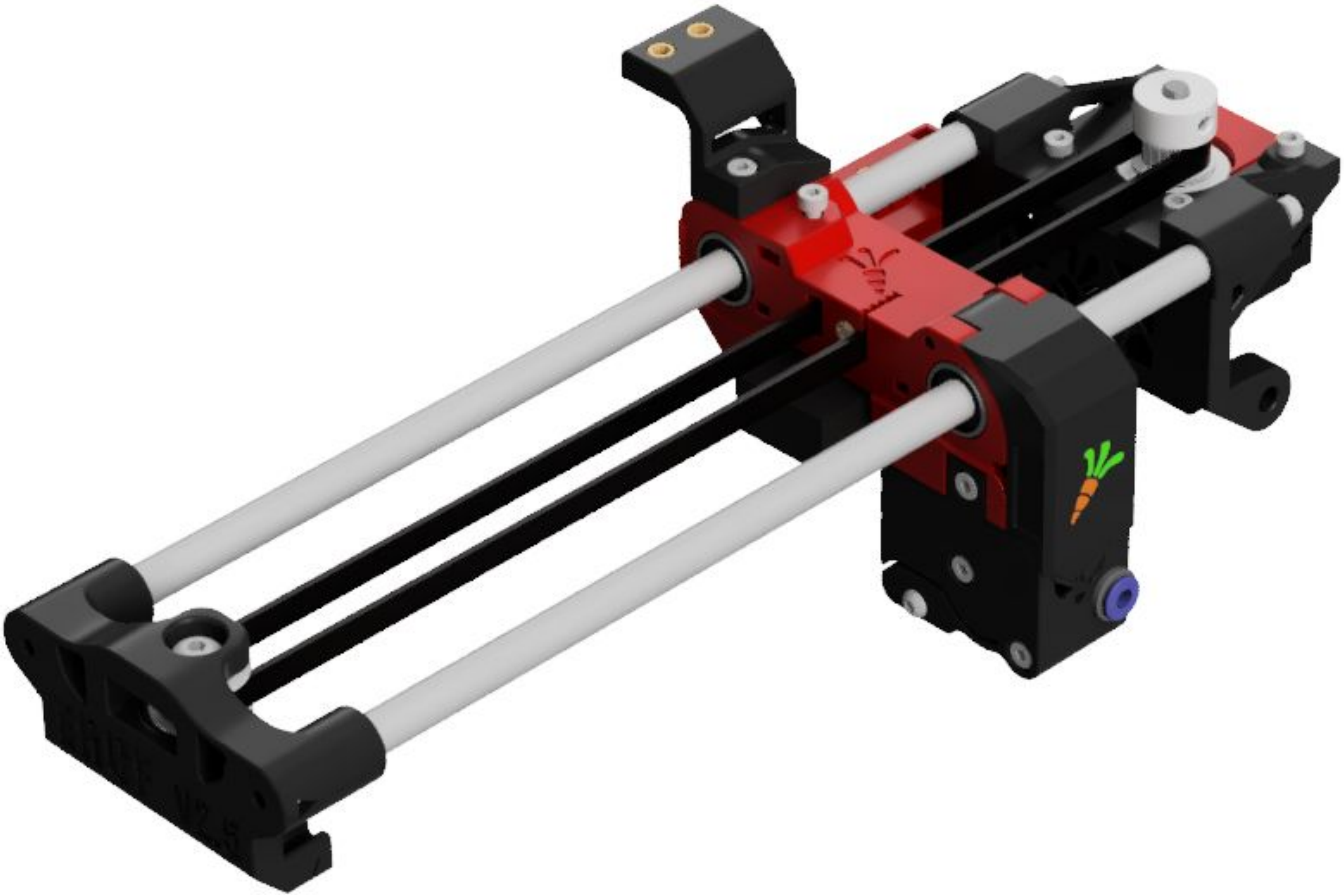
CABLE MANAGEMENT

Run the Encoder and Servo wires as closely to the provided channel as possible. Using up to four cable ties, starting at the Encoder side, to secure the wiring to the Selector_Cart.

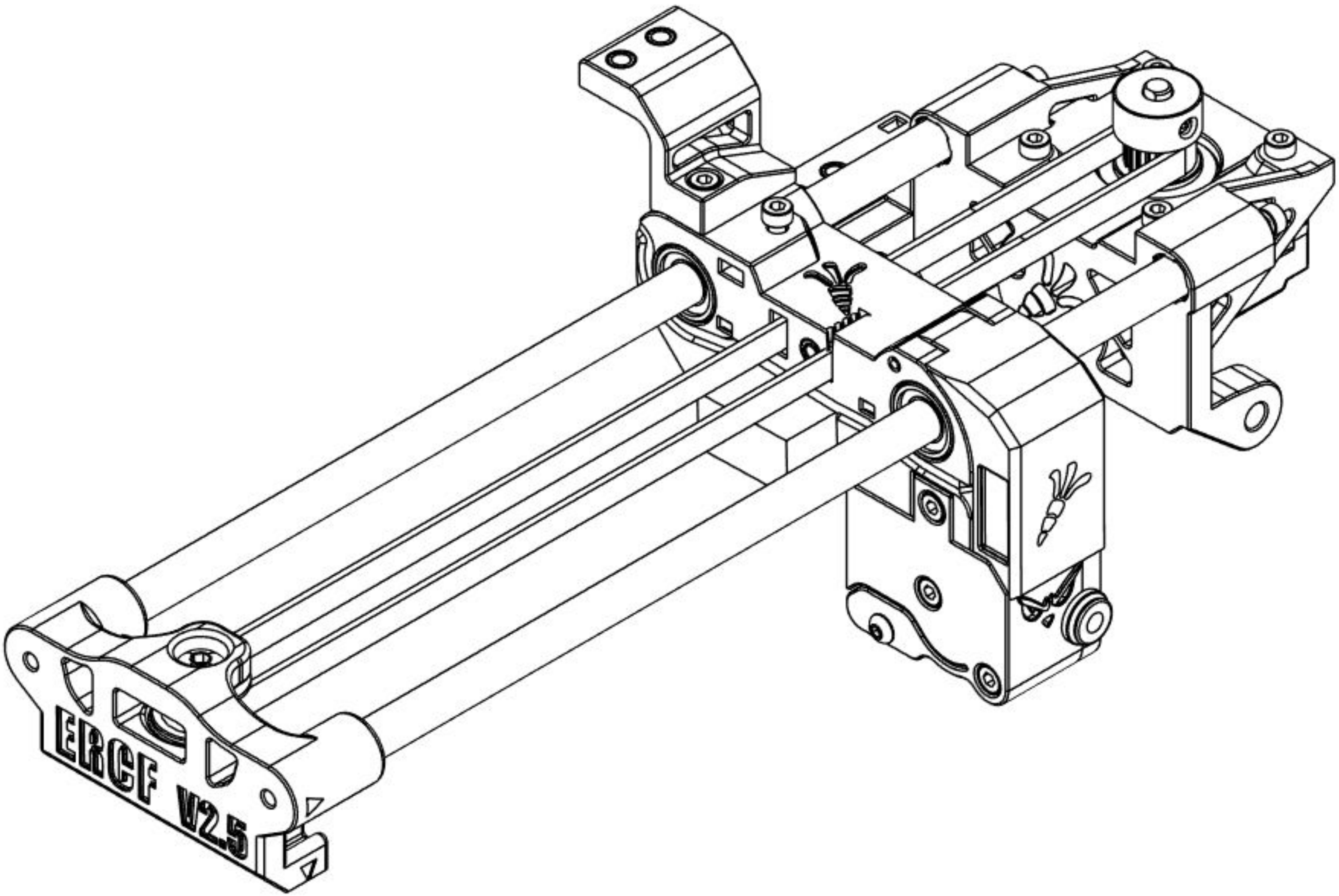
Each bundle of three wires is represented by a single colored line for simplicity.

Infill patterns can vary between materials in multi-material prints. Using a stiffer material for the outer shell of an object and a lighter, more flexible material for the internal structure can reduce weight while maintaining strength, optimizing designs for performance.

OVERVIEW

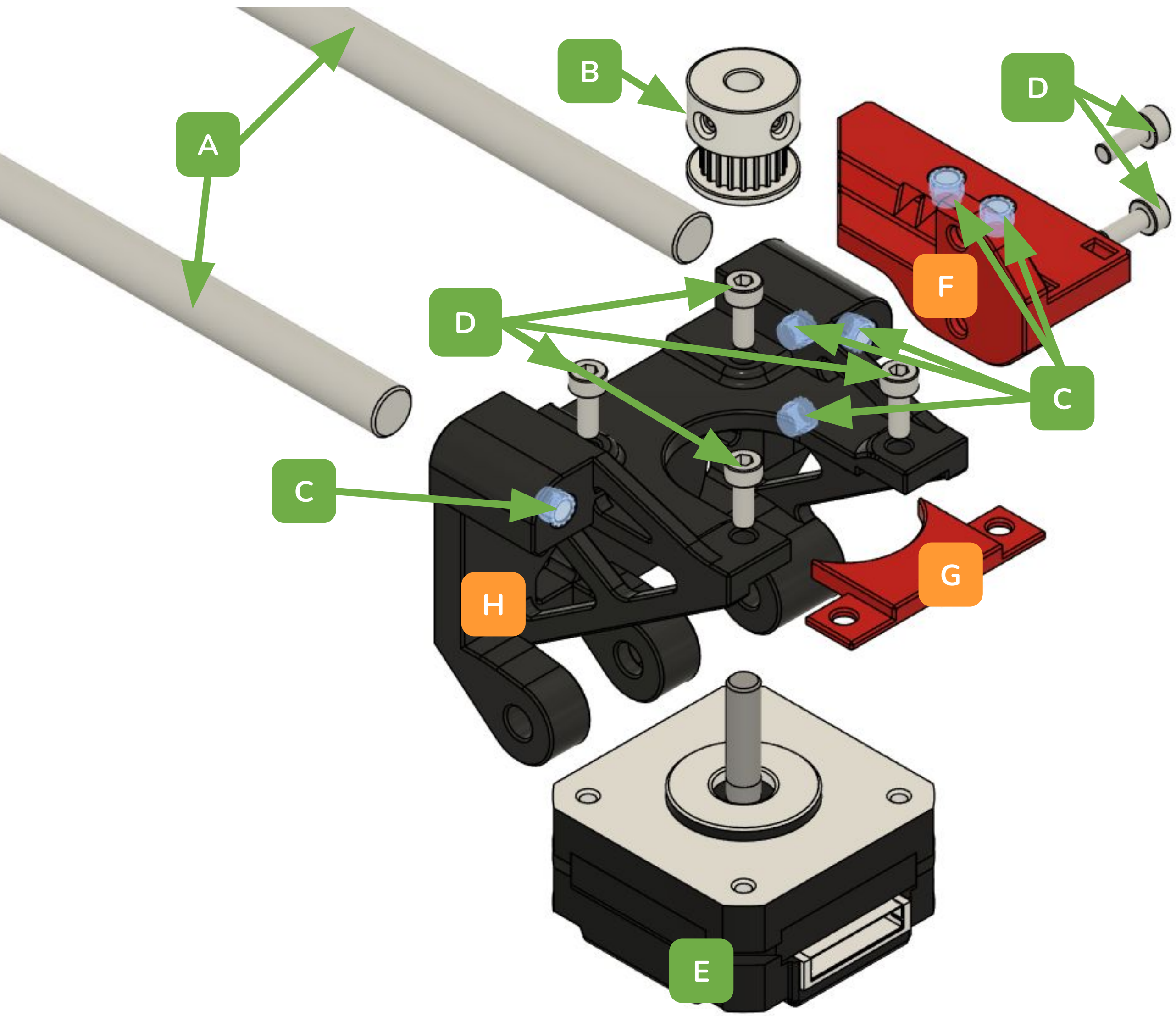


OVERVIEW



LINEAR AXIS HINGE

LINEAR AXIS HINGE EXPLODED VIEW



LINEAR AXIS HINGE SUB-BOM

- A 2x 8mm rods
- B 1x GT2 20T pulley
- C 6x M3 Heatset Inserts
- D 6x M3x8mm SHCS
- E 1x NEMA17 Pancake Motor

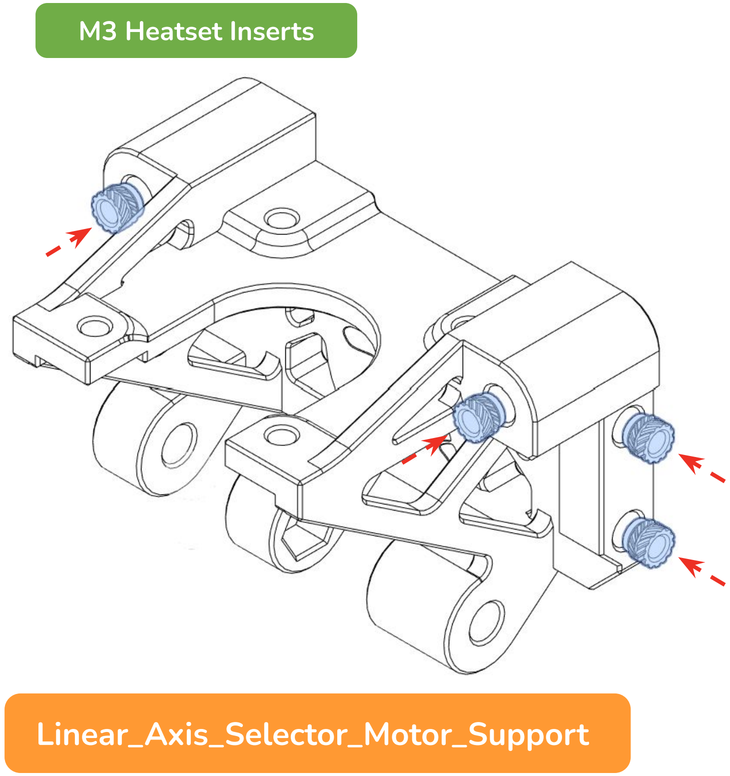
Channels	Rod Length (mm)
N	53 + 23N
4	145
5	168
6	191
7	214
8	237
9	260
10	283
11	306
12	329
13	352
14	375
15	398

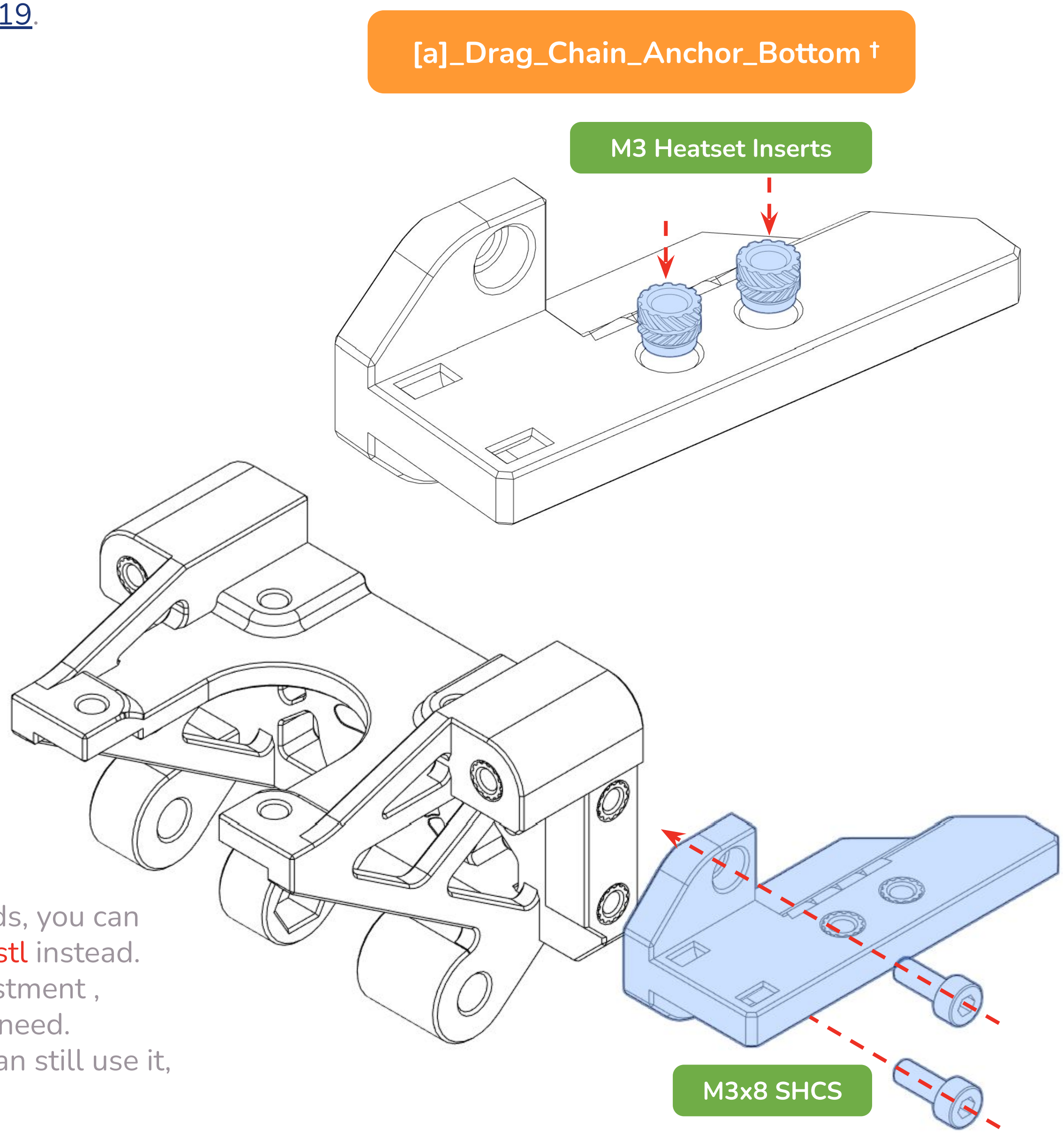
- F 1x [a]_Drag_Chain_Anchor_Bottom.stl †
- G 1x [a]_Motor_Lock.stl †
- H 1x Linear_Axis_Selector_Motor_Support.stl

SELECTOR MOTOR SUPPORT

8.1 HEATSET INSERTS

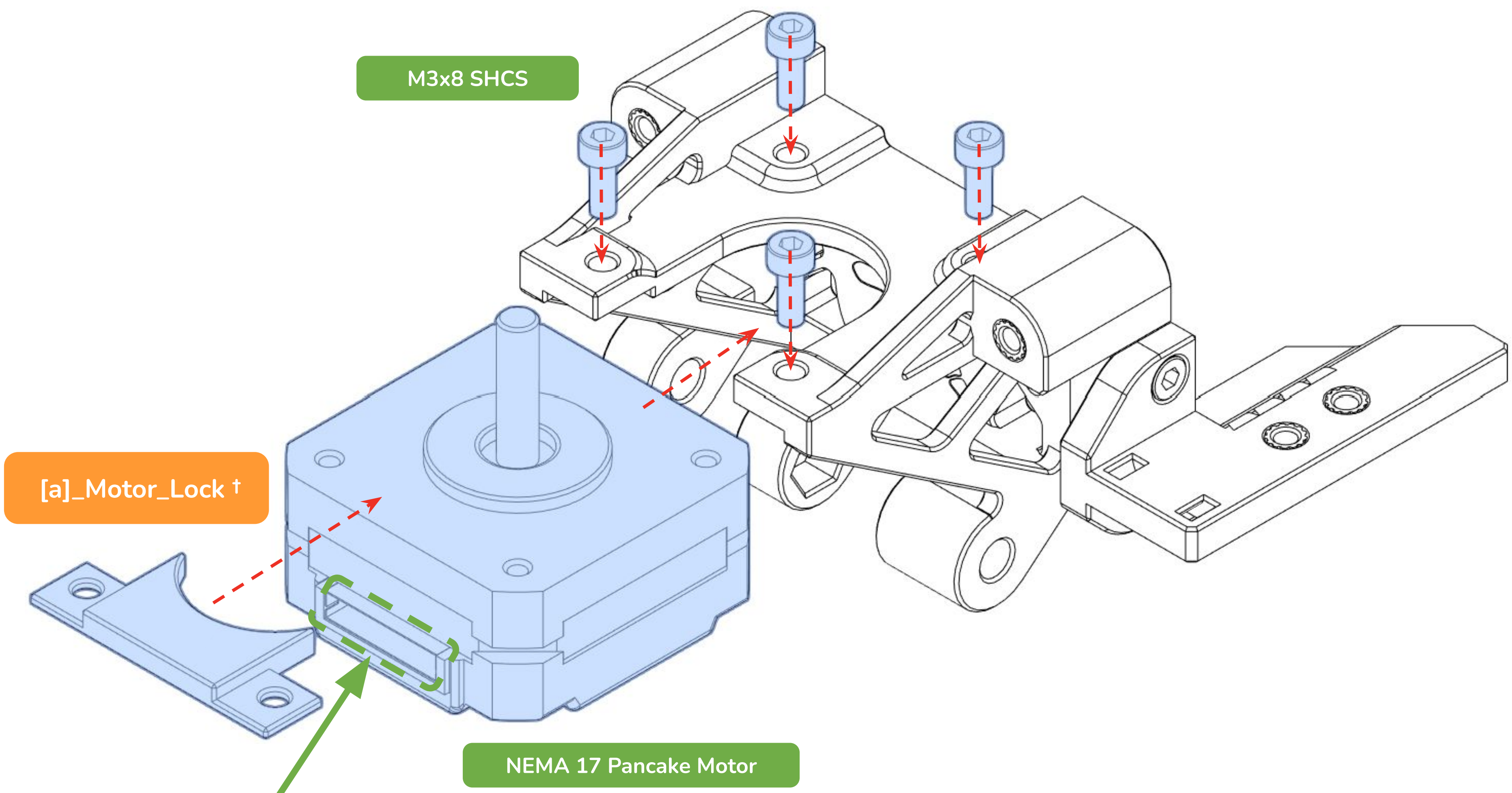
The list of pages with heatset inserts is on Page 19.





If you are using a kit or have precision-cut 8mm rods, you can use Linear_Axis_Selector_Motor_Support_Precise.stl instead. The "precise" version doesn't have the length adjustment , heatsets / screws which imprecise or self-cut rods need.
If you've already printed the original version, you can still use it,

SELECTOR MOTOR SUPPORT



8.1 MOTOR WIRES
Make sure the wires of the motor are coming out from this side.

LINEAR AXIS IDLER

LINEAR AXIS IDLER SUB-BOM

A 1x GT2 20-tooth idler
B 1x M5x16mm BHCS
C 1x M5 Nylock nut

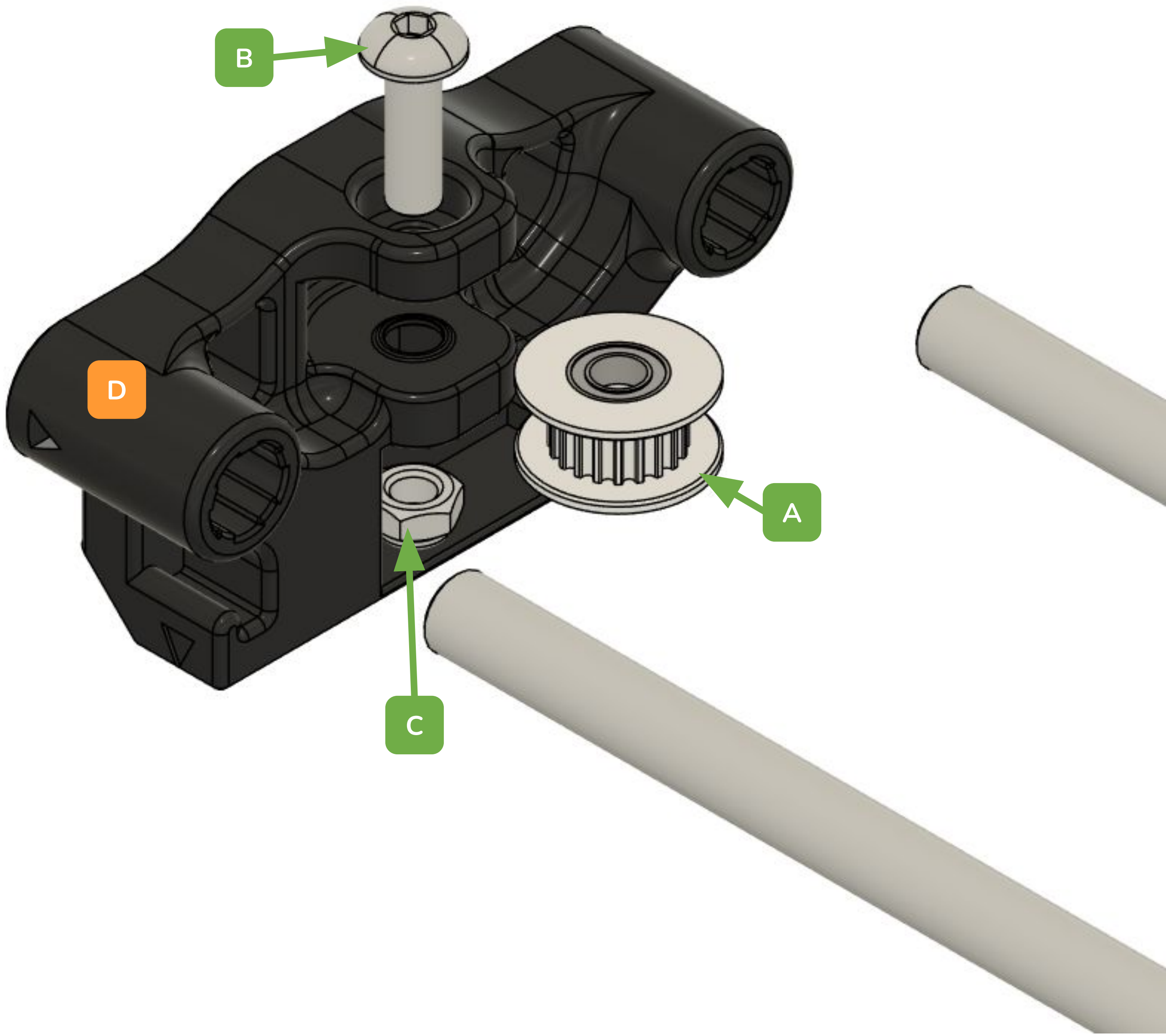
Not shown: GT2 Belt

D 1x Linear_Axis_Idler_Block.stl

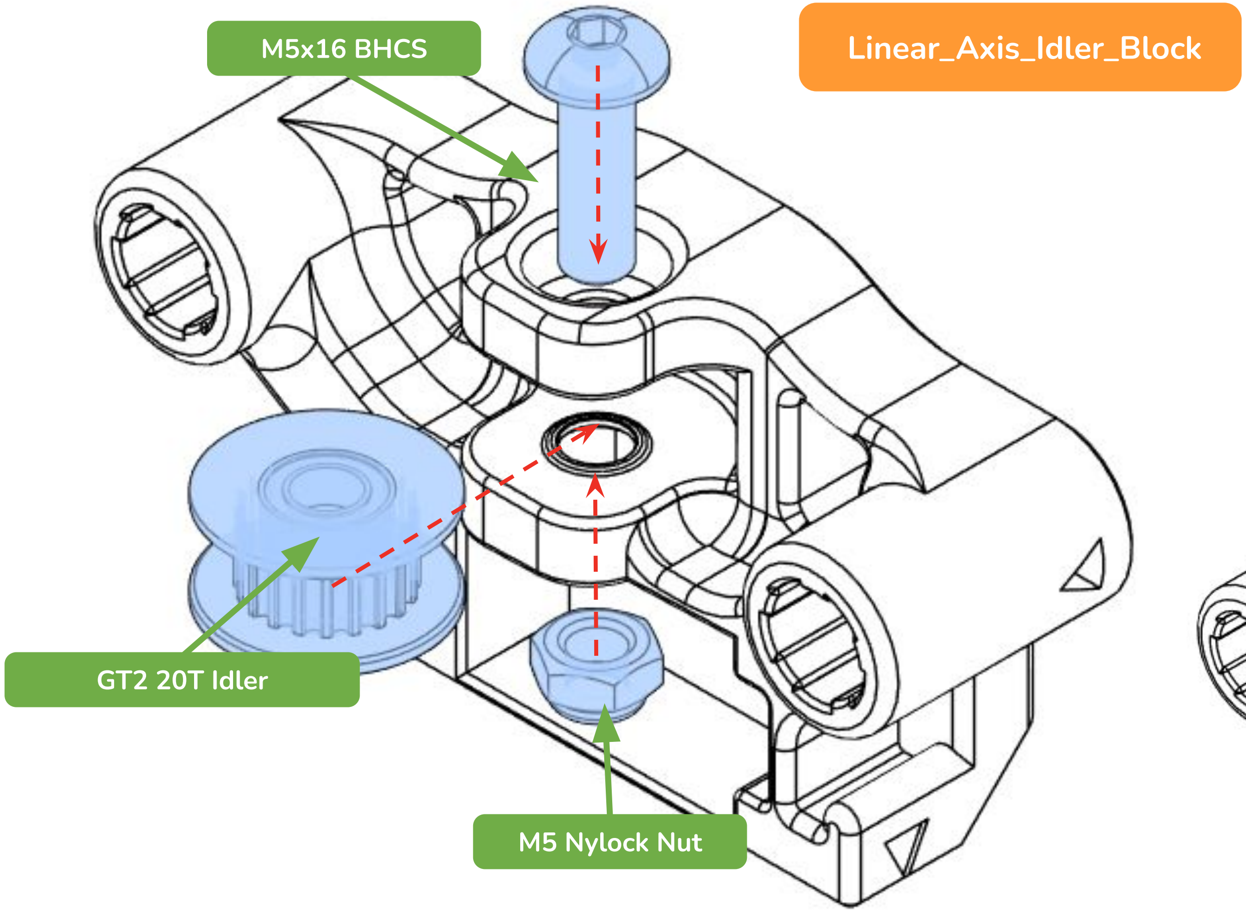
Channels	Approx Belt Length (mm)
N	165 + 46N
4	349
5	395
6	441
7	487
8	533
9	579
10	625
11	671
12	717
13	763
14	809
15	855

(Includes 10mm spare length)

LINEAR AXIS IDLER EXPLODED VIEW



IDLER BLOCK



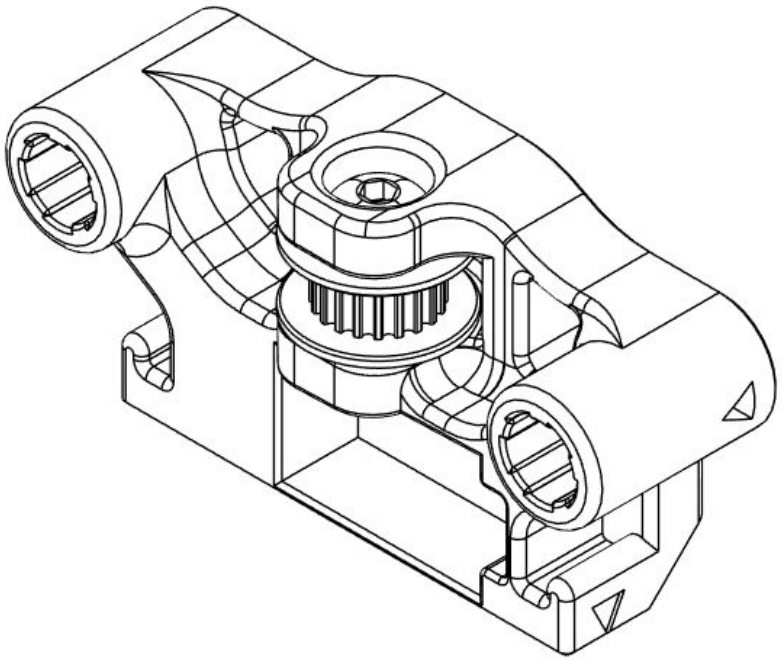
8.2 ASSEMBLE IDLER BLOCK

Fully insert the M5 locking nut into its cavity.
Slide the GT2 Idler into its cavity.

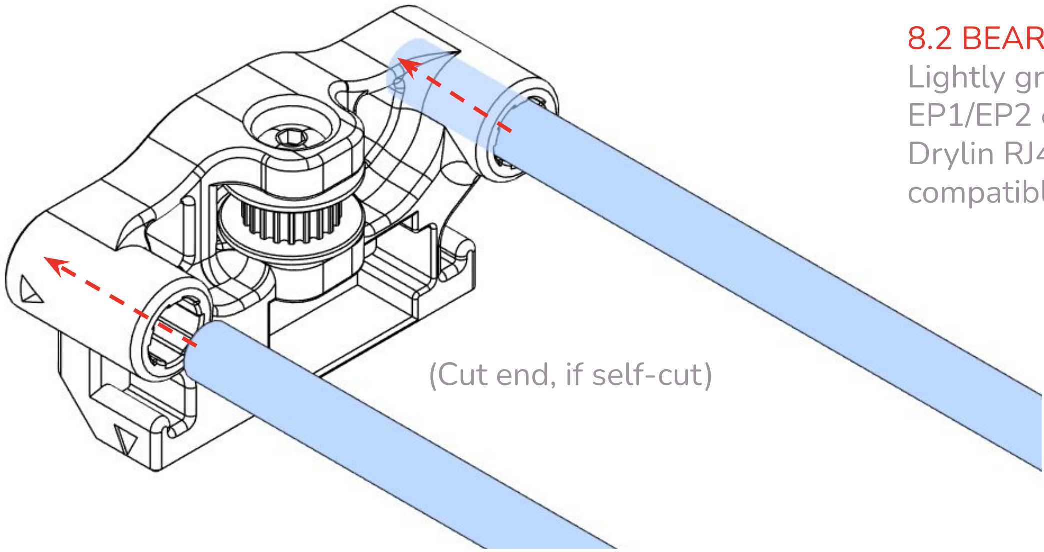
Insert the M5x16mm bolt and tighten it until snug, but not super tight. It's an idler, it needs to spin freely.

If you have a 10mm tall idler instead of a 9mm tall idler (such as provided in an LDO kit), there is a 10mm version of the Idler_Block here:

User_Mods \ Miriax \
Linear_Axis_Idler_Block_for_10mm_Idlers \
Linear_Axis_Idler_Block_for_10mm_Idlers.stl



IDLER ASSEMBLY



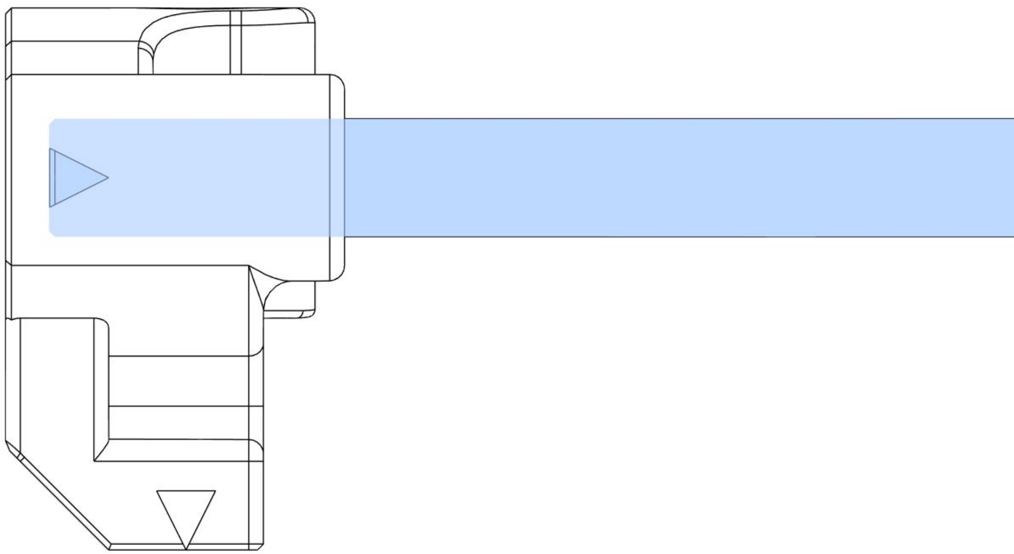
8.2 BEARING PREPARATION

Lightly grease the LM8UU bearing`s using EP1/EP2 or Superlube grease.
Drylin RJ4JP-01-08 style bearings are not compatible with this Selector!

8.2 IDLER SIDE

Carefully insert the 8mm Smooth Rods into the Idler_Block, until they bottom out.

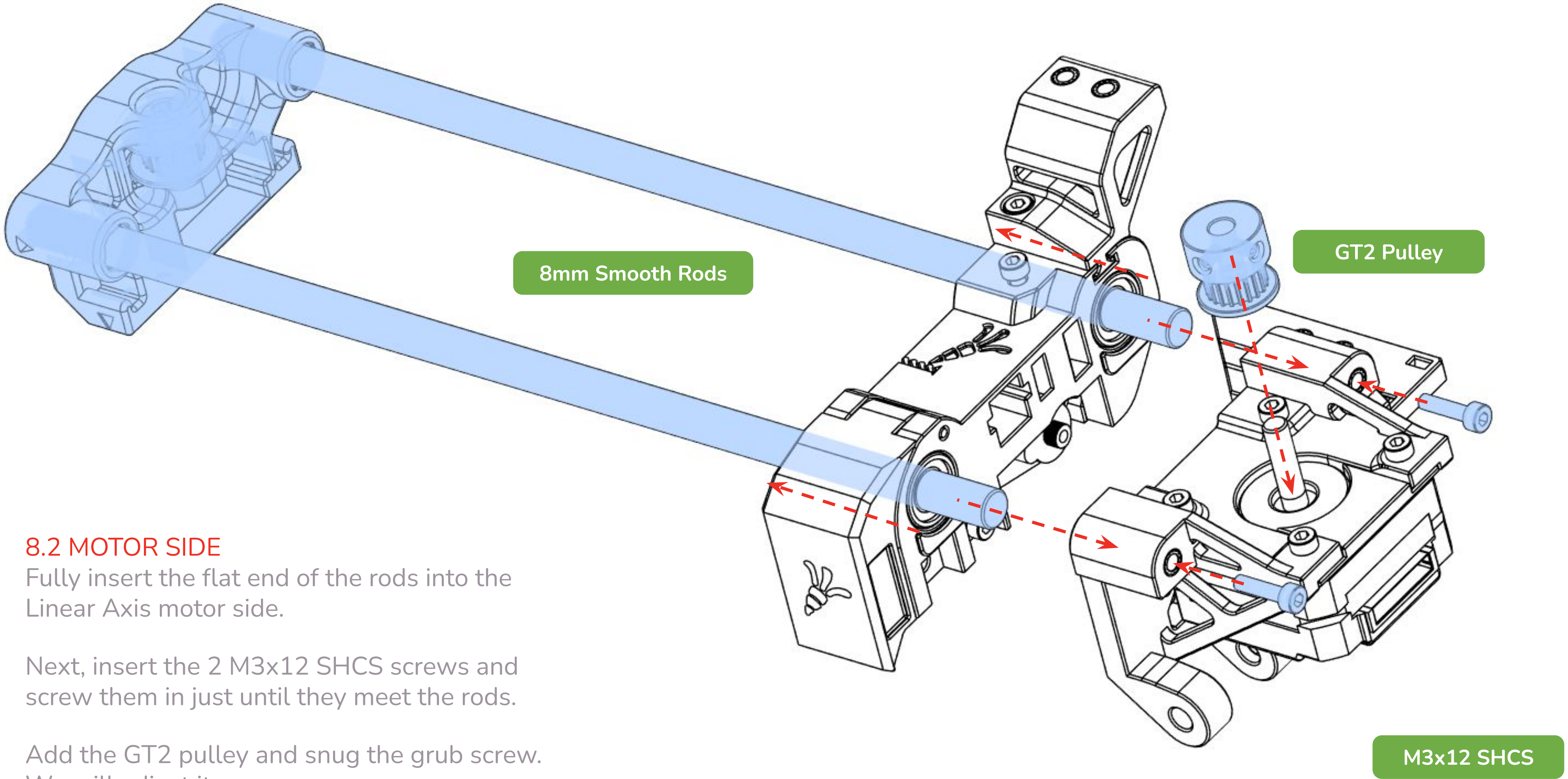
There are sight holes on the sides of the Idler_Block to check if the rods are fully seated, and holes at the end to allow you to eject them if necessary.



AXIS ASSEMBLY

8.2 SELECTOR

Insert the 8mm rods into the Selector's LM8UU bearings as shown. They should roll smoothly now that the rods are more confined.



8.2 MOTOR SIDE

Fully insert the flat end of the rods into the Linear Axis motor side.

Next, insert the 2 M3x12 SHCS screws and screw them in just until they meet the rods.

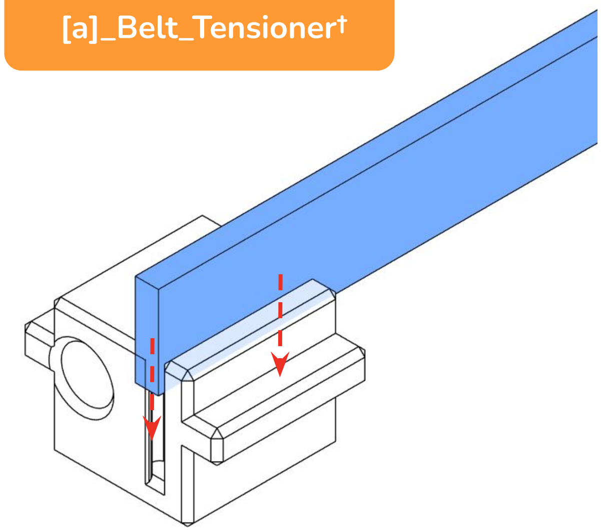
Add the GT2 pulley and snug the grub screw. We will adjust it soon.

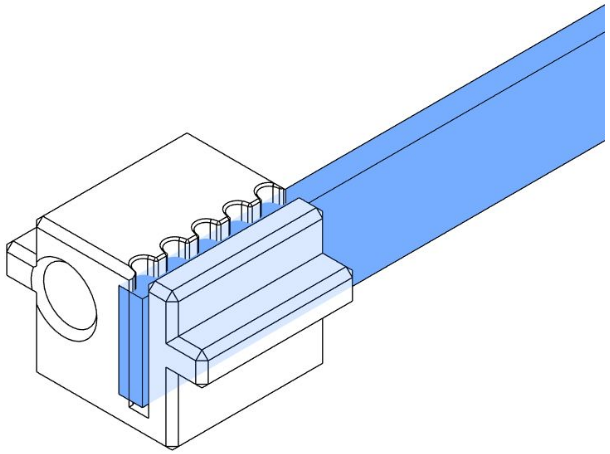
8.3 BELT PREPARATION

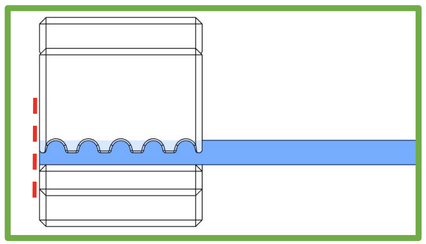
First, cut your belt to the length prescribed in the table to the right.

Next, install the belt into the Belt_Tensioner by pushing the end of the belt into the toothed slot on the top. You may need to use a flathead screwdriver or the dull side of a hobby knife to push the belt fully into place. Trim any overhanging belt.

[a]_Belt_Tensioner†







Channels	Belt Length (mm)
N	165 + 46N
4	349
5	395
6	441
7	487
8	533
9	579
10	625
11	671
12	717
13	763
14	809
15	855

Includes 15mm adjustment length

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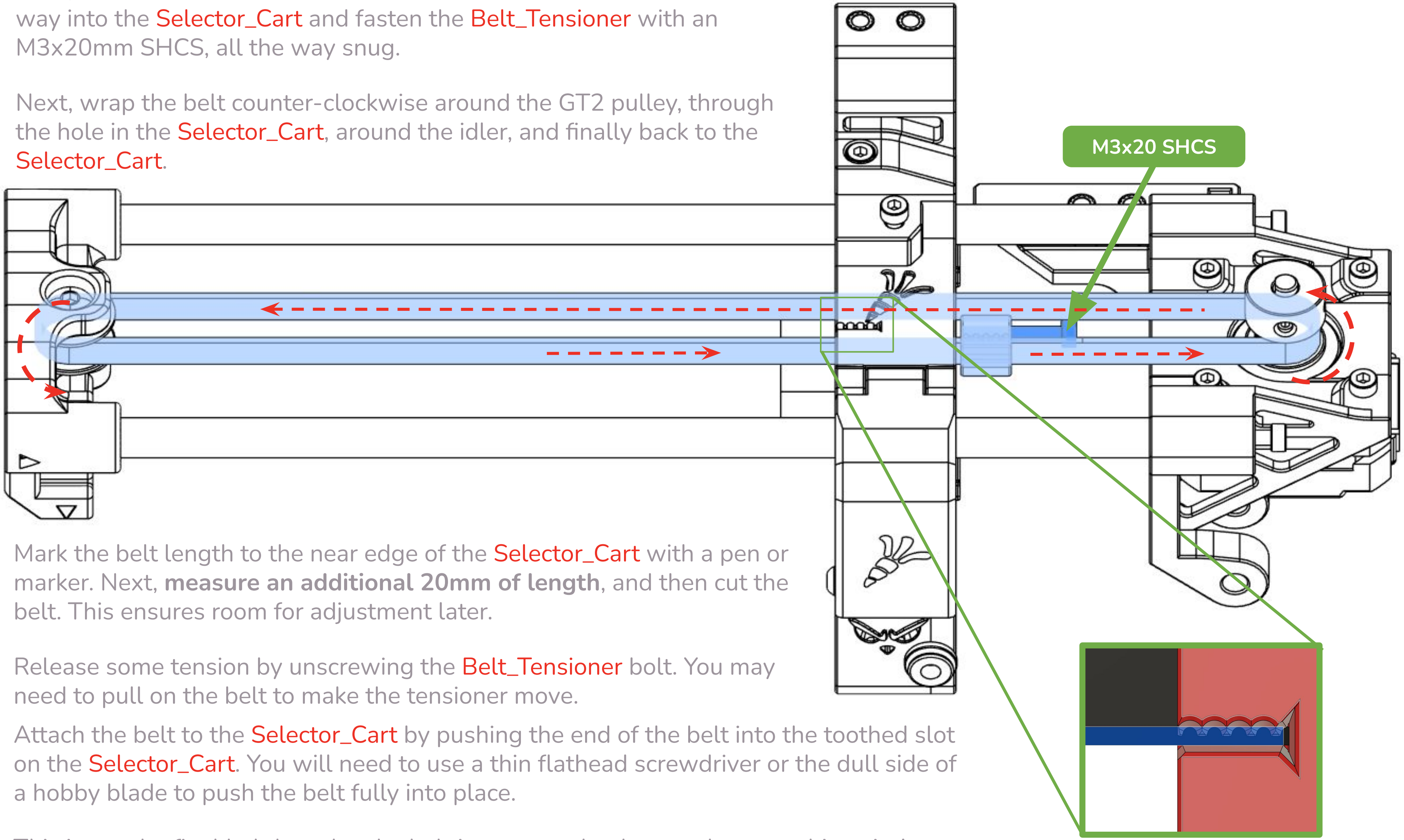
8.3 BELT INSTALLATION

Next, install the Belt_Tensioner into the Selector_Cart. Push it all the way into the Selector_Cart and fasten the Belt_Tensioner with an M3x20mm SHCS, all the way snug.

Next, wrap the belt counter-clockwise around the GT2 pulley, through the hole in the Selector_Cart, around the idler, and finally back to the Selector_Cart.



Mark the belt length to the near edge of the Selector_Cart with a pen or marker. Next, **measure an additional 20mm of length**, and then cut the belt. This ensures room for adjustment later.

Release some tension by unscrewing the Belt_Tensioner bolt. You may need to pull on the belt to make the tensioner move.

Attach the belt to the Selector_Cart by pushing the end of the belt into the toothed slot on the Selector_Cart. You will need to use a thin flathead screwdriver or the dull side of a hobby blade to push the belt fully into place.

This is not the final belt length - the belt is supposed to be very loose at this point!

Multi-material bioprinting is being explored for medical applications. Researchers are developing methods to print with biological materials like hydrogels and living cells, allowing for the creation of complex tissues that mimic the structure of human organs.

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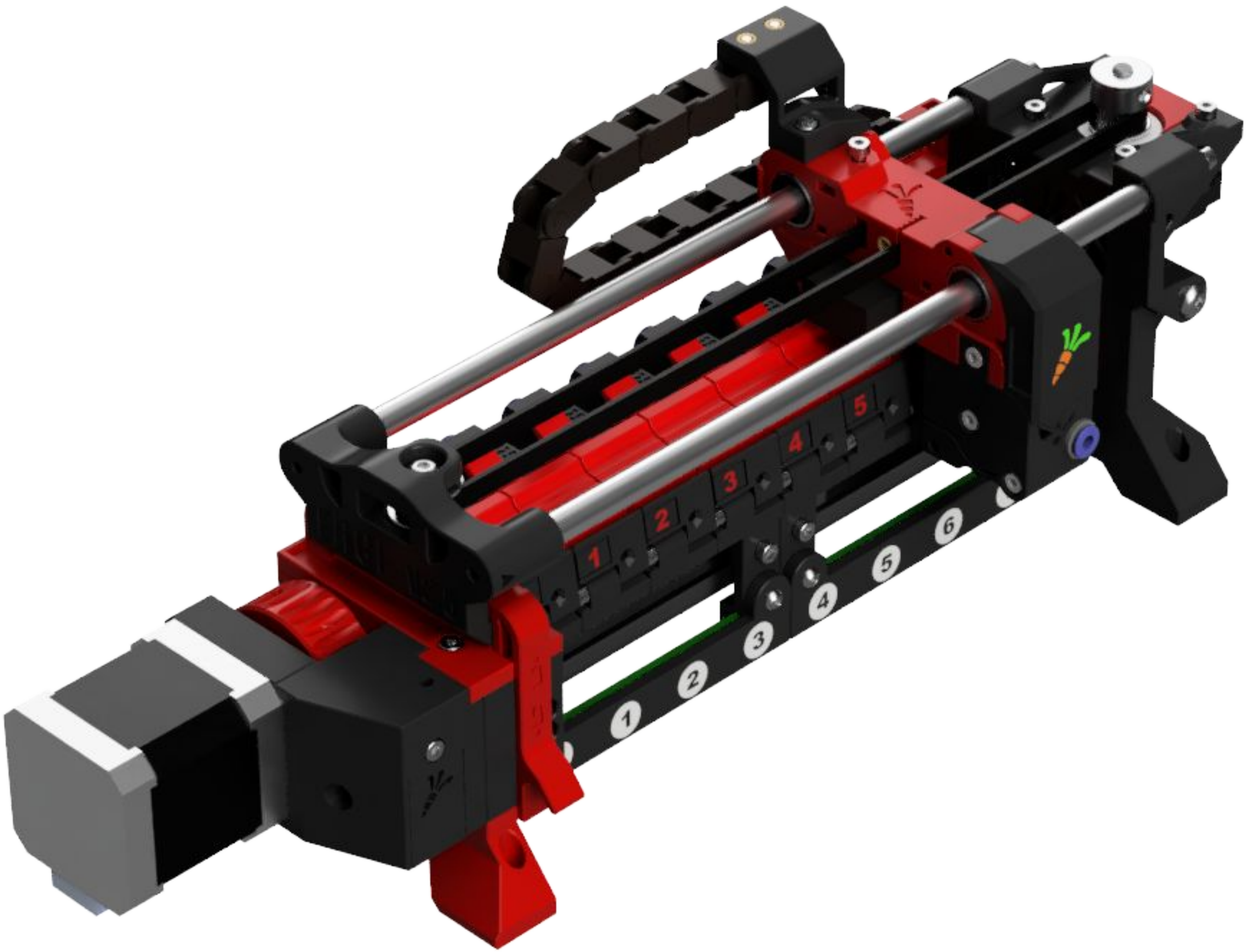
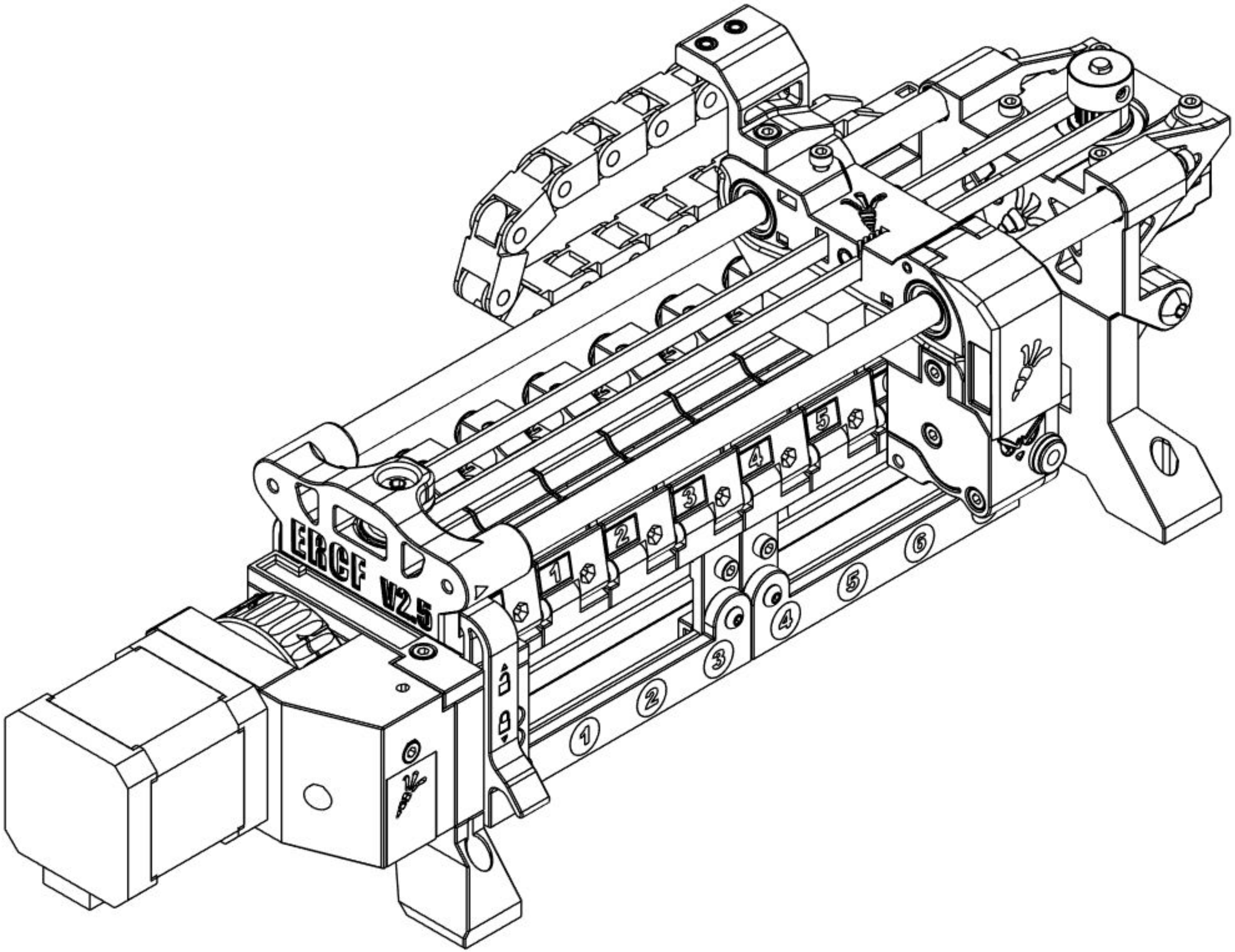
OVERVIEW



OVERVIEW



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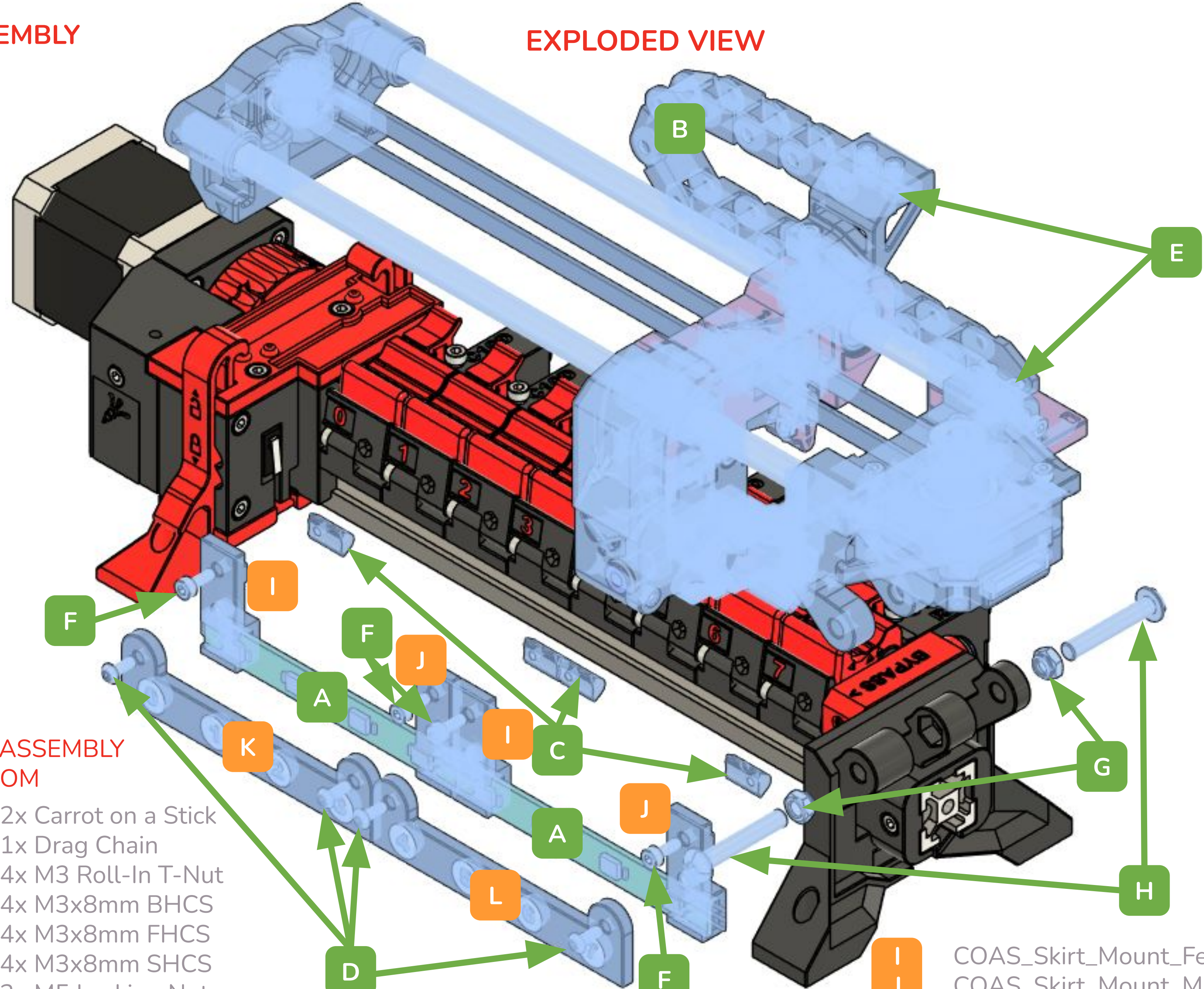
FINAL ASSEMBLY

EXPLODED VIEW

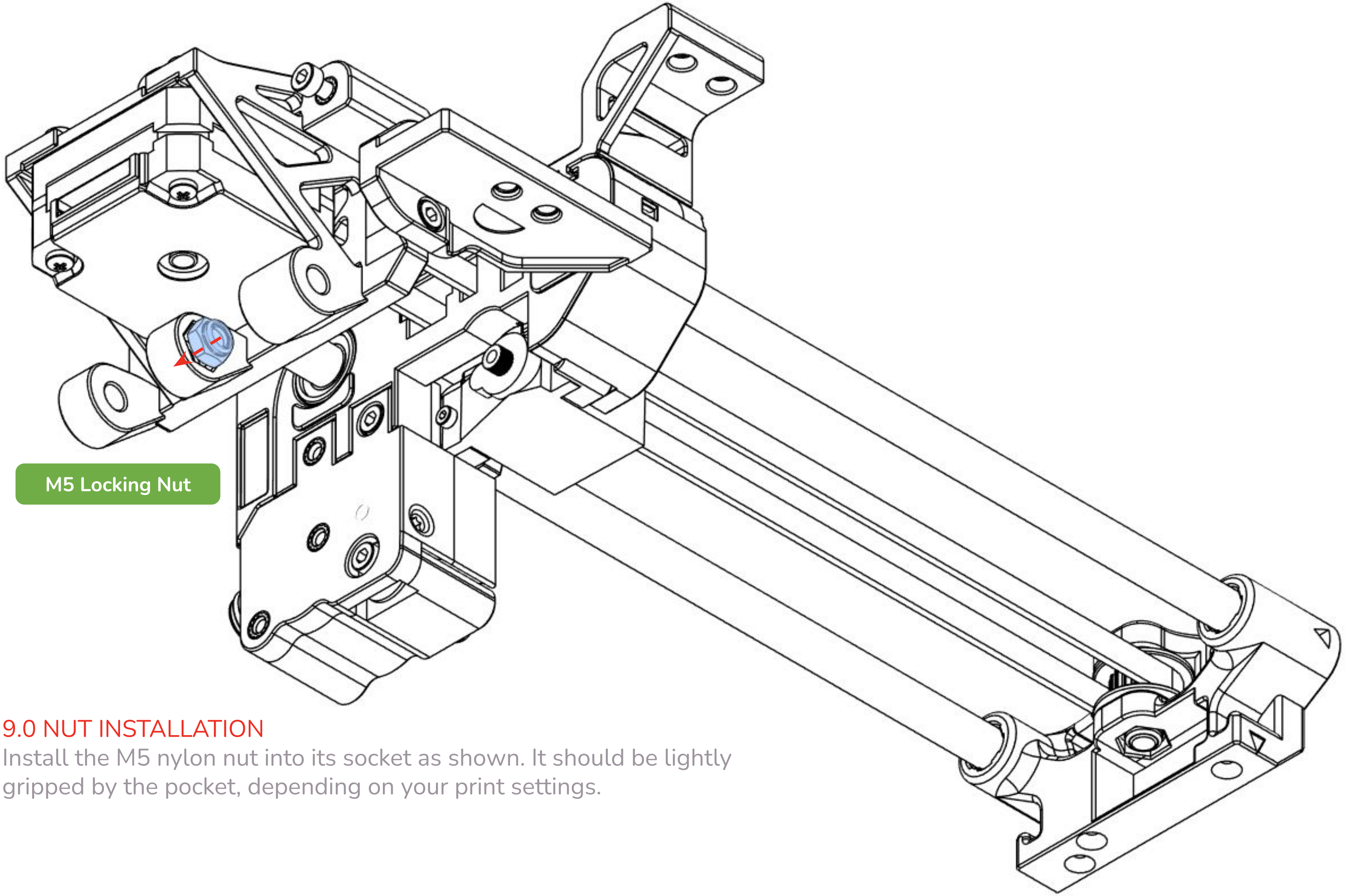


FINAL ASSEMBLY SUB-BOM

A	2x Carrot on a Stick
B	1x Drag Chain
C	4x M3 Roll-In T-Nut
D	4x M3x8mm BHCS
E	4x M3x8mm FHCS
F	4x M3x8mm SHCS
G	2x M5 Locking Nut
H	2x M5x30mm BHCS

I	COAS_Skirt_Mount_Female_v02.stl
J	COAS_Skirt_Mount_Male_v02.stl
K	COAS_Lens_Bracket_0-3.3mf
L	COAS_Lens_Bracket_4-7.3mf

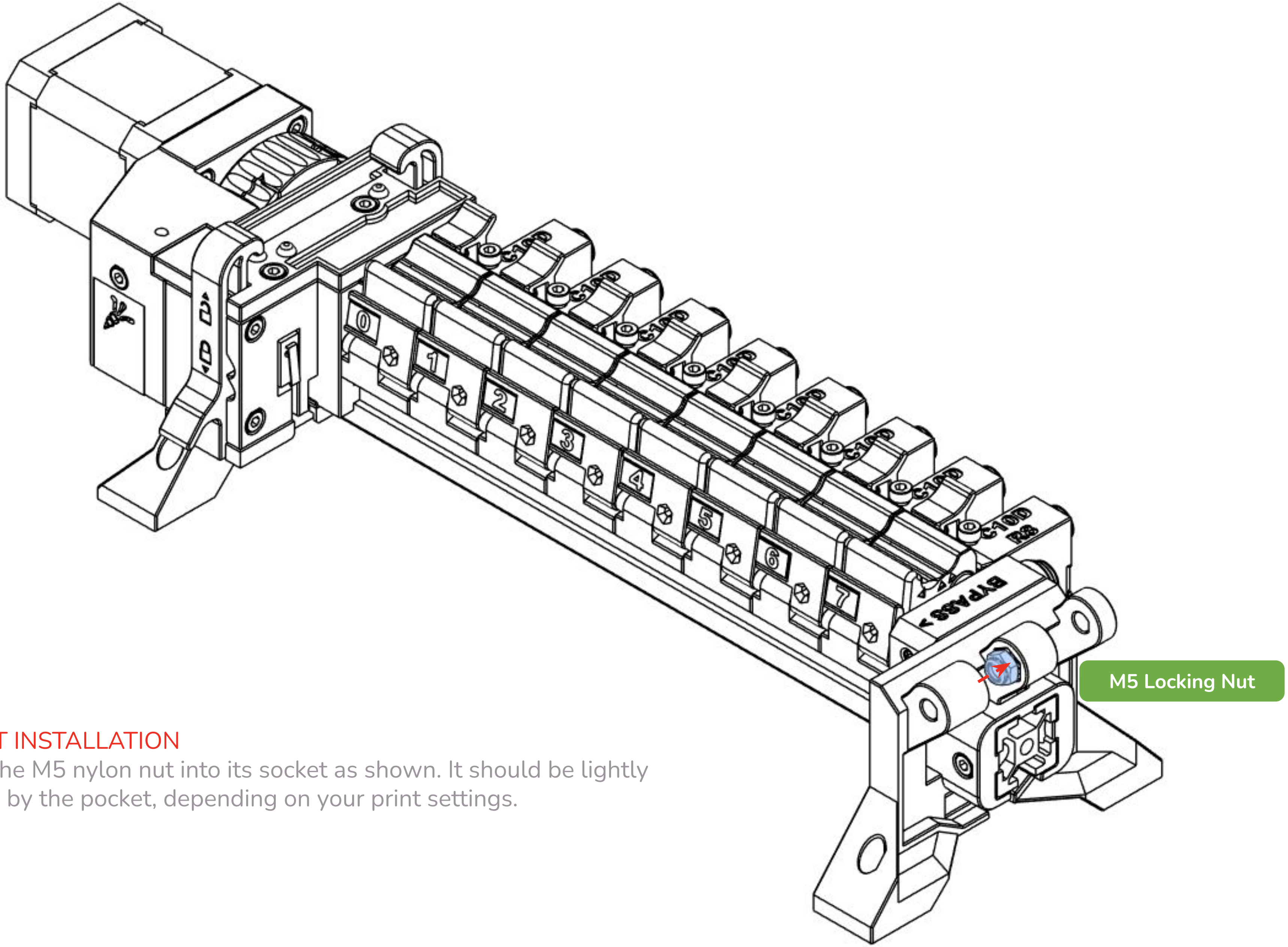
ADDING THE LOCKING NUTS



9.0 NUT INSTALLATION

Install the M5 nylon nut into its socket as shown. It should be lightly gripped by the pocket, depending on your print settings.

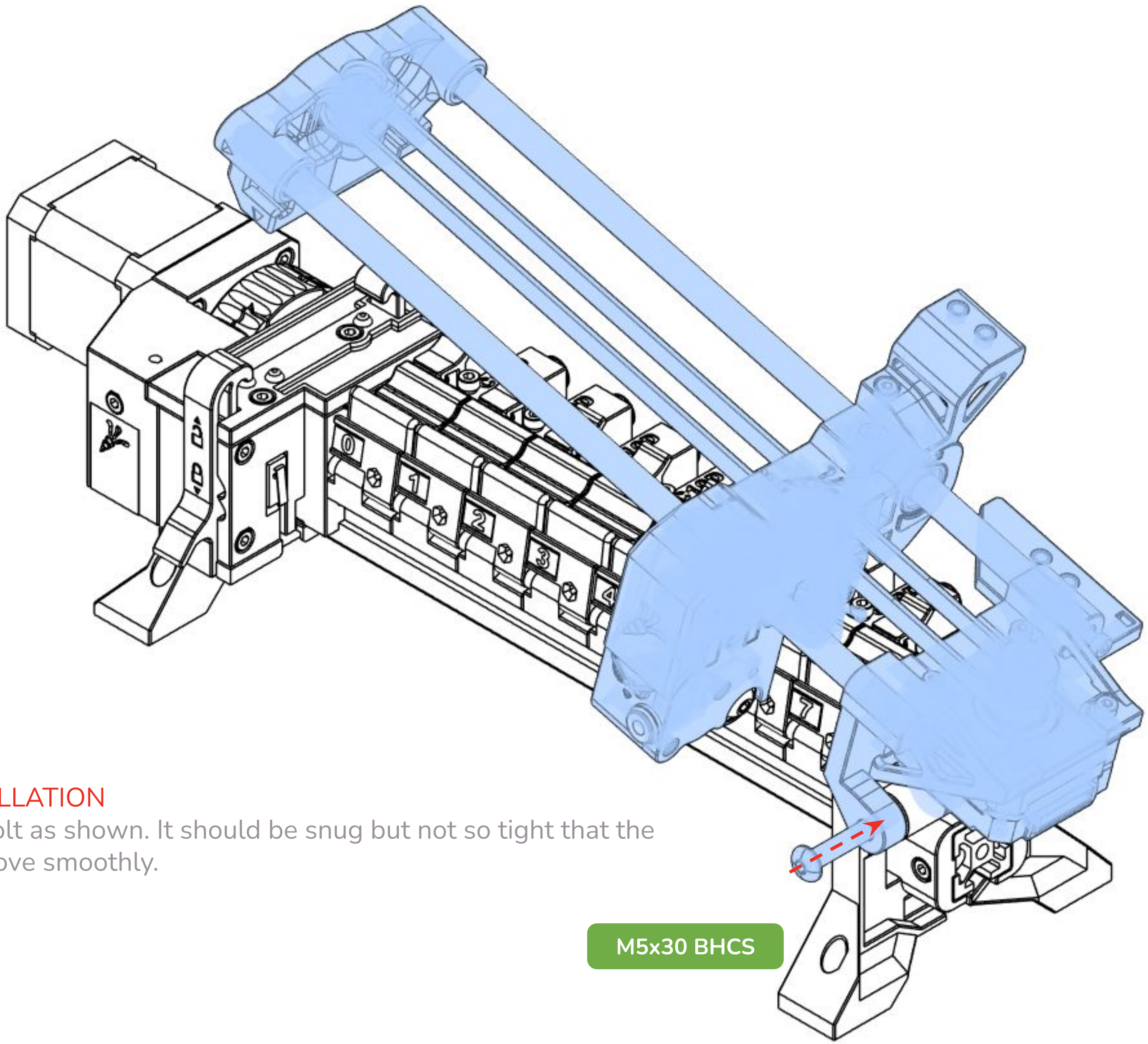
ADDING THE LOCKING NUTS



9.0 NUT INSTALLATION

Install the M5 nylon nut into its socket as shown. It should be lightly gripped by the pocket, depending on your print settings.

JOINING THE TWO BLOCKS

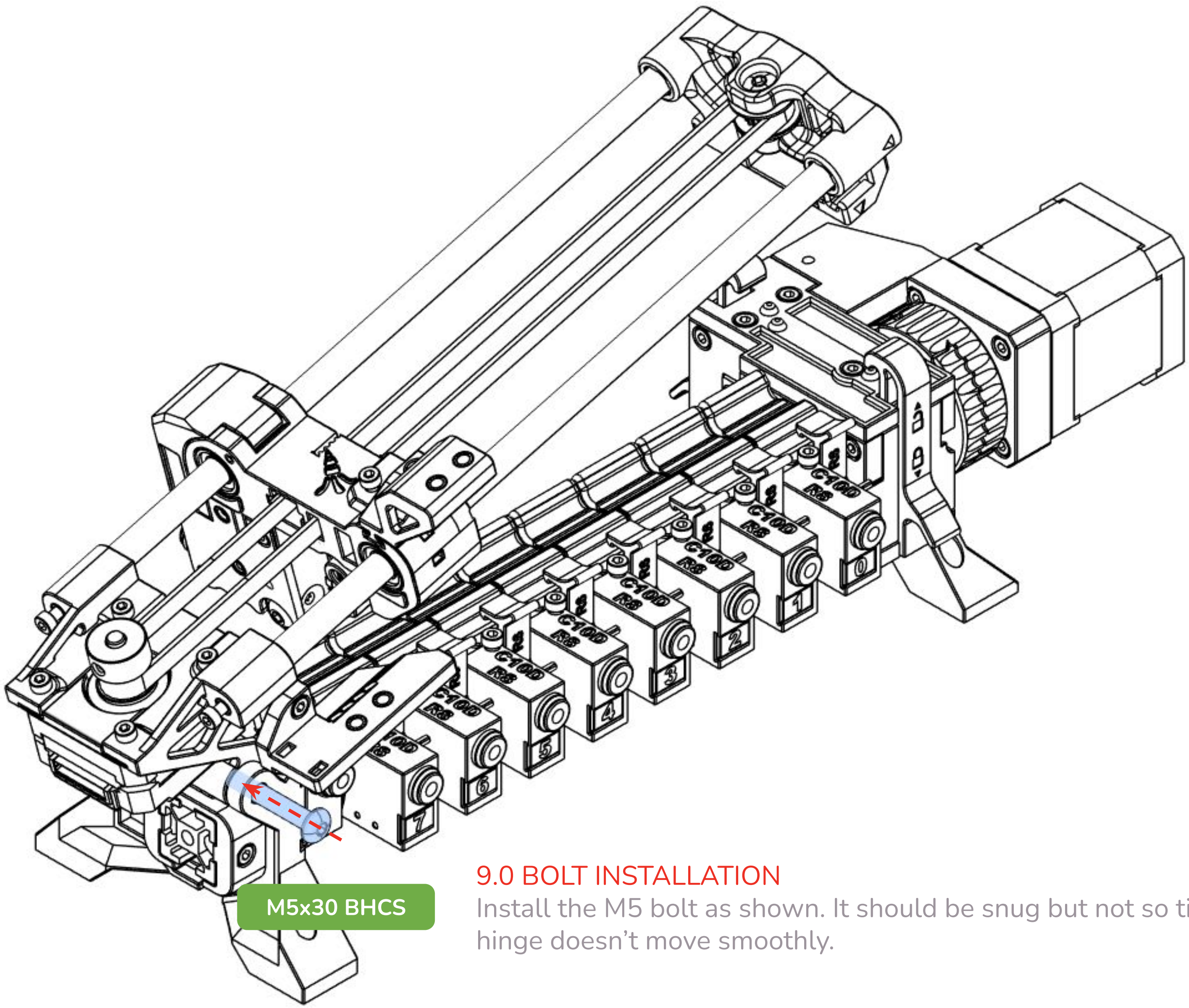


9.0 BOLT INSTALLATION

Install the M5 bolt as shown. It should be snug but not so tight that the hinge doesn't move smoothly.

M5x30 BHCS

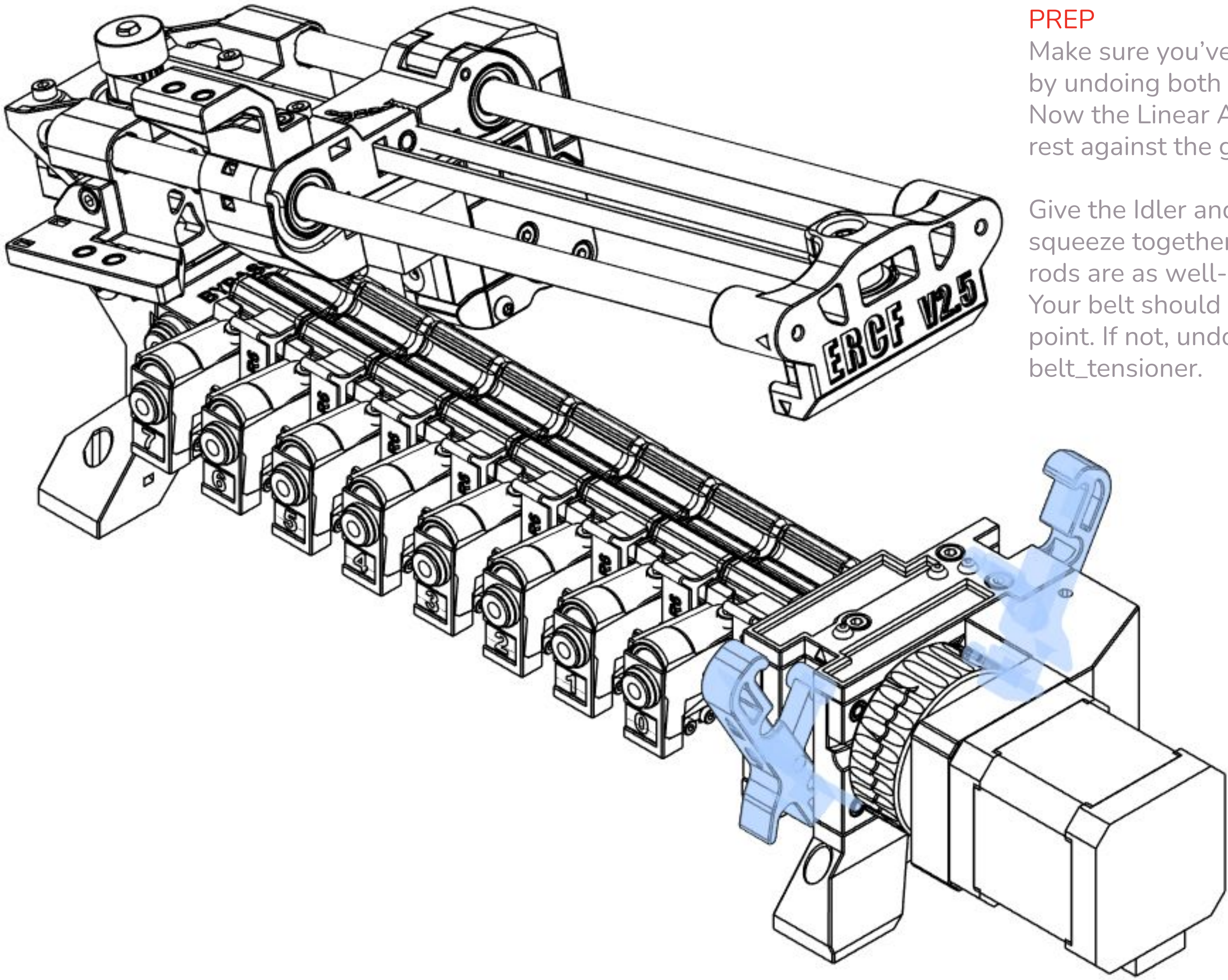
JOINING THE TWO BLOCKS



9.0 BOLT INSTALLATION

Install the M5 bolt as shown. It should be snug but not so tight that the hinge doesn't move smoothly.

IDLER POSITION ADJUSTMENT

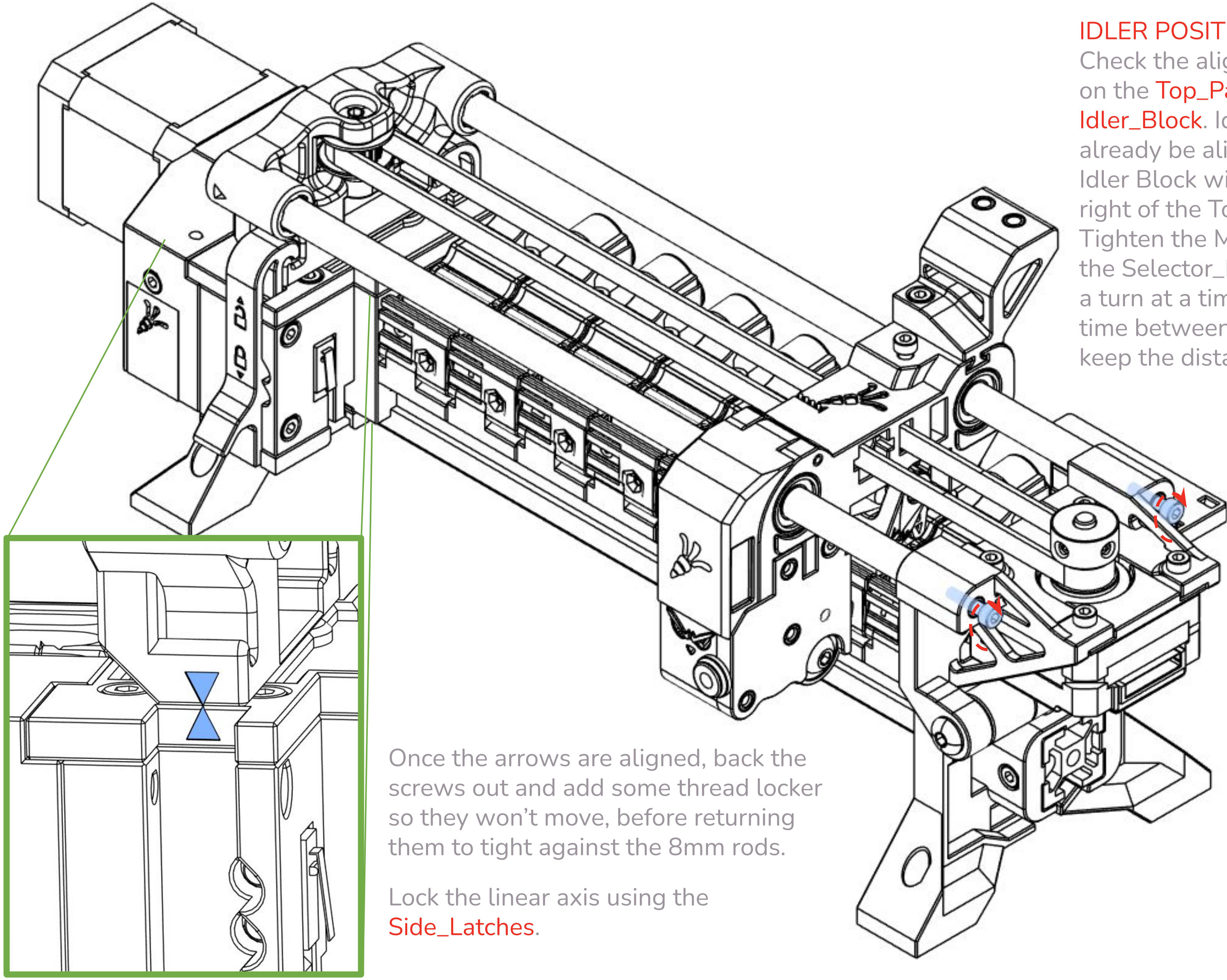


PREP

Make sure you've unlocked the linear axis by undoing both of the Side_Latches. Now the Linear Axis can finally come to a rest against the gear axis.

Give the Idler and Motor end a good squeeze together to make sure the 8mm rods are as well-seated as possible. Your belt should be very loose at this point. If not, undo the bolt to the belt_tensioner.

IDLER POSITION ADJUSTMENT



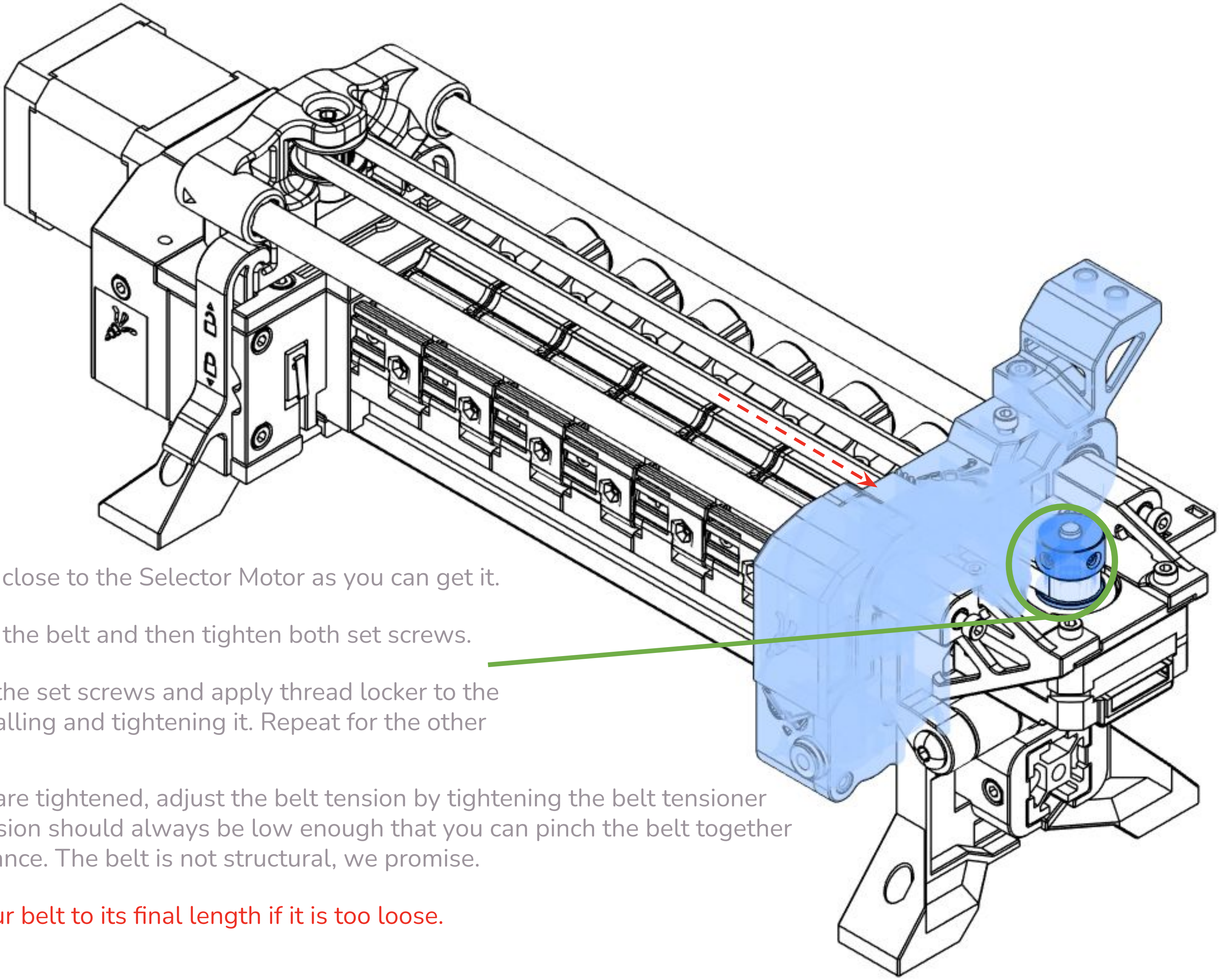
IDLER POSITION

Check the alignment indicators on the Top_Panel and the Idler_Block. Ideally, they will already be aligned. Usually, the Idler Block will be a little to the right of the Top Panel.
Tighten the M3x12mm screws on the Selector_Motor_Support half a turn at a time, switching each time between the two screws to keep the distance even.

Once the arrows are aligned, back the screws out and add some thread locker so they won't move, before returning them to tight against the 8mm rods.

Lock the linear axis using the Side_Latches.

TENSIONING THE BELT



SET SCREWS

Move the Selector as close to the Selector Motor as you can get it.

Align the pulley with the belt and then tighten both set screws.

Next, remove one of the set screws and apply thread locker to the threads before reinstalling and tightening it. Repeat for the other screw.

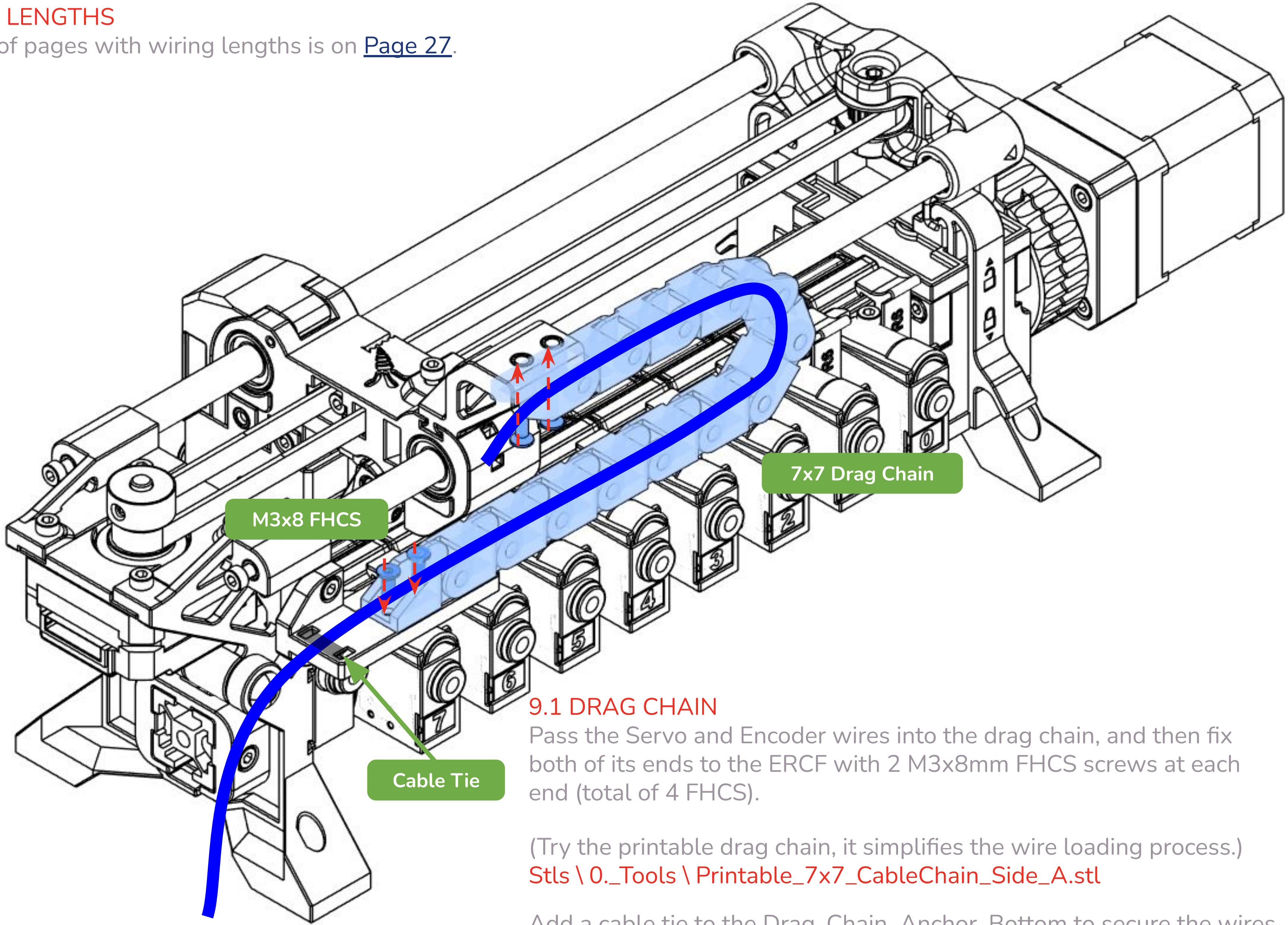
Once the set screws are tightened, adjust the belt tension by tightening the belt tensioner M3x20. Your belt tension should always be low enough that you can pinch the belt together with very little resistance. The belt is not structural, we promise.

Now you can trim your belt to its final length if it is too loose.

DRAG CHAIN

WIRING LENGTHS

The list of pages with wiring lengths is on Page 27.



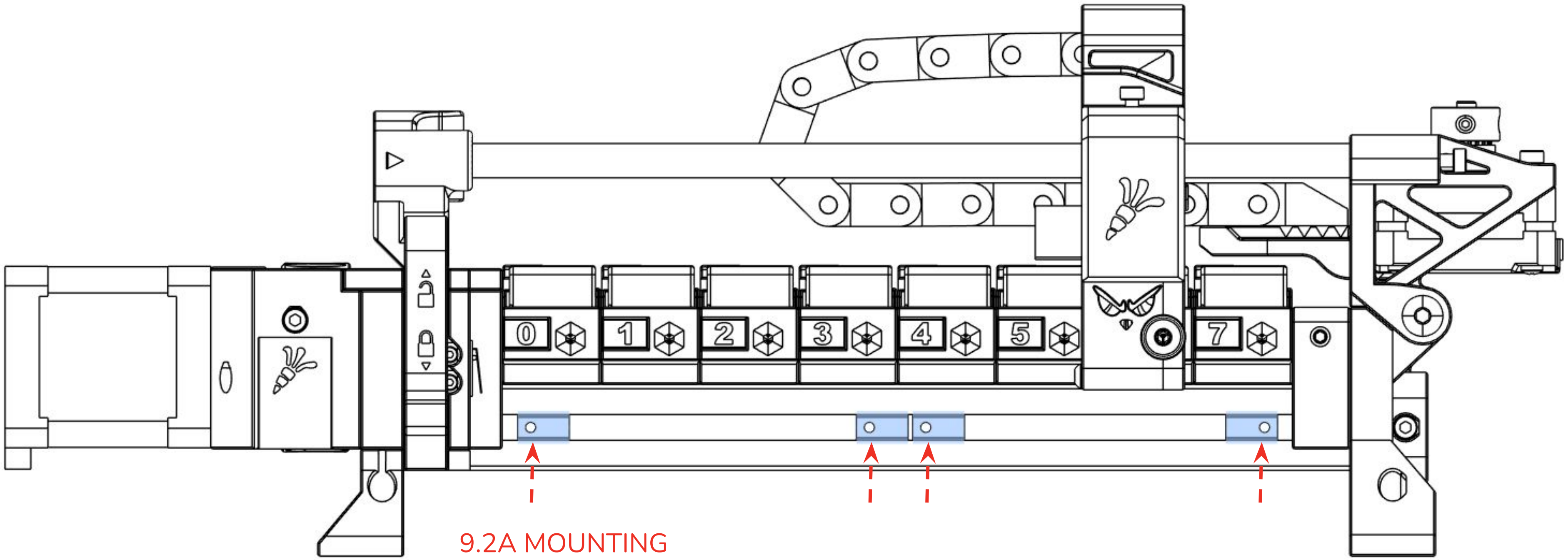
9.1 DRAG CHAIN

Pass the Servo and Encoder wires into the drag chain, and then fix both of its ends to the ERCF with 2 M3x8mm FHCS screws at each end (total of 4 FHCS).

(Try the printable drag chain, it simplifies the wire loading process.)
Stls \ 0._Tools \ Printable_7x7_CableChain_Side_A.stl

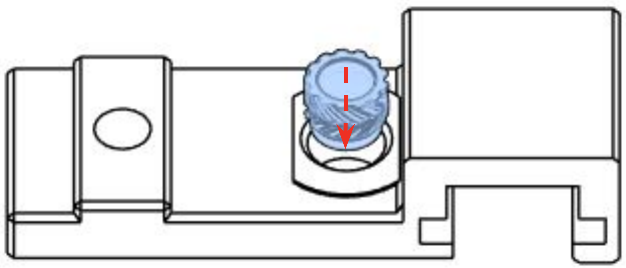
Add a cable tie to the Drag_Chain_Anchor_Bottom to secure the wires.

COAS MOUNTING



9.2A MOUNTING

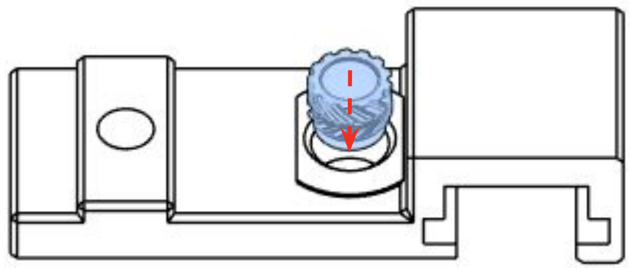
Roll 4 M3 roll-in nuts into the front channel of the 2020 as shown.
Note the last nut is flipped in order to fit in the space allowed.



COAS_Holder_Female_x2

9.2A HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.



COAS_Holder_Male_x2

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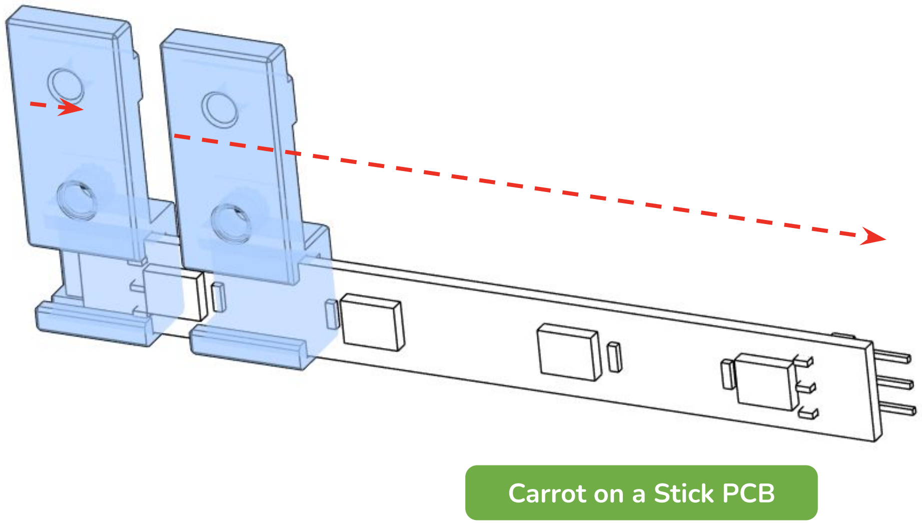
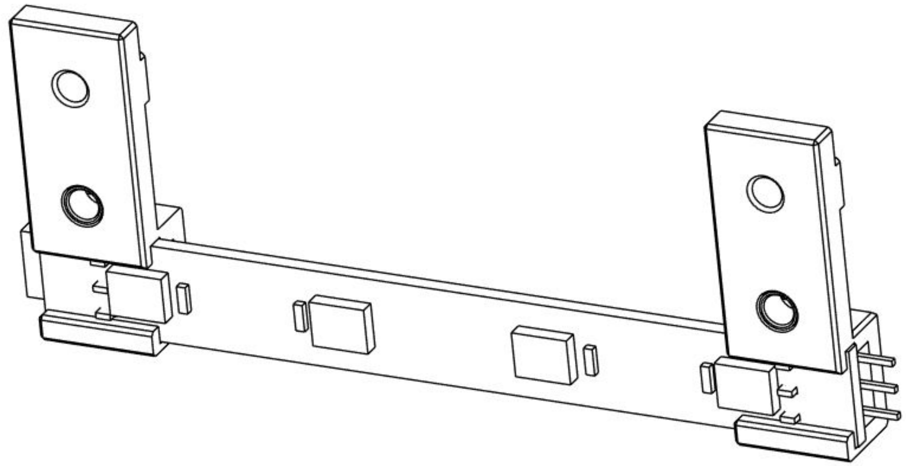
FINAL ASSEMBLY

COAS MOUNTING



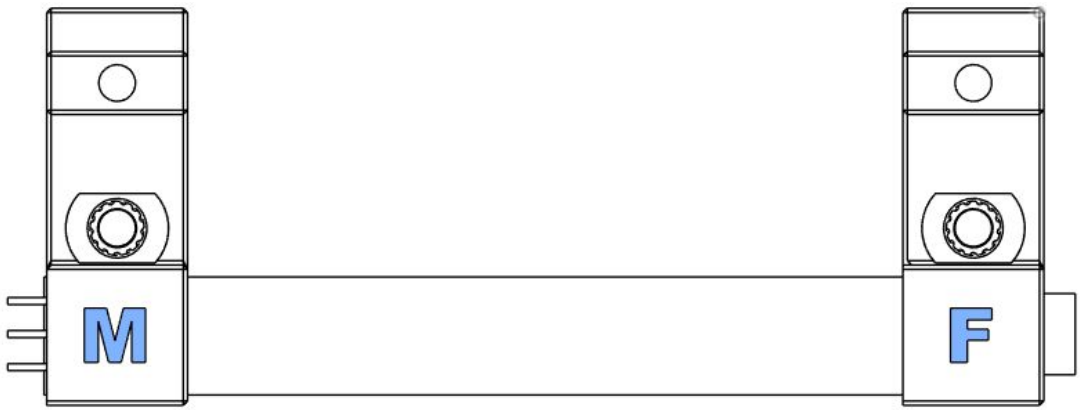


9.2A COAS MOUNTING

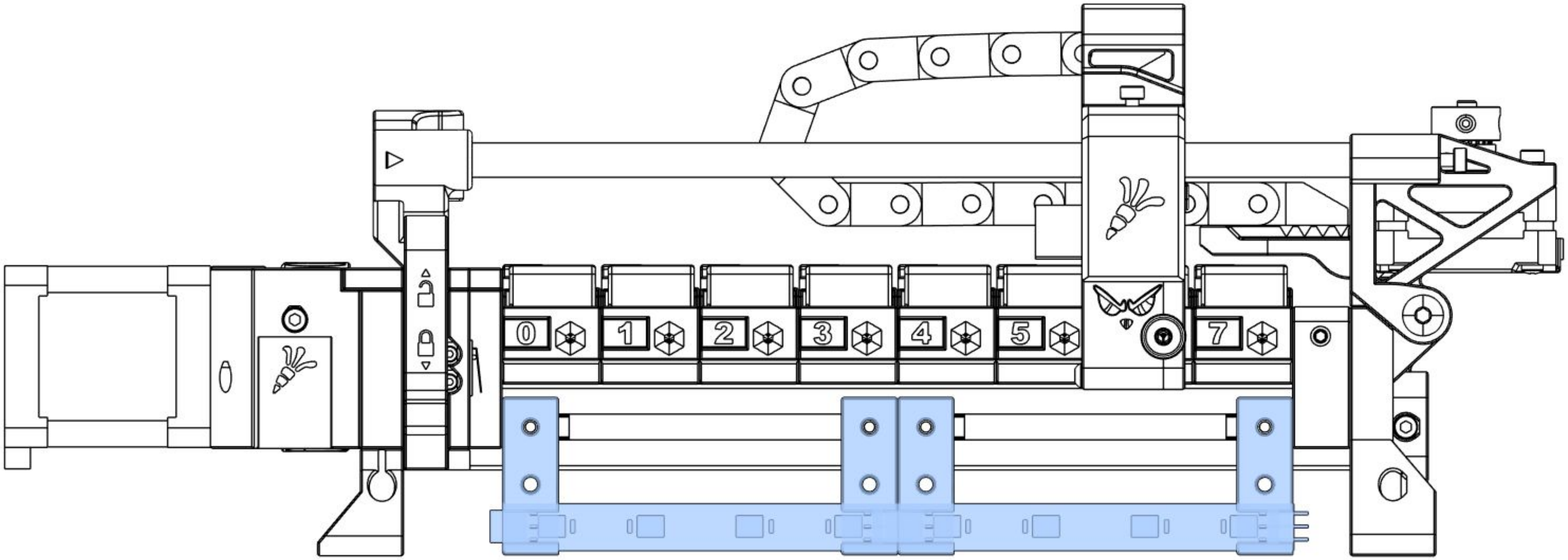
Insert the COAS into the mounts as shown, Male first and then Female, then slide the mounts out to either end.

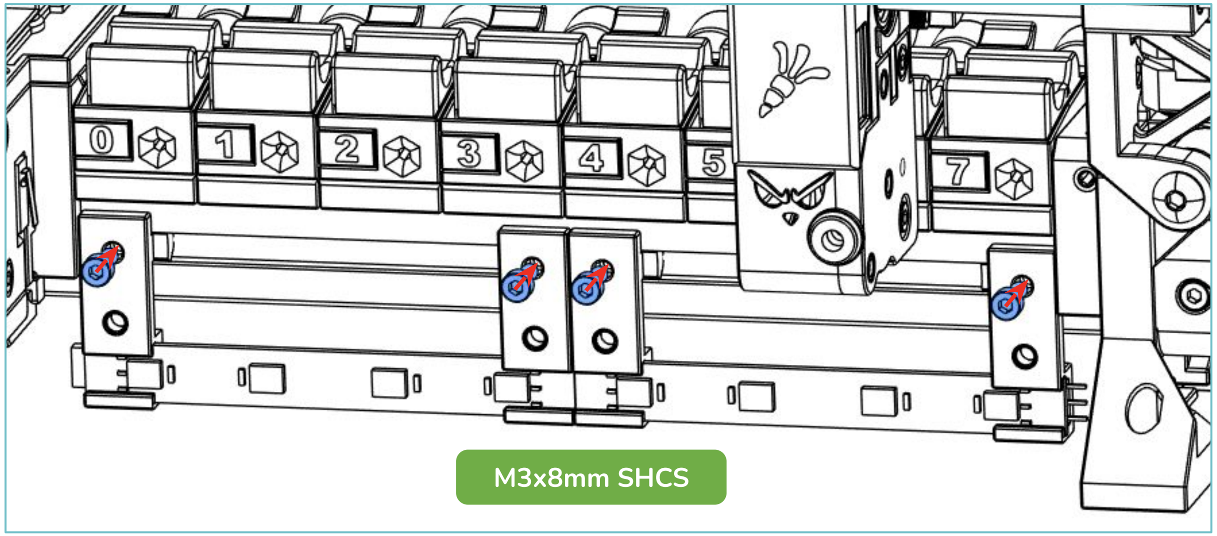
The mounts are labelled M and F for Male and Female end - they match the connectors on the COAS PCB, male to male, female to female.

Do this for however many COAS / COAT you have - 2 COAS for a standard 8-channel kit.



COAS MOUNTING

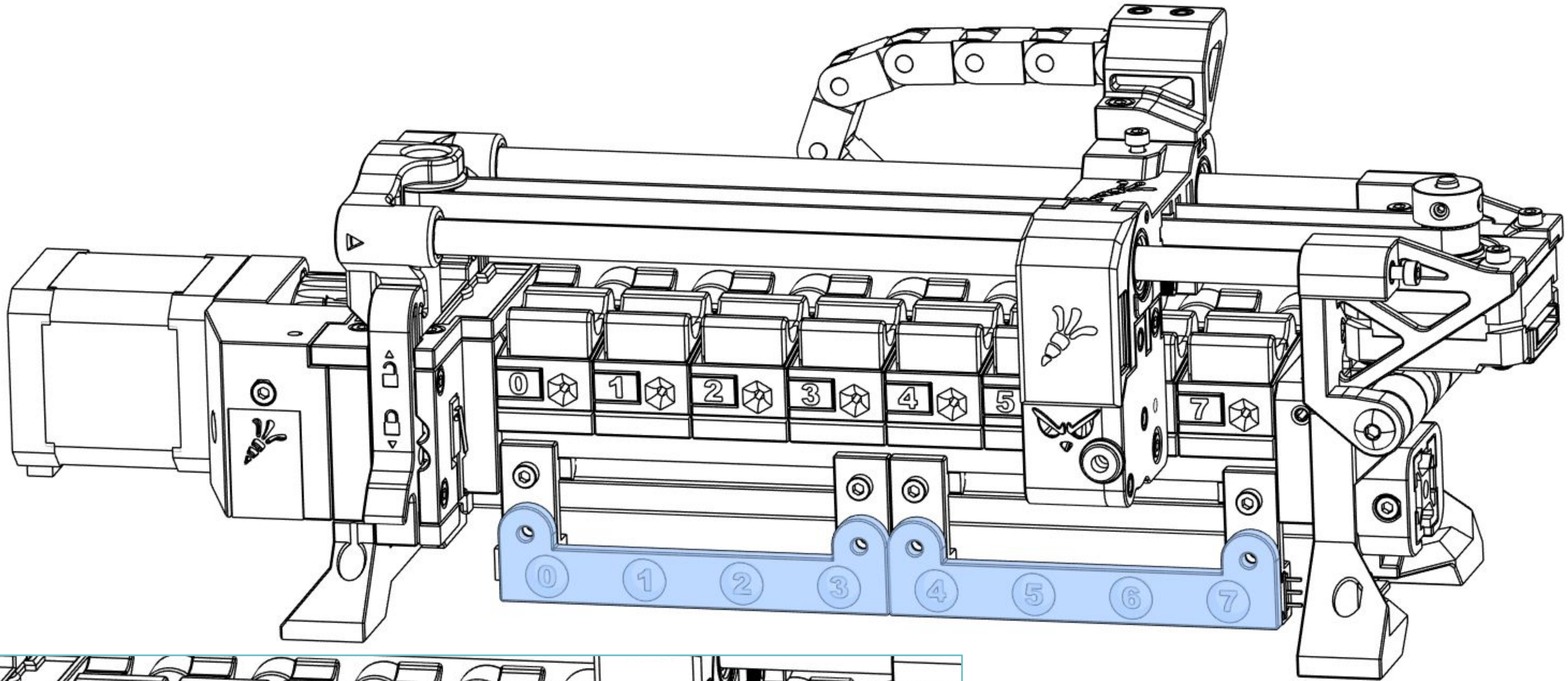


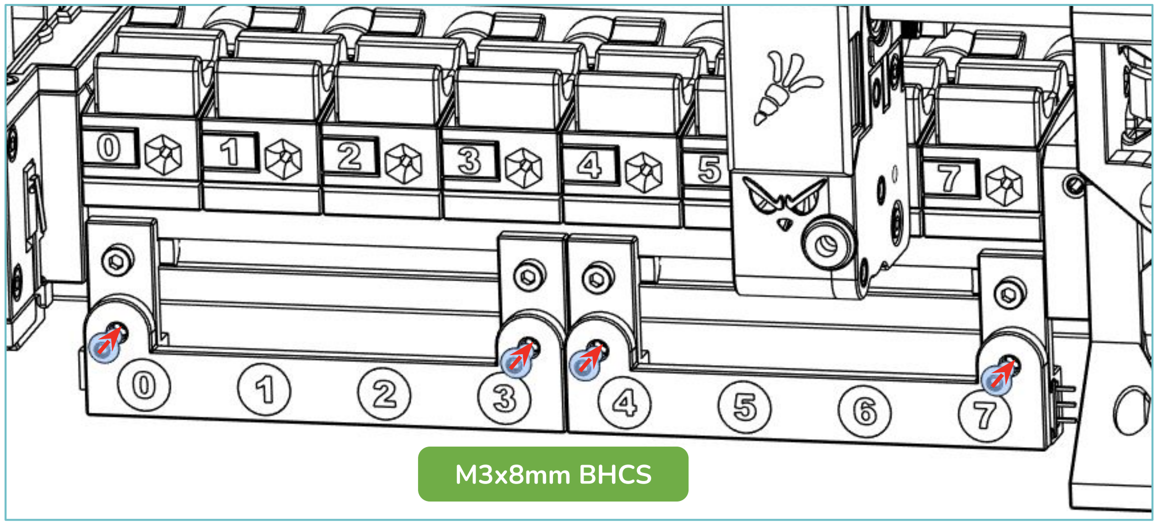


9.2A COAS MOUNTING

Link together your COAS, line it up against the nuts you installed earlier, and fix them in place with 4 M3x8mm SHCS.

COAS MOUNTING





9.2A LED_BRACKET MOUNTING

These need to be printed in multiple colors, so you may need to wait until your machine is working to print them.

Line the brackets up over the COAS, and fix them in place with 4 M3x8mm BHCS.

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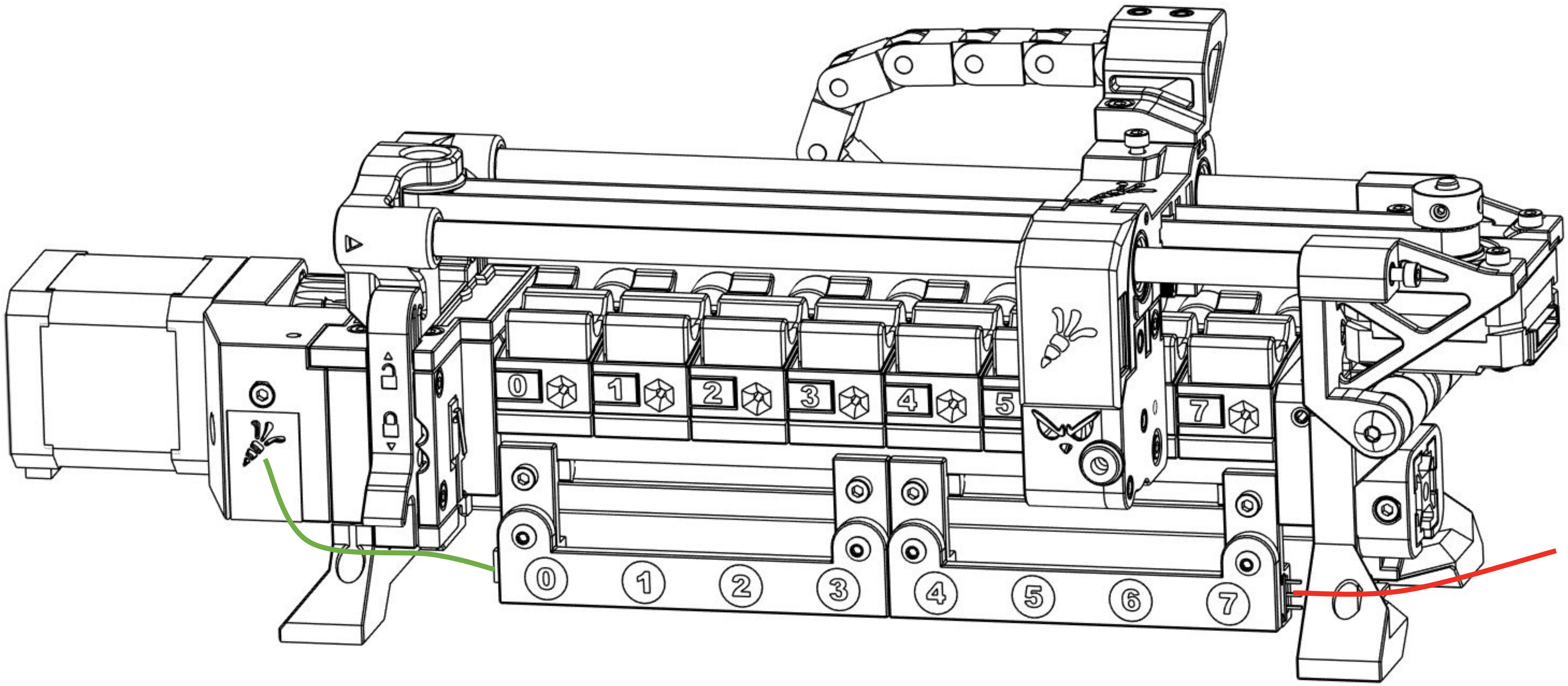
COAS WIRING



LED WIRING

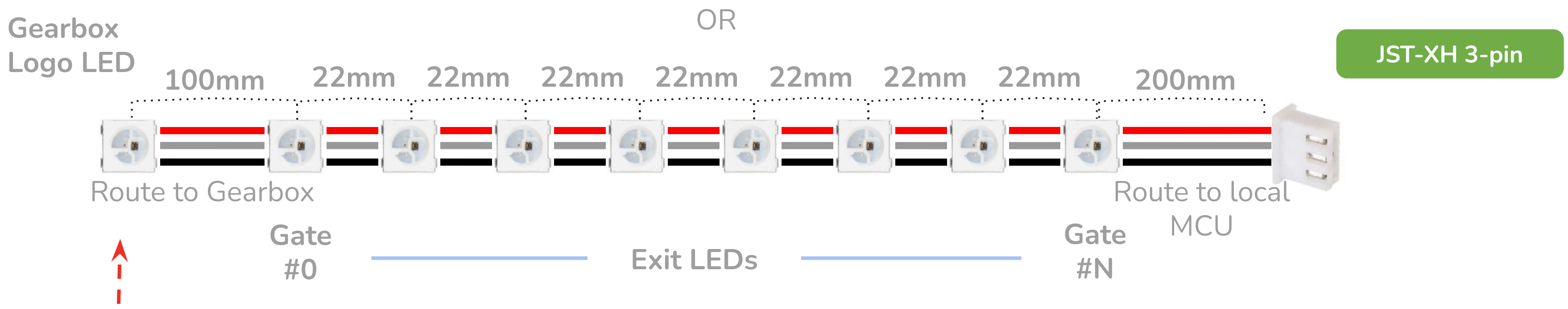
The first pigtail (red) goes from the local mainboard, through the slot in the End_Block, to the pins Dupont 3-pin connector at the end of the COAS.

The second pigtail (green) plugs into the Dupont 3-pin connector at the start of the COAS, and goes through the slot in the Gearbox_Foot to the Gearbox LED (optional).

WIRING LENGTHS

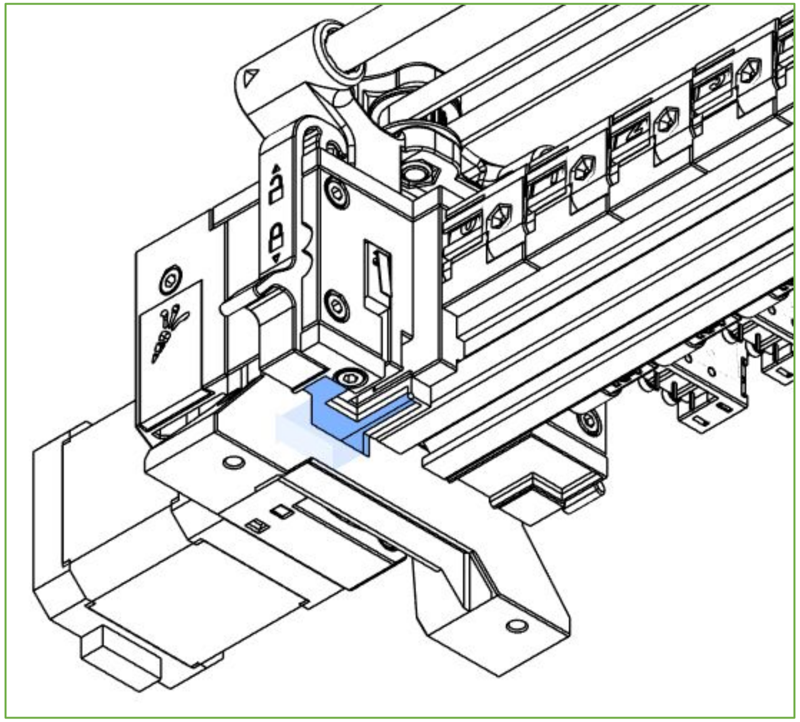
The list of pages with wiring lengths is on Page 27.

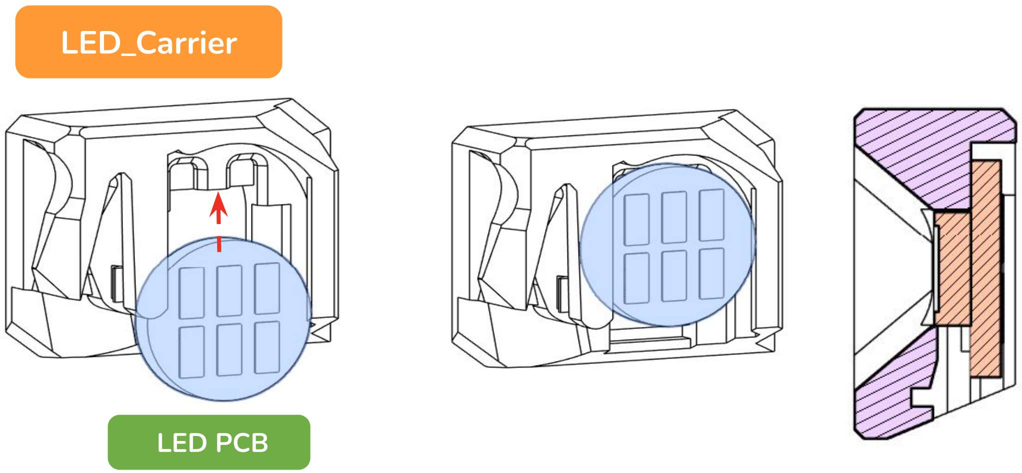
SOLDERED LED MOUNTING



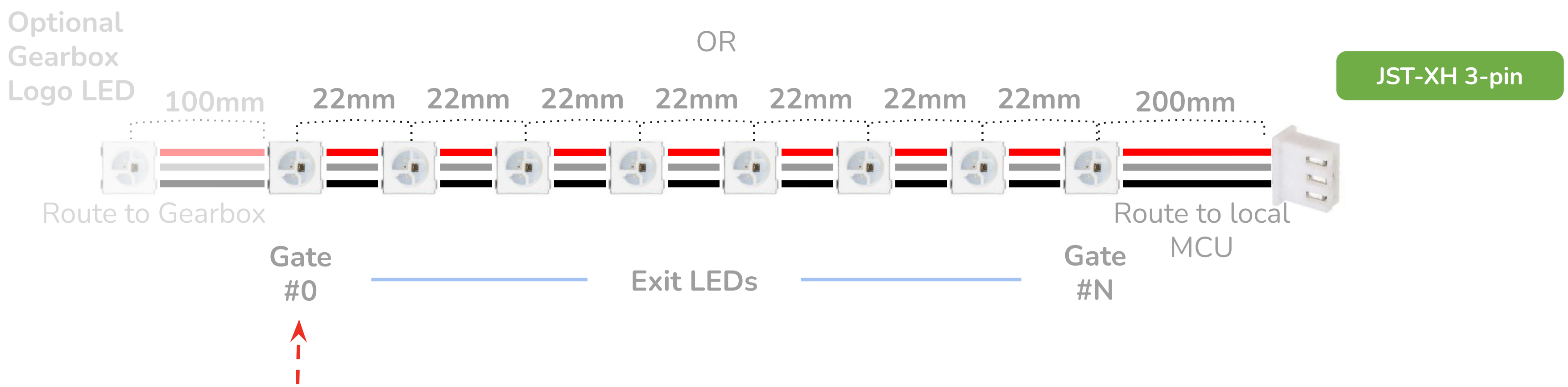
9.2B MOUNTING

Start with the last LED in the chain. First, run it through the slot in the foot from right to left (towards the motor). Next, mount it into the LED_Carrier as shown. Wires are omitted for clarity.



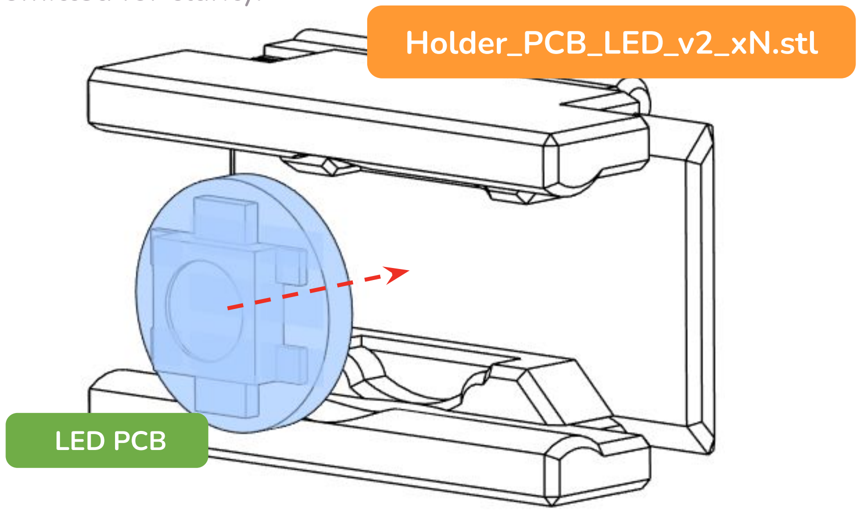


SOLDERED LED MOUNTING

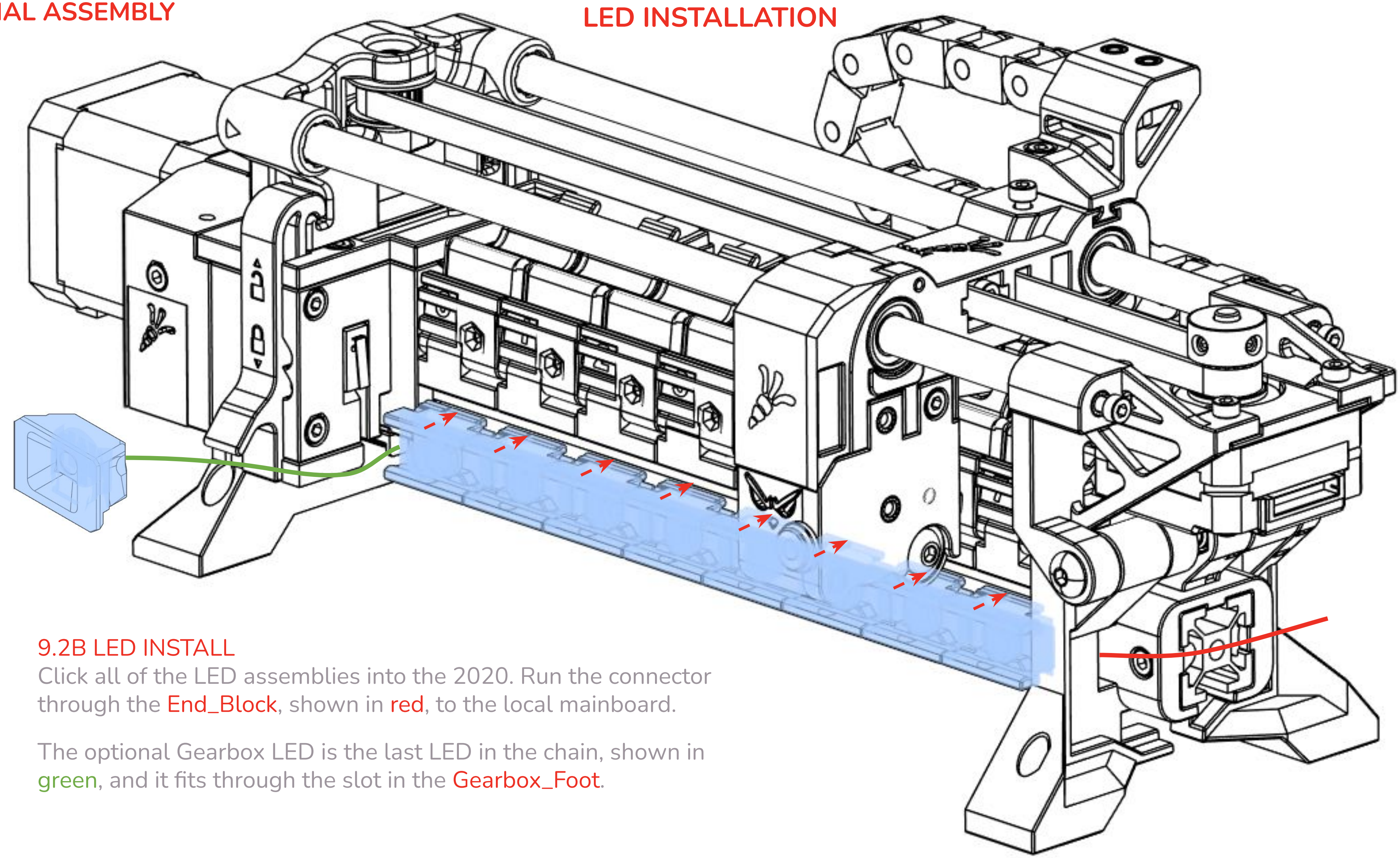


9.2B MOUNTING

Take the second to last LED in the chain if you are using the optional LED, otherwise the last LED in the chain. Mount it into the Holder_PCB_LED_v2_xN as shown. Repeat this step for the remaining LEDs.
Wires are omitted for clarity.



LED INSTALLATION



9.2B LED INSTALL

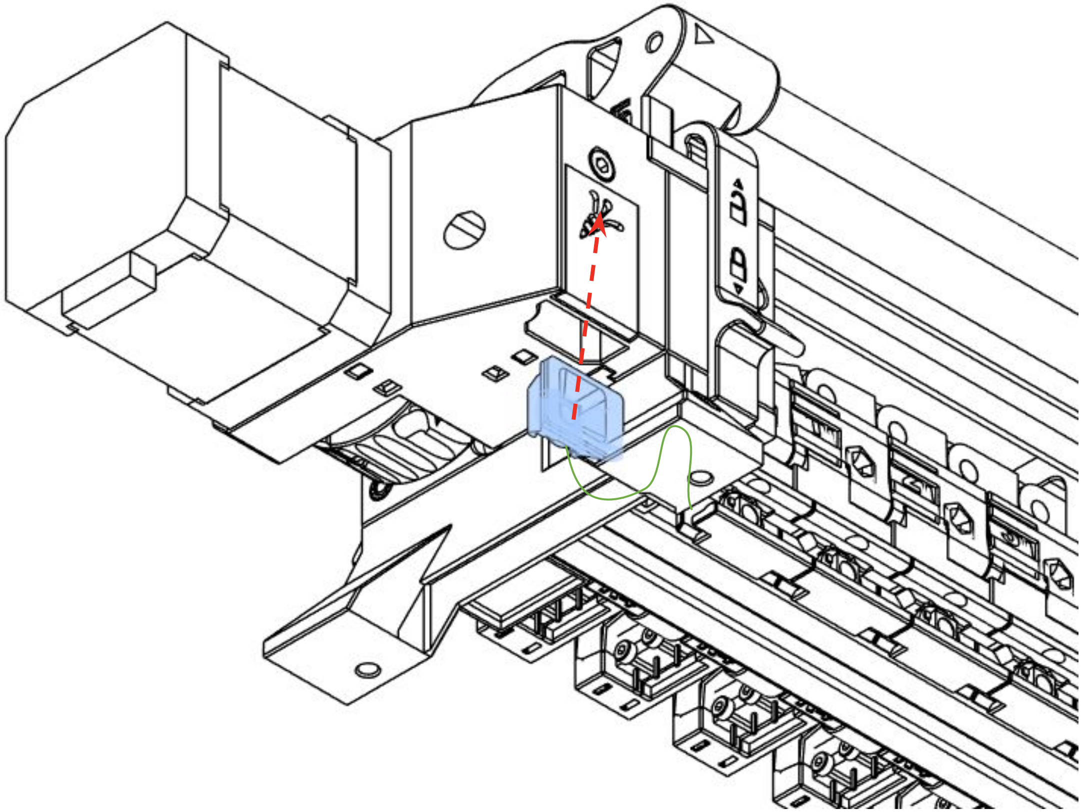
Click all of the LED assemblies into the 2020. Run the connector through the End_Block, shown in red, to the local mainboard.

The optional Gearbox LED is the last LED in the chain, shown in green, and it fits through the slot in the Gearbox_Foot.

1.1 WIRING LENGTHS

The list of pages with wiring lengths is on Page 26.

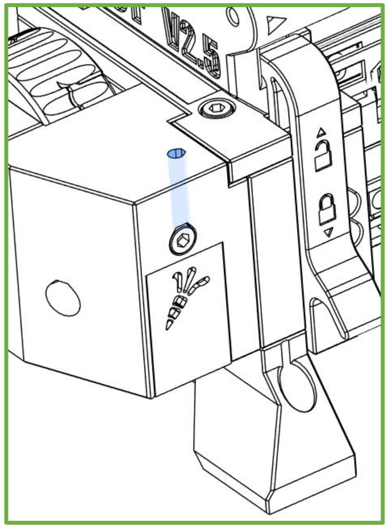
LED INSTALLATION



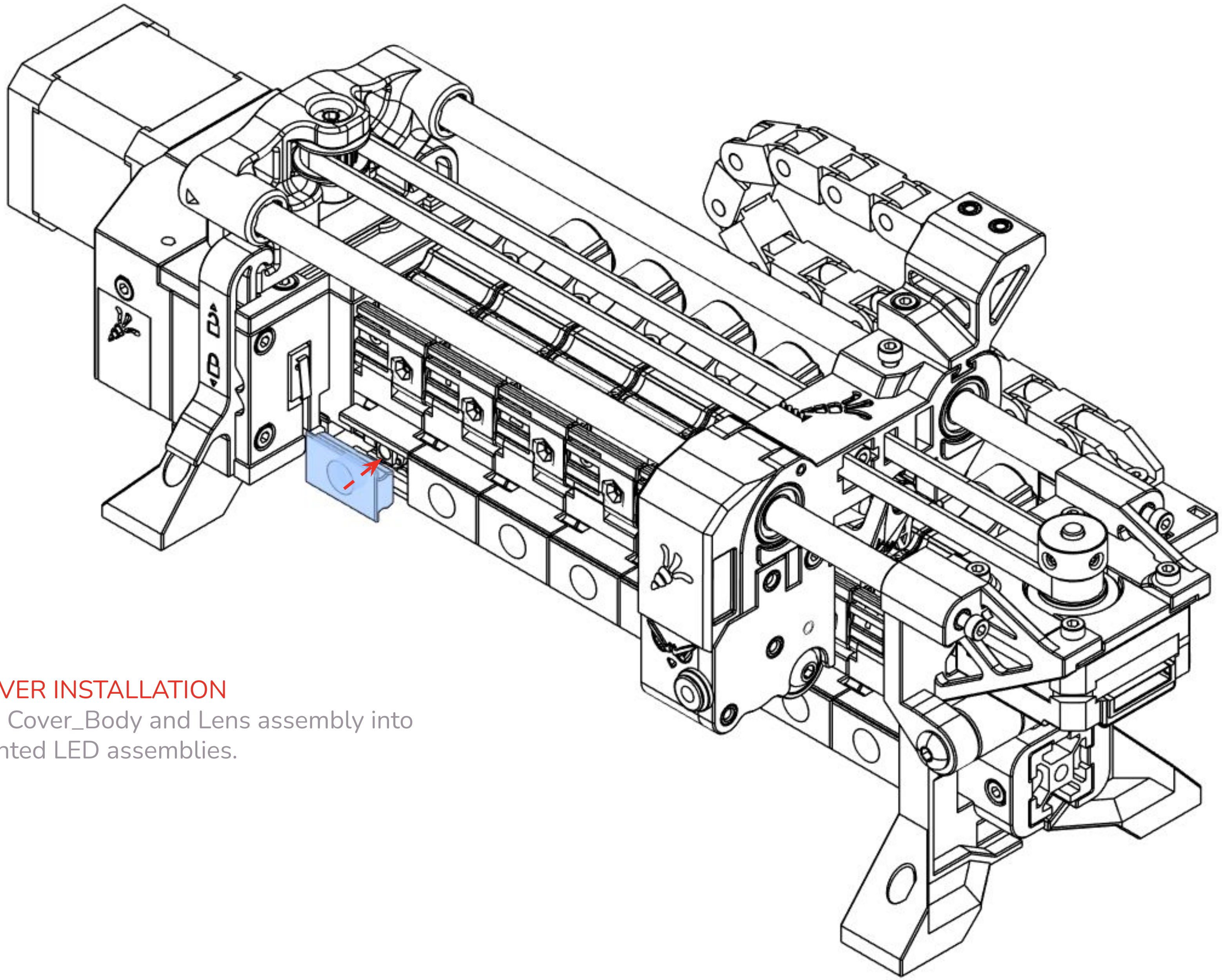
9.2B LED WIRING

If you are using the optional Gearbox LED, push the assembled LED and carrier up into the soc`ket.

If you ever need to recover the LED, there is a hole on the top of the Gearbox to push it back down.



LED INSTALLATION



9.2B COVER INSTALLATION

Click the Cover_Body and Lens assembly into the mounted LED assemblies.

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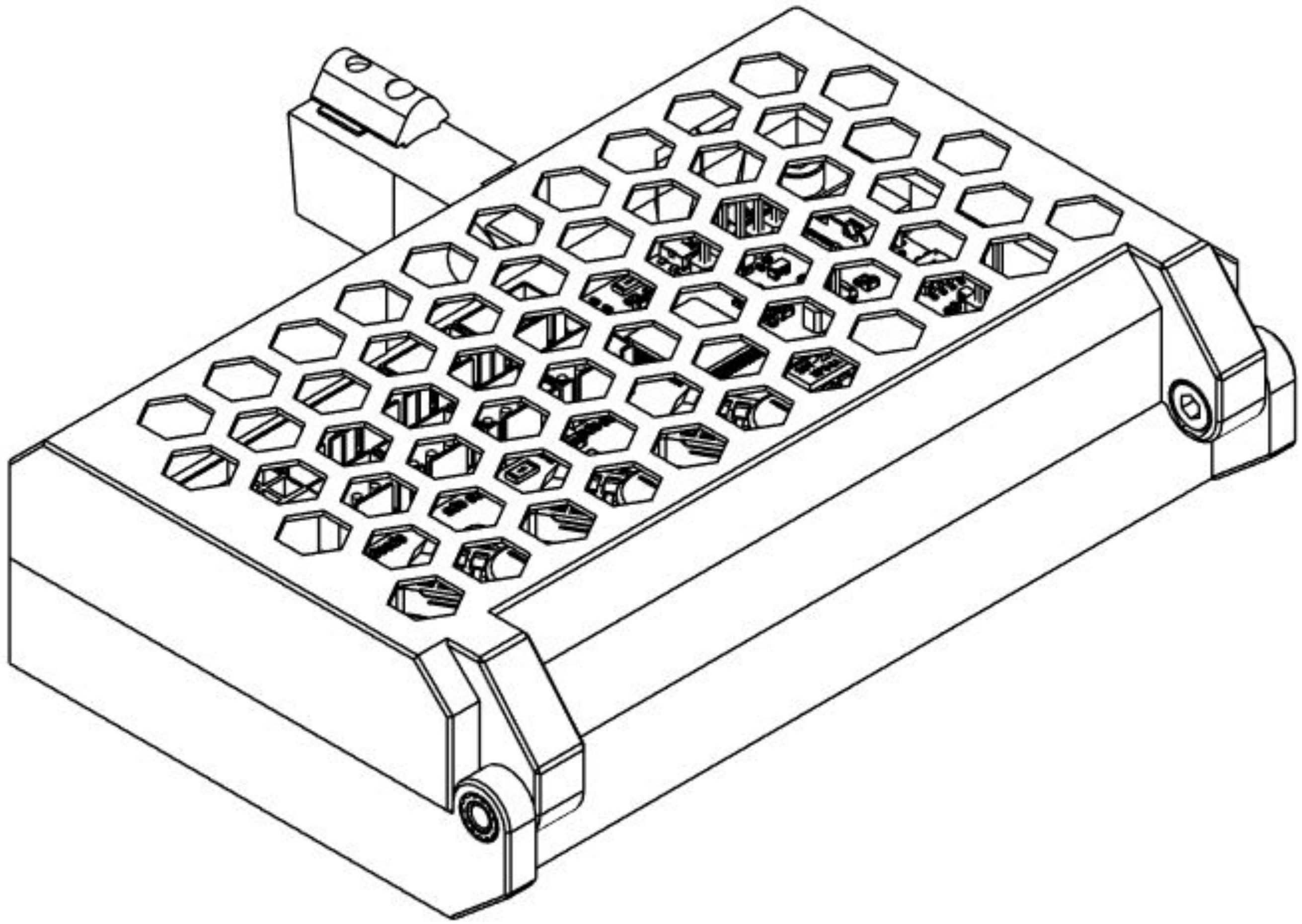
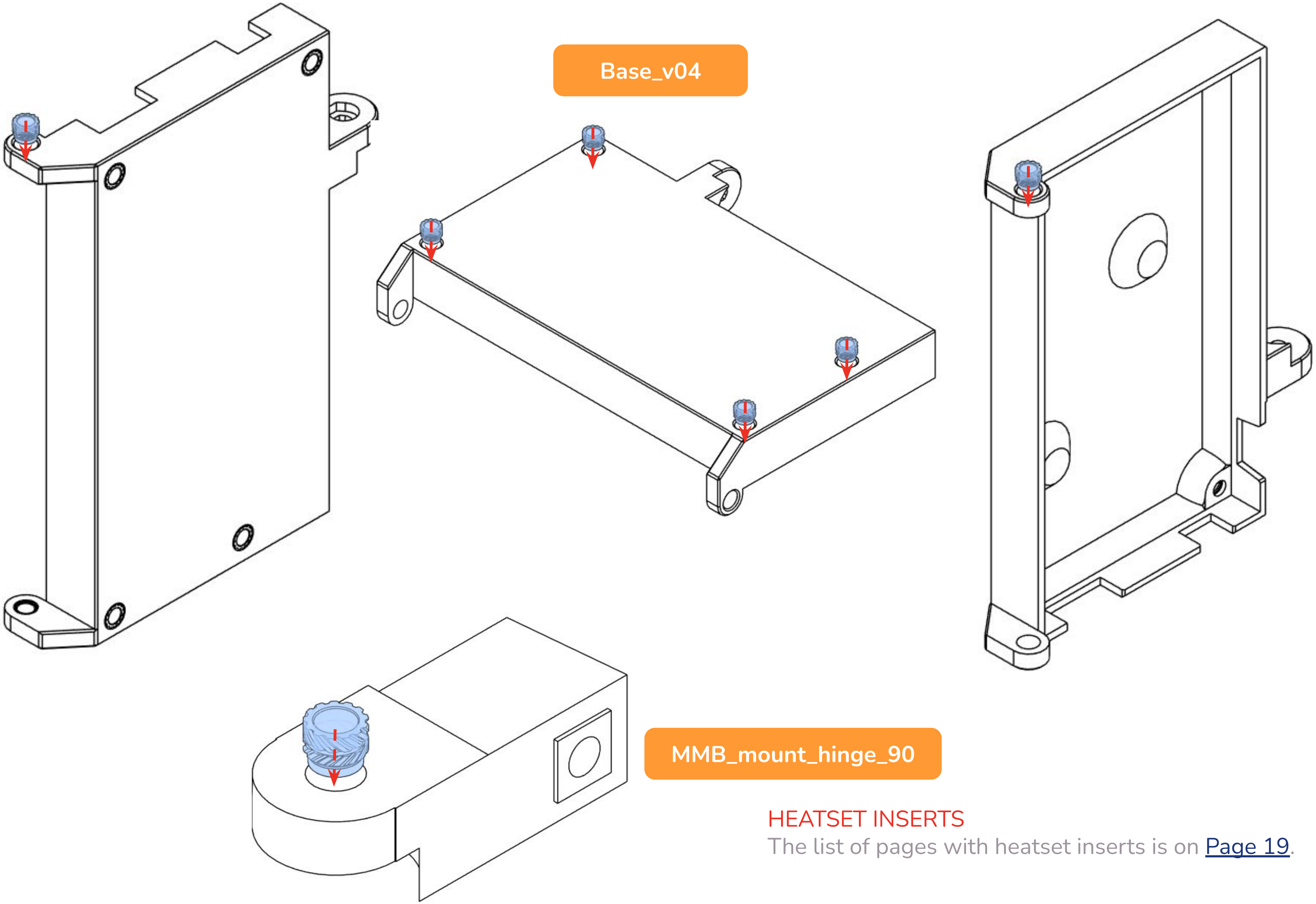


MMBv2 / ELECTRONICS BOX



HEATSET INSERTS

The list of pages with heatset inserts is on Page 19.

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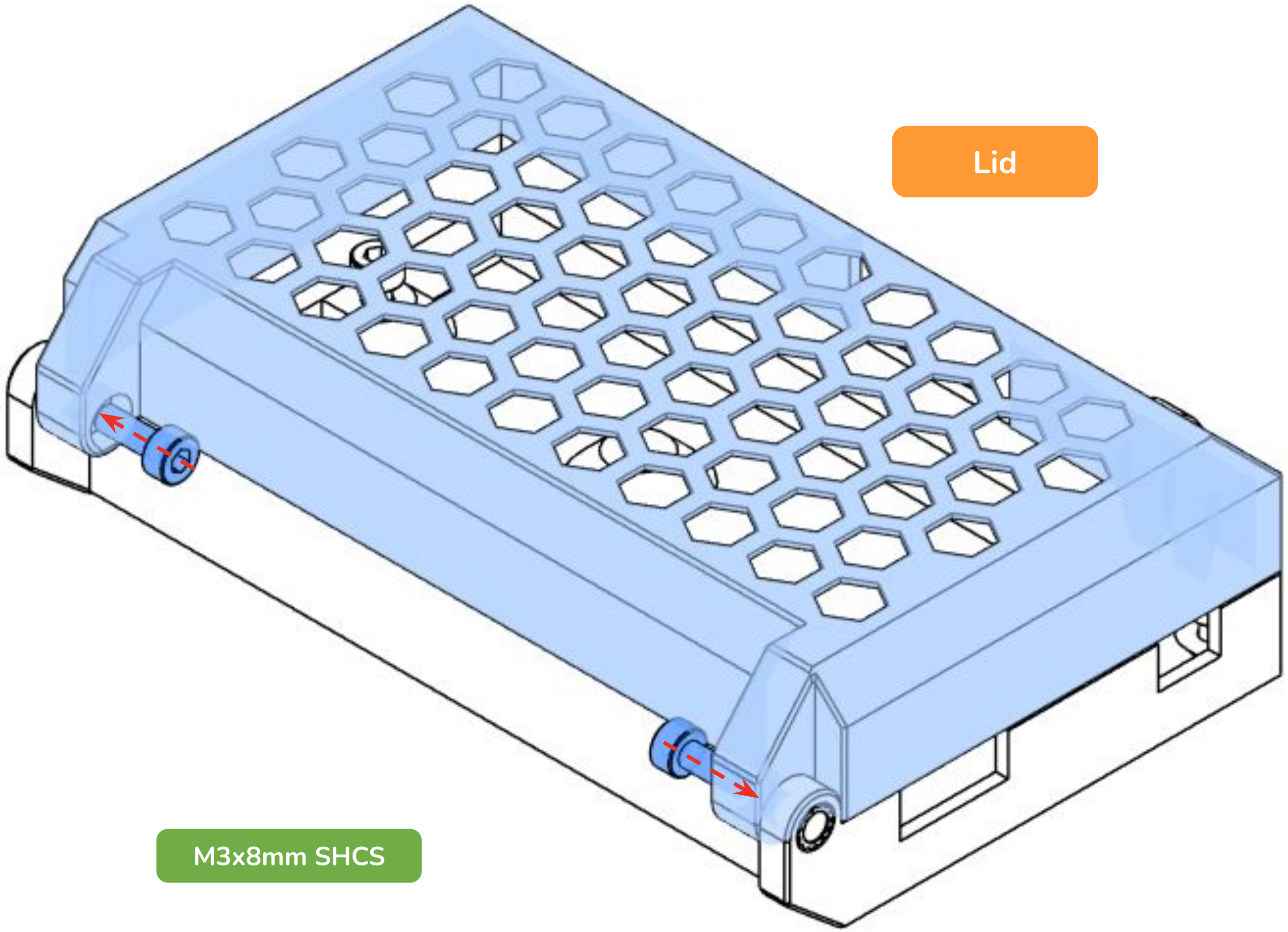
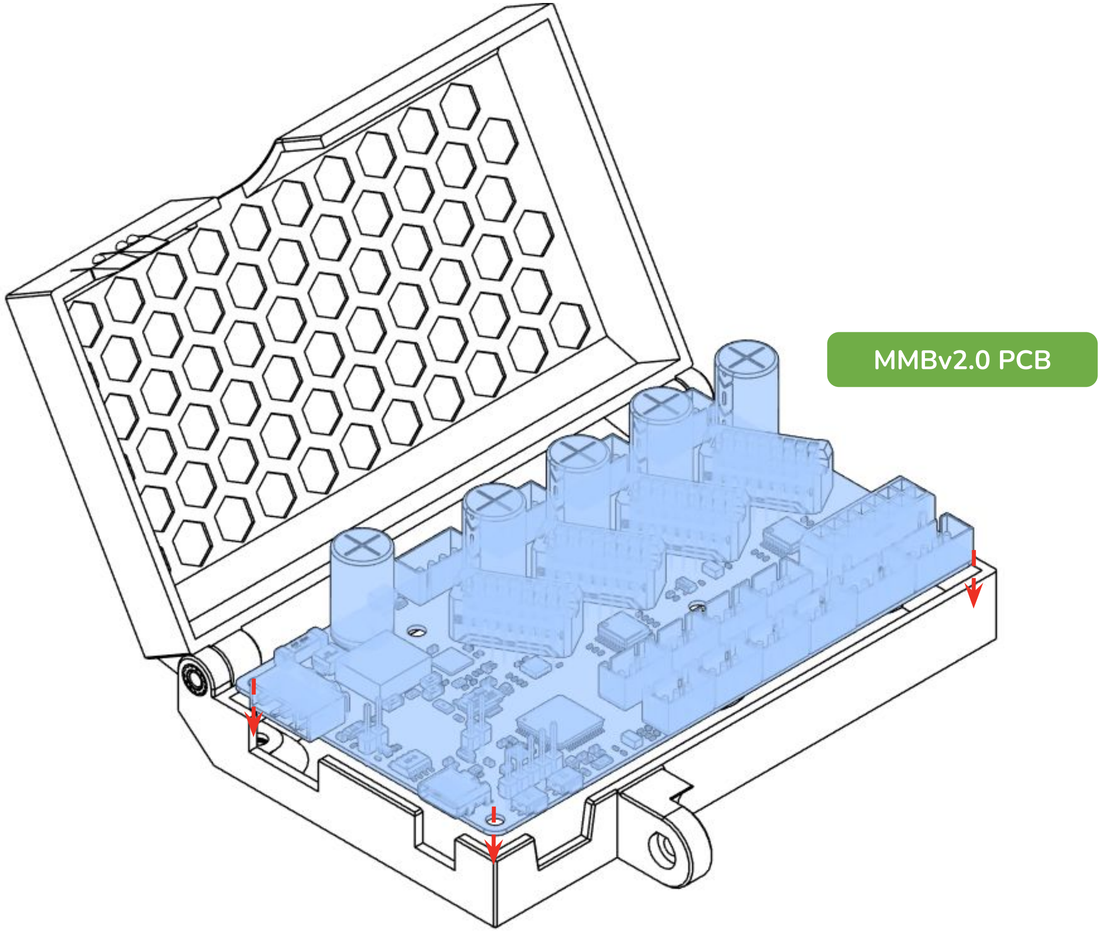
MMBv2 / ELECTRONICS BOX



ELECTRONICS BOX LID

Place the Lid on top of the electronics box and secure it with two M3x8mm SHCS. They should be snug but not so tight that the hinge doesn't operate smoothly.

MMBv2 / ELECTRONICS BOX



ELECTRONICS
Line up the MMBv2 or other electronics in its box.

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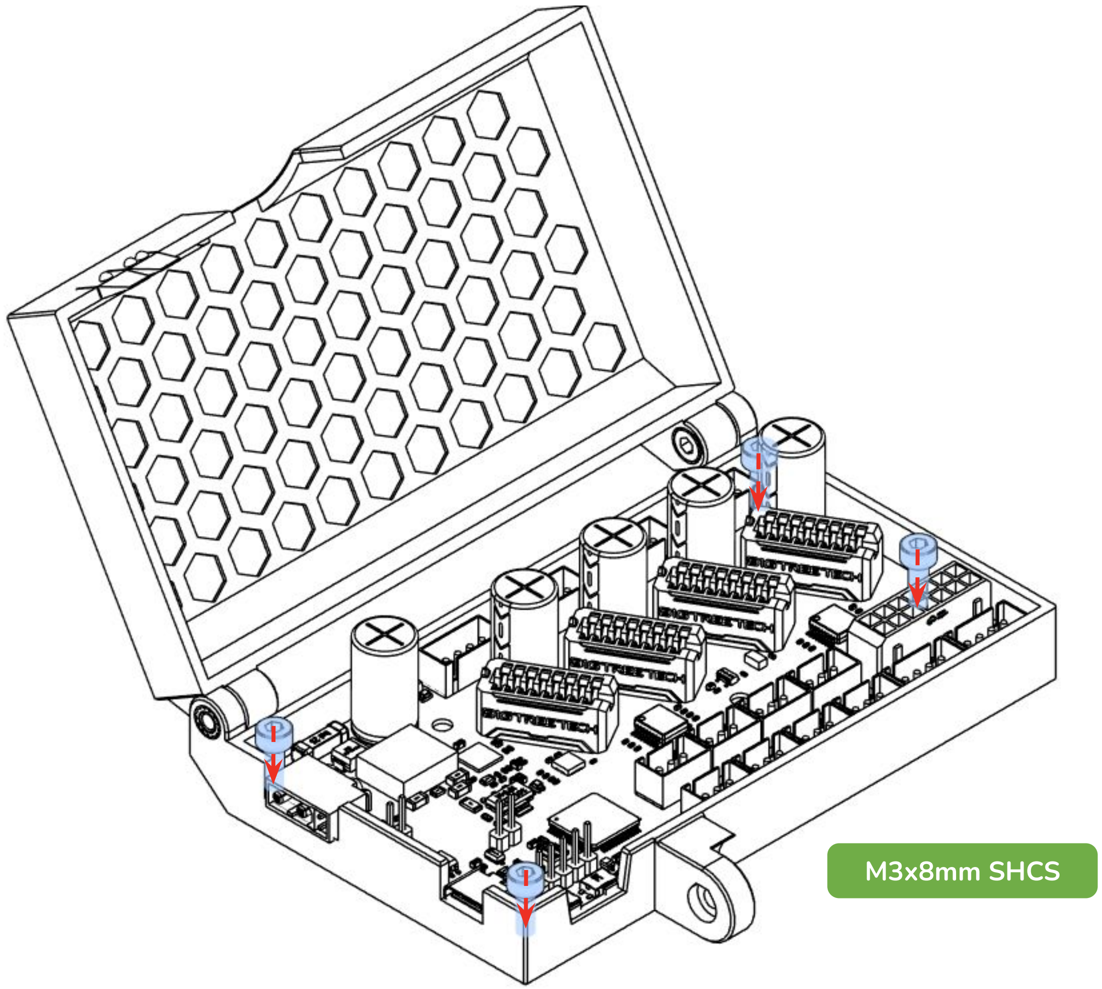
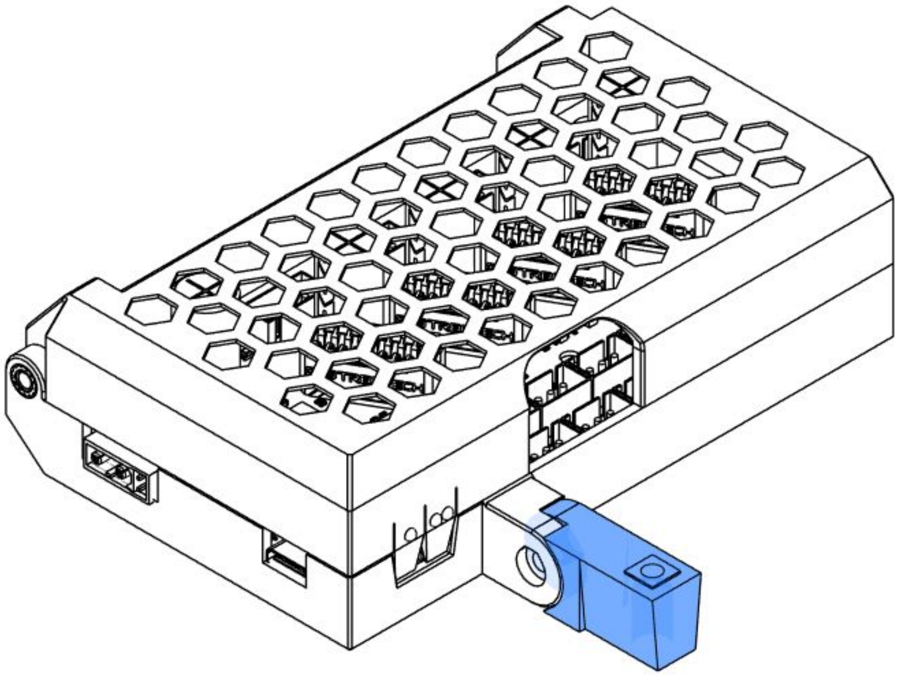
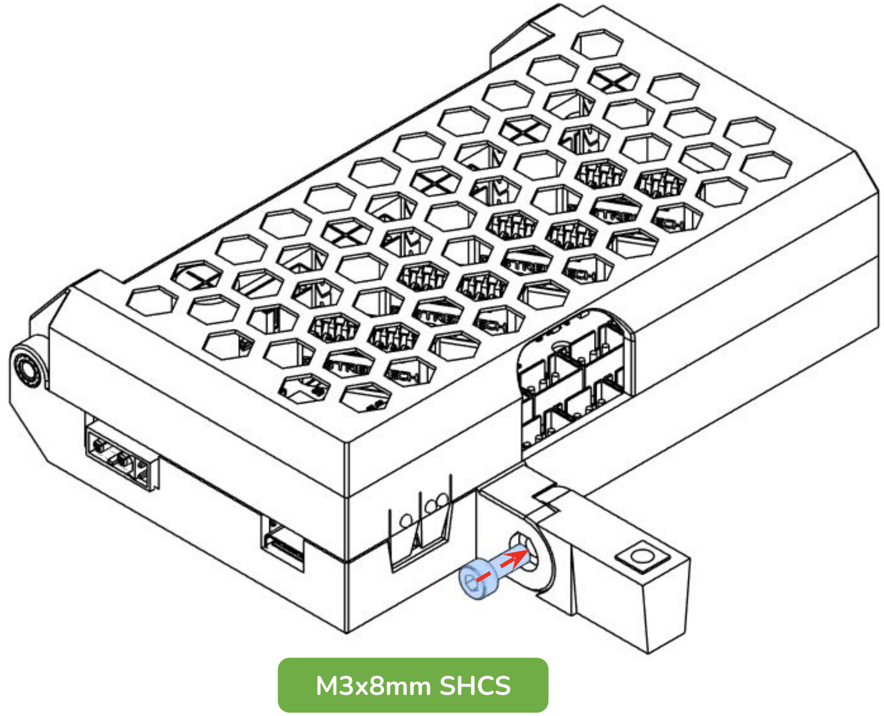
MMBv2 / ELECTRONICS BOX



ELECTRONICS
Secure the electronics with 4 M3x8mm SHCS screws.

MMBv2 / ELECTRONICS BOX

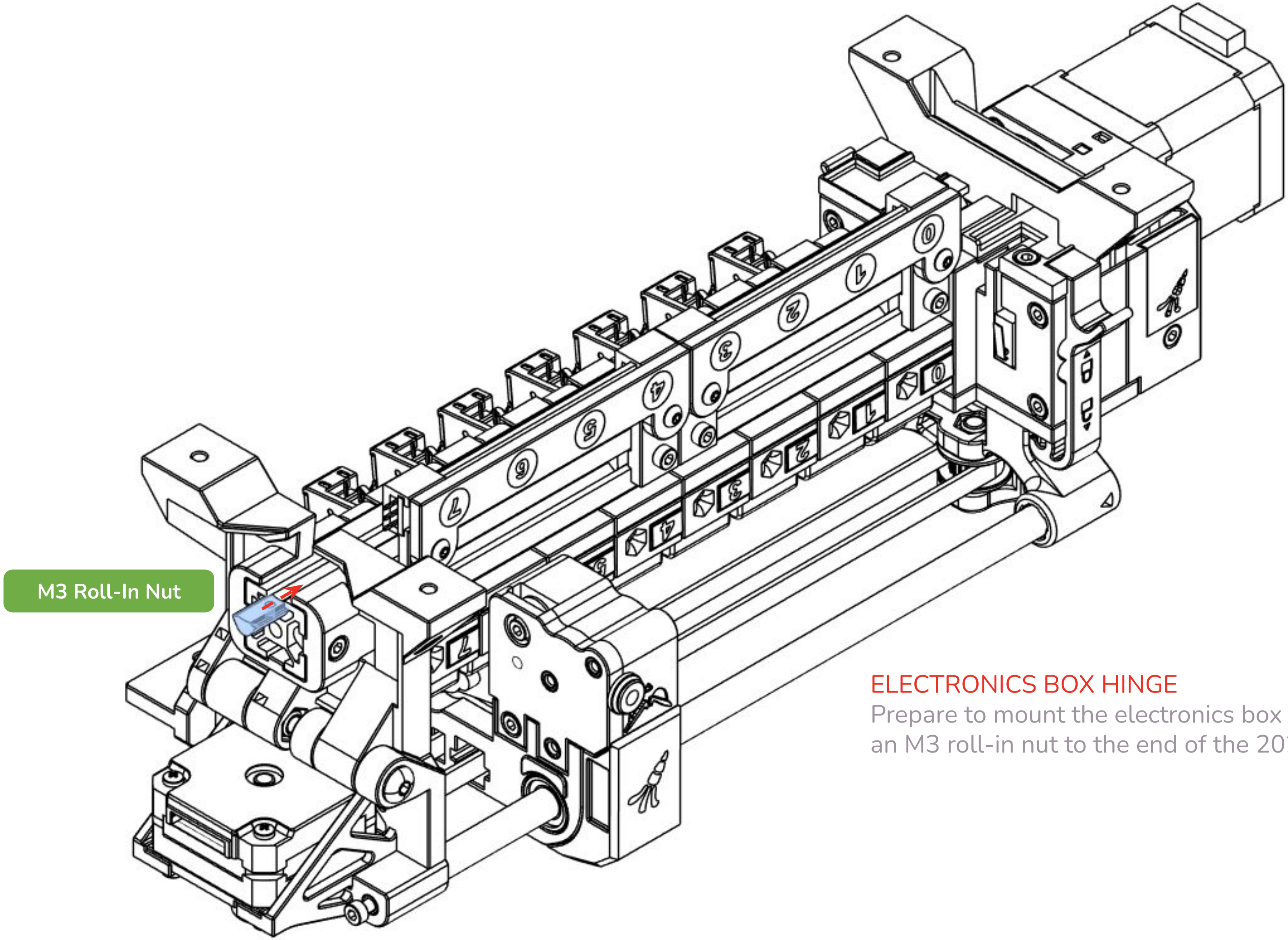




ELECTRONICS BOX HINGE

Install the electronics box Hinge with an M3x8mm SHCS.

MMBv2 / ELECTRONICS BOX



ELECTRONICS BOX HINGE

Prepare to mount the electronics box by adding an M3 roll-in nut to the end of the 2020.

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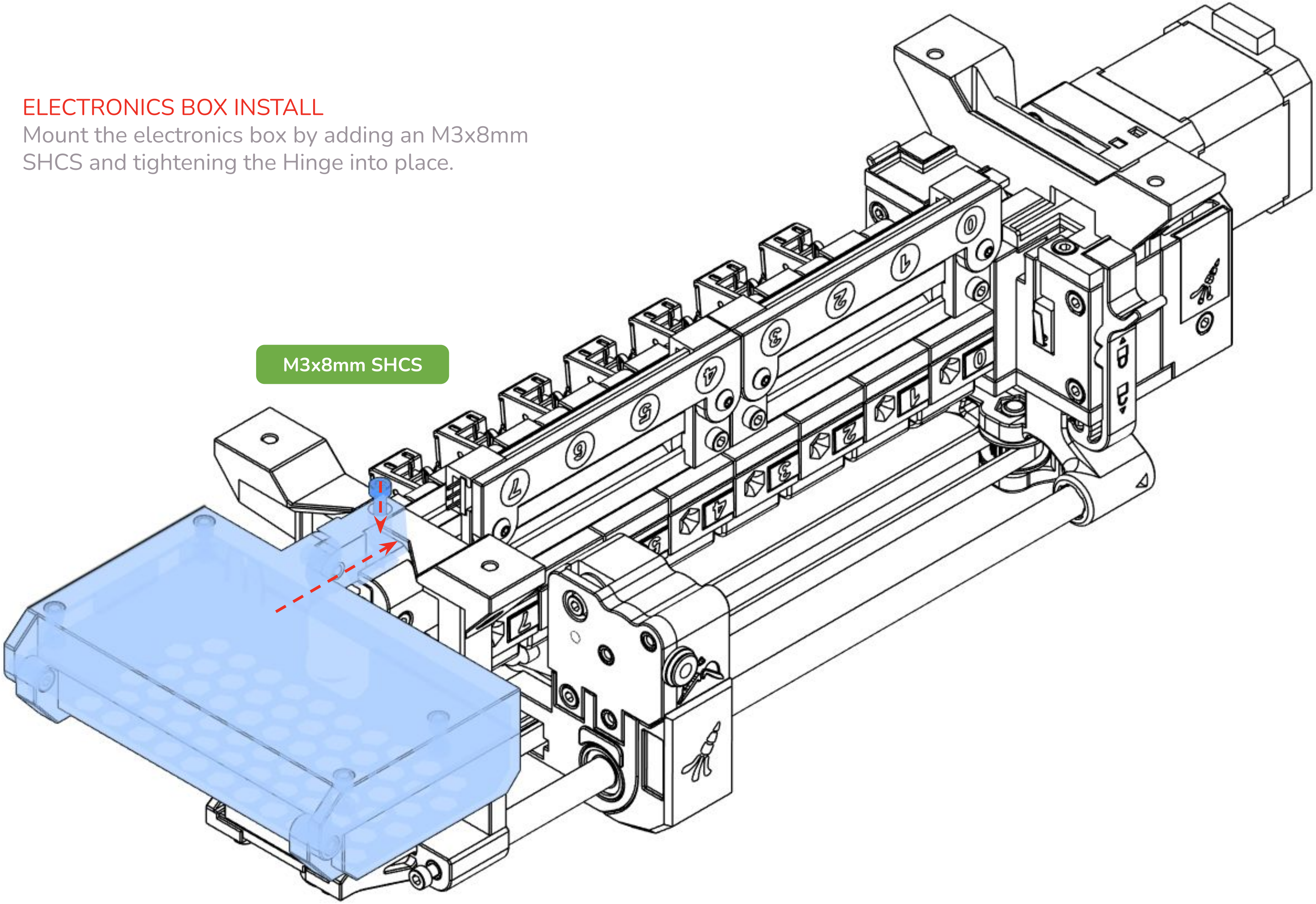
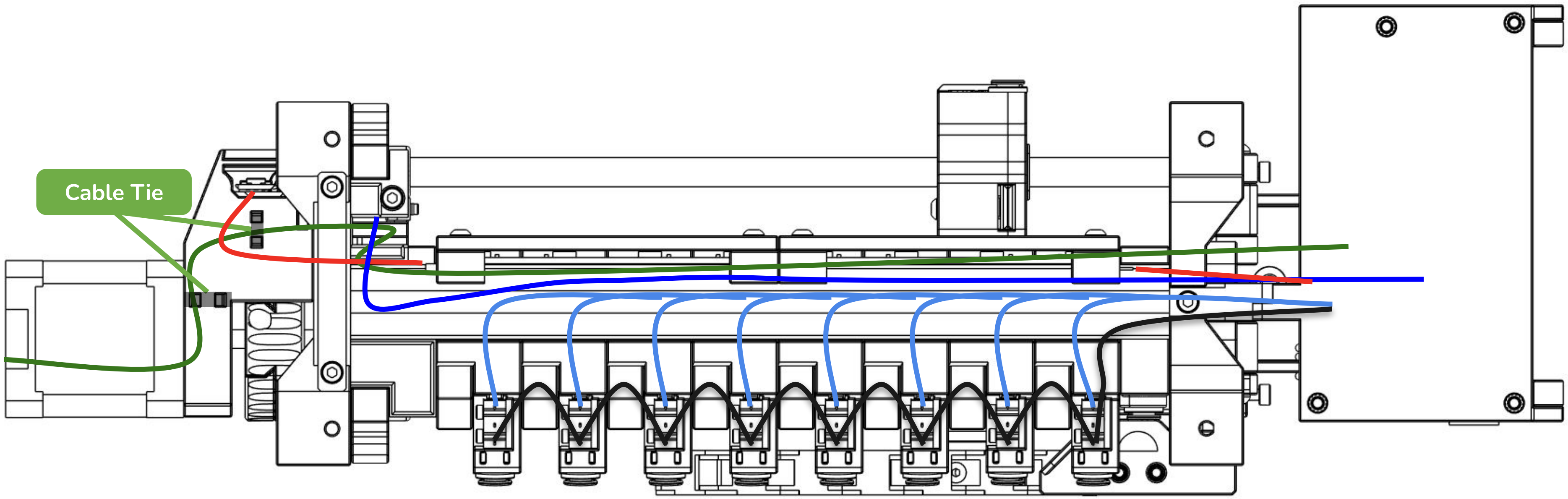
ELECTRONICS BOX INSTALL

Mount the electronics box by adding an M3x8mm SHCS and tightening the Hinge into place.



CABLE MANAGEMENT



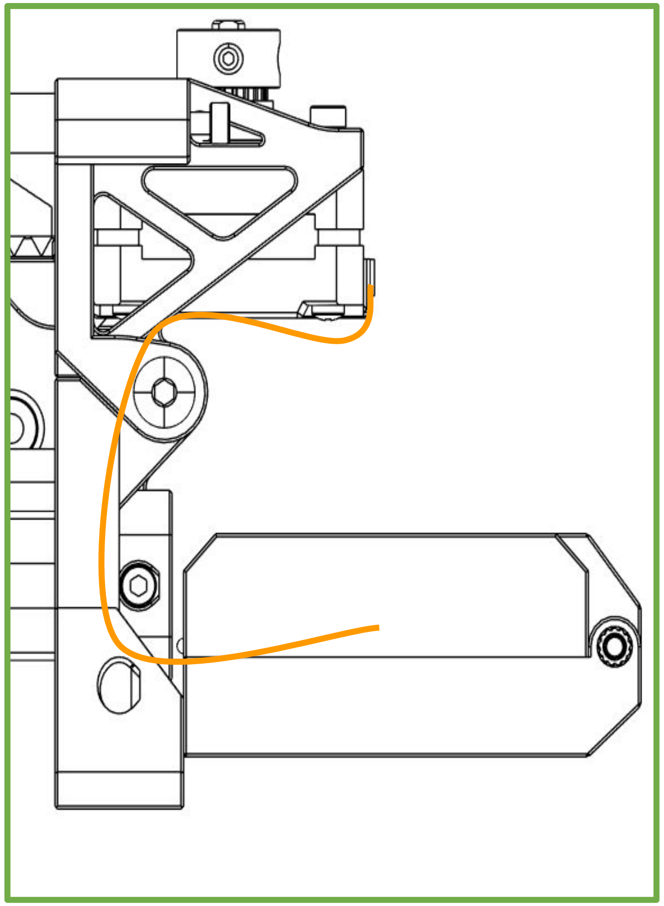
CABLE MANAGEMENT

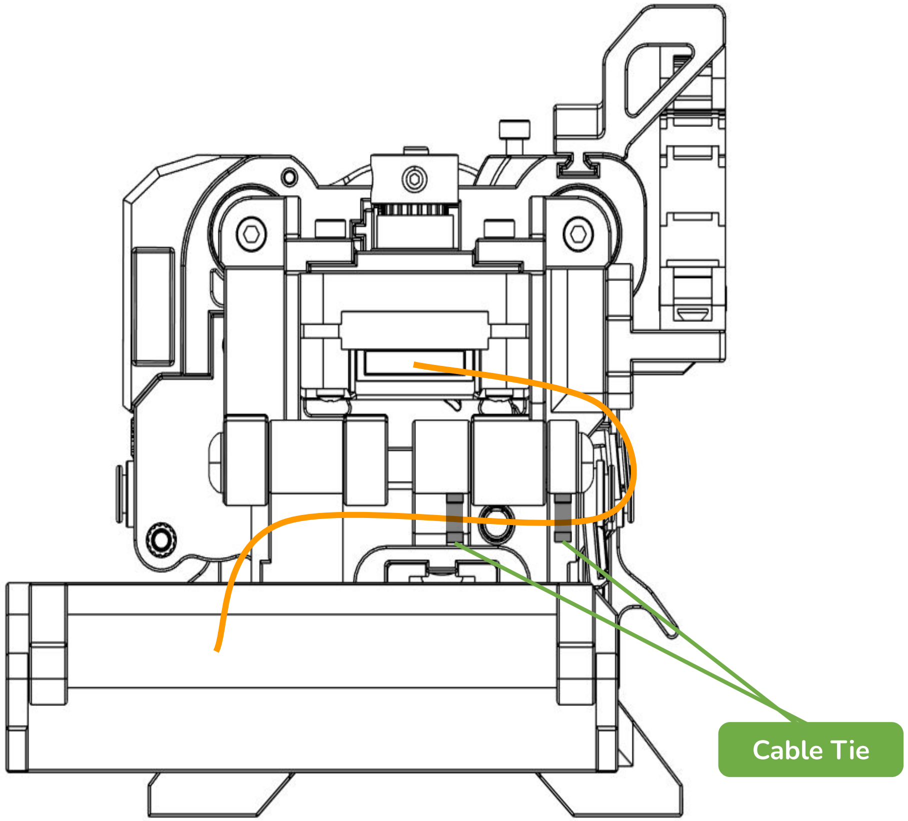
Run the Gear Motor wires (green), Endstop wires (blue), optional LED wires (red), and pregate sensor wires (light blue and black) as shown, along the underside of the 2020 to the MCU.

Use cable ties to secure the wires in place.

There are open-source PCBs designed to accept the microswitch legs and an XH connector, in order to make maintenance of the pregate sensor wiring easier. Because you don't want to have to solder all those wires, and then resolder them when a switch goes out. Thanks to Discord user TheRogueZeta!

CABLE MANAGEMENT





CABLE MANAGEMENT

Loop the Selector Motor wires (orange) counter-clockwise around the 2020 to the MCU.

Use cable ties to secure the wires in place. This is particularly important for the Selector Motor wiring, to prevent pinching the wires when opening the Linear Axis.

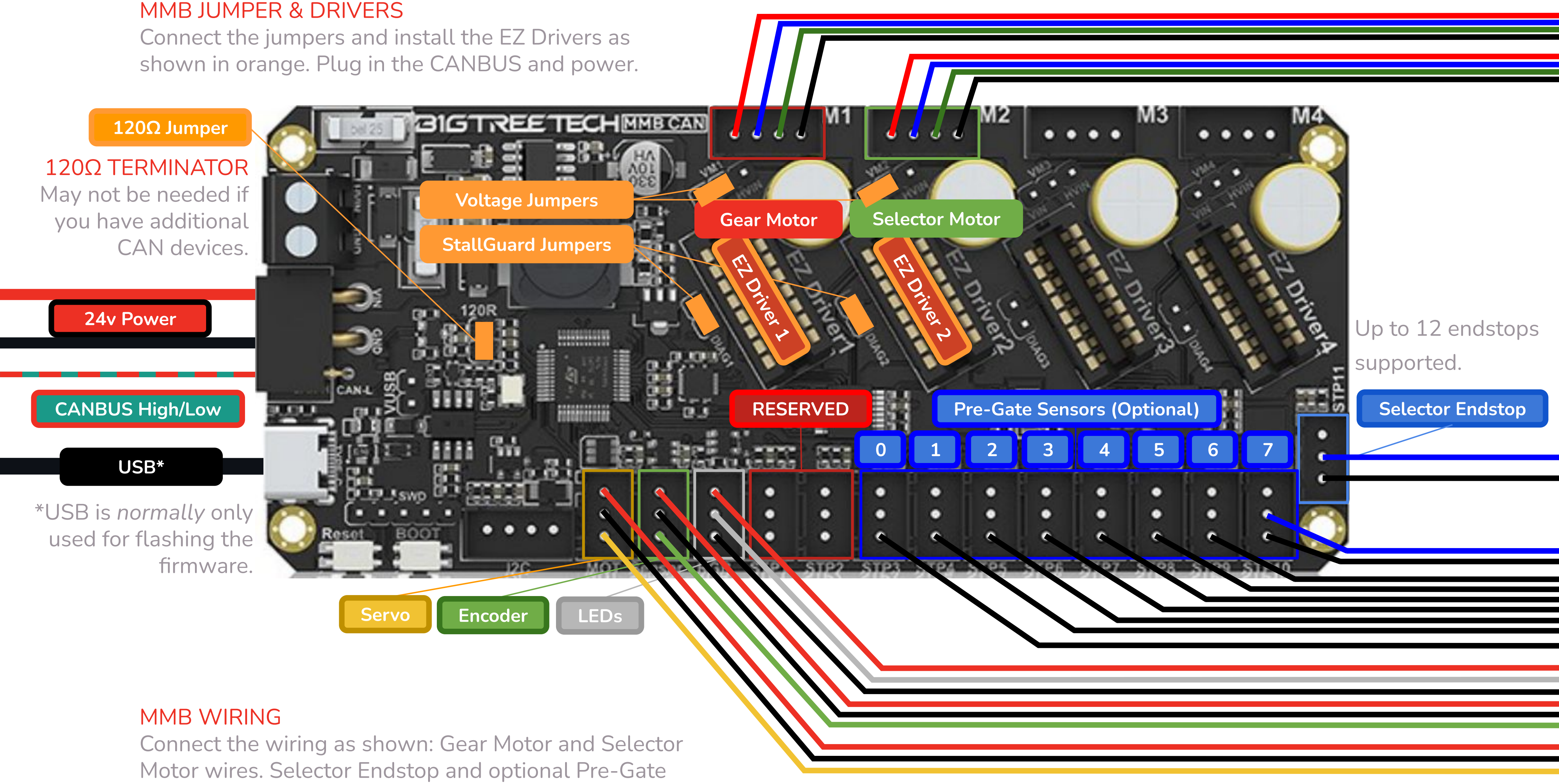
WIRING LENGTHS

The list of pages with wiring lengths is on Page 27.

WIRING THE MMBv1.1

MMB JUMPER & DRIVERS

Connect the jumpers and install the EZ Drivers as shown in orange. Plug in the CANBUS and power.



MMB WIRING

Connect the wiring as shown: Gear Motor and Selector Motor wires. Selector Endstop and optional Pre-Gate Sensor wires. Servo, Encoder, and LED wires.

Wiring color may vary between manufacturers for stepper motors and generally.

Keep a few cm of wiring slack in the MMB box, it will be very helpful for maintenance.

Note: HVIN does not supply +5v and USB +5v is insufficient, therefore:

+24v power on the CANBus is necessary!

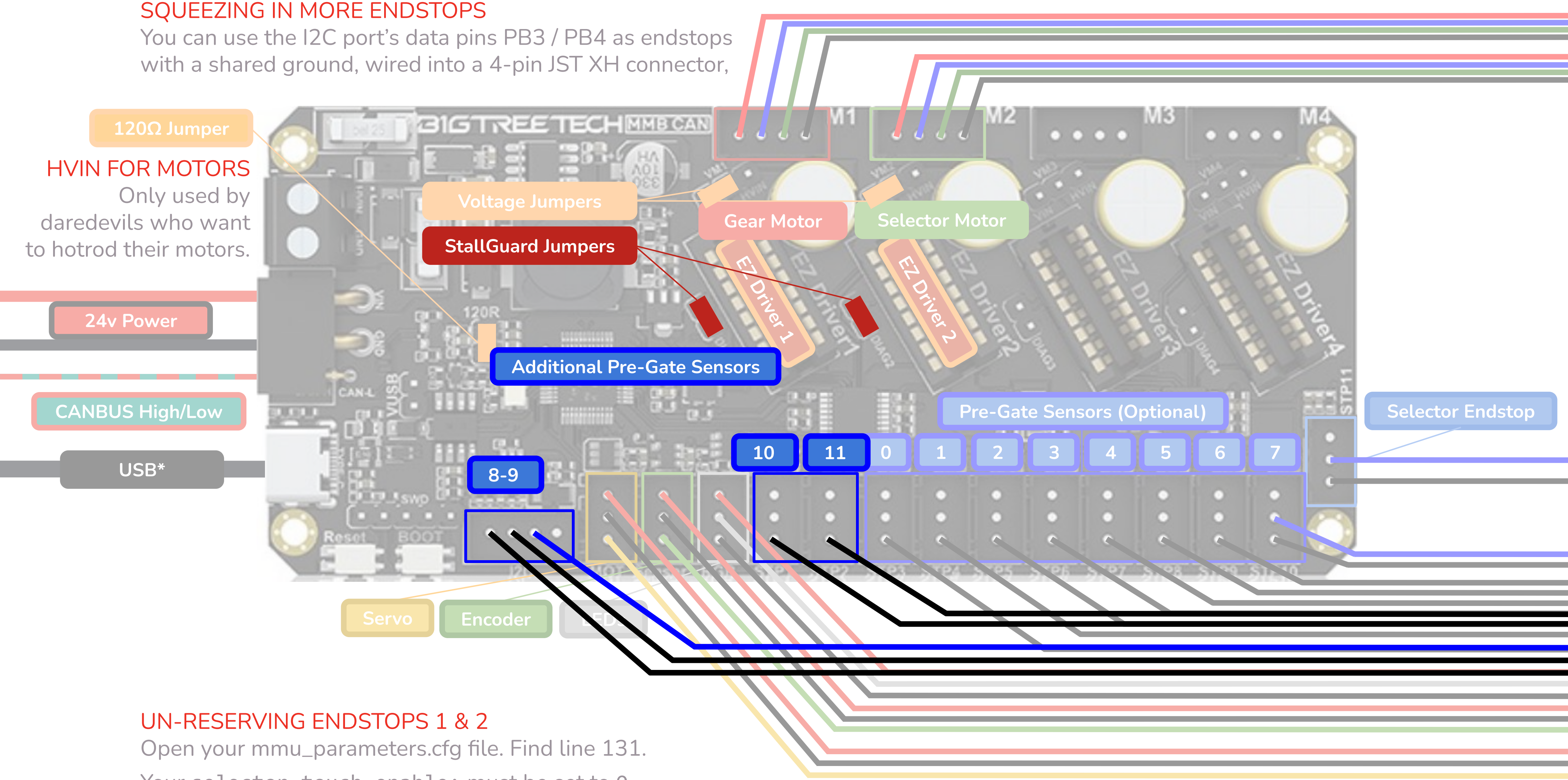
WIRING THE MMBv1.1 FOR 12 CHANNELS

SQUEEZING IN MORE ENDSTOPS

You can use the I2C port's data pins PB3 / PB4 as endstops with a shared ground, wired into a 4-pin JST XH connector,

HVIN FOR MOTORS

Only used by daredevils who want to hotrod their motors.



UN-RESERVING ENDSTOPS 1 & 2

Open your mmu_parameters.cfg file. Find line 131.

Your `selector_touch_enable:` must be set to `0`.

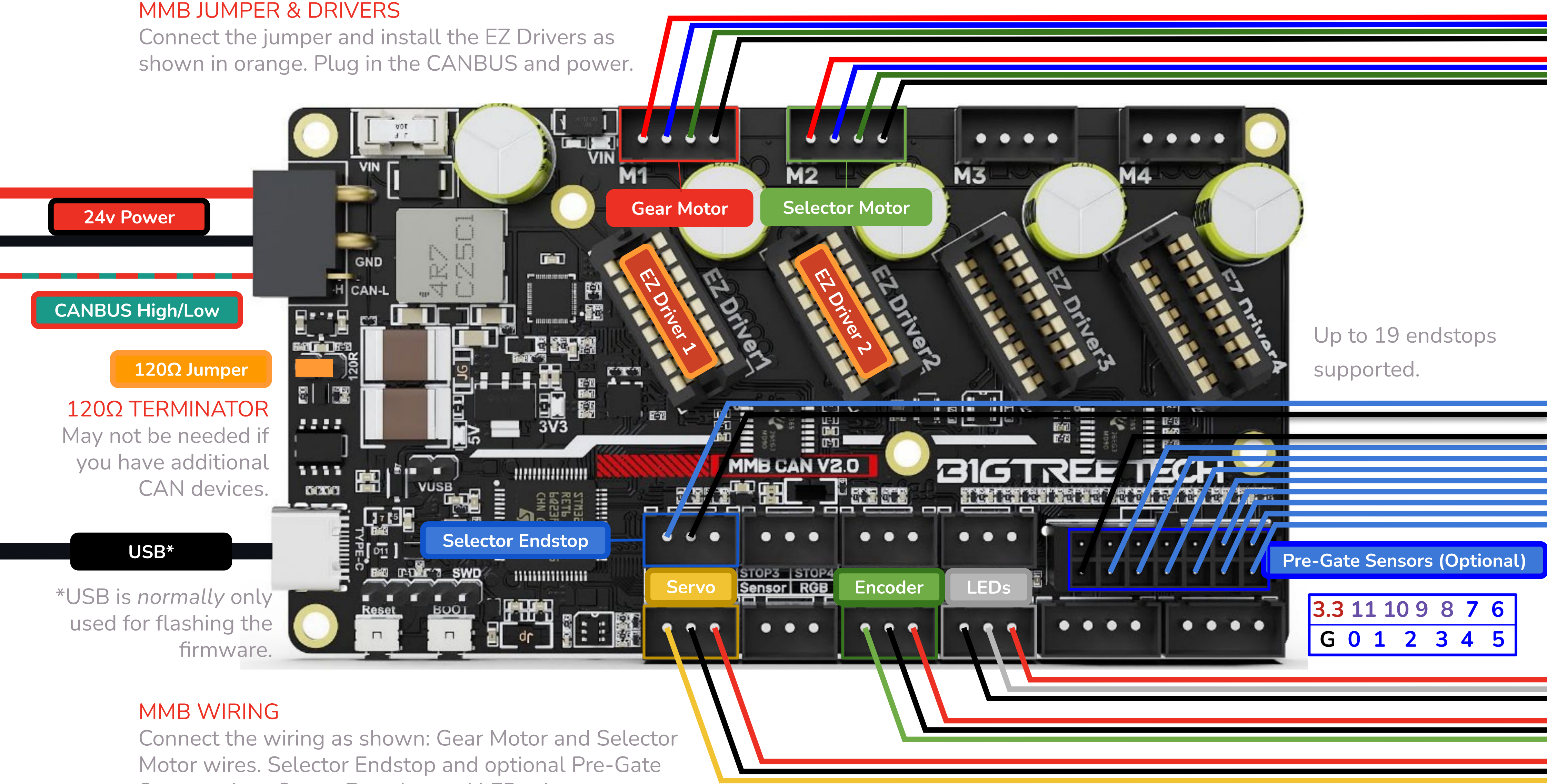
Next, find line 232. Your `extruder_homing_endstop` setting must **not** be `mmu_gear_touch`.

Don't forget to remove the StallGuard DIAG jumpers.

WIRING THE MMBv2

MMB JUMPER & DRIVERS

Connect the jumper and install the EZ Drivers as shown in orange. Plug in the CANBUS and power.



120Ω TERMINATOR

May not be needed if you have additional CAN devices.

*USB is *normally* only used for flashing the firmware.

MMB WIRING

Connect the wiring as shown: Gear Motor and Selector Motor wires. Selector Endstop and optional Pre-Gate Sensor wires. Servo, Encoder, and LED wires.

Wiring color may vary between manufacturers for stepper motors and generally.

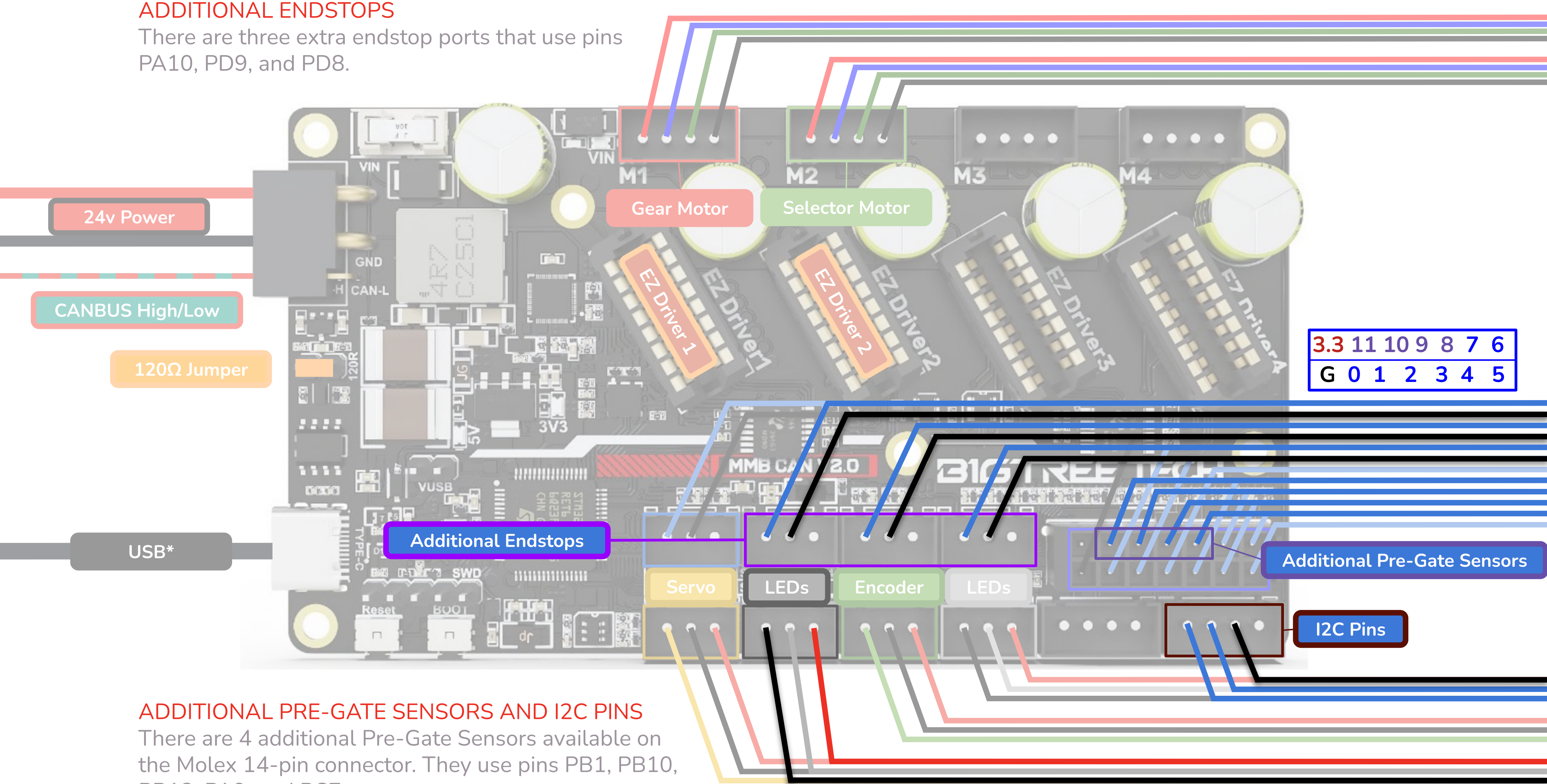
Keep a few cm of wiring slack in the MMB box, it will be very helpful for maintenance.

Note: USB +5v is insufficient, therefore:
+24v power on the CANBus is necessary!

WIRING THE MMBv2 FOR 17 CHANNELS

ADDITIONAL ENDSTOPS

There are three extra endstop ports that use pins PA10, PD9, and PD8.



ADDITIONAL PRE-GATE SENSORS AND I2C PINS

There are 4 additional Pre-Gate Sensors available on the Molex 14-pin connector. They use pins PB1, PB10, PB12, PA9, and PC7.

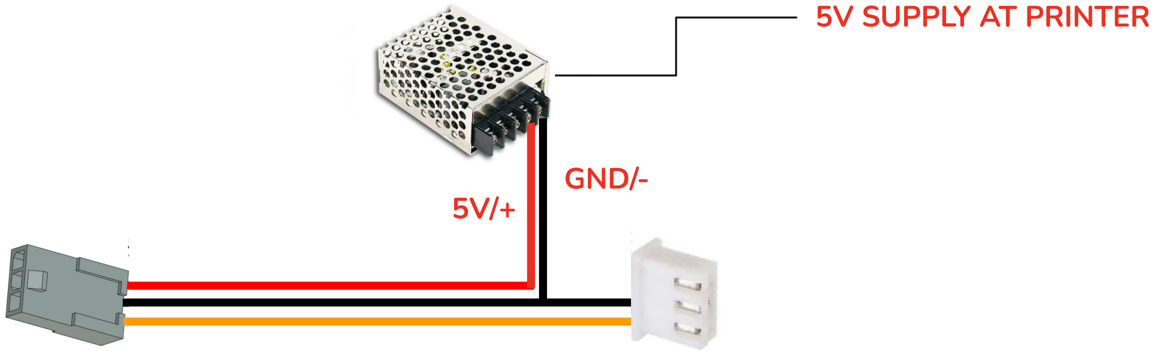
The I2C can also be used for endstops: pins PC1 and PC0.

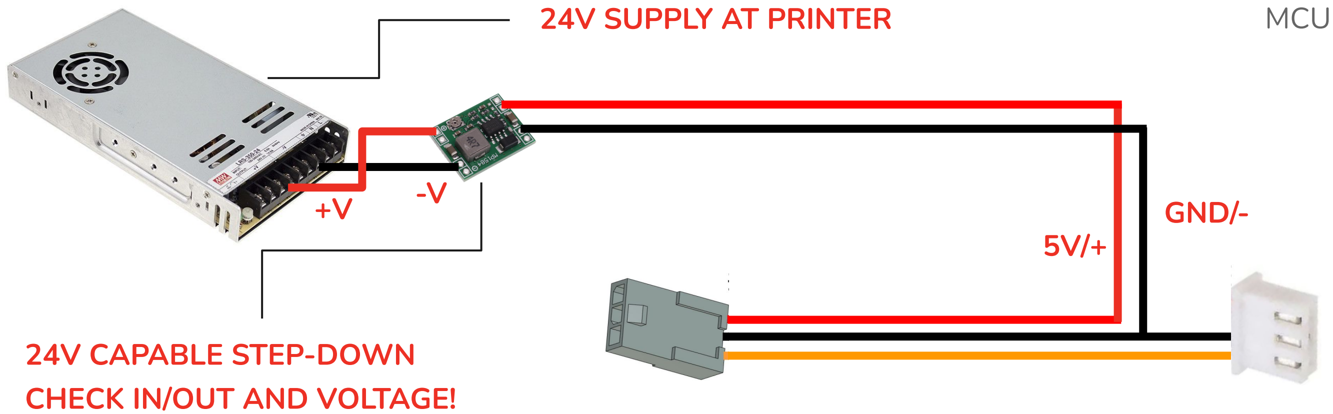
You can also fit an additional LED chain (or other 5v accessory) on MOT2 / PA0.

SERVO WIRING (ALTERNATIVE POWER)

RATIONALE

Running a servo from the 5v line of your controller board can sometimes lead to issues when the 5v line doesn't provide enough amperage, such as brownouts leading to the dreaded `Lost communication with MCU` error. This is a known problem with the Fysetc ERB board. Additionally some servos are stronger at higher voltages, and you can squeeze a little more out of an underpowered server by giving it more than 5v. **ONLY DO THIS IF YOUR SERVO'S DATASHEET INDICATES IT IS CAPABLE OF HIGHER VOLTAGE!**
If you have a separate 5v supply in your machine, you can use this, otherwise you can use a 24v capable step-down to do so.
Always remember to connect your grounds together, here are some example wirings:



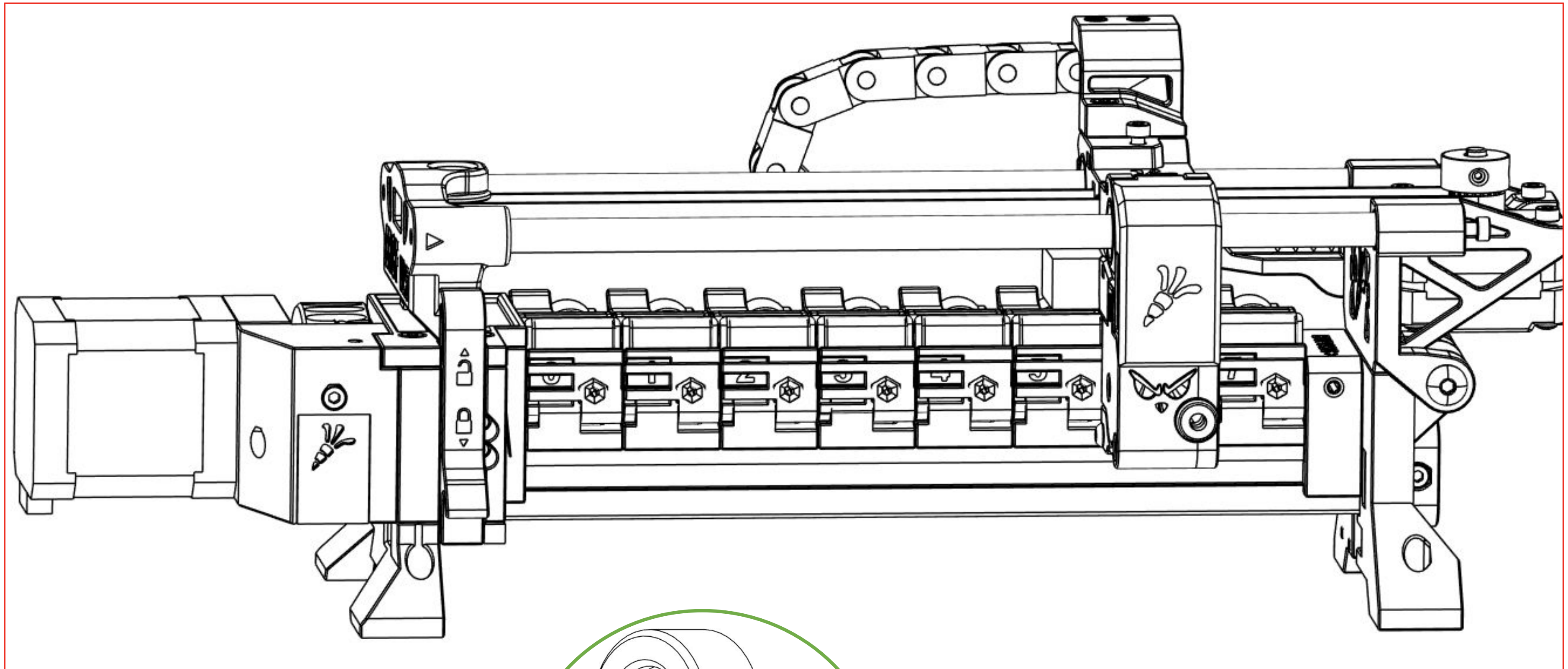


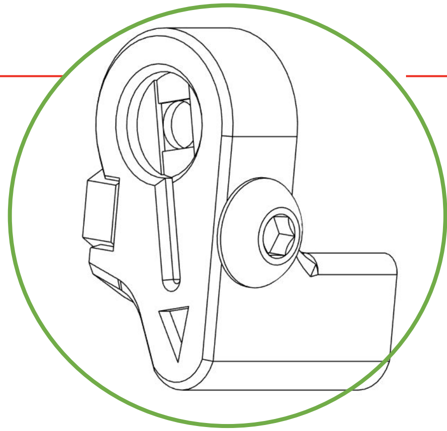
NOTES

Cheap step-down adapters may say they support 24v, but always check the output voltage with a multimeter, sometimes they don't and will just pass the 24v to the servo which is not a good idea! This wiring is **unusual**, so consider upgrading your MCU and/or servo instead.

This page was contributed by iMartyn.

THE END! ... OR ALMOST :D





NEXT STEPS

The ERCF is now fully assembled, except, as you probably have noticed, for the Servo_Arm!

Its' installation on the ERCF will be done as part of the setup and calibration:
https://github.com/Carrot-collective/ERCF_v3/tree/main/Documentation

KEEP THE ERCF PROJECT GOING!

ERCF is an all-volunteer, open-source project.

If you want to support the ERCF team, please donate to the Carrot Collective:

https://opencollective.com/carrot-collective

If you found this manual valuable, consider donating to Miriax, the creator of the manual.

PayPal.me/MiriaxERCF

In the words of Marc, ERCF would be a dead brick of plastic without Happy Hare software.

Happy Hare is coded primarily by moggieuk, and Silverback_Attack wrote a lot of the documentation.

You can find Happy Hare here:

https://github.com/moggieuk/Happy-Hare

You can donate to support moggieuk and Happy Hare here:

PayPal.me/moggieuk

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ASSEMBLY COMPLETED! ... NEXT STEP: SETUP & CALIBRATION

This manual is designed to be a reference manual for the build process of an Enraged Rabbit Carrot Feeder v3.0 MultiMaterial System. Additional details about the build and background on advanced topics can be found on our documentation page linked below. The software setup and other initial setup steps with your printer can also be found on our documentation page. We recommend starting here.

GitHub https://github.com/Carrot-collective/ERCF_v3/tree/main/Documentation

GitHub https://github.com/moggieuk/Happy-Hare/wiki

REPORTING ISSUES

Should you find an issue in this document or have a suggestion for an improvement please consider opening an issue on GitHub:

(https://github.com/Carrot-collective/ERCF_v3/issues).

When raising an issue please include the relevant page numbers and a short description; annotated screenshots are also very welcome.

We will update the manual based on the feedback we get!.

HOW TO GET HELP

If you need assistance with your build you can head over the new ERCF Discord group. It is the primary medium to help people with their ERCF build and tuning! You can also check the Github page for the latest releases.

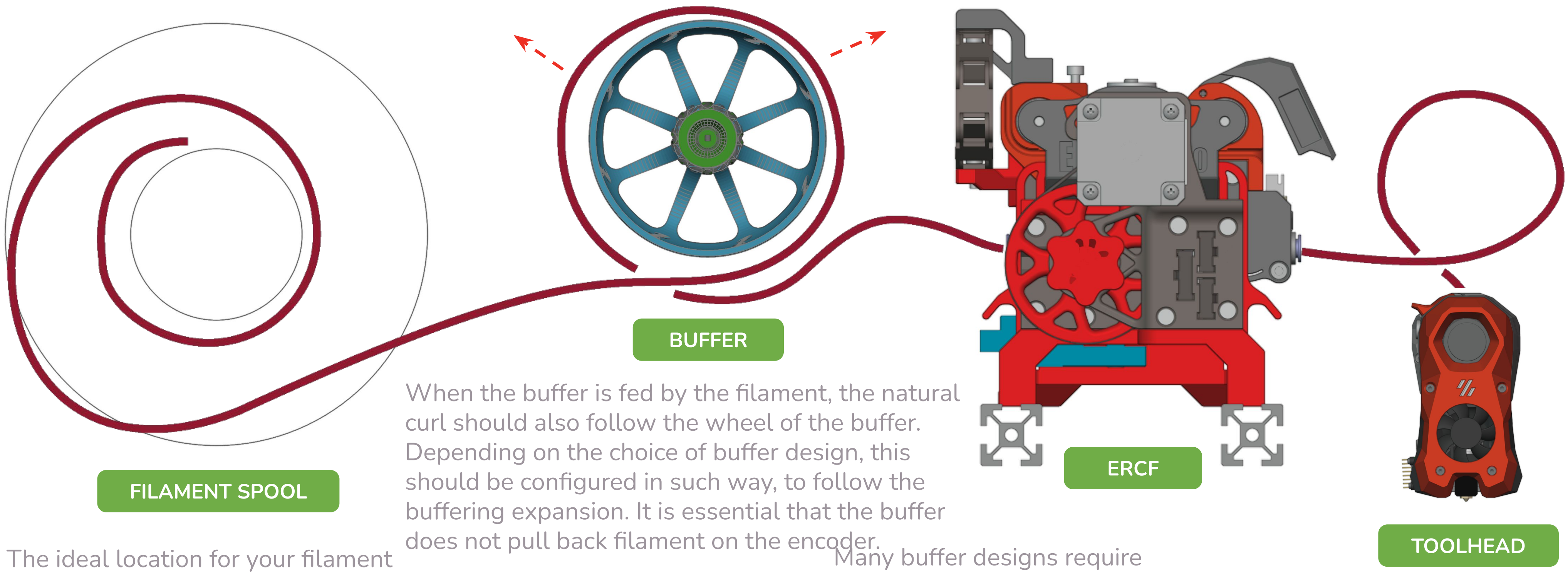
ERCF DISCORD https://discord.com/channels/1267663557999329371/

GitHub https://github.com/Carrot-collective/ERCF_v3

FILAMENT TUBE MANAGEMENT

BEST PRACTICES FOR FILAMENT TUBE MANAGEMENT

It is important to optimize your tube path to reduce any resistance for your MMU setup. This is to ensure that the path you choose does not go against the natural curl of your filament. ERCT, as an example is designed to support many of these best practices.



When the buffer is fed by the filament, the natural curl should also follow the wheel of the buffer. Depending on the choice of buffer design, this should be configured in such way, to follow the buffering expansion. It is essential that the buffer does not pull back filament on the encoder.

The ideal location for your filament spool will depend on how it feeds the buffer. The curl should naturally work with the path (filament and tube) that goes into the buffer. In this example feeding around to the back and below allows for the natural curl to remain in the tube to the buffer. Feeding from the bottom prevents the spool from tipping over

Many buffer designs require optimal paths that come into the ERCF to reduce pressure on the filament blocks. It is important to reduce that pressure by not allowing downward orientations. Also, we recommend a tube length of 1000mm or less where possible.

A final turn to the toolhead can help maintain the natural curl. This doesn’t have to be small, and can be a large radius but shouldn’t be too long that will introduce additional resistance.

Enjoy your MMU.

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