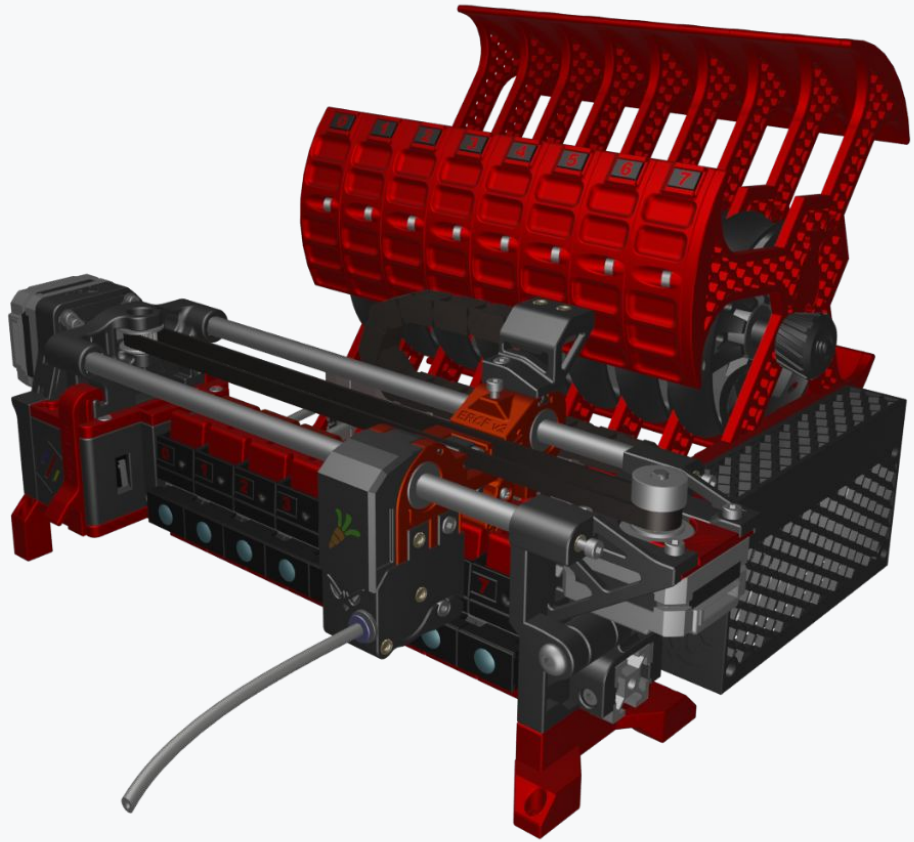
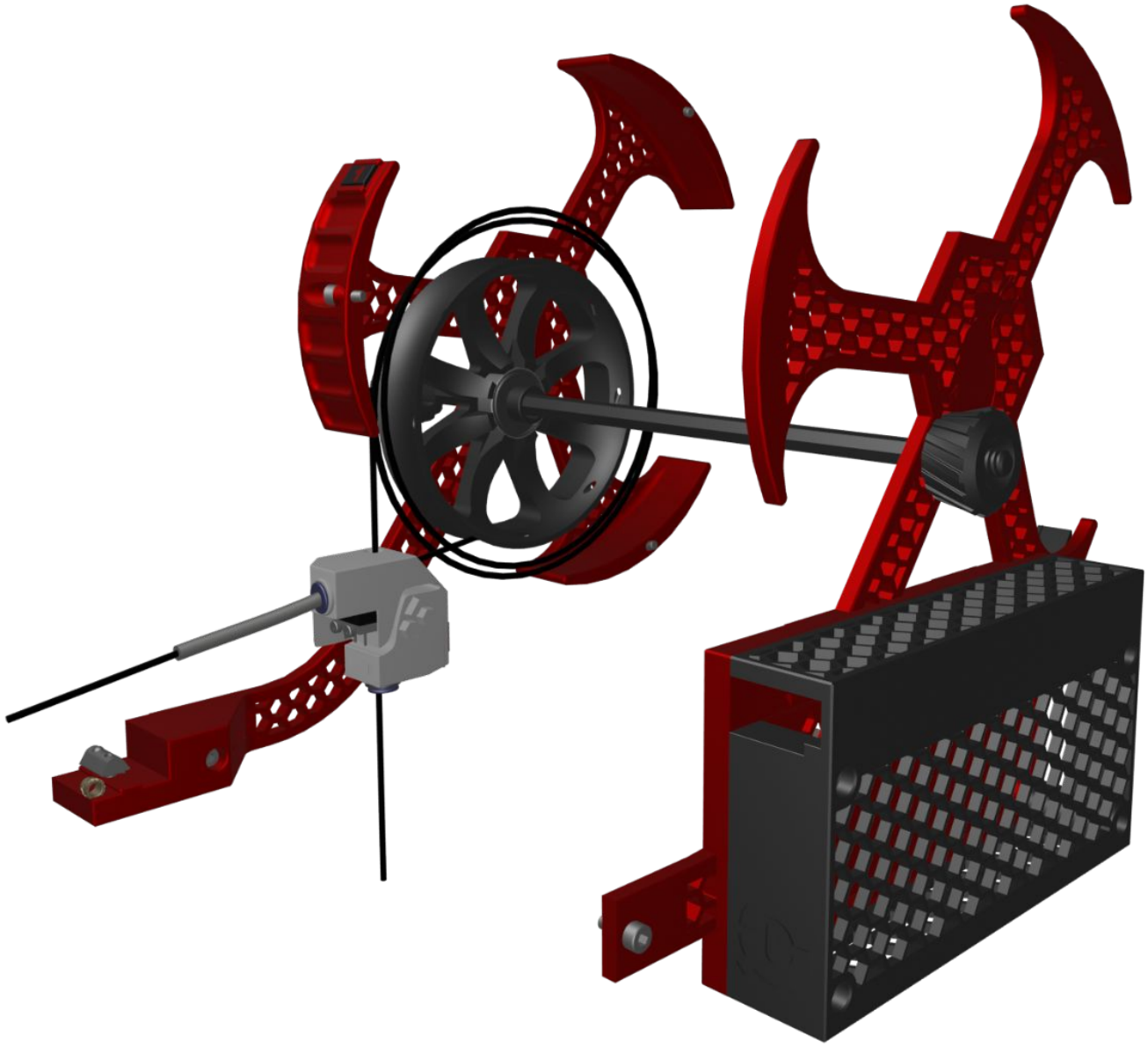
VORON



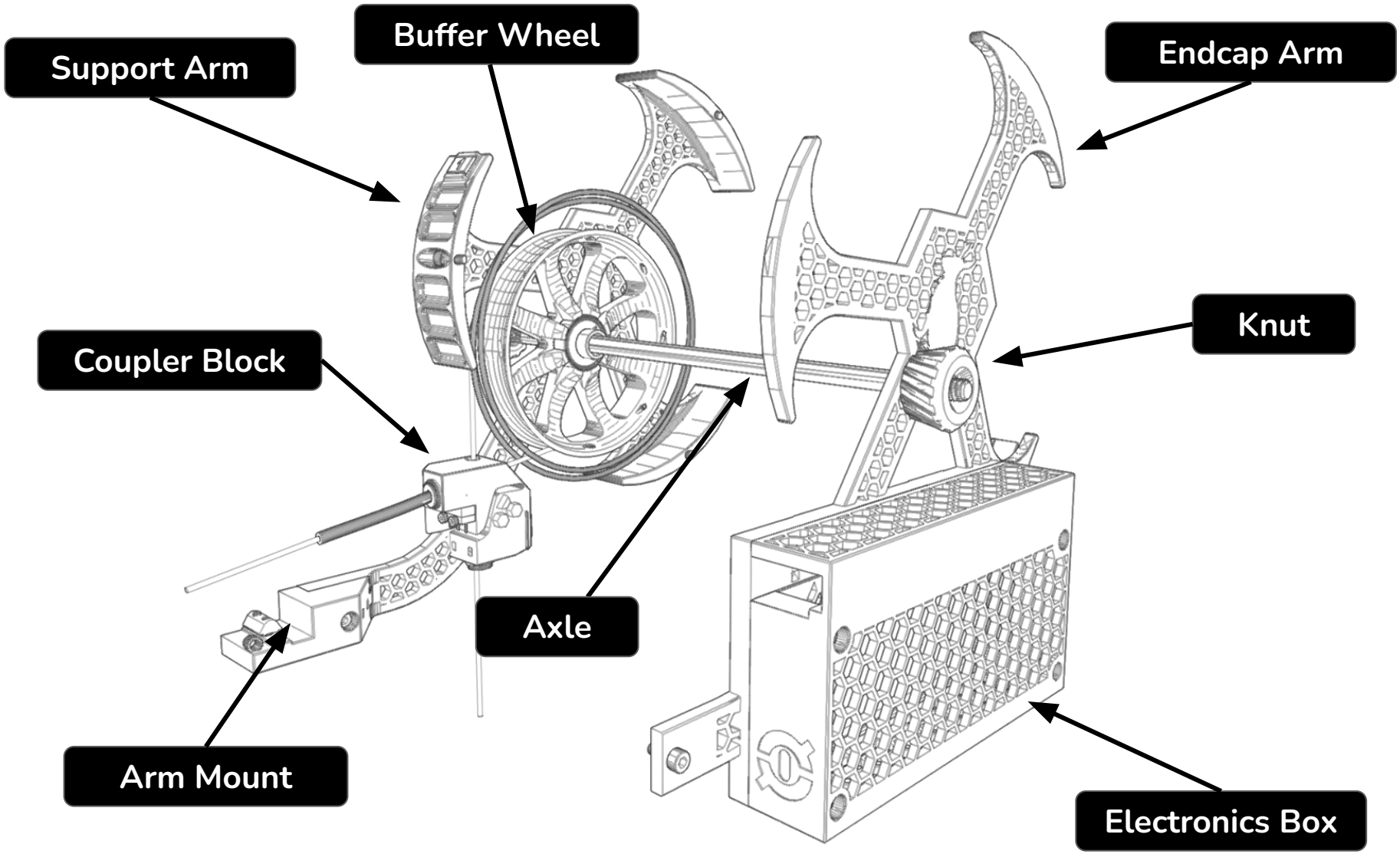
ERCT BUILD GUIDE

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

VERSION 2023-12-21



OVERVIEW


Support Arm
Buffer Wheel
Endcap Arm
Coupler Block
Knut
Axle
Arm Mount
Electronics Box

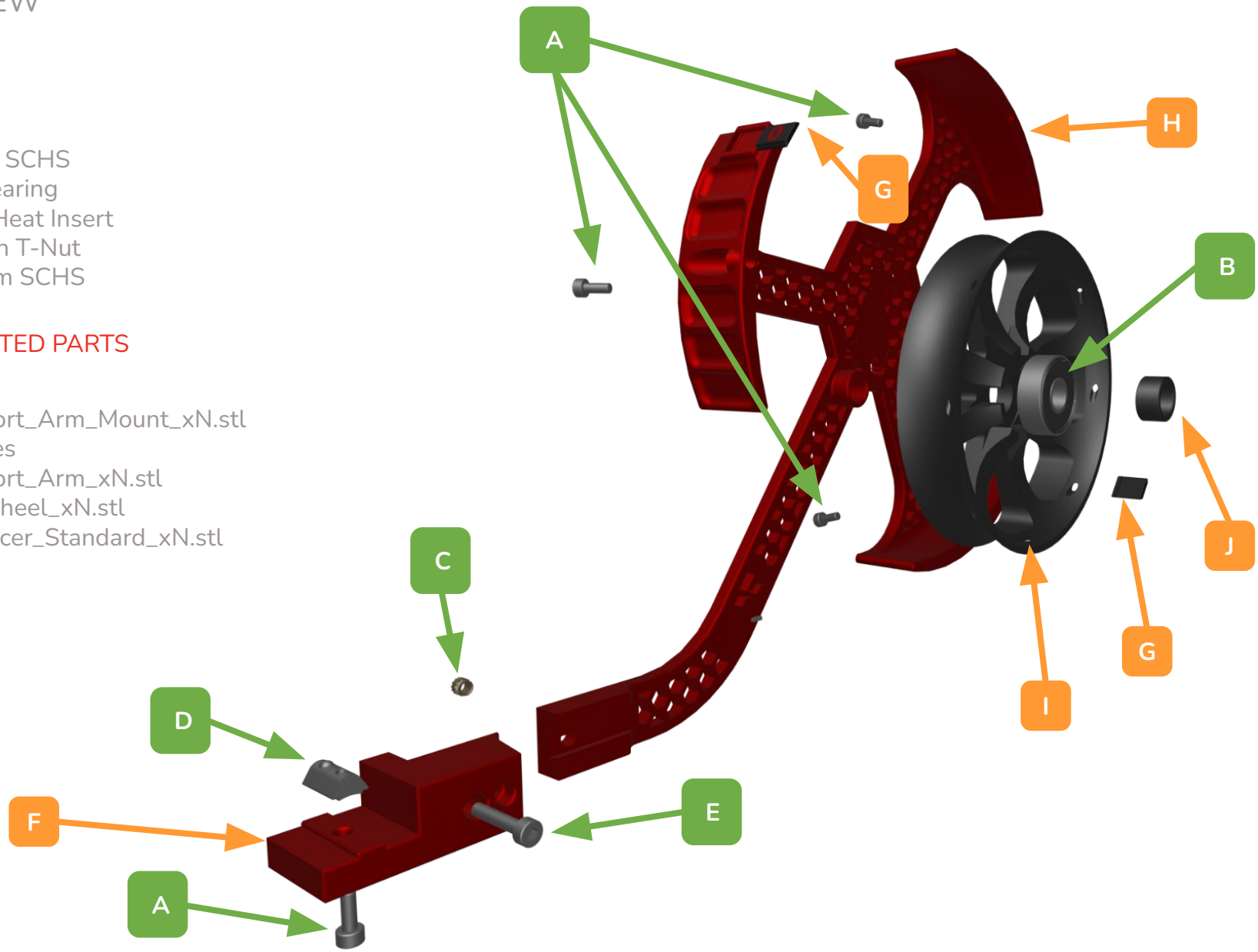
EXPLODED VIEW

ARM GROUP BOM (PER CHANNEL)

A	4x M3x8mm SCHS
B	1x 608ZZ Bearing
C	1x M3x5x4 Heat Insert
D	1x M3 Roll-in T-Nut
E	1x M3x16mm SCHS

ARM GROUP PRINTED PARTS (PER CHANNEL)

F	1x [a]_Support_Arm_Mount_xN.stl
G	2x Tag_Plates
H	1x [a]_Support_Arm_xN.stl
I	1x Buffer_Wheel_xN.stl
J	1x Axle_Spacer_Standard_xN.stl



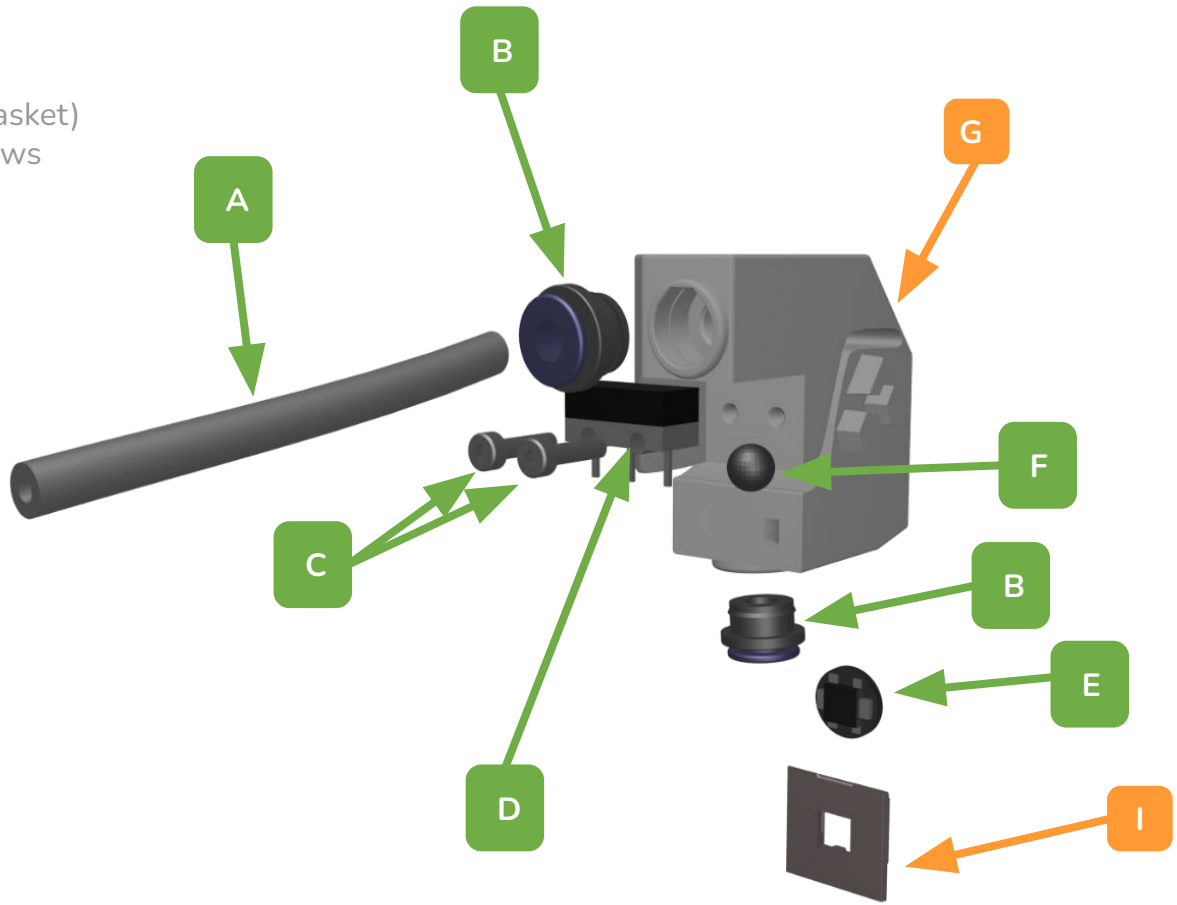
EXPLODED VIEW

COUPLER BLOCK BOM (PER CHANNEL)

A	1x 48mm OD4.0mmxID3.0mm PTFE Tubing
B	2x ECAS Coupler (2 piece - remove rubber gasket)
C	4x M2x8mm or M2x10mm Self Tapping Screws
D	1x Omron D2F-5L or D2F-01L Micro Switch
E	1x Neopixel
F	1x 5.5mm Steel Ball Bearing

COUPLER BLOCK PRINTED PARTS (PER CHANNEL)

G	Coupler_Block_xN.stl
I	[a]_LED_Carrier_xN.stl



Although the LED uses the entire Coupler Block as a diffuser for the light, it isn't required to use translucent or clear filament to print it. Choose a filament that allows it to be backlit or illuminated.

EXPLODED VIEW

END CAP ARM BOM

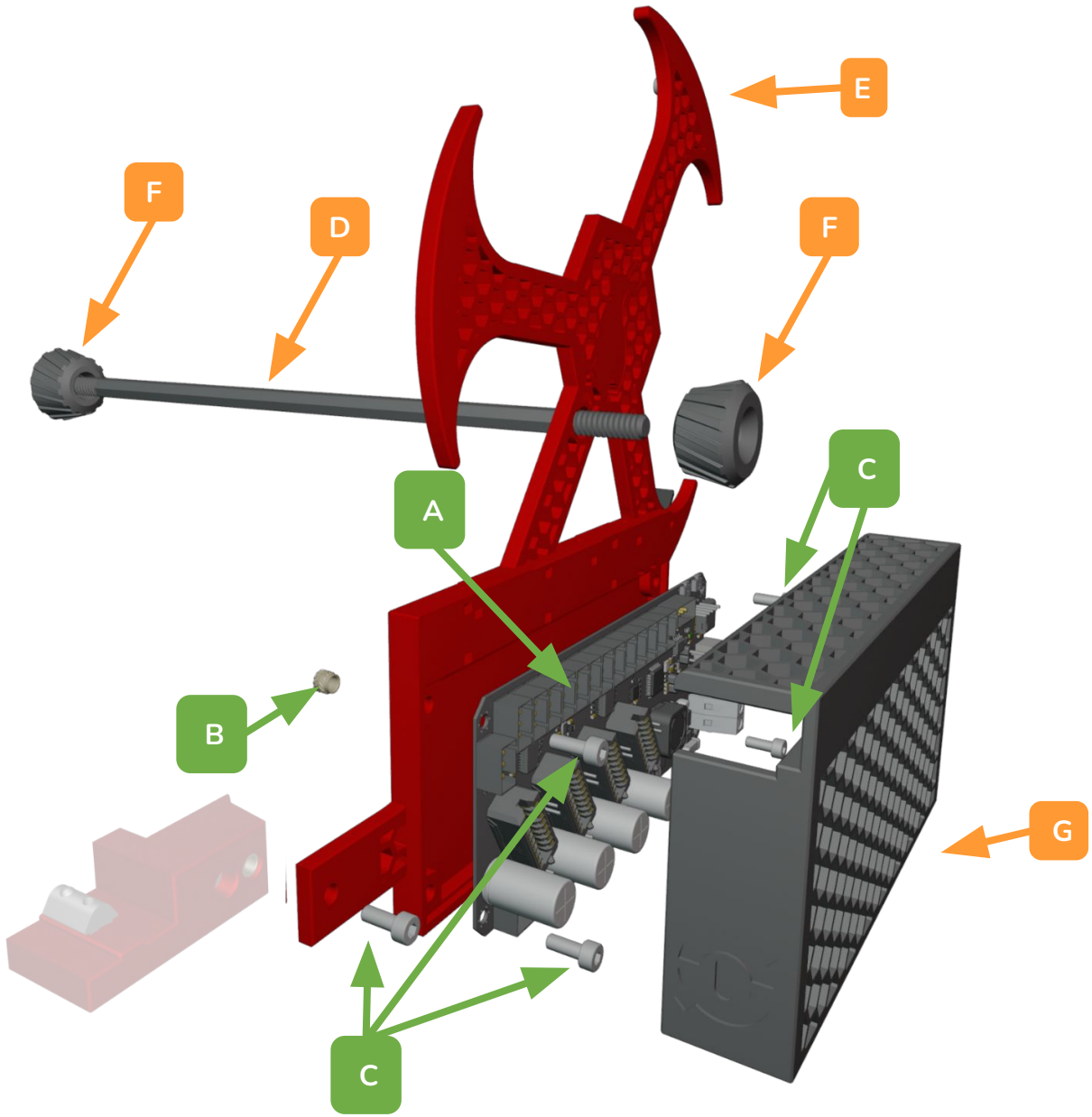
A
B
C

1x BTT MMB Controller Board
4x M3x5x4 Heat Insert (3 not pictured)
5x M3x8mm SCHS

END CAP ARM PRINTED PARTS

D
E
F
G

Axle_N_Double_Thread.stl
[a]_BTT_MMB_Support_Arm_Endcap.stl
Knut_x2.stl
[a]_BTT_MMB_Box_Lid.stl

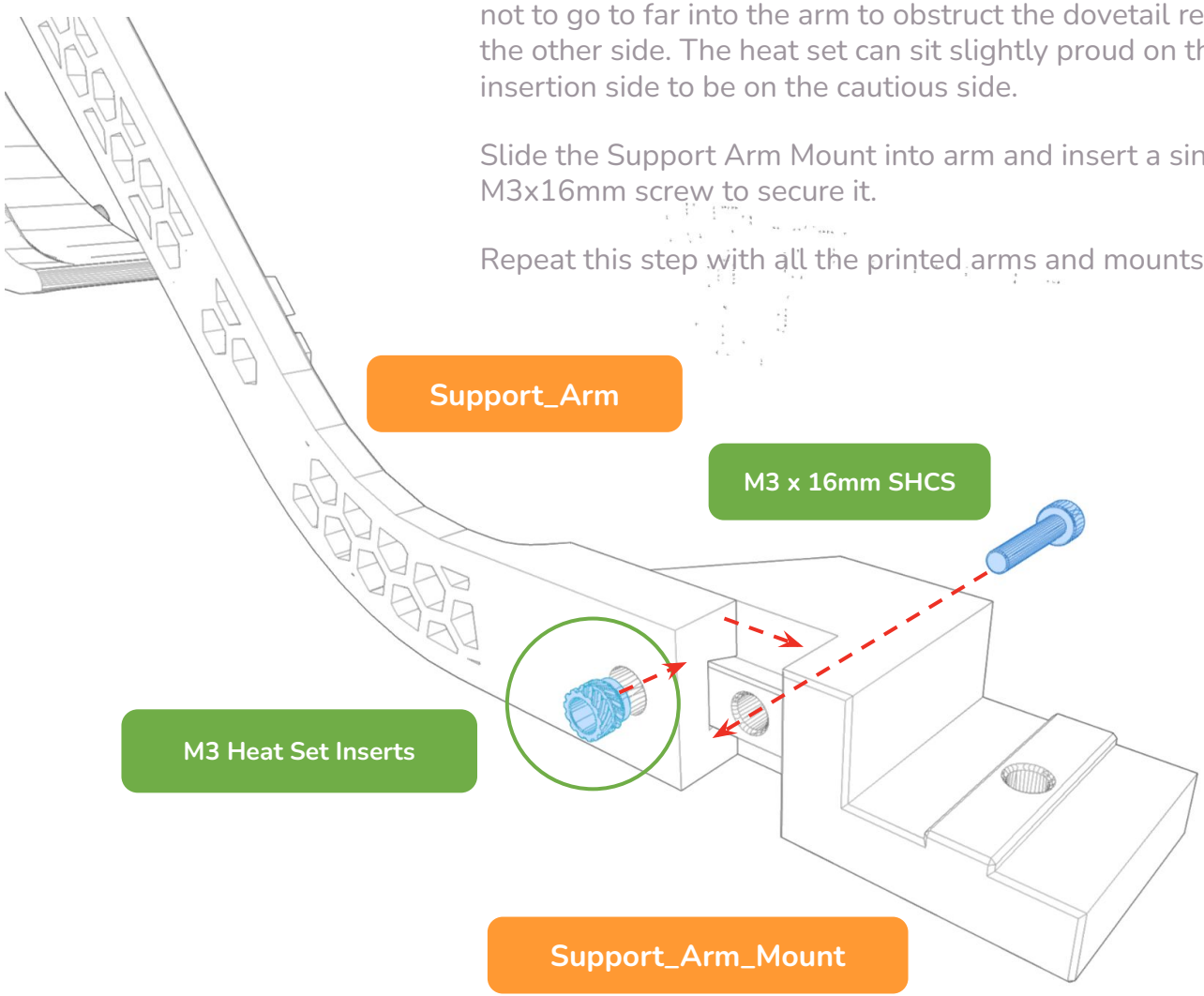


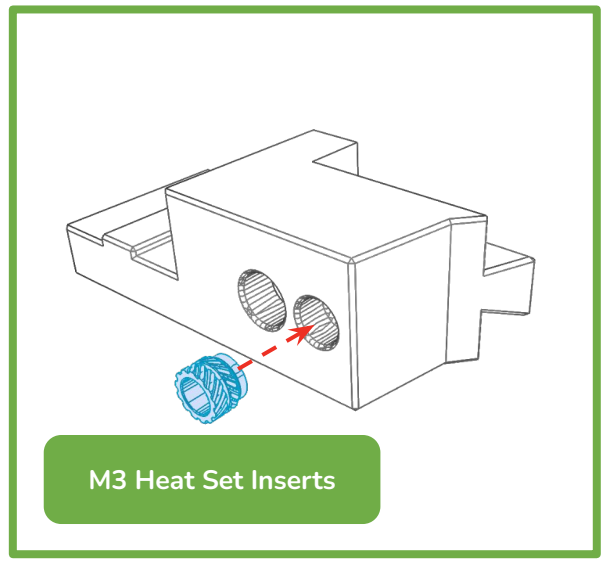
ASSEMBLY (PER ARM GROUP)

Start by adding the heat insert into each of the arms, Be careful not to go to far into the arm to obstruct the dovetail receiver on the other side. The heat set can sit slightly proud on the insertion side to be on the cautious side.

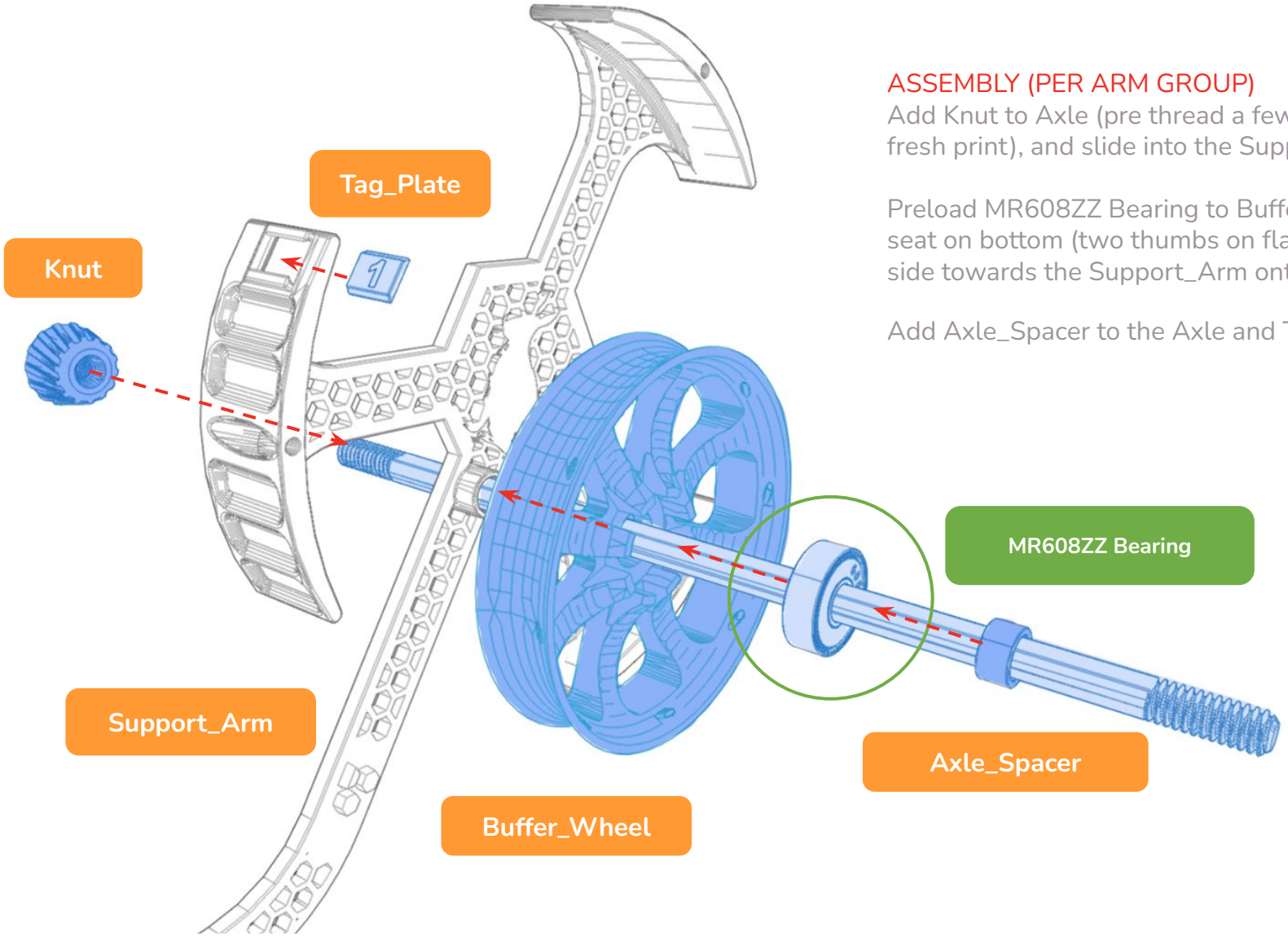
Slide the Support Arm Mount into arm and insert a single M3x16mm screw to secure it.

Repeat this step with all the printed arms and mounts.





Set aside one of the Support Arm Mounts for the end, and insert a single Heat Set into the second hole. This will be used to hold the Endcap.

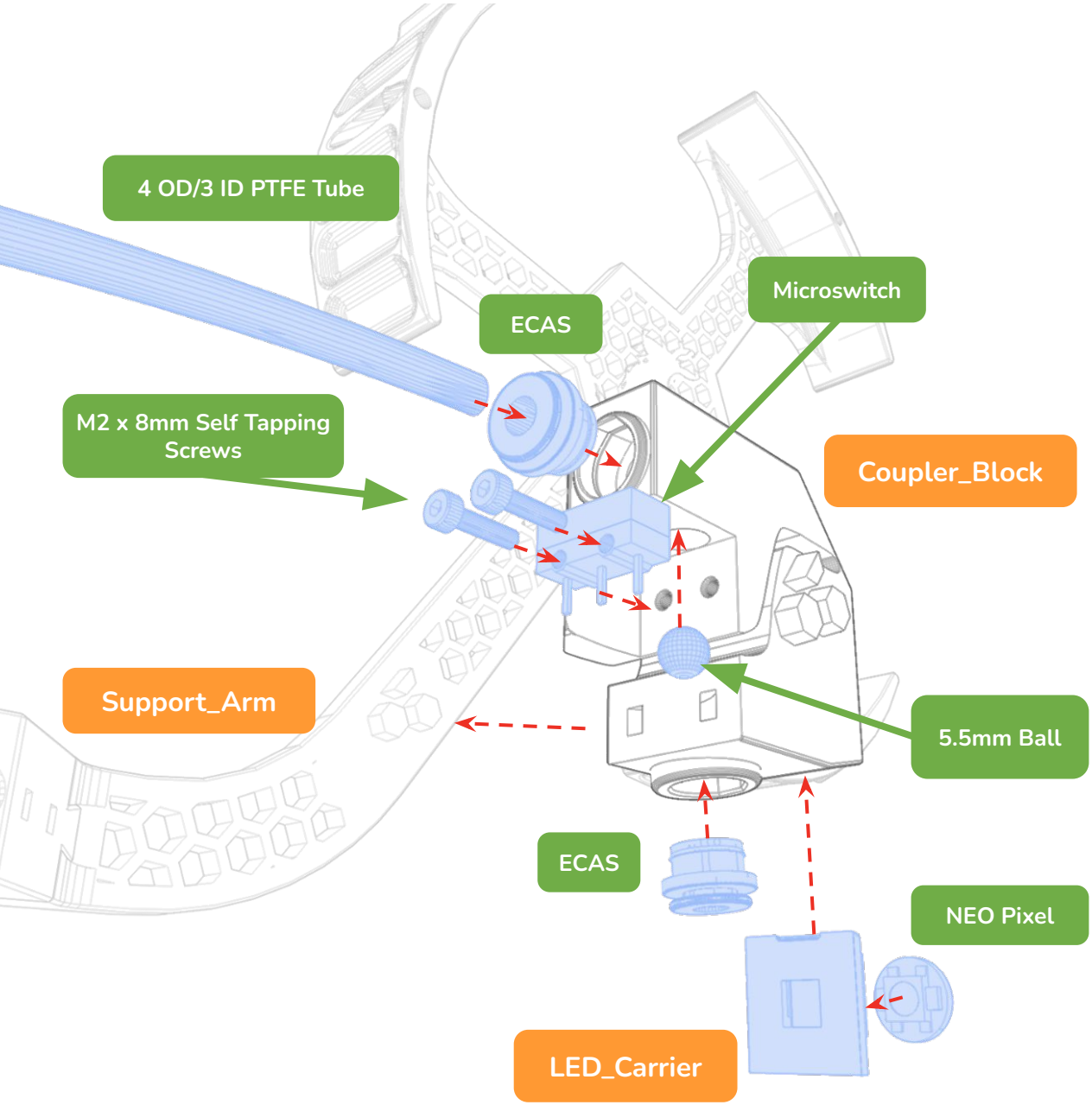


ASSEMBLY (PER ARM GROUP)

Add Knut to Axle (pre thread a few turns to loosen it up from fresh print), and slide into the Support_Arm.

Preload MR608ZZ Bearing to Buffer_Wheel, and press firmly to seat on bottom (two thumbs on flat table). Slide wheel with flat side towards the Support_Arm onto Axle_N_Double_Thread.

Add Axle_Spacer to the Axle and Tag_Plate to Support_Arm



ASSEMBLY (PER ARM GROUP)

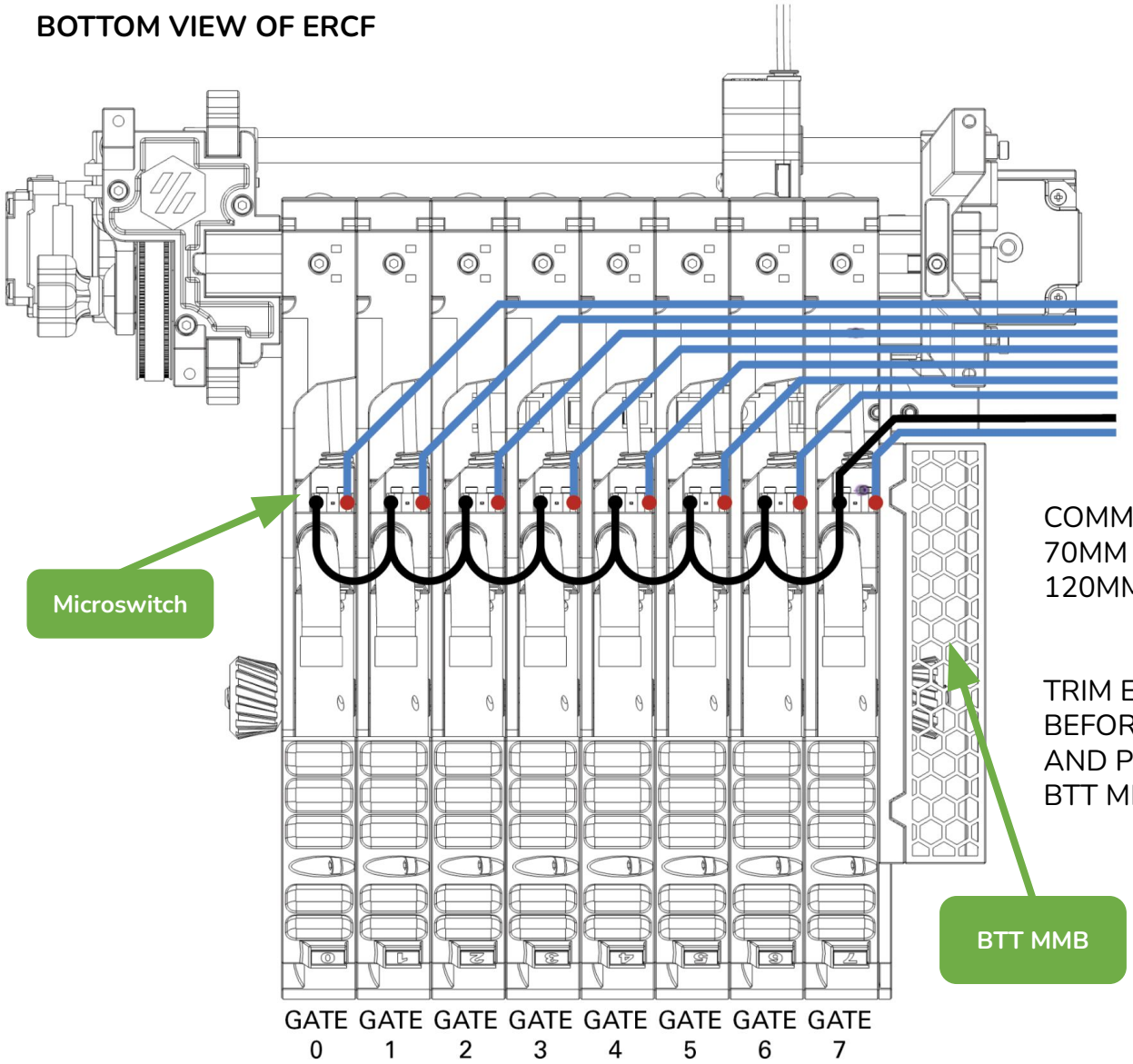
Start your assembly by inserting the ECAS collet with no rubber attached to it into the two positions of the coupler block. Use a flat surface to press in, or use a ratchet bar clamp to apply even pressure.

Use the cutting jig to cut 48.5mm of 4mm OD/3mm ID Clear PTFE Tube. Insert into the ECAS coupler. Make sure it's seated all the way in and the natural curve of the tube is curling downwards.

Install the pre wired NEO Pixel string into the LED_Carrier and slide into the coupler (this can be done at any point).

Add 5.5mm ball into the void, and screw in the micro switch *(this is recommended to be done after all arms have been assembled to keep wiring tidy, refer to wiring diagram on the following page)* with no lever arm and the plunger lined up to the ball. Use two M2x8mm or M2x10mm self tapping screws to fix.

BOTTOM VIEW OF ERCF



NC MINIMUM LENGTH
4 GATES = 50mm
8 GATES = 145mm
12 GATES = 240mm

to MMB

COMMON GROUND
70MM BETWEEN GATES
120MM FINAL LEG

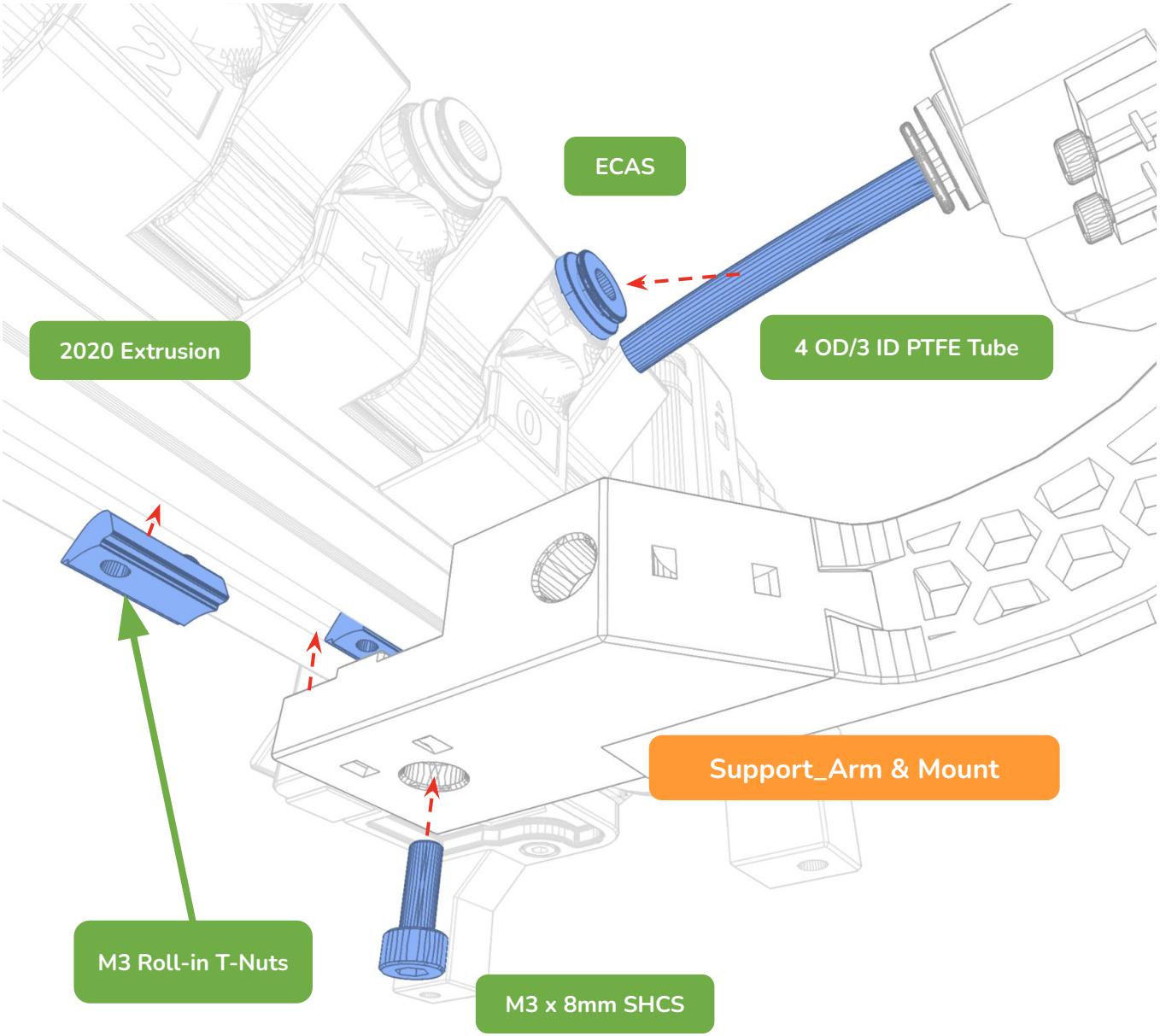
TRIM EXTRA WIRING
BEFORE CRIMPING
AND PLUGGING INTO
BTT MMU

WIRING SENSORS

Wiring the microswitch sensors should be done ahead of time. Make sure you follow the recommended lengths to ensure that the switches are not binding the Coupler Block's upper sprung section.

This takes into account extra length so you can trim the wire to be as tidy as possible.

Use cable ties to keep bundles together.



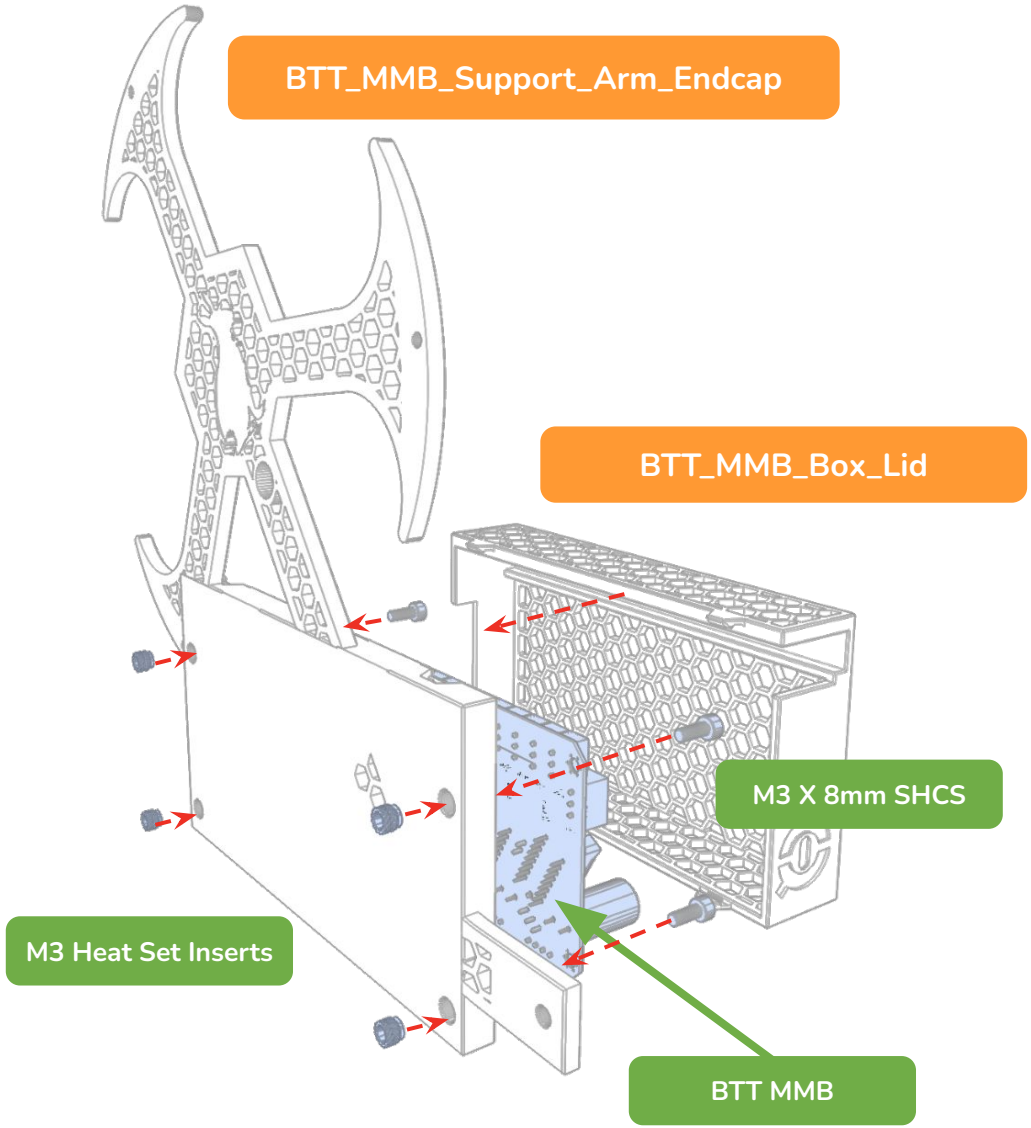
MOUNTING ARMS (PER ARM GROUP)

Preload the M3 Roll-in T-nuts into the bottom of the 2020 Extrusion.

Bring assembled arm and line up the PTFE tube to the ECAS on the Filament Block Bring the arm into the 2020 extrusion, and line up the T-nut and screw down M3 x 8mm SHCS screw, slide to align the arm.

Alternatively you can also align the arm to the T-nuts without the coupler block unattached. After it's aligned, add the coupler block with the PTFE Tube.

Repeat steps from page 139 with each arm.



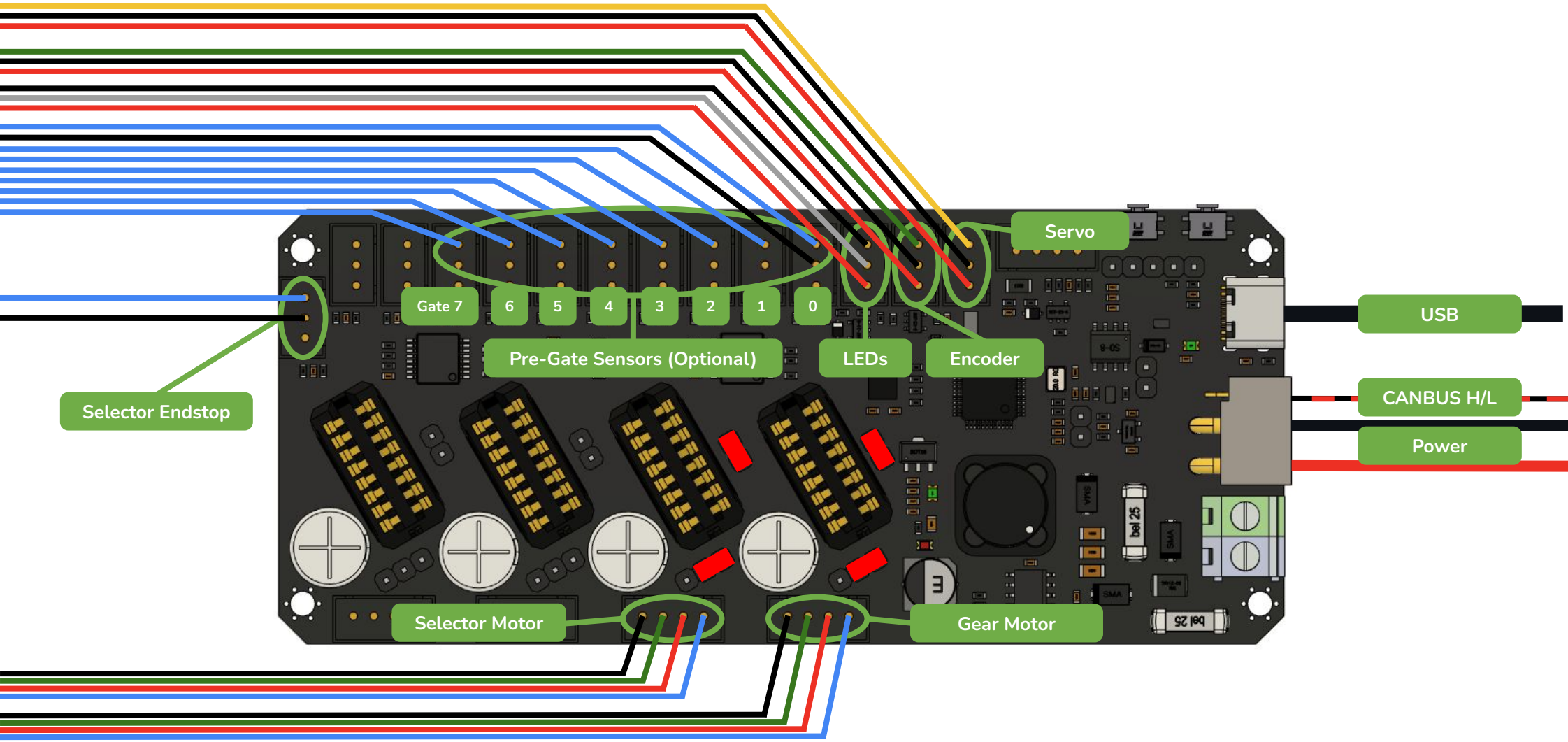
END CAP ASSEMBLY

Insert (4) M3 Heat Set inserts into the holes on the flat side of the Support Arm Endcap.

Add the BTT MMB Control board into the inset on the opposite side. There is two indents for the BOOT and RESET buttons on the board to give you the correct orientation.

Add (4) M3 x 8mm SHCS screws to secure the board.

Set aside Box Lid for snap installation after wiring is completed.

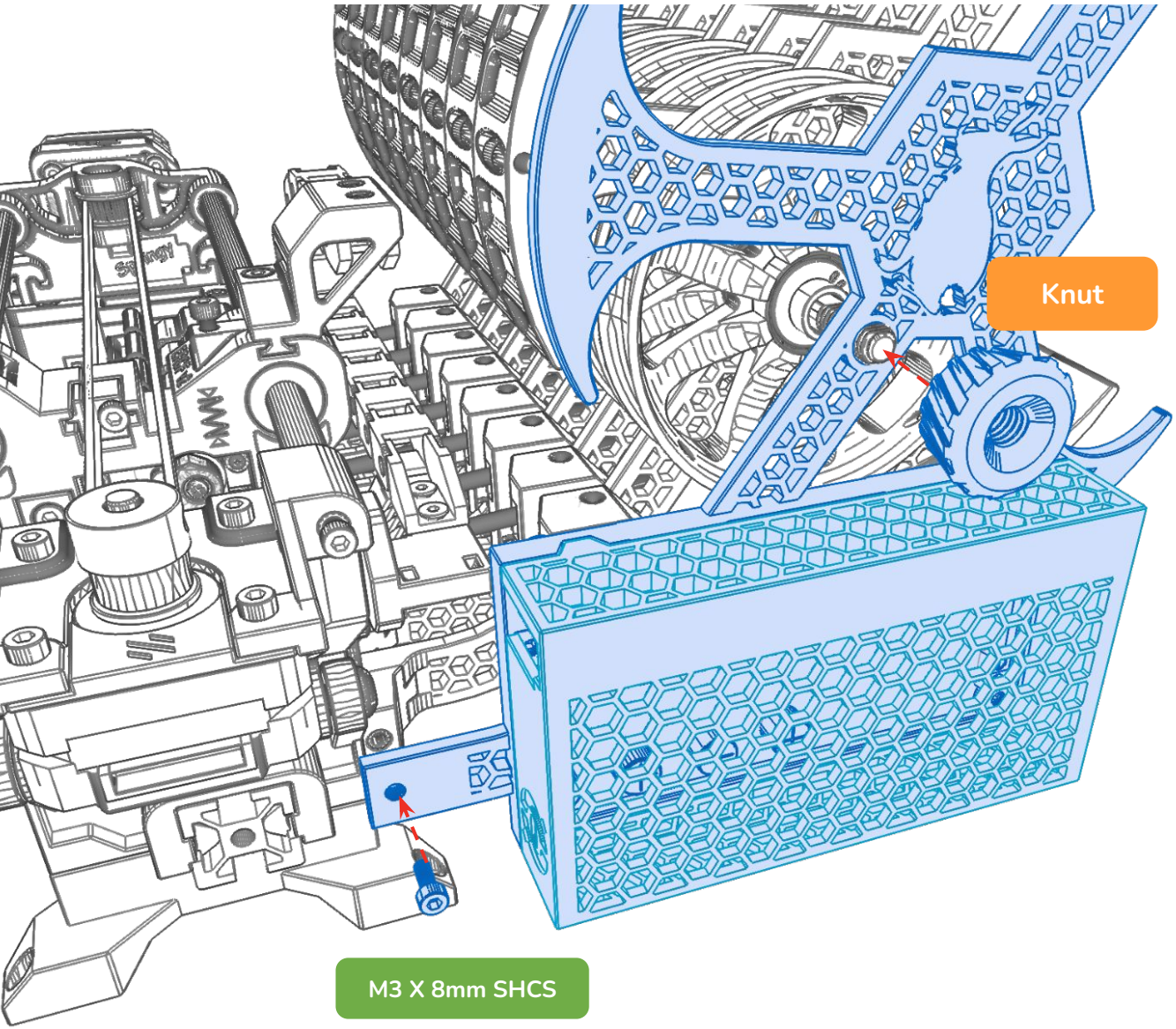


MMB WIRING

Connect the Selector Endstop and optional Pre-Gate Sensor wires. Connect the Servo and Encoder wires.

Connect the Selector Motor and Gear Motor wires. Wiring color order may vary between manufacturers for stepper motors.

Keep a few cms of wires in the MMB box, it will be helpful in case you have to disassemble//reassemble.

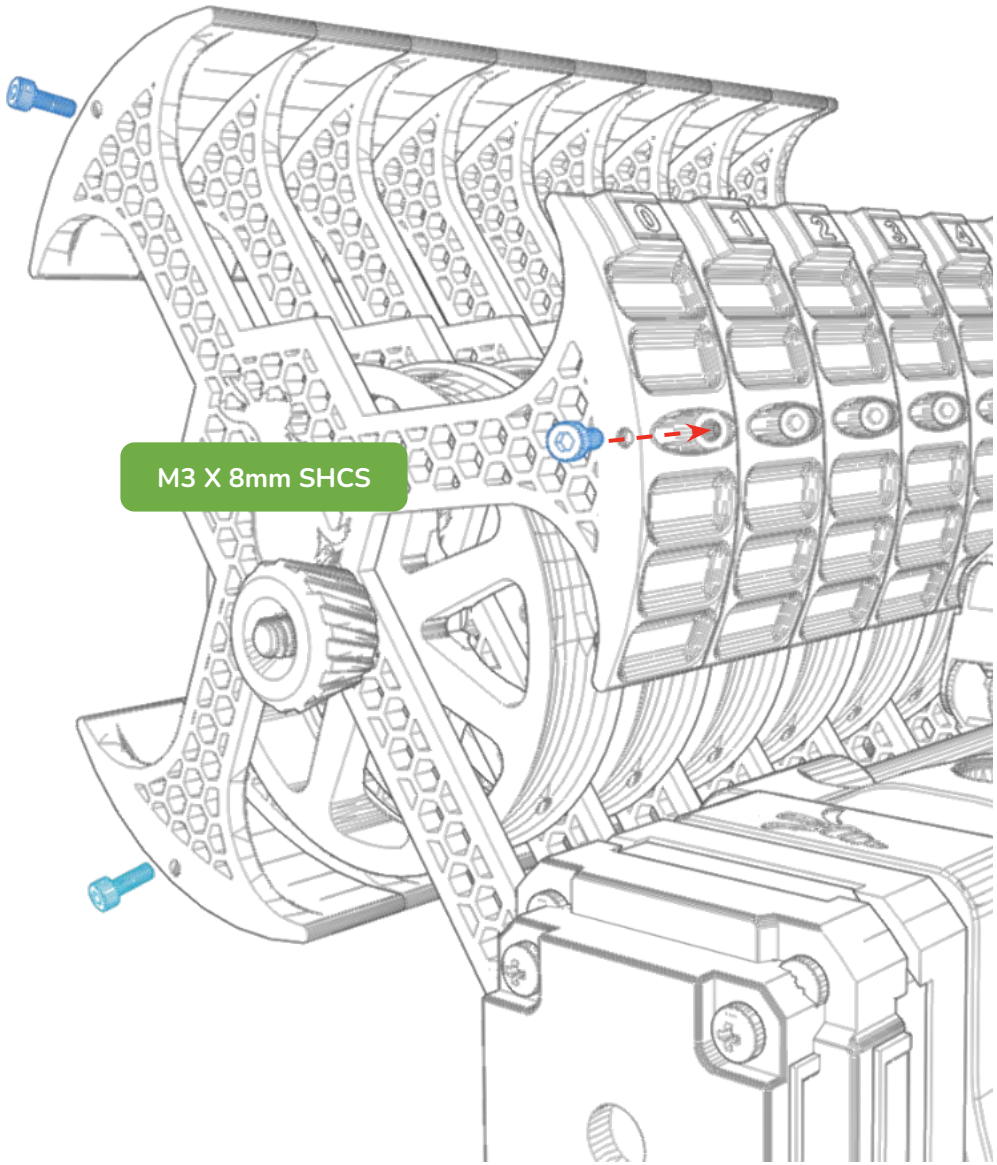


END CAP ASSEMBLY

Next step is to put the Endcap and electronics box onto the axle.

Line up the screw to the secondary hole on the Support Arm Mount you have set aside with the single heat set for the end cap.

Add the Knut, but don't over tighten. It only needs to hold the axle from wiggling back and forth.



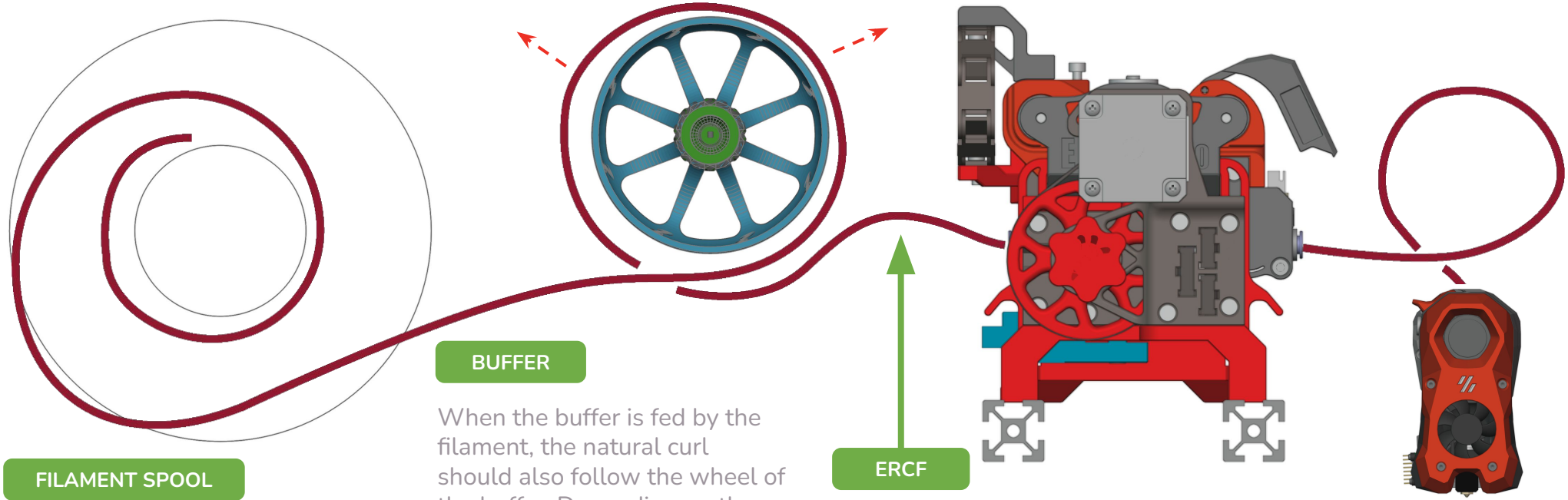
SECURE ARMS

The final step is to install three M3 X 8mm SHCS screws into each of the angled holes. Do not over tight or it will strip the plastic.

Check each of the buffer wheels as you secure each arm and ensure they are spin relatively freely. There is always a chance of touching, but as long as it spins without too much restriction, it will not be affected by the light contact.

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.



FILAMENT SPOOL

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.

BUFFER

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.

ERCF

Many buffer designs require optimal paths that come into the ERCF to reduce pressure on the filament blocks. It is important in reducing that pressure by not allowing downward orientations. The tube as well should not be too long or it meets additional resistance.

TOOLHEAD

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.

Nearly all text will use 12pt Nunito with a color of #9D959D.

Page titles should be 14pt Nunito in red.

Pictures should have a background color of flat white - #FFFFF. They should also have their Order set to Order -> Send to Back.

The Introduction section will have a light gray background color - #F7F8F9. All other pages will be flat white #FFFFFF.

All green should be #71AC78, all orange should be #FF9933, all red should be Voron Red - #ED3024.

Inset / alternate view pictures will have a 4px green stroke around them.

Green text bubbles are used to call out specific non-printed components. Use a green background, Nunito 10pt in flat white for the text.

Green lines, arrows, and circles should be a 4px stroke and be used to point out a specific non-printed component.

Orange text bubbles, line, arrows, and circles are used to call out printed parts.

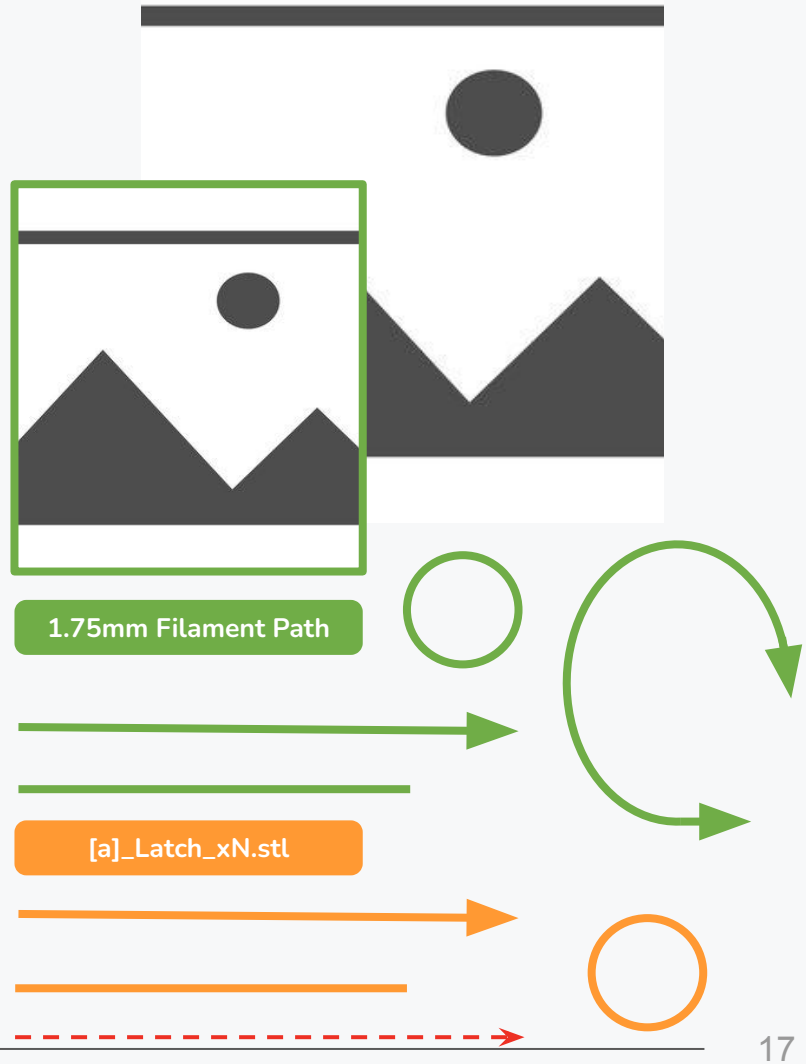
Everything is click and drag on once selected, with assistance handles. You can duplicate any of these objects by clicking on them and CTRL+D.

Action lines for insertion, etc, are dashed, red arrowhead, 2px.

table format -

Build Size	#	Bearing Carts
6	3	0, 2, 5
9	4	0, 2, 5, 8
12	5	0, 2, 5, 8, 11

Remember, if a diagram or page is too full, it should be broken into multiple pages!



To make pictures to use in this manual, we have two main types of images - Hero images, and assembly images.

Hero images usually take up most of a page. Hero images are done in full color, with “active” components highlighted in Fusion360’s default blue highlight. This is done in the Render Workspace by setting the following settings:

Scene Settings:

- Position (of illumination): 5 degrees (or behind the camera)
- Background: Solid Color (flat white)
- Ground Plane disabled
- Camera: Perspective 90mm

Render Settings:

- Web (1024 x 768px)
- Local Renderer
- Render quality: Final or Excellent

ASSEMBLY PICTURES STYLE GUIDE

To make pictures to use in this manual, we have two main types of images - Hero images, and assembly images.

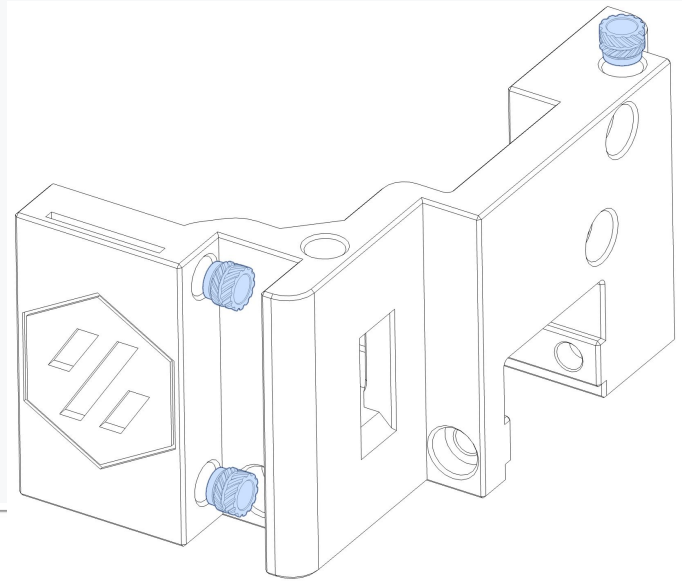
Assembly images are done in black and white, with “active” components highlighted in Fusion360’s default blue highlight. This is done in the Design Workspace by setting the following settings:

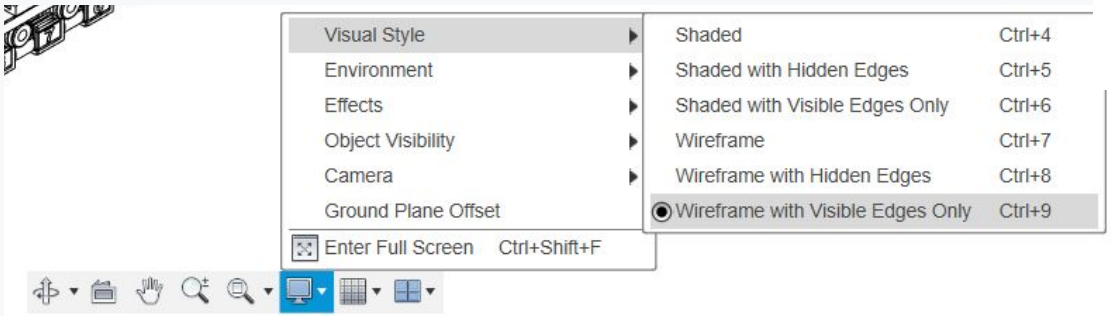
Visual Style to Wireframe with Visible Edges Only

Environment to Photo Booth

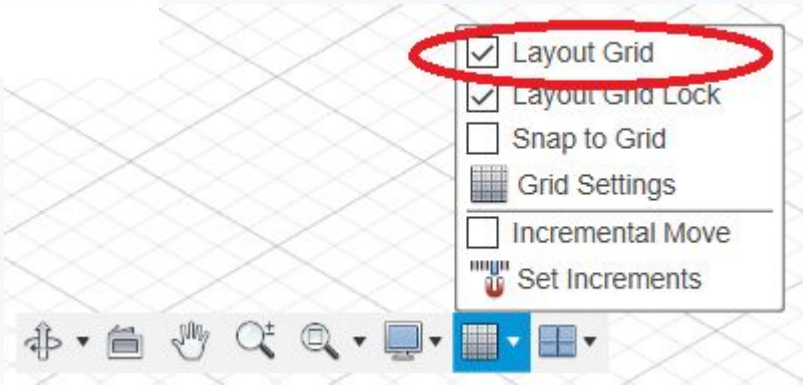
Effects to just Antialiasing

Camera to Orthographic





Disable the Layout Grid.



WRITING STYLE GUIDE

Always call out the number and type of fasteners used, eg “insert 2 M3x8mm BHCS screws,” “fasten with 4 M3x8mm FHSC screws.”

Yes, we know, saying BHCS screws is the same as “Button Head Cap Screw screws.” But it helps with comprehension.

Try to explain what each diagram is showing in plain language, to help with people whose sight isn’t the best, and to help our colleagues whose mother tongue isn’t English.

Remember Murphy’s Law as it applies to reading comprehension. If it is possible for something written to be misunderstood, it will be misunderstood.