ERCF

FILAMENTALIST BUILD GUIDE

"The Filamentalist abides…"
- The Dude, 1998

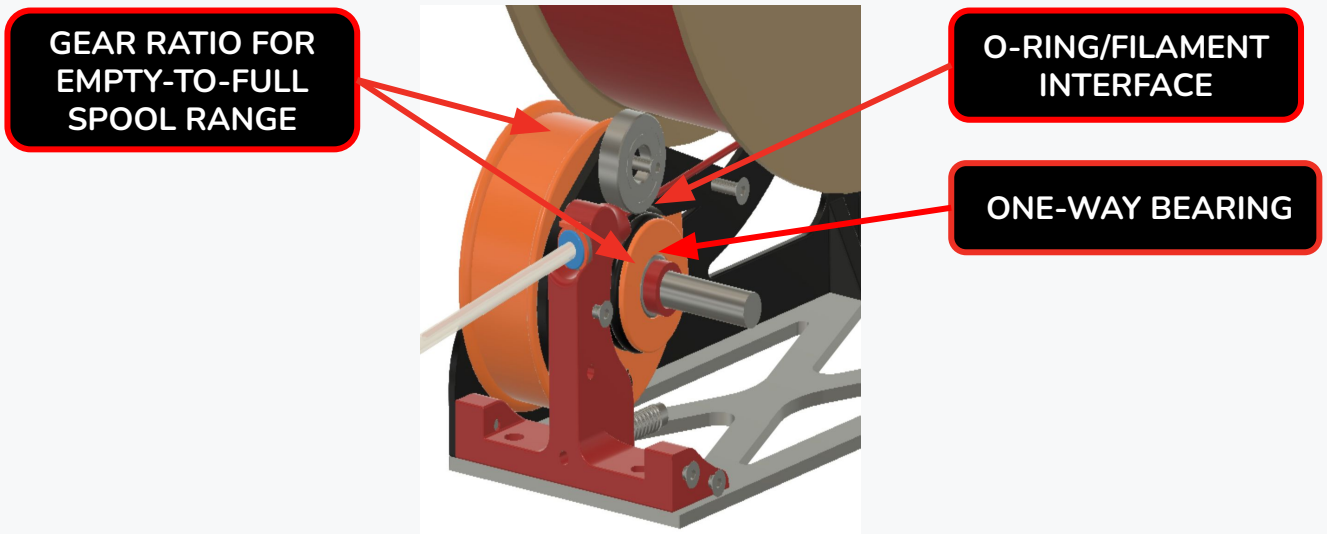
TABLE OF CONTENTS

Be Kind Rewind
–2008 starring Jack Black and Mos Def

THEORY OF OPERATION

The Filamentalist is an integrated solution for buffering and spool holding, providing space savings as well as the potential for filament path reduction, and the associated drag/resistance that comes with long runs from spool to buffer to MMU.

- The Filamentalist uses the axial force delivered by the MMU gear motor along the filament to load and unload to and from the filament spool.
- An adjustable spring clamp forces the filament against two o-rings that sit on the drive pulley to create a high traction interface, for rotating the axle and filament spool.
- A one-way clutch style bearing locks against the drive shaft and rotates the filament spool, to take up filament during an unload.
- For loading and print extruding, the clutch disengages allowing for effective free-spooling of the filament spool similar to a roller style spool holder.
- The difference in diameter of the filament driven clutched roller versus the larger roller that the filament spool sits on provides the needed gear ratio to produce enough rotations to take up, and unload a nearly empty or full filament roll.
- During unloading/buffering, to account for the varying diameter of a spool from full to empty filament tension will cause the spring loaded arm to lift a small amount and release traction from the o-rings allowing slip to occur between the filament and the o-ring interface of the rewinder (full spool = max slip, empty spool = no/minimal slip).



ACKNOWLEDGEMENTS

I would like to acknowledgement and thank:

Thisiscam who shared Muzi Xiaoyang's video of a filament driven rewinder and then continued to partner and share his brilliance in the evolution and optimization of the final product.

The Beta Test Team who provided design validation and innumerous inputs for design improvements, printability, and simplification of assembly.

Cheesefrog
Grafton
Biokeks
Meltiseugen
and many more...

All the Early Adopters who allowed a fleet of hundreds of rewinders to help further refine the Filamentalist, the documentation, and volume unit validation. You know who you are!

The ERCF Team for building, supporting, and allowing me to be part of this amazing ecosystem of multi-material printing solutions! Your creativity, commitment, professionalism, collaboration, generosity, and sense of community is an inspiration!

CONFIGURATION/OPTIONS CONSIDERATIONS

Things that you need to know include:

There are multiple options for the Filamentalist. Determine which versions/options you want and select the stl's to print accordingly.

- Unit Width: 80mm, 100mm, and custom width via Fusion 360 parametric model
- Mounting Style: Standard (shelf) mount, 2020 rail clip-in mount, 2020 clip-in mount for Filamentalist Enclosure

Based on your mounting needs, you may or may not need to print and install the Base Plate part. It is really only needed if you don't plan to attach the rewinder to a surface.

Feed Direction: The orientation of your MMU with respect to your filament spools location may require a front, rear, or bottom loading capability from the rewinder. Tensioner Mount options are provided to support this.

Pre-gate Sensors: If your MMU does not have pre-gate sensors, and the software you use supports them (like Happy Hare), there are CottonTail pre-gate sensors and Filamentalist Tensioner Mount options that support this.

If you are using, or upgrading from an ERCFv1 or v2 RC1A version you may want/need a higher torque gear motor. Many in the Beta team ran NEMA 17's spec'd at 55 N-cm max torque and config'd them for 1-1.5A (probably overkill...). Grafton's 40 Tooth NEMA 17 Mod is a good addition for gaining more speed from a high torque motor. This may not be required, so if you already have built your ERCF, try the Filamentalist with the motor/gearing you have and decide if you need more torque/speed.

CONFIGURATION/OPTIONS CONSIDERATIONS (continued)

The “standard” Filamentalist has an 80mm axle and supports a maximum spool width of 68mm and supports most standard 1, 0.5, and 0.25KG spool sizes and still be able to fit 6 rewinders across the top of a 350 size Voron printer. Some spools such as NinjaFlex and KVP's are too wide to fit the 80mm design. If you use spools wider than 68mm there is also step and stl files posted for a 100mm axle length version. If you are using Autodesk Fusion 360, the provided .f3d file in the CAD directory is a parametric based model allowing you to customize the width of your rewinder to suit your max/min spool widths and/or to design around a standard available steel axle length (see Parametric CAD Model section in this document).

Because the standard tuning of this design relies on some filament slip at the o-rings, the o-rings may ultimately wear-out. Testing and extrapolation estimates that the wear-out point is ~5K cycles. See the O-Ring Replacement section at the end of this document for o-ring swap/replacement instructions.

Questions or input?

Refer to the:

Filamentalist FAQ

Troubleshooting Guide

Filamentalist Discord Channel

Enjoy the process of building as much as utilizing your Enraged Rabbit Carrot Feeder (ERCF) and Filamentalist Rewinder!

PART PRINTING GUIDELINES

The ERCF team has provided the following print guidelines. We recommend you to 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.

The majority of mechanical issues users experience with the ERCF and its supporting components can be traced back to print quality and and accuracy. Please take the time to print the calibration tools and dial in your printer before moving forward.

FDM MATERIAL

The Filamentalist was designed for, and tested with ABS and ASA. Based on the tolerance requirements of the design we recommend to only use ABS OR ASA.

LAYER HEIGHT

Recommended : 0.2mm
First Layer: 0.25mm

EXTRUSION WIDTH

Recommended : Forced 0.4mm

INFILL TYPE

Grid, Gyroid, Honeycomb, Triangle or Cubic.

INFILL PERCENTAGE

Recommended: 40%

WALL COUNT

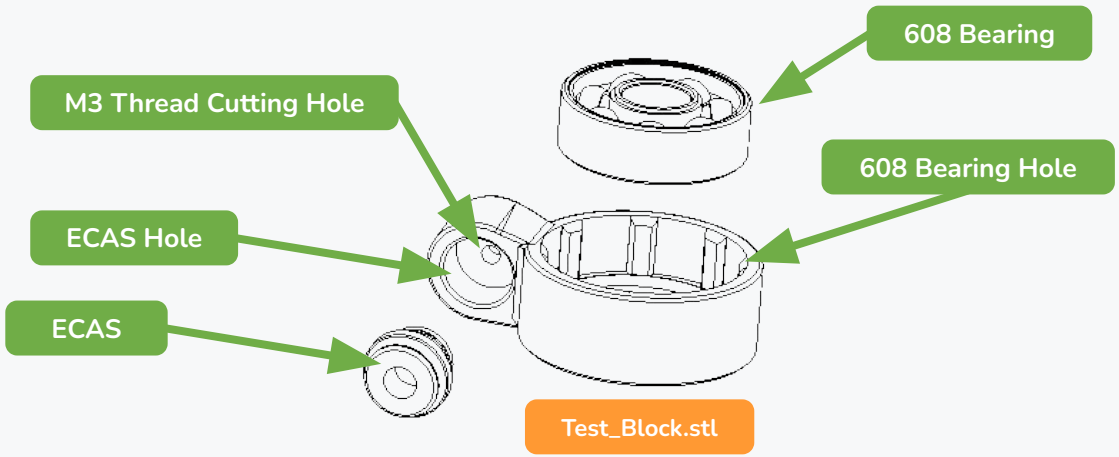
Recommended : 4

SOLID TOP/BOTTOM LAYERS

Recommended : 5

THE TEST BLOCK CALIBRATION TOOL

IMPORTANT !! The Filamentalist design relies on multiple press-fits for bearings and ECAS fittings. As a result, printer calibration is important. A Test_Block stl is included. It is highly recommended that you print this block first, check fits, and make adjustments to extrusion multipliers and/or slicer scaling if needed before printing the Filamentalist parts.



TESTS

Insert the different pieces of hardware in their dedicated positions: ECAS fitting, M3 screw thread in, and 608 bearing.

The ECAS fitting should be a tight, snap-in fit. If the plastic cracks after ECAS insertion due to too tight a fit or the ECAS is a loose fit then extrusion rates and/or interior hole settings need to be adjusted in your slicer. You may need to cut the print with clippers to remove the ECAS.

You should be able to hand press in a 608 bearing into the pocket. It is acceptable if additional force, like light hammer taps is required to fully seat the bearing. The bearing can be removed by inserting an 8mm axle/rod through the bearing and rocking the rod back and forth while gently pulling on the rod, “walking” the bearing out of the pocket.

Screw an M3 screw into the back side (opposite ECAS hole). The screw should tightly screw in and cut threads into the plastic. If the ECAS and 608 bearing press in nicely but this hole is tight, no print adjustments need to be made but M3 screw holes may need to be opened up hand turning a 2.5mm drill bit.

[Part_Name]_[Width_Version]_[Quantity_Required]_[option].stl

STL FILE NAMING KEY

Example Rim_Roller_80mm_x2.stl

FILE NAMING

By this time you should have already downloaded our STL files from the ERCF GitHub. This is how to use the naming conventions.

WIDTH VERSION

Filenames with an ‘’**80mm**’’ or **“100mm”** after the file name are specific to the width option you choose to build.

QUANTITY REQUIRED

Filenames ending with ‘’**_x#**’’ are telling you the **quantity** of that part required to build a single rewinder

[option]

Filenames with an ‘“[option]”after the filename or width are build options/alternatives such as:

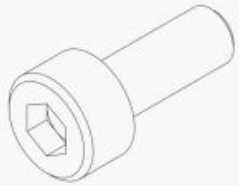
- Clip-In style mount
- Supports for the Filamentalist Enclosure
- Pre-gate sensors included in Tensioner Mounts

HARDWARE REFERENCE

FLAT HEAD COUNTERSUNK SCREW (FHCS)

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

ISO 10642



SOCKET HEAD CAP SCREW (SHCS)

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

ISO 4762

WASHER

Plain metal stamped washer.

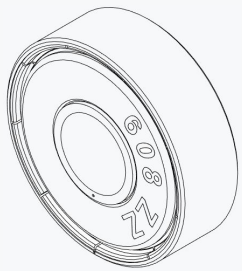
DIN 125

SELF TAPPING SCREW

Fastener with a pronounced thread profile that is screwed directly into plastic. Used with optional pre-gate sensor Filamentalist version.

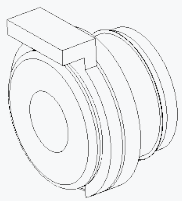
HEAT SET INSERT

Brass, threaded, with ridges on the outside. Heat to approx 250C with soldering iron and push into a hole in the plastic. Plastic cools and solidifies around the knurls/ridges for excellent resistance to torque and pull-out.



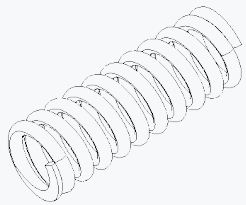
608 BEARING

For the Filamentalist, the 2RS (sealed) style is preferred but can be used with the open or ZZ (shielded) style.



ECAS FITTING

4mm Push -Fit PTFE tubing fitting.



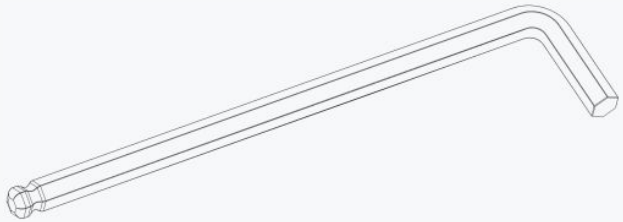
SPRING

For the Filamentalist, 304 Stainless Steel,6mm OD, 0.6-1mm Wire Size, 15mm Free Length spring used in Tensioner Assembly.

TOOLS

BALL-END HEX DRIVER

Adjustment of the Tensioner screw in this design benefits from the use of a 2.5mm ball-end hex driver.



2MM HEX DRIVER

The 2mm hex driver will see a lot of use in this build. A quality driver is strongly recommended. Refer to the sourcing guide for suggestions.

SMALL HAMMER

A small hammer my be useful/required to tap in press-fit bearings.

SOLDERING IRON

For the insertion of the single heat set insert in the Tensioner Mount part of the Filamentalist rewinder

ANGLE GRINDER/DREMEL
For cutting 8mm axle rods/tubes to length if required.

VISE
A vise is handy cutting 8mm axles.

CAD SOFTWARE
Filamentalist_80mm/100mm.step or Filamentalist_(parametric).f3d
Software is a tool too! The CAD file for the Filamentalist 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, onshape, or FreeCAD.

SUPERGLUE
Yes, we consider this a tool. Superglue may be useful if your print tolerances result in slip-fits for the bearings and ECAS. Cheap, single-use gel tubes are fine.

TEST BLOCK TOOL
ERCFv2/Recommended_Options/Filamentalist_Rewinder/Stls/Test_Block.stl
It is highly recommended that you print this Test_Block.stl part first, check fits of M3 screws, 608 bearings, and the ECAS fitting, and make adjustments to extrusion multipliers and/or slicer scaling if needed before printing the Filamentalist parts.

AXLE DEPTH TOOL
ERCFv2/Recommended_Options/Filamentalist_Rewinder/Stls/##mm_Axle/Axle_Depth_Tool.stl
Helps you set the depth that the Rim Roller parts are attached on the axle to ensure free floating CDR Spacer parts and the correct overall width of the rewinder.

If you need assistance with your build you can head over the Filamentalist Discord group and post your questions in the ercf_questions channel. 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.

Discord Link

GitHub Link

USING THE CAD FILES

We have provided the Filamentalist CAD files (ERCFv2/Recommended_Options/Filamentalist_Rewinder/CAD/Filamentalist_##mm.step and Filamentalist_(parametric).f3d), so that you can follow along with the instructions in a 3D view, if you like.

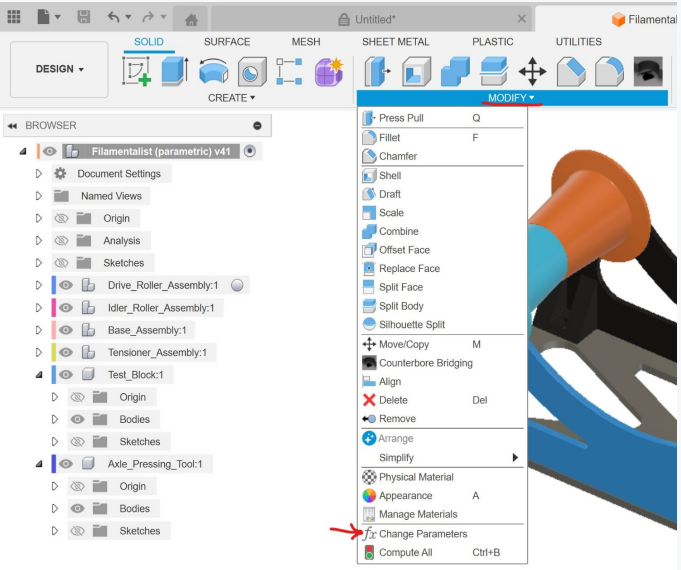
The CAD file is organized into folders based on the instructions in this manual. First hide all the parts, and then reveal the parts up to the step you are on in this manual, and the CAD should match what you are building.

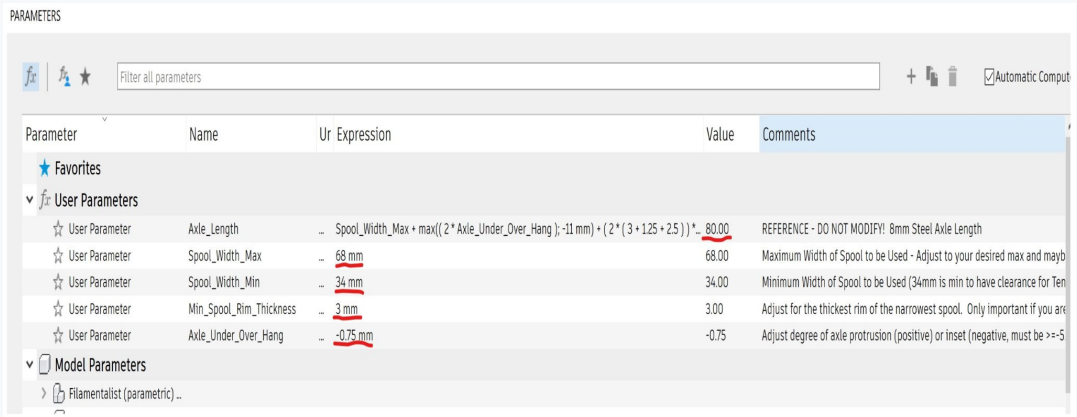
All of the non-printed parts are in each section's Hardware folder.

THE PARAMETRIC CAD MODEL

If you are using Autodesk Fusion 360 the “Filamentalist_(parametric).f3d file provided in the CAD folder is a parametric based model allowing you to customize the width of your rewinder to suit your max/min spool widths and/or to design around a standard available steel axle length. The model will update and accurately show the results of these parameters to help you visualize the acceptability of the result.

To customize your Filamentalist width and axle sizing, load the model, make sure you are in the "Solid" menu, and then select "Modify" and "Change Parameters"



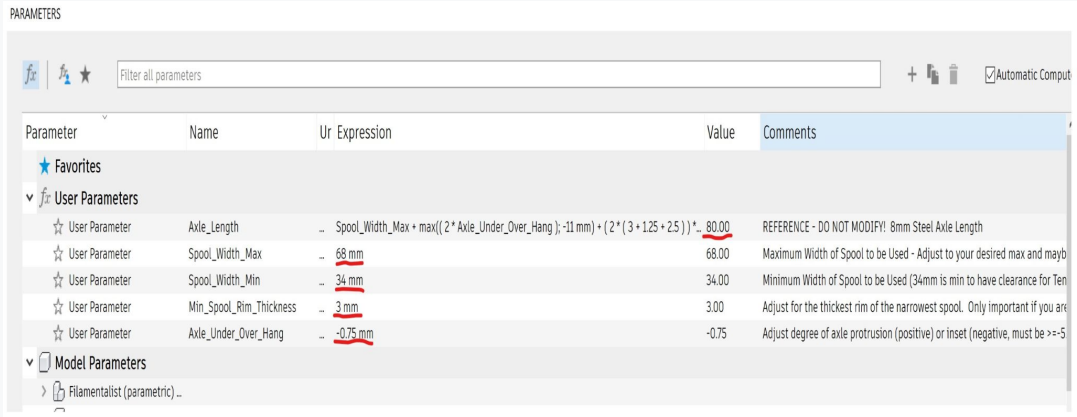


Adjust the following parameters to meet your needs:

Spool_Width_Max - Set this to accommodate the widest filament spool you expect to use. It is recommended to add ~2mm to this number to allow for spool width and rim straightness/variation.

(parameter descriptions continued on next page)

THE PARAMETRIC CAD MODEL (continued)

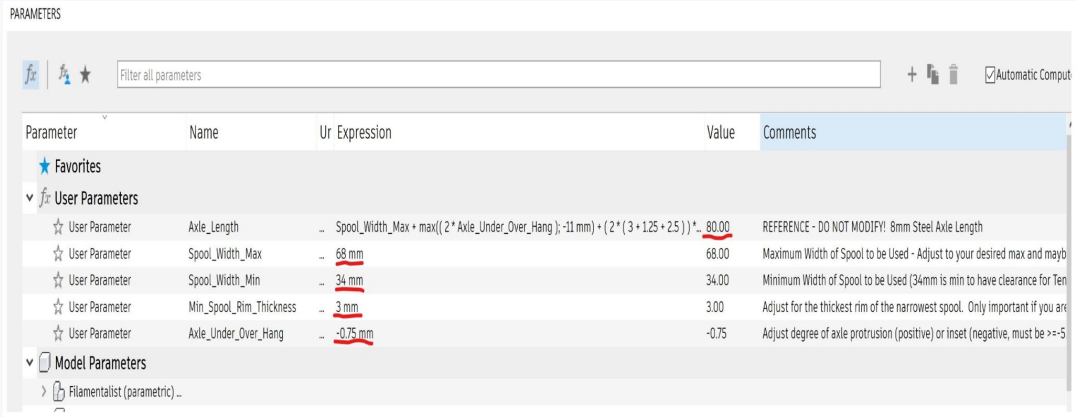


Adjust the following parameters to meet your needs (continued from previous page):

Spool_Width_Min - Set this to accommodate the narrowest filament spool you expect to use. Due to the width of the Tensioner Assembly the minimum spool width is constrained at 34mm and will default to this number if you enter something less than 34mm. If you don't expect to use narrow spools (like 250kg or 500kg spools) you can set this to a larger number to produce narrower Rim Rollers. Narrower Rim Rollers will reduce print time and filament consumed and may allow for usage of more standard less expensive rubber bands but will limit overall future flexibility of your rewinder.

Min_Spool_Rim_Thickness - Normally this can be left at the default of 3mm but if you are trying to squeeze narrow spools onto the rewinder, you are close to that 34mm minimum width, and your narrow spool rims are less than 3mm thick, you can adjust for your thickest rim of your narrowest spool to make it fit the rewinder.

THE PARAMETRIC CAD MODEL (continued)



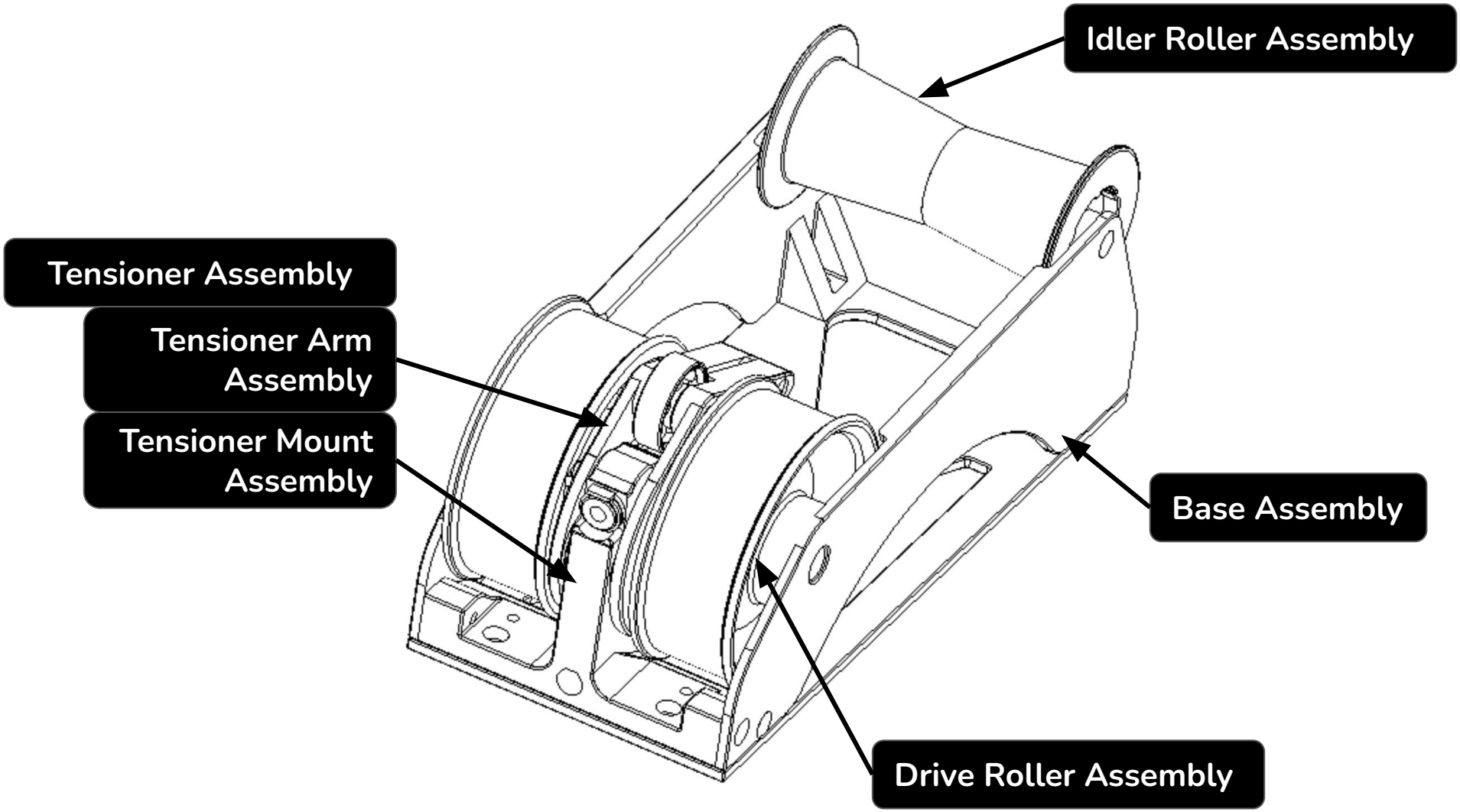
Adjust the following parameters to meet your needs (continued from previous page):

Axle_Under_Over_Hang - This can be either a positive or negative number and is used to tweak the design to use a standard available axle length (like 80mm or 100mm). A negative number will result in the axle ends sitting inside the footprint of the rewinder but the model logic will not let you underhang more than 3mm inside the 608 bearing race to ensure good support of the axles from the bearings. A positive number will result in the axle protruding beyond the footprint of the rewinder. You may want to do this if you are going to use a readily available 100mm length axle but don't need a rewinder that can support spool widths as wide as 86mm, thus saving printing time and plastic by using a lesser Spool_Width_Max like 75mm. The best case scenario is to set this value at 0 and you have the ability to cut shaft stock to the exact length for your desired Spool_Width_Max (i.e. Spool_Width_Max = 75mm to accommodate virtually all 1KG spools and cut shaft to 88.5mm length).

Axle_Length - DO NOT CHANGE THIS PARAMETER! It is there for reference to help you tweak into a standard and readily available axle length. You can tweak on Spool_Width_Max and Axle_Under_Over_Hang and iterate these values until you arrive at an overall result that meets your needs.
The model will update and accurately show the results of these parameters to help you visualize the acceptability of the result.

FILAMENTALIST REWINDER ASSEMBLY

OVERVIEW



DRIVE ROLLER ASSEMBLY

“You can’t have everything....where would you put it?”
–Steven Wright

DRIVE ROLLER ASSEMBLY

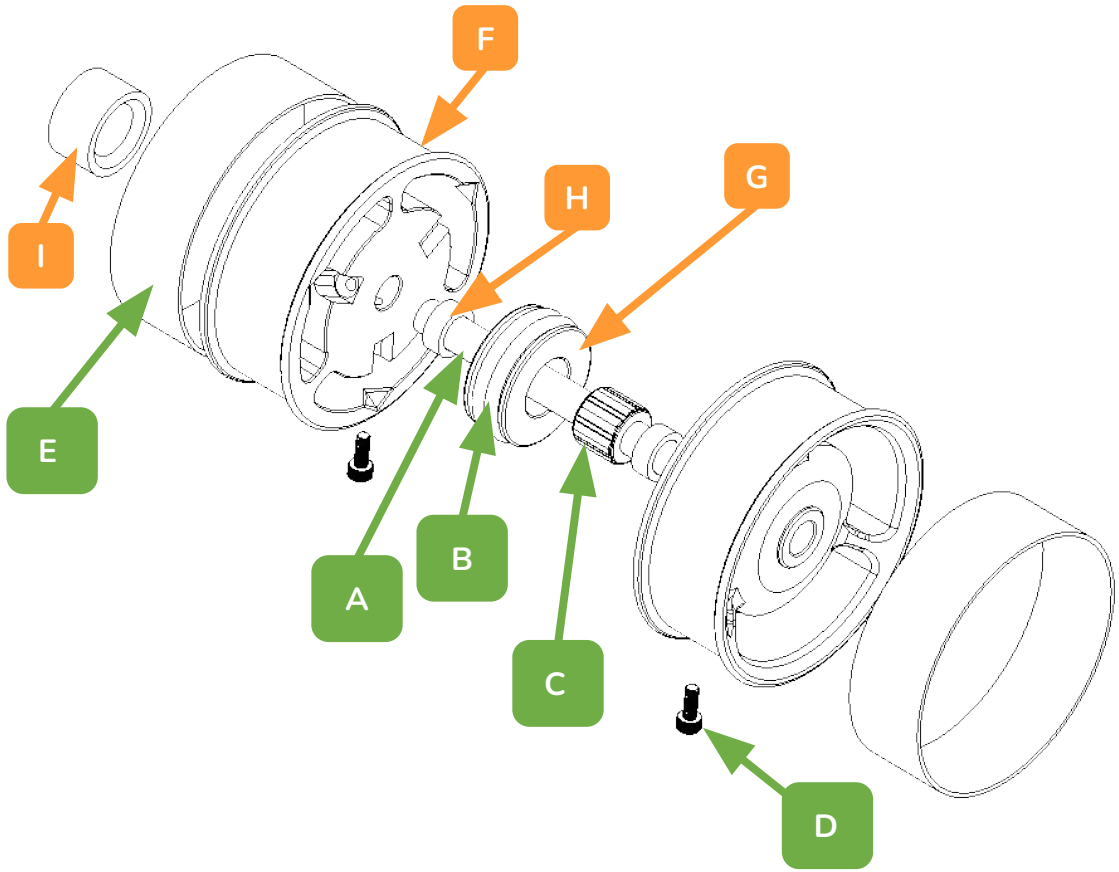
DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A	1x 8x80/100mm Stainless Steel Axle
B	2x AS568 Standard size 211 O-Ring
C	1x HF081412 One-Way Bearing
D	2-6x M3x8 Stainless SHCS Screw
E	2x Rubber Bands

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

F	2x Rim_Roller_80/100mm_(ver.)stl
G	1x Center_Drive_Roller.stl
H	2x CDR_Spacer.stl
I	Axle_Depth_Tool.stl

EXPLODED VIEW



ASSEMBLY INSTRUCTIONS

1. Stretch O-Rings (part B) onto part G.
2. Press/tap part C into part G. This should be a tight fit. If too loose, use Super Glue or reprint with an increased extrusion factor. If too tight scrape the interior hole of Center Driver Roller with an Xacto knife. Orientation of the one-way bearing does not matter at this point.
3. Slide Center Drive Roller/One-Way Bearing and CDR Spacers onto Axle (CDR spacers should be a loose fit on axle).
   - 3.1. **It is very important that the one-way bearing rotates in the unlocked direction freely with low resistance!** If the resistance of the one-way bearing is greater than the combined rolling resistance of the rest of the rewinder the one-way bearing will not disengage and freespool properly during filament loads resulting in loose coils on the spool. If you experience this issue please refer to the Filamentalist Troubleshooting Guide.

DRIVE ROLLER ASSEMBLY (continued)

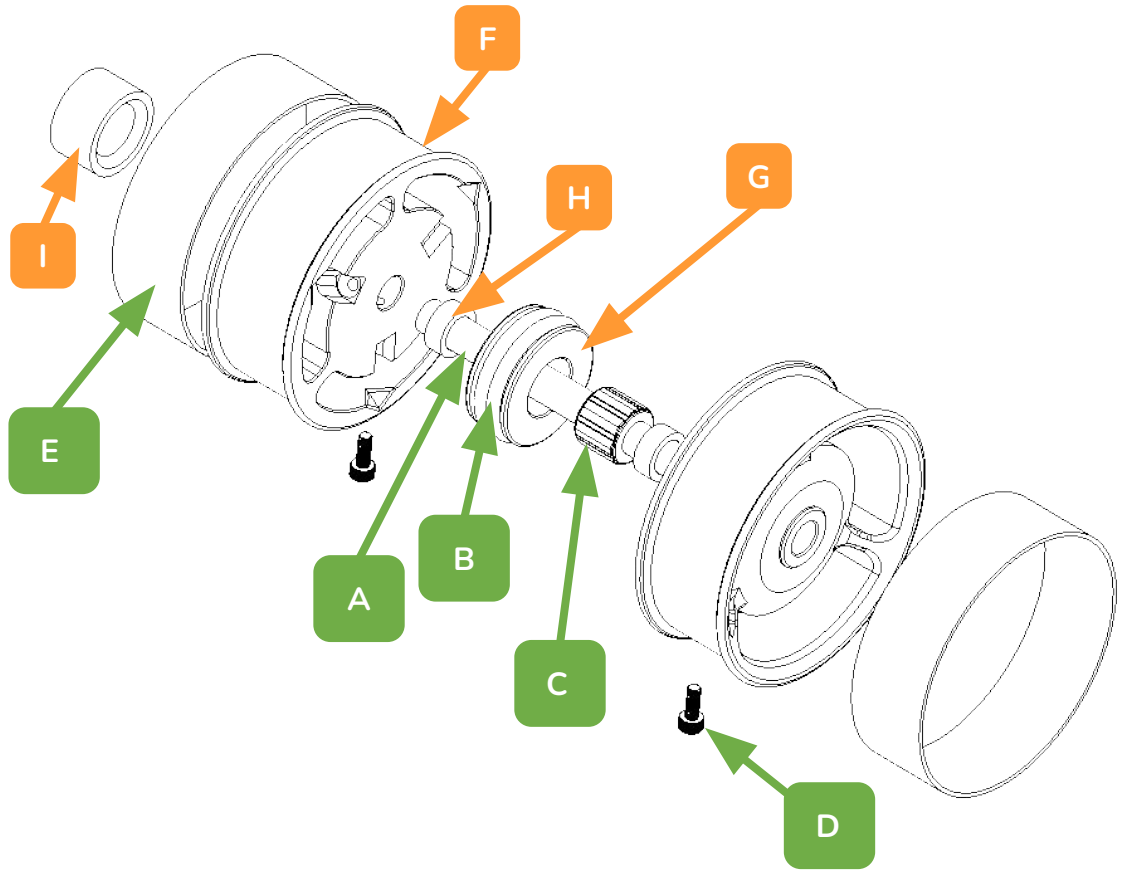
DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A	1x 8x80/100mm Stainless Steel Axle
B	2x AS568 Standard size 211 O-Ring
C	1x HF081412 One-Way Bearing
D	2-6x M3x8 Stainless SHCS Screw
E	2x Rubber Bands

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

F	2x Rim_Roller_80/100mm_(ver.)stl
G	1x Center_Drive_Roller.stl
H	2x CDR_Spacer.stl
I	Axle_Depth_Tool.stl

EXPLODED VIEW



ASSEMBLY INSTRUCTIONS

4. Install screws into Rim Rollers to cut the threads (using a ball end hex driver makes this easier). Back the screws out a little to allow the axle to be inserted. If center bore of rollers is a close fit, only one screw per roller is required. If a loose fit, use 3 screws per roller to ensure roller is centered on Axle.
5. Use Axle Depth Tool to set the correct distance of Rim Rollers from Axle ends and tighten screws firmly against Axle. The CDR spacers should freely spin on Axle with~0.5mm space between adjacent parts.
6. Install Rubber Bands onto Rim Rollers.

IDLER ROLLER ASSEMBLY

Q: What do you call a group of rabbits hopping backwards?
A: A receding hare line

IDLER ROLLER ASSEMBLY

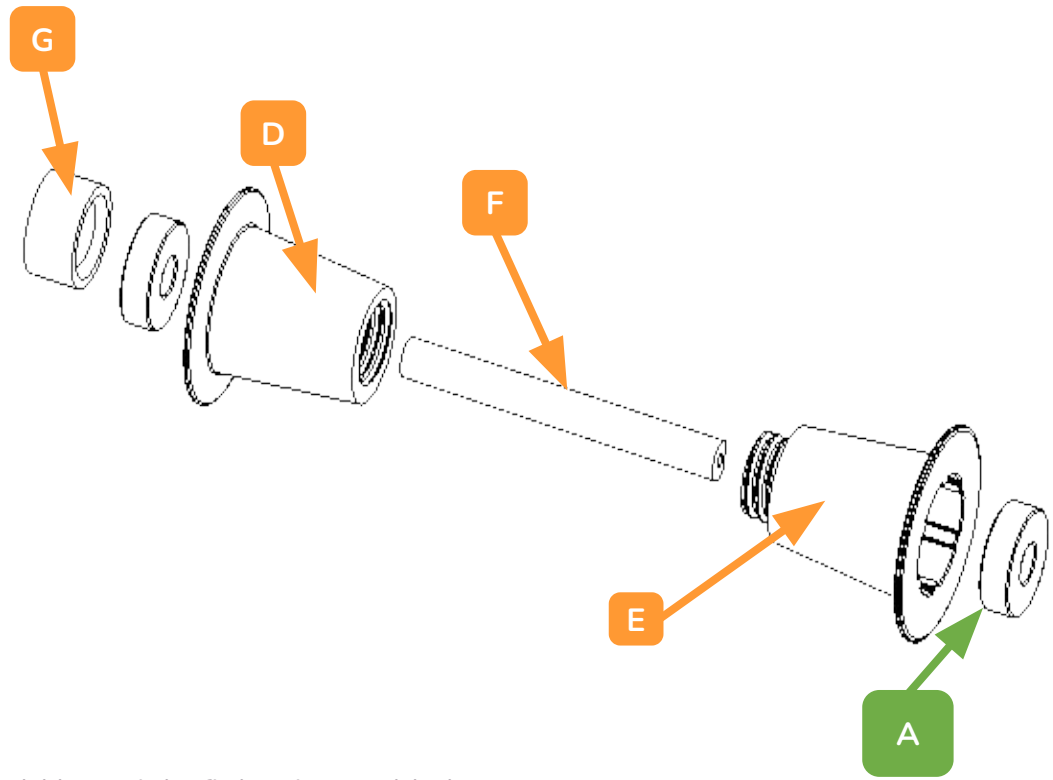
DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A	2x MR608 Bearing

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

D	1x Idler_Roller_Female_80mm/100mm_(ver.)stl
E	1x Idler_Roller_Male_80mm/100mm_(ver.)stl
F	1x Idler_Roller_Axle_80mm/100mm_(ver.)stl
G	1x Axle_Depth_Tool.stl

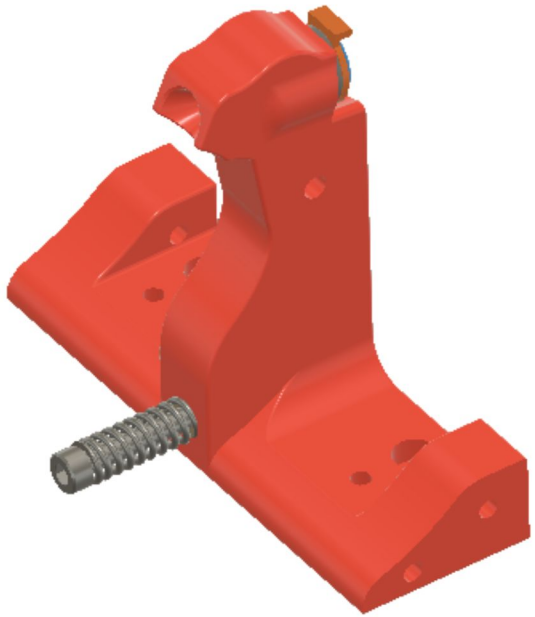
EXPLODED VIEW



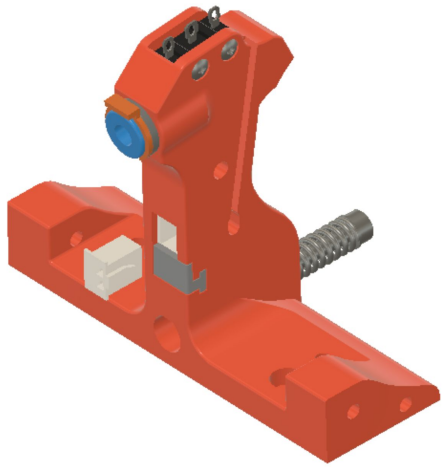
ASSEMBLY INSTRUCTIONS

1. Press MR608 bearings into parts D and E. These should be a tight fit but insertable by hand. Use the Axle Depth Tool as a pressing aid to ensure bearings are seated fully into bearing pockets.
2. Screw parts D and E together until firmly seated against each other.

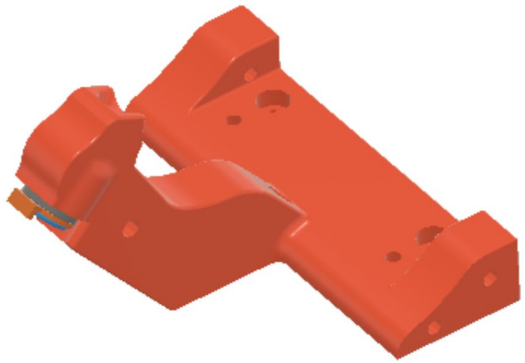
TENSIONER MOUNT ASSEMBLY



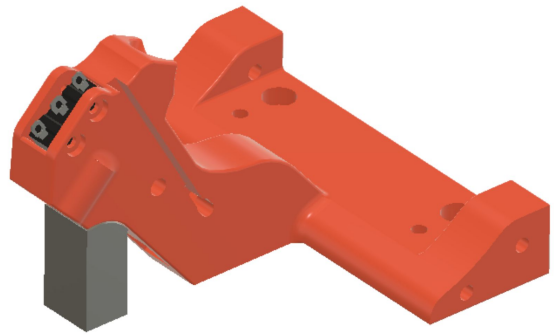
BASELINE VERSION



PRE-GATE SENSOR OPTION VERSION



REAR LOAD OPTION VERSION



REAR LOAD PRE-GATE SENSOR OPTION VERSION

Be Kind Rewind
- Jack Black and Mos Def 2008

TENSIONER MOUNT ASSEMBLY

TENSIONER MOUNT ASSEMBLY BOM (PER CHANNEL)

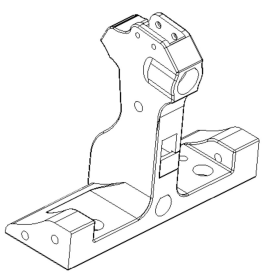
A ECAS Fitting (remove rubber seal)
B 3mm Heatset Insert

TENSIONER MOUNT ASSEMBLY PRINTED PARTS (PER CHANNEL)

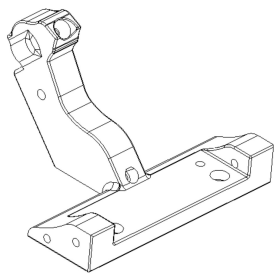
F 1x Tensioner_Mount_80mm/100mm_(ver.)stl
G 1x ECAS_Clip.stl (if not on-hand)

ALTERNATE/OPTIONAL PRINTED PART VERSIONS (PER CHANNEL)

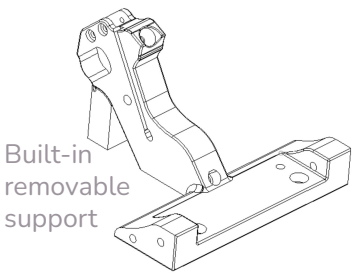
F 1x Tensioner_Mount_with_Sensor_80mm/100mm_(ver.)stl
1x Tensioner_Mount_Rear_Load_80mm/100mm_(ver).stl
1x Tensioner_Mount_Rear_Load_with_Sensor_80mm/100mm_(ver)



PRE-GATE SENSOR OPTION VERSION

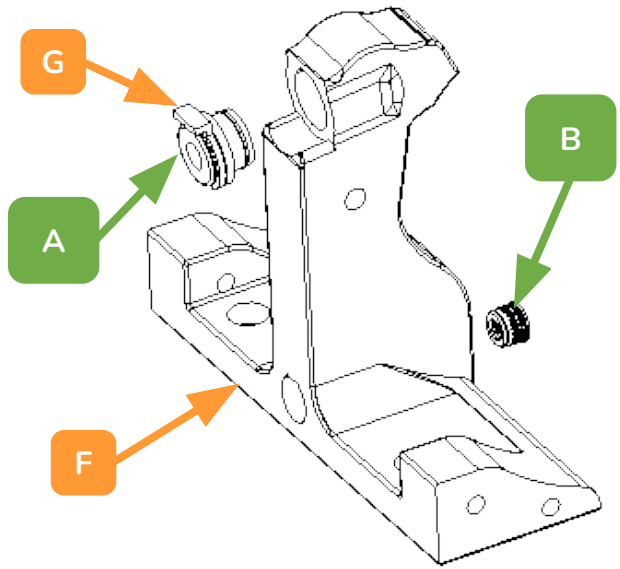


REAR LOAD OPTION VERSION



REAR LOAD PRE-GATE SENSOR OPTION VERSION

EXPLODED VIEW



ASSEMBLY INSTRUCTIONS

1. Install 3mm Heatset Insert.
2. Press ECAS Fitting into Tensioner Mount, ensuring it sits flush to face of hole. Using the 8mm axle as a pressing tool can help to get fitting fully inserted. Varying ECAS and print tolerances could result in the ECAS hole cracking. If this happens, use superglue around the ECAS hole and crack(s).

TENSIONER MOUNT ASSEMBLY (SENSOR OPTION)

SENSOR OPTION ADDITIONAL BOM ITEMS (PER CHANNEL)

- A 1x D2F-L3 Microswitch
- B 1x JST-XH 2-pin Socket
- C 2x 60mm 24 AWG wire
- D 2x M2x10 Self-tapping screw

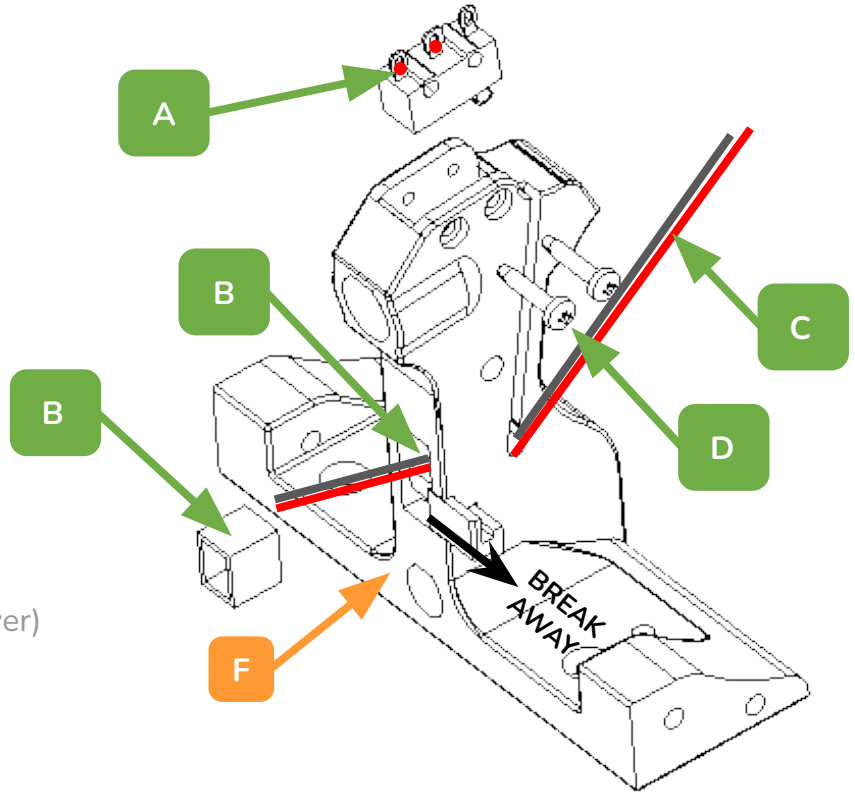
TENSIONER MOUNT ASSEMBLY PRINTED PARTS (PER CHANNEL)

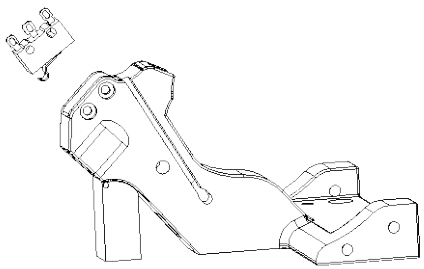
- F 1x Tensioner_Mount_with_Sensor_80mm/100mm_(ver.)stl

ALTERNATE/OPTIONAL PRINTED PART VERSIONS (PER CHANNEL)

- F 1x Tensioner_Mount_Rear_Load_with_Sensor_80mm/100mm_(ver)

EXPLODED VIEW





Built-in removable support

ASSEMBLY INSTRUCTIONS

1. Break away print-in-place JST-XH socket retaining clip using small flat blade screwdriver.
2. Install microswitch with 2x M2x10mm self tapping screws.
3. Strip 3mm from 24 AWG wire for JST-XH socket and tin with solder.
4. Feed wire through hole in wire slot and out opening for JST-XH socket.
5. Solder 2x wires at 90 degrees to terminals of JST-XH 2-pin socket and press socket into hole. Slide socket retaining clip back into place.
6. Press wire into slot and wrap around to the two switch terminals denoted with red dots in picture to assess length. Cut wire to length leaving 3mm for stripped ends to solder to terminals.
7. Solder wire to switch terminals.
8. Usa a 2-pin JST-XH plug for a harness running to main or MMU board.

TENSIONER ARM ASSEMBLY BOM (PER CHANNEL)

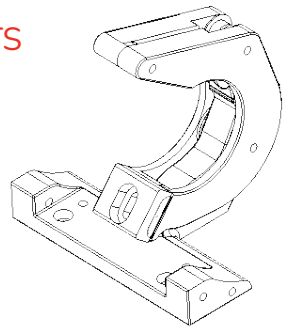
A
B
C
D
E

1x MR608 bearing
3x M3x16/18mm FHCS Screw
1x Spring
1x M3 Washer
1x M3x35mm +/- 10mm SHCS Screw

TENSIONER ARM ASSEMBLY PRINTED PARTS (PER CHANNEL)

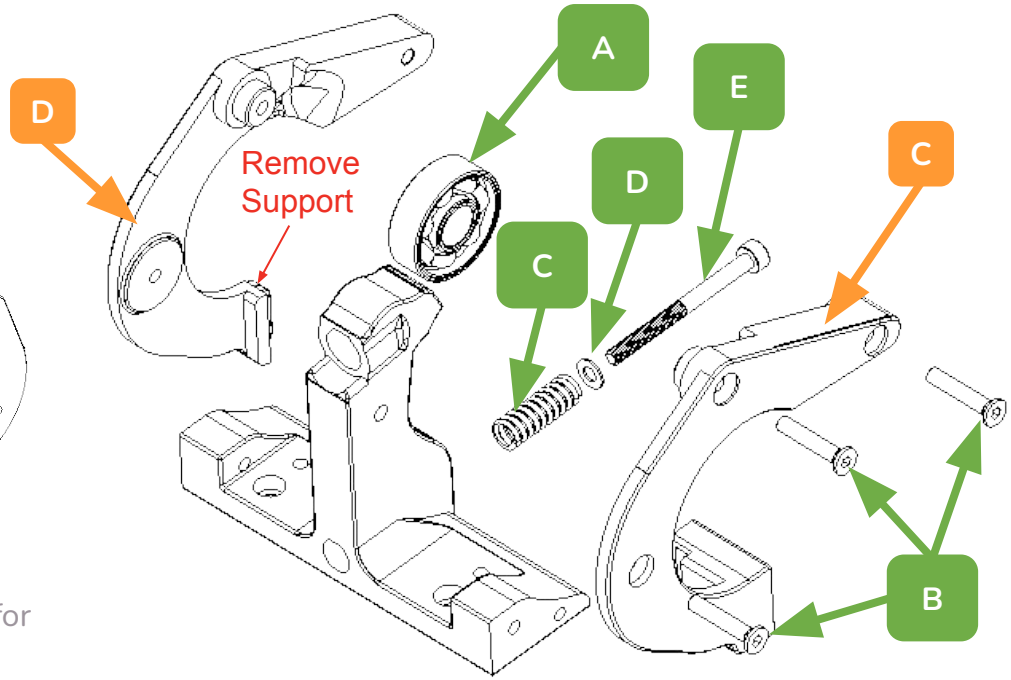
C
D

1x Tensioner_Arm_Left_(ver.)stl
1x Tensioner_Arm_Right_(ver.)stl



Arm orientation for rear load version

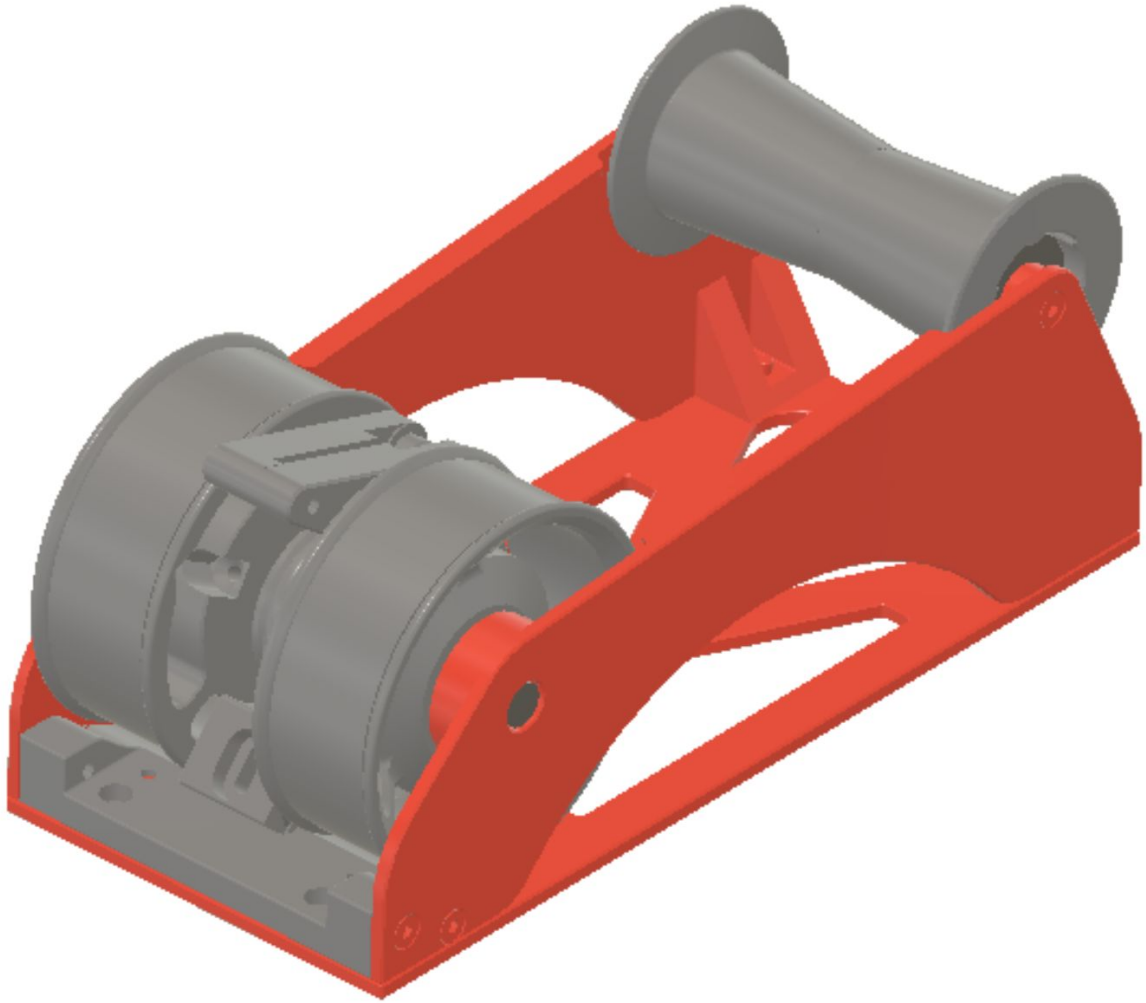
EXPLODED VIEW



ASSEMBLY INSTRUCTIONS

1. Remove support from part D.
2. Lay part D on a flat surface. Slide the 608 bearing onto the bearing post. Place part C into the 608 bearing and rotate against the part D making sure the alignment tab seats correctly into the pocket at the bottom of part C.
3. Place a M3x12/16/18 FHCS screw through the bearing mount hole of part C and moderately tighten the screw into part D. Once installed verify that the bearing turns freely.
4. Place a M3x12/16/18 FHCS screw through the hole in part C at the "nose" end and moderately tighten the screw into part D.
5. Install the Tensioner Arm onto the Tensioner Mnt using a 3x16/18mm FHCS screw. Tighten until snug and then back off until the arm rotates freely on the mount.
6. Place an M3 washer followed by the spring onto an M3x25/35/45mm SHCS screw and slide through the slotted hole in the bottom of the Tensioner Arm Assembly. Screw the SHCS screw into the heatset insert of the Tensioner Mnt. No tension should be on the spring at this point.

BASE ASSEMBLY



"Get back Jojo"
–The Beatles

BASE ASSEMBLY

DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A
B

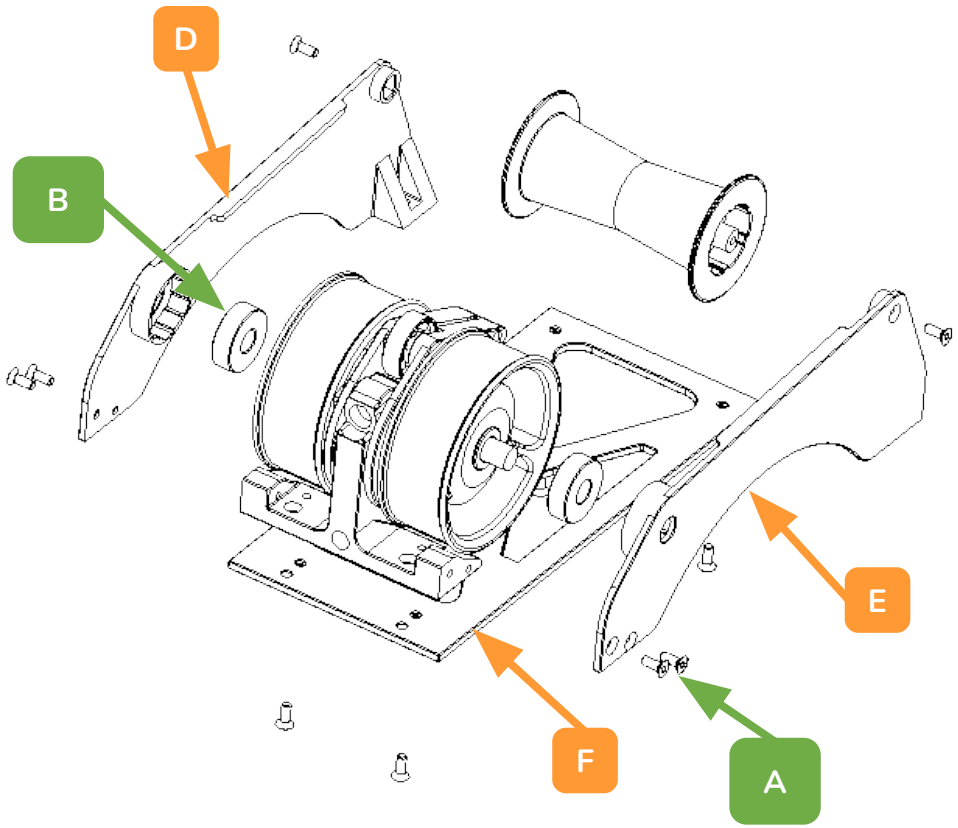
6(10)x M3X8/10/12 Flat Head Cap Screw (FHCS)
2x MR608 Bearing

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

D
E
F

1x Right_Support_(ver.)stl
1x Left_Support_(ver.)stl
1x Base_Plate_80mm/100mm_[option]_(ver.)stl

EXPLODED VIEW



BASE ASSEMBLY

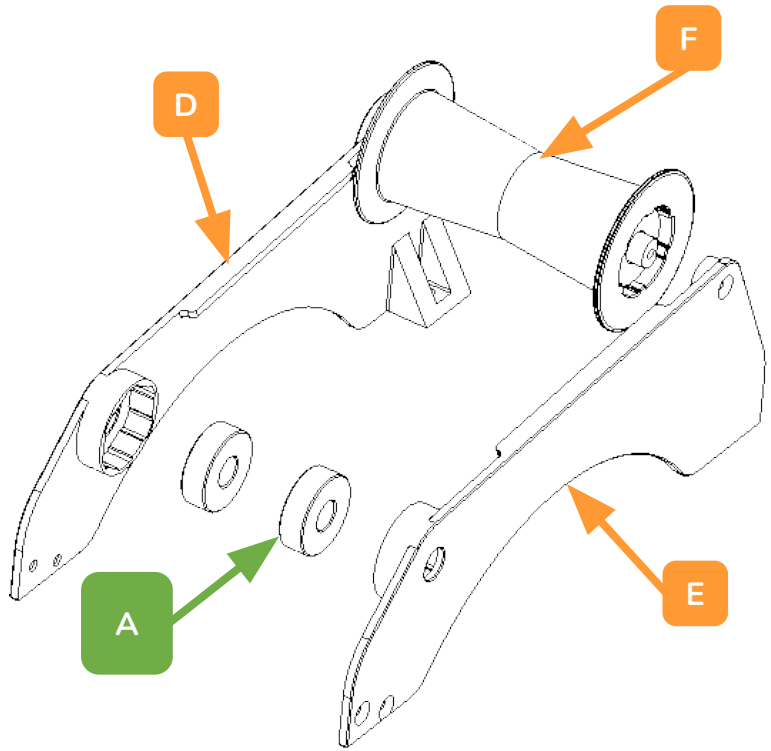
DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A	2x MR608 Bearing

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

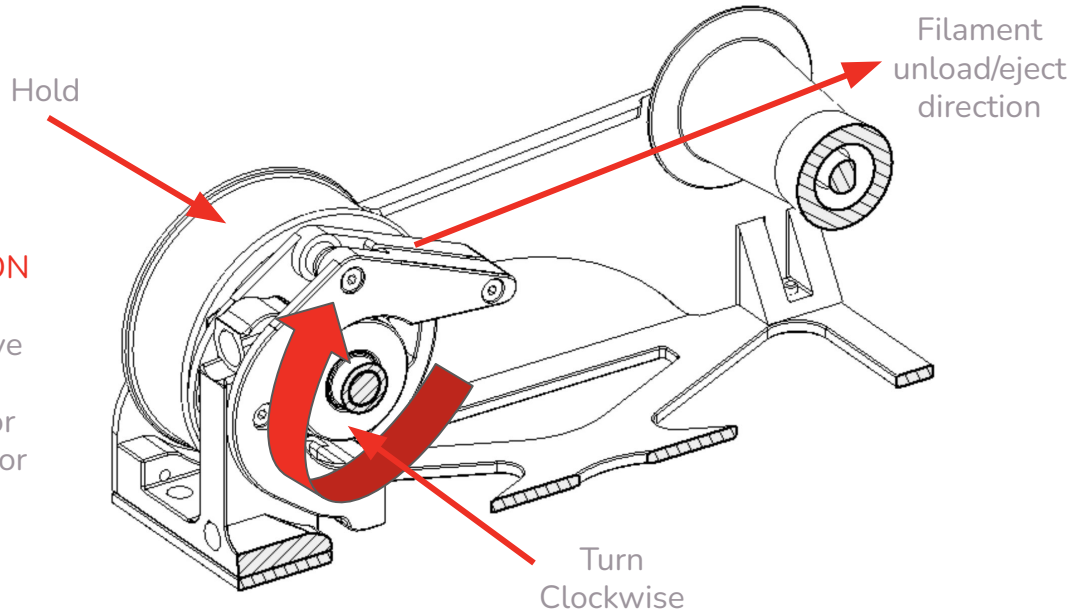
D	1x Right_Support_(ver.)stl
E	1x Left_Support_(ver.)stl
F	1x Idler Roller Assembly

EXPLODED VIEW



ASSEMBLY INSTRUCTIONS

1. Press MR608 bearings into parts D and E. These should be a tight fit but insertable by hand. If necessary, use the Axle Depth Tool and lightly tap with hammer to ensure bearings are seated fully into bearing pockets.
2. Align the D-shape end of the Idler Roller Assembly and tap/press into one of the Supports until fully seated.



ONE-WAY BEARING ORIENTATION

One-Way bearing locks when Rim Roller/Axle is held and Center Drive Roller is rotated in the direction of filament unload/eject (clockwise for standard load, counter clockwise for rear load option)

ASSEMBLY INSTRUCTIONS (continued)

3. Place Tensioner Assembly onto/over Drive Roller Assembly.
   - 3.1. **IMPORTANT!** Orient the Drive Roller Assembly so that the one-way bearing of the Center Drive Roller locks when rotated in the direction of a filament unload (if using the Tensioner Mount Rear Load option then the one-way bearing must be reversed and operate/lock in the counterclockwise direction with respect to the picture above).

BASE ASSEMBLY

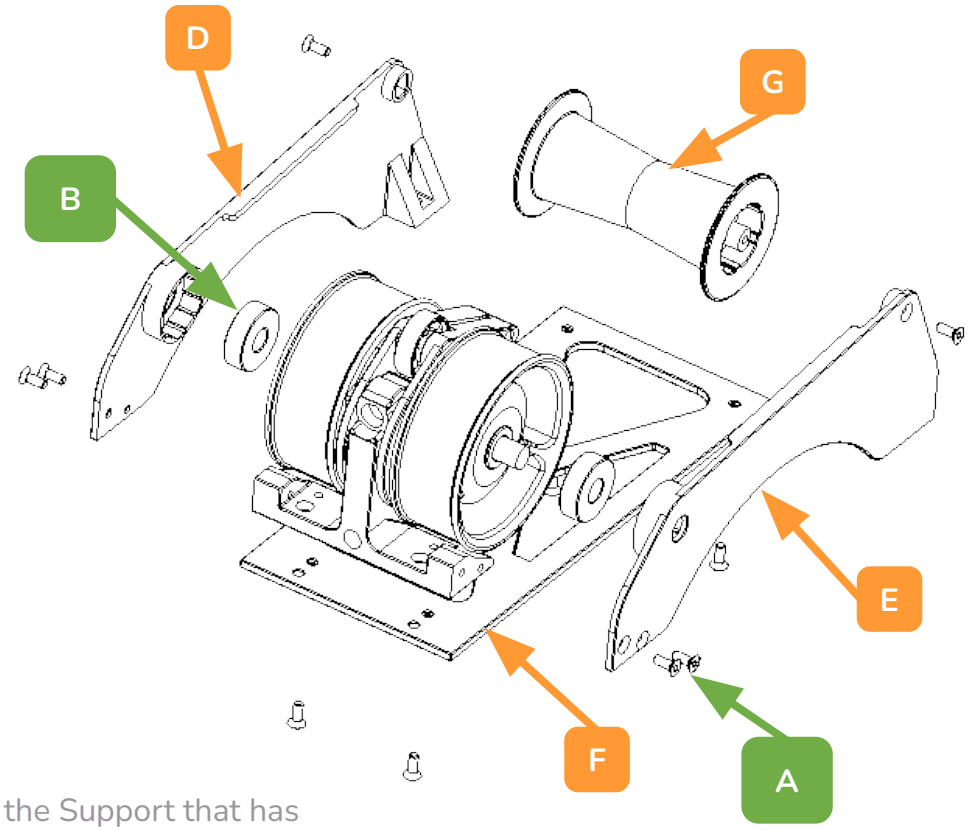
DRIVE ROLLER ASSEMBLY BOM (PER CHANNEL)

A	6(10)x M3X8/10/12 Flat Head Cap Screw (FHCS)
B	2x MR608 Bearing

DRIVE ROLLER ASSEMBLY PRINTED PARTS (PER CHANNEL)

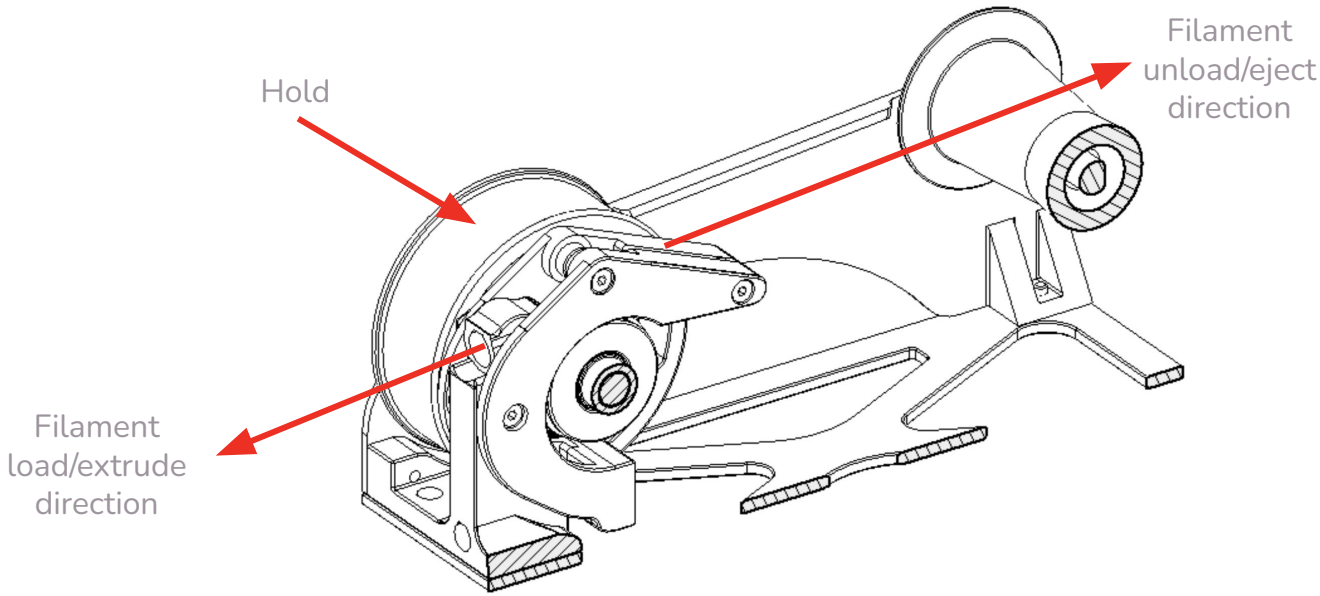
D	1x Right_Support_(ver.)stl
E	1x Left_Support_(ver.)stl
F	1x Base_Plate_80mm/100mm_[option]_(ver.)stl
G	1x Idler Roller Assembly

EXPLODED VIEW



ASSEMBLY INSTRUCTIONS (continued)

4. Insert Drive Roller Assembly axle into the MR608 bearing of the Support that has the Idler Roller Assembly installed on it.
5. Install other Support onto Center Drive Roller Axle and Idler Roller Axle. Support may need to be tapped/pressed onto the Idler Roller Axle to be fully seated.
6. Install (6) M3x8/10/12 FHCS screws through Supports and into Tensioner Mount and Idler Roller Axle.
7. If using the optional Base Plate, install (4) M3x8/10/12 FHCS screws through Base Plate and into Supports and Tensioner Mount.



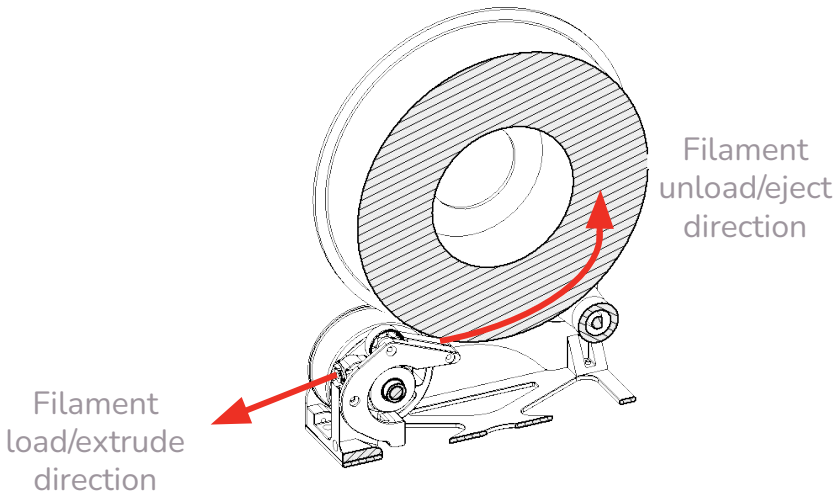
ASSEMBLY INSTRUCTIONS (continued)

8. Verify again that One-Way bearing is installed correctly. Insert a piece of filament through the filament path and tighten the Tensioner Screw to create medium spring tension.
9. Hold the center roller by placing your thumb/finger against the o-rings and try to pull the filament out in the eject direction.
10. The slip force/resistance against the filament should “light-to-moderate” (~0.2-0.3 kg or ~7-10 oz). Adjust the spring tensioner screw accordingly and err on the light side for a starting point.
11. While holding a Rim Roller with one hand, move the filament in the eject direction (see picture above). The Rim Roller should try to rotate against the pressure of your hand.
12. Continuing to hold a Rim Roller, move the filament in the load/extrude direction. The Rim Roller should not try to move and the Center Drive Roller should turn freely.

TUNING INSTRUCTIONS

Tune by setting the Tensioner Arm clamping force. The arm does not need an extreme amount of tension.

1. As a bench test (not connected to the MMU yet), load a spool of filament onto the rewinder and insert the filament through the o-ring/bearing interface and out the ECAS side of the Tensioner Mount.
2. Hold the center roller by placing your thumb/finger against the o-rings and try to pull the filament out in the eject direction.
3. The slip force/resistance should “light-to-moderate” (~0.2-0.3 kg or ~7-10 oz). Adjust the spring tensioner screw accordingly and err on the light side for a starting point.
4. Pull ~1m of filament in the load direction. Filament should stay tight on the spool (no loose loops). If loose loops form this indicates that the One-Way Bearing/Center Drive Assembly may be installed backwards (return to Center Drive Roller Assembly step), or the One-Way bearing is too tight on the Center Drive Roller Axle (see Filamentalist Troubleshooting Guide.).
5. Starting with a tightly packed filament roll, push filament back onto the spool to simulate an MMU unload/eject. If loose filament is forming around the filament spool during unload, tighten the spring tensioning screw. If no loose filament is forming around the filament roll, gradually reduce the spring tension until loose filament starts to accumulate and then increase tension in ~1/2 screw turn increments until you feel you have the lightest tension that results in a tightly packed unload.
6. Initial tuning is complete and the rewinder can now be installed into your system. The same steps above can be followed after rewinder installation if additional tuning is required.



O-RING REPLACEMENT

You may never need to replace o-rings. Testing and extrapolation estimates that the wear-out point is ~5K cycles. The impact of o-ring wear-out can be reduced by periodically swapping highly used rewinders with low use rewinders in your line-up. Also, o-rings with grooves worn in them can be swapped with their opposing partners to present the unworn side/face to the filament to extend the life of a set. For o-ring replacement, FOLLOW THE STEPS BELOW:

1. Unscrew the (6) screws of the Right and Left Supports and remove them.
2. Remove the Drive Roller Assembly from under the Tension Mount Arms.
3. Unscrew the set screw(s) on one Rim Roller and remove it from the axle.
4. Slide the CDR Spacer and Center Drive Roller from the axle
5. Remove the old o-rings (a dental pic or small flat bladed screwdriver works great).
6. Install a pair of new o-rings.
7. Reinstall the Center Drive Roller and CDR Spacer back on the axle.
8. Install the Rim Roller back onto the axle.
    a. Use Axle Depth Tool to set the correct distance of Rim Rollers from Axle end and tighten screw(s) firmly against Axle.
    b. Confirm that the CDR spacers still freely spin on Axle with~0.5mm space between adjacent parts.
9. Verify that the Center Drive Roller Assembly/One-Way Bearing is in the correct orientation and reassembly the unit.