

# Rawls and Davis Seed Tumbler Replications

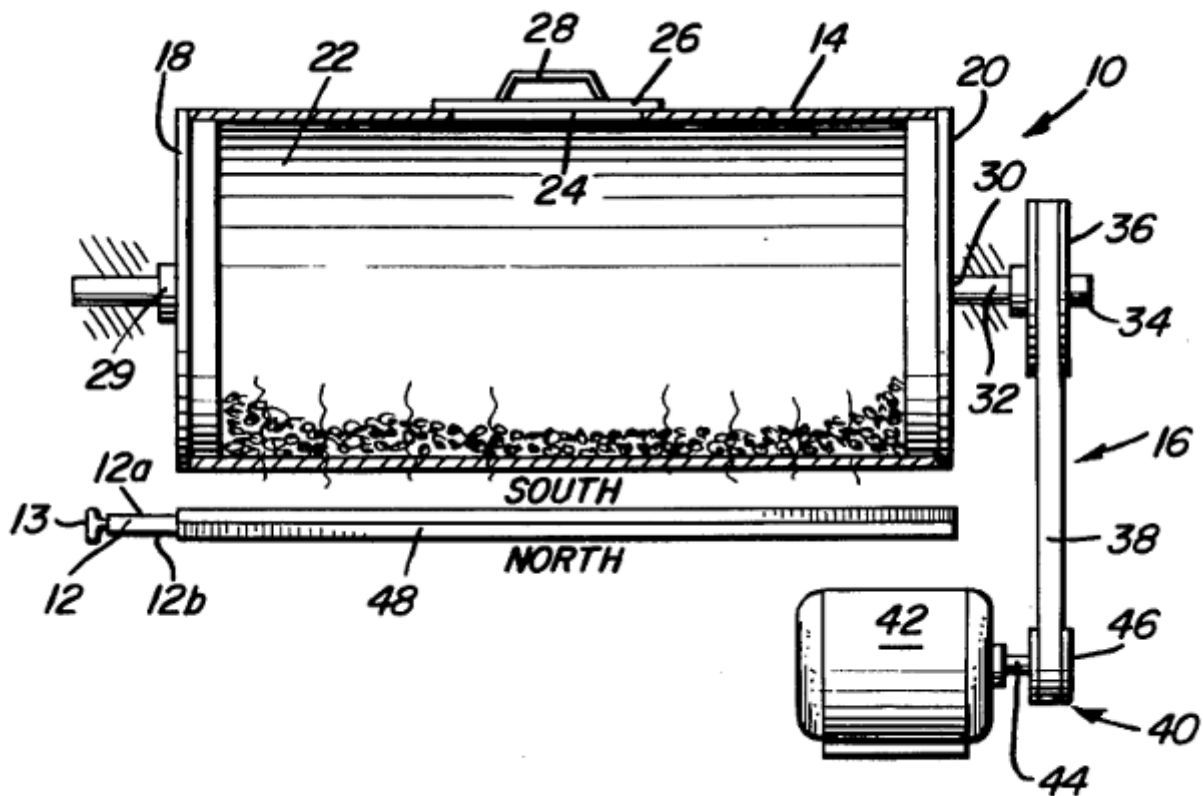
- 2in x 2in x 1in N42 Neodymium-Iron-Boron
- Internal Magnet Tumbler - N52 NdFeB 2in x 1in x 1/2in

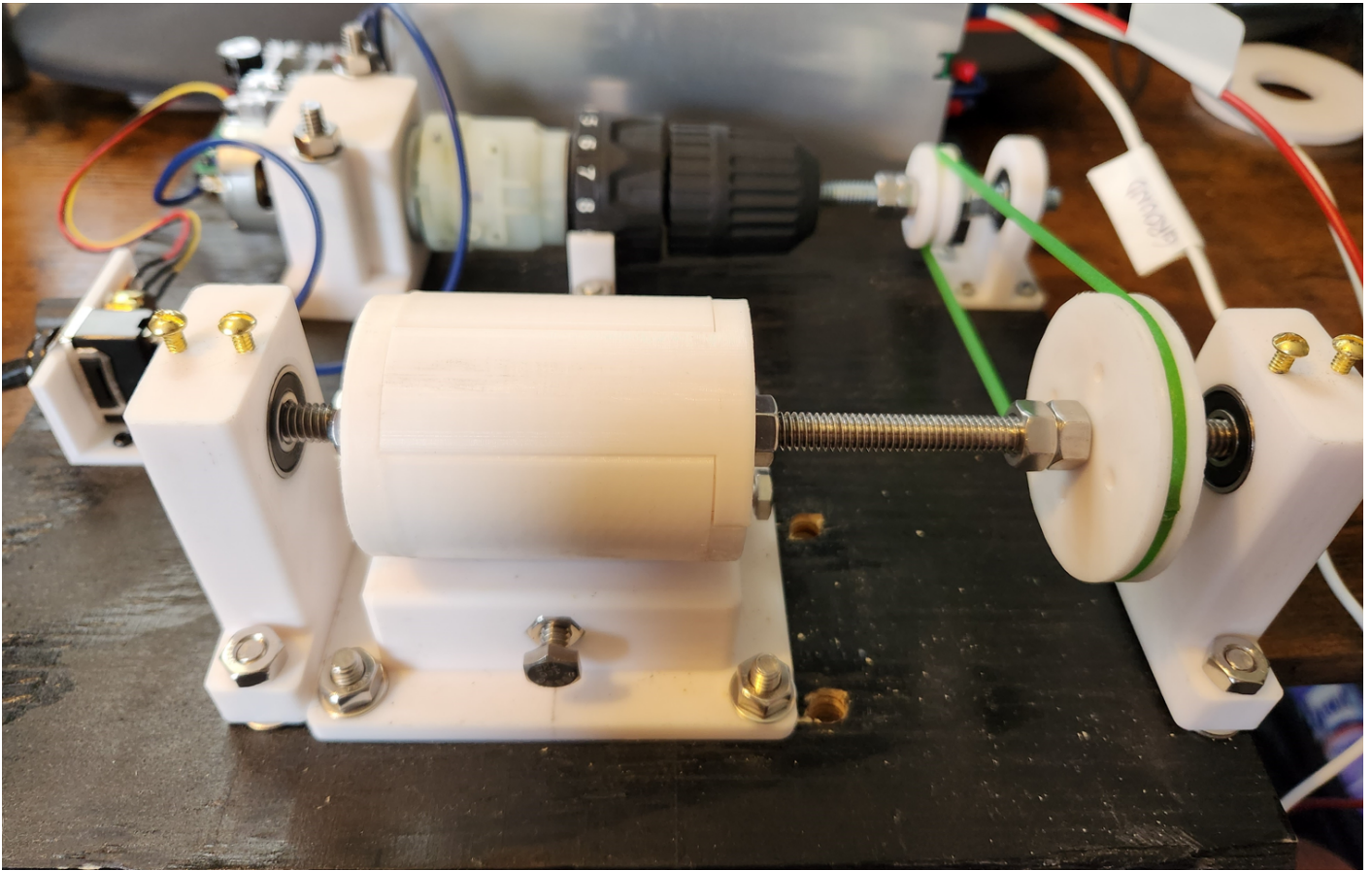
# 2in x 2in x 1in N42 Neodymium-Iron-Boron

## **APPARATUS OVERVIEW:**

The assembly is simplistic in its design. A permanent magnet, rectangular in geometry, is placed below a nonferrous cylinder that composes the tumbler main body. This tumbler is rotated slowly via pulley diameter ratios driven by an electric motor. Plastics, brass, copper, etc would be ideal materials for construction. Given the prevalence of 3D printing technology today, the replica discussed herein was made from PLA. This allows decentralized manufacturing for those who wish to investigate and corroborate my findings. STLs used in these replications are provided freely. Hardware links, domestic to USA, are also provided.

Rawls and Davis specify from the patent that the ideal Gaussian value is between 600 - 3500 for varying seed types.



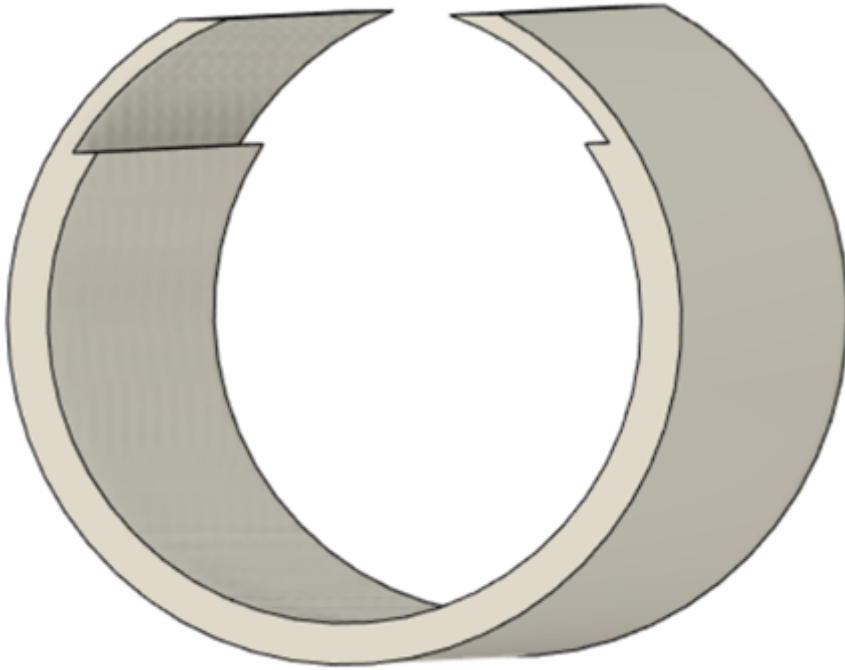


## **TUMBLER BODIES:**

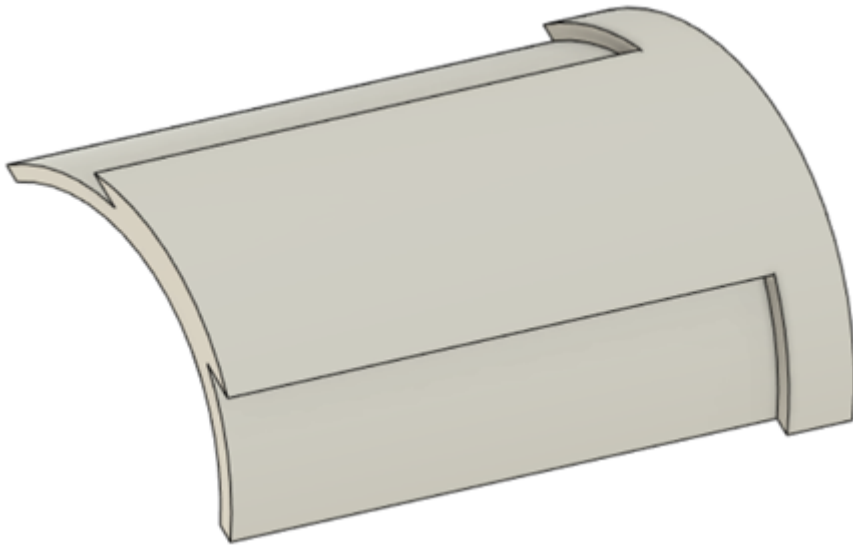
A few tumbler bodies were designed. Outside diameters were consistent, being 2.00" OD across the designs. Overall length were consistent, being 2.25" (allows insertion depth of .125" on each end for end caps). Changes in wall thickness were made. This causes spacing between the inside seeds and magnet face, which will produce a variance in gaussian strength.

Raising the tumbler up with spacers is a better way of varying the gaussian value at the seeds. This means that the tumbler wall thickness isn't terribly crucial. The tumbler body 2.0 has a fixed wall dimension for the ability to have a sliding top cap.

[Body Bottom 2.0.stl](#)



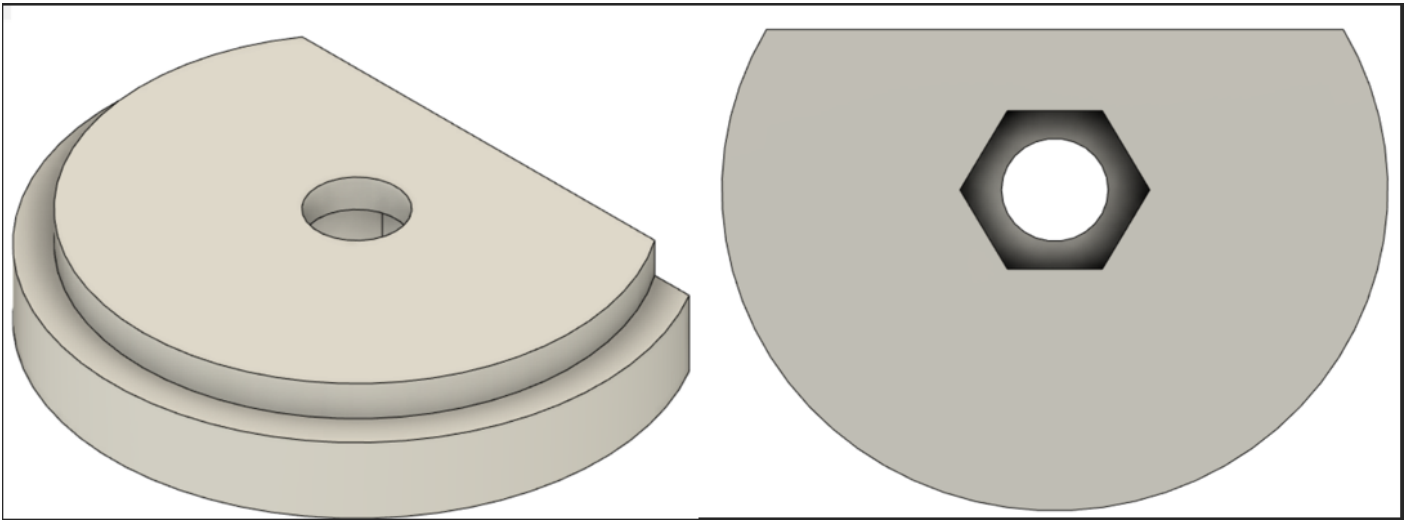
[Body Top Cap 2.0.stl](#)



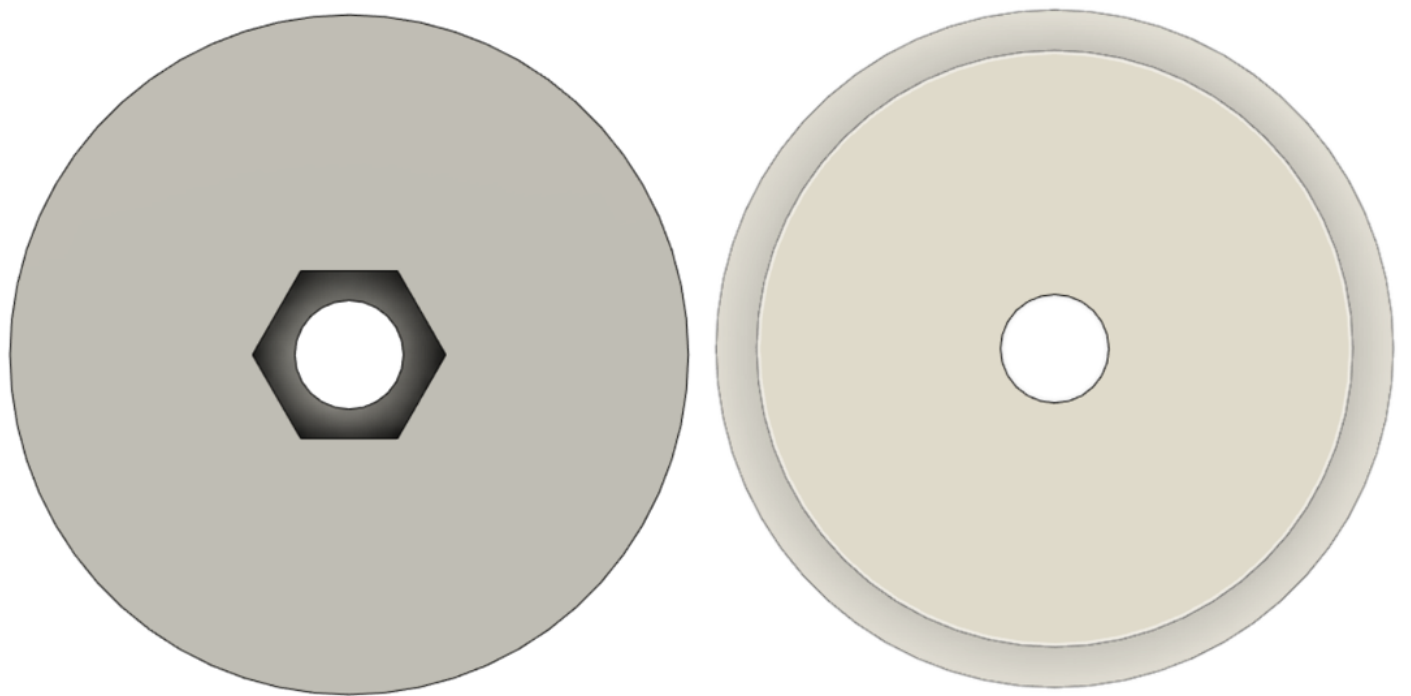
## **END CAPS:**

Revised end cap design includes an "A" and "B" label. "A" is a complete circular geometry with a cutout for a 5/16" nut to be pressed into. "B" is a semi circular geometry, with 5/16" cutout for press fitting, that allows top lid to slide into place. It maintains center alignment with the other end cap for shaft to pass through.

End Cap "B": [B\\_End Cap Body 2.0.stl](#)

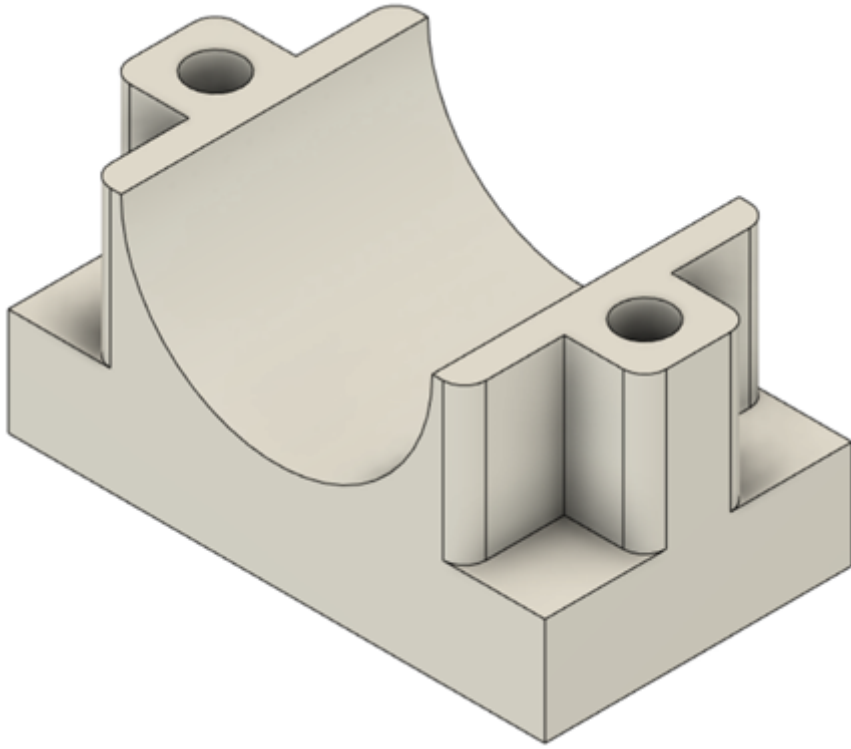


End Cap "A": [A\\_End Cap Body 2.0.stl](#)

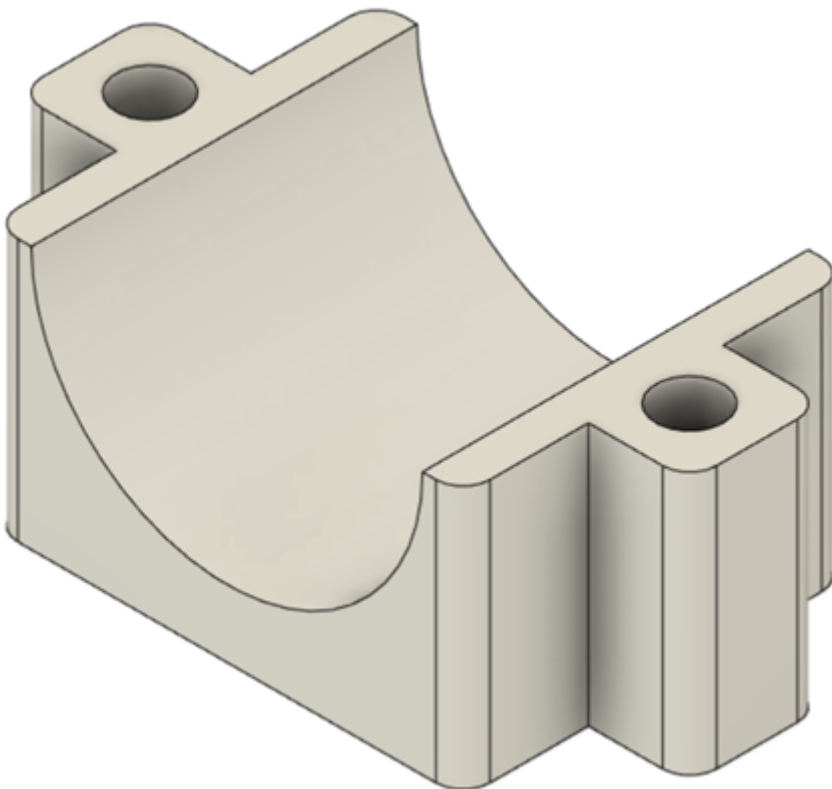


## **DRIVE MOTOR/MOUNTING:**

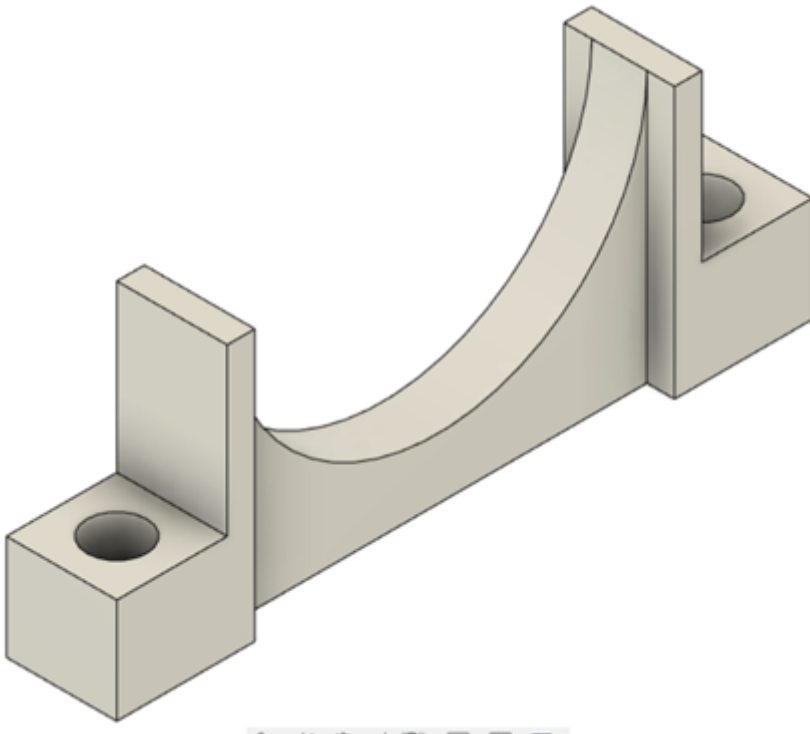
Motor Bottom: [Drive Motor Bottom.stl](#)



Motor Top: [Drive Motor Top.stl](#)



Motor Gearbox Support: [Gearbox Support .stl](#)



## **PWM DRIVE MOTOR WIRING:**

[Motor PWM Module](#)   [PWM Power Supply](#)

## **PULLEYS:**

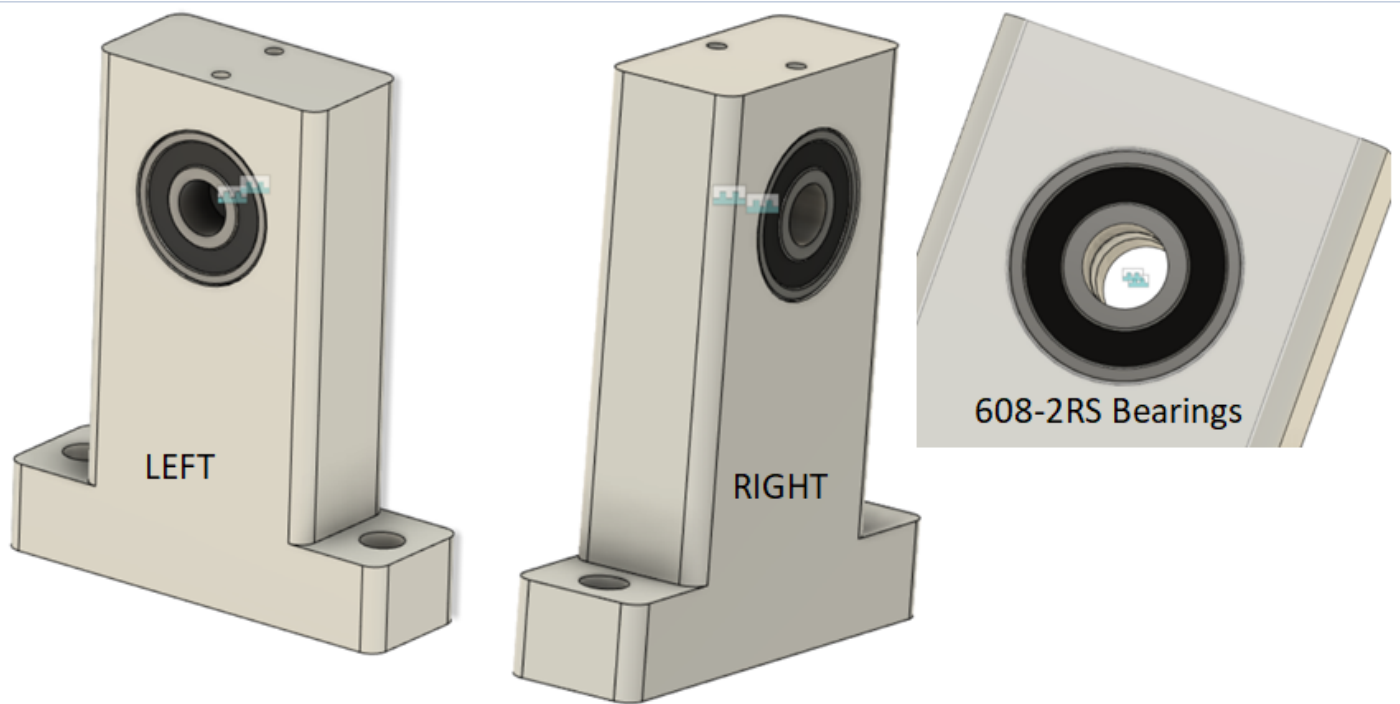
2.00" for the drive motor: [2.00 Pulley Half Piece .stl](#)

1.00" for the tumbler: [1\\_Pulley Half.stl](#)

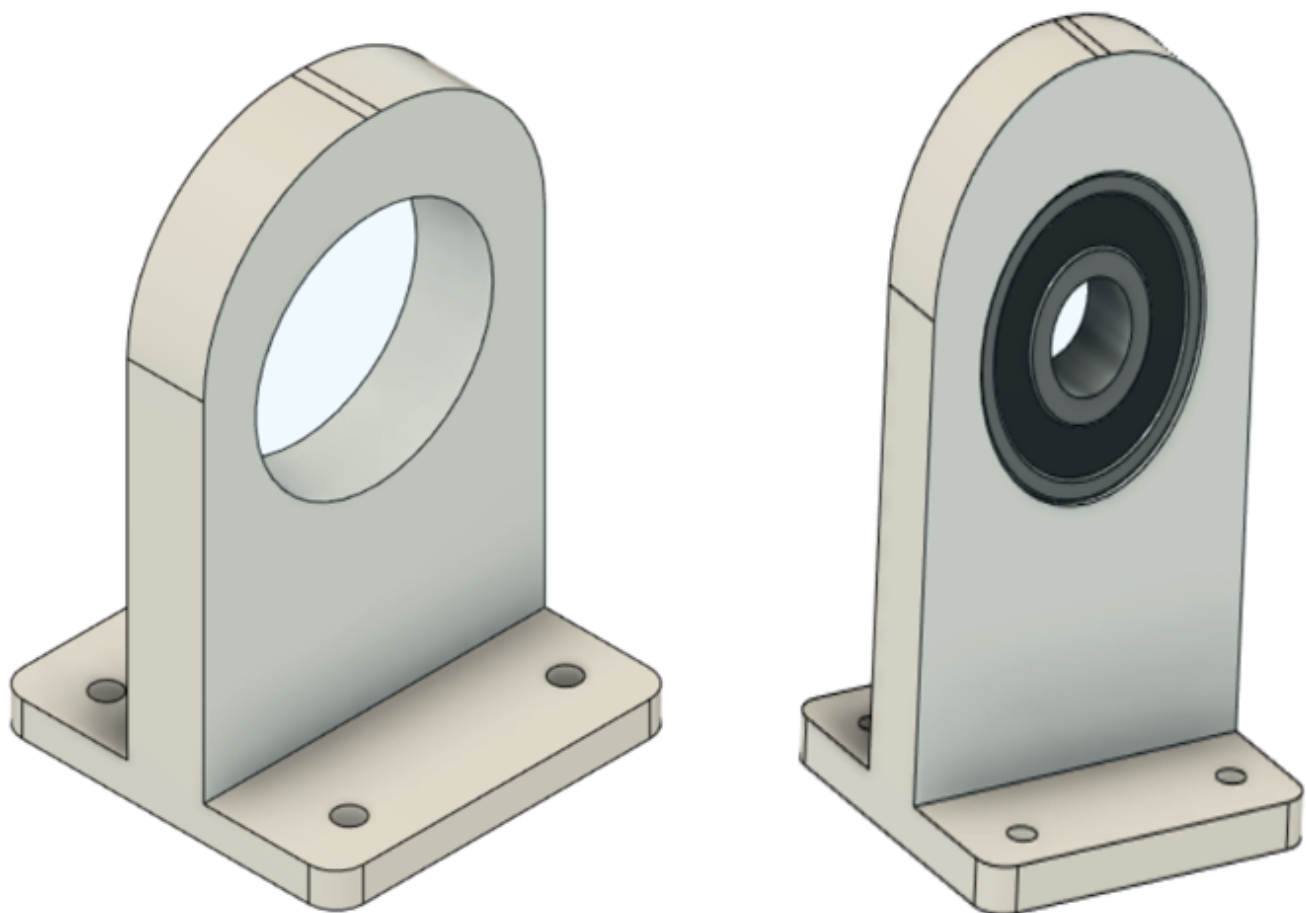
Each pulley is printed in halves to be glued together. 6-32 holes are included, 90 degrees offset, to allow reinforcement if needed.

## **END SUPPORTS:**

Supports that house the [Roller Bearings](#) that allow the 5/16 stainless steel shaft to pass through and rotate freely. The bearings/end supports are spaced enough apart to minimize the attraction of the steel bearing body towards the magnet. Stainless steel bearings are available, although more expensive.



[Seed Tumbler End With Bearing Recession v5.stl](#)

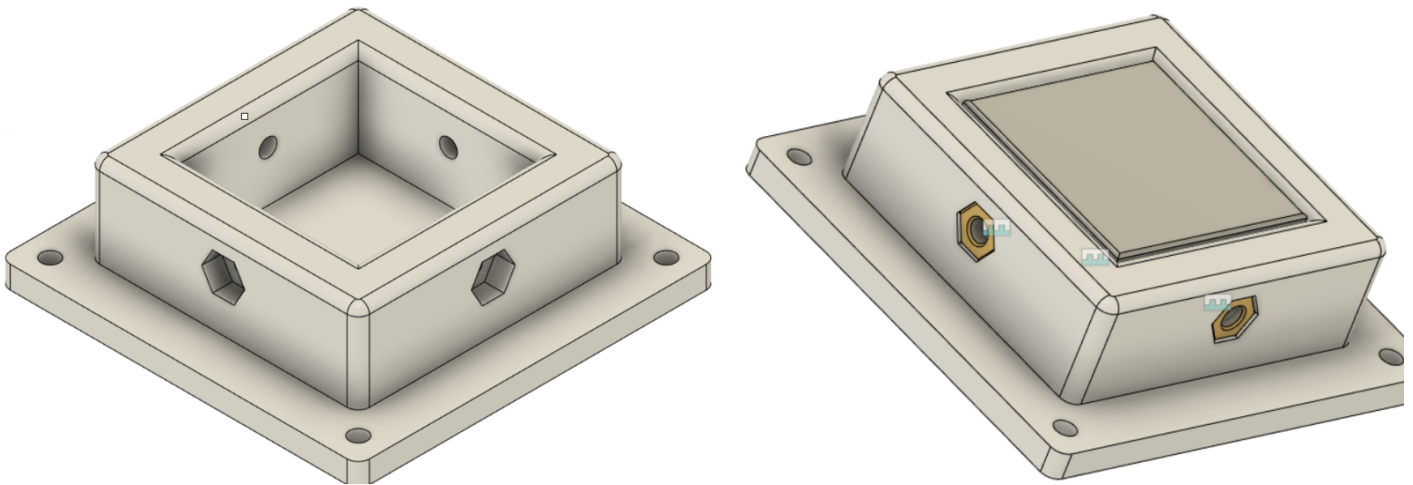


[End Bearing Support.stl](#)

**MAGNET MOUNTING/SECURING:**



NdFeB magnets have a very strong pulling force. This mount is an attempt to secure the magnet from sliding out unexpectedly. It should be recognized that this prototype is made out of plastic. The brass or stainless steel nuts shown should be tightly pressed in for better results (bench vise is best option). Idea is to spread the forces applied via screws across all four side surfaces of the magnet. All hardware used should be brass or high grade stainless to avoid attraction forces.

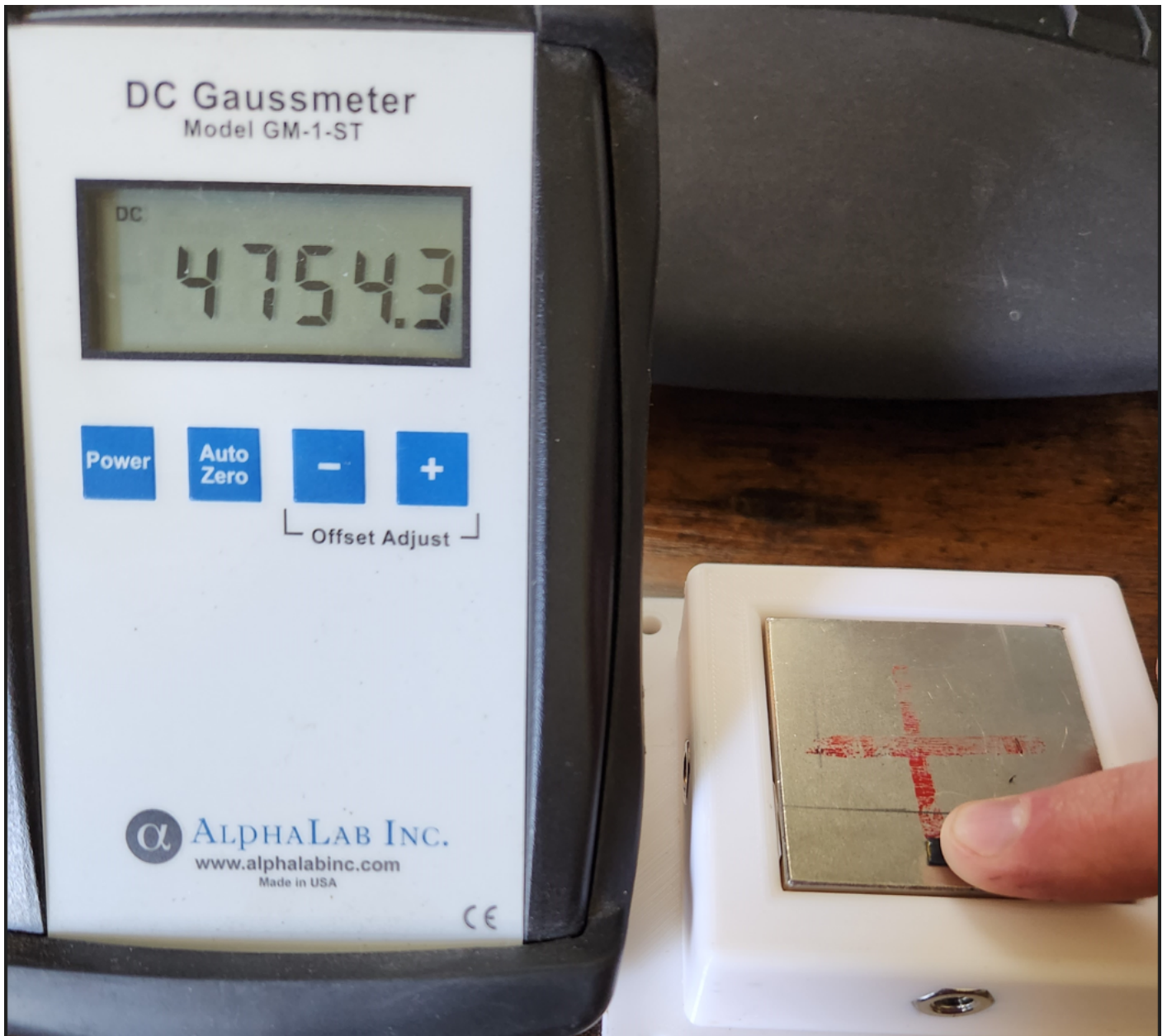


[2x2x1 mount.stl](#)

## **GAUSSIAN VALUE OF SOUTH POLE FACE:**

Below shows the gaussian value of the South pole face that will be the exposure area underneath the various tumblers. The pencil line is an arbitrary reference point to place the tumblers over. In the middle will be the ideal exposure area. This is the reason the gaussmeter's sensor is placed

here for measurements. The Gaussmeter used is the same model used by some magnet manufacturers. It is NIST certified. If the reader wishes to get a gaussmeter, please consider the WT10A model. This one is close enough to the accuracy of the Gaussmeter shown but at a much cheaper cost.



Gaussian value for C8 2"x2"x1" South pole:



**SUPPORT HEIGHT SPACERS:**

Internal Magnet Tumbler -  
N52 NdFeB 2in x 1in x 1/2in