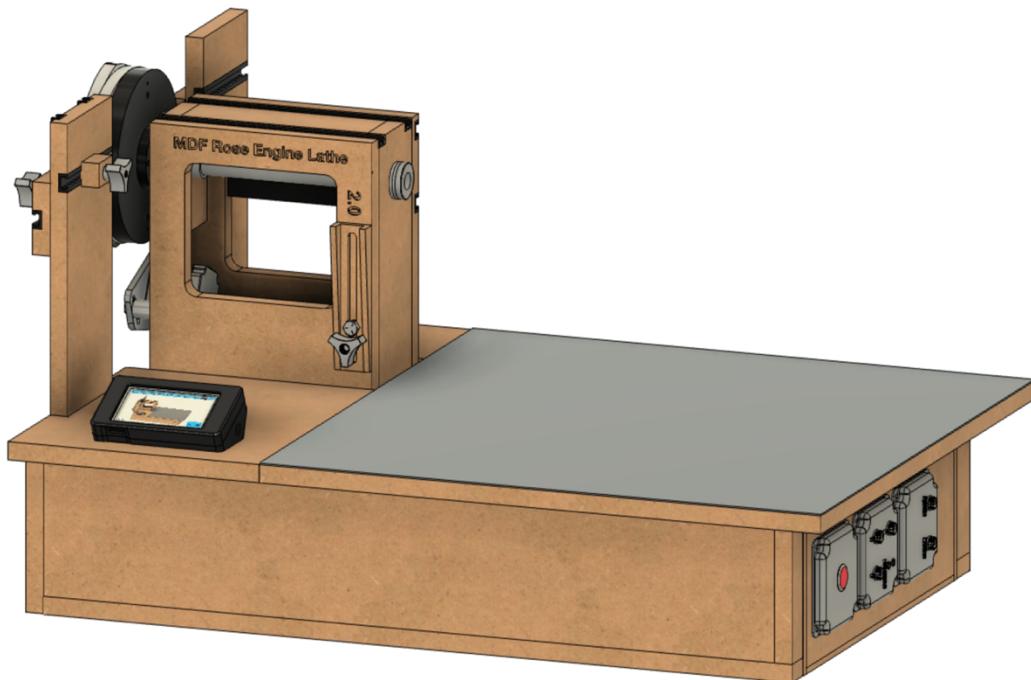


# **MDF Rose Engine Lathe 2.0 with Stepper Motor Drive**



## **Instructions for Building Jigs, Fixtures, & Add-Ons**

**Volume 1**

**Version 1.8  
14 November 2024**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

This document is intended to help one familiar with the MDF rose engine to easily build the identified jigs, fixtures, and add-ons. You can purchase these from us at [www.ColvinTools.com](http://www.ColvinTools.com), or build them yourself.

As you get started with building these jigs, fixtures, or add-ons to the MDF rose engine lathe, please consider making the machine exactly according to the outlined instructions. There are lots of ways you can modify this, and, quite frankly, the MDF rose engine encourages experimentation. But it is best to attempt those modifications after understanding how it works. Some ideas which sound grand may not appear so after understanding how the machine works (we speak from experience).

If you have any questions on the terminology in this document, check out the “Ornamental Turning Book of Knowledge” ([www.OTBoK.info](http://www.OTBoK.info)).

Throughout this document, I’ve tried to show the MDF in its native color of tan/brown. There are differences in the images I captured from the CAD drawing made, but those are not representative of the machine’s differences.

The added pieces are typically shown in different colors to ensure they stand out from the MDF rose engine lathe.

Unless otherwise noted, the MDF is  $\frac{3}{4}$ " thick.

If you have any questions, please contact us at [ColvinTools@Gmail.com](mailto:ColvinTools@Gmail.com).

Good luck and we hope you enjoy this machine as much as we.

Rich Colvin & Jack Zimmel

Permission is not granted to manufacture these for sale.

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Table of Contents

<b>Amplitude Adjuster.....</b>	<b>5</b>
<i>Bill of Materials.....</i>	7
<i>AA1 – MDF Spacer Block .....</i>	9
<i>AA2 – MDF AA Alignment Block.....</i>	10
<i>AA3 – Horizontal Bar.....</i>	11
<i>AA4 – Vertical Bar.....</i>	11
<i>105 – AA Lever Arm Axle.....</i>	12
<i>R1 – AA Rubber .....</i>	13
<i>Assembly.....</i>	15
<i>Using the AA .....</i>	18
<b>Amplitude Adjuster Components for Rubber Cartridge .....</b>	<b>20</b>
<i>Bill of Materials.....</i>	21
<i>Cartridge .....</i>	23
<i>Shelf .....</i>	28
<i>Assembly.....</i>	31
<i>Alignment &amp; Usage of the Rubber Cartridge .....</i>	32
<b>Amplitude Adjuster Components for Independent Amplitude Adjustment .....</b>	<b>33</b>
<i>Backstop .....</i>	34
<i>Clamp.....</i>	35
<b>Dynamic Amplitude Adjuster .....</b>	<b>36</b>
<i>Bill of Materials.....</i>	37
<i>MDF Backplane .....</i>	40
<i>MDF Alignment Block .....</i>	40
<i>MDF Spacer Block .....</i>	41
<i>Wood Parts Assembled .....</i>	41
<i>MDF Motor Alignment Block .....</i>	42
<i>Coupler.....</i>	43
<i>Add a Cable to the Stepper Motor .....</i>	43
<i>Attach the Stepper Motor to the Bracket .....</i>	43
<i>Attach the Linear Guide Rail .....</i>	44
<i>Attach Everything to the Base .....</i>	45
<i>Rubber Carrier.....</i>	46
<i>Insert the Leadscrew into the Rubber Carrier .....</i>	47

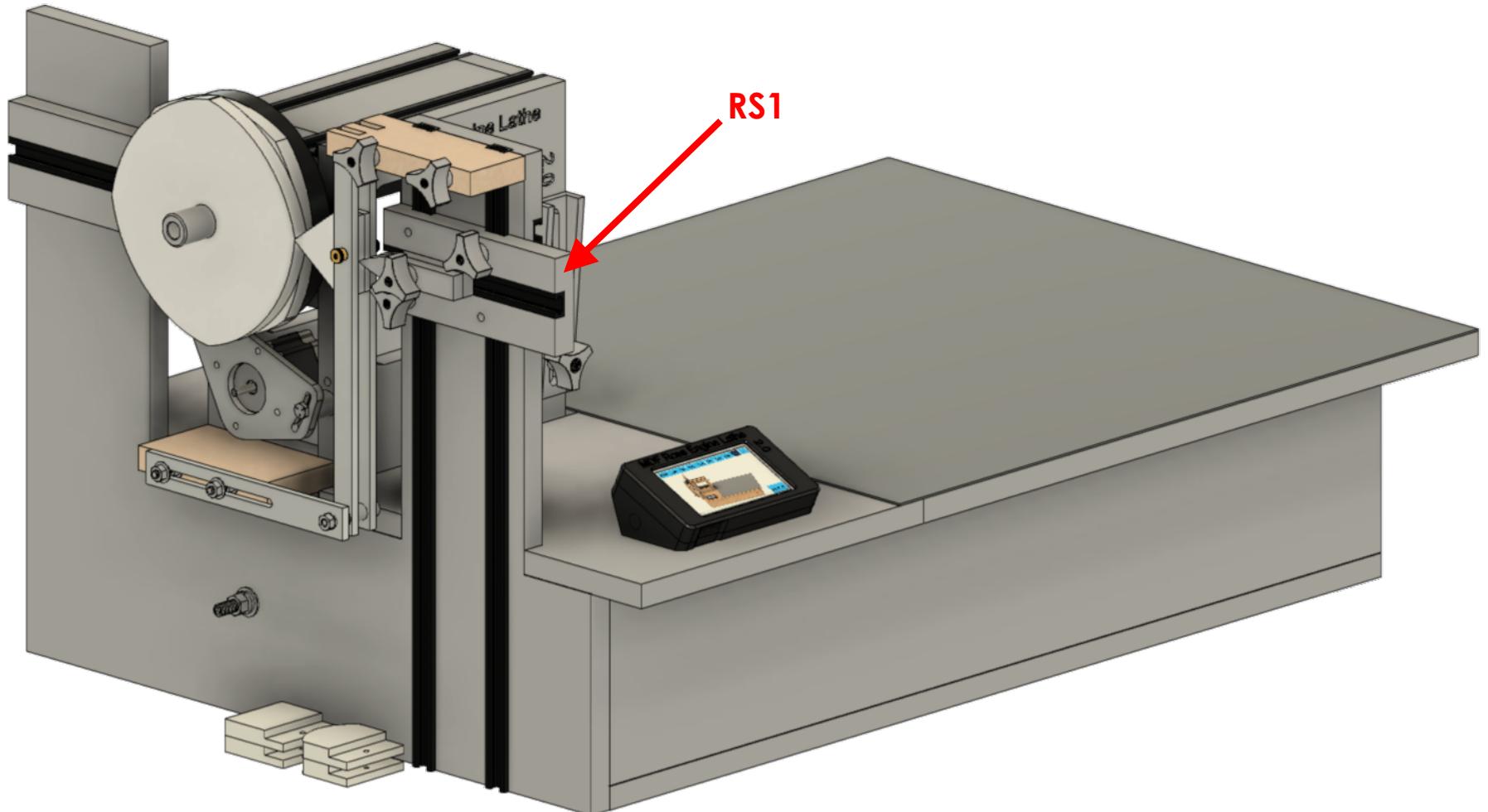
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

<i>Attach the Leadscrew to the Stepper Motor</i> .....	47
<i>Attach the Handwheel to the Stepper Motor</i> .....	47
<i>Attach the Rubber Carrier to the HGH20CA Carriage Bearing Block</i> .....	48
<i>Attach the Rubber to the Rubber Carrier</i> .....	48
<b>Rosette Phaser / Multiplier</b> .....	<b>49</b>
<i>Bottom Piece</i> .....	51
<i>Top Piece</i> .....	51
<i>Side Pieces</i> .....	52
<b>Pumping Mechanism</b> .....	<b>54</b>
<i>Bill of Materials</i> .....	56
<i>Spindle Parts</i> .....	58
<i>Frame Parts</i> .....	59
<i>Assembly</i> .....	64
<i>Installing and Aligning</i> .....	67

## Amplitude Adjuster

The amplitude adjuster for the MDF Rose Engine Lathe 2.0 is shown installed below. Also shown are some extra rubbers. Note that the RS1 has been flipped 180° to open up more space. Details for building this follow the bill of materials.



## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

**Note:** This design is intended for use as shown with the AA's rubbers being supplied by

3. The RS1 piece, flipped 180° (as shown on the prior page).
4. Using the AA Rubber Cartridge approach, as outlined on pg. 20. In this approach, the cartridge replaces the RS1.

There are two big advantages to this approach:

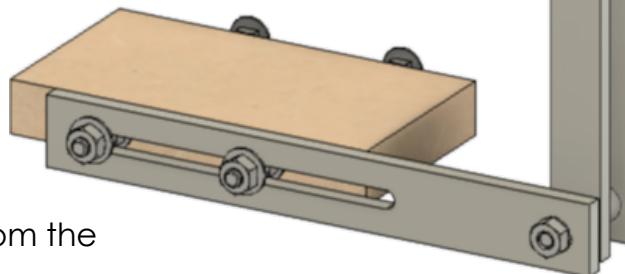
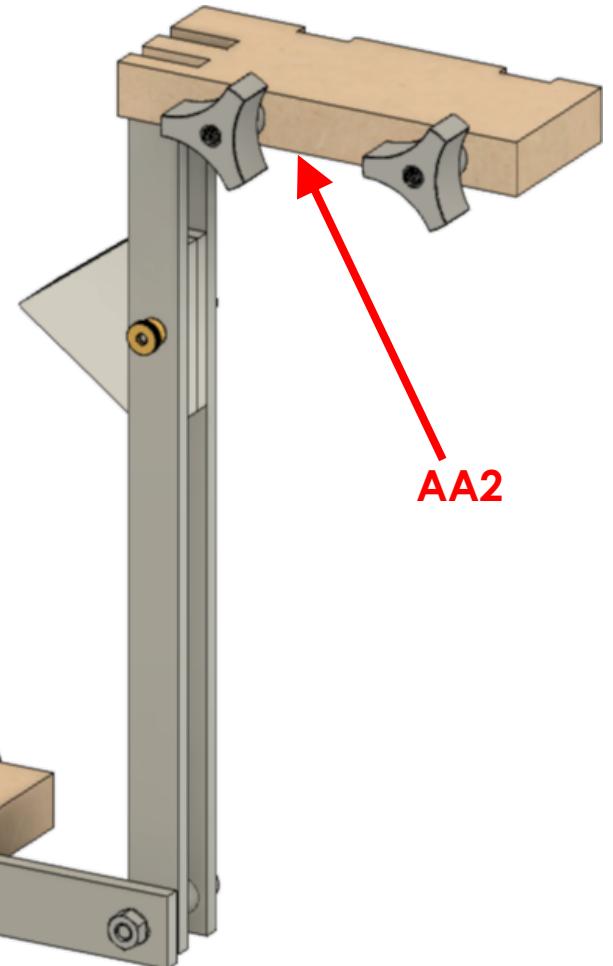
- a. The alignment of the AA rubbers can be adjusted left or right to ensure the vertical arms (AA4) stay perfectly aligned with the rosettes. This is particularly useful when considering pumping as the rosettes will be moved away from the headstock.
- b. The rubbers can be easily engaged or disengaged more finely (i.e., by the rotation of a screw).

If this approach is taken, then **AA2** is not needed.

Do note though that this was designed to use the Rosette Phaser/Multiplier at the same time. Thusly, the rosettes are moved away from the headstock by  $>\frac{3}{4}$ ".

5. With a backstop type approach as outlined on pg. 33.

This has the advantage of being able to set the amount of amplitude adjustment different for each rosette (i.e., the AA rubbers can be at different positions vertically).

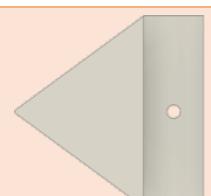
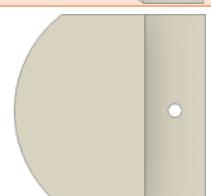
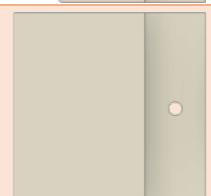


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Bill of Materials

Parts required for building this are below.

Item #	Item	Qty	Source	Source Part Number	Comments
<b>MDF Parts</b>					
AA1	MDF Spacer Block	1			
AA2	MDF AA Alignment Block	1			
<b>Machined Parts</b>					
AA3	Aluminum bar, $\frac{1}{4}$ " x 1"	1			A piece $7 \frac{3}{4}$ " to 8" long is needed. Used for the horizontal bar.
AA4	Aluminum bar, $\frac{1}{4}$ " x $\frac{3}{4}$ "	2			Two pieces, $12 \frac{1}{2}$ " to 13" long (each) are needed. Used for the vertical bars.
R1	Rubber, Pointed	2			
R2	Rubber, 2" Radius	2			
R3	Rubber, Flat	2			

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

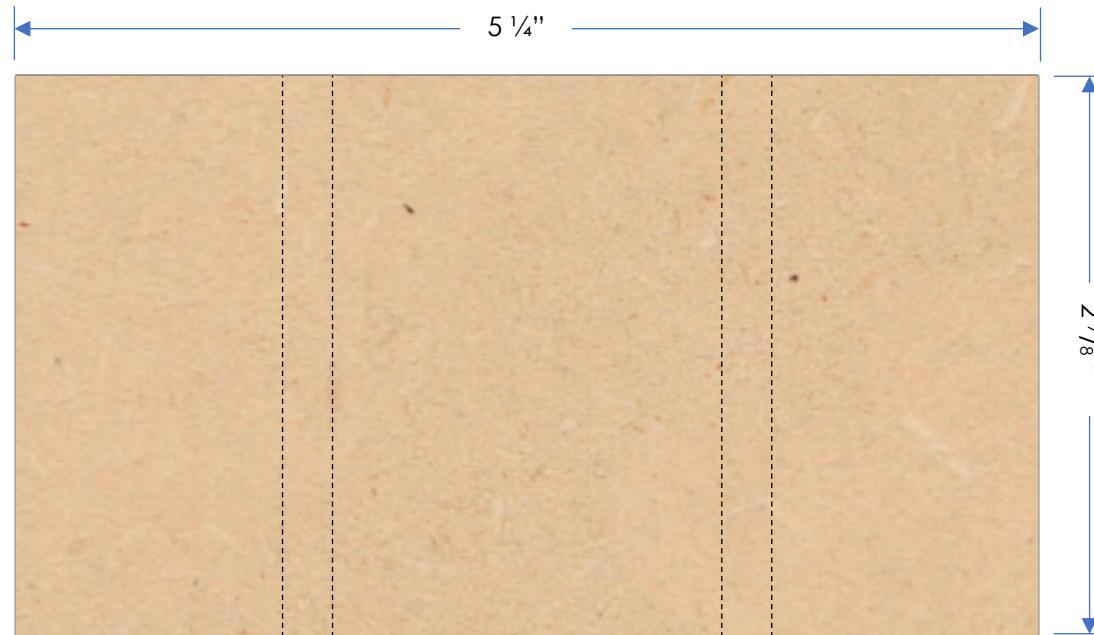
Item #	Item	Qty	Source	Source Part Number	Comments
	<b>Other Parts</b>				
101	Carriage Bolts, $\frac{1}{4}$ "-20, 4" long	2	McMaster-Carr	93548A560	
102	Washer, $\frac{1}{4}$ "	8	McMaster-Carr	90107A029	
103	Lock Washer, $\frac{1}{4}$ "	1	McMaster-Carr	92146A029	
104	Nut, $\frac{1}{4}$ "-20	5	McMaster-Carr	95505A601	
105	Bolt, $\frac{1}{4}$ "-20	1	McMaster-Carr	90272A196	Used as the axle for the vertical bars (AA4). Cut down per drawing on pg. 12). Need 1 $\frac{1}{2}$ " of unthreaded area.
					
106	Spacer, $\frac{1}{4}$ " ID, $\frac{1}{2}$ " Long	1	McMaster-Carr	92510A765	
107	Collar, $\frac{1}{4}$ " ID	1	McMaster-Carr	6432K12	
108	T-Track Bolt, $\frac{1}{4}$ "-20, 2 $\frac{1}{2}$ " to 3" Long	2	McMaster-Carr		
109	T-Track Nut, $\frac{1}{4}$ "-20	2	McMaster-Carr		
110	Bolt, #8-32, 5/8" Long	2	McMaster-Carr	90272A196	
111	Knurled Nut, #8-32	2	McMaster-Carr	92741A120	I like the brass ones as they look nice next to the aluminum.
112	Bearing	2	McMaster-Carr	57155K323	Trade number R188-ZZ or R188-2Z

## MDF Rose Engine Lathe 2.0

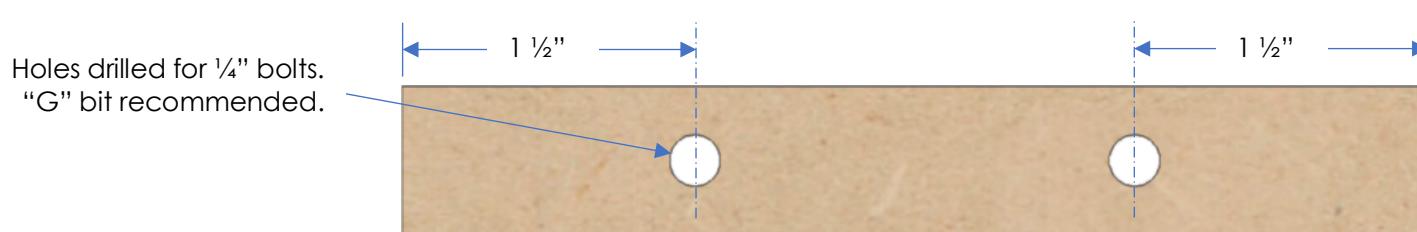
### Jigs, Fixtures, and Add-Ons

#### AA1 – MDF Spacer Block

This spacer block is used to attach the AA to the headstock at the correct distance. You will need to drill two holes in H4L on the headstock to match the thru holes.



**Top View**



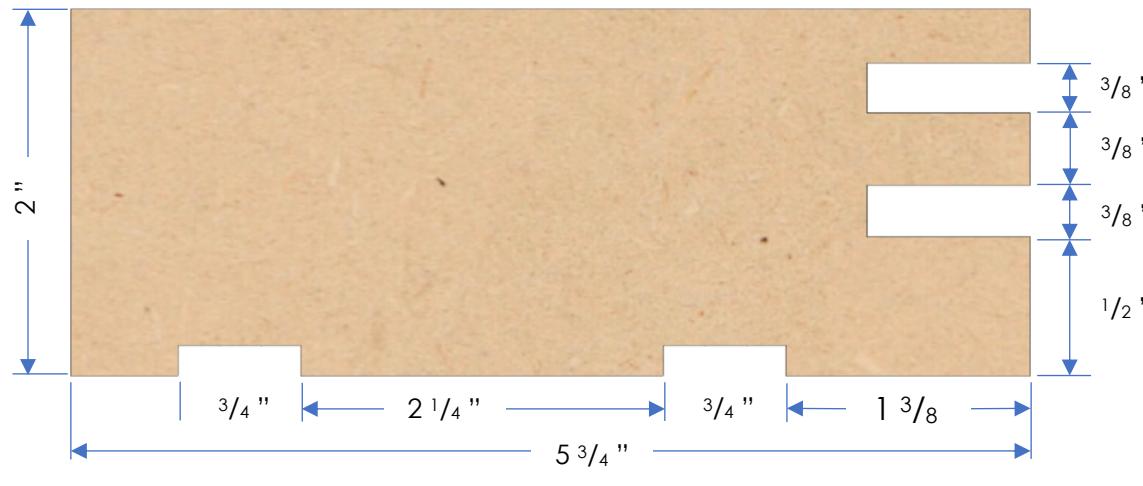
**Side View**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### AA2 – MDF AA Alignment Block

This is used to help keep the vertical bars aligned to the rosettes.



**Top View**

Holes drilled for  $\frac{1}{4}$ " bolts.  
"G" bit recommended.  
Center in slot for T-Track.



**Side View**

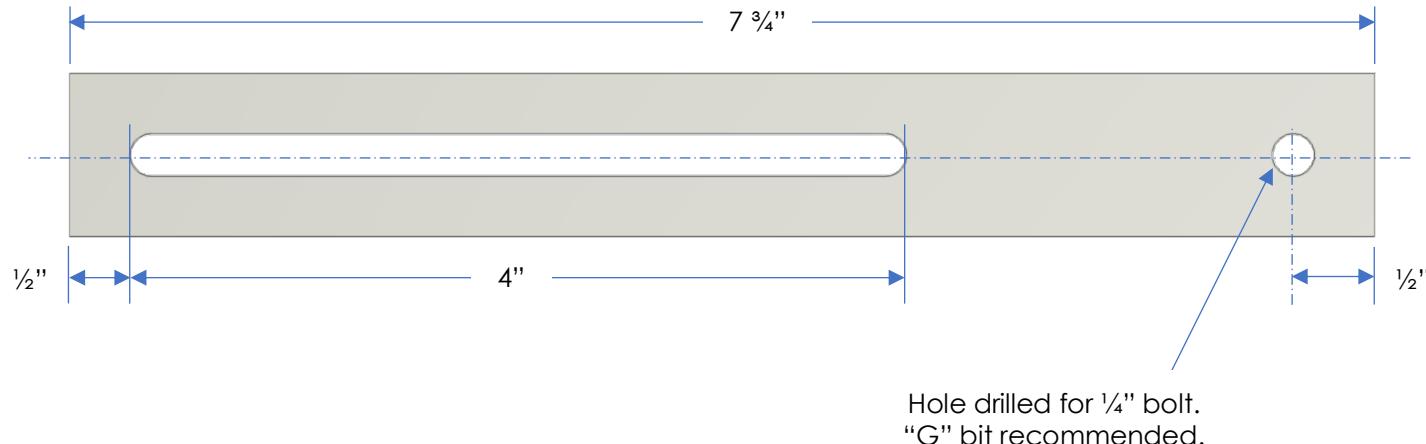
**NOTE:** There is also a 3D printable version in the 3D Printed Parts manual in the MDF Rose Engine Lathe 2.0 Library (<https://mdfre2.ColvinTools.com>).

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### AA3 – Horizontal Bar

The horizontal bar is made from 1" x  $\frac{1}{4}$ " aluminum bar.



### AA4 – Vertical Bar

The vertical bars are made from  $\frac{3}{4}$ " x  $\frac{1}{4}$ " aluminum bar. There are two of these.

1. Hole drilled thru  $31/64$ ".
2. And then reamed to  $1/2$ ".
3. Drill  $15/32$ " (or  $9/16$ ") to 0.050" deep.

Hole drilled for #8-32 bolt.  
#18 bit recommended.



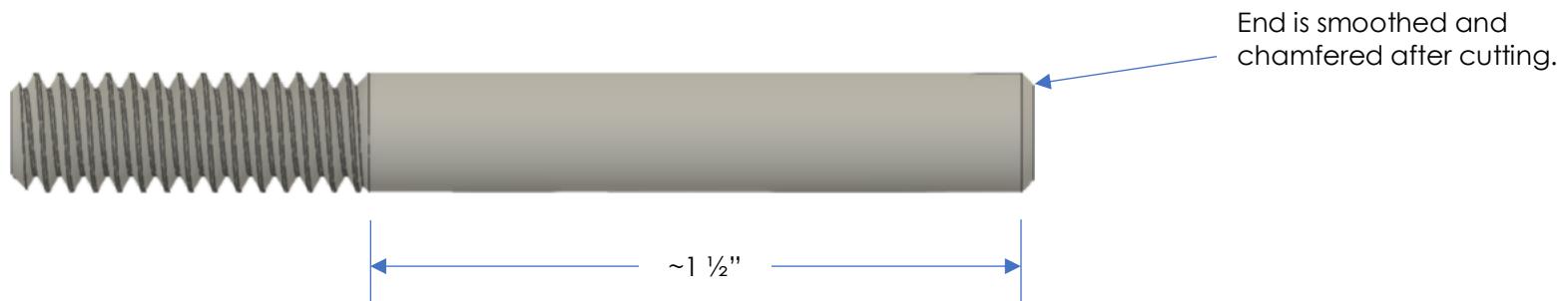
## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### 105 – AA Lever Arm Axle

This is made from a partially threaded bolt. It can be cut with a hack saw, but be sure to smooth off the end, and chamfer it.

The one specified has sufficient unthreaded space.

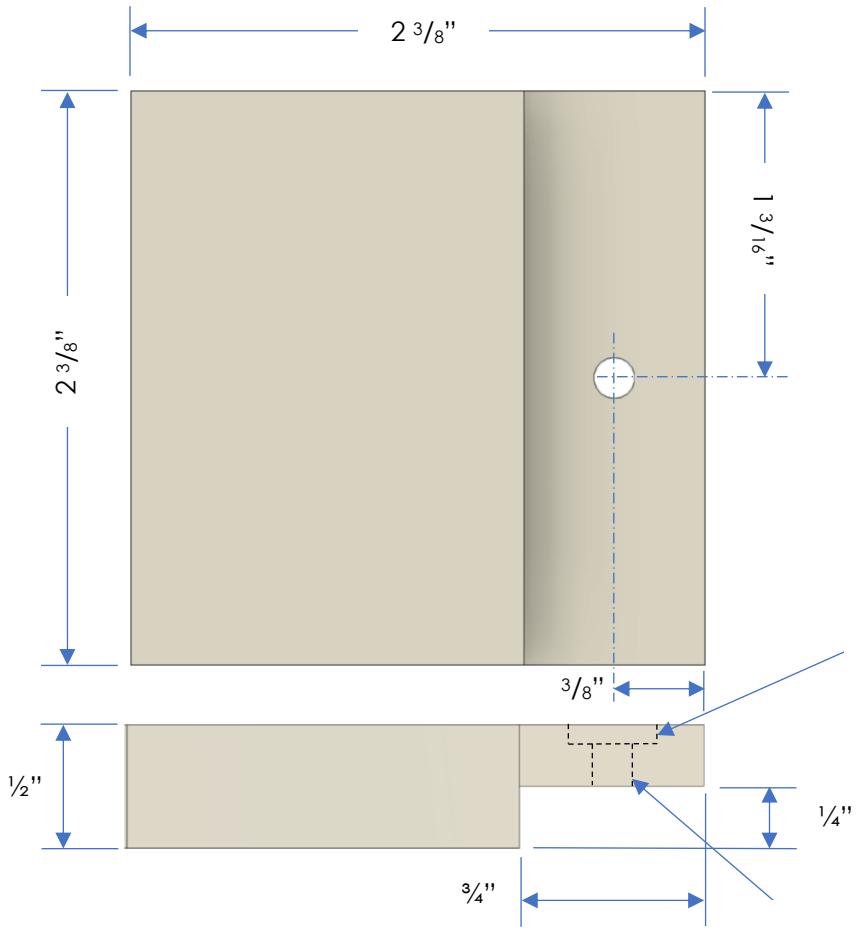


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

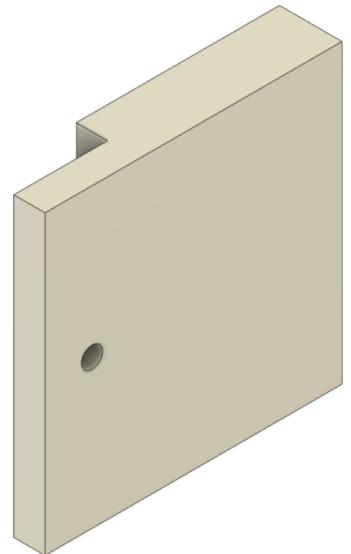
### R1 – AA Rubber

Two are needed at any one time. More can be made. The basic shape to start with is like shown to the right, with measurements below.

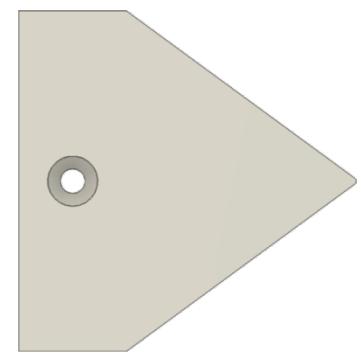


Partial hole drilled for head of #8-32 bolt. Needs to be  $> 0.350''$ .  
 $\frac{3}{8}''$  Forstner bit recommended.  
 Drill this first. The point marks where to drill the through hole.  
 Depth of the partial hole is  $0.100''$  to  $1/8''$ .

Through hole drilled for #8-32 bolt.  
 $\#18$  bit recommended.



**Flat Rubber**



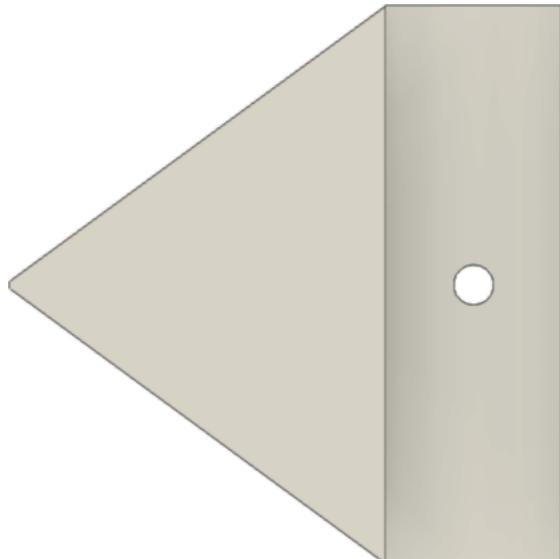
**Pointed Rubber**

## MDF Rose Engine Lathe 2.0

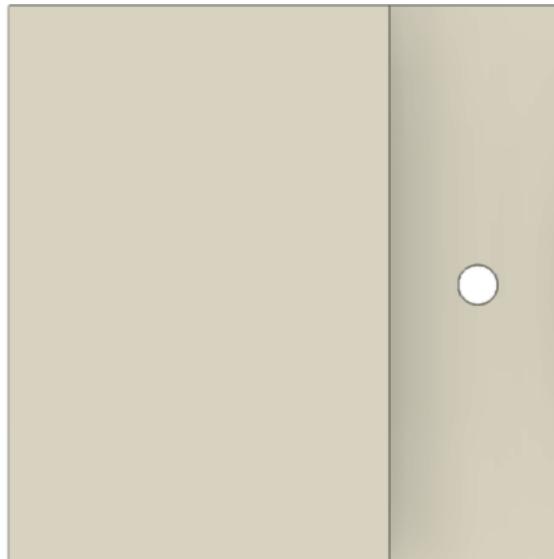
### Jigs, Fixtures, and Add-Ons

#### Various Rubber Shapes

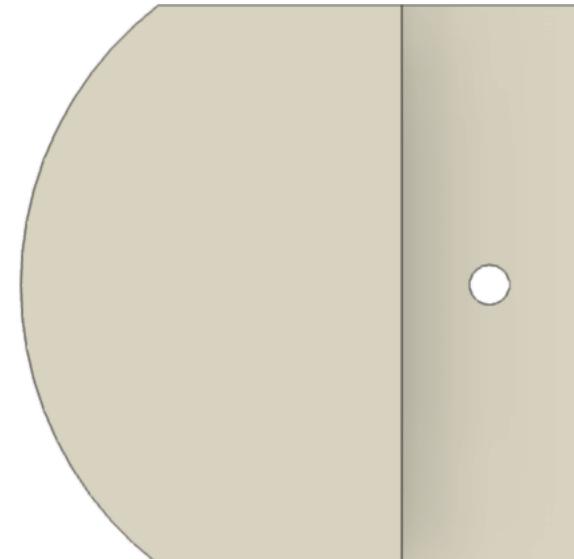
Some examples of rubber shapes are below. Others can be made to accomplish the desired results.



**Pointed**



**Flat**



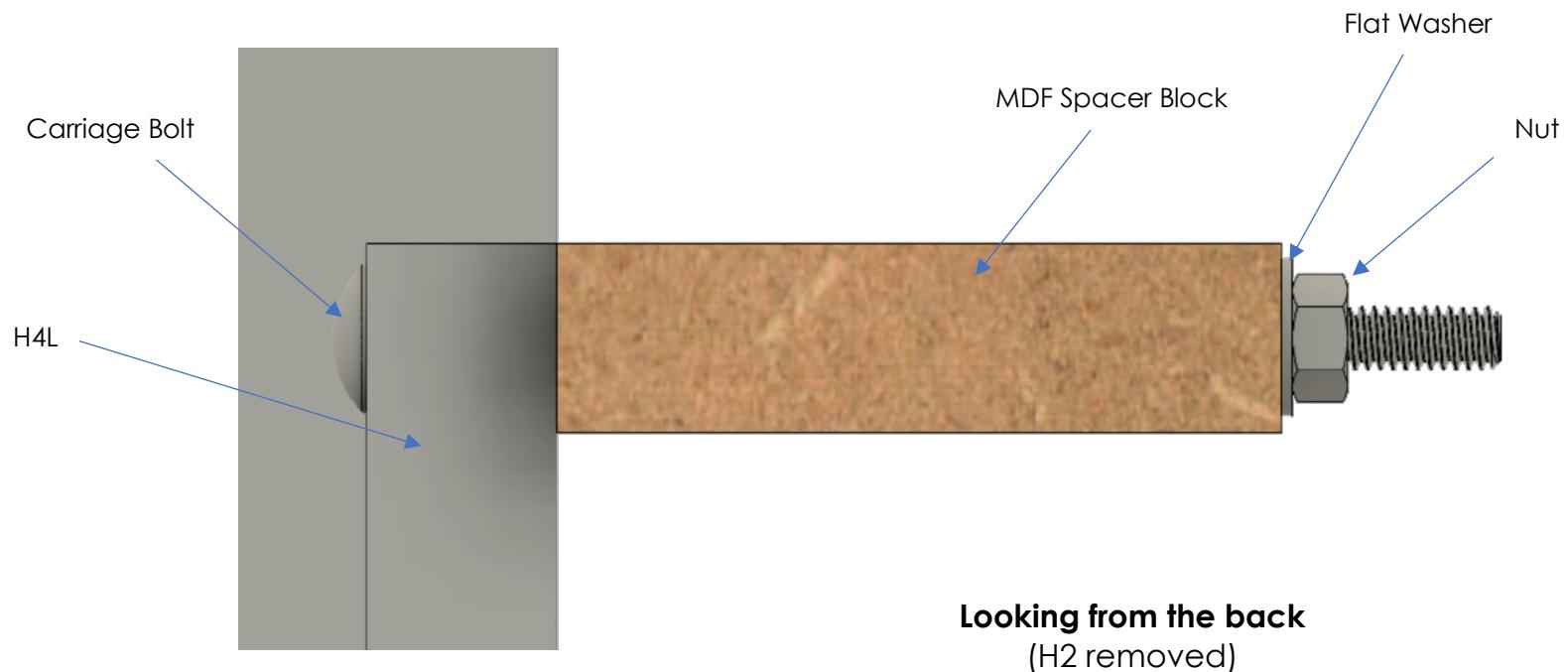
**Rounded  
(2" Radius)**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Assembly

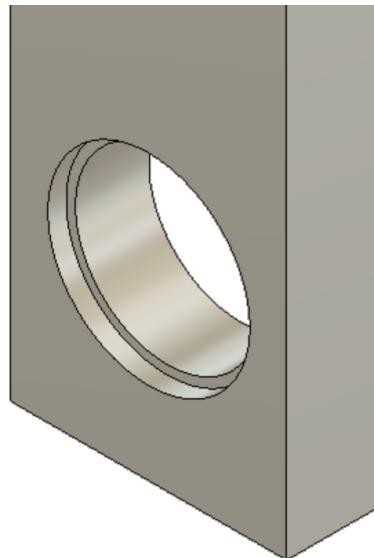
1. Drill the two holes needed in the headstock.
2. Attach the MDF Spacer Block (AA1) to the headstock using two carriage bolts with nuts and flat washers (#101, #102, & #104). The spacer block should be flush with the top of H4L.



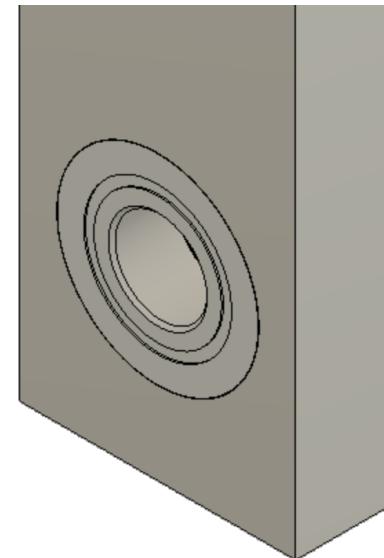
## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

3. Attach the Axle (#105, cut as shown on pg. 12) to the Horizontal Bar (AA3) using two nuts (#104). Use of a lock washer (#103) is also recommended.
4. Insert a bearing (#112) into each of the vertical arms (AA4). The bearing's flange should be flush with the surface of the vertical arm, or below it.



**Vertical Bar (AA4)**



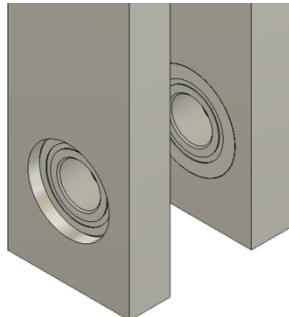
**Vertical Bar (AA4)  
with Bearing Inserted**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

5. Add items to the Axle. Add the parts in this order:
- Flat washer (#102)
  - One vertical arm (AA4) – be sure the flange for the bearing is aligned on the side away from the washer.
  - Spacer (#106)
  - The 2<sup>nd</sup> vertical arm (AA4) – be sure the flange for the bearing is aligned towards the spacer.
  - A second flat washer (#102)
  - The collar (#107)

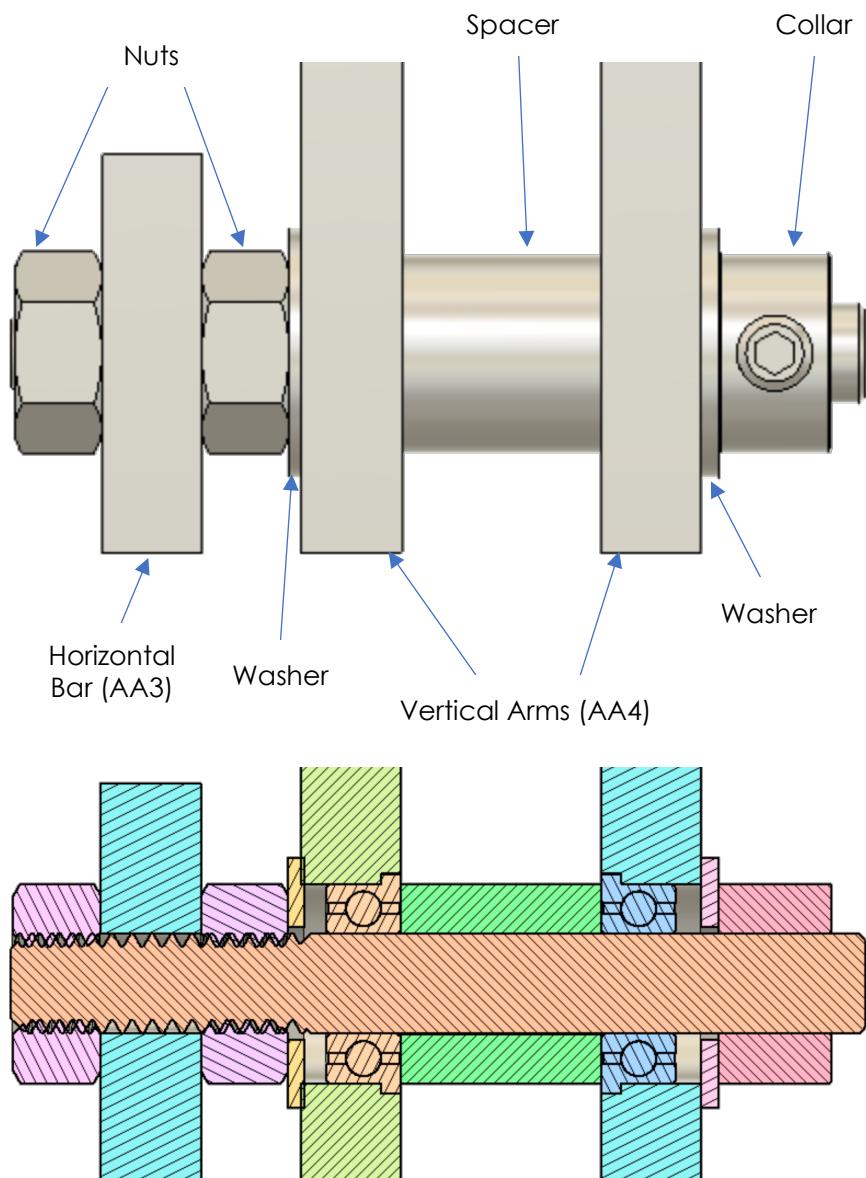
a. Press these together tightly, and tighten the set screw in the collar, locking everything into place. The vertical bars should be able to rotate easily, but not flop around.



The bearings in the vertical arms (AA4) need to be aligned so that the bearings' flanges face each other.

A sectional view of the parts when properly installed is to the right. (The nuts will be properly aligned with the screw threads;

this is simply a diagram. Also, colors are not indicative of any special purpose.)

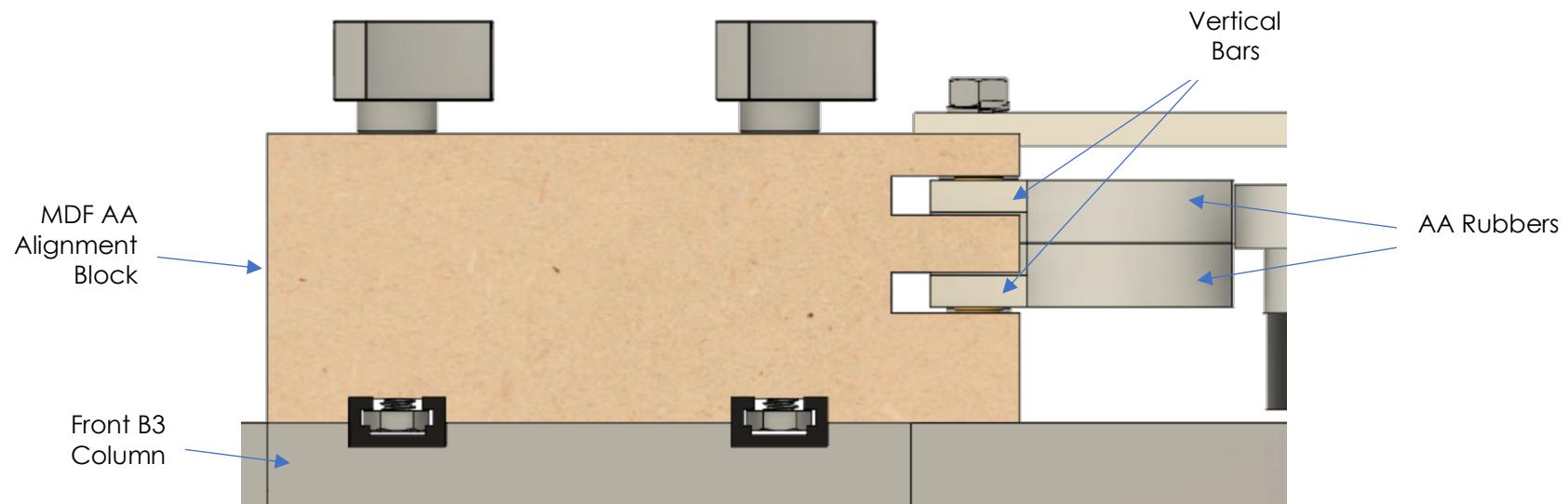


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

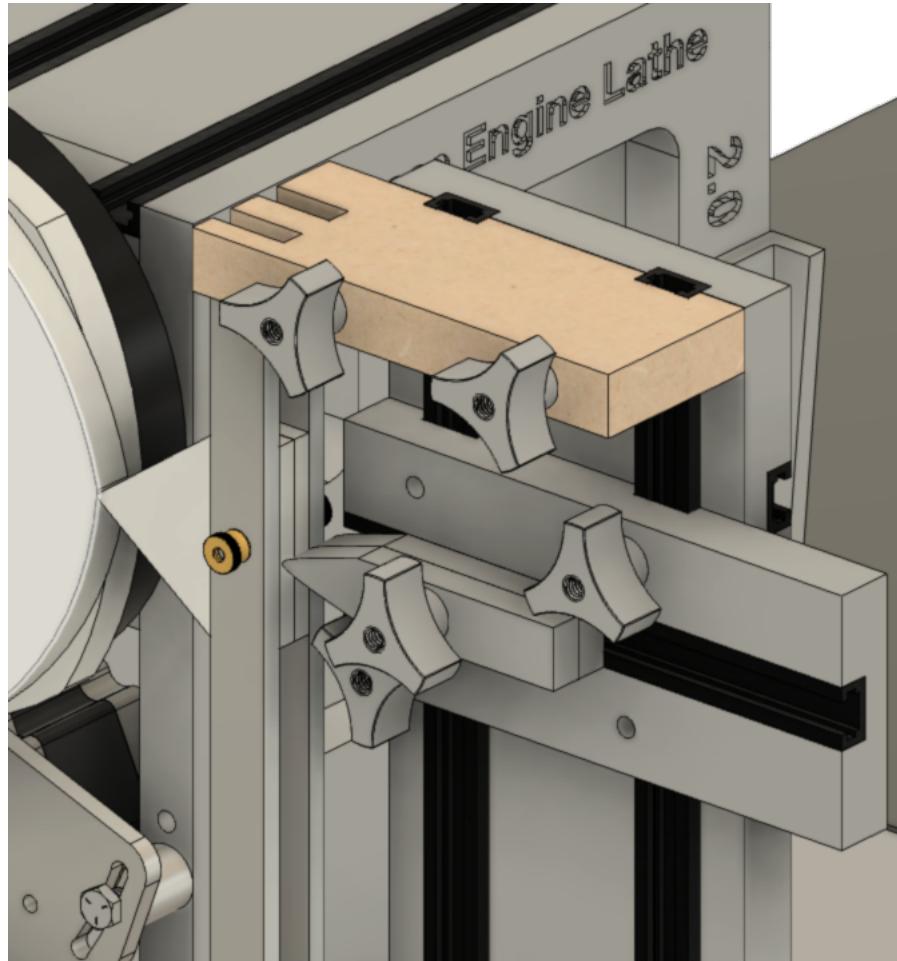
### Using the AA

1. Attach a rubber to each Vertical bar using an #8-32 bolt (#110) and a knurled nut (#111).
2. Attach the Horizontal bar to the MDF Spacer Block using two nuts and flat washers (#102 & #104). Ensure the vertical bars so that they are aligned with the front column (B3) on the MDF Rose Engine Lathe 2.0.
3. Add the MDF AA Alignment block (AA2) and hold it in place using two T-Track bolts (#108) and nuts (#109).



Looking from the top

## MDF Rose Engine Lathe 2.0 Jigs, Fixtures, and Add-Ons



MDF Alignment Block (AA2) installed at the top of the front B3 column.

- If reducing amplification, install it at the top of B3.
- If increasing amplification, install it below the RS1 rubber support, but as high as possible so as not to interfere with the AA rubbers.

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Amplitude Adjuster Components for Rubber Cartridge

The AA rubber cartridge replaces these pieces:

- RS1
- Rubbers held on RS1
- AA2

There are these advantages to this approach:

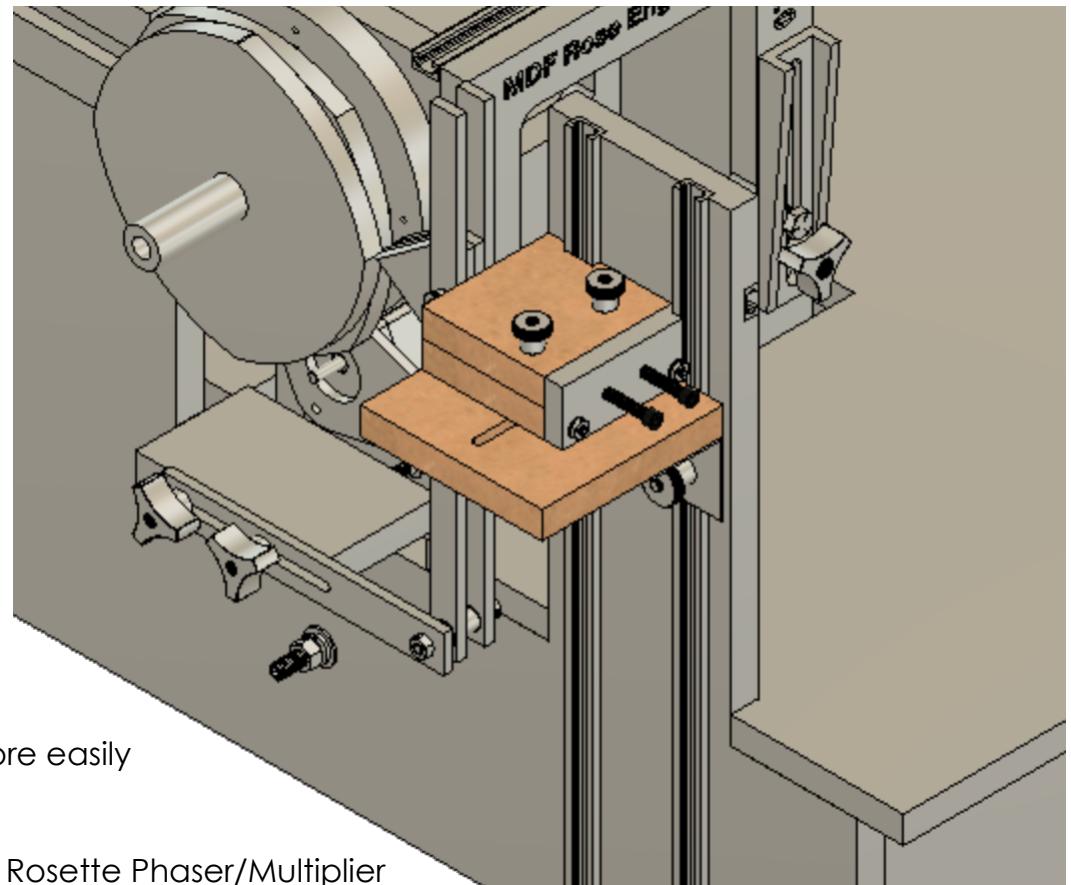
1. The alignment of the AA rubbers can be adjusted left or right to ensure the vertical arms (AA4) stay perfectly aligned with the rosettes. This is particularly useful when considering pumping as the rosettes will be moved away from the headstock.

Spacers may be needed on the MDF Spacer Block (AA1) to position the Horizontal Bar (AA3) properly.

2. The engagement of the rubbers can be more easily refined using a screw.

Do note though that this was designed to use the Rosette Phaser/Multiplier at the same time. Thusly, the rosettes are moved away from the headstock by  $>\frac{3}{4}$ ".

The two assemblies for this are the cartridge, and the shelf. Both are outlined below.



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### **Bill of Materials**

Parts required for building this are below.

The  $\frac{3}{4}$ " MDF and the  $\frac{1}{2}$ " aluminum plate are not included in this list.

Item #	Item	Qty	Source	Source Part Number	Comments
<b>Shelf Parts</b>					
101	Aluminum L-bar, 2" x 2", $\frac{1}{8}$ " to $\frac{1}{4}$ " thick	1			
102	#8 Particle Board Screws, $\frac{3}{4}$ " long	4	McMaster-Carr	91555A104	Used to attach the MDF part of the shelf to the Aluminum bracket.
103	T-Track Bolts	2	McMaster-Carr	1850A22	Used to hold the aluminum bar onto the T-Tracks
104	Knurled Grip Knob $\frac{1}{4}$ "-20 1" diameter knob	2	McMaster-Carr	6121K311	1" head on these knobs makes for easier adjusting of the vertical height of the shelf.
105	Carriage Bolt, $\frac{1}{4}$ "-20 $2\frac{3}{4}$ " long	2	McMaster-Carr	93548A553	Used to attach the cartridge to the shelf.
106	Knurled Grip Knob $\frac{1}{4}$ "-20 $\frac{3}{4}$ " diameter knob	2	McMaster-Carr	6121K211	The $\frac{3}{4}$ " head on these knobs makes for easier access. The 1" knobs (#104) could be used if desired.
<b>Cartridge Parts</b>					
201	Bearing	2	McMaster-Carr	5972K501	Trade number 608-ZZ or 608-2Z. These are also commonly available as roller skate bearings.
202	Washer, 8mm	2	McMaster-Carr	98687A112	
203	Socket Head Screw, Ultra low profile head M8-1.25, 16mm length	2	McMaster-Carr	90358A025	The head on these is only 2.7mm thick. This is needed to allow for the Roller Holders to align properly.

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

Item #	Item	Qty	Source	Source Part Number	Comments
204	Socket head screw 1/4"-20, 4" long	2	McMaster-Carr	90044A131	
205	#10-24 Threaded Rod 5" long	2	McMaster-Carr	91565A847	The full length is not needed, and it will have to be trimmed off.
206	#10 Washer	4	McMaster-Carr	92141A011	
207	#10-24 Nut	4	McMaster-Carr	90480A011	

Also recommended is

Item #	Item	Qty	Source	Source Part Number	Comments
901	3/16" Hex Wrench T-handle	1	McMaster-Carr	5374A16 or 5374A56	The T-handle type Allen wrench makes this easy to adjust the engagement of the AA for the selected rosette.

# MDF Rose Engine Lathe 2.0

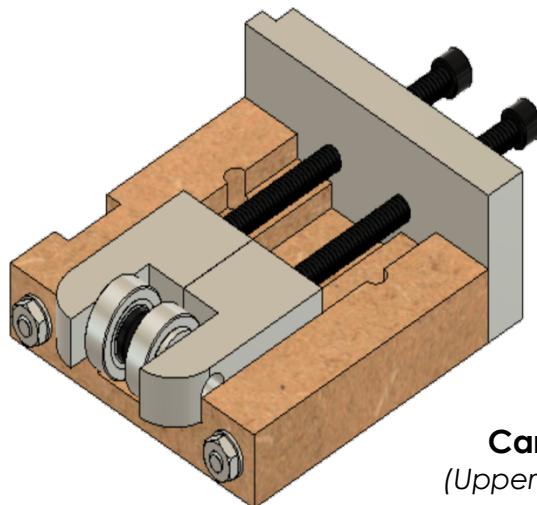
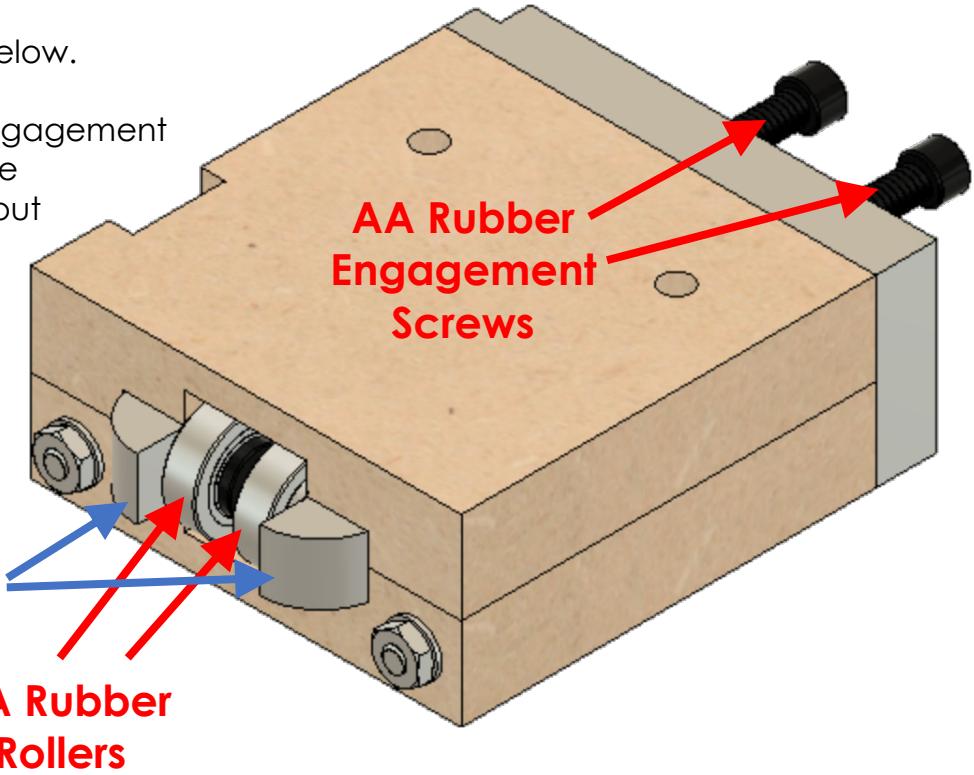
## Jigs, Fixtures, and Add-Ons

### Cartridge

The assembled cartridge is shown to the right and below.

The engagement of each AA arm is set using the engagement screws. When either of the screws is screwed into the aluminum block, the corresponding roller is pushed out of the cartridge, engaging the AA arm more for this rosette.

The “wings” beside the rollers are used to ensure the AA’s vertical lever arms (AA3) stay properly aligned with the rosette. These replace the need for using the AA2 piece.



**Cartridge Assembly**  
(Upper MDF Guide removed)

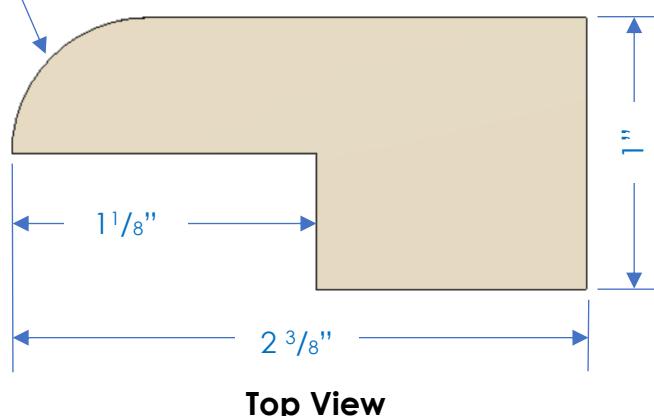
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

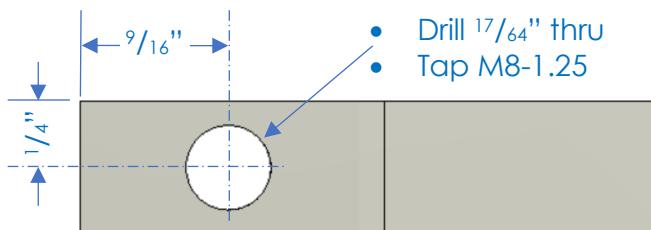
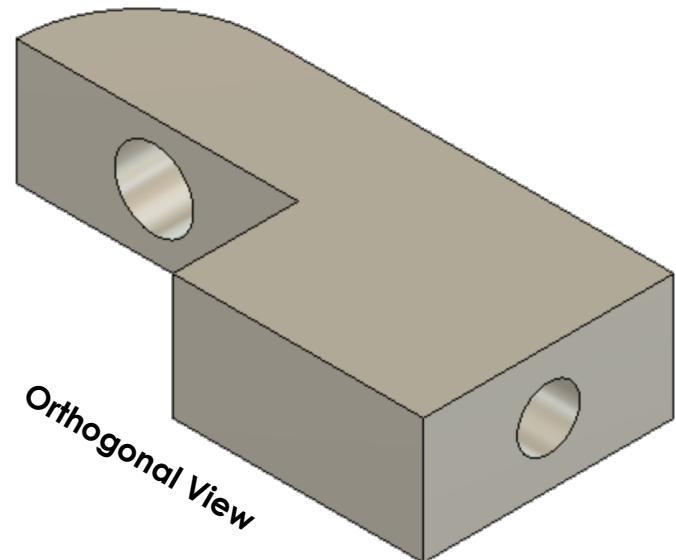
### Roller Holders (2)

These are made from  $\frac{1}{2}$ " thick Aluminum plate. Two are needed.

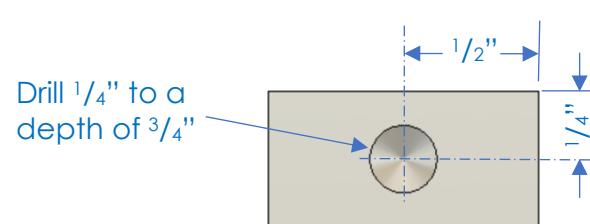
Radius is not critical;  
shape as desired.



**Top View**



**Side View**



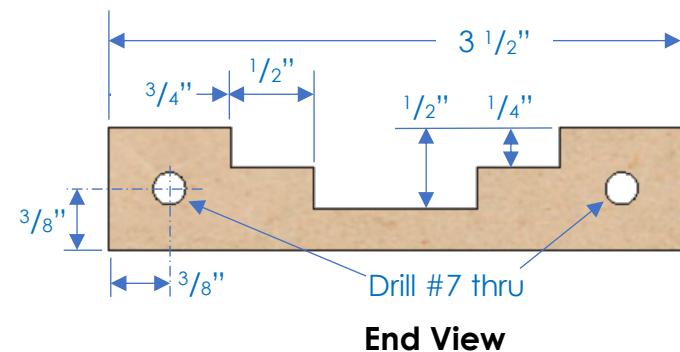
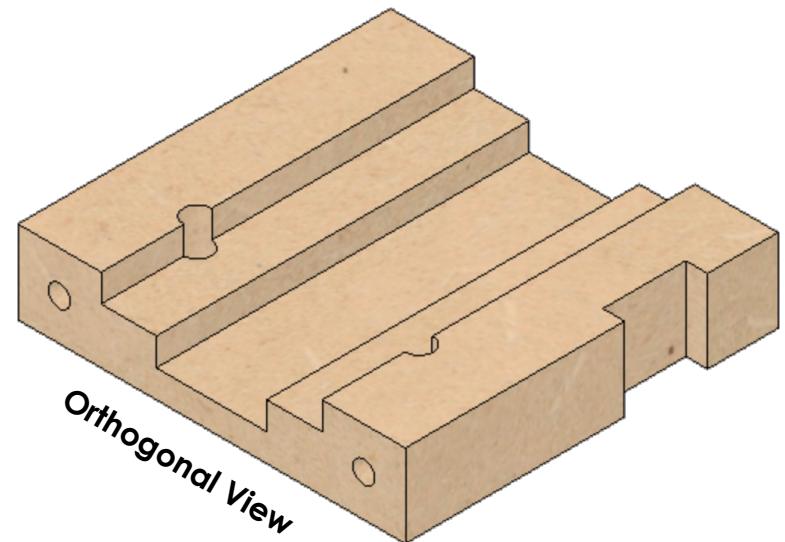
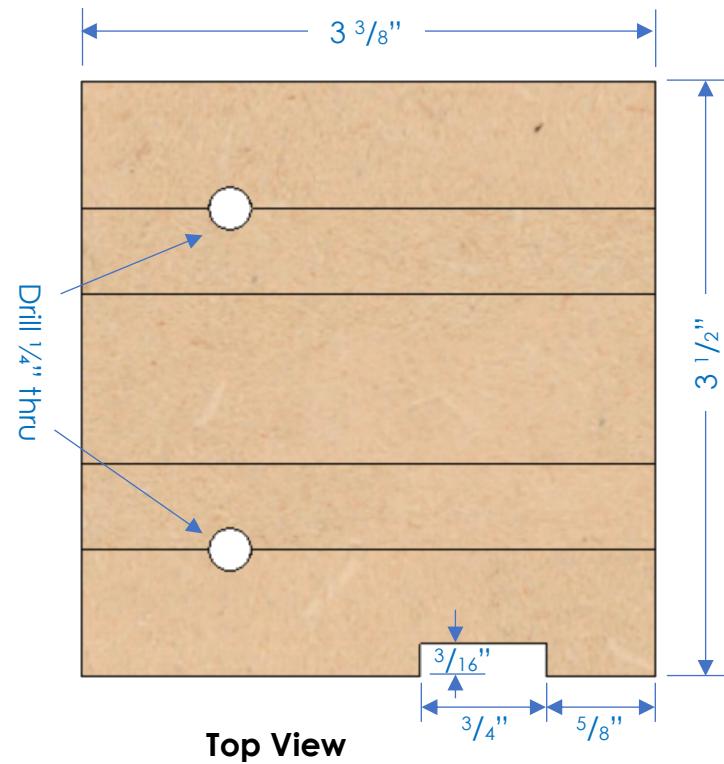
**End View**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### MDF Guide (Lower)

This is made from  $\frac{3}{4}$ " thick MDF. One is needed.

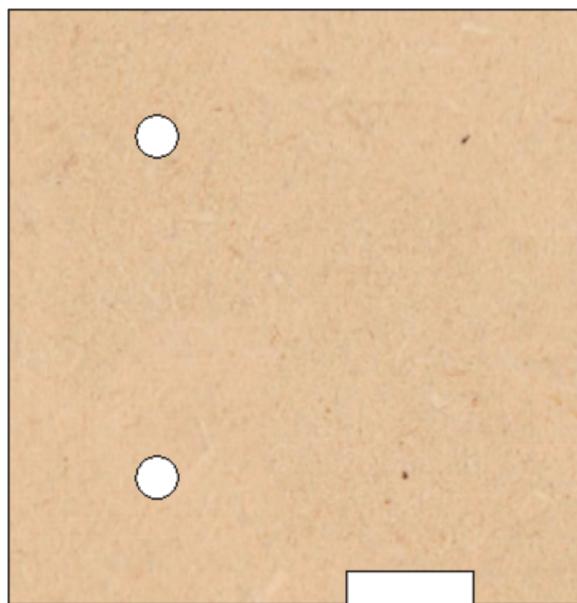


## MDF Rose Engine Lathe 2.0 Jigs, Fixtures, and Add-Ons

### MDF Guide (Upper)

This is made from  $\frac{3}{4}$ " thick MDF. One is needed.

The upper guide is the exact mirror of the lower guide, with one exception. The #7 drilled hole is not present in the upper guide.



Top View



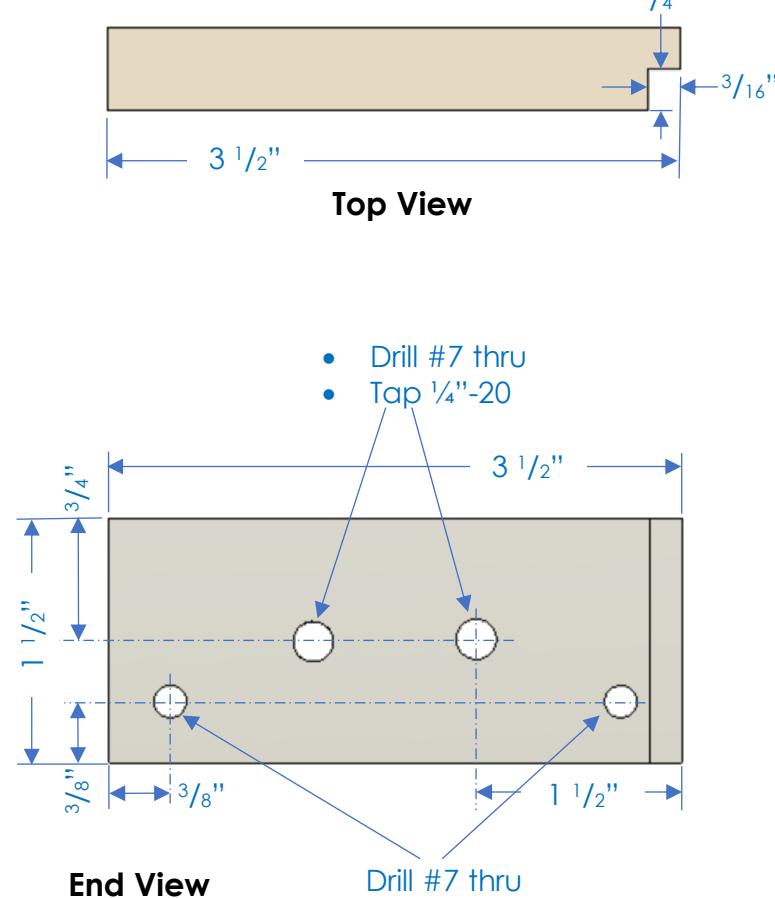
End View

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Screw Base

This is made from  $\frac{1}{2}$ " thick Aluminum plate. One is needed.

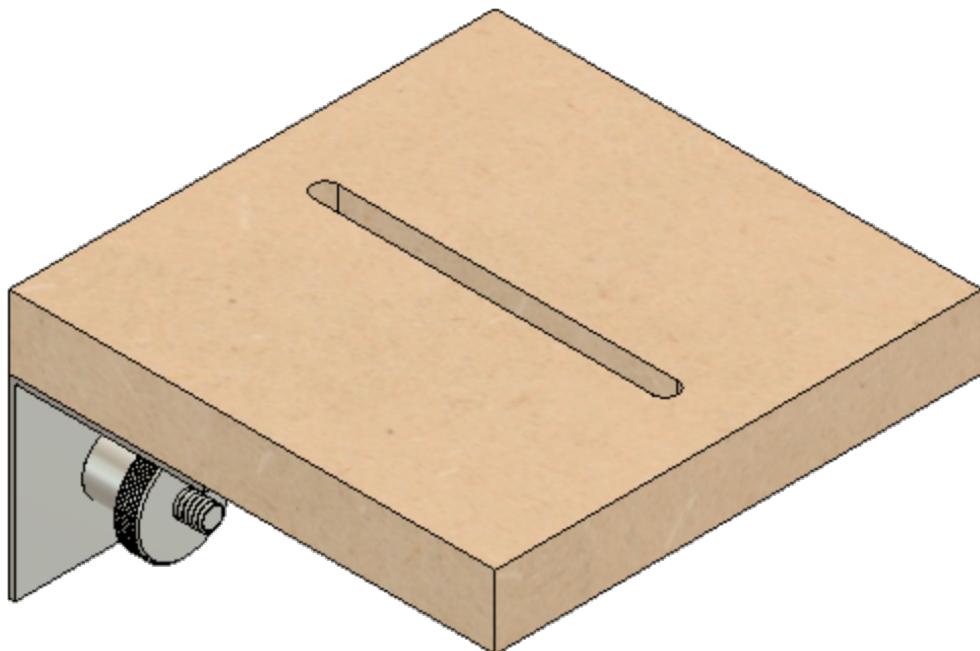


## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Shelf

The shelf allows for setting the vertical alignment of the amplitude adjuster (i.e., the amount of amplitude adjustment).



The MDF piece is affixed to the aluminum bracket using #8 particle board screws.

Two T-Track screws and nuts are used to hold the shelf in place on the vertical T-Tracks.

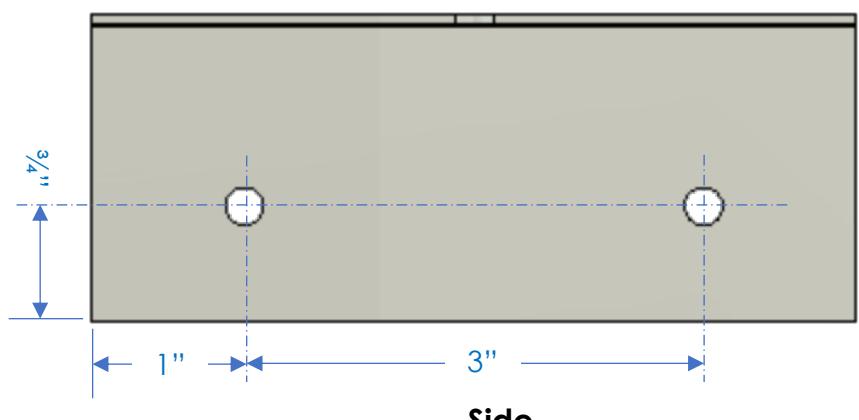
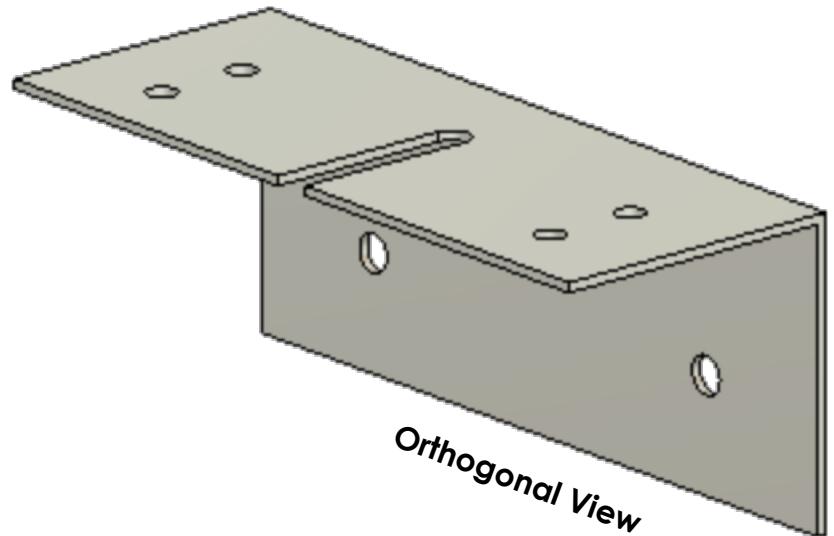
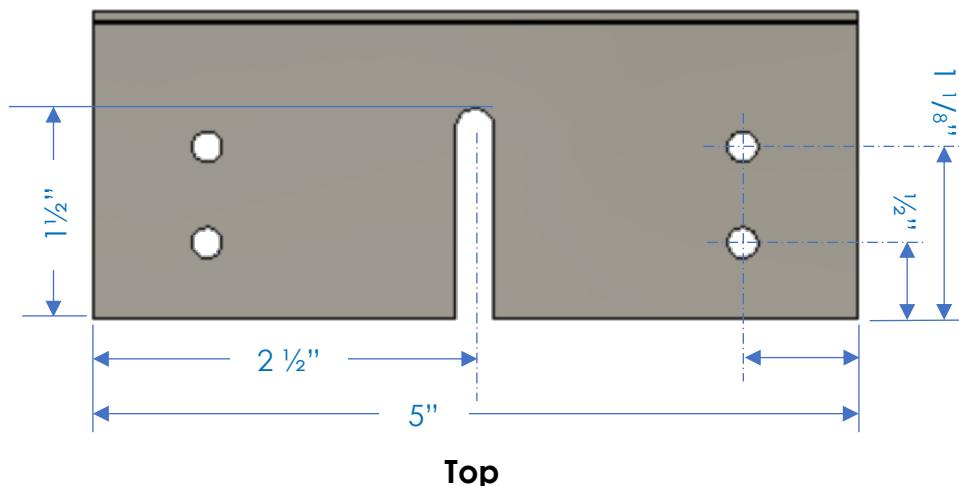
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Shelf Bracket

This is made from an aluminum bracket which has both sides at least 2" wide. The dimensions below are based on the sides being 2". If they are greater, adjust the dimensions accordingly.

The aluminum needs to be at least  $\frac{1}{8}$ " thick.

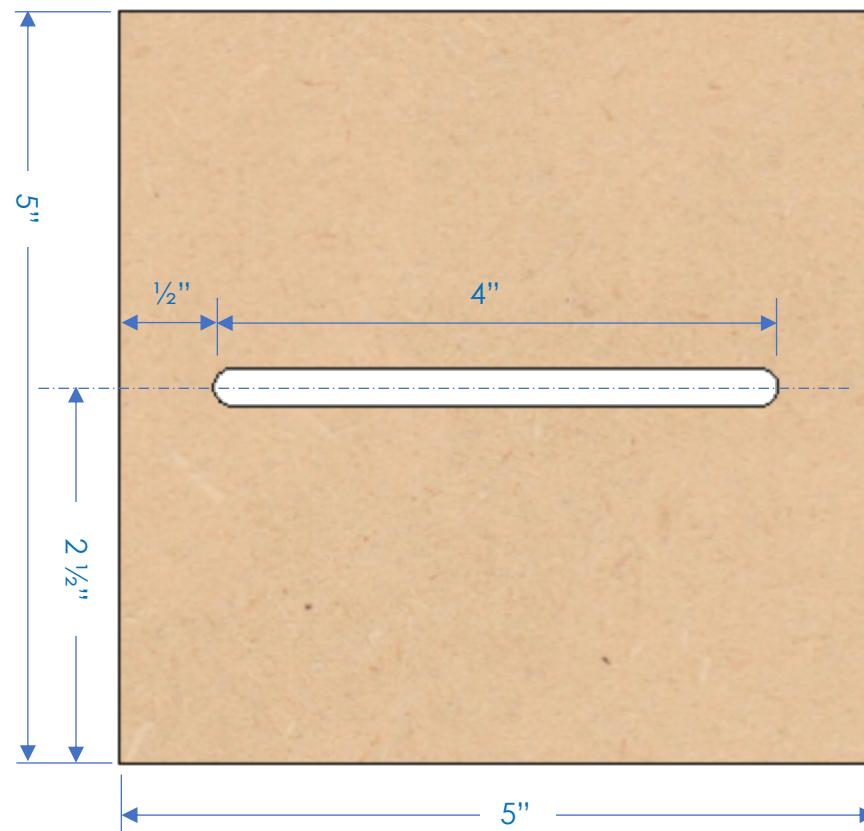


## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Shelf MDF

This is made from  $\frac{3}{4}$ " thick MDF. One is needed.

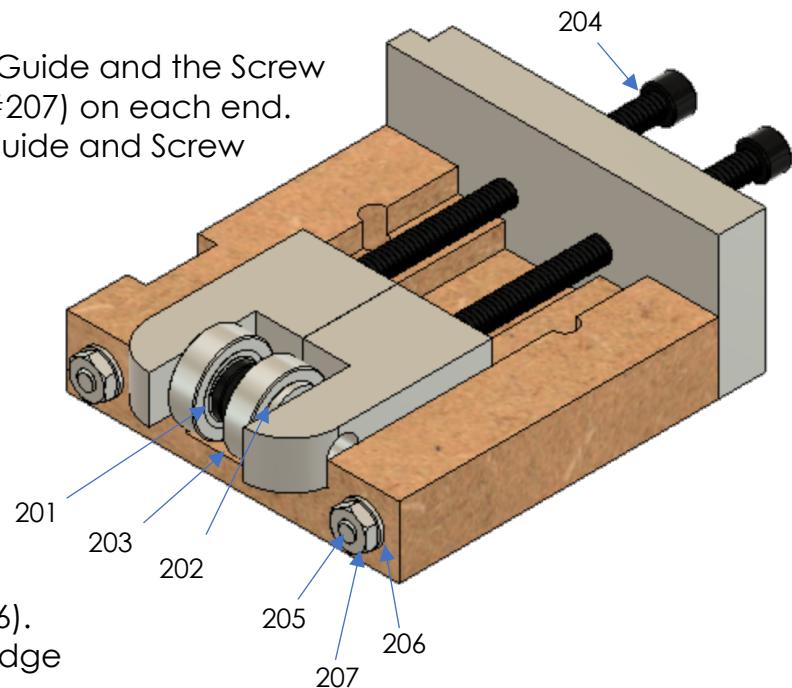


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Assembly

1. Attach the Shelf MDF to the Shelf Bracket using four #8 particle board screws (#102).
2. Attach the Shelf to the MDF Rose Engine 2.0's vertical T-Tracks (on the B3 piece). This replaces the RS1 piece. The shelf is held in place using the T-Track bolts (#103) and grip knobs (#104).
3. Attach the AA rubber bearing (#201) to the Roller Holder using an M8-1.25 screw (#203) and a washer (#202). The washer goes between the bearing and the holder.
4. Insert one of the all-thread rods (#205) into the Lower MDF Guide and the Screw Base. It is affixed in place using a washer (#206) and nut (#207) on each end.
5. Repeat the prior step for the other side of the Lower MDF Guide and Screw Base.
6. Insert two socket head screws (#204) into the Screw Base. Screw them in at least halfway.
7. Add an assembled Roller Holder assembly (from step 3, above) to the end of each of the socket head screws. The assembly thus far should look as shown to the right.
8. Add the Upper MDF Guide.
9. Insert a carriage bolt (#105) up thru the slot in the Shelf, and thru one of the vertical holes on the cartridge assembly. Secure it down using one of the grip knobs (#106).
10. Repeat the prior step for the other vertical hole in the cartridge assembly.



**Cartridge Assembly**  
(Upper MDF Guide removed)

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

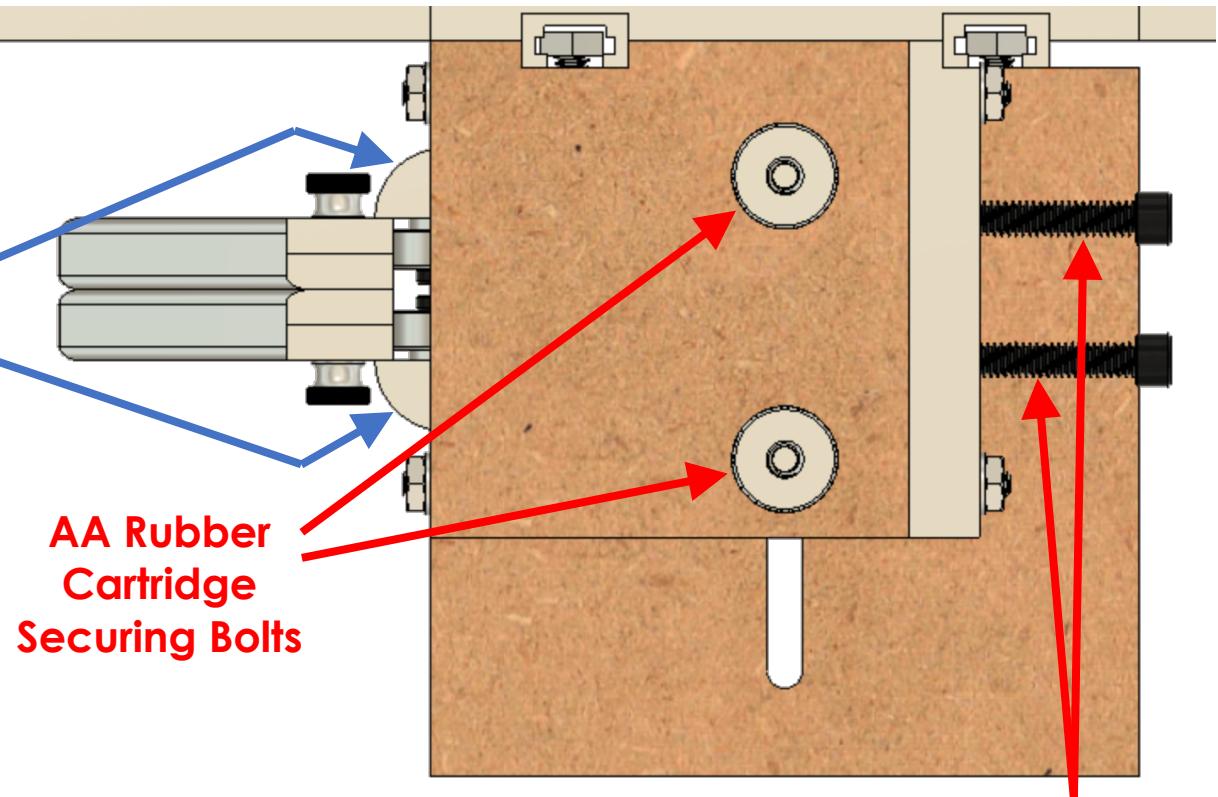
### Alignment & Usage of the Rubber Cartridge

**Step 1:** Ensure the shelf is set at the right height for the desired amplitude adjustment.

**Step 2:** Move the Rubber Cartridge left or right on the shelf so that the wings on the Rubber Roller Holders are on either side of the vertical arms (AA3).

**AA Vertical Arm Alignment Wings**

Once set, tighten the AA Rubber Cartridge Securing Bolts.



**Step 3:** Use the AA Rubber Engagement Screws to set the projection of the AA Cartridges.

Viewed from the Top

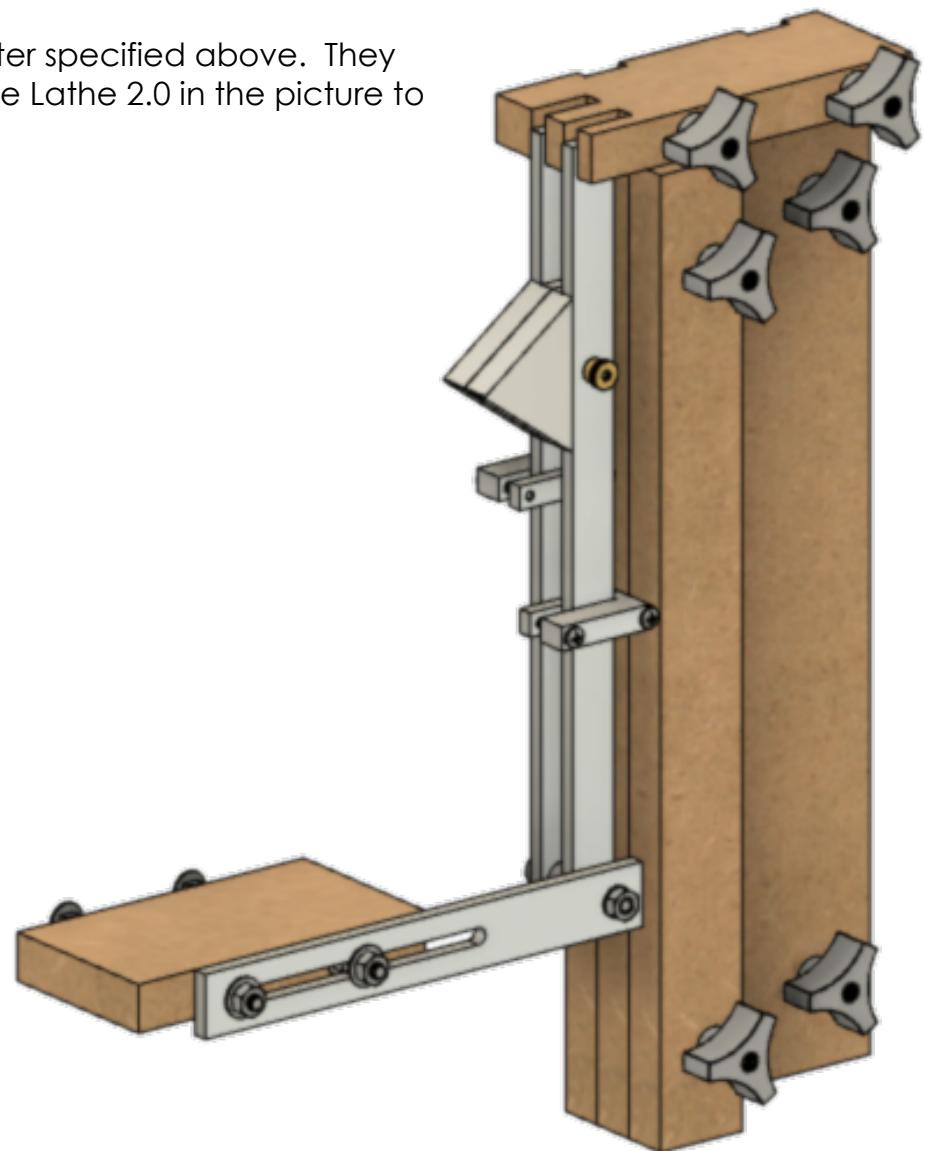
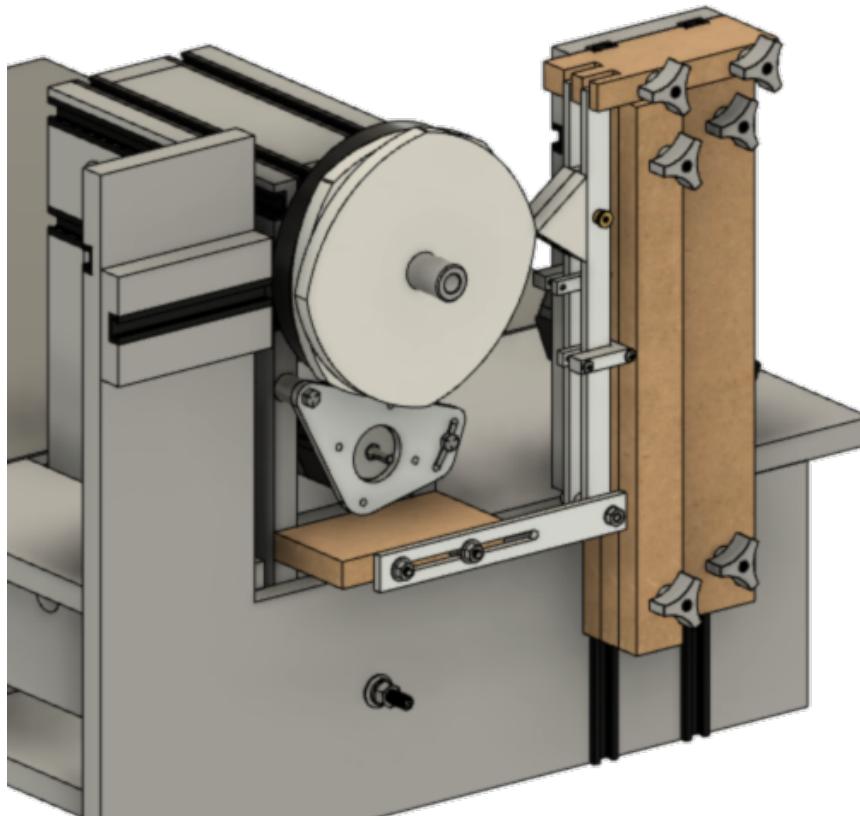
**AA Rubber Engagement Screws**

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Amplitude Adjuster Components for Independent Amplitude Adjustment

These components can be used with the amplitude adjuster specified above. They are shown below and are installed on the MDF Rose Engine Lathe 2.0 in the picture to the left.

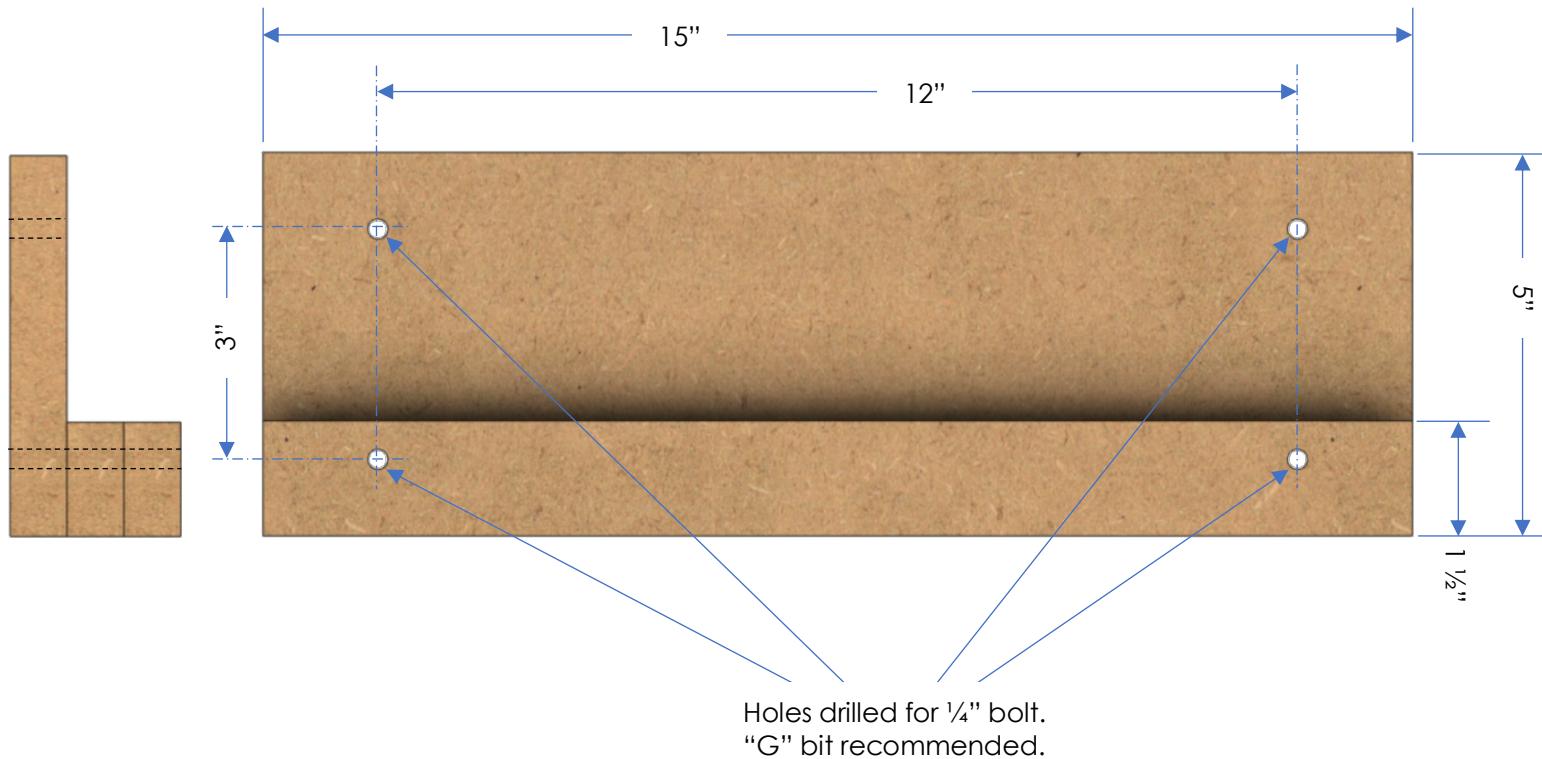


## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Backstop

This is made from 3 pieces of  $\frac{3}{4}$ " MDF.

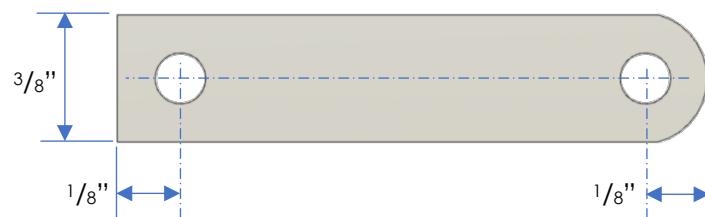
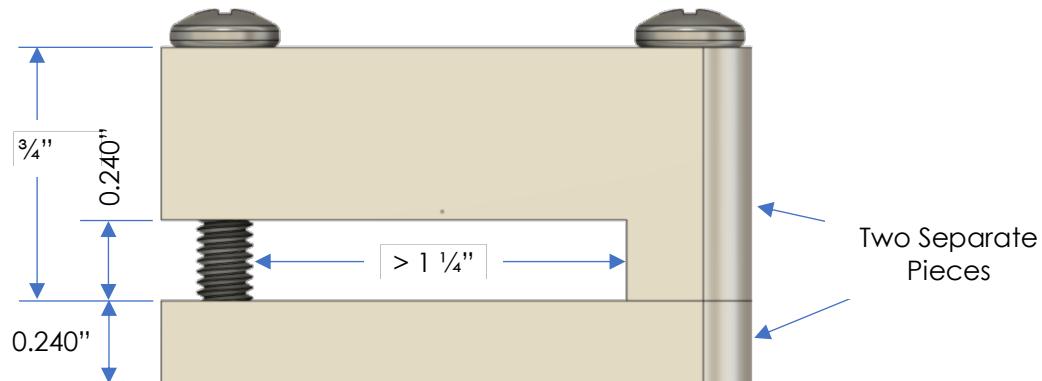


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Clamp

The clamp consists of two pieces of aluminum and two screws. Two clamps are needed.



screw.



The two screws are #8-32.

The thru holes on the L-shaped piece (the top one in the picture at the top right) are drilled #16 (0.177"). The screws simply feed thru these.

The thru holes on the flat piece (the bottom one in the picture at the top right) are drilled #28 or #29. These are tapped for a #8-32

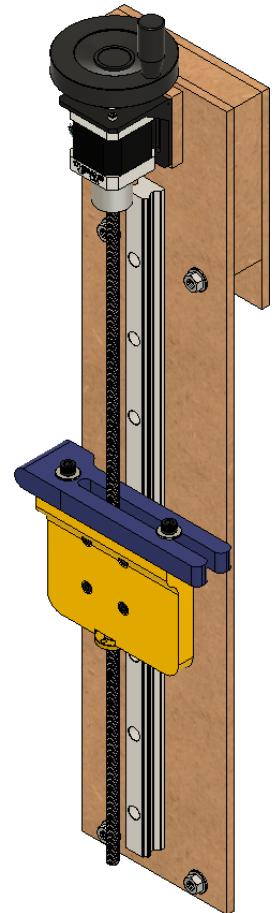
## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Dynamic Amplitude Adjuster

This device is used to replace AA2 in the Amplitude Adjuster which is outlined starting on page 5.

It requires the ability to drive a stepper motor for its operation, so a system like ELFOS is required. When I use it with ELFOS, I drive it using the M4 axis.



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Bill of Materials

Parts required for building this are below.

The MDF and steel are not included in this list.

Item #	Item	Qty	Source	Source Part Number	Comments
101	Black Plastic Machinable-Hub Solid Hand Wheel with Revolving Handle, 3-5/32" Diameter x 1-7/32" Projection Wheel	1	McMaster-Carr	61405K71	There are alternatives available at Amazon. The key is that it must fit a 5mm shaft.
102	Dual Shaft Nema 17 Bipolar Stepper Motor	1	StepperOnline	17HS16-2004D	
103	NEMA 17 Stepper Motor Alloy Steel Mounting Bracket	1	StepperOnline	ST-M1	
104	500mm 8mm Diameter 8mm Pitch Trapezoidal Lead Screw   POM Screw Nut for Tr8x8 Threaded Rod (SN-S-MB) is ordered separately from Stepper Online	1	Stepper Online  • Leadscrew • Nut	LS-MB-500 SN-S-MB	May be available at Amazon: Look for a 500mm Tr8X8 Lead Screw with T8 Brass Nut for 3D Printer (Acme Thread, 2mm Pitch, 4 Start, 8mm Lead)

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

Item #	Item	Qty	Source	Source Part Number	Comments
105	Linear Guide Rail Kit <ul style="list-style-type: none"> <li>• HGR20-500mm Linear Slide Rails</li> <li>• HGH20CA Carriage Bearing Block</li> </ul>	1	Amazon		The one I ordered came as a set of 2. Listed as Linear Guide Rail kit 2Pcs HGR20-500mm Linear Slide Rails with HGH20CA Carriage Bearing Block Linear Guideway Rail High Precision Low Noise CNC Parts for Machine and DIY Craft
106	Socket Head Screw, Black-Oxide, M5 x 0.8 mm Thread, 16 mm Long	4	McMaster-Carr *	91290A232	* These may be supplied with the linear slide. If not, the information is supplied here.
107	Hex Head Screw, 1/4"-20 Thread Size, 1/2" Long	4	McMaster-Carr	91268A410	Used to attach the backplane board to the T-tracks.
108	Hex Nut Grade 5, 1/4"-20 Thread Size	4	McMaster-Carr	95505A601	Used to attach the backplane board to the T-tracks.
109	Washer for 1/4" Screw Size	6	McMaster-Carr	92141A029	(4) Used to attach the backplane board to the T-tracks. (2) Used to attach the AA Lever Arm Rubber to the Rubber Carrier
110	Socket Head Screw, 1/4"-20 Thread Size, 1" Long	2	McMaster-Carr	91251A542	Used to attach the AA Lever Arm Rubber to the Rubber Carrier
111	Socket Head Screw, Black-Oxide, M3 x 0.5 mm Thread, 10 mm Long	6	McMaster-Carr	91290A115	(2) Used to attach the T8 brass nut to the Rubber Carrier. (4) Used to attach the stepper motor to the bracket.
112	Pan Head Screws, M5 x 0.8 mm Thread, 20 mm Long	4	McMaster-Carr	94387A332	Used to attach the linear slide to the backplane board

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

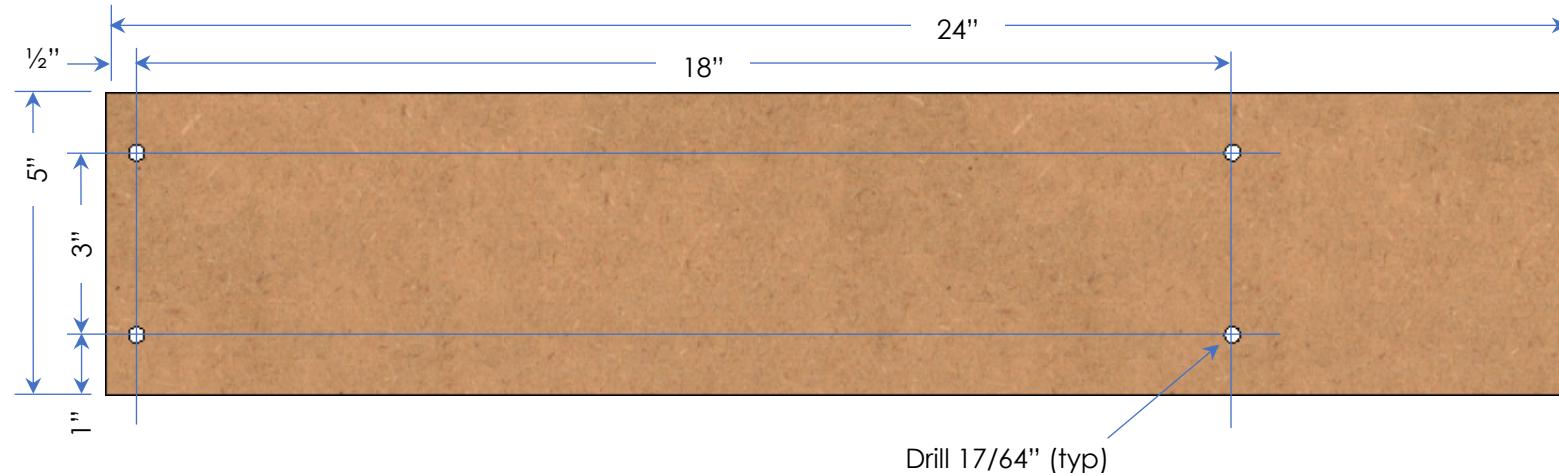
Item #	Item	Qty	Source	Source Part Number	Comments
113	Hex Nut Medium-Strength, Class 8, M5 x 0.8 mm Thread	4	McMaster-Carr	90593A004	Used to attach the linear slide to the backplane board
114	Screws for Particleboard and Fiberboard, Rounded Head, Black-Oxide Steel, Number 8 Size, 3/4" Long	4	McMaster-Carr	91555A104	Used to attach the Stepper Motor bracket to the backplane.

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

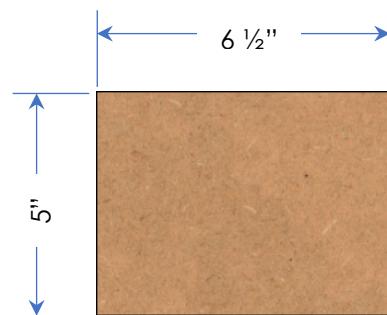
### MDF Backplane

This is made from  $\frac{1}{4}$ " MDF.



### MDF Alignment Block

This is made from  $\frac{1}{4}$ " MDF.



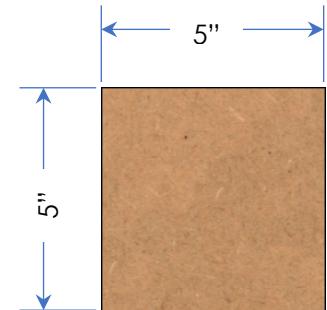
## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### MDF Spacer Block

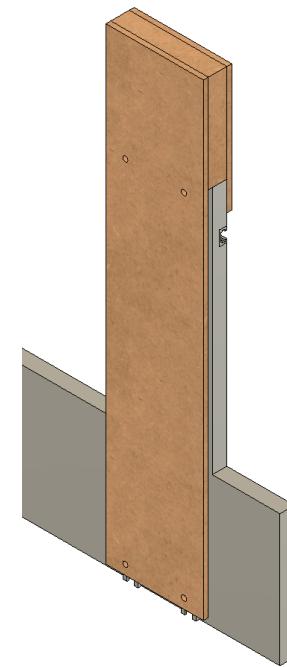
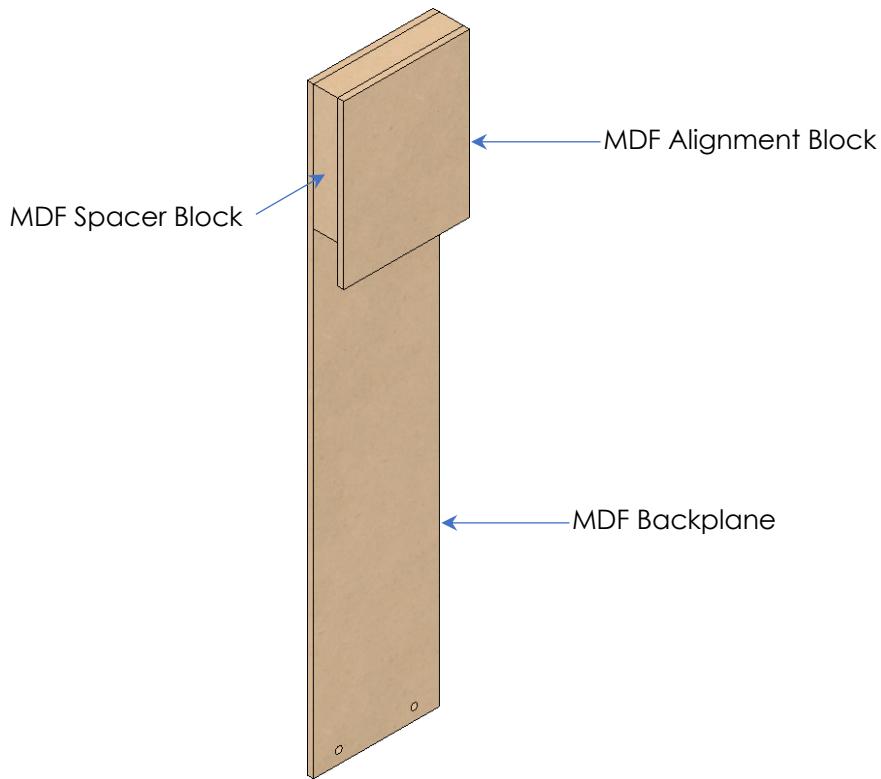
This is made from two pieces of MDF glued together:  $\frac{1}{4}$ " &  $\frac{3}{4}$ ". The completed piece will need to be sanded to be around 0.95" thick. This is a spacer block between the MDF backplane and the MDF Alignment Block.

When this is glued between the MDF backplane and the MDF Alignment Block, it should fit snugly over the front rubber column and its T-Track on the base.



#### Wood Parts Assembled

Once assembled, the 3 blocks will form a piece as shown to the left.



As installed on the B3  
front rubber column

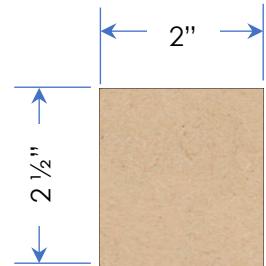
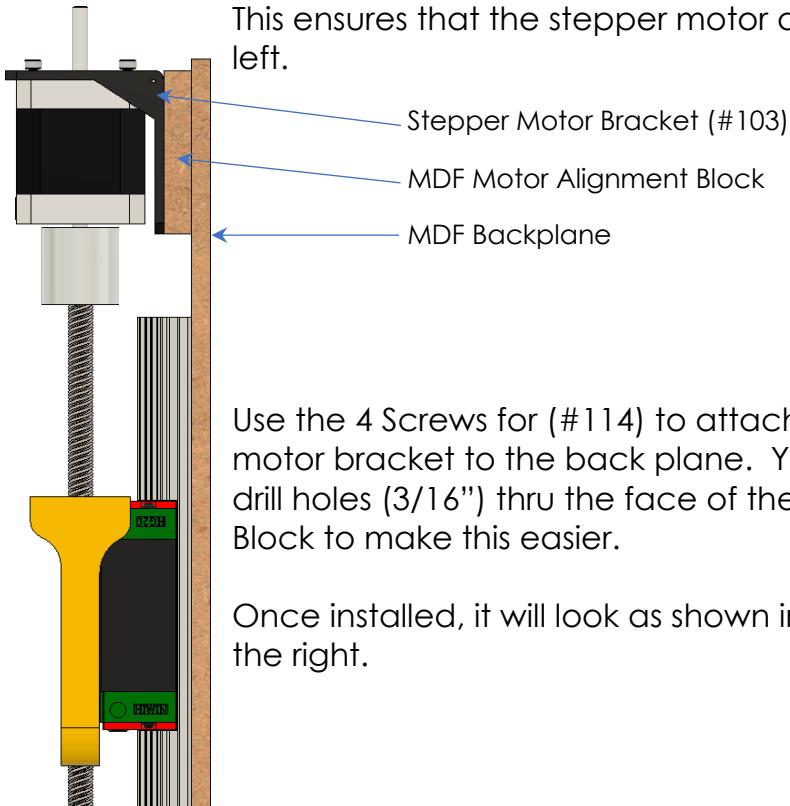
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### MDF Motor Alignment Block

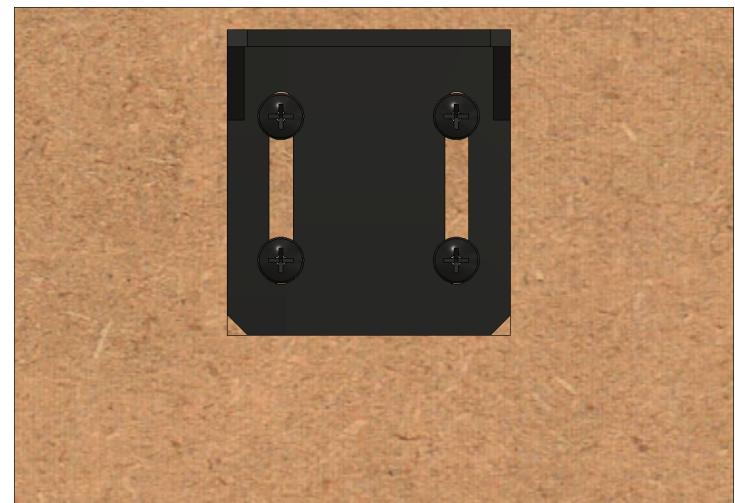
This is made from a piece of MDF. The sizes shown here are not terribly critical, however **the thickness must be 9mm**.

This ensures that the stepper motor aligns perfectly with the leadscrew as shown in the picture to the left.



Use the 4 Screws for (#114) to attach the stepper motor bracket to the back plane. You will need to drill holes (3/16") thru the face of the MDF Alignment Block to make this easier.

Once installed, it will look as shown in the picture to the right.



## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Coupler

There are couplers like the one shown to the right which are commercially available cheaply. I found that this type stretched out when moving the rubber up and the “slop” was not acceptable.

I made one from a piece of 1" diameter steel, but aluminum would work acceptably also.



It is 1" long. The piece is bored 5mm diameter for the entire length, and then 8mm diameter for  $\frac{1}{2}$ " deep. Then holes are drilled and tapped for set screws in a pattern shown on this piece.

This solid piece works much better.

#### Add a Cable to the Stepper Motor

As outlined in the ELFOS manual for electronics, attach a cable to the wires on the stepper motor (#102). The end will need a GX-16/4 plug as also outlined in that manual.

#### Attach the Stepper Motor to the Bracket

Using the M3-0.5 screws (#111), attach the stepper motor (#102) to the stepper motor bracket (#103).

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

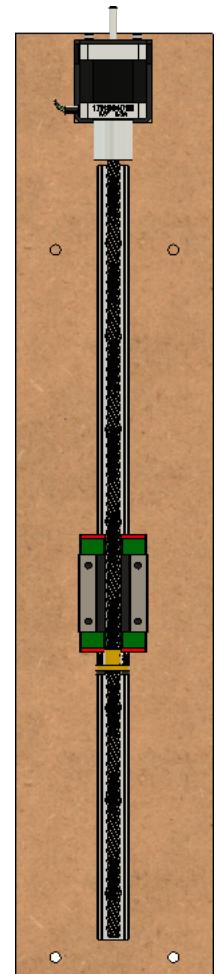
#### Attach the Linear Guide Rail

Attach the Linear Guide Rail (#105) to the MDF backplane using the M5 pan head screws and nuts (#112, 113). The rail should be centered on the MDF backplane, left to right, and positioned vertically so that it does not interfere with the stepper motor.

Key notes:

1. Vertical alignment is not critical.
2. **Horizontal alignment is very critical** as it must align with the stepper motor as shown in the picture to the right.
3. Be careful to not let the HGH20CA Carriage Bearing Block slip off the end of the rail. Ball bearings can be lost easily if that happens.

Drill holes (15/64" or 6mm) into the MDF backplane for the screws. The four screws hold the rail adequately. Space them about every other hole.



## MDF Rose Engine Lathe 2.0

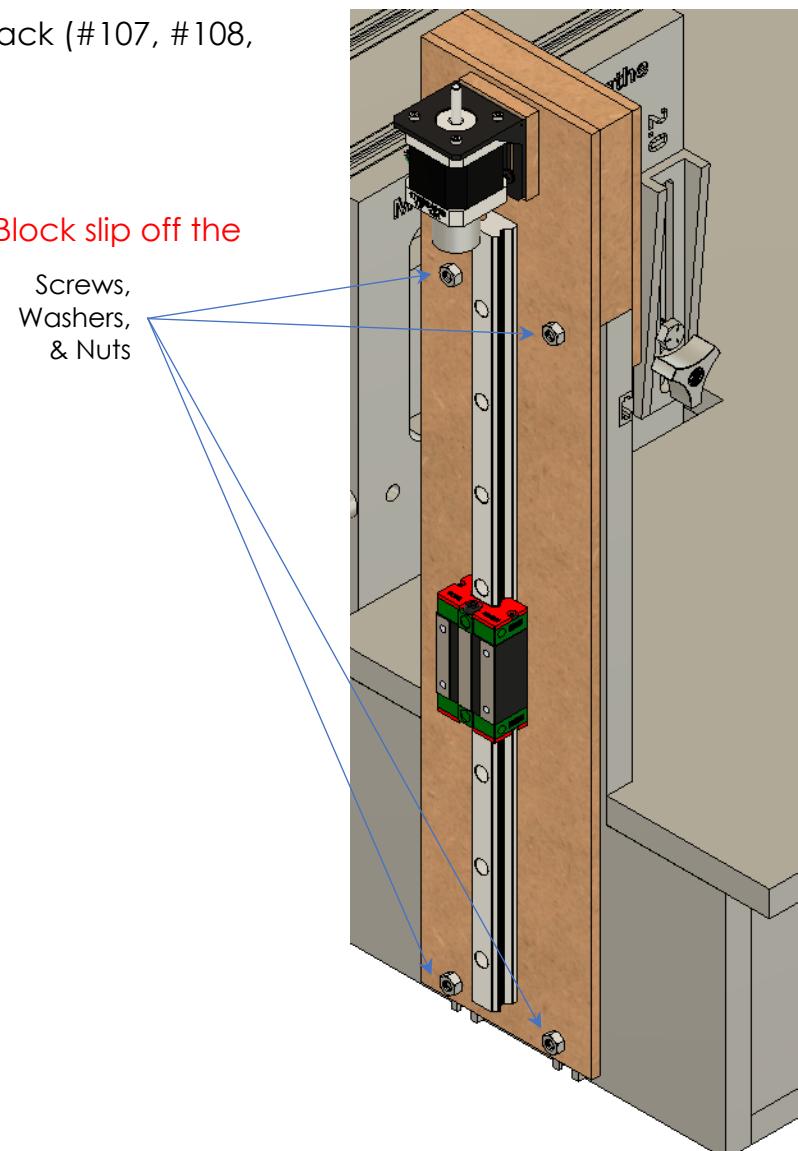
### Jigs, Fixtures, and Add-Ons

#### Attach Everything to the Base

Add the 4 screws, washers, & nuts needed to hold this to the T-track (#107, #108, #109) to the MDF backplane.

Install the parts onto the T-tracks as shown to the right.

As before, **be careful to not let the HGH20CA Carriage Bearing Block slip off the end of the rail.**



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

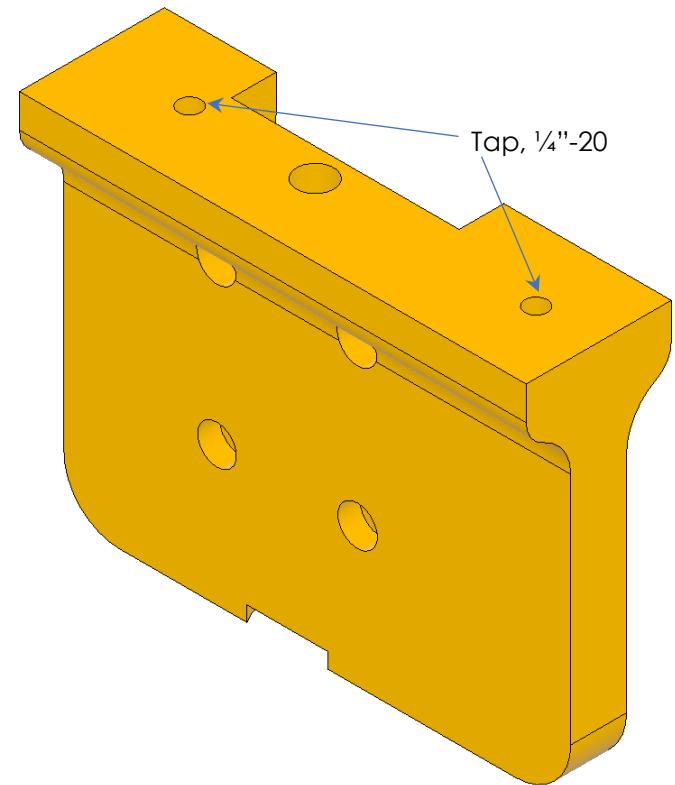
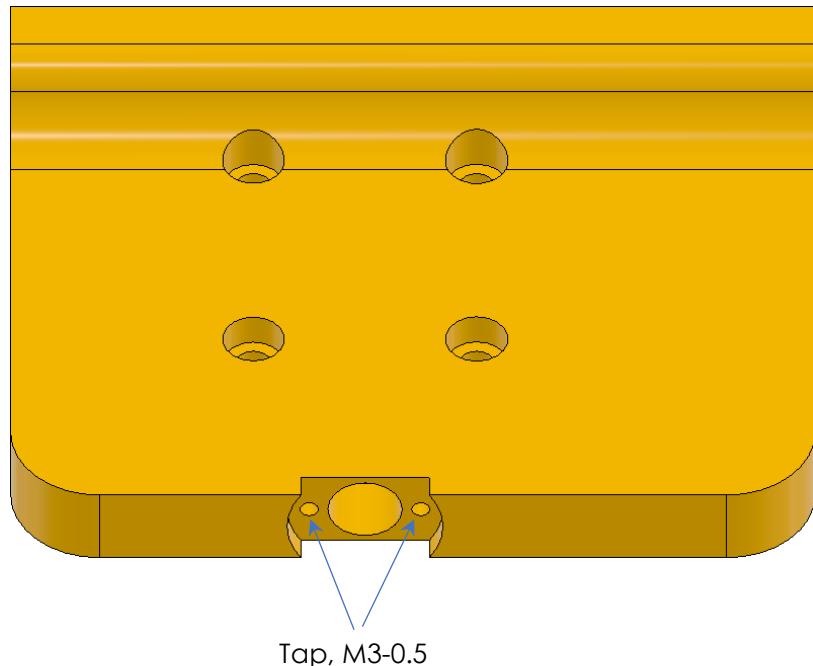
### Rubber Carrier

3D-print the rubber carrier. The design is available at the MDF Rose Engine 2.0 Library. Recommended settings for 3D printing are:

- 30% infill
- 3 layers for all outside surfaces

After printing, tap the two outside holes for  $\frac{1}{4}$ "-20. These are noted in the picture to the right.

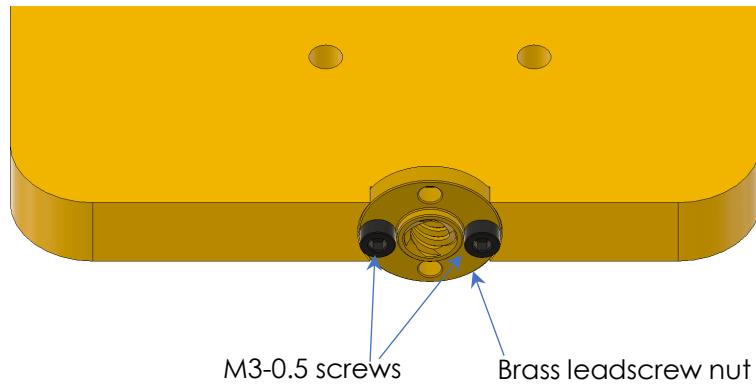
Tap the two small holes on the bottom M3-0.5. Take care when tapping these as it is easy to strip them out.



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

Attach the brass lead screw nut to the rubber carrier using the two M3-0.5 screws (#111).



### Insert the Leadscrew into the Rubber Carrier

Insert the leadscrew (#104) thru the center hole on the 3D printed part, inserting it into the brass leadscrew nut.

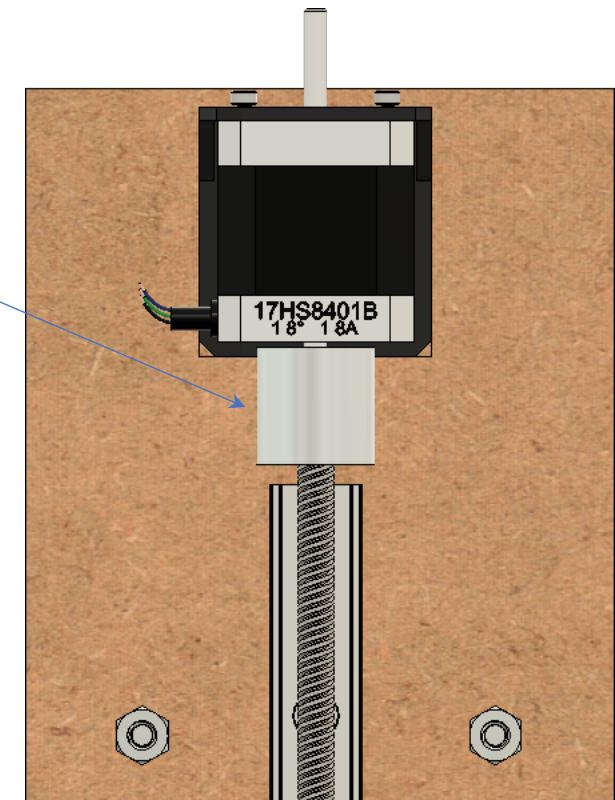
### Attach the Leadscrew to the Stepper Motor

Attach the leadscrew (#104) to the stepper motor using the coupler.

### Attach the Handwheel to the Stepper Motor

Drill the center of the handwheel (#101) with a 5mm bit. Drill and tap the side for two set screws. Attach it to the top shaft on the stepper motor.

Coupler



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

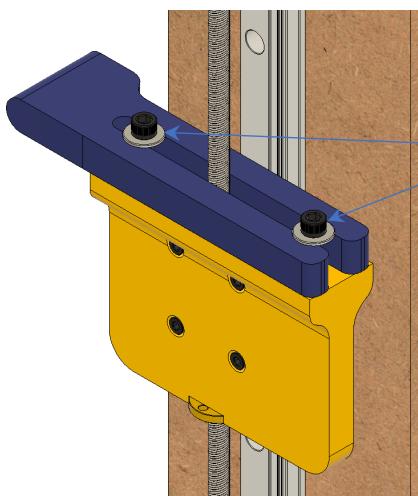
### Attach the Rubber Carrier to the HGH20CA Carriage Bearing Block

Attach the rubber carrier to the carriage bearing block using the 4 screws (#106).

### Attach the Rubber to the Rubber Carrier

3D-print the rubber. The design is available at the MDF Rose Engine 2.0 Library. Recommended settings for 3D printing are:

- 30% infill
- 3 layers for all outside surfaces

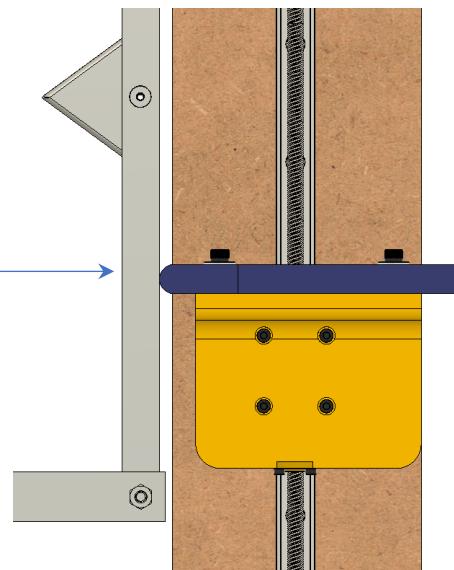


After printing, attach it to the rubber carrier using the 2 screws & washers (#109 & #110).

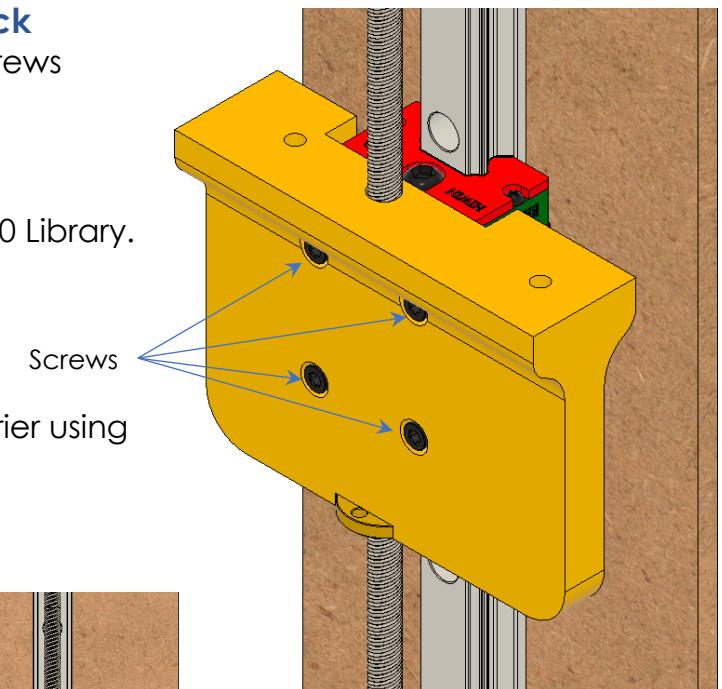
Screws & Washers

This will need to be moved in or out to align the lever arms vertically as shown to the right.

Lever Arms



The lever arm rubber can be repositioned to engage more or less as necessary for use.



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Rosette Phaser / Multiplier

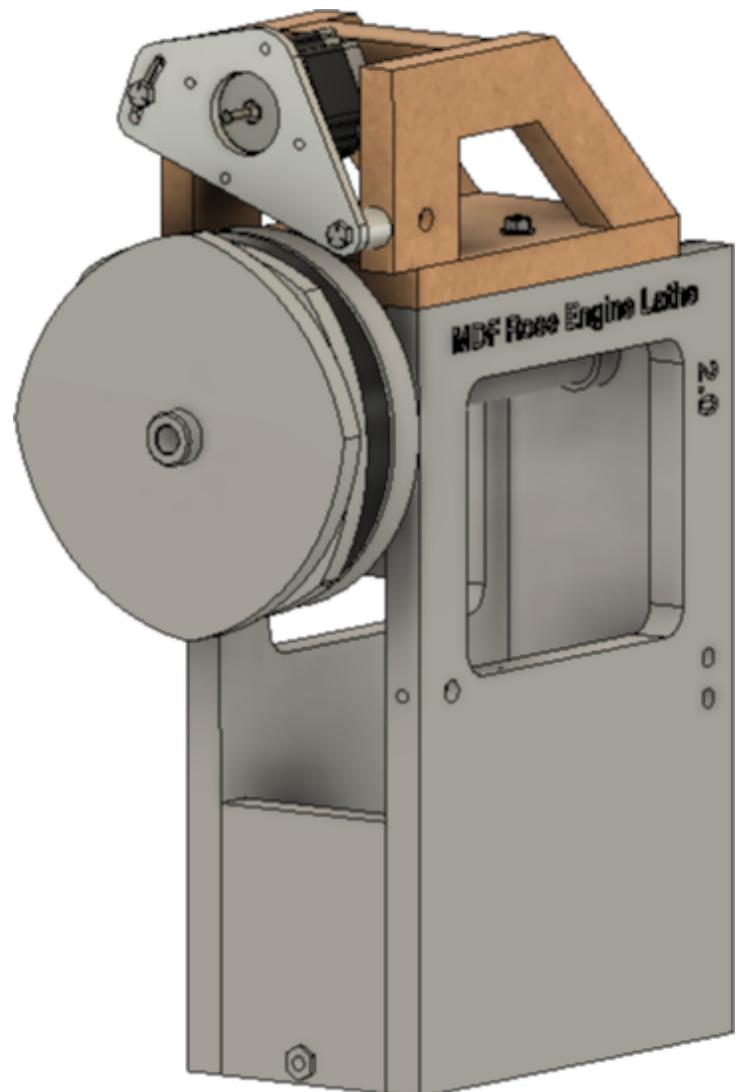
This device is used to allow a second stepper motor to drive the rosette, separately from the stepper motor driving the spindle.

It is facilitated by the Multiple Stepper Motor Control System, version 3.0. The upper stepper motor is driven as the M3 axis.

This device uses a second copy of the same components as the spindle stepper motor drive:

- Motor bracket
- Motor bracket pacers (2)
- Motor bracket screws, washers, and nuts (2 sets)
- Stepper Motor Drive gear
- Spindle Drive gear
- Drive belt

Also needed is a Needle Roller Bearing (McMaster-Carr p/n 5909K36) to separate the two drive gears.

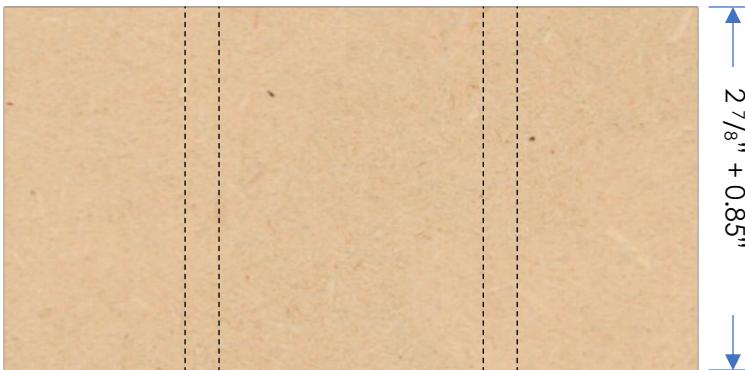


## MDF Rose Engine Lathe 2.0

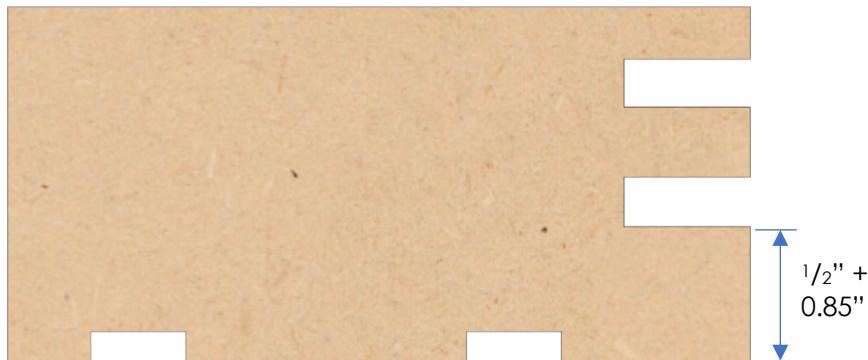
### Jigs, Fixtures, and Add-Ons

When using it with the **Amplitude Adjuster for Independent Amplitude Adjustment** outlined on 33, the arms will need to be spaced out an additional 0.85":

- MDF Spacer Block will need to be 0.85" wider, and



- MDF AA Alignment Block will need to be 0.85" further away from the vertical T-Tracks to which it attaches.



This is to accommodate the second drive gear, and the needle roller bearing, and aligning the rubbers with the new position for the rosettes.

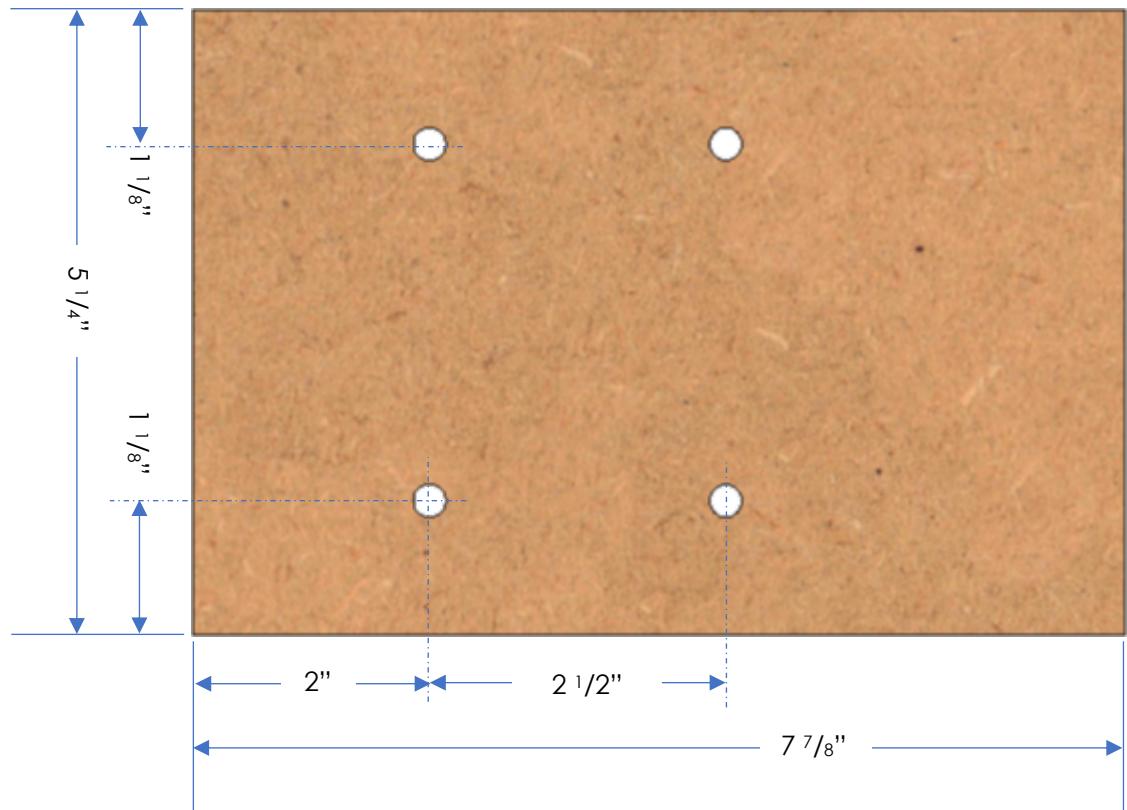
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Bottom Piece

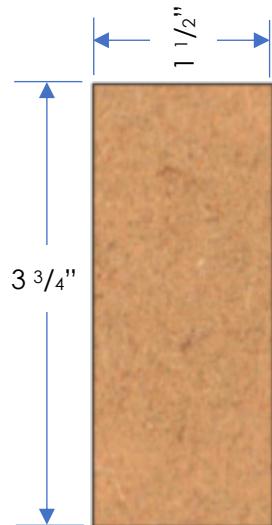
This is made from  $\frac{3}{4}$ " MDF. One is needed.

The 4 holes are  $\frac{1}{4}$ " in diameter. These accommodate the screws which hold this device to the top of the headstock (via the T-Tracks).



### Top Piece

This is made from  $\frac{3}{4}$ " MDF. One is needed.



# MDF Rose Engine Lathe 2.0

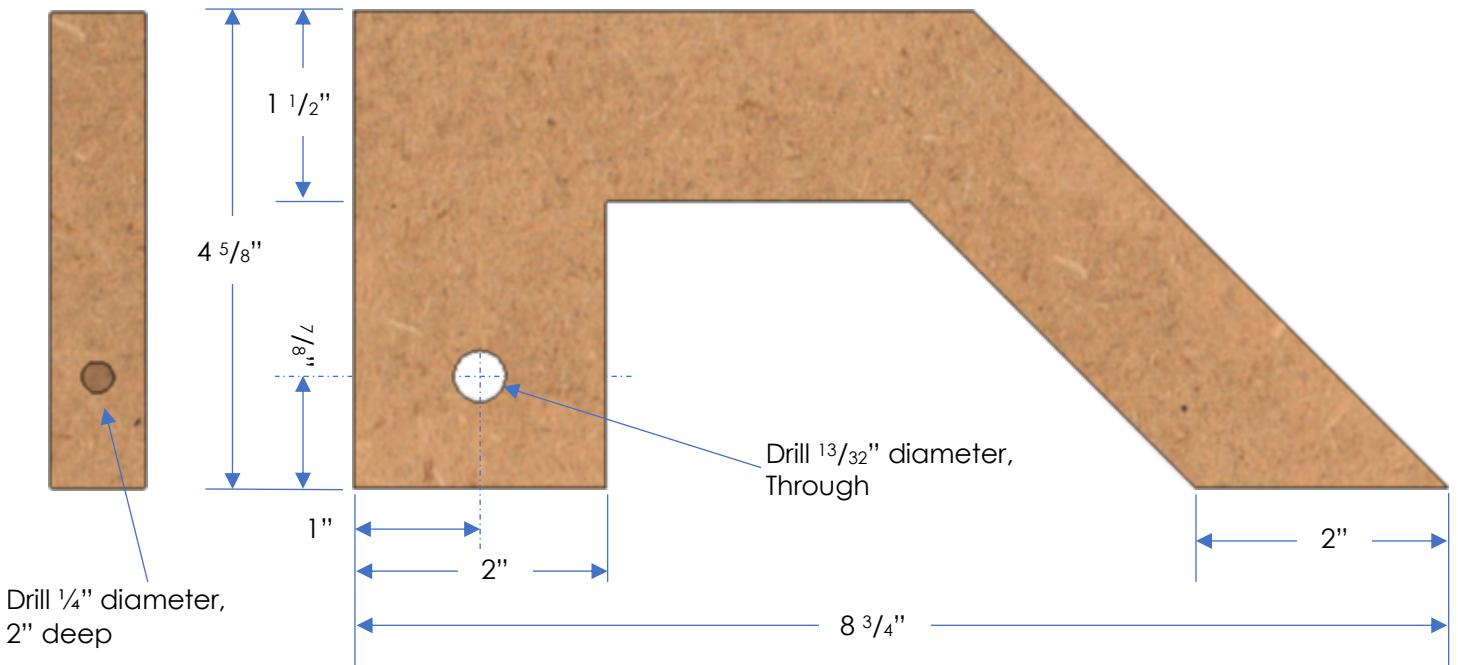
## Jigs, Fixtures, and Add-Ons

### Side Pieces

This is made from  $\frac{3}{4}$ " MDF. Two are needed.

On the front piece, drill holes as shown.

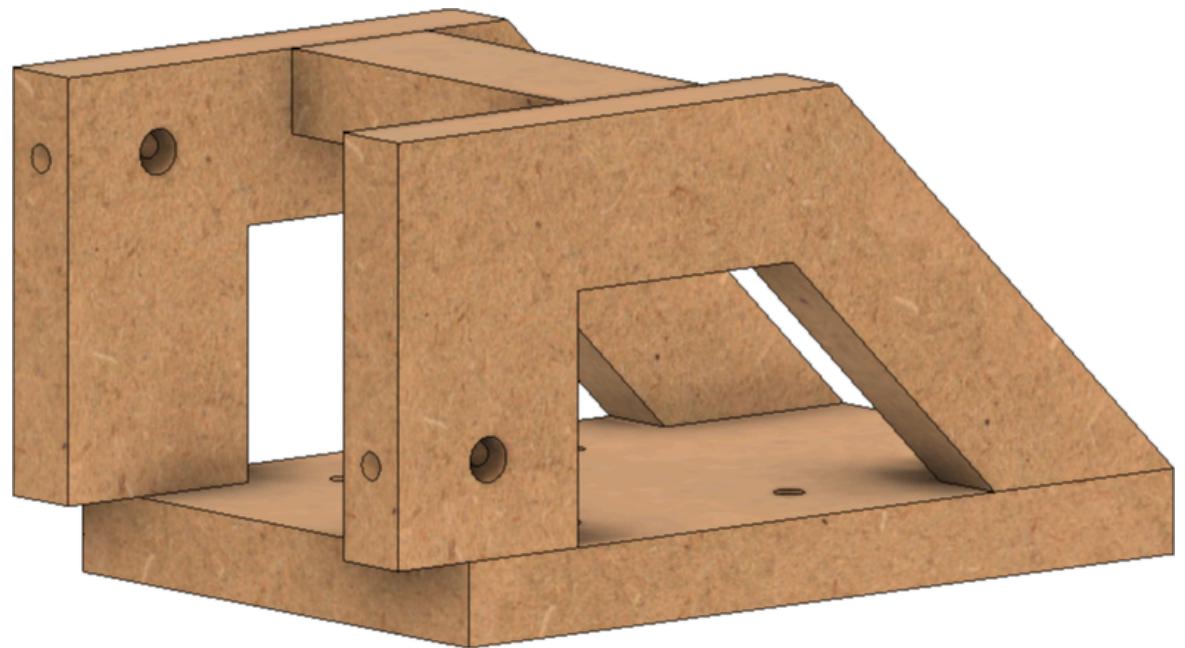
Do not drill into the back one yet piece yet; drill those after aligning the stepper motor bracket.



## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

Once assembled, the MDF pieces will look like this.



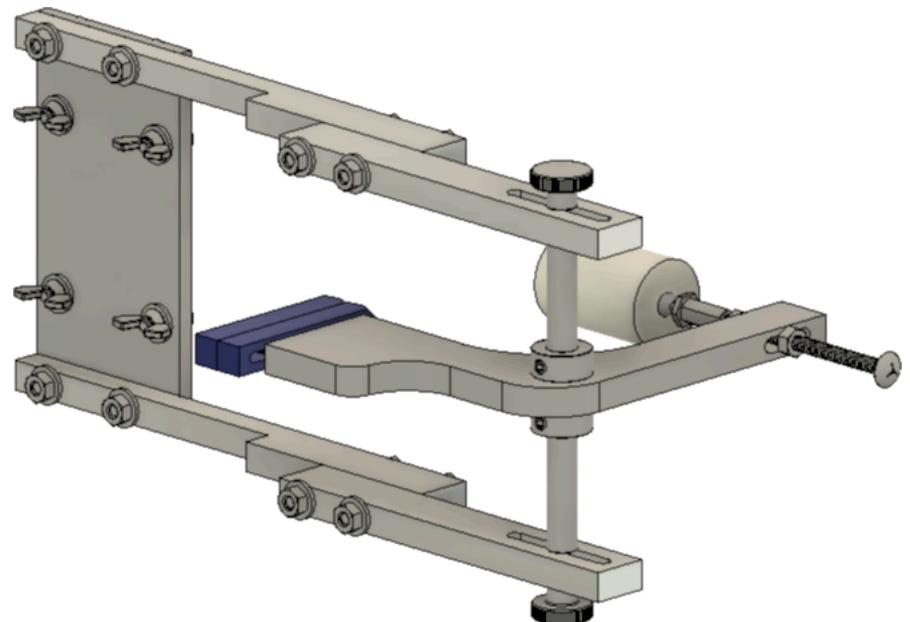
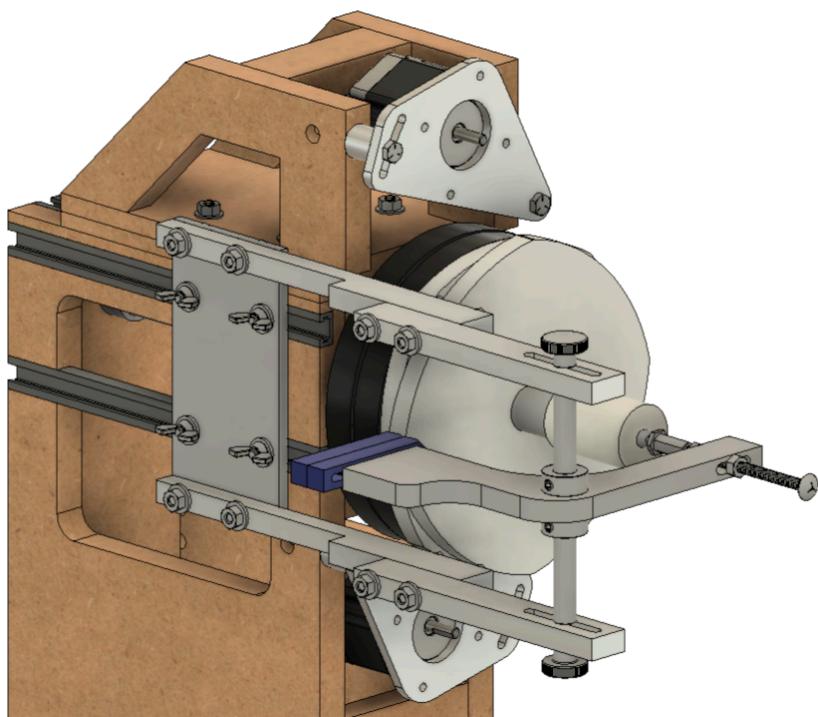
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Pumping Mechanism

The pumping mechanism for the MDF Rose Engine Lathe 2.0 is shown in the picture to the right, and as attached to the headstock in the picture below.

It was designed to attach to the back of the headstock, using the T-Tracks there. This is to facilitate also using the Rosette Phaser/Multiplier at the same time.



Additionally, testing has shown that this configuration also allows for rocking whilst pumping, creating a whole host of opportunities for the artist using this machine.

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

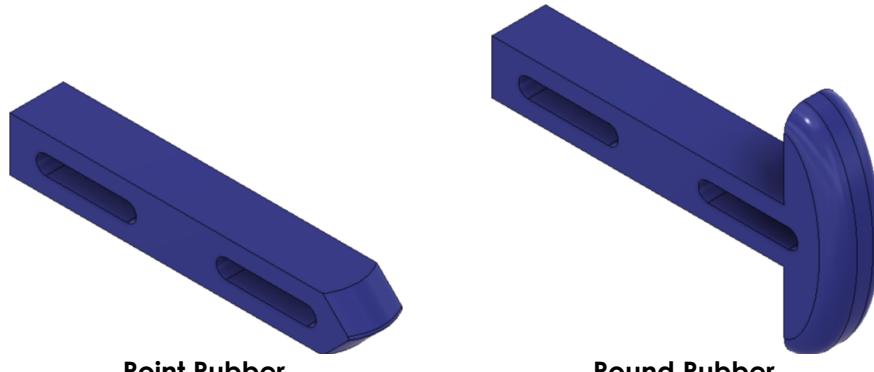
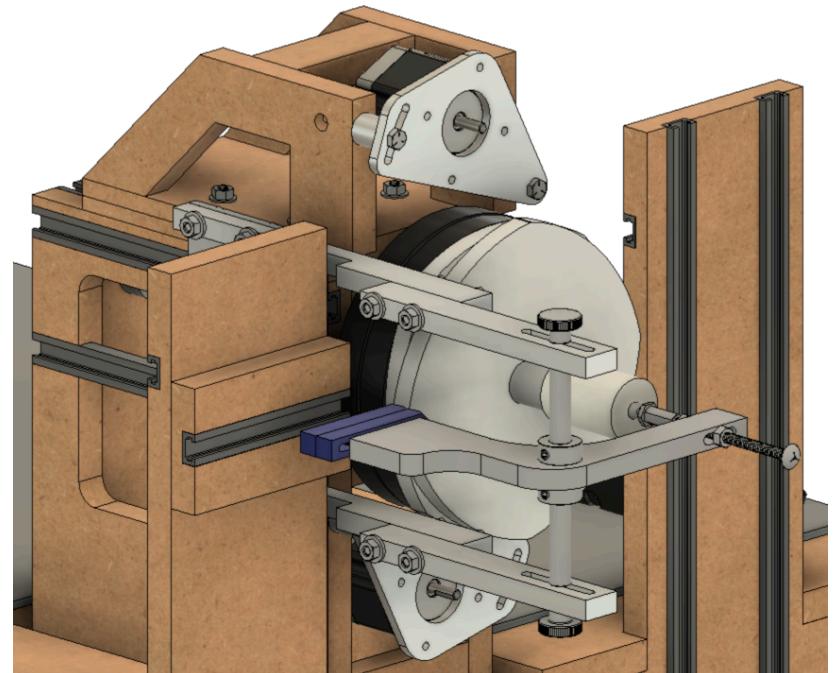
The picture to the right shows it attached with the other parts of the MDF Rose Engine Lathe 2.0 also in the picture. This is to show how it clears the rear rubber column.

Details for building and assembling this follow the bill of materials.

---

For the rubbers to use on this attachment, they are 3D printed (they are shown in blue in this picture). The directions for those are in the MDF Rose Engine Lathe 2.0 Library (<https://mdfre2.colvintools.com>). The book is the black one on the 2<sup>nd</sup> shelf. It is titled, "3D Printed Parts".

These rubbers have a curved rubbing edge so that they do not gouge into the rosette(s). Two examples are below:



**Point Rubber**

**Round Rubber**

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Bill of Materials

Parts required for building this are below.

Item #	Item	Qty	Source Part Number		Comments
			Source	Number	
<b>Spindle Parts</b>					
101	Clamping, 2-Piece Shaft Collar, 1" diam.	1	McMaster-Carr	6436K18	
102	Spring, Compression 3" Long, 1.029" ID	1	McMaster-Carr	9657K444	
103	Bearing, Needle Roller for 1" shaft diam.	1	McMaster-Carr	5909K36	
104	Washer for Needle Bearing for 1" shaft diam.	1	McMaster-Carr	5909K49	
105	Thrust Bearing for 1" shaft diam.	2	McMaster-Carr	5906K523	Bronze, oil-embedded. For 1" Shaft dia, 1/8" Thick
<b>Purchased Parts</b>					
201	Hex Head Bolt, 1/4"-20, 3/4" Long	4	McMaster-Carr	91268A502	
202	Hex Head Bolt, 1/4"-20, 2 1/4" Long	4	McMaster-Carr	92865A551	
203	Nut, 1/4"-20	8	McMaster-Carr	95505A601	
204	Washer, 1/4"	18	McMaster-Carr	90850A100	
205	Wing Nut, 1/4"-20	4	McMaster-Carr	90866A029	
206	Set Screw Shaft Collar 1/2" ID	2	McMaster-Carr	6432K16	
207	Ball Stud	1	McMaster-Carr	9512K51	
208	Coupling Nut, 1/4"-20	1	McMaster-Carr	90264A435	

## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

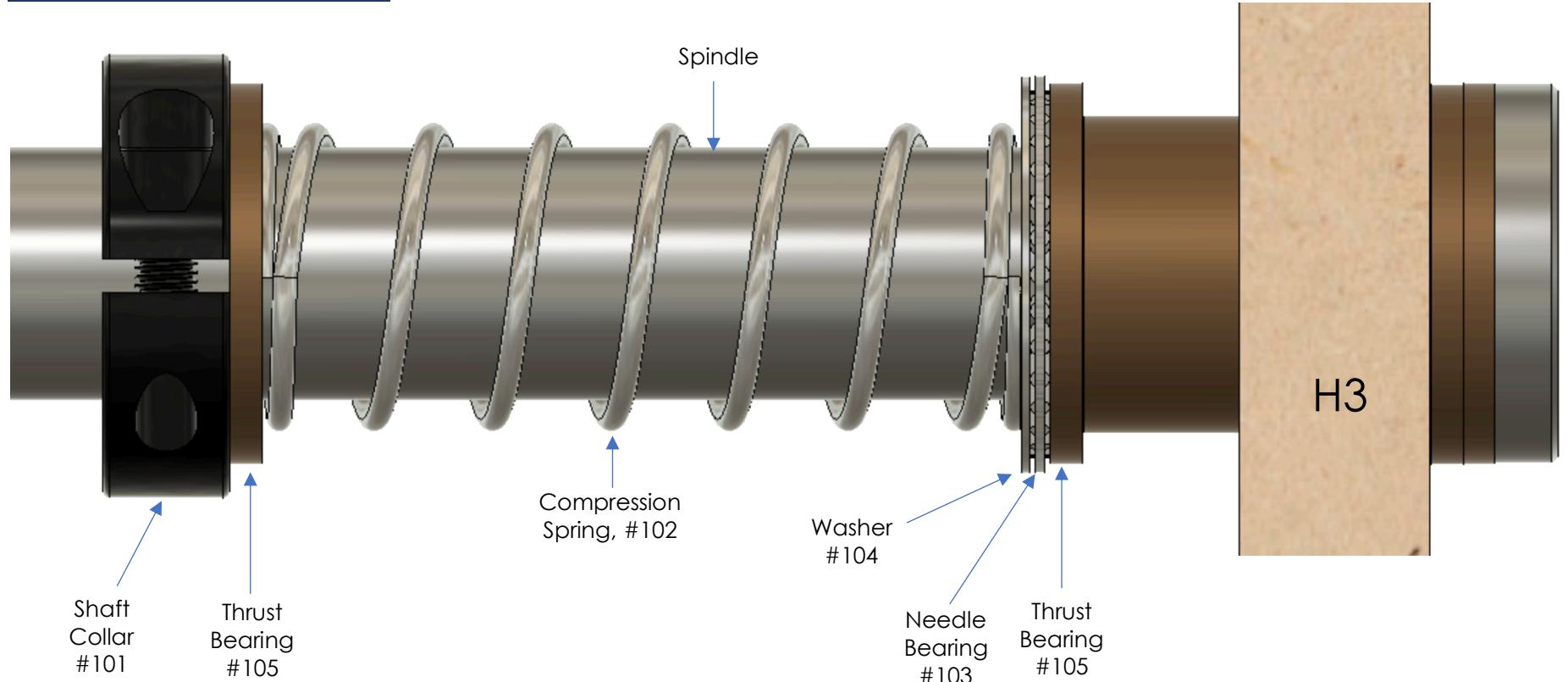
Item #	Item	Qty	Source	Source	Comments
				Part Number	
209	Carriage Bolt, 1/4"-20 4" Long	1	McMaster-Carr	90185A415	
210	Threaded Rod, #8-32, 2-1/2" Long	2	McMaster-Carr	95412A882	
211	Nut, #8-32	4	McMaster-Carr	90480A009	
212	Washer, #8	4	McMaster-Carr	92141A009	
213	Thumb Screw, 1/4"-20 1" Thread Length	2	McMaster-Carr	91882A429	
214	Flat Head Screw, 1/4"-20 1" long	4	McMaster-Carr	91253A542	
	<b>Aluminum Plate and Rods</b>				
301	Aluminum plate, 1/4" Thick 6 1/4" x 3 1/4"	1			Base
302	Aluminum plate, 1/2" Thick 5 1/4" x 7 1/2"	1			Lever Arm
303	Aluminum rod, rectangular 1" x 1/2", 40" Long	1			Arms
304	Aluminum rod, round 1/2" dia. x 5 1/4" Long	1			Pivot for Lever Arm
305	HDPE rod, round 1 1/2" dia. X 2 1/4" Long	1			Spindle coupler Similar material could be used
	<b>Rubbers</b>				
	Rubbers	2			Designs for these are in the MDF Rose Engine 2.0 Library ( <a href="http://mdfr2.ColvinTools.com">mdfr2.ColvinTools.com</a> )

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Spindle Parts

#### Assembly of the Spindle Parts



**View from the Near Side of the Headstock**  
(H1 & H2 removed)

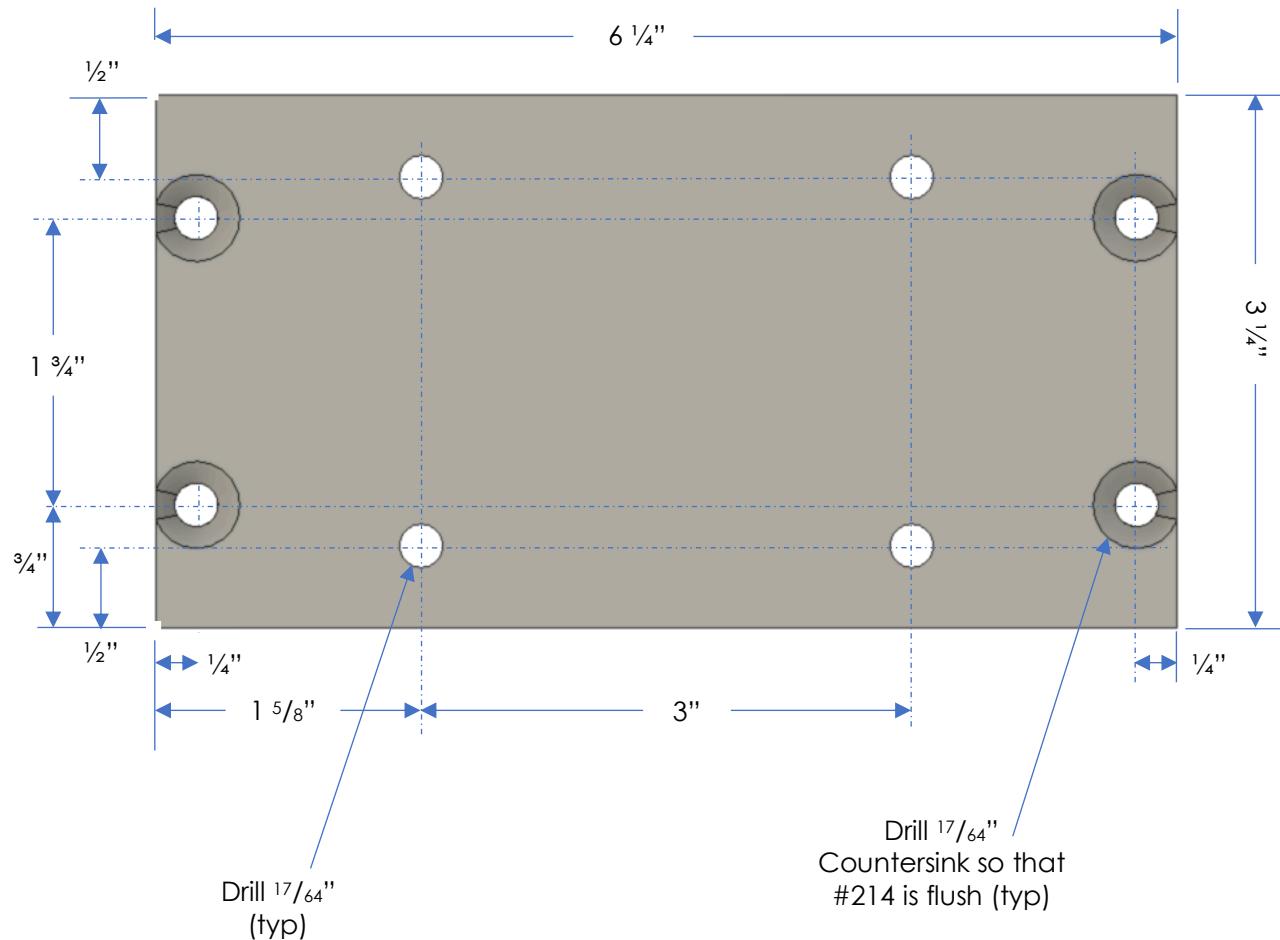
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Frame Parts

#### Base Plate

The base plate is made from  $\frac{1}{4}$ " aluminum (#301). 1 is required.



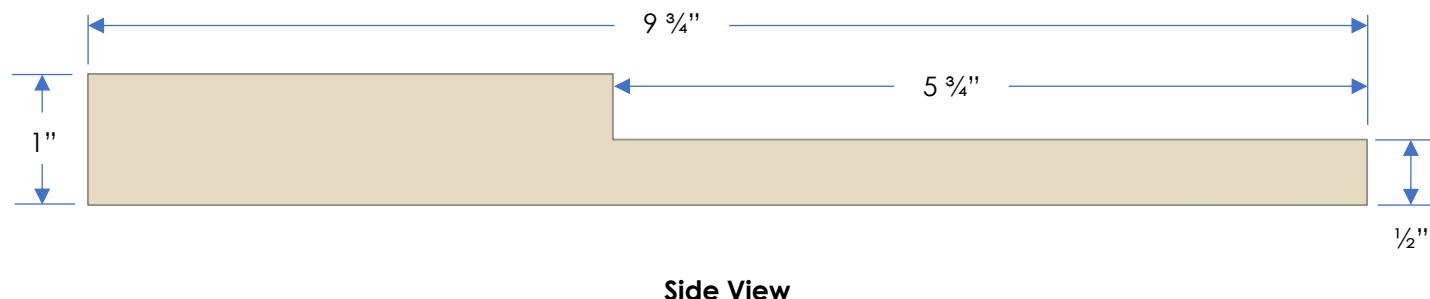
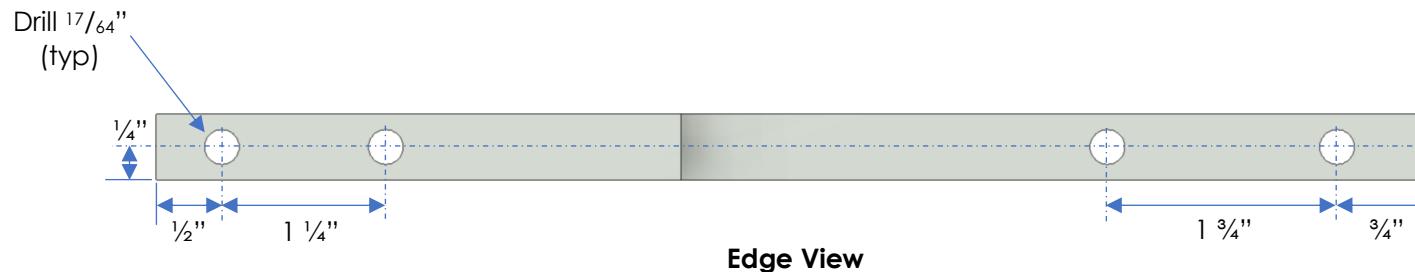
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Horizontal Arm #1

The horizontal arms are made from 1" x 1/2" aluminum rod (#303). 2 are required.

Please ignore the color differences – some odd fluke happened when copying from Fusion 360.



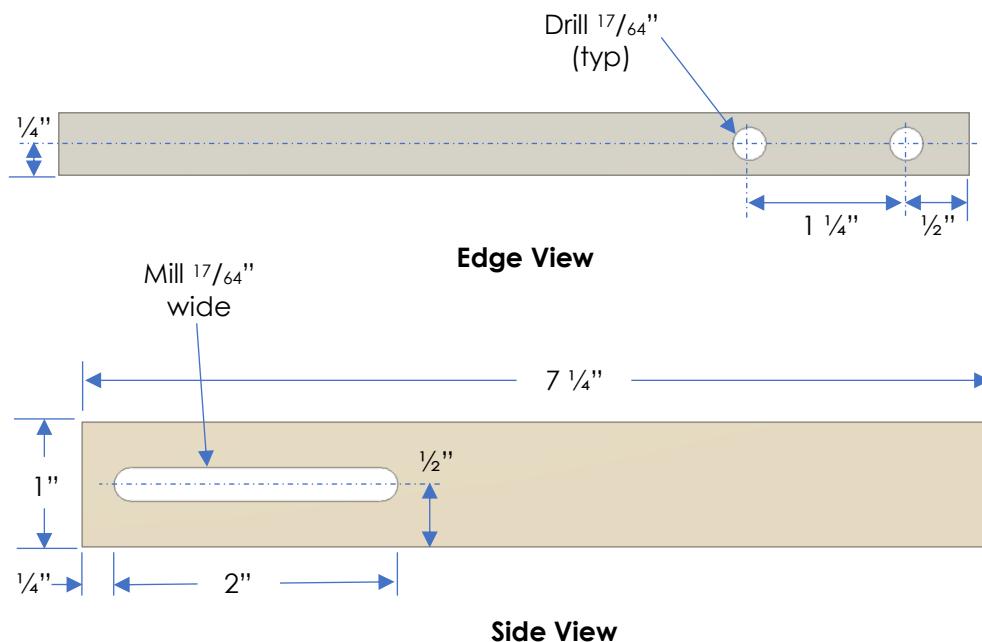
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Horizontal Arm #2

The horizontal arms are made from 1" x 1/2" aluminum rod (#303). 2 are required.

Please ignore the color differences – some odd fluke happened when copying from Fusion 360.



## MDF Rose Engine Lathe 2.0

### Jigs, Fixtures, and Add-Ons

#### Pivot Arm

The pivot arms is made from  $\frac{1}{2}$ " diameter aluminum round rod (#304). 1 is required.

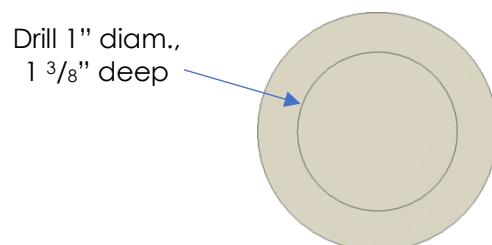
The piece is  $5\frac{1}{4}$ " long. Drill and tap both ends for a  $\frac{1}{4}$ "-20 bolt. Be sure to allow for at least  $\frac{3}{4}$ " of threads.



#### Spindle Coupler

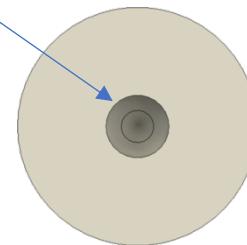
The spindle coupler is made from  $1\frac{1}{2}$ " diameter HDPE (or similar) round rod (#305). 1 is required.

The piece is  $2\frac{1}{4}$ " long.



Inboard Side

Ball Mill 10mm diam.,  
5mm deep  
(Makes a hemisphere)



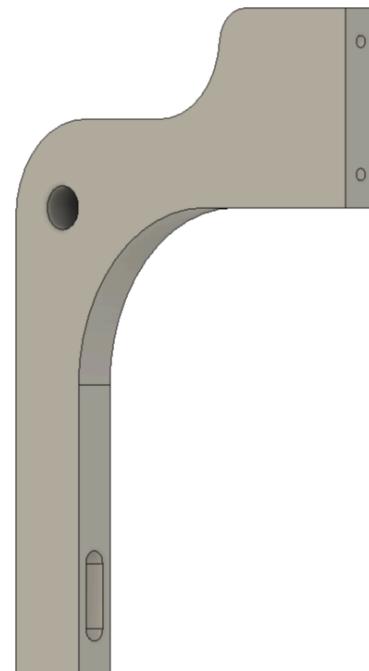
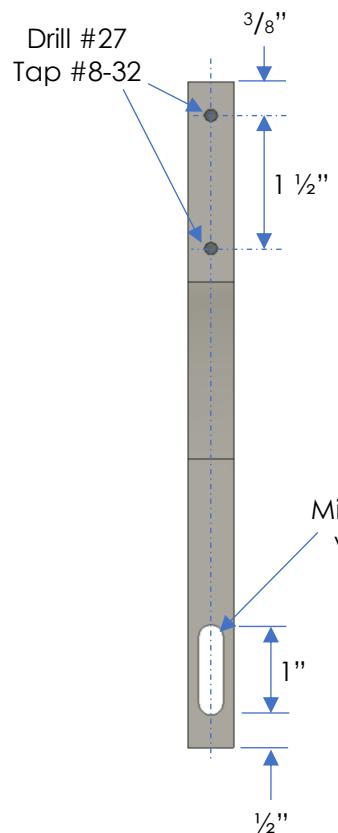
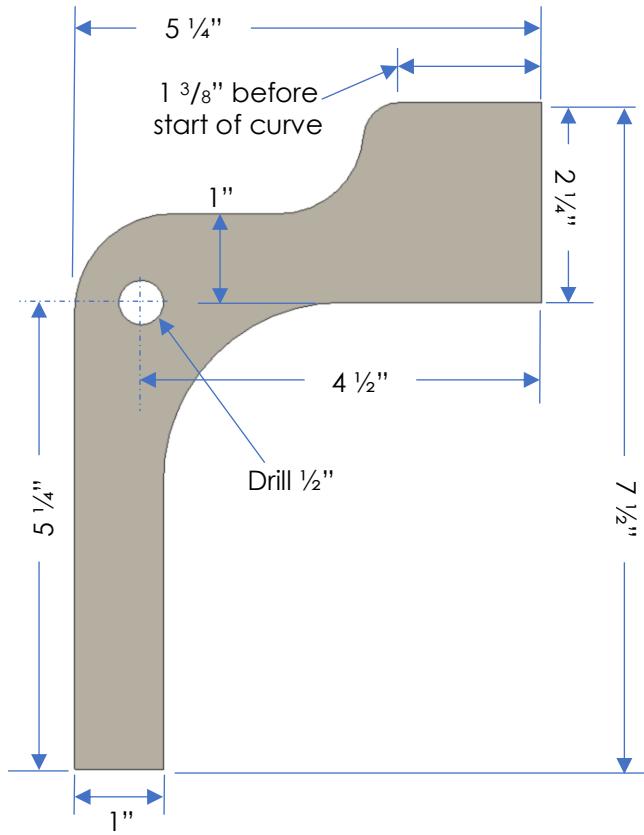
Outboard Side

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Lever Arm

The lever arm is made from  $\frac{1}{2}$ " aluminum plate (#302). 1 is required. The radii of the curves are not critical. However, do be sure the pivot hole is drilled before making the curve cuts.



Side View

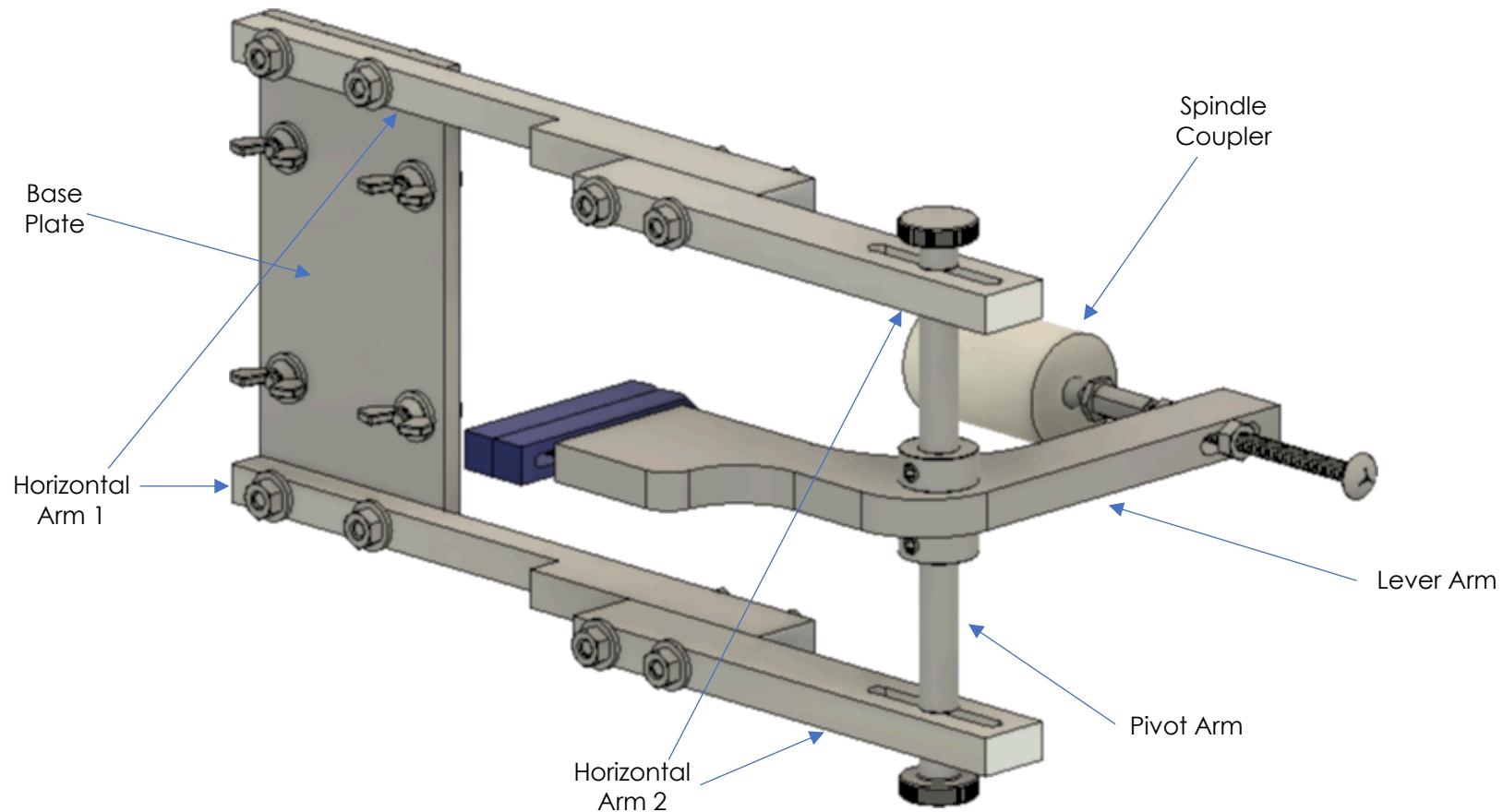
Edge View

Profile View

# MDF Rose Engine Lathe 2.0

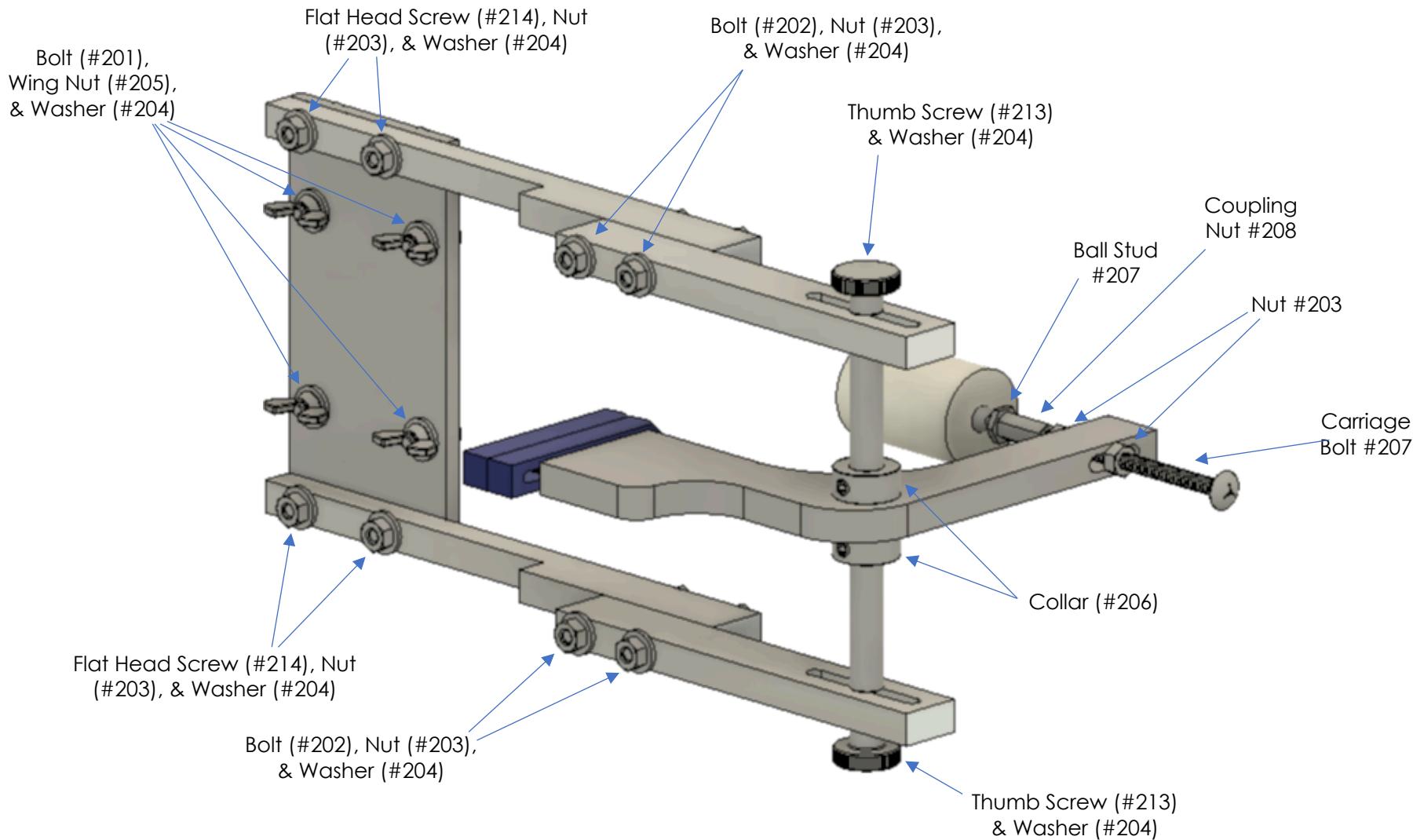
## Jigs, Fixtures, and Add-Ons

### Assembly



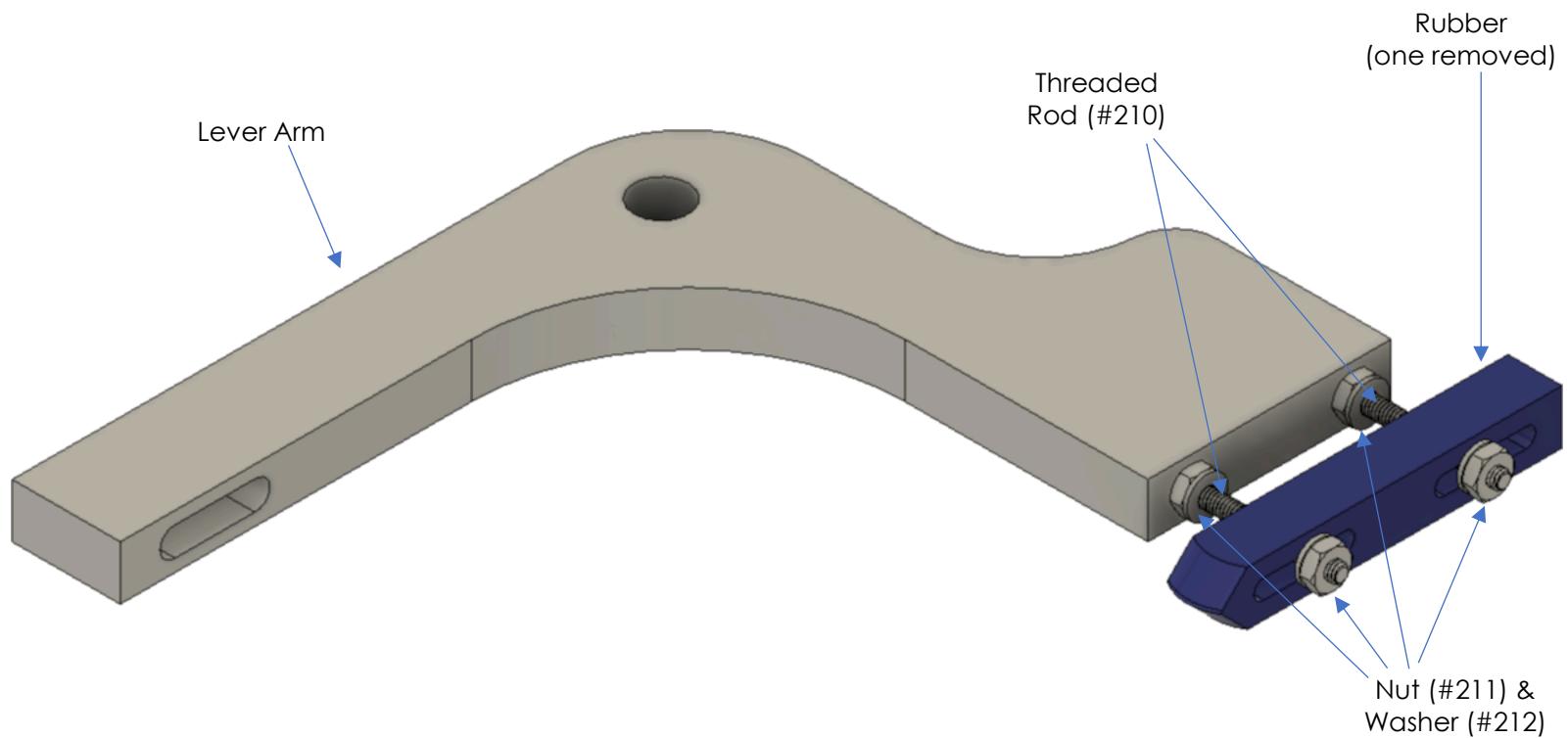
# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

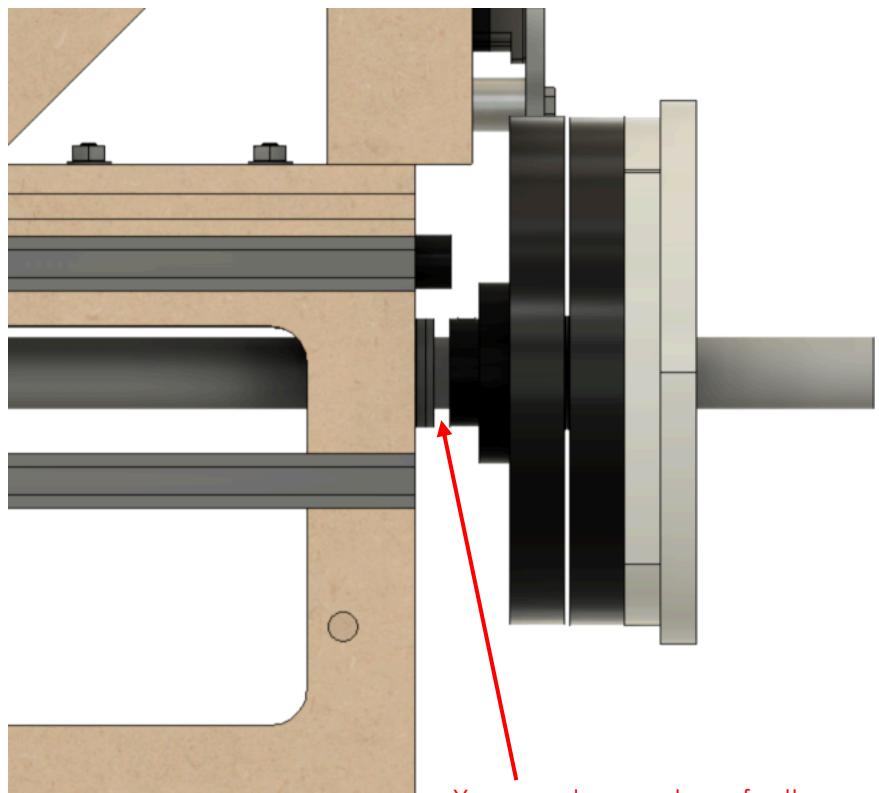


# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Installing and Aligning

Step 1 – Move the flange, gears, and rosettes to open up space for pumping

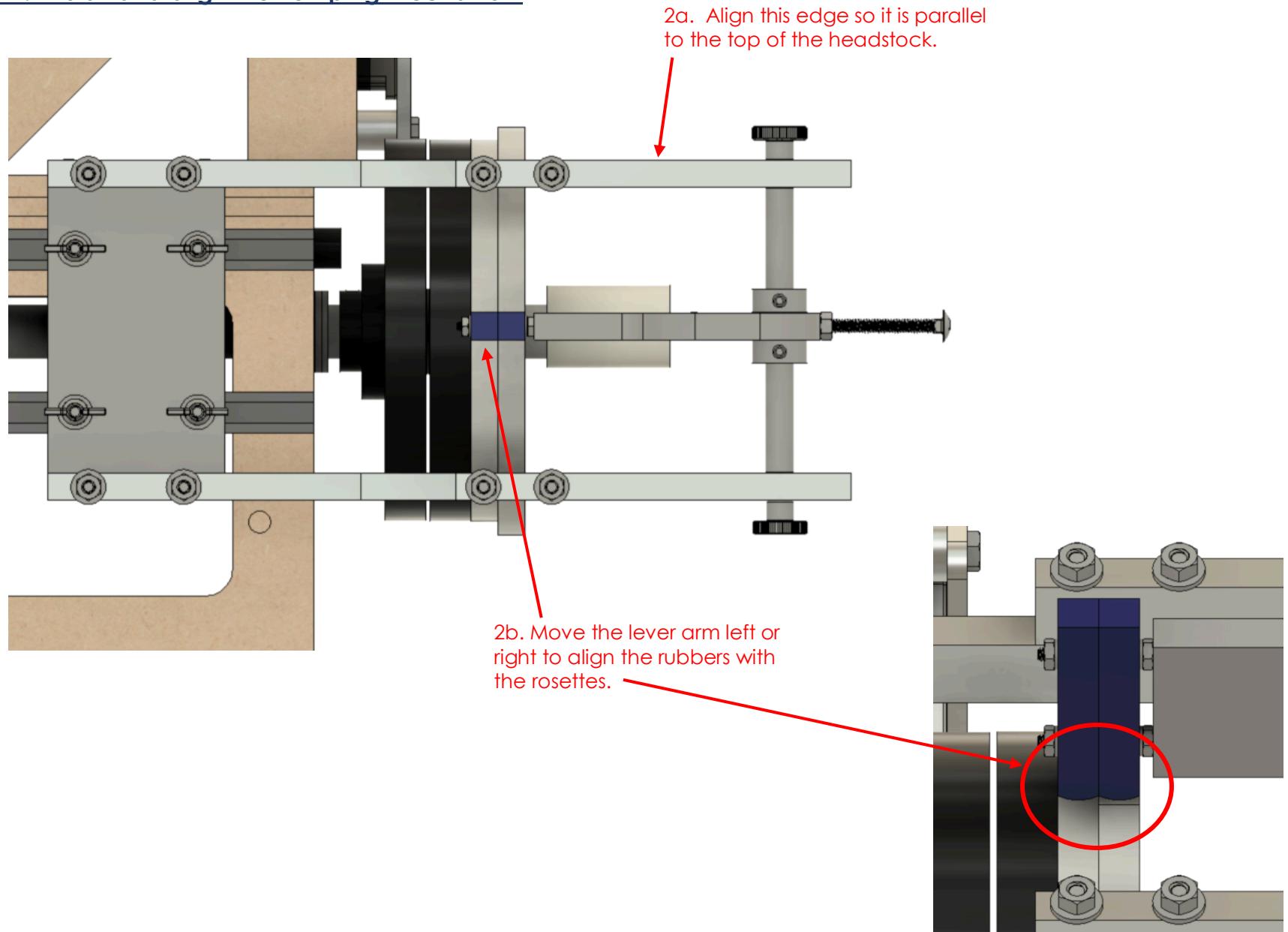


You need space here for the pumping action  
to move the spindle. I aim for around  $\frac{3}{16}$ ".

# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

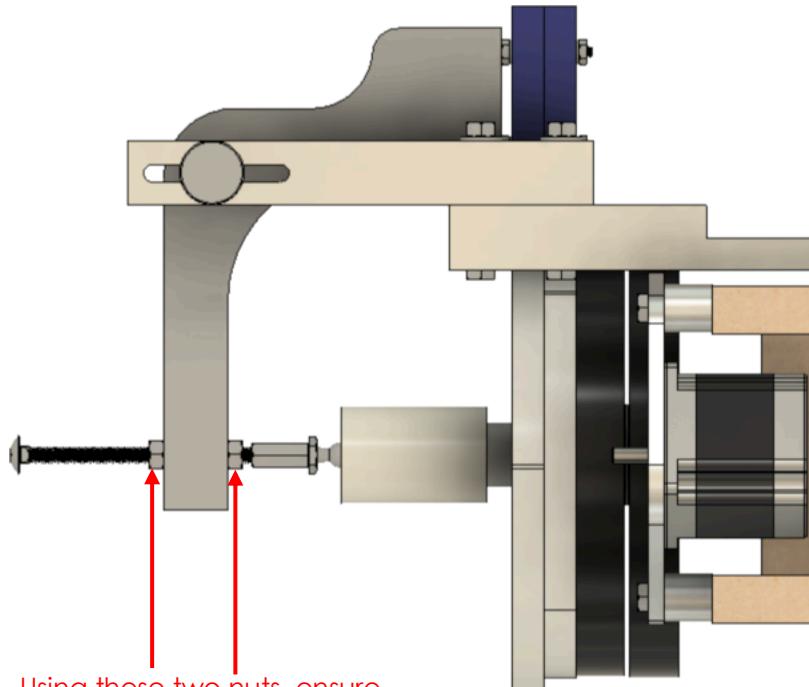
### Step 2: Install and align the Pumping Mechanism



# MDF Rose Engine Lathe 2.0

## Jigs, Fixtures, and Add-Ons

### Step 3: Tighten it up



Using these two nuts, ensure the ball stud is tightly engaged with the spindle coupler during the entire rotation of the rosette.

Move the carriage bolt in or out as necessary, but then secure it in place with both nuts.