

# ***G&S Tire Grinder Assembly Guide***

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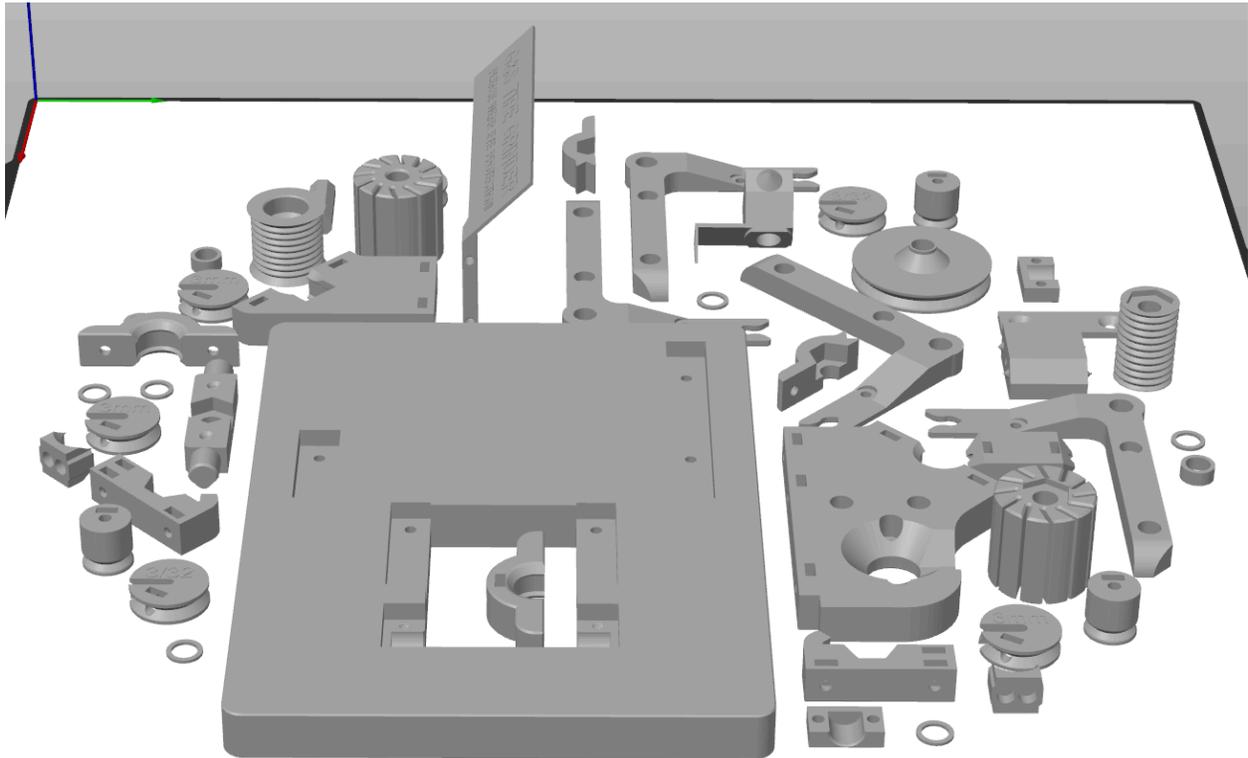
# What's in the Kit

## Hardware



- 23x - M3x10mm Socket Head Cap Screws (1 spare)
- 9x - M3x6mm Socket Head Cap Screws (1 spare)
- 3x - M3x6mm countersunk screws (1 spare)
- 4x - M3x6mm set screws (1 spare)
- 22x - M3 Square Nuts (1 spare)
- 1x - 1/4-20 x 4.5" Hex Head Bolt, fully threaded
- 2x - 1/4-20 x 2" Hex Head Bolts, fully threaded
- 3x - 1/4-20 x 7/32" Hex Nuts
- 1x - 1/4-20 Nylon Lock Nut
- 1x - 1/4-20 Acorn Hex Nut
- 1x - 1/4x3/8x1/2" spacer
- 1x - RS540 DC motor (motor specs may vary)
- 1x - 1x10 20x42x9mm Conical Spring
- 4x - R188 shielded bearings
- 4x - #128 O-Rings (1-1/2" ID, 1-11/16" OD, 3/32" Width, 1 spare)
- 2x - 1"x1" spiral band sanding sleeves, 120 grit
- 4x - 4mm OD 25mm Ballpoint Pen Compression Springs (2 spare)

## Printed Parts



In my kits, most parts have only one print, but some parts are duplicated in case of loss or damage. For example, the forks, or sides of the axle bracket, are duplicated in case of damage from forcing in a bushing that is too large. There are extra motor pulleys as well as extra split pulleys, as well as plenty of spacers to make sure you can get the sanding spindle bearings nicely aligned. If you are missing any parts from a kit provided by me, please contact me immediately at [ggaub@ggaub.com](mailto:ggaub@ggaub.com) to request a replacement.

Note that the color of printed parts may vary from the photos in this guide, in the videos, or on websites. Even the same material from the same brand is not always the same shade, and sometimes materials go out of production and new selections are made. Some printed parts may seem snug, or loose, but the machine has been designed so that those differences do not affect the performance of the machine.

Also, the design and shape of some parts may change over time as the machine is improved for functionality, printability, or changes in hardware. I will do my best to keep this document updated, but even if something changes a little bit, this should still serve as a good guide for assembly. I'm confident that you can work out any minor discrepancies that may arise over time.

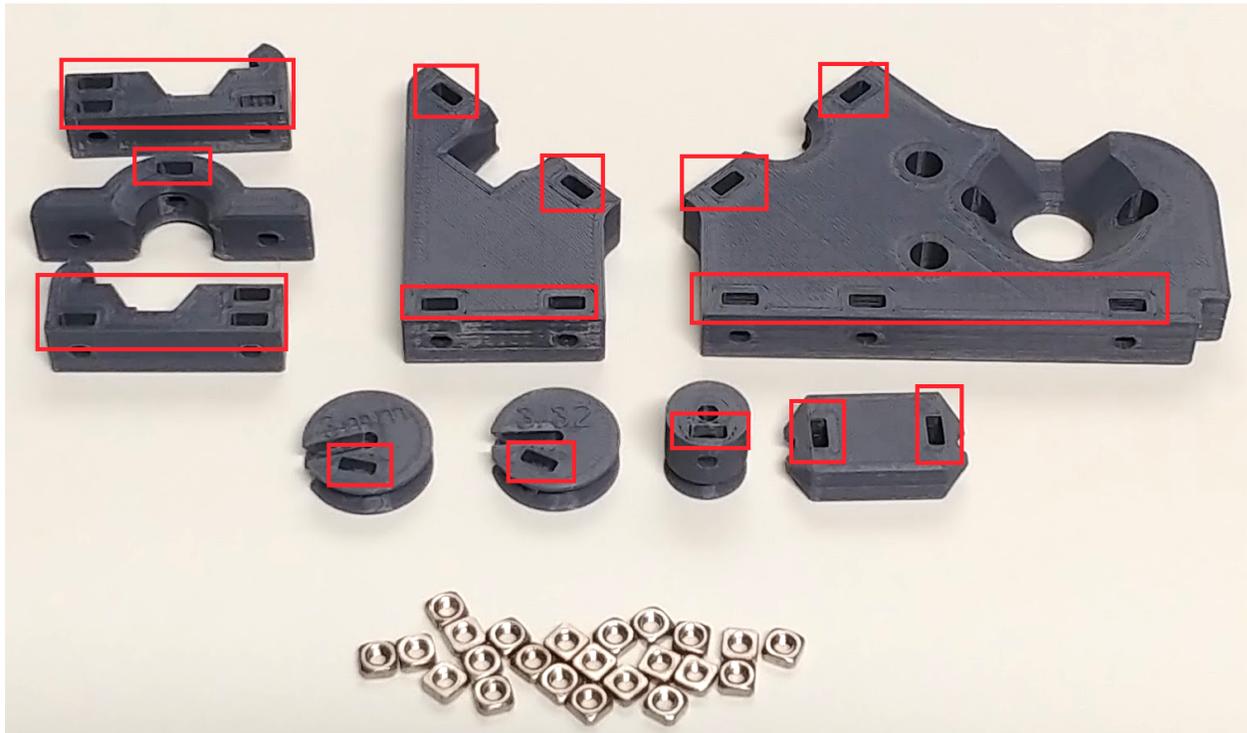
***Don't Panic!***

## Tools Needed



1. Standard Pliers that can hold a 1/4-20 nut, or a 7/16" wrench
2. Needle nosed pliers
3. Phillips head screwdriver
4. 2.5mm hex head driver
5. 1.5mm hex head driver
6. Thin, but flexible glue, such as G-S Hypo or blue cap Gorilla brand super glue.
7. Some plastic safe grease, such as silicone based SuperLube, or slot car gear grease for the left side bearing carrier
8. Not strictly needed, but you might want some blue Loctite on hand for the cap nut on the sanding spindle.

## Parts Preparation

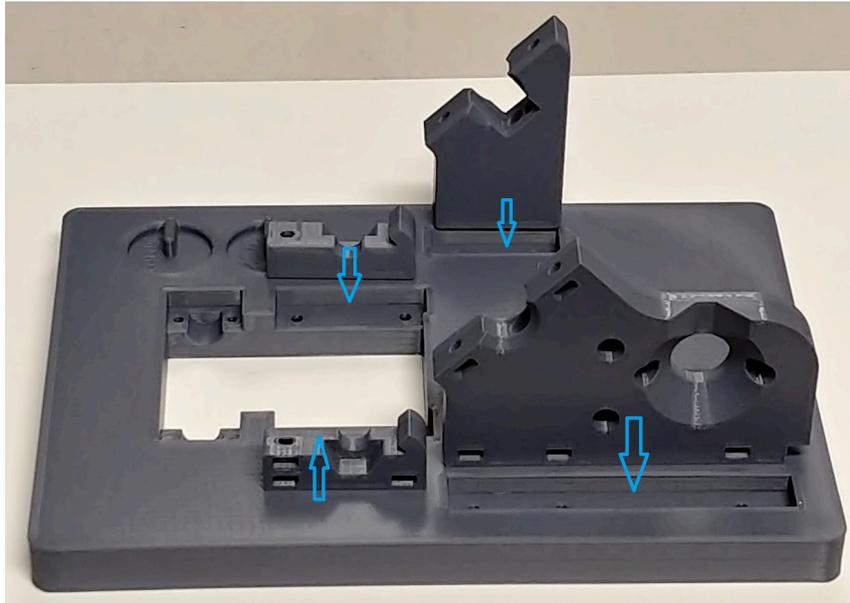


Insert one M3 square nut into each of the small rectangular holes on the sides of the above printed parts, as indicated by the red rectangles. In some cases, the hole for the nut may be quite snug, requiring the use of needle nosed pliers to hold the nut steadily while applying force to press it into the hole. Once into the hole, it's necessary to force the nut all the way to the bottom so that the threads of the nut line up with the hole that the screw is to pass through. The 1.5mm driver is good for pressing the nut all the way in.

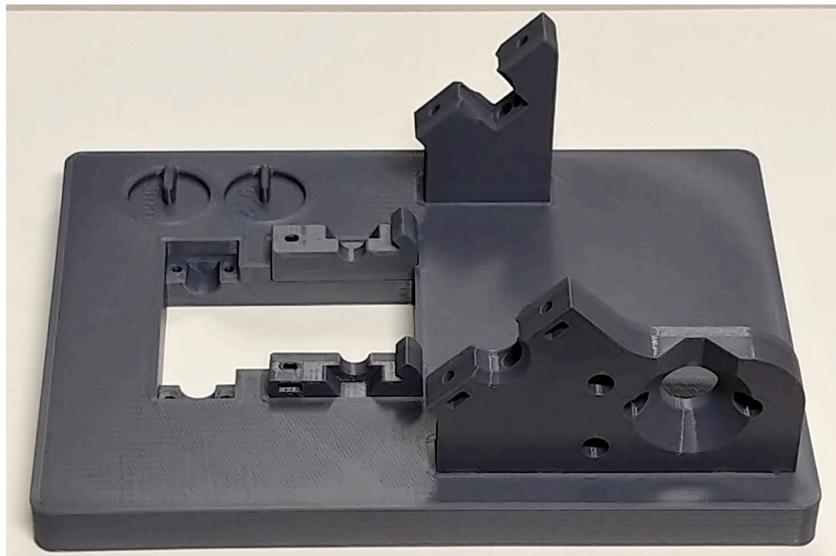
In other cases, the nut is loose in the pocket, and may fall out or lose its alignment with the hole during assembly. It can be helpful to put a drop of glue into the pocket on top of the nut to help hold it in place. A drop of plastic safe grease may also work well for this.



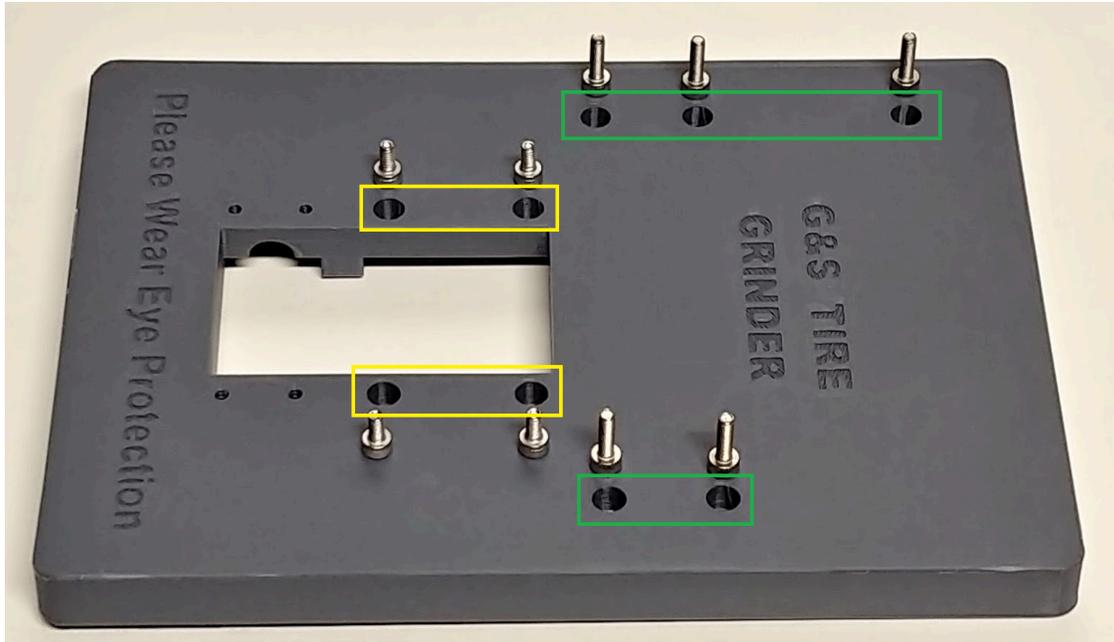
## Base



Insert the printed parts into their respective slots on the base plate. Note the orientation of each part, particularly the half-hex notches on the smaller two pieces must face the outer sides of the base plate, as pictured. Some force may be necessary to insert the parts into the slots. If they seem to not fit at all, examine the edges of the parts as well as those of the slots in the base and remove any obvious lips or flashing that may be a result of the printing process.



Do your best to ensure that each part is fully inserted into the base. The pockets for the square nuts on the bottom side of each part should be hidden by the top surface of the base plate when fully installed.

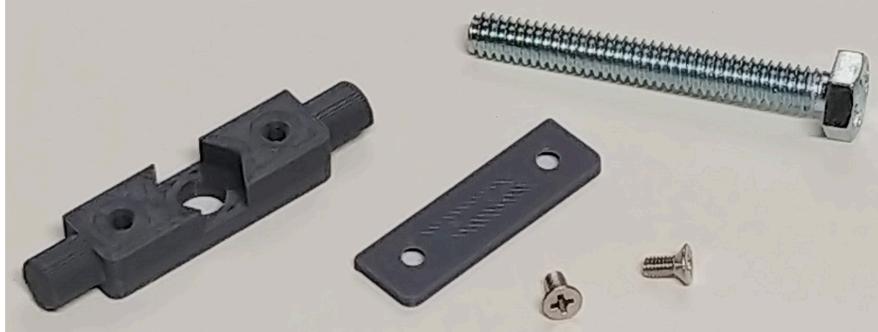


Secure each part to the base using the appropriate M3 screw. The large parts that form the base of the sanding spindle and motor mount are secured using five M3x10mm socket head cap screws (green boxes indicate location). The smaller parts that hold the axle bracket pivot bolt are secured using four M3x6mm socket head cap screws (yellow boxes).

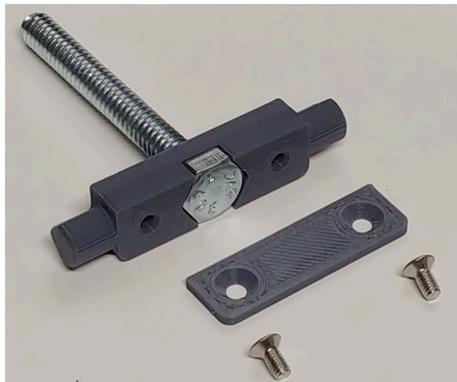


When driving these screws in, take care to ensure the nuts are still lined up with the screw hole, and that the screw does not cross-thread into the nut. If you feel much resistance, back the screw all the way out and try again. If the nuts are loose in the pockets, tilt the base up on its side so that the nuts fall to the bottom of the pocket. You'll need to flip it over to do the same on the other side. Once fully driven in, you can tighten them by hand, or the lowest setting on a torque driver.

When properly installed, all screw heads should be recessed below the surface of the bottom of the base plate.



Gather one of the 2" 1/4-20 hex bolts, two of the short countersunk screws, and the above printed parts.

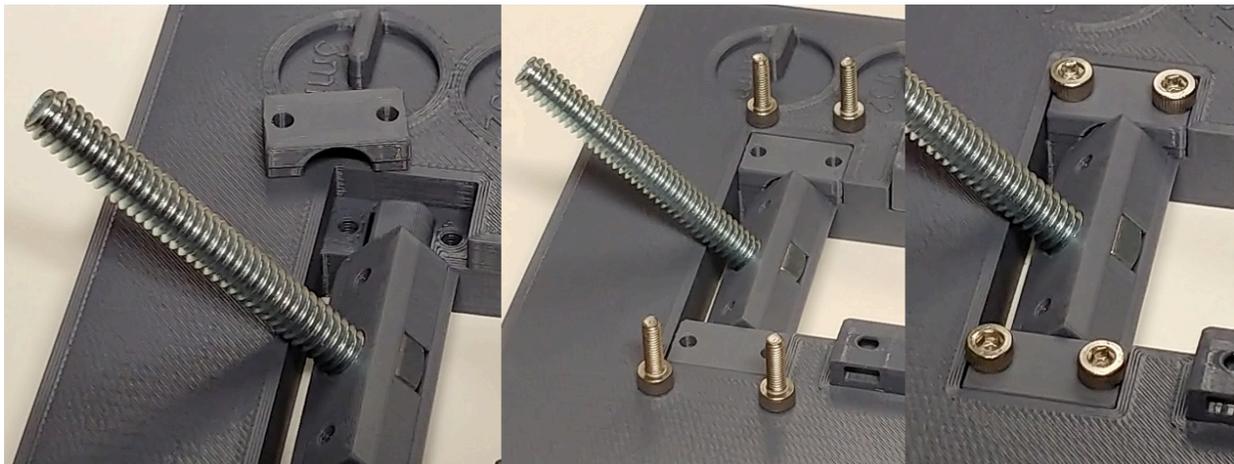


Insert the bolt into the part with the hex detent as shown. Align the cover plate with the bolt carrier by matching up the rounded edges. Make sure the countersink is facing out.

Install the two screws using your Philips screwdriver. Note that these are threading into plastic, not nuts, so tighten them down, but don't apply enough force to strip the plastic. This cover is to keep the bolt from pushing out of the carrier when using the spring release method of truing tires, so it's low stress making nuts unnecessary.



Install the bolt and carrier into the base as shown below, using four M3x10mm socket head cap screws and the small printed parts with a half circle detent and two screw holes. Again, these are threading into plastic, as they are only to prevent the bolt carrier from popping up while using the machine, and are not under much stress under normal use. Even the lowest setting on a torque driver may strip the plastic, so do the final few turns and tighten by hand.





Using the flexible glue, such as G-S Hypo, glue two of the pen springs into the bearing carrier and into the left hand spindle support. Depending on how thin the glue is, you may need to allow the glue to set in the bearing carrier before gluing it all into the spindle support. This is done so that the bearing carrier is easier to manage during final assembly, and doesn't launch itself across the room and into oblivion during that process, or when changing the drive bands later on. Make sure this all has time to set before final assembly. It is also a good idea to put a small amount of plastic safe grease, such as slot car gear grease, or silicone SuperLube in the channel that the bearing carrier follows to help it move freely from top to bottom.

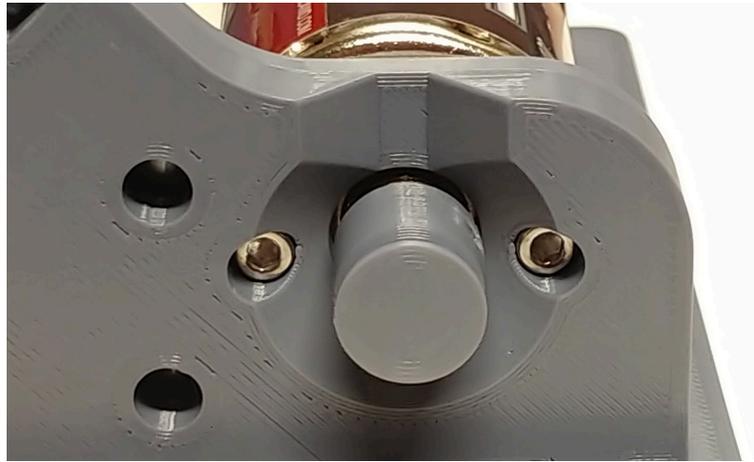
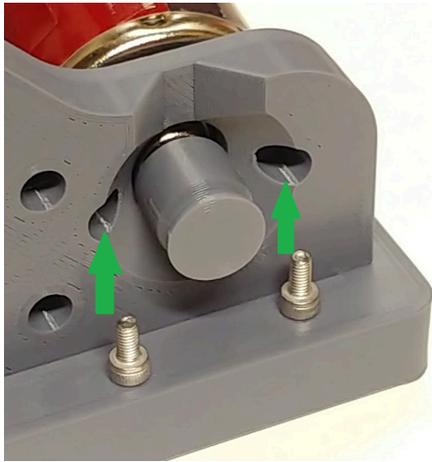
## Motor and Debris Shield

Prepare the motor by taking one of the motor pulleys, a square nut, and an M3 set screw. Install the nut into the pulley and make sure it is all the way into the slot so that the threads line up with the hole for the set screw. Use your 1.5mm hex driver to install the set screw enough that it threads into the nut, but does not go into the hole for the motor shaft. Press it onto the motor shaft as far as it can go, taking care to line up the flat spot on the motor shaft, if your motor has one, with the nut and set screw. Secure the set screw, but don't apply excessive force.



If your motor does not already have wires attached, it would be a good idea to attach some now. The terminals will usually have a red dot next to the positive input terminal. You can solder wires directly to the terminals, or get some spade connectors to push onto them if you would prefer not to solder. Even alligator clips from your PSU will work just fine.

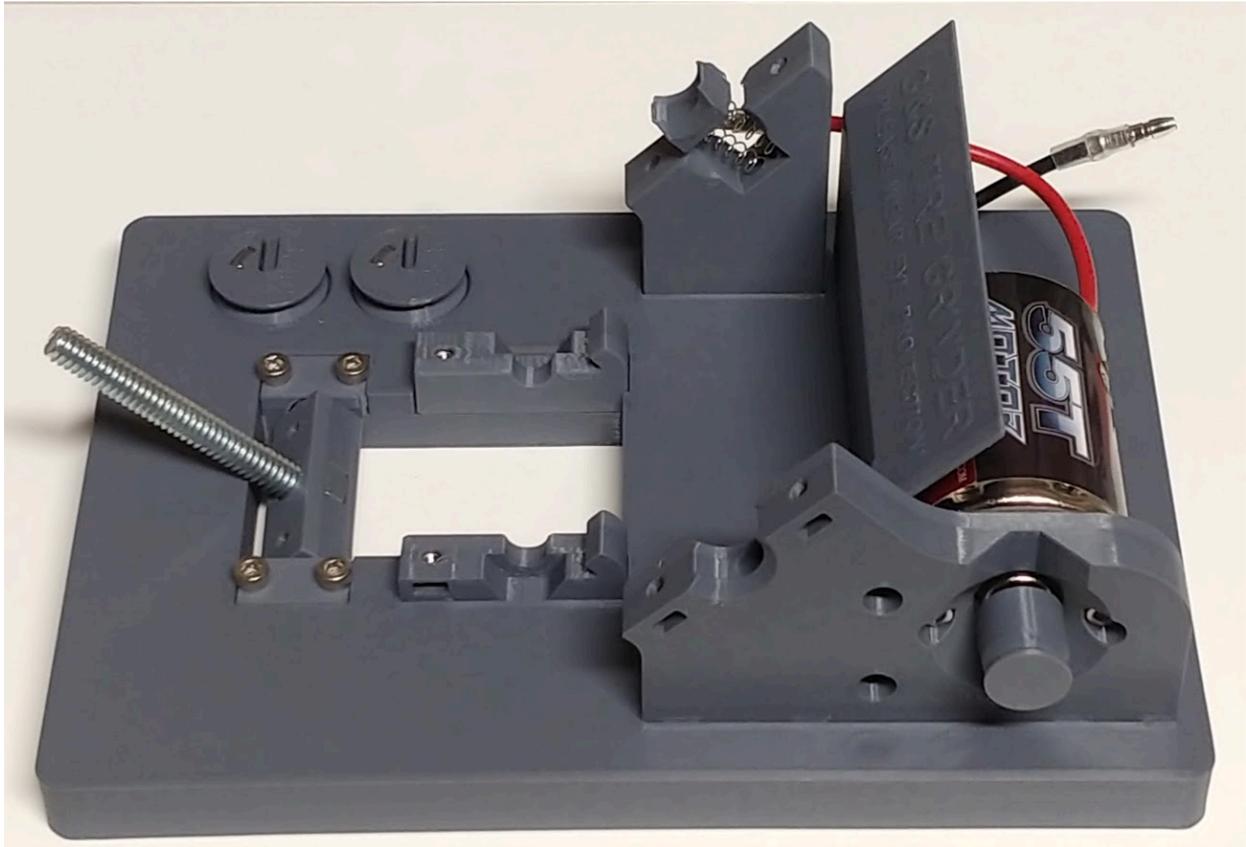
Get two M3x6mm socket head cap screws for the motor installation. It's often easiest to drive both screws into the holes enough for them to protrude from the back side where the motor will be, so that you can use the screws to line up the holes in the motor. Otherwise, do your best to line up the motor's threaded holes with the mounting holes, and drive those screws in carefully to avoid cross-threading them.



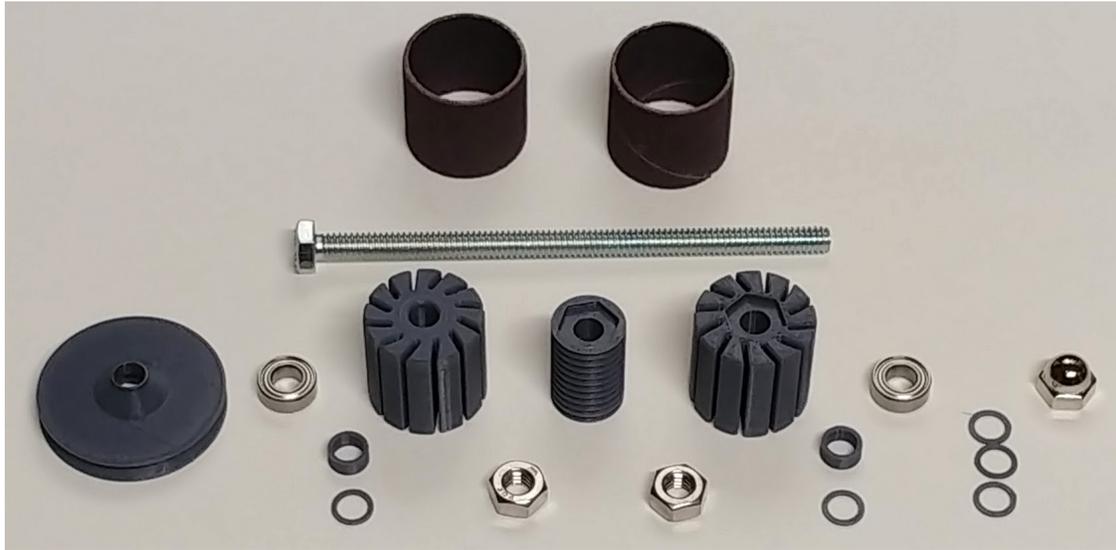
For the debris shield, you will need two of the M3x10mm socket head cap screws. These go into the two holes on the side next to the motor, and into the thicker end of the debris shield. Since these are only threading into plastic, do not tighten the screws more than necessary to snug the shield up to the motor/spindle support. It will be "free floating" at the other end of the shield. Don't worry if you see threads on the plastic before or after the screws are installed. This is normal stretching of the plastic around the screw.



Your base should now look more or less like this:



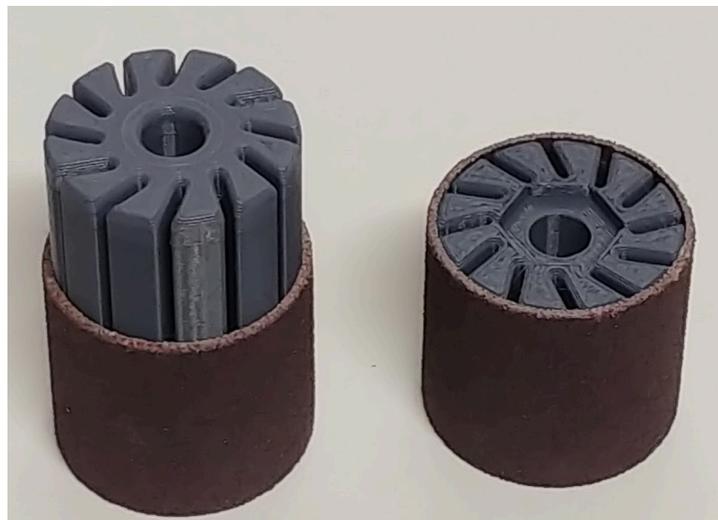
# Sanding Spindle

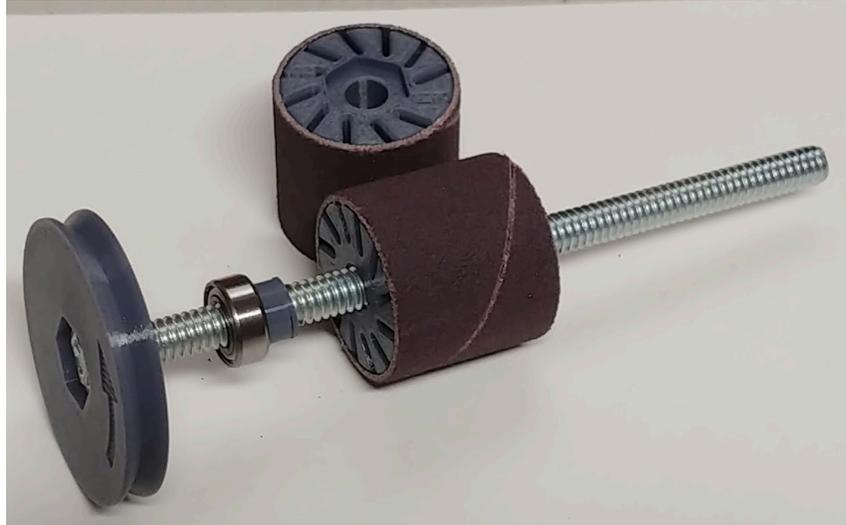


Before assembling the sanding spindle, it's best to install the sanding sleeves onto the sanding drums. My kits include 120 grit sanding sleeves. If you want a different grit, now is the best time to install them, rather than after you've assembled the machine. They are standard 1"x1" spiral band sanding sleeves which can be found at most hardware stores or your favorite online retailer. The sanding drums are designed to be a snug fit in the sleeves, so some force will be needed to assemble them. If your prints seem loose, a small amount of glue to prevent them from slipping around the drum is all that's needed. If the sleeves have obvious space between the inside of the sleeve and the printed drum, then replacement prints should be made.

Insert the 4.5" 1/4-20 bolt through the parts in the following order (some parts may need to be "screwed" on):

1. Large pulley
2. R188 shielded bearing
3. Large spacer
4. One or two thin spacers
5. Sanding drum (no hex detent)
6. 1/4-20 hex nut
7. Barrel pulley (hex detent first)
8. 1/4-20 hex nut
9. Sanding drum (hex detent first)
10. Large spacer
11. One or two thin spacers
12. R188 shielded bearing
13. Two or three thin spacers
14. "Acorn" cap nut



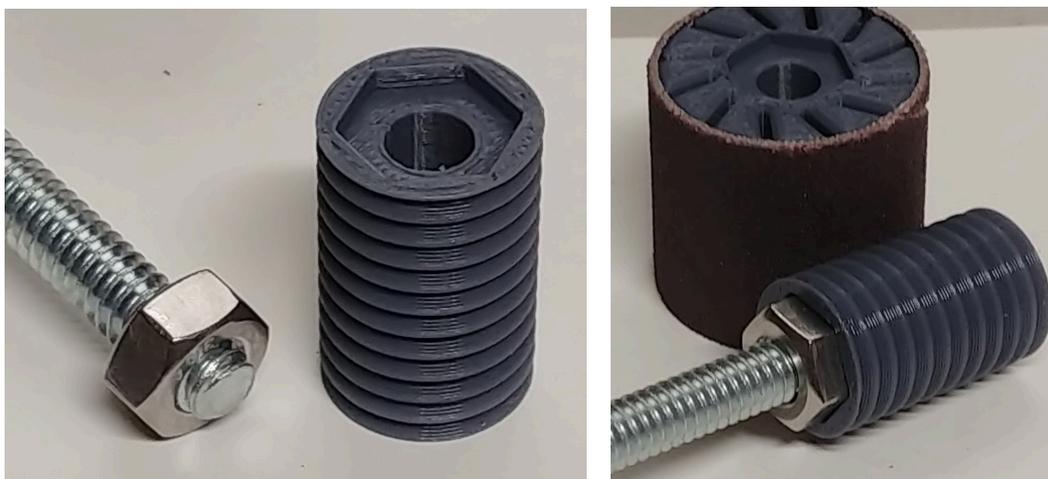


The large pulley should be put onto the bolt such that the head of the bolt goes into the hex detent in the center of the pulley. You may need to “screw” it on, but will need to force it into place at the end, if that’s the case.

The first R188 shielded bearing is next, which should slide down the bolt easily.

One large/thick spacer, and at least one thin spacer next. In some cases, a second thin spacer may be necessary for good alignment of the bearings with the supports on the base, but it’s a coin flip. It may be better not to have a second one. You won’t know either way until the spindle is mostly assembled and test fitted to the supports. Make your choice, and continue.

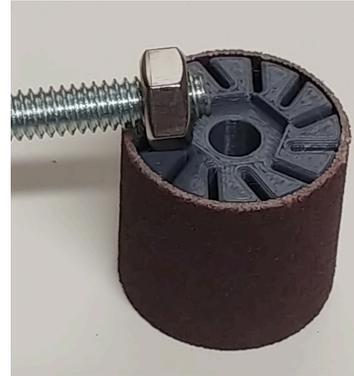
Next up is the first sanding drum. This should be the one that is flat on both ends, no hex detent. It doesn’t matter which end goes on the bolt first. Slide or screw it down to the spacers. Note that if force is necessary to “screw on” the barrel, then they may not go on straight and will need to be reprinted. They should slide easily, but not loosely, or thread on easily.



Next up is one of the  $\frac{1}{4}$ -20 hex nuts followed by the barrel pulley with the hex detent. If the pulley slides down the bolt without excessive force, then you can thread the nut down to the

first sanding drum. If not, then it's easiest to put the barrel pulley on at the same time as the nut, and thread them both down to the sanding drum at the same time.

Use your pliers to snug the nut up against the first sanding drum. If you had to thread the barrel pulley along with the nut, you can tighten them both down by hand, or use needle nosed pliers to grip the nut to tighten it. Don't use pliers on the barrel pulley, as they may damage the plastic.

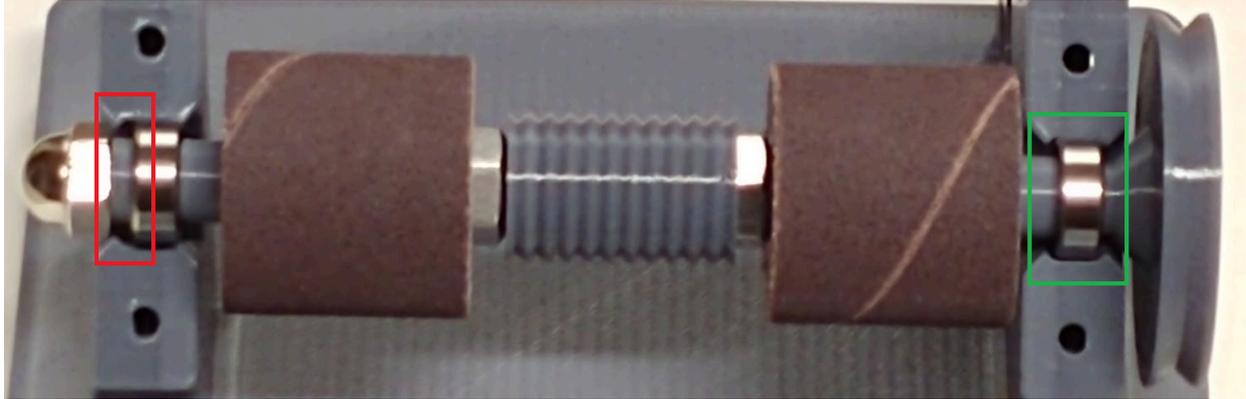


Next is the second  $\frac{1}{4}$ -20 hex nut and sanding drum with the hex detent. Do just the same as with the barrel pulley and tighten them both against the barrel pulley.

After the second sanding drum is another set of spacers, usually one thick spacer and one or two thin spacers. Follow that with another R188 shielded bearing, a couple more thin spacers, and then the cap/acorn nut. Don't tighten the acorn nut down too much yet, as you may need to take it apart to adjust the spacers.



Before tightening the acorn nut down, or adding some blue Loctite if you want to be extra secure, we need to make sure the bearings line up with the spindle supports already on the base. Just put it in place with at least one bearing lined up in its slot. If the other bearing is not also lined up with its slot, determine if it's too wide or too narrow. If it's too narrow, then you may need to add a thin spacer between the second sanding drum and the bearing. If it's too wide, you may need to remove one. The goal is for both bearings to line up nicely with their slots on the spindle supports. You should be able to easily push the left side of the sanding spindle down into the channel that it follows, and it should easily rise back up when you release pressure.



In the above image, the bearing on the right is lined up nicely (green box) while the one on the left is not (red box). It's set too narrow, or there are not enough spacers. In this case, I decided to dismantle the spindle in order to add one more spacer on the right side, so that the sanding drum is not so close to the spindle support. As long as it's not touching/rubbing on the support, it's fine, but I wanted it to be as centered between the spindle supports as possible. One more thin spacer on the right end, and another one on the left, and the drums are nicely centered with the bearings nicely aligned with their slots.

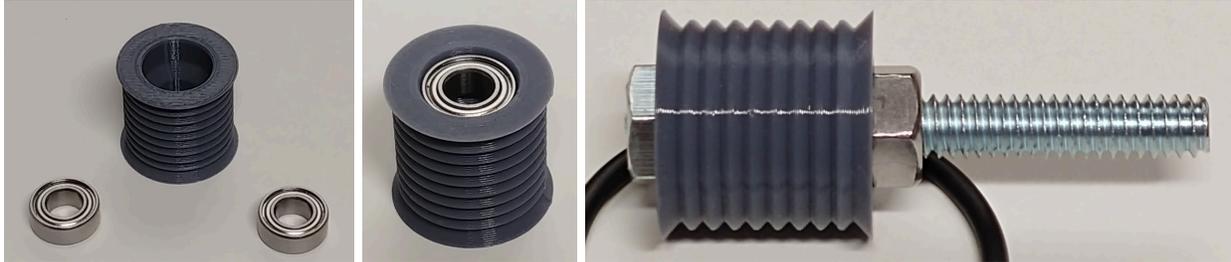


Now you can go ahead and snug down the acorn nut with a wrench. Don't "go ham" on it though, as you don't want to compress things too much and misalign the bearings. If you test again and they're not aligned anymore, maybe loosen the nut a little bit and add some blue Loctite to keep it in place. It's not a big deal if it comes off during use, since the prints will keep everything in place, anyway. The acorn nut is as much to protect fingers from the spinning end of the 1/4-20 bolt as anything else.

The entire sanding spindle should spin freely in this position. Give it a spin! If it stops immediately, look for anything that might be causing friction to slow it down. Maybe you need add or remove a spacer somewhere?

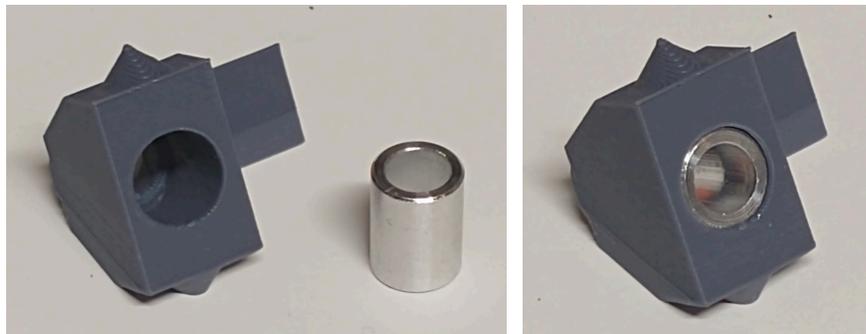
# Axle Bracket

## Parts Prep

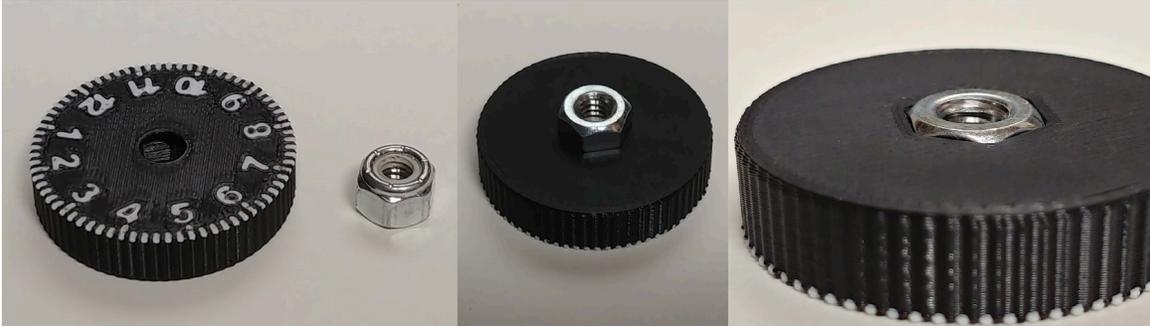


Gather the large barrel pulley and the other two R188 shielded bearings. The bearings should be a snug fit into each end of the barrel pulley. In some cases you can press them in by hand or against a hard surface, but sometimes you may need to use a bearing press to install them. Fortunately, the remaining 2" 1/4-20 bolt and nut can serve well for that purpose. Simply put a bearing on the bolt, followed by the pulley, and the other bearing, and finally a nut, and tighten down the nut until both bearings are pressed into the barrel pulley.

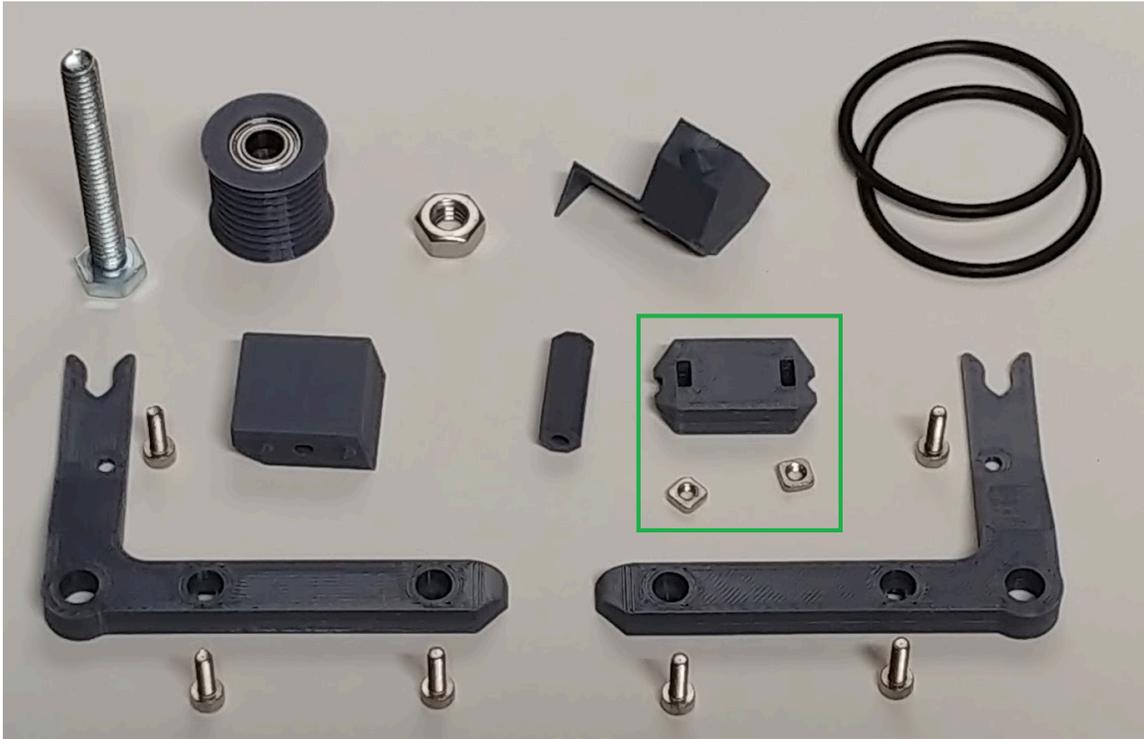
If the bearings are flush or sunk into the end as pictured, either is fine. If the bearings protrude from either end, keep pressing them in until both are flush or sunken. Then, remove the nut and bolt from the barrel pulley assembly.



Gather the indicator base and the spacer and slide the spacer into the bottom of the indicator base. There is a lip at the top, so that the spacer cannot be pressed in too far or through the print. If the spacer is loose in the print, you may have an aluminum spacer with a print made for the steel spacer, which has a slightly larger outside diameter. Similarly, if the spacer is much too large and cannot be pressed into the print without splitting the print, it may be a steel spacer with a print made for the aluminum one. If you printed your own parts, just print the other version of the indicator base. If you got a complete kit from me with both hardware and prints, contact me for a new part. If the spacer fits nicely, but seems like it slides in too easily, or is easy to remove without using a sharp tool to push it out from the other end, then some glue to hold it in place is a good idea. As long as it's not loosely rattling around in the print, there should be no impact to the function of the machine.

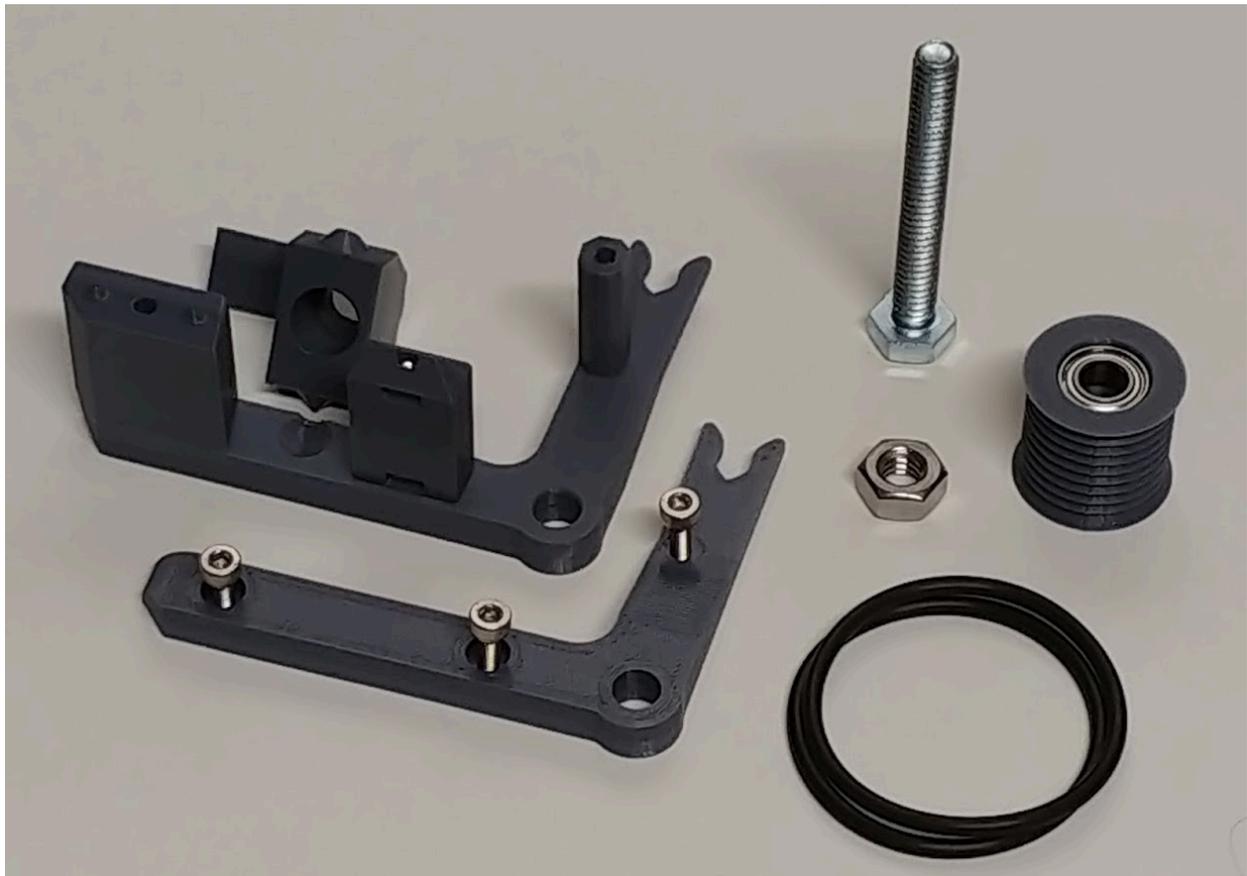


The nylon lock nut should be a snug fit in the indicator knob and can usually be pressed in by hand. Make sure you orient the nut correctly, with the nylon ring at the top of the knob where the numbers are. If you can't press it in by hand, some gentle persuasion with a vice, clamp, or light tapping with a mallet should do the trick. It should be just a little proud of the bottom surface of the indicator knob. This is by design.



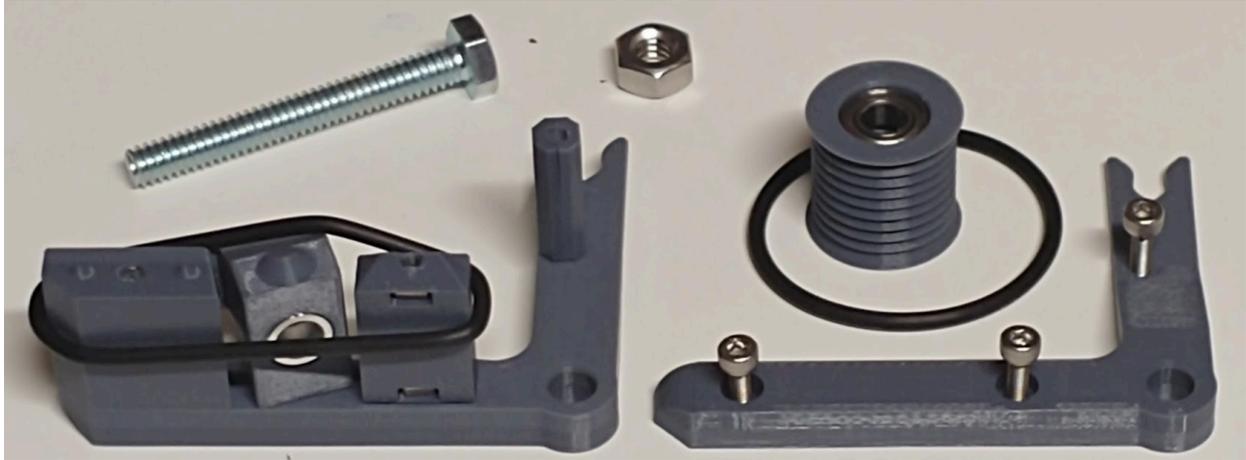
Gather up the parts shown for the axle bracket assembly. You'll need six M3x10mm socket head cap screws, two square nuts if you didn't install them previously, two o-rings, the remaining bolt and nut, as well as the printed parts shown. Note that the axle bracket sides, which have the forks for the axle bushings, are mirror images, and there are spares for each. Choose one of each side, and set the spares aside. If you have not already done so, insert the square nuts into the two slots on the part just above them in the photo (green box).

I find it easiest to start the M3x10mm socket head cap screws into the three holes on each of the side pieces. I then attach the small pieces to one side before installing the bolt, pulley, and bands.

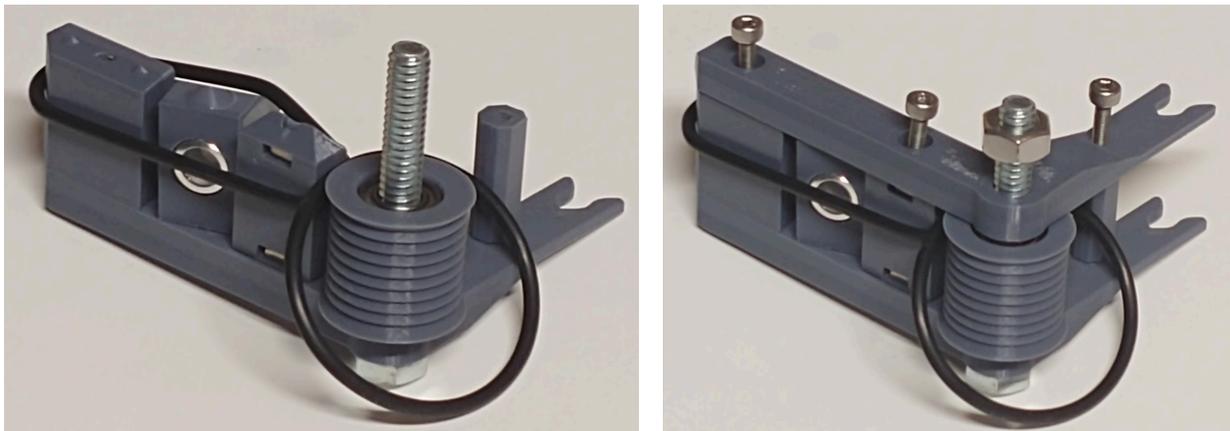


In the above photo, the various cross pieces are installed into the left side piece and the screws are all tightened. Each piece has a unique interface with the sides so it's fairly clear where each piece goes. The large piece with the hole in the center and two points on each side has a chamfer on the bottom edge that faces out. If the piece is installed correctly, then the end of the side matches smoothly with that piece.

Take note of which parts have installed square nuts, and be sure not to over-tighten the other screws that only go into plastic.



Since the indicator base is trapped by both sides of the assembly, not screwed in place, it's tricky to hold in place during assembly. I found that using one band around the bottom three pieces works well to hold it in place. Don't worry, the band will be in the correct position after the other side is installed! When placing the indicator base, make sure the pointer is facing outward, **not** toward the "elbow" of the side part.

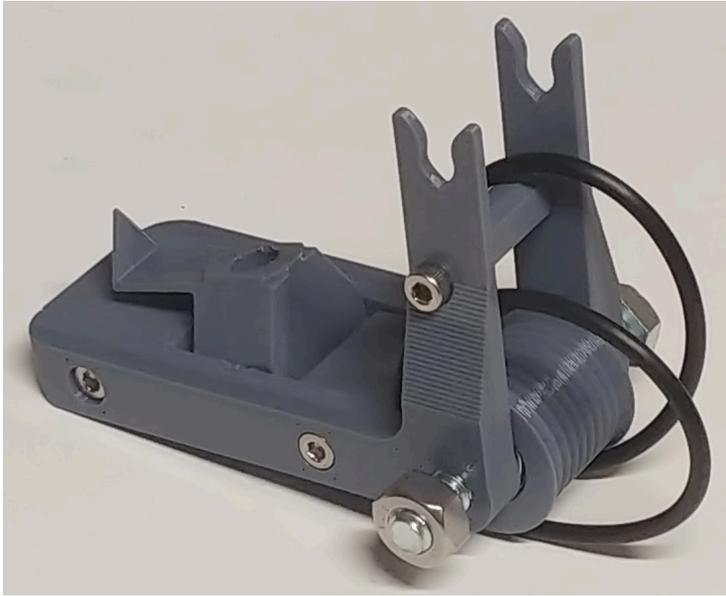


Put the  $\frac{1}{4}$ -20 bolt through the hole in the elbow, with the barrel pulley on the inside and put a second band around the barrel pulley. Again, don't worry about the band holding the indicator base in place. Trust me, it's good. 😊 Place the other side on the assembly along with the hex nut onto the bolt.

Screw all the M3 screws in, being careful not to over-tighten the ones that are going into plastic. The nut on the bolt only needs to be partially threaded, not tightened, so just leave that loosened for the final assembly.

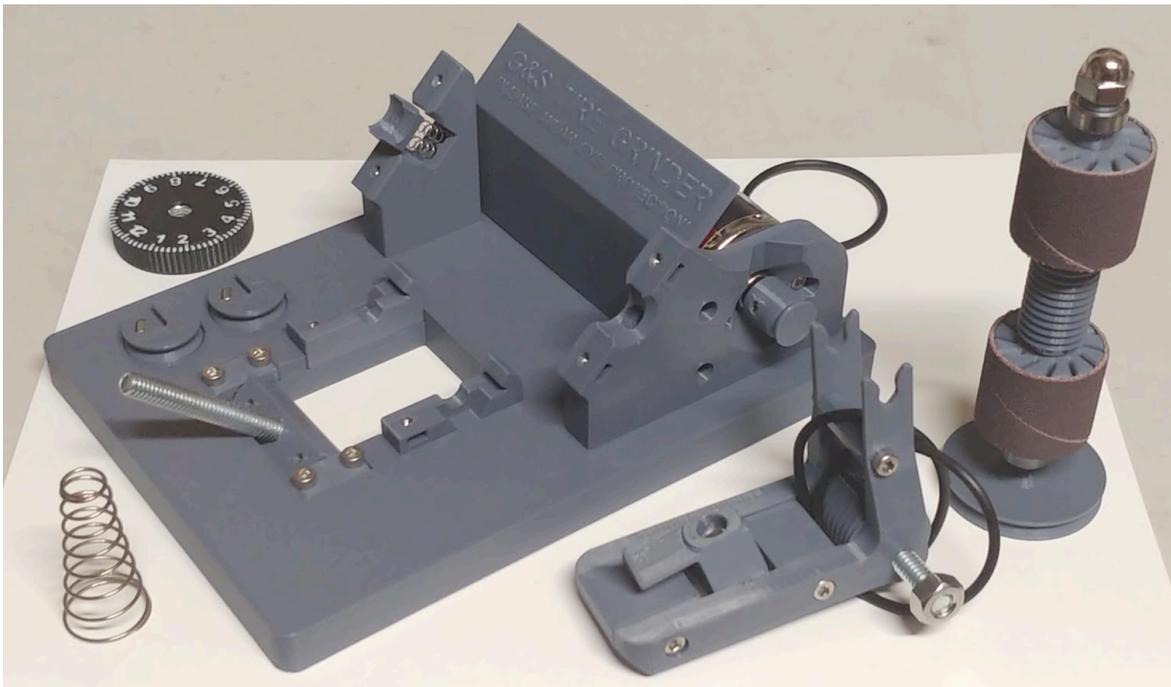
The barrel pulley should be able to rotate freely. Give it a spin! If it stops immediately, look for anything that might be creating friction. Maybe one of the bearings isn't all the way in?

Before moving to the final assembly step, move that stretched out band around the side and over one fork.



The axle bracket assembly should look like this, with one band around only the barrel pulley, and the other band around both the barrel pulley and the crossbar near the bushing forks.

## Final Assembly

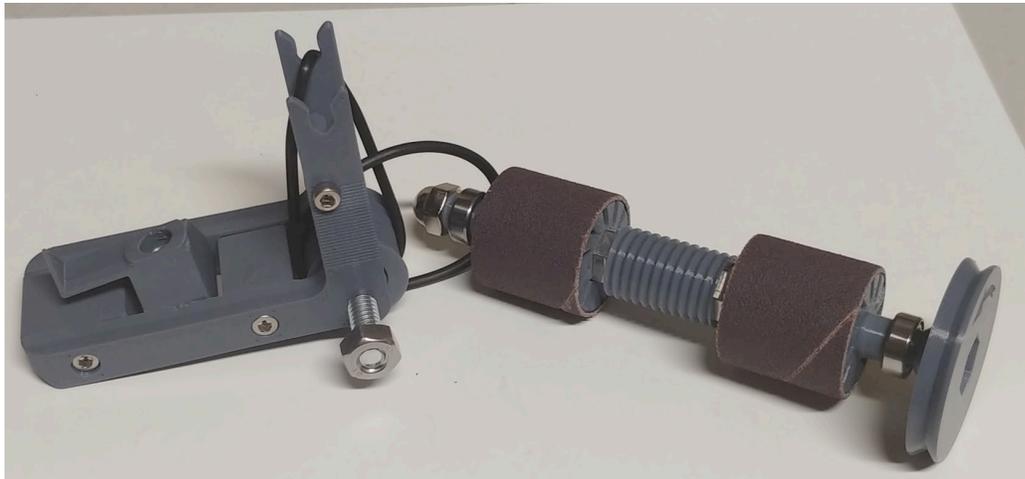


Your collection of parts should look more or less like this. Getting everything together takes a little finesse, but if you follow this guide, you should be just fine. Let's start by hooking the band that goes over the crossbar over the nearest fork. This will keep it out of the way, and prevent it from being used incorrectly.

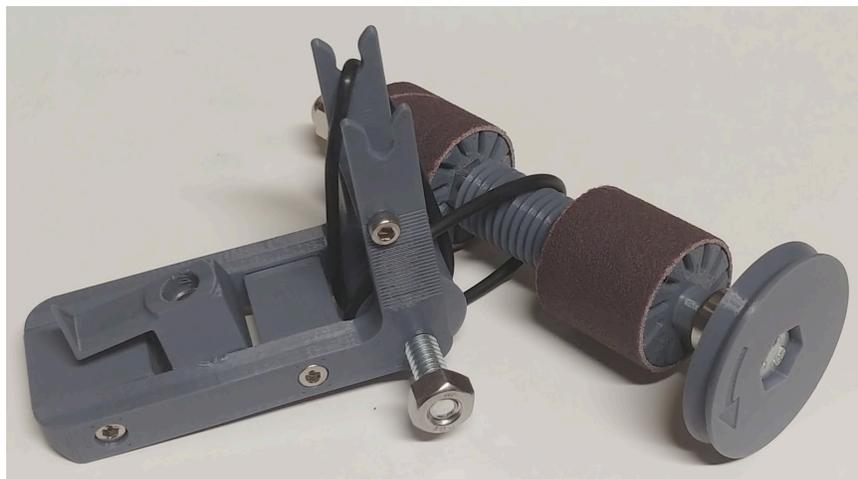


It should look like the image to the left here.

Next, insert the end of the sanding spindle that has the acorn nut on it into the second band, the one that is only going around the barrel pulley.



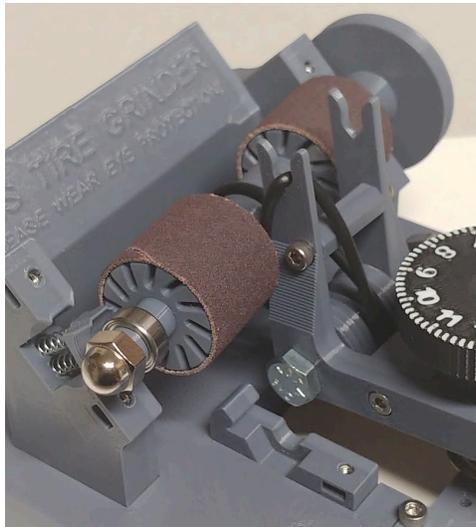
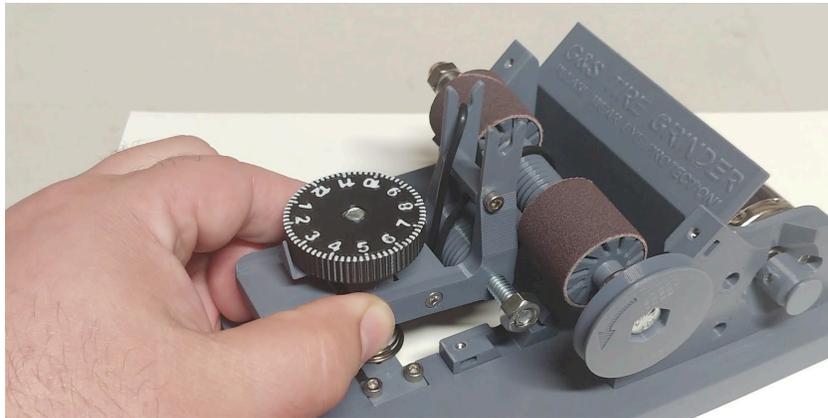
Stretch the band over the sanding drum so that it is at the center of the spindle, on the smaller barrel pulley.





Place the conical spring over the ¼-20 bolt for the axle bracket adjustment and indicator knob. The orientation of the spring does not matter. Small end up, or down, it makes no difference.

Place both the axle bracket assembly and the sanding spindle gently onto the machine, lining up the bolt with the spacer in the indicator base. Press down on the axle bracket assembly enough to start the indicator knob on the bolt. Just down to the nylon lock ring is enough for now.



Place the sanding spindle into the supports, ensuring that the R188 shielded bearings align with their slots, the left side being in the sprung bearing carrier.

Using the clamp that does not have the nut and screw in the center, place it over the right side bearing and partially screw the m3x10 screws into place. Leave them a little loose for now.





Prepare the other clamp, ensuring that the square nut is in place and all three holes have M3x10mm socket head cap screws started in them.

Taking care to keep the bearing carrier lined up with the channel in the support, use one hand to compress the springs and hold down that end of the sanding spindle while using your other hand to secure the clamp. As soon as one screw is fully secured, you can release your hold on the sanding spindle to continue driving the other screws in, including those on the right hand support clamps that were previously left a little loose.

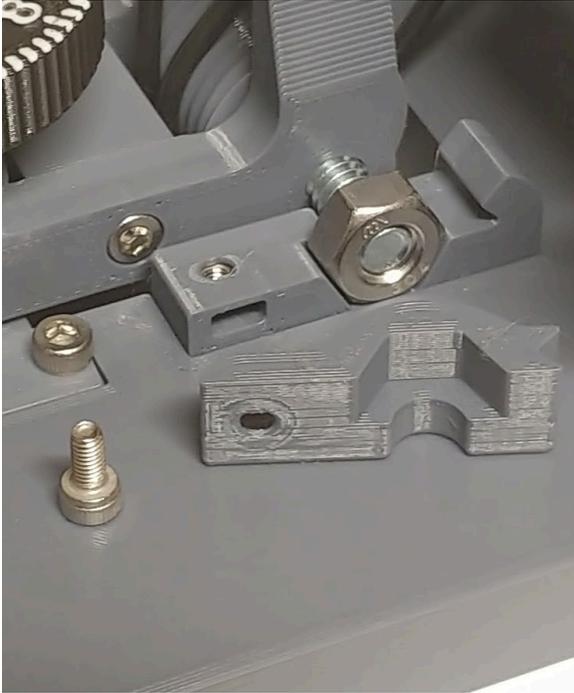


Leave the center screw partially threaded. That screw is used to tram the sanding spindle to the axle when truing your tires, and will need to be adjusted in or out depending on the position of the axle bracket and size of the wheels and tires.

Begin turning the indicator knob clockwise to screw it down onto the bolt. As you do, check the alignment and fit of the pivot bolt and nut. You may need to loosen or tighten the nut so that the bolt fits snugly into both clamps on either side of the pivot. The nut may appear to be at risk of coming off, but it will not,

since both the bolt head and the nut will be trapped in hexagonal clamps, unable to rotate.





Once the knob has been turned down enough for both ends of the bolt to rest securely in their hexagonal traps, install the appropriate clamp onto each side, matching the orientation of the hexagonal shaped hole.

Secure them to the base using a single M3x6mm socket head cap screw each.

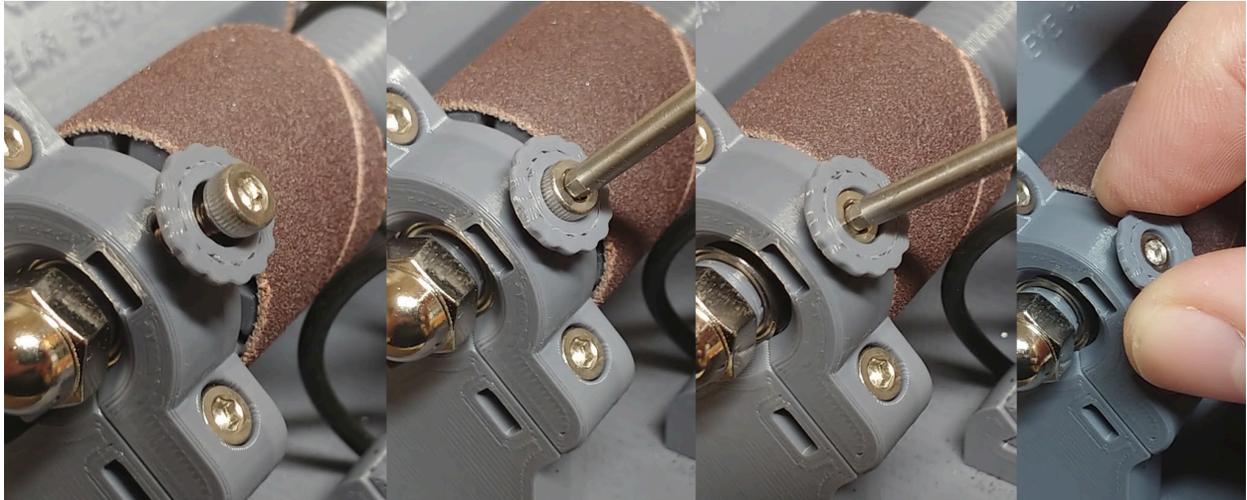
The axle bracket can now be raised and lowered, adjusted at will by rotating the indicator knob.

Refer to the setup and usage guide for best practices using the various features of the machine.

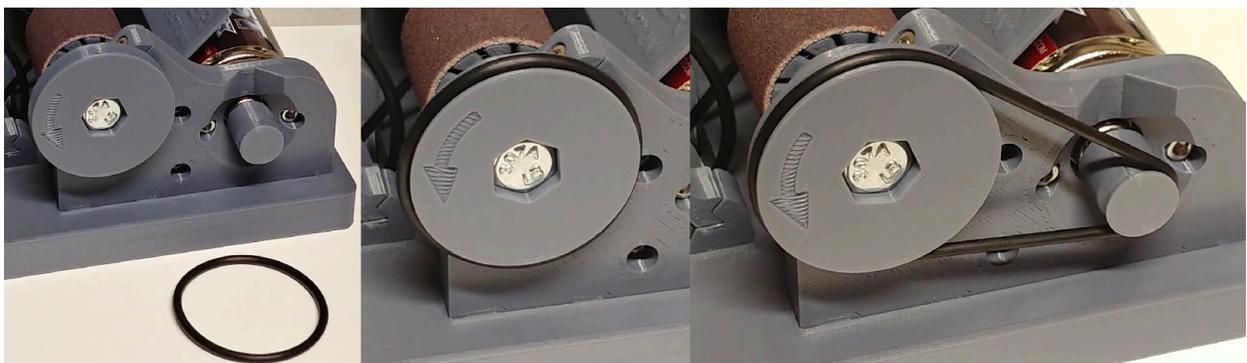


## Finishing Touches

For convenience, there is a printed thumb screw for the m3x10mm socket head cap screw used for tramming the sanding spindle. It's a press fit to the head of the screw, and the easiest way to install it is to remove the screw, put the screw through the center of the thumb screw print, and then drive the screw all the way in using your 2.5mm hex driver. You'll probably need to use the hex driver to back it out a little after driving it in, but then you can make adjustments by hand rather than a hex driver.



The machine won't work without connecting the motor to the rest of it, so grab one of the remaining bands, give it a gentle stretch to make this a little easier, and loop it around the large pulley at the motor end of the sanding spindle. Then, stretch it out and over the small motor pulley, making sure that the band rests in the notch of the pulley.



Get one of each of the two types of split pulleys. They are marked with 3mm and 3/32" text to more easily tell them apart. A black Sharpie on the raised text can help make them even more easily identifiable. Insert a square nut into the slot, and drive one of the m3 set screws in through the hole in the channel of the pulley. Be careful to keep the nut and screw lined up until

it has definitely threaded in correctly, and try to avoid cross threading. Drive the set screw in until it's below the plastic in the pulley channel, but not going into the slot for the axle.



Finally, the power supply (PSU). You can use any DC power supply that can provide up to 12v, and at least 5 amps of power. It's unlikely you'll ever need to run it as high as 12v, but most power supplies go up to that much, at least. You don't need anything higher. Five amps is highly recommended because the machine can often take over 3 amps under load, and power supplies that have a 3 amp max will drop voltage significantly when it reaches the max. You want a power supply with more amps than are needed. A power supply with a display that shows volts and amps is ideal, but volts only is good. No display is still usable, but you'll need to rely on the sound of the machine to determine how much load you are using.

Generally, you would connect the black wire to the negative on your PSU, and the red wire to the positive. If your motor does not have pre-attached wires, then the contact with a red dot nearby is usually the positive contact. In the end, all that really matters is that the rotation of the sanding spindle is in the direction of the arrow on the large pulley. This will ensure that the axle is driven into the bracket rather than out of it, and most tire debris will be flung to the base, and not into your face. In any case, eye protection is strongly recommended. If the sanding spindle is rotating the wrong way, just switch the wires at your PSU.



The base of the grinder should have small receptacles for each of the two types of split pulleys.

Depending on the print, these may be snug or loosely fitting. If they're snug, just don't press the split pulleys all the way down. If they are loose, you can use the set screws to hold the split pulley in place in the holder.

If they are loose and you don't want to use the set screws to hold them in place, you may need to grab a bottle of nail polish and add a couple coats to the tab that goes into the slot of the split pulley. Give the polish plenty of time to cure before testing the fit, and add coats as needed until you get the fit you like.

Again, a black Sharpie carefully applied to the lettering will help make the two locations more

quickly identifiable.

One final touch, which is completely optional and depends on your work space, is to add some kind of non-slip sheet or feet to the bottom of the base. Self adhesive silicone or rubber feet work nicely. It's important to support the center of the base as well as the four corners. I would put a rubber foot near the center of each of the long sides of the base to prevent flexing, as well as one at each corner.

The kits I provide come with spare parts as shown: spare axle bracket sides, two each spare split pulleys and motor pulleys, one spare bearing carrier and rubber band, as well as at least one each of the smaller pieces of hardware.



# Links

G&S Tire Grinder Setup and Use Manual

<https://www.ggaub.com/slots/GnS-Tire-Grinder-Setup-and-Use.pdf>

G&S Tire Grinder Setup and Use Video

<https://youtu.be/5vuEkP1133g>

G&S Tire Grinder Rubber Band Replacement Video

<https://youtu.be/ol07BcVMcRQ>

G&S Tire Grinder Assembly Manual (this document)

<https://www.ggaub.com/slots/GnS-Tire-Grinder-Assembly-Guide.pdf>

G&S Tire Grinder Assembly Video

[https://youtu.be/yfhOtThl\\_8c](https://youtu.be/yfhOtThl_8c)

G&S Tire Grinder 3d models, and hardware list for DIY

<https://www.printables.com/model/459450>