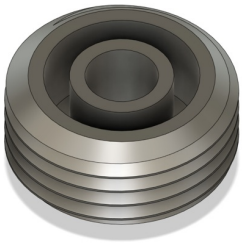

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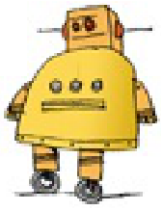

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Converting Brass Hardware Into Potentiometer Knobs With 3D Printing Instruction Manual

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Converting Brass Hardware Into Potentiometer Knobs With 3D Printing

 by neonstickynotes

I've been working on two long-term projects, the rst is a tennis racket electric guitar, inspired by Scrap Wood City

and Pucket Cigar Box Guitar and the second project is an LED-backlit box to display my art. Both require potentiometers for control and use the knurled 18t split shaft variety. One came with a knob albeit a cheap plastic one and the other needed one. I looked at brass knobs to purchase and wasn't satis ed with what I found, there weren't many options and the few that existed didn't seem to
t the projects. Later, I realized that a homemade approach would best suit the cobbled- together aesthetic I was going for.
After some rummaging through my local hardware store I noticed that gas are caps* would t the bill and are nice to turn with the faceted sides and rounded features. At rst, I tried to put a hardwood dowel into the cap and drill a hole for the potentiometer to slide into. I ran into several problems.

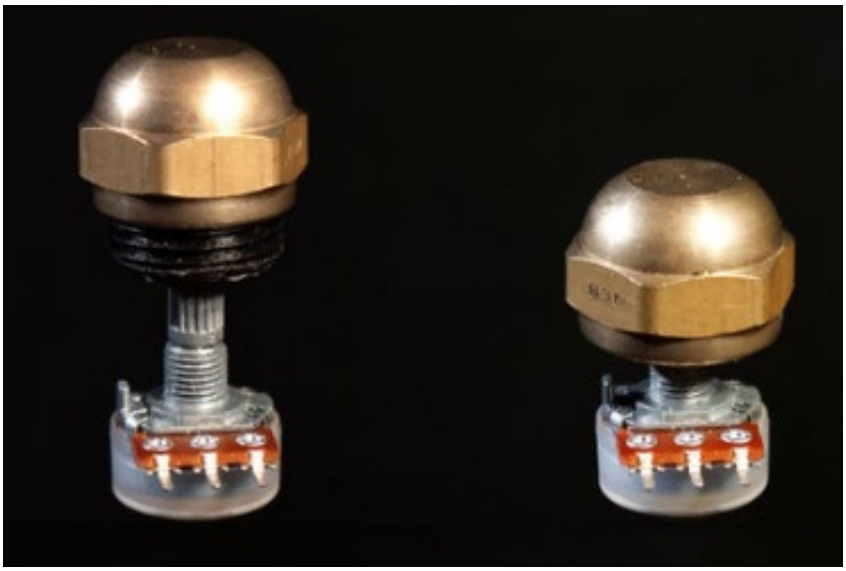
1. Drilling a hole into the end grain of a dowel makes it relatively weak and susceptible to splitting.
2. If you drill your hole o center or not perfectly perpendicular to the dowel, the knob will be all cattywampus when you turn it.

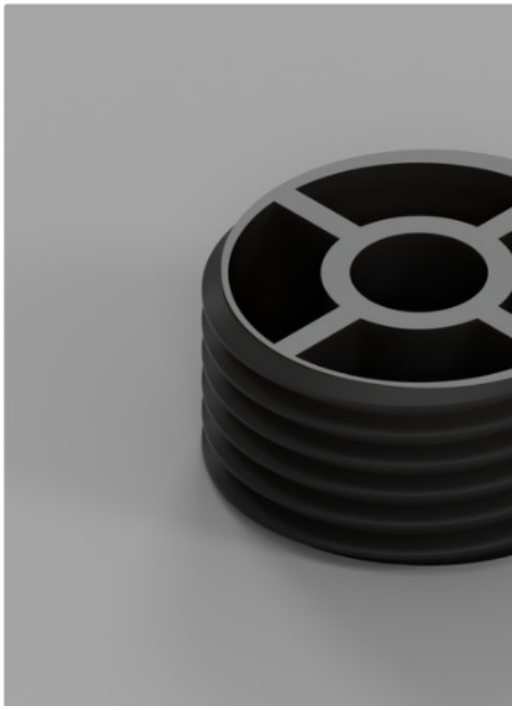
After several unsuccessful attempts to make the part with wood, I realized that using the 3D printer at my library, which I had just learned how to use, would be the ideal solution. If you have access to a printer at your library I highly recommend you check it out! The following are instructions for how you can make (what I'm calling) a cap onverter for any threaded cap.
*According to ChatGPT, A 45-degree are cap is a type of brass cap that is used to seal the end of a brass pipe or tube with a 45-degree are tting. The cap covers the end of the pipe or tube to protect it from dust, debris, and other contaminants, and to prevent uid or gas from escaping. The 45-degree are cap is typically threaded to t onto the end of a brass pipe or tube with a 45-degree are tting, and it provides a secure, leak-proof seal. This type of cap is commonly used in plumbing and piping applications, as well as in other applications that require the use of brass pipe or tube.
Supplies:

1. Access to a 3D printer
2. Filament (I used PLA)
3. 1/2″ Brass Flare Cap (~$5)
4. 15/64″ drill bit
5. 7/32″ drill bit
6. Sandpaper

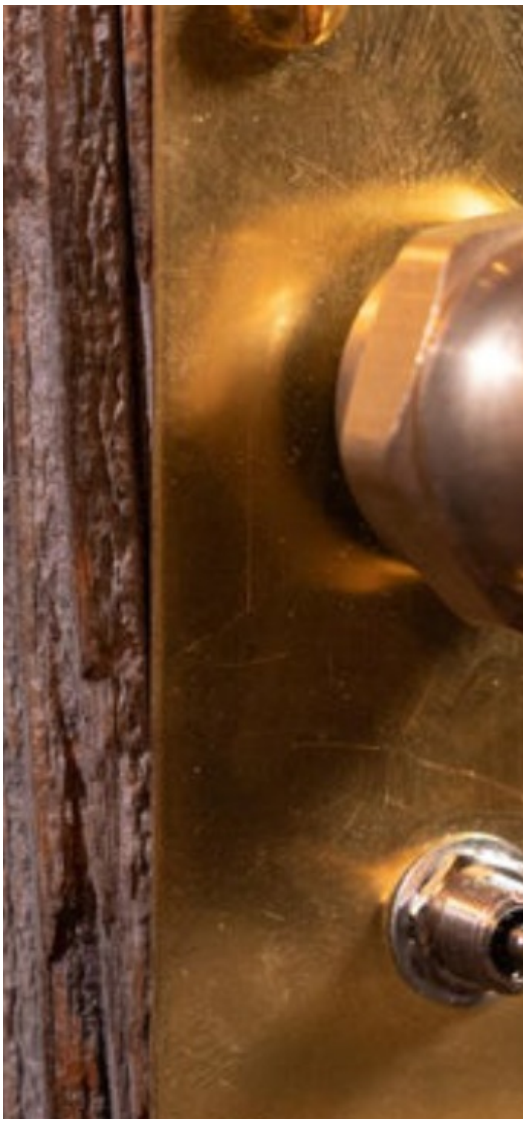
If you want to design your own cap converters

1. Autodesk Fusion 360 or another CAD program



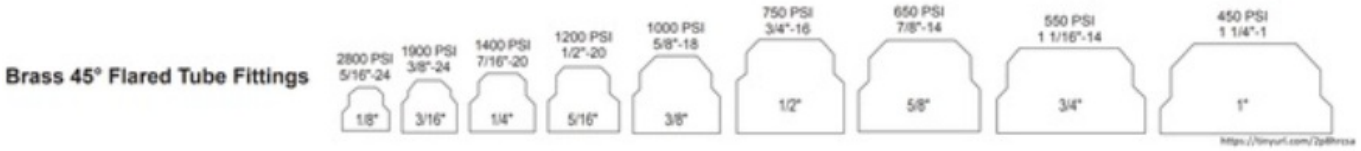


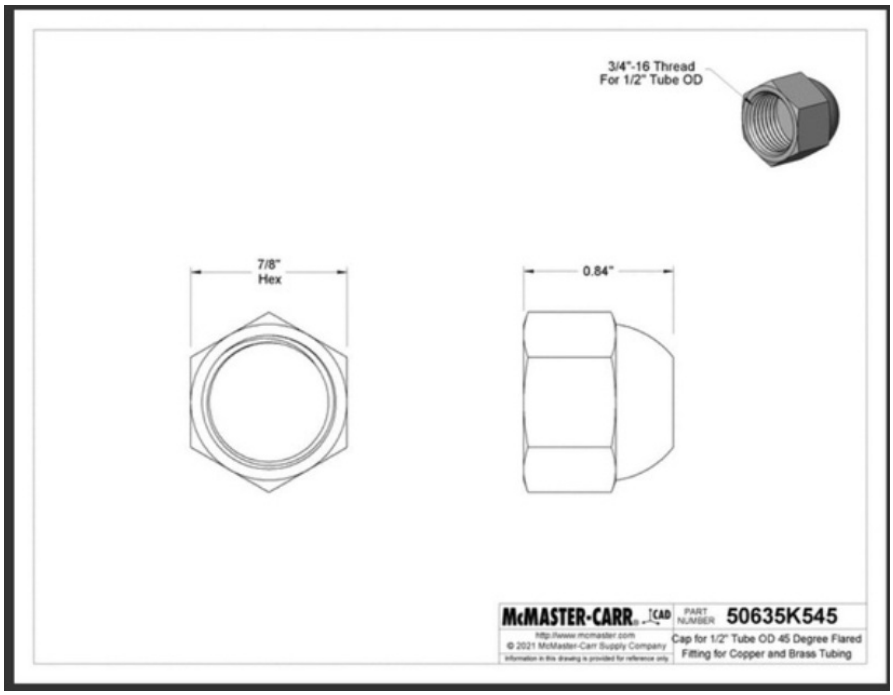

POWER KING
TEXCEL
TAPE



Step 1: Measure Your Cap

If you are using a di erent cap for your knob you will need to nd the dimensions of its thread. I found this information just by looking online but Mcmaster Carr is a great place to start as they have drawings for most hardware. The female threads of my cap are 3/4-16 which means that if you wanted to model a piece to screw into it, it would need a diameter of 3/4″ with 16 threads per inch. If you are working with a metric cap this is how you would decode the speci cations.
EX. M12-1.75
M:M: designates metric
12:12: designates the diameter as 12mm
1.75: designates the thread pitch (in mm)





Step 2: Modeling the Cap Converter

Note: After doing some more tests with different settings I decided to change two dimensions in the Video and

photos.
The instructions below are already updated. (The ” rst circle” is now 6.35mm and the “third circle” is 16.05mm.
I will show you how simple it is to make this model from scratch in case you want to use this method with other sizes/styles of hardware.

Software

The modeling operations can likely be done in any 3D modeling software but I chose Autodesk 360. You can Download Autodesk 360 Fusion for free here (for personal use).

The Design

A quick note on the design, I tried a few designs (The last three images). In the end, I chose to cross pattern to minimize the use of material and to make it easier to screw the piece into the cap with needle nose plyers.
Most of the steps are also shown in the above pictures.

1. Open up your CAD software, create a new sketch, and select the top plane.
2. Select the center diameter circle tool and draw a circle with a diameter dimension matching your caps threads. I did 3/4″ or 19.05mm.
3. Click ” nish sketch” and use the extrude tool to make your circle into a cylinder. Extrude it a little more than the length of the threads in the cap. I did 9.5mm.
4. Select the top of the cylinder and create a new sketch on that surface.
5. Draw three center-diameter circles in the center of the cylinder with diameters of 6.35mm, 8.5mm, and 16.05mm (These will form the shell structure of the part).
6. If your circles are blue and not black, use the Concentric constraint to make all 3 circles concentric to the cylinder.
7. Use the line tool to make two vertical lines (left/right of the circle’s center) that start at the second circle and stop at the third circle. Make both lines .625mm from the center of the circle on their respective sides.
8. Click Create Create>Circular Pattern Circular Pattern For the “Objects” select the two lines you just made and for “Center Point” select the center of the circles. Set “Distribution ” to “Full” and “Quantity” to “4”
9. Use the Trim tool to remove the 8 curved lines between the 8 lines we just made. This will connect the inner and outer circles.
10. Finish the sketch and Extrude (cut) the center hole and the four Simon button-looking shapes all the way through the part. “Extent type” should be set to “All” and “Operation” to “Cut”

https://www.youtube.com/watch?v=AmK916aHMVI

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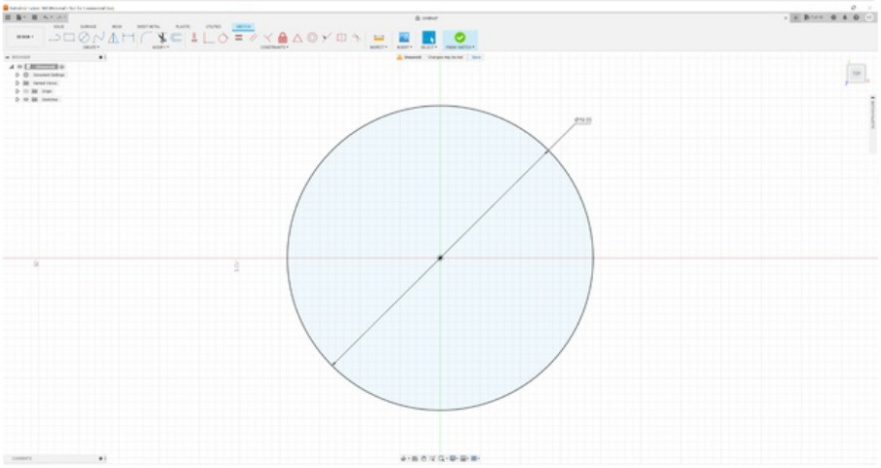

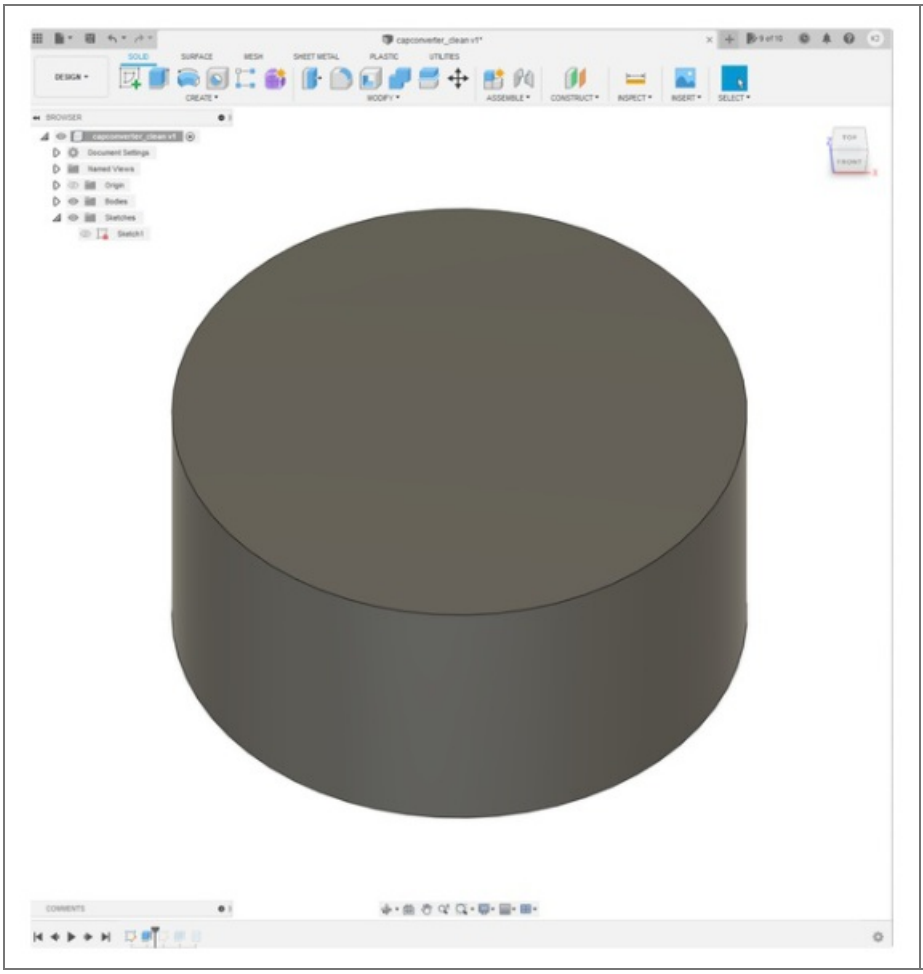

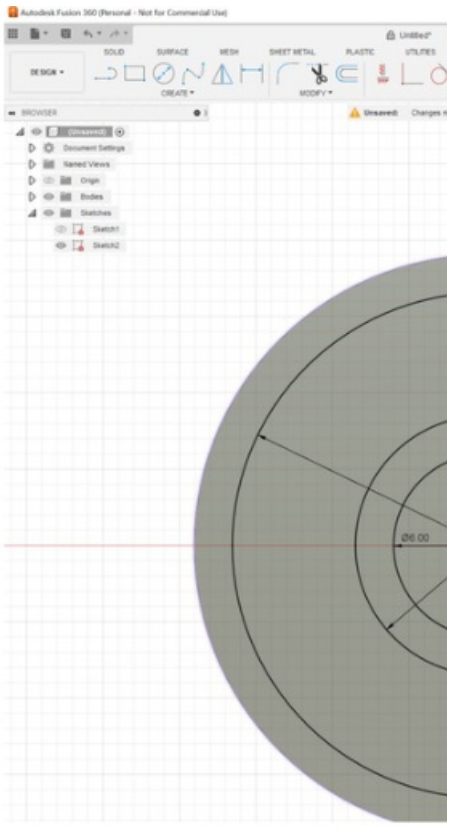
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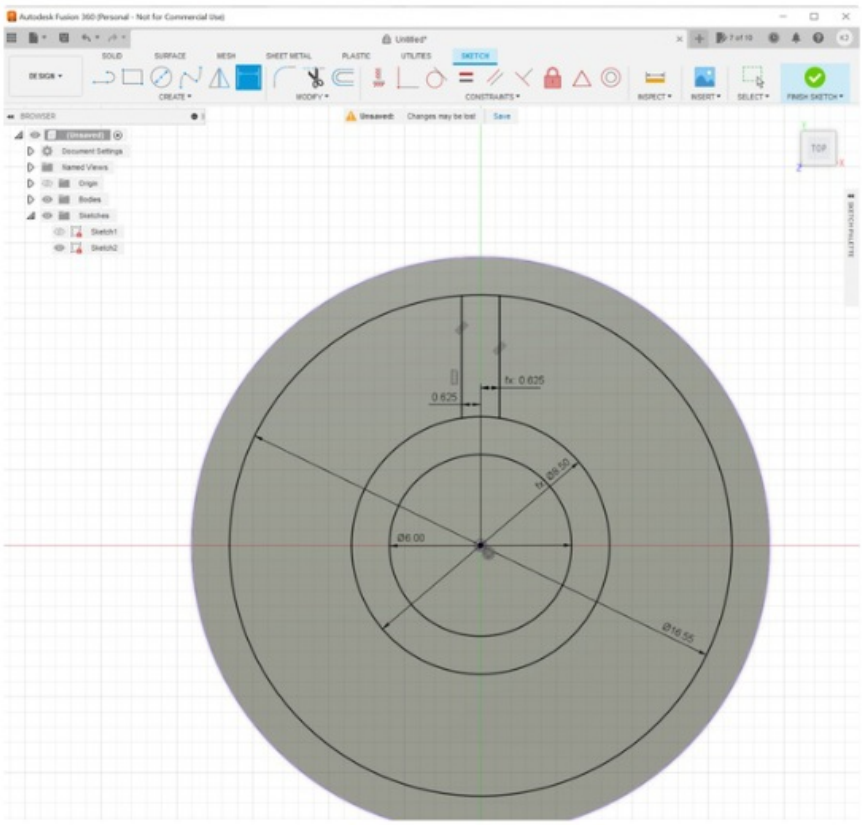
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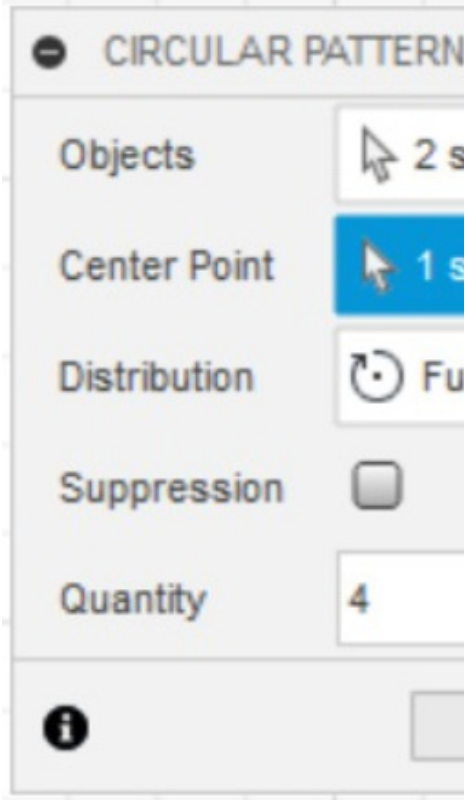
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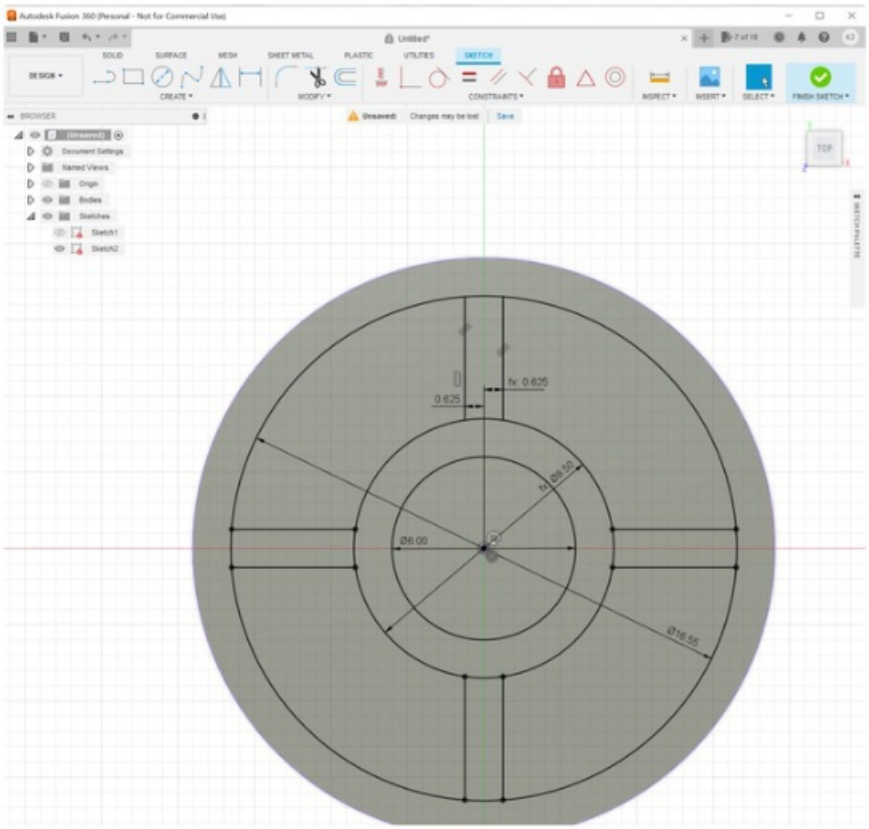
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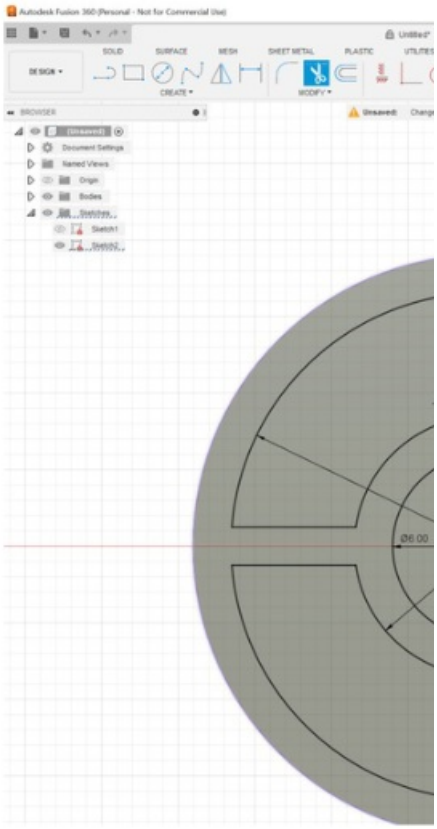

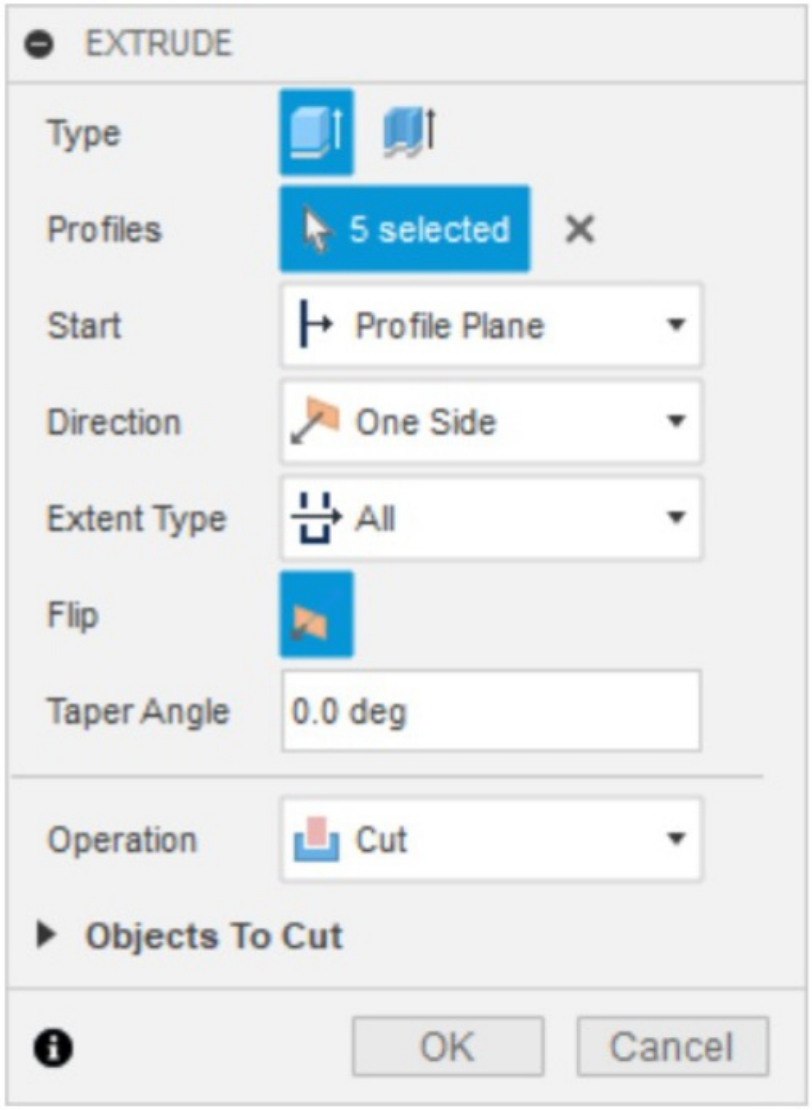
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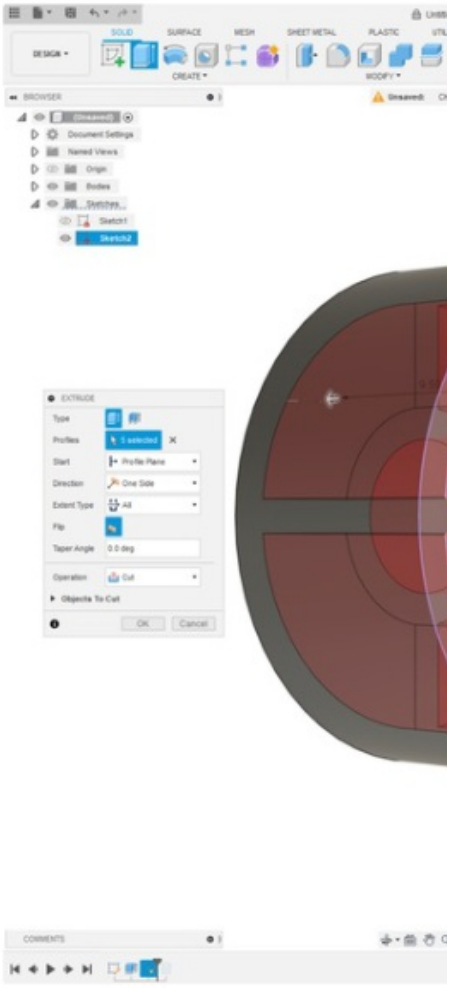
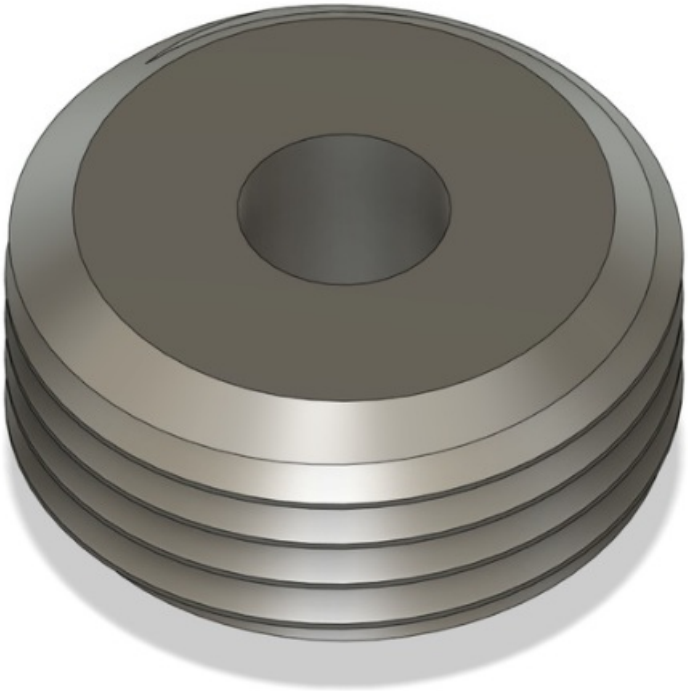
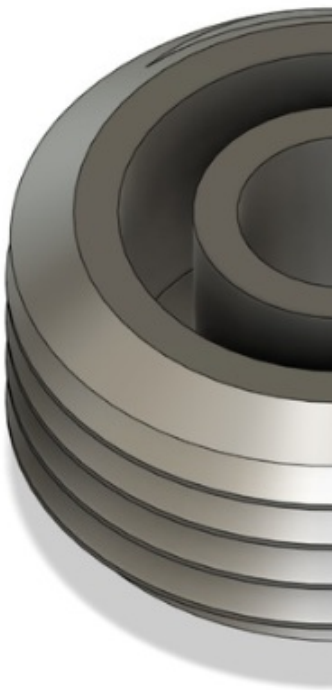
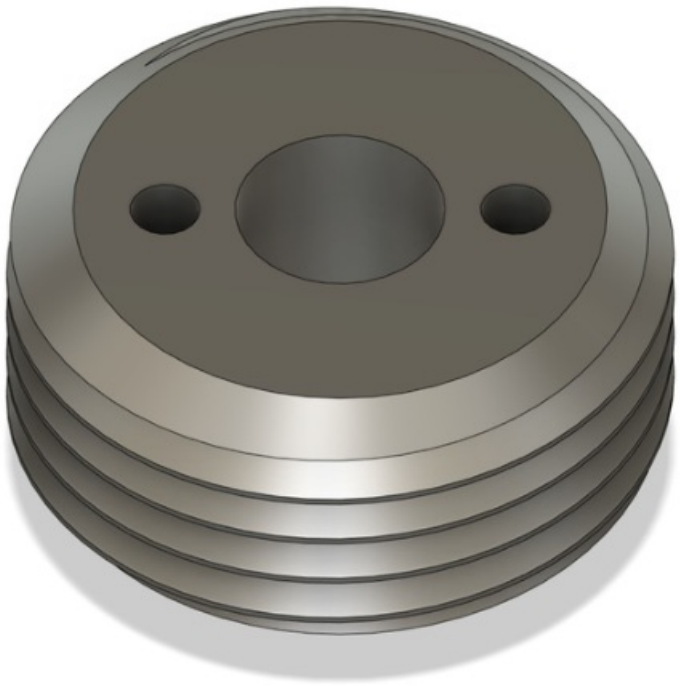






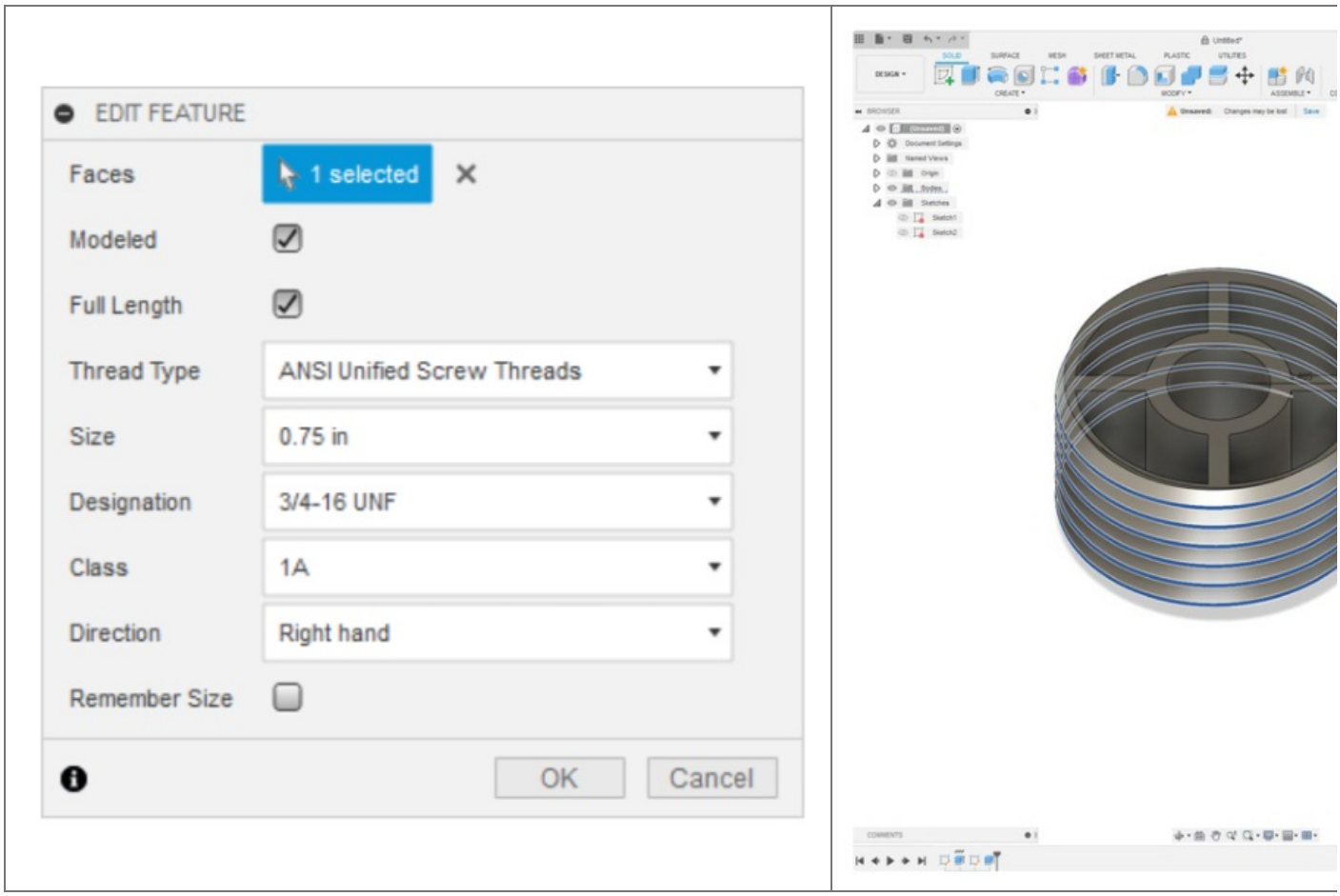


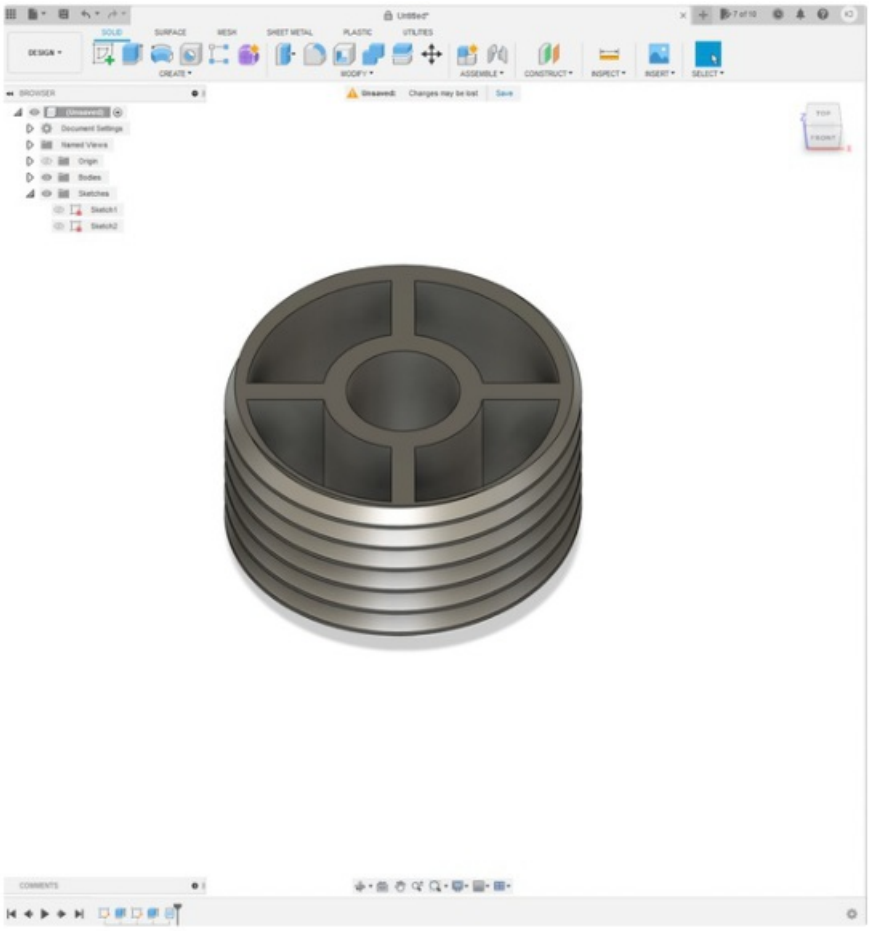
Step 3: Adding Threads

Use the thread tool to make the threads on the outside of the cylinder. Click Create Create>Thread and select the side of the cylinder. Input the settings below (If you are using a diffcylinder erent cap you will need to change the size and designation).

Thread Tool Settings

- [x] Modeled Threads (checked)
- [x] Full Length (checked)
- Thread Type: ANSI Unified Screw Thread
- Size: .75 in
- Designation: 3/4-16 UNF
- Class: 1 A
- Direction: Right Hand





Step 4: Exporting & Printing (Files for Download)

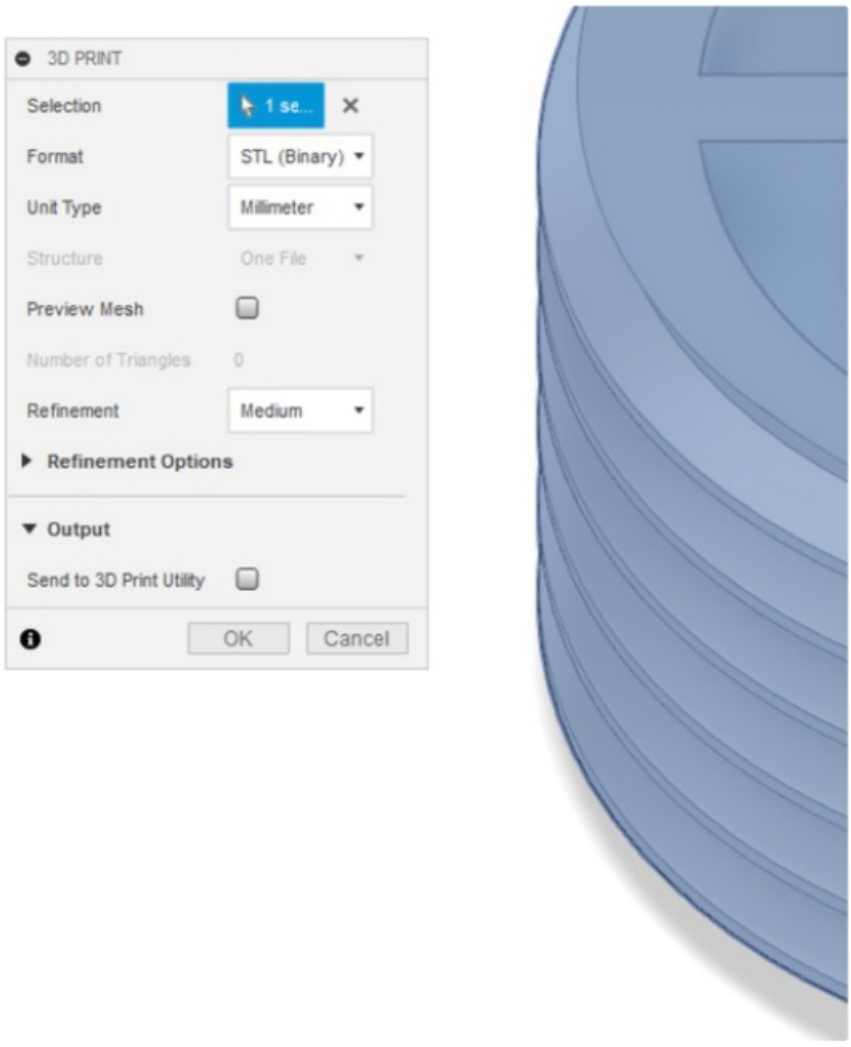
Exporting Your File To export, the file for printing go to File>3D Print>Select Your Model
3D Print Dialog Settings

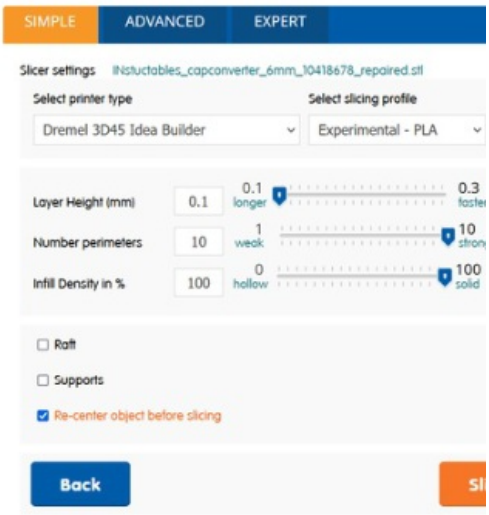
- Format: STL (Binary)
- Unit Type: Millimeter
- Refinement: Medium
- [ ] Send to 3d Print Utility: (unchecked)

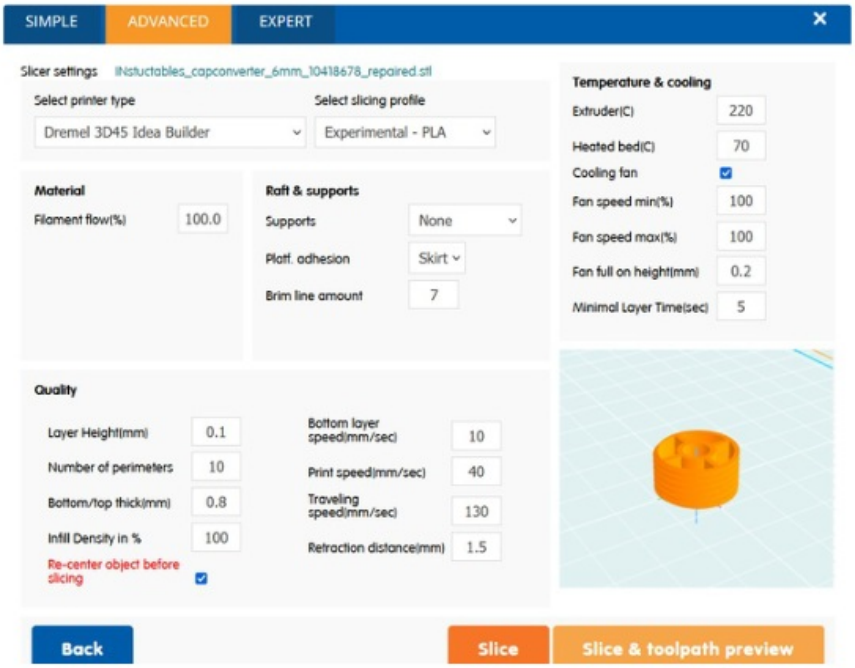
Click OK and select file destination.
Printing
Wi The step-by-step process for slicing/printing your model will vary based on your printer (My library has Dremel printers I printed with PLA and oriented the part so that the hole for the potentiometer shaft was vertical.

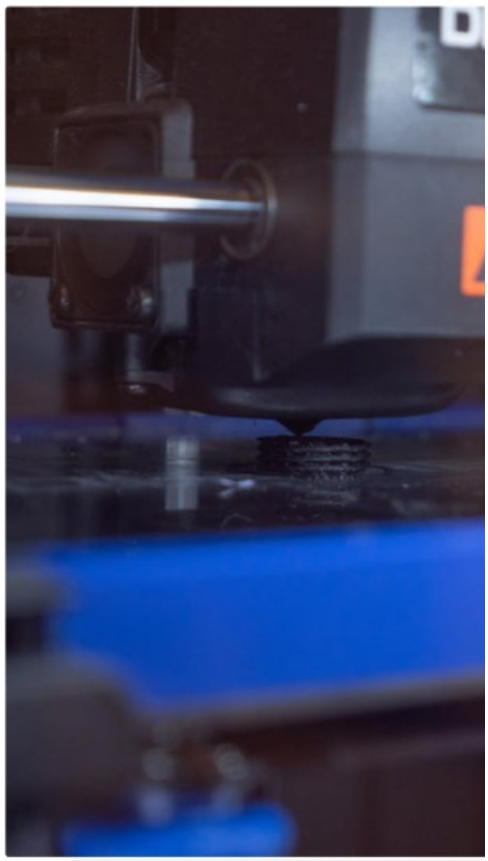
- Layer Height: .1mm (.2mm works too)
- Shell: 10 • Infillok: 1 00°/0
- Supports: None
- Raft: None

It took me 20 minutes to print.









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https://www.instructables.com/F2M/APDI/LDJ5S45F/F2MAPDI

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https://www.instructables.com/F2M/APDI/LDJ5S45F/F2MAPDILDJ5S45F.stl

Step 5: Test Fit & Adjustments

The Threads

After printing, test the fit by screwing the adapter into the cap, you may be able to screw it in by hand or you can use needle nose plyers. If your converter isn't screwing into the cap correctly (after trying both ends) I'd recommend trying to calibrate your printer or checking out this video by Product Design Online to increase the tolerance of the threads.

The Hole

Test the fit of the potentiometer in the hole by pushing it in a small amount. If it is tight you can slightly ream out the hole with a 7/32″ or 15/64″ drill bit. Put the drill bit in the hole and turn the cap while applying pressure perpendicular to the drill bit. This will very slowly shave away some plastic to make a looser fit. As a general guideline, I'd aim to be able to seat the cap with the strength of one finger. If the fit is initially loose, you can adjust the hole size in the provided source file (edit the second sketch).

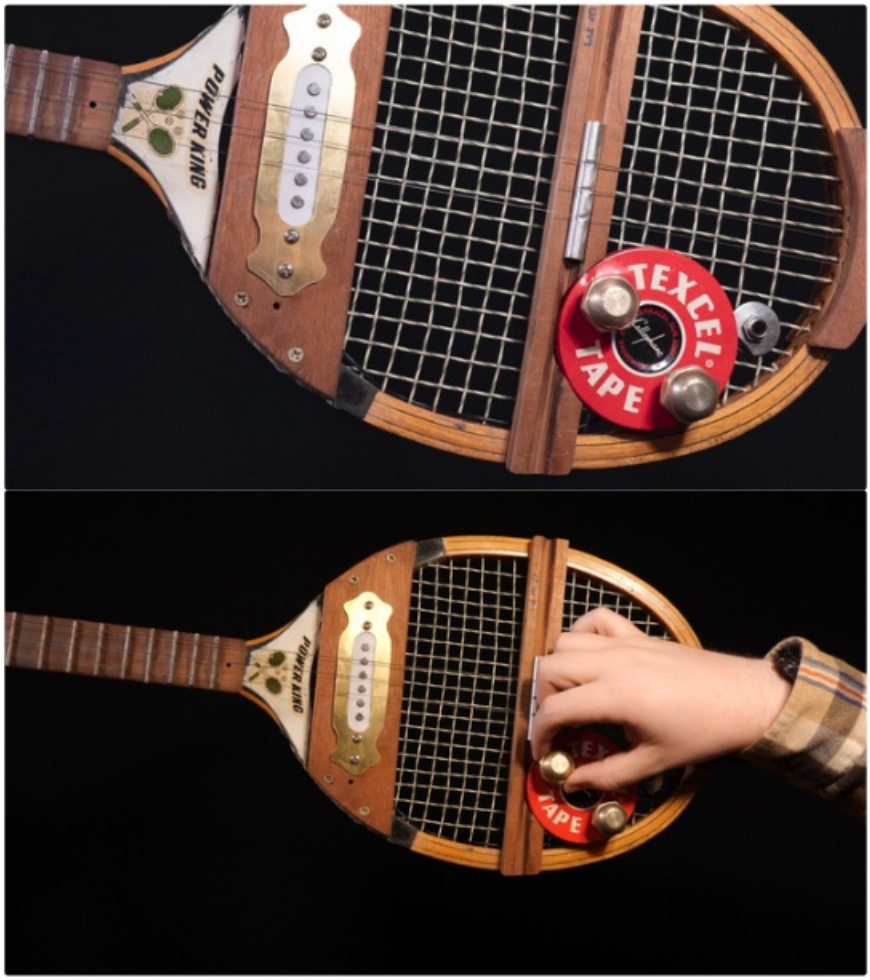
The Height

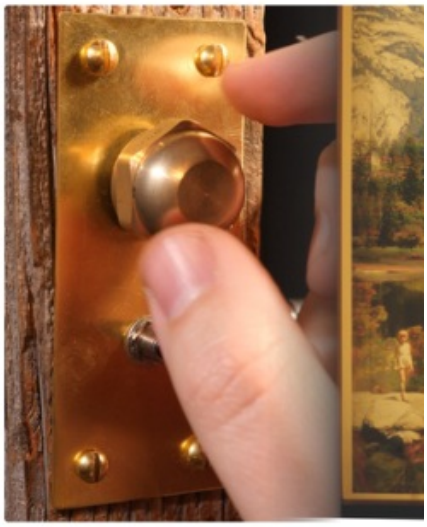
If the height of your converter is too tall for your cap, you can sand it flush with the converter placed in the cap. To prevent scratching the cap with sandpaper, unscrew the converter one turn, and then sand it. Now, when you reseat the converter it will sit flush or recessed into the cap. Once fully seated I found it to be a tight fit but, if desired you can glue the converter to the cap with epoxy.

Note: Be careful not to push the cap down past the knurled portion of the potentiometer shaft. If it is pushed down too far the converter can get stuck.

Step 6: Conclusion

Overall, I am pleased with how this came out, it is much more elegant than my original idea. Also, I have a new tool in my arsenal with the 3D printer. In the future, for further customization, I plan to experiment with stamping the cap. Now I just have to nish the other aspects of the projects!
There are many other pieces of hardware that you could do this with. Thank you for reading, I hope you learned something and can customize your projects with this method!





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Documents / Resources

	instructables Converting Brass Hardware Into Potentiometer Knobs With 3D Printing [pdf] Instruction Manual Converting Brass Hardware Into Potentiometer Knobs With 3D Printing, Converting, Brass Hardware Into Potentiometer Knobs With 3D Printing

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- content.instructables.com/FS6/9P86/LDJ5S445/FS69P86LDJ5S445.f3d
- Fusion 360 Help
- Fusion 360 Help
- Add a concentric constraint to a sketch | Search | Autodesk Knowledge Network
- What Knob Will Fit on My Gear? - Love My Switches
- upload.wikimedia.org/wikipedia/commons/c/cd/Simon_Electronic_Game.jpg
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