

## Building an Off-Center Fixture for Turning Pendants

Turning a pendant off-center with most available metal pendant chucks means that you will have a significant amount of mass off center, which will limit the RPM you can run. You are also limited to degrees of offset and pendant rotation by the fixed hole positions.

In the design below, all of the mass except the pendant blank and part of the pendant mount is always balanced, enabling safer turning, higher RPM and cleaner cuts. It also provides both a continuously variable pendant rotation and offset up to the maximum while keeping the whole fixture balanced. The dimensions below are for a fixture that has a maximum 1" offset. Larger offsets are possible, but it will require a larger diameter fixture. The fixture consists of three main assemblies – offset assembly, inset circle and pendant mount.

### Cutting the Parts

1. There are five main pieces required – three from  $\frac{3}{4}$ " plywood and two from  $\frac{3}{4}$ " thick hardwood (Figure 1).
  - a. 7" square plywood
  - b. 6" square plywood
  - c. 4" square plywood
  - d. Glue block hardwood square
  - e. Pendant mount (not shown)

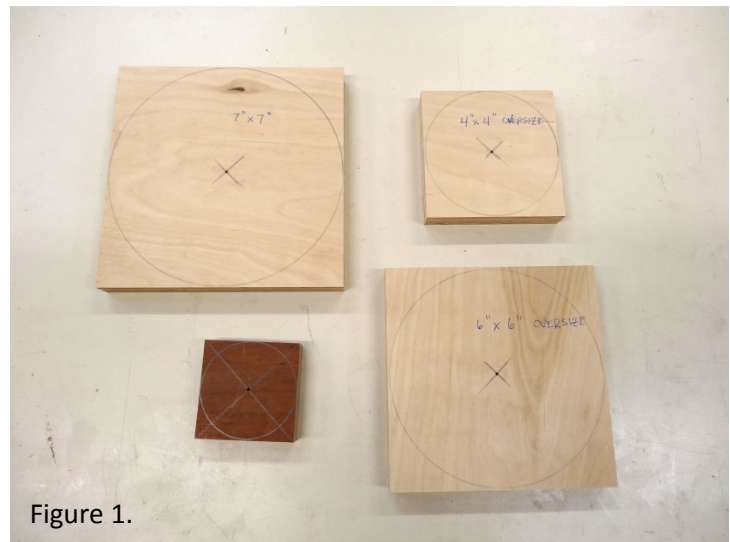


Figure 1.

2. Draw a 7" diameter circle centered on the 7" plywood square. Draw a 4" concentric circle using the same center as the 7" circle. Drill a small hole through the center to mark the center on both sides. Use a drill press or make sure the hole is perfectly perpendicular. Mark a new center  $\frac{1}{2}$ " off the center of the 7" diameter circle and draw a 6" circle using this offset center (Figure 2). Cut out the 7" circle using a bandsaw or jigsaw.

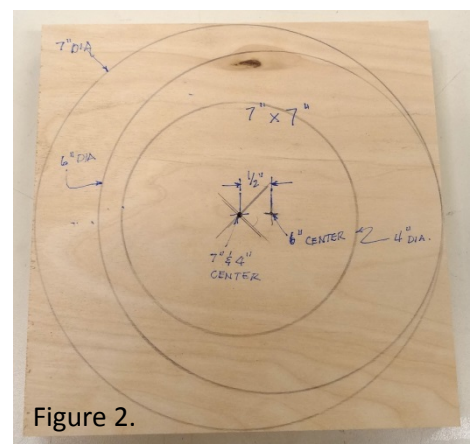
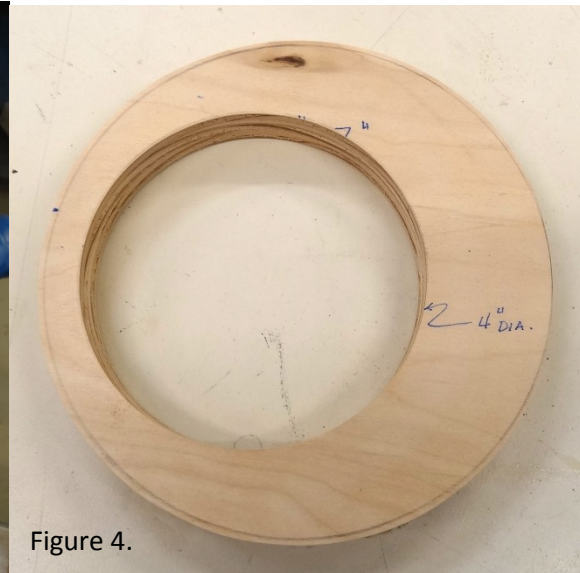
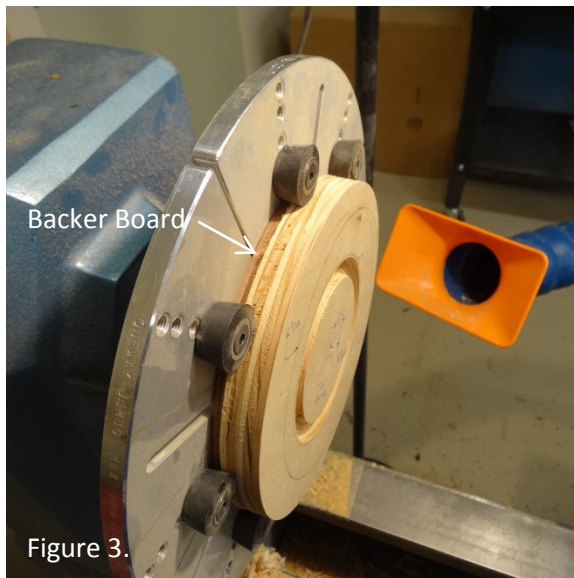


Figure 2.

3. Mount it between centers using the small hole and round the outer 7" diameter. Mount it in jumbo jaws or a Longworth chuck with a thin backer board so you do not cut into the chuck (Figure 3) and carefully cut out the 4" circle with a parting tool, being careful to keep waste inside the 4" diameter. Cleanup to the edge of the 4" line with a scraper. Make sure that the cut is perpendicular to the face

and not angled. Remove the ring from the chuck and cut out the 6" circle drawn in Step 1 using a bandsaw or jigsaw. You should now have a 6" diameter ring with a 4" hole offset by  $\frac{1}{2}$ ". Save the ring and discard the cutout (Figure 4).



4. Cut out a round glue block and drill a small hole through the center, making sure the hole is perpendicular. Select a good hard wood for the glue block so it will stand up to multiple mountings in your chuck. Mount between centers using the center hole and turn a tenon on one side to fit your chuck. Mount the tenon in the chuck, flatten the glue face and mark jaw #1 so you can remount it the same way each time. Cut out a second 6" diameter circle from  $\frac{3}{4}$ " plywood using a bandsaw or jigsaw. Drill a small hole through the center to mark the center on both sides. Use a drill press or make sure the hole is perfectly perpendicular. With the glue block mounted in the chuck, glue the 6" plywood circle to the glue block using the tailstock live center in the small hole to position it and apply pressure. Next, glue the previously prepared 6" ring with the 4" offset hole to the existing 6" circle, aligning the edges as closely as possible. Use a piece of scrap wood and the tailstock to hold it in place while it dries. When dry, apply thin CA to the outer edges of both 6" circles and true them up. You should now have an assembly that is approximately 6" in diameter and approximately  $1\frac{1}{2}$ " thick with a chuck tenon on one side and a 4" diameter hole  $\frac{3}{4}$ " deep offset  $\frac{1}{2}$ " on the other side. See Figures 5 and 6. **This is the offset assembly.**

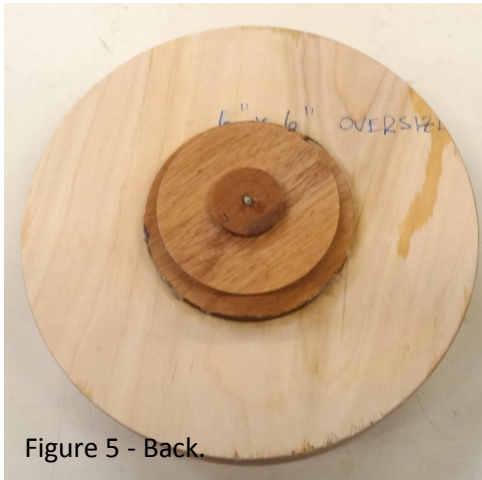


Figure 5 - Back.

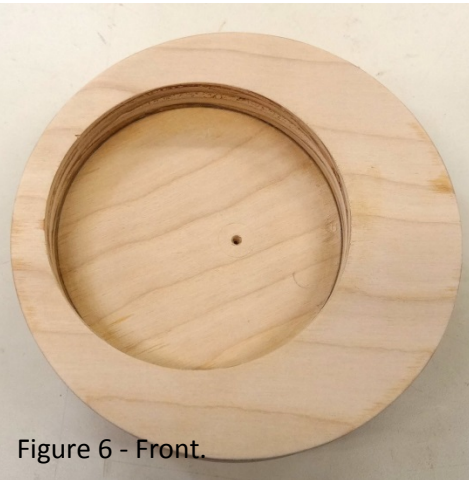


Figure 6 - Front.

5. Using the third piece of  $\frac{3}{4}$ " plywood, cut out a slightly oversize 4" circle on a bandsaw and drill a small hole through the center to mark the center on both sides. Use a drill press or make sure the hole is perfectly perpendicular. Mount the piece between centers using the center hole and saturate the  $\frac{3}{4}$ " wide edge of the plywood with thin CA to minimize tear-out. Turn the piece to fit the 4" hole in the offset assembly so that it turns freely, but is not a loose fit. See Figure 7. **This is the inset circle.**

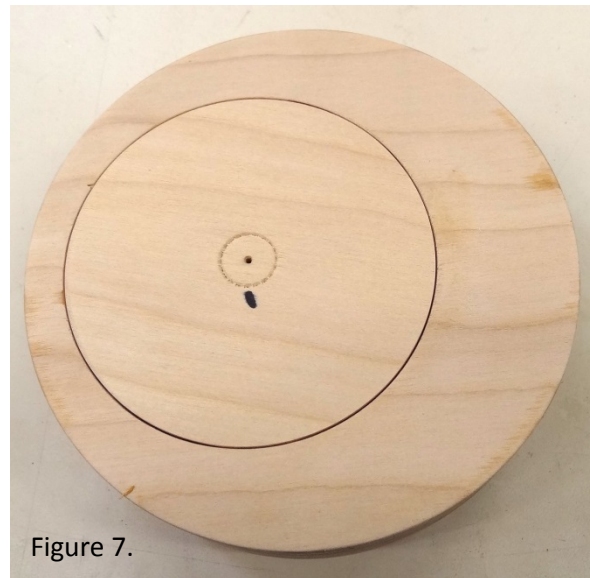


Figure 7.

6. Chuck a hardwood turning blank and turn it round to a 2" diameter. Drill a small hole slightly more than 1" deep down the center. Turn a tenon 1" in diameter  $\frac{1}{4}$ " long on the end. Part off the piece at  $\frac{1}{2}$ " so you have a  $\frac{1}{2}$ " high "hat" with a  $\frac{1}{4}$ " thick 2" diameter "brim" and a  $\frac{1}{4}$ " high, 1" diameter "crown" with a hole through the center. See Figure 8. Chuck by the 1" tenon and flatten the 2" face. **This is the pendant mount.**

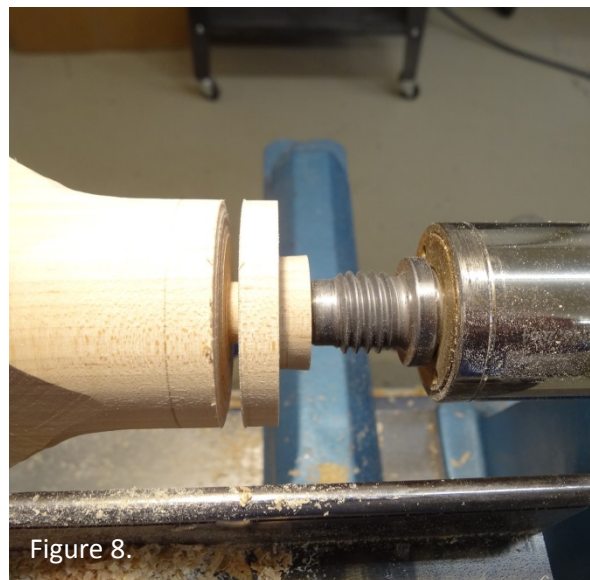


Figure 8.



### Assembling the Fixture

Give all parts a coat of wipe on poly and sand lightly. Drill two small holes in the front face of the offset assembly 180° apart about 1/8" outside the 4" hole of the offset assembly. These are for small flat head screws and washers that lock the inset circle in place and keep it from turning. The screw holes should be close enough to the 4" hole so the washers will extend over the 4" hole. Glue sandpaper in the bottom of the 4" hole. This helps to keep the inset circle from turning and also raises it slightly above the offset assembly so the locking screws and washers will hold it tightly in place. Place the inset circle in the 4" hole in the offset assembly and lock in place with the two screws and washers. **(If it is too loose, put tape around the outer edge of the inset circle to keep it centered. Drive a finish nail through the small center hole into the back but leave the head exposed. Cut off the exposed nail head, remove the inset circle, remove the tape and cut off the finish nail slightly below the front surface of the offset assembly. The nail will act as an axle for the inset circle to turn on while keeping it centered. However, if the fit is good, the nail will not be necessary.)**

Draw a short arrow on the offset assembly at the circular joint between the inset circle and offset assembly pointing toward the center of the 4" inset circle, and a mark on the inset circle opposite the point of the arrow and label it as zero. Make sure the locking screws and washers are tight and mount the fixture in your chuck. Using a forstner bit, drill a 1" diameter hole 1/4" deep in the circle insert (Figure 9). This produces an accurate zero offset for the pendant mount with the associated zero mark (Sorry, I forgot to draw the arrow and zero mark before taking the picture in Figure 9). Replace the forstner bit with the correct sized bit to drill a clearance hole for a 1" flat head screw through the inset circle at the point left by the forstner bit.

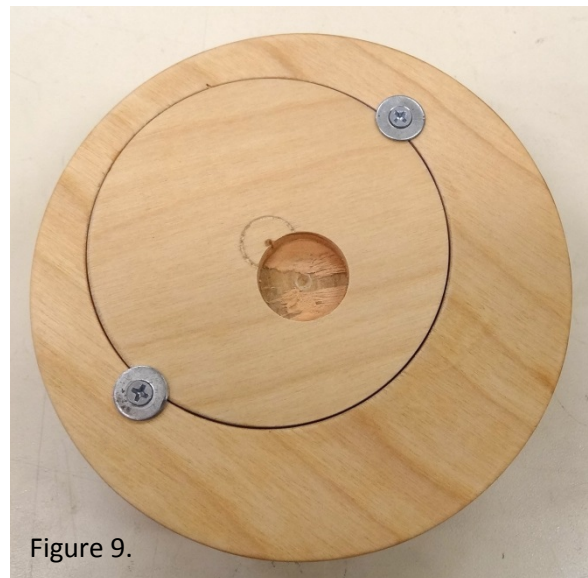


Figure 9.

Remove the inset circle and drill a countersink on the side opposite the 1" hole. Glue sandpaper in the bottom of the 1" hole of the inset circle. Place the 1" tenon of the pendant mount in the 1" hole of the inset circle and hold in place with a 1" flat head screw from the back side. You may have to enlarge the existing small hole in the pendant mount to prevent the screw from splitting the tenon. Also, you may have to grind off the tip of the 1" flathead screw so it does not protrude past the front surface of the tenon mount. Figures 10 and 11 are the front and back of the inset circle with the pendant mount installed.

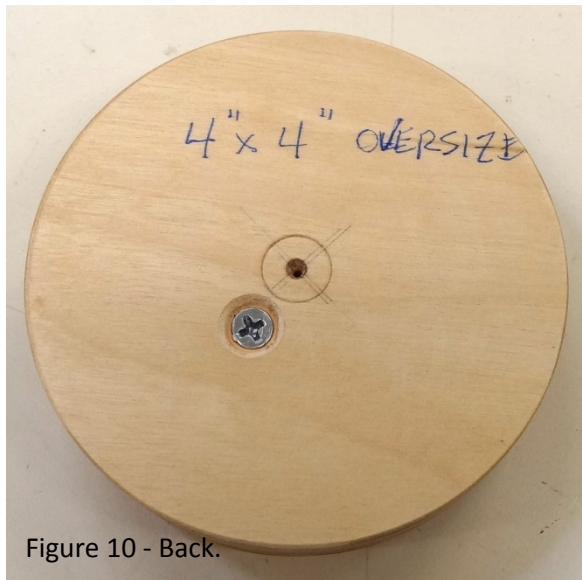


Figure 10 - Back.

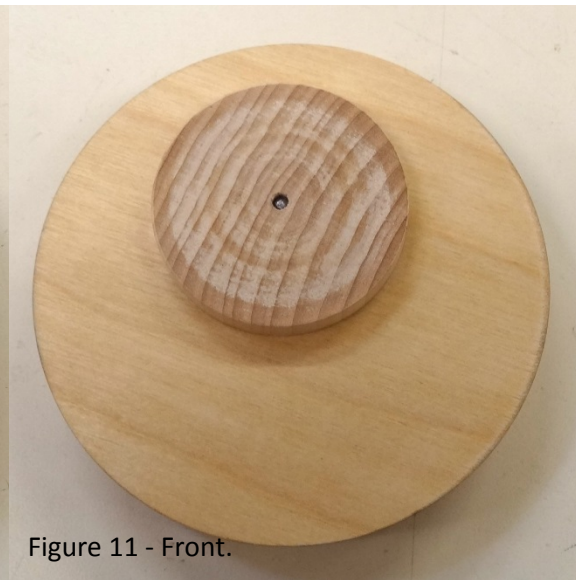


Figure 11 - Front.

Replace the inset circle/pendant mount assembly in the offset assembly.

### Calibrating the Fixture

To calibrate the offset, loosen the locking screws and washers and rotate the inset circle until there is a  $\frac{1}{4}$ " offset measured from the live center relative to the center hole in the pendant mount and mark another line on the inset circle and label it. Continue until you get to a 1" offset, which is the maximum for the dimensions in these instructions. In theory, this should be 180 degrees from the zero mark, but the offset is so insensitive at this point that it will probably be less, as shown in Figure 12. Note that the offset marks are not evenly spaced. This is normal because the relationship between the rotation of the inset circle and the offset is not a linear function.

You can calibrate the pendant holder rotation by removing it, mounting the tenon in your chuck and using the indexing capability of your lathe to mark the outer edge of the pendant mount at regularly spaced intervals. My lathe has indexing that allowed a mark every 30 degrees of rotation as you can see in Figure 12. You will also have to place a small arrow on the 4" inset circle to use as a reference for these marks.

The accuracy of the calibration is not critical, just the reproducibility. As mentioned below, the tool placement has a much larger effect on the final appearance of the offset cuts. The calibration is only to allow you to reset the fixture at a later time to reproduce a given pattern.

Congratulations, your offset fixture for turning pendants is done!

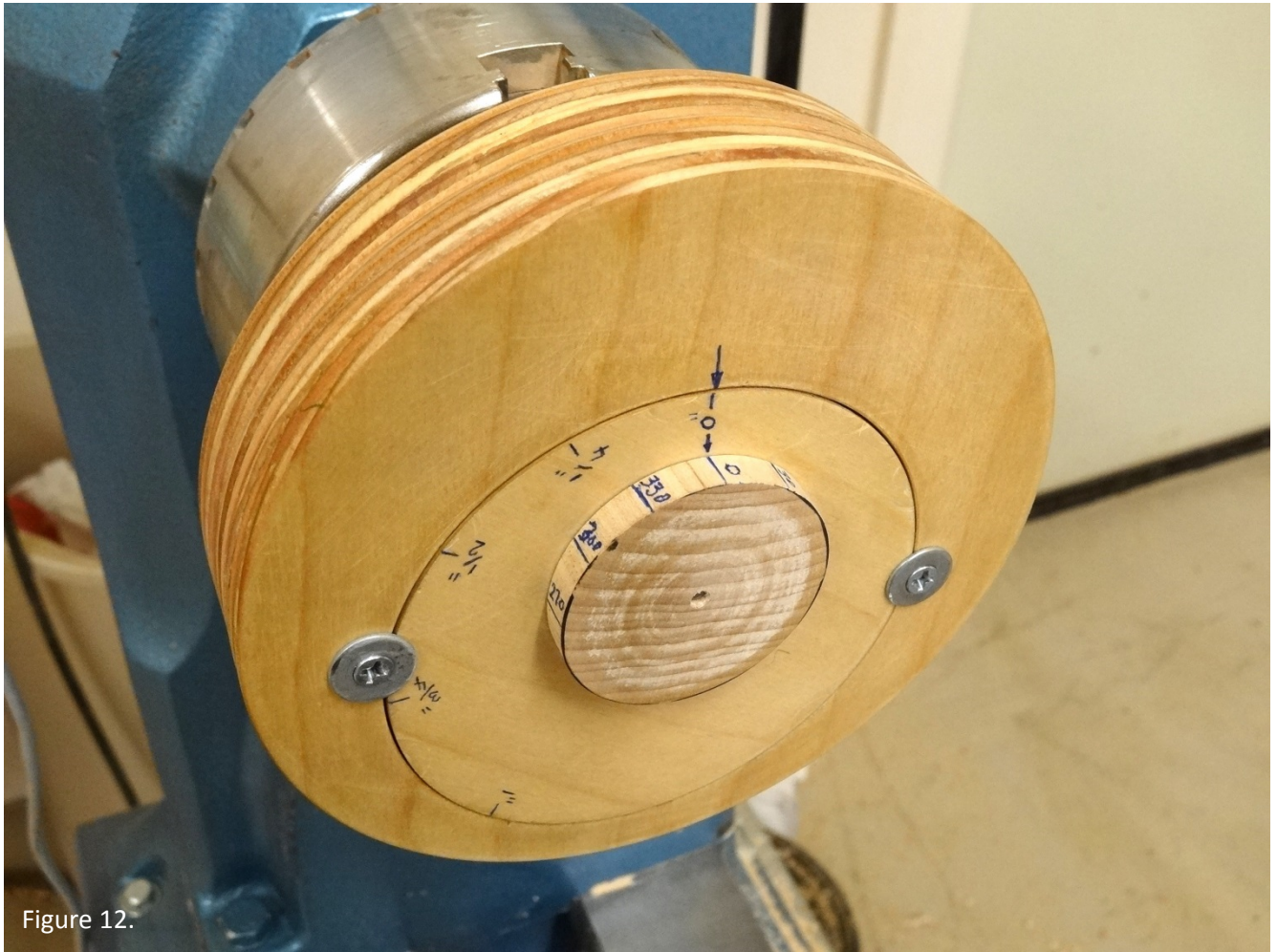


Figure 12.

### Using the Fixture

The amount of offset is controlled from the front face by loosening the two flat head screws and rotating the inset circle using the pendant mount as a handle. The rotation of the pendant mount is done by removing the insert circle and loosening the 1" flat head screw from the back.

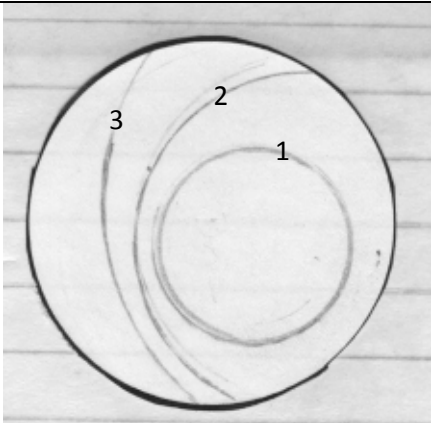
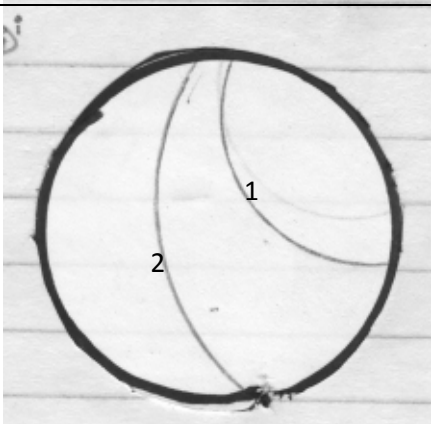
The finished pendant should have a diameter larger than the diameter of the pendant mount (2" in the instructions) and the pendant mount at least  $\frac{1}{4}$ " proud of the inset circle surface. That way you can turn and finish the edges and front face without removing the pendant from the mount. If you like smaller pendants make a smaller diameter pendant mount.

Normally, I mount a flattened and finished back of a pendant blank to the centered pendant mount with double sided tape and turn the front face and edges. You can then set the offset and rotation to decorate the face as desired. Sand and finish and you're done.

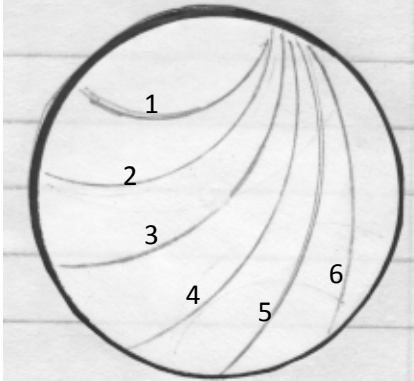
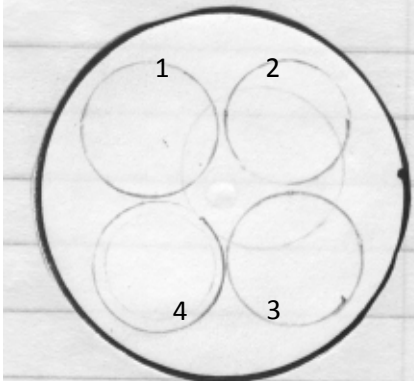
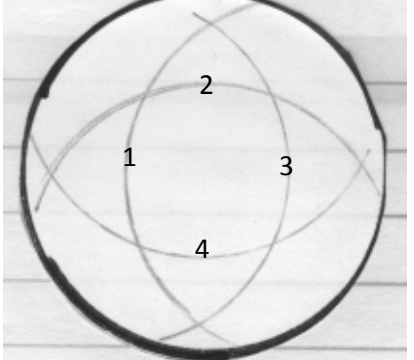
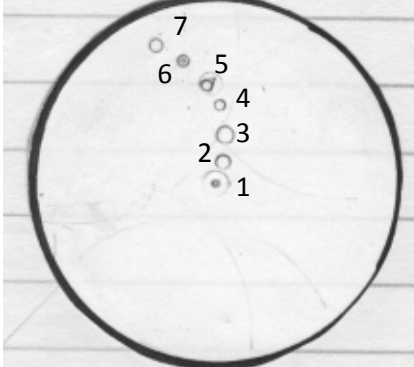
### Examples of Various Offsets and Rotations

The three main factors affecting the patterns generated from the different settings are the offset, the rotation of the pendant mount and where the tool is placed along the horizontal axis of the pendant when the cuts are made. Of the three, subtle changes in the tool placement for the cut probably have the most profound effect, so try a lot of different positions. Practice with scrap until you achieve the desired effect, recording the offset and rotation settings as you go. After that you should be able to accurately reproduce that effect using the same settings. As a learning exercise, I adjust the offset and rotation and then turn the fixture by hand using a pencil to lightly mark a scrap pendant for a proposed tool placement to see the effect the settings have. When you are ready to turn a pendant, you can also use the pencil mark technique to make it easier to see the tool placement for the cut when the fixture is turning.

Below are some examples of various offset, rotation and tool placement. They were done by placing a label on the pendant mount and drawing lines at the different settings. They were not chosen because they are attractive, but rather to give you an idea of how each can change the appearance.

<u>Example 1</u> Line 1 Line 2 Line 3 Tool placement also changed for each line.	<u>Offset</u> $\frac{1}{4}$ " $\frac{1}{2}$ " $\frac{3}{4}$ "	<u>Rotation</u> 0 0 0	
<u>Example 2</u> Line 1 Line 2 Tool placement also changed for each line.	<u>Offset</u> 1" 1"	<u>Rotation</u> 0 30	



<p><u>Example 3</u></p> <p>Line 1</p> <p>Line 2</p> <p>Line 3</p> <p>Line 4</p> <p>Line 5</p> <p>Line 6</p>	<p><u>Offset</u></p> <p>1"</p> <p>1"</p> <p>1"</p> <p>1"</p> <p>1"</p> <p>1"</p>	<p><u>Rotation</u></p> <p>15</p> <p>0</p> <p>345</p> <p>330</p> <p>315</p> <p>300</p>	
<p><u>Example 4</u></p> <p>Line 1</p> <p>Line 2</p> <p>Line 3</p> <p>Line 4</p>	<p><u>Offset</u></p> <p>½"</p> <p>½"</p> <p>½"</p> <p>½"</p>	<p><u>Rotation</u></p> <p>0</p> <p>90</p> <p>180</p> <p>270</p>	
<p><u>Example 5</u></p> <p>Line 1</p> <p>Line 2</p> <p>Line 3</p> <p>Line 4</p> <p>Note – the only difference between this example and Example 4 is tool placement.</p>	<p><u>Offset</u></p> <p>½"</p> <p>½"</p> <p>½"</p> <p>½"</p>	<p><u>Rotation</u></p> <p>0</p> <p>90</p> <p>180</p> <p>270</p>	
<p><u>Example 6</u></p> <p>Line 1 (Center of pendant)</p> <p>Line 2</p> <p>Line 3</p> <p>Line 4</p> <p>Line 5</p> <p>Line 6</p> <p>Line 7</p>	<p><u>Offset</u></p> <p>0</p> <p>1/8"</p> <p>¼"</p> <p>3/8"</p> <p>½"</p> <p>5/8"</p> <p>¾"</p>	<p><u>Rotation</u></p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p>	

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