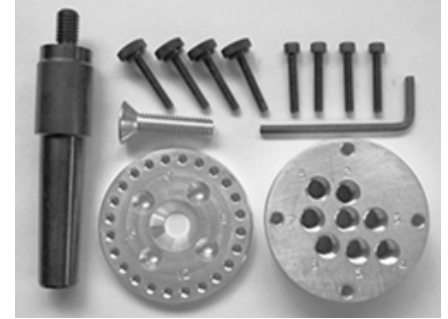


Using the Richard Joyner Off-Center Jig

By Arnold Ward

The Richard Joyner Off-Center Jig is a faceplate tool that provides a creative way to make small multi-axis turnings. The jig has 8 centers and 24 index positions. It is especially useful when precision between cuts is needed for intricate patterns and repeatability. A few typical items turned using the jig include pendants, earrings, box lids, bottle stoppers, refrigerator magnets and compact mirrors.



The most typical use of the jig is to make pendants. The jig provides a way to cut arcs into the surface of the pendant, and also create an offset hole for attaching to a necklace if desired. There are a lot of interesting designs that can be generated, from very simple with a pretty piece of wood, to very elaborate with a lot of intersecting arcs.

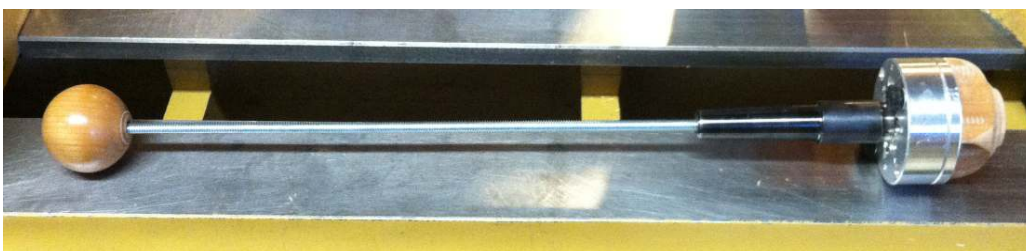
The back plate is the piece with 8 offset holes. Each hole has a 3/8" thread that fits a typical bottle stopper mandrel. The four outside holes are used to secure the indexing plate to the back plate.

Note: If you do not have the bottle stopper mandrel, you can use a 3/8" bolt threaded through a piece of wood that is held in a chuck or faceplate.

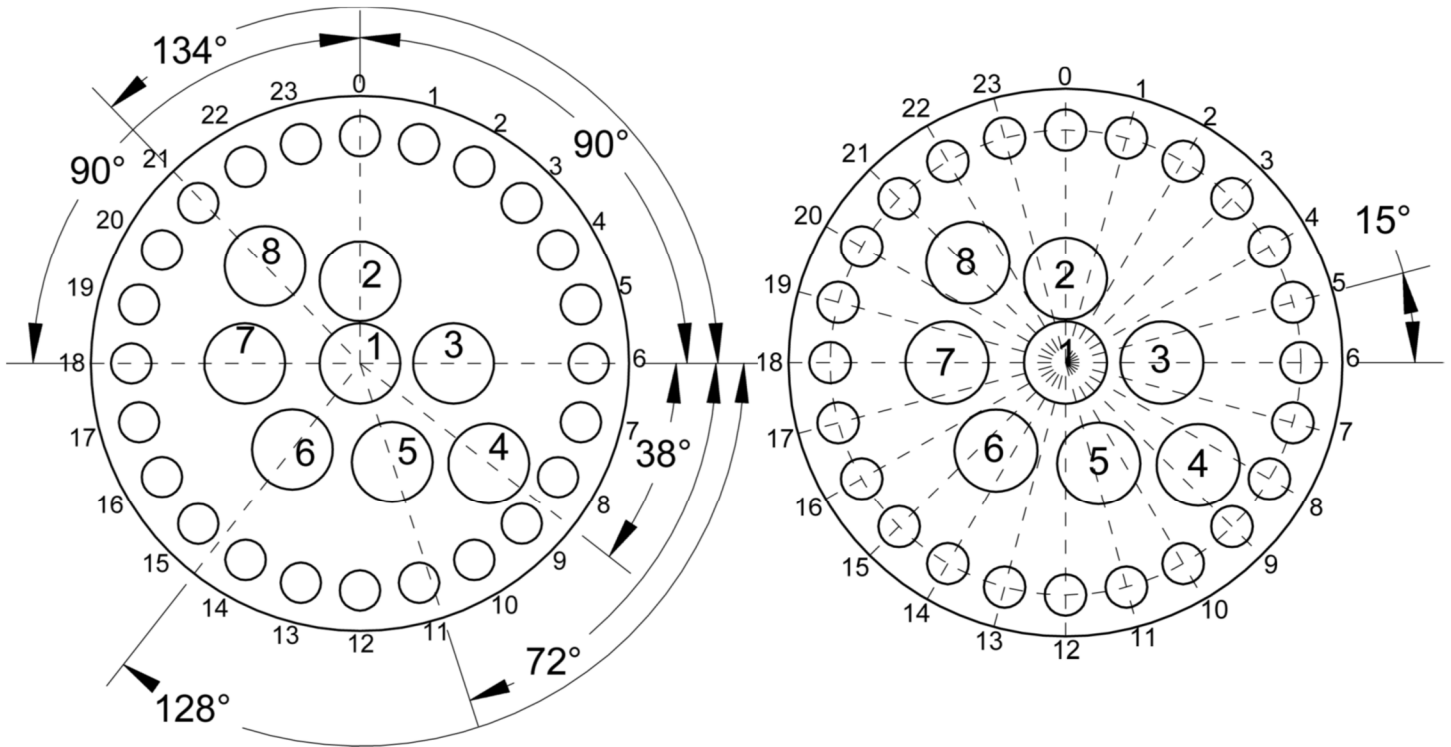


The Indexing plate has 24 indexing positions. There are four counter-sunk holes used to secure the wood to the plate. I prefer to use brass screws. These won't damage your tool edge as much if you should happen to cut into them. The middle hole is used with a 3/8" bolt that can hold a bottle stopper blank.

If you use a bottle stopper mandrel with a morse taper, then I suggest you make a drawbar to ensure it doesn't vibrate loose. This is even more important if you are turning longer items that will produce more vibration when cutting. The drawbar is made from 1/4" 20tpi threaded rod from the hardware store. This screws into the back of the mandrel. Cut the rod to fit the length of your headstock. I epoxied a nut into a wood ball that I can then hand tighten on the outboard side.



This next image is for the engineers and machinists who really want to know the numbers. Very few designs actually require this level of information, but there are some useful tidbits. For example, sometimes you just want to shift the piece on a specific axis a certain distance. I do this with hoop earrings when I want to orient the grain and I need to offset the inside hole in a specific direction. To do this, I have to use two holes that are aligned with an index position so I can switch the back plate hole and then move the index so that the turning stays on the same axis. Those are holes 2, 3, 7 and also 8 is a close approximation.



Hole	Offset from Hole 1 (inches)	Offset from Hole 1 (mm)	Degrees from Index 0	Lines up with Index
1	0.000	0.000	n/a	n/a
2	0.385	9.779	0°	0
3	0.435	11.049	270°	6
5	0.485	12.319	198°	
6	0.510	12.954	142°	
7	0.535	13.589	90°	18
8	0.635	16.129	44°	1° from 21
4	0.760	19.304	232°	

In layman terms:
 The distance from hole 1 to 2 is about 3/8". The distance between each hole from 2 to 8 is a little less than 1/16" from the next hole. Holes 2, 3 and 7 line up with an index number so they can be used to shift the piece without changing the angle.

Turning a Pendant

There are two approaches for turning pendants. One is that you have a large piece of wood that you will start with and will cut off pendants as you make them. The other approach is to start with a thin piece of wood and use a waste block with double sided tape to hold the wood while you turn a single pendant. In either case, the wood can be side grain or end grain. As with all turnings, the prettier the wood, the prettier the pendant will be! Dense hardwoods and exotics work great.



If you are starting with a block of wood, make sure it is not too long. I would suggest no more than about 5 inches. Any more and you will get a lot of vibration. Secure the block to the indexing plate with 1/2" brass screws. Pre-drill the holes and make sure the screws fit snug with no stripping. If it doesn't feel secure to you, use your best judgment and get something stronger!

Line up the 0 index marks on the index plate and back plate, and then attach the back plate using the four hex screws or thumb screws.



Attach the bottle stopper chuck in the headstock and secure it with a drawbar to ensure it doesn't vibrate loose. Screw the center hole (#1) of the back plate to the 3/8" bottle stopper bolt and use the tailstock as support. You can now round

off the blank on the tailstock end to the size of the pendants you wish to make. Leaving the headstock end thicker will reduce vibration. Remove the tailstock and slightly round over the end of the block. This will be the face of the pendant. The flatter the face of the pendant, the longer the arcs will be. Play with different surface curves to get an idea of the difference. I sand all my faces to at least 400 grit or up to 1000 grit for harder woods.



When I want a hole in the pendant for the necklace string, I usually make it before cutting arcs. By making the hole first you can better judge how the arcs will look on the hanging pendant. The hole for the string can be large or small. If you want a large hole, you will want to move the back plate to a hole that is closer to the center. If you want a small hole, you are probably best using the index hole that is closest to the edge. I



prefer that the edge of the hole be close enough to the edge of the pendant that there is about a 1/8" of wood to tie the string around. Move the back plate to a hole close to the edge. Then use a pencil to draw the size of the hole, using your hand to turn the wood. In this way, you can change your mind until you get the right size hole. **WARNING, IF YOU TURN ON THE LATHE NOW, THE WOOD IS OFF-CENTER AND WILL VIBRATE A LOT. SLOW THE SPEED DOWN BEFORE YOU TURN ON THE LATHE.**

Once you are happy with the hole size, you might want to move the hole so it best shows the wood. To do this, unscrew the four hex bolts that are holding the index plate. Rotate the index plate until the back plate hole you have chosen lines up with the spot you want the string hole to be. Screw the index plate back into place. Once again test with a pencil to make sure the hole will be in the right spot.



Before you start the lathe, set it at a SLOW SETTING! The pendant jig is now off center and will cause a lot of vibration.

Start slow and see how fast it can go before it shakes too much. You may need to add weight to your lathe, such as a sand bag, to reduce vibrations (this is a good idea for any turning you do). In general, I like to turn as fast as I can without too much vibration, but excessive speed is not necessary. The faster it goes, the easier it will be to make the cuts.



If the string hole will be smaller, it is best to first drill the hole and get a close depth. Using a Jacob's chuck in the tailstock, drill a smaller hole first. If you drill a large hole, you might crack the wood. It is better to start small and work up, or use tools after the first hole is drilled.



When drilling, first start by putting a dimple in the wood so the drill bit centers on the dimple. Hold the Jacobs chuck when drilling so the chuck doesn't work loose. Drill only the depth you need for the thickness of the pendant, plus a little extra for the width of your parting tool. Pendants are usually fairly thin, about 1/8" - 1/4" thick, so drilling 1/4" is about right.

Once the hole is drilled, you can widen it by using a skew chisel on the side to scrape the opening. Or, use any other tools that allow you to get to the bottom of the hole and cut a clean corner. Sand the hole now and try not to scratch up the already smooth surface.



Once the hole is complete, any other arcs can be cut on the front for decoration. Change the back plate hole and index plate to change the arc radius and position relative to the string hole. Use a pencil to mark the arc to make sure it is pleasing. Then cut the



groove using a diamond point tool. Make sure your point is sharp and make a light cut. If you stop the cut, it is sometimes difficult to find the same groove, which makes it harder to do than committing to a single cut. But, you can stop and start and keep making the cut deeper and longer if you need to.



The final step is to cut the pendant off with a parting tool. If vibration is a problem, use a scrap block between your tailstock and the face to provide support without marring the surface. For end grain pendants, you should use a hand saw to make the final cut to free the pendant. If you part it off to the middle, the wood will sometimes tear out at the last little point of wood. That leaves a small hole that you then have to sand down to.

The back side will still need to be cleaned up. This can be done by using double side tape on the front of the pendant to attach it to a scrap block. Use a power sander to quickly finish off the back side. You will probably need to hand sand around the inside of the string hole to clean up rough edges, but it takes only a few minutes. You may also need to clean off or sand off any tape residue from the front of the pendant.

A great alternative to using natural wood is to use laminated colored wood. The laminates can be cut at an angle which provides interesting curves, or they can be end grain, which results in a striped face, or face grain laminate which allows for color changes when cutting arcs into the pendants.

Source for blanks: Big Monk Lumber
(www.bigmonklumber.com)

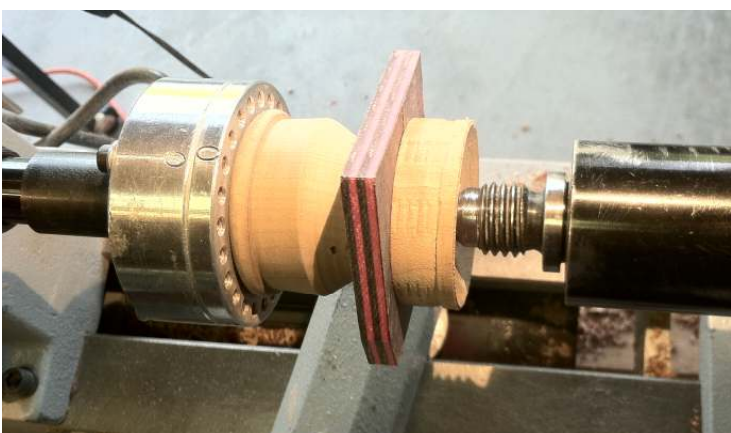
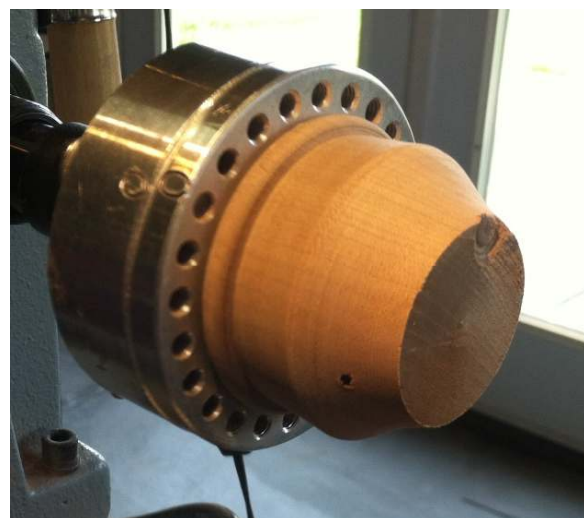


Laminate cut at an angle

End Grain and Side Grain Laminates

To mount the laminate, use a waste block mounted to the index plate. The face of the block should be flat and a little smaller in size than the pendant. If you make the surface too small, it won't hold the pendant securely enough. But, if it's too big, it may be impossible to remove without breaking (especially if the piece is end grain, which is much more fragile). Plus, with a smaller surface, you will be able to clean up the edge.

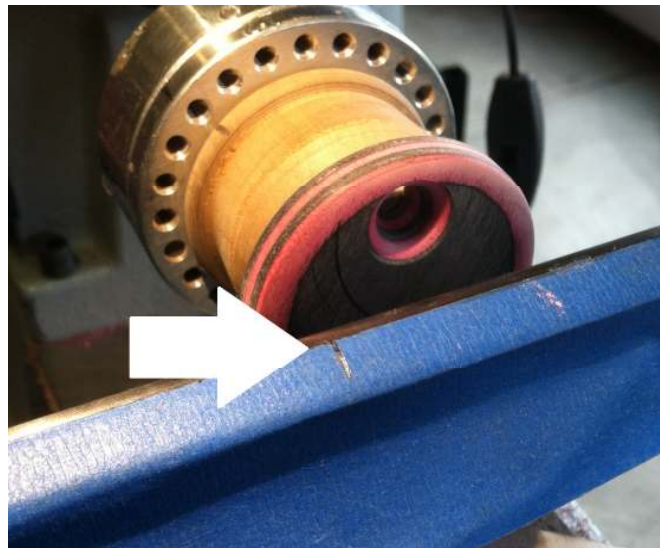
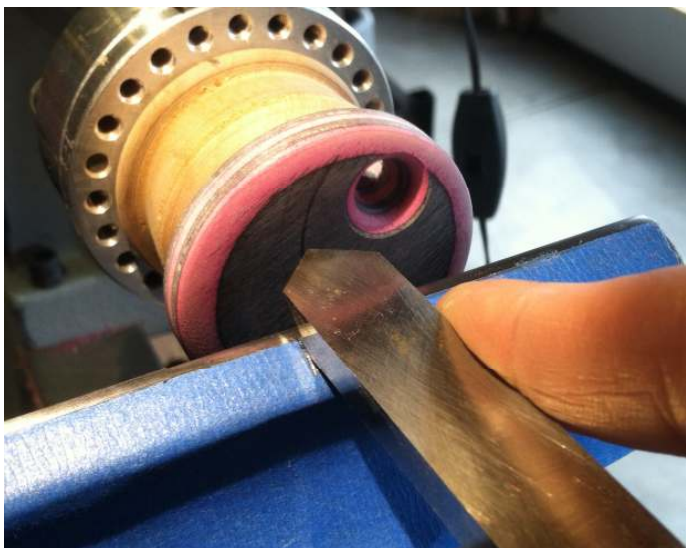
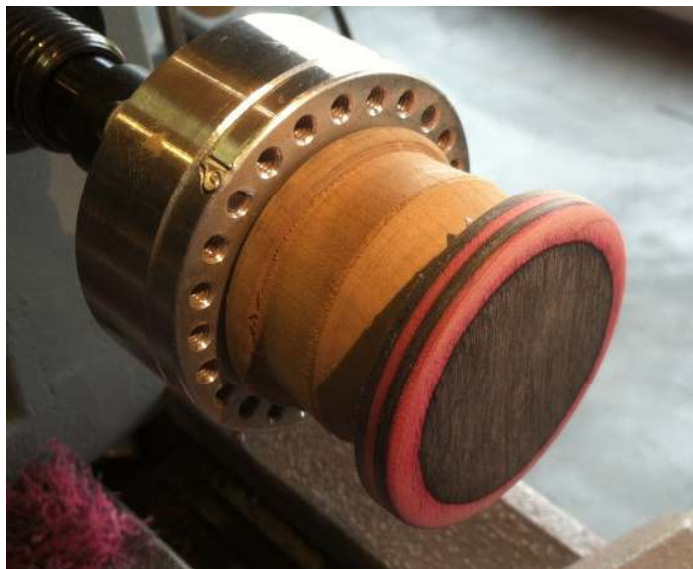
The block is added using a good quality double sided tape. The tape is pressure sensitive. So, when you apply the piece to the waste block, apply it very lightly. You can then pull it back up and reposition it until it is centered well enough to get the size of pendant you want.



Once it is centered, you need a second waste block between your tailstock and the pendant to compress the block to the tape. Leave this in place while the piece is rounded off. The jarring of turning off the sharp corners could pop it loose from the tape, but once it is rounded down to size, there is much less chance of it knocking loose.

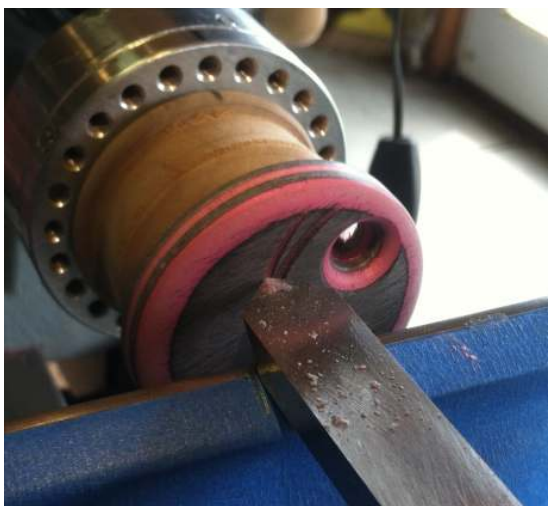
Once the surface of the blank is prepared, you can follow the same steps as with a block of wood. Be careful to make light cuts. Laminates are not a hard wood and will tear out easily, especially if you cut through the back side. I suggest supporting the back of the wood with painters tape if you are cutting the string hole and there is no wood to support the cut on the back side. It will reduce the tear-out.

When making cuts that require repeatability and precision, it is best to mark the location of the cutting tool on the tool rest. This can be done by putting masking tape on the tool rest and then mark the position before the cut.



When using this trick, it is critical that you do not move the tool rest. So, leave enough space that you can still remove the index plate and turn it, or if you need to change the back plate hole, you need enough room to do that as well.

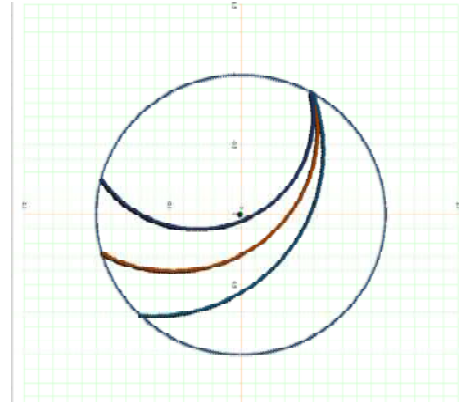
Using your mark as a guide, you can get pretty good repeatability.



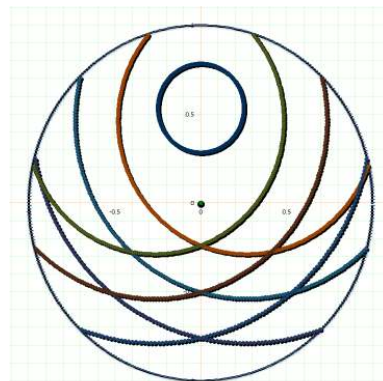
A handy Microsoft Excel spreadsheet application was put together by Bill Klopping, from Greenville Texas. This application allows you to simulate the lines and arcs on a pendant by specifying the offset hole, index hole and radius of the cut. You can save a lot of time by working out the design you want in advance of working on the lathe.

The spreadsheet can be found on the Big Monk Lumber website. Go to www.bigmonklumber.com. Detailed instructions on using the tool are in the spreadsheet. Some examples of the spreadsheet output are shown below.

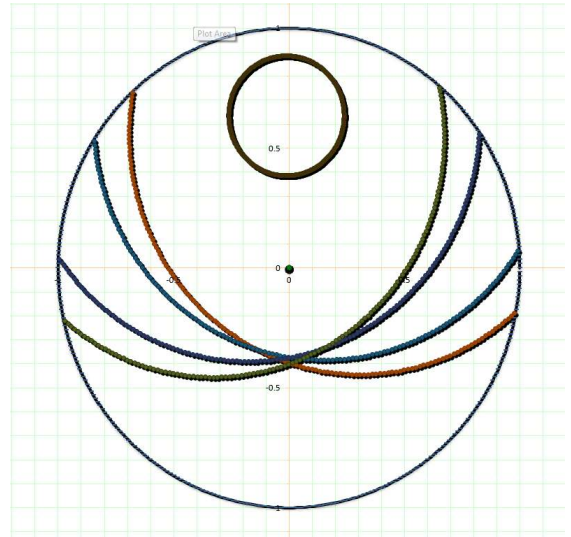
Pendant Jig Pattern Tool			
version 4.0 by W.H.Klopping			
Design Name :			
Units Used :	in	Rotation :	0
	Offset Hole	Index Hole	Radius
Pendant Shape :	1	24 = 0	1
Elements	Offset Hole	Index Hole	Radius
Element # 1:	4	24 = 0	1
Element # 2	4	1	1.18
Element # 3	4	23	0.8



Elements	Offset Hole	Index Hole	Radius
Element # 1:	7	4	0.75
Element # 2	7	4	1
Element # 3	7	4	1.25
Element # 4	7	8	0.75
Element # 5	7	8	1
Element # 6	7	8	1.25
Element # 7	7	6	0.25



Units Used :	in	Rotation :	0
	Offset Hole	Index Hole	Radius
Pendant Shape :	1	24 = 0	1
Elements	Offset Hole	Index Hole	Radius
Element # 1:	8	1	1
Element # 2	8	2	1
Element # 3	8	4	1
Element # 4	8	5	1
Element # 5	8	3	0.25



	Offset Hole	Index Hole	Radius
Pendant Shape :	1	24 = 0	1.15
Elements	Offset Hole	Index Hole	Radius
Element # 1:	8	24 = 0	1
Element # 2	8	4	1
Element # 3	8	8	1
Element # 4	8	12	1
Element # 5	8	16	1
Element # 6	8	20	1

