

SPINDLE OFFSET TURNING

Richard Pikul

This article is only a basic start for offset turning between centres. There are many ways to augment the methods shown to produce a wide variation of turned shapes.

Only two types of offset turning are described. Two offset axis parallel to the centre axis and two axis which cross the centre axis.

To begin, use only waste wood until you become familiar with how it's done and to see how even small differences in technique and marking accuracy can affect the final shape produced.

It must be emphasized that this article describes only the very basics of multi axis turning. Experiment to progress to more complex shapes. For some suggestions, refer to the reading list at the end of this article.

THOROUGHLY READ THE ENTIRE ARTICLE AT LEAST TWICE – OR MORE – TO MAKE SURE YOU UNDERSTAND ALL STEPS BEFORE YOU PUT A TOOL TO WOOD.

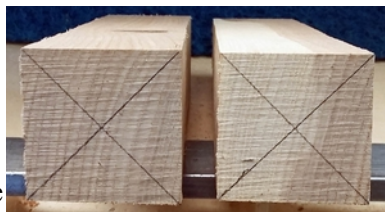
Note: each photo used shows two possible sizes of arcs in finished turning. Choose the smaller diameter for your first try.

1.0 PARALLEL AXIS TURNING

To make an oval turning, all changes to the turning axis are parallel to the centre axis.

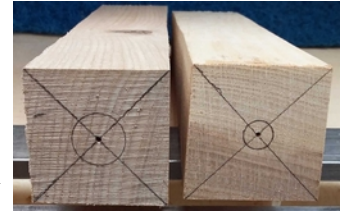
1.1 Material: 2”(50mm) x 2”(50mm) x 10”(250mm). Use any species that is knot free and cheap for your practice pieces.

1.2 Accurately mark off diagonals at each end of the blank and make a mark with an awl at the exact centre of both ends.



Make the awl 'holes' as accurate as possible as being off centre will affect the final turning.

1.3 Using a compass, draw a circle at each end of the blank, using the awl point mark as centre. Circles shown are 10mm (0.4”) and 20mm (0.8”). These dimensions chosen as the best minimum and maximum arcs for the blank size chosen. Look closely at the blank on the right, the awl hole is slightly off the marked centre. We will see how this affects the turning later.



1.4 Now it's time to mark out positions so that we can keep track of where we are when moving the centres around.

1.5 Mark the headstock (Drive) end and the tailstock (live centre) end as shown in paragraph 1.6.1 and 1.6.2 below. Do place the marks nearer to centre, I forgot to do this when marking the examples and had to remark them after starting to turn.

1.6 MAKE SURE THAT “TOP” MARKING IS ADJACENT TO THE SAME SIDE AT BOTH ENDS OF THE BLANK.

The numbers are clockwise on the headstock end and counterclockwise at the tailstock end. This is important, if wrong – the turning done according to the instructions to follow will not turn out as designed.

1.6.1. HEADSTOCK MARKING



1.6.2. TAILSTOCK MARKING

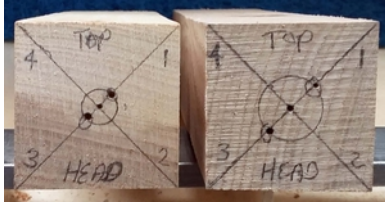


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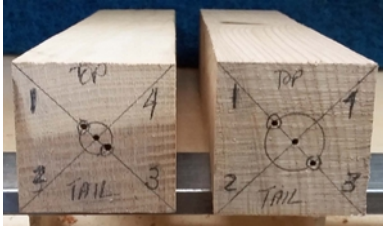
1.7 Now set the positions used for turning. Make marks with an awl to set the positions for the headstock and tailstock centre pins. Make the marks as accurately as possible!

1.7.1. HEADSTOCK POSITIONS



Make 2 awl marks on the '1' and '3' positions where the circles drawn intersect with the cross lines as shown above.

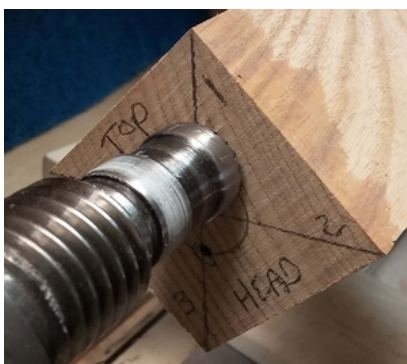
1.7.2. TAILSTOCK POSITIONS



Make 2 awl marks on the '1' and '3' positions where the circles drawn intersect with the cross lines as shown above.

Note that for turning this oval, the marks at each end are at the same numbered position.

1.8 Mount the blank on the lathe, with the awl hole "1" at the headstock end in the drive centre.



For the tailstock end of the blank, also put the awl hole "1" in the tailstock live centre pin.



Bring up the tool rest even with the lathe ways, up to the blank – just make sure that the blank clears the tool rest as it will be swinging off centre.

1.9 Finally, you can start to turn!

Bring up the lathe speed slowly, up to the speed with which you are comfortable. Remember you are mostly turning air, so increasing the RPM will improve the cut. You can also increase the speed after removing some wood.

Turn until the 'round' made reaches the adjacent corner along the blank. This will make the largest possible oval from this blank.

1.10 Now, change the axis. Move both the headstock and tailstock positions to the hole marked "3".

Repeat the turning done in step 1.9. You should now have two arcs along the length of the blank that meet at a point.

1.11 Next step is to round off the point made when turning with the two axis.

1.12 Mount the now twice turned blank along the centre axis, using the centre marks at each end.

1.13 Turn until you are happy with how much material has been removed. This is when you will see how much difference the distance between the centre axis and the offset axis has on the result.

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1.14 Now you can sand the piece. At a fairly low speed sand the piece using sandpaper that is long enough to safely hold in both hands, with both hands safely away from the spinning piece. Start with 80 grit or lower for best results. Do not apply heavy pressure, a light touch and a few extra seconds work the best.

1.15 Here is a photo showing the difference between spreading the axis by 0.8" (20mm) on the left and 0.4" (10mm) on the right. In both cases the final turning on the centre line axis has been done.



Turning on the left:

The two axis were not marked exactly the same distance from centre. Where the circles meet when turned off centre are not the same distance from the centre axis.

This results in the difference seen between the right and left hand side of the turning after the third turning using the centre axis.

If the distance between the holes and the centre was exact, the rounded turned part would have equal curves on each side.

This can be corrected by moving the centre point slightly to compensate.

Turning on the right:

Again the holes are slightly misaligned, but the resulting offset is less obvious.

1.16 Now make a couple more, with different axis spacing to become comfortable with this style of turning.

1.17 To add shapes to this turning, you can turn them during steps 1.9 and 1.10. Remembering that you must exactly copy the desired shape made during the two turning stages in steps 1.9 and 1.10.

1.18 Alternately, you can add shaping during step 1.13 and leave the original oval 'straight'.

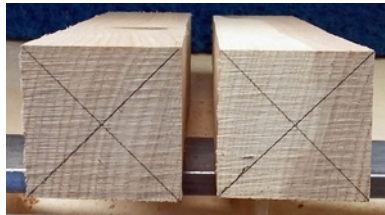
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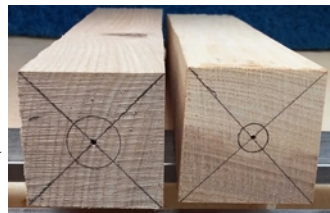
2.0 CROSS AXIS TURNING

2.1 Material: 2”(50mm) x 2”(50mm) x 10”(250mm). Use any species that is knot free and cheap for your practice pieces.

2.2 Accurately mark off diagonals at each end of the blank and make a mark with an awl at the exact centre of both ends. Make the awl 'holes' as accurate as possible as being off centre will affect the final turning.



2.3 Using a compass, draw a circle at each end of the blank, using the awl point mark as centre. Circles shown are 10mm (0.4”) and 20mm (0.8”). These dimensions chosen as the best minimum and maximum arcs for the blank size chosen.



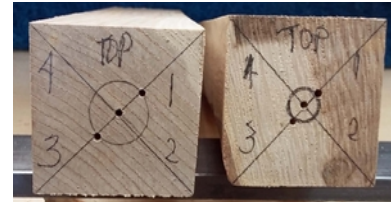
2.4 Now it's time to mark out positions so that we can keep track of where we are when moving the centres around.

2.5 Mark the headstock (Drive) end and the tailstock (live centre) end as shown in the photos below. Do place the marks nearer to centre, I forgot to do this when marking the examples and had to remark them after starting to turn.

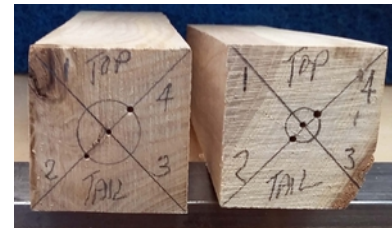
2.6 MAKE SURE THAT “TOP” MARKING IS ADJACENT TO THE SAME SIDE AT BOTH ENDS OF THE BLANK.

2.6.1 HEADSTOCK MARKING

Bonus points if you noticed that I forgot to add “Head” to this end...



2.6.2 TAILSTOCK MARKING

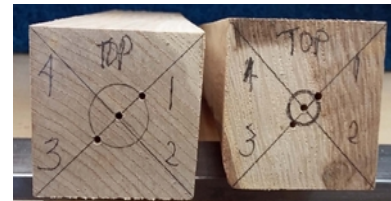


NOTE: the headstock markings are in a clockwise direction and the tailstock markings are in a counterclockwise direction.

2.7 Now set the positions used for turning. Make marks with an awl to set the positions for the headstock and tailstock centre pins. Make the marks as accurately as possible!

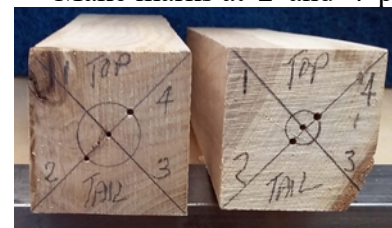
2.7.1 HEADSTOCK POSITIONS

Make marks at '1' and '3' positions.



2.7.2 TAILSTOCK POSITIONS

Make marks at '2' and '4' positions



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2.8 Mount the blank on the lathe, with the awl hole '1' at the headstock end in the drive centre. For the tailstock end of the blank, put the awl hole '2' in the tailstock live centre pin. Note that for turning a 90 degree twist, the marks at each end will be offset by 90 degrees.

Bring up the tool rest even with the lathe ways, up to the blank – just make sure that the blank clears the tool rest as it will be swinging off centre.

2.9 Finally, you can start to turn!

Bring up the lathe speed slowly, up to the speed with which you are comfortable. Remember you are mostly turning air, so increasing the RPM will improve the cut. You can also increase the speed after removing some wood.

Turn until the 'round' made reaches the the adjacent corner of the blank. This will make the largest possible oval from this blank.

2.10 Now, change the axis. Move both the headstock drive centre position to '3' and tailstock position to the hole marked '4'. Repeat the turning done in step 2.8. You should now have two arcs, twisting 90 degrees along the length of the blank that meet at a point. Photo below is of shape made with a 20mm (0.8") spacing between offset centres.



2.11 If you wish to remove the sharp edge made with a larger diameter offset, round off the point made when turning with the two axis. How? Go to step 2.11. If the edge is what is desired, go to step 2.13.

2.12 Mount the now twice turned blank along the centre axis, yes use the centre marks at each end.

2.13 Turn until you are happy with how much material has been removed.

2.14 Now you can sand the piece. If you used a larger diameter, you may have to hand sand the workpiece.

2.15 Here is a photo showing the difference between spreading the axis by 0.8" (20mm) on the left and 0.4" (10mm) on the right. In both cases NO turning on the centre line axis has been done. Also no sanding done. If sanding is required the turning on the left would be difficult to sand on the lathe without 'rounding' the sharp edges of the profile. The turning on the right could be sanded on the lathe without overly disturbing the profile. Also note that the piece on the left has more than just a 90 degree twist. To accomplish this, the shaping is started in step 2.8. To make the shape even, the shape must be reproduced exactly in step 2.9.

If the 'sharp' edges in the left photo are to be rounded, this can be done by turning the shape with the head and tail stocks using the centre axis.



2.16 Now make a couple more, with different axis spacing and adding different shapes to become comfortable with this style of turning.

Further reading:

There is not a wide choice of suitable articles available on line, either printed or on video. Most of the videos I found were not very suitable or interesting – except for those shown below :)

On line printed material:

For AAW members; using the “read” tab, go to the “AAW Explore” section. In the explore section click on the “Multi-Axis” category. Several articles will be listed, choose any that are of interest. Some of these articles are very appropriate and informative.

Book:

Multi-Axis Spindle Turning: A Systematic Exploration Hardcover – June 28, 2018
by Barbara Dill (Author)
Author is one of the most respected offset turners.

Videos:

Barbara Dill Multi-Axis spindle turning;
https://www.youtube.com/watch?v=JK1EvP_NCI0

Make a human form:
<http://www.hypersurf.com/~charlie2/Turning/MultiCenter/HumanForms/MultiAxisHumanForm1.html>
A video that demonstrates how complex a form can be while still being understandable.