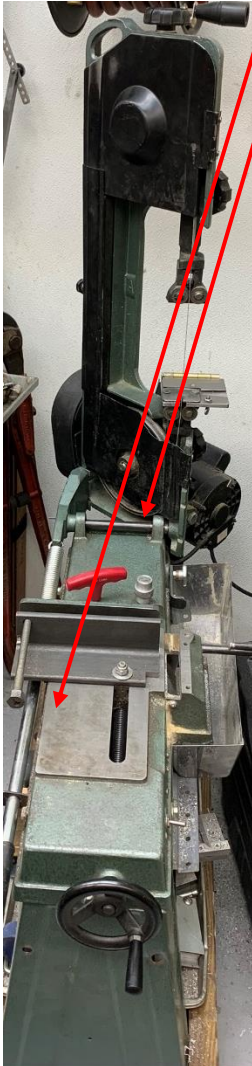


Determining if a Shaft is Parallel to a Machined Surface, Version 2.0

By **R. G. Sparber**

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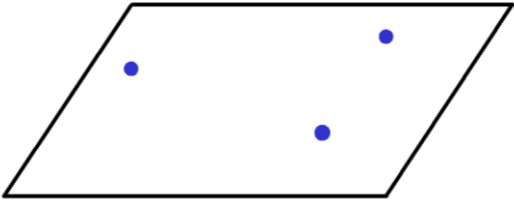
Is this machined surface on my 4 x 6 bandsaw parallel to my pivot shaft²? This is not a wildly dreamt up question. I needed to know in order to improve the cutting accuracy of my saw.

I could drag my saw to a local machine shop with 3-dimensional measuring capabilities. Well, first, I would have to beg the help of a friend with a truck. In this time of COVID-19, this is not an attractive strategy.

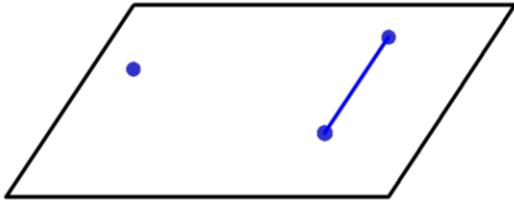
Then I got thinking about one of my favorite topics: applied geometry in my shop. Ah...

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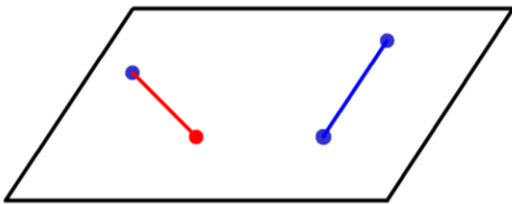
² This odd wording is because my pivot shaft is my reference and I need to know if the machined surface is true to it.



Geometry states that a plane is defined by three points.



I can connect two of these points together with a line and then state that this line plus the third point defines my plane.



Once the plane is defined, I have an infinite number of points in this plane. Any line passing through my third point and one of these other points must be made in this plane. Any line passing through my third point and a point not in this plane will not be in the plane.

OK, Pretty dry stuff. Yet apply it in my shop, and it comes alive.



My first stop was to my collection of aluminum to find a plane. I picked up this piece of 1-inch by 3-inch U channel and put it on my surface plate.

Pressing down on the channel in one place, I defined a line as the channel contacts my surface plate. I held that pressure and pressed down at other places on the channel. If I hear a click, it would mean I was rocking between one plane and a different plane. No click? This can only mean that the two surfaces are in the same plane. I heard no click. My channel was flat.

Time to move over to my saw.



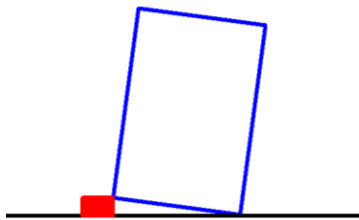
I pressed on the channel down at the pivot shaft end. This defines a line. My channel rests on the top edge of the 1-2-3 block³. Is it making contact at one point or all along this edge?

If I'm only making contact at one point, it means that the line defined by the edge of the 1-2-3 block is not in the plane. That means my machined surface is not parallel to the pivot shaft. By pushing on the channel at various spots above the block's edge, I will rock the channel and hear a click.

No click? That can only mean the top edge of the block is in the same plane as the pivot shaft.

Well, I heard a click.

By adding shims under the corner of the 1-2-3 block, I was able to make the click go away.



The 1-2-3 block was then tilted, so it is now parallel to the pivot shaft. Knowing the thickness of the shims plus that the block is 2-inches wide, I know the error per inch.

It turned out that I had a tilt of 0.002-inches per inch, which is not good.

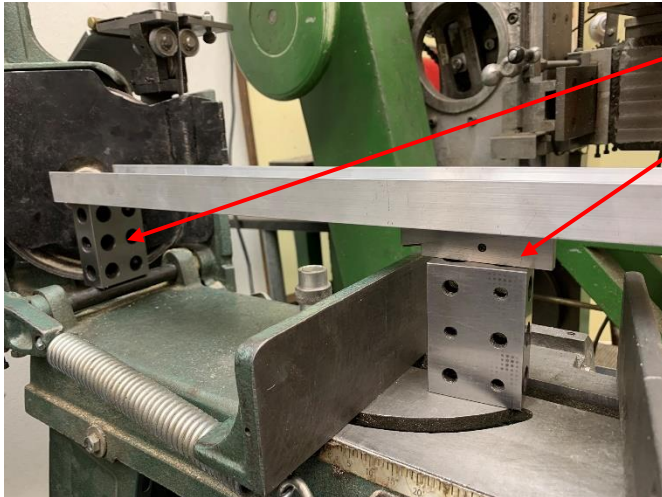


I built a sine bar and put my 1-2-3 block on top. While pushing on the channel, I adjusted the slope until there was no clicking.

Stock placed on this sine bar will be parallel to the pivot shaft. This is an essential step in improving the accuracy of my saw.

³ The fixed jaw has previously been set parallel to the pivot shaft.

John Herrmann pointed out that the plane defined by the pivot shaft can be parallel to the plane defined by the machined surface, but they can't be the same plane. Rob Sharp asked how far apart are the pivot shaft from the machined surface.



One way to figure this out is to place a 1-2-3 block between the pivot shaft and the channel. At the other end, I added an adjustable parallel on top of a 1-2-3 block.

Then, I played with the adjustable parallel until I saw no light between it and the channel.



The height of the parallel *is* the distance between the outside diameter of the pivot shaft and the machined surface.

Acknowledgments

Thanks to Gregg Kricorissian for improving the clarity of the article. Thanks to John Herrmann for his astute observation and to Rob Sharp for asking a great question.

I welcome your comments and questions.

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