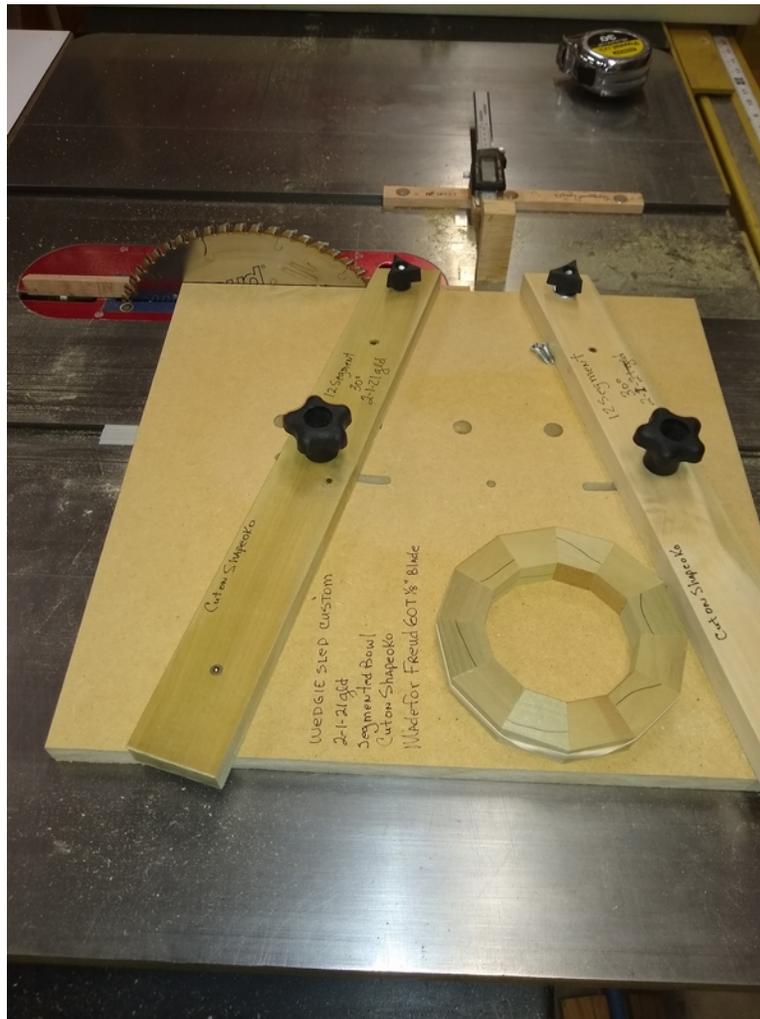


Custom Wedgie Sled Design and Build

February 2, 2021

Read this entire document before starting on building or using this Wedgie Sled.

What is a Wedgie Sled? A Wedgie Sled is a table saw jig made to cut segments for segmented wood turning. The website segeasy.com sells Wedgies that are pre cut and made for use with the Wedgie Sled. Segmented turning requires a high degree of accuracy when cutting segments. If you are not very accurate there is tremendous extra work that is required to get segmented rings ready for glue up. The Wedgie and Wedgie Sled make this process simple, easy and accurate. These are instructions for making a custom Wedgie Sled. There are plans on the segeasy.com site but that sled is somewhat smaller and so I customized the sled and cut it on my Shapeoko 3 XXL CNC Router. The project was created with Carbide Create 514. This document will discuss the design and making of a custom Wedgie Sled. The base was cut on a Shapeoko 3 XXL (32x33 inch cutting area) but the Shapeoko 3 (16x16 inch Cutting Area) or 3 XL (16x33 inch cutting area) should be able to handle this project. The base is at the limit of the 3 and XL but there is no cutting near the edges so the smaller machines should be able to cut this project.



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Materials Needed:

MDF 16.5" X 16" X .75" (Finished 16" X 16" X .75")

MDF or Hardwood 18.5" X 4.5" X .75" (Finished 2" X 17")

Four ¼ -20 Carriage Bolts 2" Long

Four ¼ Washers

Four 1/4-20 Small Diameter Threaded Knobs (Less than 2 Inches Wide)

Incra 18" Miter Bar IMS1 (https://www.incrementaltools.com/INCRA_Miter_Slider_18_p/ims1.htm)

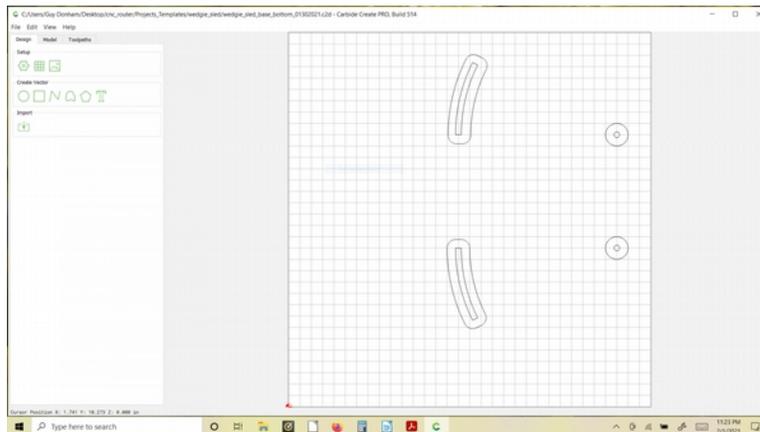
The Wedgie Sled consists of 3 separate project files

1. Wedgie Sled Bottom
2. Wedgie Sled Top for use with Incra Miter Slider 18"
3. Wedgie Sled Single Fence (Make 2)

1. Wedgie Sled Bottom Creation

Start with cutting your MDF to 16.5" X 16" from .75" stock. The segeasy.com site has a download of their original sled design that is 14" x 12". I found that sled design a little small and made my version larger to allow wider board up to 2.5" in width to be cut on the sled.

Here is a picture of the Wedgie Sled Bottom from Carbide Create 514



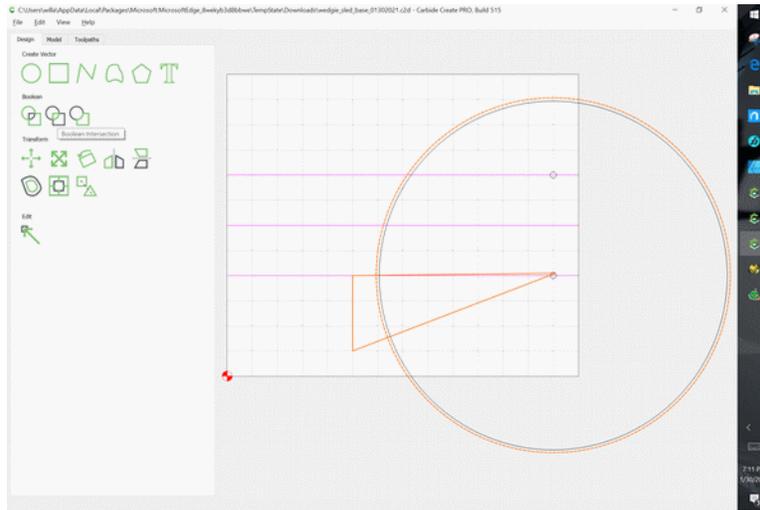
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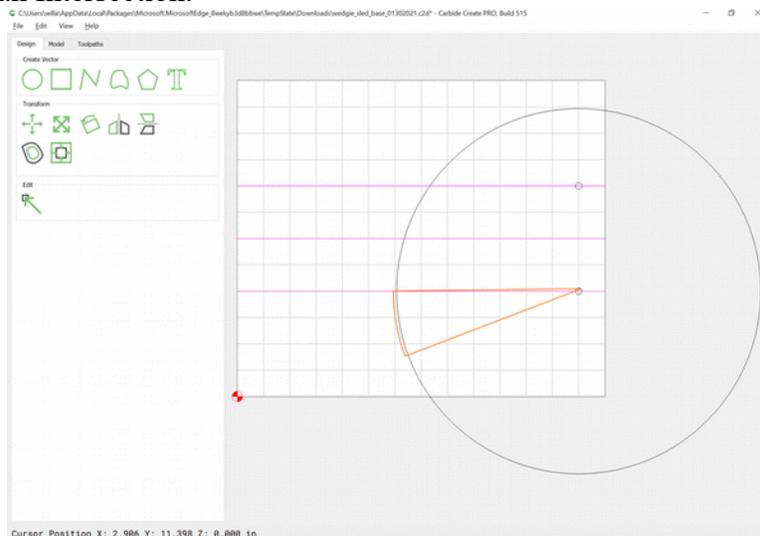
Design Information: There are two main features of the sled bottom

1. The first are on the right hand side that consist of two pockets that are 1.0" round (.5" radius) that is 1/4" deep. These are the recess for two of the 1/4-20 carriage bolt heads. Then there are the two holes that are 1/4" centered on the 1.0" recesses that are machined from 1/4 inch from top to stock bottom for a through hole. Both of these are 1.5 inches from the right hand edge. The original plan had them 1.0" inches from the right hand edge of the sled and I have allowed 1/2 inch so the sled can be trimmed with a zero clearance to the blade, then the holes center will be approximately one inch from the edge.

2. The second feature are the arcs for the other two 1/4-20 carriage bolts that allow for adjustment of the fence system. These were made seven inches on center from the 1/4 inch through hole. This arc that is 1/4 inch wide and was made by using two circles that were 6.875 and 7.125 inches in diameter centered on the 1/4 inch hole. I then created a triangle that was 90 degrees, 30 degrees and 60 degrees and placed the 30 degree angle on the horizontal center of the 1/4 inch hole. Then select the 7.125 inch circle and the triangle. The procedure for making these arcs were courtesy of William Adams from the Carbide3D Community Forum.



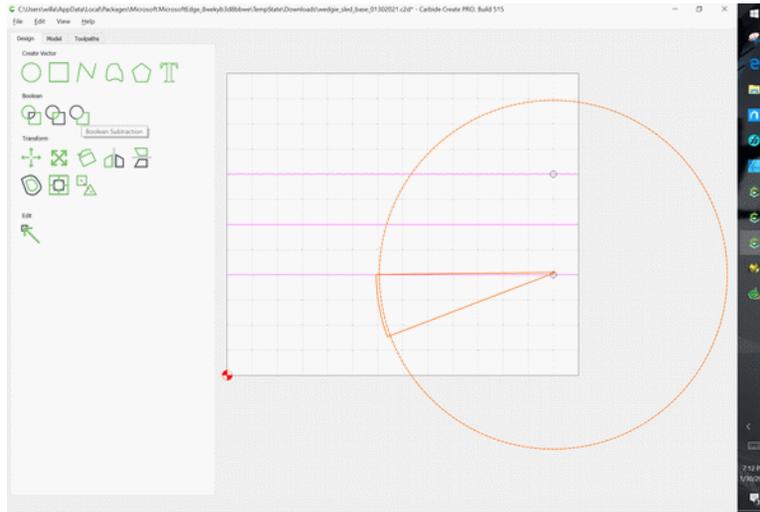
Then select the Boolean Intersection.



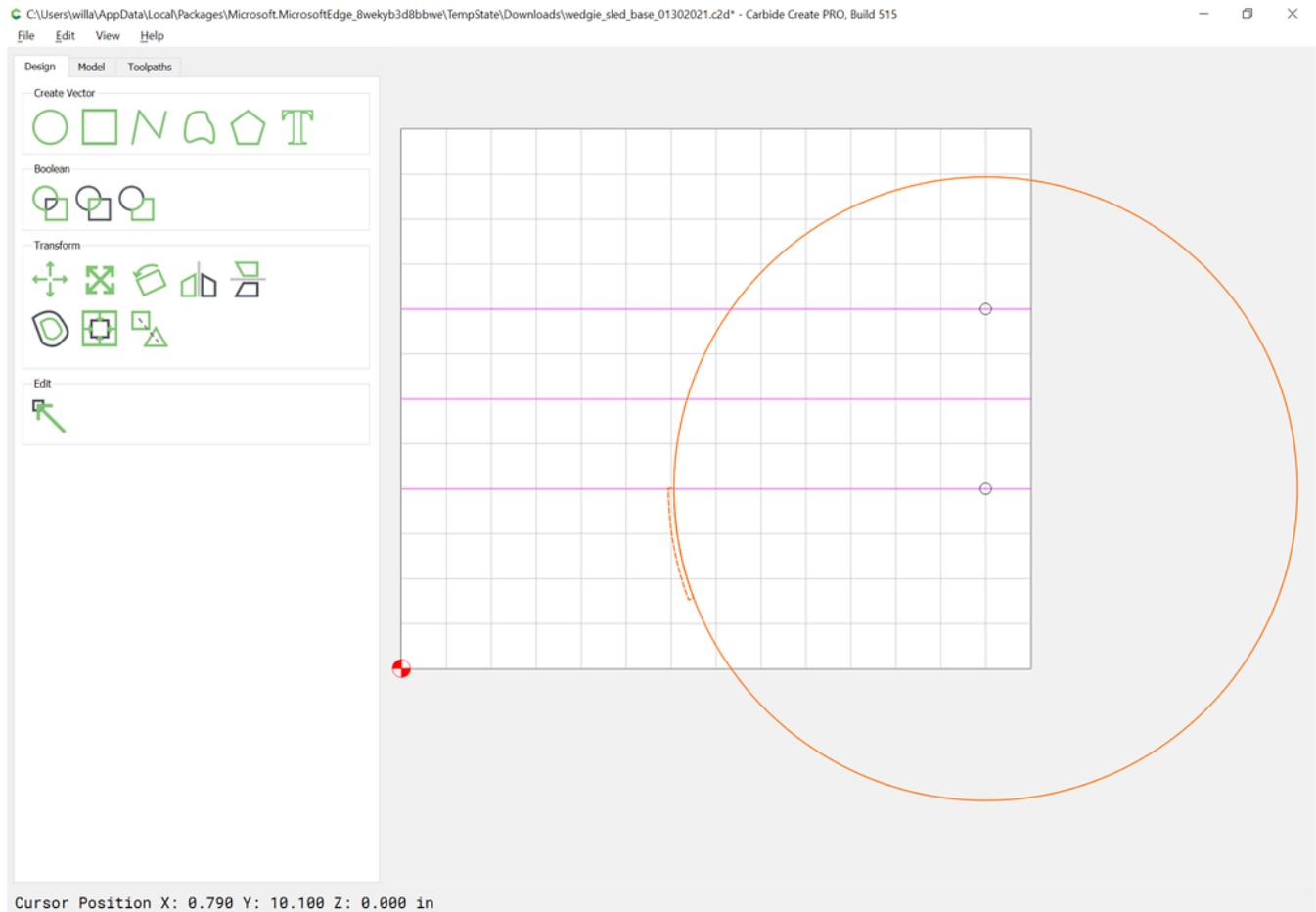
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Then select the triangle and then the inner circle that is 6.875 inches.



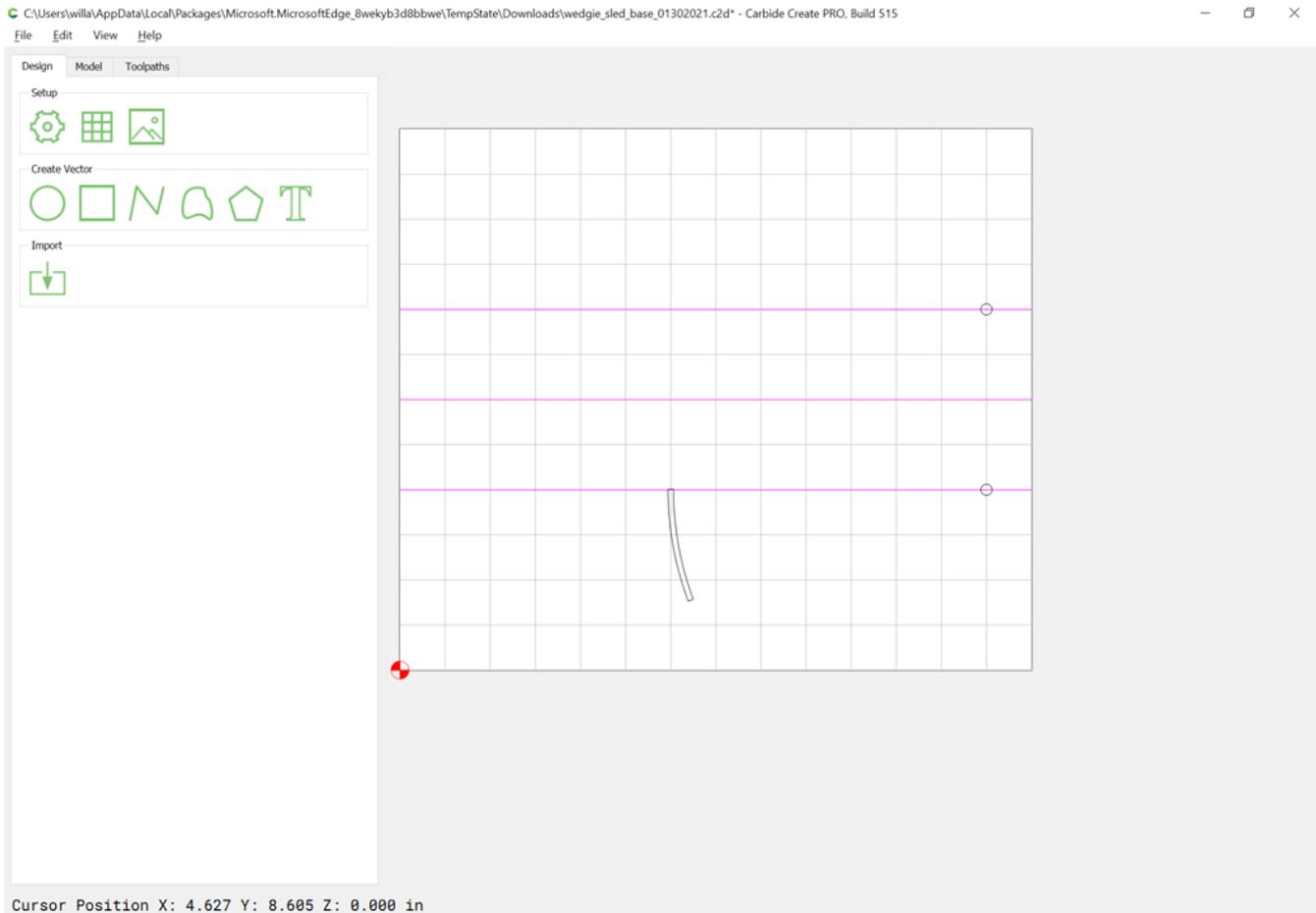
Then select the Boolean Subtraction.



Then select the smaller circle that is 6.875 inches and delete it, leaving a 1/4 inch wide arc.

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You have now created the first arc. Select the arc and do a copy, control c, and select the copied arc. Move the copied arc and do a rotate of 180 degrees. Then move the second arc into position so the bottom is in line with the horizontal center of the top $\frac{1}{4}$ inch hole. Now select the lower $\frac{1}{4}$ inch arch and then select the Offset Vectors and input the values of Distance=.375 inches and Outside, Apply and Done. Then select the second $\frac{1}{4}$ inch arc and do the same thing again.

I have a Powermatic 66 table saw and the center of my miter slot to the blade is approximately 6 inches. You need to measure the distance from your center of your miter slot to the blade and adjust the design specifications to match you specific saw. The sled design consists of both a top and bottom, the bottom $\frac{1}{4}$ inch through hole is designed to be about 1 inch from the right hand edge of the jig. The top is for an Inkra Miter Runner IMS1 and is placed to be about 6.5 inches from the right hand edge of the jig. After assembly of the jig you will trim off the right hand edge of the jig about $\frac{1}{2}$ inch so adjust your measurements for your particular table saw. It is very important that you make the necessary adjustments for a successful build.

Now select top four objects, $\frac{1}{4}$ inch through hole, 1 inch recess, $\frac{1}{4}$ inch arc and offset of $\frac{1}{4}$ inch arc objects and move the cursor to the center node of the $\frac{1}{4}$ inch through hole and drag that point to 1.5 inches from the right hand edge and 4.5 inches from the top edge. This offsets the objects toward the top of the project. Remember this is the bottom you are looking at and you will flip this over 180

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degrees top to bottom. This gives you more room for the forward fence to sit on the jig securely and not be crowded on the top edge of the jig as in the original design.

Now select the bottom 4 objects , $\frac{1}{4}$ inch through hole, 1 inch recess, $\frac{1}{4}$ inch arc and offset of $\frac{1}{4}$ inch arc objects and move the cursor to the center node of the $\frac{1}{4}$ inch through hole and drag that point to 1.5 inches from the right hand edge and 9.5 inches from the top edge. This makes the two $\frac{1}{4}$ inch through holes 5 inches on center from each other. The original design had them 4 inches apart. This made the maximum board width on the lower fence around 2 inches. With the 5 inch spacing you should be able to get about 2.5 inch boards on the lower fence. You may need to knock off the back side of the forward fence. Just dont get too close to the $\frac{1}{4}$ inch through hole in the fence. If you want to cut segments on boards that are more than 2.5 inches you will need to figure out another method to cut them. The 5 inch spacing between the fence through holes is not the absolute maximum but the SegEasy Wedgies are only so long and unless you make your own that are larger you will lose accuracy because of diminished contact with the fences and the Wedgie.

The tool paths are next

1. Select the two 1 inch recesses and create a tool path using a $\frac{1}{4}$ " end mill, #201. Make a pocket that is $\frac{1}{4}$ inch deep.
2. Select the two offset arcs and create a tool path using a $\frac{1}{4}$ " end mill, #201. Make a pocket that is $\frac{1}{4}$ inch deep.
3. Select the two $\frac{1}{4}$ inch through holes and create a tool path using $\frac{1}{8}$ " end mill, #102. Make a pocket that starts $\frac{1}{4}$ inch from the top to the stock bottom. When installing the $\frac{1}{8}$ " end mill make sure the stick out is just over $\frac{3}{4}$ of an inch so your collet will not hit your project top.
4. Now select the last two $\frac{1}{4}$ inch arcs and create a tool path using an $\frac{1}{8}$ " end mill, #102. Make a pocket that starts $\frac{1}{4}$ inch from the top to the stock bottom. When installing the $\frac{1}{8}$ " end mill make sure the stick out is just over $\frac{3}{4}$ of an inch so your collet will not hit your project top.
5. Save your tool paths together if you have a BitSetter. The order is important because you want to cut the recesses with the $\frac{1}{4}$ inch end mill first and the through cuts last because they start $\frac{1}{4}$ inch from the top surface of the project. If you do not have a BitSetter than save the individual tool paths and run in the order of creation 1-4.

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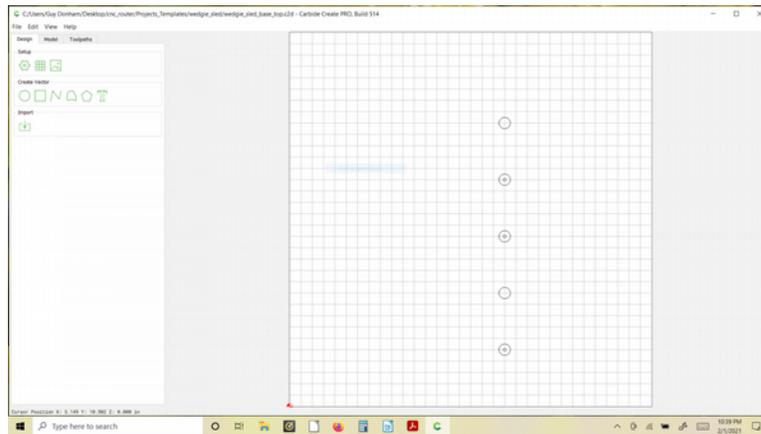
Cutting Information

These instructions are for cutting on a Shapeoko 3 XXL. If you have a different machine you will need to follow your machine instructions for cutting the sled.

When the sled was designed all the origins were the lower left corner. I used a BitZero to find the corner and set X Y and Z. If you do not have a BitZero then use the manual procedures for setting your origin to the lower left corner. If you are slightly off with the X & Y origin it is not a big deal because there is a ½ inch cushion on the right side to cut off and make a zero clearance edge to the saw blade. You want your fence fixed hole to be approximately 1 inch from the finished right hand edge. Just make sure your knob to secure your sled will not be contacted by the saw blade. When cutting the ¼ inch through holes with the 1/8 inch bit (#102) make sure the stick out of the bit is just over ¾ of an inch so your collet will not hit the top of the jig during cutting.

2. Wedgie Sled Top for use with Inkra Miter Slider 18” IMS1 Creation

The Wedge Sled Top was designed for use with an Inkra Miter Slider 18 inches long. There are two components on the Inkra Miter Slider. They are the holes (4) to attach the miter slider to the MDF jig top and the through holes (2) to allow adjustment of the sled to fit in your miter slot with no play side to side. It is very important for accurate segments that the miter slider have no play side to side. The Inkra Miter Slider has screws that adjust the thickness of the mite slider and need to be adjusted prior to assembly on the sled. You can adjust the miter bar over time as wear occurs.



Design Information: There are three main components.

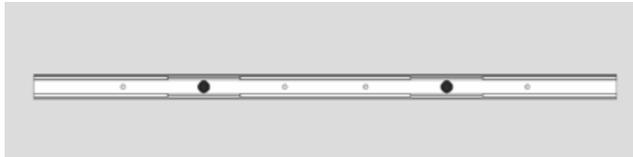
The three components are a through hole that is ½ inch diameter (¼ inch radius). A ½ inch recess (¼ inch radius) that is ½ inch deep and a 3/16 inch (0.09375 radius) through hole centered on the ½ inch recess. The ½ inch diameter through hole is for adjusting the set screws on the Inkra Miter Slider for fit in the miter slot. The ½ inch recess is to fit a washer and a screw that secures the jig body to the miter slider.

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This jig was created using an Incra Miter 18 Inch Slider Model IMS1. Additionally the design was created for my Powermatic 66 Table Saw. If you use a different miter slider and/or have a different table saw you will need to make the necessary adjustments for your particular situation.

On the Incra Miter Slide 18 Inch IMS1 there are four threaded holes to mount the sled to the miter bar and two adjustment set screws.



The hole spacing from the left to the right are from the end to the first mounting hole is 2.75 inches according to Incra's instructions. Then each of the other objects are 2.5 inches apart. I wanted the miter bar to stick out $\frac{1}{4}$ inches on the back side of my jig so I placed the first recess at 2.5 inches from the bottom edge of the jig and 6.5 inches from the right edge of the jig. Make the appropriate changes for your particular situation.

The first object from bottom to top is 2.5 inches from the bottom edge and is $\frac{1}{2}$ inch diameter ($\frac{1}{4}$ inch radius) and $\frac{1}{2}$ inch deep. There is a $\frac{3}{16}$ inch, second object, through hole starting centered on the $\frac{1}{2}$ inch recess, at $\frac{1}{2}$ inches to the bottom that is for the mounting screw. (Object 1 & 2)

The next object, third, is 2.5 inches centered from the first recess is a through hole for the miter bar adjustment screw. It is cut from the top to the bottom of the stock $\frac{1}{2}$ inches in diameter ($\frac{1}{4}$ inch radius). (Object 3)

The next object, fourth, is 2.5 inches centered from the through hole is a recess $\frac{1}{2}$ inch diameter (.25 inch radius) $\frac{1}{2}$ inch deep. There is a $\frac{3}{16}$ inch, fifth object, through hole starting centered on the $\frac{1}{2}$ inch recess, at $\frac{1}{2}$ inches to the bottom of the stock that is for the mounting screw (Objects 4 & 5)

The next object, sixth, is 2.5 inches centered from the through hole is a recess $\frac{1}{2}$ inch diameter (.25 inch radius) $\frac{1}{2}$ inch deep. There is a $\frac{3}{16}$ inch, seventh object, through hole starting centered on the $\frac{1}{2}$ inch recess, at $\frac{1}{2}$ inches to the bottom of the stock that is for the mounting screw. (Objects 6 & 7)

The last object, eighth, is 2.5 inches centered from the $\frac{1}{2}$ inch recess $\frac{1}{2}$ inch diameter (.25 inch radius) from the top of the stock to the bottom. This is for the miter bar second adjustment screw. (Object 8)

There is a fourth mounting screw you can design in but I did not think it was necessary. If you want it it is 2.5 inches centered on the previous through hole and the same as object 1 & 2.

The objects are all 6.5 inches from the right hand side of the jig. The jig will be cut off about $\frac{1}{2}$ inches to make a zero clearance to the saw blade. If your table saw has different spacing from the center of the miter bar to the blade make the appropriate adjustments.

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Make Tool Paths

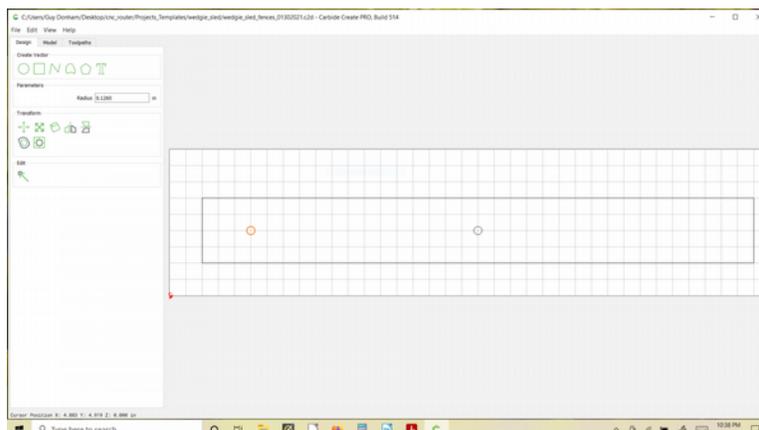
1. Select the three $\frac{1}{2}$ inch recesses and make a tool path. Make a pocket with $\frac{1}{4}$ inch end mill, #201, that is $\frac{1}{2}$ inch deep.
2. Select the two $\frac{1}{2}$ inch through holes and make a tool path. Make a pocket with $\frac{1}{4}$ inch end mill, #201, that is from the top of the stock to the bottom.
3. Select the three $\frac{3}{16}$ inch through holes and make a tool path. Make a pocket with $\frac{1}{8}$ inch end mill, #102, that is starting at $\frac{1}{2}$ inch and to stock bottom.
4. Save your tool paths together if you have a BitSetter. The order is important because you want to cut the $\frac{1}{2}$ inch recesses and the $\frac{1}{2}$ inch through cuts with the $\frac{1}{4}$ inch end mill first. Then you want the $\frac{3}{16}$ inch through cuts made with the $\frac{1}{8}$ inch bit made last. If you do not have a BitSetter than save the individual tool paths and run in the order of creation 1-3.

Cutting Information

These instructions are for cutting on a Shapeoko 3 XXL. If you have a different machine you will need to follow your machine instructions for cutting the sled. When the sled was designed all the origins were the lower left corner. I used a BitZero to find the corner and set X Y and Z. If you do not have a BitZero then use the manual procedures for setting your origin to the lower left corner. If you are slightly off with the X & Y origin it is not a big deal because there is a $\frac{1}{2}$ inch cushion on the right side to cut off and make a zero clearance edge to the saw blade. You want your fence fixed holes to be approximately 1 inch from the finished right hand edge. Just make sure your knob to secure your to the sled will not be contacted by the saw blade, use a small diameter knob.

3. Wedgie Single Fence (Make 2)

The Wedgie Sled requires two fences. The design is only one fence which you will need to make twice. The original plans had fences that were only 12 inches long. Since I made the sled wider I made the fences longer.



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Design Information: There are two components

The two components are a rectangle that is 2 inches wide and 17 inches long. The second component are two .252 inch holes for mounting the fences on the sled.

The first component was the rectangle that was 2 inches wide and 17 inches long. I created the rectangle and centered it on the stock.

The second component are two holes that are .252 inch diameter (.126 inch radius). The first hole is 1.5 inches from the left hand edge of the rectangle. The second hole is 7 inches centered from the first hole which is 8.5 inches from the left hand edge of the fence.

Make Tool Paths

1. Select the two .252 inch through holes to make a tool path. Make a pocket from the top of the stock to the bottom with a $\frac{1}{4}$ inch end mill (#201).
2. Select the 2x17 inch rectangle and select a contour on the outside from the top of the stock to the bottom. Use a $\frac{1}{4}$ inch end mill (#201). Add 4 tabs, two on each of the short sides and none on the long sides. This is because it is critical that the two long sides are parallel and cutting off the tabs could make them not parallel. The short sides are not critical because one end will be trimmed off and the other end is not important to the use of the sled. I make my tabs $\frac{1}{4}$ inch wide and $\frac{1}{8}$ inch tall. I used hardwood to make the fences. You can make them with MDF but I wanted the stability of the hardwood. Be sure to select the proper tools in Carbide Create for the material you use. The end mills and the wood used will affect the feeds and speeds of the cutting tool.
3. Save your tool paths together if you have a BitSetter. The order is important because you want to cut the .252 inch through holes first and then the rectangle cutout last. If you do not have a BitSetter then save the individual tool paths and run in the order of creation 1-2.

Cutting Information

These instructions are for cutting on a Shapeoko 3 XXL. If you have a different machine you will need to follow your machine instructions for cutting the sled. When the sled was designed all the origins were the lower left corner. I used a BitZero to find the corner and set X Y and Z. If you do not have a BitZero then use the manual procedures for setting your origin to the lower left corner.

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Assembly of Wedgie Sled and Use

After cutting the Wedgie Sled out clean up any rough edges. It would be a good idea to coat your sled and fences with either Shellac and/or Polyurethane. This will help stabilize the MDF. MDF is very porous and adsorbs moisture easily. Recommend you apply the Shellac/Poly before assembly of the Wedgie Sled.

Assembly of Wedgie Sled

Install the miter slider loosely on the Wedgie Sled and set your sled in the miter slot on the table saw. Make sure your blade is retracted all the way down. Now slide your table saw fence over to contact the edge of the Wedgie Sled. Lock your fence down and then push the sled against the table saw fence. Tighten your miter bar attachment screws and move the fence away. Install your fences on the Wedgie sled. The edges of the fence will be trimmed at the same time your Wedgie Sled base is trimmed. Insert your Wedgie and adjust the fences and lock them down. Move the Wedgie Sled back far enough and raise the blade high enough to trim the base and fences. Start your saw and push the Wedgie Sled through the blade trimming the base and making a zero clearance between your saw blade and the Wedgie Sled. You have also created a zero clearance edge of your fences. Zero clearance edges on the fences are important because it will keep you from having as much clean up on the edges of your segment pieces. The Wedgie Sled is now ready for use. Cutting segments is a cross cut on the wood. I would recommend a high tooth count saw blade to cut your segments.

Zero Clearance Setup Strip

On the segeasy.com site there is a download for making a zero clearance setup strip. This is highly recommended because during the cutting of the segments they drop off the sled and this strip helps prevent the segments from crowding the blade. Even with the strip keep a long piece of wood or a pencil handy and move the segments away from the blade.

Make a Saw Stop

You will need to make a saw stop to cut accurate length segments. On segeasy.com are plans for making a saw stop.

On youtube.com is a video for making a digital saw stop. Check it out:

<https://www.youtube.com/watch?v=gHsuyhZEeSk>

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Safety

Use of the Wedgie Sled involves danger. The blade is exposed and all care should be exercised when using the Wedgie Sled. The user assumes all liability with use of this jig. Adhere to all safety instructions that came with your power tools. Never operate your saw when impaired or tired. The operator must be aware at all times of the danger of working with woodworking tools and minimize the risk of injury during use. Be safe when using this design and do not use if you cannot assume the risk of personal injury using this Wedgie Sled.

Use of the Sled

The sled use is quite simple. You must figure out your segment lengths. There are software programs like SegCalc (<https://www.segmentedturning.com>) and Woodturner Pro (<https://woodturnerpro.com>) that simplify making a segmented vessel. However the formula for making a segmented vessel is quite complex. So I recommend you either buy the commercial software or use the free online calculators.

Here are some free online calculators:

<https://www.blocklayer.com/woodturning-segments.aspx>

<https://www.woodturnersresource.com/extras/projects/segmentcalc/index.html>

To use the sled you must prepare your stock for the rings. The software or calculators will want to know your stock thickness and number of segments per ring. You will then prepare the stock by thickness and width in preparation for making the individual segments for a ring. As with any woodworking your stock must be flat and square. Milling your stock to uniform thickness and width is mandatory. To cut the individual segments you must set up a stop to get accurate length of the segments. All segments in a ring must be the same length for the ring to fit together well. After you have set your length there are two fences on the Wedgie Sled. You always alternate between the two fences while cutting the segments. You always use the front side of the two fences to cut your segments. You could technically cut on the back side of the fence but this would lead to inaccuracy because if the wood is not held tightly against the fence the angle would be off. So always use the front of the fences and they support your wood and make cutting easier. The fence also makes a zero clearance for cutting of the segments. So you take your stock and cut off the edge and then move the stock to the opposite fence, push the edge against the stop you set earlier and make a cut and you have your first segment. Measure your first segment and if necessary adjust your stop. If you adjust your stop dispose of that first segment. Cut a new segment and verify the length. If the length is good then continue alternating the stock between the fences making the required number of segments for your ring. If you have enough material make an extra segment in case you find a defect in one of the segments. It is better to have one extra segment rather than not having enough. The use of the zero clearance set up strip referenced on the segeasy.com site makes your segments fall away from the blade after cutting. If the segments start to bunch up reach in with a long stick or pencil and move the cut segments away from the blade. If you allow the segments to pile up around the blade the segments can contact the blade and ruin them and possibly shoot them around the shop. Just do not reach down with your fingers to move the segments, always reach in with a stick and/or pencil keeping your hands and fingers well clear of the blade. The blade is set quite high and there is no blade guard over the blade. This exposes the operator to danger and

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attention must be kept on the task. Cutting segments is dangerous and you are responsible for your own safety. Be careful, stay alert and do not get complacent when cutting segments. You can get quite robotic when cutting a lot of segments and you must never go on automatic pilot.