Lake Erie Toolworks
Wagon Vise Screw Installation Instructions

www.LakeErieToolworks.com

Very Important – Please Read!

Read all instructions prior to vise screw kit installation to ensure full knowledge of the installation process. Also, please follow all proper safety rules and guidelines as appropriate when using your woodworking tools to install the vise screw kits in order to prevent any bodily injury.

Wagon Vise Kit Contents:	
Quantity	**Description**
1	Wagon Vise Screw
1	Standard Vise Nut (or optional Extended Vise Nut which eliminates the need for the nut build-up operation as detailed in this installation instruction)
1	Brass Mounting Plate with Shoulder Bolt Anchor & Stainless Steel Screws
1	Vise Handle with End Caps & O-Rings (optional based on kit)
2	UHMW Plastic Sliders (optional based on kit)
2	Maple Lower Runners with ¼" x 1" Lag Bolts & Washers (optional based on kit)
6	SPAX Lag Bolts – (4 @ ½" x 6") (2 @ ½" x 5") (optional based on kit)
Recommended Installation Tools:	
Quantity	**Description**
1	2-3/4" dia.drill bit (Hole saw, Self-feeding, Forstner bit)
1	3/16" drill bit for a hardwood bench or 5/32" drill bit for a softwood bench
1	Long 5/16" drill bit
1	½" forstner bit
1	9/16" twist drill bit
1	Pattern Guided Router Bit, ¾" length of cut (dovetailed bench only)
1	1" forstner bit
Additional Installation Tools	
1	Power Drill / Router (optional), Combination Square, Measuring Tape
1	Hand Plane or Jack Plane
1	Set of sharp chisels – various sizes
1	Set of Bar Clamps (and Dead Blow Mallet if doing Dovetail method)

Disclaimer: Woodworking is inherently dangerous and Lake Erie Toolworks cannot be held responsible for any injury to person or property arising from installation, use or misuse of our products.

Instructions for Installing Wagon Vise Screws

Preface / Reference

If you haven't started building your bench yet, there are several great books out there that can give you good guiding principles about what type of bench and vises will suit you best. If you already have a bench, chances are strong that you can retrofit and accommodate a vise of your choice.

We recommend reading the following books:

- Christopher Schwarz's The Workbench Design Book, The Art & Philosophy of Building Better Benches. He offers a great overview of different types of vises and their usefulness as well as a couple of great plans based on historical designs, all of which can use our various vise screws.

- Scott Landis's The Workbench Book is another very good workbench resource.

- Lon Schleining's The Workbench, a Complete Guide to Creating Your Perfect Bench can also provide you with some good information to help guide your overall bench building efforts.

The books mentioned above will get you thinking about the type of work that you do or plan to do and what type of bench and vise combinations will work best for you.

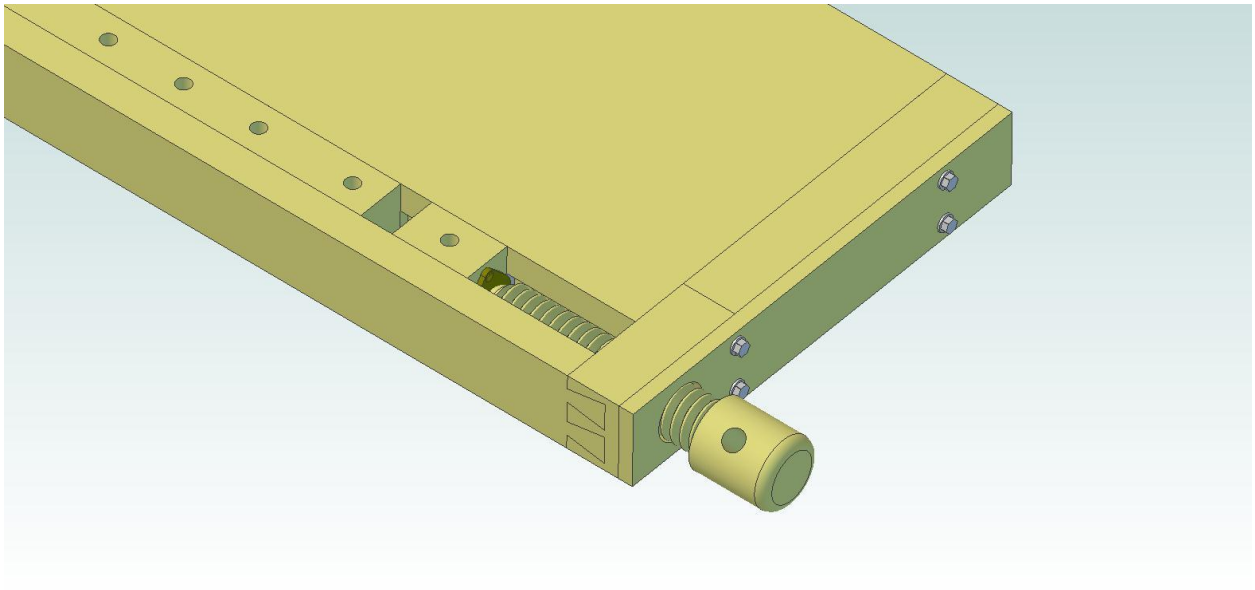
Instruction Steps

- Read all instructions first and carefully layout and check your work before actually drilling or cutting. It's easy to back yourself into a corner with clearance issues if you're not careful. It's also pretty tough to un-drill holes or un-saw a bench part once you've done it.

- We recommend that you review the next page "User Supplied Dimensions" and fully document all of the requested dimensions to be used as a reference for completing your work bench wagon vise screw installation.

User Supplied Dimensions

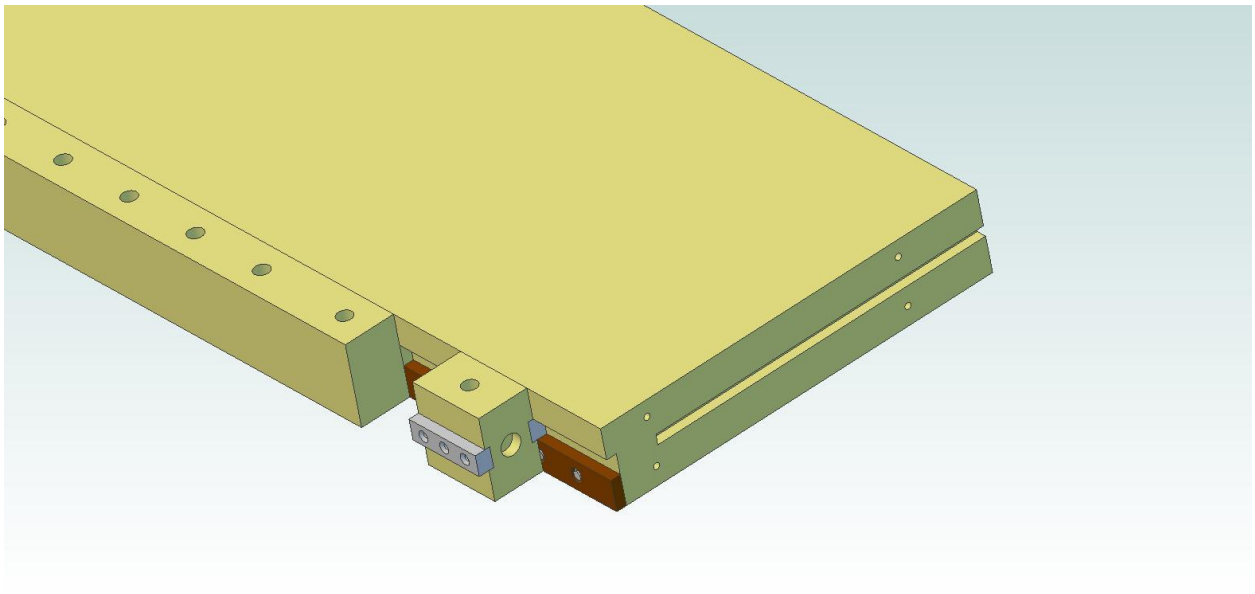
Width of Bench Top (user defined)	
Length of Bench Top including Wagon Vise Endcap Assembly, not including opposite endcap if applicable (user defined)	
Cut Down Nut Length	
Nut Extension Length =Width of Bench Top – Cut Down Nut Length	
Height of Endcap Assembly	
Width of Endcap Assembly	
Extension of Visescrew from Nut	
Length of Vise Top Pieces =Length of Bench Top - Width of Endcap Assembly + ½" extra to be trimmed after glue up	
Length of Dovetail (user defined)	
Length of Dovetailed Front of Bench	
Length of Vise Cutout = Extension of Visescrew from Nut + 4-1/4"	
Back Benchtop Width = Width of Benchtop - 4-1/4"	
Length of Bench Center = Length Vise Top Pieces - Length of Vise Cutout	
Dog Block Offset = Distance from top of benchtop to the top of the Vise Cutout	
Dog Block Cut Depth = Thickness of Slide – Depth of Vise Cutout(approx. ½") + 1/32"	



(Figure 1)

These plans for a wagon vise using a Lake Erie Toolworks Wagon Vise Kit were designed to limit the requirement of hitting exact dimensions perfectly. A few of the dimensions will need to be consistent with a complementary component although this is generally accomplished by using the same setups on machinery. The vise operates by using a sliding dog block that has two slides attached to each side and two corresponding grooves for these slides to run in. The top face of the grooves will be routed into the bench components during installation and the bottom face of the grooves are adjustable to allow for fine tuning the fit and compensating for any wear that may occur over the years. This allows for looser tolerances during the building process and a perfectly functioning vise for many years to come. (See Figure 1)

In the following picture (See Figure 2), the vise screw and the Endcap Assembly, which contains the Nut, is removed as is the front section of the bench. This shows one of the Lower Runners that the Sliding Block slides along. The Lower Runners have vertically slotted holes that allow it to be adjusted up and down to compensate for any variations during installation and to take up any wear over time if necessary. The second Lower Runner is mounted in the same way in the front section of the bench. The sliders are made out of UHMW plastic (Ultra-High-Molecular-Weight Polyethylene) to reduce friction and wear over time and are precision milled to ensure that the top and bottom faces are parallel, a requirement for a smooth operating vise.



(Figure 2)

The wagon vise operates by spinning the vise, clockwise to push the Sliding Block in and counter-clockwise to pull the Sliding Block out. The vise moves in and out with the Sliding Block during use. The linear guiding system (the UHMW Slides and their corresponding adjustable grooves) constrains the Sliding Blocks movement so that it may only move along the same axis as the vise. This removes any moment loading (side loading) of the screw and only allows axial loading of the screw, that is only the loads along the same axis as the screw such as tightening the vise. This allows for a very smooth operating and long lasting vise as there is only appreciable friction between the vise screw and vise nut when a workpiece is being actively clamped, not when moving the vise into position for clamping.

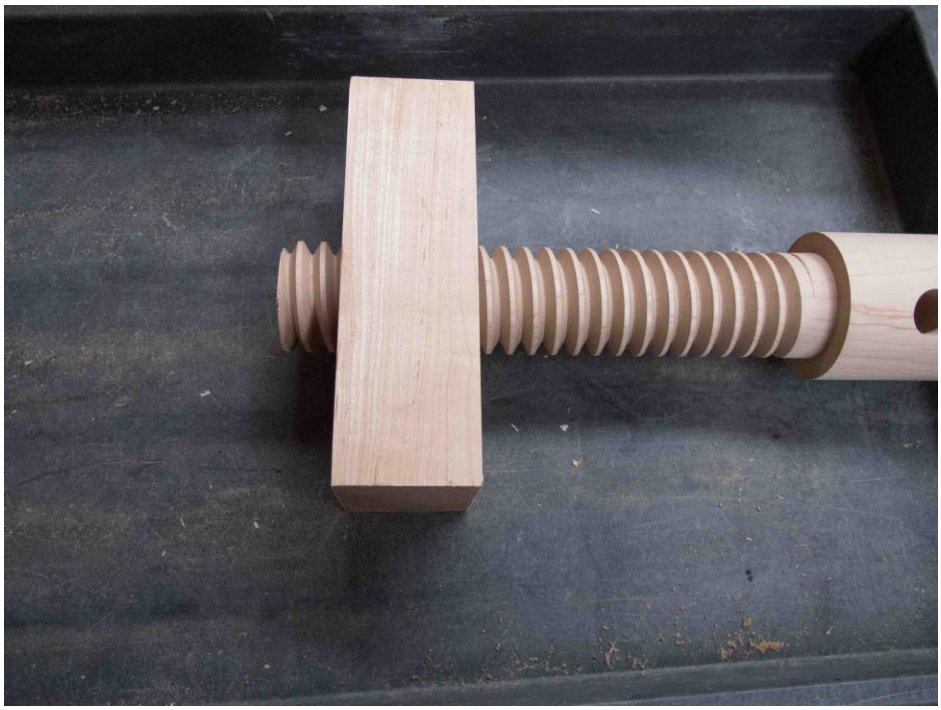
Note on new construction vs. retrofitting

The Wagon vise is easiest to install while building a bench rather than a retrofit. If you already have a bench and would like a wagon vise, I would recommend sawing the front of your bench off and starting over rather than trying to cut out the large sections necessary for a wagon vise. The through slot needs to be accurately cut, square to the bench top as well as flat and this would be difficult to do while the components are already glued together. You will likely be able to reuse the lumber sawn from the front of your bench and you may already have dog holes cut or drilled that can be reused as well.

Installation Instructions

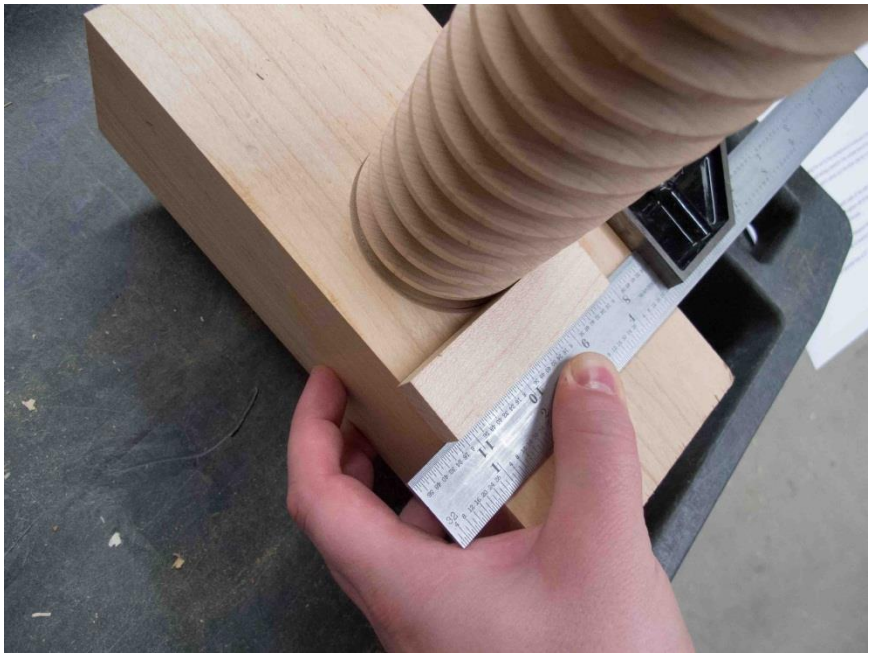
Determine the width and length of the bench top that you are going to build. The instructions assume that you will be making a 4” thick bench top but only the front section where the vise itself needs to be 4”, the back section can be made thinner if preferred. Write these dimensions down in the “User Supplied Dimensions”’ Section of this guide on Page 3.

The preferred method for joining the nut to the workbench is to butt join it to another equally thick and wide piece of wood and then laminating a board to the outside face of this assembly. First you will thread your vise into your nut until it comes out the other side by a couple of inches**.** (See Figure 3)



(Figure 3)

Then you will use a square to mark both sides of the vise on the nut as shown (See Figures 4 & 5). You may have to use a small scrap of wood to register off of the top of the threads if the thin edge of your square goes between the crests(top) of the threads.



(Figure 4)

(Figure 5)

Remove the vise and measure the distance between the two parallel lines that you just marked on the nut. Make another parallel line at exactly halfway between the first two lines (See Figure 6)

(Figure 6)

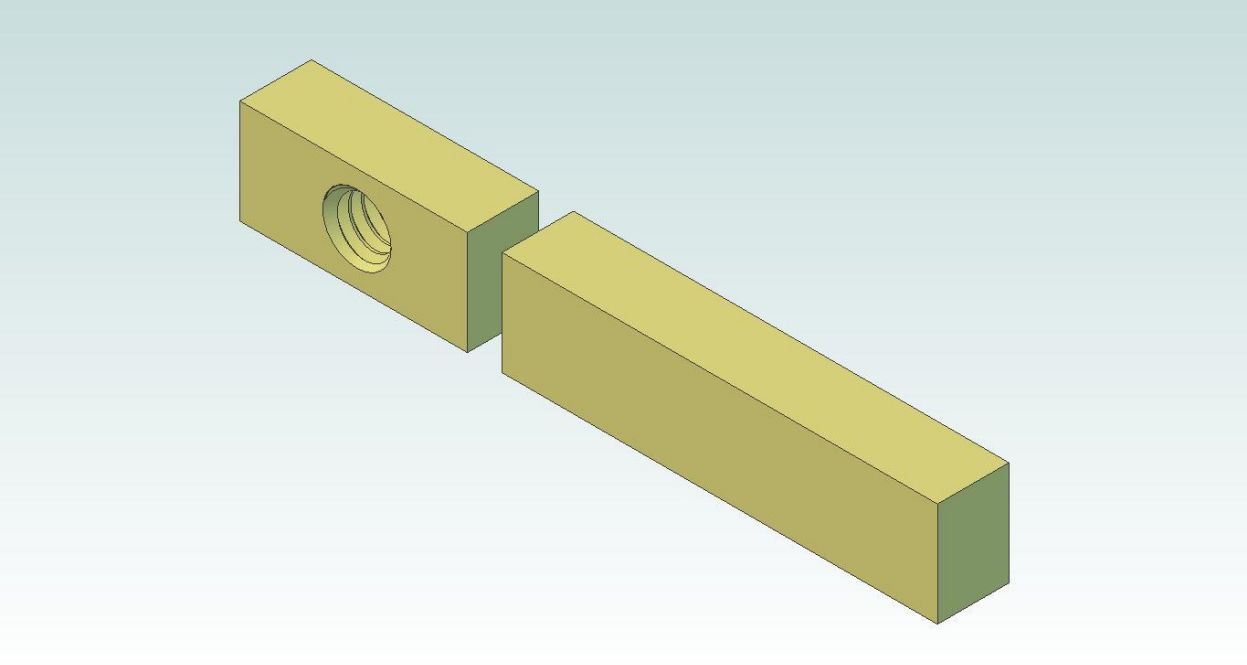
Then mark another parallel line at 3” to the left of the center line of the vise hole. (See Figure 7)

(Figure 7)

The other end of the nut will need to be joined to a piece of wood, called the ‘Nut Extension’, as described below and will need to be cut square (the nuts are delivered approx. square but not close enough to leave as is) (See Figure 8). The best method for ensuring the nut and nut extension match up properly is to use either a mitersaw or a table saw. Cutting the two pieces from opposite sides of the

blade ensure that if the fence on the mitersaw or the miter gauge on the tablesaw aren't perfectly square to the blade, then the error will be cancelled ensuring a flat joint**.**

First cut the end of the nut off. Just take enough to clean up the end, this dimension isn't critical. Then take a measurement from the last line that you drew on the nut (3" from the center hole) and the freshly cut end of the nut. Write this dimension down as "Cut Down Length of Nut" in the 'User Supplied Dimensions' section. Then subtract the 'Cut Down Nut Length' from the 'Width of Bench Top' dimension to determine the length of the Nut Extension. Choose a suitable piece of wood or laminate multiple pieces to build up a Nut Extension block that is about 1/4"-1/2" longer than the 'Nut Extension Length' calculated, and the same thickness and width of the Nut. Cut the end that will be joined to the Nut, positioning it on the opposite side of the blade as discussed above to ensure a properly fitting joint.



(Figure 8)

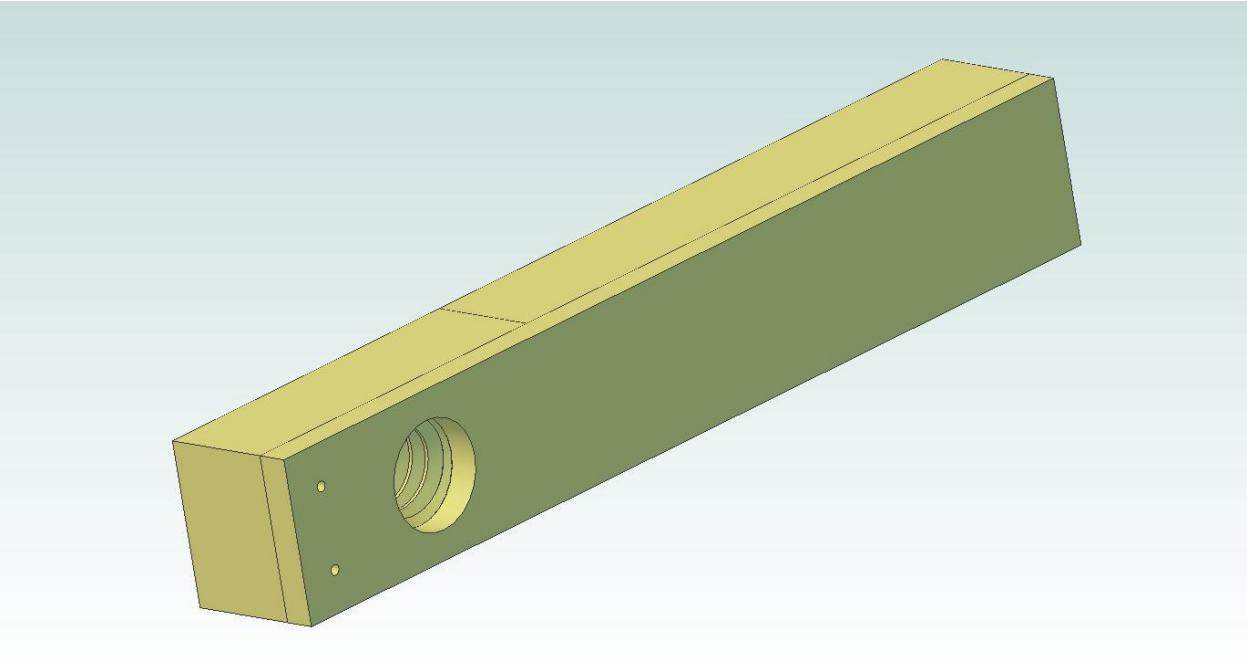
There are several methods for joining the Nut and the Nut Extension. A simple butt joint with glue works (applying a thin layer of glue to both sides of the end grain joint, letting it dry and then gluing and joining the boards is best. This is called 'sizing' the joint and is common for butt joints and miter joints.) Using dowels wouldn't hurt as well as using biscuits or loose tenons either. Join the Nut and the Nut Extension however you feel comfortable. The faces need to be kept aligned while the glue is drying, clamps or clamping flat pieces of melamine across the joint will keep it flat while longer clamps compress the butt joint.

Once the Nut and the Nut Extension are joined and the glue has dried for the recommended amount of time, the clamps can be removed and the surfaces smoothed. A hand plane is best, such as a jointer

plane as it will remove the least amount of material and provide a flat surface. Hand plane all four sides of the Nut and Nut Extension assembly until you are satisfied that they are flat and square.

Laminating a board, called the Outer Board, to the outside face of the Nut and Nut Extension assembly is the next step (See Figure 9). A ¾" board is specified although a somewhat thinner or thicker board would also work equally as well. You will need to drill a clearance hole for the visescrew, 2-3/4" is recommended. The method that we recommend is to make the board wider and longer than necessary, glue it in place, and then use either a handplane or a flush trimming bit to bring it flush to the dimensions of the Nut and Nut Extension assembly.

Make the board about 4-1/4" wide and about 2" longer than the 'Width of Bench Top' dimension listed in the 'User Supplied Dimensions' section. Mark the center of the hole 4-3/4" from the left side of the board and in the middle of the width of the board. Drill the 2-3/4" hole. Adding a chamfer (1/4") to the inside face (face to be glued) on the hole will provide a place for glue to go to avoid having it go into the threaded hole of the nut. Find 2 flat head wood screws, #10, or larger and at least 1-1/2" long and mark and drill two close fitting clearance holes for the screws about 1" from the left side and about 1" from the top and bottom and countersink them so that the screw sits slightly below the surface



(Figure 9)

Position the board on the outside face of the Nut/ Nut Extension assembly where it will be glued, and thread the vise through the board and into the threaded hole until it sticks a few inches out of the opposite side of the nut. Position the whole assembly so that the vise hub sticks upward and the Nut/Nut Extension are clamped flat on a surface. Push the board to the right so that it touches the visescrew and so that the top and bottom edges of the right side of the board have equal overhangs over the Nut Extension. Use the screws as transfer punches (or transfer punches) to mark where the screw holes are on the Nut. Then repeat the same steps but pushing the board to the left. Then push the board away from you ensuring that the bottom overhang is consistent and mark through the holes as before. Finally, repeat the previous steps by pulling the board towards you.

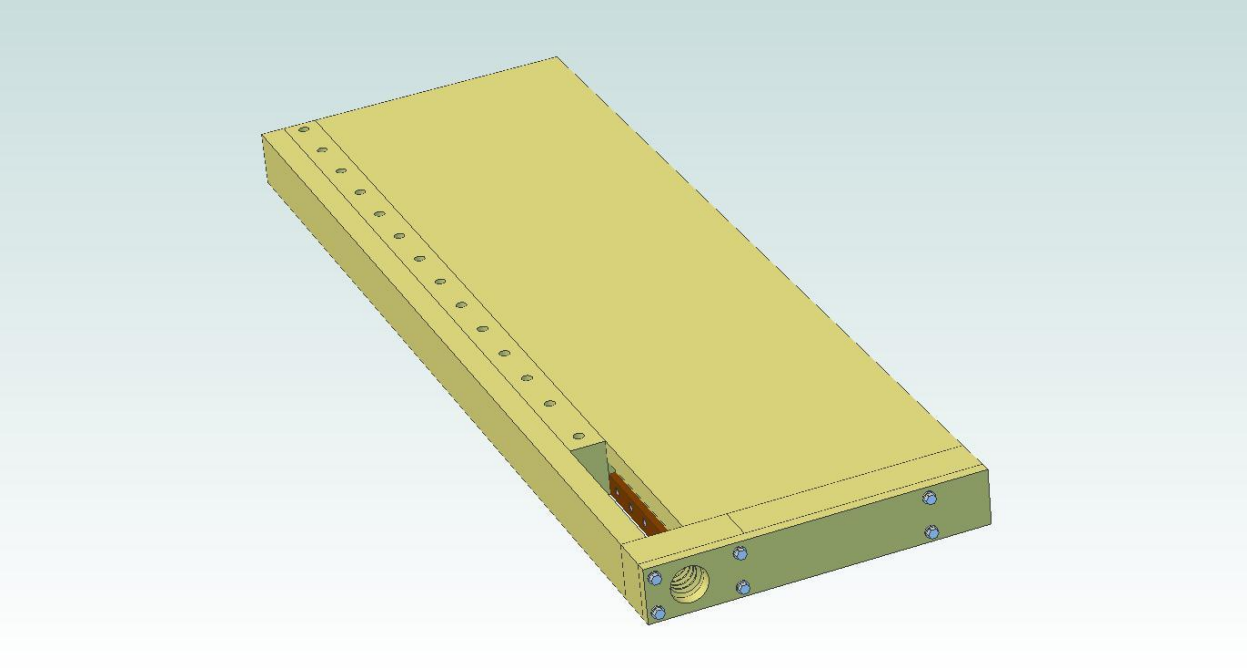
Unscrew the vise and lift off the board and you should have 8 punch marks arranged in two cross patterns. Use a rule to connect the opposing punch marks and draw the intersecting cross at both locations. Then, determine the proper pilot hole for your wood screws and drill them at the appropriate depth into the nut at the point where the crossed lines intersect. When the board is laminated to the face of the Nut/Nut Extension assembly, these two screw holes will keep the 2-3/4" clearance hole properly aligned with the axis of the vise when the screws are driven through the board and into the nut. Place the board onto the Nut assembly and drive the screws into the holes checking to make sure that the right side of the board has equal overhang. Thread the vise into the hole and check that there is an equal amount of clearance around the vise. Remove the visescrew and remove the wood screws.

The Nut/ Nut Extension assembly should be lying flat on a surface and the Outer Board and wood screws should be handy. Sawhorses with a 2 x 4 straddling and clamped to them work well for the flat surface as it allows you to clamp from below the 2 x 4. Do a dry run to ensure the joint closes up properly and that you have all of the clamps that you need. Remove all of the clamps, etc.

Apply glue to the Nut assembly being careful to avoid the threaded hole area and not getting to within ¼" of it. Make sure if you have glue close to the hole that it is spread thinly so that it won't get into the hole when clamped tight. The rest of the glued area can have a normal amount of glue for laminating. Carefully lay the Outer Board on top of the glued Nut Assembly and line up the wood screw holes. Drive the wood screws into the holes. It is helpful to flip the whole assembly over so that any glue that may enter the threaded area falls downward away from the threads rather than into the nut. Ensure that the right side of the board has the same overhang on both sides of the Nut Extension and apply a clamp to this end with moderate clamping pressure. Then, working from the Nut side of the assembly to the Nut Extension end, apply your clamps ensuring that it doesn't shift by checking the Nut Extension ends overhang after each clamp is applied. Let the glue dry the appropriate amount of time and remove the clamps and the wood screws. Flush trim the Outside Board to the rest of the assembly with either a hand plane or a flush trimming router bit. The ends don't need to be flush trimmed as they will be cut off later.

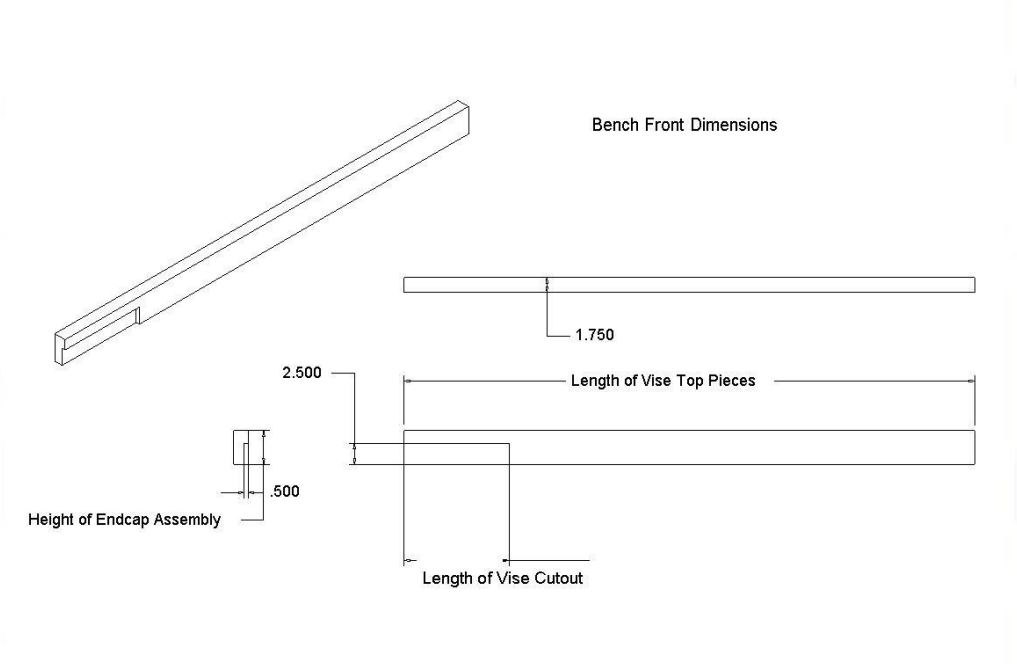
If you handplaned off the lines that you drew on the nut you will need to re-mark them using the same method as above. Measure the height of the entire Endcap Assembly (the Nut, Nut Extension and Outer Board glued together) and mark this height in the 'User Supplied Dimensions' section under "Height of Endcap Assembly". This will be the thickness for the rest of the benchtop pieces going forward. Next, measure the width of the Endcap Assembly and mark this in the 'User Supplied Dimensions' Section as "Width of Endcap Assembly". Also, thread the visescrew into the Endcap Assembly all of the way until it stops and then back it off 1/4 of a turn. Measure the distance that the vise extends past the nut. Mark down this dimension in the 'User Supplied Dimensions' Section as the "Extension of Visescrew from Nut" value, to the nearest 1/16" is fine. Remove the screw from the nut.

For Bolted Endcap Assembly (See Figure 10)



(Figure 10)

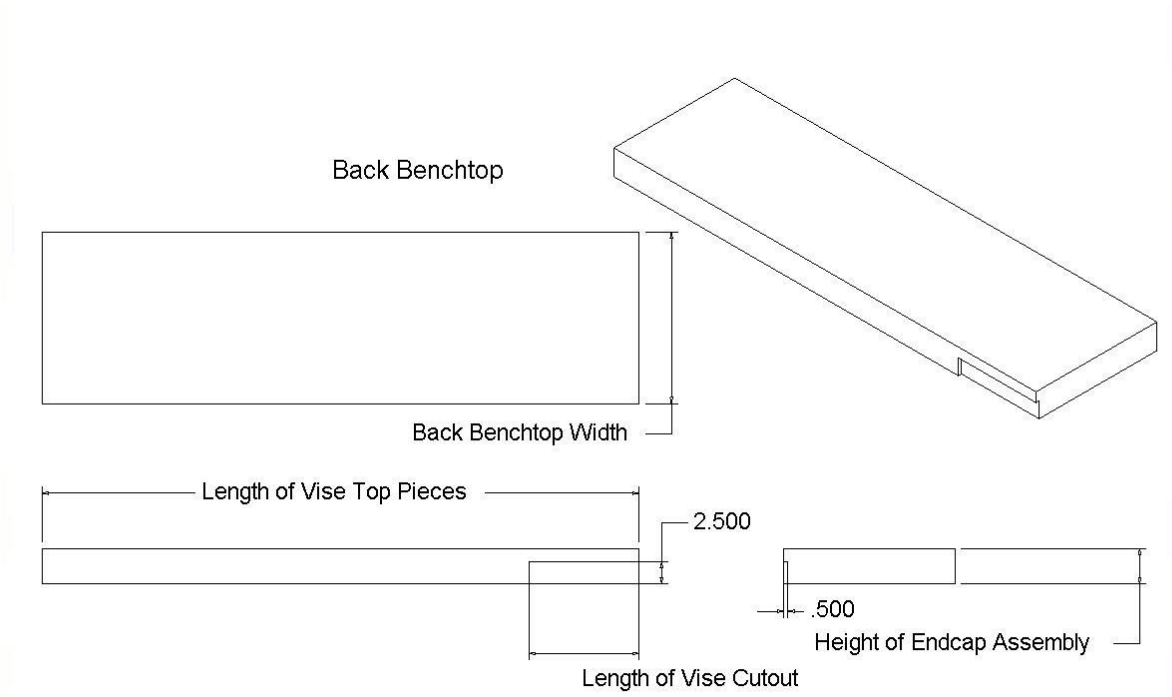
The Front of Bench piece is going to be 1-3/4” thick by the “Height of Endcap Assembly” tall by the “Length of Benchtop Pieces” measurement in length. A section of the ‘Front of Bench’ piece will need to be cut out for the sliding dog block to slide in. Here is a drawing of the ‘Front of Bench’ and its cutout and necessary dimensions: (See Figure 11)



(Figure 11)

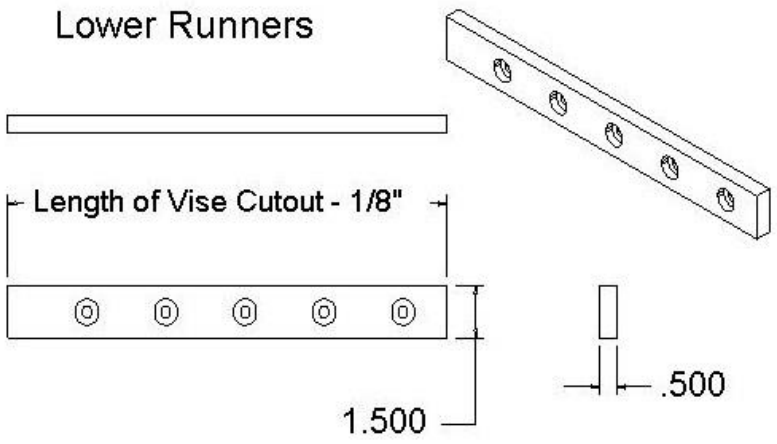
This cutout is rather critical for proper functioning and it is probably best cut with a router and a router guide. The 2.500" dimension should be cut close but it is more important that the dimensions for the cutout in the "Front Benchtop" piece are the same as the cutout in the "Back Benchtop". You should use the same setups (bit extension and router guide fence) and make both cutouts at the same time. The depth is important as the Lower Runners will need to be slightly thinner than the depth of the cutout to avoid interference. The cutout should be between 1/64" and 1/32" deeper than the thickness of the Lower Runners. The Lower Runners can be planed a small amount if the cutout doesn't end up deep enough. The Lower Runners should only be planed from the non-counterbored face.

The "Back Benchtop" can be either be a 1-3/4" thick board when the cutout is made or it can be the whole back section of the workbench glued up and planed to the thickness of the "Height of the Endcap Assembly". If it is more convenient to route the cutout while it is just one board you can do that and then carefully laminate it to the rest of the back of the benchtop, otherwise you can just rout the cutout in the whole Back Benchtop section as shown below (See Figure 12).



(Figure 12)

The Lower Runners are the next components that need to be installed. They are made out of hardwood and are ½" thick by 1-1/2" wide by the "Length of Vise Cutout" dimension in length minus 1/8". They will need to be cut to length (See Figure 13).



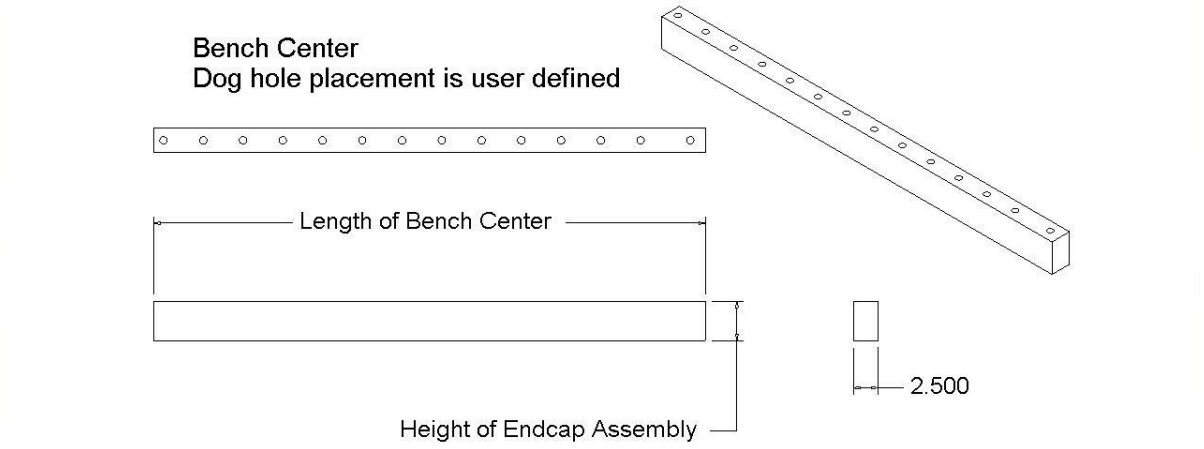
(Figure 13)

The Lower Runners are held on with five ¼" lag bolts each. It is important that the end with the first slotted hole that is 2-1/2" on center from the end be positioned toward the nut when installed. Only cut from the opposite end when sizing the Runners. This gives the lag bolt used to bolt the Endcap Assembly to the Front Benchtop part approx. 2" before it would hit the first bolt used to mount the Lower Runner. This lag bolt will likely have to be cut down to avoid any interference.

Assuming that the Vise Cutouts on the Back Benchtop and the Front Benchtop are 2-1/2" tall, the pilot holes for the bolts that mount through the slotted and counterbored holes on the Lower Runners should be ¾" from the bottom of the bench. Clamp the Lower Runners in position and use a pencil to mark the holes location. Use a combination square or marking gauge, etc., to make a line ¾" from the bottom and use the individually marked holes to mark the locations for the pilot holes. Drill the pilot holes (3/16" for hard woods, 5/32" softwoods) for the ¼" lag bolts ¾" to 7/8" deep, being careful not to go through the front of the benchtop.

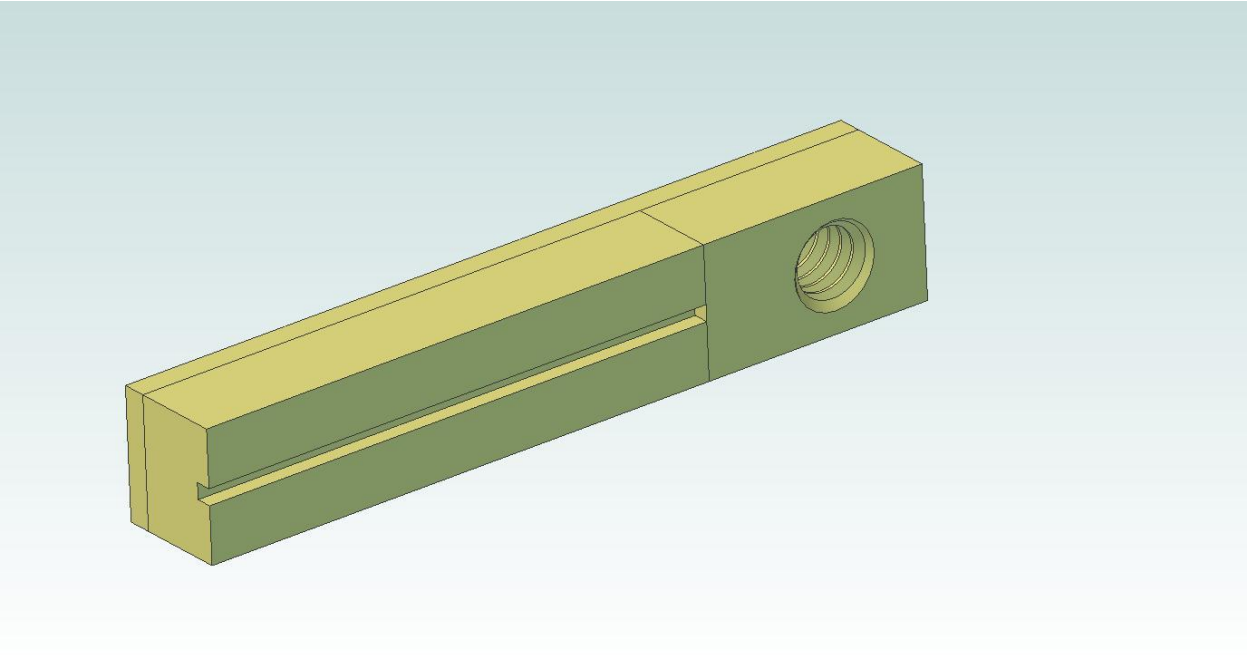
Use the included ¼" lag bolts and washers to mount the Lower Runners, checking to make sure that the Runners can be shifted up and down for adjustment purposes. Remove the lag bolts, washers and Lower Runners and set them aside, noting which Runner belongs to which cutout.

The “Center Benchtop” is the 2-1/2” wide board that is glued between the “Front Benchtop” and the “Back Benchtop” and it contains the dog holes, either round or square. The placement of these holes are up to you and the placement of the bench base and any cross stretchers that may interfere with the dog holes usage should be taken into account when these are laid out. The dimensions listed in the drawing below are found in the ‘User Supplied Dimensions’ Section (See Figure 14). It is also helpful to add 4-1/4” to the length of the Bench Center so that you can plane the Sliding Block at the same time. You will want to cut a 4” long block from the end of Bench Center for making the Sliding Block. The Sliding Block can be built later if you don’t have stock long enough to accommodate it and the Bench Center out of one board but it is a time saver and helps to ensure any wood movement that occurs should be the same between the width of the Sliding Block and the width of the slot that the Sliding Block slides in, determined by the Bench Center’s seasonal expansion and contraction.



(Figure 14)

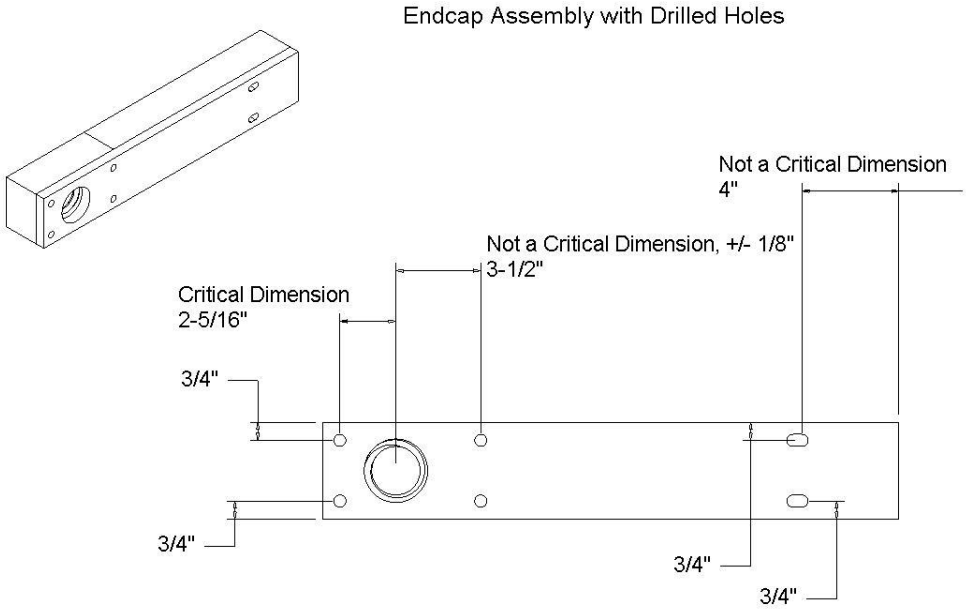
Back to the Endcap Assembly: You will want to use a wood or plywood spline to help align the Endcap Assembly to the bench top. The slot for the spline should be approx. in the center of the Endcap Assembly as show below and a corresponding groove cut into the Back Benchtop (See Figure 15).



(Figure 15)

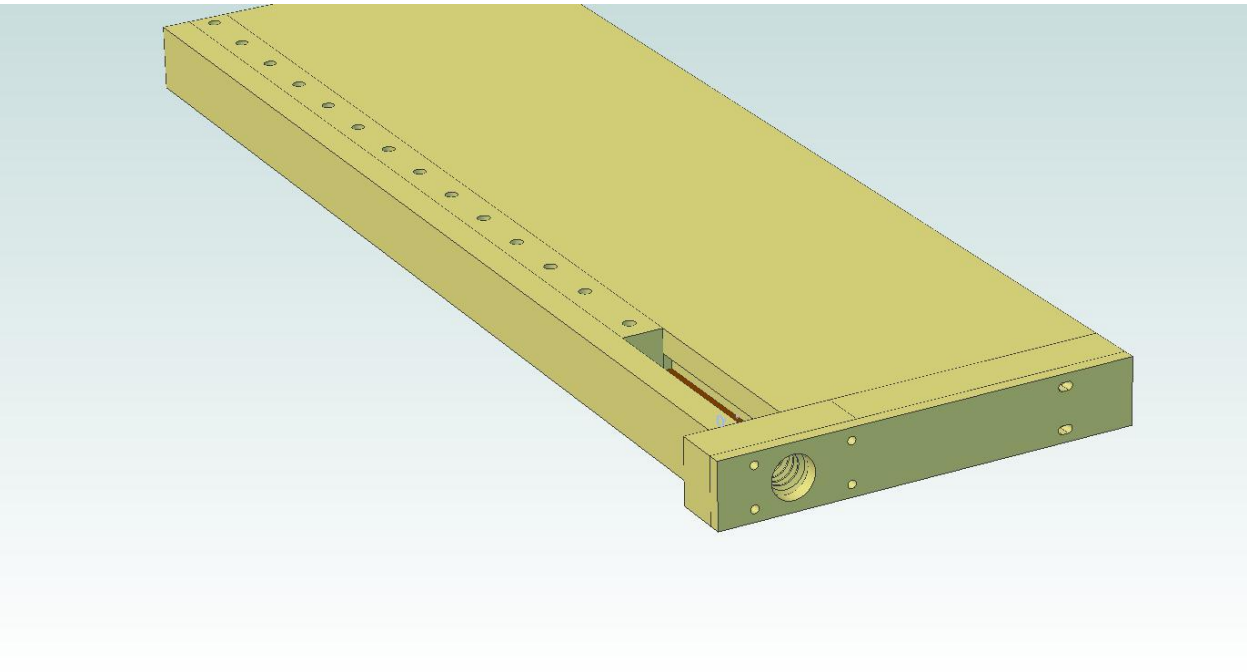
The spline groove can extend into the Nut part of the Endcap Assembly but shouldn't be any closer than 1" from the edge of the threaded hole. A router with an edge guide is probably the best method for cutting the grooves, the same setting can be used for routing the slot in the Endcap assembly as routing into the end of the Back Benchtop ensuring that the components will match up when a spline is installed. ½ wide is a good size for the spline. Also, the spline doesn't have to exit out of the back of the bench top, it can be stopped short of this if a cleaner look is preferred where the spline won't be visible. If a stopped groove is used, the spline should be about ½" shorter than the slots, so that it won't bind during seasonal movement.

Next, you will need to layout the holes for the bolts that hold the Endcap Assembly to the bench top using the dimensioned drawing that follows. You will want to use a 5/16" pilot hole if you use the recommended SPAX ½" x 6" lag bolts, otherwise you will have to determine what size pilot hole that you should use. It is recommended that you layout the round holes on your Endcap Assembly and the center of the slotted holes and use a drill press to drill these as 5/16" holes. (See Figure 16)



(Figure 16)

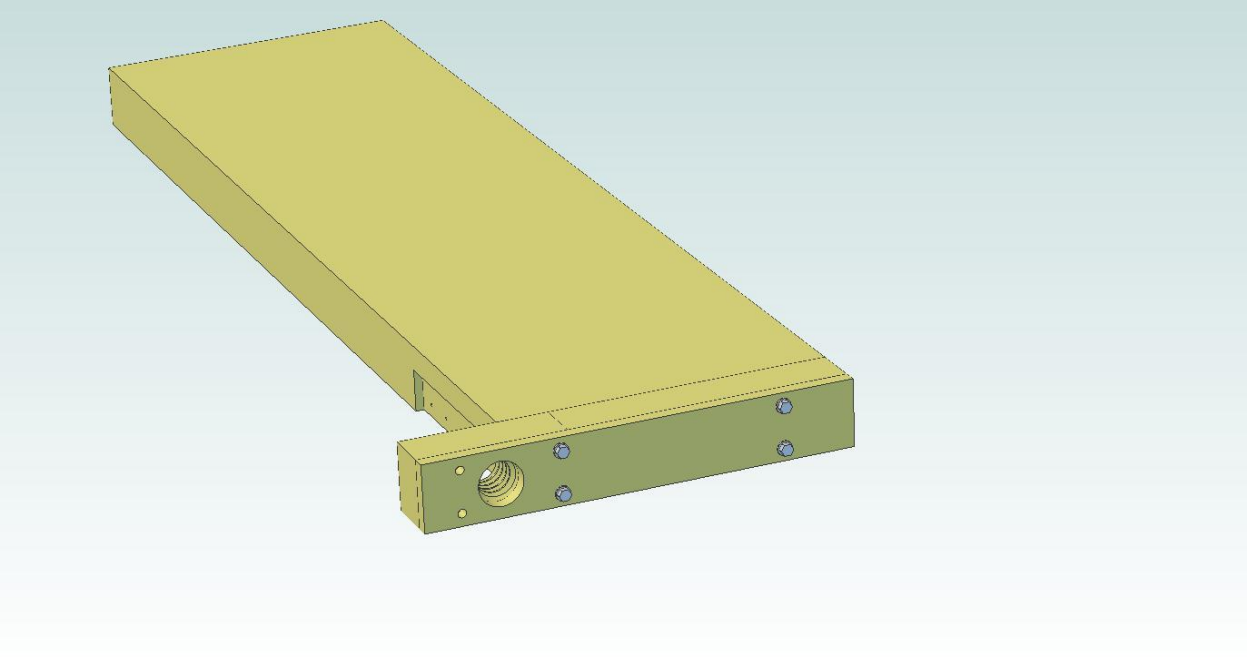
Pick a flat surface and lay your clamps on it as if you were going to glue the Bench Front, Bench Center and Bench Back together and put them on top of the clamps. Align the Bench Center to the Vise Cutouts on the Bench Front and the Bench Back and clamp them all together. Use the line drawn 3" over from the center hole on the Nut and line this up to the front of the Bench Front and use the spline and slots to align the back of the. Make sure the opening is parallel, that is the same width next to the Bench Center as it is next to the Nut. Use clamps to hold the Endcap Assembly in place and make sure the bench top and Endcap Assembly are flush. Use the 5/16" holes as drill guides and drill 2-1/2" or as deep as you can, whichever is less, into the bench top parts. Only drill 2" into the lower left hole as it will interfere with the Lower Runner's bolt if you drill deeper. You will likely have to make several passes as the chips will have nowhere to go. Unclamp the Endcap assembly and carefully redrill the holes if you weren't able to drill deep enough before.



(Figure 17)

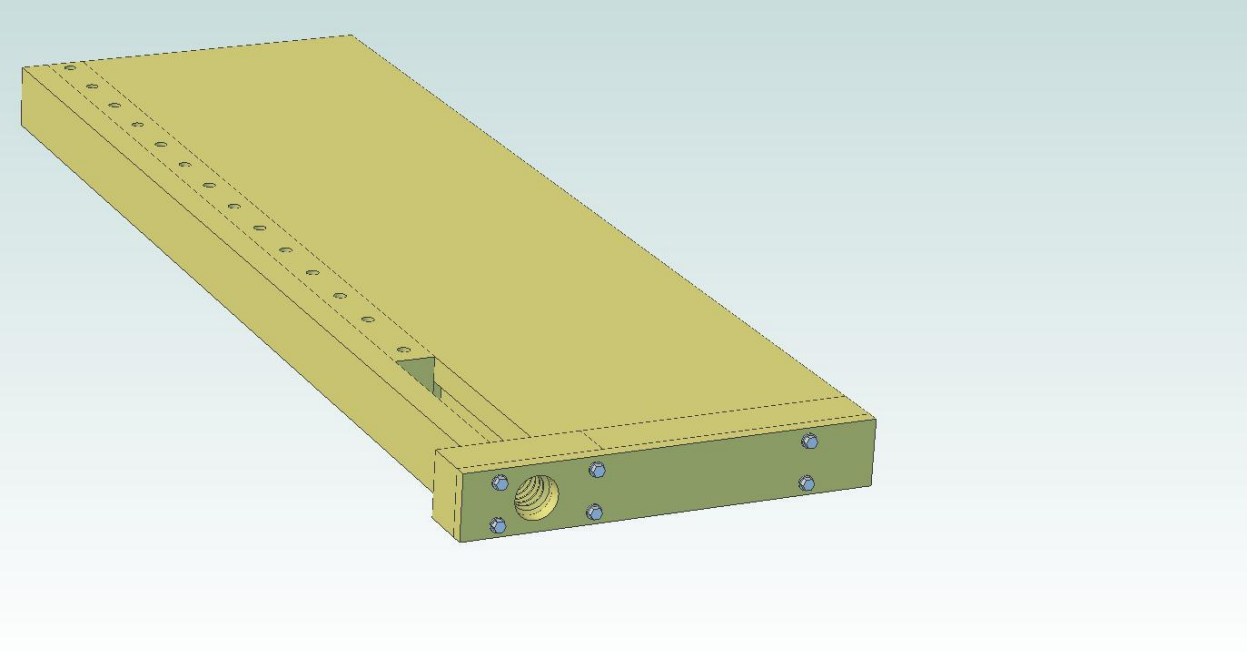
The holes in the Endcap assembly should now be redrilled on a drill press with a 9/16” twist drill and the slotted hole should be cut with a ½” forstner bit in a drill press. A twist drill will follow the existing pilot hole whereas a brad point bit will have trouble. The 5/16” hole in the center of the slotted hole would pull a twist or brad point ½” bit off center and it wouldn’t work well. (See Figure 17)

The Bench Front, Bench Center and Bench Back should now be glued up, the setup should already be there from previous steps. Do a dry run to make sure you have all the clamps that you will need handy. The Endcap assembly should be loosely bolted to the Bench Back section with the spline in place as shown below: (See Figure 18)



(Figure 18)

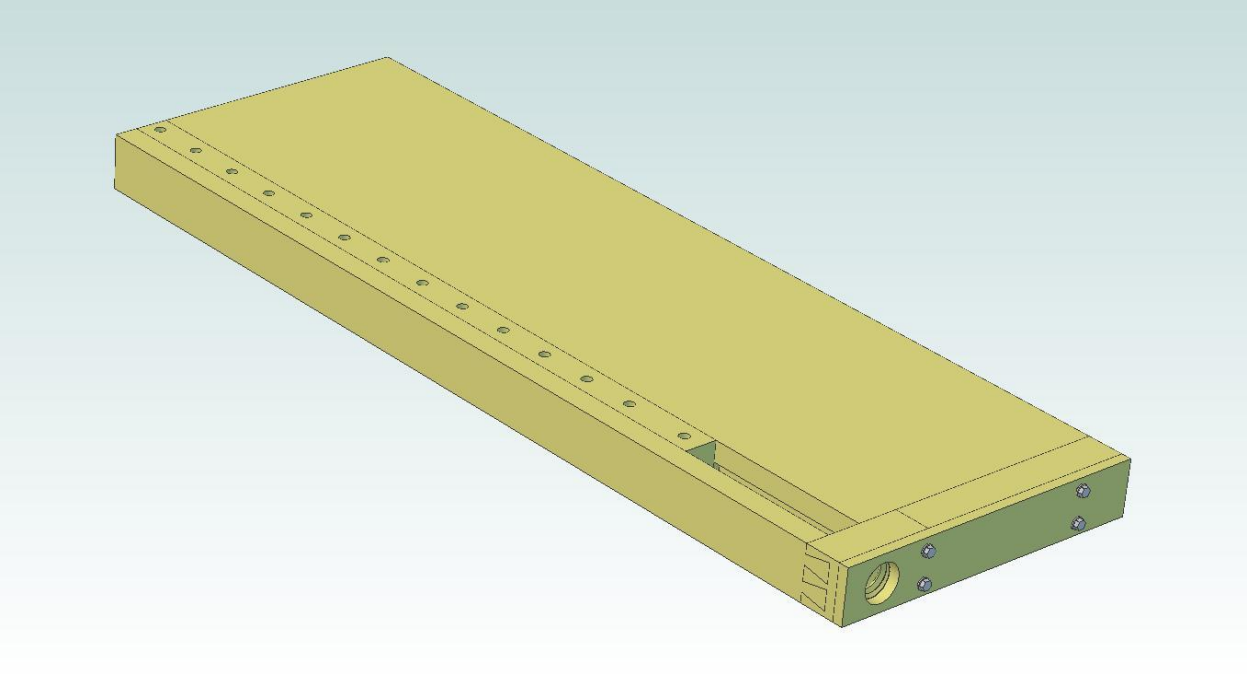
Apply glue to the Center Bench component where it meets the Bench Front. Spread the glue thinner toward the right edge so that less squeezes out in the vise's slot. Align the right end of the Bench Center with the end of the Vise Cutout on the Bench Front. It can help if you clamp a small block about 1" thick so that it is pushed up against the left edge of the Vise Cutout. This will act as a stop for the Bench Center. Push the Bench Center against the Bench Front. Rotate the whole assembly so that the Bench Front is facing down and the exposed face of the Bench center is facing up. Spread glue on the Bench Center, same as before and then rotate the assembly again and apply the glued face to the Bench Back. Put a clamp across the three pieces about 6 inches to the left of the Vise Cutout and right end of the Bench Center and lightly clamp it so that the parts can still be shifted. Install the remaining lag bolts in the Endcap Assembly and tighten them to make sure the Endcap assembly and the other bench top components are joined tightly. Use short clamps to align all of the glued joints so that they don't shift and then apply bar, pipe, or parallel edge clamps across the joints and pull them tight, working from the right end to the left. Let the glue dry the recommended amount and then remove the clamps. Below is a picture of what you should have once the clamps are removed: (See Figure 19)



(Figure 19)

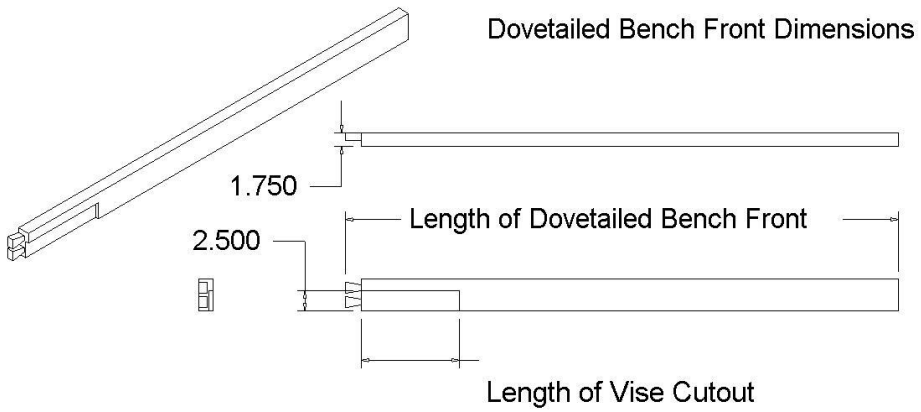
Use a pencil to mark where the Bench Front edge meets the Nut and then remove the bolts and remove the Endcap Assembly from the rest of the bench top. You can now cut the front end of the Endcap Assembly off so that it is flush to front of the bench. We recommend that you cut it slightly proud and then plane it flush to the Front Benchtop once everything is bolted back together and aligned.

For Dovetailed Endcap Assembly (See Figure 20)



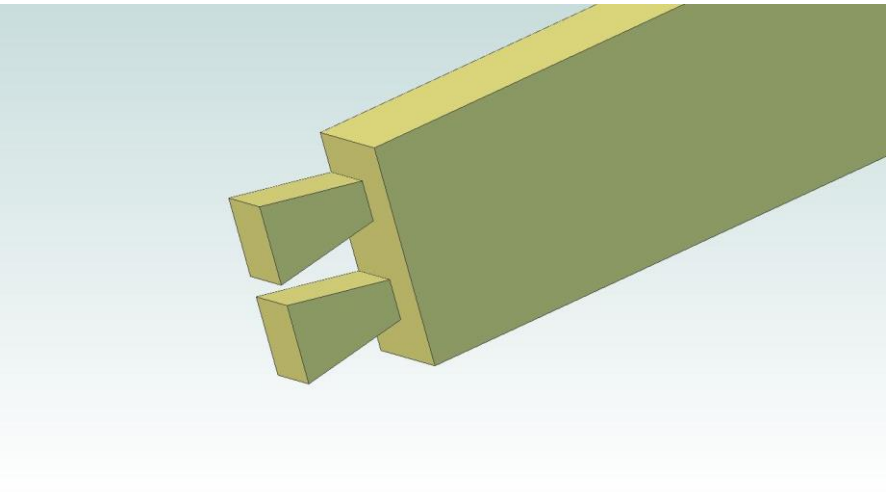
(Figure 20)

The Dovetailed Bench Front piece is going to be 1-3/4" thick by the "Height of Endcap Assembly" tall by the "Length of Benchtop Pieces" plus the "Length of Dovetail". It isn't a bad idea to make it several inches longer than necessary in case you need to redo the dovetails. A section of the Dovetailed Front of Bench piece will need to be cut out for the sliding dog block to slide in. Here is a drawing of the Front of Bench and its cutout and necessary dimensions: (See Figure 21)



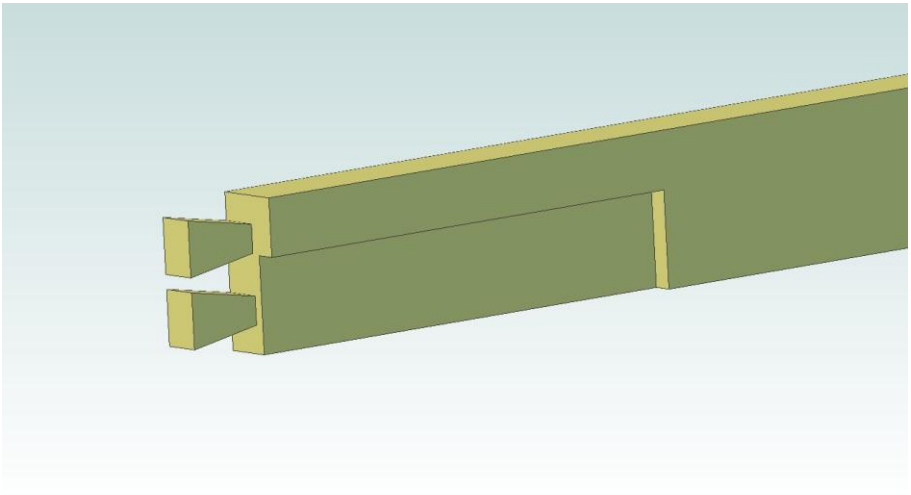
(Figure 21)

You will need to cut the dovetails first and then use them as a reference point for the rest of the dimensions on the Dovetailed Bench Front. The dovetails will end up approximately 1" thick, any thicker would compromise the integrity of the nut. You will need to relieve the inside face of the dovetails, either before they are cut or after, to create a shoulder as shown below: (See Figure 22)



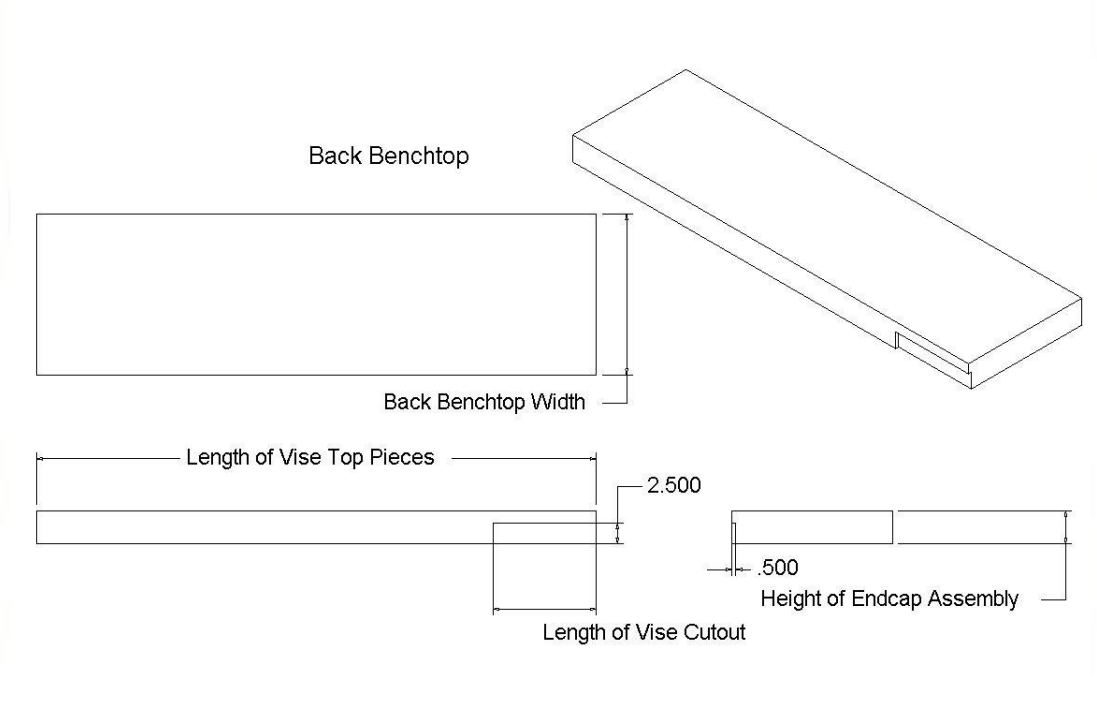
(Figure 22)

You will need to use this shoulder as the starting point for the cutout that you will create next. This cutout is rather critical for proper functioning and it is probably best cut with a router and a router guide. The 2.500" dimension should be cut close but it is more important that the dimensions for the cutout in the "Front Benchtop" piece are the same as the cutout in the "Back Benchtop". You should use the same setups (bit extension and router guide fence) and make both cutouts at the same time. (See Figure 23) The depth is important as the Lower Runners will need to be slightly thinner than the depth of the cutout to avoid interference. The cutout should be between 1/64" and 1/32" deeper than the thickness of the Lower Runners. The Lower Runners can be planed a small amount if the cutout doesn't end up deep enough. The Lower Runners should only be planed from the non-counterbored face.



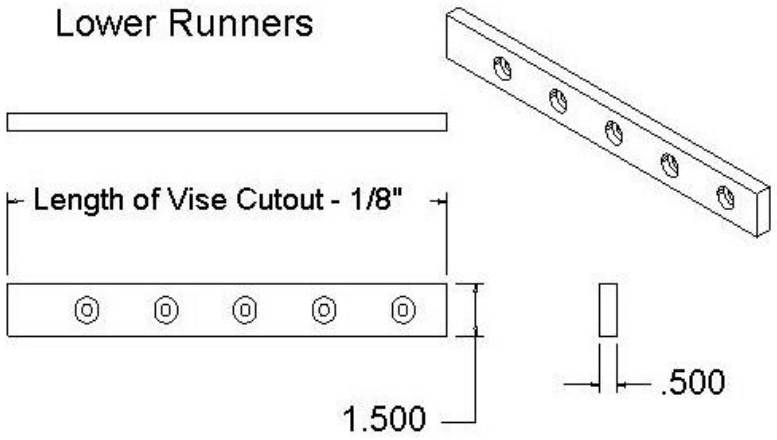
(Figure 23)

The “Back Benchtop” can be either be a 1-3/4” thick board when the cutout is made or it can be the whole back section of the workbench glued up and planed to the thickness of the “Height of the Endcap Assembly”. If it is more convenient to route the cutout while it is just one board you can do that and then carefully laminate it to the rest of the back of the benchtop, otherwise you can just rout the cutout in the whole Back Benchtop section as shown below. (See Figure 24)



(Figure 24)

The Lower Runners are the next components that need to be installed. They are made out of hardwood and are ½" thick by 1-1/2" wide by the "Length of Vise Cutout" dimension in length minus 1/8". They will need to be cut to length. (See Figure 25)

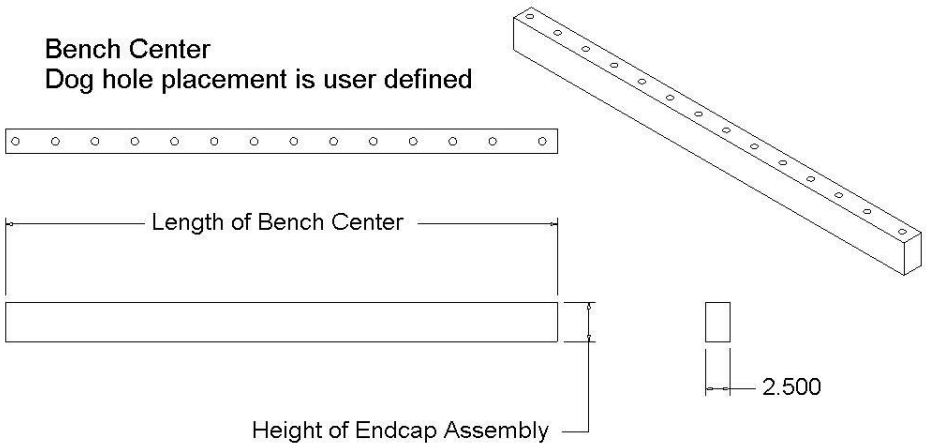


(Figure 25)

The Lower Runners are held on with five ¼" lag bolts each. Since the Vise Cutouts on the Back Benchtop and the Dovetailed Front Benchtop are 2-1/2" tall, the pilot holes for the bolts that mount through the slotted and counterbored holes on the Lower Runners should be ¾" from the bottom of the bench. Clamp the Lower Runners in position and use a pencil to mark the holes location. Use a combination square or marking gauge, etc., to make a line ¾" from the bottom and use the individually marked holes to mark the locations for the pilot holes. Drill the pilot holes (3/16" for hard woods, 5/32" softwoods) for the ¼" lag bolts ¾" to 7/8" deep, being careful not to go through the front of the benchtop.

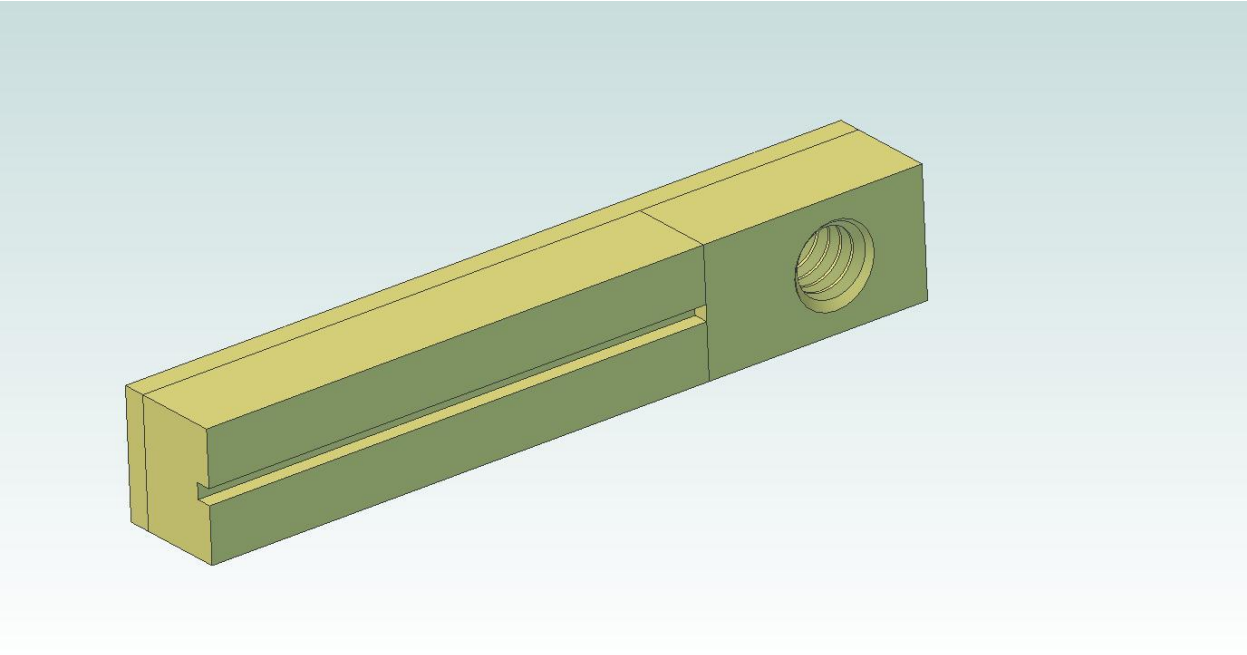
Use the included ¼" lag bolts and washers to mount the Lower Runners, checking to make sure that the Runners can be shifted up and down for adjustment purposes. Remove the lag bolts, washers and Lower Runners and set them aside, noting which Runner belongs to which cutout.

The “Center Benchtop” is the 2-1/2” wide board that is glued between the “Dovetailed Front Benchtop” and the “Back Benchtop” and it contains the dog holes, either round or square. The placement of these holes are up to you and the placement of the bench base and any cross stretchers that may interfere with the dog holes usage should be taken into account when these are laid out. The dimensions listed in the drawing below are found in the ‘User Supplied Dimensions’ Section. (See Figure 26) It is also helpful to add 4-1/4” to the length of the Bench Center so that you can plane the Sliding Block at the same time. You will want to cut a 4” long block from the end of Bench Center for making the Sliding Block. The Sliding Block can be built later if you don’t have stock long enough to accommodate it and the Bench Center out of one board but it is a time saver and helps to ensure any wood movement that occurs should be the same between the width of the Sliding Block and the width of the slot that the Sliding Block slides in, determined by the Bench Center’s seasonal expansion and contraction.



(Figure 26)

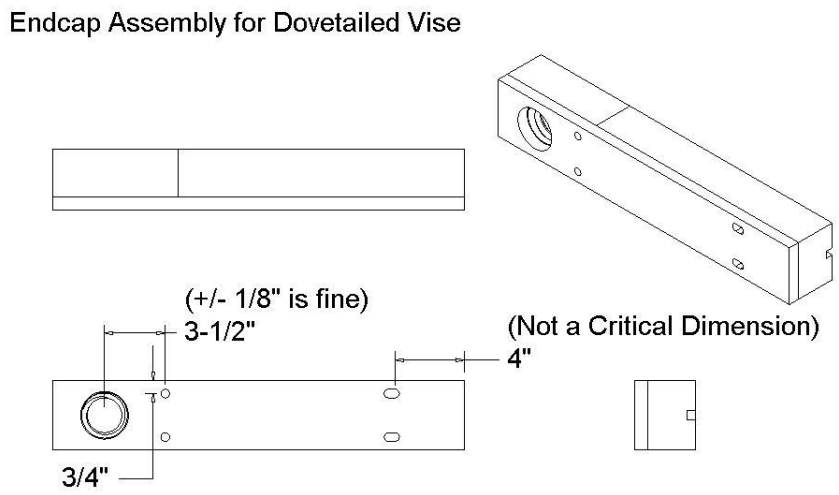
Back to the Endcap Assembly: You will want to use a wood or plywood spline to help align the Endcap Assembly to the bench top. The slot for the spline should be approx. in the center of the Endcap Assembly as show below and a corresponding groove cut into the Back Benchtop. (See Figure 27)



(Figure 27)

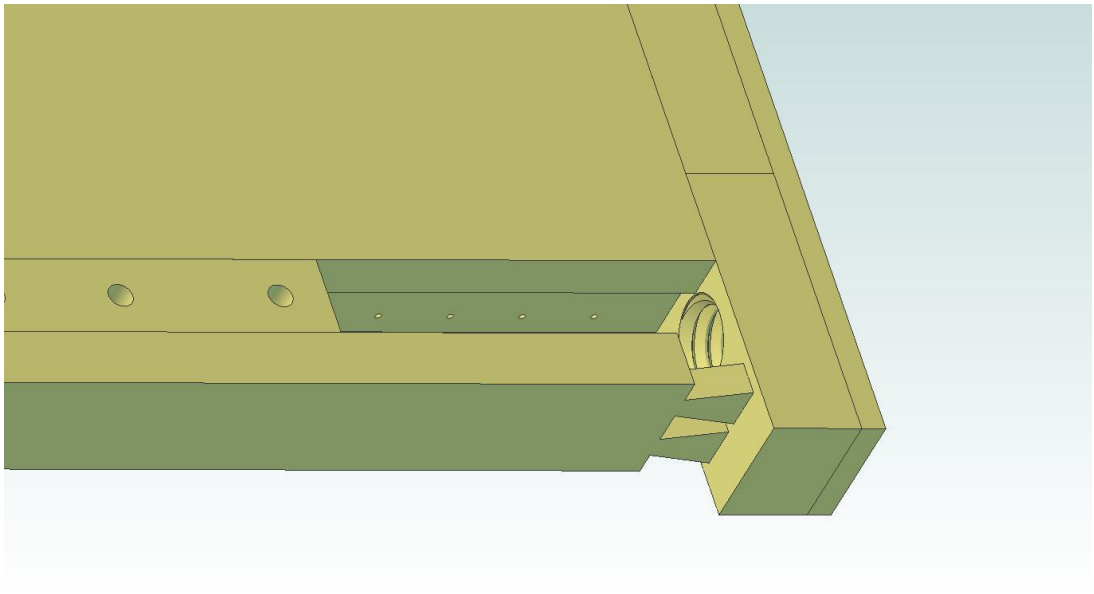
The spline groove can extend into the Nut part of the Endcap Assembly but shouldn't be any closer than 1" from the edge of the threaded hole. A router with an edge guide is probably the best method for cutting the grooves, the same setting can be used for routing the slot in the Endcap Assembly as routing into the end of the Back Benchtop ensuring that the components will match up when a spline is installed. ½ wide is a good size for the spline. Also, the spline doesn't have to exit out of the back of the bench top, it can be stopped short of this if a cleaner look is preferred where the spline won't be visible. If a stopped groove is used, the spline should be about ½" shorter than the slots, so that it won't bind during seasonal movement.

Next, you will need to layout the holes for the bolts that hold the Endcap Assembly to the bench top using the dimensioned drawing that follows. You will want to use a 5/16" pilot hole if you use the recommended SPAX ½" x 6" lag bolts, otherwise you will have to determine what size pilot hole that you should use. It is recommended that you layout the round holes on your Endcap Assembly and the center of the slotted holes and use a drill press to drill these as 5/16" holes. (See Figure 28)



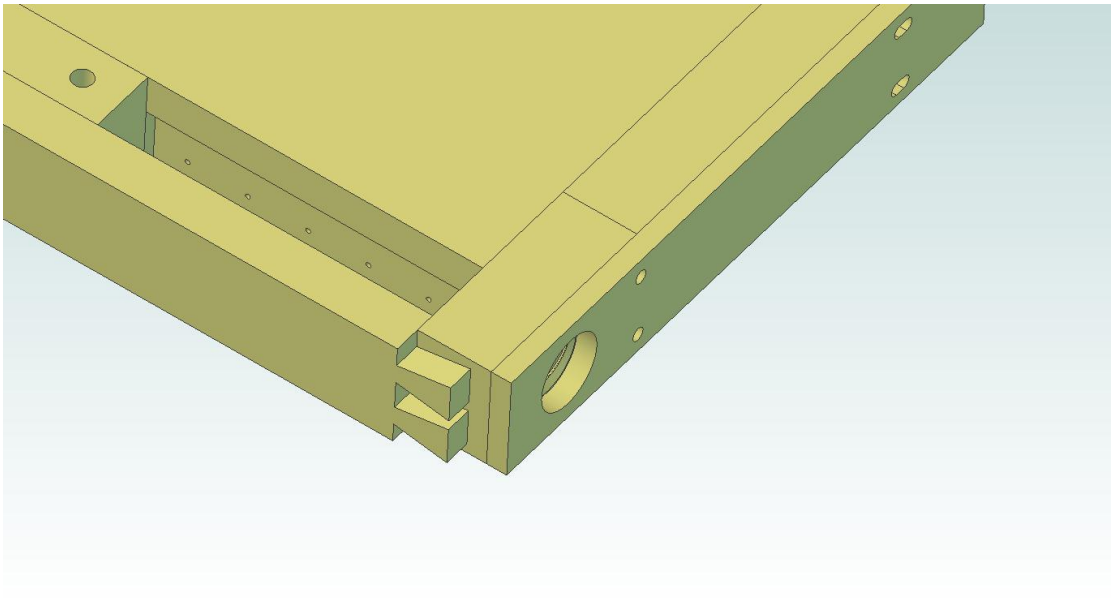
(Figure 28)

Pick a flat surface that you will later use to hold your clamps for gluing the benchtop pieces together and lay your clamps on it as if you were going to do that. Put the Dovetailed Bench Front, Bench Center and Bench Back on top of the clamps in their proper orientation. Push the Dovetailed Bench Front to the left so that it doesn't interfere with the Endcap Assembly when it is clamped to the right side of the bench, using the spline for alignment. Push the dovetailed end of the Dovetailed Bench Front up against the Endcap Assembly and clamp it tightly to the rest of the benchtop components. Ensure that the opening is parallel, that is that the width of the opening is the same next to the Bench Center as it is next to the Endcap Assembly. Shift the Endcap Assembly until the mark that you previously drew on the Endcap assembly, 3" from the center of the threaded hole, is flush with the outside edge of the dovetails. Clamp the Endcap Assembly in place and transfer the thickness of the dovetails by marking on the Endcap assembly from the inside face of the dovetails as shown below: (See figure 29)



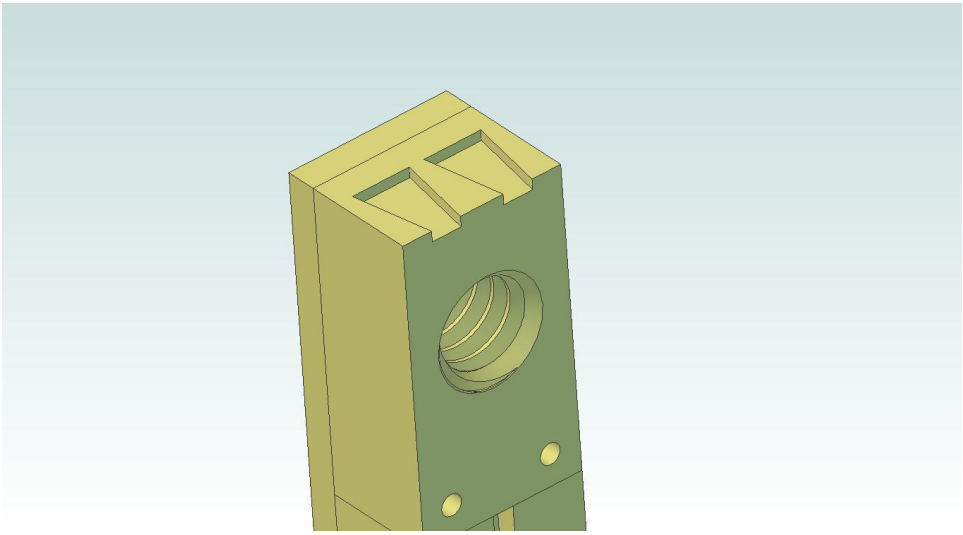
(Figure 29)

Next, you will want to remove the Endcap Assembly and cut the end nearest the nut down on the line that you marked and was previously used to align the Dovetailed Bench front. Next, you will loosen the clamp holding the Dovetailed Bench Front in place and put the Endcap Assembly back on the end of the benchtop components, using the spline to keep it aligned. You will need to push the Endcap Assembly to the right so that it is out of the way of the dovetails but so that the shoulder from the Dovetailed Bench Front can still register off of it. Push the shoulder of the Dovetailed Bench Front onto the inside face of the Endcap Assembly and then push the end of the Endcap Assembly up against the inside face of the dovetails as shown below: (See Figure 30)



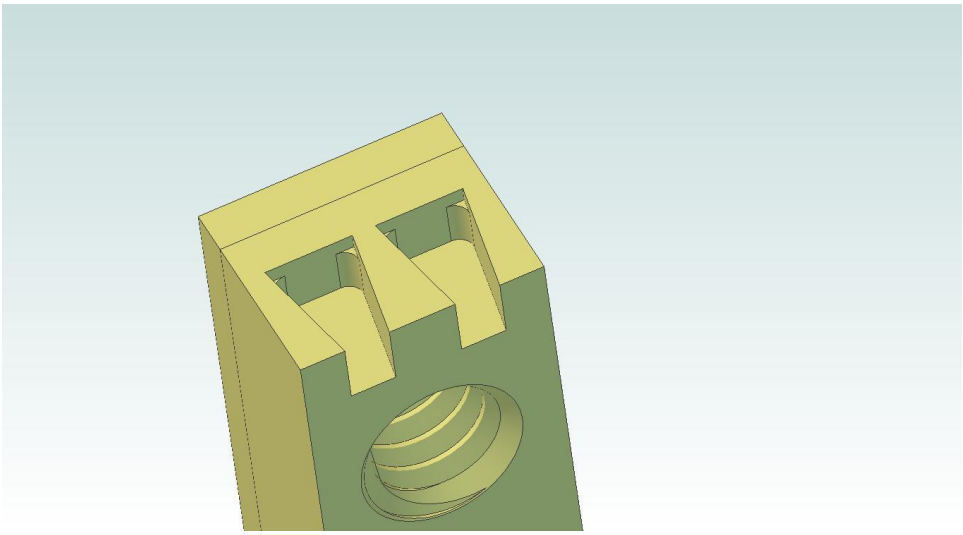
(Figure 30)

You will need to transfer the dovetails to the pin board, that is, the Endcap Assembly with a knife or pencil. I prefer the router bit method for cutting these huge dovetails but they could be done by hand. Basically, you use a hand guided router to cut about ¼" deep and clear out most of the waste, being careful not to overcut your marked lines. Follow up with a chisel and cut to your lines, only going the ¼" deep as shown below: (See Figure 31)



(Figure 31)

Next you would mount a pattern guided bit that has a ¾" or less cutting depth and set it to cut the full depth required for the dovetail (or its maximum cut depth if it isn't long enough), as marked previously on the side of the Endcap Assembly. Use the ¼" deep dovetail pocket as a pattern for the bit's bearing and cut out all of the waste except the corners with the router bit. If your pattern bit cuts less than ¾" deep, you will need to make a second pass using the same method at the full depth. This method is much faster than drilling out the waste and chiseling and it is much easier to get flat and square sides to your joints. (See Figure 32)



(Figure 32)

You will have to either chisel out the corners that were left round by the router bit, or relieve the inside corners of the dovetails, leaving the outer ¼" sharp so that you will be able to assemble it. Both will have the same look when the joint is assembled but the chiseled corner may be slightly stronger as there will be a little bit more glue area in the joint. The joint needs to be test fitted and if it takes more than hand pressure for the joint to come together, it needs to be adjusted. If the fit is too tight then the force of driving the dovetails into the pins can cause the Endcap Assembly to split into the threaded area of the nut. Slight gaps can be fixed after the joint is assembled by tapping in wedges coated with glue. Repairs like this are hard to spot once everything is cleaned up with a handplane.

Next put the Dovetailed Bench Front on the clamps next to the Bench Center and put the Endcap Assembly on the End of the Bench Back with the spline (the same as if you were going to assemble the benchtop components for their final glue up). Push it back so that the Dovetailed Bench Front can be slid in front of it so that the dovetails are in line with the pin holes of the Endcap Assembly. Use clamps to push the dovetails into the pins, making sure that the Endcap Assembly can move towards the Dovetailed Bench Front by sliding along the spline. It can be helpful to cut wedge shaped pieces of softwood that are slightly smaller than the dovetails and use those to transmit the clamping force from the clamps (taping them in place is also helpful). Tighten the clamps until the joint bottoms out, being careful to check that the dovetails are going in straight by checking with a square, adjusting clamping pressure and clamping points as needed.

Next, you will want to make sure that the Endcap Assembly is pushed up against the end of the Bench Back and clamp the Dovetailed Bench Front to the Bench Center and Bench Back. Check that the opening created is the same width from left to right, pushing the Endcap Assembly towards or away from you if there is any variation. Clamp the endcap assembly in place ensuring there are no gaps between it and the Bench Back. Now you will use the 5/16" holes that you drilled in the Endcap assembly as drill guides to drill into the Bench Back. Drill 2-1/2" deep into the Bench Back or as deep as you can, whichever is shallower.

Unclamp everything and remove the Dovetailed Bench Front and Endcap Assembly. Disassemble the joint being careful to keep it square during disassembly and using softwood pieces and/or deadblow mallets to prevent marring vise's gliding surfaces.

The holes in the Endcap assembly should now be redrilled on a drill press with a 9/16" twist drill and the slotted hole should be cut with a ½" forstner bit in a drill press. A twist drill will follow the existing pilot hole whereas a brad point bit wouldn't. The 5/16" hole in the center of the slotted hole would pull a twist or brad point ½" bit off center and it wouldn't work well.

Put the Endcap Assembly on the end of the Bench Back and use the lag bolts to tighten it to the benchtop. Ensure that you can shift it forward and backward a slight amount while the lag bolts are snugged but not tightened. Remove the lag bolts and the Endcap Assembly.

The next step is to glue everything together or just the dovetails if you don't have extended open time glue such as liquid hide glue.

Put the Dovetailed Bench Front, Bench Center and Bench Back on top of the clamps as before. Then put the Endcap Assembly on the end of the Bench Back as before so that the dovetails are right in front of their pin sockets on the Endcap Assembly. Apply glue to the dovetail joint the same as you would a normal dovetail joint and clamp the joint tight as before. If you have time to continue a glue up then you

would pull the Endcap Assembly away from the Bench back and flip it upwards so that the Dovetailed Bench Front's inside face is facing up. Apply glue to this surface being careful to only apply it where the Bench Center will meet it. Make sure the area near the vise slot is spread thinner to reduce squeeze out. Next, clamp a small block at least ½" thick to the left side of the cutout to act as a stop for the Bench Center. Put the Bench Center onto the Dovetailed Bench Front and add glue to the face that is facing up, making sure to spread it more thinly close to the right side of the Bench Center. Flip the whole assembly on its side so that the glued face of the Bench Center is facing the Bench Back. Push the Endcap Assembly towards the Bench Back (along with everything else attached to it) and interface with the spline. Next, push the Dovetailed Bench Front and Bench Center towards the Bench Back, you can use clamps if necessary. Drive in the lag bolts in to their holes and tighten them. Use clamps to tighten the glue joints joining the Dovetailed Bench Front making sure that the joints don't shift by using short clamps or boards that span the joint (cauls). Check that the width of the vise slot is consistent from left to right and if necessary, loosen the lag bolts shift the Endcap assembly and retighten the lag bolts.

If you didn't have time to do all of this, glue the dovetail joint and then follow all of the next steps without glue. You can do the next steps later on with the dovetail joint already glued and properly squared later.

Once everything is dry, remove the clamps and excess glue and plane all of the surfaces smooth.

Finishing Vise Screw

If you plan to stain your wood vise screw kit, it is important that you do so prior to applying any final finishing product.

For the threaded section of the screw we advise that you use a penetrating oil or oil-varnish mix such as what you might finish your workbench with. We don't recommend any finish that will build up a film, such as polyurethane. A good option would be to use an oil finish such as "Watco Danish Oil", "Mahoney's Walnut Oil" or "Deftoil".

The vise screw hub can be completed with whatever finish that you find appropriate.

After final finishing, we also recommend that you wax your vise screw and internal nut thread with a good quality wax of some sort (paraffin, beeswax or paste wax) to allow smooth and easy functionality. A nylon brush can be helpful when putting wax on the threads of the nut.

Bench Anchor Installation

Wagon and Shoulder vise brass mounting plates are now shipped with a self-lubricating plastic bushing. The bushing is an Igus iglide G300 series optimized for long wear and dusty environments. This reduces friction and eliminates the metal on metal contact between the shoulder bolt and the brass mounting plate, which reduces any 'clunking' noise that may occur during use.

Also, the Veritas Bench Anchor is shipped uninstalled and is to be installed by the vise owner via the following instructions. A .020" stainless steel slotted shim is also included to facilitate this as well as resetting the Bench Anchor if it ever shifts during use.

Needed items:

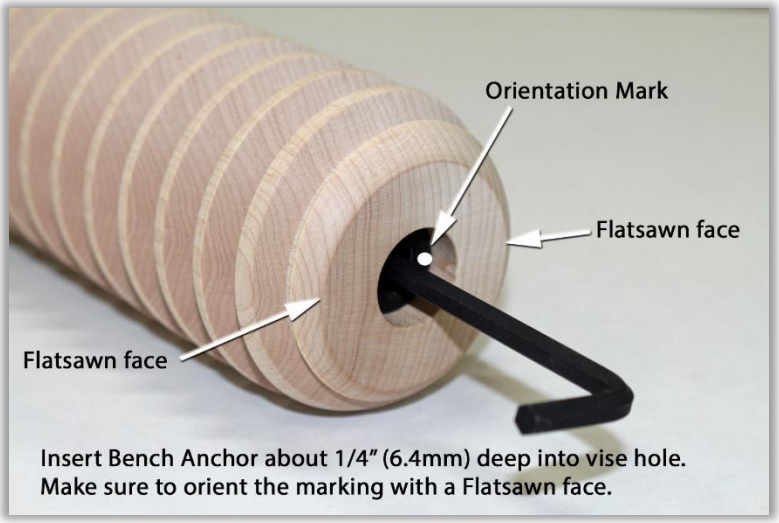
- Shoulder bolt (included in kit)
- Stainless steel slotted shim (included in kit)
- Wagon or Shoulder Vise Screw (included in kit)
- Brass mounting plate (included in kit)
- Veritas Bench Anchor and allen wrench (included in kit)
- Deadblow mallet or wooden mallet (user supplied)

First, you will want to wipe your Bench anchor with a paper towel to remove any oils. The Bench Anchor works by having two separate wedge-shaped parts pulled together by a screw, which in turn expands into the hole that the Bench anchor is inserted into.

You will want to look at the bench anchor and make a visible mark on the ½-13" tapped end so that you will know which face is pushing against the vise hole when it is installed. (See Figure 33 for clarification)

The two faces that push against the hole should be oriented so that they push against the flat sawn surfaces of the hole in the vise. Wood expands and contracts about twice as much in the tangential direction as in the radial direction (flatsawn boards move more in their width with humidity changes than quartersawn boards do). (See Figure 34 for clarification)

(Figure 33)

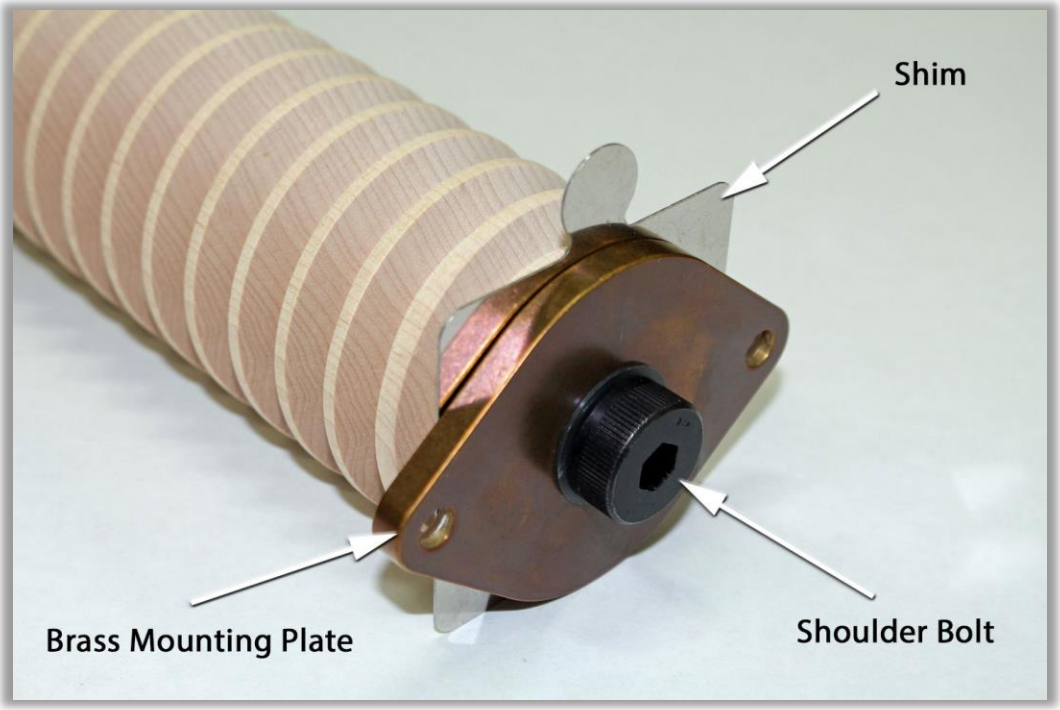


(Figure 34)

Use the allen wrench to loosen the bolt inside of the Bench Anchor *(see Bench Anchor instructions included with your kit)*. Insert the anchor until it is about ¼" below the end of the vise and orient your mark so that it is aligned with a flatsawn face of the vise, such as the top of the arch in the maples grain, and lightly snug the bench anchor. (See Figure 34)

Then, insert the shoulder bolt through the back of the brass mounting plate and tighten it by hand into the thread of the Bench Anchor. Put the .020" stainless steel shim between the vise and the brass mounting plate. (See Figure 35)

Then, take your dead blow mallet and while holding the vise with one hand, tap the shoulder bolt until it pushes the whole assembly into the vise and the shim can no longer be moved. Then, loosen the shoulder bolt, remove the brass mounting plate and the shim and then use the allen wrench to lightly snug up the Bench Anchor. It doesn't take much torque to get plenty of holding force from the Bench Anchor.

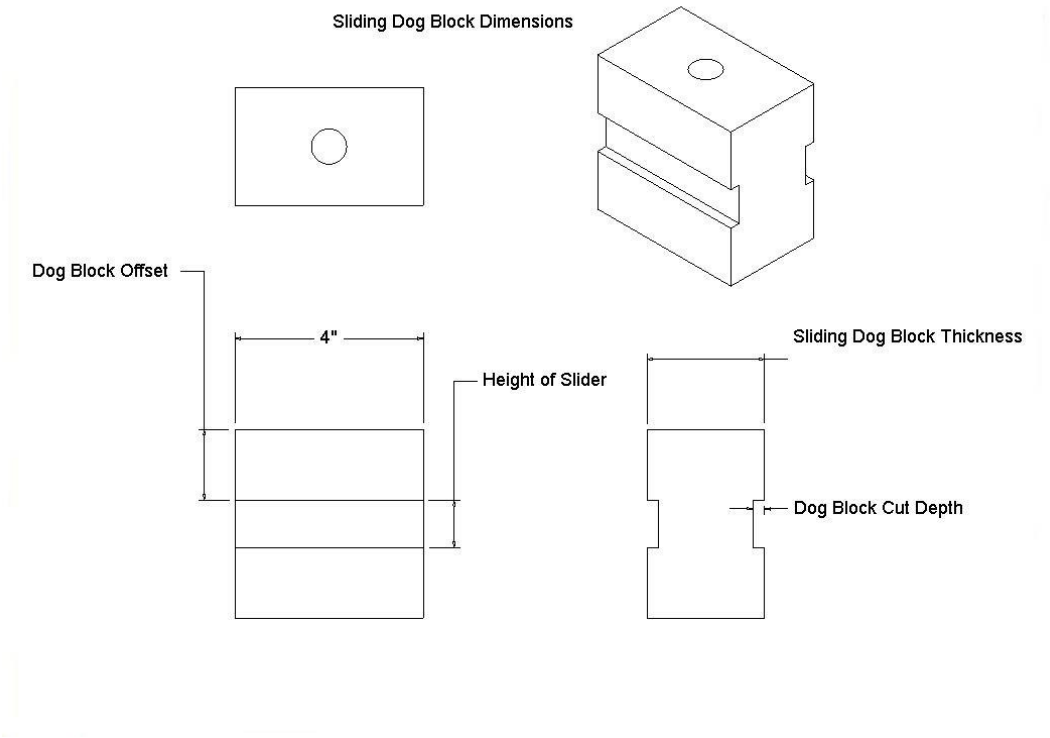


(Figure 35)

Sliding Dog Block

The next part of the assembly is making and installing the Sliding Dog Block (See Figure 36). If you made your Bench Center longer earlier in the build process, you should have enough stock already planed for the Sliding Dog Block. Otherwise, you will need to plane a block of wood that is of the same thickness as the Bench Center (that is, the same width as the opening for the vise), the same height as the benchtop and 4" long. If you purchased the UHMW slides, you will need to cut slots in both sides of the Sliding Dog Block for the Slides to sit in as shown below, otherwise you will need to make your own slides out of wood or plastic and fit them the same way. Dimensions should be 1" x ¾" x 4" each and you will need a few extra inches of the same 1" thickness for installation later in the process. Aim for a

snug fit and make sure both sides are the same height from the top. It's a good idea to add a small amount to the 'Dog Block Offset' dimension so that the Sliding Dog Block ends up slightly proud of the top of the benchtop rather than slightly below the top (It's easier to plane the Dog Block flush with the benchtop than to plane the benchtop flush to the Dog Block).



(Figure 36)

Slide the Sliding Dog Block in the vise cutout and check for binding. The Sliding Dog Block should slide with a small amount of friction and no binding. You may have to lay a sheet of fine (220 grit works) sandpaper on a flat surface and rub the sides of the block on it until it slides smoothly. You don't want to go too far though as the vise will have a loose fit. You will be surprised how easily the visescrew moves the Sliding Block after installation even if the fit is somewhat snug.

Mark a vertical line on the Sliding Dog Block that is in the center of the block on the end that is towards the vise screw. Thread the vise into the nut by about 6" and then measure the distance from the top of the bench to the screw (a combination square works well here) and write it down and then do the same from the bottom. Determine if the vise is closer to the top or the bottom and what the offset from the center of the bench is (if there is any). Now make a mark on the Sliding Dog Block on the vertical line drawn earlier that is offset from the center of the block by the same amount and in the same direction. Drill a 1" diameter hole at this point at least ½" deep. You can drill the dog hole now if you like or sometime prior to the final installation. The center of the block works well. Put the UHMW Slides in their slots and mark the holes in the Sliding Dog Block. Drill the pilot holes for the screws in the Sliding Dog Block and then install the UHMW slides or your own slides.

The next part is easier with the benchtop flipped over but not necessary. Insert the Sliding Dog Block Assembly into the vise cutout in the same orientation as it will be when installed. Thread the vise screw into the nut and then place the Brass Plate on the end of the vise screw with the countersinks facing the vise screw and use the included shoulder bolt to mount it onto the end of the screw. Back the vise out until it stops and then turn it clockwise about ¼ turn. Push the Sliding Dog block up against the Brass Plate, making sure to keep the runners tight toward the top of the Vise Cutout and line up the top hole of the Brass plate with the vertical line. Now check that the bottom hole is also lined up. If it isn't, you will need to twist the brass plate until both holes are offset from the center hole by the same amount and mentally note the offset. Remove the Sliding Dog Block and mark another vertical line parallel to the first, but offset by the amount noted earlier. Repeat the last few steps until you get a vertical line that is centered with the Brass Garter holes.

Now, thread the vise all the way in, pushing the Sliding Dog Block up against the end of the Bench Center, and back off until the Brass Plate can be slid up and down along the Dog Block. Making sure the Sliding Dog Block is tight against the Vise Cutout, push the vise downward, line up the Brass Plate holes with your final vertical line and carefully mark the outline of the holes with a fine tipped pencil such as a mechanical pencil. Now repeat the last steps but pushing the vise upwards, and then marking the holes. You should now have 4 holes drawn on the end of the Sliding Dog Block. Make a mark in the middle between the two top holes and another mark in the middle between the two lower holes. Drill pilot holes for the mounting screws at these marks along the vertical line.

Now, clean the marks off of the Sliding Dog Block and put it back into the Vise Cutout as before. Lay the Hardwood Runners in their positions and thread the lag bolts and washers into their holes until they are snug and then back them off until the Runners can be moved. Push your Sliding Dog Block all the way to one side, slide 2 thin strips of paper between the Hardwood runner and the Slider. Now, take the additional piece of plastic included in your kit or your additional length of Slider stock and put it between the Hardwood runner and the top of the Vise cutout and put 2 thin strips of paper between the Hardwood runner and the spacer stock. Use two clamps and lightly clamp down on the Hardwood runner where the Sliding Dog Block is and where the spacer is. Tighten the lag bolts where the spacer is clamped and then shift the spacer and paper over, move the clamp over and then tighten those bolts until there are no more available. Remove the spacer and slide the Dog Block over and reinsert the spacer and paper where the Dog Block was and tighten the bolts. Repeat this process for the other side, remove the spacer and all of the paper shims and you should be able to slide the Sliding Dog Block back and forth without binding.

Insert the vise screw if it's not already installed and mount the Brass Plate on the end of the screw as before and make sure the shoulder bolt is snug. Turn the vise until it pushes the Sliding Dog Block up against the Bench Center and then back it off slightly. Install the stainless screws through the Brass Plate into the Sliding Dog block's pilot holes. An angle adapter for a cordless drill works well here but you will want to put a paper towel or cloth over the screw to protect it during installation. Install the vise handle and try out the vise. It should move in and out with little effort (slightly more when the vise is near full extension) and you should be able to clamp boards to your bench top using the dog holes. Now, remove the hardwood runners, loosen the stainless screws and disassemble the vise. Perform any finishing and apply a coat of paste wax to the sliding surfaces or other lubricants as you see fit. Don't apply any wax to the surfaces of the Vise Cutout or the Hardwood runners that mate to one another. Use the previous steps to reinstall the vise and runners once everything is dry.

Install your Vise handle and your Wagon Vise should now be ready for use.

We truly hope that you enjoy your wood wagon vise screw kit from Lake Erie Toolworks and if you have any questions or comments regarding the installation method detailed in this document or if you have other installation ideas to share, please feel free to contact us via direct email at info@LakeErieToolworks.com.

We also wish you the absolute best on your woodworking projects and don't forget to drop us a line or send us some pictures on how your wagon vise screw & work bench efforts turned out. We'd be happy to add them to our website for the benefit of other woodworkers who are building their workbenches.

Best regards and happy woodworking,

Nick Dombrowski

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