

## 3 Pencil Boxes

### **Pencil Box with Oak Leaves**

- 1) A good place to start making this box is to machine the lower half. Open your machining software and load in the Oak Leaves Box DXF file.
- 2) The pocket cut to form the inside of the box is .75" deep. I chose a straight bit for a clean cut and set up the file using a cutting depth of .125" and a feed rate of 50 ipm.
- 3) The profile cut used to separate the box from the blank also uses a straight bit with the same parameters. Tabs were set up on either side of the box to keep it in place during the completion of the cut.
- 4) I started the machining with a blank of White Oak sized 3" x 12" x 1" and secured it in place on the CNC routers table. After zeroing out the axis it only took a few minutes to complete the lower part of the box.
- 5) The lid blank is sized 3" x 12" x .4375". First, the bottom of the lid will be machined to form the raised area that will index into the lower half of the box. Load in the Oak Leaves Lid Underside DXF file and use the same 1/4" straight bit and parameters. The cutting depth is .1". You may choose to change the size of the raised portion to create a tighter or looser fit. Cut a sample and see what you think. Note that the area of wood removed is larger than the finished lid so the when the lid is cut to final shape there will be a clean edge without "flash".
- 6) The indexing holes are drilled through the lid blank and into the spoil board 3/8" deep. Once the underside is machined flip the blank over and use some short pieces of 1/4" dowel to align the blank using the indexing holes. The lid is symmetric so flip it either end for end or edge to edge.
- 7) With the blank flipped and secured you can turn your attention to carving the top. I used a file from [www.Design&Make.com](http://www.Design&Make.com), #57128A Oak leaves. Design & Make offers free 3D software to use with their carving files if you don't have 3D capability. Work with the width and length of the file to get a good fit on the box lid and then set up the file. I created a boundary box for the background carving a little larger than the box itself. This is not in the DXF files so you will need to draw a box about 1/4" larger than the box and designate that as the cutting boundary. Begin with the roughing pass using a 1/8" straight bit using a .0625" deep cut and a feed rate of 35" imp.
- 8) The finishing pass uses a 1/32" tapered ball nose bit set to run with a 12% stepover, .0156 depth of cut and a feed rate of 35 imp. I set the spindle speed at 18500 RPM which works well for small diameter bits. Once the carving is complete a stiff bristle brush can help scrub away any "fuzzies" left by the carving process.
- 9) Last, go back to the 1/4" straight bit you started with and cut the profile pass using tabs to separate the lid from the parent stock.
- 10) Sand, apply finish and you've got a pretty little box that makes a great gift, a place for a favorite pen on your desk, or a side hustle at a local gift shop.

### **Pencil Box with Pine Tree**

- 1) Download the Pine Tree Box DXF file into your machining software. Start by setting up a pocket cut for the box interior using a straight bit. I entered a depth of cut of .125" and a feed rate of 50 ipm. The blank is a 5" x 12" x 1" thick piece of Maple.
- 2) Next, set up a profile cut set to about 1.05" deep and add a few tabs to keep the box in place during the last of the cutting. The router bit parameters remain the same. Run the files and separate the lower part of the box from the parent stock.
- 3) The lid for this box differs from the Oak Leaves box in two ways. One is that it relies on rare earth magnets to hold the lid in place rather than a raised area that fits into the box. Second, this lid features the use of contrasting woods to make the carving visually pop. I glued up a 5" x 12" x .625" blank of cherry and maple. The cherry and maple were planed to a thickness of .3125" before glue-up.
- 4) With the lid blank ready to mill let's turn our attention to setting up the cutting file. The file that I used is #50613A Ponderosa Pine from Design & Make. I stretched and worked with the file to get it to sit comfortably on the box size I chose. As with the Oak Leaves a boundary box was set up larger than the pencil boxes overall size as a perimeter extent. A 1/8" straight bit, .0625 cutting depth and 35 ipm., was used for the roughing pass and a 1/32" tapered ball nose bit was used for the finishing pass, .0156 depth of cut and a feed rate of 35 ipm.
- 5) The key to having the form of the carving pop is to have the joint line of the two differing woods just a hair above the background cut. The software gave information that the carving would be .3115 in depth, so I placed it just a little deeper in the stock. Plan on some trial and error so glue up extra lid blanks. With the carving work done change bits back to a 1/4" straight bit and create a file to cut the profile of the lid. Place a few tabs to keep the lid secure as it is separated from the parent stock. Run the file.
- 6) The lid is held in place with 1/8" x 1/4" rare earth magnets that grip onto #5 flat head wood screws. Layout and predrill for the screws including a countersink. Install the screws leaving them a little proud. To mark the locations for the magnets, rub a pencil on the screw heads and then set the lid in place pressing firmly. The graphite will transfer to the lid and locate the position for the magnets. Drill and install the magnets with a drop of CA glue. Run the screws flush with the box and you are done with construction.
- 7) All that is left is final sanding and a few coats of your favorite finish. You know the drill.

## **Trout Box**

- 1) This box is great fun because it is not rectangle. Instead, it is in the shape of a trout. The carving file used in this project also gives it the overall shape. The file I used is #50406A Trout from Design & Make.
- 2) The blank required for the lower half of the box measures 5" x 14" x .75". Use the supplied DXF file to set up the interior pocket cut. The cut depth is .5625" using a 1/4" straight bit, .125" pass depth at a feed rate of 50 ipm.
- 3) Using the same bit and parameters set up a profile cut using tabs and cut out the fish shape.
- 4) Now for the fun part. The fish carving, when scaled to 10.9436 inches long measures .6823" tall. The lid uses a blank that is the same size as used for the lower half of the box. When setting up the cut have the roughing and finishing passes set to the model's boundary. The

carving operation will not cut through the blank so don't worry about tabs until the profile cut. For this model I used a 1/4" straight bit, .125 pass depth and a feed rate of 50 ipm, for the roughing pass and a 1/8" tapered ball nose bit, 12% stepover, .0625 depth of cut and a feed rate of 45 ipm. for the finishing pass. This bit combination gets the job done quickly while leaving a smooth and detailed surface.

- 5) When the carving is completed go ahead and use a 1/4" straight bit with the usual parameter settings and tabs to separate the trout from the parent stock.
- 6) At this stage the lid will need some shaping and sanding. The carved portion will need to be blending into the 1/8" or so of additional material on the bottom of the lid. You will also want to place the lid on the box and sand the two to fit nicely.
- 7) I used rare earth magnets on this box installed in the same manner as the Pine Tree Box. Of course, you can also create a fitted top like the Oak Leaves Box. Another variation is to replace one of the rare earth magnet/screw combinations with a single screw that allows the lid to pivot open. Lots of options. Your choice.
- 8) Final sand and finish.

Note – With any of these boxes you can make the smaller or larger. So, how about shrinking the trout box down to 6" long for a fantastic fishing fly box?