

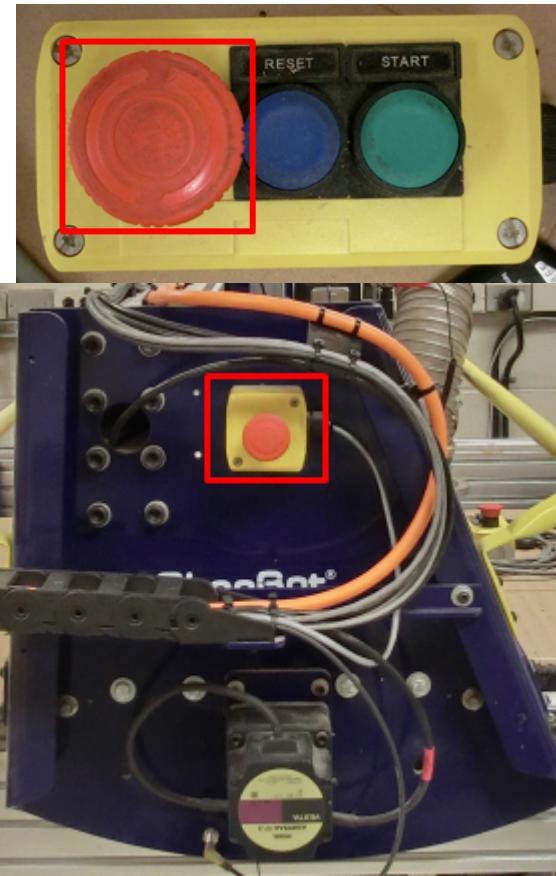
Turn the ShopBot On

1. Turn on the computer



2. Log in to the computer
Password: shopbot

3. Locate both E-Stops, one is on the yellow pendant and one is on the machine itself. Disengage both E-Stops by rotating clockwise until you hear a click. Let go of the button, it should now pop out into the disengaged position.



4. Turn the ShopBot on. The power switch is located on the side of the machine closest to the wall.

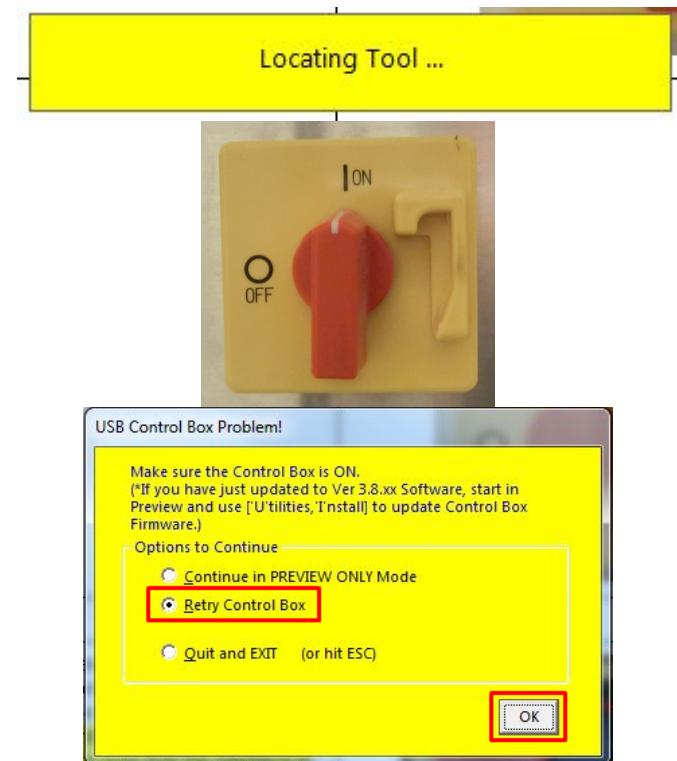


5. Open the ShopBot control software, SB3



6. Note: If you try to open the SB3 software before turning the ShopBot on, a window that says "Locating Tool ..." will display for a few seconds.

When the Locating Tool window disappears, you will see a new window titled "USB Control Box Problem!". At this point, you can turn the ShopBot on, select the "Retry Control Box" radio button, and then click "OK".



7. You should see a window titled "STOP Button is ON!"



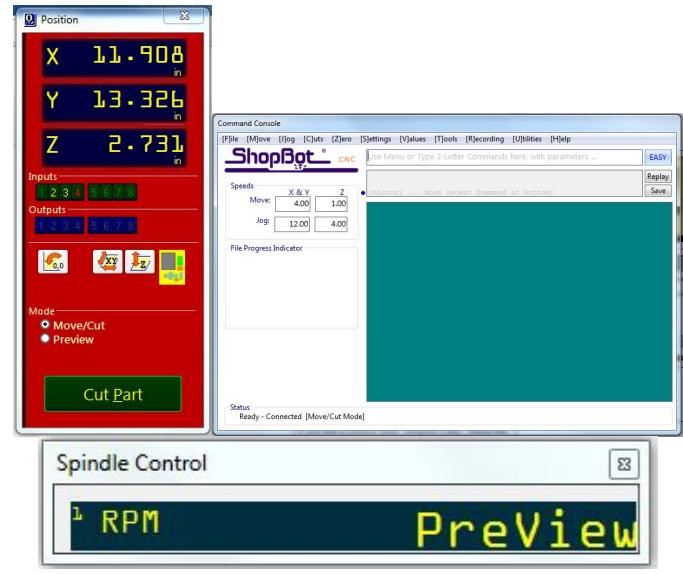
8. Press the Reset button on the pendant. You should hear a clicking sound coming from the VFD on the side of the ShopBot closest to the wall.



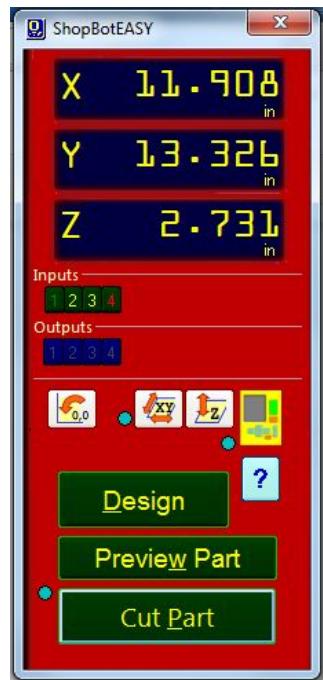
9. Click OK.



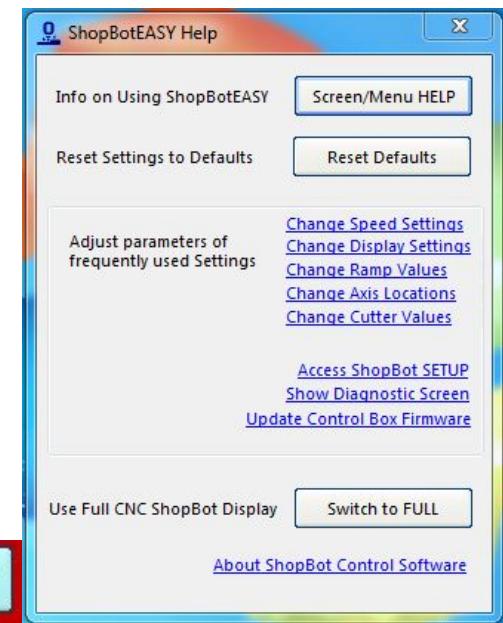
10. SB3 should now be open and in "Full" mode and you should see three windows on the computer screen: "Position", "Command Console", and "Spindle Control".



11. If you see a window titled “ShopBot Easy”, follow the following steps to change to “Full” mode, otherwise skip to step 17.



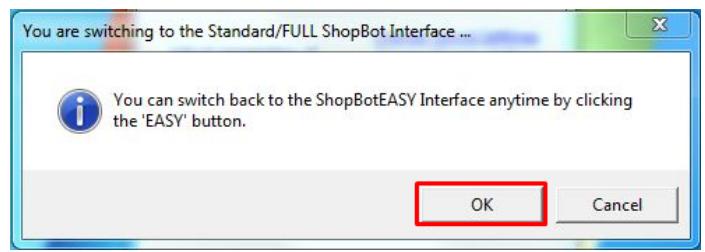
12. Click the Question Mark (?) Icon to display the ShopBot Easy Help Menu



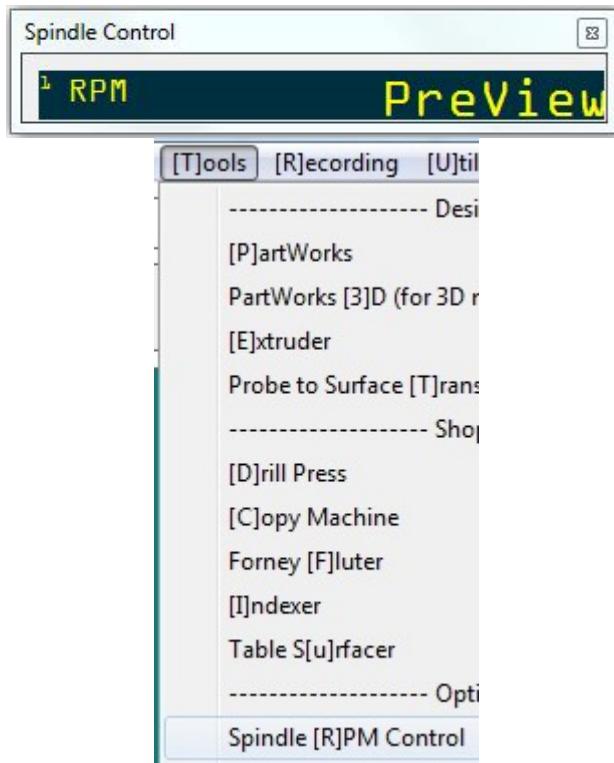
13. Click “Switch to Full”

Switch to FULL

14. A message will appear warning you that you can switch back to Easy mode at any time. Click OK. You should now be in Full mode.



17. If you are in full mode, but you do not see the "Spindle Control" window, click *[T]ools >> Spindle [R]PM Control* or press "T" and then R on the keyboard to display the window.



Material Setup

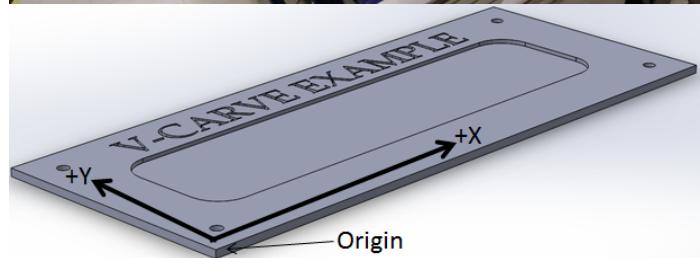
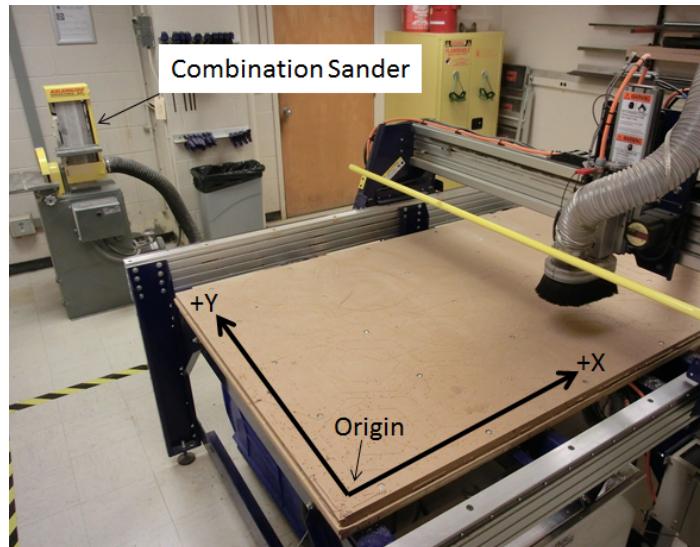
18. If your material is not already cut to fit on the table, cut your material on the panel saw or table saw.



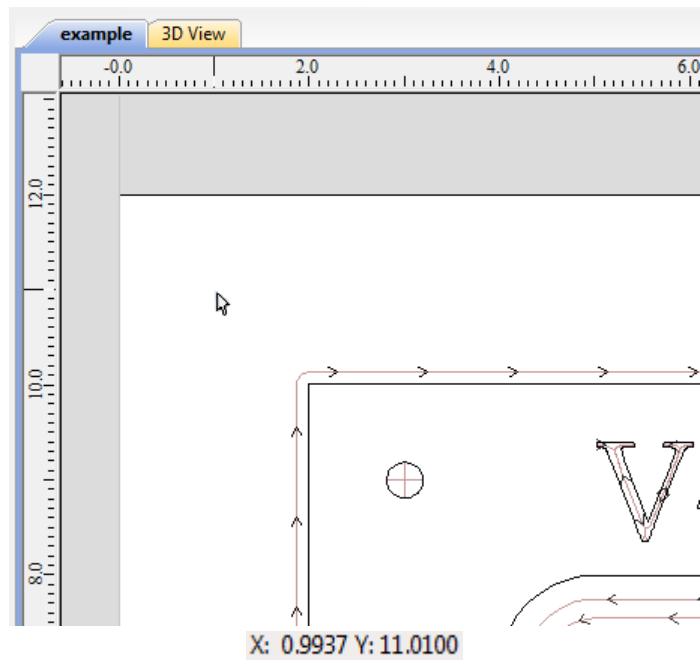
19. Think about how you are going to attach your material to the bed of the ShopBot. This tutorial only covers how to use screws. See a Teaching Assistant if you cannot use screws to secure your workpiece.



20. Again, keep the orientation of the ShopBot in mind. The lower left corner of your part should correspond to the corner closest to the computer/wall. The +X direction is away from the panel saw and the +Y direction is toward the combination sander.



21. In V Carve, move your mouse pointer to a location near one of the corners. Make sure that the location does not interfere with any of your toolpaths. In the lower right side of the V Carve interface, you will see the X and Y coordinates of your mouse pointer.



22. Use a measuring device and a sharpie from the Measurement and Marking drawer of the toolchest to mark the screw location on your material.



23. Do this for each corner of your material. If the sides of your material are warped or bowing, add screws along the edges.



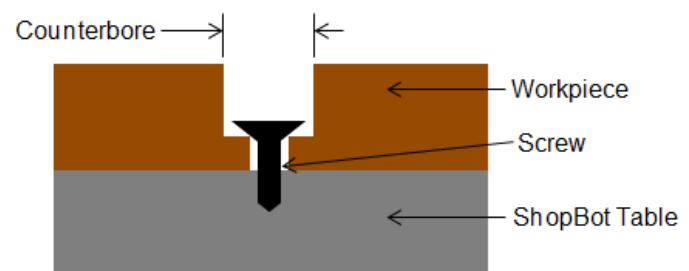
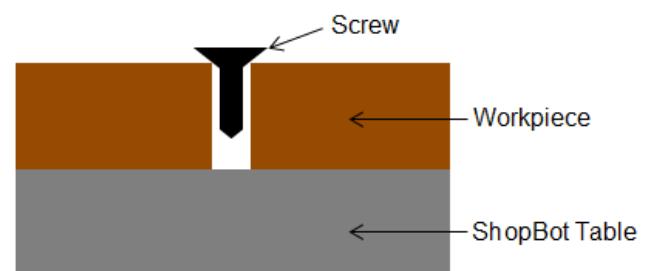
28. Place your material on a workbench. Make sure that the location of the hole you want to drill is hanging off the edge of the workbench so that when you drill through the material you won't drill into the table beneath it.



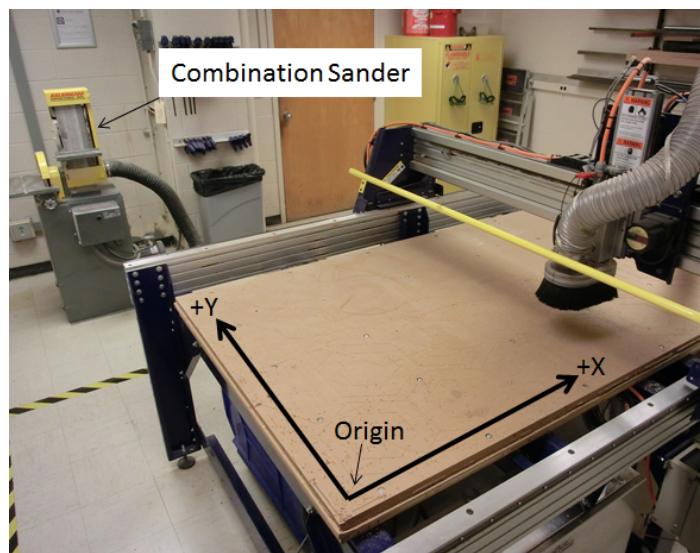
29. Drill the clearance holes.



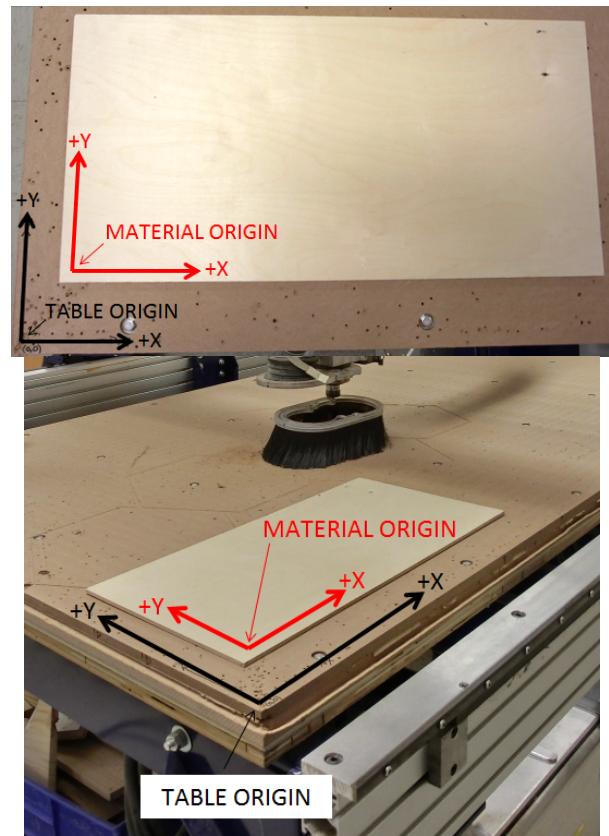
30. If you have really thick material, you will also need to counterbore your holes using the 11/32 inch diameter drill bit so that the head of the screw can sit below the surface of your material and the screw threads can reach the sacrificial ShopBot Table.



34. Notice the orientation of the ShopBot. The lower left corner of your part file should correspond to the corner closest to the computer/wall. The +X direction is away from the panel saw and the +Y direction is toward the combination sander.



35. Decide where you want to place your material. The origin of your material does not have to be in the same place as the ShopBot's origin as long as the X and Y axes of your workpiece are parallel to the ShopBot's X and Y axes.



36. Press "K" on the keyboard or click on the keypad icon on the position window to open the manual movement mode.



37. You should now see the KeyPad window.



38. Use the arrow keys and Page Up/Down to move the head of the ShopBot so there is room to place your material on the table.

Pressing the **up arrow** moves the gantry in the **+Y** direction, **toward the combination sander**.

Pressing the **down arrow** moves the gantry in the **-Y** direction, **away from the combination sander**.

Pressing the **right arrow** moves the gantry in the **+X** direction, **away from the panel saw**.

Pressing the **left arrow** moves the gantry in the **-X** direction, **toward the panel saw**.

Pressing the **page up key** moves the gantry in the **+Z** direction, **toward the ceiling**.

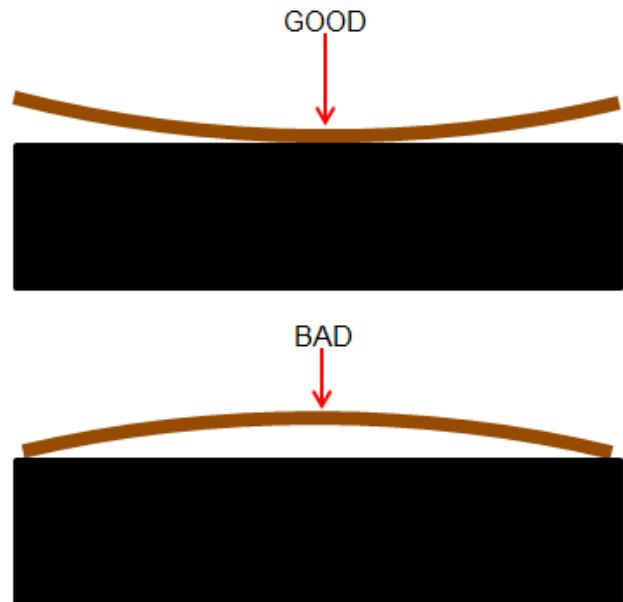
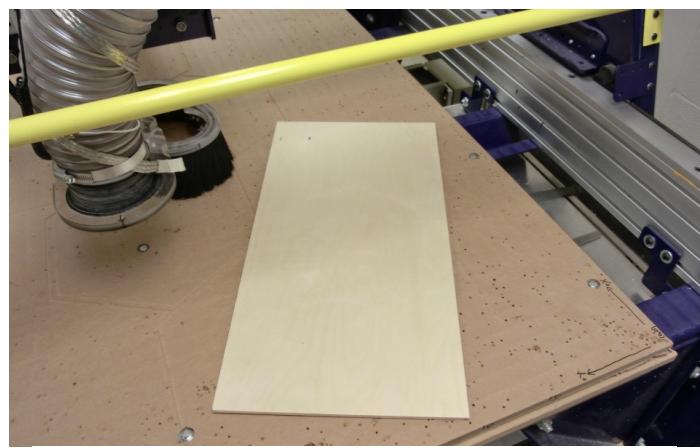
Pressing the **page down key** moves the gantry in the **-Z** direction, **away from the ceiling**.



39. Press the "Esc" key or click the x to close the keypad.



40. Place your material on the ShopBot table. If your material is warped or cupped, you want to place your material so that the concave side is facing up. The screws along the edge will then flatten your workpiece nicely.

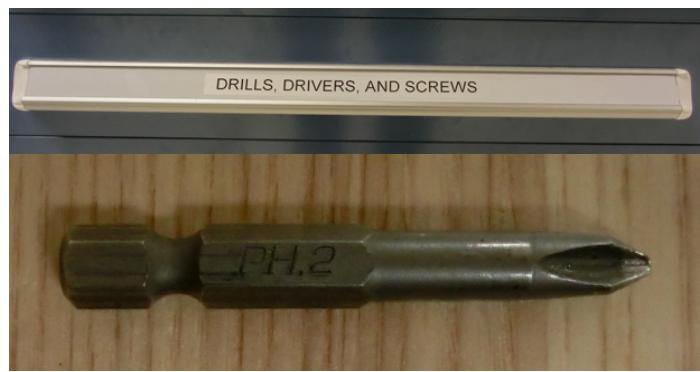


41. Decide which screws to use to attach your workpiece to the table. think[box] has $\frac{3}{4}$ inch long, $1\frac{1}{4}$ inch long, $1\frac{5}{8}$ inch long, and $2\frac{1}{4}$ inch long number 8 flat head wood screws available. If you need a different sized screw, you must supply them.

You want the screw to go through your material, and most of the way through the top layer of the machine table. This top layer is an 0.750 inch thick piece of MDF wood. For example, if your material is 0.500 inches thick, you need a screw that is around 1.250 inches thick. It is best to avoid using a screw so long that it goes into the second layer of the table.



42. Get a number 2 phillips head screw driver bit from the Drills, Drivers, and Screws drawer of the toolchest.



43. Put the number 2 phillips head bit in the cordless drill.



44. Set the torque limiter on the cordless drill to 16. When the torque limiter is set, the clutch in the head of the drill will slip if the drill experiences too much resistance. Setting the torque limiter can help prevent stripping the heads of the screws. Increase the torque limiter if it is not able to drive the screws all the way into the material.



45. Use the cordless drill to drive the screws into the holes you drilled. You want the screws to go into the sacrificial table beneath your material.



46. Press down on your material while you screw it down so that it does not rise off of the table



Machine Setup

47. In the next few steps you will be installing a machining bit into the ShopBot machining spindle.

To begin, press the “k” key on the keyboard or click on the keypad icon in SB3 to open the manual movement mode.



48. Use the arrow keys and page up/down to move the head of the ShopBot gantry to an easily accessible location.



49. Press the escape key or click the x to exit the manual movement mode.



50. Select the first bit from your partworks file.



51. Select the correct collet for the bit you selected. The collet should be the same diameter as the shank of your tool. If you do not know the diameter of the shank, measure it with calipers.

Collets are designed to clamp tools up to 1/32 inch smaller than their rated size. Never force a larger tool into a smaller collet. Always use a collet that is the same size as the tool or slightly larger.

For most of the ShopBot bits, you will either use the $\frac{1}{4}$ inch or $\frac{1}{2}$ inch collets.

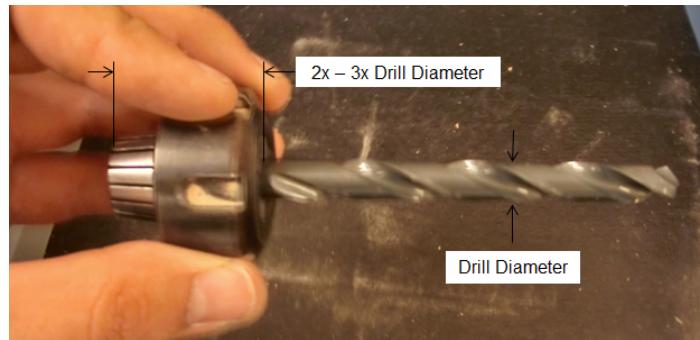
For a drill bit, for example the F drill, determine the size of the drill bit. An F drill is 0.257 inches in diameter. You cannot use a $\frac{1}{4}$ inch collet because the tool is larger than that. Instead, use the 9/32 inch collet.



52. Snap the collet into a collet nut.



53. Insert the bit you selected into the collet. Make sure that at least 2-3 times the diameter of the bit is being held by the collet.

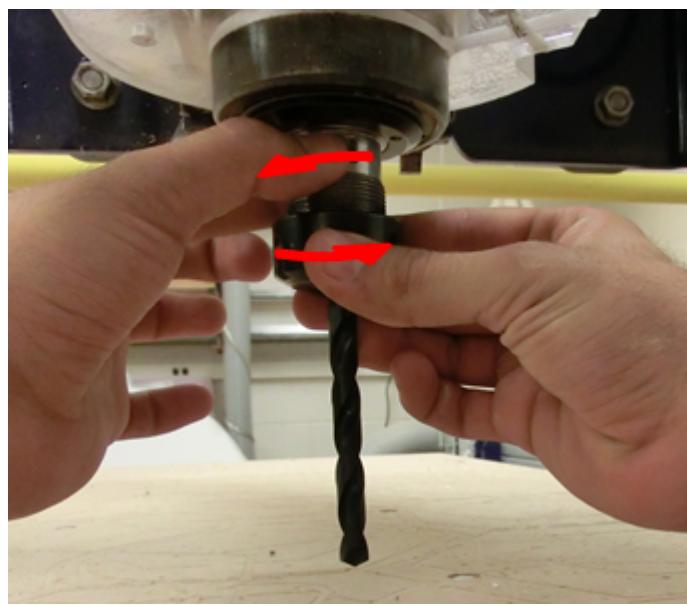


54. Do not insert the bit too far into the collet. The cutting edges (flutes) should not touch the collet. Clamping down on the cutting edges can damage the tool and the collet.



55. With one hand, hold the machine spindle so that it does not rotate. With your other hand, screw the collet nut assembly into the spindle of the machine.

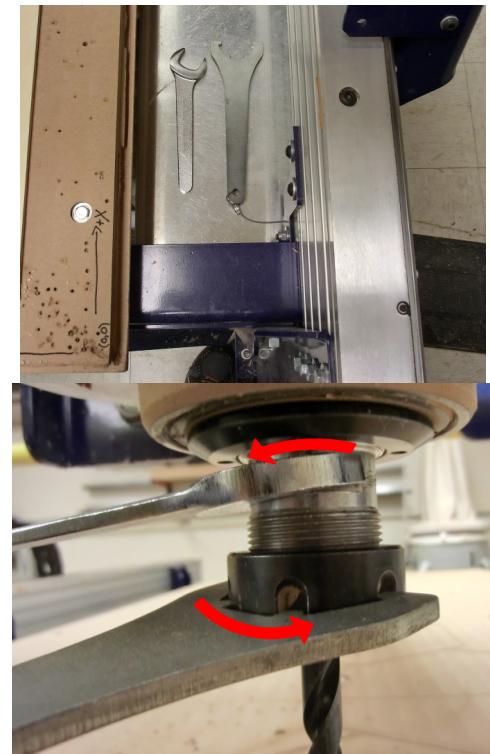




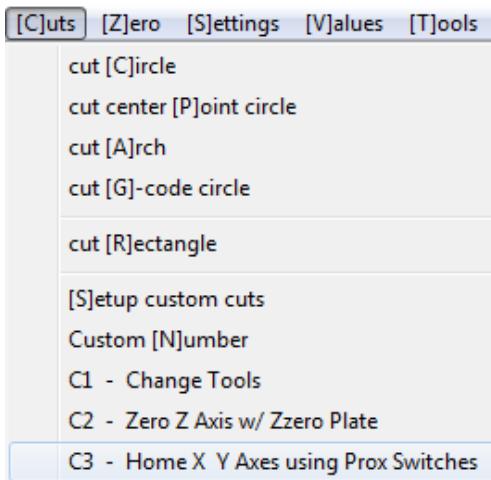
56. Once the collet nut is hand tight, use the collet wrenches to tighten the collet nut further.

A typical collet nut should be tightened to 85 foot pounds of torque. That is a lot! We do not have a torque wrench for this machine, so our advice is to tighten it just about as much as you can.

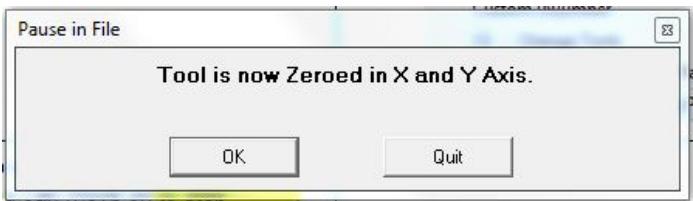
If you do not tighten the collet nut enough, what happens is the bit will start to slip out of the collet and gouge your workpiece.



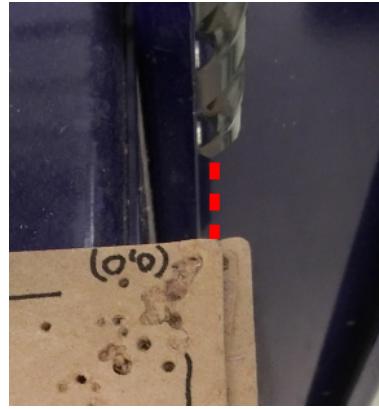
57. Click [C]utski >> C3 - Home X Y Axes using Prox Switches or press “C” and then “3” on the keyboard to have the ShopBot find the table’s home (zero) location.



58. The machine will move to its home location and then a message will be displayed on the screen. Click ok to accept the zero location.



59. If your material's zero location matches the table's zero location, then you can move on to step 69, zeroing the z axis. Otherwise, continue following the steps in order.

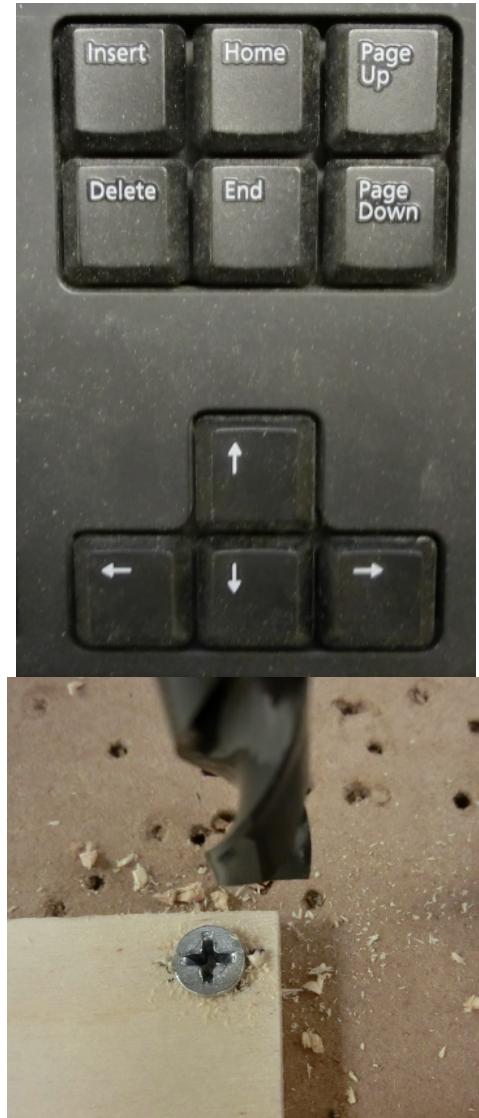


60. Open the manual movement mode by pressing “k” on the keyboard.k



61. Use the arrow keys and page up/down to move the head of the machine to the X/Y origin of your material.

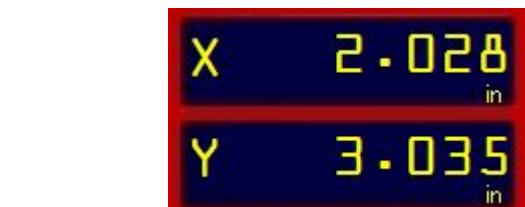
The center axis or tip of the tool should be pointing directly at the origin corner of your workpiece. Look at this from several angles to make sure that you are nearly zeroed in both the X and the Y dimensions.



62. When you get close to the origin location, you can click on the “moved fixed” button in the manual movement window, type a movement increment, and press enter on the keyboard. Now every time you press an arrow key, the gantry will only move by the specified amount.



63. When the tool is over the origin of your material, look at the X/Y coordinates on the screen and write them down. This way if the machine is disconnected for some reason, you will be able to use the same zero location and restart your job without wasting material.

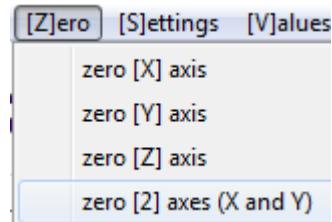


X origin : 2.028"
Y origin : 3.035"

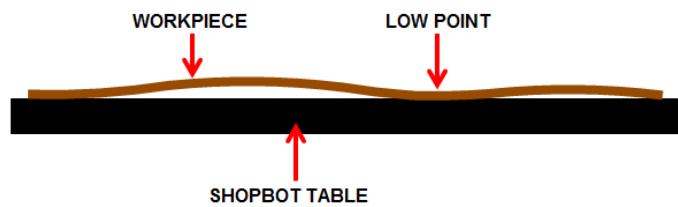
64. Press the Escape key to exit the manual movement mode.



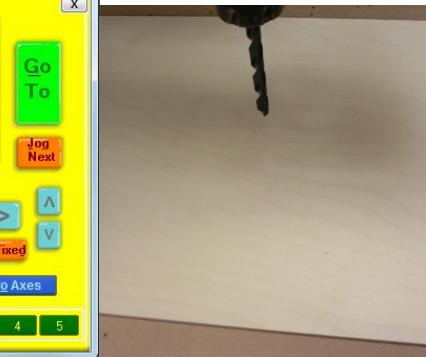
65. Click [Z]ero >> zero [2] axes (X and Y) to set the new zero location of the gantry to the origin of your material.



66. Inspect your workpiece from the side. You will notice that it is not perfectly flat. Find the lowest point on the material.



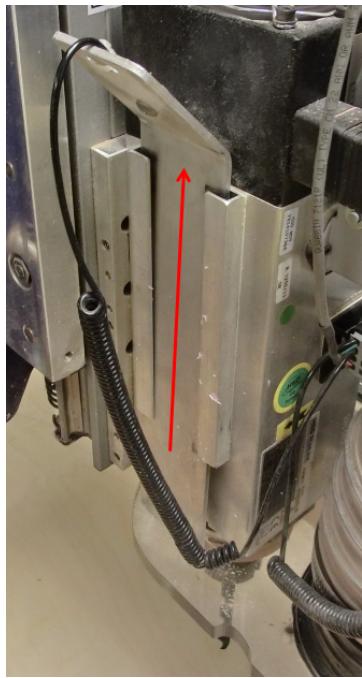
67. Use the manual movement mode to move the gantry over the lowest point of your material. If you use the lowest point on your material as the Z zero point, your toolpaths will definitely cut through the material.k



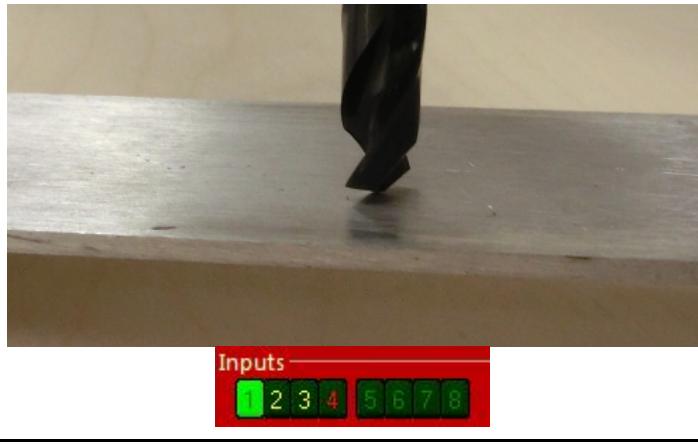
68. Press the Escape key to exit the manual movement mode.



69. Slide the Zero Plate up to remove it from the side of the machine.



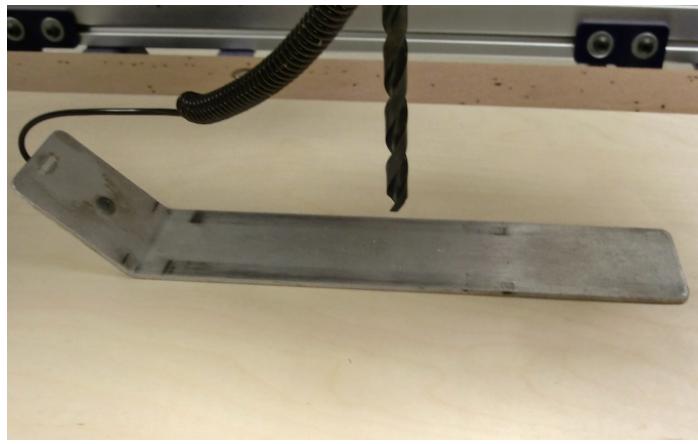
70. Touch the zero plate to the end of the tool in the ShopBot and make sure that the input 1 light in SB3 lights up when contact is made.



71. If the light does not light up, find a teaching assistant or a full time staff member to help you fix the problem.



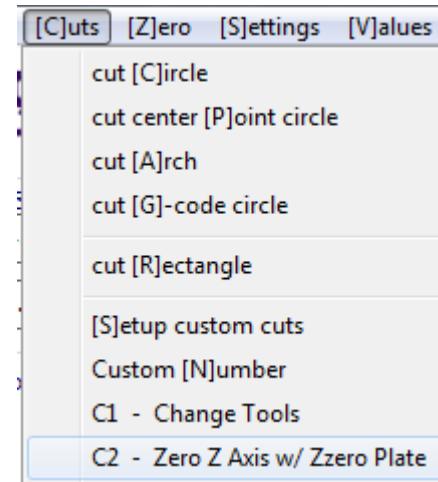
72. If the light does light up, place the zero plate on top of your material beneath the bit in the ShopBot.



73. Click [C]uts >> C2 - Zero Z Axis w/ Zzero Plate or press “C” and then “2” to begin the zeroing procedure.

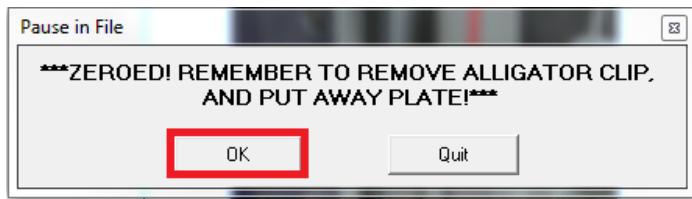
DO NOT MOVE THE ZERO PLATE.

The machine will lower the spindle until the tool touches the zero plate, and then it will do this again a second time. This is how the machine learns the location of the top of your material.

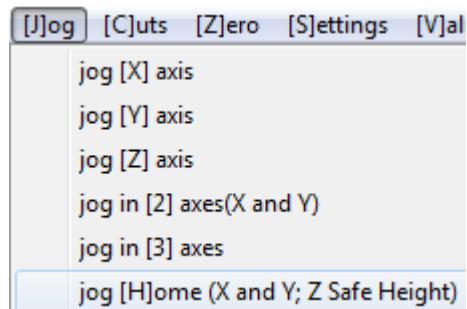


74. Wait for the machine to display this dialog, which indicates the Z Zeroing procedure is finished.

Then, click “OK” and put the zero plate away.



75. Click [J]og >> jog [H]ome (X and Y; Z Safe Height) or press “J” and then “H” to have the gantry of the machine move to the X and Y zero location and the Z safe height.



76. If the machine moved to the origin of your workpiece as expected, then you may proceed to the next step, otherwise repeat steps 57 through 75 to correctly set the zero locations.



77. Attach an appropriate dust collector brush. There are two brushes of different heights, plus an extender. Your goal is for the brush to be about the same length as your bit, so the tip of the tool is even with the lower ends of the brush.

These items attach using magnets and snap on fairly easily. Be careful not to hit your bit.

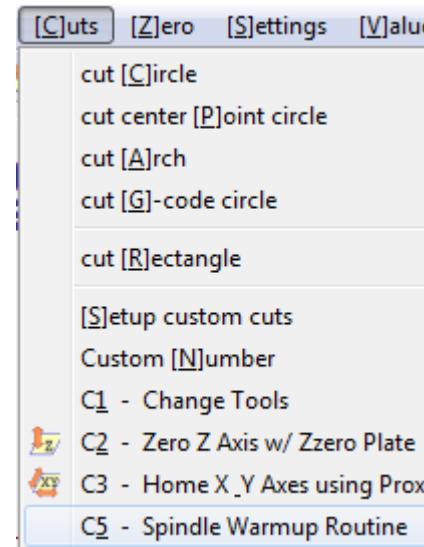
You may have to enter the manual movement mode and raise the head to have enough clearance beneath the ShopBot tool.



78. Insert the Interlock key attached to one of the collet wrenches and turn it to the “engaged” position. The keyhole is located on the side of the ShopBot closest to the wall.



79. Click **[C]uts >> C5 - Spindle Warmup Routine** or press “C” and then “5” to load the spindle warm up routine.



80. A new window titled “NOW STARTING ROUTER/SPINDLE !” will appear. Press the Start button on the yellow pendant.



81. Click OK on the “NOW STARTING ROUTER/SPINDLE” window to start the spindle warm up routine.



82. The spindle warm up routine gradually increases the speed of the spindle for 9 minutes. Doing this ensures that the grease inside of the bearings in the spindle is warm and that the metal the bearings are made of expands completely before adding a load to the cutter. This warm up routine will help increase the life of the ShopBot's spindle.

```

ATC_WarmUp.gbp - ShopBot Edit
File Edit View Tools Help
ATC_WarmUp.gbp -- Example File showing how to warm up an ATC spindle after homing it.
Copyright 2006, Shopbot Tools, Inc.
G-Bergfors 12/06 initial version for Newman Whitmire
User takes responsibility for the effects and outcomes of the use of this program.

.
C0,      'Home ATC
.
10 'Warm-up
11 .
12 ' Run at 50%
13 SC, 5,0
14 SC, 6,0
15 SC, 7,0
16 .
17 C6,      'Start spindle
18 .
19 Pause 120 'Pause 2 minutes
20 .
21 ' Run at 75%
22 SC, 5,1
23 SC, 6,0
24 SC, 7,1
25 .
26 Pause 120 'Pause 2 minutes
27 .
28 'Run at 100%
29 SC, 5,1
30 SC, 6,1
31 SC, 7,1
32 .
33 Pause 60 'Pause 1 minute
34 CT,      'Stop Spindle
35 .
36 'Warm Up complete
38 PAUSE 2
Total Lines 38 Line #1 Col #61

```

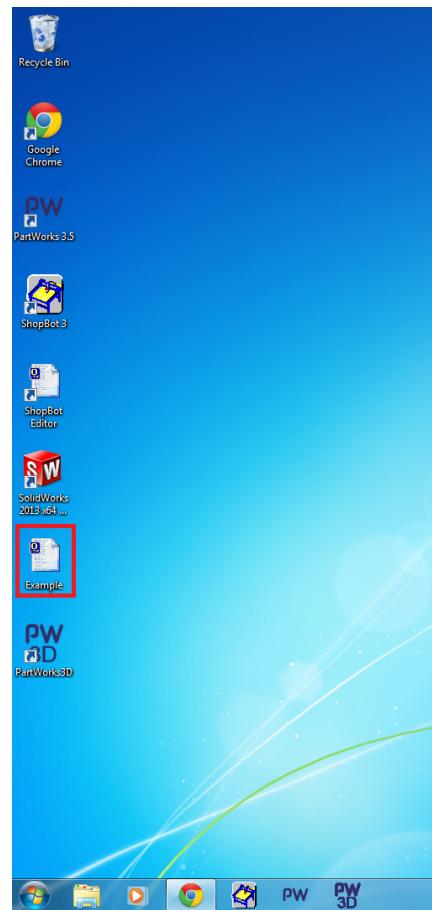
83. After 9 minutes the warm up routine will finish and the spindle will stop spinning.

84. STOP. Find a trained TS or full-time staff member to double check your work up to this point.

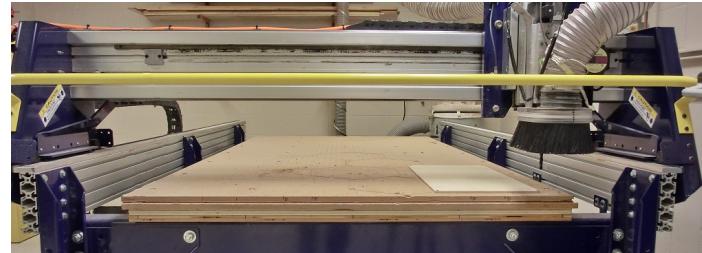


Run your file

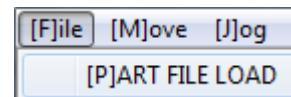
85. Using a USB flash drive, email, dropbox, or some other service, save your .sb3 file to the desktop of the computer.



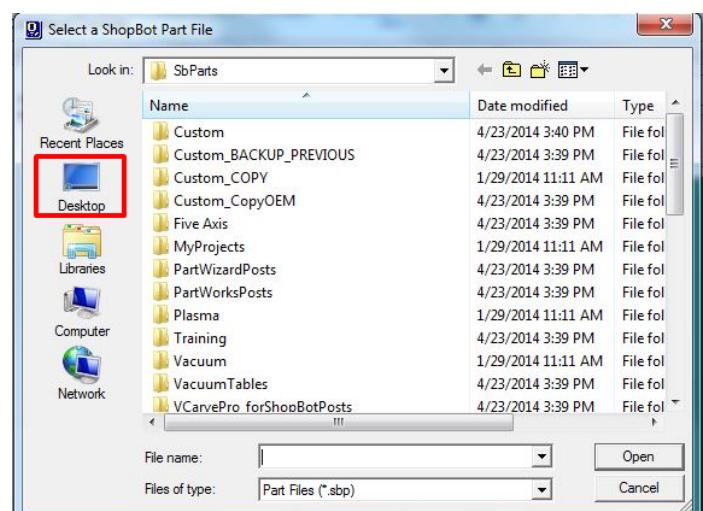
86. Double check to make sure that nothing is on the table except for your material and anything you are using to secure it to the table.



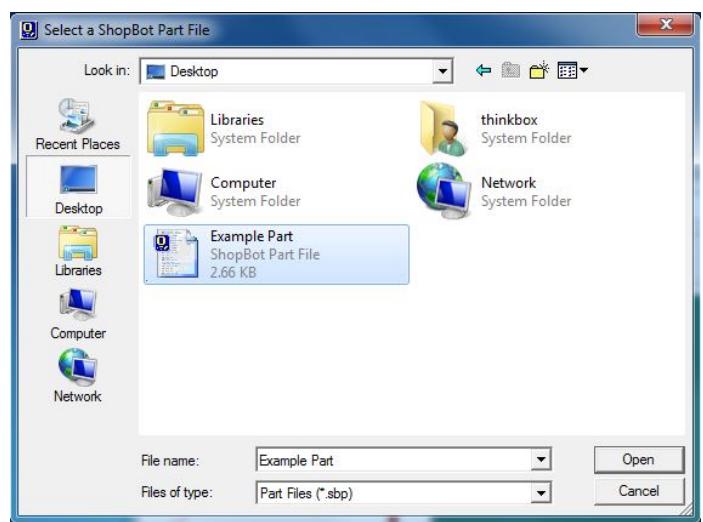
87. Click [F]ile >> [P]ART FILE LOAD or press “F” and then “P” to open a file browser window.



88. Navigate to the desktop.



89. Select your file and click Open



90. Ignore this window

Fill-In Sheet for [FP] Command

[FP] [P]ART FILE LOAD

Parameter Name:	Value:	Required
Part File Name	Example Part.sbp	*
Offset in 2D or 3D	0 - No Offset	
Proportion X	1.00	
Proportion Y	1.00	
Proportion Z	1.00	
Tabbing	0 - Off	

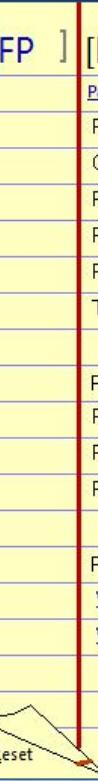
Parameters for 'templates' having just XY movements

Plunge (per repetition)	-0.00
Repetitions	1
Plunge from 0	0 - Off

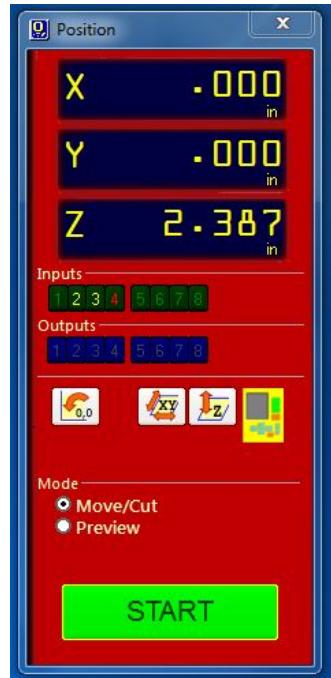
Related Commands:

[VB - to set Tabbing Values](#)
[VS - to set Speed Values](#)

Reset Recall Last Cancel



91. Click Start.



92. Press the Start button on the pendant.



94. Click OK to start the file.



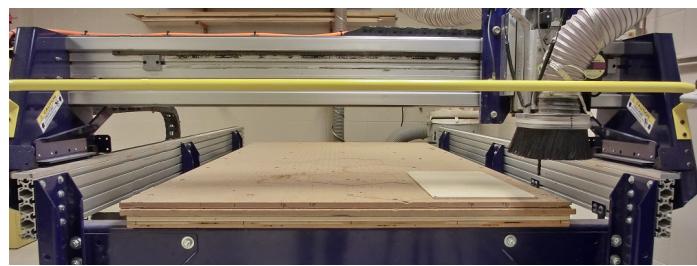
95. Once the file starts, the mouse will not be able to move off of the Stop icon. Clicking the mouse button or pressing the spacebar on the keyboard will pause the machine after it completes the next line of code in the toolpath file. Pressing either E-stop will stop the machine immediately, but the spindle will not immediately stop spinning, so you will have to wait for it to stop spinning before doing anything.



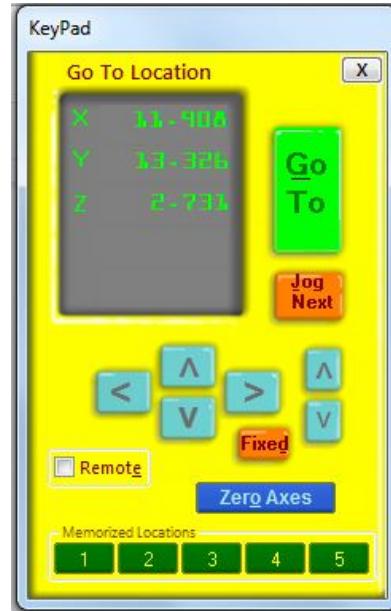
96. Watch the machine to make sure that it goes where you expect it to go. If anything unexpected happens, hit the E-Stop. This will instantly stop the gantry from moving in the X and Y directions. If this happens you would need to find a TA or a full-time staff member to help you reset the machine.

Cleanup

128. The ShopBot will automatically move to its home position and stop when the file is done machining.



130. Press "k" on the keyboard and use the manual movement mode to move the head close to you so that you may remove the bit.



131. Press the escape key to exit the manual movement mode.



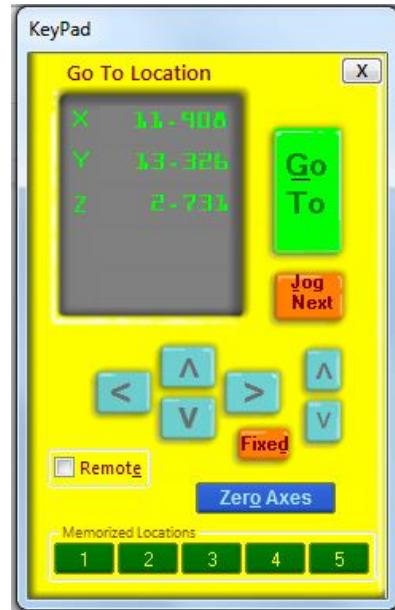
132. Disengage the spindle interlock key.



133. Remove the bit in the ShopBot.



135. Use the manual movement mode to move the gantry out of the way of the screws holding your material down to the table.



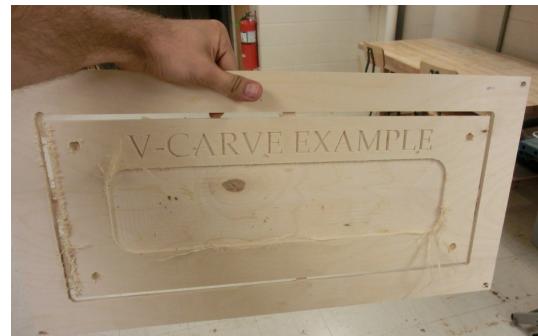
136. Exit the manual movement mode.



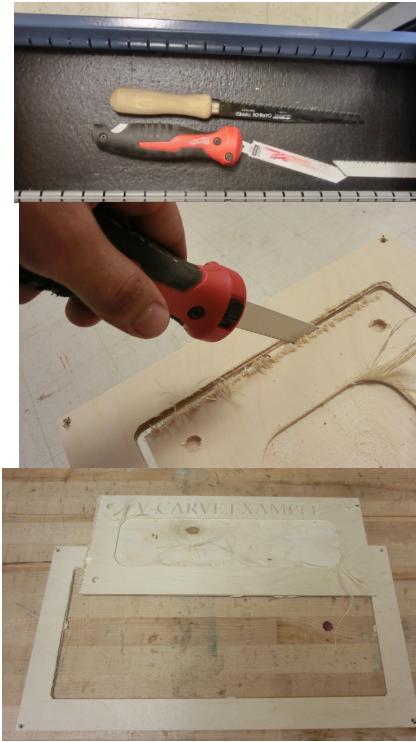
137. Use the cordless drill with a number 2 phillips head driver to remove the screws.



140. Remove your material from the table.



141. Use the hand saws to break through any tabs.

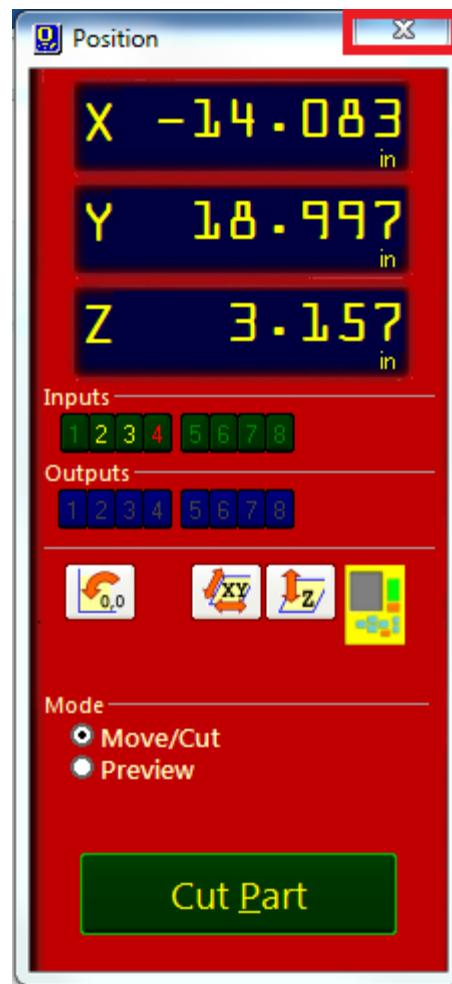


142. Use the rasps, files, and sandpaper to remove any unwanted burs or sharp splinters.





145. Exit SB3 by clicking the “X” on the Position window.

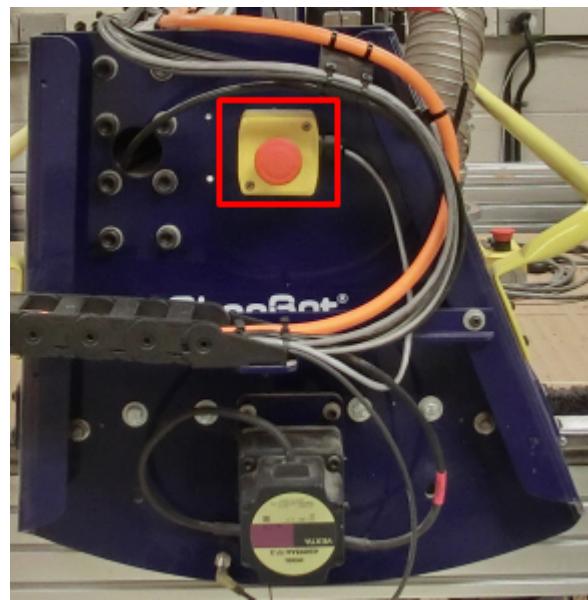


146. Turn off the ShopBot.



147. Press both E-Stop buttons.





150. Turn the computer, monitor, and speakers off.



151. Congratulations, you are done!!!

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