ShopBot CNC Router

What is it?

The ShopBot is a CNC (computer numerically controlled) router that uses a cutting bit that rotates at a very high speed to remove material from a part.

How does it work?

The machine reads a pre-programed computer file telling it where and how to cut. A cutting bit is rotated at a very high RPM by a spindle motor, which can move the bit up and down. This mechanism is moved left, right, front, and back by a cross arm. The machine is therefore known as a three-axis router because it can move on the XY & Z axis. The machine can do two dimensional cutouts and etching, as well as three-dimensional relief work.

What software can I use?

PartWorks 2D and 3D are the programs used for the ShopBot. As their names imply PartWorks 2D is set up for two-dimensional work including cutouts and etching. PartWorks 3D is set up for complex surfaces such as topographies, and double-sided milling.

What materials can I use?

You can cut MDF, plywood, solid wood, foam, and plastics.

What do I need to do before I come to the Lab?

It is highly recommended that you speak with a lab assistant beforehand to plan your project.

Familiarize yourself with the PartWorks programs before coming in to use the Lab. There are some helpful tutorials on ShopBot's website.

You should also have your file ready in PartWorks before coming to the lab. Make sure to check the time estimate and make sure that you will have enough time to complete your file, allowing extra time for setting up the machine and for tool changes. Then save your toolpaths as a .sbp file. Have a lab assistant check over your file before running the machine.

How do I work the machine once I'm at the Fab Lab?

Before attempting to operate the machine for the first time, have a lab assistant help you.

Always remain with the machine while it is running, and be ready to hit the spacebar to pause the file, or the stop button to stop the machine in case of an emergency.

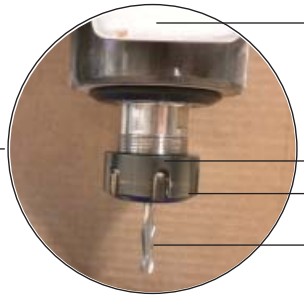
Always wear eye protection while the machine is running, and have long hair tied back.

Please refer to the diagrams on the following pages while going over these directions.

1. Turn on the machine. It is important that the machine is on before you open the ShopBot program to ensure there are no communication errors between the program and the machine.
2. Open the ShopBot program. Note that there are two windows. One is “ShopBot Console”, and the other is “ShopBot Position”.
3. You will most likely get a message telling you to hit the reset button, which is on the yellow control box. Do this, and listen for a “click” sound in the machine. This tells you that the reset has worked properly.
4. Hit the “K” button on your keyboard. This activates keyboard mode in the ShopBot program. Another window for the keypad will pop up on your computer screen. You can use this keypad or your keyboard.
5. Use the arrows on your keyboard to move the ShopBot spindle back and forth, left and right, and up and down. Move the spindle close to you so that you can change the cutting bit to the one you need.
6. Disengage the spindle. This can be done in a number of ways depending on your specific machine. On ours it is done by removing collet wrench B from its slot next to the on/off switch.
7. Lower the dust guard, if your machine has one.
8. Use the two collet wrenches in conjunction with each other to loosen the collet nut. Place wrench A and wrench B so that they are close enough for you to interlace your fingers and squeeze them together. As you loosen the nut, you will feel a safety catch. This is to prevent the bit from falling out and getting damaged or damaging your material. With one hand squeeze the wrenches together while holding the bit from underneath with your other hand.
9. Remove the collet nut and bit.
10. Select the proper collet nut and bit and tighten them onto the collet as far as you can by hand. Make sure the fluting is clear of the collet to properly clear away material.
11. Retighten the collet nut with the wrenches.
12. Push the dust guard back into position and retighten.
13. Put collet wrench B back into its slot to reengage the spindle and put collet wrench A away.
14. Move the machine to clear the area where you will be placing your material. Secure your material to the machine bed.
15. We are ready to zero out our cutting tool. This means that we will be telling the machine where to start for the X, Y, and Z axis.
16. First, set the XY home, or part home, as it is sometimes called. Move the machine so that the cutting bit is directly over the spot you want to set as your origin point. You may want to refer back to your digital file to check the origin point’s location.
17. Hit escape to exit keyboard mode. The ShopBot Console is now active. Type “Z2” to set the XY Zero. Your XY Zero is now set, and will remain at this position until you manually reset it.
18. We still need to zero the Z axis. This tells the machine where the top surface of our material is. Hit “K" to activate the keyboard again. Move the spindle to the center of your material.

19. Take out the metal plate from its slot on the spindle. Tap it lightly against the cutting bit and watch “Input 1” light up on the ShopBot Position screen. This ensures that there is electrical conductivity.
20. Place the plate under the cutting bit. Hit escape to exit keyboard mode. Type “C2” to start the Z-zero sequence. A few notices may pop up asking you if the plate is in place. Hit enter for these. The cutting bit will drop down once touching the top of the plate, and again more slowly, to get a precise reading. Put away the plate.
21. You are now ready to load your file. Click on the “Load Part File” button on the ShopBot Position window. If your file is on a flash drive, put it on the desktop first, then open the file from the desktop.
22. Put on your safety glasses.
23. Turn on the dust collector.
24. Your file will open on the ShopBot Console screen. You may get a few popups asking you to double check your steps. Hit “OK” or “Enter” for these. You will then get a popup asking you to start the alpha router spindle. Hit the start button on the yellow control box. This starts the spindle for the cutting tool.
25. You will then get another message asking you to hit the start button. Just hit “Enter” on the keyboard.
26. Your file will now cut. Make sure that you stay by the machine at all times while it is running. If anything should happen, or something does not look right, hit the spacebar to pause the machine. You can always restart the file from where you left off.
27. If your file uses multiple cutting bits, the machine will stop after each bit and you will have to change to the next one. When the machine stops it will ask, “Is tool #__ in the spindle and zeroed?” Click on “No”. Use the keyboard to move the machine so that you can change the bit. When you are done changing the bit, hit escape to exit keyboard mode and the machine will restart the file from where it left off.

ShopBot Parts



Machine Bed &
Sacrificial Board

ShopBot Tools & Accessories

Tools

Collet Wrench A

Collet Wrench B

Holders

Collet

Collet Nut

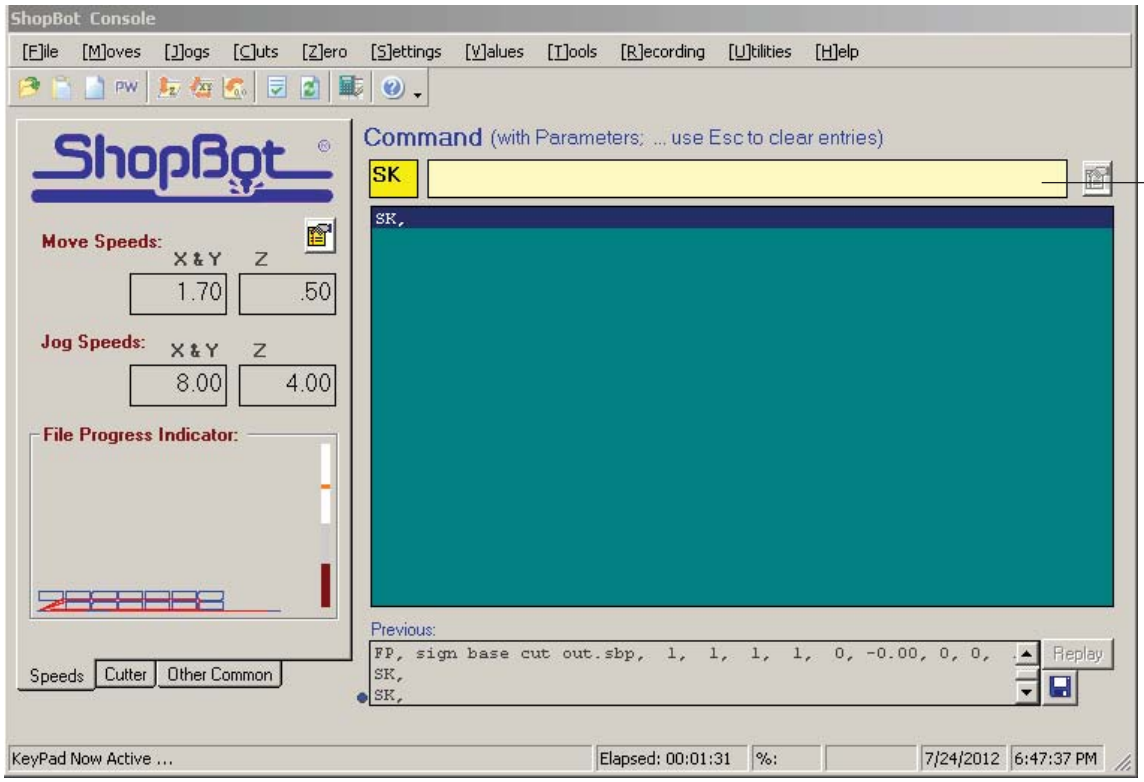
Bits

End Mill

Ball Nose

V

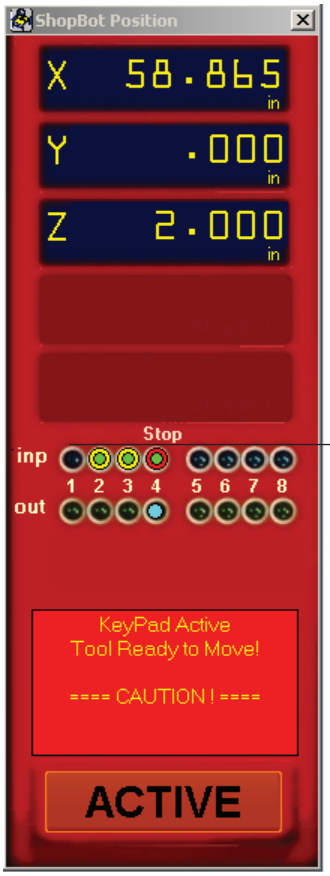
ShopBot Program



ShopBot Console

Command Line

"Z2" to zero XY axis
"C2" to zero Z axis
"K" to bring up keypad



ShopBot Position

XY&Z Position relative to zero

Input 1
Used to check for electrical conductivity of Z-zero plate

ShopBot KeyPad

Type "K" to bring up keypad

Move spindle front, back, left, right, up, down