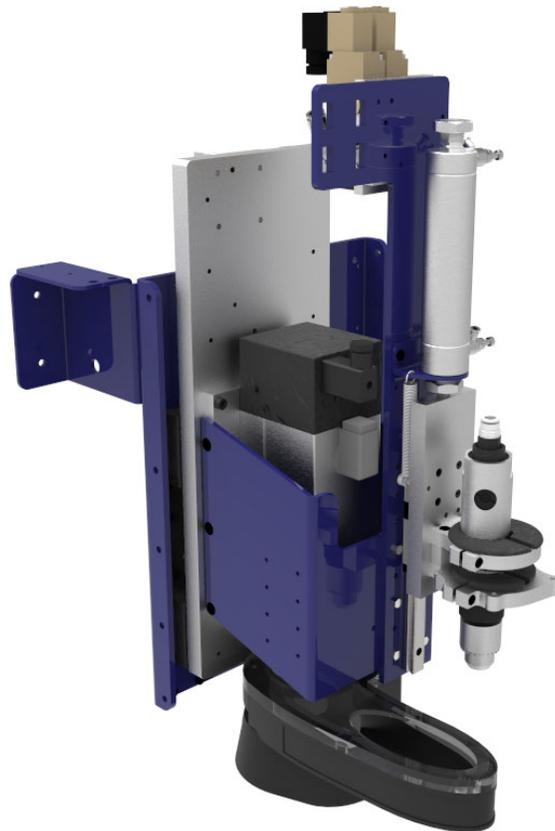


# Air Drill PRS4

## Installation and Setup





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## Introduction

This document will go over the installation and setup of the air drill accessory for ShopBot PRSAlpha tools. The air drill functions similar to a second Z-axis for the ShopBot, but is more limited in function than a second Z-axis while also being more compact and more affordable. It is a 1/3hp pneumatic powered drill with a 3/8" chuck that uses a pneumatic cylinder to lower itself into position. This allows the user to have a normal router bit in the main cutting head (usually a relatively large diameter) and a drill bit in the air drill for drilling smaller diameter holes. This eliminates the need to change bits during a file.

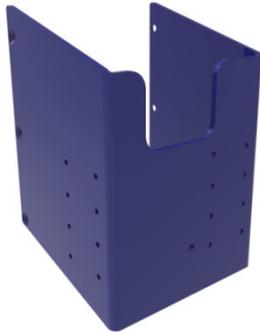
The air drill uses approximately 7.5 scfm of compressed air at 100 psi. A portable air compressor is not recommended.

Because of the increased weight of the air drill assembly, a pneumatic assist is required for the Z-axis. Please complete the installation of the pneumatic Z assist as outlined in the document "Installing the Pneumatic Assist on a PRS" before proceeding with the air drill installation.

## Tools Required

- 4mm Allen wrench (PRS4 machines shipped after 6/15/17)
- 3/16" Allen wrench (PRS3 or machines shipped before 6/15/17)
- 8mm open-end wrench or box wrench
- #2 phillips-head screwdriver
- Small flat-head electronics screwdriver
- Large flat-head screwdriver

## Parts List



Bracket mount Cage



Air Drill Assembly



Assembly Board Relay 24V



Cable Solenoid Dual 37ft



FHSCS M6 x 14 - Qty: 6 (PRS4)  
SHCS 1/4-20 x 5/8" - Qty: 8 (PRS3 or older)



HCS M5 x 12 - Qty: 6



Alignment Rod

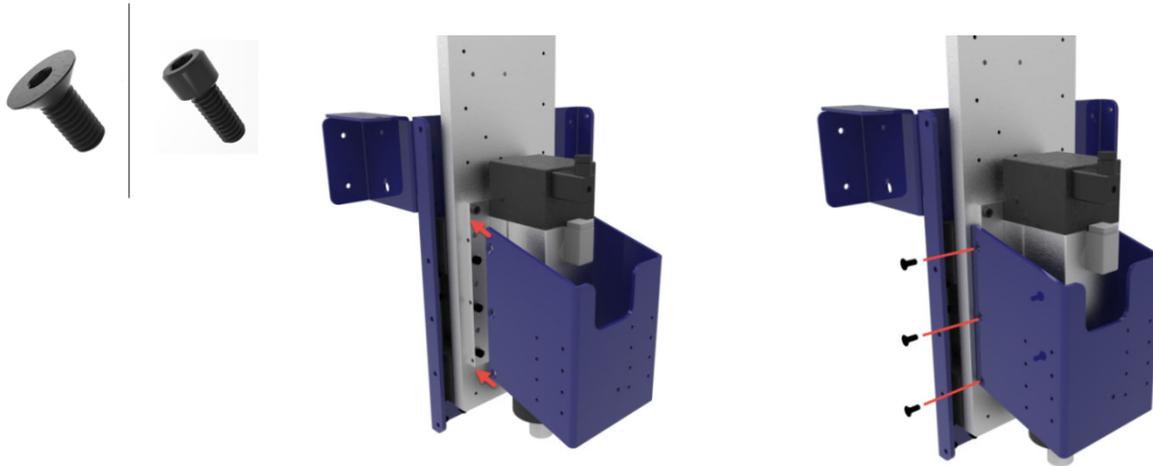


Drill Chuck Key

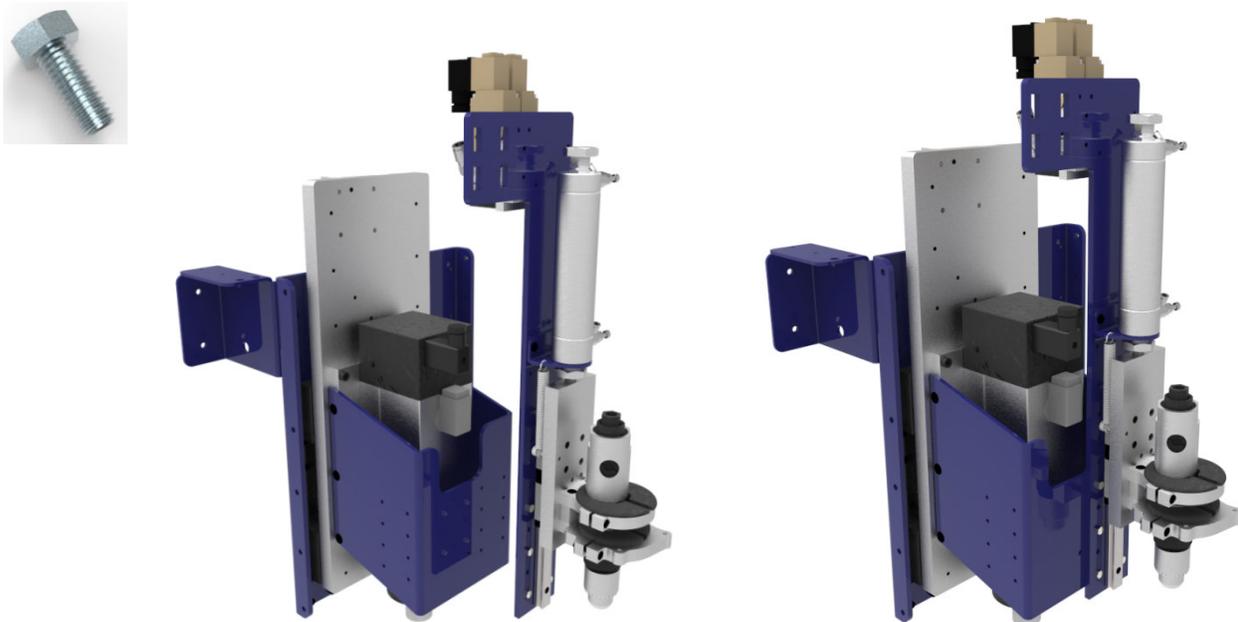
## Attaching Cage and Drill

The drill cage slides over the spindle plate and is attached using:

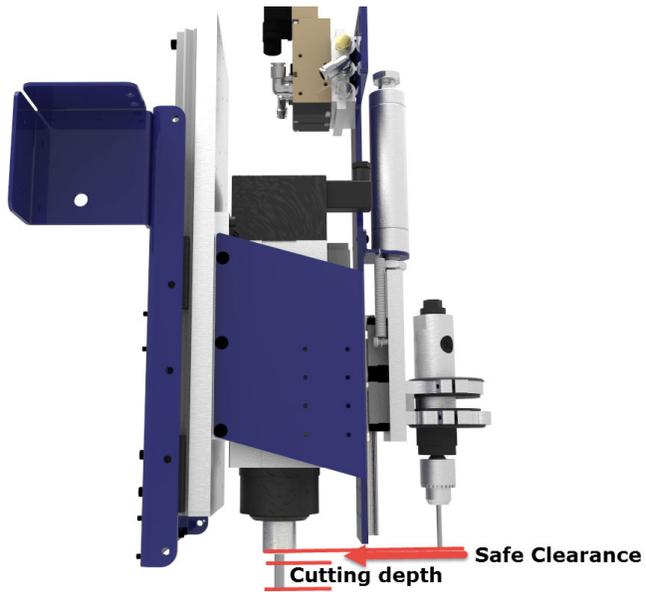
- For PRS4 tools: a total of 6 M6 x 14mm flat head socket cap screws. 3 on each side.
- For PRS3 and older tools: a total of 8 1/4-20 x 5/8" socket head cap screws. 4 on each side.



Next attach the drill assembly to the face of the drill cage using 6 M5 x 12mm hex cap screws, 3 on each side. Because of space constraints the most effective tool is an 8mm open ended wrench. There are a few mounting heights that can be selected. The ideal mounting height depends on the length of the drill bit and the cutting length of the router bit. Select a mounting height that will place the end of the drill bit in a location where the drill bit will not drag on the material when the drill is retracted and the router bit is at full cutting depth. The diagram on the next page shows an ideal mounting height. Use a square to make sure the drill assembly is perpendicular to the machine bed.

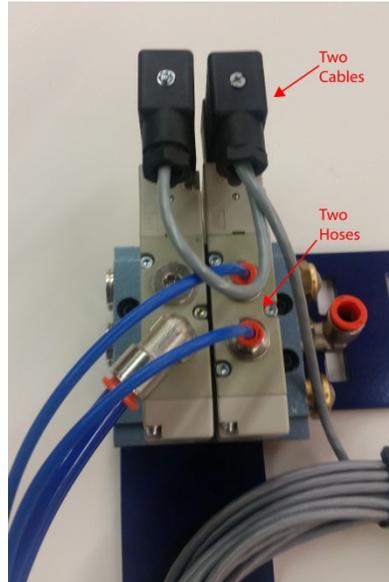
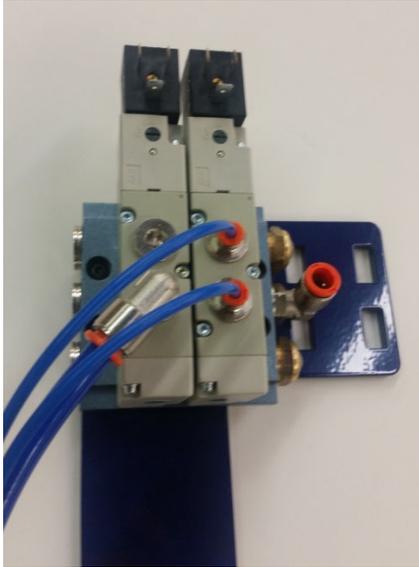


Example of an ideal drill mounting height:



## Connecting the Wiring Harness

Connect the wiring harness to the solenoid switches by pressing it into place. Then use a #2 phillips head screwdriver to tighten the connector in place. The wiring harness has two black connectors; one of the connectors has two cables coming out of it. The one with two cables is connected to the solenoid that has two of the small blue hoses.



Disconnect the main blue 3/8" air hose going to the pneumatic assist regulator by pressing down on the orange plunger and pulling out the blue tubing. Insert the T connector supplied with the drill kit into the regulator then push to main air line into the open port on the T connector.

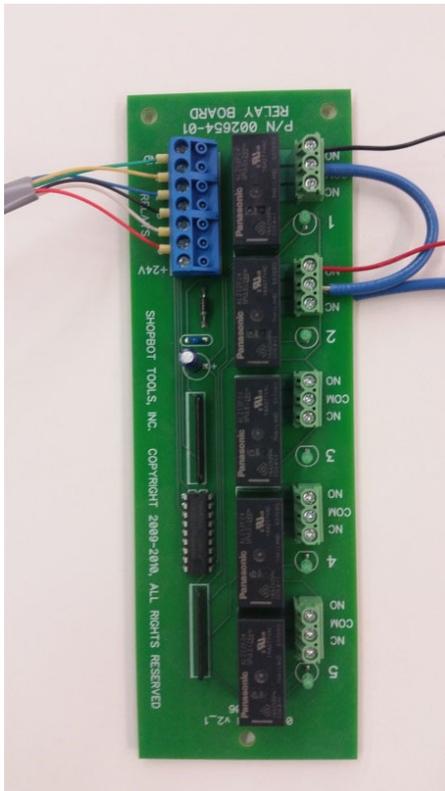


Route the cable of the wiring harness through the Y and X cable carriers and insert the cable through the cable gland on the side of the control box



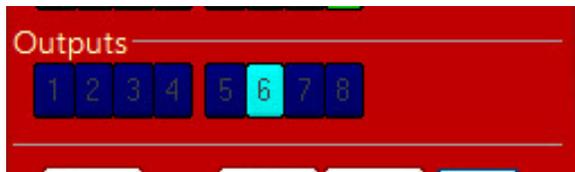
## Relay board connections

- The red wire controls the cylinder and is connected to the green terminal block labeled 2 NO.
- The black wire controls the on/off of the drill and is connected to the green terminal block labeled 1 NO.
- The center screw labeled COM for both number 1 and 2 needs to be connected to positive terminal on the blue 24v power supply, this is the bigger of the blue power supplies in the box, as shown in the picture below.
- The green wire from the drill cable needs to be connected to the negative terminal on the blue 24v power supply



## Testing the air drill(s) through the software

Now that the air drill can be switched on and off manually, the air drill(s) activation through the software should be checked. Make sure that there is no drill bit in the air drill and that the chuck of the drill is greater than 4" above the machine bed. Especially make sure that all hands and other items are out of the area directly beneath the air drill.



Power-up the control box and the SB control software. Once the SB control software is open click on the output button for the appropriate air drill.

- Air drill #1's cylinder will be activated with output #5
- Air drill #1's drill will be activated with output #6
- Air drill #2's cylinder will be activated with output #7
- Air drill #2's drill will be activated with output #8.

With output switch #5 activated on (lit up) the KeyPad, air drill #1 should cycle on and plunge to full depth and stay there until output #5 is turned off (unlit). All other outputs should respond accordingly. Ensure all air drills and cylinders are working correctly before continuing.

**Tip: ALT + (Output #) will toggle the selected output on/off.**

## Finding the XY offset between air drill(s) and spindle(s)

In the ShopBot control software version 3.5.4 or higher, use the "Tools" > "ShopBot setup" (TS) command to setup home position, Z-zero plate thickness, and offsets between multiple spindles and air drills. The software provides prompts for what to do throughout the program.

For more information, refer to the "Finding offsets for multiple spindle / air drills" document.

## Zeroing the air drill(s) in the Z or A axis

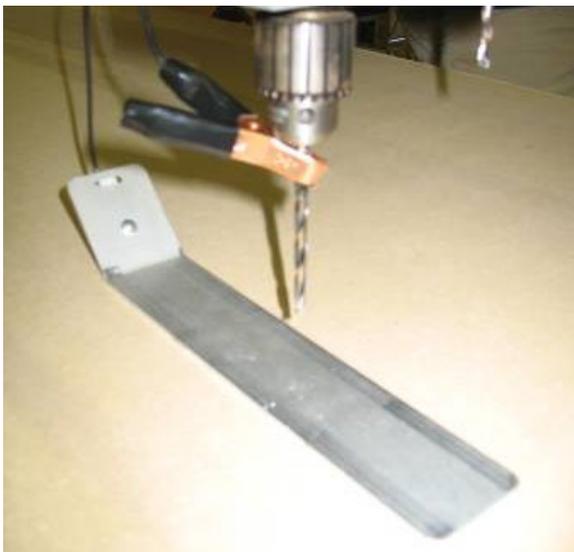
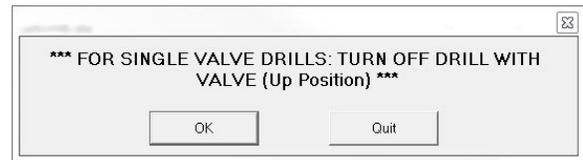
**Caution:** The air drill Z height location references the location of the bit zeroed in the spindle. The spindle bit(s) must be zeroed before the bit in the air drill(s) are zeroed out.

First zero the Z (and A axis) spindle(s) with Zzero.sbp (C2) (or Azero.sbp) to find the location of the router bit. Open the file Drill Offset.sbp to zero the bit in the air drill(s).

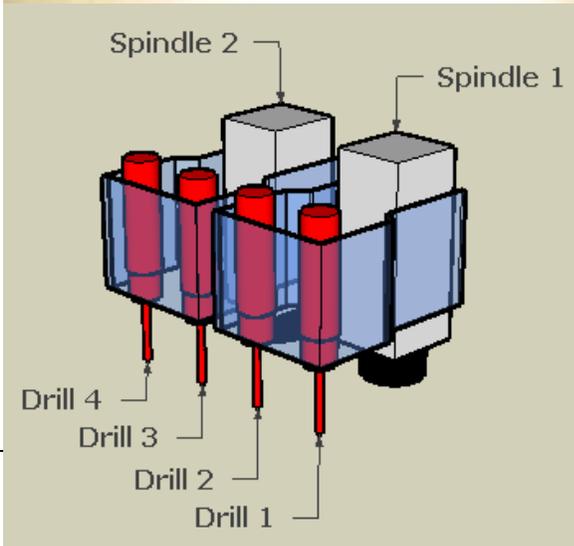
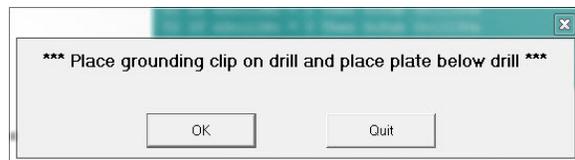
**\*\*\* Warning \*\*\* Warning \*\*\* Warning \*\*\* Warning \*\*\* Warning \*\*\***

**Pay close attention to the following instructions. Failure to do so may cause bodily harm.**

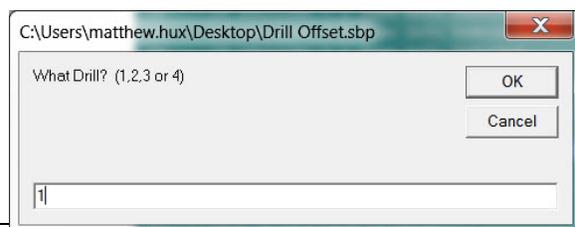
The first prompt is for older model air drills that only had a single valve that turned on the drill and plunged in a single motion. For a double valve drill (which is what this document covers) you can disregard this message and click OK. The file will raise the designated Z (or A) axis up to 6" then activates the drill's cylinder to plunge to full depth. Make sure that all hands and other items are out of the area directly beneath the air drill.



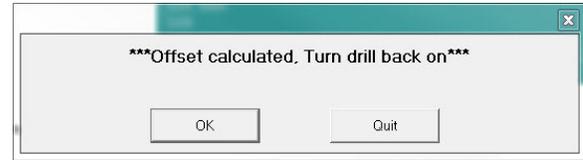
Place grounding clip on the drill bit and place the Z-zero plate below the bit. Click OK.



Type in drill position 1-4 for which drill location is needed to be zeroed. Click OK. The Z (or A) axis will move down until contact is made with the plate then move up a little, move back into the plate at a slower speed, then retract.



The final message is again for single valve drills and can be ignored on this model. Press "OK" to continue.



#### FAQ:

Q: When should I re-zero the drills?

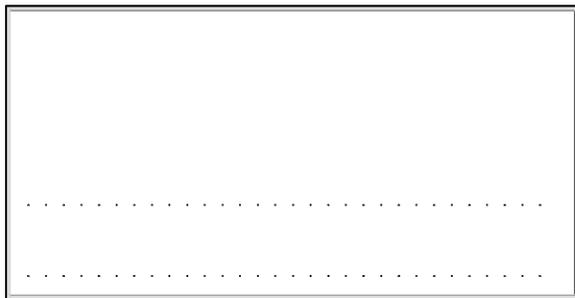
A: If a drill bit breaks, slips, or is replaced.

Q: Is it necessary to re-zero the drills if the router bit breaks?

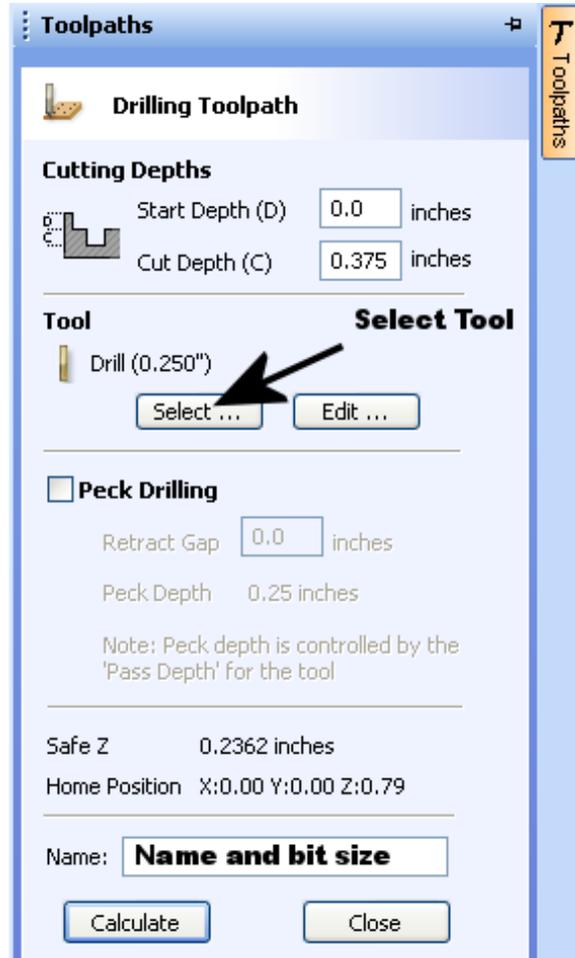
A: **Yes!** Replace the router bit and zero this bit using the Zzero (or Azero) routine. Z (A) height offsets will need to be reassigned with the Drill Offset.sbp file.

## Creating a file using the air drill(s)

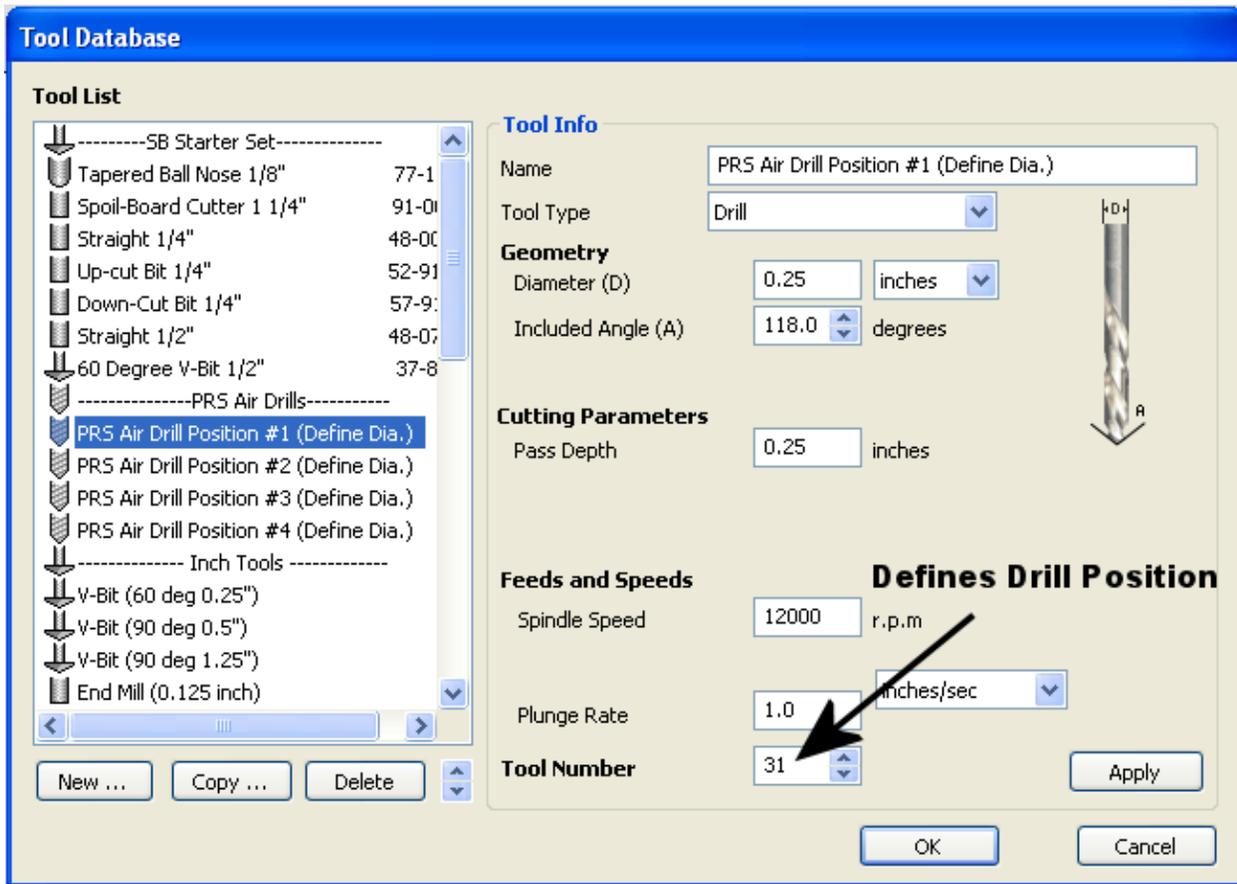
The following instructions have screen shots taken from VCarve Pro. In any software that outputs tool paths with the PRS air drill post, the setup is essentially the same. A tool must be selected from the tool database that can be recognized by air drill software. This tool will be used to generate toolpaths in the same way the software would normally process a drilling operation, however, the tool number will dictate which air drill will do the drilling.



Draw or layout what needs to be machined in VCarve Pro or your preferred software. If additional help is needed, see the documentation for that software. In this example image, holes are being made for shelf pins.



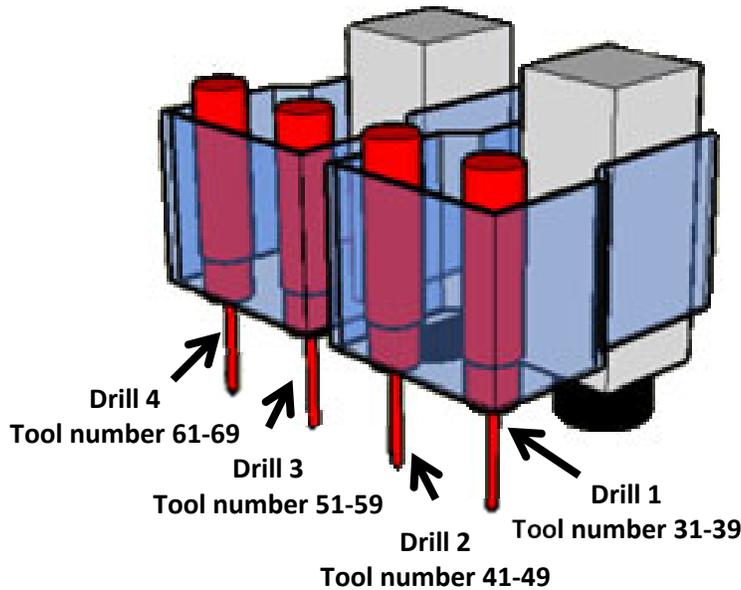
When the toolpath is ready to be created, select the holes to be drilled and open the drilling toolpath tab. Set the cutting parameters of “Start Depth” (top of material to be drilled) and “Cut Depth” (the depth of the hole to be created) then select the tool to be used.



In VCarve Pro ShopBot Edition the tool database will have PRS air drill templates already defined. The templates are named “PRS Air Drill Position #[1-4] (Define Dia.)”. These templates all have a default diameter of .25” as the geometry of the tool. The most critical portion of any of these templates is the tool number located at the bottom of the window. This information identifies what drill position the bit is in. The default drill setup assumes there is only one drill and allows for up to 9 different tool profiles for the drill to be saved. When adding a secondary drill, make sure that the tool number matches up with the range of values assigned to that drill. These tool number ranges are listed in the following table.

Drill	Tool number range
#1	31-39
#2	41-49
#3	51-59
#4	61-69

**Note:** Most other software packages that have posts for ShopBot will have the ability to define a tool number.

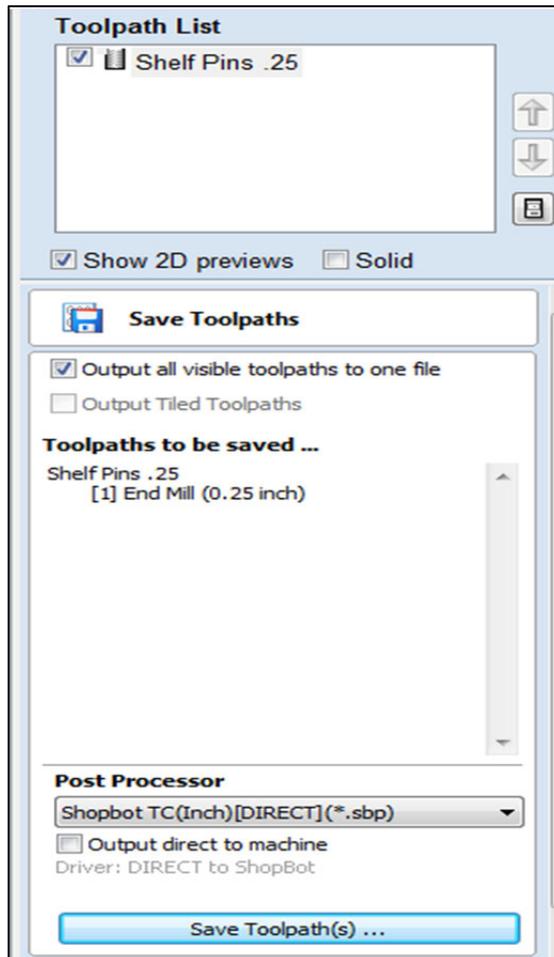


Copy the template of a drill position while that position is highlighted using the copy button at the bottom of the screen. Select the new copy and change the “(Define Dia.)” in the name to the proper size for the tool. Enter in new geometry info, angles, feeds and speeds, and any other info that would be needed then click “Apply” to save the tool.

**Tool Database**

Tool List		Tool Info	
-----SB Starter Set-----		Name	PRS Air Drill Position #1 (5MM)
Tapered Ball Nose 1/8"	77-1	Tool Type	Drill
Spoil-Board Cutter 1 1/4"	91-01	<b>Geometry</b>	
Straight 1/4"	48-00	Diameter (D)	5.0 mm
Up-cut Bit 1/4"	52-91	Included Angle (A)	118.0 degrees
Down-Cut Bit 1/4"	57-91	<b>Cutting Parameters</b>	
Straight 1/2"	48-07	Pass Depth	0.25 mm
60 Degree V-Bit 1/2"	37-8	<b>Feeds and Speeds</b>	
----- PRS Air Drills -----		Spindle Speed	12000 r.p.m
PRS Air Drill Position #1 (Define Dia.)		Plunge Rate	1.0 inches/sec
PRS Air Drill Position #1 (.25)		Tool Number	31
PRS Air Drill Position #1 (5MM)			
PRS Air Drill Position #2 (Define Dia.)			
PRS Air Drill Position #3 (Define Dia.)			
PRS Air Drill Position #4 (Define Dia.)			
----- Inch Tools -----			
V-Bit (60 deg 0.25")			
V-Bit (90 deg 0.5")			

**Copy to create multiple tools for a desired drill position**



Once a PRS air drill tool has been selected, calculate the tool path. When all toolpaths have been calculated, order them (top to bottom) in the order that they need to cut, then save all toolpaths by outputting the code with either posts: Shopbot TC (Inch)(\*.sbp) and Shopbot TC (MM)(\*.sbp).

The posts: Shopbot TC (Inch)(\*.sbp) and Shopbot TC (MM)(\*.sbp), will recognize all spindle and drill positions based on the tool number designated within the design software.