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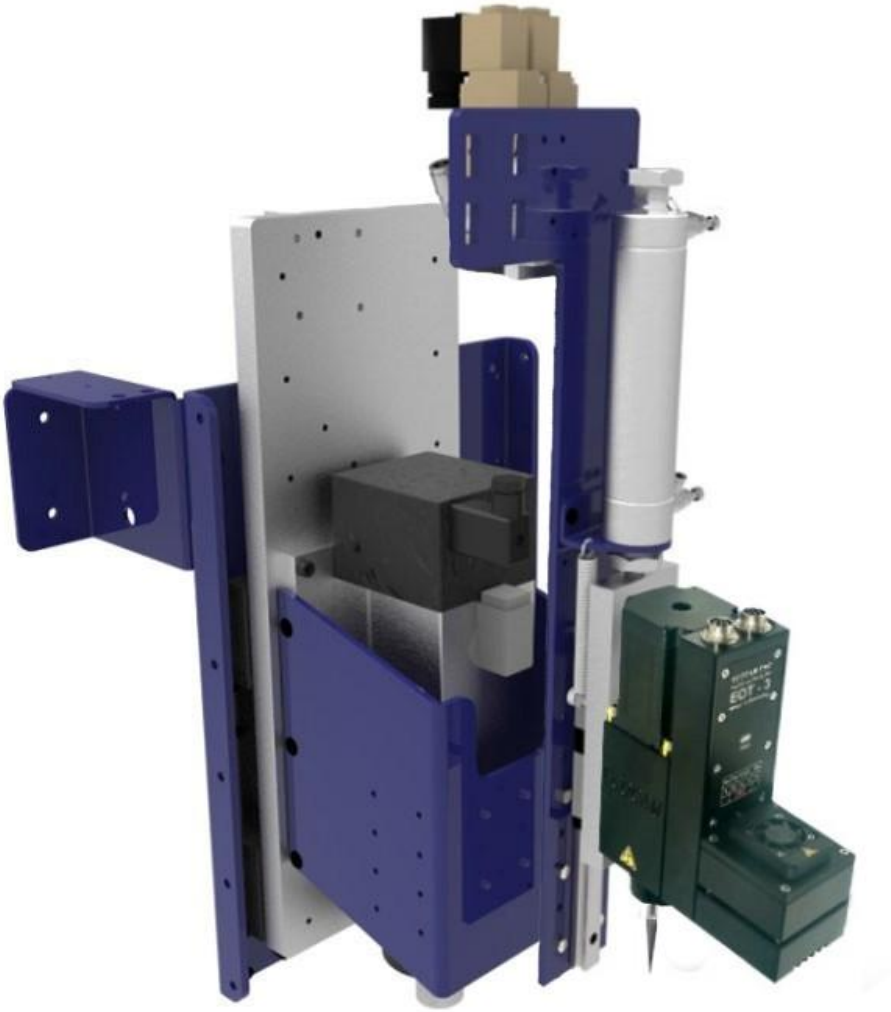
Tangential Knife Installation

For PRSalpha Gantry and Buddy Tools



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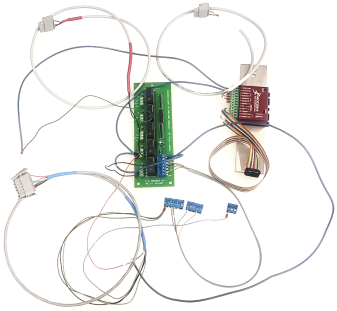
What's in the Box

Knife Assembly

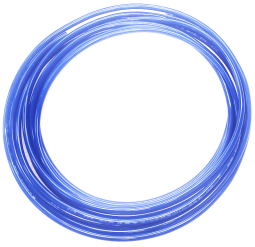
Solenoid Cable (with Red Heat Shrink)

Gray Cable (with Blue Heat Shrink)

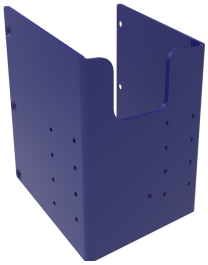
Gray Cable (with White Heat Shrink)



Pre-wired board and drive



⅜ Blue Air Hose



Drill Cage (Or other mounting hardware)

USB Flash Drive

Note: Most of the wiring has been done for the relay board and driver. If you are adding the knife to a tool you already own, there will be a few steps for you to do to add the components to your control box. If you purchased the knife with the tool, these components are already installed in your control box (see next page).

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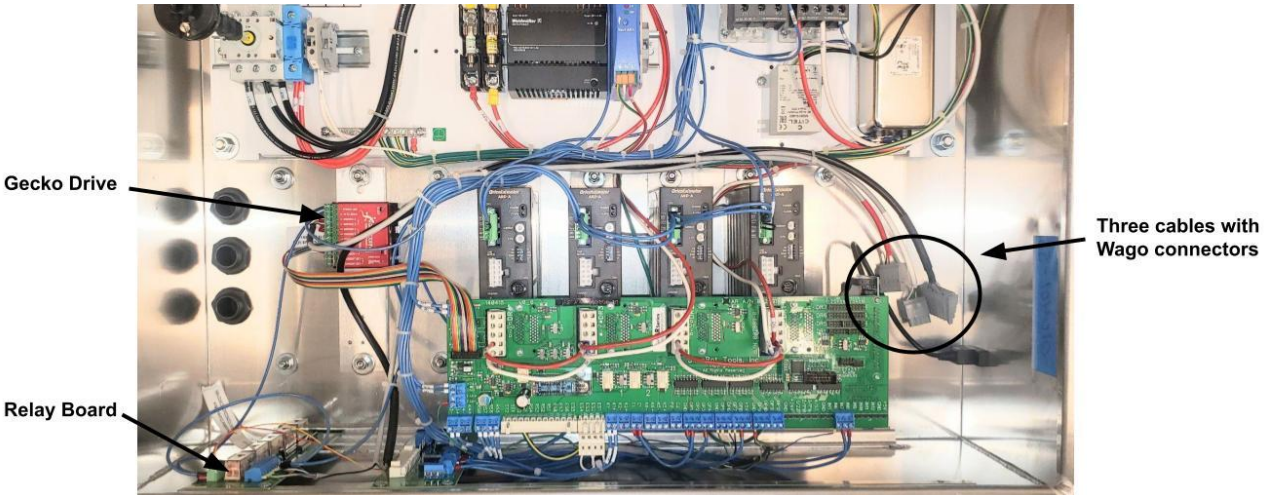
Note: Some components will already be installed in the control box if you purchased the knife at the same time you purchased the machine.



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Mounting the Tangential Knife

Note: If you are adding the knife to an already existing tool, then install the pneumatic assist (PRS4 only) for the Z plate *before* installing the Tangential Knife. If you purchased the knife along with your tool, then complete the spindle and pneumatic assist assembly before starting work on the knife. Refer to the Pneumatic Assist Install document.

If you purchased the tangential knife along with your new tool, then some of the cables will already be installed in the Y e-chain, and some of the wiring will already be done. There will be a few steps you can skip, and these will be noted in the instructions. If you are adding the knife to an already existing tool, then you will need to pay attention to which model you have. The newest model, PRS4, came into production on 6/15/2017. If your tool is older than that, some of the steps will be different. These will be noted in the instructions.

Important:

There are 3 ways to mount the knife: A non-ATC tool, an ATC tool with an 8” Z, and an ATC tool with an extended Z (14 and 26”). The following pages show how to mount the knife, please note which mounting instructions match your tool.
When you are finished mounting the knife, you can jump ahead to the **Attaching the Hoses for the Pneumatics** section to continue with the install.

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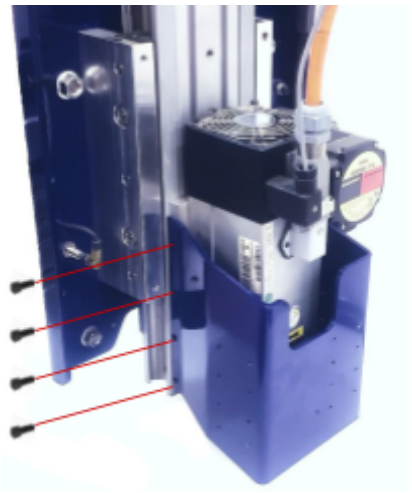
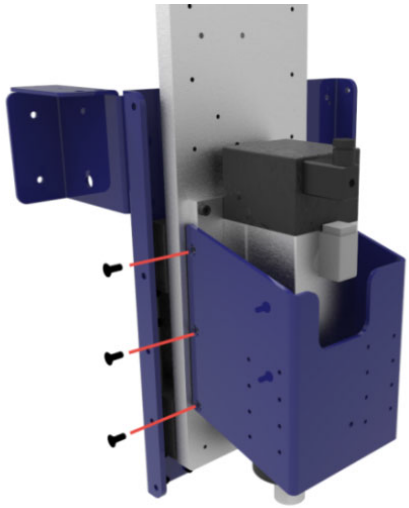
Non-ATC Tools

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

- For PRS4 tools: a total of 6 M6 x 14mm FHSCS. 3 on each side. x6
- For PRS3 and older tools: a total of 8 ¼-20 x 5/8” SHCS. 4 on each side. x8

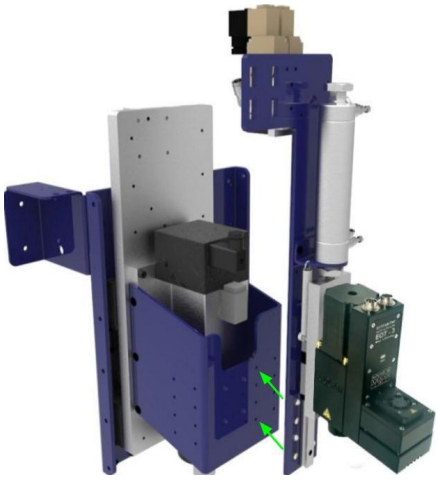


PRS 3



PRS4

Attach the knife assembly to the face of the drill cage using four M5 x 12mm HCS, two on each side. You can temporarily remove the spring from the shoulder bolt to make it easier to access the holes for the bolts if needed.



(4) M5 x 12 HCS

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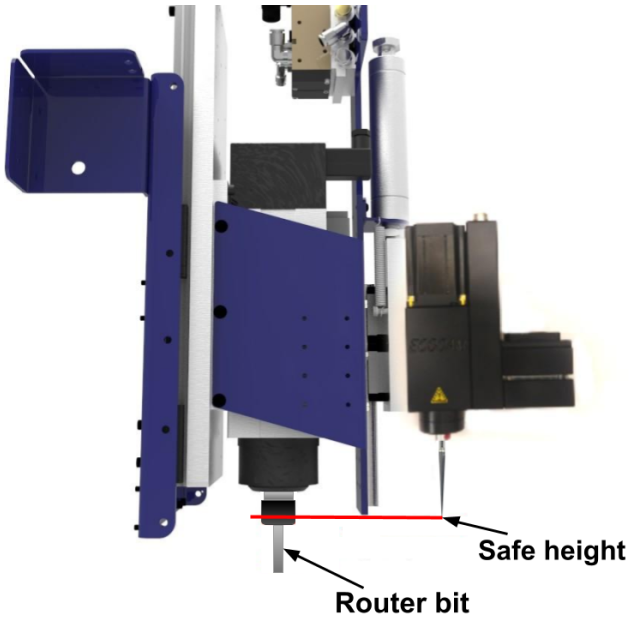
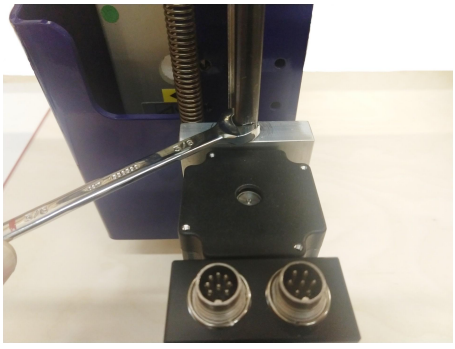
There are a few mounting heights that can be selected. The ideal mounting height depends on the length of the knife blade and the cutting length of the router bit. Select a mounting height that will place the end of the blade in a location where it will not drag on the material when it is retracted and the router bit is at full cutting depth, and allows it to reach the material when fully extended.

Example of an ideal mounting height for the knife assembly:



Because of space constraints the most effective tool is an 8mm open ended wrench for tightening the four M5 bolts.



To access all the holes with the M5 bolts, it may be necessary to loosen the threaded rod coming from the air cylinder and going into the aluminum mounting plate using a ⅜” open ended wrench. This will lower the aluminum plate so you can get the bolts in place.

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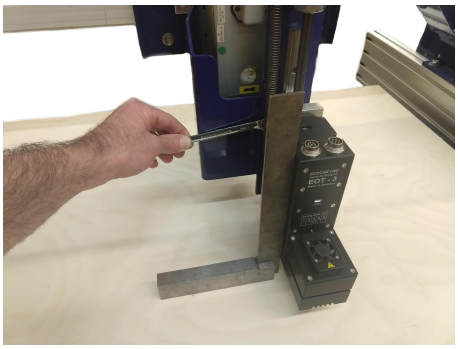
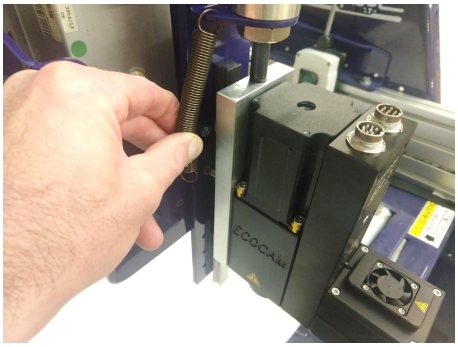


Using a machinist square, square the tangential knife to the table surface while tightening the bolts to the mounting plate. To get the most accurate results, make sure the table has recently been surfaced.



Reattach the spring after you are finished tightening all eight bolts for the mounting assembly, and make sure the threaded rod coming from the air cylinder is retightened.

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ATC Tool with an Extended Z (14 and 26”)

If you have an ATC tool, then you will mount the knife to the side of the spindle (as seen below) using a mounting plate and spacer plate. The following instructions explain how to mount the knife on a tool that has an **ATC with a 14 or 26” Z**.

Note: It is important to remember that because the knife is mounted on the side of the spindle, you will lose roughly 8 inches (200mm) of travel in the Y direction.

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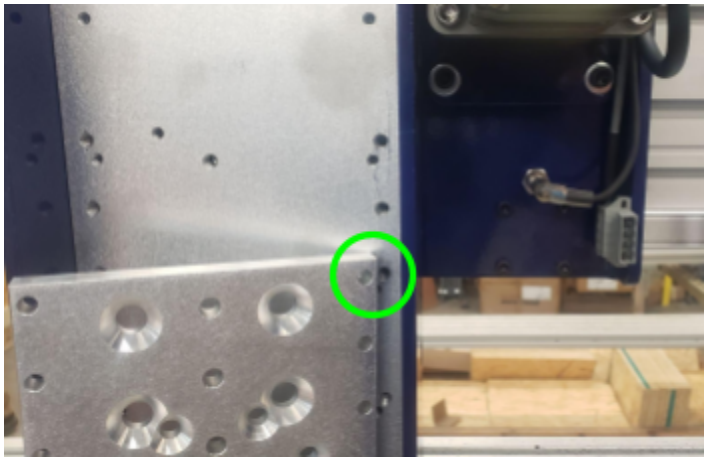
Locate and remove the bottom four flat head bolts that are on the left side of the Z plate.



Note: If you have not already done so, mount and square the spindle before doing this step.

When mounting the spindle, line up the top hole in the spindle plate with the third hole from the top in the Z plate.

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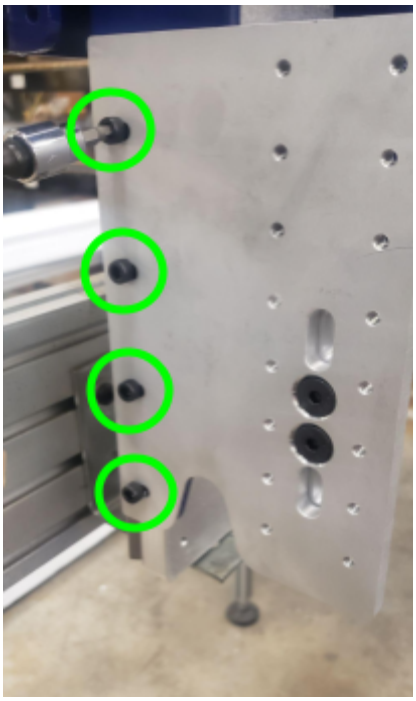
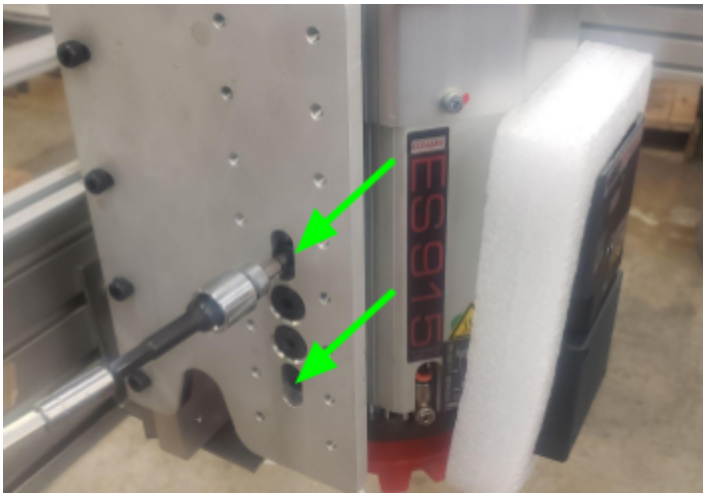


Using four M6 bolts that came with the knife, loosely mount the adapter plate to the side of the Z plate in the holes that you removed the flat head screws from.



Using the other two M6 bolts that came with the knife, loosely attach the adapter plate to the two threaded holes in the side of the spindle. You may need to loosen the two flat head bolts used for the small space plate to get the holes to align. Make sure to retighten these once you are done.

Using a square, square up the adapter plate to the table. Tighten down all 6 bolts.

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Using the four M5 HCS that were included with the hardware, mount the knife assembly to the side of the mounting adapter plate. Use the top holes and bottom holes. You will need to move the knife up and down to have full access to the holes to be able to insert the bolts and tighten them.

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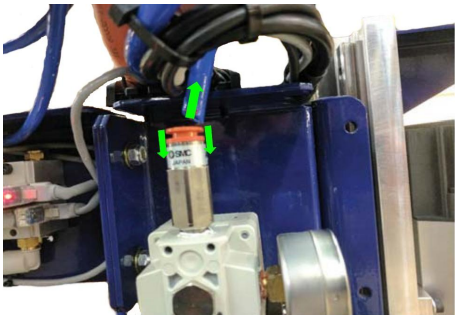
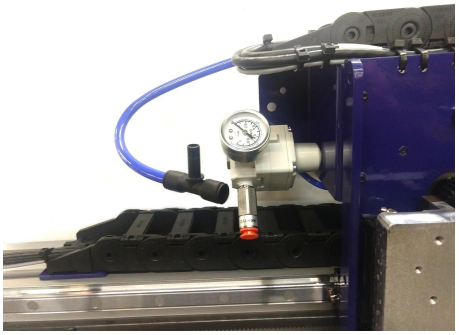
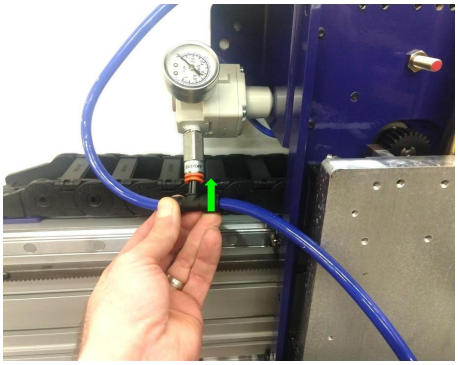
Attaching the Hoses for the Pneumatics



Remove the blue air tube from the precision regulator if it is installed, and install it into the T connector that was provided with the knife kit. Make sure the tube is pressed firmly into the connector.





Connect the ⅜” blue hose that came with the tangential knife to the other end of the T connector, then insert the T connector into the precision regulator. Make sure the T connector is pressed in all the way. You may need to trim the hose coming out of the knife if it is too long.

Note: If you purchased the knife with the tool, then the T connector should already be in place. If your tool is an ATC, then you will have two tees.

Connecting the Cables

Note: If you purchased the knife at the same time as the tool, some of these cables may already be installed in the Y e-chain.

Locate the two connector ports on the front of the knife. Plug the connector with the white heat shrink into the port on the left, and the one with blue heat shrink to the one on the right.

Note: Be careful when plugging in the connectors. Make sure the slots in the connectors align with the notch in the port.

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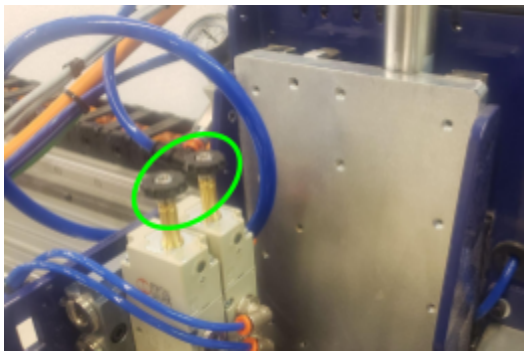
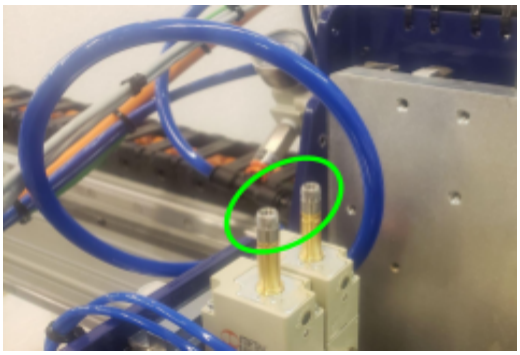
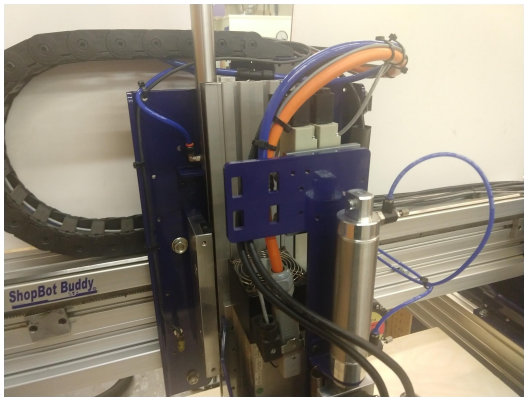


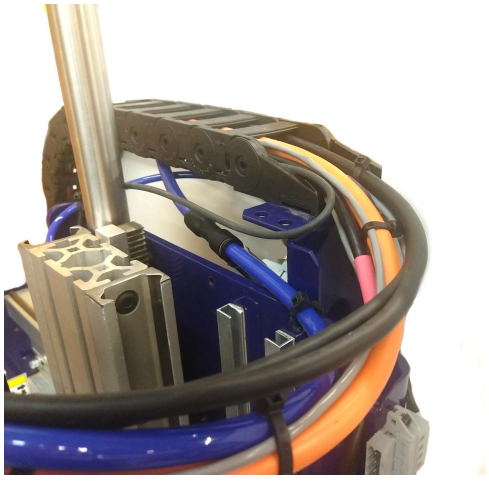
Locate the two stems coming out of the solenoids. Remove the round threaded caps from both of the stems.



Connect the solenoid cables by sliding both connectors onto the stems. The black connector with the single gray cable slides onto the stem that corresponds with the two blue air hoses. The black connector with two gray cables slides onto the stem that corresponds with two silver plugs. Place the connectors on so that the gray cables are facing down. Secure in place by replacing the round threaded caps you removed in the previous step.



Secure all the cables and hoses using zip ties.



Run the three cables and blue hose into the Y and X e-chains. The three gray cables go to the control box, and the blue hose goes to the manifold.
See Pneumatic Assist Doc for connecting the blue hose to the manifold.

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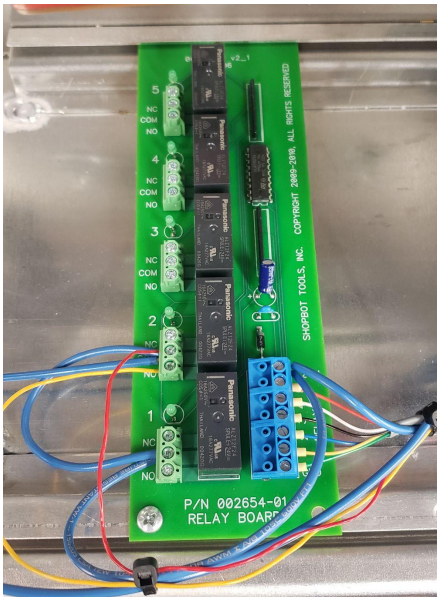
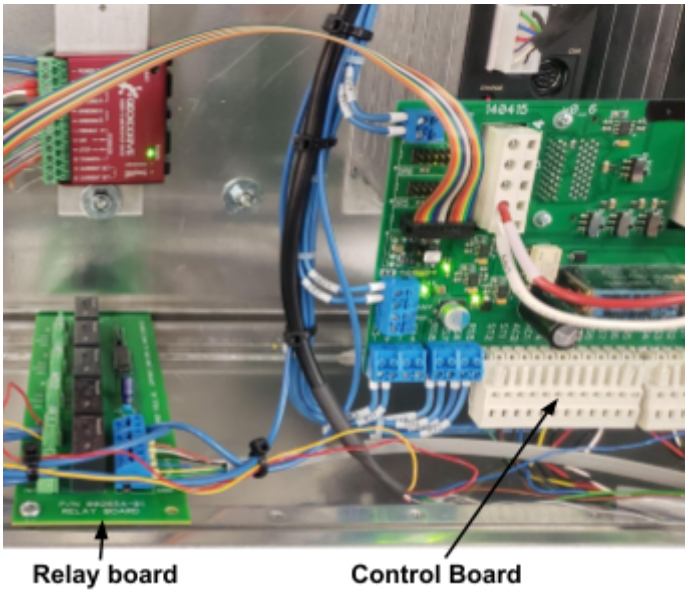
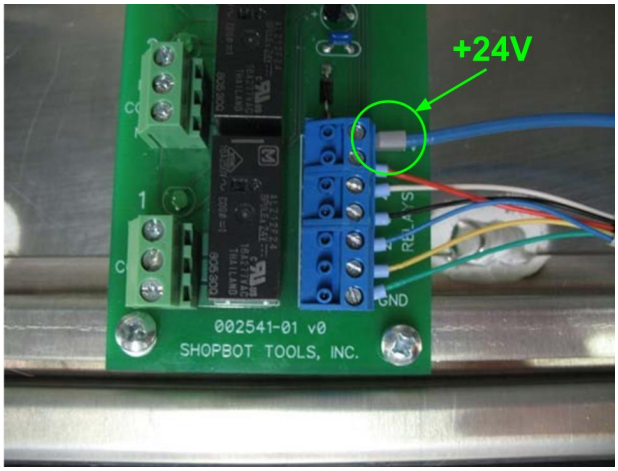
Installing the Relay Board

Note: If you purchased the knife at the same time as the tool, you can skip these steps. Jump to “Connecting Cables in the Control Box”

First, mount the relay board in the control box by sliding it into the notch in the back of the control box, then screwing the front edge of the relay board to the front lip of the control box. The relay board mounts just to the left of the control board.







Locate the blue cable coming out of the +24V terminal on the relay board. The other end of this cable must be connected to a +24V terminal in the power supply, shown in the next step.

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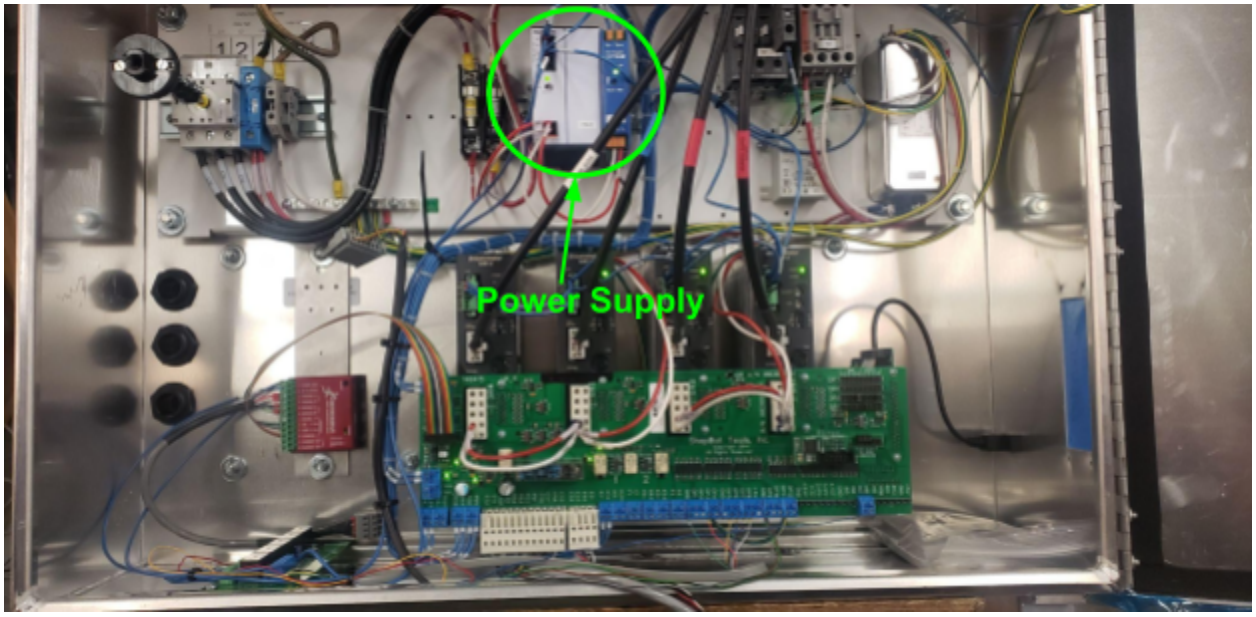
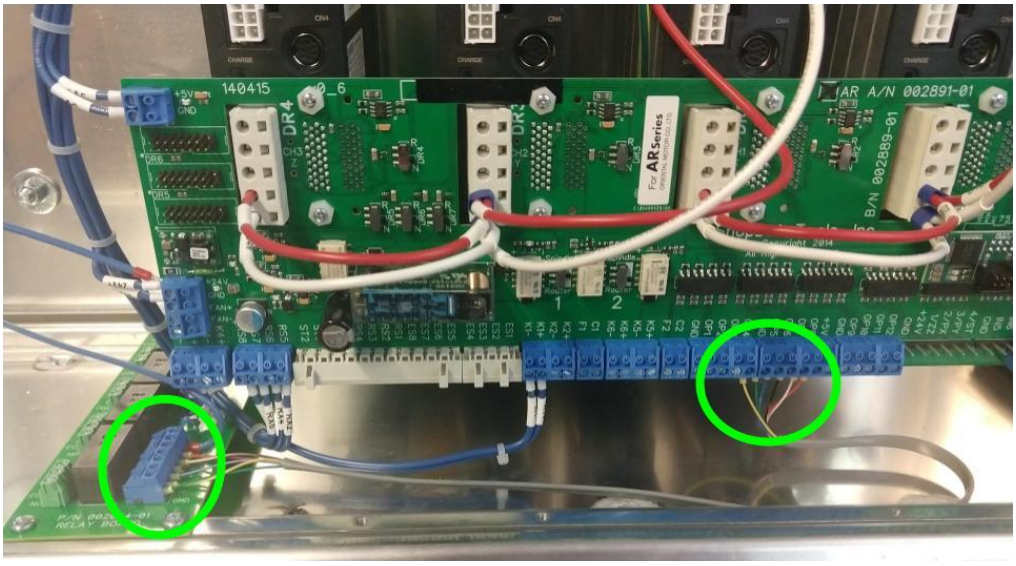


Press the ferrule at the end of the blue wire into one of the **+24V** slots in the power supply. The slot may also simply be labeled with a "**+**" symbol. Your power supply may look different than the one pictured here. You may also need to remove the ferrule at the end of the blue cable and splice the cable in with another cable that is going into one of the +24V slots.

Locate the gray cable that is wired into the blue terminal on the relay board. This has multiple wires that connect to different outputs on the control board.



See next step for which outputs to connect the wires to.

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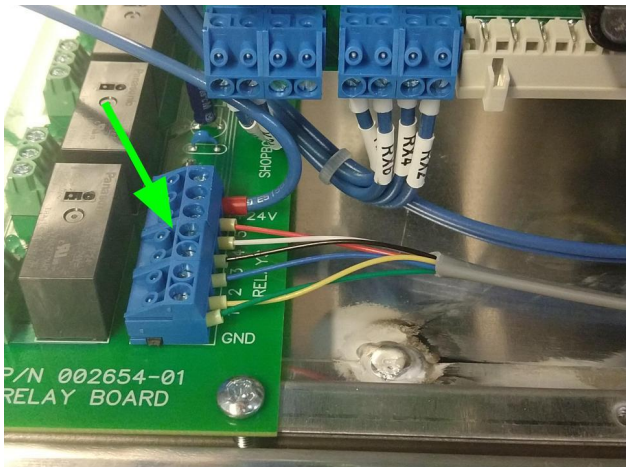
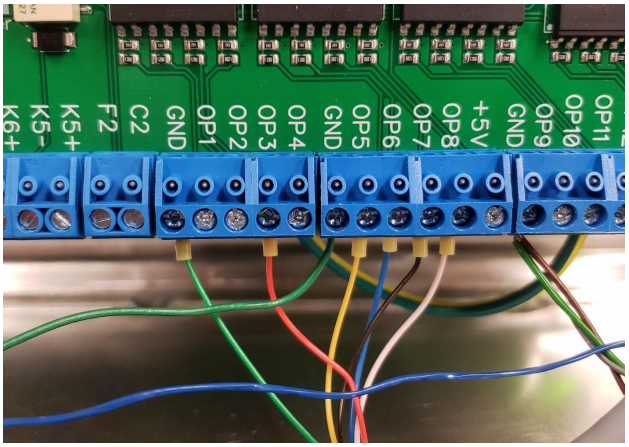


Relay Board:

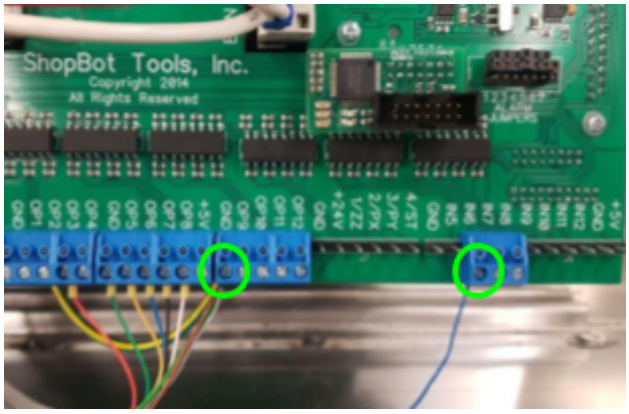
The gray cable with multiple wires is already connected.



Control Board:

Connect the wires as follows:

Red→OP3
Yellow→OP5
Blue→OP6
Black→OP7
White→OP8
Green→GND



Next, locate the green, brown and black wires that are joined together with a ferrule. Plug these into a ground terminal on the control board. Then locate the blue wire coming from the same cable, and plug it into the terminal marked **IN6** on the control board.

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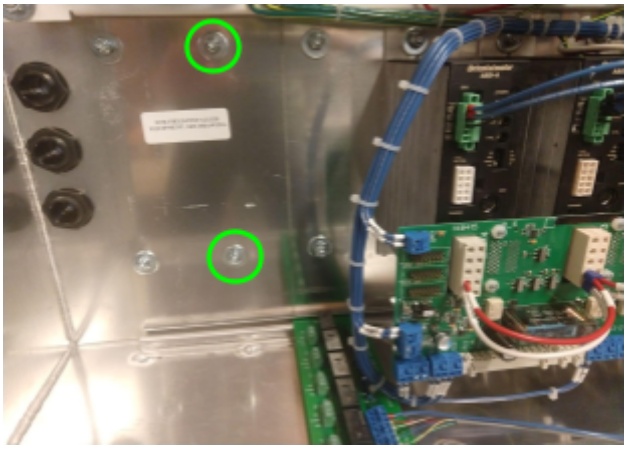
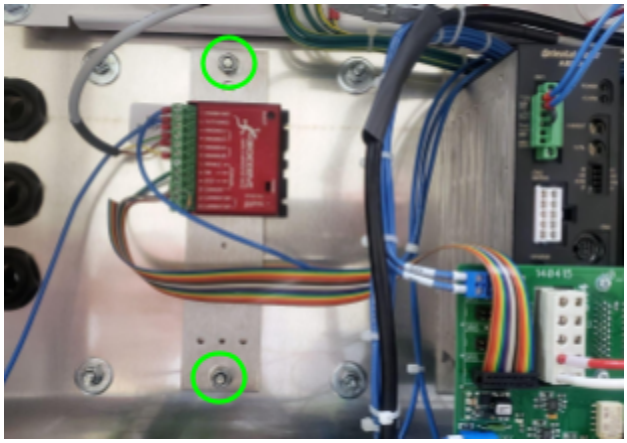
Mounting and Connecting the Driver

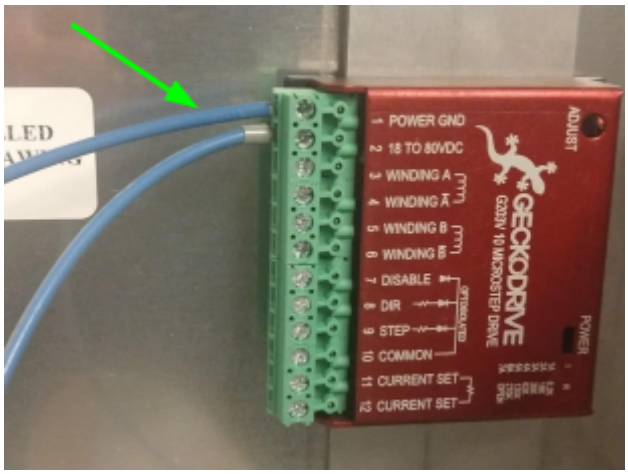
Note: The driver will already be installed if you purchased the knife with the tool.



Locate the two threaded studs on the inside back of the control box. Remove the ¼” nuts and washers from the bolts



Align the two holes in the mounting plate with the two bolts. Make sure the green terminal block on the driver is on the left side. Place the two washers and nuts back on the two bolts, and tighten down completely.



Locate the two blue cables coming out of the driver. The bottom cable is already wired into the relay board. The top cable, coming out of the terminal marked **1 POWER GND,** needs to go to a ground terminal in the power supply.

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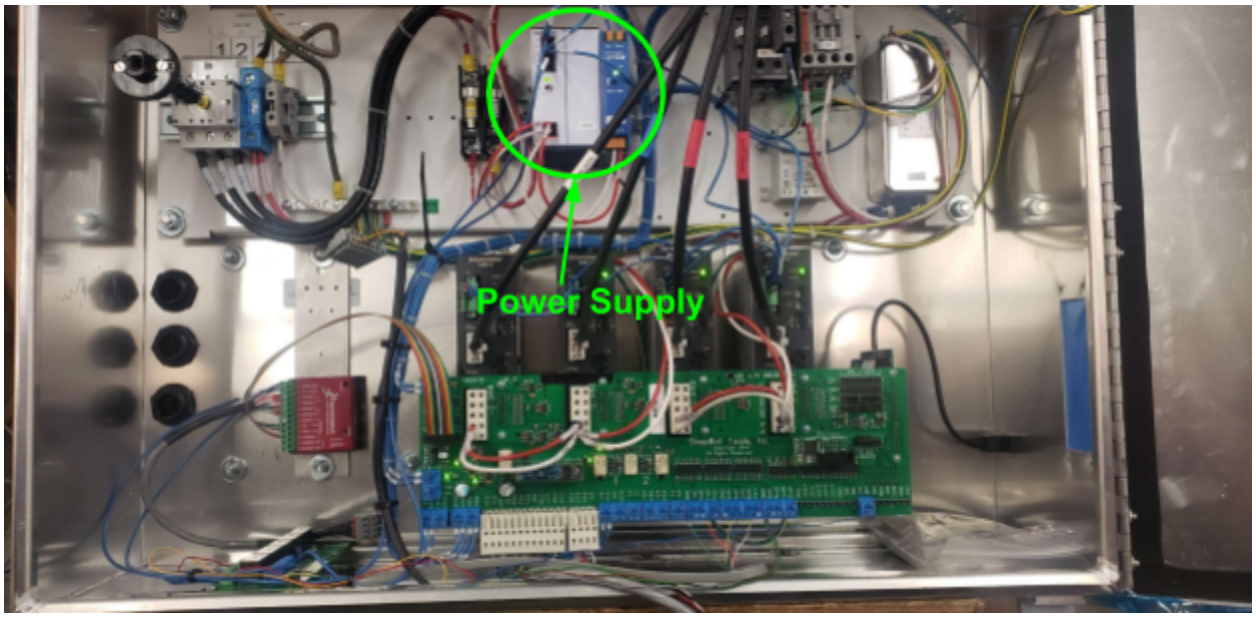
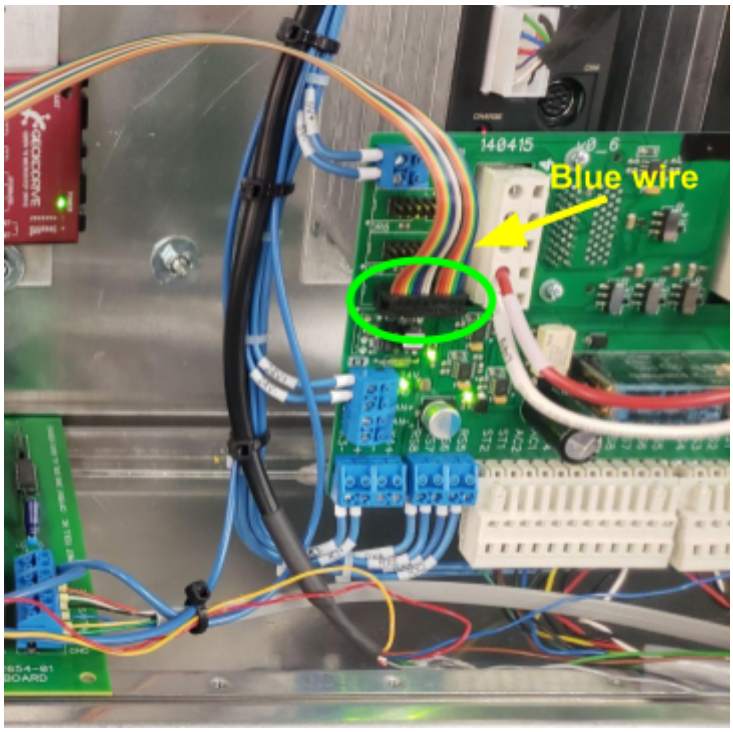


Press the ferrule at the end of the blue wire into one of the ground slots in the power supply. The slot may also simply be labeled with a “**-**” symbol.Your power supply may look different than the one pictured here. You may also need to remove the ferrule at the end of the blue cable and splice the cable in with another cable that is going into one of the ground slots.



Last, connect the multi-colored ribbon coming from the driver to the control board. There are three terminals on the left side of the control board, connect the ribbon cable to the one on the bottom. Make sure the blue wire in the ribbon cable is on the right when connecting it to the terminal.

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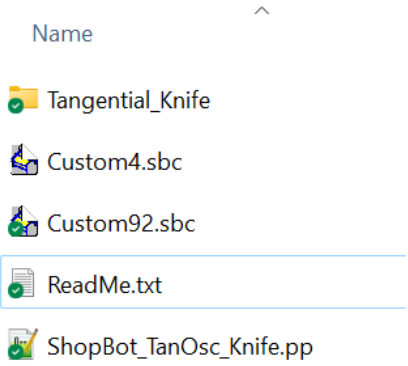
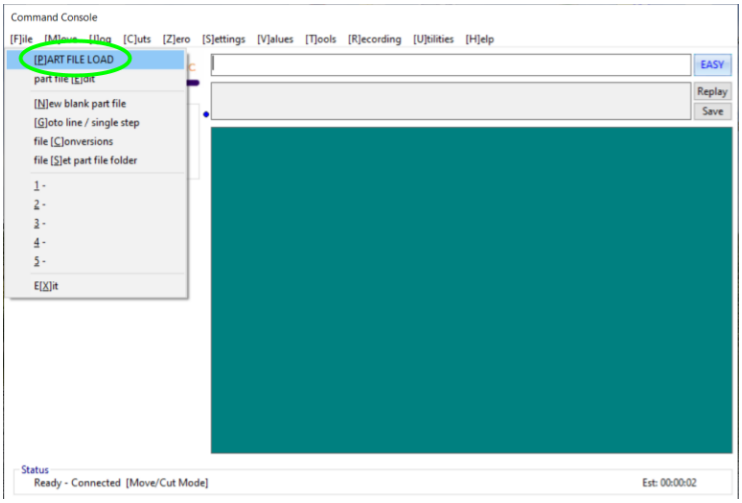
Testing the knife

At this point, your tangential knife should be fully installed and ready to operate. The next step will be to test the knife and make sure it is functioning properly. Once the electrical and air is fully installed on the tool, follow the next steps to test the knife.



A USB Flash Drive was included with your knife (you will find this in the green ShopBot Handbook if you purchased the knife with a ShopBot). Insert the USB drive into your PC and view its contents. The text file titled “ReadMe.txt” contains instructions on where to place the files included on the USB Drive. Please copy these files according to the instructions.



In the main prompt of SB3, hit “F” to open the file menu. Select “**[P]ART FILE LOAD**”

From there open the “**Custom**” folder and then “**Tangential_Knife**” folder. First run the file titled “**KnifeDefaults.sbp**” to load the default speed and unit values for the ECO-CAM EOT-3 knife. After loading default parameters, the different functions of the knife will automatically be tested.

Next run the file titled “**KnifeBOffsetRecording.sbp**” and follow the instructions displayed during the cut file.

Next, run the file titled “**KnifeXYOffsetRecording.sbp**”

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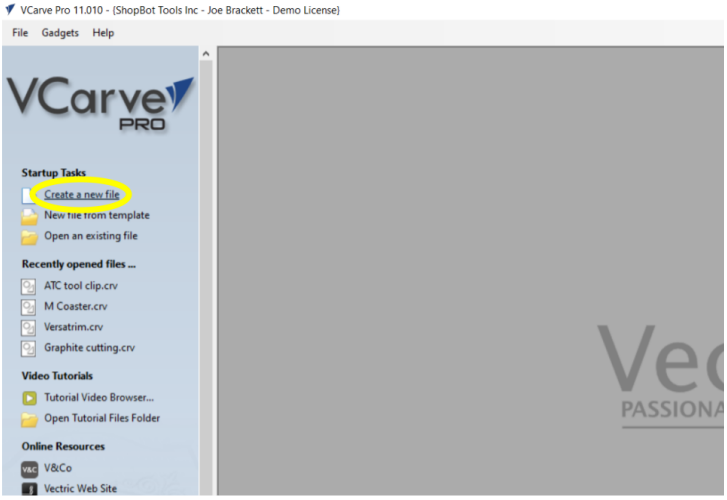
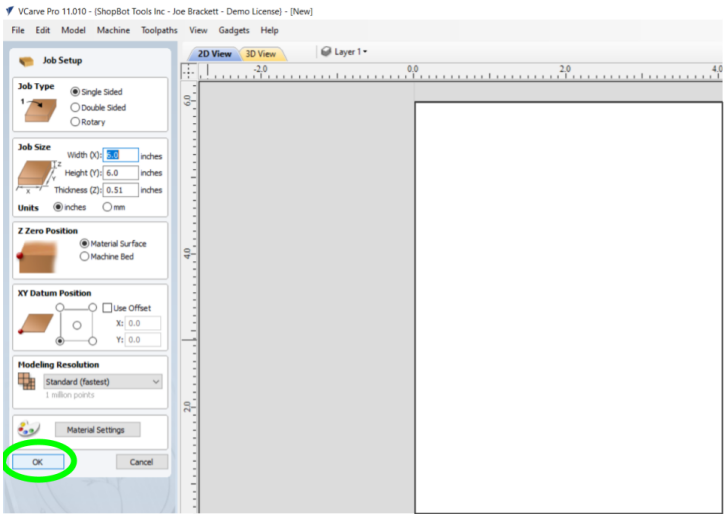
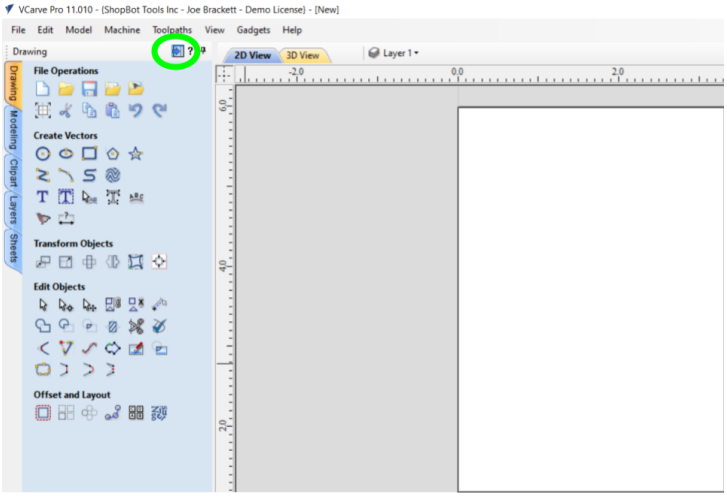
Loading the Post Processor into VCarve



Open VCarve, and select **Create a new file**



The Job Setup screen will open up, just click **OK**



Click on the icon.

This will switch to the toolpathing side of VCarve.

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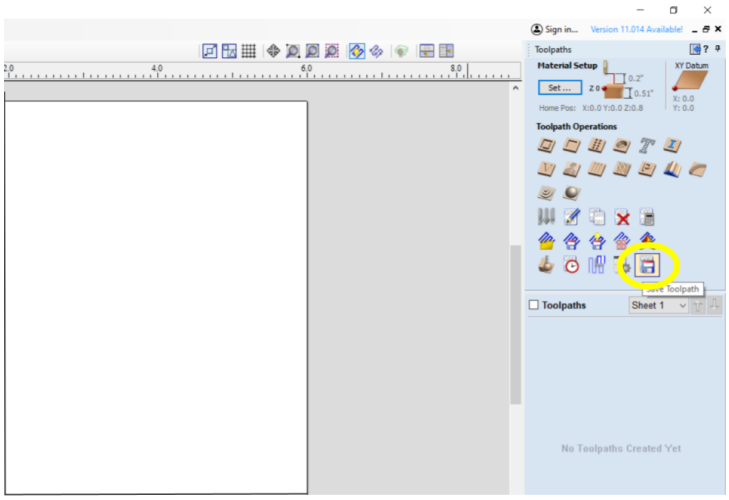
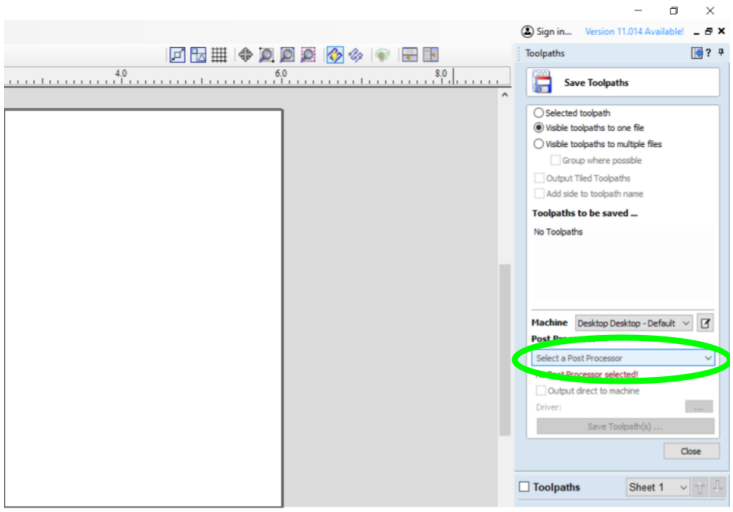
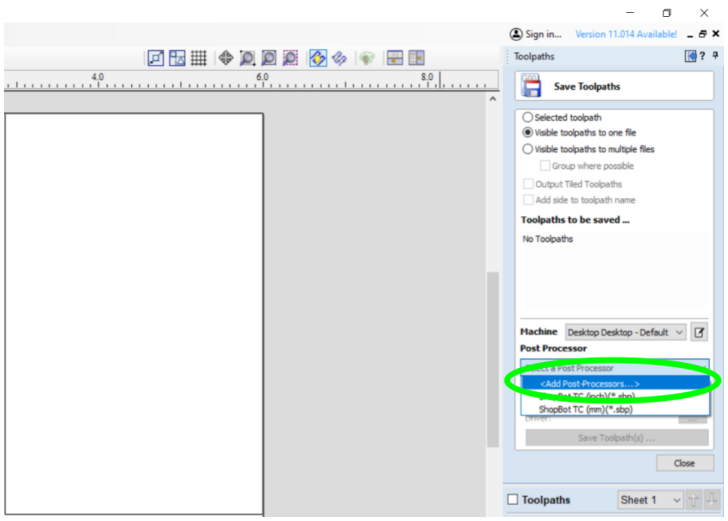


Click on the **Save Toolpath** icon.



Click on **Select a Post Processor**



Click on **<Add Post-Processors…>**

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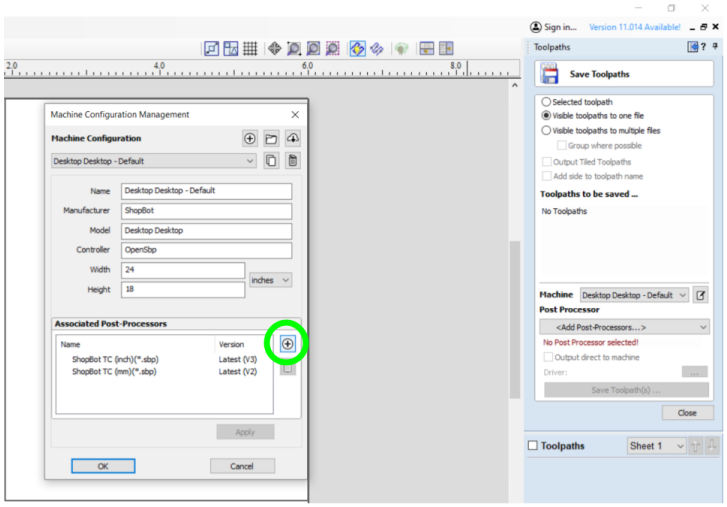
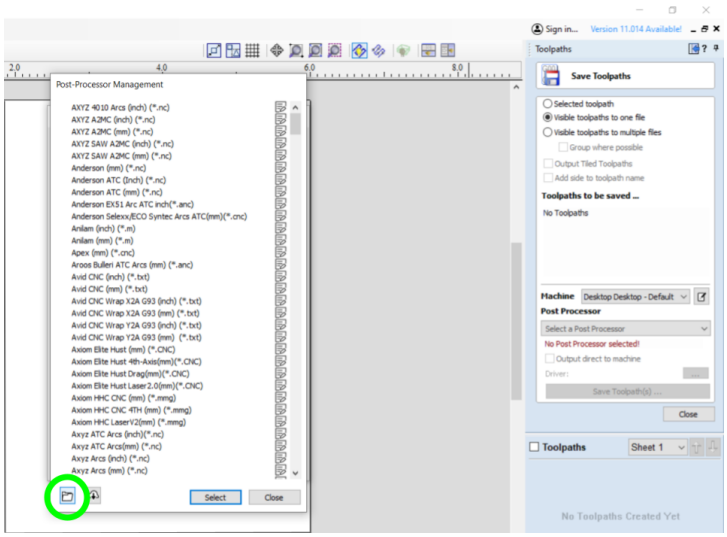


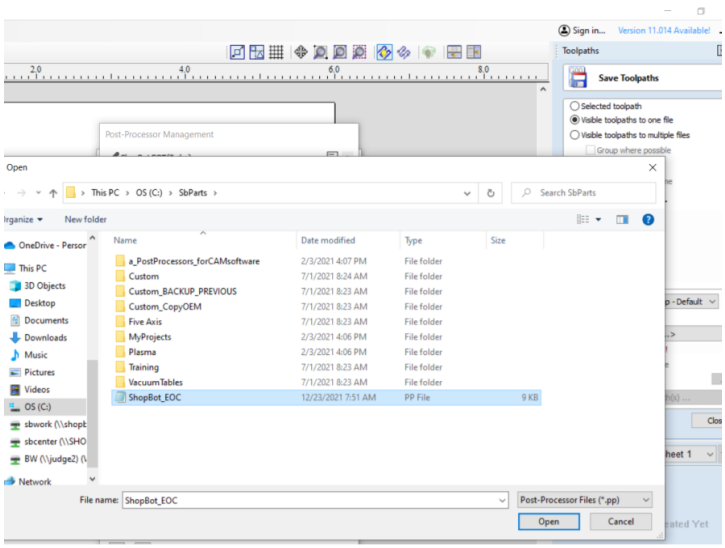
Click on the icon.

This will open a menu of all available post processors.



Click on the icon.

This will start a search for the file you want to download.



Locate the file **ShopBot_TanOsc_Knife.pp** on your USB Flash Drive and open it.

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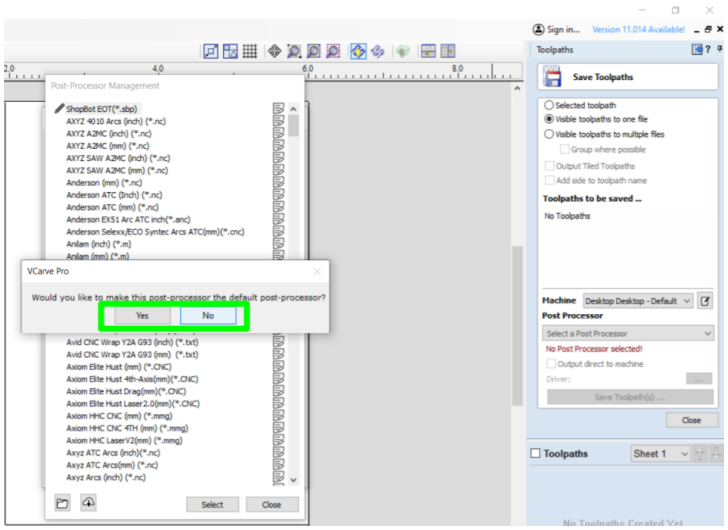
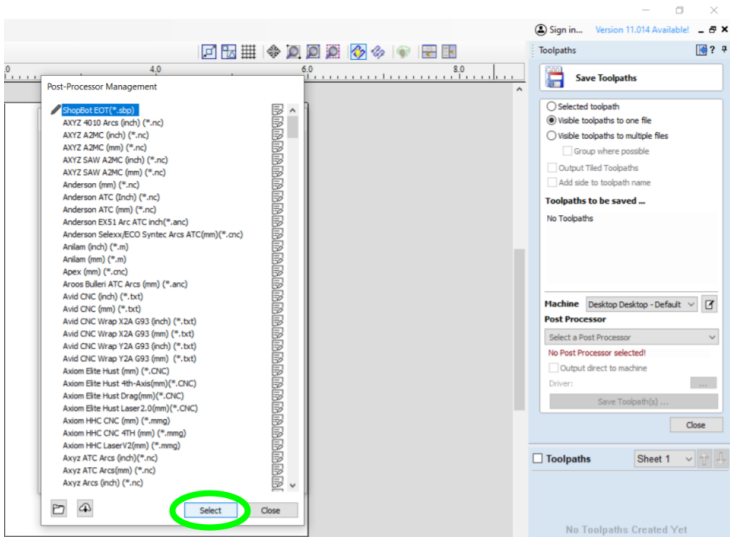
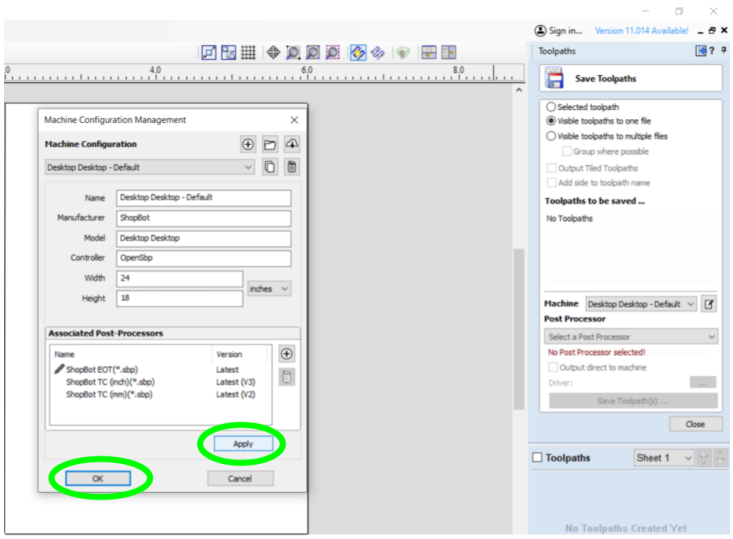


You'll get a message asking if you would like to make this post-processor the default. Either way is fine, you can always change the post later in VCarve during the process of saving a toolpath.



Find the **ShopBot Tan/Osc Knife** file in the list of post processors, click on it, then click on Select.



Click Apply, then OK.

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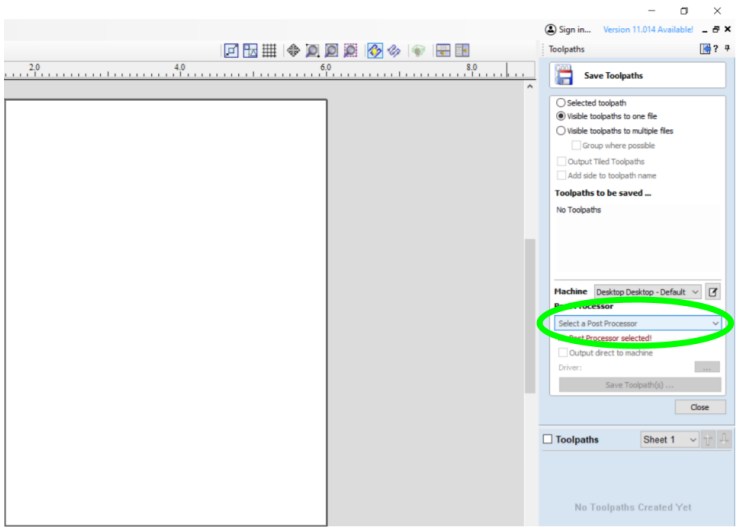
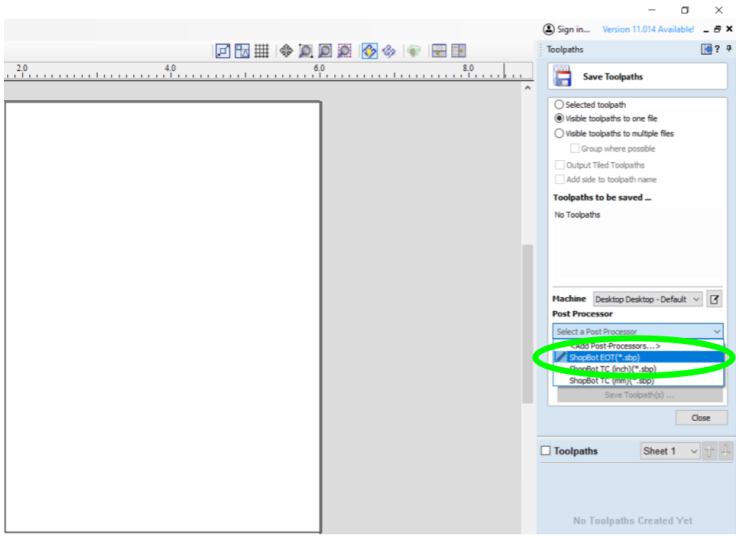


Now, click on Select a Post Processor again.



You should see **ShopBot Tan/Osc Knife** listed in the choices of Posts, click on it to set it as the post you will be saving your files to.

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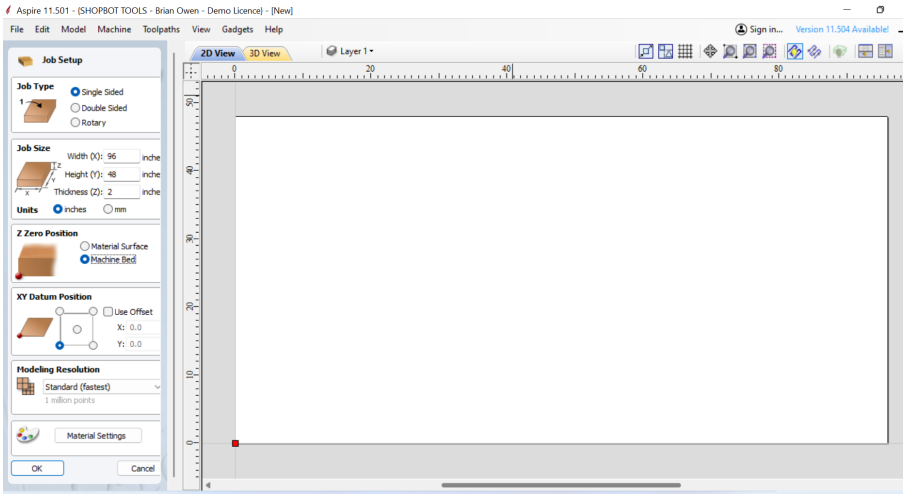
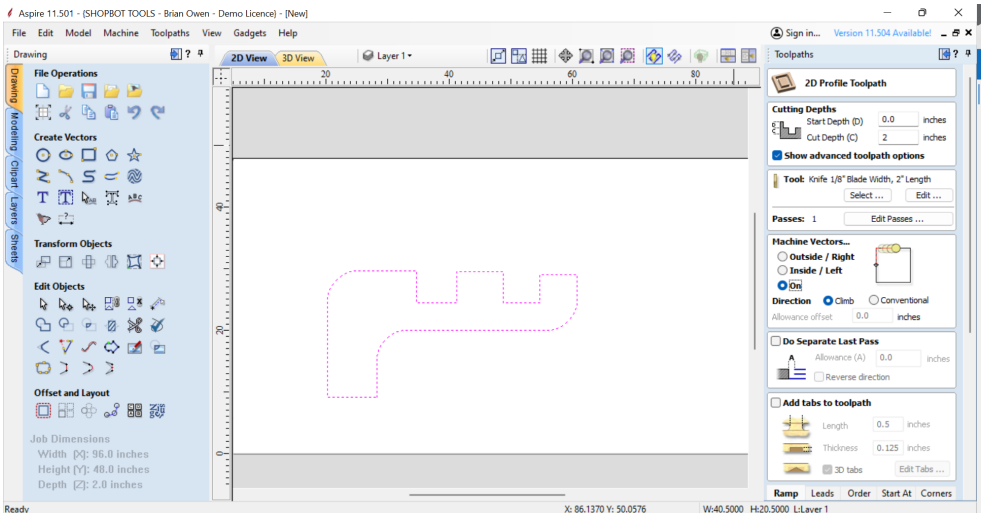
Setting up your First Knife Cut

Setup for a knife cut is much like the setup process for any normal cut using a router bit. Select the size of your material and thickness. To help avoid cutting into your machine table and damaging your knife blade, it is best to choose “Machine Bed” for your z zero location – and then to zero the tip of your knife blade to the bed of your machine prior to loading your material.



Once you have a design completed, choose the profiling toolpath option to create a toolpath for your knife. Knife cuts will always be done “On” the vector line, rather than inside or outside as you would do with a router bit. There is no tool type for a knife in Vectric’s software, so a regular end-mill bit profile can be used. Typically you will be making the full cut in one pass, so you’ll want to make sure that the pass depth on your bit profile is set high enough that you’ll be able to cut all the way through your material.



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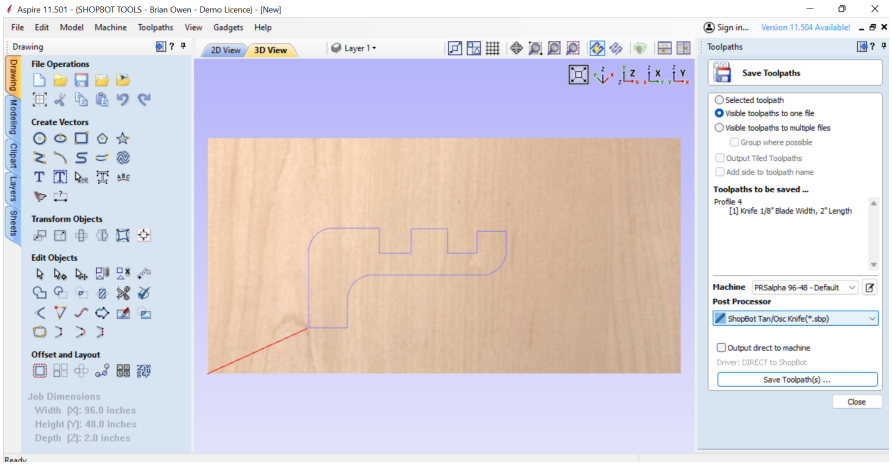
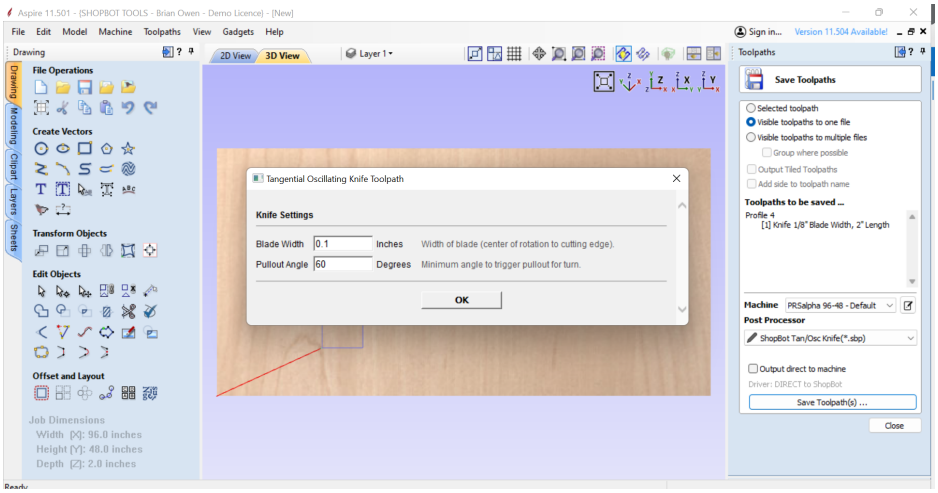
When you've got all of your toolpaths generated, save your file out in the way you would normally; selecting the ShopBot Tan/Osc Knife post processor.



Once you've given your file a name and clicked "save" you'll be presented with a dialog to determine additional settings for your cut. The first parameter to fill in is the width of your blade; this should be the approximate distance from the center of rotation of your knife to the cutting edge. This is used to determine the optimal point to begin turns during cutting. The second parameter is "pullout angle". This setting determines how sharp a turn your knife is allowed to make while fully embedded in your material. For some softer foams, it is OK to make sharp turns without pulling the knife up for rotation; in harder materials like rubber, you will want to pullout even on relatively small turns. The angle chosen will cause the knife to pull out for any turn sharper than the chosen angle. These settings will be saved for your next cut.



Once you have your file loaded onto the PC controlling your ShopBot, you will want to "home" your knife. This is done using the "C4" command by pressing the "C" key on your keyboard, followed by the "4" key – or opening the "cuts" menu in your command console and choosing "Home Tangential Oscillating Knife Blade" from that menu.

This command will first home the X, Y and Z axes on your tool, followed by the B axis (the rotary axis on your knife). Next, the knife will extend and the keypad will open, allowing you to position the knife blade above the Z-Zero plate on your machine bed. Connect the copper grounding clip

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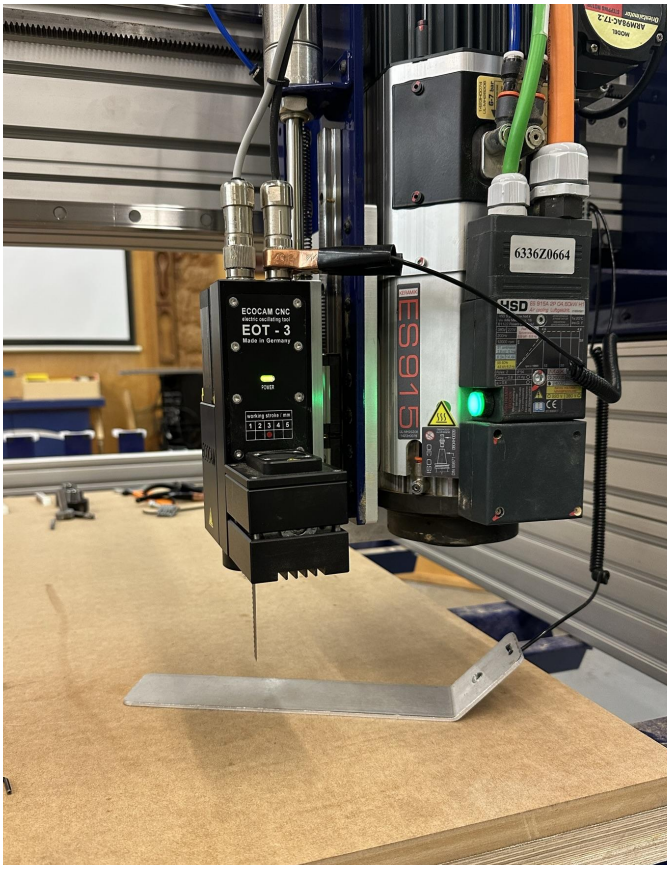

from your Z Zero plate to one of the connector housings at the top of your knife unit before starting the Z Zeroing routine.

Once this is complete, you're ready to cut. If you are using an ATC (Automatic Tool Changer). Any bit that is loaded into the spindle will be automatically unloaded at the beginning of your cut. If you're using a manual tool changer spindle, please unload any bits in the spindle prior to starting a knife cut.

To start the knife oscillating, simply press "OK" on the spindle start message that appears when you start your file.

If at any time your knife blade breaks, or the angle becomes incorrect; it is important to rehome your machine before resuming or restarting your cut to make sure that the knife angle is correct to avoid breaking another blade.

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