ShopBot®

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6 and 12” Indexer Installation

For PRSalpha Tools

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General Safety and Precautions

This safety summary contains general safety warnings that should be understood during operation of this machine. Failure to observe these precautions could result in injury.

Learn and understand safe use of the machine. Do not allow individuals to operate the machine without supervision. Be aware of the location of the Emergency Stop switches at all times.

Eye and ear protection MUST be worn by the machine operator as well as any bystanders or observers. Flying sawdust, material chips, and other debris can cause serious eye injury.

Wear closed-toe shoes at all times.

Make sure that your material is properly secured before cutting, and be aware of any small parts that may come loose after being cut. If a small part catches the edge of a spinning bit, it can be thrown forcefully in any direction, causing injury or damage.

Never place your hands on the rails of the ShopBot. Be aware that the machine may move unexpectedly in any direction, which can cause serious injury if your hands are in the path of movement.

Never wear gloves while operating the machine. As with any power tool, a glove can get caught in moving or spinning parts and pull your hand into the machinery.

Never leave a machine running and unattended. Understand that a spinning tool generates friction and heat, creating a risk of fire. This risk is minimized by using correct chip load, using sharp bits, and by always double-checking your files before cutting. Be prepared to pause or stop the cut if something seems incorrect.

Keep a working fire extinguisher within reach of the machine, for the reasons listed above.

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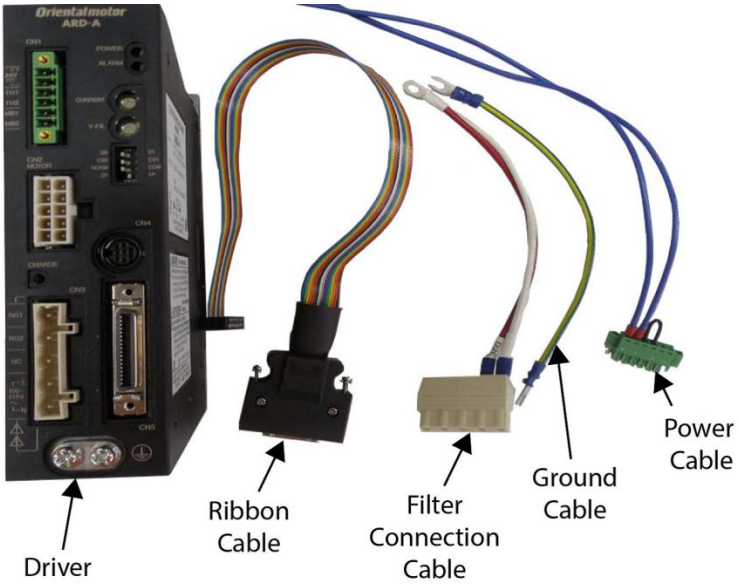
Installing Driver and Cables



RISK OF ELECTRIC SHOCK: Unplug the power prior to installation process. Failure to do so can result in electric shock and/or damage to the machine.

Note: If the indexer was purchased along with the machine, the driver and wiring are already installed. Skip to **“Connecting Indexer Cable to Driver.”**

Tools Required

- Standard sized flat-head screwdriver
- Small flat-head screwdriver suitable for electronics
- Small Phillips-head screwdriver suitable for electronics
- 1/2” wrench or socket (or adjustable wrench)
- 7/16” wrench or socket (or adjustable wrench)
- 7mm wrench or socket (or adjustable wrench)

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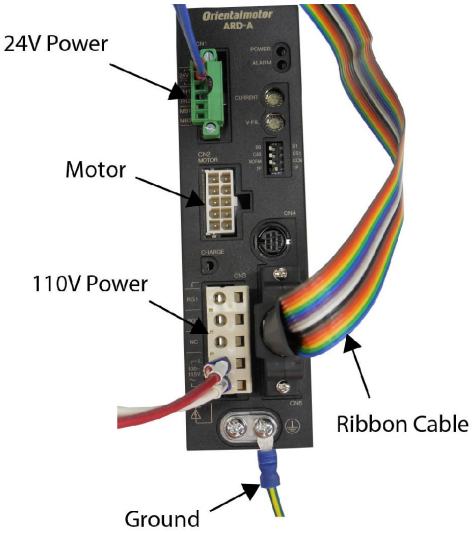
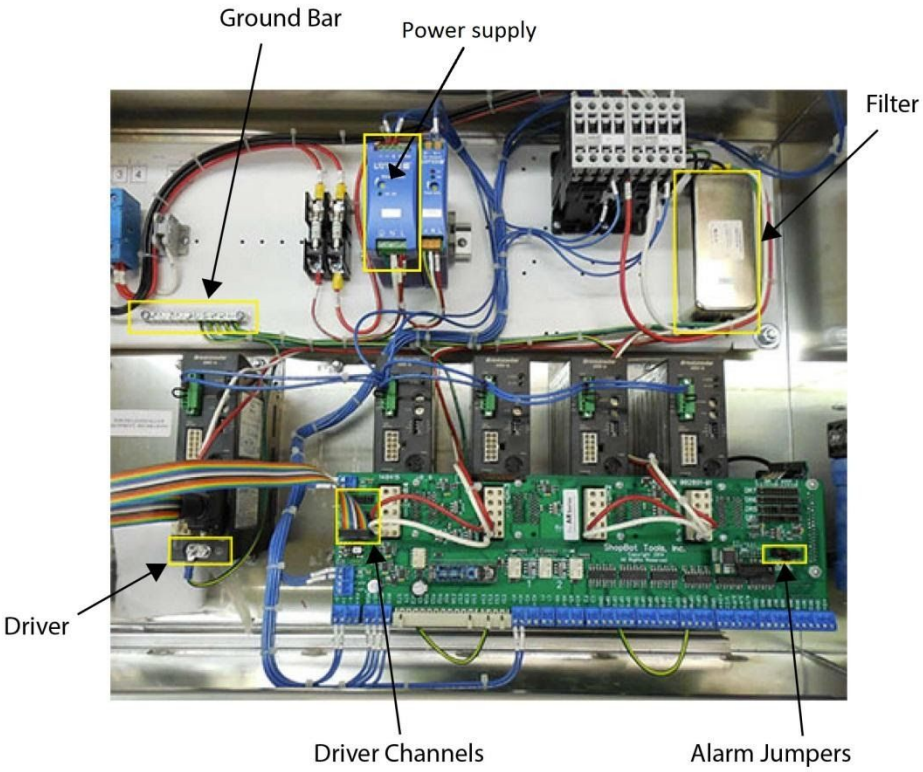
Mounting Driver in Control Box

Overview of Connections

- The 24V power wires will be connected to the power supply
- The motor wire will be connected directly from your indexer.
- The 110V power will be connected to the electrical filter in the upper right hand corner of the box.
- The ground wire will be connected to the ground bus bar.
- The ribbon cable will connect to the driver channels on the control board.



Mounting the Driver



To mount the new driver to the left of the others, use a 7/16” socket or adjustable wrench to remove the nuts from one set of screw posts. Fit the holes in the driver mounting plate onto the posts and replace the nuts.

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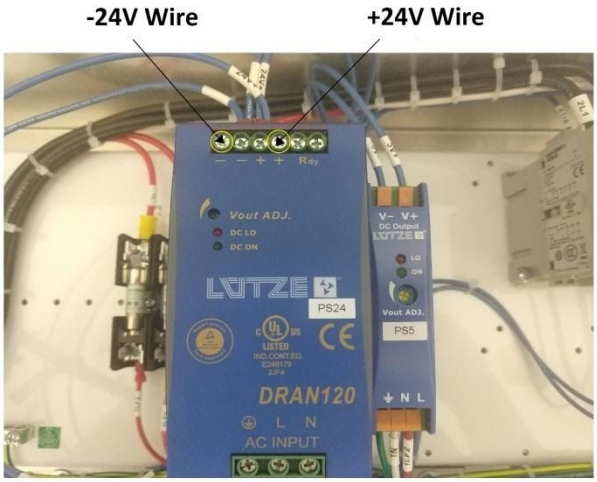
Connecting Wires to the Driver

Hook Up 24V Wires from the Driver to the Power Supply

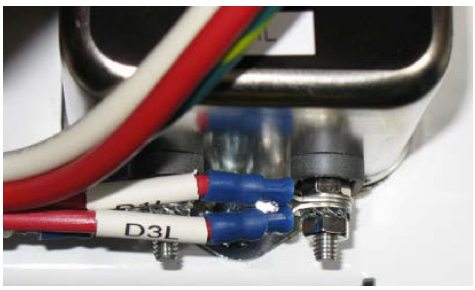
Driver

Connect the blue 24V wires coming out of the Driver into the + and – terminals on the power supply. The top wire coming out of the Driver is the +24V wire.



Power Supply

The 110V power connector is connected to the bottom white plug of the driver. Connect these wires to the electrical filter in the upper right hand corner of the control box. It may be necessary to trim back a few of the wire ties to gain access to the nuts that hold the filter wire connectors in place.



Remove nut from bottom of the Filter. Match the new wires to the existing ones: red goes with red, white goes with white. Put the open ring of the wire connector onto the screw post and tighten the nut. Make sure wires are tight and secure.

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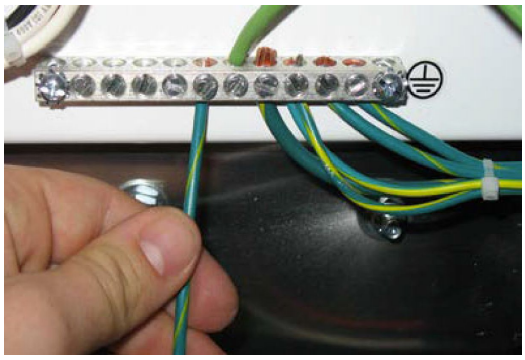
Connecting Wires Continued...

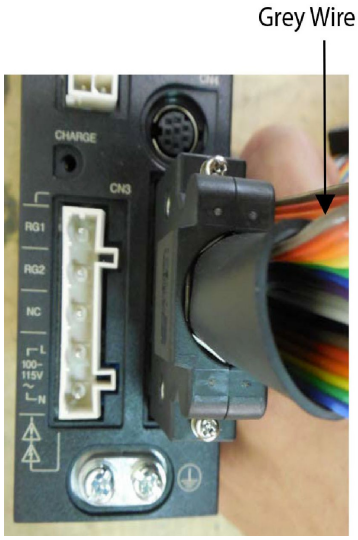
Make Ground Connection



Take bare end of the green ground wire, and connect it to any available spot on the ground bus. Loosen one of the screws until the wire slips into the gap, and tighten screw.
Ensure the screw clamps onto bare wire, not the plastic coating.

Connect the other end of the wire to one of the bottom terminals on the driver marked with the ground symbol.

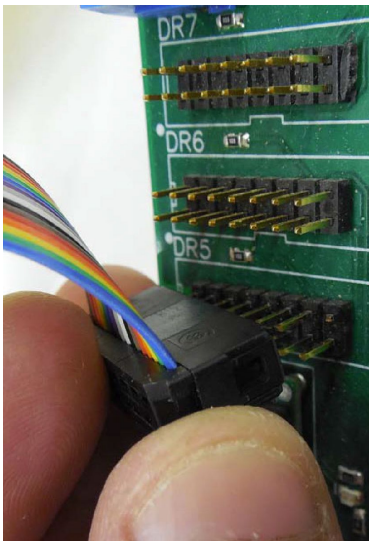
Connect Ribbon Cable



Plug the ribbon cable into the driver with the grey wire towards the top of the driver. Tighten screws.

Plug the other end of the ribbon cable into channel 5 (B-axis) located on the lower left section of the board, which is the farthest set of pins to the bottom labeled “DR5”.

Note: If channel 5 is in use then go to “DR6”. Remember the channel number for the next section.



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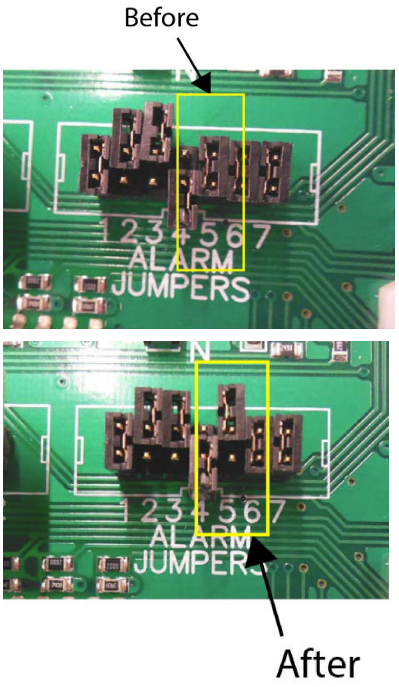
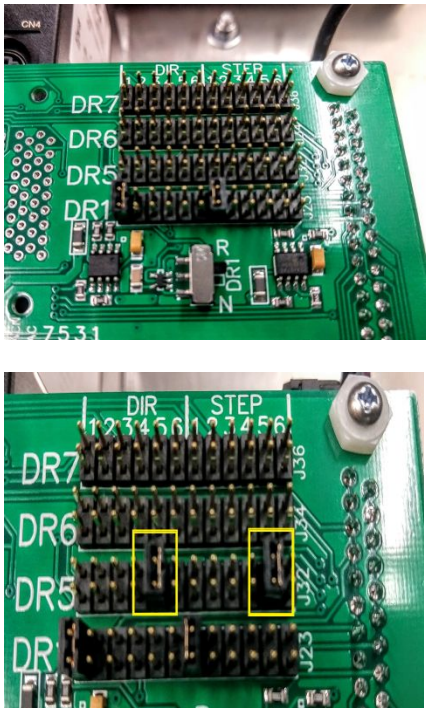
Alarm Jumpers and Channel Jumpers



There are a set of alarm jumpers found on the right-middle of the control board. Remove the jumper on the one labelled “5” and install it so it is only attached to the top pin.

Note: If using a different channel for the driver, move the corresponding jumper. Example: If “DR6” is used, move the pin to “6”.

Adding Jumpers to DR5 or DR6 Channel



Before

There are also two jumpers included with the kit that need to be added to the driver channel located at the top right section of the control board. If using channel 5, connect each jumper to a pair of pins in the row marked “DR5”, one set under column 5 of the DIR section, and one under column 5 of the STEP section. If using channel 6, put the jumpers in the row marked DR6, and use the columns marked 6 under the DIR and STEP sections

After

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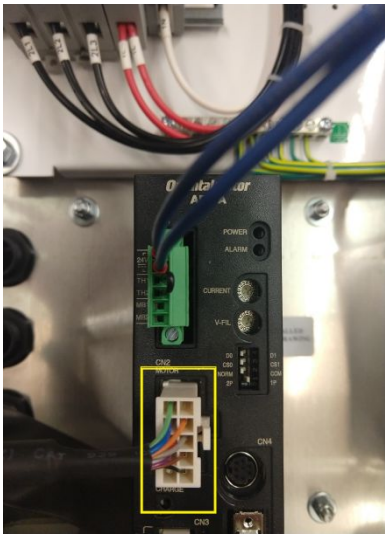
Connecting Indexer Cable to Driver

LEFT: For an Icotec cord fixture, remove the 3 bolts from the left side of the black fixture, and pull the side out. Remove one of the bottom gray squares, and run accessory cable into the control box, using one of the plugged holes in the gray square cable holder. Slide the gray square back in place, and reattach the left side to the fixture, making sure the cable reaches the driver.

RIGHT: For the Roxtec cord fixture, first loosen the bolt on the black block inside the control box (this block acts as a clamp), then remove one of the upper blue blocks that has an open slot for the cable. Run accessory cable into the control box so it reaches the installed driver. Using a sharp object, gently remove enough layers from the blue block so the cable fits snuggly into the hole. Replace the blue block, check cable lengths, and then retighten the bolt on the black clamping block.

Connect Indexer Cable to Driver



To complete the wiring, connect the accessory motor cable with the yellow band that was routed through the cord fixture to the white plug on the face of the newly installed driver. This completes the wiring portion of the indexer installation.

Note: The other end of the accessory cable will connect to the motor on the headstock of the indexer AFTER you have mounted the indexer.

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Mounting the Indexer

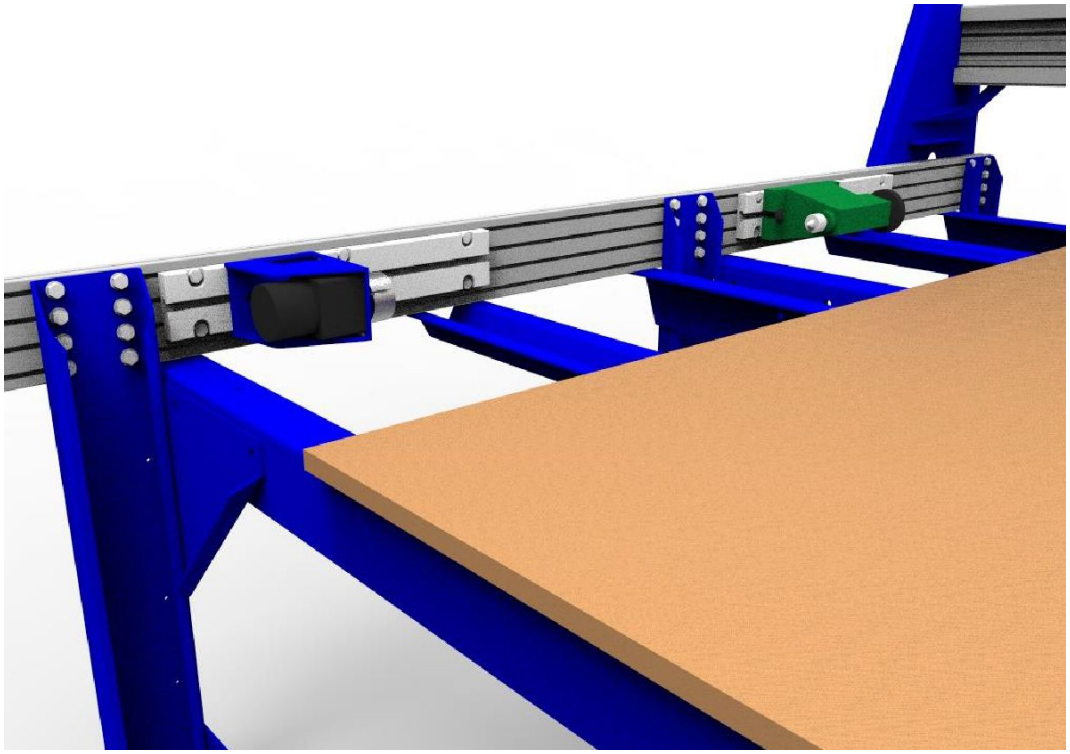
About this guide:

This document illustrates several options for mounting an indexer onto your ShopBot. You can choose the technique that works best for you, or modify one of these methods to suit your needs.

For your convenience, we have squared and aligned the headstock at our facility before shipping.

Mounting to Table Sides (for 6” Indexers only):

Mounting to table sides



Using the hardware in the 6” indexer rail mounting hardware kit (included), attach the two T-rail base plates to one of your table sides. Use a level or straightedge to align the base plates with each other. Shown above is a 96”x60” PRS Gantry tool with a 96”x48” table surface. Leaving this extra clearance space around the indexer is not required, but it does allow the turning or larger stock.

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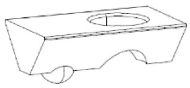
6” Indexer Rail Mounting Hardware Kit:

#002415: BHCS 5/16-18x1

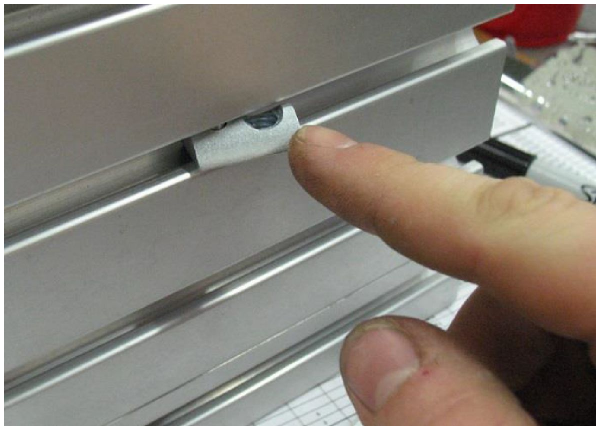
#000848: 5/16 Flat washer

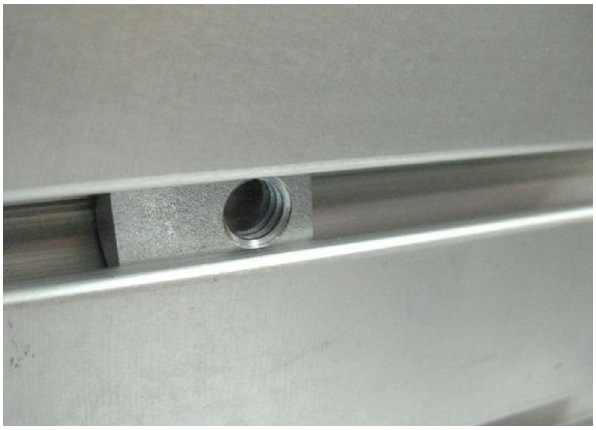


#000728: 5/16-18 ball and spring T-nut

Using the drop-in T-nuts

T-nuts allow you to create an attachment point on your machine without drilling into the frame. To insert drop-in T-nuts into the aluminum extrusion, first hold the nut with the spring-ball facing up. Press one edge of the nut into the groove until it “pops” in. Press the other end up and in until it is fully seated in the groove.





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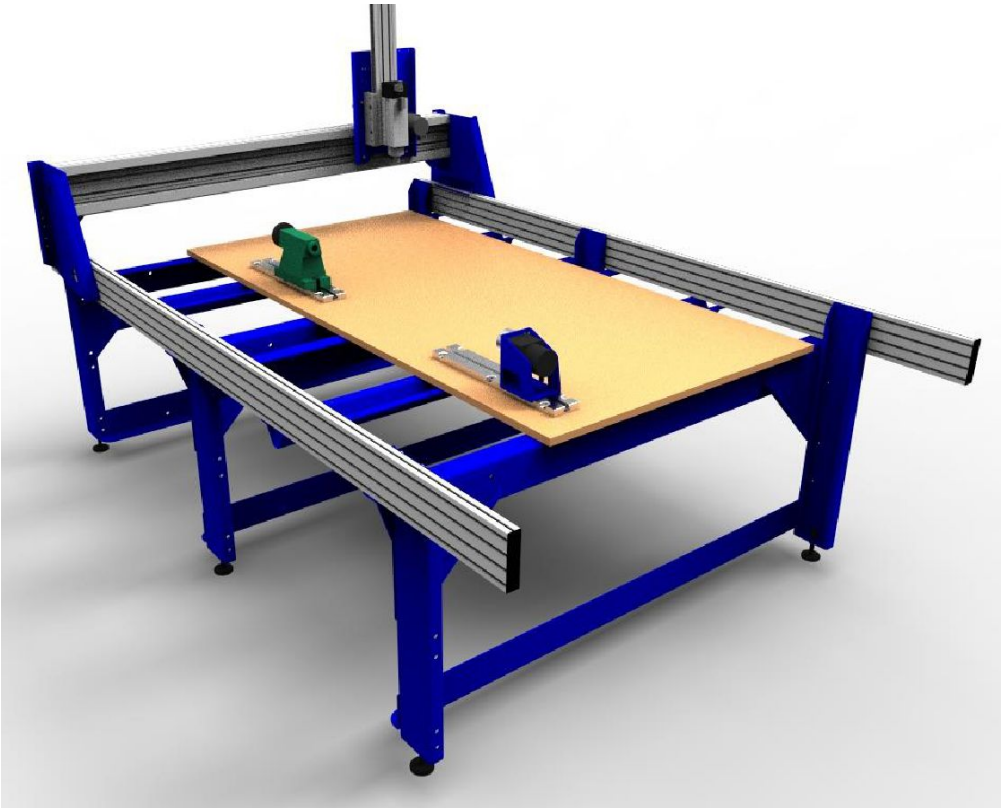
Mounting to Table Surface (6” and 12” Indexers):

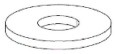
Mounting directly to table



The T-rail base plates can be bolted directly to your table using the included table mounting hardware kits.

6” Indexer Table Mounting HW Kit

#002018: SHCS 5/16-18 x 1 ¼



#000848: 5/16 Washer

#004609: Tapping Insert
5/16-18 x 25/32

12” Indexer Table Mounting HW Kit

#004613: SHCS 3/8-16 x 1 ¼

#000444: 3/8 Washer

#004614: Tapping Insert
3/8-16 x 33/64

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First, align the base plates as you would like to mount them, making sure that the base plates are aligned with each other and parallel to the table sides.

TIP: A quick and easy way to align the base plates is to cut a thin, shallow line into your table. A small cutter (such as a 30-degree V-carve bit, or a 1/8” end mill) will give the best results. If you have a spring-loaded plotter pen, this is even easier.

Take a pencil or sharpie and mark the center of each of the 6 holes in each base-plate. Drill holes at each mark according to the mounting kit that you have:

Mounting Kit	Drill Diameter	Minimum hole depth
6” Indexer	7/16”	7/8”
12” Indexer	15/32”	9/16”

Screw the threaded inserts into each hole using the provided hex key. Then tighten each rail in place using the provided bolts and washers.

You can also inlay T-track (available from www.ttrackusa.com and most woodworking supply stores) into your table, and then use T-nuts to attach the base plates. This is more work during the initial set-up, but allows you to freely move the base plates along an aligned axis.

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Mounting to Rear of Table (6” & 12” Indexers):

Mounting to rear of table

Note: Indexer Hanging Mount kit sold separately.

Overview

The hanging indexer mount allows the mounting of a rotary indexer onto the end of a ShopBot gantry tool. In order to turn the full 9.8” allowed by the ShopBot Rotary Indexer (6” version), it will be necessary to add table extensions to the table. For larger indexers (such as the 12” version) it may be necessary to have even more travel. Contact ShopBot Tools to discuss the best options.

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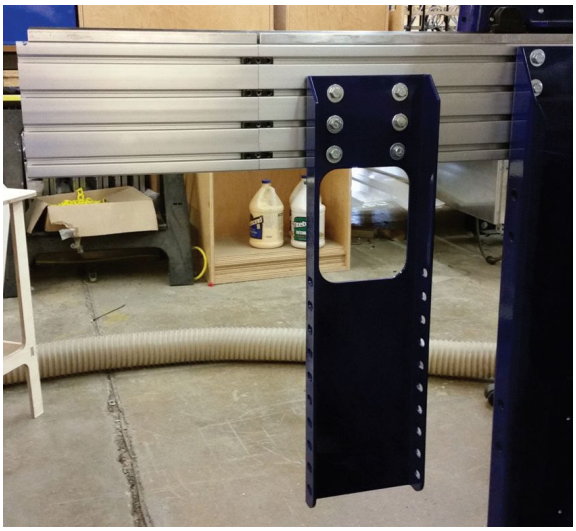
Mount Hanging Brackets

Note: Mount the Indexer hanging brackets BEFORE mounting the rail extension kit.

Mount the hanging brackets to the rails using a ½” wrench and the provided hex screws, lock washers, washers and t-nuts. For most situations the ideal placement is 3.75” from the rear table legs. This can be changed later if desired.



Mount T-Slot Plates to Beam Assembly

Attach the aluminum t-slot plates (that came with the indexer) to the beam assembly using the provided button head cap screws, washers, t-nuts and the provided 5/16” wrench. Mount the plates about a half inch from the edge of the extrusion.

NOTE: press the plates toward the center of the extrusion when tightening.

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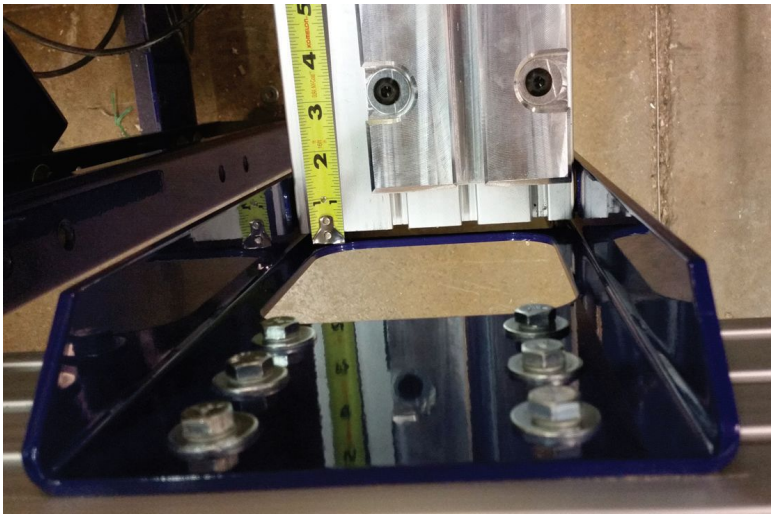
Mount the Cross Beam

Attach the cross beam using carriage bolts, washers and nuts. For the 6” indexer, the 3rd slot from the top is typically ideal; for the 12”, the 7th slot from the top. DO NOT TIGHTEN BOLTS - just thread them by hand.

After the carriage bolts are in place, adjust the beam left-right so that it is an equal distance from the hanging bracket on either end. There should be about a ¼” gap.



Use a 9/16” wrench and tighten the two nuts farthest from the table legs first, to pull the extrusion to one side of the hanging brackets, then tighten the other two nuts.

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Mount Indexer Headstock and Tailstock

When mounting the headstock, push it laterally against one side of the aluminum t-slot plate to align it to the plate.

Alignment

The following instructions will help align the indexer to the travel of the tool. it’s important to first become familiar with the shopbot control software and the keypad before proceeding. This routine is made easier with the help of a partner, as one person can sit by the indexer, the other at the control computer.

Insert ¼” drill rod into the spindle collet, leaving at least 2” protruding.

Use the keypad to bring the drill rod to the outside of the live center in the tailstock (insert the live center if you haven’t done it already). To do this precisely, click on the “fixed” button in the shopbot keypad, and enter move increments of increasingly smaller values as you get closer to the edge of the live center (down to .002”). Bring the drill rod until it is in the position shown, almost touching the edge of the live center but with just enough room for a piece of paper to slip in between.

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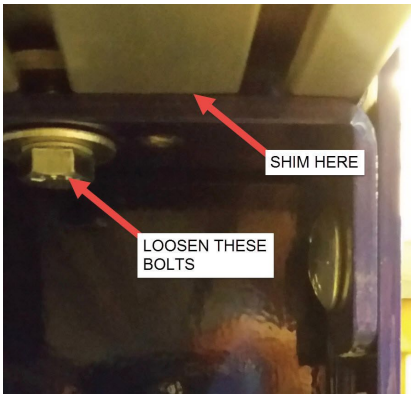
Exit the keypad, and zero the x axis by typing in ZX.

Reopen the keypad, and repeat this procedure on the outside of the chuck of the headstock (except do NOT zero the X-axis).

Look at the readout in the red-position window. The x-value should be about 0.92” (for 12” indexers, about 0.78”). If the readout gives a value of more than .02” different than this, adjust the headstock laterally by loosening the bolts holding the hanging bracket in place and tapping it with a mallet in the necessary direction.

Use the same technique to align the indexer vertically, by bringing the drill rod down from above rather than from the side.



For very precise vertical alignment, shims can be inserted on the underside of the beam.

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Mounting with an ATC

Mounting an indexer with an ATC can be done with any of the previous options, but if you choose to mount the indexer in the rear using the Indexer Hanging Mount kit, you may need to move the mounting brackets so they are closer to the rear legs of the tool.

If using the Hanging Mount kit, follow the installation instructions. After mounting the hanging kit, install the rail extensions, and then follow the instructions in the ATC installation manual for installing your ATC and the tool bar. Once the ATC is installed, check for clearance between the tool bar for the ATC, and the hanging mount kit for the indexer. You should be able to move the Z over the stock in your indexer and have the bit be centered in the rotation of the stock without the tool bar interfering with any movement. If there isn’t enough clearance, you will need to slide the brackets for the hanging mount kit forward so they are closer to the legs.

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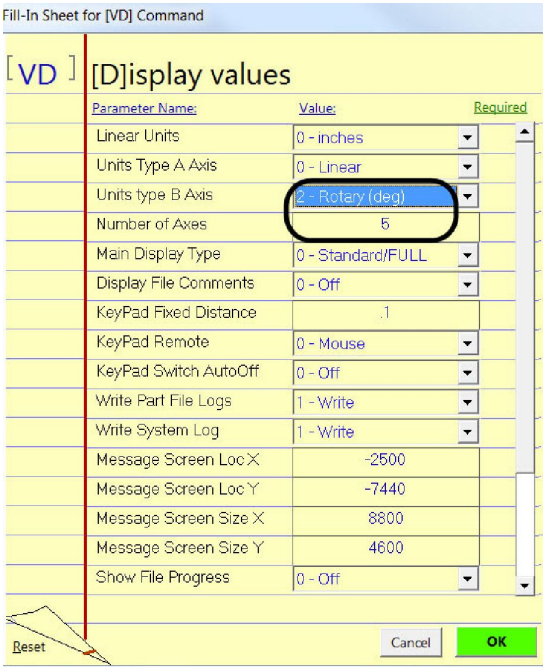
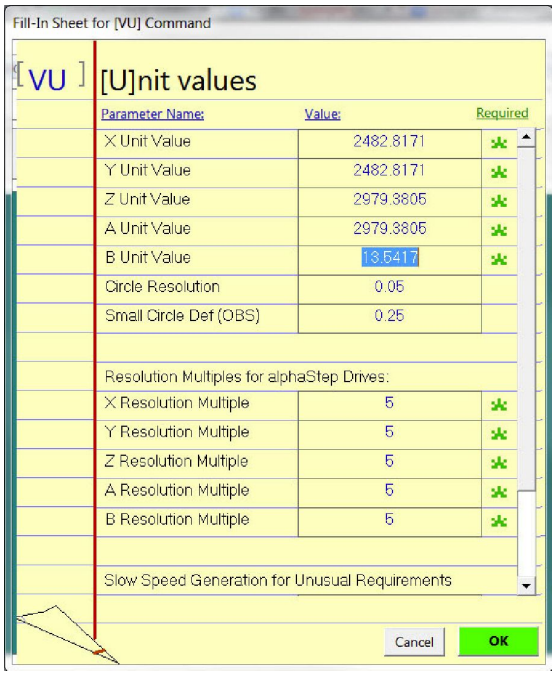
Making Changes to ShopBot Software



Open the control software and type a **VD** command into the yellow command box (or click to **Values** > **Display Values** on the top menu bar). A yellow fill-in sheet will appear. Change **Units type B Axis** to **Rotary (deg)**, and change **Number of Axes** to 5. Click **OK** at the bottom of the sheet to save changes.

NOTE: The indexer is the B axis in the software. Moving axis B will turn the indexer.



Type a **VU** command or click to **Values > Unit values**. Change the **B Unit Value** to **67.7083** (go to four decimal places). Do not make changes to any of the other values. Click **OK** to save changes.

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Setup and Operation of Indexer

Testing the Indexer

CAUTION: Avoid rotating the motor by hand when power is off. Doing so can generate an electric charge, which may damage the driver and/or control board.

If you haven’t already done so, plug in the other end of the accessory cable into the motor cable located on the headstock.

Turn on the ShopBot and ensure software is in move/cut mode.

Type a ZB command (Zero B-axis). This sets the current location of the indexer to 0. Now, type in MB 360 (Move B-axis to 360) and watch the indexer. Confirm that the indexer turned 360 degrees from the starting point. If it didn’t, refer to page 15 and confirm you entered the correct value in the VU command.

Zeroing the Tool Before a Cut

Zeroing in B: If turning the stock to a finished shape, there is no need to zero the B-axis before cutting. However, if making cuts in a very specific location, rotate the axis with move commands until the desired face or point is facing straight up (level/parallel with the table surface) - then type a ZB command for Zero B-axis.
NOTE: This step will be done after you zero the other axes and load your material

Zeroing in Z: Zero to the center point (Cylinder axis) or to the top of the material (Cylinder surface). Whichever location is chosen, make sure that the Z zero setting in the software matches what happens at the machine.

If zeroing to the center point, see the following page for **Zeroing Point and Setup.**

If zeroing to the top of the material, use the Z zero plate as usual.

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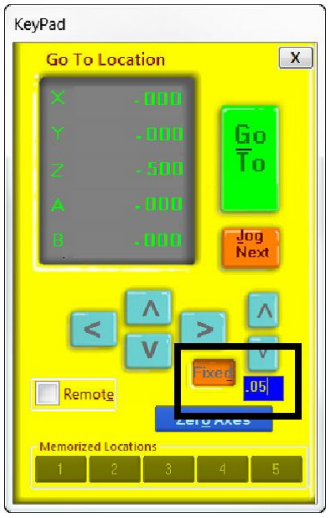
Zeroing Point and Setup

To find the center of the indexer axis, insert a pointed bit in both the headstock and the spindle.

Note: This section is written for all indexer styles. The indexing head pictured may not match the indexer on hand, but the procedure will be the same.

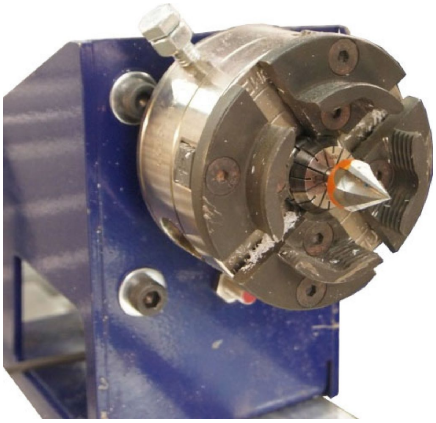


Click on the yellow button in the position window or push the “K” key to pull up the keypad window for positioning and setup of the tool head. Use the keyboard direction arrows or the blue buttons for coarse movements.

Push the “Fixed” button when finer control is needed. A numerical display box will appear, and tool distance can be specified with each push of a button. A good starting value is 0.050, while a finer value might be 0.003 inches per press.

Finding Zero location for X, Y and Z axes

To find the center of the axis, chuck up a pointed bit in the head stock. Rotate the B axis to show any offset that may be present in the bit. Correct any offset to ensure accurate positioning.



Chuck another fine bit into the spindle. Sharp ended bits allow precise identification of position relative to one another. Use the keypad to move the spindle bit about 1/8” in front of the center bit.

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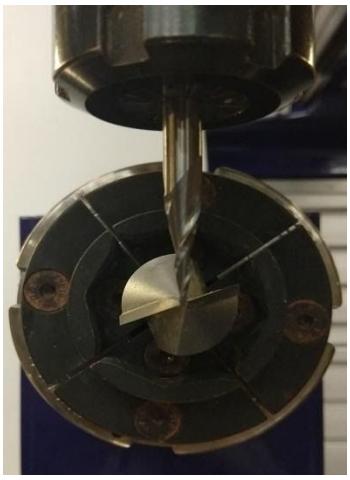
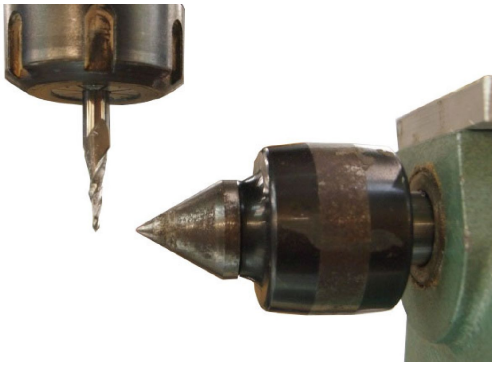


Center the spindle, as close as possible, relative to the headstock. Once in place, use the fixed mode on the keypad to make fine adjustments.

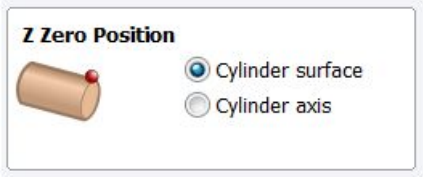


Move the spindle down the indexer axis so that the spindle bit is within 1/8” of the tailstock. The bit should be level and centered as it was at the headstock. If it is not, adjust the square of the indexer setup or the height of the headstock or tailstock.

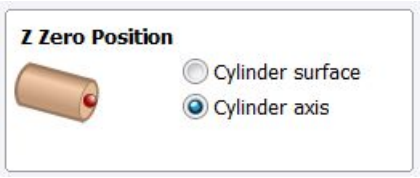
From here, where you zero your axes depends on how your drawing file is set up and how you’ve mounted your indexer.

In your CAD software (examples below are from Vcarve) there should be a Job Setup screen. In this screen, you will be able to specify zero locations for the X, Y and Z axes.

NOTE: Make sure all the software settings match what happens at the machine.



If zeroing Z to the surface, use the Z zero plate as usual.



If zeroing Z to the cylinder axis, type a ZZ command while the spindle bit is centered with the bit in the headstock.

Now it gets a little tricky. If the spindle will be moving in the X direction while cutting, then you will want to type a ZY command now, since the Y axis won’t be moving. Similarly, if the spindle is moving in the Y direction while cutting, then you would type a ZX command now, since the X axis won’t be moving. All of this is determined by how you mounted your indexer.

Lastly, you will need to determine the zero location for the final axis (X or Y).

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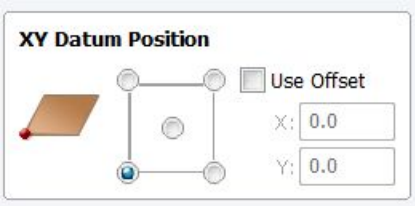
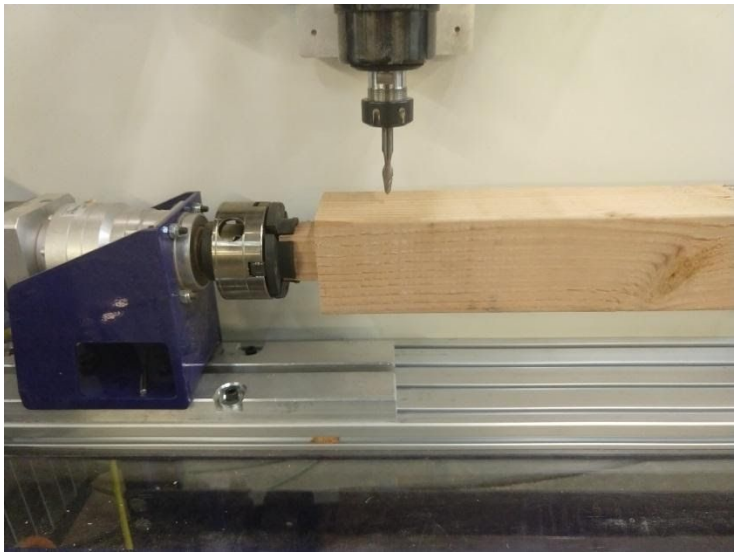
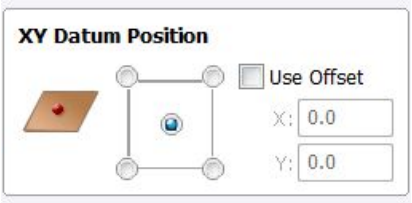
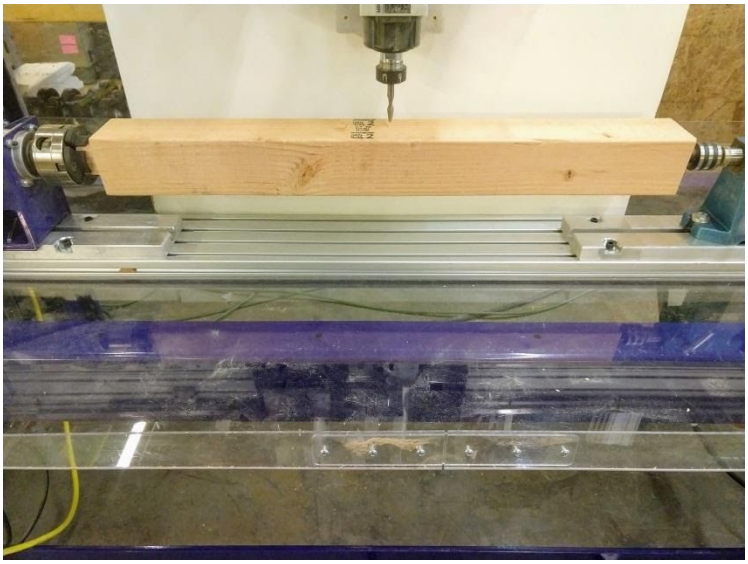


If you plan on starting the cutting at one end of your material, then you’ll zero the axis in the appropriate spot. The corner represents the end of the material when doing rotary cutting. **(See picture below)**





If you plan on starting the cutting in the middle of the material, then move the spindle so it is located directly in the middle of the material, and zero the axis here. **(See picture below)**



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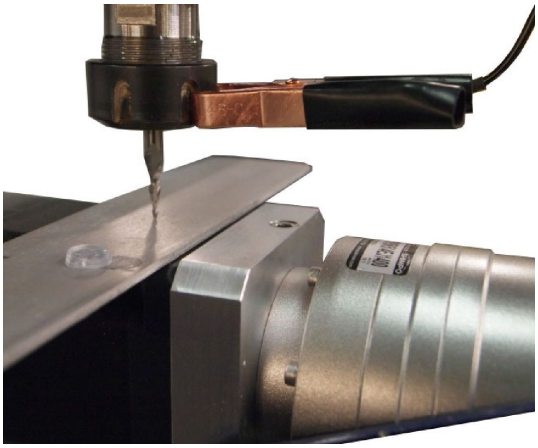
Finding Z Zero Offset (if zeroing at cylinder axis)

The Z Zero offset will allow for quickly locating the center of the indexer using the Z zero plate.

Confirm that the Z-axis is level with the headstock bit when at 0, then move the Z-axis high enough that the bit will clear the top of the indexer head.

Identify the location where the z zero plate can be laid flat and move the spindle over this location. Note and record the X or Y offset from the zero position - in this example -10 inches. This will be programmed into the software later.

Place the zeroing alligator clip on the collet and the plate on the reference surface. Use the keypad to lower the bit until it just touches the zeroing plate (use fixed key when bit is close to plate). The Input 1 indicator on the position window will light up when the bit touches the plate. Note and record the Z-axis offset measurement.



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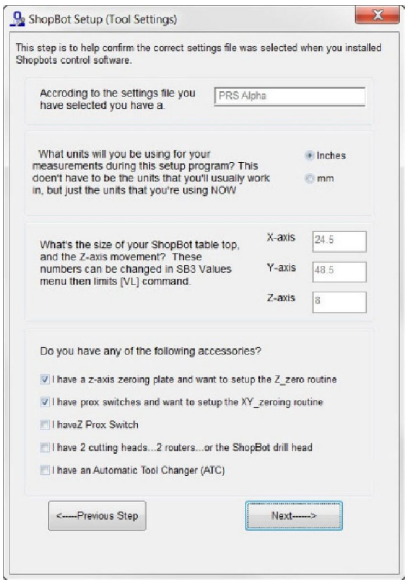
Setting up the software



Open the ShopBot Setup program in the Tools tab. Read through the directions and then choose “Next.”

ShopBot Setup can double-check the correct type and size of tool selected, and modify the offsets used for zeroing the tool.

Confirm settings file, units, and table dimensions are correct.

Check boxes for setup of the Z and XY zeroing routines, then click next.

The next screen sets up the Z zero routine, which uses the Z zero plate and a clip to create a simple circuit, telling the machine when it has reached a certain point.
Insert the offset value between Z zero and the reference plate.

Check the box for zeroing at the same place, and input the position identified for performing the Z zeroing routine. Click “Next”.

Click the button “Click Here To Make It Easy On Me.”

The software will go through the process of moving to the zero point using the keypad. Once the keypad is closed, the tool will move to find the X and Y proximity sensor targets one at a time. The distance traveled will then be recorded and used during the XY zeroing routine (C3).

Tip: Record these offsets for future reference in case it’s necessary to switch to different table configuration offsets.

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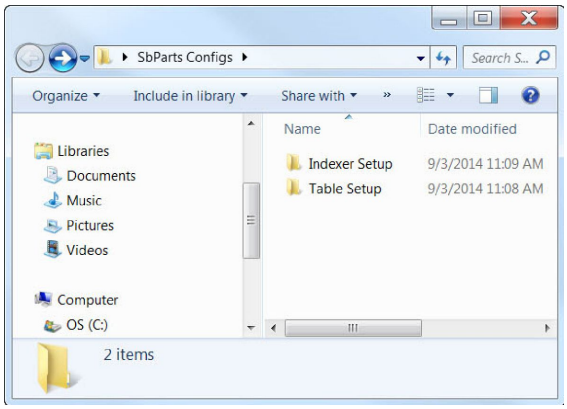
Switching Between Indexer and Table Configurations

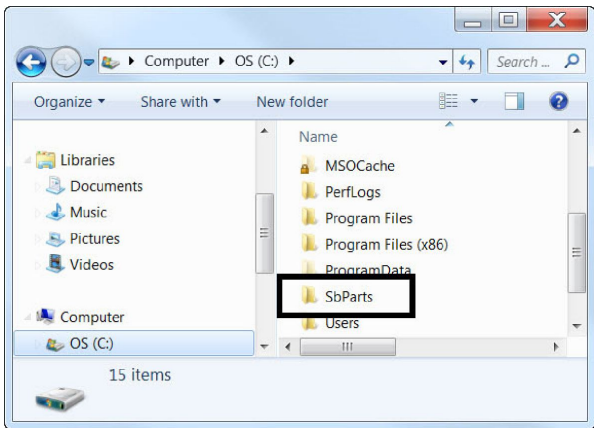
The offsets used for the X, Y, and Z zeroing routines are generally different from those used for standard 2D cutting. These settings, along with many other user variables, are stored in the SbParts folder installed on the computer’s C drive. The simplest way to switch between setups is to change out the SbParts folder. This requires creating a setup file for both configurations.

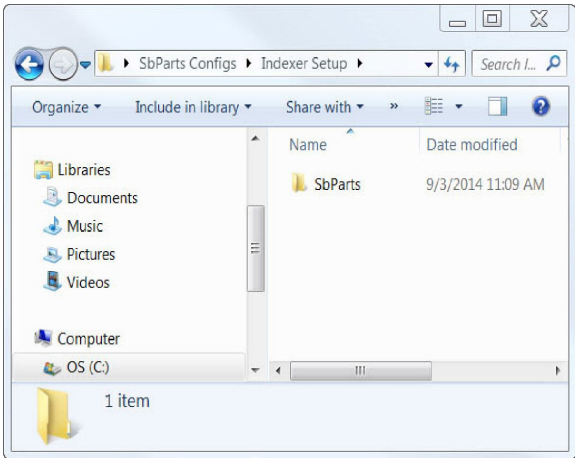


Create a folder to store both indexer and table setup files. In this example, a folder was created on the desktop.

A copy of this file must be in the C:/SbParts folder for the ShopBot software to operate correctly.

If setup has already been completed for the standard table, then copy and paste this folder into the Table Setup folder created earlier.





Make sure an SbParts folder is still on the C drive. Go through the ShopBot setup routine outlined in this document, test that the routines work as needed, and the tool behaves as you expect. The current SbParts folder is now configured for indexer operation. Copy and paste this folder from the C drive into the Indexer Setup Folder.

Once both configurations are saved and stored, it is possible to change between them by replacing the file on the C drive with one from the needed save location.

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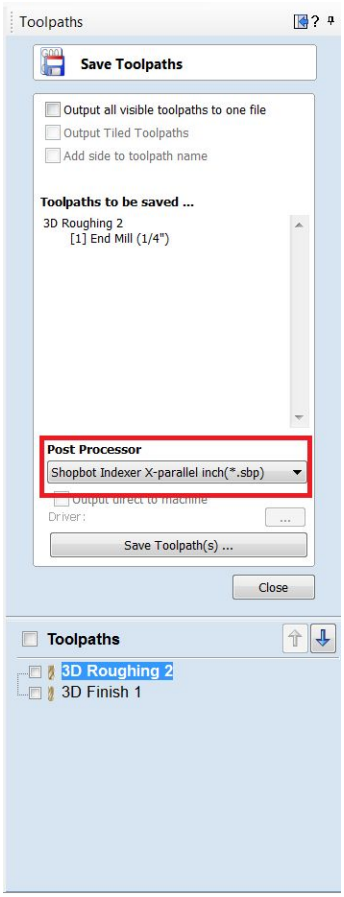
Setting up the Post Processor

Once you’ve created your drawing and calculated the toolpaths, the last step will be to save your toolpaths.

- Click on the “File” tab at the top left of the screen in Aspire or Vcarve
- Click on “Open Application Data Folder...”
- Double-click the “My_PostP” folder and leave open, you will copy new post processors here
- On your computer’s desktop, right click Windows Explorer, and open another Windows Explorer
- Locate and open “SbParts” in the new Windows Explorer screen
- Open the “PartWorksPosts” folder
- Copy and paste both the “ShopBot_TC_inch.pp” and “ShopBot_TC_MM.pp” files into the “My_PostP” window that you opened earlier
- Now back to the other window, open “PartWorksPosts_ARCHIVAL”
- Copy and paste both the “ShopBot_Indexer_X_inch.pp” and “ShopBot_Indexer_Y_Inch.pp” files into the “MyPostP” window.
- Close and re-open Aspire. This needs to be done to create the new post processor list in Aspire



Now, when you click on “Save Toolpath”, the post processors you need will be listed in the drop-down menu.

Select “ShopBot Indexer X-parallel inch(*.sbp)” if the spindle will be moving back and forth along the X axis.

Select “ShopBot Indexer Y-parallel inch(*sbp)” if the spindle will be moving back and forth along the Y axis.

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