ShopBot®

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Assembly Guide

For PRSstandard Tools

For all PRS tools shipped after 6/15/2017

Contents:

- PRS Gantry Assembly Guide
- Installing the PRS Dust Foot
- PRS Maintenance Schedule
- Correctly Assembly and Use a Collet
- Quick-Start Guide
- Table Drawings
  Note: Wiring Diagram located inside door of control box.

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Introduction

General Safety and Precautions

This safety summary contains general safety warnings that should be understood during operation of this machine. Refer also to General Power Tool Safety Warnings found in the User Guide. Failure to observe these precautions could result in injury.

Learn and understand safe use of the machine. Do not allow untrained individuals to operate the machine without supervision. Be aware of the location of the Emergency Stop switch 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.

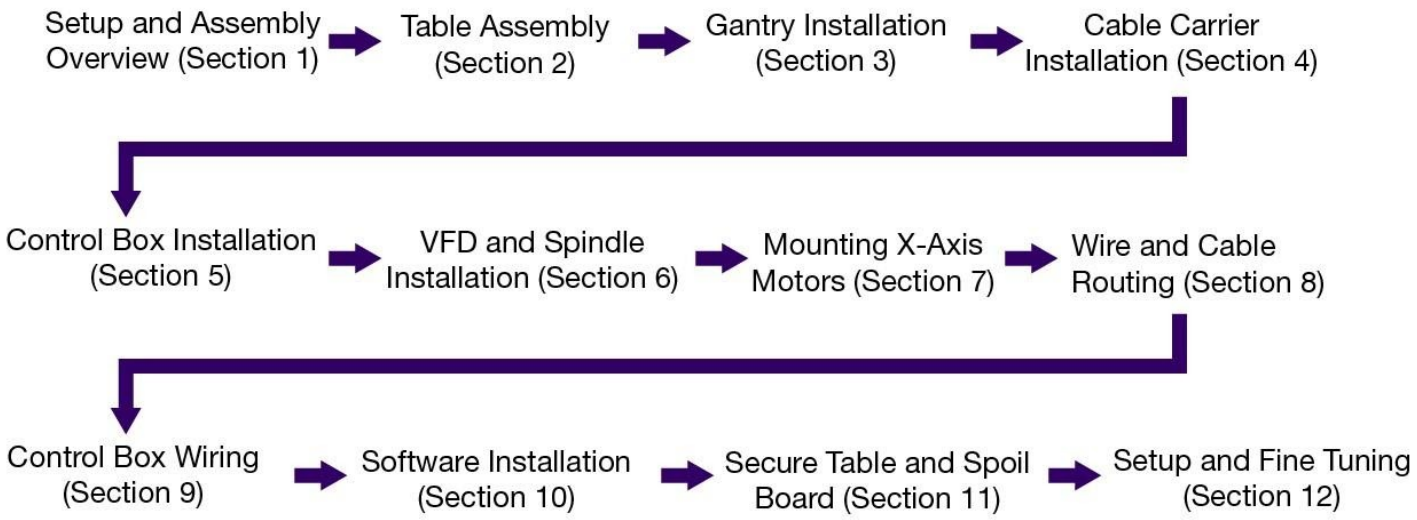
Never place your hands on the rails of the ShopBot. Be aware that the machine may move unexpectedly in any direction, which can cause serious injury if your hands are in the path of movement.

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.

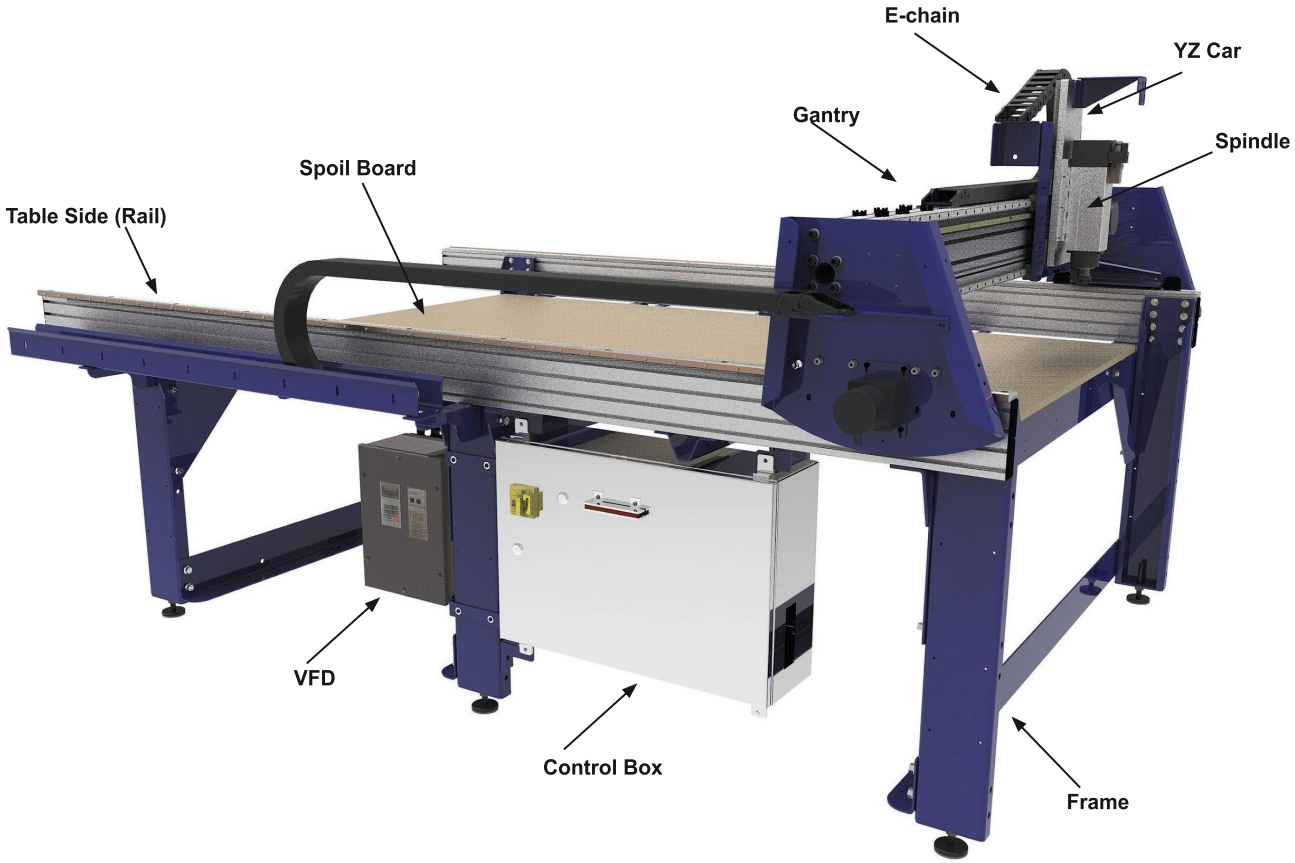
Never leave a machine running and unattended. Understand that a spinning tool generates friction and heat, creating a risk of fire. This risk is minimized by using correct chip load, using sharp bits, and by always double-checking your files before cutting. Be prepared to pause or stop the cut if something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

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

PRS Tool Assembly Process Flow



Main Parts of ShopBot Gantry Tool



Section 1. Setup and Assembly Overview

Electrical Precautions

WARNING: RISK OF ELECTRIC SHOCK

The control box must be connected to electrical service by a licensed electrician, who has experience with industrial equipment. Personal injury or damage to the machine may occur if an unlicensed individual performs this job.

A licensed electrician is required to complete the ShopBot setup. Connecting power to the control box is easiest when the tool is set up and in its final position. If the tool includes a high frequency spindle and/or a vacuum blower, these will also need to be connected by an electrician. Wiring diagrams and specifications are located inside the control box door.

Other Electrical precautions:

Ground Wire: Your ShopBot electrical connections must include a ground wire. Lack of proper grounding can result in poor machine performance, damage to electrical components and injury or death due to electrical short circuit.

Motor Connections: DO NOT connect or disconnect motor cables while power is on to the control box. This can damage or destroy the motors or drivers.

Induced Currents: AVOID moving axes by hand when the control box is powered off. If it is unavoidable, do so very slowly. Spinning the motors can generate an electric charge and damage drivers or other electronic components.

Static Discharge: Follow all wiring and grounding instructions - electronic circuits are very sensitive to static and power surges. Avoid vacuuming around the machine before it is properly grounded, as vacuums can generate a large amount of static electricity that can damage the control box.

Safety

Use caution when lifting boxes and assembled components out of the crate. Having an assistant will make things much easier – particularly when unpacking the crate and lifting the gantry onto the table rails. Do not attempt to lift the gantry without assistance.

Unpacking the Crate

ShopBot components arrive in two packages: a large wooden crate and a long box. Contact the shipping company if either piece is missing, or if they do not arrive together.

The components are packaged to avoid shifting during shipping. Use a large screwdriver to pry off the clips on top of the crate, and a Phillips head screwdriver to uncrate the components. It will require two people to lift out some of the heavier pieces.

Read through the assembly directions, and sort the components by their function to help organize the assembly process. Sort hardware by size to reduce the amount of time searching for the correct bolts, nuts and washers for a given stage of the assembly.

Many components of the machine come pre-assembled to reduce the number of assembly steps. In many places, bolts or hardware may be loosely fit in place to show their intended location. Remove this hardware prior to fitting the applicable component into place.

Major Components:

The base of the machine is referred to as the **table frame**.

The two long aluminum extrusions on each side are called **table sides**. Atop the sides are the **rails**, which create the path of travel for the X-axis.

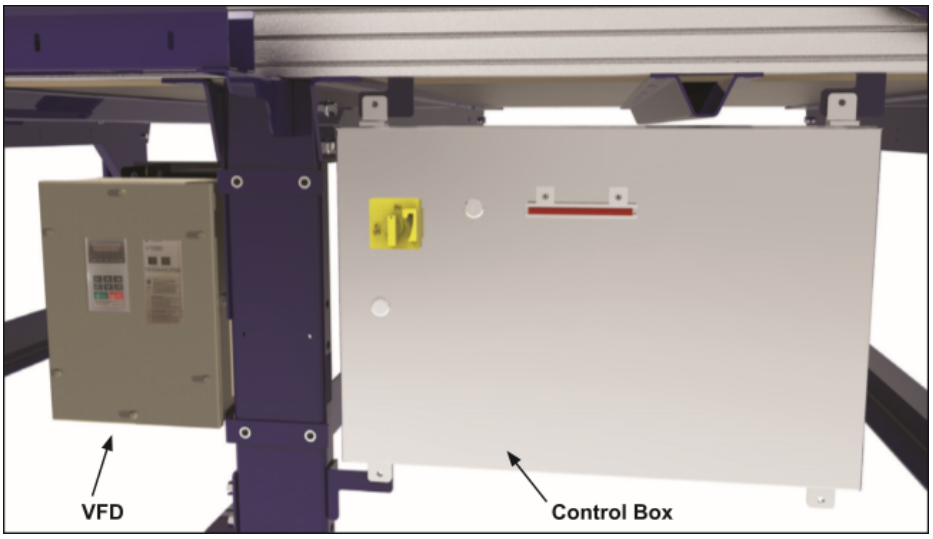
The table sides and rails are included in the long cardboard package secured to the top of the crate.

The assembly that rides along the table sides is called the **gantry**.

The gantry consists of an extruded aluminum beam, which has been fitted with linear bearings and gear rack. This forms the path of travel for the Y-axis.

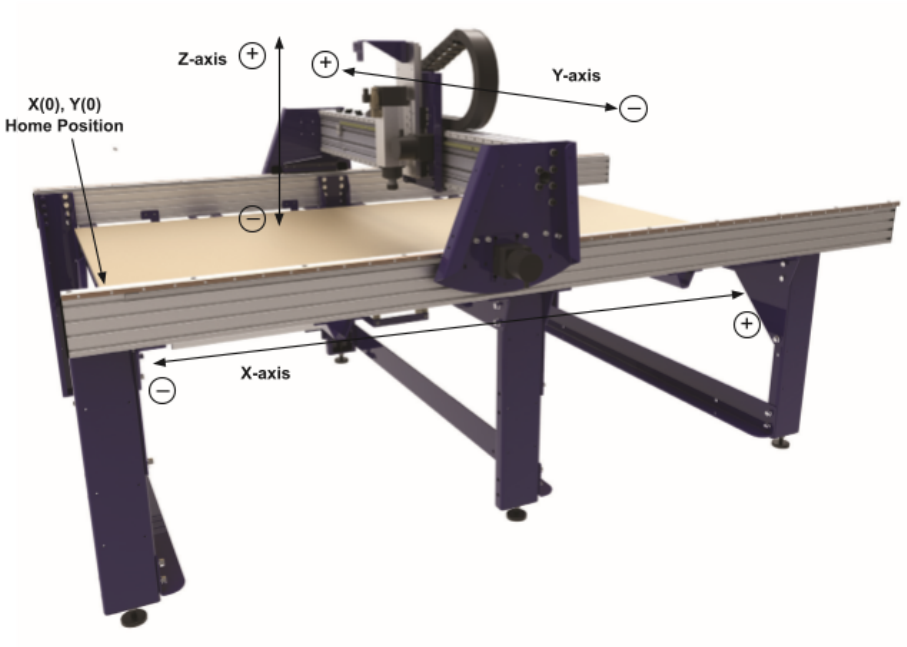
The blue plates on either side of the gantry are referred to as **end plates**.

The **YZ car** moves across the gantry and controls the height of the **cutter head** (either a router or high-speed spindle, depending on the tool).



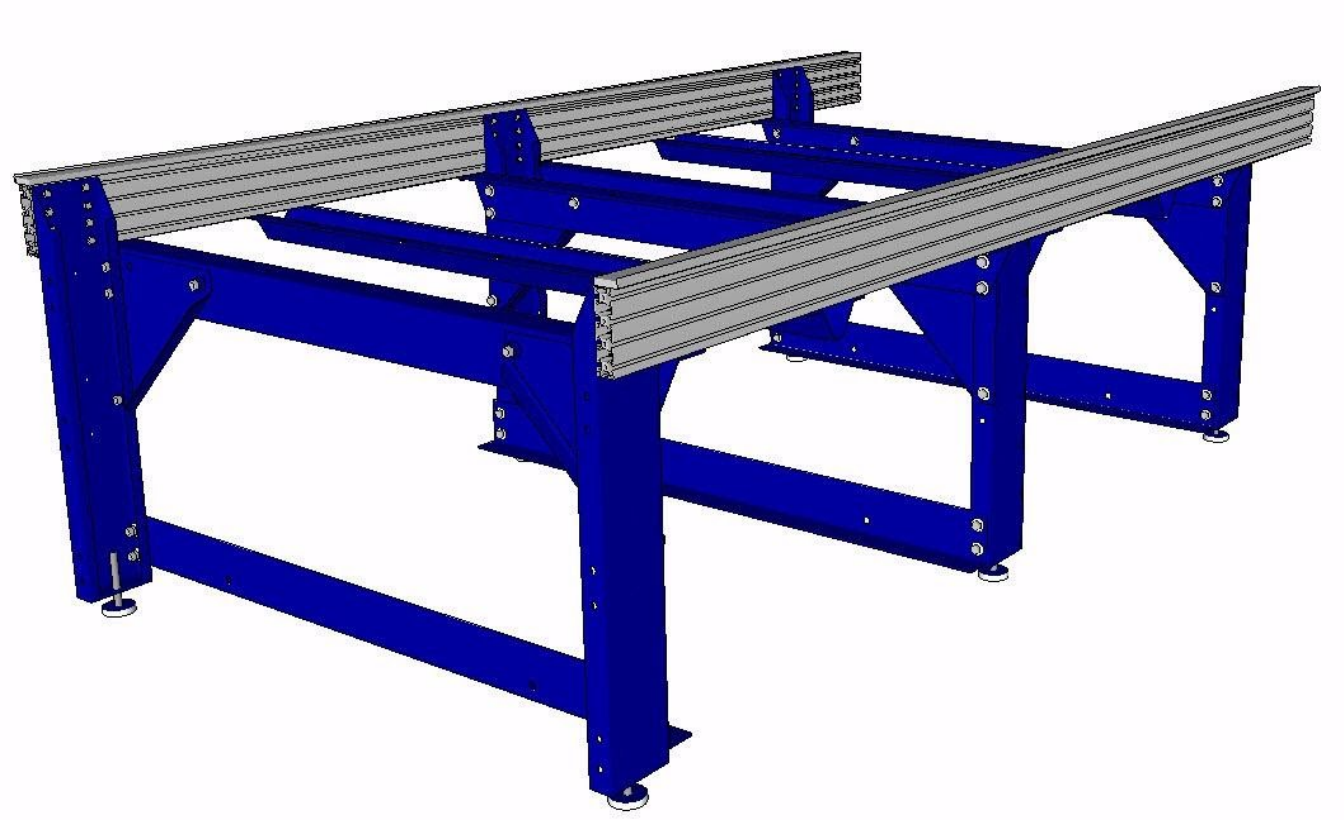
The **control box** is the “brain” of the machine and contains a control board, motor drivers, and other electronic components that allow the tool to move with precision, accuracy, and power. It connects to the computer through a single USB cable. The control box pictured here is for an alpha tool. Standard control boxes are smaller in size.

The **variable frequency device (VFD)** is used on machines that contain a spindle only (not a router). It controls speed and power for the spindle. The control box provides the VFD with on/off signals, but speed is controlled through an RPM controller unit, which connects to the PC through a separate USB cable.



In most cases, the **X-, Y-, and Z-axes** will be referred to in respect to the machine. The **XY Home Position** is also indicated here.

Section 2. Table Assembly



Introduction

The ShopBot table provides a firm foundation for all other components. This section contains instructions to assemble, square, and level the table for correct and optimal performance.

The diagrams in this manual depict a 96”x48” table, the most common ShopBot table size. The table layout may look a little different (fewer or more legs, tool changer bar, etc.) depending on the size and shape of your tool (as well as any accessories included), but the same basic steps will be followed. The table drawings provided at the end of this guide will detail specific measurements for other configurations.

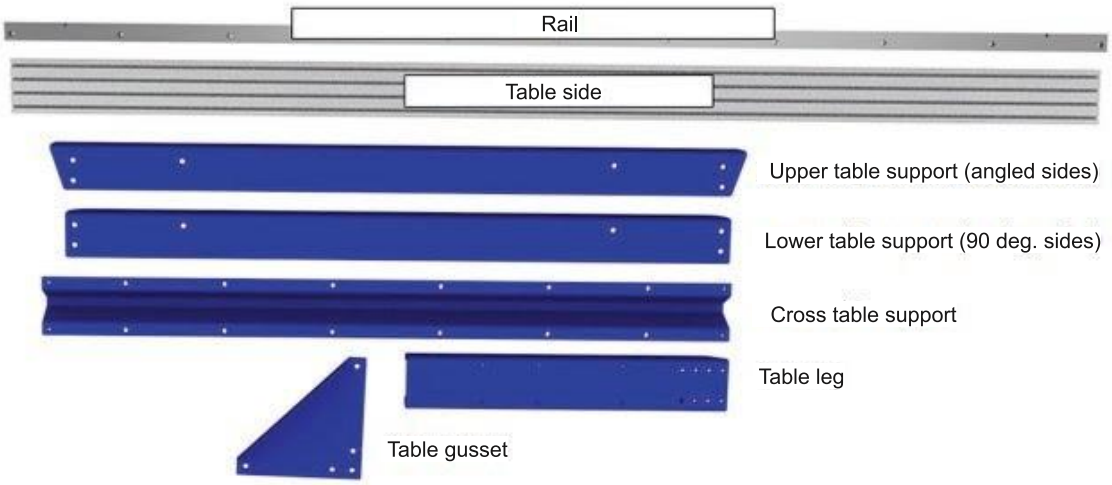
Note: It is critical to follow the table drawing carefully to ensure correct assembly of the table and accessories.

The table leveling and squaring steps should be completed with the table in its final location. Moving the table after these steps may alter the level and square.

Note: This section shows a conventional table with a 6” Z-axis. Tables configured for 12” and 24” axes have extra table side extrusions and table legs with added mounting holes.

Hardware

Part Name	Quantity	ShopBot P/N	Notes
Rail	2	001872	
Table side	2	000925	
Upper table support	4	000915	Different for other lengths
Lower table support	3	000921	Different for other lengths
Table cross support 48E	2	000926	Different for other lengths
Table leg	6	000919	Different for other lengths
Table gusset	6	000770	Different for other lengths



Except for the table levelers, all of this hardware is included in the small box marked “table hardware”:

Part Name	Quantity	ShopBot P/N	Notes
1/2-13x1-1/2” Hex Bolt	See table drawing	001956	Used for components to leg
1/2" Lock Washer	See table drawing	000588	Used for components to leg
1/2" Flat Washer	See table drawing	000029	Used for components to leg
1/2-13 Hex Nut	See table drawing	000440	Used for components to leg
5/16-18x3/4” Hex Bolt	See table drawing	000529	Used for cross supports, leg
5/16” Schnorr Washer	See table drawing	004487	Used for leg
5/16” Flat Washer	See table drawing	000848	Cross supports, leg
5/16-18 T-Nut	See table drawing	002498	Legs, cross supports, rails
5/16-18x3/4” Button Head Cap Screw	See table drawing	002033	Used for rails
5/8-11 Hex Nut	See table drawing	000160	1 per table leg
5/8-Table Leveler w/Nut	See table drawing	002926/000862	1 per table leg
3/8-16x1 1/2” Carriage bolt	See table drawing	000953	Used to secure base board

Part Name	Quantity	ShopBot P/N	Notes
3/8” Lock washer	See table drawing	000092	Used to secure base board
3/8” Flat washer	See table drawing	000444	Used to secure base board
3/8-16 Hex nut	See table drawing	000452	Used to secure base board

*Specific quantities can be found on the packing list enclosed with the hardware.

Table leveler


1/2” Hex bolt, lock washer, flat washer, hex nut

3/8” Carriage bolt, lock washer, flat washer, hex nut

5/16” Hex bolt, Schnorr washer, flat washer, hex nut

5/16” Button head cap screw, T-nut

Tools Required

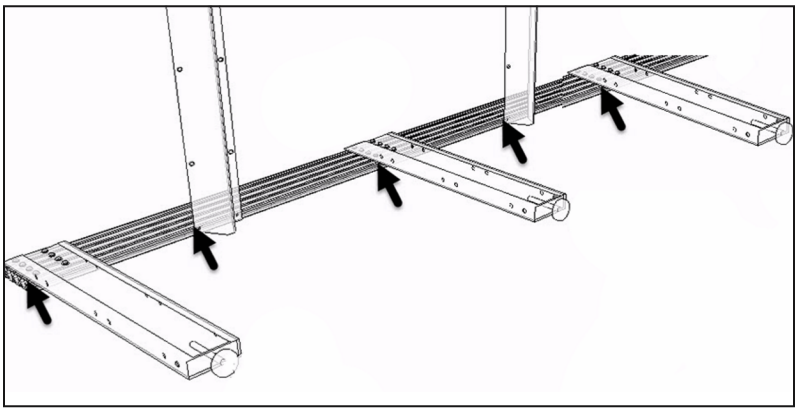
Marker (or other writing tool)	Tape Measure	Wrench or Socket, 5/16”
Mechanical Square	Rubber Mallet	Wrench or Socket, 3/8”
Safety Straps (optional)	Wrench or Socket, 5/8”	Wrench, 1”
String/Twine (at least 30ft)	Wrench or Socket, 1/2”	Wrench, Allen, 5/16”

Marking the Table Sides

Remove table sides from packaging and lay them on the floor side-by-side. Locate where the Home Position (X = 0) will be.

Note for International Customers: The location of the table legs and cross supports along the X-rails can be adjusted slightly to reflect metric units.

Locate your machine's corresponding table drawing at the back of this assembly manual. Starting from the Home Position, use a tape measure and permanent marker to indicate on the inside of the rails where each table leg and cross support will attach.

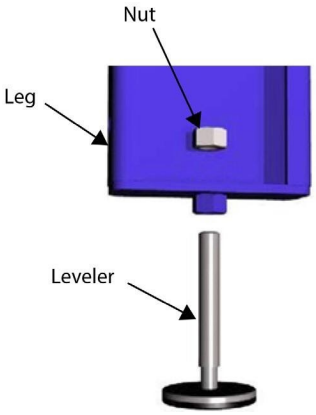


If you haven't already, it is helpful to then move the rails into the general space that the finished tool will occupy.

Note: This image indicates the rail marking locations for a 96" tool. The positions will differ for other table configurations.

Orient table sides into approximate location that the tool will occupy.

Mount Table Levelers to Legs



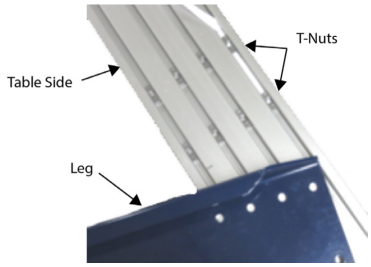
Remove table legs from packaging. Screw leveler approximately half way into the bottom of each table leg. Thread a 5/8" hex nut onto the leg leveler. Keep nut loose until table is leveled.

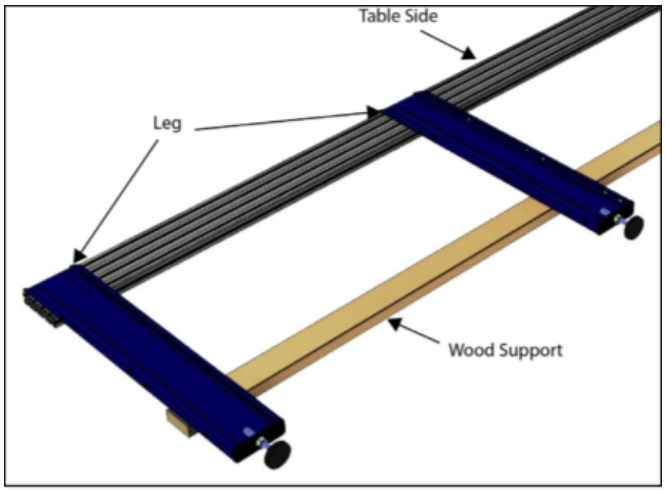
Thread the middle leg levelers all the way up to ensure that the feet do not interfere during the leveling procedure.

Note: During assembly, some holes may require tapping to remove excess powdercoating.

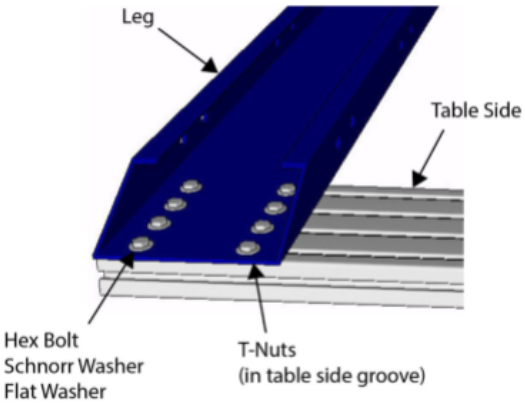
Install Table Legs

Insert eight T-nuts per table leg into the T-slots in the pattern shown, with the rough side down. Note the line marked earlier for alignment. Make sure to insert the T-nuts for the middle table legs in the T-slots prior to assembling the end table legs.



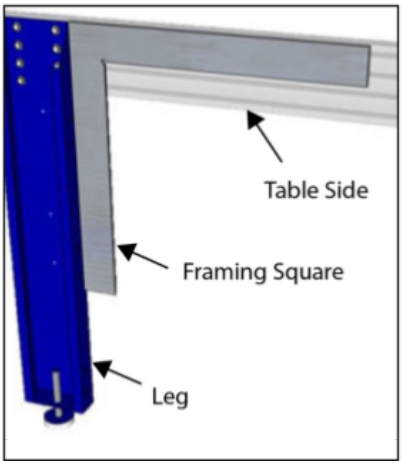


With the T-nuts in place, position the table legs to line up with them. Support the table legs so they stay level during installation.

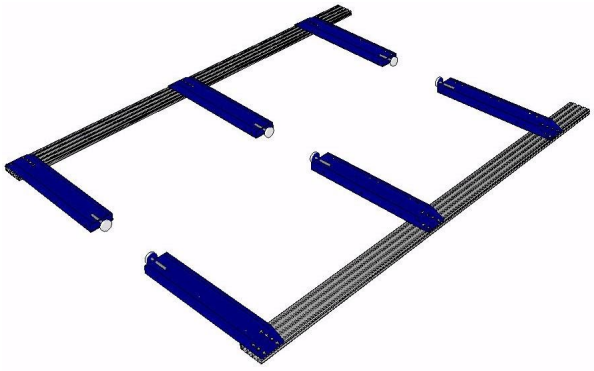


Secure the legs to T-nuts in rail with 5/16” hex bolts, Schnorr washers, and flat washers.

Note: Schnorr washers are concave washers. Install them with curve cradling the bolt head. Note that they can make threading the bolts into the T-nuts difficult. If necessary, use a zip tie or other shim behind the T-nut to force it closer to the surface of the slot so it is easier to catch the threads with the bolt assembly.



Hold a framing square against the leg and the table side while bolts are tightened to ensure leg is installed at a 90° angle. **Hand-tighten** the **top and bottom bolts** when the leg is square. **Do not tighten other bolts at this time.**



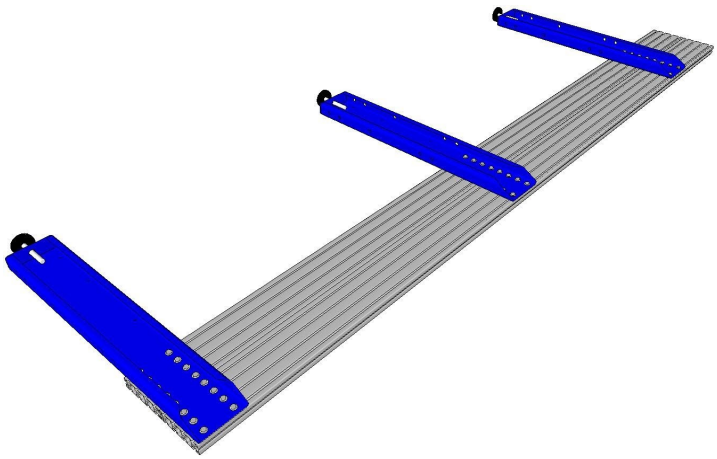
Repeat this process until all remaining legs are installed.

Table Sides for 12” and 24” Z-Axis Configurations

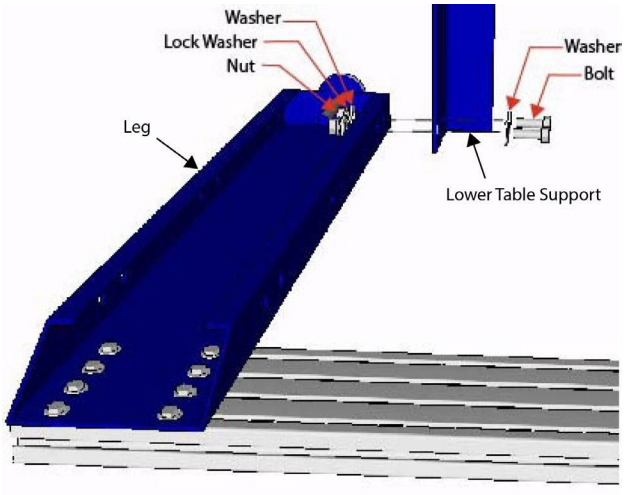
Tables configured for 12” and 24” Z-axes have extra table sides and legs with added mounting holes.

Assembly of these table configurations is identical with what’s shown, with the exception of these unique parts and extra mounting hardware.

Table supports and gussets will go under the table side, and the rails will mount to the top of the table sides.



Stabilize with Lower Table Supports

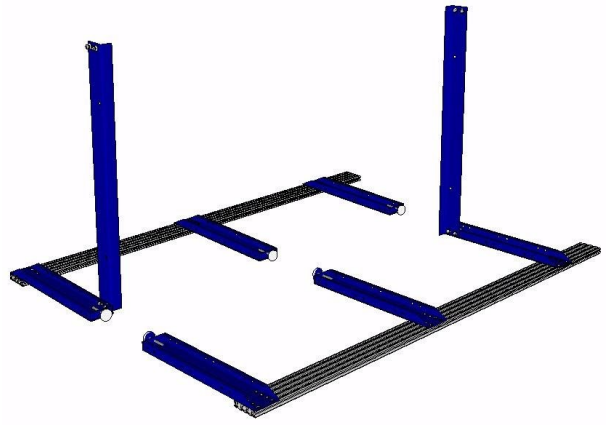


Install lower table support to the first exterior table leg with the L shape facing the interior of the machine with 1/2” bolt and flat washer on one side, and flat washer, lock washer, and nut on the back side. Tighten the bolts only until they are snug; do not tighten them completely at this time.

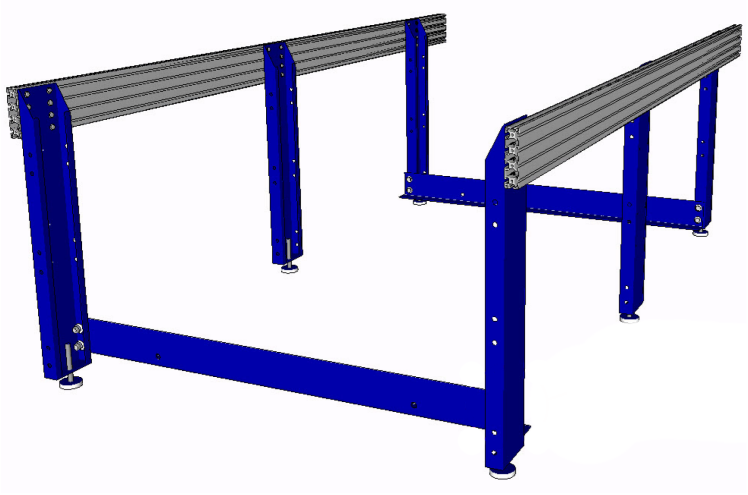
Repeat the step on the opposite exterior table leg, on the other table side. These lower table supports will act as “kickstands” to hold the table sides up for assembly.

Raise each table side. If performing the assembly alone, use safety straps to secure the sides in place to prevent injury or damage to the frame.

Note: If a leveler foot pops off while lifting the sides in place, simply place the foot under the ball of the hardware and press down on the table side to reseat it.



Connect Side Assemblies

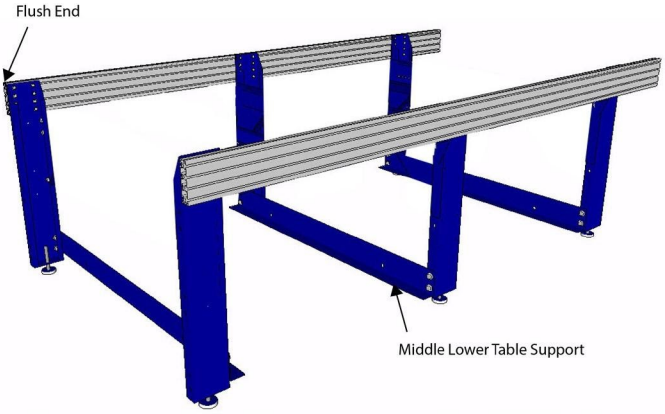


Attach lower table supports to opposite table sides.

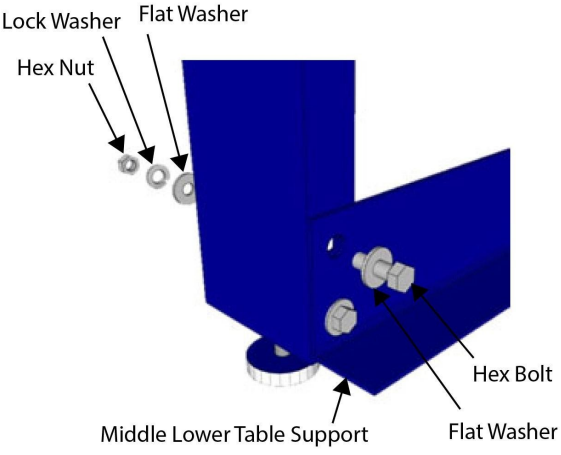
If working alone, keep safety strap attached until the frame is self-supporting to prevent injury or damage to tool.

Square table sides with the lower supports and snug the bolts enough to preload the lock washers.

Install Middle Lower Table Support



Install the middle lower table support. The horizontal flange should point to the front/flush end of the side rails.



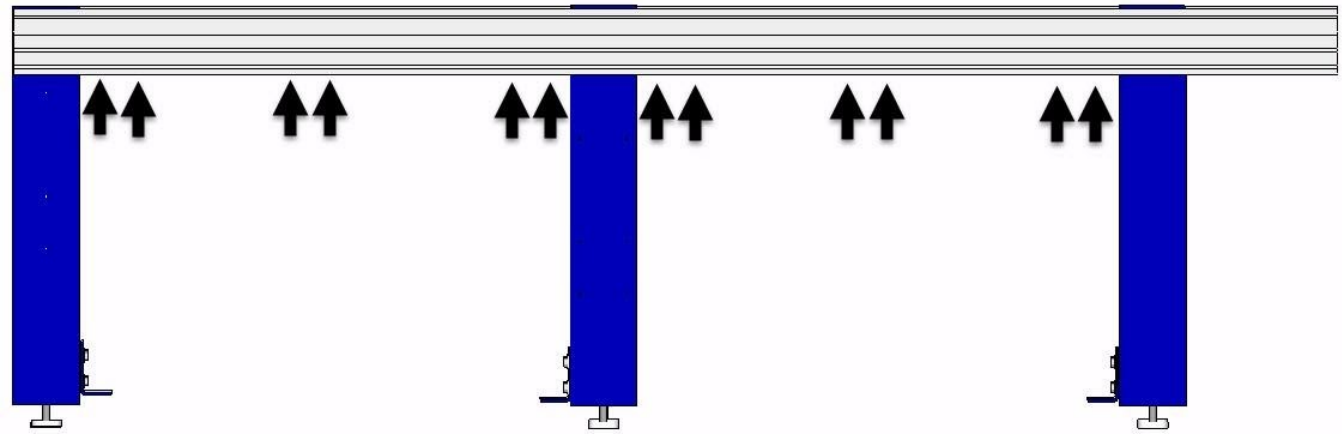
Secure middle lower table support to middle set of legs with the same order of 1/2” hex bolt and flat washer on one side, and flat washer/lock washer/ hex nut on the back side. Snug the bolts enough to preload the lock washers.

If the middle table levelers are touching the floor, raise them until they no longer make contact.

Insert T-Nuts in Bottom Slot

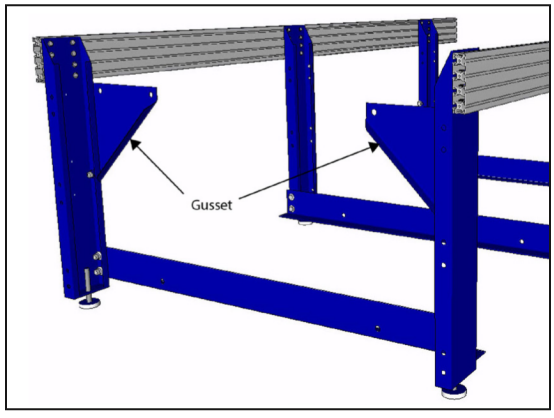
The upper table supports and cross supports are fastened to the table sides with threaded T-nuts. Insert T-nuts so the solid face is to the outside (face down) of the slot and move them to their approximate locations before mounting any components.

Note: Failure to perform this step will require disassembly to fix.



Note: This image shows the approximate T-nut locations for the upper table supports and cross supports for the PRS Gantry 96-48 table setup. A table configuration with more table legs or cross supports will require additional T-nuts as indicated on table drawing in the back of this guide. Two T-nuts are needed for every component.

Mount Table Supports and Gussets to Table Legs

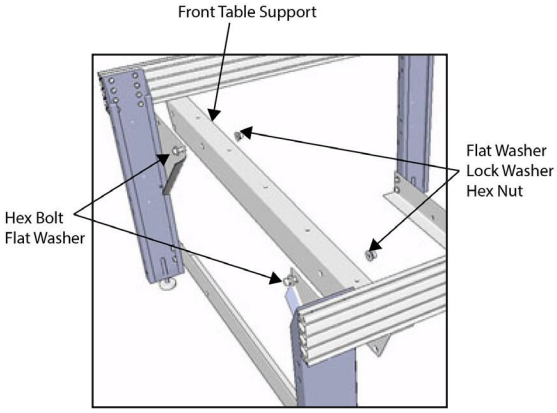


Orient the gusset with the flange facing the table leg. Use 1/2” hex bolt and flat washer on one side—flat washer, lock washer, and hex nut on the back side to secure the **bottom** corner of each gusset. When a gusset is properly oriented, the gusset flange will rest against the table leg, holding it in position. **Tighten bottom bolt only**; do not tighten the top bolt at this time.

Mount the middle two bolt locations of the table support to the gusset to hold the table support in place while the remaining hardware is installed.

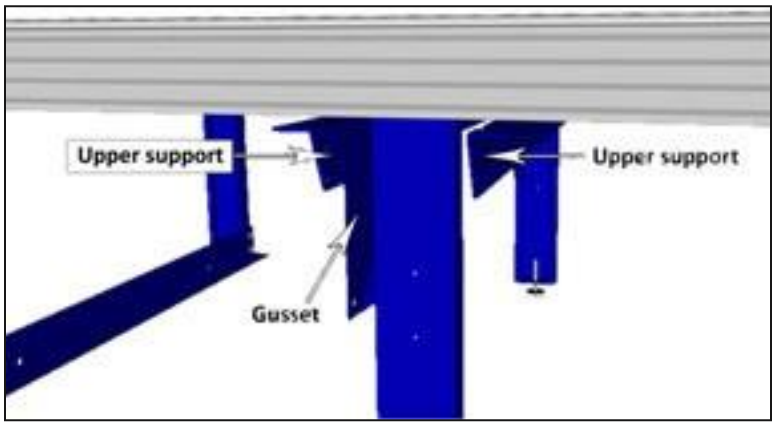
Install the 1/2” hex bolt and flat washer on one side, with flat washer, lock washer, and hex nut on the back side to secure each side of the table support and gusset. **Do not** snug bolts at this time.

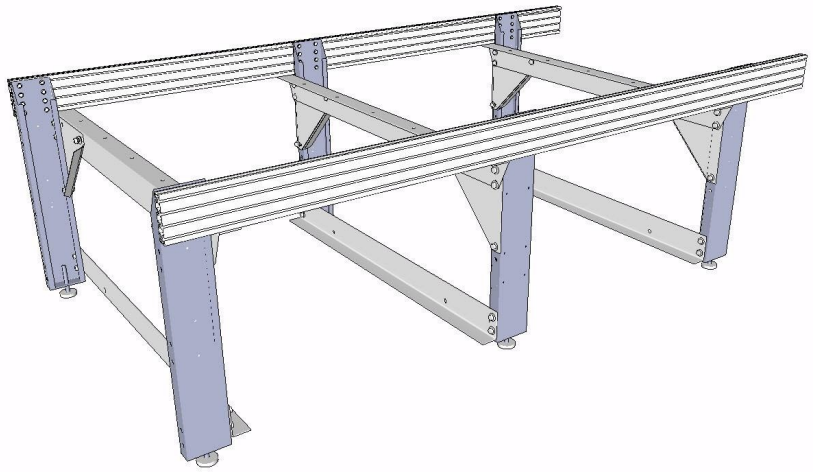
Note: The front table support has a ShopBot decal.



The middle legs will have upper table supports on both sides of the leg, but only one side uses gussets.

The middle table supports are installed facing the opposite direction as each other; the middle leg will be “sandwiched” between these two supports. If working alone, use clamps or a sling to hold the table support in place until the appropriate hardware is attached.

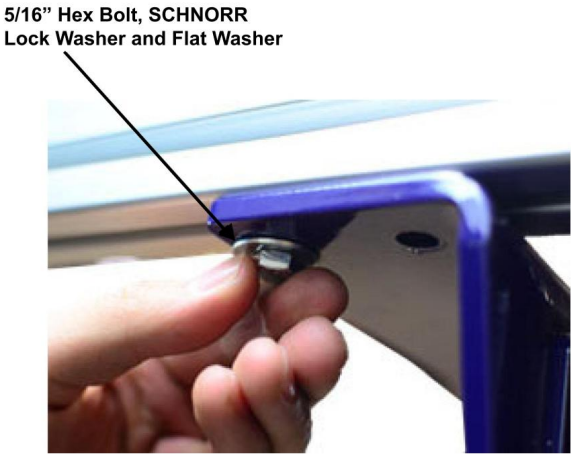




Install the remaining gussets and table supports using 1/2” hex bolt and flat washer on one side, and flat washer/lock washer/hex nut on other side.

Secure Table Supports and Cross Supports to Table Sides

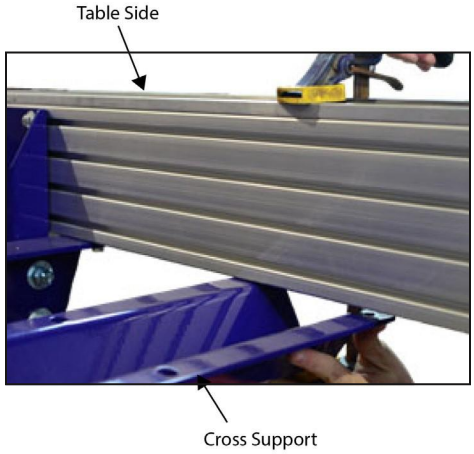
Use a zip tie to move the T-nuts (positioned earlier) so the threads are in line with the mounting holes.



Attach the upper table support to table side with two 5/16” hex bolts, SCHNORR lock washers and flat washers on each side of the upper supports.

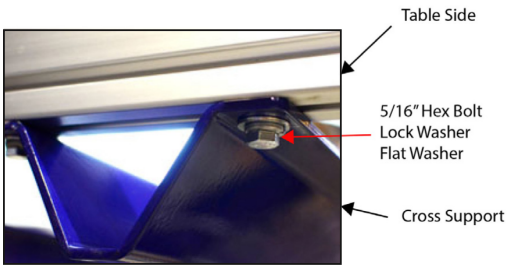
Do not fully tighten the table supports at this time.

Install Cross Supports



Use an assistant, clamp(s), or sling(s) to hold the cross supports against the bottom of the table side for installation.

Use a zip tie to line up T-nuts with mounting holes.

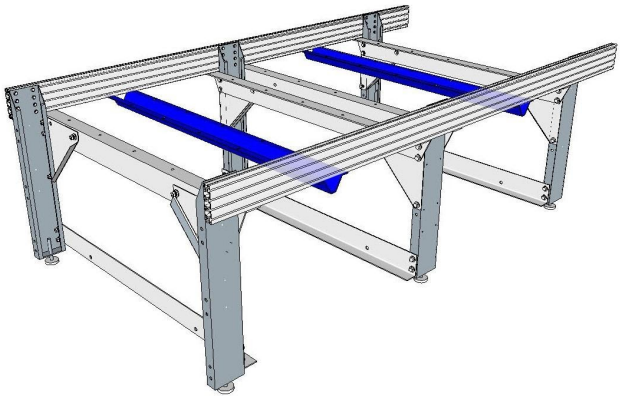


Attach each end of the cross support with 5/16” Hex bolt, Schnorr lock washer, and flat washer into the T-nuts.

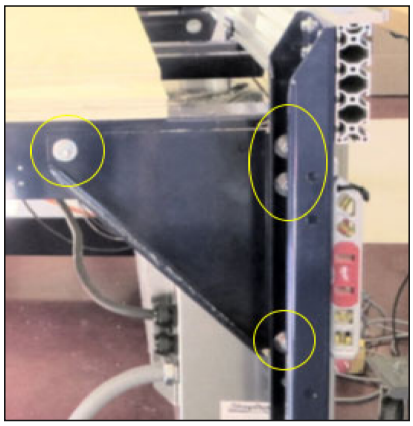
Line up the leading edge of each cross support with mark on beam and snug the bolts enough to compress the lock washers.

Do not fully tighten the cross supports at this time.

Ensure that there are no leftover cross supports or gussets. It is, however, typical to have extra table hardware such as nuts or bolts.



Square the Table

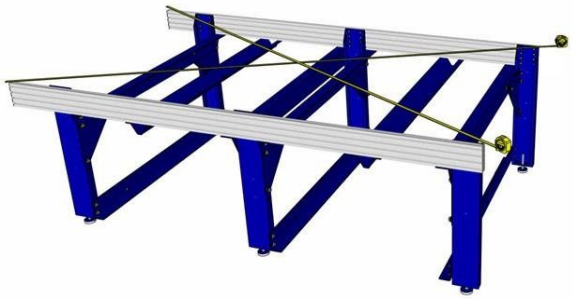


It is very important that the table is **level** and **square**. This means that all sides of the tool are on an even plane, and that the dimensions of the table are suitable to allow proper travel on all axes. Prior to leveling and squaring the table,ensure that it is located in the position where it will be used, as moving it can change these values.

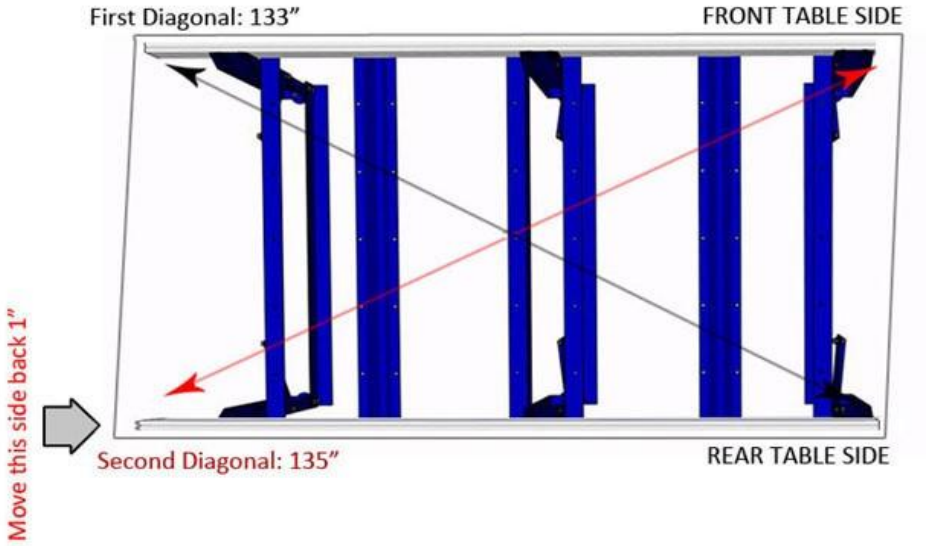
Note: When referring to the front side of the table, it is assumed that this will be closest to the 0, 0 point as indicated on the table drawing in the back of this guide.

Starting with the front side of the table, place a level on the outside of each leg to ensure that it is perpendicular to the floor. Pull the table into square side to side, and tighten the hardware on the gussets and table supports to hold the table square.

Measure the table across both diagonals. The measurements should be the same to within 1/16”. If measurements are different, adjust the rear table side. Ensure the bolts holding the cross supports onto the rear table side are loose enough to slide within the grooves.



This example is exaggerated to illustrate the correct method of squaring the table:

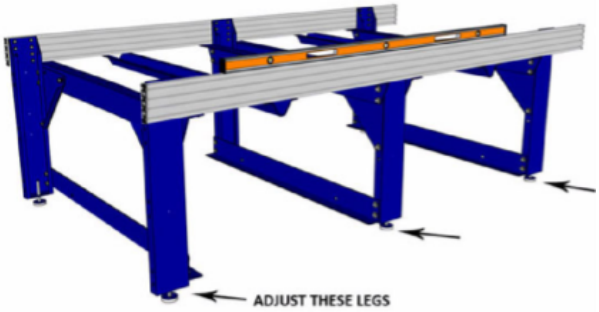


The rear table side should be moved half the difference between the two diagonal measurements. In the above example, there is a 2” difference between the measurements, so the rear table side should be moved 1”. With one person holding the opposite diagonal in place, use a rubber mallet (or a hammer and protective block of wood) to carefully knock the table into square.

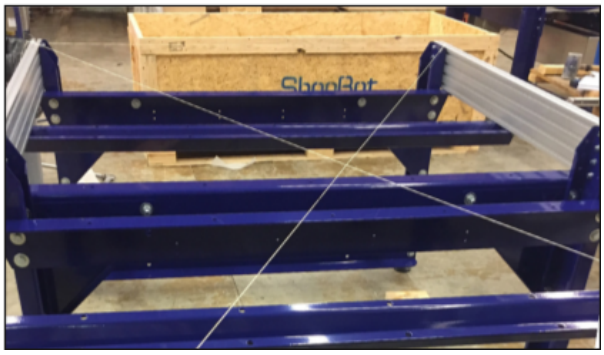
Once the diagonal measurements are verified, tighten all bolts fully, ensuring all table leg and table support bolts are secure.

Leveling the Table

Measure the distance between each table side to ensure they are equally distant along the entire length of the table. Once they are parallel, place a long level on one side of the table. Perform the main adjustments with the end legs, as the middle leg is primarily for support. Once level, you should not need to adjust this side again. **Do not** lower the middle leg levelers until the gantry is installed, and the table is level and square.



To adjust the other table side, place a long length of string around each corner so that they form an “X” in the middle of the table. Adjust the side of the table until the strings are very lightly touching. If the strings are overly tight or not touching, be sure to adjust **only** the one side, as the previous side should already be level.



Once strings are touching, the table should be level. Double check that tool is still square and adjust as necessary.

Install Rails

Lay the rail on top of the side with the rack facing away from the table side. Mark on the inside of the rail where the T-nuts go under each counter-bored hole in the top of the rail.

Set the rail aside, and slide the T-nuts into position, smooth side up.

Set the rail on top of the sides to make sure the T-nuts are visible under the counter-bored holes. Adjust as necessary.

Place one 5/16” x 3/4” Button head screw into each counterbored hole in the top of each rail.

Use a 3/16” Allen wrench to loosely install the bolts into the T-nuts to prevent any rocking, while still allowing some side to side play.

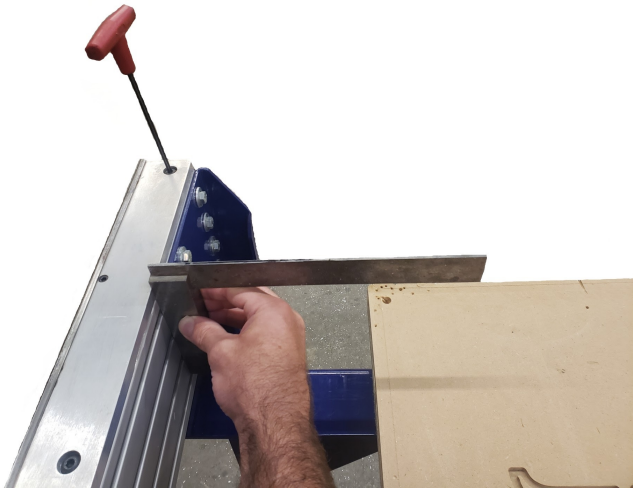
Do not fully tighten the bolts on either rail.

Adjust Front Rail

Align the end of the front rail with the end of the table side at the 0 position.

Start at one end of the table and tighten the bolts down the length of the front rail. While performing this step, check the inside of the front rail with a level or straight edge and make it flush to the table side, ensuring that the rail is perfectly straight and square with the table side.

Do not tighten the rear rail at this time.



Section 3. Gantry Installation

Introduction

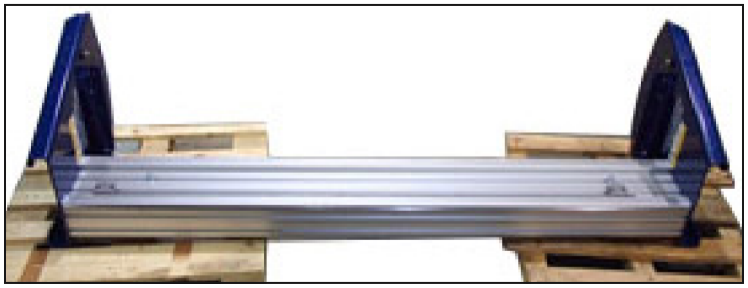
The gantry will come mostly assembled in the crate. Assistance will be required to safely lift the main assembly and place it on the table assembly.

Tools Required

Wrench, Allen, 5/16”
Wrench, 5/8”
Wrench, 1/2”
Wrench, 1”
Wrench, Allen, 1/4”
Wrench, Allen, 3/16”

Install Gantry

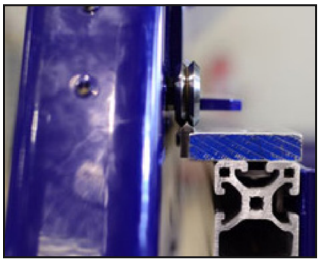
Caution: The gantry is approximately 200 pounds and awkwardly weighted. Lifting the gantry yourself is **not** recommended, and can cause injury, damage, or improper installation. For your safety, the following steps should be performed with at least three assistants.

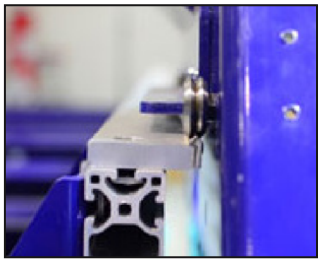


With help from another individual, remove gantry from packaging and carefully place on floor near table. Before proceeding, ensure front rails are already tightened.

Have each person grab an end of the gantry and slowly rock it forward, allowing for a better grip underneath. Then, lift it into position over table end, as shown.

The gantry wheels should ride on each rail as shown in the image to the right.

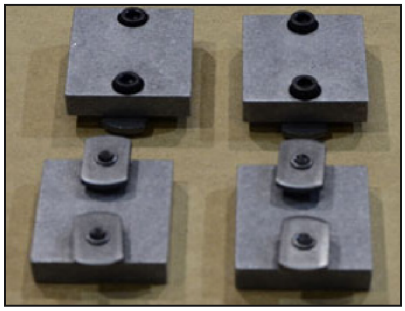




Adjust the Rails

Align the rail by running the gantry up and down the length of the rail while watching from above to make sure rail is centered in the wheel. Starting at one end of the gantry, adjust, then tighten the rail as the gantry is slid down the length.

Mount the X-Axis Stop Blocks and Proximity Targets



Assemble X-axis mechanical stop blocks using the X-axis mechanical stop, 1/4-20x1/2 Hex Cap Screws, and 1/4-20x3/8 Socket Head Set Screws.

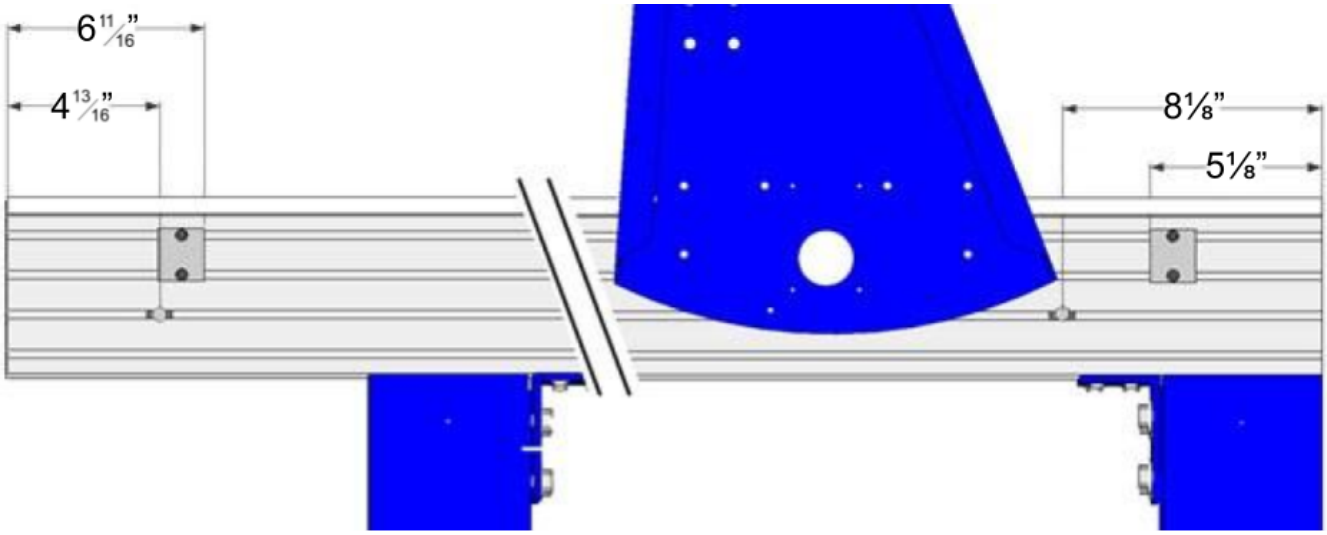
Assemble the X proximity switch targets with the 1/4-20x3/8 Socket Head Set Screw, T-nut, and 5/16-18x3/4 Hex Cap Screw.

Caution: The mechanical stop blocks will not stop the gantry from rolling off the end of the rails until the motors have been attached to the end plates. Use caution when rolling gantry near the end of the rails, or place a clamp at the end of the rails to prevent the gantry from rolling off the end of the tool.

The X-axis mechanical stop blocks prevent the gantry from leaving the rails. One goes at each end of both side plates. They must hit on both sides of the gantry at the same time. Orient the bolts vertically in the top two slots on the side rail. The stop block should just clear the geared track below the rails.

Leave stop blocks loosely attached, they will be adjusted and tightened in Section 10.

The X-axis proximity switch targets provided should be positioned so that the X proximity switch just clears the stop blocks by 1-2 mm (approximately 1/16”). They should be placed at each end of the back rail (same side as the control box side). The targets will be centered under the proximity switch when the pinion is butted against the stop block.

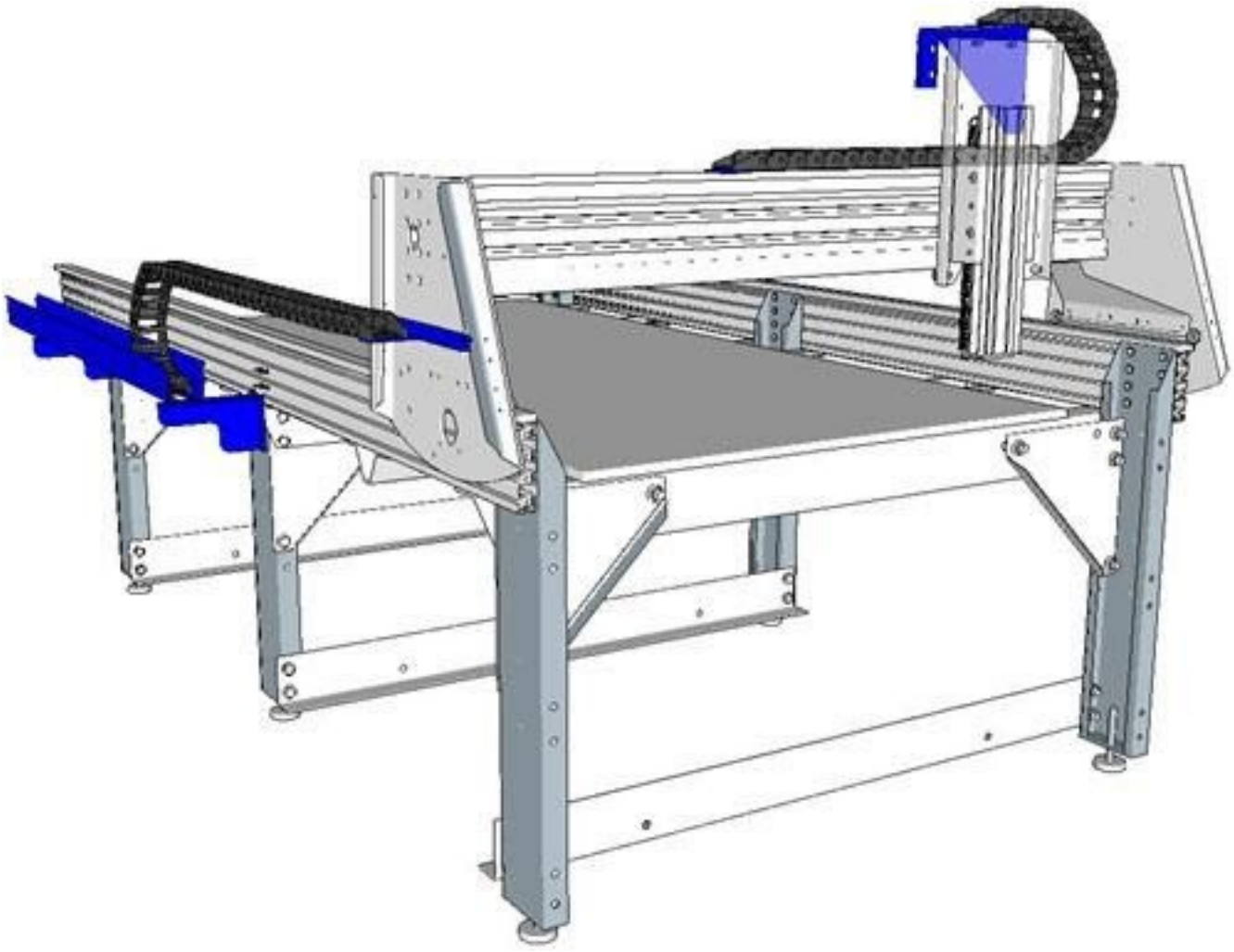


Section 4. Cable Carrier Installation

Introduction

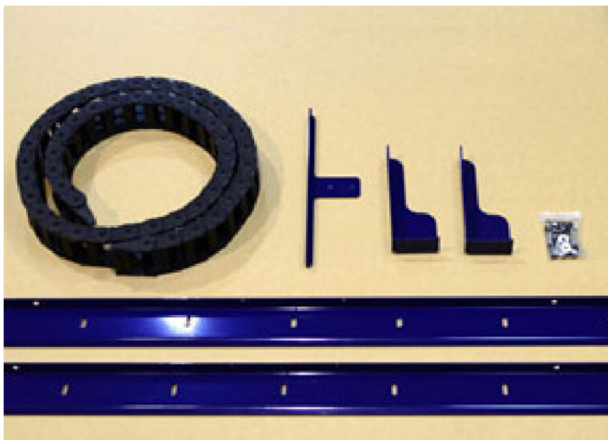
Cable carriers are also called “e-chains”. These components are used to house and protect the power and communication cables during operation. As the machine moves, the carriers flex and support the cables to keep them organized and prevent tangling or damage. All tools feature a Y-axis cable carrier going from the top of the gantry to the YZ car that will be pre-installed. X-axis cable carriers are included with PRSalpha and PRSstandard machines 96” and above. 48” or 72” X-axis machines use the included “cable carrier kit” to keep the cables organized along the X-axis. Instructions for these should be included in the shipment as a separate document. If not, they can be accessed via the Support area of our website in the Documentation section.

The cable carriers are sized to match the length of the ShopBot’s axes. They are center-mounted, meaning that they will be shorter than the actual length of the machine.



Hardware

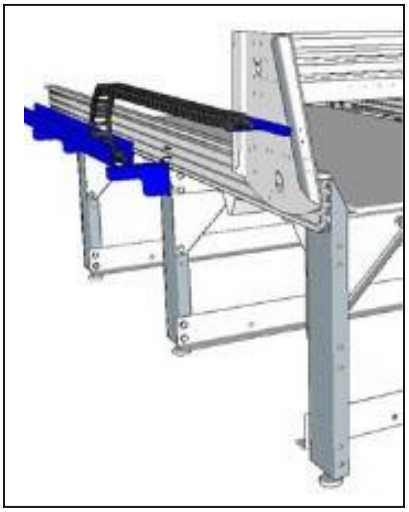
Part Name	Quantity	ShopBot Part Number	Notes
5/16-18 Twist-in T-nut	2	002240-01	
5/16-18 x 5/8” flat head screws	2	002279	
¼-20 x 1/2” socket head screws	2	001601	
¼” lock washers	2	000031	
¼” flat washers	2	000534	
10-32 x 3/4” flat head screws	4	002246	
#10 flat washers	4	000629	
#10 lock washers	2	000539	
10-32 hex nuts	2	002247	
E-chain trough bracket	1	002155	
5/16-18 x 3/4 Button head screws	2	002033	
5/16” Lock washer T-Nut	2		
T-Nut	2	000728	
64” E-chain trough or 74” E-chain trough	2	002158 002159	
1/4-20 x 3/4 Flat head screws	4	001600	
1/4" Lock washer	4	000031	
1/4" Flat washer	4	000030	
1/4" Nylock nut	4	000454	
Alternate parts:			
12” E-chain trough bracket	2	003293	
5/16-18 T-nuts		002498	
X upper E-chain bracket	1	002156	



Parts for X-axis carrier 6” Z

Parts for X-axis carrier 12” or 24” Z

X-Axis Cable Carrier



X-axis cable carriers are included with all PRSalpha and PRSstandard tools.

The first step is to assemble the trough for the cable carrier to ride in.

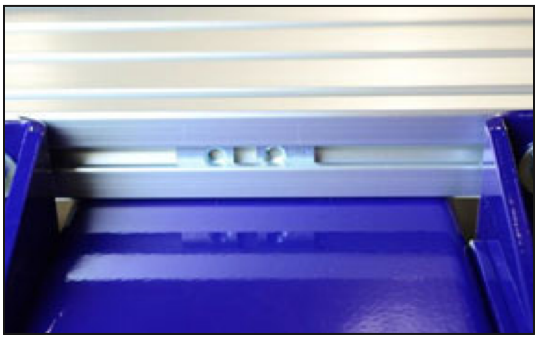
Attach one end of the cable carrier to the trough at the midpoint of the table, and the other end attached to the support on the gantry.

Diagrams of where to place the brackets for the troughs for different sized tools are found at the end of this section.

Install Trough Brackets for ShopBots with 6” Z’s

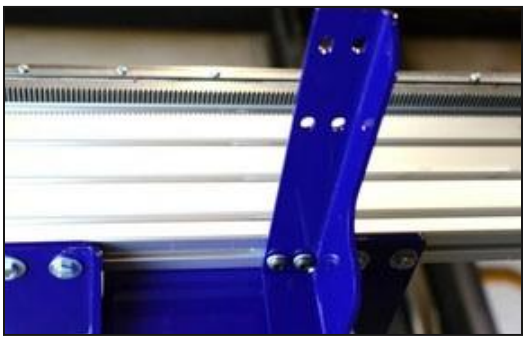
Depending on the length of the machine, the number of trough brackets needed can vary from 2-4. The hardware called for here will reflect the mounting of a single trough bracket for a tool with a 6” Z.

Note: Tools configured for 12” and 24” Zs have dual side plates and require different mounting brackets.



Place ball and spring pivot inserts into slot on bottom of the table side in line with the middle table leg.

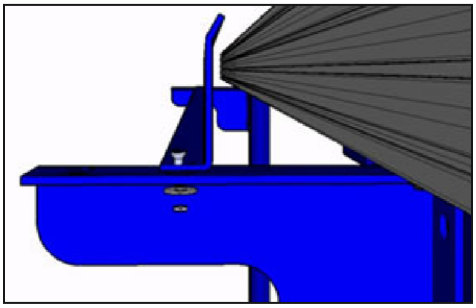
Inserts will need to be positioned so the holes are turned toward each other to match the hole spacing of the trough bracket.



Loosely install the cable carrier trough bracket with button head screws, lock washers, and flat washers.

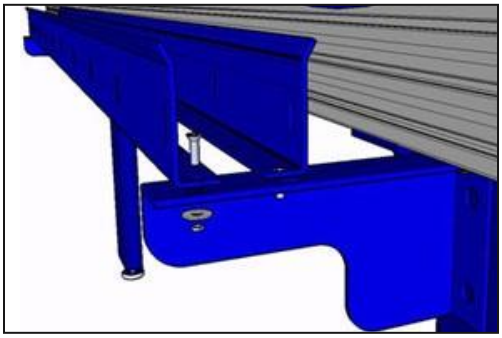
Mount additional trough brackets as needed. Most often, the middle leg and the back leg (farthest from the 0, 0 home position) are used. See diagrams at the end of this section for common configurations of the brackets and trough.

Install the X-Axis Trough: 6” Z-Axis

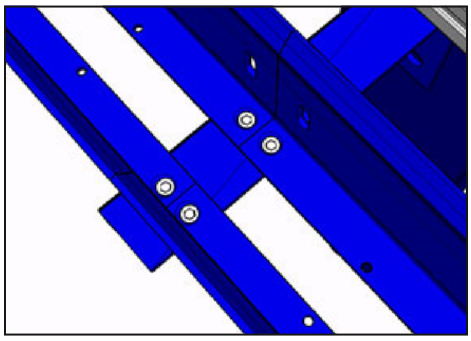


Position the first cable carrier trough so the holes closest to the edges are over the inside holes in the trough brackets.

Fasten the trough to the bracket using 1/4” flat head screws, flat washers, and nylock nuts. Leave these loose until range of motion is checked.



Repeat installation of the other trough piece, using the outer holes on the bracket.

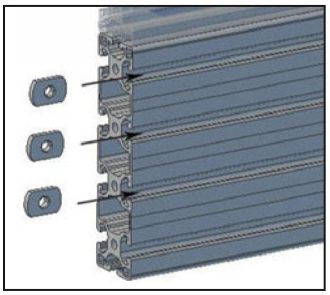


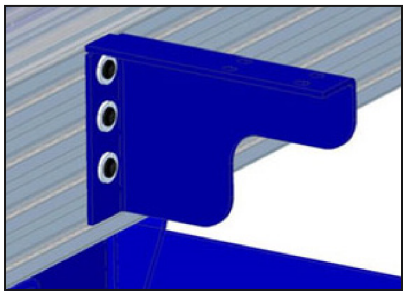
For models that need extended lengths of trough (longer than 96” in the X), use the second set of holes in the cable carrier bracket to install the troughs next to each other.

Machines with 12” and 24” Z-Axis

Machines with two side rails require alternate mounting brackets for the X-axis trough brackets. The brackets are attached to the outside of the lower frame rail with T-nuts.

Slide a 5/16-18 T-nut into each of the top three grooves on the lower table side extrusion, with the flanged face of the nuts facing towards the inside of the table. Loosely thread a 5/16-18 x 3/4 Button Head Screw and 5/16 Lock Washer through the trough bracket into each T-nut, as shown below.



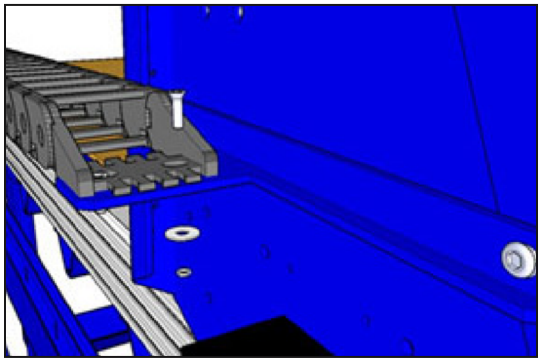


Repeat this step with the remaining bracket(s) (extended tables may have 3-4 brackets). Keep the mounting hardware loose so the brackets can slide along the table side in order to be moved into the proper position.

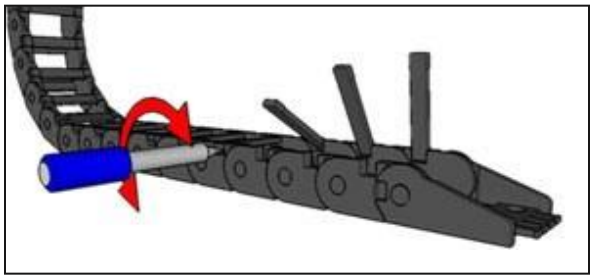
Attach the trough to the brackets in the same manner as for the tools with the 6” Z.

Cable Carrier to Upper X Bracket

The ShopBot PRSalpha and PRSstandard tools come with an X cable bracket pre-installed.

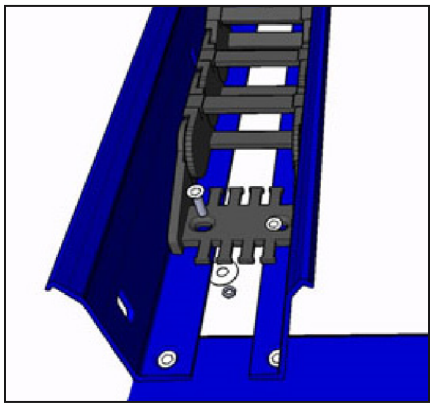


Attach one end of the cable carrier to the tab that extends from the X upper cable carrier bracket. Use flat head 10-32 screws, flat washer, lock washer and nut.



Cable Carrier to Lower X Bracket

Open the first five access gates by inserting the tip of a flathead screwdriver into either side of the hinged access gate. Turn the screwdriver approximately 1/4 turn in each direction until the side of the access gate releases.



Attach that end of the cable carrier to the holes located 3 1/2” (64mm) from the end of the trough and closest to the middle of the machine.

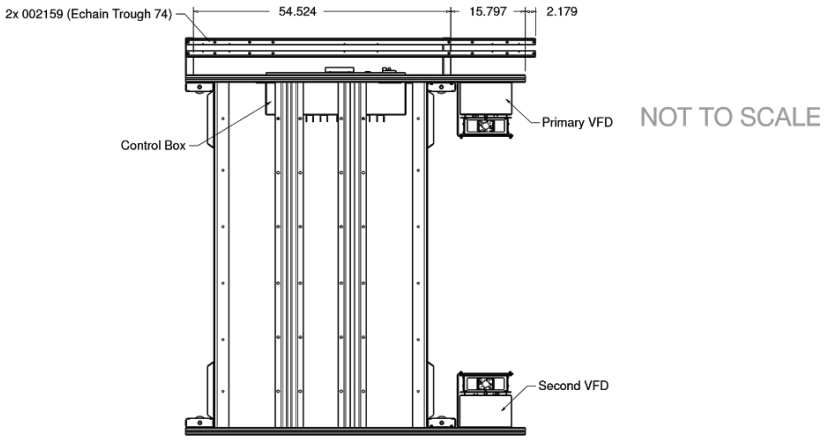
Use flat head 10-32 screws, flat washers, lock washers, and nuts to attach the lower portion of the cable carrier to the trough.

Test Cable Carrier Mobility on Both Axes

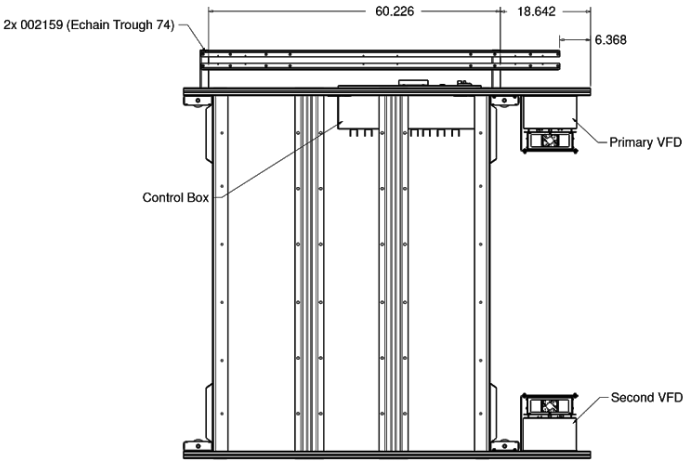
Place the open access gates close to their clasps to keep them from snagging and breaking off while testing the carrier mobility. Move the X-axis back and forth the full extent of travel. The cable carrier should not feel as though it is binding or under tension at any point. If need be, adjust the trough brackets slightly along the table side (X-axis). Finish by tightening the 5/16 button head screws holding the brackets to the table. The lower end plate on the Y-axis can also be adjusted slightly if the Y-axis binds.

X-Axis Cable Carrier Configurations

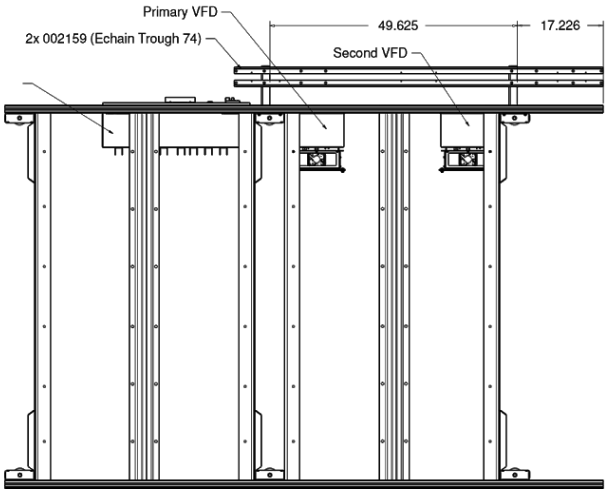
X48



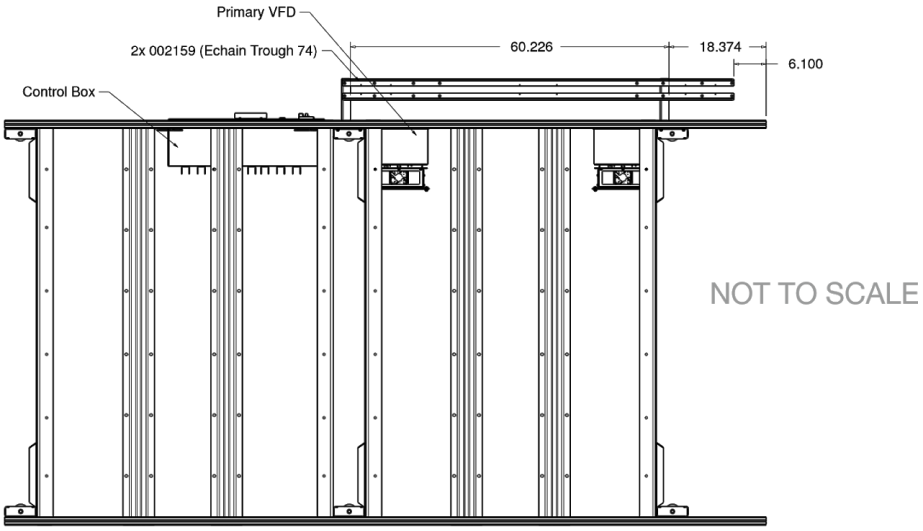
X60



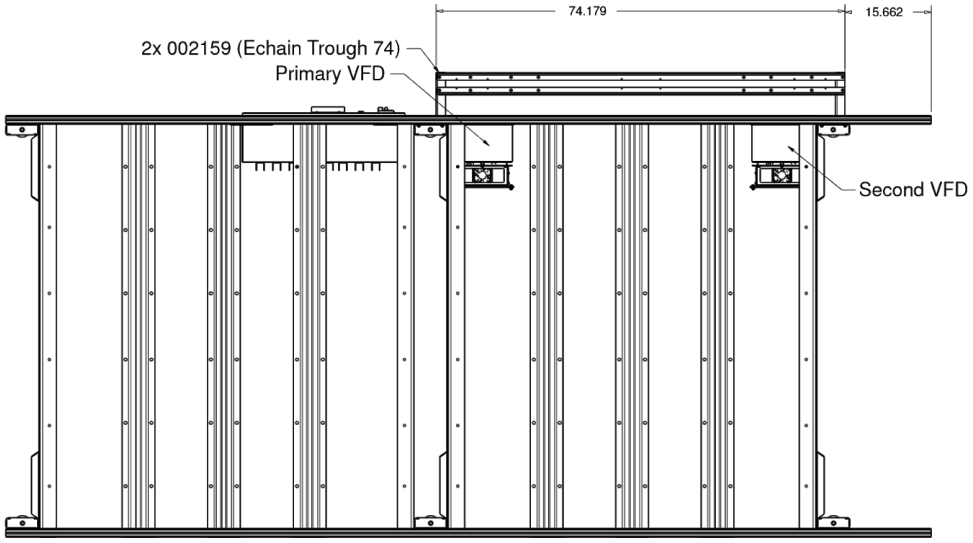
X96



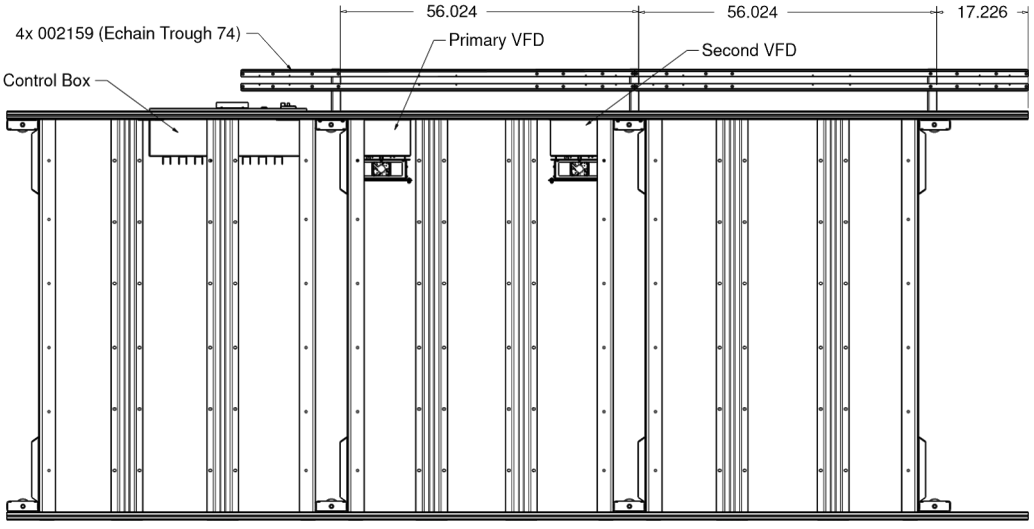
X120



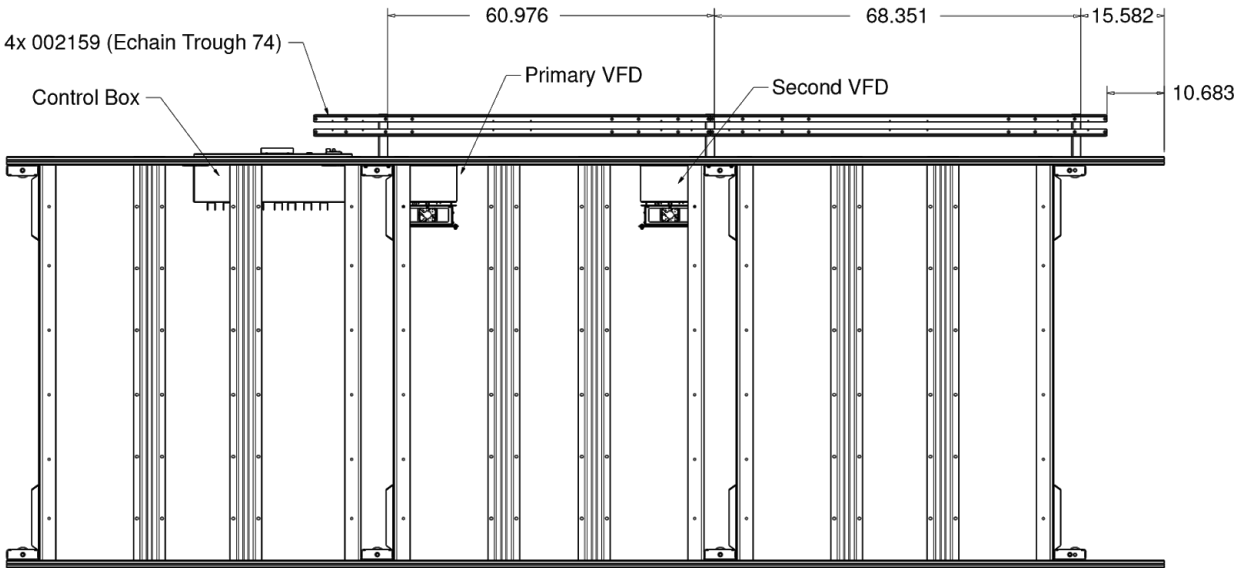
X144



X168



X192



Section 5. Control Box Installation

Introduction

All power, inputs, and outputs are routed through the control box. In this section, the control box will be mounted to the table. The control box for your PRS Standard tool has been designed for easy, quick installation; internal wiring has all been completed at the factory. All motor, sensor and control connections will be made through connectors on the side of the box, with internal connections only needed for main power and spindle drive power.

Note: This section shows a conventional table with a 6” Z-axis. Tables configured for 12” and 24” axes have an extra side rail on each side and require an alternate mounting bracket. Refer to the last page of this section for the alternate orientation. Control box mounting for 18” Z-axis tables is identical to the 6” table.

Refer to drawings in the cable carrier section for control box and VFD location.

Installation

The control box for your PRS Standard will be mounted on the same side of the tool as the E-Chain trough. The box will be positioned at the end of the E-Chain trough where the cables exit the E-Chain as shown in figure 1.

Figure 1: Standard Control Box mounted on 96x48 tool.

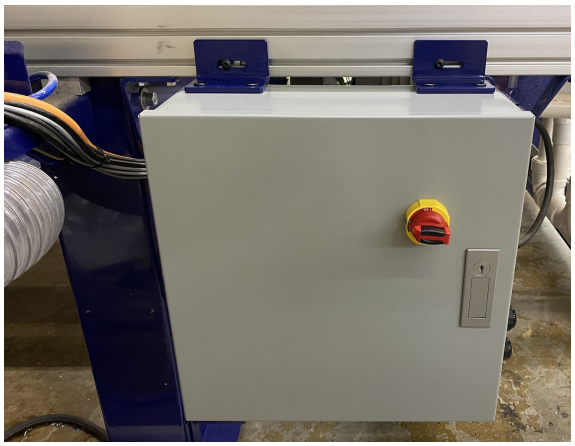


Figure 2: Close-up of mounted control box.

Two L shaped brackets are attached to the top side of the control box. Inside the box, there will be a plastic baggie containing a set of screws and drop in “T-Nuts” that will be used for mounting the box. Press the T-Nuts into the bottom T-Slot of the table-side extrusion roughly 12” apart. Hold the box up and align the slot on one of the mounting brackets with one of the T-Nuts in the slot. Insert one of the 5/16-18 bolts through the slot and thread the screw in loosely -- just enough to support the weight of the control box while you align the second mounting screw.

Slide the control box to either the left or right to align the second mounting bracket with the second T-Nut. Insert a screw through the slot and begin to tighten the screw. With both screws inserted, make sure that the control box is positioned roughly 8 inches from the end of the E-Chain trough before tightening the mounting screws. When you are satisfied with the position, tighten both screws to lock the control box in place as shown in figure 2.

Section 6. VFD and Spindle Installation/Router Installation

Introduction

This section covers mounting the variable frequency display (VFD) and spindle, or a router, depending on which one you purchased with your machine.

If attaching Automatic Tool Changer (ATC), refer to **ATC Installation Manual**. This document was provided with the tool, and can also be accessed via the Support area of our website in the Documentation section.

Refer to drawings in the cable carrier section for VFD location.

VFD Installation

ShopBot Tools with spindles use a VFD to regulate input power and control rotation speed. There are two major body sizes, 10” and 16”, which are used depending on specific voltage and phase requirements. The supplied bracket will work for either size.

Hardware

Part Name	Quantity	ShopBot Part Number	Notes
Yaskawa V1000 VFD	1		Part numbers vary based on the options available. Refer to paperwork to determine model.
VFD Mounting Kit V1000	1	003065	
FHSCS 1/4-20x5/8	2	003064	
BHSCS 1/4-20x3/4	4	002135	
flat washer 1/4 USS Z G5	6	000534	
Nylock hex nut 1/4-20 Z	6	000454	
VFD mounting strap	2	003063	

Determining the VFD Model

There are two main types of VFDs: a 10” model and a 16” model. These can be easily identified by their size and model numbers. Model numbers are found on the front of the VFD underneath the “RUN” and “STOP” buttons as shown on left.

There are five different amperage configurations. These will not impact installation, but it may be beneficial information for tech support.

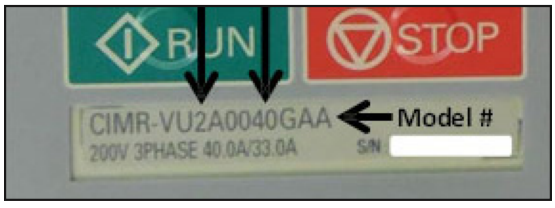
Voltage Amperage (Determines Size)

An example model number is shown below.

The model number is CIMR–VU2A0040GAA.

2 = 200-240 Vac, 3-phase

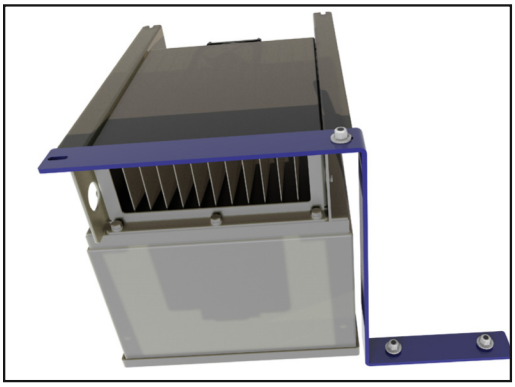
4 = 380-480 Vac, 3-phase

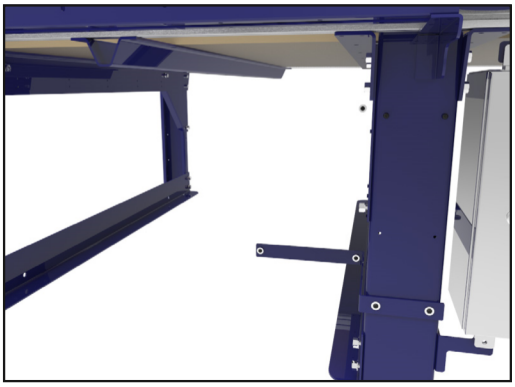


Mounting the VFD

The 10” VFD mounts to the top and middle set of holes in the middle leg of the ShopBot gantry tools with the VFD 1000 mounting kit.

It is easiest to first put the top bracket on the top of the VFD. Then, attach the bottom bracket to the leg and attach the VFD hardware very loosely. With the VFD balanced on the bottom bracket, attach the top bracket to the leg.





Insert screws, washers, and Nyloc nuts in the remaining holes and tighten.

NOTE: Depending on size of VFD, you may need to screw the bracket into either the middle or lower set of holes.

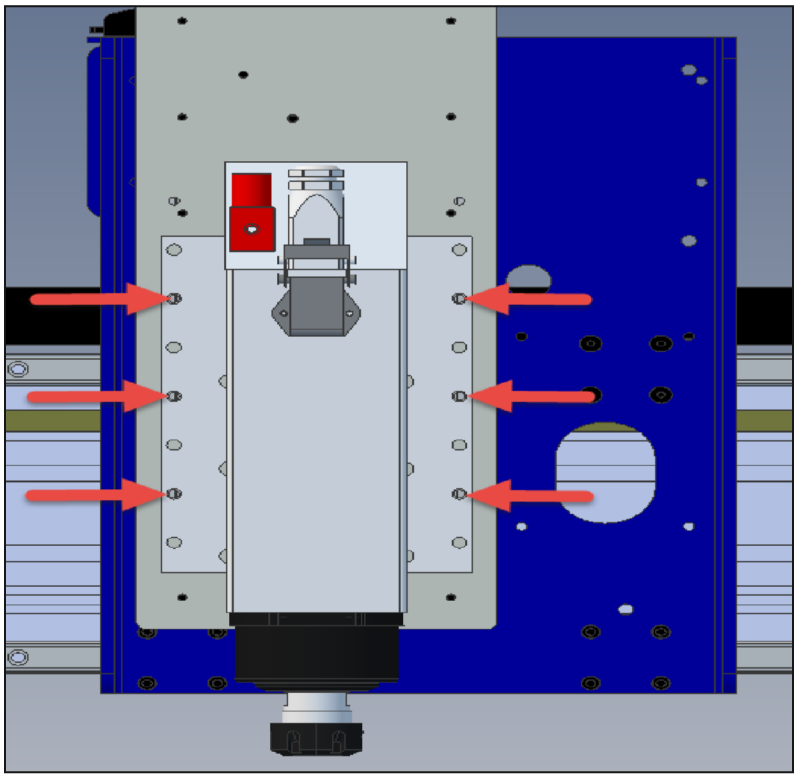
Leave VFD cables neatly in place until routing and wiring in Section 8.

Spindle Installation

Hardware

Part Name	Quantity	ShopBot Part Number	Notes
M6 - 1.0 x 25mm Socket Cap Screw	6	002925	

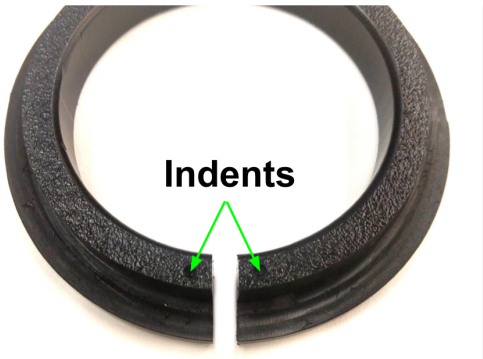
Attach Spindle



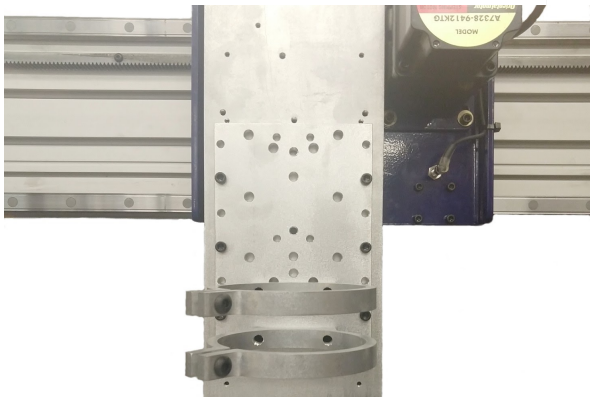
Using the six socket cap screws provided, mount the spindle to the Z-axis extrusion on the YZ car. If you experience resistance with any of the screws, uninstall and ensure the spindle is properly lined up with the holes before screwing in again.

NOTE: Misalignment of the spindle can result in poor cut quality, inaccurate dimensions, and reduced bit life. Squaring the spindle will occur after spoil board installation.

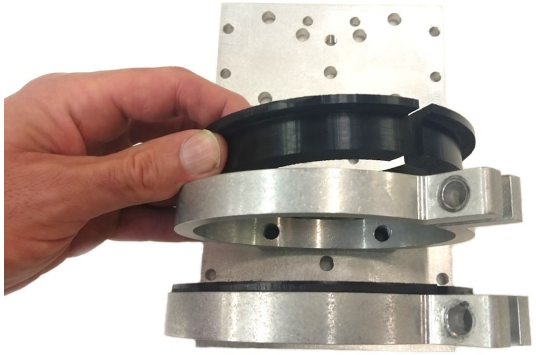
Router Installation



The router kit comes with three black adapter rings, one of them has two indents in the bottom. Set this one aside, it is used for the dust foot in a later step.

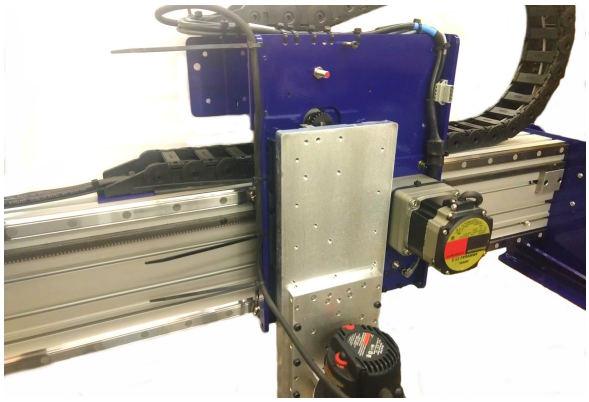


Start by mounting the router plate to the Z using the six M6-1.0 x 25mm SHCS (002925) that were provided with the tool. You can adjust the mounting plate up or down as needed for clearance depending on what you are routing.



Insert the two black adapter rings (006229) into the two mounting rings on the mounting plate. Make sure the notches in the adapter rings line up with the notches in the mounting rings. You may need to loosen the two bolts located on the mounting rings to allow the adapter rings to drop in place.

Lower the router all the way down into place, and tighten the two bolts in the mounting rings until the router is snug. It's important to make sure the bolts are tight enough to prevent twisting of the router while cutting.



Using zip ties, run the power cable from the router up the left side of the blue Y carriage plate, and then into the echain. Make sure there is enough slack in the cable so it doesn't bind up while the Z moves up and down.

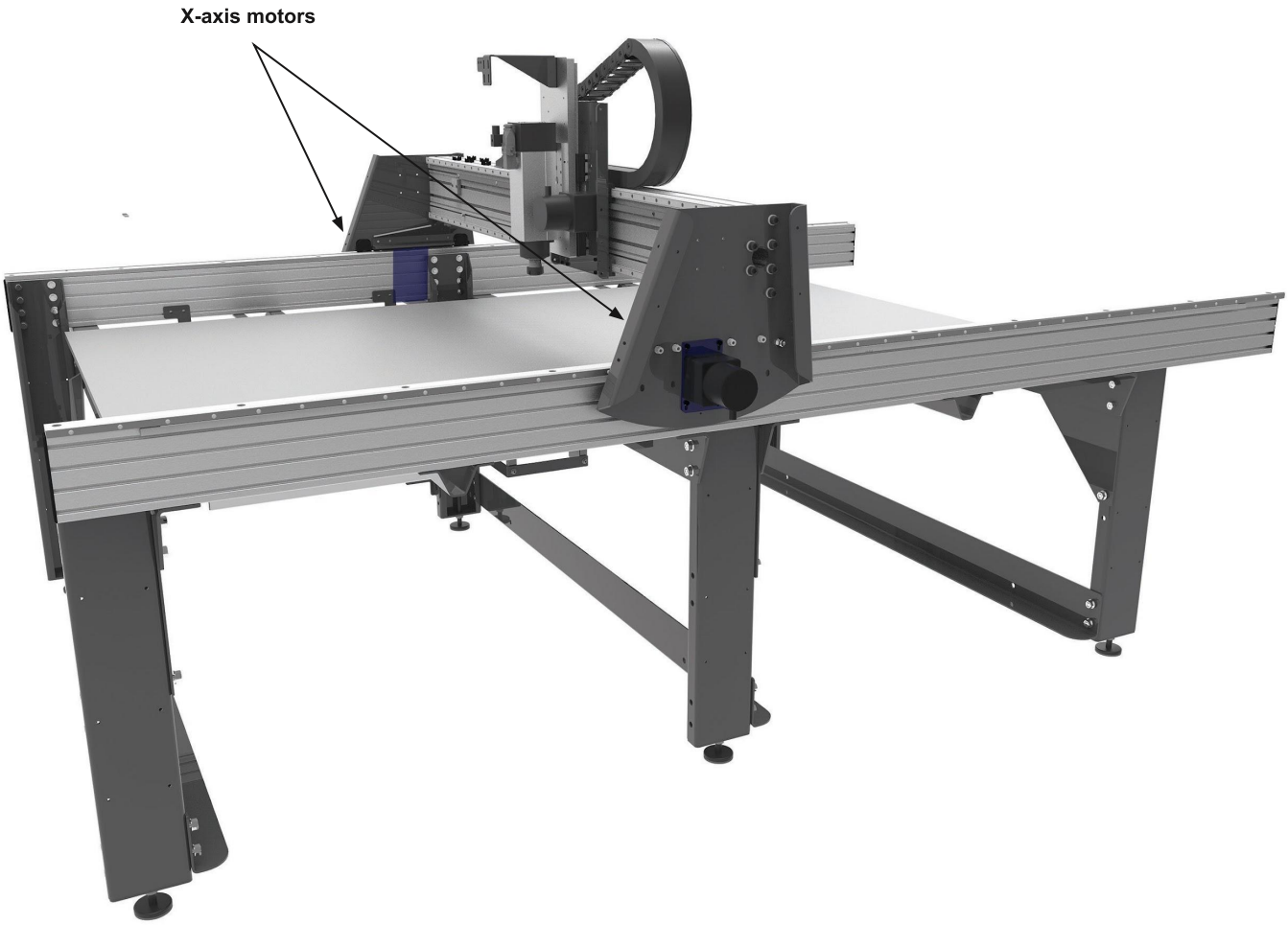
Grab the adapter ring (006266) with the two indents in the bottom, and place it inside the open ring in the dust foot.

Loosen the screw on the side of the dust foot, and slide the dust foot with the adapter ring in place onto the router. It is a snug fit, so a little force may be needed. Tighten the screw on the side of the dust foot to clamp it in place.

Section 7. Mounting X-Axis Motors

Introduction

The motors providing movement along the X-, Y-, and Z-axes use a geared pinion that engages a rack mounted to the side rails and gantry. In this section, the motors to power the X-axis will be installed. The Y- and Z-axis motors come preinstalled on the YZ car and will only need minor adjustment.



Hardware

Part Name	Quantity	ShopBot Part Number	Notes
Pinion 30 tooth	2	000071	
Check if standard pinion gears are same size			
X1 motor	1	See chart below	
X2 motor	1	See chart below	
M6-1.0 x 14mm socket head cap screw	8	005528	Preinstalled on tool
M6 lock washer	8	005227	Preinstalled on tool

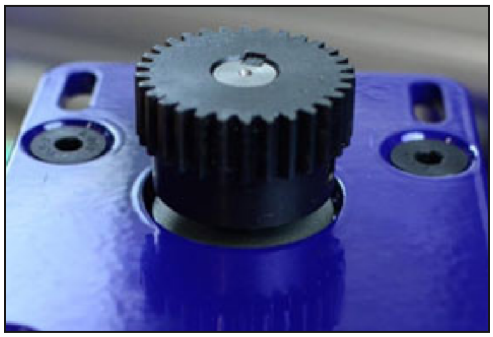
Motors

	Standard	AR	AS
Part Number (110v)	A7328-9412KTG	ARM98AC-T7.2	x
Part Number (220v)	x	x	ASM98ACE-T7.2
	Domestic	Domestic	International

Mount Pinions to Motors

Pinions can be found in a bag that includes hex keys, lithium grease, and the eccentric bearing wrench.

Inspect the motor cables to make sure they are in good condition and free of cuts or kinks. Remove the plastic sleeve from the motor shaft.



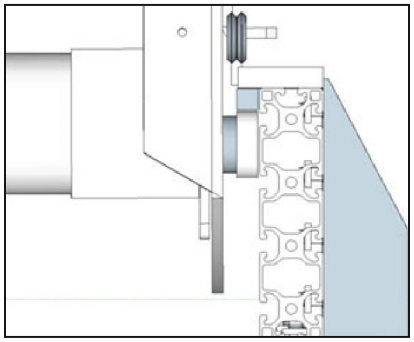
Slide pinion onto motor shaft while ensuring the key stays in place. If resistance is encountered, loosen set screws with 1/8” hex key.

Secure set screws with the 1/8” hex key.

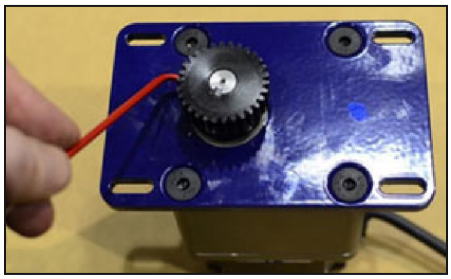
Check Alignment of Pinions with Rack

To ensure full engagement and even wear, the outside edge of the rack should line up with the edge of the pinion. The pinion should never rub on the face of the aluminum side plate extrusion.

This image shows the pinion in correct alignment.



Adjust Pinions (If Required)



Remove any motors requiring pinion adjustment.

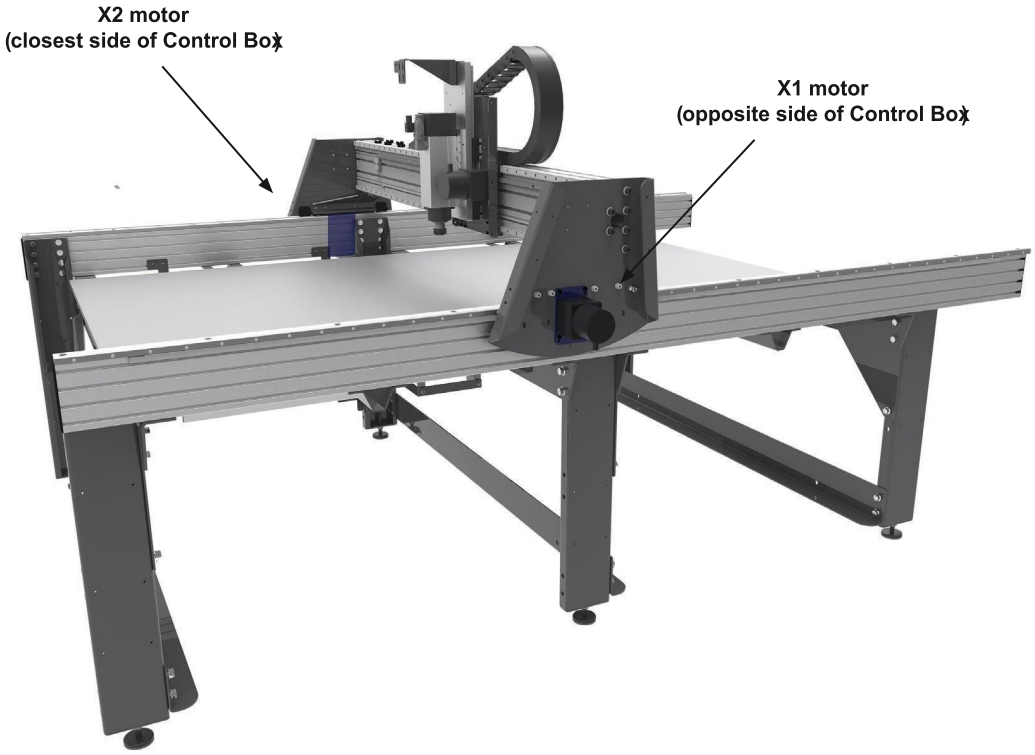
Loosen the pinion set screws using the 1/8” hex key. Adjust as needed and retighten the set screws.

Replace motors and confirm pinion/rack alignment.

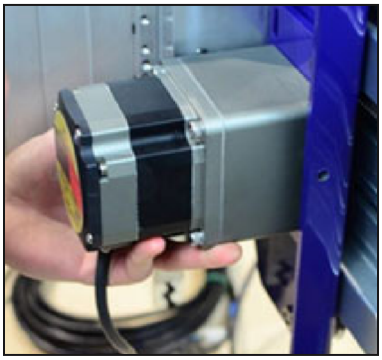
Ensure that the pinion gear set screws are really tight against the shaft.

Apply a small amount of Lithium grease to each pinion. This will ensure smooth movement and prevent corrosion.

Mounting Locations



Position Motors on Tool



Mounting hardware (M6-1.0 x 12mm socket cap) is already fitted to the gantry end plates and YZ car where the motors will be mounted.

Place each motor in proper location and loosely secure the motor with the mounting hardware and a 5mm hex key.
Keep mounting bolts loose so motor plate can slide up and down.

Engage Pinions with Rack

Push motor up to engage pinion with the rack. It may be necessary to slightly jiggle the motor to ensure teeth interlock.

Maintain firm upward pressure (15-20 lbs) with one hand while tightening mounting bolts.

If necessary, a second person or quick clamp can hold the motor in position. Once pinion is secure on rack, snug all hardware.

Section 8. Wire and Cable Routing

Hardware

Part	Quantity	ShopBot part number	Notes
Proximity switch	1	002740	
Z zero plate	1	14524	
Remote stop button	1	002723	PRSstandard

Motor and Proximity Switch Cables

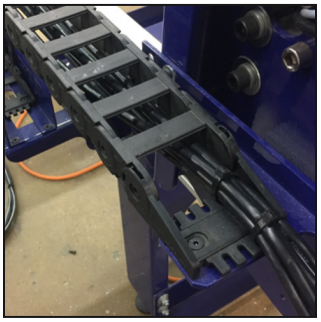
All cables for the motors and proximity switches are factory pre-installed on your tool's gantry and will need to be routed and connected.

Uncoil the bundle of pre-wired cables from gantry and remove temporary cable wraps.

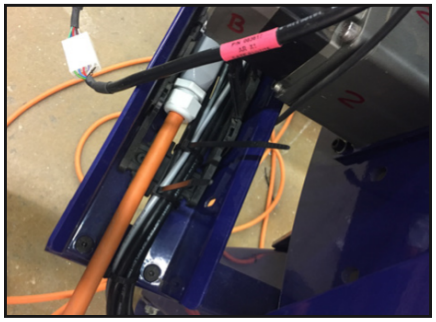
Run bundle of wires through X cable carrier and close enough to the cable carrier covers to hold wires in place but still provide movement.

Loosely secure wire bundle to strain relief at bottom of cable carrier on same side as top.

Run wire bundle under table and feed through cable entry in right side of the control box.

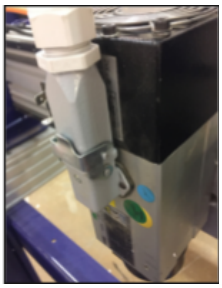


Spindle Cable



Uncoil spindle and run power cable from VFD under table to X cable carrier Open cable carrier covers using flat head screwdriver method from section 4 of this guide and place spindle cable into cable cable carrier opposite motor/ proximity cable bundle. Close cable carrier covers.

Run spindle cable up to Y cable carrier, following the path of the motor/proximity cable bundle. Open cable carrier cover and feed cable along opposite side of motor/proximity cable bundle. Close cable carrier cover.



Arch spindle cable over the YZ car and connect to the spindle, locking connector in place.

Work the cable back toward VFD. Take up slack and secure strain reliefs at both ends of Y cable carrier using cable ties. Secure cables to strain reliefs at both ends of X cable carrier, binder blocks on top of beam, and table legs.

Spindle Logic Cable

Uncoil the spindle logic cable and run from VFD into control box through cable entry.

Finishing

Manually move tool along each axis looking for even movement and binding. If binding, resistance, or height tensions occurs, relieve tension and re-secure cables as needed. Clip off all zip tie ends using wire snips.

Spindle Fan Cable Installation

Uncoil cable.

Connect plug and tighten screw, locking it into place.

Zip tie the cable to the spindle power cable up to the point where it would enter the Y carrier.

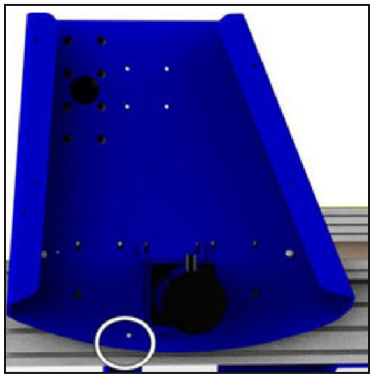
Proximity Switch Installation

NOTE: The Y- and Z-axis proximity switches and corresponding cables come pre-installed and wired for all tools purchased after June 2017.

For reference, the cables are marked with colored tape at both ends for ease of identification:

Blue: Y-axis, Red: X-axis, White: Z-axis

X Proximity Switch



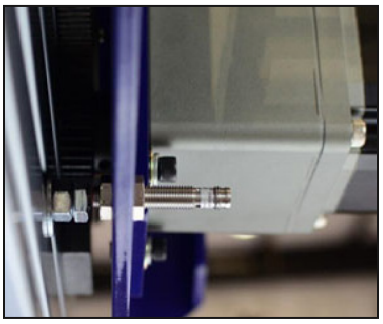
The X proximity switch is mounted in a threaded hole near the X1 motor on the gantry end plate.

Roll the gantry until it is against the stop blocks. The proximity switch hole should be centered over the target bolt. Adjust the proximity target if needed.

Note: The powder coating process sometimes leaves residue on the threads of the end plate and YZ car. If installation of the threaded proximity switch is difficult, an M8 x 1 tap will clean the threads.

Thread the proximity switch into the hole until it rests on the target. Back it out 1 to 2 turns so there is a 1/32” – 1/16” (1-2mm) gap between them.

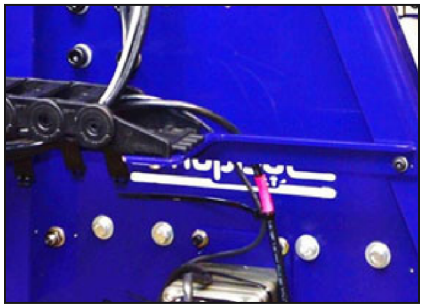
Loosely thread the 1/2” nuts onto the proximity switch so that the end plate is “sandwiched” between the two nuts.



This image shows the X proximity switch from slightly below. The X1 motor is in the background.

Rotate bolt so the three prongs are oriented as shown in the image at left. This ensures the cable will route cleanly.

Make sure the switch to target clearance is still 1/32” – 1/16” (1-2mm), and snug both nuts with a 1/2” wrench.



Connect the X-axis proximity switch cable (marked with red tape) by threading the nut onto the connector on the back of the switch.

Uncoil the cable.

Pneumatic Air Hoses

Certain applications, such as the automatic tool changer (ATC), pneumatic assist, and air drill have one or more air hoses that will route through the cable carrier.

To install an air drill, refer to the **PRSalpha Air Drill manual** located in the Support area of our website in the Documentation section.

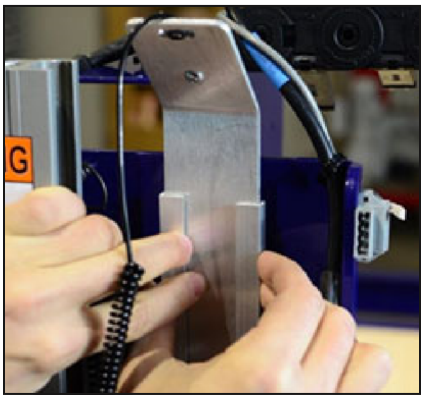
To install an ATC, refer to **ATC Installation manual** located in the Support area of our website in the Documentation section.

To install a pneumatic assist, refer to **Installing a Z-axis pneumatic assist manual** located in the Support area of our website in the Documentation section.

Route all air hoses before closing all gates.

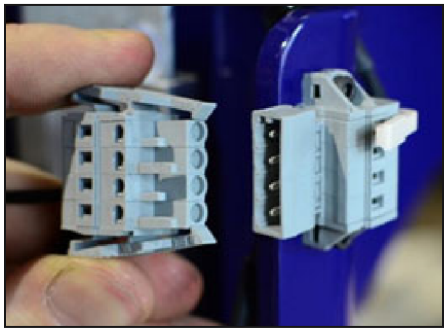
Secure Y-axis cable gates.

Mount Z Zero Plate Assembly



Sandwich the Z plate between the two U channel brackets with the VHB tape facing opposite from the upturned Z plate flange.

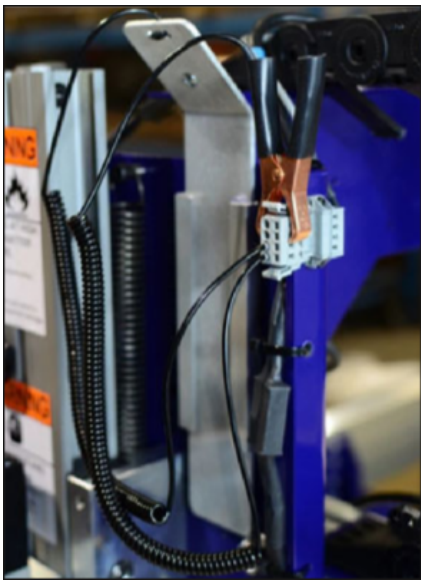
Center Z plate between Z rail and the YZ plate flange. Position brackets 1” down from top of YZ plate. Remove backing tape from VHB tape and press the brackets onto the YZ plate.



Insert the Z zero plate assembly Wago plug into the connector.

Take care to align the plug correctly, and do not force installation.

Note: This connector is also used for optional accessories such as the 3D optical probe.



The Z zero plate kit includes two rubberized tabs which act as insulators. Place one or both on the V wheel bolt below the Z zero plate. This prevents erroneous signals to the control software.

The Z zero clip can be placed on the Wago connector or other convenient location until needed.

Secure Cables

Tie cables underneath and along crossmember with zip ties.

Section 9. Control Box Wiring for Standard Tools

Powering the PRS Standard Control Box

The power to the PRS Standard Control Box should be wired into a fused disconnect by a licensed electrician familiar with industrial equipment.

The power requirements for the PRS Standard Control Box and router/spindle vary according to tool configuration. Refer to the power schematic on the inside of the control box door for more information on power requirements.

Exploring the PRS Standard Control Box

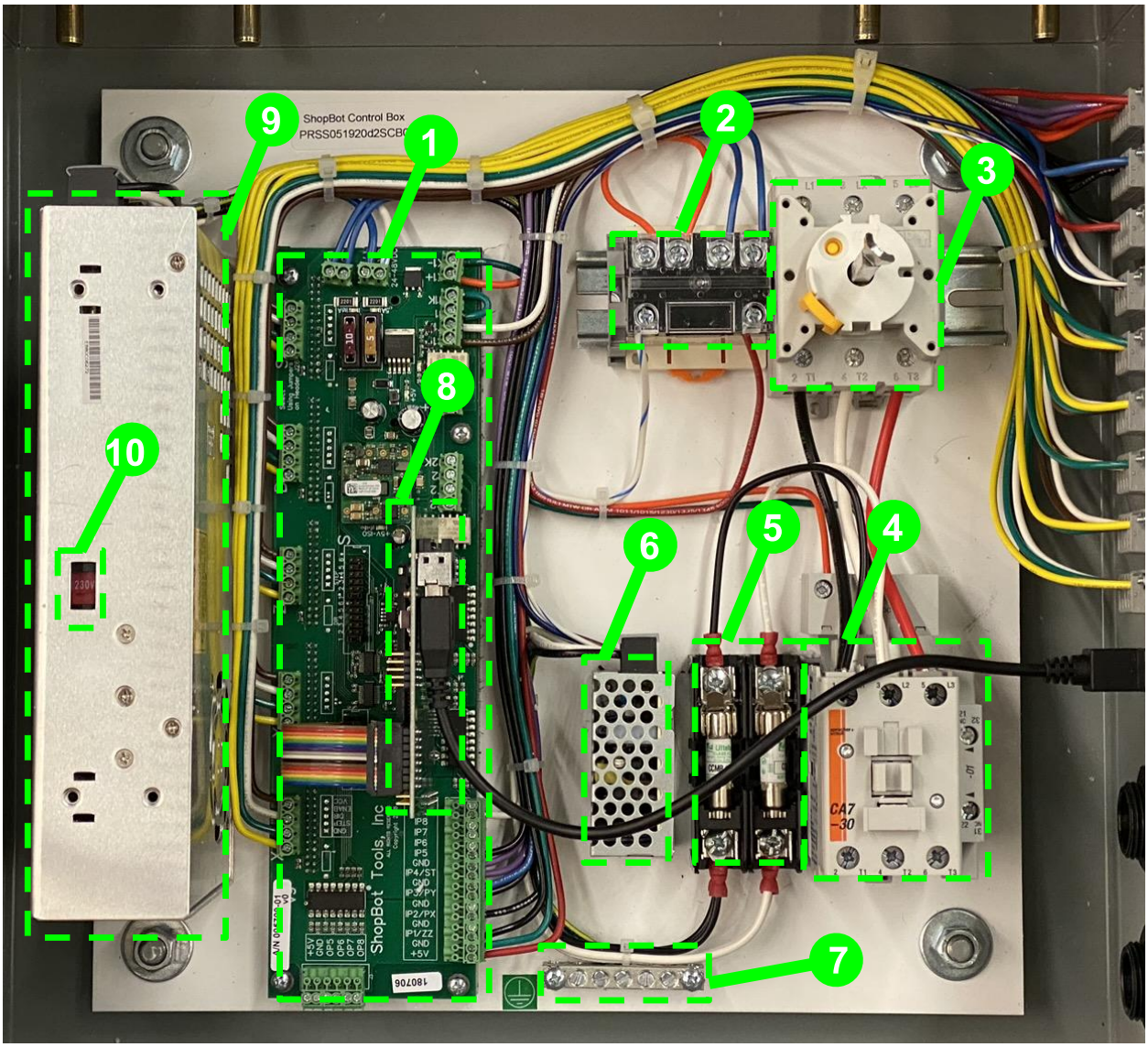
WARNING: Disconnect electrical power to the PRS Standard Control Box prior to this step!

After the electrician has hooked up the PRS Standard Control Box, you can open the box by pushing in on the flip-out handle under the keyhole. The handle will rotate outward, providing a place to grab and pull the control box door open.

When the red main power switch is turned ON, the box will be automatically locked. To access the inside of the box, turn off the main power switch.

A small pouch containing keys to control box lock will be taped to the inside of the control box door. Keep these keys in a secure place.

Inside the PRS Standard Control Box



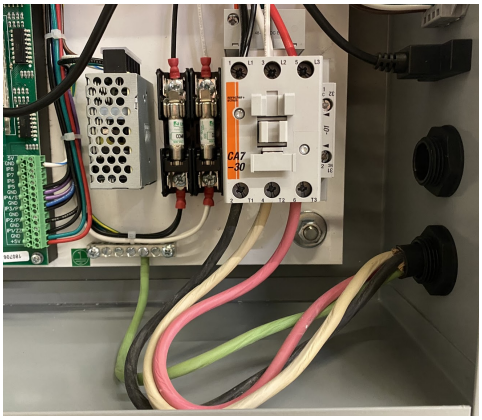
1. Control Board
2. Spindle Interlock Relay
3. Main Power Disconnect
4. Contactors
5. 10A Fuses
6. 24 VDC Power Supply (for limit switches)
7. Grounding Bar
8. Controller Card
9. 48 VDC Control Power
10. Input Voltage Selector Switch for 48 VDC Power

Connecting Spindle Drive Inside the Control Box

The spindle drive power cable will be connected to the output of the contactor inside the control box. Single phase systems will have a 3 conductor cable and Three phase systems will have a 4 conductor cable.

Pass the loose end of the cable through the cord grip (whichever one that was not used for the main power) on the side of the control box. Make sure that the loose conductors are fully inside the control box, so that the cord grip can clamp onto the black insulation of the cable.

Insert the wires from the cable into the open terminals on the bottom of the contactor (single phase models will have just black and white, while three phase models will have a third, red conductor). Match the colors of the conductors with the colors of the wires entering the top of the contactor. Find an open spot on the grounding bar and clamp the green ground wire into the grounding bar.



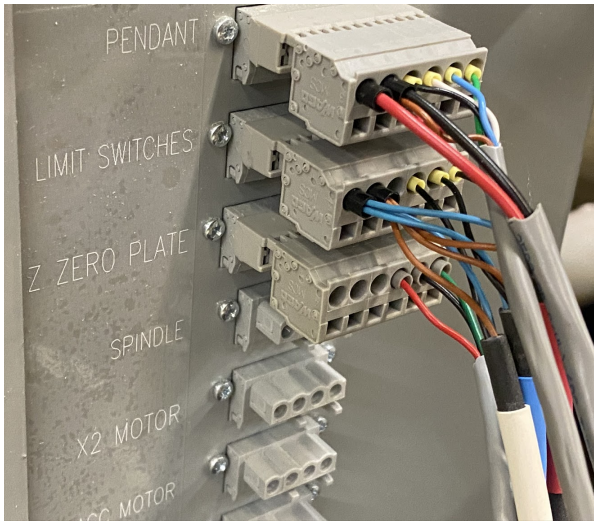
Tighten the nut of the cord grip to lock the power cable in place.

Making Connections on the Outside of the Box

On the outside of the box, above the cord grips, you will find a series of labelled WAGO connectors. These provide connection points for your motors, control pendant, limit switches, z zero plate, spindle logic cable and USB communication cable.

It is important to make sure that the connectors are inserted in the correct orientation. The connectors for the sensors and motors will have one side with holes for voltage measurements and other features while the opposite side will be featureless and smooth -- the smooth side of the connector should always be oriented upwards when making a connection to the box. This will ensure that the correct wires are connected.

First make the connections for your pendant, limit switches and z zero plate. Next connect the pendant connector. The limit switch connector will have three black cables running into it and the z-zero plate cable will have a single cable with just 3 conductors running into it.



Below that is the connector for the spindle logic cable which will be coming from your Spindle Drive (VFD). Under that are the motor connections. Each of your motor wires will be labelled according to the axis it controls. Match up the motor wires with the appropriate connectors.

At the bottom is the USB-B connector where you will plug in the USB cable that is connected to the PC that you will be using to control your ShopBot. **To ensure successful tool operation, be sure to install SB3 (ShopBot Control Software) on your control computer before plugging in your tool for the first time!**

Handheld Pendant Operation

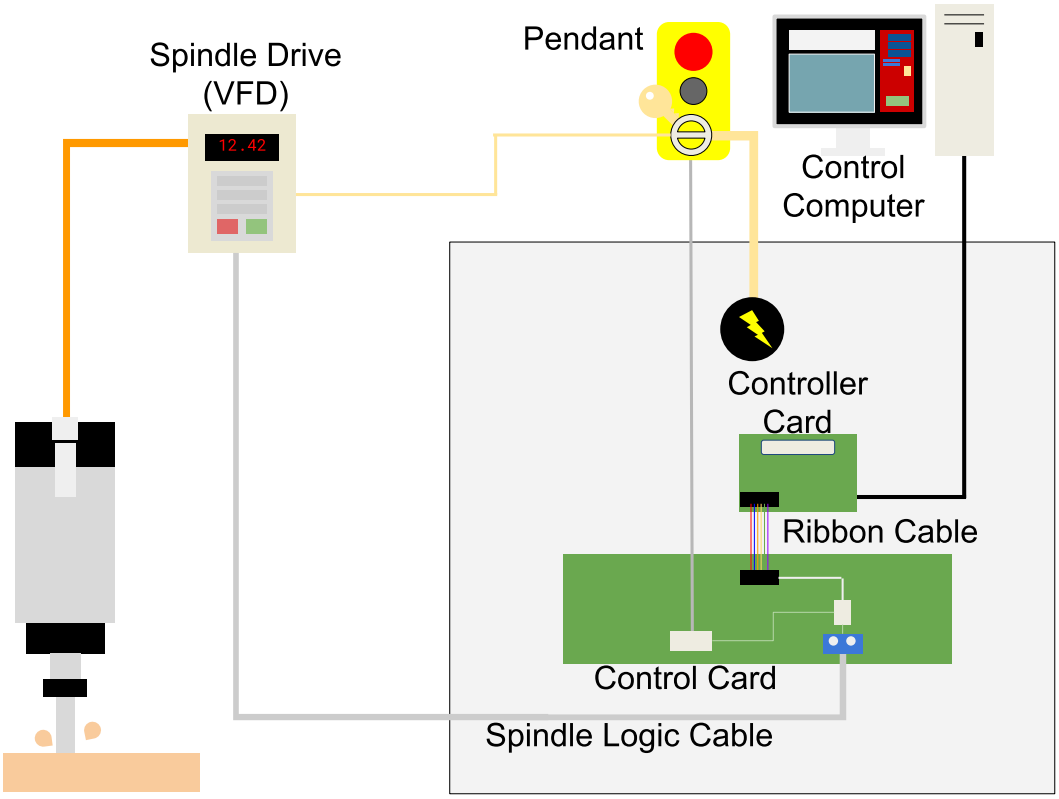
The handheld pendant features three switches. The first is an Emergency Stop; which will cut all power to the spindle and motors of your tool. Only use this in an emergency when you cannot wait for a controlled stop of the tool. Following an E-Stop of the tool, you will need to re-home and z-zero your tool to recover the correct position. To release the E-Stop, twist the red knob clockwise -- the cap of the button will pop up and power will be restored to the spindle and motors.

The second button on the pendant is a controlled stop button or “software stop” pressing this button will send a signal to the software to pause the cut and turn off the spindle. This stop will take longer to execute than an emergency stop but the accurate position of the tool will be maintained.

The third switch on the pendant is a spindle interlock key switch. The key must be inserted and the interlock closed in order to allow power to flow to the spindle. If a cut is started without the interlock closed, the spindle will not start and you might break a router bit! The pendant comes with two keys; store the spare in a secure place. If you lose your key, get in touch with ShopBot support to order a new set of keys.

Troubleshooting the Spindle Control System

WARNING: Disconnect electrical power to the PRS Standard Control Box before touching any wiring!

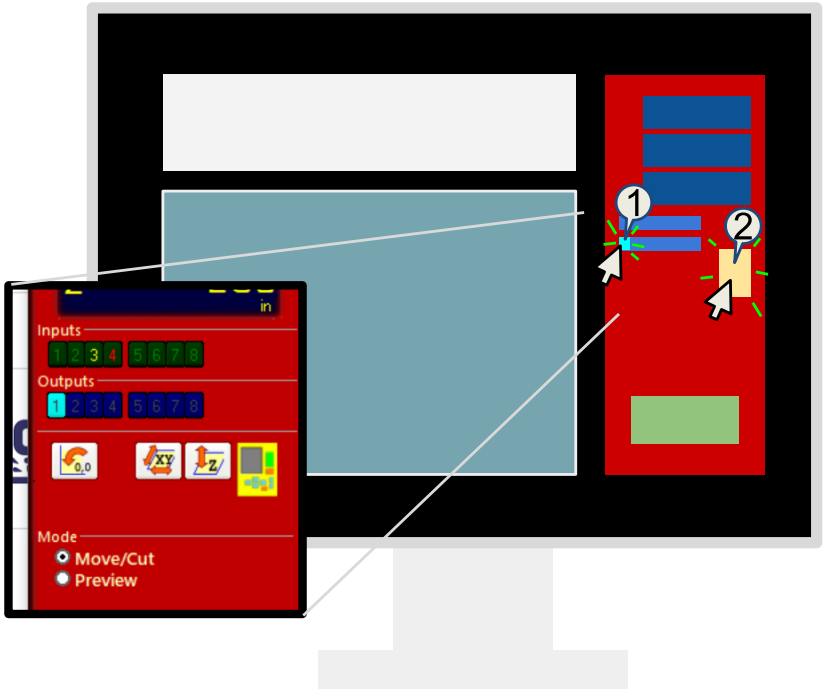


Simplified schematic of the spindle wiring and control

If the spindle on your tool will not start, there are a number of components in the system that may need to be checked. For some tests, it may be necessary to use a digital multimeter; if you do not already own one, it is a great troubleshooting tool and relatively inexpensive. It will also be necessary to have the control box open while powered on to monitor indicator lights; the tool should never be run with the control box door open for safety reasons. To power the control box on with the door open, twist the connector rod that engages the back side of the main power switch until the switch closes and the box powers on.

To test spindle operation, we will use the SB3 interface. Make sure that your software is not set to “easy” mode -- software in “easy” mode will have a blue button with a “?” in the red position window; click this button and choose to set the software to advanced mode in order to display the full set of controls.

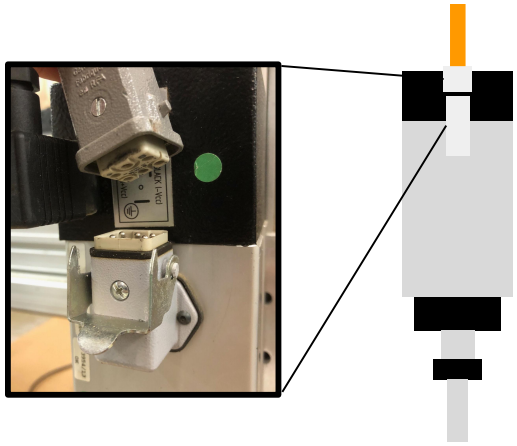
To test-run the spindle, turn on output #1 by clicking the “1” in the list of outputs under the digital position readout. Then open the manual control keypad; you’ll receive a warning that the spindle is about to start. Click “OK” on this warning and see if your spindle starts up. If not -- we’ll need to troubleshoot!

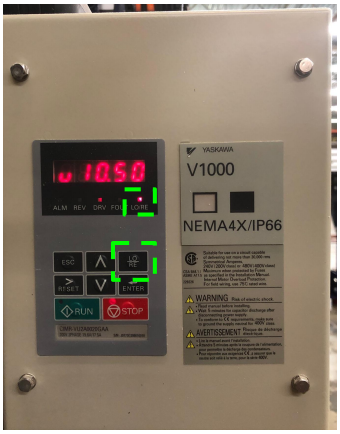


When the box is first powered on, you should hear a loud “clunk” caused by the contactor engaging to supply power to the VFD -- after a few seconds, the VFD should power on. If this does not happen, there may be an issue with the VFD or the circuit providing power to the VFD.

The first thing to check is that the “E-Stop” button is not depressed; twist the cap clockwise on the button to release it if it is depressed. Next, check that the key switch on the pendant is set to “engaged”. When the key switch is engaged, the VFD should receive power and numbers should show on the display. Inside the box, turning the key should engage the spindle interlock relay, causing an LED at the center of the relay to light up green. If either the small relay or the large contactor are not engaged -- there may be a problem with your power supply or the pendant key switch -- contact ShopBot support for more information.

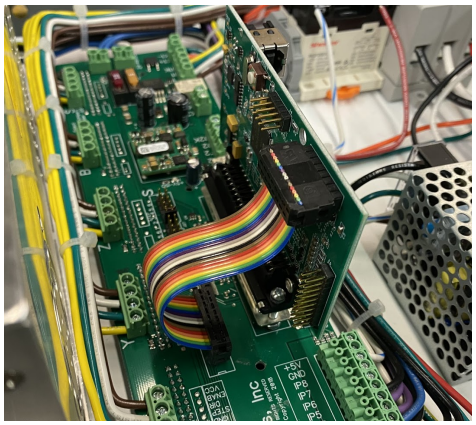
If the VFD is powered on, but your spindle is still not starting, there are a few more things to check. First, make sure that the orange spindle cable is plugged into the spindle on your tool.





Next, check the settings on the VFD. Locate the button labelled “LO/RE” and press it. A red led should light up next to the LO/RE indicator below the VFD display. This will allow you to control the spindle from the VFD control pad. Press the green “RUN” button to start the spindle. Press the red “STOP” button to stop the spindle. Once you are done with this test, press the “LO/RE” button again to turn off the indicator light.

Finally, check that the ribbon cable is plugged in correctly; connecting the controller card to the control board. The blue conductor on the ribbon cable should be on the outside -- and the black connectors on the ends of the ribbon cable must be aligned properly with the headers on both cards. The ribbon cable communicates the spindle start signal from the controller card to the main control board and must be connected for the spindle to function. If you have completed these checks and your spindle still does not start, contact ShopBot support.



Troubleshooting the Motor Control System

If your motors are not moving, first make sure that the E-stop button is not depressed. Twist the E-stop button on the pendant clockwise to disengage. Also check that the spindle interlock is engaged using the key switch on the pendant.

Next check your control software. Perform a settings reset by clicking the utilities menu and choosing “Reset default settings…”. Choose the correct settings file based on the tool you own. Once the reset is complete, try moving the tool around with the manual control keypad.

To check the motor connections--make sure that your tool is powered OFF; plugging or unplugging motor cables with the power on may damage the electronics of the tool. Unplug and replug all motor connectors; checking for any loose wires on the motor lines. Power the tool back on and check for motor motion. If the motors still do not move, open the control box to check on the status of the drivers.

The motors on your PRS Standard tool are controlled using Gecko G250x drivers. These drivers are concealed behind the main control board to protect them from any dust or debris that may get into the control box. With the power to the control box ON, red LEDs should be visible through holes milled in the main control board. These LEDs indicate that the drivers are powered on. If you do not see these lights, one of the drivers may have failed; contact ShopBot support.

Section 10. Software Installation

Introduction

ShopBot tools are shipped with three software programs that can program, edit, and run part files. This section covers the installation of all software and provides a basic overview of the ShopBot control software. Additional information and training can be found in the control software “Help” menu as well as ShopBottools.com and Vectric.com.

The following software will be installed during this section:

ShopBot 3: Control software used to operate the ShopBot tool and run part files.

ShopBot Editor: Enhanced text editing software used to view and edit ShopBot part files.

VCarve Pro – ShopBot Edition: CAD/CAM software used to create and edit designs, and assign tool paths to create part files.

Hardware

Operating computer

ShopBot installation USB drive

ShopBot tool with wiring complete

USB communication cable

Computer Recommendations

A PC running Windows XP/Vista/7/8 (Home Premium/Business, or higher) is required. The equivalent of a dual core or higher, Pentium processor, and a minimum of 4GB RAM (8GB preferred) is recommended.

A graphics display of 1024 x 768 will provide a good display, although a higher resolution may be preferable.

Computer Configuration

Important: Some programs and features will interrupt the proper installation of ShopBot 3 control software. To ensure trouble free installation and operation, ShopBot recommends performing the following actions before installation.

_____ Install program using administrative account.

_____ Set User Account Control (UAC, not applicable to Windows XP) to “Never Notify.”

_____ Disable network connection.

_____ Disable security and antivirus software.

_____ Make sure the USB cable from the ShopBot is not plugged in.

Install ShopBot 3 Control Software and VCarve Pro Software

Refer to “Installing ShopBot Applications” section in “Uninstalling and Reinstalling ShopBot and VCarve Software” document found in the Support area of our website in the Documentation section.

Software Overview

All programs included with the ShopBot are now installed. The icons below represent how they will appear on the computer desktop.

Connect ShopBot to Computer

USB Communication Cable

The USB cable is located in a packet inside the control box door.

Note: The black box pictured at left is a USB hub. It prevents older operating systems from spontaneously reducing the USB communication rate. Use only the ShopBot communication cord with this hub.

Plug the USB cable into the side of the control box and use a zip tie to secure the cable loop. The USB port is located just to the right of the cable entry port.

Note: Make sure the software has been installed on your computer *before* connecting the USB cable to your computer

Load the Settings File

ShopBot control software is designed to work with all ShopBot models, each with different table dimensions, gear ratios, and other parameters. These settings are saved in an initiation (.INI extension) file that runs each time the software is started. The first time the software is connected to a tool, you'll be prompted to set the default .INI settings file.

With the Control Box turned on and the USB cables plugged into the computer, locate the ShopBot 3 icon on the desktop or Windows Start menu. Double click on the icon to launch the control software.

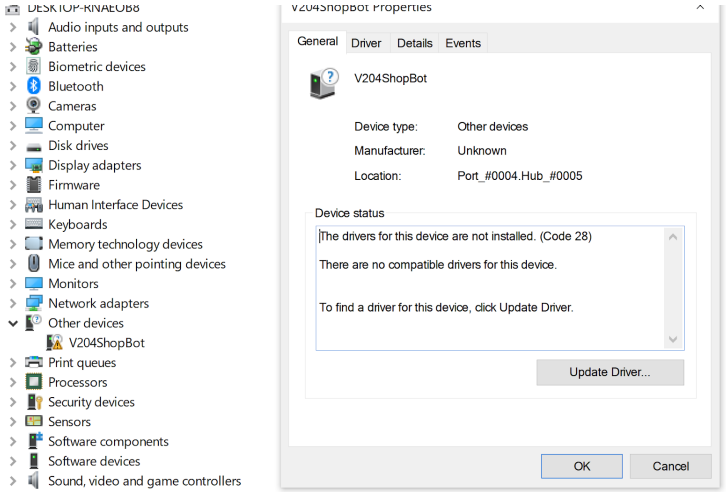
Loading the ShopBot USB Drivers Manually

Note: You will only need to load the drivers manually if they did not load properly when you installed the control software. If the ShopBot connected properly, you can skip to the next section **"Setting up your ShopBot".**

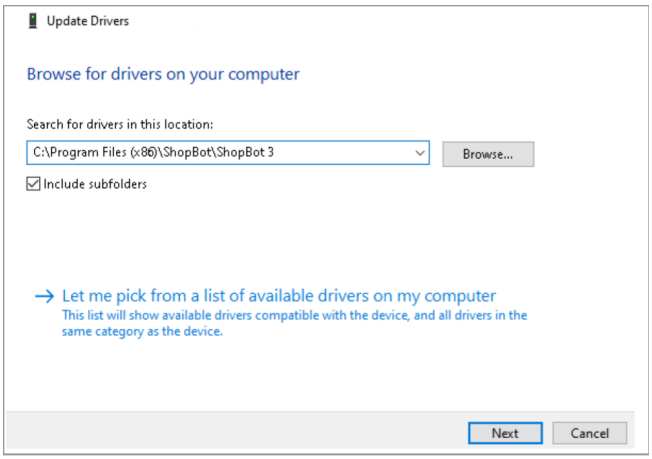
Refer to our FAQ page, question 63, for a video guide and quick steps to follow:

https://www.shopbottools.com/support/faq/63

- If the ShopBot does not connect (yellow screen), accept **preview mode** and continue
- Go to Device Manager on the computer, and look for Ports or Other Devices, or something that might give you a clue that the ShopBot driver is not installed correctly. It will be listed as "V204 ShopBot".



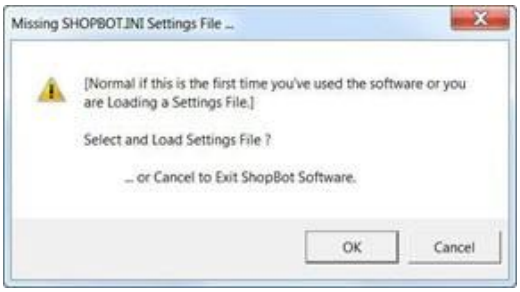
- If the device driver is not installed correctly, Update Driver and BROWSE for drivers



Browse to the main **C:** drive by clicking Computer (on the left) and then clicking OS (C:). Click on the folder labeled **Program Files (x86)**. If using a 32 bit computer, this folder will not exist – in that case click on the Program Files folder. Click on the folder **ShopBot-> ShopBot3**. Then click Next.

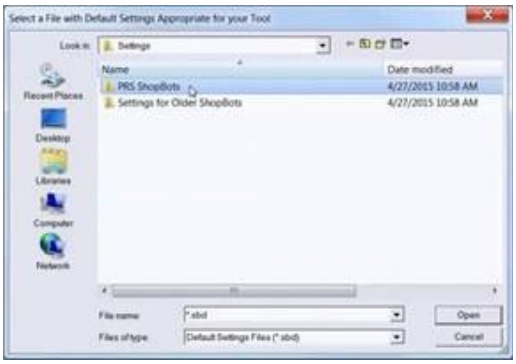
- **Do this twice. Sometimes, you have to then restart ShopBot software or even restart the computer to get it to take**
- **SOMETIMES, AFTER DOING THIS TWICE AND TRYING TO CONNECT, YOU FIND YOU HAVE TO DO IT ALL AGAIN**
- The drivers should now be loaded

Setting up your ShopBot

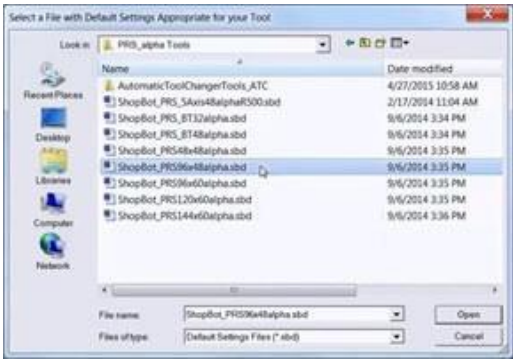


When the program is opened for the first time, a prompt will appear to load a settings file. Select “OK” to proceed.

Note: If you are unsure whether you loaded the correct file, it can be accessed again at any time by clicking on “Utilities,” and “Reset Default Settings.”



Double-click on “PRS ShopBots,” then select “PRS_alpha Tools with Zprox including ATC and 5-axis” if you have an **alpha** tool or “PRS_standard Tools - with Zprox” if you have a **standard** tool.



Select the proper file corresponding to the ShopBot tool size.

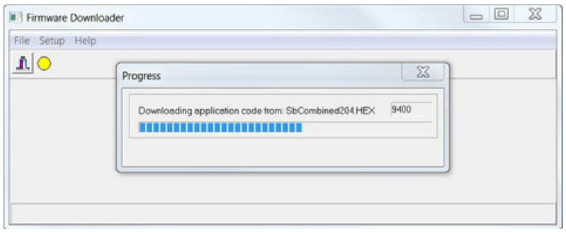
Default settings will load and the main ShopBot screen opens. Although it looks like no changes have been made, the correct settings have been loaded.

Install Control Box Firmware

The software may prompt you to update the firmware version. To do so:

- Launch SB3 and continue in Preview Mode. In the Command Console, select **Utilities->Install Control Box Firmware (UI)**. If you do not see the Command Console, and only see the red window, select the “Blue Question Mark” in the red window, and then select “Switch to Full” in the bottom right of the new window that opens. This will switch to full mode and give access to the Command Console.

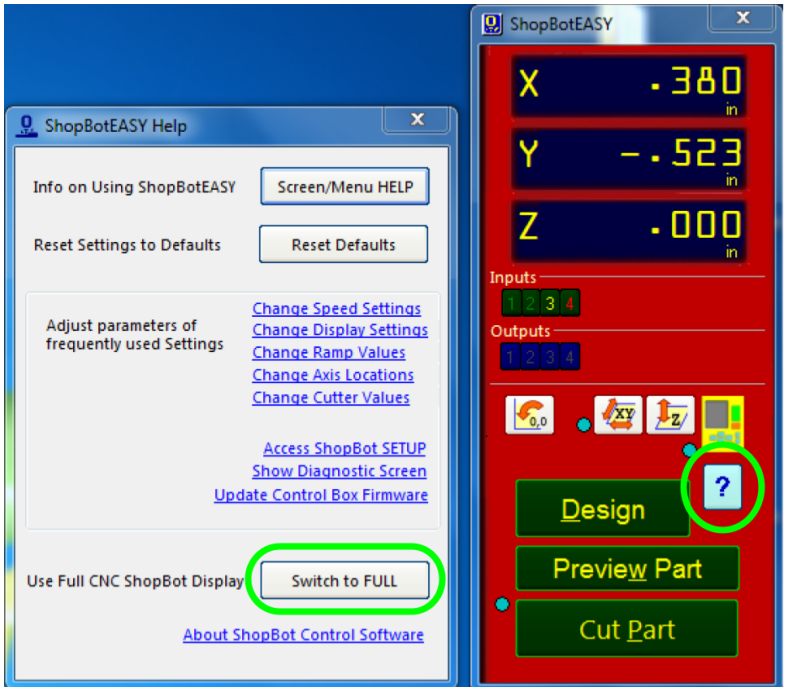
- Following the directions that appear on the screen during the firmware install: turn the ShopBot control box power off and then check the first two boxes of the firmware installer.
- A new window will appear for loading the firmware, power the box on at this point and a progress bar should appear and load through. Once it has loaded through, click the last checkbox and close the firmware installer.



- You should now be able to connect to the tool and switch into Move/Cut Mode.

ShopBot Control Software Familiarization

Easy and Full Modes

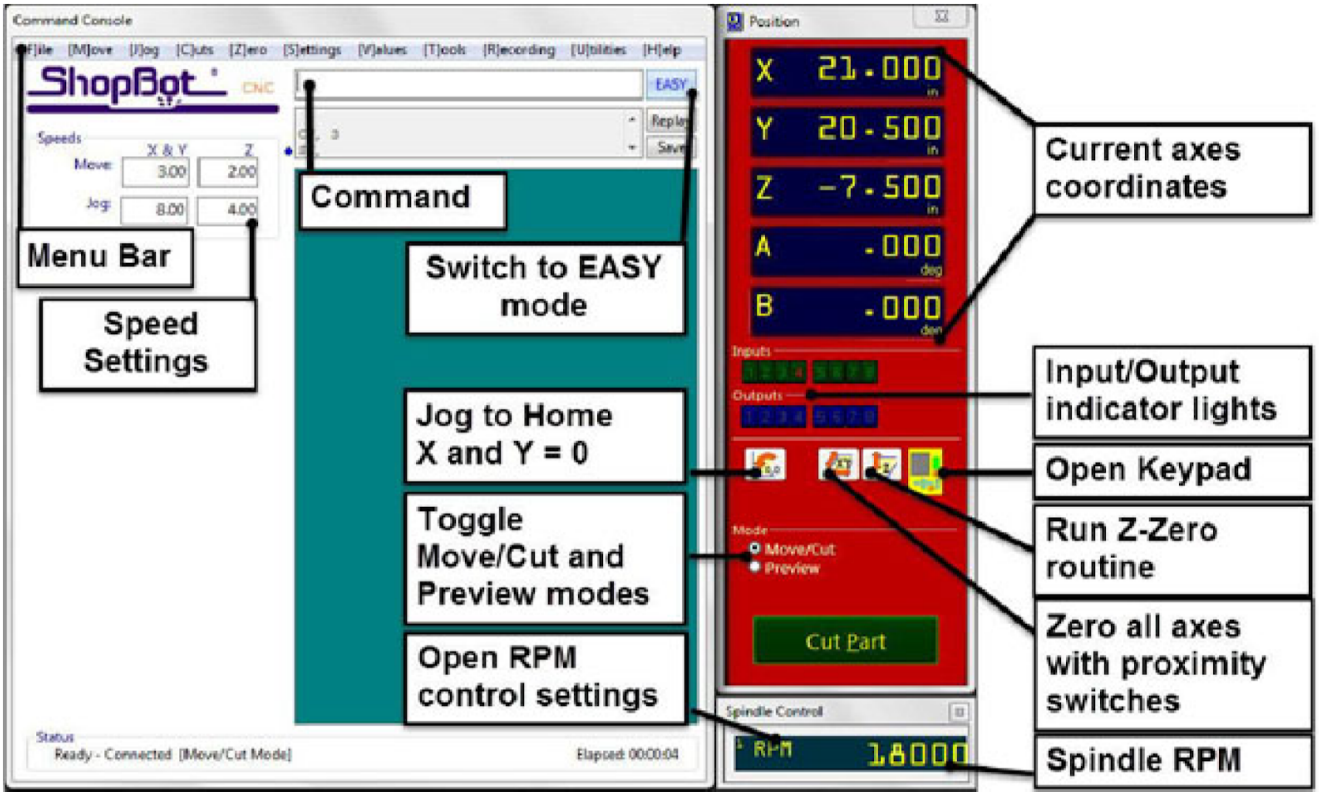


ShopBot 3 software has two user interface formats; “Easy” and “Full” modes. Easy mode is the default, and works well to run parts after all set up has taken place.

To access all features needed for setup, switch to the “Full” mode by pressing the blue question mark button. Select “Switch to FULL.”

Once setup is complete, return to the Easy display by pressing the “EASY” button at the top right of the command console window.

Full Display Overview



The Command Console window (left side) allows for adjusting settings, loading part files, and entering commands. The Position window (right side) is how the machine provides feedback in terms of its coordinates, switch positions, and alarms.

ShopBot Command Format

Note: This information is provided as a very brief overview to help keep up with the rest of the installation/setup instructions. Detailed information and a full list of available commands are available in the ShopBot User Guide.

In the ShopBot control software, commands are used to give specific directions to the machine. Any command that directs the machine to move must be followed by parameters. For example, an MX,20 command will “Move” the “X-axis” to an absolute position of 20.

Other commands are used as keyboard shortcuts to access items in the menu bar. These usually do not require parameters. FP is a useful command that is a shortcut for “File” and “Load Part File.” After entering this command, a window will appear prompting the selection of a part file.

To enter a command, click the command box in the main window and type the command followed by any parameters (if applicable).

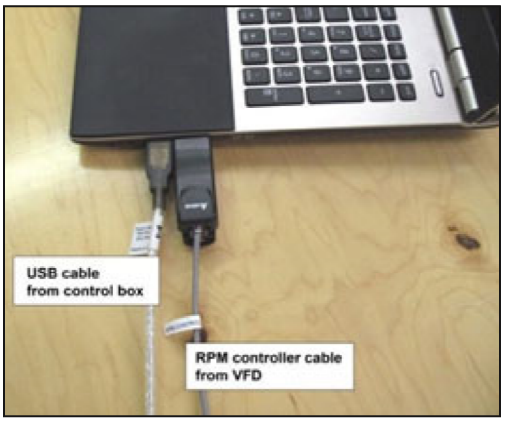
Movement Testing

Connect the USB cable from the control box to the computer.

Note: Windows 7 computers can have both USB 2.0 and 3.0 ports. The control software works best if the control cable is plugged in to a USB 2.0 port. USB 3.0 ports can be unsatisfactory, and are identified by blue color coding and/or the initials SS. Reserve these ports for other uses.

Connect the RPM controller from the VFD to a separate USB port on the computer.

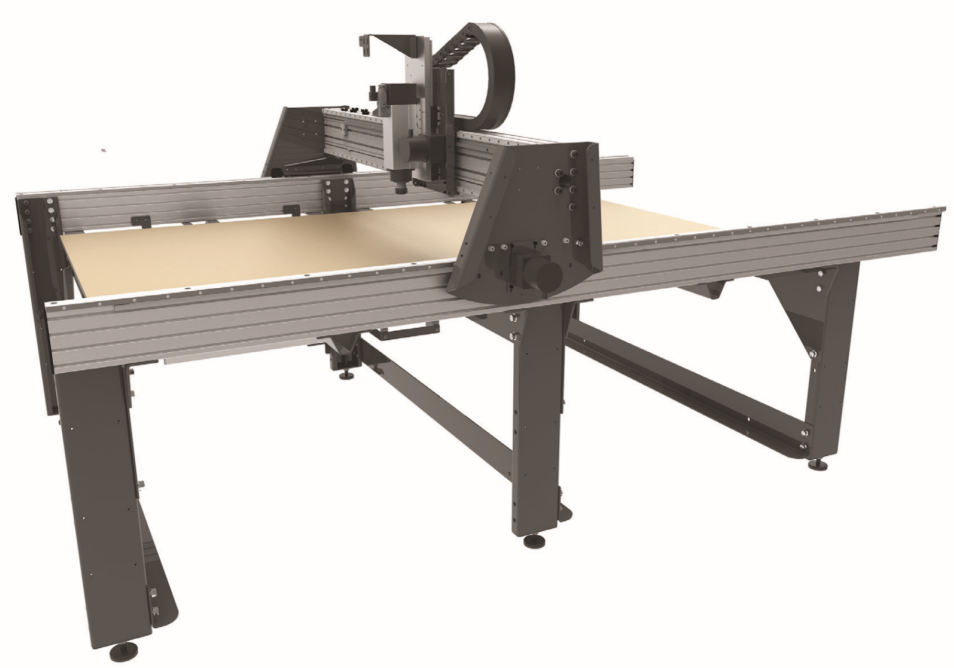
Test machine movement using arrow keys.



Section 11. Secure Table and Spoil Board

Introduction

These instructions are based on a ShopBot PRS Gantry 96-48. Larger or smaller table sizes will require additional baseboards and/or cutting material to fit.



Hardware

Part Name	Quantity	ShopBot Part Number	Notes
3/8 x1 1/2” carriage bolts	See table drawing	000953	ShopBot supplied
3/8” Lock washer	See table drawing	000092	ShopBot supplied
3/8” Flat washer	See table drawing	000444	ShopBot supplied
3/8-16 Hex nut	See table drawing	000452	ShopBot supplied
3/4” cabinet grade plywood	See table drawing		
3/4” Medium-Density Fiberboard (MDF)	See table drawing		
Wood glue	1 Gallon		

NOTE: If table size is greater than 96’x48”, it will be necessary to tile multiple sheets to cover the full working area.

Refer to the table drawing for specs and measurements specific to machine.

Base Layer

The base layer should be a sheet of 3/4” cabinet-grade plywood. This is the foundation of the workbed, and will likely last the life of the tool. When choosing plywood, keep in mind that a higher number of plies typically creates a more stable board that is less likely to warp.

The base layer is bolted directly to the table supports using 3/8”x1 1/2” carriage bolts (included in the hardware kit). Position plywood on table frame to locate mounting holes, according to the table drawing. It is imperative that the table drawing is followed on this step.

Clamp the sheet down to keep it from moving, then use an 1/8” drill bit to drill pilot holes through the cross-support holes up through the plywood. It is not necessary to drill out each hole. It is recommended to use every other one, creating a “checkerboard” pattern across the table.

Note: If installing a vacuum table, refer to vacuum table instructions.

Use a 1” Forstner or spade bit to drill a counter bore deep enough for the head of the carriage bolt to sit below the surface of the plywood.

Drill pilot holes with a 3/8” bit and press the carriage bolts into the clearance holes and through the cross-supports. Use a mallet to tap bolts through if necessary.

Measure the spacing and location of the sheet one last time to make sure that it is positioned according to the table drawing.

Use the included 3/8” flat washer and hex nuts to secure bolts to bed.

Spoilboard

The spoilboard is a sacrificial layer of 3/4” Medium-Density Fiberboard (MDF). As it gets damaged over time, it can be re-surfaced to a perfectly flat work surface until the entire board has been used up, and then simply replace it with a new sheet.

Spread a thin, even coat of glue across the entire surface of the base layer. A cheap paint roller works great.

Have someone help set the MDF sheet(s) onto the base. Place the spoil board on top of baseboard with 1/4” of overlap on all sides.

Place clamps and heavy objects onto spoilboard to help glue cure.

Section 12. Setup and Fine Tuning

This section will setup and test all tool functions, secure the table, and set zeroing locations.

Check Inputs and Outputs

Input 1 – The Z zero plate and the fixed Z zero are connected on this input. When either of these plates are connected to a ground, the circuit is closed and input “1” on the ShopBot position screen will light up. The ShopBot ATC requires that the grounding clip be used during any zeroing of Z-axis.

Input 2 – The X-axis proximity switch is connected on this input. When working properly, the input “2” light will be off in the ShopBot position screen for normal operation. When the X-axis proximity switch passes the proximity targets the light will turn on. These will be used for homing the X and Y positions and for limiting the safe table cutting boundaries, among other things.

Input 3 – The Y-axis proximity switch is connected on this input. During normal operation the input “3” light will be off in the ShopBot position screen. If the Y-axis proximity switch passes the proximity targets the light will turn on. This feature will be used for homing the X and Y positions and for limiting the safe table cutting boundaries and other techniques that you may develop to help your productivity and accuracy.

Input 4 – This input is connected to the stop switch. When inactivated the switch allows for use of the tool and when depressed the connection is severed and the tool comes to a stop.

Input 5 – The Z-axis proximity switch is connected on this input. When working properly the input “5” light will be ON in the ShopBot position screen for normal operation. When the Z-axis proximity switch passes the proximity targets the light will be turned OFF. This switch will be used most often for a reference location in zeroing the bits in the tool rack and for limiting the safe Z cutting boundary.

Input 6 – NA

Input 7 – Drawbar closed.

Input 8 – Drawbar open (changing tools).

Output 1 – Switches on the spindle.

Output 2 – Secondary spindle

Output 3 – Toggles the ATC dust skirt gate open.

Output 4 – Turns on during machine operation (safety flashing screen). Required for spindle “on” signal.

Output 5 – Air drill (if applicable)

Output 6 – Air drill (if applicable)

Output 7 – Air drill (if applicable)

Output 8 - Toggles the spindle drawbar open /close (releases tool holders from spindle).

Caution: When the spindle is not spinning, it is possible to drop the tools from the spindle if this output is triggered.

Machine Orientation

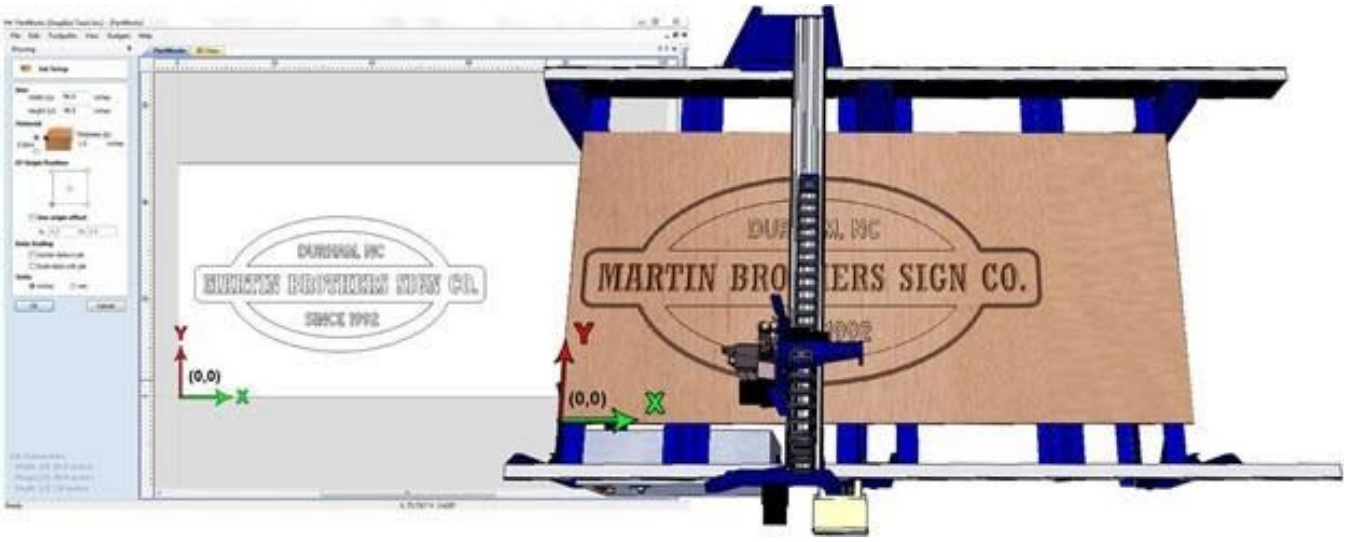
It's essential to understand how the X-, Y-, and Z-axes are oriented, and how this relates to job setup in the CAD/CAM software. The example below shows a design in VCarve Pro and its corresponding orientation on the tool.

The bottom left corner is referred to as the XY home location or "zero, zero." This is the registration point used to line up the software design with the physical material.

The X-axis is usually the longest axis of the tool. The model shown has a 96" X-axis. In the design software the X-axis goes from left to right on the screen.

The Y-axis moves across the gantry beam. The model shown has a 48" Y-axis. In the design software the Y-axis goes from bottom to top on the screen.

The Z-axis moves up and down over the table bed. The model shown has an 8" Z-axis. In the design software the Z-axis is represented by the depth of cut.



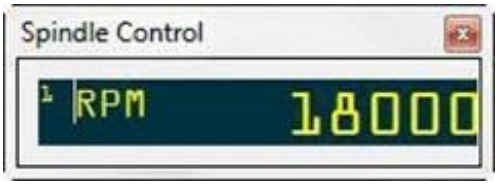
Optional Axes

Some models feature two cutting heads. This allows different types of bits to be used without spending time with tool changes. The A-axis is assigned to the second up and down axis (second Z).

Tools can also be equipped with a rotational indexer. This allows the tool to be used as a CNC lathe or perform machining operations on more than one side of a part. The B-axis is assigned to the rotational axis and is measured in degrees.

Setting Up RPM Control

Tools equipped with a spindle must be configured to allow spindle RPM control. Without these steps, the tool will not change RPM when part files instruct it to.

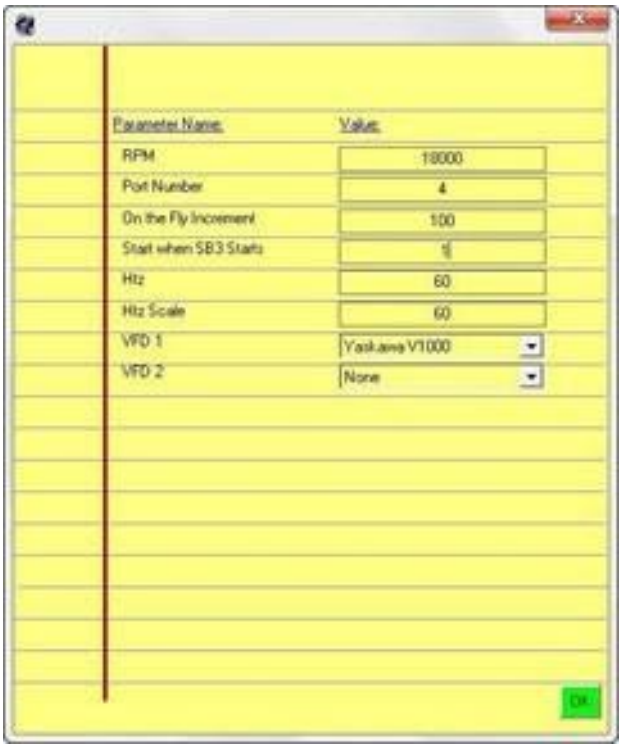


In the main console window, click on “Tools” then “Spindle RPM control.” The Spindle Control window appears.

Important: The Spindle Control window must remain open during operation for the software to communicate with the VFD and change RPM.

Connect the RPM controller to the computer. Do not plug it into the hub alongside the main Shopbot USB; it should go straight into an empty port on your computer.

Click on **RPM** in the left corner of the “Spindle Control” window and a settings window appears. Change the following parameters:



Start when SB3 starts: 1 Opens the Spindle Control window every time ShopBot 3 starts.

Start when SB3 Starts: 1

Hertz: 60 (US, Canada, Mexico, and Japan), or 50 (Europe and most other regions).

Hertz Scale: Same as Hertz setting unless adjustment is required to match VFD and software RPM displays.

VFD 1: Yaskawa V1000

VFD 2: Leave blank unless tool is equipped with two spindles

To test the function of the RPM controller, turn on the spindle and then click on the listed RPM value in the spindle control window. Change this value and then press enter. The value on the VFD’s display should match what was just entered.

System Check

Check Movement

Open the keypad control using the yellow keypad button on the red position window (or press the “K” key). Test for tool movement using the arrow keys to move X and Y. Move the Z-axis up and down using the Page Up and Page Down keys.

Check Stops and Targets

Check that the physical stops on the tool are tight and will not move when pinions hit them.

Make sure proximity target bolts are secure in the locations stated in earlier section. Check that the proximity sensors have 1-2 mm clearance over target bolts.

Note: If the stops and targets are not properly installed, a tool crash will occur in the next step.

Check Limit Switches

The proximity switches have red LED lights that are lit when the switch is not over a target. Look at each switch to identify this light. Place a small metal object such as a flat blade screwdriver near the end of the sensor. The LED light should turn off, and then turn back on when the object is pulled away.

Test the function of the limit switch and target setup. When set up properly, the sensors should “see” the targets and cause the tool to stop approximately 1/4” before the pinions hit the physical stop blocks.

Open the keypad and hold down the left arrow key to move the gantry in the negative X direction. The gantry should move down the rails until it encounters the limit switch target where the gantry should stop abruptly. Once the tool stops, release arrow key.

Note: Do not attempt to “sneak up” on the target by repeatedly pressing the arrow key. This can cause the tool to go past the target and not function properly. Always hold down the arrow button until the tool comes to a stop

Zero the X-axis: Click on the Zero Axis button on the keypad. Select the X checkbox and click the ZERO button. Notice that the X value changes to 0.000 in the position window.

Move the X-axis off the proximity target using the right arrow key.

Note: If the axis is not moved off the proximity target, the other proximity switches will be disabled and the next step will not perform properly.

Test the Y-axis limit: Hold down the down arrow key to move the YZ car in the negative Y direction. The YZ car should move toward the gantry side plate until it encounters the limit switch target where it will stop abruptly. Once the YZ car stops, release the arrow key.

Click on the Zero Axis button on the keypad. Select the Y checkbox and click the ZERO button. Notice that the Y value changes to 0.000 in the position window.

Move the Y-axis off the proximity target using the up arrow key

Check Movement Distance

This step will help find the total available movement area on the X- and Y-axes. This information will make sure the target and physical stop locations are correct and help with table placement.

The tool should now be near the XY zero location. The X- and Y-axes should have been zeroed at the proximity target locations during the previous step.

Make sure that neither proximity switch is triggered as this will prevent proper function.

Test X-Axis Distance

Hold down the right arrow key to move gantry in the positive X direction. The gantry will move down the rails until it encounters the high X target. Release right arrow key when gantry stops.

Look at the red position window to check the X value. This is the total available X movement distance. This value should be at least 1” larger than the nominal X movement distance. Record this value.

The X-axis typically has extra movement available at this end for use with the Automatic Tool Changer option. For example a 96-48 table might have an X movement distance of 102.824”.

Move the X-axis off the proximity target using the left arrow key.

Test Y-Axis Distance

Hold down the up arrow key to move the YZ car in the positive Y direction. The YZ car will move across the gantry until it encounters the high Y target. Release the up arrow key after the YZ stops.

Check the Y value in the red position window. This is the total available Y movement distance. This value should be at least 1” larger than the nominal Y movement distance. For example, a 96-48 table might have a total Y movement of 49.427”.

Test Z Zero Function

Clip the Z zero alligator clip to the Z zero plate. Check the software red positon window for Input 1 light. Disconnect the alligator clip from the Z zero plate. The Input 1 light should go out.

Proximity Switch Targets

The proximity switch targets are metal bolts that the inductance based limit switches will sense. The limit switches should be set up to pass just over the target about 1/4” (5mm) before the movement axis reaches its hard stop. When the software receives this input it will stop the tool so that position is not lost.

ShopBot Setup

Z Zero Plate

Zeroing the Z-axis is performed by placing the Z Zero plate on the zeroing surface under the bit and attaching the clip to the bit or collet. When the bit touches the plate a simple circuit is created, telling the tool to stop and record the location. This action is done using the Z zeroing program which can be run using the “Z” button in the red position window.

Z zeroing determines the zero position by adding the thickness of the zero plate to its position when the circuit is complete. By default this value is 0.121” (or 3.0734 mm). For critical applications, this value can be changed to exactly match the thickness of the plate supplied with the tool.

XY Zeroing Point

By default, the XY zeroing point will be the corner of the table nearest the control box. There is a program that will repeatedly and accurately find this point using the X and Y proximity switches. The XY zeroing program can be run by clicking on the “XY” button in the red position window. This is sometimes called a C3 routine, as entering C3 into the command line also runs this program.

Make sure the tool is clear and the Z-axis will not collide with any objects when moving toward the XY zero point. Click the “XY” button to run the XY zeroing routine. The machine will move along each axis until it stops at the proximity switch. It will then back off each a set distance to the XY zero location.

By default the offset from the proximity switches to the zero point is 1/2” (or 12.7 mm).

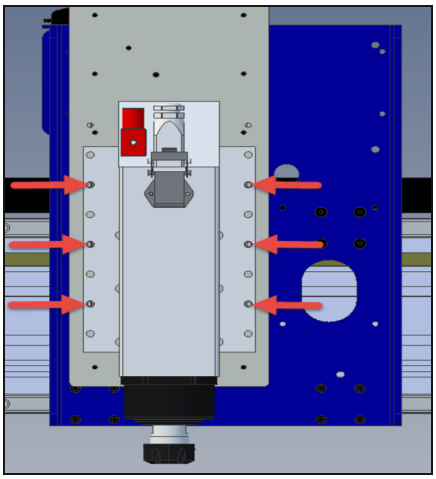
Move the corner of the plywood base board at this point and then square it with the table sides. This is the proper position for the spoil board and will allow maximum tool coverage.

Fine Tune Setup

Square the Spindle

Move the spindle over the cutting surface. Use a square on the spindle side to adjust the spindle until it is perpendicular to the temporary work surface.

The spindle side is parallel with the spindle axis and is the most accurate measuring point for squaring with the tool deck.



Secure Mounting Screws

Tighten screws to hold spindle in proper alignment. Once the screws are snug, perform final tightening. Check spindle square again after securing screws.

Test Movement Distance

Note: During this step, stay clear of the machine and be prepared to press the spacebar or emergency stop button if the machine travels further than expected.

Use the keypad controller to move the tool near the 0,0 location.

Mark the current position on the table with a pencil or pen.

Click on the zero axes button in the keypad control and check the boxes for the X- and Y-axes. The X and Y position values should change to 0.000 in the keypad and position windows.

Move the axis a set distance along the X-axis. In the keypad window click on the X value and change the value to 24 (1000 if in millimeters) then click the “Go to” button. The tool should move 24 inches (or 1000 mm) along the X-axis. If it doesn’t, go back to software setup and chose the correct default setting.

Move machine to 0,0 location. Verify jog by typing JX, 24 or JY, 24. Again, the tool should move 24 inches (or 1000 mm) along the particular axis. If it doesn’t, go back to software setup and chose the correct default setting.

Install Push Bars

The Push Bar Installation document was provided with tool documentation, and can also be accessed via the Support area of our website in the Documentation section.

Install Dust Foot

The Dust Foot Installation document was provided with tool documentation, and can also be accessed via the Support area of our website in the Documentation section.

Install End Caps

Pop end caps into place at ends of side rails.

The Gantry Tool Assembly is complete.

For usage information, see the ShopBot Quick Start Guide, which was provided with tool delivery, and can be found at http://www.shopbottools.com/ShopBotDocs/gantry.htm ShopBot Quick Start Guide

For maintenance and troubleshooting information, refer to the Support area of our website in the Documentation section.

Section 13. Resources

To the best of our knowledge, these links are current. If you find that any of them are no longer working, please contact us so that we can update them accordingly.

Detailed chip load charts:
http://www.onsrud.com/plusdocs/Doc/index.html?model.code=FeedSpeeds

ShopBot user's forum:
http://www.talkShopBot.com/forum

Vectric training videos: http://www.vectric.com/WebSite/Vectric/support/support_vcw_tutorials.htm

Additional Vectric support available within VCarve software: click on Help > Help Contents for an interactive PDF file.

100K Garages:
Post information, bid on projects, and connect with people who want to get things made!
http://www.100kgarages.com

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Installing the PRS Dust Foot

The ShopBot dust foot is designed to collect dust from routine operations as well as to prevent discharge of debris from the cutter. Use of this dust foot should not replace common industry safety practices and recommendations. Safety glasses should always be worn whenever the machine is in use. Be especially careful when the spindle or router is in operation.

Table of Contents

Introduction

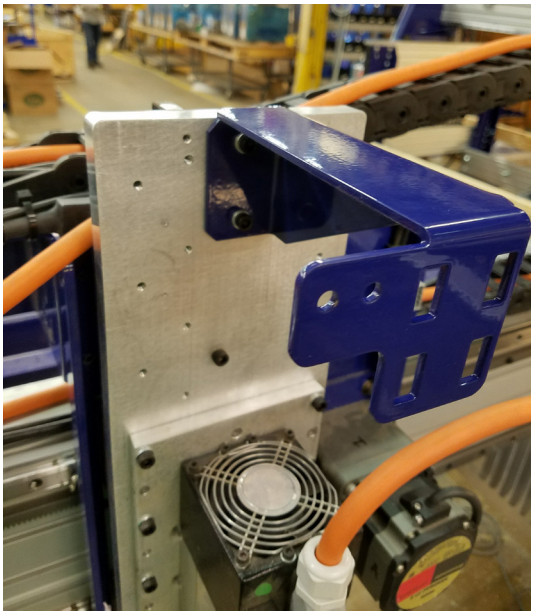
The dust foot is sold with a dust skirt hardware kit, as well as a dust foot that attaches directly to the collar of the tool's router or spindle. Dust feet are spindle-specific, and appear largely identical except for the diameter of the collar-clamping hole. They are composed of two parts that are connected magnetically to allow access to the bit and collet.

A 2.2/4HP dust foot.

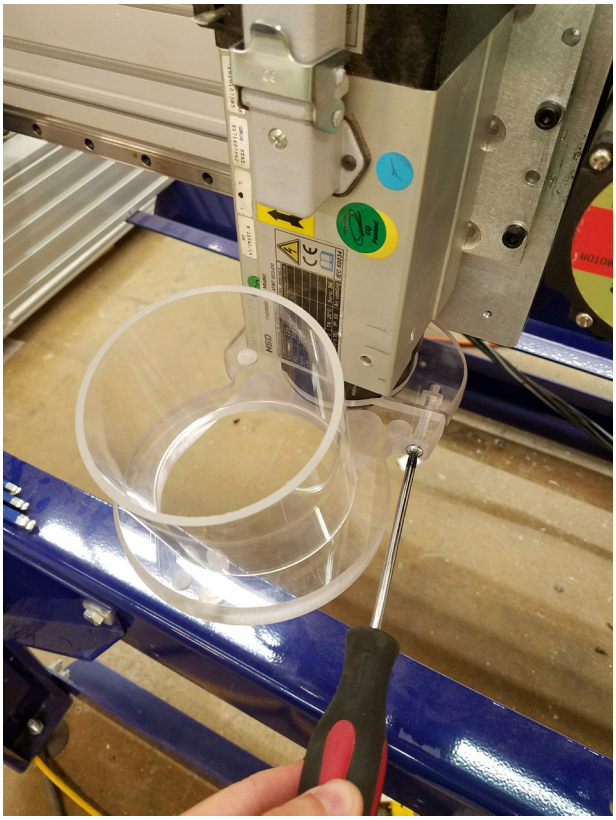
Installing the Dust Hose Mounting Bracket

The dust hose mounting bracket attaches to the two bolt holes at the top center of the Z-axis extrusion.

Using an M5 hex key, attach the dust hose mounting bracket with the pair of washers, lock washers, and screws included in the dust foot kit.

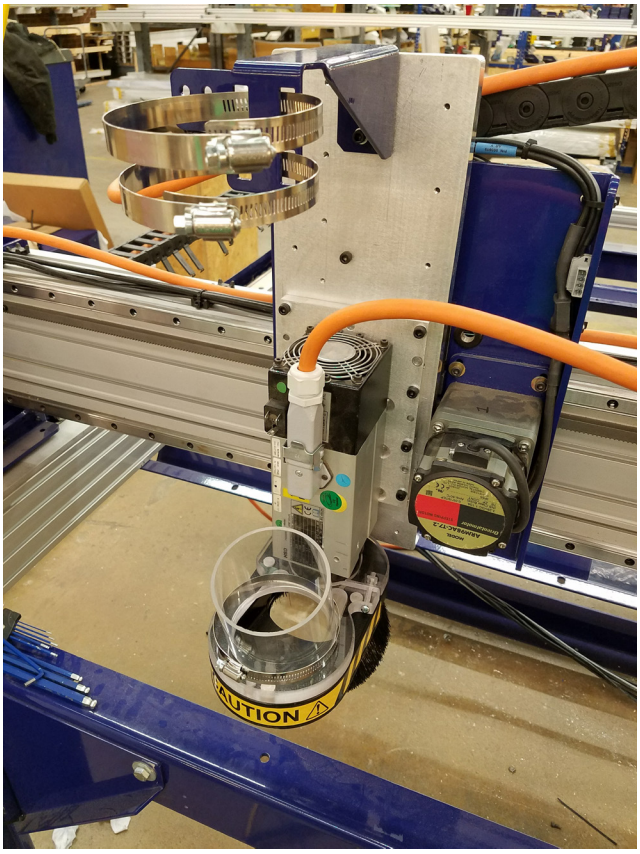


Mounting the Dust Shroud



The mount for the dust shroud clamps around the collar of the spindle and can be tightened with a Phillips head screwdriver.

Place two of the hose clamps around the hose mount bracket at the top of the Z-axis extrusion. The third hose clamp is used to attach the hose to the dust shroud mount. The dust skirt with brushes attaches magnetically for easy removal.



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PRS Maintenance Schedule

Daily before cutting:

1. **Warm up spindle** for 6-9 minutes with [C5] routine (preferred) or ½ RPM if you do not have spindle speed control. Confirm operation of spindle fan.
2. **Check bit, collet and collet nut for wear and debris.** Collets are good for 600-700 hours MAXIMUM of use if they are kept clean and no "event" occurs such as a broken bit inside the collet or a plunge that bottoms out on the collet. Keep spindle body, fans and airways clean for proper cooling. Tool tapers, shafts and collets must be scrupulously clean. Minor contamination of collets causes poor quality cuts from tool misalignment, imbalance and slippage. Tool slippage can lead operators to over-tighten collets and damage to threads. Ensure collets are tightened to the right torque. (ER25 mini-nut 3hp = 29 ft lbs., ER25 E-type nut 5hp = 95 ft.lbs.
3. **Verify square gantry** by pulling it against the stops at the end of the table prior to resetting motors. Hold in place and press reset.
4. **Check rack/pinion/motor/shaft relationship** by rapidly pushing and pulling the carriages near each motor. X1, X2, Y and Z. Adjust motor mount spring (3 1/2 turns after slack is removed) and/or tighten set screws. Adjust motor mount and/or tighten set screws. A slight clicking sound should be heard, but no movement (over a few thousandths) should be present. Adjust if needed.
5. **Move the machine** around in both move and jog ("M" and "J" commands) speeds or use a short warm up routine.
6. **Run the [C3] file** to home the tool using the prox switches.
7. **Run the [C2]** (or other custom zero routine) to zero your bit.
8. **You should verify that the bit has been zeroed properly** by using a "MZ,0" command over the surface. If bit location is not correct, run the appropriate file to zero the bit.
9. **Perform a visual inspection** of the machine, wiring, dust collection hoses and table surface.
10. **Verify proper operation of vacuum pump and dust collector** (if present).

Every 40 hrs of use:

1. **Clean rack and pinions** for X, Y and Z (2nd Z if present) with small brush and re-grease. Add a BB size blob of light grease every 6" and run the tool to its extents in all axes about 10 times. Wipe off any excess grease and recheck X & Y with push/pull test.
2. **Clean the V bearing edges** of the Z assembly with a Scotchbrite pad and WD-40. Wipe with light grease or machine oil. Clean and adjust V-rollers as needed.
3. **Scrub X & Y V-rails** with Scotchbrite pad saturated with WD-40. Wipe with clean rag. Check V-rollers for buildup and clean with small brass brush if needed.
4. **Check rack/pinion/motor/shaft relationship** by rapid push-pull. X1, X2, Y and Z. Adjust motor mount springs (3 1/2 turns past contact) or tighten set screws as needed.

Quarterly (40hrs/week) to Semi-Annual (20hrs/week)

All of the above weekly items PLUS:

1. With motors removed, or at least disengaged from the racks, **move each axis through the full extent of motion and check for looseness or binding**.

2. With motors removed, **spin test each of the V rollers** on the X and Y cars for free movement.
3. **Tighten all pinion set screws.** Check for signs of movement. Replace pinions and damaged key stock (if present) if movement was apparent.
4. **Using provided flat wrench, adjust V roller bearing eccentrics on Z axis.**
5. **Check spindle square and alignment.**
6. **Remove lower YZ car V roller dust covers and adjust eccentrics.**
7. **Update software and firmware.**
8. If you have had a Production Support Visit a folder named “SB BKUP” has been installed on your C: drive. A copy of the SB3 software that is installed on your machine is located there in case you need to reinstall it. There is also a copy of your machine settings there that can be used to reset erroneous or unexpected machine actions after a software crash or electrical storm. Type command [U][R] and navigate to the C:\SB BKUP folder. Your machine settings will be visible there. If you have made any changes to your settings, Make your own backup of those settings by using the [U] [S] command, navigating to the SB BKUP folder and overwrite the exiting file. There is also a copy of your C:\SbParts\Custom folder copied there. This folder holds any custom files that have been modified for your machine or machining preferences and all the user modified settings peculiar to your machine. If needed, these can be copied and pasted into the active C:\SbParts\Custom folder using Windows Explorer.

ShopBot Link Users have a copy of their settings located in the SB BKUP folder that they can retrieve by pressing the [Import] button and navigating to the SB BKUP folder.

Semi-Annual (40hrs/week) to Annual (20hrs/week)

All of the above weekly and Quarterly items PLUS:

1. **Replace all pinions.**
2. **Remove, clean, inspect, reassemble, lube and adjust complete Z extrusion assembly.**
3. **Replace Collets (and possibly collet nut(s) if damaged.**

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Correctly Assemble and Use a Collet

Checking and using a collet

Collets are designed to hold a designated range of diameter tools. Use the proper collet size for the bit - one too large or too small can damage the collet. Collets also may not offer enough holding force to secure the bit, which may also damage the bit or work piece. ShopBot recommends Technik collets for inch sized shank tools (such as the ones sold through ShopBot). Collet specifications can be found at http://www.techniksusa.com/metal/cnaerpci.htm.

Inspect collet and nut for wear and cleanliness before each use. If material gets into the collet, the collet will compress onto the tool unevenly, reducing clamping force. If there is material on the outside of the collet or it's mating surface in the spindle, it will cause the collet to seat crookedly, causing runout. Material on the internal bore of the collet will cause the bit to seat unevenly, causing runout. If there are marks on the bit, left by the collet, there has been tool slippage in the collet due to dirt in an improperly clamping collet.

Collets are made of spring steel and should be replaced after approximately 600-700 hours of run time. To tell if a collet is damaged or past its prime, look for burr marks or wear of the collet bore. The temper of collet steel can also be damaged by excessive heat. An easy way to check this is to insert a collet into a nut and check that the collet remains seated when shaken. If the collet easily falls out then it has lost its' spring and should be discarded.

For a more in depth discussion of collet wear and possible causes, please refer to http://www.cncroutershop.com/us/tool-maintenance.

Collet and Tool Installation

After selecting the proper collet and inspecting all mating surfaces outlined above, insert the collet into the nut at a slight angle and engage the collet groove into the locking ring of the nut. It will snap in with a click and should be held captive by the nut.

Loosely thread the nut onto the spindle and insert the tool. Ensure tool is seated fully into the collet with most of the shank engaged in the holder. Ensure that none of the chip recess is in the collet bore. If the recesses are inserted into the collet bore it can damage the collet by driving chips up into the collet. The more shaft that can be inserted into the collet, the better the collet's holding ability. Conversely, the longer the tool extends from collet, the greater the chance of resonance and chatter. The picture on the cover page shows a great example of a properly installed tool.

Once satisfied with the extension, snugly torque the nut onto the spindle. Torque specs for the nut/collet assembly are available from Technik: http://www.techniksusa.com/metal/torque_chart.htm.

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ShopBot Quick-Start Guide

For PRSalpha and PRSstandard Tools

Software versions 3.8 and above

ShopBot Tools, Inc.
3333-B Industrial Drive,
Durham NC 27704

Table of Contents

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 untrained 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.

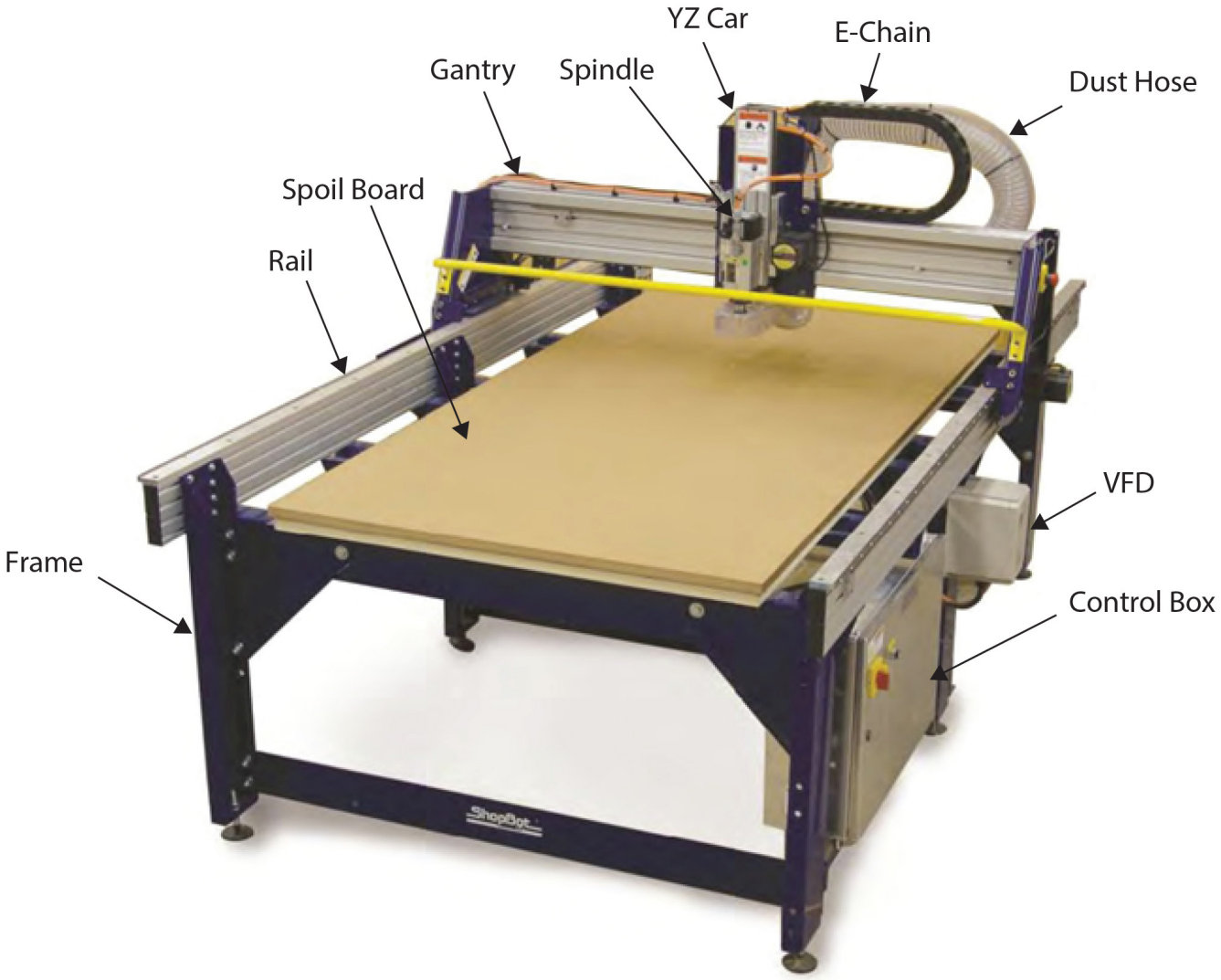
Never place your hands on the rails of the ShopBot. Be aware that the machine may move unexpectedly in any direction, which can cause serious injury if your hands are in the path of movement.

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 or unsafe.

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

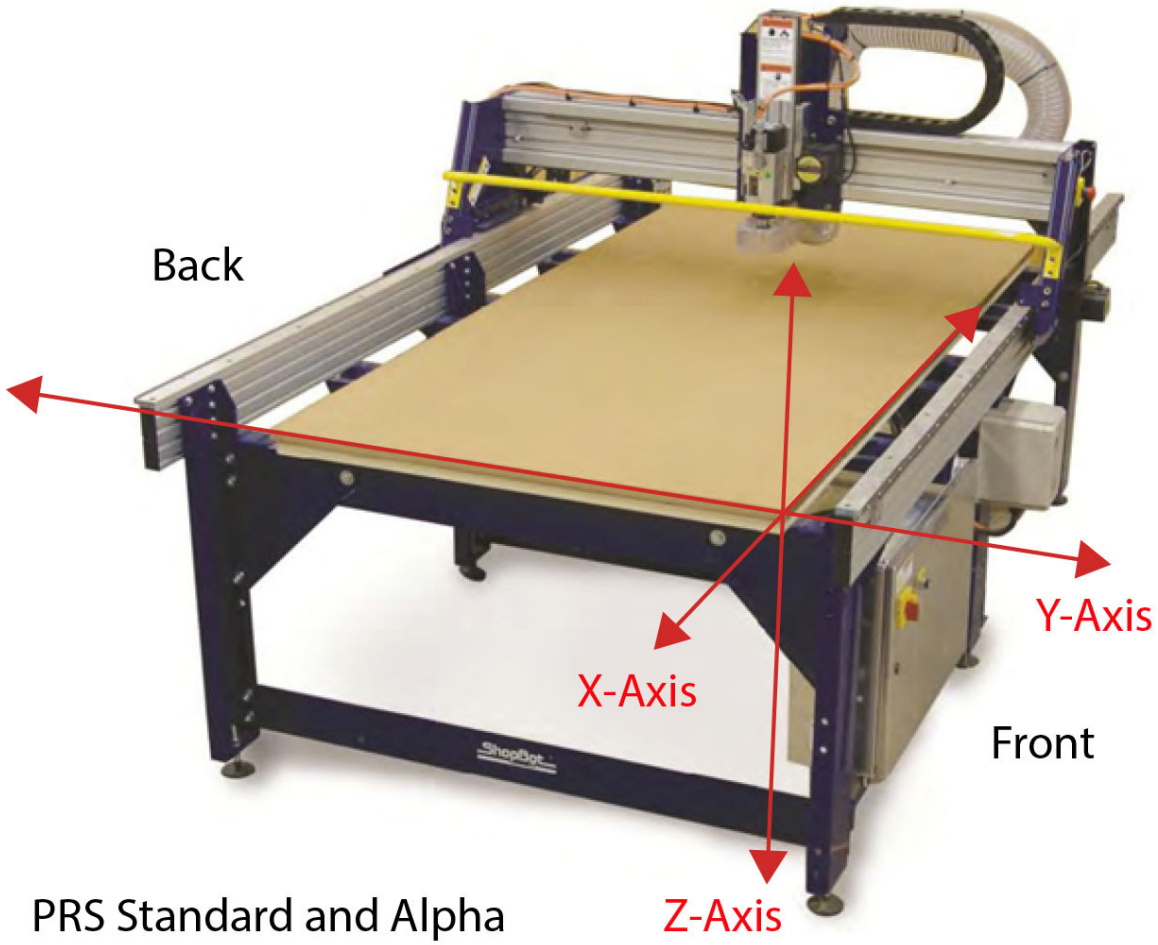
Main Parts of a PRS Tool (PRSalpha shown)



Tool Orientation and Direction of Axes

The picture below shows the axis orientation for the PRSalpha tool.

Normally, the 0, 0, 0 point is located at the intersection of the three axes as shown, and “front” is considered the side noted below.



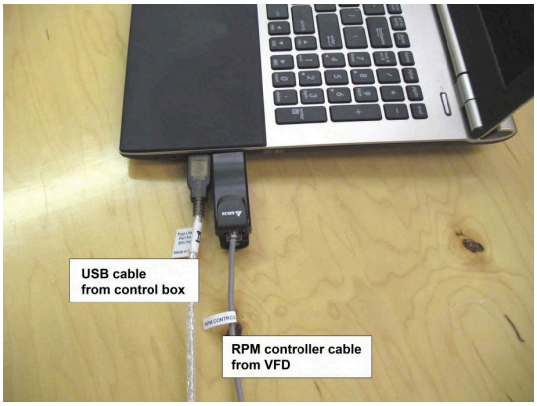
Introduction:

This document covers topics required to get started with a new ShopBot PRS. For more information on any of the topics covered here, please reference the ShopBot User's Guide provided in the binder along with this tool. See also the list of resources on the back page for more information or see http://www.shopbottools.com/ShopBotDocs/.

Software and Computer Configuration

Refer to the Uninstalling and Reinstalling ShopBot and VCarve Software document in the User Guide binder for software installation.

> **Special note for schools and large companies:** ShopBot software runs best with full administrative permissions enabled. We strongly advise against setting up separate admin and user accounts on the control computer.
>
> **For International customers:** The computer used to run the machine MUST have the language set to "United States (English)" in order for the software to run correctly.



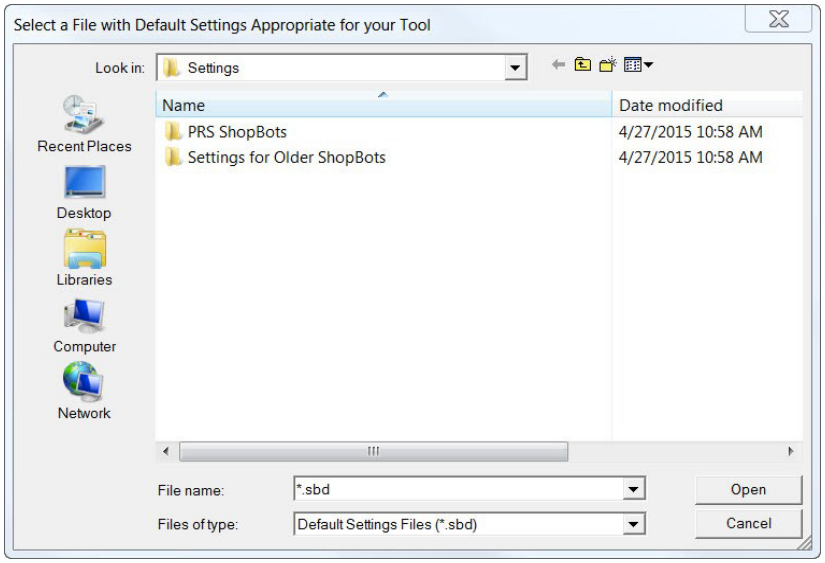
Connect ShopBot to Computer

Connect USB cable to computer and Windows will recognize a "New Device."

Note: It is best to use the same USB port every time the ShopBot is attached to the computer.

Load settings file

When prompted to load a default settings file for the first time, the following screen should appear:

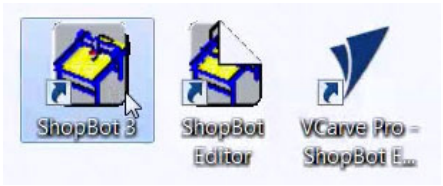


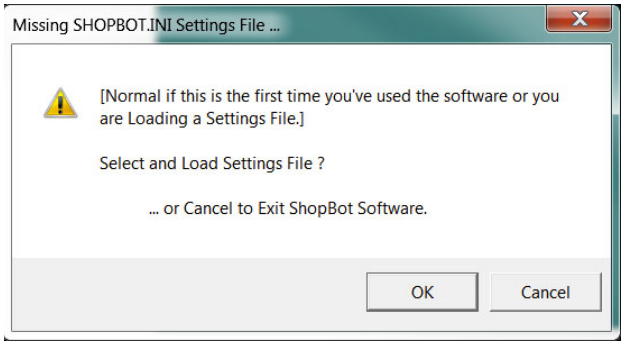
Double-click on “PRS ShopBots”, and choose “Standard”, “Alpha”, or “Buddy”, depending the model. Choose the correct table size for the machine, and this will go back to the main screen.

Note: Custom tools will not have a default setting preprogrammed in the software. Choose the correct type (Alpha or Standard), and the size closest to the tool. Edit the table limits for the table size using “Values” and “Limits for table”. Save the new setting as a custom settings file in the “Utilities” menu.

Launch Software

Double-click the ShopBot 3 icon to open the machine’s control program.





The first time the program is opened, there will not be a settings file for the machine. Click “OK” and a prompt will appear to load a settings file for the machine.

Tool Movement

The “Easy” Control Panel

This panel provides essential machine information and controls. The following steps will walk through some of the most frequently used controls, including installing a bit, zeroing the machine’s three axes, and cutting a couple of sample projects.

Click on the yellow button to bring up the “KeyPad” panel.

The Keypad

This window allows the user to manually move the X-, Y,- and Z-axes of the machine. Click on the blue arrows to move the spindle/router and gantry.

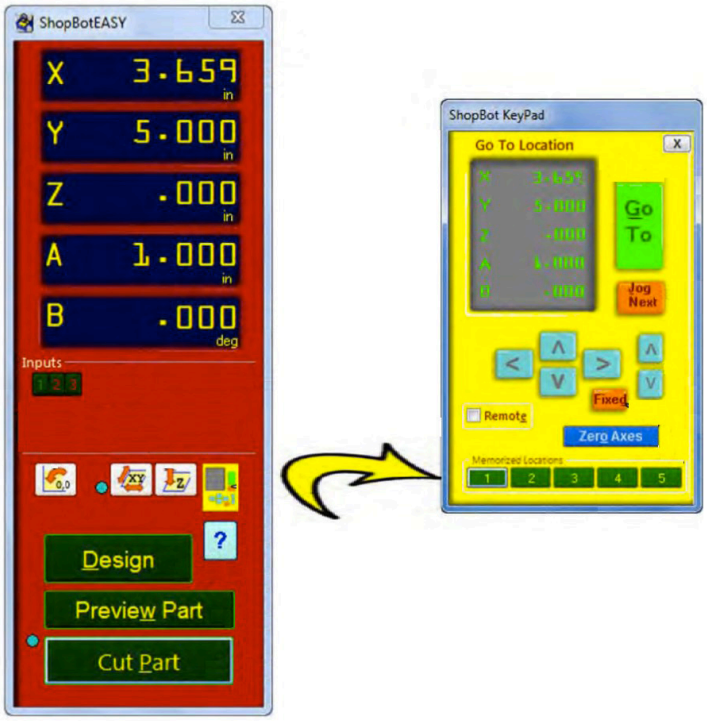
X- and Y-axes can also be moved with the cursor buttons on the computer keyboard. Use the “Page Up” and “Page Down” buttons on the keyboard to move the Z-axis up and down.

Move the spindle/router to a safe Z position below the Z proximity switch and near the middle of the deck.

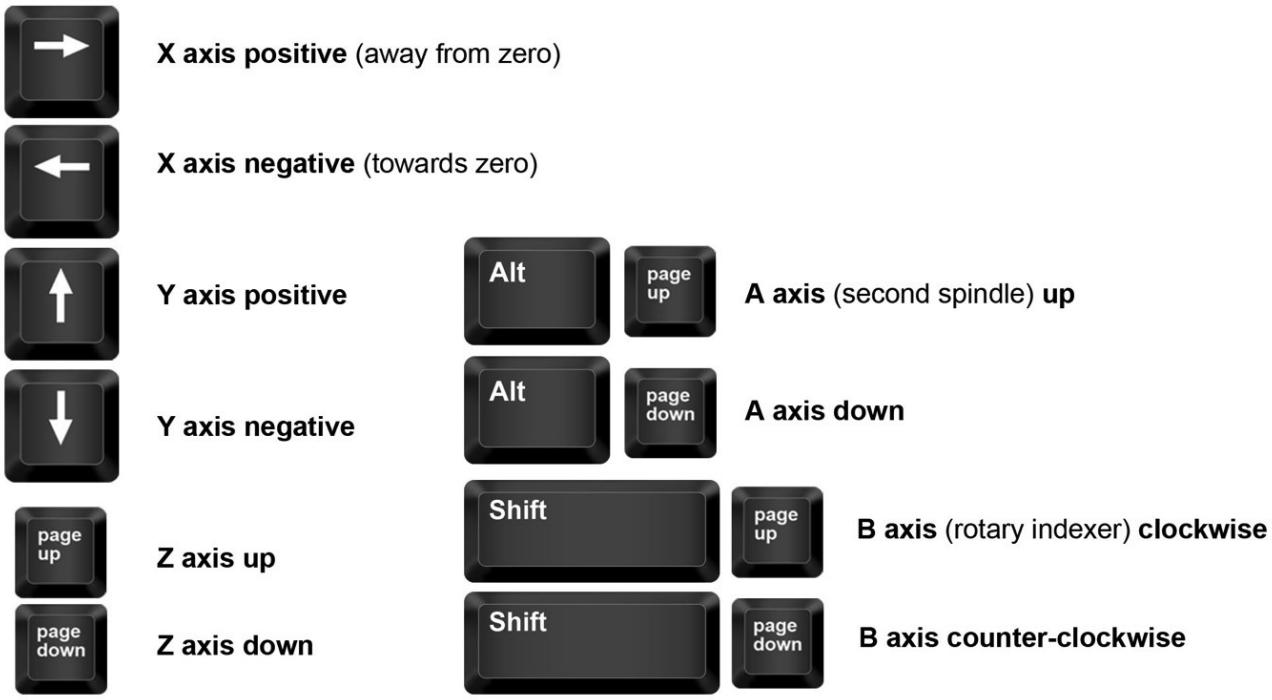
Click on the X in the upper right corner to close yellow KeyPad.

Test each axis with the keypad

Turn ON the control box. Click on the yellow keypad window icon within the red position window. If the icon is not visible, click “move/cut” under “Mode” on the red position window.



Use the buttons on the keyboard (see below) to move the spindle/router along each axis.



Test the spindle/router

Locate the key attached to the collet wrench. Insert this key into the safety lockout next to the power switch and turn the key to “ENGAGED”.

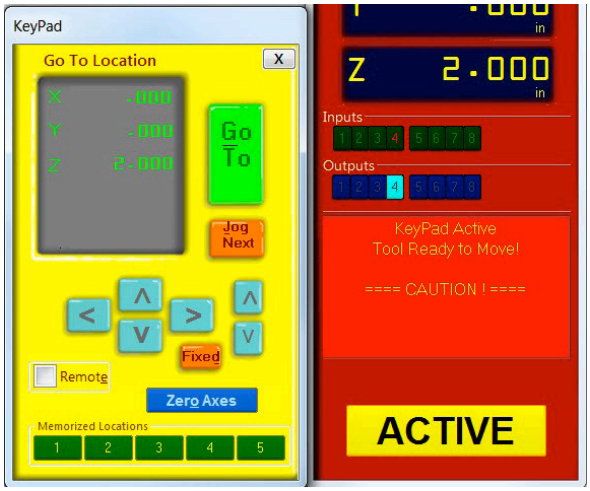
Routers: Make sure that the router’s power switch is in the ON position before proceeding.

In the main console window, type “K” to bring up the keypad move command. Notice that output 4 lights up in the red position window. Click output 1 to turn the output on. This will create a prompt to start the router/spindle.

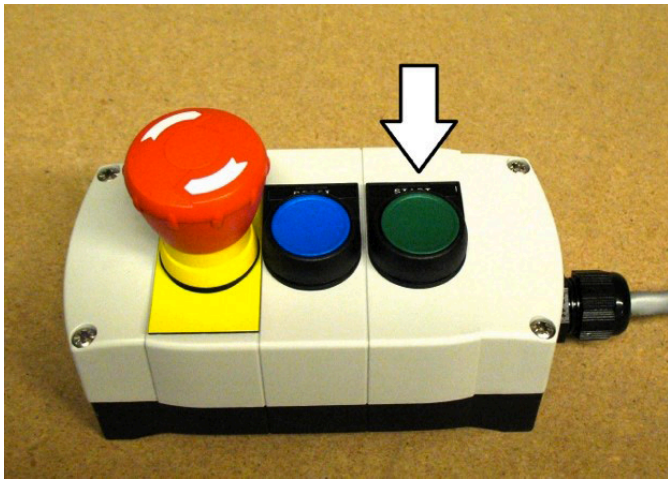
For PRSstandard models, press “OK” to start the router/spindle.

For PRSalpha models, after toggling output 1, press the green “START” button on the three button pendant.

To turn the spindle off, click the output 1 switch again or close the keypad window.



All models: turn on output 1 through keypad



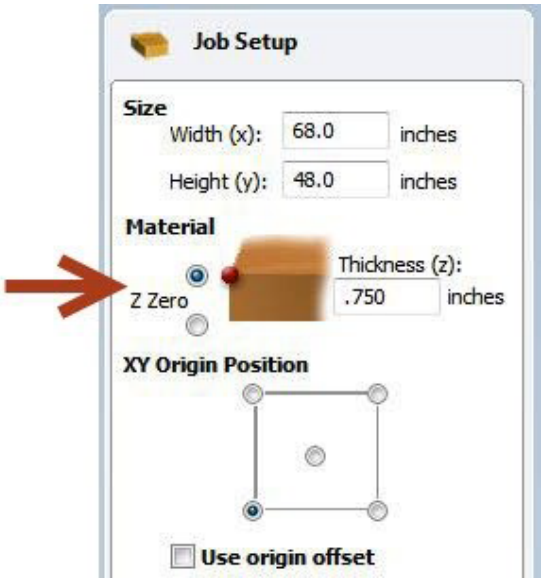
Alpha and Buddy models: press the start button

Running a Part File

This section covers setup procedures performed prior to previewing or running the part file.

Zeroing the Z-axis

The Z-axis must be zeroed each time that the machine is turned on or bits are changed. Zeroing can be done to either the top of the material or to the table surface.



Zeroing to the top of the material is a better choice when a precise cut depth is needed (when cutting an inlay pocket, for example).

Zeroing to the table surface is a better choice when through-cutting parts in wood. Because wood products naturally vary in thickness, the top surface of any given area may be higher or lower than other areas. Zeroing to the table surface will provide the most consistent through-cutting results.

Whichever location is chosen, the location must be identified in the CAD/CAM program (as shown here for VCarve Pro). Failure to match what is specified in the software with what is done at the table can result in ruined material and/or broken bits!

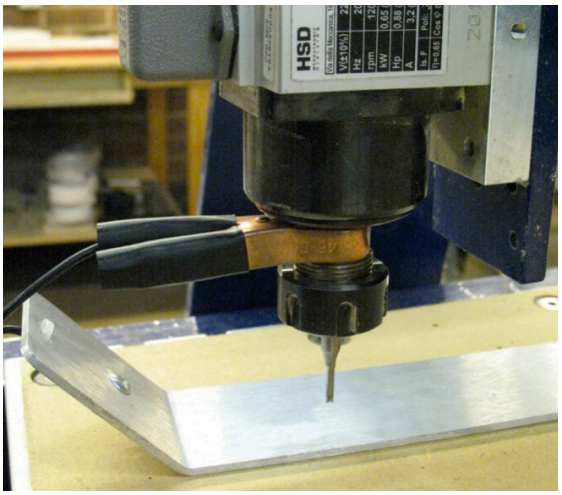
Z-axis zeroing process

Ensure that the software is set to Move/Cut mode.

Place the grounding clip on the bit, if possible. Otherwise, place it on the collet nut or shaft of the spindle.

Set the plate down directly beneath the bit.

NOTE: To test the circuit before running the zeroing routine, touch the plate to the bottom of the bit. Check that input 1 lights up on the screen and goes off as soon as contact is broken.



Click on the Z zero button, or type a C2 command. The Z-axis will touch the plate twice and then move up to a safe height. The Z-axis is now calibrated and the machine is ready to cut.

Place the Z zero plate back in its holster. Remove the grounding clip from the bit and secure it safely.

Zeroing the X- and Y-axes

The best way to zero the X- and Y-axes is by using the proximity switch homing process. This process instructs the machine to touch off from each switch to establish a zero location, which creates an accurate and repeatable start point.

Click the XY Zero button or type a **C3** command to use this feature. To make a permanent adjustment to the location of your 0,0 point based on the switches, click on [T]ools > ShopBot Setup, and "Next" until you see the screen that's marked "ShopBot setup: Prox switches." Then click "Click here to make it easy on me." The program will help set up the new permanent zero location.

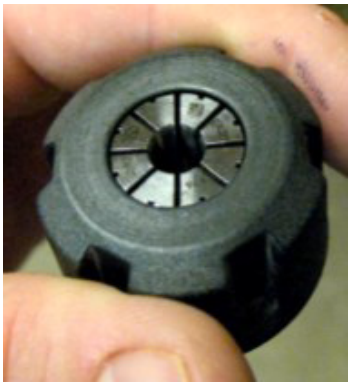
To set up a temporary zero location, move the spindle/router to the desired location. Write down these coordinates to ensure the exact location for later. Type a **Z2** (for Zero 2 axes) command. Notice that the X and Y coordinates now read zero. **This is the new 0,0 location that the cut file will reference.**

Changing bits

Note: Spindles and routers have different collet styles. Instructions are included for both.

Make sure collet and nut are completely clean. If necessary, use a wire brush, compressed air, and/or mineral spirits to remove dust or excess grease.

Spindles: Before inserting the bit, press the collet into the nut and listen for the "click." If collet does not seat, press it in at a slight angle. Confirm that the collet is snapped in by holding the nut upside-down and letting the collet hang freely. Refer to "Correctly Assemble and Use a Collet" doc included if User Guide manual, sent with tool.



Spindles: snap collet into nut, then flip it over to ensure it is snapped in securely

Routers: The router collet and nut are held together by a retaining clip. It is not necessary to disassemble the components for cleaning or bit changes.

Slide bit into collet. Make sure that the collet grips only the shank of the bit, keeping any parts of the flute outside of the collet. Ideally, the bit shank should fill at least 75% of the collet.

Thread collet and nut onto router or spindle. It should go on very easily. DO NOT apply force if nut is resistant. Stop and try again until it goes smoothly. Once the nut is finger-tight, check the bit again to make sure that it has not slipped. Use the included wrenches to fully tighten nut.

Ensure no part of flute enters collet

Setting up the RPM control

This section only applies to tools equipped with a spindle.

Ensure the RPM controller USB plug (from VFD unit) is connected to the computer.

In the main console window (should have a pic to identify this window), click on "Tools" and then "Spindle RPM Control." Drag the box below the position window to keep it out of the way. It must remain open at all times for the software to communicate with the VFD unit.

Click on “RPM” in the left corner of the Spindle RPM box to open a settings window. Change the following parameters in the settings window:

Start when SB3 Starts:	**1**
Hertz: varies by country	**60** (US, Canada, Mexico and Japan)
	50 (Europe, and most other regions)
Hertz Scale:	Same as Hertz setting unless adjustment is required to match VFD unit and software RPM displays.
VFD 1:	**Yaskawa V1000**
VFD 2:	Leave blank unless tool is equipped with two spindles.

Click “OK” to save settings.

To test the function of the RPM controller, turn on the spindle and click on the listed RPM value in the spindle control window. Change it to something different and then click “Enter”. The value on the VFD unit display should match what was just entered.

Holding down material

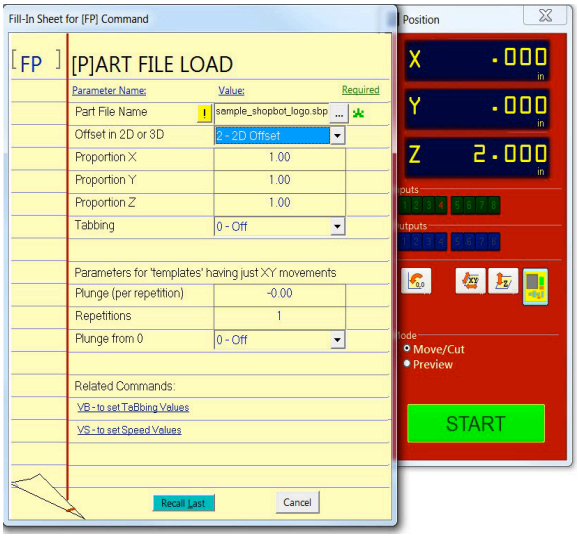
Small parts can be caught by the cutter and thrown, potentially causing serious injury or damage. It is imperative to choose the proper hold-down method for the project. Refer to “Holding Down Material for Cutting” in the User Guide binder provided with this tool.

Warming up the spindle

Note: This step is not necessary for ShopBot machines with routers.

To maximize the life of spindle bearings, warm up the spindle before cutting, after letting it sit idle for longer than 4 hours. Click on “Tools” then “Spindle RPM control” to open the spindle control window. Leaving this window open, start the spindle warm up routine (C5 command). This will run the spindle at 9000, 10000, and 12000 RPM for 3 minutes each, and will turn off the spindle when finished.

Previewing a file with an offset



There are several ways to perform a “test run” without actually cutting the material. First, enter Move/Cut mode, and click on the “Cut Part” button (or “File” and “Part File Load”). Select part file, and the following screen will appear.

Locate the line marked “Offset in 2D or 3D.”

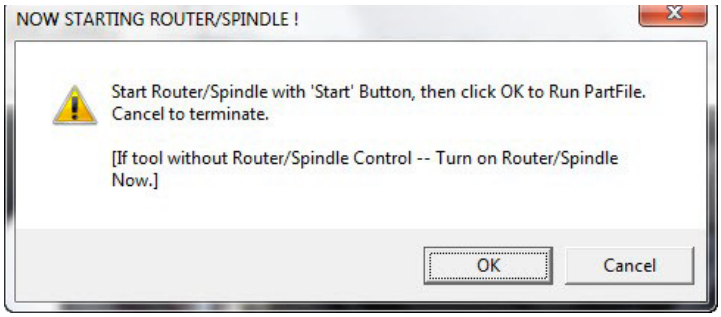
A **2D offset** will cut the file at normal depth in a different X,Y location on the table. Once the X-, Y-, and Z-axes are zeroed, simply move the cutter to the new location and load the part file with a 2D offset. Its current location will be used as 0,0.

A **3D offset** will cut at a different X, Y, and Z position. This is often referred to as “air cutting,” since it runs through the file in the air above the material. To avoid cutting into the workpiece, make sure that the starting distance between the bit and the material is greater than the maximum cut depth.

Click “START” or Enter on the keyboard to proceed.

Running the cut

If the test run looks good, click on “Cut Part” (or type **FP** command), and select part file. At the Part File (FP) setup screen (shown above), ensure “Offset in 2D or 3D” is set to “No Offset.” Click “START,” or Enter on your keyboard. You’ll see the following screen:



For **PRSalpha** and **Buddy** models, press the “Start” button on the three button pendant BEFORE clicking OK.

For **PRSstandard** models, click “OK” and the router/spindle will start automatically.

Pausing or stopping a cut

There are two ways to stop the tool while it is moving or cutting a part file. An emergency stop cuts power to the tool and stops it the fastest. A software controlled stop, or pause, will decelerate the tool, lift the Z axis to a safe height and stop the router/spindle.

Software controlled stop

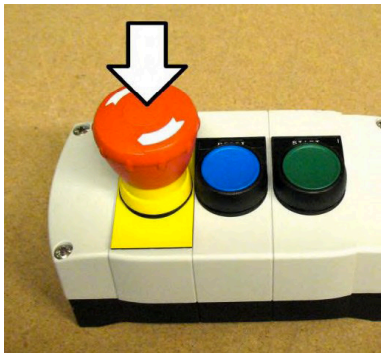
The gentlest way to stop the machine during a cut is to hit the space bar on the keyboard. This will bring the machine to a “soft stop,” and will retain zero locations. The soft stop is useful during non-emergency situations when adjustments or corrections are needed.

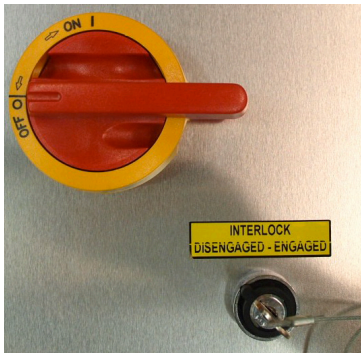
Note: The “Stop” button on **PRSstandard** acts as a soft stop. For a true emergency stop twist the main stop switch on the cover of the control box.

Emergency stop

To immediately stop the spindle/router and all motors, use the red emergency stop button or switch, which will cut off power to all systems. To continue, you will need to re-zero all axes because the locations will no longer be accurate.

PRSalpha models





PRSstandard models

Basic Information

The ShopBot website (www.shopbottools.com) houses many documents that can help with understanding additional uses of this tool. Information can also be found in the User's Guide binder (provided with the tool), or from the resources listed in the back of this guide.

Bits (Refer to "Feeds and Speeds" document provided in User's Guide manual)

Machine Maintenance (Refer to "PRS Maintenance Schedule" located at http://www.shopbottools.com/ShopBotDocs/files/PRSMaintenanceSchedule.pdf for additional information)

ShopBot machines require very little maintenance, but to keep the machine running at its best, verify the following items each day:

- **For spindles only,** warm up the spindle using the spindle warm up routine (C5).
- Clean collet, nut, and all bits, and check for signs of wear or damage. Clean collet and nut with a brass brush and/or compressed air. Clean bits with an appropriate solvent that removes any residue or gunk. Discard dull or damaged bits.
- Visually inspect all wiring and hoses. Check for cuts, scrapes, or pinch points on the cables. If motor cable is damaged, DO NOT run the machine as motor and driver damage is at risk. Call ShopBot tech support (919-680-4800) for advice on how to proceed.
- Ensure the machine and the area around it are clean. Check for any obstructions on the rails and brush away any debris.
- Turn on the power. Push and pull the machine near each motor, along its axis of movement. The motors should be locked in place with no movement. Mechanical looseness in any of the axes should be corrected before proceeding. Contact ShopBot tech support (919-680-4800) for detailed instructions specific to the machine.
- Check the gear rack on each axis and make sure that it is clean and free of any obstructions (large chips, material scraps, etc.).

Resources

To the best of our knowledge, these links are current. If you find that any of them are no longer working, please contact us so that we can update them accordingly.

Detailed chip load charts:
http://www.onsrud.com/plusdocs/Doc/index.html?model.code=FeedSpeeds

ShopBot user's forum:
http://www.talkShopBot.com/forum

Vectric training videos:
http://www.vectric.com/WebSite/Vectric/support/support_vcw_tutorials.htm

Additional Vectric support available within VCarve software: click on Help > Help Contents for an interactive PDF file.

100K Garages:
Post information, bid on projects, and connect with people who want to get things made!
http://www.100kgarages.com