Assembly Guide
For PRSalpha and PRSstandard Tools

For all PRS tools shipped after 6/15/2017
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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 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.
PRS Tool Assembly Process Flow

1. Setup and Assembly Overview (Section 1)
2. Table Assembly (Section 2)
3. Gantry Installation (Section 3)
4. Cable Carrier Installation (Section 4)

- Control Box Installation (Section 5)
  - VFD and Spindle Installation (Section 6)
  - Mounting X-Axis Motors (Section 7)
  - Wire and Cable Routing (Section 8)

- Control Box Wiring (Section 9)
  - Software Installation (Section 10)
  - Secure Table and Spoil Board (Section 11)
  - Setup and Fine Tuning (Section 12)
Main Parts of ShopBot Gantry Tool
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:**

**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.
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 on 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 **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

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

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

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

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

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

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### Tools Required

- **Marker (or other writing tool)**
- **Tape Measure**
- **Wrench or Socket, 5/16”**
- **Mechanical Square**
- **Wrench or Socket, 3/8”**
- **Safety Straps (optional)**
- **Rubber Mallet**
- **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.

**Note:** Do not install upper bolt on lower front right side - this is where the control box will attach.

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

Do not fully tighten the table supports at this time.

NOTE: Do not use lock washers with the table support assembly.

Install Cross Supports

Use an assistant, clamp(s), or sling(s) to hold the cross supports against bottom of 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, 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 counter-bored 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 each side of the front rail with a level or straight edge to be sure that the rail is perfectly straight.

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

<table>
<thead>
<tr>
<th>Wrench, Allen, 5/16”</th>
<th>Wrench, 1”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrench, 5/8”</td>
<td>Wrench, Allen, 1/4”</td>
</tr>
<tr>
<td>Wrench, 1/2”</td>
<td>Wrench, Allen, 3/16”</td>
</tr>
</tbody>
</table>

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 (opposite from 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

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Quantity</th>
<th>ShopBot Part Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
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<tr>
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<td>2</td>
<td>002279</td>
<td></td>
</tr>
<tr>
<td>⅛-20 x 1/2&quot; socket head screws</td>
<td>2</td>
<td>001601</td>
<td></td>
</tr>
<tr>
<td>¼” lock washers</td>
<td>2</td>
<td>000031</td>
<td></td>
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<tr>
<td>¼” flat washers</td>
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</tr>
<tr>
<td>10-32 x 3/4” flat head screws</td>
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<tr>
<td>#10 flat washers</td>
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<tr>
<td>#10 lock washers</td>
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</tr>
<tr>
<td>10-32 hex nuts</td>
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<td></td>
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<tr>
<td>E-chain trough bracket</td>
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<td>002155</td>
<td></td>
</tr>
<tr>
<td>5/16-18 x 3/4 Button head screws</td>
<td>2</td>
<td>002033</td>
<td></td>
</tr>
<tr>
<td>5/16” Lock washer T-Nut</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Nut</td>
<td>2</td>
<td>000728</td>
<td></td>
</tr>
<tr>
<td>64” E-chain trough or 74” E-chain trough</td>
<td>2</td>
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<td>002159</td>
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<tr>
<td>1/4-20 x 3/4 Flat head screws</td>
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<td>001600</td>
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<tr>
<td>1/4” Lock washer</td>
<td>4</td>
<td>000031</td>
<td></td>
</tr>
<tr>
<td>1/4” Flat washer</td>
<td>4</td>
<td>000030</td>
<td></td>
</tr>
<tr>
<td>1/4” Nylock nut</td>
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**Alternate parts:**

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<th>Notes</th>
</tr>
</thead>
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<tr>
<td>5/16-18 T-nuts</td>
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<td>002498</td>
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</tr>
<tr>
<td>X upper E-chain bracket</td>
<td>1</td>
<td>002156</td>
<td></td>
</tr>
</tbody>
</table>
X-Axis Cable Carrier

X-axis cable carriers are included with PRSalpha and PRSstandard tools with table sides 96” and up. Table configurations with 48” and 60” are not shipped with X-axis cable carrier kits.

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
X192

4x 002158 (Echain Trough 64)

Control Box  Primary VFD

Optional Second VFD

64.000  64.000  16.634

NOT TO SCALE
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.

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.
### Hardware

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Quantity</th>
<th>ShopBot Part Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower control box bracket</td>
<td>1</td>
<td>002580</td>
<td>for tools with 6” and 18” Z-axis</td>
</tr>
<tr>
<td>Lower control box bracket</td>
<td>1</td>
<td>003137</td>
<td>for tools with 12” and 24” Z-axis</td>
</tr>
<tr>
<td>Upper control box bracket</td>
<td>2</td>
<td>002579</td>
<td></td>
</tr>
<tr>
<td>BHSCS 5/16-18x1”</td>
<td>3</td>
<td>002415</td>
<td></td>
</tr>
<tr>
<td>BHSCS 5/16-18x3/4”</td>
<td>4</td>
<td>002033</td>
<td></td>
</tr>
<tr>
<td>Washer flat 5/16” Z USS</td>
<td>10</td>
<td>000848</td>
<td></td>
</tr>
<tr>
<td>T-nut standard 5/16-18 ball and spring pivot insert</td>
<td>4</td>
<td>000728</td>
<td></td>
</tr>
<tr>
<td>Nylock Hex Nut 5/16-18</td>
<td>3</td>
<td>002264</td>
<td></td>
</tr>
<tr>
<td>Nut 1/2-13 Z</td>
<td>1</td>
<td>000440</td>
<td></td>
</tr>
<tr>
<td>Flat Washer 1/2” SAE Z</td>
<td>2</td>
<td>000029</td>
<td></td>
</tr>
<tr>
<td>Lock Washer 1/2” Z</td>
<td>1</td>
<td>000588</td>
<td></td>
</tr>
<tr>
<td>Hex Cap Screw 1/2-13x1 1/2” Z5</td>
<td>1</td>
<td>001956</td>
<td></td>
</tr>
</tbody>
</table>
Note: The brackets for the control box are attached to the INSIDE of the table.

Notice that the control box flanges are in front of brackets at both the top and bottom. If the placement of the flanges against the brackets is not consistent, the control box will sit at an angle, and not open or close easily.
Installation

Snap in T-nut ball and spring pivot inserts on the inside face of the table side in lowest slot.

Loosely attach the two upper control box brackets to the T-nuts inside the table side slot with 3/4” button head screws and flat washers.

Note: Be aware that their orientation may need to be flipped to keep from interfering with the existing cross supports.

Mount the lower control box bracket to the lower left tab of the control box using a 1” button head screw, flat washer, and control box tab through the bracket, then washer, and a nylock nut on other side.

Note: It is important that the control box tabs sit on the same side of the blue brackets at both the top and the bottom of the control box.

Space the upper control box brackets to the approximate distance of the tabs on the control box. Lift the control box into place and mount with a button head screw, flat washer, control box flange, through the bracket, flat washer, and a nylock nut for each bracket.
If installed, remove the hardware from the top hole where the lower cross support is attached to the leg.

Slide the top brackets holding the control box toward the left until the lower bracket touches the table leg.

Securely mount the lower control box bracket to the side of the leg with bolt, flat washers, lock washer, and nut.

Once the lower bracket is firmly in place, tighten the button head screws holding the upper brackets to the table sides.

Alternate Mounting for 12" and 24" Z-Axis Models

12" and 24" Z-axis tools are configured with two side plates on each side. The second side rail requires a different lower mounting bracket. This bracket will be installed over the lower cross support with the control box mounting tab pointing down.
Section 6. VFD and Spindle Installation

Introduction

This section covers mounting the variable frequency display (VFD) and spindle.

If attaching a router instead of a spindle, refer to the Installing and Removing Router document. This document was provided with the tool, and can also be accessed via the Support area of our website in the Documentation section.

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 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

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Quantity</th>
<th>ShopBot Part Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yaskawa V1000 VFD</td>
<td>1</td>
<td></td>
<td>Part numbers vary based on the options available. Refer to paperwork to determine model.</td>
</tr>
<tr>
<td>VFD Mounting Kit V1000</td>
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<tr>
<td>FHSCS 1/4-20x5/8</td>
<td>2</td>
<td>003064</td>
<td></td>
</tr>
<tr>
<td>BHSCS 1/4-20x3/4</td>
<td>4</td>
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<td></td>
</tr>
<tr>
<td>flat washer 1/4 USS Z G5</td>
<td>6</td>
<td>000534</td>
<td></td>
</tr>
<tr>
<td>Nylock hex nut 1/4-20 Z</td>
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</tr>
<tr>
<td>VFD mounting strap</td>
<td>2</td>
<td>003036</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Quantity</th>
<th>ShopBot Part Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6 - 1.0 x 25mm Socket Cap Screw</td>
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</tbody>
</table>

### 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.
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

<table>
<thead>
<tr>
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<tr>
<td>Check if standard pinion gears are same size</td>
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</tr>
<tr>
<td>X1 motor</td>
<td>1</td>
<td>See chart below</td>
<td>One red dot</td>
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<tr>
<td>X2 motor</td>
<td>1</td>
<td>See chart below</td>
<td>Two red dots</td>
</tr>
<tr>
<td>M6-1.0 x 14mm socket head cap screw</td>
<td>8</td>
<td>005228</td>
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<tr>
<td>M6 lock washer</td>
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Motors

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<td>ARM98AC-T7.2</td>
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<tr>
<td>Part Number (220v)</td>
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<tr>
<td></td>
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<td>x</td>
<td>ASM98ACE-T7.2</td>
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</table>

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.
Identify Motors

Identify each motor to determine the position it will mount on machine. Colored dots are located on each motor plate.

Red dots indicate which X-axis goes on either side of the tool. One dot marks motor X1, and two dots identifies motor X2.

The end of the cables also have colored labels. Accessory items, such as a rotary indexer, are marked yellow.

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

It is very important to mount each motor in its correct location. Verify the markings on the motor plates as they are mounted onto the tool. X1 (one dot) is mounted on the outside of the gantry end plate opposite the side with the control box, and X2 (two dots) is mounted on the outside of the plate closest to the control box.

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

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<th>Quantity</th>
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<th>Notes</th>
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<tbody>
<tr>
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<td>002740</td>
<td></td>
</tr>
<tr>
<td>Z zero plate</td>
<td>1</td>
<td>14524</td>
<td></td>
</tr>
<tr>
<td>Remote stop button</td>
<td>1</td>
<td>002723</td>
<td>PRSstandard</td>
</tr>
<tr>
<td>E-stop</td>
<td>1</td>
<td>000777</td>
<td>PRSalpha</td>
</tr>
</tbody>
</table>

Motor, Proximity Switch, and Stop Button Cables

All cables for motors, proximity switches and stop buttons 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](https://www.shopbottools.com/support/manuals) located in the Support area of our website in the Documentation section.

To install an ATC, refer to [ATC Installation manual](https://www.shopbottools.com/support/manuals) 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](https://www.shopbottools.com/support/manuals) 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

Introduction

The wiring instructions for your specific tool should follow this page. ShopBot highly recommends that a licensed electrician hook up the source power according to local code and the wiring and power diagrams included with the tool.

If the instruction is missing or incorrect for your model/configuration, visit “http://www.shopbottools.com/ShopBotDocs/gantry.htm” then choose either “Control box mounting and wiring (standard models)” or “Control box mounting and wiring (alpha models)”, whichever is most appropriate to your tool. If you are still unable to locate the appropriate document, contact our support team either via email at support@shopbottools.com or by phone.
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.

Locate the control box USB port. The control box ships with a sticker partially covering the port that reads; “Stop! Install Software First.” Remove this sticker only after installing the ShopBot control software.

Plug the cable into the control box and use a zip tie to secure the cable loop.

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.

Locate the ShopBot 3 icon on the desktop or Windows Start menu. Double click on the icon to launch the control software.
When the program is opened for the first time, a prompt will appear to load a settings file. Select “OK” to proceed.

**Note:** If this screen does not appear when the program is opened, or 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.”

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 ShopBot control box is programmed with firmware needed to communicate with the ShopBot 3 control software. This is programmed at the factory for the software version shipped with the tool. If for some reason a different software version is loaded on the control computer, the firmware will need to be updated using this procedure.

In ShopBot 3, select “Utilities,” then “Install Control Box Firmware.”

Follow the prompts in the window that appears, checking the box as each step is completed.
After the control box is turned on, the progress bar below should pop up. It will take about 10 seconds to complete.

Once this progress bar completes, the firmware has been loaded on the control box. If progress bar does not appear, conduct the firmware downloader operation again.

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 setup 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 PRSalpha 96-48. Larger or smaller table sizes will require additional baseboards and/or cutting material to fit.

Hardware

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

**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 work-bed, 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 counterbore 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.

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:

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