Proximity Switch Installation

Proximity Switches may be used on a ShopBot as limit switches to stop an axis from hitting the mechanical stops and losing position. They may also be used with a Part File in the ShopBot Control software to locate and position the X and Y axes. For example, the Home.sbp file sends the X and Y carriages back to their respective targets, then moves them into the "Home" position and "zeroes" the X and Y axis at that location. Instructions on how to customize the Home.sbp part file to run the homing routine are included at the end of this document.

Proximity Switches are solid-state inductive switches that are activated when the switch detects a metal target. When a Proximity Switch is within range of the target, the switch is activated, lighting the LED on the proximity switch and closing Input #3 in the Control Box. In default mode, the ShopBot control software interprets the closing of Input #3 to stop the carriage in place (limit switch). Part Files can also use the action of the Proximity Switches to perform an operation, as in the Home.sbp file.

1. <u>**Mount the switches on the switch mounting plates**</u>**:**
   Attach the two switches to the mounting plates as illustrated using the fine bolt and nut.
   Note: the large slot isn't centered on the plate.
   - o When mounting the X proximity switch, the large slot should be near the bottom of the plate.
   - o When mounting the Y proximity switch, the large slot is near the top of the plate. The assembly picture indicates the orientation of the plate in relationship to the switch/plate.
   - o For both assemblies, the bolt for attaching the proximity switch to the plate is inserted into the bottom hole from the back of the plate, the nut and washer hold the switch from the front of the switch.
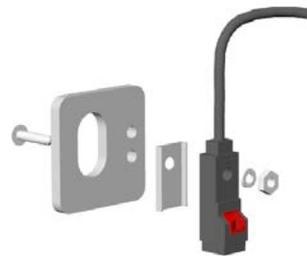
X-Axis Proximity Switch Assembly
Note: Large slot is near bottom of plate

Y-axis Proximity Switch Assembly
Note: Large slot is near top of plate

2. Mount the brackets on each axis:

- Remove the 3/8" Nylock nut on the Rear Left bearing bolt on the X carriage (X1 motor side)
- Remove the Right Front bearing bolt on the Y carriage
- Put one switch (on mounting plate) & washer on each of the bolts that you took the Nylock nuts off of. **Use a 3/8" flat washer (3/8" i.d. x 5/8" o.d. x approx. 1/8" thick) between the bearing and mounting plate on each to prevent the bearing from binding**
- Re-install the 3/8" Nylock nut (see photo)
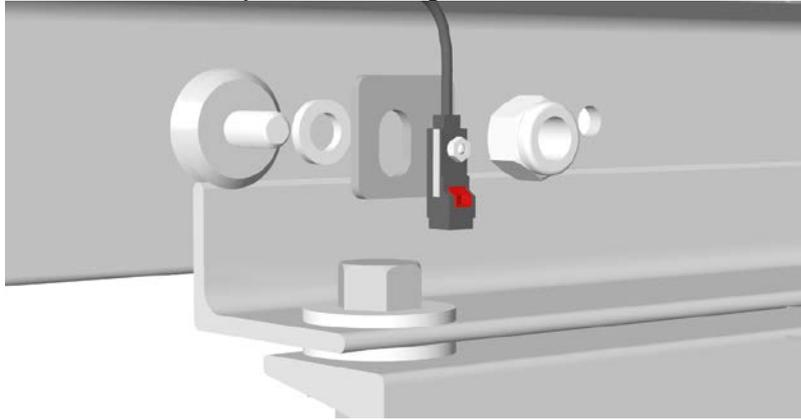
X Proximity Exploded View
Note: Switch is towards inside of X car
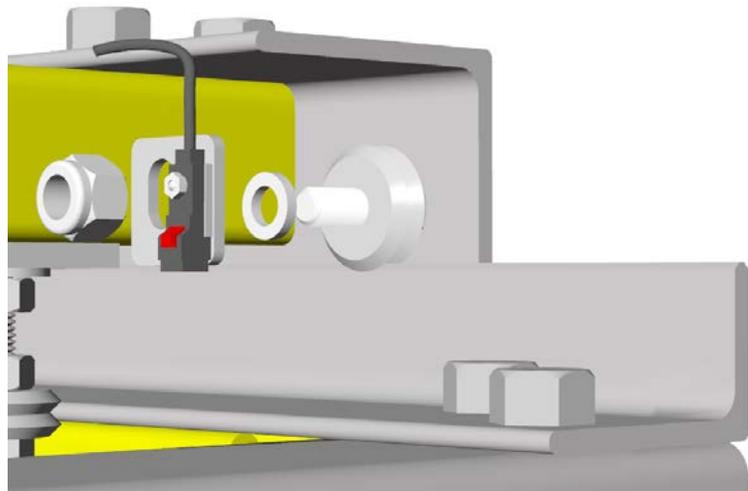
Jamb Nut installed on Y
Note: Switch is towards outside of Y car

3. <u>Run the wires to the Control Box:</u>

- Run the Y proximity switch cable over the wire guide to the back of the X carriage.
- Run the X proximity switch cable through the X car to the back of the carriage.
- Run both cables back to the Control Box.
- Installation instructions for the connection of the wiring are in Step 5.

4. <u>Mount the targets</u>:

- Put one of the targets at each end of the X- and Y-axes on the same side as the switch. At first, mount the targets with the double stick tape supplied with the target brackets. For safety's sake, mount the targets at least .5" back from where the mechanical stops would stop the carriages so that the carriages have room to slow down between when the Proximity Switches are triggered and when the carriage would hit the mechanical stops or end of the carriage.

- Mount the X targets:

  - Use (**K**)eyboard control to move the X carriage to the left until it is almost touching the mechanical stops. **Esc** from Keyboard Control and Zero the X axis **[ZX]** at that point. Move the X half inch from Zero **(MX, .5).**
  - Stick the target to the left and under the proximity switch as pictured below.
  - Use the (**K**)eyboard control to move the X carriage to the right until it is almost touching the mechanical stops. Back off .5" from the end
  - Stick the target to the right and under the Proximity Switch.
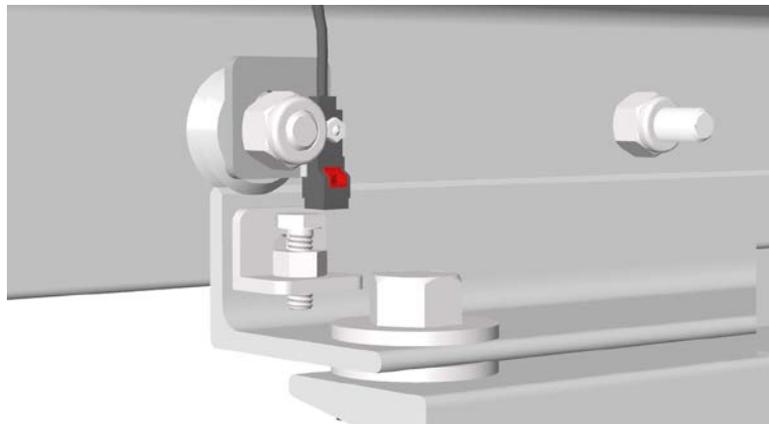
<u>X-axis Target mounted at left end of back X-rail</u>

- Mount the Y targets:

  - o Use the (**K**)eyboard control to move the Y carriage to the front until the hold down bearings are almost touching the front X car. Back off .5".
  - o Stick the target to the right and under the proximity switch as pictured below.
  - o Use the (**K**)eyboard control to move the Y carriage to the back until the hold down bearings are almost touching the rear X car. Back off .5"
  - o Stick the target to the right and under the proximity switch.
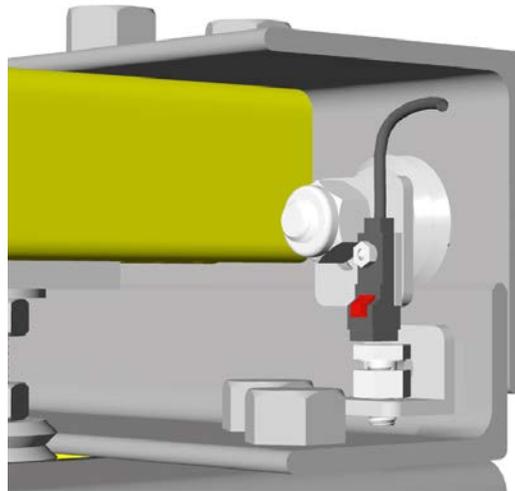
<u>Y-axis Target mounted at Front of right side Y rail</u>

- If you are using a double Z axis set up, read the instructions for mounting the two Z's before you permanently mount the targets. Leave as much room between the mechanical stops and the Proximity Switch targets as you can while still getting coverage by both Z's over the Table surface.
- When you're certain that you have the targets in the correct position, drill and mount the targets with the 6-32 x 5/8" machine screws and nuts included in the installation package.

5. <u>Wire the switches into the Control Box</u>:

- Disconnect power to the Control Box.
- Open the cover on the Control Box to expose the Control Board.
- Run the Proximity Switches Cable through the Roxtec fixture into the Control Box
- Connect the wires from both Proximity Switch cables to the terminal blocks labeled "INPUT" on the Control Board
- Green wires go into the GND terminal. If there are too many wires for the terminal, use the OUTPUT blocks GND terminal or connect all of the ground wires together and insert a single wire into the INPUT GND terminal.
  o Black wires go into the INPUT #3 terminal.
  o Red wires go into the +5 terminal.
- Replace the gaskets on the Roxtec fixture and Close the cover to the Control Box
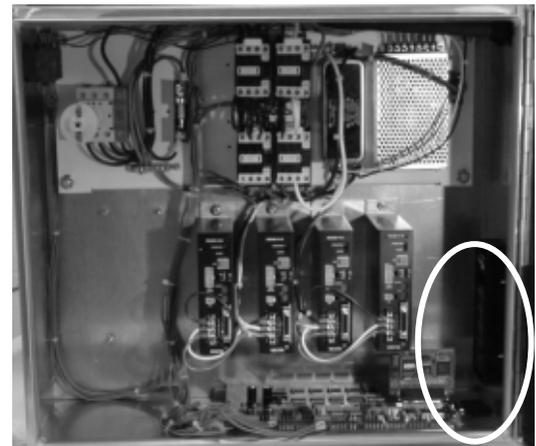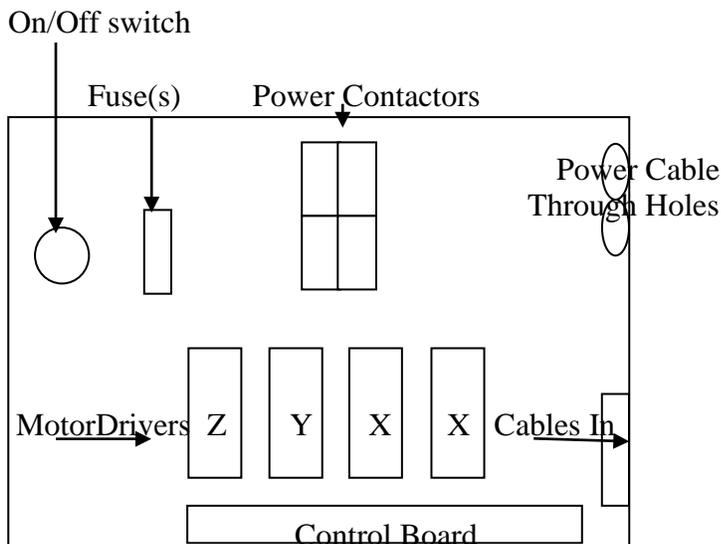
Inside the Control Box

Run the Proximity Switch Cable through the Roxtec fixture into the Control Box. See Wiring the PRTalpha for more information on the Roxtec fixture.
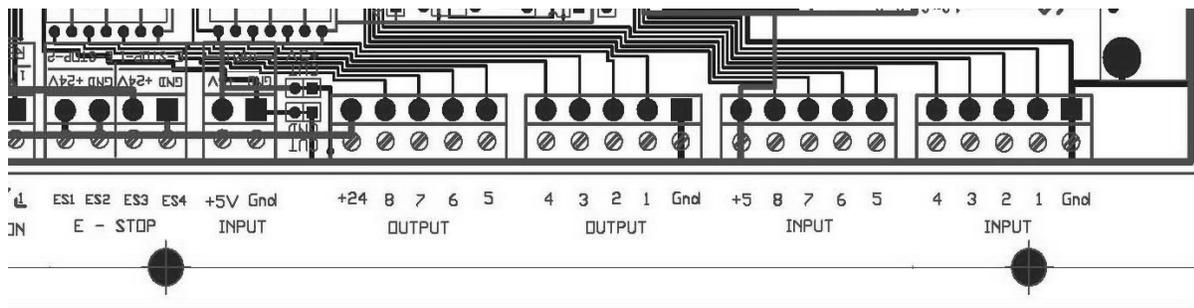
Diagram of the Control Board showing the location of the Inputs.
The Proximity Switches connect to Input #3 and Ground via the terminal block on the right, and the +5V via the terminal block on the left.

Left Terminal Block					Right Terminal Block				
+5	8	7	6	5	4	3	2	1	GND
Red						Black			Green

Remove the Terminal Blocks from the Control Board by gently lifting straight up.

Insert the wires into the terminal blocks.

Tighten the small screws at the top of the terminal block to hold the wires in place.

Gently replace the terminal blocks on the Control Board.
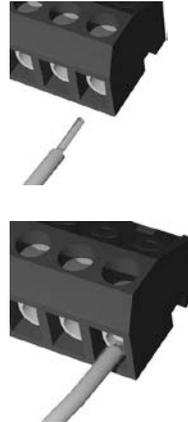
6. __Adjust the targets:__

- After you've mounted the target bracket and connected the wires, turn on your Control Box and start the ShopBot Control software.
- Use the **(K)**eyboard control to move the X proximity switch over the target on the left end of the X rail (be sure not to hit the bolt on the target bracket with the proximity switch) and adjust the target bolt to approximately 1.8 mm (0.07") under the switch. This is the ideal triggering distance. The LED on the proximity switch will light when the target is within range of the switch.
- Repeat this process for each of the targets on both axes
- Bundle the wires along with the motor cables from the X carriage to the Control Box

Note: When the proximity switch is triggered, both the LED on the proximity switch and the Input #3 light on the display screen of the ShopBot Control software will light. When using the **(K)**eyboard control, there is a slight delay when a limit switch is activated. Once this event is timed out (approx. 5 sec.), you can use the arrow keys to move the carriage and clear the proximity switch. It is also important to note that it is possible to pass the switch and run into mechanical stops once this event has timed out, possibly causing the loss of position on that axis.

mm (0.071")   1.8
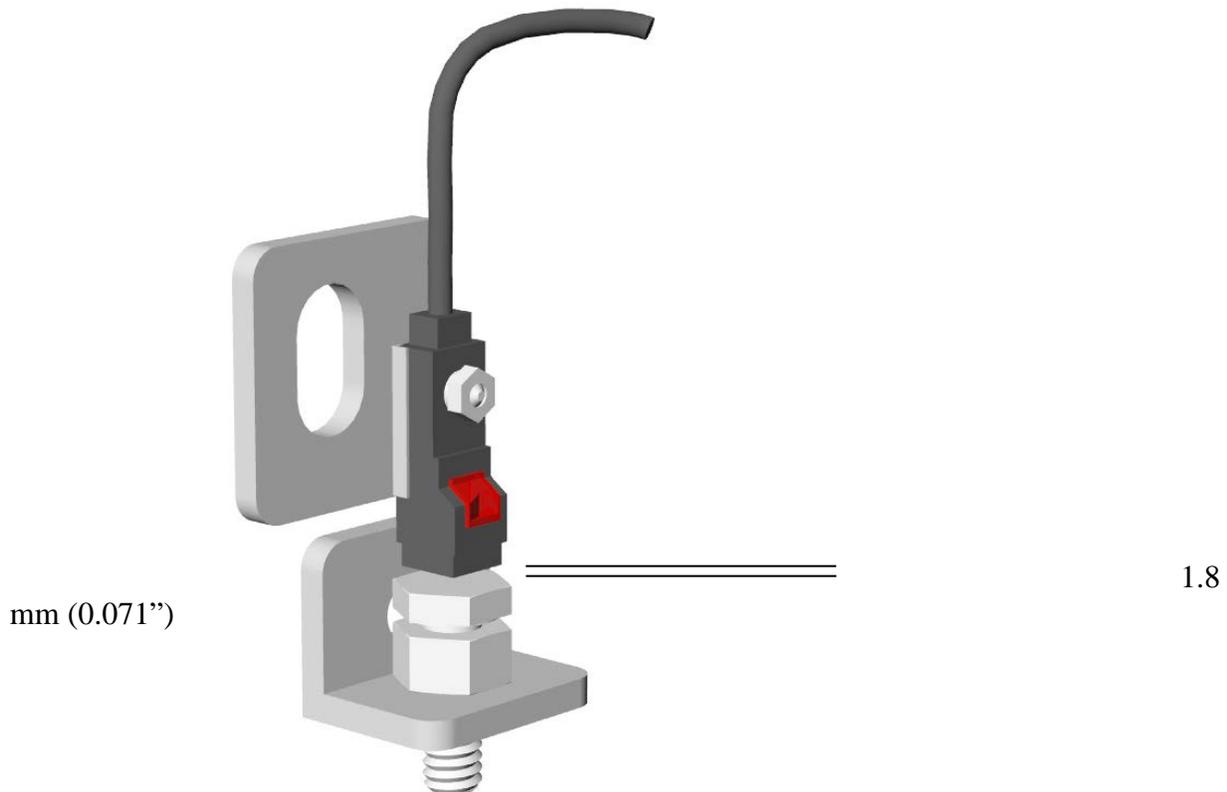
__Proximity Switch to Target Distance__

In default mode, the Proximity Switches will work as limit switches to stop the action of your carriages any time the switches are activated by running over a target.

Set up the Homing Routine

The first time that the ShopBot Control Software is loaded onto your computer, it writes two Homing files into the SBParts folder (located in the C: drive of your computer.)

- One file, named S_Home.sbp, will be overwritten each time that you download a new version of the ShopBot Control Software. That file MAY contain updates to the Homing routine.

- The other file, named Home.spb, should not be overwritten when you download a new version of the Control Software. Therefore, when you wish to customize the Home routine (for example, change the physical location of the X and Y "0" on your set-up, or change the file to work in metric rather than inches), make the modifications to Home.sbp.

- The shortcut to the Home routine, **C3 (**Custom3), calls up the Home.sbp file. If you make modifications to the Home.sbp file and give it yet another name, you must also modify the **Custom3** file. The C3 file should not be overwritten when you download a new version of the Control Software. See below for an example of how to modify the Home routine.

Before using the Proximity Switches and the ShopBot Control software to "Home" the X & Y axes, the HOME.SBP part file will need to be customized for your use. To set this up for your ShopBot:

- Decide the 0,0 location that works for the table (usually in the front left corner) and position the center of the router bit over it using the **(K)**eyboard control. When positioned correctly, press the **ESC** key to exit the Keyboard Control.
- Zero the X & Y axes by typing the **(Z)**ero**(2)**axes command at the ShopBot command prompt.
- Determine the distance from the home position to the activation point of the X axis proximity switch.
    - o Using the **(K)**eyboard control, move the X carriage from home in the negative direction (left arrow) until the proximity switch is activated.
    - o **Note:** The limit switch function in the ShopBot software should stop the carriage as soon as the proximity switch is activated. If a limit switch is activated, the keyboard control will stop working for several seconds before movement will resume. Release the key being pressed, wait 5 seconds, and then resume moving the machine with the arrow keys.
    - o When the X carriage activates the proximity switch and stops, write down the current location of the X axis. This number should be negative and can be found in the upper right hand corner of the ShopBot Control software. Press the **ESC** key to exit the keyboard control.
    - o Return the X axis back to the home position with the **(J)**og **(H)**ome command.

- Determine the distance from the home position to the activation point of the Y axis proximity switch
    - Using the **(K)**eyboard control, move the Y carriage from home in the negative direction (down arrow) until the proximity switch is activated.
    - When the Y carriage activates the proximity switch and stops, write down the current location of the Y axis. This number should be negative and can be found in the upper right hand corner of the ShopBot Control software. Press the **ESC** key to exit the keyboard control.
    - Return the Y axis back to the home position with the **(J)**og **(H)**ome command.

Edit the HOME.SBP part file using the (F)ile(E)dit command from the ShopBot Control Console. Select the Home.sbp file found in the folder C:SBParts. press ENTER to bring up the filled in ShopBot command line, and ENTER again to open the editor with the selected file.

- Scroll down the page file until you reach the lines:

```
'Set these values for your home position
              &xbot=-.500          'Change this number to set the distance between your limit
                                   '  switch and your X zero position (this number should be
                                   '  negative for the tool to travel in the correct direction)

              &ybot=-.500          'Change this number to set the distance between your limit
                                   '  switch and your Y zero position (this number should be
                                   '  negative for the tool to travel in the correct direction)
```

- Change the value after &xbot= to the one that was determined for the X axis (**This number should be negative**).
- Change the value after &ybot= to the one that was determined for the Y axis (**This number should be negative**).
- Save and exit the editor.

Running the Homing Routine:

The short cut to run the homing routine HOME.SBP is **C3**, or you may run the routine as a regular Part File using the **FP** command and selecting the Home.sbp file.

The X carriage should jog toward the target mounted on the X rail, stop and move to the right 2", stop and move back to the target, stop and jog to the X home position. Then, the Y carriage will repeat a similar process. When it is finished, the tool should be in the home position and the ShopBot screen should be display 0,0 for the X & Y axes.

Customizing the C3 file:

Use **FE** to edit the **Custom3.sbc** (found in C: SBParts, in the Custom folder)

```
 'Home X & Y Axes using Prox Switches
'-----------------------------------------------------------------------
FP, c:\SbParts\home.sbp
'-----------------------------------------------------------------------
' ... executing Custom Cut File
```

Change the **home.sbp** to the name of file that you gave your custom program (example: **home2.sbp**. S**AVE** the Custom3.sbp file, or use **SAVE AS** and give it another name (Example: Custom4.sbp) for different homing routine.

Troubleshooting

Input #3 does not light up when the Proximity Switch reaches the target and/or the carriage does not stop.

- Is the Proximity Switch activated (you see the red light come on) when it reaches the target? Adjust the distance between the target and the Proximity Switch until the Proximity Switch triggers.
- Use the Fill-in sheet in the VN (Values iNput switch) to check if the Limit Switch function is turned on in the ShopBot Control Software.
- Did you plug the wires from the Proximity Switches into the correct location on the Control Board? See above.
- If you have wired the Proximity Switches into an Input other than Input #3, did you modify the Home file to look for information from the new Input? See above.
- Did you run over the Cable from the Proximity Switches to the Control Box and break the cable? Contact ShopBot (support@shopbottools.com).
- Are you using the correct Home file? See Customizing the Home File above.

The X and Y carriages do not move to the location when running the homing routine.

- Has your X and/or Y Position somehow gotten very out of whack? Look at the red ShopBot Position Screen to see where the Control Software thinks the X and Y axes are. If they are physically sitting somewhere they should be, but the Control Software says they are sitting somewhere completely different, you may need to add a little reality to the situation. Use the **Z2** (Zero 2 Axes) command from the ShopBot Control Console to Zero the X and Y axes at their current location. Then try the home routine again.
- Are your Unit Values Correct? In other words, if you ask the Z to move 10", is it really moving 10", or perhaps it's moving 8". To check, you need a tape measure. Use **Z2** to Zero the X and Y axes at their current location. Mark that location. Use **MX, 10** to move the X axis 10 inches to the right, and measure with a tape measure to see if it really moved 10". If it really moved some other distance, your Unit Values are probably incorrect. In the Owner's Manual, see TroubleShooting in the TAB:Assembly Manual, or the Set-Up Tutorial behind the TAB: Install Software and Quick Start Tutorials to find out how to change the Values of the Units **[VU].**
- Are you running in metric, but the values in the Home.sbp file only make sense in inches?
  o Use the fill-in sheet found under the **VD** (Value Display) command to change between mm and inches **OR**
  o Modify the Home file to reflect values that make sense in metric. There are a number of places to modify the program, so feel free to contact ShopBot for help (tutorial coming soon.)