

# PRS Retro Z-Axis Installation



This document is a guide to installing the PRS Retro Z-axis on early ShopBot models. It describes installation for PR models with PK299 and PK296 SG3.6\* motors and all PRT models. Depending on the vintage of ShopBot the Y-carriage may differ; this document will describe the installation methods for each.

The PRS Retro Z-axis takes the rigidity of the current PRS Z-axis and makes it so that this rigidity can be applied to older ShopBots. The PRS Retro Z is composed of an extruded aluminum Z-beam and a captured bearing system. The PRS Retro Z has 8 inches (203mm) of travel; up to 12 inch is available. The Z-axis plate has hole locations on its side that offer multiple vertical adjustment locations. The motor from the existing Z-axis mounts to the PRS Retro Z-axis using a specified motor plate (direct or gearbox). This all comes together in a compact form that fits within the Y-cars of early ShopBots.

\*\*\* It will be necessary to upgrade the dust skirt to the PRS dust skirt (15223).\*\*\*

Other items that you may need:

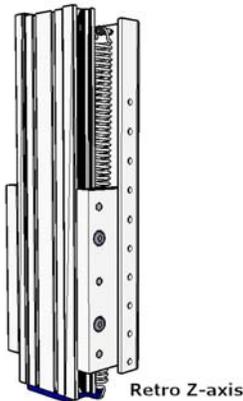
- (10249) Router Adapter Kit: Mounting plate and hardware used with an existing router mounting ring for the PRS.
- (10253) HSD Spindle Plate Adapter kit: Updated mounting plate for the PRS and hardware.
- (10254) Colombo Spindle Plate Adapter kit: Updated mounting plate for PRS and hardware.

**ShopBot Tools, Inc**  
3333B Industrial Dr  
Durham, NC 27704  
919-680-4800 or 888-680-4466  
[www.shopbottools.com](http://www.shopbottools.com)

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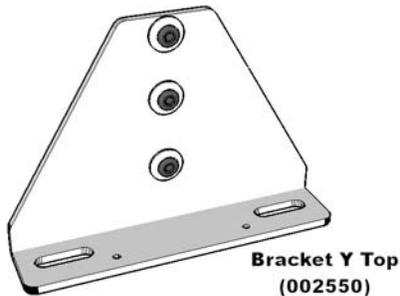
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## Components



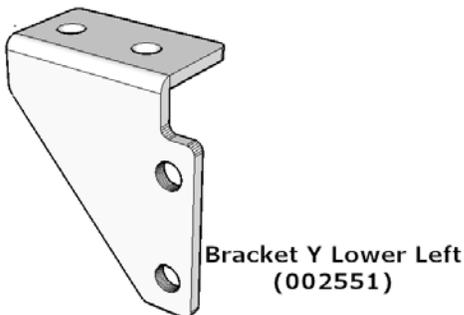
### The Retro Z-axis

Is an upgraded Z-axis with the rigidity of the current PRS Z-axis. The Mounting holes in the side allow for multiple Z height positioning on early model ShopBots.



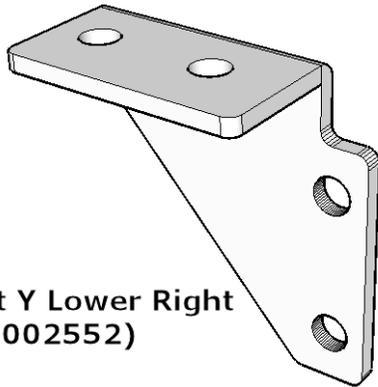
### Bracket Y Top (002550)

Mounting bracket for top side of the Y-car. 10-32 button head can aid in the squaring of the Retro Z.



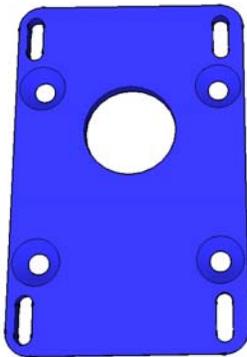
### Bracket Y Lower Left (002551)

Mounting bracket for bottom side of the Y-car.



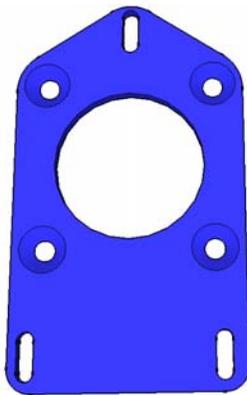
**Bracket Y Lower Right  
(002552)**

**Bracket Y Lower Right (002552)**  
Mounting bracket for bottom side of the Y-car.



**Plate Motor Mount PRS2  
(002215)  
(For Gearbox Motors)**

**Plate Motor Mount PRS2 (002215)**  
Motor mount needed for gearbox style motors (3.6 or 7.2).



**Plate Motor Mount PRS DD  
(002330)  
(For Direct Drive Motors)**

**Plate Motor Mount PRS DD (002215)**  
Motor mount needed for direct drive style motors.

## What Needs to Happen First

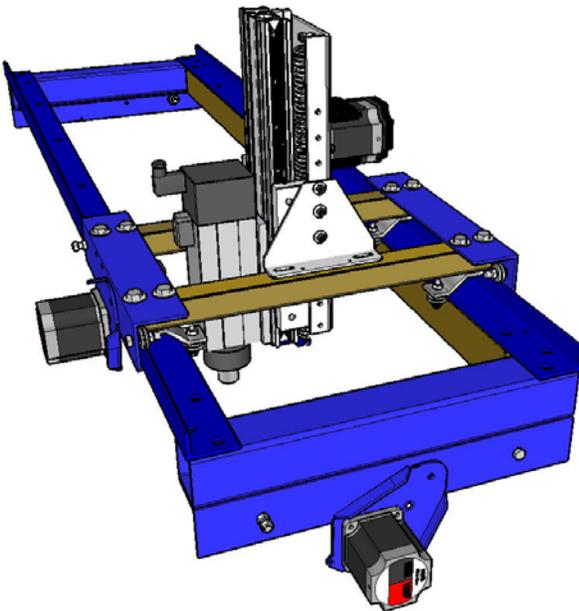
Remove the cutting head from the old Z-axis. The router or spindle mounted to the old Z-axis will probably need an updated adapter plate kit. These adapter plate kits are sold separately to accommodate every possible solution. Kits are available for HSD (10253) and Colombo (10254) spindles with a spindle mounting plate and hardware designed for the PRS style extrusion that is on the Retro Z-axis. Those who have the aluminum router mounting ring for Porter Cable routers and such will need the (10249) Router Adapter kit which includes a mounting plate and hardware that adapts the mounting ring to the PRS style extrusion.

The Retro Z-axis uses the Z motor from your old Z-axis. Remove this Z-axis motor before removing your old Z-axis frame from the Y-car. Most Z plates have access holes in the front face of the Z-axis that enable a hex key wrench to reach the mounting bolts of the motor.

With the Z motor off, remove the old Z-axis frame from your Y-car. This frame will not be used anymore. You may want to hang on to the V wheels and bushings before using the old frame for a doorstop.

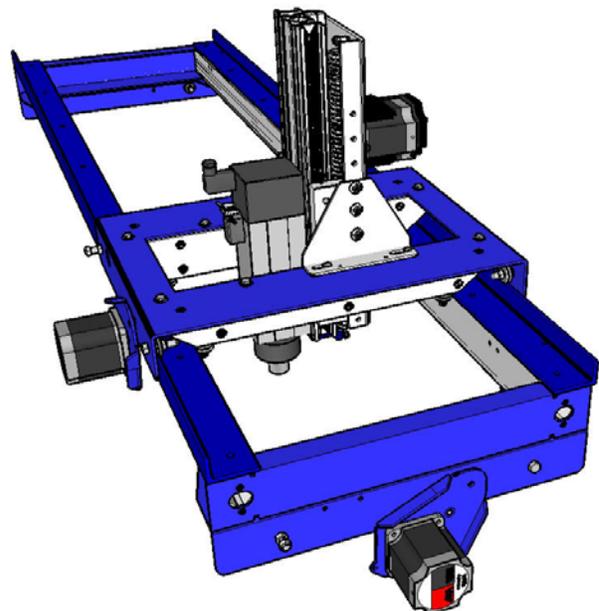
From here decide what style Y-car you have on your machine and follow those specific directions.

## What Kind of Y-car do I Have?



### Strut Style Y-car

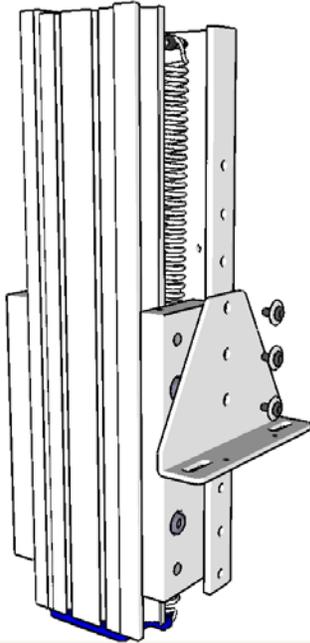
The strut style Y-cars were on the early model ShopBots produced between '98-'01. This Y-car is composed of (2) 3" x 3" angles and 1.5" x 1.5" utility strut and hold downs.



### Single Piece Y-car

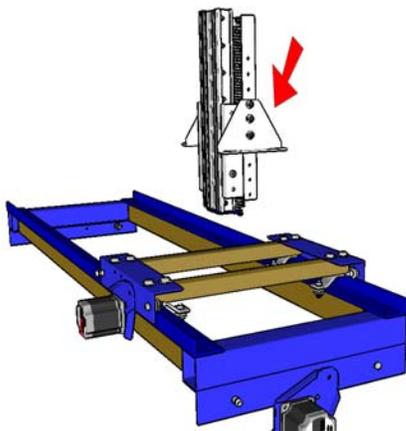
The single piece Y-cars were on later models of ShopBots produced between '01-'07. This Y-car is composed of bent sheet metal with 3" aluminum extrusion and hold downs.

## Installation for Strut Style Y-cars

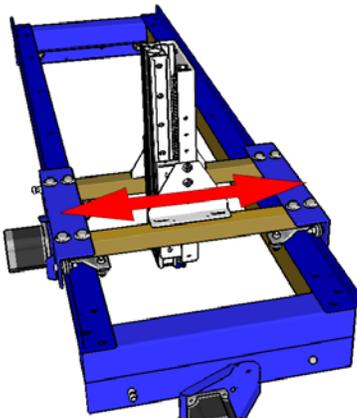


Using 6 of the 5/16 x 5/8" Button Head Socket Cap Screws (BHSCS), 5/16 lock washers, and 5/16 flat washers, mount the **Bracket Y Top (002550)** to the sides of the retro Z frame. In some instances spacers may be needed between the bracket and frame to accommodate wider than normal spacing in the Y-car strut.

**Note:** There are several hole positions available for determining the clearance heights, so determine the clearance needs of your application and use the holes that best provide for these needs. It may be necessary to mount the spindle to realize the clearance needs so the BHSCS can be left loose until this has been determined.

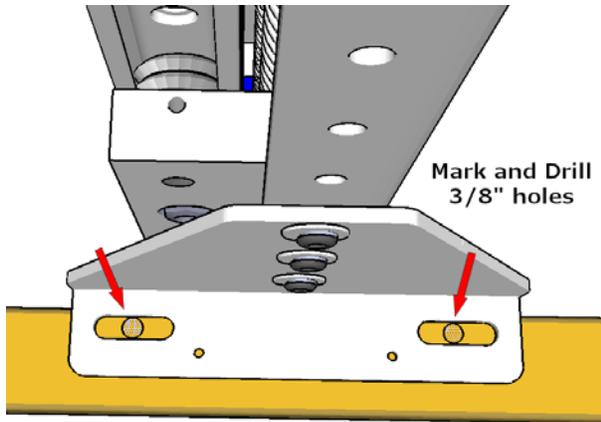


With the **Bracket Y Top (002550)** in place the Z-axis should sit neatly inside the Y-car.



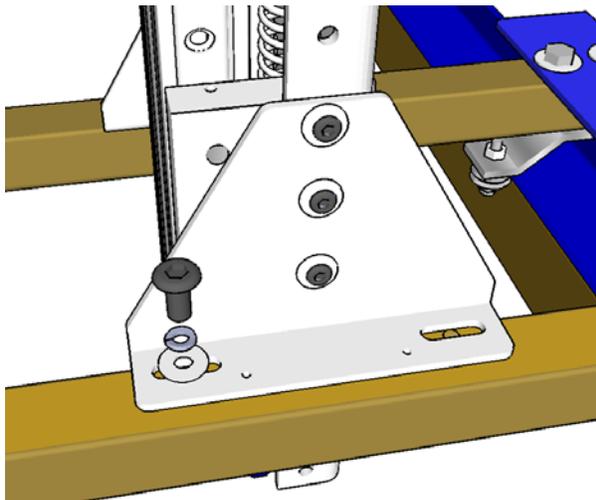
Position the Z-axis inside the Y-car so that the front face of the Z-axis extrusion allows enough room for the router / spindle but does not interfere with the sides of the Y-car. To do this, measure your router /spindle from the mounting plate to the front face of router mounting ring, the spindle's cable plug, or terminal box then add 1/2" (13mm).

**Note:** To optimize the rigidity of the Y-car system, mount the router/spindle as close as possible to the Y-axis motor without interference with the Y-car sides.

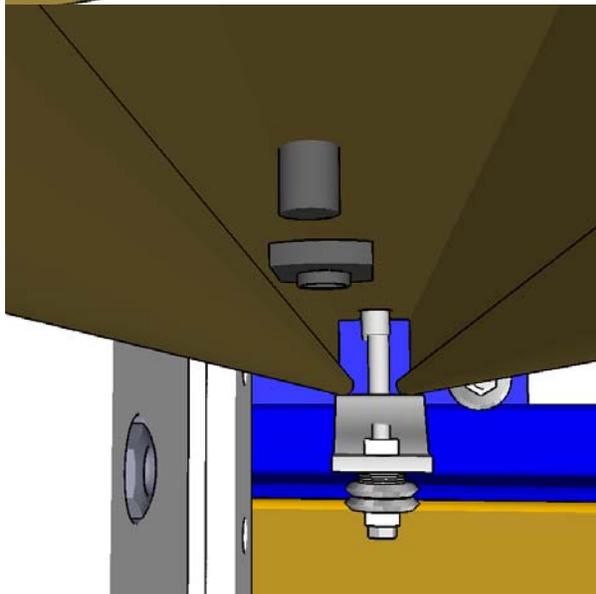


With the Z-axis now in position based on the measurement determined above, mark and drill a 3/8" (9.5mm) holes in the centers of the 4 slots.

**Note: Ideally the holes should not be more than 1/2" (13mm) from the edge of the utility strut to prevent the T-nut from spinning when installed.**



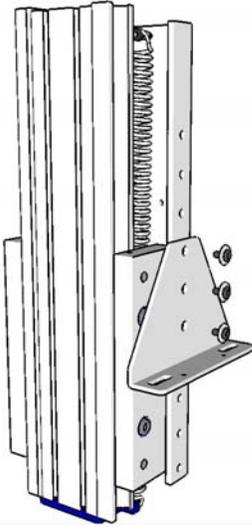
Using 6 of the 5/16 x 1" BHSCS, 5/16 lock washers, and 5/16 flat washers mount the **Bracket Y Top (002550)** to the Y-car utility strut.



On the underside of the Y-car utility strut position the 5/16" T-nut onto the 5/16" BHSCS and tighten.

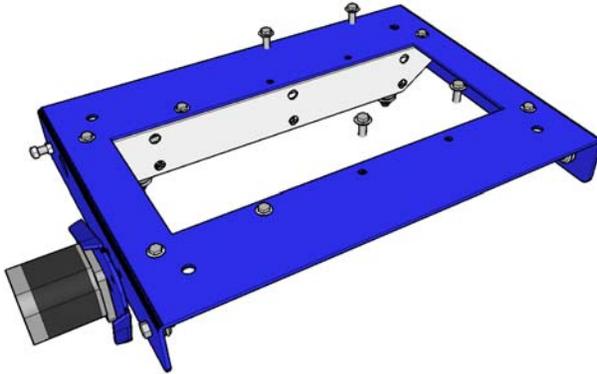
Once this is completed, go to the section **Mounting the Motors**.

## Installation for Single Piece Y-cars

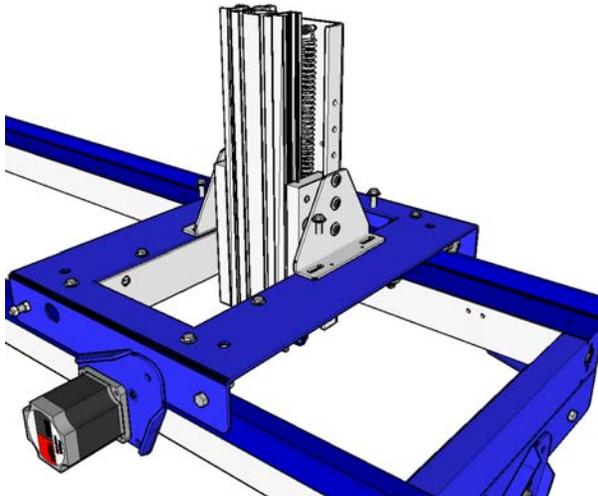


Using 6 of the 5/16 x 5/8" BHSCS, 5/16 lock washers, and 5/16 flat washers mount the **Bracket Y Top (002550)** to the sides of the retro Z frame. In some instances spacers may be needed between the bracket and frame to accommodate wider than normal spacing inside the single piece Y-car.

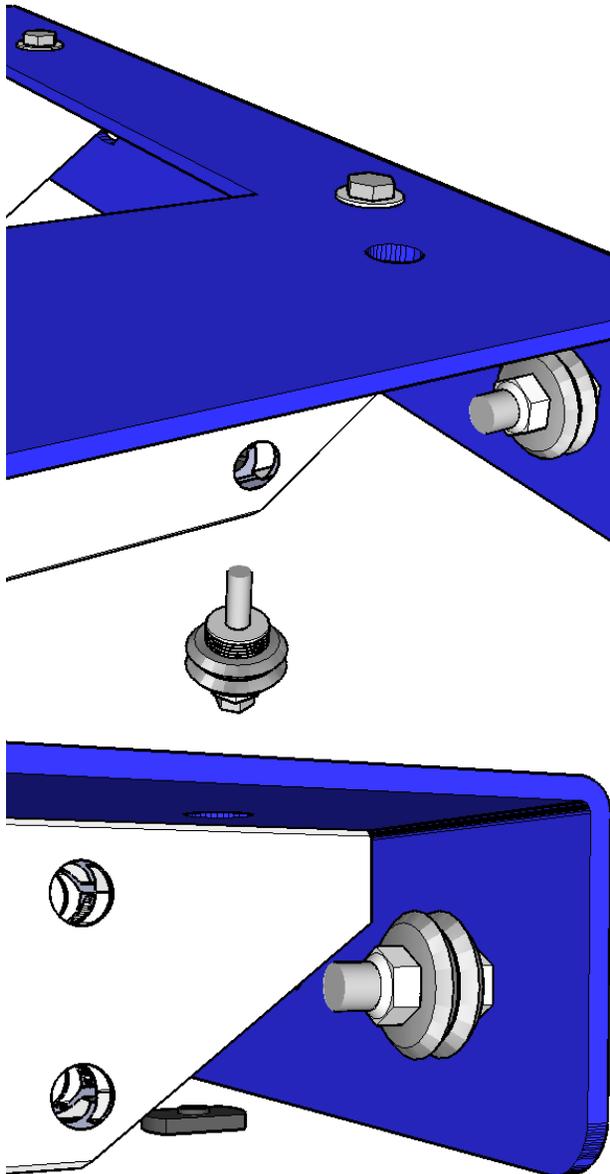
**Note: There are several hole positions available for determining the clearance heights, so determine the clearance needs of your application and use the holes that best provide for these needs. It may be necessary to mount the spindle to realize the clearance needs so the BHSCS can be left loose until this has been determined.**



Remove the 4 hex head bolts shown here. Be careful not to lose the 5/16 T-nut inside the extrusion when removing the bolt. It may be necessary to loosen all the hex bolts on the top side of the single piece Y-car to fit the retro Z frame between the extrusions.



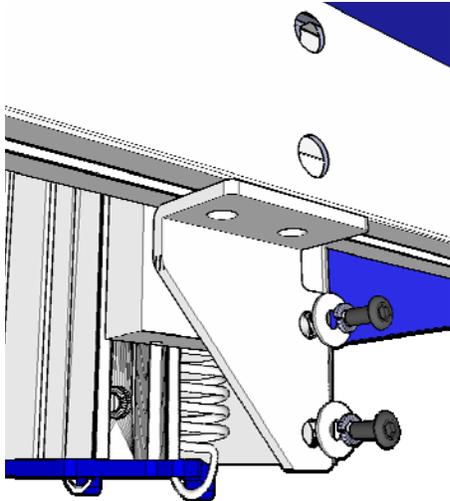
Position the retro Z frame inside the single piece Y-car. Using 4 of the 5/16 x 1" BHSCS, 5/16 lock washers, and 5/16 flat washers mount the retro Z to the single piece Y-car.



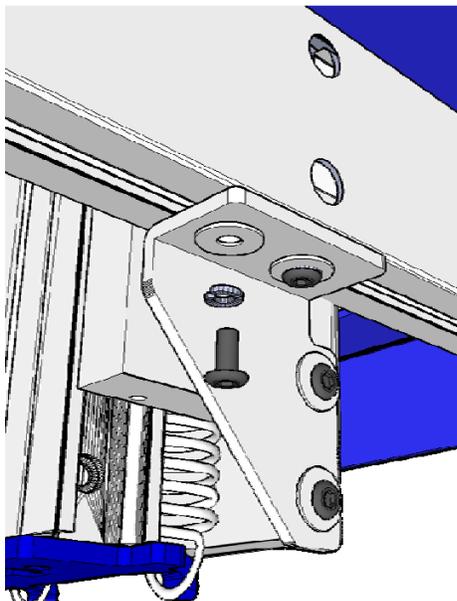
On the underside of the Y-car's extrusions remove a hold-down bearing. Be careful not to lose the spacers when removing these bearings. These bearings will need to be reinstalled later.

Remove the 1/4" T nut for the hold-down bearing as well.

Insert (2) 5/16" T nuts into the lower slot on the extrusions. Once these are in place reinsert the 1/4" T nut for the hold-down bearing.

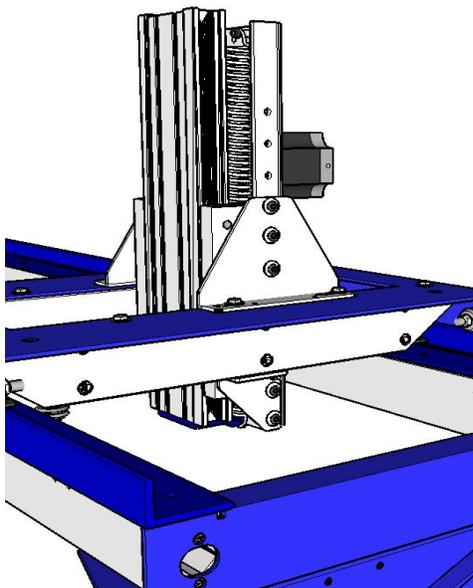


Using 2 of the 5/16 x 5/8" BHSCS, 5/16 lock washers, and 5/16 flat washers mount the **Bracket Y Lower Left (002551)** to the sides of the retro Z frame.



Position the (2) 5/16" T nuts already in the extrusion above the holes in the **Bracket Y Lower Left (002551)**. Using 2 of the 5/16 x 5/8" BHSCS, 5/16 lock washers, and 5/16 flat washers mount the retro Z to the single piece Y-car.

Repeat this process for the opposite side using the **Bracket Y Lower Right (002552)**.



If it was necessary to loosen the hex head bolts holding the extrusion of the single piece Y-car, retighten the hex head bolts now.

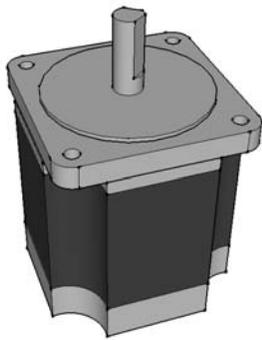
Reinstall the hold-down bearings and check that the eccentric bushing is tensioned correctly for adequate hold-down. Continue to the section **Mounting the Motors**.

## Mounting the Motors

This section describes the process for installing the motor plates and motor to the retro Z-axis for both the direct drive and the gear box motors. Your Z-axis has one or the other of these types.

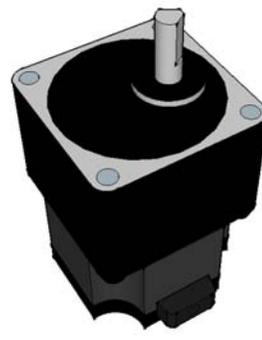
On the left will be the instructions for Z-axes with direct drive motors and on the right will be instructions for Z-axes with the gear box motors.

Direct Drive Motor and Mounting Plate



Direct Drive Motor

Gear Box Motor and Mounting Plate



Gear Box Motor

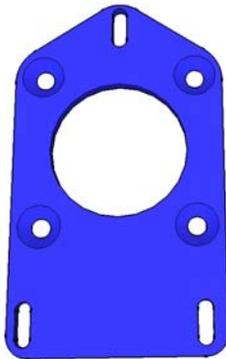


Plate Motor Mount PRS DD  
(002330)  
(For Direct Drive Motors)

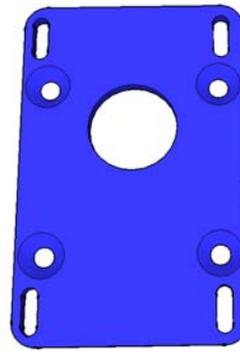
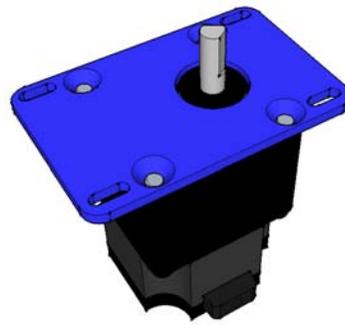
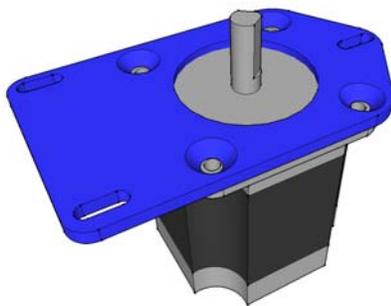
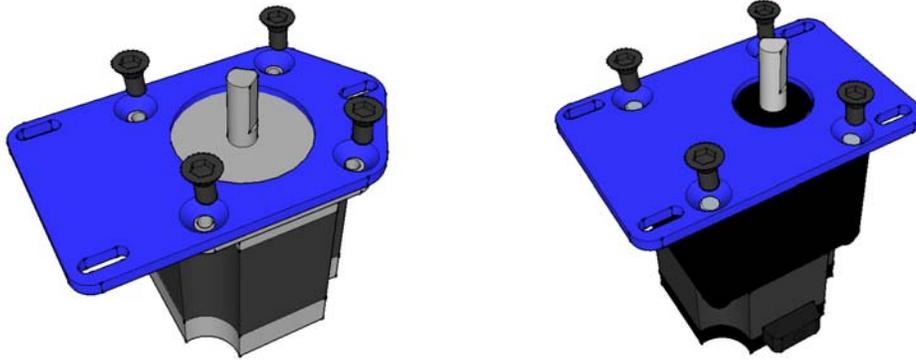


Plate Motor Mount PRS2  
(002215)  
(For Gearbox Motors)

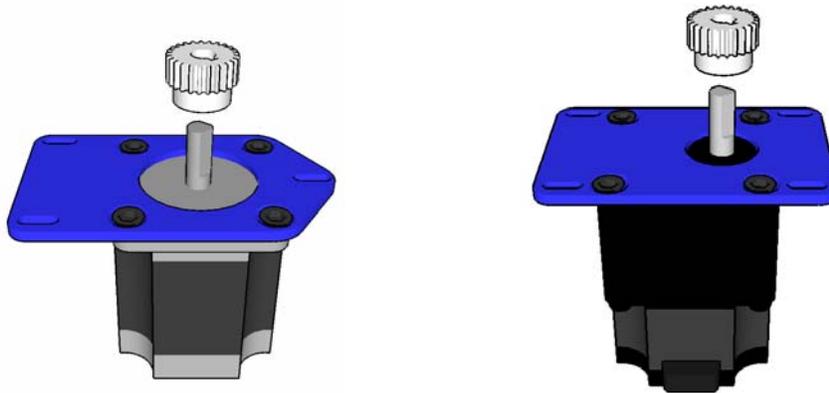
Align the motor mount with the countersinks facing upward.



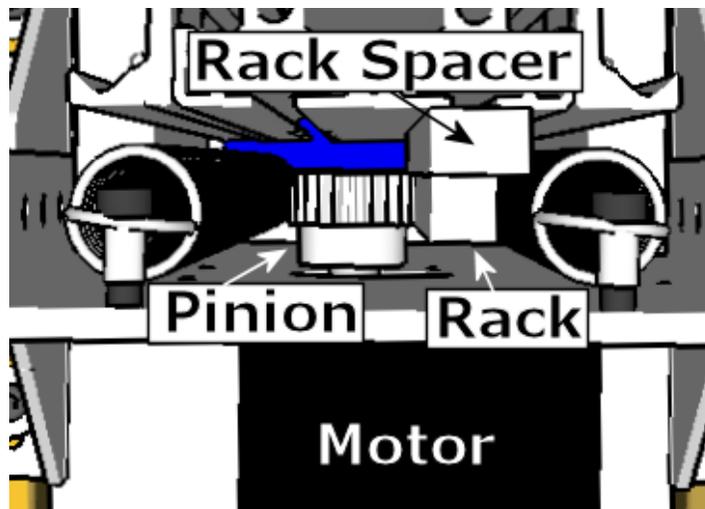
Insert the flat screws and attach the mounting plate to the motor.



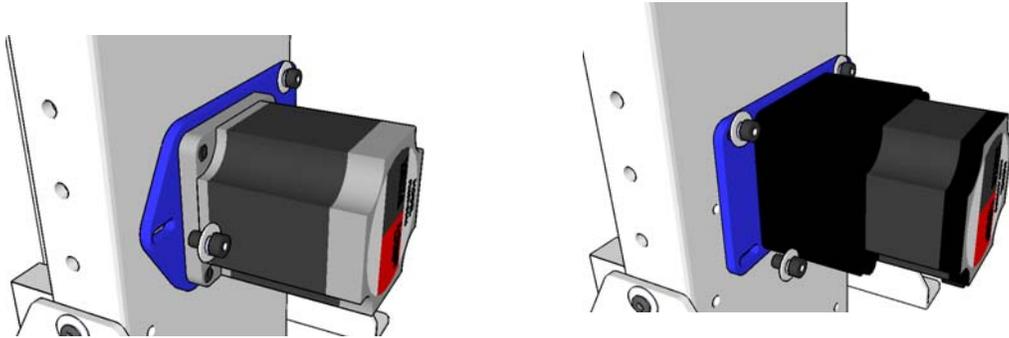
Loosely position the pinion on the shaft of the motor.



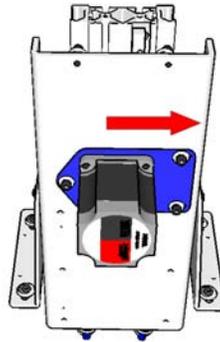
Position the mounting plate tightly to the back of the retro Z-axis. Looking from the top of the Z-axis, position the pinion on the motor shaft so that the pinion is fully aligned with the rack. Too far and the pinion's teeth may hit on the rack spacer. Once this position is found carefully remove the motor from the back of the Z-axis and tighten the pinion's set screws.



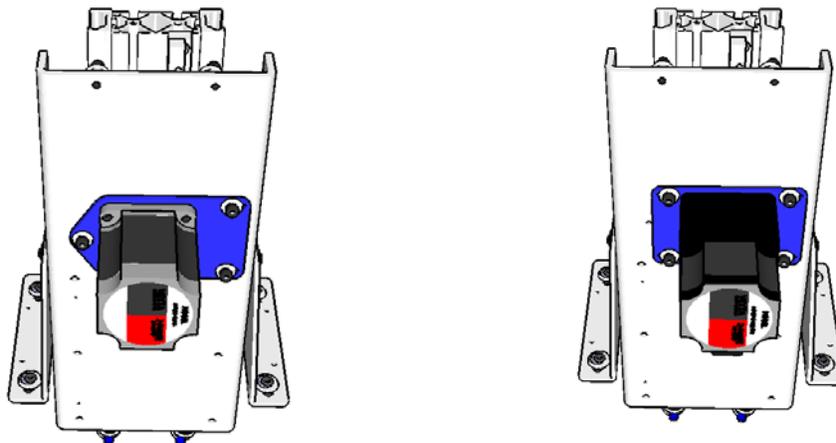
Position the motor mounting plate to the back of the retro Z-axis and using the ¼" button heads, lock washers, and flat washers loosely mount the motor. The direct drive motor has (3) slots for mounting while the gear box has (4).



Although only the direct drive motor is shown here, both motor / pinion engagement methods are the same. Looking from the back of the Z-axis, move the motor mounting plate to the right.



Engage the pinion tightly into the rack of the Z-axis and tighten the button head mounting screws tightly. Tighten (3) on the direct drive and (4) on the gear box motor mount.



Once this is completed, go to either Mounting the Spindle or Mounting the Router.

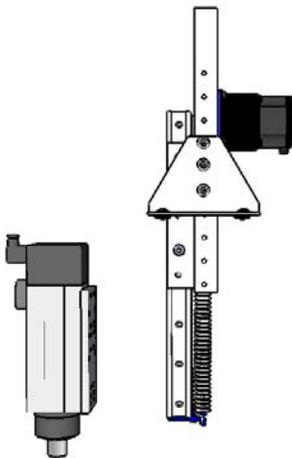
## Spindle or Router

### *Mounting the Spindle*

Make sure that you have purchased the (10253) HSD Spindle Plate Adapter kit or the (10254) Colombo Spindle Plate Adapter kit. These have the same spindle mounting plate but come with the mounting hardware that is specific for the spindle. If your old Z-axis had a spindle mounting plate, be aware that the holes in that plate probably will **not** align with the holes in the retro Z-axis extrusion.

Remove the older spindle mounting plate and replace with the new plate. Attach the new spindle mounting plate with the included hardware. You are now ready to mount the spindle to the retro Z-axis.

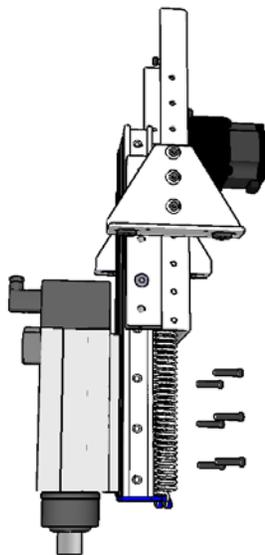
Once the motor is installed, you can power up your system for this step. Use the Z-axis to help hold the extrusion in place while mounting the spindle. This will prevent the springs from pulling the extrusion up or dropping down while installing the spindle.



Start by positioning the Z-axis in a location on the table that will give easy access to the back of the Z-axis. Once there, move the Z-axis down to a position close to the surface of the table.

A friend might be helpful at this point. With the collet nut removed, stand the spindle on the table and use the (K) Keypad inside the control software to align the mounting holes in the Z's extrusion with the mounting holes in the spindle mounting plate.

This method is meant to reduce the struggles with lifting and trying to align mounting holes.



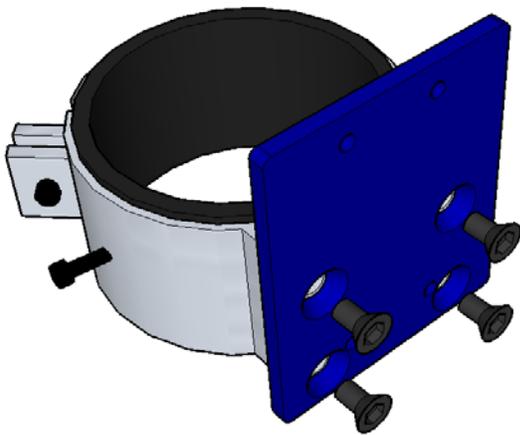
Insert the (6) 5/16 x1 1/2" socket head screws to mount the spindle. Tighten the spindle mounting plate securely to the retro Z-axis.

Once completed turn to the section **Squaring the Retro Z-axis.**

## Mounting the Router

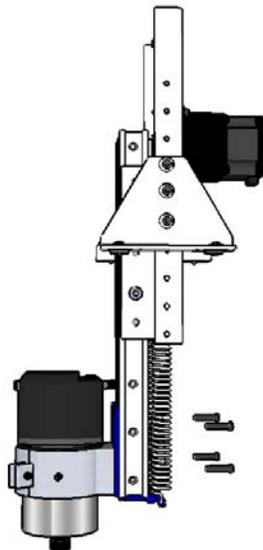
Make sure that you have purchased the (10249) Router Adapter Kit. If your old Z-axis had a router mounting ring it will require an additional plate that the ring will mount to and allow mounting to the retro Z-axis extrusion.

Once the motor is installed you can power up your system for this step. Use the Z-axis to help hold the extrusion in place while mounting the spindle. This will prevent the springs from pulling the extrusion up or dropping down while installing the router mount.



Use the included  $3/8 \times 3/4$ " flat heads to mount the router ring to the adapter plate.

Start by positioning the Z-axis in a location on the table that will give easy access to the back of the Z-axis. Once there, move the Z-axis down to a position close to the surface of the table.

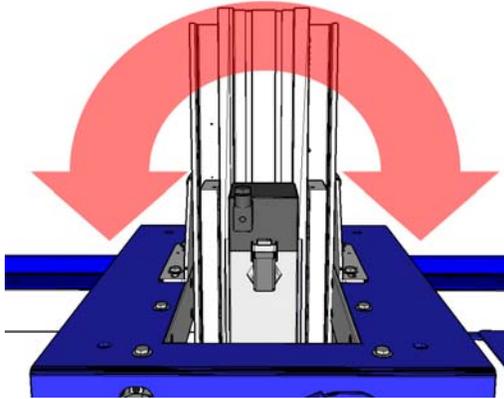


Insert the (4)  $5/16 \times 1 \frac{1}{2}$ " socket head screws to mount the router. Tighten the router mounting plate securely to the retro Z-axis.

Reinsert the router and lock in the ring with the existing  $5/16$ -18 bolt in the tab.

Once completed turn to the section **Squaring the Retro Z-axis.**

## Squaring the Retro Z-axis

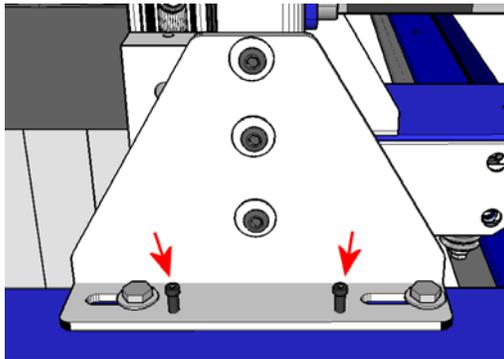


Let's start with the most difficult direction to square. This is the direction parallel to the Y axis.

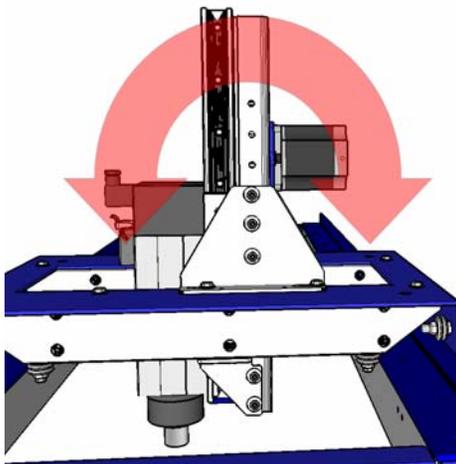
At this point in the assembly process all the screws that have been loosened during this installation should be tight except for the 5/16" button heads that are going into the sides of the retro Z-axis.

Use a level to roughly adjust the head square to the table. Tighten a few of the screws going through the Bracket Y Upper and into the retro Z-axis. With the largest surfacing bit available, do a test cut (area clearance) of a 5"x5" square and check the flatness of the cut.

If adjustments need to be made, loosen previously tightened screws and readjust, then recheck test cut.



If more adjustment is needed, there are threaded holes through the bracket Y uppers that allow the bracket to be used as a leveler. Loosen the 5/16" screws securing the brackets to the Y-car. Use the 10-32 socket head screws to finely adjust the Z-axis up or down. Retighten the 5/16" and do another test cut. Retry if necessary. When you are satisfied, move to the next step.



Loosen some of the 5/16" screws and then adjust the direction front to back (parallel to the X axis). Retighten then and perform a test cut for flatness. Repeat if necessary.

Once the desired flatness has been achieved, tighten all the 5/16" screws holding the brackets to the retro Z-axis. Do final checks with a test cut to ensure that tightening has not brought the axis out of square.