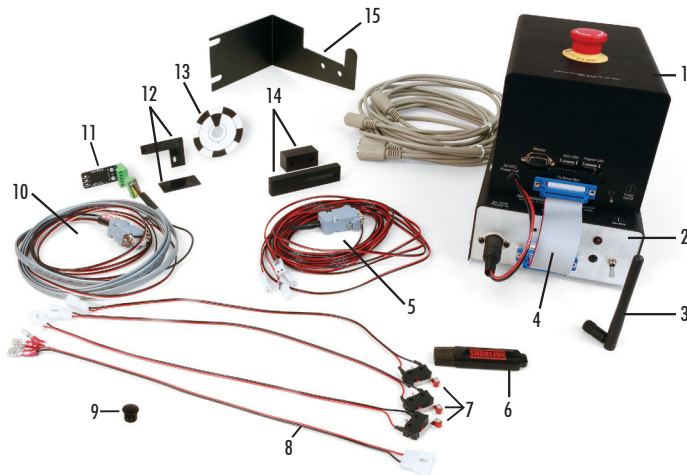




Instructions for Sherline Limit Switches and Mounts



Clockwise, from upper right

1. Controller box
 2. 4-axis CNC driver box*
 3. Wifi antenna
 4. Parallel cable
 5. Limit switch main cable bundle
 6. USB 4 GB flash drive
 7. Limit switches (with pigtail and connector)
 8. Speed control cable
 9. P/N 68047 Plastic plug for speed control housing
 10. Tach/spindle control cable bundle
 11. Optical encoder
 12. Tach gap setter and cover
 13. Tach spindle pulley RPM sticker
 14. Tach bracket and headstock spacer (standard or 3C)
 15. Ball screw mill headstock cable support (zip ties for leadscrew mills)
- * **NOTE:** P/N 8780 includes the driver box. P/N 8781 does not include the driver box.

WHAT'S INCLUDED

Shown here is what comes with the Sherline/MASSO Controller for our mill package. A lathe package will be similar except that it will have two limit switches instead of three, and different mounting hardware.

CAUTION—Protect your motors, cables, and driver board!

- Never connect or disconnect the optical encoder grounding cable or the stepper motor cables with the Controller/Drive box power on.
- Do not unplug stepper motors using the rectangular white plug that goes into the motor. Disconnect only at the cable plug.
- Do not pull on cable wires to disconnect plug—**grip at connector.**
- Turn handwheels slowly (1 rev/sec) with driver power OFF when manually positioning. For longer travels use Jog Mode.

Mounting and Adjusting the Limit Switches Y-axis Limit Switch and Eccentric Trigger

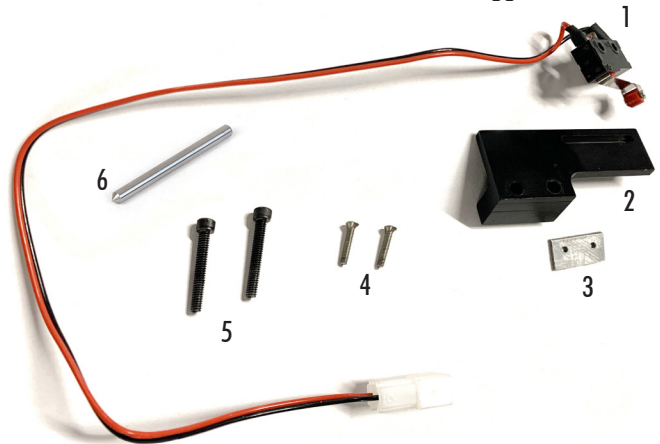


FIGURE 1—Y-axis limit switch parts, clockwise from top right:
(1) P/N 68040 limit switch w/pigtail
(2) P/N 68024 Y-axis limit switch mount
(3) P/N 68046 Limit switch mounting tab
(4) P/N 68049 #2 Phillips x 5/8" flat-head sheet metal screws (2 ea.)
(5) P/N 67115 5-40 x 7/8" SHC screws (2 ea.)
(6) P/N 87841: 1/8" x 1-1/2" steel transfer punch for mill Y-axis limit switch (Retro)
(7) Zip ties

Figure 2 shows the limit switch positioning on the Y-axis mount: Limit switch P/N 68040, Mounting screws P/N 68048, and Y-axis mounting bracket P/N 68024.

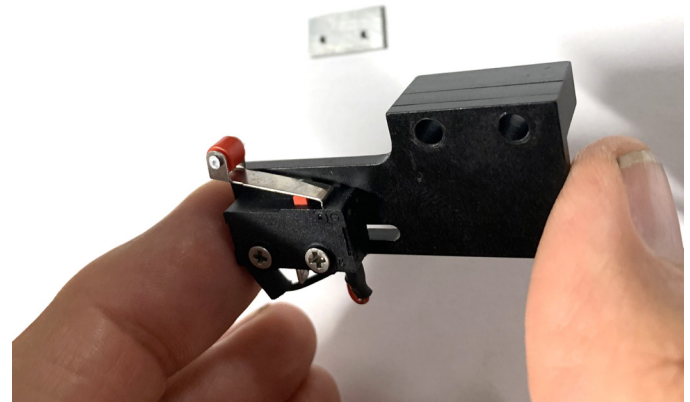


FIGURE 2—The mounting screws are used to attach the limit switch to the Y-axis limit switch mount.

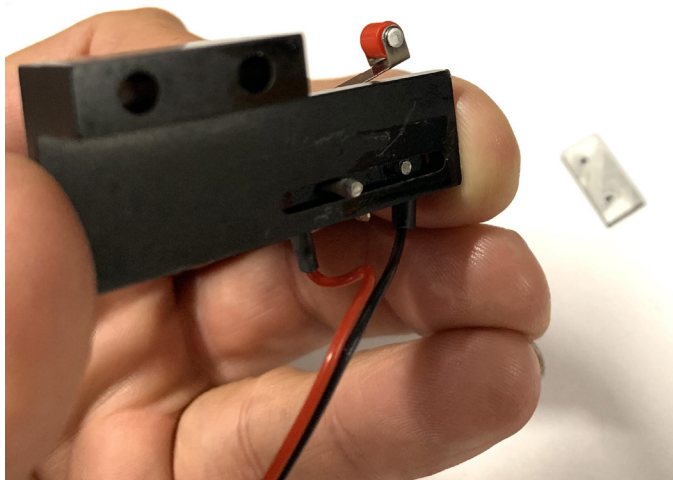


FIGURE 3—Backside view of the Y-axis limit switch assembly.



FIGURE 4—Y-axis limit switch assembly with the backing plate P/N 68046 attached.

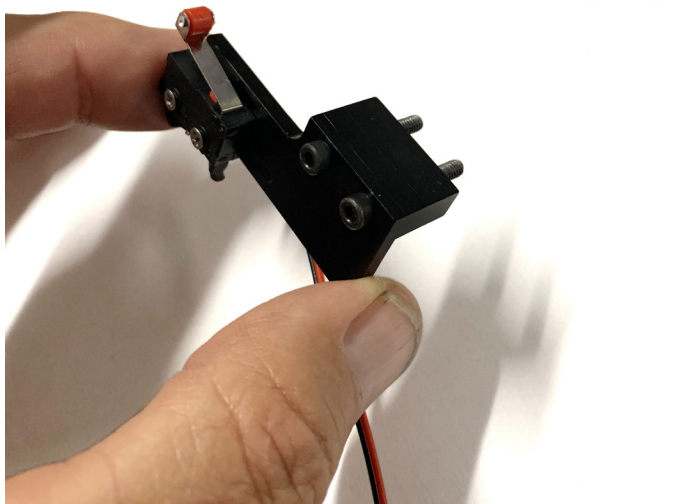


FIGURE 5—Front side view.

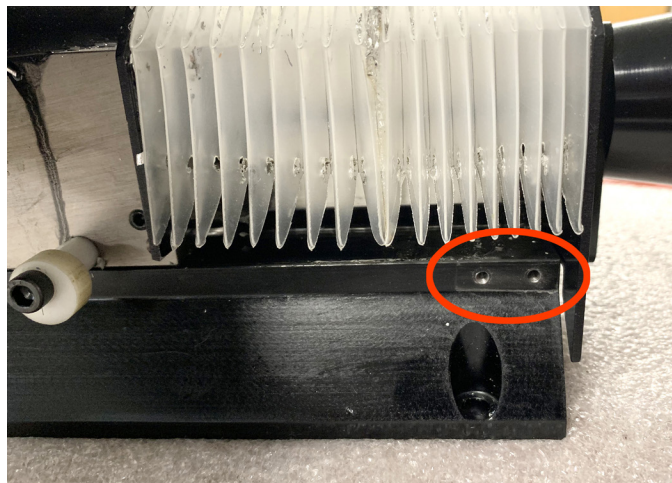


FIGURE 6—The red oval shows the mounting hole location for the Y-axis limit switch assembly.*

***NOTE:** If you are doing a retrofit, see the **Limit Switch Hole Templates** for the Y and Z-axes on page 8.

You can also watch our YouTube video, **Mill Base Limit Switch Retrofit**, for how to drill and tap these mounting holes. (<https://youtu.be/8-BOpooqIQ>)



FIGURE 7—The limit switch mounted the with wires going between the mounting bracket and the mill base.

The Eccentric Trigger Assembly and Mounting
Eccentric trigger parts.

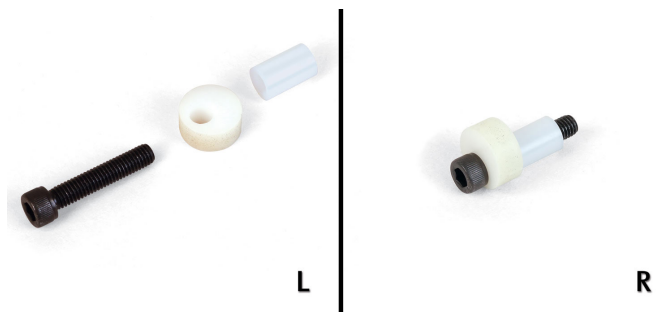


FIGURE 8—**Left:** 10-32 x 1" SHCS P/N 40340, eccentric trigger P/N 68039, and nylon spacer P/N 68044; **Right:** Assembly

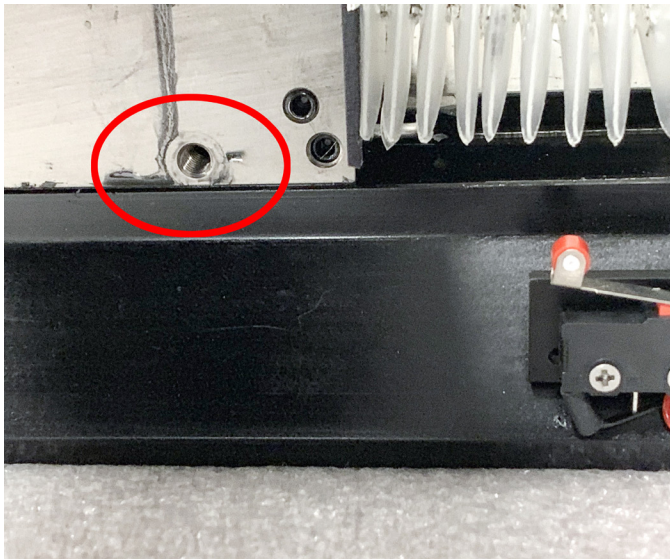


FIGURE 9a—The red oval shows the location of the eccentric trigger mounting hole on the ball screw saddle.

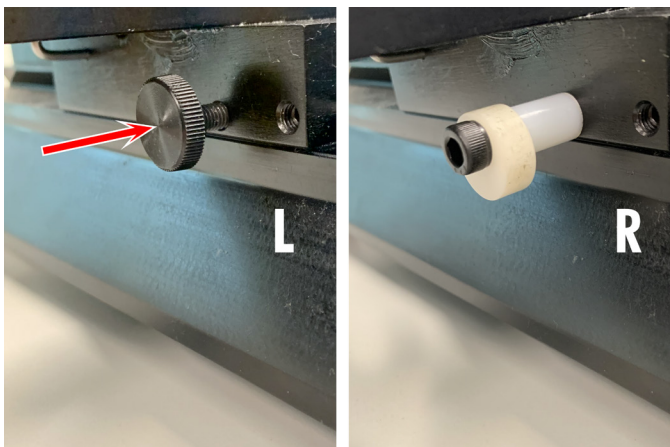


FIGURE 9b— **Left:** On a standard leadscrew machine, you will remove the Y-axis locking screw; **Right:** Then install the eccentric trigger where the Y-axis locking screw was.

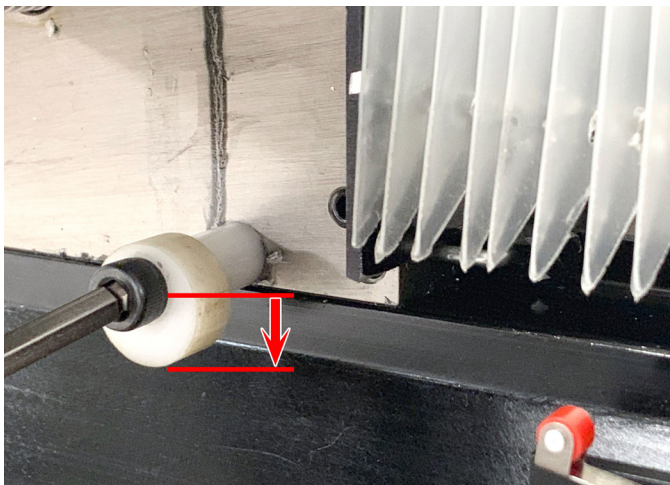


FIGURE 10—Mount the assembly with the wide side of the eccentric trigger facing down.

At this point the 10-32 screw on the eccentric trigger and the two screws that secure the limit switch are snug on the verge of being loose, so the trigger and the limit switch can be adjusted.

First turn the driver box power “Off,” and then disconnect the Y-axis stepper motor cable (**NOTE:** Never disconnect or connect the stepper motor cables with the power on).

Now by hand, move the Y-axis towards the stepper motor until the Y-axis accordion cover is almost fully closed (you want to leave some room for the inevitable chip build-up). You also need some extra room for the slight over-travel when the trigger sets the limit switch (about .100" or 2.54 mm).

Now open the F1 SETUP screen on the controller (push F1 or click on the F1 Setup button on the screen).

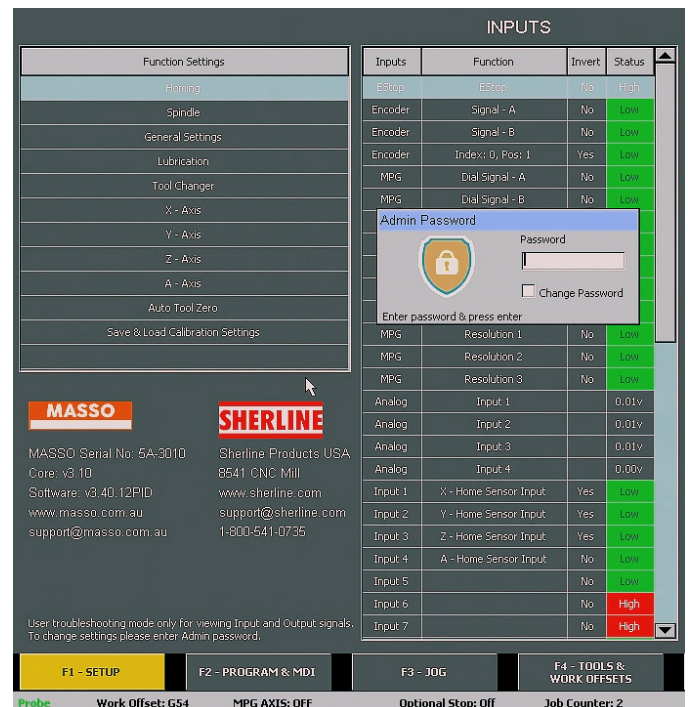


FIGURE 11—Setup screen with password box.

You don't need the password to see the input and output status of your limit switches and your encoder signal. If the password box is in the way, click on it a couple times and then click on the screen once and it will close.

Make sure that your limit switch connector is plugged into the control harness.

In the middle of the setup screen towards the bottom, you will see the “X, Y, Z, and A-Home Sensor Input.” When the limit switch is plugged in, and in the open position, the Status column will be “green – Low,” (see Figure 12).

MPG	Resolution 3	No	Low
Analog	Input 1		0.01v
Analog	Input 2		0.00v
Analog	Input 3		0.01v
Analog	Input 4		0.00v
Input 1	X - Home Sensor Input	Yes	Low
Input 2	Y - Home Sensor Input	Yes	Low
Input 3	Z - Home Sensor Input	Yes	Low
Input 4	A - Home Sensor Input	No	Low
Input 5		No	Low
Input 6		No	High
Input 7		No	High

F3 - JOG	F4 - TOOLS & WORK OFFSETS
Optional Stop: Off	Job Counter: 2

FIGURE 12—Home sensor screen for limit switches.

With your Y-axis in the home position, adjust the limit switch and the eccentric trigger so the limit switch closes at that point. You can hear the limit switch click when it closes.

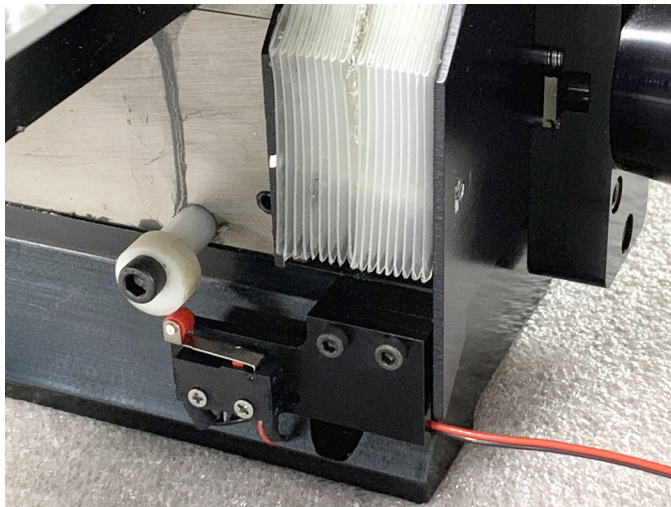


FIGURE 13—Home position for the Y-axis.

When you believe that your limit switch is set correctly, manually move the Y-axis off of the limit switch. Then look at the setup page. Now move the Y-axis back slowly and when the limit switch closes, the “green – low,” on the status will change to “red – High.”

MPG	Resolution 3	No	Low
Analog	Input 1		0.01v
Analog	Input 2		0.01v
Analog	Input 3		0.01v
Analog	Input 4		0.00v
Input 1	X - Home Sensor Input	Yes	Low
Input 2	Y - Home Sensor Input	Yes	High
Input 3	Z - Home Sensor Input	Yes	Low
Input 4	A - Home Sensor Input	No	Low
Input 5		No	Low
Input 6		No	High
Input 7		No	High

F3 - JOG	F4 - TOOLS & WORK OFFSETS
Optional Stop: Off	Job Counter: 2

FIGURE 14—Red=High status.

By looking at the status on the setup screen and moving the Y-axis back and forth, you can adjust the limit switch and the eccentric so the limit switch closes at the desired position. Once the position is set, tighten the two limit switch screws and the 10-32 eccentric trigger screw.

Z-axis Limit Switch and Eccentric Trigger

The Z-axis and the X-axis are easier to mount and adjust. For these instructions we are mounting these limit switches on a ball screw machine. The mounting brackets will be different on a leadscrew machine.

Z-axis switch, mount, and screws.

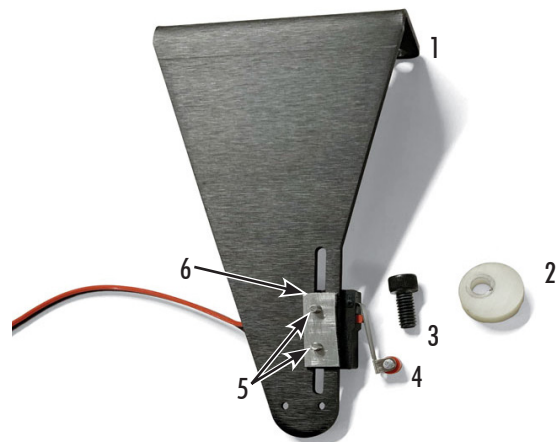


FIGURE 15—Z-axis limit switch parts, clockwise from top:

- (1) P/N 68020 Z-axis limit switch mount
- (2) P/N 68042 Eccentric trigger
- (3) P/N 12050 8-32 x 3/8" SHCS
- (4) P/N 68040 Limit switch
- (5) P/N 68048 #2 Phillips x 1/2" flat-head sheet metal screws (2 ea.)
- (6) P/N 68046 Limit switch mounting tab
- (7) Zip ties



FIGURE 16—Limit switch mounted to the Z-axis limit switch mount.

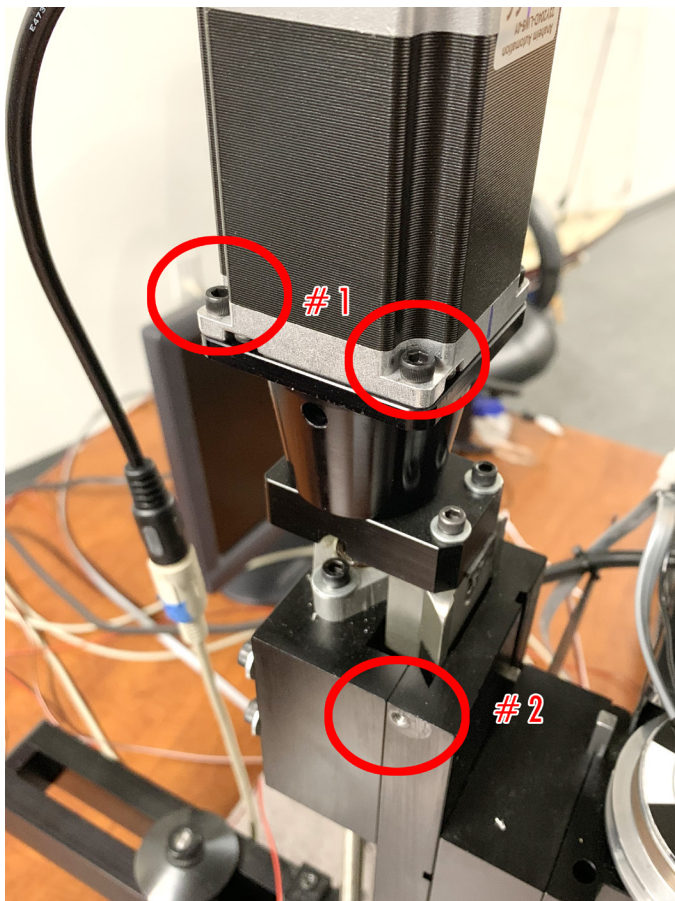


FIGURE 17—#1: The red ovals indicate the mounting screws from the stepper motors for the limit switch mounting bracket. #2: This red oval shows the location of the screw hole on the mill column saddle for the eccentric trigger.*

* **NOTE:** You may need to drill and tap the 8-32 hole on your column saddle to mount the Z-axis eccentric trigger. If this is the case, please go to page 21 of this document for the **Limit Switch Hole Templates** for the Y and Z-axes.

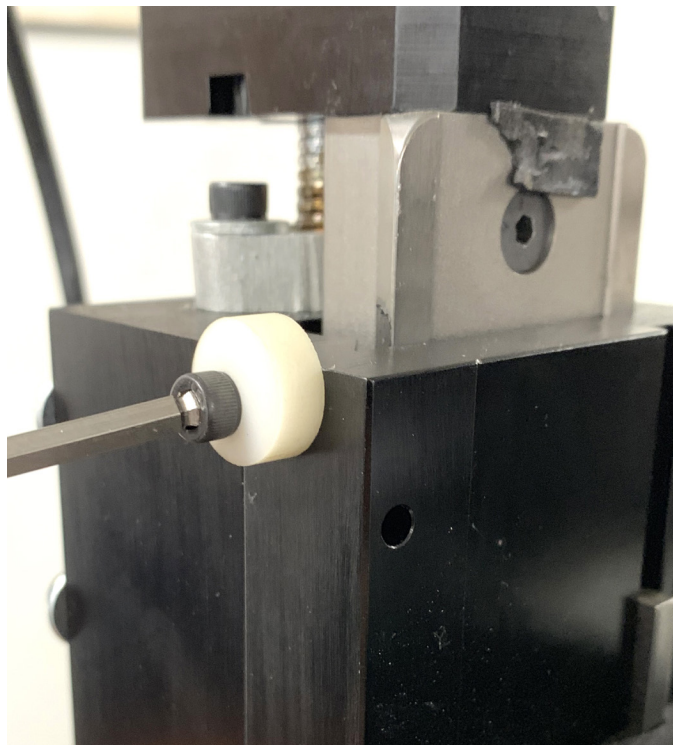


FIGURE 18—Mount the eccentric trigger on the column saddle and leave it loose.



FIGURE 19—Install the Z-axis limit switch mounting bracket using the two 8-32 screws from the stepper motor.

Once the limit switch is mounted, turn off the driver box and then disconnect the power cord to the stepper motor.

Now raise the column saddle all the way to the top of travel. Then lower the column saddle one full revolution of the handwheel. This is where you want to set your limit switch "closed position." Adjust the eccentric and the limit switch for the Z-axis the same way that you did for the Y-axis. Once the position is set, tighten all of your screws.

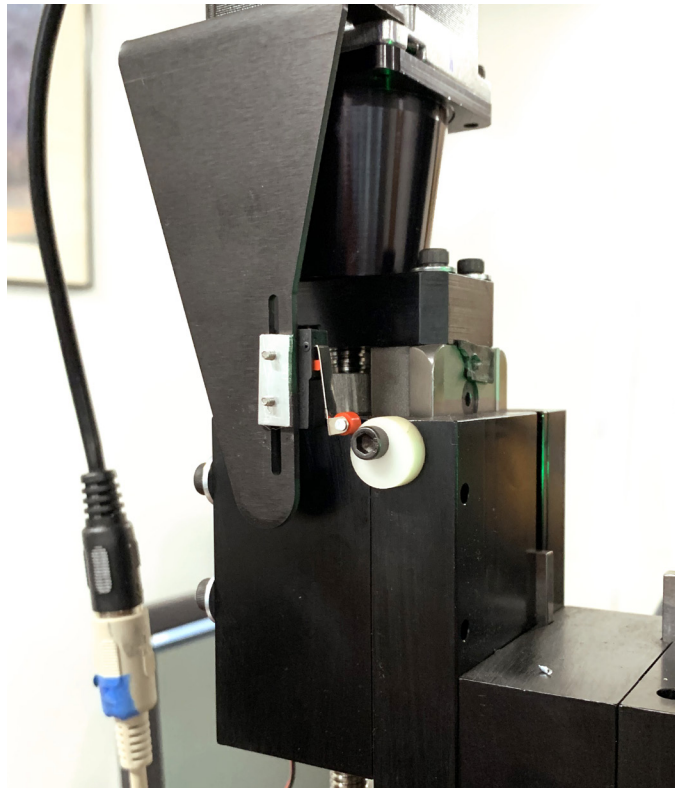


FIGURE 20—Final Z-axis limit switch position.

X-axis Limit Switch Setting and Eccentric Trigger

X-axis limit switch parts.

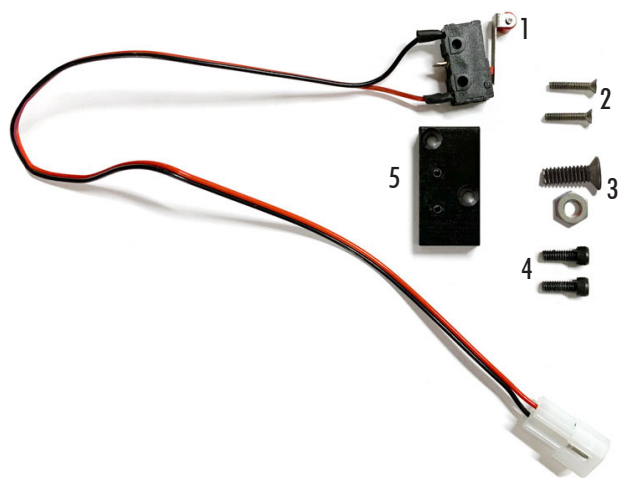


FIGURE 21—X-axis limit switch parts, clockwise from top right:
 (1) P/N 68040 limit switch w/pigtail
 (2) P/N 81270 2-56 x 3/8" Phillips head machine screws (2 ea.)
 (3) P/N 68035: 10-32 x 7/16" Phillips flat-head screw
 P/N 32100: 10-32 Hex nut (These are for the limit switch stop)
 (4) P/N 40530: 5-40 x 3/8" SHCS (2 ea.)
 (5) P/N 68026 X-axis limit switch mount
 (6) Zip ties

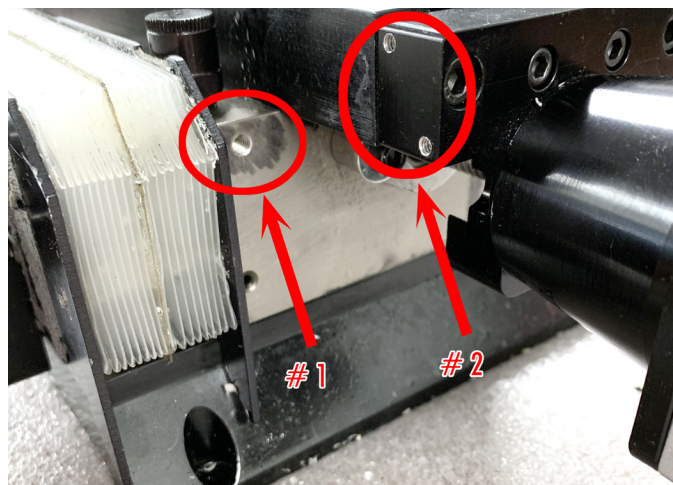


FIGURE 22—X-axis mounting holes:
 #1: 10-32 screw for the eccentric trigger.
 #2: 8-32 screws for the limit switch mounting bracket.

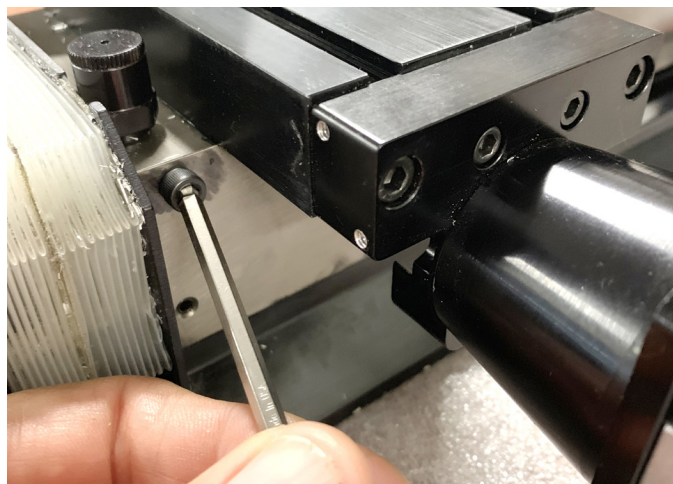


FIGURE 23—Thread the 10-32 x 7/16" Phillips flat-head screw* with the 10-32 hex nut into the side hole on the saddle. If there is a set screw in this hole, remove it first, then thread in the 10-32.

***NOTE:** We changed this 10-32 screw from a socket-head cap screw to a Phillips flat-head screw because the roller on the limit switch can sometimes go into the hex head indent and change the home position.

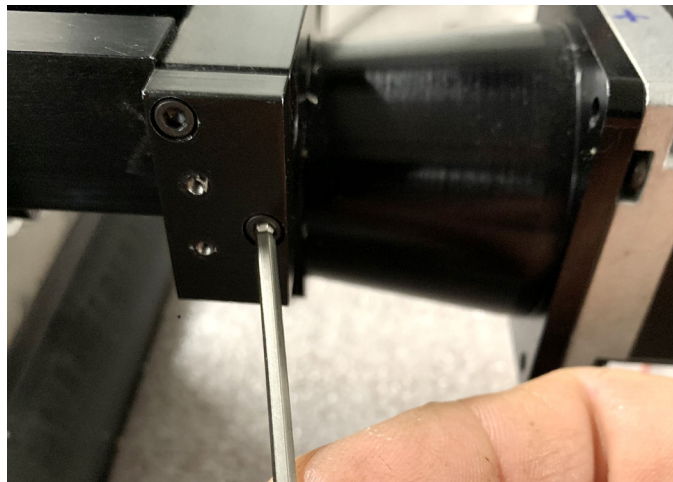


FIGURE 24—Attach the X-axis limit switch mounting bracket, P/N 68026, using the two 8-32 screws.

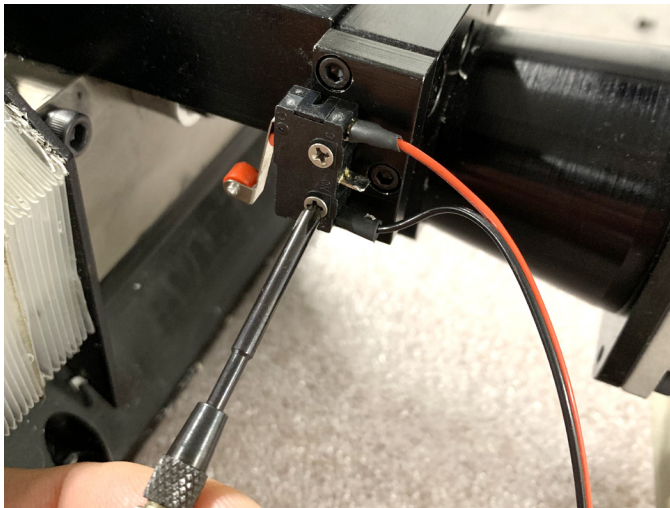


FIGURE 25—Mount the limit switch with the spring roller facing own using the two 2-56 screws P/N 81270.

The alignment of the limit switch and the 10-32 screw is fine just the way it is. No adjustments needed.

Plug in the limit switch to the main cable connector for the X-axis.

Go to the setup page.

Move the table by hand until the limit switch makes contact with the 10-32 screw. Slowly continue to move the table towards the saddle and look for the “Low Green,” status to turn to “High Red,” when the limit switch closes.

For each axis, use a small zip tie and secure the limit switch pigtail to the stepper motor cable (see pictures below).

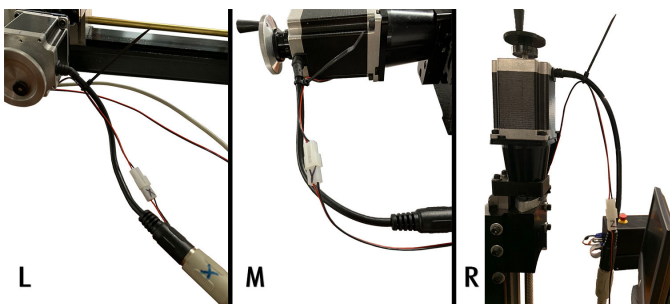


FIGURE 26—Limit switch axes connections. **Left:** X-axis; **Middle:** Y-axis; **Right:** Z-axis

Trim the Zip Ties.



FIGURE 27—Use wire cutters to trim off the excess zip tie flush at the knuckle. Exposed zip tie ends will cut you, so trim them flush.

Now We Can Home out the Machine

With the control box and driver box both on, and the E-stop triggered, and the password (SP) entered, press the Ctrl, Alt, and Home buttons on your keyboard. All of your axes will now home out on their respective limit switches. Each axis will move until they make contact with their limit switch, then the axis will stop, then it will move away from the limit switch approximately one full revolution of the leadscrew and stop. The setup files are set to home out the Z-axis first, then the Y-axis, and then the X-axis.

If you have an axis that does not home out correctly, check to see if your limit switch connector is plugged in all the way. If you are still having problems, call us for assistance (760-727-5857).

Adding a Hole for the X-Axis Eccentric Trigger Screw

If you decide that you need (or would like to have) the limit switch adjustment screw, you can drill and tap a hole in the saddle. We use a 10-32 screw. Any small screw size that you have will work. The hole location is shown on the print copy below. Just measure from the edges and make a mark. Then use a prick punch to make an indent for your drill to pick up on. This will keep your drill bit from wandering. Drill and tap the hole and insert your screw.

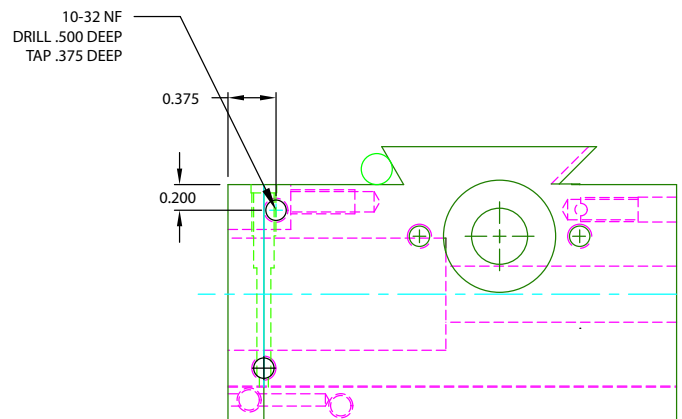


FIGURE 28—The above diagram shows the hole location for drilling and tapping for the 10-32 X-axis eccentric trigger screw.

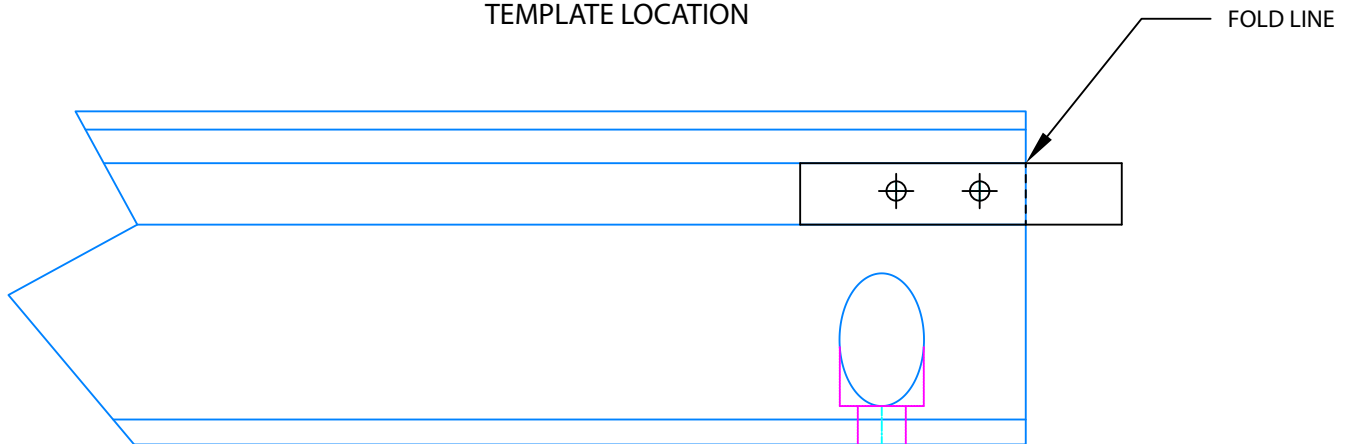
Modifying the Mill Way Cover for Use with Limit Switches

If you are doing a limit switch retrofit to an existing machine, you will need to modify the mounting plates on your accordion way cover. Please see the instructions, *Way Cover Modification for Mills with Limit Switches* (https://www.sherline.com/wp-content/uploads/2019/08/way_cvr_mod_inst.pdf).

Thank you,
Sherline Products Inc.

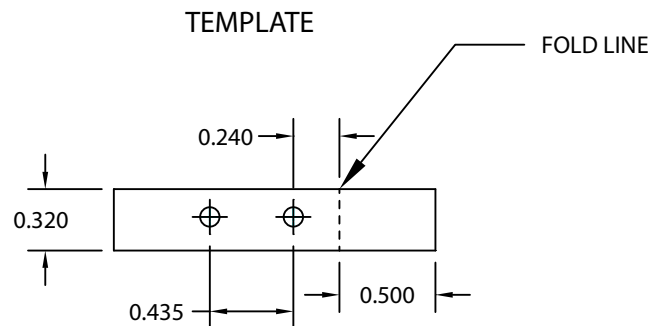
Limit Switch Mounting Templates

MILL BASE LIMIT SWITCH HOLES TEMPLATE LOCATION

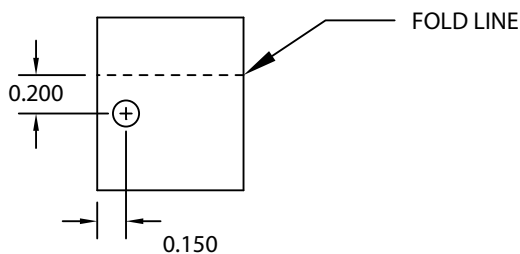


Mill Base Template Instructions

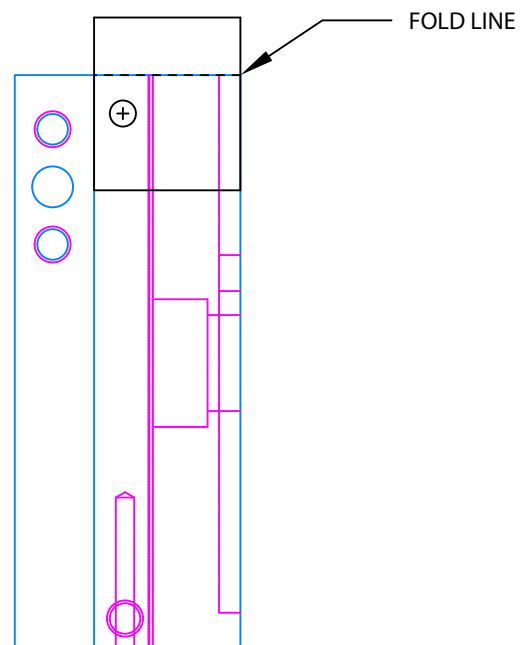
Cut the template out on the solid lines. Fold the template on the dashed line and tape it in place on your mill base. Position the targets on the side of the mill and the extra fold at the front of the base. The targets indicate the hole locations for the Y-axis limit switch mounting 5-40 screws. You will need to remove the accordion way cover plate before affixing the template if you have one mounted on your mill.



COLUMN SADDLE ECCENTRIC TRIGGER HOLE TEMPLATE LOCATION



TEMPLATE



Column Saddle Template Instructions

Cut the template out on the solid lines. Fold the template on the dashed line and tape it in place on the top of your column saddle as seen in the diagram to the right. Position the target on the side of the saddle and the extra fold on top of the saddle. The target indicates the hole location for the Z-axis eccentric trigger mounting 8-32 screws.