

Running a Job on the Large Mill

Fabrication Lab Tutorial

Written By Nathan Burnell

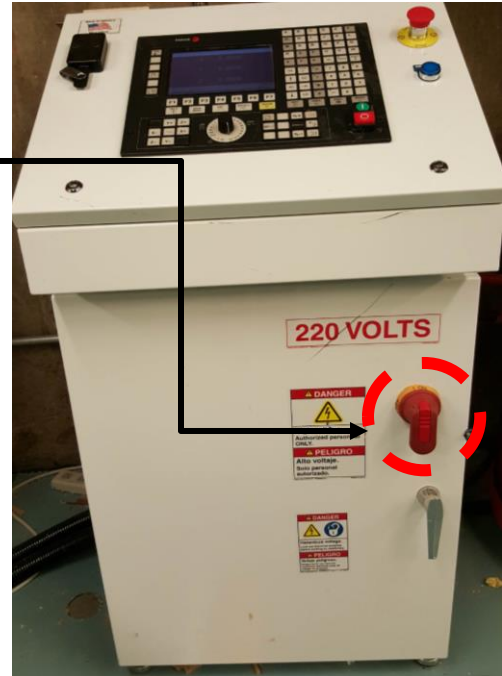
Turning On the Machine

Flip the breaker switch on the front right of the lower part of the controller box to the **ON** position. Twist the red **Emergency Stop** button to the right to deactivate it. Once the machine has finished booting, press **F4** to enter the **Jog** menu.

Press the blue **Emergency Reset Button** then hit **ESC**.

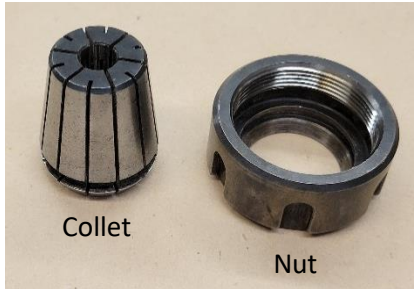
If the blue light does not go out, make sure all the red **Emergency Stop** buttons on the gantry are deactivated then repeat the process from the **Emergency Reset Button** forward.

Press the **ZERO** button on the top-left of the control panel to home the machine. This will move the gantry and the spindle to the machine's home position. (**NOTE:** This will **not** affect your zero offset location.)



Installing your Endmill

While still in the jog menu, press the **Tool Change** button, which is located at the bottom of the top-left column of the control panel. This will move the gantry closer to you making it easier to attach your endmill.

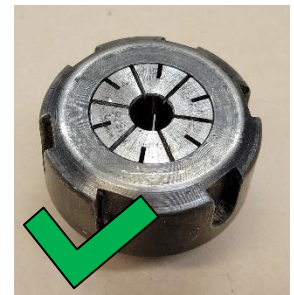


Next you should find a collet that fits your endmill. An uncompressed collet should allow the shank of the endmill to slide smoothly through it, without any jostling or sticking. If your endmill does not travel smoothly through the collet, the collet is damaged and should not be used. Squeezing a collet tightly around an endmill should lock the endmill firmly in place. If the endmill has any play or jostles in the collet, the endmill is too small for the collet and a different size collet should be used.

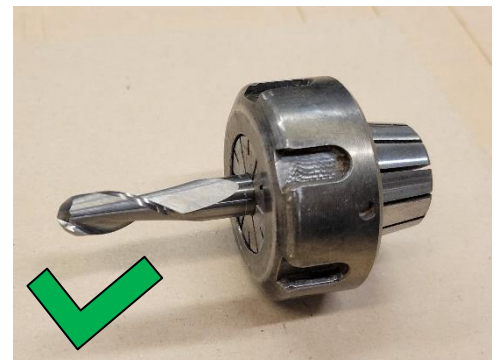
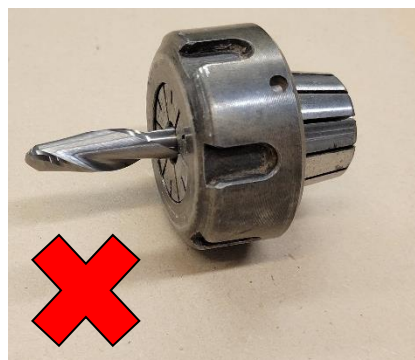
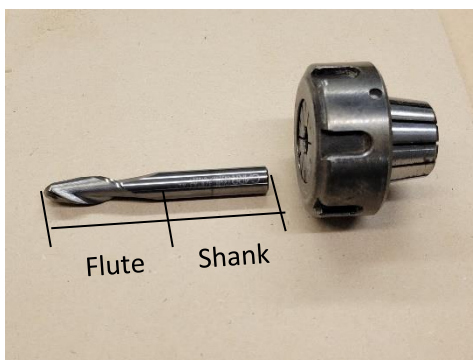


After finding the correct collet for your endmill, place the nut face down on a flat surface and press the empty collet straight down into the nut until it locks into place. It's important for the collet to be mounted straight into the nut and to not be crooked at all.

NOTE: It can take significant force to insert the collet all the way. To help insert it, find a sturdy piece of scrap wood, set it against the back of the collet, and press down on it with both hands.



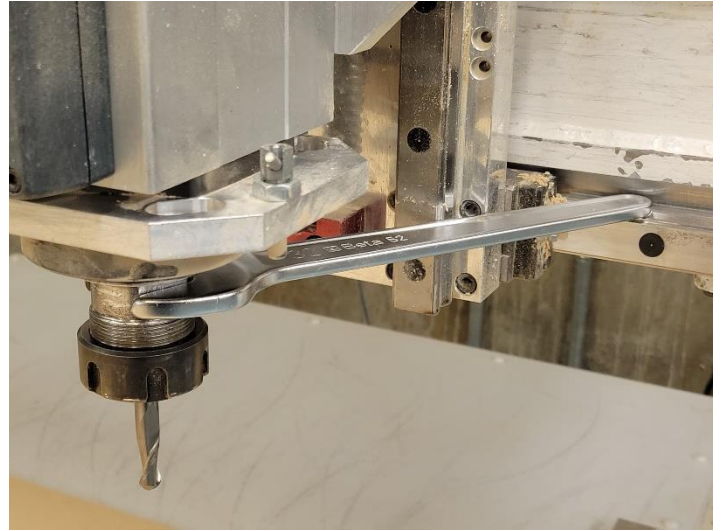
The collet should only compress on the shank, the smooth end, of your endmill. It should never cover any part of the flute, the cutting edge, of your endmill. Make sure the collet is gripping on to at least ~0.75" of the shank.



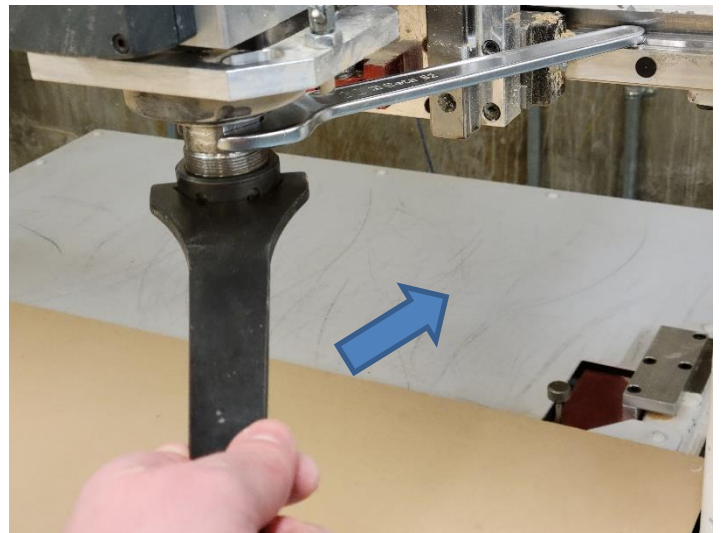
NOTE: Always make sure that your endmill is long enough to reach down past any vertical features of your mill file. The longer your endmill, the greater the risk that it can snap. Always try to use the shortest, thickest endmill that will work with the geometry you are trying to create. You may use this same process to install a drill bit on the mill for drilling holes, however you should never use a drill bit as an endmill or an endmill as a drill bit.

Once your endmill is assembled with the nut and the collet, finger-tighten the nut onto the spindle. Be sure not to cross thread the nut, then use the wrenches to give the nut one more quarter turn to tighten it all the way. It is important that your endmill is properly secured to the machine or it may start to slide which will cause significant problems.

Start by placing the silver wrench around the two flat sides at the top of the spindle and then turn the wrench until you can set it on the rail of the gantry.



Then slide the teeth of the black wrench up into the notches on the sides of the nut. Once the two wrenches are in place, push the black wrench to the right to tighten the nut. One quarter turn past finger tight should be enough. You should also avoid over tightening the nut on to the spindle.

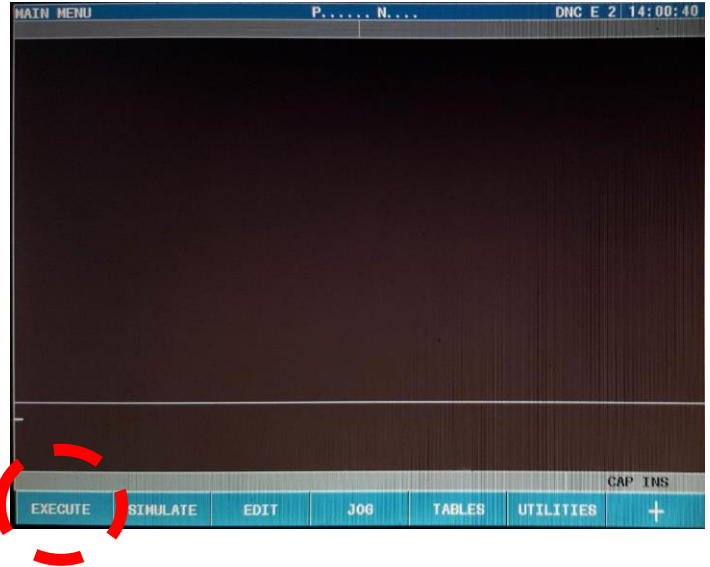


NOTE: When your file is finished running don't forget to take your endmill out of the machine. Go to the Jog menu and hit the tool change button. To take your endmill out, simply change the orientation of the wrenches. The Black wrench should be placed on the rail up against the gantry and then push the silver wrench to the right to loosen the nut.

Warming Up the Spindle

Now that the endmill is in place, you must use the *SPINDLE WARM-UP* program to ensure your endmill is installed correctly and to warm up the router.

Press the **ESC** or **MAIN MENU** button to return to the main menu. Hit the **EXECUTE** (F1) button to enter the execute menu and, if not already there, press the **MEMORY** (F1) button to enter the saved programs menu. Then navigate with the arrow keys to the right of the screen until you have highlighted program number 999996, which is the *SPINDLE WARM-UP*.



Once you have highlighted the *SPINDLE WARM-UP* program, press the yellow **ENTER** button to load the program.

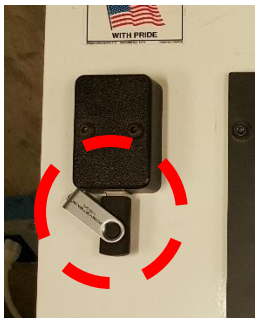
Press the **Green cycle start button** to begin running the program and make sure the **FEED Knob** is turned up to at least **50%**. This program will move the mill to its home position, so make sure the path is clear. Once it is homed, the router will spin at increasing rates for about five minutes. When it's finished, the spindle will stop running and the program will end.



Press the **MAIN MENU** or **ESC** button to return to the home screen.

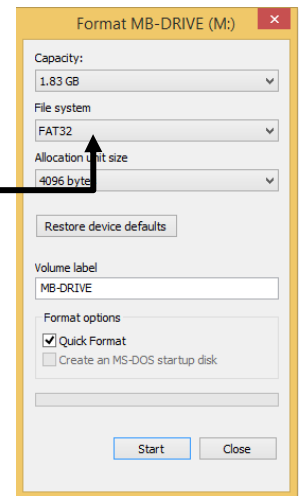
Loading your Toolpath

When post-processing your toolpath in MadCAM with the *YSOA-Large Mill* post-processor, name your resulting *.pim file as a six-digit number lower than **900000**, for example: *123456.pim*. Copy your file to a USB drive which has been formatted **FAT32**.



Plug your USB drive into the port on the top-left of the control panel.

NOTE: If you change your USB drive's file system type, it will erase everything on it. If you need help formatting your USB drive properly, please talk to an AT staff member for assistance.

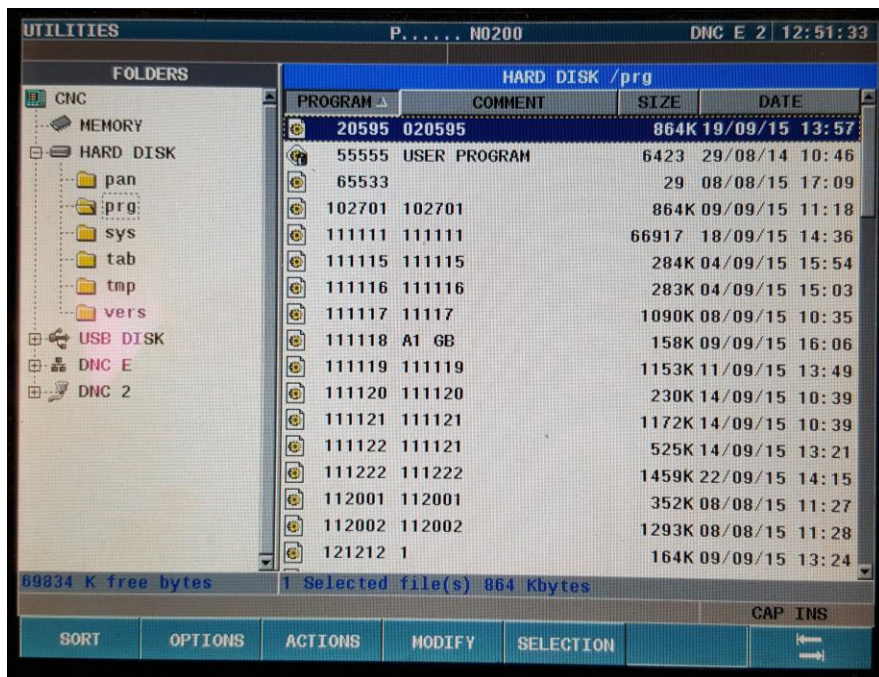


From the main menu, press the button below **UTILITIES** (F6).

Then hit the **EXPLORER** (F7) button. Press the left arrow key to move to the **FOLDERS** sidebar. Press the down arrow key until you've highlighted **USB DISK** then press **ENTER**. Use the right arrow key to move back to the explorer window.

Highlight your *.pim file then press **C** on the keyboard to copy it. Navigate back to the main hard disk and highlight the **prg** folder. Press **V** on the keyboard to copy your file to the prg folder.

You can now remove your USB stick.

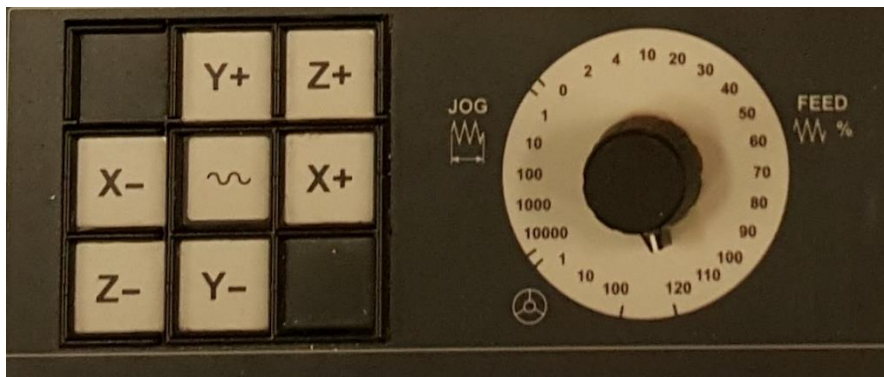


Setting your Origin

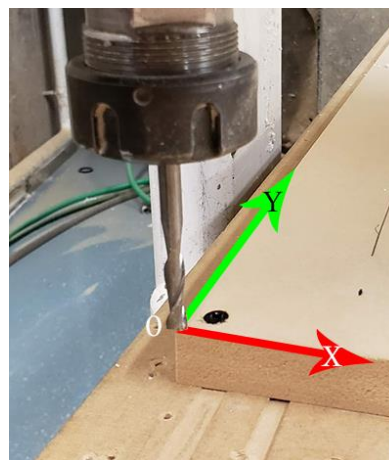
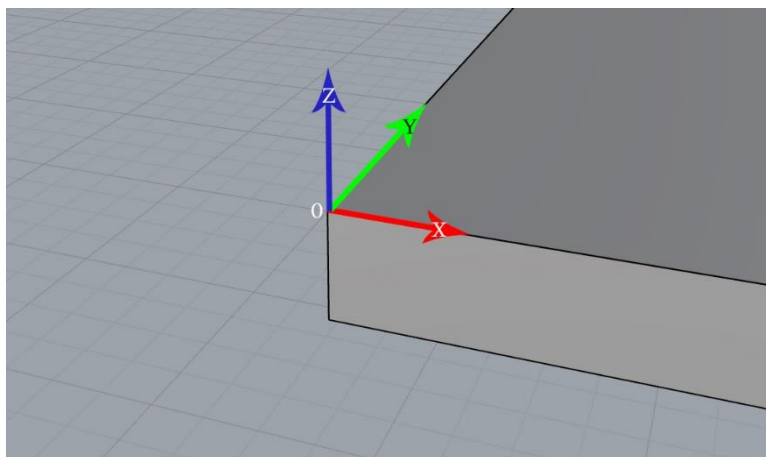
First you need to mount your stock piece to the mill bed according to the posted instructions in the mill room. It is important to make sure that your stock piece is aligned correctly along the X and Y axes. Your endmill will actually be pulling up on your material as it is cutting, so it is important that you secure your part in a way that it cannot be lifted up either. Once your stock piece is attached to the mill bed, you need to inform the machine where it is located. The origin of your job should correspond to the origin of your Rhino file.

From the main menu enter the **JOG** (F4) screen and use the **XYZ** control pad to move the gantry and head around manually.

You can control the speed with the **FEED** knob to the right of the XYZ control pad. It is recommended that you start **at 20%** and then ramp the speed up gradually as you get a feel for controlling the machine.



Move the center of the tip of your endmill to the point corresponding to your Rhino origin and press the **USER** (F5) button. Then press **LOAD ZERO OFFSETS** (F2), then press **LOAD G55**, then in order press **X G55**, **Y G55**, **Z G55**. Each of the XYZ tabs should say that the current origin is **LOADED**. Once all three are set, press **EXIT** (F7) three times to return to the **JOG** menu.



NOTE: Make sure that any screws used to attach material to the table will at no point be hit by the endmill. This will severely damage your endmill, your material block, and potentially the mill itself. If you're unsure about any screw positions or attaching your material, please ask a shop monitor or staff member.

Simulating your Toolpath

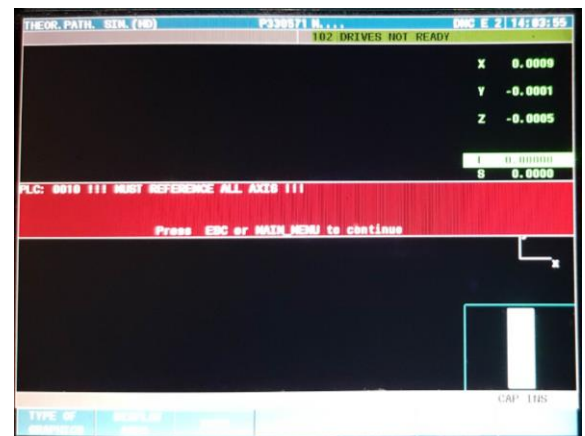
From the **MAIN MENU** hit the button below **SIMULATE** (F2). Press (F5) to look at the **Hard Disk**. Use the arrow keys to navigate to your file. Make sure both the toolpath name and the number match yours. Once highlighted, press **ENTER** then select **THEORETICAL PATH** (F1), **GRAPHICS** (F6), then **CLEAR SCREEN** (F6).

Press the **green start button** to begin the simulation. You'll see a view from the top of your job being run on the table, with your toolpath drawn out in yellow and safe moves drawn out in purple.

The **FEED** knob will also control the speed of the simulation.

If any problem arises with the toolpath, you will see a red bar appear on the screen describing the issue. Typically, issues will arise if the toolhead attempts to move beyond a limit. Check to make sure your Rhino origin is set at the top of your object's bounding box and that your object is oriented with the table correctly.

NOTE: If you do not allow the simulation to complete, you need to hit the **RESET** button before running your tool path or it will pick up where the simulation left off potentially breaking your endmill.



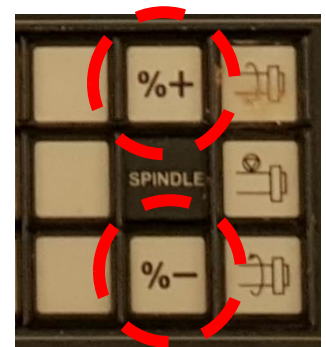
Running your Toolpath

From the **MAIN MENU** hit **EXECUTE** (F1). Use the arrow keys to navigate to your file and then press the yellow **ENTER** key. If your file is not showing in the list, press the **HARD DISK** (F5) button.

Set the **FEED** control knob to **50% or less** to start. Then press the **green cycle start button** to begin your job. You can turn the **FEED** control knob up **100%** once you start cutting and you have determined that your toolpath is running correctly. The toolhead will move to the center of your stock piece and the spindle will spin up to speed before starting to cut your part.

You can adjust your feed rate up to 120% of your defined feed rate, but do so carefully. Keep in mind that spindle speed may need to be increased when the toolhead is moving faster.

To adjust the spindle speed, press the **% +** and **% -** buttons to the right of the **FEED** control knob.



Pausing and Resuming a Toolpath

To pause your toolpath, press the **red cycle stop button**. This will pause the mill job, however, it will not stop the spindle.

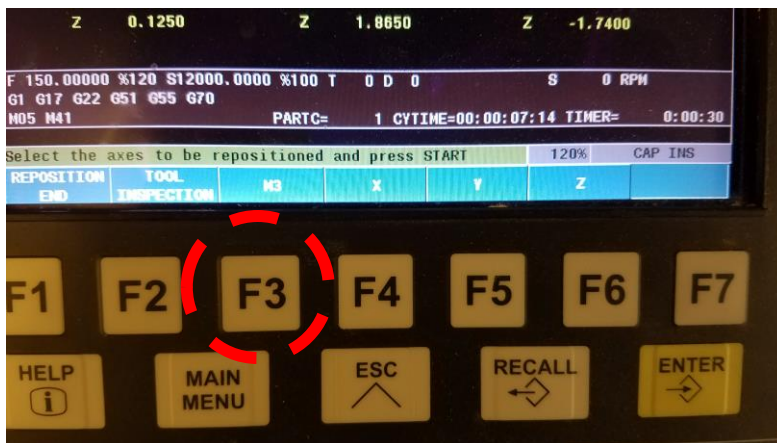
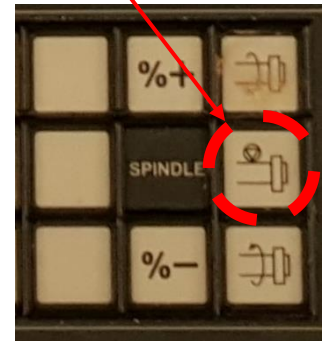


To stop the spindle, press the **TOOL INSPECTION (F5)** button and then press the **SPINDLE STOP BUTTON**.

During a “tool inspection” you will be able to use the **XYZ** control pad to move the tool head away from your part.

NOTE: Always move the z axis up first to avoid gouging your part.

To reposition and resume your toolpath, start by pressing the **REPOSITION (F6)** button. Next you will restart the spindle by pressing the **M3 (F3)** button and then pressing the **green cycle start button**.



Repeat this process to reposition the toolhead by pressing **F3** to select axis you would like to move and then pressing the **green cycle start button**. Always make sure to reposition the z axis last.

After the spindle is relocated into the correct position you must press the **green cycle start button** one last time to resume the toolpath.

NOTE: If for any reason you need to stop the mill and the spindle **immediately**, you should press the nearest **emergency stop button**. This will end the program that you are running and you will have to resume from the beginning.

Turning the Mill Off

When you are finished milling and ready to turn the machine off, go to the **MAIN MENU** then hit the **EXECUTE (F1)** button and then press the **MEMORY (F1)** button to enter the saved programs menu.

Scroll down the list of programs and highlight **GOOD-NIGHT (P999994)** and then press the **green cycle start button**. The toolhead will move to the XY home position and then take its rest position along the Z-axis. When the toolhead stops moving, press the red **EMERGENCY STOP** button then flip the breaker switch on the front of the controller box to the **OFF** position.

Please make sure that you have removed your endmill and make sure clean up any dust left behind on the mill, the floor, or surrounding area.