Running a Job on the Small Mill

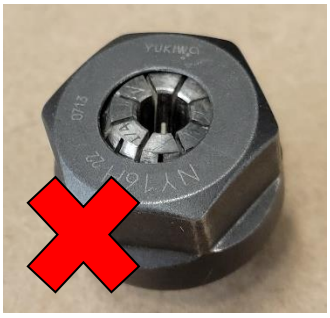
Fabrication Lab Tutorial
Written By Nathan Burnell

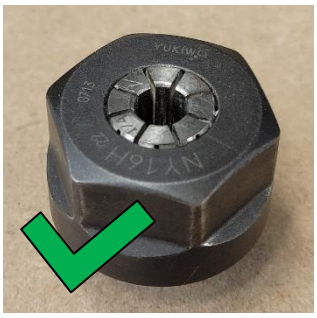
Installing your Endmill

First, ensure that the mill is powered **OFF**. You can find the power button on the right of the control panel.

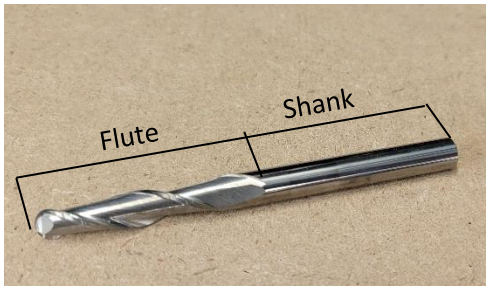
Find a collet that fits your endmill. An uncompressed collet should allow the shank of the endmill to slide smoothly through it, without any jostling or sticking. If your endmill does not travel smoothly through the collet, the collet is damaged and should not be used. Squeezing a collet tightly around 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.

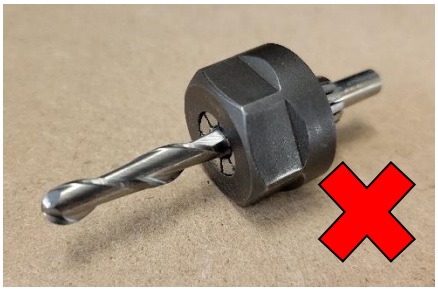
After finding the correct collet for your endmill, place the nut face down on a flat surface and press the empty collet straight down into the nut until it locks into place. It's important for the collet to be mounted straight into the nut and to not be crooked at all.

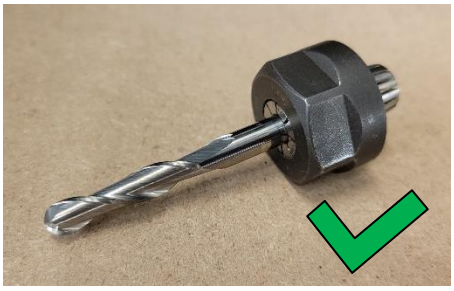




The collet should only compress on the shank, the smooth end, of your endmill. It should never cover any part of the flute, the cutting edge, of your endmill. Make sure the collet is gripping on to at least ~0.75" of the shank.

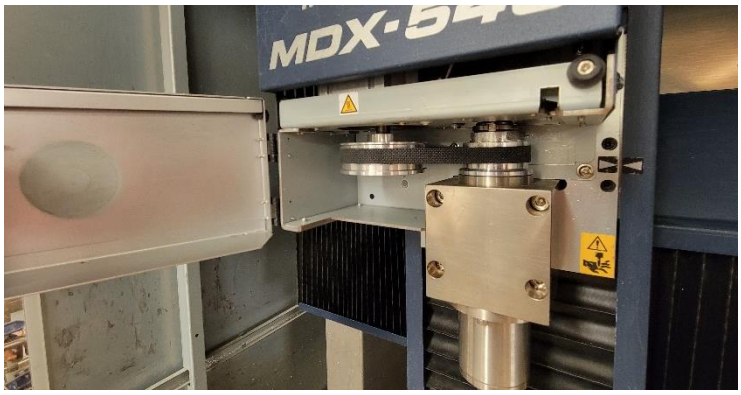




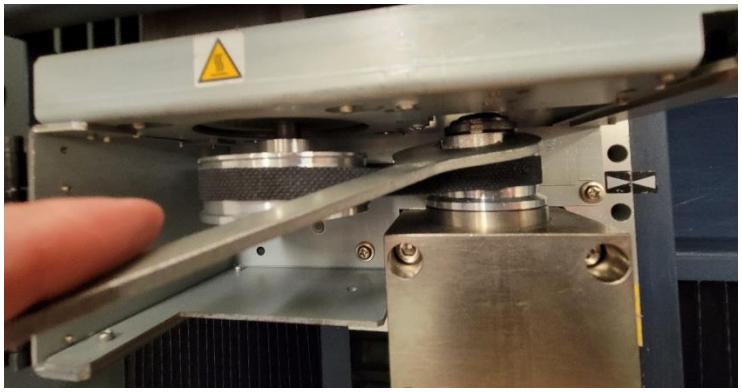


NOTE: *Always make sure that your endmill is long enough to reach down past any vertical features of your mill file. The longer your endmill, the greater the risk that it can snap. Always try to use the shortest, thickest endmill that will work with the geometry you are trying to create. You may use 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.*

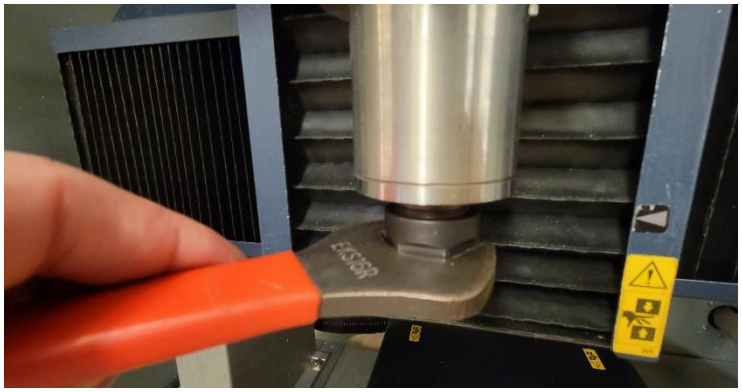
Once your endmill is assembled with the nut and the collet, finger-tighten the nut onto the spindle. Be sure not to cross thread the nut, then use the wrenches to give the nut one more quarter turn to tighten it all the way. It is important that your endmill is properly secured to the machine or it may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



Start by opening the metal door above the spindle.



Place the silver wrench around the two flat sides at the top of the spindle.

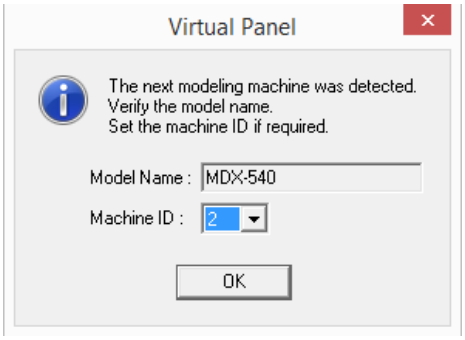


Use the red handled wrench to tighten the nut by pushing the wrench to the right. One quarter turn past finger tight should be enough. You should also avoid over tightening the nut on to the spindle. Close the metal door above the spindle when you are finished.

NOTE: *When your file is finished running don't forget to take your endmill out of the machine.To take your endmill out, turn off the machine, open the metal door and attach the wrenches. Turn the red handled wrench to the left to loosen the nut.*

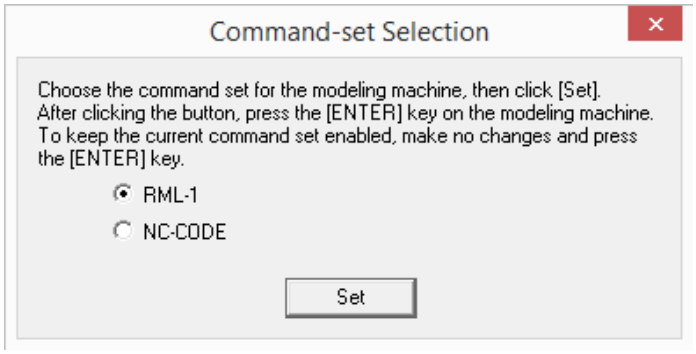
Starting the Machine

Make sure the emergency stop on the front of the machine is not pushed in. If it is, twist it to the right to pop it out then turn the mill **ON** using the switch on the right side of the control panel. When the pendant display shows this graphic, go to the computer and start ***VPanel*** from the *Start Menu*.



When VPanel starts, you will be asked to assign a Machine ID number. This number will not impact the milling process, so you can just press *OK*.

You will then be asked what machine language to set the mill to. Be sure to select ***RML-1***. If you do not, the mill will not be able to interpret your toolpath code.



Next, clear the mill bed of any material. Close the main cover and press the ***ENTER*** button on the pendant to initialize the mill. This will send the mill to the machine origin. (***NOTE:*** *This will not affect your user offset origin.)* If the mill does not initialize, ensure that the door is closed completely and properly.

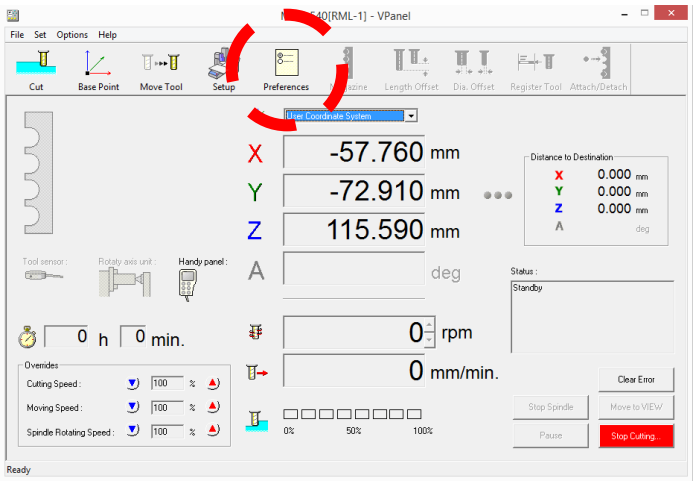
Attaching your Material

Once the mill has stopped moving, press the ***MENU*** button on the pendant. Then using the control knob at the bottom of the pendant, move to the ***VIEW*** option and select it with ***ENTER***. This will move the bed out, away from the gantry to give you clear access to it.

Place your material on the bed and secure it tightly. Your material should be aligned properly on the bed along the XYZ axes to match the alignment your Rhino file. 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.

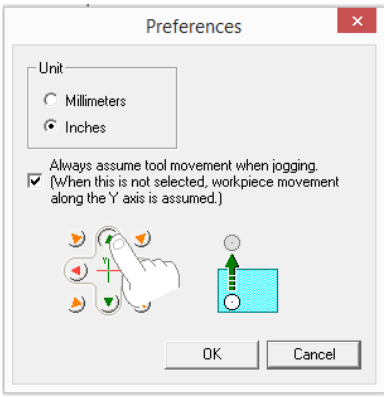
NOTE: Make sure that any screws used to attach material to the base will at no point be hit by the endmill. This will severely damage your endmill, your material block, and potentially the mill itself. If you're unsure about any screw positions or attaching your material, please ask a shop monitor or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

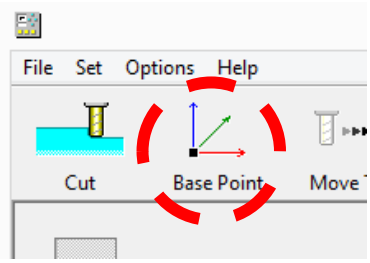
Setting your Origin



With *VPanel* loaded and the mill initialized, you can select the units the machine will use.

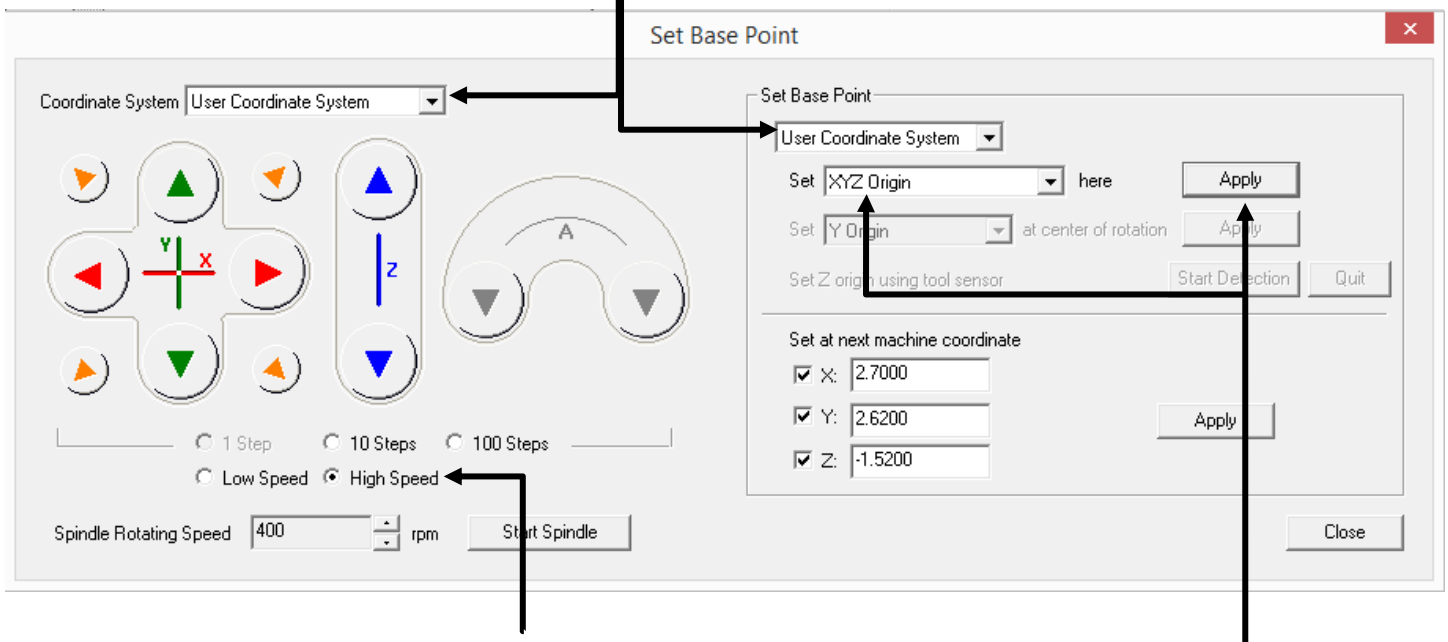
Click on the ***Preferences*** toolbar button and set the units to ***Inches***.





Click on the ***Base Point*** toolbar button to set the origin for your cut.

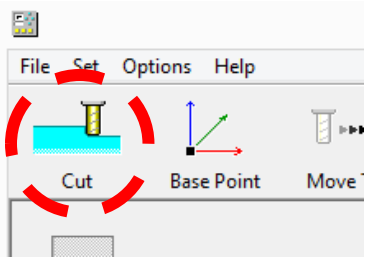
Make sure that you have selected ***User Coordinate System*** in both the *Coordinate System* and *Set Base Point* drop down menus.

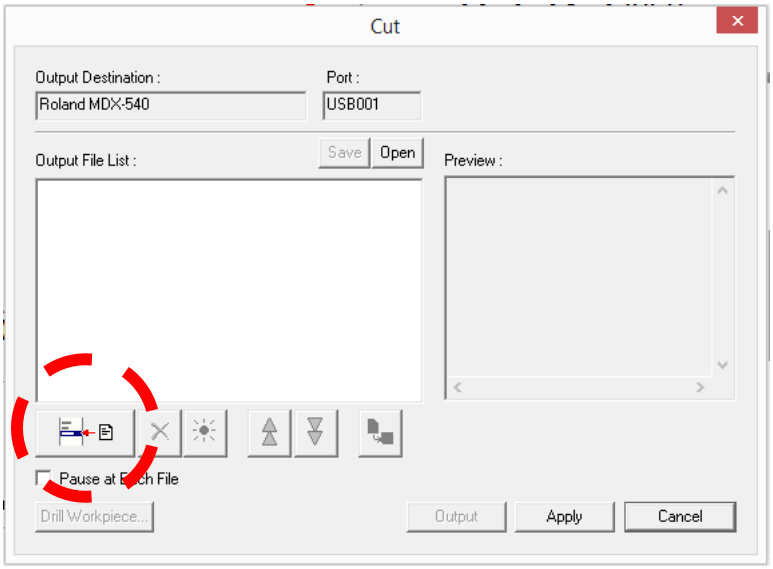


Use *High Speed* to make long moves and then use *Low Speed* to carefully approach your material. Use the arrow buttons to move the bed, or the spindle, so that the center of the tip of the endmill is touching the corner of your material that corresponds to your Rhino origin. Set your ***XYZ Origin*** with the ***Apply*** button.
Your origin is now set and you can press the ***Close*** button.

Selecting and Starting your Cut

Click on the ***Cut*** toolbar button. This will bring up the cut window.





Press the **X** button to delete any files that are already loaded. To assign your cut file, press the ***Assign*** button.

You can schedule multiple toolpaths by loading multiple files, then ordering them in the *Output File List.* They will run in order from top to bottom. Only group toolpaths that were pathed for the same endmill.

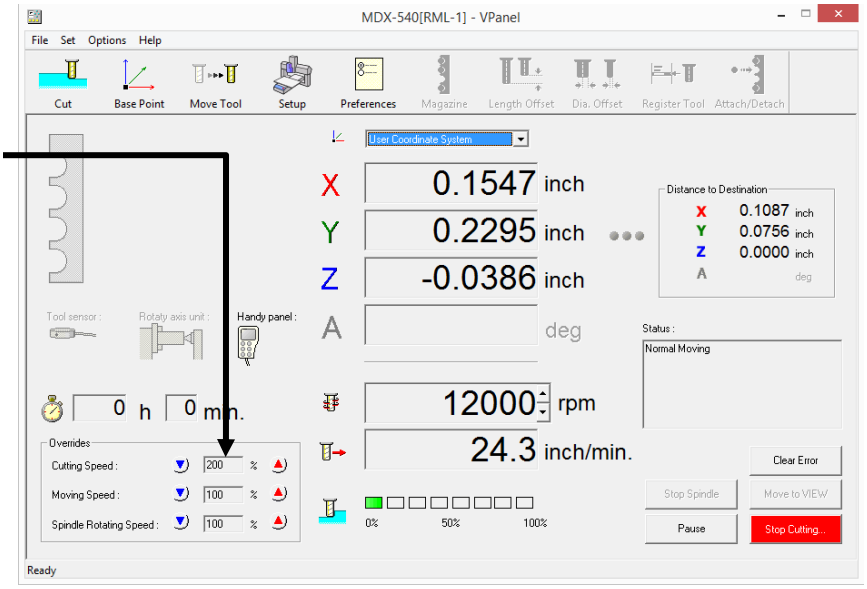
When you have finished assigning toolpath files, press ***Apply***.

To start cutting, press ***Output***.

Once your file is running on the mill, you can adjust the feed and spindle speeds with the **red and blue arrows** next to their corresponding speed, with *Cutting Speed* being your *Feed Rate*.

Adjustments are made as a percentage of the value specified in your MadCAM settings.

NOTE: The machine's spindle maxes out at 12000rpm and the feed rate maxes out at 295in/min, no matter how high you set the speed percentages.



If you need to step away from the mill, or you want to open the door to clean part way through your job, press the ***Pause*** button and then press the ***Stop Spindle*** button. Wait for the spindle to come to a complete stop before opening the main cover. To resume the cutting job, click ***Resume Cutting.*** The spindle will ramp up to speed first, and then continue cutting. If you need to stop the mill, press the ***Stop Cutting*** button in VPanel or the ***red Emergency Stop*** button on the front panel of the mill itself.

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.