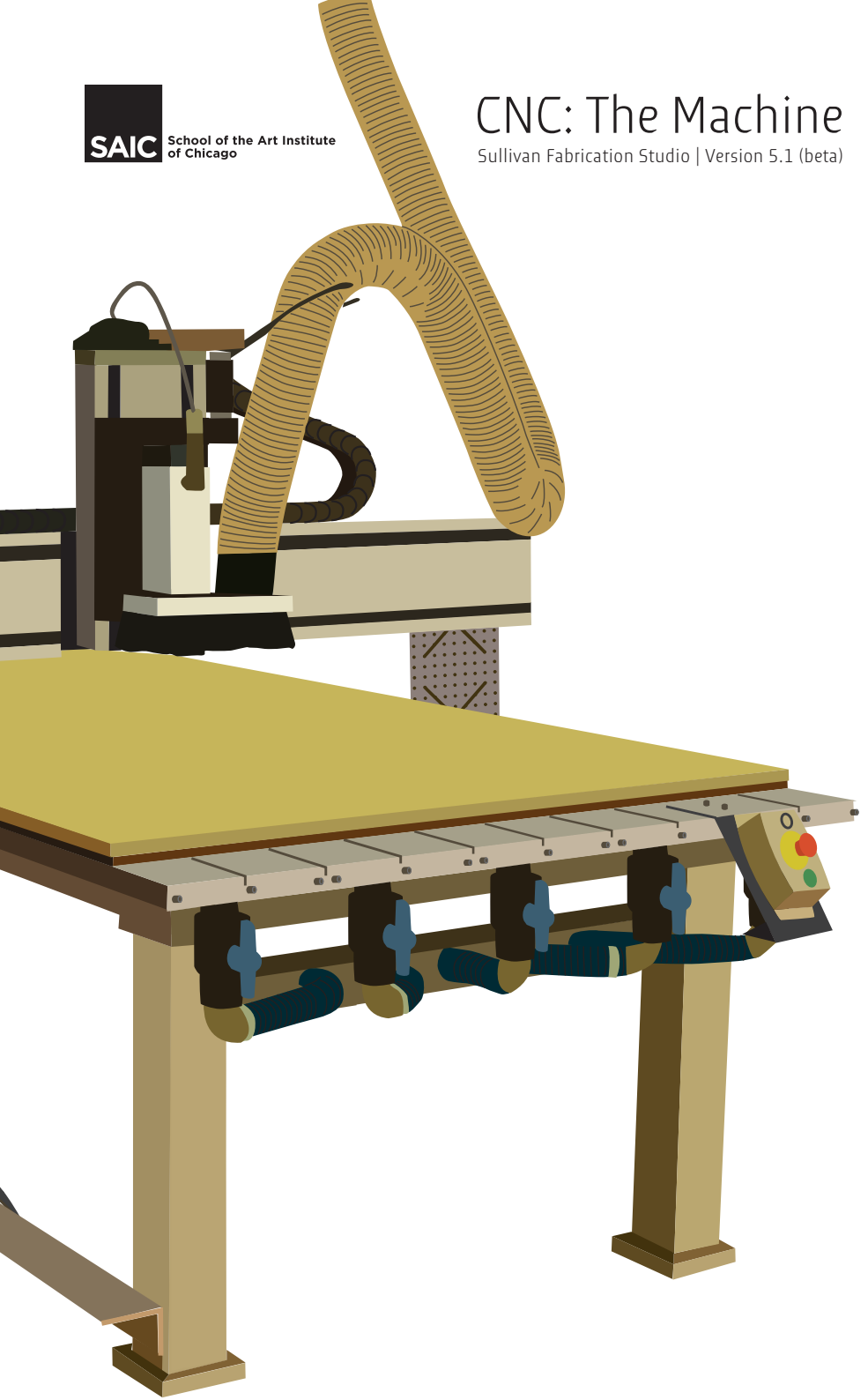
SAIC School of the Art Institute of Chicago

CNC: The Machine

Sullivan Fabrication Studio | Version 5.1 (beta)



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Initial Set-Up

Download Knowledge Base Zipfile to your PC Desktop

http://www.artic.edu/webspaces/portal/irfm/CNCKnowledge.zip

These template files contain the neccessary settings and preferences for successful machining with the CNC Router.

INSTALL THE KNOWLEDGE BASE FILES

Unzip Knowledge Base Files by right-clicking “extract all”.
Save Unzipped file in an easily accessible location like your PC desktop.

In the plugins manager, choose to have Rhinocam load manually.
Rhino will prompt you to load the plugin when you launch the application.
Only launch RhinoCAM when you are creating toolpaths.

WIFI NOTE

If you are working in Rhino off campus, or with an inconsistent wireless connection to the server, you should not launch RhinoCam. Files that are open when network connectivity is lost may lose all RhinoCam data.

About the Knowledge Base

The Knowledge Base is an accumulation of pre-configured toolpaths sorted by material. Loading from the Knowledge Base will load SFS established settings like feed speed, cut direction, and some of the advanced parameters for you, limiting complications in creating toolpaths. The Knowledge Base will be frequently updated, the newest version will always be available on the SAIC Portal (see link on left).

ABOUT THE CNC TEMPLATE FILE

A Rhino Template file is included in the Knowledge Base. This template file will provide standard units, grid and views for CNC. Please be sure all models generated for CNC are imported and saved using this template.

The CNC Template File includes:

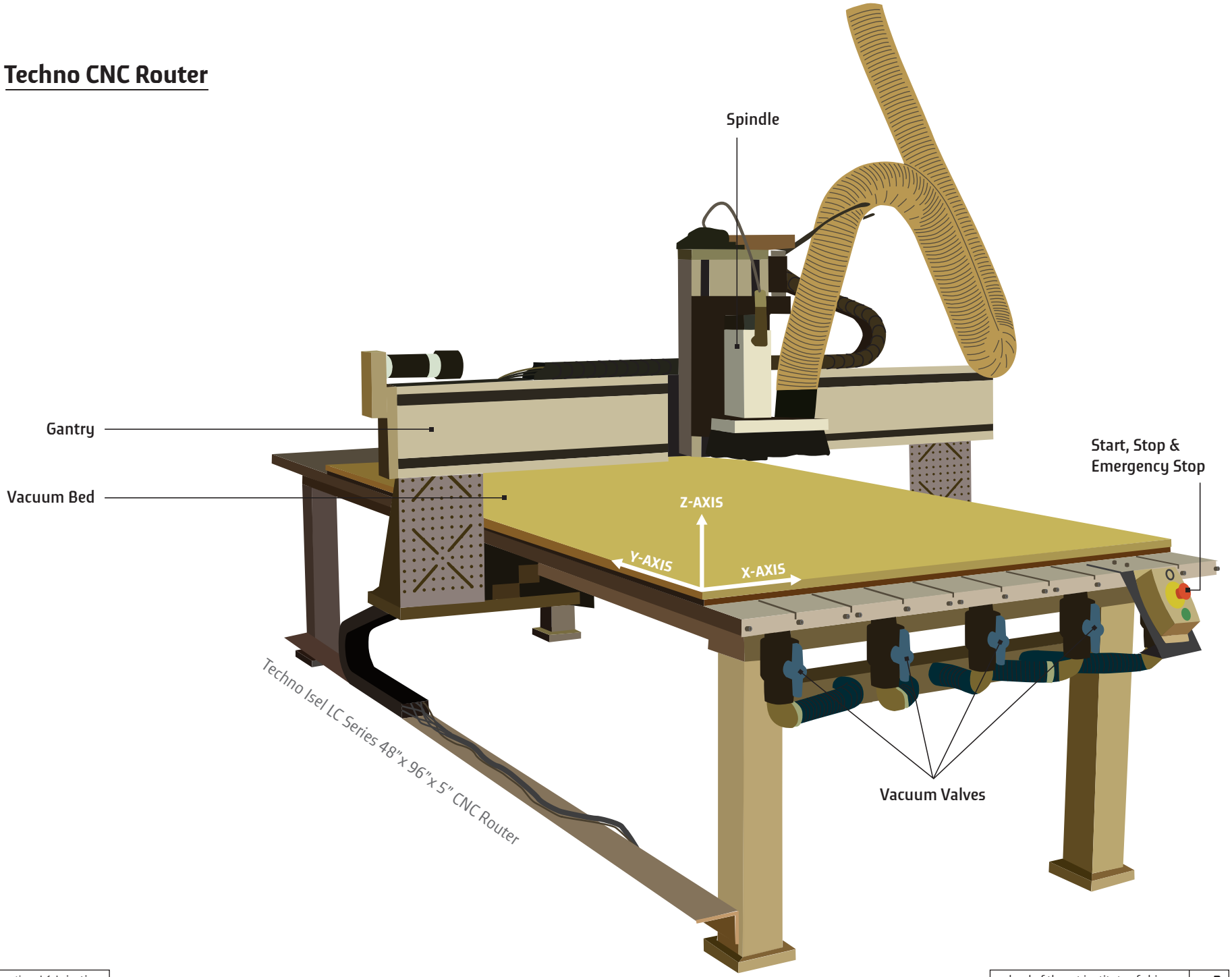
IMPORT LAYER

The import layer is the default layer, and is empty. Activate this layer before importing your geometry.

WORKING VOLUME LAYER

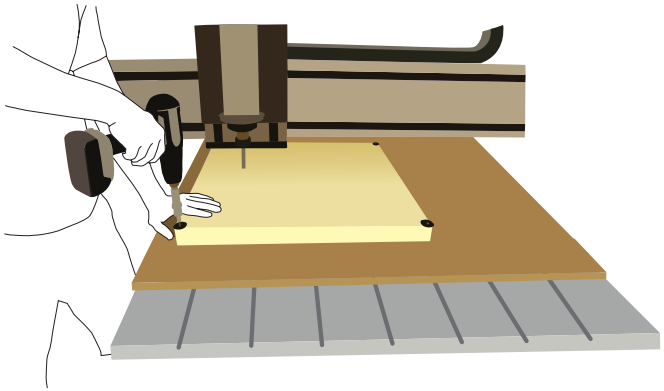
The Working Volume layer contains a solid representing the working volume of the CNC Router. **View this layer to make sure your model fits in the workable space of the CNC Router.**

Techno CNC Router



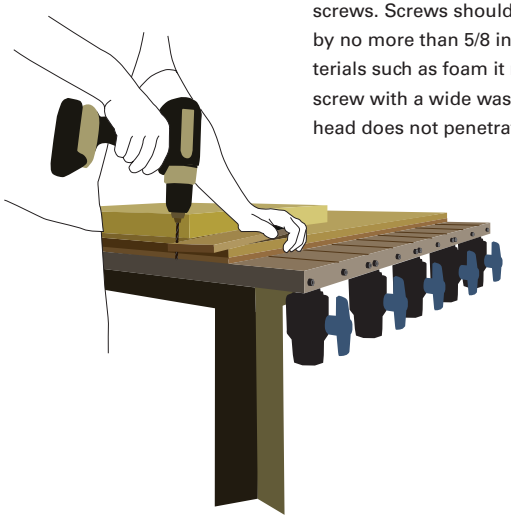
Mounting Material to Table

The CNC Router is equipped with a vacuum hold down table. A spoiler board is mounted on the CNC Bed to protect the bed from the cutting tool. Various methods including adhesives, screws (below, fig. 18.1), clamps and jigs may be used to affix your material to the CNC spoil board for milling. The Studio Staff will assist you with determining the appropriate method.



PRE-DRILL HOLES in your material either on a work bench or off the side of the machine.

In addition to a drill you will need some type of screw driving attachment and appropriately sized screws. Screws should penetrate the spoil board by no more than 5/8 inch. When fastening soft materials such as foam it may be necessary to fit the screw with a wide washer to ensure that the screw head does not penetrate the face of the material.

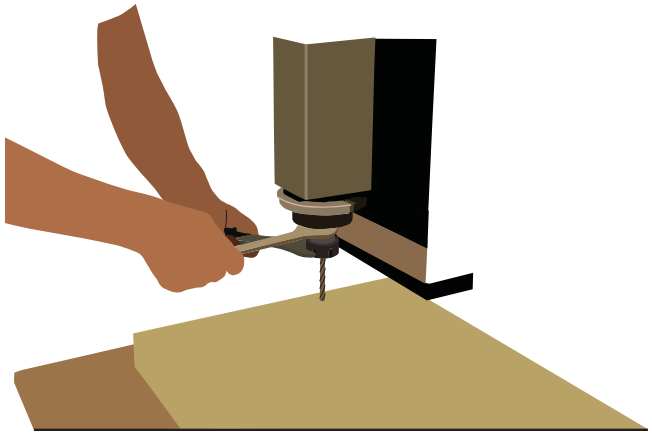


Install Router Bit

Select and install proper router bit with SFS Staff assistance.

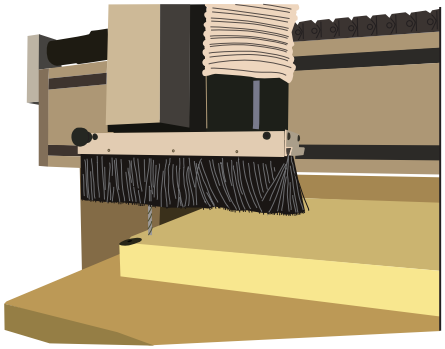
Tighten Collet

Using the two wrenches, tighten the collet. Hold the top wrench on the spindle nut, and turn the bottom wrench. Always position the wrenches so that you are squeezing them together. The bit must be secure or it could come loose during milling.



Set Origin (0,0,0)

The tip of the bit should be positioned on the surface of the material at the left front corner. “0” is the center of the bit. In the CNC Interface, select **Zero > All** to synchronize the origin in your model with the origin of the router. Be careful not to zero directly on top of a fastener or in a position that would directly conflict with any of your cut paths resulting in a collision of the bit and fastener.

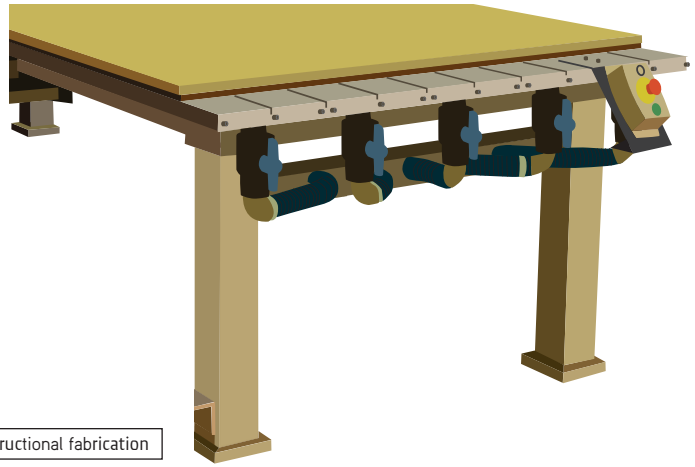


IMPORTANT!
When changing bits between milling operations it will be necessary to reset the z zero coordinate. Do not reset the x, y coordinates.

Open Table Vacuum Valves

The table vacuum valves should be closed when you open the main valve. Open the table valves one at a time and wait for the table to grip the spoiler board before opening the next. The valves should be opened from one side to the other.

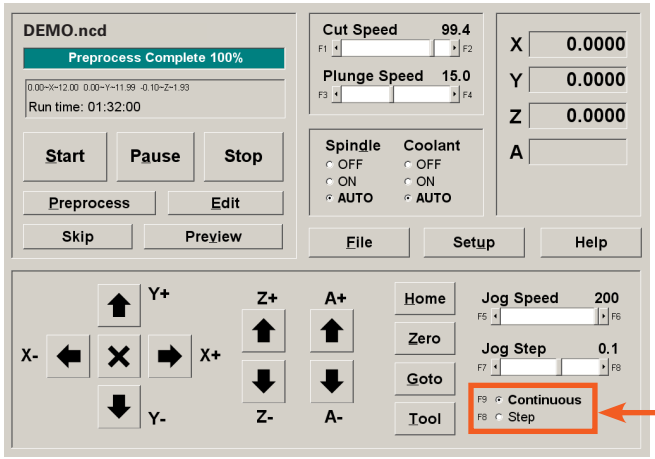
The CNC Router is equipped with a vacuum hold down table. A spoiler board is used on the table surface to protect the table from the cutting tool. This board shold be in place already. Air drawn through the board creates a vacuum strong enough to hold some materials in place.



Positioning the Router

Using the arrows and jog settings in the Techno CNC interface on the PC, Jog the router to position. You can also use hot keys, and the arrow and + - keys on the keyboard. You will need to position the router with the Z Axis all the way up, and clear of the table to position material and set up the Router.

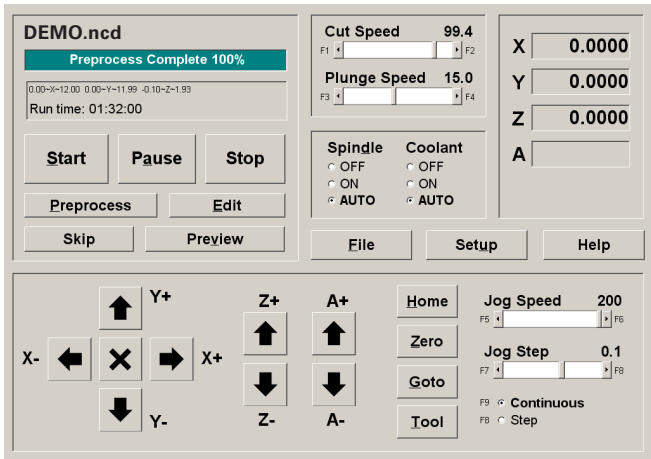
Set the Jog to Continous for rapid movement or Step for precise positioning.



Start Your Job!

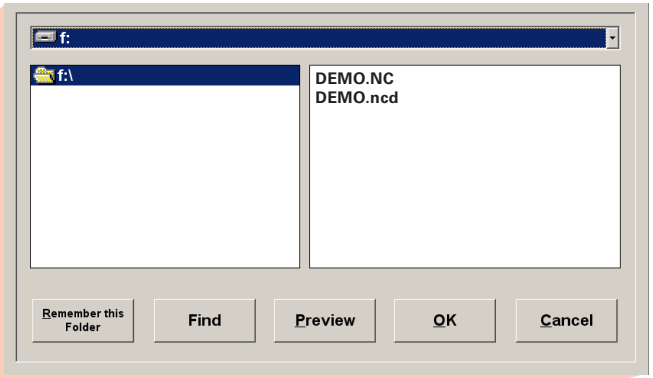
Make one last check to make sure everything is setup properly, before you start. Turn the power and set the spindle speed on on the router. Set the spindle to auto in the CNC interface.

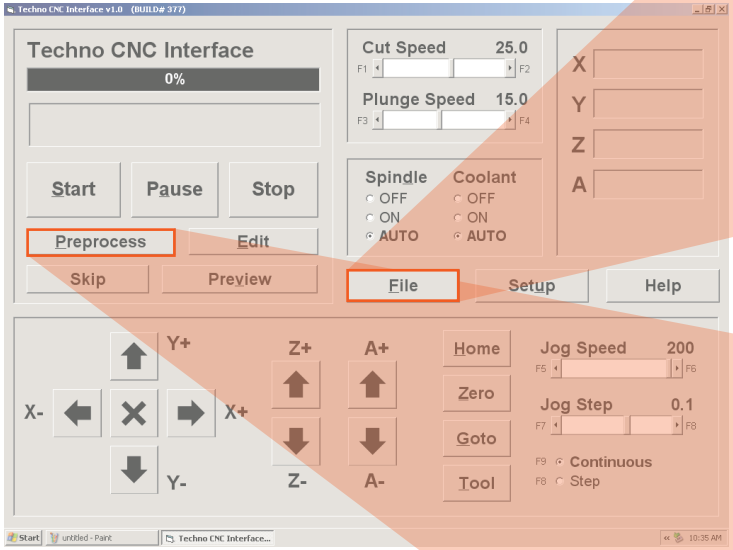
Press Start. The interface will now display a resume button, and a load tool flashing prompt. Assuming the tool has already been loaded, press Resume to begin your job.



Import NC File

- **CLICK FILE BUTTON**. A file finder will appear. Navigate to find the appropriate drive location and pick your file.
- Click OK.

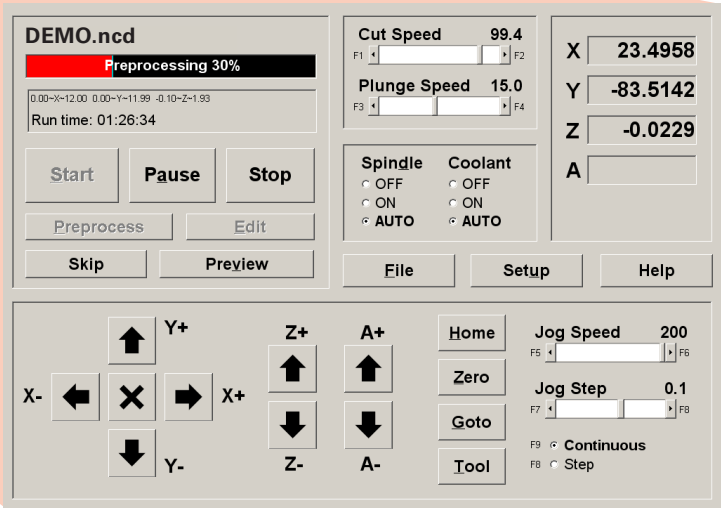




Preprocess NC File

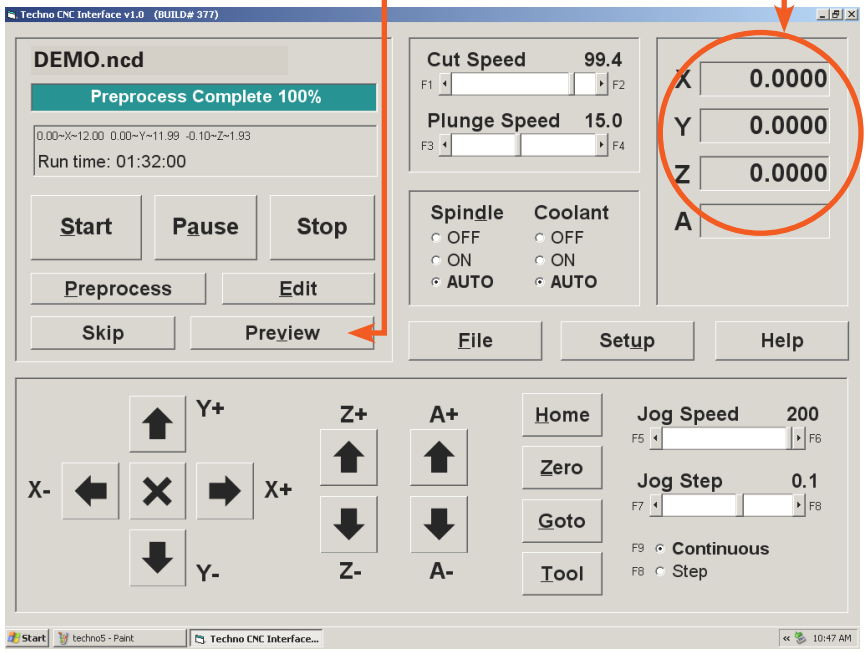
- **CLICK PREPROCESS BUTTON**.

Preprocessing analyzes your file, and calculates the job run time based on the cut speed and plunge speeds you set. After you start the file, the status bar will update.



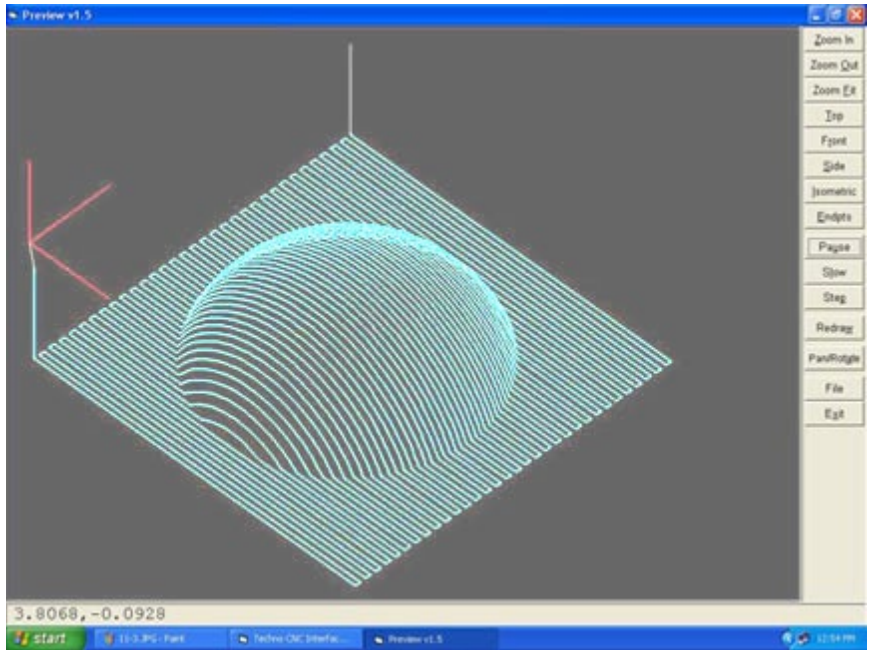
CNC Interface

- The start position of the mill end is located at the origin 0, 0, 0 coordinate.
- After preprocessing is complete, preview the file.



Previewing File

- Once Preview loads, navigate using the buttons on the right. You may need to Zoom Fit to view the whole file.
- Confirm the file's preview from side and top view in addition to isometric.
- Exit Preview to return to the interface.

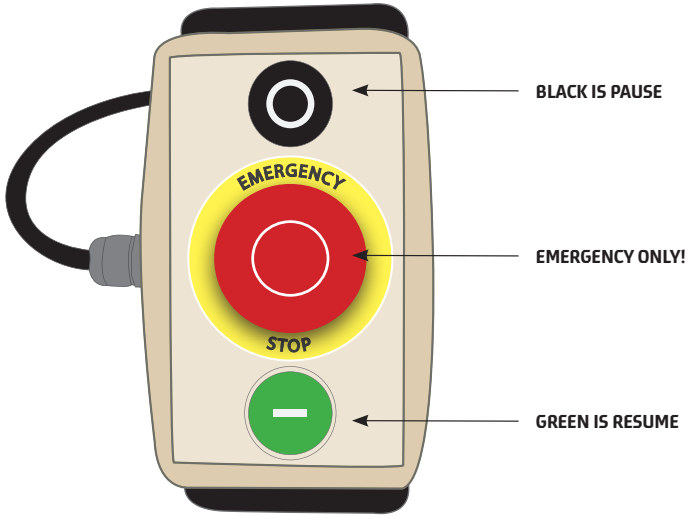


Finishing Up

1. **Unfasten your work** from the machine bed
2. **Clean up** all debris from the machine and surrounding area, cut down waste material and deposit in yellow bins
3. **Save** any files you might want from the CNC computer as files from this computer are deleted regularly.

Pause & Emergency Stop

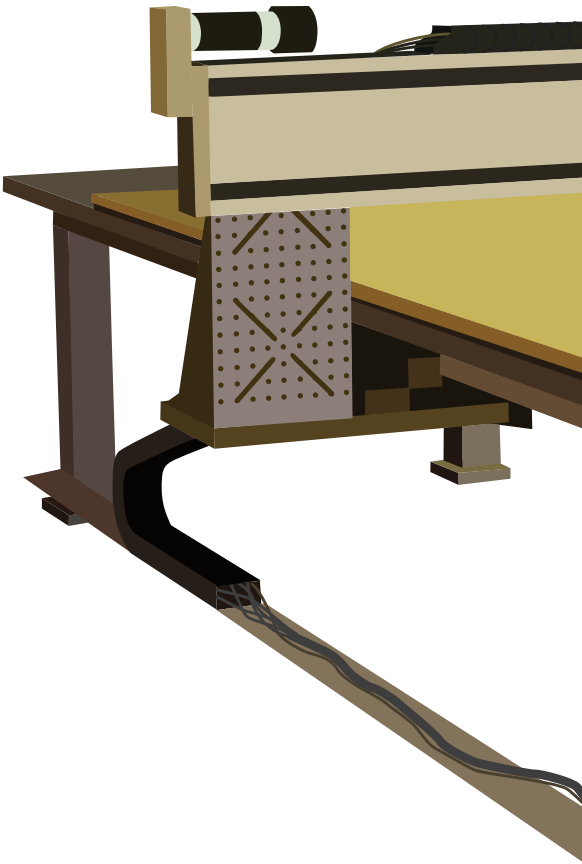
There is a remote pause/emergency stop control box located next to the PC. If at any time during the job, something goes wrong, or seems awry, press and hold the pause button until the CNC router stops. After pausing, the CNC Router can be jogged to other positions for adjustments, and the job resumed. If there is smoke, safety hazard or injury, press the Emergency Stop botton. The Emergency stop will lock the Router off until it is reset.



CNC Router Safety

- Wear eye and ear protection at all times. The Shop will supply you with both goggles and earplugs.

- Keep the table clean and free of tools and loose materials.
- Never leave the router running unattended. If you need to leave, please ask someone to watch it for you or pause the job.
- Never lean on the table or rest hands or feet on the router while it is running.
- Do not attempt to make adjustments or reposition the material while the router is running.
- Use the dust collector or vacuum while the router is cutting.
- Do not exceed recommended feed speeds or spindle speeds.

Bit Safety

- Handle bits with care, they are very sharp. Grip them by the unfluted shaft only.
- Never pull a bit out of a collet - push them out from the back.
- Store bits in the drawer or in plastic cases.
- Do not use damaged, dull, or burnt bits.