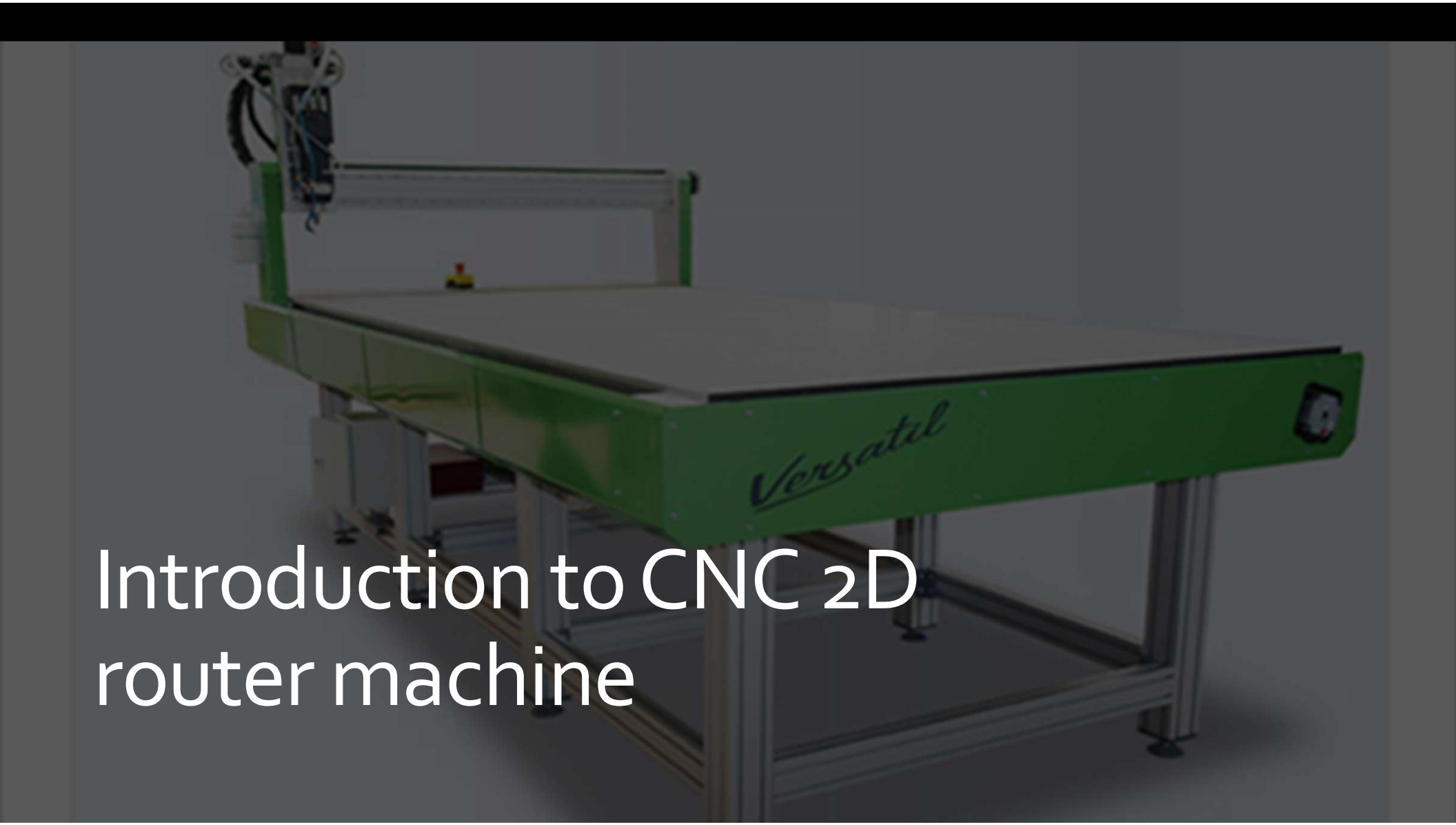


Introduction to CNC 2D router machine

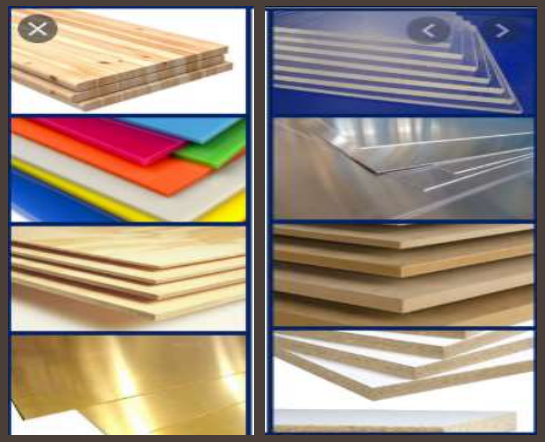
3 main areas

Operation of CNC router

Software

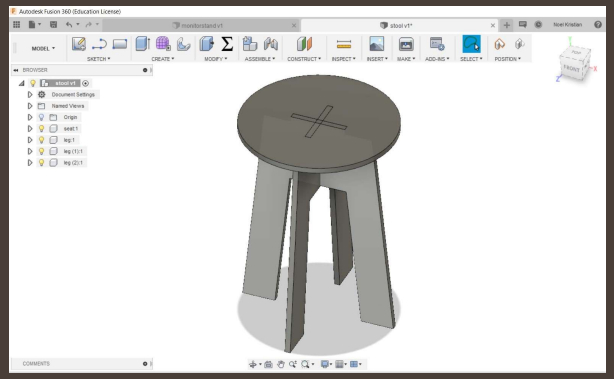
Safety

Before CNC machining….



What materials can you use? Can it be CNC ?

What material sizes can you use? Can it fit into CNC machine?

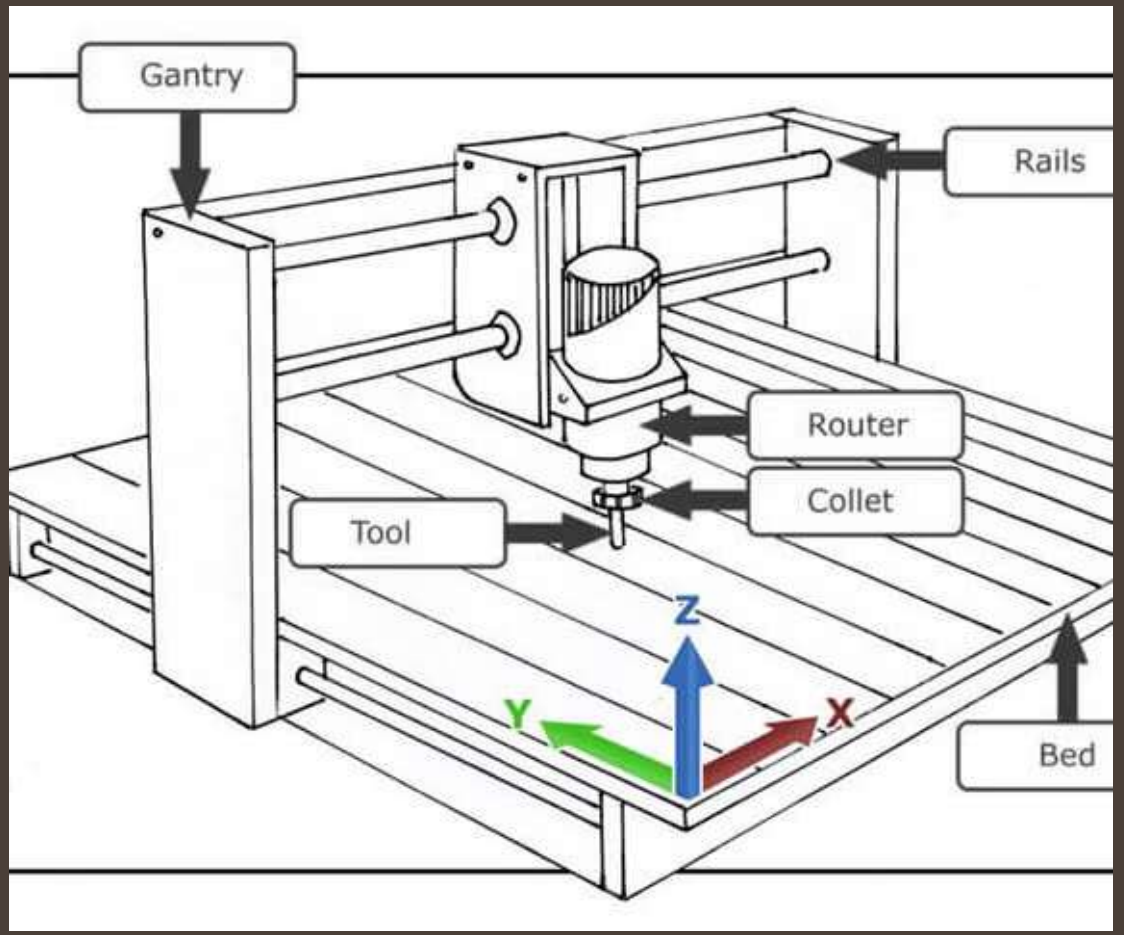


What software should you use to create the stool?

Model	Versatil 2500
Work area	2880 x 1440

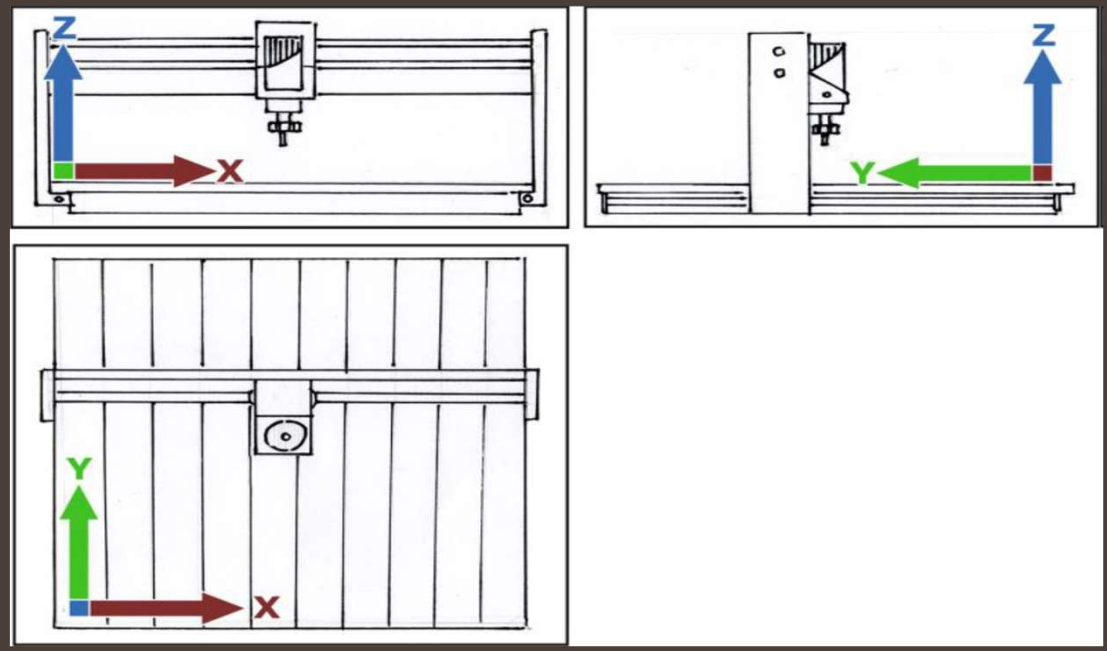
Operation of CNC 2D Router machine

How does a CNC 2D router work?



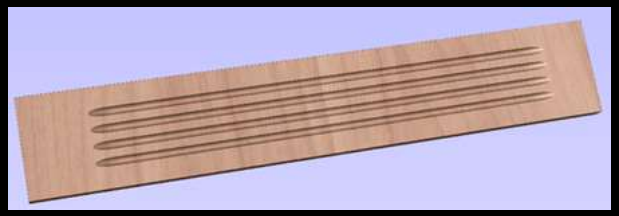
Overview of the CNC 2D Router

A 3-axis CNC machine is one that can move a router bit in the 3 primary directions, X, Y and Z. The image below show 3 views of a typical CNC setup and how the axes are referenced from each viewing direction.

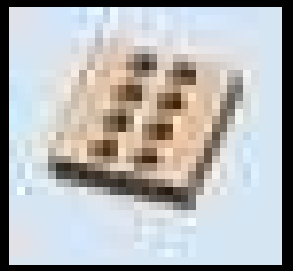


What can a CNC 2D router do?

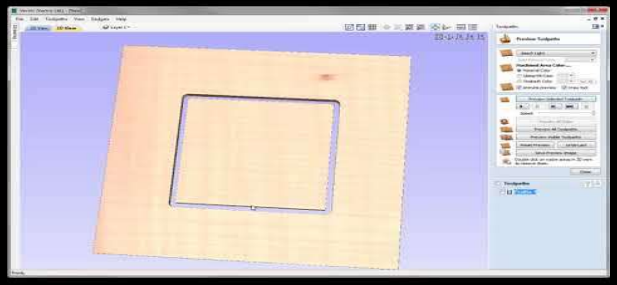
Fluting toolpath



Drilling toolpath



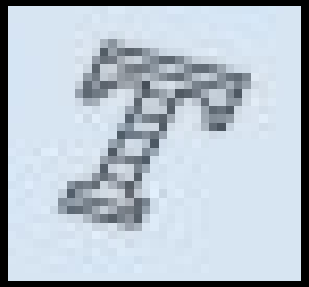
2D Profile toolpath



Pocketing toolpath

What can a CNC 2D router do?

Quick Engraving toolpath



Inlay toolpath

What can you make with a CNC

What materials can CNC cut?

Approved Materials
MDF
Base Wood
Plywood
Acrylic
Plexiglass

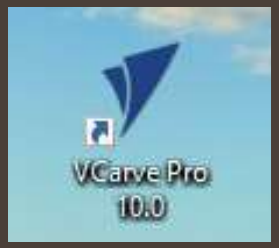
Software

File Types

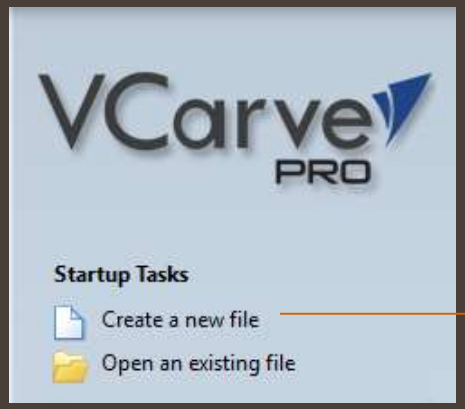
Files Type we can used for Vector	Files Type we can used for Bitmap images
CRV : Drawing from Vcrave Pro	JPG , JPEG : Compressed format commonly used for digital photographs and websites
DWG/DXF : Drawing Exchange Files from CAD systems (AutoCad / Fusion 360)	PNG : More recent format with a good range of properties
EPS : Encapsulated Postscript from Adobe Illustrator and Corel Draw etc	BMP : Windows Bitmap Format
AI : Adobe Illustrator	TIF , TIFF : A compressed format, including a 16-bit version
PDF : Portable Document Format for industry standard print data	GiF : A common web format, usually with a limited number of colors
SKP : SketchUp software files	

How to get started

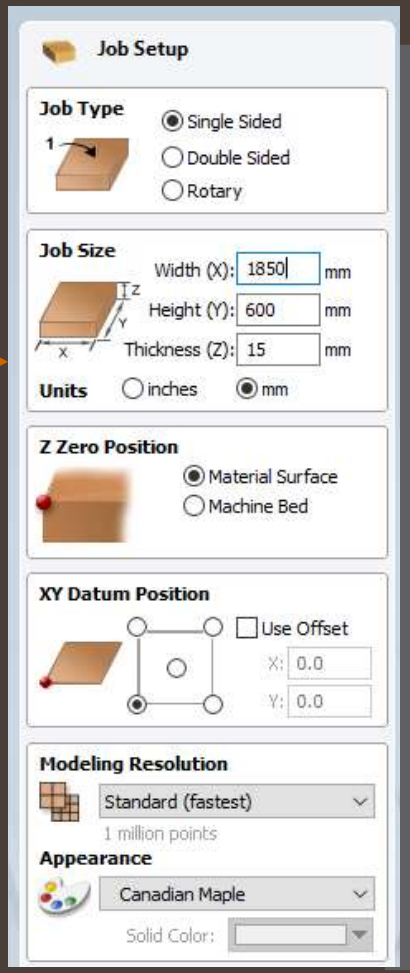
Initial Setup



Click on the Vcarve pro icon to launch the program

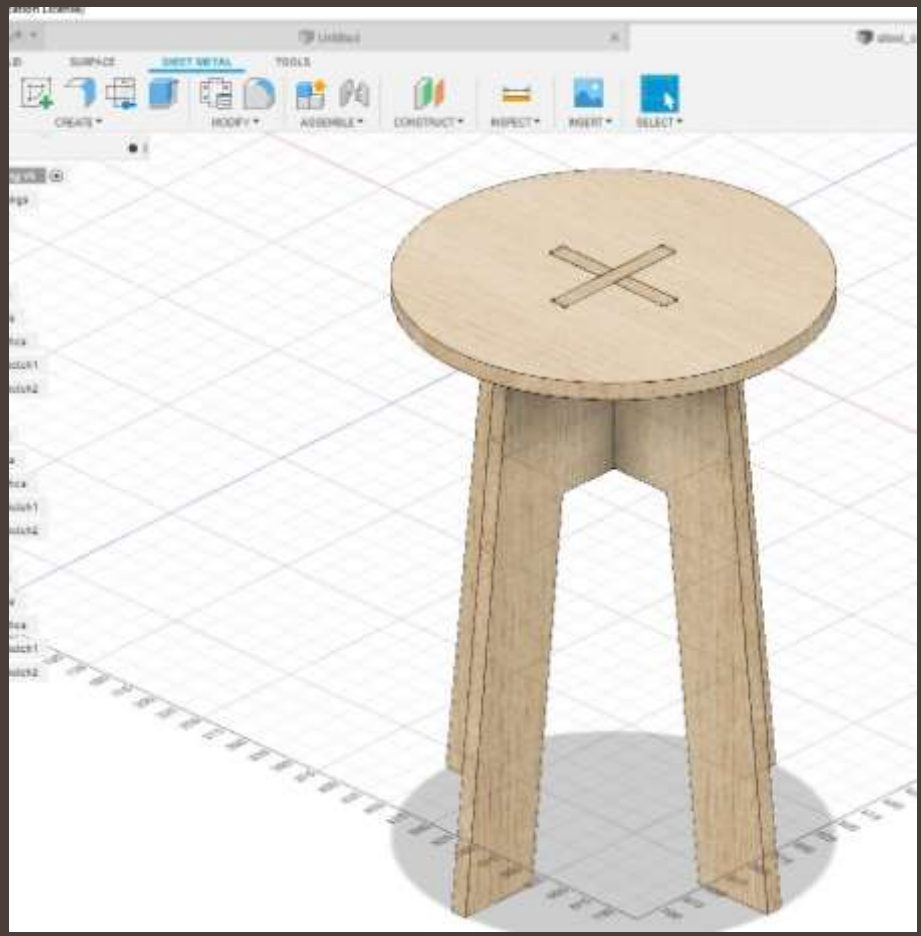


The Job Setup form is displayed whenever a new job is being created. Specify the dimension of the wood stock that I will be using: Width (X)=1850mm, Height (Y)=600mm, Thickness (Z)=15mm in the Job size. Job type: Single sided. Z Zero position : Material surface.



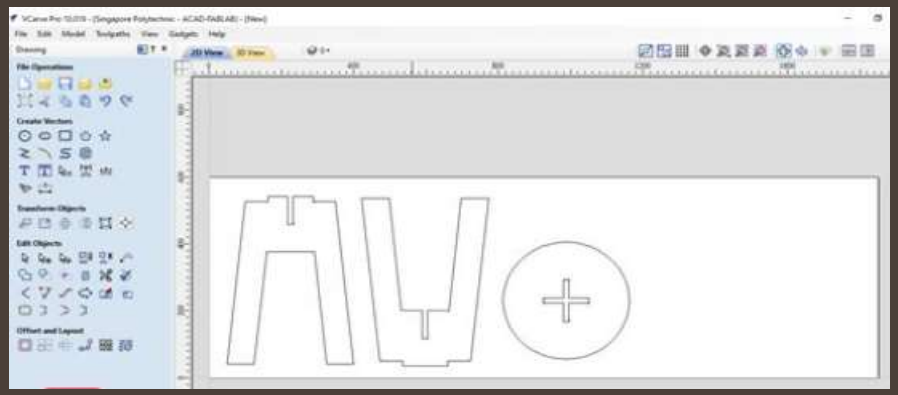
First

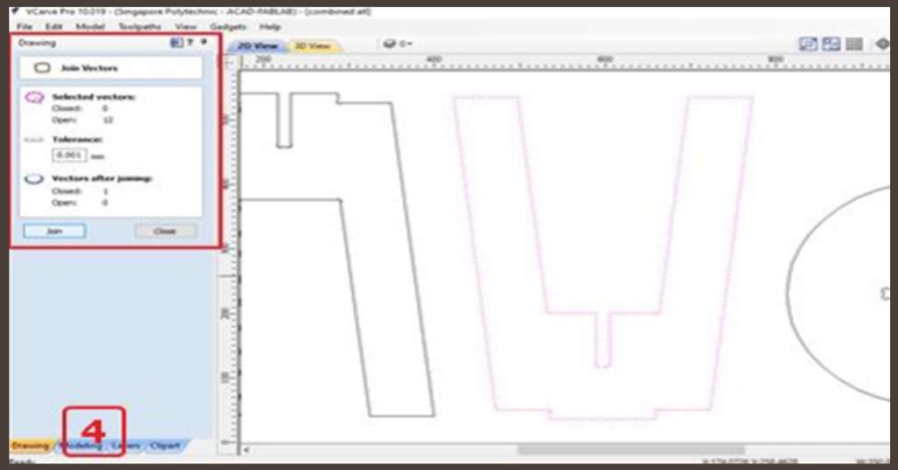
Complete all the design work using the tools and features contained in the program you are using. E.g. AutoCaD or Fusion360



Second

Import the design into your software and check the vectors. For a single component drawings, the vectors must be joined into a single vector. in preparation for the toolpath (CAM) process.





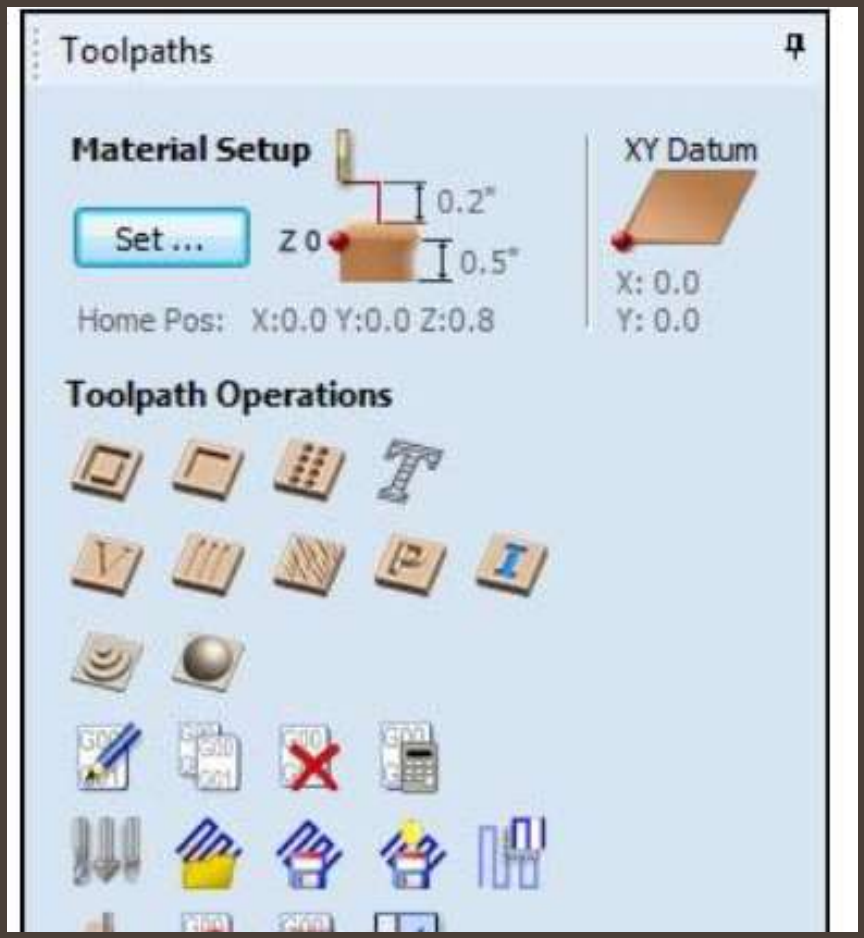
Third

Toolpaths (CAM)

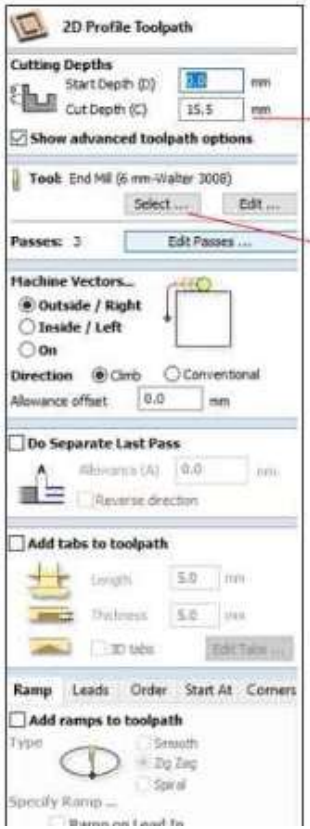
The first thing you need to do before you calculate any toolpaths is confirm your material setup and position, relative to how it will be set up on the machine itself. Although you will have previously made some choices on this when you setup the job for the design layout, you will need to double check they are still correct and potentially make changes based on things that may have evolved as you completed the design. For instance if you set XY zero in the middle of the job for drawing, you may now decide to change this to one of the corners (typically lower left) for machining.

Select the type of toolpath

Profile, "VCarving", Pocket, etc. For example, a "VCarving" strategy can be used to engrave incised vector letters or a "Profile" strategy may be chosen to cut-out a vector shape.

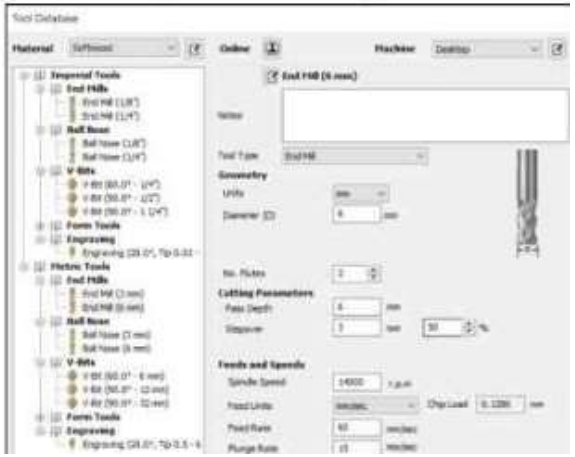


The required operation is selected. Selecting "profile" to cut through the material



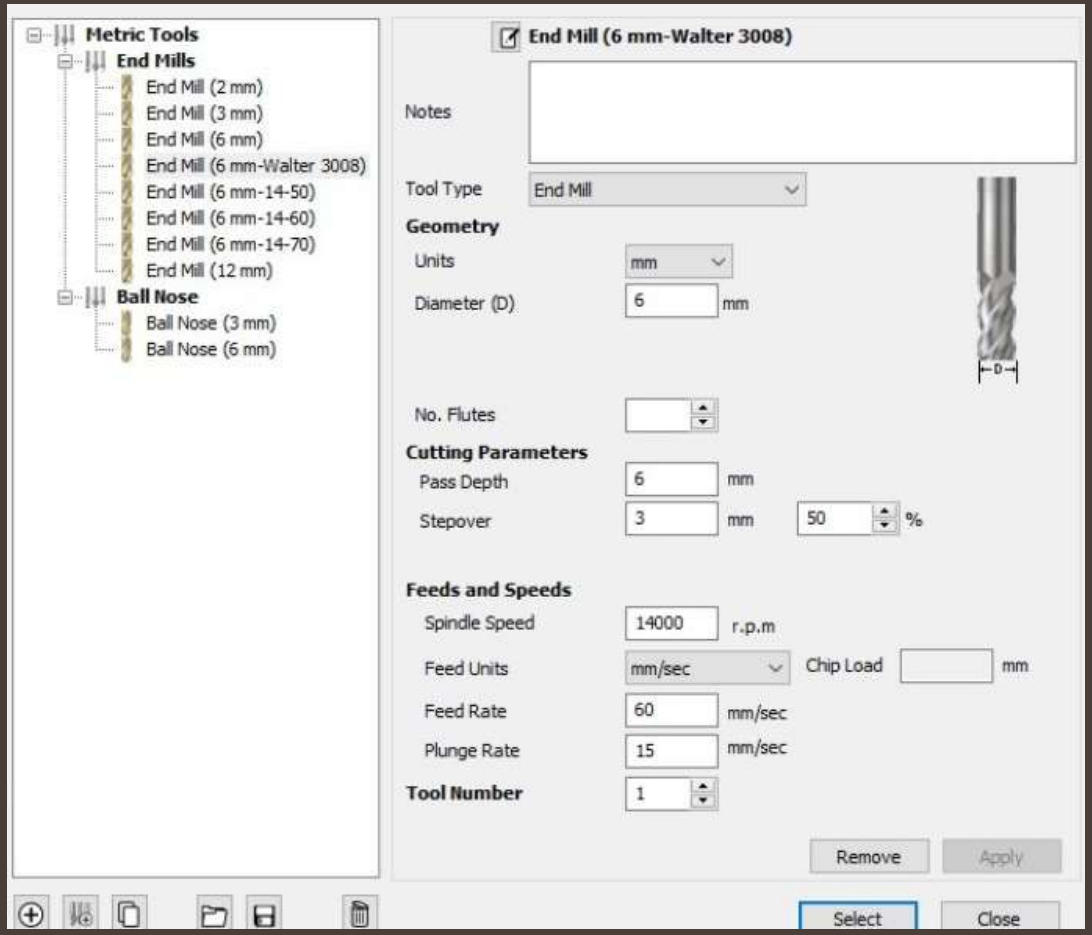
Step 1
The Cut Depth (equals the stock thickness) is entered

Step 2
The tool is selected. This will open up the Tool database



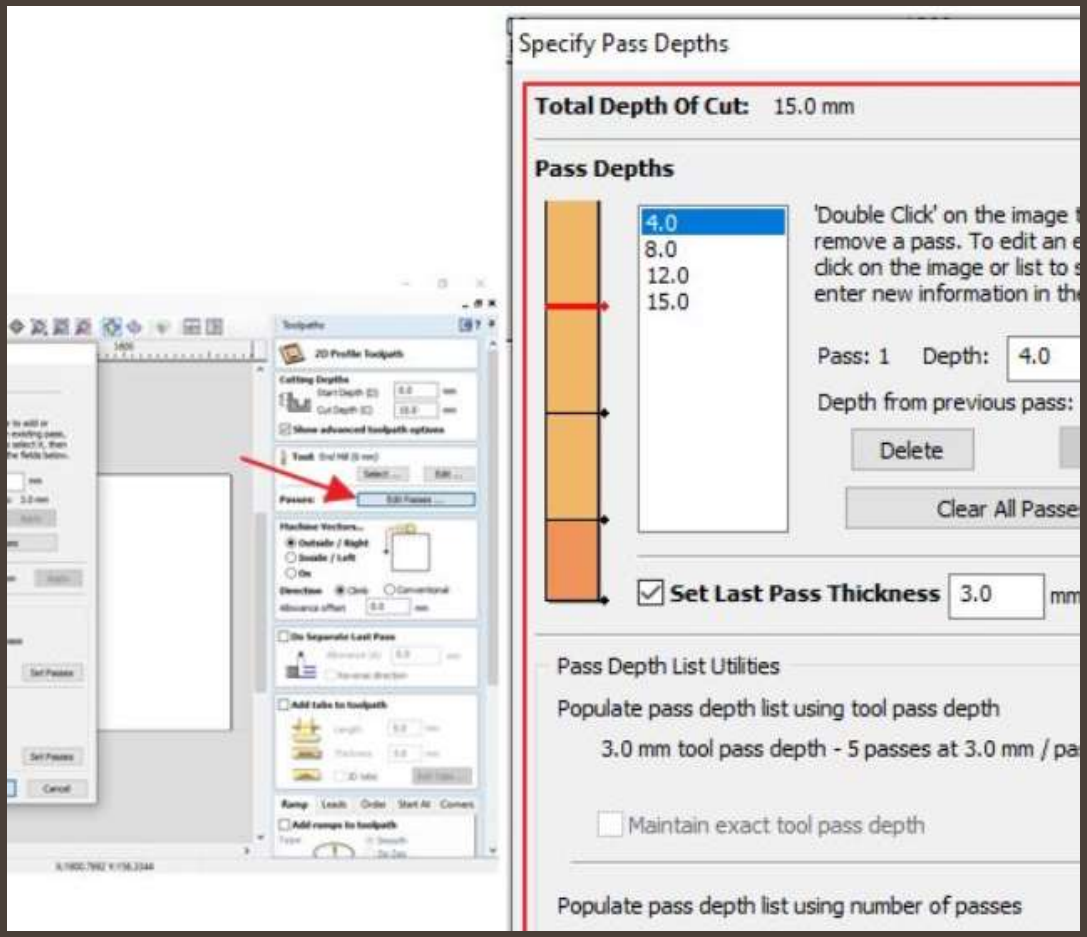
The profile menu will open up

Select the correct router bit



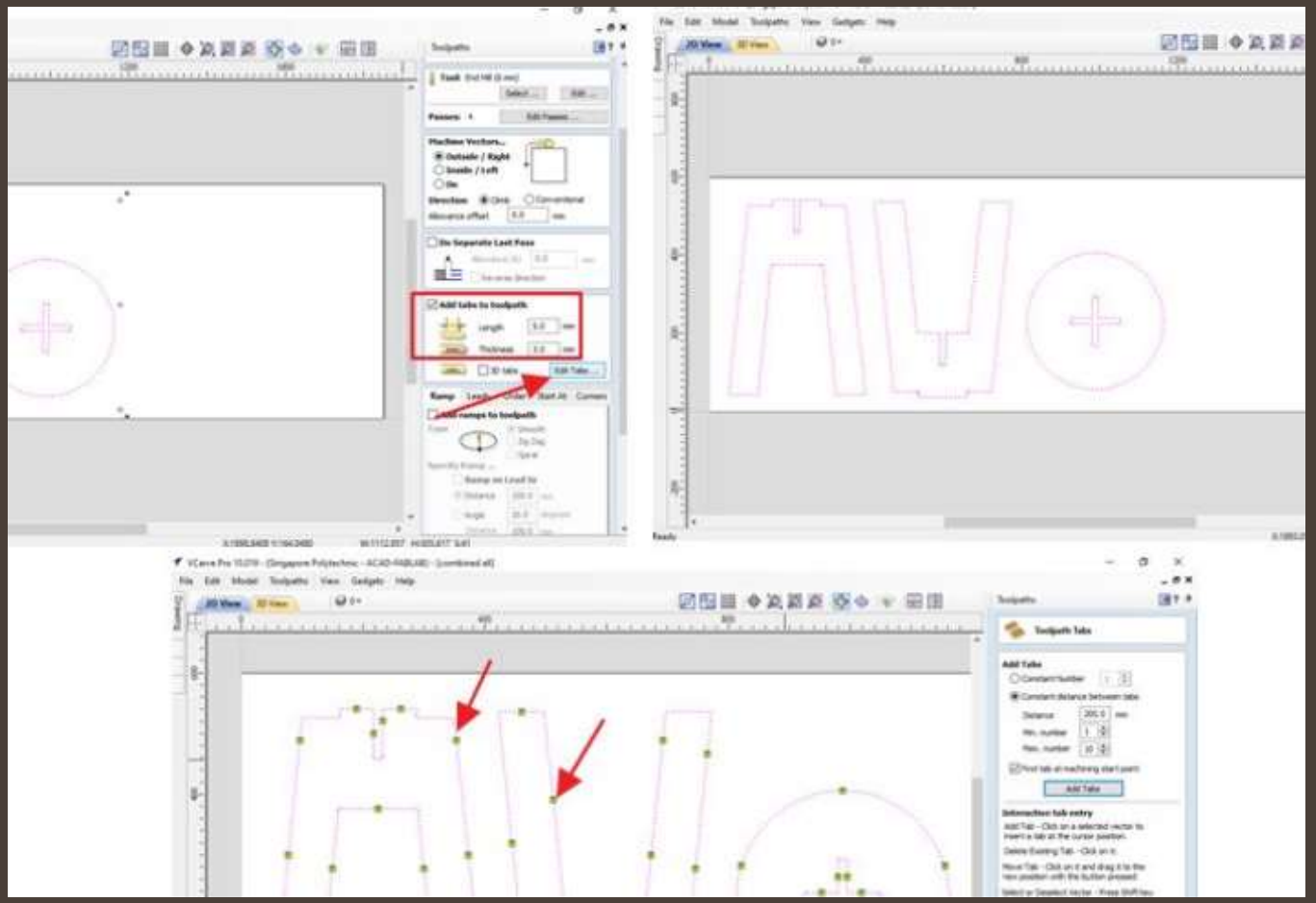
Edit Pass

In this case , You have selected the "edit passes" It is to set the number of pass you would like to cut before it reaches the final pass. It is recommended to use a whole number for the each depth.



Add **Tabs (Bridges)**

This function is to open and closed vector shapes to hold parts in place when cutting them out of material.



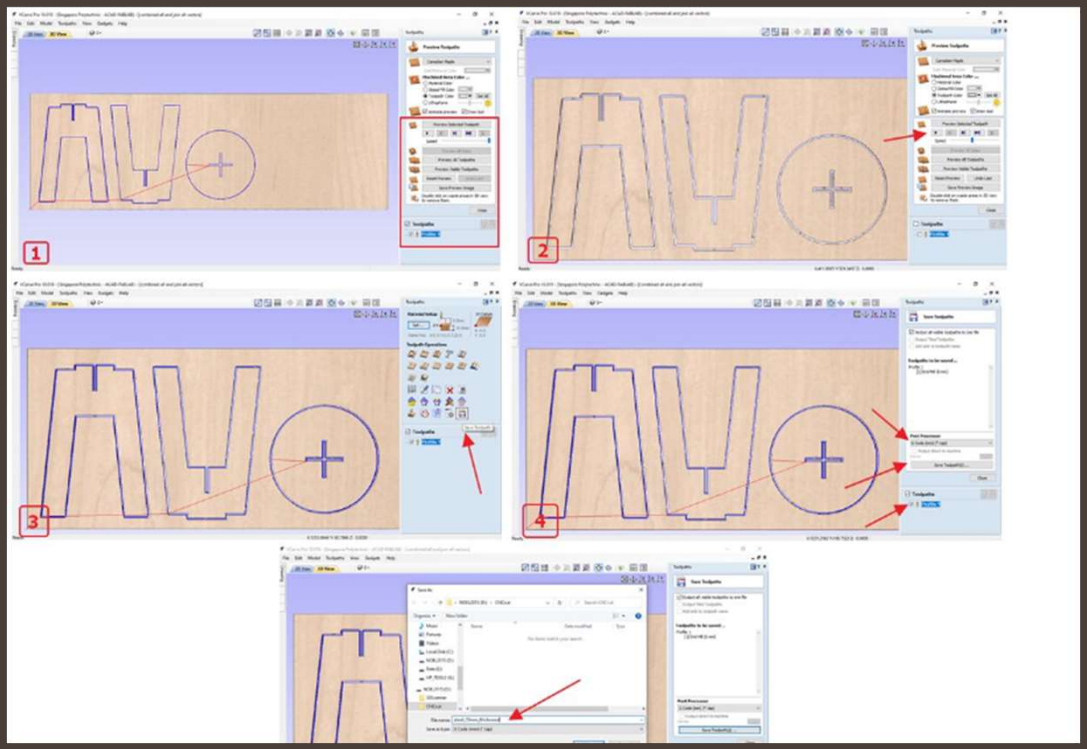
Calculate the toolpath and then preview

A powerful feature offered in all the Vectric programs is the Toolpath Preview; this allows you to accurately simulate the result of the toolpath on your computer screen in a virtual 3D piece of material.

Creating a simulation like this lets you check if the toolpath is correct based on the tool and settings you have chosen. If it does not look right in the preview then it will not be right when you cut it. This feature helps you avoid costly mistakes, a few seconds at the computer can save hours at the machine, plus prevent damage, potential safety issues and a ruined project.

Preview of the calculate toolpath

Ready to generate toolpath. Before that, need to preview the toolpath. After generating the toolpath, now I can save the generated toolpath and cut

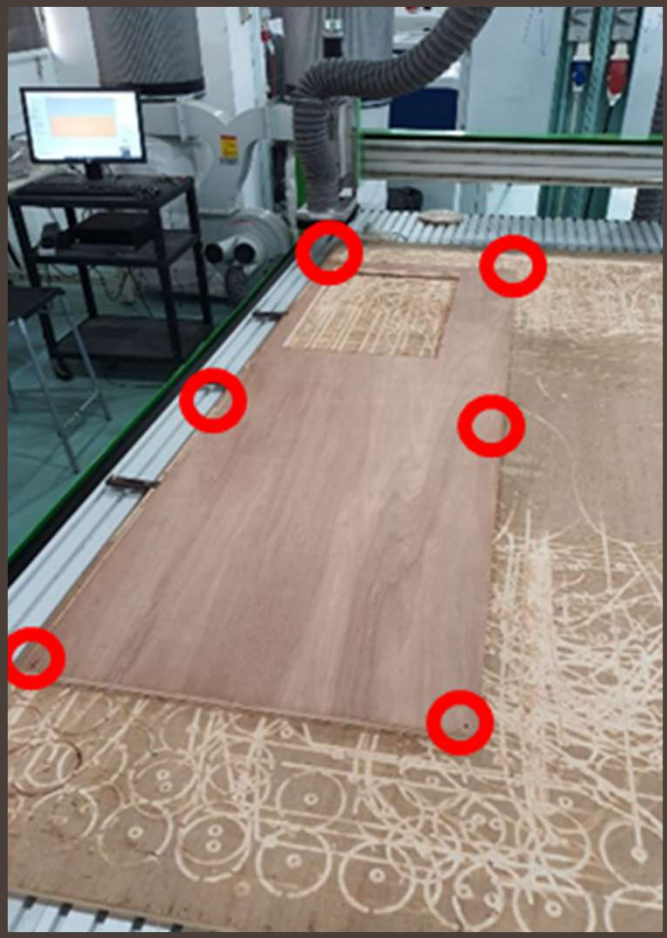


Operation of CNC 2D Router machine

How to get started

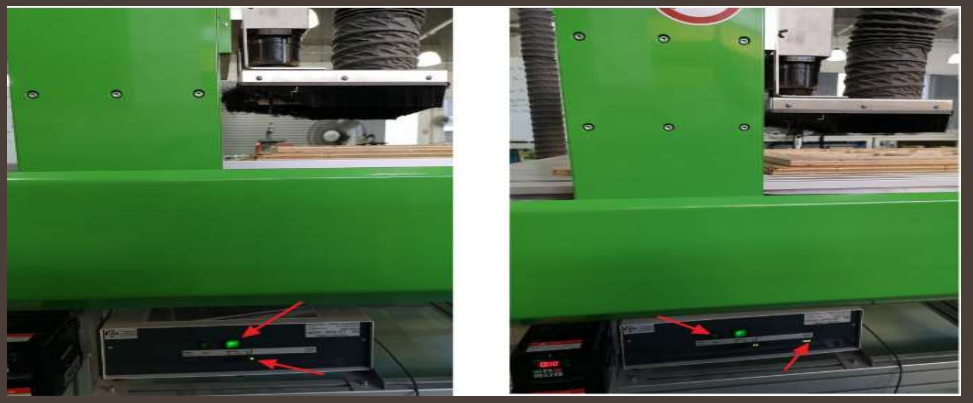
Initial Setup

Secure the stock wood on the sacrificial board using wood screws (circled in red). This to prevent the wood from moving during milling



First

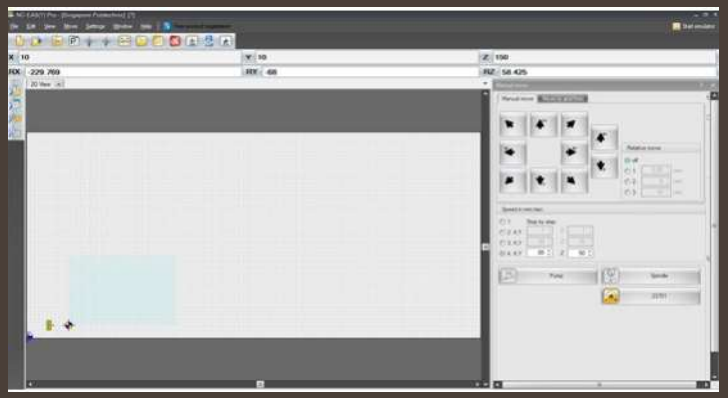
Request key from FABLAB staff to unlocked the lock at the 3 phase outlet to switch on the power supply for the machine



Once power supply is on , switch the router machine by pressing the on button then the green led is on and followed by the start button hence the ready XY Z LED will blink once.

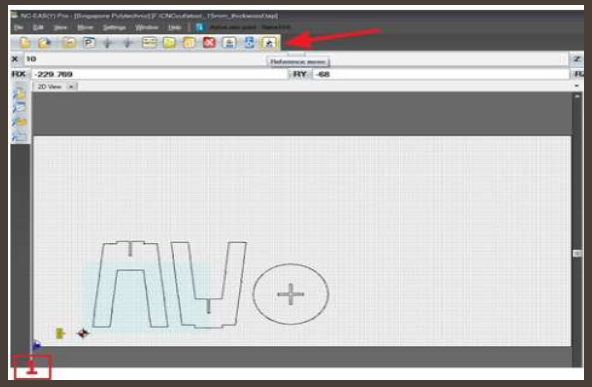
Second

Click on the EAS(Y) icon to launch the program

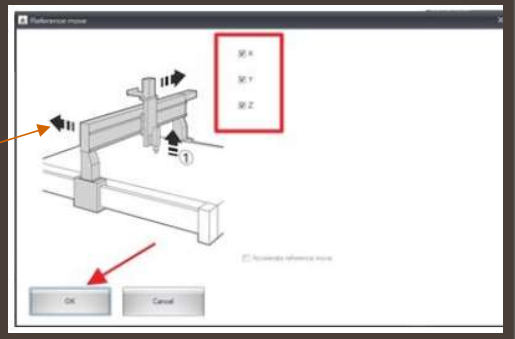


Once the program is launched it will bring you into machine bed page where you import your saved toolpath into it

Third

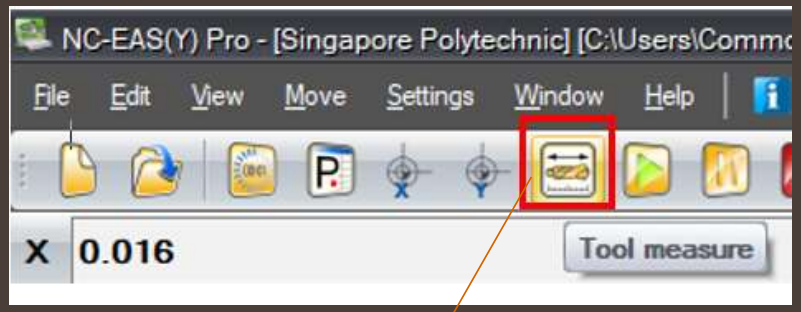


Import the save machine code(Gcode) to machine bed

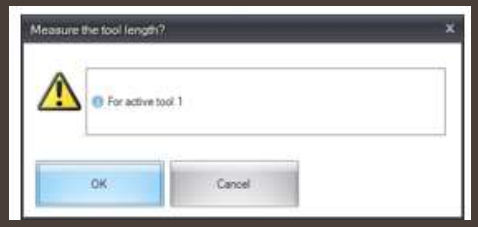


1. select "reference move
2. tick the X, Y, and Z and then press OK
The spindle will move to it's default X, Y and Z

Fourth



To calibrate the Z- axis, select "tool measure"



Quickly move the Z height sensor below the spindle as shown in the picture. Pres ok once the end mill touches the sensor. And the Z height is calbrated

Fifth

This handheld console is use to manually calibrate the X , Y position.

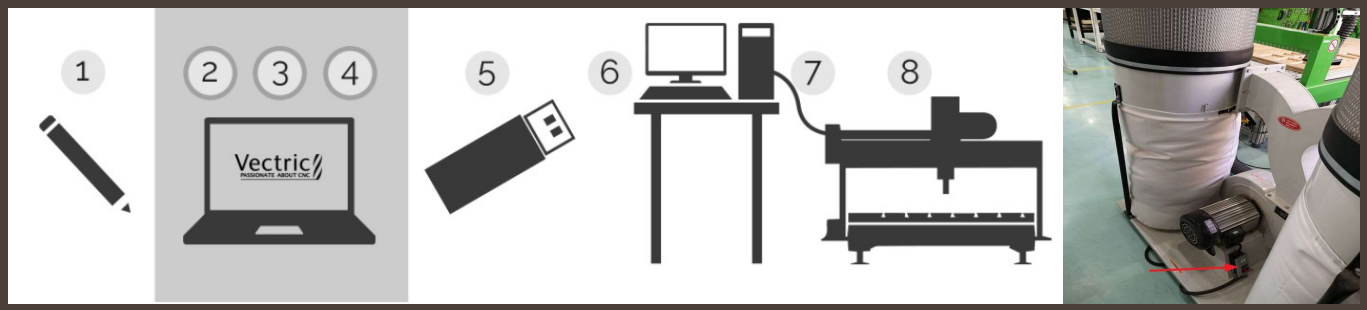
Ready to cut

Once all the above mention steps is completed. You are ready to cut . The picture on the right shown using the handheld console to start cutting by pressing start button and followed by the OK button. The second picture shown the dust collector power on button. The dust collector is to suck in all the cut dust into the collection bag to prevent it from flying into the air.

Safety

Be Prepared	Work Safe	Finish Right
Ensure you have been trained in the use of the CNC machine	Do not use gloves	Clean the floor and work area around the machine
Inspect the equipment to ensure no obvious defects: damaged chuck, dull or cracked tools, damaged shields	Ensure workpiece is clamped securely before starting machine	Clean and put away PPE
Use appropriate personal protective equipment (PPE): – Safety glasses – Hearing protection – Non-slip safety shoes	Check that tools are sharp and set correctly	
Remove rings, bracelets, watches, necklaces before work	Never reach into the CNC or an associated machine while the CNC is running	
Tie back and confine long hair	Use a brush or vacuum to clean chips off surfaces,do not use compressed air, hands or a rag	
Wear tight fitting clothing and/or roll up sleeves to prevent snagging		

During Training



1. Collect Ideas, External Design work or data
2. **Import Designs in Vectric Software**
3. **Generate Toolpaths and Simulate in 3D in Vectric Software**
4. **Export Toolpaths ready for cutting in Vectric Software**
5. Transfer the Toolpaths to the CNC Control PC
6. Load Toolpaths into the CNC Control Software
7. Prepare the Machine with correct Tooling and Material to cut
8. Run the CNC
9. Power on the dust collector machine

Demonstration of using the CNC router