# VCarve Pro

This software is used for 2D design and calculation of 2D and 2.5D toolpaths for cutting parts on a CNC Router. The software can import 2D designs from other programs such as FormZ, Rhino and Illustrator, but also includes a full set of drawing and editing tools with advanced layout options.

In this tutorial, we will cover basic **toolpathing** of 2D designs for cutting parts on the CNC.

1. Export your file from the program you created it in as a .dxf or .dwg - Make sure your units are in inches and that drawing is correctly scaled. Save it to a thumb drive, Google Drive or e-mail it to yourself.

2. Open VCarve Pro. Click the "Open an existing file" button and select your file.

3. In the **Job Setup** column on the left, you will type in the correct settings for your part(s).



**Job Size**: Type in the X & Y dimensions of your material. Always give your design at least a 1" border of buffer material on all sides. The max material size for our CNC is X = 48" and Y = 96"



**Material (Z)**: Make sure the top dot is clicked for Z Zero and type in the correct thickness of your material.



**XY Datum Position**: Make sure the dot at the bottom left corner is clicked. Uncheck "Use Offset" and set the X and Y positions to zero.



**Units**: Make sure inches is selected.

Design Scaling: Uncheck "Scale design with job size



Desig	gn Scaling
	Scale design with job size

4. Click "okay".

5. The screen should look like the image below. On the left are various options for **File Operations**, **2D View Control**, **Creating Vectors**, and **Transforming** and **Editing Objects**.



Hovering your cursor over each icon will give you a description of what the tool does. If you need to move, rotate, scale or edit the vectors in your file, now is the time to do it.

6. When your file is ready to be toolpathed, click the **Toolpaths** tab on the top right corner of the screen.

By clicking the pushpin icon, you can keep the **Toolpaths** box pinned open on the screen.

In this tutorial we will review the following **Toolpath Operations**:

**Profile**- Allows you to machine around the profile geometry of a part.

**Pocket**- Cleans out an enclosed area of a part at a specifically set depth.

You are welcome to explore other Toolpath Operations options depending on your cutting needs.

- 7	×
Toolpaths Material Setup Set $Z 0$ $0.2^{*}$ Home Pos: X:0.0 Y:0.0 Z:0.8 Toolpath Operations Q 0 $Q 0$ $Q 0$ $Q 0Q 0$ $Q 0Q 0$ $Q 0$ $Q 0Q 0Q 0$ $Q 0Q 0$	Toolpaths
Toolpath List	

#### **Pocket Toolpaths**

Pocket cuts should always be done before Profile cuts. This is because your material has the most surface area and stability on the vacuum bed so you minimize the risk of your material moving when clearing out big areas.

1. Select the first shape or set of shapes that you would like to apply a pocket toolpath of a single depth to. To do this, simply click on the shape in the image area of the screen. To select multiple shapes at once, hold down the shift key as you click. When a shape is selected, it will be denoted by a dashed pink line.



Note- If you are going to be pocket cutting different shapes at various depths, you must create separate toolpaths for each shape.

2. Once you have all the shapes you'd like selected, click on the **Pocket Toolpath** icon.



Cutting Depths		
Start Depth (	D) 0.0	inches
Cut Depth (C)	) 1.0	inches
Show advanced t	toolpath opt	ions

Set the **Start Depth** to zero and your **Cut Depth** to the desired depth. The **Cut Depth** MUST be less than the thickness of your material! Uncheck **Show advanced toolpath options**.

Click the **Select...** button to change your tool bit.

In the **Tool Database**, select the bit you are using. It is recommended that an End Mill is used for pocket cuts. Here you also have the option to adjust:

**Pass Depth**: The general rule is that your pass depth should never be more than half diameter of your bit. So if your bit is .25", your pass depth should be .125"

#### Stepover:

-The stepover should be between 1/3 and 1/10 of the tool diameter.

-Use a larger stepover, in the 1/5 to 1/3 range, for soft materials that cannot hold detail well. -Use a smaller stepover, in the 1/5 to 1/10 range, for hard materials or materials that can hold significant detail.

-Use the largest tool that will allow you to machine your geometry.

## Feeds and Speeds:

The spindle speed should be set to 18,000 rpm or less. In general, the **plunge rate** should be roughly half of the **feed rate**.

ool List	Tool Info						
End Mills	Name	End Mill (0.	25 inch)				T.
End Mill (0.25 inch)	Tool Type	End Mill		•	]		
End Mill (0.5 inch)	Notes				<i>.</i>		
Form Tools Form Tools							اسميا
	Geometry						
Drills Metric Tools	Diameter (I	D)	0.25	inches	•		10
							UI.
Ball Nose							15
Form Tools	Cutting Par	rameters	0.405	1.4			XII.
🗄 🛄 Engraving	Pass Depth	1	0.125	inches			V-III
	Stepover		0.1	inches	40.0	~ %	
	Feeds and	Speeds					
	Spindle Sp	eed	12000	r.p.m			
	Feed Rate		200				
	Plunce Pai		100	inches	/min	-	
		le l				_	
	Tool Numb	er	1			2	Apply

When your bit settings are correct, click "Okay" and continue to adjust your settings in the Pocket Toolpath dialog box.

	Raster
	Cut Direction
	Climb
UCC I	Conventional
Raster Angle	0.0 degrees
Profile Pass	Last 👻
lear Pocket .	
Offset	Raster
	Cut Direction
	() Climb
	Conventional
Raster Angle	0.0 degrees
Profile Pass	
Profile Pass	Last

You have the option to clear your pocket by an offset or a raster.

**Climb milling** is when the direction of cut and rotation of the cutter combine to try to "suck" the mill up over (hence it's called "climb" milling) or away from the work. It produces the best surface finish.

**Conventional milling** is preferred for rough surfaces.

Check **Ramp Plunge Moves** if you want your bit to enter your material on a ramp rather than a direct plunge.

Name your toolpath appropriately and click **Calculate**.

You will get a preview screen that shows your toolpaths in blue and gives you the option to watch an animated version of the toolpath.

Close

Calculate

When you are finished, click the **Close** button to return to the **Toolpath dialog box**.



### **Profile Toolpaths**

To get out of 3D view and return to your vector image, click the .dxf tab in the top left corner of the image area.



1. Select the first shape or set of shapes that you would like to apply a profile toolpath to. To do this, simply click on the shape in the image area of the screen. To select multiple shapes at once, hold down the shift key as you click. When a shape is selected, it will be denoted by a dashed pink line.



2. Once you have all the shapes you'd like selected, click on the **Profile Toolpath** icon.





Set your **Start Depth** at zero and you **Cut Depth** to the thickness of your material plus an extra .05" to cut a bit deeper and into your spoil board. So if your material is .25" you'll want a Cut Depth of .255"

Click **Select...** to change your tool bit.

In the **Tool Database**, select the bit you are using. It is recommended that an End Mill is used for profile cuts. Here you also have the option to adjust:

**Pass Depth**: The general rule is that your pass depth should never be more than half diameter of your bit. So if your bit is .25", your pass depth should be .125"

**Stepover** is not relevant for profile cuts.

#### Feeds and Speeds:

The spindle speed should be set to 18,000 rpm or less. In general, the **plunge rate** should be roughly half of the **feed rate**.

ool List	Taal Info						
Imperial Tools	Name	End Mill (0.	25 inch)				1
End Mill (0.25 inch)	Tool Type	End Mill		*	1		
End Mill (0.5 inch)	Notes				)		
under weiter Ball Nose	Hotes						
Form Tools							
Engraving E	Geometry						[ <b>−</b> □→]
	Diameter (	D)	0.25	inches	-		111
End Mills							10
🗄 🛄 Ball Nose							1A
E V-Bits	Cutting Pa	rameters	-				102
Engraving	Pass Dept	1	0.125	inches			Unit
	Stepover		0.1	inches	40.0	\$%	
	Feeds and	Speeds					
	Spindle Sp	eed	12000	r.p.m			
	Feed Rate		200				
	Plunge Ra	te	100	linches	min	•	
	TeelNumb		1	1			Apply

When your bit settings are correct, click "Okay" and continue to adjust your settings in the Pocket Toolpath dialog box.

Machine Ve	ctors	
Outside	/ Right	
Inside	Left	₽
On On		
Direction	Climb	Conventional

Select from **Outside/Right**, **Inside/Left** or **On** depending on what side of the path you want the cut to be made on.

**Climb milling** is when the direction of cut and rotation of the cutter combine to try to "suck" the mill up over (hence it's called "climb" milling) or away from the work. It produces the best surface finish.

**Conventional milling** is preferred for rough surfaces.

Ram	p Plunge Mov	res	
5	Distance	4.0	inches

Check **Ramp Plunge Moves** if you want your bit to enter your material on a ramp rather than a direct plunge.

Add tab	s to toolpat	th	
1	Length	0.5	inches
	Thickness	0,125	inches
		Edit Ta	bs

**Check Add tabs to toolpath** and enter the length and thickness you want for the tabs.

## Click Edit Tabs...

Click <b>Constant Number</b> and type in the number
of tabs you want for each shape. Generally, the
larger the shape, the more tabs you want to hold
it in place.

Then click **Add Tabs** and you will see them appear on your vector image represented by the letter "T". When you are finished adding tabs, click **Close** to return to the Toolpath Dialog Box.

|--|

Constant N	lumber 4 🚔
🔘 Constant d	istance between tabs
Distance	8.0 inches
Min. numb	er 1 🚔
Max. numb	per 10 🔺
Interactive ta Add Tab - Click insert a tab at t Delete Existing	<b>b entry</b> on a selected vector to he cursor position. Tab - Click on it.
Move Tab - Click	on it and drag it to the h the button pressed
new position wit	
new position wit Select or Deseler while dicking on	ct Vector - Press Shift key the vector

Safe Z		0.2 inches		
Home Position		X:0.00 Y:0.00 Z:0.80		
Name:	Profile	file 1		
Calcula	ate		Close	

Name your toolpath appropriately and then click **Calculate**.

Select the **Profile Toolpath** from the Toolpath List and click the Play button to watch an animated preview.



Finish toolpathing all the shapes in your file and do a final preview of all toolpaths.



Click the **Save Toolpaths** icon in the **Toolpath Operations** box.



**Toolpath Operations** 

You are now ready to load your toolpaths in Techno CNC!