Getting Started With

Cut2D

Rocket

Tutorial 3
Model Locomotive Name plate

Vectric

Disclaimer

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Introduction

Many hobbyists and businesses use their CNC machine for simply cutting out flat letters and shapes from plastic sheet, or machining standard badges and nameplates, which are all based on simple 2D machining strategies. Cut2D provides an incredibly simple way to handle these day to day tasks and introduce you to the exciting world of CNC machining.

Cut2D requires no formal classroom training, it has a simple intuitive interface, that will take you step by step through the very simple tasks required to produce toolpaths for your CNC machine.

The idea is to make CNC machining an enjoyable experience and hopefully, more profitable if you run a business.

The manual takes you step-by-step through an illustrated tutorial that shows and explains exactly how to use the Cut2D Software.

Tips and tricks have also been included that will help you get the most from your CNC machine.

We hope you enjoy using the software.

What the software allows you to do

Cut2D can be used to produce objects and products such as,

Sign making	House signs, Business, Restaurants, Pubs, Gold Leafed and Gilded
Woodworking	Kitchen cabinet doors, Chairs, Doors, Table tops
Engraving	Commemorative Brass plaques, Company logos
Gifts	Key rings, Personalized gifts

What file formats can be used?

Cut2D will open files that have been saved in the following formats.

DXF	Drawing Exchange Files from CAD systems
EPS	Encapsulated Postscript from Adobe Illustrator and Corel Draw etc.
AI	Adobe Illustrator
PDF	Portable Document Format for industry standard print data

ⓘ   If the designs are being prepared with software such as Corel Draw or Adobe Illustrator we recommend that you **convert the vector geometry and text to curves** and **switch off all patterns or colour fills** before exporting, **preferably as an EPS file**.

Getting Help

If you need assistance when using the software there are 5 primary places to look.

1. **Program Help File** - From the Main menu select Help

2. **Video Tutorials** - These are supplied on the installation CD or can be downloaded from the Vectric website.

3. **User Forum** - The Vectric user forum at www.vectric.com/forum is a very useful resource for information on Cut2D along with materials, cutters etc. and also to share knowledge and experiences.

4. **E-mail Support**: - The Vectric Support Team at support@vectric.com

5. **Frequently Asked Questions (FAQ)** - The support area on the Vectric web site at www.vectric.com maintains a list of the most frequently asked questions along with the answers.

Watch the supporting tutorial videos

The video camera icon indicates there is a video file for that particular section of the manual.

Many of the tutorials and help files have associated video footage that will make learning to use this software more interesting and enjoyable. These are on the installation CD or Downloadable from the web site. Windows Media Player is required to view the video files.

If you experience problems running these files or need assistance please visit the technical support area on the web site and follow the links.

Overview of the interface
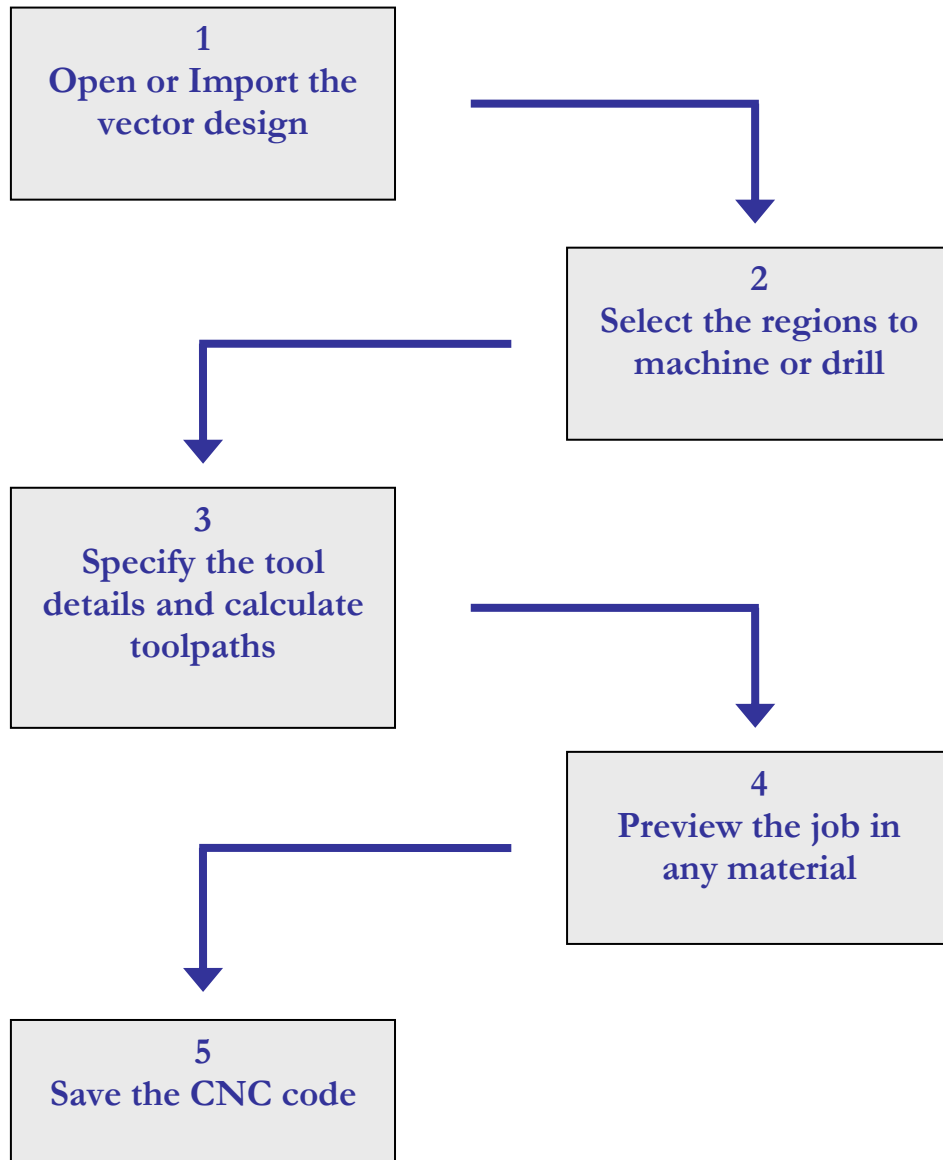
The screen area is split into 6 main regions.

1. The **Main Menu bar** along the top of the screen provides access to additional, less commonly used commands available in the software. Simply click and each option will show a drop-down list of the functions.

2. The **Drawing Tab** on the left side of the screen provides general drawing tools for design modification, sizing, alignment etc. prior to machining.

3. The **Toolpath Tab** on the right side of the screen is where toolpaths are defined, calculated, edited and deleted. The Material set-up and Job Preview tools are also in this area.

4. The **Command forms** automatically appear in the Drawing window and the Toolpath tabs when tools are selected that require details to be entered such as dimensions for sizing or positioning etc.

5. The **2D Design window** is where the design is drawn, edited and selected ready for machining. Designs can be imported or created directly in Cut2D. This occupies the same area as the 3D Preview window and the display can be toggled between the two using F2 and F3 or the tabs at the top of the window.

6. The **3D Preview window** is where toolpaths and the colour shaded job preview are displayed.
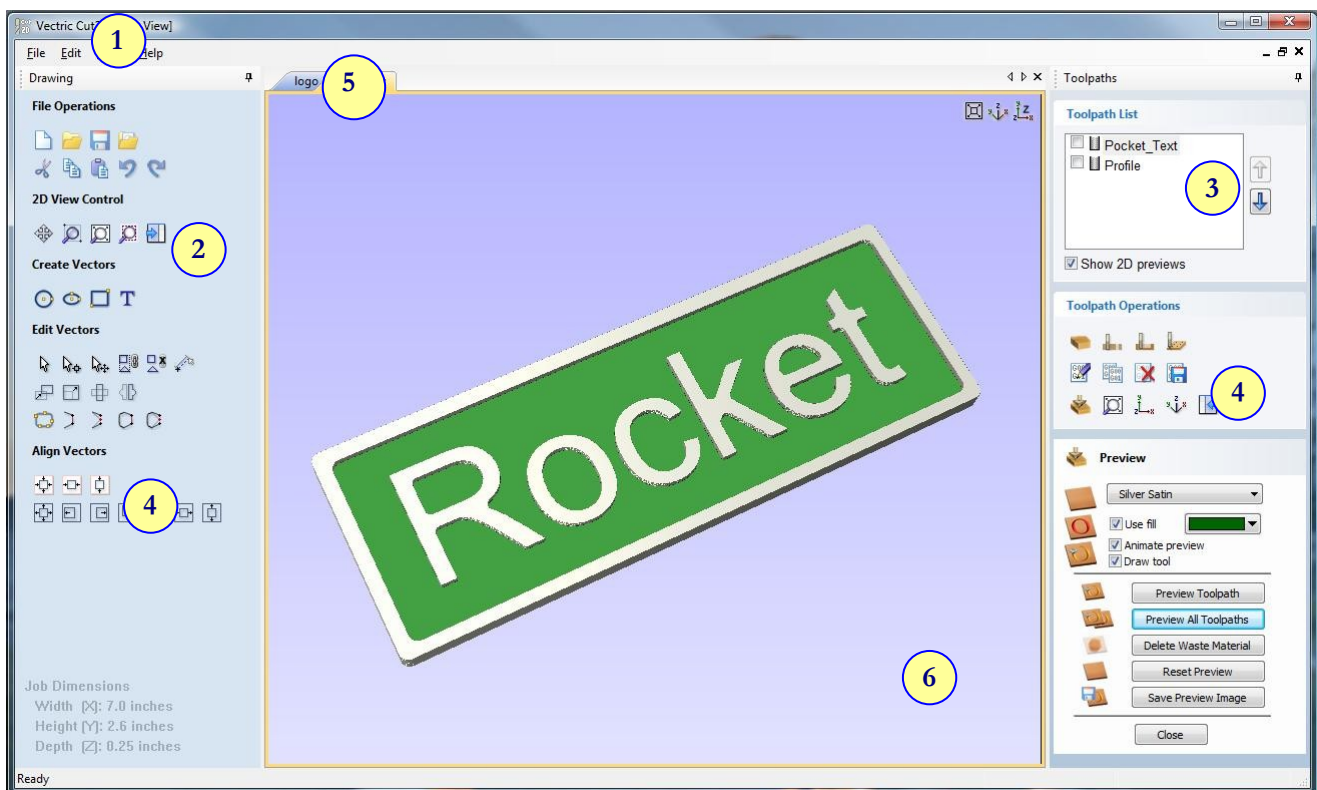

The User Interface

The Cut2D Logic

Cut2D has been developed specifically to open decorative designs and calculate perfect 2D Profile, Pocketing and Drilling toolpaths as quickly and easily as possible. The general work flow logic to apply to most jobs is explained in the diagram below.

```
┌─────────────────────────┐
│            1            │
│   Open or Import the    │ ────────┐
│      vector design      │         │
└─────────────────────────┘         │
                                    ▼
                        ┌─────────────────────────┐
              ┌──────── │            2            │
              │         │   Select the regions to │
              ▼         │     machine or drill    │
┌─────────────────────────┐ └─────────────────────────┘
│            3            │
│     Specify the tool    │ ────────┐
│  details and calculate  │         │
│        toolpaths        │         │
└─────────────────────────┘         ▼
              ┌──────── ┌─────────────────────────┐
              │         │            4            │
              ▼         │    Preview the job in   │
┌─────────────────────────┐ │      any material       │
│            5            │ └─────────────────────────┘
│    Save the CNC code    │
└─────────────────────────┘
```

Cut2D is an excellent toolpath engine that also includes boundary and editing tools that allow designs to be prepared and modified. Tools for positioning, alignment and node editing are very easy to use and multiple design elements can also be imported, scaled, positioned and interactively edited to make a new design. Text can also be created using any TrueType font installed on your computer.

Managing windows - Auto Show / Hide

The two primary **Drawing** and **Toolpath Tabs** have Auto Hide / Show behaviour which allows them to automatically close when not being used, maximizing the working screen area. They can be opened and closed at any time by clicking the left mouse over the **Drawing** and **Toolpaths tabs** in the **top left** and **top right** corners of the interface.
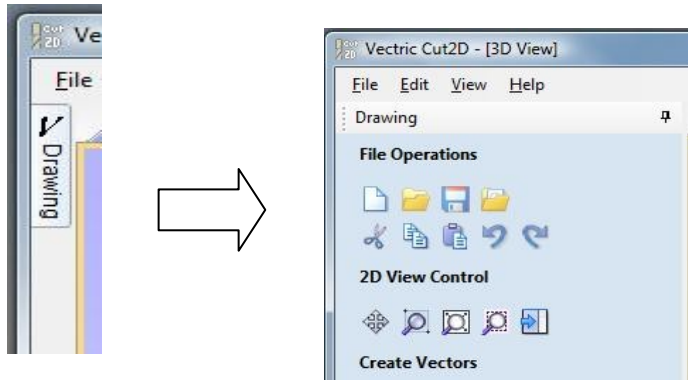

Click on the Drawing Tab to open the Drawing Window
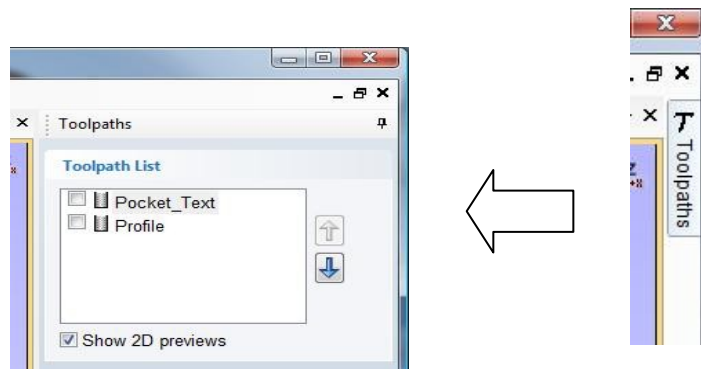
Click on the Toolpaths Tab to open the Toolpaths Window

ⓘ   Clicking on the Drawing or Toolpath tab will also close an open window.

Both windows have Auto Hide / Show behavior and can be locked open by clicking on the **Push-Pin button** in the top right corner of the window region as shown below.

Pin In (Lock Window)

Pin Out (Auto hide)
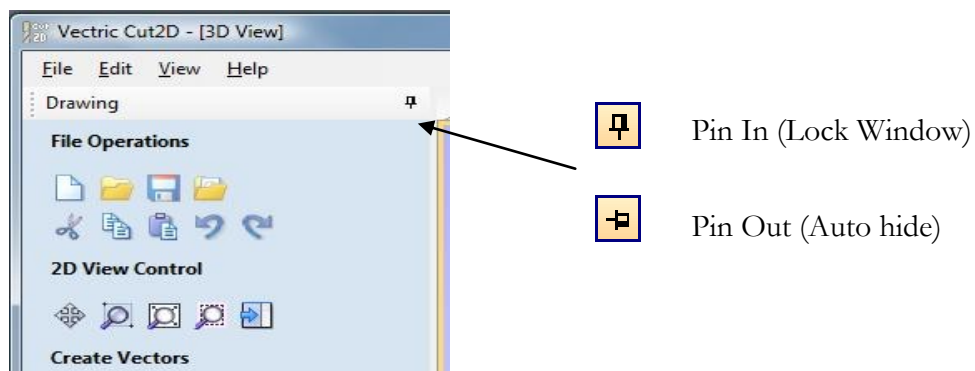
Auto Hide / Show windows

View Controls

The View Control options available when working in the 2D Design and 3D Preview windows are,

2D Design Window

	Zoom Interactive	Mouse with Middle Wheel – Push / Pull
	Zoom Box	Click top left corner Click bottom right corner
	Pan	Click and hold the Left mouse button – Esc to cancel **Shortcut**: Click and drag the **Middle** mouse button
	Zoom Extents	Zooms to show material limits in the 2D window
	Zoom Selected	Click to select an object or objects Zooms to the bounding box of the selections

ⓘ   Mouse with Middle Wheel can be used to interactively zoom in / out.

3D Window

	3D Twiddle	Click and drag **Left** mouse button in the 3D window
	Zoom	**Right** mouse button – Push / Pull Mouse with Middle Wheel – Push / Pull
	Pan	Click and drag **Right** mouse button + **Ctrl** Click and drag **Right** and **Left** mouse button
	Plan View	Looks directly down the Z axis onto the design in 3D window
	Isometric View	Shows the model in a 3D isometric view in the 3D window

ⓘ   Pressing **F2 & F3** will toggle between displaying the **2D & 3D windows**

Vectors

Decorative vector designs and shapes will be imported from another drawing package such as Corel Draw, AutoCAD etc. rather than being drawn in Cut2D. The imported vector shape(s) can be moved, modified, scaled, rotated, mirrored or deleted.

Vector selection methods

Multiple vectors can be selected in the following **4 ways**.

1. Manual multiple selection

   Hold down the **Shift** key while clicking the **Left** mouse button on each vector required.

   Objects can be deselected simply clicking on the object again with the **Shift** key pressed.

2. Moving the cursor from **Left** to **Right selects only FULLY enclosed** objects.

   Click and drag the left mouse button moving from **Left to Right** selects all objects fully inside the selection rectangle.

3. Moving the cursor from **Right to Left selects all objects INSIDE** the selection rectangle and also any objects that the selection rectangle **TOUCHES**.

   Click and drag the left mouse button moving from Right to Left selects all objects inside the selection rectangle + any that the selection touches.

4. Pressing the keyboard keys **Ctrl + A will select all** vector objects in the design

ⓘ   Selected vectors are displayed as dotted purple lines.

Vector deselect

Selections can be cancelled by simply,

1. Left clicking on an area outside the selection

2. Pressing the **Right mouse button** and selecting **Unselect All** (top option) from the list. You must click on the white drawing background to get this option in the menu.

Vector editing

A design is created from vector lines, arcs and bezier spans, which all have different properties that can be selected, modified and moved at any time.

Vector Selection Tool — Selected from the Drawing tab on the left

Selected vectors are shown as dotted purple lines. Vectors need to be selected before any of the editing tools such as scaling and moving etc. can be used.
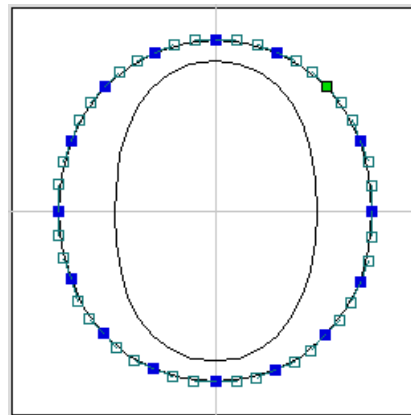

Node Editing Tool — Selected from the Drawing tab on the left
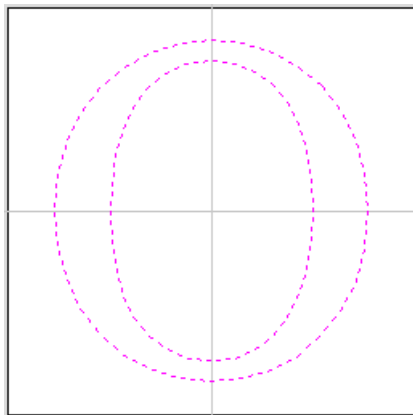
Vectors selected   Bezier node editing

When the Node Editing tool is active the cursor changes to a Black Arrow indicating that individual points (nodes) can be edited. Nodes can be interactively moved by clicking and dragging the left mouse button on a node to select and move the node to a new position.

The shape of lines, arcs and bezier spans can be edited by clicking and dragging on the nodes or control points to move them. Multiple nodes and control points can be selected and moved by using the multiple selection options such as the Shift key and dragging to make a selection.

If you right click on nodes or spans a context sensitive popup menu will be displayed which allows you to insert or delete points and nodes, cut the vector, move the start point etc.

Drawing shapes

Simple shapes and designs can be drawn using the Circle, Oval and Rectangle options. These shapes are commonly used to create new borders for signs or as a reference plate for a kitchen cabinet door etc. Shapes can be created by either entering exact dimensions in the Command Window or simply clicking the left mouse button in the 2D window to specify the parameters and coordinates interactively.

Drawing shapes is covered in more detail during the tutorials in this manual.

Introduction

This tutorial will show you how to construct the name plate shown below in Figure 1, which is approximately 7" (178mm) wide by 2.6" (65mm) high. The artwork for this sign is unusual, in that it has been constructed within Cut2D using the boundary tools and the text feature.

We estimate that this tutorial should take you approximately **15 minutes** to complete.

Figure 1. The finished Name Plate

There are 5 key stages in opening and preparing toolpaths for this sign.

1. Open a new design
2. Create the vectors to machine (boxes and text)
3. Calculate the toolpaths
4. Preview the completed job
5. Save the toolpaths

1.   Opening the Design

1.   From the **Startup Tasks** tab toolbar click on the **Create a new file** icon.

A new blank design, as shown below in Figure 2, will now be displayed in the 2D window and the Material Setup form is opened.
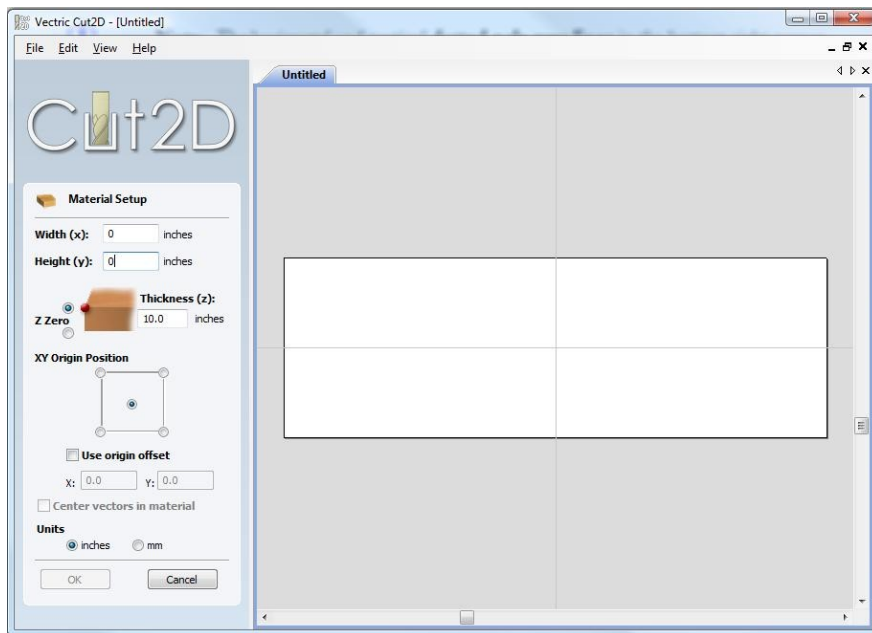
Figure 2 New blank design

ⓘ   **Note**:   The horizontal and vertical **dotted pale grey lines** across the middle represent the **X0 and Y0** axes.

Figure 3. Material Form

2. Complete this form as shown above

Width (X)= **7"**   Height (Y) = **2.6"**

Material Thickness = **0.25"**

Z Zero on the **Material Surface**

Click X0, Y0 Origin to be **Center**

Select the Units = **Inches**

Click **OK** to set the material size and close the form.

2. Create the Vectors to Machine

3. First we will create a rectangle with rounded corners to serve as the outer edge of our design.

Click the **Left mouse button** on the **Draw Rectangle** icon
(This is located in the Create Vectors section within the Drawing Tab)

This will bring up the Draw Rectangle form.
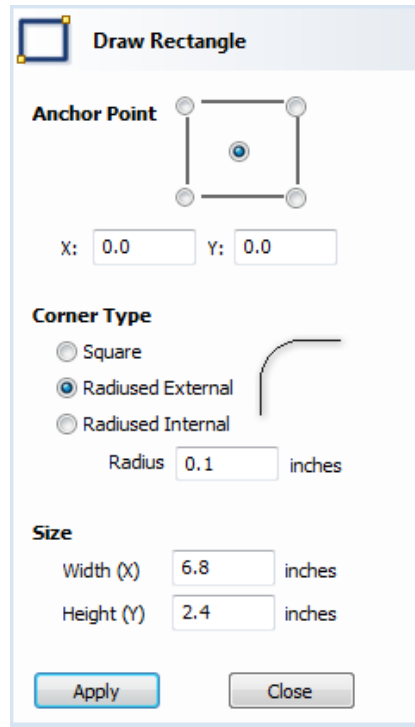
Figure 4. Draw Rectangle Form

4. Enter in the values for the box that we will use for the outer edge of the border to our design.

    The anchor point selection, will allow us to choose either one of the four corners, or the center of the rectangle to become the positioning point of the rectangle.

    The **X** and **Y** position boxes, will allow us to choose where that positioning point, should be placed in our 2D space.

    For this example, we would like the center of our rectangle, to be placed on the center of our material.

    Complete this form as shown above

    > **Anchor Point** to be in **Center**
    >
    > Anchor Point **X: = 0**   Anchor Point **Y: = 0**
    >
    > **Corner Type**   Radiused External   Radius = **0.1"**
    >
    > **Size**   Width(X)= **6.8"**   Height(Y)=**2.4"**

    Click **Create** to create the rectangle and display it on the 2D View Window.

    The Draw Rectangle form has remained open, we will change the values to create the inner edge to our border.

Figure 5. Inner Border Edge Rectangle Form

5. Enter in the values for the box that we will use for the inner edge of the border to our design.

Complete this form as shown above

Anchor Point to be in **Center**

Anchor Point **X: = 0**   Anchor Point **Y: = 0**

Corner Type   Radiused External   Radius = **0.05"**

Size   Width(X)= **6.5"**   Height(Y)=**2.1"**

Click **Create** to create the rectangle and display it on the 2D View Window.

Click **Close** to close the Draw Rectangle form.

Next we will create the text for our Name Plate.

Click the **Left mouse button** on the **Create Text** icon

(This is located in the Create Vectors section within the Drawing Tab)

This will bring up the Create Text form.
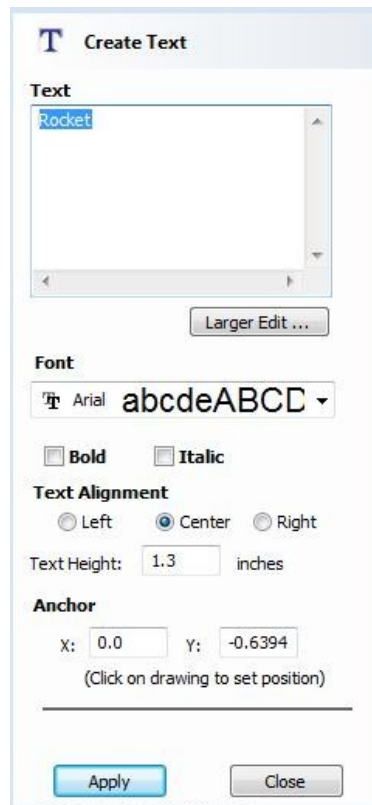
Figure 6. Create Text Form

6. Complete this form as shown above

   Within the **Text** box type **Rocket**

   For the **Font**, Use the drop down list to select **Arial**

   (Cut2D should be able to use any True Type font installed on your PC)

   Click the **Left mouse button** on the **Center** radio button, within the Text Alignment section.

   Type in **1.3** into the **Text Height:** (Inches) box.

   You can leave the Anchor settings at **X: = 0**, **Y:=0** for now.

   Click on the 2D View window, where you would like the text to be placed.

   (You will see the position appear in the **Anchor X,Y** boxes)

   Click the **Left mouse button** on the **Apply**, the text should now have appeared next to where you clicked the mouse on the 2D View window.

   Click the **Left mouse button** on the **Close** button, to close the Create Text form.

The text will appear in the 2D preview window and, depending on where you clicked in the window, will look similar to the figure below.
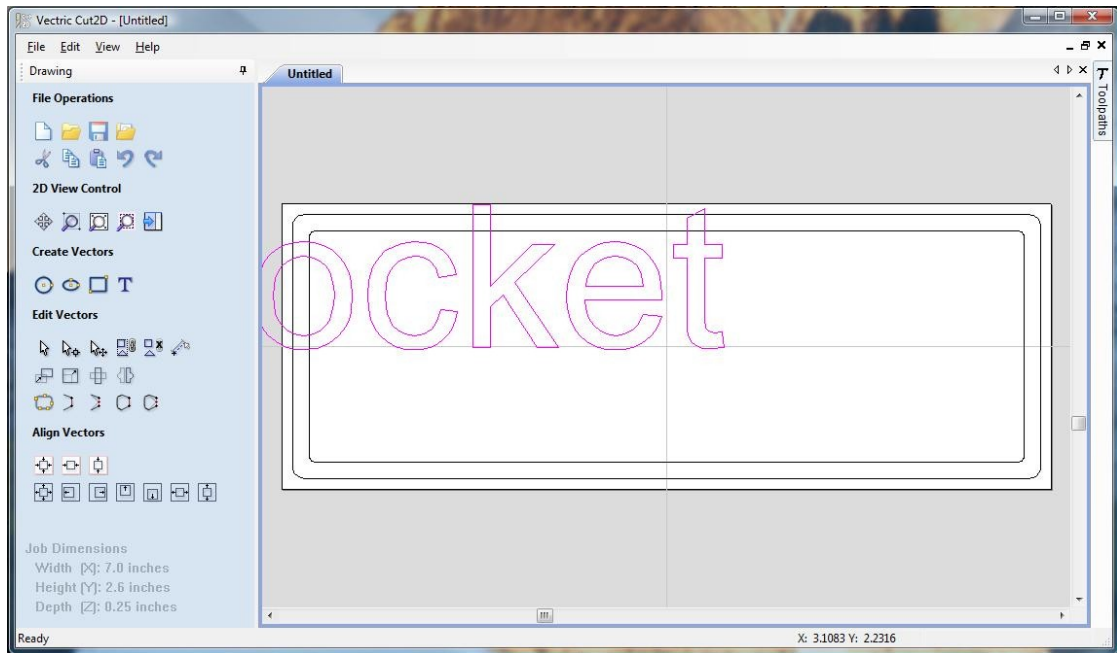
Figure 7. Text Inserted.

7. Next, we need to center the text, do do this, **Click** the **Left mouse button** on the

    Center In Material ⊹ icon,   The text will now have Centered as shown in Figure 8 below.

    (This is located in the Align Vectors section within the Drawing tab)
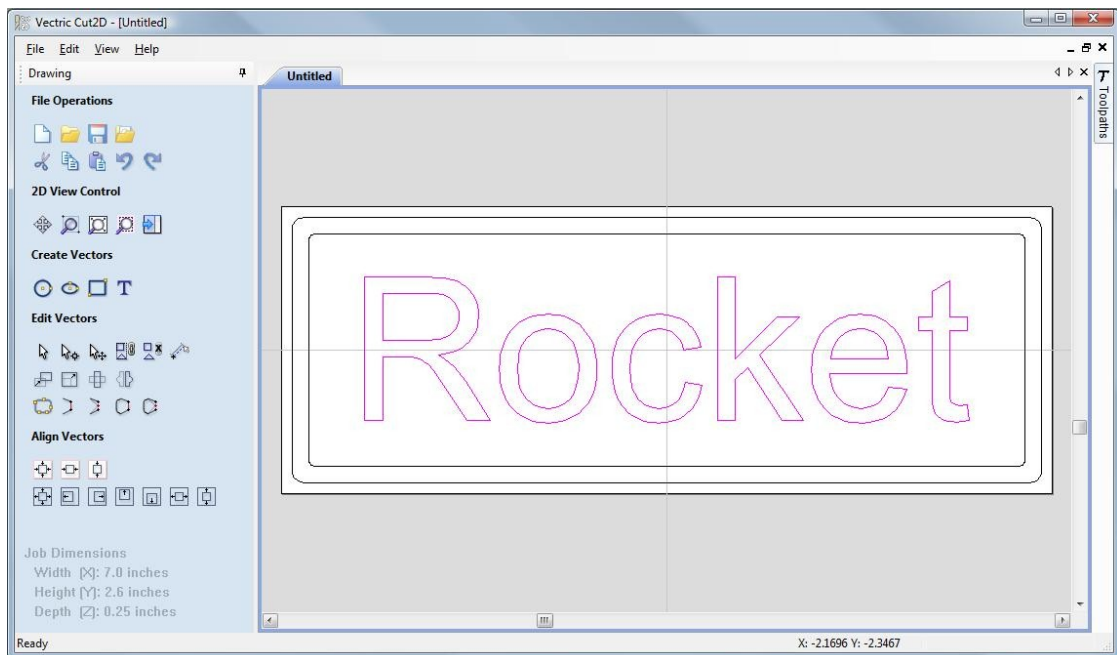
Figure 8. Text Centered.

3. Calculate the Toolpaths

For our design, we will create two toolpaths.

The first will be a pocket toolpath around the text, in order to give it depth.

To do this we must select the text vectors and the inner border.

The text is still highlighted (colored purple) from the last operation, in order to keep this selected and select the inner border, press and hold down the **Shift** key on the keyboard.

Whilst still holding down the **Shift** key, **Click** the **Left mouse button** on the inner border.

(Both the text and the inner border will now be colored purple).

The design is now ready to calculate the pocketing toolpath.

8. From the **View Control** area select the **Switch to Toolpaths tab** .

This automatically **closes** the **Drawing Tab** and **opens** the **Toolpath Tab** on the **Right** side of the screen as shown below in Figure 9.

2D > 3D Window Tab

Toolpath Operations Tab
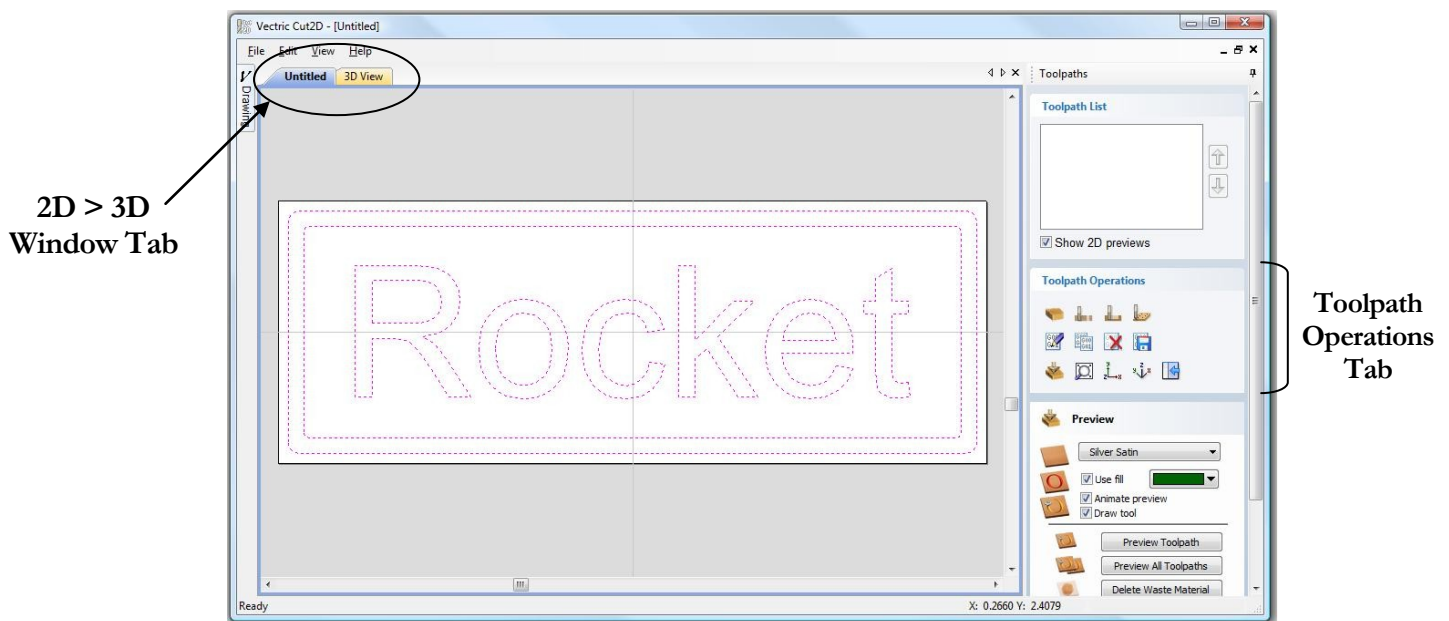
Figure 9. Toolpath Tab

ⓘ   To re-open the **Drawing Tab** simply click the cursor on the **Drawing icon** in the **Top Left corner** of the screen and the drawing tools will automatically appear.

ⓘ   The **Drawing** and **Toolpath Tabs** have an Auto Hide and Show behavior, which allows them to automatically close when not being used, maximizing the working screen area.

Click the **Push-Pin** to lock them in the Open position as shown below in Figure 10.

Pin-In Lock Window

Pin-Out (Auto hide)
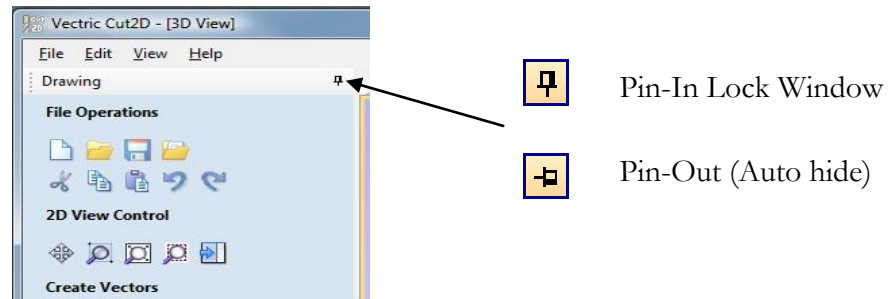
Figure 10. Auto Hide & Show windows

9. Select the **Material Setup** icon from the **Toolpath Operations** list on the Toolpaths tab and specify the Rapid Clearance Gap to be **0.2"** and Home position to be **X0, Y0, Z2"** as shown below in Figure 11.

Note
Z Zero position is set to the top of the material.
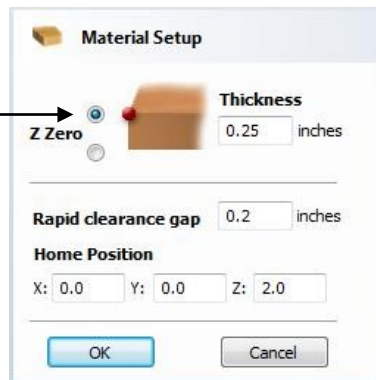
Figure 11. Material Setup

10. Next, select the **Create Pocket Toolpath** icon from the **Toolpath Operations** list and complete the form as shown below in Figure 13.

Figure 12. Toolpath Operations Tab.

In this example we are cutting plastic with a **1/8" (3.175mm) Diameter, End Mill Tool** and the maximum cut depth per pass will be set to 0.125" (3.175mm), this can be greater if cutting soft materials or less, if cutting harder materials.

Select an End Mill Tool from the Tool Database

Edit the cutting parameters to suit your machine and the material being cut
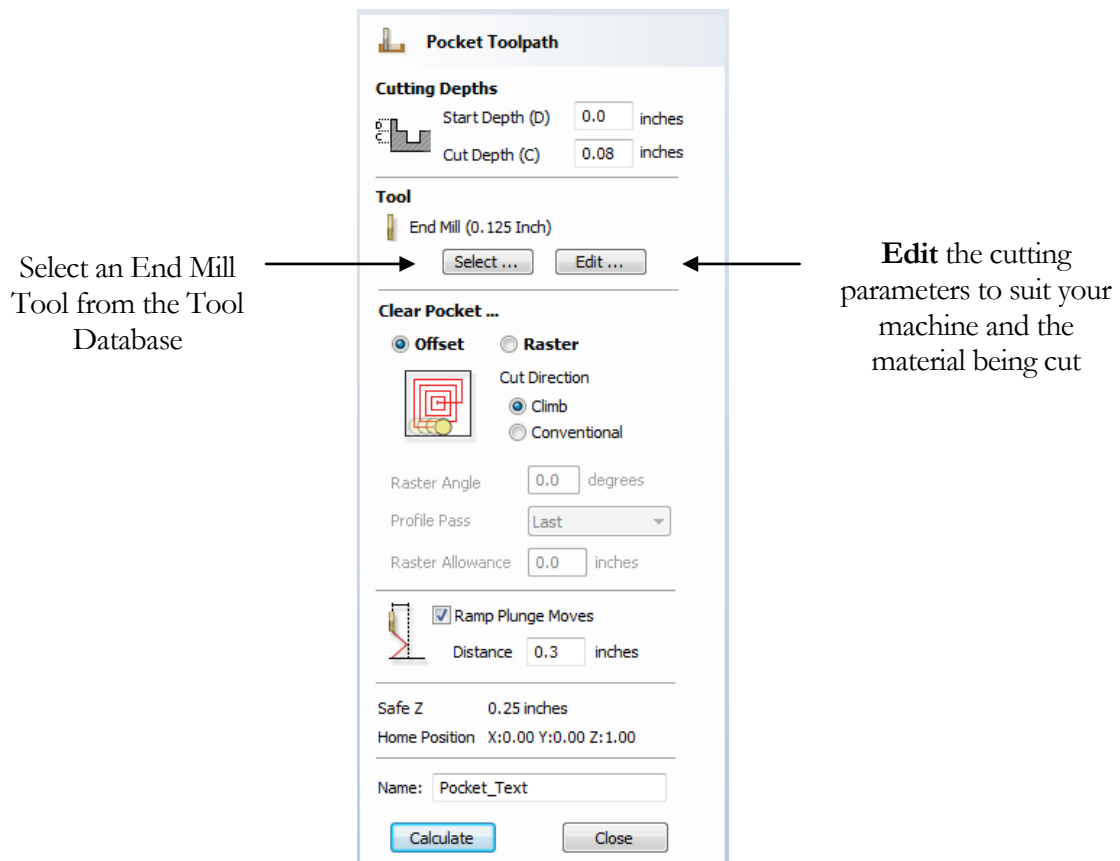
Figure 13. Pocket Toolpath parameters

Click on the **Select** button to open the Tool Database and select the tool shown below.
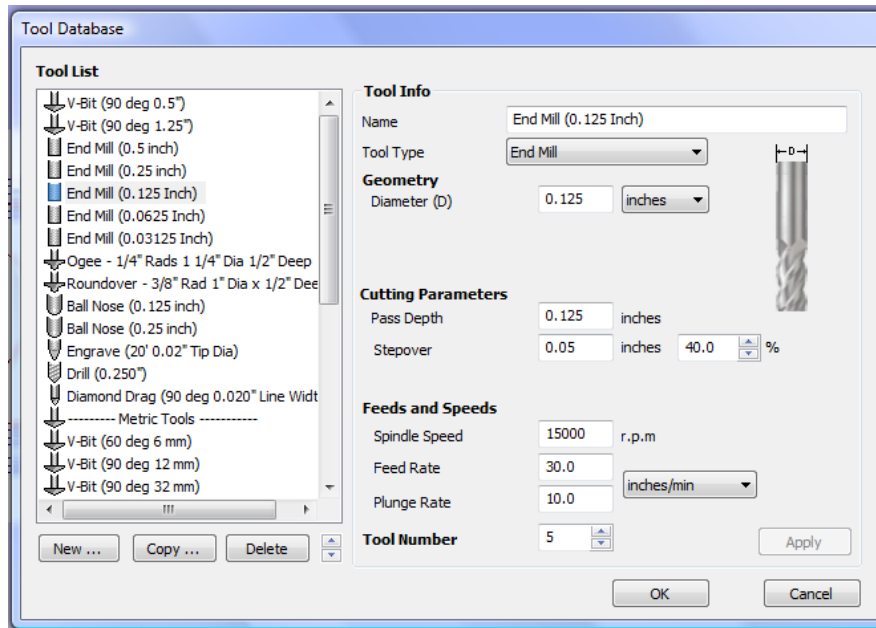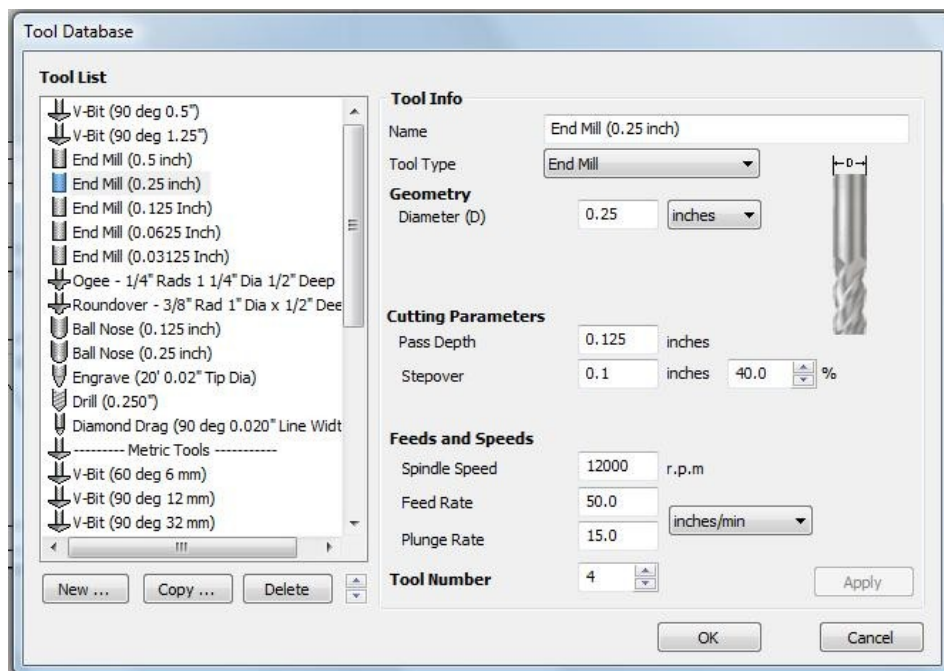

Figure 14. Tool Database

Important   The **Cutting Parameters** should be set for the material you are cutting

Click the **Edit** button to modify the cutting parameters to match the tooling you are using and the material being machined.
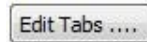
11. Click the **Calculate** button and the resulting toolpath will automatically be drawn in the **3D view** and the **Preview job** form opened, as shown below in Figure 15.
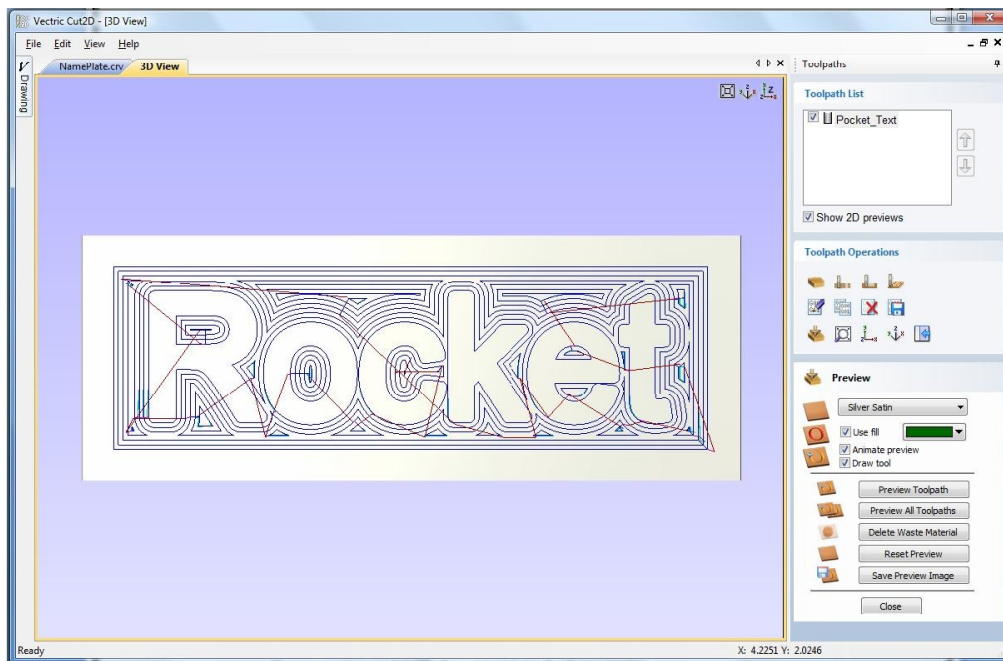
Figure 15. 3D View showing Toolpath & Material

Next we will produce a profile toolpath to correctly size the block of material and to round the external corners.

First we need to return to the 2D window, to do this **Click** the **Left mouse button** on the 2D Window tab.
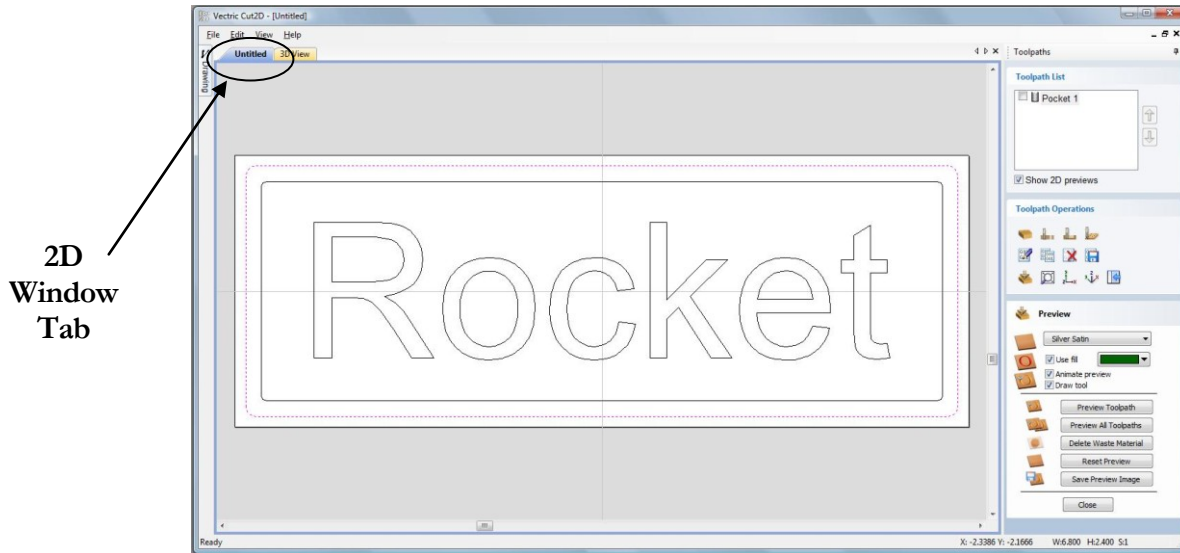
2D Window Tab

Figure16. Selecting the 2D window.

In the 2D window, **Click** the **Left mouse button** on the outer border.

(The outer border will now be colored purple).

12. Next, select the **Create Profile Toolpath** icon from the **Toolpath Operations** list and complete the form as shown below in Figure 18.

Figure 17. Toolpath Operations Tab.

For the profile we will use a **1/4" (6.35mm) Diameter, End Mill Tool** and the maximum cut depth per pass will be set to 0.125" (3.175mm), this can be greater if cutting soft materials or less, if cutting harder materials.

Select an End Mill Tool from the Tool Database

Edit the cutting parameters to suit your machine and the material being cut

Add holding tabs

Figure 18. Profile Toolpath parameters

Click on the **Select** button to open the Tool Database and select the tool shown below.

Figure 19. Tool Database

Important   The **Cutting Parameters** should be set for the material you are cutting

Click the **Edit** button to modify the cutting parameters to match the tooling you are using and the material being machined.

Adding Holding Tabs

Tick the **Add tabs to toolpath** tickbox.

Set the **Length** to be 0.15 inches.

Set the **Thickness** to be 0.15 inches.

Click on the **Edit Tabs…** button.   Edit Tabs ....

The **Toolpath Tabs** form will appear, as shown below in Figure 20.

Figure 20. Toolpath Tabs Form.

We will add four holding tabs by clicking four times around the profile vector in the locations that we would like the tabs to be positioned.

ⓘ   The tabs can be moved after they have been added, by clicking and dragging them around the profile to the desired position.

Click the **Close** button, to finish adding the tabs.
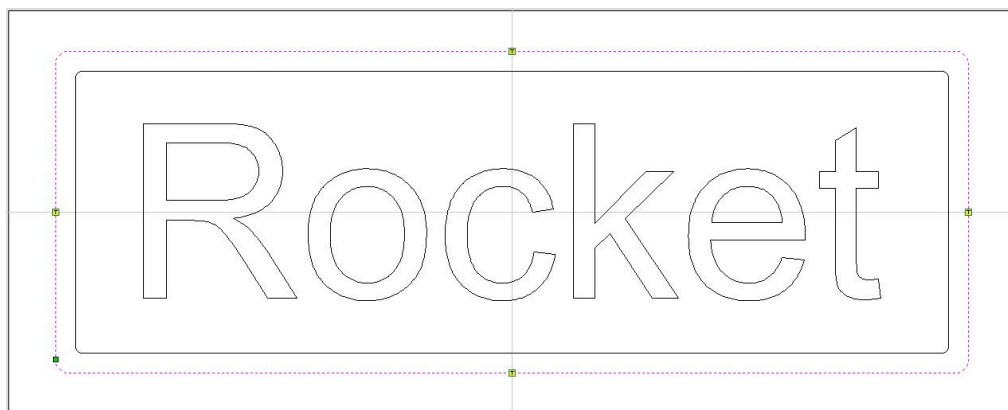
Figure 21. Profile Toolpath with Holding Tabs Added.

(The Tabs are denoted by small yellow squares marked with a black "T")

13. Click the **Calculate** button and the resulting toolpath will automatically be drawn in the   **3D view** and the **Preview job** form opened, as shown below in Figure 22.
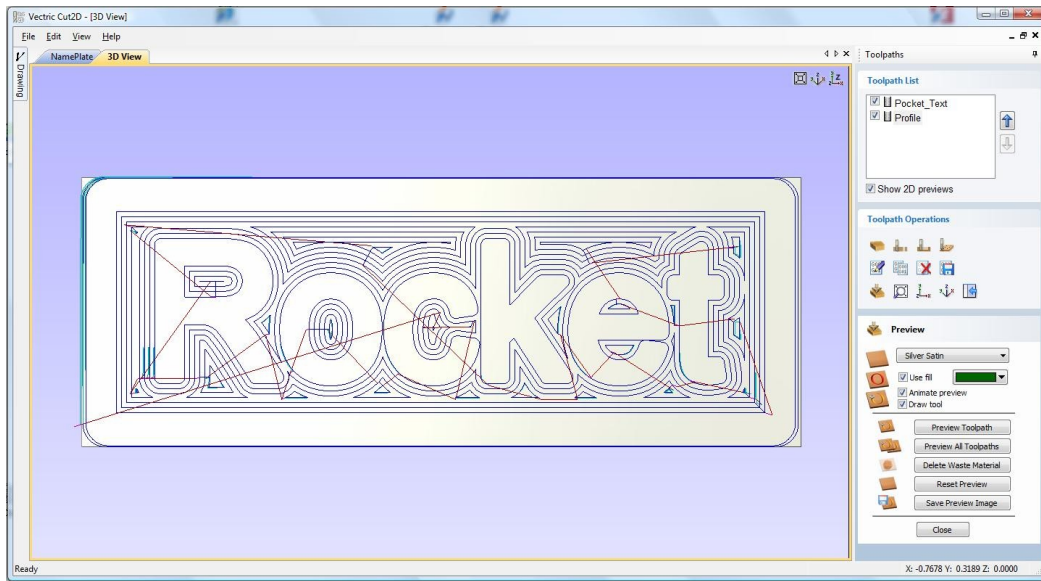

Figure 22. 3D View showing Toolpaths & Material

Rotating the 3D View

To rotate the model, **Click** and hold the **Left** mouse button.

To zoom, use **Middle Wheel** on mouse **or Push / Pull** the **Right mouse button**

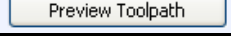Pan using **Ctrl** + **Right** mouse button or the **Left + Right mouse buttons** together

For the standard views use the **ISO** and **Plan** view icons in the top right corner of the 3D view.

4.   Preview the finished job

After calculating a toolpath the **Preview form** is automatically opened. This form is used to simulate the toolpath and also to define different material and colour fill settings, which can be changed to create realistic screen images.

Figure 23. Job Preview

14.   Click the **Preview Toolpath** [Preview Toolpath] icon and an animated representation of the Tool cutting into the material will be shown in the 3D window.

ⓘ   If running the software on low performance / old hardware, you might wish to switch off the **Animate Preview** and **Draw Tool** options, as this will increase the simulation speed.

15.   The finished design can be shaded in different Material types and Fill Colors as shown below in Figure 24, which shows the sign in Brass and Satin Silver with a painted fill.

Figure 24. Finished Sign shown in Brass + No Fill and Satin Silver + Fill

ⓘ   If you have used holding tabs and you wish to preview the finished job without the waste material, un-tick the tabs option and re-calculate the toolpath, then re-preview.
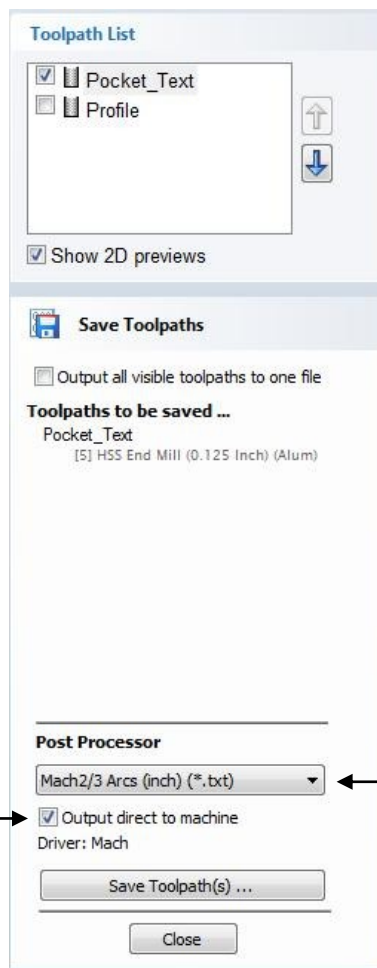
16.   Click the **Save Preview** [Save Preview] button to save the 3D window as an image file (bmp, jpg or gif) for use in customer quotations, marketing brochures or web site pictures etc.

5.   Editing and Saving the Toolpaths

Calculated toolpaths can be edited by either,

Clicking the **Edit Toolpath** icon [icon] or **Double clicking** on the name of the Toolpath name in the Toolpath List.

17. **Save** the Toolpaths by clicking the **Save Toolpath** [icon] icon.

Cut2D can send the NC file directly to some machine controllers

Select the post processor that matches your machine controller.

(Cut2D will remember the last one that was used)

Figure 25. Save Toolpath form

18.   From the pull-down list of postprocessors, select the appropriate one for your CNC machine as shown above in Figure 25.

19.   Click the **Save Toolpaths** button and enter a name to save the toolpath with.

You have now saved one or two NC files that can be run on your machine tool.

ⓘ   Take extreme care to ensure the material and cutter are setup correctly before using the toolpath.

Vectric

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If you have any questions or need assistance

Visit the Vectric User Forum - www.vectric.com/forum

Or

E-mail – support@vectric.com

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