Contents



TECHNO / ENROUTE TRAINING

EnRoute: 1.1 - Starting a New File

• This section covers the procedure for opening a new file in EnRoute.

EnRoute: 1.2 – Initial Setup

• This section will go over the program preferences as well as setting up the correct machine driver.

EnRoute: 1.3 – Installing the Driver

• This section will describe how to install a new driver in the EnRoute software.

EnRoute: 2.1 – Layers

• This section shows how to use layers in EnRoute.

EnRoute: 2.2 – Tool Paths

• This section covers the basics on common types of tool paths.

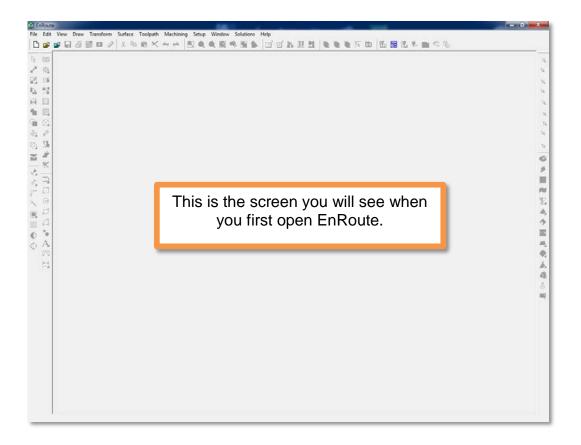
EnRoute: Project 1 EnRoute: Project 2 EnRoute: Project 3

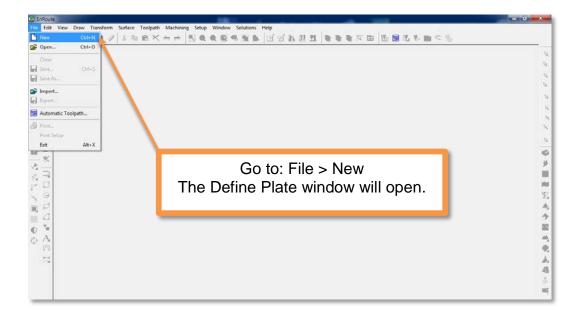
Safety Instructions / Proper Colleting



EnRoute: 1.1 - Starting a New File

This section covers the procedure for opening a new file in EnRoute.





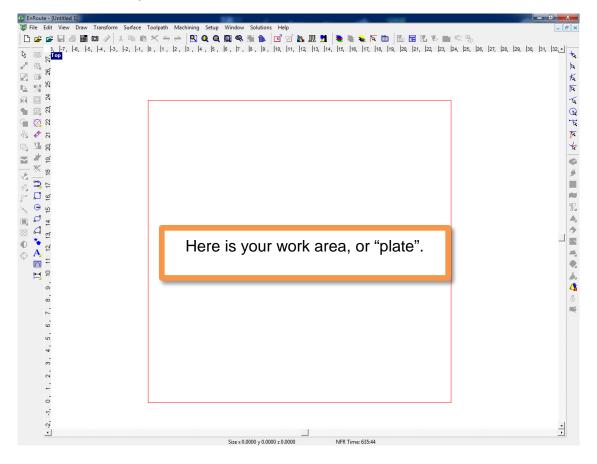


EnRoute: 1.1

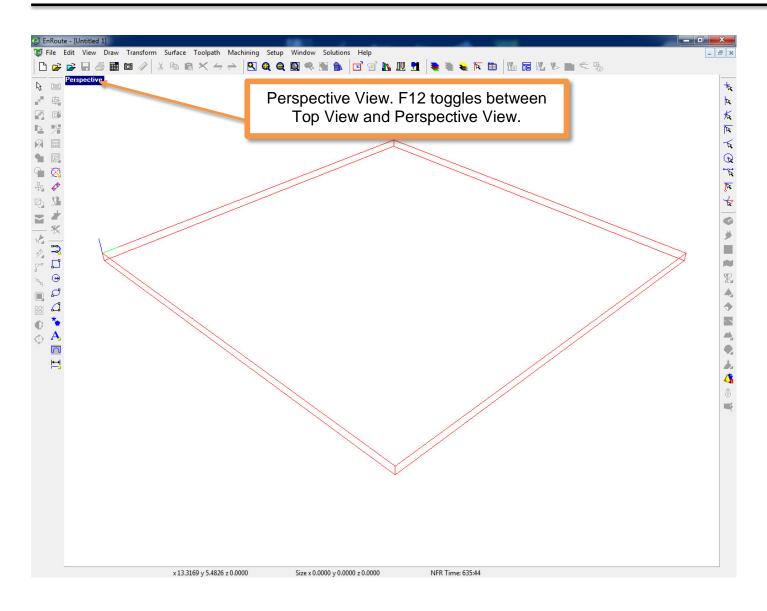
emplate:	1			-	OK
	efined	Width (x):	24.0000	t in .	Cancel
C Fit Plat	te to <u>D</u> esign	Height (y):	24.0000	in	Save <u>A</u> s
C Fit Plat	te to <u>S</u> election	Thickness (z):	0.5000	in ∫	
⊻ Origin:	0.0000	in XMargin:	0.0000	í <u>▲</u> in	<u>R</u> emove
Y Origin:	0.0000	in YMargin:	0.0000	in in	
Surface	at top of plate				
Surface	at bottom of plate				

This box is where you will define your material size and origin position. For most cases, you will leave the X and Y origin at 0 and the surface at the top of the plate. This means that when you bring your output file to the machine, you will set your origin at the top of the material, in the lower left corner.

Note: The plate size does not limit your work area. It is there to help visualize where your cuts will be in relation to your material.







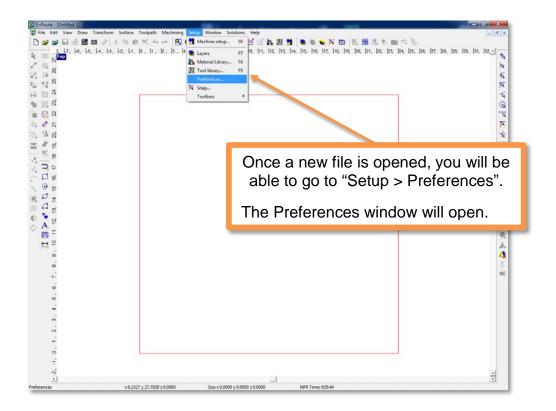
This will be the procedure each time you create a new file in EnRoute. Plate definitions can be saved as templates for future use and materials can be set up for default cut values.

Next we will go over the initial setup of EnRoute.



EnRoute: 1.2 – Initial Setup

This section will go over the program preferences as well as setting up the correct machine driver.



Preferences	
Relief Start Points General Initialization Disp	Dimensions Ordering Day Units Grid View Setup
Merge Contours	Automatic Cleanup
🔲 Import	Import
☐ <u>P</u> aste	☐ <u>P</u> aste
Tolerance: 0.001 • in	Tolerance: 0.001 ; in
Undo Operations Limit C Unlimited C Limited	Save I Auto Save ime Interval: 20min
Allow scaling of toolpath groups	Bump Increment: 0.100 - in
Clip toolpaths to plate	Click Increment: 0.100 - in
F Horizontal cutting	Snap Threshold 30 ÷ pixels
	OK Cancel

Here are the general settings



Relief Start P	oints	Dimensio	ons	Ordering
General Initialization	Display	Units	Grid	View Setup
Initialization	I ✓ Pro	mpt <u>f</u> or Plate		2
Small Part Sizes Small size threshold 0.0775		ons Path nRoute5\Solut	ions	
			ок (Cancel

Initialization settings.

Relief	Start F	Points	Dimensio	ons	Ordering
General In	itialization	Display	Units	Grid	View Setup
Background Foreground			🔽 🔽 Show L	57 A	
Plate			Vpdate	buttons	
Selected Contour (C		-	🔽 Realtime	e rendered pan	ning
Selected Contour (C Selected Open Coni		_	Rendering	Options	
Selected Open Con Selected Mesh Obje			 OpenGL Level 3 OpenGL Level 2 		
Default Relief Color					
Default Mesh Color			C OpenGL Level 1		
Male Router Offset			and the second second	ws Graphics	
Female Router Offse	et				
Restore Defa	ault Colors				
				ок (Cancel

Display and graphics settings.



Relief	Start Po	ints	Dimensio	ons	Ordering
General 📔	Initialization	Display	Units	Grid	View Setup
Length	Speed				
C mm	C mm/sec				
C cm	C cm/sec				
€ in	C in/sec				
Time	C mm/min				
C sec	⊂ cm/min				
⊙ min					
					1

Output units. These should be set to inches and inches per minute.

Relief Start	Points	Dimensio	ns	Ordering
General Initialization	Display	Units	Grid	View Setup
Major Grid	Mir	nor Grid		
Show grid	v	Show grid		
1.0000 • Interval	0.3	2500	Interval	
Cross 💽 Style		ck 🗾 🔻	Style	
2 • Size	1	- A - V	Size	
Color		_	Color	
Show grid in perspective.				
		1	ок.	Cancel

Grid settings.



Relief Start P	'oints	Dimension	is 🛛	Ordering
General Initialization	Display	Units	Grid	View Setup
itandard Items:	Toolpath Ite	ems:		
✓ Plate		Toolpaths		
Contours	~	Direction		
Contour loops		Entry/Exit		
Open contour direction		Bridges		
Popup menu on right click	V	Start Point		
	Toolpa	th width:	Lines	
		Depth:	All depths	+
		Tools:	All tools	•
		-	ж	Cancel

View settings. I prefer to have everything visible.

Preferences	
General Initialization Display Units Grid Relief Start Points Dimensions	View Setup
	Vertical angle
OK	Cancel

Rendering settings for 3d models.



0000 🚖	3
C	0000

Start points for tool paths.

Preferences	
General Initialization Display Relief Start Points	Units Grid View Setup Dimensions Ordering
Arial Regular Bold Italic	
123.45 Bold Italic	
3.0000 € 0. <u>12</u> 2 €	
1 3.0000 € 0.12 2 €	
₩* <u>*</u>	
	OK Cancel

Settings for dimensions.

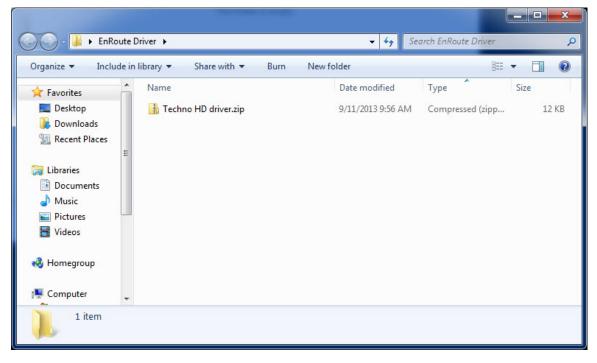
Priority Order Priority Order 1 Layer Tool Order 2 Tool Strategy 3 Strategy Object 4 Object Object Order 5 Pass Object Order Small parts first Maintain grouping Add tool Reset active Delete tool Reset parameter		eral Initialization Relief Start	Display Points	Units Grid Dimensions	View Setu Ordering
1 Layer 2 Tool 3 Strategy 4 Object 5 Pass		Priority Order	*	Priority Order	
2 Tool 3 Strategy 4 Object 5 Pass Small parts first Maintain grouping Add tool Reset active	1	Layer			1
4 Object 5 Pass Small parts first Maintain grouping Add tool Reset active	2	Tool			-
5 Pass Small parts first Maintain grouping Add tool Reset active	3			Strategy Urder	1
Small parts first Maintain grouping Add tool Reset active	4	Object		Object Order	
Small parts first Maintain grouping Add tool Reset active	5	Pass			
Maintain grouping Add tool Reset active	Sm	all parts first	*		
Delete tool Reset paramete			Add to	ol Reset a	active
			Delete I	tool Reset par	ameters
Clear tools				iols	

This screen sets the defaults for your output order. I prefer to output in layer order, so I drag "layer" to the top priority. In order to re-arrange the priority order you must click on the number, release the click, and then click a second time. You will see the mouse curser change to show a little white box under the pointer. At that point, you can drag to the new desired position.



EnRoute: 1.3 – Installing the Driver

This section will describe how to install a new driver in the EnRoute software.



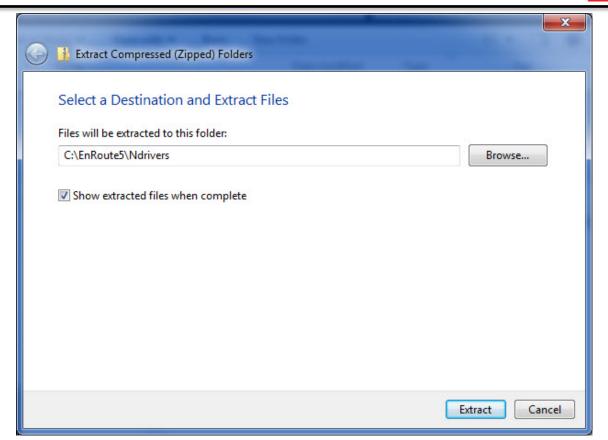
Download the HD driver from Techno's support site:

support.technocnc.com

C S C InRoute Driver		✓ 4y Sea	urch EnRoute Driver
Organize ▼	9	New folder Date modified 9/11/2013.9:56 AM Open Open in new window Extract All Scan Techno HD driver.zip Open with Share with Restore previous versions Send to Cut Copy	B ▼ □ 0 Type Size Compressed (zipp 12 KB
Techno HD driver.zip Date modified: 9/1 Compressed (zipped) Folder Size: 11.		Create shortcut Delete Rename	014 9:10 AM

Right click on the ZIP file and select "Extract All".





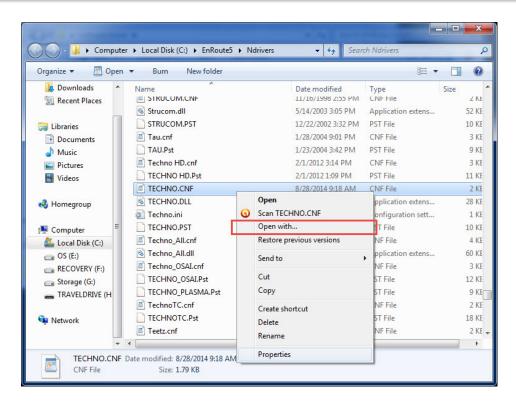
Click "Browse" and navigate to "C:\EnRoute5\Ndrivers" as the location to extract the driver to.

						<u> </u>
🔾 🗸 🗸 Com	puter	► Local Disk (C:) ► E	nRoute5 🕨 Ndrivers	✓ 4 ₂ Sei	arch Ndrivers	,
Organize 👻 🥂 O	pen		older		855	- 🗆 🔞
Downloads 🗐 Recent Places	*	Name STRUCOM.CNF	A	Date modified 11/16/1998 2:55 PM	Type CINF File	Size 2 KB
🕞 Libraries		 Strucom.dll STRUCOM.PST Tau.cnf 		5/14/2003 3:05 PM 12/22/2002 3:32 PM 1/28/2004 9:01 PM	Application extens PST File CNF File	52 KB 10 KB 3 KB
 Documents Music Pictures 	ш	TAU.Pst		1/23/2004 3:42 PM 2/1/2012 3:14 PM	PST File CNF File	9 KB 3 KB
Videos		TECHNO HD.Pst		2/1/2012 1:09 PM 8/28/2014 9:18 AM	PST File CNF File	11 KB 2 KB
⊷ Homegroup 1. Computer		TECHNO.DLL Techno.ini TECHNO.PST	Type: CNF File Size: 1.79 KB Date modified: 8/28/20	11/24/1998 12:27 11:36 AM 14 9:18 AM 98 2:15 PM	Application extens Configuration sett PST File	28 KB 1 KB 10 KB
Local Disk (C:)		Techno_All.cnf		2/27/2008 5:33 PM 3/11/2008 11:25 AM	CNF File Application extens	4 KB 60 KB
RECOVERY (F:)	T NF C	<	4 9:18 AM Date cr	m eated: 4/15/2009 3:18 PN		•
CNF File		Size: 1.79 KB		38 38		

The file location should open in a new window. Locate the file "Techno.cnf".

Note:

This file may not show an extension but may be labeled as a "speed dial" file.



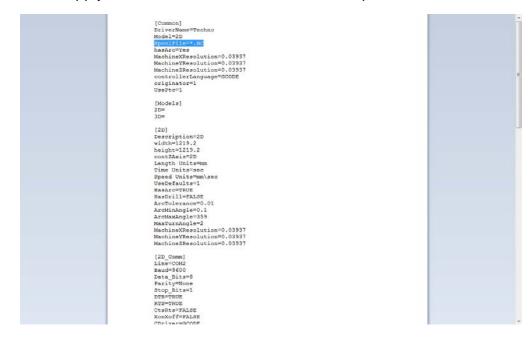
Right click on the file and select "Open with..."

	TECHNO.CNF
Type of file:	CNF File (.CNF)
Opens with:	MordPad Change
Location:	C:\EnRoute5\Ndrivers
Size:	1.79 KB (1,842 bytes)
Size on disk:	4.00 KB (4,096 bytes)
Created:	Wednesday, April 15, 2009, 3:18:44 PM
Modified:	Today, August 28, 2014, 1 minute ago
Accessed:	Today, August 28, 2014, 1 hour ago
Attributes:	Read-only Hidden Advanced





Click on "Change" and select Wordpad from the list of programs. Then click "Apply" and "OK". Double click the file to open it.



Locate the line that reads "SpoolFile=*.NCD" and change it to "SpoolFile=*.NC" as shown. This changes the extension of the output file.

| | | | | Tran | don | | f.s. | ~ | Tee | Insti | | Anch | inin | | | | Nin | low | Se | Intic

 | - | He | de | _
 | _ | | | | | | _
 | | | | | |
 | | | | - | | | | | | - |
|-------|---|---|---|---|----------------------------|---|---|--------------------------------|----------------------------------|--------------------------------------|---|---|---|---|--|--|--|--|--
--
--
--
---|---|--
---|--|---|--|---
---	---	---	---	---	---
---	--	---	--	-------	-------

 | | | | lle.
 | 1111 | | 1 | _ | - | _ | 8
 | P.P.4 | 197. | _ | - TWF | | | | | | | | | | | | | | | | |
 | - gel | 114 | | | | | | | | - |
| | | | | | | ்
• | · 印册 | 1 | | | 7 3
14 | | | 1 | | | | set | up |

 | | 2 | 20 | | | | | | | | | | | | | | | | | |
 | | <u> </u> | | • | ۰. | • |
 | | | | 21 | 1 10 |
 | 5 kr | 1
1
1
1 | | 20 F | 20 | 20 F | | 22 | 22 | 24.1 |
| 6×110 | 9, -4
10 - | n -/ | - 14 | N 1-5 | o, ∣• | 4, - | -9, I | -4 | 1-1 | 10 | 2 | - | þ | | - | | | | |

 | | 14 | 114 | 114
 | 113 | - 14 | - 115 | а I. | o' li | 4 P | ۹ II
 | 9 12 | ų j∠ | 4 P | 54 J | 29 | 29
 | (a) 4 | 50, Ja | cr, e | (9 | c9, | oų į | 91, I | эд [; | əq. | - 66 |
| 8 | | | | | | | | | | | | | | - 4 | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | ų | _ | | | | |

 | · > | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| 54 | | | | | | | | | | _ | | - | - 2 | - 8 | | | | Les. | |

 | | | | n.
 | | 70 | | | - 7 | - 1 | | | | | | | | | | | | | | |
 | | - 72 | 10 | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| ន | | | | | | | | | | | | | | | | | 40 | | 140 | 14

 | - 23 | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | 1 | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | 1 | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | 1 | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | K., |
| | | | | | | | | | | Ť. | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | 1 |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | - |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | r. |
| - | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | r. |
| - | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | + |
| - | | | | | | | | | | 1 | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | ÷. |
| m | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | ۴., |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | + |
| | | | | | | | | | | - | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | 4. |
| | | | | | | | | | | L | | | | - | | _ | - | | |

 | _ | | - | | | | | | | | | | | | | | | | | |
 | | | | | - | - |
 | - | | | | |
 | | | | | | | | | | 4. j |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | 6 |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| ņ | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | + |
| | | | | | | | | | | | | | | | | | | | |

 | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | ¥. |
| φ | | | | | | | | | | | | | | | | | | | + |

 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
 | | | | | | |
 | | | | | |
 | | | | | | | | | | |
| | -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 2, 47 19 | -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 28 27 49 19 19 19 | en de la constante de la consta
La constante de la constante de
La constante de la constante de | en a 2, 2, 1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11 12 13 14 15 16 17 18 12 22 23 24 25 26 24 29 24 24 24 24 24 24 24 24 24 24 24 24 24 | ti view Draw Tran
2 2 2 | Edit View Draw Transform
Com Dia (1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1 | 4, 3, 2, 1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 28 20 20 20 20 20 20 20 20 20 20 20 20 20 | Edit View Draw Transform Surfa | Edit View Draw Transform Surface | Edit View Draw Transform Surface Toc | Edit View Draw Transform Surface Toolpati | Edit View Draw Transform Surface Toolpath | Edit View Draw Transform Surface Toolpath Mach
□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ | Edit View Draw Transform Surface Toolpath Machining Image: Surface Toolpath | Edit View Draw Transform Surface Toolpath Machining C
□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ | Edit View Draw Transform Surface Toolpath Machining Surface Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Toolpath Machining Surface Toolpath Machining Surface Image: Surface Toolpath Machining Surface Image: Surface Toolpath Machining | Edit View Draw Transform Surface Toolpath Machining Serup 1 Image: Se | Edit View Draw Transform Surface Toolpath Machining Setting Wind Setting Wind Image: Setting S | Edit View Draw Transform Surface Toolpath Machining Setter Window Setter Window Image: Setter Window Image: Setter Window Image: Setee Window Image: Setter Window | Edit View Draw Transform Surface Toolpath Machining Setup Window Sc Image: Setup Structure Image: Setup Structure Image: Setup Structure Image: Setup Structure <t< td=""><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solution Setup Status Solution Image: Setup Status Solution Image: Setup Status Solution Image: Setup Status Solution Image:</td><td>Edit View Draw Transform Surface Toolpath Machines Setup Window Solutions Image: Solution State Stat</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solution: He Image: Setup Window Solutio</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Strate St</td><td>Edit View Draw Transform Surface Toolpath Machining Setting Window Solutions Help Image: Setting Seting Setting Seties Setting Setting Seties S</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solution Strate Image: So</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solutions Help Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field<</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu</td><td>Edit View Draw Transform Surface Toolpath Machining Stup Window Solution: Help Image: Stup Stup Stup Stup Stup Stup Stup Stup</td><td>Edit View Draw Transform Surface Toolpath Machining Setting Window Solutions Help Image: Setting Solutions Help Machine seture 16 Image: Setting Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Material Library 17 Image: Solutions Help Image: Solutions Help Help Help Image: Solutions Help Image: Solutions Help Help Help Image: Solutions Help Image: Solutions Help Help Help Help Help Help Image: Solutions Help Help Help Help Help Help Image: Solutions Help Help Help Help Help Help <</td><td>Edit View Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solution Strength Machine Setup fo Solutions Help Image: Solution Strength Help Machine Setup fo Solutions Help Image: Solution Strength Help Image: Solution Strength Help Help Help Image: Solution Strength Help Help Image: Solution Strength Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength <</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu</td><td>Edit View Draw Transform Surface Toolpath Machining Sever Window Solutions Help Image: Sever Seve</td><td>Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu</td><td>Edit View Draw Transform Surface Toolpath Machines Setting Window Solutions Help Image: Setting Seting Setting Setting Setting Setting Seting S</td><td>Edit View Draw Transform Surface Toolpath Maching Serup Mindow Solution. Help Image: Serup Mindow Solution.</td><td>Edit Vew Draw Transform Suffice Teolipath Machining Setty Window Solution: Heip Image: Setty Sety Se</td><td>Edit Vew Draw Transform Suffice Tolgath Maching Settion Hep Image: Settion Settion Settion Hep Image: Settion Settion Settion Hep Image: Settion Settion Settion Settion Settion Hep Image: Settion Setion Settion Seties</td><td>Edit Vew Draw Tarafem Suffer Tolpath Machings Sec. Window Solutions Hep Image: Sec. Sec. Sec. Sec. Sec. Sec. Sec. Sec.</td><td>idit Ver Draw Transform Sufface Techen Machines Seletions Help Image: Seletion Seletion Seletion Seletion Seletion Seletions Help Image: Seletion Sel</td><td>Edit Ver Draw Tundom Sufface Toolpub Maching Setting Setting</td><td>dit Virus Surface Totalytim Tot</td><td>dia View Draw Turedom Surface Toolgath Machine Strope. The Window Solutions Help
The Dial No. No. No. No. No. No. No. No. No. No.</td><td></td><td></td><td></td><td>Get Ward Daw Taraferm Sufface Toolgab Machines (Machines (Machine</td></t<> | Edit View Draw Transform Surface Toolpath Machining Setup Window Solution Setup Status Solution Image: Setup Status Solution Image: | Edit View Draw Transform Surface Toolpath Machines Setup Window Solutions Image: Solution State Stat | Edit View Draw Transform Surface Toolpath Machining Setup Window Solution: He Image: Setup Window Solutio | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Strate St | Edit View Draw Transform Surface Toolpath Machining Setting Window Solutions Help Image: Setting Seting Setting Seties Setting Setting Seties S | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solution Strate Image: So | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solutions Help Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Surface Toolpath Machining Setup Window Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field Image: Solutions Field< | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu | Edit View Draw Transform Surface Toolpath Machining Stup Window Solution: Help Image: Stup Stup Stup Stup Stup Stup Stup Stup | Edit View Draw Transform Surface Toolpath Machining Setting Window Solutions Help Image: Setting Solutions Help Machine seture 16 Image: Setting Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Machine seture 16 Image: Solutions Help Image: Solutions Help Material Library 17 Image: Solutions Help Image: Solutions Help Help Help Image: Solutions Help Image: Solutions Help Help Help Image: Solutions Help Image: Solutions Help Help Help Help Help Help Image: Solutions Help Help Help Help Help Help Image: Solutions Help Help Help Help Help Help < | Edit View Transform Surface Toolpath Machining Setup Window Solutions Help Image: Solution Strength Machine Setup fo Solutions Help Image: Solution Strength Help Machine Setup fo Solutions Help Image: Solution Strength Help Image: Solution Strength Help Help Help Image: Solution Strength Help Help Image: Solution Strength Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength Help Help Help Help Help Help Image: Solution Strength < | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu | Edit View Draw Transform Surface Toolpath Machining Sever Window Solutions Help Image: Sever Seve | Edit View Draw Transform Surface Toolpath Machining Setup Window Solutions Help Image: Setup Setu | Edit View Draw Transform Surface Toolpath Machines Setting Window Solutions Help Image: Setting Seting Setting Setting Setting Setting Seting S | Edit View Draw Transform Surface Toolpath Maching Serup Mindow Solution. Help Image: Serup Mindow Solution. | Edit Vew Draw Transform Suffice Teolipath Machining Setty Window Solution: Heip Image: Setty Sety Se | Edit Vew Draw Transform Suffice Tolgath Maching Settion Hep Image: Settion Settion Settion Hep Image: Settion Settion Settion Hep Image: Settion Settion Settion Settion Settion Hep Image: Settion Setion Settion Seties | Edit Vew Draw Tarafem Suffer Tolpath Machings Sec. Window Solutions Hep Image: Sec. Sec. Sec. Sec. Sec. Sec. Sec. Sec. | idit Ver Draw Transform Sufface Techen Machines Seletions Help Image: Seletion Seletion Seletion Seletion Seletion Seletions Help Image: Seletion Sel | Edit Ver Draw Tundom Sufface Toolpub Maching Setting Setting | dit Virus Surface Totalytim Tot | dia View Draw Turedom Surface Toolgath Machine Strope. The Window Solutions Help
The Dial No. | | | | Get Ward Daw Taraferm Sufface Toolgab Machines (Machines (Machine |

Note: This step should not be necessary if the driver was sent from tech support.



Now we have to make the new driver active. Shut and re-start EnRoute. Then open a new file and go to "Setup > Machine Setup"

Current Driver JMa	artin3D - RArcs			•	OK
					Cancel
Items	Current Value		Unit	_ ^ _	
Driver Description				=	
Name	JMartin3D			-	Close
Model	RArcs				
Description	3D Transform				
Driver Parameters				_	
Width	78.7402	\$	in		
Height	39.3701	\$	in		
Z Lift	0.1969	\$	in		
Home position				_	
Home type	User Defined				
X:	0.0000	\$	in		
Y:	0.0000	÷	in		Active Drivers
7.	0.0000			L	Active Drivers

The "Machine Drivers" window will come up. Notice that the current driver is not correct. Click on "Active Drivers".

Manufacturers:		Active Drivers:		OK
Stratus	•	JMartin3D - RArcs		12 G 1
strucom	•			Cancel
Tau				
Techno HD				
Techno	-			
Techno_All	-			
Techno_Osai	•			
TechnoTC	•			
Teetz	- 📃			Path
TekcelGC	-			
TekcelGC-Doors	• •		-	Remove
, Driver Path:				

Locate "Techno HD" from the list on the left.



fanufacturers:		Active Drivers:	OK	2
Stratus	* *	JMartin3D - RArcs		
strucom	•		Cano	:el
Tau	•			
Techno HD	•			
RArcs				
IJAres				
Techno_Osai	-			
TechnoTC	•			
Teetz	•		Path	
TekcelGC	-			
TekcelGC-Doors	• •			ove

Click on the arrow and select "IJ Arcs". The correct post will appear in the "Active Drivers" list.

Manufacturers:		Active Drivers:	OK
Stratus	* *	JMartin3D - RArcs	
strucom	-	Techno HD - IJArcs 🔨	Cancel
Tau	-		
Techno HD	•		
Techno	-		
Techno_All	-		
Techno_Osai	-		
TechnoTC	•		
Teetz	•		Path
TekcelGC	-		
TekcelGC-Doors	• •		- Remove
Driver Path:			

Now, remove the default JMartin3d post. Highlight it and click "Remove".



			OK
-	Techno HD - IJArcs	A	
•			Cancel
-			
7			
-			
-			
-			
-			
-			Path
			Remove

Click "OK".

Machin	e Drivers				×
Curr	rent Driver Techno	HD - IJArcs			ок
	Items	Current Value	Unit		Cancel
Đ	Driver Description		bu		
Đ	Driver Parameters				Open
Đ	ToolChanger			-	
Đ	Drill Bank			-	
Đ	Driver Speeds			-	
Đ	Driver Units			-	
Đ	Communication parameter			-	
Ŧ	Advanced Parameters			-	
				-	
					Active Drivers
				T	Active Diffels

The correct driver is now active and we can check the parameters.

Current Driver	Tech	no HD - IJArcs			-	OK
						Cancel
Iter	ns	Current Value		Unit	_ ^ _	
Driver Descripti	on					
Name		Techno HD				Close
Model		HD				
Description	า				=	
Driver Paramete	ers					
Width		61.0000	\$	in		
Height		121.0000	+	in		
Z Lift		0.2500	\$	in		
Home pos	ition					
Home type)	User Defined				
X:		0.0000	+	in	_	
Y:		0.0000	\$	in	_	Active Drivers
7.		0.0000			-	Active Drivers

These next few screens show what the driver settings should be. The "Z Lift" parameter is variable. It defines the clearance height of the tool. This is how far above the material the tool will raise before traverse movements.

Current Driver	Techno	HD - IJArcs			<u> </u>	OK
Items		Current Value		Unit		Cancel
Home corn	~	Lower Left	-	Unit	- ^	
ToolChanger		Lower Leit	2444		- 1	Close
Auto tool chang	jer					
🗉 Drill Bank					_	
Has drill bank		Γ			=	
Driver Speeds						
Spindle Speed		18000.00	+	rpm		
Within the mate	rial					
Feed						
Default		300.0000	÷	in/min		
Maximu	m	800.0000	+	in/min		
Minimur	n	1.0000		in/min		Active Drivers

"Auto tool changer" and "Drill bank" should be unchecked as they do not apply to the HD machines.



Current Driver	Techr	no HD - IJArcs				OK
						Cancel
Items	E.	Current Value		Unit	_ ^ _	
Minir	num	1.0000	+	in/min		
Plunge						Close
Defa	ult	75.0000	\$	in/min	_	
Maxi	mum	150.0000	\$	in/min		
Minir	num	1.0000	+	in/min		
Dwell						
Defa	ult	0.0000	\$	min		
Minir	num	0.0000	\$	min	=	
Maxi	mum	0.0000	+	min	=	
Above the m	aterial					
Feed						
Defa	ult	1000.0000	\$	in/min		
Maxi	mum	1200.0000		in/min		Active Drivers

These default speed values will fill in the g code if no speeds are defined in the tool path.

Current Driver	Techno	HD - IJArcs			•	OK
						Cancel
Items	13	Current Value		Unit	_ ^ T	
Above the m	aterial					
Feed					_	Close
Defa	ult	800.0000	÷	in/min		
Maxi	mum	1000.0000	÷	in/min		
Minir	num	1.0000	\$	in/min		
Plunge						
Defa	ult	100.0000	\$	in/min		
Maxi	mum	150.0000	\$	in/min		
Minir	num	1.0000	-	in/min		
Driver Units						
E Communication p	arameter				=	
Advanced Param	otore					Active Drivers

EnRoute: 1.3

Techno CNC Systems

Current Driver	Techno	HD - IJArcs			• _	OK
						Cancel
ltems		Current Value		Unit	_ ^ _	
Minir	num	1.0000	÷	in/min		
Plunge				34		Close
Defa	ult	100.0000	\$	in/min		
Maxi	mum	150.0000	÷	in/min		
Minir	num	1.0000	+	in/min		
Driver Units						
Length		in	•			
Speed		in/min	•			
Time		sec				
Use defaults	:					
E Communication p	arameter				E	
 Communication p Advanced Param 					-1	Active Drivers

Units should be set to: inches, inches per minute, and seconds.

Current Driver	Techno H	D - IJArcs		•	OK
					Cancel
Items		Current Value	Unit		
Advanced Parame	ters				
Machine reso	lution				Close
X:		2540.0000	\$ steps/in		
Y:		2540.0000	\$ steps/in	_	
Z:		2540.0000	\$ steps/in		
Angles				_	
Arc tolera	ance	0.0004	\$ in		
Minimum	angle	0.1000	\$ deg.		
Maximum	i angle	359.0000	\$ deg.		
Maximum	i turn angle	2.0000	\$ deg.	_	
Has Arcs				E	
Has Drill Fund	tion	Г		0.00	Active Drivers

"Has arcs" should be checked and "has drill function" should not be checked.

Once all of the settings are confirmed, click "OK".

EnRoute is now ready to output files to run your HD machine!



EnRoute: 2.1 – Layers

This section shows how to use layers in EnRoute.

👿 File Edit View Draw	Transform Surface Toolpath Machinin Image: Second state \swarrow \land \Leftrightarrow \land \land	3 Setup Window Solutions Help	N. III. M. 🗨 🗨 👟 🔽 🖽 🔟 🖬 🖾 🖉 👞 🕾 🐁	- 5 ×
Layer 1	₩		Toggle the Layer toolbar	ke ke T
		3 4 ⁵	, 6 , , , 7 , . , , 8 , , , 9 , , , , 10 , , , 11 ,	
· 中国 · · · · · · · · · · · · · · · · · ·				a a a a a a a a a 👘
			5 は 秋波 秋のは あば 秋水は あば 秋水は あは 秋水 秋水	1 5 5 5 5 5 6 5 5 5 V

Locate and click on the icon to show the layer toolbar.

EnRoute - [Untitled 1]	100 C		
🐺 File Edit View Draw Transform Surface Toolpath Machin			_ <i>B</i> ×
□ 🛩 📽 🖬 🚳 🖬 🔯 🥔 ↓ 🖻 🛍 🗙 ≒ ⇒	S Q Q D S 🕷 🐘 🖂 🗹 🛝 🛄	1 👟 📚 🕅 🖽 🔢 🖉 👞 🖿	K B
Layer 1 💽 🛨 😵		Define layers (F7)	
	. 3 4; . 5 6 .	, 7, , 8, , 9, , 10,	1, 11, , 12, , 13, -
		· · · · · · · · · · · · · · · · · · ·	

Click on the "Define Layers" button or hit "F7" to add and manage layers.

Layers									X
<u>S</u> how:	All layers		·					ľ	ОК
Curren	t	Name	On	Off	Lock	Move Lock	Color	*	Cancel
	Layer 1		v						New
									Delete
									Remove Empty
								3	Move Up
•		1					Þ	Ŧ	Move Down

Click on the "New" button to create a new layer.



ayers									×
<u>S</u> how:	All layers	•							OK
Current		Name	On	Off	Lock	Move Lock	Color	*	Cancel
	<mark>Layer 1</mark> Layer 2			Г	Г	Г			New
	Layer 3		V		Γ				Delete
									Remove Empty
									Move Up
•							Þ	*	Move Down

Repeat for as many layers as you need. Just click on the layer name and type a new name to keep the layers better organized.

They can be re-ordered using the "Move Up" and "Move Down" buttons.

The order the layers are in from top to bottom will be the order that they output in if "Layer" is selected as the output priority. For example: I would use the last layer as my cutout, so all of the other cuts would happen first.

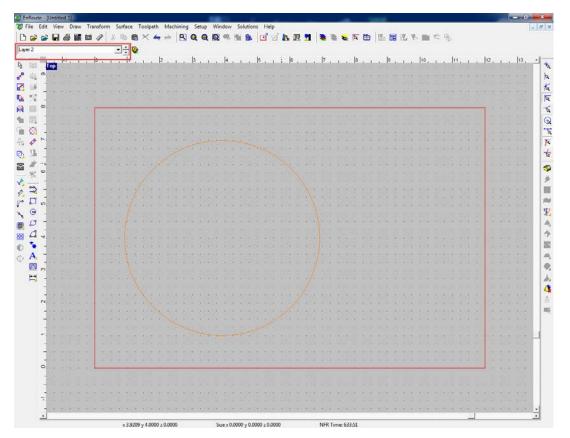
<u>S</u> how:	All layers	•							_	ОК
Current		Name	On	Off	Lock	Move Lo	ck	Color	*	Cancel
Г	Layer1		~	Г	Г					
	Layer 2		~		Γ					New
V	Layer 3			Г	Γ					Delete
										Remove Empty
										Move Up
									-	Move Down

Double click on the color column to change the layer's color. This comes in handy when there are multiple active layers.

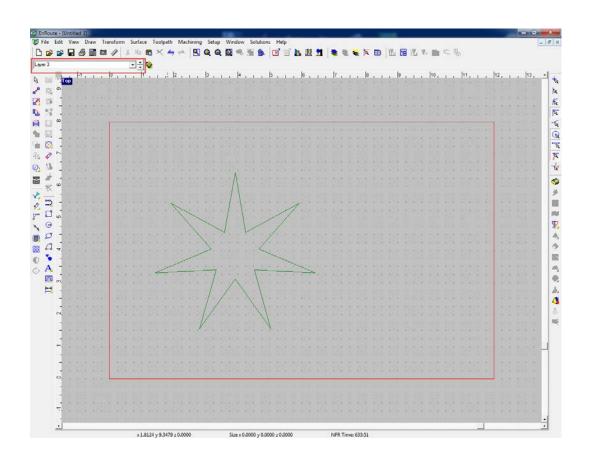


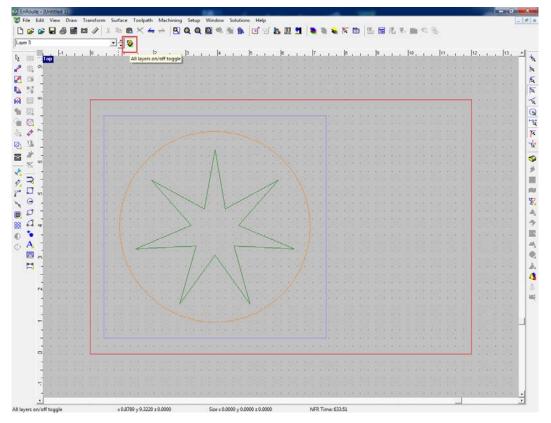
dit	1		-	Dras				m				olp	ath	M								Sol	ution							1.						-														
÷	6		43		1 0	2	1		 33			<	4	1		R	Q	9		8 0	R 1	1		C	1 5	a	3	00	21			1	=	× 1	Ð	W.	D.	1.	R	-	1.42		b.							
									ŀ	N	1																																							
h	op		1				۰.			۲.	-1	2	.	2,	1	¥.	3	1	il.	ł	6.	1	1	5			6	5	i.	. 1	7.	1	1	8,	1	1	9	<u>.</u>	1	10		14	11		1	12	i	<u> </u>	13	3,
0	op	1																	9909																												7.174			
1																																																		
4																																															17.19			
-																																															201			
×.						1			 			-			_		-							_																-				_		7	1.11			
1																																																		
1																	-																														1004			
-																																																		
4																																																		
ł																																															53			
ō.																																																		
2																																																		
1																		4																			Ş.													
4																																																		
n,																																															*127*			
ł																																																		
1																																																		
1																																															10.00			
1																																																		
4																																																		
-																																															-			
n.																																															100			
1																																																		
1																	1																														1774 1774			
ν.																																																		
-																																																		
ł												3																																			222			
1																																																		
1																																																		
1																																																		
4																																																		
э.													-																											_				_	_	1				
-																																								3							10.3			
-												1							3(0)							2013																					100			
-																			*																												0.0014			
1																																																		

Use the layer toolbar to choose the active layer. All vectors will be the color of the layer that they are on.









The little light bulb on the layer toolbar makes all layers visible



EnRoute: 2.2 – Tool Paths

This section covers the basics on common types of tool paths.

File		View	Draw	Transf														7	HDI						1100				< D					- 0	-
	-6 -6		, . -	🖾 🥢	3	-2 ı	- 1-1-1 - 1-1-1	, 0	n di	•] [1	, 2,	, 3		4, 1) 5,	, 6,	<u>e 2</u>		119. 8, 1	, 9,	, 10	. X	1 	12 1	1161 13	08 21 , 14	i ¥⊳ 15	■ ≪ , , 16	~ 🌜	1, 18	- 1	19	20 1	, 21 ,	
中国	-																																		
7																																			ľ
	12 .																																		
Ø.	=																																		l
1	10											/~		÷			: +:		¥)	¥.,	.+		_												l
*	6										1																								
2	8																								1										
[] ©	1. 7.							a de la come																	ali.										L
p A	1.6,																								æ										ľ
*	2										1	*													/										l
A								-					-	÷	-	4	: +(4.)	+'	+	.+		/	- + .										l
	2.1.3																																		l
	1 - 1																																		l
	10																																		
	2																																		
	e, •					1																			-21									a de la como	÷
,ľ ľ	Radiu		<u>י (</u>	L Cor	mer 1	Y: 10	3.4588 <u>-</u> 3.5663 <u>-</u> 0000 <u>-</u>	÷	Corner :	Y	13.45	63	3 -			fidth 0 eight 0			-	pply lose]														
						×1	13.4588 y	y 10.5	5663 z 0	0.000	D		Sia	ze x 0.	0000 y	0.0000	z 0.000	00			NFR T	ime: 63	4:56												

First, we'll start with a basic closed contour.



nRoute - [Unt File Edit V		Transform	n Surfac	e Too	Ipath Machinin	ig Setup W	indo	v Salu	tions	Help										- 0-
i 📽 📽 🖥	8		36 Ra	F 🗗	Routing Offset												1 < B			
	1 -5, 1	, 4, 1	-3, 1,	4	Offset open cont	our	1	2, 1	3,	. 4.	1.15.	, 16,	1. 7.	1, 8,	1, 19,	, 10,	1 . 111, 1	, 12,	, 113 ,	. 14
44.				_	Hatch Fill Island Fill															
12					Spiral Fill		11													
12				Ĭ	Drill															
2					Slots															
0.					Engraving															100
🖾 🗈				100	Pyramid		-88													100
ð -					Edit toolpaths															
2 2					Edit Entry/Exit Edit Bridges		11													~~ ~
* :					Distort toolpaths															
* =					Daisy chain															123
- 2					Project toolpaths														o	
1 2				*	Delete toolpaths				/											
Θ :								1											1	
ο.								/												
a :																			1	
- -																			11	TAV 8
A -																				
							1												. 6	
H																				
é					9														2	200
-					2															
10					a .			1											1	1165
1								1												
-1																		-		
1							3	3											······ė	
ē																				647 5
1																				
~					2															56 5
1																				
÷					8															6. 3
											1									

The most commonly used tool path is a cutout, or "Routing Offset". Note: Geometry must be selected <u>before</u> tool path is available.

ter Offset					
<u>S</u> trategy:			•		OK
Order Tool	Туре	Depth	Edit	-	Cancel
🕨 1 🚖 1/4'' End Mill	Rough	0.0000	÷		
					Edit Plan
					<u>S</u> ave as
				-	
					Add Tool
Available Tools:		Sort tools by	: <u>`</u>		Delete Tool
Description	Tool Type	Color		-	
	nd Mill				Clear
	nd Mill	1			
	nd Mill				
Router Offset Parameters:					
External (male)		1			
Internal (female)		1		-	and the second se
Weld offsets	E				>>
Sharp corners					
Inlay					
With bridges	+				

Select which cutter you want to use and whether it is an internal or external cut.

QE	Rout	te - [l	Untitled 1	<u>n</u>				10 / 10 m A 100		- 0 ×
10	file	Edit	View					Setup Window Solutions Help		- 6 ×
-	•	8			4	3		t @ @ @ @ @ @ @ @ @ @ @ # # # # # # # # 	. 112	
\$	000	1	op	1111	- itelested				11111111	
4	·臣,	- 5								ha b
	100	-					- X			ta ha
		4								-6
-							15			Q
G.		13								T
-29	Ф	1					Router Offset			A.
Ø	2	12					Strategy.	OK		4
2	2	1					Order	Tool Type Depth Cancel		
*	*	=					<u> </u>	4"End Mill Rough 0.0000		2 3 9
4	3	-						Save as	~	ę 📕
8.	ū	10						Add Tool	1	2
3		-					Available Tools:	Cut Definition		8
	1	0					De 3/16" End Mill			
888	*	-					1/4" End Mill 3/8" End Mill	Cut Templates • OK		
š	A	00					1/2" end mill	Current Tool 1/4" End Mill * Cancel	S 8.	
~		1					Router Offset P	Items Current Value Unit A Save as		
	별	-					External (male)	Cutippe Rough		1 de
		-					Internal (female Weld offsets	ග් 🖻 Passes		4
							Sharp comerc Inlay	Ø □ Wolts □ Ø □ Feeds and Speeds ¥		A A A A A A A A A A A A A A A A A A A
							With bridges	Ø		
		-						Image: Strategy (Section 2010) 30 Tooloather?		
		. 4					100	Channel Tags?		
		1								Ċ
		e,							1. A.	
		-								
		~					10			27
		-								
		-					10			12 2
										-

Techno CNC Systems

Click on the "..." under the edit column. This will bring up the "Cut Definition" window. This is where all of the tool path parameters are defined, such as the cut depth, number of passes, and speeds.

Cut 1	Temp	lates							•	OK
	ent T		1/4" End Mill						•	Cancel
			Items		urrent Value		П	Unit		<u>S</u> ave as
		Cut type			Rough					
8		Depths		<u>¥</u>						Library
		Surface			0.0000	+	ir			
		Final De	epth		0.5500	+	ir			
T		Passes		7					=	
		Number			3	+				Close
		Maximu	m per Pass		0.7500	+	ir			
		Actual p	per Pass		0.2500		ir			
		Final Pa	155		•					
		F	inal Pass Depth		0.0500	-	ir			N
T	ŧ	Widths					-			
8	Đ	Feeds and S	peeds	÷۲						4

Just go from top to bottom, filling in the desired parameters. In this view we see the total depth of cut and the number of passes to get there. The "Final Pass" is independently definable with it's own depth and speed.



Cut 1	Temp	plates						ок
Curro	ent T	ool	1/4" End Mill				•	Cancel
			Items	Current Value	1	Unit		<u>S</u> ave as
		Fi	nal Pass Depth	0.0500	ŧ	in		
T	Ŧ	Widths			T			Library
8		Feeds and Sp	peeds	<mark>→Ľ</mark>	T			
		Feed Ra	ite	250.0000	F	in/min •	•	
		Final Pa:	ss Feed	100.0000	I	in/min •	•	
		Plunge F	Rate	50.0000	I	in/min •	-	Close
		Dwell		0.0000	I	sec		
		Spindle		18000	I	rpm		
T	Ŧ	Direction		t <u>i</u> ji	1	9	=	
T	Ŧ	Entry/Exit Par	rameters	X				N N
		3D Toolpaths	?					
		Channel Tags	\$?	Г				J 🔺

Fill in the feed rates and spindle speed.

Cut Templates					•	OK
Current Tool	174" End Mill				•	Cancel
	Items	Current Value		Unit		<u>S</u> ave as
Sp	bindle	18000	+	rpm		
🖉 🗉 Directio	n	₩				<u>L</u> ibrary
Co	onventional	Г				
Cli	imb		Т			
	xit Parameters	H			_	
Er	ntry - None	Г				Close
	Arc	Г		1		
	Line	V			H	
	Length	0.5000	÷	in		
	Angle	10.0000				M
	3D Line	v				
	Lift	0.0000		in		4

Choose a cut direction and an entry/exit If you are using a cutter with a flat bottom, it is recommended that you add a ramp-in move. "3D Line" will allow the entry move to ramp as it plunges down.

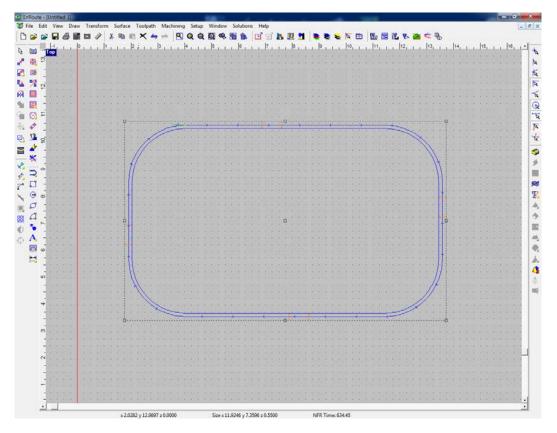
Click "OK" when all of the parameters are entered.

Tool paths can be saved as strategies to avoid having to re-enter the same parameters if the cuts will be similar.

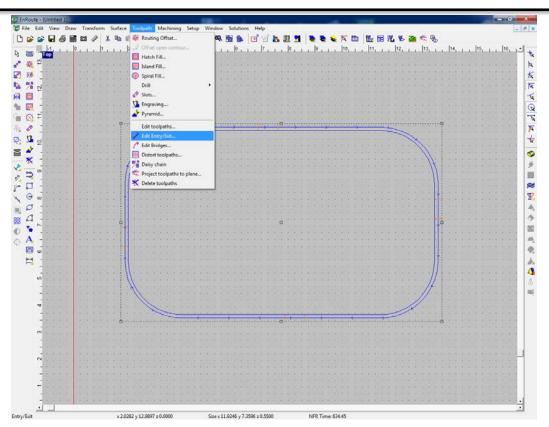


<u>S</u> trategy:					-		OK
Order	Tool		Туре	Depth	Edi	t 🔺	Cancel
🕨 1 🚖 1/4'' End Mill	-		Rough	0.5500	▲		
							Edit Plan
							<u>S</u> ave as
						<u></u>	Add Tool
vailable Tools:				Sort tools by	c.		Delete Tool
Description	To	ool Type		Color		•	Delete 100
3/16" End Mill	End	vfill				_	Clear
174'' End Mill	End	vfill					
3/8'' End Mill	End	Mill					
1/2'' end mill	End	Mill	Ψ.				
louter Offset Parameters:							
With bridges	V						
with blidges	Lift						Sec.
Bridge type	0.5000	🜲 in					
	0.0000		=				
Bridge type	0.0500	🌲 in					
Bridge type Length		≑ n					

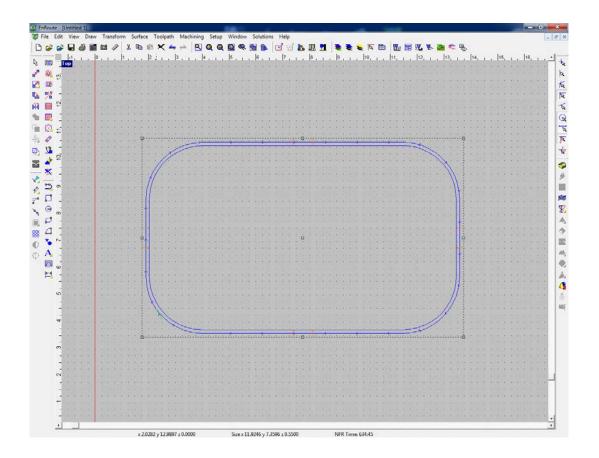
If bridges are needed to secure the cut part to the material, they can be defined here.



Here is a look at our tool path. The green lines are the entry and the orange brackets are the bridges.

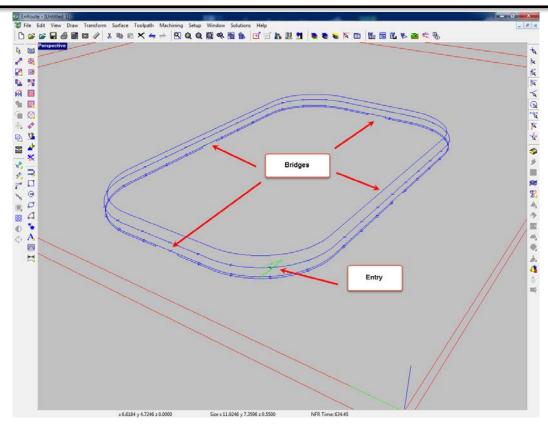


The positions of the entry and the bridges can be adjusted. Go to "Toolpath > Edit..." and then just click and drag them to the desired position on the geometry.









Hit F12 to toggle Perspective view.

You can see the different passes of the tool path as well as the cut direction, entry, and bridges.

| ew D | - | ston | m S | | _ | | _ | | | Setu | ip 1 | | | |
 | | |

 |

 |
 | | | 1 | - | - par |
 | 1.1
 | W.
 | - | - 6 |
 | |
 | | | | - |
|-------|--|------|-----|---------|---------------|-------|--|--|-----------|--|---|---------|---|---
---|---|---
--
--

--
--
--|---
---|---|---|---|---
--
--

--
---|---|---|---

---|---|---|---|---|
| La | And the local division of the local division | 13 | 1.2 | - | - | | | | | | | | | | 19 |
 | |

 | 2 11

 | | 4 14
 | 11 | 117 | İta | 115 | | 121

 | 122
 | 123 | 124 | D
 25 | l26
 | 127 | 128
 | 129 | 130 | 13-1 |
| a foi | 1 | 1 | | (martin | | | | | | | | | 100 | 1 | 1000
 | | |

 |

 | 1
 | | | | - | |
 | 10000
 | 1997
 | | 1990 | 100
 | 1000 |
 | len | 100 | 1.00 | 1 | | | | | | | | | | | |
| | | | | | | Islar | d Fill | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | ۲ | | | | | | | | - | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | - | | | | | | | - | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 4 | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | hs | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | plan | e | _ | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | * | Dele | te to | olpat | hs | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | 1 | | | | | | | | | | | |
| | | | | | | | D | | | | | | | a |
 | | |

 |

 | - a 1
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | 1 | 1 | | | | | 1 | |
 | 1 | |

 | 1

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | 1 | | | | | | | |
 | | |

 | 1

 | 1
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | - | | | | | | | |
 | | |

 |

 | 1
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | - | | | | | | | 0 |
 | | |

 |

 | E.
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | Å | - | | | | | | |
 | | |

 | 1

 | 1
 | | | | | |
 |
 |
 | | |
 | |
 | | | | |
| | | | | | | | | N | | | | - | ., | |
 | 1.72 | | -

 | L

 | -
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | ġ | | | | | | | |
 | | |

 |

 | - 🖸
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | - | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | 5 | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
 | | |

 |

 |
 | | | | | |
 |
 |
 | | |
 | |
 | | | | |
| | |
 | | | 6 8 8 0 / x % | | a <u>6</u> <u>1</u> <u>10</u> <u>2</u> <u>2</u> <u>3</u> <u>8</u> | a
a
b
b
b
b
b
b
b
b
b
b | 3 ∰ 10 20 | A B B C A A A A A A A A A A A A A A A A | Image: Solution of the second of the seco | 3 S B C | Image: Solution of the second sector of the second seco | Image: Solution of the set of the s | Image: Solution of Solu | Image: Solution of the second of the seco | Image: Second | Image: Solution Control Image: Solution Control Image: Solution Contre Image: Solution Control <td>Image: Solution Content Image: Solution Content Image: Solution Content Image: Solution Content <td>Image: Solution (Section Contour.) Image: Solutio</td><td>Image: Solution of the second of the seco</td><td>Image: Solution (Section (</td><td>Image: Solution of the second of the seco</td><td>Image: Solution (Section (</td><td>A Bo Co A K Bo Control Offset. a, s, 4, 3, 2, 1, Offset span Control. Harch Fill Bland Fill A Bo B R Band Fill Bland Fill A Bo B R Band Fill Bland Fill B B B R B R Band Bland Fill District toplashs District toplashs District toplashs District toplashs</td><td>Image: Solution of Street Image: Solution of Street Jab. 15, 14, 13, 12, 14, 15, 16, 17, 15, 16, 16, 15, 16, 16, 16, 16, 16, 16, 16, 16,</td><td>3 Image: Control Control 3 5 14 13 12 14 15 16 17 18 10 <td< td=""><td>Image: Solution Control Image: Solution Control Image: Solution Contrel Image: Solution Control <td>3 5 14 13 12 14 15 12 14 15 16 17 16 16 17 16 16 17 16 16 17 16 16 16 16 17 16 1</td><td>3 5 14 13 12 14 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 10 15 12 14 15 16 10 15 12 14 15 16 15 12 12 14 16 10 15 16 15 16 1</td><td>Image: Solution of the second control Jas. Jas. Jas. Jas. Jas. Jas. Jas. Jas.</td><td>Image: Solution of the second control Image: Solution of the second control <td< td=""><td>Image: Solution of the solution</td><td>Image: Solution of the solution</td><td>3 10 2 10 1</td><td>Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td></td></td<></td></td></td<></td></td> | Image: Solution Content Image: Solution Content Image: Solution Content Image: Solution Content <td>Image: Solution (Section Contour.) Image: Solutio</td> <td>Image: Solution of the second of the seco</td> <td>Image: Solution (Section (</td> <td>Image: Solution of the second of the seco</td> <td>Image: Solution (Section (</td> <td>A Bo Co A K Bo Control Offset. a, s, 4, 3, 2, 1, Offset span Control. Harch Fill Bland Fill A Bo B R Band Fill Bland Fill A Bo B R Band Fill Bland Fill B B B R B R Band Bland Fill District toplashs District toplashs District toplashs District toplashs</td> <td>Image: Solution of Street Image: Solution of Street Jab. 15, 14, 13, 12, 14, 15, 16, 17, 15, 16, 16, 15, 16, 16, 16, 16, 16, 16, 16, 16,</td> <td>3 Image: Control Control 3 5 14 13 12 14 15 16 17 18 10 <td< td=""><td>Image: Solution Control Image: Solution Control Image: Solution Contrel Image: Solution Control <td>3 5 14 13 12 14 15 12 14 15 16 17 16 16 17 16 16 17 16 16 17 16 16 16 16 17 16 1</td><td>3 5 14 13 12 14 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 10 15 12 14 15 16 10 15 12 14 15 16 15 12 12 14 16 10 15 16 15 16 1</td><td>Image: Solution of the second control Jas. Jas. Jas. Jas. Jas. Jas. Jas. Jas.</td><td>Image: Solution of the second control Image: Solution of the second control <td< td=""><td>Image: Solution of the solution</td><td>Image: Solution of the solution</td><td>3 10 2 10 1</td><td>Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td></td></td<></td></td></td<></td> | Image: Solution (Section Contour.) Image: Solutio | Image: Solution of the second of the seco | Image: Solution (Section (| Image: Solution of the second of the seco | Image: Solution (Section (| A Bo Co A K Bo Control Offset. a, s, 4, 3, 2, 1, Offset span Control. Harch Fill Bland Fill A Bo B R Band Fill Bland Fill A Bo B R Band Fill Bland Fill B B B R B R Band Bland Fill District toplashs District toplashs District toplashs District toplashs | Image: Solution of Street Image: Solution of Street Jab. 15, 14, 13, 12, 14, 15, 16, 17, 15, 16, 16, 15, 16, 16, 16, 16, 16, 16, 16, 16, | 3 Image: Control Control 3 5 14 13 12 14 15 16 17 18 10 <td< td=""><td>Image: Solution Control Image: Solution Control Image: Solution Contrel Image: Solution Control <td>3 5 14 13 12 14 15 12 14 15 16 17 16 16 17 16 16 17 16 16 17 16 16 16 16 17 16 1</td><td>3 5 14 13 12 14 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 10 15 12 14 15 16 10 15 12 14 15 16 15 12 12 14 16 10 15 16 15 16 1</td><td>Image: Solution of the second control Jas. Jas. Jas. Jas. Jas. Jas. Jas. Jas.</td><td>Image: Solution of the second control Image: Solution of the second control <td< td=""><td>Image: Solution of the solution</td><td>Image: Solution of the solution</td><td>3 10 2 10 1</td><td>Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td></td></td<></td></td></td<> | Image: Solution Control Image: Solution Control Image: Solution Contrel Image: Solution Control <td>3 5 14 13 12 14 15 12 14 15 16 17 16 16 17 16 16 17 16 16 17 16 16 16 16 17 16 1</td> <td>3 5 14 13 12 14 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 10 15 12 14 15 16 10 15 12 14 15 16 15 12 12 14 16 10 15 16 15 16 1</td> <td>Image: Solution of the second control Jas. Jas. Jas. Jas. Jas. Jas. Jas. Jas.</td> <td>Image: Solution of the second control Image: Solution of the second control <td< td=""><td>Image: Solution of the solution</td><td>Image: Solution of the solution</td><td>3 10 2 10 1</td><td>Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td></td></td<></td> | 3 5 14 13 12 14 15 12 14 15 16 17 16 16 17 16 16 17 16 16 17 16 16 16 16 17 16 1 | 3 5 14 13 12 14 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 17 16 10 15 12 14 15 16 10 15 12 14 15 16 10 15 12 14 15 16 15 12 12 14 16 10 15 16 15 16 1 | Image: Solution of the second control Jas. Jas. Jas. Jas. Jas. Jas. Jas. Jas. | Image: Solution of the second control Image: Solution of the second control <td< td=""><td>Image: Solution of the solution</td><td>Image: Solution of the solution</td><td>3 10 2 10 1</td><td>Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td></td></td<> | Image: Solution of the solution | Image: Solution of the solution | 3 10 2 10 1 | Image: Solution Content Image: Solution Content Image: Solution Conten Image: Solution Content <td>Image: Source of the second content. Image: Source of the second content cont</td> | Image: Source of the second content. Image: Source of the second content cont |

Now, lets take a look at some other tool paths. Let's delete this one.

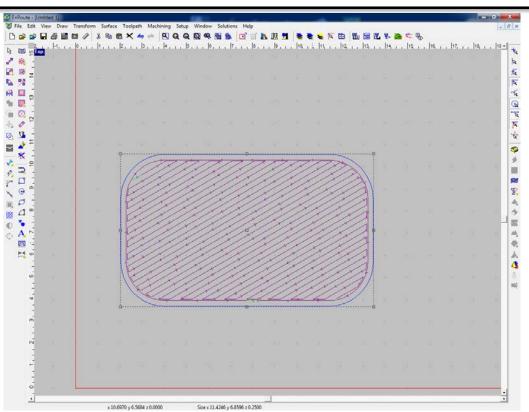


oute - [Unt						111	-					12	-					-	• •
	iew Draw Tran		ce Toolpath Ma		Setup Wi							-	(M)						E
e 🚅 🕻		J & 40	Offset ope			PK 5		991		1 .		R 🖽		1 2- I	1 45 Q	b he	In	. Les	lee
	, -1, , , 0,	LI PIT	Hatch Fill.			10,	1.1.14	1 1 10 1	1 1 la 1	1, 114	1.1.11	1.1.114	1 13 1	1 114	1 114 1	119	1 124 1	, [16]	1, 119
ą -			U Island Fill.																
1			Spiral Fill																
- Ť.	53		Drill			10													1.5
-			🛷 Slots																
2	72		Congraving.			(\overline{v}_{i})													- 7
1			Pyramid																
• ≅	1273		Edit toolpa			2													17
1 -			P Edit Entry/																
, =	8		/* Edit Bridge			1													- 54
< -			Distort too																
			Daisy chair																
2 ⁻			Project too K Delete too		dane								1						
1 .			TX DELE LUO	(paries									/						12
, i i i i i i i i i i i i i i i i i i i	- 12 - 14 - 14 - 14 - 14 - 14 - 14 - 14		1																
9 -																			
1 °°	- E		1.000										- 15 S						12
•								2028											8
1	<		1 00					0											14
7																			
1 0	and a		1 222										- a 3						5
			1										1						
in .	100		1										/						- 04
2			$\langle X \rangle$										/						
- -			\sim																
			ġ					B					······································						
-	12																		
	1.0																		
	-																		
	2																		12
1																			
-	- C																		10
5																			
	. N																		- 5
, <u> </u>			.9740 y 15.2042 z 0.0					6 z 0.0000			Time: 634:								

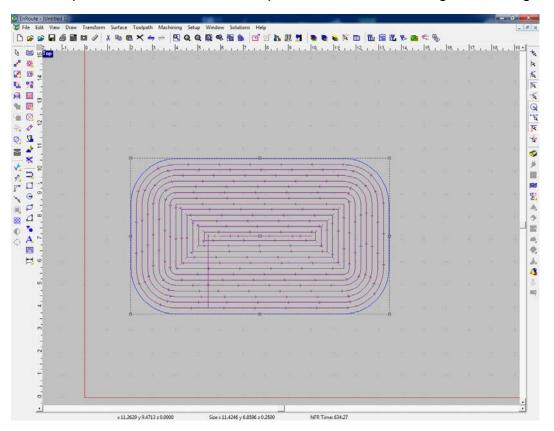
Highlight the geometry again and select "Hatch Fill" from the Toolpath menu. This is a pocketing tool path.

ut Templates				-	OK
urrent Tool	1/2" end mil			•	Cancel
	Items	Current Value	Unit		<u>S</u> ave as
Cut typ		Fill		- <u>-</u>	<u>0</u> 070 00
グ 🗉 Depths		<u>¥</u>			Library
	urface		; in	=	
	nal Depth		in		
🏹 🗆 Fill					
0,	verlap	50.0000	%		Close
H	atch angle				
🗸 🗆 Passes		F			
N	umber				
М	aximum per Pass	1.0000	in		N
A	ctual per Pass	0.2500	in		X
Fi	nal Pass	Г			-

Most of the cut parameters are the same. Depth, feed rates, number of passes, etc... The hatch fill will move back and forth across the pocket. The hatch angle is defined here.

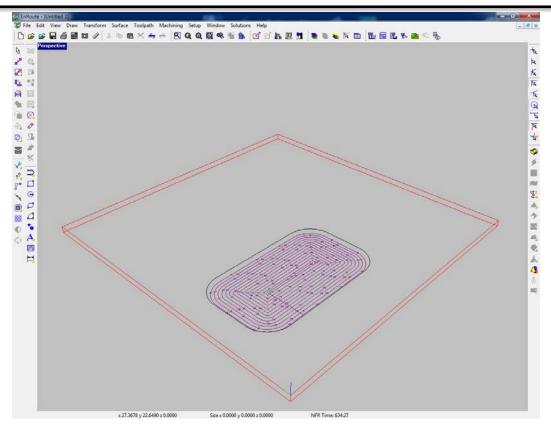


This is the top view of the Hatch Fill tool path. Note the hatch angle of 30 degrees.

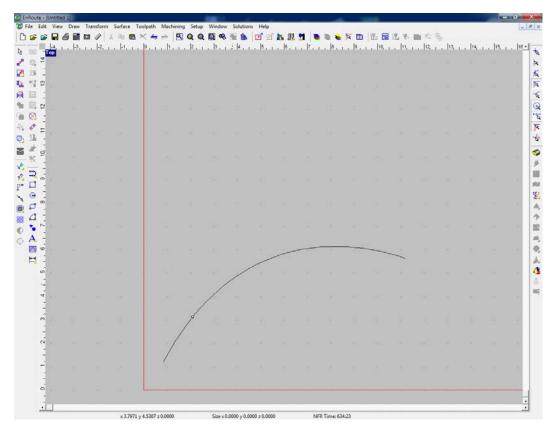


The "Island Fill" tool path will give you the same end result. In this case, the path follows the contour of the shape. This makes more sense than hatch filling in a lot of situations (like lettering, for example).





Here is a perspective view of the island fill.



Now, let's take a look at an open contour.

EnRoute: 2.2



nRoute - [Unt File Edit V		Transform	Surface	Toolpath Machining Setu	m Wind	ion Solution	v Hele		_		- 1	-						
			X Rb C			R 🛅 🏠		N				11%	N. W.	100	Ð.,			1
La	1.1			🤞 Offset open contour		1 . 4 . 1										. 14	, 115	. 116
	and successes			Hatch Fill														2040 DAN 27
e 1				E Island Fill														
12				Spiral Fill Drill	2.2													
10000				Slots														1
8.1				Engraving														
42				Pyramid														2.
0-				Edit toolpaths														
12 -				🖋 Edit Entry/Exit														10
1				/* Edit Bridges														
≪ [₽]				Distort toolpaths														- 51
n 2				 Daisy chain Project toolpaths to plan 	2.1													
				K Delete toolpaths	90 I													- 33
⊕]																		
0 ~																		
a :																		
~																		
A				D				p					0					
N 9																		4.1
₩ }							/											
10						/												4.1
-																		
4				100 8									1					
1				¢									0					
e				1 4														12
1																		
5													1					
-																		
1								g					e					
1				10 10														7.1
1																		
0							_		_		_	_						
-			_															
<u>.</u>	contour			030 y 14.5349 z 0.0000		×10.3413 y 4.				R Time: 63		_						-

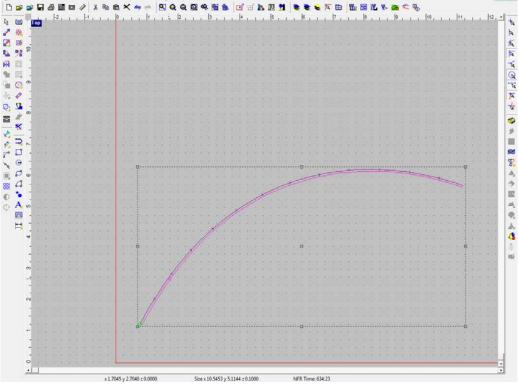
Some of the tool paths are only for closed contours, so only the paths that will work are available.

en Contour Offset			4		
Strategy:			•		OK
Order To	ol	Туре		Edit 🔺	Cancel
🥒 1 韋 1/8'' End Mill		Rough	0.1000 🜲		Edit Plan
					<u>S</u> ave as
l Available Tools:			Cart toole bur	<u> </u>	Add Tool
Description	Tool Type	•	Sort tools by: Color	-	Delete Tool
120 deg. Conic	Conic	Î.	[Color		Clear
1/16" End Mill	End Mill			-	Cical
1/8" End Mill	End Mill				
3/16" End Mill	End Mill				
Open Contour Offset Parameters: Follow contour	Г	*	1 _		_
Side					
Left		E			
Middle	Γ				
Right					
WithRelief	_				

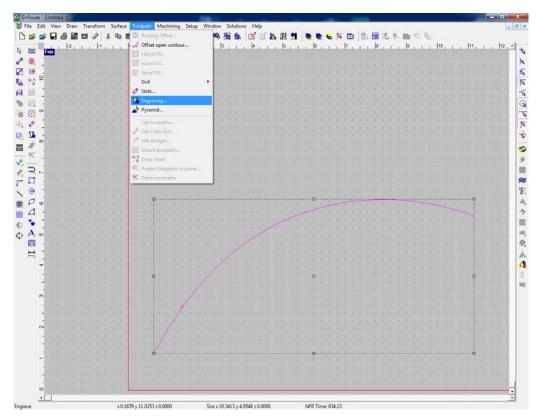
Choose whether to machine to the left, right, or center of the open contour. The line direction will be visible on your top view.

Don't forget to edit your cut definition for depths, feeds, and speeds!

EnRoute - R



Notice how the cut is to the left of the line, relative to its direction.

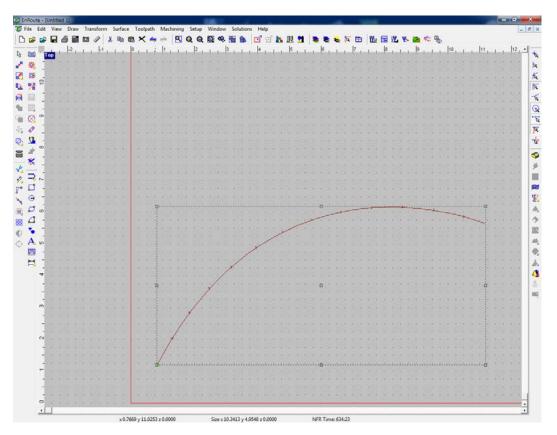


Another open contour tool path option is Engraving. This will have the tool follow the line to a designated depth. Cutting to the left or right of the line is not an option here.



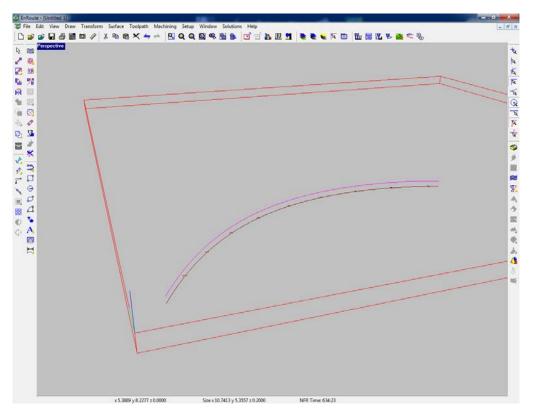
<u>è</u> trategy:			•			OK
Order	Tool	Туре	Depth	Edit		Cancel
🕨 1 🌲 90 Deg Conic	14	Engrave	0.2000 🌲			
						Edit Plan
						<u>S</u> ave as
					<u> </u>	Add Tool
vailable Tools:			Sort tools by:			Delete Tool
Description	Tool Type	A	Color			Delete 1 del
5mm Drill	Drill					Clear
174'' Drill	Drill				-	
0.03'' Engrave	Engrave 2					
0.06'' Engrave	Engrave 2	-				
ngrave Parameters:						
3D engrave toolpath	Г	*		100	<u> </u>	
Square corners	V				~	en la
Follow contour						4
External (male)	V					
Internal (female)					V	Gen U
Apply relief	V					

Select cutter and define cut as usual.

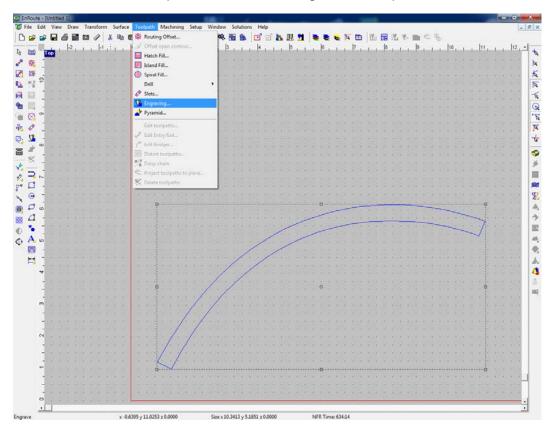


The cut follows the line.



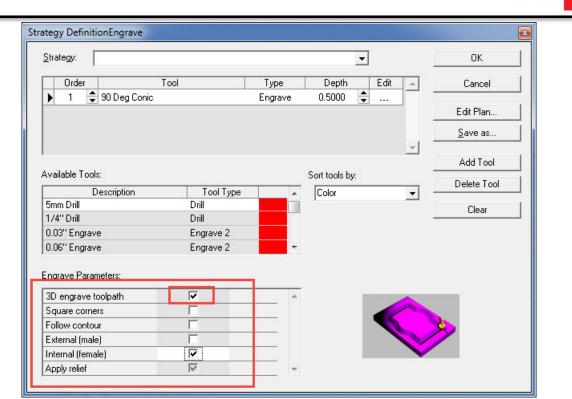


Perspective view showing the cut depth.



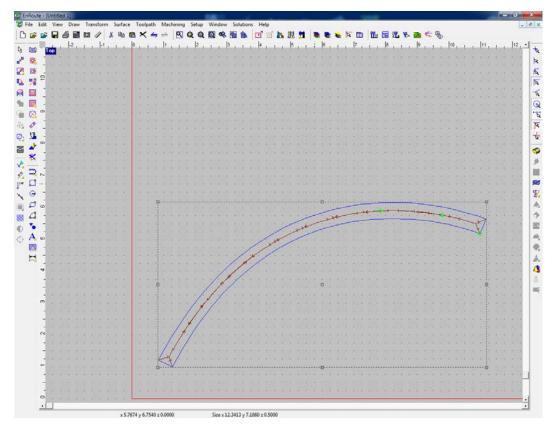
3D engraving or V-Carving is also available with the Engrave tool path. A closed geometry is required.

EnRoute: 2.2

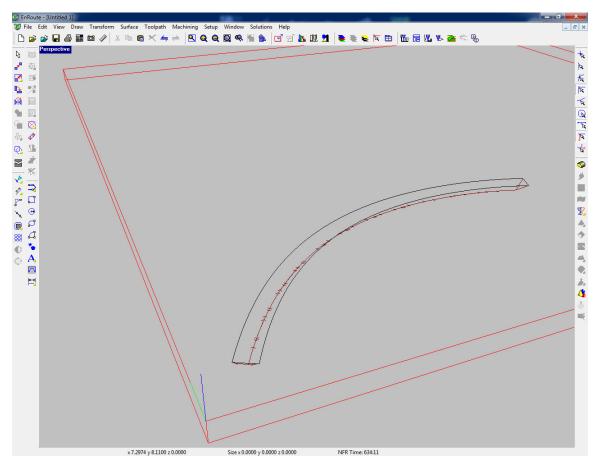


Techno CNC Systems

The key to the carving is to check "3D engrave toolpath" in the cut definition. In this case, the depth of cut will be variable. You can set the max depth, but the cutter will lift and adjust based on the width of the contour it is carving. This allows sharp inside corners and fine detail.



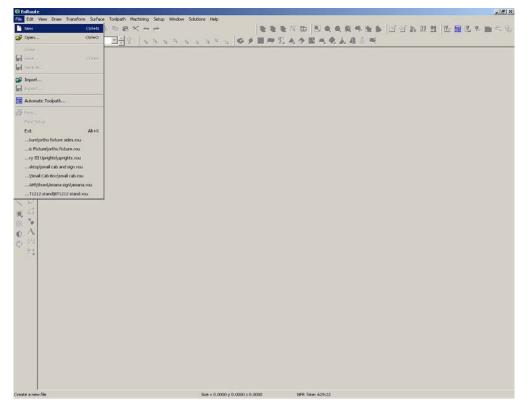
Top view of the 3D engrave tool path. Notice how the tool path is the centerline of the geometry.



Here is the perspective view to illustrate how the cutter ramps in and out to give sharp inside corners.



This section covers a nameplate project from start to finish.



To start a new file, go to "File > Open".

User Defined	Width (x):	12.0000 + in	Cancel
C Fit Plate to <u>D</u> esign	Height (y):	8.0000 + in	Save <u>A</u> s
C Fit Plate to <u>S</u> election	Thickness (z):	0.7500 🛓 in	
(Origin: 0.0000 -	≓in ×Maggin:	0.0000 ÷ in	<u>R</u> emove
Origin: 0.0000	in YMargin:	0.0000 • in	
Surface at top of plate			

Enter your material size, make sure that the X and Y origins are set to 0 and the surface is at the top of the plate.

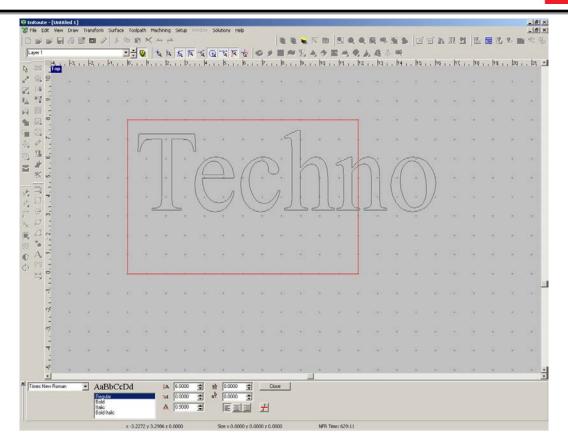


Untitled		onder	n 5	eface	Too	in the second	Ma	chinava	540	10 A	in the			. He		-		-	-	-	-	-	-	-	-	-	-											-
										200										-	h I	-		0	0 1		R. 76		16	n coj	K	12 9	1.13			1. 4		1
	0.000		201							85	1		-	17	21	0	1												10.75		-		2 10	-		2,6722		
la .	. 92 .	h						ы, ра 	,10	19	54	,w	54	14	14		2	.10	E k	itar i	.10	- 10 17		100 .	in.	4	g .		.10	. 1	n	10	he .		e	42.	ω.	
-		-	14		1	de la	~			de la					199					10		1	11	100				Part.				1	111	1.1.1				ŝ
+		1					122			-	1	00			1.352		-	0										-				122				100		
																						1						÷										
					*			+) ()																				#. +		+:::#			* *			1. C. A		
																												1										
													• •															÷ 1										
		1																																				
+ •											•														-					* •								
																						1			2			3										
		1																																				
		-			1			-																				1					1			100		
					-			-											1000			1			3													
	view 0		Vene Draw Transfor	Vew Draw Transform S	Vere Draw Transform Surface	Vew Draw Transform Surface Too ☐ 25 0 1 COI 27 3 4 1 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	Vew Draw Transform Surface Toolpoth	Vew Draw Transform Surface Toolauth Ma	Vern Draw Transform Surface Toolpath Hadming □	Vew Draw Transform Surface Toolauth Machining Set	Yen Dram Transform Surface Toolauth Machining Setup V □ A III III / X III III X A A III III / X III III X A A III III / X III IIII X A A III III / X IIII X A A III IIII / X IIII X A A III IIII / X IIII X A A III IIII / X IIII X A III IIII / X IIII X A IIII X A IIII	Yem Draw Transform Surface Toobush Machines Setup Window ☐ @ IIII (2) × 100 (2) × 4-2	Yeen Draw Interform Surface Todesh Machines Setup Window Sak 日日日前間1日/IX Int 100×イムー 日日100×15k 友友友友なな。 人、「「」」」、「」、「」、「」、「」、「」、「」、「」、」、「」、	Yeen Draw Transform Sufface Toologich Mediening Setup Window Subtorn 日本語 日本 アンドローン (An Rei An	ven Cren tereform Suffer Todpath Hodrang Setup Wenden Subscript □	ven Dren Tanafors Safar Todash Hadang Sena Wadan Sakara Heb 日音間間のグメキロペイーク 日子愛した人名日本 空子愛した人名氏なんのであった。 日子愛した人名氏 ママル・ト・マ	Wen Dam Taraforn Safae Todoth Hodenny Setup Weden Sature Heb 日后間間は/上半胞ズムナ 日気間気気/上半胞ズムナ 日気を開始した、「ないた」を、「ないた」ので、た、ので、	Wen Dam Tatafore Safar Todoth Maching Stop Wodow Salatan Heb 日前間間の/上市電気メート 日前間間/上市電気メート 日前間になった。 日前間に、 日前目 日前間に、 日前目 日前間に、 日前目 日前目 日前目 日前日、 日前日、 日前日、 日前日、 日前日、 日	Wenn Chenn Teardronn Surface Toolpath Machineng Settup Window Soldzers Help ☐ 25 11 20 20 20 20 20 20 20 20 20 20 20 20 20	veen Dreen Teardorn Suffice Toolpath Machana Setup Window Subtrars Help □ ③ ■ 00 > × 10 00 × 1 → □ ∃ 00 × 10 k k k k k k k k k k k k k k k k k k	Wen Dam Interform Suffee Todach Holdeng Step Weden Solutions Heb 日日間間ログドキャラストーー 日白の「私日友下」(日本下大会)を手載した。 日日、日本市大会」「日本下大会」「日本下大会」「日本市大会」」	Wen Dam Taraforn Safae Tobath Hadrang Setup Weden Salaons Heb 日后間間の/上小市商×~~ 回台を「大市商×~~ 日台を「大市太郎」(国际大学)を手載ののよう。 日日の「日本」)、「日本、日本、日本、日本、日本、日本、日本、日本、日本、日本、日本、日本、日本、日	Wen Dam Tatafore Safar Todoth Maching Stup Weden Salars Heb 日の間ログンド市のメート 日気の間ログンド市のメート 日気の「たち」の大力な「気気気気な」の少し、大力な「気気気気な」のよう。 日気の「気気な」の、たいの、たいの、たいの、たいの、たいの、たいの、たいの、たいの、たい	wer Den Interfern Suffer Toolanth Maching Stup Window Saktors Heb 日音間ログンド地路メール 日子の大人大人大同人の文大大の大人の大人の大人の大人の大人の大人の大人の日本 日子の人人、「「」」、「」、「」、「」、「」、「」、「」、「」、「」、」、「」、」、	wer Dam Tarafor Sofer Tobert Holang Stip Winder Solars Heb 日前間間/と半電気イーペー 回当後一大大反下式QC以下す。の世界によう開発の。	Wen Dam Taraforn Suface Todath Hodeng Seno Weden Sakara Heb 日の間回/ドキモモメート 回台を たんな同情の写下すの意味のの見ません。 日台を たんな同情のです。 日台を 1000000000000000000000000000000000000	Wen Dam Taraforn Safae Tobath Hadrang Setup Wedan Salaton Heb 日后間間が/ド市商×イード 日子の「大市商×イード 日子の「大市太陽」な「国际な」の学習が出入今回共会な。 日子の「大市太陽」など、日本の「大市」の「大市」の「大市」の「大市」の「大市」の」の「大市」の「大市」の「大	Wen Dam Taraforn Safar Todoth Hadrang Stap Wadow Salaton Heb 日の間ログメルトロスメート 日白の目のグストルロスストート 日白のマストート 日白のマストートーーーーーーーーーーーーーーーーーーーーーーーーーーーーーーーーーー	wer Dar Interform Sufface Tookoth Maching Statu Woodow Saktors Heb 日本語語が/ドキ語ストーー 回想の「大キャ語ストーー」 回想の「大キャ語ストーー」 回想の「大キャ語」の「大学」の「大学」の「大学」の「大学」の「大学」の「大学」の「大学」の「大学	ver Dam Tarafor Sufar Tolah Holang Ship Weder Salars Heb 日前間間/ドキャラス・イー 回当後、大大友下式QTS下去のが目前にあったようにあった。たって、たって、たって、	Wen Dam Interform Suffer Todesh Holeney State Window Salaces Heb 日心間間がアメキモモイート 回当後、大人友下式QUNITを会体サ目中にようなようなような。 「日日」、「大人友下式QUNIT」を、「「、」」、「、」、「、」」、「、」」、「、」」、「、」」、「、」」、「	Wer Daw Interform Suffer Todeth Holderg Step Winder Skitzer Heb 日心間ログンド型商ペート 回当後、大人友同式QTST友(多単目型別人方面共会人体の共 した。内、た、内、た、内、た、内、た、内、た、内、た、内、た、内、た、内、た、内、	Wen Dam Interform Suffee Todach Holdeng Steps Weden Solution Heb 日本語語がアメキャラ・ 日本語を入りた 日本語を入りたで、「「「「「「」」」」」 「「」」」」」 「」」」、「」」」、「」」」、「」」	Wen Dam Taraforn Suface Toboth Holenny Seno Weden Sakara Heb 日の間回/と中色メート 回台を「太内友同式Q(文百女を)を単言を入めるのののを始め(ゴゴム記録) 日台を「太月太同式Q(文百女を)を単言を入めるような。4、4、4、4、4、4、4、4、4、4、4、4、4、4、4、4、4、4、4、	Wen Dam Taraforn Safar Todoth Hadrang Stap Wadow Salares Heb 日の間間グメキャロス・イード 回当の 大力人所に、Q 国际大会での美国市営人会開発の成の美 した。 Ph. D. Ph. D. Ph. B. Ph. Ph. B. Ph. Ph. B.	Wen Dam Taraforn Safar Todoth Hadrang Stap Wadow Saktors Heb 日本語語が/ドキ語ストーー 日本語(大人大阪家家庭院家会会)の中国である今回の代表の第一日には「日本語』では、 日本の「たん」の「たっていた」の「たっていた」の「たっていた」の「たっていた」の」で、「たっていた」の、「たっていた」の、「たっていた」の、「たっていた」の、	New Conference Series Toologies, Holines Series Worker Soldiers Hele □ ② ■ ◎ ■ ◎ > × 〒 〒 × ← → □ ③ ■ ◎ > × 〒 〒 × ← → □ ④ ● ● ● ■ ○ N ● ○ ● ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ●	New Tore Tore for Notesh Techano State Weder Select Heb □ S ■ Im P × K = C × C + C □ S ■ Im P × K = C × C + C □ S = M = K = C × C + C + C + C + C + C + C + C + C +

The first step of the drawing is to choose a font a write the nameplate text.

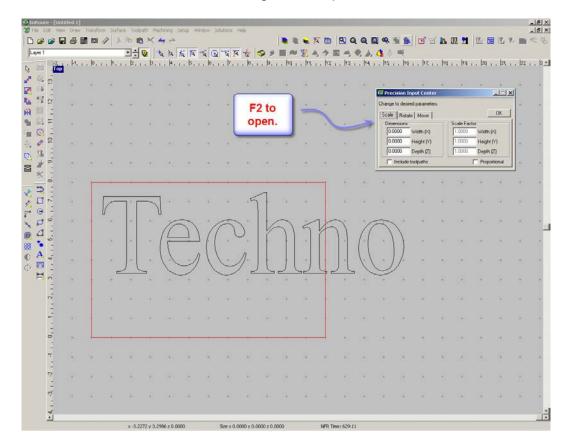
	- 6		nsform S	X 国	8	< 4	\rightleftharpoons								e e		≞ !			R 4.	N 1	3	9 I	s II	1				
Layer 1				-]÷ 😵	+	-	KA	TA	Q 7	- R	*	6 9			A _4 <		▲, (2. 3.		5 1115								
	, -3	- N	2, 1 , -1		0, , ,	1.1.1	2,	, 3, 1	, 4,	u d	5, 1,	6,1	. 7	, 8 ,	, 9,	1,1	9	11	12 1	, 13 ,	, 14 ,	, 15	, he	1.1	17, 1,	18	, þig i	, 20 ,	, 21
璧 8	-	4	+	+			1	+	14.	4		¥	÷	+	+	+			÷	+	+	14.	+		ŧ.	+	+	+	14
D 1																													
- F	+	+	+	+	+		+	+	+	9		÷	*	+	+	+		÷	+	+	+	+	+		+	+	+	+	+
L L L L L L L L L L L L L L L L L L L		+		1															1	+			+		+	+		- 40	+
\$ \$ 1 - 7 - 1	1.40	4							+					14						+	- 4				e.		1.4		+
¢ :					1			J																					
<u>n</u> .		+	*	e - 19	• •		+	+	+	+		+	+	+	+	+			-	+	. +	+	+		+	+		+	+
2 - X																													
	+	+	+		• •	2	*	+	+	+		+	+	+	+	+			-	+	+	+	+		÷	+	+	+	+
© 🗖 🔊	4	14	+					+	14	4		¥.	¥	+	÷.	+				+	+	34	+			4	4	+	14
3 4						J	l	~~~																					
ື ຕັ	+	+	+				÷.	+	+			*	*	+	+	+			-	+	+	+	+		ŧ	•	+	+	+
2. L.																													
4 *	+	+	+				+	+	+	+		+	*	+	+	+			Ť	+	+	+	+		+	+	+	+	+
A-	+	+	+				+	+	+			+	+	+	+	+			1	+	+	+	+		+	+	+	+	+
A -																													
	1.00	+						1												*	. +		1		e.	*	. •		
-		.*	+				*	+		1		*	*	*	. +	*			*	*	*	. *			•	*	. *	1.1	1
Ņ	+	+	+	+			+	+	+	+		+	+	+	+	+			+	+	+	+	+		+	+	+	+	+
2																													
97 -	+	+	+	+	•		÷.	+	+	+		+	+	+	+	+			+	+	+	+	+		+	+	+	+	+
-	+	+	+	*	*		*	+	+	*		*	*		+	+			+	+	+		+		+	+		+	+
ų	+	+							+					+	+				+	+	+				+		+		+
•		_					-		-						1														
Times New Ro	man	•	AaBt	oCcD	d	(i)	- C	5.0000			0.0000 0.0000	1	C	lose	J														
			Regular Bold Italic				186 J.		•			± ∃	Ŧ																
			Bold Ital	ic			+ I		*	1	ĒĒ		Ŧ																

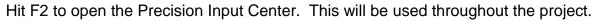
For now, just click anywhere and start typing. We will move the text into position later.

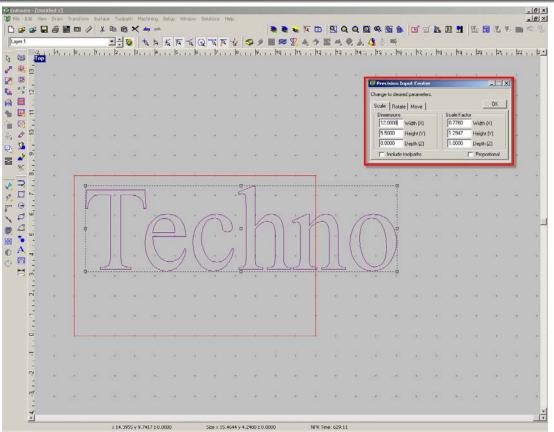


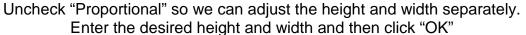
Techno CNC Systems

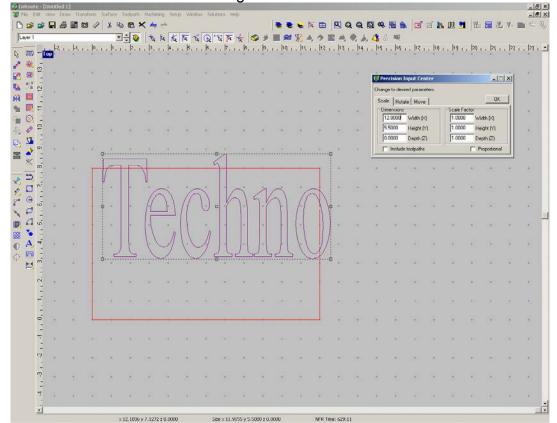
The finished text is too large for the plate. We will resize it.





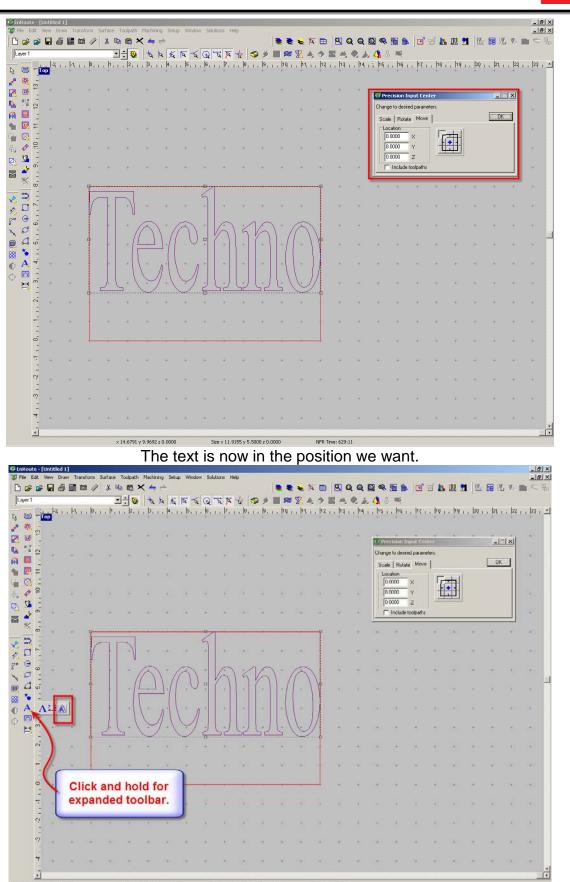






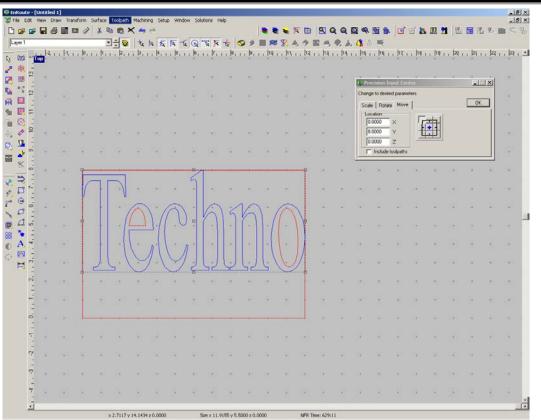
The text changes to reflect the new dimensions. Now we can move it into the correct position.

ert text oby

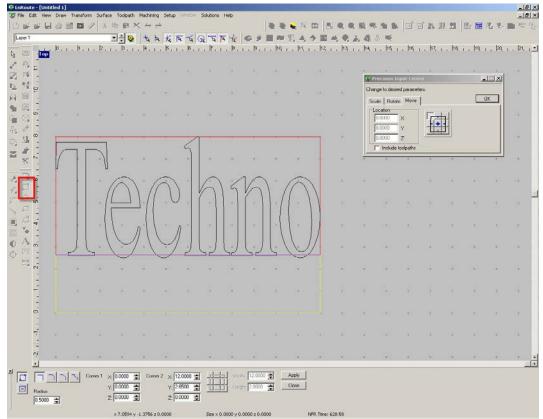


Techno CNC Systems

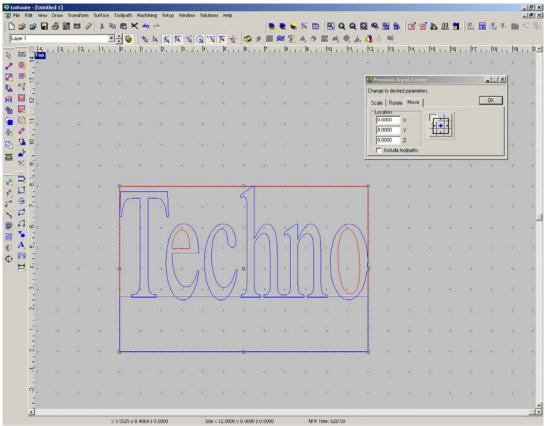
Click and hold the text icon to expand the toolbar. Then click on the icon to change the text to curves.



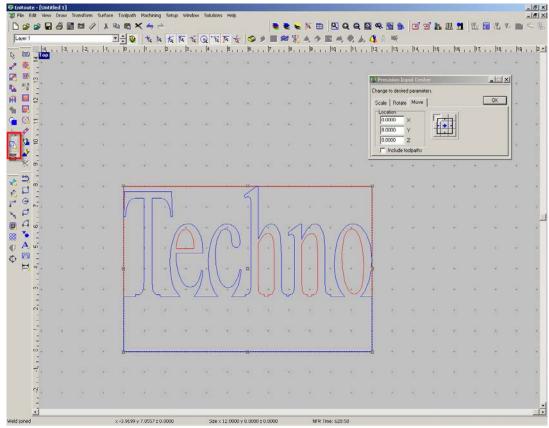
The text is now vectorized. Notice how the inside geometries are red. This is EnRoute's way of indicating that it recognizes a closed geometry inside of another closed geometry.



To make the base of the nameplate, select the "draw rectangle" tool.

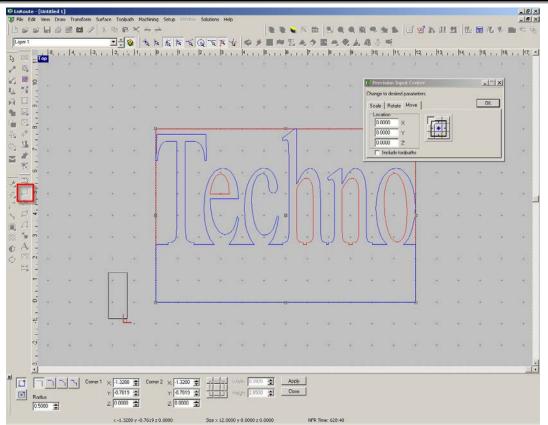


The rectangle should slightly overlap the bottoms of all the letters.

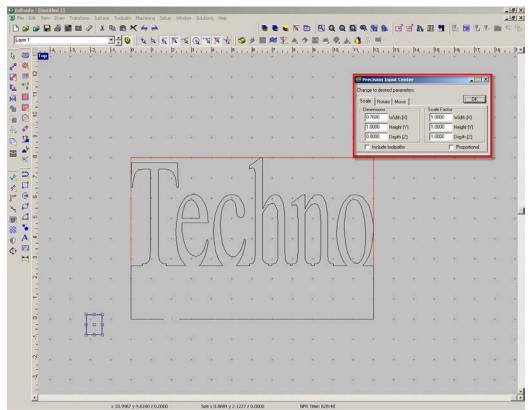


Highlight both the lettering and the rectangle.

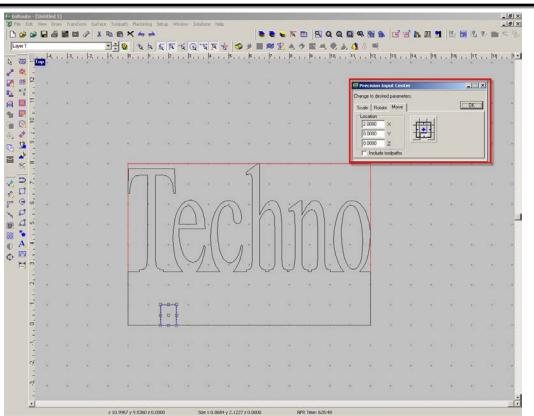
Then click on the "weld joined" tool to automatically trim the overlapped lines.



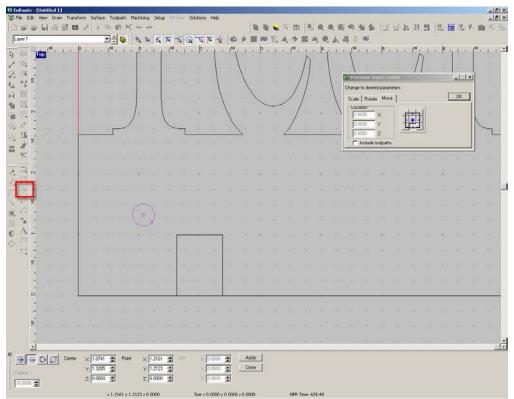
Now we have to add the slots for the nameplate feet.



Using the PIC, resize the new rectangle to .76" wide by 1" high. We want to make the slot slightly wider than the thickness of the material.

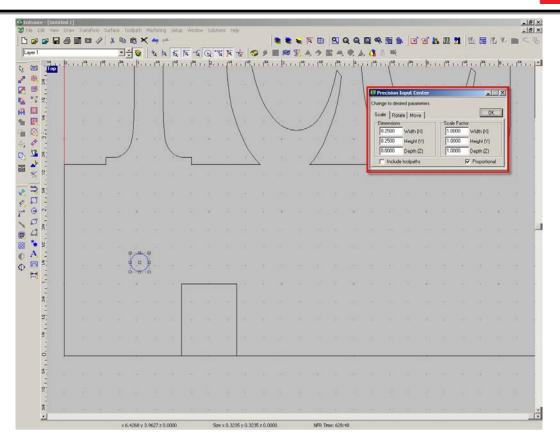


Now move the resized rectangle so that the bottom center is at X=2 and Y=0. The PIC grid selects the anchor points.



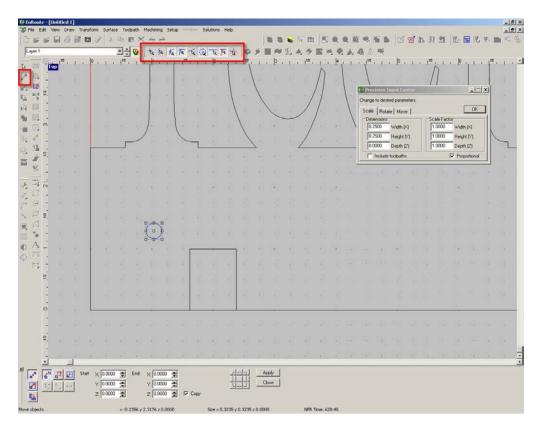
Now, so we don't have to worry about inside corners getting in the way later, we can add a dog-bone fillet to the slot.



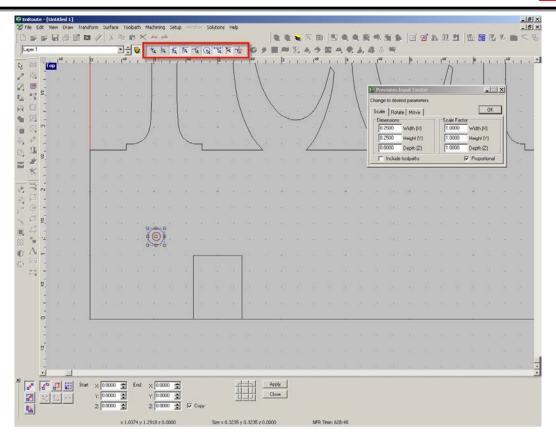


Techno CNC Systems

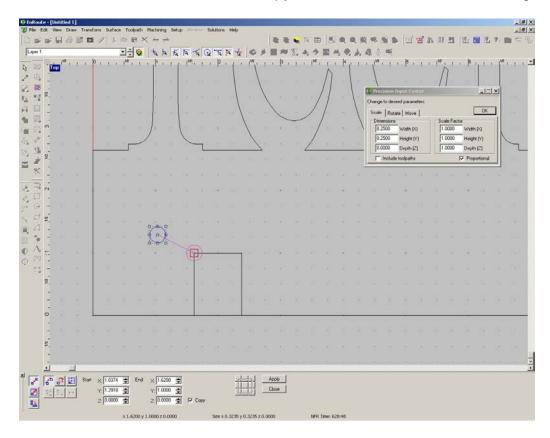
Create a circle and resize it to .25".



Now we can use our "move objects" tool to copy the circle to the corners of the slot. Make sure that you have the appropriate "snaps" turned on.

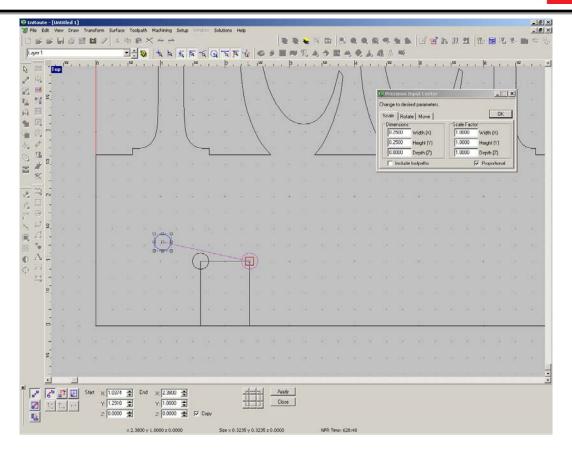


Grab the circle from the center and copy it to the first corner of the rectangle.



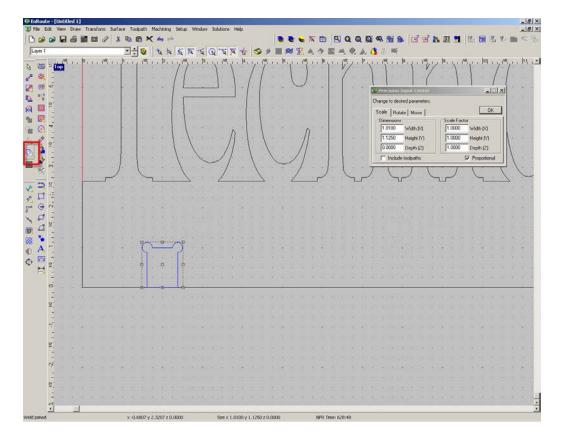
Click to apply.



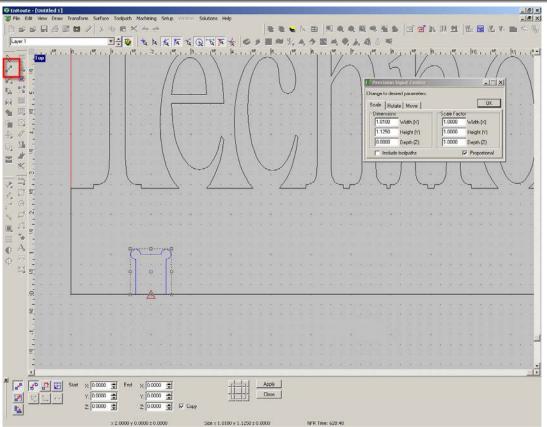


Techno CNC Systems

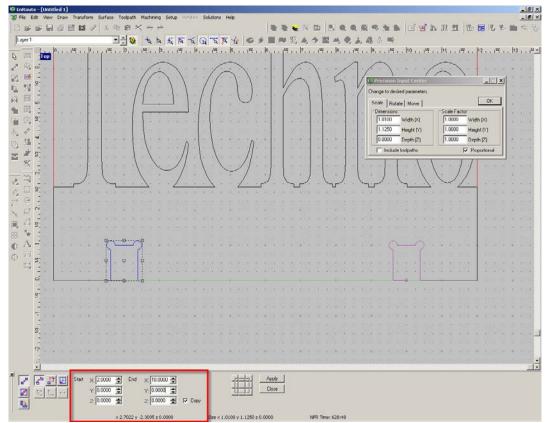
Repeat for the other corner and then delete the original circle..



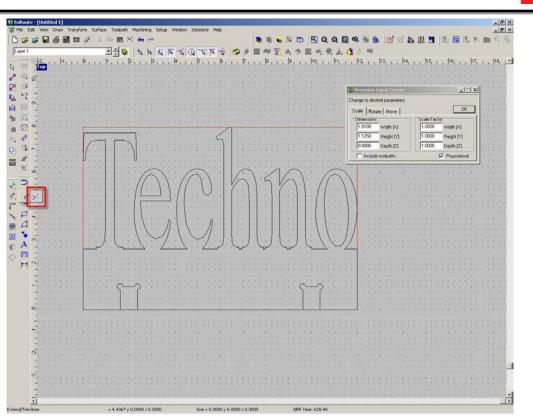
Select the rectangle and circles and use the "weld joined" tool again to trim the overlap.



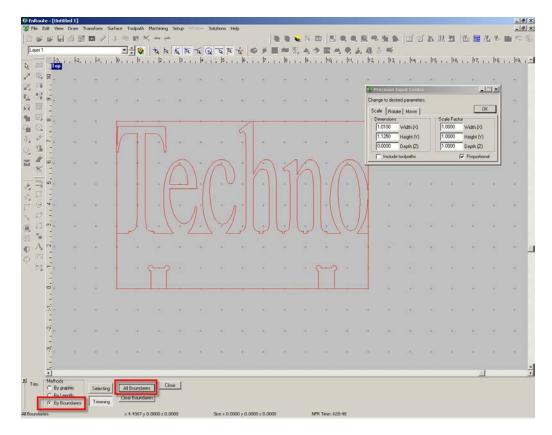
Now, we want to copy the new geometry to the other side of the nameplate for the second stand.



Using the "move selected" tool again, copy the slot so the center is at X=10, Y=0.

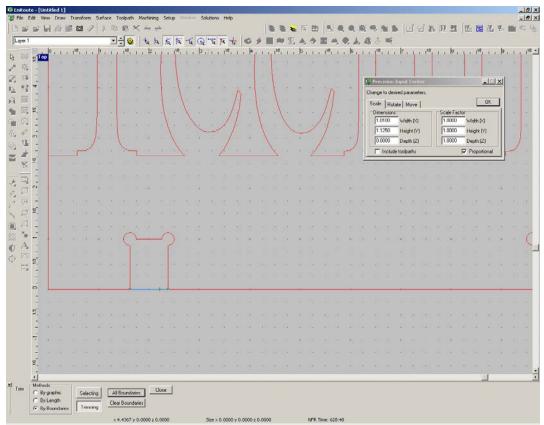


Now we will use the "trim" tool to open up the bottoms of the slots.



Select "by boundries" and "all boundries".

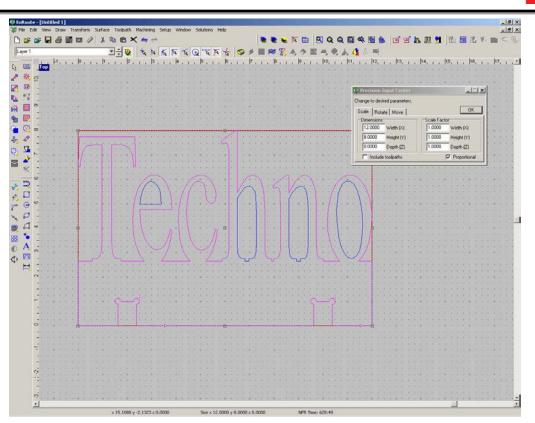




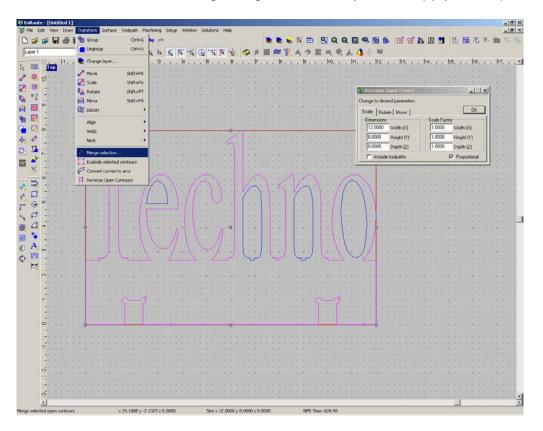
Then click on the segment to trim out. It will highlight a different color.

_				÷	•	tete	KR	2 - 6	Q 1	R to	G	#	1	3 A. 1	*	4, 4,	. A. 1	6 8	ШĘ –					
-	7.1	1.19	1 1 19	1.124	1, 18,	1.19	1 1 199	1.19	, , ja ,	1 1 199	1 149	1. 124	, hq	1.11	1 100	1117	1. 11	1.154	1.14	1.1 199	1 12 1	1.1%	1 1 149 1	1 124
		1		0	×	1		10	11	0		1	×		1		1		/	1				
	-	1		1	1	1.		1	-	1		1	4		1		1	Preti	sion Inpr	at Center	2			-02
	-				Ц				-				-	107		<u></u>			to desired (OK
																		Dime				ale Fact	or	
																		1.01		idth (M) Night (M)		0000	Width (Height (
	•				÷.				2				8				2	0.00		epth (Z)	Ī	0000	Depth [2	
																		(F)	nclude too	lpaths	-		Proport	ional
									\sim		(1												
															ſ.,									
_																-0-	- X							
	÷.,				•								*								÷.			
de	_	-1																				_		1

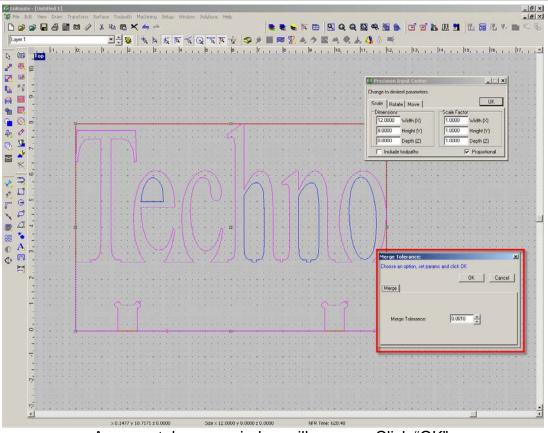
Repeat for the other side as well.



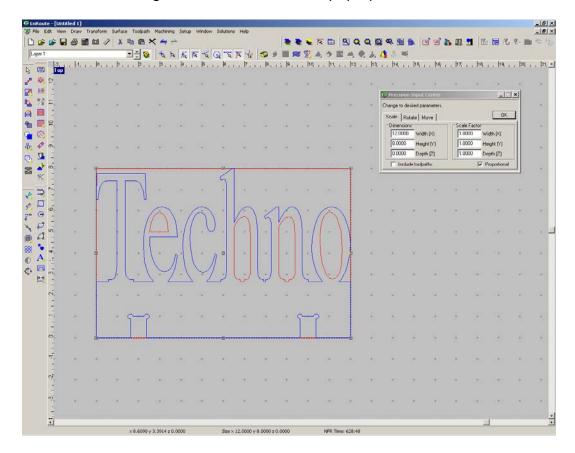
If you highlight the vectors you will notice that some of them are pink. That indicates that they are open contours and need to be merged together before you can apply a tool path.



Go to "Transform > Merge Selection".

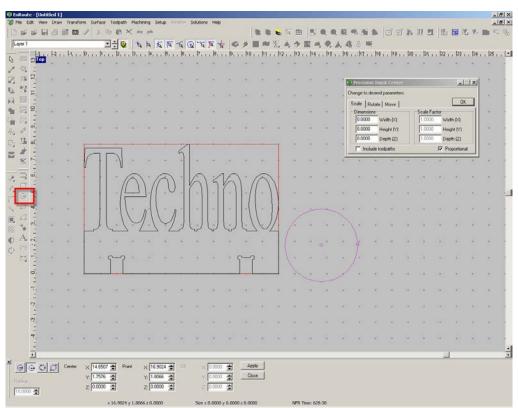


A merge tolerance window will pop up. Click "OK".

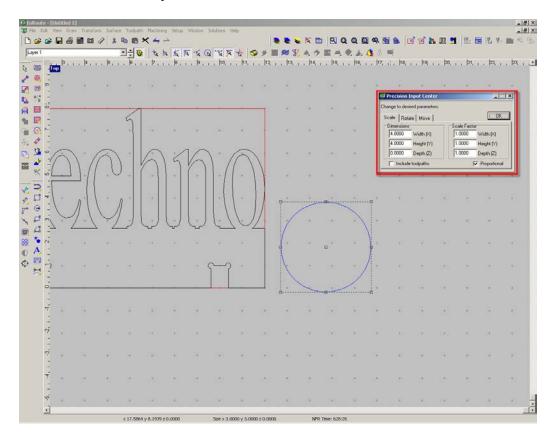


The re-merged outline.

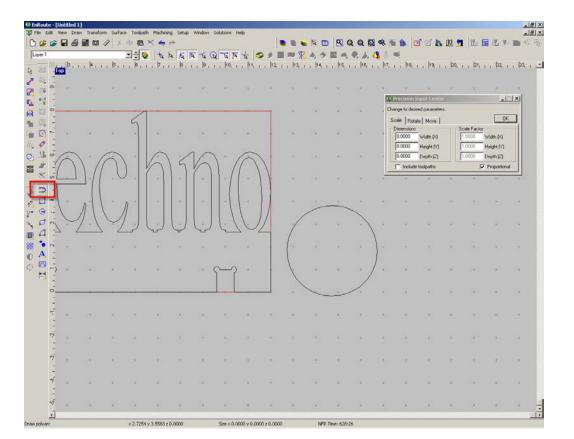




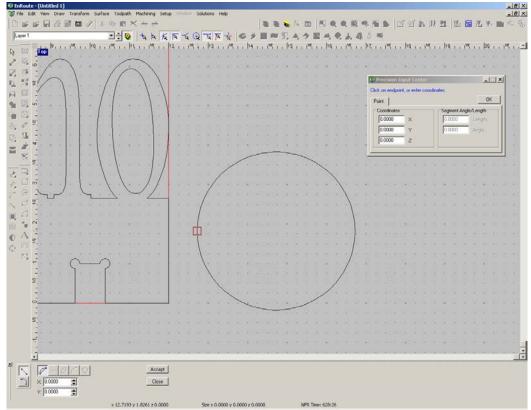
Now we need to make the feet. It is OK to work outside of our plate – it is only there for visualization. Create a circle.



Resize the circle to a 4" diameter, using the PIC.

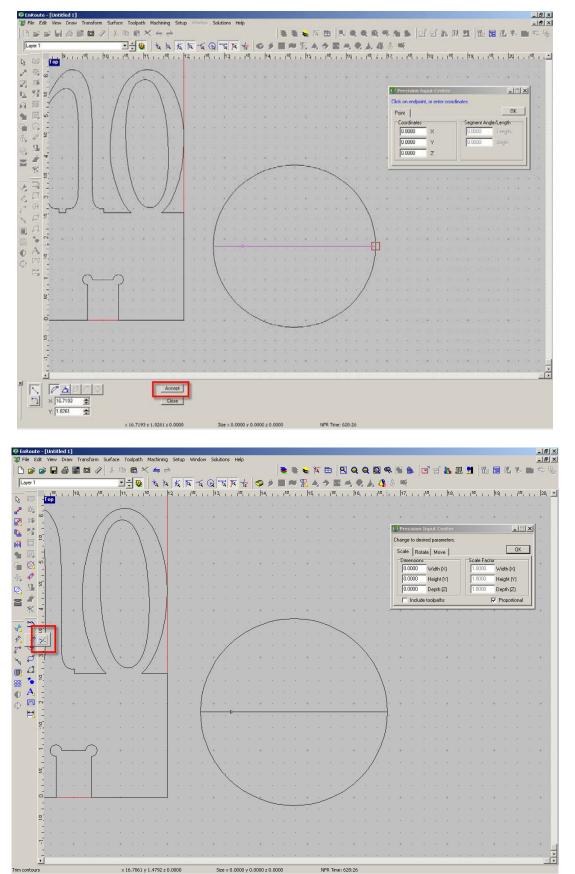


Select the "draw polyarc" tool to create a line.

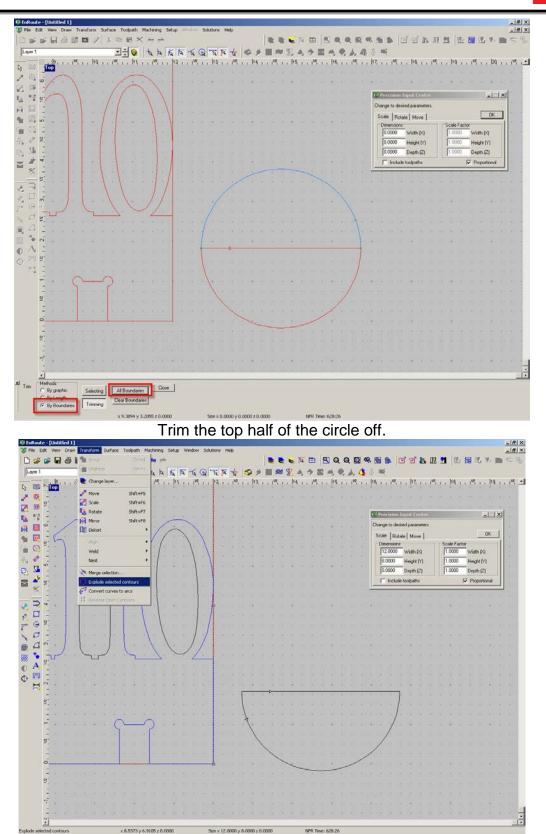


Using the snaps, draw a line bisecting the circle.



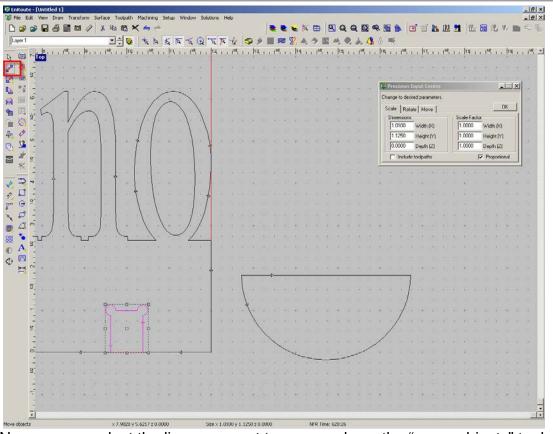


Now that the line is drawn, go to the "trim" tool.

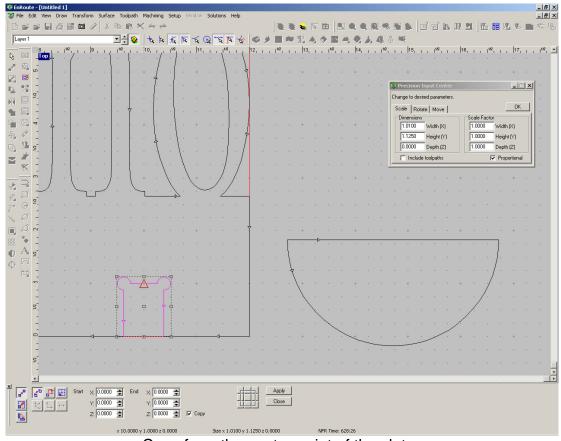


Techno CNC Systems

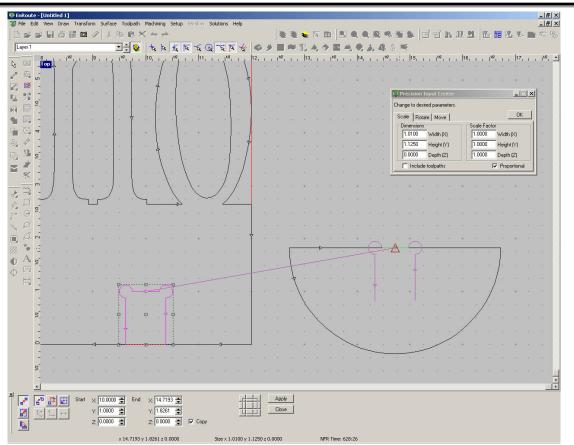
I'd like to use our slot from the nameplate to copy onto the new shape. To do this, I can just explode the closed geometry back into segments. Select the closed geometry, then go to "Transform > Explode Selected Contours".



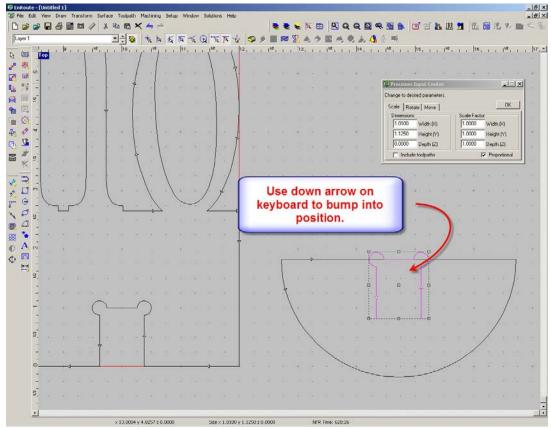
Now we can select the lines we want to copy and use the "move objects" tool.



Copy from the center-point of the slot...

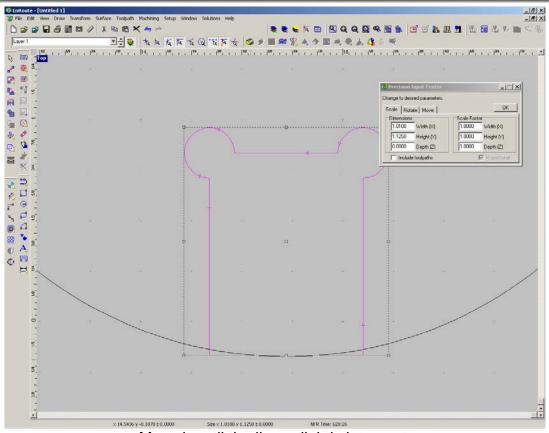


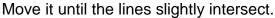
...and copy to the center-point of the foot. Don't worry about the Y position - we will move it.

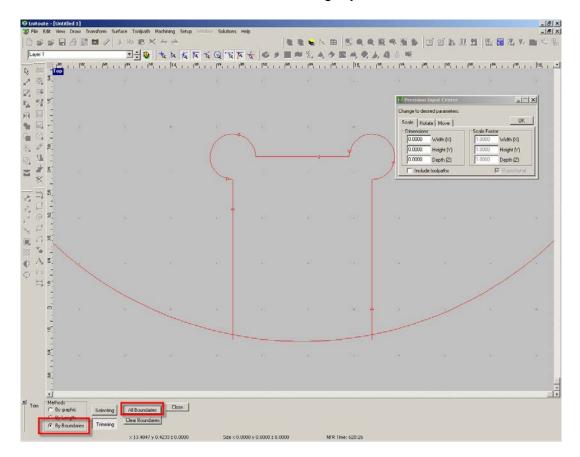


Use the down arrow on your keyboard to bump the selected lines down.



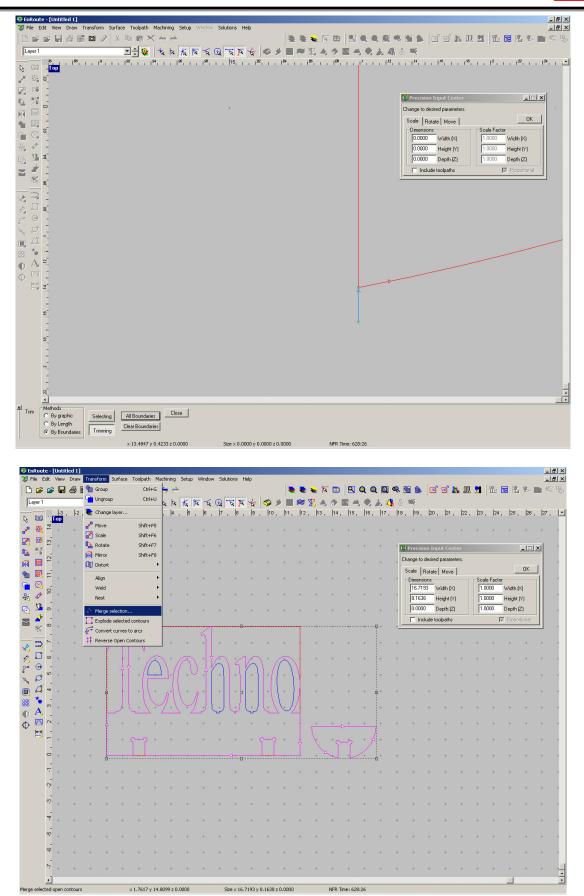






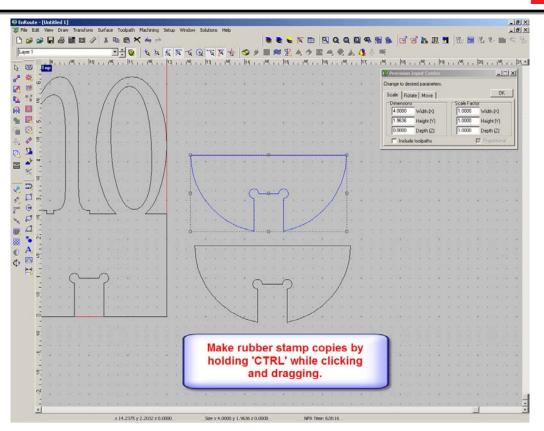
Go back to the "trim" tool and trim out the intersected lines.



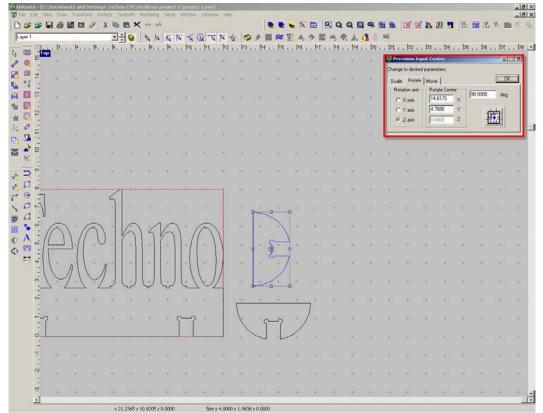


Now we can re-merge everything.

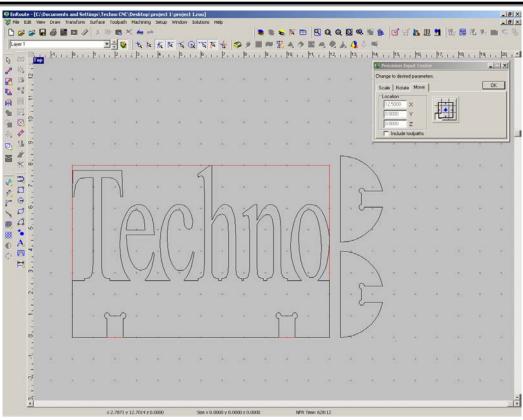




Make a copy of the foot by selecting it, holding "CTRL" on the keyboard and then clicking and dragging to a new location.

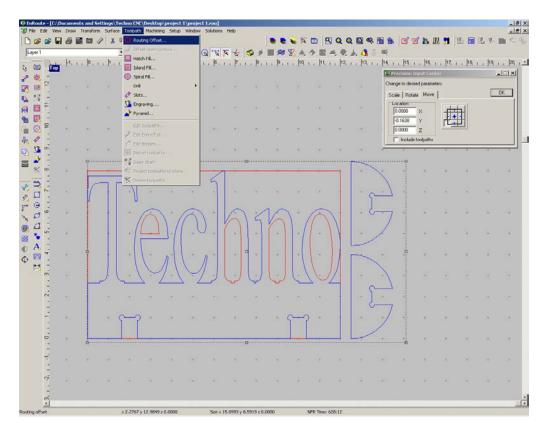


Now we can position the feet closer to the rest of the cuts so we don't waste material.



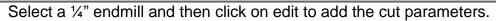
Techno CNC Systems

This is how it will look when it cuts.



Time to add a tool path. Select everything and go to "Toolpath > Routing Offset". This is the tool path that we want because it is a cutout.

-			114	-		
<u>S</u> trategy:					_	OK
Order	Tool	Туре	Depth	Edit		Cancel
🖉 1 🌲 1/4'' End Mill		Rough	0.0000			
						Edit Plan
					- -	<u>S</u> ave as
						Add Tool
vailable Tools:			Sort tools by:			Delete Tool
Description	Tool Type	A	Color		-	
1/8" End Mill	End Mill					Clear
3/16" End Mill	End Mill				-	
1/4'' End Mill	End Mill					
1/8" roundover	End Mill	•				
Router Offset Parameters:						
External (male)		🔺				
Internal (female)				1	-	
Weld offsets	Γ				I	
Sharp corners	—					
1.1	Г				V	
Inlay						

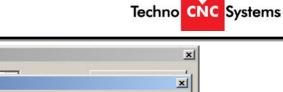


Cut 1	Temp	olat	es					_		•	OK
	ent T		(14.54)	1/4" End Mill							Cancel
				Items		Current Value			Unit		<u>S</u> ave as
		C	ut type			Rough				_	
8		D	epths		<u>¥</u>						Library
			Surface			0.0000		in			
			Final Dept	th		0.7600	+				
T	Ξ	P	asses		Ŧ						
			Number			4	*				Close
			Maximum	per Pass		2.0000	+	in			-
			Actual per	Pass		0.2400		in			
			Final Pass	:		•					
			Fina	al Pass Depth		0.0400	*	in			M
T	Ŧ	W	/idths								8
8	Ξ	F	eeds and Spe	eds	÷ĭ				~~	-	
-		-						5 J			

Note that the final depth of cut is a little deeper than the material thickness.

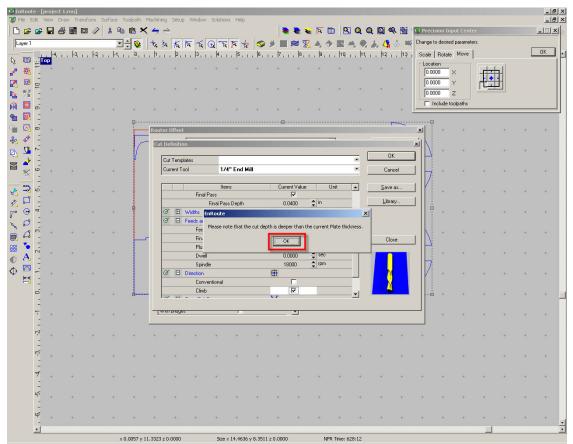
This is to ensure that we cut all the way through. I'm also adding a "final pass" this allows the pass that actually cuts through the material is gentler and helps the objects stay in place.

Pouter Offen

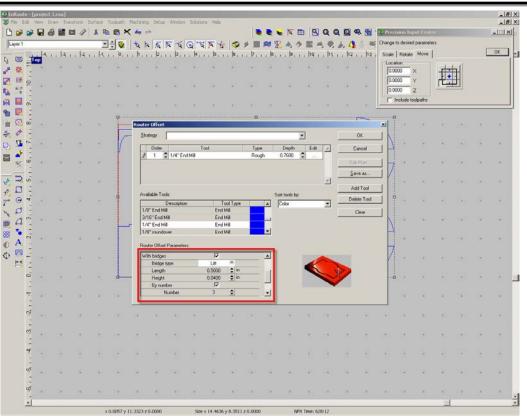


Cut	Temp	plates						OK
Cum	ent T	ool	174" End Mill					Cancel
			Items	Current Valu		Unit		<u>S</u> ave as
		1	Final Pass Depth	0.0400	¢	in		
T	Ŧ	Widths						<u>L</u> ibrary
T	Ξ	Feeds and S	Speeds	→ĭ				
22662		Feed F		150.0000	+	in/min	•	
		Final P	ass Feed	100.0000	\$	in/min		
		Plunge	Rate	50.0000	-	in/min	- 1 F	Close
		Dwell		0.0000	-	sec	- -	
		Spindle	,	18000	+	rpm		
T		Direction		€ }			-	
		Conve	ntional					M
		Climb						2
T	Ŧ	Entry/Exit P	arameters				-	
_	_		20 1					

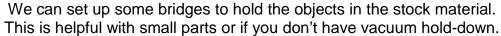
Enter the feed rates. The final pass feed rate is a little slower.

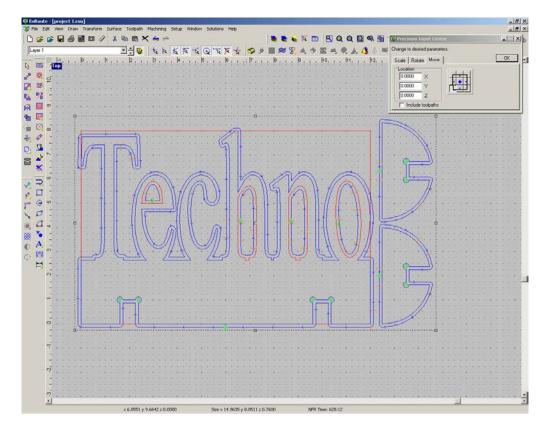


Click "OK". You will get a message saying that the cut is deeper than the plate thickness. Click "OK".



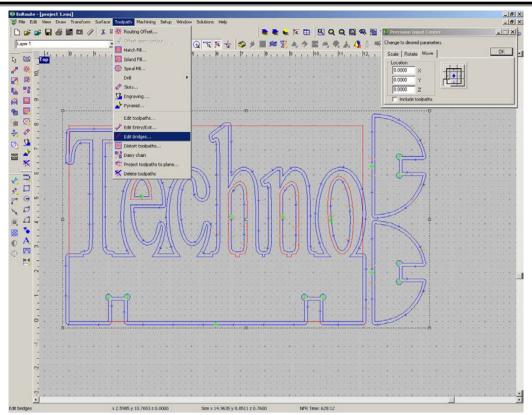
Techno CNC Systems



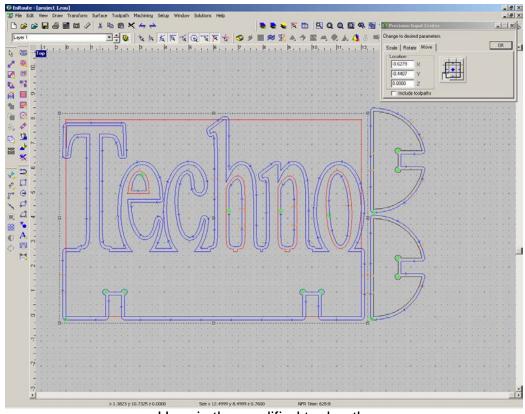


This is what the tool path looks like. I want to move the bridges a little bit.



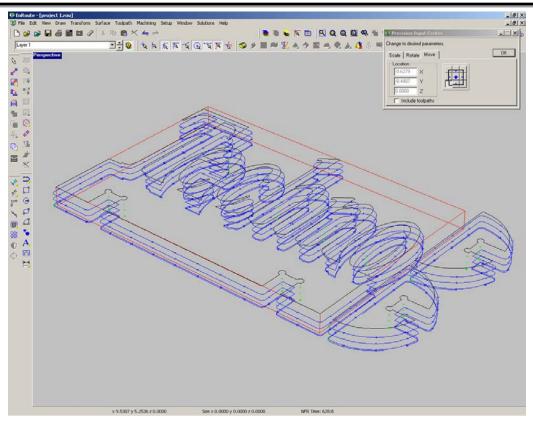


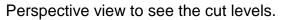
Go to "Toolpath > Edit Bridges" and then simply drag them to the desired location. You can right-click and delete any unwanted bridges or add more.

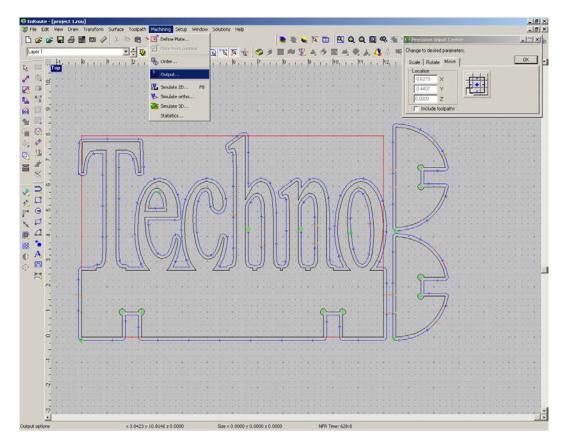


Here is the modified tool path.









Now we can output this file and take it to the machine to cut!



	Priority Order	r 📃	Pric	ority	To File
1	Layer				To Machine
2	Tool		Tool	Order	
3	Strategy		Strateg	y Order	
4	Object		Object	Order	Cancel
5	Pass		Object	order	
	all parts first intain grouping	<u>×</u>) 	<u>P[*] P[*]</u>	
			A	<u> </u>	
	intain grouping		×	<u> </u>	
	intain grouping Which toolpaths?			<u> </u>	
	intain grouping Which toolpaths? All toolpaths			<u> </u>	
	intain grouping Which toolpaths? All toolpaths Selected			<u> </u>	
	intain grouping Which toolpaths? All toolpaths Selected Depth	All		<u> </u>	

Click on "Machining > Output". Then click "To File".

Save As					<u>? ×</u>
Save in:	🗀 project 1		•	🗢 🗈 💣 🗉	•
My Recent Documents					
Desktop					
My Documents					
My Computer					
My Network	File name:	project 1 250		•	Save
Places	Save as type:	Output file (*.NC)		•	Cancel

Name and save the file.

At this point, you can copy this file to a flash drive and take it to the machine.



EnRoute: Project 2

This section will cover a simple 3D engraving project.

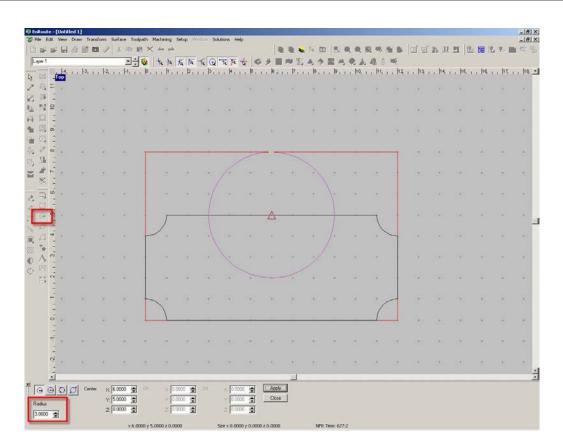
		err 1	haw		form 1 🧳								Setup	Wr	dow	Solu	sions	Help						5	m		~	~	-				2		1 6		-	197		
ar 1			27 -	# 15	a 4	13							F	Ξ.	20		-	÷.	. 1	20			. 977	-			a	4	4	6 D			21	B 12	2 3	1 I II	08	nu -		1000
			.10	1	9, 1 .	,10					Q b	R	12	R h	4	10	4	4 1	.10	e y k	4	10	24	.10	- h			la.	4	() ()	h.	.10	, , h q			h1 .	.10	42		þ
10.4	o Tic		1.1.1			1.0		Constraint of the second	1		1	4.4			1	10.1		die.	1.1	1 151			P. 1			q.	11			a Li	Pre 1	111	1.1.4	La E					d. a. d.	
η.	5																																							
÷ 1																																								
4.																																								
				1																																				
51	5																																							
	5.																																							
0	÷ .			ž.													-			14			+ -		-			4			4 -		- + -			114		+		
2.5	-																																					2		
21																																								
٢.																																								
× '	2																																							
3	5																																							
9	1																																							
	6																15			100					124			1												
3																																								
1	2																																							
•	3										1																											1		
٩.	1																																							
7	Ξ.																																							
1	m,			3			÷ (+												-33					2.4												4.7.4
1																																								
	21-1																																							
	2																																							
	S:																																							
	2																																							
-	1																+						2/15										. * .					÷		
	-																																							
	6																																							
	-													1						10																				100
	¥.																																							
	1																																							
	7, 1	100		1			8.3							1						10			* 0										1. A.S.			(*) (*				1110
		_	_	_	_	_	_	_	_	_		2 0.0	_			_	_		_	000 z 000							_												_	-

Let's start with a new file. Set the plate size to 12" x 8" x .75".

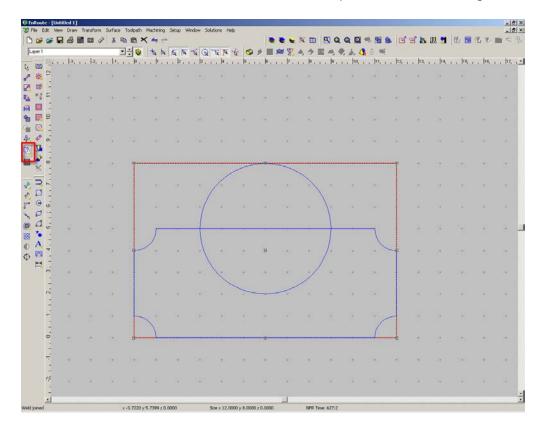
	dR View	Draw Tro		kurlace To X III:			Setup 11	ndan S	olutions Hel	p			in t	1.00		es: 40		e ne		6 T	. <u>m</u>	I.W. C	-	V. 18	-10
Layer 1	ar tel	C7 10	u /		and the second second		KE	-	AP	+ 0				1940		.4	0. ME		Ш	an o	ищ) this is			1220
100	14	, , a,	1 . 1-2,						1 4 M 1				10.	1000				2	ha ,	. 14	H	s.,.	ha ,	. 67	, HQ
	-																								
岛西	5				5			1	S.			121	2			5					1			1	
12	₽ ,	3	÷.	12					7							i.							ŝ	÷.	
	1.1																								
同	σ.	12	12	4	1	025	1	12		27	-	143	14	14	4	1	-			228	12		i.		21
	-																								
12	°° + -			+								+								2.412	104		÷		
1										~										1.00					
*	2																								
- 22	ώ.	1		*1		383	57			8	10	373	31		35	(*)			1	1.0	6				÷
13	1																								
.0	10 ·	10	1	10						1						1				125					2
R	3				12												-								4
11	100	3	2	3 0			2	82	8	23	29	1	2	20	2	8				60	172			8	1
A	m.																						i.		
5	-																								
-	- 3	9		(#2) (#2)		243	54	56		160	83	849	а. 1	(iii	(#) 	(#)			P		39		2	(a)	÷)
	3																								
		10																							÷
	÷ .															6									
	2																								
	5	12	100	83	÷8	302	12	35	<u>(*)</u>		18	242	243	3	35	181			53	123	- 33		5	(8)	- 51
	5																								
	-																			3			5		
	1											1													- 13
0	Badus 1.0000	J I	T Come	Y: 00	000 全 000 全 000 全	Corner 2	× 120 × 500 z 000	1 D	曲	wan 7 Height 1	6840 🚖 7865 🚖		oly sse												
	_			× 1.	3324 y -2	.4003 2 0.1	0000		Size × 0.000	0 y 0.0000	z 0.0000		NFR	Time: 627;	:2										

The first thing we'll do is draw a rectangle with reverse filleted corners.



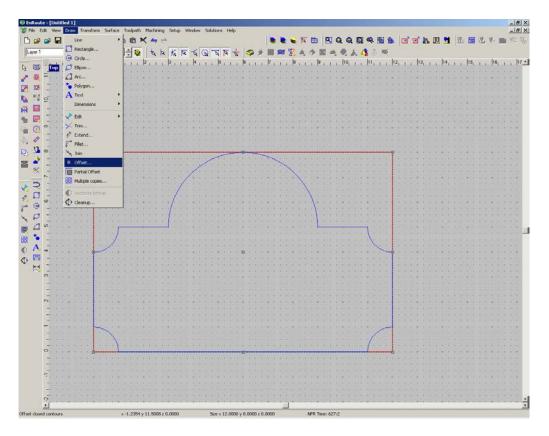


Next, let's add a circle, centered on the top side of the rectangle.

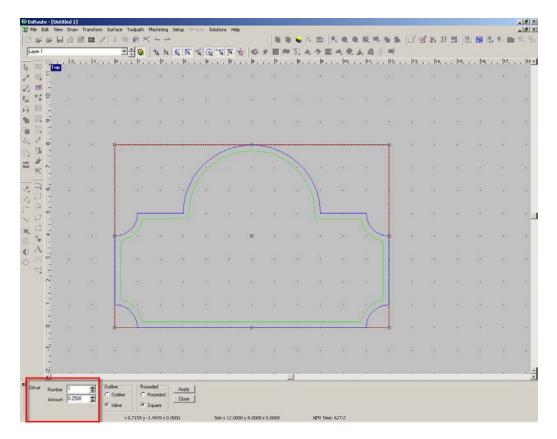


Highlight both objects and click the "weld joined" tool to trim out the intersection.



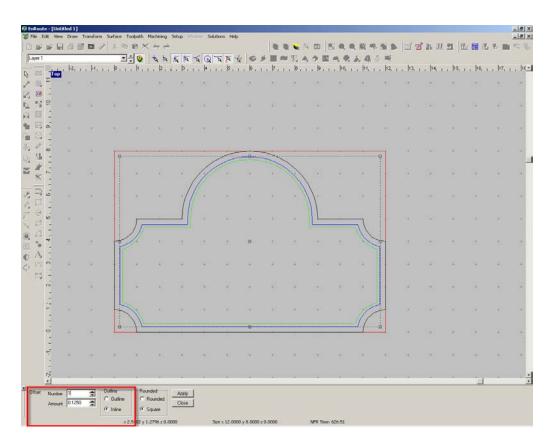


Highlight the new contour and go to "Draw > Offset".

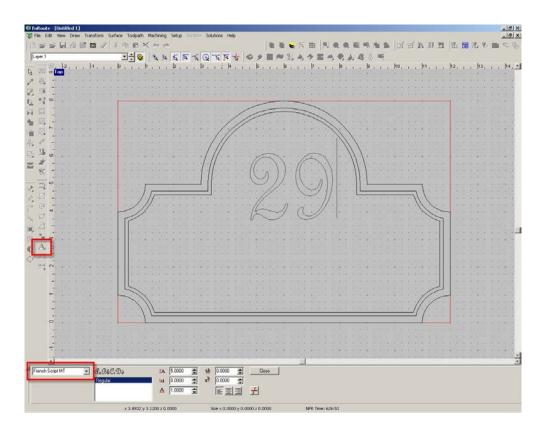


Now, let's offset the contour in 1/4".



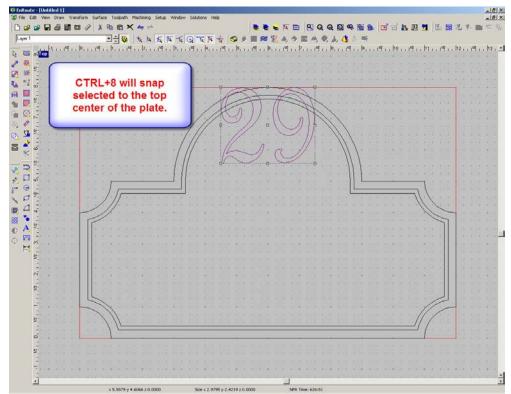


Then offset that line in an additional 1/8".

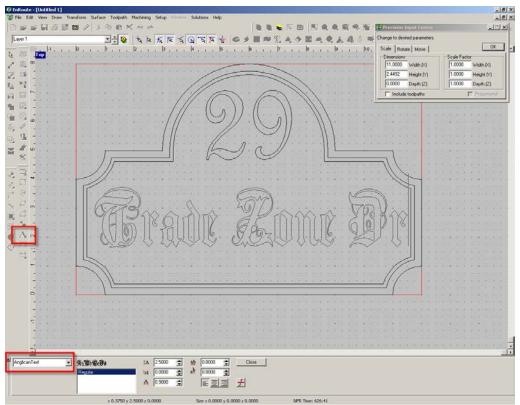


Now, add some text. We'll make this an address plaque.



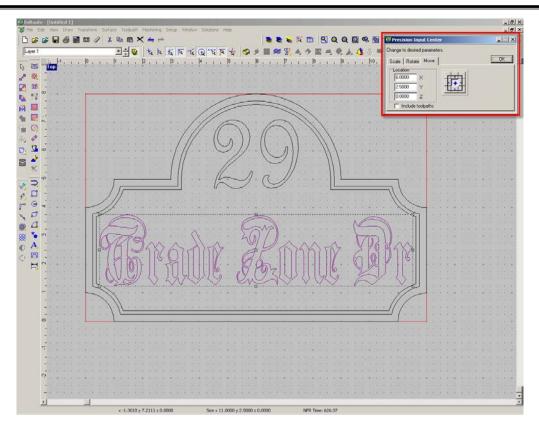


Click on the text and move it to the top center of the plate by holding CTRL=8. (You can snap to the 9 corresponding points on the plate with the different numbers on the keyboard's number pad.) Then, use the down arrow to bump the number into a good position. Of course you can also use the Precision Input Center (PIC) to move it as well.

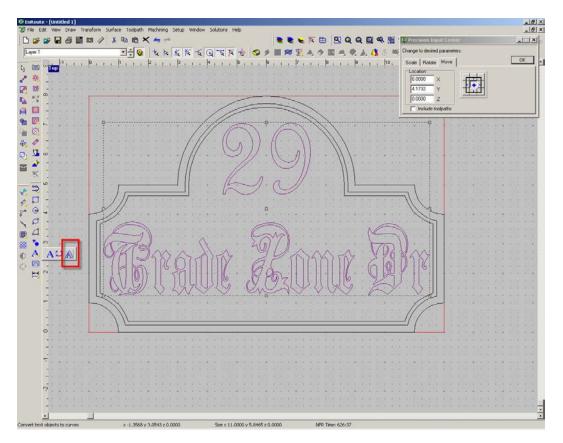


Now, go to the text tool again and type in an address.



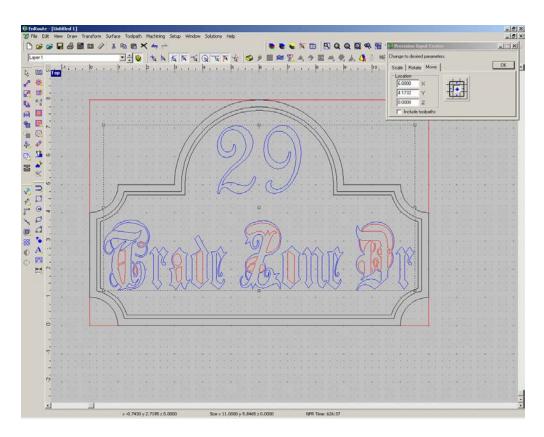


This time, we'll use the PIC to move the center of the text to the X=6, Y=2.5 - which will be centered in our initial rectangle.

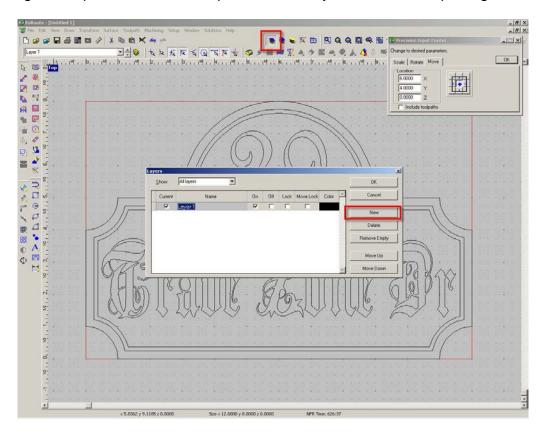


Now, convert the text to curves.



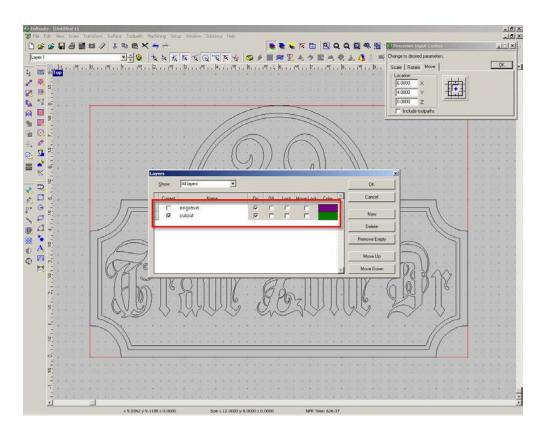


The drawing is complete. Now let's separate it into layers to make outputting the cuts easier.

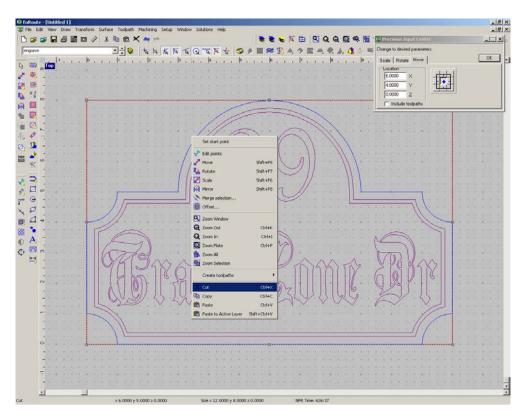


Click on "Define Layers" or hit F7 to open the layer manager. Click the "New" button once to create one additional layer.



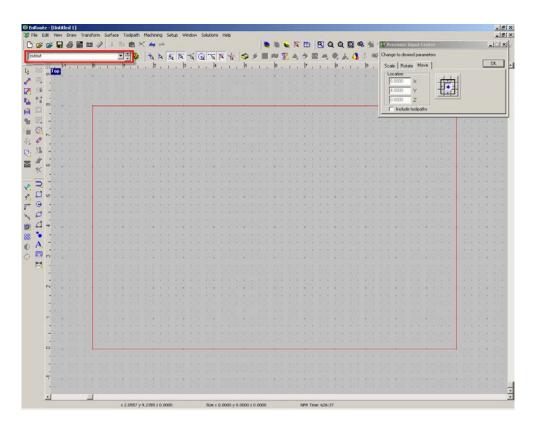


Now we have enough layers. Rename layer 1 to "engrave" and layer 2 to "cutout". You can also change the layer color.

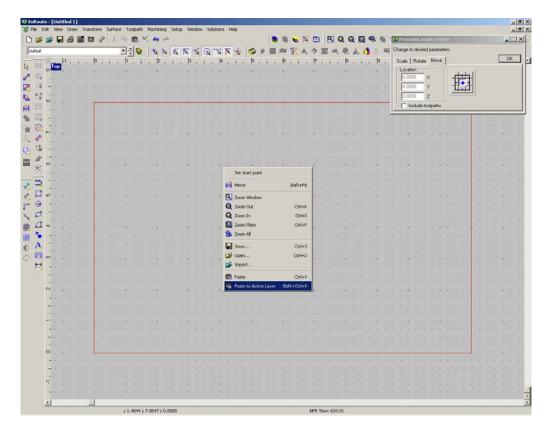


Close the layer manager and select the outer border. This will be our cutout line. Right click on it and select "Cut".



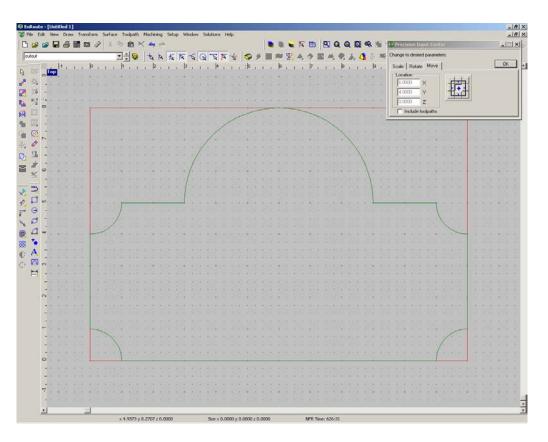


Now, using the layer toolbar, go to the "cutout" layer.

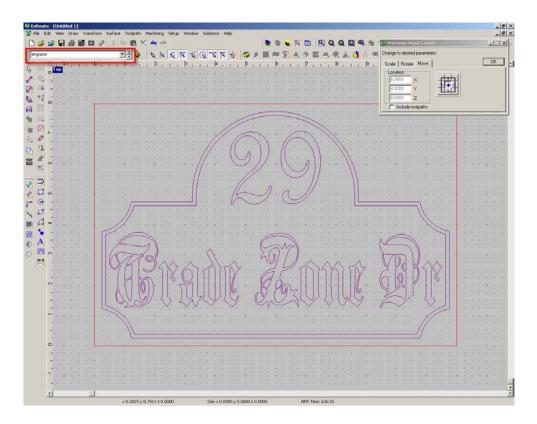


Right-click somewhere on the screen and then select "paste to active layer". Note: if you just select "paste", the object will be pasted back on its original layer.





Now the cutout contour is on the correct layer.

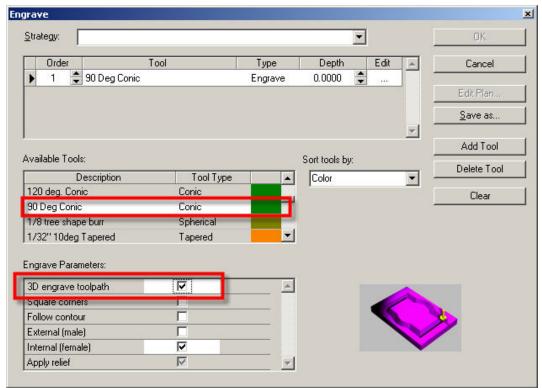


Use the layer toolbar and go back to the "engrave layer".



	ute - [Untitled 1]						X
1200000			iurface Toolpath Machining Setup Windo	and the second se			<u>_16 ×1</u>
			🐒 🗄 👰 Routing Offset	the second se			
engra	we		2 Officet open contour	夏 🖉 🔮 🖉 🖉 🔊	4 * S 4 8 4 4 6 1	Change to desired parameters.	
	and the second	i, þ.	Hatch Fil	4 , , , 5 , , , 6 , , , 7 ,	1 , 8 , 1 , 9 , 1 , 10, 1	, Scale Rotate Move	OK .
9 0			 Island Fil Spiral Fil 			Location	
1 4	o	+ + + + +				60000 × -	
2	• • • • • • • • •		Drill 🕴	and the state state state		4.0000 Y	
📭 🏸						0.0000 Z	
A .	ω	111	Engraving			Include toolpaths	
		1 1	Pyramid	Burgar			
0.0		14	Edit toolpoths				
• •	P	that a	· · · P Edt Entry/Ext	1.00	the state and a state		A BOARD BOARDS
₽. ₽		100	* * /* Edit bridges		e e 💦 e e e e e e e e e e		
0 7			Distort todoeths		///////////////////////////////////////		
2	ω		📲 Dasy chan				
- *		404	S. Project toolpaths to plane	I and the second second	teres the second second		
	- 10 1 1 1 1	100	💥 Delete coolpaths			NOM THE DOUD NOW THE	
1 -	40	24		In all			
1 5	1	staate			• • • • • •	And a state and a state of the	A 10.1 A 10.1 A
8ª @		22				No	
° 0	9 -4			· · · · · · · · · · · · · · · · · · ·			
7 7	9	4.4					
	6	100	Fil	Gia da		and a second second second	
88 *	m		(and	0			
O A		1.4	Chign A	MA TOLA	AN A VOAL	1	
0 0	🛛 🗖 de la constante 🖉	7052	1911910/075		1511 C C C	310/11	
* <u></u>	1 01	122		1111 60 00 111			
				0 197		and the second second second second	
		22	1 4 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	a ora	000 2		
		4.74			- Karana ang tang tang tang tang tang tang ta		
						1/	
		100	and the second second	a a a a a a a a a a a a a a a a	e enere enere enere enere	Here i servere	
	0			0		0	
	-						
							A PLAN A PLAN
	2				1 2011 2011 2013 2013		
		2.1				101 101 101 121 12	
	m.						
	<u>.</u>	-					
Engrave			x 2.9854 y 9.6432 z 0.0000	Size x 11.5000 y 7.5000 z 0.0000	NFR Time: 626:31		

Select all and go to "Toolpath > Engraving".



Select a 90 degree tool for the cut. IMPORTANT: If "3D engrave toolpath" is not selected, the lines of the selected contours will be engraved and the cut will be wrong. We want to engrave within the lines, not on them.

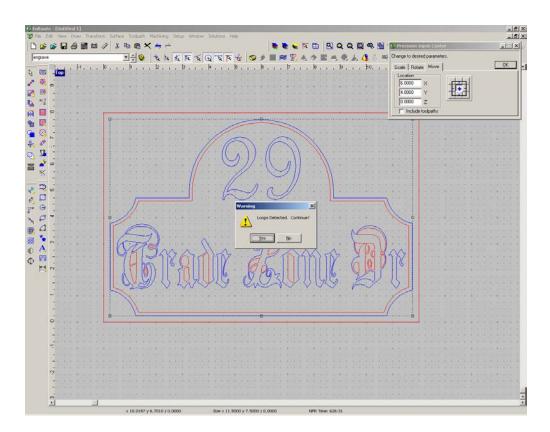


									ОК
Cut	Temp	ilates						-	
Curr	ent T	ool	90 Deg Conic						Cancel
			ltems	(Current Valu	e	Unit		<u>S</u> ave as
		Cut type			Engrave				
Q	Ξ	Depths		<u>*</u>					Library
		Surface			0.0000	\$	in		
		Final Dep	oth		0.5000	\$	in		
T	Ξ	Passes		Ē					
		Number			1	*			Close
		Maximum	n per Pass		0.7500	-	in		
		Actual pe	er Pass		0.5000		in		
		Final Pas	:S						
		Fir	hal Pass Depth		0.0000		in		
8	÷	Feeds and Sp	eeds	⇒ĭ					
Ø	Ŧ	Direction		t.					
~	-			1					

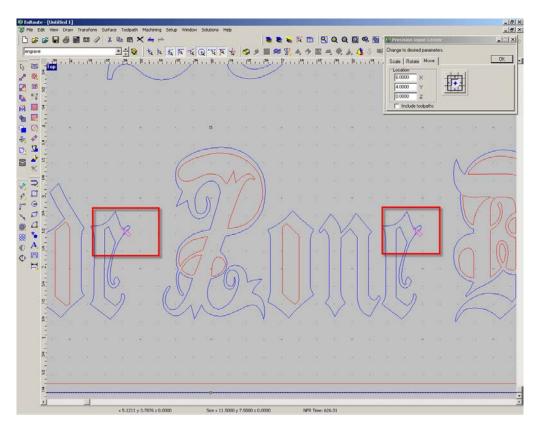
Fill in the cut parameters.

Cut	Temp	plates						OK
Curr	ent T	ool	90 Deg Conic				*	Cancel
			Items	Current Value	в	Unit		<u>S</u> ave as
		Final P	ass					
		1	Final Pass Depth	0.0000		in		Library
T	Ξ	Feeds and S	Speeds	<mark>.⇒ĭ</mark>				
		Feed F	late	200.0000	+	in/min	•	
		Final P	ass Feed	0.0000		in/min	•	
		Plunge	Rate	100.0000	*	in/min	•	Close
		Dwell		0.0000	-	sec	_	
		Spindle	•	18000	+	rpm	_	
T		Direction		-t <mark>5</mark> -			_	
		Conve	ntional	Γ			_	
		Climb						
T	Đ	Entry/Exit P	arameters	ă			_	



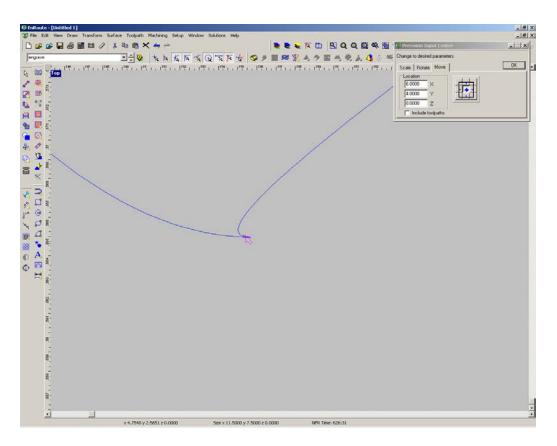


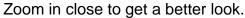
Loops detected. The may happen sometimes with engraving fonts due to how they import. Say "No" and we'll have to clean up the drawing a little bit.

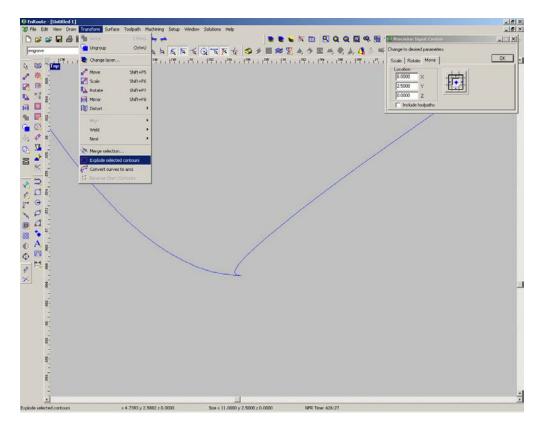


EnRoute points to the problem spots.



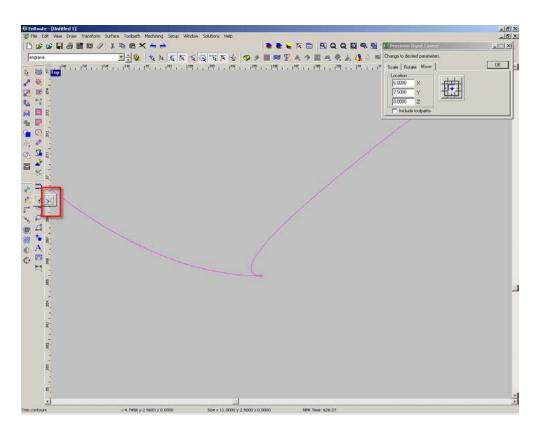




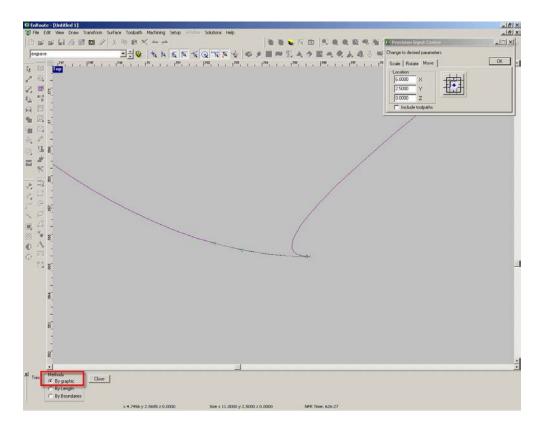


You have to trim out the loop. First explode the contour.



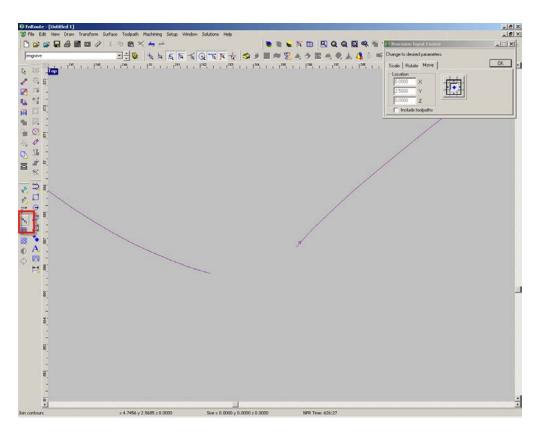


Then, go to the trim tool.

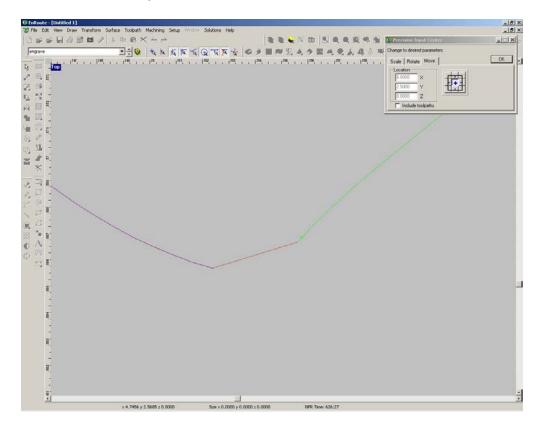


You can trim by graphic. This is a very small area and doesn't have to be that precise.



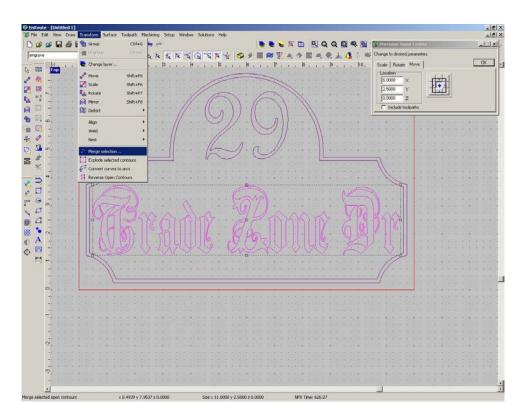


Once the loop is trimmed out, select the "Join Contours" tool.

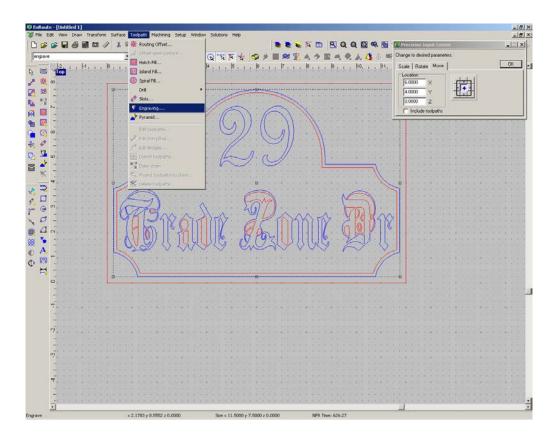


Click on one line, then the other and they will connect.



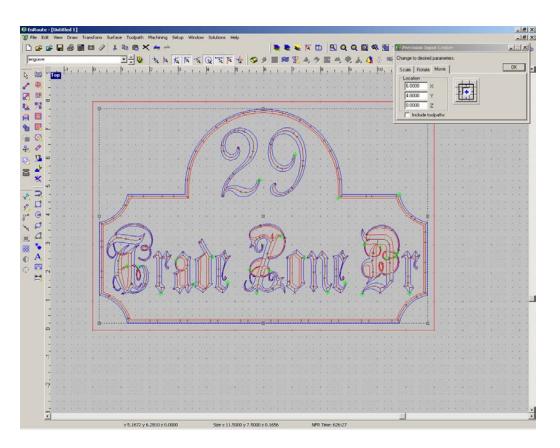


Now, we have to re-merge the contours.

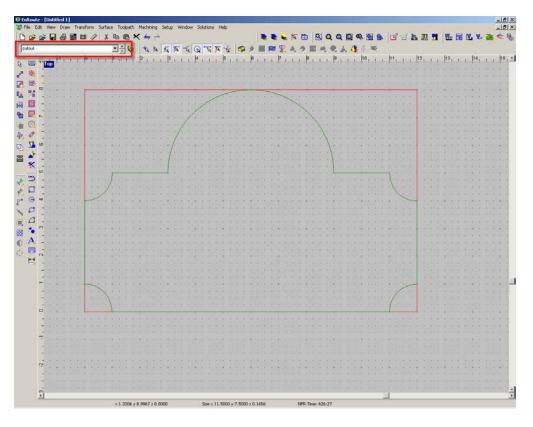


Once they are merged, select all again and re-apply the engrave tool path. All of the settings we entered earlier are still there, so you can just click "Ok".



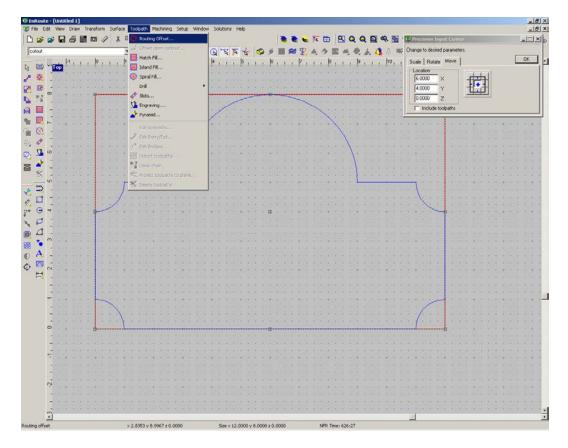


Here is the 3D engrave tool path. Notice how all of the cut lines are inside the contours.



Now, switch to the "cutout" layer and add the offset toolpath.





Select the line and go to "Toolpath > Routing Offset".

uter Offset						
Strategy:]		OK
Order	Tool	Туре	Depth	Edit		Cancel
🕨 1 🚖 1/4'' End Mill	C 1 (1) - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	Rough	0.0000			
						Edit Plan
						<u>S</u> ave as
					-	
						Add Tool
Available Tools:			Sort tools by:			Delete Tool
Description	Tool Type	▲	Color		-	
1/8" End Mill	End Mill					Clear
2/16" End Mill	End Mill		N		-	
174" End Mill	End Mill					
178" roundover	End Mill		8			
Router Offset Parameters:						
Internal (female)				1	~	
Weld offsets	Γ					
Sharp corners					N/	
1 1						
Inlay						

Select a 1/4" endmill and an external cut.



Cut Templates					-	ок
Current Tool	174" End Mill					Cancel
	Items	Current Valu	e	Unit		<u>S</u> ave as
Cut type		Rough				
😕 🗆 Depths		<u>¥</u>				<u>L</u> ibrary
Surfa	ace	0.0000	-	in		
Final	Depth	0.7600	-	in		
S 🗆 Passes		t	12710			
Num	ber	4	*		Ē.	Close
Maxi	mum per Pass	2.0000	+	in		
Actu	al per Pass	0.2433		in		
Final	Pass					
	Final Pass Depth	0.0300	+	in		M
of ⊞ Widths						<u> </u>
😕 🖾 Feeds and	d Speeds	<mark>.→Ľ</mark>			_	
E Feeds and -		<u>≯ĭ</u>		i J		

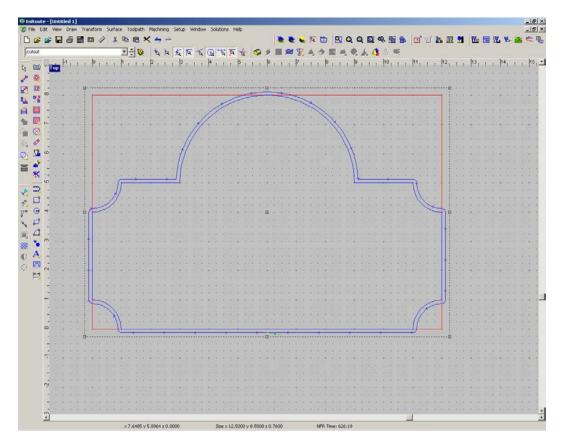
Add the cut parameters as usual.

Cut	Temp	plates			_			OK
Curr	ent T	ool	1/4" End Mil	l				Cancel
-			Items	Current Value		Unit		<u>S</u> ave as
T	Ξ	Feeds and Sp	eeds	<mark>.⇒ĭ</mark>				
		Feed Ra	te	150.0000		in/min	-	<u>L</u> ibrary
		Final Pas	s Feed	100.0000	\$	in/min	•	
		Plunge R	ate	50.0000	+	in/min	•	
		Dwell		0.0000		sec		
		Spindle		18000		rpm		Close
T	Ξ	Direction		長				
		Conventi	onal	Γ				
		Climb		V				
T	Ξ	Entry/Exit Par-	ameters	ă				M
		Entry - N		<u> </u>				
		Arc		Γ			_	4
_				=			- <u>-</u>	-



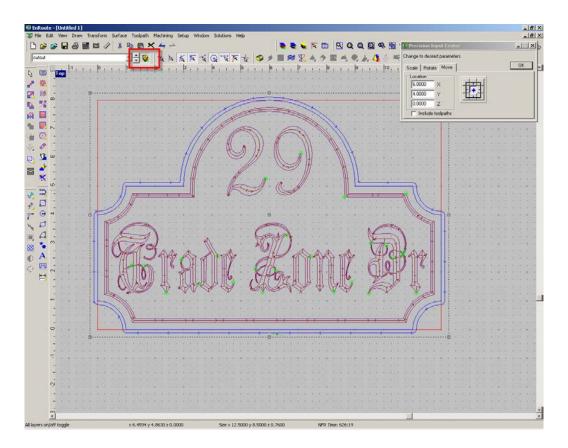
Cut Templates				—	OK
Current Tool	174" End Mill			•	Cancel
	Items	Current Value	Unit		Save as
Clim			1		2010 00
🔊 🗆 Entry/Exit	Parameters	ă			<u>L</u> ibrary
	/-None				
	Arc	Γ			
	Line				
	Length	0.5000 🌲	lin		Close
	Angle	10.0000 🌲		-1-	
	3D Line				
	Lift	0.0000 🔶	in		
	Combination				M
Exit	None				X
	Arc	Г			4

We can put a 3D entry in, so that the cutter doesn't plunge straight in. The entry angle is 10 degrees off of the cut line.

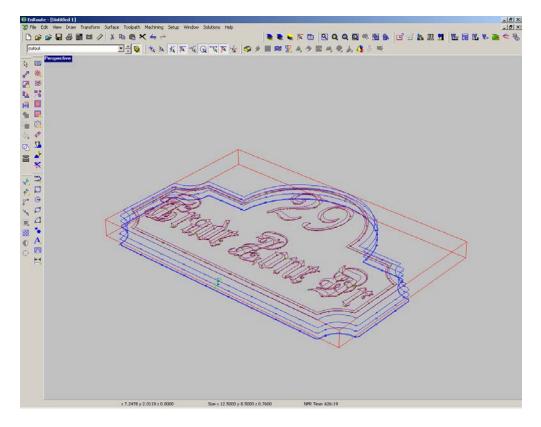


Here is the cutout tool path.



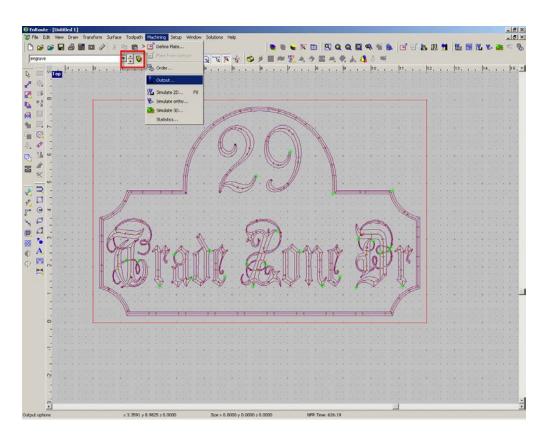


Click on the little light bulb on the layers toolbar to show both layers at once.



Perspective view of all toolpaths.





Time to output the files. Turn off the light bulb and go to the "engrave" layer. Go to "Machining > Output".

Tools	Use 🔺	Priority		To File
1 90 Deg Conic		Tool Orde		To Machin
		Strategy Orc	ler	Cancel
		Object Orde	er (-	Cancer
		1.00		
	<u></u>	<u> </u>	P *	
mall parts first	<u>*</u>	<u> </u>	<u> </u> P_]	
mall parts first	<u>*</u>		P	
imall parts first faintain grouping	<u>*</u>		<u> </u> P_]	
	<u>×</u>] <u>P</u>	P	
	<u>×</u>		<u>P</u>	
faintain grouping				
faintain grouping Which toolpaths?				
faintain grouping Which toolpaths? All toolpaths				
faintain grouping Which toolpaths? All toolpaths Selected				
faintain grouping Which toolpaths? All toolpaths Selected Depth	All			



Save As					<u>?</u> ×
Save in:	project 1		•	+ 🗈 💣 🎟 -	
My Recent Documents Desktop My Documents My Computer	project 1 250.	NC			
My_Network	File name:	project 2 90v		•	Save
Places	Save as type:	Output file (*.NC)		_ _	Cancel

Name the file and "Save".

I like to name the files with the cutter included so I know which is which.

	- [Untitled 1]	and the second second			_ & ×
File Edit			Solutions Help		-16 ×
000					
cutout	트는 😡	Plate from contour	A 🕱 🛤 🖉 🔶 🚽 🖉 🖌	A, 今 盟 A, ●, あ 🕼 & ₩	
		Crder	4 8 8 7	A, A 🔤 🙈 A, J, 🐴 🖉 🖉 🤫 1 , 0 , 1 , 0 , 1 , 00 , 1 , 01 , 1 , 02 , 1 , 03 , 1 , 04 , 1 ,	15, -
		Cutput			
P 49					sast
2 0	- · · · ·	Simulate 20 F8	0		3257
1 %		Simulate ortho		No sea a se	
A .	1993 2014 1 2014 1993 1	🚰 Simulate 30	//	Norman and a second sec	4 . 4
9 .		Statistics	fine en constantes e		2267
-		· · · · · // ·		and the second second second second second second	
· · · · · ·	100101 01001001	//			8989
£; ₽		· · · · ·		an an African an an an an an African an a	12112
🔊 🏆 «	°	· · · · //· · · ·		ana ena a 🔰 enara ene enareman e 🕂 🔤 ena enaramente ena e	1.4
2 *				THE RECEIPTION OF COLLEGES AND ADDRESS ADDRESS.	
- *	The second s				
- 4	• • • • • • • • • • • • •			a a se a a b inne a se a	6.00
8 - P	• • • • • • • • • • • • • • • • • • •			and the end of the state of the	6101
90					
80 00 -	• • • •		· · · • · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
10	- the second s			ana anana ana ana ana anana an 🔢 🔤 ana ananana ana a	002002
-1	Tene 1 1 1 1 1 1 1 1 1 1 1 1			· · · · · · · · · · · · · · · · · · ·	
· · · ·	n		 Alternative and a second s	The matching of the second way were seen as a first way to be a second of the	
× •	- and the later of the second s			and share a second state of the second state o	
OA.					0.2002
00.	N				
1	• • • • • • • • • • • • • • • •				
					1.1
					1000
	- and and the state			an energy and the second first state and the second s	ant at
	· · · · · · · · · · · · · · · · · · ·			and share any share and share of the state of the state of the	
		· · · · ·	4 6 4 A		0.000
				· · · · · · · · · · · · · · · · · · ·	
3	· ALL SALE ALL SALE ALL S				Setupt 1
	• • • • • • • • • • • • • • •			the end of a state was considered as a provide the state of	
	100 100 10 100 100 1				STAT
9	<mark>7</mark>	A.C		AND REAL AND ADDRESS AND ADDRESS AND ADDRESS ADDRESS ADDRESS ADDRESS	147.00
					5415
	100000000000000000000000000000000000000				STR.
	ŋ				-
Output options		9.0391 z 0.0000	Size x 12.5000 y 8.5000 z 0.7600	NFR Time: 626:17	

Now go to the "cutout" layer and do the same.



Tools	Use 🔺	Priority	ToFile
1/4" End Mill			To Mach
		Tool Order	
		Strategy Ord	er Cance
		Object Orde	
	_	P	* p*
nall parts first aintain grouping		<u>*</u>	
aintain grouping Which toolpaths?			
aintain grouping			
aintain grouping Which toolpaths? All toolpaths			
aintain grouping Which toolpaths? All toolpaths Selected			
aintain grouping Which toolpaths? All toolpaths Selected Depth	All		

Save As					<u>?</u> ×
Save in:	C project 1		•	🗕 🗈 💣 🎟	
My Recent Documents) project 1 250.				
Desktop My Documents					
My Computer					
My Network	File name:	project 2 250		•	Save
Places	Save as type:	Output file (*.NC)		•	Cancel

This project has 2 files that will go to the machine. Run the engrave file first, and then the cutout.



EnRoute: Project 3 This section covers setting up a basic 3D texture.

inRead- (Indide 2)	
#Te få Nee Dee Teeden Sries Todott Hoteeg Star Weder Solare Heb ■ 金田山田ノド市会×チーー 電影を下田 民会会員先生会 回回知記述 胚層法を用く	(i).
	100
	141
× 88 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
Crime Plate 2	
Tenglate) OK	
(7 []est Defined Vidth (s): [6 0000 ± n Cancel	
C Fritaire to Design Height bit 60000 🖆 m Save &st.	
A Rever	
20000 ± n ×Magar 00000 ± n	11
Confine Flate al Implate OK Concel Concel Concel Concel	
G Surface at typ of plate C Surface at bothom of plate	
Material Litray.	
	-
x - 2.0215 v 4.4992 z 0.0000 Sze x 0.0000 v 0.0000 MPR Text 524:22	-

First, let's start with a 6" x 6" x .75" plate.

		ad .	es:	iii (125	Ŧ.	1.4									are					NS.	3 14	1													919	93	23	n i	<i>u</i> .,	21	Was	08	24	R.	-	25
ayer 1		10		1.		10			-	۵.	1					1.1		K]			0			1.8								. 4			μĘ		1				1.				i.		
	SIG	100	1	14		1	1	10		1 180		; 10	1	1	ĩ,	1	1	1.1	5		K)	11	12	1.1	P.,	1.1	10	11	19.1	1.1	177	11	P	1	· 1 ⁹⁵		. 10	1.1		1	1. 14	1	1.1.		1 10	1.1.	1-
嘲	1																																														
	ū			÷				-																																	(+)						
17	2																																														
-	2																																														
12	1																																														
12	sõ.							+																	ate				а. А. 1																+1		
de.	2																																														
12	5																																														
#	2																																														
*	47																																														
00	1																																														
	1																																														
6-	Ŀ.																																														
0	en e															1													1																		
1	2																																														
14	5																																														
	1																																														
A.	ei.			4				6								6.4					20				14				1 3				12								1				14		
in	-																																														
3	S,																																														
	-																																														
	-			÷				(a)								8.9					45				(e)S				g i				4														
	3																																														
	ä.																																														
	2																																														
	0			÷.				(*)																																	(4)						
	2																																														
	a																																														
	•			_	_	_			_			_				_	_			_	_	_	_	_	1			_	_	_	_		_	_				_	_		_		_		_	_	_
	F	7	3	13		Come			0000			ionner					4	H	1			1.000				pply	1																				
and in	Radu	3	2	-2				Y:0	0000	0 🚖				Y: 6	0000	-				Hes	21.	0.007	73	E	C	İotê	1																				

Draw a 6x6 square.



	te - [U					-		-														-						_													-	10
File (Draw								-	Setup	W	ndow	Solu	tions	Help								-	-				-		1			-			-	an s			10
			0		1 /				a×		5							F	71		•			* 🖽	1	3 (2 0					्राष्ट	B	-	112	1	The state	68	an i		10	
eyer 1								1.					A	TA		R P		2	9	1	5	9 2	5 4	1	22		Φ,				БĘ.					- 13						
-	3 10	p l	- 1 ^M	1.1	, F	5	- 1	12 	1.1.	p.,		140,	н. с.	p .	1.1	152,	1.1	-	-	100,	1.1	р,	-	140,	1.1.1	14	1	1 140	• •	, P	1	- 142		, N	ą.	110	1		- 1 -	1100	1	6
御		and and																																								
									2	0												-																				
片	-				2				10		1996	1.1.1.5		A800	11155	220.000		122200		221.1.0	51225		21.1.01			0.002	216.2.56	222.02		0.06530				T				1				
									20																																	
	1								*																																	
Ø	-								1	1																																
ø	40 ;				1.3				22	1				ŧ., ;				8 S												15								3				
2	2								80	1.0																																
*	10.								ŧΞ.																																	
*									R.																																	
3	4.								4.1	£																																
	-								414 I																																	
Θ	10																																									
ø	-																																									
4																																										
*									*									<u> </u>				8				2								ľ								
A									**																																	
	2																																									
H	1.7								51 I																																	
	ę.,								<u>ti</u>)									8.3				2				30												2				
	E.								•0 (1.13																																
	51.								а) –	1.5																																
									ā,																																	
	÷.,								-																																	
	1.								4																																	
	5.								-	1																																
																																		1								
									c	3			222	3225																												
	1																																									
	-																					-																				
e rele		-	_	-	-	-	- 22	2.0		6000	- 0.04		-	-	372	28 x 6.			-			and .	-	100000	CONTRACT.	624:3	1245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	f

Highlight the square and click the "Create Relief" icon.

Laye	1	1.014			0000	10000	100	81 A		14	10		t	he	K	100	1	1a	1-3		- 1		0	44							-						C									
			e, ,	. 1	2,		150	1						0, 1		124	1.	h.		15																		16,		110	1.1	Þ.,	 12		þ,	L L ^K
Q		10	0																																											
B		-11																																												
	e 4	0		6 8									1	-		-															•••••	••••						-9							•	
	1	- 1											2																																	
	5	1											2																																	
1	2	2.5																																												
1 0		ñ											2					**				+																								
. 4		2.																																												
17	1 9	£																																												
1	2	1																																												
×	£.	÷																																												
-	2	2.																																												
5		2																																												
		-																																												
																																						1								
6	9								(2)									55				2																T				-				
	4	-																																												
1	-	21																																												
		-											8																																	
B		N							-				2					*1				1				1																*			* 3	
1		1											ġ.																																	
		- 1											1																																	
	-	11		1					-									***				*								. •												• :			•	
		-																																												
	5	-																																												
		÷.,																																				-							+	
		- 1																																												
	-																																													
	2	•	-				_	_	-	_	_	_							-	_	_	_	_	_	_	100		_	_	_	_	_	_	_	_	_	_	_	_	_	_	_		_		
	۵	D (2	n	J	00	Nor	aten	t heig	**				4 0.0 9 0.0	_	_	1				- [-	Ang 45	/* 0000	-	F	-	Appl	-																	

Create a flat, zero height relief.



Laper 1	-				1.4	91.				+	h.	K	<u>F</u>	4	0	- 95	The	ų	. 1	0	Γ		P			2 4	0.4	~			-			-		1 Pers			1.00		- 65	
	5 100		1-2,	1.	192	1.0	. 14	 14	Ċ,			1.1	100	11	11 .	1 1	157		, 12			3	. 6	150		. 4	. 1		 , 5	1.1	. 1	27	 6 ,	 187	1.	17.	ί.	142	÷.,	, 8	. 1	. 1 ^e
, 🔟	- 100																				-	Ē																				
n (9) N (5)	1.1																																									
	9									-		100				1111				11111		 -4-			1	111	1111				1111		-1							*		
1	a.									3																																
	9									3																																
	-																																									
	10						34			8																														4		
4 m	-									2																																
7 7	51°																																									
										8																																
- DA	4						1.8																																			
. 2	20									3																																
	ä.																																									
• •	-									100																																
0	÷.									ġ												0																				
0	2									100																																
•	≌																																									
A	1									3																																
5	e.									3																																
H	2.																																									
	2																																									
	1																																									
	÷		22				12																													12				14		
	1									3																																
	5'									3																																
	2																																									
	1.4																																							- 37		
	9																																									
-	0 4	5 00	1	1	No	mai	t heig	 1	-	eigh	0.0	0000	-					ा	C.F	And	le:	-		Apply		1																

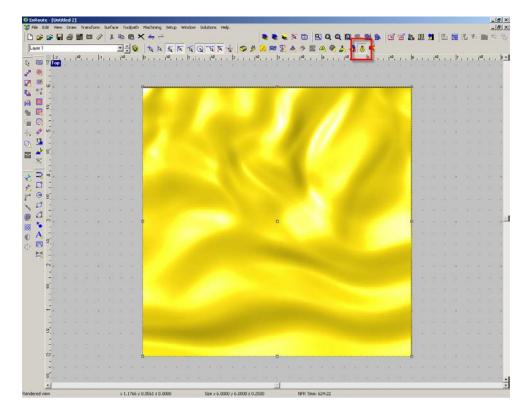
Click and hold the "Texture" icon to expand the toolbar.

) 🎯	6	3 4		61	4	10			100	<	7	۳.											•	•	-											E	-	m	3	lm	1 08	1.10	1.10		1	- 1
Layer 1			1.				1.1	1		1	1000	*			A				te		9 2	3 (1. 5	2 2	3	5,6		0	94	6,4	54	h (5	Ę.												
00	5 10	11	12,	11	1	10	1.1	1	110	1	1	to t	10	°. !	•	1.	11	100	11	12.	1.1	1	15	# \$	53	18	36		8	¢.	20-1	83	83	ia	-	田 8		142,	11	17.	1.	110	(bet	18	1	1
南	30																									10	-																			
	9.						2				10-																									0										
. 71	24																																													
	5																																													
	-																																													
0	40																																													
0	5																																													
7	2																																													
*	-																																													
*	-																																													
2																																														
	3																																													
	-																																													
0	1																																													
0	· ·		-								4													9												1				*						
4																																														
	2																																													
A	1																																													
	2		98																																					•						
E																																														
	2																																													
	-																																													
			*::				*																																	ъ.:						
	- 10																																													
	말.										1																																			
	-																																													
	0										-	911	1121	222	<u> </u>	2233		1116	1022	191	9929	80	114	-17-	3313	1999	1112	000	(212)	lidi	1993	<u> </u>	1211	1122	2222	-6										
	24																																													
	S.																																													
	1	_	_					_	_		_		_								_	_	_	1	-	_			_	_	_	_	_	_	_	_	_					_		_	_	
	0 4	00		6	Nor	nal						0.0		10 10	H				Г	1	Angle					Apply																				
	-	-	-	6	Cor	stant le to l t to h	heig	H.C.		31	lase:	0.0	000	ALC: NO	1					1	45.0	000	1			Close	Q																			

Select the "flame" texture.

		ute -	Unti	tled 1		_									-				-																								F X
	Fle	Edit	View	Dra					ace		ath 1		1000	Set	₽. //		Solu	tions	Help			1174		-	-		nen.			an a						100	-	line.	8		1		7 ×
110) B			63	9 mil	101	1	3						_	<u> </u>				-22														elle	25	-45	302	21) IN	08	ц×	-		10
1	Layer	1				-		-	-	1	0	4	. 1	K	R	Te	ΘI.	R	R 6	<	9 9	2.	100	R	4, 5	> 1				4	۲	×.		-			10,52		- 10			12	
D			ind.	145	1.1	2,	1.1	140		4,7,1	- Gat	4	- 1	0, 1	1 100	-	þ.,	1.1	144 1	, P,	- 1.4	144	1.1.3	3.1	110	21.1	14.	1.1	102	. 1	4.1	140	ана.	10. I	- 1	5.0	P .	6.4.4	14, 1	, 10	1.1.1	110	1
2		10.00	4																																								
2		9											1																					a .			-						
L	-	-																																									
2		ä.																																									
9		1 1																																									
G		10							8 B																												1965						
-	4																																										
	5	3.																																8.									
	1																																	8.									
14	*	4							8.8																												1983			(4)			
-	- 14																																										
1	1	4 S.																																									
1	1	12																																g .									
No.		m				ŧ ŝ			ê G				d											1.										p .			0.4X2			1(4)			10
1	1	-																																ų .									
	6	ä.																																									
	3																																										
€	1.4	-				6 3			9 2																															3 (#)			
¢,	5	-																																									
		- S.																																8.									
		-																																3									
		-							8 8																									8			5. 5 3						
																																		8.									
		25.																																									
		-																																									
		0				ŧ. 1			8.3				C															1111						9			2.633			1.(*)			
		-																																									
_	_	2	1				5 3	-			2 33	-			- 22	-	-		8, 8	÷.,	10	80	82.3			2.	2	22		2		2.	-	2	2.3		100						
4	۵	ilane Bane Sala	Tedu	9 4		Tem	plate	Se	ave		to		2	4		Ac Ck Re		3	Scale < 1.0 (1.0 2. 0.2	00 🛫		Y a	20000 00000 00000	ŧ		anpin	Powe g rang al nois	0 15	0000	ŧ			der [1.) ize [3.)										
L									×	-0.5	754 y -	0.57	105 z	0.000			5	ize x é	5.0000	y 6.000	0 2 00	0000			N	FR Tw	ve: 624	1:22															

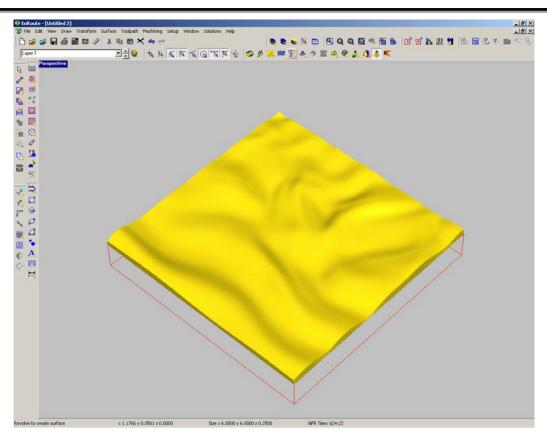
Adjust the parameters to change the texture as desired and click "Apply".



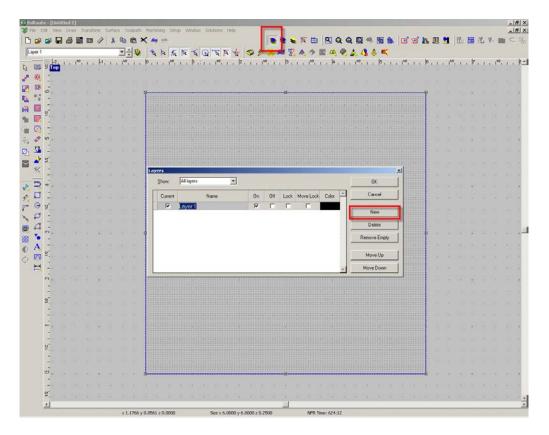
Click the light bulb on the surface toolbar to render the surface.



EnRoute: Project 3

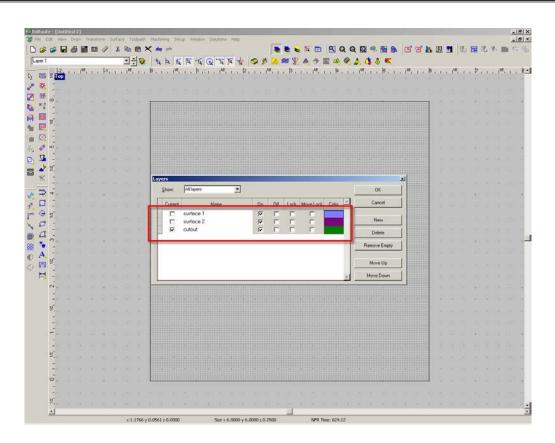


Perspective view of the texture.

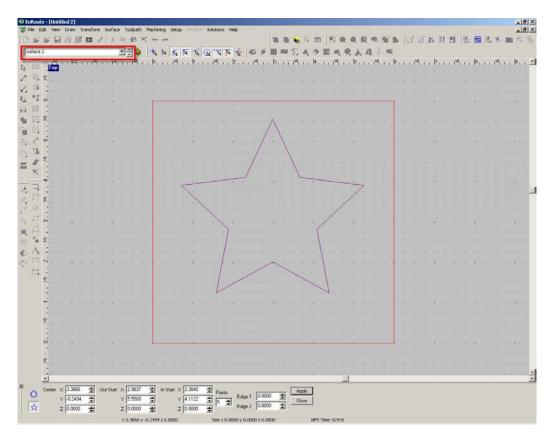


Now, let's add some layers.



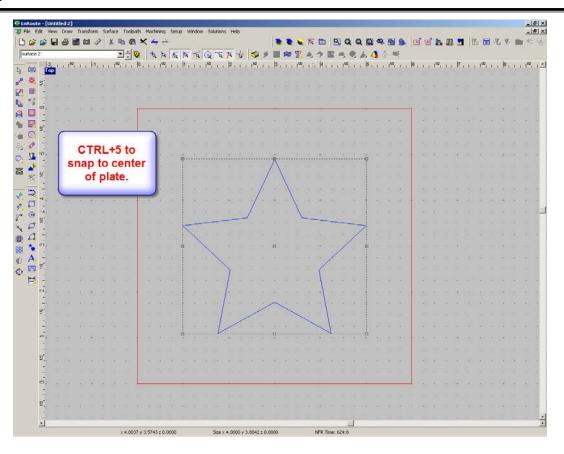




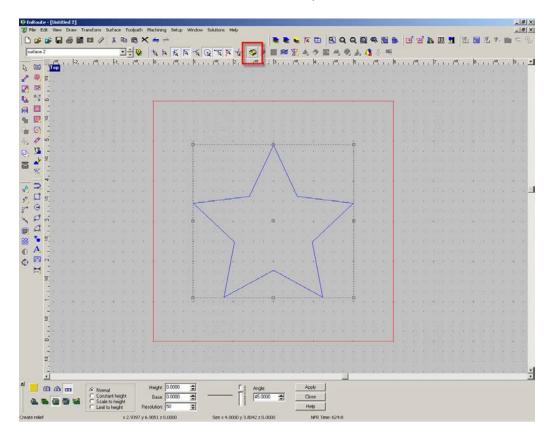


Go to the "surface 2" layer and use the "Draw Polygon" tool to create a star.

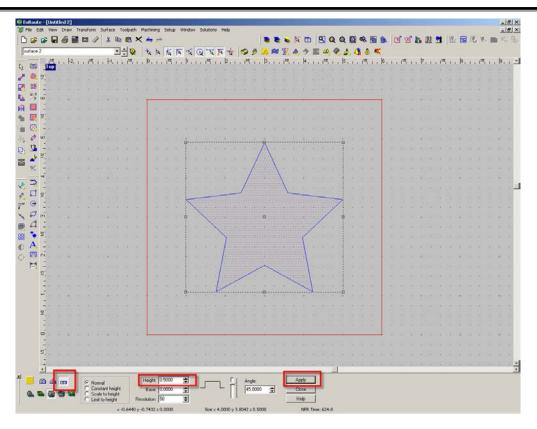
EnRoute: Project 3



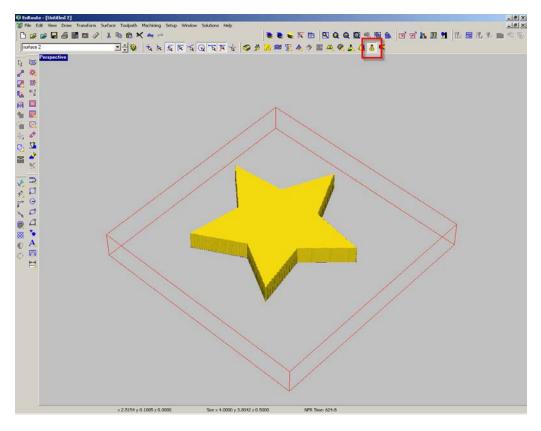
Center it in the plate.



Highlight the start and click "create relief" again.

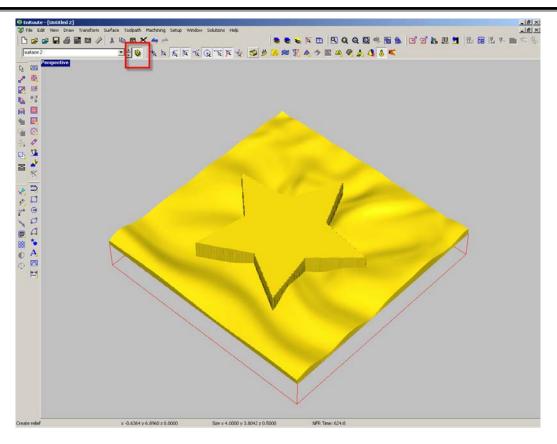


We're going to do another flat surface, only this time we'll give it a .5" height.

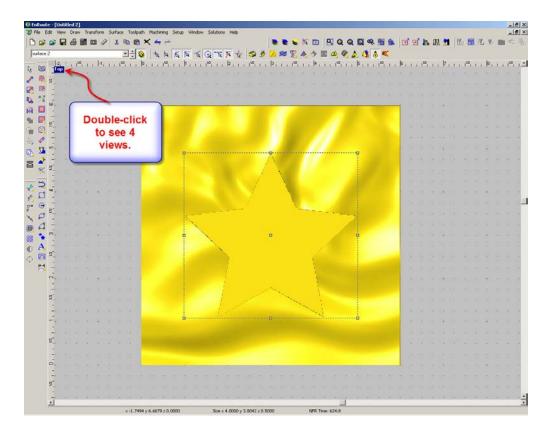


Rendered perspective view of Surface 2.





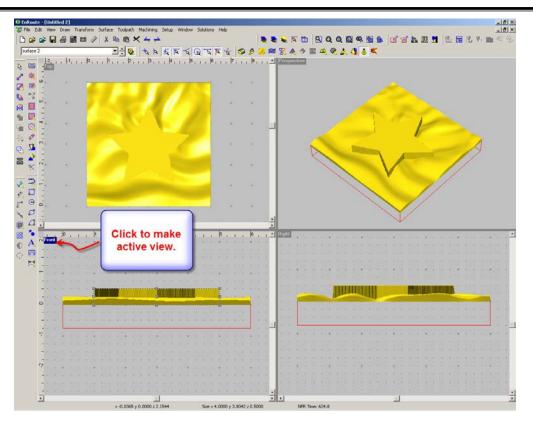
Both surfaces together.



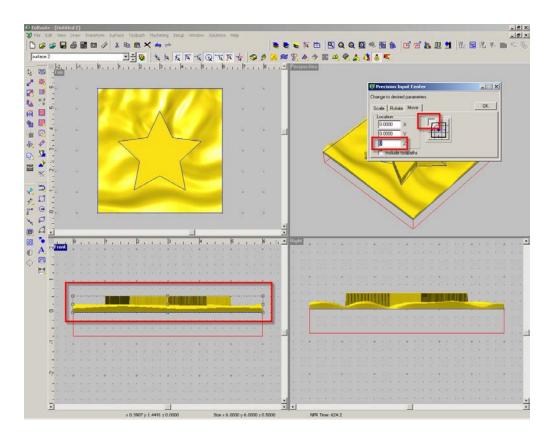
Double-click on the view name to make all views visible.



EnRoute: Project 3

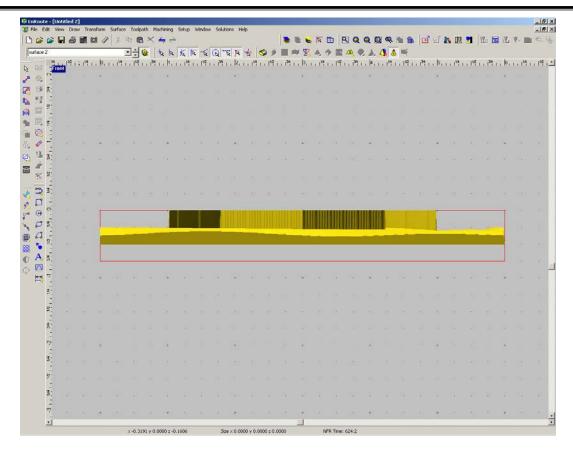


Click on the front view so that the name is highlighted.

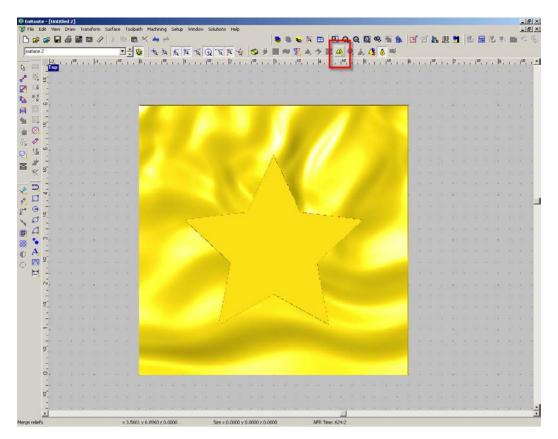


Now open the PIC (F2), select both surfaces together in the front view and move the top of the surfaces to Z=0.

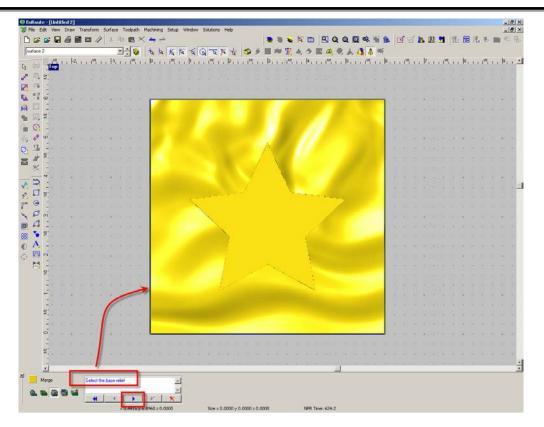
EnRoute: Project 3



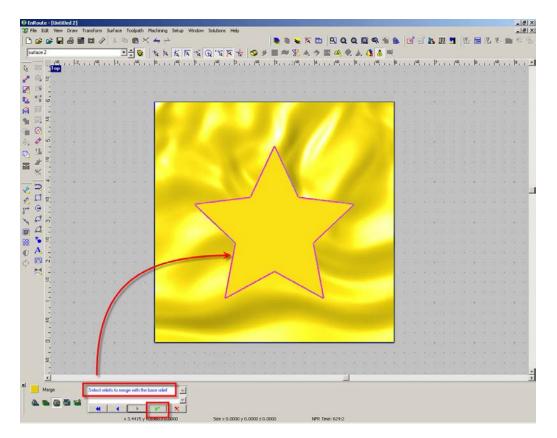
The surfaces moved into the plate.



Go back to the top view. Now we can merge the two reliefs together.

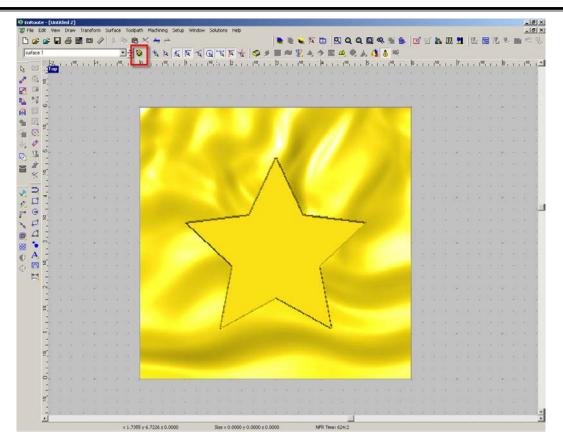


Click the "Merge Reliefs" tool and follow the instructions. First, select the base relief then click the blue arrow.



Then select the relief to be added and click the green check.





The reliefs are now combined together on layer 1. We don't need the "surface 2" layer anymore.

	view	Draw		ansfo ICH	m /2	Surfa		Tool	path	1997		9 SA	etup	Win	dow	Solu	tions	He	b			1			Þ	-		1			5 a	a #	8 8	1	a' o				1		2 1	7. U		Br
		8	1000	1040	a.				20	ñ.,										1														. 16	3 2	-		6 11	14	Les u	B	LI DE		1
			_			_	-	÷	12.0			× 1		*	2	Q.	De .	P	ti	1	2		18	R	A,	9	22	100	•	de.	4	0	NR .											
Ū	2, 1	. 1	•	. 1	4,		100	1.	; jo	. 1	· 18	11	. 1			112,	1.1	12.	1.1	110	1	, 3	1.1	1 150	1	. 14		1 100	11	, K	x 1.	. (e, 1	, 16	. 1	, 1 ¹⁶	51	, 17	1.	110		, 18,	1	
q.	-																																											
3.																																												
1																																												
ω.									-													-2-																						
-																																												
g'																																												
-																																												
1 1																																												
9				3. 5									1					*				12				2												240				. *		
-																																												
51.																																												
-																																												
1				, ¥									14													4				1								4				4		
1																																												
10																																												
-																																												
m.									9																									9								. 4		
5																																												
-																																												
N.																						14				12				4												14		
-																																												
2°																																												
-																																												
-													-																									(A)						
-																																												
5.																																												
ō.				2 4					-																									-				140						
-																																												
10																																												
÷	- 0	3.4				4.) - I	4	14		.4.7	- 14.1	- 10	1			*	A. 1	4	1	4.11	14.1	. 4	14	- 0.		(4)		4	12	14	- 14.1	114	1.0	4	3.5	1.8	-4	12	4.7		-14	1		

Go to the "cutout" layer and draw a 6x6 box like we started with.



EnRoute: Project 3

| | | | | m S | iurfac | 100 | - | _ | | | | up . | Wind | low | Sol | ution
 | 8 1 | Help | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | 16 |
|-------|-----|---------|-----|-----|--------|--------|---------|-------|-----------|-------------------------------------|---|---|--|---|---
---|---|--|--|--
--|---|---|---|---|---
--	---	---	---	---

--

--|---|---|---|---
---|--
---|---|---|
| | 5 | | 2 | 1 | X | | | | | | | | | | |
 | | | | |
 | | | e | * | A |
 | 15 | 5 | Q (| al | 0
 | œ, | 1 | - | C | 12 | 1

 | . 1
 | 2 2 | 1 | We. | 88 | 1. Carl
 | R | | 15
 | と真 |
| _ | _ | _ | _ | _ | Т | | C. 131. | 10000 | 1.1.7.00 | cont | Str | | | - (| ଇ | T
 | R | 4 | L. | 5 | 2
 | 5 0 | 1 5 | 2 9 | R | 4 | \$
 | 22 | 4 | 9 | 4 | 4
 | | | 5 | | |

 |
 | | | | |
 | | |
 | |
| 5 T - | 1.1 | с. Т. : | , P | 1.1 | . 1 | ×7, | | | | | | | | | 57, | 1
 | 12 | | | 150 | . 1
 | . 1 | | | 15 | 1. | 4
 | I. | , i ⁴ | e, 1 | . 1 | 5
 | | 117 | 1.1 | ₿ , | 1. | 142

 |
 | , Þ | . 1 | . 1 | 10, | 1.1.
 | ₿ , | 1.1 | 150
 | P. 1. |
20															
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
							-							,	
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
| | | | | | | | | | | | | | | | | 38
 | | | | |
 | | | | 277 | 22 |
 | 5575 | 80 | | | 100
 | | 28 | | -12 | |

 |
 | 1 | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
							-							-1	
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
			- 4												
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
												ine i			
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
						2	-	-	-			111		-	
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | 1 | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
			1.4												
 | | | | |
 | 0 | | | | |
 | | | | |
 | | | | | |

 |
 | 1 | | | |
 | ۰. | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
			4												
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
													101		
 | 101 | | | |
 | - | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
 | | | | |
 | | | | | |
 | | | | |
 | | | | | |

 |
 | | | | |
 | | |
 | |
| | | 861 | 848 | . 4 | 8680/ | 8492/* | | | A Barrier | A B C A A A A A A A A A A A A A A A | A Control of Freedom A Control of Freedom A Control of Fr | A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant of first A Constant A Cons | Resting Offset Resting Offset Construction Resting Offset Construction Resting Offset Rest | Constant and the second s | A Barry Start Cooling Lange Chains and the second start and the sec | Construction of Freedmann Construction Const | Control of the c | Pouring Offset Crises oper control Crises control
 Crises control Crises control Crises control Crises control Cr | Constant of Freedom Constants Constant of Constants Cons Constants Constants | A Barry character A Control Control of Section A Control Control Control Control A Control Control A Control Control A Control | Resting Offset Conservation of Section Conservation Resting Offset Conservation Resting Offset Conservation Resting Offset Conservation Resting Offset Resting | Works connection Mach Fill. Start Fill. Start Fill. Diagram Presed Filt transfille Diagram Presed Diagram Presed Diagram Presed Diagram D | Image: Source of the construction Image: Source of the construction | Posting Offset Construction of Flat Construction of Flat Construction of Flat Construction of Flat Social Flat Construction of Flat | Construction office Construction office Construction Const | Image: Source of the constraint of th | Proving Offset Offset Seen control Seen offset Offset Seen control Seen offset Offset Seen control Off | Image: Source of the construction of the
construction of the construction o | Construction office Construction Construction | Image: Source of the construction o | Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints | Image: Source of Source o | Construction of first Construction of first | Image: Source of the construction of the
construction of the construction o | Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Source of the constraints Image: Sourc | Image: Source of the construction o | Image: Source of the compact of the comp | Image: Source of the construction Image: Source of the construction <td>Image: Source of the constraints Image: Source of the</td> <td>Image: Source of the control of the</td> <td>Image: Source of the compact of
the compact of the comp</td> <td>Image: Second Plane Image: Second Plane</td> <td>Image: Source of the control of the cont</td> <td>Image: Source of the compact of the comp</td> <td>Image: Source of the construction Image: Source of the construction<td>A Barrow Contract A Barrow Contract A Barrow Contract A Contract Contract Contract A Contract Contend Contract Contract Contend Contract Contract Contend Contract C</td><td>Image: Source of the constraint of the
constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of the constraint of th</td><td>Image: Source of the comparison of th</td></td> | Image: Source of the constraints Image: Source of the | Image: Source of the control of the | Image: Source of the compact of the comp | Image: Second Plane Image: Second Plane | Image: Source of the control of the
control of the cont | Image: Source of the compact of the comp | Image: Source of the construction Image: Source of the construction <td>A Barrow Contract A Barrow Contract A Barrow Contract A Contract Contract Contract A Contract Contend Contract Contract Contend Contract Contract Contend Contract C</td> <td>Image: Source of the constraint of th</td> <td>Image: Source of the comparison of the
comparison of the comparison of th</td> | A Barrow Contract A Barrow Contract A Barrow Contract A Contract Contract Contract A Contract Contend Contract Contract Contend Contract Contract Contend Contract C | Image: Source of the constraint of th | Image: Source of the comparison of th |

Now go back to the surface layer and select a "Hatch Fill" tool path.

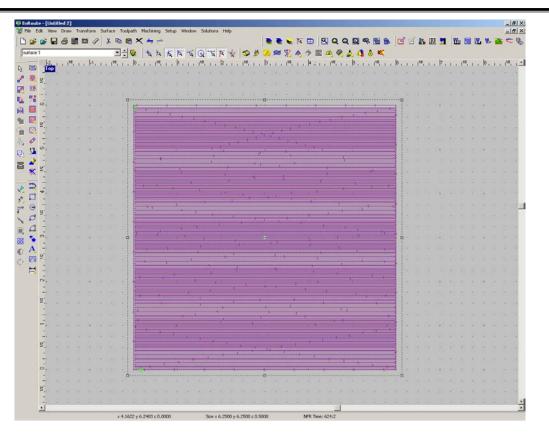
ch Fill						
Strategy:				-]	OK
	l ool	Туре	Depth	Edit		Cancel
🕨 1 🚖 1/4'' Ball End Mi	1	Fill	0.0000	•		
						Edit Plan
						<u>S</u> ave as
					-	
						Add Tool
Available Tools:			Sort tools by:			Delete Tool
Description	Tool Type		Color		-	Delete 1001
1/8" Ball End Mill	Ball Nose					Clear
3/16" Ball End Mill	Ball Nose				-	
1/4'' Ball End Mill	Ball Nose					
3/8° Ball End Mill	Ball Nose	M				
Hatch Fill Parameters: Optimization Apply to relief	Standard *					
Apply to surface						
Carve into surface	Γ				y w	
		_				100 C
Apply Overcut	0.0000	1.00				

For any 3D surface, you want to use a ball end mill. You can apply an overcut so that the cutter reaches the edge of the surface.

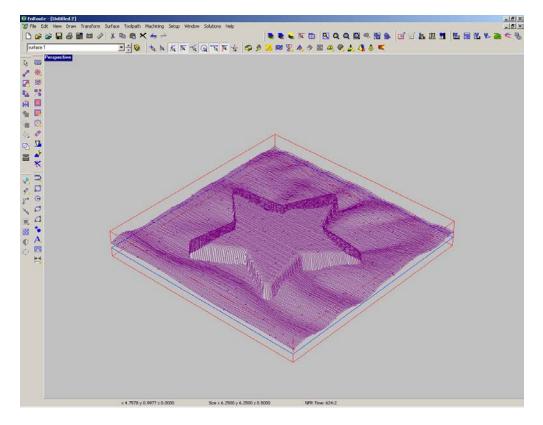
Dut 1	Temp	lates					<u> </u>	OK
	ent T		1/4" Ball End P	Mill			-	Cancel
-	_		Items	Current V	alue	Unit		<u>S</u> ave as
		Cut type	Roms	Fill	100	Onix		<u>J</u> ave as
T	Ξ	Depths		<u>¥</u>				<u>L</u> ibrary
		Surface		0.0000	🌲 ir	E	_	
		Final Dep	oth	0.6000				
		Offset fro	m surface	0.0000				
		Step Rou	ugh	Γ				Close
T	Ξ	Fill	86- 			20		
		Overlap		90.0000				
		Hatch ar	ngle	0.0000	Ŧ	8		
T		Passes		1				N
		Number		1	-			X
		Maximum	n per Pass	5.0000	📫 ir	i.		

A large overlap is important for 3D – otherwise, you will see a scalloped surface.

Cut	Temp	plates					-	· –	OK
Curr	ent T	ool	1/4" Ball End Mill						Cancel
-			Items	Current Value		Unit			<u>S</u> ave as
T		Feeds and Sp	eeds	<mark>.→Ľ</mark>					
		Feed Rat	e	150.0000	-	in/min	•		Library
		Final Pas	s Feed	0.0000	1990	in/min	•		
		Plunge R	ate	100.0000	-	in/min	•		
		Dwell		0.0000	\$				
		Spindle		18000	+	rpm			Close
T		Entry/Exit Para	ameters	ы					
		Entry - No	one	V					
		Arc	2						
		Lin	e						N
		Exit - Nor	ie	V					X
		Arc)						
_				-					



Top view of the tool path. Note how close the path lines are.



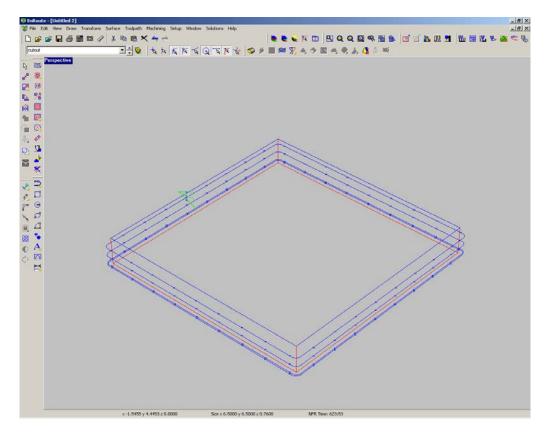
Perspective view of the surface.



EnRoute: Project 3

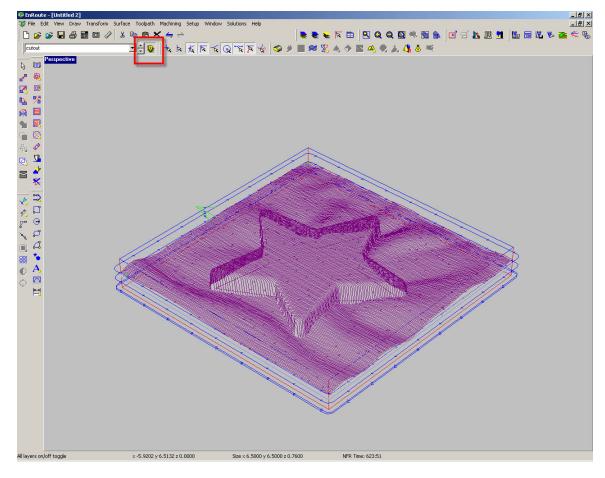
File Edit				rans	form	5	urfac	•	oalpal	th N	tachi	ning	Set	up I	Mind		Soluti	ons	Hel	>																									1	8
1 1 1 1		8	-	1	1	2	x	17	Re Ro	outing	Off	set														A		18		2 0		9				12	d b		. 71	1	6	8 8	2 2	. 2	-	
cutout	_		_		_				4 0							G	0 7	51		te	5	1 1		-	8			-	-		3.	3	13 1	ų.												
00	op	-		177	-	CT.	7.1		H								e, 1		2.	1.1	110		, þ.	. 1	140		. 4	1	14	P. 1	, \$, 150	1	, k ,	10	. 150	÷1.,	þ.	1.5	110		, 10	. 1	150	į
00 j	op								E Isl							5																														
8. s.								-	Dr		900) 1				ä																															
10 T									P 34							i.																														
9					6			1	En	gai	ng	22				-																		1010	-11				12				34			
									Py Py	ramic	1																																			
S.									Ed	H too	pati	Sin.																																		
0 -									1 60																																					
10 10.									/ Ed																		-																			
1 -									Die Die			whe																																		
× 5.									雪口																																					
2 :									E Pr Ke De																																					
4								1	N. De	1979	000	surs				1																														
Ω.																							1				1												71				11			
⊖																																														
Ø.									2																																					
0 :									3																																					
* ^m -					×				1									2.3					ш				9				6				4											
A -									3																																					
m 9																																														
H -									8																																					
· ~																																							+							
Ξ.																																														
2																																														
1																																														
÷.														112									-								- 24												112			
-																																														
2																																														
Ξ.																																														
ο,											-		-	-	-						-		-a-												-11				13				1			
-																																														
5																																														
- -	8 3	5			÷		4					4	+					5							42					1		42							42	2						
ing offset	-	-	-	-	-	-	-		0.0569	-			-	-	-	-	-	e x 6.	-	-	-	_	_	_	_	_	NER	-	-	1	_	_	_	_	_	-	_	_	-	-	-	-	_	_	-	ļ

Go to the "cutout" layer and apply a "routing offset" tool path for our cutout.



Perspective view of the cutout.





Both toolpaths.

At this point you are ready to output your files and take them to the machine.

Safety Instructions / Proper Colleting



READ THESE INSTRUCTIONS THOROUGHLY <u>BEFORE</u> OPERATING MACHINE. DO NOT OPERATE MACHINE IF YOU ARE UNFAMILIAR WITH THESE SAFE OPERATING INSTRUCTIONS. DO NOT OPERATE MACHINE WITHOUT KNOWING WHERE THE EMERGENCY STOP SWITCH IS LOCATED.

WARNING: IMPROPER OR UNSAFE OPERATION OF THE MACHINE WILL RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.

- 1. Keep fingers, hands, and all other objects away from machine while power is on.
- 2. Disconnect power to all system components when not in use, when changing accessories, and before servicing.
- 3. Do not loosen, remove, or adjust machine parts or cables while power is on.
- 4. Exercise care with machine controls and around keyboard to avoid unintentional starting.
- 5. Make sure voltage supplied is appropriate to specifications of components.
- 6. Machines must be plugged into threepronged grounded outlets. Do not remove the grounding plug or connect into an ungrounded extension cord.
- 7. Keep cables and cords away from heat, oil, and sharp edges. Do not overstretch or run them under other objects or over work surfaces.
- 8. Use proper fixtures and clamps to secure work. Never use hands to secure work.
- 9. Do not attempt to exceed limits of machine.
- 10. Do not attempt to use machine for purposes other than what is intended.
- 11. Use machine only in clean, well-lit areas free from flammable liquids and excessive moisture.

- 12. Stay alert at all times when operating the machine.
- 13. Always wear safety goggles and dust mask.
- 14. Do not wear loose-fitting clothing or jewelry when operating machine. Long hair should be protected.
- 15. Always maintain proper balance and footing when working around the machine.
- 16. Maintain equipment with care. Keep cutting tools clean and sharp. Lubricate and change accessories when necessary. Cables and cords should be inspected regularly. Keep controls clean and dry.
- 17. Before using, check for damaged parts. An authorized service center should perform all repairs. Only identical or authorized replacement parts should be used.
- 18. Remove any adjusting <u>keys</u> and wrenches before turning machine on.
- 19. Do not operate the machine unattended.
- 20. Follow all safety instructions and processing instructions in the MSDS for the material being processed.
- 21. Use proper precautions with dust collection systems to prevent sparks and fire hazards.
- 22. Make sure to have proper fire extinguishing equipment on hand at all times.

PREVENT FIRE HAZARDS by using the proper feeds, speeds, and tooling while operating your Techno machine. For example, setting feeds and speeds too low and/or using dull tool bits creates friction at the material. The friction generates **heat which can result in a fire that can be drawn through the vacuum table or** dust collector without warning. Fire hazard from friction heating caused by dull tools is possible when cutting certain materials, especially composite material such as wood composites, MDF and Particleboard. © 08/2014

Call: 1-516-328-3970 or Visit: support.technocnc.com



relation to the nut. The collet is not flush to the end of the collet nut. Correct this assembly before using.

as the collet properly goes into the collet nut. Once it is assembled, then "SCREW" the nut onto the threaded spindle end.

DO NOT PUSH THE COLLET **INTO THE SPINDLE AT ANY TIME!**

Only the proper assembly should be screwed onto the spindle.



FOR TOOLCHANGE AND FIXED COLLET **SPINDLES:**

ONLY USE TOOLHOLDERS, COLLET NUTS AND TOOLS THAT ARE BALANCED TO MEET OR EXCEED THE MAX **RATED SPEED OF** THE SPINDLE.

Call: 1-516-328-3970 or Visit: support.technocnc.com