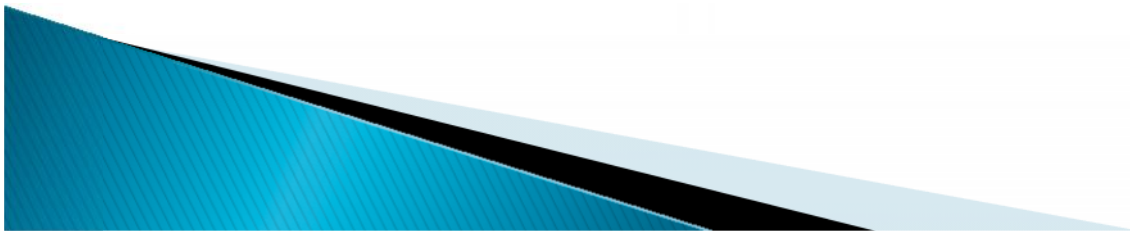


# From Drafting to G Code

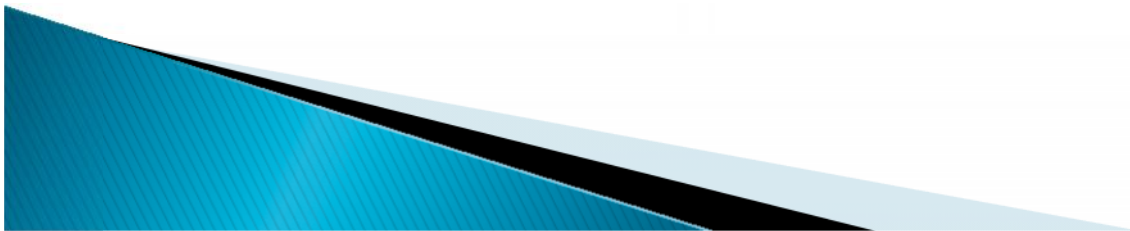
A CNC Journey

- By Bruce Lunde
- Presented at The Home Metal Shop Club
- July 10, 2010 Meeting



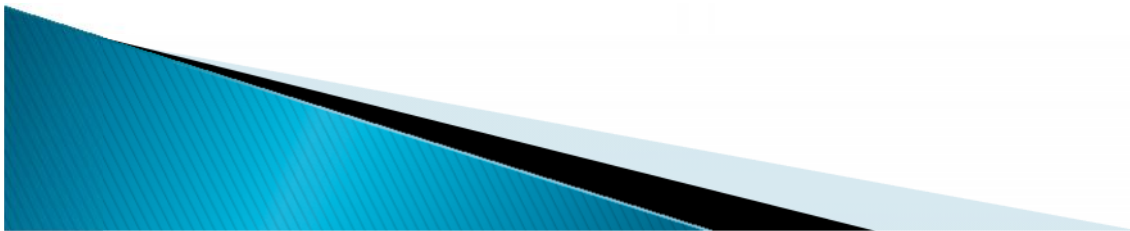
# Presentation Agenda

- ? Walk through of a Design to G-code process
- ? Examine my toolset in depth
  - Alibre Features
  - Cut2D Features
  - Mach3 Features
- ? Wrap-Up & Questions



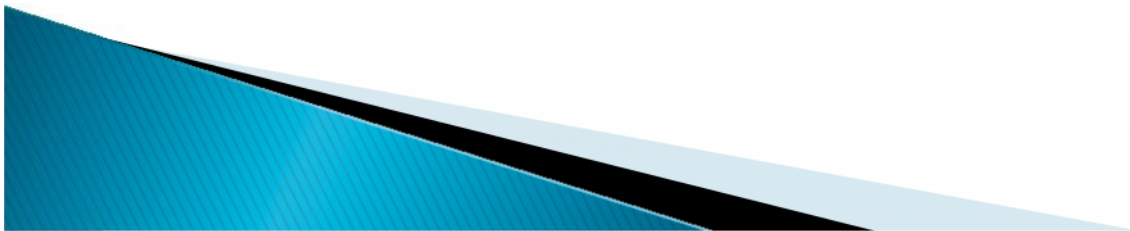
# The Tools I Use

- ? A computer with resources to match the highest requirements (Alibre Pro)
- ? Alibre Design Professional
- ? Vectric Cut2D
- ? ArtSoft Mach3

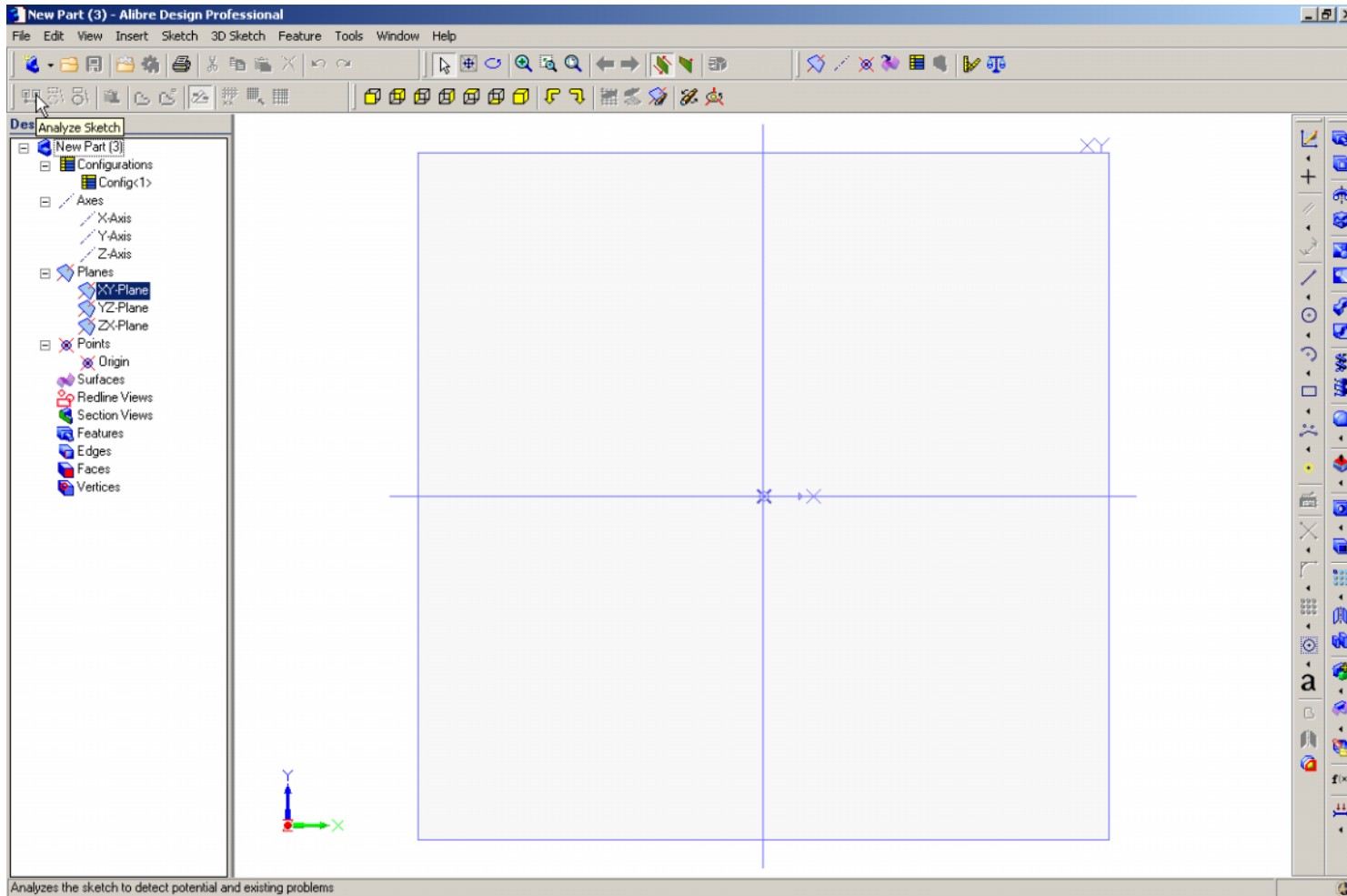


# The Process

- ? Design a Part with Alibre Design Professional
- ? Create a Drawing of the Alibre Part
- ? Export a .dxf (AutoCad)
- ? Import the Drawing into Cut2D
- ? Create toolpaths
- ? Save the Cut2d drawing
- ? Export the g-code
- ? Open in Mach3, do a test run
- ? Make Chips!

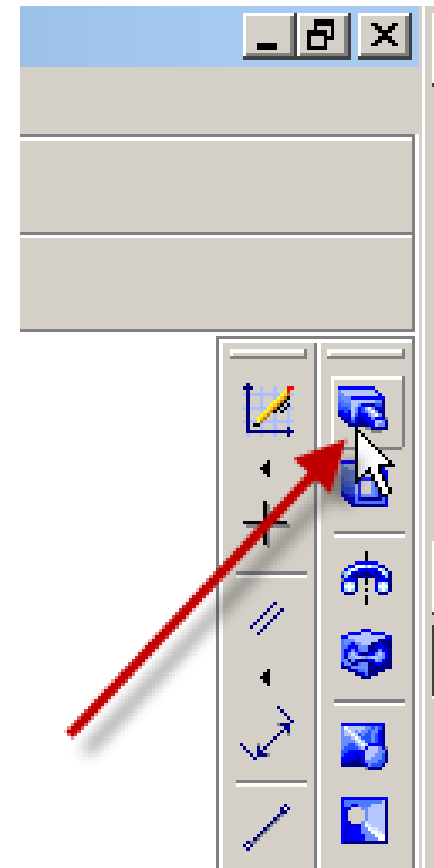
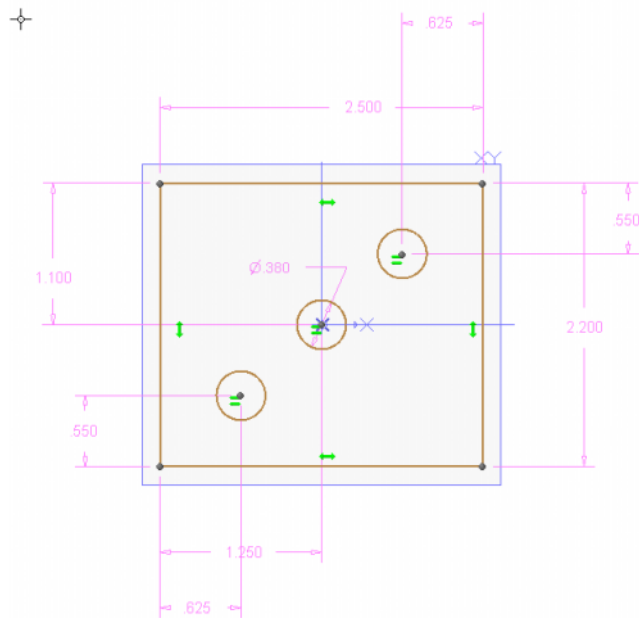


# Create a Part – The Part Window

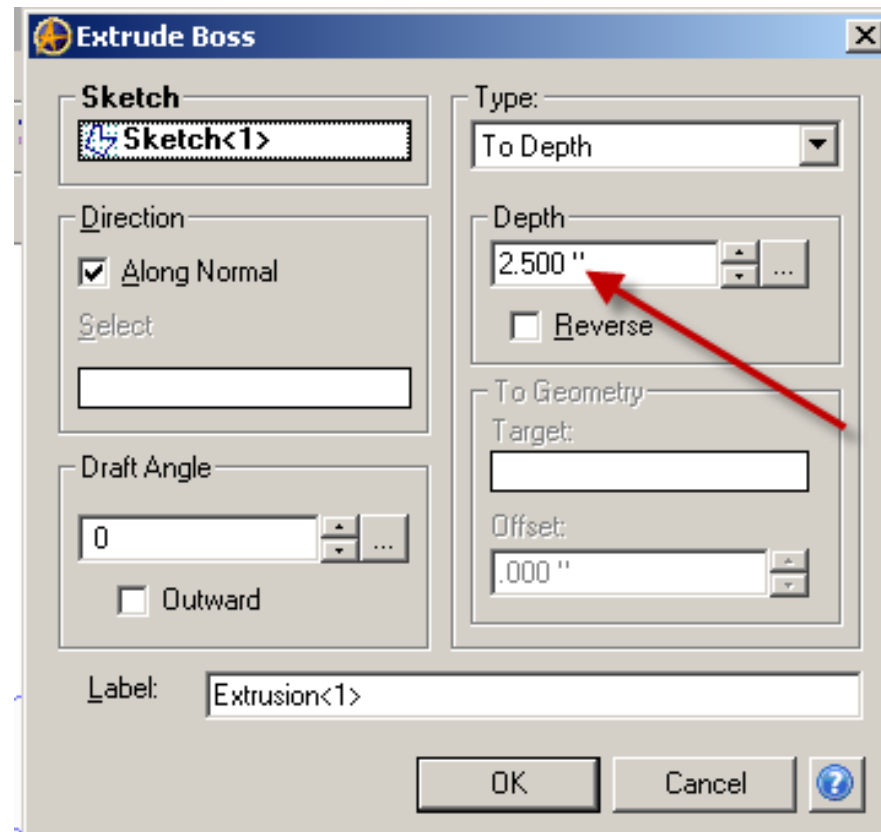


# Setup the 3<sup>rd</sup> Dimension

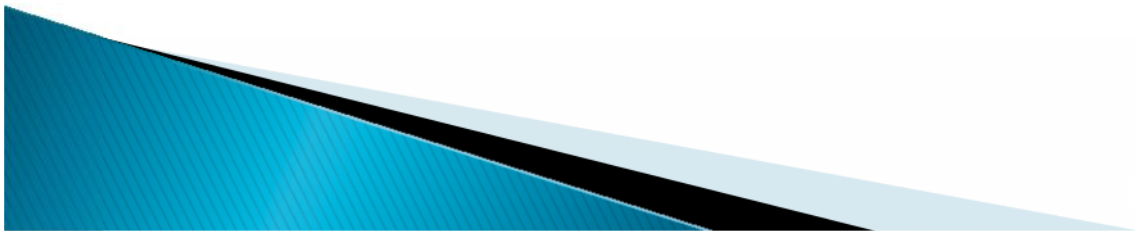
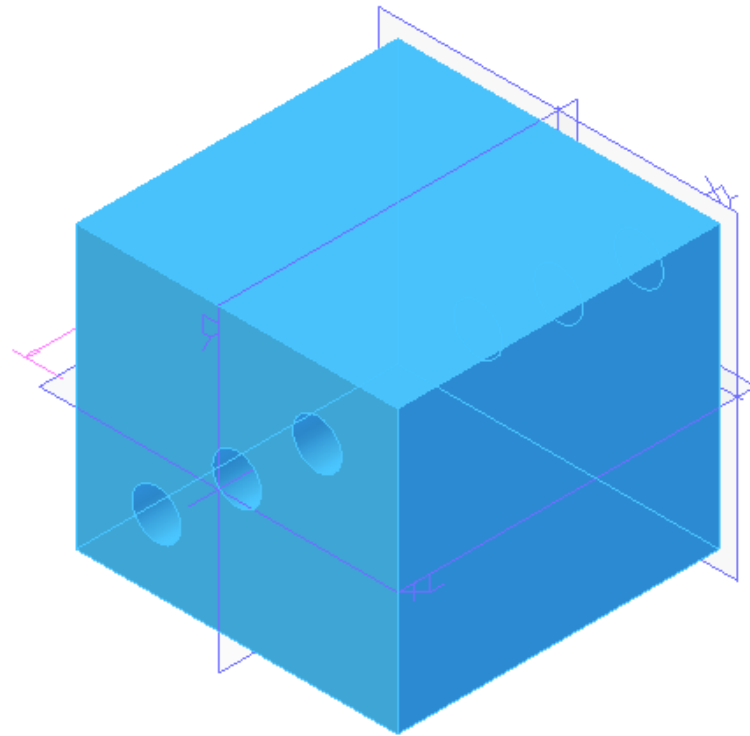
? Now that the part is drawn, we want to “extrude” the drawing to the proper thickness.



# Fill out the Extrusion info screen

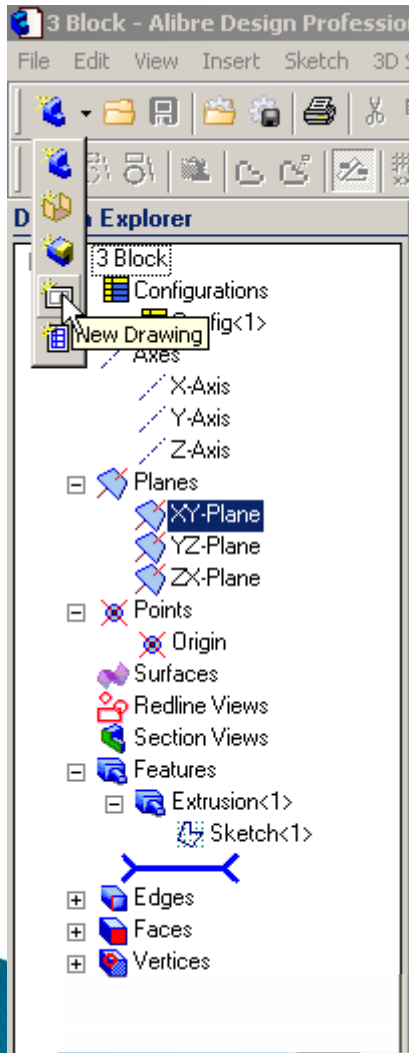


# Finished 3D Part

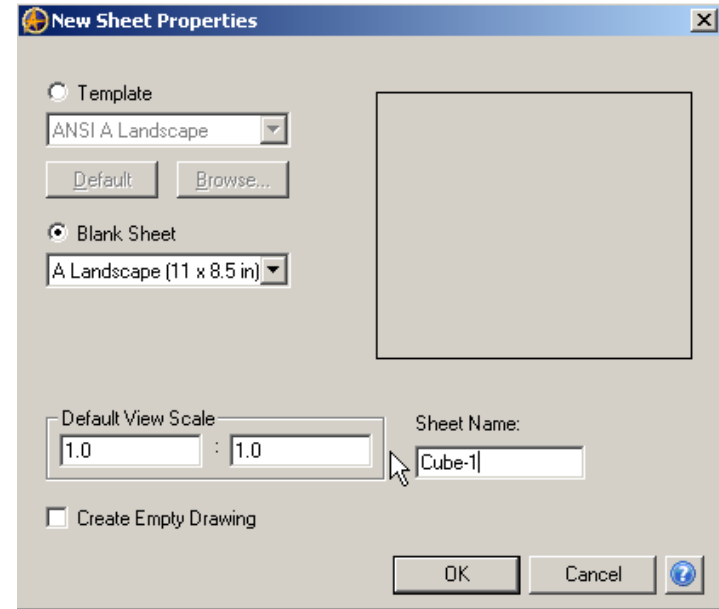




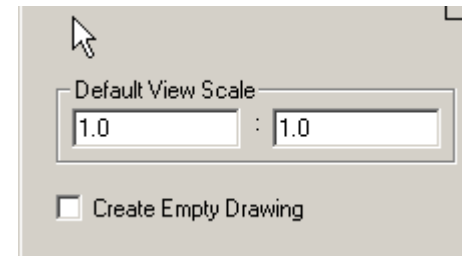
# Create a Drawing file



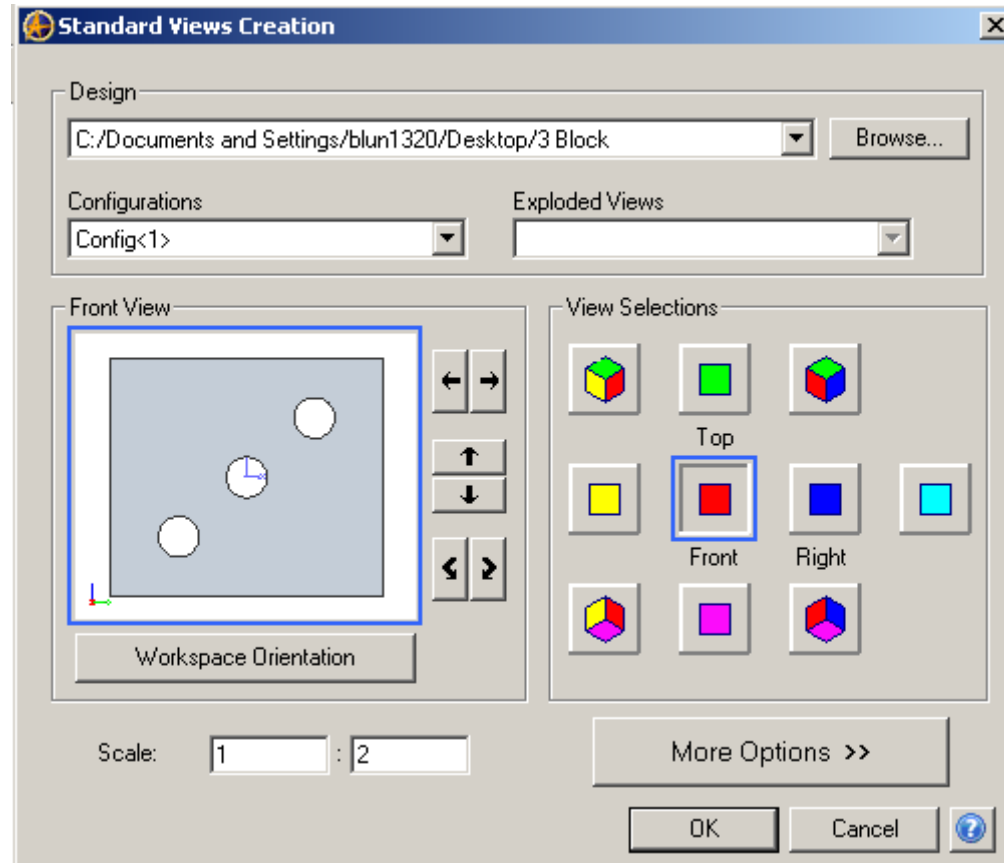
Select New Drawing from the menu



Make sure you change the scale to 1-1

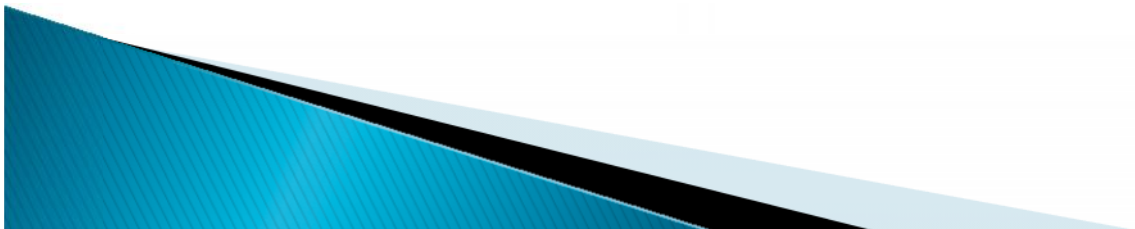
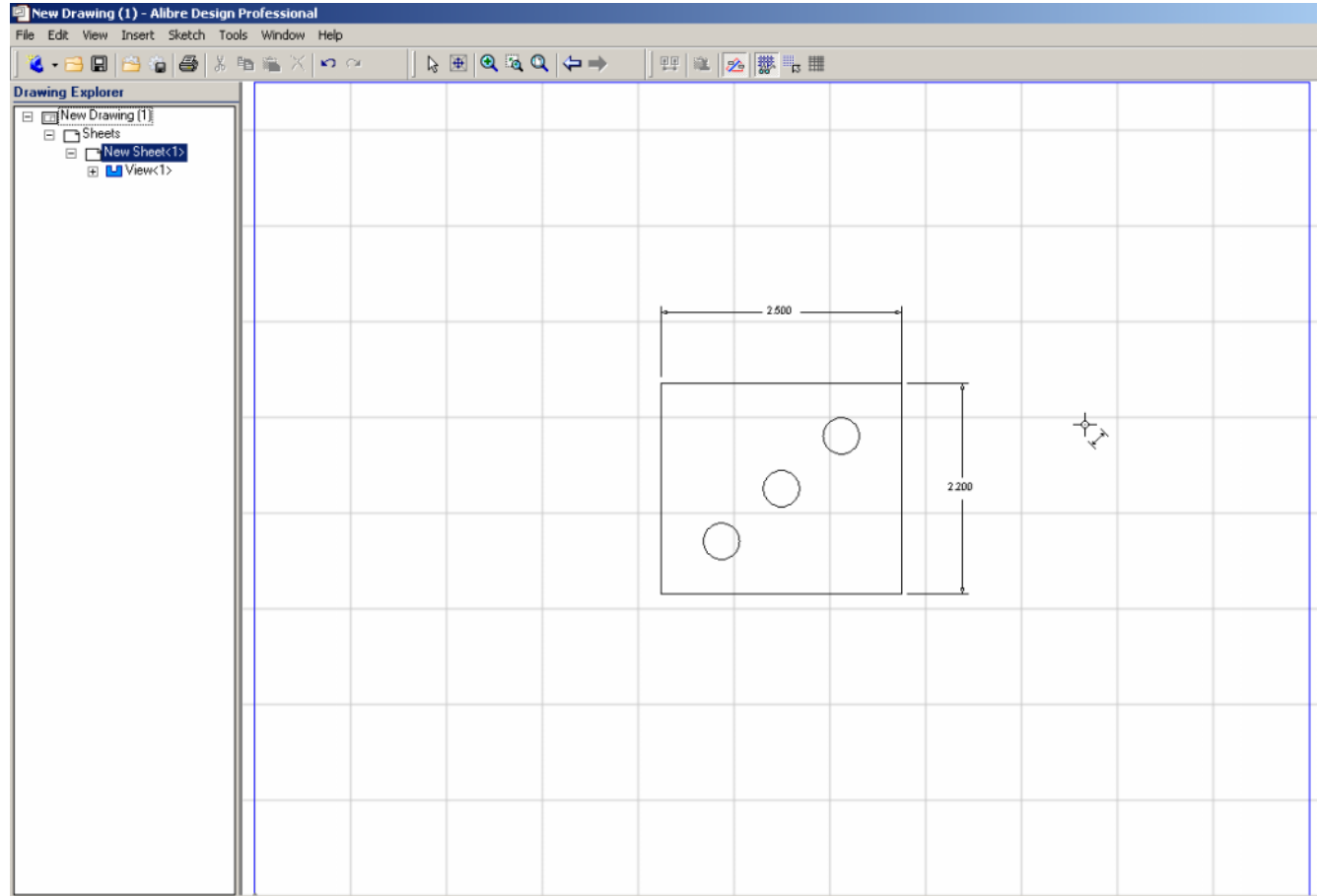


# Choose the settings

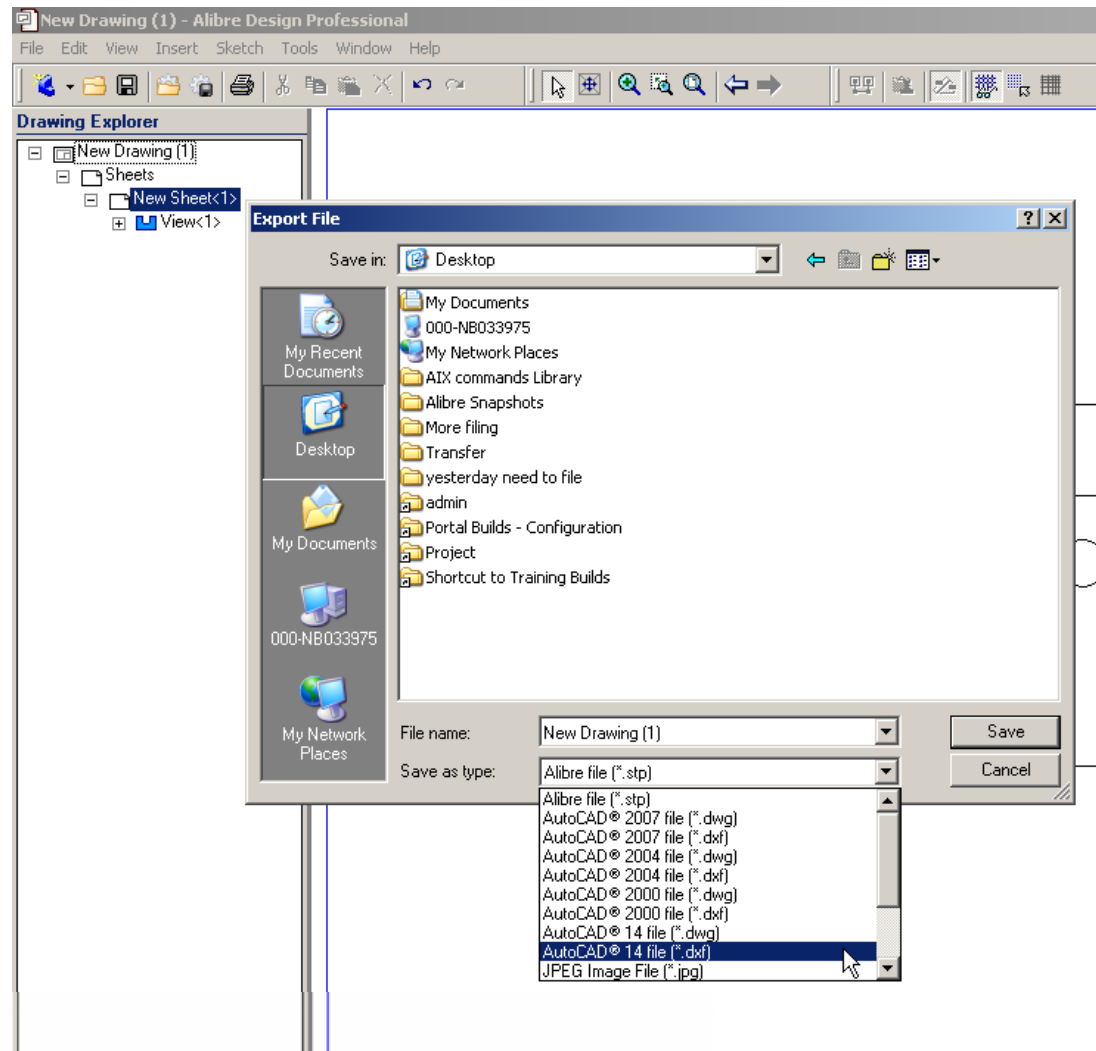


# Position the Drawing

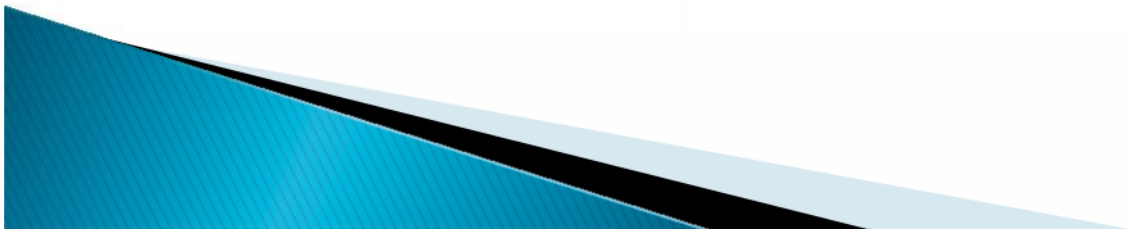
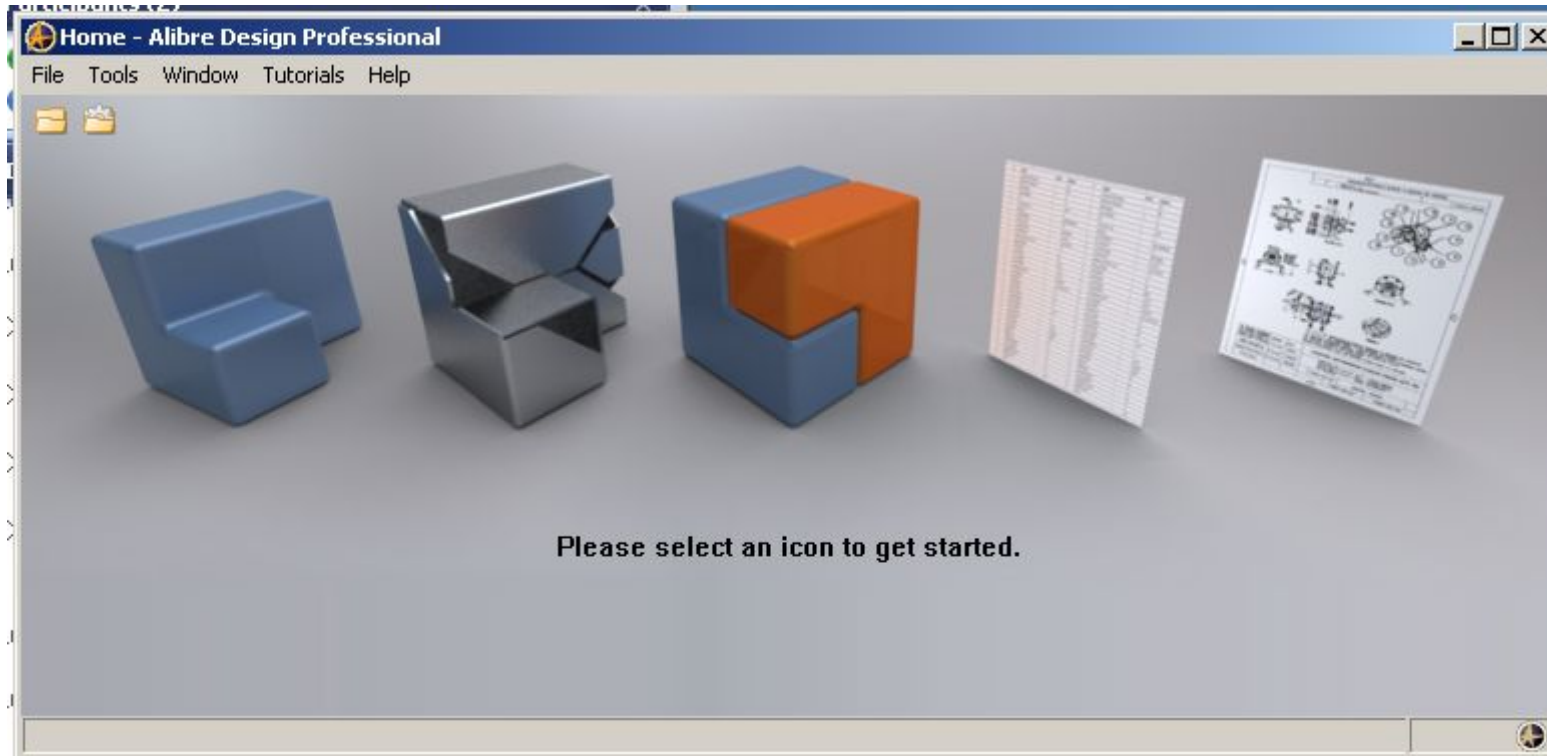
You can add Dimensions to verify!



# Export to a .DXF



# Demonstration of Alibre

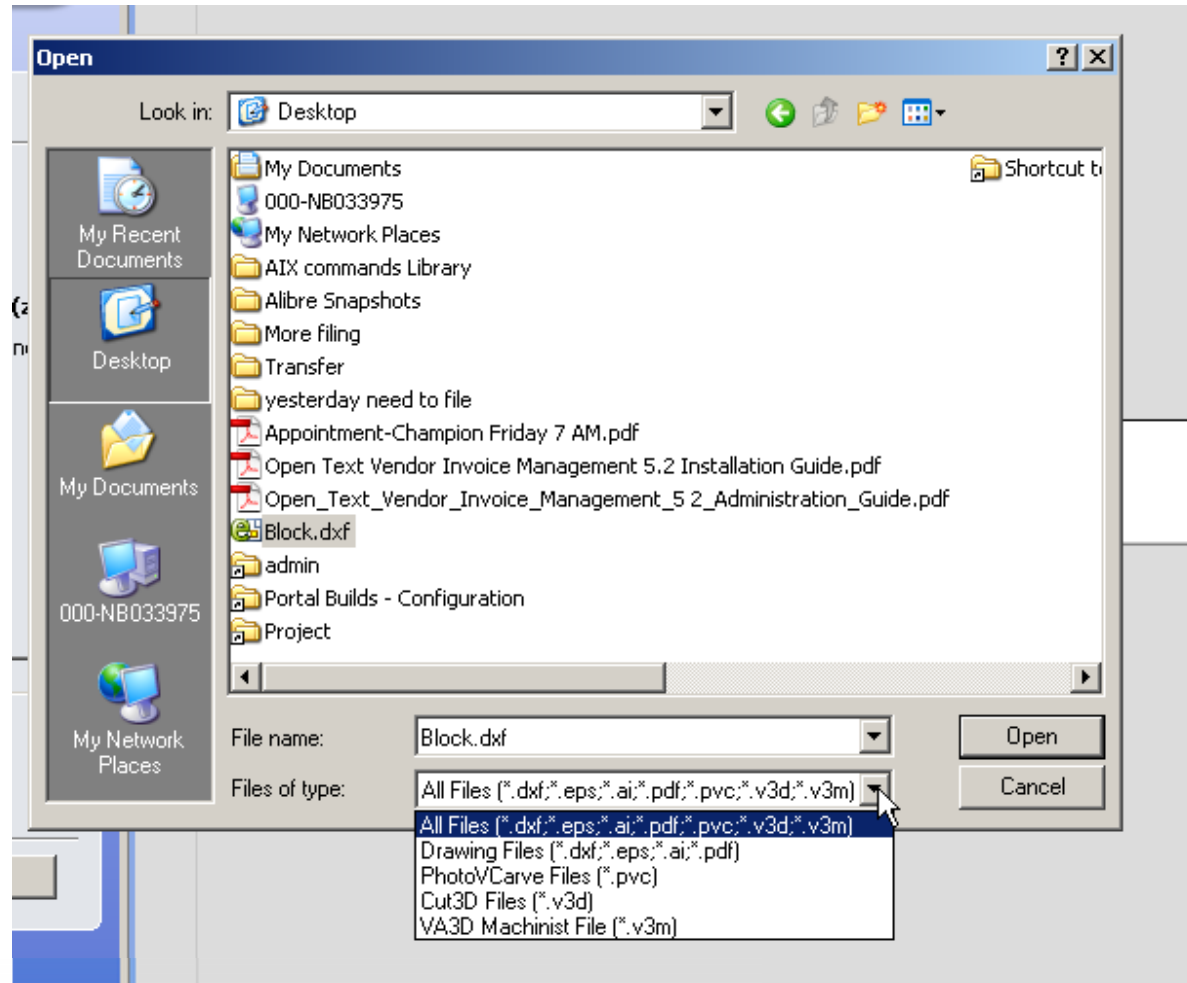


# Start Cut2D

? Create a New file

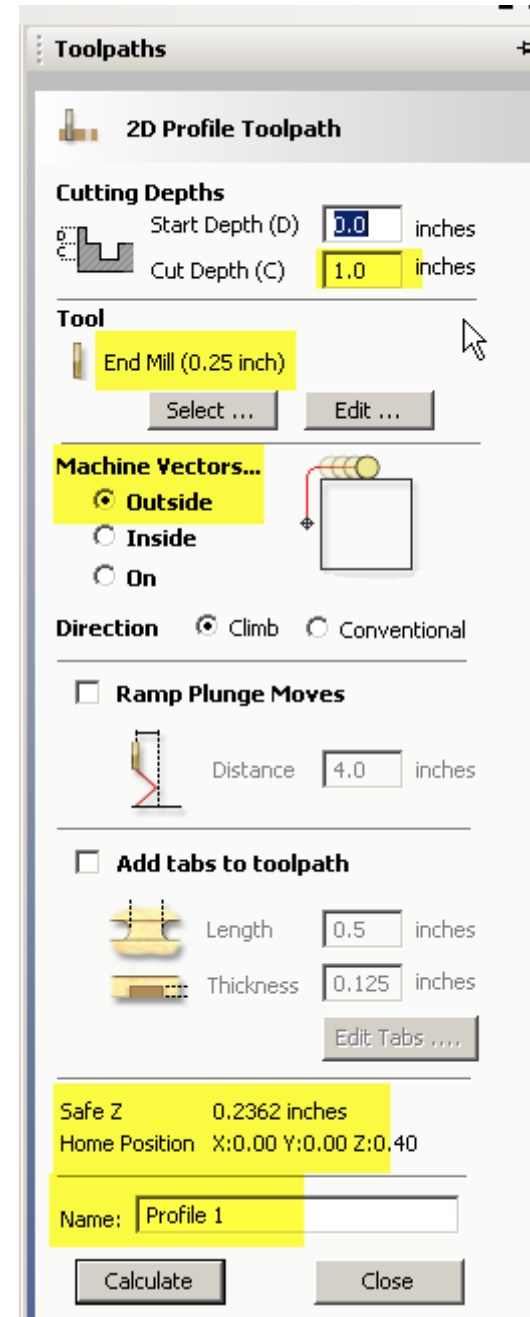


# Import to Cut2D



# Prepare for CNC

- Import
- Check for Open Vectors
- Highlight each Cut
  - Highlight the area
  - Create a toolpath
  - Name the toolpath





# Setup the Tools, Toolpaths

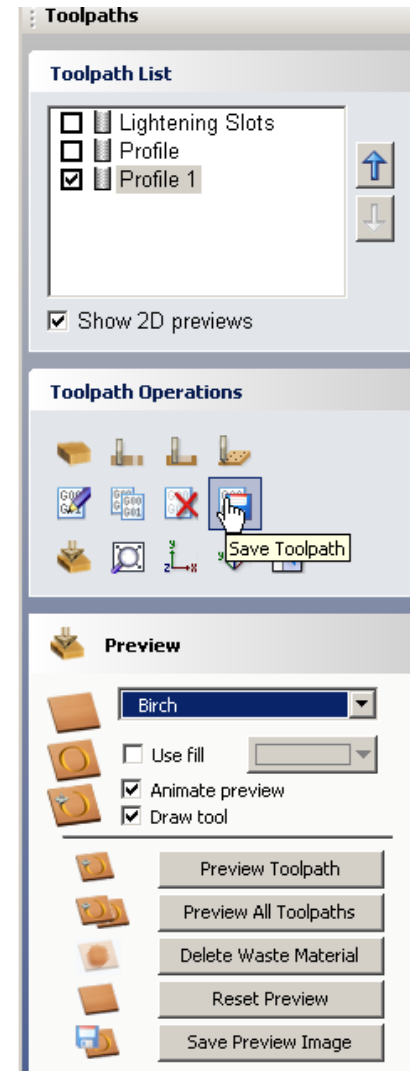
The screenshot displays the Vectric Cut2D software interface. The main workspace shows three circles arranged in a triangular pattern. The left sidebar contains various tool icons categorized into File Operations, 2D View Control, Create Vectors, Edit Vectors, and Align Vectors. The bottom-left corner shows Job Dimensions: Width [X]: 2.5 inches, Height [Y]: 2.2 inches, and Depth [Z]: 1.0 inches. The status bar at the bottom indicates 'Ready' and coordinates X: 4.3986 Y: 3.3139 W: 2.500.

The right-hand panel is titled 'Toolpaths' and is configured for a '2D Profile Toolpath'. The 'Cutting Depths' section shows Start Depth (D) set to 0.0 inches and Cut Depth (C) set to 1.0 inches. The 'Tool' section is set to 'End Mill (0.25 inch)'. The 'Machine Vectors...' section has 'Outside' selected. The 'Direction' section has 'Climb' selected. The 'Ramp Plunge Moves' section is unchecked, with a distance of 4.0 inches. The 'Add tabs to toolpath' section is unchecked, with a length of 0.5 inches and a thickness of 0.125 inches. The 'Safe Z' is set to 0.2 inches, and the 'Home Position' is X:0.00 Y:0.00 Z:2.00. The toolpath is named 'Profile 1'. Buttons for 'Calculate' and 'Close' are visible at the bottom of the panel.

34 Y: 3.7806

# Save the toolpath files

- ? Starting out, save them individually!
- ? Later you can combine paths that use the same tools



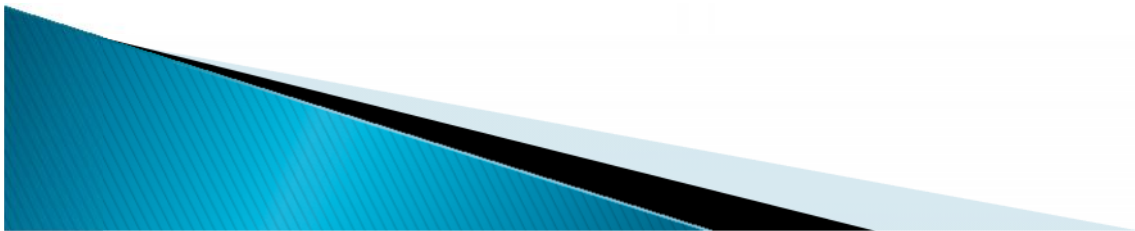
# Cut2D Demonstration

? Create a New file



# Bring in the G-code to Mach3

- ? Open Mach3
- ? Load the G-code in
- ? Make sure to test with no cutter, so you don't waste metal
- ? Let the chips fly!



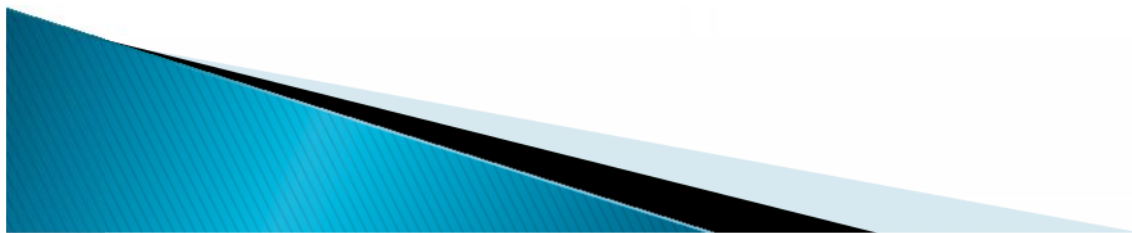
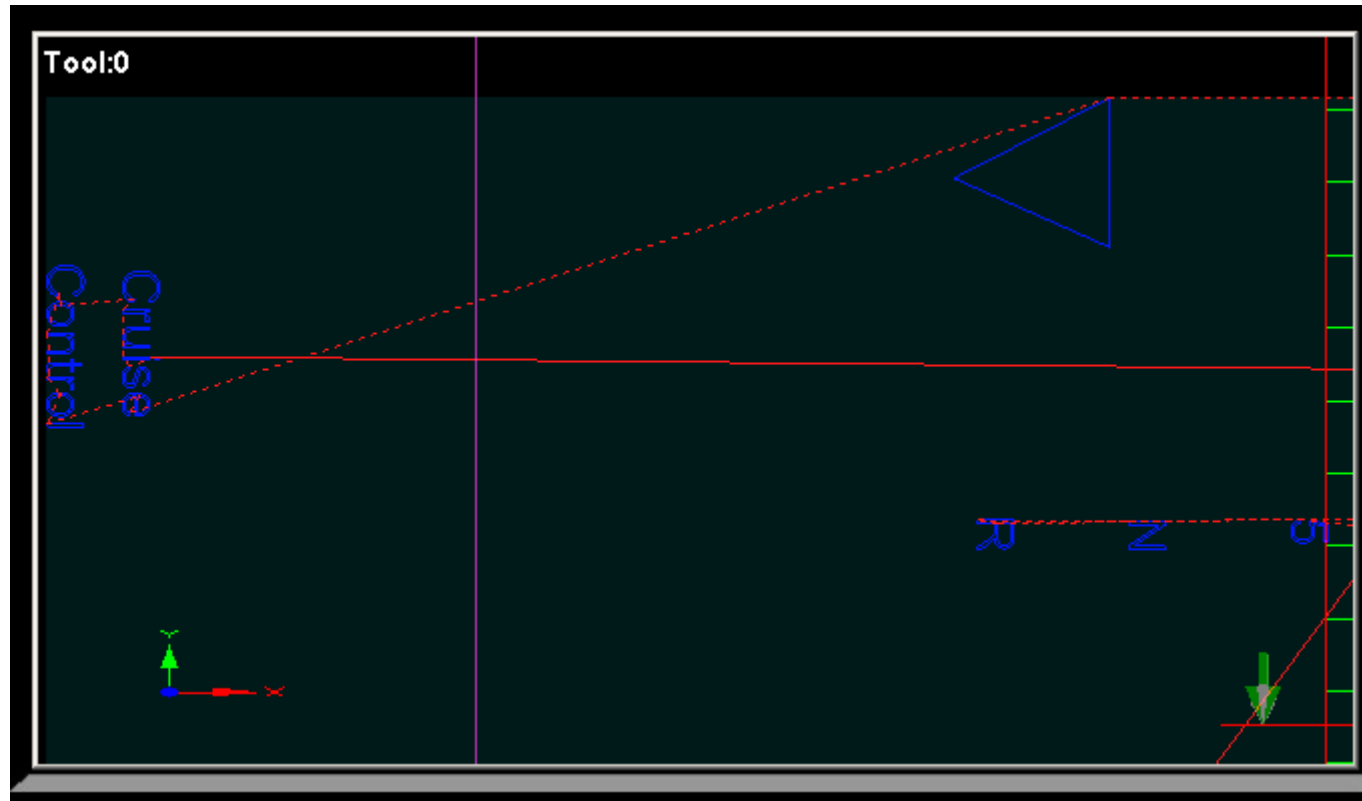
# Mach 3 - Main Screen

The screenshot displays the Mach3 CNC Demo software interface. The window title is "Mach3 CNC Demo" and the menu bar includes File, Config, Function Cfg's, View, Wizards, Operator, PlugIn Control, and Help. The main menu bar contains Program Run (Alt-1), MDI (Alt-2), Tool Path (Alt-4), Offsets (Alt-5), Settings (Alt-6), and Diagnostics (Alt-7). The current tool path is Mill->G15 G1 G17 G40 G20 G90 G94 G54 G49 G99 G64 G97.

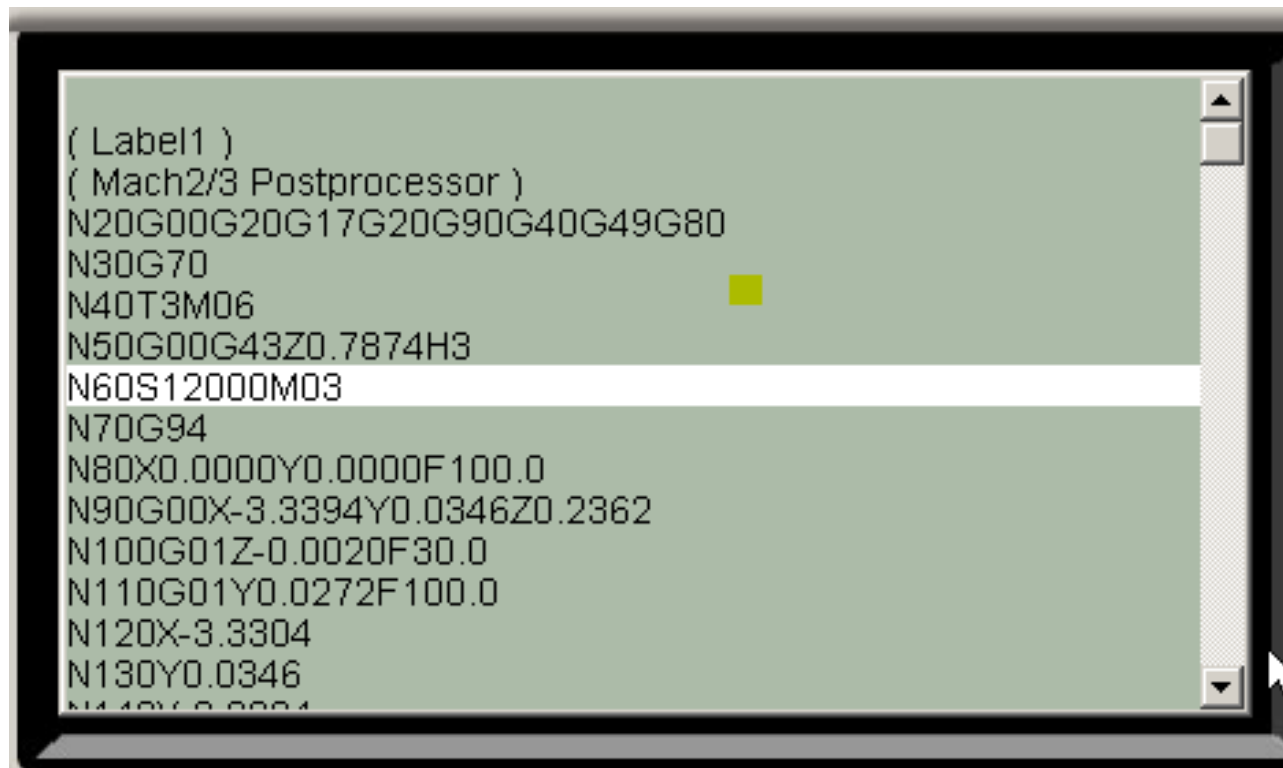
The interface is divided into several sections:

- Program Run:** A text area showing G-code: ( Label1 ), ( Mach2/3 Postprocessor ), N20G00G20G17G20G90G40G49G80, N30G70, N40T3M06, N50G00G43Z0.7874H3, N60S12000M03, N70G94, N80X0.0000Y0.0000F100.0, N90G00X-3.3394Y0.0346Z0.2362, N100G01Z-0.0020F30.0, N110G01Y0.0272F100.0, N120X-3.3304, N130Y0.0346.
- Offsets:** A vertical column on the left labeled "REF ALL HOME" with four zeroing buttons: Zero X (-2.5500), Zero Y (-3.4420), Zero Z (+0.0000), and Zero 4 (+0.0000). Each has a Scale of +1.0000. A Radius Correct button is also present.
- Control Buttons:** OFFLINE, GOTO ZERO, To Go, Machine Coord's, and Soft Limits.
- File:** J:\Drawings\cut files\Section 1 - Side Panel - Engrave.bt
- Wizards:** Load Wizards, Last Wizard, NFS Wizards, Regen. Toolpath, Display Mode, and Jog Follow.
- Tool Information:** Tool 0, Dia. +0.0000, H +0.0000, Auto Tool Zero, Remember, Return, Elapsed 00:01, Jog ON/OFF Ctrl-Alt-J.
- Feed Rate:** OverRidden, FRO %, Rapid FRO 100, FRO 6.00, Feedrate 6.00, Units/Min 0.00, Units/Rev 0.00.
- Spindle Speed:** Spindle CW F5, SRO %, RPM 0, S-ov 0, Spindle Speed 0.
- Control Panel:** Cycle Start <Alt-R>, Feed Hold <Spc>, Stop <Alt-S>, Reset, Edit G-Code, Recent File, Close G-Code, Load G-Code, Set Next Line, Line: 6, Run From Here, Rewind Ctrl-W, Single BLK Alt-N, Reverse Run, Block Delete, M1 Optional Stop, Flood Ctrl-F, Dwell, CV Mode, On/Off Z Inhibit +0.000, G-Codes, M-Codes.
- Status:** Mach2/3 Postprocessor, Profile: Mach3Mill.

# Mach3 - Tool Path

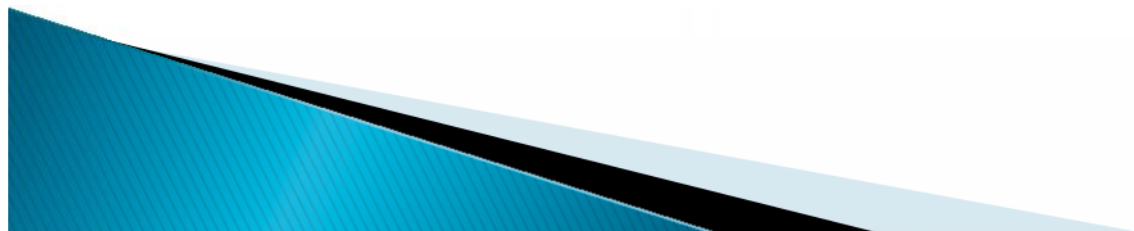


# Mach3 - G-Code Window



The screenshot shows a window titled "G-Code Window" with a light green background. The window contains a list of G-code lines, each starting with a line number (N) followed by G, X, Y, Z, F, and H codes. A yellow cursor is positioned on the line "N40T3M06". A vertical scrollbar is on the right side of the window, and a mouse cursor is pointing at the bottom right corner.

```
( Label1 )  
( Mach2/3 Postprocessor )  
N20G00G20G17G20G90G40G49G80  
N30G70  
N40T3M06  
N50G00G43Z0.7874H3  
N60S12000M03  
N70G94  
N80X0.0000Y0.0000F100.0  
N90G00X-3.3394Y0.0346Z0.2362  
N100G01Z-0.0020F30.0  
N110G01Y0.0272F100.0  
N120X-3.3304  
N130Y0.0346  
N140Y0.0346
```



# Mach3 – DRO





# Mach 3 Demonstration

The screenshot displays the Mach3 CNC Demo software interface. The main window title is "Mach3 CNC Demo" and the menu bar includes "File", "Config", "Function Cfg's", "View", "Wizards", "Operator", "PlugIn Control", and "Help". The "Tool Path (Alt-4)" menu item is highlighted.

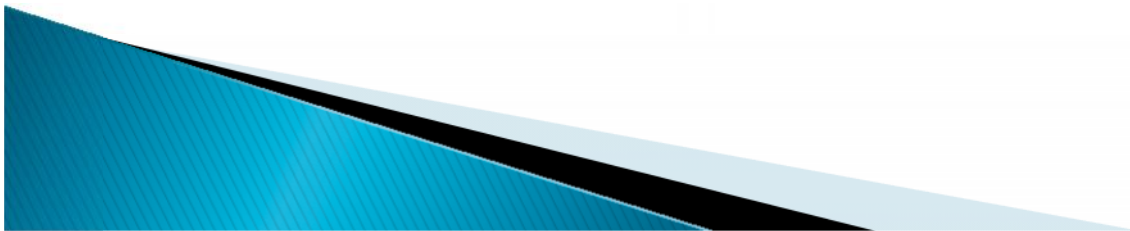
The interface is divided into several sections:

- Program Run (Alt-1):** A text area showing G-code: 

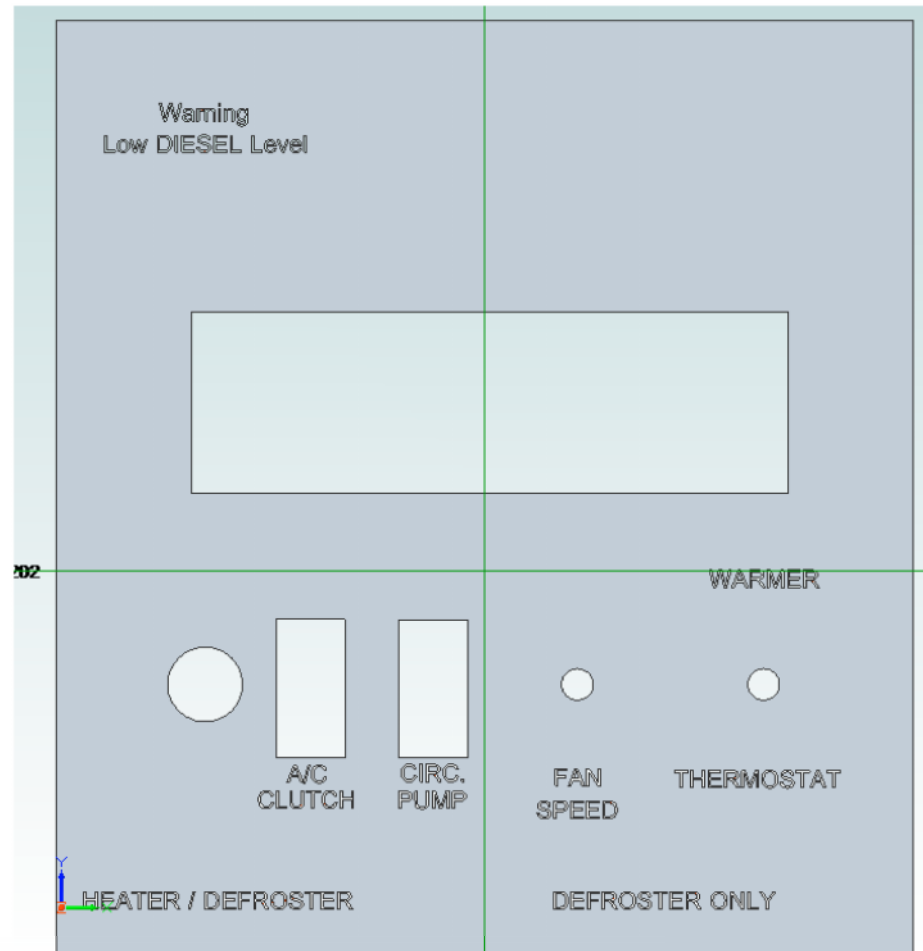
```
( Label1 )  
( Mach2/3 Postprocessor )  
N20G00G20G17G20G90G40G49G80  
N30G70  
N40T3M06  
N50G00G43Z0.7874H3  
N60S12000M03  
N70G94  
N80X0.0000Y0.0000F100.0  
N90G00X-3.3394Y0.0346Z0.2362  
N100G01Z-0.0020F30.0  
N110G01Y0.0272F100.0  
N120X-3.3304  
N130Y0.0346  
N140Y0.0346
```
- REF ALL HOME:** A vertical column of buttons for homing axes.
- Zero X, Y, Z, 4:** A table of zero offsets for each axis, with "Zero X" and "Zero Y" highlighted by red boxes. The values are: X: -2.5500, Y: -3.4420, Z: +0.0000, 4: +0.0000. Each entry includes a "Scale" or "Radius Correct" field.
- Buttons:** "OFFLINE", "GOTO ZERO", "To Go", "Machine Coord's", and "Soft Limits".
- File:** "J:\Drawings\cut files\Section 1 - Side Panel - Engrave.bt".
- Wizards:** "Load Wizards", "Last Wizard", "NFS Wizards", and "Last Wizard" (highlighted).
- Regen. Toolpath, Display Mode, Jog Follow:** Control buttons for regeneration and display.
- Control Panel:** Includes "Cycle Start <Alt-R>", "Feed Hold <Spc>", "Stop <Alt-S>", "Reset", "Edit G-Code", "Recent File", "Close G-Code", "Load G-Code", "Set Next Line", "Run From Here", "Rewind Ctrl-W", "Single BLK Alt-N", "Reverse Run", "Block Delete", "M1 Optional Stop", "Flood Ctrl-F", "Dwell", "CV Mode", "On/Off", "Z Inhibit", "G-Codes", and "M-Codes".
- Tool Information:** Shows "Tool 0", "Dia. +0.0000", "H +0.0000", "Auto Tool Zero", "Remember", "Return", "Elapsed 00:01", and "Jog ON/OFF Ctrl-Alt-J".
- Feed Rate:** Shows "OverRidden", "FRO %", "Rapid FRO 100", "FRO 6.00", "Feedrate 6.00", "Units/Min 0.00", and "Units/Rev 0.00".
- Spindle Speed:** Shows "Spindle CW F5", "SRO %", "RPM 0", "S-ov 0", and "Spindle Speed 0".
- Status:** "Mach2/3 Postprocessor".
- Profile:** "Mach3Mill".

# Side notes

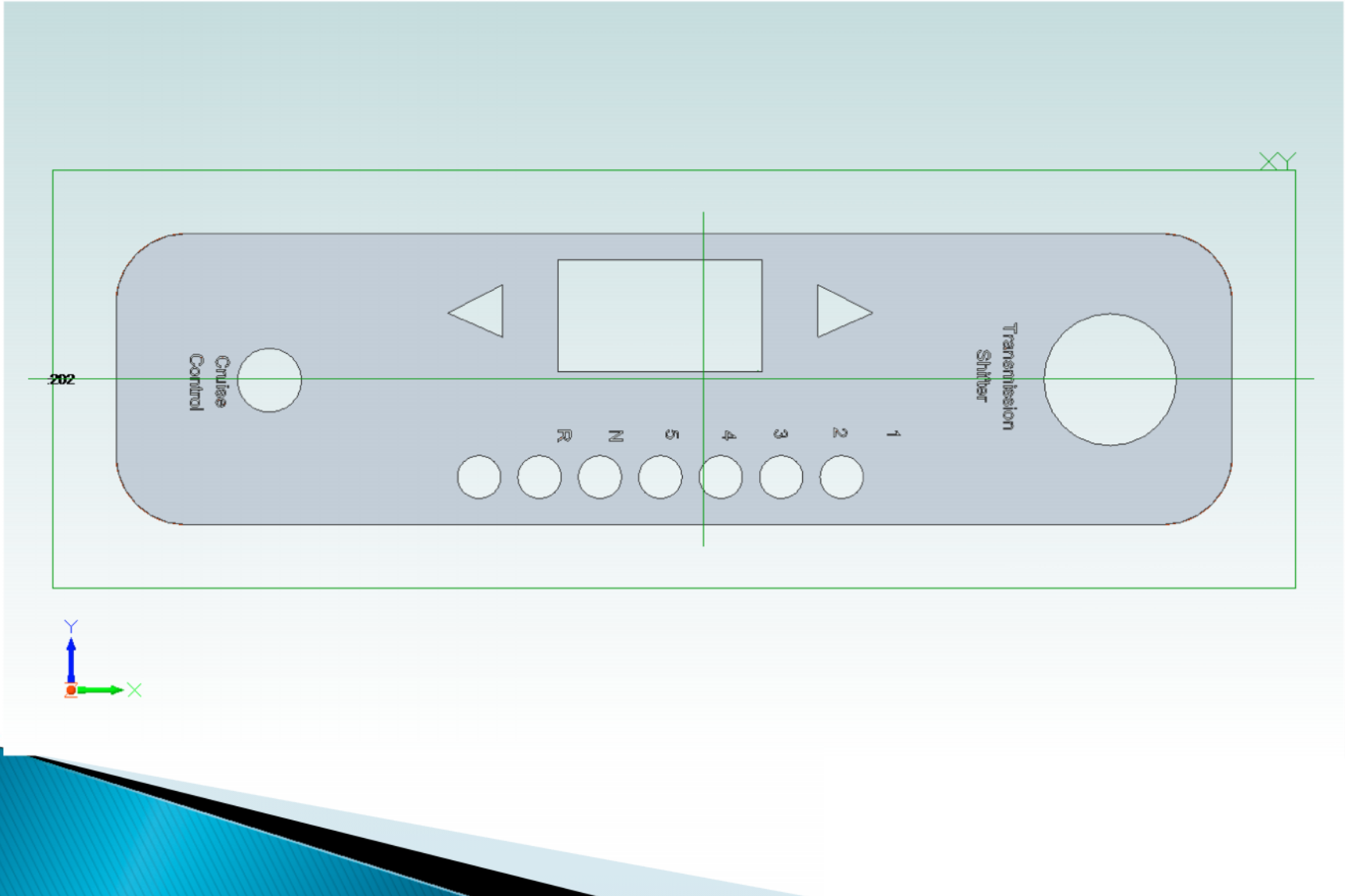
- ? Lots of choices, this is just one set of tools
- ? Consider the functionality needed (you can work harder with the tools than needed if you're not careful!)
- ? Look hard at the functionality in Mach3, can save you loads of time
- ? Cut2D can be used by itself to do many parts



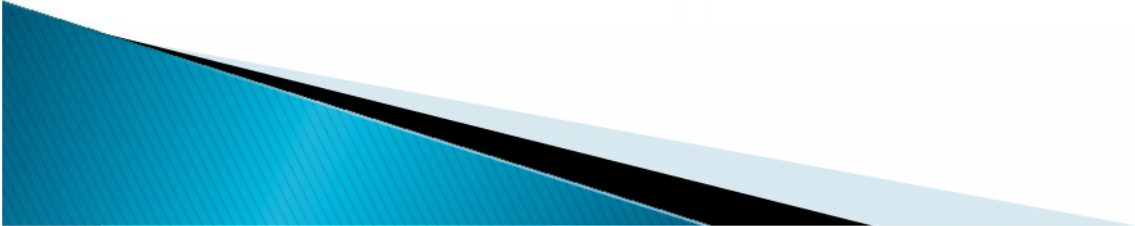
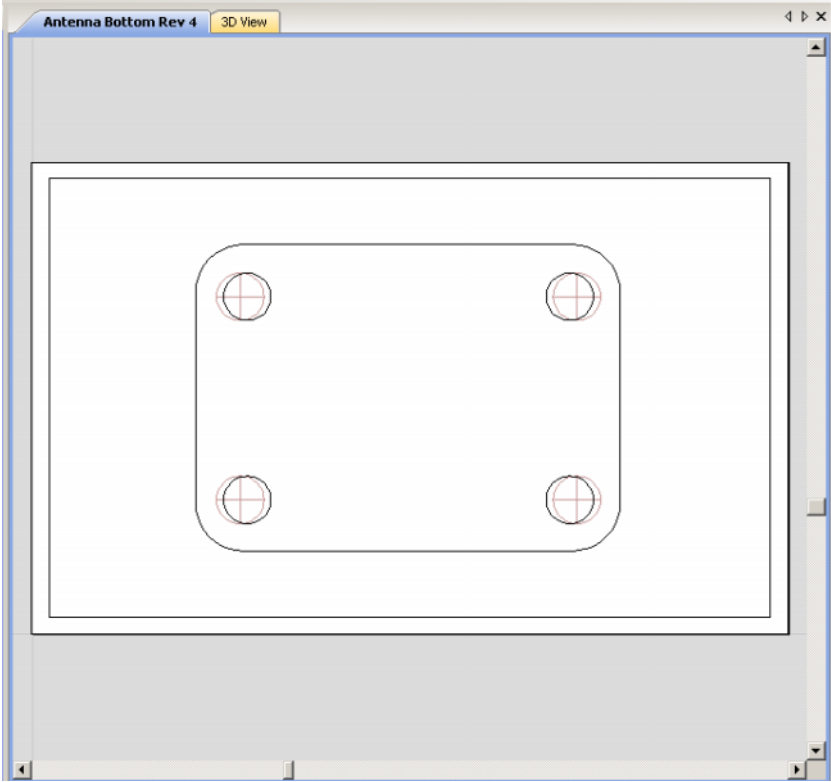
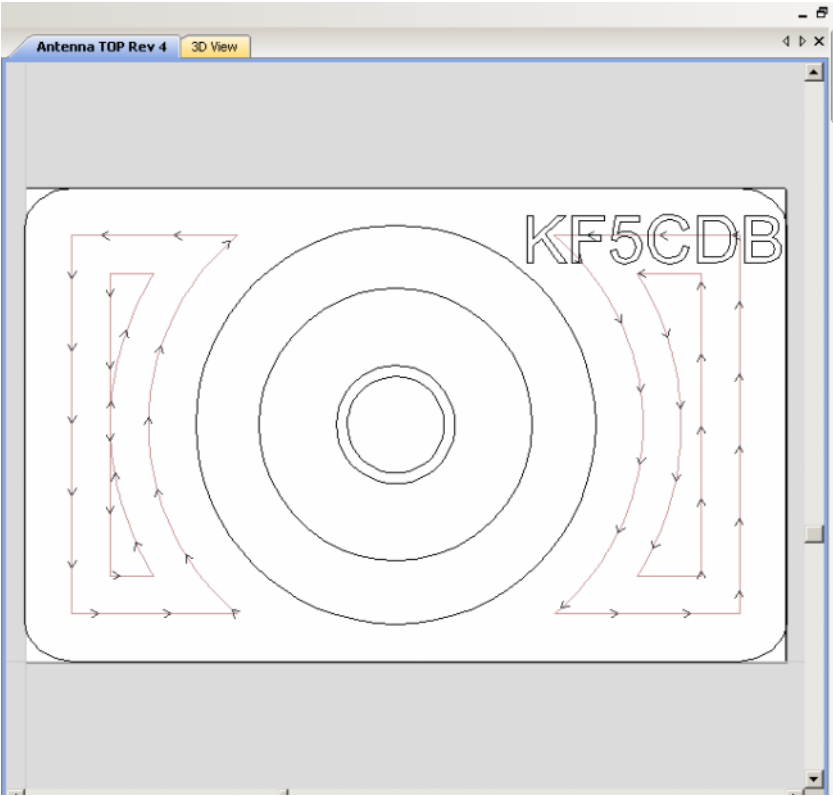
# Alibre Samples



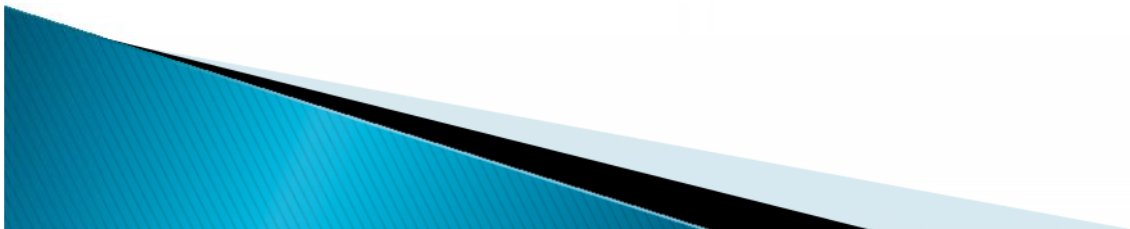
# Alibre Samples



# Cut2D Samples – Antenna Mount



# Mach3 Samples



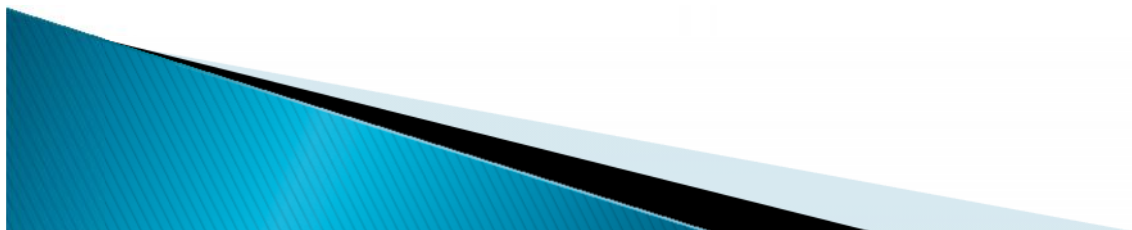
# Mach3 Samples – Wizards

**Cam Function Addons**

These Wizards are donated by users to the community of Mach users, they are unsupported, but found to be very useful. Please report any trouble on the Yahoo support group for Mach3, and repairs will be done as time allows.

Function Name	Description	Author
4th Axis Digitize	Creates Digitizing Program	Art Fenerty
Angle slot 2v4	Angle Slot Cutter Rev. 2.4	Jeff Elliott
Circle Center	Circle Center v1	German Bravo
Circular bolt pattern	Drill Circular Bolt Pattern	Brian Barker
Circular Pocket	Cut a Circular Pocket	Brian Barker
CopyCat	Jog and Learn for Router	Newfangled Solutions
Cut Arc	Cut Arc	Brian Barker
Cut Circle	Cut Circle	Kiran
Cut spline or gear	Gears and Splines	Brian Barker / updated By ...
Digitize Wizard	Creates Digitizing Program	Art Fenerty
Feeds and Speeds	Speed and Feed Calculator	Brian Barker
Key way	Slot and Keyway	Brian Barker
Milling 2D	Milling 2D with radius linking	Olivier ADLER

Run Cancel



# Mach3 Samples – Wizards

**Cam Function Addons**

These Wizards are donated by users to the community of Mach users, they are unsupported, but found to be very useful.  
Please report any trouble on the Yahoo support group for Mach3, and repairs will be done as time allows.

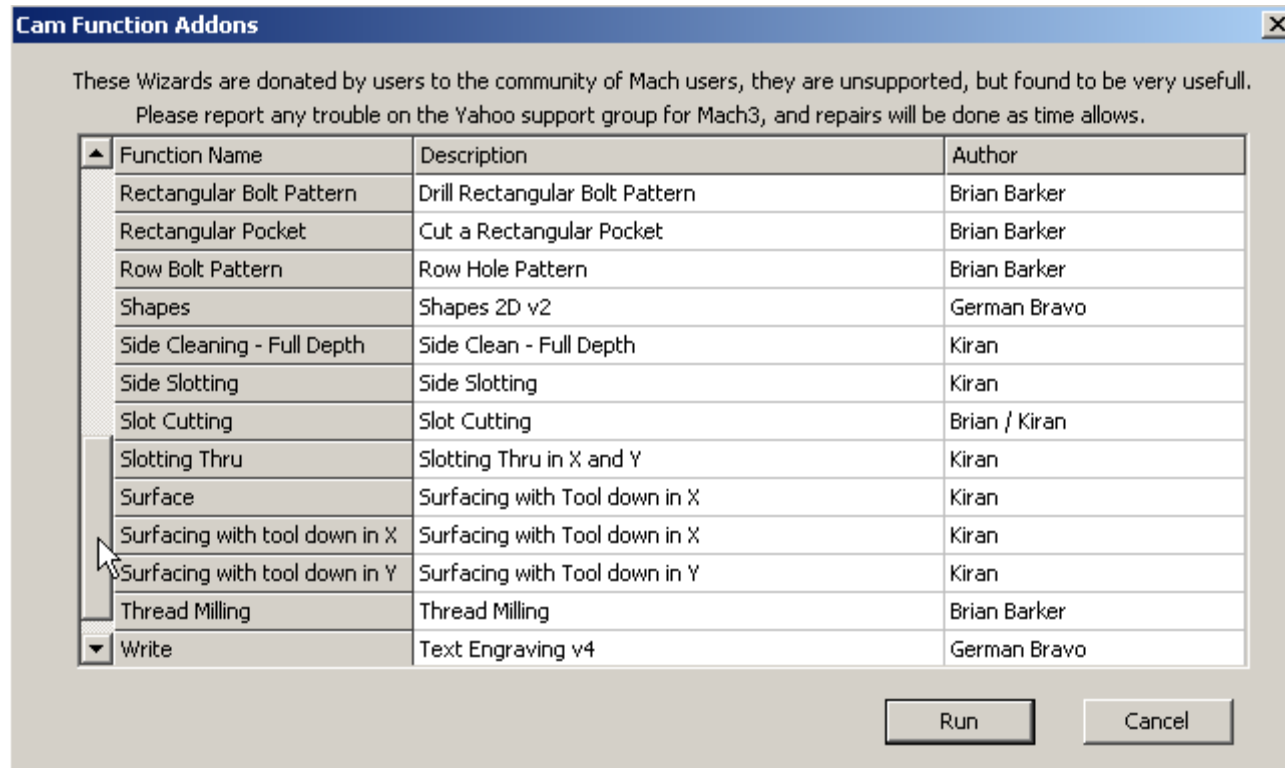
Function Name	Description	Author
Multi Pass	Multi Pass File Converter Rev1	Newfangled Solutions
Nesting	Nesting Wizard	Olivier ADLER
Newfangled	A Suite of Handy Wizards	Newfangled Solutions
Offset Setup	No Description	Brian Barker
Pocket Cutting	Rectangular Pocketing	Brian / Kiran
PowerFeed XY	Power feed for X and Y Axis	Newfangled Souldions
Rectangular Bolt Pattern	Drill Rectangular Bolt Pattern	Brian Barker
Rectangular Pocket	Cut a Rectangular Pocket	Brian Barker
Row Bolt Pattern	Row Hole Pattern	Brian Barker
Shapes	Shapes 2D v2	German Bravo
Side Cleaning - Full Depth	Side Clean - Full Depth	Kiran
Side Slotting	Side Slotting	Kiran
Slot Cutting	Slot Cutting	Brian / Kiran

Run Cancel






# Mach3 Samples – Wizards



# Mach3 Samples – Wizards

Please Choose an Operation:

Inch  MM

 V2.70

**Milling Operations:**

- Cut Arc
- Cut Circle
- Cut Keyway
- Surface Material
- Thread Milling

**Drilling Operations:**

- Circ. Hole Pattern
- Linear Hole Pattern
- Rect. Hole Pattern
- Multiple Hole Pattern
- Cut Rectangle

**4th Axis Operations:**

- Cut Gear
- Cut Spline

**Pocketing Operations:**

- Circular Pocket
- Rectangular Pocket

**Electrical Shapes**

Operation list    Delete Last Operation    Return To MachX

**Verify Toolpath**    **Exit**

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