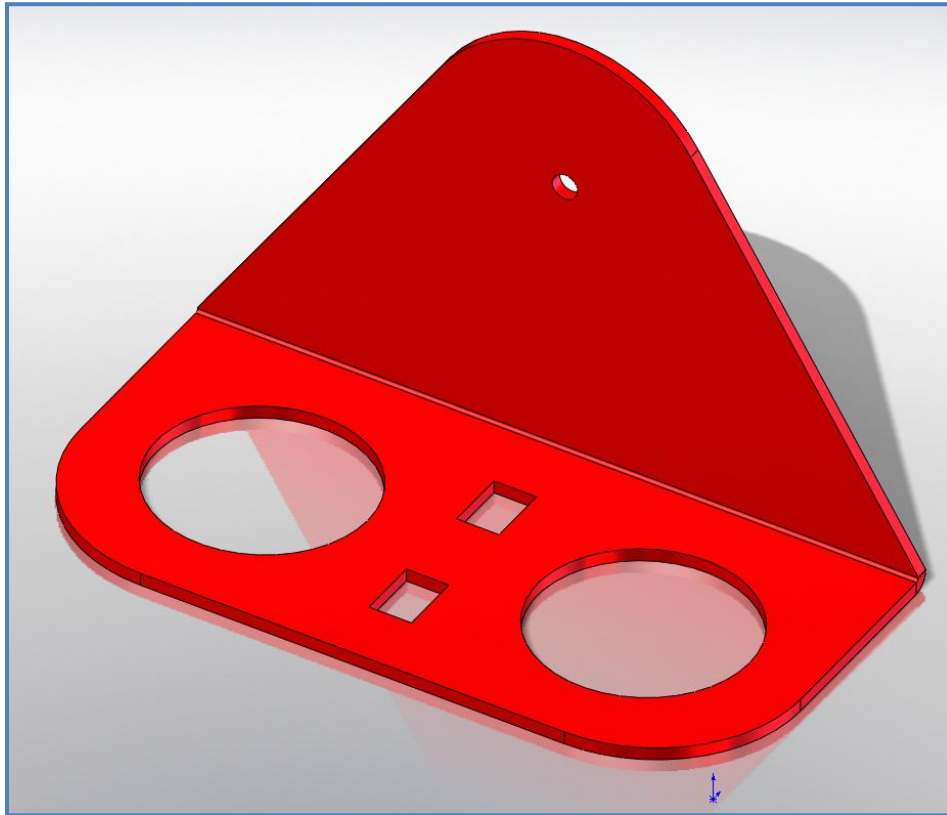


Toothbrush Holder Project – 2D Machining



Prerequisite Toothbrush Holder drawn and saved as a “DXF” file in SolidWorks

Focus of the Lesson On completion of this exercise you will have:

- Used the Techsoft 2D Design Version 2.0 software
- Imported DXF File format into 2D Design
- Set up Techsoft MDX40 for Machining
- Created a Toolpath
- Outputted a Toolpath
- Setup Tool Set Points
- Machined Component

Techsoft MDX 40- Techsoft 2D Design

Toothbrush Holder

File Format

The Toothbrush Holder was generated as a 3D part file (Figure 1) in Solidworks and saved in the DXF file format.

Techsoft 2D Design will open an existing 2D design file or import a DXF file.

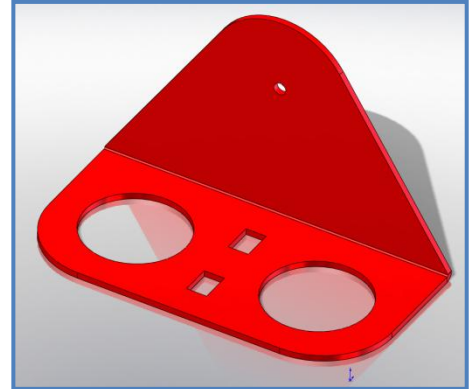


Figure 1

Getting Started

Double Click on the Techsoft 2D design icon on the desktop (Figure 2) or from the Start menu select -> All Programs-> Techsoft Design Tools-2D Design.



Figure 2

2D Design Opening Screen (Figure 3)

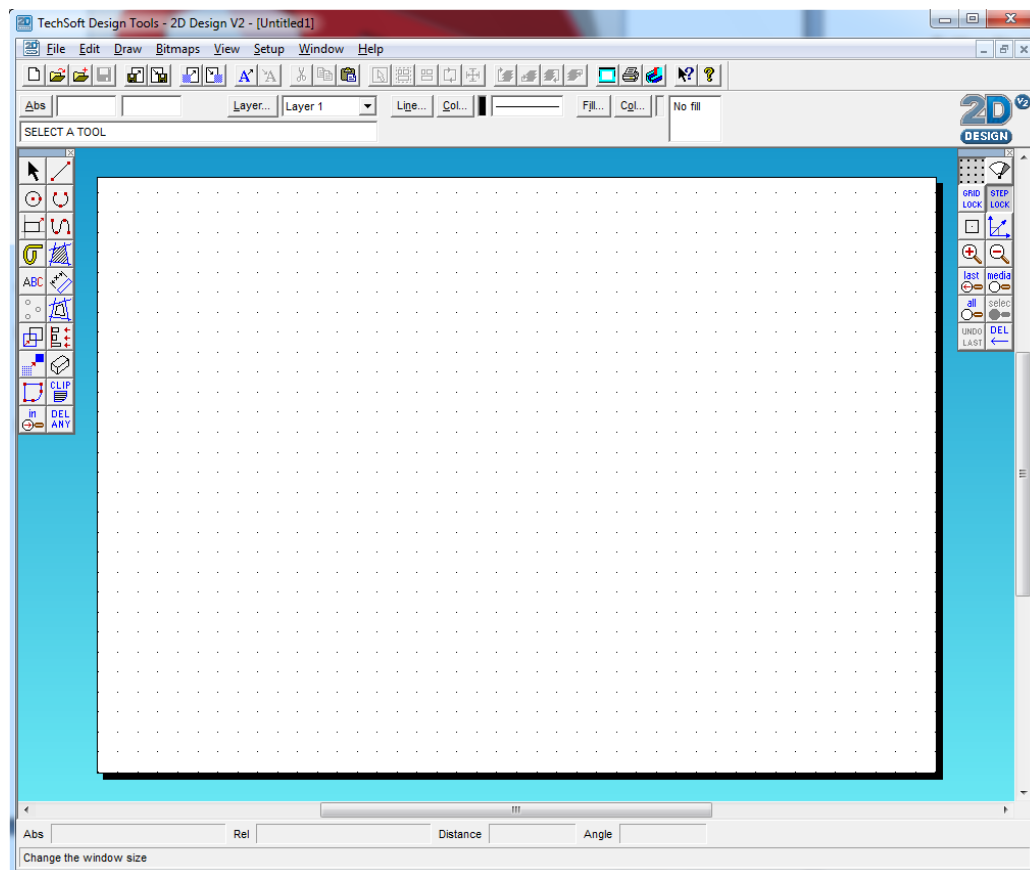


Figure 3

Machining Toothbrush Holder (Techsoft MDX40)

Before importing the DXF file set the working area within the 2D Design program to the actual size of the bed on the Techsoft MDX40 machine. This will give a good indication of proportion and allow for the positioning of a number of components for machining if required.

- Choose Setup – Drawing – Layout (Figure 4)
- Select “Set for CNC Device” (Figure 5).
- Select “Roland MDX-40” from the list of devices (Figure 5)
- Click the OK button.

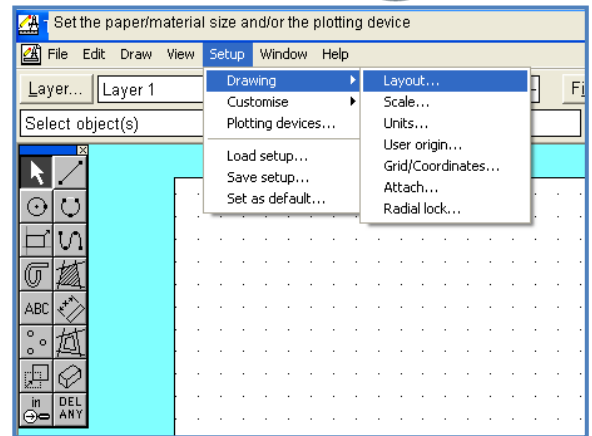


Figure 4

The screen will resize to 305mm x 305mm, the actual area of the machine bed.

File importing

These instructions refer to a part file modelled and saved as a “DXF” file in Solidworks.

Note: A Solidworks “prt” file cannot be loaded directly into 2D Design.

- Choose: File > Import File.

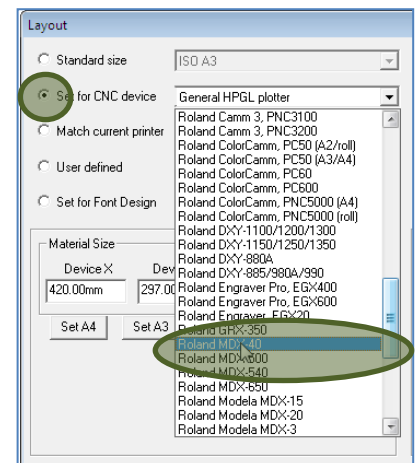


Figure 5

Locate the “**Toothbrush_Holder**” file.

- Click on the Open button to import the file (Figure 6).

The DXF Import setup window will open (Figure 7).

- It is important that the settings are selected as show in Figure 7, particularly that the Units are set to mm.

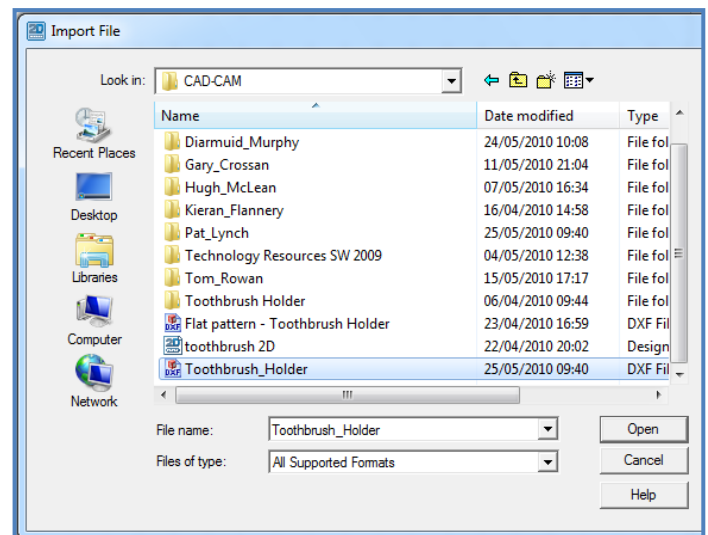


Figure 6

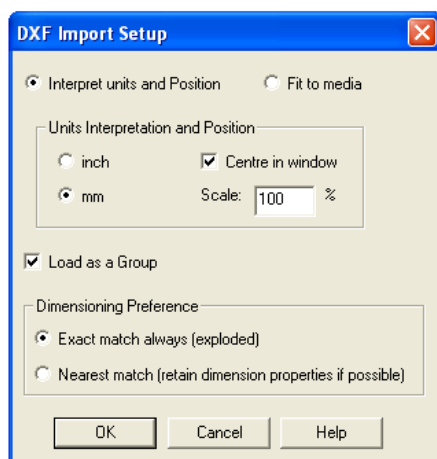


Figure 7

Depending on the software the default setting may be imperial, but the piece will be distorted if metric is not selected.

Click the OK button to proceed.

You may receive an Import Warning message as shown in Figure 8.

- Press the Continue button to ignore the message.

The DXF drawing is imported and positioned on the centre of the table. It can be re-positioned by clicking on the centre handle, holding down the left mouse and dragging component to new position as shown in Figure 9. Note the actual position of the component being machined on the worktable in Figure 10.

Note:

If an existing 2D Design file was created previously it can be opened by:

- File-> Open.
- Browse to location of file ->select -> open

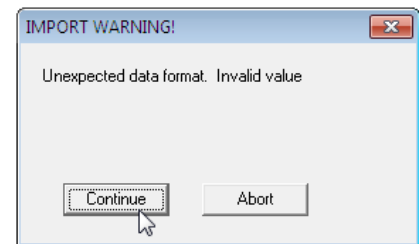


Figure 8

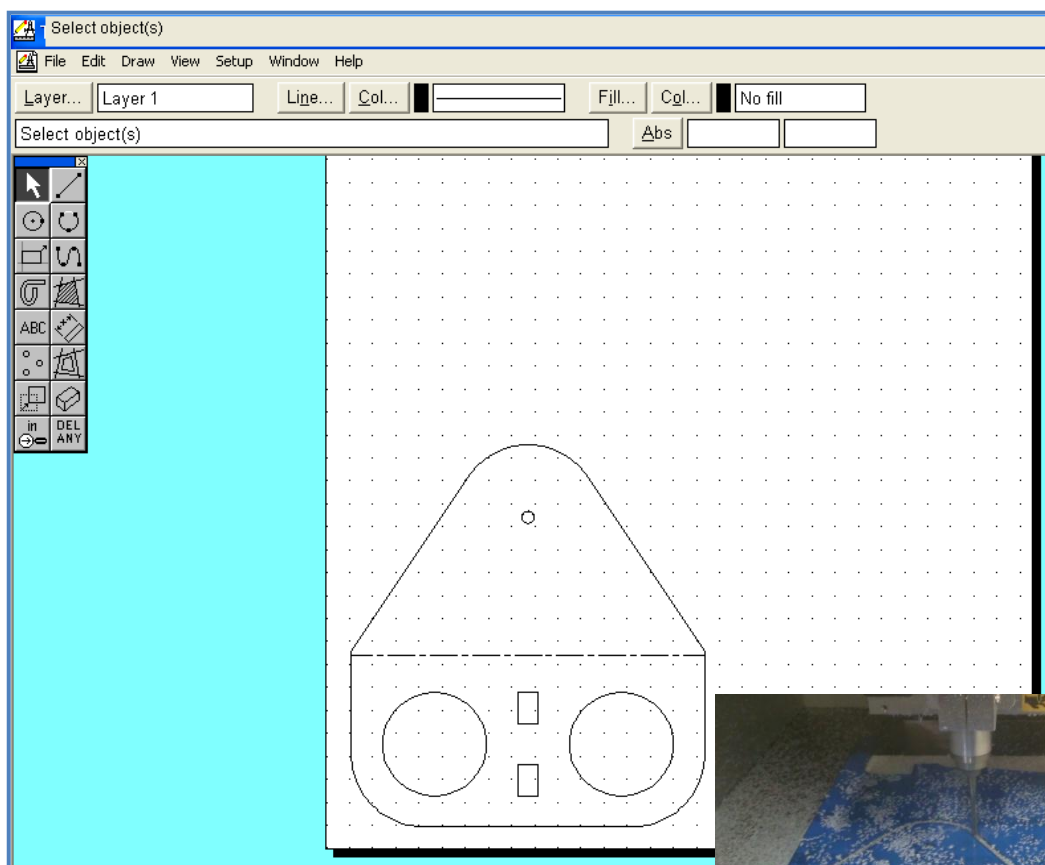


Figure 9

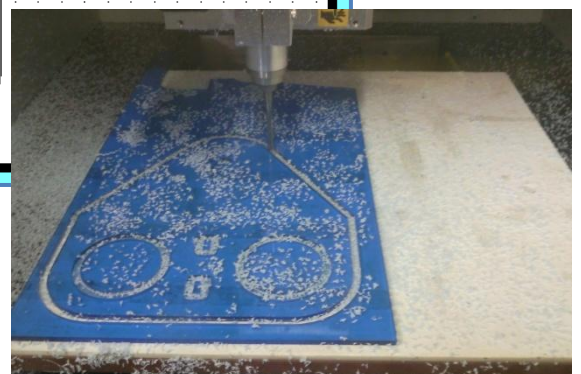


Figure 10

Toolpaths & Cutting Setup

An overview of toolpaths and tool setup was covered in the round 6 Professional Development sessions and is available for download from the T4 website.

- Technology > Teaching Resources > Professional Development >
- Options > Electronics & Control > CAD/CAM
- Notes on Miller / Router – Techsoft
- PDF document- CNC Routing and Applications (Page 50)

Setting up Cutting Tool

- Choose Setup > CNC Device (Figure 11)

Select the Roland MDX40 from the list of machines if it is not already selected (Figure 12).

- Click the Tools button (Figure 12)
- Click on the ->Edit button, set 'Final depth of cut' to 3.00mm, click on -> Colour button (Figure 13)
- Select Red from the Custom Colours list
- Click the OK button twice

Only one tool is required to machine this component and all machining operations on the 3mm acrylic is to a similar depth.

The cutting tool used is a 2mm slot drill. The cutting depth per pass is .75mm with a feed rate of 10mm/s (Figure 14).

It is important to slow down the vertical feed rate to avoid the tool jamming as it lowers on each pass. A vertical feed rate of 8mm/s was found to be effective. This rate will vary depending on tool size, tool wear and the material being machined.

Edit Tool Parameters

- Click on the Edit Button under tool Parameters
- Set the parameters as shown in figure 14
- Click the OK buttons to close all dialog boxes.

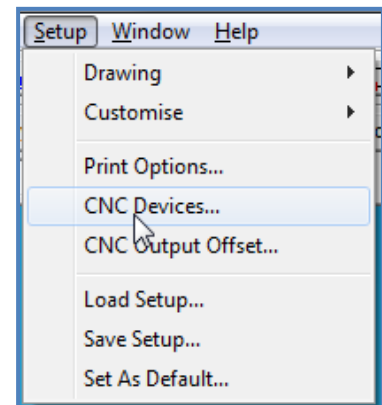


Figure 11

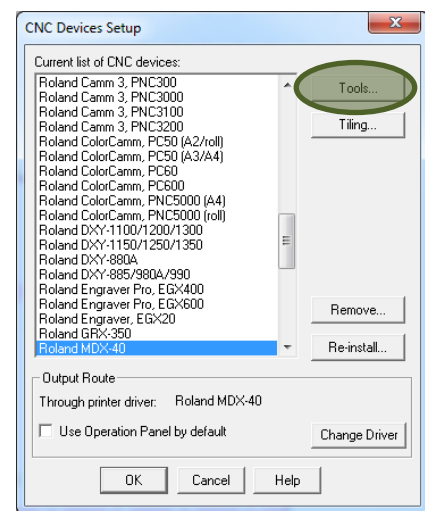


Figure 12

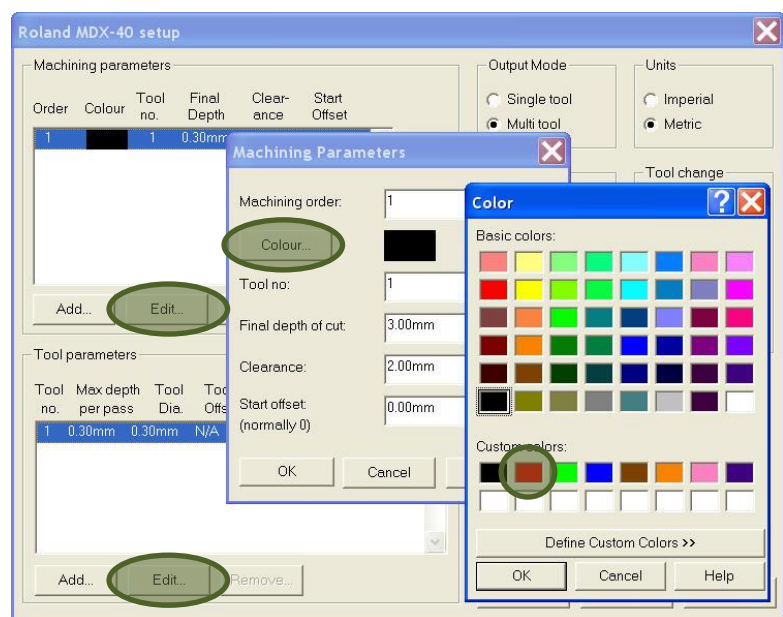


Figure 13

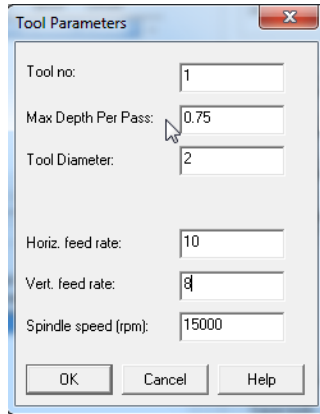


Figure 14

Creating the Toolpath

It is necessary to create a tool path that cuts externally around the design profile and internal paths that will remove the circles and slots. The path is offset half the width of the cutting tool (radius of cutting tool) from the cutting lines. This will be an external offset for machining the profile, but an internal offset for machining the internal circles and slots.

Select the contour button on the left hand menu options as shown in figure 15. This will open the contour settings box.

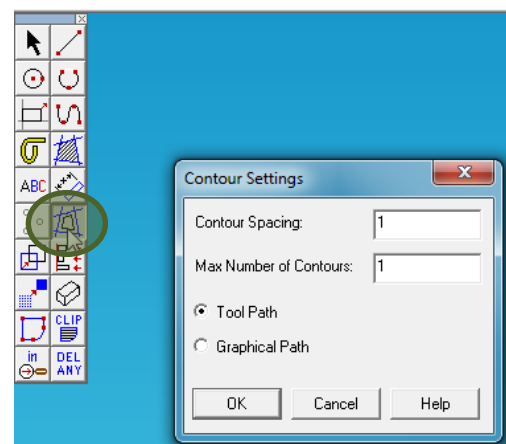


Figure 15

- The contour spacing is set to 1 (1mm- the radius of the cutter).
- Max no of contours used is set to 1.
- Select OK

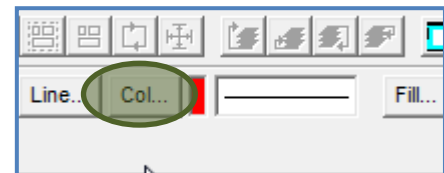


Figure 16

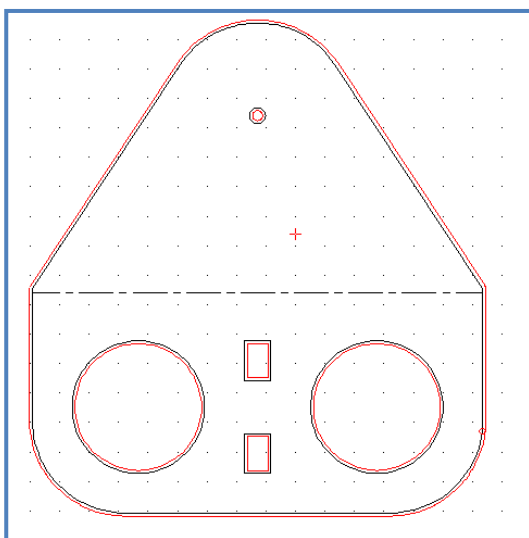


Figure 17

The line colour must be selected to match the exact colour set for the corresponding tool. For this example the cutting tool colour selected was **red**.

- Set the colour to red by clicking on the "Col" button (Figure 16).
- On the drawing click on the correct side of each line that is to be machined (Figure 17).

Note: It is important to click on the correct side of the line that the cutting tool should pass. For example the tool should pass outside the perimeter of the artefact and not inside.

Only lines that require machining should be selected. Note that the fold line is not selected. The software will match these red offset lines to the preset tool values.

Outputting tool path

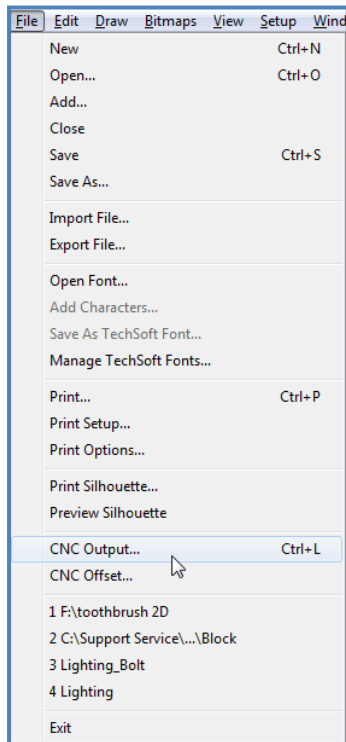


Figure 18

Tools button.

- Click Output to proceed.

The part is now ready to be machined.

Note: There should be no cutting tool in the machine at this stage. The tool will be fitted later.

The acrylic is fixed to the sacrificial bed using double sided tape.

- Select File-> CNC Output (Figure 18).

Ensure that the CNC device is the Roland MDX-40 and the Output Route is set for the same Printer Driver (Figure 19).

If necessary the cutting tool parameters can be edited from this window by selecting the

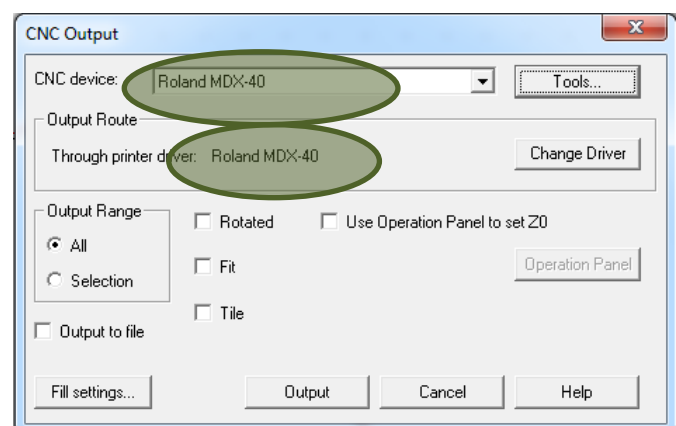


Figure 19

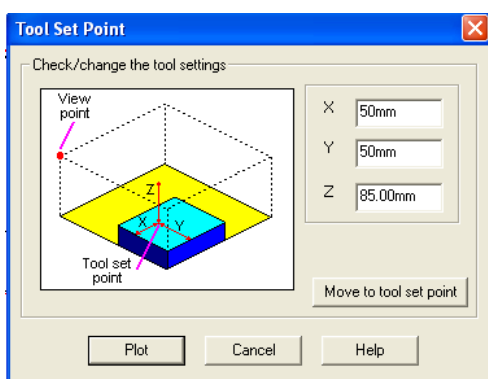


Figure 21

Tool Set Point

The cutting tool positioning is set at this point.

For tools that are held in the machine using the brass collets (Figure 22), a Z value of 85mm should be entered Figure

21). The X/Y value is not critical but it is a good idea to move the tool away from the corner (50mm x 50mm) when

setting the Z value to allow for greater accuracy.



Figure 22

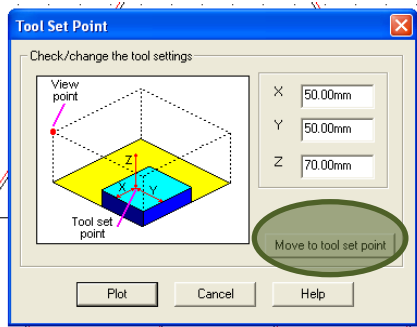


Figure 24

If using the large long reach tools (Figure 23), a Z value of 70mm should be entered (Figure 24).

- Click on the button "Move to tool set point" (Figure 24).

Ensure that the Techsoft MDX40 is not in View Mode.

- Once the tool head moves into

position insert the cutting tool and secure.



Figure 23

The Techsoft MDX40 will record the Z value as the top of the acrylic piece which is to be machined.

- Click on Plot.

A tool change window will now open to allow for the fitting of the correct tool. This is not relevant in this exercise as there is only one tool being used and it has already been fitted.

- Click Continue (figure 25).

The machine will begin to process the part.

- Once the part is machined (Figure 26) press the View button and when the table is fully extended remove the acrylic piece from the bed.



Figure 25



Figure 26