DENFORD

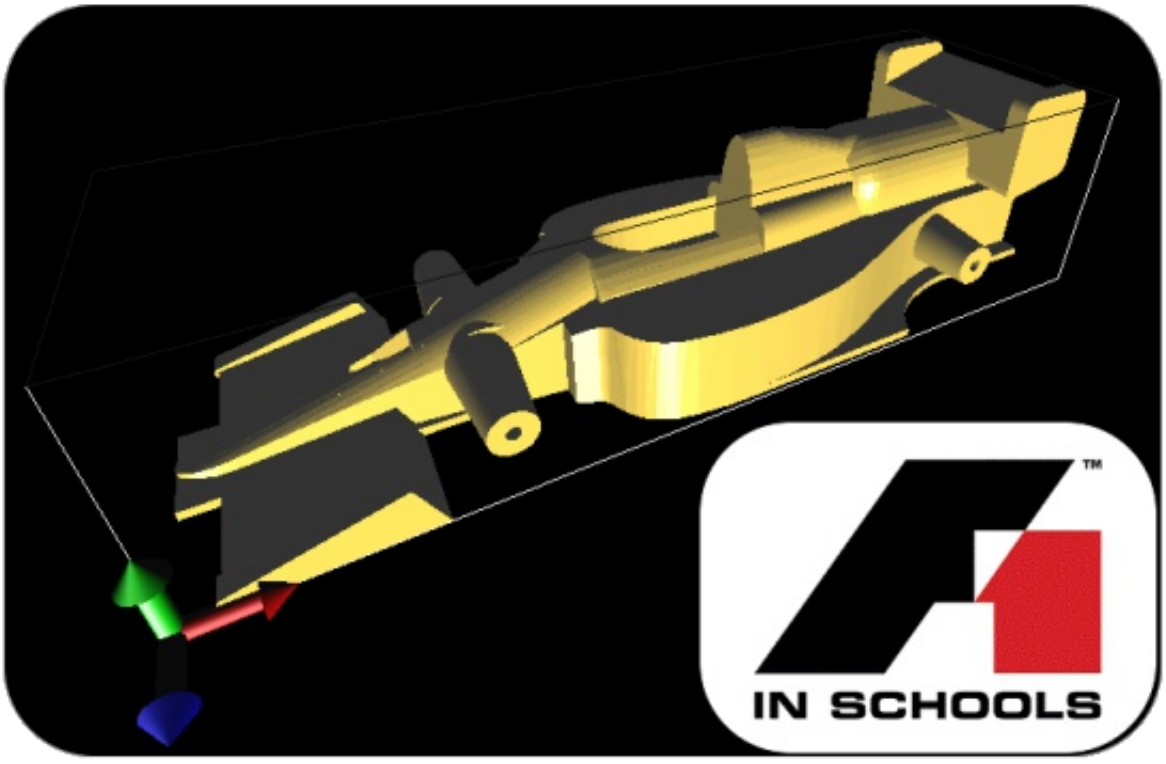
CAD/CAM Solutions & Projects for Education

QuickCAM Pro

Advanced Milling CAM Software

F1™ in Schools Training Guide

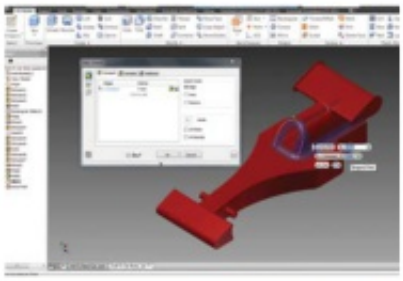
QuickCAM Pro (V1.13)
VR Milling (V5.61)



DENFORD

F1 Consumables

F1 IN SCHOOLS EQUIPMENT & CONSUMABLES



DESIGN

3D Design Software AUTODESK.

Design your car using Autodesk® 3D Design Software. Autodesk and F1 in Schools™ partnered to offer design tools to help prepare next-generation designers. Students and schools participating in F1 in Schools™ can access an extensive portfolio of Autodesk® 3D design software free of charge. To get your software please visit: www.f1inschools.com/autodesk

QuickCAM Pro

An advanced, yet simple to use, wizard-based CAM package, which is used to create cutter paths for machining 3D parts on a milling machine or router.

Site Licence	BID1806P

ANALYSE

Virtual Wind Tunnel

F1 VWT Analysis Software

Single Seat	BID1841
5 User Licence	BID1841A
Site Licence	BID1841C

MAKE

CNC Machine Options for F1 Car Manufacture:

MRC 40	MRC004000
Compact 1000 Pro (Metal Cutting)	MRC003000
Router 2600	MRP002000
Router 2600 Pro (Metal Cutting)	MRP003000
Router 6600	MRF002000
Router 6600 Pro (Metal Cutting)	MRF003000

F1 in Schools Car Fixture NR1/0400UA

Comes as standard with two clamping systems to enable the manufacture of Bloodhound SSC & Formula 1® Class cars. The fixture clamps directly to the T-slotted table on the MRC 40 (T-slotted table not standard equipment with MRC 40), Compact 1000 Pro and Router 2600/ Pro and is also suitable for use on the VMC 1300 (it is necessary to remove the tool changer to fit the fixture)

Contents

About 4
Introduction 4
Launching QuickCAM Pro 5
Navigating QuickCAM Pro 6
Opening your Model 6
Orientate Model 8
Set Cut Depth 9
Set Billet Size 10
Set Model Size 11
Set Model Position 12
Set Boundary 13
Setup Tools 14
Machining Plans 15
    Raster Roughing 16
    Creating a Custom Border 17
    Raster Finishing 20
Toolpath Simulation 21
CNC File Output 22
Saving the CNC File 23
    F1 in Schools Car Manufacturing Fixture 23
    4th Axis F1 in Schools Conversion Kit 24
Machining the F1 in Schools Billet 25
    F1 in Schools Car Manufacturing Fixture 25
    4th Axis F1 in Schools Conversion Kit 29
Running the Program 33

About QuickCAM Pro

QuickCAM Pro is an advanced, yet simple to use, wizard based CAM package, which is used to create cutter paths for machining 3D parts on a milling machine or router. Both STL files and image files can be imported into QuickCam Pro, and a comprehensive set of machining plans can be used individually or in combination to produce complex 3D surfaces and lithophanes.

Introduction

The aim of this training guide is to show you how to navigate your way around QuickCAM Pro and instruct you how to operate this software to manufacture an F1 in Schools car using the Official F1 Model Block

This guide will cover all the steps required to convert the STL file of your car into a machined car body.

This guide makes use of screen shots where possible and will use the following conventions:

Instructions will be in this format

Text to be typed will be in this format

Any software buttons to be pressed, a picture of the button will follow the instruction

This guide assumes that your software has already been installed and your machine has been commissioned.

If any of the features described in this guide are not operating as described please check that the version number you are using is the same as that shown on the front cover. Version is written on the title bar of the main software window.

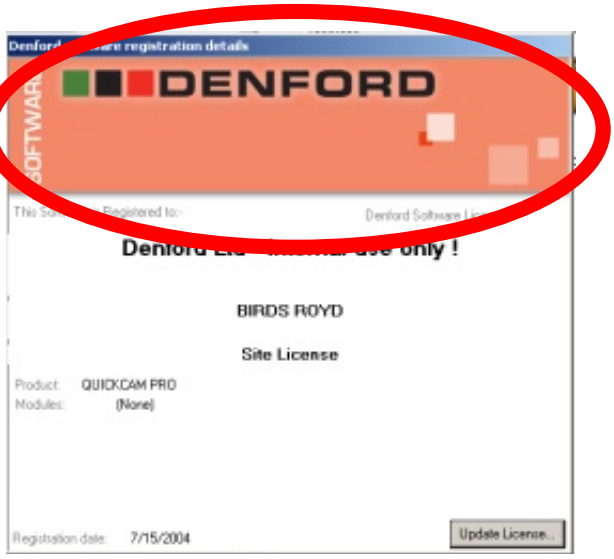
Denford provide machine training and it is recommended that you undertake the training and use this guide as a revision guide after completion of the machine training.

Launching QuickCAM Pro

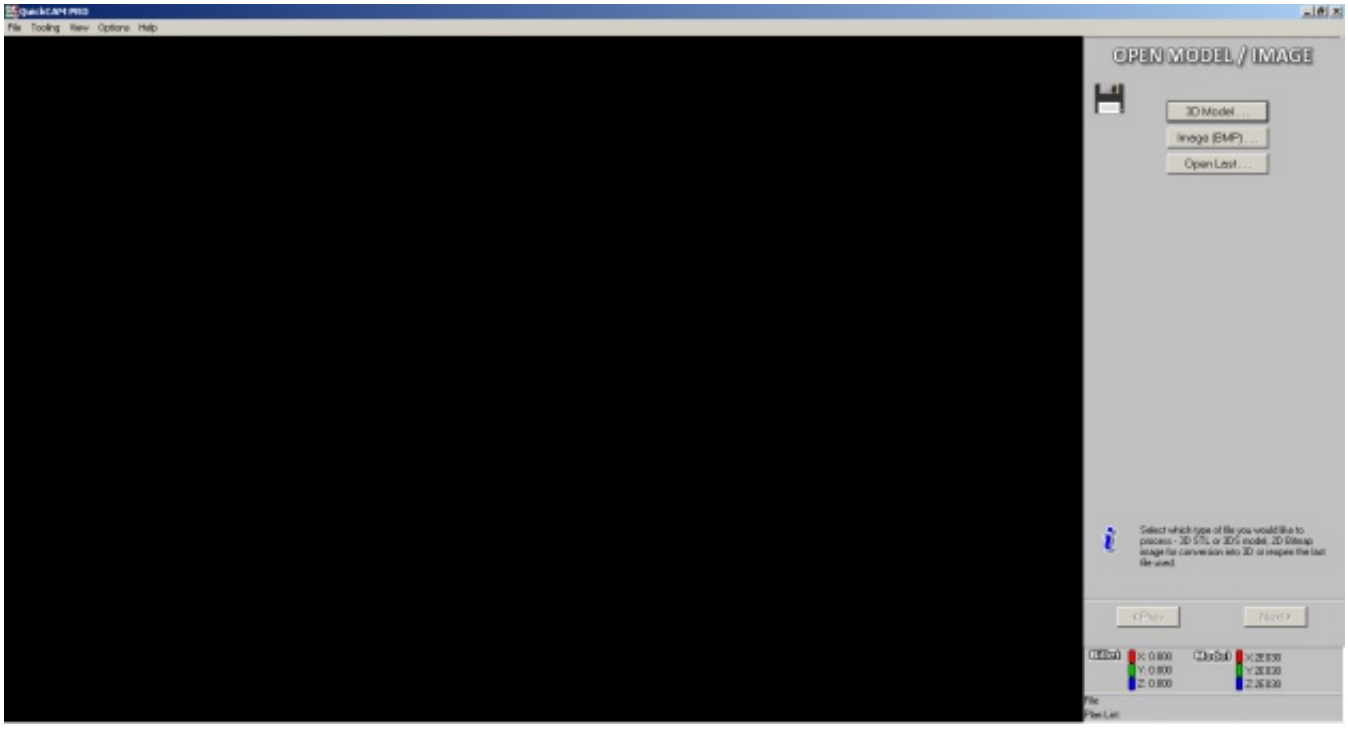
Open the "Denford Applications" folder.
"Double click" on the QuickCAM Pro icon.

The screen shown on the right will be displayed and the software will take a minute or 2 to open.
You can force the software to open quicker by following the next instruction.

"Double click" on the area circled below.



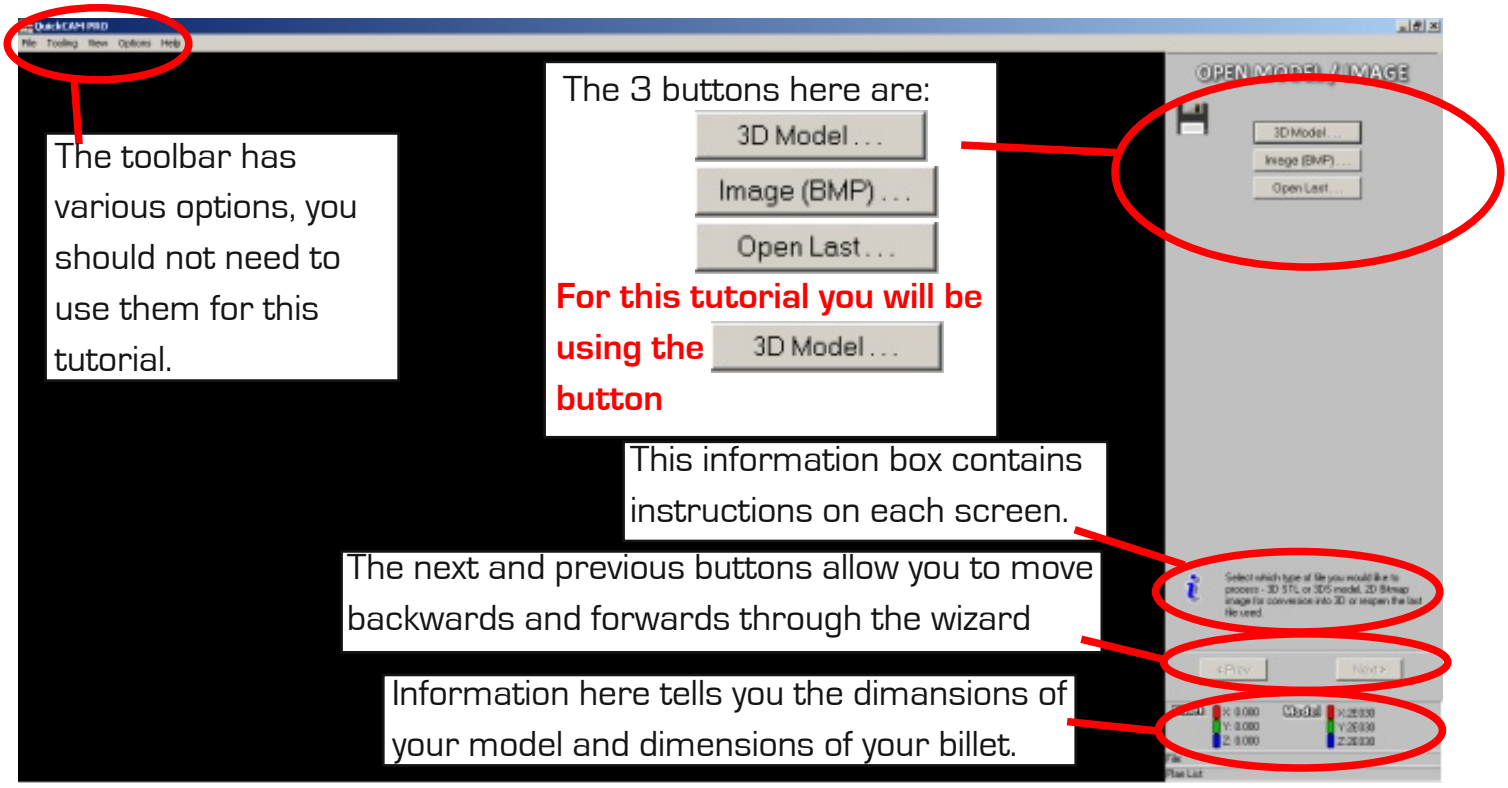
The software will open and you will be greeted with the screen below.



Navigating QuickCAM Pro

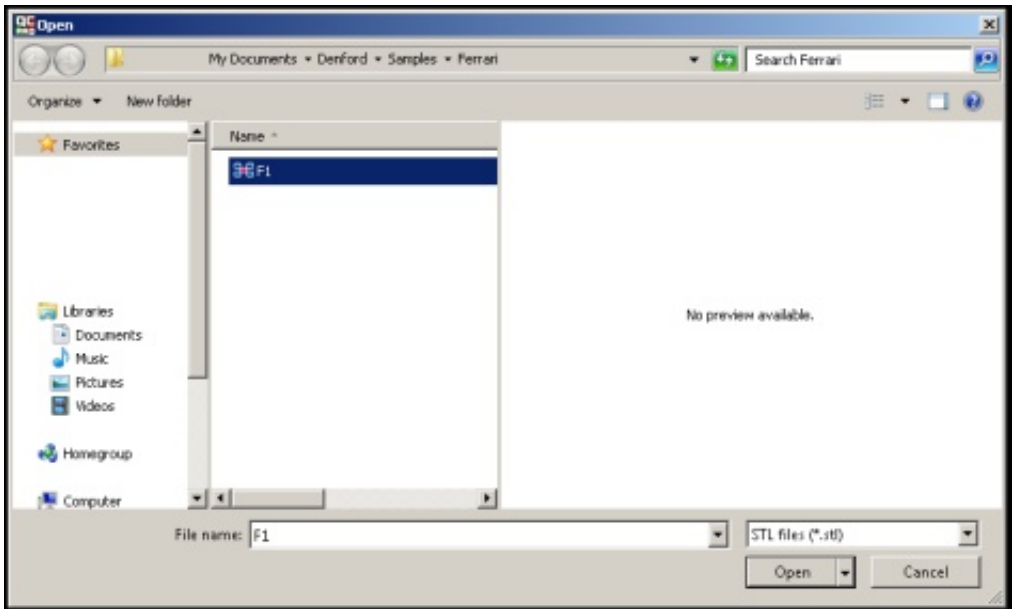
QuickCAM Pro is very easy to use, the main screen displays what is going on and the navigation panel on the right is how you select options and move around this wizard based program.

The left mouse button allows you to rotate the main display and the right mouse button allows you to zoom in and out.



Opening your Model

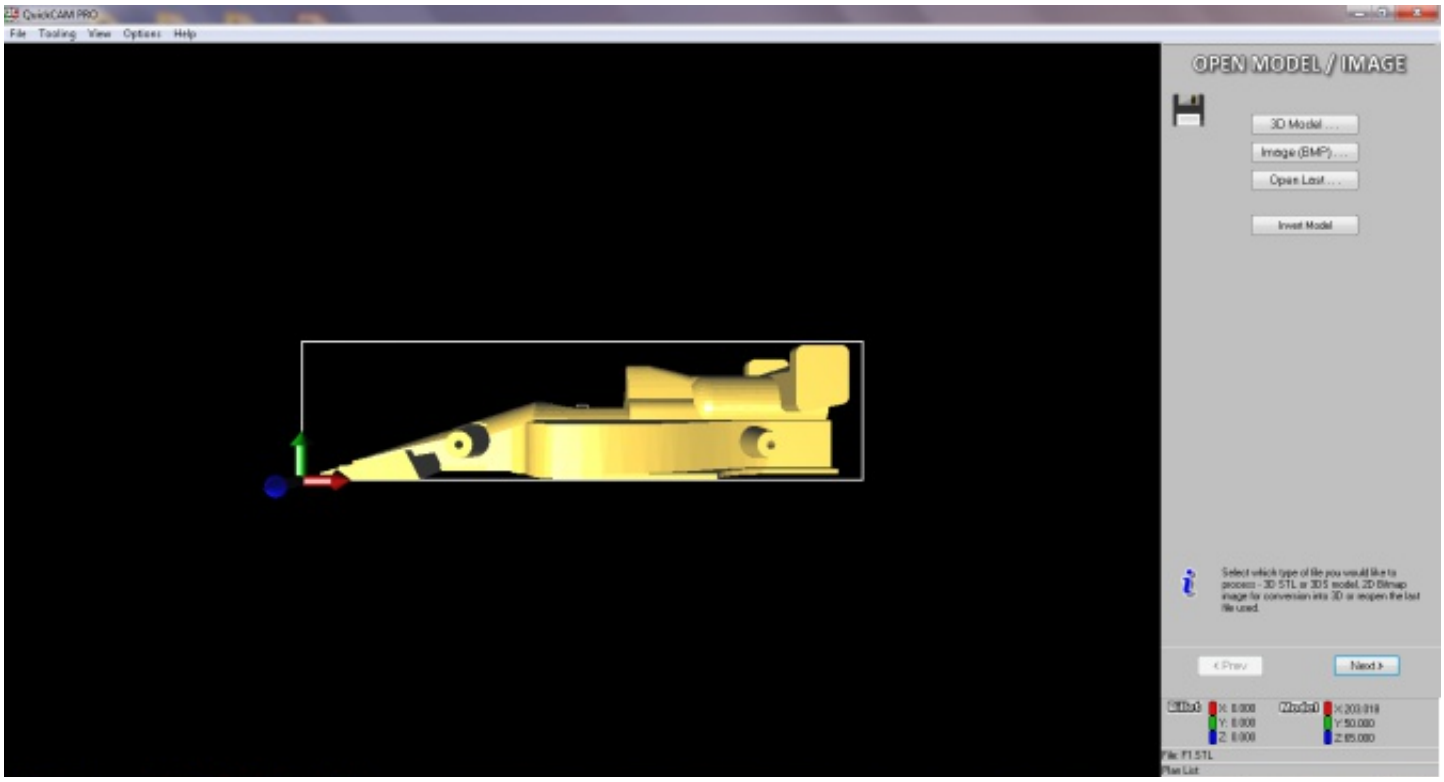
Select the 3D Model button 3D Model . . .



Select the .STL file you wish to machine and click the open button Open

Your model will now be displayed in the main screen.
You can hold the left mouse button to rotate your model, holding the right mouse button zooms in and out.
A new button has appeared, this is the invert button

We do not use it for this tutorial.



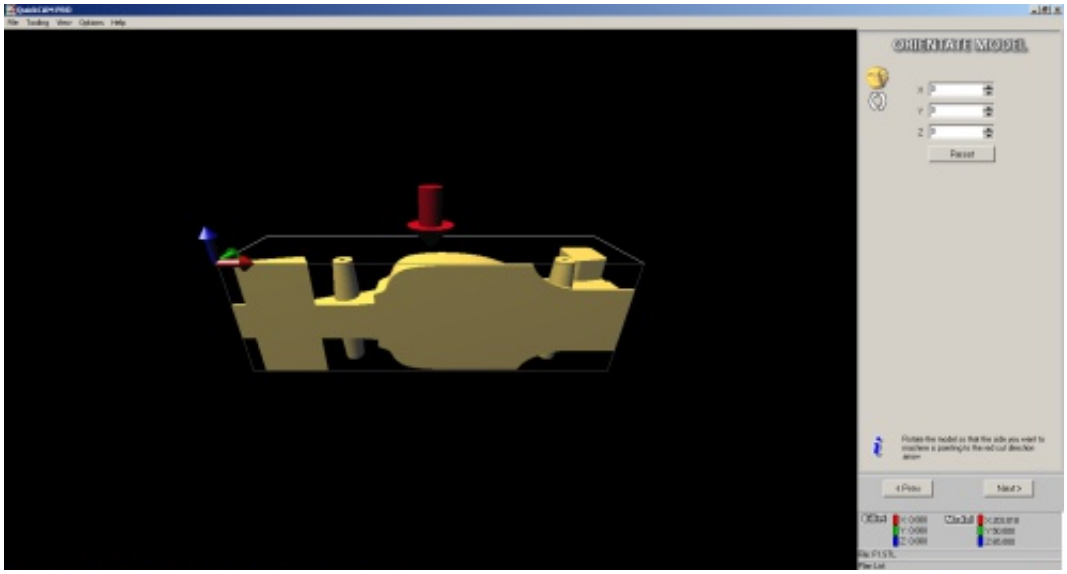
Click the next button

Orientate Model

There are a number of ways to orientate the model, there is no right or wrong way as long as the fixture in the machine is aligned in the same way.

For this tutorial we will orientate the model so that the cartridge hole is on the left and the bottom of the model is facing us so that we machine the right hand side of the car first.

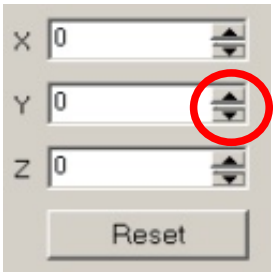
In the illustration below you can see a large red arrow has appeared in the main display, this represents the direction that the cutting tool will be coming from.



We need to rotate the model 180 degrees along the Y axis to orientate the model correctly.

Click on of the Y axis buttons twice

As you can see these buttons rotate the model in 90 degree increments

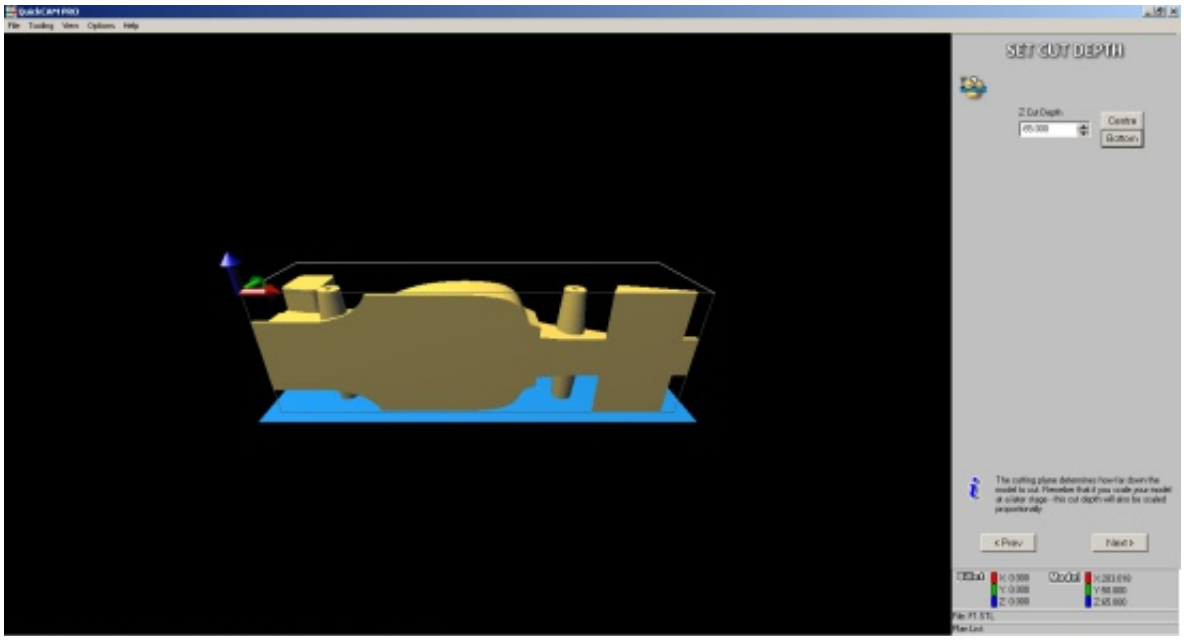


Whether or not the model will need rotating will depend on which planes you used when creating the model.

When your model is correctly orientated, click the Next button

Set Cut Depth

This screen allows you to set the cut depth



As we will be machining the car from the left and the right hand sides we could set this to the centre, but as we will be using a ball-nose cutter this would leave a ridge down the centre of the model.

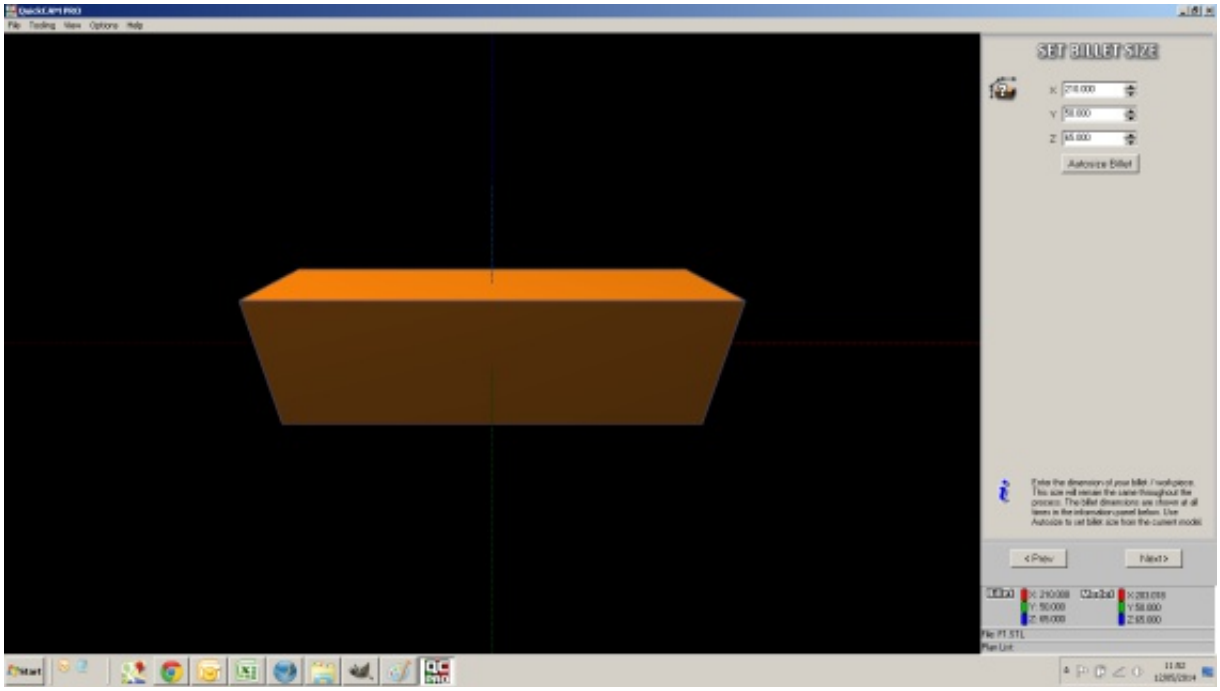
For this tutorial set the cut depth to the bottom and we will create a custom offset later in the tutorial.

Click the Bottom button

Click the Next button

Set Billet Size

This screen is where we set the size of the billet.

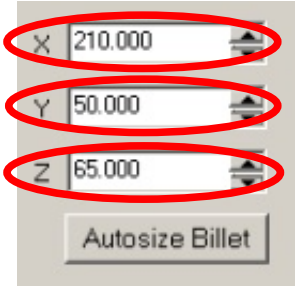


Whilst the Official F1 in Schools Model Block is 223mm x 50mm x 65mm, we cannot use this full size as part of the billet is lost to the aluminium fixture.

Click in the X dialogue box and type *210*

Click in the Y dialogue box and type *50*

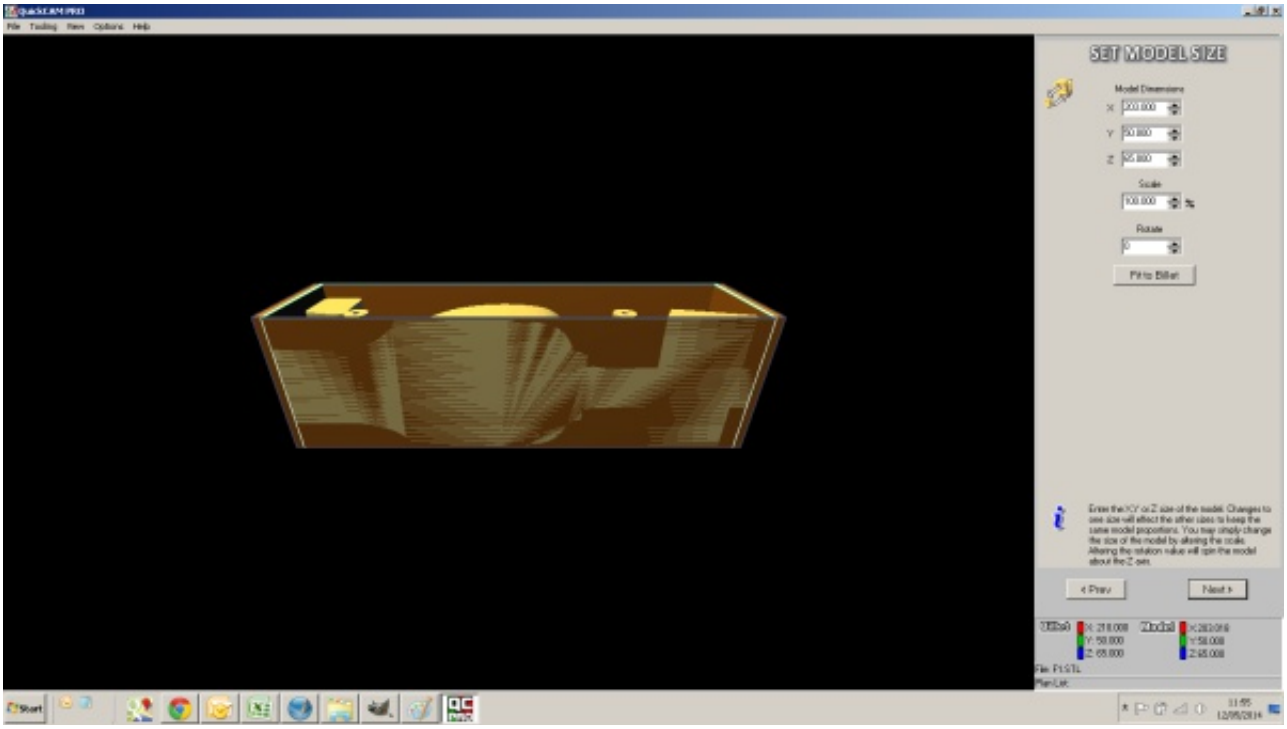
Click in the Z dialogue box and type *65*



Click the Next button

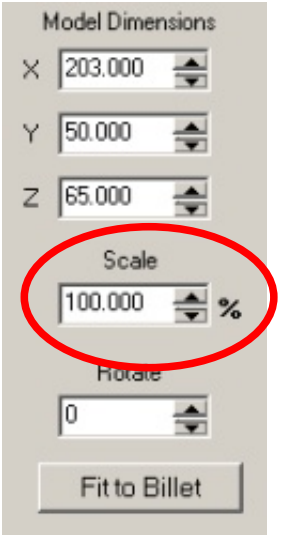
Set Model Size

This screen allows you to set the size of the model.



Having designed your model to a certain size you should cut it out the same size.

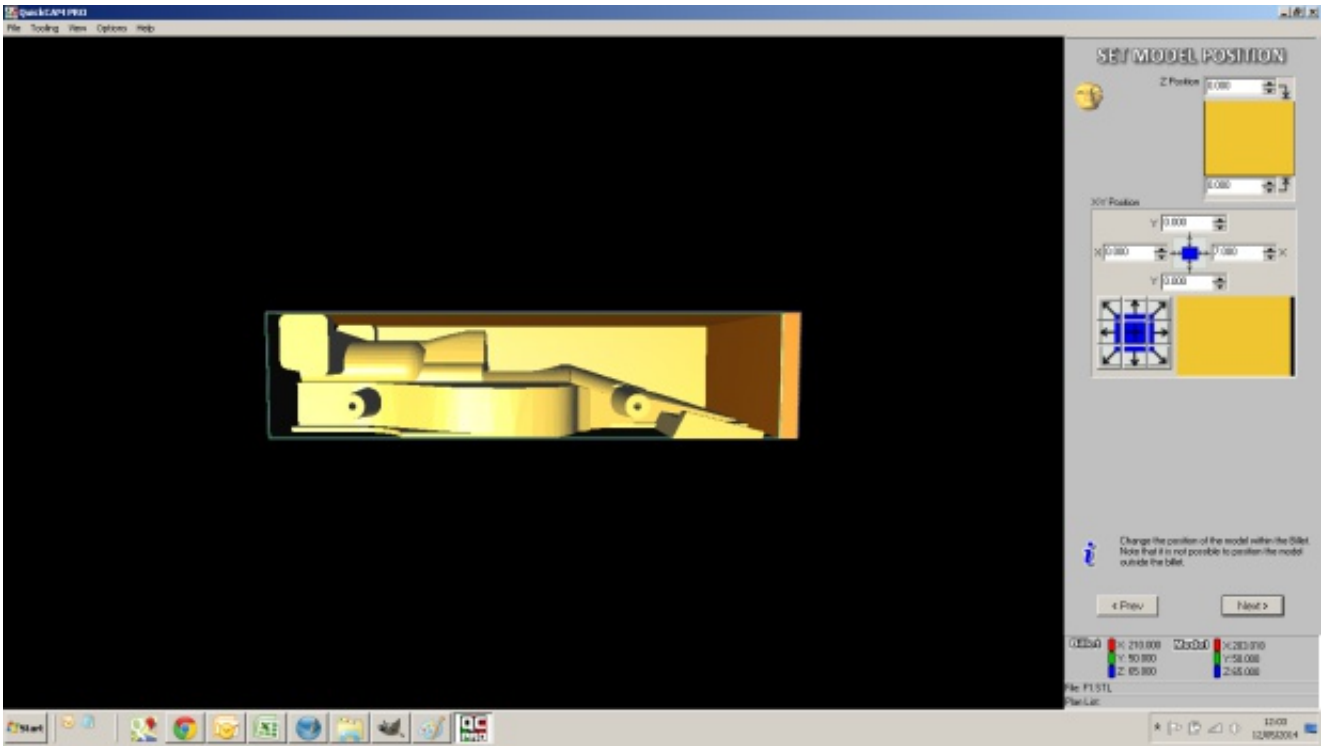
Check that the scale is set to 100%



Click the Next button

Set Model Position

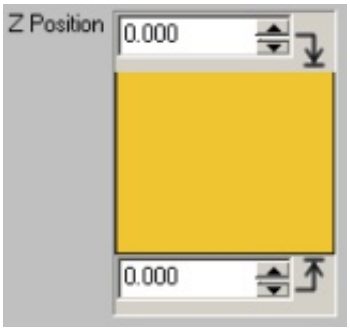
This screen is where you set the position of your model within the billet.



It is very important to get this correct as the cartridge hole is already in the billet and has an aluminium post inserted into it, getting the model position wrong may cause damage to the fixture and possibly break a tool.

The Z position is up and down but as your model is on its side it is best to think of this as moving the model left and right. As the cartridge hole is in the centre the model should be in the centre.

Ensure that the values in both of the Z dialogue boxes are equal



The X position moves the model left or right, as the cartridge hole is on the left the model should be moved as far to the left as possible.

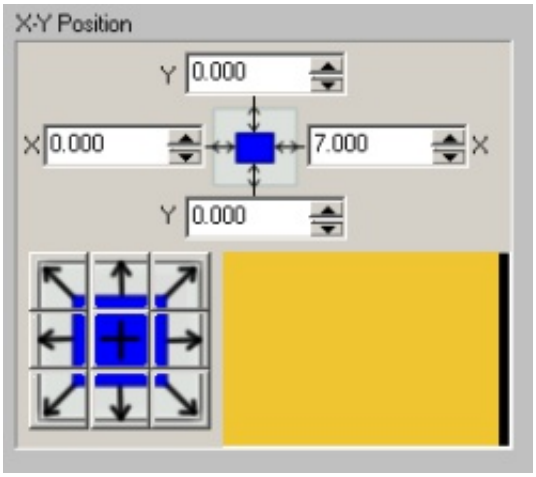
Ensure that the value in the left X dialogue box reads 0

The Y position controls where the base of the model is, as the balsa blank has the tether line guide already machined in it the model should line up with it.

Ensure that the bottom Y value reads 0

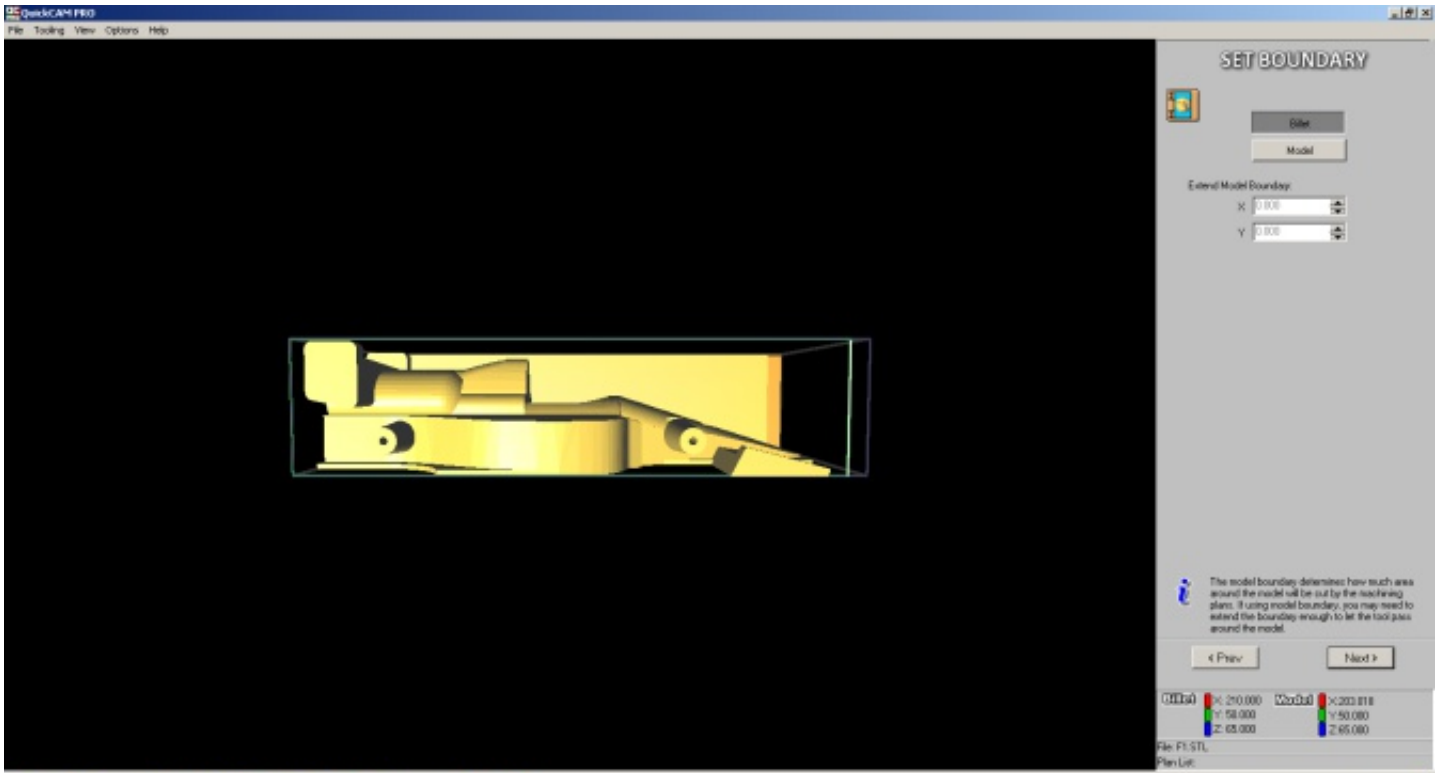
This model is the same size as the billet in the Y and Z directions making it easier to position.

Click the Next button



Set Boundary

This screen is where you can set the boundary.



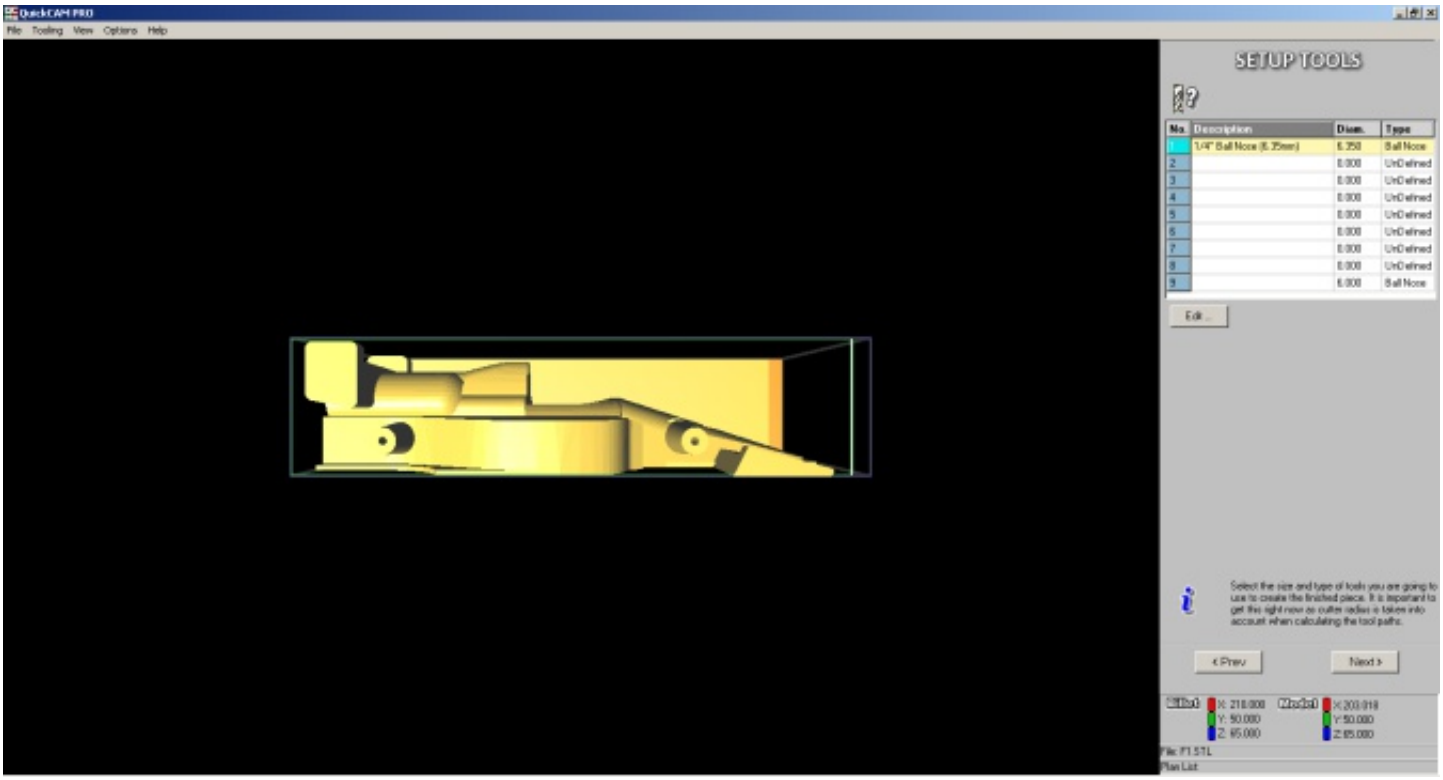
For this tutorial we will be using a custom offset so we will set the boundary to be the same as the billet.

Click the Billet button

Click the Next button

Setup Tools

Manufacture of the F1 in Schools cars is best done with the 1/4" (6.35mm) Long series Ball-nose cutter as it has a 40mm flute and will have about 50mm of length sticking out from the spindle nut. Using this cutter should prevent any clearance issues, the last thing you want to do is run the spindle nut into either your billet or the F1 fixture.
The screen below is where you set-up tools.

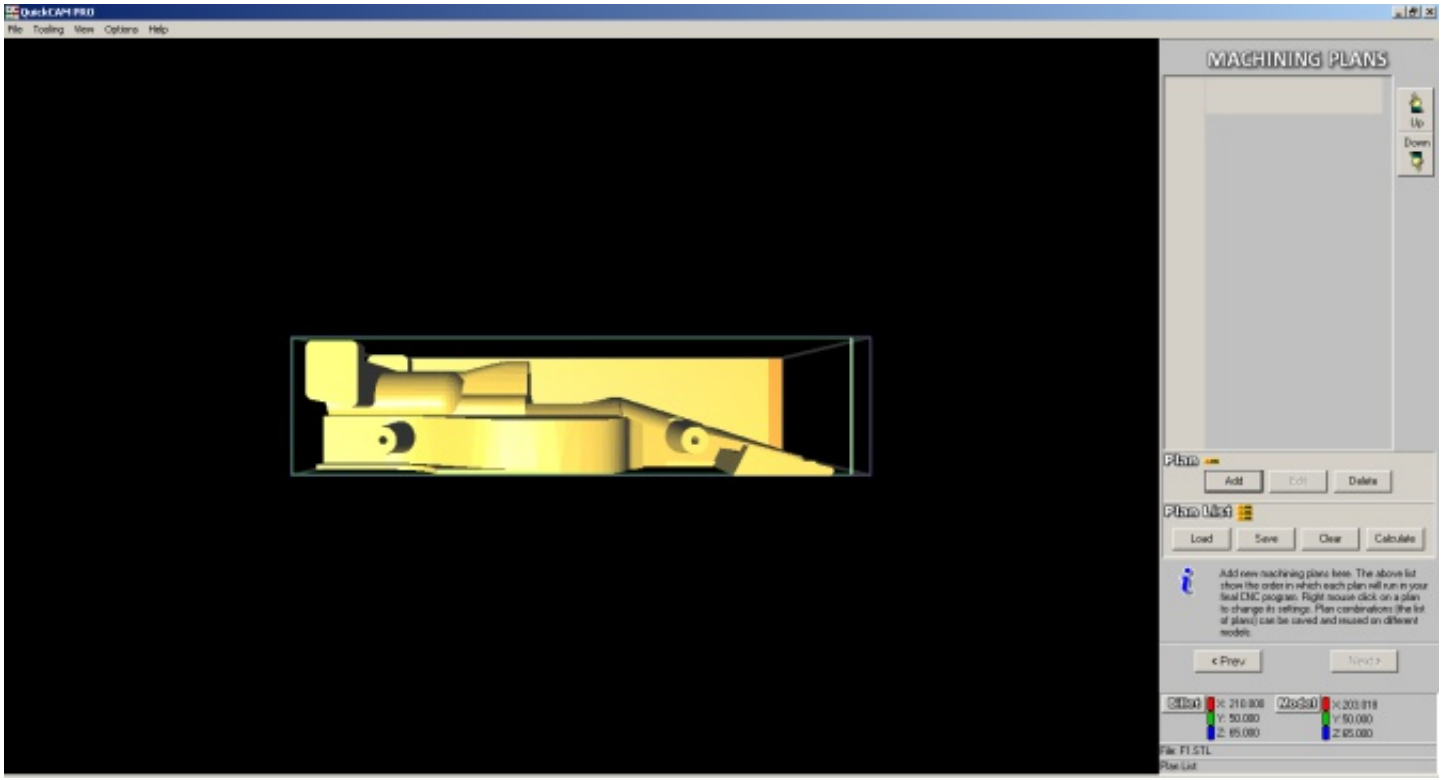


This screen takes the tooling information from VR Milling V5, as long as you have set the 1/4" Ball-nose in VR Milling V5 it should be showing here.

Click on the 1/4" (6.35mm) Ball-nose
The tool number should highlight in light blue
Click the next button Next >

Machining Plans

The screen below is where you create your machining plans having already instructed QuickCAM Pro on the size of your billet and the position and orientation of your model within it.



Click the Add button

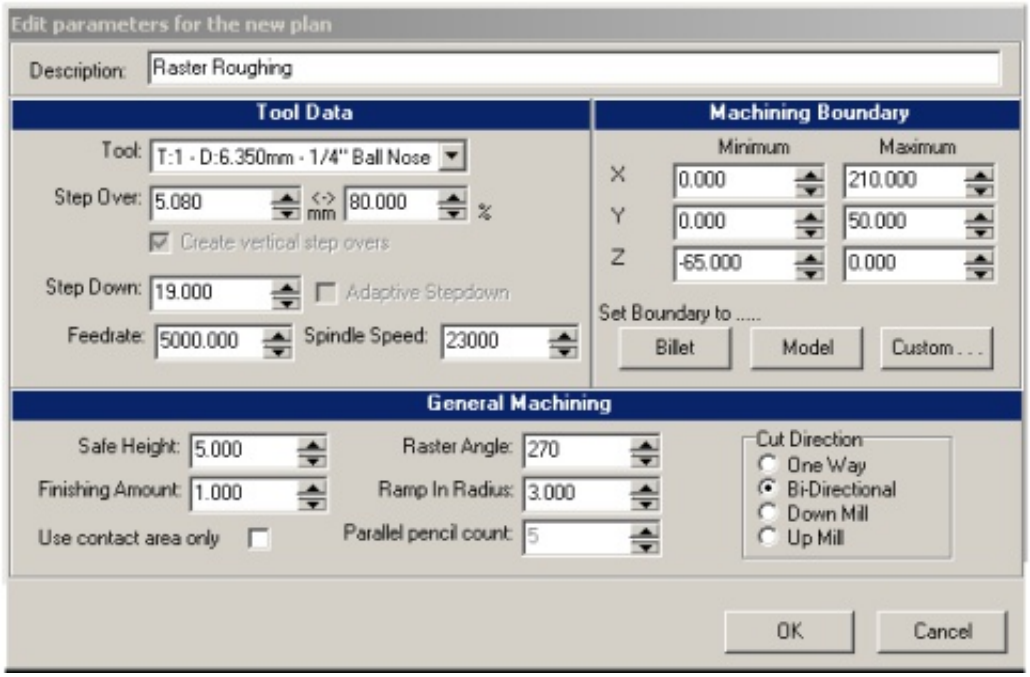
The window below will pop up.

Here you have a choice of 3 roughing plans, 6 finishing plans, and 3 fine finishing plans. For this tutorial we are going to use a Raster roughing and a Raster finishing plan.

Click the Raster Roughing button

Raster Roughing

The window below will appear, this is where you set the parameters for Raster roughing.



Enter the details shown below

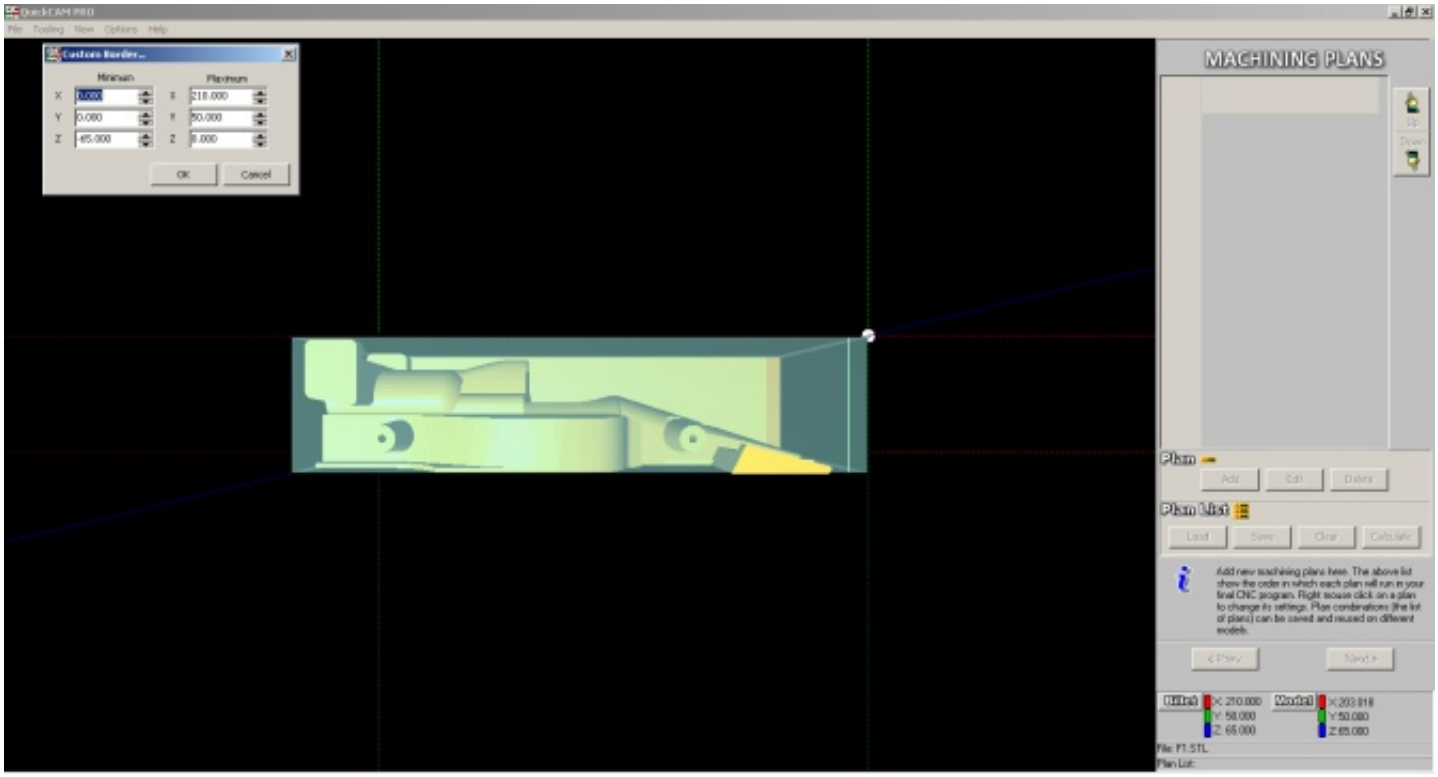
Raster Roughing Parameters

Tool Data		
Tool	1/4" Ballnose	This should already be selected
Step Over	80%	This is a percentage of the tool diameter, it wants to be high to remove material quickly
Step Down	19mm	Step down for balsa is 300% of the tool diameter
Feedrate	5000mm/s	Feedrate for balsa is 5000mm/s
Spindle Speed	23000rpm	Spindle speed for balsa is 23000rpm
General Machining		
Safe Height	5mm	This is the height above the billet the cutter moves to when not cutting, 5mm should miss the fixture
Finishing Amount	1mm	To get a good finish some material needs to be left for the finishing plan, this will leave 1mm all over the model
Raster Angle	270	You should raster accross the grain, 270 degree will start on the left where the cartridge hole is. As your model likely comes to a point it is not a good idea to start on the right as it may break away when machining the 2nd side
Ramp in Radius	3	CNC tools are designed to cut sideways and not straight down, to get to the desired cutting height the tool moves down in a spiral motion and this is the radius of that spiral
Parallel pencil count	N/A	This option is for fine finishing only and will be greyed out here
Cut Direction	Bi-Directional	When rastering from front to back this will cut in both directions
Machining Boundary		
Enter all other parameters first then follow the instruction below		

Click the Custom button

Creating a Custom Border

A custom border window will appear and the main display will change so that your model has a shaded box over it as shown below



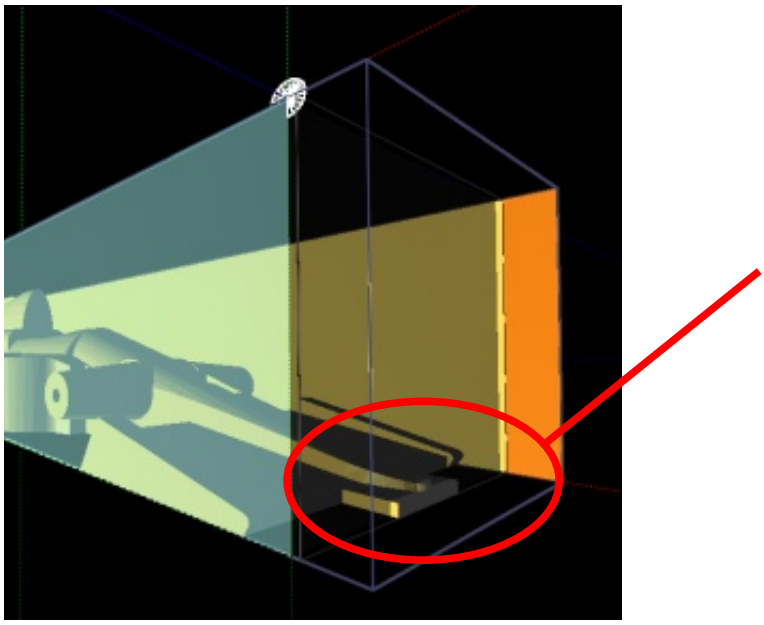
The shaded area is the area that will be cut with this machining plan.

X Minimum

Do not change this from 0, increasing it will miss part of your model, decreasing it may cause the tool to hit the aluminium post which is inserted in the cartridge hole.

X Maximum

This should be the same length as your model, modify your model before exporting the .STL to include a tail-stock so that it will not break when making the 2nd side of the model, as can be seen in the image below.



Tailstock modelled into the nose of the model to prevent it from breaking away during machining. X Maximum has been reduced so part of the model protrudes from the shaded border, this ensures the tailstock will not be parted off.

Y Minimum

As you are rastering in the Y direction it is a good idea to extend this boundary by at least the tool diameter so that the tool is accelerating / decelerating / and changing direction in fresh air. Make this -8mm.

Y Maximum

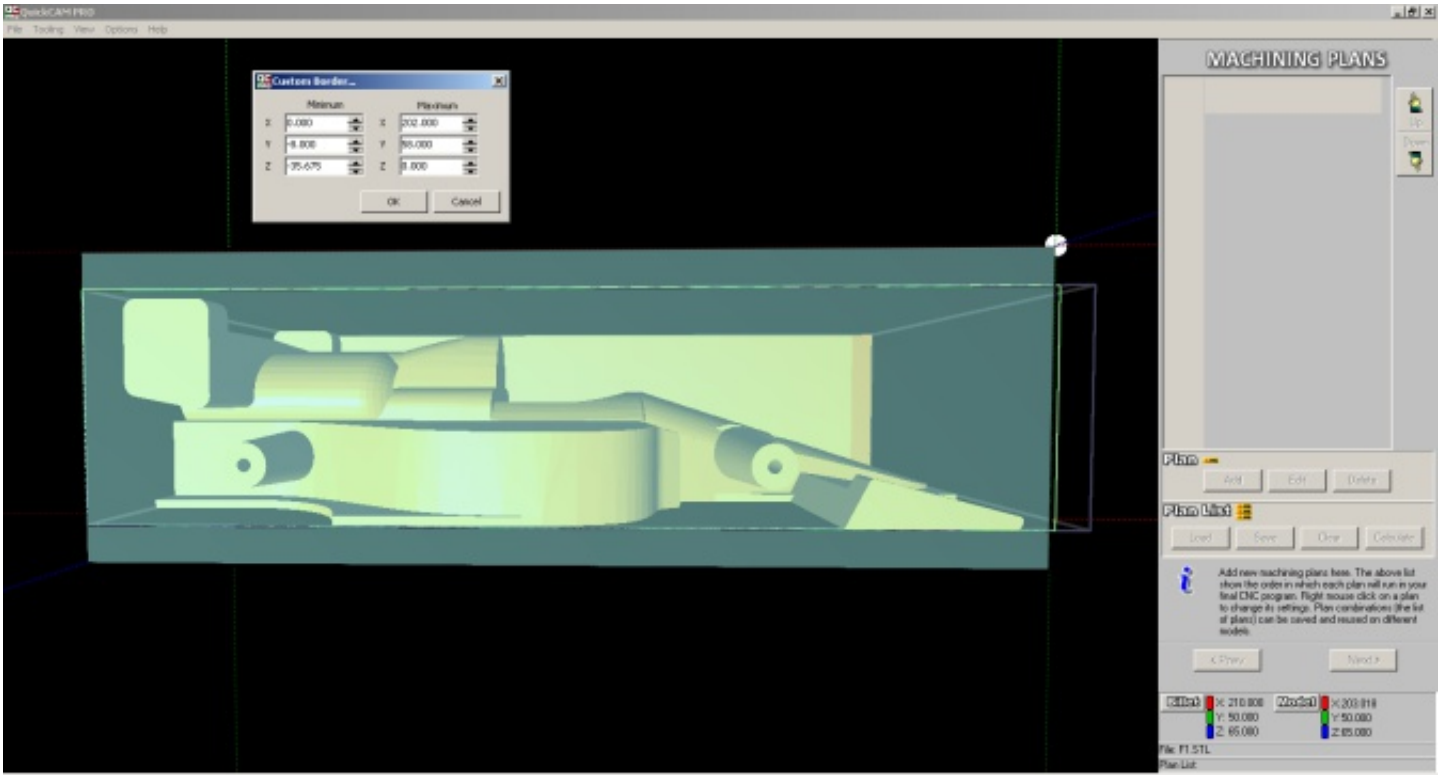
As you are rastering in the Y direction it is a good idea to extend this boundary by at least the tool diameter so that the tool is accelerating / decelerating / and changing direction in fresh air. Make this 58mm.

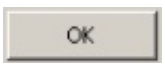
Z Minimum

As you are cutting from both sides you want to cut down to the centreline of the billet which is 32.5mm, but as you are using a 1/4" (6.35mm) Ball-nose you need to go beyond the centreline by the tools radius so make this -35.675mm.

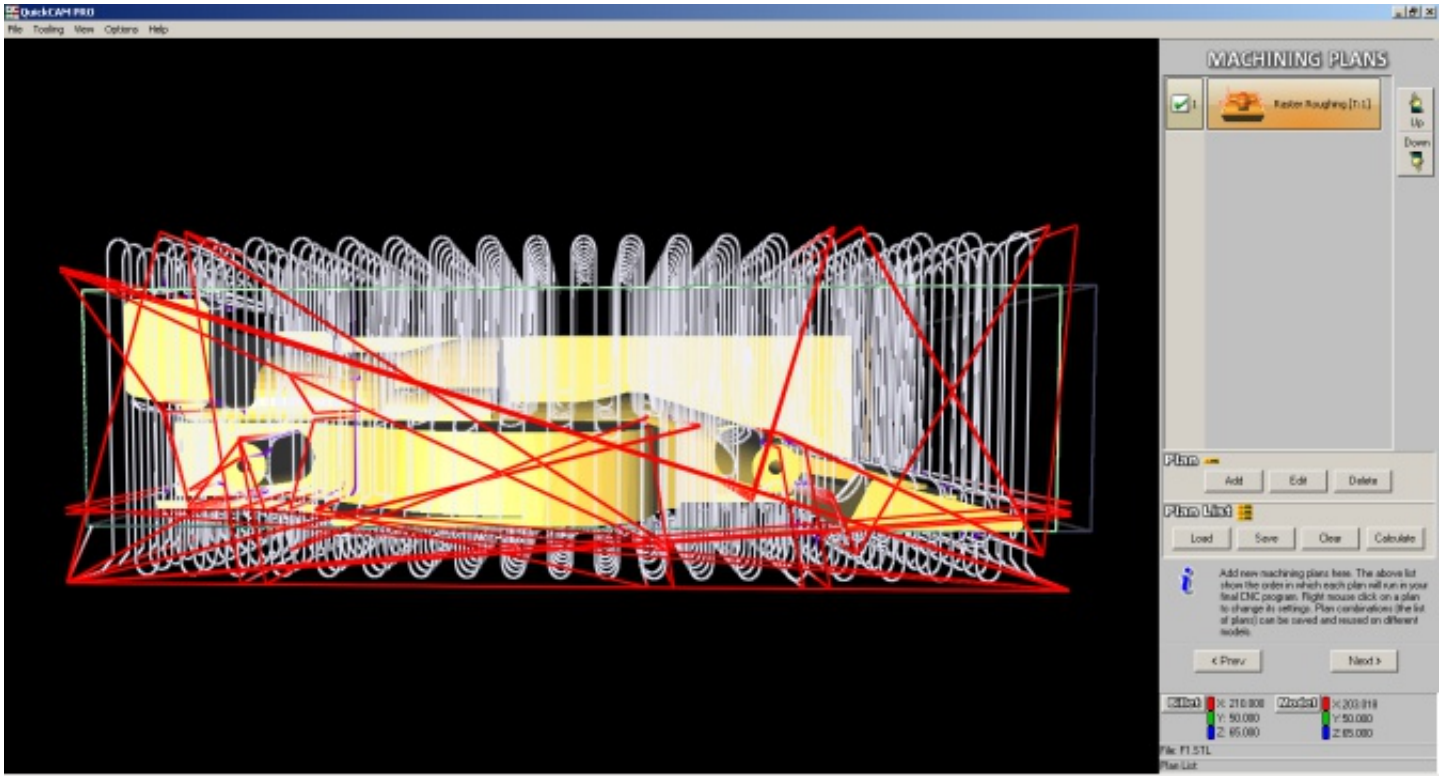
Z Maximum

This is the top of the billet so should be 0mm

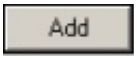


Click the OK button 

QuickCAM Pro will now calculate the Raster Roughing plan using the parameters you have entered.
Depending on the speed of your PC this may take some time.
On completion your screen should look like the image below.



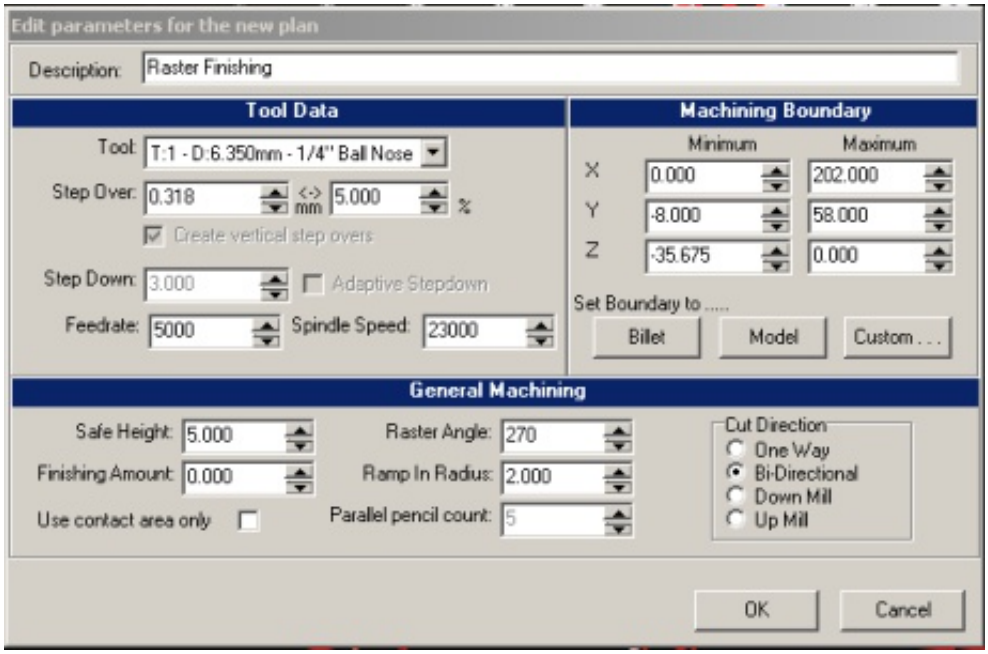
You are now ready to add a finishing plan.

Click the Add button 

Click the Raster Finishing button

Raster Finishing

The window below will appear, this is where you set the parameters for Raster Finishing.



Enter the details shown below

Raster Finishing Parameters

Tool Data		
Tool	1/4" Ballnose	This should already be selected
Step Over	5%	This is a percentage of the tool diameter, it wants to be low to give a good finish. Between 20% and 5% is recommended, this is a trade off between quality and time.
Step Down	N/A	This will be greyed out as it is a finishing plan
Feedrate	5000mm/s	Feedrate for balsa is 5000mm/s
Spindle Speed	23000rpm	Spindle speed for balsa is 23000rpm
General Machining		
Safe Height	5mm	This is the height above the billet the cutter moves to when not cutting, 5mm should miss the fixture
Finishing Amount	0mm	This is the finishing plan so set this to 0mm
Raster Angle	270	You should raster accross the grain, 270 degree will start on the left where the cartridge hole is. As your model likely comes to a point it is not a good idea to start on the right as it may break away when machining the 2nd side
Ramp in Radius	3	CNC tools are designed to cut sideways and not straight down, to get to the desired cutting height the tool moves down in a spiral motion and this is the radius of that spiral
Parallel pencil count	N/A	This option is for fine finishing only and will be greyed out here
Cut Direction	Bi-Directional	When rastering from front to back this will cut in both directions
Machining Boundary		
By default the machining boundary settings here will be the same as you used for the raster roughing, no need to change these. After filling in parameters above, follow instructions below.		

Click the OK button

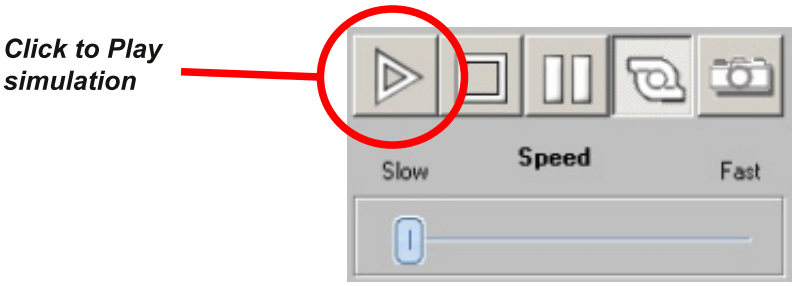
Like the Raster Roughing this may also take some time to calculate depending on the speed of your PC.

Once the calculation has completed.

Click the Next button

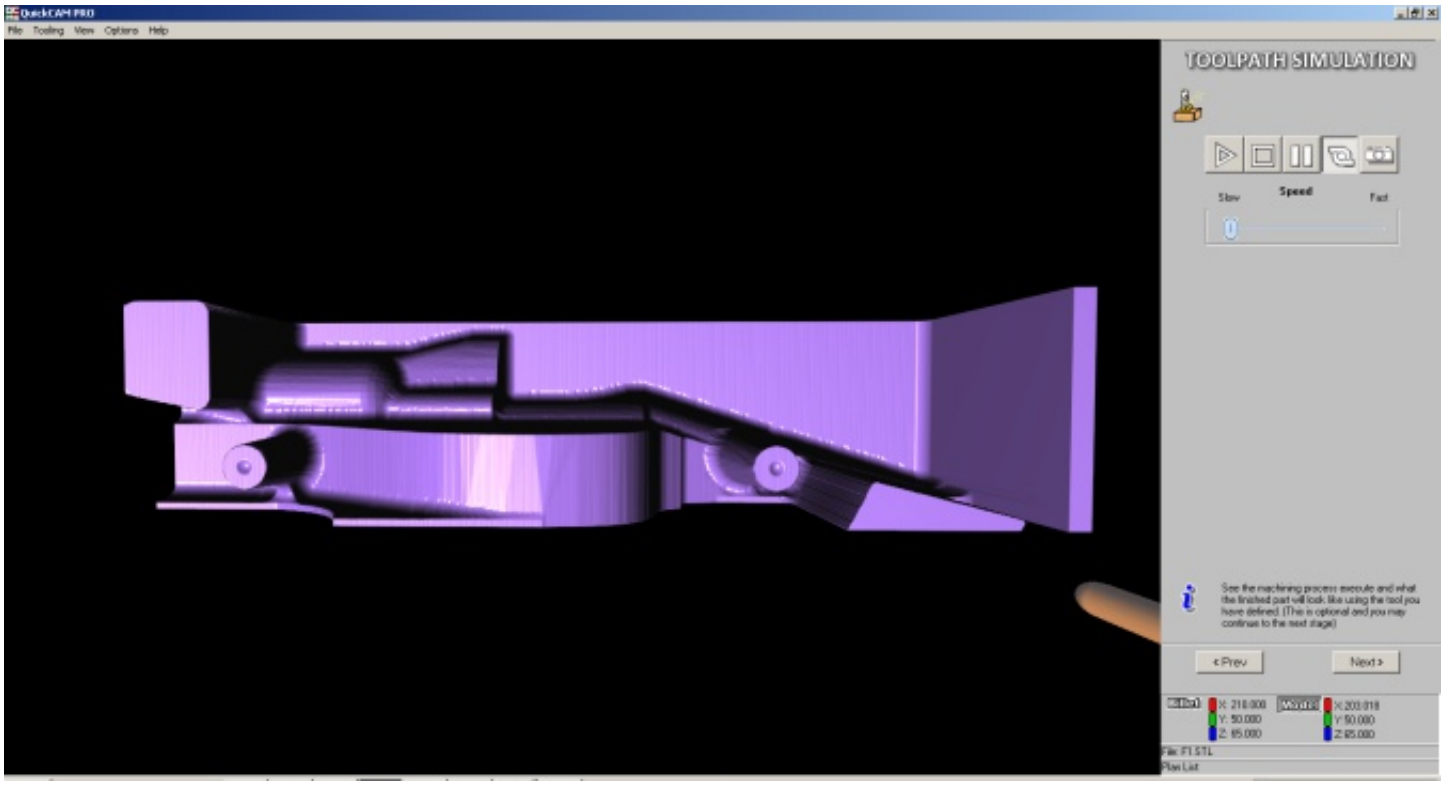
Toolpath Simulation

The Navigation panel on the right of your screen now has the video control buttons shown below



Click the Play button to run a simulation of your toolpath

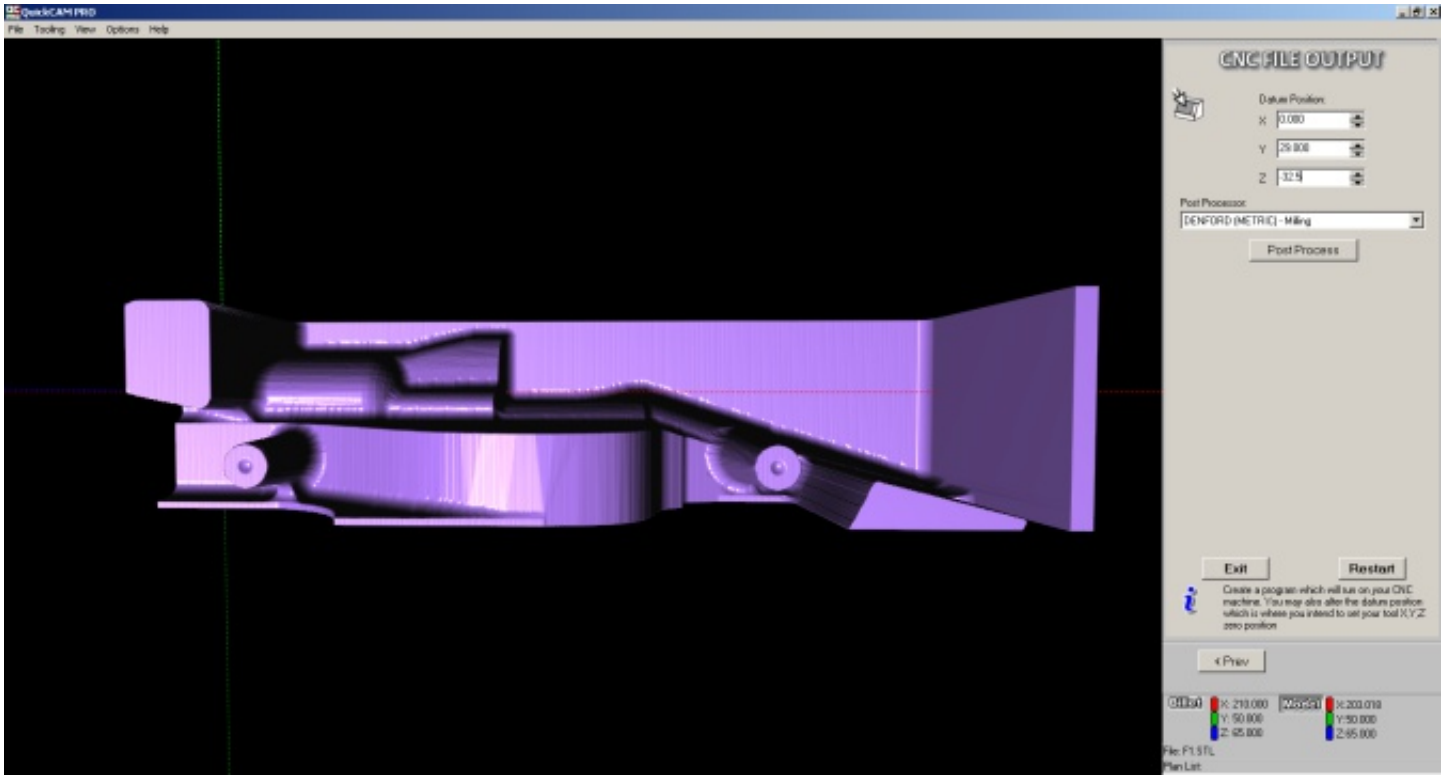
It should look something like the one image below.



Click the Next button

CNC File Output

This is the final screen where we create the CNC file which is a .FNC file.



Setting the DATUM

For the F1 in Schools models we set the DATUM as the axis of rotation which is in this case the centre of the cartridge hole.

Set the DATUM to the values below

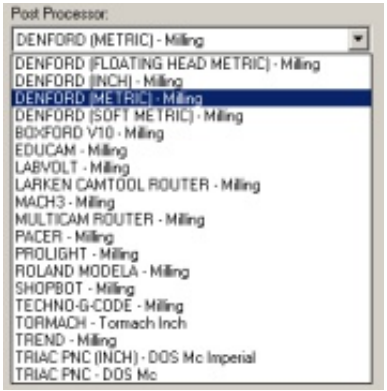
X0

Y29

Z-32.5

Post Processor

QuickCAM Pro includes a number of Post Processors to enable you to create programs for makes of CNC machines.



For Denford Mills and Routers select Denford (Metric) - Milling

Select Denford (Metric) - Milling

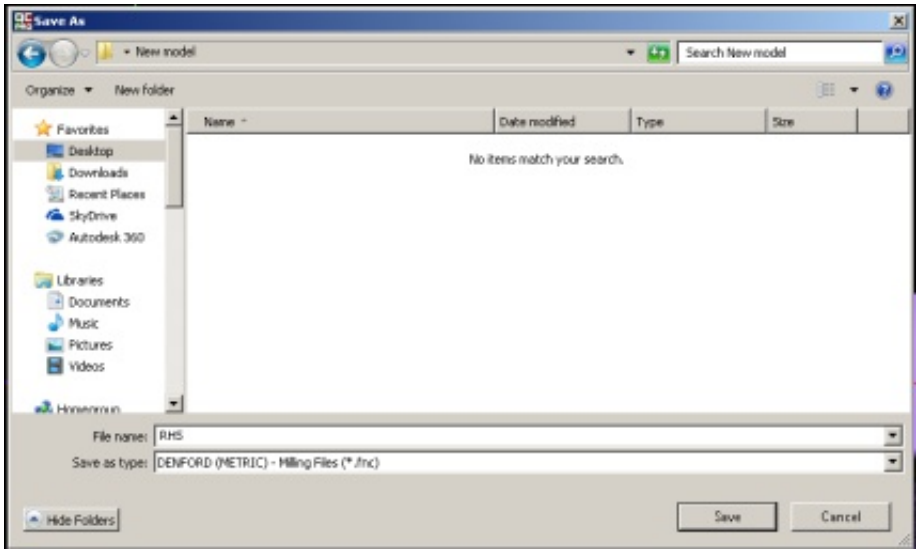
Click the Post Process button

Saving the CNC File

A "Save As" dialogue box will have popped up.

As you will be machining your model from at least 2 sides it is a good idea to create a new folder with the name of your model, as you can see from the image below I have created a folder called "New Model".

How you save the file depends on which fixture you are using.



F1 in Schools Car Manufacturing Fixture

You have just created the toolpath for the right hand side of your model so name this file RHS

Type "RHS"

Click the Save button

Wait while VR Milling V5 opens

Your CNC file is now showing in the editor window, we are going to make some changes.

Highlight line 1 and change it to the text below

(File: LHS.fnc

Hit the Enter button to create a new line

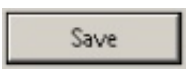
Type "M71"

M71 is a miscellaneous function which mirrors the Y axis

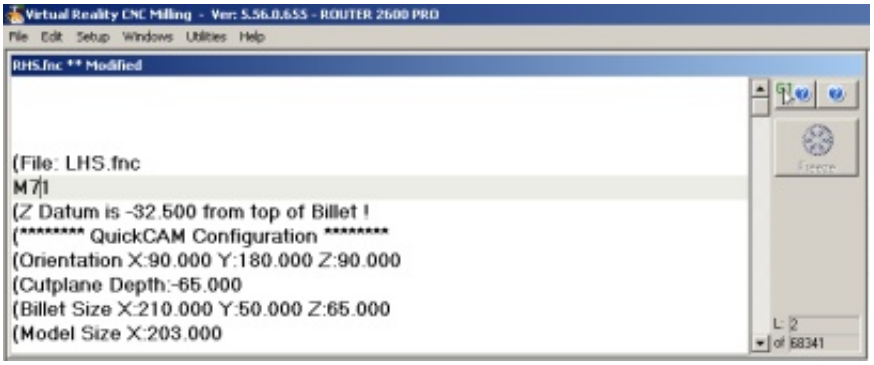
From the Toolbar select >File>Save As

Save the file as LHS

Type "LHS"

Click the Save button 

You have now created the Right and Left programs for your model and are ready to start machining



4th Axis F1 in Schools Car Manufacturing Conversion Kit

Follow the instructions for the F1 in Schools Car Manufacturing fixture

Open the folder which contains the files RHS.fnc and LHS.fnc

Rename RHS.fnc to 0001.fnc

Rename LHS.fnc to 0002.fnc

We now need to create a subcall routine which will automatically rotate the 4th axis and call the programs 001.fnc and 0002.fnc

In VR Milling V5 you need to create a new file

From the Toolbar select >File>New

Type the following:

M70

G00 A90

M98 P0001

G00 A270

M98 P0002

G00 A360

M70 is another miscellaneous function, it mirrors the X axis. This is required as on the 4th axis the cartridge hole is on the right hand side.

G00 A90 instructs the 4th axis to turn 90 degrees

M98 P0001 calls program 0001.fnc and executes it

G00 A270 instructs the 4th axis to turn a further 180 degrees

M98 P0002 calls program 0002.fnc and executes it

G00 A360 returns the 4th axis to the start position

Save this file in the same folder as program 0001.fnc and program 0002.fnc

Save this file as

Subcall.fnc

This is the file which you will run when using the 4th axis to machine an F1 in Schools billet.

Machining the F1 in Schools Billet

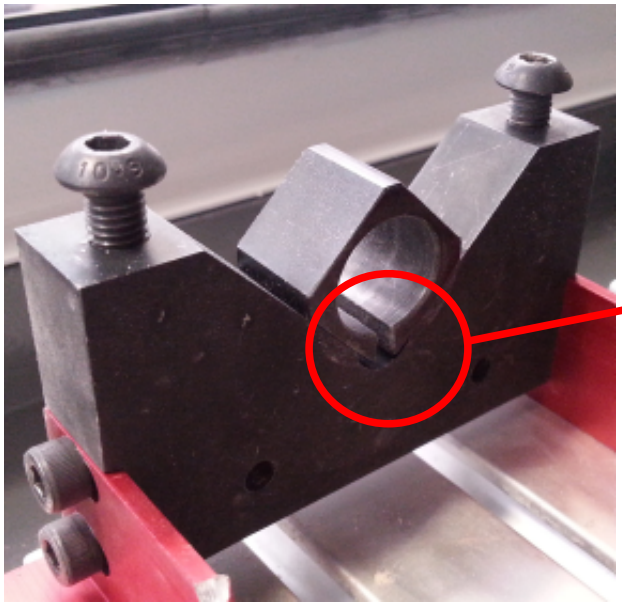
If using the 4th Axis go to page 29, the instructions from pages 25 to 28 are for the F1 in Schools Car Manufacturing Fixture only.

F1 in Schools Car Manufacturing Fixture

The billet should be positioned in the machine as shown in the image below.

Note that the tether line guide slot is facing you, this is set up for the right hand side to be machined

When tightening the bolts circled in the image above always tighten the right hand side before the left to prevent the billet from being twisted.



Ensure that this cutout is at the bottom. As the bolts are tightened onto the aluminium bar that goes over this bracket the cutout closes up and secures the aluminium post which is inserted into the cartridge hole.

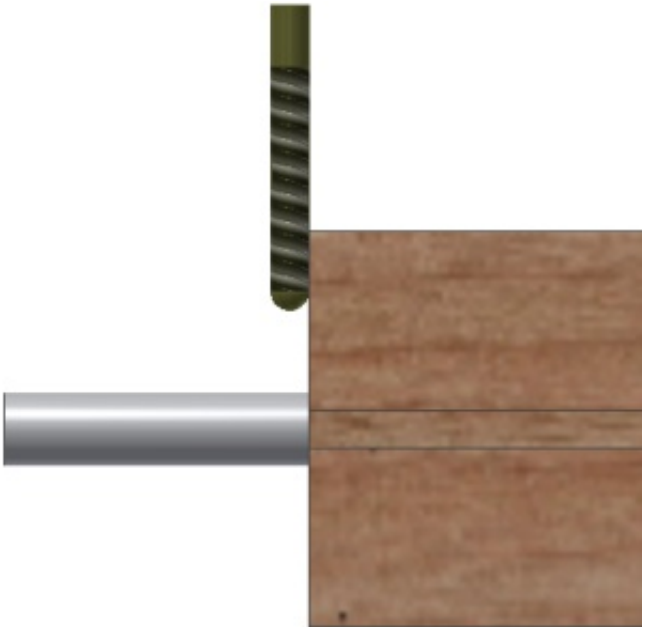
On the left hand side the bar which is inserted into the cartridge hole has an aluminium block around it with a cutout, ensure the cutout is to the bottom as shown in the image below.

Set the datum to the left hand side of the billet with Y and Z on the centreline of the aluminium bar as shown on the next page.

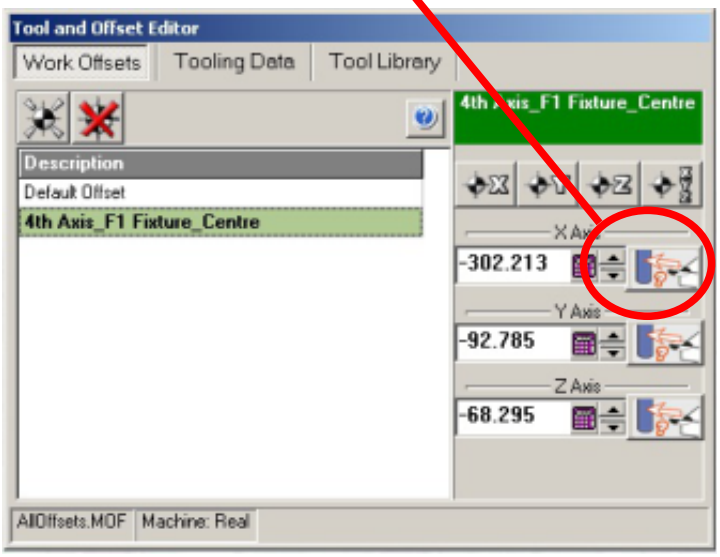
Setting the DATUM

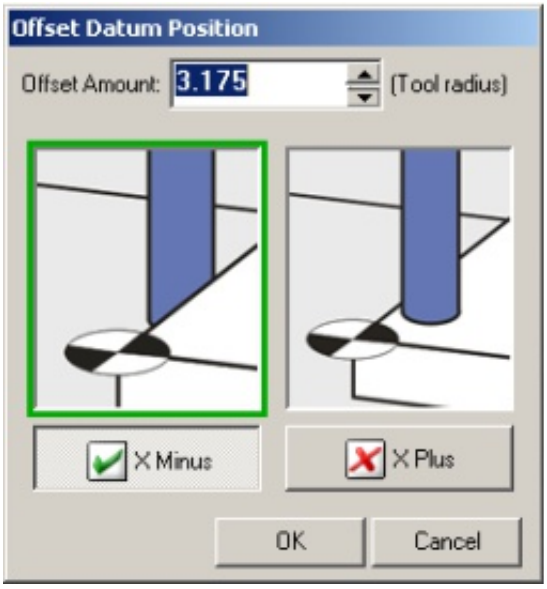
X Axis

Touch the tool onto the left hand side of the billet as shown in the image below



In the Tool and Offset Editor window select the X axis datum offset button





Type the value shown below into the offset amount

3.175

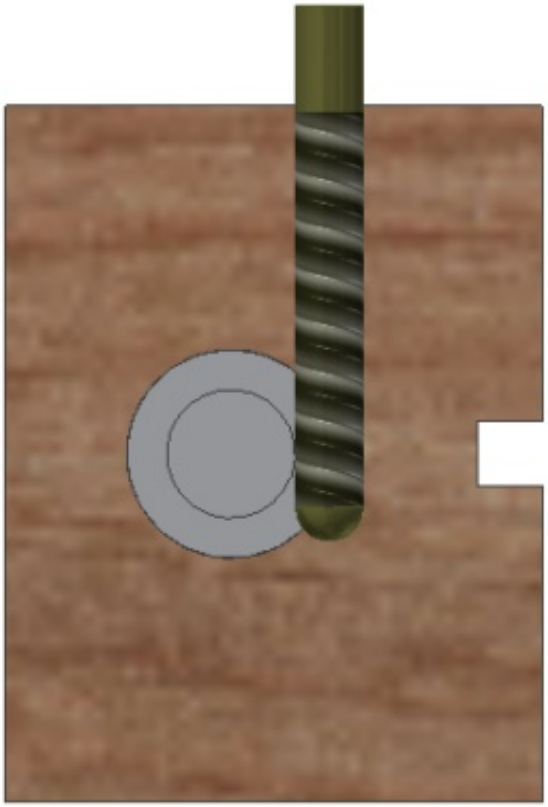
Click the X Minus button

Click the OK button

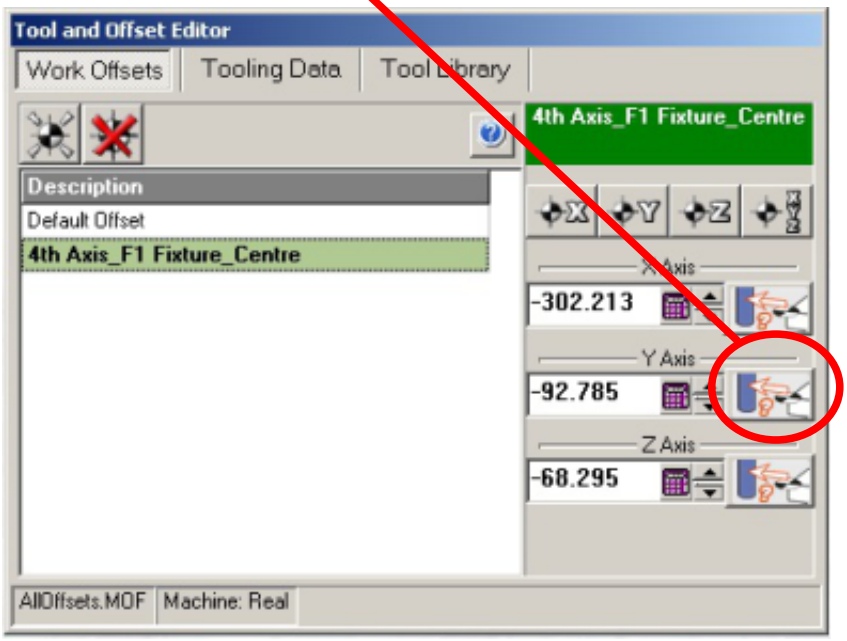
You have now set the X axis

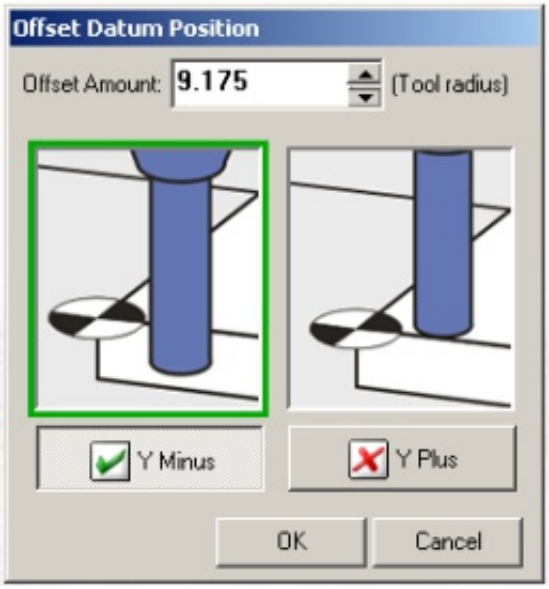
Y Axis

Touch the tool onto the front of the aluminium bar as shown in the image below



In the Tool and Offset Editor window select the Y axis datum offset button





Type the value shown below into the offset amount.

9.175

This is the radius of the tool and the radius of the bar

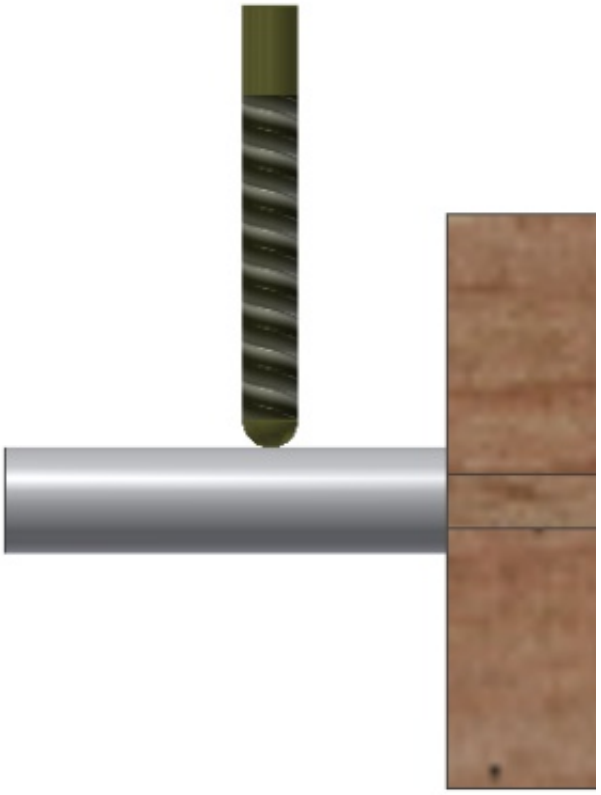
Click the Y Minus button

Click the OK button

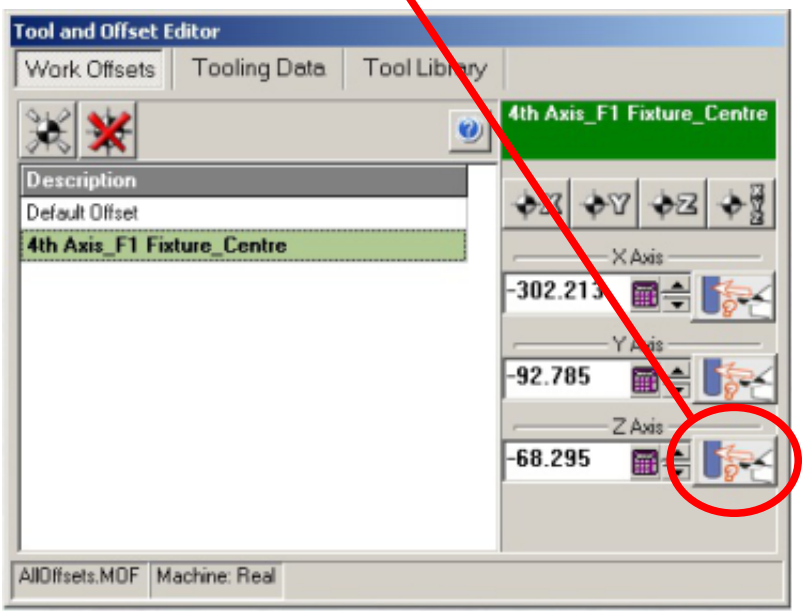
You have now set the Y axis

Z Axis

Touch the tool onto the top of the aluminium bar as shown in the image below.



In the Tool and Offset Editor window select the Z axis datum offset button

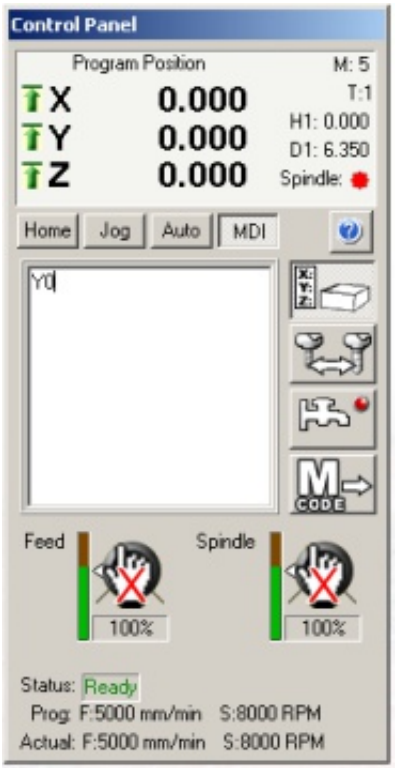


To do this the Y axis must be at 0

Go to the MDI tab in the Control Panel

Type "Y0"

Press the Start button

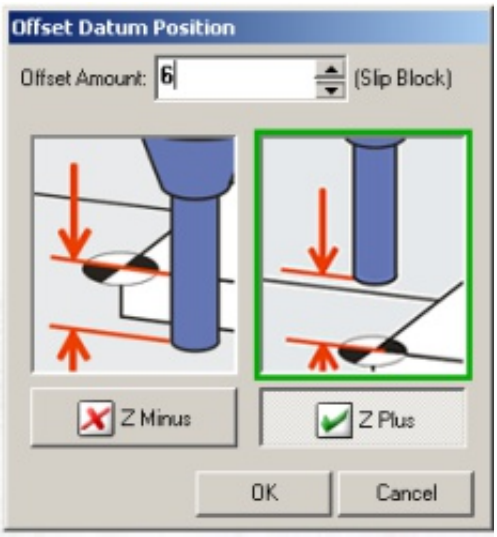


Go to the jog tab and lower the tool onto the top of the bar

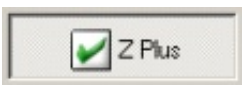
Type the value shown below into the offset amount.

6

This is the radius of the bar



Click the Z Plus button



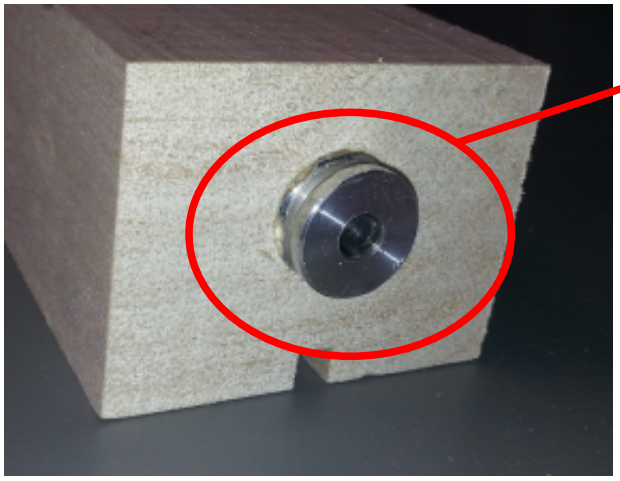
Click the OK button

You have now set the Z axis and can run the program RHS.fnc, when this is finished simply rotate the billet and run the program LHS.fnc

4th Axis F1 in Schools Conversion Kit

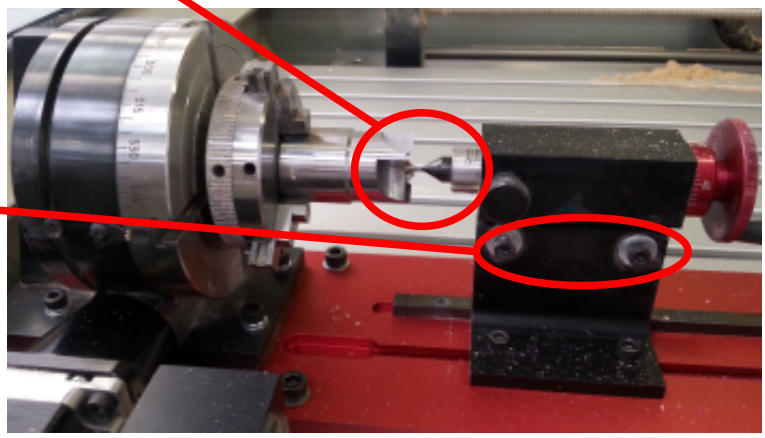
The billet should be positioned in the machine as shown in the image below.

Note that the tether line guide slot is at the bottom closest to the bed of the machine and the cartridge hole is on the right, the cartridge hole should have the aluminium cartridge fitted into it and this mates up to the tail-stock of the 4th axis.

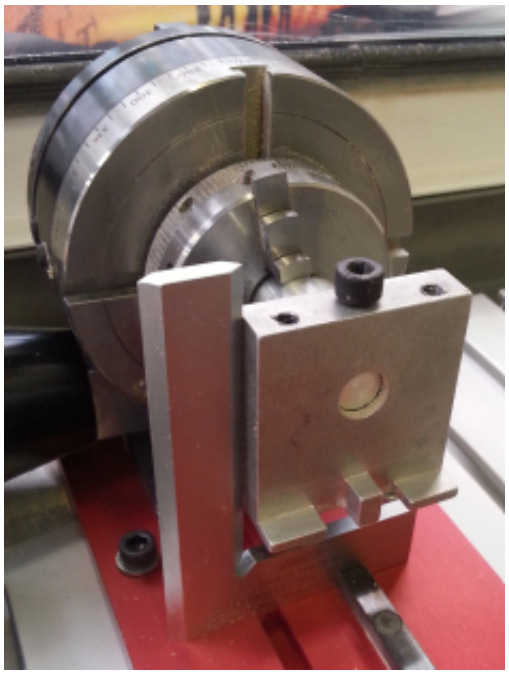


Aluminium cartridge inserted into the cartridge hole in the billet. Note the hole in the centre, this locates onto the 4th axis tail-stock.

The tail-stock must be aligned with the chuck of the 4th axis. To do this fit the spiked drive into the 4th axis and slide the tail-stock up to it, adjust the 4th axis so that the centre point of the drive and the point from the tail-stock align with each other.



Use these bolts to loosen the tail-stock in order to align it with the chuck.



The aluminium block which holds the billet fixes into the chuck of the 4th axis.

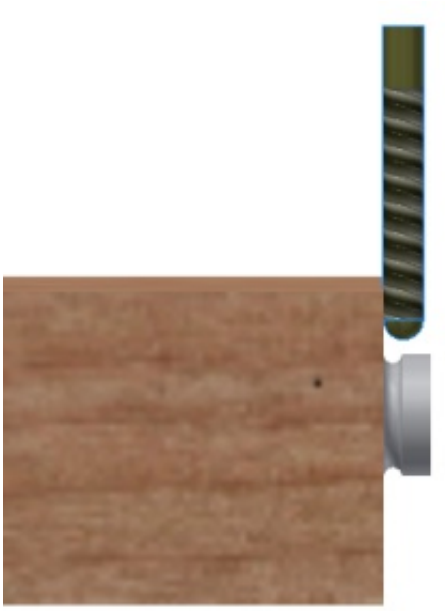
The 4th axis does not have a datum switch, this means that whatever position it is in when you connect to the router is taken as 0 degrees.

Use an engineers square to set the aluminium block so that it is parallel to the bed of the machine and then tighten the chuck on the 4th axis.

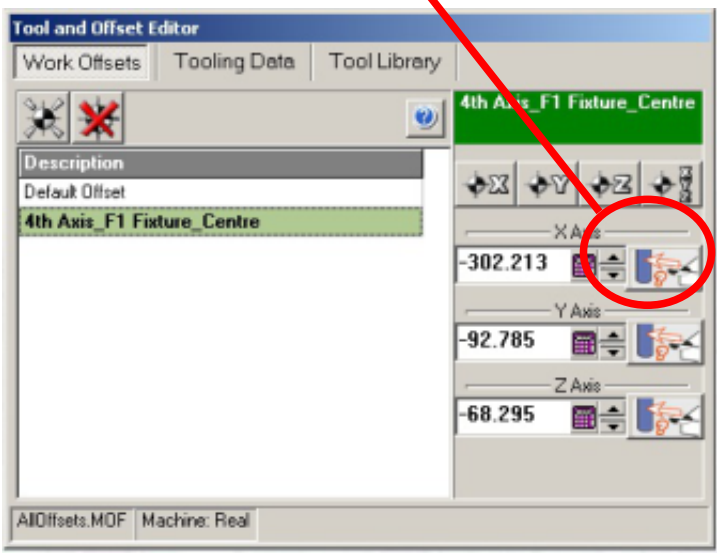
Setting the DATUM

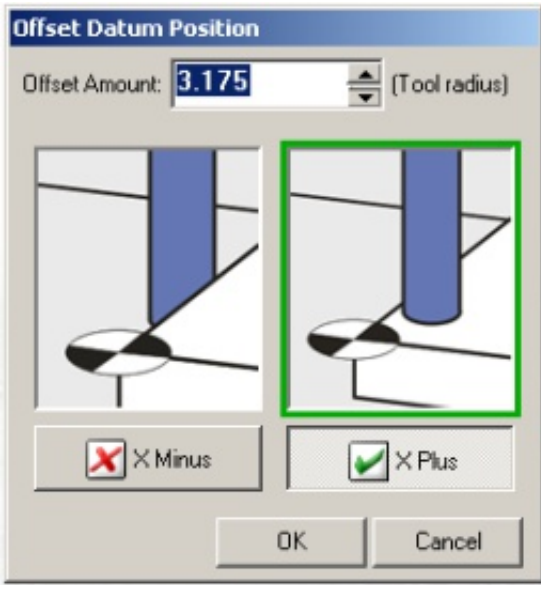
X Axis

Touch the tool onto the right hand side of the billet as shown in the image below



In the Tool and Offset Editor window select the X axis datum



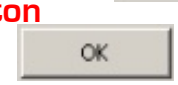


offset button

Type the value shown below into the offset amount

3.175

Click the X Plus button

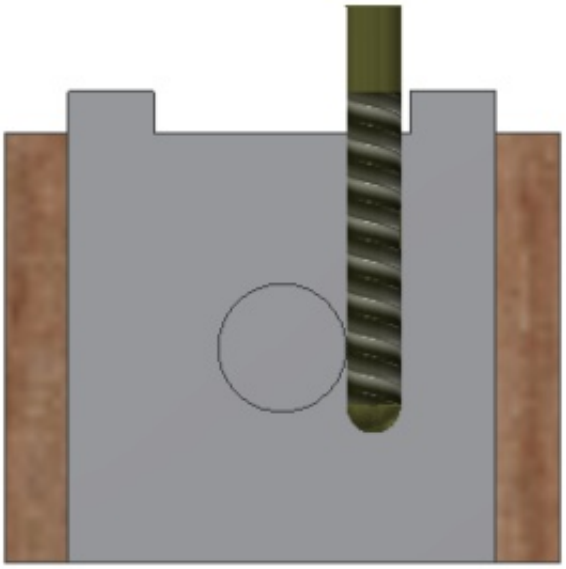


Click the OK button

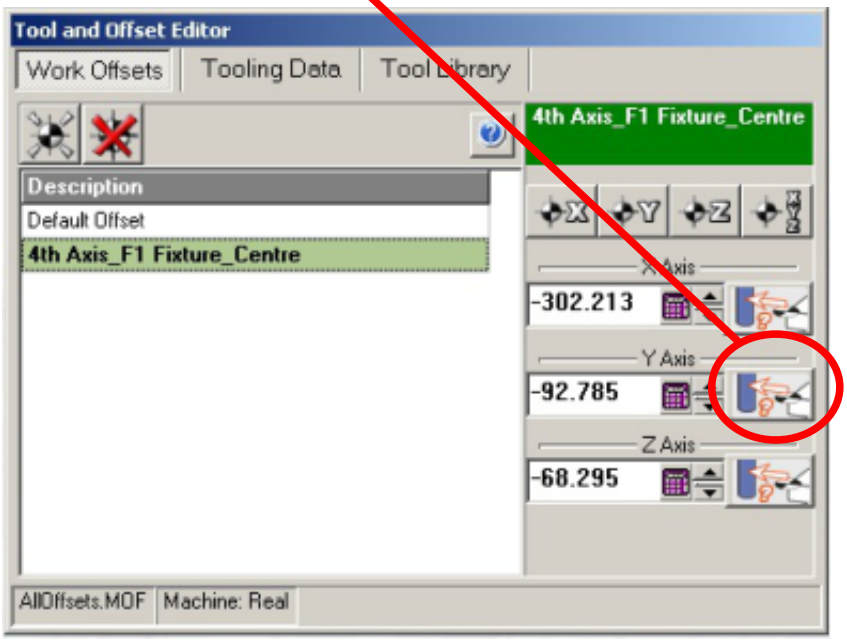
You have now set the X axis

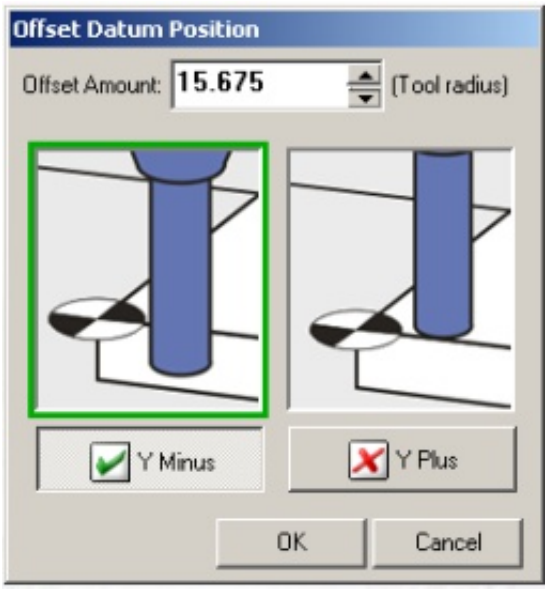
Y Axis

Touch the tool onto the front of the aluminium bar as shown in the image below



In the Tool and Offset Editor window select the Y axis datum offset button





Type the value shown below into the offset amount.

15.675

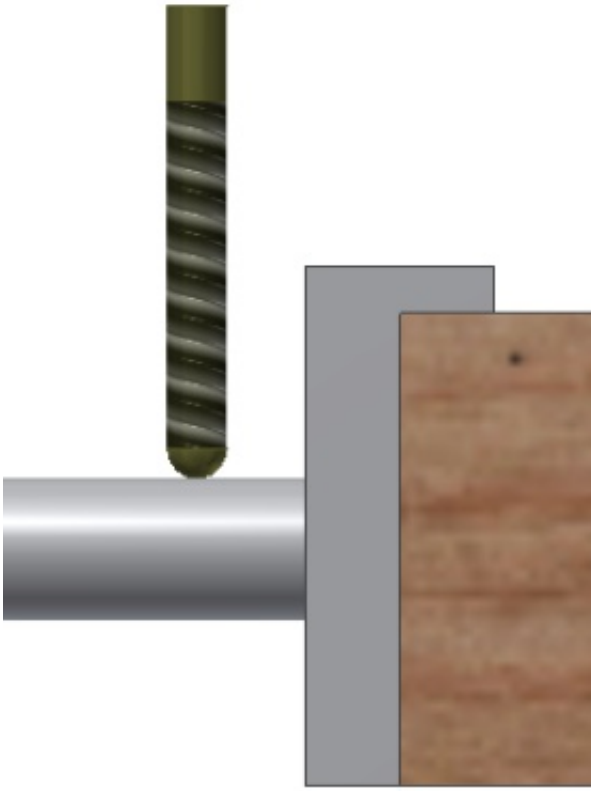
This is the radius of the tool and the radius of the bar behind the aluminium block which holds the left hand side of the billet

Click the Y Minus button

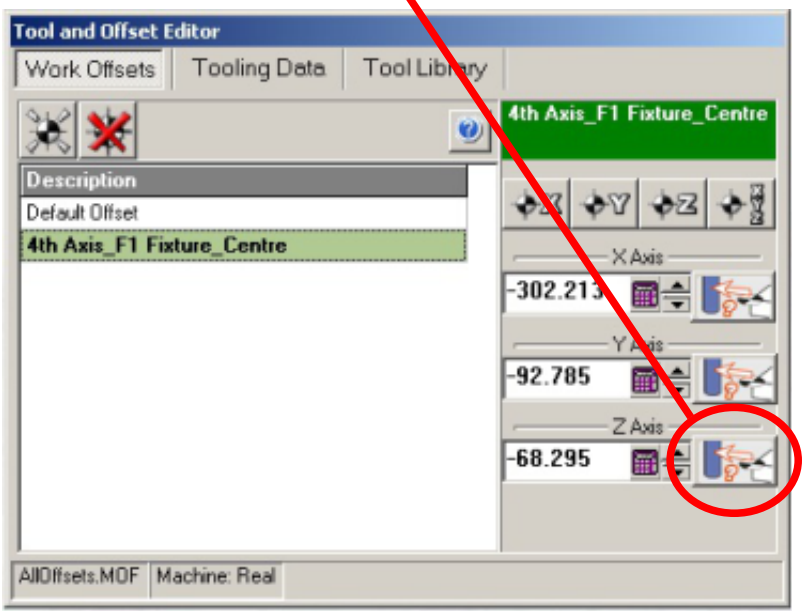
Click the OK button

Z Axis

Touch the tool onto the top of the aluminium bar as shown in the image below.



In the Tool and Offset Editor window select the Z axis datum offset button

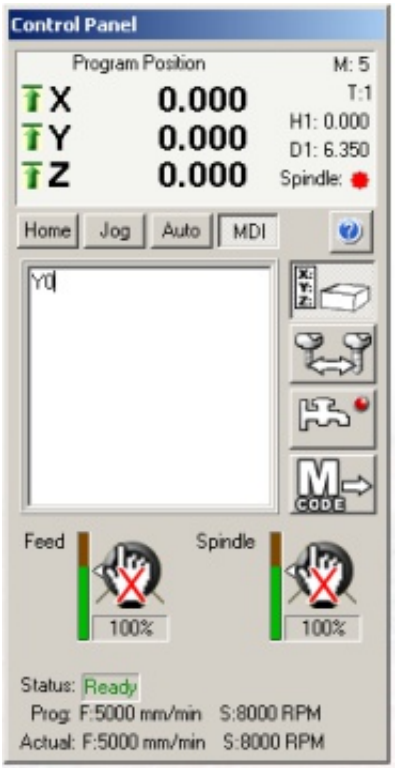


To do this the Y axis must be at 0

Go to the MDI tab in the Control Panel

Type "Y0"

Press the Start button

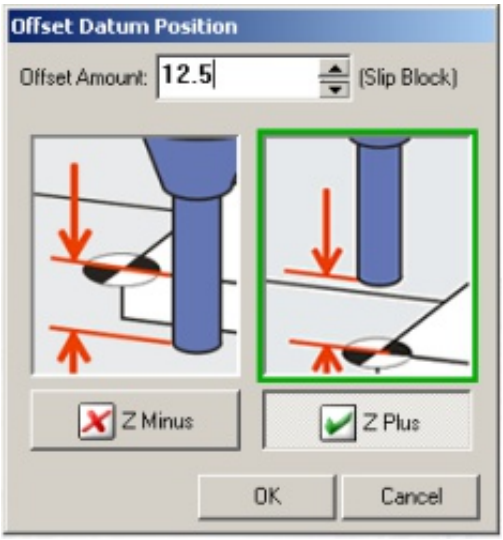


Go to the jog tab and lower the tool onto the top of the bar

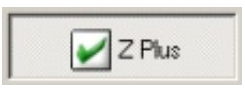
Type the value shown below into the offset amount.

12.5

This is the radius of the bar



Click the Z Plus button



Click the OK button

You have now set the Z axis and can run the program Subcall.fnc which will automatically rotate the 4th axis and execute program 0001.fnc and 0002.fnc

Running the Program

F1 in Schools Car Manufacturing Fixture

Open the "RHS.fnc" file that you created on page 23 of this guide.

4th Axis F1 in Schools Conversion Kit

Open the "Subcall.fnc" file that you created on page 24 of this guide.

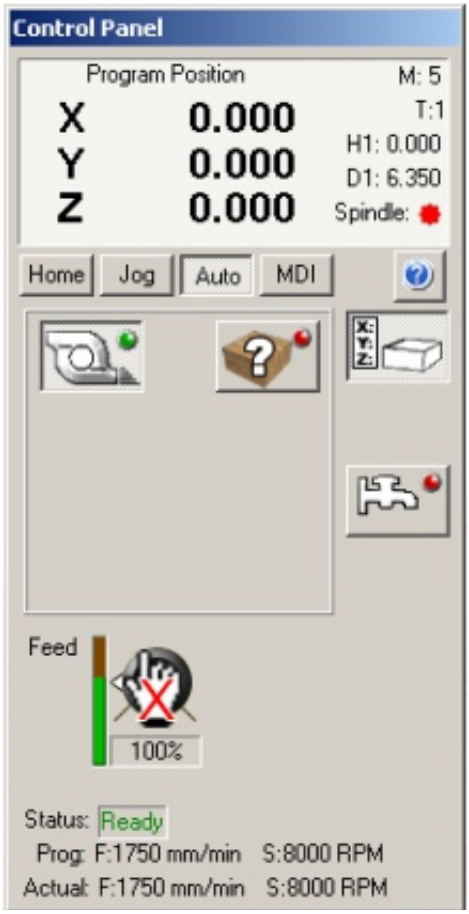
Running the Program

On the Control Panel, ensure that you are in Auto mode

Be sure that Turbo Mode is turned on

Make sure that Material Overide is turned off

Chek that the Feed Rate Overide on the front of the router is set to 100%



With the file control buttons select Stop, Rewind, then Start

Whilst you could just press Start, the above method is safer as it will ensure that you do not start a program part way through which could cause damage to the fixture and the tool.

F1 in Schools Car Manufacturing Fixture

When the first side has finished turn the billet over, instructions for fixing the billet are on page 25

4th Axis F1 in Schools Conversion Kit

When the program has finished remove the finshed design

DENFORD

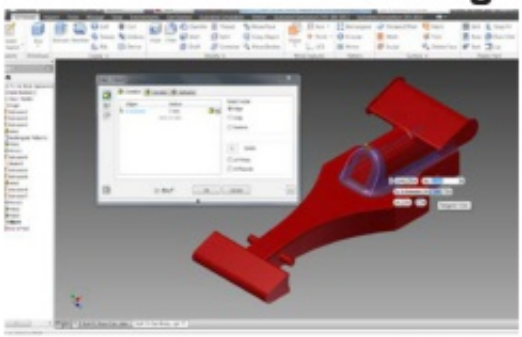
F1 in Schools Package

A COMPLETE PACKAGE INCORPORATING DESIGN, ANALYSE, MAKE, TEST & RACE

The F1 in Schools Technology Challenge stimulates a student's interest in, and understanding of the entire process of design and manufacture. Through involvement in the F1 in Schools Challenge, students will gain first hand experience of teamwork and communication, whilst encouraging individual flair and confidence. The F1 in Schools Challenge provides students with the opportunity to reflect industrial working practice of developing a product from concept, to prototype to production.

Plan

Design



Analyse

Make

Test

Race

f1inschools.com

CE APPROVED

Ideal for use in conjunction with F1 IN SCHOOLS

F1 in Schools Package

In support of the F1 in Schools Technology Challenge, Denford offer an F1® Package, which includes all of the equipment required to get you up and running for this innovative educational project - covering Design, Analyse, Make, Test & Race.

A brief overview:

1. Plan: Prepare a **business plan,** develop a budget and raise sponsorship. Teams are encouraged to collaborate with industry and create business links.

2. Design: Using 3D CAD (Computer Aided Design) software, **design** an F1® car of the future to the specifications set by the International Rules Committee just like in Formula 1®.

3. Analyse: Aerodynamics are **analysed** for drag coefficiency in a virtual wind tunnel using Computational Fluid Dynamics Software (CFD).

4. Make: Using 3D CAM (Computer Aided Manufacture) software, the team evaluates the most efficient machining strategy to **make** the car.

5. Test: Aerodynamics are **tested** in wind and smoke tunnels.

6. Race: Time to test what your team has worked so hard together to achieve: **a winning car.**

The F1 in Schools Package:

DESIGN:
Autodesk® 3D Design, Drafting & Simulation Software
QuickCAM Pro Advanced Milling/Routing CAM software (site licence).

ANALYSE:
Virtual Wind Tunnel (VWT) Software (single licence).

MAKE:
CNC Machine Options
- Router 2600/Router 2600 Pro (Metal Cutting).
- Compact 1000 Pro (Metal Cutting).
- MRC 40

Car Manufacture Fixture
F1 in Schools Car Manufacturing Fixture for both Bloodhound SSC & Formula 1® Class cars.

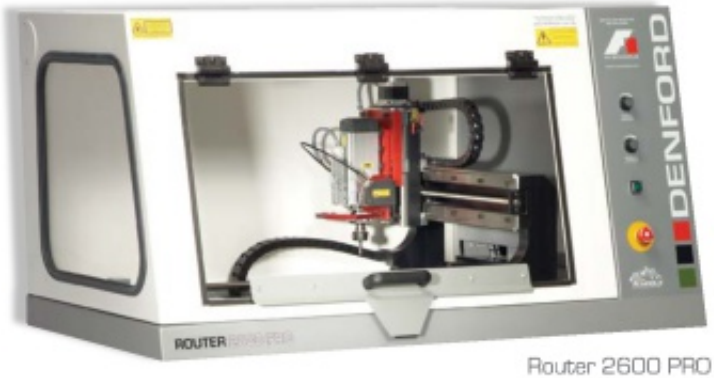
Consumables - Bloodhound SSC & Formula 1® Class Cars
- Formula 1® Class Balsa Wood Blanks - Pack of 20.
  Fusion Wheels - Black - Pack of 100.
  Screw Eyes 1" - Pack of 100.
  Long Axles - 65mm - Pack of 100.
  Straw Wheel Spacers - Pack of 500.
  Washers - 4mm - Pack of 100.
  Decal Stickers - Pack of 25 sheets.
  Paint Stand.

- Bloodhound SSC Class Balsa Wood Blanks - Pack of 20.
  PX Wheels - Rear - Black - Pack of 100.
  LX Wheels - Front - Black - Pack of 100.
  Screw Eyes 1/4" - Pack of 100.
  Short Axles - 43mm - Pack of 100.

TEST:
Scout Wind Tunnel.
Fog Maestro Smoke Generator including 1Ltr. Fog Fluid.

RACE:
Elevated Race Track - 25m track.
F1 Race System (x1 Start & Finish Gate, x2 Launch Triggers, x2 Launchers, x1 Power Supply, x1 Control Box).
8 Gram Competition Cartridges (pack of 120).

Compact 1000 PRO



Router 2600 PRO

For the full range of F1 consumables & race equipment see pages 72 - 77.

DENFORD

Denford reserves the right to alter machines and software specifications without prior notice. All Denford products are subject to copyright. All brands and products are trademarks or registered trademarks of their respective companies.

Get in touch...
T: +44(0)1484 728000
denford.co.uk

denfordata.com/bb/

On-Line Technical Forum

TECHNICAL SUPPORT AVAILABLE 24 HOURS A DAY, 7 DAYS A WEEK

Denford's Technical Forum is a free of charge on-line technical support service that is available to Denford customers 24 hours a day, 7 days a week.

"The technical forum has provided a wealth of information and support for our 20-year-old Denford CNC machine, in fact just as good as the support we receive for our brand new CNC Router!"

Denford's On-Line Technical Forum is a free of charge service that can be accessed 24 hours a day, 7 days a week.

The On-Line Technical Forum is available to Denford customers, old and new, and it couldn't be easier to use. Just visit http://www.denfordata.com/bb/ and register on line.....it's that simple.

Denford's On-Line Technical Forum opens up the traditional communication channels that can restrict customer and technical support, due to availability of staff, teaching commitments or different time zones.

A multitude of topics relating to Denford machines and software (both new and old) are covered within the forum, which is simple to search, and easy to use.

Denford's Technical Team and Denford customers from around the world regularly log on to the forum to offer support and advice and, most importantly, post a solution for all to see.

As well as offering comprehensive technical support, Denford's On-Line Technical Forum enables customers to share ideas and projects with other users. Media such as teaching material, project work, PDF's, images, drawings and text documents are easily attached to messages for all users to view and comment on.

You can also read the latest Denford news before anyone else, and keep track of machine and software upgrades, some of which can be downloaded direct from the Technical Forum web site.

The On-Line Technical Forum has proved to be hugely popular with customers. One recent user posted a note to inform us that the Technical Forum has "provided a wealth of information and support for our 20-year-old Denford CNC machine, in fact just as good as the support we receive for our brand new CNC Router!"

Of course the traditional methods of phone and email are still available, but try out this new service by simply logging on to www.denfordata.com/bb/ and register.

Scan this to view our website

denford.co.uk ISO9001 Compliant

DENFORD
T: +44(0)1484 728000
F: +44(0)1484 728100 Email: info@denford.co.uk
Denford Limited, Armytage Road, Brighouse, West Yorkshire HD6 1QF, England