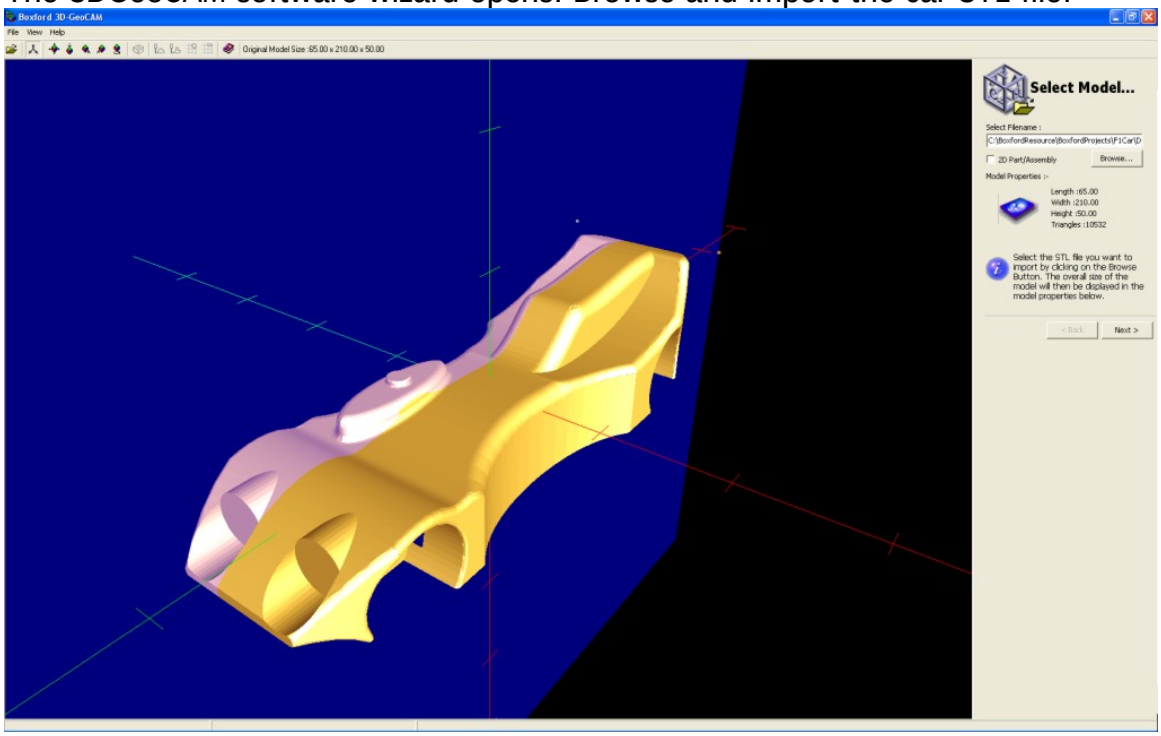
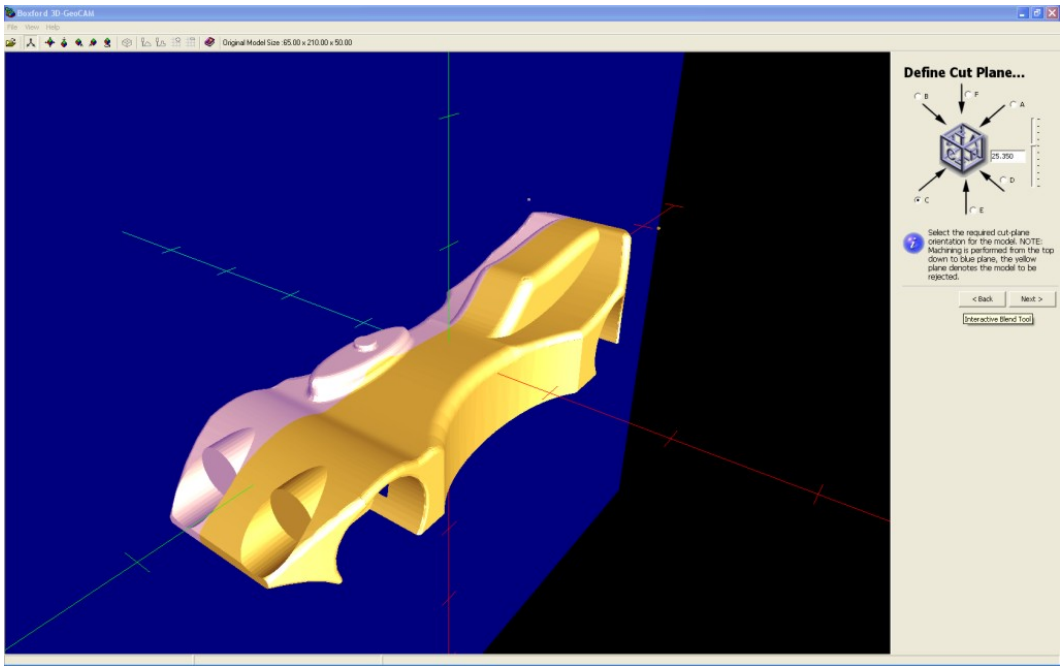
Manufacturing R type Co2 Cars on Boxford Equipment (Four Sided Machining).

1. In the design package, assemble the Car Design with the Boxford Jig. Export the assembly as a combined STL file.
2. From the Front End of the Boxford 'CADCAM Design Tools' software, select FILE – IMPORT – IMPORT 3DGeoCAM.
3. The 3DGeoCAM software wizard opens. Browse and import the car STL file.



4. Select NEXT.
   Select one of the radio buttons (A to F) so the cut plane is parallel with the car sides and the flat bottom side (6mm Square Groove side) of the car is facing away from you, with the blue side of the cut plane facing up, and the cartridge end of the car facing to the left.

   To explain: We are trying to orient the car so that the machining will start on the right side of the block in relation to the real world block in the machine. The machine has a support mandrel at the left side and in position 1 = 0 Degrees. The 6mm slot that accepts the safety cable is facing away from the operator. Hence we must start machining on the left side of the car first if the STL file is to match the block. To clarify the block starts on its side with the roof facing the front of the machine and the cartridge hole to the left.

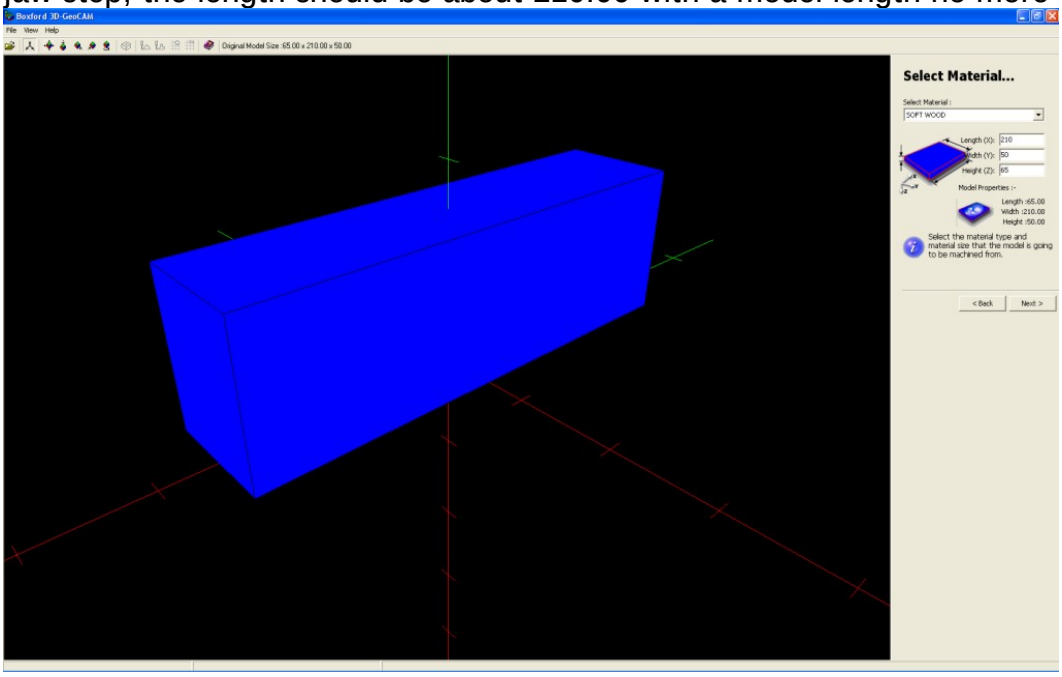


It is recommended that you change the cut plane value in the edit field to be the current value minus 4mm (E.g. If the initial value was 20.00, enter a revised value of 16.00).

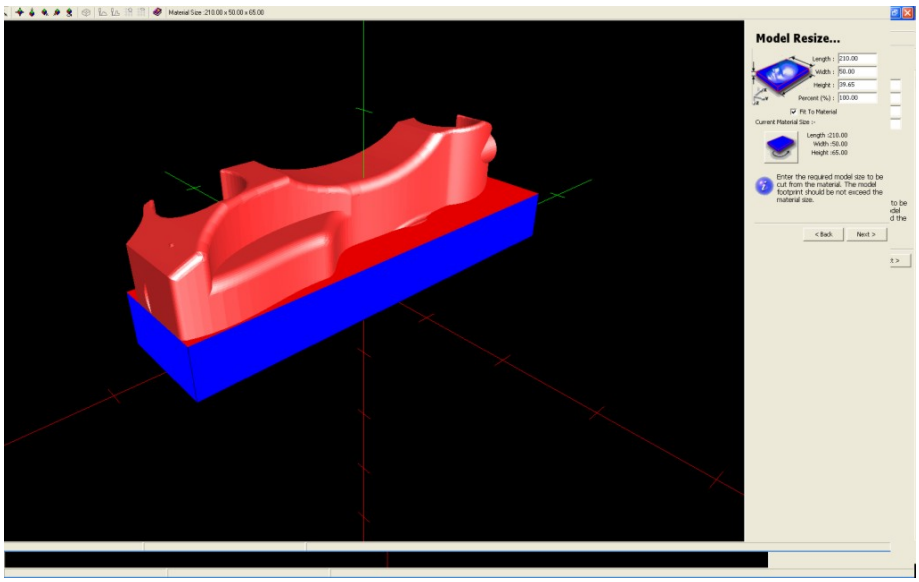
The purpose of this is to ensure that the cutting tool moved below half way thus not leaving a radius that forms a ridge along the cut line. However due to the fact that the machining is to take place from four sides it may be unnecessary as the ridge could be caught by the tool when it is cutting the face that is 90 degrees further round. Machining from four sides also allows more flexibility at the design stage. In the D type it is not be possible to machine out the drivers cockpit area. It is also worth ensuring at this stage that any similar indentation features finish above the cutting plane. I.e. When machining the roof area the cutting plane would default to 25mm in the middle. If you have cut a drivers cockpit that finishes just above the 6mm slot, when machining the tool would stop at 25mm when it may need to go as deep as 40mm to machine out the base of the cockpit.

Select NEXT.
Select the material from the drop down.
Enter the material size using the block dimensions the Y and Z dimensions in this first cut are Y = 50 and Z = 65 . The X dimension should be at least 5mm longer than the original model size but not longer than the blank less the area gripped in the vice. If the blank locates to the back of the

jaw step, the length should be about 210.00 with a model length no more then 205.

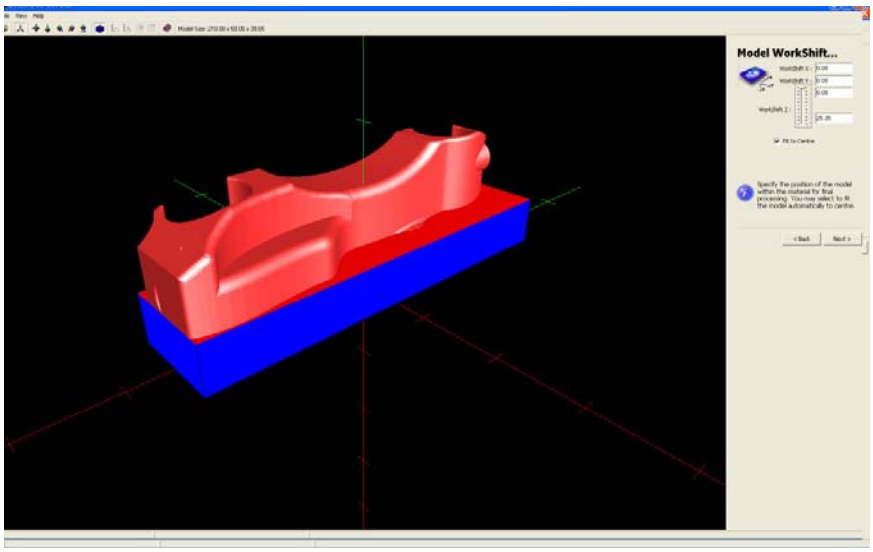


5. Select NEXT.
   The percentage should automatically be set to 100% scale and does not need modifying unless the model requires spinning then it may be necessary to re-enter 100%.

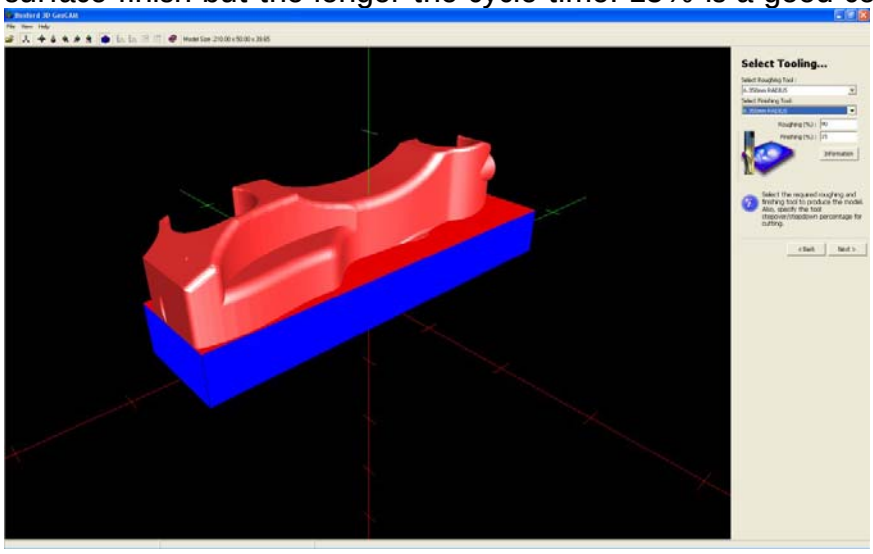


   If your model is not oriented properly inside the blue blank use the spin icon to rotate the model 90 degrees. The height may seem wrong but this is a cutting height not overall height.

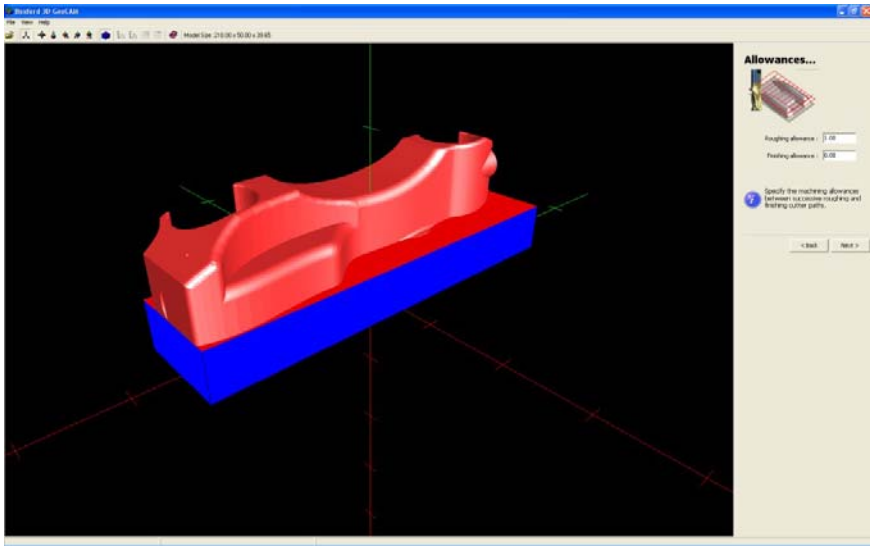
6. Select NEXT.
   Set the first Three edit fields (X, Y and upper Z) to 0.00



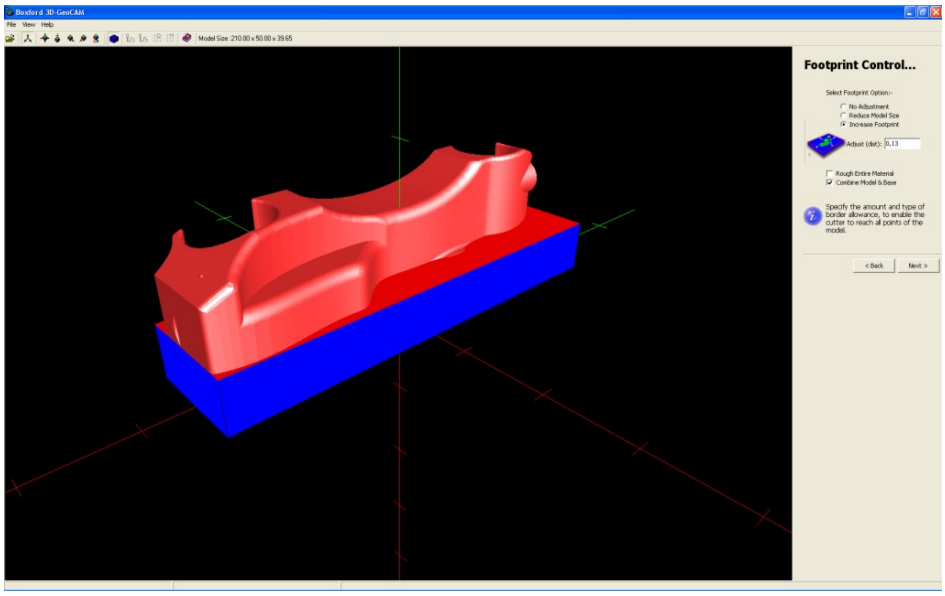
7. Select NEXT.
   From the ‘Select Finishing Tool’ dropdown, select the required tool (usually 6.35mm or 6.00mm Radius). The Roughing Tooling can be ignored.
   Set the ‘Finishing (%)’ to the required value. Remember the smaller the value, the better the surface finish but the longer the cycle time. 15% is a good compromise.



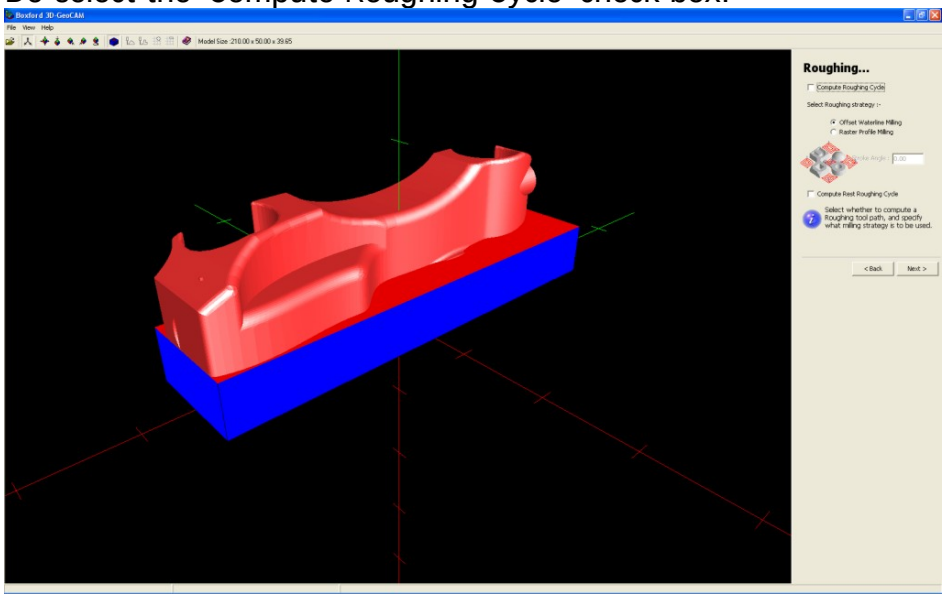
8. Select NEXT.



9. Select NEXT.
   De-select the ‘Rough Entire Material’ check box.
   Select the ‘Increase Footprint’ radio button and enter the value 0,13 in the ‘Adjust (dist)’ edit field. It is worth pointing out that this is 0,13 (Zero comma 13) not 0.13 This is an instruction to the software to extend the footprint only in the Y direction and not the X. I.E. Zero in Y and 13 (Twice the tool width) in X. Thus the machine will move one whole tool width either side of the workpiece. To do the same in X would cause the tool to possibly hit the jaws or the mandrel.
10. Select the ‘Combine Model & Base’ check box.

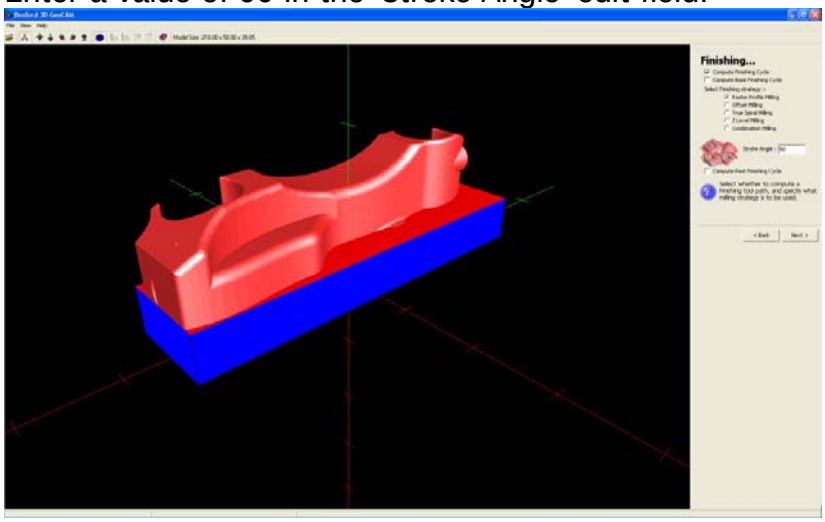


11. Select NEXT.
    De-select the ‘Compute Roughing Cycle’ check box.

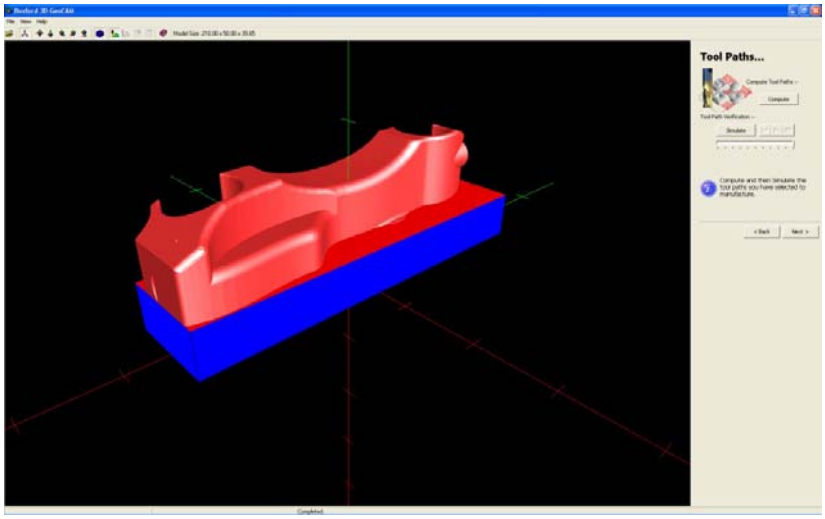


12. Select NEXT.
    De-select the ‘Compute Base Finishing Cycle’ check box.
    Ensure the ‘Raster Profile Milling’ radio button is selected.

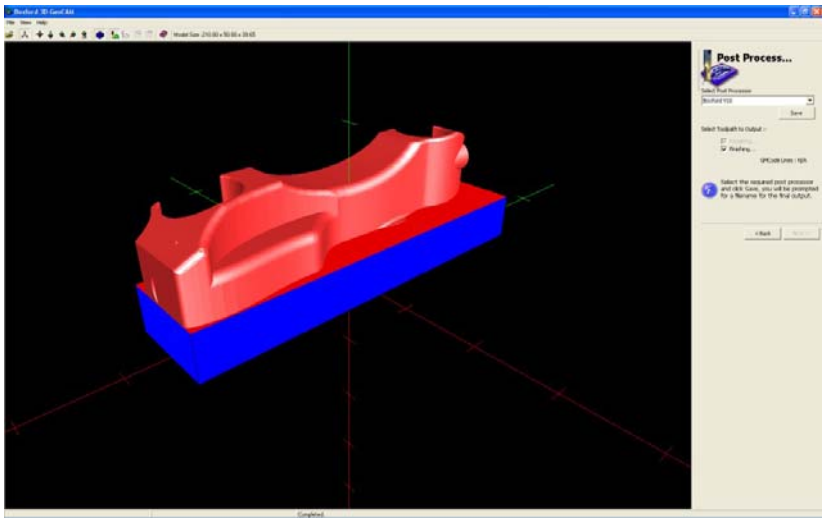
Enter a value of 90 in the ‘Stroke Angle’ edit field.



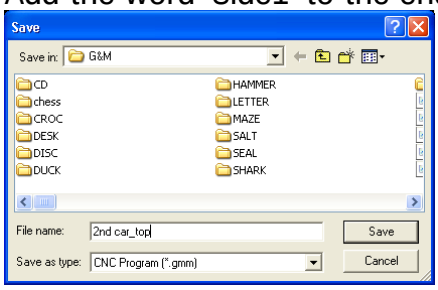
13. Select NEXT.
    Select COMPUTE.



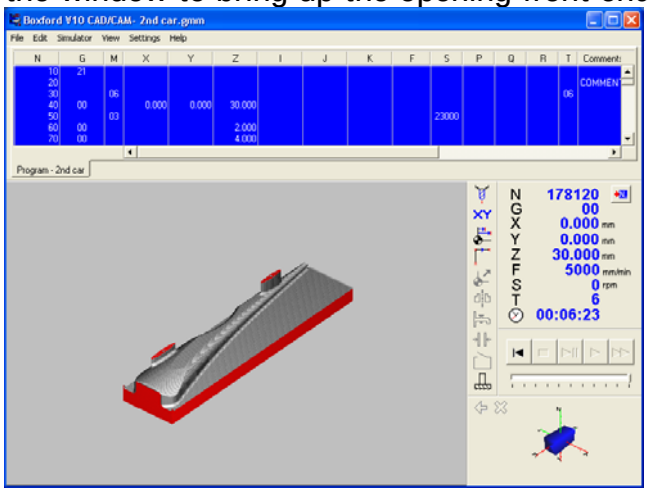
14. When the Toolpath has been calculated, select NEXT.
    Select SAVE

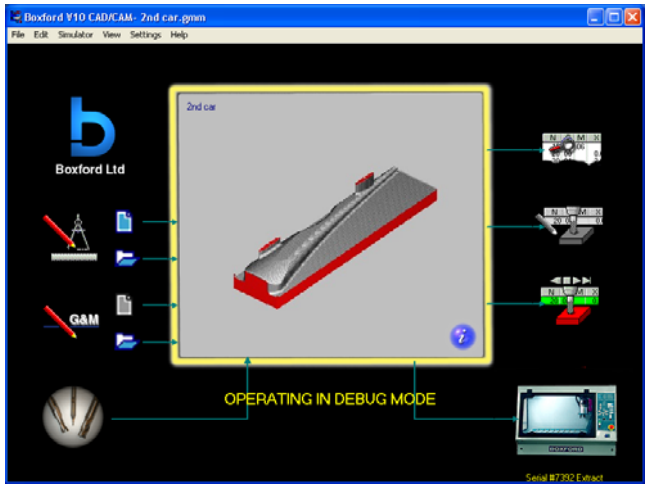


15. The save dialog will be shown.
    Add the word ‘Side1’ to the end of the filename and select SAVE



16. The file machining cycle will automatically be simulated.
    WAIT until the simulation has finished and then select the ‘X’ in the top right hand corner of the window to bring up the opening front end screen.

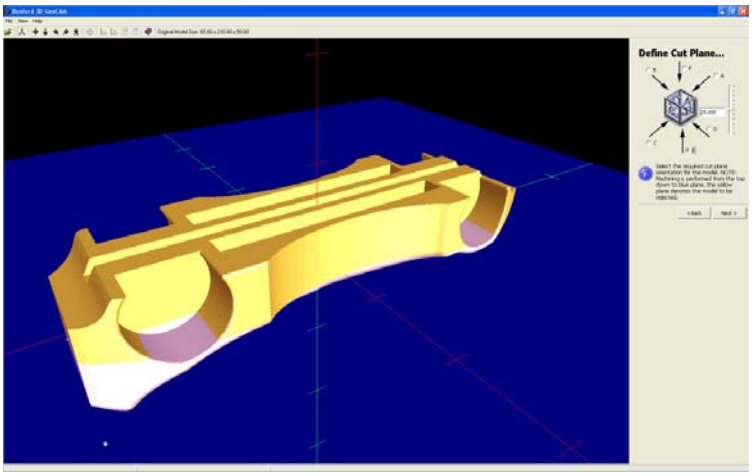




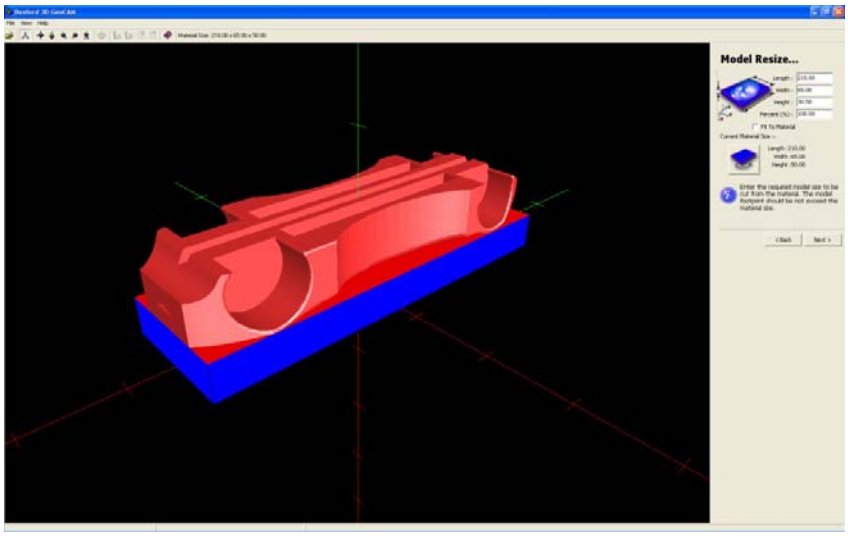
17. Select ‘3D-GeoCAM’ from the Taskbar at the bottom of the screen.
    Using the BACK button, go back through the Wizard pages to the ‘Define Cut Plane’ page.
    Make a note of the current value in the ‘Cut Plane’ edit field.

Select the next radio button to move cut plane round 90 degrees, as a clue we should now be machining the base.

Modify the value in the ‘Cut Plane’ edit field back to the previously noted value. If you have forgotten, it is half the smallest model size dimension minus 4.00mm. But remember to check it is getting any pocketed areas.

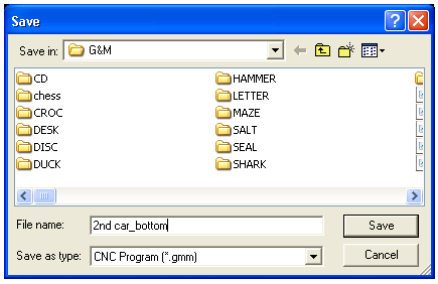


18. Using the NEXT button, go forward through the wizard to the ‘Model Resize’ page. Select the model rotate button  repeatedly until the model is facing in the correct way. You will also have to switch the Height and the width measurements as the block is now facing in the other way.

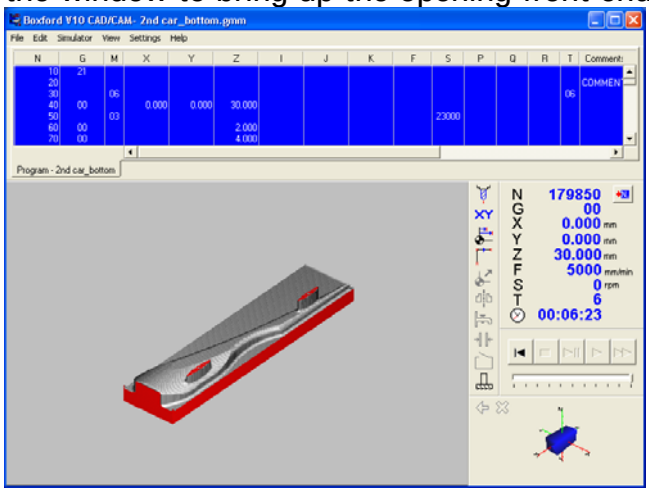


19. Using the NEXT button, go forward through the wizard to the ‘Tool Paths’ page and select COMPUTE.
    When the Toolpath has been calculated, select NEXT.
    Select SAVE

20. The save dialog will be shown.
    Add the word ‘Side 2’ to the end of the filename and select SAVE



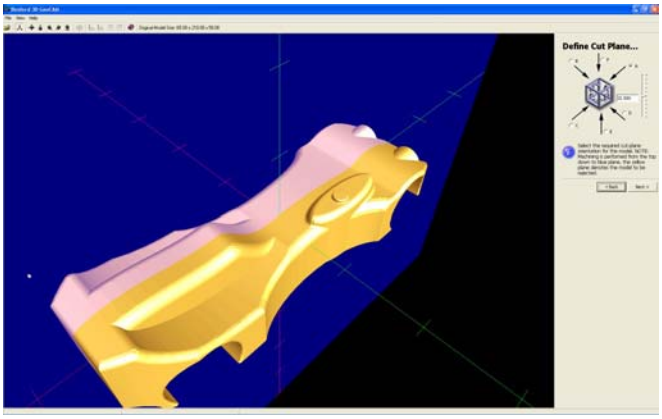
21. The file machining cycle will automatically be simulated.
    WAIT until the simulation has finished and then select the ‘X’ in the top right hand corner of the window to bring up the opening front end screen.



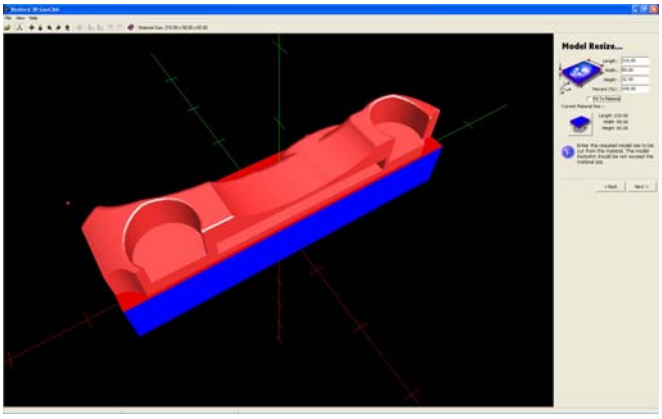
22. Select ‘3D-GeoCAM’ from the Taskbar at the bottom of the screen.
    Using the BACK button, go back through the Wizard pages to the ‘Define Cut Plane’ page.
    Make a note of the current value in the ‘Cut Plane’ edit field.

Select the next radio button to move cut plane round 90 degrees, as a clue we should now be machining the right side of the vehicle.

Modify the value in the ‘Cut Plane’ edit field back to the previously noted value. If you have forgotten, it is half the smallest model size dimension minus 4.00mm. But remember to check it is getting any pocketed areas.

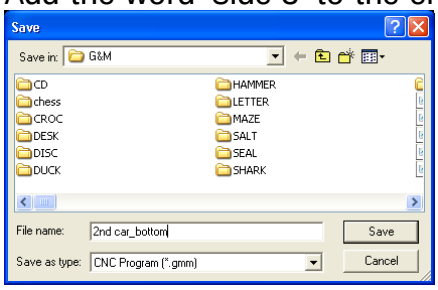


Using the NEXT button, go forward through the wizard to the ‘Model Resize’ page. Select the model rotate button  repeatedly until the model is facing in the correct way. You will also have to switch the Height and the width measurements in the select material window as the block is now facing in the other way.

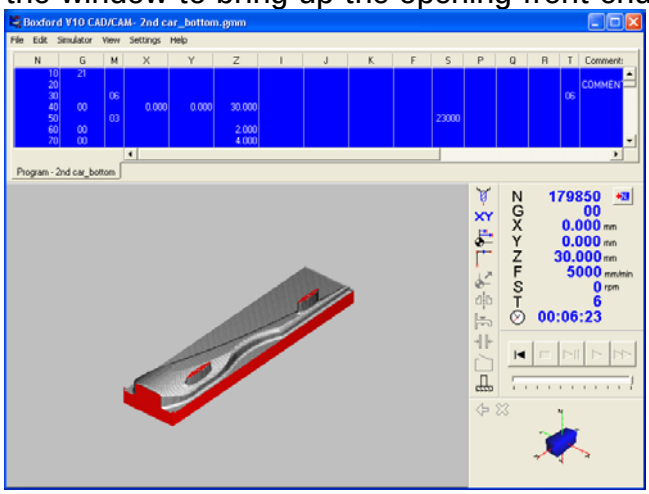


23. Using the NEXT button, go forward through the wizard to the ‘Tool Paths’ page and select COMPUTE.
    When the Toolpath has been calculated, select NEXT.
    Select SAVE

24. The save dialog will be shown.
    Add the word ‘Side 3’ to the end of the filename and select SAVE



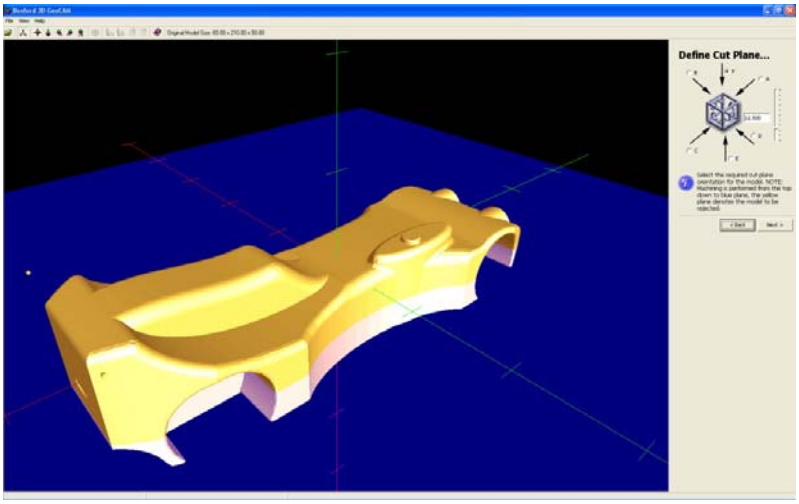
25. The file machining cycle will automatically be simulated.
    WAIT until the simulation has finished and then select the ‘X’ in the top right hand corner of the window to bring up the opening front end screen.



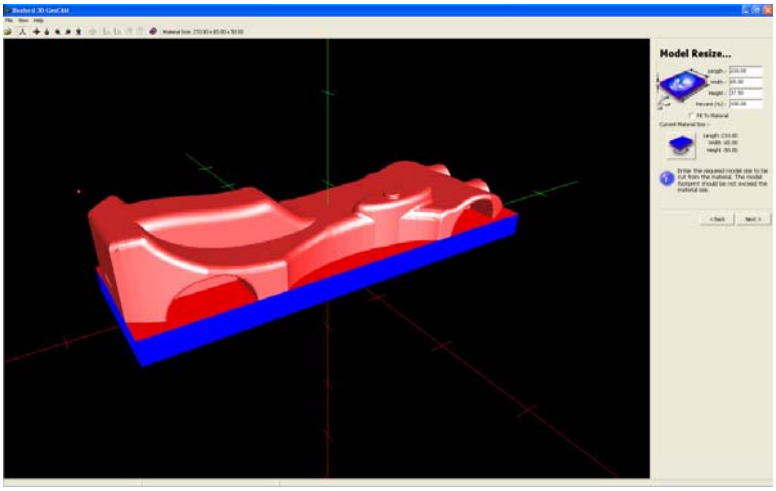
26. Select ‘3D-GeoCAM’ from the Taskbar at the bottom of the screen.
    Using the BACK button, go back through the Wizard pages to the ‘Define Cut Plane’ page.
    Make a note of the current value in the ‘Cut Plane’ edit field.

Select the next radio button to move cut plane round 90 degrees, as a clue we should now be machining the base.

Modify the value in the ‘Cut Plane’ edit field back to the previously noted value. If you have forgotten, it is half the smallest model size dimension minus 4.00mm. But remember to check it is getting any pocketed areas.

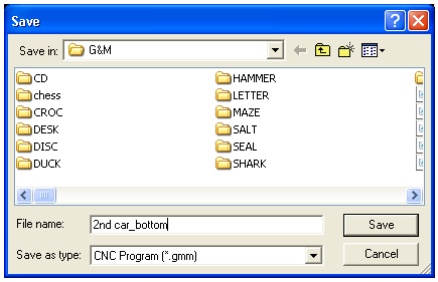


Using the NEXT button, go forward through the wizard to the ‘Model Resize’ page. Select the model rotate button  repeatedly until the model is facing in the correct way. You will also have to switch the Height and the width measurements as the block is now facing in the other way.



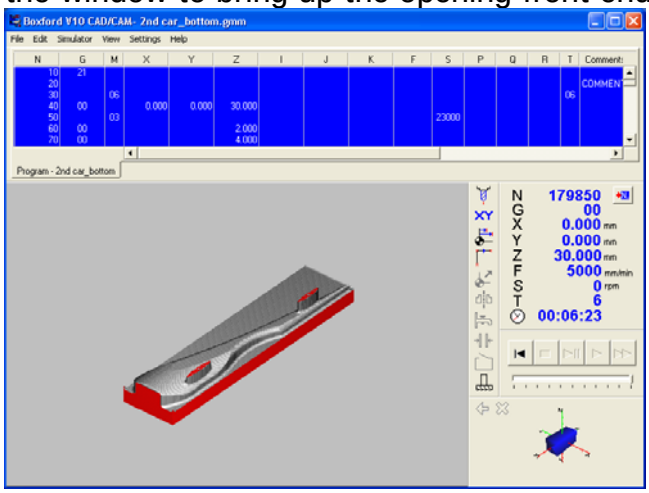
27. Using the NEXT button, go forward through the wizard to the ‘Tool Paths’ page and select COMPUTE.
    When the Toolpath has been calculated, select NEXT.
    Select SAVE

28. The save dialog will be shown.
    Add the word ‘Side 4’ to the end of the filename and select SAVE

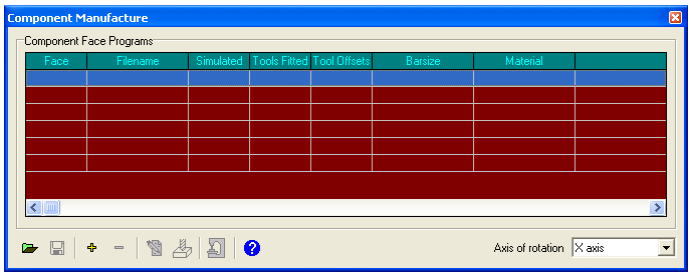


29. The file machining cycle will automatically be simulated.
    WAIT until the simulation has finished and then select the ‘X’ in the top right hand corner of

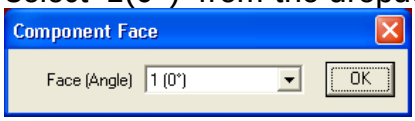
the window to bring up the opening front end screen.



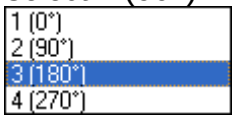
30. Select FILE – COMPONENT MANUFACTURE
    The window below is shown.



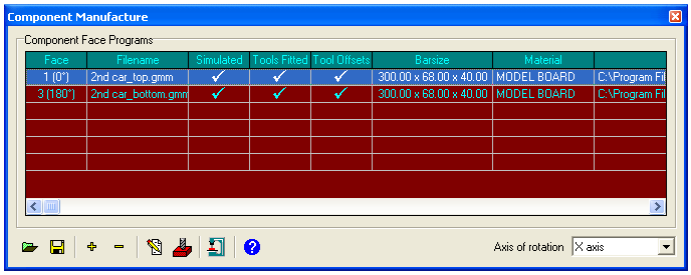
31. Select the 'Add program to the Component' icon 
    Select the program with the word 'Side1' at the end and select OPEN.
    The dialogue below is shown.
    Select '1(0°)' from the dropdown followed by OK.



32. Select the 'Add program to the Component' icon 
    Select the program with the word 'Side2' at the end and select OPEN.
    Select '2(90°)' from the dropdown followed by OK.

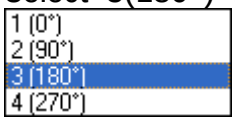


33. Both programs to manufacture the car should now be in the list, as shown in the diagram below.

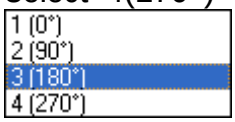


34. Select the 'Add program to the Component' icon 
    Select the program with the word 'Side3' at the end and select OPEN.

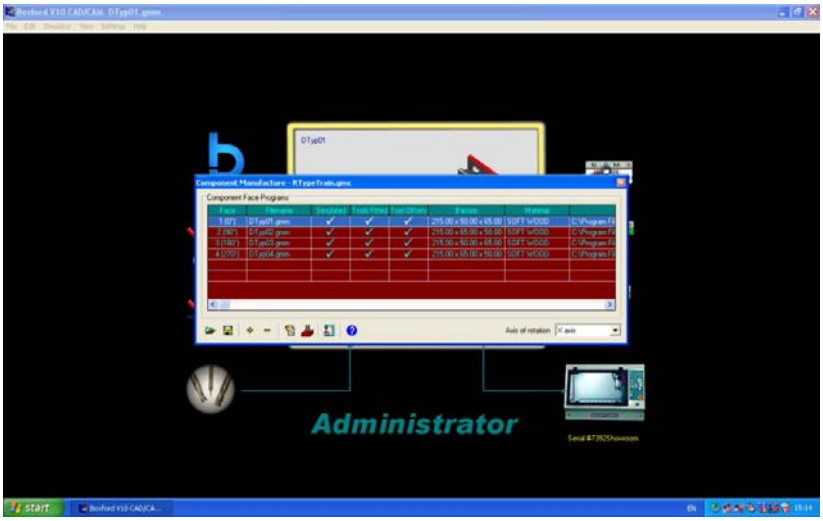
Select ‘3(180°)’ from the dropdown followed by OK.



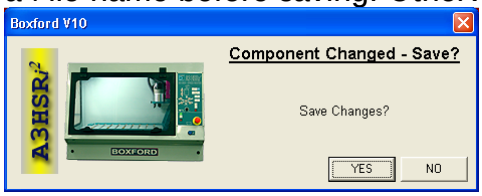
35. Select the ‘Add program to the Component’ icon 
    Select the program with the word ‘Side4’ at the end and select OPEN.
    Select ‘4(270°)’ from the dropdown followed by OK.



The screen should look similar to this.



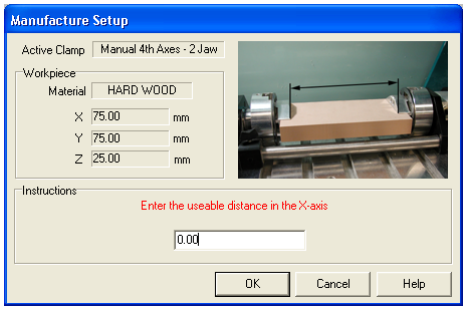
36. Select the ‘Manufacture all Programs’ icon 
    The save dialogue below is shown.
    If you want to save the ‘Component List’ so the car can be made again, select YES and specify a File name before saving. Otherwise, select NO.



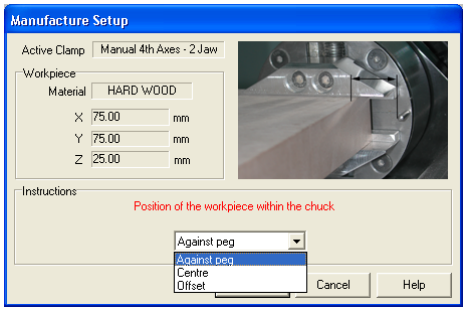
37. The manufacture set-up procedure is initiated.
    When prompted, select the ‘Rotary Indexer’ as the ‘Active Clamp’.

38. When prompted to ‘Enter the useable distance in the X-axis’, enter the Workpiece X dimension value shown in the ‘Workpiece’ section of the dialogue. This should be no more than 210mm

Select OK

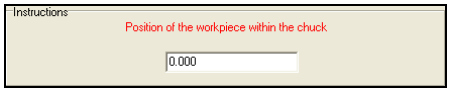


39. Fit the billet in the fixture, ENSURING the slotted side 6mm/6mm wire slot is pointing towards the the back of the machine, and the distance from the front of the chuck jaws to the left hand end of the billet is EXACTLY the value entered in step 38.
    Ensure the fixture is in position 1 with all thumb screws tightened.
40. When prompted to specify the 'Position of the Workpiece within the chuck', select the 'Offset' option from the drop down menu.
    Select OK



41. Measure the distance from the inside edge of the peg to the workpiece as shown. Enter that value into the edit field as a guide it should be about 10mm.

    Select OK.



42. Following the remaining prompts to manufacture all four sides of the component.