

## Advanced CO2 car Import CAM Procedures

While the standard CO2 car tutorial within Quick CAM has a part that is sized to fit the billet as custom designed cars are produced this will not be the case.

Before proceeding with the manufacture of any car it is VERY IMPORTANT to check the bore for the CO2 cartridge is positioned correctly 29mm above the base of the car.

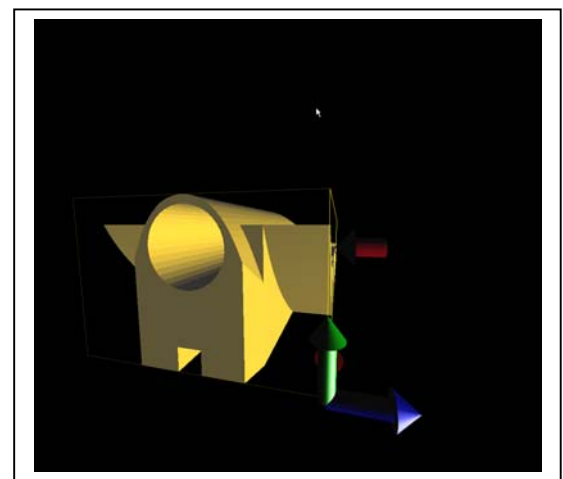
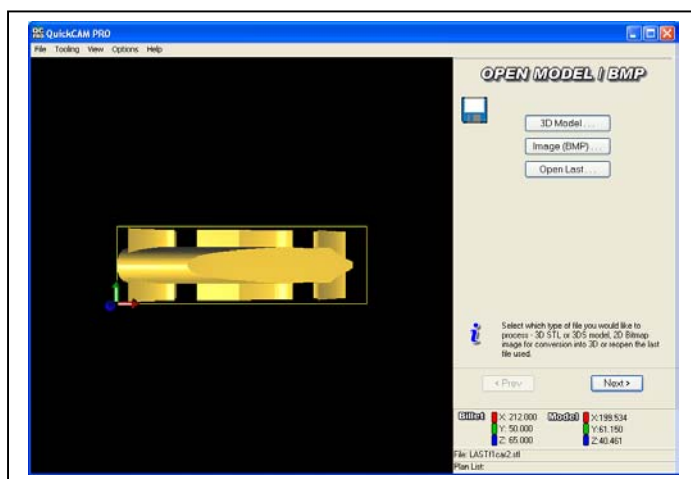
If you cannot be sure the bore is in the correct position **DO NOT MAKE THE PART as damage the fixture may result.**

In the example below the car supplied does not fit the full billet size so we need to decide how it should be positioned within the block.

The bore should start at the back of the car and be the correct depth to fit the cylinder in.

The bore should be 29mm above the base of the car (19.7mm diameter)

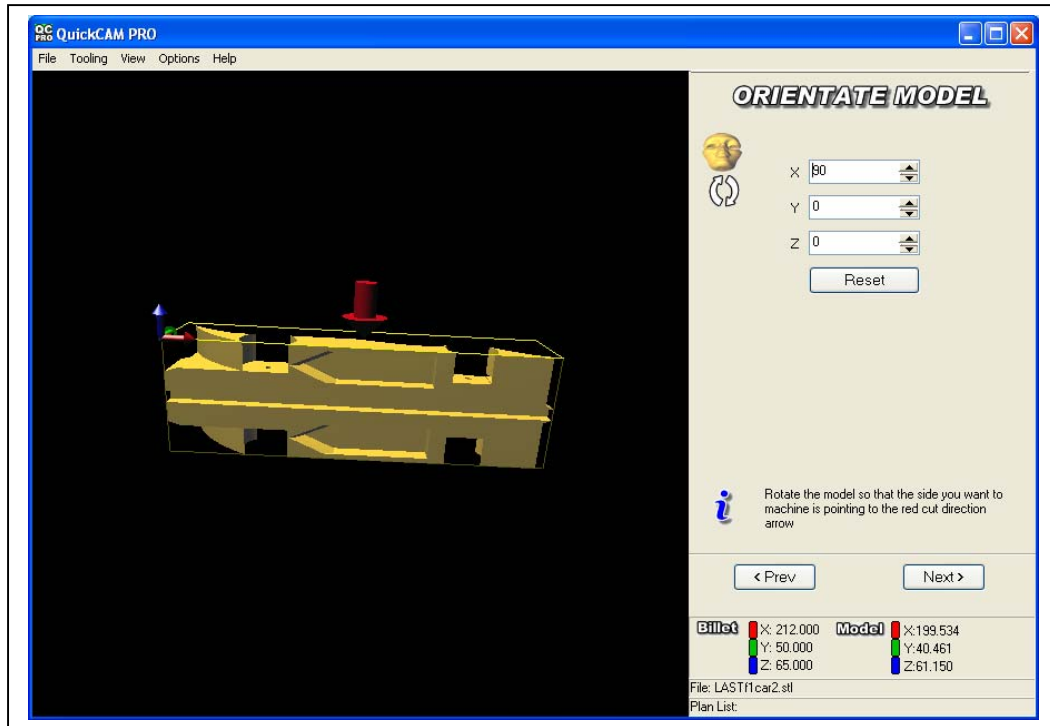
This means that the car must be a minimum height to the top of the bore of  $29 + 9.85 = 38.85\text{mm}$  plus the cylinder wall thickness of at least 2mm so the model should be 40mm high.



Without the design software it is hard to tell if the cylinder is in the correct position in the supplied design.

The model height is 40.461 and the wall thickness looks quite thin so I assume the cylinder bore is in the correct position. It helps to know the exact dimension the bore is from the base of the car.

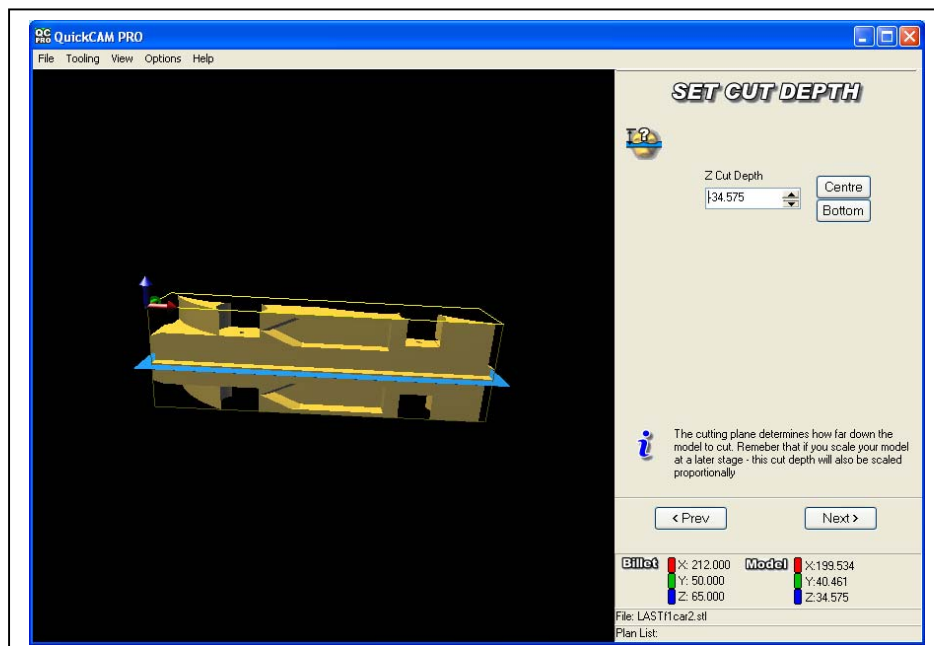
The model is imported and the design rotated through 90 degrees as shown to get the base of the car to the front and the Right hand side upright.



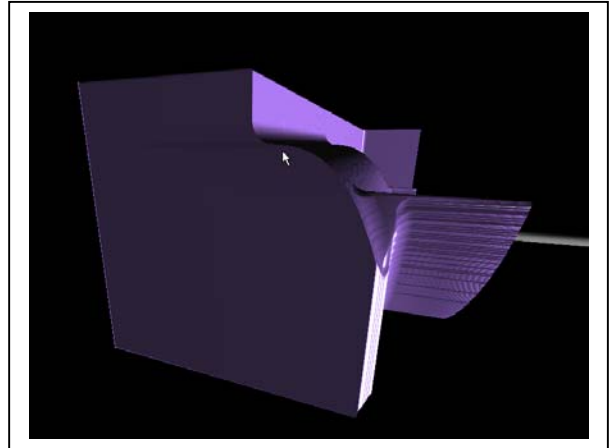
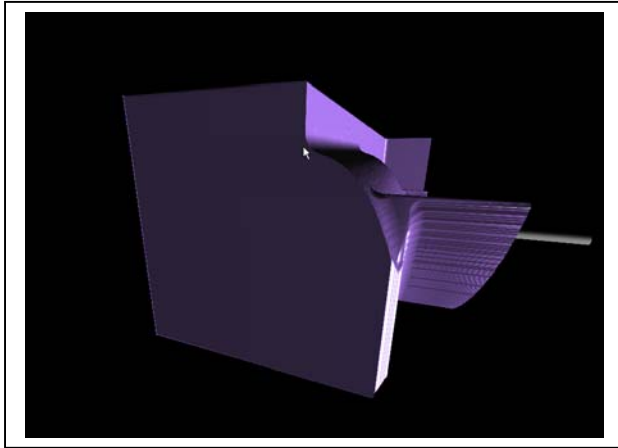
Next we define the cut plane.

This should always be the centre line of the model plus at least the radius of the cutter.

In this case set it to  $30.575 + 4\text{mm} = 34.575$

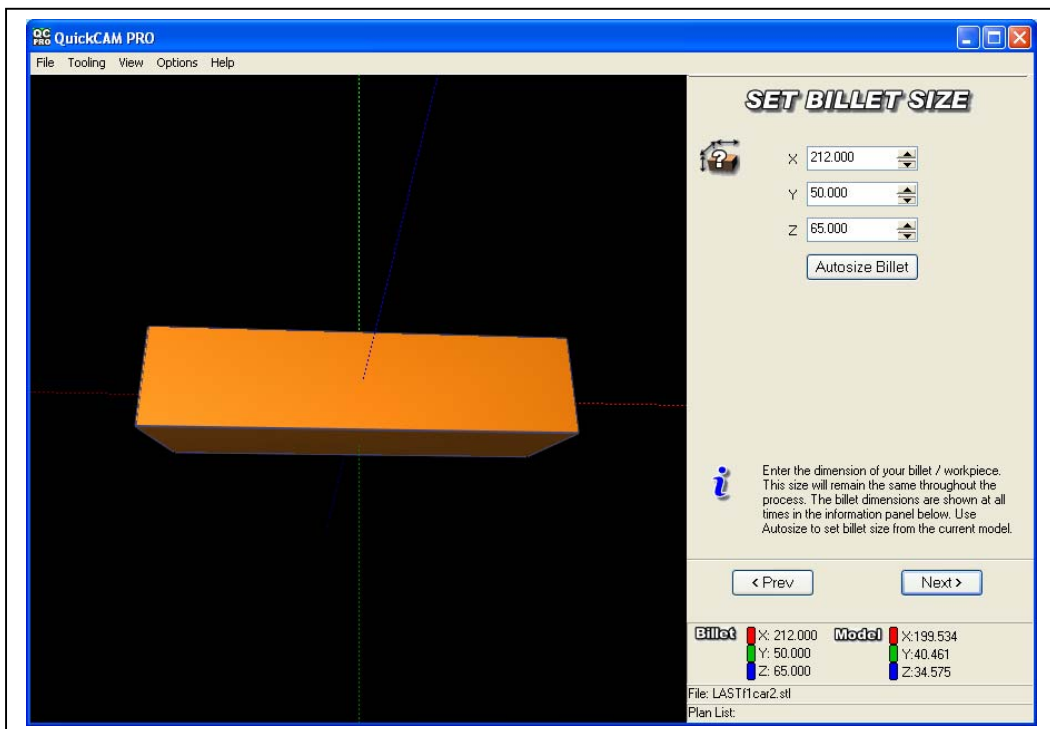


If the cut plane is left at the centre line only the tip of the tool will cut that deep and there will be a ridge left on the top of the car that is the size of the tool radius as shown.

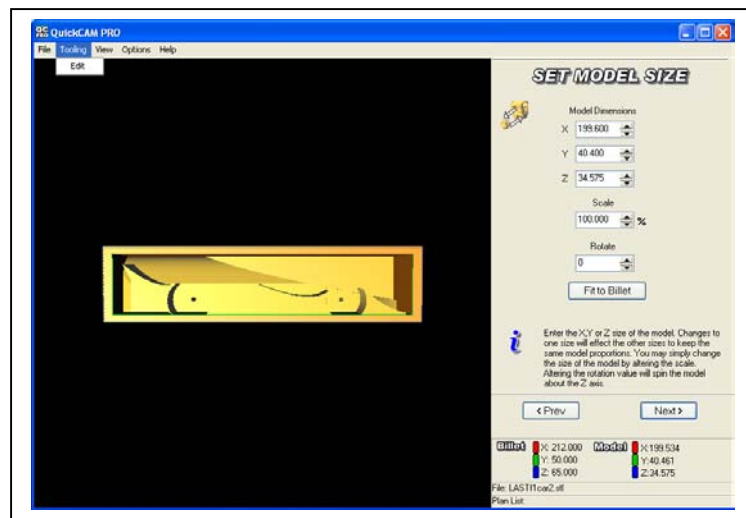


The images above show a cut to the centre line and one 4mm below. Once the second side is cut the first part would be left with a ridge on the top the second would be smooth.

Next we define the billet size. This will always be X212 x Y50 x Z65 which is the area of the block that can be machined.



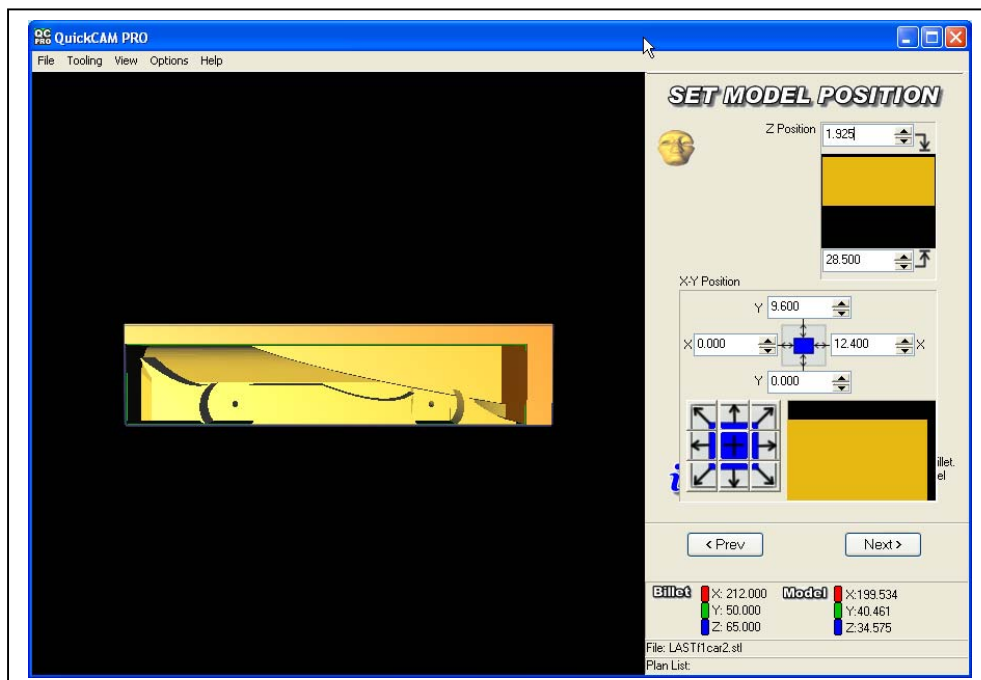
Now you have to position the component correctly into the billet. The part is automatically centred within the block but this does not position the centre of the bore 29mm above the base unless the model is exactly the same height as the block.



In the case of this model if the part is cut in the position shown the left hand end of the car will not be machined correctly and if the block is cut down later the cylinder bore will not be deep enough.

Also if the bore is 29mm above the base of the car when it was designed the car is 40.46mm high and has been positioned midway between the top and bottom of the block if it is machined in this position the bore will be  $(50-40.46)/2 = 4.77\text{mm}$  out of position.

We have to orient the car to the bottom left of the block to get the correct cutter path.



To do this either drag the orange block to the bottom left position or click the bottom right position arrow from the XY POSITION box as shown.

Also this car is only 61.15mm wide so the car is has to be positioned within the block correctly in the Z-axis. Set the z position to be half the difference between the block depth and the model depth.

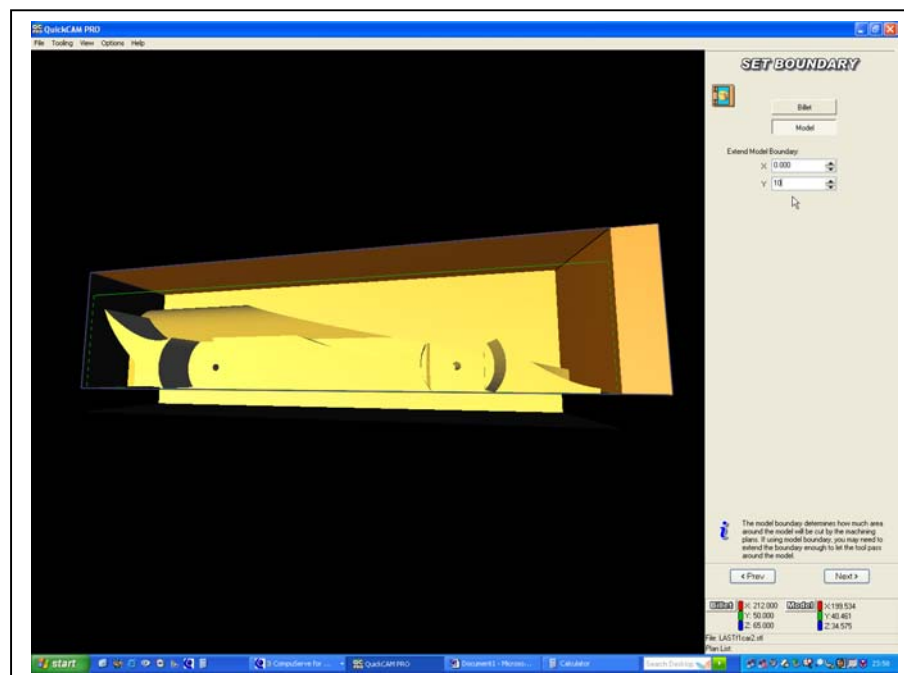
$$65 - 61.15 = 3.85$$

$$3.85 / 2 = 1.925\text{mm Z position.}$$

Next we need to set the machining boundary. If we do not change this the top and bottom of the car will not be machined.

We only change the boundary in the Y-axis as we do not want the tool to machine outside the model boundary in X or it would collide with the fixture.

In this case I have increased the Y boundary to 10mm to allow the tool to remove all the material above the car.



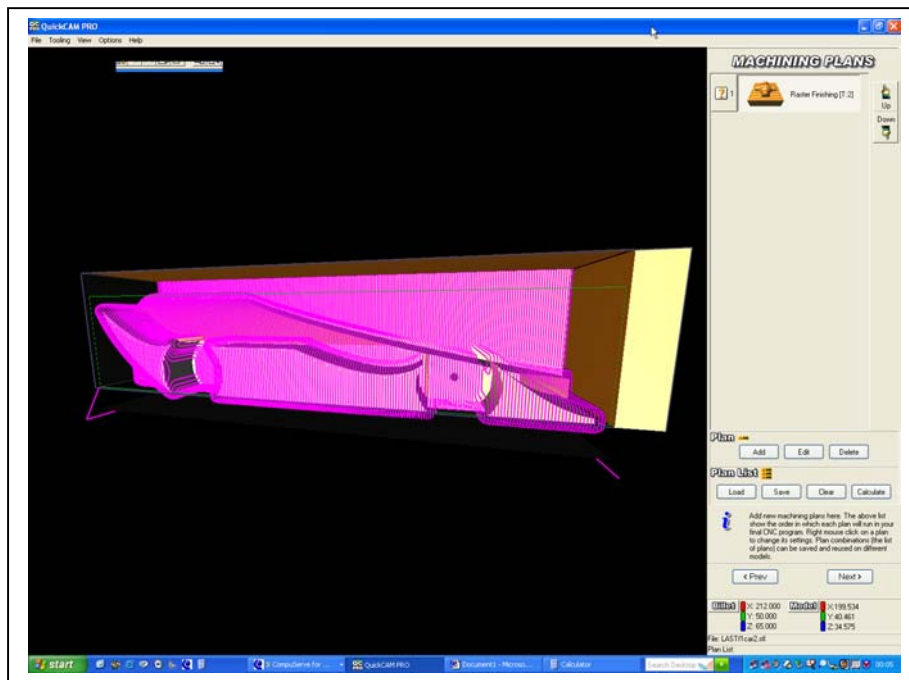
Note the centre of the tool will travel to the extent of the boundary.

In the next step select the 6.35mm (1/4") ball end cutter that is the tool that will be used to machine the part. It is important that the exact tool diameter is used here.

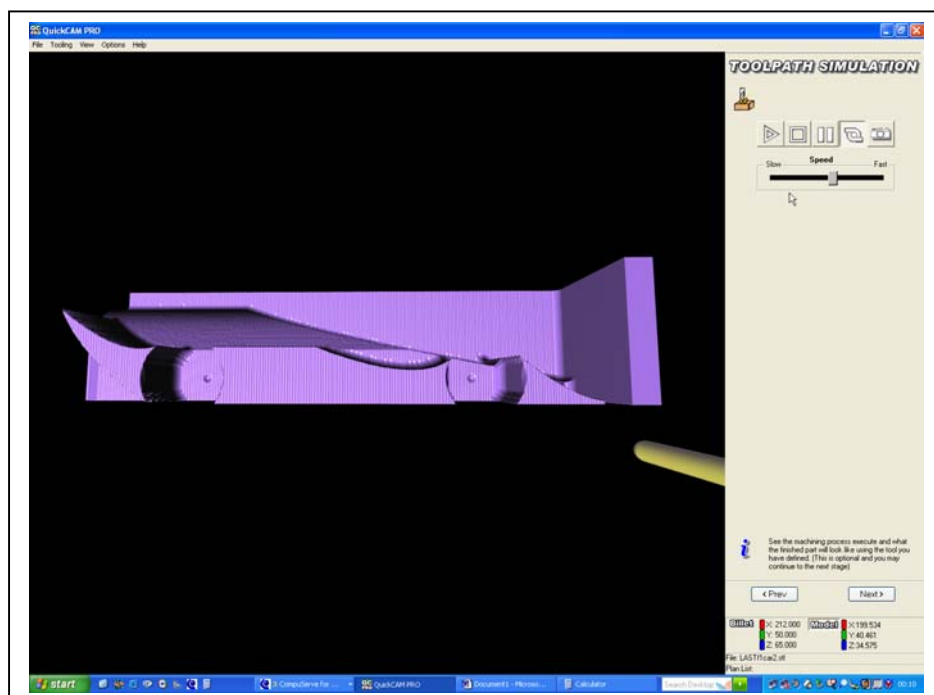
Select the raster finishing strategy.

Select the 6.35mm Ball end cutter with a step over of 15% (you can change the step over 10% will give a better result but take longer)

For Quick Cam 3D set the Raster angle to 90 (Quick CAM PRO 270). This will make the raster cut start at the front left of the model.



Simulate the part and ensure the tool path does not chop machine off the nose of the part or fun down the back of the borehole.

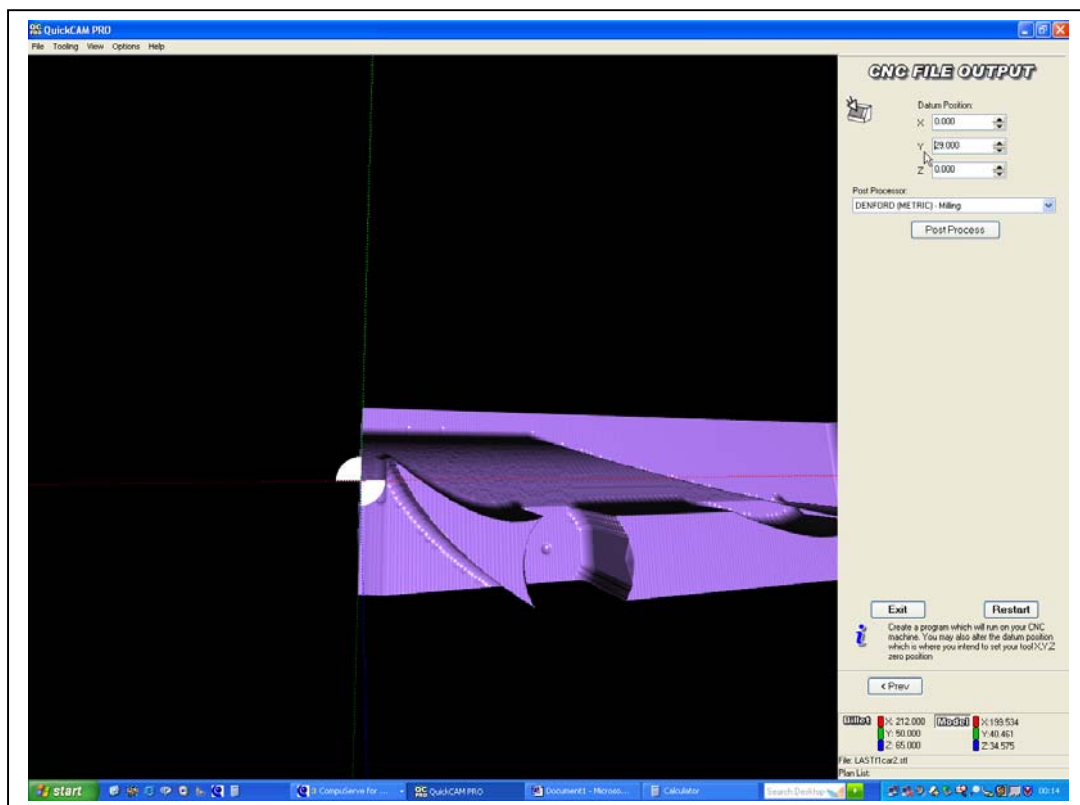


In the final stage set the origin of the program to be X0, Y29 and Z 0

This sets the machine origin on the centre of the machine bore level with the top LHS of the billet.

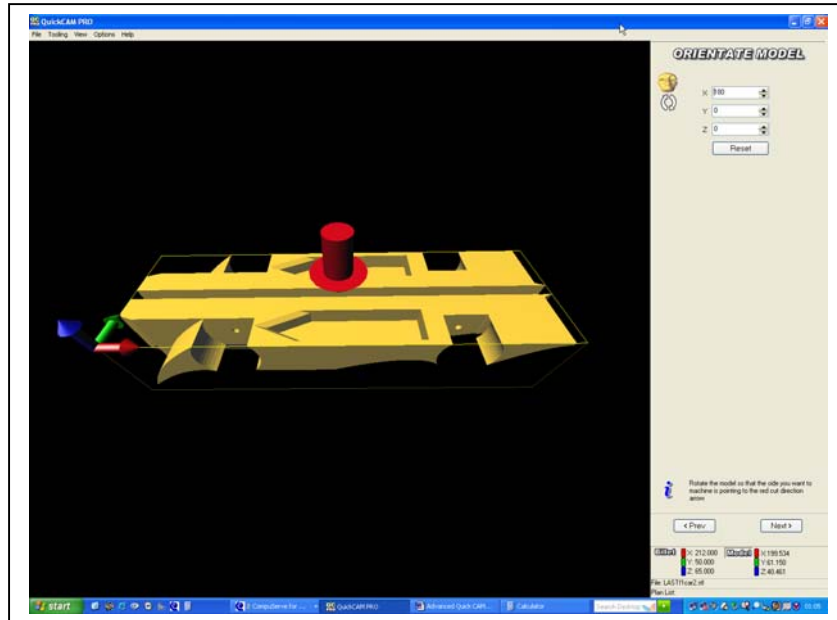
This is where the machine Datum will be set.

Doing this allows the mirror command to be used to machine the second half of the car.



## How to cut a 3 or 4 Sided Car

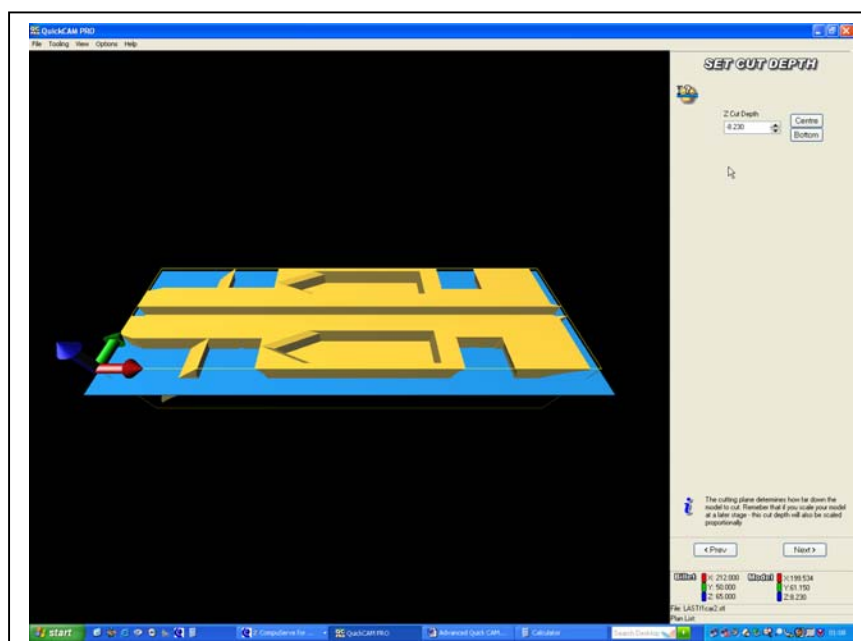
Open the model in Quick cam then rotate it to 0 or 180 degrees to locate the side you want to machine.



In this case we are going to cut the underside so set the rotation to 180

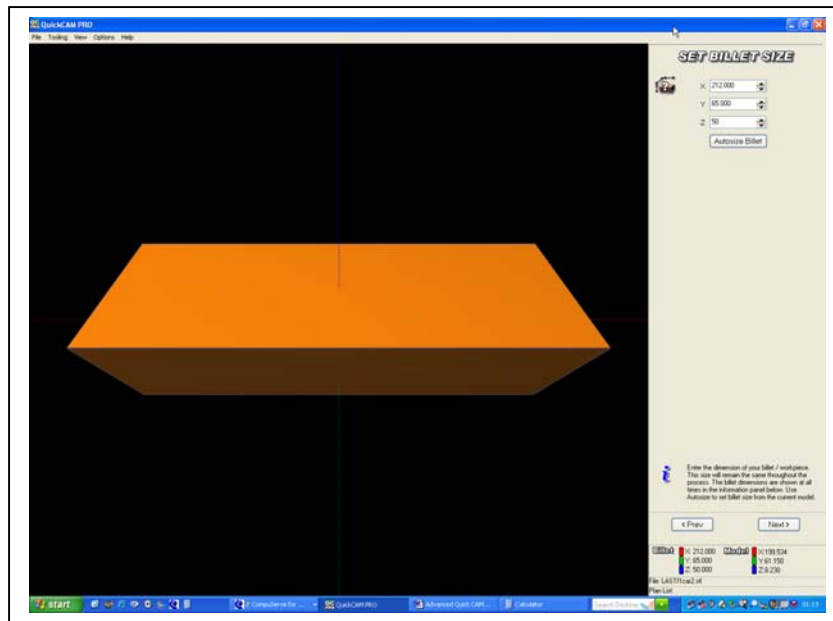
Set the cut plain to the shallowest value possible that will machine the area you want to machine in this case take it to the point where you can no longer see blue in the side pockets.

There is no need to cut beyond this depth, as the rest will be machined when cutting the sides.

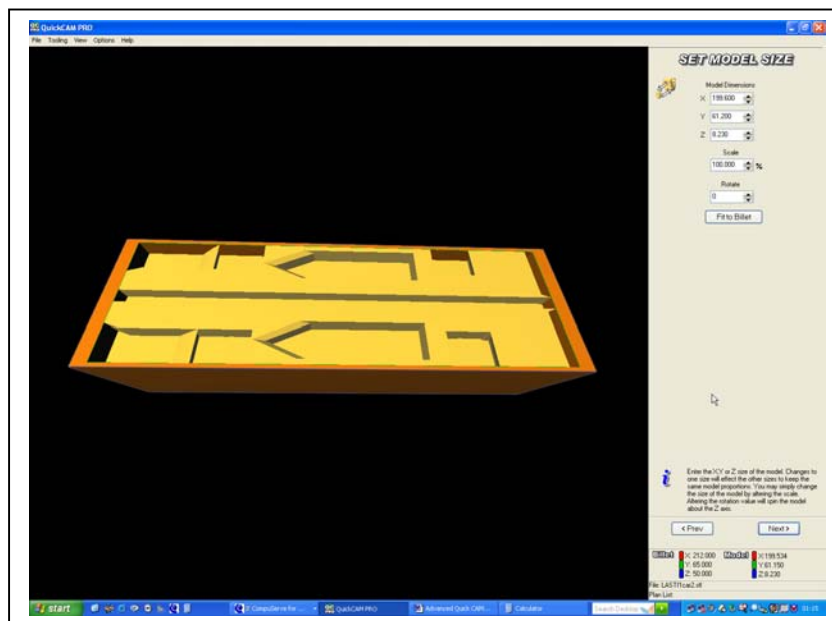




The billet size will now be X212, Y65 and Z 50 as the block is rotated.



The model is positioned centrally within the billet as shown.

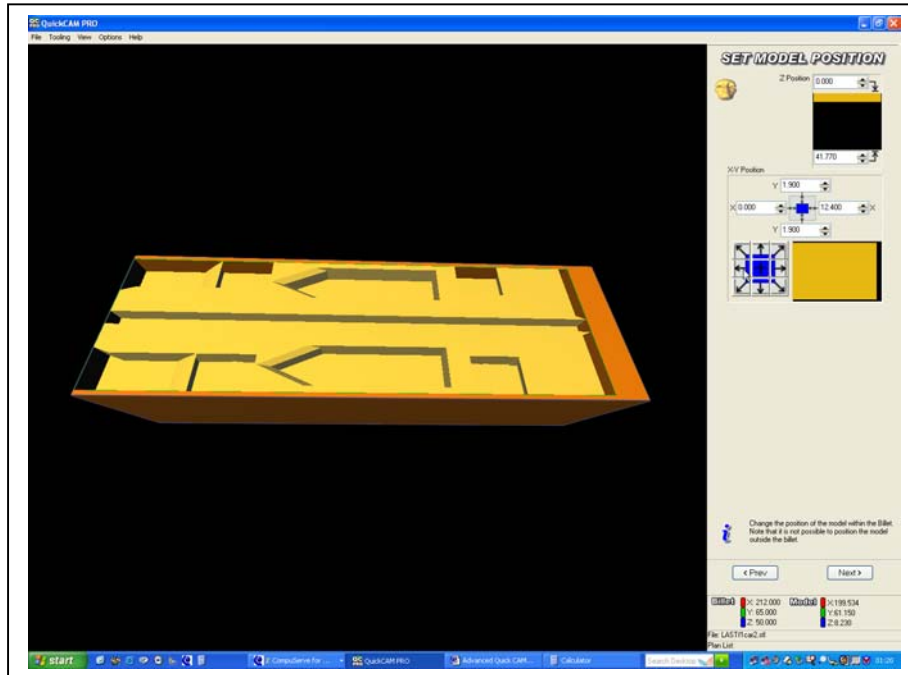


Leave the model size at 100%.

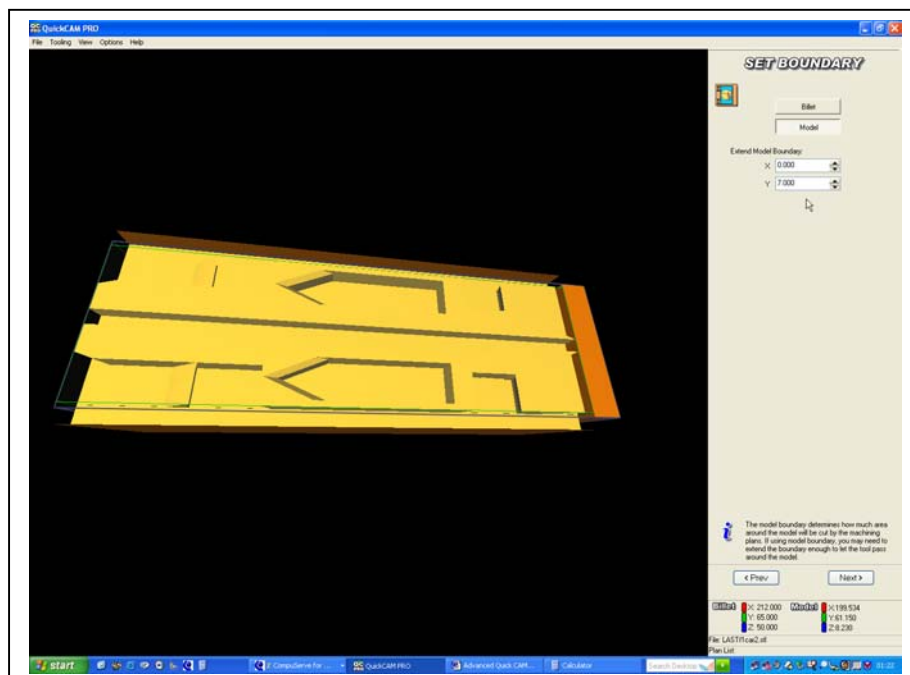
Now we have to position the model within the billet so that the base can be machined. As we are cutting the base there is no work shift to be made in the Z axis.

If we were cutting a model from the top we would have a Z work shift calculated by the block height – the model height.

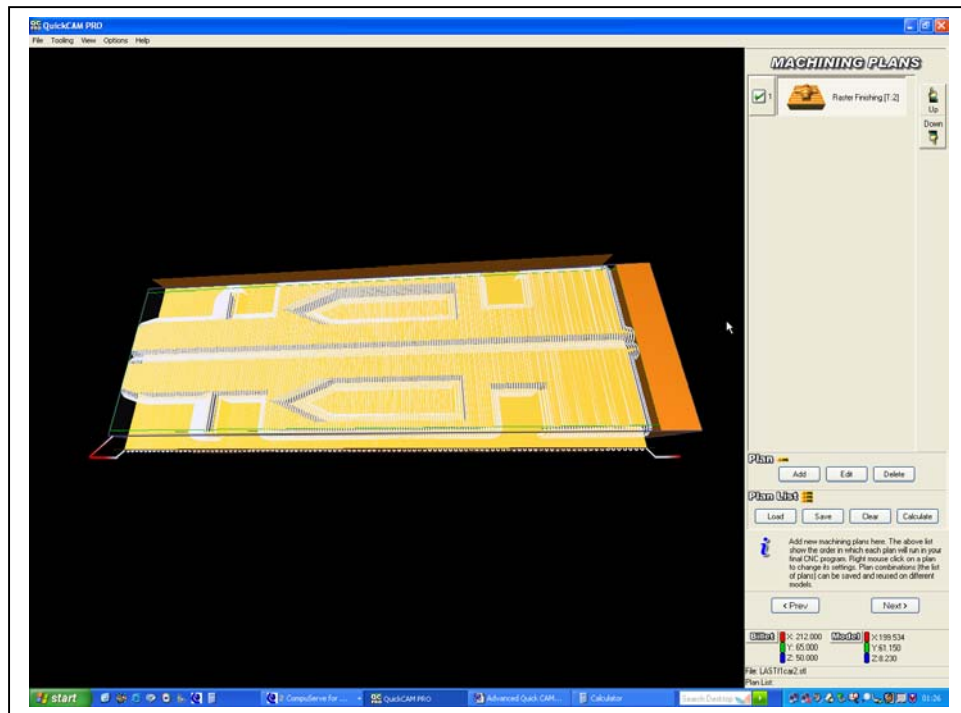
In this case we just position the model to the centre left as shown.



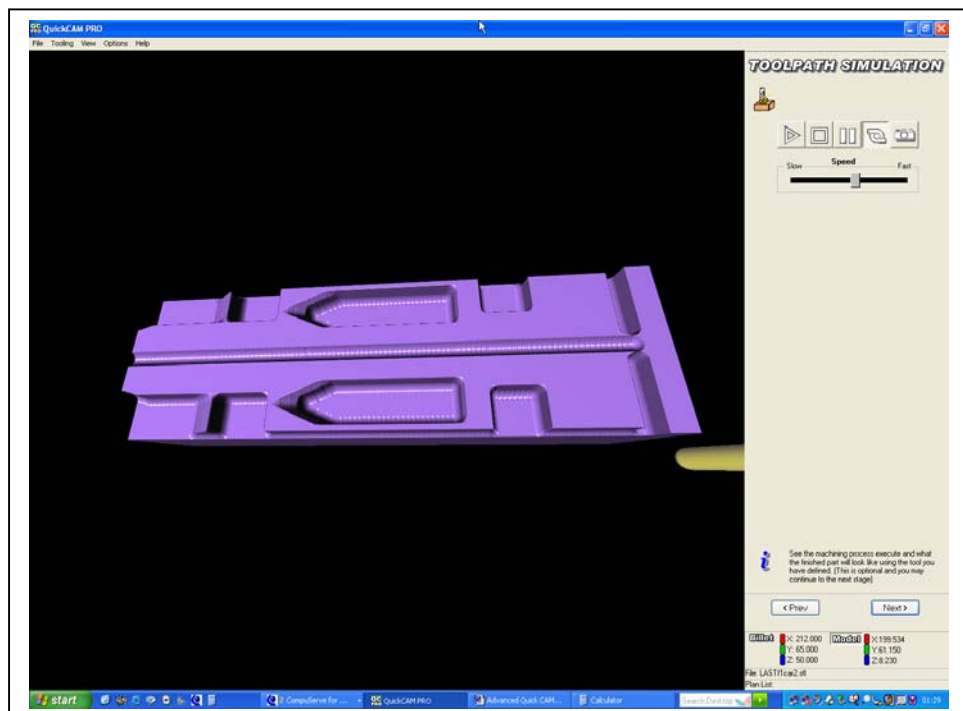
The cut boundary could in this case be left at zero as there is no need for the cutter to move outside the billet but it has been set to 7mm in the Y so the tool will cut outside the model.



Select the 6.35mm Ball end cutter then select the raster cutting strategy and calculate the tool path.

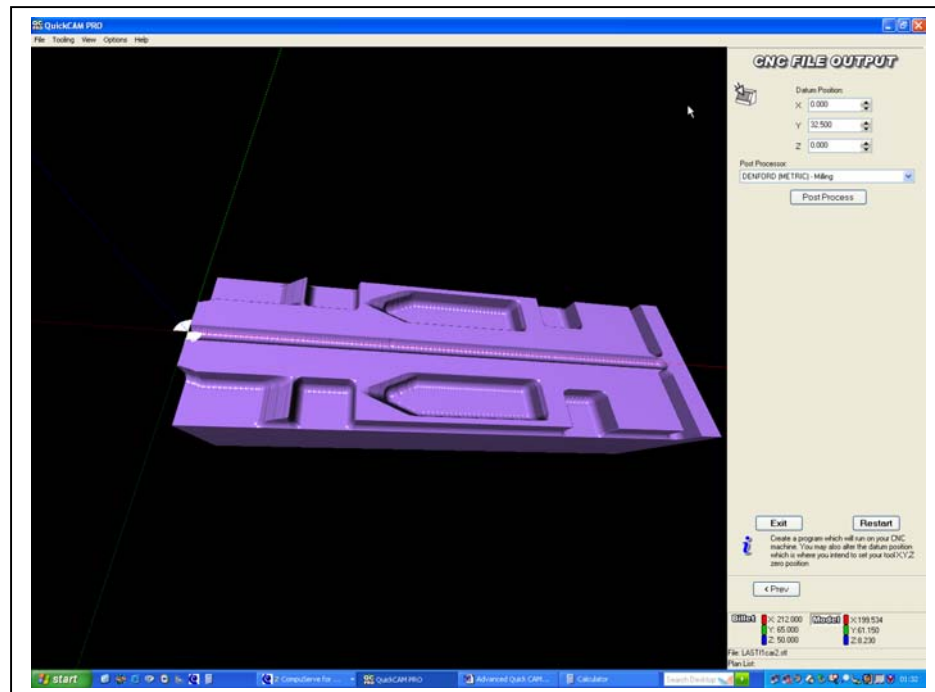


Simulate the tool path.



The finished file will have the Y origin set in the centre of the bore.

This is midway through the Y axis of the block so  $65\text{mm} / 2 = 32.5\text{mm}$



When manufacturing the car the X and Y offsets will not have to be reset they will remain the same as when cutting the side of a car.

The only offset that has to be reset is the Z axis.

### **Tips to help with manufacturing cars**

- 1 Always ensure the cut plane is at least the cutter radius below the centre line.
- 2 Always ensure the car is located in the bottom left hand corner of the billet
- 3 Never cut a car unless you are sure it has been designed with the bore for the cylinder 29mm above the base of the car.
- 4 With QuickCAM 3D set the raster angle to 90
- 5 With QuickCAM Pro set the Raster angle to 270
- 6 Always check the tool path does not pass down the ends of the billet (and collide with the fixture)

### **Why does my car have a ridge down its length that is bigger at one end than the other?**

The fixture fitted to the machine not being parallel would cause this.

Align the fixture following the instructions in the help tutorials.

### **Why does my car have a ridge down the middle after it has been cut?**

If there is a ridge between the two halves of after it has been cut this could be because of a couple of 3 things.

#### **Option 1**

If the ridge is only evident on the top of the car then the cutter may have not passed beyond the centre line and has left the tool radius visible. There is no ridge on the bottom because this is where the slot is located.

#### **Solution 1**

Set the cut plane more than the cutter radius below the centre line of the model and ensure the Z offset has been set when positioning the model in the block

### Option 2

The tool fitted to the machine is a 6.35mm Cutter and the tool selected in the tool library is 6mm. This will cause the tool to be offset and create a ridge 0.35mm in size even when the offset is correct.

### Solution 2

Ensure the correct tool is loaded in the library and selected (edit the library if required)

### Option 3

The machine offset in Y locates the centre of the bore in the car. This is the Y zero coordinate and is the point about which the car is indexed to cut the second side. If there is a step on both the bottom and the top of the car then measure the amount of the step.

### Solution 3

The Y offset should be changed by half of the measured ridge.

Open the tool offset window and write down the Y offset. Manually change the value by half the step measurement then make another car.

Once you have a car with no ridge make sure you record the offset.

Why does my car has a ridge down its length that is bigger at one end than the other?