
ArtCAM Pro

Tutorials

By Delcam plc

ArtCAM PRO



THE QUEEN'S AWARDS
FOR ENTERPRISE
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Overview

Tutorials

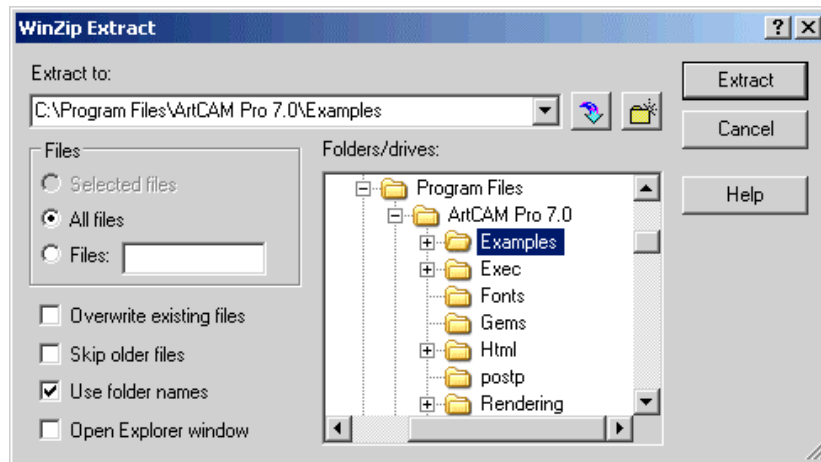
The tutorials contained within this manual are designed to help you to understand the practical uses of the design tools and toolpaths available in ArtCAM Pro.

The majority of the tutorials use example files from the ArtCAM Pro 7.0\Examples directory. If you cannot locate the example files used in a specific tutorial here, you must download the *TutorialExamples.zip* archive from the **Downloads** area at <http://www.artcam.com/>.

You will require the Winzip application to use the files contained within the archive. If you do not already have Winzip installed on your computer, you can download a free evaluation copy of the latest version from <http://www.winzip.com/>.

Extract the contents of the archive to the ArtCAM Pro 7.0\Examples\ directory, which is located wherever you have installed ArtCAM Pro 7.0 on your computer. To do so:

1. Using Windows Explorer, go to the directory to where you have downloaded the archive named *TutorialExamples.zip*.
2. Right-click on the archive to display the context menu, then click on the **Extract to...** option to launch Winzip and display the **Winzip Extract** dialog box:



3. In the **Folders/drives** window, go to the ArtCAM Pro 7.0\Examples directory on your computer.
4. Click on the **Extract** button to extract the files to the ArtCAM Pro 7.0\Examples directory.

You are now ready to use any of the tutorials contained within this manual.

3D Modelling

Overview

The following tutorials demonstrate various aspects of three-dimensional modelling in ArtCAM Pro:

- "Tutorial - Creating a Relief from Vectors" on page 5.
- "Tutorial – Creating a Relief from a Bitmap" on page 17.
- "Tutorial – Face Wizard" on page 33.
- "Tutorial – Swept Profiles" on page 45.
- "Tutorial – 3D Blend" on page 75.
- "Tutorial – 3D Clipart" on page 91.
- "Tutorial – Texturing" on page 105.
- "Tutorial – Copying and Pasting Reliefs" on page 111.
- "Tutorial – Lizard" on page 123.
- "Tutorial – Two Rail Sweep" on page 137.
- "Tutorial – Simple Jewellery Designs" on page 149.
- "Tutorial – Pendant" on page 159.
- "Tutorial – Casino Chip" on page 169.
- "Tutorial – ISO-FORM Lettering" on page 183.
- "Tutorial – Interactive Sculpting" on page 189.
- "Tutorial – Scanning" on page 195.

Tutorial - Creating a Relief from Vectors

Overview

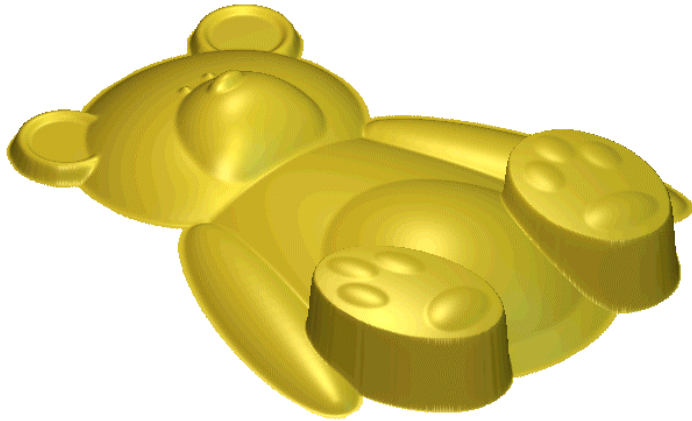
The following tutorial demonstrates how to create three-dimensional shapes from vector artwork and combine them to create a relief using the relief operations tools available in ArtCAM Pro.

Teddy Bear

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the teddy bear relief.

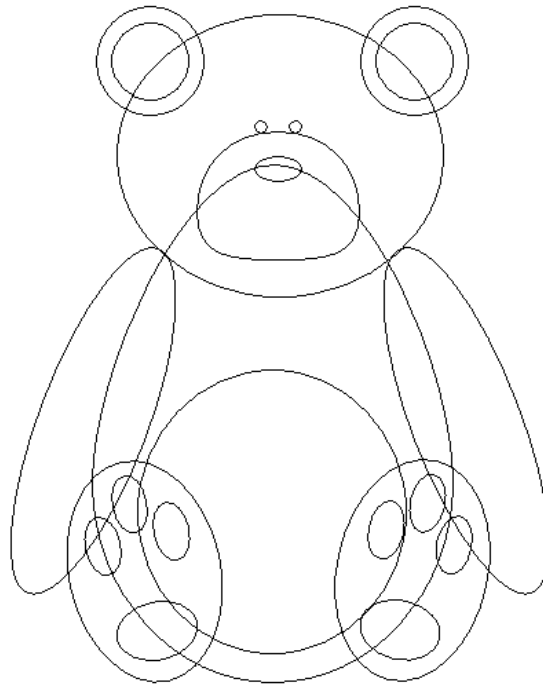
The tutorial will lead you through each of these stages, guiding you through the complete process of applying three-dimensional shapes to vector artwork, and then combining these shapes with the relief to produce the teddy bear shown below:



Preparing the Model


First, we will open the ArtCAM model containing the artwork that you will use to create the teddy bear relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box:
2. Click on the **Look In** list box and select *C:\Program Files\ArtCAMPro 7.0\Examples\NewTeddy* (assuming ArtCAM was installed into the default location – the files can also be found on the installation CD within the Examples directory).
3. Click to select the .art file named *NewTeddy*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the *NewTeddy* model. The following vector artwork appears in the **2D View** window:




You can see that the teddy bear is made up mostly of elliptical vector objects that were created in ArtCAM Pro. We will use these vector objects in the course of the tutorial to gradually build the teddy bear relief.

The finished teddy bear relief has also been saved as part of the ArtCAM model.

5. Click on the **3D View** button  in the **2D View** toolbar to display the **3D View** window, where you can see the finished teddy bear relief.



Note: You can also press the **F3** key on your keyboard to display the **3D View** window.

6. Now that you have seen the relief that we will create during the course of this tutorial, we must delete the relief by clicking on the **Reset Relief** button in the **Relief Operations** area of the **Assistant's** Home page.
7. Click on the **2D View** button  in the **3D View** toolbar to return to the **2D View** window.



Note: You can also press the **F2** key on your keyboard to display the **2D View** window.

Creating the Teddy Bear

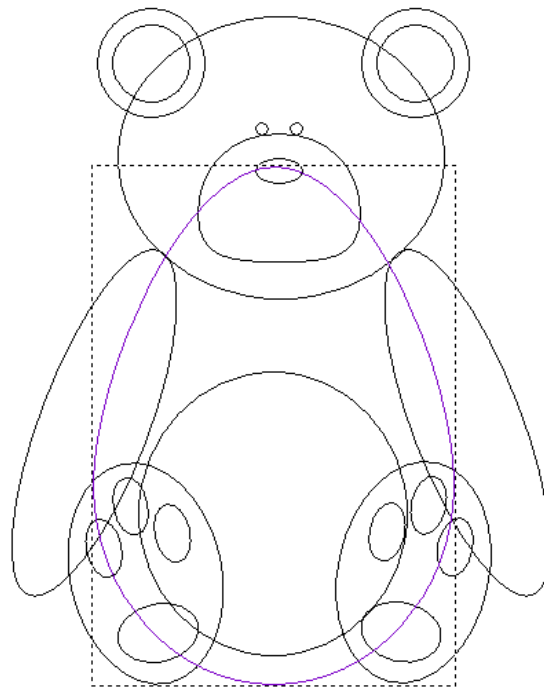
We will combine different three-dimensional shapes to create the finished teddy bear relief. We will create the shapes that represent the teddy's body parts in the following order:

- Body.
- Ears.
- Head and arms.
- Stomach and feet.
- Snout and paw-prints.
- Eyes and nose.

Creating the Body



First, we will create a three-dimensional shape representing the body of the teddy bear then combine this with the existing relief.

1. Click to select the vector representing the teddy's body.



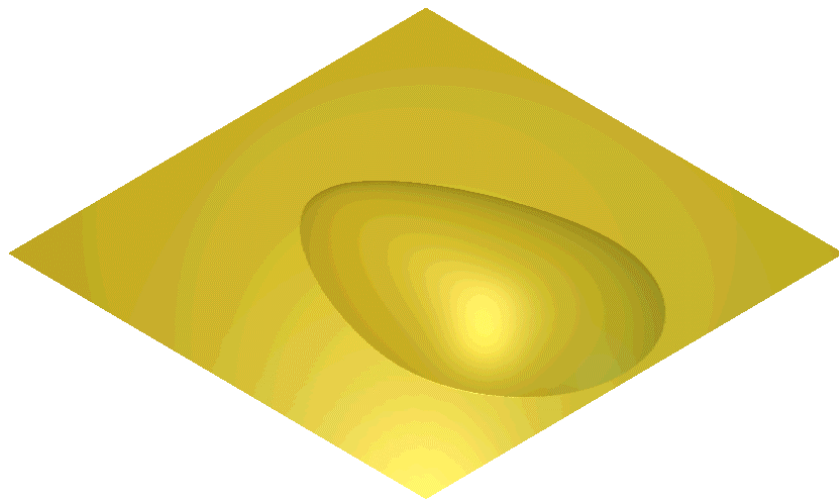
The vector turns purple, indicating that it is now selected.

2. Right-click on the selected vector object to display the **Vector Editing** menu, then click on the **Shape Editor** option to display the **Shape Editor** dialog box.

3. Click on the **Round** button , and then type *30* in the **Angle** box.
4. Click on the **Add** button. This option instructs ArtCAM Pro to add the points in the shape to the current relief.
A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.
5. Click on the **Close** button to close the **Shape Editor** dialog box.
6. Click on the **3D View** button  in the **2D View** toolbar to display the relief in the **3D View** window:



Note: You can also press the **F3** key on your keyboard to display the **3D View** window.



Creating the Ears

Next, we will create the three-dimensional shapes that represent the ears, and then combine them with the existing relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the vector representing the outside of the left ear of the teddy's head.

The vector representing the outside of the left ear of the teddy's head is grouped along with the vector representing the outside of its right ear. Therefore, both vectors turn purple and are surrounded by a bounding box.

3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.

The **Plane** button is selected by default, so we do not need to click on any of the shape buttons.

4. Type *0.5 mm (0.02")* in the **Start Height** box.
5. Click on the **Merge High** button. This option instructs ArtCAM Pro to merge the points in the shapes with the current relief, so that only the highest points show in the new relief.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.

6. Hold down the **Shift** key on your keyboard, and then click to select the vector for the inside of the teddy's left ear.

The vector for the inside of the teddy's left ear is grouped along with the vector for the inside of its right ear.

Therefore, both vector objects turn purple and are surrounded by a bounding box. All of the vector objects representing the teddy's ears are now selected.

7. Press the **F12** key to display the **Shape Editor** dialog box if it is not already visible.

8. Click on the **Round** button .

9. Make sure that the **Start Height** is set to *0.5 mm (0.02")*.

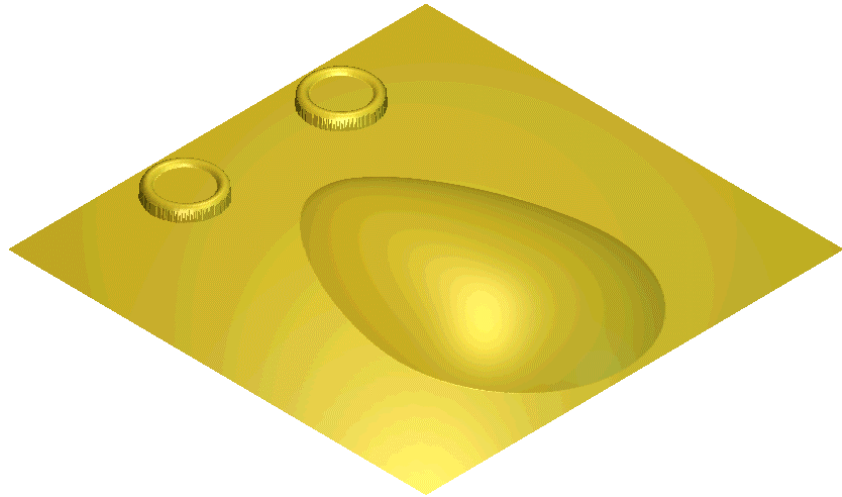
10. Click to select the **Scale** option , and then type *2* in the box below.

11. Click on the **Merge High** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.

12. Click on the **Close** button to close the **Shape Editor** dialog box.

13. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



Creating the Head and Arms

We are now ready to create the three-dimensional shapes that represent the head and arms of the teddy bear, and then combine them with the existing relief.

1. Press the **F2** key to display the **2D View** window.
2. Click to select the vector for the teddy's left arm.

The vector for the teddy's left arm is grouped along with the vectors for its right arm and its head. Therefore, all three vector objects turn purple and are surrounded by a bounding box.

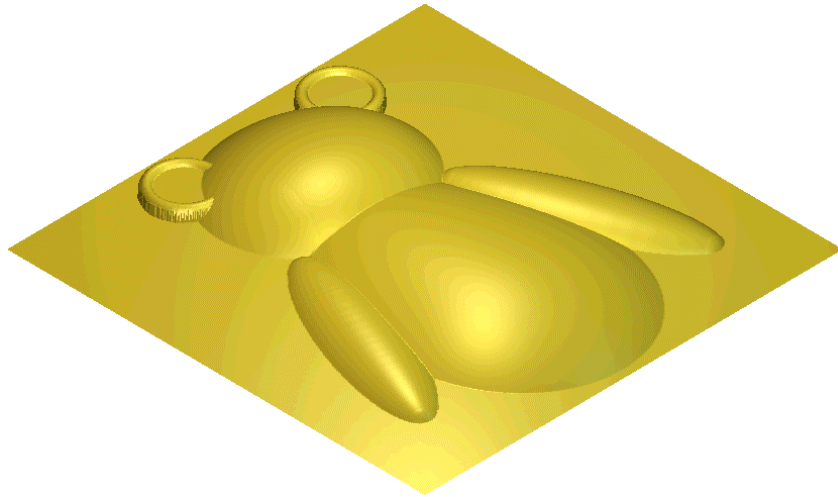
3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box if it is not already visible.

4. Click on the **Round** button , and make sure that the **Angle** is set to 45° .

5. Click on the **Merge High** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.

6. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Creating the Stomach and Feet


We are now ready to create the three-dimensional shapes that represent the stomach and feet of the teddy bear, and then combine them with the existing relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the circular vector representing the teddy's stomach. The vector turns magenta, indicating that it is now selected.
3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.

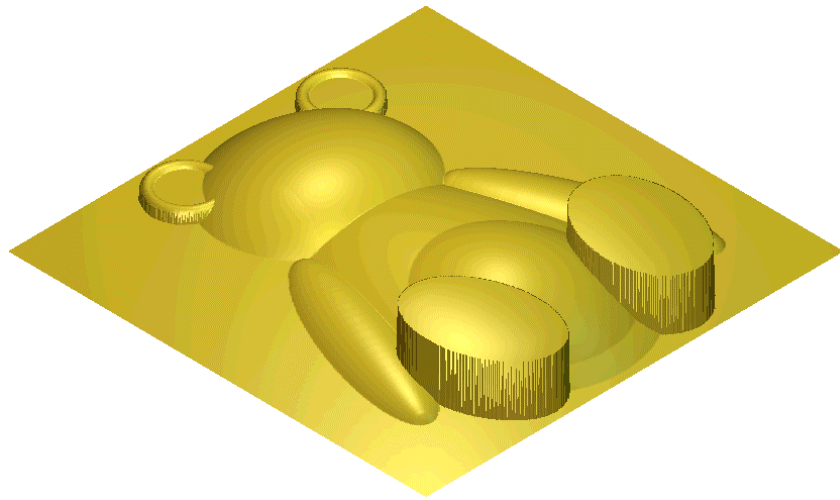
4. Click on the **Round** button , and then type *20* in the **Angle** box.
5. Click on the **Add** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.

6. Click to select the vector for the teddy's left foot.
The vector representing the teddy's left foot is grouped along with the vector representing its right foot. Therefore, both vectors turn purple and are surrounded by a bounding box.
7. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box if it is not already visible.


8. Click on the **Round** button , and then type *10* in the **Angle** box and *3 mm (0.12")* in the **Start Height** box.
9. Click on the **Merge High** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.
10. Click on the **Close** button to close the **Shape Editor** dialog box.
11. Press the **F3** key to display the new relief in the **3D View** window:



Creating the Snout and Paw-Prints

We are now ready to create the shapes that represent the snout and paw-prints of the teddy bear.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the vector object representing the teddy's snout. The vector turns magenta, indicating that it is now selected.
3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box if it is not currently visible.
4. Click on the **Round** button , and make sure that the **Angle** is set to *45°* and the **Start Height** as *0*.
5. Click on the **Add** button.

6. Click on the **Close** button to close the **Shape Editor** dialog box.
7. Click to select the vector representing the paw-prints on the teddy's left foot.

The vectors representing the paw-prints on the teddy's left foot are grouped along with the vectors representing the paw-prints on the teddy's right foot. Therefore, all of these vector objects turn purple and are surrounded by a bounding box.

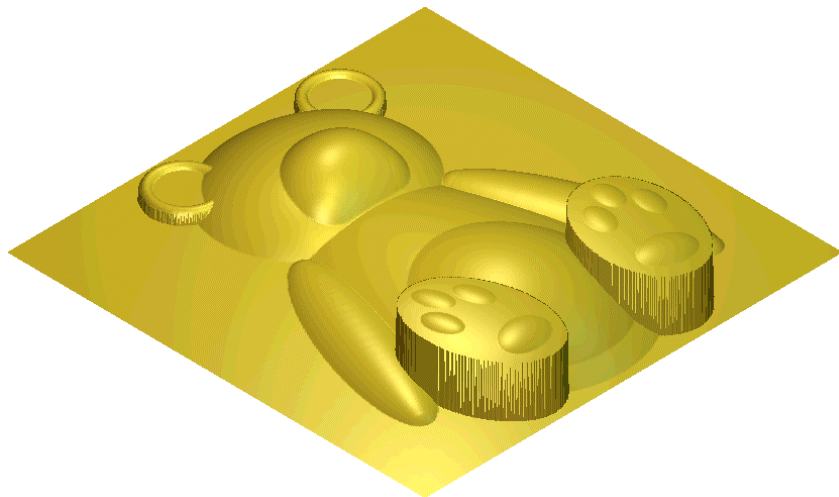
8. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box if it is not already visible.

9. Click on the **Round** button , and then type *20* in the **Angle** box.

10. Click on the **Add** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the new relief.

11. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:




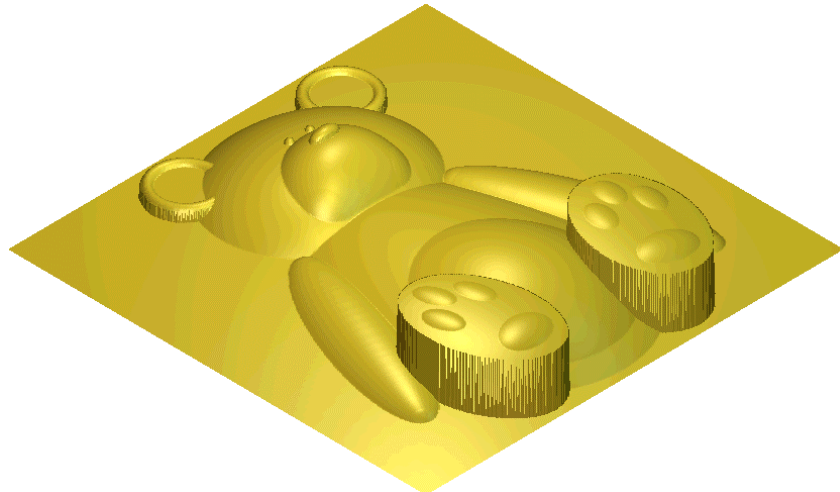
Creating the Eyes and Nose

We are now ready to create the eyes and nose of the teddy bear.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the vector representing the teddy's nose.


The vector representing the teddy's nose is grouped along with the vectors representing the teddy's eyes. Therefore, all of these vector objects turn purple and are surrounded by a bounding box.

3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box if it is not already visible.
4. Click on the **Round** button , and then type *90* in the **Angle** box.
5. Click on the **Add** button.
6. Click on the **Close** button to close the **Shape Editor** dialog box.
7. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Smoothing the Relief

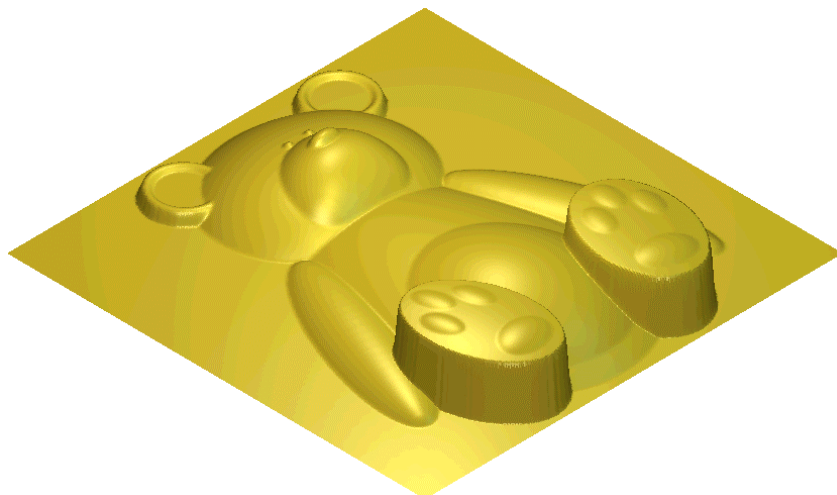
To complete the teddy bear, we will smooth the current relief.

1. Click on the **Smooth Relief** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Smooth Relief** dialog box:



2. Make sure that the **Whole Relief** option is selected by clicking on its radio button .
3. Type 3 in the **Smoothing Passes** box.
4. Click on the **Apply** button.
5. Click on the **Cancel** button to close the **Smooth Relief** dialog box.

The smoothed teddy bear relief is displayed in the **3D View** window as follows:



Tutorial – Creating a Relief from a Bitmap

Overview

The following tutorial demonstrates how to create a relief from an imported bitmap image using colour linking techniques in multiple design windows, together with the bitmap editing and relief operation tools available in ArtCAM Pro.

Bird

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Colouring the bitmap image.
- Editing the colour image.
- Creating new views.
- Creating the relief.

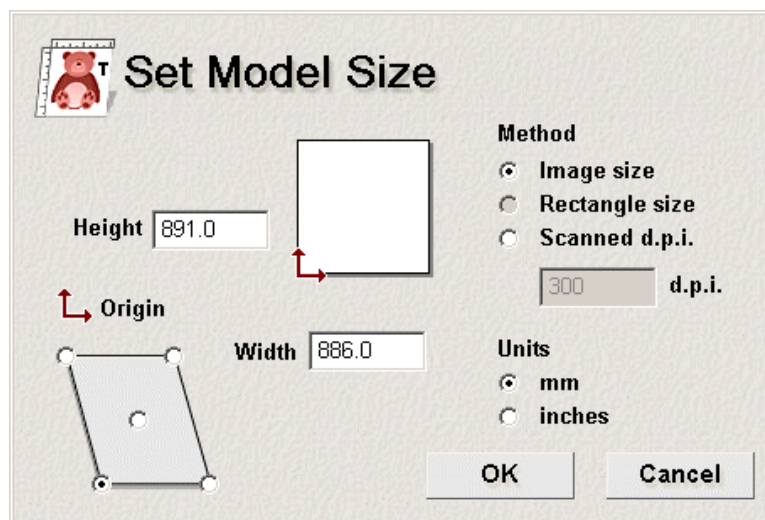
The tutorial will lead you through each of these stages, guiding you through the complete process of opening a bitmap image, adding colour to the image, editing the image, creating multiple design windows, creating colour links within these windows, applying shape attributes to selected colours, then calculating and combining separate reliefs to form the following relief:



Preparing the Model

First, we will open the bitmap file containing the image from which we will create a relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Files of type** list box, and then click to select the **Windows Bitmap (*.bmp)** option.
3. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Bird.
4. Click to select the file named *bird.bmp*. The file name appears in the **File name** box.
5. Click on the **Open** button to display the **Set Model Size** dialog box:



6. Click on the **OK** button to close the **Set Model Size** dialog box and open the bitmap image.

The following artwork appears in a **2D View** window automatically named **Bird:0**.



Colouring the Bitmap Image

Now we will colour the bitmap image using the **Paint Selective** and **Flood Fill** tools in ArtCAM Pro and a previously saved, custom Colour Palette.

We will use the **Paint Selective** tool to paint the current Primary Colour in all areas of the image currently using the Secondary Colour.

Then we will replace areas of *any* selected colour, using the **Flood Fill** tool.

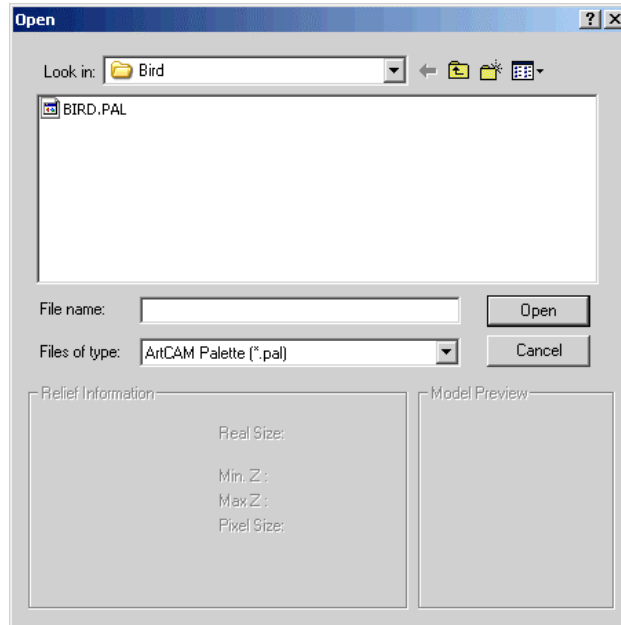





Note: Examples of what the bird looks like after each stage are provided in the ArtCAM Pro 7.0\Examples\Bird directory.


Bird01.art shows how the **Paint Selective** tool is used. **Bird02.art** shows the image after the flood-fill tool has been used.

Before we use the tools, however, we must load a customised Colour Palette into ArtCAM Pro.


1. From the Main menu bar, click on the **Colour** option to display the **Colour** menu, then click on the **Load** option to display the **Open** dialog box:



2. Click to select the file named *Bird.pal*. The file name appears in the **File name** box.
3. Click on the **Open** button to display the *Bird* Colour Palette beneath the **Bird:0** window.
4. Click on the  button in the top-right corner of the **Bird:0** window to maximise it, then click on the **Window Fit** button  in the **Bird:0** toolbar to fit the image to the window size.
5. Click on the light-green colour in the Colour Palette beneath the **Bird:0** window to select it as the Primary Colour.
6. Right-click on the white colour in the Colour Palette to select it as the Secondary Colour.
7. Click on the **Paint Selective** button  in the **Bitmap Editing** area of the **Assistant's** Home page.
8. Click and drag on the **Brush Diameter** slider in the **Bitmap Editing** area and set the brush diameter to 7.
9. Click and drag on the areas in the bitmap image representing the spines of the leaves.

If you make a mistake, use the **Undo** button  in the **File** area to restore the image as it was prior to your last action.



10. Click and drag on the **Brush Diameter** slider in the **Bitmap Editing** area and set the brush diameter to 3.

11. Click on the **Zoom In Tool** button  in the **Bird:0** toolbar, then click and drag to form a bounding box around the leaves. Release the mouse button to zoom in on this area.
12. Click and drag on any white areas in the spines of the leaves to make sure that they are coloured completely.
13. Using the same method as detailed, colour the rest of the bitmap image in the following way:
 - Colour the branch highlights in orange.
 - Colour the bird's upper-body highlights in purple.
 - Colour the bird's lower-body highlights in cyan.
 - Colour the bird's beak in yellow.
 - Colour the bird's feet in dark-grey.
 - Colour the bird's feet highlights in light grey.

The bitmap image should now look something like this:



14. Click on the dark-green colour in the Colour Palette to select it as the Primary Colour.
15. Click and drag on the areas between where a leaf starts and branch ends to mark it in the current Primary Colour. This prevents the Flood Fill tool from flood-filling unwanted areas in the Primary Colour.

16. Move the  cursor over the leaf that you have marked, and then click on the **Flood Fill** button  in the **Bitmap Editing** area to flood-fill the leaf in green.

Before...



After...



17. Using the same method as detailed, flood-fill the rest of the bitmap image in the following way:

- Flood-fill the leaves in dark-green.
- Flood-fill the bird's body in dark-blue.
- Flood-fill the bird's feet in dark-grey.
- Flood-fill the tree in dark-brown.
- Flood-fill the line that divides the bird's beak in beige.
- Flood-fill the bird's eye in blue.
- Flood-fill the pupil in the bird's eye in blue.

The bitmap image should now look something like this:



Editing the Colour Image



Now that we have finished colouring the bitmap image, there are several areas in the colour bitmap image that need to be edited. Before we can create a relief, we must:

- Make sure that the outline of each leaf is clearly defined in white.
- Make sure that all spines in the leaves are clearly defined in light green.
- Make sure that the point at which a branch ends and a leaf begins is clearly defined.
- Make sure that each claw in the bird's feet is clearly defined.
- Make sure that there are no rogue pixels in the image. For example, black pixels in an area coloured in dark-green.

We must edit the bitmap image in this way because the relief is calculated using the three-dimensional shape attributes applied to each of the colours. The larger the area of colour, the higher the relief.



Note: You can open an example of the edited bitmap image, which is saved as **bird03.art** in the ArtCAM Pro 7.0\Examples\Bird directory.


1. Zoom in on the leaves above the bird using the **Zoom In Tool** button .
2. Click on the white colour in the Colour Palette to select it as the Primary Colour.
3. Click on the **Draw** button  in the **Bitmap Editing** area.
4. Click and drag to draw a line marking the outline of the leaf in the current Primary Colour.

Before...



After...

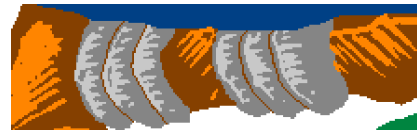



5. Repeat these step to create outlines for all of the leaves in the image.
6. Use the **Zoom In Tool** button  to zoom in on the claws in the bird's feet.
7. Click on the brown colour in the Colour Palette to select it as the Primary Colour.
8. Click and drag to draw brown lines between each of the bird's claws.

Before...

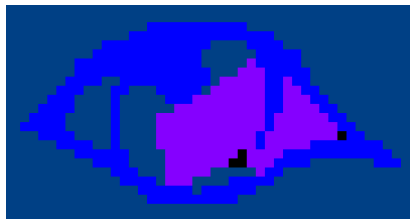


After...

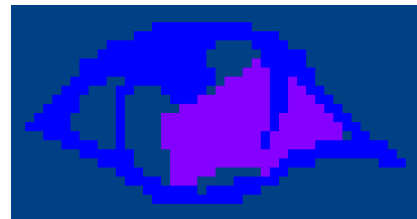


9. Zoom in on the bird's eye using the **Zoom In Tool** button .
10. Click on the dark-purple colour in the Colour Palette to select it as the Primary Colour.

Before...



After...



11. Click on each of the rogue black pixels in the bird's eye to colour them all purple.
12. Continue editing the bitmap image in this way until you are satisfied that it will produce a relief without any surface irregularities.

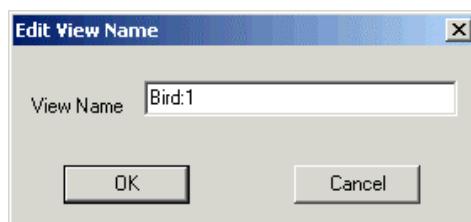
The bitmap image should now look something like this:



Creating New Views

Before we can create the relief, we need to create duplicate copies of the **Bird:0** window. These windows represent the number of layers required to produce the finished relief. Each successive window contains exactly the same image as the original, but we will alter their appearance by applying different colour links to them.

1. From the Main menu bar, click on the **2D View** menu, then click on the **New View** option to create a new window named **Bird:1**.
2. Repeat the previous step three times to create three more windows named **Bird:2**, **Bird:3** and **Bird:4**.
3. Click on the **Bird:1** window to make it active.
4. From the Main menu bar, click on the **2D View** option to display the **2D View** menu, then click on the **Edit View Name** option:



5. Type *Leaves and Main Body:1* in the **View Name** box.

It is good practice to number each of the windows that you create, as it makes it easier to recall how the finished relief was built at a later date. Each window should also be named to reflect what aspect of the relief it will be used for.

6. Click on the **OK** button to apply the name change and close the **Edit View Name** dialog box.
7. Re-name the **Bird:2** window as *Highlights:2*, the **Bird:3** window as *Eyes and Claws:3* and the **Bird:4** window as *Pupils:4*.

Creating the Relief

In this tutorial, we want the leaves, bird and branches in the bitmap image to become the main features in the relief, with the highlighted areas of the image as the detail in the relief. The bird is the most prominent part of the image, and therefore requires more height than the other features.

To create the finished relief, we must manipulate each of the windows so that the bitmap image represents the overall shape of each layer of the relief that we want to create.

Linking the Colours

First, we will link colours in the Colour Palette for each of the windows to alter the appearance of the bitmap image and define the areas to which we want to apply a three-dimensional shape.



Note: You can open an example of the colour links used for each of the windows, which is saved as **bird04.art** in the ArtCAM Pro 7.0\Examples\Bird directory.

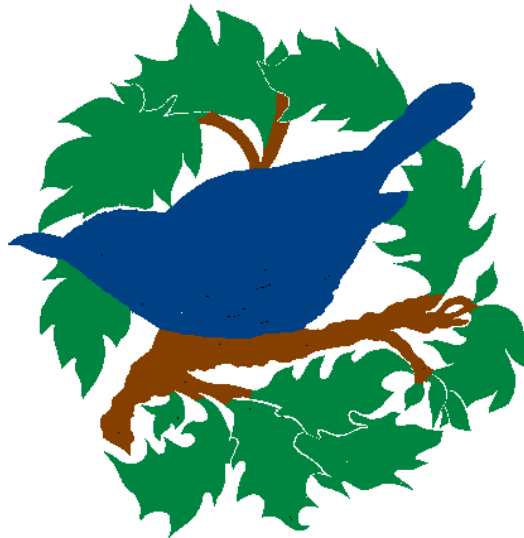
1. Click on the **Leaves and Main Body:1** window to make it active.
2. Click on the dark-green colour in the Colour Palette to select it as the Primary Colour.
3. Double-click the right mouse button on the light-green colour to link it to the Primary Colour. The leaves now appear entirely as dark-green.
4. Using the method detailed in the previous steps, create the following colour links:
 - Select the colour representing the main-body of the bird as the Primary Colour, then link the colours representing the bird's wing, under-body, beak, beak dividing-line, eye and its pupil to it.

- Select the colour representing the branch as the Primary Colour, then link the colours representing the branch highlights and the bird's feet to it.

The Colour Palette should look as follows:



The bitmap image should now only contain the colours representing the leaves, the branch and the bird:




5. Create the following colour links for the other windows:
 - **Highlights: 2** – Select the colour representing the main-body of the bird as the Primary Colour, then link the colours representing the bird's eye and its pupil to it. Next, select the colour representing the birds' feet as the Primary Colour, then link the colour representing the feet highlights to it.
 - **Eyes and Claws:3** – Select the colour representing the birds eye as the Primary Colour, then link the colour representing its pupil to it.



Applying Shapes to the Colours

Now that all of the necessary colour links have been made, we are ready to create the shapes that will be combined to form the relief.



Note: You can open an example of the shapes applied to each of the windows, which is saved as **bird05.art** in the ArtCAM Pro 7.0\Examples\Bird directory.




1. Click on the **Leaves and Main Body:1** window to make it active.
2. Double-click on the dark-blue colour in the Colour Palette that represents the bird to display the **Shape Editor** dialog box:
3. Click on the **Round** button , and then type *30* in the **Angle** box.
4. Type *0.5 mm (0.02")* in the **Start Height** box.
5. Click on the **No Limit** radio button to select this option.
6. Click on the **Apply** button, followed by the **Close** button.
7. Using the method detailed in these steps, apply the following shape attributes to the remaining parts of the **Leaves and Main Body:1** window:




Part	Shape	Angle	Start Height	Region Height	Scale
Leaves		15°	<i>0.3 mm (0.012")</i>	<input checked="" type="radio"/> Limit To Height <i>Height: 1 mm (0.04")</i>	-
Branches		45°	<i>0.3 mm (0.012")</i>	<input checked="" type="radio"/> No Limit	-

The Colour Palette beneath the **Leaves and Main Body:1** window should now look as follows:



8. Apply the following shape attributes to the colours representing the following parts of the **Highlights:2** window:



Part	Shape	Angle	Start Height	Region Height	Scale
Beak		-	<i>0.75 mm (0.03")</i>	-	-
Wing		-	<i>0.5 mm (0.02")</i>	-	-
Body/Eyes		-	<i>0.5 mm (0.02")</i>	-	-

Branch Highlights		45°	0	<input checked="" type="checkbox"/> No Limit	-
Leaf Spines		45°	0.2 mm (0.008")	<input checked="" type="checkbox"/> No Limit	-
Feet		45°	0.2 mm (0.008")	<input checked="" type="checkbox"/> No Limit	-

The Colour Palette beneath the **Highlights:2** window should now look as follows:




9. Apply the following shape attributes to the colours representing the following parts of the **Eyes and Claws:3** window:

Part	Shape	Angle	Start Height	Region Height	Scale
Eye		45°	0	<input checked="" type="checkbox"/> No Limit	-
Feet Highlights		45°	0.3 mm (0.012")	<input checked="" type="checkbox"/> Limit To Height Height: 3 mm (0.12")	-

The Colour Palette beneath the **Eyes and Claws:3** window should now look as follows:



10. Apply the following shape attributes to the colour representing the following part of the **Pupils:4** window:

Part	Shape	Angle	Start Height	Region Height	Scale
Pupil		-	0.15 mm (0.006")	-	-

The Colour Palette beneath the **Pupils:4** window should now look as follows:



Calculating and Saving the Relief

Having applied all of the shape attributes to the necessary colours in each of the four windows, we are now ready to calculate the reliefs associated with them. We will also save the relief at selected intervals.



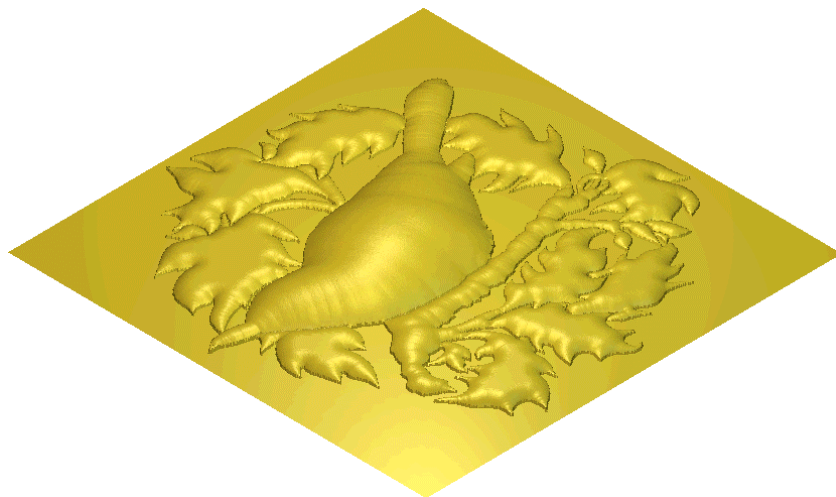
Note: You can open an example of the relief created from the **Leaves and Main Body:1** window, which is saved as **bird01.art** in the ArtCAM Pro 7.0\Examples\Bird directory. You can also open an example of the finished relief, which is saved as **bird04.art** in the same directory.


1. Click on the **Leaves and Main Body:1** window to make it active.

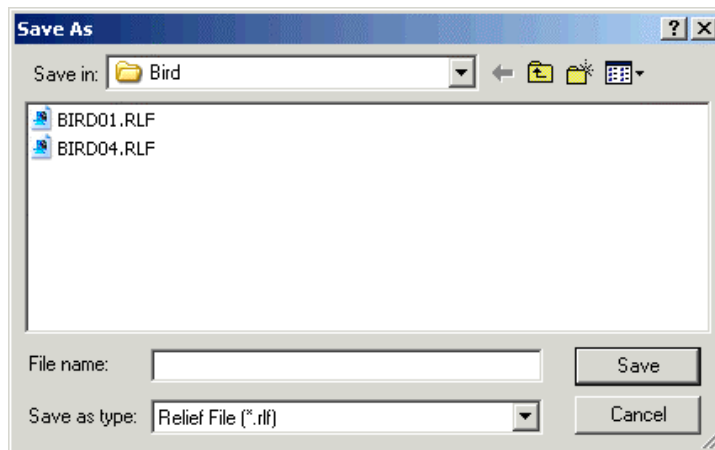
2. Click on the **Add Relief** button  in the **Relief Operations** area of the **Assistant's** Home page.

A progress bar appears beneath the window indicating the progress ArtCAM Pro is making in calculating the relief. As a rule, larger reliefs take longer to process than smaller areas. In this tutorial, calculating the relief from the **Leaves and Main Body:1** window takes significantly longer than for any of the other windows.

3. Press the **F3** key on your keyboard to display the relief in the **3D View** window:

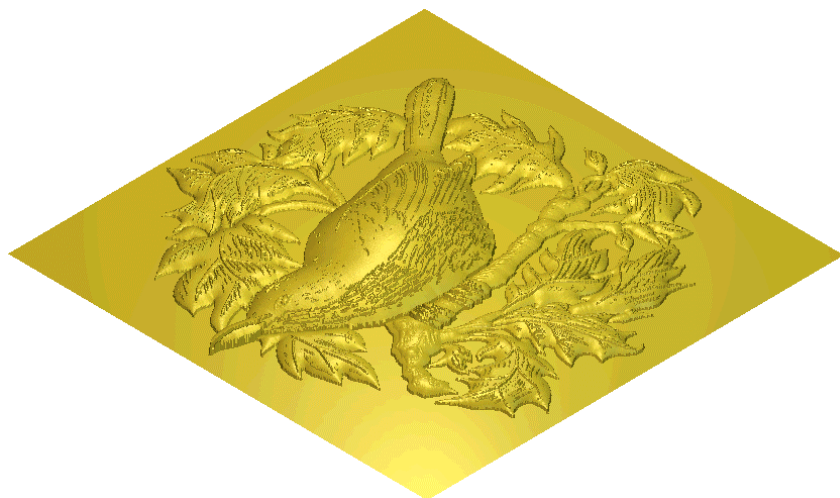


4. Click on the **Save Relief** button  in the **Relief Operations** area to display the **Save As** dialog box:



It is worthwhile saving this relief due to the time it takes to calculate. Also, if you wanted to amend any of the reliefs created from successive windows, you could now do so without having to re-calculate the base to which they are added.

5. Click on the **Save In** list box and select the directory where you want to save the relief.
6. Type *BaseRelief* in the **File Name** box.
7. Click on the **Save** button.
8. Press the **F2** key on your keyboard to display the **Leaves and Main Body:1** window.
9. Calculate the **Highlights:2**, **Eyes and Claws:3** and **Pupils:4** windows in the same way as the **Leaves and Main Body:1** window. The finished relief should look something like this:



10. Save this relief as *BirdRelief*.

The benefit of saving the finished relief is that it is then available for you to load and machine at any time.

Tutorial – Face Wizard

Overview

The following tutorial demonstrates how to create a relief using a photographic image containing a side-profile of a person's head and neck, and the Face Wizard tool available in ArtCAM Pro.

3D Face

The stages that you will cover during the course of this tutorial are:



- Importing the image.
- Creating the vector artwork.
- Creating the relief.
- Sculpting the relief.

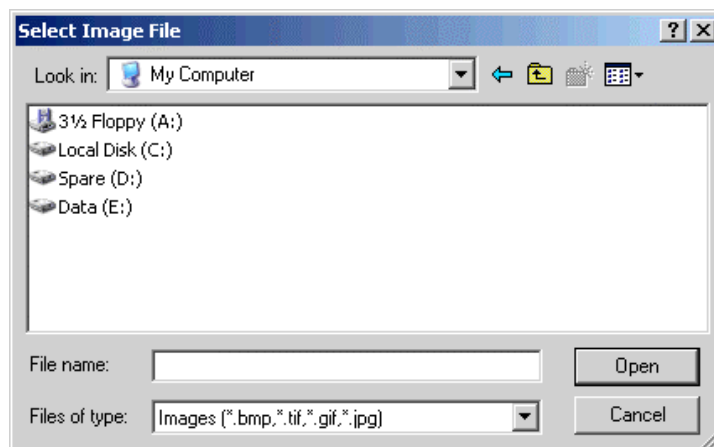
This tutorial will lead you through each of these stages, guiding you through the complete process of producing the face relief shown as follows:



Importing the Image

First, we will start the Face Wizard and import the photographic image from which we will create a relief:

1. Click on the **Face Wizard** icon  on the **Assistant's Getting Started** page to display the first page of the **Face Wizard**.
2. Click on the **Open Photo...** icon  to display the **Select Image File** dialog box:



3. Click on the **Look In** list box and select *C:\Program Files\ArtCAMPro 7.0\Examples\FaceWizard* (assuming ArtCAM was installed in the default location – the files can

also be found on the installation CD within the *Examples* directory).


4. Click to select the file named *female_head.tif*. The file name appears in the **File name** box.
5. Click on the **Open** button to import the image into ArtCAM Pro and display the second page of the Face Wizard.

The following image appears in the **2D View** window:




Creating the Vector Artwork

Next we will create the vector artwork needed for the Face Wizard to calculate the relief from the imported image.


1. Click on the **Create Polyline Tool** button  on the Face Wizard page to enter polyline creation mode.
2. Click to select the **Draw Smooth Polyline** option to instruct ArtCAM Pro to join each point in the polyline with a bezier span, rather than a linear span.
3. In the **2D View** window, click and drag your mouse to create a polyline around the head and neck of the woman, shown as follows:

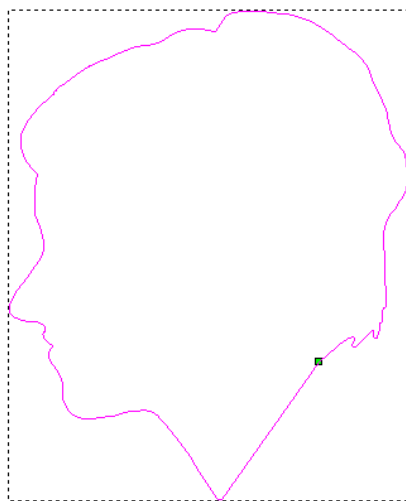


4. Click on the **Close Vector With A Line** button  to create a closed vector out of the polyline. A closed vector must be created before moving onto the next step.

You might want to use either of the other two buttons to close the polyline, depending on which of them best preserves the outline of the face area.


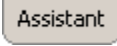


If you are not happy with the results achieved, press the **Ctrl + Z** keys on your keyboard to undo the closing action and try another of the buttons.

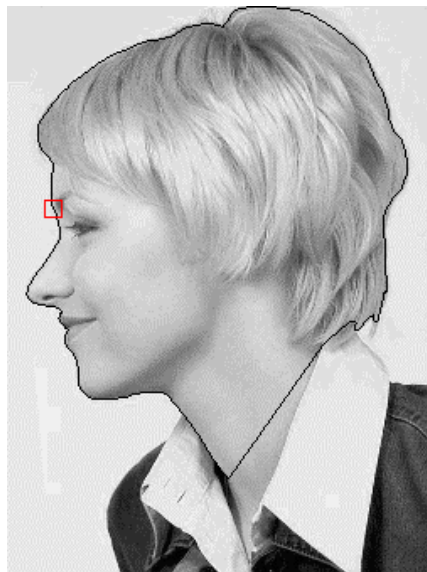
5. Click on the **Bitmap On/Off** button  in the **2D View** toolbar to hide the woman's image. You can now see the polyline that you have drawn clearly.



If the polyline you have drawn is shown in black, it is currently open. You must repeat the previous step in order

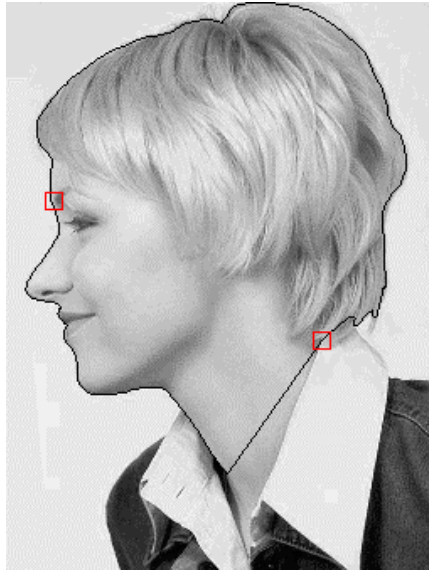
to close the polyline. When closed, the polyline is shown in magenta.

6. Click on the **Bitmap On/Off** button  in the **2D View** toolbar to view the woman's image again.
7. Click on the **Assistant** tab  to display the **Assistant's** Home page.
8. Click on the **Node Editing** button  in the **Vector Editing** area to enter Node Editing mode. You can see the points (nodes), control points and spans that make up the polyline you have drawn.
9. Edit the shape of polyline so that it follows the outline of the face area perfectly, or is even a pixel distance inside of the face area. For further information, see "Editing Vector Spans" and "Editing Vector Nodes" in the Working with Vectors chapter of the Reference Manual.
10. Click on the **Add In** tab  to return to the second page of the Face Wizard tool.
11. Click on the **Next** button to display the third page of settings. You are now ready to define the points needed to identify specific facial features in the image.
12. Click on the centre-front of the woman's eyebrow, as shown below:



A red square marks the selected point.

13. Click on the nape of the woman's neck, shown as follows:



A red square marks the selected point.

Creating the Relief

Next we will create the relief from the vector artwork that we have drawn and the points we have used to define the features shown in the imported image. We will also create an ArtCAM model during the process.

1. Click on the **Next** button to display the fourth page of settings.

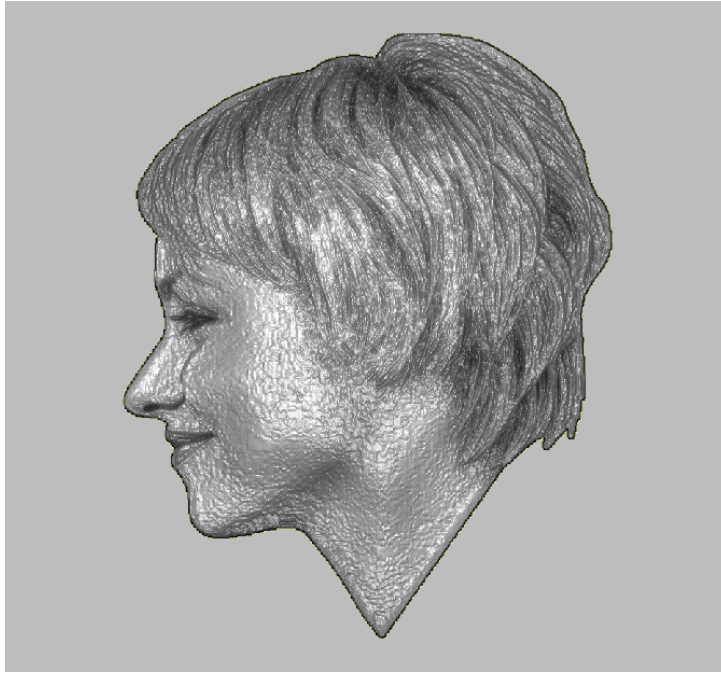
In the **Head Dimensions** area, the Face Wizard indicates that the height of the relief we are creating will be approximately 72 mm and its width will be approximately 90 mm.

In the **Model Dimensions** area, the Face Wizard indicates that both the height and width of the ArtCAM model in which the relief will be created is approximately 100 mm.

2. Click on the **Next** button to create the ArtCAM model and calculate the relief according to the dimensions shown on the page.

A progress bar appears beneath the design window area indicating the progress ArtCAM Pro is making in calculating the relief.

The following relief is displayed in the **3D View** window:



The area of the image originally shown within the polyline is projected onto the relief by default. The **Interactive Sculpting** page is also displayed in the **Assistant** window.


Sculpting the Relief


Next we will sculpt the face to give definition to some of its features and improve its overall surface appearance.



Warning: You might want to click to deselect the **Use Colours From 2D View** option in the **Shading Colour** area of the **Interactive Sculpting** page before sculpting the face relief. If the photo image is projected onto the relief during a sculpting session, your results can often be deceptive.




1. The **Smooth** tool **Smooth** is selected by default. Set its **Diameter** to *100*, its **Strength** to *100%* and its **Smoothness** to *100%* by clicking and dragging on each of the sliders in turn.
2. Click and drag the tool cursor  over the face to smooth its surface. Since the diameter of the tool is large here, it is being very careful to avoid smoothing the hair, lips, eye, nose, nostril and eyebrow areas, as they will lose their definition.


3. Click and drag the **Diameter** slider to the left to set it as *50*.
4. In the **3D View** window, click and drag the tool cursor  close to the nose, around the lips, the eye and the eyebrow. Do not move the cursor directly over the hair, lips, nostril, eye and eyebrow areas, as they will lose their definition.
5. Click and drag the **Strength** slider to the left to set it as *20*.



Note: If your mouse has a wheel, you can roll it backwards to reduce the strength, or forwards to increase the strength of the selected tool.

6. In the **3D View** window, click and drag the tool cursor  over the nose, nostril, lips, eye and the eyebrow. You can now smooth these areas without losing their definition.



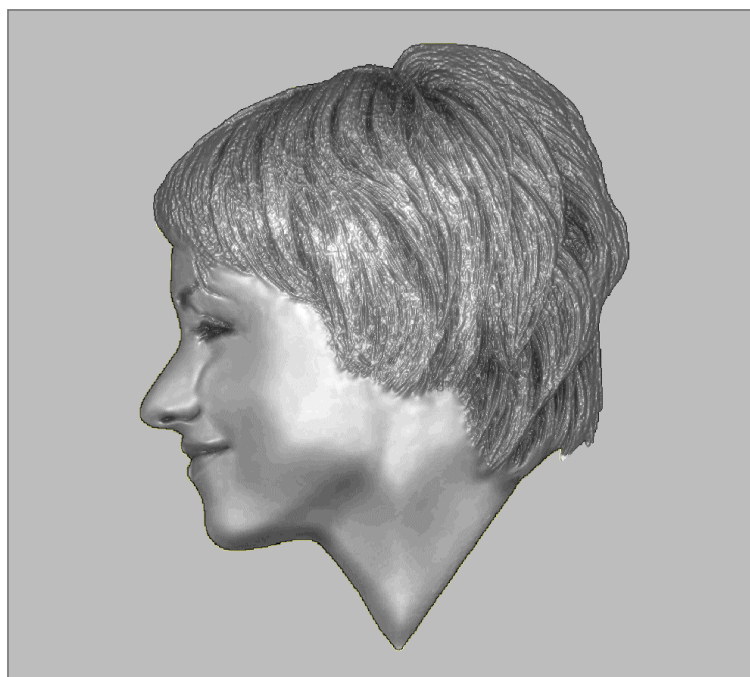
7. Click on the **Eraser** tool icon , and then set its **Diameter** to *20*, its **Strength** to *20%* and its **Smoothness** to *100%* by clicking and dragging on each of the sliders in turn.



Note: You can also press the **5** key on your keyboard to select the **Eraser** tool.

8. In the **3D View** window, click and drag the tool cursor carefully over the eyebrow area to restore any lost hair detail in the eyebrow.

The face relief should now look something like this:




- Click on the **Apply** button to confirm the changes that you have made to the relief thus far.



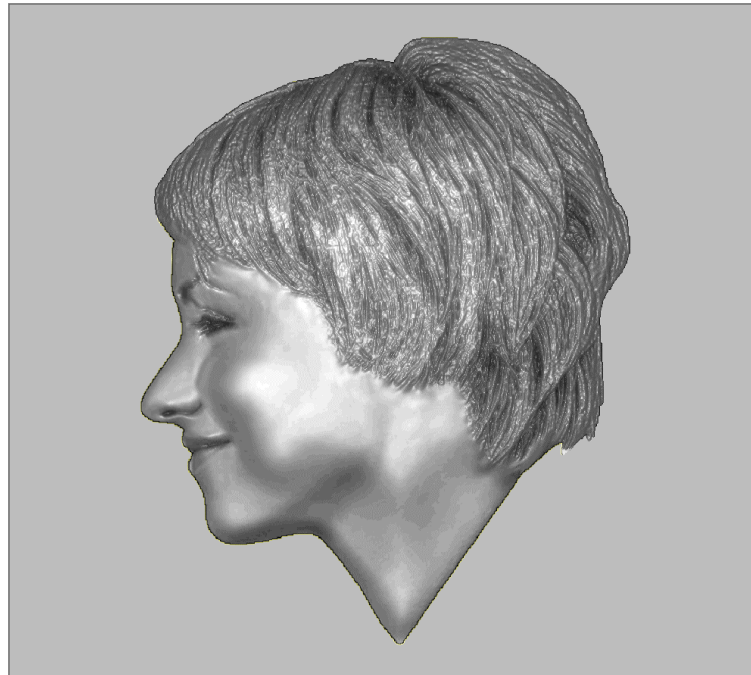
- Click on the **Smudge** tool icon **Smudge**, and then set its **Diameter** to 100, its **Strength** to 10% and its **Smoothness** to 100% by clicking and dragging on each of the sliders in turn.



Note: You can also press the **2** key on your keyboard to select the **Smudge** tool.

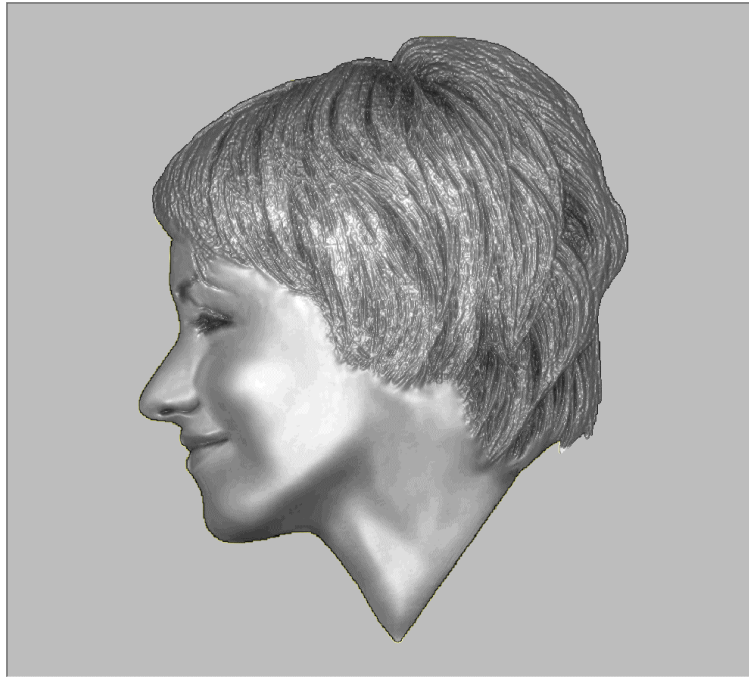
- In the **3D View**, click and drag the tool cursor  to the left to exaggerate the cheekbone area.

The face relief should now look something like this:



- Click slightly below where the hair covers the ear and drag the mouse downward to the end of the chin, following the line of the jaw.
- Click underneath the line of the jaw at the end of the chin and drag upward along the line of the jaw.
- Click in the middle of the neck area, and drag upward slightly to remove the appearance of the bulge in the neck.

The face relief should now look something like this:





15. Click on the **Apply** button to confirm the changes that you have made to the relief thus far.

16. Click on the **Smooth** tool icon  **Smooth**, and then set its **Diameter** to 100, its **Strength** to 10% and its **Smoothness** to 100% by clicking and dragging on each of the sliders in turn.



Note: You can also press the **1** key on your keyboard to select the **Smooth** tool.

17. In the **3D View**, click and drag the tool cursor  over the areas you have smudged to smooth them.

18. Click and drag the tool cursor  to make a single pass over the hair areas. This removes some detail in the hair area, which will make it easier to machine the relief, without losing its definition altogether.

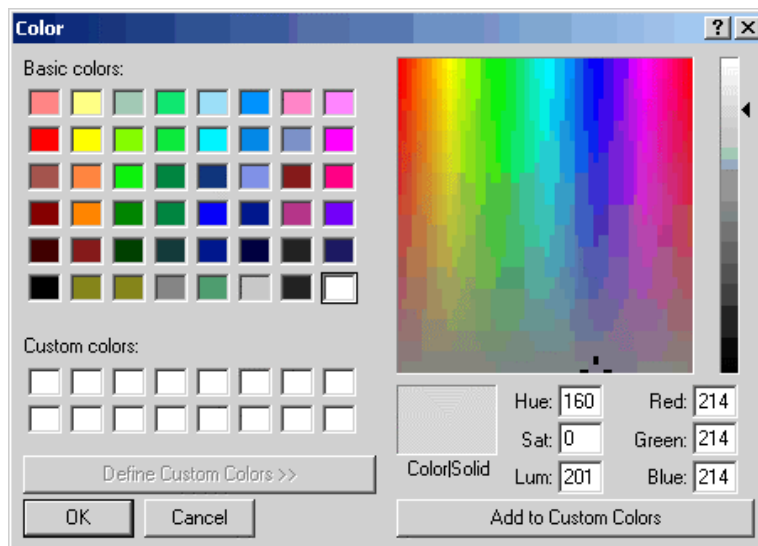
19. Click on the **Apply** button to confirm the final changes that you have made to the relief.


20. Click on the **Finish** button to return to the **Assistant's** Home page.

Lights and Material Settings

Finally we will adjust the lights and material settings used in the **3D View** window so that the sculpted relief can be seen as if it were cast in silver.

1. Click on the **Lights and Material** button  in the **Model** area to display the **Lights and Material** page.
2. In the **Shading Setup** area, click and drag the **Ambient** slider to the right to set it as *43*.
3. Click on the **Colour Palette** button  in the **Colour** area to display the **Color** dialog box:



4. Type *214* in the **Red**, **Green** and **Blue** boxes to create a colour resembling silver, and then click on the **OK** button. The silver colour is displayed in the **Material** area of the page.
5. Click on the **Reflection Map** list box, and then on the *Brushed Silver* option to select it.
6. Click on the **Background** list box, and then on the *Selected Colour* option to select it.
7. Click on the **Colour Palette** button  in the **Background** area to display the **Color** dialog box.
8. Click on the white colour in the **Basic Colours** area to select it, and then click on the **OK** button.

- Using the remaining default settings on the page, click on the **Apply** button to apply your settings to the **3D View** window.



- Click on the **Done** button to return to the **Assistant's** Home page.

Tutorial – Swept Profiles

Overview

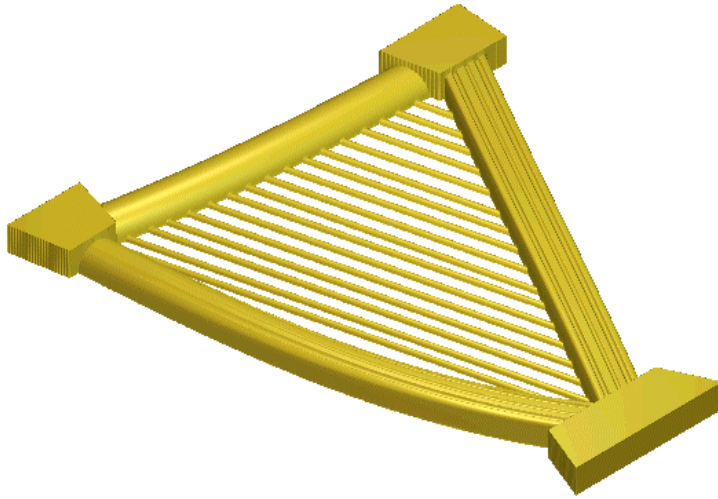
The following tutorial demonstrates how to create three different types of swept profiles using the vector drawing and vector based relief creation tools available in ArtCAM Pro. The techniques used for creating the swept profiles in this tutorial are extruding, spinning and turning.

Extruded Profile

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the joints in the harp's frame.
- Creating the harp's frame.
- Creating the harp's strings.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating an extruded profile that produces a relief in the shape of a harp:

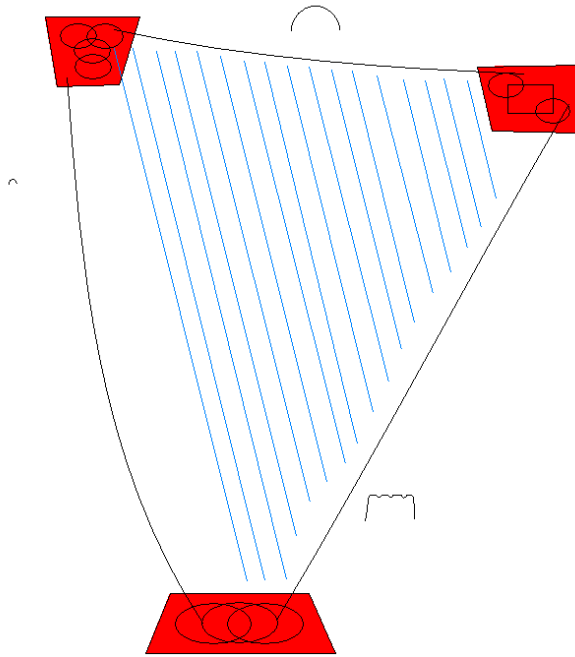


Preparing the Model

First, we will open the ArtCAM model containing the vector and bitmap artwork that will be used to create the harp relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Swept_p.
3. Click to select the file named *Harp.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the Harp model.

The following artwork appears in the **2D View** window:



The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains bitmap colours and vectors that will be used to create different shapes. These shapes are combined to create the harp relief.

Creating the Joints in the Harp's Frame

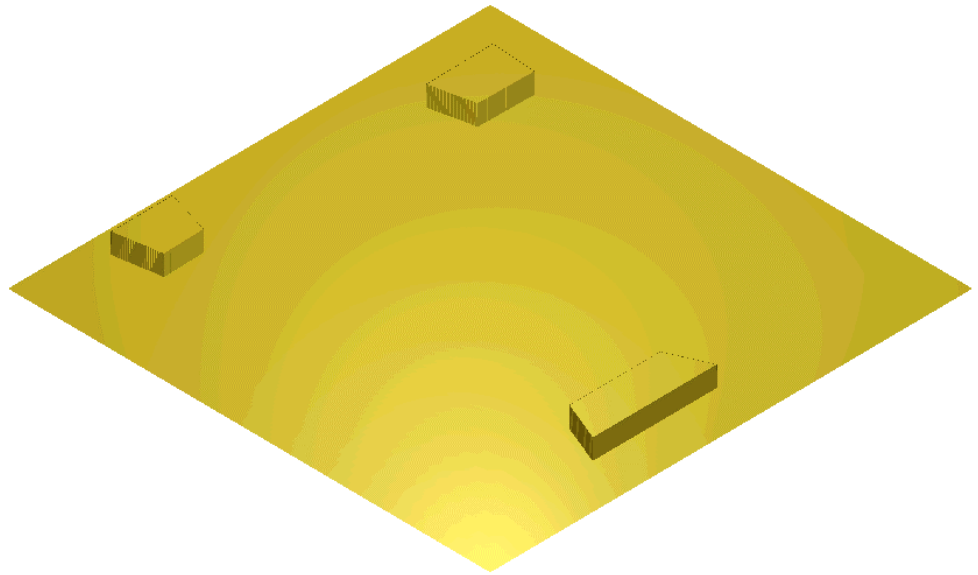
You can see that a flat shape has already been applied to the red colour. This is shown by the line on the red colour in the Colour Palette beneath the **2D View** window.

We will create the joints in the harp's frame from the red bitmap colour.

1. Click on the **Replace Relief** button  in the **Relief Operations** area of the **Assistant's** Home page.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.

2. Press the **F3** key on your keyboard to display the current relief in the **3D View** window:




Creating the Harp's Frame

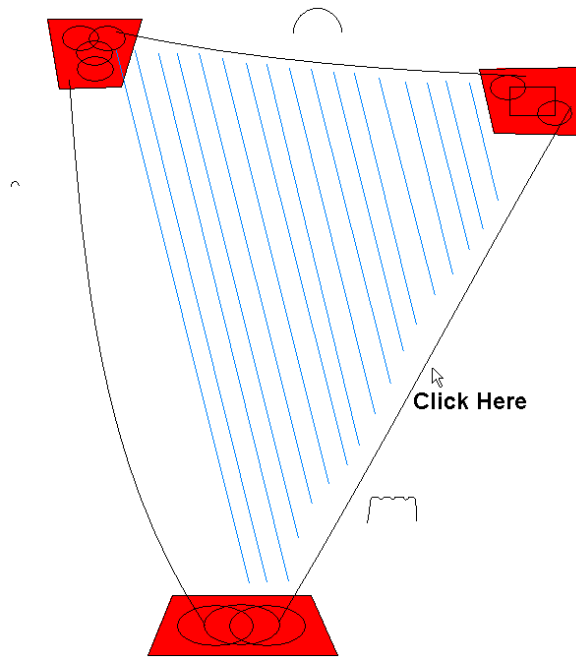
Next, we will extrude the shapes that represent the harp's frame and combine them with the existing relief. We will extrude these shapes along the vectors representing each side of the harp's frame. These vectors are referred to as drive curves. We will set the profile of the cross-section in the harp's frame using another vector object.

You will be guided through the process of selecting the drive curves and cross-sectional profiles in the model that will be used along with the **Extrude Wizard** to create shapes and combine them with the existing relief.

Creating the Right Side of the Frame

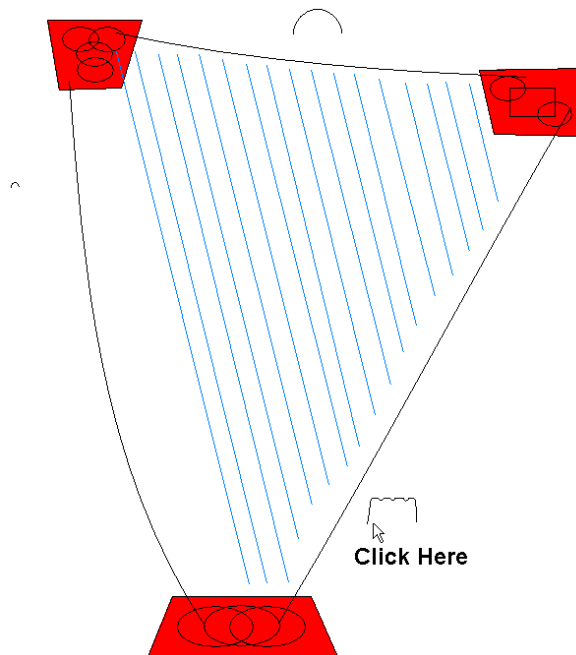
First we will create the right side of the harp's frame:

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Extrude** button  in the **Vector Based Relief Creation** area to display the **Extrude Wizard**:
3. In the **2D View** window, click to select the polyline for the right edge, as shown below:



The polyline turns magenta and is surrounded by a bounding box.

4. Click on the **Select** button in the **Extrude Wizard** to select the polyline as the drive curve. A direction arrow appears in the mid of the drive curve.
5. Click on the **Next** button. The drive curve turns red.
6. In the **2D View** window, click to select the vector that we want to use as the cross-section at the start of the extruded shape, as shown:



The vector turns magenta and is surrounded by a bounding box.

7. Click on the **Select** button in the **Extrude Wizard** to select the vector as the start profile. Direction arrows appear along the inside edge of the start profile.

This vector will also be used as the cross-sectional profile at the end of the extruded shape. If you wanted to have a blend between two different shapes at either end of the harp's frame on this edge, you could use two cross-sectional profiles.

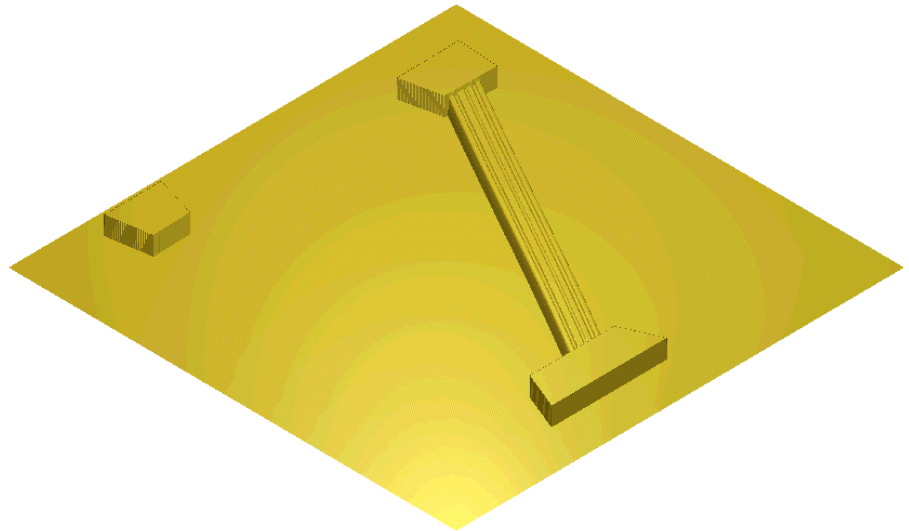
8. Click on the **Next** button. The start profile turns blue.
9. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
10. Since no z modulation vector is used in this tutorial, click on the **Next** button.

If you wanted to control the height and contour of the cross-section in the extruded shape, you could use a z modulation vector.

11. Click to select the **Merge Highest** radio button .


This option instructs ArtCAM Pro to merge the points in the extruded shape with the existing relief, so that only the highest points of the two show in the relief.

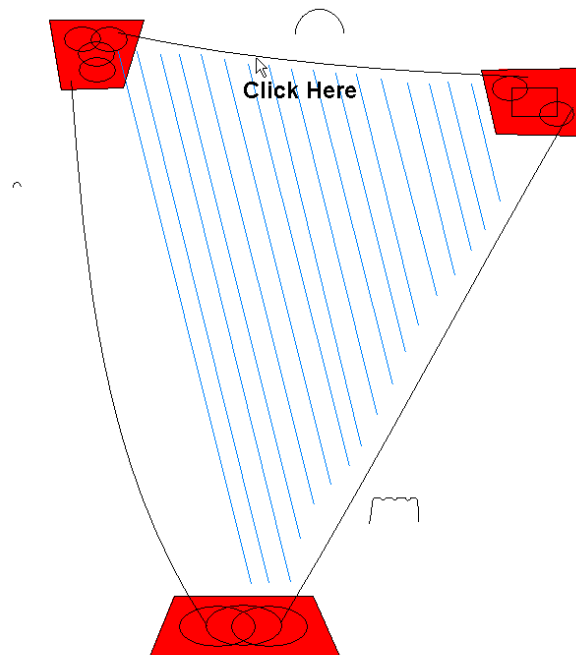
12. Click on the **Extrude** button in the **Extrude Wizard** to extrude the shape and then calculate the relief.
13. Click on the **Close** button to close the **Extrude Wizard**.
14. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Creating the Top of the Frame

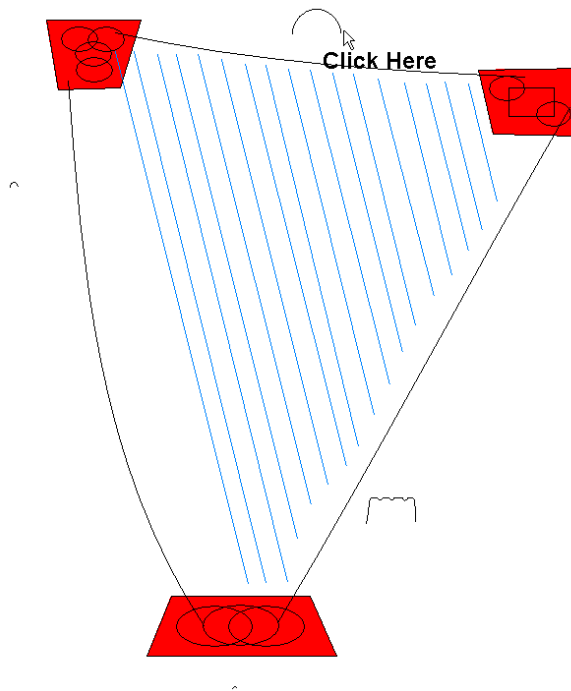
In this section, we will create the top of the harp's frame. We will use the polyline representing the top of the harp's frame as the drive curve, and the curved vector object directly above it as the start and end cross-sectional profile in the extruded shape.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Extrude** button .
3. In the **2D View** window, click to select the polyline for the top of the harp, as shown:



The polyline turns magenta and is surrounded by a bounding box.

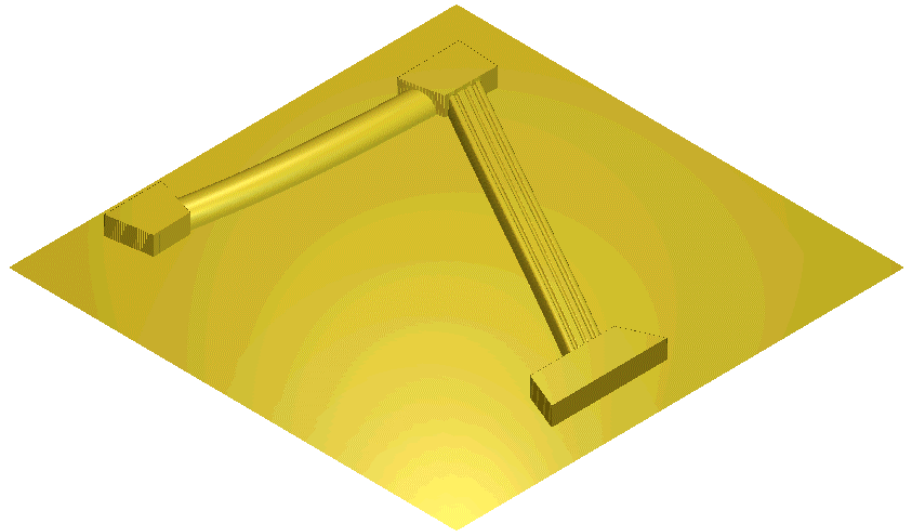
4. Click on the **Select** button in the **Extrude Wizard** to select the polyline as the drive curve. A direction arrow appears in the mid of the drive curve.
5. Click on the **Next** button. The drive curve turns red.
6. In the **2D View** window, click on the vector object that we want to use as the cross-section at the start and the end of the extruded shape:



The vector turns magenta and is surrounded by a bounding box.


7. Click on the **Select** button in the **Extrude Wizard** to select it as the start profile. A direction arrow appears in the mid of the start profile.
8. Click on the **Next** button. The start profile turns blue.
9. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
10. Click on the **Next** button.
11. Click to select the **Merge Highest** radio button , and then click on the **Extrude** button in the **Extrude Wizard** to extrude the shape and calculate the relief.
12. Click on the **Close** button to close the **Extrude Wizard**.

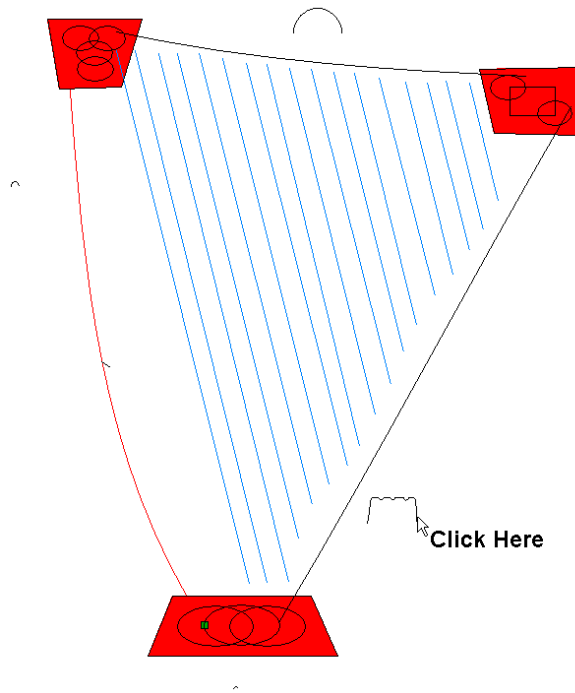
The relief in the **3D View** window now looks like this:



Creating the Left Side of the Frame

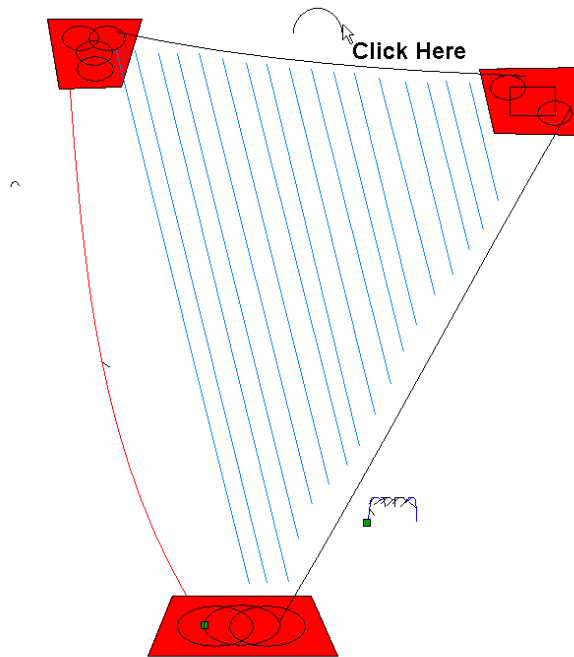
We are now ready to create the left side of the harp's frame using the same techniques. However, for this shape we will use a different cross-sectional profile for each end of this part of the harp's frame:

1. Click on the **Extrude** button .
2. In the **2D View** window, click to select the polyline for the left-edge of the harp, as shown:
3. Click on the **Select** button in the **Extrude Wizard** to select the polyline as the drive curve. A direction arrow appears in the mid of the drive curve.
4. Click on the **Next** button. The drive curve turns red.
5. In the **2D View** window, click to select the polyline shown below:



The vector turns magenta and is surrounded by a bounding box.

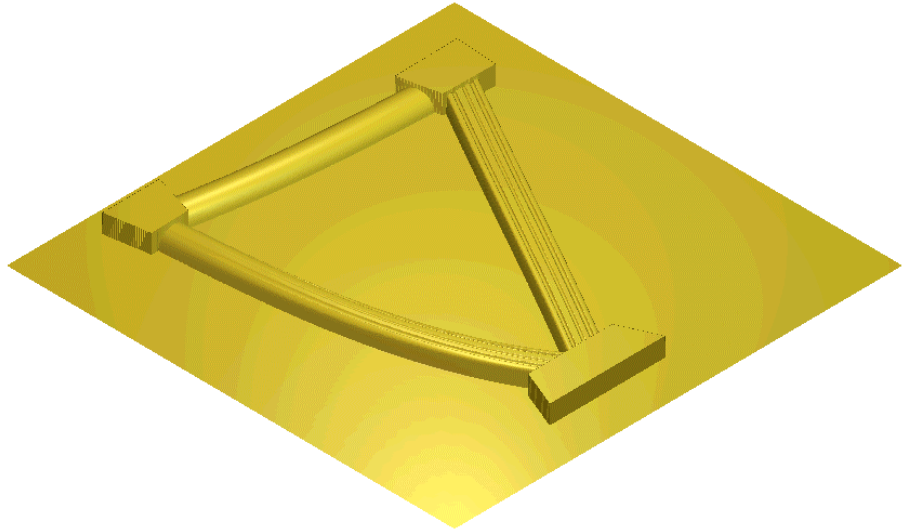
6. Click on the **Select** button in the **Extrude Wizard** to select the vector as the start profile. A direction arrow appears in the mid of the start profile.
7. Click on the **Next** button. The start profile turns blue.
8. Click to deselect the **End profile is the same as the start profile** option .
9. In the **2D View** window, click to select the vector shown as follows:



The vector turns magenta and is surrounded by a bounding box.



10. Click on the **Select** button in the **Extrude Wizard** to select the vector as the end profile. A direction arrow appears in the mid of the end profile.
11. Click on the **Next** button. The end profile turns blue.
12. Click on the **Next** button.
13. Click to select the **Merge Highest** radio button , and then click on the **Extrude** button in the **Extrude Wizard** to extrude the shape and calculate the relief.
14. Click on the **Close** button.

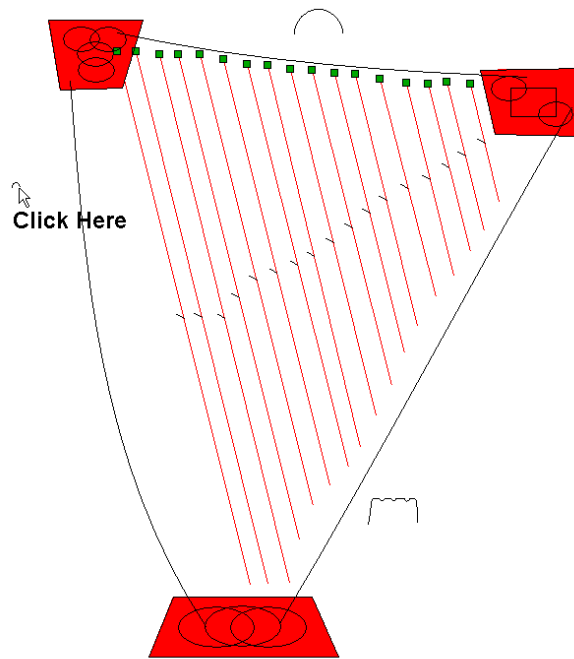
The harp's frame is now complete, as you can see in the **3D View** window:



Creating the Harp's Strings

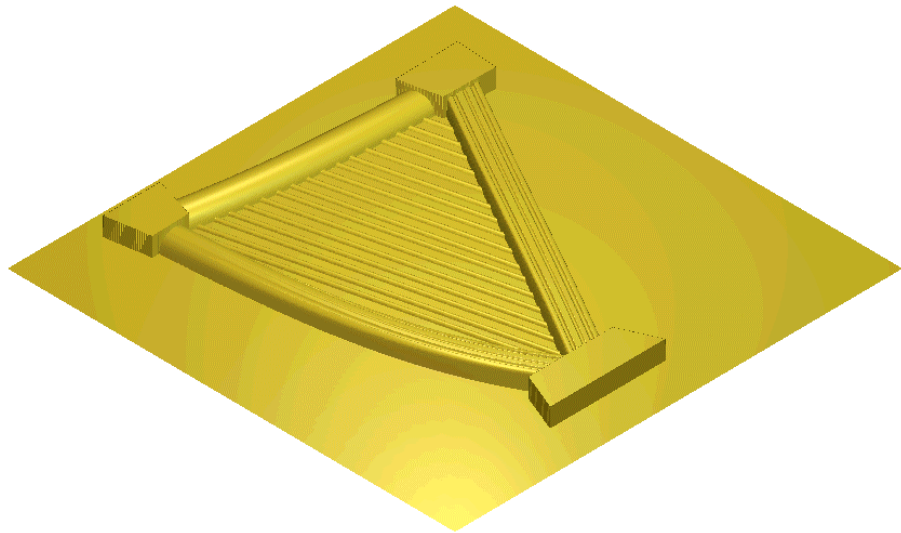
We are now ready to create the strings in the harp using the same techniques as for the harp's frame, but here we can extrude all of the strings at once as the vectors representing them all have the same shape and are grouped together:


1. Click on the **2D View** button  in the **3D View** toolbar to display the **2D View** window.
2. Click on the **Extrude** button .
3. In the **2D View** window, click on any of the vectors representing the harp strings. As the strings are grouped together, therefore all of the strings turn purple and are surrounded by a bounding box.
4. Click on the **Select** button in the **Extrude Wizard** to select each string as a drive curve. A direction arrow appears in the mid of each drive curve.
5. Click on the **Next** button. Each drive curve turns red.
6. Click on the cross-sectional profile we will use for the strings, as shown:

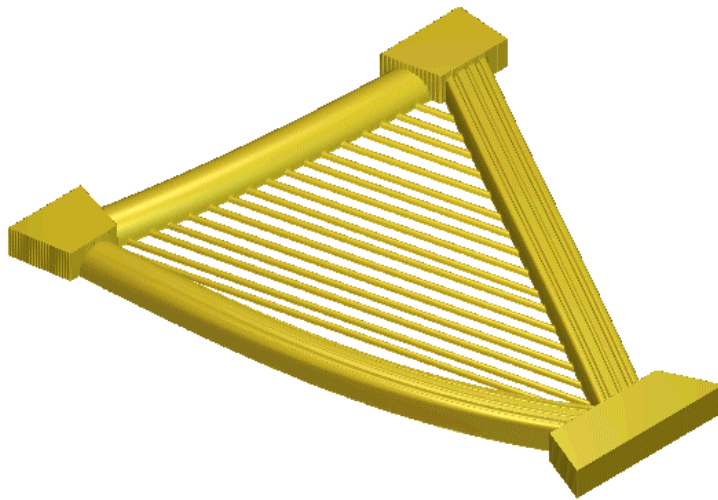


The vector turns magenta and is surrounded by a bounding box.

7. Click on the **Select** button in the **Extrude Wizard** to use the vector as the start profile. A direction arrow appears in the mid of the start profile.
8. Click on the **Next** button. The start profile turns blue.
9. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
10. Click on the **Next** button.
11. Click to select the **Merge Highest** radio button , and then click on the **Extrude** button in the **Extrude Wizard** to extrude the shape and calculate the relief.
12. Click on the **Close** button.
13. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



14. Click on the **Draw Zero Plane** button  in the **3D View** toolbar to hide the zero plane in the relief and view the finished harp more clearly:



Spun Profile

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the spun shape.
- Creating the shape of the leaves.
- Creating the spine in the leaves.
- Smoothing the relief.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating a spun profile that produces a relief in the shape of a group of leaves:

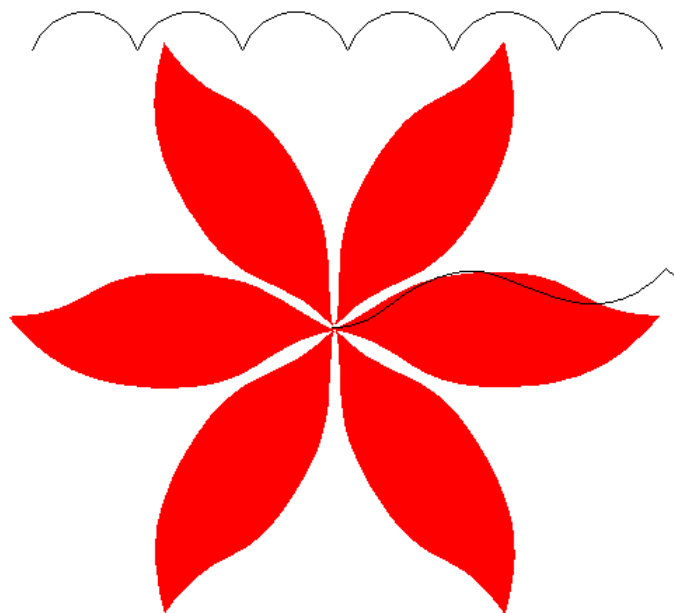


Preparing the Model

First, we will open the ArtCAM model containing the vector and bitmap artwork that will be used to create the relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Swept_p.
3. Click to select the file named *Spinleaf.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the model.

The following artwork appears in the **2D View** window:




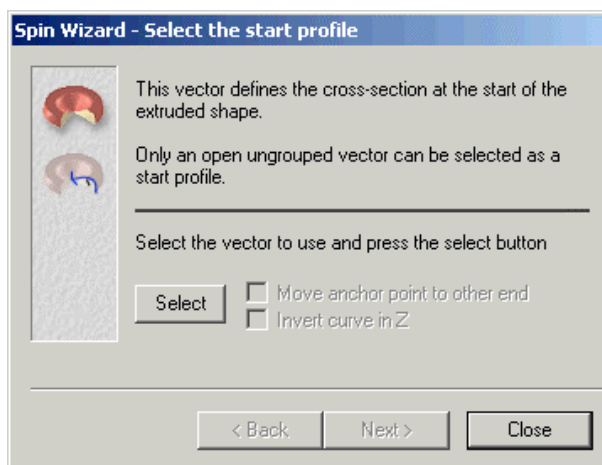
The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains bitmap colours and vector objects that will be used to create different shapes. These shapes are combined to create the relief.

Creating the Spun Shape

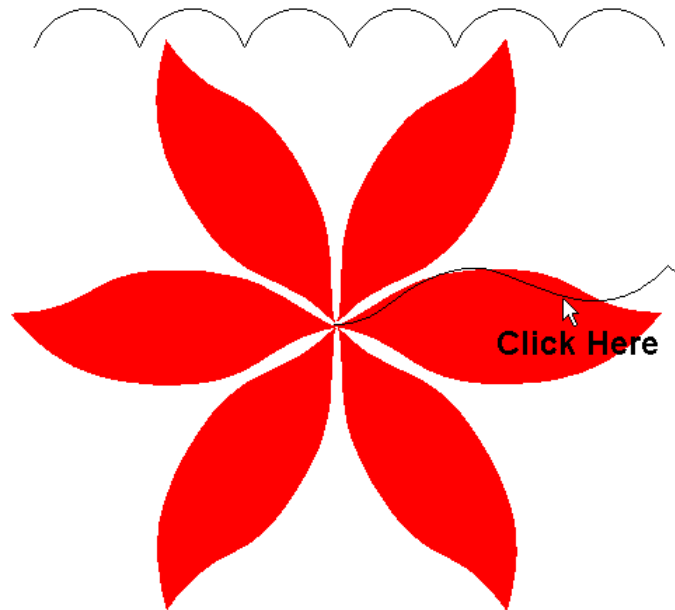
Next, we will spin the shape of a rippled disc, from which we will create the shape of the leaves. We will spin this shape using the vector object starting in the centre of the bitmap image of the leaves. This is referred to as the cross-sectional profile. We will set the the height and contour of the cross-section in the spun shape using the vector object above the bitmap image of the leaves. This is referred to as the z modulation vector.

You will be guided through the process of selecting the cross-sectional profile and the z modulation vector in the model that will be used along with the Spin Wizard to create a shape and combine it with the existing relief.

1. Click on the **Spin** button  in the **Vector Based Relief Creation** area to display the **Spin Wizard**:

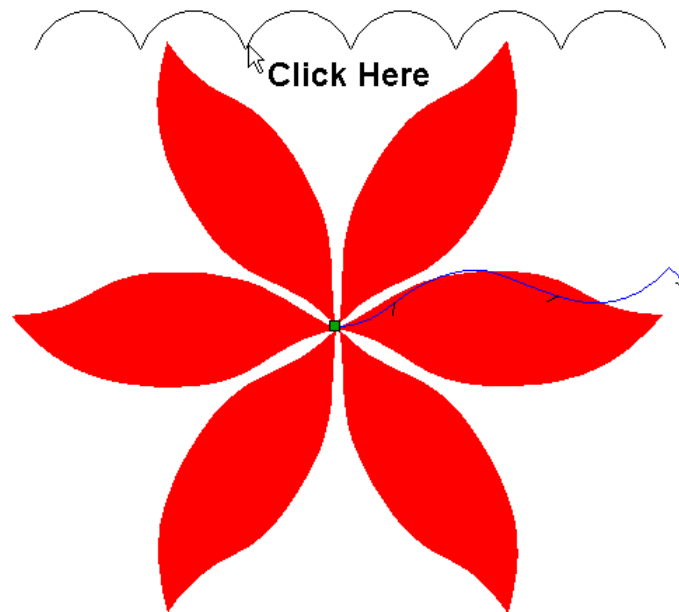


2. In the **2D View** window, click to select the polyline for the start profile, as shown:

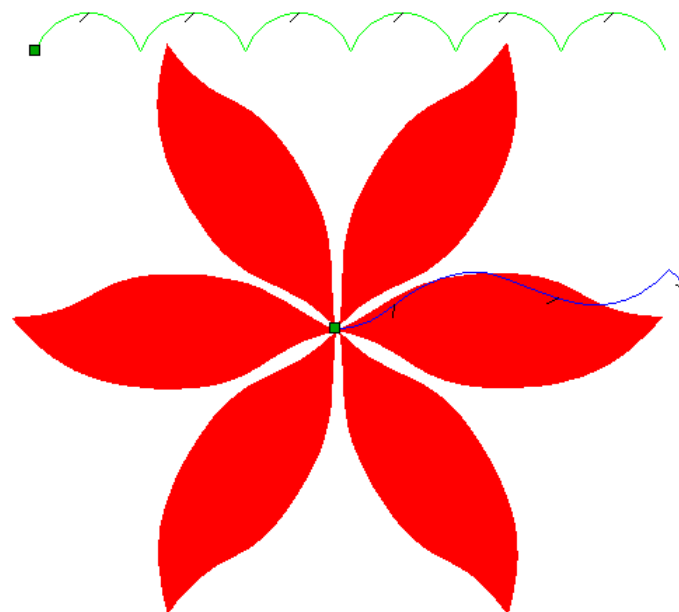


The polyline turns magenta and is surrounded by a bounding box.

3. Click on the **Select** button in the **Spin Wizard** to select the polyline as the start profile. You can see direction arrows all along its inside edge.
4. Click on the **Next** button. The start profile turns blue.
5. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
6. Make sure that the **Sweep through 360 degrees** option is selected , and then click on the **Next** button.
7. Click to select the **Use a z modulation vector** option .
8. In the **2D View** window, click to select the polyline for the z modulation vector, as shown:



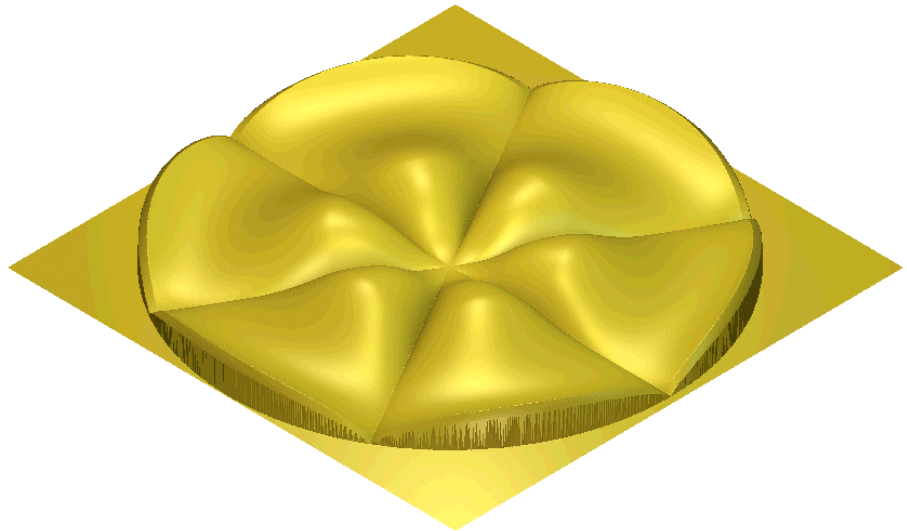
9. Click on the **Select** button in the **Spin Wizard** to select the polyline as the z modulation vector:



This instructs ArtCAM Pro to use the shape of the z modulation vector to control the height of the cross-section in the spun shape. The z modulation vector turns green and you can see direction arrows all along its inside edge.

10. Click on the **Next** button.
11. Click to select the **Add** radio button .

12. Click on the **Spin** button in the **Spin Wizard** to spin the shape and then calculate the relief.
13. Click on the **Close** button to close the **Spin Wizard**.
14. Press the **F3** key on your keyboard display the relief in the **3D View** window:



Creating the Shape of the Leaves

Next, we will create the shape of the leaves from the existing relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on red in the Colour Palette beneath the **2D View** window to select it as the Primary Colour.

The Colour Palette appears as follows:



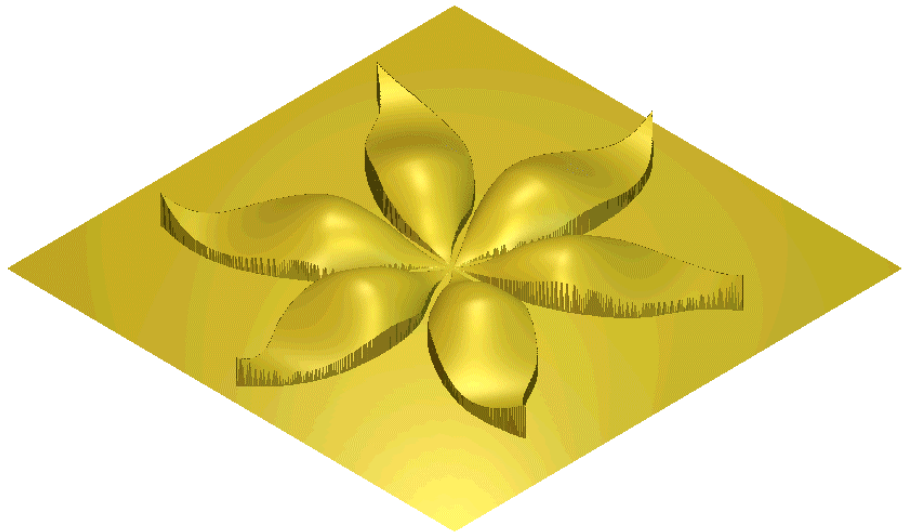
You can see that the red and green colours are linked together. This means that the green colour is treated as the same as the red.

3. Click on the **Keep Under Colour** button  in the **Relief Editing** area of the **Assistant's** Home page.

This option instructs ArtCAM Pro to reset the height of all areas of the existing relief not under the current Primary Colour to zero.

4. Press the **F3** key on your keyboard to display the **3D View** window.

The shape of the leaves is made, as you can see in the **3D View** window:



Creating the Spine in the Leaves

An angled shape with an angle of -45° has already been applied to the green colour in the *Spinleaf* model. This can be confirmed by double-clicking on the colour to display the **Shape Editor** dialog box.

We will create the spine in the leaves from the green bitmap colour used in the *Spinleaf* model.

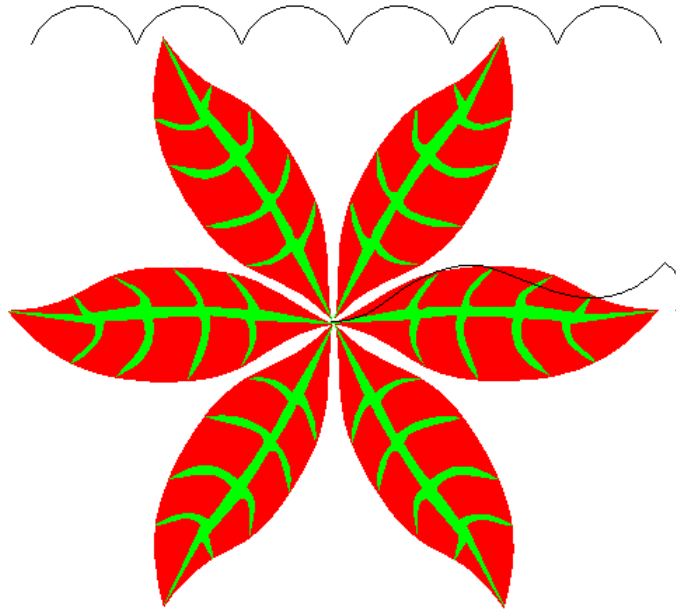
1. Press the **F2** key on your keyboard to display the **2D View** window.
2. From the Main menu bar, click on the **Colour** menu, and then click on the **Reset All Links** option to unlink the red and green colours in the Colour Palette.


The Colour Palette appears as follows:



The line drawn over the green colour indicates that an angled shape has already been applied to the colour.

You can see that the green colour in the Colour Palette represents the spine in the leaves:

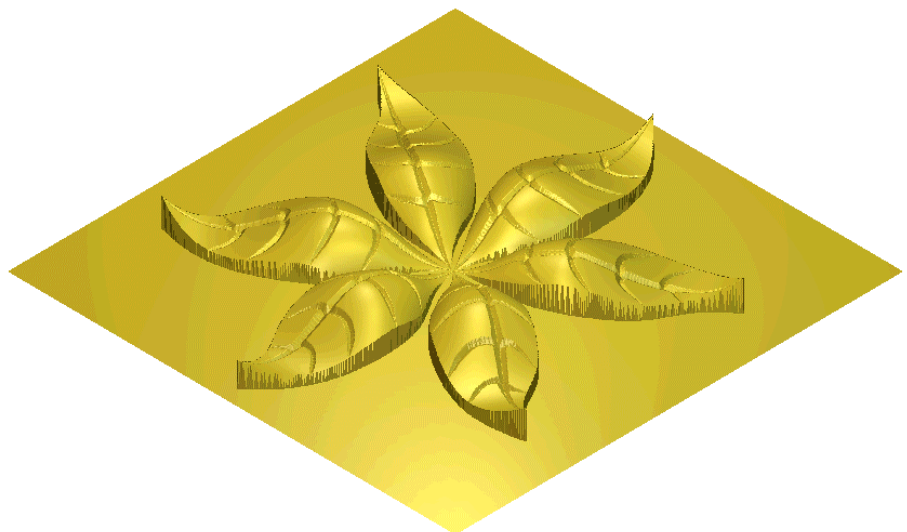


3. Click on the **Add Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to calculate the new relief.

This option instructs ArtCAM Pro to add the points in the angled shape to the current relief.


4. Press the **F3** key on your keyboard to display the **3D View** window.

The leaves are now complete, as you can see in the **3D View** window:



Smoothing the Relief


Finally, we will smooth the relief to improve the appearance of its surface.

1. Click on the **Smooth Relief** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Smooth Relief** dialog box:



2. Make sure that the **Whole Relief** option is selected by clicking on its radio button .
3. Type 5 in the **Smoothing Passes** box.
4. Click on the **Apply** button to smooth the relief.
5. Click on the **Cancel** button to close the **Smooth Relief** dialog box.
6. Press the **F3** key on your keyboard to display the smoothed relief in the **3D View** window:



- Click on the **Draw Zero Plane** button  in the **3D View** toolbar to hide the zero plane and view the finished leaves more clearly:

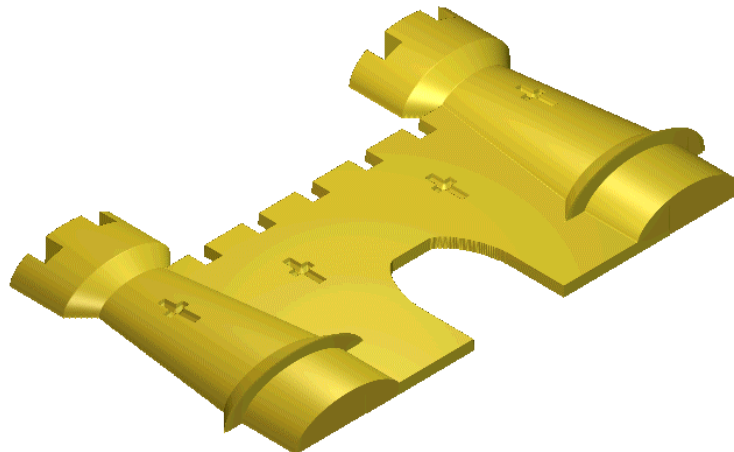


Turned Profile

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the turned shapes.
- Creating the turret crenellations.
- Creating the face of the castle.
- Creating the arrow-slits in the castle.
- Saving the model.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating a relief in the shape of the castle. This includes the turned profiles for each of the castle's towers.



Preparing the Model

First, we will open the ArtCAM model containing the artwork that will be used to create the castle relief:

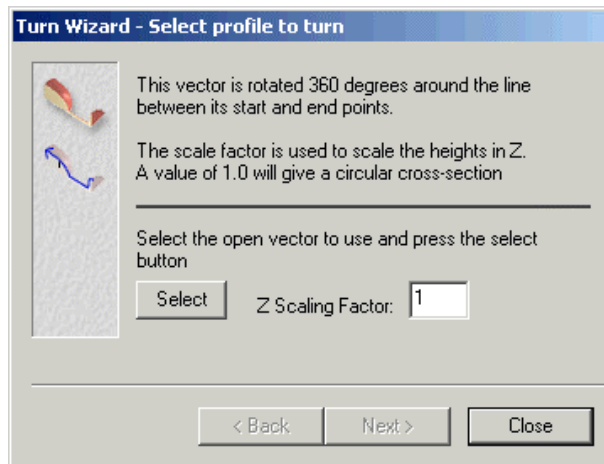
1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Castle.
3. Click to select the file named *Castle.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the model.

The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains three **2D View** windows, each of them containing different views of the castle artwork. We will use the bitmap colours and vector objects in each of these views to create different shapes and combine them to form the castle relief. The **Castle View1** window will be used to create the castle turrets, the **Castle View2** window will be used to create the face of the castle and the **Castle View3** window will be used to create the arrow-slits in the castle.

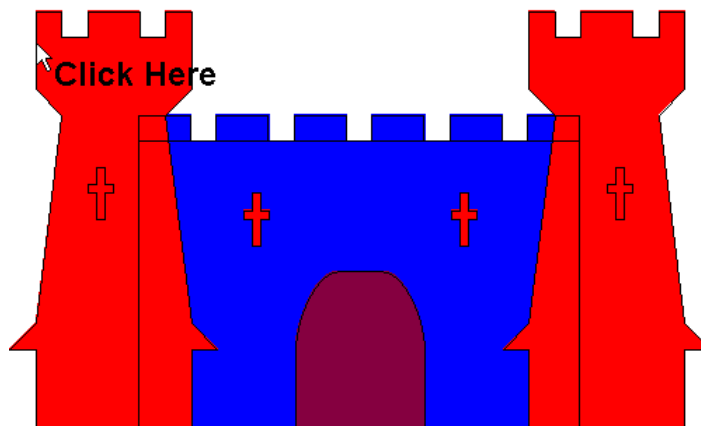
Creating the Turned Shapes

We will create the castle turrets using two turned profiles.

1. Click anywhere in the **Castle View1** window to select it as the current view.
2. Click on the **Turn** button  in the **Vector Based Relief Creation** area of the **Assistant's Home** page to display the **Turn Wizard**:



3. In the **Castle View1** window, click to select the polyline along the edge of the left turret, as shown below:

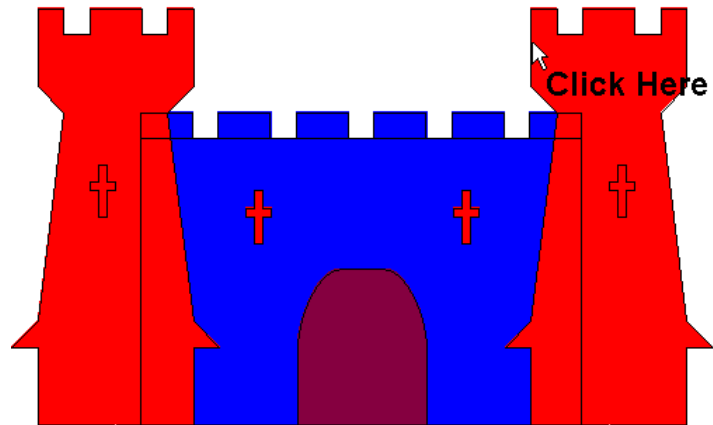


The polyline turns magenta and is surrounded by a bounding box.

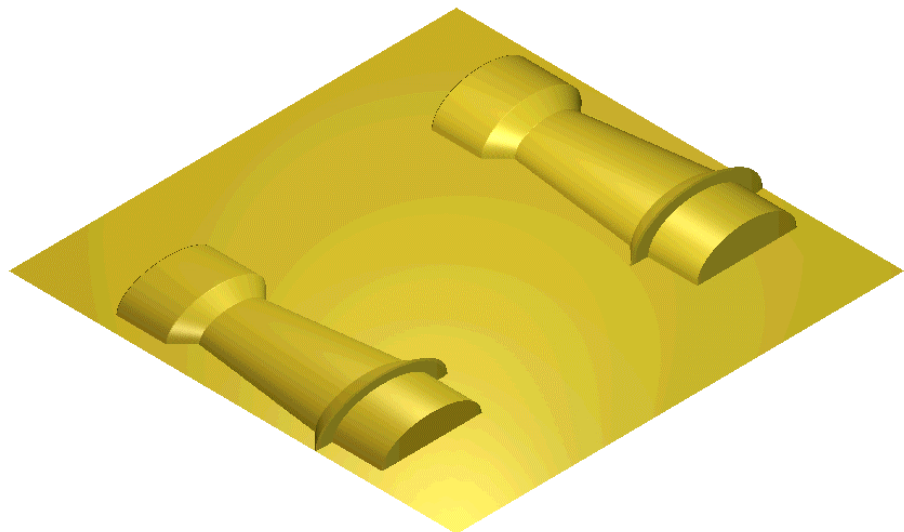
4. Click on the **Select** button in the **Turn Wizard** to select the ployline as the profile to turn. Direction arrows appear all along its outside edge.
5. Type *0.5* in the **Z Scaling Factor** box.
6. Click on the **Next** button. The profile turns blue.
7. Click to select the **Add** radio button .

This option instructs ArtCAM Pro to add the points in the turned shape to the current relief.

8. Click on the **Turn** button in the **Turn Wizard** to create the turret's turned shape and calculate the relief.
9. Repeat these steps to create the right turret using the profile shown below:




10. When you have created the second turret, click on the **Close** button to close the **Turn Wizard**.
11. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



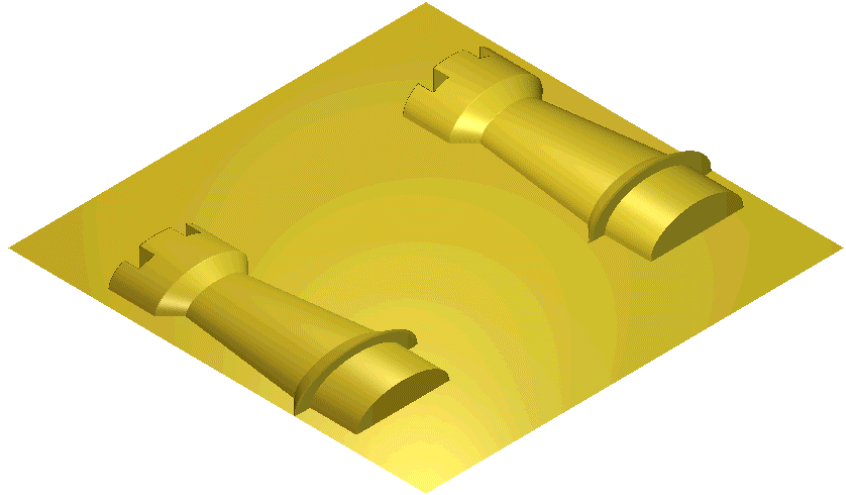
Creating the Turret Crenellations

We will now create the crenellations in both of the castle turrets from the existing relief:

1. Press the **F2** key on your keyboard to display the **Castle View1** window.
2. Click on the white colour in the Colour Palette beneath the **Castle View1** window to select it as the Primary Colour.
3. Click on the **Zero Relief Under Colour** button  in the **Relief Editing** area of the **Assistant's** Home page.

All areas of the current relief under the current Primary Colour are set to zero.

4. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Creating the Face of the Castle

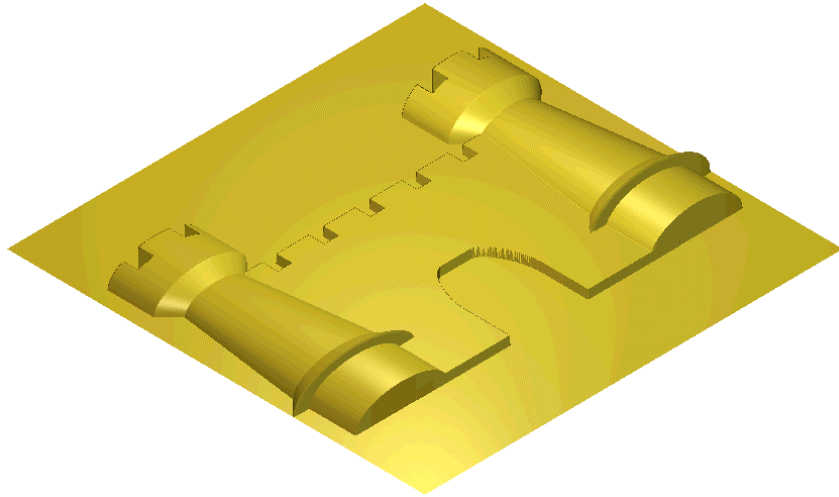
When the *Castle* model was created, the artisan applied a flat shape to the blue bitmap colour used in the **Castle View 2** window. This is shown by the line drawn on the blue colour in the Colour Palette beneath the window. We will create a shape from this colour, combining it with the existing relief, which is shown in the **3D View** window.

1. Press the **F2** key on your keyboard to display the **Castle View1** window.
2. Click on the **Castle View 2** window to make it active.

3. Click on the **Merge High** button  in the **Relief Operations** area of the **Assistant's** Home page.

This option instructs ArtCAM Pro to merge the points in the flat shape with the existing relief, so that only the highest points of the two show in the new relief.

4. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:




Creating the Arrow-slits in the Castle

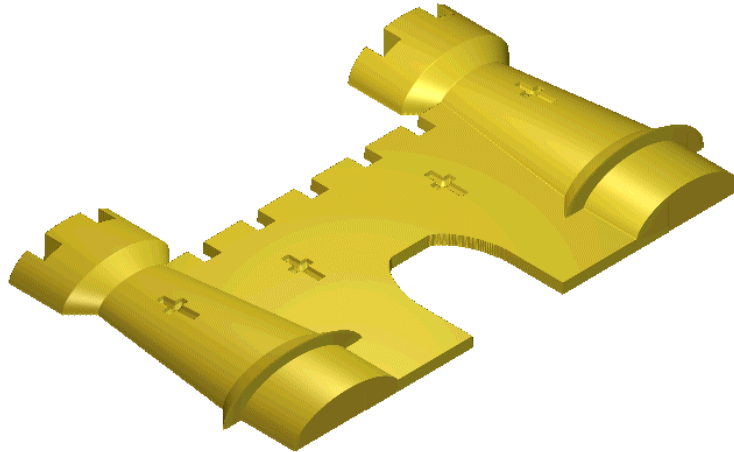
When the *Castle* model was created, the artisan applied an angled shape to the green bitmap colour used in the **Castle View 3** window. This is shown by the line drawn on the green colour in the Colour Palette beneath the window. We will create shapes from this colour, combining them with the existing relief, which is shown in the **3D View** window.

1. Press the **F2** key on your keyboard to display the **Castle View 2** window.
2. Click on the **Castle View 3** window to make it active.

3. Click on the **Add Relief** button .

This option instructs ArtCAM Pro to add the points in the angled shape to the current relief. As the angled shape has a negative value, this has the effect of removing material from the relief.

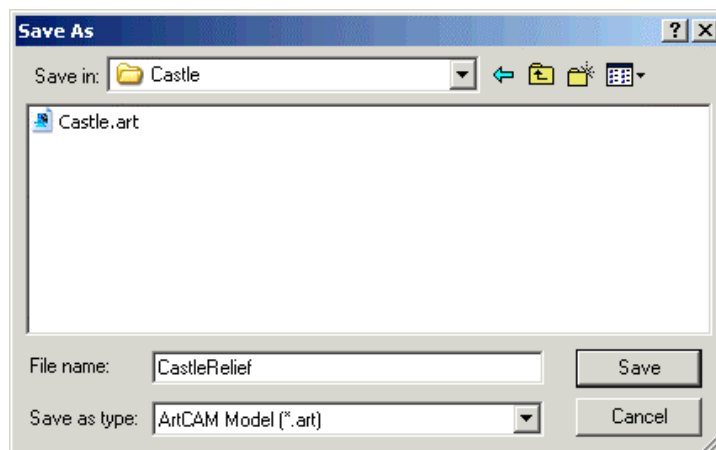
4. Press the **F3** key on your keyboard to display the new relief in the **3D View** window.
5. Click on the **Draw Zero Plane** button  in the **3D View** toolbar to hide the zero plane and view the finished castle more clearly:



Saving the Model

We are now ready to save the finished model:

1. From the Main menu bar, click on the **File** option to display the **File** menu, then click on the **Save As...** option to display the **Save As** dialog box:



You should already be in the ArtCAM Pro 7.0\Examples\Castle directory. If you are not, go to this directory before continuing to the next step.

2. Type *CastleRelief* in the **File name** box.
3. Click on the **Save** button to close the **Save As** dialog box and save the ArtCAM Pro model.

Tutorial – 3D Blend

Overview

The following tutorial demonstrates how to create smooth, or blended, shapes from vector artwork using the Relief Editing tools, render a relief using the Lights and Material Settings, and create a triangle model using the Relief Operations tools available in ArtCAM Pro.

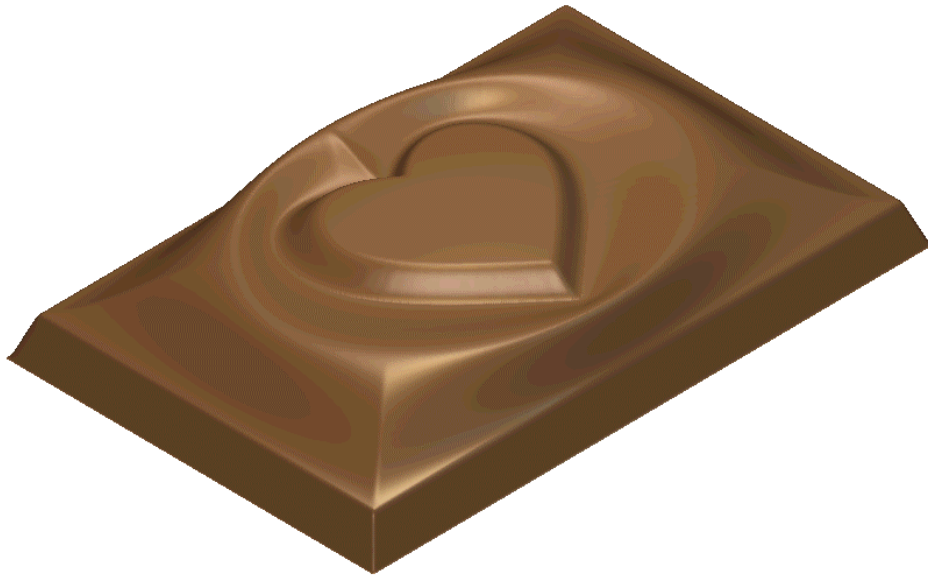
Chocolate Mould

The stages that you will cover during the course of this tutorial are:

- Preparing the model.
- Creating the vector artwork.
- Creating the relief.
- Rendering the relief.
- Creating a triangle model and finding the weight of the finished product.


The tutorial will lead you through each of these stages, guiding you through the complete process of using vector artwork and the 3D Blend tool to produce the three-dimensional shapes that make up the chocolate mould relief and rendering them so that they appear as if manufactured in chocolate. From the relief, a triangle mesh is created so that the mould can be sent for rapid prototyping and the required amount of chocolate can be calculated.

The chocolate mould relief that you will create during this tutorial is shown as follows:



Preparing the Model

First we will set up the dimensions for the block of material needed for this particular job:

1. Click on the **Create New Model** icon  on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:
2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *40 mm (1.57")* in the **Height** box and *60 mm (2.36")* in the **Width** box.
4. Click on the centre of the white box diagram to set the job origin in the centre of the model.
5. Click and drag on the **Resolution** slider to set the resolution of the model to *159740* points.
6. Click on the **OK** button to close the **Size For New Model** dialog box.


A **2D View** automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis. A **3D View** window is also created.

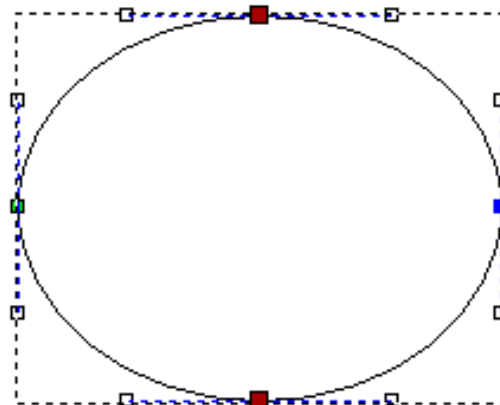
Creating the Vector Artwork

The next stage is to create the vector artwork needed to produce the blended shape that will be used to manufacture the chocolate mould.

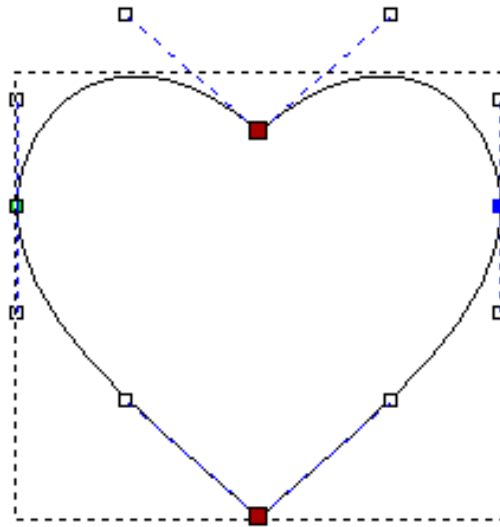
Creating the Heart-Shaped Vector

First, we will create an ellipse and then convert it into a heart-shaped vector by repositioning two points within the ellipse, whilst working in Node Editing mode.

1. Click on the **Create Ellipse** button  in the **Vector Editing** area to display the **Ellipse Creation** page.
2. Type 20 mm (0.79") in the **Height** box and 25 mm (0.98") in the **Width** box.
3. Make sure that the value in the **Angle** box remains at the default setting of 0°.
4. Click on the **Preview** button to view the ellipse in the **2D View** window.
5. Click on the **Create** button to create the ellipse, centred on the model's origin.
6. Click on the **Close** button to return to the **Assistant's** Home page.
7. Make sure that the ellipse is selected by clicking on it.
8. Press the **N** key on your keyboard to enter **Node Editing** mode. A bounding box surrounds the selected ellipse, within which you can see the spans, points and control points that make up the vector.
9. Click and drag to create a bounding box around the two central points within the ellipse. The selected points turn red, indicating that they are selected, as shown below:




10. Use the **Down Arrow** ↓ key on your keyboard to 'nudge' the selected points downward vertically until the ellipse takes the form of a heart shape:

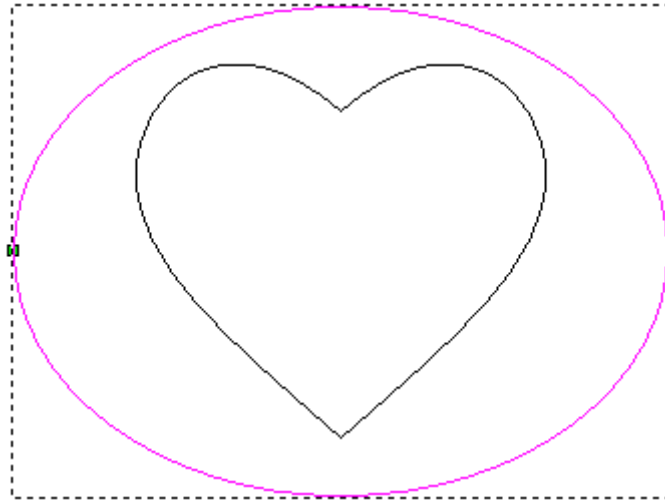


11. Press the **Esc** key on your keyboard to return to **Select Vectors** mode.
12. With the heart-shaped vector selected, press the **F9** key on your keyboard to position it in the centre of the model area (the white area).

Creating the Central Ellipse



Next, we will create a second ellipse that will surround the heart-shaped vector that we have created.

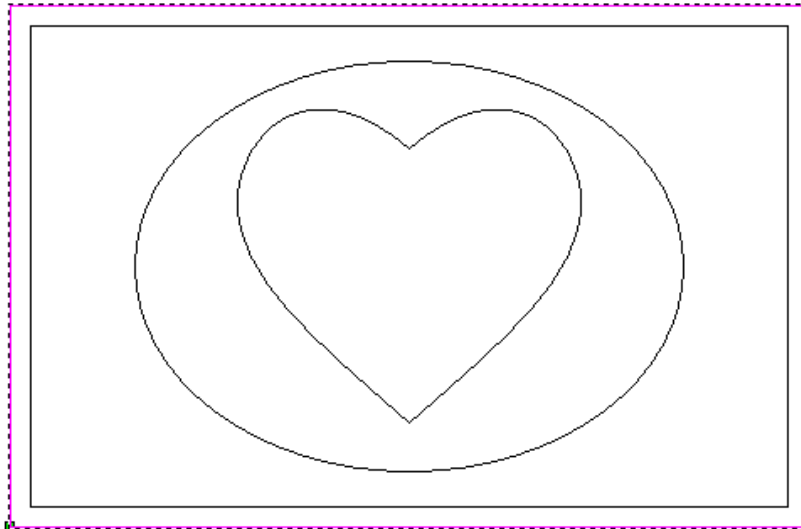
1. Click on the **Create Ellipse** button  in the **Vector Editing** area to display the **Ellipse Creation** page.
2. Type **30 mm (1.18")** in the **Height** box and **40 mm (1.57")** in the **Width** box.
3. Make sure that the value in the **Angle** box remains at the default setting of 0° .
4. Click on the **Create** button to create the ellipse.
5. Click on the **Close** button to return to the **Assistant's** Home page.
6. With the ellipse selected, press the **F9** key on your keyboard to position it in the centre of the model area (the white area).



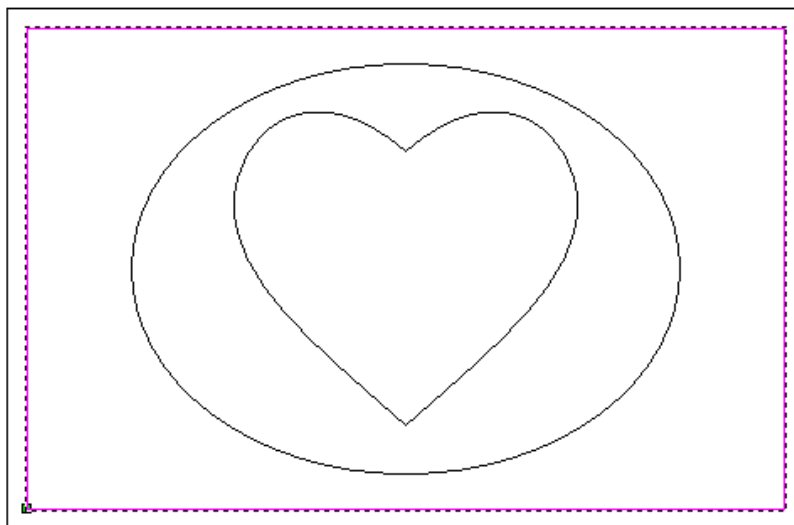
Creating the Rectangle Border

Finally, we will create two rectangular vectors that we will make up the border of the chocolate mould design:

1. Click on the **Create Rectangle** button  in the **Vector Editing** area to display the **Rectangle Creation** page.
2. Make sure that the **Rectangle** option is selected .
3. Type 55 mm (2.17") in the **Height** box and 35 mm (1.38") in the **Width** box.
4. Click on the **Create** button to create the first rectangle in the model area.]
5. Type 58 mm (2.28") in the **Height** box and 38 mm (1.50") in the **Width** box.
6. Click on the **Create** button to create the second rectangle in the model area.
7. Click on the **Close** button to return to the **Assistant's** Home page.



8. In the **2D View** window, make sure that the outside rectangle is selected by clicking on it.
9. Press the **F9** key on your keyboard to position it in the centre of the model area.
10. Click to select the inside rectangle, and then press the **F9** key on your keyboard to position it in the centre of the model area.



All of the vectors that you have drawn, as illustrated above, complete the vector artwork needed to produce the chocolate mould.

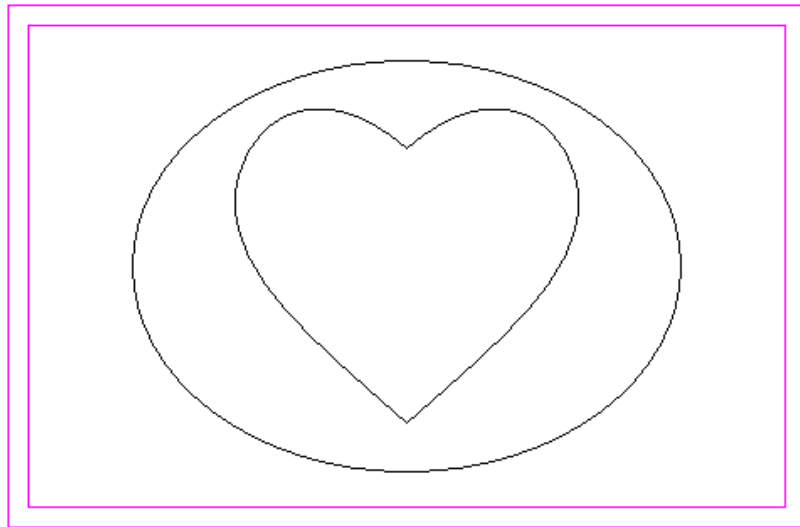
Creating the Relief



We are now ready to create the blended shapes that make up the chocolate mould relief using the vector artwork shown in the **2D View** window and the **3D Blend** tool.

Creating the Base Shape


First, we will create the blended shape that will be used as the base of the chocolate mould relief.

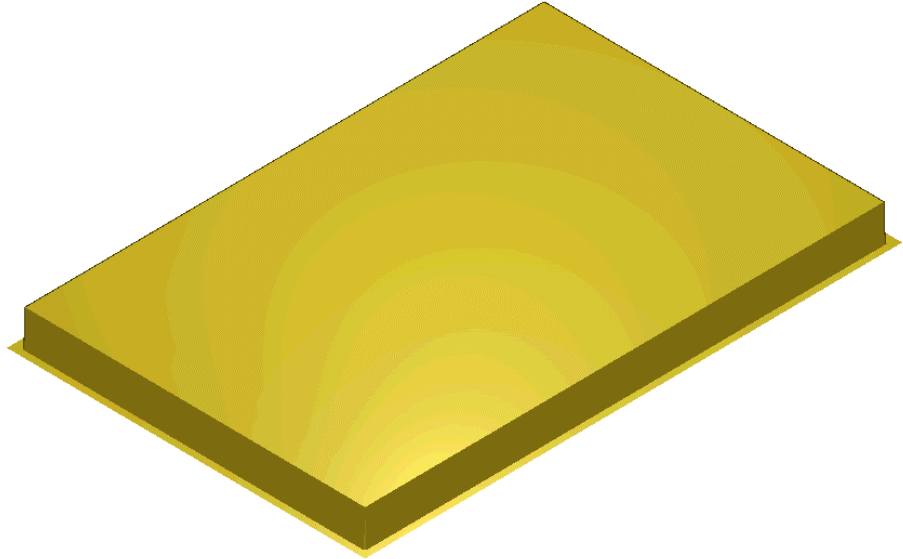
1. Make sure that the inner rectangle is selected by clicking on it.
2. Hold down the **Shift** key on your keyboard, and then click to select the outer rectangle. Both rectangles are shown in magenta.



3. Click the **Create 3D Blend** button  in the **Relief Editing** area of the **Assistant's** Home page.
4. In the **Profile** area, make sure that the **Linear** radio button is selected.
5. In the **Heights** area, make sure that both of the **From Relief** options are deselected.
6. Type *4 mm (0.16")* in the **Inner** box, and leave the default value of *0* in the **Border** box.
7. In the **Blend from Border to** area, click to select the **Inner Vector Edge** radio button .
8. Make sure that the **Fill Inner Vector** option is selected.
9. Make sure that the **Proportion** is set to 100%.


These settings instruct ArtCAM Pro to blend the outside (border) rectangle with a height of *0*, to the inside (inner) rectangle with a height of *4 mm (0.16")* and fill in-between the two vectors with a solid shape. The profile of the blend will be linear.

10. In the **Combine** area, click to select the **Add** radio button . This instructs ArtCAM Pro to add the points in the blended shape to the current relief.
11. Click on the **Create Blend** button.
12. Press the **F3** key on your keyboard to display the base relief in the **3D View** window:

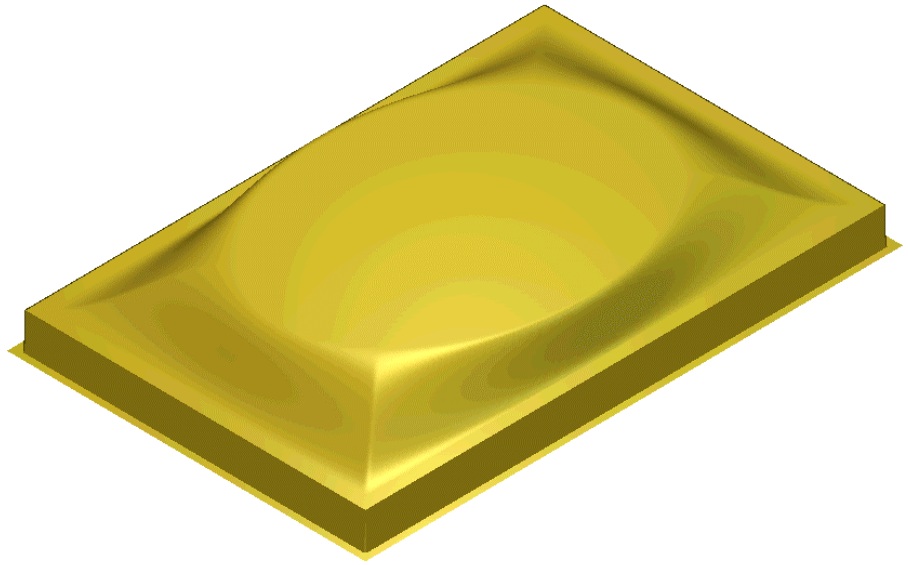


Creating the Base for the Heart Shape

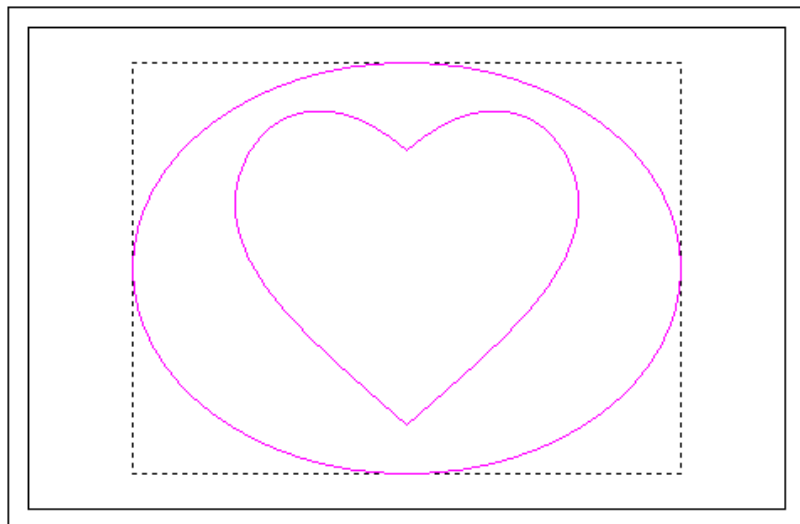
Next we will create a blended shape from the top of the base relief, as defined by the inside rectangle, to the ellipse surrounding the heart shaped-vector, and then combine it with the existing relief. We will also create a recess between the ellipse and the hear-shaped vector ready for when we create the heart shape.

1. Press the **F2** key on your keyboard to return to the **2D View** window.
2. In the **2D View** window, click anywhere in the model area (white area) to deselect the current vectors, and then click to select the inside rectangle.
3. Hold down the **Shift** key on your keyboard, and then click to select the ellipse.
4. In the **Profile** area of the **3D Blend** page, click to select the **Smooth** radio button .
5. Using all of the existing settings displayed on the **3D Blend** page, click on the **Create Blend** button to add the blended shape with the existing relief.

6. Press the **F3** key on your keyboard to display the relief in the **3D View** window:

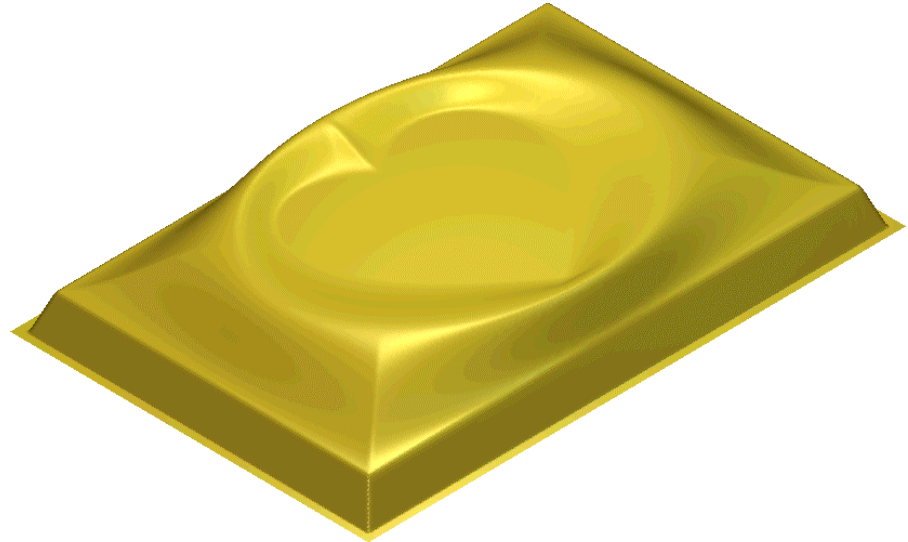


7. Press the **F2** key on your keyboard to return to the **2D View** window.
8. In the **2D View** window, click anywhere in the model area (white area) to deselect the current vectors, and then click to select the ellipse.
9. Hold the **Shift** key down on your keyboard, and then click to select the heart vector.



10. In the **Heights** area of the **3D Blend** page, type 2 mm (0.08") in the **Inner** box.
11. In the **Combine** area, click to select the **Subtract** radio button to instruct ArtCAM Pro to subtract the blended shape from the existing relief.

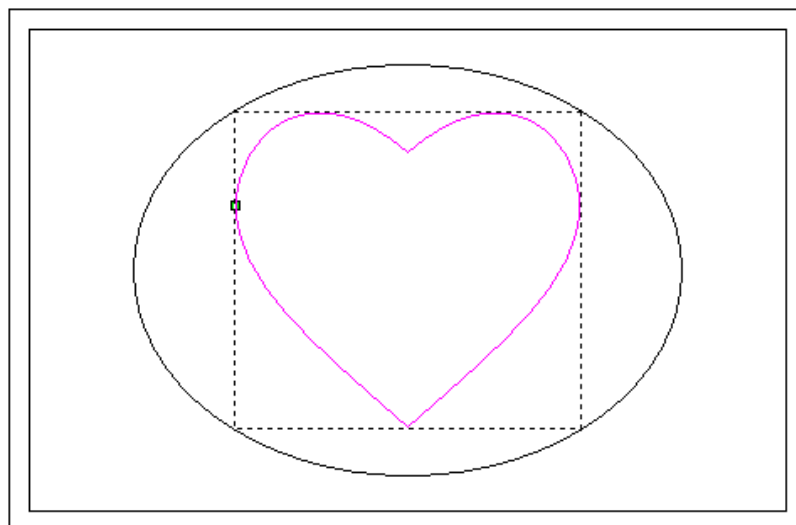
- Using all of the remaining settings displayed on the **3D Blend** page, click on the **Create Blend** button.
- Press the **F3** key on your keyboard to display the relief in the **3D View** window:



Creating the Heart Shape

Finally, we will create the heart shape in the relief. This is done using only one vector and blending it to a specified point.

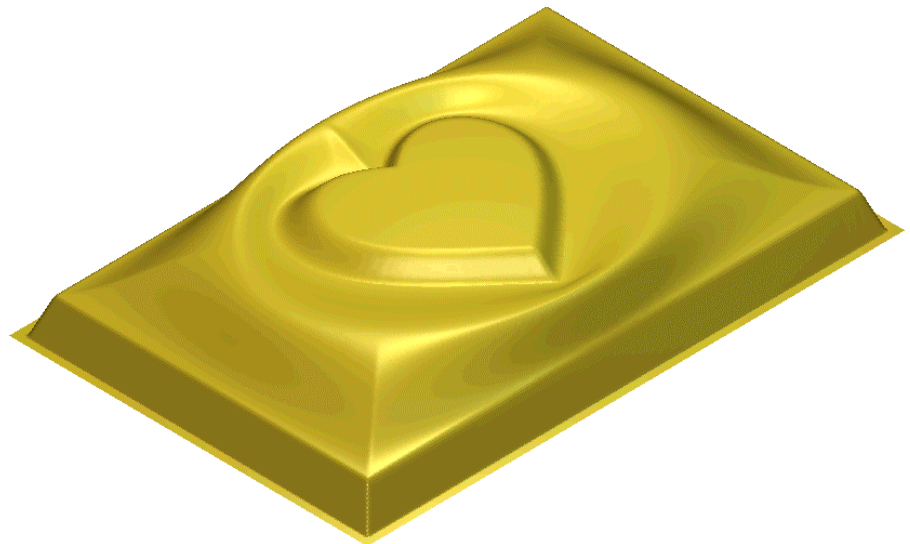
- Press the **F2** key on your keyboard to return to the **3D View** window.
- In the **2D View** window, click anywhere in the model area (white area) to deselect the current vectors, and then click to select the heart vector.



On the **3D Blend** page, the **Selected Vector** and **Inner Vector Edge** options turn red. This indicates that these

options are not compatible with the currently selected vector. In this instance, there is only one vector selected and these particular options require two selected vectors.


3. In the **Blend from Border to** area, click to select the **Middle of Border Vector** radio button . This instructs ArtCAM Pro to create a blended shape from the edge of the heart vector towards a point at its centre.
4. Click and drag on the slider to set the **Proportion** to 25%.
The **Proportion** setting controls the blend to reach its specified height of 2 mm (0.08") at a distance that is only 25% of the total distance between the border and the centre of the heart vector. In effect, this creates a smoothly blended and filled shape with a height of 2 mm.
5. In the **Combine** area, click to select the **Add** radio button .
6. Using all of the remaining settings displayed on the **3D Blend** page, click on the **Create Blend** button.
7. Click on the **Close** button to return to the **Assistant's** Home page.
8. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



Rendering the Relief


By default, the relief is rendered in ArtCAM's default lights and material scheme. To see how the finished product will look, perhaps

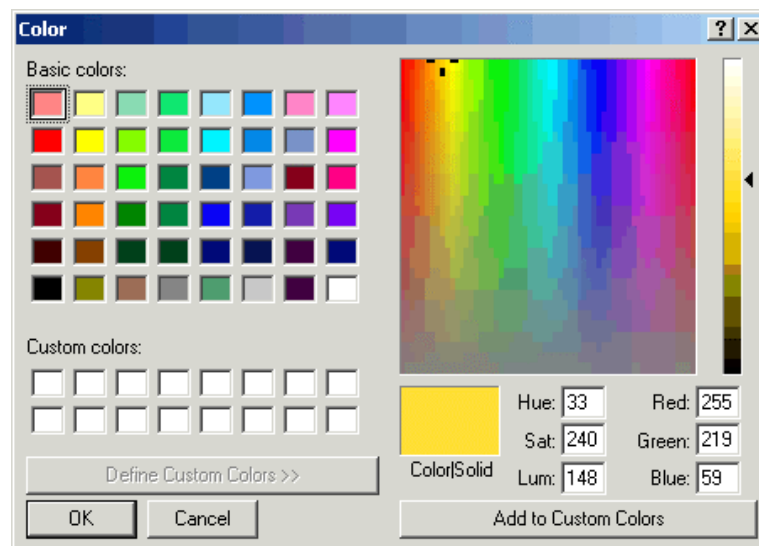
for customer approval, we can render it as if it were made from chocolate.

1. Click the **Lights and Material** button  in the **Model** area to display the **Lights and Material** page.
2. In the **Shading Setup** area, click on the list box to display its list of options.
3. Since a setting resembling chocolate is not included in ArtCAM Pro by default, we will create the setting ourselves. Click to select the *Blue Wax* option.

This is a good starting point for our new material since, apart from the colour, the shading properties are likely to be quite similar to chocolate. Starting with the closest matching preset is generally a good method for creating new material types.

4. If you cannot see the **Material** settings on the page, click on the arrow to display them.

5. In the **Colour** area, click the **Colour Palette** button  to display the **Color** dialog box:



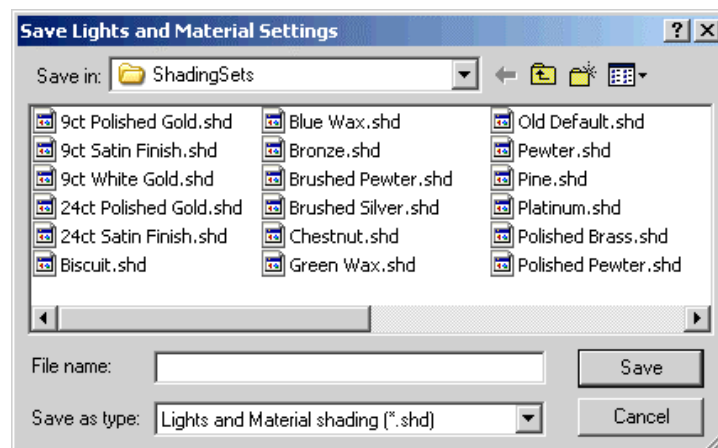
6. Type *140* in the **Red** box, *90* in the **Green** box and *55* in the **Blue** box to create a colour resembling chocolate, and then click on the **OK** button. The chocolate colour is displayed in the **Material** area of the page.
7. Click on the **Background** list box, followed by the *ArtCAM* option to select it. This uses a background image in the **3D View** window rather than a colour.

- Click the **Apply** button to display the settings in the **3D View** window:



To avoid having to recreate these settings again in the future, we will save them as a preset in ArtCAM Pro.




- Click the **Save...** button to display the **Save Lights and Materials Settings** dialog box:



- Type *Chocolate* in the **File name** box.
- Click the **Save** button. The *Chocolate* shading setup is now available in the **Shading Setup** list box.
- Click on the **Close** button to return to the **Assistant's** Home page.

Creating a Triangle Model and Finding the Weight of the Finished Product

The relief we have calculated can be used directly to generate the toolpaths for male or female moulds. Alternatively, a rapid prototype of the model can be created. To do this, the relief needs to be converted into a closed triangle mesh suitable for output as an STL file. Creating a triangle mesh also allows us to calculate amount of chocolate that we will require to manufacture the mould.

1. Click on the **Create Triangle Mesh** button  in the **Relief Operations** area to display the **Mesh Creator** page.
2. Type *0.01* mm (*0.0004*") in the **Tolerance** box.
3. In the **Backface** area, click to select the **Close With A Flat Plane** radio button .
4. Click on the **Create Triangles** button. ArtCAM Pro creates a closed triangle mesh from the relief as a solid piece.
5. Move the mouse cursor over the centre of the **3D View** window and then click and drag to twiddle the view. You can see that the triangle mesh is a complete solid.
6. Click on the **Weight** list box, followed by the *Chocolate* option to select it.
7. Make sure that the **Shrinkage** is set to 0.0%, and then click on the **Update** button.
In the **Result** area, ArtCAM Pro advises that we require approximately 17g of chocolate to manufacture the mould.
8. In the **Backface** area, click to select the **Create Offset Back Face** radio button .
9. Type *2* mm (*0.08*") in the **Thickness** box.
10. Click on the **Create Triangles** button. ArtCAM Pro creates a new closed triangle mesh from the relief as a hollow piece, with a *2* mm (*0.08*") wall thickness.
11. Move the mouse cursor over the centre of the **3D View** window and then click and drag to twiddle the view. You can now see the finished triangle mesh.

In the **Result** area, ArtCAM Pro advises us that we require approximately 7g of chocolate to manufacture the mould.

We are now ready to save the triangle mesh so that it can be created using a rapid prototype machine.

12. Click the **Save Triangles** button to display the **Save Triangle Mesh** dialog box.
13. Type *ChocolateMould* in the **File name** box.
14. Click on the **Save In** list box and select the directory in which you want to save the triangle mesh.
15. Click on the **Save** button to save the triangle mesh as an STL file, which can usually be sent directly to your rapid prototype machine.

Tutorial – 3D Clipart

Overview

The following tutorial demonstrates how to import a clipart relief and paste it onto the surface of an existing relief using the relief operations tools available in ArtCAM Pro.

Plate Design

The stages that you will cover during the course of this tutorial are:

- Preparing the model.
- Creating the leaves.
- Creating the flower.
- Saving the relief.
- Creating the plate.

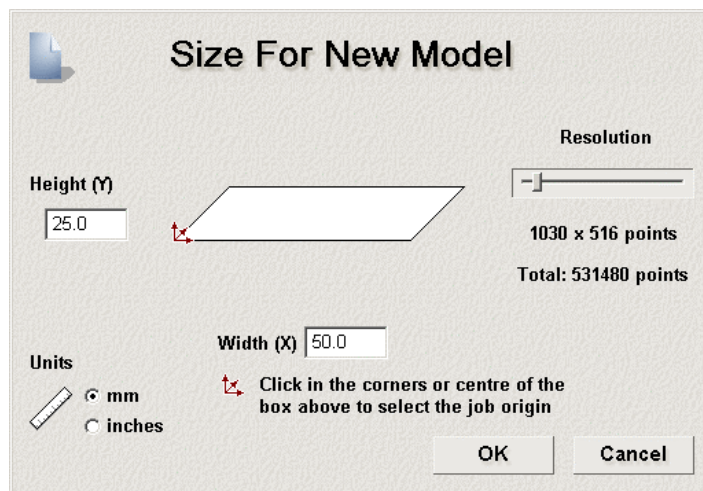
The tutorial will lead you through each of these stages, guiding you through the complete process of loading and manipulating a clipart relief to produce the plate shown below:



Preparing the Model

First, we will set up the dimensions of the block of material needed for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:



2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type 25 mm (0.98") in the **Height** box and 50 mm (1.97") in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to 531480 points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.


A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

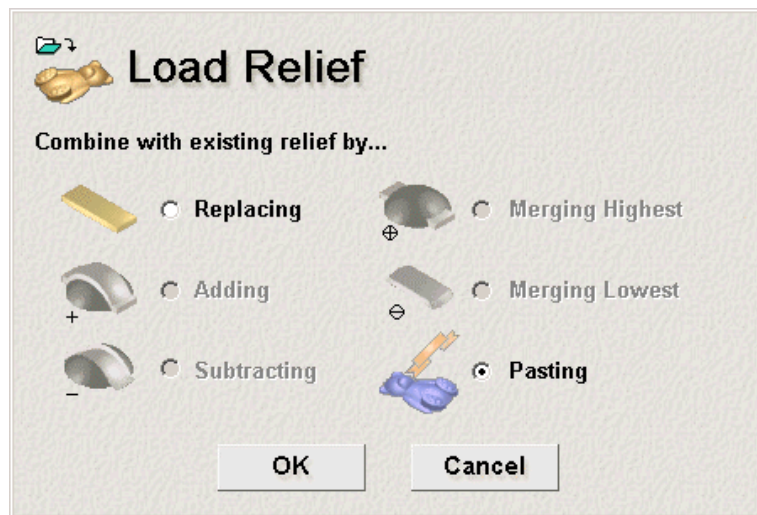
Creating the Leaves


Next, we will create a relief that represents the leaves in the plate design. The plate itself will be created later and the leaves design will be added to it.

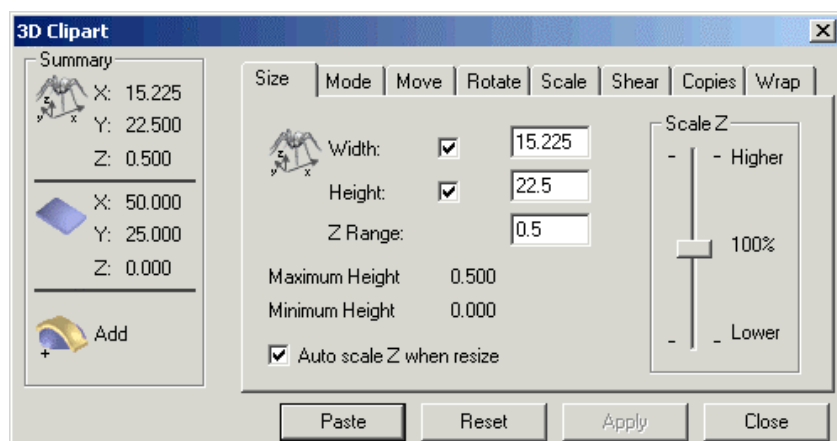
Loading the Clipart Relief

First, we will load the clipart relief that will be used to create the leaves design on the plate.

1. Click on the **Load Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to display the **Open** dialog box:
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Clipart.
3. Click on the .rlf file named *Leaves* to select it.
4. Click on the **Open** button to display the **Load Relief** dialog box:

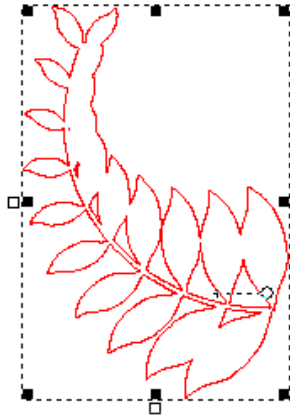


5. Make sure that the **Pasting** option  is selected by clicking on it. This is because we want to paste the clipart relief onto the existing relief.
6. Click on the **OK** button to close the **Load Relief** dialog box and display the **3D Clipart** dialog box:



The **3D Clipart** dialog box is displayed because we are using the **Pasting** option .

A red outline of the leaf clipart relief appears in the **2D View** window surrounded by a bounding box:



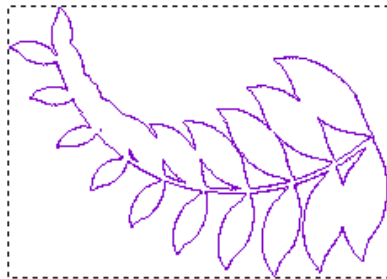
This is a vector outline indicating the current shape of the leaf clipart relief and its position in relation to the existing relief in the model.

The bounding box indicates that this vector outline can be manipulated in the same way as any grouped vector object in ArtCAM Pro. However, when using the **3D Clipart** dialog box, the changes that you make to this outline are also applied to the clipart relief.


Manipulating the Clipart Relief

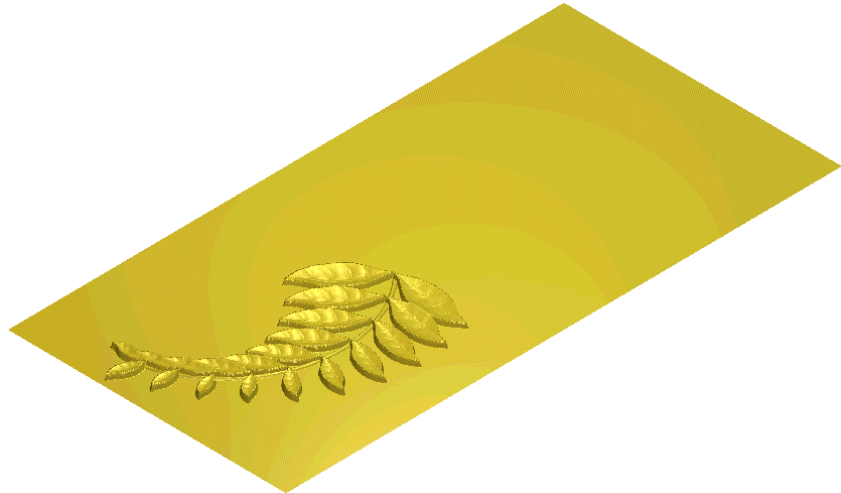
We are now ready to manipulate the leaf clipart relief and paste it onto the existing relief to form the leaves in the plate design. We will change the position of the leaf clipart relief before pasting it onto the plate relief by rotating it. We also want to create a second, mirrored copy of the leaf clipart relief and also paste this onto the plate relief.


1. Click on the **Rotate** tab in the **3D Clipart** dialog box to display the **Rotate** page.
2. Type **-40** in the **Rotate by angle** box.
3. Click on the **Apply** button to rotate the clipart relief. The outline in the **2D View** window turns purple and is rotated as shown:



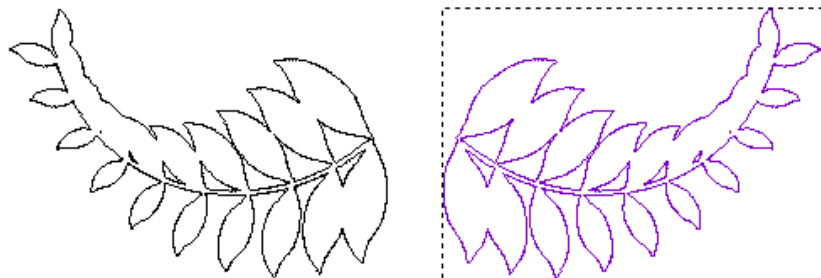
4. Click on the **Paste** button in the **3D Clipart** dialog box to paste the clipart relief onto the current relief.


- Click on the **3D View** button  in the **2D View** toolbar to display the new relief in the **3D View** window:





- Click on the **2D View** button  to return to the **2D View** window.
- On the **Rotate** tab, click on the **Horizontal** button to create a preview image of the clipart relief as it would look when mirrored.
- Click on the **Move** tab.
- Type 25 in the **Move X origin** by box.
- Click on the **Apply** button to move the clipart relief along the X-axis to the right.

The outline in the **2D View** window is mirrored and moved as shown:



- Click on the **Paste** button to paste the clipart relief onto the current relief.
- Click on the **Close** button to close the **3D Clipart** dialog box.
- Click on the **3D View** button  in the **2D View** toolbar to see what the relief now looks like:




14. Click on the **2D View** button  to return to the **2D View** window.
15. Click on the **Greyscale View** button  in the **2D View** toolbar to display a greyscale image of the relief in the **2D View** window. This allows you to see where you are pasting relief clipart on the current relief.
16. Make sure that the purple vector outline of the leaf on the left is selected by clicking on it. A bounding box surrounds the leaf.
17. Hold down the **Shift** key on your keyboard, and then click on the red vector outline of the leaf on the right. A bounding box surrounds both leaves.
18. Press the **Delete** key on your keyboard to delete the vector outline of both leaves from the **2D View** window. Now that the leaves have been pasted onto the existing relief, we no longer need the vector outline representing the leaf clipart relief.

Creating the Flower

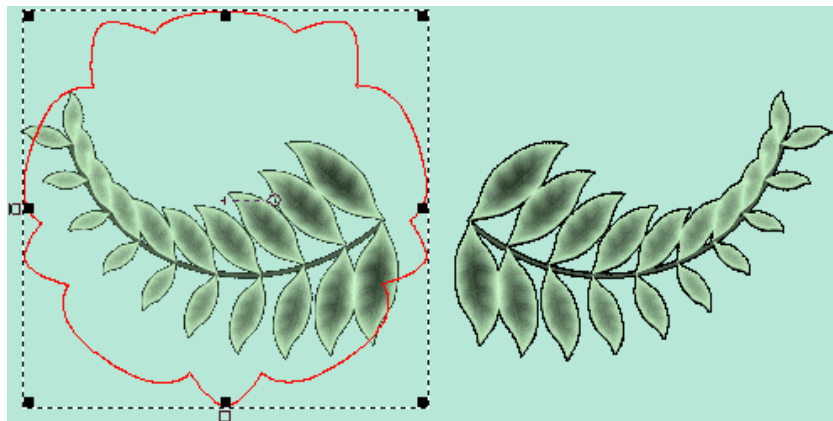
Next, we will create a relief that represents the flower in the plate design.

Loading the Clipart Relief

First, we will load the clipart relief that will be used to create the flower.

1. Click on the **Load Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Clipart.
3. Click on the .rlf file named *Flower* to select it.
4. Click on the **Open** button to display the **Load Relief** dialog box.
5. Make sure that the **Pasting** option is selected by clicking on it.
6. Click on the **OK** button to close the **Load Relief** dialog box and display the **3D Clipart** dialog box.

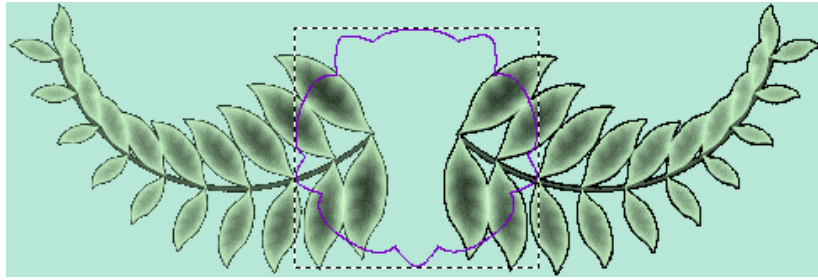
A red outline of the clipart relief also appears in the **2D View** window surrounded by a bounding box:



Manipulating the Clipart Relief

We will adjust the size of the clipart relief so that it fits between the two leaves.

1. Click on the **Scale** tab in the **3D Clipart** dialog box to display the **Scale** page.
2. Type *60* in the **New scale %** box, and then click on the **Apply** button. The vector outline is scaled and turns purple.
3. In the **2D View** window, click and drag on the purple vector outline of the clipart relief to position it between the two leaves, as shown below:




Pasting the Clipart Relief

We are now ready to paste the clipart relief onto the relief to form the flower.


1. Click on the **Mode** tab, then click on the **From Current** radio button to select it. This option instructs ArtCAM Pro to paste the clipart relief onto the existing relief at the current Z height.
2. Click on the **Merge Highest** radio button to select it. This option instructs ArtCAM Pro to merge the points in the clipart relief with the existing relief, so that only the highest points of the two show in a new relief.
3. Click on the **Paste** button in the **3D Clipart** dialog box to paste the clipart relief onto the current relief.
4. Click on the **Close** button in the **3D Clipart** dialog box.

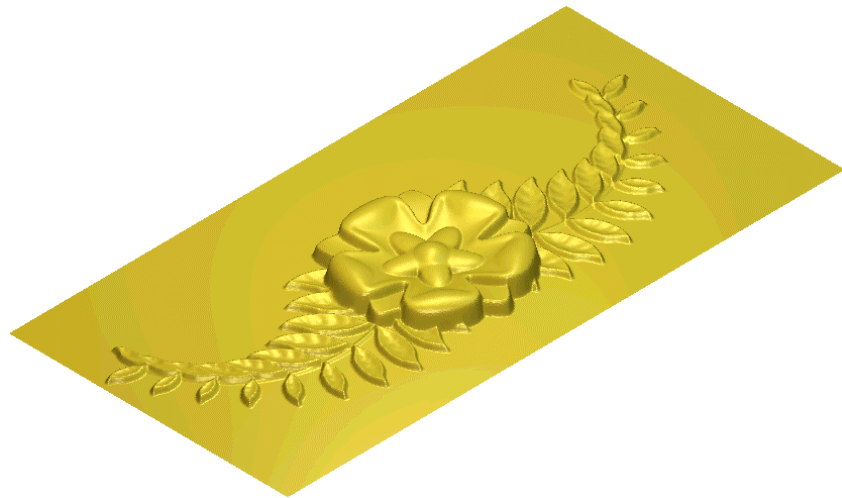
Smoothing the Relief

To complete the motif that we want to use for the plate, we will smooth the current relief.

1. Click on the **Smooth Relief** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Smooth Relief** dialog box:




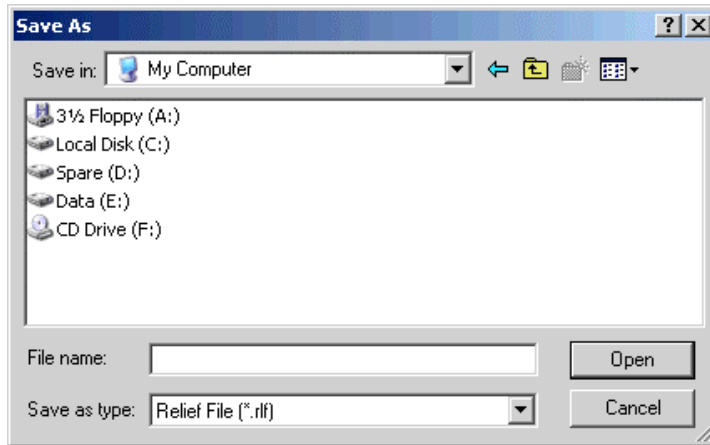
2. Type **4** in the **Smoothing Passes** box, and then click on the **Apply** button.
3. Click on the **Cancel** button to close the **Smooth Relief** dialog box.
4. Click on the **3D View** button  in the **2D View** toolbar to display the new relief in the **3D View** window:



Saving the Relief

We need to save the relief so that it can be pasted onto the plate relief later.

1. Click on the **Save Relief** button  in the **Relief Operations** area to display the **Save As** dialog box:



2. Click on the **Save In** list box and select the directory where you want to save the relief.
3. Type *Motif* in the **File Name** box.
4. Click on the **Save** button to close the **Save As** dialog box and save the relief.



Note: You can open an example of the motif relief, which is saved as **Motif.rlf** in the ArtCAM Pro 7.0\Examples\Clipart directory.

Creating the Plate

We are now ready to load the plate relief and apply the motif that you have created to the plate.

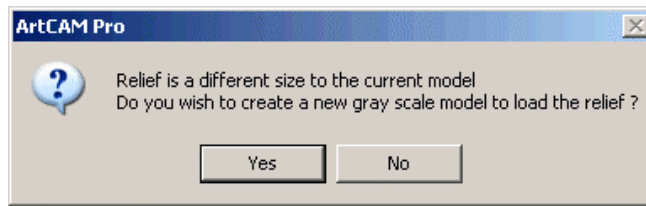
Replacing the Relief

First, we will replace the current relief with a relief in the shape of a plate:

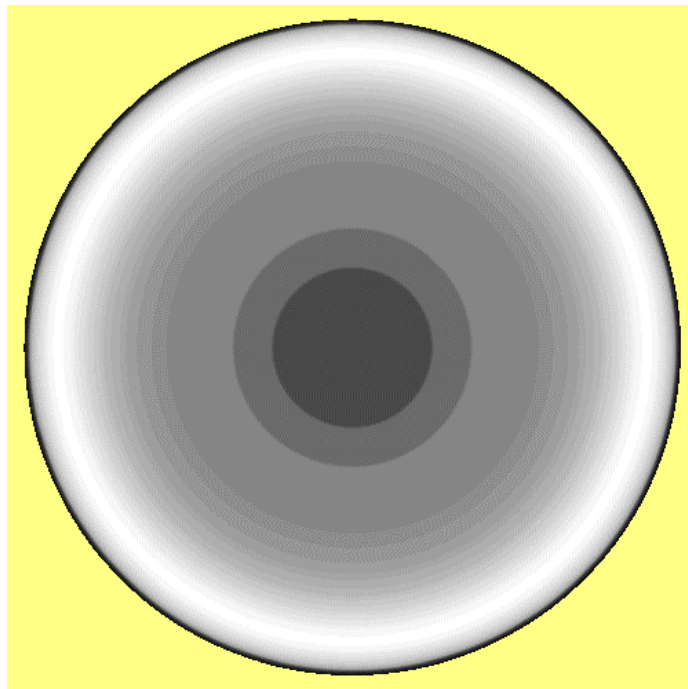
1. From the Main menu bar, click on the **Relief** option to display the **Relief** menu, then click on the **Load > Replace** option to display the **Open** dialog box.

This option deletes the current relief and prompts you to open an existing relief file with which to replace it.

2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Clipart.
3. Click on the .rlf file named *Plate* to select it.
4. Click on the **Open** button to load the relief. The following message box is displayed:





5. Click on the **Yes** button to close the message box and load the plate relief.
6. Click on the **2D View** window to make it active. You can see the following greyscale image of the plate:



Loading the Clipart Relief

We will load the motif that is to be pasted onto the current relief:

1. Click on the **Load Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Clipart.
3. Click to select the file named *Motif.rlf*.
4. Click on the **Open** button to display the **Load Relief** dialog box.
5. Make sure that the **Pasting** option  is selected by clicking on it.

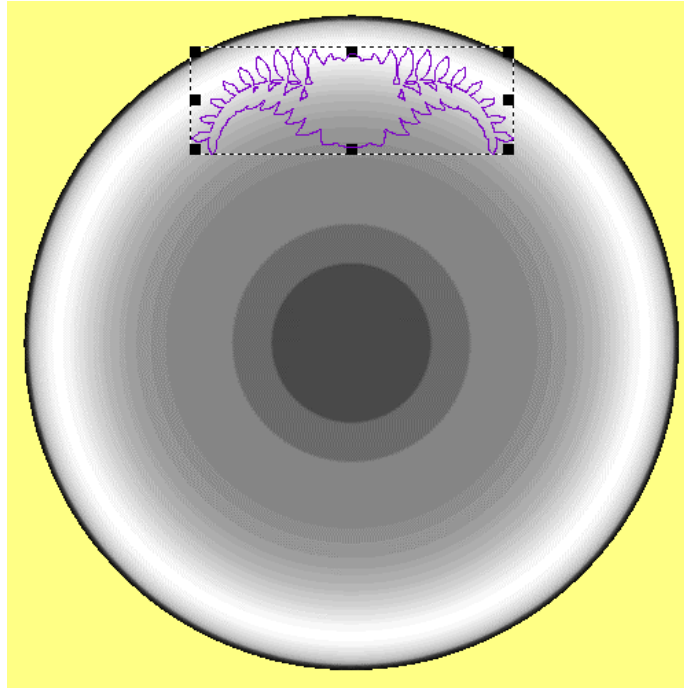
6. Click on the **OK** button to close the **Load Relief** dialog box and display the **3D Clipart** dialog box.


A red vector outline of the leaves appears in the **2D View** window. The red vector outline is much larger than the greyscale image of the plate.

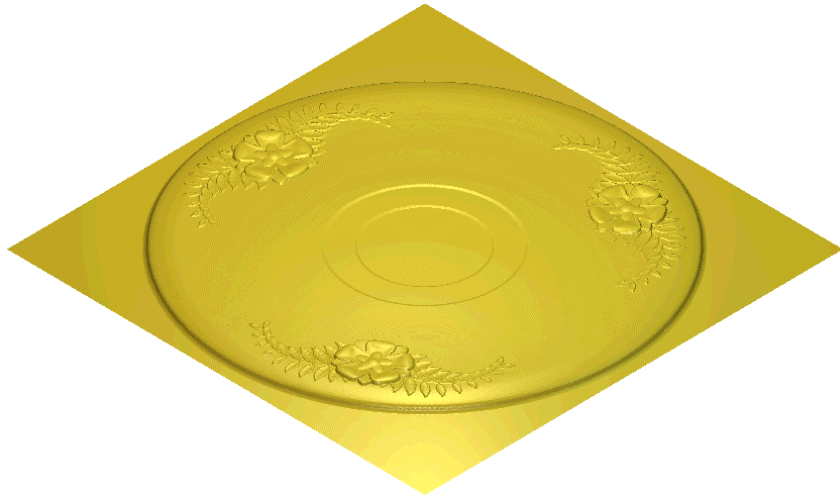
Manipulating the Clipart Relief

We are now ready to adjust the size and position of the motif, then paste it onto the plate relief. As we want three sets of the motif on the plate design, we will rotate and paste the motif clipart relief a further two times.

1. Click on the **Scale** tab in the **3D Clipart** dialog box to display the **Scale** page.
2. Type *25* in the **New scale %** box, and then click on the **Apply** button. The vector outline of the motif turns purple.
3. Click on the **Rotate** tab.
4. Click on the **Vertical** button to mirror the scaled motif clipart relief in the Y-axis, then click on the **Apply** button.
5. Click on the **Size** tab.
6. Type *0.2 mm (0.008")* in the **Z Range** box, and then click on the **Apply** button.
7. In the **2D View** window, click and drag on the purple vector outline of the motif and position it in the middle at the top of the plate.



8. Click on the **Paste** button to paste the motif onto the current relief.
9. Click on the **Rotate** tab.
10. Type *120* in the **Rotate by angle** box.
11. Click on the **Rotate about centre** option to deselect it .
12. Type *12.5* in both the **X** and **Y** boxes, then click on the **Apply** button. This defines the centre of the plate, around which the motif can now be rotated.
13. Click on the **Paste** button to paste a new copy of the motif onto the plate relief.
14. Type *120* in the **Rotate by angle** box, and then click on the **Apply** button to rotate the motif again.
15. Click on the **Paste** button to paste the final motif onto the plate relief, followed by the **Close** button to close the **3D Clipart** dialog box.
16. Click on the **3D View** button  in the **2D View** toolbar to display the new relief in the **3D View** window:



You can see that three duplicate copies of the motif clipart relief have been pasted onto the plate relief to make the finished plate design.



Note: You can open an example of the finished plate relief, which is saved as **Findesgn.rlf** in the ArtCAM Pro 7.0\Examples\Clipart directory.

Tutorial – Texturing

Overview

The following tutorial demonstrates how to add texture to the relief using the relief editing tools available in ArtCAM Pro.

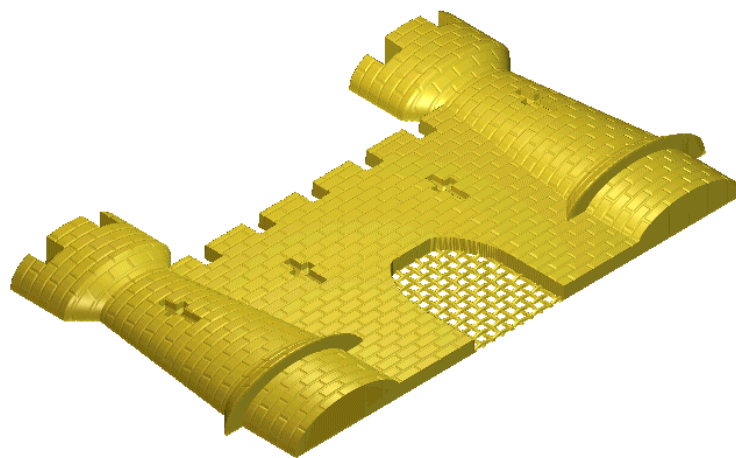
Before starting this tutorial, you must have created the castle relief, as described in "Turned Profile" on page 67.

Adding Textures to a Relief

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Adding texture to the relief.
- Creating a portcullis for the castle.

The tutorial will lead you through each of these stages, guiding you through the complete process of adding textures to a relief in the shape of a castle, which will produce a brick-effect on its surface and create a portcullis in its entrance:




Preparing the Model

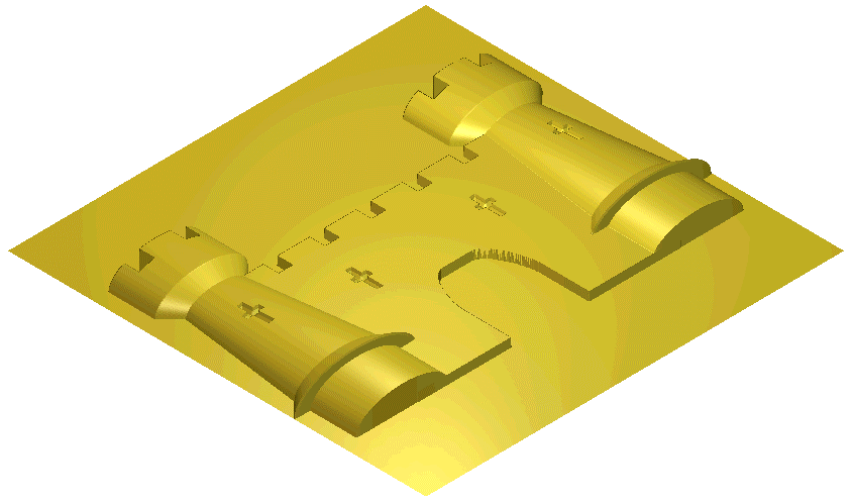
First, we will open the ArtCAM model containing the castle relief to which textures will be added:


1. Click on the **Open Existing Model**  icon on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Castle.
3. Click to select the file named *CastleRelief.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the *CastleRelief* model.
Three **2D View** windows appear, each of them containing different views of castle artwork. The active window is named **Castle View 3**.

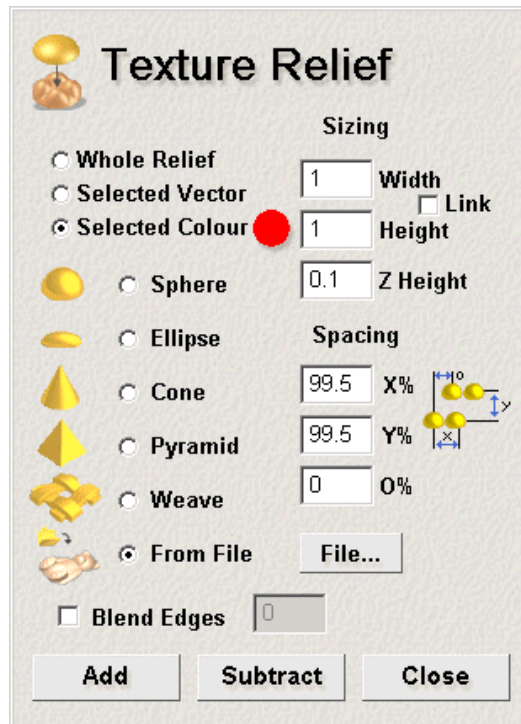
Adding Texture to the Relief


Now we will add a texture to the castle relief to create a brick-effect on its surface. The brick-effect texture is saved as a relief file. We cannot see the results of adding a texture to the castle relief in the **2D View** window, therefore we will make the **3D View** window the active view for this tutorial.

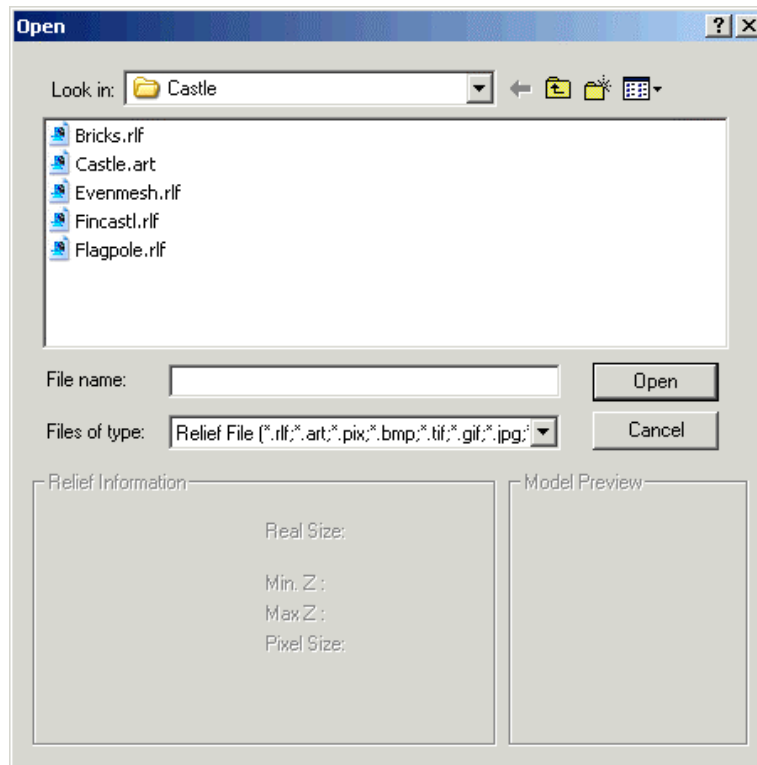
1. Click on the red colour in the Colour Palette beneath the **Castle View 3** window to select it as the Primary Colour.
Textures can only be applied to areas of the relief under the current Primary Colour.
2. Click on the **3D View** button  in the **2D View** toolbar to display the current relief in the **3D View** window:



- Click on the **Texture Relief** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Texture Relief** dialog box:

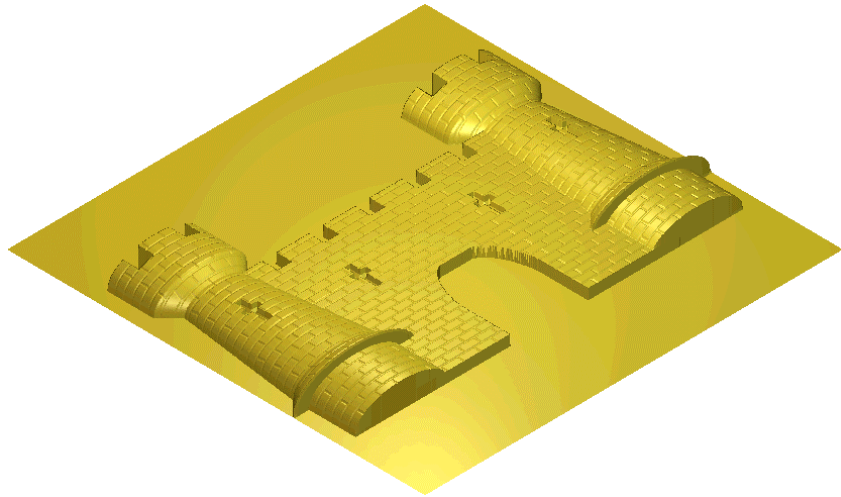


- Click on the **From Relief** radio button  to select this option.
- Click on the **File** button to display the **Open** dialog box:




6. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Castle.
7. Click to select the file named *Bricks.rlf*.
8. Click on the **Open** button to load the relief file and close the **Open** dialog box.
9. Click on the **Link** option to deselect it . This is because we do not want to adjust the texture's height and width proportionately.
10. In the **Sizing** area, type *1.0 mm (0.04")* in the **Height** and **Width** boxes. This sets the height and width of each brick in the texture.
11. Type *0.1 mm (0.004")* in the **Z Height** box. This sets the Z height of each brick in the texture.
12. In the **Spacing** area, type *99.5* in the **X%** and **Y%** boxes, then type *0* in the **O%** box. This sets the space between each of the bricks in the texture.
13. Click on the **Add** button. This option instructs ArtCAM Pro to add the points in the texture to the current relief.
14. Click on the **Close** button to close the **Texture Relief** dialog box.

The new relief is displayed in the **3D View** window.

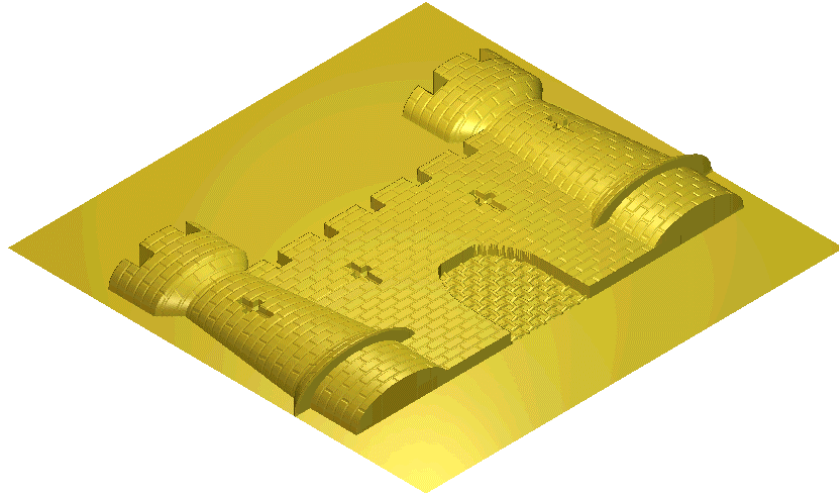




Creating a Portcullis for the Castle

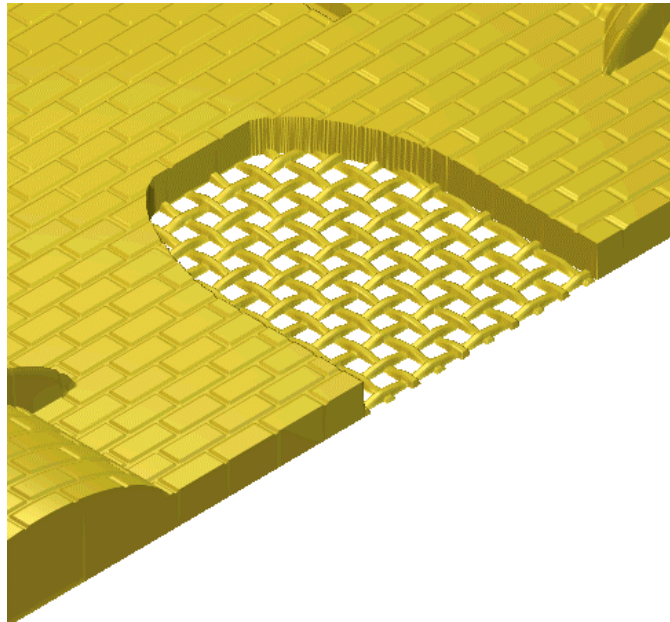
We are now ready to add another texture to the relief to create a portcullis for the castle entrance.

1. Press the **F2** key on your keyboard to return to the **Castle View 3** window.
2. Click on the plum colour in the Colour Palette to select it as the Primary Colour.
3. Press the **F3** key on your keyboard to view the castle relief in the **3D View** window.
4. Click on the **Texture Relief** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Texture Relief** dialog box.
5. Click on the **From Relief** radio button to select this option.
6. Click on the **File** button to display the **Open** dialog box.
7. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Castle.
8. Click to select the file named *EvenMesh.rlf*.
9. Click on the **Open** button to load the relief file and close the **Open** dialog box.
10. Make sure that the **Link** option is deselected .
11. In the **Sizing** area, type *1.0 mm (0.04")* in the **Height** and **Width** boxes.
12. Type *0.1 mm (0.004")* in the **Z Height** box.

13. In the **Spacing** area, type 99.5 in the **X%** and **Y%** boxes, and then type 0 in the **O%** box.
14. Click on the **Add** button, followed by the **Close** button.
The new relief is displayed in the **3D View** window.



15. Click on the **Draw Zero Plane** button  in the **3D View** toolbar to hide the zero plane and view the textures on the relief more clearly.
16. Click on the **Zoom** button  in the **3D View** toolbar.
17. Click and drag to form a bounding box around the castle entrance, then release the mouse button to zoom in on it.



You can see the brick-effect on the castle walls and the portcullis clearly.

Tutorial – Copying and Pasting Reliefs

Overview

The following tutorial demonstrates how to copy and paste areas of a relief using the Relief Editing tools available in ArtCAM Pro.

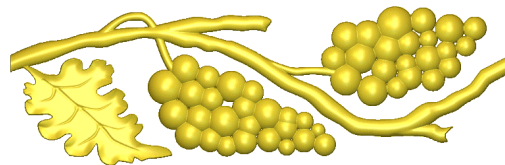
Grapevine

The stages that you will cover during the course of this tutorial are:

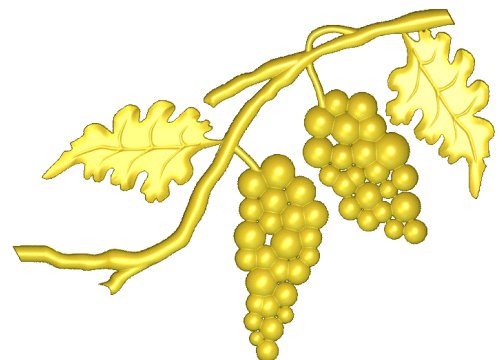
- Preparing the model.
- Copying and pasting the relief.

The tutorial will lead you through each of these stages, guiding you through the complete process of copying and pasting different areas within an existing relief, and combining them to construct an entirely new relief, as shown below:

Before...




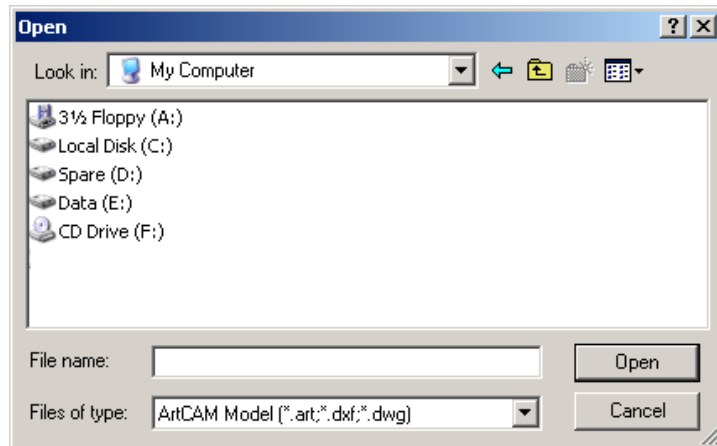
After...



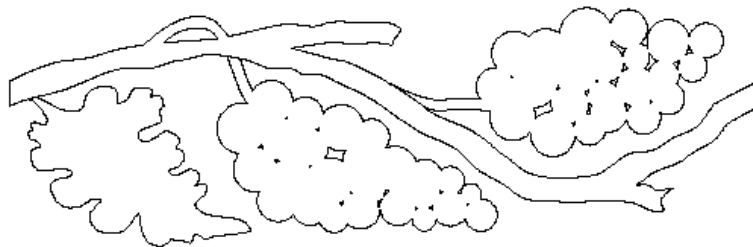
Preparing the Model


First, we will open the ArtCAM model containing the relief you will reconstruct:

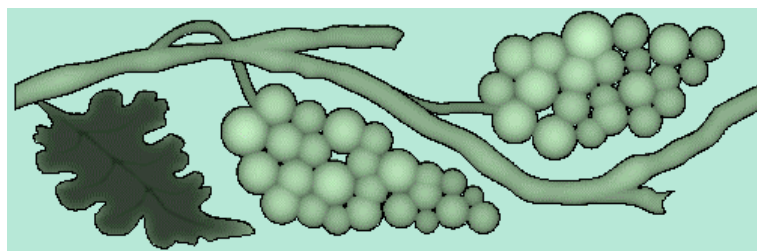
1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box:



2. Click on the **Look In** list box and select *C:\Program Files\ArtCAMPro 7.0\Examples\Grapevine* (assuming ArtCAM was installed into the default location – the files can also be found on the installation CD within the *Examples* directory).
3. Click to select the file named *grapevine.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the *grapevine* model. The following vector artwork appears in the **2D View** window:



5. Click on the **Greyscale View** button  in the **2D View** toolbar to display a greyscale view of the relief saved as part of the ArtCAM model:



The greyscale view of the relief allows us to see any changes we make, as and when they are made. We will work in the greyscale view for the duration of this tutorial.

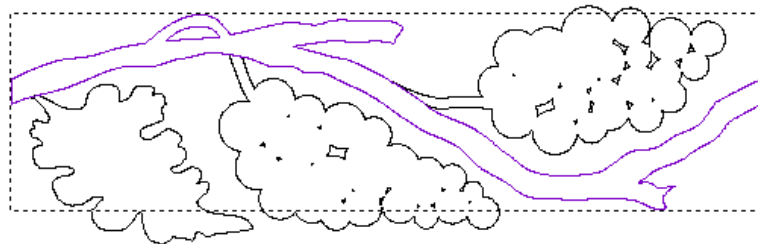
Copying and Pasting the Relief





Next we will copy different areas within the existing relief, identified by vector boundaries, adjust their shape and position, and then paste them in order to reconstruct the relief.

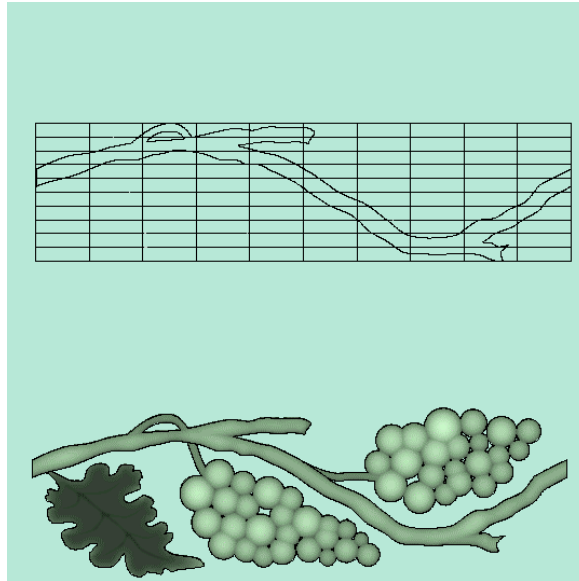
Repositioning the Vine

First we will copy the vine and then paste it in the space available in the model area. During the process, we will adjust the original shape of the vine using a relief distortion envelope.

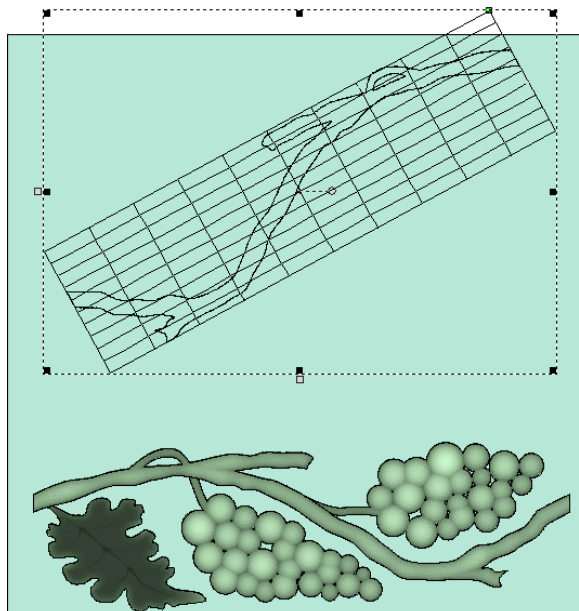
1. Click to select the vector outline of the vine. The vector turns purple and is surrounded by a bounding box.



2. Click on the **Relief Envelope Distortion** button  in the **Relief Editing** area to display the **Relief Envelope Distortion** page.
3. In the **Original Relief** area, make sure that the **Keep original relief (Copy)** radio button  is selected by clicking on it. This allows us to keep a copy of the relief as it appears prior to distortion.
4. Click on the **Transform Envelope** button  in the **Editing Mode** area to work in transform mode. Working in transform mode allows you to move, resize, rotate or shear the distortion envelope along with its associated vector and relief.
5. Move the cursor over the centre of the distortion envelope. When the cursor changes to , click and drag upwards so that the distortion envelope is positioned in the top of the model area, as shown below:

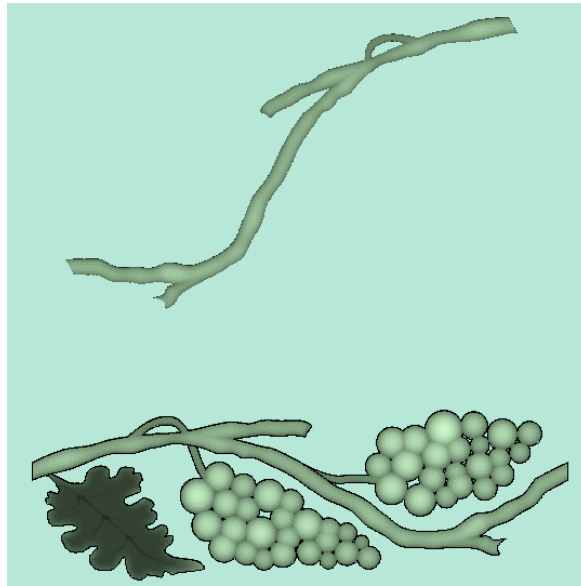


6. On the right-edge of the distortion envelope, click on the middle point and drag left until the envelope crosses over itself and you have created a mirror outline of the vine vector.
7. Move the cursor over the centre of the distortion envelope and then click and drag right to move the vine vector into the top-middle of the model area.
8. Click and drag the rotation handle attached to the centre of the distortion envelope upwards and anti-clockwise until it is positioned approximately at the angle shown below:



9. Using the remaining settings on the page, click on the **Paste** button to add the distorted relief to the existing relief.

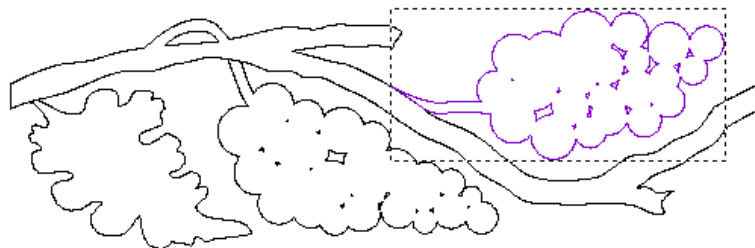
10. Click on the **Finish** button to return to the **Assistant's** Home page. You can see a greyscale image of the new vine in the relief in the **2D View** window:





Repositioning the Grapes

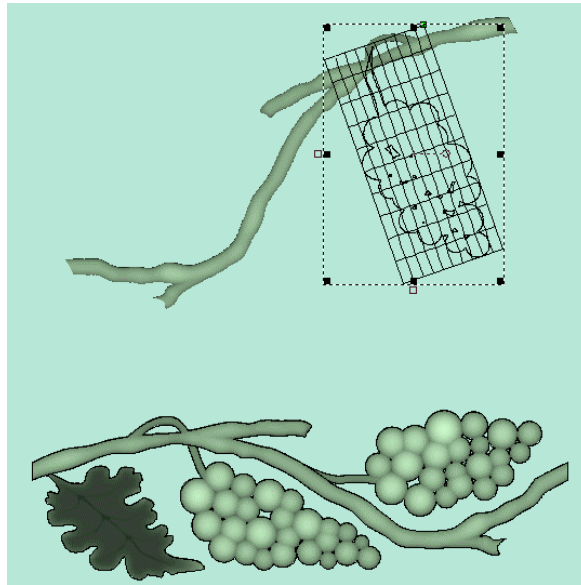
Next we will copy both bunches of grapes in the original relief, and then paste them so that they are merged with the new vine that we have created. In the process, we will adjust their original shape and position using a distortion envelope.

1. Click to select the vector outline of the grapes on the right. The vector turns purple and is surrounded by a bounding box.



2. Click on the **Relief Envelope Distortion** button  in the **Relief Editing** area to display the **Relief Envelope Distortion** page.
3. Click on the **Transform Envelope** button  in the **Editing Mode** area to work in transform mode.
4. Move the cursor over the centre of the distortion envelope and then click and drag it upwards so that it is positioned below the right of the vine.

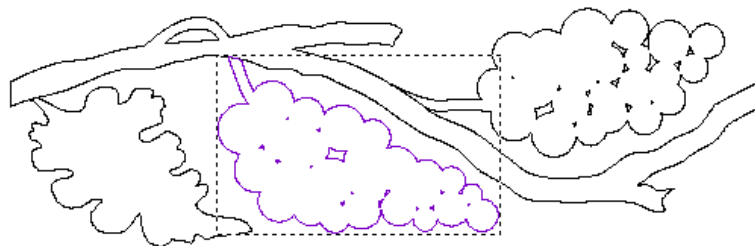
5. Click and drag the rotation handle attached to the centre of the distortion envelope downwards and clockwise until the branch attached to the grapes appears to continue the looped branch at the top of vine.
6. Move the cursor over the centre of the distortion envelope and then click and drag to move the grapes into the position shown below:





7. Click on the **Highest** radio button in the **Combine** area. This instructs ArtCAM Pro to merge the grapes with the vine.
8. Using the remaining settings on the page, click on the **Paste** button to merge the distorted relief with the existing relief.
9. Click on the **Finish** button to return to the **Assistant's** Home page. You can see a greyscale image of the new bunch of grapes in the relief in the **2D View** window:



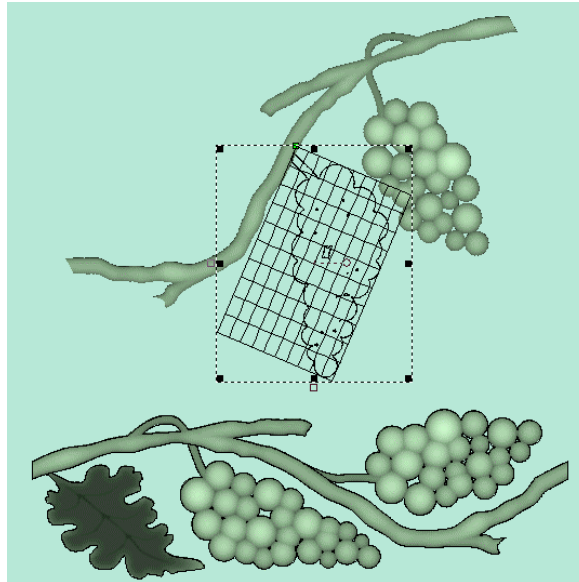
- Click to select the vector outline of the grapes on the left. The vector turns purple and is surrounded by a bounding box.



- Click on the **Relief Envelope Distortion** button  in the **Relief Editing** area to display the **Relief Envelope Distortion** page. A distortion envelope surrounds the selected vector.
- Click on the **Transform Envelope** button  in the **Editing Mode** area to work in transform mode.
- Move the cursor over the centre of the distortion envelope and then click and drag it upwards so that it is positioned to the left of the grapes you have just pasted.
- Click and drag the rotation handle attached to the centre of the distortion envelope downwards and clockwise until the grapes hang vertically.
- You will notice that we need the branch on the grapes to face the opposite direction so that we can join it to the vine. On the right-edge of the distortion envelope, click on the middle point and drag to the until the envelope crosses over

itself and you have created a mirror outline of the vector (as done previously with the vine).

16. Move the cursor over the centre of the distortion envelope and then click and drag to move the grapes into the position shown below:





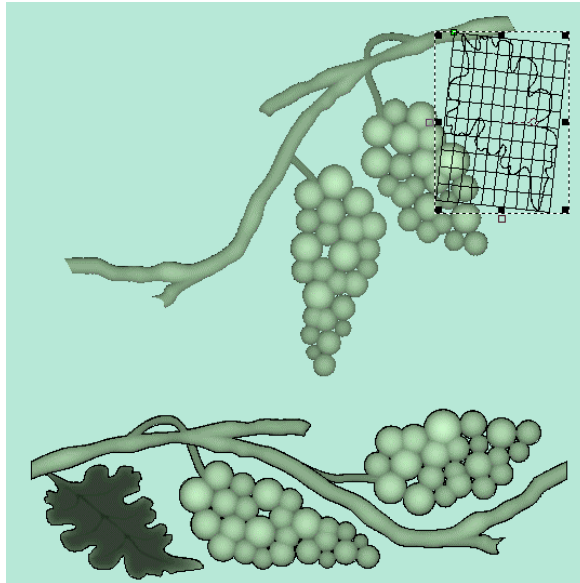
17. Using the existing settings on the page, click on the **Paste** button to merge the relief with the existing relief.
18. Click on the **Finish** button to return to the **Assistant's** Home page. You can see a greyscale image of the new second bunch of grapes in the relief in the **2D View** window:



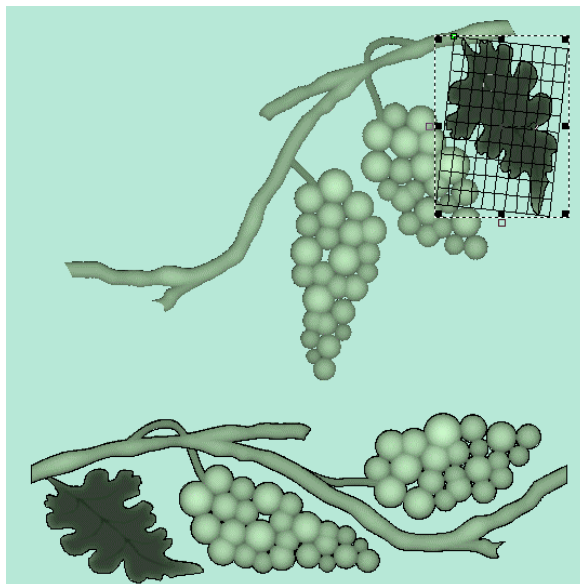
Repositioning the Leaf

Finally we will copy the leaf in the original relief, and then paste it so that it is merged with the new vine that we have created. During this process we will adjust the original shape and position of the leaf using a distortion envelope. We will also create a second leaf on our vine.

1. Click to select the vector outline of the leaf. The vector turns purple and is surrounded by a bounding box.
2. Click on the **Relief Envelope Distortion** button  in the **Relief Editing** area to display the **Relief Envelope Distortion** page.
3. Click on the **Transform Envelope** button  in the **Editing Mode** area to work in transform mode.
4. Move the cursor over the centre of the distortion envelope and then click and drag it upwards so that it is positioned beside the grapes on the right.
5. You will notice that we need the leaf to face the opposite direction so that we can join it to the vine. On the right-edge of the distortion envelope, click on the middle point and drag to the left until the envelope crosses over itself and you have created a mirror outline of the vector (as done previously with the vine and the grapes on the left).
6. Click and drag the rotation handle attached to the centre of the distortion envelope upwards and anti-clockwise until the leaf points downward.
7. Move the cursor over the centre of the distortion envelope and then click and drag to move the leaf into the position shown below:

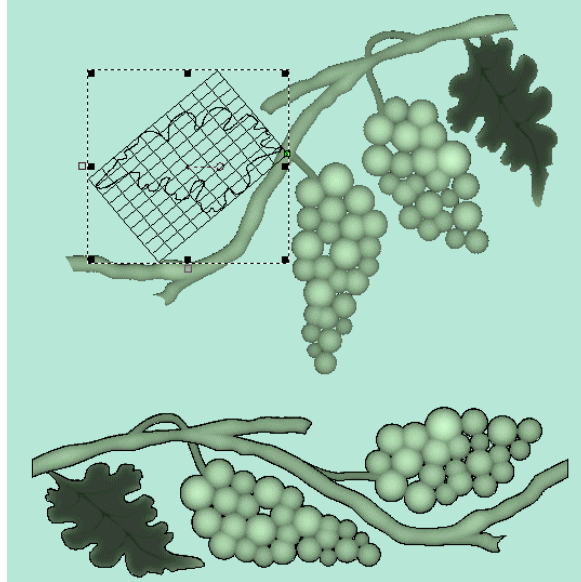


8. Using the existing settings on the page, click on the **Paste** button to merge the relief with the existing relief. You can see a greyscale image of the new leaf in the relief in the **2D View** window:



9. Move the cursor over the centre of the distortion envelope and then click and drag left so that it is positioned above the vine, opposite the bunch of grapes furthest along the vine.
10. You will notice that we need the leaf to face the opposite direction so that we can join it to the vine. On the right-edge of the distortion envelope, click on the middle point and drag to the left until the envelope crosses over itself and you have created a mirror outline of the vector (as done previously with the vine, the grapes on the left and the other leaf).

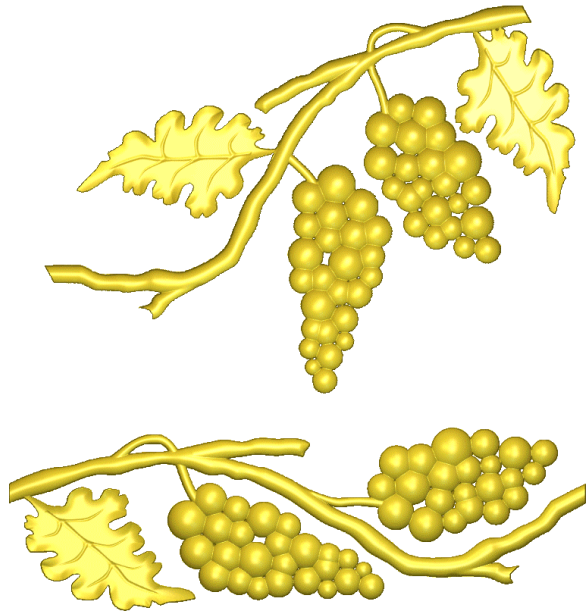
11. Click and drag the rotation handle attached to the centre of the distortion envelope downwards and clockwise until the leaf appears almost horizontal.
12. Move the cursor over the centre of the distortion envelope and then click and drag to move the leaf into the position shown below:



13. Using the existing settings on the page, click on the **Paste** button to merge the relief with the existing relief.
14. Click on the **Finish** button to return to the **Assistant's** Home page. You can see a greyscale image of the new second leaf in the relief, and the finished grapevine, in the **2D View** window:



15. Press the **F3** key on your keyboard to display the new grapevine relief in the **3D View** window, shown as follows:



Tutorial – Lizard

Overview

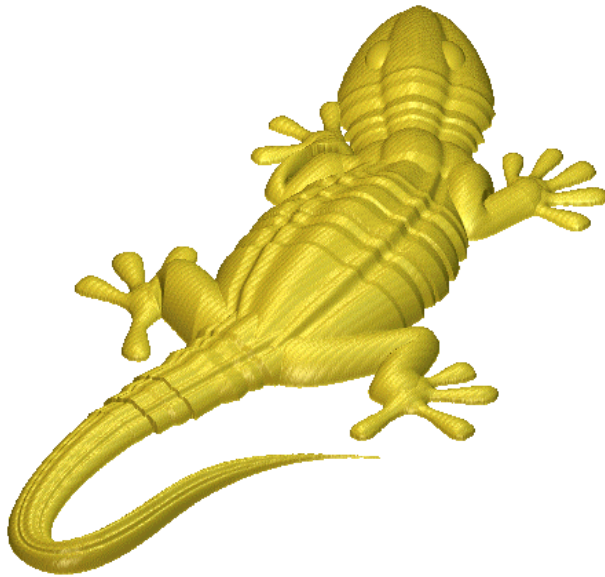
The following tutorial demonstrates how to create a relief from vector objects and apply a texture to it using the vector based relief creation and relief editing tools available in ArtCAM Pro.

Lizard

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the main body.
- Creating the legs.
- Creating the feet.
- Adding texture to the lizard.
- Adding the eyes.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating three-dimensional shapes using vector objects and combining these shapes to form a relief in the shape of a lizard. Finally, you will apply a texture to the lizard relief to add the effect of scales on the lizards' skin:

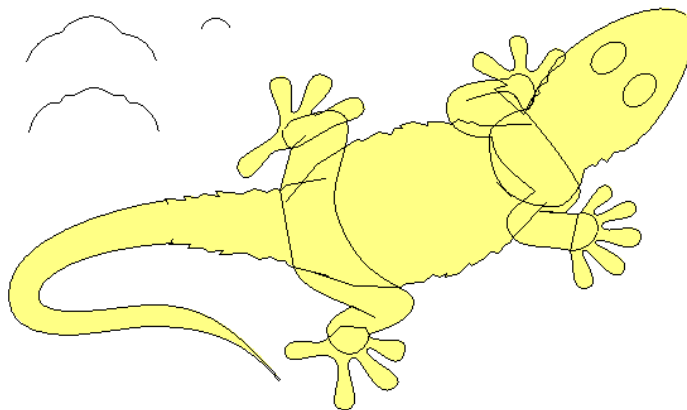


Preparing the Model

First, we will open the ArtCAM model containing the artwork from which we will create the lizard relief:


1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Lizard.
3. Click to select the file named *Lizard.art*. The file name appears in the **File name** box.
4. Click on the **Open** button.

The following artwork appears in the **2D View** window:



The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains vector objects

that will be used to create the different parts of a lizard. Some of the vector objects will be used as drive rails, others as cross-sections, from which shapes will be two-rail swept. Other vector objects will only have shape attributes applied to them, from which a shape will then be calculated and combined with the relief.


5. Click on the **Reset Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to delete the relief that was saved as part of the *Lizard* model.

Creating the Main Body

First we will create the main body of the lizard using the three cross-sections drawn in the top-left corner of the model and the pairs of vector objects that represent each part of the lizard. As you will see, almost the entire lizard is created using a process where a three-dimensional shape is created by sweeping a cross-section between two vectors, referred to as drive rails. This process is called a two-rail sweep.

Creating the Tail

We will start with the lizards' tail.

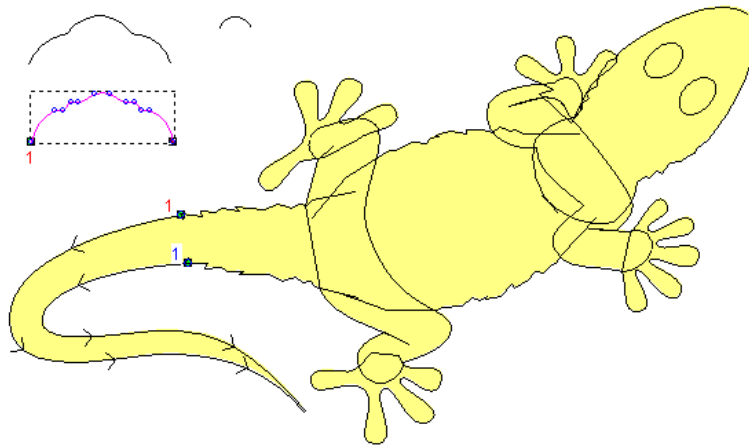
1. Click on the **Two Rail Sweep** button  in the **Vector Based Relief Creation** area to display the **Two Rail Sweep** page.
In the **Combine** area, the **Add** radio button is selected.
2. Click to select the vector object representing the left-edge of the lizard's tail. The vector object turns magenta, and a bounding box surrounds it.
3. In the **Select Control Vectors** area, click on the **Select** button for the **Top Drive Rail**.
Direction arrows appear along the vector object, which is now referred to as the first drive rail. In the **Status** area, the **First Drive Rail** status changes from **Not Selected** to **Valid**. A red *A* also appears beside the first drive rail in the **2D View** window.
4. Click to select the vector object representing the right-edge of the lizards' tail. The vector object turns magenta, and a bounding box surrounds it.

5. In the **Select Control Vectors** area, click on the **Select** button for the **Bottom Drive Rail**.

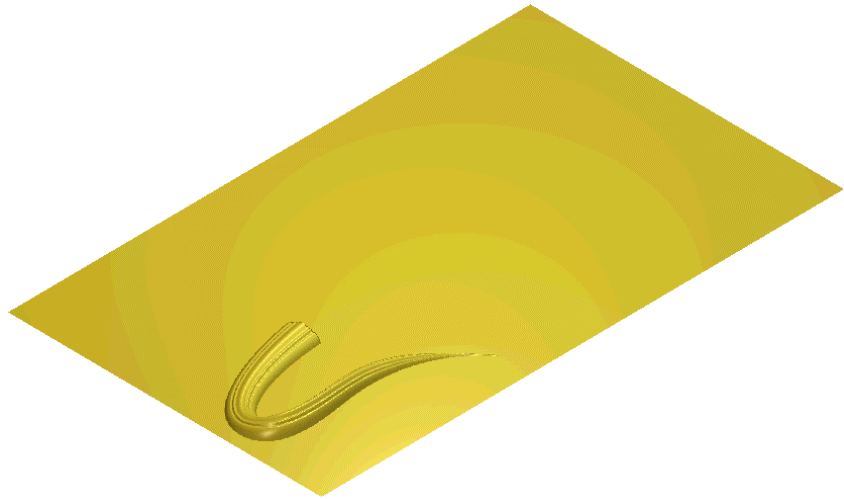
Direction arrows appear along the vector object, which is now referred to as the second drive rail. In the **Status** area, the **Second Drive Rail** status changes from **Not Selected** to **Valid**. A red *B* also appears beside the second drive rail in the **2D View** window.

6. Click to select the cross-section vector nearest to the vector object representing the left-edge of the lizard's tail. The cross-section vector turns magenta, and a bounding box surrounds it.
7. Click on the **Add Cross Section** button. In the **Status** area, *Cross Section 1* is now listed with its status as **Valid**. We can see that the cross-section vector is made up of eleven spans. A red *I* also appears beside the cross-section in the **2D View** window.

A red *I* now marks the position of the cross-section along the first drive rail in the **2D View** window. A blue *I* now marks the position of the cross-section along the second drive rail in the **2D View** window:




8. Click on the **Calculate** button to accept the default settings on the page and create the two-rail swept shape. ArtCAM Pro adds the points in the two-rail swept shape to the current relief.
9. Click on the **Close** button to return to the **Assistant's** Home page.
10. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



Creating the Tail-Base

Now we will combine the base of the tail with the part of the tail that we have already added to the relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Two Rail Sweep** button  in the **Vector Based Relief Creation** area to display the **Two Rail Sweep** page.
3. Click to select the vector object representing the left-edge of the lizard's tail-base. The vector object turns magenta, and a bounding box surrounds it.
4. In the **Select Control Vectors** area, click on the **Select** button for the **Top Drive Rail**.

Direction arrows appear along the vector object, which is now referred to as the first drive rail. In the **Status** area, the **First Drive Rail** status changes from **Not Selected** to **Valid**. A red *A* also appears beside the first drive rail in the **2D View** window.

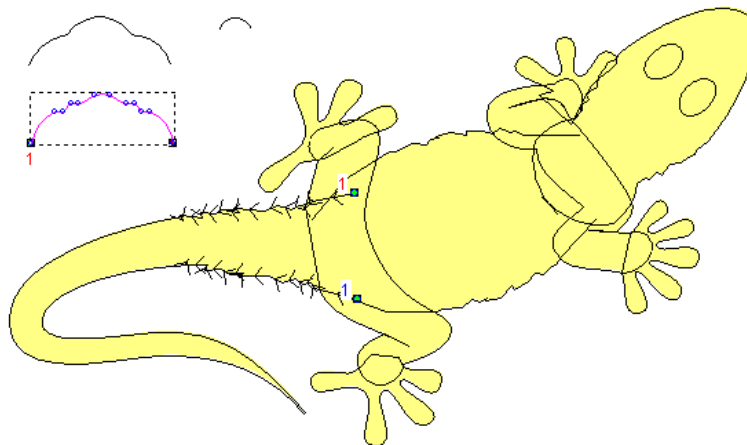
5. Click to select the vector object representing the right-edge of the lizard's tail-base. The vector object turns magenta, and a bounding box surrounds it.
6. In the **Select Control Vectors** area, click on the **Select** button for the **Bottom Drive Rail**.

Direction arrows appear along the vector object, which is now referred to as the second drive rail. In the **Status** area, the **Second Drive Rail** status changes from **Not**

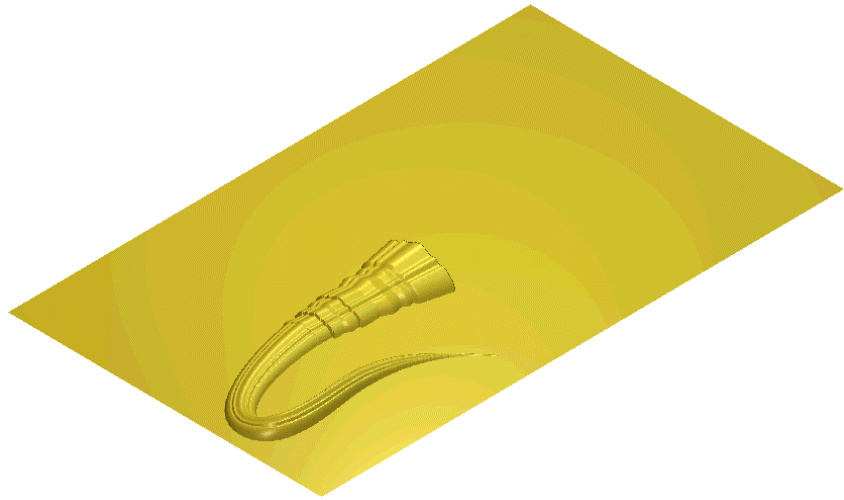
Selected to Valid. A red *B* also appears beside the second drive rail in the **2D View** window.

7. Click to select the cross-section vector nearest to the vector object representing the left-edge of the lizard's tail. The cross-section vector turns magenta, and a bounding box surrounds it.
8. Click on the **Add Cross Section** button. In the **Status** area, *Cross Section 1* is now listed with its status as **Valid**. We can see that the cross-section vector is made up of eleven spans. A red *I* also appears beside the cross-section in the **2D View** window.

A red *I* now marks the position of the cross-section along the first drive rail in the **2D View** window. A blue *I* now marks the position of the cross-section along the second drive rail in the **2D View** window:



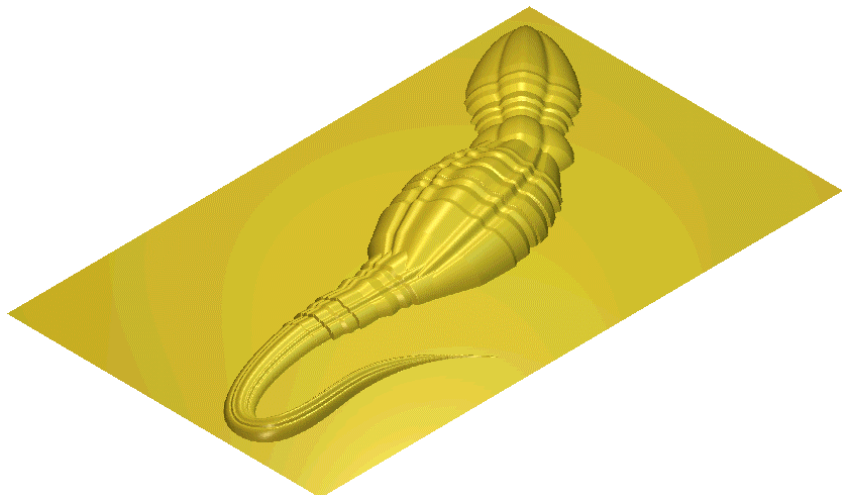
9. In the **Combine** area, click to select the **Highest** radio button . This option instructs ArtCAM Pro to merge the tail-base with the tail-end, so that only the highest points of the two show in the new relief.
10. Click on the **Calculate** button to accept the other default settings on the page and merge the two-rail swept shape with the current relief.
11. Click on the **Close** button to return to the **Assistant's** Home page.
12. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



Creating the Head and Body


Next we will combine the lizards' head and body with its tail.

1. Press the **F2** key to display the **2D View** window.
2. Repeat the steps used to create the lizards' tail base, this time selecting the vector objects representing the lizards' body, and using the same cross-section as before.
3. Repeat the steps used to create the lizards' body, this time selecting the vector objects representing the lizards' head and the cross-section above that which was previously used.
4. Press the **F3** key to display the relief in the **3D View** window:

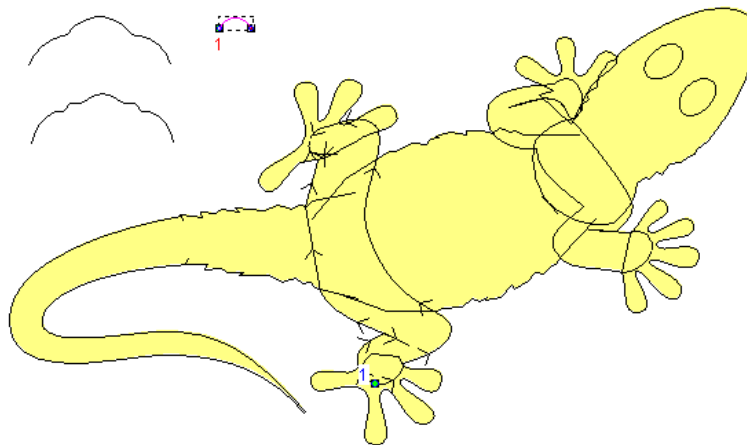


Creating the Legs

We are now ready to create the lizards' legs in the same way as its head and body.

1. Click to select the vector object representing the lower part of the lizards' back legs. The vector object turns magenta, and a bounding box surrounds it.
2. Hold down the **Shift** key on your keyboard, and then click on the upper part of the lizards' back legs, followed by the smallest of the cross-section vectors. The vector objects are magenta and surrounded by a bounding box.
3. Click on the **Two Rail Sweep** button  in the **Vector Based Relief Creation** area to display the **Two Rail Sweep** page.

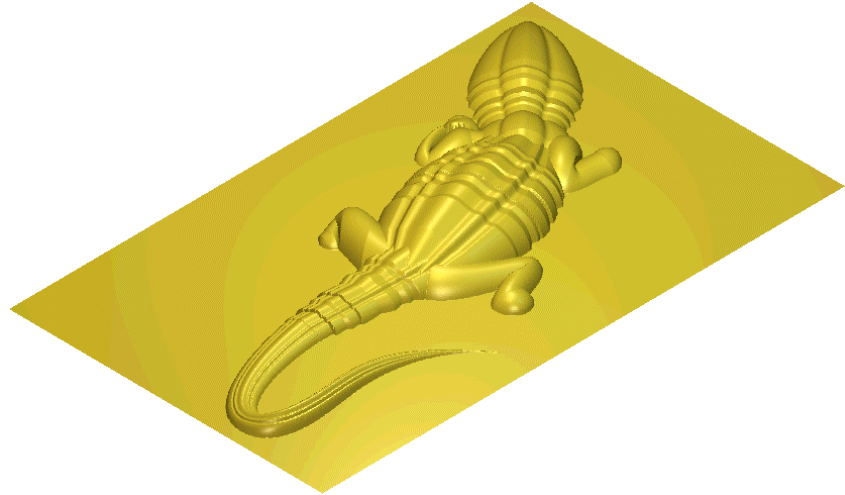
In the **Status** area, the *First Drive Rail*, *Second Drive Rail* and *Cross Section 1* are identified as **Valid**. We can see that the cross-section is made up of one span. A red *1* is shown beside the cross-section in the **2D View** window. A blue *1* marks the position of the cross-section along the second drive rail:



4. In the **Combine** area, make sure that the **Highest** option is selected by clicking on its radio button .
5. Click on the **Calculate** button to accept the other default settings on the page and merge the legs with the lizards' body.
6. Click on the **Close** button to return to the **Assistant's** Home page.
7. Press the **F3** key on your keyboard to see what the relief now looks like.
8. Using the **2D View** window, repeat the steps used to create the lizards' back legs, this time selecting the vector objects

representing the lizards' front legs, and using the same cross-section as before.

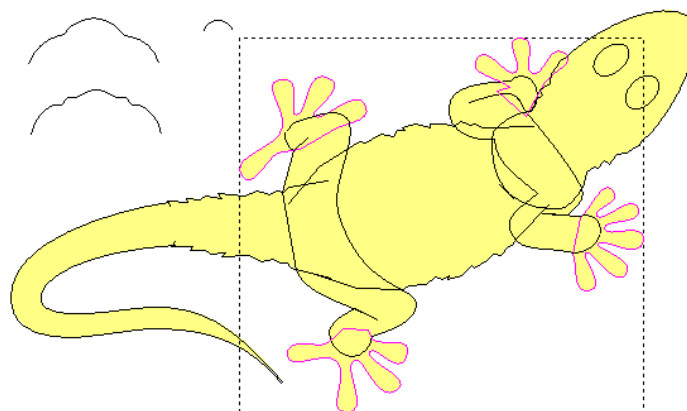
9. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



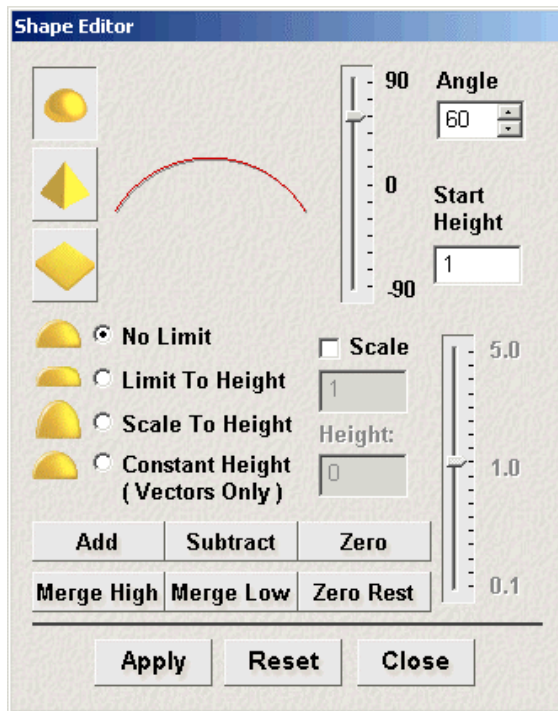
Creating the Feet

The lizards' feet can be created directly from the vector objects representing their outline. Applying shape attributes to the vectors, then combining these shapes with the current relief does this.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Hold down the **Shift** key on your keyboard, and then click on each of the four vector objects representing the lizards' feet. The vector objects are magenta and surrounded by a bounding box.



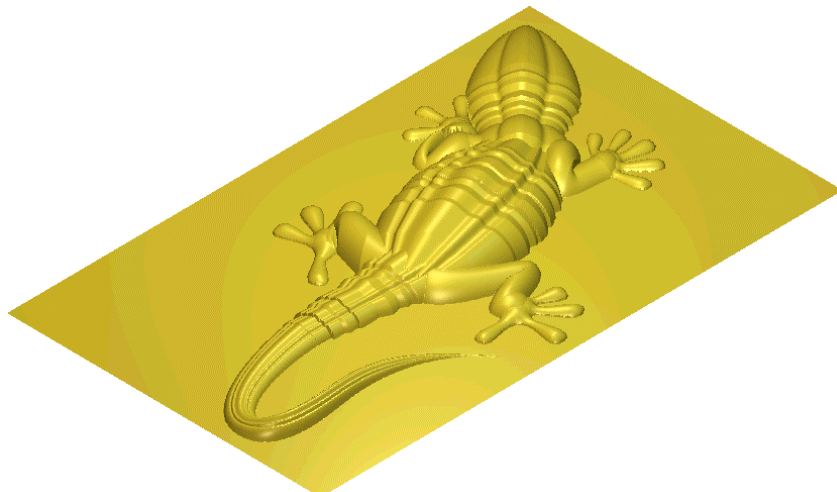
3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box:



4. In the **Shape Editor**, set the options to create a rounded shape with an angle of 60° and a start height of 1 mm (0.04"), then click on the **Apply** button to apply these settings to the selected vector objects.
5. Click on the **Merge High** button. This option instructs ArtCAM Pro to merge the points in the shapes with the current relief, so that only the highest points of the two show in a new relief.


A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.

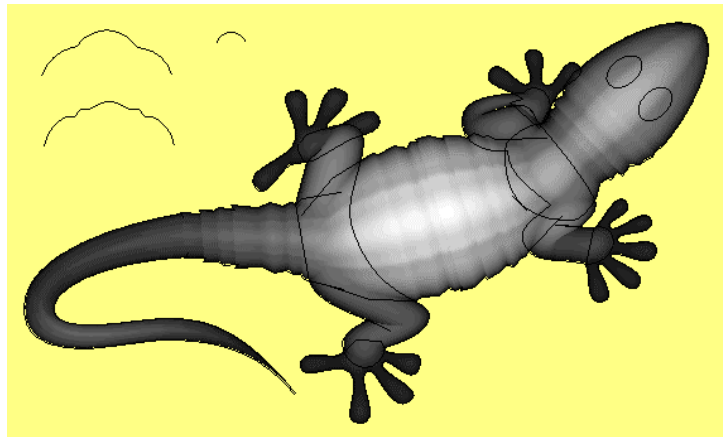
6. Click on the **Close** button, and then press the **F3** key on your keyboard to display the relief in the **3D View** window:




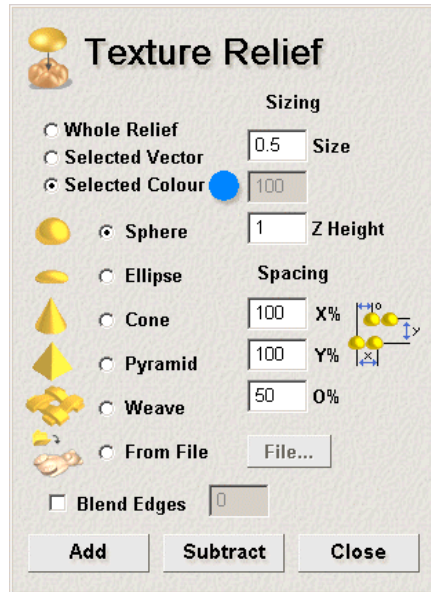
Adding Texture to the Lizard

To add the effect of scales on the lizards' skin, we will apply small spheres across the relief surface.



1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Greyscale From Relief** button  in the **Model** area to create a greyscale image of the current relief.



3. Click on the blue colour next to the yellow colour in the Colour Palette beneath the **2D View** window to select it as the Primary Colour.
4. Right-click on the yellow colour in the Colour Palette to select it as the Secondary Colour.
5. Click on the **Flood Fill Selective** button  in the **Bitmap Editing** area. This allows you to flood-fill areas of any colour with the current Primary Colour, until it meets pixels of the current Secondary Colour.
6. Move the  cursor over the grey area of the greyscale image, and then click to flood-fill the lizard in blue.
7. Click on the **Texture Relief** button  in the **Relief Editing** area.




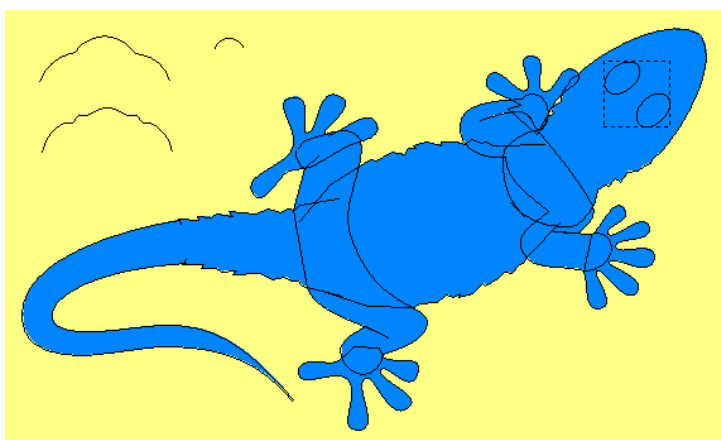
The texture will be applied to all areas of the relief under the blue colour which now covers the entire lizard within the greyscale image.

8. Make sure that the **Selected Colour** radio button  is selected by clicking on it.
9. Click on the **Sphere** radio button  to select it as the texture shape.
10. In the **Sizing** area, type *0.5 mm (0.02")* in the **Size** box and *1 mm (0.04")* in the **Z Height** box. This defines the dimensions of each sphere.
11. In the **Spacing** area, type *50* in the **O%** box. This offsets each row of spheres in the texture by 50% of their actual size. We will use the default values in the **X%** and **Y%** boxes.
12. Click on the **Add** button. This option instructs ArtCAM Pro to add the points in the texture to the current relief.
A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in adding the texture to the relief.
13. Click on the **Close** button, and then press the **F3** key on your keyboard to display the textured relief in the **3D View** window.

Adding the Eyes

Finally, we will add the lizards' eyes to the relief using the same process that was used to create its feet.

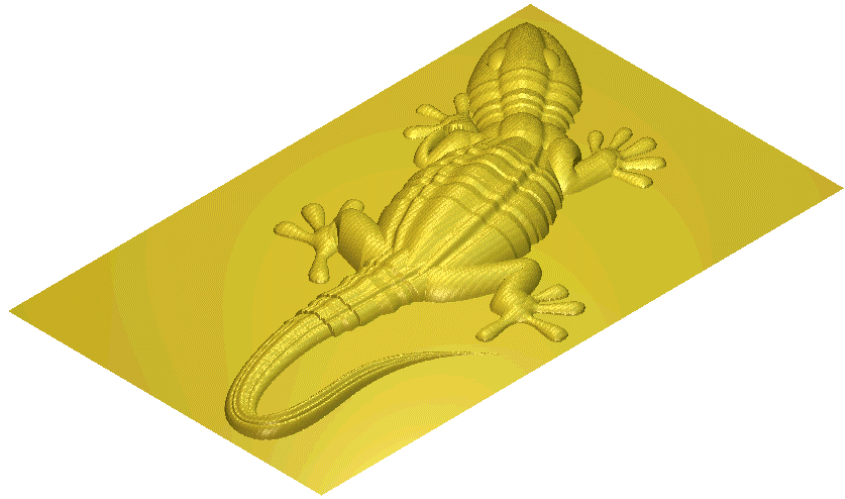
1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Select Vectors** button  in the **Vector Editing** area.
3. Hold the **Shift** key down on your keyboard, and then click on the vector objects representing the lizards' eyes. The vector objects are purple and surrounded by a bounding box.



4. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.
5. In the **Shape Editor**, set the options to create a rounded shape with an angle of 60° and a start height of 15 mm ($0.6''$) then click on the **Apply** button to apply these settings to the selected vector objects.
6. Click on the **Merge High** button, followed by the **Close** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.

7. Press the **F3** key on your keyboard to display the finished relief in the **3D View** window:



Tutorial – Two Rail Sweep

Overview

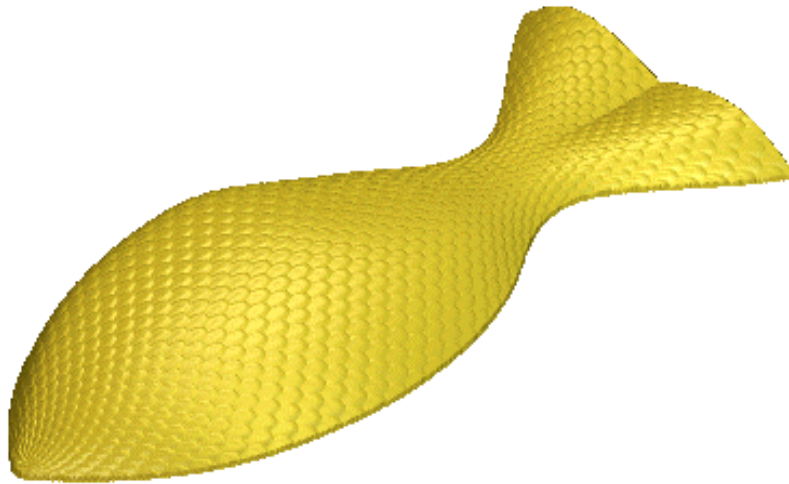
The following tutorial demonstrates how to create freeform three-dimensional shapes using vector artwork and the Vector Based Relief Creation and Relief Editing tools available in ArtCAM Pro.

Fish

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the body.
- Creating the scales.

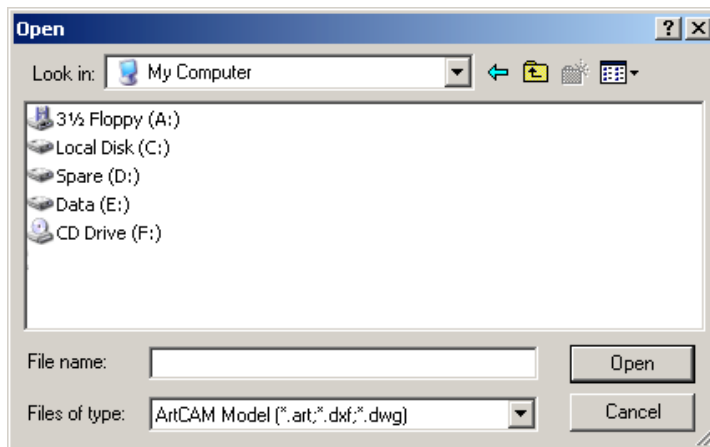
The tutorial will lead you through each of these stages, guiding you through the complete process of creating a three-dimensional shape from vector artwork to form a relief in the shape of a fish. Finally, you will apply a texture to the fish relief to give the impression of scales on its body:



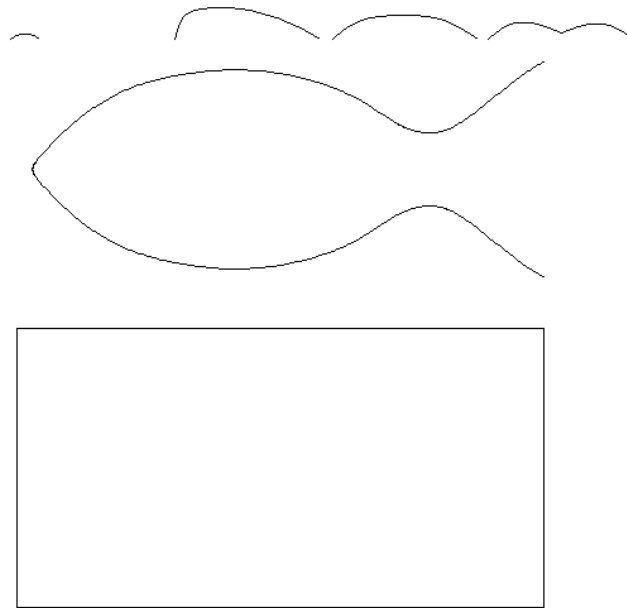
Preparing the Model

First, we will open the ArtCAM model containing the vector artwork needed to create the fish:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box:




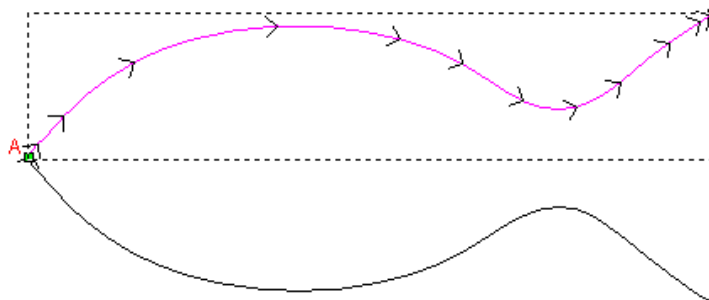
2. Click on the **Look In** list box and select *C:\Program Files\ArtCAMPro 7.0\Examples\Fish* (assuming ArtCAM was installed into the default location – the files can also be found on the installation CD within the *Examples* directory).
3. Click to select the file named *fish.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the *fish* model. The following vector artwork appears in the **2D View** window:



Creating the Body

We will create the body of the fish using the four cross-sections drawn in the top-left corner of the model area and the pair of vectors that represent its overall shape. As you will see, sweeping each of the cross-sections between two vectors, referred to as drive rails, creates the body shape. This process is called a two-rail sweep. Using multiple cross-sections allows us to create variations in the overall shape in specific areas.

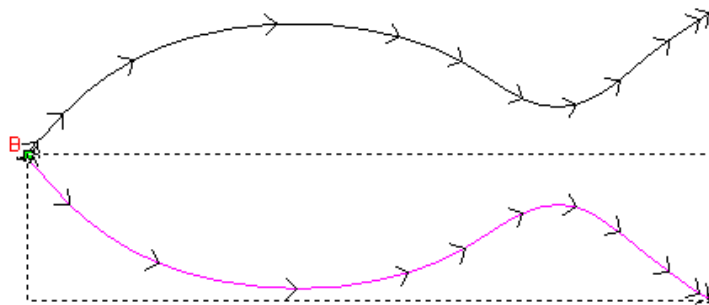
1. Click on the **Two Rail Sweep** button  in the **Vector Based Relief Creation** area to display the **Two Rail Sweep** page.
2. Click to select the vector representing the top-edge of the fish. The vector turns magenta and is surrounded by a bounding box.
3. In the **Select Control Vectors** area, click on the **Select** button for the **Top Drive Rail** to confirm the selected vector as the top drive rail.



Arrows appear on the vector selected as the drive rail to indicate its direction.

In the **Status** area, the *First Drive Rail* changes to *Valid*. A red letter *A* appears beside the drive rail in the **2D View** window.

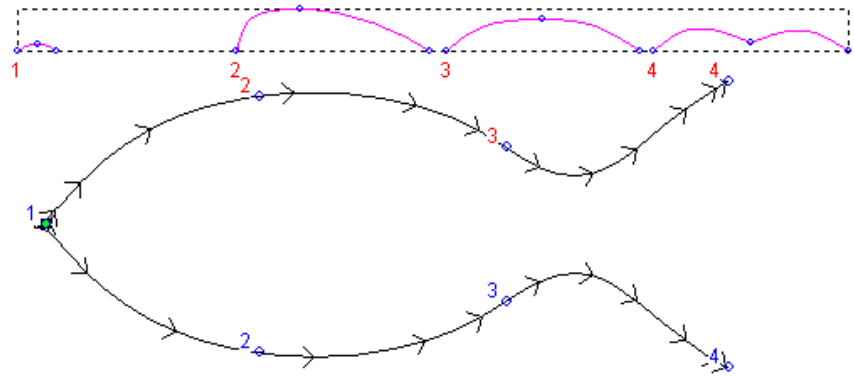
4. Click to select the vector representing the bottom-edge of the fish. The vector turns magenta and is surrounded by a bounding box.
5. In the **Select Control Vectors** area, click on the **Select** button for the **Bottom Drive Rail** to confirm the selected vector as the bottom drive rail.




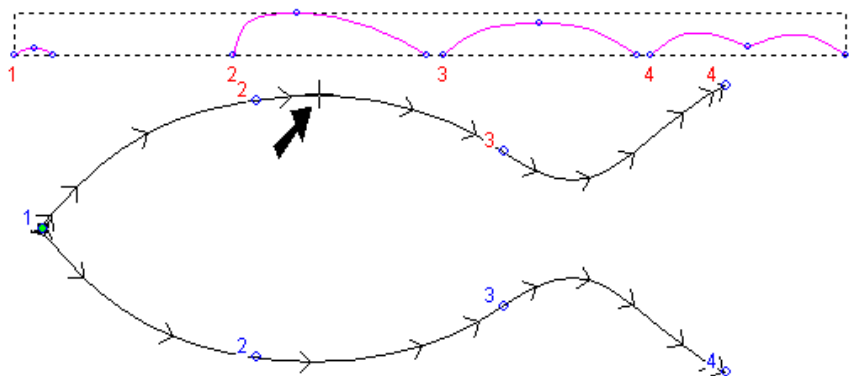
Arrows appear on the vector selected as the drive rail to indicate its direction.

In the **Status** area, the *Second Drive Rail* changes to *Valid*. A red letter *B* appears beside the drive rail in the **2D View** window.

6. Click anywhere in the model area to deselect the second drive rail.
7. Hold the **Shift** key down on your keyboard, and then click to select all four of the cross-section vectors drawn above the first drive rail from left to right. Each of the vectors turns magenta, all of which are surrounded by a bounding box.
8. Click on the **Add Cross Section** button. Each of the cross-sections is numbered in the **2D View** window, and they are listed iteratively in the **Status** area. Each of the cross-sections is assigned to specific positions along the drive rails. The red numbers in the **2D View** window indicate the position of each of the cross-sections along the first drive rail, and the blue numbers indicate the position of each of the cross-sections along the second drive rail.

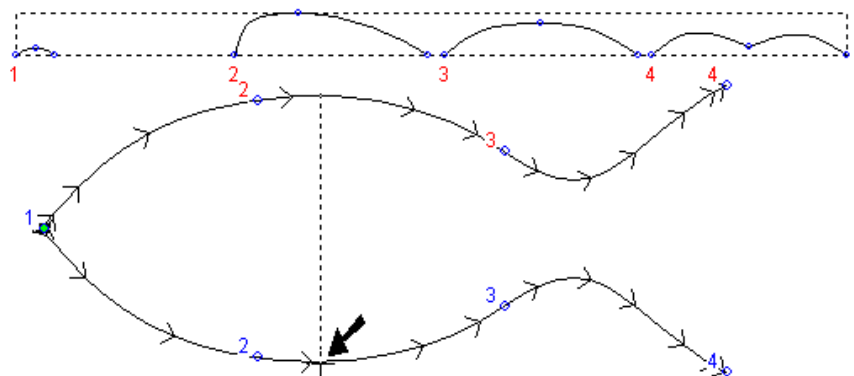


9. Make sure that the **Sweep Between Spans** option is selected . When all of the selected cross-sections contain the same number of spans, in this instance two, ArtCAM Pro can match each span whilst sweeping along the drive rails.
10. In the **Status** area, click on the **Set Position** button  for the second cross-section.
11. Click on the position on the first drive rail as shown below:




The red *1st Rail* text changes to *2nd Rail* in blue.

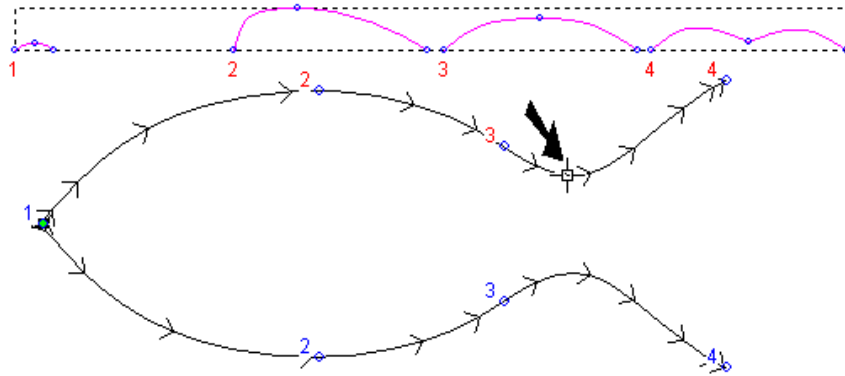
12. Click on the position on the second drive rail as shown below:



The blue *2nd Rail* text changes to *Position* in black, and the new position of the cross-section is marked on the first drive rail as a red 2 and the second drive rail as a blue 2.

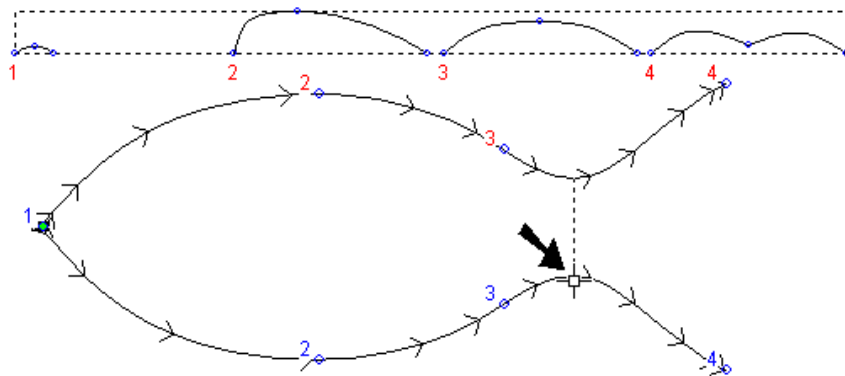
13. In the **Status** area, click on the **Set Position** button  for the third cross-section.

14. Click on the position on the first drive rail as shown below:




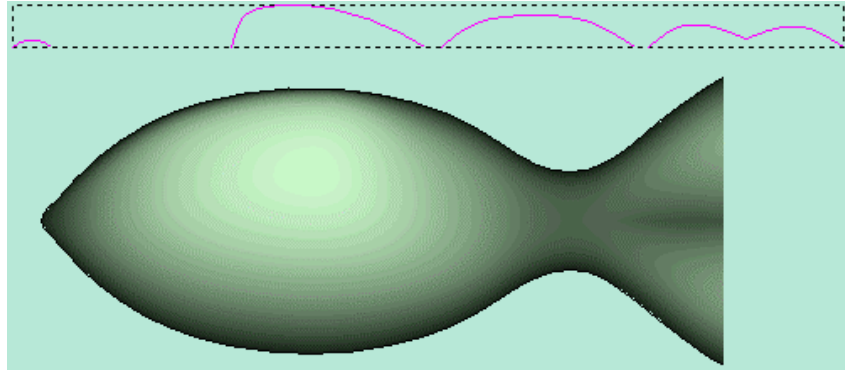
The red *1st Rail* text changes to *2nd Rail* in blue

15. Click on the position on the second drive rail as shown below:

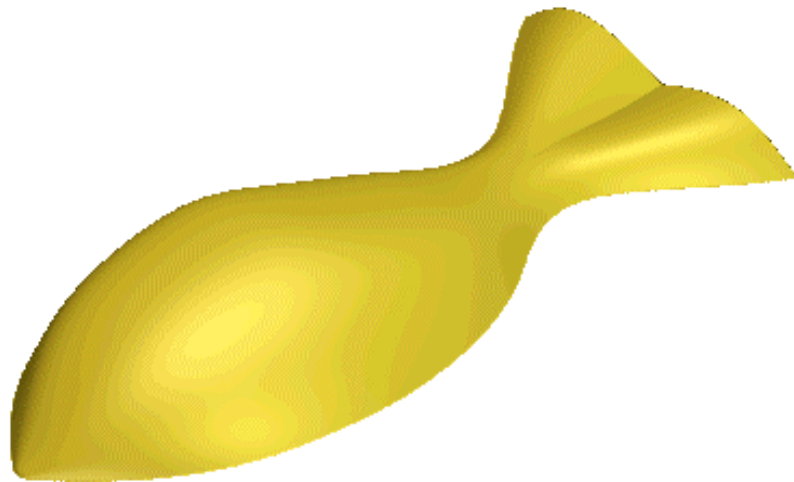


The blue *2nd Rail* text changes to *Position* in black, and the new position of the cross-section is marked on the first drive rail as a red 3 and the second drive rail as a blue 3.

16. Click on the **Calculate** button to create the swept shape.
17. Click on the **Close** button to return to the **Assistant's** Home page.
18. Click on the **Greyscale View** button  in the **2D View** toolbar to display a greyscale view of the relief, as shown below:



19. Press the **F3** key on your keyboard to display the swept shape in the **3D View** window, as shown below:




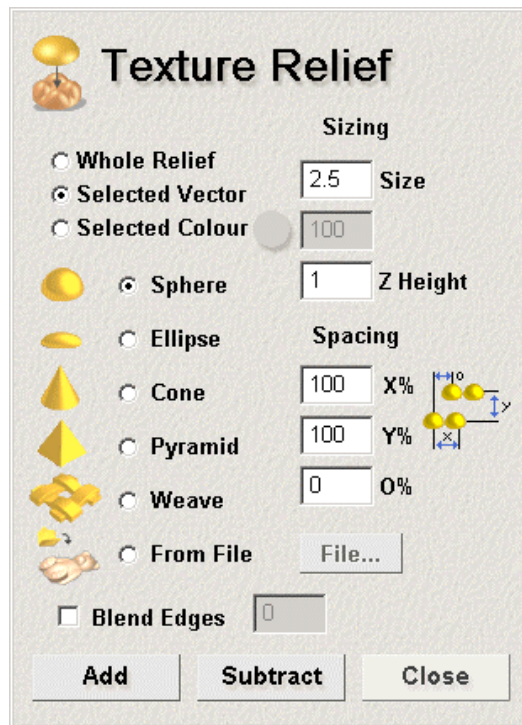
Creating the Scales

We are now ready to create the fish scales. We will create a textured relief that resembles fish scales, distort their shape to follow the profile of the body and then apply the scales to complete our fish relief.

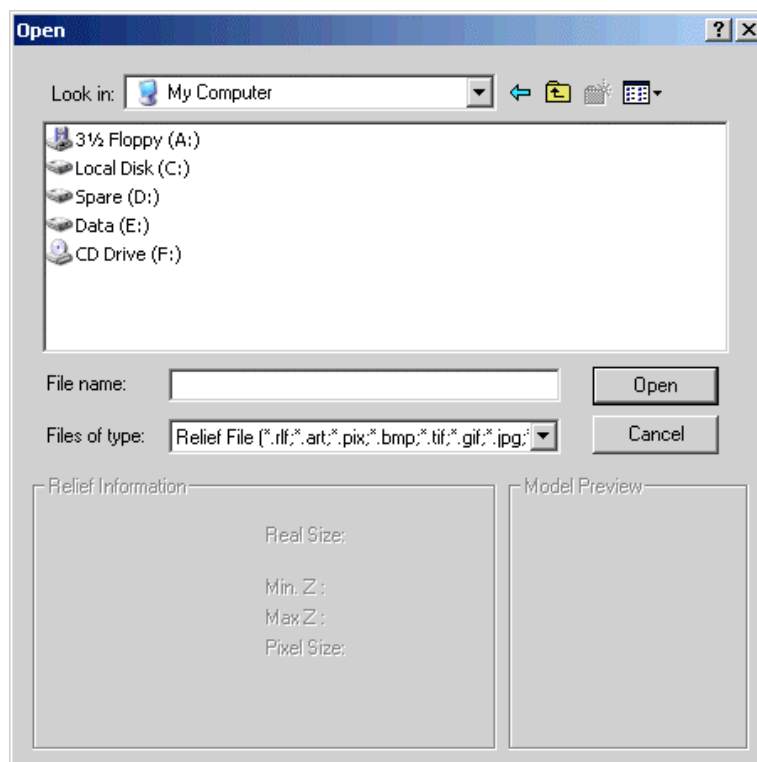
Creating the Texture

First we will create a textured relief that resembles the scales on a fish.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the rectangular vector. The vector turns magenta and is surrounded by a bounding box.
3. Click on the **Texture Relief** button  in the **Relief Editing** area to display the **Texture Relief** dialog box:




4. Make sure that the **Selected Vector** radio button is selected. This is because we only want to create the texture within the area of the relief identified by the selected rectangle.
5. Click on the **From File** radio button . The **File...** button is activated.
6. Click on the **File...** button to display the **Open** dialog box:



7. Click on the **Look In** list box and select *C:\Program Files\ArtCAMPro 7.0\Examples\Fish* (assuming ArtCAM was installed into the default location – the files can also be found on the installation CD within the *Examples* directory).
8. Click to select the file named *scale.rlf*. The file name appears in the **File name** box.
9. In the **Sizing** area, type *0.4 mm (0.02")* in the **Z Height** box.
10. In the **Spacing** area, type *60* in the **X%** box, *60* in the **Y%** box and *90* in the **O%** box.
11. Click on the **Add** button to add the texture to the relief within the area marked by the rectangular vector.
12. Click on the **Close** button.

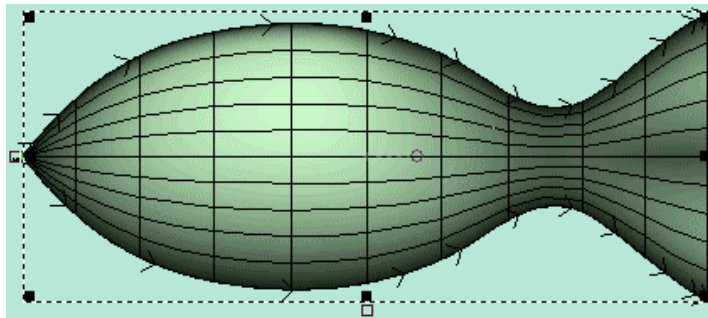
Applying the Texture

Next we will distort the texture using the Relief Envelope Distortion tool. We will apply the texture between the two vectors that we used as the drive rails in the swept shape, so that the texture then follows the profile of the swept shape. We will combine the distorted texture with the swept shape to form a relief that resembles a fish.

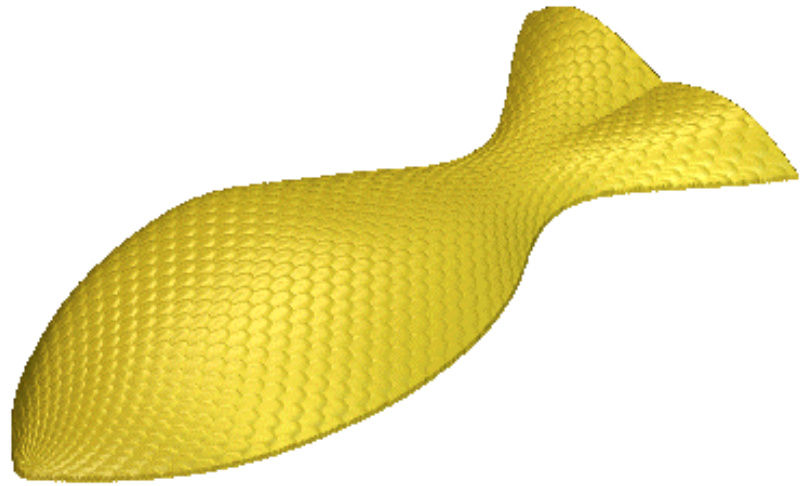
1. From the **2D View** window, click to select the rectangular vector. The vector turns magenta and is surrounded by a bounding box.
2. Click on the **Relief Envelope Distortion** button  in the **Relief Editing** area to display the **Relief Envelope Distortion** page.
3. In the **Original Relief** area, click on the **Replace Original Relief (Cut)** radio button to select it. This is because we do not need to keep the texture within the rectangular vector after it has been combined with the swept shape.
4. Click on the **Relief Z Height Scaling** list box, and then on the **Keep Current Z** option to select it. This instructs ArtCAM Pro to maintain the existing Z height of the texture.
5. Click to select the **Use existing curve(s)** option to display its settings. This option allows us to use curved

vector objects drawn in the **2D View** window to control the dimensions and position of the distortion envelope

6. Click on the **Wrap between 2 curves** radio button to select it. The **Wrap along single curve** settings are now greyed-out.
7. Click to select the vector that you previously used as the first drive rail in the swept shape, and then click on the **Select Top Curve** button.
8. Click to select the vector that you previously used as the second drive rail in the swept shape, and then click on the **Select Bottom Curve** button.
9. Click on the **Apply** button. The distortion envelope is applied between the two selected vectors. You can see how the texture has been distorted to follow the profile of the swept shape, as shown below:



10. In the **Combine** area, make sure that the **Add** radio button is selected. This instructs ArtCAM Pro to add the distorted texture to the swept shape that we previously created.
11. Click on the **Paste** button.
12. Click on the **Finish** button to return to the **Assistant's** Home page.
13. Press the **F3** key on your keyboard to display the textured relief in the **3D View** window, as shown below:



Tutorial – Simple Jewellery Designs

Overview

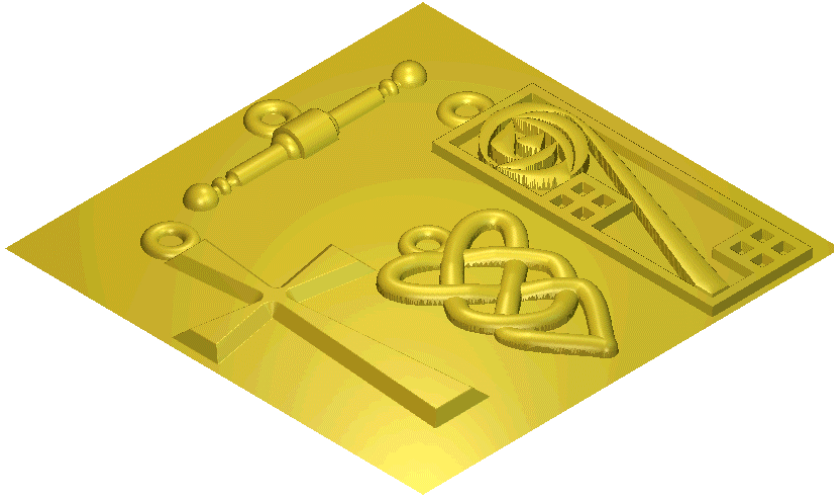
The following tutorial demonstrates how to create three-dimensional shapes that can be used as jewellery designs, using vector objects together with the vector based relief creation tools in ArtCAM Pro.

Jewellery

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating a t-bar.
- Creating a crucifix and a Mackintosh-style pendant.
- Creating a weave pendant.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating complex three-dimensional shapes using vector objects, combining these shapes to form a relief in the shape of four items of jewellery as shown:

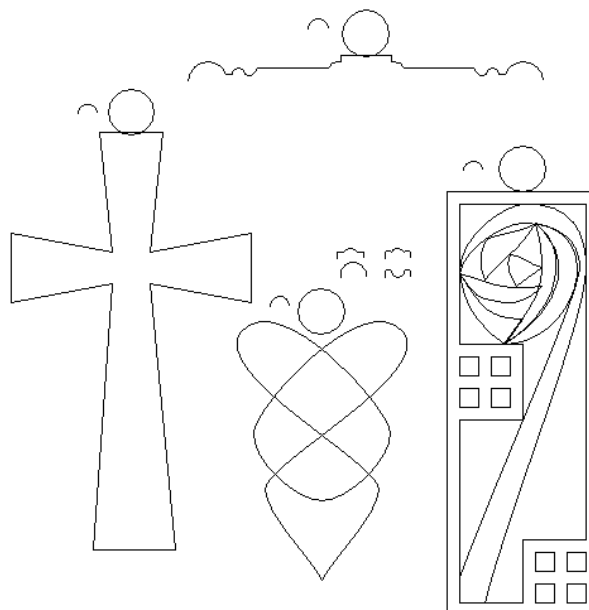


Preparing the Model

First, we will open the ArtCAM model containing the artwork from which we will create the jewellery relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Jewellery.
3. Click to select the file named *Jewellery.art*. The file name appears in the **File name** box.
4. Click on the **Open** button.

The following artwork appears in the **2D View** window:




The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains vector objects that will be used to create the different items of jewellery in the relief. Some of the vector objects will be used as drive curves, others as cross-sectional profiles, from which shapes will either be turned or extruded. Other vector objects will only have shape attributes applied to them, from which a shape will then be calculated and combined with the relief.

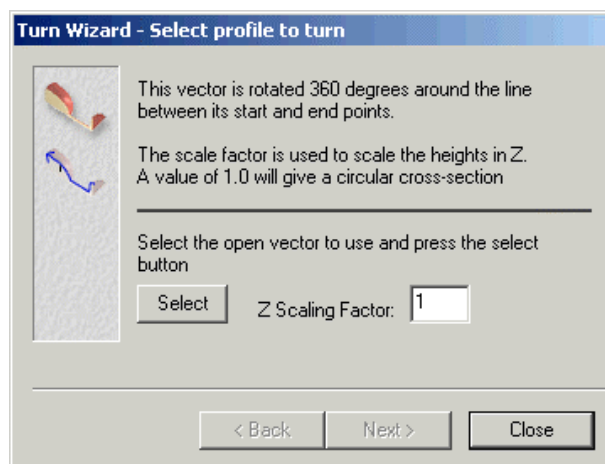
Creating a T-Bar

The first item of jewellery that we will create is a T-bar design. This can be created in two stages, firstly the bar itself and then the eyelet which will be attached to it.

Creating the Bar

First we will create the bar itself by turning the profile vector object. An imaginary line between the start point (node) and end point (node) in the selected vector object acts as an axis about which the profile is turned to create the cross-section of the shape. This shape will then be added to the relief.

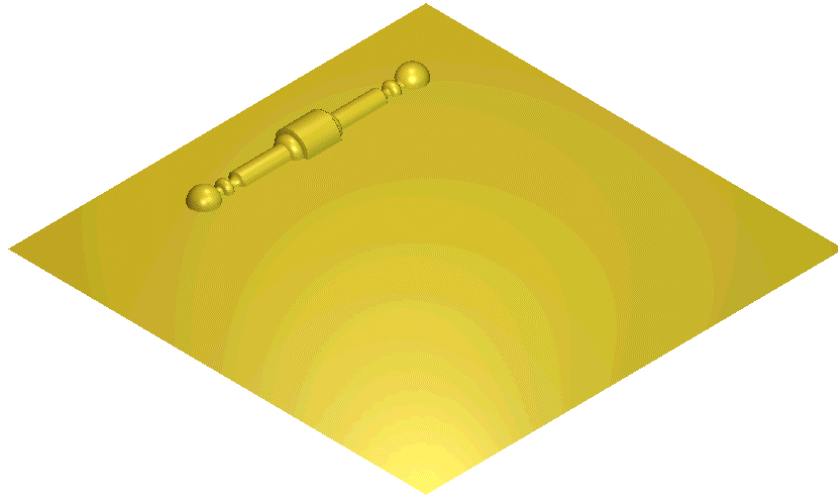
1. Click on the **Turn** button  in the **Vector Based Relief Creation** area of the **Assistant's** Home page to display the **Turn Wizard**:



2. Click on the following vector object for the bar to select it.




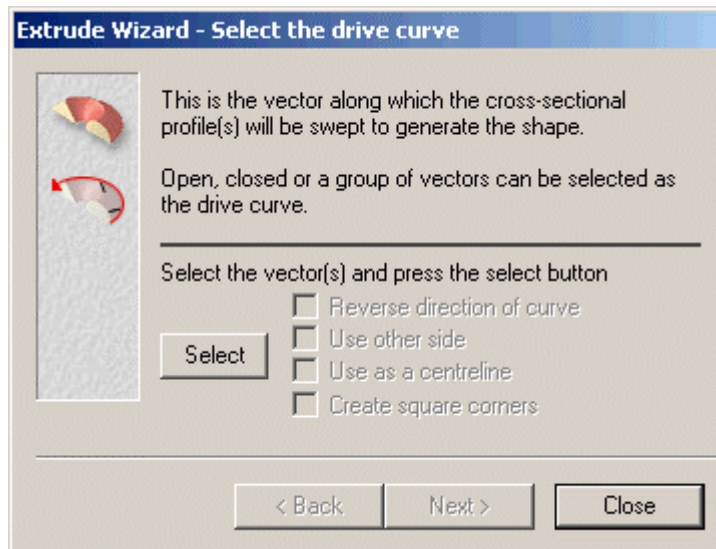
3. Click on the **Select** button in the **Turn Wizard**. The vector object is magenta and you can see direction arrows all along its inside-edge. These indicate the side of the vector object to which the cross-section will be attached.
4. Click on the **Next** button, followed by the **Turn** button to add the points in the turned shape to the relief.
5. Click on the **Close** button, then press the **F3** key on your keyboard to display the relief in the **3D View** window:



Creating the Eyelet

To finish the T-bar design, we must create an eyelet. We will extrude this shape using two selected vector objects. The first vector object defines the line along which the shape is extruded. This is referred to as the drive curve. The second vector object defines the cross-sectional profile of the shape. The shape will then be combined with the existing relief.

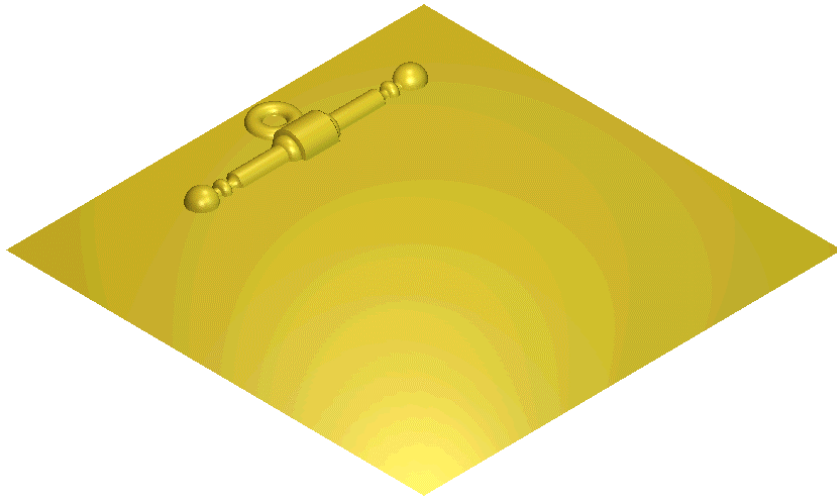
1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click on the **Extrude** button  in the **Vector Based Relief Creation** area to display the **Extrude Wizard**:



3. Click to select the circular vector object for the eyelet. A bounding box surrounds the vector object.
4. Click on the **Select** button in the **Extrude Wizard**. The vector object is magenta and you can see direction arrows around its outside-edge. These indicate the side of the vector object to which the cross-section will be attached.
5. Click on the **Use as centreline** option to select it . This option instructs ArtCAM Pro to extrude the middle of the shape along this vector object. You can see direction arrows along the inside-edge of the selected vector object.
6. Click on the **Next** button. The vector object turns red.
7. Click to select the semi-circular vector object to the left of the eyelet. A bounding box surrounds the vector object.
8. Click on the **Select** button. The vector object is magenta and you can see a direction arrow on its inside-edge. The arrow shows the current Z-axis direction, which determines the side on which the shape will be extruded.
9. Click on the **Next** button. The vector object turns red.
10. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
11. Since we do not want to use a z modulation vector to add a contour and scale the shape in the Z-axis along its length, click on the **Next** button.
12. Click on the **Merge Highest** radio button to select it. This option instructs ArtCAM Pro to merge the points in the

extruded shape with the current relief, so that only the highest points of the two show in a new relief.

13. Click on the **Extrude** button to create the extruded shape.
14. Click on the **Close** button, then press the **F3** key on your keyboard to display the new relief in the **3D View** window:



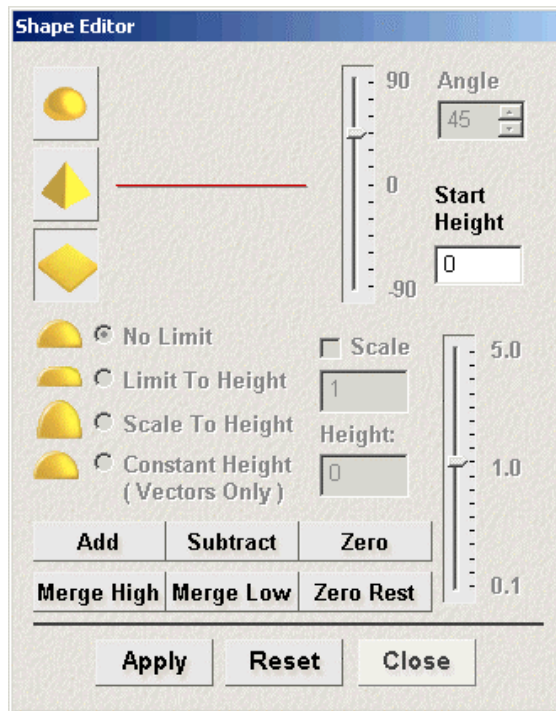
Creating a Crucifix and a Mackintosh-Style Pendant


The second and third items of jewellery that we will create are a crucifix and a Mackintosh-style pendant design.

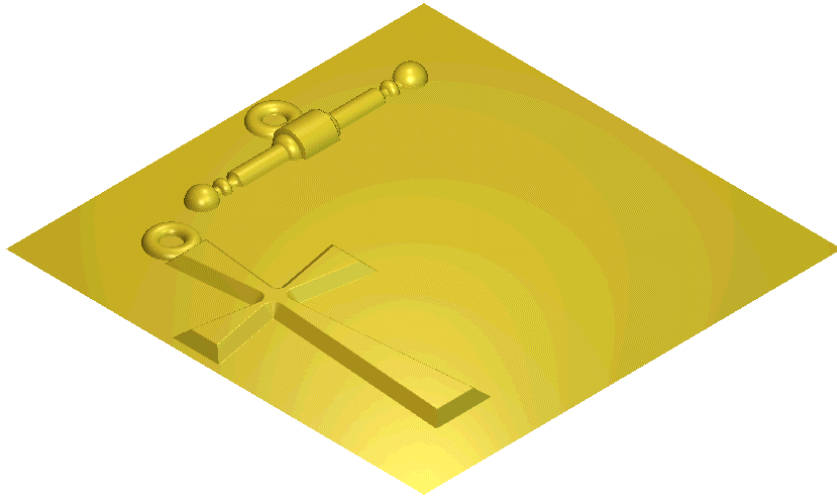
Creating the Crucifix

We are now ready to create the crucifix relief by applying shape attributes to the vector object representing the crucifix and combining the shape with the existing relief.

1. Click to select the crucifix design. A bounding box surrounds the selected vector object.
2. Press the **F12** key on your keyboard display the **Shape Editor** dialog box:




3. Click on the **Angular** button . This will create angled walls in the crucifix.
4. Click on the **Limit To Height** radio button , and then type 2 mm (0.079") in the **Height** box. This will create a flat-top for the crucifix.
5. Type 1 mm (0.039") in the **Start Height** box.
6. Click on the **Apply** button.
7. Click on the **Add** button to add the points in the shape to the current relief.
8. Click on the **Close** button.
9. Repeat the steps used to create the eyelet in the T-bar design, this time using the circular and semi-circular vector objects above the crucifix.
10. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:

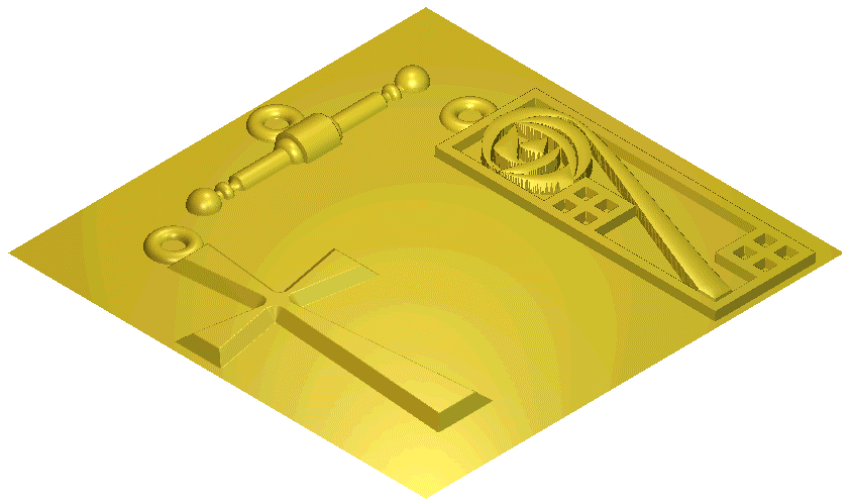


Creating the Pendant

Next, we will create a pendant design by applying shape attributes to a selected vector object, then combining the shape with the existing relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the group of vector objects representing the outside-edge of the pendant. The selected group of vector objects is purple and surrounded by a bounding box.
3. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.
4. Type 2 mm (0.079") in the **Start Height** box. This sets the height at which the pendant's edges are created.
5. Click on the **Add** button to add the points in the shape to the current relief.
6. Click on the **Close** button.
7. Click to select the group of vector objects representing the flower in the pendant. The selected group of vector objects is purple and surrounded by a bounding box.
8. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.
9. Click on the **Round** button . This sets the shape of the flower in the pendant.
10. Type 20 in the **Angle** box. This sets the angle of the rounded shape.


11. Type 2.5 mm (0.098") in the **Start Height** box. This sets the height at which the rounded shape is created.
12. Click on the **Merge High** button to merge the points in the shape with the current relief, so that only the highest points of the two show in a new relief.
13. Click on the **Close** button.
14. Repeat the steps used to create the eyelet in the T-bar design, this time using the circular and semi-circular vector objects above the pendant.
15. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Creating a Weave Pendant

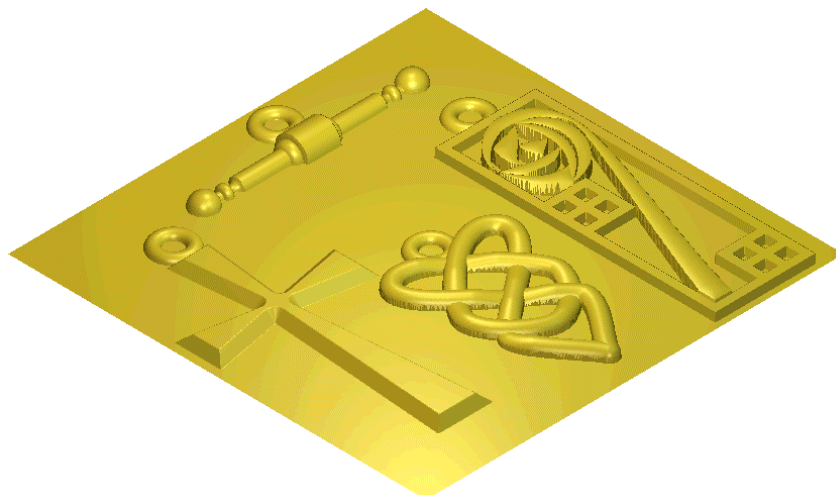
Finally, we will create a weave pendant design using two selected vector objects. The first vector object overlaps itself and represents the weave pattern. The second vector object represents the cross-section of the weave shape. We will extrude the cross-section along the weave pattern. ArtCAM Pro automatically scales its height up and down at each intersection. This shape will also be combined with the existing relief.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Hold down the **Shift** key on your keyboard, and then click to select the vector object representing the weave pattern, followed by the arched cross-section in the set of four above. The selected vector objects are magenta and surrounded by a bounding box.

3. Click on the **Weave Wizard** button  in the **Vector Based Relief Creation** area to display the **Weave Wizard** dialog box:



4. Click on the **OK** button to accept the default settings and add the points in the weave shape to the current relief.
5. Repeat the steps used to create the eyelet in the T-bar design, this time using the circular and semi-circular vector objects above the weave pattern.
6. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



Tutorial – Pendant

Overview

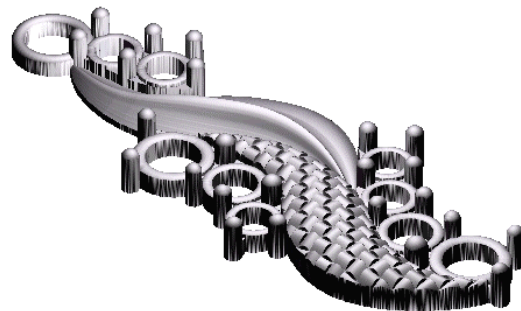
The following tutorial demonstrates how to create a complex pendant design from bitmap colours and vector objects using the relief operations and relief editing tools available in ArtCAM Pro.

Pendant

The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Creating the basic shapes.
- Adding the texture.
- Creating the overall shape.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating three-dimensional shapes using linked bitmap colours and vector objects. You will also create a two-rail swept shape using vector objects, and combine this with the other shapes to form a relief containing the pendant's features. A weave texture will also be applied to the relief surface. Finally, you will combine a shape with the relief to act as a base for the finished pendant, as shown:




Preparing the Model

First, we will open the ArtCAM model containing the artwork that will be used to create the pendant relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Jewellery.
3. Click to select the file named *pendant_demo.art*. The file name appears in the **File name** box.
4. Click on the **Open** button.

The .art file that you have opened is a model previously created in ArtCAM Pro. The model contains two **2D View** windows, each of them containing different views of the pendant artwork. We will use the bitmap colours and vector objects in each of these views to create different shapes and combine them to form the pendant relief. The **Add Colours/Merge Vectors:1** window will be used to create the features of the pendant, and the **Add Plane Under Blue:2** window will be used to create a base for the pendant itself.

5. Click on the **Reset Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to delete the relief that was saved as part of the *pendant_demo.art* model.

Creating the Basic Shapes

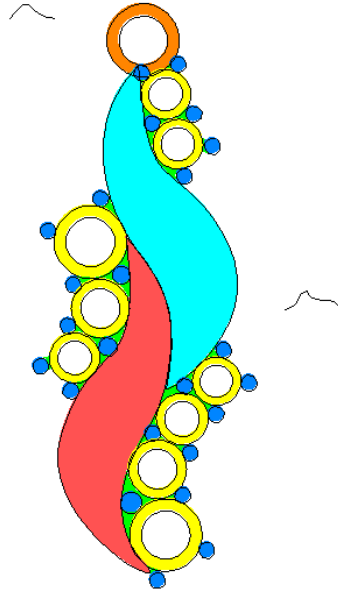
Next we will calculate the features in the pendant relief.

The artisan who created this model has already applied shape attributes to the bitmap colours and vector objects representing the features in the pendant artwork. We will use these colours and vector objects to build up the relief.

Creating Shapes from Bitmap Colours

We are ready to calculate the relief from the shape attributes applied to selected bitmap colours in the model, and those colours that have been linked to them.

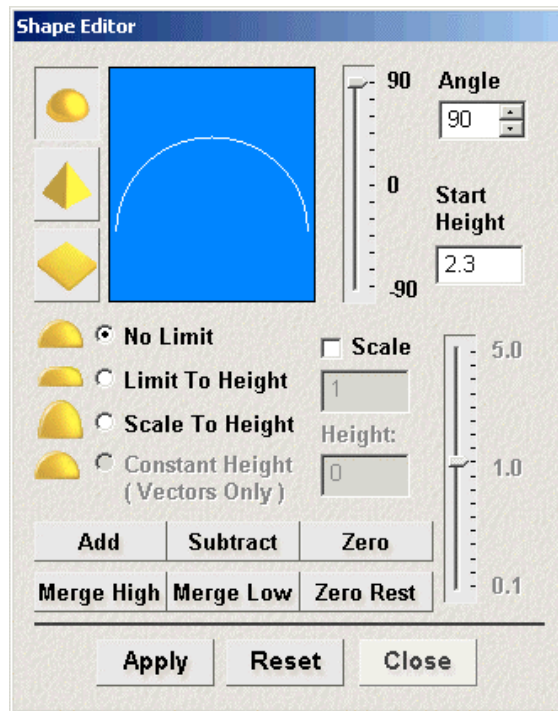
1. Click on the **Add Colours/Merge Vectors:1** window to make it active. This window contains the following artwork:



You can see that different colours have been used to represent the features in the pendant design. The lines drawn over the three colours in the Colour Palette beneath the window indicate that a shape has already been applied to each of them.



2. Double-click on the dark-blue colour in the Colour Palette to display the **Shape Editor** dialog box.




You can see that a round shape with an angle of 90 and a start height of 2.3 mm (0.091 ") has been applied to this colour.

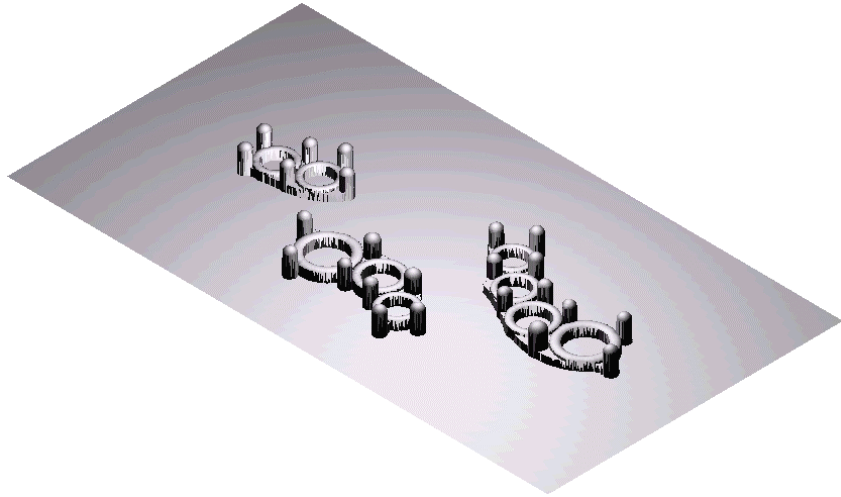
3. Click on the **Close** button.
4. Double-click on the yellow colour in the Colour Palette to display the **Shape Editor** dialog box.

You can see that a round shape with an angle of 45 , a start height of 1 mm (0.039 ") and a height limit of 0.2 mm (0.0079 ") has been applied to this colour.

5. Click on the **Close** button.
6. Double-click on the green colour in the Colour Palette to display the **Shape Editor** dialog box.


You can see that a flat shape with a start height of 0.8 mm (0.0315 ") has been applied to this colour.

7. Click on the **Add Relief** button  in the **Relief Operations** area of the **Assistant's** Home page to add the points in the shapes to the relief.
8. Press the **F3** key on your keyboard to display the relief in the **3D View** window:



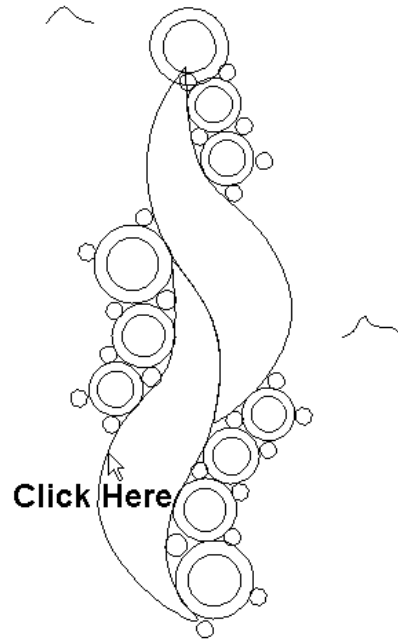
Creating Shapes from Vector Objects

Now we will calculate the relief from shape attributes applied to selected vector objects in the model. We will also create a two-rail swept shape using four vector objects, then combine it with the relief.

1. Press the **F2** key on your keyboard to display the **Add Colours/MergeVectors:1** window.
2. Click on the **Bitmap On/Off** button  in the **Add Colours/MergeVectors:1** toolbar to hide the bitmap colours used in the window.
3. Click to select the group of two circular vector objects representing the eyelet at the top of the design. The group of vector objects is purple and surrounded by a bounding box.
4. Press the **F12** key on your keyboard on the **Shape Editor** option to display the **Shape Editor** dialog box.

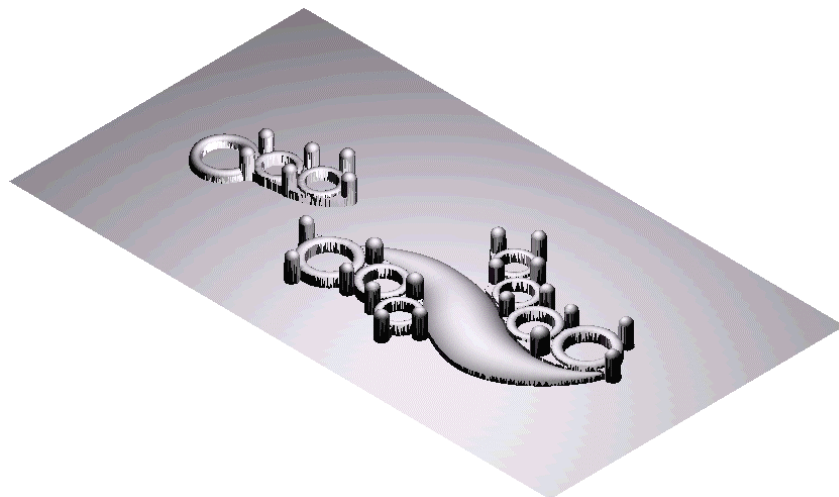
You can see that a round shape with an angle of 90° , a start height of 0.5 mm ($0.0197''$) has been applied to this group of vector objects.

5. Click on the **Merge High** button to merge the points in the shape with the current relief, so that only the highest points of the two show in a new relief.
6. Click on the **Close** button.
7. Click to select the vector object as shown below:

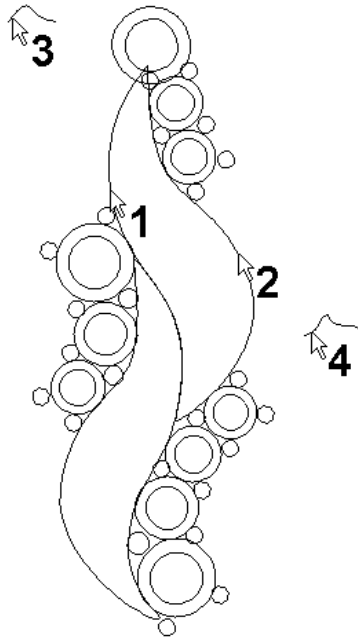


The selected vector object turns magenta, and is surrounded by a bounding box.

8. Press the **F12** key on your keyboard to display the **Shape Editor** dialog box.
9. Click on the **Merge High** button, followed by the **Close** button.
10. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



11. Press the **F2** key on your keyboard to display the **Add Colours/MergeVectors:1** window.
12. Hold the **Shift** key on your keyboard, and then click on the four vector objects shown below in sequence to select them.

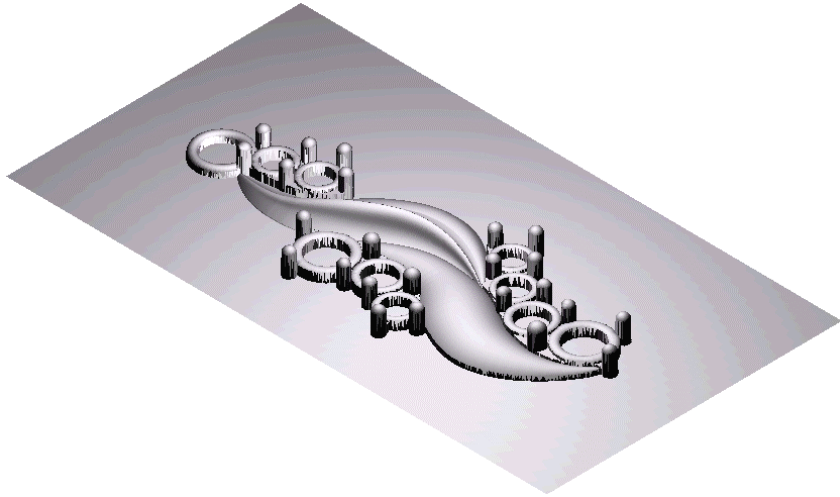


The selected vector objects are magenta and surrounded by a bounding box.

13. Click on the **Two Rail Sweep** button  in the **Vector Based Relief Creation** area to display the **Two Rail Sweep** page.


In the **Status** area, the *First Drive Rail*, *Second Drive Rail*, *Cross Section 1* and *Cross Section 2* are indicated as *Valid*. Both of the vector objects selected as the drive rails are magenta with direction arrows along them, while both the cross-sections are magenta.

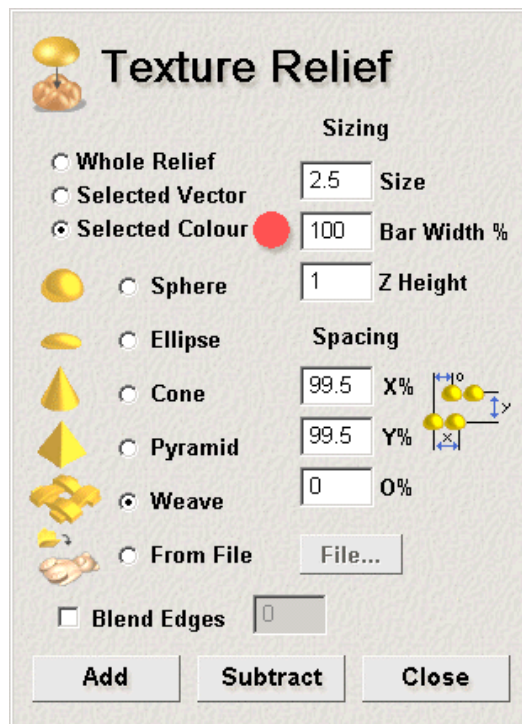
14. Click to select the **Highest** radio button . This option instructs ArtCAM Pro to merge the points in the two-rail swept shape with the current relief, so that only the highest points of the two show in a new relief.
15. Click on the **Calculate** button, followed the **Close** button.
16. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:




Adding the Texture

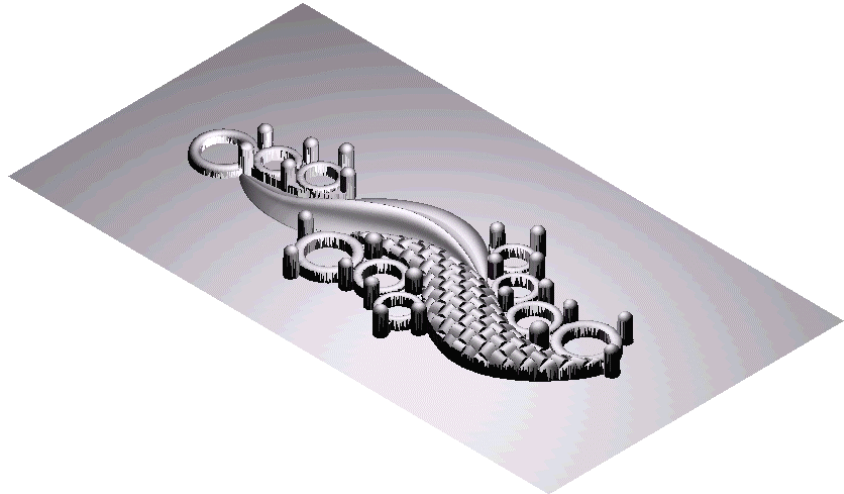
In this section, we will apply a weave texture to a selected area of the relief surface.

1. Press the **F2** key on your keyboard to display the **Add Colours/MergeVectors:1** window.
2. Make sure that the red colour in the Colour Palette is selected as the Primary Colour by clicking on it.
3. Click on the **Texture Relief** button  in the **Relief Editing** area to display the **Texture Relief** dialog box:.



4. Click on the **Weave** radio button  to select this option.

5. Click on the **Add** button to accept the default values and add the points in the texture to the current relief.
6. Click on the **Close** button, then press the **F3** key on your keyboard to display the textured relief in the **3D View** window:

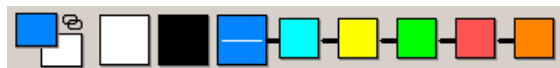


Creating the Overall Shape

Finally, we will combine another shape with the relief to act as the base for the overall pendant shape.

1. Press the **F2** key on your keyboard to display the **Add Colours/MergeVectors:1** window.
2. Click on the **Add Plane Under Blue:2** window to make it active.

In the Colour Palette below the **Add Plane Under Blue:2** window, you can see that all except two of the colours have been linked to the dark blue colour. These linked colours appear as and are treated as the Primary Colour to which they are linked.

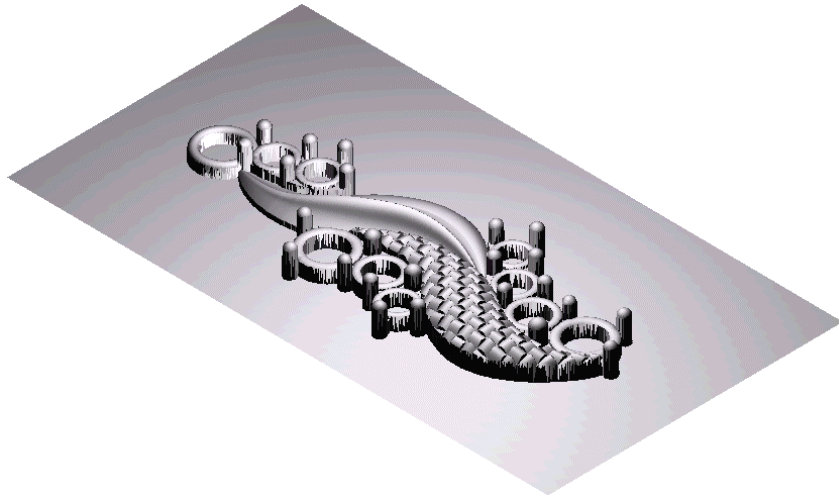


3. Double-click on the dark blue colour in the Colour Palette to display the **Shape Editor** dialog box.

You can see that a flat shape with a start height of *0.5 mm (0.0197"*) has been applied to this colour.

4. Click on the **Add** button to add the points in this shape to the current relief.

5. Click on the **Close** button, then press the **F3** key on your keyboard to display the new relief in the **3D View** window:



You have now created the finished pendant relief.

Tutorial – Casino Chip

Overview

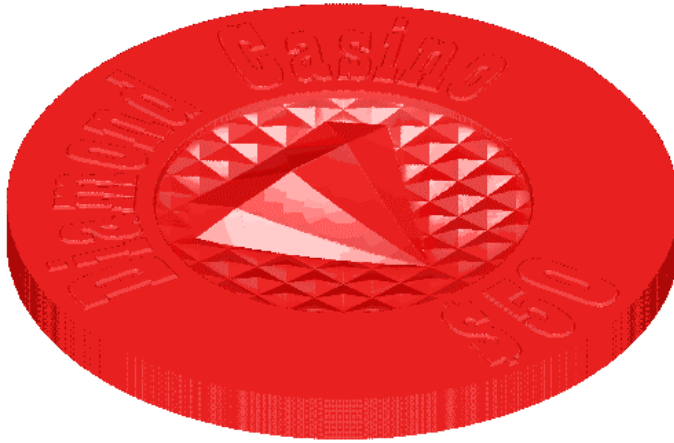
The following tutorial demonstrates how to create an angled plane, a cross-section from an existing model and a triangle mesh using the relief operations and relief editing tools available in ArtCAM Pro.

Casino Chip

The stages that you will cover during the course of this tutorial are:


- Preparing the diamond model.
- Creating the angled planes.
- Saving the relief.
- Preparing the damaged chip model.
- Repairing the damaged chip relief.
- Creating the finished casino chip relief.
- Creating a triangle mesh.

We will create a three-dimensional diamond shape relief by creating angled planes from a piece of two-dimensional artwork. This diamond relief will be used as the centrepiece of a casino chip face, for which we have a damaged model. Once we have created the diamond relief, we will repair the casino chip face by creating a spun shape and combining it with the damaged relief. With the casino chip face relief repaired, we will then combine it with the diamond relief to form the basis of the finished casino chip face. A texture will be added to this relief around the diamond centrepiece to complete it. Finally, we will create a closed triangulated mesh by combining the casino chip face relief with an imported relief representing its back-face.

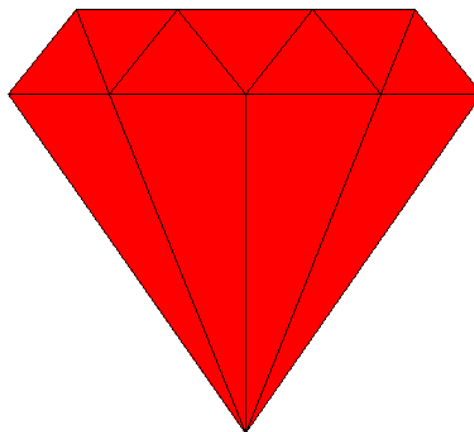


Preparing the Diamond Model

First, we will open the ArtCAM model containing the artwork from which we will create a diamond relief:

1. Click on the **Open Existing Model** icon  on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Casino Chip - STL.
3. Click to select the file named *Jewel.art*. The file name appears in the **File name** box.
4. Click on the **Open** button.

The following artwork appears in the **2D View** window:




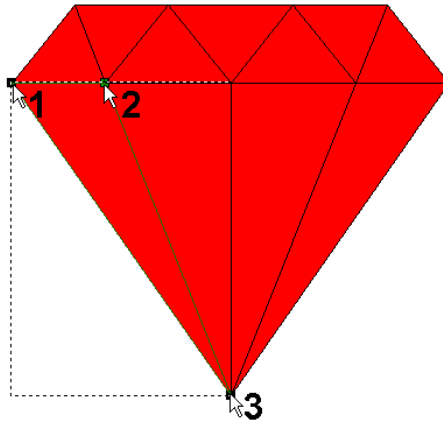
The .art file that you have opened is a model previously created in ArtCAM Pro. We will use the bitmap colours and vector objects the diamond artwork to create a number of angled planes that will be combined to form a diamond

relief. This relief will be saved and used as the centrepiece of a casino chip relief.

Creating the Angled Planes

First, we will create nine angled planes from the diamond vector object and combine them to form a relief in the shape of a diamond.

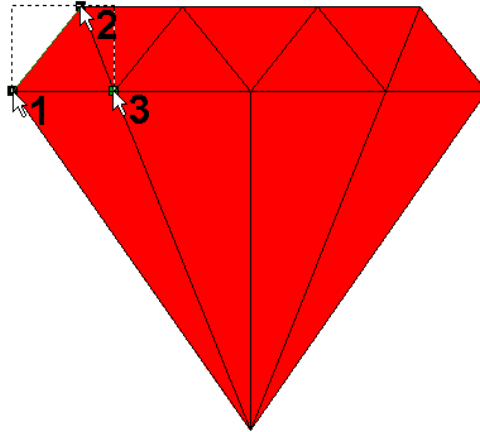
1. Click on the diagonal polyline on the bottom-left edge of the diamond to select it. A bounding box surrounds the bottom-left section of the diamond.
2. Click on the **Create Angled Plane** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Create Angled Plane** page.
3. Click to select the **Set Third Point** option . This is because we will select three points for our angled plane.
4. Click on the **Start** button, and then click on the points (nodes) on the diamond vector object in the following order to select them:



The co-ordinates of the selected points (nodes) are displayed in the **Z** boxes on the page.

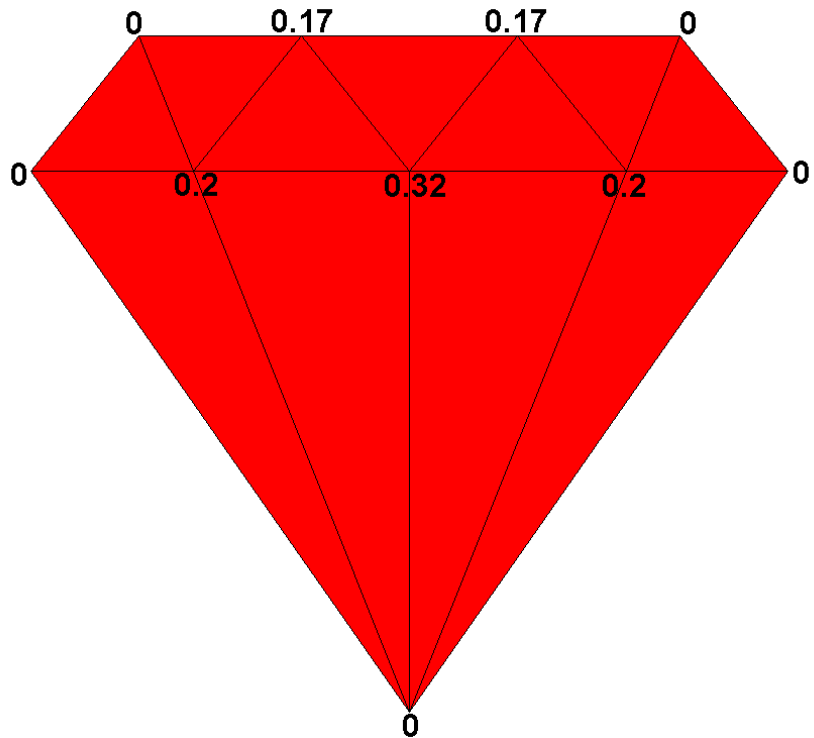
5. In the **First Point on Plane** area, type 0 in the **Z** box.
6. In the **Second Point on Plane** area, type 0.2 in the **Z** box.
7. In the **Third Point on Plane** area, type 0 in the **Z** box.
8. Click on the **Create** button to create the angled plane. This creates a relief that looks like one of the angled-edges in the face of a diamond.

9. Click on the diagonal polyline on the top left-edge of the diamond to select it. A bounding box surrounds the top-left section of the diamond.
10. Click on the **Start** button, then click on the points (nodes) on the diamond vector object in the following order to select them:



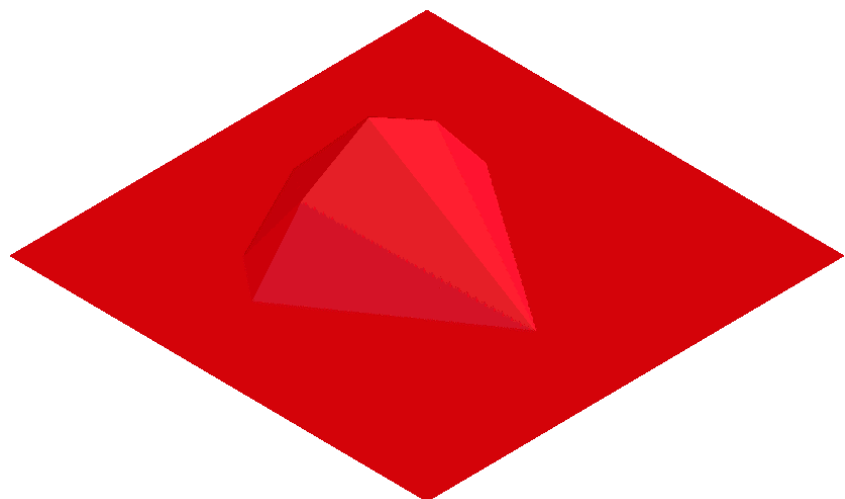
The co-ordinates of the selected points (nodes) are displayed in the **Z** boxes on the page.

11. In the **First Point on Plane** area, type 0 in the **Z** box.
12. In the **Second Point on Plane** area, type 0 in the **Z** box.
13. In the **Third Point on Plane** area, type 0.2 in the **Z** box.
14. Click to select the **Highest** radio button . This option instructs ArtCAM Pro to merge the points in the angled plane with the existing relief, so that only the highest points of the two show in the relief.
15. Click on the **Create** button to create the angled plane.
16. Repeat this process for all of the polylines in the diamond vector object, typing the co-ordinates shown in the following diagram in the appropriate **Z** box.



Remember to click on the **Start** button before selecting each set of three points (nodes) on the diamond vector object, and to make sure that the **Highest** option is selected before creating each angled plane.


17. Click on the **Close** button to return to the **Assistant's** Home page.
18. Click on the **3D View** button in the **2D View** toolbar to display the relief in the **3D View** window:

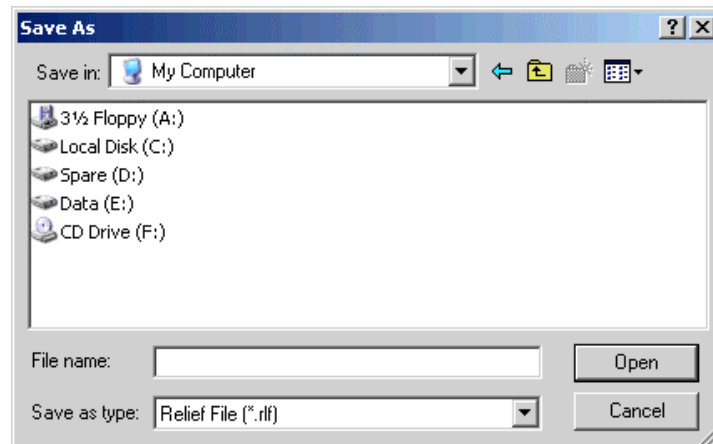


19. Click on the **Draw Zero Plane** button to hide the zero plane and view the relief more clearly.

Saving the Relief

We will now save the current relief so that we can import it later as 3D clipart.



1. Click on the **Save Relief** button  in the **Relief Operations** area to display the **Save As** dialog box:



2. Click on the **Save In** list box and select the directory where you want to save the relief.
3. Type *Diamond* in the **File Name** box.
4. Click on the **Save** button.

Preparing the Damaged Chip Model

Now that we have saved the diamond relief, we are ready to import the ArtCAM model containing a bitmap image of a damaged casino chip and its corresponding relief. We will then repair the damage using the relief editing and vector based relief creation tools in ArtCAM Pro.

1. Click on the **Open File** button  in the **File** area to display the **Open** dialog box.
2. Click to select the file named *Casino_Chip_Demo.art*, and then click on the **Open** button.
3. Press the **F3** key on your keyboard to display the current relief in the **3D View** window.
4. Press the **F2** key on your keyboard to display the **2D View** window.
5. Click on the **Greyscale View** button  in the **2D View** toolbar to create a greyscale image of the current relief in


the **2D View** window. You can clearly see the damage on the chip design.

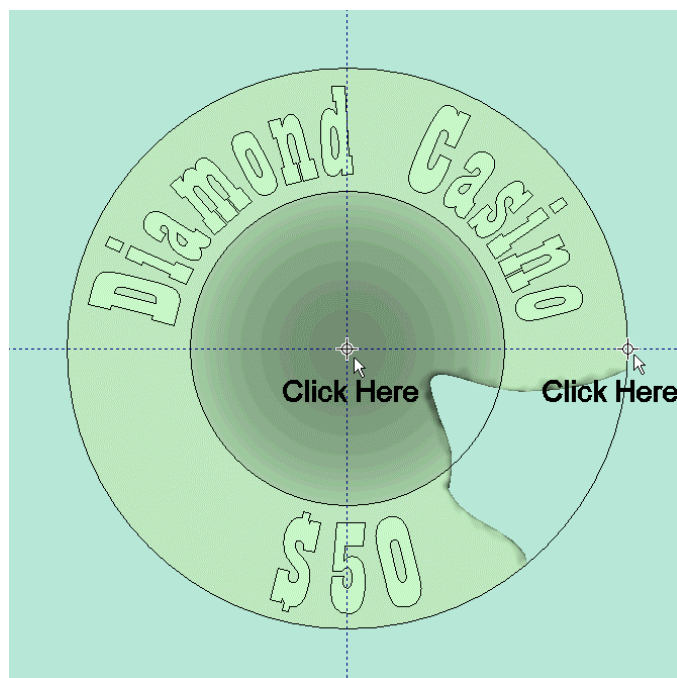
Repairing the Damaged Chip Relief

We will now repair the damaged area of the casino chip relief using the relief editing and vector based relief creation tools in ArtCAM Pro.

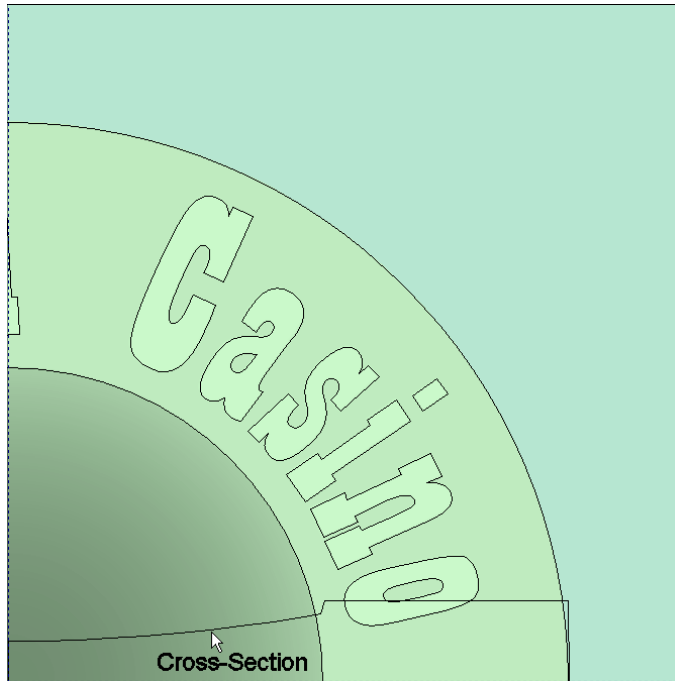
Creating the Cross-Section

First, we will create a cross-section using the vector object representing the casino chip, and the guidelines in the model. This cross-section can then be used to create a spun shape that will replace the missing part of the casino chip.

1. Click on the **Create Cross-Section**  button in the **Relief Operations** area to display the **Create Relief Cross-Section** page.
2. Move the mouse cursor over the position where the guidelines intersect in the centre, and then click.
3. Move the mouse cursor over the position where the guideline intersects with the circular vector object on the outside right, and then click.




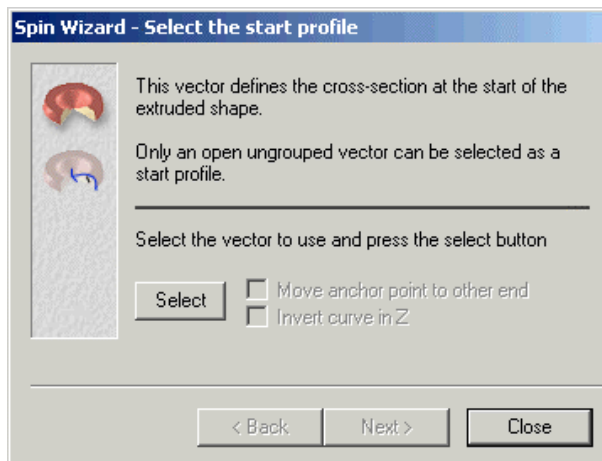
4. Click on the **Create** button, followed by the **Close** button.
The cross-section appears as shown below:



Creating the Spun Shape

Now we will create a spun shape using the cross-section that we have created. This spun shape will be calculated and combined with the existing relief to repair the damage on the current casino chip relief.

1. Click on the **Spin** button  in the vector **Based Relief Creation** area to display the **Spin Wizard**:



2. Click to select the cross-section. The cross-section turns magenta and is surrounded by a bounding box.
3. Click on the **Select** button to select the cross-section as the start profile. Direction arrows appear all along the inside edge of the start profile.
4. Click on the **Next** button. The start profile turns blue.


5. Make sure that the **End profile is the same as the start profile** option is selected , and then click on the **Next** button.
6. Make sure that the **Sweep through 360 degrees** option is selected , and then click on the **Next** button.
7. Since we are not using a z modulation vector in this tutorial, click on the **Next** button.
8. Click to select the **Merge Highest** option . This tells ArtCAM Pro to merge the points in the spun shape with the current relief, so that only the highest points of the two show in a new relief.
9. Click on the **Spin** button to create the spun shape, then click on the **Close** button.
10. Press the **F3** key on your keyboard to display the new relief in the **3D View** window.

Creating the Finished Casino Chip Relief


To create the relief representing the face of the casino chip, we will combine the current relief with the diamond relief that we created earlier and then apply a texture to a selected area of the new relief.

Combining Reliefs

First, we will import the diamond relief that we created earlier as clipart, alter its scale and height, then combine it with the current relief.

1. Click on the **Load Relief** button  in the **Relief Operations** area to display the **Open** dialog box.
2. Click on the **Open** button to display the **Load Relief** dialog box.
3. Click on the **Look In** list box and go to the directory where you saved the diamond relief.
4. Click to select the file named *diamond.rlf*, then click on the **Open** button to display the **Load Relief** dialog box:





5. Click to select the **Pasting** radio button , followed by the **OK** button.
6. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area of the **Assistant's** Home page to place the red vector outline of the diamond clipart relief in the centre of the model.
7. Click on the **Scale** tab, and then type *60* in the **New Scale %** box. This scales the diamond clipart relief to 60% of its original size.
8. Click on the **Size** tab, and then type *1.2 mm (0.05")* in the **Z Range** box. This sets the Z height of the diamond clipart relief.
9. Click on the **Mode** tab, and then make sure that the **Add** radio button is selected by clicking on it. This option instructs ArtCAM Pro to add the points in the diamond clipart relief to the current relief.
10. Click on the **Paste** button. The red vector outline of the diamond clipart relief turns purple.
11. Click on the **Close** button.
12. Press the **F3** key on your keyboard to display the new relief in the **3D View** window.

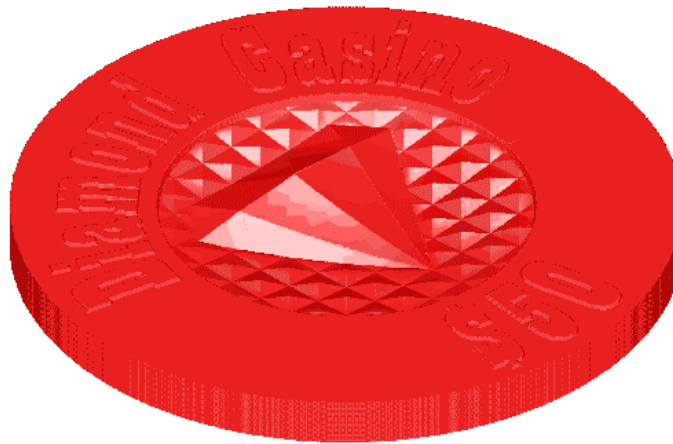
Adding Texture to the Relief

To produce the finished casino chip relief, we shall add a texture to a selected area in the current relief. Texture can only be applied to areas of the relief marked in the current Primary Colour. When creating the

texture, we will select its shape, define the size of the shape, the repeat distance in the X and Y axes, and the overlap distance.



1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click to select the vector outline of the diamond. The vector outline turns purple and is surrounded by a bounding box.
3. Hold the **Shift** key on your keyboard, and then click on the inner-circle vector in the casino chip to select it. A bounding box surrounds both vector objects and the inner-circle vector is magenta.
4. Click on the pink colour in the Colour Palette to select it as the Primary Colour.
5. Click on the **Flood Fill Vectors** button  in the **Bitmap – Vector** area to colour the area between the two selected vector objects in the current Primary Colour. This is the area to which we will apply texture.
6. Click on the **Texture Relief** button  in the **Relief Editing** area to display the **Texture Relief** page.
7. Click on the **Pyramid** radio button to select it as the texture's shape.
8. In the **Sizing** area, type 2.5 mm (0.1") in the **Size** box and 1 mm (0.04") in the **Z Height** box.
9. Click to select the **Blend Edges** option , and then type 10 mm (0.4") in the adjacent box. This instructs ArtCAM Pro to begin blending the edges of the texture at this distance from the edges in the selected relief area.
10. Click on the **Add** button. This option instructs ArtCAM Pro to add the points in the texture to the current relief.

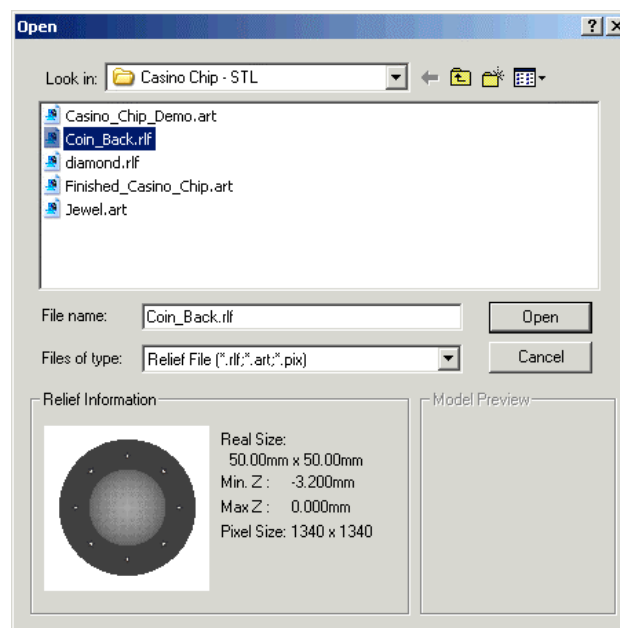
A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the textured relief.
11. Click on the **Close** button.
12. Press the **F3** key to display the new relief in the **3D View** window:



Creating a Triangle Mesh

Finally, we will create a closed triangle mesh model using the current relief and an imported relief representing the back face of the casino chip.

1. Click on the **Create Triangle Mesh** button  in the **Relief Operations** area to display the **Mesh Creator** page.
2. Type *0.01* mm (*0.0004*") in the **Tolerance** box.
3. Click to select the **Use Relief From File** radio button , followed by the **Load** button to display the **Open** dialog box:



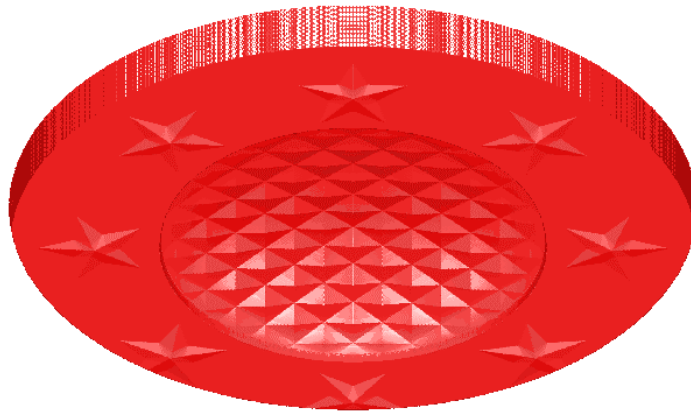
4. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Casino Chip - STL.

- Click on the file named *Coin Back.rlf*, followed by the **Open** button.

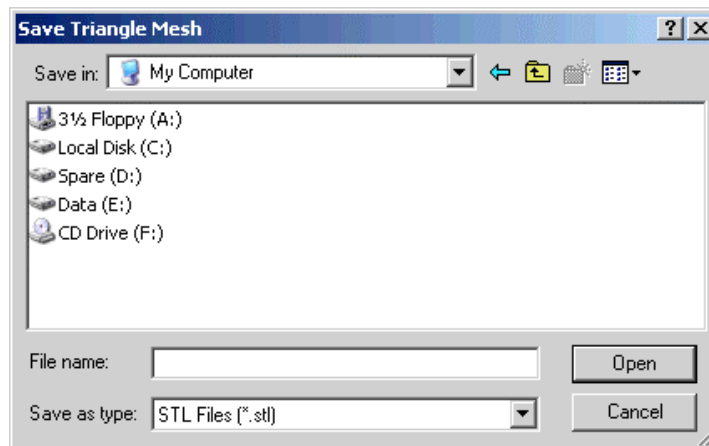
In the **Relief Information** area, notice that the size of the imported relief is identical to that of the current relief. When using a relief as a back face, its size and resolution must match that of the current relief in your model.

- Click on the **Create Triangles** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in creating the triangle mesh. The back face of the triangle mesh appears in the **3D View** window as follows:



- Click on the **Save Triangles** button to display the **Save Triangle Mesh** dialog box:



- Click on the **Save In** list box and select the directory that you want to save the triangle mesh in.
- Type *Coin Mesh* in the **File name** box, and then click on the **Save** button to save the triangle mesh as a .stl file. This file can now be sent to rapid prototyping machines or other CAD/CAM systems.

Tutorial – ISO-FORM Lettering

Overview

The following tutorial demonstrates how to create ISO-FORM lettering from vector text using the vector based relief creation tools available in ArtCAM Pro.

ISO-Form Letters

The stages that you will cover during the course of this tutorial are:

- Preparing the model.
- Creating the vector text.
- Creating the ISO-FORM letters.

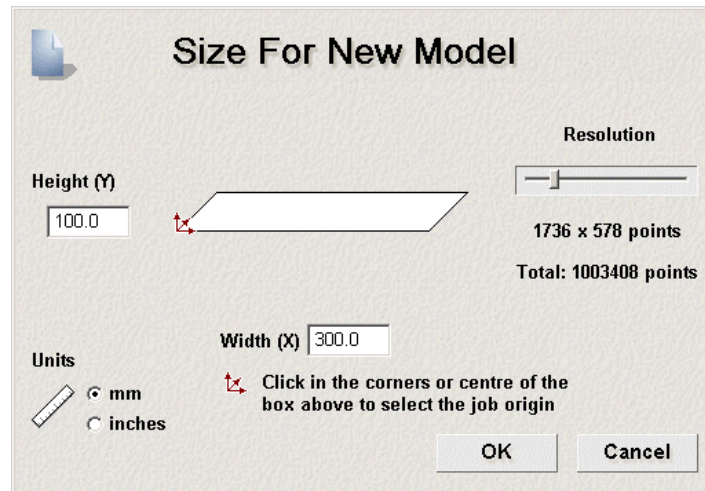
The tutorial will lead you through each of these stages, guiding you through the complete process of creating ISO-FORM letters from vector text, then combining these shapes with the relief to produce the lettering shown below:



Preparing the Model

First, we will set up the model dimensions for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:





2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *100 mm (3.9")* in the **Height** box and *300 mm (11.8")* in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to *1003408* points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

Creating the Vector Text


Now we will create the vector text from which the three-dimensional ISO-FORM letters are to be created.

1. Click on the **Create Vector Text** button  in the **Vector Editing** area of the **Assistant's Home** page to display the **Text Tool** page.
2. In the **Style** area, click on the **Bold** button  to type in bold.
3. Click on the **Font** list box, and then click on **Times New Roman** to select it.

4. Make sure that **Western** is selected in the **Script** list box.
5. Click on the **Size** list box, and then click on the appropriate units of measurement.
6. Type *60 mm (2.4")* in the **Size** box.
7. Click anywhere in the model area (the white area in the **2D View** window), and then type *Cafe*.
8. Click on the **Done** button to create the vector text and return to the **Assistant's** Home page.

The vector text appears, surrounded by a bounding box indicating that it is selected. The vector text is grouped by default.



9. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to move the vector text to the centre of the model area.

Creating the ISO-FORM Letters


We are now ready to create the ISO-Form letters from the vector text you have created.

An ISO-Form letter is essentially made up of two parts, the **Bottom Height** and the **Top Height**. The former describes the vertical height (side-wall) in the base of the letter, while the latter describes the height in the angled or circular cross-section added to its base to complete the letter.

We will create a combination of letters, some with a circular cross-section and others with an angular cross-section.

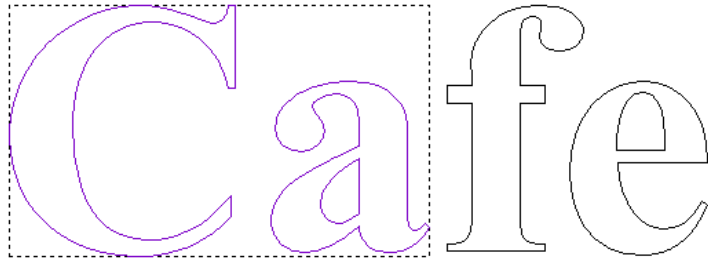
Creating Letters with a Circular Cross-Section


First, we will create the ISO-Form letters with a circular cross-section.

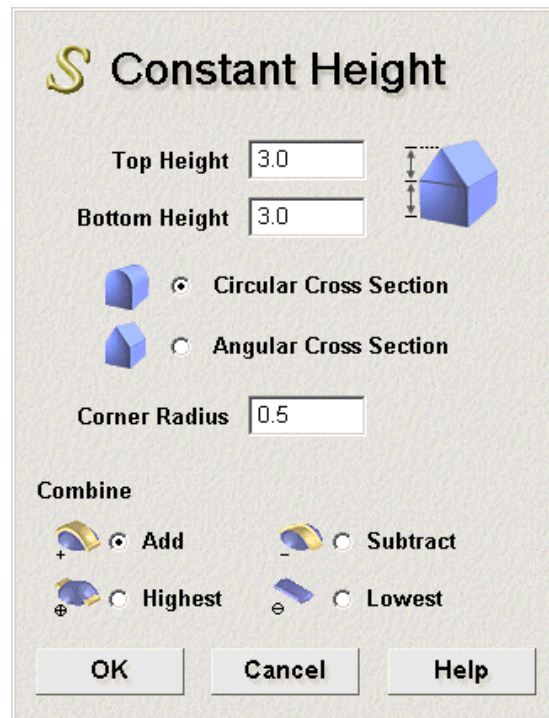
1. Click on the **Ungroup** button  in the **Group Merge Join Trim Vectors** area to ungroup the vector text.


The bounding box surrounding the vector text is removed, indicating that it is no longer selected.


2. Click and drag to form a bounding box around the first two letters in the vector text, then release the mouse button to select them. The selected vector text turns purple.

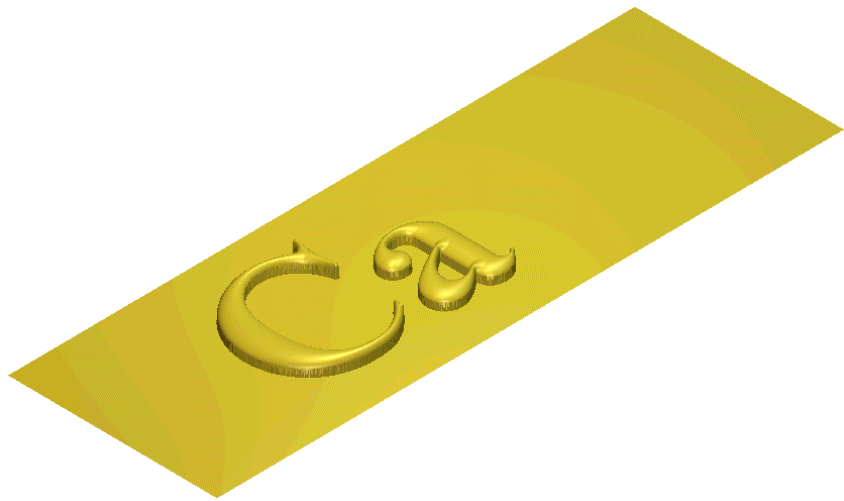


3. Click on the **ISO-FORM Letters** button  in the **Vector Based Relief Creation** area of the **Assistant's** Home page to display the **Constant Height** dialog box:



4. Type *3.0* mm (*0.12*") in both the **Top Height** and **Bottom Height** boxes. This sets the height of the base and the cross-section in the ISO-Form letters.
5. Make sure that the **Circular Cross Section** option  is selected by clicking on it.
6. Type *0.05* mm (*0.002*") in the **Corner Radius** box. This option instructs ArtCAM Pro to taper all areas of the constant relief height that have a radius smaller than *0.05* mm (*0.002*").

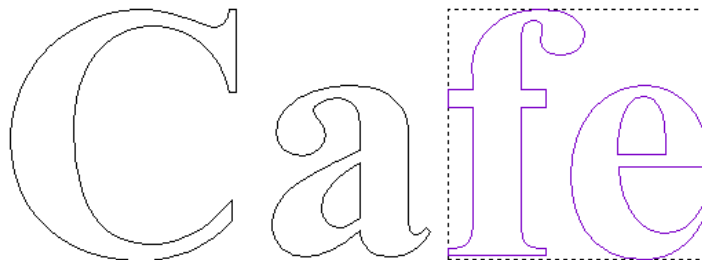
7. In the **Combine** area, make sure that the **Add** option is selected . This option instructs ArtCAM Pro to add the points in the letters to the current relief.
8. Click on the **OK** button to create ISO-FORM letters with a vertical height of 3 mm (0.12") and a curved top profile. The letters have a constant height of 6 mm (0.24") in total.
A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.
9. Press the **F3** key on your keyboard to display the relief in the **3D View** window:




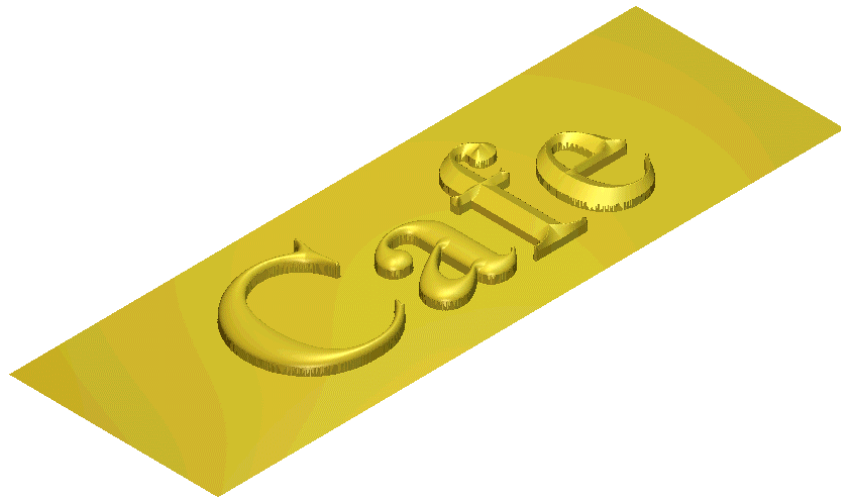
Creating Letters with an Angular Cross-Section

Now we will create the ISO-Form letters with an angular cross-section.

1. Press the **F2** key on your keyboard to display the **2D View** window.
2. Click and drag to form a bounding box around the last two letters in the vector text, then release the mouse button to select them. The selected vector text turns purple.



3. Click on the **ISO-FORM Letters** button  to display the **Constant Height** dialog box.
4. Type *3.0 mm (0.12")* in both the **Top Height** and **Bottom Height** boxes.
5. Click on the **Angular Cross Section** option to select it.
6. Type *0.05 mm (0.002")* in the **Corner Radius** box.
7. In the **Combine** area, make sure that the **Add** option is selected .
8. Click on the **OK** button to create ISO-FORM letters with an angular cross-section and a total height of *6 mm (0.24")*.
A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the relief.
9. Press the **F3** key on your keyboard to display the new relief in the **3D View** window:



You have now finished creating the ISO-FORM letters.

Tutorial – Interactive Sculpting

Overview

The following tutorial demonstrates how to use the Interactive Sculpting tools in ArtCAM Pro to enhance your three-dimensional designs. The Interactive Sculpting tools are particularly useful for editing and modifying scanned data taken from sources such as touch probe and laser scanners.

Teddy Bear


The stages that you will cover during the course of this tutorial are:


- Preparing the model.
- Sculpting the relief.

The tutorial will lead you through each of these stages, guiding you through the complete process of using the Interactive Sculpting tools to edit the appearance of a Teddy Bear relief.

Preparing the Model

First, we will open the ArtCAM model containing the relief that you will edit using the Interactive Sculpting tools:

1. Click on the **Open Existing Model**  icon on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Ted_bear.

3. Click to select the file named *Sculpt_Teddy.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the Teddy Bear model. A greyscale image of the Teddy Bear relief appears in the **2D View** window.
5. Press the **F3** key on your keyboard to display the relief in the **3D View** window.
6. Click on the **View Along Z** button  in the **3D View** toolbar to display the relief from the Z-axis.



Sculpting the Relief

We are now ready to sculpt the relief using some of the Interactive Sculpting tools in ArtCAM Pro.

Smoothing the Teddy Bear

First, we will use the **Smooth** tool to smooth an area of the relief, as well as remove an area of it altogether.

1. Click on the **Sculpting** button  in the **Relief Editing** area of the **Assistant's** Home page to display the **Interactive Sculpting** page.

The **Smooth** tool is selected by default. This allows you to blend one area of the relief with the next.

2. Click and drag on the **Diameter** slider and set the tool diameter to 10 mm (0.4").


The diameter of the tool determines how much material is blended into the area of the relief affected by the tool.


3. Click and drag on the **Strength** slider and set the strength of the tool to 100%.

The strength of the tool determines the width of the blend as a percentage of the tool width. The image to the left of the slider changes as you move the slider, to reflect the width of the blend.

4. Click and drag on the **Smoothness** slider to set the smoothness of the tool to 50%.

The smoothness of the tool determines how sharp the tip of the tool is.

5. Click on the **Zoom** button  in the **3D View** toolbar, then click and drag to form a bounding box around the teddy bear's right ear. Release the mouse button to zoom in on this area.

6. Move the  cursor over the inside of the teddy bear's right ear, then click and drag the mouse.

The shape of the ear changes as the cursor passes over it. The teddy bear's ear should look something like this:

Before...






After...



7. Change the diameter, strength and smoothness of the **Smooth** tool and experiment with smoothing other areas of the relief.

If you make a mistake and you want to revert back to how the relief was at the start of this sculpting session, click on the **Revert** button.

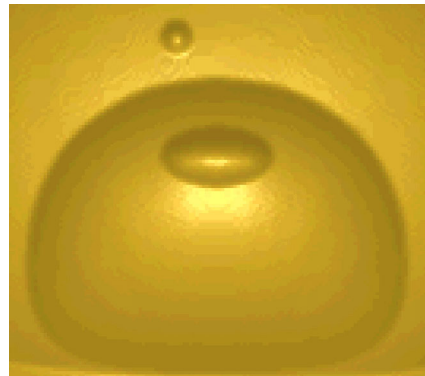
8. When you are happy with your changes, click on the **Apply** button to replace the relief shown in the **3D View** window with a new relief that contains your sculpting changes.
9. Click on the **Scale To Fit** button  in the **3D View** toolbar to view the entire relief.
10. Use the **Zoom** button  to zoom in on the teddy bear's snout.
11. In the **Combine** area, click on the **Lower Only** radio button . This option instructs ArtCAM Pro to lower the highest points under the tool cursor.
12. Move the  cursor over the teddy bear's right eye, then click and drag the mouse.

You can see that the eye is removed without damaging the surrounding area of the relief.

Before...



After...





13. Click on the **Revert** button to restore the teddy bear's eye.

Carving the Teddy Bear

Now we will use the **Carve** tool to remove an area of the relief.



1. Click on the **Carve** icon  to display the tool's settings.
2. Click and drag on the **Diameter** slider and set the tool diameter to 4 mm (0.16").
3. Click and drag on the **Strength** slider and set the strength of the tool to 80%.
4. Click and drag on the **Smoothness** slider to set the smoothness of the tool to 100%.

5. Make sure that the **Add** option is selected in the **Relief Combine Mode** area of the page. This option allows you to carve material from the relief.
6. Move the  cursor over the teddy bear's nose, then click and drag the mouse downwards to carve the following shape into the relief:

Before...



After...



7. Click on the **Apply** button to save your sculpting changes.
For information on using the other tools and their settings on the Interactive Sculpting page, see the Working with Reliefs chapter in the ArtCAM Pro Reference Manual.
8. Click on the **Finish** button to return to the **Assistant's** Home page.

Tutorial – Scanning

Overview

This tutorial demonstrates how a scanned image can be edited and manipulated using ArtCAM Pro. It also offers general advice for using colour and black and white scanned images in ArtCAM Pro.

Principles of Scanning

You should spend time when creating a good scanned image. It is often best to experiment with the scanning software to get the best possible results and then import that image into ArtCAM Pro. Consider all of the various image options available to you, such as black and white, colour and photograph, as well as the brightness and colour settings. You should always crop the image to the minimum size required and then edit the image in any way that will improve its quality, such as removing rogue pixels.

You need to find a balance between the need for a high-resolution image and to keep the file size small. The fewer the number of dots per inch (dpi), the smaller the file size, but the more likely it is you will find coarse pixel editing in the artwork and rippled effects when machining. The larger the number of dots per inch (dpi), the less likely you are to find rippled effects when machining, but the larger and more cumbersome the file becomes. The dpi you choose is therefore a compromise between these two requirements.

In ArtCAM Pro, you can load a scan saved as any one of the following types of file:

- Windows Bitmap (*.bmp)
- TIFF image (*.tif)
- PCX image (*.pcx)
- CompuServe image (*.gif)

- JPEG image (*.jpg)

Comparisons of Scans


Now we will look at some examples of the effects of scanning.

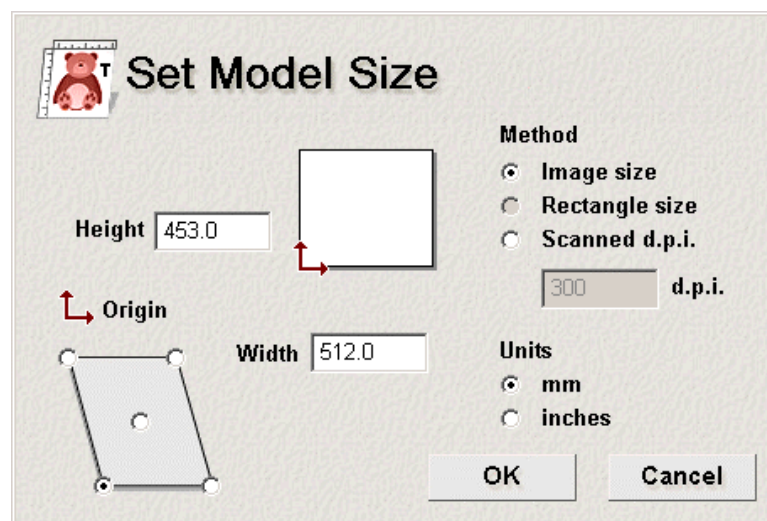
Effects of Changing Resolution


Scanned resolution is normally expressed in dots per inch (dpi). A larger dpi value will usually yield a better scan, but the size of the scanned file increases significantly. We will consider the differences between three scanned files used in ArtCAM Pro.

Scanning at 100 dpi

First, we will look at an image scanned at 100 dpi.

1. Click on the **Open Existing Model**  icon on the **Assistant's Getting Started** page to display the **Open** dialog box.
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Crest.
3. Click on the **Files of type** list box and then on the **All Files (*.*)** option to select it.
4. Click to select the file named *Crest10.bmp*. The file name appears in the **File name** box.
5. Click on the **Open** button to display the **Set Model Size** dialog box.

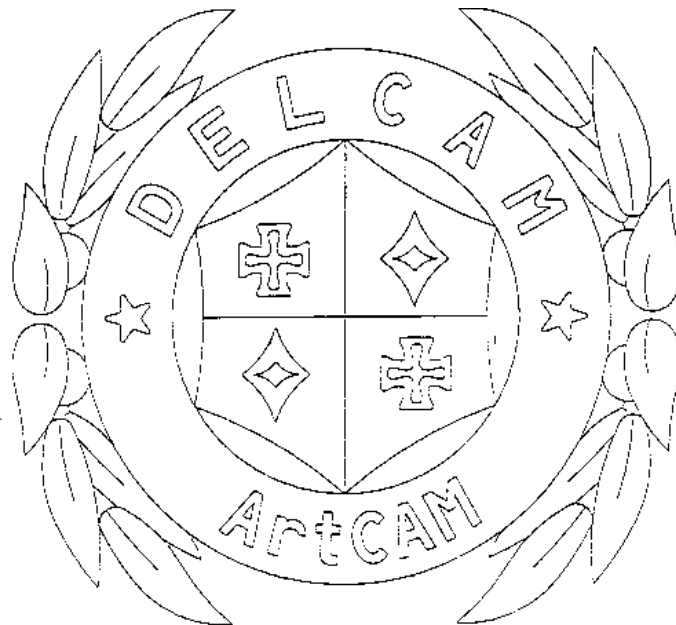



6. Click on the **Scanned d.p.i.** radio button  to select this option, then type *100* in the **d.p.i.** box. The **Height** changes to *115.062 mm (4.53")* and the **Width** changes to *130.048 mm (5.12")*.

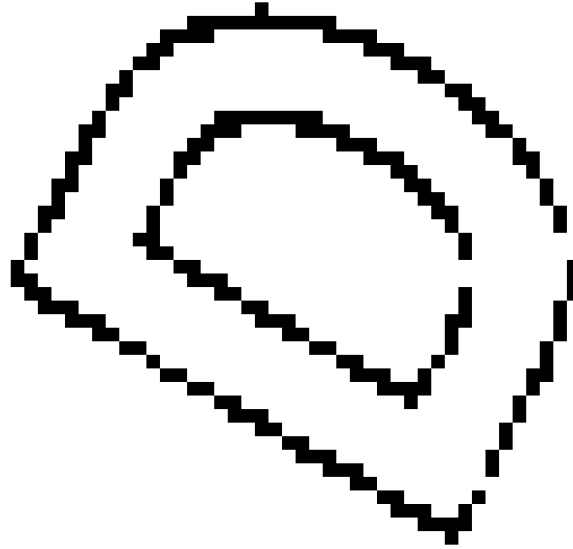
This sets the size of the model according to the dpi at which the image was scanned.

7. Click on the **OK** button to close the **Set Model Size** dialog box. The scanned artwork is displayed in the **Crest10:0** window.

In the **Project Information** area of the **Assistant's** Home page, you can see that the artwork contains 512 x 453 pixels.



8. Click on the **Zoom In Tool** button  in the **Crest10:0** toolbar, click and drag to form a bounding box around the "D" in the text, then release the mouse button to zoom in on it.




You can see that the pixels are large. Using this scan would produce a rippled surface when machining. There are pixels that need to be added to maintain the profile of the letter.

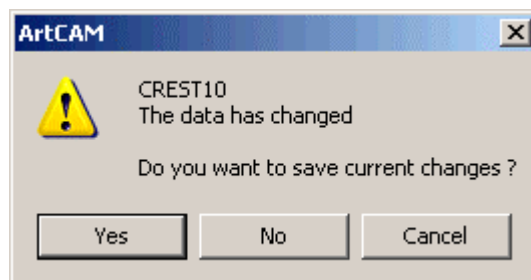
It would be easy to repair the damaged straight-line segments in this scan using the **Bitmap Editing** tools in ArtCAM Pro, but it would be much harder and more time-consuming to repair the damaged curved segments whilst also trying to maintain the profile of the shape or letter.

Scanning at 150 dpi

Next we will look at an image scanned at 150 dpi.

1. Click on the **Open File** button  in the **File** area of the **Assistant's** Home page.

The following message box appears:



2. Click on the **No** button to close the message box and display the **Open** dialog box.
3. Click on the **Files of type** list box and then on the **All Files (*.*)** option to select it.

4. Click to select the file named *Crest15.bmp*. The file name appears in the **File name** box.
5. Click on the **Open** button to display the **Set Model Size** dialog box. The **Height** of the model is 707.0 mm (27.8") and the **Width** is 787.0 mm (31.0").
6. Click on the **Scanned d.p.i.** radio button to select this option, then type 150 in the **d.p.i.** box. The **Height** changes to 119.719 mm (4.71") and the **Width** changes to 133.096 mm (5.24").
7. Click on the **OK** button to close the **Set Model Size** dialog box.

In the **Project Information** area, you can see that the artwork contains 786 x 707 pixels.

8. Zoom in on the "D" in the text.



You can already see that by increasing the dpi, the image quality has improved. The pixel size is much smaller, so using this scan would produce a better surface finish when machining. There are no pixels that need to be added to maintain the profile of the letter, reducing the time required for editing.

Scanning at 200 dpi

Now we will look at an image scanned at 200 dpi.

1. Repeat the previous steps, this time selecting the file named *Crest20.bmp* and typing 200 in the **d.p.i.** box.

The **Height** of the model is 114.935 mm (4.52") and the **Width** is 130.048 mm (5.12").


In the **Project Information** area, you can see that the artwork contains 1024 x 905 pixels.



This letter has a clearly defined profile, but the large number of pixels in the artwork means that ArtCAM Pro will run more slowly.

Comparing File Sizes

We will now compare the file sizes of each of the scanned images used in this tutorial so far.

1. Click on the **Open File** button  in the **File** area to display the **Open** dialog box.
2. Right-click on the *Crest10.bmp* file to display the context menu, and then click on the **Properties** option to display the **Properties** dialog box.

In the **Size** area, you can see that the file is 29,054 bytes.

3. Click on the **OK** button to close the **Properties** dialog box.
4. Repeat these steps for each of the other *Crest* bitmap files. The *Crest15.bmp* file is 70,762 bytes, while the *Crest20.bmp* file is 115,902 bytes.

You can see that there is a significant increase in file size between the image scanned at 100 dpi and that scanned at 200 dpi. As ArtCAM Pro works slower with larger files, you should find a balance between quality and resolution when scanning images.

Scanning Colour Pictures

So far, we have looked at scanning black and white line drawings. In this section, we will consider scanning colour images.

Scanning at 150 dpi B&W

First, we will look at a black and white image scanned at 150 dpi.

1. Open the *dcam15.bmp* file from the ArtCAM Pro 7.0\Examples\Dcam directory, entering a scanned dpi of 150.

The **Height** of the model is 18.796 mm (0.74") and the **Width** is 87.013 mm (3.4").

In the **Project Information** area, you can see that the artwork contains 505 x 111 pixels.



You can see that this scanned image is of very poor quality.

Scanning at 150 d.p.i. Colour

Now we will look at a colour image, also scanned at 150 dpi.

1. Repeat the previous steps, this time selecting the .bmp file named *dcam15c*.

The **Height** of the model is 19.981 mm (0.79") and the **Width** is 87.013 mm (3.4").

In the **Project Information** area, you can see that the artwork contains 505 x 118 pixels.



You can see that scanning the image in colour is the better option. The number of dpi depends on the size of the model and the quality of finish that you require.

Non-Vertical Lines

In the previous example, you might have noticed that the vertical and horizontal lines in the letters "A" and "M" of "Delcam" stray from the

X and Y axes by 1 pixel. You should aim to minimise this effect in all scanned images, whilst considering if it is worth the time and effort to do so. Your decision will depend on the degree to which horizontal and vertical lines stray from their respective axis and the surface finish that you require when machining. Editing a scanned image in this way can be very time consuming.

In the previous example, the vertical alignment is acceptable. Now we shall consider how to improve poor alignment between the straight edges in the scanned image and the horizontal and vertical axes of the model.

Before...

After...



You can see a considerable improvement between the above images. The image was rotated anti-clockwise using the **Deskew** tool with an angle of -2° . For more details, see the "Working with Models" chapter in the ArtCAM Pro 7.0 Reference Manual.

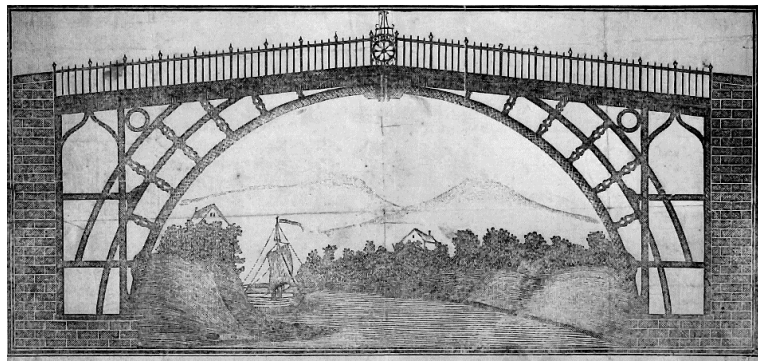
The alternative to deskewing is to manually adjust the vertical and horizontal alignment of the straight edges on the scanner bed, then re-scan the image.

Large Colour Palettes

Photographs and transparencies can be difficult to scan as they produce a multitude of colours. Black and white photographs can create several different shades of grey, and colour photographs can produce a similar number of different colours. It is good practice to edit a photograph as much as possible before importing it into ArtCAM Pro.

1. Open the *Bridge1a.bmp* file from the ArtCAM Pro 7.0\Examples\Bridge directory.

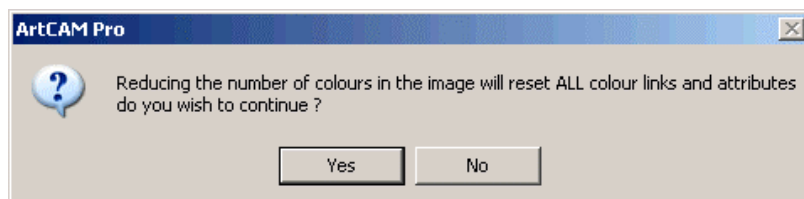
The artwork in the **Bridge1a.bmp:0** window looks as follows:



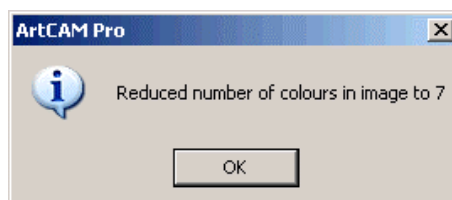
2. Click on the **Reduce Colours** button  in the **Model** area of the **Assistant's** Home page to display the **Reduce Number Of Colours In Image** dialog box:



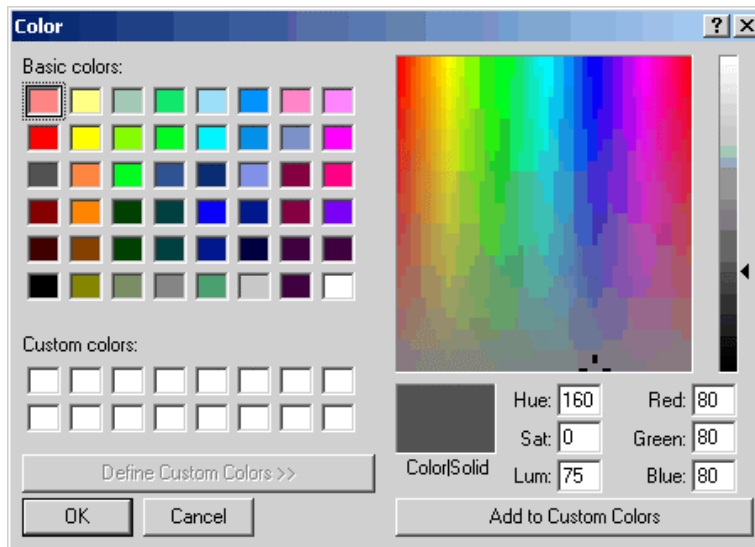
3. Type **7** in the **New Maximum Number Of Colours For Image** box, then click on the **OK** button. The following message box is displayed:




4. Click on the **Yes** button to close the message box and reduce the number of colours in the image. The following message box appears:



5. Click on the **OK** button to close the message box. You can see that there are now only seven colours in the Colour Palette beneath the **Bridge1a.bmp:0** window.



6. Click on the **Add Colour** button  in the **Bitmap Editing** area to display the **Color** dialog box.
7. Click on the white colour in the **Basic Colors** area, and then click on the **Add To Custom Colours** button.
8. Click on the **OK** button to close the **Color** dialog box and add the white colour to the Colour Palette. This colour is automatically set as the Primary Colour.
9. Double right-click on each of the colours in the Colour Palette shown below to link them to the Primary Colour.

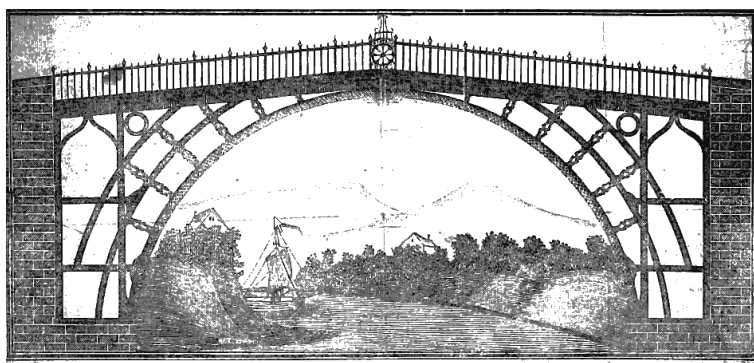
Before...



After...



The image is clarified substantially, as shown below:




Problems Using Flood Fill



When working with scanned data, the **Flood Fill** tool in ArtCAM Pro can produce some interesting results. These are caused by bitmap outlines not being closed, where the colour "leaks" from the area that you want to fill. In this example, we will create a Colour Palette with which we will add colour to a black and white bitmap image.

1. Open the *Crest01.bmp* file from the ArtCAM Pro 7.0\Examples\Crest directory.

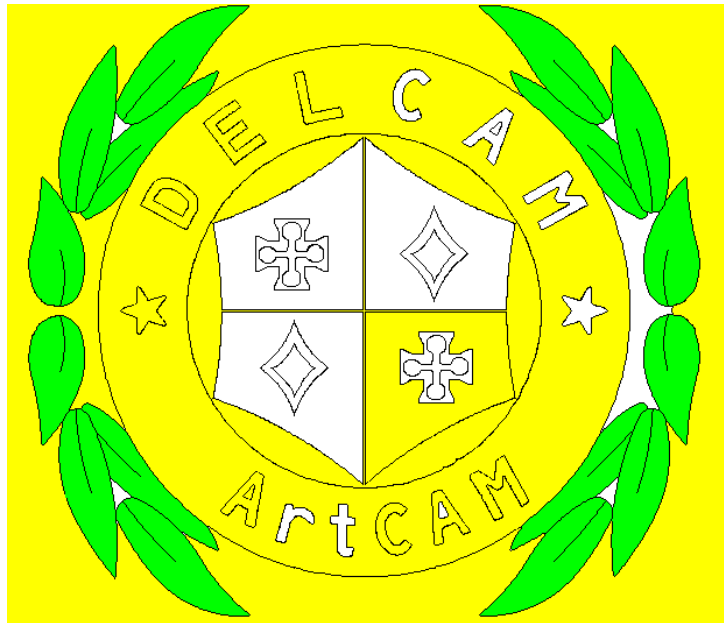
The **Base & Leaves:1**, **Central Base:2**, **Letters:3** and **Diamonds & Crosses:4** windows appear.

2. Click on the **Base & Leaves:1** window to make it active.
3. Click on the **Add Colour** button  in the **Bitmap Editing** area to display the **Color** dialog box.
4. Click on the yellow colour in the second row of the **Basic Colors** area, and then click on the **Add To Custom Colours** button.
5. Repeat the previous step to add the green colour in the third row of the **Basic Colors** area, then click on the **OK** button to close the **Color** dialog box and add both colours to the Colour Palette. The green colour is automatically set as the Primary Colour.





6. Click on the **Flood Fill** button  in the **Bitmap Editing** area.

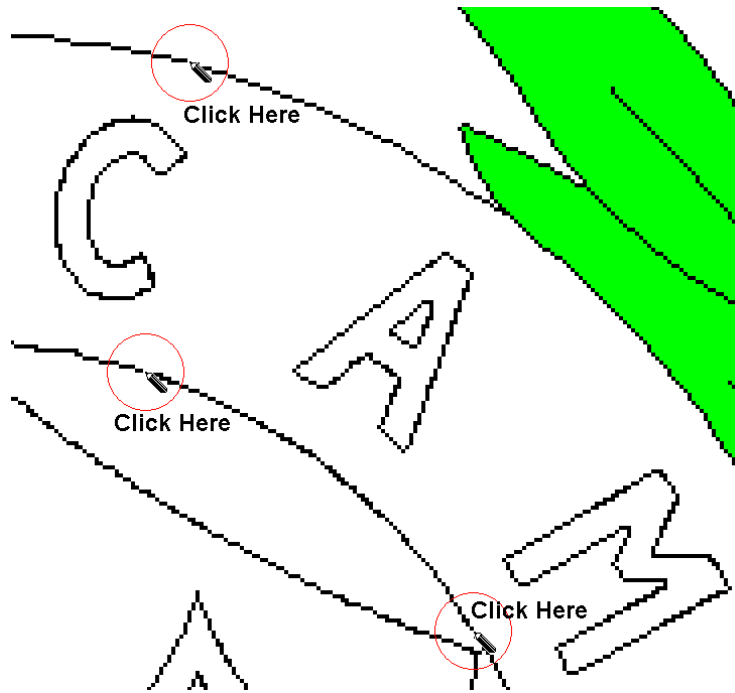
7. Move the  cursor over each of the leaves in the image, and then click to flood-fill them in the current Primary Colour, green.
8. Click on the yellow in the Colour Palette to select it as the Primary Colour.
9. Move the  cursor in between the two circles in which the text appears, and then click to flood-fill them in yellow.

You can see that areas outside of the two circles are also flood-filled in yellow during this process:



This indicates that the bitmap lines representing the following areas of the image are not closed:

- The "D", "E" and "L" within the "DEL CAM" text.
 - The star on the left.
 - The bottom-right corner of the crest emblem.
 - The cavity of the "A" within the "ArtCAM" text.
 - The "A", "C", "A" and "M" within the ArtCAM text.
10. Click on the **Undo** button  in the **Base & Leaves:1** toolbar to remove the flood-filled colour.
 11. Click on the **Zoom In Tool** button  in the **Base & Leaves:1** toolbar, click and drag to form a bounding box around the "C" in the "DEL CAM" text, then release the mouse button to zoom in on it.
 12. Click on the black colour in the Colour Palette to select it as the Primary Colour.
 13. Click on the **Draw** button  in the **Bitmap Editing** area, then move the  cursor over the areas shown below and click to join the broken bitmap lines together:




14. Click on the **Window Fit** button  in the **Base & Leaves:1** toolbar to view the whole image.

15. Repeat the previous steps for the areas shown below:



16. Click on the yellow colour in the Colour Palette to select it as the Primary Colour.

17. Click on the **Flood Fill** button .

18. Move the  cursor in between the two circles in which the text appears, and then click to flood-fill them in yellow.



19. Repeat these steps, repairing all of broken bitmap lines identified earlier, flood-filling areas in other colours selected from the **Color** dialog box and added to the Colour Palette.

For the **Base & Leaves:1** window, the area between the two circles should be coloured in yellow, as should be the text and the stars within it. The shield in the centre of the crest should be coloured in orange.



Note: You can open an example of the finished colour-filled image, which is saved as **Crest13.art** in the ArtCAM Pro 7.0\Examples\Crest directory.

3D Machining

Overview

The following tutorials demonstrate various aspects of machining three-dimensional models in ArtCAM Pro:

- "Tutorial – Machining Reliefs" on page 211.
- "Tutorial – Feature Machining" on page 223.

Tutorial – Machining Reliefs

Overview

The following tutorial demonstrates how to create the toolpaths needed to machine a relief. It also demonstrates how to resize a model, create an offset vector and calculate toolpaths in a batch.

Teddy Bear

The stages that you will cover during the course of this tutorial are:

- Opening the model.
- Setting the model's size.
- Creating an offset vector.
- Machining the model.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating toolpaths often used to machine a relief, calculate the toolpaths in a batch and then simulate them.

Opening the Model


First, we will open the ArtCAM model containing the artwork that you will use to create the teddy bear relief:

1. Click on the **Open Existing Model**  icon on the **Assistant's Getting Started** page to display the **Open** dialog box:

2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\NewTeddy.
3. Click to select the file named *NewTeddy.art*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the *NewTeddy* model.

Setting the Model's Size

Before machining the model, we will ensure that the size of the model is correct.

1. Click on the **Set Model Size** button  in the **Model** area of the **Assistant's** Home page to display the **Set Model Size** dialog box:
2. If you are using inches make sure that the **Units** are set to inches.
3. Type *100 mm (4.0")* in both the **Height** and **Width** box.
4. Click on the **OK** button to close the **Set Model Size** dialog box and set the model's size.


Creating an Offset Vector

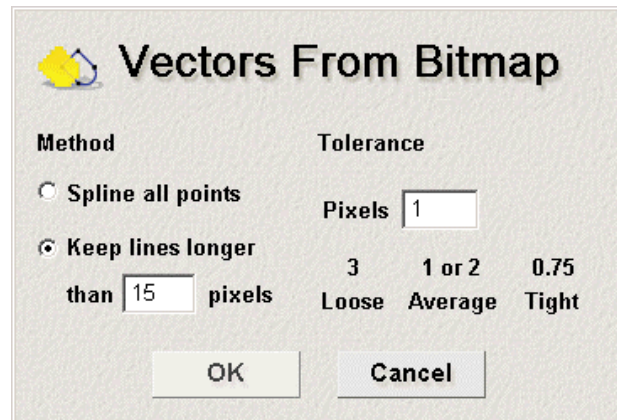
Before we can create the toolpaths that we will use to machine the relief, we must create an offset vector in the shape of the teddy bear to ensure that the Ball Nose tool machines onto the flat plane surrounding the teddy bear, thus giving it a well-defined edge.

We will delete all of the vector objects used to create the teddy bear relief as we no longer need them. We will then create a vector outline of the teddy bear from a greyscale image of the relief. From this vector outline, we will create an offset vector.

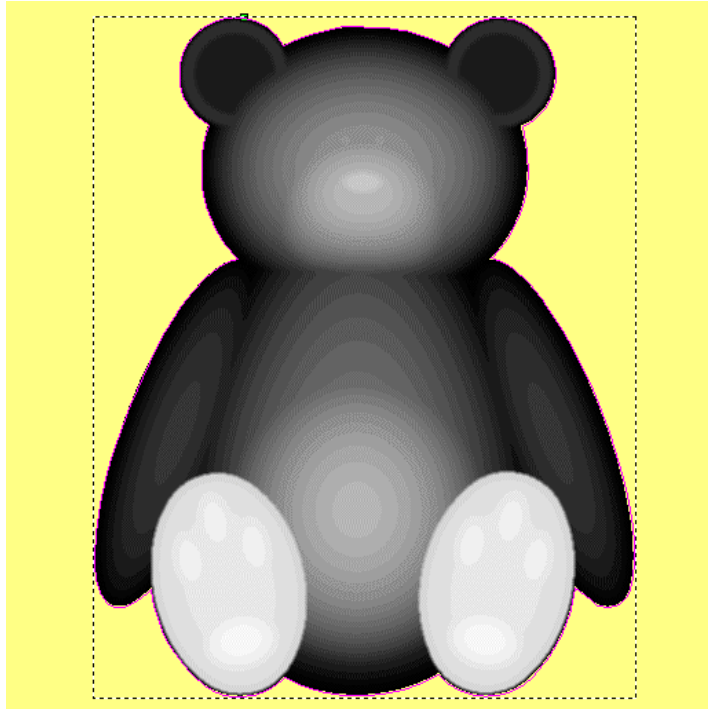
1. In the **2D View** window, click and drag to form a bounding box around all of the vector objects from which the relief was created, and then release the mouse to select them. The vector objects turn purple and magenta and are surrounded by a bounding box.
2. Press the **Delete** key on your keyboard to delete the selected vector objects. The **2D View** window is now empty.
3. Press the **F10** key on your keyboard to create a greyscale image of the relief in the **2D View** window. You can see


that the area surrounding the teddy bear relief is coloured in yellow by default.

4. Click on the yellow colour in the Colour Palette to select it as the Primary Colour.
5. Click on the **Bitmap to Vector** button  in the **Vector – Bitmap** area to display the **Vectors From Bitmap** dialog box:



6. Click on the **OK** button to create vector objects in the shape of the outline of all areas in the current Primary Colour and close the **Vectors From Bitmap** dialog box.
7. Click anywhere in the model area to deselect the vector objects that have been created using the bitmap colour.
8. Click to select the rectangular vector object representing the outline of the material, and then press the **Delete** key on your keyboard to remove it. We do not need to use this vector object for anything so it is better to remove it altogether.
9. Click to select the vector object representing the outline of the teddy bear. The vector object turns magenta.



10. Click on the **Offset Vector(s)** button  in the **Vector Editing** area to display the **Offset Vector(s)** page.
11. Type *1.5 mm (0.06")* in the **Offset Distance** box.

This distance is equal to the radius of the Ball Nose tool that we will use to machine the area of the relief inside the offset vector.
12. In the **Offset Direction** area, make sure that the **Outwards/Right** radio button is selected.
13. In the **Offset Corners** area, make sure that the **Radiused** radio button is selected.
14. Click to select the **Delete original vectors** option , and then click on the **Offset** button. This deletes the original vector outline from which we are creating the offset vector, after the offset has been performed.
15. Click on the **Close** button to return to the **Assistant's** Home page.

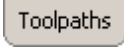


The offset vector in the **2D View** window is selected by default.

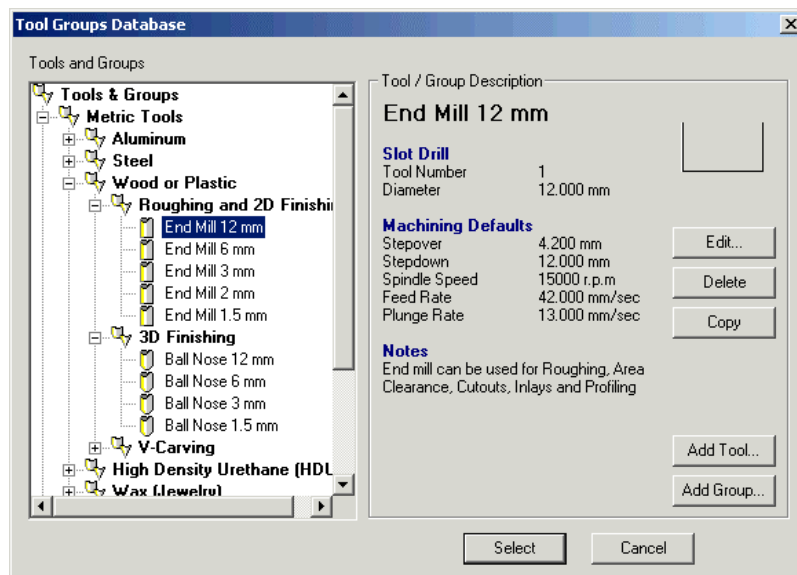
Machining the Model


We are now ready to create the toolpaths that will be used to machine the model.

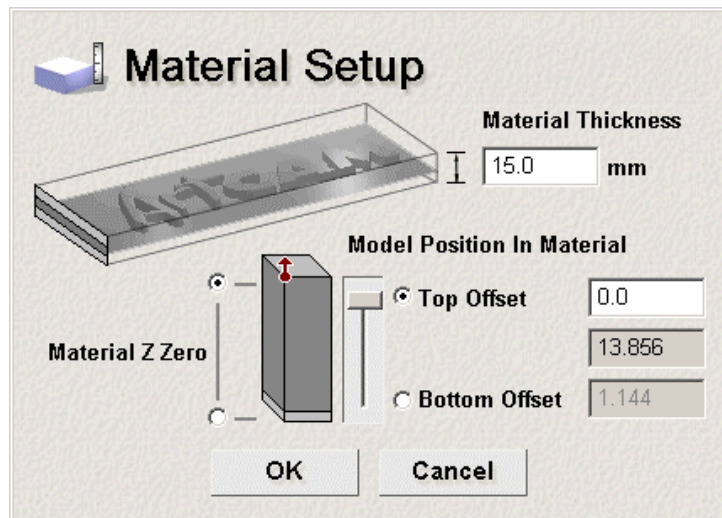
Creating a Roughing Toolpath

The first toolpath that we will create will be used to rough the model. We will also define the thickness of the block of material we will use for this job.

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Click on the **Z Level Roughing** button  in the **3D Toolpaths** area to display the **Z Level Roughing** page.
3. In the **Area to Machine** area, make sure that the **Complete relief** radio button  is selected.
4. Click on the **Select** button to display the **Tool Groups Database**:



5. Click on the **End Mill 12 mm** tool (End Mill 1/4 Inch) in the **Wood or Plastic\Roughing and 2D Finishing** tool group to select it.
6. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Z Level Roughing** page.
7. Click to select the **Add Ramping Moves** option .
Adding ramping moves, also known as zigzag plunge moves, allows the tool to enter the block of material gradually.
8. Click on the **Setup** button to display the **Material Setup** dialog box:





9. Type *15 mm (0.6")* in the **Material Thickness** box.
10. Make sure that the **Material Z Zero** is set to the top of the block, by clicking on the radio button at the top of the block.
11. Make sure that the **Top Offset** is set to *0.0 mm (0.0")*.
12. Click on the **OK** button to close the **Material Setup** dialog box.
13. Click on the **Apply** button in the **Z Slices** area of the **Z Level Roughing** page to update the boxes based on the machining parameters of the 12 mm (1/4 Inch) End Mill tool.
14. Click on the **Later** button to save all of the toolpath parameters we have defined. We will use the batch processing option to calculate the *Z Roughing* toolpath later.
15. Click on the **Close** button to return to the **Toolpaths** Home page.

The *Z Roughing* toolpath you have created is shown on the **Toolpaths** Home page, but it has not yet been calculated.



Creating a Toolpath to Machine the Surface Relief

To show the difference between machining the complete relief and machining a specified area we will create two finishing toolpaths. However, in the real world only one of these toolpaths would be used to machine the final model. First, we will create a toolpath that will be used to machine the entire surface of the relief including the flat plane surrounding the teddy.

1. Click on the **Machine Relief** button  to display the **Machine Relief** page.
2. In the **Area To Machine** area, make sure that the **Whole Model** option  is selected.
3. Click on the **Strategy** list box, and then click on the **Raster In X** option to select it.
4. Click on the **Select** button to display the **Tool Groups Database**.
5. Click on the **Ball Nose 3 mm** tool (Ball Nose 1/8 Inch) in the **Wood or Plastic\3D Finishing** tool group to select it.
6. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Machine Relief** page.
7. Click on the **Later** button to save the toolpath parameters that we have defined, so that we can calculate the *Machine Relief* toolpath later.
8. Click on the **Close** button to close **Machine Relief** page and return to the **Toolpaths** Home page.
9. The *Machine Relief* toolpath you have created is shown on the **Toolpaths** Home page, but it has not yet been calculated.

Creating a Toolpath to Machine only the Teddy Relief

Next, we will create a toolpath that will be used to machine an area of the relief defined by the vector representing the outline of the teddy bear.

1. Click on the **Machine Relief** button  to display the **Machine Relief** page.
2. In the **Area To Machine** area, make sure that the **Selected Vector** option  is selected.
3. Click on the **Strategy** list box, and then click on the **Raster** option to select it.
4. Click on the **Select** button to display the **Tool Groups Database**.

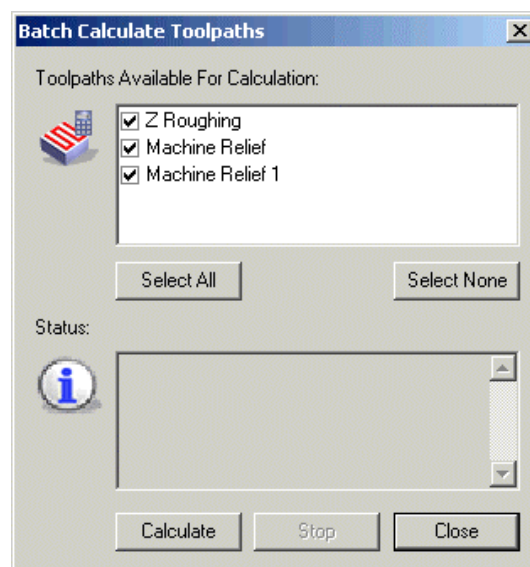
5. Click on the **Ball Nose 3 mm** tool (Ball Nose 1/8 Inch) in the **Wood or Plastic\3D Finishing** tool group to select it.
6. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Machine Relief** page.
7. Click on the **Later** button to save the toolpath parameters that we have defined, so that we can calculate the *Machine Relief 1* toolpath later.
8. Click on the **Close** button to close **Machine Relief** page and return to the **Toolpaths** Home page.

The *Machine Relief 1* toolpath you have created is shown on the **Toolpaths** Home page, but it has not yet been calculated.

Calculating the Toolpaths

Now that we have created all of the toolpaths needed to machine the relief, we are ready to calculate them.

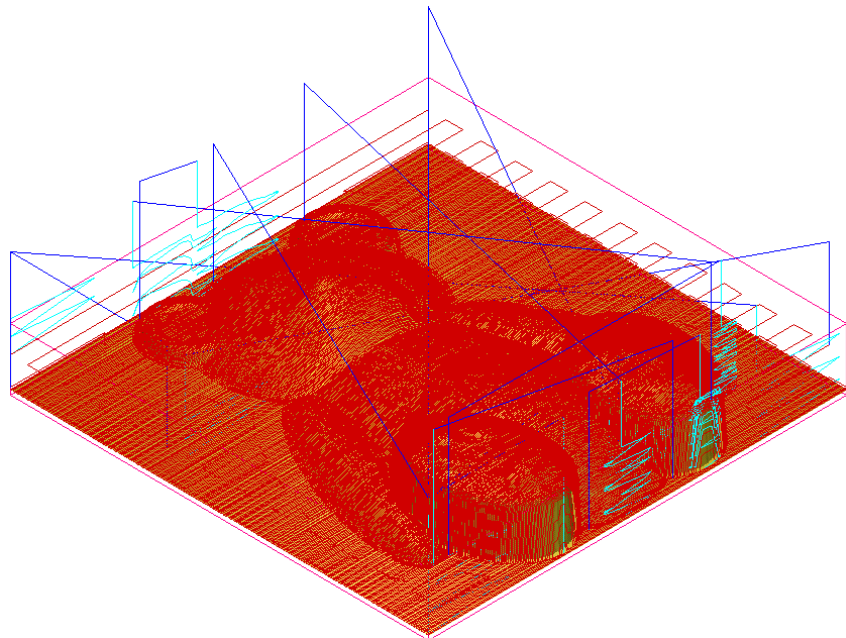
1. Click on the **Batch Calculate Toolpaths** button  to display the **Batch Calculate Toolpaths** dialog box:



You can automatically calculate all three of the toolpaths in sequence using ArtCAM Pro's batch calculation process. This process gives you the freedom to work continuously on creating a model during the day, and calculate all of its corresponding toolpaths during the night if they were very

complex over a very large relief and hence would take a long time to calculate.

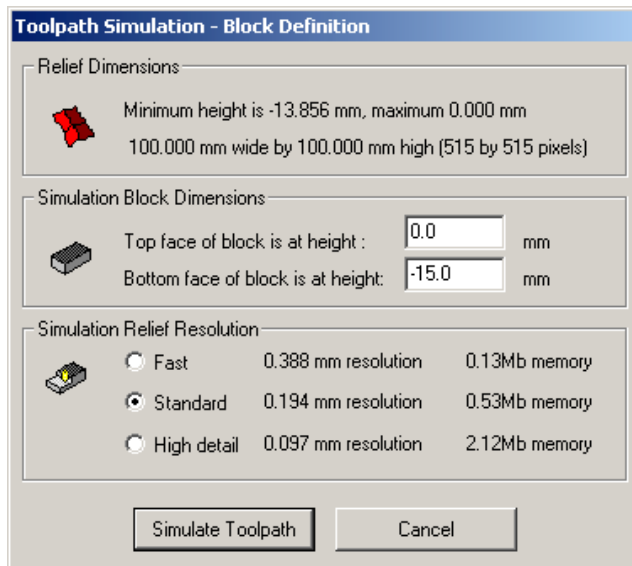
2. Click on the **Calculate** button to calculate the toolpaths. ArtCAM will now calculate each toolpath in turn displaying the time taken for each.
3. When you see the "Completed batch calculation of 3 toolpaths" message in the **Status** window, click on the **Close** button to close the **Batch Calculate Toolpaths** dialog box.
4. Press the **F3** key on your keyboard to display in the **3D View** window a preview of all three of the toolpaths used to machine the model:



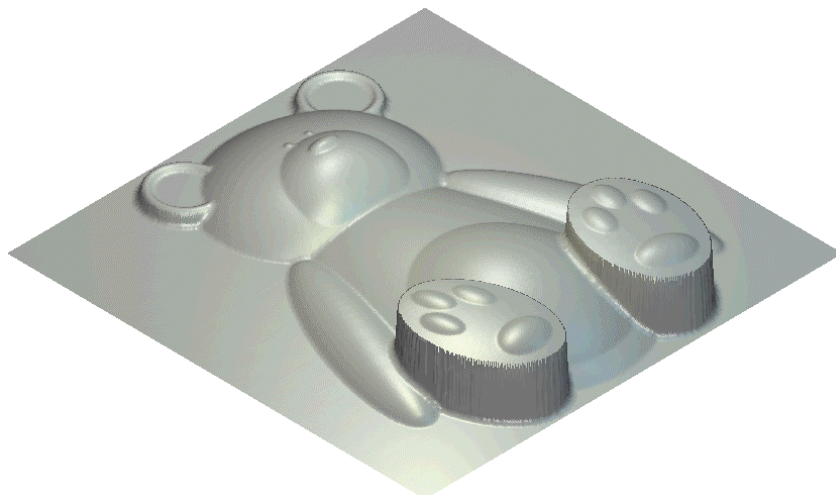
Simulating the Toolpaths

Finally, we are ready to simulate the toolpaths that we have created. We can either simulate all the toolpaths at once, or simulate each toolpath individually. First, we will simulate them all at once, and then we will simulate them individually.


1. From the Main menu, click on the **Toolpaths** option to display the **Toolpaths** menu, then click on the **Simulate All Toolpaths** option to display the **Toolpath Simulation – Block Definition** dialog box:






2. Click on the **Simulate Toolpath** button to simulate all three of the toolpaths in sequence. The following isometric view of the machined model is displayed in the **3D View** window:



We are now ready to simulate each of the individual toolpaths.

3. Click on the **Delete Simulation** button  in the **Toolpath Simulation** area to delete the simulated toolpaths shown in the **3D View** window.
4. Click on the *Z Roughing* toolpath listed at the top of the **Toolpaths** Home page to select it.

In the **3D View** window, you can see how the block of material appears after the roughing tool has been used.

5. Click on the **Simulate Toolpath Fast** button  to display the **Toolpath Simulation – Block Definition** dialog box.
6. Click on the **Simulate Toolpath** button to simulate the *Z Roughing* toolpath.
7. Click to select *Machine Relief* toolpath, the second listed on the **Toolpaths** Home page. This is the toolpath which machines the entire relief surface, including the flat plane which surrounds the teddy.
8. Click on the **Simulate Toolpath Fast** button  to simulate the *Machine Relief* toolpath.
9. Click to select *Machine Relief 1* toolpath, the last listed on the **Toolpaths** Home page. This is the toolpath which machines within the area defined by the offset vector that surrounds the teddy bear only.
10. Click on the **Simulate Toolpath Fast** button  to simulate the *Machine Relief 1* toolpath.

You can see that this toolpath does not machine onto the flat plane and there are areas at the edge of the relief where the roughing tool has left materia. This is because the diameter of the tool was too great to machine them. For example, the feet of the teddy bear and the edge of the block.

Tutorial – Feature Machining

Overview

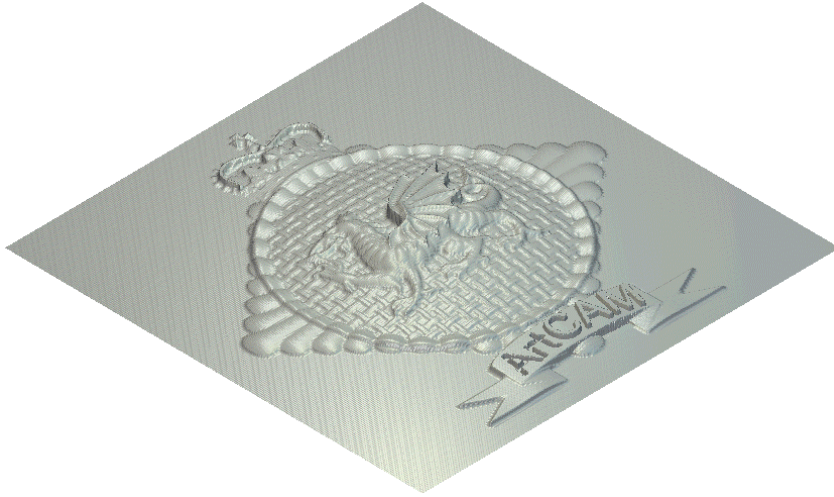
The following tutorial demonstrates how to import vector artwork, create raised and recessed features from vector objects, and then machine a feature using the 3D toolpath strategies available in ArtCAM Pro.

Dragon Badge

The stages that you will cover during the course of this tutorial are:

- Preparing the model.
- Importing the vector text.
- Creating the features.
- Machining the model.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating raised and recessed features from imported vector text, then machining them in the relief to create the text on the following badge.

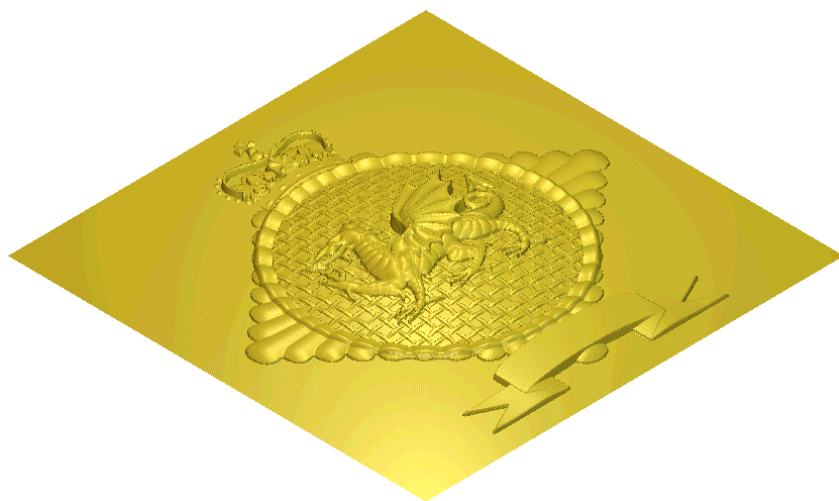


Preparing the Model

First, we will open the ArtCAM relief containing the artwork that you will use to create your model:


1. From the Main menu bar, click on the **Relief** menu, then click on the **Load > Replace** option to display the **Open** dialog box:
2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Overview.
3. Click to select the file named *Dragbadg.rlf*. The file name appears in the **File name** box.
4. Click on the **Open** button to open the relief.

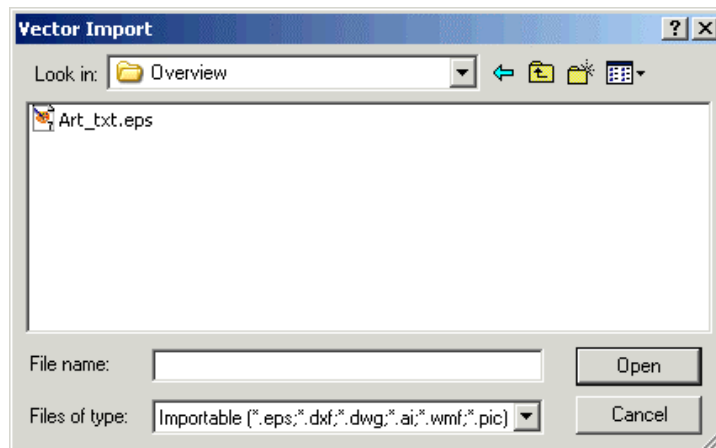
The following relief appears in the **3D View** window:



Importing the Vector Text




Next, we will import the vector text that will be used to machine the text on the Dragon badge.



1. Click on the **2D View** window to make it active.
2. Click on the **Import Vector Data** button  in the **Model** area of the **Assistant's** Home page to display the **Vector Import** dialog box:



3. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples\Overview.
4. Click to select the file named *Art_txt.eps*. The file name appears in the **File name** box.
5. Click on the **Open** button to close the **Vector Import** dialog box and import the vector text.




A grouped string of vector text reading as *ArtCAM* appears over the scroll area of the greyscale image of the relief.


6. Click on the **Ungroup** button  in the **Group Merge Join Trim Vectors** area to ungroup the vector text.
7. Click on the **Bitmap On/Off** button  in the **2D View** toolbar to hide the greyscale image of the relief.
8. Click and drag to form a bounding box around the first three letters of the vector text, and then release the mouse button to select them.
9. Click on the **Group** button  in the **Group Merge Join Trim Vectors** area to group this text.

10. Click and drag to form a bounding box around the last three letters of the vector text, then release the mouse button to select them.
11. Click on the **Bitmap On/Off** button  to show the greyscale image of the relief.
12. Click on the **Group** button  in the **Group Merge Join Trim Vectors** area to group this text.

Creating the Features

We are now ready to make features out of the two groups of vector text that you have created. The *Art* feature will be engraved into the scroll at the base of the badge. The *CAM* feature will be raised lettering.

1. Click to select the *Art* grouped vector text. The vector text turns purple and is surrounded by a bounding box.
2. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
3. Click on the **Recessed Feature** button  to display the **Recessed Feature** page.
4. Type *1 mm (0.04")* in the **Feature Depth** box to set the depth of the recessed feature.
5. Click to select the **Vector at Bottom Edge** radio button .

This option places the machining tool in contact with the bottom edge of the *Art* vector text during the machining process.
6. Type *Art* in the **Name** box.
7. Click on the **Create** button, followed by the **Close** button.
8. Click to select the grouped *CAM* vector text. The *Art* vector text turns blue, indicating that it is now a feature.
9. Click on the **Raised Feature** button  to display the **Raised Feature** page.
10. Type *1 mm (0.04")* in the **Feature Height** box to set the height of the raised feature.
11. Type *1 mm (0.04")* in the **Feature Allowance** box.

12. Make sure that the **Clear inner islands** option is deselected .

This option is deselected as the feature allowance we have defined will also apply to the central cavity in the letter 'A' of the *CAM* vector text.


13. Type *CAM* in the **Name** box.
14. Click on the **Create** button, followed by the **Close** button.

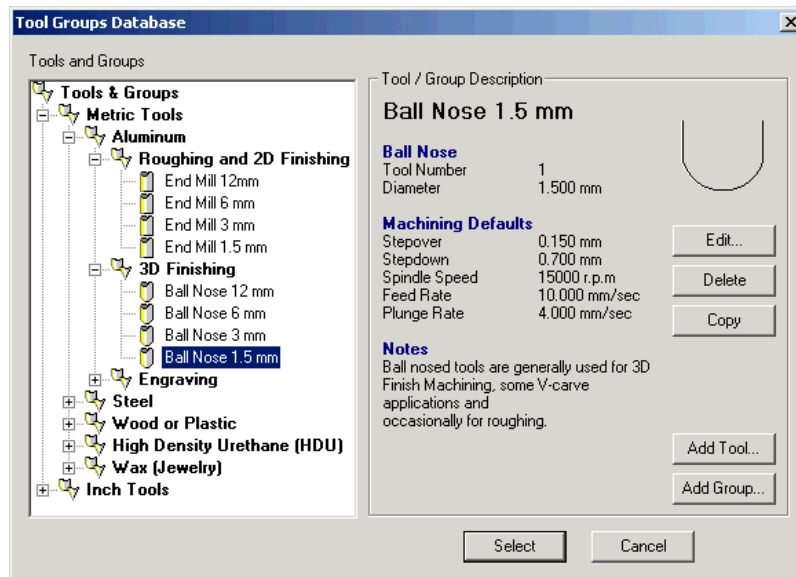
Machining the Model


We are now ready to create the toolpaths that will be used to machine the relief, and the raised and recessed features.

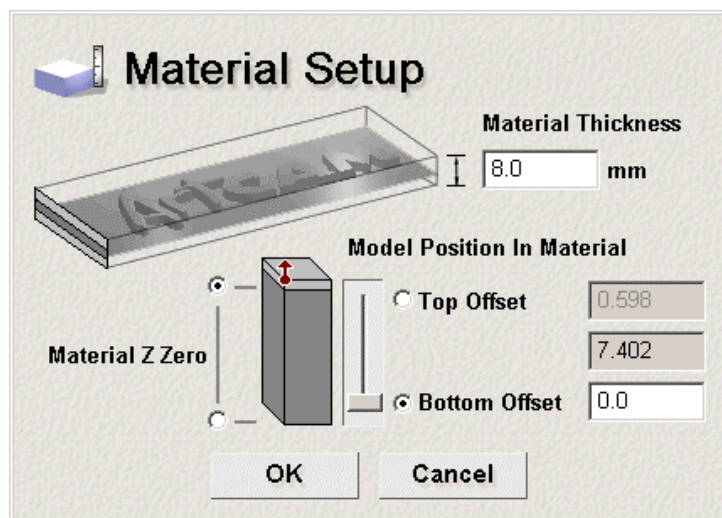
Creating a Toolpath to Machine the Badge Surface

Before we create the toolpath for the features, we must create a toolpath for the badge relief. When calculating the toolpath, ArtCAM automatically leaves sufficient material on the surface to allow for both of the features to be machined. This material is referred to as the feature relief.

1. Press the **F3** key on your keyboard to display the **3D View** window.
2. Click on the **Machine Relief** button  to display the **Machine Relief** page.
3. In the **Area to Machine** area, click on the **Whole Model** radio button to select this option.
4. Click on the **Strategy** list box to display the list of options, then click on the **Raster in X** option to select it.
5. Type *0.01* mm (*0.0004*") in the **Tolerance** box.
6. Click on the **Select** button to display the **Tool Groups Database**:



7. Click on the **Ball Nose 1.5 mm** tool (Ball Nose 1/16 Inch) in the **Aluminum\3D Finishing** tool group to select it.
8. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Machine Relief** page.
9. Click on the  arrow in the **Tool** area to display the machining parameters of the Ball Nose tool.
10. Type *0.4 mm (0.016")* in the **Stepover** box.
11. Click on the **Setup** button to display the **Material Setup** dialog box:




- The middle box in the **Model Position In Material** area shows that relief height is *7.402 mm (0.29")*.
12. Type *8.0 mm (0.31")* in the **Material Thickness** box. This is sufficient to machine the relief.

13. Click on the **OK** button to close the **Material Setup** dialog box.
14. Click on the **Later** button to create the Machine Relief toolpath.
15. Click on the **Close** button to return to the **Toolpaths** Home page.

Creating a Toolpath to Machine the Raised Feature

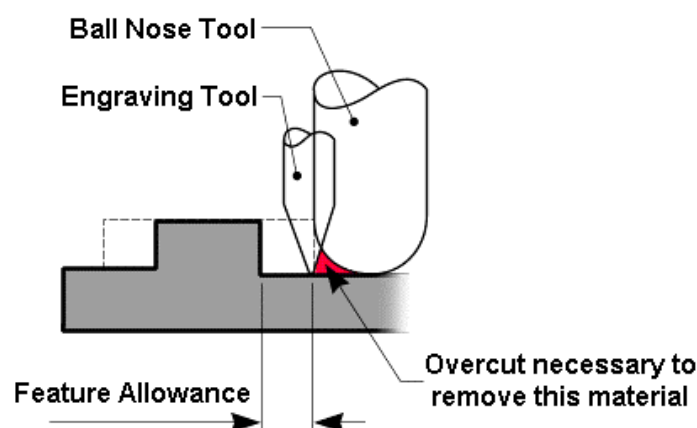
Next we will create the toolpath that will be used to machine the raised *CAM* text.

1. Click on the **Feature Machining** button  to display the **Feature Machining** page.
2. Click on the **Choose Feature** list box to display the list of features available, then click to select the *CAM* option.
3. Make sure that the **Area Clear** radio button is selected by clicking on it.


This strategy allows the machining tool to clear an area of material based on the boundary of the feature, then to make profile passes around it.

4. Type 2.0 mm (0.08") in the **Overcut Distance** box.

The overcut distance allows you to remove the ridge of unwanted material that will appear around the feature during the machining process. This ridge appears because the radius of the Ball Nose tool used to machine the feature relief is greater than that of the engraving tool we will use to machine the features.



5. Click to select the **Corner Sharpen** option .

6. Click on the **Select** button to display the **Tool Groups Database**.
7. Click on the **Conical 0.125 Flat – 10 degrees** tool (Conical 0.005 Flat – 10 degrees) in the **Aluminum\Engraving** tool group to select it.
8. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Feature Machining** page.
9. Click on the  arrow in the **Feature Tool** area to display the machining parameters of the Conical tool.
10. Type *0.1 mm (0.004")* in the **Stepover** box.
11. Click on the **Later** button to create the Feature Machine toolpath.

Creating a Toolpath to Machine the Recessed Feature

Now we are ready to create the toolpath that will be used to machine the recessed *Art* text by editing the toolpath created for the raised *CAM* feature.

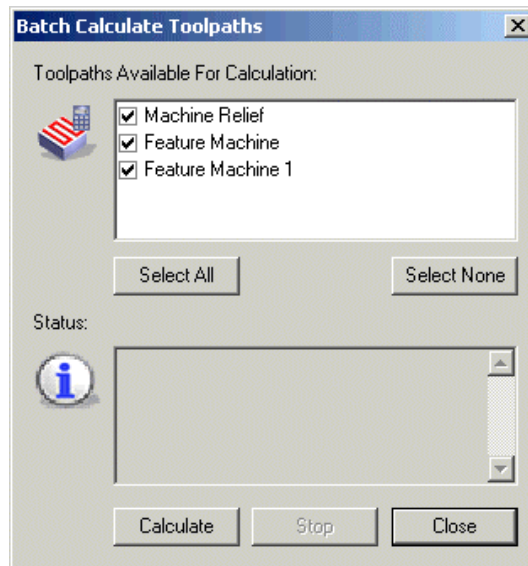
1. Click on the **Choose Feature** list box to display the list of features available, and then click to select the *Art* option.
2. Type *Feature Machine 1* in the **Name** box.
3. Click on the **Later** button to create the Feature Machine toolpath.
4. Click on the **Close** button to return to the **Toolpaths** Home page.

The toolpaths that you have created are shown on the **Toolpaths** Home page, but they have not yet been calculated.

Calculating the Toolpaths

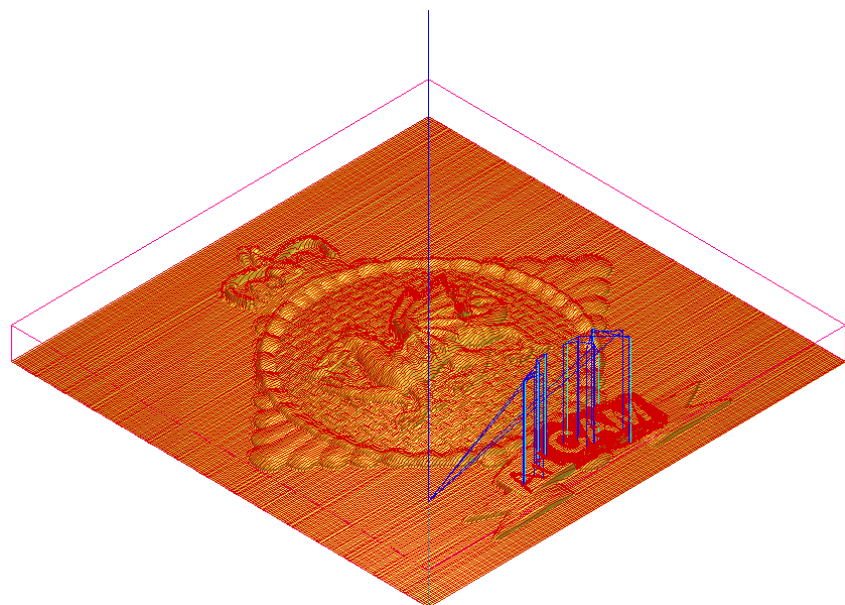
Now that we have created all of the toolpaths needed to machine the main badge relief and the two features created for the text, we are ready to calculate them.

1. Click on the **Batch Calculate Toolpaths** button  to display the **Batch Calculate Toolpaths** dialog box:



You can automatically calculate all three of the toolpaths in sequence using ArtCAM Pro's batch calculation process. This process gives you the freedom to work continuously on creating a model during the day, and calculate all of its corresponding toolpaths during the night.

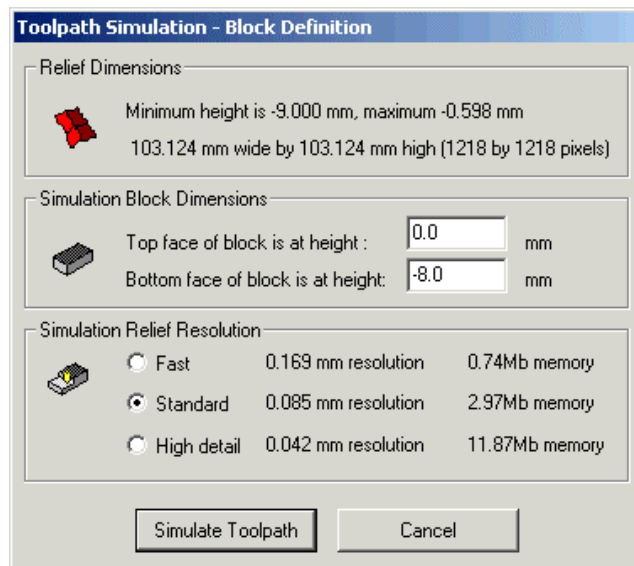
2. Click on the **Calculate** button to calculate the toolpaths.
3. When you see the "Completed batch calculation of 3 toolpaths" message in the **Status** window, click on the **Close** button to close the **Batch Calculate Toolpaths** dialog box.
4. Press the **F3** key on your keyboard to display in the **3D View** window a preview of all three of the toolpaths used to machine the main badge relief and both of the features:



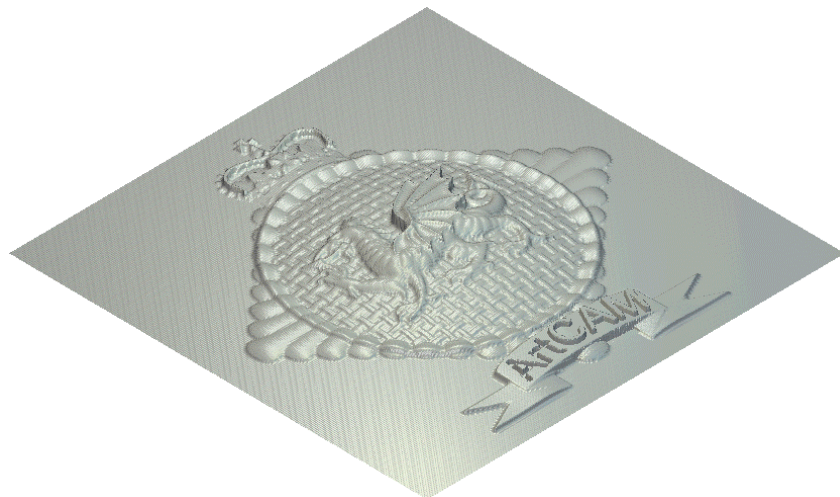
Simulating the Toolpaths

Finally, we are ready to simulate all of the toolpaths that we have created.

1. From the Main menu, click on the **Toolpaths** option to display the **Toolpaths** menu, then click on the **Simulate All Toolpaths** option to display the **Toolpath Simulation – Block Definition** dialog box:



2. Click on the **Simulate Toolpath** button to simulate all three of the toolpaths in sequence. The following isometric view of the machined model is displayed in the **3D View** window:



2/2½D Modelling

Overview

The following tutorials demonstrate various aspects of two-dimensional modelling in ArtCAM Pro:

- "Tutorial – Aston Martin" on page 235.
- "Tutorial – Smart Engraving" on page 261.
- "Tutorial – Bevelled Carving" on page 269.
- "Tutorial – Nesting Vectors" on page 275.
- "Tutorial – Bridging" on page 283.

Tutorial – Aston Martin

Overview

The following tutorial demonstrates how to create an *Aston Martin* sign from imported vector artwork, using the vector drawing and 2D toolpath tools available in ArtCAM Pro.

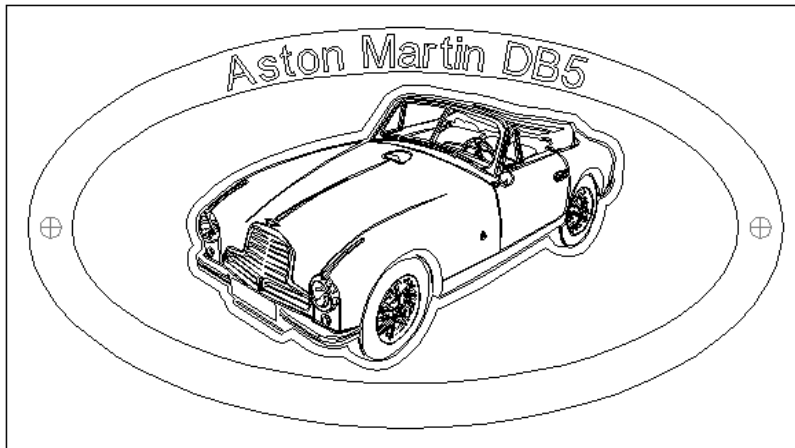
The design is courtesy of Holmes & Cottrell Graphic Technologies. Visit their website www.vectorart.com for high quality designs.

Aston Martin

The stages that you will cover in this tutorial are:


- Preparing the model.
- Creating a frame for the sign.
- Importing the vector artwork.
- Creating the vector text.
- Wrapping the vector text.
- Creating an offset vector.
- Machining the vectors.
- Marking the drill holes with circles.
- Creating the drill holes.
- Saving the toolpaths.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating the *Aston Martin* sign below.



Preparing the Model

First, we will set up the model dimensions needed for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:
2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *300 mm (12")* in the **Height** box and *500 mm (20")* in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to *1004144* points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.



Creating a Frame for the Sign

Next, we will create the vector objects that represent the sign's frame.

Creating the Outer Rectangle

First, we will draw the outer rectangle of the sign's frame:

1. Click on the **Assistant** tab  to display the **Assistant's Home** page.


2. Click on the **Create Rectangle** button  in the **Vector Editing** area to display the **Rectangle Creation** page.
3. Make sure that the **Rectangle** option is selected  by clicking on it.
4. Type 250 mm (10") in the **Height** box and 450 mm (18") in the **Width** box.
5. Click on the **Preview** button to view the rectangle. It is centred on the model's origin, which is in the bottom left corner.



Note: All newly created vector objects are centred on the model's origin.

6. Click on the **Create** button to create the rectangle in your model:




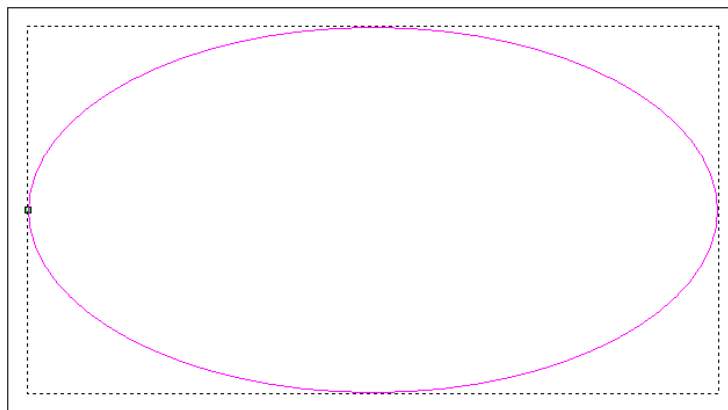
7. Click on the **Close** button to return to the **Assistant's** Home page.
8. Make sure that the rectangle is selected by clicking on it. The rectangle should be magenta and surrounded by a bounding box.
9. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to move the rectangle to the centre of your model.

This rectangle represents the total area of the sign that you are creating in your model.

Creating the Outer Ellipse

Second, we will draw the outer ellipse of the sign's frame:


1. Click on the **Create Ellipse** button  in the **Vector Editing** area to display the **Ellipse Creation** page.
2. Type 225 mm (9") in the **Height** box and 425 mm (17") in the **Width** box.
3. Make sure that the value in the **Angle** box remains at the default setting of 0°.
4. Click on the **Preview** button to view the ellipse.
5. Click on the **Create** button to create the ellipse, centred on the origin.
6. Click on the **Close** button to return to the **Assistant's** Home page.
7. Make sure that the ellipse is selected.
8. Press the **F9** key on your keyboard to place the ellipse in the centre of your model.

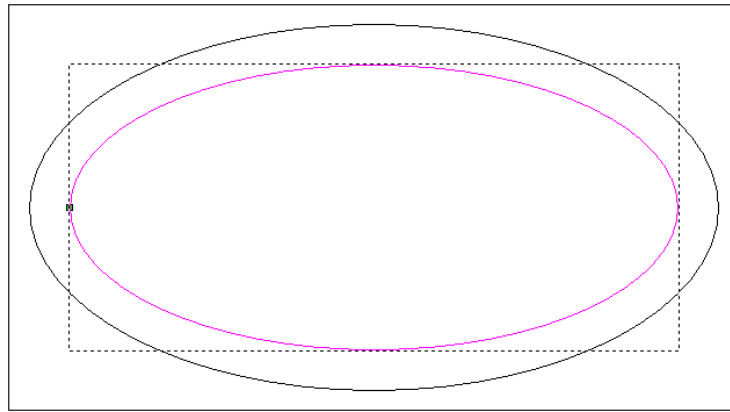


Creating the Inner Ellipse

Now we will draw an inner ellipse to complete the sign's framework:

1. Make sure the ellipse you have just created is selected by clicking on it.
2. Click on the **Copy** button  in the **File** area of the **Assistant's** Home page to create a duplicate of the selected ellipse and place it on the clipboard.
3. Click on the **Paste** button  in the **File** area to place the duplicate ellipse in your model, overlaying the original.

4. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
5. In the **Size** area, click to deselect the **Link Width and Height** option .
6. Type *375 mm (15")* in the **Size's New Width** box.
7. Type *175 mm (7")* in the **Size's New Height** box.
8. Click on the **Apply** button to create a preview image of the second, scaled ellipse.
9. Click on the **Close** button to create the second, scaled ellipse in your model and return to the **Assistant's Home** page:

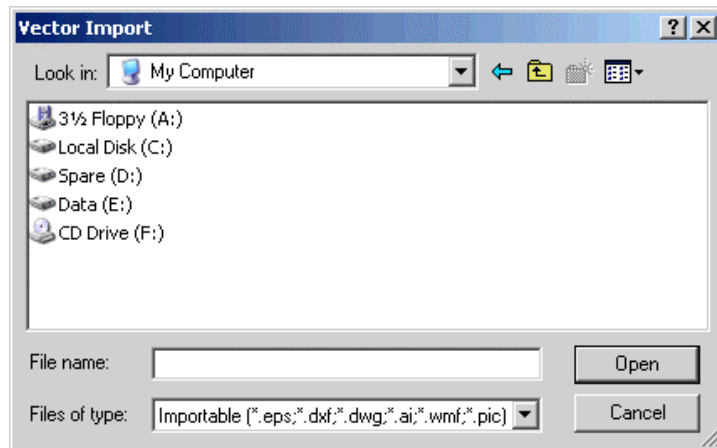


All three of the vector objects that you have drawn, as illustrated above, complete the frame for the *Aston Martin* sign.

Importing the Vector Artwork

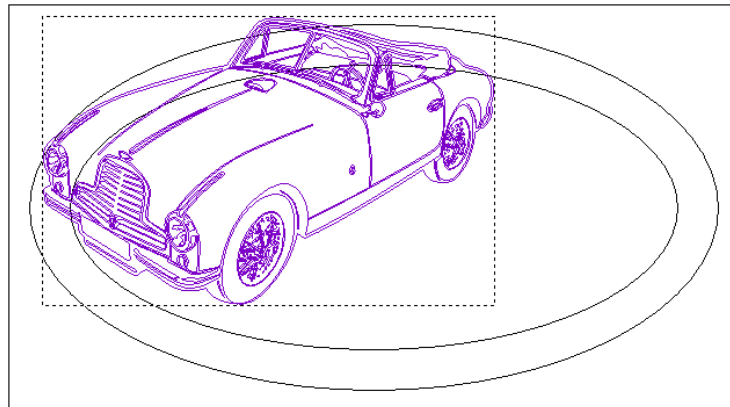
The next stage is to import the Aston Martin vector artwork:

1. Click on the **Import Vector Data** button  in the **File** area to display the **Vector Import** dialog box:



2. Click on the **Look In** list box and select ArtCAM Pro 7.0\Examples.
3. Click to select the file named *AstonCar.eps*, and then click on the **Open** button to import the vector artwork.


The Aston Martin artwork is purple, showing that it is a grouped set of vector objects:



4. Make sure that the grouped vector objects that make up the Aston Martin are selected by clicking anywhere on the Aston Martin.

The grouped vector objects are purple and surrounded by a bounding box.

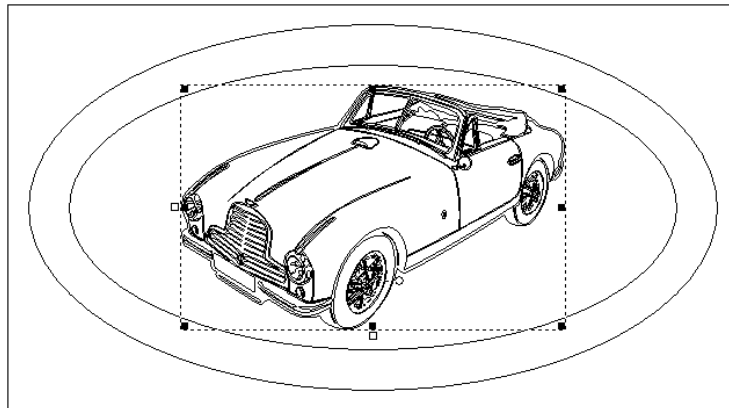
5. Press the **F9** key on your keyboard to move the Aston Martin to the centre of your model.

6. Click on the **Transform Vector(s)** button  to display the **Transform Vector(s)** page.

7. Make sure that the **Link Width and Height** option is selected .

8. Type *150 mm (5.91")* in the **Size's New Height** box.

- Click on the **Apply** button to create a preview image:




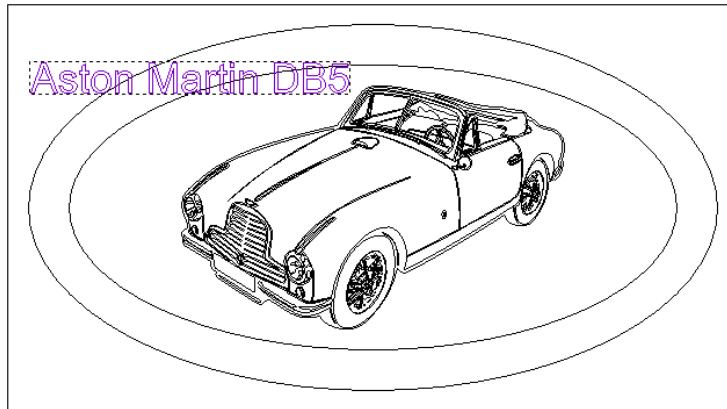
A value of 236.235 mm (9.3112") automatically appears in the **Size**'s **New Width** box. This is because the **Link Width and Height** option is selected .

- Click on the **Close** button to resize the vector objects and return to the **Assistant**'s Home page.

Creating the Vector Text


The next stage is to create vector text for the writing on the sign:

- Click on the **Create Vector Text** button  in the **Vector Editing** area to display the **Text Tool** page.
- Click on the **Font** list box, and then click on **Arial** to select it.
- Click on the **Size** list box, and then click on the appropriate unit of measurement option (millimetres or inches).
- Type *18 mm (0.71")* in the **Size** box.
- Click anywhere in your model (the white area in the **2D View** window), and then type *Aston Martin DB5*.
- Click the **Done** button to create the vector text and return to the **Assistant**'s Home page.



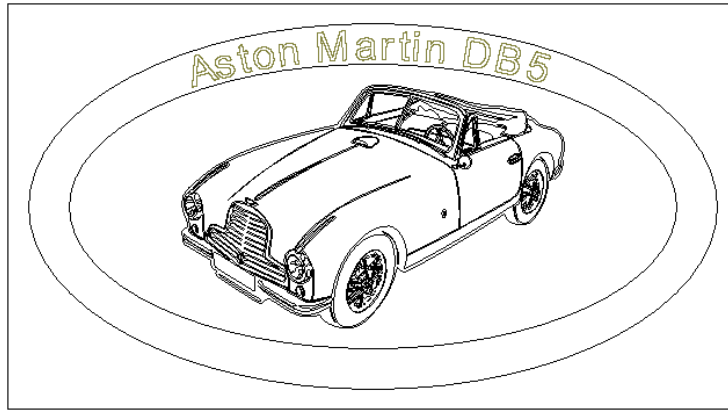
Wrapping the Vector Text

Next, we will wrap the vector text around the inner ellipse:

1. Click to select the inner ellipse in your model.
2. Hold down the **Shift** key on your keyboard, and then click to select the vector text.
3. Click on the **Wrap Text Round A Curve** button  in the **Vector Editing** area to display the **Text On A Curve** page.
4. Click on the **Text Position** list box, and then click on **Specify** to select it.

This option allows you to position the block of vector text around the inner ellipse, using a positive or negative value that you type in the **Specify** box.



5. Type 3 mm (0.12") in the **Specify** box.
6. Click to select the **Text on Other Side** option . The vector text is moved to the outside edge of the inner ellipse.
7. In the **Text Alignment** area, click on the list box and then on the **Sweep Around Curve** option to select it. ArtCAM Pro distorts the original shape of characters by fitting arcs around them and then offsetting them from one another.
8. Click and drag the vector text approximately into the centre of the frame, as shown below:

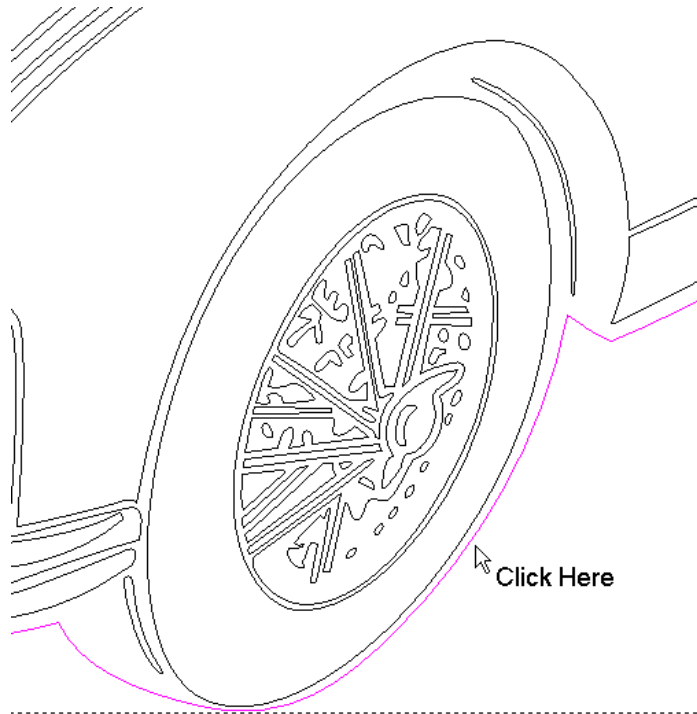


9. Click on the **OK** button to return to the **Assistant's** Home page.

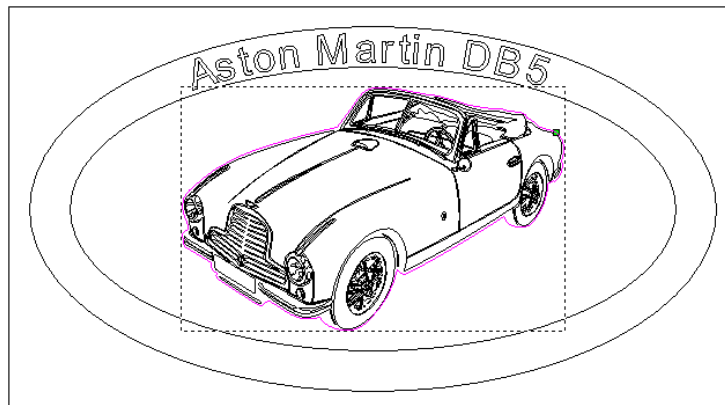
Creating an Offset Vector

Next we will create a vector object, offset from the outline of the Aston Martin. This is referred to as the "offset vector":


1. Click to select the group of vector objects that make up the Aston Martin.
2. Click on the **Ungroup** button  in the **Group Merge Join Trim Vectors** area of the **Assistant's** Home page.
By ungrouping the group of vector objects, you can see that the Aston Martin is made up of a number of separate vector objects.
3. Click on the **Zoom In Tool** button  in the **2D View** toolbar.
4. Click and drag to form a bounding box around the front wheel of the Aston Martin, then release the mouse button to zoom in on it.
5. Click to select the outer vector object of the Aston Martin:



6. Click on the **Window Fit** button in the **2D View** toolbar to view the whole of the model:



The offset vector you will now create acts as a boundary for the Area Clearance tool you will use to machine this area of the sign.

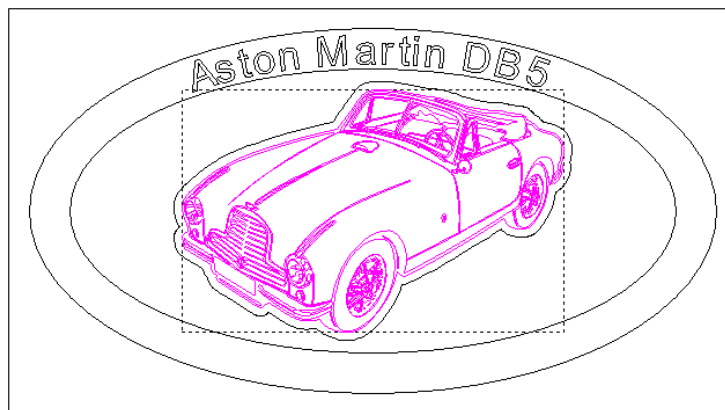
7. Click on the **Offset Vector(s)** button  in the **Vector Editing** area to display the **Offset Vector** page.
8. Type 5 mm (0.20") in the **Offset Distance** box.
9. Make sure that the **Outwards/Right** option is selected for the **Offset Direction**.
10. Make sure that the **Sharp** option is selected for the **Offset Corners**, and the **Max. Sharp Offset Distance** is set to 100 %.


11. Click on the **Offset** button to create the offset vector.
12. Click on the **Close** button to return to the **Assistant's** Home page.

You are now ready to regroup the vector objects that make up the Aston Martin car so that they can be machined at the same time.

13. Click and drag around the Aston Martin car and its offset vector to select all of the vector objects.
14. Hold down the **Shift** key on your keyboard, and then click on the offset vector to deselect it.

The offset vector is now black, whilst the vector objects that make up the Aston Martin remain magenta:



15. Click on the **Group** button  in the **Group Merge Join Trim Vectors** area to group the vector objects that make up the Aston Martin. The Aston Martin artwork turns purple.

Machining the Vectors

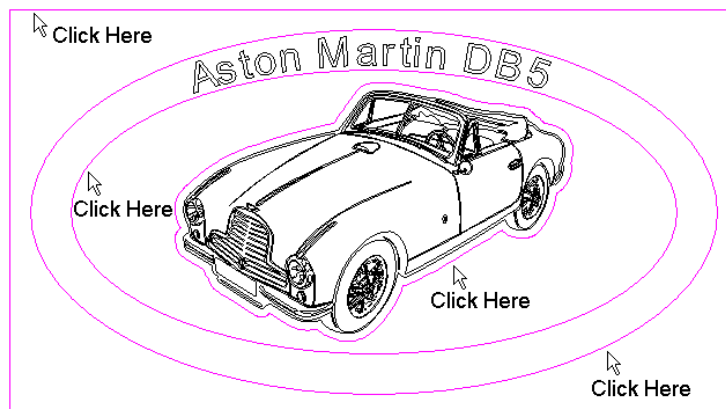
Now that we have positioned and resized the Aston Martin car, you will create the toolpaths that will be used to machine your model, and thus create your sign.




Clearing the Unwanted Material

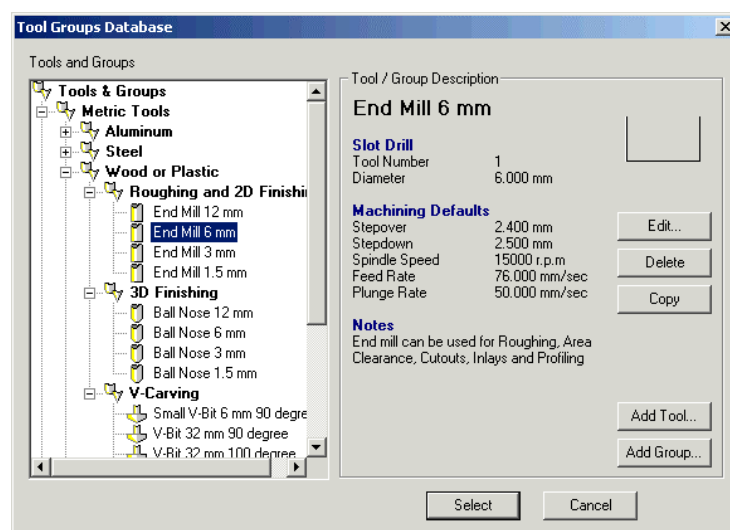
First, we will create an Area Clearance toolpath that will remove the unwanted material in your model:

1. Click to select the rectangle.

2. Hold down the **Shift** key on your keyboard, and then click on each of the ellipses and the offset vector in turn to select them:

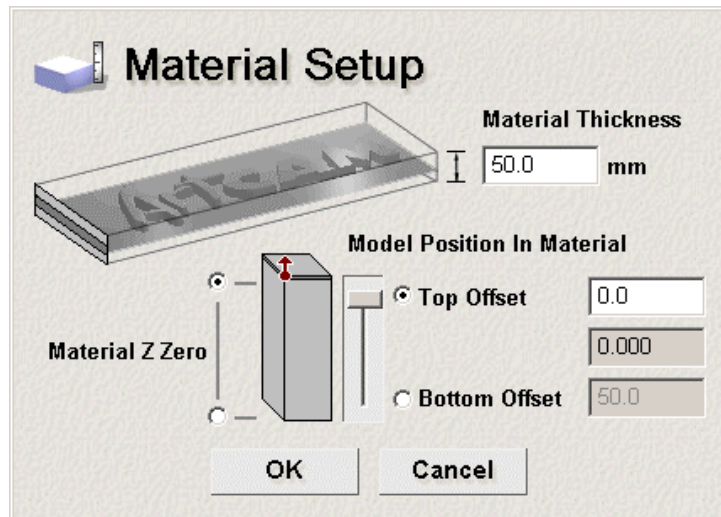


3. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
4. Click on the **Area Clearance** button  to display the **2D Area Clearance** page.
5. Type *10 mm (0.39")* in the **Finish Depth** box.
6. Type *0.02 mm (0.001")* in the **Tolerance** box.
7. Click on the  arrow in the **Machine Safe Z** area of the page to display the **Safe Z** box.
8. Type *3 mm (0.12")* in the **Safe Z** box.
9. Click on the **Add** button beneath the **Tool List** window to display the **Tool Groups Database**:



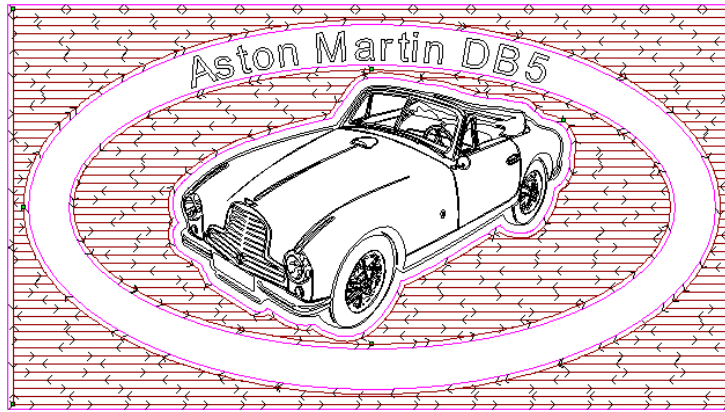
10. Click on the **End Mill 6mm (End Mill ¼ Inch)** tool in the **Wood or Plastic/Roughing and 2D Finishing** tool group to select it.

11. Click on the **Select** button to close the **Tool Groups Database** and add the tool to the **Tool List** on the **2D Area Clearance** page.
12. Type 5 mm (0.20") in the **Stepover** box.
13. Make sure that the **Raster** option is selected in the **Tool Clearance Strategy** area.
14. Click on the **Setup** button to display the **Material Setup** dialog box:



15. Make sure that the **Material Z Zero** is set to the top of the block, by clicking on the radio button at the top of the block.
16. Type 0.0 in the **Top Offset** box.
17. Click on the **OK** button to close the **Material Setup** dialog box.
18. Make sure that the **Create 2D Preview** option is selected .
19. Click on the **Now** button to calculate the Area Clearance toolpath.


The Area Clearance toolpath appears in the **2D View** window as follows:

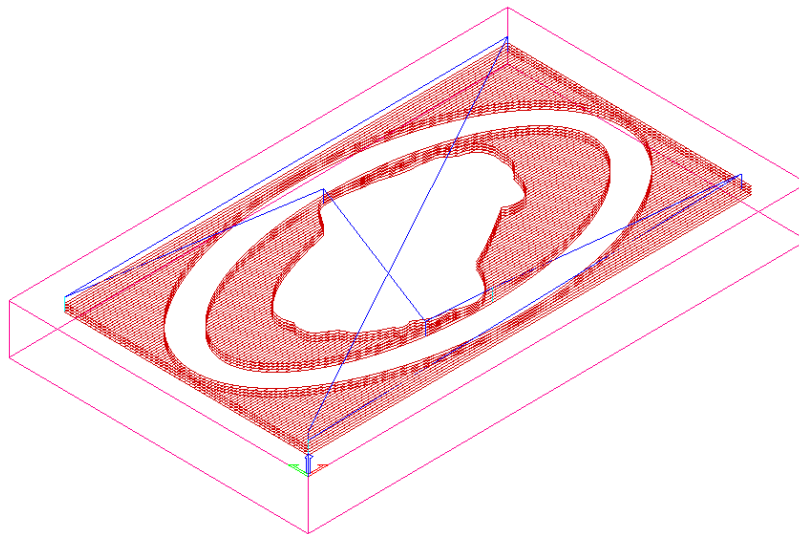


20. Click on the **Close** button to return to the **Assistant's** Home page.

Simulating the Toolpath

Now we can simulate the Area Clearance toolpath. A toolpath simulation allows you to visualise the machining passes used to machine your model.

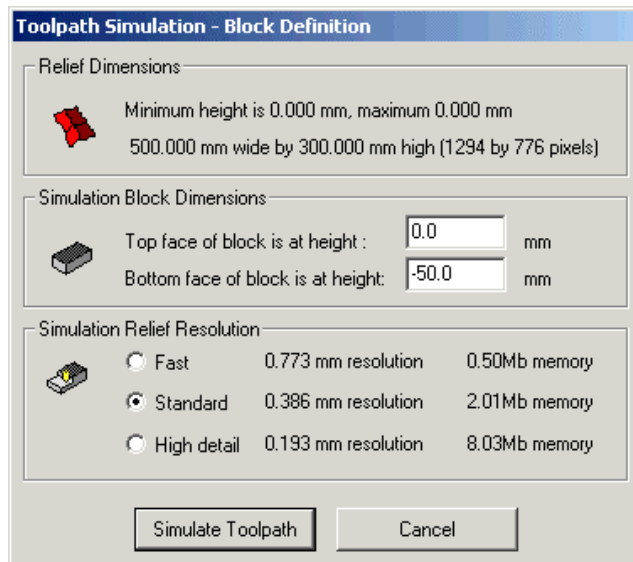
1. Click on the **3D View** button  in the **2D View** toolbar to display an isometric view of the Area Clearance toolpath in the **3D View** window:



2. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.

The **Toolpaths** Home page allows you to edit, simulate and save the toolpaths that you have created.

3. Click on the **Simulate Toolpath Fast** button  to display the **Toolpath Simulation - Block Definition** dialog box:




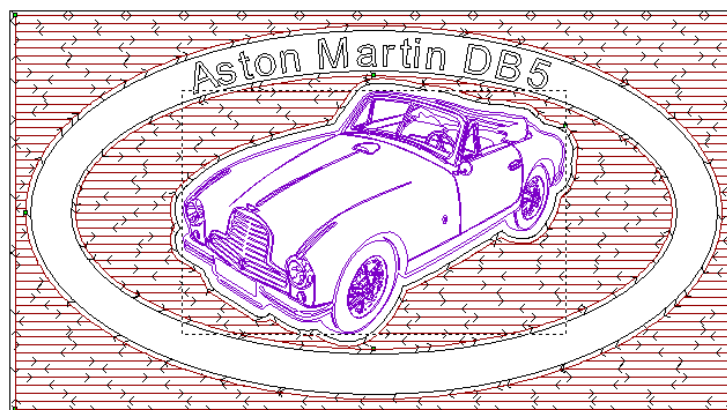
4. Click on the **Simulate Toolpath** button in the dialog box to simulate the Area Clearance toolpath.

As you simulate each individual toolpath, you will see in the **3D View** window what the machined sign would look like afterwards.


Carving the Aston Martin

We are now ready to create a V-Bit Carving toolpath that will carve the Aston Martin vector object in your model:

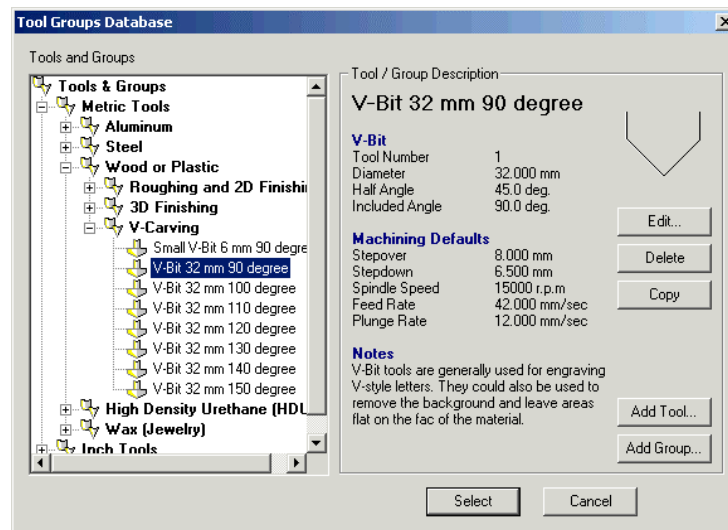
1. Click on the **2D View** button  in the **3D View** toolbar to display the **2D View** window.
2. Click to select the Aston Martin vector object:




3. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.

4. Click on the **V-Bit Carving** button  to display the **V-Bit Carving** page.

- Type *0.02* mm (*0.001*") in the **Tolerance** box.
- Click on the **Select** button in the **Carving Tool** area to display the **Tool Groups Database**:



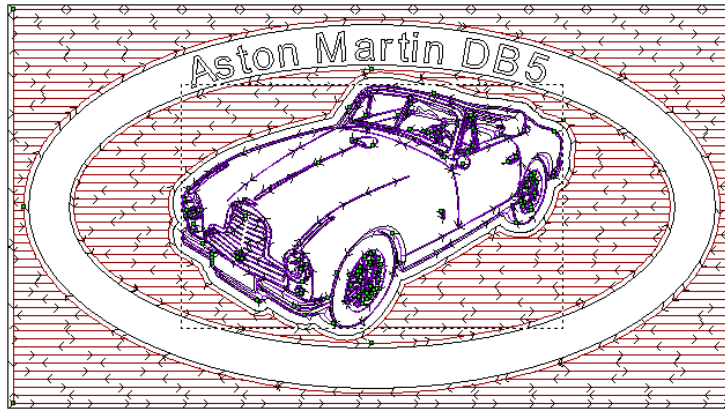
- Click on the **V-Bit 32 mm 90 degree** (V-Bit 1.25 Inch 90 degree) tool in the **Wood or Plastic\V-Carving** tool group to select it.
- Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Carving Tool** area of the **V-Bit Carving** page.
- Click on the  arrow to display the machining parameters of the selected tool.
- Type *2* in the **Tool Number** box.

This number should correspond with the position of the tool in your CNC machine's tool changer.

- Click on the **Now** button to calculate the V-Bit Carving toolpath.

The Aston Martin vector object is colour-filled in cyan during the centreline calculation process. A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the centreline.


The V-Bit Carving toolpath appears in the **2D View** window as follows:

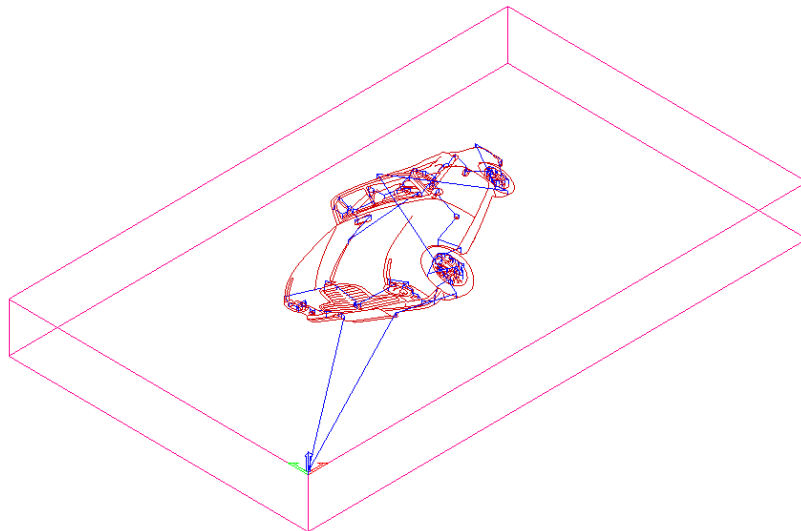



12. Click on the **Close** button to return to the **Assistant's** Home page.

Simulating the Toolpath

Now we can simulate the V-Bit Carving toolpath:

1. Click on the **3D View** button  in the **2D View** toolbar to display an isometric view of the V-Bit Carving toolpath in the **3D View** window:

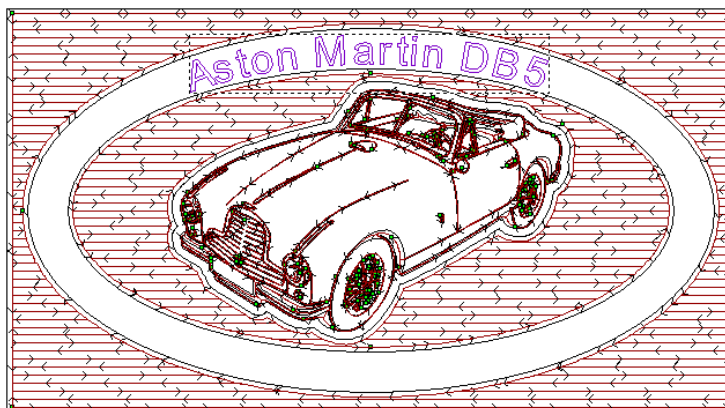



2. Click on the **Toolpath** tab to display the **Toolpaths** Home page.
3. Click on the **Simulate Toolpath Fast** button  to simulate the V-Bit Carving toolpath.

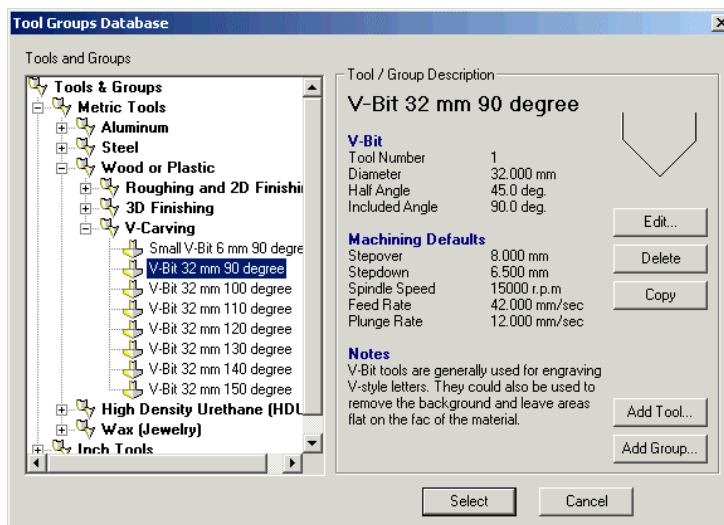
Carving the Text

Next, we will create a V-Bit Carving toolpath that will carve the *Aston Martin DB5* vector text in your model:

1. Click on the **2D View** button **2D** in the **3D View** toolbar to display the **2D View** window.
2. Click to select the *Aston Martin DB5* vector text:




3. Click on the **V-Bit Carving** button  to display the **V-Bit Carving** page.
4. Type *0.02 mm (0.001")* in the **Tolerance** box.
5. Click on the **Select** button in the **Carving Tool** area to display the **Tool Groups Database**:



6. Click on the **V-Bit 32 mm 90 degree** (V-Bit 1.25 Inch 90 degree) tool in the **Wood or Plastic\V-Carving** tool group to select it.

This tool is the same as that which was used to carve the Aston Martin vector object.

7. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Carving Tool** area of the page.

- Click on the  arrow to display the machining parameters of the selected tool.
- Type 2 in the **Tool Number** box.
- Click on the **Now** button to calculate the V-Bit Carving toolpath.

The *Aston Martin DB5* vector text is colour-filled in cyan during the centreline calculation process.


The V-Bit Carving toolpath appears in the **2D View** window as follows:

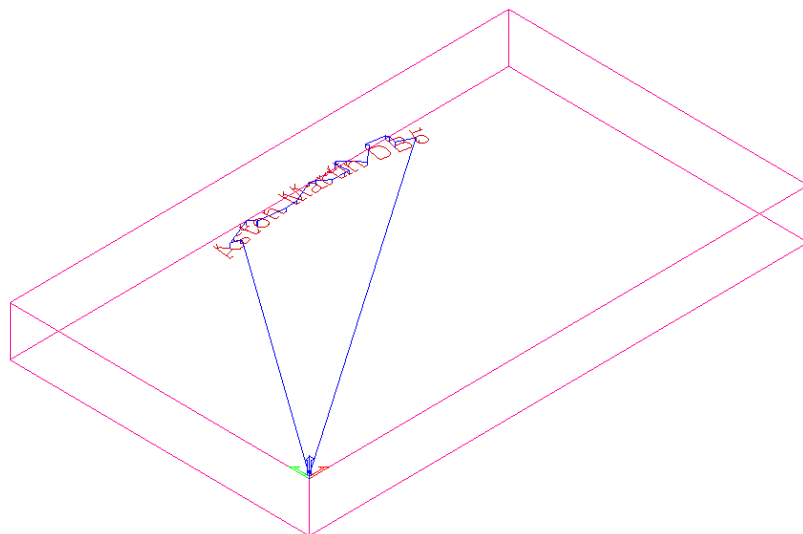



- Click on the **Close** button to return to the **Assistant's** Home page.

Simulating the Toolpath

Now we can simulate the V-Bit Carving toolpath:



- Click on the **3D View** button  in the **2D View** toolbar to display an isometric view of the V-Bit Carving toolpath in the **3D View** window:

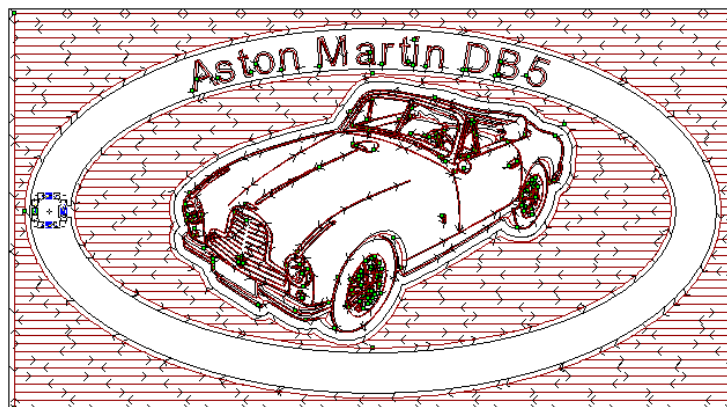


2. Click on the **Toolpaths** tab to display the **Toolpaths Home** page.
3. Click on the **Simulate Toolpath Fast** button  to simulate the V-Bit Carving toolpath.

Marking the Drill Holes with Circles

Now we will mark the position of the drill holes that you want to machine using circles:

1. Click on the **2D View** button  in the **3D View** toolbar to display the **2D View** window.
2. Click on the **Assistant** tab to display the **Assistant's Home** page.
3. Click on the **Create Circles** button  in the **Vector Editing** area to display the **Circle Creation** page.
4. Type *50 mm (2")* in the **Circle Centre's X** box.
5. Type *150 mm (6")* in the **Circle Centre's Y** box.
6. Type *9 mm (0.35")* in the **Circle Radius** box.
7. Click to select the **Create with arcs** option . This instructs ArtCAM Pro to create the circle with four arc spans, rather than four bezier curve spans.
8. Click on the **Create** button to create a circle between the middle of the inner and outer ellipse on the left side of the model:



9. Type *450 mm (18")* in the **Circle Centre's X** box.
10. Type *150 mm (6")* in the **Circle Centre's Y** box.
11. Type *9 mm (0.35")* in the **Circle Radius** box.

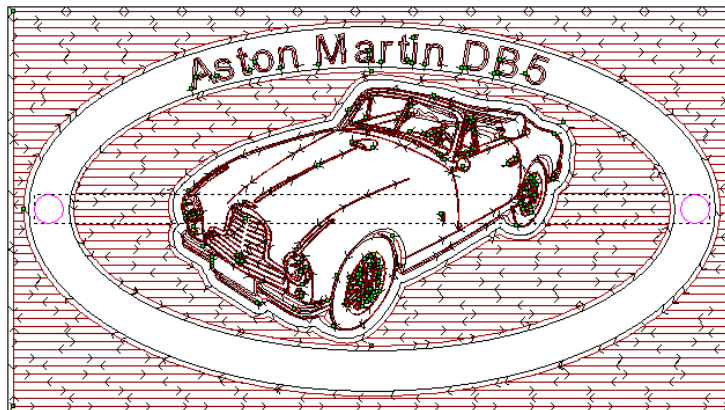
12. Click on the **Create** button to create a circle between the middle of the inner and outer ellipse on the right side of the model, opposite the first drill hole.
13. Click on the **Close** button to return to the **Assistant's** Home page.



Creating the Drill Holes

In this next stage, we will create drill holes inside the selected circles:

1. Hold down the **Shift** key on your keyboard, and then click to select both of the circles that you have created.

The circles turn magenta and are surrounded by a bounding box:

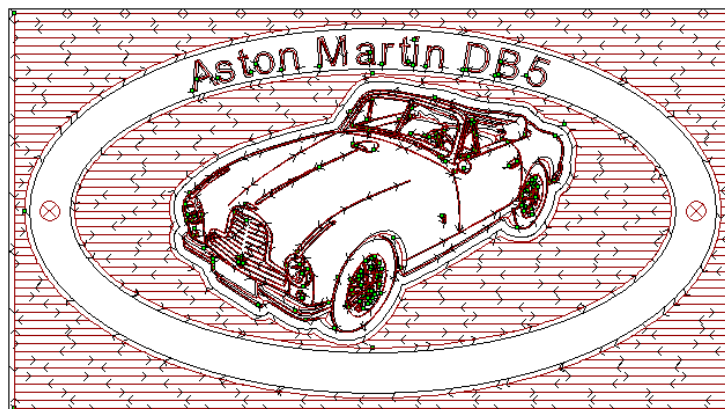


2. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.
3. Click on the **Drilling** button  to display the **Drilling** page.
4. Type *50 mm (2")* in the **Finish Depth** box.
5. Click on the **Select** button in the **Tool** area of the page to display the **Tool Groups Database**.
6. Click on the **End Mill 12 mm (End Mill ½ Inch)** tool in the **Wood or Plastic\ Roughing and 2D Finishing** tool group to select it.
7. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Tool** area of the **Drilling** page.
8. Click on the  arrow to display the machining parameters of the selected tool.

9. Type 3 in the **Tool Number** box.
10. Click to select the **Circular Vectors** radio button in the **Drill Centre of...** area, and type 0.05 mm (0.002") in the **Tol.** box.

This option is used because you have selected circles to define the position of the drill holes.

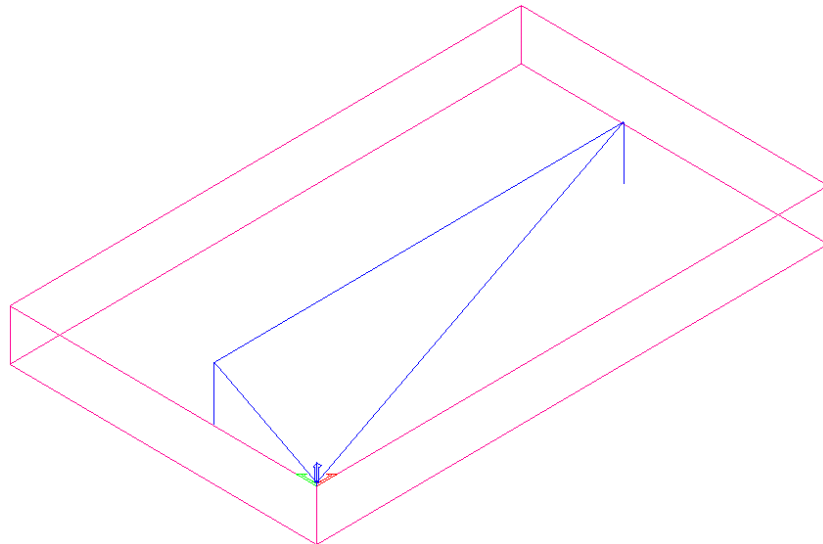
11. Make sure that the **Create 2D Preview** option is selected .
12. Click on the **Now** button to calculate the Drilling toolpath.
The Drilling toolpath appears in the **2D View** window, shown as a cross in the centre of both circles.
13. Click on the **Close** button to return to the **Assistant's** Home page.
14. Press the **Delete** key on your keyboard to delete the two circles, leaving just the drill holes:




Simulating the Toolpath

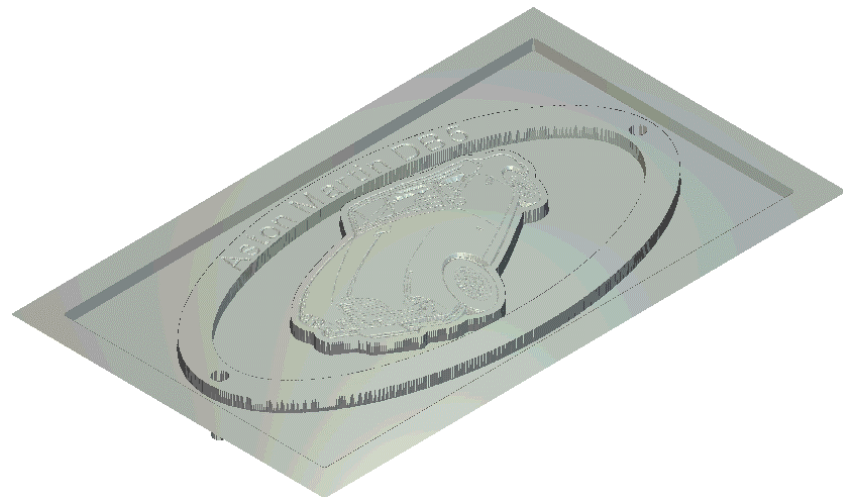
Now we can simulate the Drilling toolpath:

1. Click on the **3D View** button in the **2D View** toolbar to display an isometric view of the Drilling toolpath in the **3D View** window:



2. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.
3. Click on the **Simulate Toolpath Fast** button  to simulate the Drilling toolpath.

You have simulated all of the toolpaths you will use to create the Aston Martin sign. The **3D View** window now gives an impression of what the model will look like after all of the toolpaths have been machined:






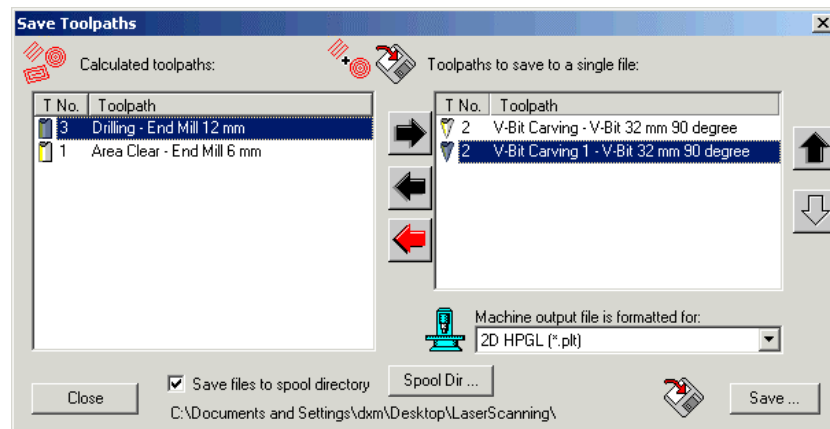
Saving the Toolpaths

We are now ready to save the toolpaths that you have created to machine the *Aston Martin* sign.



We will save the toolpaths as separate files, grouping together those that use the same tool. Both of the **V-Bit Carving** toolpaths have the

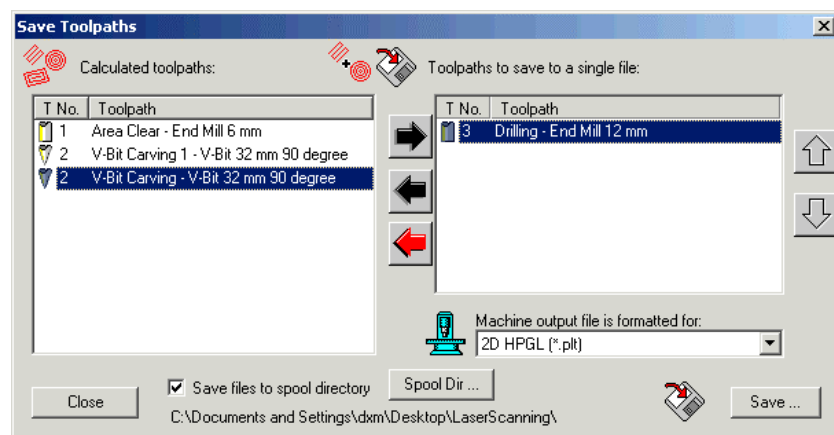
same tool number because the **V-Bit 32 mm 90 degree** (V-Bit 1.25 Inch 90 degree) tool is used in each of them.

1. Click to select the **Area Clear** toolpath. The toolpath name at the top of the page is highlighted in blue.
2. Click on the **Save Toolpaths** button  to display the **Save Toolpaths** dialog box.
3. Click on the **Machine output file is formatted for** list box and then click to select the format compatible with your CNC machine.
4. If you want to save the toolpaths to the spool directory, make sure that the **Save files to spool directory** option is selected .
5. Click on the **Save...** button to open the **Save As...** dialog box.
6. Type *Area Clearance* in the **File Name** box.
7. Click on the **Save** button to save the toolpath to the selected directory.
8. Click on the  button to send the **Area Clear** toolpath to the **Calculated Toolpaths** window.
9. Hold down the **Shift** key on your keyboard, and then click on both of the **V-Bit Carving** toolpaths in the **Calculated Toolpaths** window to select them.
10. Click on the  arrow to send both of the selected toolpaths to the **Toolpaths to save to a single file** window:



Both of the **V-Bit Carving** toolpaths are saved as a single file because the **V-Bit 32 mm 90 degree** (V-Bit 1.25 Inch 90 degree) tool is used in each of them.

11. Click on the **Save...** button to open the **Save As...** dialog box.
12. Type *V-Bit Carving* in the **File Name** box.
13. Click on the **Save** button to save the toolpath.
14. Click on the  button to send both the **V-Bit Carving** and the **V-Bit Carving 1** toolpath to the **Calculated Toolpaths** window.
15. Click to select the **Drilling** toolpath.
16. Click on the  button to send the selected toolpath to the **Toolpaths to save to a single file** window:



17. Click on the **Save...** button to open the **Save As...** dialog box.
18. Type *Drilling* in the **File Name** box.
19. Click on the **Save** button to save the toolpath.
20. Click on the **Close** button to close the **Save Toolpaths** dialog box.

These toolpath files can now be sent to your CNC machine tool to create the *Aston Martin* sign.

Tutorial – Smart Engraving

Overview

The following tutorial demonstrates how to create engraved text using the vector editing and the Smart Engraving toolpath available in ArtCAM Pro.

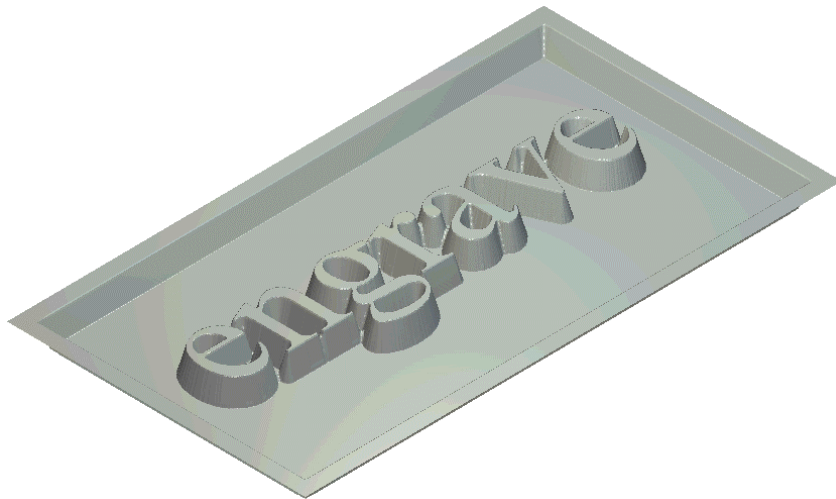
A Smart Engraving toolpath allows you to produce engraved vector text effectively and efficiently.

Engraved Text

The stages that you will cover during the course of this tutorial are:

- Preparing the model.
- Creating the outer-edge of the engraved area.
- Creating the vector text.
- Machining the model.
- Saving the toolpaths.

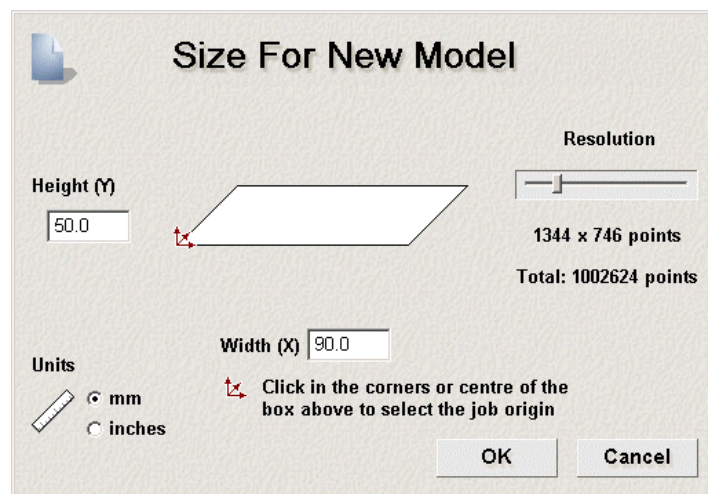
The tutorial will lead you through each of these stages, guiding you through the complete process of creating the engraved text below:



Preparing the Model

First, we will set up the model dimensions needed for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:

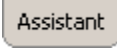





2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type **50 mm (2.0")** in the **Height** box and **90 mm (3.5")** in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to **1002624** points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

Defining the Outer-Edge of the Engraved Area


In this next stage we will create a rectangle that represents the outer-edge of the area to be engraved:

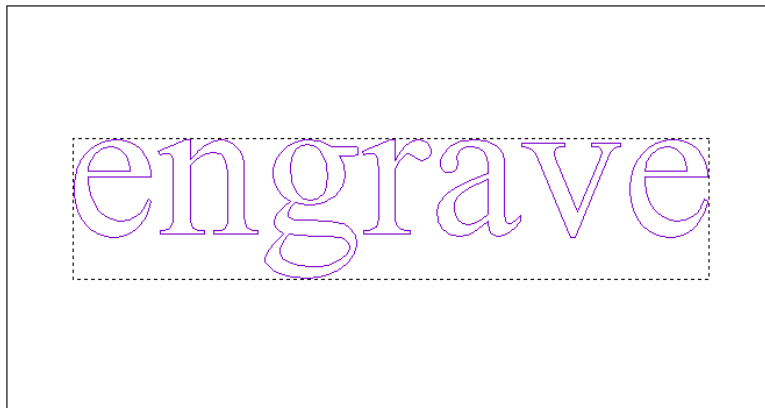
1. Click on the **Assistant** tab  to display the **Assistant's** Home page.
2. Click on the **Create Rectangle** button  in the **Vector Editing** area to display the **Rectangle Creation** page.
3. Make sure that the **Rectangle** option is selected .
4. Type *45 mm (1.8")* in the **Height** box and *85 mm (3.3")* in the **Width** box.
5. Click on the **Preview** button to view the rectangle. It is centred on the model's origin, which is in the bottom left corner.
6. Click on the **Create** button to create the rectangle in your model.
7. Click on the **Close** button to return to the **Assistant's** Home page.
8. Make sure that the rectangle is selected by clicking on it. The rectangle should be magenta and surrounded by a bounding box.
9. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to move the rectangle to the centre of your model.

This rectangle represents the outer-edge of the area to be engraved.

Creating the Vector Text

The next stage is to create the vector text that we will engrave:


1. Click on the **Create Vector Text** button  in the **Vector Editing** area of the **Assistant's** Home page to display the **Text Tool** page.
2. Click on the **Font** list box, and then click on **Times New Roman** to select it.
3. Click on the **Size** list box, and then click on the appropriate units of measurement.
4. Type *15 mm (0.6")* in the **Size** box.
5. Click anywhere in your model (the white area in the **2D View** window), and then type *engrave*.
6. Click the **Done** button on the **Text Tool** page to create the vector text and return to the **Assistant's** Home page.
7. Make sure that the *engrave* vector text is selected by clicking on it. The *engrave* vector text should be purple and surrounded by a bounding box.
8. Press the **F9** key on your keyboard to move the vector text to the centre of your model:




Machining the Model

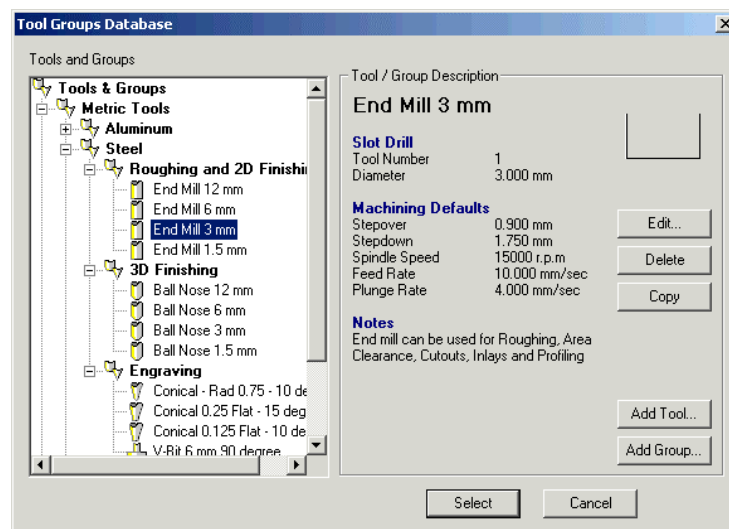
Next, we will create two toolpaths to engrave the design. A 3 mm End Mill (1/8 Inch End Mill) tool will be used to rough the part and a Conical 0.25 mm Flat – 15 degrees (Conical 0.01 Inch Flat – 15 degrees) tool will be used to finish engrave it:

1. Click to select the rectangle.
2. Hold down the **Shift** key on your keyboard, and then click to select the *engrave* vector text. The vector text turns purple and the rectangle turns magenta.


3. Click on the **Toolpaths** tab to display the **Toolpaths Home** page.
4. Click on the **Engraving** button  to display the **Smart Engraving** page.
5. Type 4 mm (0.15") in the **Finish Depth** box and 0.02 mm (0.001") in the **Tolerance** box.
6. Make sure that the **Vectors are on surface** option is selected .
7. Make sure that the **Offset end mills for engraving tools** option is selected .

This option will automatically offset the roughing tool in order to leave sufficient material for the angled-edge of the Conical engraving tool to form the side of the engraved feature.

8. Click on the  arrow in the **Machine Safe Z** area of the page to display the **Safe Z** box.
9. Type 3 mm (0.12") in the **Safe Z** box.
10. Click on the **Add** button in the **Tools List** area of the page to display the **Tool Groups Database**:



11. Click on the **End Mill 3mm** (End Mill 1/8 Inch) tool in the **Steel\Roughing and 2D Finishing** tool group to select it.
12. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Smart Engraving** page.

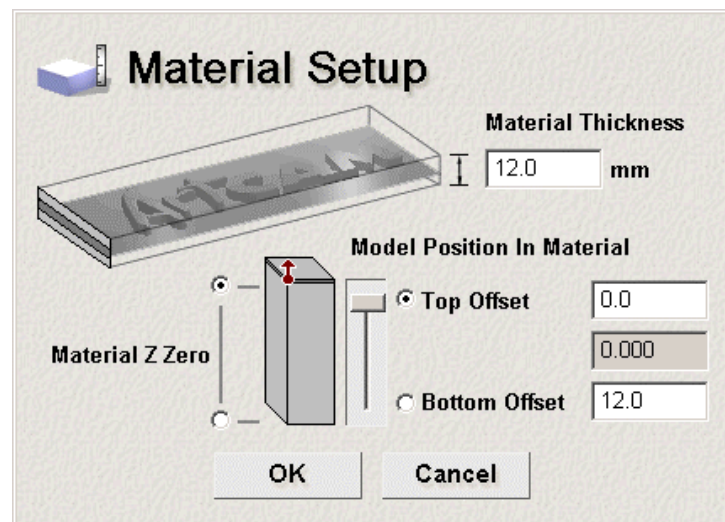
13. Click on the **Add** button to display the **Tool Groups Database** again.
14. Click on the **Conical 0.25 Flat – 15 degrees** (Conical 0.01 Flat – 15 degrees) tool in the **Steel Engraving** tool group to select it.
15. Click on the **Select** button to close the **Tool Groups Database** and display this tool under the End Mill tool in the **Smart Engraving** page.
16. If you cannot see the machining parameters of the Conical tool, click on the  arrow to display them.
17. Type *2* in the **Tool Number** box.

This number should correspond with the position of the Conical tool in your CNC machine's tool changer.

18. Click to select the **Do corner sharpening** option .

The corners of the engraved feature will be sharpened by the Conical engraving tool.

19. Click on the **Setup** button to display the **Material Setup** dialog box:



20. Type *12* mm (*0.5*") in the **Material Thickness** box.
21. Make sure that the **Material Z Zero** is set to the top of the block by clicking on the radio button at the top of the block.
22. Type *0.0* in the **Top Offset** box.
23. Click on the **OK** button to close the **Material Setup** dialog box.

24. Make sure that the **Create 2D Preview** option is selected .
25. Click on the **Now** button to calculate the Smart Engraving toolpath. The Smart Engraving toolpath appears in the **2D View** window as follows:



26. Click on the **Close** button to return to the **Assistant's** Home page.

Tutorial – Bevelled Carving

Overview

The following tutorial demonstrates how to create bevelled (angle-edged) lettering using the vector text and 2D toolpath tools available in ArtCAM Pro.

Bevelled Letter B

The stages that you will cover during the course of this tutorial are:

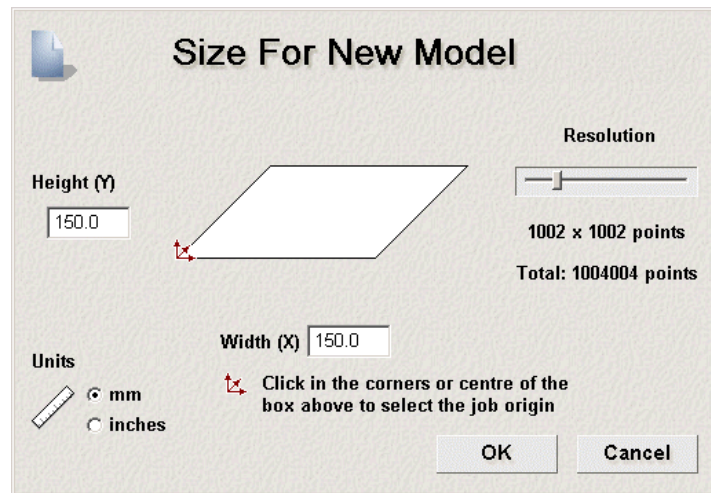
- Preparing the model.
- Creating the vector text.
- Machining the vector text.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating a bevelled letter *B*.

Preparing the Model

First, we will set up the model dimensions needed for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:

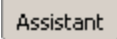





2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *150 mm (6")* in the **Height** box and *150 mm (6")* in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to *1004004* points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

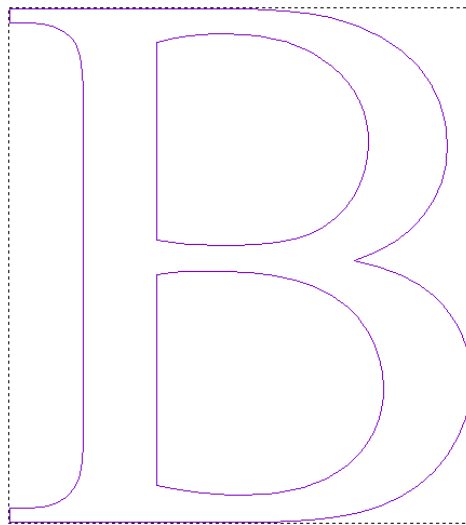
A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

Creating the Vector Text

Now we will create the vector text we will use to produce the bevelled letter *B*:



1. Click on the **Assistant** tab  to display the **Assistant's** Home page.
2. Click on the **Create Vector Text** button  in the **Vector Editing** area to display the **Text Tool** page
3. In the **Style** area, make sure that the **Bold** button  is not selected. We do not want to type in bold text.
4. Click on the **Font** list box, and then click on **Times New Roman** to select it.
5. Click on the **Size** list box, and then click on the appropriate units of measurement.

6. Type *110* mm (*4.3*") in the **Size** box.
7. Click anywhere in your model (the white area in the **2D View** window), hold down the **Shift** key on your keyboard and then type *B*.
8. Make sure that the *B* vector text is selected by clicking on it. The *B* vector text should be purple and surrounded by a bounding box.
9. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to move the *B* vector text to the centre of your model.

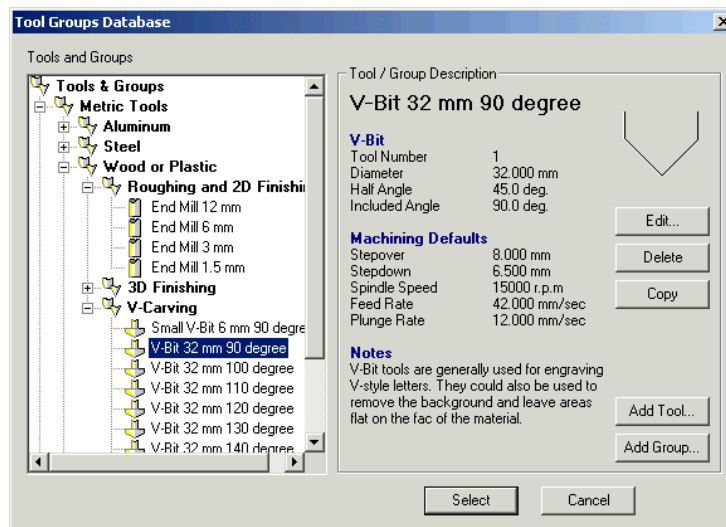


Machining the Vector Text

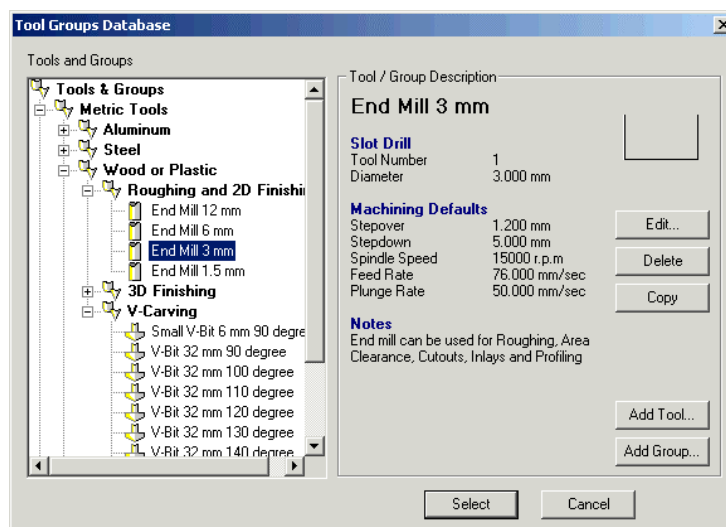
We are now ready to create the toolpath that will be used to machine the *B* vector text, and thus create the bevelled letter:

1. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.
2. Click on the **Bevel Carving** button  to display the **3D Bevel Carving** page.
3. Type *3* mm (*0.15*") in the **Wall Height** box.
4. Type *15* mm (*0.6*") in the **Finish Depth** box
5. Type *0.02* mm (*0.001*") in the **Tolerance** box.
6. Click on the  arrow in the **Machine Safe Z** area of the page to display the **Safe Z** box.
7. Type *3* mm (*0.12*") in the **Safe Z** box.


- First, select the Carving tool by clicking on the **Select** button in the **Carving Tool** area:





- In the **Tool Groups Database**, click on the **V-Bit 32 mm 90 degree** (V-Bit 1.25 Inch 90 degree) tool in the **Wood or Plastic\V-Carving** tool group to select it.
- Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Carving Tool** area of the **3D Bevel Carving** page.
- Next, we will select the Profiling tool by clicking on the **Select** button in the **Profiling Tool** area:



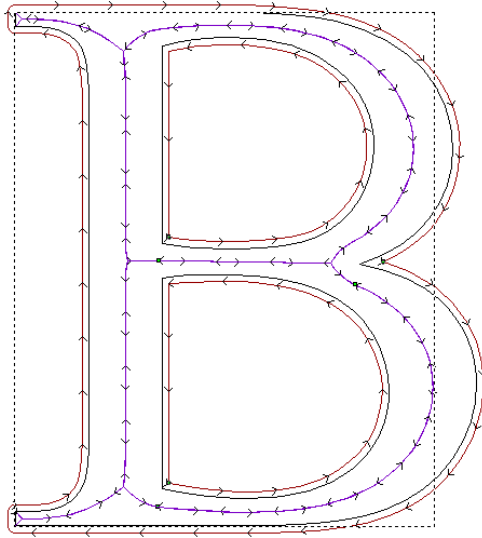
- In the **Tool Groups Database**, click on the **End Mill 3 mm** (End Mill 1/8 Inch) tool in the **Wood or Plastic\Roughing and 2D Finishing** tool group to select it.

13. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Profiling Tool** area of the **3D Bevel Carving** page.
14. Click on the  arrow to display the machining parameters of the Profiling tool.
15. Type 2 in the **Tool Number** box.

This number should correspond with the position of the tool in your CNC machine's tool changer.
16. Click on the **Setup** button to display the **Material Setup** dialog box:
17. Type 15 mm (0.6") in the **Material Thickness** box.
18. Make sure that the **Material Z Zero** is set to the top of the block by clicking on the radio button  at the top of the block.
19. Type 0.0 in the **Top Offset** box.
20. Click on the **OK** button to close the **Material Setup** dialog box.
21. Make sure that the **Create 2D Preview** option is selected .
22. Click on the **Now** button to calculate the Bevelled Carving toolpath.

The *B* vector text is colour-filled in cyan during the centreline calculation process. A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the centreline.

The Bevelled Carving toolpath appears in the **2D View** window as follows:



23. Click on the **Close** button to return to the **Assistant's** Home page.

Tutorial – Nesting Vectors

Overview

The following tutorial demonstrates how the Nesting tool in ArtCAM Pro repositions vector objects in order to minimise material wastage when you are machining.

Nesting Vectors

The stages that you will cover during the course of this tutorial are:

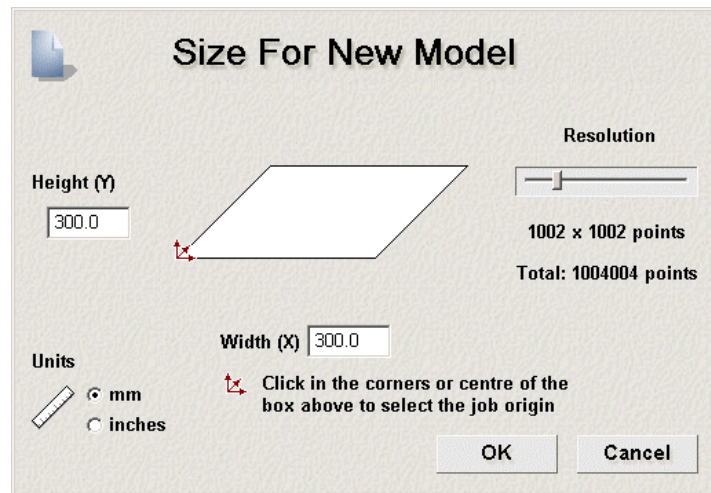
- Preparing the model.
- Defining the material shape.
- Creating the vector text.
- Nesting the vector text.
- Machining the nested vector text.

The tutorial will lead you through each of these stages, guiding you through the complete process of nesting. At the end of this tutorial you will have nested text within an area of material, and created the toolpath with which to machine it.

Preparing the Model

First, we will set up the model dimensions needed for this particular job:

1. Click on the **Create New Model**  icon on the **Assistant's Getting Started** page to display the **Size For New Model** dialog box:







2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *300 mm (12")* in both the **Height** and **Width** boxes.
4. Click and drag on the **Resolution** slider to set the resolution of the model to *1004004* points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

Defining the Material Shape

In this next stage, we will create the vector object in which we will nest the vector text:

1. Click on the **Assistant** tab  to display the **Assistant's** Home page.
2. Click on the **Create Rectangle** button  in the **Vector Editing** area to display the **Rectangle Creation** page.
3. Make sure that the **Rectangle** option is selected .
4. Type *75 mm (3")* in the **Height** box.
5. Type *200 mm (8")* in the **Width** box.
6. Click on the **Preview** button to view the rectangle. It is centred on the model's origin, which is in the bottom left hand corner.

7. Click on the **Create** button to create the rectangle in your model.
8. Click on the **Close** button to return to the **Assistant's** Home page.
9. Make sure that the rectangle is selected by clicking on it. The rectangle should be magenta and surrounded by a bounding box.
10. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to move the rectangle to the centre of your model.
11. Click on the **Node Editing** button  to enter node editing mode.
12. Move the cursor over the right edge of the rectangle, right-click to display the Node Editing menu, and then click on the **Convert span to arc** option.

The rectangle now appears as follows:





13. Move the cursor over the left edge of the rectangle, then press the **A** key on your keyboard to convert this span to an arc as well.

This vector object represents the total area of the material you have available in which to machine a block of vector text.

Creating the Vector Text

Now that we have created the vector object, we will create the vector text that shall be nested within it:

1. Click on the **Create Vector Text** button  in the **Vector Editing** area to display the **Text Tool** page.

2. Click on the **Font** list box, and then click on **Arial** to select it.
3. Click on the **Size** list box, and then click on the appropriate units of measurement.
4. Type 35 mm (1.38") in the **Size** box.
5. Click on the **Bold** button  to type in bold.
6. Click anywhere in your model (the white area in the **2D View** window), and then type *ArtCAM Pro*.
7. Click on the **Done** button to create the vector text and return to the **Assistant's** Home page.

The vector text appears, surrounded by a bounding box indicating that it is selected.


Nesting the Vector Text

We are now ready to nest the *ArtCAM Pro* vector text within the vector object representing the material:

1. Click to select the vector object representing the material in your model
2. Hold down the **Shift** key on your keyboard, and then click on the vector text to select it as well.

The vector object is magenta and the *ArtCAM Pro* vector text is purple, both of which are surrounded by a bounding box:



3. Click on the **Nest Selected Vectors** button  in the **Position Size Align Vectors** area to display **Nesting** page.
4. Type 3 mm (0.125") in the **Tool Diameter (D)** box.
5. Click to select the **Allow Part Rotation** option .
6. Type 45 in the **Step Angle (A)** box.

7. Click on the **Nest From** list box, and then on the **Bottom Left** option to select it.
8. Type *0.02 mm (0.001")* in the **Curve Tolerance** box.
9. Click to select the **Create Leftover Material Vector** option .

This option creates a vector object that represents the area of material after the vector text has been machined.

10. Click on the **Nest** button.

A progress bar appears beneath the **2D View** window indicating the progress ArtCAM Pro is making in calculating the position of the nested vector text.

The nested vector text appears in the **2D View** window as follows:



11. Click on the **Close** button to return to the **Assistant's** Home page.
12. Click to select the vector object representing the total area of the material.



You can see that the area of the material that surrounds the nested vector text is now a vector object in which you could nest other vector objects into. You could save this vector object for the next time you use this area of material in a job.

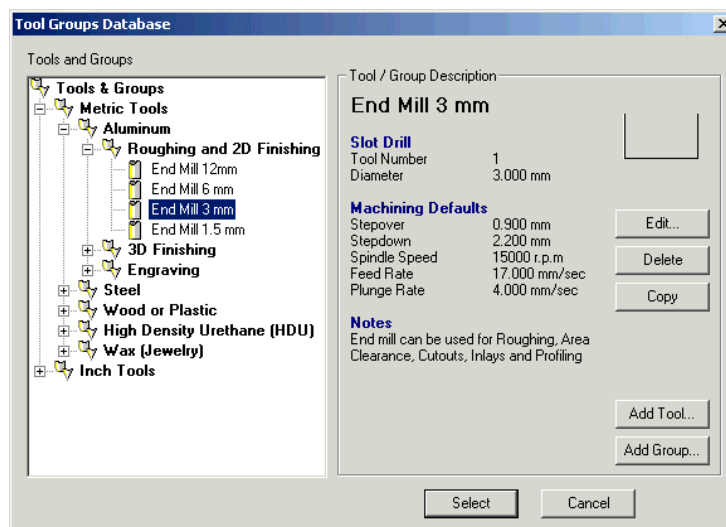
Machining the Nested Vector Text

Now that the *ArtCAM Pro* vector text has been nested, we are ready to create the Profile toolpath that will be used to machine it:

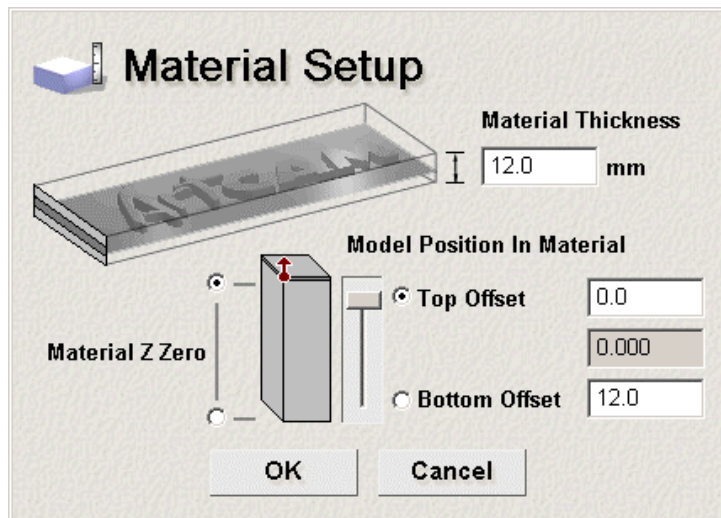
1. Click anywhere in the **2D View** window to deselect the vector objects.
2. Click to select the nested vector text.



3. Click on the **Toolpaths** tab to display the **Toolpaths** Home page.
4. Click on the **2D Profiling** button  to display the **Profiling** page.
5. Make sure that the **Outside** radio button is selected.
6. Make sure that the **Finish Depth** is set to *12 mm (0.5")*.
7. Type *0.02 mm (0.001")* in the **Tolerance** box.
8. Click on the  arrow in the **Machine Safe Z** area of the page to display the **Safe Z** box.
9. Type *3 mm (0.12")* in the **Safe Z** box.
10. Click on the **Select** button in the **Profiling Tool** area of the page to display the **Tool Groups Database**:



11. Click on the **End Mill 3mm** (End Mill 1/8 Inch) tool in the **Aluminum\Roughing and 2D Finishing** tool group to select it.
12. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool in the **Nesting** page.
13. Click on the **Setup** button to display the **Material Setup** dialog box:



14. Type *12 mm (0.5")* in the **Material Thickness** box.
15. Make sure that the **Material Z Zero** is set to the top of the block by clicking on the radio button at the top of the block.
16. Type *0.0* in the **Top Offset** box.
17. Click on the **OK** button to close the **Material Setup** dialog box.
18. Make sure that the **Create 2D Preview** option is selected .
19. Click on the **Now** button to calculate the Profile toolpath.

You can see by looking at the toolpath that ArtCAM Pro has nested the individual characters in this way to leave a sufficient offset for the 3mm End Mill (1/8 Inch End Mill) tool to profile each of them without causing gouging.

A 3mm End Mill (1/8 Inch End Mill) tool must be used to machine the nested vector text for each character to be cut from the area of material successfully.
20. Click on the **Close** button to return to the **Assistant's** Home page.

Tutorial – Bridging

Overview

The following tutorial demonstrates how to add bridges, also referred to as tabs, to a Profile toolpath. Bridges are used to hold a part in place during machining.

Bridged Letter B


The stages that you will cover during the course of this tutorial are:

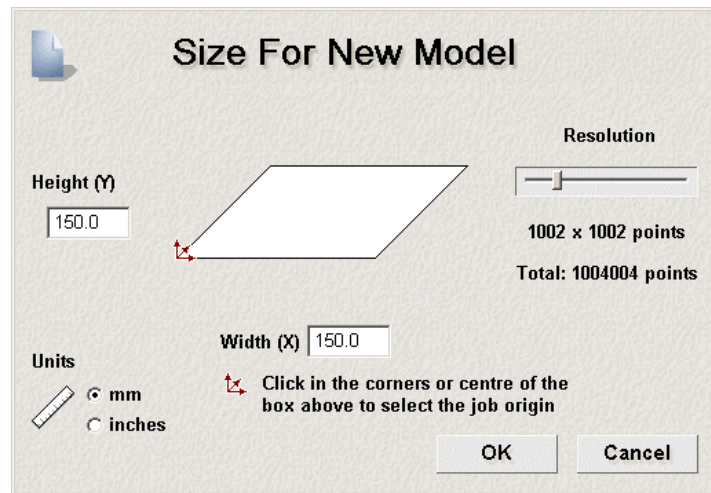
- Preparing the model.
- Creating the vector text.
- Creating the toolpath.
- Adding the bridges.
- Editing the bridges.
- Viewing the toolpath.

The tutorial will lead you through each of these stages, guiding you through the complete process of creating a profiled letter *B* with bridging.

Preparing the Model

First, we will set up the model dimensions needed for this particular job:

1. Click on the **Create New Model**  icon in the **Assistant** window to display the **Size For New Model** dialog box:

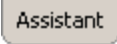




2. Click on the **Units** option that you want to use (millimetres or inches).
3. Type *150 mm (6")* in the **Height** box and *150 mm (6")* in the **Width** box.
4. Click and drag on the **Resolution** slider to set the resolution of the model to *1004004* points.
5. Click on the **OK** button to close the **Size For New Model** dialog box.

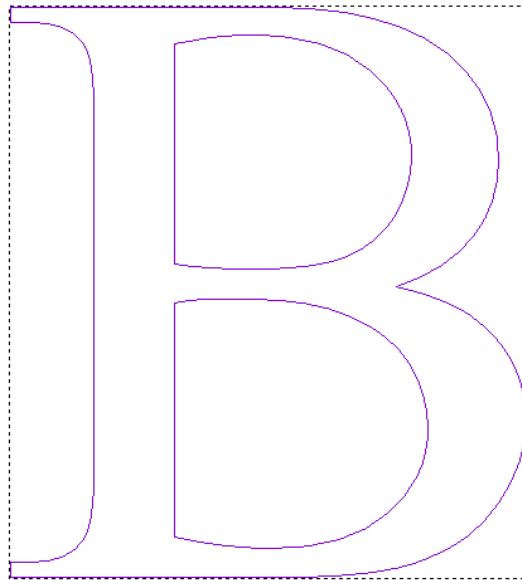
A **2D View** window automatically fills the previously empty design window area. This window represents the block of material viewed down the Z-axis.

Creating the Vector Text

The next stage is to create the vector text to which we will be adding bridging:

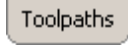

1. Click on the **Assistant** tab  to display the **Assistant's** Home page.
2. Click on the **Create Vector Text** button  in the **Vector Editing** area to display the **Text Tool** page.
3. Click on the **Font** list box, and then click on **Times New Roman** to select it.
4. Click on the **Size** list box, and then click on the appropriate units of measurement.
5. Type *110 mm (4.3")* in the **Size** box.


6. Click anywhere in your model (the white area in the **2D View** window), hold down the **Shift** key on your keyboard and then type *B*.
7. Click on the **Done** button to create the vector text and return to the **Assistant's** Home page.
8. Make sure that the *B* vector text is selected by clicking on it. The *B* vector text should be magenta and surrounded by a bounding box.
9. Click on the **Centre In Page** button  in the **Position Size Align Vectors** area to place the *B* vector text in the centre of your model:

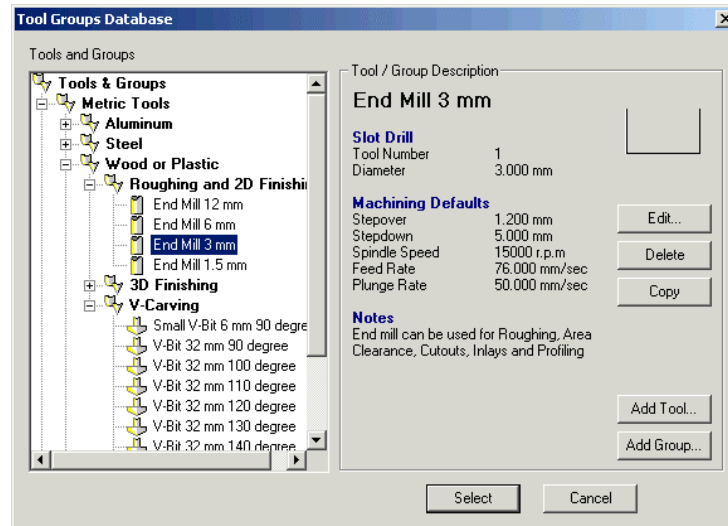


Machining the Vector Text

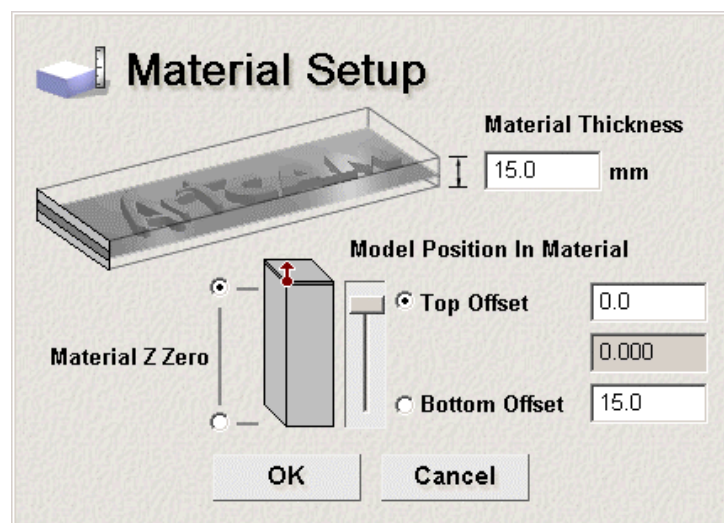
In this next stage, we will create a Profile toolpath that will be used to machine the *B* vector text:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Click on the **2D Profiling** button  to display the **Profiling** page.
3. Make sure that the **Outside** radio button is selected.
4. Make sure that the **Finish Depth** is set to *15 mm (0.6")*.
5. Type *0.02 mm (0.001")* in the **Tolerance** box.

6. Click on the  arrow in the **Machine Safe Z** area of the page to display the **Safe Z** box.
7. Type 3 mm (0.12") in the **Safe Z** box.
8. Click on the **Select** button in the **Profiling Tool** area to display the **Tool Groups Database**:



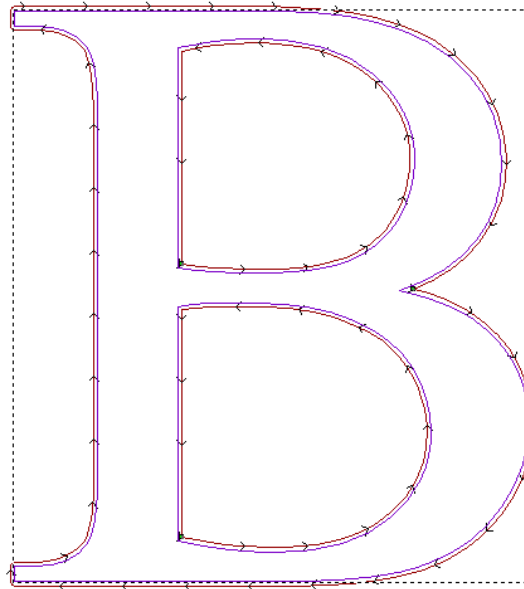
9. Click on the **End Mill 3 mm** (End Mill 1/8 Inch) tool in the **Wood or Plastic/Roughing and 2D Finishing** tool group to select it.
10. Click on the **Select** button to close the **Tool Groups Database** and display the selected tool on the **Profiling** page.
11. Click on the **Setup** button to display the **Material Setup** dialog box:



12. Type 15 mm (0.6") in the **Material Thickness** box.

13. Make sure that the **Material Z Zero** is set to the top of the block by clicking on the radio button at the top of the block.
14. Type *0.0* in the **Top Offset** box.
15. Click on the **OK** button to close the **Material Setup** dialog box.
16. Make sure that the **Create 2D Preview** option is selected .
17. Click on the **Now** button to calculate the Profile toolpath.

The Profile toolpath appears in the **2D View** window as follows:





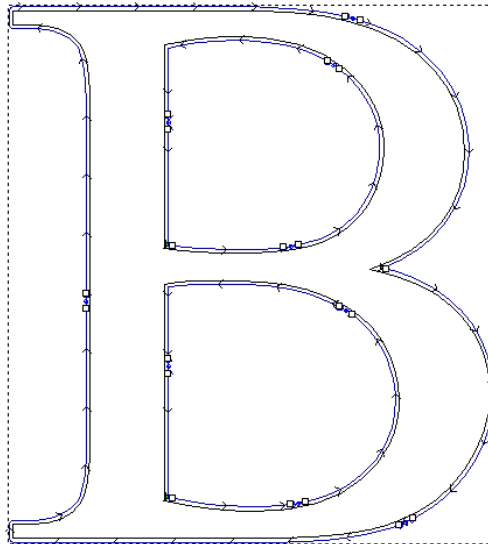
18. Click on the **Close** button to return to the **Assistant's** Home page.

Adding the Bridges

We can now add the bridges to the Profile toolpath that has been created:

1. Click to select the preview of the Profile toolpath in the **2D View** window. The toolpath preview turns blue and a bounding box surrounds it.
2. Click on the **Toolpaths** tab to return to the **Toolpaths** Home page.


3. Click on the **Profile Options** button  to display the **Profile Options** page. The bridging settings are displayed by default.
4. Make sure that the value in the **Bridge Length** box is 3 mm (0.125").
5. Make sure that the value in the **Bridge Thickness** box is 1 mm (0.05").
6. Make sure that the **Constant Number** option is selected  in the **Add Bridges To Profiles** area of the page.
7. Type 3 in the **Number** box. This will add three bridges to each part of the Profile toolpath.
8. Click on the **Create Bridges** button to add the bridges to the Profile toolpath as follows:



Editing the Bridges

Now we will edit the bridges that were added to the Profile toolpath.

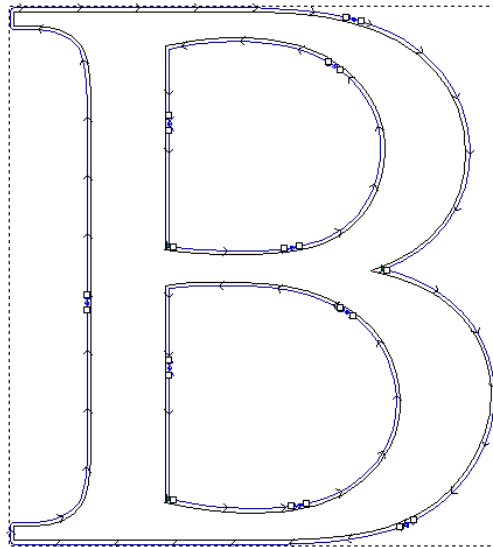
It is important to position the bridges on the Profile toolpath in places to make it easier to snap the letter from the block of material and file down the bridged areas after it has been machined.

To delete a bridge, move the  cursor over it and double-click the left mouse button. To move a bridge, click and drag it into position.

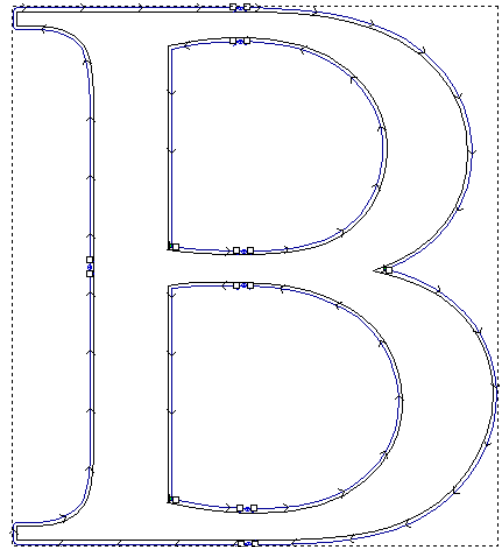
For the letter 'B', we only need three bridges on the outer profile pass and two on each of the inner profile passes.

1. Delete and move the bridges on the Profile toolpath until the bridges are as shown:

Before...




After...

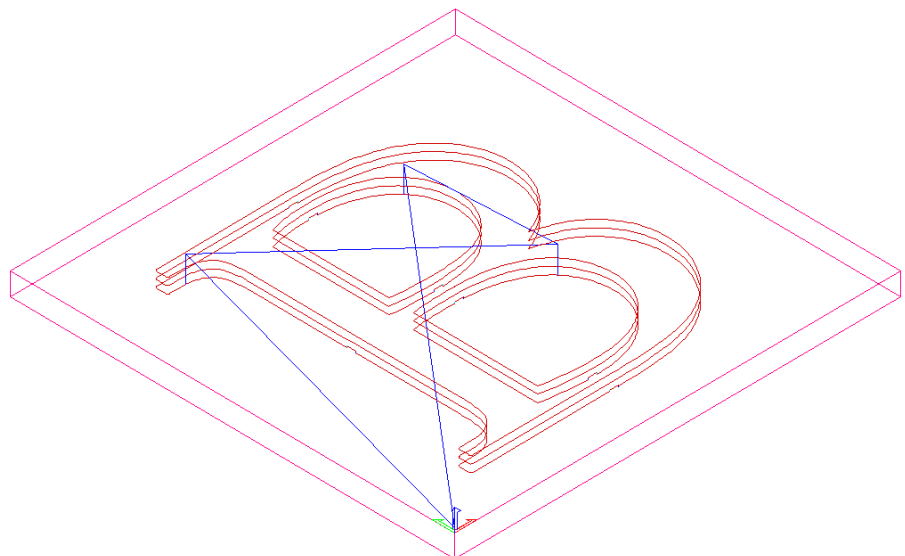


2. Click on the **Close** button to return to the **Assistant's** Home page.

Viewing the Toolpath

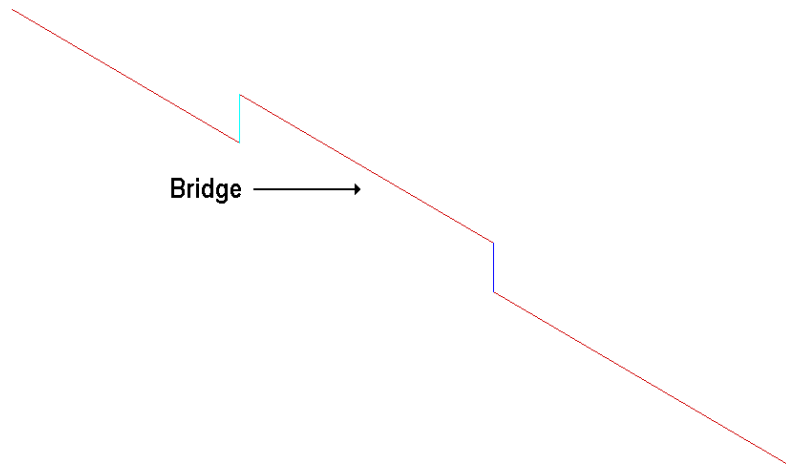
Now we will look at the Profile toolpath more closely to see how the bridges have been added to the profile passes.

1. Click on the **3D View** button  in the **2D View** toolbar to display the following isometric view of the Profile toolpath in the **3D View** window:



2. Click on the **Zoom** button  in the **3D View** toolbar.

3. Click and drag in the **3D View** window to create a bounding box around one of the bridges. You can now see the bridge on the Profile toolpath clearly:



You are now ready to simulate and save the toolpath. For further information, see "Simulating Toolpaths" and "Saving a Toolpath" in the Machining Models chapter of the Reference Manual.