

User Guide



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Overview

Part Wizard Overview

Part Wizard is a powerful 2D machining solution for professional CNC engravers and router users. In addition to its 2D machining abilities, Part Wizard will machine in 2.5D 10 fonts that are included in the Part Wizard install.

Designs can be created using Part Wizard's comprehensive vector drawing tools or imported from other graphics packages. Part Wizard handles complex designs with ease and provides flexible machining strategies that are fast, accurate and very reliable.

Information about Part Wizard

You can find information about working in Part Wizard using the following resources:

1. The Part Wizard **Assistant**.
When working in Parti Wizard, click on the **Show Help** button on each page displayed in the **Assistant** window to view In-Line Help.
2. The Part Wizard On-Line Help pages.
From the Main menu bar, click on the **Help** menu, followed by the **Index** option.
3. The Part Wizard **User Guide** (this manual).
The .pdf version of the this manual on the CD is "bookmarked", so clicking on a topic will take you to the information about that topic
4. Tutorials are found in the ShopBot Owner's Manual.
5. The ShopBot website www.shopbottools.com
The ShopBot User Forum and additional tutorials may be found on the ShopBot website.

Part Wizard User Guide

This manual provides you with instructions on how to create, manipulate and machine a 2D model design.

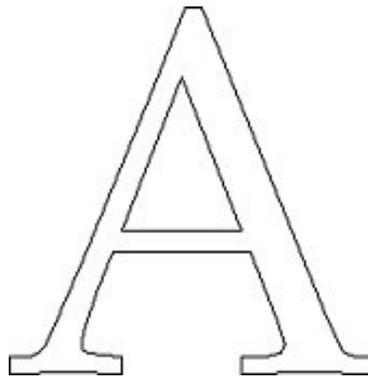
This User Guide is divided into the following parts:

- **Overview** provides an overview of what Part Wizard can be used for.
- **Part Wizard Layout** explains the layout of Part Wizard, how to use its design windows and manage its preferences.
- **Working With Models** explains how to create and manage a Part Wizard model.
- **Working With Vectors** explains how to create and manipulate vector artwork in a model.
- **Machining Models** explains how to machine a model from the vector artwork that you have created.
- **Generating a ShopBot Part (*.sbp) file** explains how to create a part file for the ShopBot Control software to read.

Comparing Vector and Bitmap Data

Vectors and bitmaps are two different methods of reproducing particular types of images. Part Wizard uses vector objects to generate 2D models. Before clip art and other bitmap data can be imported into a Part Wizard file, the object must be converted from a bitmap or raster to a vector object. See below for examples of programs that will conveniently convert a bitmap to a vector.

Vector Data...



Bitmap Data



Vector Data

Vector data is defined mathematically by a drawing language. Objects are geometrical, being made up of a number of points mapped on a grid connected by lines or curves. In being geometrical objects, vectors are extremely flexible and can be manipulated with both ease and accuracy.

The amount of data required to display all of the attributes of a vector object is very little, so graphics made up of vector objects can have very small file sizes. As the objects become more complex, the sizes increase.

As you can see in the previous images, vector data is ideal for producing smooth features. The vector letter not only has greater definition than the bitmap; vector objects can also be used to drive an assigned machining tool directly, which produces a far superior finish.

Part Wizard can read files containing vector data saved in the following formats:

- Drawing Interchange files, including PowerSHAPE and AutoCAD 2D (**.dxf**)
- AutoCAD 2D Drawing files (**.dwg**)
- PostScript format (**.eps**)
- Adobe Illustrator image (**.ai**)
- Windows Metafile (**.wmf**)
- DUCT picture (**.pic**)Bitmap Data

Bitmap Data

This section is provided for your information only. Part Wizard does not read bitmap data.

Bitmap data is made up of a set of binary values specifying the color of individual pixels (picture elements) that make up an image. Bitmap data is characterised by resolution and bit depth. Resolution relates to the detail in an image and is expressed in dots per inch (**.dpi**) or pixels per inch (**.ppi**). Bit depth has to do with the number of colors the image can display. Unlike vector data, bitmap data is large.

ShopBot's customers have tried a variety of programs that will read bitmaps data and convert it to vectors. Some suggestions from our customers include:

CorelDraw with CorelTrace included (Version 9 and 11, not 10)

TraceArt: do a google search for TraceArt (no space)

VEXTRACTOR v2.31 <http://www.vextrasoftware.com>

These programs have been suggested by our customers. ShopBot takes no responsibility for your success with any of these programs, nor do we offer technical support on these programs.

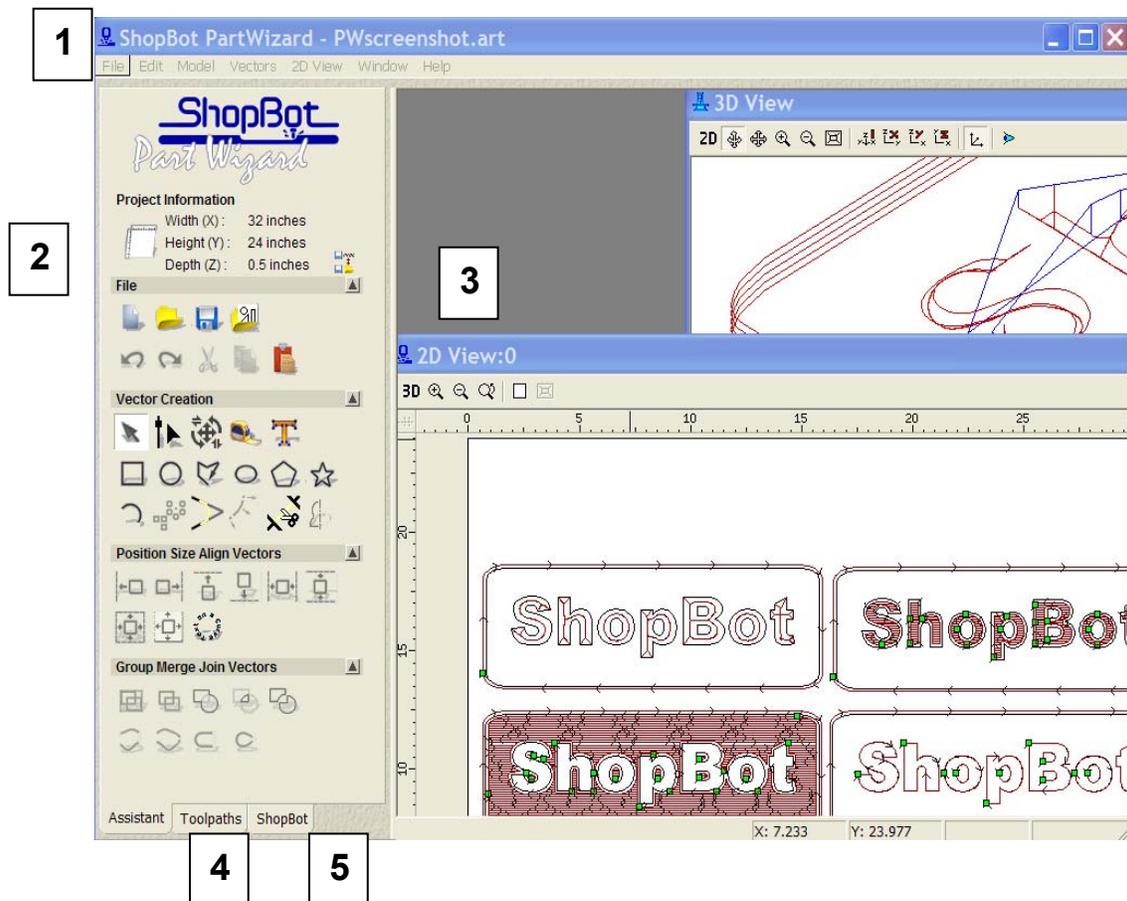
Part Wizard Layout

Part Wizard Layout

The hub of Part Wizard is the **Assistant** window. When you have an open model, the **Assistant**'s Home page displays a collection of tools to help you create, edit and machine a 2D design. With Part Wizard, you may also V-bit carve text (2.5D lettering) in 10 fonts.

The tools are grouped in a logical arrangement so that you may navigate quickly to the button you require. To find out more about most of the tools on the **Assistant**'s Home page, click on the tool's button to display a page about that tool. Each tool page has a **Show Help** button to call up the In-line Help which will inform you of exactly where, when and how to use the tool.

The screen layout is divided into five regions:



1. **Main menu bar** - Click on a menu to display a drop-down menu that contains a range of sub-menus and commands relating to the features in Part Wizard. If an item in a menu is greyed-out, then it does not apply to the currently active **2D View**.
2. **Assistant Window** - On starting Part Wizard, the **Assistant's Getting Started** page is displayed. This page contains two icons. These allow you to create a new model, or work on an existing model. You can also open any of the last four models that you have been working on. When an Part Wizard model has been created or opened, the **Assistant's** Home page is displayed.

The **Assistant's** Home page contains buttons for each of the features in Part Wizard, as well as a summary of your model dimensions.

These buttons are divided into four areas:

- **File** - You can use these buttons to manage your model files, and to import or cut/copy/paste the vector artwork that you want to use as part of a model.
- **Vector Creation** - You can use these buttons to create, measure and manipulate the vector objects that make up the artwork in your model.
- **Position Size Align Vectors** - You can use these buttons to transform, mirror, align and center vector objects, as well as wrap vector text around a curve.
- **Group Merge Join Vectors** - You can use these buttons to group, merge and join vector objects.

You can change the appearance of the **Assistant's** Home page in the following ways:

- Click on the **Toggle Display** icon  in the **Project Information** area to reveal or hide text labels naming each of the buttons on the **Assistant's** Home page.
- Click on the arrow displayed in each of the four areas of the **Assistant's** Home page to either hide  or display  the buttons within that particular area.

When you call up a tool, you can change the appearance of each tool's page displayed in the **Assistant** window when you click on any of the following buttons on the **Assistant's** Home page:

- Click on **Hide Help** to hide all In-line Help shown on the page.

You can also click on the **?** icon in the top-right corner of the page to hide the In-line Help shown.

- Click on **Show Help** to display In-line Help on the page.

You can also click on the **?** icon in the top-right corner of the page to display the In-line Help.

- Click on the **×** icon in the top-right corner of the page to return to the **Assistant's** Home page.

3. **Design Windows** - This is the central area of the screen. Part Wizard uses two types of view. The **2D View** window displays the vector artwork in your model and previews of any calculated toolpaths, while the **3D View** window displays a three-dimensional representation of the machined model.

4. **Toolpaths** - This tabs to the **Toolpaths** Home page. You can use the **Toolpaths** page to create machining toolpaths, drill holes, and manage the tools database.

You can also use the **Toolpaths** page to generate ShopBot part files, edit toolpaths, and edit the machining parameters relating to a tool.

5. **ShopBot** - This tabs to the ShopBot page and displays the options that you can call up to use ShopBot-related software and help. You can use this page to edit, preview or run a ShopBot (.sbp) part file from the ShopBot Control software, or to get to the ShopBot help and information data base.

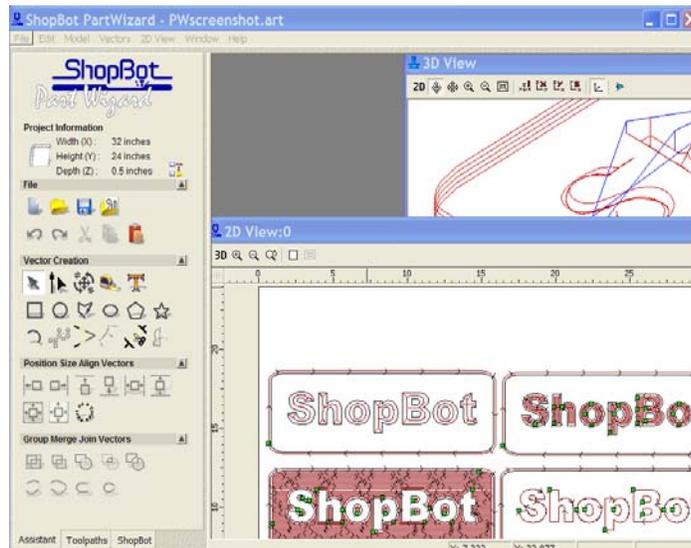


Tip: You can toggle between the **Assistant**, **Toolpaths** and **ShopBot** tabs using the **F4** key on your keyboard.

Adjusting the Window View

When you create or open a model in Part Wizard, the **2D View** and **3D View** design windows are automatically displayed. You use the **2D View** window to create the vector artwork you need to produce a model. The **3D View** window shows the toolpaths that you have created. You can adjust the appearance of the **2D View** and **3D View** windows in Part Wizard:

1. From the Main menu bar, click on the **Window** menu, followed by the option that you want to use to adjust the view of the design windows:
 - **Cascade** - Click on this option to display both the **2D View** and **3D View** windows overlapping one another (shown below).
 - **Tile** - Click on this option to display both the **2D View** and **3D View** windows beside one another.
 - **2D View** - Click on this option to display the **2D View** window only.
 - **3D View** - Click on this option to display the **3D View** window only.



Tip: You can toggle between minimising and maximising the **2D** and **3D View** windows using the **F2** and **F3** keys on your keyboard.

2D View Manipulation

You can change the **2D View** of a model using the tools above the window:



3D View

Click on the **3D View** button  to display the **3D View** window.



Note: You can also move from the **2D View** to the **3D View** window by pressing the **F3** key on your keyboard.

Zoom In Tool

You can use the **Zoom In Tool** button  in two ways. You can:

- Enlarge the area directly beneath the  cursor by 50%.
- Zoom in on a defined area of the model.

To enlarge an area directly beneath the  cursor by 50%:

1. Click on the **Zoom In Tool** button , move the magnifying cursor  over the area of the model that you want to zoom in on and then click.



Note: You can also magnify the area directly beneath the cursor by 50% if you hold down the **Ctrl** key on your keyboard and right-click.

To zoom in on a defined area of the model:

1. Click on the **Zoom In Tool** button  and move the magnifying cursor  over the area of the model that you want to zoom in on.
2. Click and drag the mouse to create a bounding box around the area of the model in which you are interested.
3. Release the left mouse button to view the area in the bounding box only.

Zoom Out Tool

Each click on the **Zoom Out** button  reduces the size of the image by 50%.



Note: You can also reduce the area directly beneath the cursor by 50% if you hold down the **Shift** key on your keyboard and right-click.

Zoom Previous

Click on the **Previous Zoom** button  to restore the previous zoom setting.

Window Fit

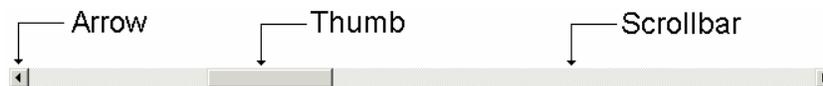
Click on the **Window Fit** button  to automatically adjust the zooming to view the whole model.

Zoom Object(s)

Click on the **Zoom Object(s)** button  to focus on the vector objects currently selected in the model.

Scrolling the 2D View

If you cannot see all of a model in the **2D View** window, often as a result of zooming in, Part Wizard displays scrollbars along the vertical and horizontal axes:



To view a different area of the model, you can:

- Click on the arrow at either end of the scrollbar.
- Drag the thumb in the scrollbar to the appropriate position.
- Click directly in the scrollbar on either side of the thumb to page back and forth.

2D View Options

When drawing vector objects in Part Wizard, there are three invaluable features available to help you create a vector object according to an exact set of measurements. These are:

- Rulers
- The Snap Grid
- Horizontal and Vertical Guidelines

You can also snap or align a vector object relative to another vector object or guideline.

These features help consistently align and size vector objects.

Using Rulers

You can use the rulers adjacent to the X and Y-axis of the **2D View** window to make measurements.

The ruler along the X-axis also displays the units of measurement (millimetres or inches) selected for the model that is shown in the **2D View** window. For details, see "Creating a Model" in the Working with Models chapter.

To disable the rulers:

1. From the Main menu bar, click on the **2D View** menu, followed by the **Show Rulers** option to deselect it. The rulers along the X and Y-axis of the **2D View** window are hidden.

To enable the rulers:

1. From the Main menu bar, click on the **2D View** menu, followed by the **Show Rulers** option to select it. Rulers appear adjacent to the X and Y-axis of the **2D View** window.

Using the Snap Grid

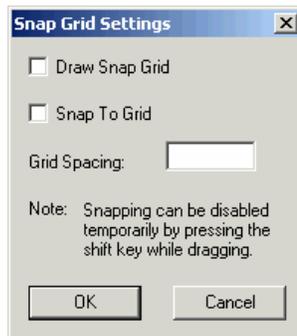
The snap grid is a network of fixed points that govern the placement of vector objects, making it easier to consistently size and align them.

You can use the **Snap Grid Settings** dialog box to adjust the spacing of gridlines, to activate or deactivate the grid, or to force vector objects to automatically align themselves to the snap grid.

Displaying the Snap Grid

To display the snap grid in an active **2D View** window:

1. From the Main menu bar, click on the **2D View** menu, followed by the **Snap Grid Settings** option. The **Snap Grid Settings** dialog box is displayed:



2. Click to select the **Draw Snap Grid** option .
3. Click on the **OK** button to close the **Snap Grid Settings** dialog box and draw the snap grid.

To hide the snap grid in an active **2D View** window, repeat the previous steps, clicking on the **Draw Snap Grid** option to deselect it .

Setting the Grid Spacing

You can set the spacing between grid points using the model's units of measurement, as selected in the **Setup Job Dimensions** dialog. For details, see "Creating a Model" in the Working with Models chapter.

To set the grid spacing:

1. From the Main menu bar, click on the **2D View** menu, followed by the **Snap Grid Settings** option. The **Snap Grid Settings** dialog box is displayed.

2. Define the distance you want to set between each grid point in the **Grid Spacing** box.
3. Click on the **OK** button to close the **Snap Grid Settings** dialog box and set the grid spacing.

Snapping to the Grid

To make the cursor snap to the nearest point on the grid during the creation or editing of a vector object:

1. From the Main menu bar, click on the **2D View** menu, followed by the **Snap Grid Settings** option. The **Snap Grid Settings** dialog box is displayed
2. Click to select the **Snap To Grid** option .
3. Click on the **OK** button to close the **Snap Grid Settings** dialog box and activate grid snapping.



Note: To temporarily disable the snapping behavior, press and hold the **Shift** key down on your keyboard.

Using Guidelines

While a **Snap Grid** is made up of a network of fixed points, a guideline is a solid line parallel to either the horizontal (X) or vertical (Y) axis that can be moved to any position in the **2D View** window.

To create guidelines, the rulers option must be selected. To create a horizontal guideline:

- Click and hold down the left mouse button on the top ruler to display a guideline in the **2D View** window, and then drag it into position.

To create a vertical guideline:

- Click and hold down the left mouse button on the left-hand ruler to display a guideline in the **2D View** window, and then drag it into position.

To reposition a guideline:

- Move the cursor over the guideline you want to move. When the cursor changes to a double-headed arrow \leftrightarrow , click and drag the guideline into its new position.

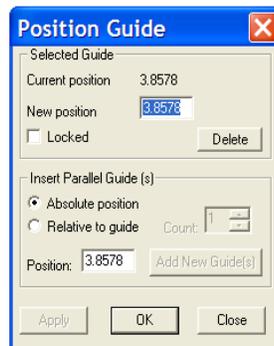


Warning: You must have the both the **Show Rulers** and the **Show Guidelines** options selected in the **2D View** menu to see guidelines in the **2D View** window.

Defining a Guideline's Position

You can define the position of a guideline using the **Position Guide** dialog box. This is a more accurate method than clicking and dragging a guideline into position.

To display the **Position Guide** dialog box, move the mouse cursor over a guideline and click the right mouse button:



The **Selected Guide** area of the **Position Guide** dialog box allows you to:

- Reposition a guideline.
- Delete a guideline.
- Lock a guideline into position.

To reposition a guideline:

1. Define the new position for the guideline in the **New Position** box, and then click on the **Apply** button.

To delete a guideline:

1. Click on the **Delete** button.

To lock a guideline in its current position:

1. Click to select the **Locked** option .

The **Insert Parallel Guide(s)** area of the **Position Guide** dialog box allows you to:

- Create a guideline at an absolute position.
- Create any number of guidelines at a position relative to the selected guideline.

To insert a parallel guideline at an absolute position:

1. Click on the **Absolute position** radio button .
2. Define the position of the parallel guideline in the **Position** box.
3. Click on the **Add New Guide(s)** button to draw the guideline.
4. Click on the **OK** button to close the **Position Guide** dialog box.

To insert any number of parallel guidelines at a relative position:

1. Click on the **Relative to guide** radio button .
2. Define the number of guidelines that you want to draw using either of the following methods:
 - Type the number of guidelines in the **Count** box.
 - Use the  and  buttons on the right of the **Count** box to set the number of guidelines.
3. Define the distance that you want to set between each of the parallel guidelines in the **Position** box. You can set the relative position for the new guidelines using a positive or negative value.

For example, if you want to create a new guideline to the right of an existing vertical guideline, or above an existing horizontal guideline, you must type a positive value in the **Position** box e.g. 10.0.

If you want to create a new guideline to the left of an existing vertical guideline, or below an existing horizontal guideline, you must type a negative value in the **Position** box e.g. -10.0.

4. Click on the **Add New Guide(s)** button to draw the guidelines.



Tip: If you want to carry out more than one action in the **Position Guide** dialog box, instead of clicking on the **OK** button, click on the **Apply** button. This applies the change and keeps the dialog box open.

Snapping to Objects

Using snapping, you can align a vector object relative to another vector object or guideline shown in the **2D View** window.

Snapping is enabled by default. You can enable and disable snapping as follows:

- From the Main menu bar, click on the **2D View** menu, followed by the **Snap to Objects** option.

When enabled, the **Snap to Objects** option is selected

Snap To Objects, and vice versa.



Tip: To temporarily disable snapping, press and hold down the **Shift** key on your keyboard.

With the **Snap to Objects** option enabled, the mouse cursor shown in the **2D View** changes when it snaps to any of the following places:

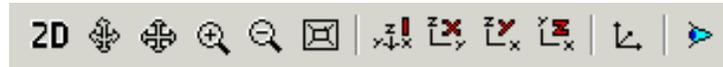
- A point (node) in another vector object. This is shown by the cursor changing to a .
- The mid of a linear or arc span within another vector object. This is shown by the cursor changing to a .
- The center of another vector object, defined by a bounding box. This is shown by the cursor changing to a .
- The point at which two guidelines intersect. This is shown by the cursor changing to a .
- A horizontal guideline. This is shown by the cursor changing to a .
- A vertical guideline. This is shown by the cursor changing to a .
- Directly above or below the X co-ordinate of a polyline's Start Point (node). This is shown by the  cursor changing to a .
- Directly above or below the Y co-ordinate of a polyline's Start Point (node). This is shown by the  cursor changing to a .



Note: The  and  cursors only appear when you are creating polylines.

3D View Manipulation

You can change the view of a model using the tools above the **3D View** window:



2D View

Click on the **2D View** button  to display the **2D View** window.



Note: You can also move from the **3D View** to the **2D View** window by pressing the **F2** key on your keyboard.

Twiddle Tool

The **Twiddle Tool** button  allows you to rotate the model around a central point, adjust the viewpoint (pan) and zoom in on or out from the current viewpoint.

To rotate the model:

1. Click on the **Twiddle Tool** button .
2. Move the  cursor over the model, click and hold down the left mouse button, and then drag the model to the required viewing angle.

To pan the model:

1. Click on the **Twiddle Tool** button .
2. Move the  cursor over the model, click and hold down both mouse buttons, and then drag the model to the required viewing position.

To zoom in on the model:

1. Click on the **Twiddle Tool** button .
2. Move the  cursor over the model, click and hold down the right mouse button, and then drag upwards.

3. Release the mouse button to set the viewpoint.

To zoom out from the model:

1. Click on the **Twiddle Tool** button .
2. Move the  cursor over the model, click and hold down the right mouse button, and then drag downwards.
3. Release the mouse button to set the viewpoint.

Pan View

The **Pan View** button  allows you to adjust the viewing position of the model:

1. Click on the **Pan View** button .
2. Move the  cursor over the model, and then click and drag the model into the required viewing position.



Note: You can also adjust the viewpoint of the model by holding down the left and right mouse buttons simultaneously and then dragging into the required viewing position.

Zoom

You can use the **Zoom** button  to zoom in on a defined area of the model:

1. Click on the **Zoom** button , and then move the magnifying cursor  over the area of the model that you want to zoom in on.
2. Click and drag the mouse to create a bounding box around the area of the model that you are interested in.
3. Release the left mouse button to view the area defined by the bounding box.



Note: You can also hold down the right mouse button and push the mouse forwards to zoom in on the model shown in the **3D View** window.

Zoom Out

Click on the **Zoom Out** button  to reduce the size of the image by 50%.



Note: You can also hold down the right mouse button and push the mouse backwards to zoom out from the model shown in the **3D View** window.

Scale To Fit

The **Scale To Fit** button  resizes the model so that it fits in the **3D View** window.

Isometric View

The **Isometric View** button  displays the model in the standard isometric view. The viewing angle is shown by the XYZ representation on the button.

View Along X

The **View Along X** button  displays the model from the X-axis.

View Along Y

The **View Along Y** button  displays the model from the Y-axis.

View Down Z

The **View Down Z** button  displays the model from the Z-axis.

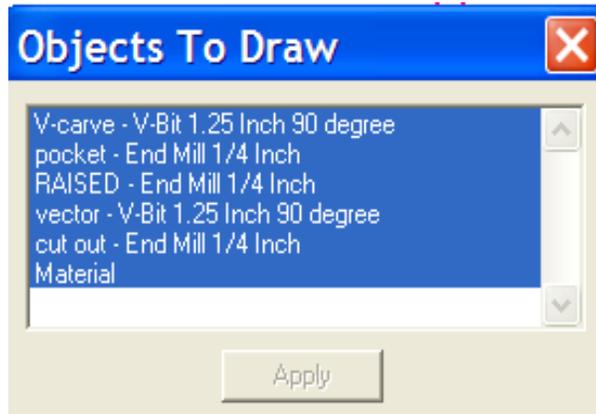
Origin

Click on the **Origin** button  to display/hide the origin in the **3D View** window. The X-axis is red, the Y-axis is green and the Z-axis is blue.

Objects To Draw

Click on the **Objects To Draw** button  to display the **Objects To Draw** list box.

The **Objects To Draw** list box lists the block of material and all of your calculated toolpaths:



All items in the **Objects To Draw** list box are highlighted in blue in the **Objects To Draw** list box. If an item is not highlighted, it is not shown in the **3D View** window.

You can hide any of the objects displayed in the **3D View**:

1. Click on the object in the list box that you want to hide. The selected object is no longer highlighted.
2. Click on the **Apply** button to hide the object in the **3D View** window.
3. Click on the  in the top right corner of the **Objects To Draw** list box to close it.

To show any of the hidden objects in the **3D View**:

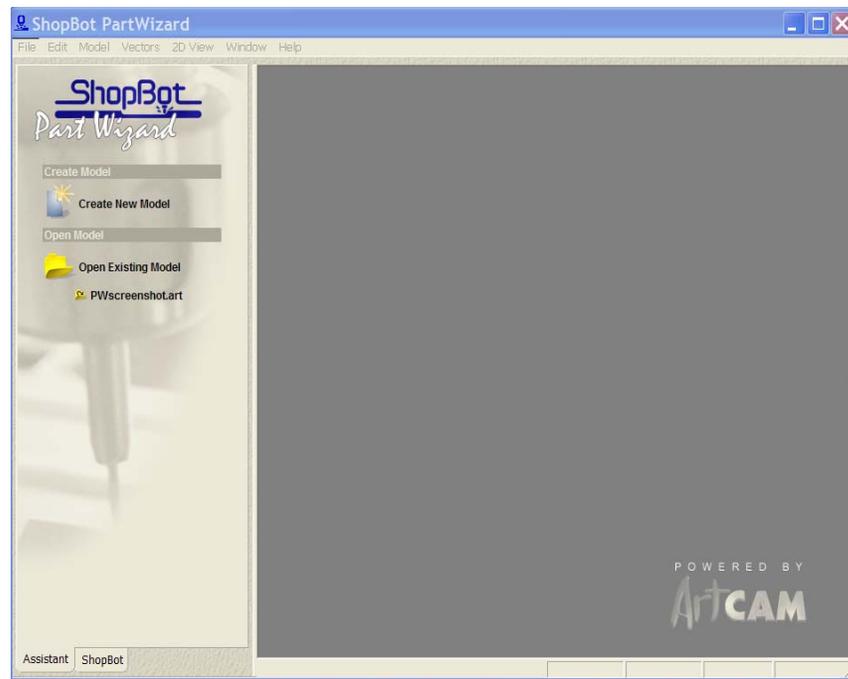
1. Click on the object in the list box you want to show. The selected object is highlighted in blue.
2. Click on the **Apply** button to show the object in the **3D View** window.
3. Click on the  in the top-right corner of the **Objects To Draw** list box to close it.

Working with Models

Getting Started

When you start Part Wizard, the **Assistant's Getting Started** page is displayed. This page is divided into two areas:

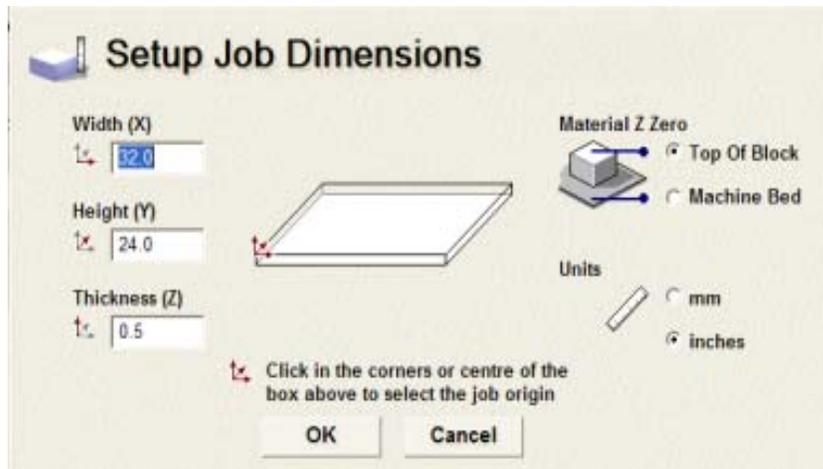
- **Create New Model** – This allows you to define the dimensions of a block of material from which you want to produce a Part Wizard (.art) model.
- **Open Existing Model** – This allows you to open one of the last four Part Wizard (.art) files that you have already created.



Creating a Model

To create a model:

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



Note: You can also display the **Setup Job Dimensions** dialog box by pressing the **Ctrl + N** keys on your keyboard.

2. Type in the **Width (X)**, **Height (Y)** and **Thickness (Z)** values of the material that you will be using to cut out your parts. *Note: the units in these pictures are in inches. To change to mm, select the radio button for inches.*
3. Click on one of the **Material Z Zero** radio buttons  to define the Z-axis zero level, or the position of the cutter relative to the surface of the block of material to be machined:
 - Click on the **Top Of Block** radio button  if you want to position the cutter on the material surface. The **Job Origin** icon  appears on the top-front-left corner of the box.
 - Click on the **Machine Bed** radio button  if you want to position the cutter on the bed of the machine. The **Job Origin** icon  appears on the bottom-front-left corner of the box.

- Click on the center or any of the four corners of the box to define the X-axis zero and Y-axis zero origin. The lower left corner of the box is the conventional starting point for most applications.

The **Job Origin** icon  appears in the position you have clicked on.

- Make sure that the **Units** option is set according to those you are working in, either millimetres or inches.
- Click on the **OK** button to display a **2D View** window.

This window is the area in which you draw or import the vector objects that make up your model.



Note: You can create a new model at any time by clicking on the **New Model** button  in the **File** area of the **Assistant's** Home page.

Information about the project is given on the **Assistant's** home page.

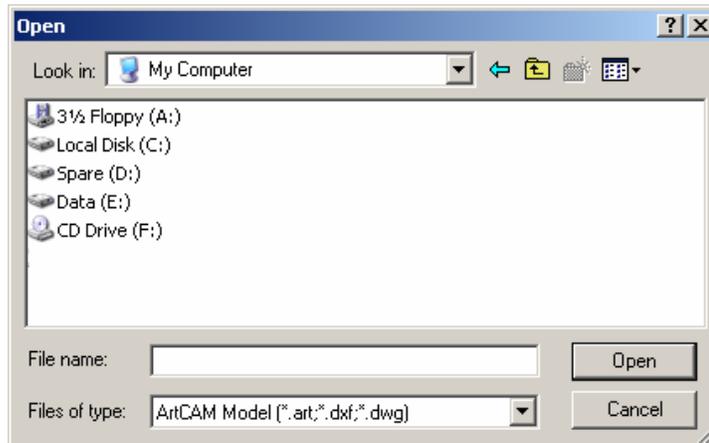


You can modify the project information by selecting **Model > Set Size** from the Main menu bar.

Opening an Existing Model

To open a model that you have previously saved:

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 on the file type of the model you want to open.



Note: You can only open a model saved as a Part Wizard *.art file.

3. Click on the **Look in** list box and select the directory where the model file that you want to open is stored.
4. Once you have found the model file, click on its file name.
5. Click on the **Open** button to open the model.



Note: You can also click on the **Open File** button  in the **File** area of the **Assistant's** Home page to open a model while working on another, or display the **Open** dialog box by pressing the **Ctrl + O** keys on your keyboard.

Opening Recent Models

If you want to open a model that you were working on recently:

From the **Assistant's Getting Started** page, click on the  icon beside the correct Part Wizard file name.



Tip: You can also open previously saved models by clicking on the **File** menu in the Main menu bar, and then clicking on the appropriate file name listed above the **Exit** option. Up to four models can be listed.

Closing a Model

To close the Part Wizard model that you are currently working on:

From the Main menu bar, click on the **File** menu, followed by the **Close** option.

If you click on the **Close** option before saving a new model, or any changes that you may have made to an open model, the following message box appears:



Click on the **Yes** button **Save** the model or to open the **Save As...** dialog box.

Click on the **No** button to close the message box and return to the **Getting Started** page without saving the model.

Shutting Down Part Wizard

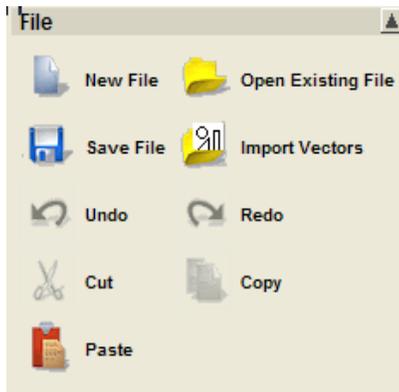
To shut down Part Wizard, from the Main menu bar, click on **File > Exit**.

If you click on the **Exit** option before saving a changed model, the "Do you want to save" message box appears:

Managing a Model

When you have created or opened a model in Part Wizard, the **Assistant's** Home page is automatically displayed.

The tools in the **File** area of the **Assistant's** Home page help you manage a model:



With the tools within the **File** area of the **Assistant's** Home page you can:

- Create a new model (**New File**)
- Open a saved model (**Open Existing File**)
- Save an open model (**Save File**)
- Import vector files created in other applications (**Import Vectors**)
- Correct a mistake that you have made (**Undo, Redo**)
- Cut/Copy and Paste selected vectors (**Cut, Copy, Paste**)

With tools from the **Main menu bar**, you can also

- Save an open model with another name (**File > Save As**)
- Print a copy of your model in 2D or 3D view (**File > Print**)
- Undo actions (**Edit > Undo** the named action)
- Change the size of your model (**Model > Set Size**)
- Mirror your model (**Model > Mirror**)
- Rotate your model (**Model > Rotate**)

Creating a New Model

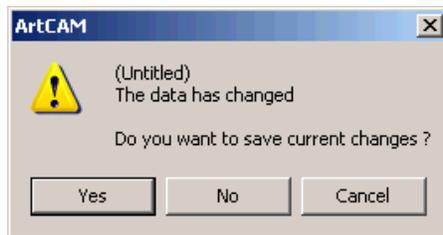
To create a new model:

Click on the **New Model** button  in the **File** area of the **Assistant's** Home page to display the **Setup Job Dimensions** dialog box.



Note: You can also create a new model by pressing the **Ctrl + N** keys on your keyboard, or by clicking on the **File** menu in the Main menu bar, followed by the **New** option.

If you click on the **New Model** button  while working on an unsaved model, and then the **OK** button in the **Setup Job Dimensions** dialog box, the following message box appears:



If you want to save the model:

Click on the **Yes** button to open the **Save As...** dialog box.

If you do not want to save the model you are working on:

Click on the **No** button to close the message box and return to the **Getting Started** page.

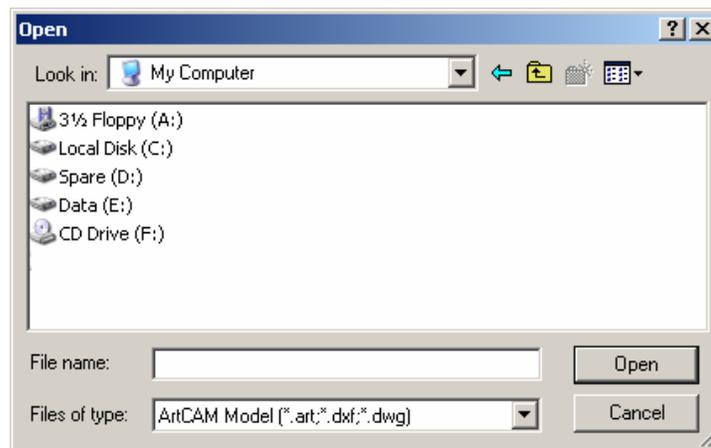
Opening a Saved Model

To open a model that you have previously saved:



Note: You can only open a model saved as a Part Wizard *.art file.

Click on the **Open** button  in the **File** area of the **Assistant's** Home page to display the **Open** dialog box:



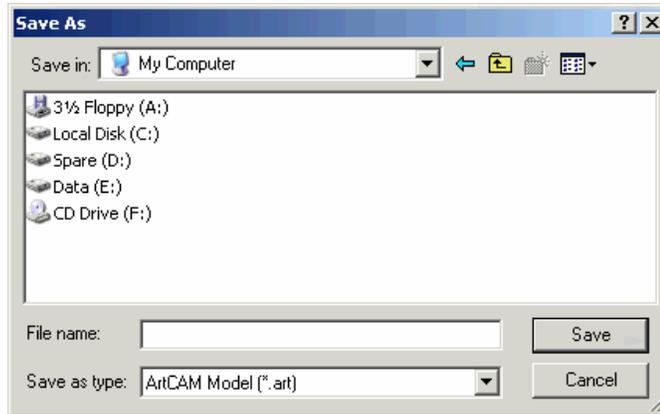
Note: You can also display the **Open** dialog box by pressing the **Ctrl + O** keys on your keyboard.

Saving a Model

You can save a model as a Part Wizard (*.art) file.

To save a new model that you have created:

1. Click on the **Save** button  in the **File** area of the **Assistant's** Home page to display the **Save As...** dialog box:



2. Click on the **Save In** list box and select the directory you want to save the model in.
3. Type the file name you want to use for the model in the **File name** box.



Tip: Create a system for saving your files in a location where you can find them again. One technique is to create a new folder for each job, and save ALL the information related to that job in that folder. Then, it will be easier to find Part Wizard (.art) and ShopBot part (.sbp) files as well as any other supporting documentation when you need it later.

Note: Part Wizard saves the model as an *.art file. This is an ArtCAM proprietary file that stores not only the two-dimensional image, but also any toolpaths that have been created as part of the model.

4. Click on the **Save** button.
5. After you have saved a model the first time, clicking on the **Save** will automatically save the current changes to the same file and location. Save your work frequently.

Importing Vector Artwork

In Part Wizard, you can import vector artwork saved as files of type ***.dxf**, ***.eps**, ***.dwg**, ***.ai**, ***.wmf** or ***.pic** into a model.

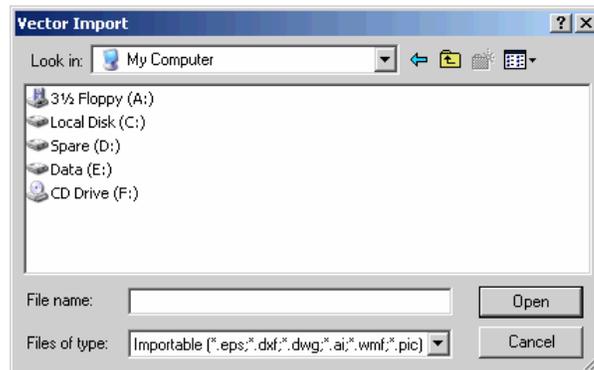
When importing Drawing Interchange (***.dxf**) or AutoCAD Drawing (***.dwg**) files, you can position the artwork in the center of the ArtCAM model and define the units of measurement used.

When importing Encapsulated PostScript (***.eps**, ***.ai**) files with an origin outside of an ArtCAM model, you can position the artwork in the center of the ArtCAM model or according to the origin saved in the files.

Windows Meta (***.wmf**) and Lotus or PC Paint PIC (***.pic**) files import into Part Wizard directly.

To import vector artwork:

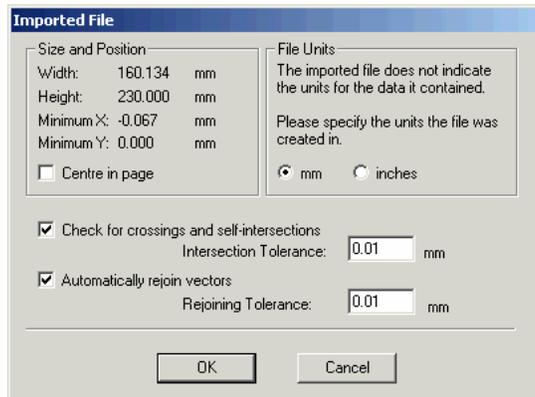
1. Click on the **Import Vector Data** button  in the **File** area of the **Assistant's** Home page to display the **Vector Import** dialog box:



Note: You can also open the **Vector Data** dialog box by clicking on **File > Import > Vector Data** from the Main menu bar.

2. Click on the **Look In** list box and find the file that you want to import.
3. Once you have found the file, click on its file name.
4. Click on the **OK** button to import the vector artwork into the Part Wizard model.

If you are importing vector artwork saved as a ***.dxf** file, the **Imported File** dialog box is displayed:



Make sure the settings for the imported vector data are correct:

- If you want to position the imported vector data in the center of the model, click to select the **Center In Page** option .
- In the **File Units** area, make sure that the units for the imported data are the same as the model units by clicking on the correct radio button .
- If you want to identify all self-intersecting spans in the vector data within tolerance, make sure that the **Check for crossings and self-intersections** option is selected . Define the tolerance in the **Intersection Tolerance** box.

Self-intersecting spans are shown in red when selected, with white circular shapes marking the positions where the spans overlap. For details, see "Selecting Vectors" in the Working with Vectors chapter.

- If you want to rejoin any spans in the vector data that have been 'exploded' within tolerance, make sure that the **Automatically rejoin vectors** option is selected . Define the tolerance in the **Rejoining Tolerance** box.

The imported vector object is selected by default. It is magenta and surrounded by a bounding box. You will have to **Ungroup** the imported vector before editing it. For further information, see the "Working with Vectors" chapter.

Correcting an Action

There are two buttons you can use to correct your mistakes when working in Part Wizard:

- Click the **Undo** button  in the **File** area of the **Assistant's** Home page to cancel your last action.
- Click the **Redo** button  in the **File** area of the **Assistant's** Home page to repeat the last action made before clicking on the **Undo** button.



Note: You can also cancel your last action by pressing the **Ctrl + Z** keys on your keyboard, and redo your last cancelled action by pressing the **Ctrl + Y** keys on your keyboard.

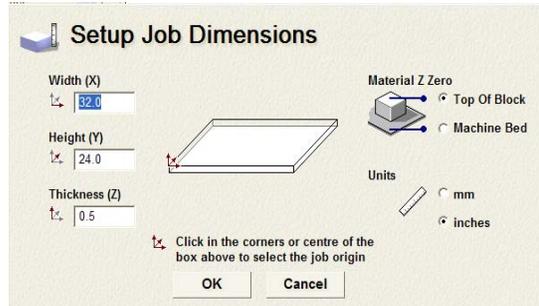


Note: Alternatively, click on **Edit > Undo** or **Edit > Redo** from the Main menu bar. The action that you are undoing/redoing is listed when you select Edit in this manner. For example: **Edit > Undo Draw Rectangle**. There seems to be no limit on the number of actions that you can undo.

Editing the Model Dimensions

To edit the dimensions originally defined for a model when it was created:

1. To open the **Setup Job Dimensions** dialog box, click on the **Model** menu in the Main menu bar, followed by **Set Size**.



2. Using the **Setup Job Dimensions** dialog box, you can change:
 - The height, width and/or thickness of the block of material.
 - The job origin.
 - The material Z zero level.
 - The units of measurement you are using.

Mirroring a Model

You can mirror an open model both vertically and horizontally.

From the Main menu bar, click on **Model**, followed by

Mirror > Horizontal *or*

Mirror > Vertical

Rotating a Model

You can rotate an open model both clockwise and anti-clockwise.

From the Main menu bar, click on **Model**, followed by

Rotate 90 Degrees > Clockwise *or*

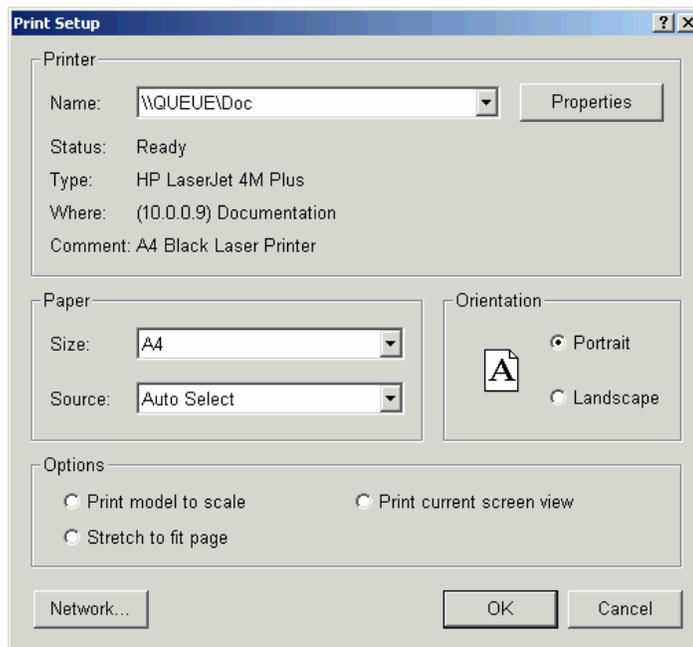
Rotate 90 Degrees > AntiClockwise

Printing a Model

You can print a model as it is shown in the active design window.

To print a model:

1. Click to select the design window that you want to print.
2. From the Main menu bar, click on the **File** menu, followed by the **Print Setup** option to display the **Print Setup** dialog box:



3. Set up the printer settings correctly.
4. In the **Options** area, click on the print option that you want to use:

- **Print model to scale** – Click on this radio button if you want to print the model according to its physical dimensions.

Before printing, make sure that the model can fit onto the paper to which it is currently being printed.

- **Stretch to fit page** – Click on this radio button if you want to print the model according to the dimensions of the paper onto which it is to be printed.

- **Print current screen view** – Click on this radio button if you want to print the model as it currently appears in the **2D View** window.



Note: If you are printing the **3D View** window, the print options are automatically greyed-out. In this instance, Part Wizard prints to fit the **3D View** window in its current orientation.

5. Click on the **OK** button to close the **Print Setup** dialog box and print the active design window.

Print Preview

You can view the content of the active design window as it would appear when printed.

To create a print preview:

1. Click to select the design window that you want to print.
2. From the Main menu bar, click on the **File** option, followed by the **Print Preview** option to display a preview image of the active design window.
3. Use the buttons in the menu bar at the top to view the preview image in more detail.
4. If you want to print the preview image, click on the **Print** button. If not, click on the **Close** button.

Working with Layers

All Part Wizard models have a single default layer.

Working with Vectors

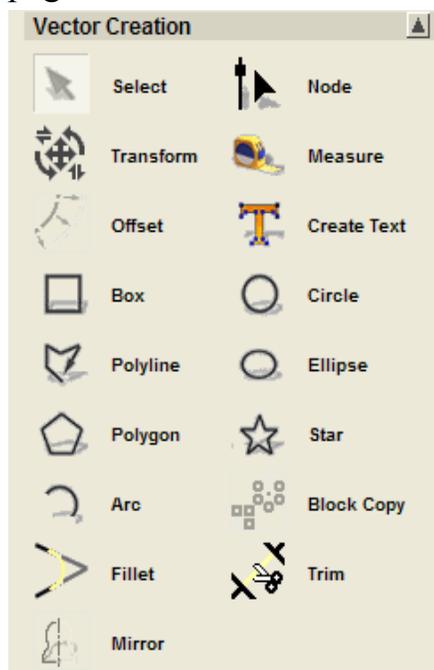
Overview

A vector object, or object-oriented graphic, is made up of a sequence of commands or mathematical statements that places lines and shapes in a given two-dimensional or three-dimensional space. Vector objects are fully scalable without loss of resolution, and file sizes are independent of resolution.

In Part Wizard, you can:

- Create freeform vector objects using polylines.
- Create vector objects in the form of simple shapes, including squares, rectangles, circles, ellipses, polygons, arcs and stars.
- Create vector objects in the form of text in any selected font.
- Import vector artwork from other applications.

The group of **Vector Creation** tools is found on the **Assistant**'s Home page:



Drawing with Polylines

You can create freeform vector objects from polylines, which are one or more linear or bezier curve spans joined together by points (nodes).

Creating a Polyline

To create a polyline:

1. Click on the **Create Polyline** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Polyline Creation**.
2. Click in the **2D View** window to create the polyline's Start Point.
3. Move the mouse. A dotted line appears indicating the position of the polyline's first linear span.
4. Click at the position where you want to create another point in the polyline.



Tip: Hold down the **Ctrl** key on your keyboard during each click of the mouse if you want to constrain the angle of the linear span drawn between points (nodes) to 15° increments.

A linear span is drawn connecting the two points. In creating a span, you have also created a vector object.



Tip: Click and drag the mouse to create a bezier curve span. Release the mouse button to create the point in the polyline.

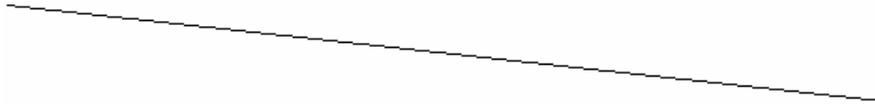
Repeat the previous steps to create further points in the polyline, connected by linear or bezier curve spans.

5. Right-click to end the polyline and return to the **Assistant's** Home page.

You can also end the polyline and return to the **Assistant's** Home page by:

- Pressing the **Esc** key on your keyboard.
- Clicking on the **Close** button on the **Polyline Creation** page.

For example, if you click in the left of the **2D View** window, drag downwards and right, and then right-click, you can create a polyline that looks something like this:



You can also create a polyline using co-ordinates taken from the **2D View** window:

1. Click on the **Create Polyline** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Polyline Creation** page.
2. Define the X and Y co-ordinates for first point in the **X** and **Y** boxes, then click on the **Add** button. Nothing will appear on the 2D design screen until you go to the next step.
3. Define the position of the next point, using any of the following methods:



Tip: Move the cursor to the position where you want to create the point in the polyline. The X and Y co-ordinates for the position are shown in the **Cursor Position** area of the page.

- Define the X and Y co-ordinates for the next point in the **X** and **Y** boxes.
 - Define the angle of the next span in the polyline in the $^{\circ}$ box, followed by its length in the **L** box.
 - Define the distance from the previous point in the X and Y axes in the **dx** and **dy** boxes.
4. Click on the **Add** button to create the point in the polyline.
 5. Repeat these steps until you have finished creating the polyline, and then click on the **Close** button to return to the **Assistant's** Home page.

Completing Polyline Creation

To complete the polyline you are drawing, but remain in polyline creation mode:

- Press the **Space Bar** on your keyboard.

To finish creating a polyline and return to the **Assistant's** Home page, leaving it as an open vector object, you can either:

- Right-click on your mouse.
- Press the **Esc** key on your keyboard.
- Press the **Enter** key on your keyboard.
- Click on the **Close** button on the **Polyline Creation** page.

By default, the polyline is black, indicating that an ungrouped, open vector object has been created.

Closing a Polyline to Create a Polygon

If you are in **Polyline Creation** mode, you can finish creating a polyline and automatically join its Start Point with its last point to form a polygon if you:

1. Press the **Tab** key on your keyboard.

If you have already created a polyline, you can join its Start Point with its last point to form a polygon if you:

1. Select the polyline that you have created. The polyline is black and surrounded by a bounding box.
2. Click on the Start Point and drag it to meet the last point in the polyline.

Amending a Polyline

A polyline is made up of spans and points (nodes). Spans can be linear, arcs or bezier curves. You can change the position of the points and the nature of the spans after the polyline is created. For example, a linear span can be changed to an arc or a bezier curve span.

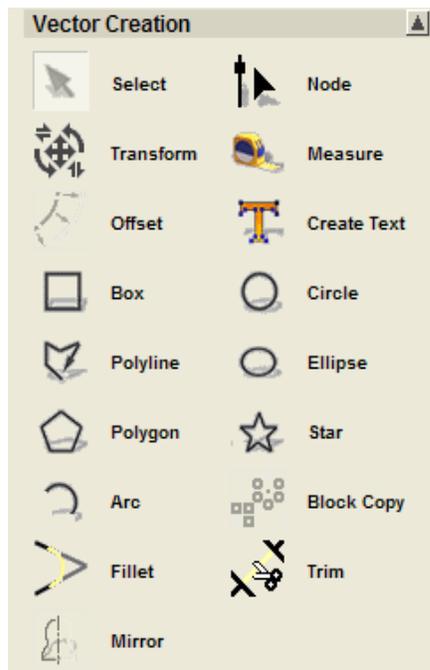
You change polylines using both the Node Editing and Span Editing menu options. These menus are displayed when you right-click on a span or a node. For details, see "Editing Vector Spans" and "Editing Vector Nodes."

Creating Simple Shapes

In addition to the **Create Polyline** button , there are a further six buttons in the **Vector Creation** area of the **Assistant's** Home page that allow you to create specific vector object shapes.

You can create:

- Rectangles or Squares
- Circles
- Ellipses
- Polygons
- Stars
- Arcs



Creating a Rectangle

You can create either an exact or an approximate square or rectangular shaped vector object.

To create an exact square or rectangle:

1. Click on the **Create Rectangle** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Rectangle Creation** page.
2. Click on the **Square** or **Rectangle** radio button  to select the type of shape you want to create.
3. Define the height of the shape in the **Height** box.
4. Define the width of the shape in the **Width** box.
5. If you want filleted (rounded) corners, type the radius you want to apply to all four corners of the shape in the **Corner Radii** box. Otherwise, leave the default value of 0 in the **Corner Radii** box.
6. Define the center point of your shape. To do so, you can either:
 - Define the X and Y co-ordinates of the center point in the **Center Point's X** and **Y** boxes.
 - Move the **+** cursor over the **2D View** window and click on the position that you want to set as the center point. The X and Y co-ordinates of the point appear in the **Center Point's X** and **Y** boxes.
7. If you want your shape to be drawn at a specific angle to the model block, define the angle in the **Angle** box:
 - Type a positive value to rotate the shape clockwise.
 - Type a negative value to rotate the shape anti-clockwise.
8. Click on the **Preview** button to see the shape you are about to create in the **2D View** window.

9. If you want to draw your shape and remain in Rectangle Creation mode, click on the **Create** button.

If you want to draw your shape and return to the **Assistant's** Home page, click the right mouse button.

To create an approximate sized square or rectangle:

1. Click on the **Create Rectangle** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Rectangle Creation** page.
2. Click on the **Square** or **Rectangle** radio button  to select the type of shape you want to create.
3. Move the + cursor over the **2D View** window, and then click and drag to create the size of shape you want.
4. Release the mouse button to draw a preview image of the shape you are creating in the **2D View** window.
5. If you want to draw your shape and remain in Rectangle Creation mode, click on the **Create** button.

If you want to draw your shape and return to the **Assistant's** Home page, click the right mouse button.

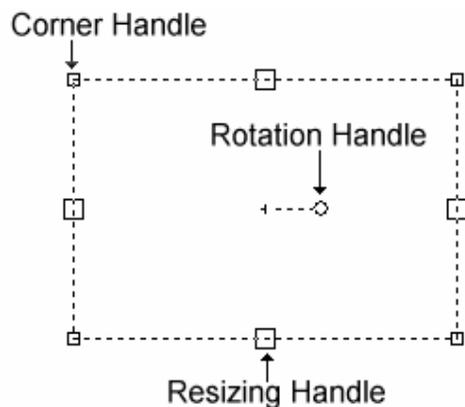
Editing a Square or Rectangle

You can edit the size, position, corners and/or angle of a square or rectangular shaped vector object.

To begin editing a square or rectangle:

1. Select the square or rectangle you want to edit.
2. Right-click on the selected shape to display the Vector Editing menu.
3. Click on the **Edit Rectangle** option to display the **Rectangle Editing** page in the **Assistant** window.

The selected shape now appears with resizing handles attached, along with a rotation handle joined to its center point:



Note: You can display the **Rectangle Editing** page by selecting a square or rectangle, and then pressing the **E** key on your keyboard.

You can now change the size, position, corners and/or angle of the selected square or rectangle using the **Rectangle Editing** page, or by manipulating the handles on the shape itself.

To edit the selected square or rectangle using the **Rectangle Editing** page:

- Type a new value in the appropriate box for each attribute of the shape that you want to adjust.

For example, typing a new value in the **Height** box increases or decreases the height of the selected square or rectangle.

You can edit the selected square or rectangle using the shape itself:

- Click and drag any of the resizing handles to adjust the size of the shape. The new height and width is shown in the **Height** and **Width** boxes on the page.
- Click and drag any of the corner handles to add filleting to all four corners of the shape. The new radius of the filleted corners is shown in the **Corner Radii** box on the page.
- Click and drag the rotation handle to adjust the angle of the shape. The new angle is shown in the **Angle** box on the page.
- Move the **+** cursor over the center point of the shape. When it changes to the **↕** cursor, click and drag to move the whole shape. The new center point appears in the **Center Point's X** and **Y** boxes on the page.



Tip: To create an exact square, hold down the **Shift** key on your keyboard and drag the resizing handles on your rectangle to the required size.

To confirm the new shape shown in the **2D View** window and return to the **Assistant's** Home page, click the right mouse button.

Creating a Circle

You can create a circular shaped vector object.

To create a circle of a specified size:

1. Click on the **Create Circles** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Circle Creation** page.
2. Define the center point of your circle. To do so, you can either:
 - Define the X and Y co-ordinates of the center point in the **Circle Center's** **X** and **Y** boxes.
 - Move the **+** cursor over the **2D View** window and click on the position you want to set as the center point. The X and Y co-ordinates of the point are shown in the **Circle Center's** **X** and **Y** boxes.
3. Define the circle radius in the **Circle Radius** box.
4. Click on the **Preview** button to draw a preview image of the circle you are creating in the **2D View** window.
5. If you want to draw your circle and remain in **Circle Creation** mode, click on the **Create** button.

If you want to draw your circle and return to the **Assistant's** Home page, click on the right mouse button.

To create an approximate sized circle:

1. Move the **+** cursor over the **2D View** window, and then click and drag to create the size of circle you want.
2. Release the mouse button to draw a preview image of the circle you are creating in the **2D View** window.
3. If you want to draw your circle and remain in Circle Creation mode, click on the **Create** button.

If you want to draw your circle and return to the **Assistant's** Home page, click the right mouse button.

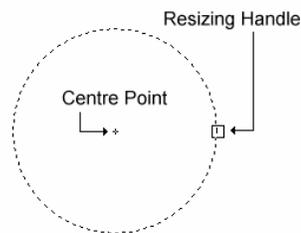
Editing a Circle

You can edit the radius and position of a circular shaped vector object.

To edit a circle:

1. Select the circle you want to edit.
2. Right-click on the circle to display the Vector Editing menu.
3. Click on the **Edit Circle** option to display the **Circle Editing** page in the **Assistant** window.

The selected circle now appears as a preview image with a resizing handle on its circumference:



You can now change the size and position of the selected circle using the **Circle Editing** page, or by manipulating the resizing handle and the center point on the shape itself.

To edit the selected circle using the **Circle Editing** page:

- Type a new value in the appropriate box for either of the shape's attributes that you want to adjust.
For example, typing a new value in the **Radius** box immediately increases or decreases the size of the selected circle.

You can edit the selected circle using the shape itself:

- Click and drag the resizing handle to adjust its radius. The new radius is shown in the **Radius** box on the page.
- Move the + cursor over the center point of the circle. When it changes to the  cursor, click and drag to move the circle. The new center point is shown in the **Center Point's X and Y** boxes on the page.

To confirm the new circle shown in the **2D View** window and return to the **Assistant's** Home page, click the right mouse button.

Creating an Ellipse

You can create an elliptical shaped vector object.

To create an ellipse of a specified size:

1. Click on the **Create Ellipse** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Ellipse Creation** page.
2. Define the center point of your ellipse. To do so, you can either:
 - Define the X and Y co-ordinates of the center point in the **Start Point's** **X** and **Y** boxes.
 - Move the **+** cursor over the **2D View** window and then click on the point. The X and Y co-ordinates of the point are shown in the **Start Point's** **X** and **Y** boxes.
3. Define the height of the ellipse in the **Ellipse Height** box.
4. Define the width of the ellipse in the **Ellipse Width** box.
5. If you want your shape to be drawn at a specific angle to the model block, define the angle in the **Angle** box:
 - Type a positive value to rotate the ellipse clockwise.
 - Type a negative value to rotate the ellipse anti-clockwise.
6. Click on the **Preview** button to see the ellipse you are about to create in the **2D View** window.
7. If you want to draw your ellipse and remain in **Ellipse Creation** mode, click on the **Create** button.

If you want to draw your ellipse and return to the **Assistant's** Home page, click the right mouse button.

To create an approximate sized ellipse:

1. Move the **+** cursor over the **2D View** window, and then click and drag to create the size of ellipse you want.

2. Release the mouse button to draw a preview image of the ellipse you are creating in the **2D View** window.
3. If you want to draw your ellipse and remain in Ellipse Creation mode, click on the **Create** button.

If you want to draw your ellipse and return to the **Assistant's** Home page, click the right mouse button.

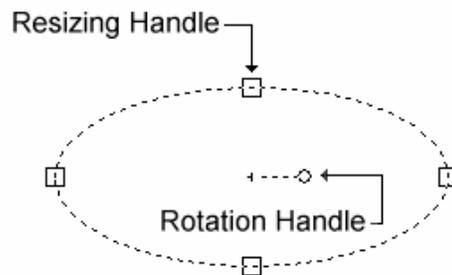
Editing an Ellipse

You can edit the size, position and/or angle of an elliptical shaped vector object.

To edit an ellipse:

1. Select the ellipse you want to edit.
2. Right-click on the selected ellipse to display the Vector Editing menu.
3. Click on the **Edit Ellipse** option to display the **Ellipse Editing** page in the **Assistant** window.

The selected ellipse now appears as a preview image with resizing handles attached around its circumference, along with a rotation handle joined to its center point:



Note: You can display the **Ellipse Editing** page by selecting an ellipse, and pressing the **E** key on your keyboard.

You can now change the size, position and/or angle of the selected ellipse using the **Ellipse Editing** page, or by manipulating the handles on the ellipse itself.

To edit the selected ellipse using the **Ellipse Editing** page:

- Type a new value in the appropriate box for each attribute of the ellipse that you want to adjust.

For example, typing a new value in the **Height** box immediately increases or decreases the height of the ellipse.

You can edit the selected ellipse using the shape itself:

- Click and drag any of the resizing handles to adjust the size of the ellipse. The new height and width is shown in the **Height** and **Width** boxes on the page.
- Click and drag the rotation handle to adjust the angle of the ellipse. The new angle is shown in the **Angle** box on the page.
- Move the + cursor over the center point of the ellipse. When it changes to the  cursor, click and drag to move the whole ellipse. The new center point is shown in the **Start Point's X** and **Y** boxes on the page.

To confirm the new ellipse shown in the **2D View** window and return to the **Assistant's** Home page, you can either:

- Click on the **Apply** button, followed by the **Close** button on the **Ellipse Editing** page.
- Click the right mouse button.

Creating a Polygon

You can create a vast range of polygonal shaped vector objects.

To create an exact polygon:

1. Click on the **Create Polygons** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Polygon Creation** page.
2. Define the polygon's number of sides in the **Settings' No. of Sides** box.



Warning: A polygon must have a minimum of three sides. Typing 3 in the **Settings' No. of Sides** box produces a triangle.

3. If you want your polygon to be drawn at a specific angle to the model block, define the angle in the **Settings' Angle** box.
4. Define the center point of your polygon. To do so, you can either:
 - Define the X and Y co-ordinates of the center point in the **Polygon Center's X** and **Y** boxes.
 - Move the \oplus cursor over the **2D View** window and click on the position you want to set as the center point. The X and Y co-ordinates of the point are shown in the **Polygon Center's X** and **Y** boxes.
5. Define the polygon's radius in the **Geometry's Radius** box.
6. Click on the **Preview** button to see the polygon you are about to create in the **2D View** window.
7. If you want to draw your polygon and remain in Polygon Creation mode, click on the **Create** button.

If you want to draw your polygon and return to the **Assistant's** Home page, click the right mouse button.

To create an approximate sized polygon:

1. Move the **+** cursor over the **2D View** window, and then click and drag to create the size of polygon you want.
2. Release the mouse button to draw a preview image of the polygon you are creating in the **2D View** window.
3. If you want to draw your polygon and remain in Polygon Creation mode, click on the **Create** button.

If you want to draw your polygon and return to the **Assistant's** Home page, you can either:

- Click the **Create** button, followed by the **Close** button on the **Polygon Creation** page or Click the right mouse button.

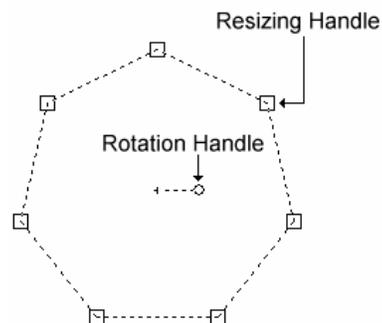
Editing a Polygon

You can edit the size, position, sides and/or angle of a polygonal shaped vector object.

To edit a polygon:

1. Select the polygon you want to edit.
2. Right-click on the polygon to display the Vector Editing menu.
3. Click on the **Edit Polygon** option to display the **Polygon Editing** page in the **Assistant** window.

The polygon now appears as a preview image with resizing handles attached around its circumference, and a rotation handle joined to its center point:



You can now change the size, position, sides and/or the angle of the selected polygon using the **Polygon Editing** page, or by manipulating the handles on the polygon itself.

To edit the selected polygon using the **Polygon Editing** page:

- Type a new value in the appropriate box for each attribute of the polygon that you want to adjust.

For example, typing a new value in the **No. of Sides** box immediately increases or decreases the number of sides in the selected polygon.

You can edit the selected polygon using the shape itself:

- Click and drag any of the resizing handles to adjust the size of the polygon. The new size is shown in the **Geometry's Radius** box on the page.
- Click and drag the rotation handle to adjust the angle of the polygon. The new angle is shown in the **Angle** box on the page.
- Move the **+** cursor over the center point of the polygon. When it changes to the **↕** cursor, click and drag to move the whole polygon. The new center point is shown in the **Polygon Center's X** and **Y** boxes on the page.

To confirm the new polygon shown in the **2D View** window and return to the **Assistant's** Home page, you can either:

- Click on the **Apply** button, followed by the **Close** button on the **Polygon Editing** page.
- Click the right mouse button.

Creating a Star

You can create a star shaped vector object.

To create an exact star:

1. Click on the **Create Stars** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Star Creation** page.
2. Define the polygon's number of sides in the **Settings' No. of Points** box.
3. If you want your star to be drawn at a specific angle to the model block, define the angle in the **Settings' Angle** box.
4. Define the center point of your star. To do so, you can either:
 - Define the X and Y co-ordinates of the center point in the **Star Center's X** and **Y** boxes.
 - Move the $+$ cursor over the **2D View** window and click on the position you want to set as the center point. The X and Y co-ordinates of the point are shown in the **Star Center's X** and **Y** boxes.
5. Define the polygon's radius in the **Geometry's Radius of first Points** box. This sets the radius of the polygon, upon which the outer points (nodes) of the star lie.
6. Define the polygon's radius in the **Geometry's Radius of second Points** box. This sets the radius of the polygon, upon which the inner points (nodes) of the star lie.
7. Click on the **Preview** button to see the star you are about to create in the **2D View** window.
8. If you want to draw your star and remain in Star Creation mode, click on the **Create** button.

If you want to draw your star and return to the **Assistant's** Home page, click the right mouse button.

To create an approximate sized star:

1. Move the **+** cursor over the **2D View** window, and then click and drag to create the size of polygon you want, upon which the outer points in the star lie.
2. Click and drag to create the size of polygon you want, upon which the inner points in the star lie.
3. Release the mouse button to draw a preview image of the star you are creating in the **2D View** window.
4. If you want to draw your star and remain in Star Creation mode, click on the **Create** button.

If you want to draw your star and return to the **Assistant's** Home page, you can either:

- Click the **Create** button, followed by the **Close** button on the **Star Creation** page.
- Click the right mouse button.

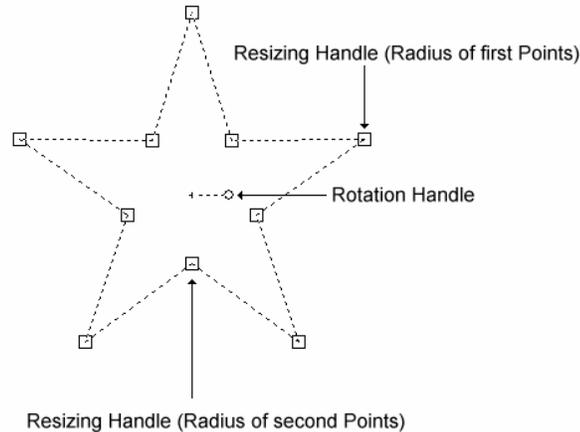
Editing a Star

You can edit the size, position, sides and/or angle of a star shaped vector object.

To edit a star:

1. Select the star you want to edit.
2. Right-click on the star to display the Vector Editing menu.
3. Click on the **Edit Star** option to display the **Star Editing** page in the **Assistant** window.

The star now appears as a preview image with resizing handles attached around its circumference, and a rotation handle joined to its center point:



You can now change the size, position, sides and/or the angle of the selected star using the **Star Editing** page, or by manipulating the handles on the star itself.

To edit the selected star using the **Star Editing** page:

- Type a new value in the appropriate box for each attribute of the star that you want to adjust.

For example, typing a new value in the **No. of Sides** box immediately increases or decreases the number of sides in the selected star.

You can edit the selected star using the shape itself:

- Click and drag any of the inner or outer resizing handles to adjust the size and shape of the star. The new size is shown in the **Geometry**'s **Radius of first Points** and/or **Radius of second Points** boxes on the page.
- Click and drag the rotation handle to adjust the angle of the star. The new angle is shown in the **Angle** box on the page.
- Move the \oplus cursor over the star's center point. When it changes to the \oplus cursor, click and drag to move the whole star. The new center point appears in the **Star Center**'s **X** and **Y** boxes on the page.

To confirm the new star shown in the **2D View** window and return to the **Assistant**'s Home page, you can either click on the **Apply** button, followed by the **Close** button on the **Star Editing** page *or* click the right mouse button.

Creating an Arc

You can create an arc shaped vector object.

To create an arc:

1. Click on the **Create Arcs** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Arc Creation** page.
2. Click on either of the **Arc Type** radio buttons  to select the type of arc you want to create:
 - **Center – Start – End** – A swept arc created by defining a center point, a Start Point and then an end point.
 - **Start – End – Point On Arc** – A fitted arc created by defining a Start Point, an end point and then a mid point.
3. If you have selected the **Center – Start – End** option:
 - Move the \oplus cursor over the **2D View** window and then click on the position that you want to set as the arc's start point. The X and Y co-ordinates of the point are shown in the **Start Point** area of the page.
 - Move the \oplus cursor over the **2D View** window and click on the position that you want to set as the arc's end point. The X and Y co-ordinates of the point are shown in the **End Point** area of the page.
 - Move the \oplus cursor over the **2D View** window and click on the position that you want to set as the arc's mid point. The X and Y co-ordinates of the point are shown in the **End Point** area of the page.
4. If necessary, you can now change the position of any of the three defined points:
 - If you want to change the position of the center point, define the co-ordinates of its new position in the **X** and **Y** boxes in the **Edit Center Point** area.

- If you want to change the position of the Start Point, define the co-ordinates of its new position in the **X** and **Y** boxes in the **Edit Start Point** area.
 - If you want to change the position of the end point and the swept angle of the arc, define the co-ordinates of its new position in the **X** and **Y** boxes in the **Edit End Point** area, and then define its new angle in the **Swept Angle** box.
 - If you want to change the position of the end point and the radius of the arc, define the co-ordinates of its new position in the **X** and **Y** boxes in the **Edit Center Point** area, and then define its new radius in the **Radius** box.
5. Click on the **Preview** button to see the arc you are about to create in the **2D View** window.
 6. If you want to draw your arc and remain in Arc Creation mode, click on the **Create** button.

If you want to draw your arc and return to the **Assistant's** Home page, click on the right mouse button.

Grouping/Ungrouping Vector Objects

Grouping

Grouping combines all of the individual spans, points (nodes) and control points that make up a vector object as a single entity.

You can group an individual vector object or a selection of them. When you group a selection of objects, they stay in relation to each other. This can be important for both design (e.g. aligning, centering) and machining (drilling, clearing) functions.

To group an open vector object:

1. Select the vector object that you want to group. The selected vector object is magenta.
2. Click on the **Group** button  in the **Group Merge Join Vectors** area of the **Assistant's** Home page. The vector object turns purple. When deselected, the vector object is blue.



Note: You can also group the selected vector object(s) by 1) pressing the **Ctrl + G** keys on your keyboard or 2) by clicking on the **Vectors > Group Vector(s)** in the Main menu bar or 3) right-clicking and then selecting the **Group Vector(s)** option from the menu.

To group a closed vector object:

1. Select the vector object that you want to group.
2. Click on the **Group** button  in the **Group Merge Join Vectors** area of the **Assistant's** Home page. The vector object turns purple.

If you group a closed vector object containing self-intersections, when deselected it turns red with the  icon marking the position of all intersections.

If you select a combination of open and closed vector objects with the intention of grouping them, all of them turn magenta. However, when they have been grouped and deselected, the closed vector objects appear in black, while the open vector objects appear in blue.

Ungrouping Vector Objects

You can also ungroup vector objects. You must ungroup an object before you can edit its individual spans, points (nodes) and control points.

You can ungroup a selection of vector objects that have been grouped together (for example, letters in a Text string), and then have to ungroup the individual object (each letter) to edit the object.



Note: Vectors that have been imported from another source (.dxf, .dwg, .eps, ai, .wmf) must be **Ungrouped** before they can be edited.

To ungroup any vector object:

1. Select the vector object that you want to ungroup.
2. Click on the **Ungroup** button  in the **Group Merge Join Vectors** area of the **Assistant's** Home page. The vector object is deselected. If the selected vector object is open, the vector object turns blue. If the selected vector object is closed, it is black.



Note: You can also ungroup the selected vector object(s) by 1) pressing the **Ctrl + U** keys on your keyboard or 2)) by clicking on the **Vectors > Ungroup Vector(s)** in the Main menu bar or 3) right-clicking and then selecting the **Ungroup Vector(s)** option from the menu.

Editing Vector Objects

To edit a vector object, it must be **Ungrouped**.

You can edit any of the standard shapes of vector object in the same way: square, rectangle, circle, ellipse, polygon and star.

To edit any of these standard shapes, click to select the vector object and then either:

- Press the **E** key on your keyboard.
- Right-click to display the Vector Editing menu and then click to select the **Edit** command for the selected vector object e.g. **Edit Ellipse**.

Part Wizard displays the **Editing** page for the selected vector object in the **Assistant** e.g. **Ellipse Editing**. You are then able to change the properties for the selected shape of vector object by modifying the appropriate values. For example, the **Height** of a rectangle.

You cannot edit the following vector objects using an Editing page in the **Assistant**, although they still can be edited:

- Created with the **Polyline Creation** tool.
- Created with the **Arc Creation** tool.
- Created with one of the buttons in the **Vector Creation** area of the **Assistant's** page, and in which you have moved or edited a point (node) or span.
- Imported directly into Part Wizard.

Selecting Vectors

To select a single vector object:

1. Click on the **Select Vectors** button  in the **Vector Creation** area of the **Assistant's** Home page, and then on the vector object that you want to select.



Note: If the **Select Vectors** button is shown as  in the **Vector Creation** area, you are already in Select Vectors mode.



Note: Use the **N** key on your keyboard to toggle between the different modes. Pressing the **N** key once when in Transform Vectors mode takes you into Node Editing mode. Pressing it twice takes you into Select Vectors mode.

To select more than one vector object:

1. Click on the **Select Vectors** button  in the **Vector Creation** area of the **Assistant's** Home page.
2. Hold down the **Shift** key on your keyboard, and then click on each vector object that you want to select. A bounding box surrounds all selected vector objects.
3. You can also click and drag around any number of vector objects to select them. The complete vector must be inside the box to be selected. A bounding box surrounds all selected vector objects.



Tip: To deselect a vector object you have selected by mistake, hold the **Shift** key on your keyboard and then click.

What the Colors Signify

- By default, one or more ungrouped vector objects are magenta when selected. When deselected, they are black.
- By default, all grouped closed vector objects are purple when selected, unless they are self-intersecting. Then they are shown in red with the  icon marking the position of all intersections. When deselected, all grouped closed vector objects are black.
- By default, any locked vector object is grey when selected. When deselected it is green.
- A grouped open vector object is blue when deselected.
- If you click and drag to around a vector object to select it, and it has one or more overlaying copies, the vector object turns red.

Moving Vectors



Note: You cannot move a vector object if it is locked.

To move a vector object to another position:

1. Select the vector object that you want to move.
2. Move the cursor over the bounding box that surrounds the vector object or over the vector(s) itself. The cursor now changes to .
3. Click and drag the bounding box to its new position, and then release the mouse button.



Tip: Hold down the **Alt** key on your keyboard to restrict dragging to the **X** or **Y**-axes.

Editing Vector Spans

Spans within a vector object can be linear, an arc or a bezier curve. You can change the type of span between points or nodes using the Span Editing options. To display the Span Editing options, be sure that you are working in the **Node Editing** mode, then right-click on any span within a selected vector object. (The Hot Key for each Span Editing option follows the option.)

Working in Node Editing mode allows you to:

- Convert spans to a line (**L**).
- Convert spans to a bezier curve (**B**).
- Convert a span to an arc (**A**).
- Insert a point (node) into a span (**I**).
- Insert a Start Point into a span (**P**).
- Remove a span (**R**).

Converting Spans to a Line

Converting spans to a line allows you to change arc or bezier curve spans within a vector object to a linear span.

To convert a span to a line:

1. Make sure that you are in Node Editing mode .
2. Click to select a vector object containing an arc or bezier curve span. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. If you want to convert a single span to a line:
 - Position the cursor over the arc or bezier curve span. When the cursor changes from  to , right-click to display the Span Editing menu.



Note: You can also convert an arc or bezier curve span to a linear span by moving the cursor over the span and pressing the **L** key on your keyboard.

If you want to convert two or more continuous spans to a line:

- Click to select the Start Point, hold the **Shift** key down on your keyboard, and then click to select the end point of two or more continuous spans (at least three selected points). The selected points and/or control points turn red. Right-click on any of the selected points or control points to display the Node Editing menu.

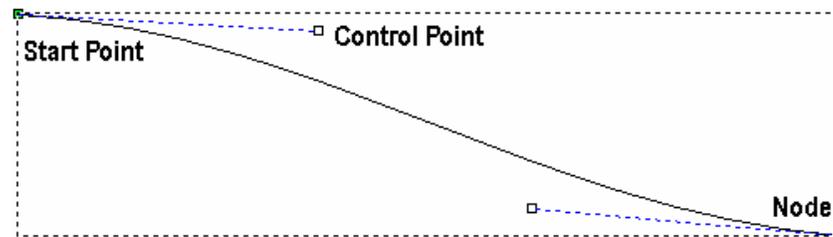


Note: You can also convert multiple arc or bezier curve spans to linear spans by pressing the **L** key on your keyboard when the end point of two or more continuous spans is selected (at least three selected points).

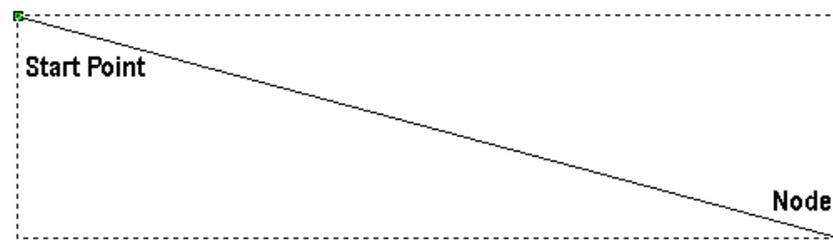
4. Click on the **Convert span(s) to a line** option to convert the existing span(s) into a linear span.

For example, if you were to convert a bezier curve span to a linear span you would see that its adjoining control points have been removed along with any curvature, as shown below:

Before...



After...



Converting Spans to a Bezier Curve

Converting spans to a bezier curve allows you to alter the appearance of bezier, linear or arc spans within a vector object to a single bezier span.

A bezier curve has two control points on the span, both of which can be dragged to add or reduce its curvature.

To convert spans into a bezier curve:

1. Make sure that you are in Node Editing mode .
2. Click to select a vector object containing an arc or linear span. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. If you want to convert a single span into a bezier curve:
 - Position the cursor over the arc or linear span. When the cursor changes from  to , right-click to display the Span Editing menu.



Note: You can also convert an arc or linear span to a bezier curve span by moving the cursor over the span and pressing the **B** key on your keyboard.

If you want to convert two or more continuous spans into a bezier curve:

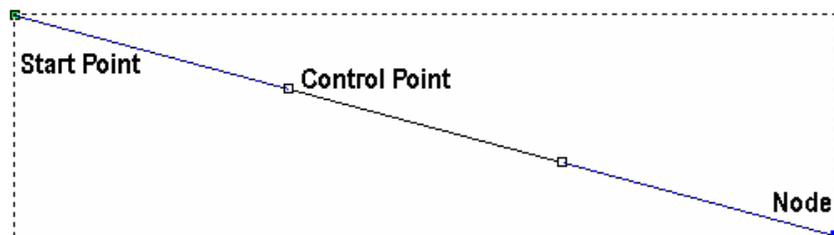
- Click to select the Start Point, and then click to select the end point of two or more continuous spans (at least three selected points). The selected points and/or control points turn red. Right-click on any of the selected points or control points to display the Node Editing menu.



Note: You can also convert multiple arc or linear spans to bezier curve spans by pressing the **B** key on your keyboard when the end point of two or more continuous spans is selected (at least three selected points).

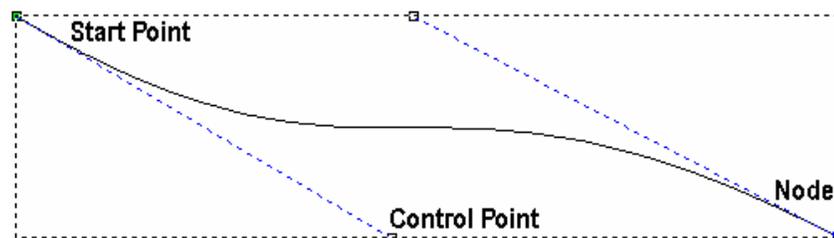
4. Click on the **Convert span(s) to bezier** option to convert the existing spans into a bezier curve span.

For example, your span may look something like that shown below:



Although this span may not look like a curve now, the two control points indicate that it is a bezier curve span.

In our example, by dragging the control points as shown below, a bezier curve span with a smooth curvature is produced:



Converting a Span to an Arc

Converting a span to an arc allows you to alter the appearance of a linear or bezier curve span within a vector object.

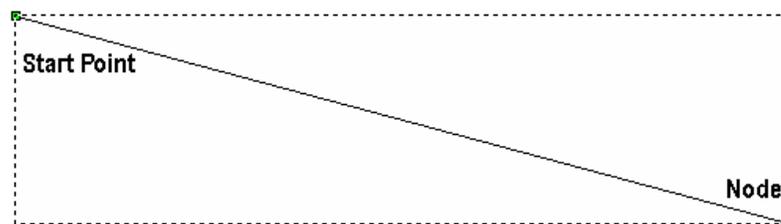
Converting a span to an arc places one control point in the middle of the span. This can be dragged to add or reduce the degree of curvature in the arc.

To convert a span into an arc:

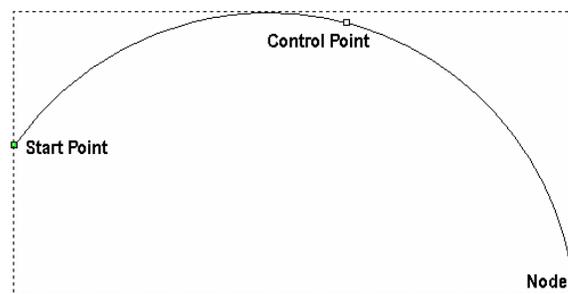
1. Make sure that you are in Node Editing mode .
2. Click to select a vector object containing a bezier curve or linear span. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Position the cursor over the linear or bezier curve span. When the cursor changes from  to , right-click to display the Span Editing menu.
4. Click on the **Convert span to an arc** option to convert the existing span into an arc span.

For example, if you were to convert a linear span to an arc span you would see that one control point is now positioned in the center of the arc. You can drag the control point to create a curve, as shown below:

Before...



After moving the control point...



Inserting a Point

You can insert a point (node) in any span. Inserting a point divides a span into two new spans of the same type as the original. By inserting a point you add greater flexibility in changing the shape of the vector object.



Tip: Adding points to a vector object can be a time consuming process. Alternatively, you can use the **Create Polyline** tool to create more complicated shapes from the beginning. With the **Create Polyline** page displayed, each corresponding movement and click of the mouse creates a new point and connects it to the last with a linear or bezier curve span. For details, see "Creating a Polyline".

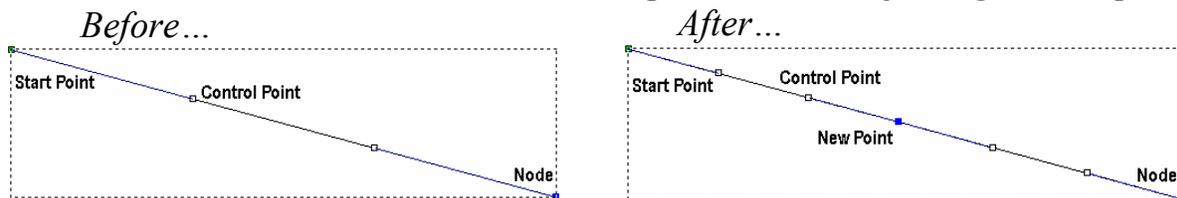
To insert a point into a span:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object into which you want to insert a point. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Position the cursor over the span. When the cursor changes from  to , right-click to display the Span Editing menu.
4. Click on the **Insert a point** option to create a new point in the span, dividing it into two separate spans of the same type as the original.



Note: You can also insert a point by moving the cursor over the span and pressing the **I** key on your keyboard.

For example, a point has been inserted into the bezier curve span illustrated below. You can see that doing so has created a second bezier curve span with two adjoining control points:



Inserting a Start Point

The Start Point in a vector object determines the point at which a tool enters the block of material when you are machining your model. For further details, see "Changing the Start Point Position" in the Machining Models chapter. The current Start Point is shown in green.

Inserting a Start Point divides a span into two new spans of the same type as the original. Alternatively, you can set an existing point (node) in a span as the Start Point.



Note: For open vector objects, the Start Point must be at either end.

To insert a Start Point in a span:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object into which you want to insert a Start Point. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Position the cursor over the span. When the cursor changes from  to , right-click to display the Span Editing menu.
4. Click on the **Insert Start Point** option to produce a new Start Point in the span and divide it into two separate spans of the same type as the original.



Note: You can also insert a Start Point into a span by moving the cursor over the span and pressing the **P** key on your keyboard.

Removing a Span

You can remove a linear, bezier curve or an arc span within any selected vector object in the same way.

To remove a span:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object from which you want to remove a span. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. If you want to remove a single span:
 - Position the cursor over the span. When the cursor changes from  to , right-click to display the Span Editing menu.

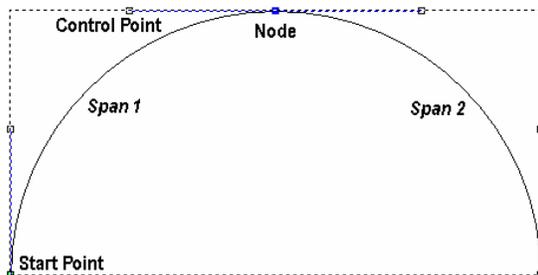


Note: You can also remove a span by moving the cursor over the span and pressing the **R** key on your keyboard.

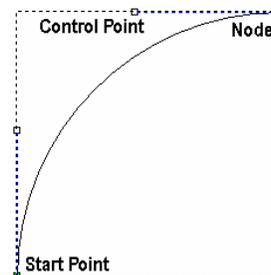
If you want to remove two or more continuous spans:

- Click to select the Start Point, and then click to select the end point of two or more continuous spans (at least three selected points). The selected points and/or control points turn red. Right-click on any of the selected points or control points to display the Node Editing menu.
- Click on the **Remove Span(s)** option to delete the selected span(s).

For example, a vector object with two spans appears as follows:



If you remove the second span from the vector object, the remaining span looks as follows:



Editing Vector Nodes

You can change the structure and appearance of a vector object using the Node Editing options. To display the options while you are in Node Editing mode, right-click on any point (node) within a selected vector object.

Working in Node Editing mode allows you to:

- Select points (nodes) and control points.
- Move points (nodes) and control points.
- Align points (nodes).
- Smooth points (nodes) (**S**).
- Delete points (nodes) (**D**).
- Change the position of the start point (**P**).
- Change the position of points (nodes) and control points.

To edit points within a vector object, you must work in Node Editing mode. Use any of the following methods to enter Node Editing mode:



Note: If the **Node Editing** button is shown as  in the **Vector Creation** area, you are already in Node Editing mode.

- Click on the **Node Editing** button  in the **Vector Creation** area of the **Assistant's** Home page.
- Press the **N** key on your keyboard.
- Hold the **Ctrl** key down on your keyboard, and then click once.

The **Node Editing** button changes to  when you are working in Node Editing mode.



Note: If you click outside of the bounding box that surrounds the selected vector object once, Part Wizard remains in Node Editing mode. If you click more than once, Part Wizard returns to Select Vectors mode.

Selecting Points and Control Points

You can select single or multiple points and/or control points in a selected vector object.

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the points and/or control points that you want to edit. A bounding box surrounds the selected vector, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. If you want to select a point (node) or control point:
 - Move the cursor over the point or control point that you want to select. When the cursor changes from  to , click to select. The selected point or control point turns red.

If you select a point that has adjoining control points, these are selected along with the point, all of which turn red.

If you want to select more than one point (node) or control point, you can use any of the following methods:

- Click and drag to form a bounding box around them. The selected points and/or control points turn red.
- Click to select a point or control point. Hold the **Ctrl** key down on your keyboard, and then click on further points and/or control points to select them. The selected points and/or control points turn red.
- Click to select a point or control point. Hold the **Shift** key down on your keyboard, and then click to select a second point. Part Wizard finds the shortest distance between these two points, and then selects all of the other intermediate points. The selected points and/or control points turn red.

Deselecting Points and Control Points

If you want to deselect a point or control point:

1. Move the cursor over the point or control point that you want to deselect. When the  cursor changes to , hold the **Shift** key down on your keyboard and then click on the point or control point to deselect it.

Moving Points

You can move one or more points and/or control points to a new position.

To move a selection of points (nodes) and/or control points:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the points you want to move. A bounding box surrounds the selected vector, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Hold the **Shift** key down on your keyboard, and then click to select the points and/or control points that you want to move. The selected points and/or control points turn red.
4. You can now move the selected points and/or control points using either of the following methods:
 - Move the  cursor over any of the selected point(s) and then click and drag the point into its new position.
 - Use any of the four arrow keys on your keyboard to nudge the selected point(s) into its new position.

Aligning Points

You can align a selection of points (nodes) and/or control points within a selected vector object in either the horizontal (X) or vertical (Y) axis.

To align a selection of points (nodes) and/or control points:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the points you want to align. A bounding box surrounds the selected vector, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Hold the **Shift** key down on your keyboard, and then click to select the points and/or control points you want to align with that selected last. The selected points and/or control points turn red.



Note: The order of selection is very important. The point that you select last is the point that all the other points will align to. See #5

4. Right-click on any of the selected points and/or control points to display the Node Editing menu.
5. Click on the **Align Nodes** option, followed by either the **in X** or the **in Y** option, depending on the axis with which you want to align the points and/or control points. **By default, the point selected first is aligned with the point selected last**, and a single horizontal (X) or vertical (Y) linear span replaces the intermediate points.



Note: You can also align selected points and/or control points along the X-axis by pressing the **X** key on your keyboard, and along the Y-axis by pressing the **Y** key on your keyboard.

Smoothing Points

You can smooth any point (node) in a vector object other than the Start Point or the last point in an ungrouped, open vector object.

In smoothing, the span on either side of a point is converted to a bezier curve span. Part Wizard positions control points next to the point, allowing you to control the degree of curvature in the whole vector object.

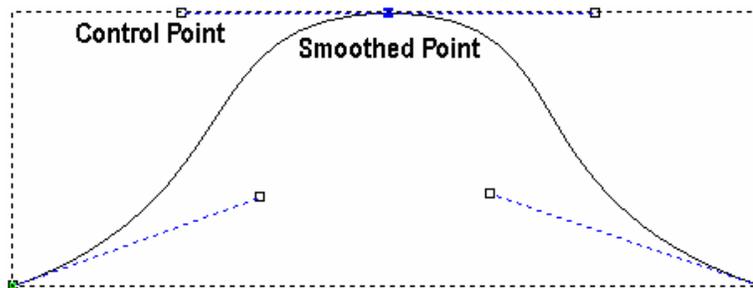
To smooth a single point:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the point you want to smooth. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object. All unsmoothed points are shown in black.
3. Move the cursor over the point that you want to smooth. When the  cursor changes to a , right-click to display the Node Editing menu.
4. Click to select the **Smooth Point** option to convert the spans on either side of the point to bezier curves. The point turns blue.



Note: Moving the cursor over the point and pressing the **S** key on your keyboard also smooths it.

For example, the point in the middle of the vector object shown below has been smoothed:



If you move one of the control points next to the smoothed point, the other automatically moves with it. This simultaneous movement preserves the tangency between the two bezier curve spans.

To smooth a group of points:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the points you want to smooth. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object. All unsmoothed points are shown in black.
3. Select the points that you want to smooth. The selected points turn red.
4. Right-click on any of the selected points to display the Node Editing menu.
5. Click on the **Smooth Points** option to convert the spans on either side of the selected points to bezier curves. The selected points turn blue.



Note: Moving the cursor over any of the selected points and pressing the **S** key on your keyboard also smoothes them.

To remove the smoothing from a smoothed point:

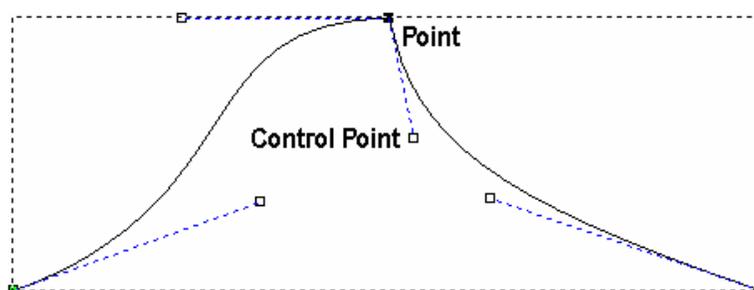
1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the smoothed points from which you want to remove the smoothing. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object. All smoothed points are shown in blue.
3. Move the cursor over a smoothed point (node). When the  cursor changes to a , right-click to display the Node Editing menu. The **Smooth Point** option is selected.
4. Click on the **Smooth Point** option to deselect it. The point (node) turns black.



Note: Moving the cursor over a smoothed point and pressing the **S** key on your keyboard also removes its smoothing.

Although the span on either side of the point (node) remains as a bezier curve span, deselecting the **Smooth Point** option causes the control point on either side of the point (node) to affect its adjoining bezier curve span only, rather than the whole vector object.

In our example, you can see that moving one control point no longer automatically moves the other:



Deleting Points

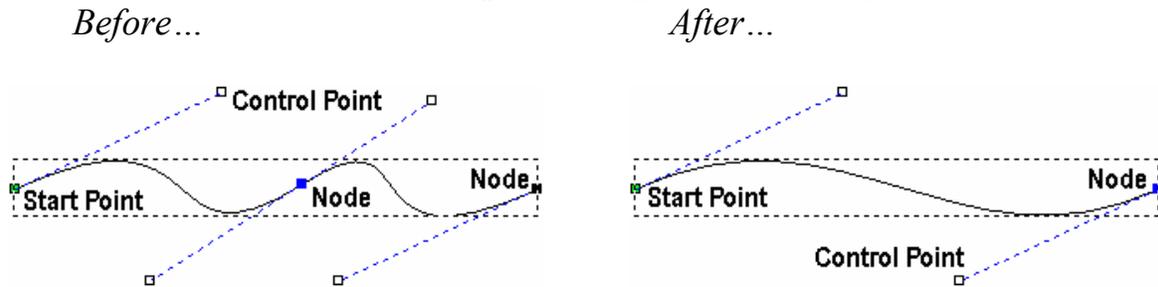
You can delete any of the points (nodes) within a vector object. Deleting a point does not change the type of span on either side of the point but it does reduce your ability to manipulate the shape of the whole vector object.

To delete a single point:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the point you want to delete. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Move the cursor over the point that you want to delete. When the  cursor changes to a , right-click to display the Node Editing menu.

4. Click to select the **Delete Point** option to delete the point from the vector object.

In the following example, you can see that by deleting the middle point, the number of control points is reduced and the overall shape is changed considerably:



To delete a group of points:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object containing the points you want to delete. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Select the points that you want to delete. The selected points turn red.
4. Right-click on any of the selected points to display the Node Editing menu.
5. Click on the **Delete Points** option to delete the selected points.



Note: You can also delete a point or a group of points by moving the cursor over the point(s) and then pressing the **D** key on your keyboard.

Changing the Start Point

The Start Point in a vector object determines the point at which a tool enters the block of material when you are machining a model.

You can change the position of the Start Point in any vector object. The current Start Point within a vector object is shown in green.



Note: Close any Toolpath Screens or Assistant Screens you may have open before you attempt to change the Start point. Otherwise, you may have difficulty getting Part Wizard to accept the new Start Point.

To change the position of the Start Point:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object in which you want to change the position of its Start point. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Move the cursor over the point that you want to set as the Start Point. When the  cursor changes to a , right-click to display the Node Editing menu.
4. Click on the **Start Point** option to make the selected point the Start Point. The point changes from black to green.



Note: You can also change the position of the Start Point by moving the cursor over the point you want to set as the new Start Point and then pressing the **P** key on your keyboard.

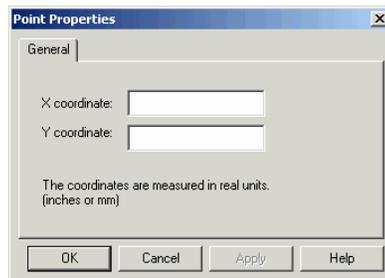
Using a toolpath preview in the **2D View** window, you can also set the position of the Start Point in any toolpath containing a profile pass. For further details, see "Changing the Start Point Position" in the Machining Models chapter.

Changing the Position of Points

You can change the position of any point (node) or control point within a selected vector object.

To change the position of a point or control point:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object in which you want to change the position of a point or control point. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Move the cursor over the point that you want to reposition. When the  cursor changes to a , right-click to display the Node Editing menu.
4. Click on the **Properties** option to display the **Point Properties** dialog box:



5. Define the X and Y co-ordinates of the point's new position in the **X coordinate** and **Y coordinate** boxes.
6. Click on the **OK** button to reposition the point.

To change the approximate position of a point or control point:

1. Make sure that you are in Node Editing mode .
2. Click to select the vector object in which you want to change the position of a point or control point. A bounding box surrounds it, within which you can see the spans, points (nodes) and control points that make up the selected vector object.
3. Click and drag on the point or control point into its new position. Release the mouse button to set its position.

Deleting Vector Objects

You can delete any vector object or group of vector objects using any of the following methods:

- First, hold the **Shift** key down on your keyboard and then click to select the vector objects that you want to delete. Next, right-click on any of the selected vector objects to display the Vector Editing menu, and then click on the **Delete** option.
- Select the vector objects that you want to delete, and then press the **Delete** key on your keyboard.
- Select the vector objects that you want to delete, and then press the **Ctrl + X** keys on your keyboard.

If you try to delete any locked vector object or group of vectors, the following message box appears:



Click on the **Yes** button to close the message box and delete the selected vector object(s). For further information, see "

Locking and Unlocking Vector Objects" in the Working with Models chapter.

Copying and Pasting Vector Objects

There are three buttons in the **File** area of the **Assistant's** Home page that you can use to copy, paste and cut vector objects in a model.



To copy, paste or cut a vector object:

1. Select the vector object(s) that you want to copy, paste or cut.
2. In the **File** area of the **Assistant's** Home page, click on the appropriate button:

- Click on the **Cut** button  to remove the selected vector object and place it on the clipboard.
- Click on the **Copy** button  to create a duplicate of the selected vector object and place it on the clipboard.
- Click on the **Paste** button  to copy the selected vector object back from the clipboard into its original position.



Note: Because the **Paste** button pastes the vector object back into its original position, it is easy to paste multiple copies of a vector object onto itself. If you click and drag around a vector object and the selected vector object turns red, there are one or more overlaying copies of the object.

To move a pasted copy, move the cursor over the selected vector object until it changes to a , and then click and drag into position. See also "Transforming Vector Objects".



Note: You can also cut, copy or paste a selected vector object by clicking on the **Edit** menu in the Main menu bar, followed by the appropriate option.

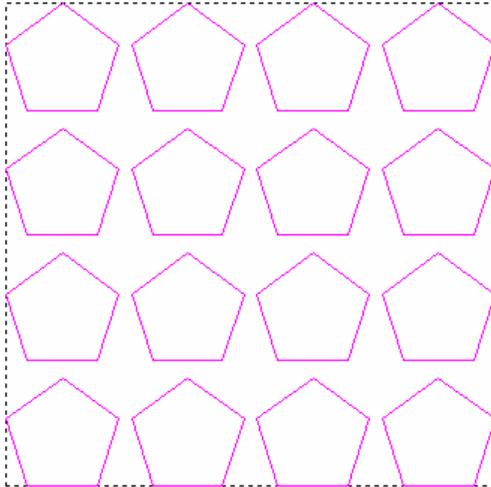
You can **Cut** or **Copy** vector objects from one Part Wizard file and **Paste** them in the same location into another Part Wizard file.

Block Copy and Rotate Copy

You can use the **Block Copy** button  in the **Vector Creation** area of the **Assistant**'s Home page to create multiple copies of a vector object in regular patterns:

Block Copy

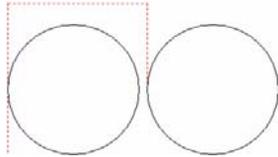
You can produce several copies of a selected vector object in a grid format:



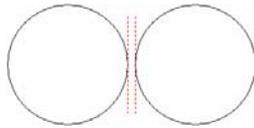
To create a block of copies in a grid format:

1. Select the vector object that you want to copy and paste. By default, it appears as magenta and is surrounded by a bounding box.
2. Click on the **Block Copy** button  in the **Vector Creation** area of the **Assistant**'s Home page to display the **Block and Rotate Copy** page.
3. Click on the **Block Copy** radio button to display the settings on the page.
4. Select the method you want to use to set the distance between each copy within the block:

- The **Distances are offsets** option allows you to set the distance at which each copy of a vector object will be created from the bottom left corner of the previous copy in the block. The overall distance between each copy equates to the height or width of the vector plus the gap. The **Distances are offsets** radio button is selected by default.



- The **Distances are gaps** option sets the distance and direction at which each copy of a vector object will be created from any of the four edges of the previous copy in the block. The overall distance between each copy is equal to the defined gap. Click on the **Distances are gaps** radio button to display its settings.



If you have selected the **Distances are offsets** option:

- First, define the distance you want to set between each copy along the X-axis in the **X Offset** box.
- Next, define the distance you want to set between each copy along the Y-axis in the **Y Offset** box.



Note: You can set the offset distance between each copy using a positive or negative value. To create a block of copies to the right of and above the selected vector object, define positive values in the offset boxes e.g. 90. To create a block of copies to the left of and below of the selected vector object, define negative values in the offset boxes e.g. -90.

- Finally, define the total number of copies by typing the number of rows and columns you want to create in the **Number of Rows** and **Number of Columns** boxes.

If you have selected the **Distances are gaps** option:

- First, define the width of the gap between each subsequent copy of the selected vector object along the X-axis in the **X Copy** box.
- Next, define the width of the gap between each subsequent copy of the selected vector object along the Y-axis in the **Y Copy** box.
- Now, define the total number of copies by typing the number of rows and columns you want to create in the **Number of Rows** and **Number of Columns** boxes.
- Finally, set the direction in which you want to create the block of copies:

The **Copy From Left To Right** button  allows you to copy the selected vector object to the right along the X-axis.

The **Copy From Right To Left** button  allows you to copy the selected vector object to the left along the X-axis.



Note: You can toggle between the **Copy From Left To Right** and **Copy From Right To Left** direction by clicking on whichever button is currently displayed.

The **Copy From Bottom To Top** button  allows you to copy the selected vector object upwards along the Y-axis.

The **Copy From Top To Bottom** button  allows you to copy the selected vector object downwards along the Y-axis.

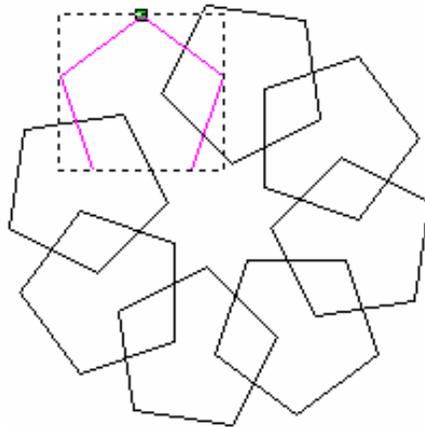


Note: You can toggle between the **Copy From Bottom To Top** and **Copy From Top To Bottom** direction by clicking on whichever button is currently displayed.

5. Click on the **Apply** button to create the new block of vector objects.
6. Click on the **Close** button to return to the **Assistant's** Home page.

Rotate Copy

You can produce several copies of a selected vector object in a circular pattern by defining a rotation center:



To create multiple copies in a circular pattern:

1. Select the vector object that you want to copy and paste. By default, it appears as magenta and is surrounded by a bounding box.
2. Click on the **Block Copy / Rotate** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Block and Rotate Copy** page.
3. Click on the **Rotate Copy** radio button  to display the settings on the page.

4. Define the point around which you want to rotate the selected vector object. You can either:
 - Define the X and Y co-ordinates of the origin of rotation in the **Rotation Center X** and **Rotation Center Y** boxes.
 - Click to select the **Pick Center with Mouse** option . Move the  cursor over the point in the model (white area) that you want to use as the origin of rotation, and then click to select. Its co-ordinates appear in the **Rotation Center X** and **Rotation Center Y** boxes.
5. Define how each of the copies are rotated by clicking on either of the **Angle** radio buttons 
 - **Incremental** - To rotate each subsequent copy of the selected vector object by a specified angle.
 - **Total** - To rotate each copy of the selected vector object evenly within a specified angle.
6. Define the angle of rotation in the **degrees** box:
 - Type a positive value to rotate the vector object clockwise.
 - Type a negative value to rotate the vector object anti-clockwise.
7. Define the number of copies you want to create in the **Number of Objects** box.
8. Click on the **Apply** button to create the new circular pattern of vector objects.
9. Click on the **Close** button to return to the **Assistant's** Home page.

Offsetting Vector Objects

You can create an offset vector from any of the vector objects already drawn in your model.

To create an offset vector from a vector object:

1. Select the vector object from which you want to create an offset vector.
2. Click on the **Offset Vector(s)** button  in the **Vector Creation** area of the **Assistant**'s Home page to display the **Offset Vector(s)** page.

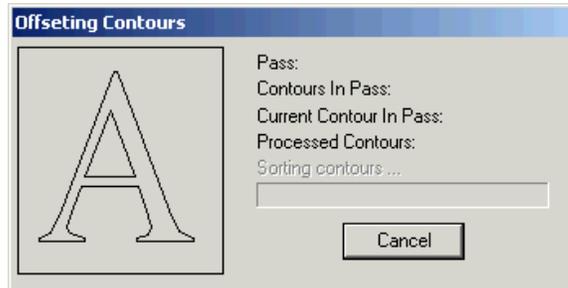


Note: You can also display the **Offset Vector(s)** page from the Main menu bar by clicking on the **Vectors** menu, followed by the **Offset...** option.

3. Define the distance between the selected vector object and the offset vector in the **Offset Distance** box.
4. Click to select one of the **Offset Direction** radio buttons  to set the position of the offset vector:
 - Select **Outwards/Right** if you want the offset vector to be drawn outside of the selected vector object if it is closed, or to the right of the Start Point, looking down the selected vector object if it is open.
 - Select **Inwards/Left** if you want the offset vector to be drawn within the selected vector object if it is closed, or to the left of the Start Point, looking down the selected vector object if it is open.
5. If you want to replace the original vector object with the offset vector, click to select the **Delete original vectors** option .

6. Click on the **Offset** button to draw the offset vector.

The **Offsetting Contours** message box is displayed while Part Wizard calculates the position of the offset vector(s):



Note: You may not see the **Offsetting Contours** message box if you are creating an offset vector from a simple shape of vector object. For example, a circle.

7. Click on the **Close** button to return to the **Assistant's** Home page.

You can also display the **Offset Vector(s)** page in the **Assistant** window if you:

1. Select the vector object from which you want to create an offset vector.
2. From the Main menu bar, click on the **Vectors** menu, followed by the **Offset...** option.

Filleting Vector Objects

A fillet is an arc which is made up of two points (nodes) and a control point. Part Wizard allows you to define and subsequently edit the radius of the fillet arc that you create.

You can close an open vector object with a fillet, or by joining the two points at the junction. In the latter instance, Part Wizard extends the spans connected to the two points.



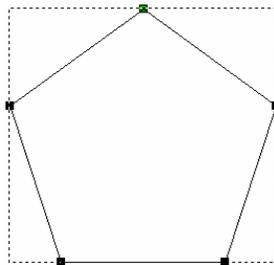
Note: Not all open vector objects can be closed with a fillet. For practical results, a vector object should contain at least three points (nodes) and have sufficient space to fit the fillet arc.

You can also convert a sharp corner within a vector object into a filleted, or rounded, corner.

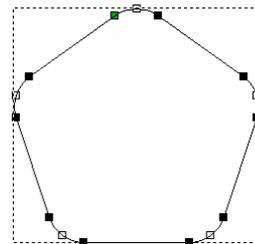
To convert a sharp corner into a filleted corner:

1. Select the vector object in which you want to insert filleted corners.
2. Click on the **Fillet Vector With An Arc** button  in the **Vector Creation** area to display the **Fillet Tool** page.
3. Click to select the **Insert Fillet** radio button .
4. Define the radius of the filleted corner you want to insert in the **Fillet Radius** box.
5. Move the cursor over the point (node) in the selected vector object, and then click to insert the fillet. The existing point is converted into two points and a control point.

Before...



After...



6. Click on the **Close** button to return to the **Assistant's** Home page.

You can also convert a sharp corner into a filleted corner if you:

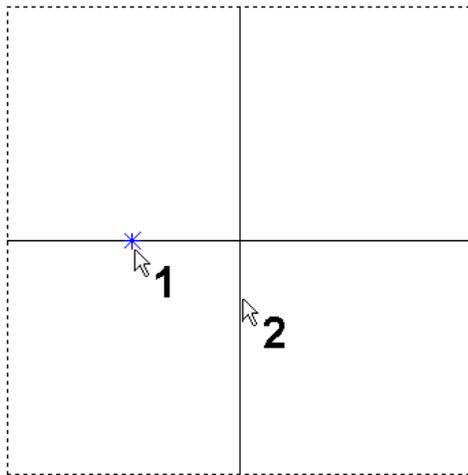
1. Select the vector object in which you want to insert filleted corners.
2. Click on the **Fillet Vector With An Arc** button  in the **Vector Creation** area to display the **Fillet Tool** page.



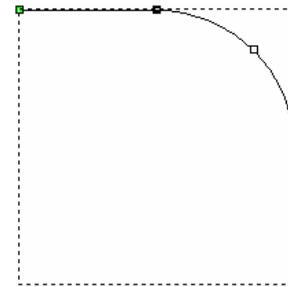
Note: You can also display the **Fillet Tool** page from the Main menu bar by clicking on the **Vectors** menu, followed by the **Fillet...** option.

3. Click to select the **Insert Fillet** radio button .
4. Define the radius of the filleted corner you want to insert in the **Fillet Radius** box.
5. Click on a span on either side of a point (node) or intersection in the selected vector. The * icon appears on the selected span.
6. Click on the span opposite to that already selected to insert the fillet. The existing point or intersection is converted into two points and a control point.

Before...



After...



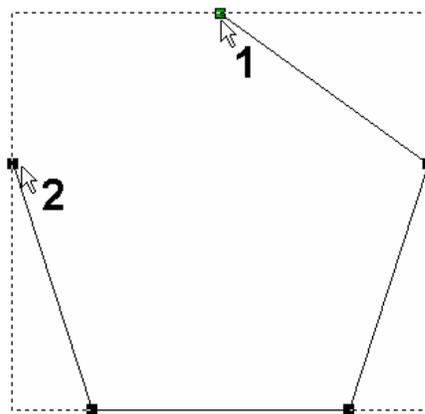
Note: If the radius of the fillet is too large or the selected spans are not parallel, a warning message appears on the page in red text. This message disappears within a few seconds.

7. Click on the **Close** button to return to the **Assistant's** Home page.

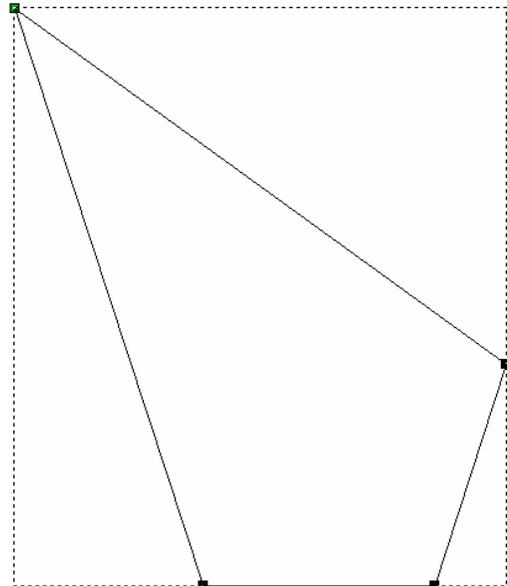
To close an open vector object with extended spans:

1. Select the vector object in which you want to insert filleted corners.
2. Click on the **Fillet Vector With An Arc** button  in the **Vector Creation** area to display the **Fillet Tool** page.
3. Click to select the **Extend/Trim Line to Intersection** radio button .
4. Click to select the first point (node) in the junction of the open vector object. The  icon appears around the selected point.
5. Click to select the second point in the junction. Part Wizard joins the two points, extending their connecting spans while doing so.

Before...



After...

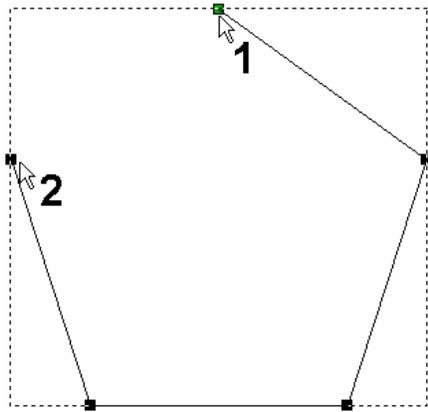


6. Click on the **Close** button to return to the **Assistant's** Home page.

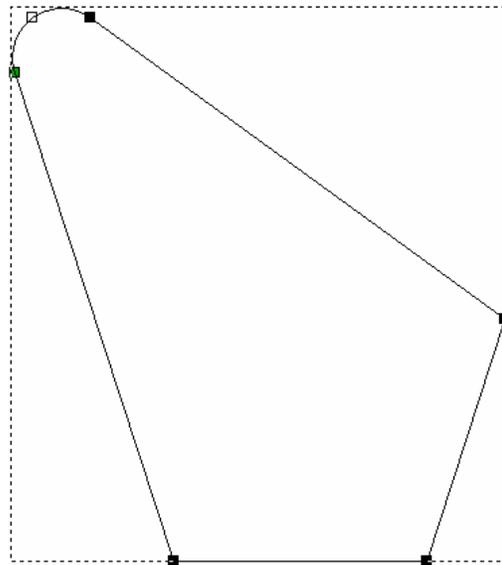
To close an open vector object with a fillet:

1. Select the vector object that you want to close with a fillet.
2. Click on the **Fillet Vector With An Arc** button  in the **Vector Creation** area to display the **Fillet Tool** page.
3. Click to select the **Insert Fillet** radio button .
4. Define the radius of the fillet with which you want to close the vector object in the **Fillet Radius** box. The wider the radius, the shorter the extended spans.
5. Click to select the first point in the junction of the open vector object. The  icon appears around the selected point.
6. Click to select the second point in the junction. Part Wizard joins the two points with a fillet, extending their adjoining spans while doing so.

Before...



After...



7. Click on the **Close** button to return to the **Assistant's** Home page.

Editing a Fillet

You can alter the radius of a fillet after it has been created:

1. Select the vector object containing the fillet that you want to edit.
2. Click on the **Fillet Vector With An Arc** button  in the **Vector Creation** area to display the **Fillet Tool** page.
3. Click to select the **Insert Fillet** radio button .
4. Define the new radius of the fillet in the **Fillet Radius** box.
5. Click on the control point between the two points in the fillet to alter its radius.
6. Click on the **Close** button to return to the **Assistant's** Home page.

Trimming Vector Objects

You can control exactly which part of any number of overlapping vector objects you want to remove.

To trim two or more ungrouped overlapping vectors:

1. Make sure that you are in **Node Editing** mode .
2. Select the vector objects that you want to trim. The vector objects turn magenta and a bounding box surrounds them.
3. Click on the **Trim Vector To Intersections** button  in the **Vector Creation** area to display the **Trim Tool** page.



Note: You can also display the **Trim Tool** page from the Main menu bar by clicking on the **Vectors** menu, followed by the **Trim...** option.

4. If you want to create a copy of the original vector object you are trimming, click to select the **Keep Original** option . The copy is overlaying the original vector object.
5. Move the  cursor over a span within the area in which the vector objects overlap. When the cursor changes to , click to delete the span.

Part Wizard creates a point (node) at each place where the vector object that you are trimming intersects with the overlapping vector object.

The next available intersection point (node) in the trimmed vector object's original direction of geometry becomes its start point.

To trim two or more grouped overlapping vectors:

1. Make sure that you are in **Node Editing** mode .
2. Select the grouped vector objects that you want to trim. The grouped vector objects turn purple and a bounding box surrounds them.

3. Click on the **Trim Vector To Intersections** button  in the **Vector Creation** area to display the **Trim Tool** page.
4. Click on the **Explode Selection** button. Part Wizard ungroups the vector objects and then converts the spans between every two points (nodes) within them into individual vector objects.
5. Move the  cursor over a span that you want to remove. When the cursor changes to , click to delete the span.
6. Click on the **Close** button to return to the **Assistant's** Home page.

Locking and Unlocking Vector Objects

You can prevent a vector object from being moved to a different position in your model by locking it.

To lock a vector object in its current position:

1. Select the vector object that you want to lock into position.
2. Right-click to display the Vector Editing menu, then select the **Lock Vector(s)** option. The selected vector object turns grey.

If you want to move any vector object that has previously been locked into position:

1. Select the locked vector object that you want to move.
2. Right-click to display the **Vector Editing** menu, then select the **Unlock Vector(s)** option.



Note: A vector object that has been toolpathed is locked until the toolpath is deleted or the toolpath hidden.

Working with Vector Text

You can create and manipulate vector text using two tools:

- The **Create Vector Text** button  in the **Vector Creation** area of the **Assistant's** Home page.
- The **Wrap Text Round a Curve** button  in the **Position Size Align Vectors** area of the **Assistant's** Home page.

Creating Vector Text

Creating vector text in Part Wizard is similar to typing text in most word processing packages.

To create vector text:

1. Click on the **Create Vector Text** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Text Tool** page.
2. Select the formatting for the text using the options on the **Text Tool** page (see below).
3. Move the  cursor over to the **2D View** window and click where in the model (the white area) you want to create the vector text. A text box appears in the **2D View** window and the mouse cursor changes to .
4. Type the vector text you want to create.
5. Click on the **Done** button or press both the **Ctrl + Enter** keys to create the vector text and return to the **Assistant's** Home page.

By default, the block of vector text is purple, indicating that the vector objects that make up the text are grouped. A bounding box also surrounds the block:



Formatting Vector Text

Text formatting refers to setting the way vector text looks using different fonts, bold or italic type, indents and alignments.

You can format a character or block of vector text both during and after its creation using the formatting buttons and the list boxes in the **Style** area of the **Text Tool** page.

You can use the formatting buttons as follows:

- Click on the **Bold** button  to make the vector text bold, or to remove the bold formatting.
- Click on the **Italic** button  to make the vector text italic, or to remove the italic formatting.
- Click on the **Align Left** button  to align the selected vector text to the left of the text box with a ragged right edge. This button affects selected vector text of more than one line.
- Click on the **Centered** button  to place the selected vector text in the center of the text box. This button affects vector text of more than one line.
- Click on the **Align Right** button  to align the selected vector text to the right of the text box with a ragged left edge. This button affects selected vector text of more than one line.
- Click on the **Toggle Vertical Text Flow** button  to display vector text vertically, rather than horizontally.

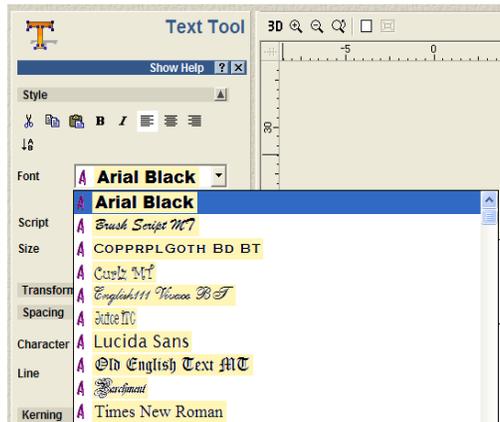
When the **Toggle Vertical Text Flow** button  is selected, the **Kerning** options are removed from the **Text Tool** page and the alignment buttons are reoriented to Top, Center and Bottom of the text box, respectively.

To change the font you are using:

- Click on the **Font** list box, and then click on the font required. In the **Font** list box, you can see a preview of the font style before it is selected.



Note: In Part Wizard, you can V-Bit Carve 10 fonts installed with the software. To select one of the 10 fonts available for V-Bit carving, scroll to the top of your font list and choose a font highlighted in yellow and marked with ArtCAM A.



Any font on your computer may be toolpathed to create pocketed or raised letters (Area Clear), machined along the design line (Machine Along Vectors), or cut out the size drawn (Profile).

To change the size of the font you are using:

- Define the font size in the **Size** box. You can also change the units of measurement by clicking on any of the three options in the list box to the right.

To change the script you are using:

- Click on the **Script** list box, and then on the required script.

To scale a character or block of vector text:

- In the **Resize** area, define the percentage by which you want to scale the text as you type, or apply to the currently selected vector text, along the X and Y axes in the **%(X)** and **%(Y)** boxes.

For example, vector text set at 12 mm scaled to 75% in both the X-axis and 75% in Y-axis appears something like this:



To adjust the angle of a character or block of vector text:

- Define the angle at which you want to type, or apply to the currently selected vector text, in the **Angle** box.



Note: If you are typing in italics, the vector text will have an angle even if no value or a 0 is in the **Angle** box. You can use negative values to tilt the vector text in the opposite direction.

For example, vector text with an angle of 45° appears something like this:



To rotate a character or block of vector text:

- Define the angle at which you want to rotate the vector text as you type, or apply to the currently selected vector text, in the **Rotation** box. Each character is rotated around the center of the area defined by its width, and both the ascent and descent of the current font.

For example, vector text rotated at an angle of 18° appears something like this:



Kerning and Spacing

You can use either of the following methods to adjust the amount of white space on either side of a character in a block of vector text:

- Define the distance you want to place between each character using the **Character** box.
- Click and drag on the **% of space** slider to adjust the value in the **Character** box.

To adjust amount of white space between lines in a block of vector text:

- Define the distance you want to place between each line using the **Line** box.

Kerning, like **Spacing**, applies white space on either side of a character in a block of vector text. Kerning, however, considers the shape of the previous character in relation to the character that is being typed, and adjusts the distance between them so that their fit looks good.

To adjust the kerning between all the characters in a block of vector text:

1. In the **Kerning** area, click on the **Mode** list box and select how you want to apply kerning to the vector text:
 - If you want Part Wizard to automatically apply kerning to newly created or edited text, click on the **Auto** option.
 - If you want to manually apply kerning to a selected block of vector text, click on the **Manual** option.
2. Define the amount of kerning that you want to apply to a selected block of vector text. To do so, you can either:
 - Define the amount of kerning in the **Kerning** box.
 - Click and drag on the **% of space** slider to adjust the value in the **Kerning** box.
3. If you want to apply Part Wizard's default kerning settings to a selected block of vector text, click on the **Default Kerning** button.

The **Constraints** area allows you to apply a bounding box to a block of vector text. By enclosing vector text in a bounding box, you can align its characters in different ways, and apply constraints to the text when typing. The alignment methods are as follows:

- Click on the **Align Top** button  to align the vector text with the top of the bounding box.
- Click on the **Centered** button  to position the vector text in the center of the bounding box.
- Click on the **Align Bottom** button  to align the vector text with the bottom of the bounding box.

You can control how the bounding box is used to constrain the vector text:

1. Click on the **Method** list box, and then select any of the constraining methods:



Note: If you are creating vector text within a selected vector object, the vector object will be used to constrain the vector text according to the method selected from the list box.

- **None** – This option allows you to type according to the size of the vector text as defined in the **Size** box without using a bounding box.
 - **Limit by Box** – This option allows you to type vector text at the size defined in the **Size** box, until it reaches the edge of the bounding box. After reaching its edge, the vector text continues to reduce in size as you type, so that all characters can be contained within the bounding box.
 - **Scale to Box** – This option scales the vector text as you type, so that it fills as much of the area defined by the bounding box as possible.
2. If you want to set the dimensions of the bounding box:
 - Define the width and height of the bounding box in the **Width** and **Height** boxes.



Note: If you have applied a constraint setting to one or more characters in a block of vector text and the **Constraints** settings are not displayed on the page, these are displayed when the cursor moves over that character.

Fonts available for V-Bit Carving:

Arial Black

Brush Script MT

COPPERPLATEGOTHIC BOLD BT

Carlz MT

English Vivace BT

Juice TC

Lucinda Sans

Old English Text MT

Barchment

Times New Roman

Selecting Vector Text

You can select vector text while the **Text Tool** page is displayed using either of the following methods:

- Click and drag over the character or block of vector text that you want to select; or
- Hold the **Shift** key down on your keyboard, and then use the arrow keys on the keyboard to control your selection.
- The selected vector text is white and is highlighted in black:



Editing Vector Text

Text editing refers to making changes in vector text, such as adding and deleting, or copying and pasting individual characters or blocks of vector text.

You can add or delete characters when the **Text Tool** page is displayed in the **Assistant** window using your keyboard:

- Use the character keys on your keyboard to add characters to the block of vector text.
- Press the **Enter** key to start another line of text.
- Press the **Backspace** key on your keyboard to delete the last typed character.

You can use either of the following methods to edit a selected character or block of vector text after it has been created:

- Right-click on the block of vector text to display the Text Editing menu, and then click on the **Edit Text Block** option to display the **Text Tool** page.
- Press the **E** key on your keyboard to display the **Text Tool** page.

You can also cut, copy and/or paste a block of vector text after it has been created using the editing buttons in the **File** area of the **Assistant's** Home page.



Note: If you copy a block of vector text that contains multiple fonts, when you use the **Paste** button  the vector text is written in the font currently selected on the **Text Tool** page.



Note: A selected block of vector text that has already been transformed, e.g. sheared, appears as a default block while the **Text Tool** page is displayed. After closing the page, the transform is restored and any changes that you have made to the text are applied.



Tip: Use the **Transform** tool from the **Assistant** page to size and locate text.

You can delete a selected block of vector text when the **Text Tool** page is not displayed in the **Assistant** window using either of the following ways:

- Move the cursor over the block of vector text, and then press the **Delete** key on your keyboard.
- Right-click on the selected block of vector text to display the Vector Editing menu, and then click on the **Delete** option.

Wrapping Text Round a Curve

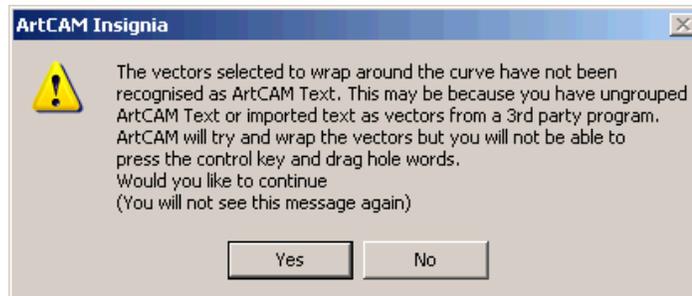
Part Wizard allows you to place vector text on or around any open or closed curved vector object.

Before you wrap a block of vector text around a curve, you must draw both the curved vector shape and the vector text.

To wrap vector text around a curved vector:

1. Select the curved vector object around which you want to wrap vector text.
2. Hold the **Shift** key on your keyboard, and then click to select the block of vector text you want to wrap. A bounding box surrounds the selected vector objects.
3. Click on the **Wrap Text Round a Curve** button  in the **Position Size Align Vectors** area of the **Assistant's** Home page.

If you are attempting to wrap imported vector text created in another package, or vector text that is ungrouped, the following message box appears:



If you want Part Wizard to attempt to wrap the vector text, click on the **Yes** button. The message box closes.



Warning: Although you can wrap imported vector text created in another package, or an ungrouped block of vector text created in Part Wizard, around a curved vector object, you cannot reposition whole words using the click and drag method detailed in this section. You can drag individual letters into position, and use the **Text Settings** options on the **Text on a Curve** page, but the results may not always be accurate and unwanted copies of the text may remain in your vector artwork.

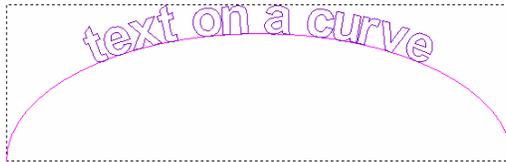
If you want to abort the wrapping of the text around the curve, click on the **No** button. The message box closes.

If the vector text was created in Part Wizard, you can now wrap the vector text around the curved vector object.

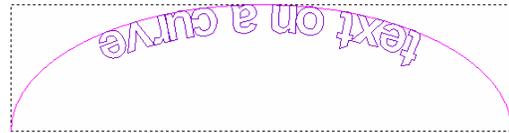
4. Click on the **Select** button to wrap the vector text around the selected vector object. You can reposition the block of vector text using either of the following methods:
 - Click and drag the vector text along the curve.
 - Use the **Text Settings** on the **Text on a Curve** page.

To reverse the direction of the curved vector object, click to select the **Text on other side** option .

Text on other side *Off...*



Text on other side *On...*

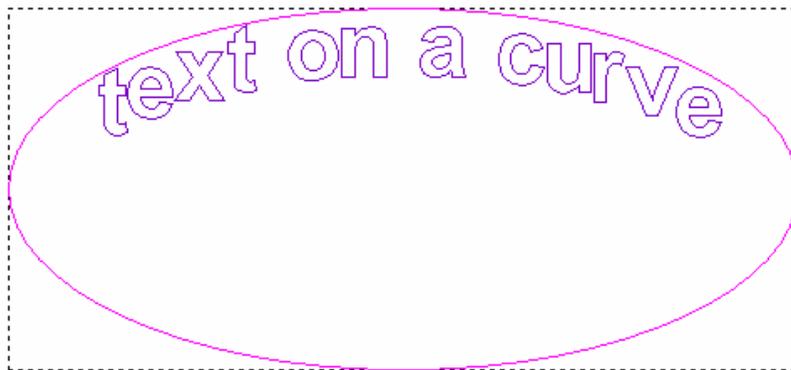


Text Alignment

You can align vector text to a curve either vertically or perpendicularly. When aligning text perpendicular to a curve, random characters can overlap one another making it extremely problematic to machine them. You can sweep text around a curve to avoid this problem altogether. You can also stretch vector text around the length of a curve.

When using the **Text on a Curve** tool, you can use the following **Text Alignment** option:

- **Vertical** - Click on this radio button to align the text vertical to the curve:



Text Spacing

You can set the distance between characters within a block of vector text using the **Text Spacing** slider.

Click the slider and drag to set the spacing. Drag to the right if you want to increase the spacing. Drag to the left to reduce it.

When you are satisfied with the spacing between the characters in the block of vector text, click on the **OK** button.

You can select what vector text you want to edit using the **Editing Style** options:

- **Whole Sentence** - Click on the radio button to move all text into position on the curve.
- **Single Words** - Click on the radio button to move a specific word into position on the curve.



Note: Alternatively, you can hold down the **Ctrl** key on your keyboard and then click and drag a specific word into place.

- **Single Letters** - Click on the radio button to move a character into position on the curve.



Note: Alternatively, you can hold down the **Alt** key on your keyboard and then click and drag a specific character into place.

Measuring Vector Objects

You can find out the size, position and angle of any vector object as follows:

1. Click on the **Measure Tool** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Measure** page.



Note: You can also display the **Measure** page by clicking on the **M** key on your keyboard.

2. Click on the position in the model from which you want to measure. This position is known as the **Anchor Point**.
3. Drag the mouse to the position to which you want to measure and then click.

Both the **Distance** and **Angle** between the current and anchor points are calculated and displayed on the **Measure** page.

Part Wizard calculates the measurement details in real time and displays them on the **Measure** page as you drag the cursor into position.

By default, the cursor snaps to specific positions on the vector objects or guidelines that have been drawn. For further information, see "Snapping to Objects" in the Part Wizard Layout chapter.



Note: To temporarily disable snapping, hold the **Shift** key down on your keyboard while dragging the cursor.

Transforming Vector Objects

You can transform a vector object directly from the **2D View** window or when the **Transform Vector(s)** page is displayed in the **Assistant** window.

Using Transform Vectors Mode

To transform a vector object directly from the **2D View** window, you must work in Transform Vectors mode.

To transform a vector object directly from the **2D View** window:

1. Select the vector object that you want to transform.
2. Use any of the following methods to enter Transform Vectors mode:

- Click on the **Transform Vectors** button  in the **Vector Creation** area.



Note: If the **Transform Vectors Mode** button is shown as  in the **Vector Creation** area, you are already in Transform Vectors mode.

- Press the **T** key on your keyboard.
- Hold the **Ctrl** key down on your keyboard, and then click until transform handles appear on the bounding box that surrounds the selected vector object.

The **Transform Vectors Mode** button changes to . Resizing handles, a rotation handle and shearing control points are displayed about the selected vector object.



Note: If you click outside of the bounding box that surrounds the selected vector object once, Part Wizard remains in Transform Vectors mode. If you click more than once, Part Wizard returns to Select Vectors mode.

When working in Transform Vectors mode, you can transform the selected vector object in the following ways:

- To move the vector object, move the cursor over its center, one of its spans or its bounding box, and then click and drag it into position.



Note: Hold down the **Ctrl** key on your keyboard to keep a copy of the selected vector object in its original position when moving it.

- To adjust the size and shape of the vector object, move the cursor over any of its resizing handles, and then click and drag.



Note: Hold down the **Shift** key on your keyboard when scaling to preserve the ratio between the vector object's width and height.



Note: Hold down the **Alt** key on your keyboard when scaling to scale the selected vector object about the center of its bounding box.

- To adjust the angle of the vector object, click and drag the rotation handle joined to its center of gravity.
- To shear the vector object vertically, move the cursor over the control point outside of the bottom edge of the bounding box, and then click and drag.
- To shear the vector object horizontally, move the cursor over the control point outside of the right edge of the bounding box, and then click and drag.



Note: If you want to transform the selected vector object about a defined origin and/or using specific values, press the **T** key on your keyboard again to display the **Transform Vector(s)** page in the **Assistant** window.

Using the Transform Vector(s) Page

You can use the **Transform Vector(s)** page to transform a selected vector object in a number of ways.

To display the **Transform Vector(s)** page:

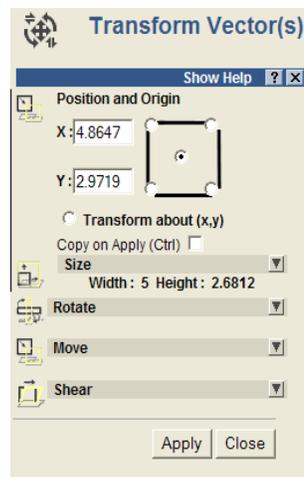
1. Select the vector object that you want to transform.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area of the **Assistant's Home** page.



Note: You can also display the **Transform Vector(s)** page by 1) pressing the **T** key on your keyboard twice or 2) clicking on **Vectors > Transform** from the Main menu bar or 3) right-clicking before selecting **Transform Vector(s)** from the menu.

The **Transform Vector(s)** page is divided into the following areas:

- **Position and Origin** - This allows you to define the origin about which the selected vector object is transformed.
- **Size** - This allows you to change the size of the selected vector object.
- **Rotate** – This allows you to spin a selected vector object around the model's X and Y-axes.
- **Move** – This allows you to move a selected vector object along the X and Y-axis.
- **Shear** - This enables you to shear a selected vector object.



Defining the Transform Origin

You can transform a selected vector object relative to a defined origin using the **Position and Origin** area of the **Transform Vector(s)** page.

To define the origin by which you want to reposition, resize or rotate a selected vector object:

1. Select the vector object that you want to transform.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page in the **Assistant** window.
3. The co-ordinates in the **X** and **Y** boxes show the current position of the transform origin. Define the new origin about which you want to transform the selected vector object in any of the following ways:
 - Click on any of the five radio buttons  on the rectangle diagram to set the origin to one of five pre-set positions. The co-ordinates of the selected position are displayed in the **X** and **Y** boxes.
 - Define the X and Y co-ordinates of the position you want to set as the origin in the **X** and **Y** boxes.
 - Click to select the **Transform about (x,y)** option . The default **X** and **Y** boxes are greyed-out and new **X** and **Y** boxes are displayed on the page. The **+** icon appears in the **2D View** window, marking the current position of the transform origin.

To set the origin you can either define its X and Y co-ordinates in the **X** and **Y** boxes or move the **+** cursor to the position in the **2D View** window that you want to use, and then click to select. In the latter instance, the co-ordinates of the selected position are displayed in the **X** and **Y** boxes.
4. Click on the **Apply** button to define the transform origin. You can now transform the selected vector object about this origin.

Scaling Vectors

You can change the size of a vector object using the **Size** area of the **Transform Vector(s)** page in the following ways:

- Using specific measurements.
- Using the slider.
- Using a percentage of its original size.



Tip: The Transform function uses the bounding box surrounding the selected vectors as the reference for changing the size. For some odd-shaped objects, **Offset Vectors** may be the more satisfying choice.

To change the size of a vector object using specific measurements:

1. Select the vector object that you want to resize.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to resize the selected vector object is correct.
4. If you want to preserve the ratio between the width and height of the selected vector object, make sure that the **Link Width and Height** option is selected . This option is selected by default.
5. Define the width of the selected vector object using the **New Width** box. If the **Link Width and Height** option is selected , the current value in the **New Height** box is adjusted. If the **Link Width and Height** option is deselected , you must define its height using the **New Height** box.



Note: If you want to keep a copy of the selected vector object in its original size, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when scaling.



Note: Hold down the **Shift** key on your keyboard when scaling to preserve the ratio between the vector object's width and height

Hold down the **Alt** key on your keyboard when scaling to scale the selected vector object about the center of its bounding box.

6. Click on the **Apply** button to resize the selected vector object. The values shown in the **New Width** and **New Height** boxes are adjusted.
7. Click on the **OK** button to return to the **Assistant's** Home page.

To change the size of a vector object using the slider:

1. Select the vector object that you want to resize.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to resize the selected vector object is correct.
4. If you want to preserve the ratio between the width and height of the selected vector object, make sure that the **Link Width and Height** option is selected . This option is selected by default.



Note: If the **Link Width and Height** option is deselected , only the width of the selected vector object can be adjusted using the slider.



Note: If you want to keep a copy of the selected vector object in its original size, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when scaling.

5. Click and drag the slider in the appropriate direction:
 - Drag to the right if you want to increase the size of the selected vector object.
 - Drag to the left if you want to reduce the size of the selected vector object.



Note: If you drag the slider without selecting the **Link Width and Height** option , only the value in the **New Width** box changes.

A preview image of the new size of the selected vector object appears in the **2D View** window.

6. Click on the **Apply** button to resize of the selected vector object.
7. Click on the **Close** button to return to the **Assistant's** Home page.

To scale a vector object as a percentage of its original size:

1. Select the vector object that you want to resize.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to resize the selected vector object is correct.
4. Define the percentage of the vector object's original size to which you want it to be scaled in the **Scale** box.



Note: If you want to keep a copy of the selected vector object in its original size, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when scaling.

5. Click on the **Apply** button to resize of the selected vector object. The values shown in the **New Width** and **New Height** boxes are adjusted.
6. Click on the **Close** button to return to the **Assistant's** Home page.

Rotating Vectors

You can rotate a vector object in two ways using the **Rotate** area of the **Transform Vector(s)** page:

- Using a specific angle.
- Using the slider.

To rotate a vector object using a specific angle:

1. Select the vector object that you want to rotate.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to rotate the selected vector object is correct.
4. Define the angle by which you want to rotate the selected vector object in the **Rotate** box:
 - A positive value rotates the selected vector object clockwise.
 - A negative value rotates the selected vector object anti-clockwise.



Note: If you want to keep a copy of the selected vector object in its original position, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when rotating.

5. Click on the **Apply** button to rotate the selected vector object by the defined angle.
6. Click on the **Close** button to return to the **Assistant's** Home page.

To rotate a vector object around the X and Y axes using the sliders:

1. Select the vector object that you want to rotate.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to rotate the selected vector object is correct.
4. Click and drag the slider in the appropriate direction:
 - Drag to the right if you want to rotate the selected vector object clockwise.
 - Drag to the left if you want to rotate the selected vector object anti-clockwise.



Note: If you want to keep a copy of the selected vector object in its original position, click to select the **Copy on Apply (Ctrl)** option  or hold down the **Ctrl** key on your keyboard when rotating.

5. Click on the **Apply** button to rotate the selected vector object by the angle shown in the **Rotate** box.
6. Click on the **Close** button to return to the **Assistant's** Home page.

Moving Vectors

You can reposition a vector object in two ways using the **Move** area of the **Transform Vector(s)** page:

- Using specific co-ordinates.
- Using the sliders.

To move a vector object to a specific position:

1. Select the vector object that you want to move.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to move the selected vector object is correct.
4. Define the co-ordinate to which you want to move the selected vector object along the X-axis in the **Move X** box.

A positive value moves the selected vector to the right, while a negative value moves it to the left.



Note: If you want to keep a copy of the selected vector object in its original position, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when moving.

5. Define the co-ordinate to which you want to move the selected vector object along the Y-axis in the **Move Y** box.
A positive value moves the selected vector upwards, while a negative value moves it downwards.
6. Click on the **Apply** button to reposition the selected vector object.
7. Click on the **Close** button to return to the **Assistant's** Home page.

To move a vector object along the X and Y axes using the sliders:

1. Select the vector object that you want to move.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Make sure that the origin by which you want to move the selected vector object is correct.
4. Click and drag the sliders in the appropriate direction:
 - Drag the **Move X** slider to the right if you want to move the selected vector object to the right.
 - Drag the **Move Y** slider to the right if you want to move the selected vector object upwards.
 - Drag the **Move X** slider to the left if you want to move the selected vector object to the left.
 - Drag the **Move Y** slider to the left if you want to move the selected vector object downwards.



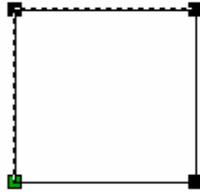
Note: If you want to keep a copy of the selected vector object in its original position, click to select the **Copy on Apply (Ctrl)** option  or hold down the **Ctrl** key on your keyboard when moving.

5. Click on the **Apply** button to reposition the selected vector object.
6. Click on the **Close** button to return to the **Assistant's** Home page.

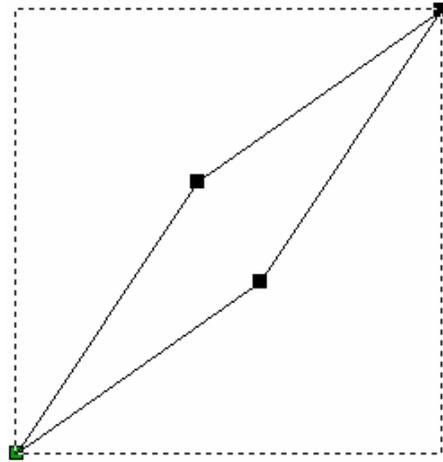
Shearing Vectors

Shearing can be visualised by thinking of an image superimposed onto a flexible rubber sheet. If you hold the sides of the sheet and move them up and down in opposite directions, the image undergoes a spatial stretching known as shearing:

Before Shearing...



After Shearing in the X-axis...



You can shear a vector object in two ways using the **Shear** area of the **Transform Vector(s)** page:

- Using specific angles.
- Using the sliders.

To shear a vector object using specific angles:

1. Select the vector object that you want to shear.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. Define the angle by which you want to shear the selected vector object vertically in the **Shear X** box.



Note: If you want to keep a copy of the selected vector object in its original shape, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when shearing.

4. Define the angle by which you want to shear the selected vector object horizontally in the **Shear Y** box.
5. Click on the **Apply** button to shear the selected vector object.
6. Click on the **Close** button to return to the **Assistant's** Home page.

To shear a vector object along the X and Y axes using the sliders:

1. Select the vector object that you want to shear.
2. Click on the **Transform Vector(s)** button  in the **Position Size Align Vectors** area to display the **Transform Vector(s)** page.
3. To shear the vector object vertically, click and drag the **Shear X** slider.



Note: If you want to keep a copy of the selected vector object in its original shape, click to select the **Copy on Apply (Ctrl)** option or hold down the **Ctrl** key on your keyboard when shearing.

If you want to shear the vector object horizontally, click and drag the **Shear Y** slider.

4. Click on the **Apply** button to shear the selected vector object.
5. Click on the **Close** button to return to the **Assistant's** Home page.

Manipulating Vector Objects

There is a range of tools in both the **Position Size Align Vectors** and **Group Merge Join Vectors** areas of the **Assistant's** Home page designed to assist you in manipulating vector objects.

Mirroring Vectors

Using the **Mirror Vectors** page, you can reverse the direction of a vector object from its original position.

To mirror a selection of vector objects:

1. Select the vector objects that you want to mirror.
2. Click on the **Mirror Vectors** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Mirror Vectors** page.



Note: You can also display the **Mirror Vectors** page from the Main menu bar by clicking on the **Vectors** menu and then on the **Mirror...** option.

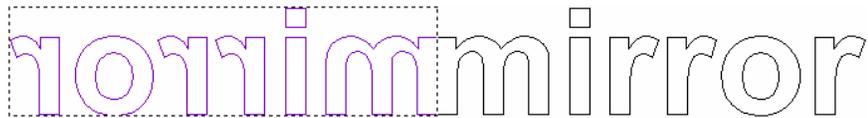
3. If you want to produce mirrored copies and keep the original position of the selected vector objects, click to select the **Copy the Original Vectors (Ctrl)** option or hold down the **Ctrl** key on your keyboard when mirroring.
4. Click on any of the options listed in the **Mirror Types** area of the page to mirror the selected vector object.
5. Click on the **Close** button to return to the **Assistant's** Home page.

Using the Mirroring Options

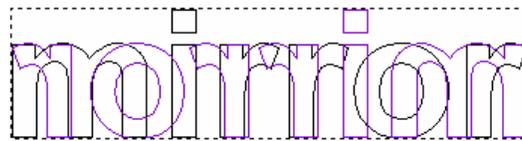
You can mirror a selected vector object horizontally, vertically or about a line.

You can use the options in the **Mirror Types** area of the **Mirror Vectors** page to mirror a vector object in the **Horizontal** plane in the following ways:

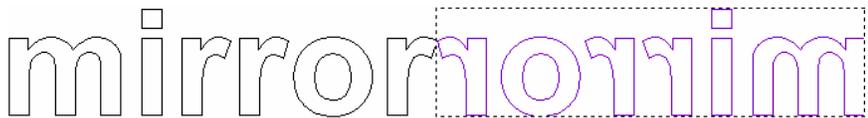
- **Left** - This option mirrors the selected vector objects in the horizontal plane about a point on the left edge of the selected vector objects:



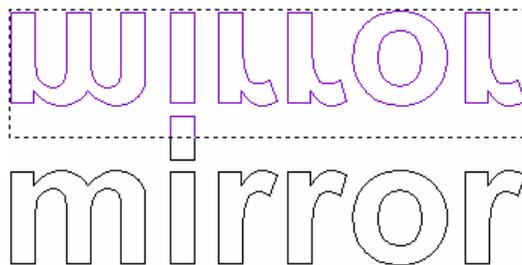
- **Center** - This option mirrors the selected vector objects in the horizontal plane about a point in the center of the selected vector objects:



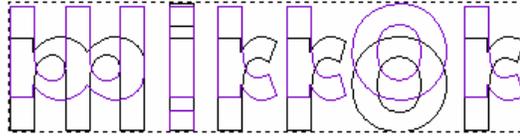
- **Right** - This option mirrors all your selected vector objects in the horizontal plane about a point on the right edge of the selected vector objects:



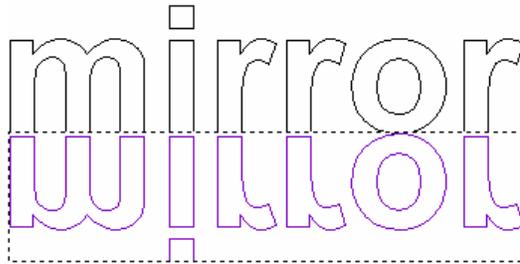
- **Top** - This option mirrors all your selected vector objects in the horizontal plane about a point on the top edge of the selected vector objects:



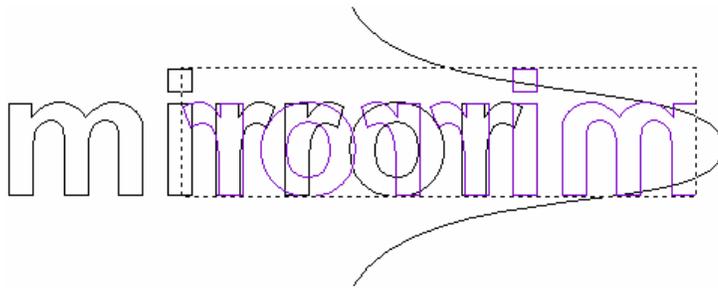
- **Center** - This option mirrors the selected vector objects in the vertical plane about a point in the center of the selected vector objects:



- **Bottom** - This option mirrors the selected vector objects in the horizontal plane about a point on the bottom edge of the selected vector objects:



You can also mirror a selected vector object about an open vector object, such as a polyline, using the **About Line** option on the page:



To mirror a vector object about an open vector object:

1. Select the open vector object about which you want to mirror a vector object.
2. Hold the **Shift** key down on your keyboard, and then click to select the vector object that you want to mirror.
3. Click on the **Mirror Vectors** button  in the **Vector Creation** area of the **Assistant's** Home page to display the **Mirror Vectors** page.
4. Click on the **About Line** option on the **Mirror Vectors** page.
5. Click on the **Close** button to return to the **Assistant's** Home page.

Aligning Vectors

You can position two or more vector objects relative to one another in different ways using the align buttons in the **Position Size Align Vectors** area of the **Assistant**'s Home page.

Every vector object that you select will be aligned to the vector object selected last. This is referred to as the base vector object. You may wish to **Group** objects together before aligning them to the base vector object.

To align two or more vector objects:

1. Select two or more vector objects that you want to position relative to one another. The order of selection is important. Select the object you wish to align to **LAST**. A bounding box surrounds all of the selected vector objects.
2. Click on the appropriate align button in the **Position Size Align Vectors** area of the **Assistant**'s Home page to align all of the selected vector objects relative to the base vector object:
 - Click on the **Align Left** button  to align the left edge of all other selected vector objects to the left edge of the base vector object.
 - Click on the **Align Right** button  to align the right edge of all other selected vector objects to the right edge of the base vector object.
 - Click on the **Align Top** button  to align the top edge of all other selected vector objects to the top edge of the base vector object.
 - Click on the **Align Bottom** button  to align the bottom edge of all other selected vector objects to the bottom edge of the base vector object.



Note: You can also use the **Ctrl +** arrow keys on your keyboard to align all other selected vector objects to the base vector object.

Centering Vectors

You can center one or more vector objects inside of another in different ways using the centring buttons in the **Position Size Align Vectors** area of the **Assistant**'s Home page.

Every vector object you select will be centered inside of the vector object selected last. This is referred to as the base vector object. You may wish to **Group** objects together before aligning them to the base vector object.

To center one or more vector objects inside of another:

1. Select two or more vector objects that you want to position relative to one another. The order of selection is important. Select the object you wish to center within LAST. A bounding box surrounds all of the selected vector objects.
2. Click on any of the centring buttons in the **Position Size Align Vectors** area to center all of the selected vector objects inside of the base vector object:
 - Click on the **Center Vertically** button  to align the center of all other selected vector objects to the center in the X-axis of the base vector object.
 - Click on the **Center Horizontally** button  to align the center of all other selected vector objects to the center in the Y-axis of the base vector object.
 - Click on the **Center Vector** button  to align the center of all other selected vector objects to the center of the base vector object.



Note: You can also use the **Shift +** arrow keys on your keyboard to Center all other selected vector objects to the base vector object.

Center in Page

- Click on the **Center In Page** button  or **F9** to align the center of all the selected vector objects to the center of the model area (the white area).

Merging Vectors

You can merge two or more shapes of vector objects in order to create a new shape of vector object using the merging buttons in the **Group Merge Join Vectors** area of the **Assistant's** Home page.



Warning: You can only merge two or more vector objects if they are ungrouped and overlapping. For further information, see "Ungrouped Vectors".

To merge two or more ungrouped vector objects:

1. Select the vector objects that you want to merge.
2. Click on any of the merging buttons in the **Group Merge Join Vectors** area to merge the selected vector objects:



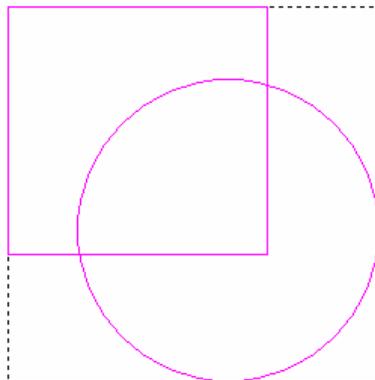
Note: You can also merge the selected vectors using the Main menu bar. Click on the **Vectors** menu, and then on the **Merge Vectors** option followed by the merging option you want to use: **Weld**, **Intersect**, or **Subtract**.

- Click on the **Weld Vectors** button  to take two or more vector objects and create a new vector object that is the outline of them when fused together:

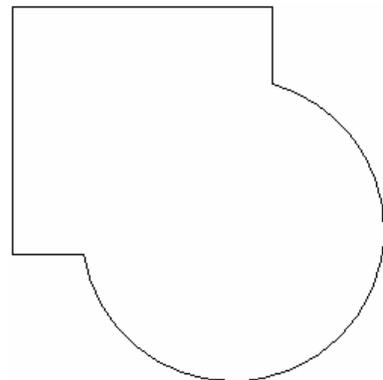


Warning: The **Weld Vectors** button  is the only merging button in the **Group Merge Join Vectors** area of the **Assistant's** Home page that you can use to merge more than two overlapping vector objects.

Before...

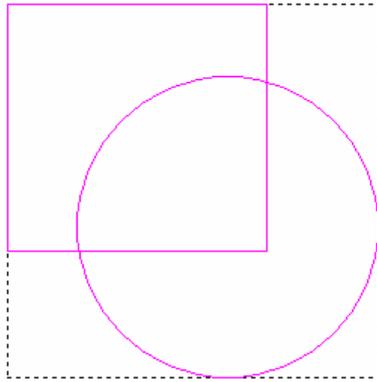


After...

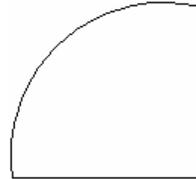


- Click on the **Intersect Vectors** button  to take two vector objects and create a new vector object that is the shape of the area where they overlap:

Before...

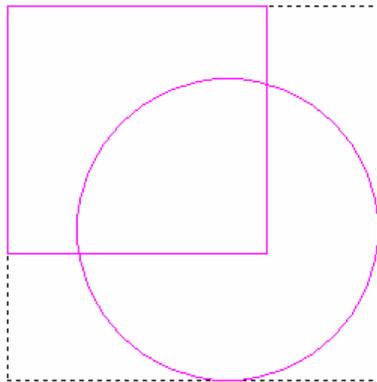


After...

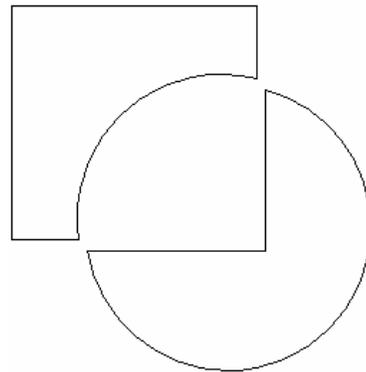


- Click on the **Trim Vectors** button  to combine two selected vector objects in such a way that all that remains are the areas of the vector objects which are not overlapping:

Before...



After...



Joining Vectors

You can join two or more vector objects to create one of two types of new shape using the joining buttons in the **Group Merge Join Vectors** area of the **Assistant's** Home page.



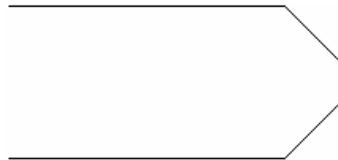
Note: The vector objects must be open and ungrouped.

To join together open, ungrouped vector objects:

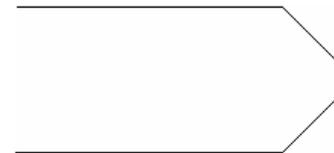
1. Hold the **Shift** key down on your keyboard, and then click to select the adjacent vector objects that you want to join together.
2. Click on any of the joining buttons in the **Group Merge Join Vectors** area of the **Assistant's** Home page to join the selected vector objects:

- Click on the **Join Vectors With A Line** button  to link the nearest points in the two vector objects with a linear span:

Before...

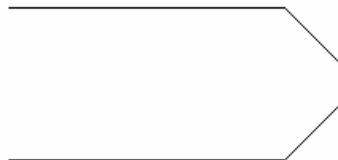


After...



- Click on the **Join Vectors By Moving Ends** button  to link the nearest points in the two vector objects by moving each of their end points to a central position:

Before...



After...



Closing Vectors

You can close an open vector object to create one of two types of closed vector object using the closing buttons in the **Group Merge Join Vectors** area of the **Assistant's** Home page.



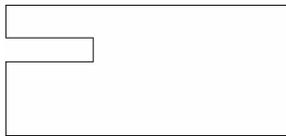
Note: The vector objects must be ungrouped.

To close an open vector object:

1. Select the vector object that you want to close. The selected vector object is magenta.
2. Click on any of the closing buttons in the **Group Merge Join Vectors** area of the **Assistant's** Home page:

- Click on the **Close Vector With A Line** button  to join the Start Point and end point with a linear span, as shown below:

Before...

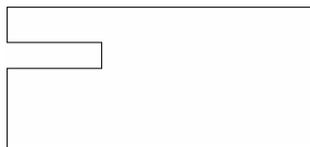


After...

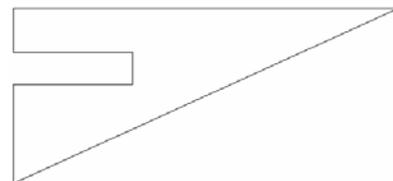


- Click on the **Close Vector – Move End Points** button  to join the end point with the Start Point, as shown below:

Before...



After...



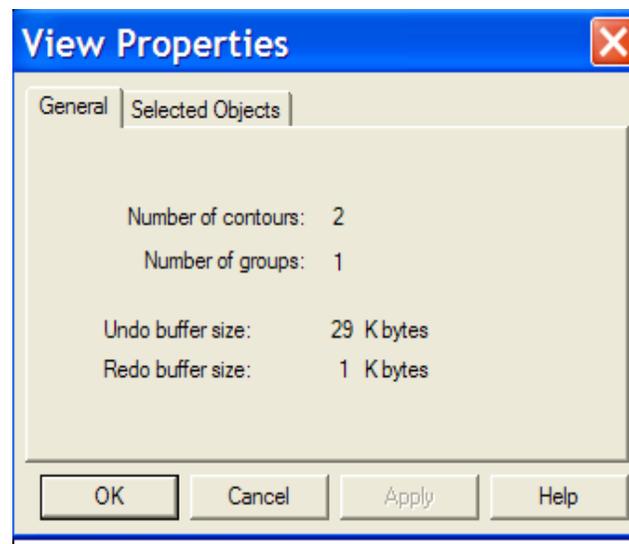
Viewing the Properties of a Vector Object

You can find out the number of points (nodes), linear, bezier curve or arc spans within any ungrouped vector object using the **Vector Properties** dialog box.

To view the properties of an ungrouped vector object:

1. Select an ungrouped vector object.
2. Right-click to display the Vector Editing menu, then click on the **Properties...** option to display the **Vector Properties** dialog box.

The **General** page of the **Vector Properties** dialog box is displayed by default:



The **Number of Spans** area shows the total number of spans in the selected vector object. It also shows the number of linear, bezier curve and arc spans that make up the total number of spans.

The **Number of points** area shows the number of points and control points in the selected vector object. Numbers of points and control points are not counted separately.

There is only one **Layer** in Part Wizard.

3. Click on the **OK** button to close the **Vector Properties** dialog box.

Reversing a Vector Object's Direction

You can reverse the current direction of any closed vector object to determine the cutting direction in the toolpath used during the machining process. However, the most efficient way to determine the cut direction of a closed vector is to select the cut direction in the toolpathing.

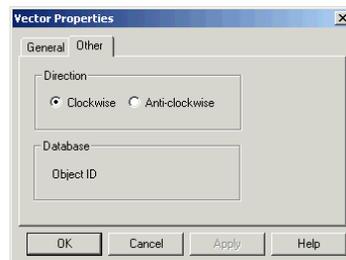
Ungrouped Vectors

To reverse the direction of an ungrouped, closed vector object:

1. Select an ungrouped, closed vector object. The vector object is magenta.
2. Right-click to display the Vector Editing menu, and then click on whichever direction change option is available:
 - **Make Clockwise** – To set the vector object's direction as clockwise.
 - **Make Anti-Clockwise** – To set the vector object's direction as anti-clockwise.

You can also reverse the direction of an ungrouped, closed vector object if you:

1. Right-click to display the Vector Editing menu, then click on the **Properties** option to display the **Vector Properties** dialog box:
2. Click on the **Other** tab to display the **Other** page:



3. Click on the appropriate **Direction** radio button :
 - **Clockwise** or **Anti-clockwise**
 - Click on the **OK** button to set the direction and close the **Vector Properties** dialog box.

Grouped Vectors

You can reverse the direction of a grouped, closed vector object that you have created.

To reverse the direction of a grouped, closed vector object:

1. Select a grouped, closed vector object. The selected vector object is purple.
2. Right-click to display the Vector Editing menu, then click on the **Reverse Vector(s)** option.

You can confirm the direction of a grouped, closed vector object by ungrouping it after you click on the **Reverse Vector(s)** option, and then regrouping it again.

Importing Vector Artwork

In Part Wizard, you can import vector artwork saved as ***.dxf**, ***.eps**, ***.dwg**, ***.ai**, ***.wmf** or ***.pic** files into an open model. For more details, see "Importing Vector Artwork" in the Working with Models chapter.

Imported artwork comes in as a Grouped Object. Before you can manipulate the artwork, you must **Ungroup** it.

Machining Models

Overview



Warning: It is assumed that you already know how to operate your machine tool, and that you are able to select the appropriate tools and the necessary cutting conditions for the job you are doing. If you are not confident about any aspect of operating your machine tool, consult a member of staff or your machine tool supplier.

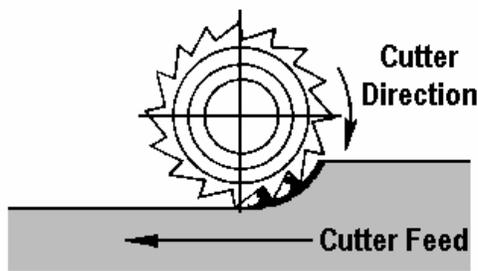
You use toolpaths to machine all or part of a model from the vector objects you have created.

Part Wizard provides a database containing a broad selection of tools (bits) that you can use when creating your toolpaths. You can edit the machining parameters of these tools and add new tools to the database if necessary.

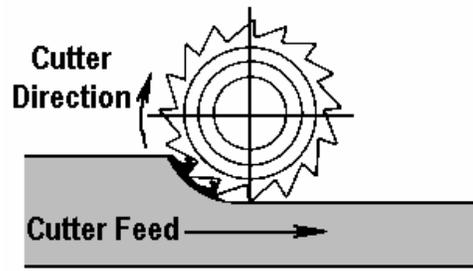
You can control the cut direction of the tools used for machining by selecting either Conventional or Climb Milling in almost all of the toolpaths available in Part Wizard.

In Conventional Milling, the teeth of the tool meet the block of material at the bottom of the cut. The teeth of the tool slide along until sufficient pressure builds up to break through the material surface. This sliding action, under pressure, tends to abrade the edge of the tool, which results in dulling. Also, the cutting action has a tendency to lift the block of material, fixture and table from their positions.

Climb Milling...



Conventional Milling...



In Climb Milling, the teeth of the tool meet the block of material at the top of the cut, at the thickest part of the chip. This provides instant engagement of the tool with the block, providing a chip of definite thickness at the start of the cut. Climb Milling does not cause the abrasive action cause by Conventional Milling. It also permits the gradual removal of the tool from the block, so that dwell marks are largely eliminated. Climb Milling often provides a better finish, permits greater tool feed rates and prolongs the life of a tool.

In order to machine the model that you have created, you must generate a part file from the toolpaths you have calculated. A part file contains one or more calculated toolpaths. Each part file is made up of a sequence of commands, which directs the ShopBot CNC machine along the paths it is required to follow to produce your part.

You save the part file in a format called .sbp (ShopBot Part) recognised by your ShopBot PRT. This ensures that the commands within the part file are interpreted accurately by your system.

Since the standard ShopBot does not have a tool changer, you must generate separate part files for each bit or tool that you want to use.

Using Toolpaths

Part Wizard provides a number of toolpaths that you can use to machine all or part of a model. These are available using the **Toolpaths** Home page, which is displayed when you click on the **Toolpaths** tab .

You can also find buttons on the **Toolpaths** Home page that assist you in managing and modifying the toolpaths you have created.

You can define the parameters of individual tools when you work with the **Tool Library**.

Toolpaths

With Part Wizard, you can machine your model with the following types of toolpaths:

- **Profiling.**
This toolpath machines either outside or inside the boundary of a vector object. Part Wizard moves the toolpath outside (inside) the design lines the radius of the bit.
- **2D Area Clearance.**
This toolpath clears an area of material either inside the boundary of a vector object (pocket) or between the vector object and a border for a raised look.
- **V-Bit Carving.**
V-Bit Carving uses the shape of the V-Bit and the 3-D movement of the ShopBot to create an engraved look to text. With Part Wizard, you can V-Bit carve in 10 fonts.
- **Drilling Holes.**
This toolpath allows you to create drill holes.
- **Machine Vectors.**
This toolpath follows right along the design lines or boundary of a vector object with the center of a tool.



Note: When you set up the dimensions of your model, you defined whether the origin (zero) of the Z was at the surface of the material (top of block) or the surface of the table (machine bed). Part Wizard uses that information to calculate **Start Depth** and **Finish Depth**. If you need to change that in the model, do so before you begin to create toolpaths. From the Main menu bar, **Model > Set Size** brings up the **Set Up Job Dimensions** screen.

You will use the settings in the **Tool Library** to determine the depth of cut for each pass of a toolpath.



Tip: It is a good idea to **Save** your .art file before you start toolpathing it, then use **Save As** and give the file another name so that your design artwork remains intact in case something goes wrong during the toolpathing sessions.

Profiling



The **2D Profiling** button  in the **2D Toolpaths** area of the **Toolpaths** Home page allows you to create a toolpath for machining either inside or outside the boundary of a selected vector object.

A Profile toolpath is ideal for cutting out letters and shapes from a block.

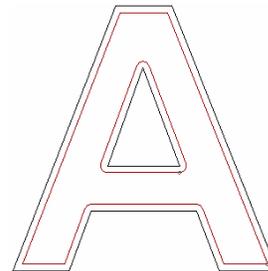
To profile a vector object:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Select the vector object that you want to profile.
3. Click on the **2D Profiling** button  in the **2D Toolpaths** area of the **Toolpaths** Home page to display the **Profiling** page.
4. In the **Profile Side** area of the page:
 - Click on the **Outside** radio button to instruct the tool to profile outside of the selected vector object.
 - Click on the **Inside** radio button to instruct the tool to profile inside of the selected vector object.

Profile Side – Outside...

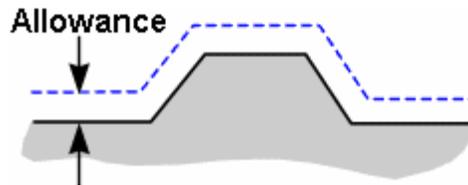


Profile Side – Inside...



5. The **Start Depth** (default = 0) defines the depth (Z) at which you want to start the cut into the surface of the material.
6. Define the depth (Z) of the cut from the surface of the material in the **Finish Depth** box. The program defaults to the thickness of the material, but you may change this value. Enter the value as an absolute (positive) number.

7. If you want to add or remove extra material around the vector object, define the distance between the boundary of the selected vector object and the profiling tool in the **Allowance** box. Type a positive value to add material or a negative value to remove it.



8. Define how closely you want the cutter to follow the shape of the vector object in the **Tolerance** box (default = .001)
9. If you want to change the height at which the Profiling tool makes rapid moves between toolpath segments:
 - First, click on the  arrow in the **Machine Safe Z** area to display the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, define the height in the **Safe Z** box.

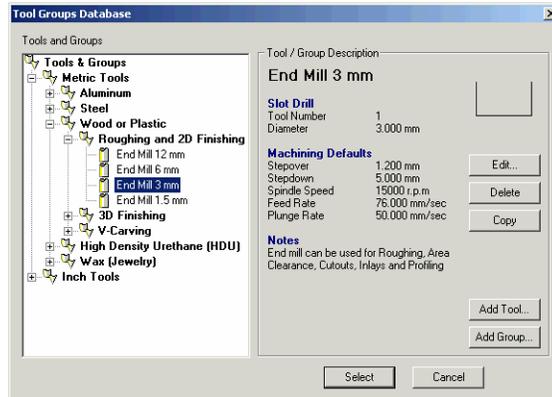
If you want to define the **Home Position** for the machining tool:

- First, define the X, Y and Z co-ordinates of the home position in the **Home Position**'s **X**, **Y** and **Z** boxes.
- Next, click on the  arrow in the **Machine Safe Z** area to hide the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.



Warning: If you have set the Material Z Zero to **Machine Bed** when you set up the Model, please make sure that the position of your **Safe Z** is sufficient to clear the thickness of the material and **add enough height so that the rapid moves clear the material**. The software will warn you if the Safe Z is not sufficient to clear the material, and will adjust the Home Z to match the Safe Z.

10. Click on the **Select** button in the **Profiling Tool** area of the page to open the **Tool Groups Database**:



11. Double-click on the tool you want to use. Part Wizard closes the **Tool Groups Database** and displays the selected tool's description in the **Profiling Tool** area. See "Using the Tools Group Database" for more information on setting up your tool library.

If you want to amend the machining parameters for the selected tool, click on the  arrow in the **Profiling Tool** area.

When you have finished, click on the  arrow to hide the machining parameters.

12. The cutting direction defaults to **Climb Mill**. If you want to change this, click on the  arrow in the **Cut Direction** area, then click to select either of the **Cut Direction** radio buttons :

- **Climb Mill** - Climb Milling rotates the cutter in the same direction as the feed motion.
- **Conventional** – Conventional Milling rotates the cutter in the opposite direction to the feed motion. For more details, see "**Overview**".

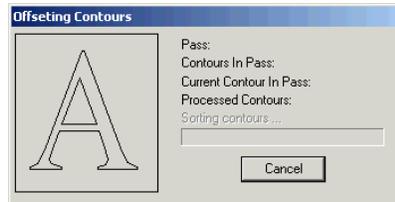
13. See below to:

- **Add lead in** move to control where your tool cuts into the block of material *OR*
- **Add bridge** at the start of the cut to help hold the part in place while cutting

14. Type a name for the toolpath in the **Name** box.

15. **Calculate** the toolpath.

The **Offsetting Contours** dialog box is displayed while Part Wizard calculates the toolpath:



A dark red line represents the machining passes used to profile the selected vector object in the model. It is drawn either inside or outside of its boundary, according to the **Profile Side** that you had selected.

16. Click on the **Close** button to return to the **Toolpaths** Home page.

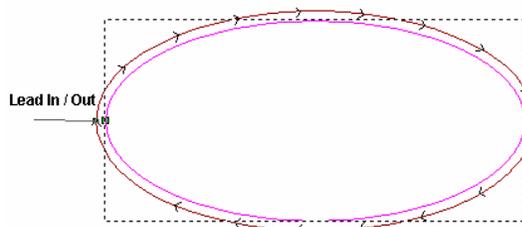
Add Lead In/Add Bridges to Start Point

Only one of the next two options, **Add Lead In** and **Add Bridges to Start Point**, may be chosen at a time.

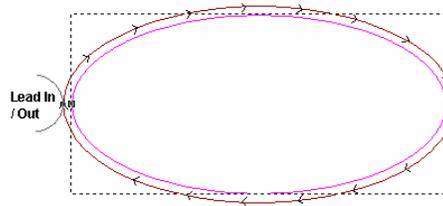
1. To add lead moves to the toolpath, click to select the **Add Lead In Moves** option .

- Define the distance from the toolpath that you want the tool to cut into the vector object's boundary in the **Distance (D)** box.
- Select how you want the tool to move using the **Add Lead In/Out Moves** radio buttons . Part Wizard only adds Lead Ins, and not Lead Outs:

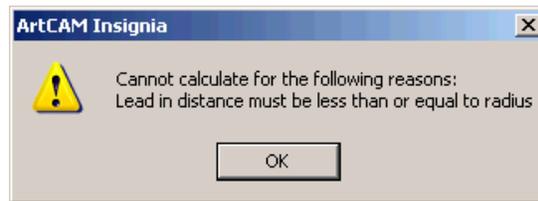
Linear – Click on the **Linear** option to instruct the tool to lead into and out of the vector object's boundary in a straight-line motion:



Circular Arc – Click on the **Circular Arc** option  to instruct the tool to lead into and out of the vector object's boundary in an arc motion:



If you select the **Circular Arc** option, define the radius of the arc in the **Radius (R)** box. The value in the **Distance (D)** must be less than or equal to the value in the **Radius (R)** box, otherwise the following message box appears when you calculate the toolpath:



Click on the **OK** button to close the message box.

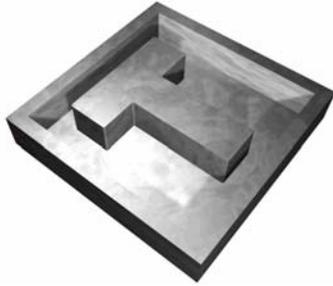


Tip: If you wish to change the start point after starting to create a toolpath, close the Toolpath screen, put the cursor on the new Start Point and right click to bring up the Point menu. Choose the New Start point option. Then, re-open the Toolpath screen and choose the Lead-In option.

2. To add a bridge at the beginning lead moves to the toolpath, choose the **Add Bridges to Start Points** radio button . Fill in the blanks to determine the length and height of the single bridge.

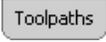
Calculate, Name and **Close** the **Profile** page as above.

2D Area Clearance



The **Area Clearance** button  in the **2D Toolpaths** area of the **Toolpaths** Home page allows you to create a toolpath to clear an area of material based on the boundaries of the vector objects you have selected.

To area clear a vector object:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Select the vector objects that represent the area you want to clear.



Tip: To create the look of a raised object or text, place a border around the area that you want to be raised. Then, select the object or text, hold down the Shift key, and select the border. The area between the object/text and the border will be cleared.

3. Click on the **Area Clearance** button  in the **2D Toolpaths** area of the **Toolpaths** Home page to display the **2D Area Clearance** page.
4. The **Start Depth** (default = 0) defines the depth (Z) at which you want to start the cut into the surface of the material.
5. Define the depth (Z) to which you want to clear in the **Finish Depth** box. Enter the value as an absolute (positive) number, the software will figure how far down from the surface of the material it needs move.
6. If you want to add or remove extra material around the vector object, define the distance between the boundary of the selected vector object and the cutting tool in the **Allowance** box. Type a positive value to add material or a negative value to remove it.
7. Define how closely you want the cutting tool(s) to follow the shape of the vector object in the **Tolerance** box (default = 001).

8. If you want to change the height at which a cutting tool makes rapid moves between toolpath segments:

- First, click on the  arrow in the **Machine Safe Z** area to display the **Safe Z** box and the **Home Position's X, Y and Z** boxes.
- Next, define the height in the **Safe Z** box. See Warning

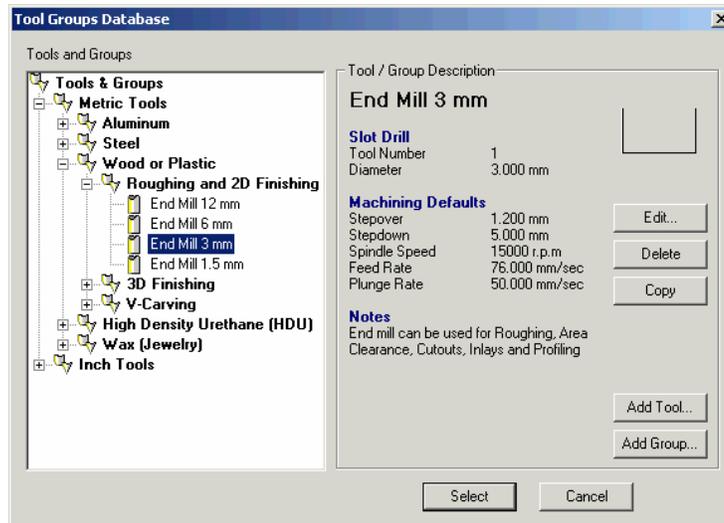


in Profile for information about Safe Z.

If you want to define the **Home Position** for the machining tool(s):

- First, define the X, Y and Z co-ordinates of the home position in the **Home Position's X, Y and Z** boxes.
- Next, click on the  arrow in the **Machine Safe Z** area to hide the **Safe Z** box and the **Home Position's X, Y and Z** boxes.

9. In the **Tools List** area, click on the **Add** button to open the **Tool Groups Database**:



17. Double-click on the tool you want to use. Part Wizard closes the **Tool Groups Database** and displays the selected tool's description in the **Profiling Tool** area. See "Using the Tools Group Database" for more information on setting up your tool library.

If you want to amend the machining parameters for the selected tool, click on the  arrow in the **Profiling Tool** area.

When you have finished, click on the  arrow to hide the machining parameters.

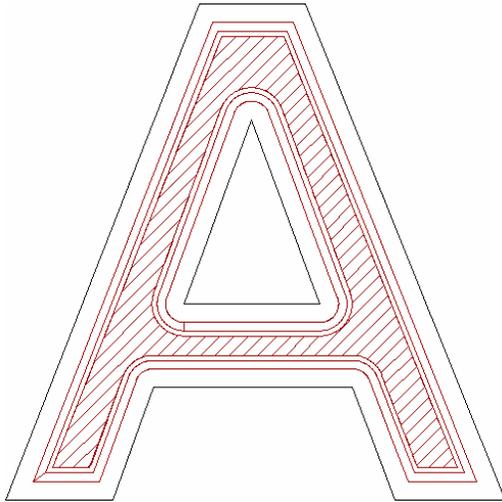
10. Select how you want the tool to clear the area using the **Tool Clearance Strategy** radio buttons :

- **Raster** - This strategy machines in passes back and forth along the X-axis at a specified angle. If you select this strategy, define the angle at which you want the tool to move in the **Raster Angle** box.
- **Offset** - This strategy machines in repeated passes, each time moving inwards by the selected tool's **Stepover** value.

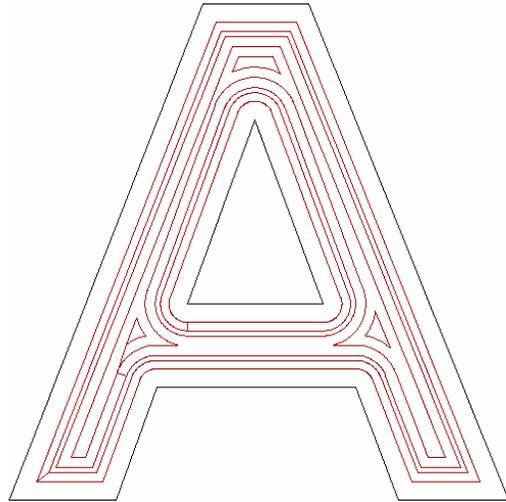


Note: You can see the stepover value of the selected tool when the machining parameters are displayed in the **Tools List** area.

Raster Tool Clearance at 45° ...



Offset Tool Clearance ...



If you select **Offset**, click on one of the **Cut Direction** radio buttons :

Climb Mill – In Climb Milling, the cutter rotates in the same direction as the feed motion.

Conventional – In Conventional Milling, the cutter rotates in the opposite direction to the feed motion. For more details, see "**Overview**".

Next, click on either of the **Start Point** radio buttons 

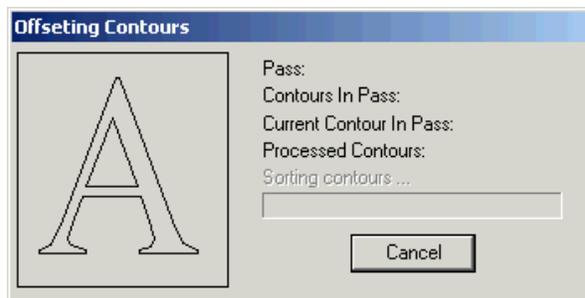
Outside - Select this option if you want the tool to cut into the material at the vector object's boundary, then machine inwards.

Inside - Select this option if you want the tool to cut into the material at the vector object's center, then machine outwards. For safety reasons, this is the preferred option.

11. Type a name for the toolpath in the **Name** box.

12. **Calculate** the toolpath.

The **Offsetting Contours** dialog box is displayed while Part Wizard calculates the toolpath:



The machining passes used to clear the area about the selected vector object are represented by a sequence of dark red lines drawn either inside or outside of its boundary.

13. Click on the **Close** button to return to the **Toolpaths** Home page.

V-Bit Carving



The **V-Bit Carving** button  in the **2D Toolpaths** area of the **Toolpaths** Home page allows you to create a toolpath that replicates a hand carved look for the text that you have selected.

You control the depth of the centerline carved into the block of material with the selection of the V-bit that you use to create the carving.

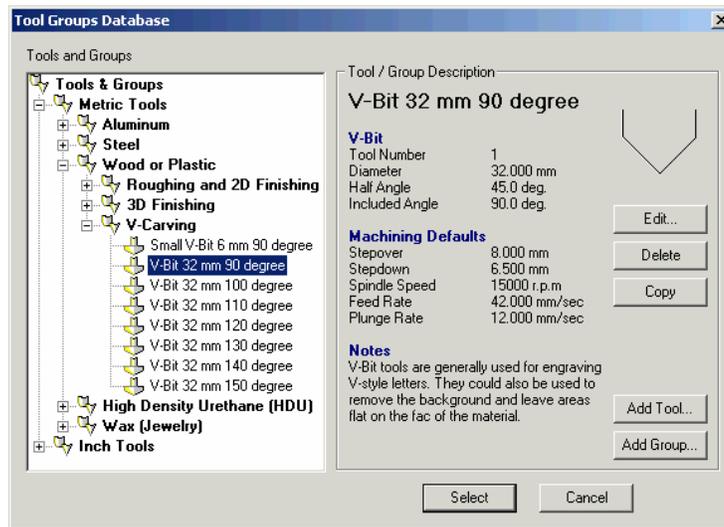
Part Wizard V-Bit carves 10 fonts. See "Working with Text Vectors" in the

To V-bit carve one of the available text fonts:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Select the text that you want to carve..
3. Click on the **V-Bit Carving** button  in the **2D Toolpaths** area of the **Toolpaths** Home page to display the **V-Bit Carving** page.
4. The **Start Depth** (default = 0) defines the depth (Z) at which you want to start the cut into the surface of the material.
5. Define how closely you want the Carving tool(s) to follow the shape of the vector object in the **Tolerance** box (default = .001)
6. If you want to change the height at which the Carving tool makes rapid moves between toolpath segments:
 - First, click on the  arrow in the **Machine Safe Z** area to display the **Safe Z** box and the **Home Position's X, Y and Z** boxes.
 - Next, define the height in the **Safe Z** box. See Warning  in Profile for information about Safe Z.

If you want to define the **Home Position** for the machining tool:

- First, define the X, Y and Z co-ordinates of the home position in the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, click on the  arrow in the **Machine Safe Z** area to hide the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
7. In the **Carving Tool** area, click on the **Select** button to open the **Tool Groups Database**:



8. Double-click on the V-Bit, Conical or Ball Nose tool that you want to use. Part Wizard closes the **Tool Groups Database** and displays the selected tool's description in the **Carving Tool** area.

If you want to amend the machining parameters, click on the  arrow in the **Carving Tool** area.

When you have finished, click on the  arrow to hide the machining parameters.

- Part Wizard will find what it thinks is the most efficient machining order.
9. You can now calculate the maximum depth and width of the carving pass in the toolpath by clicking on the **Centerline** button.



Tip: If you get an error message stating that vectors overlap (usually when you have chosen a script text), one option is to: **Close** the V-Carve toolpath screen. **Ungroup** the text, and select every other letter of the text. Open the V-carve screen again, and toolpath the alternate letters. With the V-carve screen still open, select and toolpath the remaining letters and give the second toolpath another name. It will take two passes to V-carve all the letters.

You can also adjust the **Kerning** (space between the letters) to avoid vectors overlapping, but the end result may not be as pleasing.

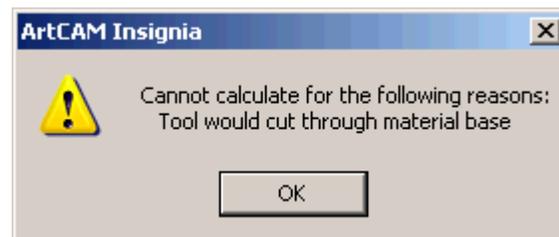


Note: If you have chosen a Carving tool with a smaller diameter than the maximum width of the carving pass, Part Wizard makes multiple passes to clear the specified width.

To stop the centerline calculation process, click on the **Cancel** button  found beneath the design window area.

After the centerline calculation process is complete, the maximum depth and width of the carving pass are shown below the **Carving Tool** area.

If the maximum depth of the carving pass is greater than the thickness of the material block, the following message box appears when the toolpath is calculated:



Click on the **OK** button to close the message box. To overcome this problem, you can select a different Carving tool (broader angle) or use a thicker block of material.

10. Type a name for the toolpath in the **Name** box.
11. **Calculate** the toolpath.

Dark red lines drawn inside its boundary represent the machining passes used to carve the selected vector object.

12. Click on the **Close** button to return to the **Toolpaths** Home page.

Machine Vectors



The **Machine Along Vector** button  in the **2D Toolpaths** area of the **Toolpaths** Home page allows you to machine along the boundary of a vector object.

The boundary of a selected vector object represents the centerline of the Profiling tool. The machined feature has no diameter other than that of the tip of the Profiling tool.

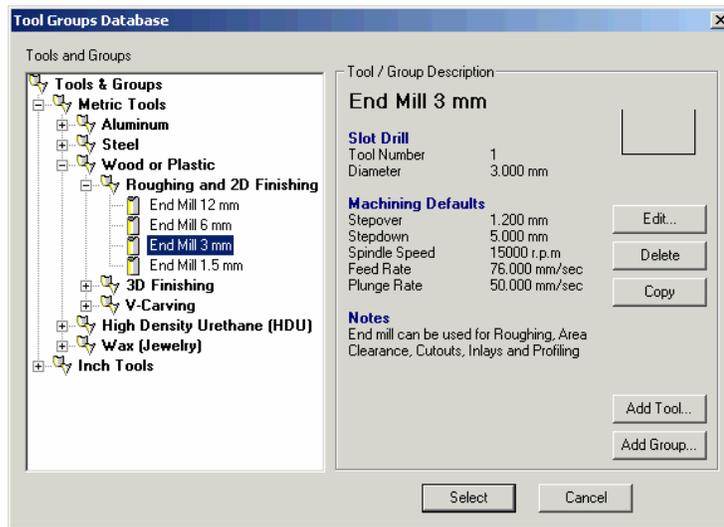
This toolpath is mainly used to produce the effect of engraved text or to provide sharp profiling for detailed edges.

To machine a vector object:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Select the vector object that you want to machine.
3. Click on the **Machine Along Vector** button  in the **2D Toolpaths** area of the **Toolpaths** Home page to display the **Machine Vectors** page.
4. The **Start Depth** (default = 0) defines the depth (Z) at which you want to start the cut into the surface of the material.
5. Define the depth (Z) of the bottom of the cut in the **Finish Depth** box. Enter the number as an absolute (positive) number.
6. Define how closely you want the Profiling tool to follow the shape of the vector object in the **Tolerance** box (default = .001)
7. If you want to change the height at which the Profiling tool makes rapid moves between toolpath segments:
 - First, click on the  arrow in the **Machine Safe Z** area to display the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, define the height in the **Safe Z** box. See Warning  in Profile for information about Safe Z.

If you want to define the **Home Position** for the machining tool:

- First, define the X, Y and Z co-ordinates of the home position in the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, click on the  arrow in the **Machine Safe Z** area to hide the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
8. In the **Profiling Tool** area, click on the **Select** button to open the **Tool Groups Database**:



9. Double-click on the tool you want to use. Part Wizard closes the **Tool Groups Database**, and displays the selected tool's description in the **Profiling Tool** area.

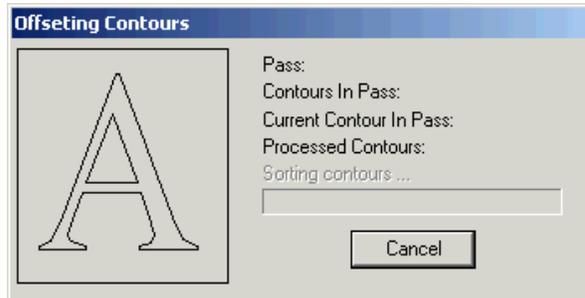
If you want to amend the machining parameters for the selected tool, click on the  arrow in the **Profiling Tool** area.

When you have finished, click on the  arrow to hide the machining parameters.

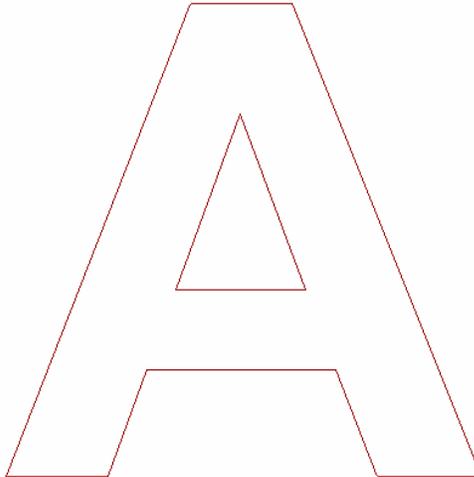
10. Type a name for the toolpath in the **Name** box.

11. **Calculate** the toolpath.

The **Offsetting Contours** dialog box is displayed while Part Wizard calculates the toolpath:



The passes used to machine the vector object are represented by dark red lines drawn on the boundary of the selected vector object:

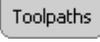


12. Click on the **Close** button to return to the **Toolpaths** Home page.

Drill Holes

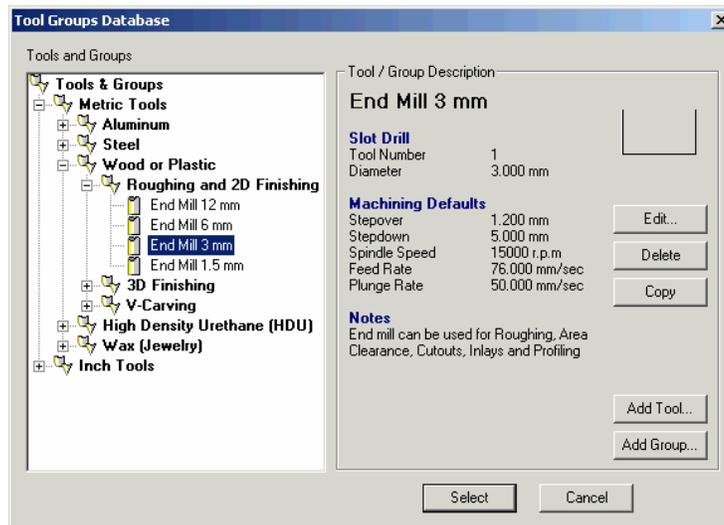
The **Drilling** button  in the **2D Toolpaths** area of the **Toolpaths** Home page allows you to create drill holes. The size of the drill hole is determined by the diameter of the cutting tool that is used during the machining process. Peck drilling is not available in Part Wizard.

To create drill holes in your model:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. If you are creating drill holes from vector objects, select those that you want to use. For details, see "Selecting Vectors" in the Working with Vectors chapter.
3. Click on the **Drilling** button  in the **2D Toolpaths** area of the **Toolpaths** Home page to display the **Drilling** page.
4. The **Start Depth** (default = 0) defines the depth (Z) at which you want to start the cut into the surface of the material.
5. Define the depth (Z) of the bottom of each drill hole in the **Finish Depth** box. Enter the number as an absolute (positive) number, the software will figure out how deep it needs to cut from the surface of the material.
6. If you want to change the height at which the cutting tool makes rapid moves between toolpath segments:
 - First, click on the  arrow in the **Machine Safe Z** area to display the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, define the height in the **Safe Z** box. See Warning  in Profile for information about Safe Z.

If you want to define the **Home Position** for the machining tool:

- First, define the X, Y and Z co-ordinates of the home position in the **Home Position**'s **X**, **Y** and **Z** boxes.
 - Next, click on the  arrow in the **Machine Safe Z** area to hide the **Safe Z** box and the **Home Position**'s **X**, **Y** and **Z** boxes.
7. Click on the **Select** button in the **Tool** area of the page to open the **Tool Groups Database**:



8. Double-click on the tool you want to use. Part Wizard closes the **Tool Groups Database** and displays the selected tool's description in the **Tool** area.

If you want to amend the machining parameters for the selected tool, click on the  arrow in the **Tool** area.

When you have finished, click on the  arrow to hide the machining parameters.

9. Type a name for the toolpath in the **Name** box.
10. **Calculate** the toolpath:

The passes used to machine the drill holes are represented by a circle with a cross mark in it.

11. Click on the **Close** button to return to the **Toolpaths** Home page.

Using the Tool Groups Database

When creating a toolpath in Part Wizard, it is necessary to select a tool with which to machine your model. A broad range of pre-defined tools can be selected from the **Tool Groups Database**.

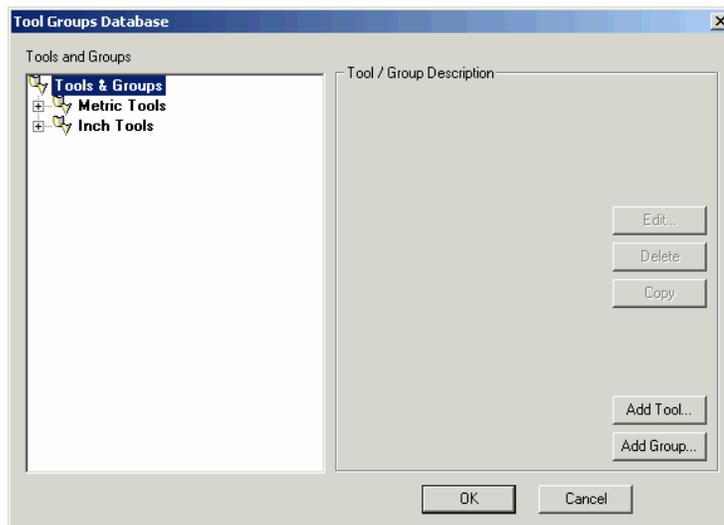
The **Tool Groups Database** allows you to:

- Select a tool with which to machine a toolpath.
- Edit the default machining parameters of any selected tool.
- Define and add your own tools.
- Group tools together, as you prefer.

Editing a tool in the Tool Groups Database:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.

2. Click on the **Tool Database** button  in the **Toolpath Operations** area to open the **Tool Groups Database**:



3. Click on the tool in the **Tools and Groups** window that you want to edit. The selected tool is highlighted in blue.



Note: Before editing the machining parameters of a selected tool, you may want to make a copy of it. To do so, click on the tool in the **Tools and Groups** window, and then click on the **Copy** button. A copy of the tool appears directly beneath the original in the **Tools and Groups** window.

The machining parameters of the selected tool appear in the **Tool / Group Description** area of the dialog box.

4. Click on the **Edit** button to open the **Edit Tool** dialog box:

5. Define all new machining parameters and tool geometry settings for the selected tool using the boxes in the dialog box, or by clicking on the appropriate options in the list boxes. See below for an explanation of the parameters and settings.
6. Click on the **OK** button to save these new settings and parameters and to return to the **Tool Groups Database**.

The tool you have edited appears in the **Tools and Groups** window, and the information that you had typed in the **Edit Tool** dialog box appears in the **Tool / Group Description** area of the **Tool Groups Database**.

7. Click on the **OK** button to close the **Tool Groups Database**.

Parameters and Settings in the Tool Groups Database

You can set the geometry and the default machining parameters of any tool selected from the **Tool Groups Database**:

- **Description** – Type the name of the tool in this box. Be specific so that you can call up the tool at a later time.
- **Tool Number** – Define the number of the selected tool to correspond with its position on a tool changer in this box. However, Part Wizard and ShopBot do not support tool changers.
- **Tool Units** – Click on the **Tool Units** list box and then on the unit of measurement you want to use. ShopBot uses inches or mm.
- **Rate Units** – Click on the **Rate Units** list box and then on the unit of speed you want to use. ShopBot uses inches/sec or mm/second. The rate should correspond to the units you intend to use when running the ShopBot part file.
- **Notes** – If you want to make any notes about the selected tool, type them in this box.
- **Diameter** – Define the diameter of the selected tool in this box. Be accurate. If it is critical that the part be a specific size, measure the bit and record it accurately.
- **Stepdown** – Stepdown determines how deep the Z will plunge in each pass. Part Wizard will use this information to calculate how many passes are required to cut the part to the depth set in the toolpath. For example, if the stepdown is .25 and the material is .75" thick, Part Wizard will calculate that it will take 3 passes to cut through the material.

A good rule of thumb for cutting in hard wood is to make the stepdown less than or equal to 1.5 times the diameter of the bit.
- **Stepover** – Define the distance between adjacent machining passes made by the selected tool in this box. A smaller stepover may result in smoother cuts, but longer machining time.

You can also adjust the stepover of the selected tool using the **% of** box and buttons:

- Each click on  increases the stepover of the selected tool by 1% of the value shown in the **Diameter** box.
- Each click on  decreases the stepover of the selected tool by 1% of the value shown in the **Diameter** box.
- Type a value in the **% of** box to define the **Stepover** as a percentage of the tool **Diameter**.
- **Spindle Speed** – ShopBot does not support changing spindle speed as yet. Use this command as a memory enhancer to remind yourself what works for this material and bit.
- **Feed Rate** – Define the rate at which the tool moves in the X and Y axes in relation to the block of material in this box.
- **Plunge Rate** – Define the rate at which the tool moves in the Z direction and plunges into the block of material in this box.

Setting the geometry of certain types of tools in the **Tool Groups Database** requires more data than with other tools. The additional information required includes:

- **Included Angle** – Define the angle of a V-Bit tool in this box.
- **Half Angle** – Define the angle of a Conical tool in this box.
- **Flat Radius** – Define the radius of a flat Conical tool in this box.
- **Tip Radius** – Define the radius of a rounded Conical tool in this box.

Modifying the Tool Groups Database

You can modify the Tool Groups Database by: Copying, Adding or Deleting a Tool.

Copying a Tool

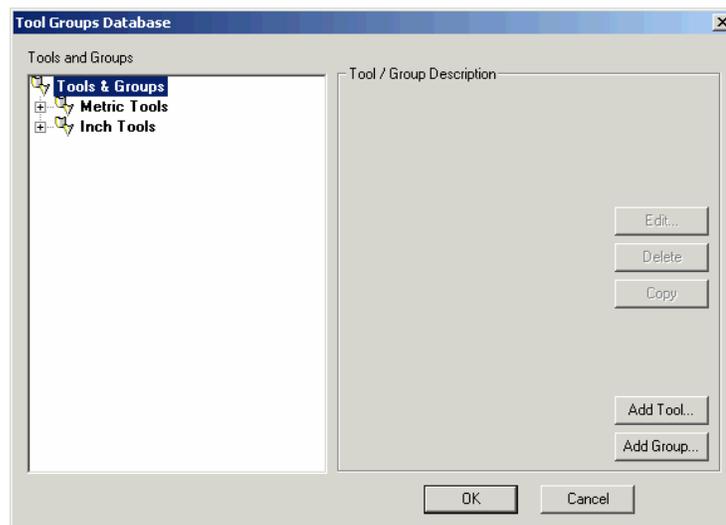
You can copy any tool within the **Tool Groups Database**:

1. Click on the tool that you want to copy in the **Tools and Groups** window. The selected tool is highlighted in blue.
2. Click on the **Copy** button. A copy of the tool appears directly beneath the original tool. You can move the location of the tool by clicking and dragging on it.

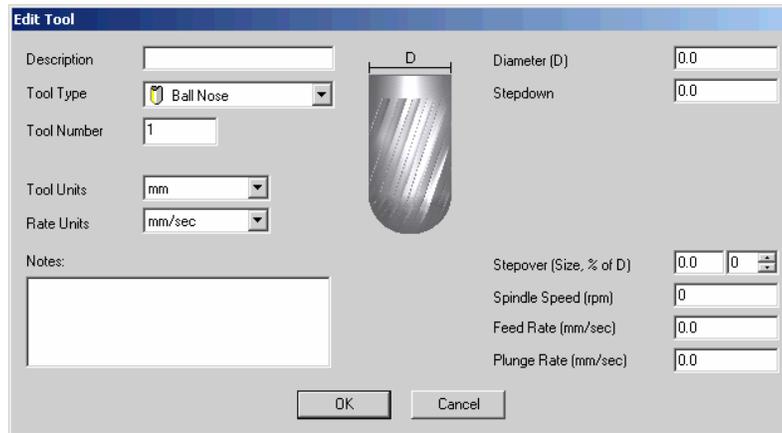
Adding a Tool

To define and add a new tool to the **Tool Groups Database**:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Click on the **Tool Database** button  in the **Toolpath Operations** area to open the **Tool Groups Database**:



3. Click on the **Add Tool** button to open the **Add Tool** dialog box:



4. Type a name for the tool in the **Description** box.
5. Click on the **Tool Type** list box, and then click to select one of the tool types listed. An image representing the selected **Tool Type** appears in the middle of the dialog box. Boxes to type in the necessary machining parameters of the tool appear in the right side of the dialog box.
6. Fill in the parameters and settings as described above.
7. Click on the **OK** button to add the tool to the **Tool Groups Database**. The tool you have added appears in the **Tools and Groups** window, and its details appear in the **Tool / Group Description** area of the **Tool Groups Database**.
8. Click on the tool in the **Tools and Groups** window and drag it into the appropriate group in the **Tool Groups Database**.
9. Click on the **OK** button to close the **Tool Groups Database**.

Deleting a Tool

You can delete any tool listed in the **Tool Groups Database**:

1. Click on the tool that you want to delete in the **Tools and Groups** window. The selected tool is highlighted in blue.
2. Click on the **Delete** button. A message box appears requesting you to confirm your decision to delete the tool.
3. Click on the **Yes** button to delete the tool.

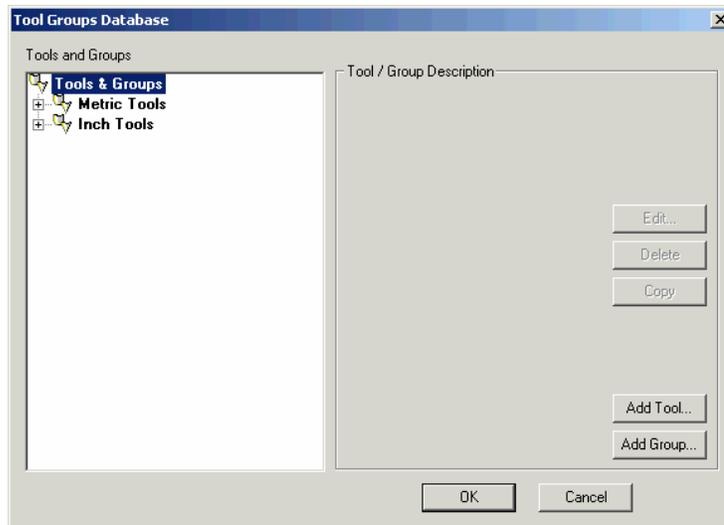
Modifying a Tool Group

Within the **Tool Groups Database**, tools are organised into various groups for ease of reference. You can Add or Edit groups within the **Tool Groups Database**.

Adding a Tool Group

To create a new tool group:

1. Click on the **Tool Database** button  in the **Toolpaths** area of the **Assistant's** Home page to open the **Tool Groups Database**:



2. Click on the **Add Group** button. A folder named **New Group** appears in the **Tools and Groups** window:

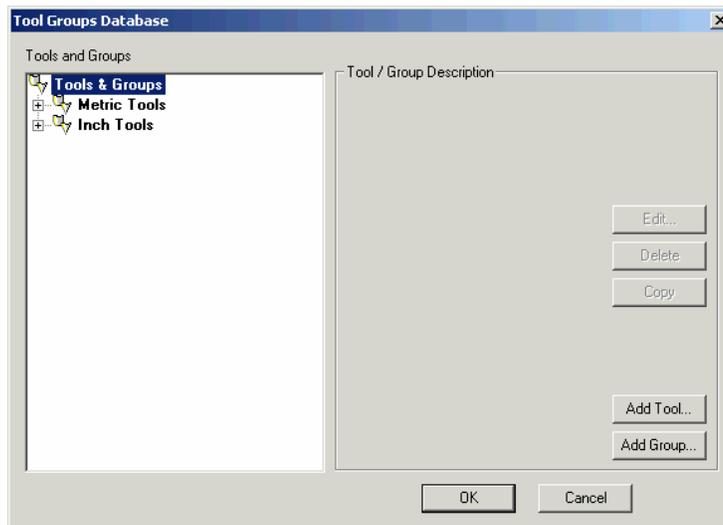


3. Click on the **New Group** folder, and type the name for the tool group you want to add to the database. You can now click and drag any tools listed in the **Tools and Groups** window into the tool group folder that you have created.
4. Click on the **OK** button to close the **Tool Groups Database**.

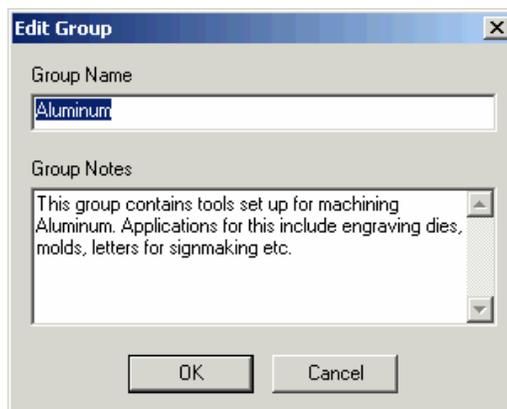
Editing a Tool Group

You can edit the name and description of any tool group selected from the **Tool Groups Database**:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Click on the **Tool Database** button  in the **Toolpath Operations** area to open the **Tool Groups Database**:



3. Click on the tool group in the **Tools and Groups** window that you want to edit. The selected tool group is highlighted in blue and details about the group appear in the **Tool / Group Description** area of the database.
4. Click on the **Edit** button to open the **Edit Group** dialog box:



5. If you want to give the tool group a new name, type it in the **Group Name** box.

6. If you want to make any notes about the selected tool group, type them in the **Notes** box.
7. Click on the **OK** button to close the **Edit Group** dialog box.

Copying a Tool Group

You can copy any tool group within the **Tool Groups Database**:

1. Click on the tool group that you want to copy in the **Tools and Groups** window. The selected tool group is highlighted in blue.
2. Click on the **Copy** button. A copy of the tool group appears directly beneath the original tool group. You can move the location of the tool group by clicking and dragging on it.

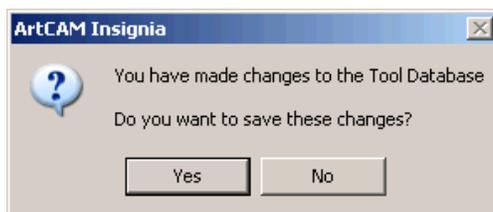
Deleting a Tool Group

You can delete any tool group listed in the **Tool Groups Database**:

1. Click on the tool group that you want to delete in the **Tools and Groups** window. The selected tool group is highlighted in blue.
2. Click on the **Delete** button. A message box appears requesting you to confirm your decision to delete the tool group.
3. Click on the **Yes** button to delete the tool group.

Saving the Tool Groups Database

If you make any changes to the **Tool Groups Database**, and then click on the **OK** button to close the database, the following message box appears:



Click on the **Yes** button to save the changes that you have made to the database before closing it, or click on the **No** button to close the database without saving your changes.

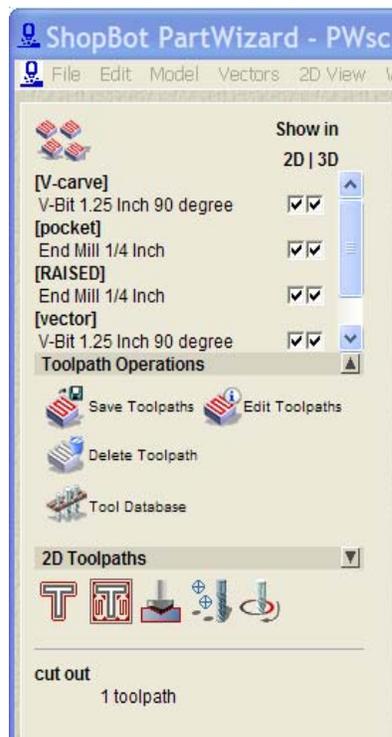
Managing and Modifying Toolpaths

You can modify or manage a toolpath in the following ways:

- Select a toolpath preview.
- Edit a toolpath.
- Delete a toolpath.
- Adjust the machining parameters of a tool both during and after the toolpath creation.

In some cases, you use the **Toolpaths** Home page to modify and manage the toolpaths that you have created.

- Save a toolpath in a part file. Use this option to **GENERATE A SHOPBOT PART (*.sbp) FILE.**
- Add to, edit or delete the tools within the **Tool Groups Database.**



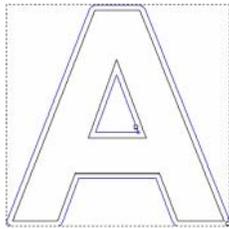
Selecting Toolpaths

You can manipulate calculated 2D toolpaths in the same way as you would vector objects in Part Wizard.

In the **Assistant** Page, you can select a toolpath preview from the **2D View** window:

1. Make sure that you are in **Select Vectors** mode .
2. Click to select the preview of the toolpath that you want to use. The selected toolpath preview turns blue and is surrounded by a bounding box.

The preview of a Profiling toolpath is shown below:



To select more than one toolpath preview from the **2D View** window:

1. Make sure that you are in **Select Vectors** mode .
2. You can now use either of the following methods to select more than one toolpath preview:
 - Click and drag to form a bounding box around the previews of the toolpaths that you want to use. The selected toolpath previews are blue and surrounded by a bounding box.
 - Hold down the **Shift** key on your keyboard, and then click to select each of the toolpath previews that you want to use. The selected toolpath previews are blue and surrounded by a bounding box.

Once the toolpath(s) have been selected, Right-click to bring up a menu of options available from the **2D View**.

On the **Toolpaths** Home page, you can edit, save, delete, calculate, or adjust the machining parameters of a toolpath. To select a toolpath listed on the **Toolpaths** Home page, click on the name of the tool. The tool name is highlighted in blue.

Adjusting the Machining Parameters in a Toolpath

You can adjust the machining parameters for CNC machine tools in Part Wizard as follows:

- When creating a toolpath, in the toolpath's page. For example, the **Profiling** page.
- After creating a toolpath, using the **Toolpaths** Home page.



Note: You can also change the tool's default machining parameters stored in the **Tool Groups Database**. This method should only be used before selecting a toolpath.

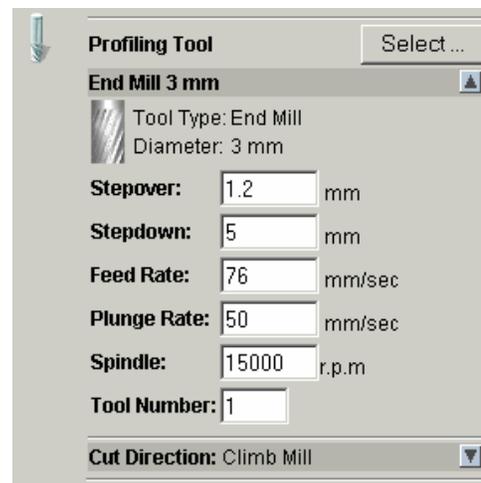
Adjusting Machining Parameters When Creating a Toolpath

You can change the machining parameters of the CNC machine tool used to machine a model when creating a toolpath.

To change the machining parameters of a CNC machine tool for that toolpath only (this does not change the tool library):

1. With the toolpath page displayed in the **Assistant** window, display the machining parameters of the selected tool by clicking on the  arrow in the tool area of the page.

For example, if you have selected a 3mm End Mill tool in a Profiling toolpath, the tool area of the **Profiling** page looks like this:



2. You can now set the new machining parameters:
 - To change the stepover of the selected tool, define the new distance between adjacent machining passes in the **Stepover** box.
 - To change the stepdown of the selected tool, define its maximum cutting depth in the **Stepdown** box. The stepdown generates multiple machining passes.
 - To change the feed rate of the selected tool, define the new rate at which the tool moves in relation to the block of material in the **Feed Rate** box.
 - To change the plunge rate of the selected tool, define the rate at which the tool moves in the Z direction and plunges into the block of material in the **Plunge Rate** box.
 - ShopBot Control software does not support changing the rotational speed of the spindle or router. Still, you must keep a number in this box.
 - To give the selected tool a number, click on the **Tool Number** list box and then on the number you want to assign to it. Since ShopBot does not allow for changing tools, this number is for your information only.

Adjusting Machining Parameters in a Created Toolpath

When you have created a toolpath, you can adjust the machining parameters, except for the **Stepdown** and the **Stepover**. In addition, you can amend toolpath parameters such as the **Home Position** and the **Safe Z** level.

To adjust the machining or toolpath parameters:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Click to select the tool listed beneath the toolpath name for which you want to change the machining parameters.

For example, a 3mm End Mill tool used in creating a Profiling toolpath appears as follows:



3. Click on the **Edit Parameters** button to display the machining parameters for the selected tool.

For example, if you selected a 3mm End Mill tool when creating a Profiling toolpath, the **Parameters** area looks like this:

You can change the machining parameters in this area as described in "Adjusting the Machining Parameters".

- The tool's name.
 - The height, or **Safe Z** level, at which the cutting tool makes rapid moves between toolpath segments.
 - The **Home Position** (XYZ) of the tool.
 - The comment about the toolpath, usually its name.
4. Click on the **Apply** button.

Editing a Toolpath

You can change the settings in any toolpath that you have created.

To edit the settings in a toolpath from the **Assistant** page using the **2D View** window:

1. Click on the **Select Vectors** button  in the **Vector Creation** area of the **Assistant**'s Home page.
2. Select the preview of the toolpath that you want to edit.
3. Right-click to display the Toolpath menu, and then click on the **Edit Toolpath** option to display the toolpath's details in the **Assistant** window.

For example, if you select a Profiling toolpath and then the **Edit Toolpath** option from the Toolpath menu, the **Profiling** page is displayed in the **Assistant** window.

Alternatively, you can edit toolpath settings using the **Toolpaths** Home page:

1. Click on the **Select Vectors** button  in the **Vector Creation** area of the **Assistant**'s Home page.
2. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
3. Select the toolpath listed that you want to edit.
4. Click on the **Edit Toolpath** button  in the **Toolpath Operations** area to display the page for the toolpath in the **Assistant** window.

Deleting Toolpaths

You can delete a toolpath or from the **Assistant** or the **Toolpaths** home page.

To delete a toolpath from the **Assistant** page from the **2D View** window:

1. Click on the **Select Vectors** button  in the **Vector Creation** area of the **Assistant's** Home page.
2. Select the preview of the toolpath that you want to delete to select it.
3. Right-click to display the Toolpaths menu, then click on the **Delete Toolpath** option.

Calculating the Estimated Machining Time

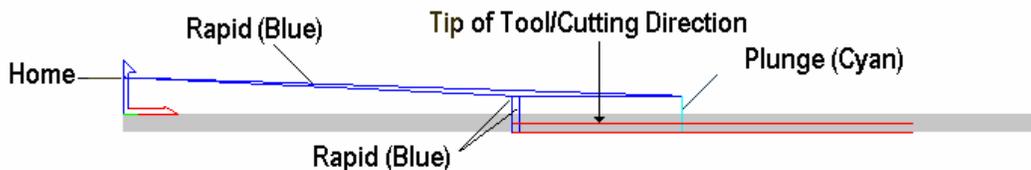
Part Wizard does not have the capacity to estimate machining time. However, you may calculate the machining time by previewing the file in the ShopBot Control Software. See "Previewing an .sbp file" in the ShopBot Control software manual or help files for more details.

Viewing a Toolpath

You can view a toolpath you have created in both the **2D View** and **3D View** windows. A toolpath is displayed as a sequence of dark red lines in the **2D View** window, and a series of multi-colored lines in the **3D View** window.

The color in which a toolpath is displayed within the **3D View** window shows the movement the selected tool will make when machining the vector object.

The following example shows a toolpath simulation as seen along the Y-axis:



Rapid and Plunge Moves

The selected tool leaves the **Home** position, moves to the **Safe Z** level, then above and across the material surface until it reaches the point of entry. This movement is known as a **Rapid** move, and a blue line marks this.

The tool cuts into the material surface at its **Plunge** rate. A cyan line marks plunge moves.

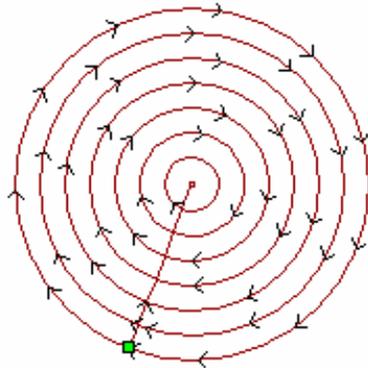
Once the cutting is complete, the tool retracts from the block of material to the **Safe Z** level and then moves above and across the material surface until it reaches the **Home** position. This is another **Rapid** move marked by a blue line.

- If a toolpath simulation contains several **Rapid** and **Plunge** moves, the lines representing the movement of the selected tool in the **3D View** window can become obscured.

Cutting Direction

As an aid to visualisation, arrows indicating the cutting direction used in a 2D toolpath are used in toolpath previews drawn in the **2D View** window. The cutting direction is shown by default.

A Conventional cut direction is illustrated with anti-clockwise arrows, and a Climb Mill cut direction with clockwise arrows. For example, we can see that a Climb Mill cut direction has been used in the Area Clearance toolpath preview shown below:



Hiding a Toolpath

You can hide any toolpath shown in either the **2D View** or **3D View** window.

To hide a toolpath shown in the **2D View** window:

1. Click to select the toolpath preview that you want to hide.
2. Right-click to display the Toolpath Editing menu, and then click on the **Hide Preview** option.

To hide a toolpath shown in the **3D View** window:

1. Double right-click in the **3D View** window to display a list of toolpath viewing options, and then click on the toolpath you want to hide. The toolpath that you want to hide is deselected.

For example, clicking on the **Profile – End Mill 3mm** option hides the toolpath from view.

Restoring a Hidden Toolpath

You can restore a toolpath that has been hidden in either the **2D View** or **3D View** window.

To restore a toolpath hidden in the **2D View** window:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.
2. Make sure that the **2D View** window is displayed.

If the **3D View** button  is in the toolbar above the design window, the **2D View** is displayed. If not, click on the **2D View** button .

3. Click to select the **Show In 2D** box next to the relevant toolpath you want to view . The toolpath appears in the **2D View** window in dark red.

To restore a toolpath hidden in the **3D View** window:

1. Double right-click in the **3D View** window to display a list of toolpath viewing options, and then click on the toolpath you want to view. The toolpath that you want to restore is now selected.

For example, clicking on the **Profile – End Mill 3mm** option restores the toolpath to view.



Note: You can hide or restore any of the toolpaths hidden in the **3D View** window using the **Objects To Draw** button  in the **3D View** toolbar.

Saving a Toolpath

You can save the toolpaths along with the model you are currently working on as a model file (*.art). For details, see "Saving a Model" in the Working with Models chapter.

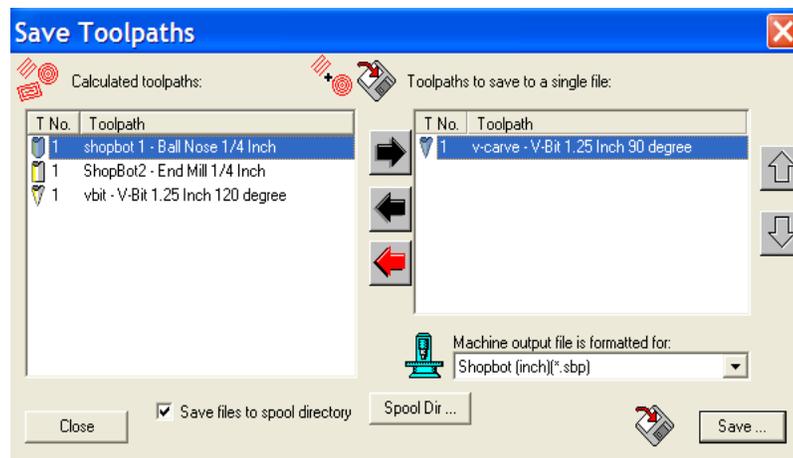
Generating ShopBot Part (*.sbp) files

Generating ShopBot code

Once you have saved your design work and toolpaths in your Part Wizard (*.art) file, you must generate the code for the ShopBot Control software to run. In order to be run with the ShopBot Control software, the toolpath(s) must be saved as ShopBot Part (.sbp) files. To generate the toolpath data as an .sbp file:

1. Click on the **Toolpaths** tab  to display the **Toolpaths** Home page.

2. Click on the **Save Toolpaths** button  in the **Toolpath Operations** area to open the **Save Toolpaths** dialog box:



3. Click on the toolpaths in the **Calculated toolpaths** window that you want to save as one machine-specific toolpath file.

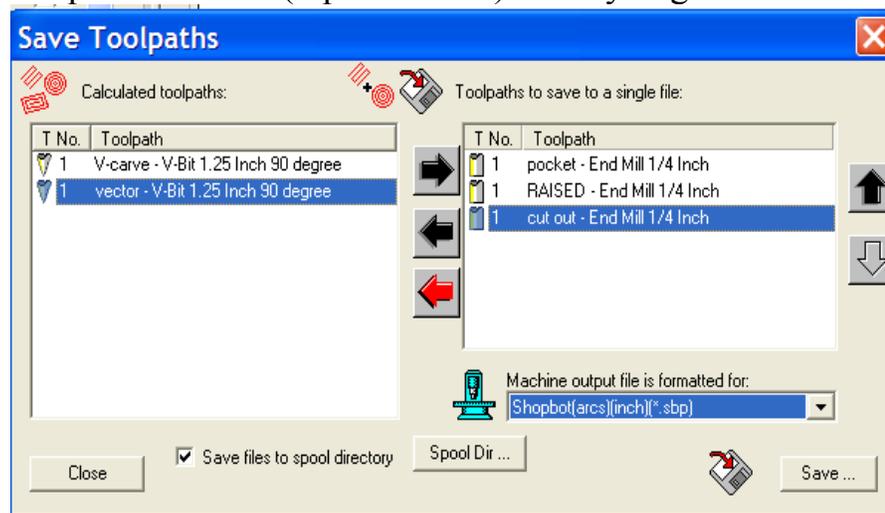
To select more than one toolpath, hold the **Shift** key down on your keyboard and then click on each of the toolpaths.

4. Click on the right button  to transfer your selected toolpaths to the **Toolpaths to save to a single file** window.
5. Make sure that the toolpaths are in the correct order.



Note: Part Wizard determines the order of cut within each toolpath.

You set the order of cut of multiple toolpaths within a single ShopBot part (.sbp) file by determining the order of that the individual toolpaths will run (top to bottom) when you generate the .sbp file.



In the example above, the part file will do all the detail work first, then cut out the individual parts.

Click on the up  and down  buttons to set the order in which the toolpaths will be saved. Each click, up or down, moves the selected toolpath one position in the list.

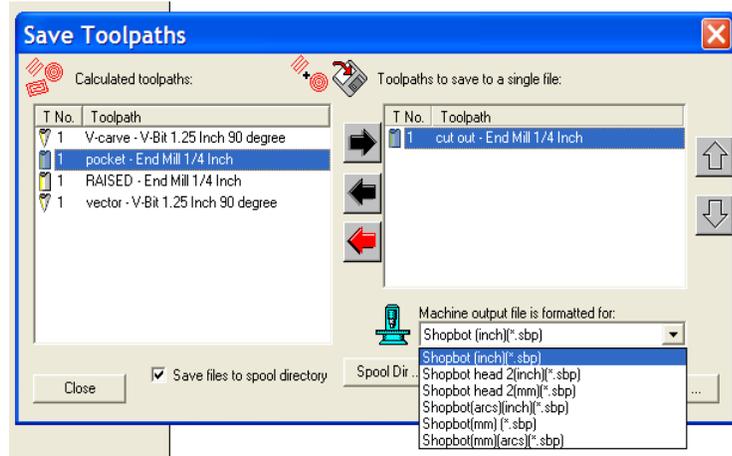
Click on the black left button  to transfer the currently highlighted toolpaths back to the **Calculated toolpaths** window.

Click on the red left button  to transfer all toolpaths back to the **Calculated toolpaths** window.

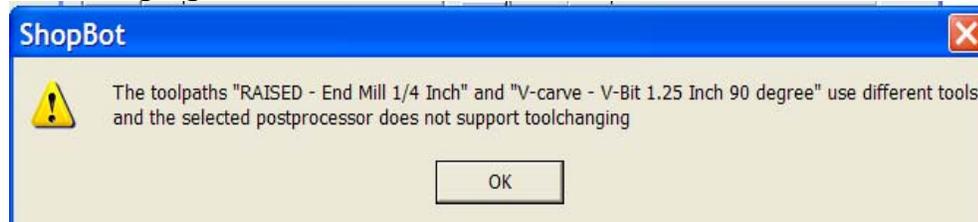
- Click on the **Machine output file is formatted for** list box, and then click to select the machine format you want to use.



Note: It is important that you format the .sbp file with the same units (inches or mm) that you used when when you **Set the Model Size**.

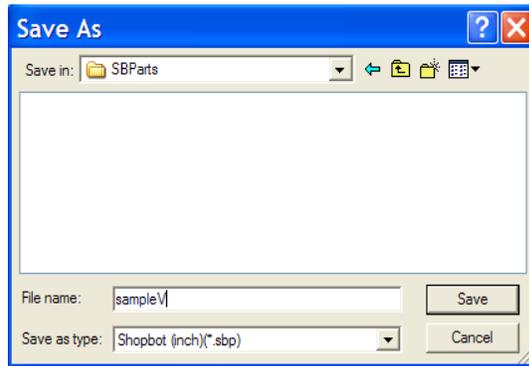


Note: All the toolpaths saved into the same ShopBot part (.sbp) file must use the same bit. If you attempt to save toolpaths that use different bits into the same ShopBot part file, you will receive a message saying that the selected processor does not support toolchanging.



To correct the error, click **OK**, then use the arrow keys to move the toolpaths until only those using the same bit are on the right side of the screen. Save the toolpaths that use another bit to a different .sbp file.

7. Click on the **Save** button to bring up the location of where you would like to save your .sbp file.



Tip: Create a system for saving your files in a location where you can find them again. One technique is to create a new folder for each job, and save ALL the information related to that job in that folder. Then, it will be easier to find .sbp, .art and any other supporting documentation when you need it later.

8. Type the file name for the ShopBot part (.sbp) file in the **File name** box.
9. Click on the **Save** button to generate the .sbp file. After the part file is generated, the **Save As** dialog box will close. This is the only indication that the .sbp file has been generated successfully.
10. Click on the **Close** button in the **Save Toolpaths** dialog box to return to Part Wizard.
11. You can use the ShopBot Control software to look at the machine code (File>Edit) and Preview the part file before you cut it out with the ShopBot.

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