



Patterner Version 3.0

The Windows® software tool for manipulating surface meshes

Patterner user manual

The information in this booklet is given as a guide only, the author accepts no responsibility or liability for any mistakes made by the reader in interpreting the generalisation necessary to cover many possibilities. There is no part of this booklet that refers to specific design problems, therefore the reader must consult with his/her designer for specific design features. This book makes it quite clear that the responsibility in law lies with the designer, builder, manager or employer for their actions, not the author. Errors and omissions excepted E&OE

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Installing Patterner on your computer

Thank you for buying Patterner for Windows Version 3.0. This section explains how to install Patterner.

The first step to getting started with Patterner is to install it on your hard disk. The setup program makes installation simple.

When you have finished installing Patterner you can proceed to the section, "Getting Started". This gives a brief description of the program itself.

Installation Requirements

To install Patterner, you need:

A personal computer with an 80386 processor or higher with at least 4 megabytes of memory. A Pentium processor is highly recommended.

Microsoft Windows 3.1 or Windows 95, Windows NT is not supported.

A VGA display or better.

Approximately 2 Megabytes of space free on your hard disk.

A 3.5-inch high-density (1.44MB) disk drive or a CD ROM disk drive.

To print, an A4 or Letter size 300 dpi (min) Windows printer or Fax modem.

A 2d/3d CAD package such as AutoCAD or FastCAD is useful but not essential.

Installation instructions

Launch Windows if it is not already running, and close any open applications.

Insert the Patterner Setup disk in your disk drive.

From the Program Manager File menu, choose Run.

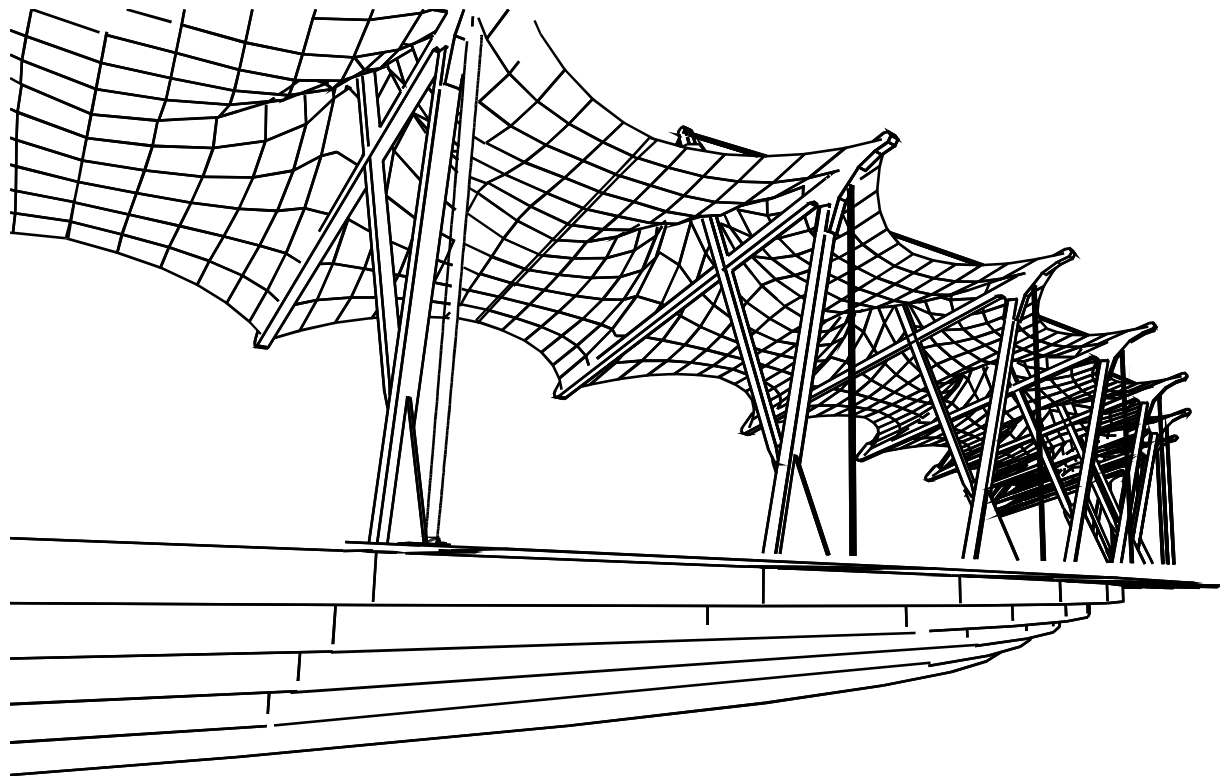
In the Command Line box, type *drive letter*:\setup

For example, if the Patterner Setup disk is in drive A, type **a:\setup**

Choose the OK button.

Follow the screen instructions.

When installation is complete, ensure that the hardware lock is inserted and double-click on the Patterner icon to start the program.



Getting started

On opening Patterner, you will notice that no model is loaded and the only functions available to you are under the 'File' and 'Help' pull-down menus. You can start by creating a new mesh, loading a *.mem file or importing a 3d *.DXF file.

Important: there is full on-line help available in Patterner, simply press F1 at the top-left of your keyboard at any time to access Help.

'Mem' files are the native file format of Patterner, when you save your work, this is the file format you will be using.

Start by loading a demonstration *.mem file. (*.mem uses standard Windows file commands, *.* , etc, for help, check your Windows help files or manuals). For reference, there is a list of demo files supplied with Patterner in Appendix 1 at the back of this guide.

Viewing

Practice using the different viewpoints, click on the 'Perspective', 'Plan', 'Front' and 'Side' buttons, each gives a different view of the surface. It is important to note that functions involving selecting nodes with a mouse do not work in Perspective view.

Click on the scroll bars to the right and bottom of the view screen to move the viewpoint up, down, left and right. The 'Centre' button resets the viewpoint to place the image in the middle of the screen.

Click on the 'View' pull-down menu, the current view scale is indicated with a tick, click on another scale to zoom in and out.

Selecting nodes

Each surface/mesh consists of an array of nodes, each of these nodes can be assigned different properties. These properties are indicated by a different colour dot for each.

Practice changing the properties of nodes, the currently selected node is indicated by a black square outline. Use the arrow keys on your keyboard or the arrows on the bottom left of the screen to navigate around the mesh.

To change the properties of a node simply press the enter/return key or click on the 'Adjust' button, this brings up the 'Adjust Node' dialogue box, alternatively click on the node you wish to adjust with the right button on your mouse and select a new property from the pop-up menu (this function is not available in perspective view).

Node properties

Notice that for corner nodes, there are only two possible properties, 'Floating corner' or 'Fixed Control Point'.

For nodes on the edge of the surface, there are six possible properties, 'Fixed Control Point', 'Straight Edge', 'Mirror edge', 'Floating Corner', plus two alternative 'Perimeter Cable' options.

For nodes in the middle of the mesh, there are only two properties, 'Floating (default)' and 'Fixed Control Point'. It is unlikely that you will use the latter as this represents a point load/support on your surface.

Moving nodes

You can reposition each node by inputting in x, y and z coordinates in the 'Adjust Node' dialogue box, alternatively use the left button on your mouse to drag a node to a new position (this function is not available in perspective view), notice that the coordinates of the node are shown at the top right of the view-screen.

Standard architectural convention is used, i.e.. x and y are plan dimensions and z is the vertical dimension.

If you wish to position nodes accurately, select 'Snap to Grid' in the 'Grid' pull down menu. When you drag a node with this function enabled, the node is placed on an invisible grid 100mm square.

These coordinates need only be set with the 'Fixed Control Point' and the 'Floating Corner' node properties. Note: all units are assumed to be millimetres, however as Patterner does not perform any load based calculations, your model can be any size in any arbitrary units of your choosing.

For detailed descriptions of the node properties, please refer to the on-line help (press F1).

Relaxation

You will notice that there are three buttons marked '1000 Relax', '100 Relax' and '5 Relax'. These buttons all perform the same function to different degrees of accuracy. Try moving a fixed point node (red) on one of the sample files and clicking on '100 relax' button.

After a few seconds, you will notice that a smoothing function has been applied to the surface, making it anticlastic (saddle shaped), whereas before it may not have been.

Notice, that all these functions indicate their progress on the progress bar, at the top left of the screen. You can interrupt the function at any time by pressing 'Esc' at the top left of your keyboard.

Creating a new project using the new mesh wizard

This removes any existing information in Patterner, so save any work before proceeding.

This is the simplest and most straightforward method of starting a new project in Patterner, click on 'New..' in the 'File' pull down menu to begin.

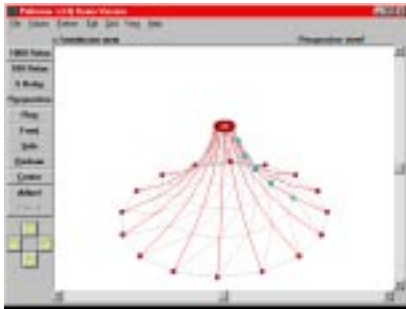
The 'New Mesh Wizard' dialog box contains the following settings:

Section	Parameter	Value
Rectangular Mesh	Width	7500
	Length	4500
	Maximum panel width (mm)	1450
	Number of panels	6
Radial mesh	Included angle, 360° for full circle.	360
	Overall height (in millimetres)	3000
	Bottom radius (mm)	3600
	Top radius (mm)	300

You will be presented with basic options for types of mesh: the rectangular mesh function creates a plain flat rectangle for you to manipulate into whatever shape you wish. the radial mesh function creates a circular type surface.

For now, accept the default settings and click on create. After a short message reminding you that the 'New mesh wizard' only creates the shapes you ask it to, you are presented with a plan view of the new surface.

Click on the 'Perspective' button and you should see the following surface:



Congratulations! you have designed your first surface in Patterner. To see how easy it is to create a set of fabrication drawings of this surface, select 'Pattern to 2d *.DXF..'' from the 'Pattern' pull down menu.



The row of triangles you see represent the all the fabric panels required to make the surface you have designed. Also shown is the total surface area and the individual overall panel sizes. All the panels are identical, because the surface you have designed is completely symmetrical.

Next we will try creating a non-symmetrical surface:

First, create a new radial surface using the 'New Mesh Wizard'. Change the included angle from 360° to 90° allowing you to design just a quarter of the surface instead of the whole thing, this will save time later.

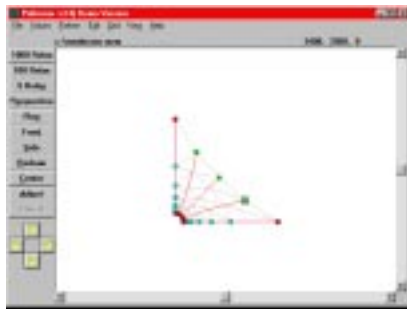
Notice that when you change the included angle, the 'New Mesh Wizard' automatically recalculates the number of panels required.



If you select 'Pattern to 2d *.DXF..' from the 'Pattern' pull down

menu, you will see that the fabric panels are identical to before, except there are just four instead of sixteen.

Second, in plan view using the right mouse button to pop-up the node type menu, change the node type of three of the (red) fixed nodes to 'Perimeter Cable 1'. Click on '100 Relax' and your surface should look like this:



Now you have a surface with a perimeter cable, click on 'Pattern to 2d *.DXF.' from the 'Pattern' pull down menu. The panels have changed to match the new shape of the surface.



Click on the 'Print' button and follow the instructions to print a full set of drawings for this surface on A4 or letter size paper. The file windows will allow you to save a DXF format version of the drawings.

The first page will be a plan with the panels, cable sizes and fitting angles indexed. The remainder of the pages will be individual drawings for each of the panels.

Importing 3d meshes from external packages

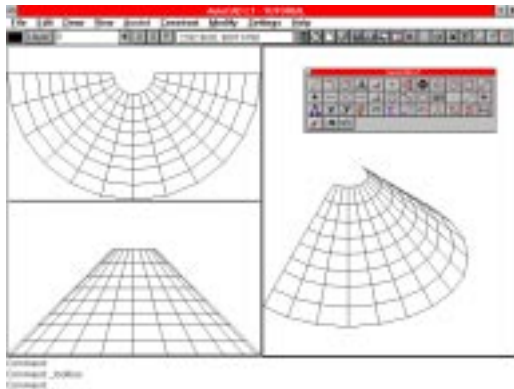
Patterner Version 3.0 supports 3d DXF files from FastCAD and AutoCAD v10-13 and most other 3d CAD software.

Patterner accepts the following AutoCAD DXF objects: Rulsurf, Edgesurf, Revsurf and 3dmesh. It does not accept 3dface, 3dpoly or any other 3d object.

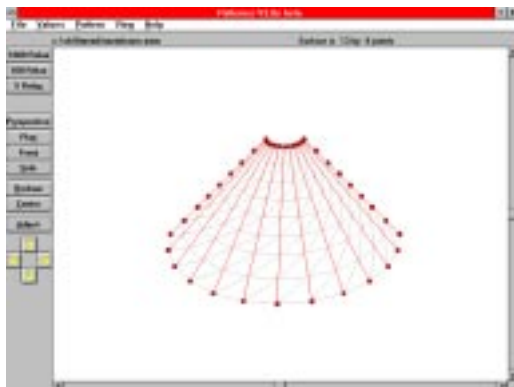
If you are having trouble importing files, make sure that the DXF file contains only the surface required and no other objects. (Patterner attempts to load only the first object it encounters).

Example of importing a typical mesh

The accompanying picture shows a 3d mesh/surface in AutoCAD. Notice that all other objects have been deleted, only the 3d mesh required remains. In AutoCAD the command for exporting a 3d DXF file is DXFout. Give the temporary 3d DXF file a name and save it.



Switch to or open Patterner and select 'Import 3d *.DXF' from the 'File' menu. Select the temporary 3d DXF file and click the OK button.



The DXF file should now appear in the view screen. Zoom in to an appropriate scale using the 'View' pull-down menu. You will notice that the default node type for the perimeter is 'Fixed control point' (Red dots).

Now save your file as a native *.mem file using the 'Save As *.mem' dialogue on the 'File' pull-down menu. Give your surface-mesh an appropriate file name and click on the 'OK' button.

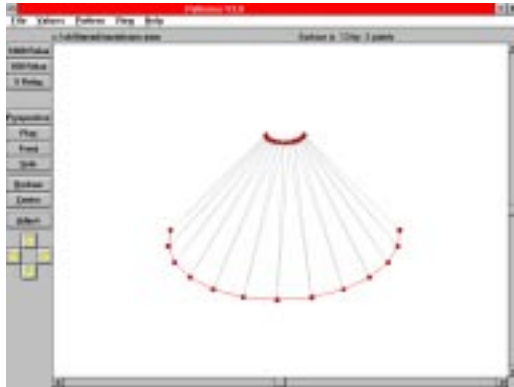
Refining your design

It is perfectly possible and productive to use Patterner simply as a tool to create 2d production drawings of 3d meshes developed in another package, without using any of the node and mesh editing tools available.

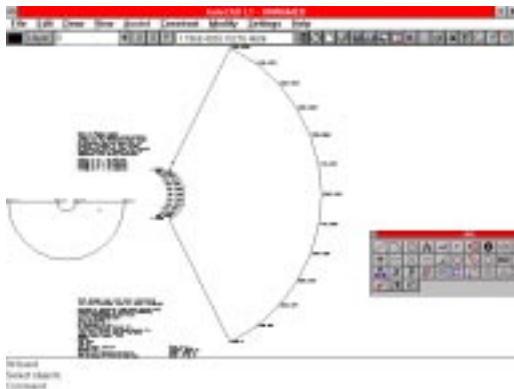
For example, using a Revsurf (a surface of revolution) to pattern a

spherical structure or a simple single pole round tent.

Shown below is the ruled surface imported in the previous section used to create a template for a conic metal ventilation duct. Surplus seams have been deleted (see getting the right panel width overleaf).



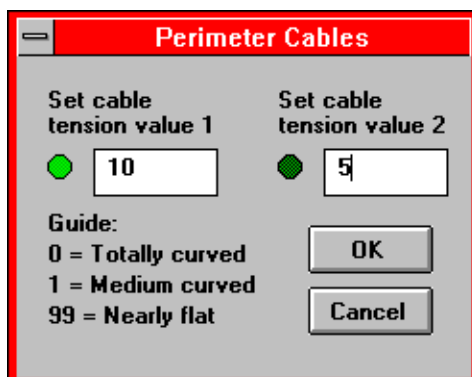
Now view the resulting 2d drawing in AutoCAD.



However this would not be using the program to its full advantage, Patterner comes with a whole series of mesh, node and panel editing tools.

Using perimeter cables

There are two different perimeter cable settings in the 'Cables' dialogue box in the 'Values' pull-down menu, these allow you to have two different cable types of different radii.



Pick the nodes that you want to be cables (using the right mouse button, or by using the keyboard arrow keys and the enter/return key to bring up the node edit dialog box), leave the corner fittings as 'fixed points', and click on the '5 relax' button to see the effect. If the radius appears to large or small, then change the values in the 'cables' menu.

Simulating Inflatables

Patterner can simulate an inflatable shape by applying a perpendicular offset to the surface. To experiment with inflatables, load demo_005.mem and try changing the values in the 'values/inflatables' menu, relaxing each time.



Notice that a negative value will cause the surface to curve in the opposite direction. Patterner does not assume which side you wish to be inside and which outside.

Again, as with all the other surface functions, Patterner will not tell you if the surface you have designed requires an improbable internal air pressure, material or support strength, it simply creates a form.

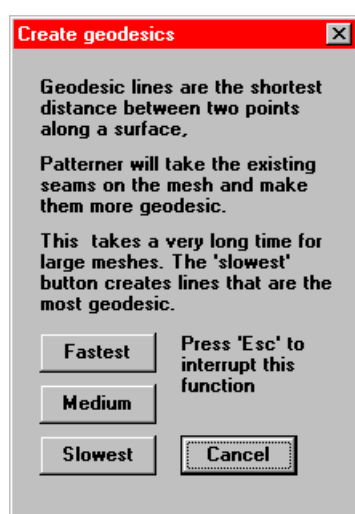
Changing the seam direction

When a 3d DXF file is imported into Patterner, or a new surface is created using the 'New Mesh Wizard' a seam direction is shown (the seams are highlighted red).

If this direction is wrong and needs changing, click on 'Toggle Direction' in the 'Pattern' pull down menu. This 'selected direction' also determines how the 'create geodesic seams' and the 'delete/insert panel' functions work.

Creating geodesic seams

A geodesic or geodetic line is the shortest distance between two points on a surface. On a flat surface such as a sheet of paper, the geodesic is a straight line. On a spherical surface like the earth the geodesic is a 'great circle' like the equator or a line of longitude.



When laid flat for patterning, panels from an anticlastic surface tend to be 'banana shaped', this is usually a very inefficient use of material.

By using the 'Create geodesic seams' function in the 'Pattern' menu, Patterner shuffles all the seams along the surface and progressively shortens them. This makes the panels more symmetrical and consequently easier to fit into your standard material width.

Note that this function makes the seams 'more geodesic' not 'actually geodesic', this is important, particularly for seams with a lot of nodes, these would require an unreasonable amount of processing time to achieve a good approximation. Some shapes are intrinsically wasteful of material, as a result there is not always an ideal solution.

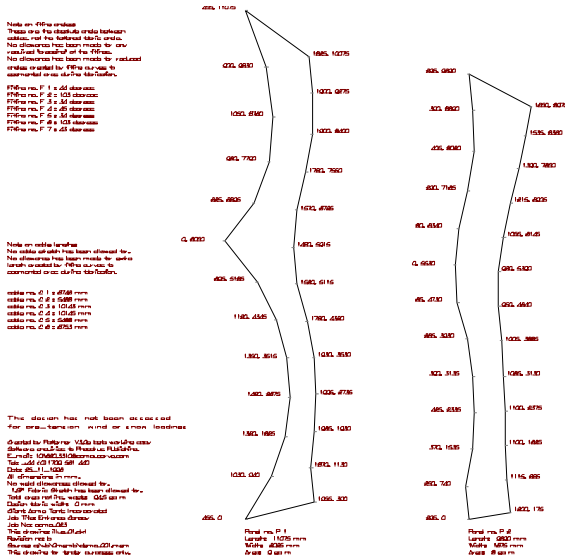
This function can take a long time and may have to be aborted, so save your mesh before proceeding. Patterner grabs all the processing power of your computer, so the only way to terminate the geodesic and relax functions is to press the 'Esc' key at the top

left of your keyboard.

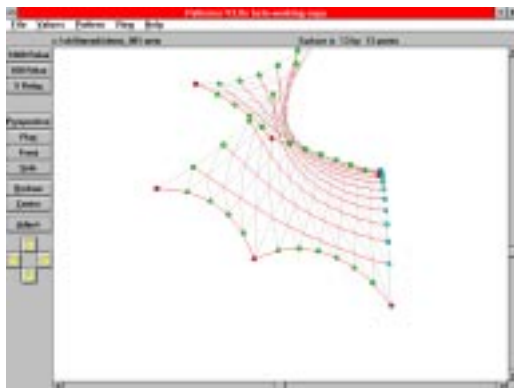


This process is perhaps better illustrated with an example. If you load the demonstration file demo_001.mem and relax it using the '5 Relax' button, you will see the relaxed mesh shown above.

Notice that the seam nearest the bottom of the screen forms a wavy line. When the mesh is patterned, the two panels on either side look like this:



This is not the easiest shape to cut and fabricate. If you select create geodesics (medium) after the process has finished (possibly taking quite some time), the mesh has changed to:



To make panels narrower, first use the geodesic seams function (see above) this will optimise the panels. If this doesn't work you can insert an extra panel using the 'Insert row/column' function in the 'Pattern' pull-down menu, relax the mesh and create geodesic seams again. Note the number of seams changes the shape of the surface so you may have to add seams in the perpendicular (opposite) direction to compensate.

If there are many panels that are too narrow, then you can remove seams using the 'Delete row/column' function.

Patterner will not insert or delete a seam when the selected seam is an edge. When inserting a seam, the new nodes at each end are created as 'Straight Edges' (yellow). You will have to change them to 'cables', 'floating corners' or whatever node type you wish them to be.

Exporting 3d meshes to external packages

Often you will need to export your 3d meshes to other packages, either to use their editing functions, perform structural analysis on the surface or to create a presentation.

Patterner provides two methods of doing this.

Exporting 3d DXF format models

To transfer your 3d mesh to another CAD package, such as FastCAD, AutoCAD or 3dStudio, use the 'export *.DXF' dialogue box on the 'File' pull down menu. Set the required file name and refer to the external packages' documentation for details of how to import DXF files.

Patterner allows you to use an alternate DXF file format, there is no need to use this unless you are having trouble importing files.

Viewing your surface in a World Wide Web browser.

Patterner does not produce rendered and shaded 3d images, however you can quickly view your mesh in one of several freely available VRML viewers. These allow you to spin and walk around your smoothed, lit and coloured surface.

In addition, VRML is a World Wide Web internet standard, with a bit of effort you can incorporate your models into a presentation scene and allow clients to wander around your design on the internet.

To use your mesh in a VRML [virtual reality modelling language] viewer such as Netscape or Internet Explorer, pick the 'Export *.wrl' dialogue box on the 'File' pull down menu. You will be presented with a series of options for colouring and hyperlinking the mesh.



The hyperlink function can be left blank or filled with a hyperlink address such as: <mailto:101620.3310@compuserve.com> or <http://home.netscape.com/> clicking on the surface in the viewer will take the user to that address.

The self referring URL option creates a surface that links to itself when clicked, this is useful when several surfaces are being viewed at the same time and you need to look at just one.

The stripe option colours alternate panels, there is no facility for striping every third panel etc..

Creating production drawings

This is where the full power of Patterner is used to save many hours of work turning 3d ideas into 2d drawings for manufacture.



Although Patterner will print a full set of production drawings direct to an A4 printer or even a fax modem, there will a time when it is necessary to have the 2d pattern drawings in an editable electronic file format.

There are various possible reasons for this:

You may wish to use a large-scale plotter or cutter to bypass the labour intensive job of marking out panels.

You may want to use a 2d CAD program to print drawings on a A1 or larger printer, perhaps to make a large test model or just so that you can use your own drawing boxes.

You may need to e-mail drawings to the other side of the world.

You may wish to change aspects of the patterning in a 2d CAD program, add offsets or indicate different materials and colours.

To do this instead of printing your drawings, select the 'Pattern to

2d *.DXF' in the 'Pattern' pull down menu, choose a DXF file name and click OK.

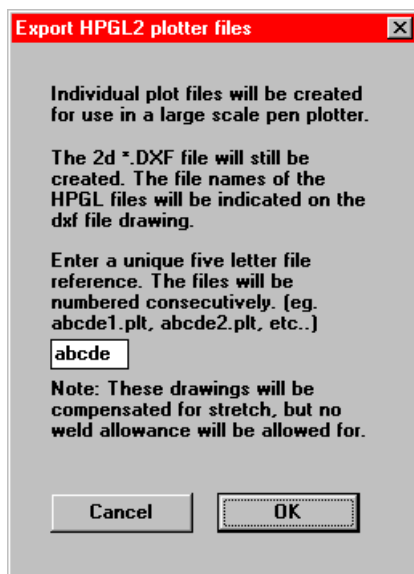
This creates a 2d DXF (drawing exchange format) file which can be imported into a drawing package such as AutoCAD, FastCAD or EasyCAD.

Using Patterner with CAD/CAM

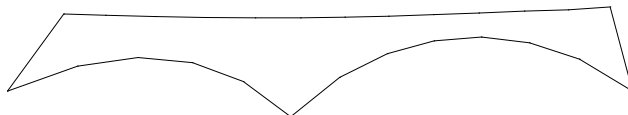
The DXF files created are not directly in a format for proprietary CAM (computer aided manufacture) marking of panels, there is information such as text that might confuse a plotter.

As an alternative method of transferring the raw shape of the panel to a large scale plotter, you can ask Patterner to create a set of HPGL (Hewlett Packard Graphics Language) plotter files. Select 'Generate HPGL files' when you create a DXF drawing file.

This will bring up the following dialogue box:



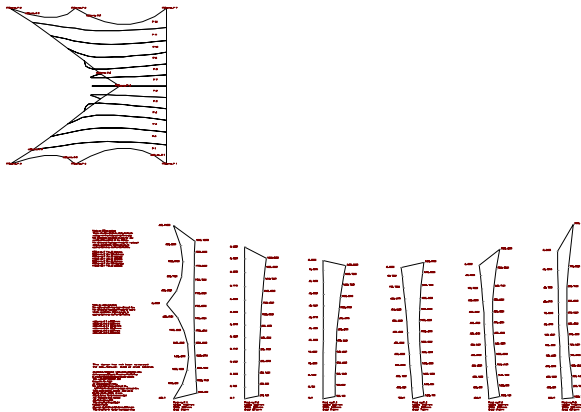
Enter a five character file reference and Patterner will create one file for each panel numbered consecutively (e.g.. abcde1.plt, abcde2.plt, etc..).



The picture shows the contents of a typical HPGL *.plt file

Information included in drawings

It is important to be aware of exactly what information is put on the drawings and what information is not. The picture shown is a typical output DXF file.



Printed output is very similar, except with the plan-index on the first page and a separate sheet for each panel.

Included on the drawing is the following information:

- Cable lengths. These are calculated between fixed nodes and corners, there is no allowance for stretch or for extra length caused by fitting curves to the segmented arcs during construction.
- Fitting angles.
- Dimensions and areas. The values shown are calculated after allowing for the stretch value shown on the drawing, set this with the values/materials pull-down menu. All dimensions are assumed to be in millimetres.

The total fabric area of the finished surface is calculated, however as this is the cut area, there is no allowance for fabrication wastage. The design fabric width, set in the pattern pull-down menu, is also shown. Please refer to the previous section on refining your panel widths.

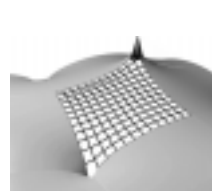
- Project information. This is set in the values/project data pull-down menu.
- File names. Also included on the drawing is the current date and the file names of the source mesh and exported drawing.
- Weld allowances. Patterner does not calculate weld allowances. All drawings created assume that the weld width is zero, as a result, you need to indicate weld offsets for seams.

The layout and format of the raw DXF file created will almost certainly have to be adjusted before printing out. Either to split it up into several more manageable sections or to add detail references and drawing boxes.

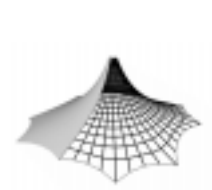
Appendix 1: Index of demonstration *.mem files



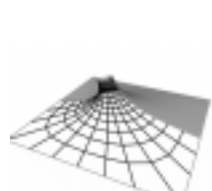
demo_001 This mesh has a mirror line and cable perimeters.



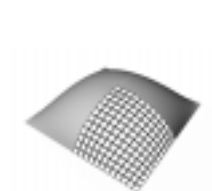
demo_002 This mesh has mirror edges on all four sides. The surface has two point supports which are not adequate.



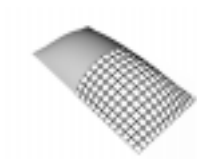
demo_003 This uses two mirror edges to model half of a one pole tent.



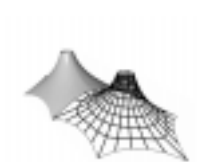
demo_004 This uses two mirror edges to model half a roof membrane. The neck is inclined



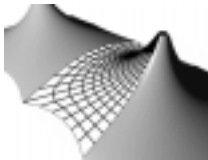
demo_005 This is one quarter of an inflatable surface. There are two mirror edges and one floating corner.



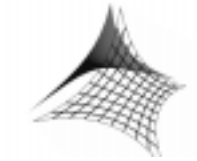
demo_006 This is one half of an inflatable. Try changing the values in the inflatables menu to change the radius.



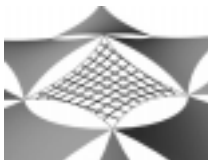
demo_007 This is one half of a two pole surface. Two overlapping mirror edges give the effect of a continuous conic mesh.



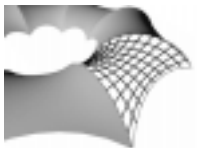
demo_008 This is a variation of demo_003. It is half of a middle section to turn demo_003 into a two pole tent. The mirror edges from demo_003 have been turned to fixed points.



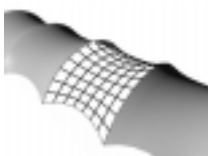
demo_015 This is a model of a simple saddle surface that would be supported by one pole and no stays.



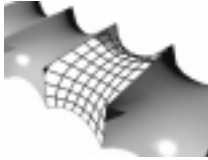
demo_016 This is a standard sail surface. Geodesics have been generated for ease of patterning and manufacture.



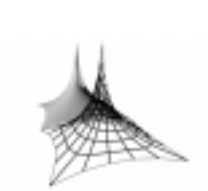
demo_017 This is a typical saddle surface between two hoops. The hoops are at an angle to each other.



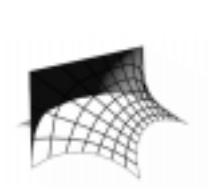
demo_018 This is a typical saddle surface between two parallel hoops. This would connect with demo_017 above.



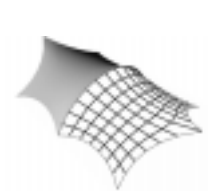
demo_019 This is another saddle surface between two hoops. The hoops can be any shape. Try moving the corner nodes.



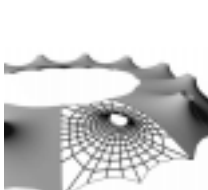
demo_020 This is a simple one pole surface with a cable support in the middle rather than a bale ring.



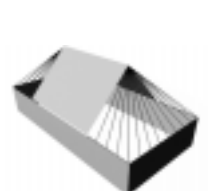
demo_021 This is an end section which would join onto a middle section such as demo_019.



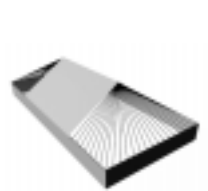
demo_022 This is an end section which would join onto a middle section such as demo_017 or demo_018.



demo_040 This is a section of an arena canopy. Provided the inner catenary is supported on a Velarium ring cable, There is no need for any inner supports.



demo_043 A 6m (20ft) span marquee. This model has no curvature at all. Try moving some of the control points to pattern marquees with different sizes.



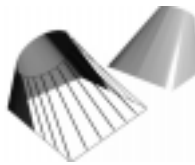
demo_044 This is another marquee, based on demo_043 above. Overall size is 12m (40 ft). Use the 'pattern to DXF' function to create triangle cutting patterns.



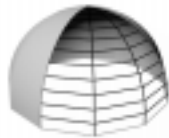
demo_045 This is a shape similar to the one on the cover of this guide. Notice that there are fixed points within the mesh surface to simulate the support hoops.



demo_046 A difficult steel container shape with elliptical ends and inclined seams. This shows the fabrication potential of Patterner.



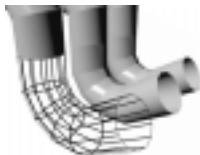
demo_047 This is a mesh representing an air-conditioning cowl, a rectangular base fitting meets an inclined circular duct fitting. Pattern the mesh to see the template drawing.



demo_048 Any surface of revolution can be patterned, this is a model of a simple dome shaped structure constructed from twelve segments.



demo_049 A more complicated shape, the surface was created in a 3d CAD program. These segments together with appropriate baffles make an inflatable bottle.



demo_050 Large ducts and pipes are easy to pattern with Patterner. This mesh is exactly as imported into Patterner.

Appendix 2: Common questions

- Why do the arrow keys move the selected node in the wrong direction?

This happens with some meshes because the 1,1 index of the mesh as it was imported is at the top left corner of the mesh in plan, instead of the bottom right. The arrow keys move the selected node along the surface of the mesh, rather than in 3d space.

- When I enter a value to create an inflatable, the surface turns inside out.

Try entering a negative value.

- I have a series of mirror edge nodes and they haven't formed a straight line in plan, instead they 'jump off' to one side. How do I stop this happening?

This is caused by all the nodes in the edge having the same x coordinates, try making the offending node a 'straight edge' (yellow) or typing the x coordinate in the adjust node dialog box.

The other cause of this effect, is a mirror edge that overlaps itself. Any two nodes that have similar x and y coordinates but different z coordinates are likely to return a false value for the mirror edge. Try typing in the coordinates directly, adding or deleting a seam perpendicular to the mirror edge, or making the offending mirror node a 'straight edge'.

- When I pattern a drawing to a 2d DXF file, the panels seem to be 'folded' over each other and wrong. What do I do?

The first cause of this effect is likely to be two or more nodes at the same coordinates. Do not allow to seams to start at exactly the same point or to meet each other in the middle.

The second cause of this effect may be a panel with an extreme curvature (c-shaped or s-shaped). Try patterning the section with the seams toggled in the other direction, or create geodesics to make the panel more regular in shape.

- Why does my CAD package refuse to import my exported 2d DXF drawing?

The DXF files created have been found to be compatible with all tested CAD programs, but not with some word processors. If you are having trouble, try importing into another package and re-exporting the DXF file from that program. If this does not cure the fault, please post or e-mail the file to the address at the beginning of this guide, giving details of the program you are trying to use. We will attempt to find a solution.

Appendix 3: Program reference

Menus



File menu

Use this to open and save.

New..

Selecting 'New..' brings up the 'New mesh Wizard'. If do not wish to edit an existing mesh, you can create a variety of different surfaces with this. After creating a mesh, it is displayed in plan view. You may wish to click on the 'Perspective' button to see it from an angle.

The rectangular mesh function creates a simple mesh for you to manipulate. Enter the overall size in plan and the desired fabric width. You will have to change the heights of the fixed perimeter nodes to give the surface curvature [after creating the mesh, select your node and click on 'Adjust']. If you require perimeter cables, you will have to change the node types of the perimeter nodes [use 'adjust' or click the right button on your mouse.]

The radial mesh function creates a circular mesh, this has more options than those for creating rectangular meshes:

Included angle. 360 degrees is the default. If you intend your mesh to be symmetrical, then you should enter 45, 90, or 180 here. This would speed up the design process enormously.

Overall height. If you intend your surface to be 10 metres high, but 4 metres above the ground, enter 6000 here.

Bottom radius. This would typically be half the overall diameter of the surface.

Top radius. This would typically be half the diameter of a 'bale ring'.

Maximum panel width. Enter the usable width of the fabric you intend to use, the number of panels that would be needed is indicated below.

Mem Files

*.mem is the Patterner native file format, mesh data is stored along with project, cables and material data.

Printing

Patterner is designed to print to any installed Windows compatible printer, including fax modems. This means that the drawings are optimised for Letter (8½" x 11") or A4 size sheets of paper.

On selecting 'Print..' from the 'file' menu, you will be presented with several options:

Print Setup... Click here to select a printer and adjust printer settings.

Project Data... Use this to change the project information that will be printed on the drawings.

Number of copies. Change this to print more than one set of drawings.

Dimensions to nearest 5mm. By default, all dimensions on the drawings are rounded down to the nearest 5mm. Deselect this checkbox to print dimensions to the nearest mm.

Click 'Print..' to print a set of drawings. Note that the demonstration version of Patterner prints only the first panel of the drawing set.

Before printing, Patterner calculates the scale that the panel drawings will be printed at to fit on a sheet of A4 paper. You can change this value to a larger number to print smaller drawings. The index plan drawing on the first sheet will not be printed at this scale.

Note: if you wish to print your drawings at a larger scale or using a plan printer, then you must use the Pattern to *.DXF.' function in the 'Pattern' menu [see below]. This will allow you to edit and arrange the drawings in a 2d CAD package before printing at any scale or size you wish.

DXF Files

*.DXF is the standard Drawing Exchange Format. Patterner imports FastCAD, AutoCAD10 & 12 3D *.DXF meshes, and exports AutoCAD, 3DStudio and FastCAD compatible 3D *.DXF files.

Patterner accepts the following AutoCAD DXF objects: Rulsurf, Edgsurf, Revsurf and 3dmesh, it does not accept 3dface, 3dpoly or any other 3d object.

If you are having trouble importing files, make sure that the DXF file contains only the surface required and no other objects [Patterner accepts only the first object it encounters].

Arr Files

*.arr is a [now defunct] older file format, this converter has been included for full backward compatibility.

Wrl Files

*.wrl is the world wide web VRML [virtual reality modelling language] standard. An exported *.wrl file can be viewed, rotated or flown around in real time using a viewer such as Netscape or Internet Explorer.

Save options are:

Export Units, [Patterner nominally uses millimetres as units, VRML doesn't seem to have any standard units] this is important when including a surface in an existing model.

URL internet address. Set this to any ftp://, http:// or mail to: address. Clicking on the model will link to that new address.

Enabling the 'Self referring URL' check box will mean that clicking on that mesh within a larger model will cause that mesh to be loaded individually.

Colours: pick any of 281 trillion different colour combinations for your mesh using the sliding bars.

Exit

Closes Patterner.

Values menu

This contains various universal settings applied to the mesh. Note: this menu is unavailable until a file is loaded.

Cables

Set values for cable tension. This is a geometrical function not a force function, so there are no units. A value of 0 will create a cable of the minimum radius possible [very curved], a value of 99 will create a cable with the maximum radius possible [almost straight].

There are two settings to allow for situations where two cables may require different radii, these are indicated on the view window by dark and light green dots.

It is possible to create a single cable with a combination of tension values, though not advisable.

Inflatables

Sets a value to simulate inflatable structures. Again, this is a geometrical function not a force function, so there are no units. You must set a positive or negative value not equal to zero to enable this function. The greater the value, the more pronounced the inflation.

Materials

Version 3.* of Patterner supports fast geometrical relaxation only, this method is material independent.

The stretch allowance box allows the user to 'shrink' the surface before patterning. For example: a stretch allowance of 0% would create patterns without any stretch allowance at all, an allowance of 3% would create patterns 97.1% of the final required size.

Typical stretch allowances for PVC coated Polyester fabric are 1.5% to 5%. depending on material.

Project Data

Use this data to keep track of projects, clients, jobs etc..

This information is included in all patterns created by Patterner.

Pattern Menu

This menu is where all patterning functions are performed. Note: this is unavailable until a file has been loaded or created with the 'New..' function..

Toggle Direction

The mesh is rectangular in nature, use this button to indicate which direction [highlighted red] you wish the individual panel seams to run. Note: there is a third 'diagonal' seam direction, Patterner V3 does not support patterning for this mode.

Create Geodesics...

This takes the selected seams and turns them into geodesic arcs. This is crucial to avoid creating difficult to build 'banana shaped' panels.

Important: 'Create Geodesics' can occupy your computer for several minutes, The [red] progress bar at the top left will indicate progress. To interrupt press 'Esc' on your keyboard once, after a short while you will be returned to the program.

Show Width...

This quickly patterns the surface, lays it flat and orients it to calculate the maximum panel widths used. By setting the value in the dialog box you can see which panels are wider than your preferred width.

Tip: if you use the 'Create Geodesics' function beforehand, the panels will fit better into your ideal width.

Pattern to *.DXF...

'Pattern to *.DXF' brings up the above save dialog.

Indicate a 2D *.DXF file to save the construction drawing information to and click OK. You have the opportunity to check the project data before exporting, as this is included in the file.

The picture below shows a portion of a typical output from the 'Pattern to *.DXF' module, viewed in AutoCAD prior to printing. The

exported DXF files have been found to be compatible with all tested CAD and drawing software. If you are having trouble importing these files into your CAD software, then please contact us at the address in the users guide.

All dimensions are given to nearest 5 millimetres, the panels are numbered 1,2,3,4 etc..

Important note: Patternner has no idea which side of the fabric is inside, and which side is outside.

You will have to indicate this on the drawing unless your surface is symmetrical.



Insert Row/Column

The number of panels can be increased by selecting a seam to 'double'. The seam is chosen by a combination of the selected node [highlighted blue] and the selected seam direction [highlighted red]. Note: edge seams cannot be doubled. Also if the end node of a seam is a 'fixed point' or a 'floating corner', then the new seam will start at the same point. Two nodes at the same location will cause problems when patterning.

Delete Row/Column

The number of panels can be decreased by selecting a seam to delete. The seam is chosen by a combination of the selected node [highlighted blue] and the selected seam direction [highlighted red]. Note: edge seams cannot be deleted.

Edit Menu

All the options in the 'Edit' menu operate on the entire mesh. If you wish to alter the position of individual nodes either:

Drag them with your mouse [not in perspective view] or select the node [use your mouse or navigate using the arrow keys] and type in the required coordinates [open the adjust window by pressing 'Enter' or click on the 'Adjust' button].

These are not a full set of CAD editing tools, you can export your mesh [using the 'Export *.DXF.' function] to a 3d CAD package to perform further manipulations before re-importing back to Patternner.

Move mesh..

Move the mesh in the x, y or z directions. Patterner uses standard engineering/architectural convention. ie. x is rightward, y is backward and z is upward.

Define origin..

This moves the mesh so that the currently selected node is at the datum point 0,0,0.

Scale mesh x,y,z..

Use this to resize, squash or stretch your mesh. Again Patterner uses standard x,y,z convention [see 'Move mesh..' above].

Rotate mesh..

This will rotate your mesh in plan by a specified angle.

Mirror mesh

This flips your mesh like a mirror. To flip your mesh from back to front, use in combination with 'Rotate mesh..'

Grid menu

The grid is one of the most powerful aspects of Patterner, it allows accurate designs to be created quickly.

The grid in Patterner is not visible, this is why you cannot see it.

Snap to grid

This enables the 'snap to grid' function and the 'Define grid..' menu item [see below]

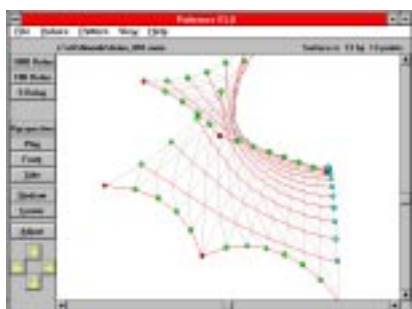
Define grid..

The default grid is 100,100,100. This means that all the fixed nodes dragged into place are placed accurately to the nearest 100mm. For example, if you change 'grid z' to 1000, then all the nodes that you move [in front or side elevation, not plan view] will have a height above datum of 1m, 2m, 3m, etc..

View Menu

Use this menu to zoom in and out of the drawing, the scales provided are approximately correct, a large surface would require a large scale [1:1000], a small surface would require a small scale [1:5].

Screen Buttons



Relax

These buttons run the main relaxation module, [1000 relax performs 1000 iterations etc..] Simply relax the membrane until the required shape is achieved. Membrane Patterner uses a simple geometric method of relaxation, not a force based method. This method is entirely size independent, ie: it will return the same geometry whether the membrane is very small or improbably large.

The relax module works by taking each point in the mesh in turn, and placing that point in a suitable position relative to the eight surrounding points. It then repeats or iterates this process however many times it is asked to [5, 100 or 1000 times]. Note: pressing '5 relax' two hundred times is equivalent to pressing '100 relax' ten times or pressing '1000 relax' once.

The relax module can take several minutes, interrupt it by pressing 'Esc' on your keyboard.

Perspective

This alters the view in the view window to a front perspective. The viewpoint cannot be altered, use the view menu to change scale and the scroll bars to move the image.

Note: Nodes cannot be selected or dragged using the mouse in perspective view.

Plan

This alters the view in the view window to a plan [non-perspective] view. Use the view menu to change scale and the scroll bars to move the image.

Front

This alters the view in the view window to a front [non-perspective] view. Use the view menu to change scale and the scroll bars to move the image.

Side

This alters the view in the view window to a right-hand side [non-perspective] view. Use the view menu to change scale and the scroll bars to move the image.

Redraw

This refreshes the image in the view window. To save time, some edit functions do not redraw the screen at every opportunity. If you wish to view your edits press this button.

Center

This recalculates the centroid of the membrane and moves the view to that point.

Adjust

This calls up the Node adjustment module, this module can also be called up at any time by pressing the Enter/Return key. The selected node is indicated on the view window by a blue circle, there are eight node types.

Floating, this is the default, this node will be positioned by the relax module.

Fixed, [red] this is the default for any perimeter node, use this for corner plates and any other fixed element.

Special, unused.

Straight edge, [yellow] this will place any node or series of nodes in a fixed straight line, use this for clamped edges etc..

Mirror edge, [cyan] this is crucial to fast use of Membrane Patterner, a series of these will allow half a symmetrical membrane to be modelled rather than two identical halves. It makes an edge node behave as if it were a floating node.

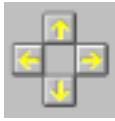
Floating corner, [magenta] this is fixed in plan, but will change in height [z direction] to suit adjacent nodes.

Perimeter Cable 1, [green] use this to make an edge node part of a perimeter cable, use the Values pull-down menu to set the tension.

Perimeter Cable 2, [dark green] as above, use this to indicate a perimeter cable with a different tension. Use the Values pull-down menu to set the tension.

Specify Coordinates, edit the positions of your fixed nodes in these text boxes.

Note: A faster way to change the position of nodes is to drag them using your mouse and a relevant grid setting. To change the 'node type' of a node, use the 'right' button of the mouse to bring up a menu of options.

Arrow key/buttons

Use these keys to navigate around the membrane, and determine the node to adjust. Note: you can use the arrow keypad on your keyboard to speed this process up, then press enter to bring up the node Adjust module.