

3D Printing Features

Now available in TurboCAD Mac Pro and TurboCAD Mac Deluxe version 9

3D PRINT CHECK

The 3D Print Check tool checks a part for its print viability, displaying warnings or errors to the user. The checks include:

Position Check – The position check examines the extents of the part and verifies that the part is within the positive x,y,z coordinate system. Use the Auto Position tool to automatically position the part within the positive coordinate system.

Facet Count Check – Some 3D printing service bureaus, cannot process more than 1,000,000 facets. If you have more the 1,000,000 facets you may need to reduce the number of facets in your model. Some options include changing the solid to facet conversion or using the Facet Reduction command.

Size Check – If your model is too large or too small for standard 3D printers, a warning message is displayed. The too small message warning is displayed if the model is less than 0.3 x 0.3 x 0.3 cm.

Closed and Water Tight Check – A 3D printer must have a closed volume to print. If your model is detected to have open edges an Error alert is displayed. To find your open edges, use the Find Open Edges command in the Mesh menu.

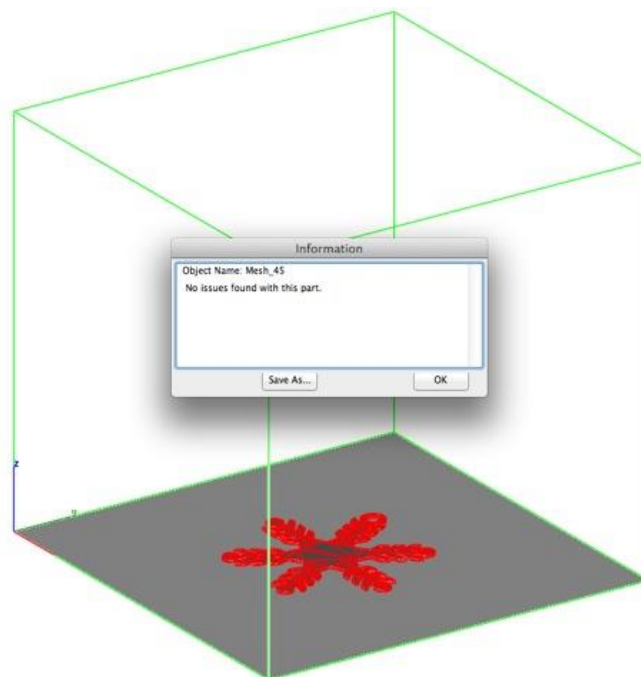
Duplicated Facets – This check examines each facet as unique in the model. If it finds another facet at the same position, an Error message is displayed. To correct this issue, use the Delete Duplicate Facets tool.

Collapsed Facets – A collapsed facet has no area. This check will inform you if the part has zero area facets. To correct Collapsed Facets, use the Remove Collapsed Facets command.

Normals Check – Facet normals define the inside and outside areas of your part. If some of your facet normals are pointing the wrong way, the 3D Printer may have problems creating the part.

If you have a normals issue, there are several commands that can help you fix this problem. First use the Display Surface Normals tool to isolate inverted facets. Use the Fix Flip Normals to correct bad normals.

Manifold Check – Some solid modeling programs allow you to create non-manifold solids. A manifold part has exactly two facets connected to each edge. If an edge has one facet attached, then the edge is open and is detected by the Closed Water Tight Check. However it is possible for a model to have more than two facets connected to an edge. This check isolates those type of edges and reports as an error.



SURFACE NORMALS CHECK

This tool performs a visual analysis of a part's surface normals. Facets displayed green have correct facet normals whereas red represent an improperly defined facet normal.

3D Printing must have normals pointing away from the material.

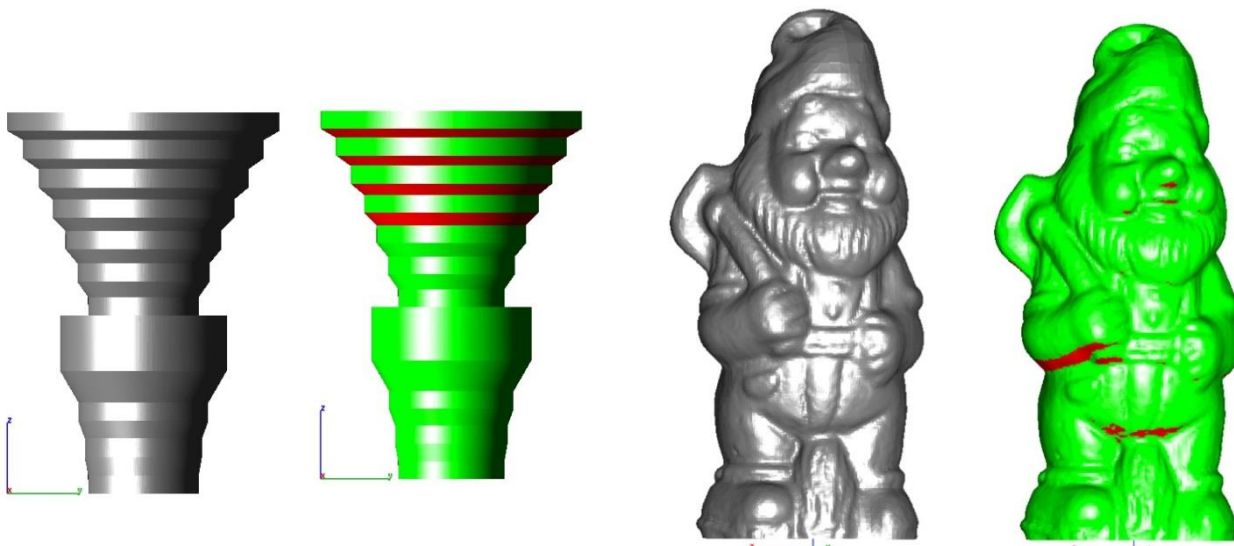
If you determine that the mesh contains improper surface normals use either the Fix Flipped Normals tool to auto repair an entire mesh or the Flip One Normal to specifically flip one facet normal.



OVERHANG ANALYSIS

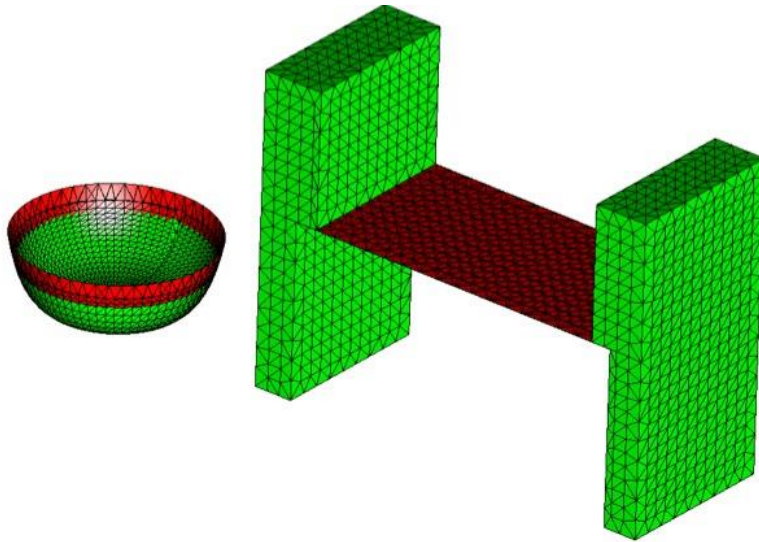
The Overhang Analysis tool provides a means to visually inspect modeling areas that may require structural support for 3D printing. Meshes, surfaces, and solids facets normals are compared to the work plane direction. Angles that are less or equal to 45 degrees are highlighted as red.

Overhangs can still be printed if you apply appropriate support structure. To add support structure to an overhang, use the Support Structure tools of PowerPack.



WALL THICKNESS ANALYSIS

The Wall Thickness Analysis tool provides a means to visually inspect modeling areas that may be too thin for 3D printing. Meshes, surfaces, and solids facets are examined using ray intersections.



PREVIEW SLICES

The Preview Slices tool provides a user interface to slice models given a direction and thickness. The dialog box allows for animation through the slices as well as single stepping.

One use of the Preview Slice tool is to verify a part has closed, non overlapping sections, a requirement for 3D printing.

Slice Direction – Defines the cut direction for slicing. For 3D Printing use the Z-Axis. For examining sections such as fuselage stations, use the X-Axis.

#Steps – Defines the number of slices through as function of the extents of the part.

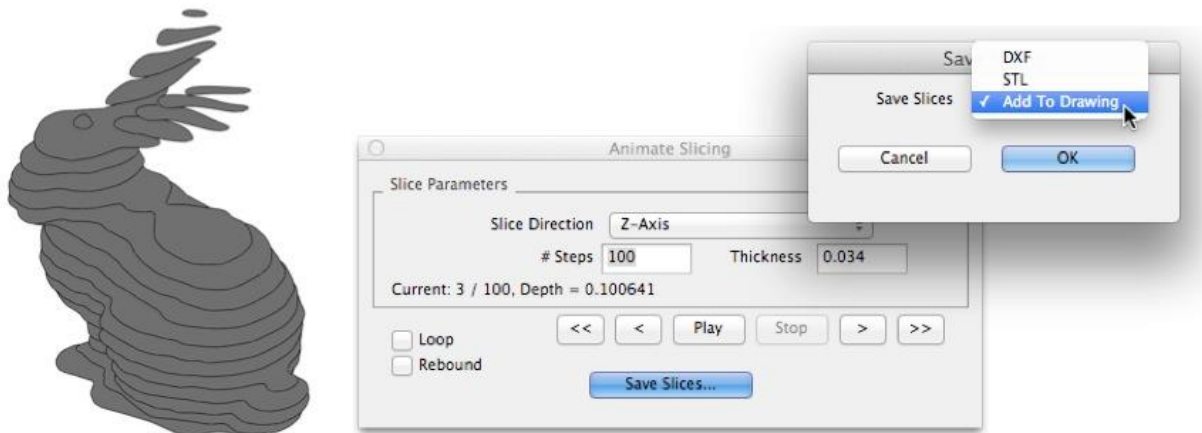
Thickness – Specify the distance between steps as a thickness.

Loop – Continue looping through the slicing when the fore and aft extents are reached.

Rebound – After reaching the last step, start backwards from the current position.

Play – Start viewing slices.

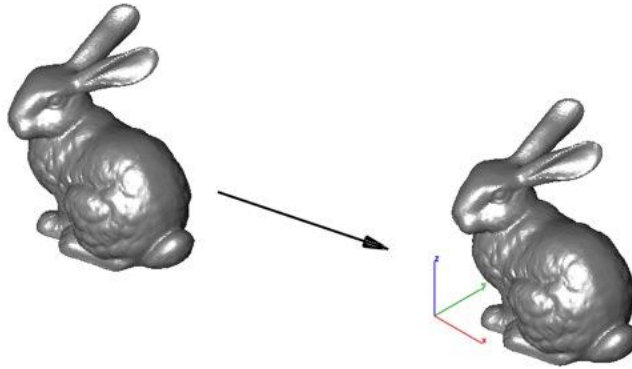
Save Slices – The Save Slices... option provides several options to save slices to DXF, STL or add the results directly into the drawing.



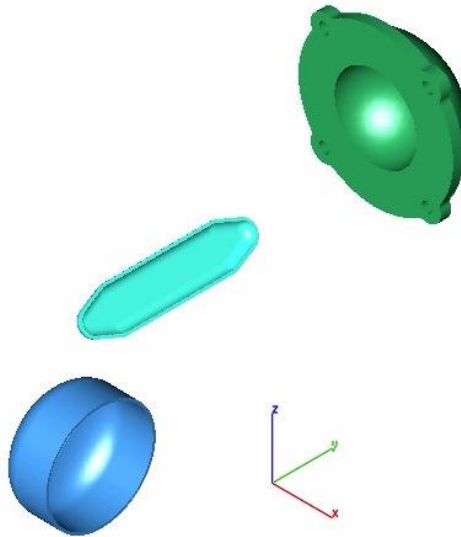
AUTO POSITION

The Auto Position tool positions a collection of parts within the boundaries of the default print platform.

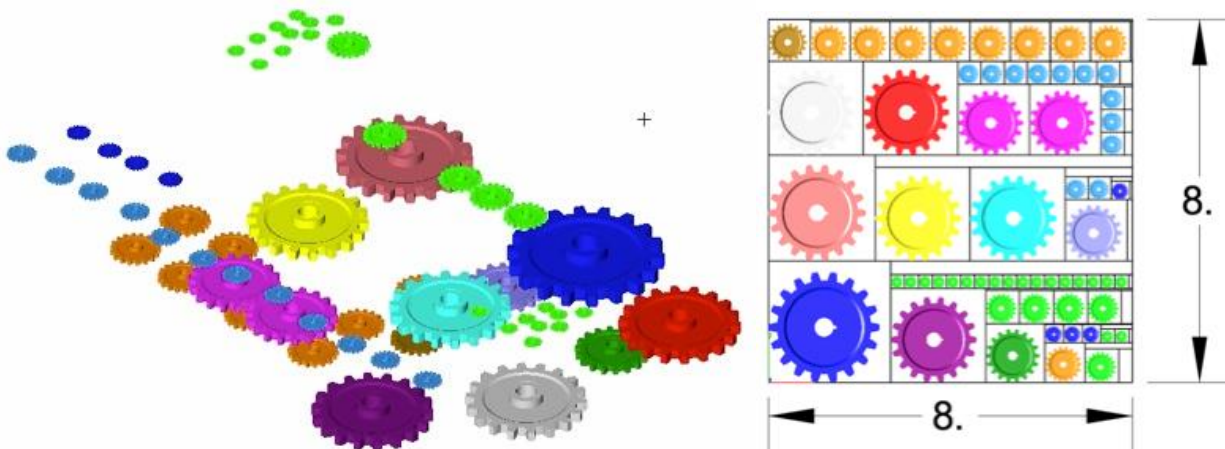
Centered – The selected parts are translated to the center of the print platform.



Align From Facet – The selected part is rotated and translated to the print platform center. The selected facet is used to align the part to the print platform.



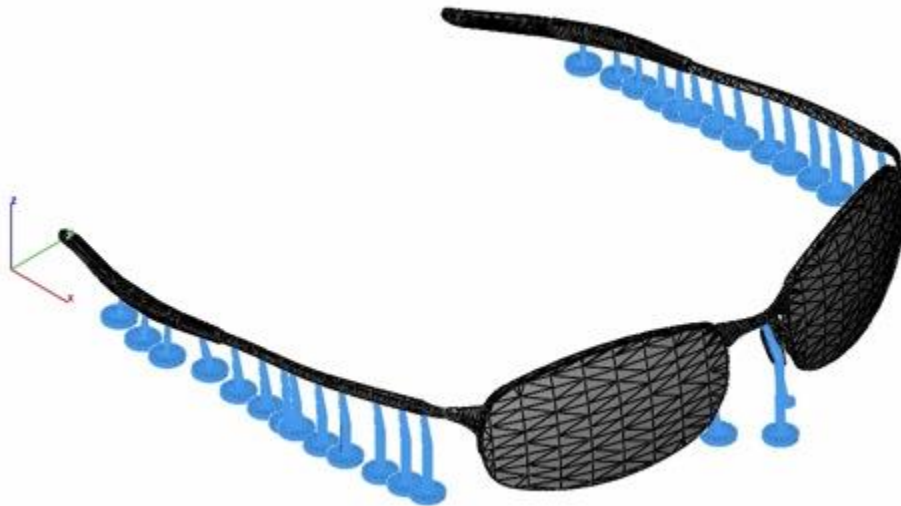
Optimal Packing – The selected parts are distributed on the print platform such that the available space is optimally used.



SUPPORT STRUCTURE

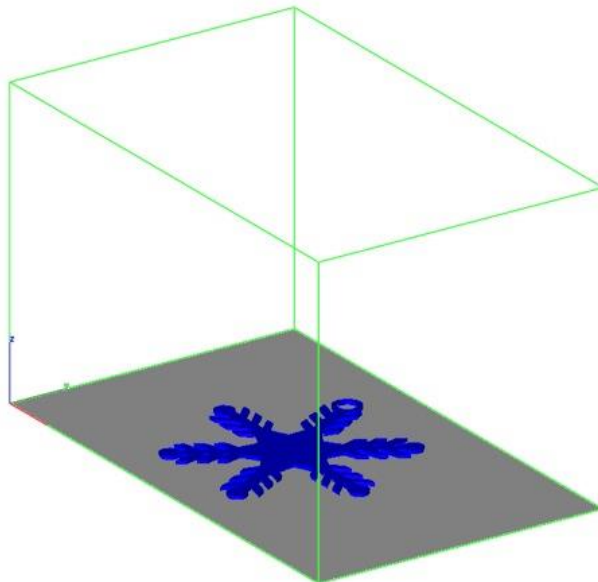
The Support Structure provides a tool that manually adds geometry to support material as it is created by the 3D printer. Support structures controls include:

- Attach Radius
- Midpoint Radius
- Base Radius
- Base Thickness
- Drag base and mid points to modify structure location



SHOW PRINT VOLUME

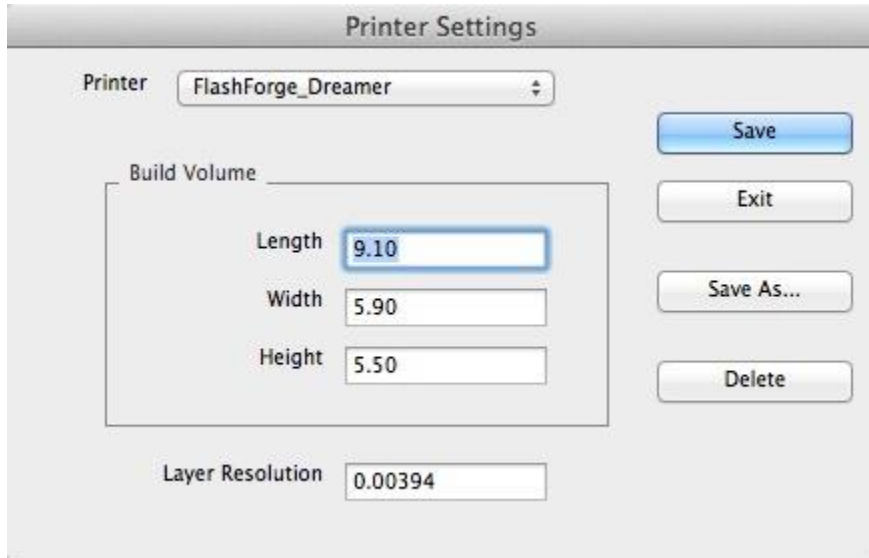
This command toggles the boundary of the default 3D Printer. The volume is defined within the Printer Definitions dialog box.



PRINTER DEFINITIONS

The Printer Definitions dialog box provides a means to set key parameters of the 3D printer. The parameters include the length, width, and height of the volume accessible by the printer. The parameters in the Printer Definitions dialog box are used for commands such as 3D Print Check and Auto Position.

To show the Printer Build Volume, select the “Show Print Volume” option from PowerPack. This will display a graphically volume representing the printable volume for the given printer.



Printer – Select a printer definition file already defined from a menu.

Length – The maximum length along x accessible by the printer.

Width – The maximum width along y accessible by the printer.

Height – The maximum height along z accessible by the printer.

Layer Resolution – The height between print layers.

Save – Change the current settings to the Printer.

Save As – Change the settings and Save As a new printer definition.

Delete – Remove the existing Printer from the menu.