
PowerSHAPE 2016

Reference Help

Cloud modelling



PowerSHAPE

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Patent Information

Emboss functionality is subject to patent number GB 2389764 and patent applications US 10/174524 and GB 2410351.

Morphing functionality is subject to patent application GB 2401213.

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Cloud modelling

Use the following sections for information on importing and editing points and clouds.

Importing data

- Import a cloud (see page 3)
- Acquire points using various devices (see page 7)
- You can copy items from PowerINSPECT as a cloud and paste into PowerSHAPE.
- The point cloud data file can contain more than just point data on each line of the file. The x y and z must be the first 3 columns of data.

For example, PowerSHAPE can now read a file that contains the following line:

```
0.23124 1.27482 9.288374 JJJJJJ KKKKKK LLLLLL
```



The first three columns of data must be numeric. The remaining data can be text.

Editing a cloud


- Select clouds (see page 14)
- Convert clouds (see page 28)
- Combine clouds (see page 29)
- Edit a cloud using the Cloud editing toolbar.




You can also cut or copy selected points from a cloud and paste them elsewhere.

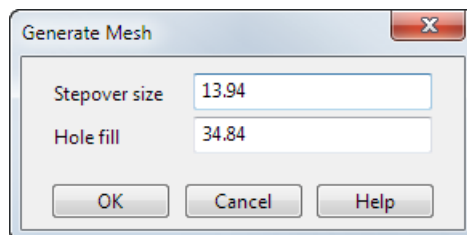
Importing a cloud

Import a point cloud (.asc, .csv, or .mod file type) using the following steps:

- 1 Click the Import  button on the Main toolbar.
The **Import File** dialog is displayed.
- 2 Select a file and click **Open**. The cloud of points is imported and the **Cloud Edit** toolbar is displayed.



- 3 Click the **Generate Mesh**  button on the **Cloud Edit** toolbar.
The **Generate mesh** dialog is displayed.




Stepover size specifies the size of the triangles in the mesh. The value that is displayed initially is a rough estimate, based on the size of the mesh. Smaller **Stepover size** values give a finer and smoother mesh.

Hole fill specifies the maximum diameter of holes to fill automatically. The mesh generator attempts to fill holes that have a diameter equal to, or smaller than, the **Hole fill** value.

- 4 Update the **Stepover size** value using one of the following techniques:
 - Enter a new value.
 - Use the **Measure** tab on the **Calculator** to measure between two points in the mesh.


- 5 If required, enter a new **Hole fill** value.
- 6 Click **OK** to create a triangulated mesh.



- 7 Click the Delete  button on the Main toolbar to delete the cloud and display the mesh.



- 8 Select the mesh.

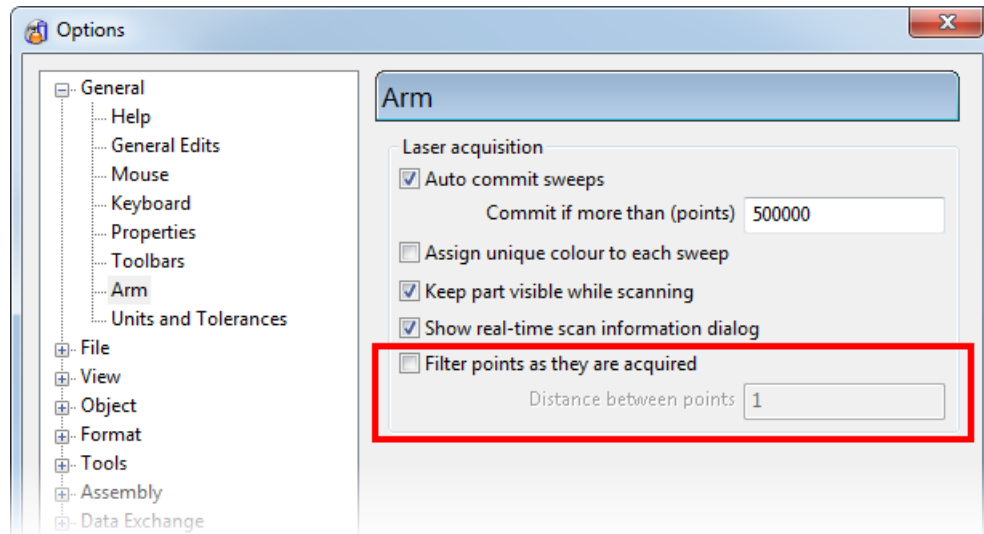
- 9 In this example, the mesh needs reversing, so click the **Reverse Mesh**  button to reverse the mesh.



Files imported that contain grouped points are imported as clouds. If the points are not in a group then individual point entities are created.

Filtering points on import

Use the **Filter points as they are acquired** option on the **Tools > Options > General > Arm** dialog to filter points during scanning.



- 1 Select **Filter points as they are acquired**.
- 2 Enter a value for **Distance between points**. This distance is used to remove points that lie within a specified distance of another point.



*The distance is specified in the units that are defined in **Tools > Options > General > Units and Tolerances**.*

Using devices to acquire scan data

You can acquire point data using various devices supported by PowerSHAPE. Use these devices to scan an object or part; the point data is acquired directly into PowerSHAPE.

To enable a device to use for scanning:




- 1 Ensure the device is connected to your computer and turned on.
- 2 Click the **Connect to various devices** button on the **Main** toolbar:



The **Devices** toolbar is displayed:



- 3 Click the button corresponding to the device you want to use:

-  — **Connect to Artec devices** (see page 7)
-  — **Connect the arm, for laser heads** (see page 8)
-  — **Connect the arm**



*These devices can also be accessed from **Tools > Devices**.*


Acquiring scan data using Artec scanners

You can acquire scan data using handheld **Artec** 3D scanning devices.



This functionality is available in PowerSHAPE Pro and Delcam Toolmaker Pro.


To use an Artec device to acquire scan data:

- 1 Click the **Connect to Artec devices**  button on the **Devices** toolbar. The **Artec Toolbar** is displayed:






The scanner mode is displayed as **Stopped**.

- 2 Press the Play/Pause button on the scanner to enter **Previewing** mode and scan your part. A preview appears in the graphical window as each frame of your scan is received.
- 3 Press the Play/Pause button again to enter **Recording** mode and scan your part. The final scan is produced and appears in the graphical window as you scan.

- 4 Click the **Generate a mesh**  button to generate a mesh from the scanned data.

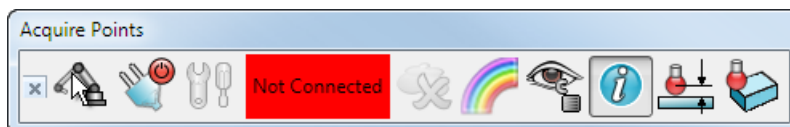


*Once you have generated a mesh from your scan, you can not continue to scan. You must close and then re-open the **Artec Toolbar** to scan again.*

- 5 Click the **Apply textures to mesh**  button to apply the scanned textures from the part to the mesh.
- 6 Click the  to accept changes and close the toolbar, or the  to cancel changes and close the toolbar.


Acquiring scan data using laser scanners





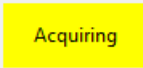
You can use the **Acquire Points** toolbar to acquire point data from laser scanners directly into PowerSHAPE.



If you have a PowerSHAPE Pro licence you can use the **Acquire Points** toolbar to work with devices which include a laser and a probe, without the need to switch between laser acquisition and PS-Arm.

To use a laser scanner to acquire scan data:

- 1 Click the **Connect the arm, for laser heads**  button on the **Devices** toolbar to display the **Acquire Points** toolbar.

- 2 Click the **Driver**  button to open the **Delcam CMM Driver Configuration** dialog (see page 10) and select a connection protocol.
- 3 Click the **Connect**  button to connect to the selected device.
Status information is updated to 
- 4 Click  to configure the device settings using manufacturer specific dialogs.
- 5 Start scanning your part. The status changes to  when you are acquiring points.



When a device is connected the cursor changes, depending on whether a laser or probe is attached:







— This cursor is displayed when you have a probe connected.



— This cursor is displayed when you have a laser scanner connected.

Additional tools

Use the following buttons on the toolbar as required:



- Click the **Delete**  button to delete the most recent sweep. This button is unavailable until you have performed at least one sweep.
- Click the **Information**  button to open or close the **Sweep Information** dialog (see page 11).
- Use the following buttons to specify how the clouds are displayed:
 -  **Colour clouds** — Select this button to give each sweep a unique colour. You can choose the default setting for this option using the **Tools > Options > General > Arm** dialog.
 -  **Lock View** — Select the button to lock the view in the current position. You can choose the default setting for this option using the **Tools > Options > General > Arm** dialog.



PowerSHAPE requires CMMDriverForPowerSHAPEPro 2015 or PowerINSPECT 2015 SP1 to be installed for laser scanning.

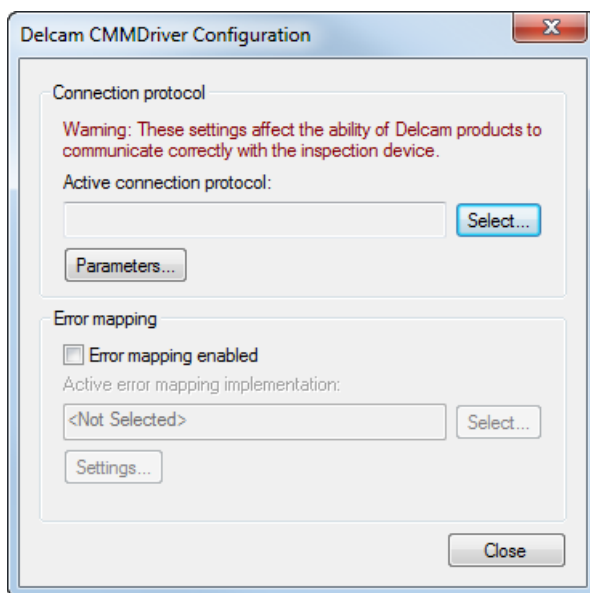
Probe tools

Use the following buttons on the toolbar if you are using a device which includes a probe:

-  **Probe compensation** — Click this button to toggle probe compensation. If on, the probed point is offset in the direction of the probe and its magnitude is determined by the radius of the probe. The probe should be normal to the surface being probed.
-  **Primitives from points** — Click this button to display the **Primitives from Points** dialog (see page 20).

Delcam CMMDriver Configuration dialog

Use this dialog to specify the connection protocol for the device.



To select a connection protocol:

- 1 Click **Select** to open the **Select Connection Protocol** dialog.
- 2 Select a connection protocol from the list.
- 3 Click **OK**. The dialog closes and the selected protocol is displayed as the **Active connection protocol**.
- 4 If the protocol you selected requires additional parameters, click **Parameters** to open a parameters dialog and specify the settings.
- 5 Click **Close**.

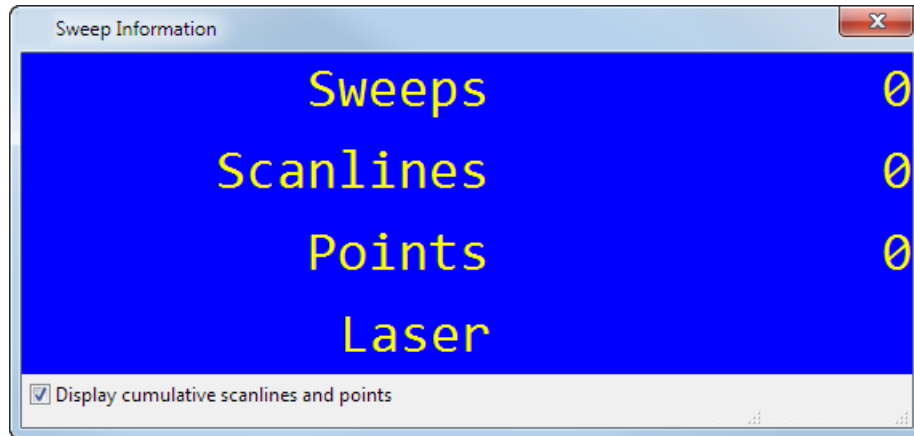


Error mapping is not supported by PowerSHAPE.

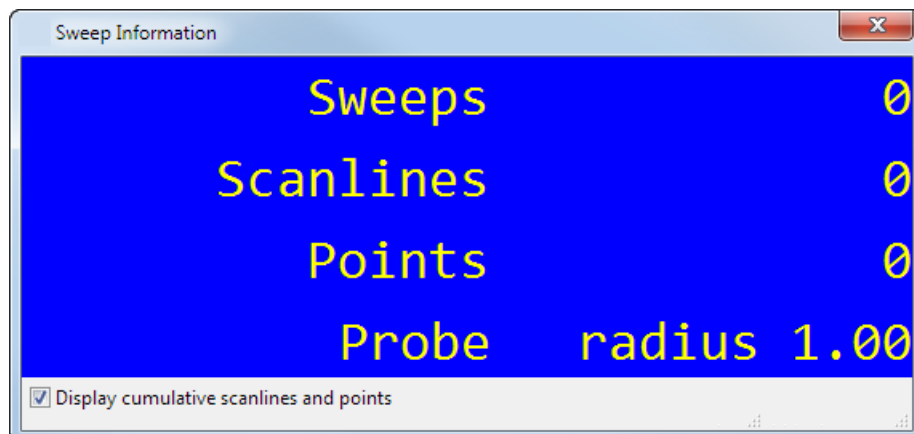
Sweep Information dialog


The Sweep Information dialog displays the number of Sweeps, Scanlines, and Points that you have captured in the current session. Additionally the dialog displays what type of device is connected:

- Laser



- Probe



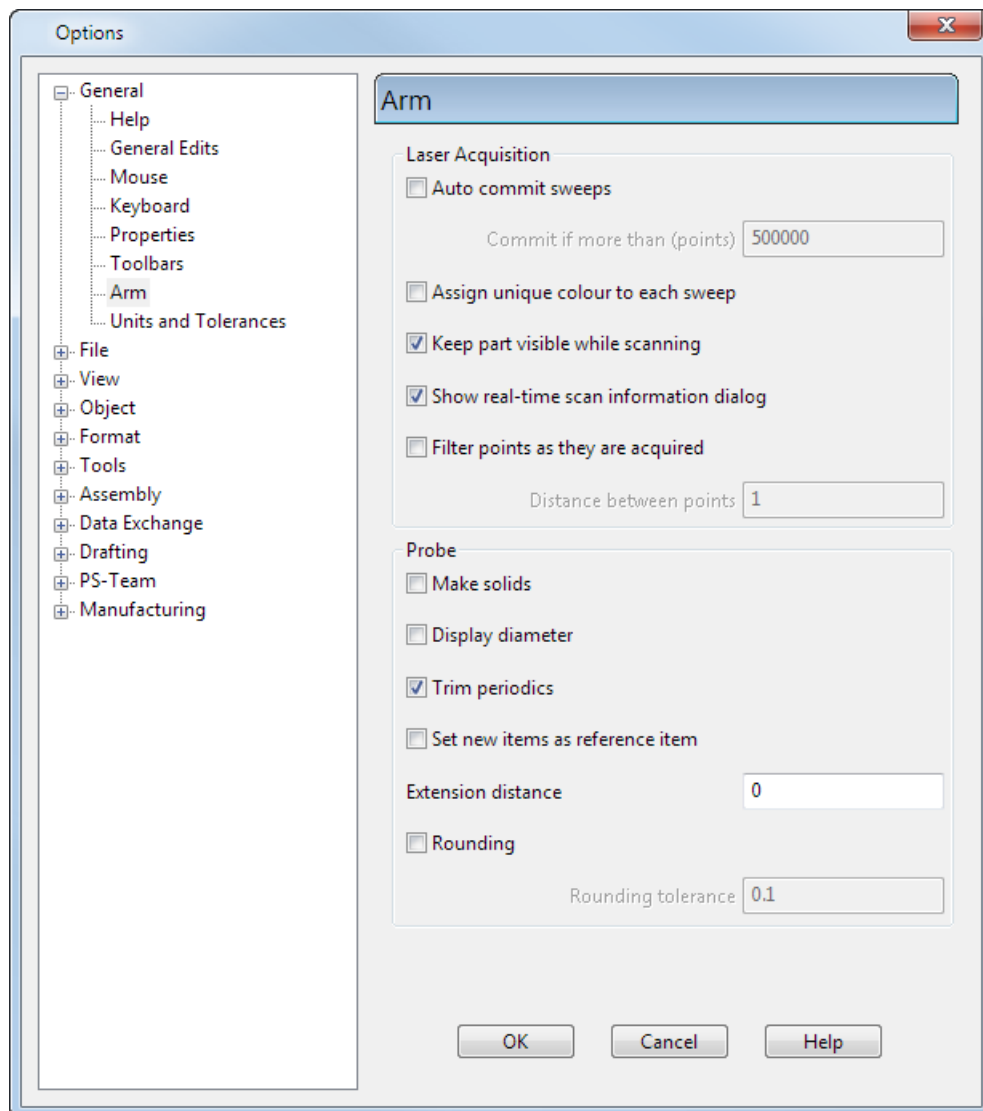
- Click the Information  button on the Acquire Points toolbar to display the **Sweep Information** dialog. This dialog is displayed when you open the toolbar if you have selected Show real-time scan information dialog on the **Tools > Options > General > Arm** dialog.
- Deselect **Display cumulative scanlines and points** to display only the data for the current sweep.



You can resize this dialog to increase the font size, to increase visibility if your measuring device is located away from your machine.

Arm options

Use the options in this dialog to set the defaults for using the **Acquire Points** toolbar.



Laser Acquisition

Auto commit sweeps — Select this option to automatically save sweeps when the number of points taken exceeds the number specified in the box. You can combine (see page 29) the point clouds after you have acquired all points.

Assign unique colour to each sweep — Select this option to assign a unique colour to each sweep by default. You can also select or

deselect this option using the **Colour clouds**  toggle button on the **Acquire Points** toolbar.

Keep part visible while scanning — Select this option to display the points already acquired while you continue scanning.

Show real-time scan information dialog — Select this option to display the **Sweep Information** dialog (see page 11) by default when the **Acquire Points** toolbar is displayed. You can also select or deselect



the **Information** toggle button on the **Acquire Points** toolbar.

Filter points as they are acquired — Select this option to filter points while scanning and enter a value for **Distance between points**. This distance is used to remove points that lie within the specified distance of a different point. The distance is specified in the units that are set on the **Units and Tolerances** page.

You can also control the frames per second for laser acquisition by adding **cmmFPS: nn** to the powershape.con file. Where **nn** is an integer. To override the default and .con file settings before starting a sweep using the following command:

let cmm_fps = x where x is an integer.

Probe

Make solids — Select this to set the default geometry type as solids when creating primitives from points using the **Primitives from Points** dialog.

Display diameter — Select this option to display **Diameter** instead of **Radius** on the **Sweep Information** dialog.

Trim periodics — Select this option to automatically trim primitive surfaces and arcs, created using the **Primitives from Points** dialog, to the distance of the points plus the extension distance.

Set new items as reference item — Select this option to set new items created using the **Primitives from Points** dialog as the next reference item.

Extension distance — Enter a value to define the distance by which each primitive created using the **Primitives from Points** dialog extends beyond the edge of its region.

Rounding — Toggle this option to turn rounding on or off for. If on, enter a **Rounding tolerance** value to define the accuracy to which geometry is created using the **Primitives from Points** dialog.

Selecting clouds

Use the following methods to select clouds:

Selecting clouds using filter

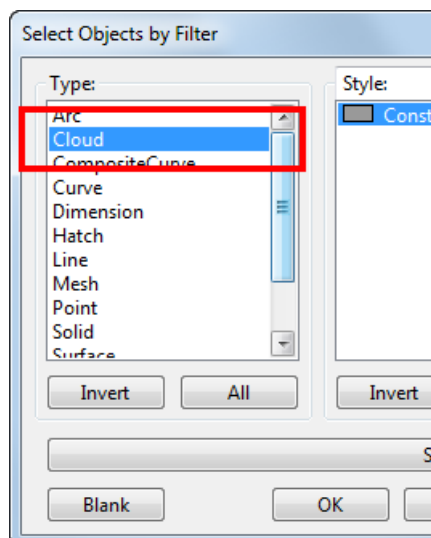
Select clouds using one of the following methods:

- Click the **Quick-Select Clouds**  button on the Selection flyout toolbar.



This is the same as selecting **Edit > Select > Quick Select > Clouds**.

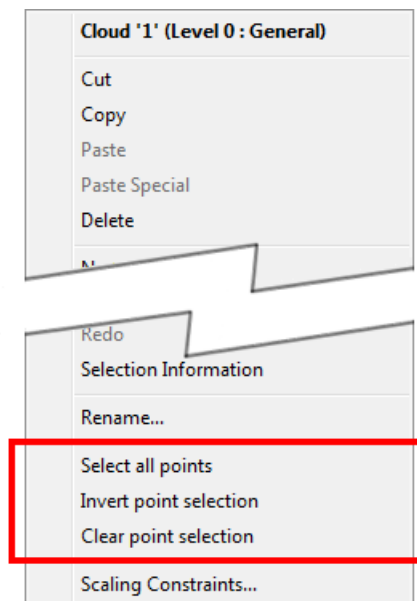
- Select the **Cloud** option in the **Selection Filter** dialog.



- Use **Box Select**  button on the **Cloud Edit** toolbar.

Selecting clouds using the context menu

Right-click on a cloud and select the points in the cloud using the options on the cloud menu.



Select all — Click this option to select all points.

Invert selection — Click this option to invert the point selection.

Clear selection — Click this option to clear the point selection.

Selecting points in a cloud

Use the **Cloud selection** flyout on the **Cloud Edit** toolbar to select areas of a cloud.



*It is possible to make a selection of points that originate from multiple clouds. The clouds must all be selected before using the **Cloud selection** flyout.*



Box select. — Select this button to select cloud points by dragging a box around them.

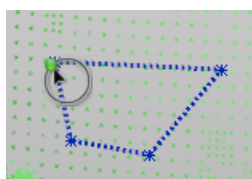


Discrete lasso.

1 Click .

2 Click points to specify the segments in the lasso.

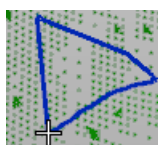
3 Click the start point to create a closed curve.



Continuous lasso.

1 Click .


2 Click a point and drag the cursor to define the lasso.

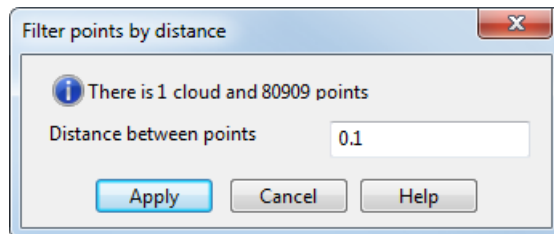


Filtering points in a selected cloud

Use the **Filter** button on the **Cloud Edit** toolbar to filter points in the selected cloud.



- 1 Select one or more clouds.
- 2 Click the **Filter**  button to display the **Filter points by distance** dialog.




The number of clouds and number of points in the selected clouds is displayed.

- 3 Enter the **Distance between points**. After filtering, no point lies within this distance of any other point.

Creating primitives from probe points

You can create wireframe, primitive surfaces and primitive solids by clicking points on a CAD model, or probing points on a physical model.

To create geometry from probed points:

- 1 Click the **Primitives from Points**  button from one of the following:

- The **Acquire Points** toolbar



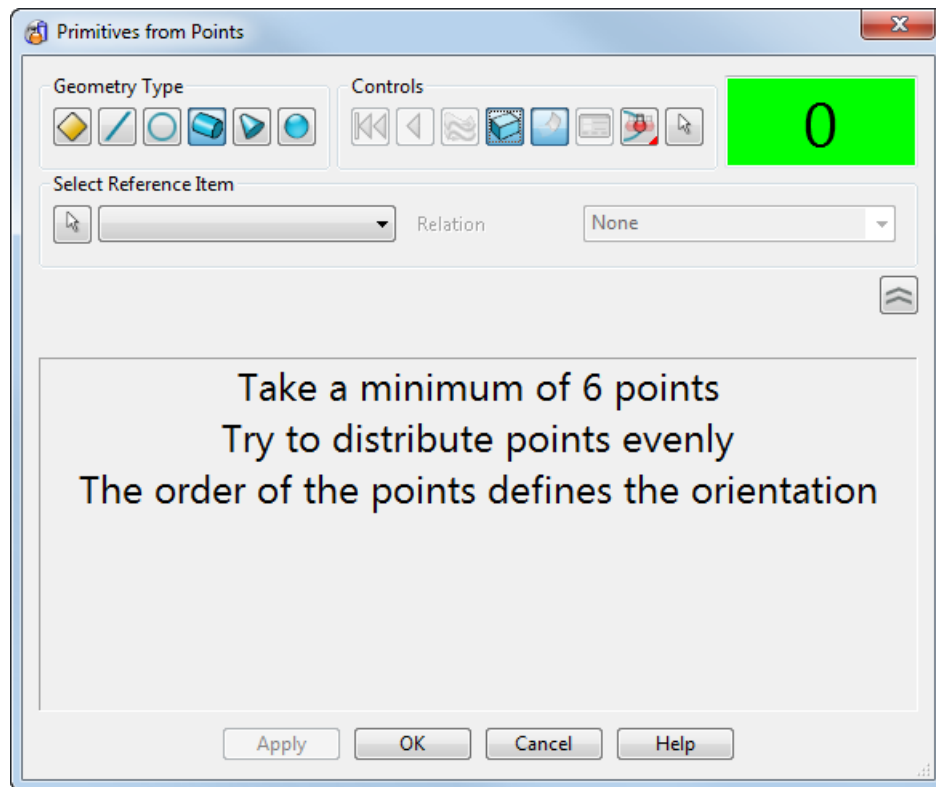
- The **Wizards** toolbar



The **Primitives from Points** dialog is displayed.

- 2 Use the options on the **Primitives from Points** dialog (see page 20) to define the shape and type of geometry you want to create.

- 3 Probe your model with the number of points requested by the dialog.



The geometry is drawn on the CAD model:



- 4 Add more points if required to fine tune your geometry.
- 5 Click **Apply** to accept any changes and add the geometry to the model.



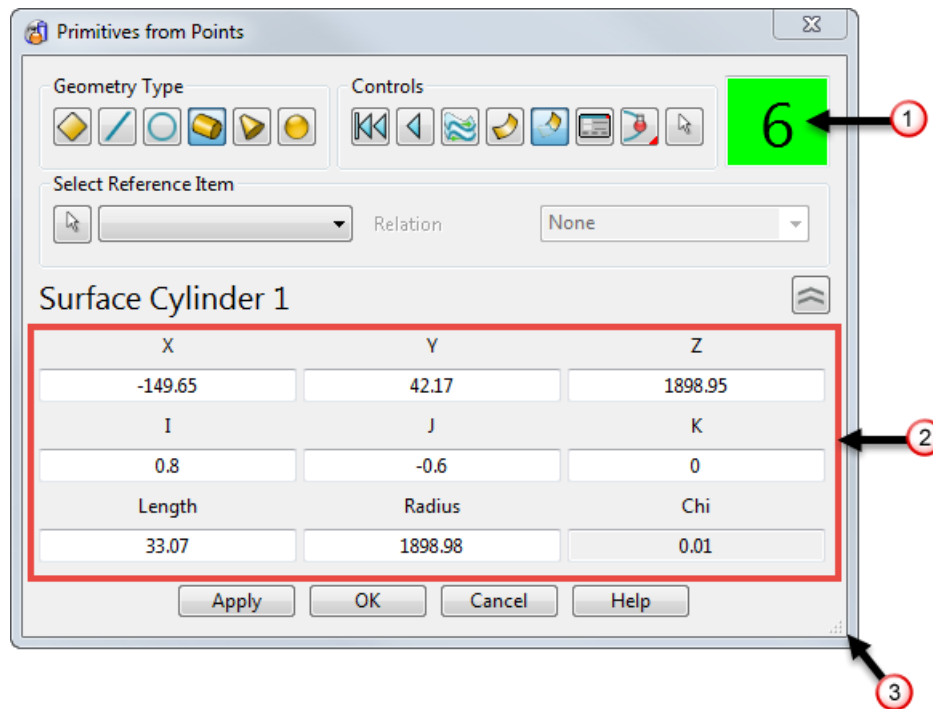
You can also use right-click to apply changes and add geometry.



This functionality is only available in PowerSHAPE Pro.

Primitives from Points dialog

Use the options on the **Primitives from Points** dialog to control the shape and type of geometry that you want to create.













Geometry Type — Use the options from this area to define the shape of the geometry you want to create from the probed points.

- — Select this option to fit a surface plane to the probed points.
- — Select this option to fit a wireframe line to the probed points.
- — Select this option to fit a wireframe arc to the probed points.
- / — Select this option to fit a surface or solid cylinder to the probed points.
- / — Select this option to fit a surface or solid cone to the probed points.
- / — Select this option to fit a surface or solid sphere to the probed points.


Controls — Use the options from this area to control how the geometry is created.

- — Click this button to clear all points.
- — Click this button to undo individual points.

-  — Click this button to reverse the orientation of the surface. This button is only available if you create a surface.
-  — Click this button to toggle between surface and solid creation.
-  — Click this button to toggle surface trimming on or off. This button is only available if you create a surface.
-  — Click this button to display the dialog to edit the appropriate primitive. For example, for a surface cylinder the **Cylinder** dialog is displayed.
- **Probe Compensation** — Select a probe compensation type, depending on the orientation of the probe from when the first point is taken, to adjust for the size of the probe.
 -  — Select this option to apply automatic compensation.
 -  — Select this option to apply no compensation
 -  — Select this option if the probe is inside the part, and to apply compensation outwards.
 -  — Select this option if the probe is outside the part, and to apply compensation inwards.
-  — Click this button to select an item from the graphical window to become active. You can select any primitive surface, primitive solid, arc, or line, and edit it using the available options.

 — This displays the number of points you have currently probed.

Select Reference Item — Use the options in this area to select a primitive object to use as a reference item, and its relationship to the geometry you want to create.

-  — Click this button then select a primitive on your model to set it as the reference item. The selected primitive is added to the drop-down list.
- **Relation** — Use the options in the drop-down list to control the relationship between the reference item and the new geometry.
 - None** — The reference item has no relationship with the new geometry.
 - Coplanar** — The base of the new geometry is defined to lie in the XY plane of the reference item's workplane.

Concentric — The workplane of the new geometry is defined to match the workplane of the reference item.

Axis aligned — The sides of the new geometry are defined to run parallel to either the X or Y axis of the reference item's workplane.

Parallel — For lines only, the line is defined to run parallel to the reference line.

Perpendicular — For lines and surface planes only, the new geometry is defined to run perpendicular to the reference items workplane.




*When the **Coplanar**, **Concentric** or **Axis aligned** options are selected the **Offset** area is displayed. Enter the **Height** above the reference item, or select **As Probed** to automatically calculate the height from the probed points. Enter values into the **Azimuth** and **Elevation** fields to define the angular offset of the new geometry from the reference item.*

Offset			
Height	<input type="text" value="0"/>	<input type="checkbox"/> As probed	
Azimuth	<input type="text" value="0"/>	Elevation	<input type="text" value="0"/>

② — This area contains a number of fields that depend on the type of item being created or edited. They define the size and position of the geometry. Enter values into the fields to modify your new geometry. If the item was created by probing, the **Chi** value describes how well the created geometry fits the probed points. A smaller Chi value indicates a closer fit.

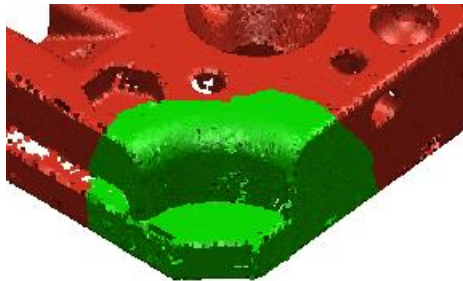
③ — Use this handle to increase the size of the dialog. The text and icons scale with the size of the dialog, enabling you to read the dialog from a distance.


Creating meshes from a cloud

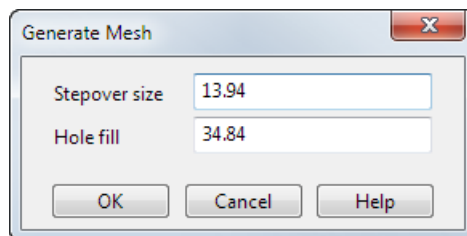
Use the **Generate Mesh**  button on the **Cloud Edit** toolbar to create a mesh from a cloud, or selection of cloud points.

To create a mesh from a selection of points:

- 1 Select the points to create a mesh from.



- 2 Click the **Generate Mesh**  button on the **Cloud Edit** toolbar.
The **Generate mesh** dialog is displayed.



- 3 Enter the desired values into the **Stepover size** and **Hole fill** fields.
- 4 Click **OK**.

A mesh is created from the selected points.




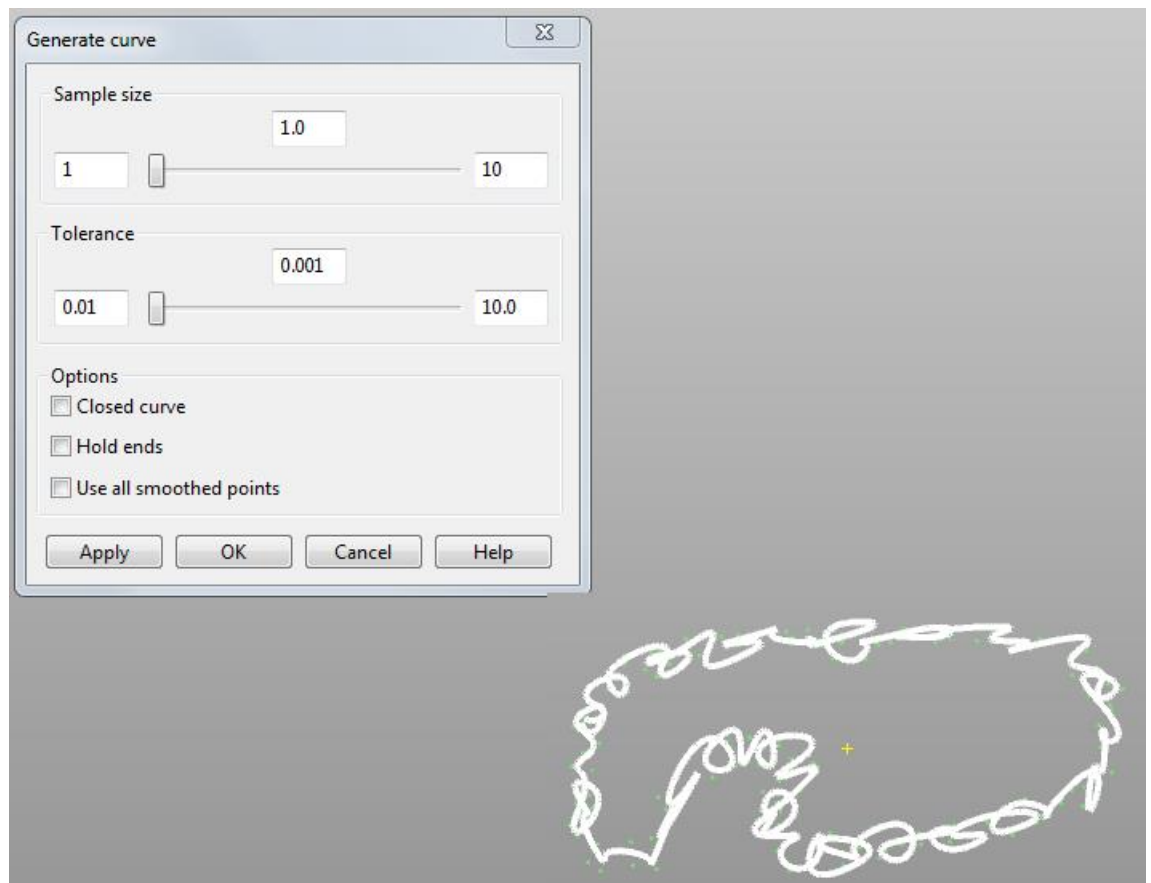
To create a mesh from the whole cloud, select all the cloud points.

Generating a curve from a selected cloud

Use the **Generate Curve** button on the **Cloud Edit** toolbar to generate a curve from a selected cloud using the **Curve Generation** dialog.

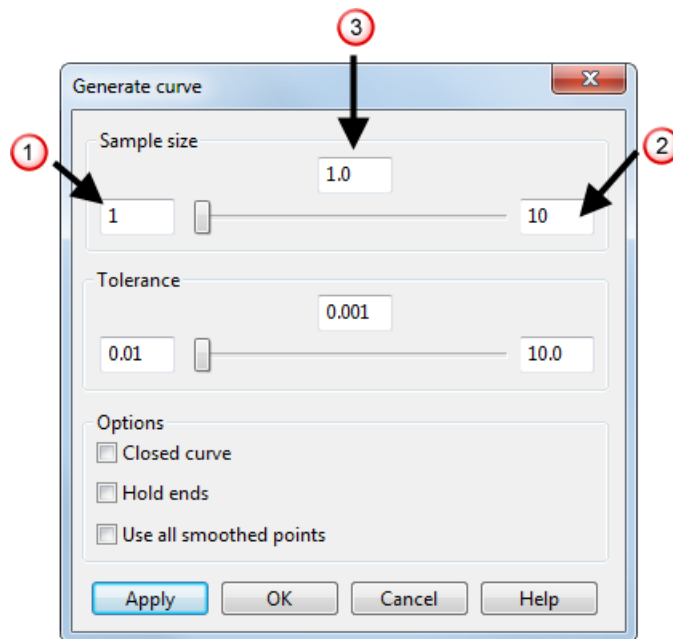


- 1 Select the cloud.
- 2 Click the **Generate Curve**  button. The **Generate curve** dialog is displayed, together with a curve that conforms to the default curve creation values.



The points in the cloud are assumed to be 'in order'; if the cloud was imported, the first point is the start of the curve and the last point is the end of the curve.

- 3 Use the sliders on the **Generate curve** dialog to create the required curve.



For each slider option, the following values are displayed:

- minimum value ①.
- maximum value ②.
- current value ③.

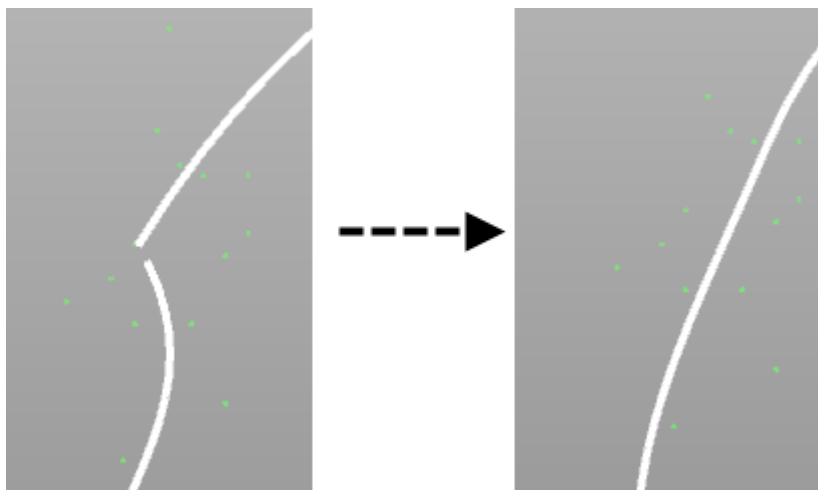
Use a combination of the sliders to create a smooth curve to represent the cloud:

- Use the **Sample size** slider to control the number of points to sample to create a smoother approximation of the cloud for the curve. The minimum value is 1.

- Use the **Tolerance** slider to specify the maximum distance allowed from any given point in the cloud to the closest part of the curve. The minimum value is 0.



- 4 Create a closed curve from an open curve by selecting the **Closed curve** option.

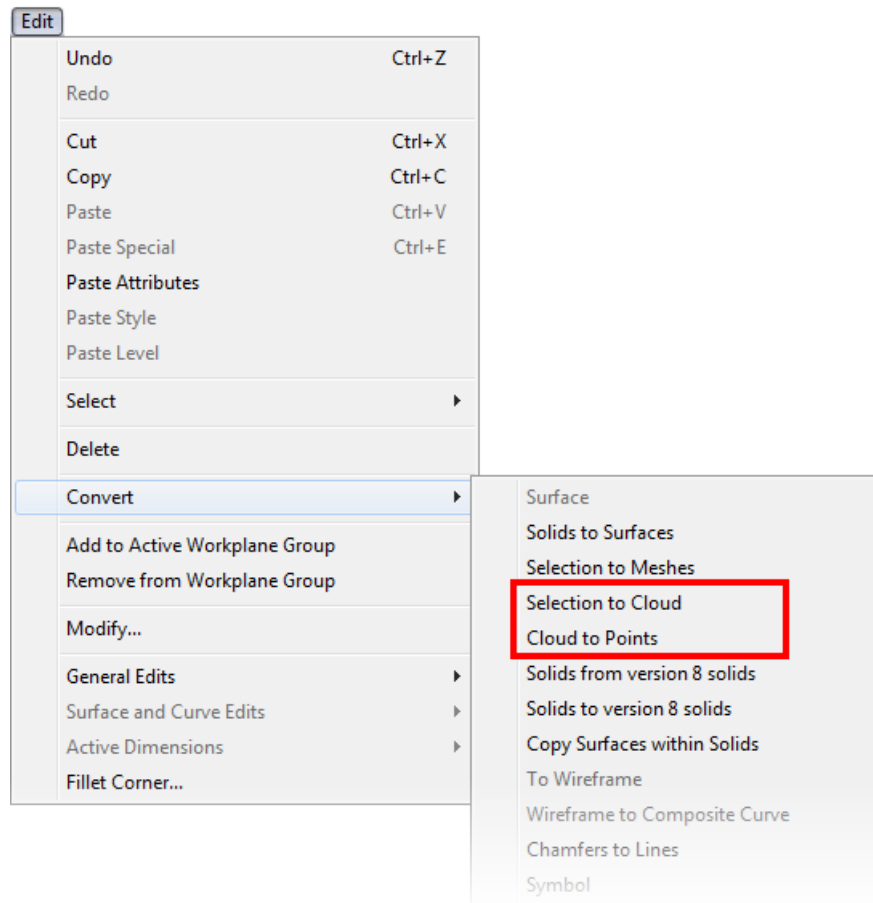


The following options are available when **Closed curve** is selected:

- Select **Hold ends** to start and end the curve at exactly at the start and end points of the cloud.
- Select **Use all smoothed points** to use smaller samples at the start and end of a curve, in cases where less points are available.

Converting clouds

Use the **Edit > Convert** menu to convert to and from clouds.

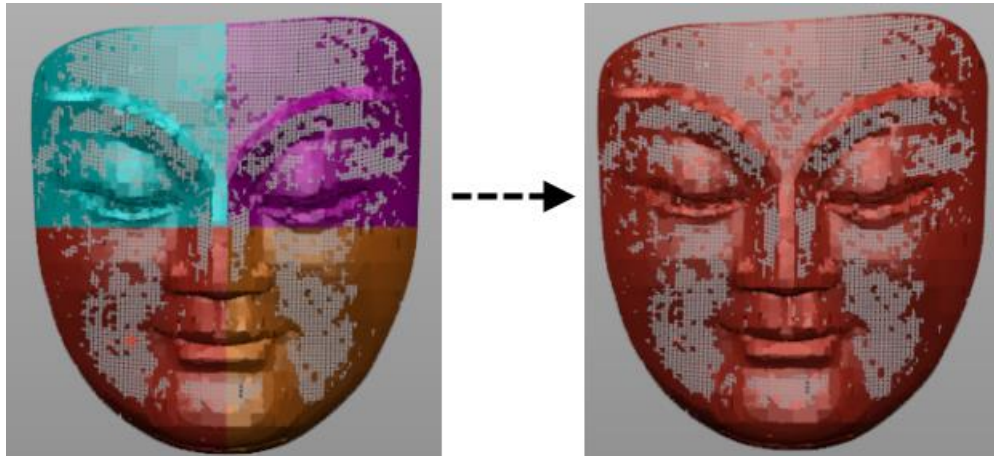



Selection to Cloud — Select this option to convert the selection to a point cloud.

Cloud to Points — Select this option to explode a cloud to points.

Combine clouds - an example

Use the following steps to combine four clouds into a single cloud:



- 1 Select the clouds using a box selection. Each cloud has a yellow selection marker.
- 2 Click the **Combine**  button on the Cloud Edit toolbar to combine the four clouds into a single cloud. Alternatively, select **Object > Cloud > Combine** from the menu.