



DCAD

VectorSpace vers. 3

Reference



Macintosh® | Windows®

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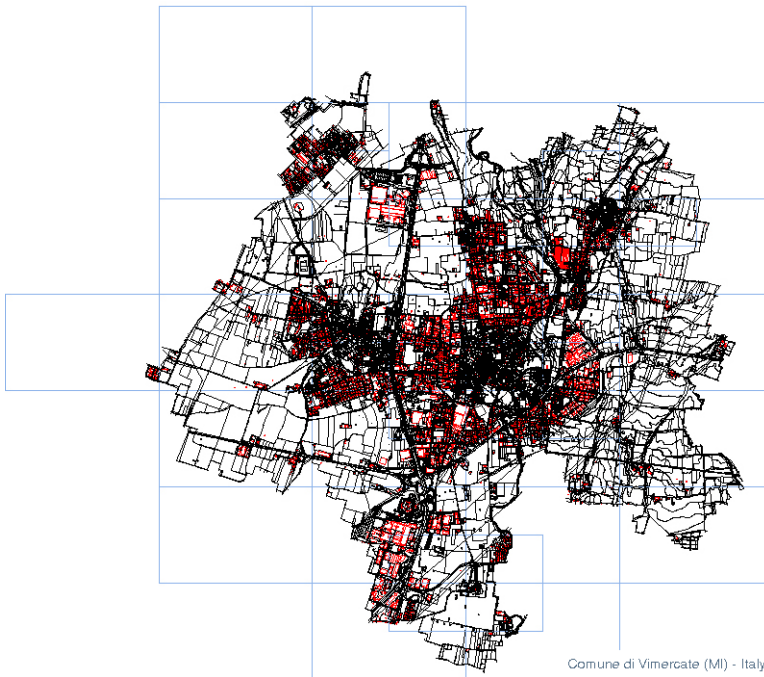
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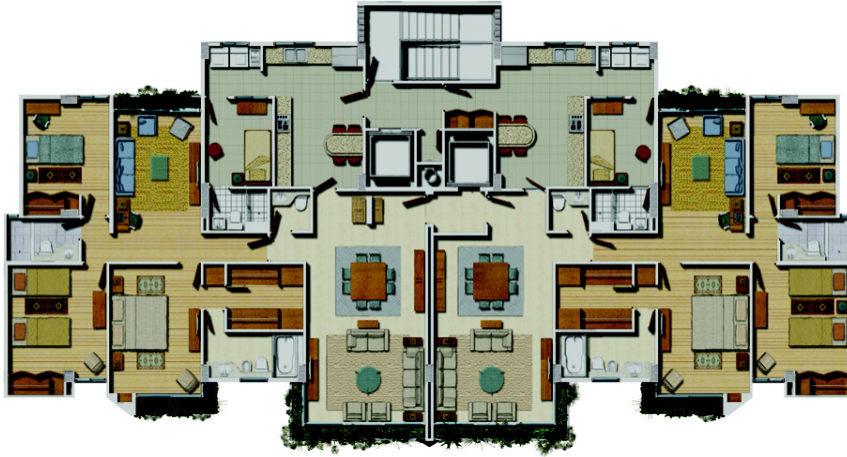
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Italy	bitWAVE Strada Statale nr.14 - 23875 Osnago (LC) - Italy Tel. 039-92.80.600 Fax 039-92.80.171 Web: www.bitWAVE.it E-mail: info@bitWAVE.it
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Reference



2D and 3D Drawing Tools



In this chapter:

- Introduction
- Using drawing tools
- Arc tools
- Camera Path Tool
- Curve tool
- Dimension tools
- Ellipse tools
- Library tool
- Light Source tools
- Line tool
- Pan Tool
- Polygon tools
- Polyline tools
- Rectangle tools
- Selection tools
- Text Tools
- Zoom tool



Introduction

This chapter describes how to use drawing tools to create objects in Draft and Sculpt modes. Information on general 2D and 3D drawing principles is included with instructions for using each tool. The

sections on each type of object also include procedures for applying attributes to objects, and methods for editing the shapes of 2D and 3D objects created with each tool.

Drawing in Draft and Sculpt modes

In general, you use the same tools and procedures to create objects in Draft mode and Sculpt mode. However, you draw 2D objects in Draft mode and draw 3D objects in Sculpt mode.

For example, you can use the Rectangle Diagonal tool to draw a 2D rectangle in a Draft mode window. In a Sculpt mode window, the same tool draws a 3D box, one face of which is visible when you draw it.

Therefore, each drawing tool can create two kinds of objects. The object names depend on the mode you use. For example, using an arc tool in Draft mode produces a 2D arc. In Sculpt mode, the same tool produces a 3D curved plane.

Objects created in different modes can often appear to be the same because you see them in only two dimensions.

Note: You do not create objects in the Render mode window, although you can view 3D objects in Render mode. You create 3D objects in Sculpt mode before rendering them.



Draft mode objects

An object created in Draft mode is a two-dimensional object. A 2D object has a width and a height. You can see a 2D object only when the Draft mode window is set to the same view — Top, Bottom,

Left, Right, Front, or Back — in which you created the object. You can't see a Draft mode object in other views because each view is a separate drawing.

Sculpt mode objects

An object created in Sculpt mode is a three-dimensional object. A 3D object is made of chained polygons, which correspond to the faces of the 3D solid. For example, a cube is a 3D object made up of 6 rectangles, which are chained to form the faces of the cube.

You can see a 3D object in any view — Top, Bottom, Left, Right, Front, or Back — in the Sculpt mode window. This is because a conventional 3D object has depth in addition to its width and height. In Top view, when you draw a rectangle, you draw the top face of a cube. If you switch to Bottom view, you see the bottom face, which matches the top face of the cube.

Extrusion methods

When you draw objects in Sculpt mode, or extrude objects in Draft mode, **DCAD VectorSpace** uses an extrusion method that you specify. The default type of extrusion is a linear extrusion.

Extrusion formats

When you draw objects in Sculpt mode, or extrude objects in Draft mode, **DCAD VectorSpace** uses an extrusion format that you specify.



There are three extrusion formats: Sides, Front Cap, and Back Cap.

With these formats, you can create 3D objects that are complete solids, or objects that have one or more sides missing.

The default extrusion formats create 3D solid objects with solid sides and both end caps. In this chapter, the discussions of drawing tools and 3D objects generally refer to these types of objects.

When you open a new drawing, all three extrusion formats are selected. Any object you create with all three buttons on will be a complete solid. See **Extrusion Format buttons**, page 104 for more information.

Sculpt mode pointer

The pointer you use in Sculpt mode gives valuable information as to which extrusion formats are selected.

This pointer can be a useful visual reminder, if the Status bar is off, of what extrusion formats are active.

Extrusion planes

The depth to which objects in Sculpt mode are projected in 3D space is specified by the range between two extrusion planes.

The default set of extrusion planes is in effect for new **DCAD VectorSpace** documents. Using the 3D Plane commands in the Layout menu, you can set the extrusion depth before drawing 3D objects. You can set up new extrusion planes at any time, and also save a set of extrusion planes.

As you create 3D objects, you can change the active set of extrusion planes using the 3D Plane pop-up menu on the Status bar. Additionally, this pop-up menu shows you which set of extrusion planes is active. You can open the menu to select a set of extrusion planes that you have saved, a temporary set of extrusion planes created with the commands in the 3D Plane submenu, or the default set of extrusion planes. See **3D Plane submenu**, page 109 for more information.

Unchaining objects

In Draft mode, if you unchain a 2D polygon, it separates into line segments. Each line segment is a separate object that you can edit individually.

In Sculpt mode, if you unchain a 3D polygon, it becomes separate polygons corresponding to the sides or faces of the original object. You can edit the unchained polygons individually.

Using drawing tools

Objects can be created in Draft and Sculpt modes with the Arc tools, Ellipse tools, Curve tool, Line tool, Polygon tools, Polyline tools, and Rectangle tools. In addition, you can also use the Dimension and Text tools in Draft mode.

You'll notice that the tool names refer to the 2D objects created by drawing in Draft mode. Although a few toolbox items change when you switch from

Draft mode to Sculpt mode, the drawing tools remain in the same locations in the toolbox.

To create an object in either Draft or Sculpt mode, activate the window you want to work in, select a tool, and follow the drawing procedure for the selected tool. When you select a tool, the Help bar displays the basic procedure for drawing objects with the tool.

Snaps menu constraints

The Snaps menu provides constraints that let you precisely align objects by controlling the pointer and the drawing vector, without having to specify angles or distances numerically.

Using the Snaps menu

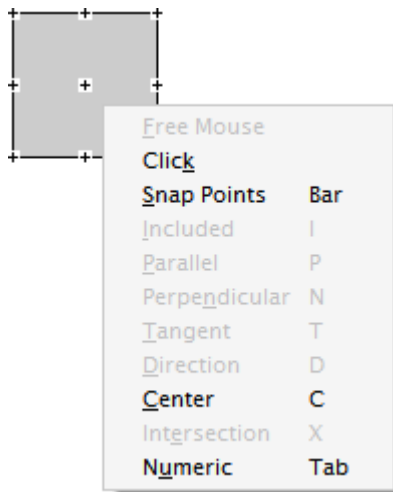



Figure 1.- The snaps menu

The Snaps menu pops up in the drawing area when you press the right mouse button (Windows) or the Control key and the mouse button (Mac OS) at the same time.

Note: When you open the Snaps menu, not all Constraints are available at all times. The available constraints depend on the position of the pointer and the type of operation in progress. 

In most cases, you indicate which object should be the reference for the constraint by pointing to an object when you press the right mouse button (Windows) or Control (Mac OS). In descriptions of the constraints in this section, the object you point to when you open the Snaps menu is called the *reference* object.

You can also make the Snaps menu appear whenever you press the mouse button to draw an object (without pressing the right mouse button or Control key). To do this, select the check box labeled “Always Show Snap Options” on the General tab in the Preferences dialog box.

You can combine constraints and use different constraints to set each creation point when you draw objects. Also, snap constraints can be used for all DenebaCAD operations, not just object creation.

Constraints can be applied to the positioning of planes when you define extrusion planes, clipping planes, and Relative Views. For example, when you use the Define Frontal 3D Plane command, you can choose Included in the Snaps menu to align the plane with the slope of a roof gable.

The Snaps menu lets you constrain the drawing vector and pointer in many ways. Listed below are all the constraints in the Snaps menu. If a constraint has a keyboard shortcut, it appears after the constraint name.

Free Mouse. This option frees the pointer and drawing vector from any constraint that is in effect. In other words, Free Mouse is not a constraint itself; it restores the pointer to free movement.

Click. Choosing Click is a substitute for clicking the mouse during a procedure.

Snap Points (Spacebar). This constraint displays the Snap points of the reference object. When an object's snap points are displayed, the vector snaps to the closest point. Refer to **# of Snap Pts.** and **Temporary # of Snap Pts.**, page 189 for more information.

Included (I). The Included constraint confines the pointer or vector to the path of the object at the pointer; if you move the pointer beyond the object, the constraint continues as if the object or segment were extended through the entire drawing.

Parallel (P). Choosing Parallel constrains the vector to a path parallel to the object at the pointer. If you choose Parallel before setting an object's first creation point, a line appears at the pointer, parallel to the object you indicated. Move the pointer and then click to establish the offset

from the object. An Offset dialog box appears so you can confirm the offset, or type a new value in the text box. Click OK to set the offset. A small cross appears where you click, and the pointer is constrained to the parallel line at the specified offset distance.

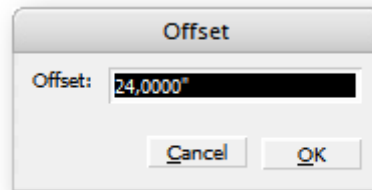


Figure 2.- Offset dialog box

Perpendicular (N). This constraint snaps the pointer or vector to a path perpendicular to the object you indicate (the object at the pointer) when you choose the constraint.

Tangent (T). Tangent constrains the vector to be tangent to a circle or circular arc. After setting the first endpoint of a line, choose Tangent and the vector snaps to the perimeter of the indicated circle. This constraint is not available unless the pointer is on a circle or circular arc.

Direction (D). The Direction constraint snaps the vector to the angular direction that you establish before choosing the constraint. For example, as you move the pointer away after setting the first creation point of a polyline, you establish a direction. If you choose Direction or press D, the vector locks to the established direction.

Center (C). Snaps the pointer and vector to the center of the reference object or segment.

Intersection (X). Aligns the pointer and vector to the intersection of two separate objects, such as the point at which two lines meet or cross.

Numeric (Tab). Choosing Numeric is the same as pressing Tab during an operation: it lets you

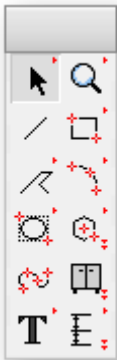
enter position data in the Info bar during an operation. For example, you might click to set the first creation point of an object, and then

type numeric values to set the length and direction of the vector to complete an object.

The toolbox

The tools you can use for drawing are located in the **DCAD VectorSpace** toolbox. The toolbox is a small window that floats, or remains in front of, any **DCAD VectorSpace** drawing windows that are open on screen.

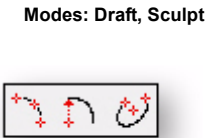
Tools appear in the toolbox as small square icons. You select a tool by clicking it's icon. When a tool is selected, it becomes active



and its icon is shaded. Only one tool at a time is active.

Arc tools

Three tools for drawing arcs and curved surfaces are located in the Arc toolbar in the toolbox.



Arc 3 Points tool. Draws a 2D arc or a 3D curved surface through three points you specify.

Arc Radius tool. Draws a 2D arc or a 3D curved surface with the radius and length you specify.

Arc Elliptical tool . Draws a 2D arc or a 3D curved surface by defining five points.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in place of tool names in **DCAD VectorSpace**'s PTF language.

Arc Data Types

The arc tools have the data types listed below.

Arc Tools

Arc 3 Points	"3PointsArc"
Arc Radius	"CenterRadiusArc"

Arc Elliptical

"ElliptArc"

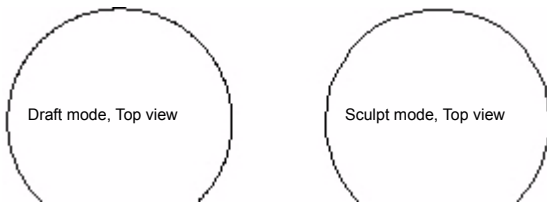
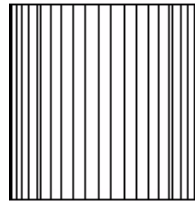


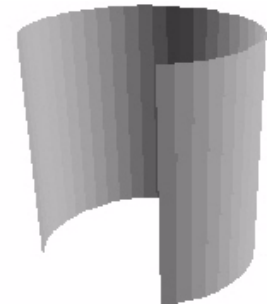
Figure 3.- Arcs in Draft, Sculpt and Render modes - I

Arcs are sections of ellipses or circles. In Draft mode, the arc tools draw perfect circular arcs. In Sculpt mode, the arc tools draw curved planes that are made of chained polygons. You can set the num-

ber of segments for drawing 3D arcs in the Preferences dialog box in the Edit menu.



Sculpt mode, Front
view



Render mode, Solid ren-
dering

Figure 4.- Arcs in Draft, Sculpt and Render modes - II

Drawing arcs and Curved planes

To draw arcs in Draft mode and curved planes in Sculpt mode, use the following procedures.

Arcs created in Draft mode are two-dimensional objects. Like all 2D objects, arcs appear only in the Draft mode view in which they are created.

When you draw them in Sculpt mode, curved planes look the same as arcs. When you change to other views in Sculpt mode, curved planes have depth produced by the projection of the arc between the active set of extrusion planes.

The “arc” referred to in the following procedures is a 2D arc in Draft mode, or the arc component of a 3D curved plane in Sculpt mode.

To use the Arc 3 Points tool

The Arc 3 Points tool lets you draw an arc through two endpoints and a third point on the arc’s perimeter.



1. Select the Arc 3 Points tool in the Arc toolbar.
2. Click to set one endpoint of the arc.
3. Move to the location of the second endpoint. The drawing vector follows the pointer and corresponds to the open part of the arc.
4. Click to set the second endpoint of the arc.
5. Move to a point on the perimeter of the arc. The arc expands or contracts depending on the direction you move the pointer. The drawing vector indicates the chord from the second endpoint.
6. Click to set the perimeter point and finish the arc. The new arc is selected. To deselect the object, click an empty area of the drawing.

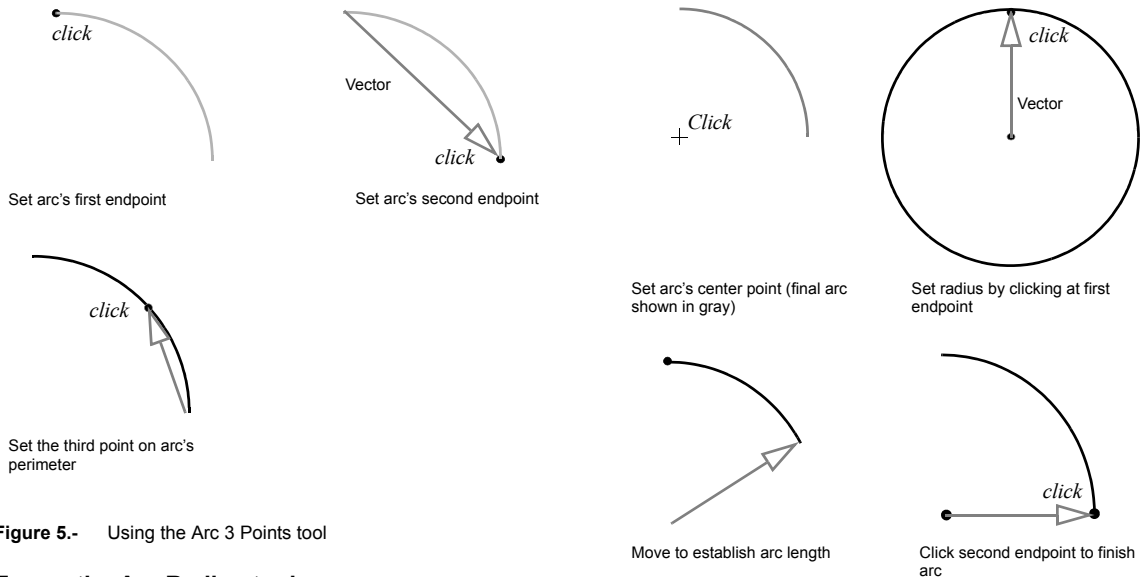


Figure 5.- Using the Arc 3 Points tool

To use the Arc Radius tool

The Arc Radius tool lets you specify the center point, radius, and length of an arc.



1. Select the Arc Radius tool in the Arc toolbar.
2. Click to set the center point. The arc will be a section of a circle centered on this point.
3. Move to the first endpoint of the arc. The outline of a circle and the drawing vector follow the pointer, indicating the arc's radius.
4. Click to set the first endpoint of the arc and establish the radius of the arc. The circle outline disappears.
5. Move to the other endpoint. The drawing vector follows the pointer, rotating around the arc's center. An arc section appears to indicate the arc's length.
6. Click to set the second endpoint and finish the arc. The new arc is selected. To deselect the object, click an empty area of the drawing.

Figure 6.- Using the Arc Radius tool

To use the Arc Elliptical tool

The Arc Elliptical tool lets you specify the center point, length, and width of an elliptical arc as well as its endpoints.



1. Select the Arc Elliptical tool in the Arc toolbar.
2. Click to set the center point. The arc will be a section of an ellipse centered on this point.
3. Move the pointer to set the length of the ellipse that contains the arc. The drawing vector follows from the center point of the ellipse.
 - Press the Shift key while dragging the drawing vector to constrain the vector to 15 degree intervals.
4. Click to set the length of the ellipse.
5. Move the pointer to specify the width of the ellipse. The drawing vector moves perpendicular to the length of the ellipse.

lar to the length of the ellipse. The ellipse expands from the center point.

6. Click to set the width of the ellipse. The drawing vector snaps to the center point of the ellipse, and the ellipse disappears.
7. Move the pointer to the first endpoint of the arc. The drawing vector follows the pointer, rotating around the arc's center.
 - The length of the drawing vector does not affect the dimension or shape of the arc. The arc's endpoint is placed at the intersection of the drawing vector and circumference of the previously established ellipse.
8. Click to set the first endpoint of the arc. An arc section appears to indicate the arc's length.
9. Move the pointer to set the second endpoint of the arc. The drawing vector follows the pointer, rotating around the arc's center.
10. Click to set the second endpoint and finish the arc. The new arc is selected. To deselect the object, click an empty area of the drawing.

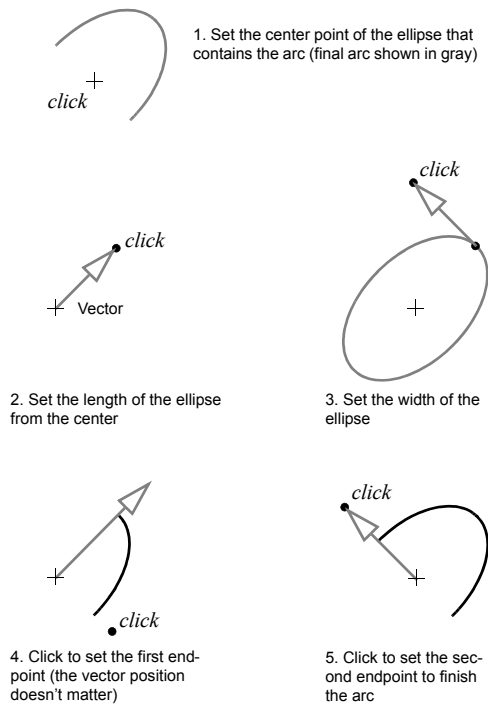


Figure 7.- Using the Arc Elliptical tool

Editing arcs and curved planes

Procedures for editing a 2D arc differ from procedures for editing most other objects. An arc doesn't display a bounding box that can be reshaped, and its creation points are arc-specific.

Editing arcs in Draft mode

To edit the shape or angular length of a 2D arc, you can move the arc's creation points. The position of the creation points depends on the tool used to draw the arc in Draft mode.

Arc Radius tool. An arc drawn with the Arc Radius tool has a creation point at the center, one at the first endpoint, and one at a point indicating the arc's angular length (**figure 8**). This point can be inside or outside the arc; the angle it defines from the first endpoint is significant, but its distance from the arc is not.

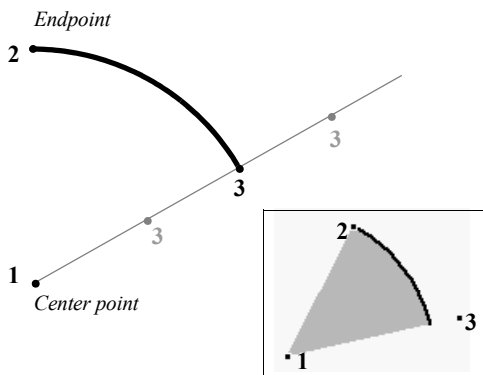
Arc 3 Points tool. An arc drawn with the Arc 3 Points tool has a creation point at each endpoint, and a third point on the perimeter of the arc.

Arc Elliptical tool. An arc drawn with the Arc Elliptical tool has a creation point at the center

point of the arc and each point you set to establish the width and length of the arc.

To edit an arc's creation points

1. In the Draft mode window, click the arc with the Selection tool (or use another selection method) to select the arc. The arc's creation points appear.
2. Drag a creation point to move it. The drawing vector follows from the point's original location.
3. After you move a creation point, the arc remains selected. You can continue moving points to reshape the arc.
4. When you finish editing the arc, click an empty area of the drawing to deselect it. The creation points are no longer visible.



The third creation point defines the arc's length. It can appear on the arc, or inside or outside the arc.

Figure 8.- Creation points placed by Arc Radius tool

Editing curved planes in Sculpt mode

Like most other objects in Sculpt mode, curved planes are 3D objects made of chained polygons. The original arc's creation points do not exist in

Sculpt mode. However, you can use the Reshape command to display handles of the chained polygons, which you can drag to reshape the curved plane object.

A curved plane can be edited in any view in the Sculpt mode window.

To edit a curved plane

1. In the Sculpt mode window, click the curved plane with the Selection tool to select it. The curved plane's bounding box appears.
2. Choose Reshape in the Edit menu or click the Reshape button. Handles appear at the corners of each polygon in the curved plane.
3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the curved plane remains selected. You can continue moving handles to reshape the curved plane.
5. When you finish editing, click an empty area of the drawing to deselect the object. The reshape handles are no longer visible.

Applying commands to arcs and curved planes

You can perform operations on an arc or a curved plane by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are available only when you select more than one object. For example, to use the Align command, at least two objects must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected arcs or curved planes: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

Commands in the Object menu you can apply to selected arcs or curved planes are: Align, Scale, Chain, Unchain, Group, Ungroup.

Commands in the following submenus in the Object menu can be applied to selected arcs or curved planes: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, Trim.

Unchaining arcs, converting arcs to polygons, and unchaining curved planes

Unchain arcs. If you apply the Unchain command to an arc, it becomes a series of separate polyline objects, each made of one straight line segment.

Convert to Polygon. Applying the Convert to Polygon command changes an arc into a polygon object. Polygon objects are made of multiple straight segments.

Unchain curved planes. If you apply the Unchain command to a curved plane, it becomes a series of separate polygon objects.

Applying attributes to arcs and curved planes

When you draw an arc or curved plane, **DCAD VectorSpace** applies the current Draft or

The number of line segments or polygon objects created when an arc or curved plane is unchained or converted to a polygon is determined by a Preference setting in effect when you draw the object. The smaller the line segments, the smoother the arc or curved plane appears after you apply the Unchain or Convert to Polygon commands.

To set the preferred number of segments in arcs and curved planes

1. Choose Preferences in the Edit menu.
2. In the Preferences dialog box, change the Arc step setting. A larger number results in more line segments in unchained arcs or curved planes.

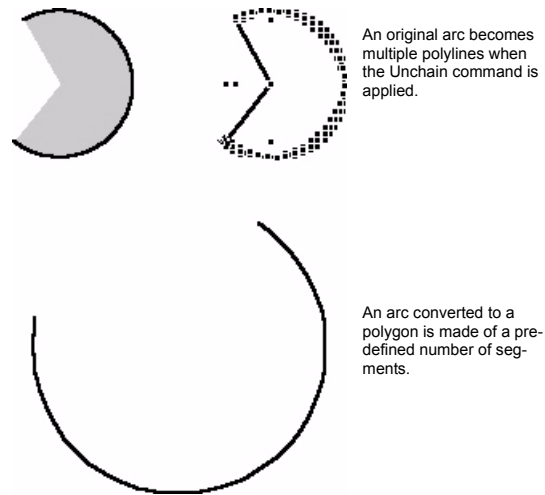


Figure 9.- Arcs converted to polylines and polygons

Sculpt mode attributes to the object. You can modify the object's attributes in the appropriate mode.

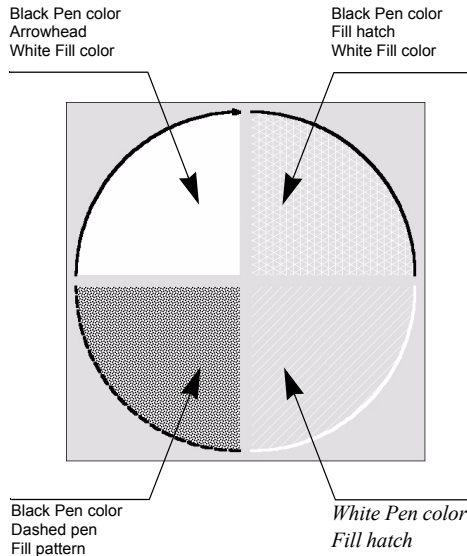


Figure 10.- Attributes applied to arcs

Draft mode . Arcs accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to an arc. With fill attributes applied, arcs appear as pie-shaped wedges or pies with slices removed (**figure 10**).

Sculpt mode . Curved planes accept Pen colors and Surface materials.

Camera Path Tool

Mode: Sculpt

The Camera Path tool creates camera paths. This tool is located in the toolbox.



The Camera Path tool draws a camera path by setting a series of points. The camera path is also referred to as the walkthrough path.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in place of tool names in **DCAD VectorSpace**'s PTF language.

The Camera Path tool has the data type "Walkthrough" in **DCAD VectorSpace**.

Camera Path tool

Camera Path	"Walkthrough"

There are three parts to a walkthrough path. They are the camera location, the camera sightline and the path line.

- The handle at the base of the arrow indicates the location of the camera.
- The arrow indicates the camera's sightline. The sightline is set to the direction and angle the camera is pointed. The length of the sightline determines the duration of the view.

- The path line represents the path the camera follows through the model.

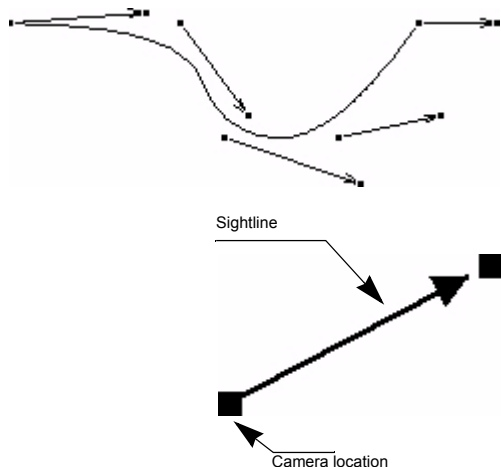


Figure 11.- Parts of a walkthrough path

You create a walkthrough path in Sculpt mode, but you use the walkthrough path in Render mode.

You view a walkthrough of a model in the Render mode using the Walkthrough command.

You also use the walkthrough path as the path the camera follows when you generate a QuickTime movie in Render mode.

The following procedure is for creating a simple camera path through a plan view of a model. This procedure can be used with any view.

To use the Camera Path tool

The Camera Path tool lets you establish the walkthrough path the camera follows by setting a series of points.



1. Activate or open a Sculpt mode window and set the view to Top view.

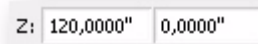
- Because you are creating a 3D path in only two dimensions, you need to create the walkthrough path in one view and specify the vertical angles of the camera's sightlines in a different view.

2. Open or activate a second Sculpt mode window and set the view to Front view.

- This lets you see height of the cameras. You can edit the vertical angle of the sightlines in this window, once you've completed your walkthrough.

3. You can select a saved set of extrusion planes, or define a new set for the walkthrough path. If you do not choose a set of extrusion planes in the 3D Plane pop-up menu, the walkthrough path is placed on the lower extrusion plane in the active set.

- When you create a new walkthrough path,



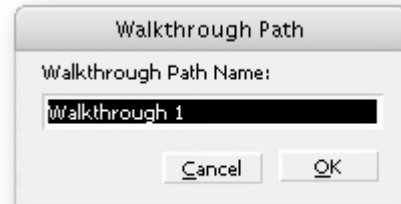
DCAD VectorSpace places it on the lower extrusion plane. If the Info bar is visible, you can determine which is the lower extrusion plane by looking at the values in the text boxes at the far right of the Info bar. The lower number indicates the lower extrusion plane.

- The lower extrusion plane is also defined by which view you are working in. For example, if you draw a cube in Top view, the bottom of the cube is the lower extrusion plane.

4. Select the Camera Path tool in the toolbox.
5. Activate the Top view window. Click to set the first camera location at the starting point of the path.

-
6. Point to the location of the second camera. As you move the pointer, the drawing vector follows from the first camera to the location of the second camera.
 7. Click to set the second camera location.
 8. Point to the location of the third camera. As you move the pointer, the drawing vector follows from the second camera to the location of the third camera.
 9. Click to set the third camera location. Continue to move the pointer and click to set each successive point as a camera location on the path line.
 10. Double-click to set the end point of the walkthrough path. Or, press the Return key to make the last point set the end point of the walkthrough path. A dialog box appears.

11. Type the name of the new walkthrough path in the Walkthrough Path Name text box.



12. Click OK. The new walkthrough path is selected. To deselect the object, click an empty area of the drawing.

Editing a walkthrough Path

You can move the entire walkthrough path, like you would any other object, by dragging it to another location.

Camera location

To edit a walkthrough path, you can move the points that represent the cameras' locations, or the points that represent the cameras' sightlines.

The points that represent the cameras' locations are the creation points.

Moving a camera handle also alters the pathline because you are moving a point that created the walkthrough path.

Camera sightlines

You can also move the points that represent the cameras' sightlines. The handle at the tip of the arrow is the point you move to change the direction of the sightline.

Moving a sightline handle won't alter the pathline because you are editing the direction the camera is pointing.

To edit a camera path

1. Activate a Sculpt mode window set to Top view.
 - If you need to change the camera location, the horizontal direction of a sightline, or the shape of the walkthrough path, the Top view is the most helpful.

- To change the height of the camera or the vertical angle of a sightline, use a Sculpt mode window set to Front view.
2. Select the walkthrough path with the Selection tool. Handles appear at the creation points and at the end of the camera sightlines.
 3. Point to a handle that either represents the camera location or the angle of the sightline, and drag to a new location. As you move the pointer, the drawing vector follows from the original handle location to the new location.
 4. After you move a creation point, the walkthrough path remains selected. You can continue moving points to reshape the walkthrough path.
 5. Click an empty area of the drawing when you finish editing the walkthrough path. The creation points are no longer visible.

Applying commands to walkthrough paths

You can perform operations on a walkthrough path by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to apply the Align command to a selected walkthrough path, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected walkthrough paths: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected walkthrough paths: Align, Scale, Group, and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit walkthrough paths: Arrange, Copy to Layer, and Send to Layer.

Applying attributes to walkthrough paths

When you draw a walkthrough path, **DCAD VectorSpace** applies the current Sculpt mode attributes to the object. You can modify the object's attributes in the appropriate mode.

Sculpt mode . Walkthrough paths accept Pen colors.

Curve tool

Mode: Draft, Sculpt

The Curve tool draws 2D curves or 3D curved planes defined by creation points that you specify. The Curve tool is the fifth icon from the top in the first



column of the toolbox.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in place of tool names in **DCAD VectorSpace**'s PTF language.

The Curve tool has the data type "QB_Spline."

Curves are lines that deviate from straightness in a smooth continuous fashion. In Draft mode, the Curve tool draws curved lines. In Sculpt mode, the

Curve tool draws curved planes which are 3D objects composed of chained polygons

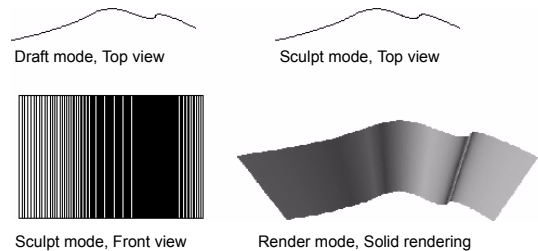


Figure 12.- Curves drawn in Draft and Sculpt modes

Drawing curves and curved planes

Curves created in Draft mode, and curved planes created in Sculpt mode are drawn with the same tools and by following the same procedures. It is the objects themselves that are different.

Curves, created in Draft mode, are two dimensional objects that can be seen in only the view they were created in.

Curved planes, created in Sculpt mode, look the same as two dimensional curves from the view they were created in; however, they can also be seen from all other views because they have depth.

The curve referred to in the following procedures is the actual curve object when creating an object in Draft mode, and the curved path of the curved plane when creating an object in Sculpt mode.

To use the Curve tool

The Curve tool lets you create single lines with curved or straight segments.



When you use the tool, you can set successive points to define the curved line.

1. Select the Curve tool from the Toolbar.
2. Click to set the first point of the curve.
3. Move to the location of the second point. As you move the pointer, the drawing vector points from the first point.
4. Click to set the second point. As you move the pointer, the drawing vector points from the second point to the location of the third point.
5. Click to set the third point. Continue to move the pointer and click to set each successive point on the curve.
6. Double-click to finish the curve and to set the end point. Or press the Return key to finish the curve with the last point set as the endpoint. The new curve is selected.
7. Click an empty area of the drawing to deselect the curve.

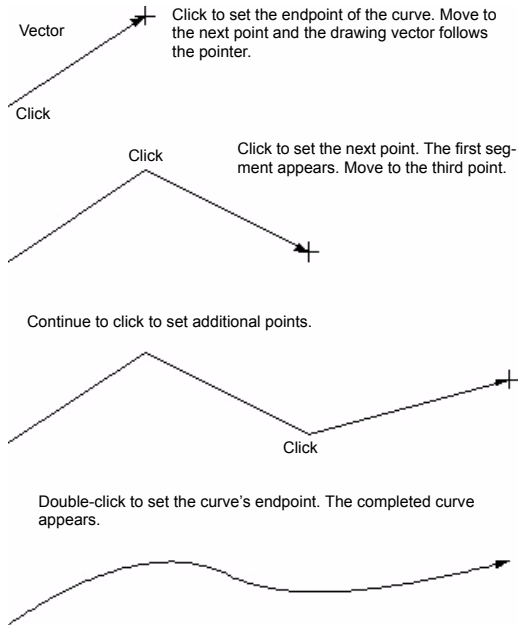


Figure 13.- Drawing with the Curve tool

Editing curves and Curved planes

Editing curves in Draft mode

After drawing a curve, you can move the creation points to change the shape and dimension of the curve.



Figure 14.- Creation points of a curve

To edit a curve's creation points

1. Select the curve with the Point Selection tool. The curve's creation points appear.

2. Drag a creation point to a new location. As you drag, the drawing vector indicates the original location of the creation point.
3. After you move a creation point, the curve remains selected. You can continue moving points to reshape the curve.
4. Click an empty area of the drawing when you finish editing the curve. The creation points are no longer visible.

Editing curved planes in Sculpt mode

Like most other objects in Sculpt mode, curved planes are 3D objects composed of chained polygons. A curved plane's creation points do not exist in

Sculpt mode. You can, however, use the Reshape command to display and drag the handles of the chained polygons to reshape the curved plane.

A curved plane can be edited in any view. Refer to **Orthogonal View commands**, page 87 for more information on changing views.

To edit a curved plane

1. Select the curved plane with the Selection tool. The curved plane's handles appear.
2. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of each chained polygon are visible.
3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the curved plane remains selected. You can continue moving handles to reshape the curved plane.
5. Click an empty area of the drawing when you finish editing the curved plane. The handles are no longer visible.

Applying commands to curves and curved planes

You can perform operations on a curve or a curved plane by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to apply the Align command to a selected curve or curved plane, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected curves or curved planes: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected curves or curved planes: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit curves or curved planes: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Unchaining curves and curved planes

If you apply the Unchain command to a curve, it becomes a series of separate polyline objects, each made of one straight line segment.

If you apply the Unchain command to a curved plane, it becomes a series of separate polygon objects.

The number of line segments in an unchained curve or curved plane is determined by a Preference setting in effect when you draw the object. The smaller the line segments comprising the object, which is determined by the size of the object and the number of line segments, the smoother the object's outline appears.

To set the segment preference for curves

1. Choose Preferences in the Edit menu.
2. In the Preferences dialog box, change the Curve Step setting. A larger number results in more line segments in unchained curves or curved planes.

Applying attributes to curves and curved planes

When a new curve or curved plane is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new curve or curved plane. You can then modify an existing object by changing its attributes anytime after its creation.

Draft mode . Curves can accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to a curve.

Sculpt mode . Curved planes can accept the following attributes: Pen color and Surface materials.

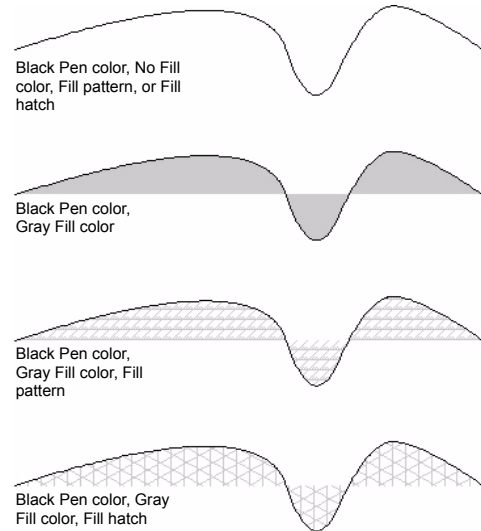


Figure 15.- Attributes applied to curve objects

Dimension tools

Mode: Draft



DCAD VectorSpace provides five tools to dimension an object and one tool to annotate an object. These tools are located in the Dimensions toolbar.

Chain Dimension tool . Draws dimensions by setting a chain of dimensions from point to point.

Baseline Dimension tool . Draws dimensions based on a series of measurements made from a common starting point.

Leader Dimension tool . Lets you draw dimensions by setting two points.

Constrained Dimension tool . Lets you draw dimensions by setting two points.

Angle Dimension tool . Draws dimensions by defining a radius and an angle.

Leader Text. Lets you draw a leader line and place text, to annotate objects, by setting points along a path.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in place of tool names in **DCAD VectorSpace**'s PTF language.

The Dimension tools have the data type listed below.

Dimension tools	
Chain Dimension	"ChainDimm"
Baseline Dimension	"BaseLineDimm"
Leader Dimension	"LeaderDimm"
Constrained Dimension	"DoubleLeaderDimm"
Angle Dimension	"AngleDimm"
Leader Text (line)	"Polyline"
Leader Text (text)	"Text"

Once dimension lines are drawn, they are like any other editable object. Additional settings such as the size of lines, gaps, text, and tolerances can be easily customized by double-clicking a dimension tool icon and using the tool's dialog box, or by selecting an existing dimension line and using the Tools tab in the Properties Manager.

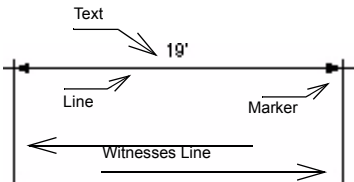


Figure 16.- Parts of a dimension

To use the Chain Dimension tool

The Chain Dimension tool lets you draw a chain of dimensions from point to point.



1. Select the Chain Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Chain Dimension icon to open the Chain Dimension dialog box.
2. Click to set the first point of the first dimension in the chain.
3. Point to the location of the second point. As you move the pointer, the drawing vector follows from the first point to the location of the second point. The dimensioned length is between these two points.
4. Click to set the second point. The two points that have just been set are the endpoints of the witness lines (if Long is selected in the Witness Line pop-up menu in the tool's dialog box; otherwise, the witness lines are the same length).
5. Point to the location of the third point. As you move the pointer, the drawing vector follows from the second point, to the location of the third point, which is the offset of the dimension line.
6. Click to set the third point.
7. Point to the location of the fourth point. As you move the pointer, the drawing vector follows diagonally to the location of the fourth point. This point defines the second dimension in the chain and is the endpoint of the third witness line. The length of the witness line depends on the location of this point.
8. Click to set the fourth point. Continue to move the pointer and click to set successive points to be included in the chain.

9. Double-click to finish the chain of dimensions and to set the last point of the chain. Or, press the Return key to finish the chain with the last point set as the last dimensioned point. The new dimension chain is selected. To deselect the object, click an empty area of the drawing.

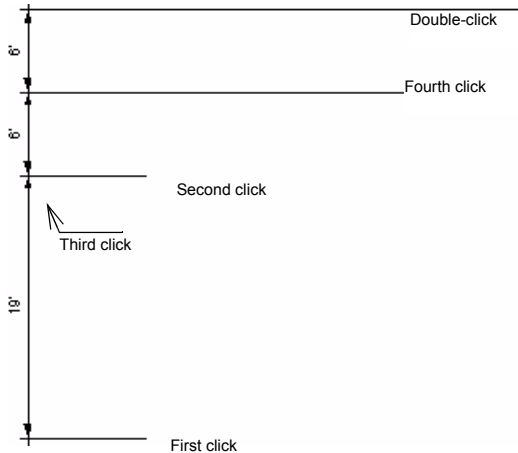


Figure 17.- Chain dimension

To use the Baseline Dimension tool

The Baseline Dimension tool lets you draw dimensions based on a series of measurements made from a common starting point.



1. Select the Baseline Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Baseline Dimension icon to open the Baseline Dimension dialog box.

2. Click the first point which will be the common starting point of the baseline.
3. Point to the location of the second point. As you move the pointer, the drawing vector follows from the first point to the location of the second point. The dimensioned length is between these two points.
4. Click to set the second point. The two points that have just been set are the endpoints of the dimension line's witness lines (if Long is selected in the Witness Line pop-up menu in the tool's dialog box; otherwise, the witness lines are the same length).
5. Point to the location of the third point. As you move the pointer, the drawing vector follows from the second point, to the location of the third point, which is the offset of the first dimension line.
6. Click to set the third point.
7. Point to the location of the fourth point. As you move the pointer, the drawing vector follows diagonally to the location of the fourth point. This point defines the second dimension and is the endpoint of the second witness line of the second dimension line. The length of the witness line depends on the location of this point.
8. Click to set the fourth point. Continue to move the pointer and click to set successive points.
9. Double-click to finish the dimensions and to set the last point. Or, press the Return key to finish dimensioning with the last point set as the last dimensioned point. The new baseline dimensions are selected. To deselect the object, click an empty area of the drawing.

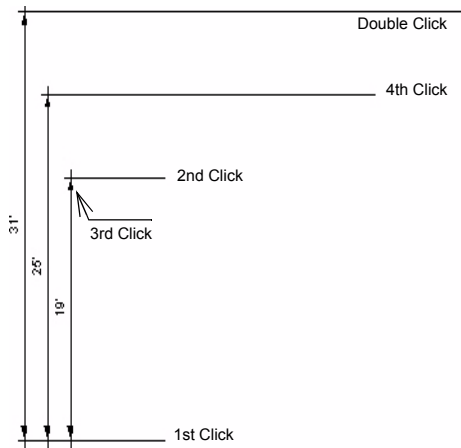


Figure 18.- Baseline dimension

To use the Leader Dimension tool

The Leader Dimension tool lets you draw dimensions by setting two points.

1. Select the Leader Dimensions tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Leader Dimension icon to open the Leader Dimension dialog box.
2. Click to set the first endpoint of the dimension line.
3. Point to the location of the second point. As you move the pointer, the drawing vector follows to the location of the second endpoint which is also the location of the dimension marker.
4. Click to set the second endpoint. The new dimension line is selected. To deselect the object, click an empty area of the drawing.

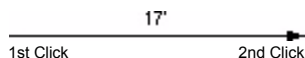


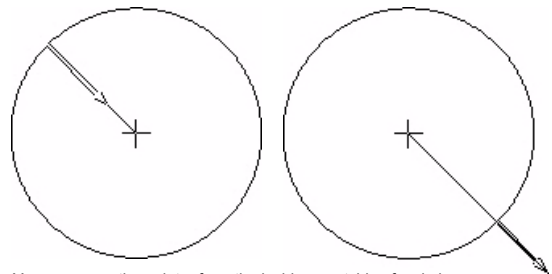
Figure 19.- Leader dimension

To use the Leader Dimension tool with circles and arcs

The Leader Dimension tool lets you dimension the radius of a circle or an arc by selecting the object and setting a point for the location of the marker of the dimension line.



1. Select the Leader Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Leader Dimension icon to open the Leader Dimension dialog box.
2. Place the pointer over the perimeter of the circle or arc and click to snap the drawing vector to the perimeter.
3. Move the pointer to the second point to set the angle and length of the dimension line. The drawing vector follows the pointer from the perimeter of the object.
 - You can move the pointer inside of the perimeter of the circle or arc, or outside of it. If you move the pointer inside of the perimeter, the dimension line will appear inside of the object. If you move the pointer outside of the perimeter, the dimension line will appear outside of the object.



You can move the pointer from the inside or outside of a circle

Figure 20.- Snapping to the perimeter of a circle

- Click to set the second point. The second point locates the dimension text as well as establishes the length of the dimension line.

Note: Note that the length of the drawing vector does not determine the radius of the circle or arc. **DCAD VectorSpace** calculates the radius based on the object, not the length of the drawing vector.



- The new dimension line, with its marker located on the perimeter of the circle or arc, is selected. To deselect the object, click an empty area of the drawing.

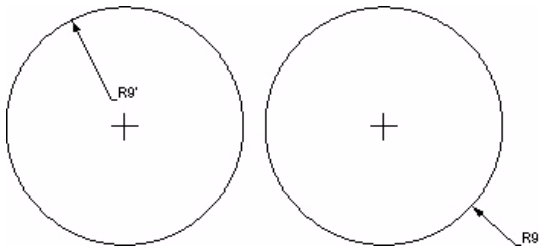


Figure 21.- Leader dimension of a circle

To use the Constrained Dimension tool

The Constrained Dimension tool lets you draw dimensions by setting two points.



- Select the Constrained Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Constrained Dimension icon to open the Constrained Dimension dialog box.
- Click to set the first endpoint of the dimension line. Move the pointer to set the second point. As you move the pointer, the drawing vector follows to the location of the second endpoint.

- Click to set the second endpoint. The new dimension line is selected. To deselect the object, click an empty area of the drawing.

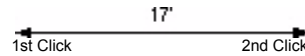


Figure 22.- Constrained dimension

To use the Constrained Dimension tool with circles and arcs

The Constrained Dimension tool lets you dimension the diameter of a circle or an arc by selecting the object and setting a point for the location of the marker of the dimension line.



- Select the Constrained Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Constrained Dimension icon to open the Constrained Dimension dialog box.
- Point to the perimeter of the circle or arc, and then click to snap the drawing vector to the perimeter.
- Move the pointer to the second point to set the angle and length of the dimension line. The drawing vector follows the pointer from the perimeter of the object.
 - You can move the pointer inside of the perimeter of the circle or arc, or outside of it. If you move the pointer inside of the perimeter, the dimension line will appear inside of the object. If you move the pointer outside of the perimeter, the dimension line will appear outside of the object. See (figure 20).
- Click to set the second point. The second point locates the dimension text as well as establishes the length of the dimension line.

Note: Note that the length of the drawing vector does not determine the diameter of the circle or arc. **DCAD VectorSpace** calculates the diameter based on the object, not the length of the drawing vector.



5. The new dimension line, with its marker located on the perimeter of the circle or arc, is selected. To deselect the object, click an empty area of the drawing.

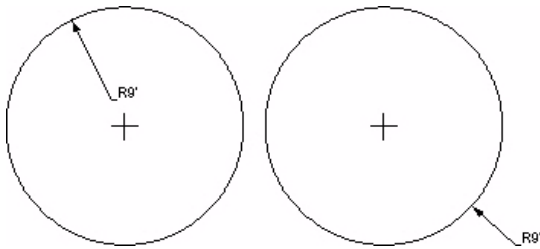


Figure 23.- Constrained dimension of a circle

To use the Angle Dimension tool

The Angle Dimension tool lets you draw dimensions by defining a radius and an angle.



1. Select the Angle Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Angle Dimension icon to open the Angle Dimension dialog box.
2. Click to set the center point of the dimensioning arc.
3. Point to the location of the first endpoint of the arc. As you move the pointer, a circle expands from the center and the drawing vector indicates the arc's radius.
4. Click to set the first endpoint of the dimensioning arc.

5. Point to the location of the second endpoint. As you move the pointer, the drawing vector rotates around the arc's center. The position of the pointer establishes the angle and length of the radius.
6. Click to set the angle and length. The dimension line is selected. To deselect the object, click an empty area of the drawing.

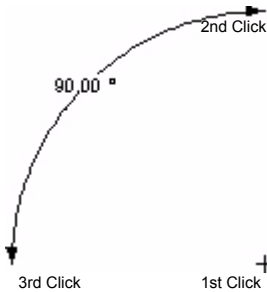


Figure 24.- Angle dimension

To use the Angle Dimension tool to dimension non-parallel lines

The Angle Dimension tool lets you dimension the angle of two, non-parallel lines. The tool lets you draw the angle dimension by selecting the two lines, and by locating the dimensioning arc. The lines do not have to touch. The lines can intersect.



1. Select the Angle Dimension tool from the Dimensions toolbar.
 - If you need to change the current properties of the dimension line, double-click the Angle Dimension icon to open the Angle Dimension dialog box.
2. Click the first line of the angle you want to dimension.

3. Move the pointer to select the second line. As you move the pointer, the drawing vector follows from the point you set on the first line.
4. Click the second line of the angle you want to dimension.

Note: Note that where you click the lines does not affect the angle of the dimension.

DCAD VectorSpace calculates the angle based on the relationship of one line to the other. The radius of the dimensioning arc is the intersection of the two lines.



5. Move the pointer to set the location of the dimensioning arc. As you move the pointer, the drawing vector follows from the point you set on the second line. The dimensioning arc expands from the point where the two lines intersect.
6. Click to set the location of the dimensioning arc. The dimension line is selected. To deselect the object, click an empty area of the drawing.

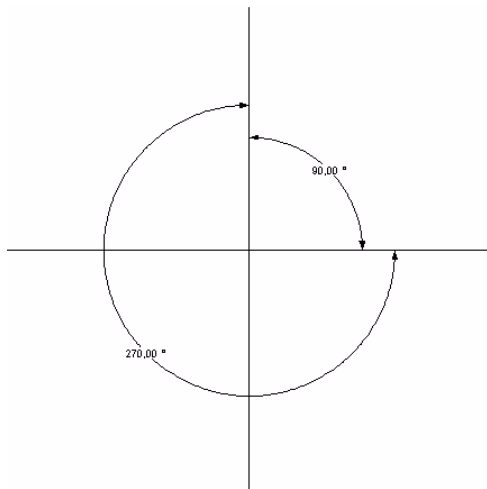


Figure 25.- Angle dimension of two lines

To use the Leader Text tool

The Leader Text tool lets you draw a leader line by setting points along a path. You can then type text at the insertion point at the end of the leader line.



1. Select the Leader Text tool from the Dimensions toolbar.
 - If you need to change the current properties of the leader line, double-click the Leader Text icon to open the Leader dialog box.
2. Click to set the first point of the leader line. This point is the location of the marker.
3. Point to the location of the second point. As you move the pointer, the drawing vector follows to the location of the second point.
 - To draw constrained line segments, press the Shift key while dragging the drawing vector. The line will snap at 15 degree angles.
4. Click to set the second point. Move to the third point of the leader line. The drawing vector follows to the location of the third point.
5. Click to set the third point. Continue to move the pointer and click to set each successive point on the leader line.
6. Double-click to finish the leader line and to set the endpoint, or press the Return key to finish the line with the last point set as the endpoint. The new leader line is selected. An additional line segment and insertion point appear at the endpoint of the leader line.
 - Note that **DCAD VectorSpace** adds a horizontal line segment at the endpoint of the leader line to indicate the final placement of the text. You can change the length of this line in the Leader dialog box.

7. Type to enter a line of text in the document. When you finish typing, press the Enter key. The text appears with the current attributes, and is centered at the endpoint of the horizontal line segment. The leader line and the text are selected.
 - Note that unlike other dimension objects, the leader line and its text are separate objects.

8. To deselect the objects, click an empty area of the drawing.

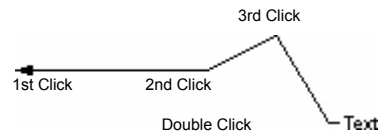


Figure 26.- Leader Text

Applying commands to dimensions

You can perform operations on dimensions by selecting them and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to apply the Align command to a selected dimension, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected dimensions: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected dimensions: Align, Scale, and Group.

The commands found in the following submenus in the Object menu can be used to edit dimensions: Arrange, Copy to Layer, Send to Layer, and Position.

Refer to the specific command for more information on how to use it to revise an object.

Reshaping Dimensions. You can place an object in Reshape mode to change the length of dimensions, move dimension text, change the angle of dimension lines, or change the length of witness lines.

You can reshape dimension objects in Draft or Sculpt mode. To reshape a dimension object in Sculpt mode, make sure you have “View 3D & 2D Objects” checked in the View Options pop-up menu.

You can use the Reshape command to reshape dimension objects created with the Chain or Baseline Dimension tools.

You do not need to use the Reshape command to reshape dimension objects created with the Constrained, Leader or Angle Dimension tools. These objects appear in Reshape mode when you select them with the Selection tool.

To reshape Chain or Baseline dimensions

Select the dimension object and choose Reshape in the Edit menu, or click the Reshape action button in the Attributes bar. The dimension object's creation points appear.

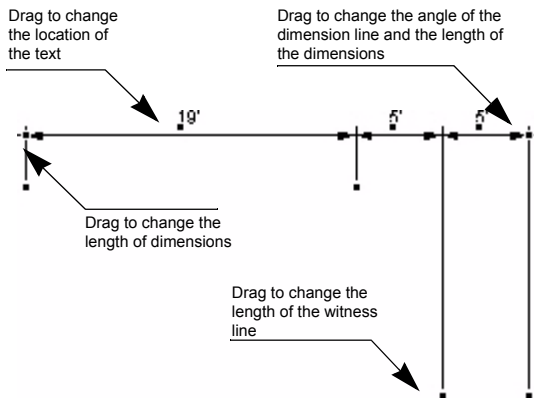


Figure 27.- Chain Dimension in Reshape mode

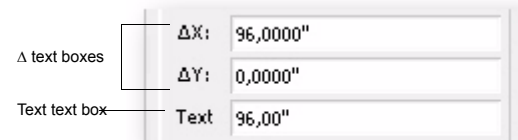
Editing Dimensions and Dimension Text

Editing the text of the dimension can directly affect the dimension line. If you add to the measurement of a dimension in the Properties Manager, using the “Ø” text boxes, you will lengthen the dimension line. The same is true when subtracting from a measurement. You will shorten the dimension line.

Setting up dimension tools

Each Dimension tool has a dialog box you can use to set up the tool. This feature lets you draw dimension objects with the arrowheads, witness lines, and text formatting. To set up a Dimension tool, double-click its icon in the toolbox. This action makes the dialog box for the tool you double-click appear.

You can change the dimension text without changing the length of the dimension line by entering a new value in the “Text” text box in the Properties Manager. You can also type words in this box.



You can edit the text in dimensions in Draft and Sculpt mode. Refer to **Coordinates tab**, page 120 for more information on how to edit dimensions and dimension text using the Properties Manager.

Applying attributes to dimensions

When a new dimension is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new dimension. You can then modify an existing object by changing its attributes anytime after its creation.

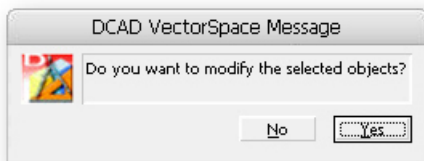
Draft mode . Dimensions can accept the following attributes: Pen color, Pen weight, Pen style; and Arrowheads.

You can choose standard settings for the appearance of dimension objects, or you can specify custom settings. You can save custom settings to use later. Additionally, you can set up a dimension tool anytime, with or without objects selected.

Configuring a Dimension tool with a dimension object selected

If you double-click a dimension tool, and a dimension object created with that tool is selected, the settings in the dialog box do not reflect the settings of the selected dimension object. To see the settings of a selected dimension object, double-click the object, and then look at its settings in the Properties Manager.

However, if you change the settings in the Dimension tool's dialog box with a dimension object selected, **DCAD VectorSpace** asks you if you want to modify the selected object.

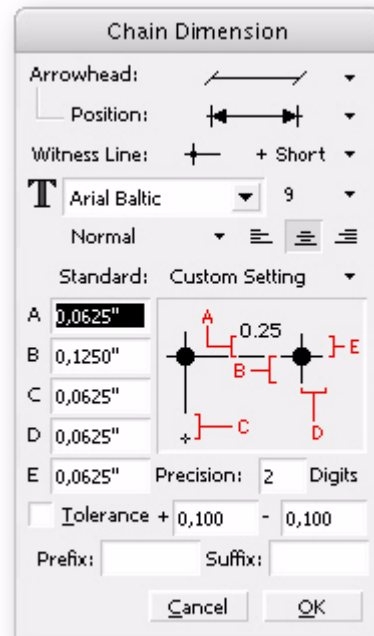


Click Yes to modify the selected object using the new settings for the Dimension tool.

To change the attributes of a dimension object without affecting the current settings for a Dimension tool, double-click the dimension object. Then use the Properties Manager to edit the object's attributes.

To set up a Dimension tool

1. Double-click a Dimension tool icon in the toolbox. The dialog box for that Dimension tool appears.



To use standard settings, choose the standard (ANSI, DIN, ISO, BS-380, or JIS) in the Standard pop-up menu. To customize the tool settings, use the options (described below) to specify custom spacing, arrowhead, witness line length, tolerance, precision, or text formatting.

- If you change a setting, "custom setting" appears in the Standard pop-up menu, and the Save Settings command becomes available in the pop-up menu.

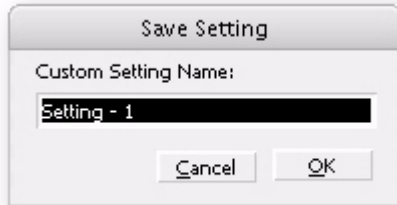
2. Click OK to apply the settings to the Dimension tool.

To save custom settings

You can save settings using the Save Settings command in the Standard pop-up menu.

1. Set up the Dimension tool dialog box options.

2. Choose Save Settings in the Standard pop-up menu. In the Save Setting dialog box, type a name for the settings.

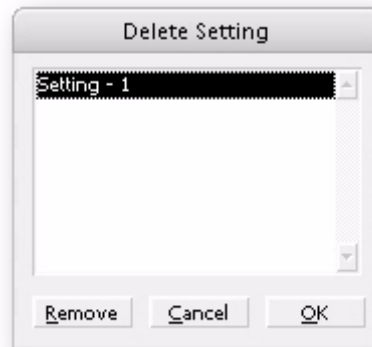


3. Click OK to save the custom settings. **DCAD VectorSpace** returns to the Dimension tool dialog box. The name of the new saved settings appears in the Standard pop-up menu. If you want to use other settings, choose the name in the Standard pop-up menu.
4. Click OK to apply the current settings in the Dimension tool dialog box to the Dimension tool.

To delete custom settings

You can delete custom settings using the Delete Settings command in the Standard pop-up menu.

1. If necessary, double-click the Dimension tool icon with custom settings you want to delete.
2. Choose the name of the custom settings you want to delete in the Standard pop-up menu. The Delete Setting dialog box appears.



3. In the Delete Setting dialog box, select the settings you want to remove. The Remove button becomes available.
4. To temporarily remove the selected settings, click Remove.
5. To permanently delete the settings, click OK.

Options for the Dimension tools

Each Dimension tool has its own dialog box of options. Some dimension tools don't have all of the options described in the section.

Arrowhead. Choose an arrowhead from the pop-up menu. The current arrowhead appears in the menu box. You can choose from the arrowheads that appear on the Arrowhead tab in the Pen palette.

Position . Choose inside or outside placement of arrowheads by choosing one of the two graphics in the Position pop-up menu. This option is available for the Baseline and Chain Dimension tools.

Witness line . Choose Long or Short in the pop-up menu to set the length of witness lines. This option is available for the Baseline and Chain Dimension tools.

Text options . Use the pop-up menus to specify font, type size, and type style for the text in dimension objects. Use the buttons to specify text alignment within dimension objects.

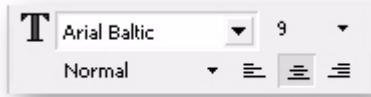
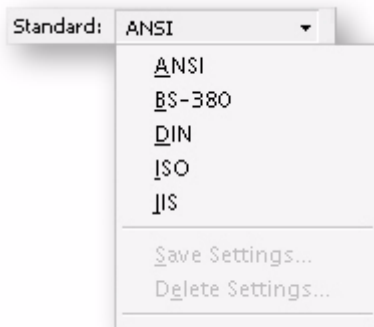


Figure 28.- Text options for Dimension tools

Standard. If you want to use standard settings for all options in a Dimension dialog box, choose the name of the standard in the pop-up menu.



The name appears in the Standard box, and the standard's settings appear throughout the Dimension tool's dialog box. The Standard pop-up menu contains the following dimension object standards.

ANSI: American National Standards Institute

BS-380: British Standards Institute

DIN: Deutsches Institut für Normung

ISO: International Organization for Standardization

JIS: Japanese Industrial Standard

The Standard pop-up menu also contains commands to save and delete custom settings that you create.

Position and spacing values. The values in the text boxes labeled A, B, C, D, and E control spacing and positioning of parts of a dimension object. The adjacent diagram in the dialog box identifies the items for each Dimension tool. You can type new values in the text boxes to set custom spacing and positioning.

Certain position and spacing options are not available for all Dimension tools, such as the Leader Dimension tool and the Constrained Dimension tool. No position and spacing options are available for the Angle Dimension tool.

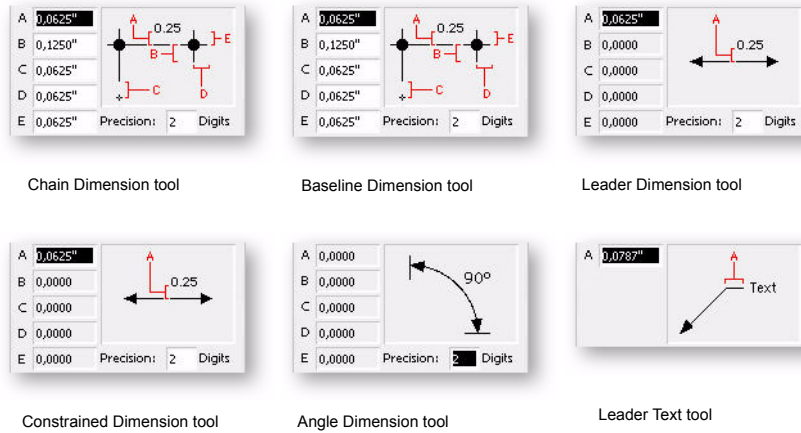


Figure 29.- Dimension tools position and spacing settings

Precision. Type the number of digits to include after the decimal point in measurements. You can type a number from 0 to 16.

Precision: 2 Digits

Suffix. Type the text in the Suffix text box that you want placed behind the dimension text.

Prefix: Suffix:

Tolerance. Select the Tolerance check box to display the tolerance values in the (+) and (-) text boxes in the dimension text. To set Tolerance values, type numbers in the (+) or (-) text boxes.

☐ Tolerance + 0,100 - 0,100

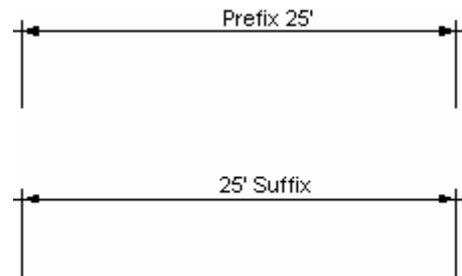


Figure 30.- Examples of Prefix and Suffix

Prefix. Type the text in the Prefix text box that you want placed in front of the dimension text.

Ellipse tools

Mode: Draft, Sculpt



DCAD VectorSpace provides five tools to draw circles, ellipses and cylinders. These tools are located together in the Ellipse toolbar in the toolbox.

Ellipse Diagonal tool . Draws a circle, ellipse, or cylinder from two points defining the corners of a bounding box.

Ellipse Center to Corner tool. Draws a circle, ellipse or cylinder from the center to the corner of a bounding box.

Circle Radius tool . Draws a circle or cylinder from the center with the radius that you specify.

Circle 3 Points tool. Draws a circle or cylinder whose circumference passes through three points you specify.

Ellipse 3 Points tool . Draws an ellipse or cylinder by defining the center point, length and width of the object.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**’s PTF language.

The ellipse tools have the data types listed below.

Ellipse tools

Ellipse Diagonal	“DiagonalEllipse”
Ellipse Center to Corner	“CenterEllipse”

Ellipse tools

Circle Radius	“CenterRadiusCircle”
Circle 3 Points	“3PointsCircle”
Ellipse 3 Points	“FreeEllipse”

Circles are closed 2D shapes in which all points on the object’s outline are equidistant from one point, the circle’s center. Ellipses are a deviation of a circle.

In Draft mode, the ellipse tools draw 2D ellipses or circles. The circle tools draw only perfect circles. In Sculpt mode, the ellipse and circle tools create 3D cylinder-shaped objects, which are made of chained polygons.

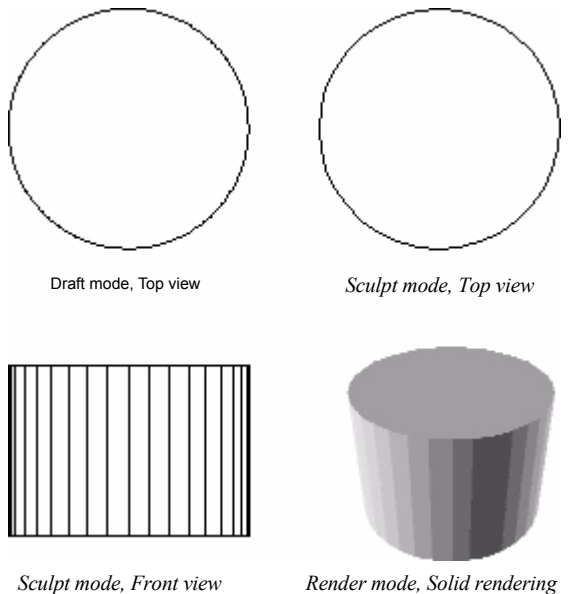


Figure 31.- Ellipses in Draft, Sculpt and Render modes

Drawing Circles, ellipses and cylinders

To draw circles and ellipses in Draft mode, or oval and round cylinders in Sculpt mode, use the following procedures.

Circles and ellipses created in Draft mode are two-dimensional objects. Like all 2D objects, ellipses and circles appear only in the Draft mode view in which they are created.

When you draw them in Sculpt mode, cylinders look the same as ellipses or circles. When you change to other views in Sculpt mode, cylinders have depth produced by the projection of the ellipse or circle between the active set of extrusion planes.

The circle or ellipse referred to in the following procedures is a 2D circle or ellipse in Draft mode, or the circle or ellipse component of a cylinder in Sculpt mode.

To use the Ellipse Diagonal tool

The Ellipse Diagonal tool lets you specify opposite corners of a bounding box to draw an ellipse or circle. If the bounding box is a square, the tool draws a circle.



1. Select the Ellipse Diagonal tool in the Ellipse toolbar.
2. Click to set one corner of the object's bounding box.
3. Move to the opposite corner of the bounding box. The drawing vector follows from the first point, indicating a diagonal of the bounding box, and the object appears.
 - To draw a circle press Shift and move the pointer from the first point at a 45-degree

angle. You can also snap to other angles in 15-degree increments while pressing Shift.

4. Click to set the opposite corner of the bounding box. The ellipse or circle appears.

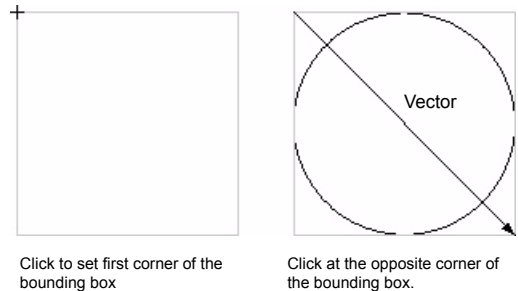


Figure 32.- Drawing with the Ellipse Diagonal tool

To use the Ellipse Center to Corner tool

The Ellipse Center to Corner tool lets you set a center point and a bounding box corner point to draw an ellipse or circle. If the bounding box is square, the tool draws a circle.



1. Select the Ellipse Center to Corner tool in the Ellipse toolbar.
2. Click to set the center point of the ellipse or circle.
3. Move to the corner of the object's bounding box. The drawing vector follows the pointer from the first point, indicating half of the bounding box diagonal. The object appears.
 - To draw a circle press Shift and move the pointer from the first point at a 45-degree angle. You can also snap to other angles in 15-degree increments while pressing Shift.

- Click to set the corner of the bounding box. The ellipse or circle appears and is selected.

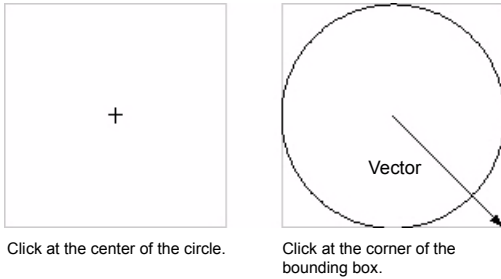


Figure 33.- Drawing with the Ellipse Center to Corner tool

To use the Circle Radius tool

The Circle Radius tool lets you set a center point and radius to draw a circle.

- Select the Circle Radius tool in the Ellipse toolbar.
- Click to set the center point of the circle.
- Move to expand the circle from the center point. The drawing vector follows the pointer and indicates the circle's radius.
- Click to set the circle's radius. The circle appears and is selected.

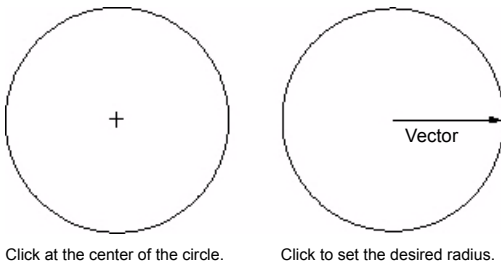


Figure 34.- Drawing with the Circle Radius tool

To use the Circle 3 Points tool

The Circle 3 Points tool lets you draw a circle by setting three points on the circle's circumference.



- Select the Circle 3 Points tool in the Ellipse toolbar.
- Click to set the first point on the circle's circumference.
- Move to a second point on the circle. The drawing vector follows from the first point. Click to set the second point.
- Move to a third point on the circle's circumference. The circle follows the pointer, and the drawing vector indicates a chord of the circle from the second point to the third point.
- Click to set the third point on the circle. The circle appears and is selected.

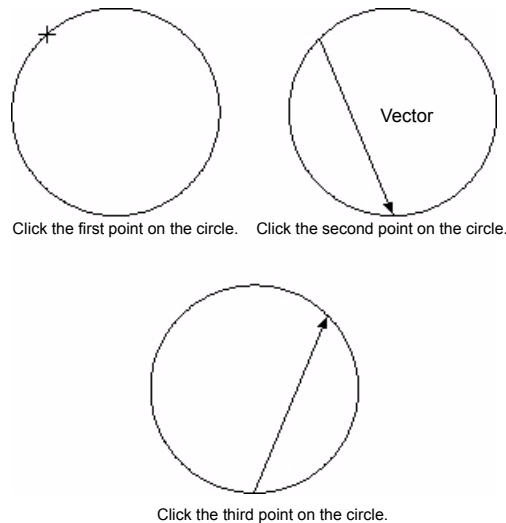


Figure 35.- Drawing with the Circle 3 Points tool

To use the Ellipse 3 Points tool

The Ellipse 3 points tool lets you set the center point, length, and width of an ellipse.



1. Select the Ellipse 3 Points tool in the Ellipse toolbar.
2. Click to set the center point of the ellipse.
3. Move the pointer to set the length of the ellipse. The drawing vector follows from the center point.
 - Press the Shift key while dragging the drawing vector to constrain the vector to 15 degree intervals.
4. Click to set the length of the ellipse.
5. Move the pointer to set the width of the ellipse. The drawing vector moves perpendicular to length of the ellipse. The ellipse expands from the center point.

6. Click to set the width of the ellipse. The ellipse appears and is selected.

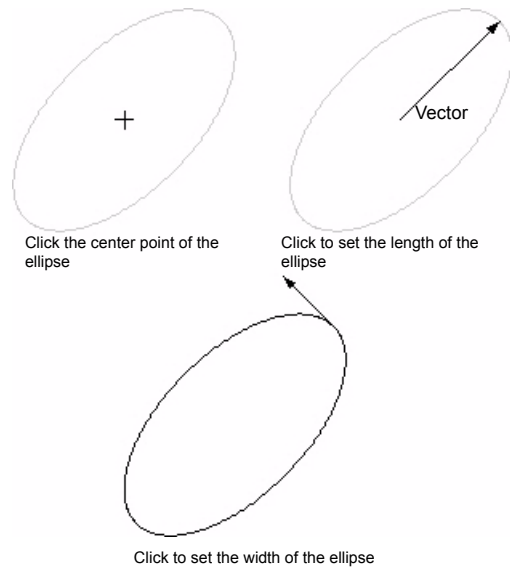


Figure 36.- Drawing with the Ellipse 3 Points tool

Editing Circles, Ellipses, and cylinders

Editing circles and ellipses in Draft mode

After drawing a circle or an ellipse, you can move the object's creation points to change its shape. The location of an object's creation points depends on the tool used to create the object.

To edit creation points of circles and ellipses

1. Select the circle or ellipse with the Point Selection tool. The object's creation points appear.
2. Drag a creation point to a new location. As you drag, the drawing vector points from the original location.

3. After you move a creation point, the circle or ellipse remains selected. You can continue reshaping the object by moving creation points.
4. Click an empty area of the drawing when you finish editing the circle or ellipse. The creation points are no longer visible.

Editing cylinders in Sculpt mode

Like most other objects in Sculpt mode, cylinders are 3D objects composed of chained polygons. A cylinder's creation points do not exist in Sculpt mode. You can, however, use the Reshape command

to drag the handles of the chained polygons to reshape the cylinder.

A cylinder can be edited in any view. Refer to the specific commands in the View menu for more information on changing views.

To edit a cylinder

1. Select the cylinder with the Selection tool. The cylinder's handles appear.
2. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of each chained polygon are visible.
3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the cylinder remains selected. You can continue moving handles to reshape the cylinder.
5. Click an empty area of the drawing when you finish editing the cylinder. The handles are no longer visible.

Applying commands to circles, ellipses, and cylinders

You can perform operations on a circle, an ellipse or a cylinder by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to use the Align command with a selected circle, ellipse or cylinder, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected circles, ellipses, or cylinders: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected circles, ellipses, or cylinders: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit circles, ellipses, or cylinders: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Unchaining circles, ellipses, and cylinders

If you apply the Unchain command to a circle or an ellipse, it becomes a series of separate polyline objects, each made of one straight line segment.

If you apply the Unchain command to a cylinder, it becomes a series of separate polygon objects.

The number of line segments in an unchained circle, ellipse, or cylinder is determined by a Preference setting in effect when you draw the object. The smaller the line segments comprising the object, which is determined by the size of the object and the number of line segments, the smoother the object's outline appears.

To set the segment preference for ellipse objects

1. Choose Preferences in the Edit menu.
2. In the Preferences dialog box, change the Circle Step setting. A larger number results in more line segments in circles, ellipses, and cylinders when these objects are unchained or converted to polygons.

Applying attributes to circles, ellipses and cylinders

When a new circle, ellipse, or cylinder is created, **DCAD VectorSpace** applies the current Draft or

Sculpt mode attributes to the object. You can modify the object's attributes in the appropriate mode.

Draft mode . Circles and ellipses can accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to a circle or an ellipse.

Sculpt mode . Cylinders can accept Pen color and Surface materials.

Library tool

Mode: Draft, Sculpt

The Library tool lets you organize saved objects and symbols to use in **DCAD VectorSpace** documents. The Library tool is located in the toolbox.



Library Objects. When you place a Library Object in a drawing, **DCAD VectorSpace** scales it to the drawing.

For example, you can create and save a door in a drawing with a scale set to 1/2"=1'-0". You can then place the door, using the Library tool, into a drawing with a scale of 1/4"=1'-0", and **DCAD VectorSpace** scales the door to fit the drawing.

A Library Object can be a 2D or 3D object, and you can create linked instances of 2D/3D Library Objects.

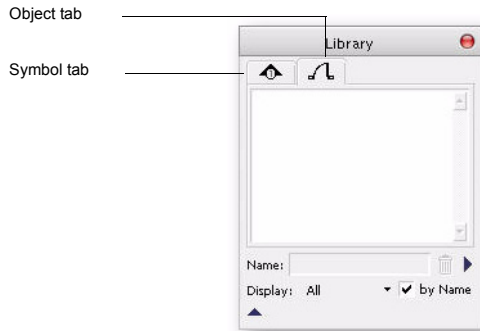
Library Symbols. Library Symbols are designed to be used for drawing elements such as, electrical, HVAC, drawing, and mechanical symbols. Library Symbols are 2D objects.



A Library Symbol is the same size in every document, no matter what a document's output scale is set to.

Library palette

The Library palette organizes Library items on two tabs. To bring a tab to the front, click the tab. The tab marked with a symbol icon contains Library Symbols. The tab marked with the door icon contains Library Objects.

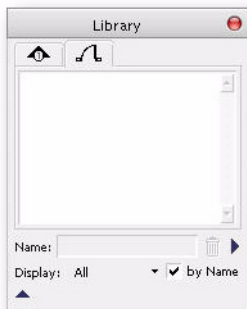


To use the Library tool

The Library tool opens the Library palette. You can select items from the Object or Symbol tabs.



1. Double-click the Library tool in the toolbox. The Library palette opens. The Library palette shows the available Objects or Symbols.
 - If Display by Name is checked, the names of Objects and Symbols appear in the palette.
 - 2D/3D appears at the bottom left of the palette if the Library has a 2D and 3D version of the same Library Object.



2. If you need to, click the Object or Symbol tab to bring it to the front.
3. Click the Object or Symbol you want to place in the drawing. The name of a selected item appears highlighted.
4. Without pressing the mouse button, move the pointer from the Library palette to the drawing, to place the Object's or Symbol's bounding box.
5. Drag the drawing vector to set the Object's or Symbol's orientation. The Object or Symbol appears and is selected.
6. To deselect the Object or Symbol, click an empty area of the drawing.

Library palette commands

Four commands in the Library pop-up menu let you manage the Objects and Symbols in the active document. The following commands appear in the pop-up menu.

Add. Lets you add Objects and Symbols to the active document's Library. This command is not available for Symbols in Sculpt mode.

Select. Lets you select the Objects and Symbols you have placed in the drawing using the Library tool. This command is not available for Symbols in Sculpt mode.

Replace. Lets you replace an existing Object or Symbol with another from the Library of the active document. This command is not available for Symbols in Sculpt mode.

Update. Lets you update the currently placed Object or Symbol with one that has been revised in the original document in which it was created and saved. This command is not available for Symbols in Sculpt mode.

To use the Add command

1. Double-click the Library tool in the toolbox. The Library palette opens. The palette is empty if this is a new document.
2. Choose the Add command from the pop-up menu under the right triangle button. A directory dialog box opens.
3. Go to the directory where you have saved your **DCAD VectorSpace** documents and select a document in which you have saved Objects and Symbols.
4. Click Open. The Library Picker appears.
5. Click the Object or Symbol tab to bring it to the front.
6. Click the name of the item you want to add to the Library. The selected item appears highlighted in the scrolling list. A picture of the selected item appears in the palette.
7. Click the Add button to import the selected item into the Library of the current **DCAD VectorSpace** document.
8. When you are finished using the Library Picker to add Library items, click OK. The Library Picker closes. The items you have added appear in the Library Palette in the active document.

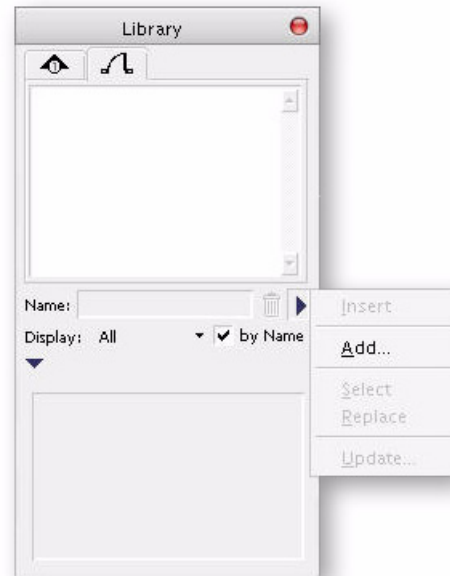


Figure 37.- Library palette pop-up menu

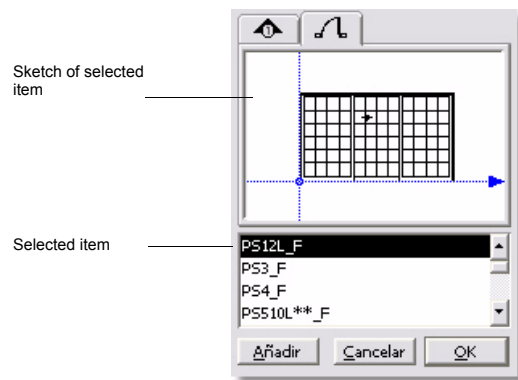


Figure 38.- Library Picker

To use the Select command

1. Double-click the Library tool in the toolbox. The Library palette opens. The Library palette shows the available Objects or Symbols.

-
2. If you need to, click the Object or Symbol tab to bring it to the front.
 3. Click to highlight the name of the Object or Symbol you want to select.
 - If Display by Name is not checked, you can click the picture of the Object or Symbol to select it.
 4. Choose the Select command in the pop-up menu under the right triangle button. **DCAD VectorSpace** selects all the Objects or Symbols with the selected name throughout the active document.

To use the Replace command

1. Select the Objects or Symbols in the active document to be replaced.
2. Double-click the Library tool in the toolbox. The Library palette opens. The Library palette shows the available Objects or Symbols.
3. If you need to, click the Object or Symbol tab to bring it to the front.
4. Click to highlight the name of the new Object or Symbol replacing the existing, selected ones.
 - If Display by Name is not checked, you can click the picture of the Object or Symbol to select it.
5. Choose the Replace command in the pop-up menu under the right triangle button. A message asks you to confirm the operation.
6. Click Yes to replace the selected Objects or Symbols. **DCAD VectorSpace** replaces the items and the new items are selected.

To use the Update command

1. Double-click the Library tool in the toolbox. The Library palette opens. The Library palette shows the available Objects or Symbols.

2. If you need to, click the Object or Symbol tab to bring it to the front.
3. Click to highlight the name of the Object or Symbol you want to update.
 - If you do not have Display by Name checked, you can click the picture of the Object or Symbol.
4. Choose the Update command in the pop-up menu under the right triangle button.
5. The Objects or Symbols are updated throughout the active document, and are selected.
6. To deselect the Object or Symbol, click an empty area of the drawing.

Applying attributes to Library Objects and Symbols

Attributes are graphical modifiers, such as color and Pen weight, of objects. When you place a Library Object or Symbol, it does not take on the current attributes.

If you want to change the attributes of a Library Object or Symbol, you first have to group the Object or Symbol with the Group command. You then have to ungroup the object with the Ungroup command. (You might have to use the Ungroup command twice to ungroup all of the objects). The result is separate objects which you can apply new attributes to.

Note: However, if you ungroup a Library Object or Symbol, it no longer exists as a Library Object or Symbol. You can't select it, update it or replace it using the Library tool.



You can change a Library Object's or Symbol's attributes after you ungroup it by selecting it and using the Fill and Pen palettes.

3D Library Objects and views

It is important to note that when you create a 3D Library Object, the Library Object is view dependent. In other words, the Library Object maintains its spatial relationship to the views you use to create it.

For example, if you create a door Library Object so that Top View is the plan of the door, and Front View is the front of the door, then Left View shows the left side of the door.

You can place the door Library Object in any view. In general, you should place 3D Library Objects in Top View, because Top View lets you orient the plan of the object to any other view.

When you change views, the Library palette changes the way it displays 3D Library Objects in the palette in order to reflect the change in views. The Library palette displays 3D Library Objects the way they will look when you placed in the current view.

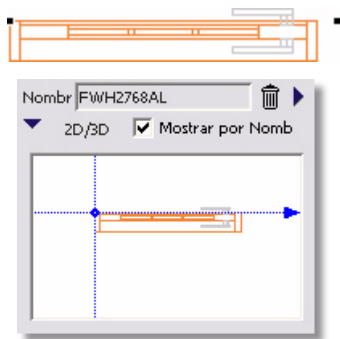


Figura 39.- 3D Door - Plan View

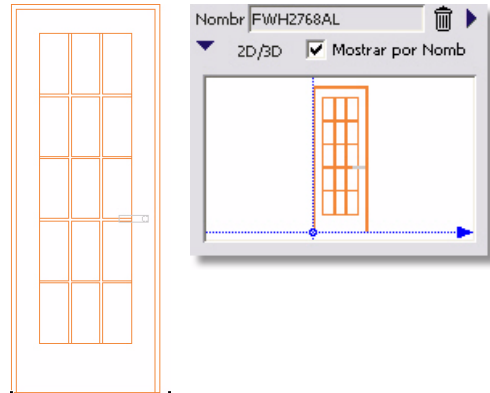


Figura 40.- 3D Door - Front View

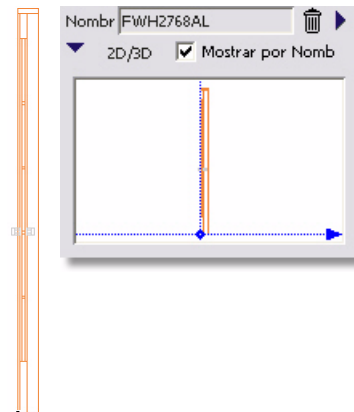


Figura 41.- 3D Door - Left View

Light Source tools

DCAD VectorSpace provides two tools to place lights in a model. These tools are located in the Light Source toolbar.

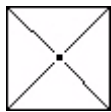
Directional Light tool . Lets you place a light source by specifying two points: one point at the origin of the light, and the second point indicating the length and direction of the cone of illumination.

Omnidirectional Light tool. Lets you place light sources by placing a point at the origin of the light.

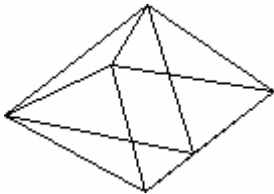
DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**'s PTF language.

These tools have the data types listed below.

Light Source tools	
Directional Light	"LightSource"
Omnidirectional Light	"DirectLightSource"



Omnidirectional Light, Sculpt mode, Top view



Omnidirectional Light displayed as a Wire-frame rendering in Render mode

Figure 43.- Omnidirectional Light

Mode: Sculpt



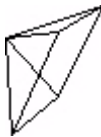
The Directional Light tool places a light source that projects a cone of illumination on all modeled objects. The tool draws lights as vector objects whose origin defines the light source position and whose direction coincides with the direction and angle of the cone of illumination.

A directional light has three properties: power, size and angle.



Angled directional light, Sculpt mode

■ Handle



Directional Light displayed as a Wire-frame rendering in Render mode

Figure 42.- Directional Light

The Omnidirectional Light tool places a light source that projects a spherical illumination field on all modeled objects.

An Omnidirectional Light has two properties: power and size.

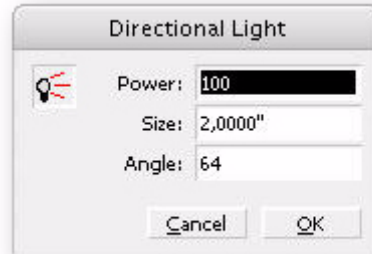
To use the Directional Light tool

The Directional Light tool Lets you place light sources by placing one point at the origin of the light, and placing a second point to position the light's cone of illumination.



1. Activate a Sculpt mode window and choose Top in the View menu. In Top view, you can place of the light in relation to your plan.
 - Because you are placing a 3D light in two dimensions only, you need to place the light in one view, and then specify the vertical height and the direction of the light in a different view.
2. Open or activate a second Sculpt mode window, and choose Front in the View menu.
 - In Front view, you can see the height of the light. This lets you edit the vertical direction of the light, and the length of the light's cone of illumination.
3. If necessary, specify a plane to place the light on. To do this, activate a saved set of extrusion planes with the upper plane in the position you want, or define a new set of extrusion planes with the upper plane in the position you want. If you do not specify a plane for the light, **DCAD VectorSpace** places the light on the upper plane in the active set of extrusion planes.
 - When you place a new light source, **DCAD VectorSpace** always places it on the upper extrusion plane. If the Info bar is visible, you can determine which plane is the upper extrusion plane by looking at the values in the text boxes at the far right of the Info bar. The higher number indicates which plane is the upper extrusion plane.
4. Select the Directional Light tool in the Light Sources toolbar.

- You can double-click the Directional Light tool icon to change the current settings in the Directional Light tool dialog box.



5. Activate the Top view window. Point to the location of the light source and click to set the point.
6. Move the pointer to the location of the second point. As you move the pointer, the drawing vector follows from the location of the light fixture to the second point. The second point indicates the direction of the cone of illumination.
7. Click to set the second point. The light appears and is selected.
 - Because you are working in the Top view, the drawing vector places the second point on the same plane as the first point.
 - You can see the height and placement of the selected light's points in the Sculpt mode window set to Front view.
8. Click anywhere in the Sculpt mode window, set to Front view, to activate it.
9. Reselect the light.
10. Drag the second point, the point that represents the direction of the cone of illumination, to the desired position. The drawing vector indicates the direction and location of the point.

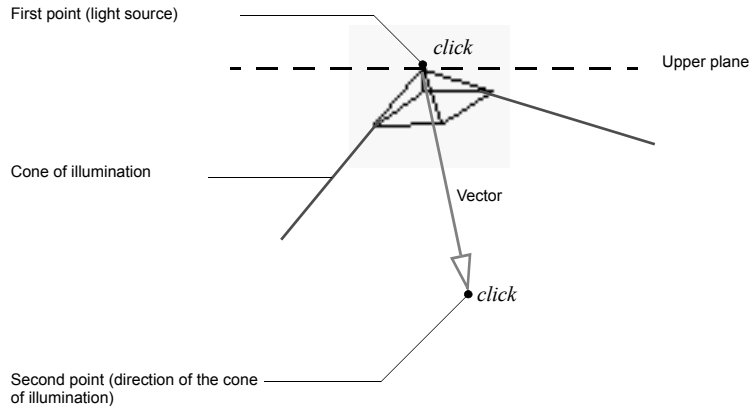


Figure 44.- Parts of the Directional light

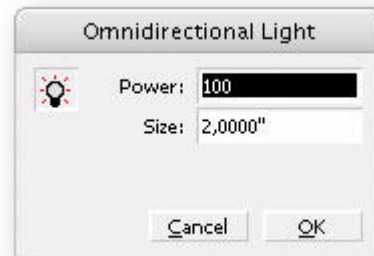
To use the Omnidirectional Light tool

The Omnidirectional Light tool lets you place light sources by placing a point at the origin of the light.



1. Activate a Sculpt window and choose Top in the View menu. In Top view, you can place the light in relation to your plan.
2. If necessary, specify a plane to place the light on. To do this, activate a saved set of extrusion planes with the upper plane in the position you want, or define a new set of extrusion planes with the upper plane in the position you want. If you do not specify a plane for the light, **DCAD VectorSpace** places the light on the upper plane in the active set of extrusion planes.
 - When you place a new light source, **DCAD VectorSpace** always places it on the upper extrusion plane. If the Info bar is visible, you can determine which plane is the upper extrusion plane by looking at the values in the text boxes at the far right of the Info bar. The higher number indicates which plane is the upper extrusion plane.
3. Select the Omnidirectional Light tool in the Light Sources toolbar.

- You can double-click the Omnidirectional Light tool icon to change the current settings in the Omnidirectional Light tool dialog box.



4. Point to the location of the light sources and click to set the point. The light appears and is selected.

Applying commands to lights

You can perform operations on lights by selecting them and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and Edit menu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to apply the Align command to a selected light, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected lights: Cut, Copy, Clear, Select, Reshape (Directional), Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected lights: Align, Scale, Chain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit lights: Arrange, Copy to Layer, Send to Layer, and Position.

Applying attributes to lights

Attributes are the graphical modifiers that are assigned to an object when it is created.

When a new light is placed, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you place a new light. You can then modify an existing object by changing its attributes anytime after its creation.

Sculpt mode . Lights can accept the following attributes: Pen color

Note: The color of the light object does not affect the color of the light it shines.



Line tool

Mode: Draft, Sculpt

The Line tool draws a straight single line in Draft mode or a flat plane in Sculpt mode. The tool draws a straight segment between two endpoints you define.



Data type abbreviations also appear in **DCAD VectorSpace**'s PTF language.

Line tool	
Line	"Line"

The Line tool is located in the toolbox in the second row, under the Selection tools.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool.

Lines are a set of two points that satisfy a linear equation. In Draft mode, the Line tool draws single straight lines. In Sculpt mode, the Line tool draws flat planes which are single polygon objects.

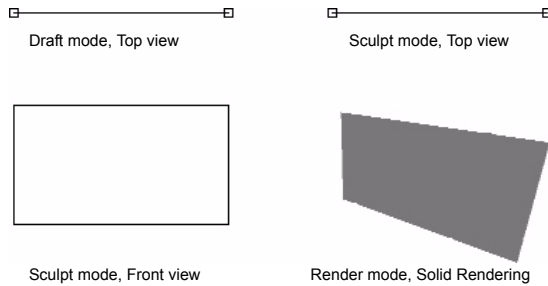


Figure 45.- Lines drawn in Draft and Sculpt modes

Drawing lines and planes

Lines created in Draft mode, and planes created in Sculpt mode are drawn with the same tools and by following the same procedures. It is the objects themselves that are different.

Lines created in Draft mode are two dimensional objects that can be seen in only the view they were created in.

Planes created in Sculpt mode look the same as two dimensional lines from the view they were created in. However, they can also be seen from all other views because they have depth.

The “line” referred to in the following procedures is the actual linear object in Draft mode, and the linear path of the plane in Sculpt mode.

To use the Line tool

The Line tool lets you specify the two endpoints of a line.



1. Select the Line tool from the Tool-box.

2. Click to set the first endpoint of the line. Move to the second endpoint of the line. The drawing vector follows from the first point.
 - To draw a constrained line, press Shift while dragging the drawing vector. The line will snap at 15 degree intervals.
3. Click to set the second endpoint of the line. The new line is selected.
4. Click an empty area of the drawing to deselect the line. The handles are no longer visible.

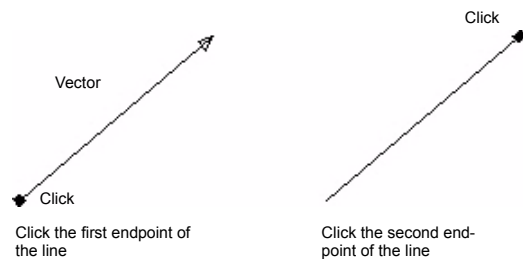


Figure 46.- Drawing with the Line tool

Editing lines and planes

Editing lines in Draft mode

After drawing a line, you can move the creation points to change the dimension of the line.

To edit a line's creation points

1. Select the line with the Point Selection tool. The line's creation points appear.
2. Drag a creation point to a new location. As you drag, the drawing vector points from the original location.
3. After you move a creation point, the line remains selected. You can drag creation points to continue resizing the line.
4. Click an empty area of the drawing when you finish editing the line. The creation points are no longer visible.

Editing planes in Sculpt mode

Like most other objects in Sculpt mode, planes are 3D objects composed of a polygon. A plane doesn't have creation points. You can, however, use the Reshape command to display the handles of the polygons which comprise the plane. You can then drag the handles to reshape the plane. Because planes are 3D objects, you can edit them in any view.

To edit a plane

1. Select the plane with the Selection tool. The plane's handles appear.
2. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of the polygon are visible.

3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the plane remains selected. You can continue moving handles to reshape the plane.
5. Click an empty area of the drawing when you finish editing the plane. The handles are no longer visible.

Applying commands to lines and planes

You can perform operations on a line or plane by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and submenu are dependent on selecting additional objects, or establishing certain attributes to perform the operations properly.

For example, to apply the Align command to a selected line or plane, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands. The following commands in the Edit menu can be applied to selected lines or planes: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands. The following Object menu commands can be applied to selected lines or planes: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit lines or planes: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Applying attributes to lines and planes

Attributes are the graphical modifiers that are assigned to an object when it is created.

When a new line or plane is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new line or plane. You can then modify an existing object by changing its attributes anytime after its creation.

Draft mode . Lines can accept the following attributes: Pen color, Pen weight, Pen style and Arrowheads.

Sculpt mode . Planes can accept the following attributes: Pen color and Surface materials.

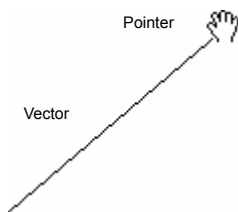
Pan Tool

Mode: Draft, Sculpt

The Pan tool lets you scroll a drawing in the drawing window the same way you would slide a drawing on a piece of paper across a desk.



When you scroll with the Pan tool, you change the view in the active document window. Using the Pan tool to change your view of a drawing is similar to using the scroll bars, but the Pan tool is more flexible.



The Pan tool appears in the View toolbar with the Zoom tool. This toolbar is at the top right of the toolbox in Draft and Sculpt modes.

To use the Pan tool

The Pan tool lets you move a drawing in the active document window to change the document area that's visible in the window.



1. Select the Pan tool in the toolbox. The pointer changes to a hand.
2. Drag in the drawing, the drawing vector defines the distance and direction that the view will change.

Polygon tools

Mode: Draft, Sculpt

DCAD VectorSpace provides two tools to draw regular polygons and columns. These tools are located together in the Polygon toolbar in the toolbox.



Polygon Vertex tool. Draws polygons from the center point of the polygon to the vertex of one of its sides.

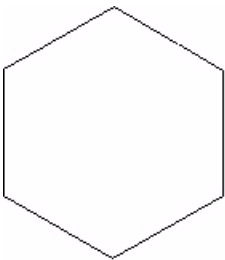
Polygon Midpoint tool. Draws polygons from the center point of the polygon to the midpoint of one of its sides.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**'s PTF language.

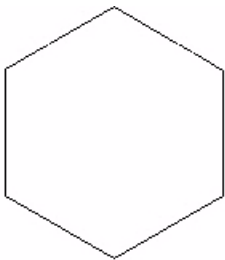
These tools have the data types listed below.

Polygon tools	
Polygon Vertex	"PolygonVertex"
Polygon Midpoint	"PolygonMidpoint"

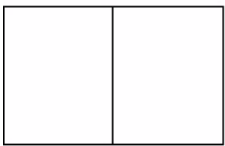
Polygons are closed objects bounded by three or more line segments. In Draft mode, **DCAD VectorSpace**'s polygon tools draw regular polygons, polygons with all sides of equal length. In Sculpt mode, the polygon tools draw columns which are 3D objects composed of chained polygons.



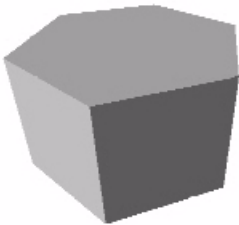
Draft mode, Top view



Sculpt mode, Top view



Sculpt mode, Front view



Render mode, Solid rendering

Figure 47.- Polygons drawn in Draft and Sculpt modes

Drawing polygons and columns

Polygons created in Draft mode, and columns created in Sculpt mode are drawn with the same tools and by following the same procedures. However, resulting objects are different.

Polygons, created in Draft mode, are two dimensional objects that can be seen in only the view they were created in.

Columns created in Sculpt mode look the same as two dimensional polygons from the view they were created in. However, they can also be seen from all other views because they have depth.

The polygon referred to in the following procedures is the actual polygon object when creating an object

in Draft mode, and the polygon shaped surface of the column when creating an object in Sculpt mode.

To use the Polygon Vertex tool

The Polygon Vertex tool lets you set the center point of the polygon and the vertex of one of its sides.



1. Select the Polygon Vertex tool from the Polygon toolbar.
 - If you need to change the current number of sides of the polygon, double-click the polygon icon to open the Polygon Vertex dialog box and enter the new number in the “# of sides” text box.
2. Click to set the center point of the polygon.
3. Move to the second point of the polygon. The drawing vector follows from the first point. The polygon expands and contracts depending on the direction that you move the pointer.
4. Click to set the second point on the vertex of the polygon’s side. The new polygon is selected.
5. Click an empty area of the drawing to deselect the polygon. The handles are no longer visible.

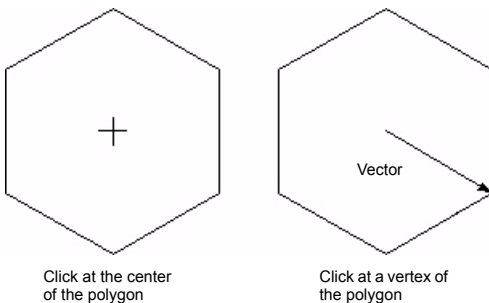


Figure 48.- Drawing with the Polygon Vertex tool

To use the Polygon Midpoint tool

The Polygon Midpoint tool lets you set the center point of the polygon and the midpoint of one of its sides.



1. Select the Polygon Midpoint tool from the Polygon toolbar.
 - If you need to change the current number of sides of the polygon, double-click the polygon icon to open the Polygon Midpoint dialog box and enter the new number in the “# of sides” text box.
2. Click to set the center point of the polygon.
3. Move to the second point of the polygon. The drawing vector follows from the first point. The polygon expands and contracts depending on the direction that you move the pointer.
4. Click to set the second point on the midpoint of the polygon’s side. The new polygon is selected.
5. Click an empty area of the drawing to deselect the polygon. The handles are no longer visible.

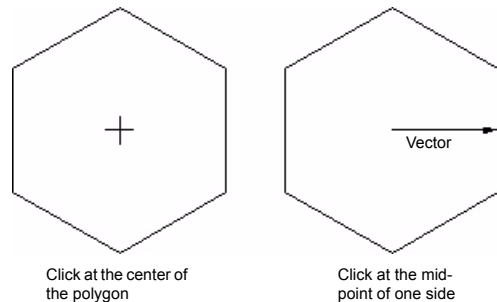


Figure 49.- Drawing with the Polygon Midpoint tool

Editing polygons and columns

Editing polygons in Draft mode

After drawing a polygon, you can move the creation points to change the object's shape. The location of the creation points depends on the tool used to create the polygon.

To edit a polygon by its creation points

1. Select the polygon with the Point Selection tool. The polygon's creation points appear.
2. Drag a creation point to a new location. As you drag, the drawing vector points from the original location.
3. After you move a creation point, the polygon remains selected. You can continue reshaping the object by moving its creation points.
4. Click an empty area of the drawing when you finish editing the polygon. The creation points are no longer visible.

Editing columns in Sculpt mode

Like most other objects in Sculpt mode, columns are 3D objects composed of chained polygons. A column's creation points do not exist in Sculpt mode. You can, however, use the Reshape command to display and drag the handles of the chained polygons to reshape the column.

A column can be edited in any view. Refer to the specific commands in the View menu for more information on changing views.

To edit a column

1. Select the column with the Selection tool. The column's handles appear.
2. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of each chained polygon are visible.
3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the column remains selected. You can continue moving handles to reshape the column.
5. Click an empty area of the drawing when you finish editing the column. The handles are no longer visible.

Applying commands to polygons and columns

You can perform operations on a polygon or a column by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and Edit menu require that you select additional objects, or establish certain attributes to perform the operations properly.

For example, to apply the Align command to a selected polygon or column, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected polygons or columns: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected polygons or columns: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit polygons or columns: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Unchaining polygons and columns

Unchain polygons. If you apply the Unchain command to a polygon, it becomes a series of separate polyline objects, each made of one straight line segment.

Unchain columns. If you apply the Unchain command to a column, it becomes a series of separate polygon objects.

The number of line segments in an unchained polygon or column is determined by a Preference setting in effect when you draw the object. The smaller the line segments comprising the object, the fewer the sides.

To set the preferred number of segments in polygons and columns

1. Choose Preferences in the Edit menu. The Preferences dialog box appears. If necessary, click the Tools tab to bring it to the front.
2. In the Preferences dialog box, change the “# Sides Poly” setting. A larger number results in more line segments in unchained polygons or columns.
 - Note that changing the “# of Sides Poly” preference changes the current number of sides setting also.

Applying attributes to polygons and columns

Attributes are the graphical modifiers that are assigned to an object when it is created.

When a new polygon or column is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new polygon or column. You can then modify an existing object by changing its attributes anytime after its creation.

Draft mode . Polygons can accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to a polygon.

Sculpt mode . Columns can accept the following attributes: Pen color and Surface materials.

Polyline tools

Mode: Draft, Sculpt

DCAD VectorSpace provides two tools to draw polylines and planes. These tools are located together in the Polyline toolbar in the toolbox.



Single Polyline tool. Draws a polyline or plane through the points set along a path.

Double Polyline tool. Draws a double polyline or plane through the points set along a path.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**'s PTF language.

These tools have the data types listed below.

Polyline tools	
Single Polyline	"Polyline"
Double Polyline	"OffsetPoly"

Single polylines are a connected series of line segments chained together to form one object. Double polylines are a connected series of parallel line segments chained together to form one object. In Draft mode, **DCAD VectorSpace**'s polyline tools draw single or double polylines. In Sculpt mode the polyline tools create 3D planes composed of chained polygons.

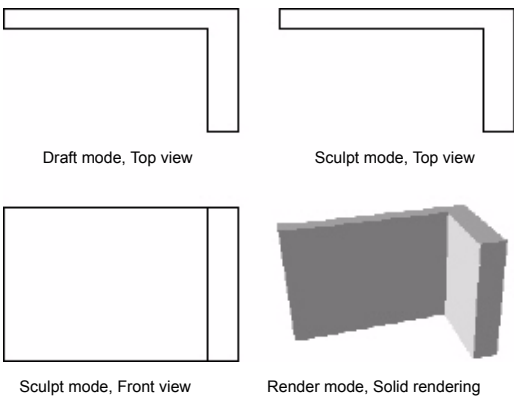


Figure 50.- Polyline drawings in Draft and Sculpt modes

Drawing polylines and planes

Polylines and double polylines created in Draft mode, and planes created in Sculpt mode are drawn with the same tools and by following the same procedures. However, resulting objects are different.

Polylines and double polylines, created in Draft mode, are two dimensional objects that can be seen in only the view they were created in.

Planes created in Sculpt mode look the same as two dimensional polylines from the view they were created in. However, they can also be seen from all other views because they have depth.

The polyline or double polyline referred to in the following procedures is the actual polyline object when creating an object in Draft mode, and the polyline path of the plane when creating an object in Sculpt mode.

To use the Single Polyline tool

The Single Polyline tool lets you specify points along a path to draw a single polyline.



1. Select the Polyline tool from the Polylines toolbar.
2. Click to set the first point of the polyline.
3. Move to the second point of the polyline. The drawing vector follows from the first point to the location of the second point.
4. Click to set the second point. The drawing vector follows from the second point to the location of the third point.
5. Click to set the third point. Continue to move the pointer and click to set each successive point on the polyline.
 - To draw constrained line segments, press the Shift key while dragging the drawing vector. The line will snap at 15 degree intervals.
6. Double-click to finish the line and set the endpoint, or press the Return key to finish the line with the last point set as an endpoint. The new polyline is selected.
7. Click an empty area of the drawing to deselect the polyline. The handles are no longer visible.

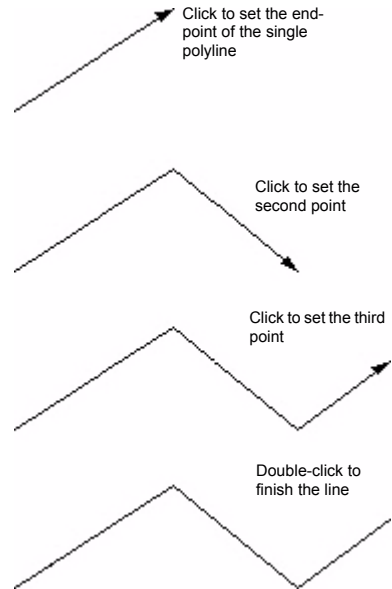


Figure 51.- Drawing with the Single Polyline tool

To use the Double Polyline tool

The Double Polyline tool lets you specify points along a path to draw a double polyline.



1. Select the Double Polyline tool from the Polylines toolbar.
 - If you need to change the current width and offset of the double polyline, double-click the double polyline icon to open the Double Polyline dialog box and enter the new numbers in the Width and Offset text boxes.
2. Click to set the first point of the double polyline.
3. Move to the second point of the double polyline. The drawing vector follows from the first point to the location of the second point.
4. Click to set the second point. The drawing vector follows from the second point to the location of the third point.

5. Click to set the third point. Continue to move the pointer and click to set each successive point on the double polyline.
 - To draw constrained line segments, press the Shift key while dragging the drawing vector. The line will snap at 15 degree intervals.
6. Double-click to finish the line and set the end-point, or press the Return key to finish the line with the last point set as an endpoint. The new double polyline is selected.
7. Click an empty area of the drawing to deselect the double polyline. The handles are no longer visible.

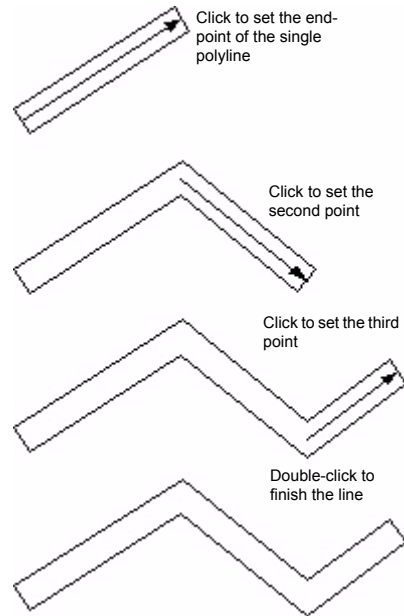


Figure 52.- Drawing with the Double Polyline tool

Editing polylines and planes

Editing in Draft mode

After drawing a polyline, you can move the creation points to change its shape.

To edit a polyline or double polyline

1. Activate a Draft mode window by clicking in it.
2. Select the polyline, or double polyline, with the Point Selection tool. The object's creation points appear.
3. Drag a creation point to a new location. As you drag, the drawing vector points from the original location.
4. After you move a creation point, the object remains selected. You can drag creation points to continue reshaping the polyline.
5. Click an empty area of the drawing when you finish editing the polyline or double polyline. The creation points are no longer visible.

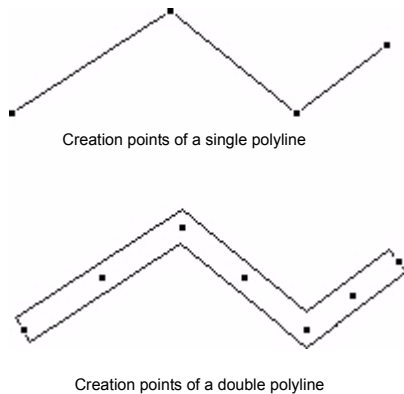


Figure 53.- Editing polylines

Editing planes in Sculpt mode

Like most other objects in Sculpt mode, planes are 3D objects composed of chained polygons. A plane's creation points do not exist in Sculpt mode. You can, however, use the Reshape command to display and drag the handles of the chained polygons to reshape the plane.

A plane can be edited in any view. Refer to the specific commands in the View menu for more information on changing views.

To edit a plane

1. Activate a Sculpt mode window by clicking in it.
2. Select the plane with the Selection tool. The plane's handles appear.
3. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of each chained polygon are visible.
4. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.

5. After you move a handle, the plane remains selected. You can continue moving handles to reshape the plane.
6. Click an empty area of the drawing when you finish editing the plane. The handles are no longer visible.

Applying commands to single polylines, double polylines and planes

You can perform operations on a polyline, a double polyline, or a plane by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and Edit menu require you to select additional objects, or establish certain attributes to perform the operations properly.

For example, to apply the Align command to a selected single or double polyline or plane, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected single or double polylines, or planes: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected single or double polylines, or planes: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit single or double polylines, or planes: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Unchaining single polylines, double polylines, and planes

If you apply the Unchain command to a polyline, it becomes a series of separate polyline objects, each made of one straight line segment.

If you apply the Unchain command to a plane, it becomes a series of separate polygon objects.

The number of line segments in an unchained polyline or plane is determined by the number of points set when you draw the object.

Applying attributes to single polylines, double polylines and planes

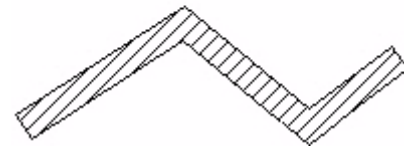
Attributes are the graphical modifiers that are assigned to an object when it is created.

When a new polyline or plane is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new polyline or plane. You can then modify an existing object by changing its attributes anytime after its creation.



Single polyline; Black Pen color, Black Fill color, Fill pattern



Double polyline; Black Pen color, Black Fill color, Fill pattern

Draft mode . Single and double polylines can accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to a polyline.

Sculpt mode . Planes can accept the following attributes: Pen color and Surface materials.

Rectangle tools

Mode: Draft, Sculpt

DCAD VectorSpace

provides five tools to draw rectangles and cubes. These tools are located in the Rectangle toolbar in the toolbox.



Rectangle Diagonal tool. Draws a rectangle by setting two points as the opposite corners of the rectangle.

Rounded Rectangle Diagonal tool. Draws a rectangle with rounded corners by setting two points as the opposite corners of an invisible bounding box.

Rectangle Center to Corner tool. Draws a rectangle by setting the first point as the center point of the rectangle and the second point as one of its corners.

Rounded Rectangle Center to Corner tool. Draws a rectangle with round corners by setting the first point as the center point of the rectangle, and the second point as a corner of an invisible bounding box.

Rectangle 3 Points tool . Draws a rectangle by setting three points as the three corners of the rectangle.

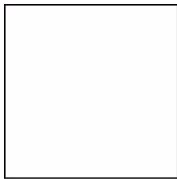
DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**’s PTF language.

These tools have the data types listed below.

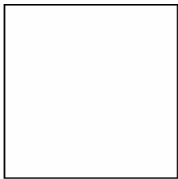
Rectangle tools	
Rectangle Diagonal	"DiagonalRect"
Rounded Rectangle Diagonal	"DiagonalRoundRect"
Rectangle Center to Corner	"CenterRect"
Rounded Rectangle Center to Corner	"CenterRoundRect"

Rectangle tools	
Rectangle 3 Points	"FreeRect"

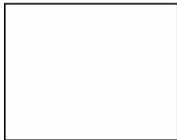
Rectangles are parallelograms with right angles. Rounded rectangles are parallelograms with right angles and radius corners. In Draft mode, **DCAD VectorSpace**’s rectangle tools draw rectangles and rounded rectangles. In Sculpt mode, the rectangle tools create cube shaped 3D objects composed of chained polygons.



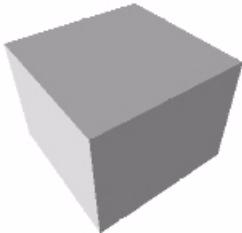
Draft mode, Top view



Sculpt mode, Top view



Sculpt mode, Front view



Render mode, Solid rendering

Figure 54.- Rectangles drawn in Draft and Sculpt modes

Drawing rectangles and cubes

Rectangles and rounded rectangles created in Draft mode, and cubes created in Sculpt mode are drawn with the same tools and by following the same procedures. However, the resulting objects are not the same.

Rectangles created in Draft mode are two-dimensional objects that can be seen in only the view they were created in.

Cubes created in Sculpt mode look the same as two dimensional rectangles from the view they were created in. However, they can also be seen from all other views because they have depth.

The rectangle or rounded rectangle referred to in the following procedures is the actual rectangle object in Draft mode, and the rectangular surface of the cube in Sculpt mode.

To use the Rectangle Diagonal tool

The Rectangle Diagonal tool lets you set two points as the opposite corners of the rectangle.



1. Select the Rectangle Diagonal tool in the Rectangle toolbar.
2. Click to set the first corner of the rectangle.
3. Move to the opposite corner of the rectangle. The drawing vector follows from the first point, indicating the diagonal of the rectangle.
 - To constrain the rectangle to a square, press Shift and move the pointer from the first point at a 45-degree angle.
4. Click to set the opposite corner of the rectangle. The new rectangle is selected.
5. Click an empty area of the drawing to deselect the rectangle. The handles are no longer visible.

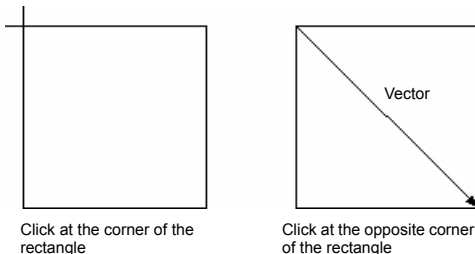


Figure 55.- Drawing with the Rectangle Diagonal tool

To use the Rounded Rectangle Diagonal tool

The Rounded Rectangle Diagonal tool lets you set two points as the opposite corners of an invisible bounding box.



1. Select the Rounded Rectangle Diagonal tool in the Rectangle toolbar.
 - To change the current radius of the rounded rectangle's corners, double-click the icon to open a dialog box and enter a new value in the Radius text box.
2. Click to set one corner of the object's invisible bounding box.
3. Move to the opposite corner of the bounding box. The drawing vector follows from the first point, indicating the diagonal of the bounding box.
 - To constrain the rounded rectangle to a square, press Shift and move the pointer from the first point at a 45-degree angle.
4. Click to set the opposite corner of the bounding box. The new rounded rectangle is selected.
5. Click an empty area of the drawing to deselect the rounded rectangle. The handles are no longer visible.

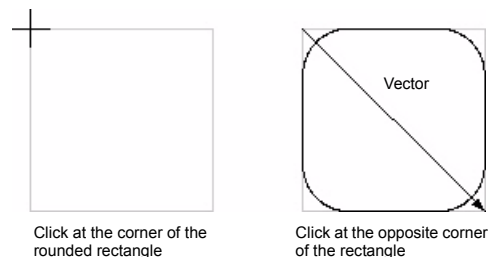


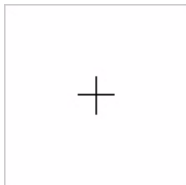
Figure 56.- Drawing with the Rounded Rectangle Diagonal tool

To use the Rectangle Center to Corner tool

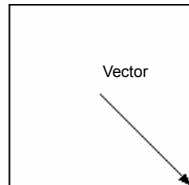
The Rectangle Center to Corner tool lets you set the center point of the rectangle and one of its corners.



1. Select the Rectangle Center to Corner tool in the Rectangle toolbar.
2. Click to set the center point of the rectangle.
3. Move to a corner of the rectangle. The drawing vector follows from the first point, indicating the diagonal of the rectangle.
 - To constrain the rectangle to a square, press Shift and move the pointer from the first point at a 45-degree angle.
4. Click to set the corner of the rectangle. The new rectangle is selected.
5. Click an empty area of the drawing to deselect the rectangle. The handles are no longer visible.



Click at the center of the rectangle



Click at the corner of the rectangle

Figure 57.- Drawing with the Rectangle Center to Corner tool

To use the Rounded Rectangle Center to Corner tool

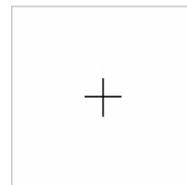
The Rounded Rectangle Center to Corner tool lets you set the center point of the rectangle and a corner of an invisible bounding box.



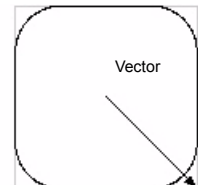
1. Select the Rounded Rectangle Center to Corner tool in the Rectangle toolbar.

- To change the current radius of the rounded rectangle's corners, double-click the icon to open a dialog box and enter a new value in the Radius text box.

2. Click to set the center point of the rounded rectangle.
3. Point to a corner of the bounding box. The drawing vector follows from the first point, indicating the diagonal of the bounding box.
 - To constrain the rounded rectangle to a square, press Shift and move the pointer from the first point at a 45-degree angle.
4. Click to set the corner of the bounding box. The new rounded rectangle is selected.
5. Click an empty area of the drawing to deselect the rounded rectangle. The handles are no longer visible.



Click at the center of the invisible bounding box



Click at the corner of the invisible bounding box

Figure 58.- Drawing with the Rounded Rectangle Center to Corner tool

To use the Rectangle 3 Points tool

The Rectangle 3 Points tool lets you set three points as the three corners of a rectangle, so you can draw rotated rectangles.



1. Select the Rectangle 3 Points tool from the Rectangle toolbar.
2. Click to set the first corner of the rectangle.

3. Move to a corner of the rectangle. The drawing vector follows from the first point, indicating the angle of the rectangle and the placement of the second corner.
4. Click to set the second point. The drawing vector follows, perpendicular from the second point, indicating the direction of the placement of the third point.
5. Click to set the third point as the third corner of the rectangle. The new rectangle is selected.
6. Click an empty area of the drawing to deselect the rectangle. The handles are no longer visible.

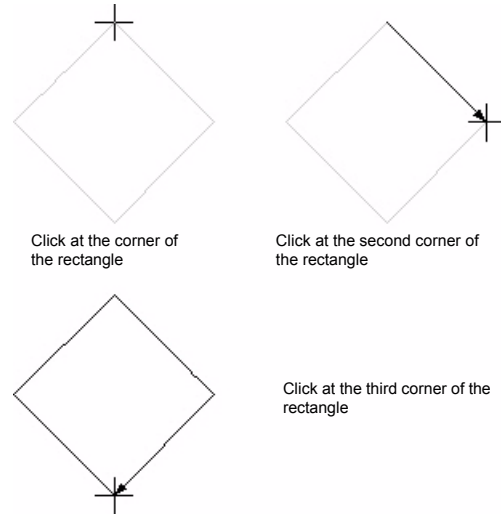


Figure 59.- Drawing with the Rectangle 3 Points tool

Editing rectangles and cubes

Editing in Draft mode

After drawing a rectangle or rounded rectangle, you can move the creation points to change its shape. The location of the creation points depends on the tool used to create the rectangle.

To edit a rectangle or rounded rectangle

1. Select the rectangle, or rounded rectangle, with the Point Selection tool. The object's creation points appear.
2. Drag a creation point to a new location. As you drag, the drawing vector points from the original location.
3. After you move a creation point, the object remains selected. You can drag creation points to continue reshaping the rectangle.

4. Click an empty area of the drawing when you finish editing the rectangle or rounded rectangle. The creation points are no longer visible.

Editing cubes in Sculpt mode

Like most other objects in Sculpt mode, cubes are 3D objects composed of chained polygons. A cube's creation points do not exist in Sculpt mode. You can, however, use the Reshape command to display and drag the handles of the chained polygons to reshape the cube.

A cube can be edited in any view. Refer to the specific commands in the View menu for more information on changing views.

To edit a cube

1. Select the cube with the Selection tool. The cube's handles appear.
2. Choose the Reshape command in the Edit menu or click the Reshape button. The handles of each chained polygon are visible.
3. Drag a handle to a new location. As you drag, the drawing vector follows from the handle's original location.
4. After you move a handle, the cube remains selected. You can continue moving handles to reshape the cube.
5. Click an empty area of the drawing when you finish editing the cube. The handles are no longer visible.

Applying commands to rectangles, rounded rectangles, and cubes

You can perform operations on a rectangle, a rounded rectangle, or a cube by selecting it and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and Edit menu require you to select additional objects, or establish certain attributes to perform the operations properly.

For example, to apply the Align command to a selected rectangle or cube, at least one other object must be selected.

Refer to a specific command for more information on how to use it to revise an object.

Edit menu commands

The following commands in the Edit menu can be applied to selected rectangles, rounded rectangle, or cubes: Cut, Copy, Clear, Select, Reshape, Duplicate, Create Publisher.

Object menu commands

The following Object menu commands can be applied to selected rectangles, rounded rectangles, and cubes: Align, Scale, Chain, Unchain, Group and Ungroup.

The commands found in the following submenus in the Object menu can be used to edit rectangles, rounded rectangles, or cubes: Arrange, Copy to Layer, Send to Layer, Combine, Extrude (Draft mode only), Position, Path, and Trim.

Unchaining rectangles, rounded rectangles, and cubes

Unchain rectangles. If you apply the Unchain command to a rectangle, it becomes four separate polyline objects; each one a straight line segment.

Unchain rounded rectangles. If you apply the unchain command to a rounded rectangle, it becomes a series of separate polyline objects, each made up of one straight line segment. The number of line segments of an unchained rounded rectangle is determined by the radius preference setting in effect when you draw the object.

Unchain cubes. If you apply the Unchain command to a cube, it becomes six separate polygon objects.

To set the preferred number of segments in rounded rectangles

1. Choose Preferences in the Edit menu.
2. In the Preferences dialog box, change the Round Radius. A larger number results in more line segments in unchained rounded rectangles.
 - Note that changing the Round Radius preference changes the current Round Radius setting also.

Applying attributes to rectangles and cubes

When a new rectangle or cube is created, it is assigned the current attributes.

You can use the current attributes or select new attributes to be the current attributes before you create a new rectangle or cube. You can then modify an existing object by changing its attributes anytime after its creation.

Draft mode . Rectangles can accept the following attributes: Pen color, Pen weight, Pen style; Arrowheads; Fill color, Fill pattern, and Fill hatch.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to a rectangle.

Sculpt mode . Cubes can accept the following attributes: Pen color and Surface materials.

Selection tools

Mode: Draft, Sculpt

DCAD VectorSpace provides two tools to select objects. These tools are located in the Selection toolbar in the toolbox.



Selection tool. Selects objects and distinguishes them from other, unselected objects.

The Point Selection tool . Selects specific creation points and puts an object in Reshape mode.

In Sculpt mode, the Point Selection tool places objects in Reshape mode and highlights the creation points of the polygons which comprise the objects. In Draft mode, the Point Selection tool selects an object's creation points. These actions place the object in Reshape mode

See **Reshape**, page 109 for more information on Reshape mode.

In Draft and Sculpt modes, the Selection tool selects an object and highlights handles at each corner of its bounding box. These handles indicate the object can be resized, moved, or modified by various commands.

In Draft and Sculpt mode, an object can be selected only if it is on an active layer. Objects that are visible but not active can't be selected. Refer to **Activating and Selecting Layers**, page 105 for more information on working with layers.

To use the Selection tool

The Selection tool lets you select one or more objects and distinguish them from other, unselected objects.



To select one object:

1. Select the Selection tool.
2. Click any point of the object. Or, drag a selection box around the entire object.

3. Handles appear on the object, or surrounding the object, to indicate the object is selected.

To select more than one object:

1. Select the Selection tool.
2. Click any point of each object you want to select while pressing the Shift key. Or, drag a selection box around the objects you want to select. The selection box must completely enclose all of the objects. Handles appear on each object, or surrounding each object, to show that it is selected.

Note: You can also use the [Select All](#) command in the Edit menu to select all objects on the active layer.



[Refer to the Selection command for more information on selecting objects using the Selection palette in the Edit menu.](#)

To deselect an object

1. Select the Selection tool.
2. Click an empty portion of the drawing window. The handles disappear from all selected objects.

To deselect one object among several

1. Select the Selection tool.
2. Hold down the Shift key and click objects that are selected. The handles on the objects disappear, while the handles on the remaining selected objects are still visible.

To move an object

1. Select the Selection tool.

2. Drag the object to its new location. As you move the pointer, the drawing vector follows from the original location to the new location.

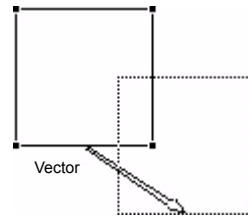


Figure 60.- Moving an object with the Selection tool

To resize an object with the Selection tool

1. Select the Selection tool.
2. Click an object to select it. The handles appear.
3. Point to a handle and drag it to the desired location. As you move the pointer, the drawing vector follows from the original set point, to the new location of the point.
 - You can press the Shift key while holding the mouse button and dragging at a 45 degree angle to constrain an object to its original proportions.
4. Release the mouse button. The object appears and is selected.

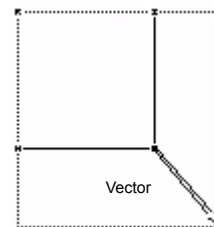
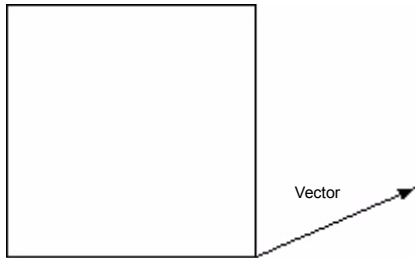


Figure 61.- Resizing an object with the Selection tool

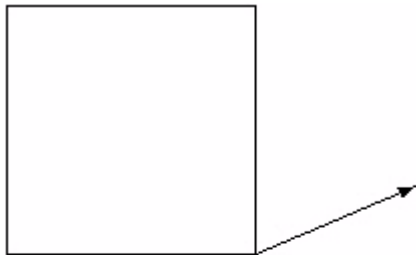


Reshaping a rectangle, created with the Rectangle Diagonal tool in Draft mode, with the Point Selection tool

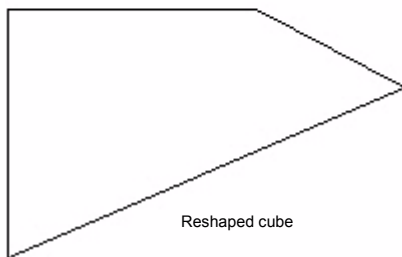


Reshaped rectangle

Figure 62.- Reshaping in Draft mode



Reshaping a cube, created with the Rectangle Diagonal tool in Sculpt mode, using the Point Selection tool



Reshaped cube

Figure 63.- Reshaping in Sculpt mode

To use the Point Selection tool

The Point Selection tool lets you select some or all of the creation points of an object in Draft mode.



It lets you select some or all of the vertices of an object in Sculpt mode.

1. Select the Point Selection tool.
2. Drag a selection box around the object. The selection box doesn't need to completely enclose the object, but must enclose the points you want to edit.
 - In Draft mode, handles appear at the creation points you select.
 - In Sculpt mode, handles appear at the vertices you select.
3. Point to a handle and drag it to a new location. As you move the pointer, the drawing vector follows from the original location of the point to the new location of the point.
4. Release the mouse button. The object appears and is selected.

Text Tools

Mode: Draft

Creating text objects

DCAD VectorSpace provides two tools to place text in a document in Draft mode. These tools are located in the Text toolbar in the toolbox.



Text tool. Places text as a single horizontal line or as a multi-line block of text with margins that you can define.

Text Rotated tool. Places a single line of text with its baseline set at any angle.

DCAD VectorSpace uses a data type abbreviation for the name it assigns to objects created by a tool. Data type abbreviations also appear in **DCAD VectorSpace**'s PTF language.

These tools have the data types listed below.

Text Tools	
Text	"Text"
Text Rotated	"VectorText"

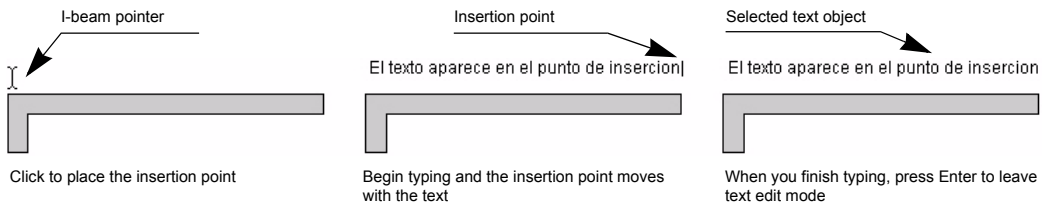


Figure 64.- Typing a line of text with the Text tool

Text objects can be created and edited in Draft mode. You can view and edit text in Sculpt mode only if the command View 3D & 2D Objects is active. You can choose this command in the View Options submenu or the View Options pop-up menu on the Status bar.

To place a line of text in Draft mode

The Text tool lets you click and type to place a single line of text in Draft mode.



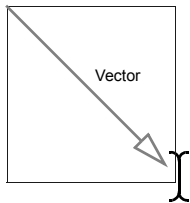
1. Select the Text tool from the Text toolbar. The pointer becomes an I-beam.
2. Click in the Draft window to set the location of the starting point of a line of text. An insertion point appears where you click.
3. Type to enter a line of text in the document. When you finish typing, press the Enter key. The text appears with the current attributes and the text object is selected.

To create a block of text

The Text tool lets you place a block of text in a document in Draft mode.



1. Select the Text tool from the Text toolbar. The pointer becomes an I-beam.
2. Drag to create a rectangular text box in the document. An insertion point appears at the upper-left corner of the invisible text box.
3. Begin typing the text. When you reach the right side of the text box, the text will wrap around between the box's sides. If the text exceeds the depth of the text box, the box expands from the bottom.
4. When you finish typing, press Enter. The text appears with the current attributes and the text object is selected.



Drag to create a box to contain a text block

Enter text in this invisible bounding box with the Text tool.

Text you type fits inside the box sides

Figure 65.- Creating a text box with the Text tool

To use the Text Rotated tool


The Text Rotated tool lets you set an insertion point and an angle for a single line of text.



1. Select the Text Rotated tool from the Text toolbar. The pointer becomes an I-beam.
2. Click to set the starting point of the line of text, and then move the pointer to define the angle of

the text baseline. The drawing vector follows the pointer and indicates the baseline angle (the length of the vector is not significant). Click again to set the text baseline angle.

3. An insertion point appears where you clicked. Type the text, which appears from the insertion point on a horizontal baseline.
4. When you finish typing, press the Enter key to leave text entry mode. The text baseline rotates to the specified angle, and the text object is selected.

Note: If you type more characters than **DCAD VectorSpace** can accommodate, or while editing text, insert more characters than can be accommodated in the angled text object, **DCAD VectorSpace** beeps and displays a message telling you that no more text characters can be inserted. If this message appears, click OK to continue. 

Adjusting text objects

The handles that surround a selected block of text can be dragged to change the shape and dimension of the box. Changing the text box does not change the size of the type, which is based on the font and type size assigned to it.

To resize a text box

1. Select the text object. Handles appear at the corners of the object when it is selected.
2. Drag a handle to create the desired box shape. The drawing vector follows the pointer as you drag the handle. When you release the mouse button, the revised text box remains selected. You can continue resizing the text box by dragging a handle.
3. When you finish resizing the object, click an empty area (or select another object) to deselect the text object

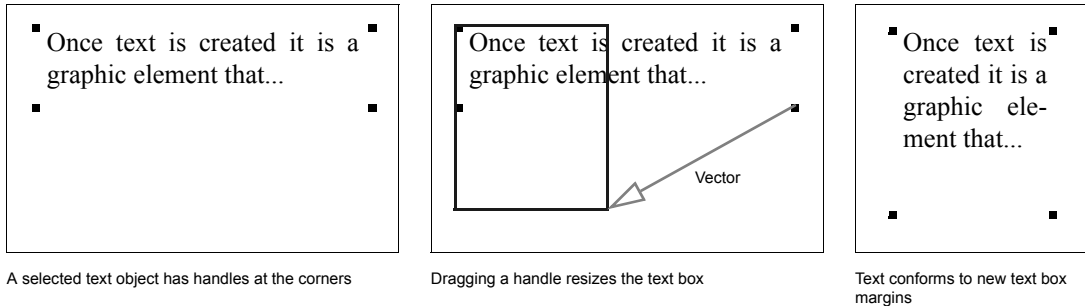


Figure 66.- Resizing a text object

Editing text

After placing a text object in a drawing, you can edit the object and the text it contains using the Text tools, the text attributes controls, and various commands.

The following sections explain how to work in text edit mode, how to insert, delete and replace text characters, how to change the attributes of text objects and individual characters, and how to select, copy, delete, paste, and modify entire text objects.

Selecting a text object

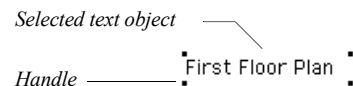
When you want to apply a command, or a text attribute, to an entire text object, you first select the text object.

For example, if you want to change the font of the text in a label, apply a background color, and rotate the text 90 degrees, you need to select the text object first.

You can select a text object using the same methods that you use to select other objects in **DCAD VectorSpace**:

- Use the Selection tool to click the text object or to drag a selection box around the text object.
- Use the Select All command to select all objects in a document.
- Use the Select Palette. Choose Select in the Edit menu to do this.

When a text object is selected, handles appear at the corners of the object's bounding box.



To deselect a text object, use the same methods you use to deselect other objects:

- Click in an empty area of the drawing
- Select another object

Applying commands to text objects

You can perform operations on text objects by selecting them and applying commands in the Edit and Object menus.

Many of the commands that you can use in the Object menu and Edit menu are dependent on selecting additional objects. For example, to apply the Align command to a text object, at least one other object must be selected.

Refer to a specific command for more information on how to apply it to an object.

Edit menu commands. The following commands in the Edit menu can be applied to selected text objects: Cut, Copy, Clear, Reshape, Duplicate, Create Publisher.

Object menu commands. The following commands in the Object menu can be applied to selected text objects: Align, Scale, Group, Ungroup.

Commands in the following submenus in the Object menu can be applied to selected text: Arrange, Copy to Layer, Send to Layer, Combine, Position.

Note: You can copy text into the Material Editor in the Fill palette to use bit mapped text as a Surface material in Render mode.



Working in text edit mode

To alter the text contained in a text object, you work in text edit mode. When you place a text object in edit mode, you can do the following:

- Select text characters so you can cut or copy them to the Clipboard.
- Edit the text by inserting, deleting, and replacing text characters.
- Change the color, font, type size, and type style of characters selected in the text.

To place a text object in edit mode

Double-click the object with the Selection tool, or click the text with the Text tool.

When you place a text object in edit mode, either an insertion point appears or a previous text selection is restored:

- In a text object in which no text was selected the last time it was in edit mode, the insertion point (a vertical bar) appears in the text to indicate the point where characters can be inserted or deleted. The insertion point appears at the end of

the text, or at the previous insertion point location.

- In a text object that had a text selection active the last time it was in edit mode, the same text selection appears highlighted.

The tool that you use to place a text object in edit mode remains active. The tool you use also affects the action of the pointer:

- If you double-clicked the object with the Selection tool, the pointer displays an I-beam when it is in the text object, and is a selection arrow when it is outside the object. If you click in the text, the insertion point appears where you click; if you click outside the object, you leave edit mode and deselect the text object.
- If you clicked the object with the Text tool, the pointer is an I-beam wherever you move it in the document. If you click in the text, the insertion point appears where you click; if you click outside the text object, you create a new text object where you click, and the previous text object leaves edit mode and is deselected.

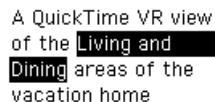
Editing rotated text

When you place a rotated text object in edit mode, the text baseline becomes horizontal for editing. When you exit edit mode, the text object rotates to its previous angle.

Selecting text characters

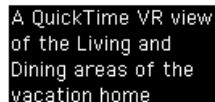
When a text object is in edit mode (see **Working in text edit mode**, page 72), you can make a selection of characters within the text.

When you select text, you can apply text attributes and commands to the text selection, rather than the entire object. A text selection appears highlighted.

A screenshot of a text object in edit mode. The text reads "A QuickTime VR view of the Living and Dining areas of the vacation home". The words "Living and Dining" are highlighted with a black background and white text. The text is rotated approximately 45 degrees clockwise.

A QuickTime VR view
of the Living and
Dining areas of the
vacation home

Selected characters are highlighted in a text object

A screenshot of a text object in edit mode. The text reads "A QuickTime VR view of the Living and Dining areas of the vacation home". The entire text is highlighted with a black background and white text. The text is rotated approximately 45 degrees clockwise.

A QuickTime VR view
of the Living and
Dining areas of the
vacation home

Entire text object is highlighted when all characters are selected

Figure 67.- Text selections

To select characters in a text object

1. Place a text object in edit mode (see **Working in text edit mode**, page 72).
2. Use the I-beam pointer to drag over the characters you want to select, or do one of the following:
 - Click before the first character (or space) you want to select, then press Shift and click after the last character of the text selection.
 - Press Shift and use the keyboard arrow keys to extend a selection one character left or

right, or one line up or down, from the insertion point.

- Press Shift and Option and use the Left and Right arrow keys to extend a selection one word left or right from the insertion point.
- Double-click a word to select it.
- Use Select All (Command+A) to select all the text characters in the object.

Deselecting a text selection

When text is highlighted in a text object, you can click the I-beam pointer anywhere in the text to deselect the selected text. Or, you can press Enter to leave text edit mode. If you click outside of the text object, you also deselect the text object.

Inserting and deleting text

When a text object is in text edit mode, you can insert and delete characters, and replace existing text. You can also apply the Cut, Copy, Clear, and Paste commands to a text selection.

To insert text

1. Place the object in text edit mode (see **Working in text edit mode**, page 72).
2. Click the I-beam pointer where you want to add text. An insertion point appears. Begin typing and the new text appears at the insertion point.
3. Press the Enter key when you finish editing to leave text edit mode.

To delete text in a text object

You can use this procedure to delete a selection within a text object, or to replace a selection with new text that you type or paste from the Clipboard.

1. Place the object in text edit mode (see **Working in text edit mode**, page 72).
2. Do one of the following to delete text characters:
 - Place the insertion point to the right of the text you want to delete, and press the Delete key to erase characters to the left one at a time.

- Make a text selection, and then press the Delete key, or choose Cut (Command+X) or Clear in the Edit menu to erase the selection. See **Selecting text characters**, page 73 for selection procedures.
- Begin typing to replace the text selection with the text that you type.

3. When you finish editing, press the Enter key to leave text edit mode.

Applying attributes to text

Text in **DCAD VectorSpace** uses the following attributes: Text color, font, type size, style, alignment, Fill color, Fill pattern, and Fill hatch.

When you create a text object, **DCAD VectorSpace** assigns the current text attributes to the text characters.

You can use the current attributes or change them before you type text. You can modify existing text by changing the attributes of an entire text object or of a selection within the text.

Applying attributes to text objects

When you select a text object, you can change the attributes of all the text within the object at once by selecting the attribute you want to apply from the Text controls on the Attributes bar, or from the floating Fill palette.

You can apply a Fill color, a combination of a Fill color and a Fill pattern, or a combination of a Fill color and a Fill hatch to the text box background. However, the palette must be floating before you select a text object, because the Fill controls do not appear on the Attributes bar when a text object is selected or in edit mode.

Applying attributes to text selections

You can change some text attributes of individual characters within a text object by selecting the text you want to change and using the text controls on the Attributes bar.

You can change the text color, font (typeface), type size, and style of selected text.

If you change the alignment setting when text is selected, the new alignment applies to the entire text object.

You cannot apply fill attributes (color, hatch, and pattern) to a text selection, only to selected text objects.

To change the attributes of a text selection

1. Place the text object in text edit mode (see **Working in text edit mode**, page 72).
2. Select the text you want to modify. See **Selecting text characters**, page 73 for selection procedures.

Note: Select an attribute using the text controls on the Attributes bar. You can change the color, font, type size, and type style of the



selection using the text color palette and the pop-up menus.

3. Press the Enter key to leave edit mode when you finish editing the text's attributes.

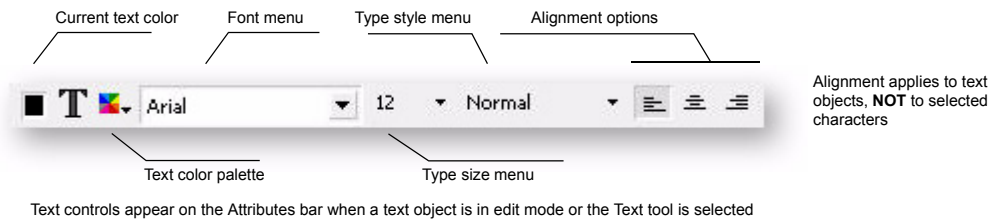


Figure 68.- Text Attribute Controls

Zoom tool

Mode: Draft, Sculpt

DCAD VectorSpace's Zoom tool lets you change the view magnification in a drawing. This tool is located in the tool-box.



You can use the Zoom tool to select an area of the drawing to enlarge or reduce the view.

Note: Changing magnification changes only the appearance of objects on screen, not the actual size of the objects in the drawing.



The Zoom tool is available in Draft and Sculpt modes.

To use the Zoom tool to magnify a view

The Zoom tool lets you change the view magnification of a drawing.



1. Select the Zoom tool from the tool-box.
2. Drag a selection box around the area you want to magnify. The view of the objects within the selection box is magnified.

To use the Zoom tool to reduce a view

1. Select the Zoom tool from the tool-box.
2. Press the Shift key while dragging a selection box around the area you want to reduce. The view of the objects within the selection box is reduced.



The Zoom bar

The Zoom bar in the lower-left corner of the screen displays the current magnification, and other magnification options. You can use the Zoom bar to step to the next preset magnification levels or to set a specific magnification level. Refer to **The Zoom bar**, page 75 for more information on how to use it.

Note: The zoom level should not be confused with the scale of a document. Though they both affect the way a drawing appears on screen, the zoom level doesn't affect the scale of the document.



Render tools

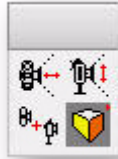


In this chapter:

- Horizontal Focal Point tool
- Vertical Focal Point tool
- Dual Focal Point tool
- Perspective Render tool
- Isometric Render tool

Render tools

When you work in Render mode, you can use the Render mode tools to set focal points and angles. You can also view perspective or isometric renderings using tools that appear in Render mode.



When you open a Render mode window for the first time in a new document, the window displays a perspective Wireframe rendering of 3D objects. The focal point and its cone of vision are centered horizontally and vertically to all of the 3D objects in the document. The Render mode window displays the objects that fall inside the cone of vision.

If all the objects are not within the cone of vision, you might not see any objects when you first open

the Render mode window. You can use the focal point tools to adjust the placement and angle of the focal point and its cone of vision so that the Render mode window displays the objects that you want to see.

Horizontal Focal Point tool . Sets the viewer's position horizontally, and the view direction.

Vertical Focal Point tool . Sets the viewer's position vertically, and the view angle.

Dual Focal Point tool . Sets the viewer's position and view angle horizontally and vertically.

Isometric Render tool . Sets the Render window to display isometric renderings.

Perspective Render tool . Sets the Render window to display perspective renderings.

Horizontal Focal Point tool

The Horizontal Focal Point tool establishes the distance from the viewer to the rendering, and also sets the horizontal direction of the sight line as it relates to objects.



To use the Horizontal Focal Point tool

The Horizontal Focal Point tool lets you set a point to represent the distance from the viewer to objects, and a point to represent the horizontal direction of the sight line in respect to objects.

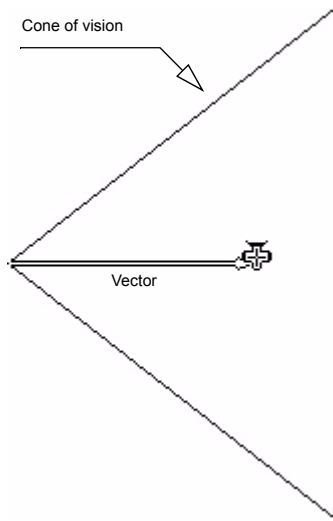


1. Select the Horizontal Focal Point tool. The Render mode window changes to Sculpt mode and the view changes to Top.

- The location of the viewer is indicated by a circle with an X. A **red** line indicates the horizontal direction of the sight line.



2. Move the pointer to set the new location of the viewer. Click to set the point.
3. Move the pointer to set the horizontal direction of the viewer's sight line. The sight line is represented by the a vector extending from the set point. A cone of vision also extends from the set point. Objects within the cone will appear in the rendering.



4. Click to set the horizontal direction of the sight line. The window changes to Render mode and displays a Wireframe rendering.

Vertical Focal Point tool

DCAD VectorSpace provides a tool to set the vertical focal point of a perspective. This tool is located in the toolbox.



The Vertical Focal Point tool . Establishes the height of the viewer and vertical angle of the sight line as it relates to objects.

To use the Vertical Focal Point tool

The Vertical Focal Point tool lets you set a point to represent the height of the viewer, and the vertical angle of the sight line in.



1. Select the Vertical Focal Point tool in the toolbox.
 - Notice in the Title bar that the window changes to Sculpt mode and the view changes to Front view.

- The current location of the viewer is shown by a circle with an X. A **red** line indicates the direction of the sight line.



2. Move the pointer to set the new height of the viewer. Click to set the point.
3. Move the pointer to set the vertical angle of the viewer's sight line.
 - The viewer's sight line is represented by the drawing vector as it extends and revolves at a 180 degree angle from the set point. A cone of vision also extends from the set point. All objects that fall between the two lines of the cone of vision will be displayed in the selected view.
4. Click to set the vertical angle of the sight line. The window changes back to the original Ren-

der mode window, and displays the objects as a Wireframe rendering.

Dual Focal Point tool

The Dual Focal Point tool establishes the distance and height of the viewer as well as the horizontal direction and vertical angle of the sight line as it relates to objects in a rendering.



To use the Dual Focal Point tool

The Dual Focal point tool lets you set the horizontal and vertical focal points of a perspective. It lets you set a point to represent the distance from the viewer to objects, and a point to represent the horizontal direction of the sight line in respect to objects.



This tool also lets you set a point to represent the height of the viewer, and the vertical angle of the sight line in respect to objects.

1. Select the Dual Focal Point tool in the Toolbox.
 - Notice in the Title bar that the Render mode window changes to Sculpt mode and the view changes to Top view.
 - The location of the viewer is indicated by a circle with an X. The **red** line indicates the horizontal direction of the sight line.



2. Move the pointer to the new location of the viewer and click to set the point.
 - The sight line is represented by the drawing vector as it extends and revolves around the set point. A cone of vision also extends from the set point. All objects that fall between the two lines of the cone of vision will be displayed in the selected view.
3. Click to set the horizontal direction of the sight line.
 - The window changes to Sculpt mode and the view changes to Front.
 - The location of the viewer is indicated by a circle with an X. The **red** line indicates the direction of the sight line.



4. Move the pointer to the new height of the viewer and click to set the point.
 - The sight line is represented by the drawing vector as it extends and revolves at a 180 degree angle from the set point. A cone of vision also extends from the set point. All objects within the cone of vision will be displayed in the selected view.
5. Click to set the vertical angle of the sight line. The window changes back to Render mode, and displays a Wireframe rendering.

Perspective Render tool

The Perspective Render tool lets you view renderings as perspectives.



The Perspective Render tool creates a perspective view of objects. This view is the representation of three dimensional objects and depth relationships in a two dimensional environment.

A perspective has vanishing points on the horizon where all parallel lines drawn in perspective converge or terminate.

To use the Perspective render tool

1. Activate a Render mode window.
2. Select the Perspective Render tool in the toolbox. The isometric Wireframe rendering changes to a perspective Wireframe rendering.

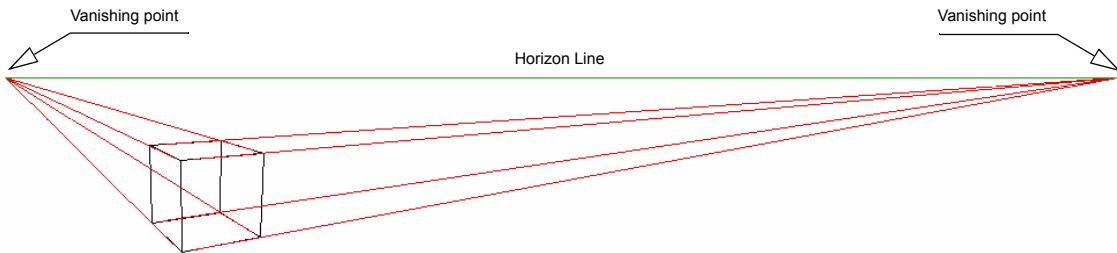


Figure 69.- Perspective view of a cube

Isometric Render tool

The Isometric Render tool lets you view renderings as isometrics.



The Isometric render tool creates parallel drawings. These drawings are projected representations of objects that give the objects a three dimensional quality.

These drawings differ from perspective drawings in that the projection lines remain parallel instead of converging to a point on the horizon.

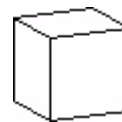


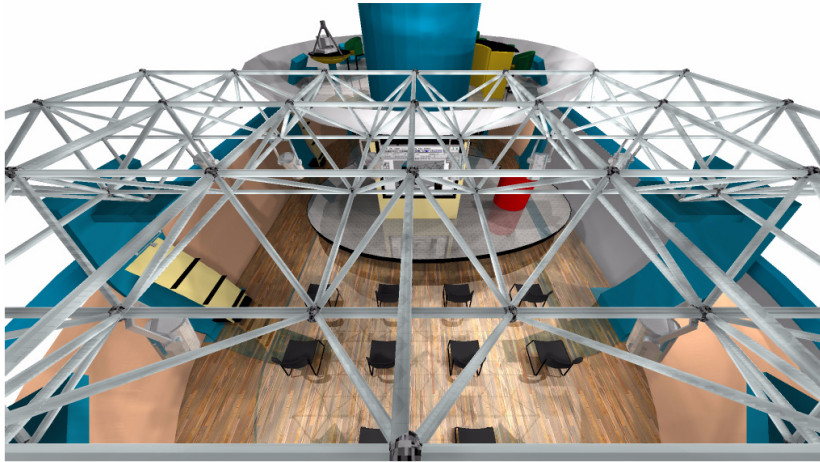
Figure 70.- Isometric view of a cube

To use the Isometric Render tool

1. Activate a Render mode window.
2. Select the Isometric Render tool in the toolbox. The perspective Wireframe rendering changes to an isometric Wireframe rendering.



Object attributes



In this chapter:

- Object attributes
- How attributes apply to objects
- Pen attributes
- Fill attributes

Object attributes

You can use colors, patterns, and surface materials to distinguish objects in 2D drawings and give realism to renderings that you create in **DCAD VectorSpace**.

This chapter describes the attributes that can be applied to objects: Pen color, Fill color, Pen weight, Pen style, Arrowhead, Fill pattern, Fill hatch, and Surface material.

The buttons on the Attributes bar make it convenient to apply attributes to objects, while the Pen and Fill palettes let you apply attributes from a floating window. You can also use the Pen and Fill palettes to modify or create new colors, patterns, hatches, arrowheads, and materials, as described in this chapter.

How attributes apply to objects

You can select attributes from the buttons on the Attributes bar, or from the Pen palette and the Fill palette.

Current attributes

DCAD VectorSpace applies some default attributes to objects when you create the objects. The term “current attributes” refers to the attributes that **DCAD VectorSpace** applies to a new object. You

can change the current attributes, and you can change the attributes of existing objects, using the Attributes bar, Pen palette, and Fill palette.

When you create a new object, **DCAD VectorSpace** applies the current attributes that are shown in the small boxes at the left of the Pen and Fill buttons on the Attributes bar (**figure 71**).

You can change the current attributes at any time when no objects are selected.



Figure 71.- Current attribute boxes on the Attributes bar

If you select an attribute when one or more objects are selected, the change applies to the selected objects; the current attributes do not change.

Available attributes

The attributes that you can select depend on the current mode (Draft, Sculpt, or Render). When a Draft mode window is active, Surface materials are not available, because these are attributes of 3D objects. In Sculpt mode, only Pen colors and Surface materi-

als are available. In Render mode, no attributes can be applied to objects.

Changing attributes of objects

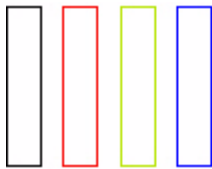
After you create an object, you can modify its attributes at any time.

Attributes of 2D objects

The attributes that can be applied to objects in Draft mode are Pen color, Pen weight, Pen style; Arrowhead; Fill color, Fill pattern, and Fill hatch. These attributes are described here in brief:

Pen color . A solid color defined in the RGB color space, which appears on the outline of an object in Draft mode. All 2D objects have a Pen color.

Note: The display of Pen colors assigned to objects can be overridden by display settings, such as View 2D & 3D Objects (if you select the option that distinguishes object type by color), or other display options that affect object colors in Draft mode.



Examples of Pen colors

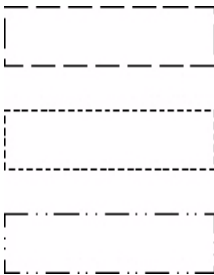


Examples of Pen weights

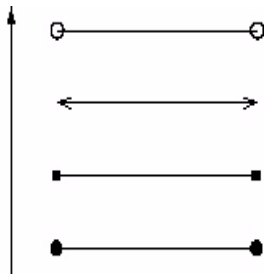
Pen weight . The thickness of an object's outline, specified in millimeters. All 2D objects have a Pen weight.

The Properties Manager is a useful for checking attributes of objects in Draft mode and Sculpt mode. And, while you can't display Surface materials in Sculpt mode, you can use the Properties Manager to check the name and appearance of the Surface material of a selected object.

Pen style. A pattern of solid, dashed, and dotted segments, which appears on an object's outline. An object's Pen color is used on the solid segments of the Pen style; blank segments appear transparent. All 2D objects have a Pen style.



Examples of Pen styles



Examples of Arrowheads

Arrowhead. A terminator, such as an arrow, slash, or other shape, that appears at the end of a line segment.

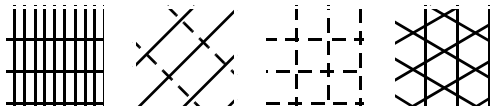
Fill color. A solid color that tints an object's Fill pattern or Fill hatch. Fill colors can be applied only to 2D objects in Draft mode.



Examples of Fill colors (printed as grays)



Examples of Fill patterns (with black Fill color)



Examples of Fill hatches (with black Fill color)

Fill pattern . A raster pattern that appears in the interior of an object. If an object has a black-and-white Fill pattern, you can apply a Fill color to the object and the color will replace black pixels in the Fill pattern.

Fill hatch . A pattern made of line segments, which appears in the interior of an object. Hatch patterns are typically used to represent building materials.

Attributes of 3D objects

In Sculpt mode, only two attributes apply to 3D objects: Pen color and Surface material.

In a Sculpt mode window, only Pen color is displayed on a 3D object. In a Render mode window, either an object's Pen color or its Surface material is

displayed on the object's surfaces, depending on the type of rendering that you select.

When a Sculpt mode window is active, the Pen color and Surface material buttons are available on the Attributes bar, while other attribute controls are dimmed (**figure 72**).



Figure 72.- Attributes available in Sculpt mode

Pen color. In Sculpt mode, Pen color is similar to Pen color in Draft mode: the color appears on the outline of the 3D object.

In Render mode, the appearance of an object's Pen color depends on the type of rendering you select, and whether the object's Surface material is rendered.

- In Wireframe or Hidden Line renderings, an object's Pen color appears on the outlines of its surfaces. Surface materials do not appear in Wireframe or Hidden Line renderings.
- In renderings created with the Solid command, an object's Pen color appears as a solid surface color if the object has no Sur-

face material (or if the object has a Surface material, but the Materials checkbox is not selected in the Rendering Options dialog box). Otherwise, the object's Surface material appears in the rendering, and the Pen color isn't displayed.



Figure 73.- Example of Pen colors (printed as grays) in a Wire-frame rendering



Figure 74.- Example of Pen colors (printed as grays) in a Solid rendering

Surface material. A Surface material is a color raster image, which **DCAD VectorSpace** applies as

Using the Attributes Bar

The Attributes bar is a toolbar that appears at the top of the screen (under the menu bar) whenever **DCAD VectorSpace** is running. You can use the buttons on the Attributes bar to assign attributes to objects in Draft mode and Sculpt mode.

a skin over the surfaces of 3D objects when you use the Solid command to create renderings.



Figure 75.- Example of Surface materials in a Solid rendering

To apply Surface materials, you select 3D objects in Sculpt mode and choose Surface materials from the Fill palette.

You can create Surface materials from digitized photographic images or computer-generated designs. Surface materials can incorporate brightness, reflectivity, gloss, and transparency settings.

Attributes applied to extruded objects

When you create a 3D object by extruding a 2D object, **DCAD VectorSpace** applies the current Pen color to the new 3D object; the attributes of the 2D object do not transfer to the 3D object.

From the buttons on the Attributes bar, you can select each type of object attribute: Pen color, Pen weight, Arrowhead, Pen Style, Fill color, Fill pattern, Fill hatch, and Surface material.

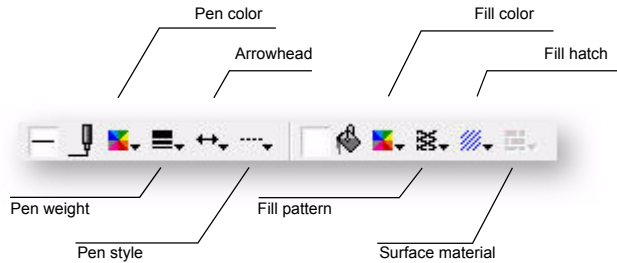


Figure 76.- Attributes buttons on the Attributes bar

The buttons on the Attributes bar act like pop-up menus. When you press a button, a palette of attributes pops open. Each pop-up palette corresponds to a tab in the Pen palette or the Fill palette. For example, when you press the Pen weight button, the Pen weight tab of the Pen palette pops open.

If you drag a palette away from any of the Pen attributes buttons, the Pen palette appears. If you drag a palette away from any of the Fill attributes

buttons, the Fill palette appears. See **Using the Pen and Fill palettes**, page 89 for more information on how to use these floating palettes. For information on specific attributes, see the section on each attribute later in this chapter.

Text attributes. Whenever the Text tool or a text object is selected, buttons and pop-up menus for applying attributes to text replace the Attributes buttons on the Attributes bar.

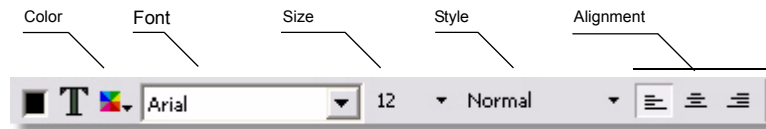


Figure 77.- The Attributes bar with text controls

Using the Pen and Fill palettes

You can open the Pen palette and the Fill palette by dragging a pop-up palette away from its button on the Attributes bar. The Pen palette appears when you drag from the Pen color, Pen weight, Arrowhead, or Pen Style button. The Fill palette appears when you drag from the Fill color, Fill hatch, Fill pattern, or Surface material button. After you “tear off” either palette, it becomes a floating palette that you can move to any position on screen by dragging the palette’s title bar.

You can use the Pen and Fill palettes to apply attributes to objects, the same as you would use the pop-up palettes that open from the buttons on the Attributes bar.

However, the Pen and Fill palettes offer features that are not available from the buttons on the Attributes bar: the palettes let you create, edit, and delete attributes. The palettes also let you select all objects in the active window that share a particular attribute.

To display the Pen or Fill palette

1. Press a Pen attribute button (for the Pen palette) or a Fill attribute button (for the Fill palette). The button's palette pops up.
2. Drag the palette away from the Attributes bar. As you drag, the outline of the floating palette appears. When you release the mouse button, the palette remains open.

To apply attributes from the palettes

You might find that it's easier to apply attributes using the Pen and Fill palettes, rather than the but-

tons on the Attributes bar, when you apply multiple attributes. With the palettes, you just click an attribute to apply it to any selected objects. To apply a different type of attribute, just click the appropriate tab to bring it to the front.

For example, select an object in a plan. Set its Pen color with a click on the Pen color tab. Click the Pen weight tab and click the 0.5 mm setting. Then, click the Pen style tab and click a dashed setting, without having to move the mouse back and forth to the Attributes bar to select and apply each attribute.

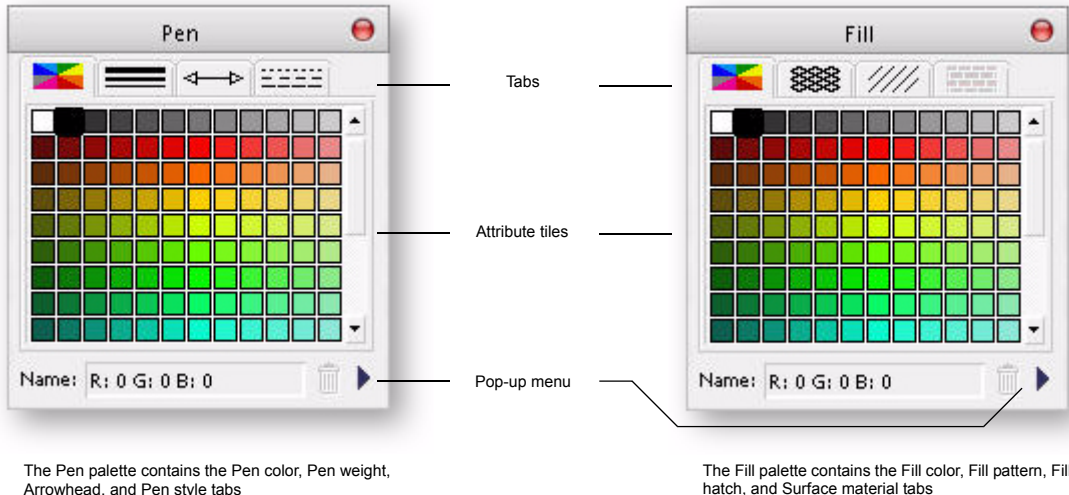


Figure 78.- The Pen palette and Fill palette

Pen attributes

Pen attributes affect the outlines of objects. For general information on Pen attributes, see **How attributes apply to objects**, page 85.

This section describes how to apply, create, and modify Pen attributes. You can use the Pen palette or

buttons on the Attributes bar to apply pen attributes to objects. The tabs in the Pen palette correspond to the Pen color, Pen weight, Arrowhead, and Pen style buttons on the Attributes bar.

For information on using the palette to apply attributes, see **Using the Pen and Fill palettes**, page 89.

Pen Color



Figure 79.- Attributes Bar - Pen Color

An object's Pen color sets the color of the object's outline in Draft and Sculpt modes. In Wireframe and Hidden Line renderings, Pen colors appear on the outlines of objects. In Solid renderings, Pen colors appear as solid surface colors on objects that do not have rendered Surface materials.

Pen color can be applied to 2D objects in Draft mode and to 3D objects in Sculpt mode.

All objects have a Pen color attribute.

You can use the Pen color button on the Attributes bar or the Pen color tab in the Pen palette to set the current Pen color and to change the Pen colors of selected objects.

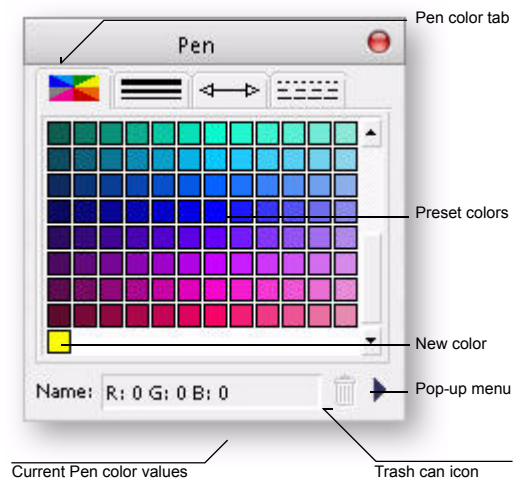


Figure 80.- The Pen color tab in the Pen palette

To apply a Pen color

1. Select 2D or 3D objects whose Pen color you want to change.
2. Press the Pen color button in the Attributes bar and drag into the Pen color tab to select a Pen color. If necessary, use the scroll bar to view additional colors (if the palette is floating).

To create a Pen color


When you add a color to the Pen color tab, the new color appears after the preset colors on the tab. The color also appears on the Fill color tab.

1. Open the Pen palette by dragging the palette away from the Pen color button on the Attributes bar.
2. Press the right-arrow button and choose New from the pop-up menu. The Color Picker dialog box appears. See **Pen weight**, page 93.

To edit a Pen color

1. Open the Pen palette by dragging the palette away from the Pen color button on the Attributes bar.
2. Double-click a color you created that you want to edit. The applicable operating system Color Picker dialog box appears.

- You can also click a color and then choose Edit in the palette's pop-up menu to edit the selected color.

Note: You can't edit or delete the preset colors on the Pen color tab. If you double-click a preset color, nothing happens. If a preset color is selected, the Edit command is not available in the pop-up menu, and the trash can icon at the bottom of the palette is not available. 

To delete a Pen color

1. Open the Pen palette by dragging the palette away from the Pen color button on the Attributes bar.
2. Click the color on the Pen color tab that you want to delete. You can delete any color that you have added to the palette, but not the preset colors.
3. Click the trash can icon in the bottom of the Pen palette to delete the selected color.

Pen weight



Figure 81.- Attributes Bar - Pen Weight

Pen weight is a measure of the thickness of an object's outline. Pen weight is specified in millimeters. You can apply Pen weights in Draft mode only. All 2D objects have a Pen weight.

You can use the Pen weight button on the Attributes bar or the Pen weight tab in the Pen palette to set the current Pen weight, and to change the Pen weight of selected objects.

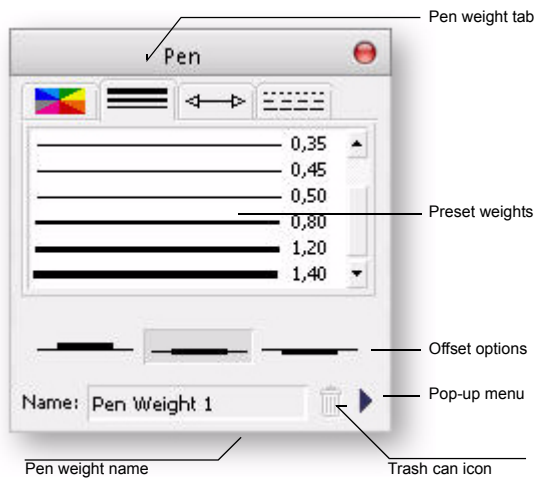


Figure 82.- The Pen weight button and tab

To apply a Pen weight

1. Select objects whose Pen weight you want to change.
2. Press the Pen weight button in the Attributes bar and drag into the Pen weight tab to select a Pen

weight. If necessary, use the scroll bar to view additional settings (if the palette is floating).

- If you use the Pen palette, you can click one of the three buttons at the bottom of the palette to specify the position of the Pen weight on the outline of objects.



For information about the Pen palette, see **Using the Pen and Fill palettes**, page 89.

To create a Pen weight

1. Open the Pen palette by dragging the palette away from the Pen weight button in the Attributes bar.
2. Press the right-arrow button and Choose New from the pop-up menu. The Line Weight Editor dialog box appears.
3. In the text box, type the width in millimeters of the Pen weight you want to create.
4. Click OK to create the Pen weight. The new Pen weight appears after the preset Pen weights on the Pen weight tab.

To edit a Pen weight

1. Open the Pen palette by dragging the palette away from the Pen weight button on the Attributes bar.

2. Double-click a Pen weight you created that you want to edit. The Line Weight Editor dialog box appears.
 - You can also click a Pen weight to select it and choose Edit in the palette's pop-up menu to edit the selected Pen weight.
3. In the text box, type the new width in millimeters for the selected Pen weight.
4. Click OK to modify the selected Pen weight.

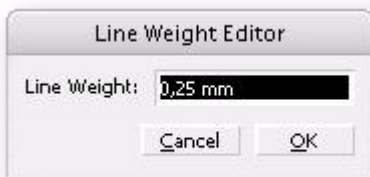


Figure 83.- The Line Weight Editor dialog box

Arrowheads



Figure 84.- Attributes Bar - Arrowheads

An Arrowhead is terminator, such as an arrow, slash, or other shape, that appears at the end of a line segment. You can apply Arrowheads in Draft mode only.

You can use the Arrowhead button on the Attributes bar or the Arrowhead tab in the Pen palette to change the current Arrowhead or apply Arrowheads to objects.

Note: You can't edit or delete the preset Pen weights. If you double-click a preset Pen weight, nothing happens. If a preset Pen weight is selected, the Edit command is not available in the pop-up menu, and the trash can icon at the bottom of the palette is not available. ✓

To delete a Pen weight

1. Open the Pen palette by dragging the palette away from the Pen weight button on the Attributes bar.
2. Select a Pen weight to delete. You can delete any Pen weight you have created, but not the preset Pen weights.
3. Click the trash can icon at the bottom of the Pen palette to delete the selected Pen weight.

Only 2D lines, polylines, and dimension objects can display an Arrowhead. An Arrowhead can appear at one or both ends of a line or dimension line, and at one or both end segments of a single polyline.

Note: You can apply an Arrowhead to other objects, including rectangles and polygons, but Arrowheads do not appear unless you separate the objects into segments by applying the Unchain command to the objects. ✓

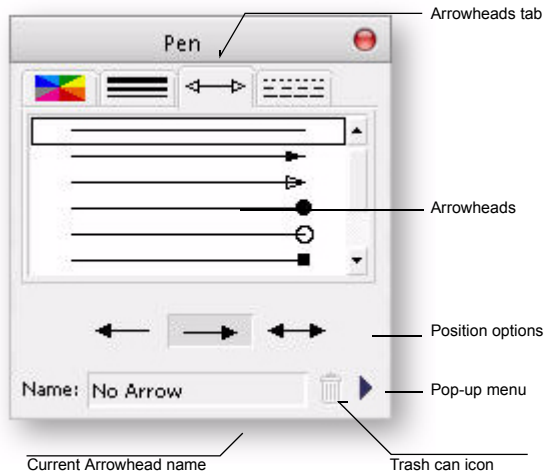


Figure 85.- The Arrowhead button and tab

To apply Arrowheads

1. Select the objects to which you want to apply an Arrowhead.
2. Press the Arrowhead button on the Attributes bar and drag into the palette to select an Arrowhead. If necessary, use the scroll bar to view additional settings (if the palette is floating).
 - To change the position of the Arrowhead, drag to the Arrowheads Mode submenu and choose the left, right, or two-sided option. The Arrowhead examples in the palette are based on the current Arrowhead Mode.
 - If you use the Pen palette, you can click one of the three buttons under the Arrowhead examples to set the position of the Arrowhead on line segments.

For information about the Pen palette, see **Using the Pen and Fill palettes**, page 89.

To create an Arrowhead

1. Open the Pen palette by dragging the palette away from the Arrowhead button on the Attributes bar.
2. Press the right-arrow button and Choose New from the pop-up menu. The Arrow Editor dialog box appears.
3. Click an Arrowhead style in the Arrowheads list.
4. Type the horizontal dimension of the Arrowhead in the first text box under Head Size. Type the vertical dimension of the Arrowhead in the second text box.
5. Click OK to create the Arrowhead. The new Arrowhead appears after the preset Arrowheads on the Arrowhead tab.

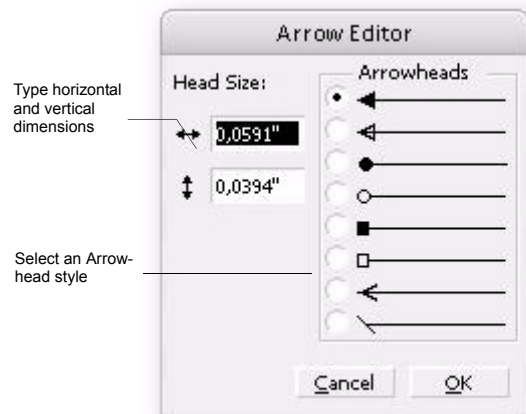


Figure 86.- The Arrow Editor dialog box

To edit an Arrowhead

1. Open the Pen palette by dragging the palette away from the Arrowhead button on the Attributes bar.
2. Double-click an Arrowhead you created that you want to edit. The Arrow Editor dialog box appears (**figure 86**).
 - You can also click an Arrowhead to select it and choose Edit in the palette's pop-up menu to edit the selected Arrowhead.
3. Change any of the current settings for the Arrowhead: the Arrowhead style in the Arrowheads list, the horizontal dimension in the first text box, and the vertical dimension in the second text box.
4. Click OK to replace the selected Arrowhead on the Arrowhead tab with the new settings.

Note: You can't edit or delete the preset Arrowheads. If you double-click a preset Arrowhead, nothing happens. If a preset Arrowhead is selected, the Edit command is not available in the pop-up menu, and the trash can icon at the bottom of the palette is not available.



To delete an Arrowhead

1. Open the Pen palette by dragging the palette away from the Arrowhead button on the Attributes bar.
2. Select an Arrowhead to delete. You can delete any Arrowhead you have created, but not the preset Arrowheads.
3. Click the trash can icon at the bottom of the Pen palette to delete the selected Arrowhead.

Pen Style



Figure 87.- Attributes Bar - Pen Styles

A Pen style defines a 2D object's outline as either an unbroken stroke, or a pattern of dashed or dotted segments. All 2D objects have a Pen style. Pen styles are available in Draft mode only.

Pen styles are represented in the Pen palette as black and white patterns. However, when applied to an

object, a Pen style appears in the object's Pen color. Blank segments in a Pen style are transparent.

You can use the Pen style button on the Attributes bar or the Pen palette to apply a Pen style to selected objects, or to change the current Pen style.

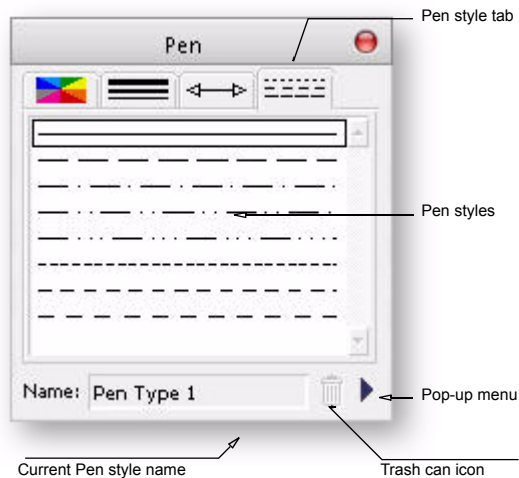


Figure 88.- The Pen style button and tab

To apply a Pen style

1. Select the objects to which you want to apply a Pen Style.
2. Press the Pen style button on the Attributes bar and drag into the pop-up palette to select a Pen style. If necessary, use the scroll bar to view additional settings (if the palette is floating).
 - You can also use the Pen palette to select and apply Pen styles. For information about the Pen palette, see **Using the Pen and Fill palettes**, page 89.

To create a Pen style

1. Open the Pen palette by dragging the palette away from the Pen style button on the Attributes bar.
2. Press the right-arrow button and Choose New from the pop-up menu. The Dash Editor dialog box appears.

3. Click in the Dash Editor window below the ruler where you want a line segment to begin or end. A segment handle appears where you click. Segment handles begin and end segments.
4. Continue to add and position segment handles until you have the dash pattern you want. You can reposition a segment handle by dragging it.
5. Click OK to create the Pen style. The new Pen style appears after the preset Pen styles on the Pen style tab.



Figure 89.- Using the Dash Editor - Click to place the first segment handles

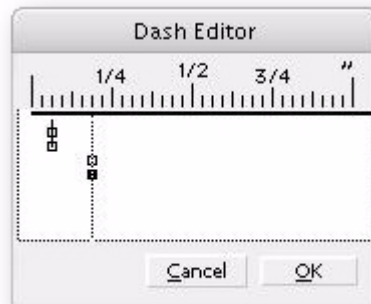


Figure 90.- Using the Dash Editor - Drag a handle to separate the segments

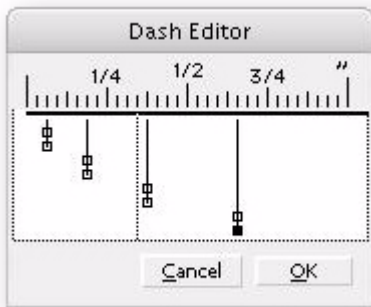


Figure 91.- Using the Dash Editor - Click to place handles for additional segments

To edit a Pen style

1. Open the Pen palette by dragging the palette away from the Pen Style button on the Attributes bar.
2. Double-click a Pen Style you created that you want to edit. The Dash Editor dialog box appears.
 - You can also click a Pen style to select it and choose Edit in the palette's pop-up menu to edit the selected Pen style.
3. Click in the Dash Editor window below the ruler where you want the first segment to end. Two segment handles appear where you click.

4. Use the handles in the dash preview window to adjust the segments in the selected Pen style.
 - To adjust the segment length, drag the right handle on the segment to the left to shorten the segment, or drag it to the right to lengthen the segment.
 - To move a segment closer to the preceding segment, drag the handle at the left end of the segment to the left.
5. Click OK to replace the selected Pen style on the Pen style tab with the new settings.

Note: You can't edit or delete the preset Pen styles. If you double-click a preset Pen style, nothing happens. If a preset Pen style is selected, the Edit command is not available in the pop-up menu, and the trash can icon at the bottom of the palette is not available.



To delete a Pen style

1. Open the Pen palette by dragging the palette away from the Pen style button on the Attributes bar.
2. Select a Pen style you created that you want to delete.
3. Click the Trash can icon at the bottom of the Pen palette.

Fill attributes

Fill attributes affect the area inside an object's outline. For general information on Fill attributes, see **How attributes apply to objects**, page 85.

This section describes how to apply, create, and modify Fill attributes. You can use the Fill palette or buttons on the Attributes bar to apply fill attributes to

objects. The tabs in the Fill palette correspond to the Fill color, Fill pattern, Fill hatch, and Surface material buttons on the Attributes bar.

For information on using the Fill palette to apply attributes, see **Using the Pen and Fill palettes**, page 89.

Fill Color



Figure 92.- Attributes Bar - Fill Color

A Fill color is a hue that appears inside a 2D object. Fill colors can be applied to 2D objects in Draft mode. Fill colors are not available in Sculpt mode or Render mode, and can't be applied to 3D objects.

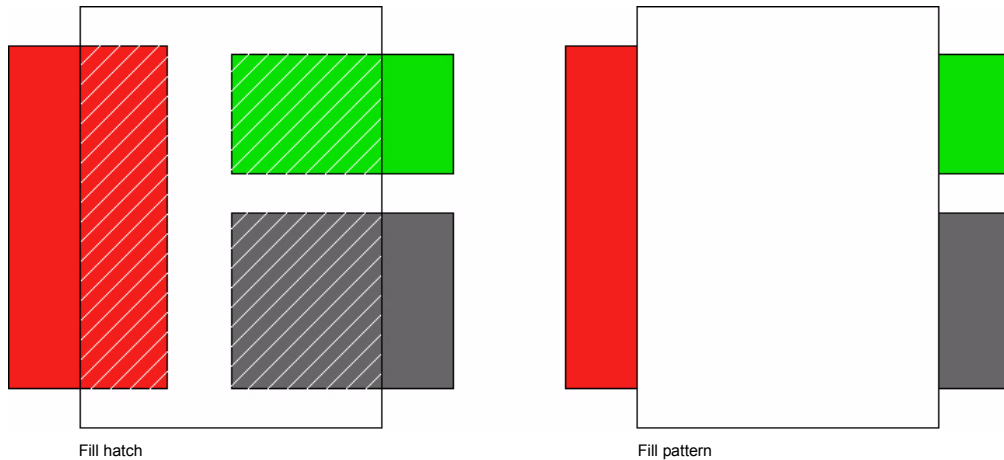
All 2D objects have a Fill color attribute, although the Fill color's appearance depends on the object's Fill pattern or Fill hatch setting. A Fill pattern or Fill hatch fills an object, while the object's Fill color tints the pattern or hatch.

If an object's Fill pattern is set to solid white, the object has an opaque white fill. If its Fill pattern is set to "no pattern" (symbolized by a white box with a diagonal slash in the first position of the Fill pattern

tab), the object appears hollow, with no visible Fill color, pattern, or hatch.

Fill hatches are transparent, while Fill patterns are not. Therefore, the effect of a white Fill color is different when an object has a Fill pattern or a Fill hatch.

If you apply white Fill color to an object that has a Fill pattern, the object appears to be filled with solid white. If you do the same to an object that has a Fill hatch, only the hatch lines are white and the rest is transparent. On a white background this isn't visible, but it can be seen if darker objects are in the background.



The large rectangle in the foreground has a Fill hatch (left) and a solid Fill pattern (right). When the object's Fill color is white, the lines in the Fill hatch are white, and the Fill pattern is an opaque white rectangle.

Figure 93.- Fill Hatch Vs. Fill pattern

If an object has a Fill pattern other than solid white, the black areas of the Fill pattern are colored with the object's Fill color. For example, if you apply a checkerboard Fill pattern to an object, and the object's Fill color is red, the object's interior has a red-and-white checkerboard pattern.

Fill colors are defined in the RGB¹ color space. The preset colors in **DCAD VectorSpace**, and any colors you create, are available as both Pen colors and Fill colors; the same tab appears in the Pen palette and the Fill palette.

You can use the Fill color button on the Attributes bar, or the Fill color tab in the Fill palette, to set the current Fill color, and to change the Fill colors of selected objects. For more information, see **Current attributes**, page 85.

1. Red - Green - Blue

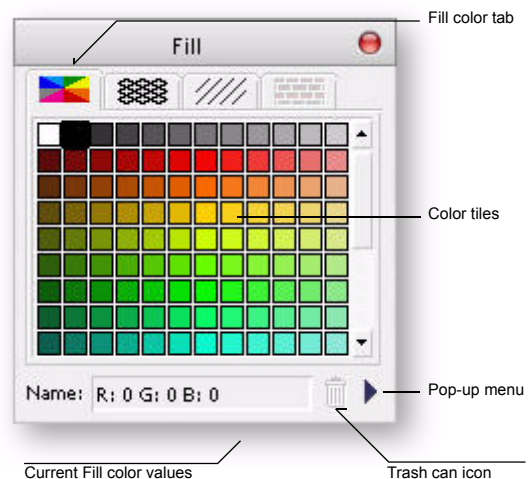


Figure 94.- The Fill color button and tab

To apply a Fill color to objects

1. Select 2D objects whose Fill color you want to change.

2. Press the Fill color button in the Attributes bar and drag into the Fill color tab to select a color. If necessary, use the scroll bar to view additional colors (if the palette is floating).

To create a Fill color


When you add a color to the Fill color tab, the new color appears after the preset colors on the tab. The color also appears on the Pen color tab.

1. Open the Fill palette by dragging the palette away from the Fill color button on the Attributes bar.
2. Press the right-arrow button and choose New from the pop-up menu. The Color Picker dialog box appears.

To edit a Fill color

1. Open the Fill palette by dragging the palette away from the Fill color button on the Attributes bar.
2. Double-click a color you created that you want to edit. The Color Picker dialog box appears.

- You can also click a color and then choose Edit in the palette's pop-up menu to edit the selected color.

Note: You can't edit or delete the preset colors on the Fill color tab. If you double-click a preset color, nothing happens. If a preset color is selected, the Edit command is not available in the pop-up menu, and the trash can icon at the bottom of the palette is not available. 

To delete a Fill color

1. Open the Fill palette by dragging the palette away from the Fill color button on the Attributes bar.
2. On the Fill color tab, click the color that you want to delete. You can delete any color that you have added to the palette, but not the preset colors.
3. Click the trash can icon at the bottom of the Fill palette to delete the selected color. **DCAD VectorSpace** removes the color from the Pen color tab and the Fill color tab.

Fill pattern



Figure 95.- Attributes Bar - Fill Pattern

A Fill pattern is a raster pattern that appears in the interior of a 2D object. If the pattern is composed of black-and-white pixels, the black pixels are colored by the object's Fill color.

Fill patterns can be applied to 2D objects in Draft mode only.

An object can have either a Fill pattern or a Fill hatch, but not both. If you apply a Fill pattern or Fill hatch to an object, the new attribute replaces either previous attribute.

You can use the Fill pattern button on the Attributes bar or the Fill pattern tab in the Fill palette to apply Fill patterns to 2D objects and to change the current Fill pattern. For more information, see **Using the**

Attributes Bar, page 88, and **Using the Pen and Fill palettes**, page 89.

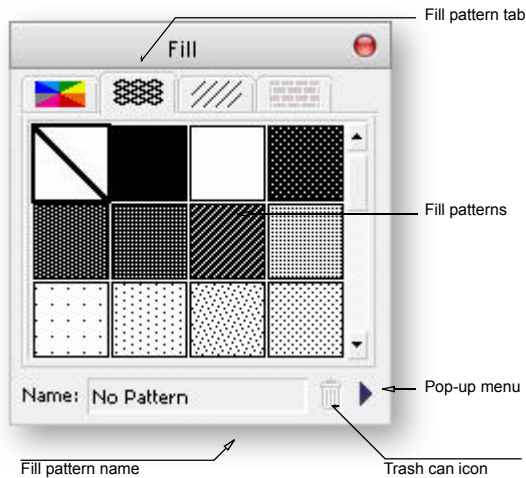


Figure 96.- The Fill pattern button and tab

Fill pattern orientation

Each Fill pattern has a fixed orientation independent of the objects it fills. If you move the object, the Fill pattern doesn't reorient itself. The effect is the same as if you were to move a frame on a wallpaper pattern; different parts of the pattern would appear in the frame. The effect is usually insignificant with small, simple patterns, but the shift might be noticeable with a large pattern.

To apply a Fill pattern to objects

1. Select the 2D objects whose Fill patterns you want to change.
2. Press the Fill pattern button in the Attributes bar and drag into the tab to select a Fill pattern. If necessary, use the scroll bar to view additional Fill patterns (if the palette is floating).
 - To set the current Fill pattern or the Fill pattern of selected objects to "none," choose

the box with a diagonal line at the upper-left corner of the Fill pattern tab.


To create a Fill pattern

You can add patterns to the Fill pattern tab by pasting raster images from the Clipboard. You can create patterns using any image-editing or screen capture software.

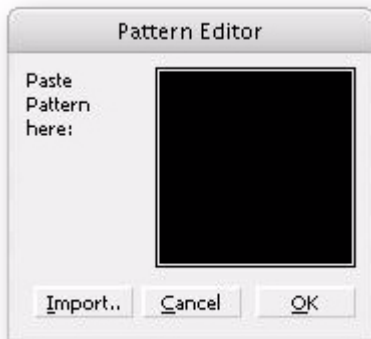
1. Copy a raster image to the Clipboard.
2. Open the Fill palette by dragging the palette from the Fill pattern button on the Attributes bar.
3. Press the right-arrow button and choose New from the pop-up menu. The Pattern Editor dialog box appears.
4. Press Ctrl+V (Windows) or Cmd+V (Mac OS) to paste the pattern into the dialog box. Click OK to close the dialog box and add the pattern to the Fill pattern tab.

To edit a Fill pattern

1. Open the Fill palette by dragging the palette from the Fill pattern button on the Attributes bar.
 - You can also click a Fill pattern and then choose Edit in the palette's pop-up menu to edit the selected pattern.
2. Double-click a Fill pattern you created that you want to edit. The Pattern Editor dialog box appears.
3. Press Ctrl+V (Windows) or Cmd+V (Mac OS) to paste the pattern into the dialog box. Click OK to close the dialog box and replace the selected pattern on the Fill pattern tab.

Note: You can't edit or delete the preset Fill patterns. If you double-click a preset Fill pattern, nothing happens. If a preset Fill pattern is selected, the Edit command is not available. 

able in the pop-up menu, and the trash can icon at the bottom of the palette is not available.



To delete a Fill pattern

1. Open the Fill palette by dragging the palette from the Fill pattern button on the Attributes bar.
2. Select a Fill pattern you created that you want to delete. You can delete any pattern that you have added to the palette, but not the preset patterns.
3. Click the trash can icon at the bottom of the palette to delete the selected Fill pattern.

Fill hatch



Figure 97.- Attributes Bar - Fill Hatch

A Fill hatch is a pattern made of line segments, which appears in the interior of a 2D object. Hatch patterns are typically used to represent building materials.

Fill hatches can be applied to 2D objects in Draft mode only.

An object can have either a Fill pattern or a Fill hatch, but not both. If you apply a Fill pattern or Fill hatch to an object, the new attribute replaces either previous attribute.

You can use the Fill hatch button on the Attributes bar or the Fill hatch tab in the Fill palette to apply Fill hatches to 2D objects and to change the current Fill hatch. For more information, see **Using the Attributes Bar**, page 88, and **Using the Pen and Fill palettes**, page 89.

The lines in an object's Fill hatch appear in the hue specified by the object's Fill color. For more information, see **Fill Color**, page 99.

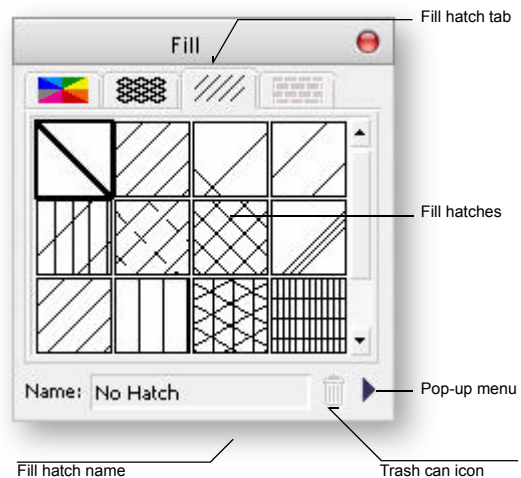


Figure 98.- The Fill hatch button and tab

To apply a Fill hatch to objects

1. Select the 2D objects that you want to have Fill hatches.
2. Press the Fill hatch button in the Attributes bar and drag into the tab to select a Fill hatch. If necessary, use the scroll bar to view additional Fill hatches (if the palette is floating).
 - To set the current Fill hatch, or the Fill hatches of selected objects, to “none,” choose the box with a diagonal line at the upper-left corner of the Fill hatch tab.

Note: Selecting “None” in the Fill hatch tab removes an object's Fill hatch or its Fill



pattern, if the object has either a Fill hatch or a Fill pattern.

To create a Fill hatch

1. Open the Fill palette by dragging from the Fill hatch button on the Attributes bar.
2. Press the right-arrow button in the Fill palette and choose New in the pop-up menu. The Hatch Editor dialog box opens.
3. Specify settings for the lines in each Hatch Set. See “Settings for Fill hatches,” next, for more information about the Hatch Editor.
4. Click OK to add the new Fill hatch to the Fill hatch tab in the Fill palette.

Settings for Fill hatches

The options in the Hatch Editor dialog box let you specify the angle, spacing, number of lines, and other settings for a Fill Hatch (**figure 99**).

Press Tab to move the insertion point from one text box to another in the Hatch Editor dialog box. When you change a setting, a new preview of the Fill hatch appears in the preview box.

Hatch Set. Select Set 1, Set 2, Set 3, or Set 4 from the Hatch Set pop-up menu. The settings in the

dialog box affect the lines in the selected Hatch Set. A Fill hatch can have up to four groups of lines.

Lines. This value sets the number of lines in the current Hatch Set, from 1 to 255. If the “# Lines” value is zero, no lines appear in the current Hatch Set. To remove a set of lines, type 0 in the text box.

Angle. Type a value from -360 to 360 degrees to specify the angle of the lines in the current Hatch Set. A value of 90 or 270 degrees places the lines vertically, while a value of 0 or 180 degrees places the lines horizontally.

Spacing and Stage Spacing. Type the distance between lines in the current Hatch Set in the Spacing text box. This value and the Stage Spacing value together set the total distance between the lines in the current Hatch Set.

Origin Offset. A value greater than zero places blank space at the origin of the Hatch Fill, which appears as a space at the upper or left edge of a filled object, or the lower or right edge, depending on the Angle setting.

Pen style and Pen weight . Use the pop-up menus to set the Pen style (dash pattern) and Pen weight of the lines in the current Hatch Set.

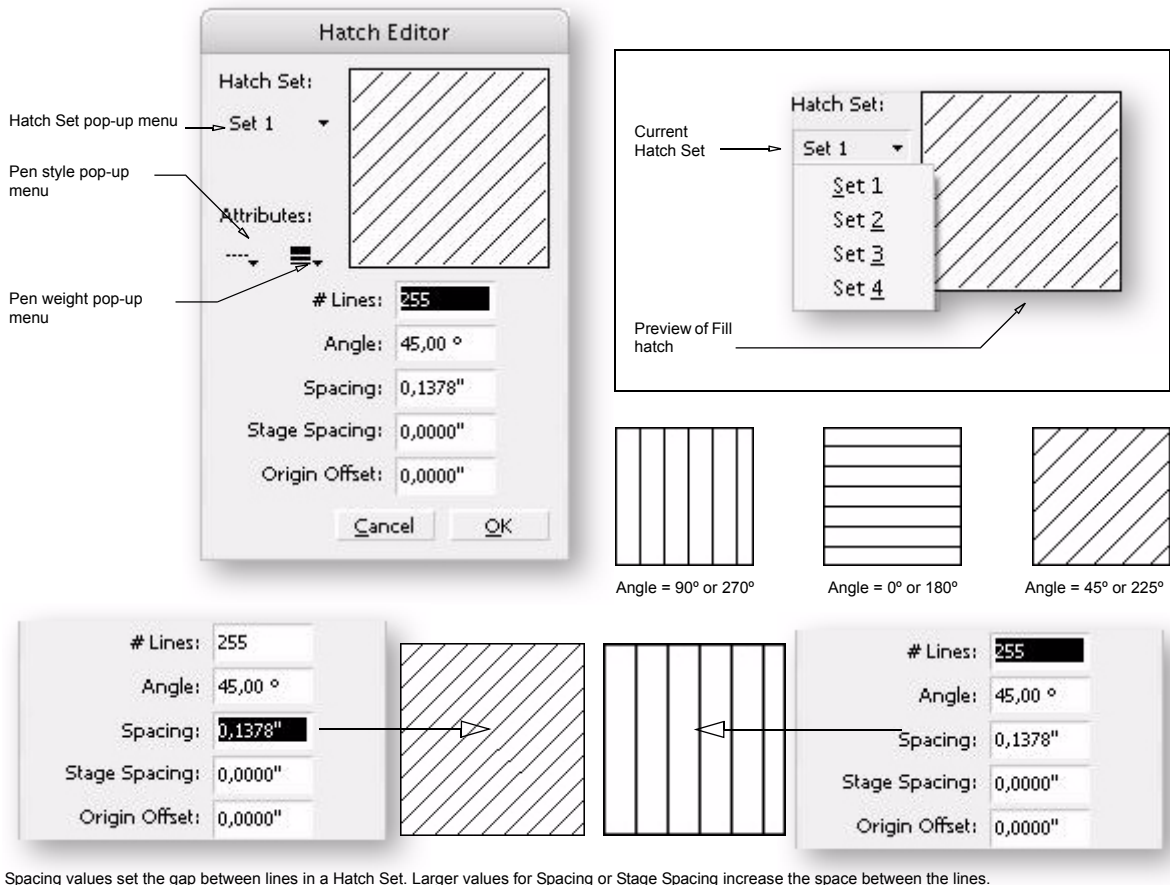


Figure 99.- The Hatch Editor dialog box

To edit a Fill hatch

1. Open the Fill palette by dragging from the Fill hatch button on the Attributes bar.
2. Double-click a Fill hatch you created that you want to edit. The Hatch Editor dialog box appears.
 - You can also click a Fill hatch and then choose Edit in the palette's pop-up menu to edit the selected hatch.

3. Use the Hatch Editor dialog box to adjust the values of the Hatch Sets that make up the Fill hatch. See **Settings for Fill hatches**, page 105 for more information.
4. Click OK to replace the selected Fill hatch with the new settings in the Hatch Editor.

Note: You can't edit or delete the preset Fill hatches on the Fill hatch tab. If you double-click a preset Fill hatch, nothing happens. If a preset Fill hatch is selected, the Edit command is not available in the pop-up menu, and



the trash can icon at the bottom of the palette is not available.

To delete a Fill hatch

1. Open the Fill palette by dragging from the Fill hatch button on the Attributes bar.
2. Select a Fill hatch you created that you want to delete. You can delete any Fill hatch that you added to the palette, but not the preset Fill hatches.
3. Click the Trash can icon at the bottom of the palette to delete the selected Fill hatch.

Surface material



Figure 100.- Attributes Bar - Surface Material

A Surface material is a color raster image. When you use the Solid command to create renderings, **DCAD VectorSpace** renders a 3D object's Surface material over the object's surfaces.

You can apply Surface materials to 3D objects in Sculpt mode only. However, Surface materials do not appear in Sculpt mode, but appear in Render mode when you use the Solid command and the checkbox labeled Materials is selected in the Render Options dialog box.

You can use the Surface material button on the Attributes bar or the Surface material tab in the Fill palette to set the current Surface material and to change the Surface materials of selected objects. For more information, see **Current attributes**, page 85.

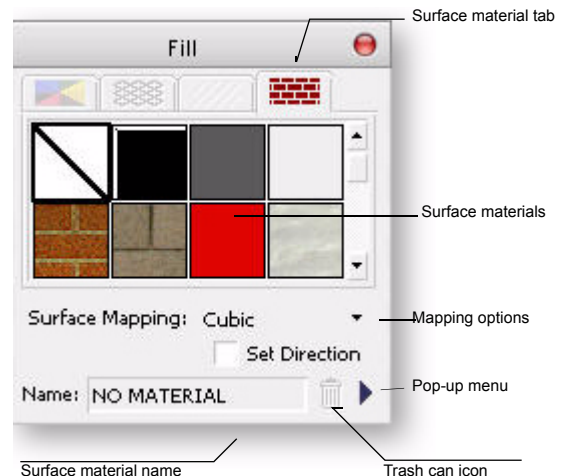


Figure 101.- The Surface material button and tab

To apply a Surface material to objects

1. Select the 3D objects to which you want to apply a Surface material.
2. To pick a Surface Mapping option, drag into the Surface Mapping pop-up menu and choose Cubic, Brick, Cylindrical, or Planar. For more information, see **Surface Mapping options**, page 108.

- If you use the Surface material tab in the Fill palette, you can choose a Surface Mapping option from the Surface Mapping pop-up menu on the tab.
3. Press the Surface material button on the Attributes bar and drag into the pop-up palette to select a Surface material. As you drag in the palette, the name of the Surface material under the pointer appears in the Help bar at the bottom of the screen (if the Help bar is displayed).
- To set the current Surface material, or the Surface material of selected objects, to “None,” choose the box with a diagonal line at the upper-left corner of the Surface material tab.

Surface Mapping options



Figure 102.- Surface Mapping pop-up menu

Cubic. Tiles the Surface material from the center of each face of the object. This results in the same Surface material pattern on each face of the rendered object.

Brick. Creates a seamless effect on objects by conforming the Surface material to the corners of each face of the object. For example, applying a “wall paper” material and choosing Brick maintains the seams of the wall paper by wrapping it around the corners of the walls.

Cylindrical. Maps the Surface material to the object based on a radius you set. The radius you set for Cylindrical mapping depends on how you want the Surface material to map the object. In general, the larger the radius, the smaller the pattern will be after it maps to the object’s faces. Cylindrical is ideal for mapping Surface materials to rounded objects.

Planar. Maps the Surface material to the object’s face in the current view, and then extends the edge pixels of the material over every other face of the object.

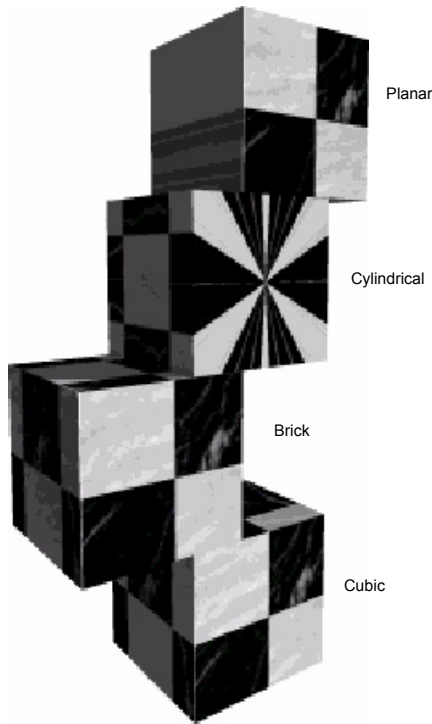


Figure 103.- Examples of the Surface Mapping options

Set Direction. You can select the Set Direction checkbox on the Surface material tab to use the drawing vector to set the direction in which the selected Surface material begins mapping around the object. This option is not available from the Surface material button on the Attributes bar.

To create a Surface material

1. Copy to the Clipboard a raster image that you want to use as a Surface material. You can use any image-editing or screen capture program to prepare a raster image and copy it to the Clipboard.

2. Drag the Fill palette from the Surface material button on Attributes bar.
3. Press the right-arrow button and choose New in the palette's pop-up menu. The Material Editor dialog box appears.
4. Click the Edit box. A black outline indicates that you can paste a material into the box. Press Ctrl+V (Windows) or Cmd+V (Mac OS) to paste the image into the Edit box.
5. Adjust the settings in the dialog box to set the brightness, gloss, reflectivity, and transparency of the Surface material. See **Material Editor options**, page 111 for information on these settings.
6. Click OK. A directory dialog box appears. Select a location on disk to save the Surface material file.
 - You can keep all your Surface material files together, or create separate folders for each project.
 - When you open a document, if **DCAD VectorSpace** can't locate the Surface materials assigned to objects in the document, a directory dialog appears in which you select a Surface material file to indicate the location of the document's Surface materials.
7. Click Save. **DCAD VectorSpace** saves the Surface material file on disk.

Note: You must add a new Surface material to the Fill palette to use it in a document; see [To add a Surface material from disk](#), page 110.



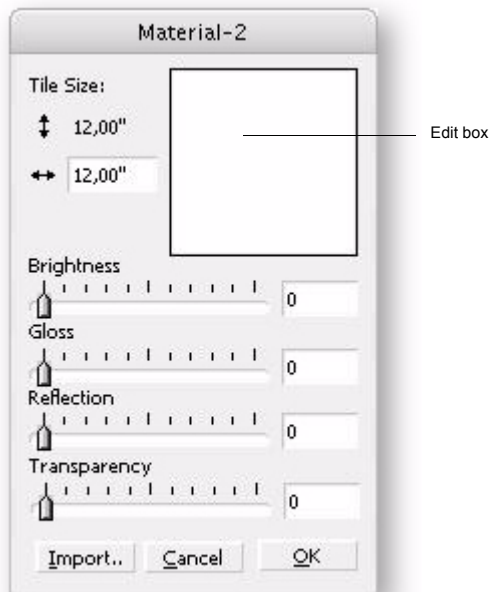


Figure 104.- Material Editor dialog box

To edit a Surface material


1. Open the Fill palette by dragging it from the Surface material button on the Attributes bar. Double-click the Surface material you want to edit. The Material Editor dialog opens.
 - You can click a Surface material to select it and then choose Edit in the palette's pop-up menu to edit the Surface material.
 - You can edit the preset Surface materials that ship with **DCAD VectorSpace** or any Surface materials that you have added to the tab.
2. To replace the Surface material with a new image, click the Edit box. A black outline indicates you can paste a new image into the dialog box. Press Ctrl+V (Windows) or Cmd+V (Mac OS) to paste an image from the Clipboard.

3. Adjust the settings in the dialog box to set options for the Surface material. See **Material Editor options**, page 111 for information on these settings.

4. Click OK to replace the selected Surface material with the new settings.

To delete a Surface material

1. Open the Fill palette by dragging it from the Surface material button on the Attributes bar.
2. Select a Surface material you have added to the palette that you want to delete.
3. Click the Trash can icon at the bottom of the Fill palette.

Note: If you try to delete a Surface material that has been applied to objects in a document, a message box tells you that you can't delete the material because it is in use. Click OK in the message box to continue. 

To add a Surface material from disk

Surface materials are stored in individual files on disk. You might save hundreds of Surface material files, but you probably don't want to use that many Surface materials in every document, or keep that many in the Fill palette.

At any time, you can add a Surface material to the Fill palette by using the palette's Add command. You need to do this when you create a new Surface material (because creating the Surface material stores it on disk, but doesn't add it to the palette).

1. Open the Surface material tab of the Fill palette. In the pop-up menu, choose Add. A directory dialog box appears.
2. Select the file of the Surface material you want to add.
3. Click Open. **DCAD VectorSpace** inserts the Surface material into the Surface material tab.

Material Editor options

The settings in the Material Editor dialog box control the appearance of Surface materials in Solid renderings.

You can use the Material Editor to adjust the settings of a new material or edit existing materials.

To change a setting in the Material Editor

Drag the slider to the left or right until you reach the desired value. Or, type a value in the text box next to the setting you want to change.

When you adjust settings in the Material Editor, a higher number increases the effect of the particular setting (Gloss, Brightness, Reflectivity, and Transparency). For example, a higher Transparency setting makes the Surface material more transparent.

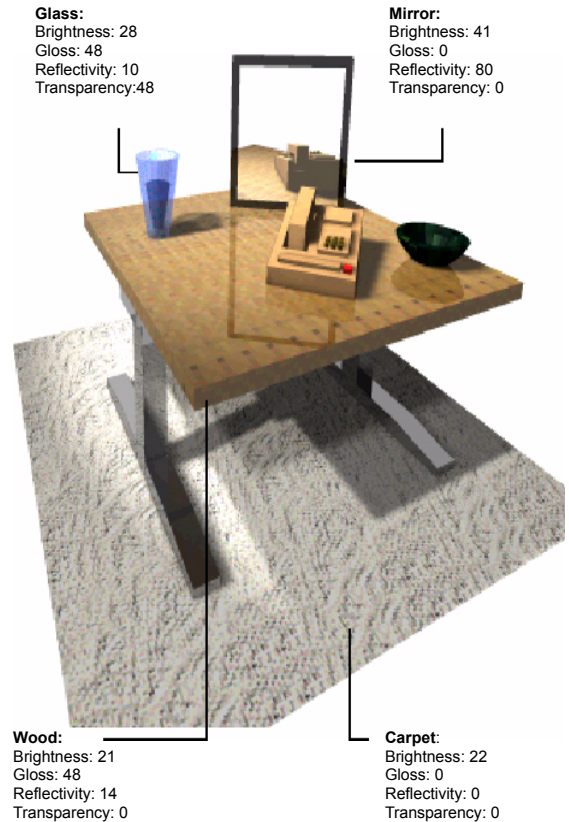


Figure 105.- Surface Material settings

Brightness . Gives a Surface material the ability to reflect light. In a Solid rendering, when light shines on a Surface material that has a high degree of Brightness, the colors of the Surface material fade. At a Brightness setting of 100, a Surface material's color fades to white.

Gloss . Adds shine to Surface materials. Gloss is similar to Brightness in that it gives the Surface material the ability to reflect light. Gloss, however, does not fade colors, but rather brightens them. When light shines on a Surface material in a Solid rendering, Gloss adds shine to the material by brightening colors but does not add reflectivity.

For example, the shiny surface of a marble wall has gloss, whereas the dull surface of a brick wall has no gloss.

Reflectivity . Adds a mirror-like quality to Surface materials. In a Solid rendering, if the Surface material has color and a high value of Reflectivity, the color of the Surface material is not that apparent. The more reflectivity the material has, the less color will be displayed. A Surface material with a Reflectivity setting of 100 displays no color of its own.

For example, to create gray mirror, you can use a gray Surface material with Reflectivity set to

50. The mirror will reflect objects and still retain some of its own color.

Transparency . Makes Surface materials clear or partially transparent. In a Solid rendering, you can see through Surface materials that have a high value of Transparency. At a Transparency setting of 100, a Surface material is invisible in a Solid rendering.

For example, you can see the glass in a window, as well as see through the glass, when the Transparency of the glass Surface material is set to 50.

Toolbars



In this Chapter:

- Action buttons
- Help bar
- Info bar
- Layer bar
- Mode pop-up menu
- Status bar
- Display Options pop-up menu
- Relative View pop-up menu
- Relative View pop-up menu
- Clipping Plane pop-up menu
- Snap buttons
- 3D Axis pop-up menu
- 3D Plane pop-up menu
- View Options pop-up menu
- Zoom bar

Toolbars

The **DCAD VectorSpace** toolbars contain pop-up menus, shortcut buttons, and other controls. They provide quick access to commands, attributes, and settings. Toolbars also display information and let you enter values when you create and manipulate objects.

This chapter describes the following toolbars and controls:

Action buttons. A row of buttons on the Attributes bar. Action buttons provide shortcuts for most commands in the Object menu.

Attributes bar. A bar near the top of the screen that displays controls for attributes and also displays the Action buttons.

Display Options pop-up menu. A menu in the Status bar that lets you display selected objects and layers.

Extrusion format buttons. Three buttons in the Status bar that control the format for Linear and Sweep extrusions.

Help bar. A bar at the bottom of the screen that displays command and tool names, and gives feedback on procedures and the progress of operations.

Info bar. A bar near the top of the screen containing text boxes and the Coordinate System pop-up menu. The text boxes display coordinate information and let you enter drawing vector data.

Layer bar. A group of controls at the bottom of Draft and Sculpt windows that let you work with layers.

Mode pop-up menu. A menu at the bottom of all drawing windows that lets you change the window's mode to Draft, Sculpt, or Render.

Relative View pop-up menu. A menu in the Status bar that lets you activate and deactivate Relative Views.

Clipping Plane pop-up menu. A menu in the Status bar that lets you activate and deactivate clipping planes.

Snaps buttons. Two buttons in the Attributes bar that activate snap-to options.

Status bar. The current settings for several commands appear in the Status bar, and you can choose commands for layers, display modes, extrusion planes, and sectioning from its pop-up menus.

3D Plane & 3D Axis pop-up menus. Two menus in the Status bar (only one is visible at a time) that let you activate extrusion planes and axes.

View Options pop-up menu. A menu in the Status bar that lets you control what types of objects (2D & 3D) are displayed in Draft and Sculpt mode windows.

Zoom bar. A group of controls at the bottom of Draft, Sculpt, and Render mode windows that let you set zoom levels.

Action buttons

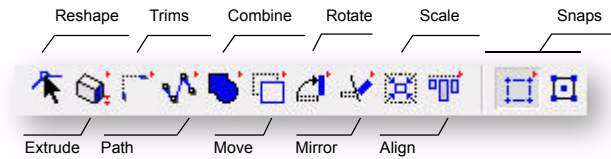


Figure 106.- The Action buttons toolbars

You can use the Action buttons in the Attributes bar as shortcuts for common object commands.

The Action buttons can be turned on and off using the Toolbars command in the Layout menu.

The Action buttons are grouped into toolbars. These toolbars act the same way as toolbars in the toolbox. A right-pointing red arrow in the upper right corner of an Action button indicates that it is part of a toolbar. You can drag from an Action button in a toolbar down to other Action buttons in the toolbar.

The following are the names of the Action button toolbars and the commands available in each:

Reshape . Reshape command.

Extrude toolbar. Linear, Spin, and Sweep commands.

Trims toolbar. Trimmer, Join, Chamfer, Extend, and Fillet commands.

Path toolbar. Convert to Polygon, Round, Offset, and Smooth commands.

Combine toolbar. Unite, Intersect, Punch from Front, Punch from Front and Trim, Punch from Back, and Punch from Back and Trim commands.

Move toolbar. Move, Move a Copy, and Linear Array commands.

Rotate toolbar. Rotate, Rotate a Copy, and Polar Array commands.

Mirror toolbar. Mirror and Mirror a Copy commands.

Scale. Scale command.

Align toolbar. The action buttons in the Align toolbar correspond to the alignment and distribution options in the Align palette.

The last command you chose in a toolbar occupies the home position in the toolbar. The Action buttons in the home position are the Action buttons you see without popping a toolbar out.

Align toolbar

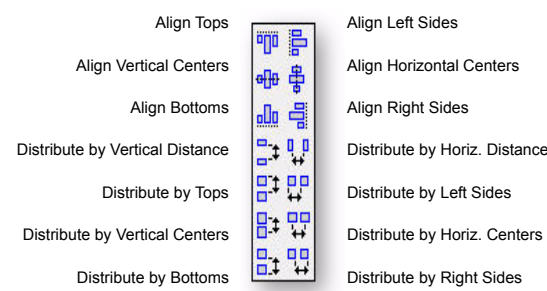


Figure 107.- The Align toolbar

To position objects in **DCAD VectorSpace**, use the Align action buttons. You can align objects horizontally or vertically. Or, you can distribute objects within a specified area. As the reference point for alignment and distribution, **DCAD VectorSpace** uses the objects' bounding rectangles.

You can also Align objects using the Alignment palette by choosing the Align command in the Object menu

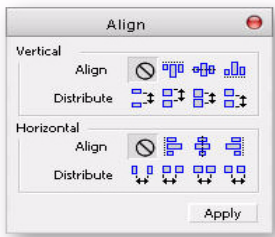


Figure 108.- Align Options Dialog

This table summarizes the vertical alignment and distribution options

Table 1: Vertical alignment and distribution options



















Option		Procedure	
	No Action	No action is taken to align or distribute objects vertically.	
		Note: .This button is available only on the Align Options Dialog that opens from the Objects Menu.	
	Top vertical alignment	To line up the tops of selected objects by moving them vertically on-screen, select this button. This lines up the top of each object along an invisible horizontal line that passes through the top of each object.	
	Centered vertical alignment	To line up the centers of selected objects by moving them vertically on-screen, select this button. This lines up the center of each object along an invisible horizontal line that passes through the center of each object.	
	Bottom vertical alignment	To line up the bottoms of selected objects by moving them vertically on-screen, select this button. This lines up the bottom of each object along an invisible horizontal line that passes through the bottom of each object.	

Table 1: Vertical alignment and distribution options (Continued)

Option		Procedure
	Inside vertical distribution	To equalize the space between the inside edges of selected objects by moving them vertically on-screen, select this button. This distributes the inside edges of the objects along invisible horizontal lines that pass through the inside edge of each object.
	Top vertical distribution	To equalize the space between the top edges of selected objects by moving them vertically on-screen, select this button. This distributes the inside edges of the objects along invisible horizontal lines that pass through the top edge of each object.
	Centered vertical distribution	To equalize the space between the centers of selected objects by moving them vertically on-screen, select this button. This distributes the centers of the objects along invisible horizontal lines that pass through the center of each object.
	Bottom vertical distribution	To equalize the space between the bottom edges of selected objects by moving them vertically on-screen, select this button. This distributes the bottom edges of the objects along invisible horizontal lines that pass through the bottom edge of each object.

This table summarizes the horizontal alignment and distribution options.

Table 2: Horizontal alignment and distribution options

Option		Procedure
	No Action	No action is taken to align or distribute objects horizontally. Note: .This button is available only on the Align Options Dialog that opens from the Objects Menu. 
	Left horizontal alignment	To line up the left sides of selected objects by moving them horizontally on-screen, select this button. This lines up the left side of each object along an invisible vertical line that passes through the left side of each object.
	Centered horizontal alignment	To line up the centers of selected objects by moving them horizontally on-screen, select this button. This lines up the center of each object along an invisible vertical line that passes through the center of each object.
	Right horizontal alignment	To line up right sides of selected objects by moving them horizontally on-screen, select this button. This lines up the right side of each object along an invisible vertical line that passes through the right side of each object.
	Inside horizontal distribution	To equalize the space between the inside edges of selected objects by moving them horizontally on-screen, select this button. This distributes the inside edges of the objects along invisible vertical lines that pass through the inside edge of each object.
	Left horizontal distribution	To equalize the space between the left edges of selected objects by moving them horizontally on-screen, select this button. This distributes the left edges of the objects along invisible vertical lines that pass through the left edge of each object.
	Centered horizontal distribution	To equalize the space between the centers of selected objects by moving them horizontally on-screen, select this button. This distributes the centers of the objects along invisible vertical lines that pass through the center of each object.
	Right horizontal distribution	To equalize the space between the right edges of selected objects by moving them horizontally on-screen, select this button. This distributes the right edges of the objects along invisible vertical lines that pass through the right edge of each object.

When you align or distribute selected objects, **DCAD VectorSpace** aligns or distributes the objects relative to each other using the objects' bounding rectangles.

- When you use the Align action buttons, you can apply one type of alignment or distribution at a time.

Combine toolbar

DCAD VectorSpace provides six buttons in the Combine toolbar: Intersect, Punch from Back, Punch from Back & Trim, Punch from Front, Punch from Front & Trim, and Unite (**figure 109**).

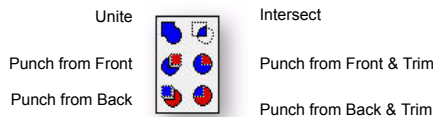


Figure 109.- Combine toolbar

Intersect button

The Intersect button executes the Intersect command. The Intersect command is in the Combine submenu in the Object menu.

By using the Intersect command, you can create a new object from the overlapping area of multiple objects. The parts of the objects outside the intersection are then hidden. The Intersect command is available in Draft and Sculpt modes only.

To execute the Intersect command: With two or more objects selected, select the Intersect button in the Combine toolbar. Or, click the Intersect button if it's in the home position.

See **Intersect**, page 95 for more information.

To use the Align action buttons

1. Select the objects you want to align.
2. Using the Align action buttons, choose how you want to align or distribute objects. **DCAD VectorSpace** aligns or distributes the objects in the manner you specify.

Punch from Back button

The Punch from Back button executes the Punch from Back command. The Punch from Back command is in the Combine submenu in the Object menu.

By using the Punch from Back command, you can take an object at the front of the stacking order and use it to “knock out” (or punch) a hole in all of the overlapping objects behind it.

When you use the Punch from Back command on Sculpt mode objects, it's often easier to see the results of the operation in Render mode.

To execute the Punch from Back command: With two or more objects selected, select the Punch from Back button in the Combine toolbar. Or, click the Punch from Back button if it's in the home position.

The Punch from Back command does not refer to “Back” view. It refers to taking an object at the front of the object creation order and using it to knock a hole through objects behind it.

See **Punch from Back**, page 96 for more information.

Punch from Back & Trim button

The Punch from Back & Trim button executes the Punch from Back & Trim command. The Punch from Back & Trim button is in the Combine submenu in the Object menu.

By using the Punch from Back & Trim command, you can use an object in the front of the stacking order to “knock out” a hole in all of the overlapping objects behind it.

When you use Punch From Back & Trim, **DCAD VectorSpace** doesn’t recall the original objects when you put the object in Reshape mode, because non-overlapping areas of the front object are “trimmed” to fit the shape of the punched object. If the front object completely overlaps all selected objects behind it, there is no difference between “Punch from Back” and “Punch from Back & Trim.”

When you use the Punch from Back & Trim command on Sculpt mode objects, it’s often easier to see the results of the operation in Render mode.

To execute the Punch from Back & Trim command: With two or more objects selected, select the Punch from Back & Trim button. Or, click the Punch from Back & Trim button if it’s in the home position.

The Punch from Back & Trim command does not refer to “Back” view. It refers to taking the object at the front of the stacking order, and using it to knock a hole in objects behind it.

See **Punch from Back & Trim**, page 97 for more information.

Punch from Front button

The Punch from Front button executes the Punch from Front command. The Punch from Front button is in the Combine submenu in the Object menu.

The Punch from Front command knocks holes in the object at the back of the stacking order using the objects in front. Unlike Punch from Back, which uses the front object to punch one hole through all objects behind it, Punch from Front can cut several holes from the back object.

When you use the Punch from Front command on Sculpt mode objects, it’s often easier to see the results of the operation in Render mode.

To execute the Punch from Front command: With two or more objects selected, select the Punch from Front button. Or, click the Punch from Front button if it’s in the home position.

The Punch from Front command has no relation to “Front” view. Rather, it refers to taking objects at the front of the object creation order and using them to knock holes through the object in the back of it.

See **Punch from Front**, page 98 for more information.

Punch from Front & Trim button

The Punch from Front & Trim button executes the Punch from Front & Trim command. The Punch from Front & Trim command is in the Combine submenu in the Object menu.

The “Punch from Front & Trim” command knocks holes in the object at the back of the stacking order using the objects in the front, similar to “Punch from Front.” However, unlike “Punch from Front,” areas

that don't overlap the back object are permanently deleted, and cannot be recalled in Reshape mode.

If all objects in front completely overlap the back object, there is no difference in operation between "Punch from Front & Trim" and "Punch from Front."

When you use this command on Sculpt mode objects, it's often easiest to see the results of the operation in Render mode.

To execute the Punch from Front & Trim command: With two or more objects selected, select the Punch from Front & Trim button. Or, click the Punch from Front & Trim button if it's in the home position.

The Punch from Front & Trim command does not refer to "Front" view. Rather, it refers to taking objects at the front of the object creation order and using them to knock holes through the object in the back of it.

See for information.

Unite button

The Unite button executes the Unite command. The Unite command is in the Combine submenu in the Object menu.

By choosing the Unite command, you can create a new object from the outline of multiple selected objects.

The Unite command provides a simple and powerful way to create complex shapes. After uniting objects, they become one, composite object that you can move, resize, edit and offset as a single object.

To execute the Unite command: With two or more objects selected, select the Unite button. Or, click the Unite button if it's in the home position.

See **Unite**, page 101 for more information.

Extrude toolbar

DCAD VectorSpace provides three buttons in the Extrude toolbar: Linear Extrude, Spin Extrude, and Sweep Extrude. The Extrusion button that occupies the home position of the Extrude toolbar is the active extrusion method (**figure 110**).

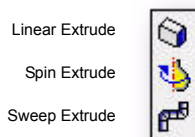


Figure 110.- The Extrude toolbar

Linear Extrude button

The Linear Extrude button performs one of three operations: executes the Linear command, changes the active extrusion method, or opens the Extrude Options dialog box. The operation the Linear Extrude button performs depends on how you use it.



To execute the Linear command in Draft mode:

Select the Linear Extrude button with objects selected. Or, click the Linear Extrude button if it's in the home position. This operation

extrudes the selected objects using the Linear extrusion method.

To activate the Linear extrusion method in Draft mode: Select the Linear Extrude button with no objects selected.

To activate the Linear extrusion method in Sculpt mode: Select the Linear Extrude button.

To open the Extrude Options dialog box: Double-click the Linear Extrude button. The Extrude Options dialog box appears with the Linear tab in front.

See **Extrude submenu**, page 104 for more information about the Linear extrusion method.

Spin Extrude button

The Spin Extrude button performs one of three operations: executes the Spin command, changes the active extrusion method, or opens the Extrude Options dialog box. The operation the Spin Extrude button performs depends on how you use it.



To execute the Spin command in Draft mode:

Select the Spin Extrude button with objects selected. Or, click the Spin Extrude button if it's in the home position. This operation extrudes the selected objects using the Spin extrusion method.

To activate the Spin extrusion method in Draft mode: Select the Spin Extrude button with no objects selected.

To activate the Spin extrusion method in Sculpt mode: Select the Spin Extrude button.

To open the Extrude Options dialog box: Double-click the Spin Extrude button. The Extrude Options dialog box appears with the Spin tab in front.

See **Extrude submenu**, page 104 for more information about the Spin extrusion method.

Sweep Extrude button

The Sweep Extrude button performs one of three functions: executes the Sweep command, changes the active extrusion method, or opens the Extrude Options dialog box. The operation the Sweep extrude button performs depends on how you use it.



To execute the Sweep command in Draft mode:

Select the Sweep Extrude button with a sweep path selected.

To activate the Sweep extrusion method in Draft mode: Select the Sweep Extrude button with no objects selected.

To activate the Sweep extrusion method in Sculpt mode: Select the Sweep Extrude button.

To open the Extrude Options dialog box: Double-click the Sweep Extrude button. The Extrude Options dialog box appears with the Sweep tab in front.

See **Extrude submenu**, page 104 for more information about the Sweep extrusion method.

Mirror toolbar

The buttons in the Mirror toolbar let you apply Mirror commands to selected objects in Draft and Sculpt modes.

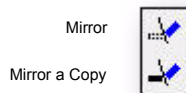


Figure 111.- The Mirror toolbar

Mirror button

The Mirror button executes the Mirror command. The command is also available in the Position submenu in the Object menu.

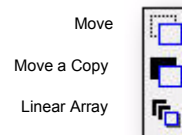


The Mirror command flips selected objects up to 180 degrees over an axis that you draw. You can set the mirror axis anywhere, and use the Snaps pop-up menu to constrain the axis.

For more information about the Mirror command, see **Mirror**, page 121.

Move toolbar

The buttons in the Move toolbar let you apply Position submenu commands to selected objects in Draft and Sculpt modes.



To apply the Mirror command: Select the Mirror button when objects you want to mirror are selected. Or, click the Mirror button when it appears in the Mirror toolbar's home position.

Mirror a Copy button

The Mirror a Copy button executes the Mirror a Copy command. The command is also available in the Position submenu in the Object menu.



The Mirror a Copy command flips copies of selected objects up to 180 degrees over an axis that you draw. You can set the mirror axis anywhere, and use the Snaps pop-up menu to constrain the axis.

See **Mirror a Copy**, page 122 for more information about the Mirror a Copy command.

To apply Mirror a Copy: Select the Mirror a Copy button when objects you want to mirror are selected. Or, click the Mirror a Copy button when it appears in the Mirror toolbar's home position.

Linear Array button

The Linear Array button executes the Linear Array command. The command is also available in the Position submenu in the Object menu.



The Linear Array command makes evenly spaced copies of a selected object. You can specify the number of copies. You use the drawing vector to set the distance between copies, or the total distance from the original.

See **Linear Array**, page 120 for more information about the Linear Array command.

To apply the Linear Array command: Select the Linear Array button when objects you want to array are selected. Or, click the Linear Array button when it appears in the Move toolbar's home position.

Move button

The Move button executes the Move command. The command is also available in the Position submenu in the Object menu.



Path toolbar

The buttons in the Path toolbar let you apply Path submenu commands.

The Move command repositions selected objects. While you can drag objects with the Selection tool to move them, the Move command lets you specify movement numerically and with the mouse.

See **Move**, page 123 for more information about the Move command.

To apply the Move command: Select the Move button when objects you want to move are selected. Or, click the Move button when it appears in the Move toolbar's home position.

Move a Copy button

The Move a Copy button executes the Move a Copy command. The command is also available in the Position submenu in the Object menu.



The Move a Copy command copies selected objects to the location you specify, relative to the original objects.

See **Move a Copy**, page 123 for more information.

To apply Move a Copy: Select the Move a Copy button when objects you want to copy and move are selected. Or, click the Move a Copy button when it appears in the Move toolbar's home position.

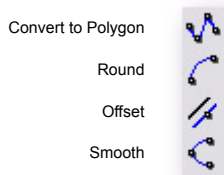


Figure 113.- The Path toolbar

Convert to Polygon button

The Convert to Polygon button executes the Convert to Polygon command. The command is also available in the Path submenu in the Object menu.



The Convert to Polygon command creates a polygon from selected objects. This operation removes an object's creation points, and lets you edit the object by moving its segment endpoints.

Curved shapes are converted to segments based on settings in the Preferences dialog box. A higher number of segments makes curves appear smoother, because shorter segments result when you apply the Convert to Polygon command.

See **Convert To Polygon**, page 117 for more information.

To apply the Convert to Polygon command:

Select the Convert to Polygon button when object you want to convert are selected. Or, click the Convert to Polygon button when it appears in the Path toolbar's home position.

Offset button

The Offset button executes the Offset command. The command is also available in the Path submenu in the Object menu.



The Offset command offsets the path of a 2D object to create parallel polylines. The Offset command is not available in Sculpt and Render modes.

See **Offset**, page 117 for more information for more information about the Offset command.

To execute the Offset command: Select the Offset button when a 2D object is selected. Or, click the Offset button when it appears in the Path toolbar's home position.

Round button

The Round button executes the Round command. The command is also available in the Path submenu in the Object menu.



The Round command changes a 2D object's sharp corners to rounded corners. You can apply the Round command to any object that has at least one vertex. Rounding converts an object to a polyline or polygon (which eliminates specific object properties the object might have had).

The Round command is not available in Sculpt and Render modes. See **Round**, page 118 for more information about the Round command.

To apply the Round command: Select the Round button when a 2D object is selected. Or, click the Round action button when it appears in the Path toolbar's home position.

Smooth button

The Smooth button executes the Smooth command. The command is also available in the Path submenu in the Object menu.



The Smooth command changes polygons and polylines to B-spline curves. The command can be applied to any object that has at least one vertex.

Although you can use the Smooth command on shapes that contain curves, the “smoothing” effect is

more pronounced on shapes that have sharp corners. Smoothing a curved object converts the object to a polyline or polygon, which removes any special properties of the original object.

The Smooth command is not available in Sculpt and Render modes. See **Smooth**, page 119 for more information about the Smooth command.

To apply the Smooth command: Select the Smooth button when a 2D object you want to smooth is selected. Or, click the Smooth button when it appears in the Path toolbar’s home position.

Reshape button

The Reshape button executes the Reshape command, which puts selected objects into reshape mode.



In Reshape mode, an object’s creation points appear as handles that you can drag to reshape the object.

See **Reshape**, page 109 for more information about the Reshape command.

To apply the Reshape command: Click the Reshape action button when an object you want to reshape is selected.

Rotate toolbar

The buttons in the Rotate toolbar let you apply rotation commands to selected objects.

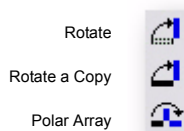


Figure 114.- The Rotate toolbar

Polar Array button

The Polar Array button executes the Polar Array command. The command is also available in the Position submenu in the Object menu.



The Polar Array command copies objects and places the copies in radial arrangements. See **Polar Array**, page 124 for more information about the Polar Array command.

To apply the Polar Array command: Select the Polar Array button when objects you want to copy are selected. Or, click the Polar Array but-

ton when it appears in the Rotate toolbar's home position.

Rotate button

The Rotate button executes the Rotate command. The command is also available in the Position submenu in the Object menu.



The Rotate command rotates selected objects by the amount you specify. See **Rotate**, page 125 for more information about the Rotate command.

To apply the Rotate command: Select the Rotate button when the objects you want to rotate are selected Or, click the Rotate button when it is in the Rotate toolbar's home position.

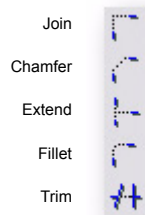
Scale button

The Scale button executes the Scale command. The command is also available in the Object menu.



The Scale command lets you resize selected objects relative to their original sizes. See **Scale**, page 127 for more information.

Trims toolbar



Rotate a Copy button

The Rotate a Copy button executes the Rotate a Copy command. The command is also available in the Position submenu in the Object menu.



The Rotate a Copy command rotates copies of selected objects. See **Rotate a Copy**, page 126 for more information about the Rotate a Copy command.

To apply Rotate a Copy: Select the Rotate a Copy button when objects you want to copy and rotate are selected. Or, click the Rotate a Copy button when it appears in the Rotate toolbar's home position.

To execute the Scale command: Click the Scale button when objects you want to scale are selected.

Figure 115.- The Trim toolbar

DCAD VectorSpace provides five buttons in the Trims toolbar: Trim, Join, Chamfer, Extend, and Fillet.

Chamfer button

The Chamfer button executes the Chamfer command. The Chamfer command is in the Trim submenu in the Object menu.



The Chamfer command lets you connect two non parallel lines by joining them together with an angled line.

You can chamfer lines that don't touch, or lines that intersect.

You can also use the Chamfer command to chamfer the corners of a rectangle. You can chamfer rectangles drawn with the Rectangle Diagonal, Rectangle Center to Corner, or Rectangle 3 Points tool.

When you select the Chamfer command, the Chamfer dialog box opens. You can configure the chamfer settings using this dialog box.

To execute the Chamfer command: Select the Chamfer button with or without objects selected. Or, click the Chamfer button if it's in the home position.

The Chamfer command is not available in Sculpt or Render modes. See **Chamfer**, page 128 for more information.

Trim button

The Trim button executes the Trim command. The Trim command is in the Trims submenu in the Object menu.

The Trim command clips, or trims, objects so they end at the cutting edge defined by other objects.

The Trim command is not available in Sculpt and Render modes.

To execute the Trim command: Select the cutting edges and then specify the objects to trim or clip, trimming them in sequence.

See **Trim**, page 132 for more information.

Extend button

The Extend button executes the Extend command. The Extend command is in the Trim submenu in the Object menu.



You can use the Extend command to lengthen or shorten a line so that it meets another line. The lines can be two ends of the same open-sided object, or two separate lines. **DCAD VectorSpace** extends each line so that they meet, but does not combine them into one object.

You cannot use this command on two parallel lines, closed objects, or parallel polylines. You can use this command on lines that intersect.

When two lines do not meet, **DCAD VectorSpace** lengthens the first line you click until it meets the other line.

When two lines intersect, **DCAD VectorSpace** trims the first line you click to meet the other line.

Additionally, you can use the Extend command to divide a line into separate line segments. The line you want to divide intersects with the line that divides it.

The Extend command is not available in Sculpt and Render modes.

To execute the Extend command: Select the Extend button with or without objects selected. Or, click the Extend button if it's in the home position.

See **Extend**, page 130 for more information.

Fillet button

The Fillet button executes the Fillet command. The Fillet command is in the Trim submenu in the Object menu.



The Fillet command creates a convex round line join between two lines. The lines can be two ends of the same open-sided object, or two separate lines. You can set the radius of the rounded corner; if necessary, **DCAD VectorSpace** extends the lines so they can form the specified corner. The objects are combined into one object.

You cannot use this command on two parallel lines, closed objects, or parallel polylines.

The Fillet command is not available in Sculpt and Render modes.

To execute the Fillet command: Select the Fillet button with or without objects selected. Or, click the Fillet button if it's in the home position.

See **Fillet**, page 131 for more information.

Join button

The Join button executes the Join command. The Join command is in the Trim submenu in the Object menu.



The Join command connects two lines by extending or trimming them until they meet at a vertex. The lines can be two ends of the same open-sided object, or two separate lines. **DCAD VectorSpace** extends each line so that they meet, but does not combine them into one object.

You cannot use this command on two parallel lines, closed objects, or parallel polylines.

The Join command is not available in Sculpt and Render modes.

To execute the Join command: Select the Join button with or without objects selected. Or, click the Join button if it's in the home position.

See **Join**, page 131 for more information.

Snap buttons

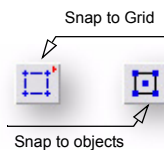


Figure 116.- Snap buttons on the Attributes bar

Snap to Grid button

You can use the Snap Grid button to execute the Snap to Grid command and the Grid Setup command.



To execute the Snap to Grid command: Click the Snap Grid button.

The Snap to Grid command restricts the movement of the drawing vector to the dots in the grid, even if

the grid is not visible. By contrast, when Snap to Grid is not active, the drawing vector moves freely even if the grid is visible. When you open a new document, **DCAD VectorSpace** activates Snap to Grid by default.

The Snap to Grid command is also available in the Snaps submenu in the Layout menu. See **Snap to Grid**, page 100 for more information.

To choose a grid setup

1. Press the Snap Grid button.
2. Choose a grid measurement in the pop-up menu.

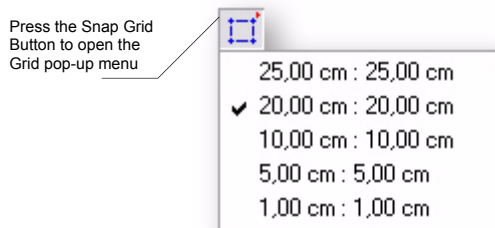


Figure 117.- Grid selection menu

Help bar

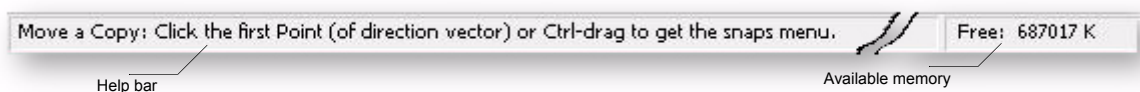


Figure 118.- Help bar

The Help Bar displays several types of useful information. If you point to a command in a menu, or a tool icon in the toolbox, information about the command or tool appears in the Help bar. The Help Bar also displays the amount of free system memory available to **DCAD VectorSpace**.

The Grid Setup command, which lets you set up grid measurements, is available in the Layout menu. See **Grid Setup**, page 95 for more information.

Snap to Objects button

You can use the Snap to Objects button to execute the Snap to Objects command.



To execute the Snap to Objects command:

Click the Snap to Objects button.

The Snap to Objects command restricts the movement of the drawing vector and can snap the outlines of objects to the grid points.

The Snap to Objects command is also available in the Snaps submenu in the Layout menu. See **Snap to Objects**, page 100 for more information.

To display or hide the Help bar, use the Toolbars command in the Layout menu. For more information, see **Toolbars**, page 120.

Info bar

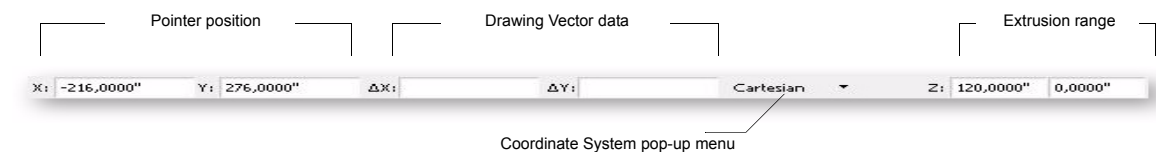


Figure 119.- Parts of the Info bar

The Info Bar displays the location of the pointer, the distance and direction an object has been moved, the active coordinate system, and the range of the active set of extrusion planes.

You can also use the Info Bar to create objects by typing their creation points.

The information in the Info Bar is constantly changing as you change modes and views, move the pointer, and move objects. For example, the illustration below displays the Info Bar as it appears in Top view, with the Cartesian coordinate system and a custom set of extrusion planes active.

Coordinate System pop-up menu

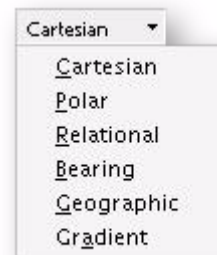


Figure 120.- Coordinate System pop-up menu

The Coordinate System pop-up menu displays the active coordinate system. You can use the pop-up menu to select a new coordinate system.

The coordinate system you choose affects the labels of the text boxes in the Info Bar.

DCAD VectorSpace offers six coordinate systems: Cartesian, Polar, Relational, Bearing, Geographic, and Gradient.

Drawing Vector data

These two text boxes display information for the drawing vector. This information can be displayed in many ways depending on the active coordinate system.

Extrusion range

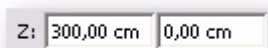


Figure 121.- Extrusion range

The extrusion range text boxes display the coordinates of the first and second extrusion planes. The extrusion planes define extrusion depth for linear extrusions.

Layer bar

You can use the Layer bar at the bottom of the active window to maneuver through the layer structure and open the Layer Manager.

The Layer bar is made up of the Layer pop-up menu in the center, with a Previous Layer button on the left, and a Next Layer button on the right.

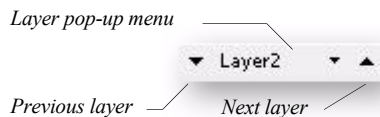


Figure 123.-

The values displayed in the text boxes change when you activate a new set of extrusion planes. If one of the current extrusion planes is inclined, the values change when you move the pointer because **DCAD VectorSpace** displays the extrusion range based on the pointer's position.

Pointer position

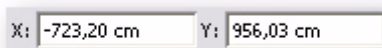


Figure 122.- Pointer position

The first two text boxes at the left end of the Info bar display the current pointer coordinates. Depending on the active coordinate system, the pointer position can be displayed as a coordinate position, or as a distance and angle from the Centerpoint. The text boxes' labels also reflect the current coordinate system.

Clicking the Previous Layer button activates the next lower layer in the layer structure. Clicking the Next Layer button activates the next higher layer. If the layer you activate is not visible based on the setting in the Layer Manager, the layer becomes visible.

You can use the Layer buttons and pop-up menu the same way in Draft and Sculpt modes.

The Layer pop-up menu

The Layer pop-up menu displays the layer's in the current layer structure. If a layer name is too long to fit in the pop-up menu, **DCAD VectorSpace** displays the beginning of the layer's name.

Open the pop-up menu to activate a layer, or choose the Layer Manager command.

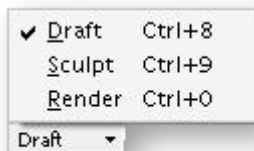
Pressing Ctrl+L (Windows) or Cmd+L (Mac OS) also opens the Layer Manager.



Figure 124.- The Layer pop-up menu

Mode pop-up menu

You can use the Mode pop-up menu at the bottom of an active document window to change the mode of the document window. The Mode pop-up menu is available in Draft, Sculpt, and Render mode windows.



The Mode pop-up menu displays the mode of the active document window.

To change to Draft mode: Choose the Draft command in the Mode pop-up menu, press Ctrl+8 (Windows) or Cmd+8 (Mac OS). The document window changes to Draft mode.

To change to Sculpt mode: Choose the Sculpt command in the Mode pop-up menu press Ctrl+9 (Windows) or Cmd+9 (Mac OS). The document window changes to Sculpt mode.

To change to Render mode: Choose the Render command in the Mode pop-up menu press Ctrl+0 (Windows) or Cmd+0 (Mac OS). The document window changes to Render mode.

In **DCAD VectorSpace**, changing modes changes the tools available in the toolbox, as well as which menu commands are available.

Using multiple windows set to the same mode

You can use the Mode pop-up menu if you want to have more than one Draft, Sculpt, or Render window

open at one time. By choosing a mode from a window's mode pop-up menu, you change the mode of that window, and the mode in which you are working, without affecting other open windows.

If you change the mode of any open windows, the Hide commands in the Window menu will correspond to the modes of the open windows. In other words, if there are three Sculpt mode windows open, the three commands at the top of the Window menu will be Hide Sculpt commands.

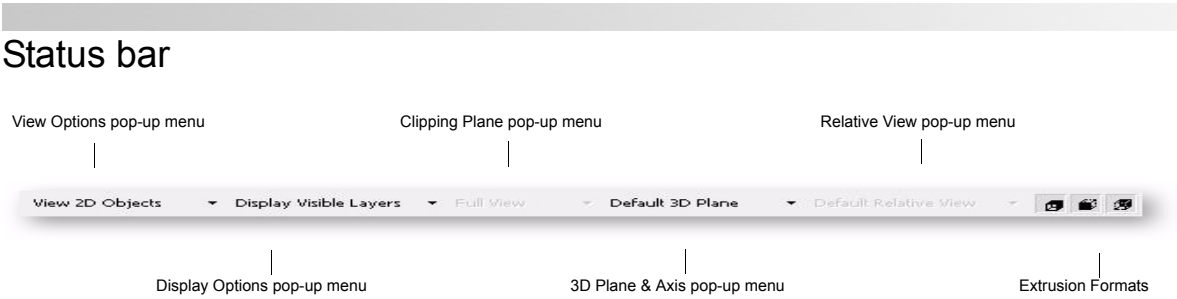


Figure 125.- The Status Bar

You can use the pop-up menus in the Status Bar to change the way **DCAD VectorSpace** displays your work, and the way you create objects. You can activate and deactivate extrusion planes, clipping planes, Relative Views, and extrusion formats.

The Status Bar also displays the status of these features. You can tell at a glance what extrusion planes, views, and formats are active.

You can display the Status Bar or remove it from the screen with the Toolbars command in the Layout menu; see **Toolbars**, page 120

This section describes basic features of the pop-up menus and buttons in the Status Bar in alphabetical order. For more information on commands, refer to the command descriptions in the menu commands chapters.

Display Options pop-up menu

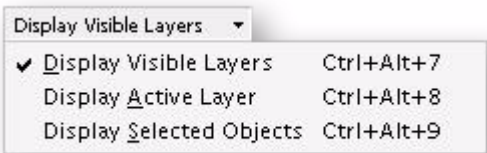


Figure 126.- Display Options pop-up menu

The commands in the Display Options pop-up menu let you set what layers and objects are visible. These commands are also available in the Layout menu.

Display Visible Layers: Displays the objects on visible layers.

Display Active Layer: Displays only the objects on the active layer.

Display Selected Objects: Displays selected objects only.

- Display Visible Layers, Display Active Layer, and Display Selected Objects are mutually exclusive. If you activate one of these commands, **DCAD VectorSpace** deactivates the other two.
- When you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if Display Visible Layers, Display Active Layer, or Display Selected Objects is in effect. If so, one of these commands appears in the Display Options pop-up menu.

Display Visible Layers

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+7
Windows Shortcut: Ctrl+Alt+7

The Display Visible Layers command displays objects on visible layers in the active document window only. To specify visible layers, use the Layer Manager.

Extrusion Format buttons

The Extrusion Format buttons give you control over which elements of 3D objects are created when you perform Linear or Sweep extrusions. The Extrusion Format buttons do not affect Spin extrusions.



When you extrude 2D objects to create 3D objects, you create objects with sides, a front face, and a back face. You can use the Extrusion Formats to create 3D objects with all or some of these elements.

See **Display Visible Layers**, page 92 for more information.

Display Active Layer

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+8
Windows Shortcut: Ctrl+Alt+8

This command displays objects on the active layer only; it affects the active document window only.

See **Display Active Layer**, page 92 for more information.

Display Selected Objects

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+9
Windows Shortcut: Ctrl+Alt+9

This command displays selected objects on visible layers only; it affects the active document window only.

For example, if you turn off the Front Cap Extrusion Format, all objects you extrude will have sides and a back face, but not a front face.

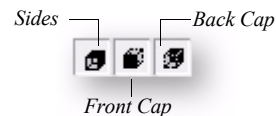


Figure 127.- Extrusion Formats

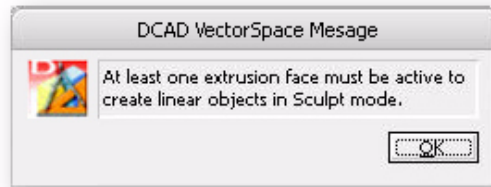
Sides. Objects created with this Extrusion Format deactivated do not contain sides.

For example, a rectangle you extrude when this Extrusion Format is not selected will have a front face and back face only, with no sides.

Front Cap. Objects created when this Extrusion Format is selected have a front face.

Back Cap. Objects created when this Extrusion Format is selected have a back face.

Note: If you attempt to extrude objects when all three Extrusion Formats are deselected, **DCAD VectorSpace** displays a message.



Click OK to close the message box. Activate at least one extrusion format before extruding again.

See **Display Selected Objects**, page 93 for more information.

Relative View pop-up menu

The commands in the Relative View pop-up menu let you select Relative Views, saved Relative Views, and the Default Relative View.

Custom Relative View

Mode: Sculpt

Custom Relative View appears as the last Relative View you defined, even if you didn't save it using the Save Relative View command.

Until you define a Relative View, Custom Relative View won't appear in the Relative View pop-up menu. If you save a Relative View, Custom Relative View disappears.

Custom Relative View reappears when you define another Relative View.

In addition, when you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if Custom Relative View is active. If so, Custom Relative View appears in the Relative View pop-up

menu. See **Custom Relative View**, page 92 for more information.



Default Relative View

Mode: Sculpt

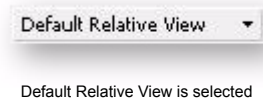
Mac OS Shortcut: Cmd+Opt+Shift+S

Windows Shortcut: Ctrl+Alt+Shift+S

The Default Relative View command selects the Default Relative View. The Default Relative View command appears in the Relative View pop-up menu when you select it, or until you define a Relative View.

In addition, when you activate a Sculpt mode window, **DCAD VectorSpace** shows you if the Default Relative View command is active. If so, Default Relative View appears in the Relative View pop-up

menu. See **Default Relative View**, page 92 for more information.



Selecting Relative Views

In **DCAD VectorSpace**, there's always a Relative View active; it can be the Default Relative View, Custom Relative View or a saved Relative View. Once you save a Relative View, it appears in the Relative View pop-up menu. You can select Relative Views in the Relative View pop-up menu.

The names of saved Relative Views appear in the pop-up menu on the Status bar.

Clipping Plane pop-up menu

The Clipping Plane pop-up menu commands allow you to activate and deactivate defined clipping planes. The Clipping Plane pop-up menu shows whether a sectioned view is active, or if the full project is visible.

Full View

Modes: Sculpt, Render
Mac OS Shortcut: **Cmd+[**
Windows Shortcut: **Ctrl+[**

You can use the Full View command to deactivate a clipping plane. Once a clipping plane is deactivated, you can reactivate it at any time using the Sectioned View command. This command works the same way in Sculpt mode and Render mode. This command is also available in the Clipping Planes submenu in the

View menu. See **Full View**, page 90 for more information.

Sectioned View

Modes: Sculpt, Render
Mac OS Shortcut: **Cmd+]**
Windows Shortcut: **Ctrl+]**

You can use the Sectioned View command to activate a defined clipping plane. Once a clipping plane is activated, you can deactivate it using the Full View command.

This command works the same in Sculpt and Render mode. This command is also available in the Clipping Planes submenu in the View menu. See **Sectioned View**, page 91 for more information.

3D Axis pop-up menu

The commands in the 3D Axis pop-up menu allow you to activate and deactivate spin extrusion axes. This menu also displays which spin extrusions axis is active in the current a view.

These commands are available only when the Spin extrusion method is selected.

Custom 3D Axis. Appears as the last spin extrusion axis you set, whether or not it was saved.

Default 3D Axis. Lets you select the default spin extrusion axis.

Custom 3D Axis

Modes: Draft, Sculpt

Custom 3D Axis appears as the last spin extrusion axis you created in the current view, if you didn't save it using the Save 3D Axis command.

Until you create a spin extrusion axis, Custom 3D Axis doesn't appear in the 3D Axis pop-up menu. If you save a spin extrusion axis, the command disappears from the 3D Axis pop-up menu.

When you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if the last spin extrusion axis you defined (but didn't save) is active. When it is, "Custom 3D Axis" appears in the 3D Axis pop-up menu. See **Custom 3D Axis**, page 102 for more information.

Default 3D Axis

Modes: Draft, Sculpt

Mac OS Shortcut: Cmd+Shift+O

Windows Shortcut: Ctrl+Shift+O

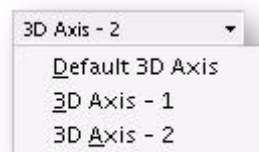
The Default 3D Axis command selects the default spin extrusion axis in the current view. In new **DCAD VectorSpace** documents, the default spin extrusion axis passes through the Absolute Origin, which is the default Centerpoint for new documents. The Default 3D Axis command appears in the 3D Axis pop-up menu the first time you select the spin extrusion method in a view.

The first time you select the Spin extrusion method, **DCAD VectorSpace** activates Default 3D Axis in the 3D Axis pop-up menu.

In addition, when you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if Default 3D Axis is active. When it is, Default 3D Axis appears in the 3D Axis pop-up menu. See **Default 3D Axis**, page 102 for more information.

Selecting a 3D Axis

Before you select a saved spin extrusion axis, make sure you're in the correct view. The correct view is the view in which you defined the spin extrusion axis. In each view, the names of saved spin extrusion axes appear in the 3D Axis pop-up menu on the Status bar.



Saved spin extrusion axes appear in the 3D Axis pop-up menu

3D Plane pop-up menu

The 3D Plane pop-up menu commands let you to activate and deactivate defined extrusion planes. The menu also indicates which set of extrusion planes is active in the current view.

The 3D Plane pop-up menu commands are available when the Linear or Sweep extrusion method is active.

Custom 3D Plane. Appears as the last set of extrusion planes defined in the current view, if you didn't save it.

Default 3D Plane. Activates the default set of extrusion planes for the current view.

Selecting extrusion planes

In each view, the names of saved sets of extrusion planes appear in the 3D Plane pop-up menu.

If a saved set of extrusion planes is active in a view, its name appears in the 3D Plane pop-up menu.

Custom 3D Plane

Modes: Draft, Sculpt


Custom 3D Plane represents the last set of extrusion planes you created in the current view, if you didn't save the set using the Save 3D Plane command.

Until you define a set of extrusion planes, Custom 3D Plane doesn't appear in the 3D Plane pop-up

menu. If you save a set of extrusion planes, the command disappears from the 3D Plane pop-up menu.

In addition, when you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if the set of extrusion planes you defined last (but didn't save) is active. When this set is active, "Custom 3D Plane" appears in the 3D Axis pop-up menu.

In each view, Custom 3D Plane is available after you've defined a set of extrusion planes using Define Frontal 3D Plane, Define Lateral 3D Plane, or Define Vertical 3D Plane. See **Custom 3D Plane**, page 111 for more information.



Custom 3D Plane is selected

Default 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+O
Windows Shortcut: Ctrl+Shift+O

For each view in **DCAD VectorSpace**, you can select the default set of extrusion planes by choosing Default 3D Plane in the 3D Plane pop-up menu.

When the default set of extrusion planes is selected, "Default 3D Plane" appears in the 3D Plane pop-up menu. See **Default 3D Plane**, page 111 for more information.

View Options pop-up menu

Commands in the View Options pop-up menu control which types of objects are visible in Draft and Sculpt modes. These commands are also available in the View options submenu in the View menu.

In both Draft and Sculpt modes, you can display 2D objects only, or 2D and 3D objects. You can also display both object types and lock one type or the other, depending on the mode of the active window: In Draft mode, you can lock 3D objects (when you display both 2D and 3D objects). In Sculpt mode, you can lock 2D objects (when you display both 3D and 2D objects).

View 2D & 3D Objects

Modes: Draft
Mac OS Shortcut: Cmd+Opt+5
Windows Shortcut: Ctrl+Alt+5

To display 2D and 3D objects at the same time, choose View 2D & 3D Objects in the View Options pop-up menu. See **View 2D & 3D Objects**, page 98 for more information.

View 2D & Lock 3D Objects

Modes: Draft
Mac OS Shortcut: Cmd+Opt+6
Windows Shortcut: Ctrl+Alt+6

The View 2D & Lock 3D Objects command locks 3D objects in addition to displaying them. You can't move, delete, or edit locked objects. This helps to prevent accidental changes. To do this, choose View 2D & Lock 3D Objects in the View Options pop-up menu.

See **View 2D & Lock 3D Objects**, page 99 for more information.

View 2D Objects

Mode: Draft
Shortcut: Command+Option+4

To view 2D objects only, choose View 2D Objects in the View Options pop-up menu. See **View 2D Objects**, page 98 for more information.

View 3D & 2D Objects

Modes: Sculpt
Mac OS Shortcut: Cmd+Opt+5
Windows Shortcut: Ctrl+Alt+5

To display 3D and 2D objects at the same time, choose View 3D & 2D Objects in the View Options pop-up menu. See **View 2D & 3D Objects**, page 98 for more information.

View 3D & Lock 2D Objects

Modes: Sculpt
Mac OS Shortcut: Cmd+Opt+6
Windows Shortcut: Ctrl+Alt+6

The View 3D & Lock 2D Objects command locks 2D objects in addition to displaying them. You can't move, delete, or edit locked objects. This helps to prevent accidental changes. To do this, choose View 3D & Lock 2D Objects in the View Options pop-up menu.

See **View 3D & Lock 2D Objects**, page 100 for more information.

View 3D Objects

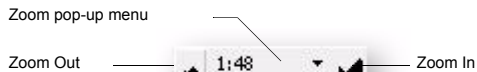
Modes: Sculpt
Mac OS Shortcut: Cmd+Opt+4
Windows Shortcut: Ctrl+Alt+4

To view 3D objects only, choose View 3D Objects in the View Options pop-up menu. See **View 3D Objects**, page 99 for more information.

Zoom bar

You can use the Zoom bar at the bottom of the active window to change the magnification (zoom) level. The Zoom bar is available in Draft and Sculpt modes, and when the Isometric Render tool is selected in Render mode.

The Zoom pop-up menu is located in the center of the Zoom bar. The Zoom bar also contains a Zoom Out button to the left of the Zoom bar and a Zoom In button on the right of the pop-up menu.



To reduce the zoom level by half: Click the Zoom Out button.

To double the zoom level: Click the Zoom In button.

In Render mode, you must select the Isometric Render tool in the toolbox before you can use the Zoom bar. The Zoom bar is not available in Render mode when the Perspective Render tool is selected.

The Zoom pop-up menu

The Zoom pop-up menu displays the current zoom level. The zoom level appears as a percentage, or as a ratio if the Zoom by Scale option in the Preferences dialog box is selected.

Open the pop-up menu to select a zoom level or a zoom view command. The Zoom pop-up menu contains the following items:

The Home View command (Command+Option+U). This command centers the drawing at 100% magnification at the default Absolute Origin.

The Fit to Page command. This command changes the zoom level to the maximum level at which the defined printing area fills the window. You can define the printing area using the Set Print Area command in the File menu. The default printing area is centered on the Absolute Origin. When you choose this command, **DCAD VectorSpace** also activates the Show Page Breaks command.

The Fit to Window command (Command+Option+W). This command reduces or increases the zoom level to the maximum zoom

level at which the visible objects in the document fill the window.

The Zoom In Command (+ -- Plus). Magnifies the window content to the next higher level in the preset zoom levels list.

The Zoom Out Command (- -- Minus). Reduces the window content to the next Lower level in the preset zoom levels list.

The Pan Command (* -- Asterisk). Invokes the window pan command.

The Save Zoom command. This command saves zoom levels.

The Delete Zoom command. This command deletes saved zoom levels.

Preset zoom levels from 1,600% to 6.2%. These zoom levels are displayed as percentages, or as ratios if you select the Zoom by Scale option in the Preferences dialog box.

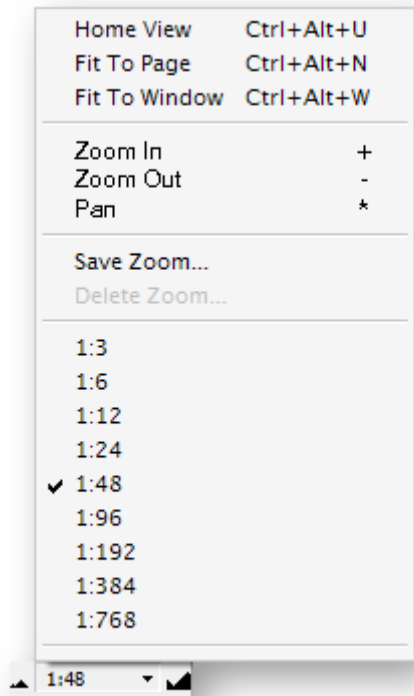


Figure 128.- Zoom pop-up menu

Zoom levels

When you create a new document, **DCAD VectorSpace** defaults to 100% zoom level. At this zoom level, objects appear on screen at actual scaled size.

The range of available zoom levels depends on the scale that has been set for the drawing. For example, at 1:100 scale, you can set the zoom level from .2% to 1,000,000%.

You can change the zoom level using the zoom buttons, preset zoom levels in the Zoom pop-up menu,

and the Zoom tool. Each window maintains its own zoom level independently of other windows.

If the Panned Zoom option is selected in the Preferences dialog box, when you zoom in, **DCAD VectorSpace** displays a rectangle that corresponds to the visible area after magnification. Move

the pointer to position the rectangle, and then click to complete the zoom.

DCAD VectorSpace saves the zoom level with a document and reopens a document at the saved zoom level.

Saving custom zooms

You can save custom zoom levels. You can return to a saved custom zoom by choosing it from the Zoom pop-up menu.

This feature makes it simple to use non-preset zoom levels.

To save a custom zoom

1. Choose the Save Zoom command in the Zoom pop-up menu. The Save Zoom dialog box opens.
2. Type the custom zoom value as a percentage or as a ratio if the Zoom by Scale option is selected in the Preferences dialog box. **DCAD VectorSpace** zooms to the percentage or ratio that you typed.
3. Click OK. The Save Zoom dialog box closes. **DCAD VectorSpace** adds the custom zoom to the bottom of the Zoom pop-up menu.

DCAD VectorSpace saves custom zooms with the document. The same custom zooms are available when the document they were created in is reopened. Custom zooms for a document are available in all windows and at all times that the Zoom bar is available.

To delete a custom zoom

1. Select the custom zoom that you want to delete from the Zoom pop-up menu. **DCAD VectorSpace** zooms in or zooms out to the new zoom level.
2. Choose the Delete Zoom command in the Zoom pop-up menu.
3. A message box appears, asking you to confirm that you want to delete the zoom. Click Yes to remove the custom zoom from the Zoom pop-up menu.

File menu commands

File	
New	Ctrl+N
Open...	Ctrl+O
Import...	Ctrl+Alt+O
Close	Ctrl+F4
Save	Ctrl+S
Save As...	Ctrl+Alt+S
Revert	
Printer Setup...	
Print...	Ctrl+P
Set Print Area	Ctrl+Alt+P
Exit	Alt+F4

In this chapter:

- About
DCAD VectorSpace
- Close
- Import
- New
- Open
- Page Setup (Mac OS) /
Printer Setup
(Windows)
- Print
- Quit (Mac OS) / Exit
(windows)
- Revert
- Save
- Save As
- Set Print Area

File menu commands



The commands in the File menu let you create, open, close, save, and print documents. The File menu also contains commands used to import and export your work to and from a number of common file formats.

The About **DCAD VectorSpace** command appears in the Help menu (Windows) or the Application Menu (Mac OSX). This command is described first in this chapter.

Figure 129.- File menu commands

About DCAD VectorSpace



Figure 130.- The **DCAD VectorSpace** startup screen¹

1. The Splash Screen shown is for illustration purposes only. It may vary according to the actual software version, to the application languages and/or local and international legal requirements.

The startup screen appears when you start **DCAD VectorSpace**. When the program is running, you can use the About **DCAD VectorSpace** command in the Help menu (Windows) or the Apple menu (Mac OS) to display the startup screen.

To display the DCAD VectorSpace startup screen: Choose About **DCAD VectorSpace** in the Help menu (Windows) or the Apple menu

(Mac OS). The startup screen appears and remains on screen until you click it.

The startup screen also displays the name of the registered user and the program version number. It's important to know the program version number if you request technical help from your technical support personnel.

Close

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+W
Windows Shortcut: Ctrl+F4

To close an active **DCAD VectorSpace** document without ending the current work session, choose Close in the File menu, press Ctrl+F4 (Windows) or Cmd+W (Mac OS). When you choose the Close command, **DCAD VectorSpace** closes all of the windows associated with the document you're closing, but **DCAD VectorSpace** continues to run.

If you have only one window open, you can also close a document by clicking the close box at the left end of the title bar. If you have more than one window open, clicking the close box will close the active window only.

To use the Close command

1. Choose Close in the File menu or press Command+W. If the active document has no unsaved changes, **DCAD VectorSpace** closes all windows of the document.

2. If the active document has unsaved changes, a message asks you if you want to save the changes before closing the document. The dialog box offers three choices:

- To close the document and save the changes, click Save. If the document hasn't been saved in **DCAD VectorSpace** format, clicking Save works the same way as the Save As command. Otherwise, it works the same way as the Save command. In either case, after saving the document, **DCAD VectorSpace** closes all windows of the document.
- To close the document and discard the changes, click Don't Save. **DCAD VectorSpace** closes all windows of the document without saving changes to the document on disk.
- To keep the document open, click Cancel.

Import

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+O
Windows Shortcut: Ctrl+Alt+O

You can bring the contents of a file into a **DCAD VectorSpace** document by using the Import command in the File menu. You can Import docu-

ments saved in **DCAD VectorSpace** format, or in any file format that **DCAD VectorSpace** supports.

Note: When you use the Import command, **DCAD VectorSpace** integrates the contents of the file you're importing into the active **DCAD VectorSpace** document.



To use the Import command

1. Choose Import in the File menu. A directory dialog box appears.
2. In the File Format pop-up menu, choose the format of the file you want to Import. "PTF" is the default format.
3. Use the file and folder list and the pop-up menu to locate the folder containing the file you want to Import. The name of the current folder appears in the pop-up menu. You can select a folder in the list and click Open (or double-click the folder's name in the list) to open the folder and display its contents. The pop-up menu lets you select any folder in the hierarchy of folders

that enclose the current folder. To go directly to the Finder desktop, click the Desktop button.

4. In the file list, select the file you want to Import. The selected file is highlighted in the list.
 - To select a file, click a file name, use the up-arrow and down-arrow keys to move through the list, or begin typing a file name to select the first file whose name begins with the characters you type. You can use the scroll bar to scroll the list without changing the selected file.
5. After selecting the file you want to import, click Open to import the file.
 - You can double-click a file name to import the file without first selecting it and clicking Open.
6. At this point, when you use some file formats, an options dialog box appears. See "Import options," next, for more information.

Import options

The following options are available in the directory dialog box that appears when you use the Import command.

File Format. The Files of type (Windows) or File Format (Mac OS) pop-up menu under the file list lets you select a specific file format that **DCAD VectorSpace** can import.

If you need to open a file saved in a format that **DCAD VectorSpace** doesn't support, you might be able to save the file in a format that **DCAD VectorSpace** can open by opening the

file in the program in which it was created, choosing Save As in the File menu, and then saving the file in a format that **DCAD VectorSpace** supports.

Show All Files. Select this option in the Files of type pop-up menu (Windows) or the checkbox in the dialog box (Mac OS) if you want to display in the file list the name of every file that is contained in the current folder, even files that **DCAD VectorSpace** can't import.

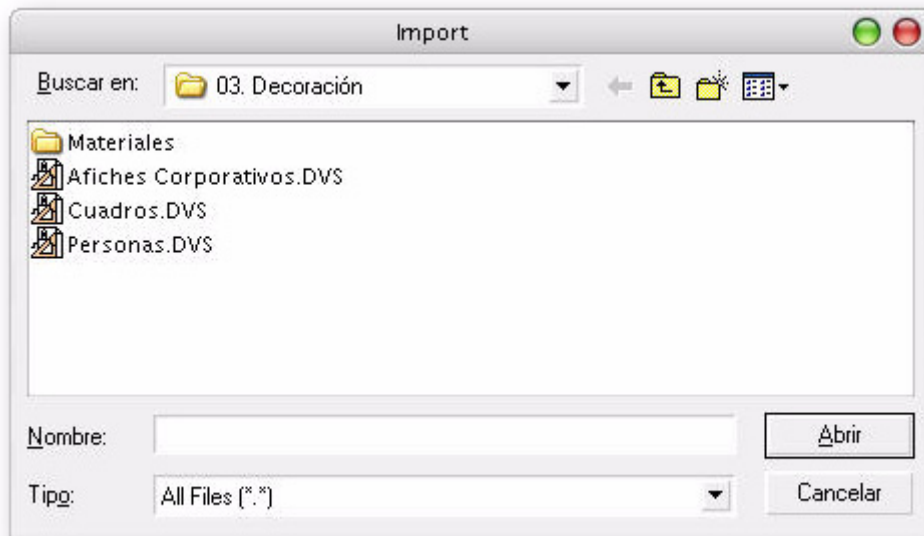


Figure 131.- Directory dialog box used to import a file

Import file formats

DCAD VectorSpace can open the following standard file formats.

BMP . The Windows metafile format that contains bitmap images.

CGM (Computer Graphics Metafile). An ANSI format for RGB color illustrations. It supports 2D vector and raster graphics, layers, and formatted text. Refer to **Using CGM import options**, page 151 for more information on CGM import options.

DWF. AutoCAD's Drawing Web Format can be imported into **DCAD VectorSpace** documents.

DWG . The proprietary native file format of AutoCAD. **DCAD VectorSpace** imports documents created in all AutoCAD releases through release 14.01. Refer to **Using DWG import options**, page 151 for more information.

DXF 3D (Drawing Interchange Format). A meta-file format that supports plain text, and 2D and 3D geometric data.

EPS (Encapsulated PostScript). A PostScript format for printing graphics from other applications.

HPGL (Hewlett-Packard Graphics Language). A vector file format, generally used for plotter printing files.

IGES (Initial Graphics Exchange Specification). A 2D and 3D vector graphics format used in CAD and rendering applications.

PICT. A standard Mac OS graphics file format, PICT supports 2D objects, raster images, and text. It does not support 3D objects.

PTF (Parametric Text Format). A text file format for describing **DCAD VectorSpace** objects. PTF

files describe objects using creation points and attributes from **DCAD VectorSpace**.

3DMF . The QuickDraw 3D metafile format developed by Apple Computer.

TIFF (Tag Image File Format). A raster image file format that supports high-resolution color and grayscale images.

WMF . The Windows metafile format that may contain both vector and raster graphic formats.

Import options

Some file formats have options you can set when importing a file.

Using CGM import options

When you import a CGM file, the Units dialog box opens.

Choose meters, centimeters, or inches in the Units pop-up menu. Click OK. One CGM unit will be equal to one of the units of measure that you choose.

Using DWG import options

When you import a DWG file, the Units dialog box opens.

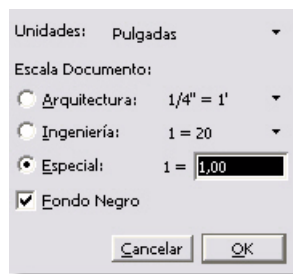


Figure 132.- DWG import options

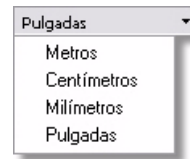


Figura 133.- Units menu

The document opens using the measurement system you selected and the output scale set to 1:1.

Adjusting output scale

A document in which the output scale is 1:1 will probably be much too large to print on one sheet of paper. An output scale of 1:1 means the objects in the document will print at actual size. For example, you would fill a 20-foot-long sheet of paper when you print a 20-foot-long room if the output scale is 1:1.

To change the output scale of the document, choose the Output Setup command in the Layout menu. You can then select a standard architectural or engineering scale, or specify a custom scale. Refer to **Output Setup**, page 96 for more information.

New

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+N
Windows Shortcut: Ctrl+N

You can create a new **DCAD VectorSpace** document by choosing New in the File menu.

“Untitled-*number*-Draft-Top,” appears in the title bar of a window in a new **DCAD VectorSpace** document.

- *number* is the document number. The first document you create is labeled Untitled, the second is labeled Untitled-2, the third is labeled Untitled-3, and so on.
- Draft-Top is the current mode and view. In **DCAD VectorSpace**, new documents always appear in Draft mode, Top view, with the default grid, unit, and output settings.

You can create as many documents at once as your system’s resources allow. In general, the number of documents you can have open at once depends on the amount of free memory, and the amount of data contained in the documents.

To create a new document: Choose New in the File menu, press Ctrl+N (Windows) or press Cmd+N (Mac OS). A new document opens with a window in Draft mode, Top view. The document window appears in front of any other **DCAD VectorSpace** document windows.

In the Window menu, the document’s name appears with a check mark to indicate that this is the active document. The names of any other open documents also appear at the bottom of this menu.

Open

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+O
Windows Shortcut: Ctrl+O

You can open an existing **DCAD VectorSpace** document by choosing the Open command in the File menu.

When you open a **DCAD VectorSpace** document, the document appears with its last saved grid and unit settings. Additionally, a document opens in the mode it was in at the time it was last saved.

If a document was saved while showing a Sculpt mode window only, it opens with a Sculpt mode window. If a document was saved while showing

multiple windows, it opens with a single window in the same mode as the active window at the time the document was saved.

For example, if you open a document that was saved with Draft, Sculpt, and Render mode windows open, and the active window was a Sculpt mode window, **DCAD VectorSpace** opens the document with a Sculpt mode window.

You can have as many documents open at once as your system’s resources allow. In general, the number of documents you can have open at once depends on the amount of free memory, and the amount of data contained in the documents.

Opening documents

The easiest way to open a **DCAD VectorSpace** document stored on disk is to double-click its icon in a folder or on the desktop. If **DCAD VectorSpace** is not running, this launches the program and opens the document. If **DCAD VectorSpace** is already running, this makes **DCAD VectorSpace** active and opens the document.

To use the Open command

1. Choose Open in the File menu, press Ctrl+O (Windows) or press Cmd+O (Mac OS). The Open dialog box appears.
2. Using the file and folder list and the pop-up menu above the list, locate the folder containing the **DCAD VectorSpace** document you want to open.
 - The name of the current folder appears in the pop-up menu. You can select a folder in the list and click Open (or double-click the folder's name in the list) to open the folder

and display its contents. The pop-up menu lets you select any folder in the hierarchy of folders that enclose the current folder. To go directly to the Finder desktop, click the Desktop button.

3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click Open.
 - To select a document in the list, click a document name, use the up-arrow and down-arrow keys to move through the list, or begin typing a document name to select the first document whose name begins with the characters you type.
 - You can use the scroll bar to scroll the list without changing the selected folder or document.

You can click Cancel to close the Open dialog box and not open a document.

Page Setup (Mac OS) / Printer Setup (Windows)

Mode: Draft

You can specify page size, orientation, and other printing options with the Printer Setup (Windows) and Page Setup (Mac OS) commands. When you choose the Printer Setup or Page Setup command, the applicable dialog box opens. You can choose the options you want, and then click OK to make them take effect.

Windows: To use the Printer Setup command

1. Choose Printer Setup in the File menu. The Printer Setup dialog box opens.

2. In the dialog box, configure the available options.
3. To implement the new settings, click OK. To keep the original settings, click Cancel.

Mac OS: To use the Page Setup command

1. Choose Page Setup in the File menu. The Page Setup dialog box opens.
2. In the dialog box, configure the available options.
3. To implement the new settings, click OK. To keep the original settings, click Cancel.

Print

Modes: Draft
Mac OS Shortcut: Cmd+P
Windows Shortcut: Ctrl+P

Printing in **DCAD VectorSpace** is done in Draft mode only. To print objects from a Sculpt mode window or to print renderings, you need to bring them into a Draft mode window.

When you print a **DCAD VectorSpace** document, the Print dialog box opens. You can specify the settings you want, and then click Print to send a document to the current output device, usually a printer or a plotter.

Printing documents

Before you print a **DCAD VectorSpace** document, depending on how you want your document to print, you might need to specify certain settings in the Page Setup dialog box.

To use the Print command

1. Choose Print in the File menu, press Ctrl+P (Windows) or Cmd+P (Mac OS). The Print dialog box opens.

2. In the dialog box, specify the settings you want, and then click Print to output the document. To close the dialog box without printing, click Cancel. To save the settings you specify, click Save Settings (Mac OS).

Quit (Mac OS) / Exit (windows)

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Q
Windows Shortcut: Alt+F4

To end a DCAD VectorSpace work session: and close the program, choose Quit in the File menu, press Alt+F4 (Windows) or Cmd+Q (Mac OS).

If you have an unsaved document open, **DCAD VectorSpace** asks you if you want to save the document before ending the session.

To quit without saving, click Don't Save. To save the document before quitting, click Save. If the document hasn't been saved in **DCAD VectorSpace** format, clicking Save is the same as choosing Save As. Otherwise, clicking Save is the same as choosing the Save command.

To continue working in **DCAD VectorSpace** without quitting, click Cancel.

Revert

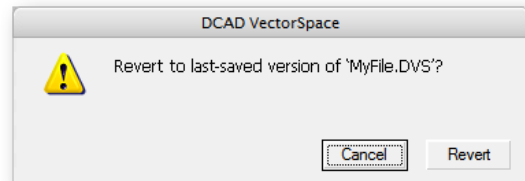
Modes: Draft, Sculpt, Render

You can discard all changes made to a **DCAD VectorSpace** document since it was last saved with the Revert command. Essentially, the Revert command is a shortcut for closing the current document and opening the original version stored on disk.

This command cannot be reversed with the Undo command, so make sure you really want to discard all of your changes before you choose Revert.

The Revert command is not available when no documents are open, when the current document has not been saved, and when a document opened from disk has not been changed.

To use the Revert command: Choose Revert in the File menu. A warning dialog box appears.



- To discard the current document and replace it with the version stored on disk, click Revert.
- To keep the current document, click Cancel.

Save

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+S
Windows Shortcut: Ctrl+S

You can store the current **DCAD VectorSpace** document on disk by choosing the Save command in the File menu.

As you work in **DCAD VectorSpace**, you should use the Save command often to keep the current version of your work safely stored on disk. **DCAD VectorSpace** will not save a document unless you choose the Save command.

- If a document hasn't yet been saved in **DCAD VectorSpace** format, the Save command functions like the Save As command, which lets you type a name and select a

folder in which to store the document. See **Save As** on page 156.

- If a document has been saved in **DCAD VectorSpace** format, the Save command stores a new version of the document on disk, and the new version overwrites the previous version. If you want to keep the previous version, use the Save As command to save a copy of the document with a different file name.

To use the Save command: Choose Save in the File menu, press Ctrl+S (Windows), or Cmd+S (Mac OS). If the Save command is not available (appears dimmed in the menu), the document has not changed since it was last saved.

Save As

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Shift+S
Windows Shortcut: Ctrl+Alt+S

You can save a copy of the current document on disk with the Save As command. You can also save (export) a copy in a non-**DCAD VectorSpace** file format to open in other applications, such as another CAD program, or a page layout program. Additionally, you can save an entire document, a particular view of a document, or only the visible objects in a document.

To use the Save As command

1. Choose Save As in the File menu, press Ctrl+Alt+S (Windows) or press Cmd+Shift+S (Mac OS). The Save As dialog box opens.
2. In the Save As dialog box, locate the folder or directory where you want to store the file.
3. Type a file name in the Save As text box.
4. In the File Format pop-up menu, choose a file format for the saved file. The default format is “**DCAD VectorSpace**.”
5. In the Save Scope pop-up menu (Mac OS), choose how you want to save the document. Descriptions of these options appear below. If you’re saving in **DCAD VectorSpace** format,

the default scope is “Document.” If you’re saving in a non-**DCAD VectorSpace** format, certain options might not be available in the Save Scope pop-up menu.

6. Click Save to store the file on disk. Depending on the file format you use an options dialog box might open. See Export Options for information on using these options.

Save As options (Mac OS)

Save Scope. Choose an option in this pop-up menu to specify what parts of your **DCAD VectorSpace** document you want to save.

- To save the entire document, choose Document in the Save Scope pop-up menu. This option is available only when you use **DCAD VectorSpace** format.
- To save all objects in the active window, choose Entire View in the Save Scope pop-up menu. This option is not available when you use **DCAD VectorSpace** format.
- To save only visible objects in the active window, choose Visible Objects in the Save Scope pop-up menu.

File Formats

In the Save As dialog box, the File Format pop-up menu lists file formats you can use for saving or exporting your work.

The native format for documents is “**DCAD VectorSpace**.” You should always save documents in **DCAD VectorSpace** format so you can open and edit them with all items intact, includ-

ing 2D and 3D objects, attributes, layers, Library Objects and Symbols, Relative Views, and other **DCAD VectorSpace** features.

Note: Information and objects can't always be converted successfully when you export to other file formats. If you want to be able to edit a document in **DCAD VectorSpace**, be sure



to save the document in **DCAD VectorSpace** format before you export it.

Generally, exporting your work from **DCAD VectorSpace** should be the final step in a project, *after* you have saved the finished version of your work in **DCAD VectorSpace** format.

DCAD VectorSpace offers the following file formats in the File Format pop-up menu:

BMP. The Windows metafile format that contains bitmap images.

CGM (Computer Graphics Metafile). An ANSI format for RGB color illustrations. It supports 2D vector and raster graphics, layers, and formatted text. This format is available in Draft mode. **(Windows Only)**

DVS. **DCAD VectorSpace**'s native format. This format is available in Draft, Sculpt, and Render mode.

DWF. AutoCAD's Drawing Web Format which allows you to publish **DCAD VectorSpace** documents on the World Wide Web. **(Windows Only)**

DWG. The proprietary native file format of AutoCAD. This format is available in Draft and Sculpt mode.

Note: When you save a document in the DWG file format, **DCAD VectorSpace** saves the 2D information in AutoCAD release 10 file format. This means that you can use the release 10 version of AutoCAD to open and save **DCAD VectorSpace**'s exported DWG files. AutoCAD release 10 does not import **DCAD VectorSpace**'s 3D information.



AutoCAD releases 11 through 14 do, however, import **DCAD VectorSpace**'s 3D information along with its 2D information. This means that you can use the release 11 through 14 versions of AutoCAD to open and save the exported

DCAD VectorSpace files that contain 2D and 3D information.

DXF (Drawing Interchange Format). A Metafile format that supports plain text, and 2D and 3D geometric data. This format appears as "DXF" in Draft mode, and "DXF 3D" in Sculpt mode or Render mode. DXF files do not use any measurement system, such as English or metric, to define units. Instead, in a DXF file, units are defined as generic units.

EPS (Encapsulated PostScript). A PostScript format for printing graphics that are placed into other applications, such as page layout programs and graphics programs.

GIF (Graphics Interchange Format). An 8-bit raster format used for Internet graphics.

HPGL (Hewlett-Packard Graphics Language). A vector format generally used for plotter printing files. **(Windows Only)**

IGES (Initial Graphics Exchange Specification). A 2D and 3D vector graphics format used in CAD and rendering applications. **(Windows Only)**

JPEG (Joint Photographic Experts Group). A raster image format in which images can be compressed at various compression levels using "lossy" compression.

PICT. A standard Mac OS graphics file format, PICT supports 2D objects, raster images, and text. It does not support 3D objects.

PTF (Parametric Text Format). A text file format for describing **DCAD VectorSpace** objects.

PNG (Portable Network Graphics). A new cross-platform format for storing raster and vector graphics with compression.

PSD (Adobe Photoshop Native Format). The format used by Adobe Photoshop to store both vector and raster graphic formats.

QIF (QuickTime Image). A standard Apple QuickTime graphics file format, QIF supports raster images.

3DMF. The QuickDraw 3D metafile format developed by Apple Computer.

TIFF (Tag Image File Format). A raster image file format that supports high-resolution color and

grayscale images. You can save raster images from a Render mode window or a Draft mode window in **DCAD VectorSpace**.

WMF . The Windows metafile format that may contain both vector and raster graphic formats. **(Windows Only)**

Export Options

Some file formats have options you can choose when you save a file.

Using DXF 3D export options

When you save a file in DXF 3D format, the DXF Units dialog box opens.

Choose meters, centimeters, or inches in the Units pop-up menu, and then click OK. The units that you choose will be converted to DXF units in the saved file.

Using PICT export options

When you save a file in PICT format, a dialog box opens.

Type a resolution value (in pixels per inch) in the text box, and then click OK. **DCAD VectorSpace** saves the file using the specified resolution.

Using PTF export options

When you save a file in PTF format, a dialog box presents several options. For more information, see **Options for saving PTF files**, page 424.

Using TIFF export options

When you save a file in TIFF format, the TIFF Output Filter Setup dialog box (**figure**) appears. You can use the dialog box to specify the number of colors and the resolution to be used in the TIFF file.

Format. In the Format area, click the button for the color format you want to use in the TIFF file.

- Bi-Level saves a black-and-white image and discards all color information in the image.
- 16 Gray saves the image using a palette of 16 gray shades.
- 256 Gray saves the image using a full range of gray tones.
- 24 Bit RGB Color saves the image using a full range of colors.
- 8 Color saves the image using an eight-color palette.
- 16 Color saves the image using a 16-color palette.
- 256 Color saves the image using a 256 (8-bit) color palette.

Compression. In the Compression area, select a compression method if you want to compress the image.

Some compression methods are available with particular color formats only. For example, Group 3 and Group 4 (CCIT G3 and CCIT G4) are available only when Bi-Level is selected in the Format area.

Resolution. In the Resolution area, select a resolution option.

- The TIFF file is saved at 72 ppi (pixels per inch) if you select Screen, Printer, or Source.
- The TIFF file is saved at the resolution in the text boxes if you click the button at the left of the text boxes.

Note: Be sure the resolution value is the same in both boxes unless you want to stretch or distort the image.



Size. To select a size for the image, click a button next to an option in the Size area.

- The image is saved at your screen size if you select Screen.
- The image is saved at your printer's selected paper size if you select Printer.
- The image is saved at its original size if you select Source.
- The image is saved at the size entered in the text boxes if you click the button at the left of the text boxes.

Note: If you change a number in one of the text boxes without changing the other number proportionally, **DCAD VectorSpace** stretches the image.



Color Translation. Be sure Normal is selected in the Color Translation area unless you want to alter or inverse the colors in the image.

To save a TIFF profile

You can save the settings in the TIFF Output Filter Setup dialog box as a profile. You can select a pro-

file from the Profiles pop-up menu in the TIFF Output Filter Setup dialog box the next time you save a TIFF file.

1. Select the options you want in the TIFF Output Filter Setup dialog box.
2. Click New. A dialog box opens.
3. Type a profile name in the text box. In the pop-up menu, you can select an existing profile on which to base the new profile.
4. Click OK. The Profile dialog box closes and you return to the TIFF Output Filter Setup dialog box.
5. Click OK. **DCAD VectorSpace** saves the TIFF file with the options you selected.

To delete the current profile: Click the Delete button. **DCAD VectorSpace** deletes the profile from the list.

Using JPEG export options

When you save a file in JPEG format, the JPEG Output Filter Setup dialog box (**figure**) appears. You can set options in this dialog box for the number of colors and the image resolution.

You can save the settings in this dialog box for future use.

The following options can be configured when you save a raster image in JPEG format.

Format. In the Format area, click the button for the color format you want to use.

- Monochrome saves a black-and-white image and discards all color information.
- YCC color saves the image using a device-independent standard color format.

Quality. In the Quality area, select Default to use no compression. Or, type a compression percentage in the text box.

Operation. The image is stored in a standard format if you select Baseline. If you select Progressive, the image is stored in an interlaced format, which allows a low-resolution image to appear while a download operation is in progress.

Resolution. In the Resolution area, click a button next to a resolution option.

- The file is saved at 72 ppi (pixels per inch) if you select Screen, Printer, or Source.
- The file is saved at the resolution entered in the text boxes if you click the button at the left of the text boxes.

Note: Be sure the resolution is the same in both text boxes, unless you want to stretch or distort the saved image.



Size. To select a size for the image, click a button next to an option in the Size area.

- The image is saved at the screen size if you select Screen.
- The image is saved at your printer's selected paper size if you select Printer.
- The image is saved at its original size if you select Source.

- The image is saved at the size entered in the text boxes if you click the button at the left of the text boxes.

Note: If you change a number in one of the text boxes without changing the other number proportionally, **DCAD VectorSpace** stretches the image.



Color Translation. Be sure Normal is selected in the Color Translation area unless you want to alter or inverse the colors in the image.

To save a JPEG profile

1. Select the options you want in the JPEG Output Filter Setup dialog box.
2. Click New. A dialog box appears.
3. Type a name for the profile in the text box. In the pop-up menu, you can select an existing profile on which to base the new profile.
4. Click OK. You return to the JPEG Output Filter Setup dialog box.
5. Click OK. **DCAD VectorSpace** saves the JPEG file with the options you selected.

To delete the current profile: Click the Delete button. **DCAD VectorSpace** deletes the profile from the list.

Set Print Area

Modes: Draft
Mac OS Shortcut: Cmd+Opt+P
Windows Shortcut: Ctrl+Alt+P

To specify which part of a document to print, choose Set Print Area in the File menu. The printable area is the part of the page available to **DCAD VectorSpace** for printing documents. The size of the printable area depends on the current printer or plotter driver, and the options selected in the Page Setup dialog box.

When you choose the Set Print Area command, the printable area appears on screen as a gray rectangle, which you can move to enclose different areas of a drawing. After you choose Set Print Area, the printable area remains visible on screen if Show Page Breaks is in effect. The displayed area can change if you adjust the settings in the Page Setup dialog box. To hide the printable area, choose Show Page Breaks in the Layout menu.

To use the Set Print Area command

1. Choose Set Print Area in the File menu, press Ctrl+Alt+P (Windows) or press Cmd+Opt+P. The pointer changes to a cross centered in a gray rectangle. The gray rectangle represents the printable area.

Note: If the view magnification is high, you might not see the entire rectangle. In this case, reduce the view magnification.



2. Move the pointer to position the rectangle over the part of the document you want to print. The

gray rectangle follows the pointer. Center the area you want to print within the rectangle.

3. Click to set the printable area. The printable area remains visible until you close the document, or choose Show Page Breaks in the Layout menu.

If you adjust the options in the Page Setup dialog box, the size of the printable area can change. For more information, see **Page Setup (Mac OS) / Printer Setup (Windows)**, page 153.

Edit menu commands

Edit	
Undo	Ctrl+Z
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Paste Special...	Ctrl+Shift+V
Clear	Del
Copy View to Draft	
Select All	Ctrl+A
Select...	Ctrl+Shift+A
Reshape	Ctrl+R
Duplicate	Ctrl+D
Recalculate	Ctrl+Alt+K
External Reference	▶
Preferences	▶
Preferences...	

In this chapter:

- Clear
- Copy
- Copy View to Draft
- Cut
- Duplicate
- External Reference
- Paste
- Paste Options
- Preferences Menu
- Preferences Dialog
- Recalculate
- Redo
- Reshape
- Select
- Select All
- Show Clipboard / Hide Clipboard
- Undo

Edit menu commands

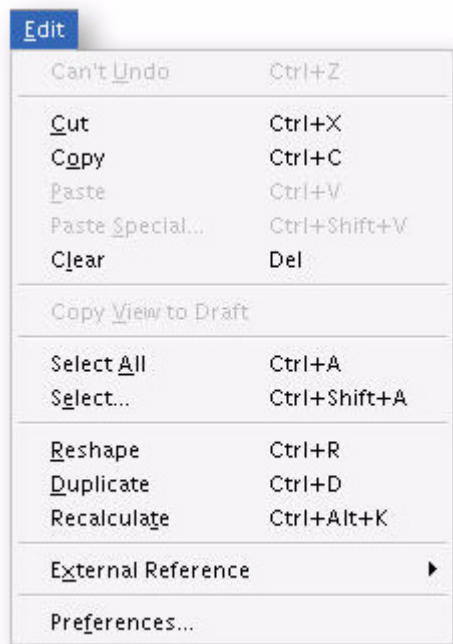


Figure 134.- Edit menu commands

The Edit menu contains commands that let you manipulate objects through selection, reshaping, and duplication.

The Edit menu also contains Links commands that let you share objects among documents; the Undo and Redo commands that let you cancel and uncancel actions; and the Preferences command that lets you adjust the **DCAD VectorSpace** environment.

This chapter describes how to use each command in the Edit menu. The commands and submenus are listed in the chapter in alphabetical order.

Clear

Modes: Draft, Sculpt
Shortcut: Delete or Backspace

The Clear command removes selected objects and highlighted text selections from the active window. The command is available when an object or text is selected in the active window.

Choosing the Clear command is the same as pressing the Delete key to remove selected objects or text from the active window.

Choosing Clear doesn't place the selected objects or text on the Clipboard, and doesn't replace the current Clipboard contents. Therefore, you can use the Clear command when you want to remove a selection without affecting the Clipboard contents.

If you want to be able to paste objects or text after removing them from a document, use the Cut command instead of Clear.

If you delete objects by mistake, you can restore the objects by immediately choosing Undo in the Edit menu, or by pressing Command+Z. However, the Undo command will not restore a text selection that has been deleted with the Clear command.

To use the Clear command

1. In a Draft or Sculpt window, select the objects you want to remove, or highlight a text selection that you want to delete.
2. Choose Clear in the Edit menu. The selection disappears.

Copy

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+C
Windows Shortcut: Ctrl+C

The Copy command puts a copy of selected objects, text selections, or renderings on the Clipboard. Doing this makes it possible to paste the contents of the Clipboard into **DCAD VectorSpace** documents and into other programs.

The Copy command is available when an object or text is selected in the active Draft or Sculpt window. The Copy command is also available when the Render window is active.

Using Copy to place copies of selected objects, text, or renderings on the Clipboard does not remove the originals from the active Draft or Sculpt window or affect the rendering in the Render window. However, the operation does replace the contents of the Clipboard with the copied selection or rendering.

The Clipboard, which is part of your computer's operating system, stores only one item at a time. Each time you choose Cut or Copy in any application, the current contents of the Clipboard are replaced by the new selection. If you copy items to the Clipboard that you want to use repeatedly, make sure you paste the items into a document before using the Cut or Copy command again.

To see the contents of the Clipboard, choose Show Clipboard in the Edit menu in **DCAD VectorSpace**.

Some other commands let you place objects on the Clipboard or make copies.

- You can transfer selected objects and text from a document to the Clipboard with the Cut command. Choosing Cut removes the selected objects or text from the document.
- To make copies of objects in a **DCAD VectorSpace** document without affecting the contents of the Clipboard, use the Duplicate command.

To copy objects or text to the Clipboard

1. Select the objects or text you want to copy in the active Draft or Sculpt window.
2. Choose Copy in the Edit menu, press Ctrl+C (Windows) or press Cmd+C. **DCAD VectorSpace** copies the selection to the Clipboard.

Copying the Render mode window

When the Render mode window is active, choosing the Copy command copies the window contents to the Clipboard as an image. You can then paste the rendered image from the Clipboard into a Draft mode window.

You can also paste a rendering from the Clipboard into other programs, such as page-layout and image-editing applications.

To copy renderings to the Clipboard

1. Set the rendering options, focal points, and window size for the rendered image.
2. Choose Wireframe, Hidden Line, or Solid in the Rendering menu to generate a rendering of the document.
3. Choose Copy in the Edit menu, press Ctrl+C (Windows) or press Cmd+C. **DCAD VectorSpace** copies the rendered image to the Clipboard.

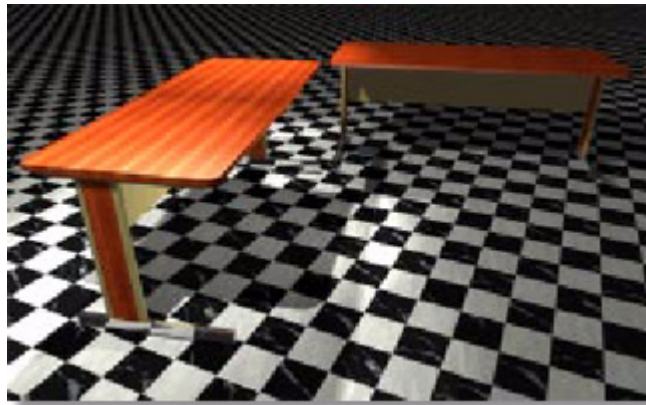


Figure 135.- Rendering copied from Render window

Copy View to Draft



Figure 136.- Copy View to Draft

The Copy View to Draft submenu appears in the Edit menu in Sculpt mode only. The commands in the submenu create renderings of 3D objects and insert the renderings into Draft mode.

All printing in **DCAD VectorSpace** is done from Draft mode. You can use the Copy View to Draft commands to create renderings of 3D objects in the document, and insert the renderings into Draft mode so they can be printed.

Hidden Line

Mode: Sculpt
Mac OS Shortcut: Cmd+J
Windows Shortcut: Ctrl+J

The Hidden Line command in the Copy View to Draft submenu creates a 2D copy of the 3D objects in a Sculpt mode window, and inserts the objects into the Draft window.

This command is useful for extracting elevations from a 3D model.

To use the Hidden Line command

1. Make sure the active window is a Sculpt mode window.
2. Choose the Hidden Line command, press Ctrl+J (Windows) or press Cmd+J (Mac OS). **DCAD VectorSpace** creates 2D objects viewable in Draft mode based on the 3D objects in the active Sculpt mode window.

The objects appear in the same view as the view of the Sculpt mode window when you choose the command.

For example, if you choose Hidden Line while the active window is a Sculpt mode window in Top view, the objects appear in Draft mode, Top view.

Objects created in Draft using the Hidden Line command can be moved, reshaped, and extruded like other objects created in Draft mode.

If more than one 3D object is in the Sculpt mode window, **DCAD VectorSpace** creates the object in Draft as one grouped object. You can use the Ungroup command in the Object menu to ungroup the object and work with the separated objects.

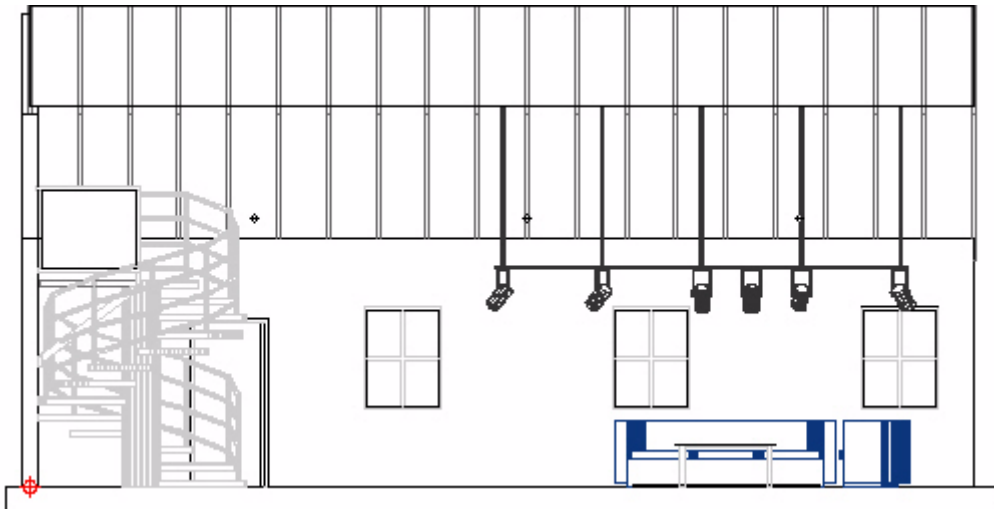


Figure 137.- A rendering created by the Hidden Line command

Solid

Mode: Sculpt
Mac OS Shortcut: Cmd+Opt+J
Windows Shortcut: Ctrl+Alt+J

The Solid command in the Copy View to Draft sub-menu creates a 2D raster image in Draft mode of the 3D objects in a Sculpt mode window. The image created in Draft mode is similar to a Solid rendering created in a Render mode window.

DCAD VectorSpace uses Surface materials, light sources, and the settings in the Rendering Options dialog box when creating a Solid rendering.

To use the Solid command

1. Make sure the active window is a Sculpt mode window.
2. Choose the Solid command, press Ctrl+Alt+J (Windows), or Cmd+Opt+J (Mac OS). **DCAD VectorSpace** creates an image in Draft mode based on the 3D objects in the active Sculpt mode window.

The image appears in the same view as the view of the Sculpt mode window when you choose the command.

For example, if you choose Solid while the active window is a Sculpt mode window in Front view, the objects appear in Draft mode, Front view.

An image created in Draft mode with the Solid command is equal in size to the displayed area of the active Sculpt mode window.

For example, if the active Sculpt mode window displays an area of 30' by 50', the image created in the draft window will be 30' by 50'.

You can resize the image. However, the individual objects in the image can not be resized, reshaped, or extruded.

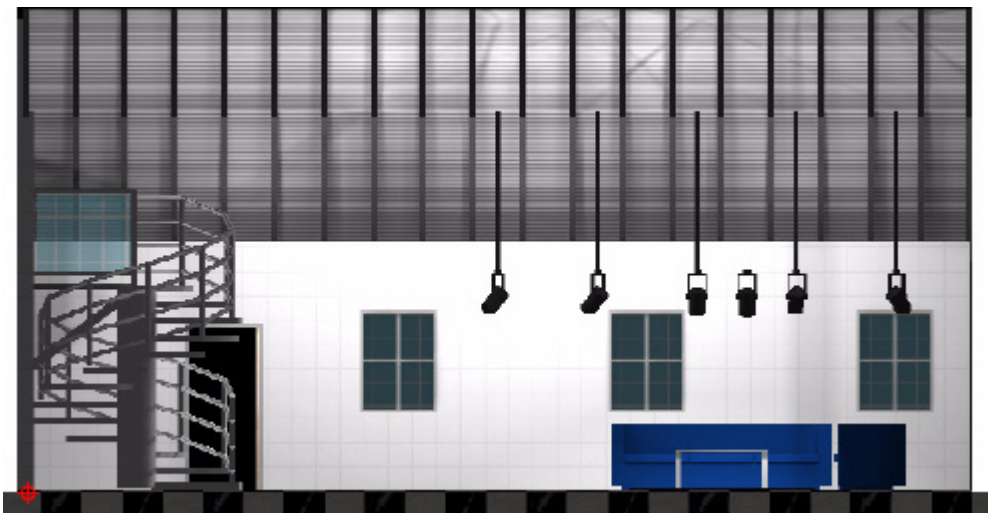


Figure 138.- Rendering created using the Solid command

Cut

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+X
Windows Shortcut: Ctrl+X

The Cut command in the Edit menu removes selected objects or text from a document and transfers the selection to the Clipboard.

The Cut command is available when one or more objects is selected or text is highlighted in Draft or Sculpt mode.

When you use the Cut command, selected objects or text characters disappear from the active Draft or Sculpt window. **DCAD VectorSpace** places the selection on the Clipboard, and you can then use the Paste and Paste Special commands to place it in a **DCAD VectorSpace** drawing.

You can also use the Paste command in another application to insert a copy of the Clipboard contents into another program. However, if you paste an object cut from **DCAD VectorSpace** into a document created in another application, the object might lose some of its properties.

The Clipboard, which is part of the Mac OS operating system, stores only one item at a time. Each time you choose Cut or Copy in any application, the current contents of the Clipboard are replaced by the new selection. If you copy items to the Clipboard that you want to use repeatedly, make sure you paste the items into a document before using the Cut or Copy command again.

To see the contents of the Clipboard, choose Show Clipboard in the Edit menu in **DCAD VectorSpace**.

To remove an item without affecting the Clipboard, use the Clear command in the Edit menu.

To use the Cut command

1. Select the objects or highlight the text that you want to remove from the document.
2. Choose Cut in the Edit menu, press Ctrl+X (Windows), or Cmd+X (Mac OS). **DCAD VectorSpace** removes the selection from the document and places it on the Clipboard.

Duplicate

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+D
Windows Shortcut: Ctrl+D

The Duplicate command in the Edit menu makes duplicate copies of selected objects in the Draft or Sculpt window.

The Duplicate command is available when one or more objects is selected in Draft or Sculpt mode. Duplicate is not available when the Render window is active or when a text object is in edit mode.

When you choose Duplicate, **DCAD VectorSpace** makes a copy of the selected objects in the active Draft or Sculpt window without replacing the Clipboard contents.

DCAD VectorSpace places the duplicated objects in the same position as the originals. The duplicated objects are selected.

Because a duplicate appears in the same position as the original, the duplicate isn't visible as a separate object until you move it away from the original. You

can press the keyboard arrow keys or drag a duplicated object to move it away from the original object.

Use the Duplicate command to copy objects in a single step, rather than the two steps required when you copy objects using the Copy and Paste commands.

To use the Duplicate command

1. Select one or more objects that you want to duplicate. You can select 2D, 3D, and Text objects, but not highlighted characters within a Text object.
2. Choose Duplicate in the Edit menu, press Ctrl+D (Windows), or press Cmd+D (Mac OS). **DCAD VectorSpace** places the duplicate objects in the same position as the original selected objects.

External Reference

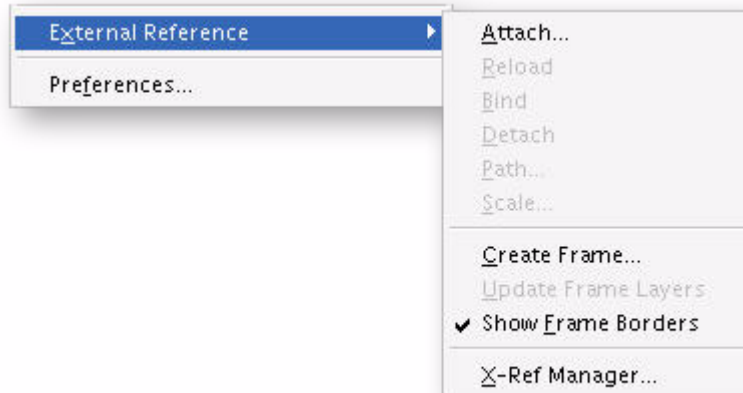


Figure 139.- External Reference Menu

The External Reference submenu in the Edit menu contains commands that let you compose multi-scale objects from many **DCAD VectorSpace** DWG or DXF documents in a single **DCAD VectorSpace** document for presentation and output. External References (X-Refs) create dynamic associations between either pre-defined areas of **DCAD VectorSpace** documents, termed “Frames,” or between entire **DCAD VectorSpace** documents and DXF or DWG files. X-Refs make it possible to

share information between **DCAD VectorSpace** documents on either Windows or Mac OS platforms.

Unlike inserting an object or drawing as a Library Object, in which you add all the objects from the Library Object into the current document, X-Refs attach a pointer to the external reference file. Objects in an X-Ref appear in the current document; however, the objects themselves are not added to the current document.

Additionally, when you attach an X-Ref to a document, any changes you make to the original drawing file containing the external reference are automatically reflected in the document that reference it. These changes appear automatically each time you open the document containing the external reference. If you know that the original drawing was modified, you can reload the external reference and/or update the frame layers anytime you're working on the document.

When you attach an X-Ref, its layers, linetypes, text styles, and other attributes are not added to the current document. Rather, these elements are also loaded from the linked file each time you update the X-Ref. Attached X-Refs can themselves contain other, nested X-Refs. When you attach an X-Ref, any nested references contained in the file also appear in the current document.

You can attach as many copies of an X-Ref as you want, each with a different position and scale.

DCAD VectorSpace X-Refs are available in both Draft and Sculpt modes, while Frames are available in Draft mode only.

X-Ref Frames

X-Ref Frames are “snapshots” of the visible information displayed inside the Frame Border in the original **DCAD VectorSpace** document. Frames create dynamic associations between pre-defined areas of **DCAD VectorSpace** documents.

Using Frames, you can automatically update an X-Ref Frame appearing in several different documents whenever you change the original object.

One practical use for Frames is to create a Draft mode document containing objects drawn at different scales. To do this, you create a Frame object,

then attach it in either the same or another document for printing.

If you change and save a Frame, you can refresh its association in a document with the Update Frame Layers command.

In **DCAD VectorSpace**, Frames operate in Draft mode. You can create 2D Frame objects from a Draft mode window and attach them in Draft mode. The Frame submenu commands are not available in Sculpt and Render modes.

Attach . links an external reference in the active window of the current document.

Reload . updates the selected X-Ref with its currently saved information.

Bind . copies the selected X-Ref into the current document.

Detach . completely removes the selected X-Ref from the current document.

Path . updates the directory information of the selected X-Ref.

Scale . modifies the selected X-Ref with the selected scale settings.

Create Frame . makes the selected area inside the frame Border in the active window of the current document an external reference.

Update Frame Layers . updates the selected Frame so that an object within the Frame Border on any visible layer is included in the X-Ref.

Show/Hide Frame Borders . toggles the display of gray borders around Frames.

X-Ref Manager... displays a list and graphical thumbnail of all external references attached to the current document. The X-Ref Manager palette also contains a pop-up menu for manipulating the X-Refs attached to the current document.

Attach

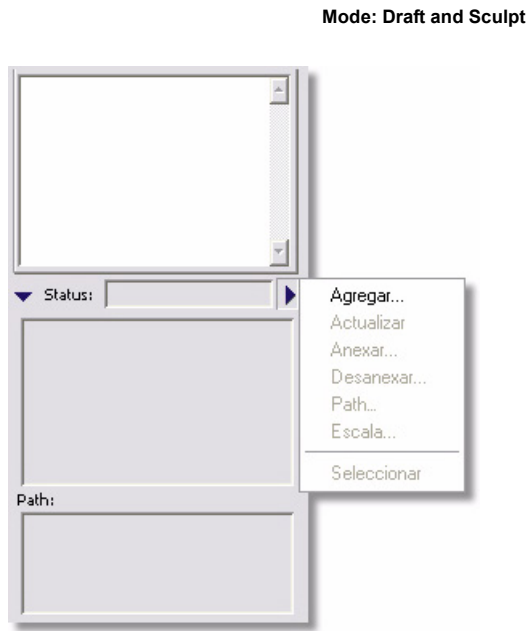


Figure 140.- Attach

Attaching a separate drawing to the current document creates an external reference. The external reference appears in the current document as an X-ref, whose objects are linked rather than added to the current document. If you modify the linked drawing, you can update the X-Ref so that the current document reflects the latest version of the external reference.

Reload

Mode: Draft and Sculpt

If you modify a drawing that is attached to the current document as an external reference, you can reload the current drawing to display the latest version of the X-Ref drawing.

When you attach an X-Ref to the current document, its layers, linetypes, text styles and other attributes are not added to the current document. Rather, these attributes are also loaded from the external reference file each time you update the external reference. Attached reference files can themselves contain other, nested reference files. When you attach an external reference, any nested references contained in the file also appear in the current document. You can attach as many copies of an external reference file as you want. Each copy can have a different position, scale and rotation angle.

To attach an external reference file

1. Choose Attach in the X-Refs submenu. A directory dialog box appears.
2. Using the file and folder list, locate the external reference file you want to attach.
3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click OK. (If the file you are attaching is a DWG, DXF or a **DCAD VectorSpace** file that does not contain a Frame, it will be attached automatically. If, however the **DCAD VectorSpace** file contains one or more Frames, you get the Attach Frames dialog box that let you attach the entire document or the selected Frames.)

To reload an X-Ref

1. Choose Reload in the X-Refs submenu. A directory dialog box appears.

-
2. Using the file and folder list, locate the external reference file you want to update.
 3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click OK.

You can click Cancel to close the dialog box and not reload the external reference.

Bind

Mode: Draft and Sculpt

X-Refs are not part of the document. Rather, they are links to an externally referenced file. To provide a copy of a drawing containing external references to someone else, you must also provide all the external reference files. In addition, the person receiving the drawings must either re-create the same paths you used when linking the external reference file or change the paths for the X-Ref.

The Bind command in the X-Refs submenu lets you insert an X-Ref file into the current document. To provide a copy of a drawing that contains an X-Ref, it is best to Bind the X-Ref file.

If you Bind a scaled X-Ref, you will get a warning explaining that dimension objects will be converted in separated Text, Lines and Arrows, and that

clipped objects contained inside Frames will be bound as PIC objects.

To bind an X-Ref

1. Choose Bind in the X-Refs submenu. A directory dialog box appears.
2. Using the file and folder list, locate the external reference file you want to insert.
3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click OK. You can continue to select additional files to bind by selecting them and clicking the OK button.
4. When you are finished, click OK to close the dialog box, or click Cancel to close the dialog box and not bind the external reference file(s).

Detach

Mode: Draft and Sculpt

To completely remove an X-Ref file from your document, you must detach the reference file. Deleting the external reference does not remove the attributes such as layers and linetypes added to the current document. This command is only available once an external reference file (X-Ref) has been attached to the current document.

To detach an X-Ref

1. Choose Detach in the X-Refs submenu. A directory dialog box appears.
2. Using the file and folder list, locate the external reference file you want to detach.
3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click OK. You can continue to select additional files to detach by selecting them and clicking the OK button.

4. When you are finished, click OK to close the dialog box, or click Cancel to close the dialog box and not detach the external reference file(s)

Path

If the file associated with an X-Ref is moved to a different directory or renamed, **DCAD VectorSpace** displays a message indicating that it can not update the external reference file. You can re-establish the link to the file by changing the path for the external reference file.

To change the X-Ref path

1. Choose Path in the X-Refs submenu. A directory dialog appears. Using the file and folder

list, locate the external reference file you want to re-establish the path to.

2. In the list, double click the document name or select the **DCAD VectorSpace** document and click OK. You can click Cancel to close the dialog box and not re-establish the path to the external reference file.

Scale

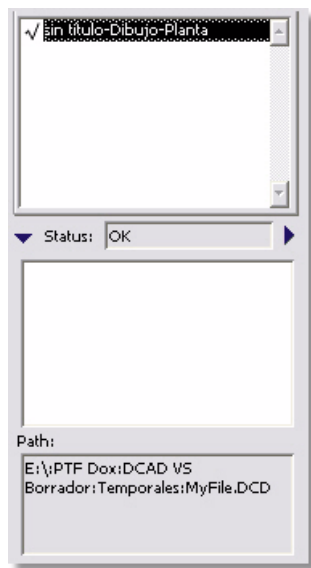


Figure 141.- Scale

The Scale command in the X-Refs submenu sets the scale for and resizes X-Refs. When you Scale an X-Ref, all objects, except for text, dimension text and arrows will be scaled. Text, dimension text and arrows will be scales according to the settings in Output Setup, unless the “Resize text and arrows” checkbox is checked.

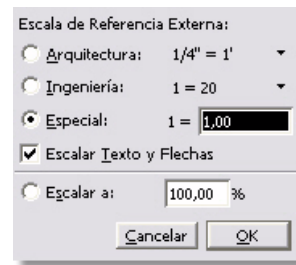


Figure 142.- X-Ref Scale dialog box

If you resize an X-Ref or X-Ref Frame, all objects, including text, dimension text and arrows are resized accordingly.

To set the scale of an X-Ref or X-Ref Frame

1. Select the X-Ref or X-Ref Frame in the active window or select its name from the X-Ref Manager's list.

2. Choose Scale in the X-Ref submenu. You get the Scale X-Ref dialog box.
3. Select the scale factor or percentage you want to apply to the X-Ref.

Note: the **Resize text and arrows** option is disabled when the **Resize X-Ref** option is selected.



4. Click OK to set the X-Ref Scale, or Cancel to close the dialog box.

Create Frame

Mode: Draft

The Create Frame command designates one or more selected 2D objects, or a specified area in a Draft window, as an X-Ref which can be attached to any number of additional documents.

The Create Frame command is only available when a Draft mode window is active. When you create an X-Ref, **DCAD VectorSpace** saves an internal reference file containing the linked selection. When you create Frames, the objects must be on visible layers.

To create a Frame

1. Select the objects in **DCAD VectorSpace** you want to include in a Frame. If you want to designate an area as a Frame, skip to Step 4.
2. Choose Create Frame in the X-Refs submenu. A dialog box appears in which you can name the X-Ref Frame.
3. Enter the Frame name and click OK. You can click Cancel to close the dialog box and not create the Frame.
4. If you did not select objects to Frame, a cross pointer appears in the drawing window. Drag the pointer to define a rectangular area as the Frame in the drawing.

5. Enter the Frame name in the dialog box that appears when you release the mouse and click OK. You can click Cancel to close the dialog box and not create the Frame.

Using Frame borders

When you create an X-Ref Frame, and the Show Frame Borders command is active, **DCAD VectorSpace** displays a gray rectangle around the Frame.

The rectangular border **DCAD VectorSpace** displays around an X-Ref Frame is like a picture window into the external reference file. **DCAD VectorSpace** references objects that are within this border. You can resize and move the border and move objects into and out of it to change the contents of the Frame.

To move an X-Ref border

1. If necessary, show the Frame border by choosing Show Frame Borders in the X-Refs submenu.
2. Drag the Frame border to a new location.

To resize the Frame border

1. If necessary, show the Frame border by choosing Show Frame Borders in the X-Refs submenu.
2. Select the Frame.
3. Drag the selection handles of the Frame border to resize the area.

Show/Hide Frame Borders

Mode: Draft

Frames are surrounded by a gray rectangle by default. This border helps you distinguish these areas from other objects in a document. However, borders can be distracting and add clutter to the project. You can hide and display the borders as needed.

The Show Frame Borders command displays borders around Frames in a drawing. The Hide Frame Borders command turns off the display of these borders. Only one of these commands is available in the X-Refs submenu at a time when a Draft mode window is active.

When the Hide Borders command is active, a border still appears when you select a Frame. To do this, you must click the edge of the Frame.

To use Hide Frame Borders: Choose Hide Frame Borders in the X-Refs submenu to make the shaded boundaries invisible. This command is available when borders are displayed.

To use Show Frame Borders: Choose Show Frame Borders in the X-Refs submenu to make the shaded borders visible. This command is available when borders are hidden.

Update Frame Layers

Mode: Draft

When you create an X-Ref Frame, all visible layers are included inside the Frame Border. If you change the visibility of layers containing Frames, you can use the Update Frame Layers command to refresh, or update your X-Ref with the latest information. This ensures that all objects on visible layers are included in X-Ref.

To update an X-Ref's layer structure

1. Select the X-Ref Frame whose layer structure has been modified or needs updating.
2. Choose Update Frame Layers in the X-Refs submenu.
3. In the list, double-click the document name or select the **DCAD VectorSpace** document and click OK. You can click Cancel to close the dialog box and not update the layer structure of the X-Ref.

Paste

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+V
Windows Shortcut: Ctrl+V

The Paste command in the Edit menu inserts the contents of the Clipboard into the active Draft or Sculpt window.

The Paste command is available when a Draft or Sculpt window is active and the Clipboard contains objects that can be pasted into a **DCAD VectorSpace** drawing. The Paste command is not available in Render mode and when the Clipboard contains nothing that can be pasted.

You can place selected objects and highlighted text selections on the Clipboard by using the Cut or Copy commands.

Pasting objects

You can use the Paste command to make copies of objects in the same document or a different **DCAD VectorSpace** document. You can also use the Paste command in other applications to place objects copied from **DCAD VectorSpace** into another application's documents.

When you choose the Paste command, **DCAD VectorSpace** inserts the Clipboard contents in the center of the active window. The pasted objects appear on the active layer.

- To paste the Clipboard contents in a specific location, use the Paste Special command in the Edit menu.
- Because the Paste command does not remove the Clipboard contents, you can use the Paste command to insert multiple copies of an object.

- You can view the contents of the Clipboard with the Show Clipboard command.

Viewing pasted objects

The View Options submenu affects the visibility of pasted objects. For example, you can paste 3D objects into a window set to Draft mode, but you won't be able to see the objects unless View 2D & 3D Objects is in effect in the View Options submenu. Conversely, you can paste 2D objects in a window set to Sculpt mode, but you won't see the objects unless View 3D & 2D Objects is in effect.

Pasting renderings in Draft mode

If the Render window contains a Solid rendering, and you use the Copy command to place the contents of the Render window on the Clipboard, you can paste the image into a Draft window. After you paste the rendering, you can use the Recalculate command in the Edit menu to make quick changes to Surface materials, textures, or colors in the rendering. This technique lets you make changes without having to repeatedly re-render every object to see the changes.

To use the Paste command

1. Use the Cut or Copy command in the Edit menu of **DCAD VectorSpace** or another application to place a selection on the Clipboard.
2. Make sure the window where you want to paste the Clipboard contents is active. You can open a new window using a Window menu command, or click a Draft or Sculpt window to make it active.

-
3. Choose Paste in the Edit menu, press Ctrl+V (Windows), or Cmd+V (Mac OS). **DCAD VectorSpace** pastes the Clipboard contents in the center of the active window on the current layer.

Note: If the view magnification is high, you might need to reduce the view magnification to see the pasted object.



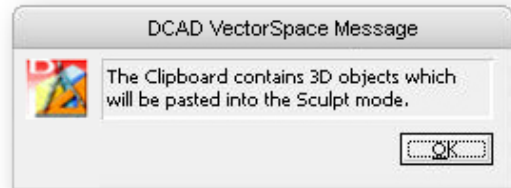
Pasting in other modes

If the type of object on the Clipboard does not match the mode of the active window, the result of choosing the Paste command depends on the view setting of the active window.

If the view setting would make the pasted selection invisible in the active window, **DCAD VectorSpace** displays a message to tell you that the Clipboard contents will appear in another window.

Pasting 2D objects. If the Clipboard contains 2D objects, and the Sculpt window is active when you choose Paste, a message informs you that the contents will appear in the Draft environment. Click OK in the message box to paste into the Draft window. If the Draft window where the selection originated isn't open, **DCAD VectorSpace** doesn't paste the Clipboard contents.

Pasting 3D objects. If the Clipboard contains 3D objects and the Draft window is active when you choose Paste, a message tells you that the contents will appear in the Sculpt environment. Click OK in the message box to paste the Clipboard contents into the Sculpt window. If the Sculpt window is not open, **DCAD VectorSpace** doesn't paste the Clipboard contents.



If the view setting of the active window is View 2D & 3D Objects, or View 2D & Lock 3D Objects, this allows a pasted selection to be seen even if it doesn't match the mode of the active window. In this case, **DCAD VectorSpace** pastes the selection in the appropriate window, even if the window isn't active, without displaying a message, because the pasted selection can be seen in the active window.

For example, you copy a 3D object from a Sculpt window, and the Draft window is active when you choose Paste. If the view mode of the Draft window is "View 2D & 3D Objects," **DCAD VectorSpace** pastes the 3D object in the Sculpt window, but the object also appears in the Draft window.

Paste Options

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+V
Windows Shortcut: Ctrl+Shift+V

The Paste Options command inserts the contents of the Clipboard into the active Draft or Sculpt windows at a location that you specify. The command

functions the same as the Paste command, except that you can choose where in the document you want to paste the Clipboard contents.

The Paste Options command is available when a Draft or Sculpt window is active and the Clipboard

contains objects that can be pasted into a **DCAD VectorSpace** drawing. The Paste Options command is not available and appears dimmed in the menu in two situations: when you work in Render mode and when the Clipboard contains nothing that can be pasted into a **DCAD VectorSpace** document.

To use the Paste Options command

1. Use the Cut or Copy command in the Edit menu of **DCAD VectorSpace** or another application to place objects on the Clipboard.
2. Choose Paste Options in the Edit menu, press Ctrl+Shift+V (Windows), or Cmd+Shift+V (Mac OS). The Paste Options dialog box appears.
3. Choose an option in the Paste pop-up menu and click OK. The dialog box closes.
 - If you choose Absolute or Relative, **DCAD VectorSpace** pastes the Clipboard contents in the specified manner.
 - If you choose Cursor Position, the pointer changes to a cross. Position the center of the cross and click in the drawing where you want the top-left corner of the pasted selection's bounding rectangle to appear.

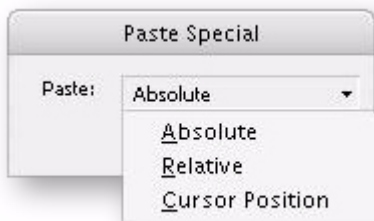


Figure 143.- Paste Options dialog box

Paste Options choices

In the Paste Options dialog box, the Paste pop-up menu contains three positioning methods: Absolute, Relative, and Cursor Position.

Absolute. pastes the contents of the Clipboard in the same position in the document as the original objects.

Relative. pastes the contents of the Clipboard in the center of the active window. The Paste command pastes objects using this method also.

Cursor Position. lets you specify a point at which to paste the top-left corner of the bounding rectangle of the Clipboard contents. For a rendering copied from the Render window, the size of the bounding rectangle depends on the size of the Render window.

Pasting in other modes

When you use the Paste Options command, **DCAD VectorSpace** displays a message if objects you are pasting do not match the active window mode. For more information on pasting objects that do not match the active window mode, **Pasting in other modes**, page 179.

Preferences Menu

Mode: Draft, Sculpt, Render

The Preferences submenu in the Edit menu lets you customize the **DCAD VectorSpace** work environ-

ment. The Preferences submenu is available when any **DCAD VectorSpace** document is open.

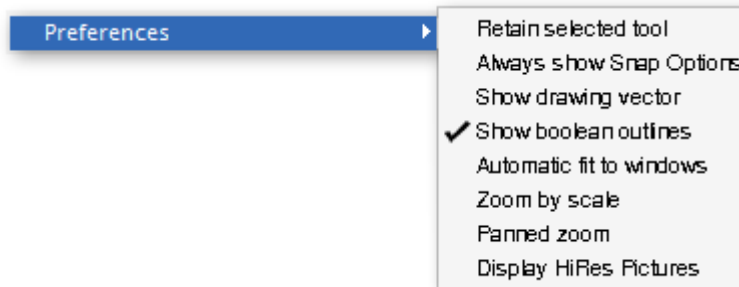


Figure 144.- Preferences menu

To change preference settings

1. Open the Preferences submenu in the Edit menu.
2. Click on the desired preference in the submenu to turn it On or Off.
3. The new preferences take effect immediately.

Note: The Active (ON) preferences appear marked by a check-sign (✓) to the left of the option.



Retain selected tool

If you select this option, **DCAD VectorSpace** activates the Selection tool after you use a drawing tool, so you can move the object you just created. After you move the object, you need to click an empty area of the active window to switch back to the previous drawing tool.

Even if you do not move the object you just created, you need to click an empty area of the active window to switch back to the previous drawing tool.

If this option is not checked, **DCAD VectorSpace** activates the Selection tool after you use any other tool. The Selection tool remains active even after you use it to select or move objects.

Always show snap options

If you check this option, **DCAD VectorSpace** displays the Snaps pop-up menu whenever you press the pointer in the document. This means the Snaps menu appears if you use a drawing tool and you drag to draw an object. However, the Snaps menu doesn't appear if you click (rather than drag) in the document to set the first point of an object, but the menu does appear if you press (not click) to set subsequent creation points of an object.

If “Always show snap options” is not checked, the Snaps menu appears when you hold down the Control key and press the pointer in a drawing.

Show drawing vector

If you check this option, **DCAD VectorSpace** displays the drawing vector when you draw, move, extrude, rotate, place, or otherwise manipulate the position of an object.

The drawing vector is a hollow arrow that indicates direction and distance when you draw or perform operations on objects.

As you move or drag the mouse, the drawing vector follows the pointer. Its exact position depends on the operation you perform. If you draw with the Circle Radius tool, for example, the drawing vector extends from the center of the circle to its perimeter as you draw. If the Snap to Grid command is active, the pointer and the tip of the drawing vector snap to points on the grid. If the Snap to Grid command isn't active, the drawing vector and pointer do not snap to the grid.

Show boolean outlines

If you check this option, **DCAD VectorSpace** displays a red outline around a combined object when the object is in reshape mode. Combined objects are groups of individual objects that have been merged with a command in the Combine submenu in the Object menu. The red outline helps you remember the combined shape as you reshape individual objects using the Reshape command.

When “Show Boolean outlines” is not checked, the red outline does not appear when combined objects are in reshape mode.

Automatic Fit to Window

If you check this option, **DCAD VectorSpace** calculates the magnification of a new Draft or Sculpt window so that all objects appear and are centered within the newly opened window.

If “Automatic Fit to Window” is not checked, objects in the new Draft or Sculpt window appear at the same magnification as the active window. This means the objects might not be visible when you open a new window.

Zoom by Scale

If you check the Zoom by Scale option, the magnification levels in the zoom pop-up menu appear as ratios based on the current drawing scale. For example, if the drawing scale is $1/4'' = 1'$ (one-quarter inch equals one foot), the 100% magnification level appears as the ratio 1:48, and the 50% magnification level appears as the ratio 1:96.

You can set the drawing scale with the Output Setup command in the Layout menu.

If the Zoom by Scale option is not selected, the magnification levels in the Zoom pop-up menu appear as percentages, with 100% indicating normal view magnification.

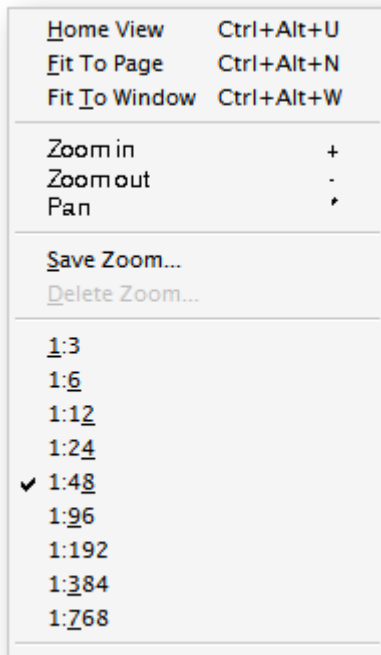


Figure 145.- Magnification levels in the Zoom pop-up menu - Scale

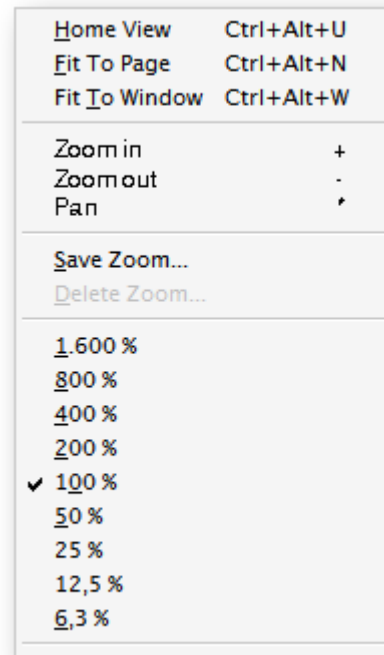


Figure 146.- Magnification levels in the Zoom pop-up menu - Percentage

Panned Zoom

If you check the Panned Zoom option, you can select the view area in a drawing when you increase the zoom level. Selecting this preference makes the Zoom pop-up menu work more like the Zoom tool. With the Zoom tool, you always specify the view area when you increase magnification.

When the Panned Zoom option is checked and you choose an increased zoom level in the Zoom pop-up menu, **DCAD VectorSpace** displays a gray rectangle in the drawing. The rectangle indicates the area that

will be visible in the window at the new zoom level. Move the pointer to position the rectangle, and click to zoom in.

The size and proportions of the Panned Zoom rectangle matches the size and proportions of the drawing window.

When the Panned Zoom option is not checked, the zoom level changes as soon as you choose a zoom level in the Zoom pop-up menu. When you increase the zoom level, **DCAD VectorSpace** zooms in to the current view in the drawing window.

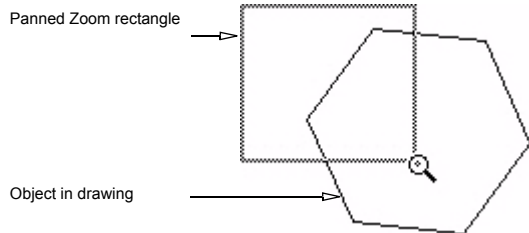


Figure 147.- Zooming with the Panned Zoom rectangle

Display HiRes Pictures

If you check this option, **DCAD VectorSpace** displays Solid renderings pasted into Draft mode win-

dows at the resolution specified in the Rendering Options dialog box.

If you do not check “Display HiRes Pictures”, **DCAD VectorSpace** displays Solid renderings at 72 ppi, regardless of the resolution specified in the Rendering Options dialog box. This option is for display purposes only. The “Display HiRes Pictures” option doesn’t affect the actual resolution of a solid rendering. If you don’t check “Display HiRes Pictures,” it has no effect on printing solid renderings, or saving drawings.

Preferences Dialog

Mode: Draft, Sculpt, Render

The Preferences command in the Edit menu lets you customize the **DCAD VectorSpace** work environment. The Preferences command is available when any **DCAD VectorSpace** document is open.

When you choose the Preferences command, the Preferences dialog box appears.

The Preferences dialog box organizes options on two tabs. To bring a tab to the front, click the tab.

- The tab marked with a window icon contains General preference settings.
- The tab marked with an arrow icon contains Tools preference settings.

Changing preferences

Preferences affect the operation of **DCAD VectorSpace** at the program level. The cur-

rent preferences affect open **DCAD VectorSpace** documents and new documents you create. When you click OK in the Preferences dialog box, all preferences take effect immediately.

However, existing objects do not change when you implement new preferences that affect objects, such as the “# of Snap Points” and “Round Radius” preferences.

When you save a document, **DCAD VectorSpace** updates the current preferences information, which is stored in the **DCAD VectorSpace** Pref file. This file is in the Preferences folder in the System Folder.

To change preference settings

1. Choose Preferences in the Edit menu. The Preferences dialog box opens.
2. Configure the preferences in the dialog box. To change tabs, click the icon at the top of the tab to bring the back tab to the front.

-
3. To make the new preferences take effect, click OK. To leave the last saved preferences unchanged, click Cancel.

General tab



A window icon appears at the top of the General preferences tab.

Retain selected tool

If you select this option, **DCAD VectorSpace** activates the Selection tool after you use a drawing tool, so you can move the object you just created. After you move the object, you need to click an empty area of the active window to switch back to the previous drawing tool.

Even if you do not move the object you just created, you need to click an empty area of the active window to switch back to the previous drawing tool.

If this option is not checked, **DCAD VectorSpace** activates the Selection tool after you use any other tool. The Selection tool remains active even after you use it to select or move objects.

Always show snap options

If you check this option, **DCAD VectorSpace** displays the Snaps pop-up menu whenever you press the pointer in the document. This means the Snaps menu appears if you use a drawing tool and you drag to draw an object. However, the Snaps menu doesn't appear if you click (rather than drag) in the document to set the first point of an object, but the menu does appear if you press (not click) to set subsequent creation points of an object.

If “Always show snap options” is not checked, the Snaps menu appears when you hold down the Control key and press the pointer in a drawing.

Show drawing vector

If you check this option, **DCAD VectorSpace** displays the drawing vector when you draw, move, extrude, rotate, place, or otherwise manipulate the position of an object.

The drawing vector is a hollow arrow that indicates direction and distance when you draw or perform operations on objects.

As you move or drag the mouse, the drawing vector follows the pointer. Its exact position depends on the operation you perform. If you draw with the Circle Radius tool, for example, the drawing vector extends from the center of the circle to its perimeter as you draw. If the Snap to Grid command is active, the pointer and the tip of the drawing vector snap to points on the grid. If the Snap to Grid command isn't active, the drawing vector and pointer do not snap to the grid.

Show boolean outlines

If you check this option, **DCAD VectorSpace** displays a red outline around a combined object when the object is in reshape mode. Combined objects are groups of individual objects that have been merged with a command in the Combine submenu in the Object menu. The red outline helps you remember the combined shape as you reshape individual objects using the Reshape command.

When "Show Boolean outlines" is not checked, the red outline does not appear when combined objects are in reshape mode.

Automatic Fit to Window

If you check this option, **DCAD VectorSpace** calculates the magnification of a new Draft or Sculpt window so that all objects appear and are centered within the newly opened window.

If "Automatic Fit to Window" is not checked, objects in the new Draft or Sculpt window appear at

the same magnification as the active window. This means the objects might not be visible when you open a new window.

Auto-tile windows

If you check this option, **DCAD VectorSpace** arranges windows on screen so they do not overlap when you open a new Draft, Sculpt, and Render window using the "Show" commands in the Window menu. When you open a Draft, Sculpt, and Render window, this option places the Draft window on the left half of the screen, with the Sculpt window above the Render window on the right half. When you open two windows, each occupies half of the screen.

If you close a window, **DCAD VectorSpace** does not resize or arrange the remaining windows.

If "Auto-tile windows" is not checked, each new window you open fills the screen.

Zoom by Scale

If you check the Zoom by Scale option, the magnification levels in the zoom pop-up menu appear as ratios based on the current drawing scale. For example, if the drawing scale is $1/4" = 1'$ (one-quarter inch equals one foot), the 100% magnification level appears as the ratio 1:48, and the 50% magnification level appears as the ratio 1:96.

You can set the drawing scale with the Output Setup command in the Layout menu.

If the Zoom by Scale option is not selected, the magnification levels in the Zoom pop-up menu appear as percentages, with 100% indicating normal view magnification.

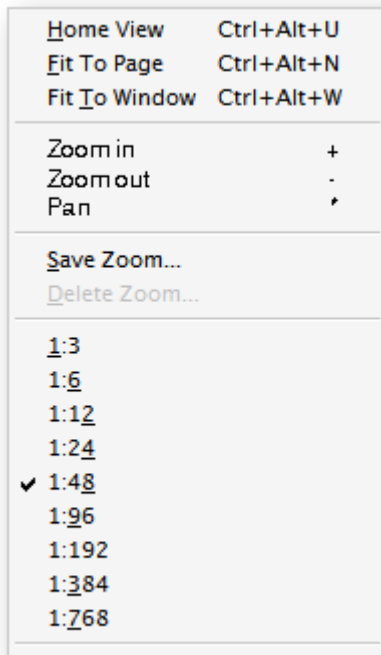


Figure 148.- Magnification levels in the Zoom pop-up menu - Scale

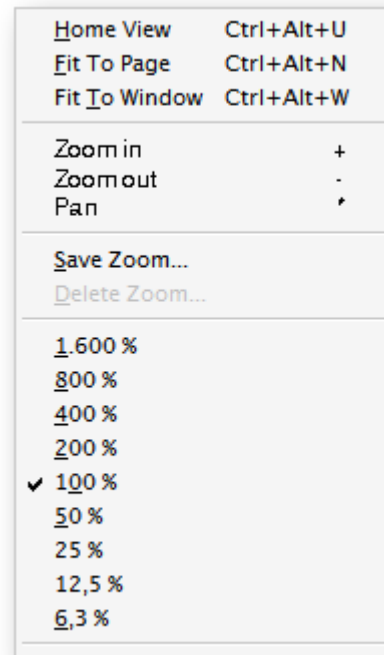


Figure 149.- Magnification levels in the Zoom pop-up menu - Percentage

Panned Zoom

If you check the Panned Zoom option, you can select the view area in a drawing when you increase the zoom level. Selecting this preference makes the Zoom pop-up menu work more like the Zoom tool. With the Zoom tool, you always specify the view area when you increase magnification.

When the Panned Zoom option is checked and you choose an increased zoom level in the Zoom pop-up menu, **DCAD VectorSpace** displays a gray rectangle in the drawing. The rectangle indicates the area that

will be visible in the window at the new zoom level. Move the pointer to position the rectangle, and click to zoom in.

The size and proportions of the Panned Zoom rectangle matches the size and proportions of the drawing window.

When the Panned Zoom option is not checked, the zoom level changes as soon as you choose a zoom level in the Zoom pop-up menu. When you increase the zoom level, **DCAD VectorSpace** zooms in to the current view in the drawing window.

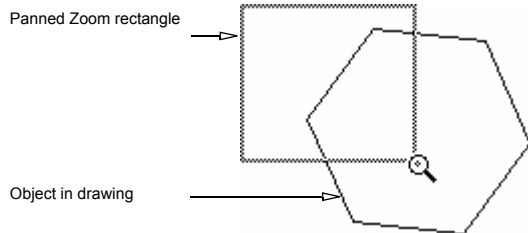


Figure 150.- Zooming with the Panned Zoom rectangle

Display HiRes Pictures

If you check this option, **DCAD VectorSpace** displays Solid renderings pasted into Draft mode windows at the resolution specified in the Rendering Options dialog box.

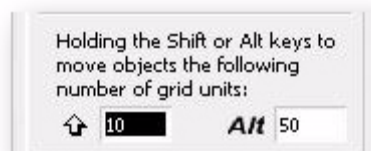
If you do not check “Display HiRes Pictures”, **DCAD VectorSpace** displays Solid renderings at 72 ppi, regardless of the resolution specified in the Rendering Options dialog box. This option is for display purposes only. The “Display HiRes Pictures” option doesn’t affect the actual resolution of a solid rendering. If you don’t check “Display HiRes Pictures,” it has no effect on printing solid renderings, or saving drawings.

Arrow key settings

The text boxes at the bottom of the General Preferences tab let you specify the number of grid units a selected object moves when you use a combination of modifier and keyboard arrow keys.

In the box on the left, type the number of grid increments to move objects when you hold down the Shift key and press a keyboard arrow key.

In the box on the right, type the number of grid increments to move selected objects when you hold down the Option key and press a keyboard arrow key.



For example, with the settings shown above, pressing Shift+Left Arrow moves a selected object 10 grid units to the left, and pressing Option+Right Arrow moves a selected object 50 grid units to the right.

To specify units, use the Units Setup command in the Layout menu.

Tools tab

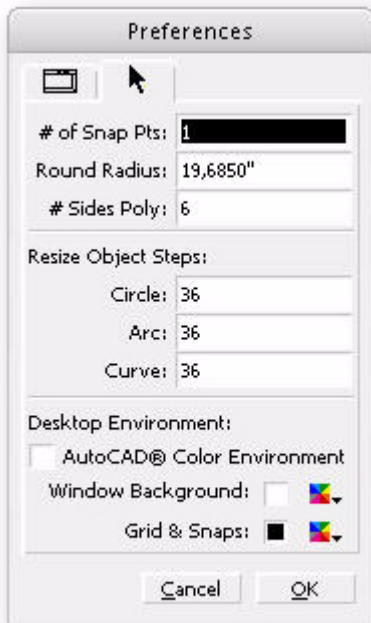


Figure 151.- Tools tab

A solid arrow appears at the top of the Tools tab in the Preferences dialog box. The options on the tab let you specify settings for objects you create with drawing tools. You can also use Desktop Environment options to change the colors of the window background, drawing grid, and snap objects.

of Snap Pts.

The “# of Snap Pts.” preference sets the number of snap points that appear on a line segment, arc, or curve. Type the number of points in the text box.

DCAD VectorSpace displays snap points on selected objects when you point to an object and

choose Snap Points in the Snaps pop-up menu or press the Spacebar.

- For squares and rectangles, snap points appear evenly spaced between the corner points.
- For polygons, snap points appear evenly spaced between each vertex.
- For curved polylines, snap points appear evenly spaced between the points through which the curve is defined.
- For arcs, snap points appear evenly spaced between the end points. **DCAD VectorSpace** treats circles as four arcs.

Temporary # of Snap Pts.

The “# of Snap Pts.” preference may be changed temporarily, without affecting the stored preference value.

To make a temporary change of the # of Snap Pts. preference:

1. Place the cursor on an existing object.
2. Press **Ctrl+Spacebar** on the keyboard.
3. Type in the desired value in the dialog that opens and clic **OK**.

Note: The new value will remain active until: **a)** a new temporary value is set; or **b)** DCD is turned off.



Round Radius

The Round Radius preference controls the radius of the corners of rounded rectangles. To change the value, type the radius measurement in the text box.

You can change the Round Radius amount at any time. Changing this value does not affect existing objects, but does affect the next rounded rectangle that you draw.

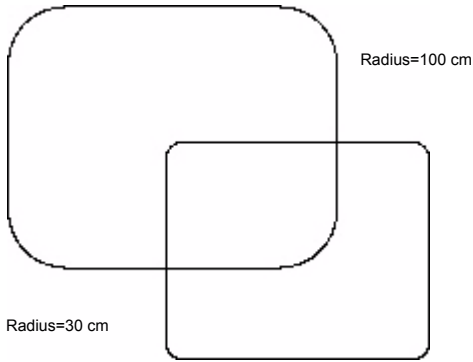


Figure 152.- Effect of Round Radius settings

Sides Poly

The “#Sides Poly” preference specifies how many sides the Polygon Vertex and Polygon Midpoint tools create when you use these tools to draw polygons.

You can change this preference by double-clicking the Polygon Vertex or Polygon Midpoint tool icons in the toolbox. In the dialog box that appears, type a number in the “# of sides” text box and click OK to change the preference.

Resize Object Steps

Curved objects become polylines or polygons when you perform certain operations on them.

An arc, circle, or curve becomes polylines or polygons when you do the following:

- Apply the Convert to Polygon command to a 2D object. The resulting object is a polygon made of multiple segments.
- Apply the Unchain command to a 2D object. The result is a series of separate polyline objects.
- Extrude a 2D object in Draft mode or draw a 3D curved object in Sculpt mode. The resulting object is made of a series of linked polygons.

The “Resize Object Steps” preference controls the number of steps in these converted or extruded objects. “Steps” refers to separate polygons in 3D objects, and separate polylines or polygon segments in 2D objects.

For example, if you unchain a circle, the Circle Step preference determines the number of segments in the resulting polygon. When you draw a 3D cylinder with a circle tool, the Circle Step preference determines the number of facets or faces of the 3D object. Higher Circle Step values result in smoother and more complex 3D objects.

Circle Step. sets the number of steps in an extruded or polygonized circle.

Arc Step. sets the number of steps in an extruded or polygonized arc.

Curve Step. sets the number of steps in an extruded or polygonized curve.

Desktop environment

The Desktop Environment preferences on the Tools tab let you specify background and grid colors for drawing windows.

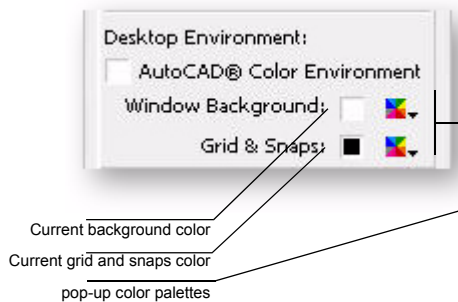


Figure 153.- Desktop Environment options

Window Background

The Window Background preference lets you pick a background color for Draft and Sculpt mode windows. Render mode windows do not use the Window Background color. You choose the Render window background in the Rendering Options dialog box.

The current background color appears in the box. You can choose a preset or custom color from the pop-up color palette.

To change the background color, press the pop-up color palette and drag to the color in the grid that you want to use. To select a custom color, drag to the “Other...” area at the bottom of the grid.

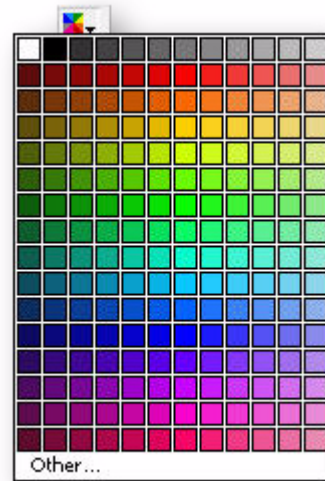


Figure 154.- Options in the pop-up color palette

Choosing a Custom color

When you select “Other...” in the pop-up color palette, the System Color Picker appears. This dialog box lets you specify custom colors from a color wheel or by entering color values numerically.

To specify a custom color, click in the color wheel, or enter color values in the Hue, Saturation, Brightness or Red, Green, Blue text boxes. Click OK to accept the current color.

In some cases, a different dialog box appears when you select “Other...” This happens if you use a system extension that replaces the standard Mac OS Color Picker. Some color management utilities do this. For information on other color pickers, refer to your system documentation or to the documentation for your color management software.

Grid & Snaps

The Grid & Snaps preference lets you pick a color for the drawing grid in Draft and Sculpt mode windows. Render mode windows do not use the Grid & Snaps color because the grid doesn't appear in Render mode.

The current grid color appears in the color box. You can choose a preset or custom color from the pop-up color palette.

To change the Grid & Snaps color, press the pop-up color palette and drag to the color in the grid that you want to use. To select a custom color, drag to the "Other..." area at the bottom of the grid to open the Color Picker dialog box.

Recalculate

Mode: Draft
Mac OS Shortcut: Cmd+Shift+K
Windows Shortcut: Ctrl+Alt+K

Note: To recalculate a rendering, it must be in the same **DCAD VectorSpace** document as the 3D model on which it is based.



The Recalculate command updates a rendering, created with the Solid command, that has been pasted into a Draft mode window. You can use the Recalculate command to make the rendered image match the current attributes of the objects, after you change the attributes of any object that appears in the rendering.

Note: See [figure 155](#) and [figure 156](#) for an example of the use of the Recalculate Command



Recalculate is available when a pasted rendering is selected in the Draft mode window.

Using renderings in Draft mode

You can copy Solid renderings from the Render mode window, and then use the Paste command to insert the renderings into a Draft mode window. You can then change the color or Surface materials of objects, and use the Recalculate command to re-render only the objects you've changed. In this way, you can avoid re-rendering all 3D objects in the document when you just want to experiment with different colors or Surface materials.

Using the Recalculate command makes it easy to change some aspects of a rendering without having to set camera angles and re-render all 3D objects.

For example, you can paste into a Draft mode window a rendering of a room that contains many rendered elements. Then, change the color of the carpet, and use the Recalculate command to assess the effect of the change without having to re-render every object in the entire room.

When you choose Recalculate, new fill colors and Surface materials appear in the Draft mode copy of a rendering only. Recalculate does not change the current rendering in the Render mode window.

If you do want to see new fill attributes in Render mode, you must use the Solid command to create a new rendering with colors and Surface materials in Render mode.

Before you can use the Recalculate command, you must copy a rendering and paste it into a Draft mode window. You must also make a modification to an object in Sculpt mode.

To paste a rendering into Draft mode

1. Create a rendering in the Render mode window using the Solid command. Choose Copy in the Edit menu.
 - You can use the Solid command in the Copy View to Draft submenu in the Edit menu to copy a rendering to a Draft window.
2. Open or activate a Draft window. Choose Paste in the Edit menu, press Ctrl+V (Windows), or Cmd+V (Mac OS). A copy appears in the center of the window.

To change colors or Surface materials

1. In a Sculpt window, select the objects to apply colors or surface material.

2. Select a Pen color in the Pen palette, or, select a Surface material in the Fill palette.

Note: An object's Pen color appears as its "fill" color in Solid renderings when the object does not have a Surface material.



To use the Recalculate command

1. If necessary, follow the above procedures to paste a rendering into Draft mode and change the color or Surface material of 3D objects in Sculpt mode.
2. Select the rendering in Draft mode.
3. Choose Recalculate in the Edit menu, press Ctrl+Alt+K (Windows), or Cmd+Shift+K (Mac OS). **DCAD VectorSpace** recalculates the rendering in the active Draft mode window to match the current Pen color or Surface material of the objects in the rendering.

A Solid rendering that has been pasted into Draft mode



Figure 155.- How the Recalculate command works - I

Here, the rendering has been updated by the Recalculate command, after a marble surface material was applied to the floor in Sculpt mode

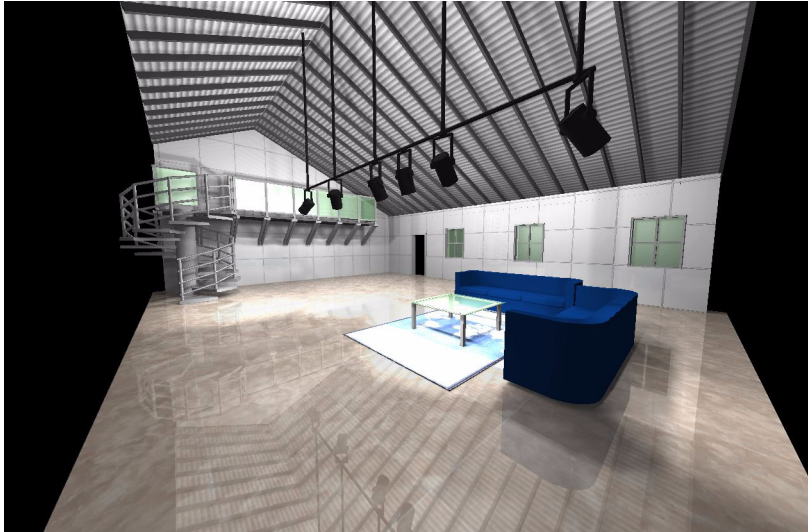


Figure 156.- How the Recalculate command works - II

Redo

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Z
Windows Shortcut: Ctrl+Z

The Redo command cancels the effect of the Undo command. Redo is available in the Edit menu after you apply the Undo command.

Once you choose Undo, Redo replaces the Undo command in the Edit menu until you perform another editing action.

To use the Redo command: To reinstate a canceled action, choose Redo in the Edit menu, press Ctrl+Z (Windows), or Cmd+Z (Mac OS) immediately after choosing Undo.

Note: If you can redo a command, *Redo command name* appears in the Edit menu, where *command name* is the name of the command you can reinstate.



Reshape

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+R
Windows Shortcut: Ctrl+R

The Reshape command puts selected objects in reshape mode. In this mode,



an object's creation points appear as handles that you can drag to reshape the object.

The Reshape command is available when an object that can be reshaped is selected in the active Draft or

Sculpt window. The Reshape action button duplicates the function of the Reshape command.

You can reshape selected objects at any stage in the design process.

In reshape mode, you can reshape an object by editing its creation points. On screen, an object's creation points appear as tiny black squares. In general, an object in Reshape mode behaves like a selected object; if you press Delete, for example (or choose Clear), the object disappears.

The locations of creation points depend on how the object was created. For example, the creation points of a rectangle drawn with the Rectangle Diagonal tool in Draft mode, are the points you set to create the rectangle. By contrast, the creation points of a cube drawn with the Rectangle Diagonal tool in Sculpt mode, appear at each corner of the object.

For Boolean objects, creation points are at the creation points of each of the constituent objects. (A Boolean object is two or more objects combined using a command in the Combine submenu.)

As you reshape a Boolean object, you can see the Boolean object's original outline if the preference "Show Boolean outlines" is active. This is one of **DCAD VectorSpace**'s most useful features.

After you finish reshaping a Boolean object, **DCAD VectorSpace** reapplies the original Boolean operation. If you're working with "Show Boolean outlines" off, you can still use the Reshape command on Boolean objects, but you won't be able to see the Boolean object's original outline as you work. In general, to make reshaping Boolean objects easier, you should leave "Show Boolean outlines" selected.

To use the Reshape command

1. Select one or more objects to reshape.

2. Choose Reshape in the Edit menu, click the Reshape action button, press Ctrl+R (Windows), or Cmd+R (Mac OS). The creation points of the selected objects appear.
 - If you selected a Boolean object, creation points appear on each object in the shape.
3. To reshape the object, drag its creation points.
4. To exit Reshape mode, click an empty area of the document. The creation points of the selected objects disappear and the objects are no longer selected.

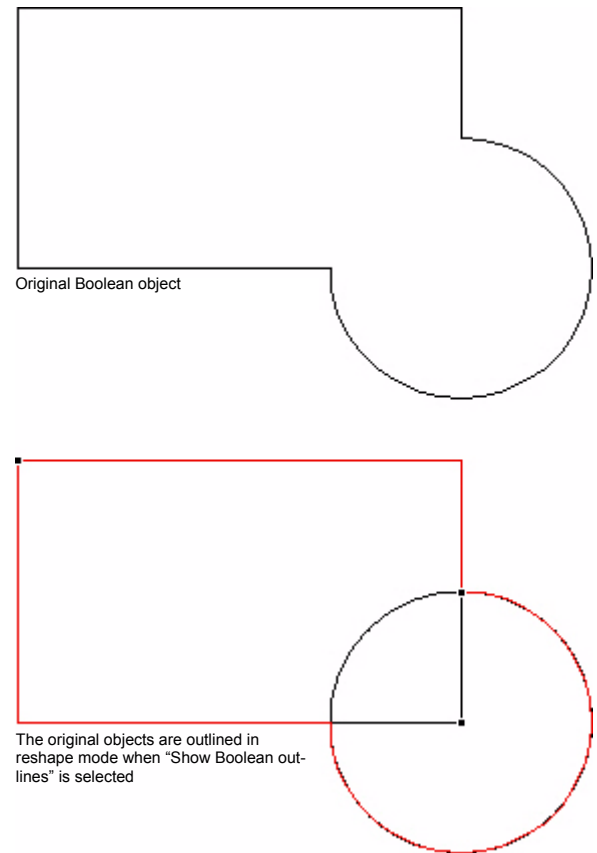


Figure 157.- Effect of Show Boolean Outlines preference

Select

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+A
Windows Shortcut: Ctrl+Shift+A

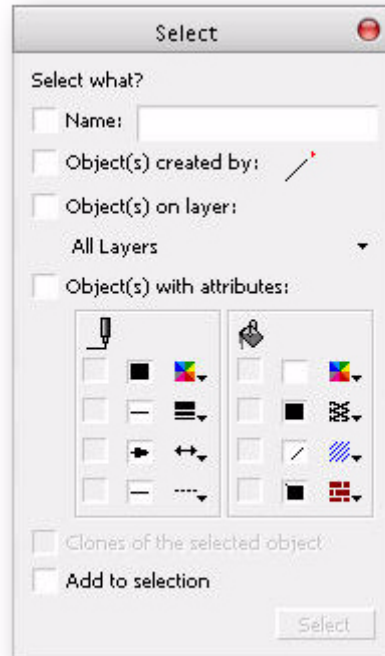
The Select command lets you select objects in a document based on their attributes, the tools used to create the objects, and other properties.

The Select command is available whenever a Draft or Sculpt mode window is active.

By using the Select command, you can select only the objects with the properties you specify. When you choose this command, **DCAD VectorSpace** displays the Select palette. You can then specify the properties of the objects you want to select.

To use the Select command

1. Choose Select in the Edit menu, press Ctrl+Shift+A (Windows), or Cmd+Shift+A (Mac OS). The Select palette appears.
2. Configure the selection options in the palette. You must check the options for the properties you want **DCAD VectorSpace** to use for selecting objects with the corresponding properties. These options are described later in this section.
3. To select the objects, click Select. **DCAD VectorSpace** selects the objects with the specified properties.



Selection methods

In the Select palette, you can select objects by the following properties:

- name
- the tool used to create the objects
- layers

- Pen and Fill attributes

You can also select clones of selected objects, or add to a current selection.

You can use a single selection property or multiple properties. When you use more than one property,

DCAD VectorSpace selects objects that match all of the properties, and not objects that meet *any* of the properties. This type of selection can be described as a logical “And” selection.

For example, if you choose the “Objects created by” option and the Line tool icon, and also check the Pen color option and choose a pen color, **DCAD VectorSpace** selects objects drawn with the Line tool and that also match the color you specified.

On the other hand, if you want to perform a logical “Or” selection, you can do this in the Select palette by specifying one property at a time, clicking Select, and then using the “Add to selection” option to select a series of objects.

Select palette options

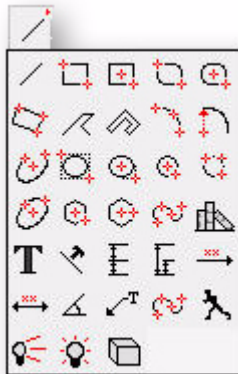


Figure 158.- Select palette - Tools menu

Name. If this option is checked, **DCAD VectorSpace** selects all objects with the name you type in the Name text box.

Object(s) created by. If this option is checked, **DCAD VectorSpace** selects all objects created

by the tool you choose in the adjacent pop-up menu.

Object(s) on layer. If this option is checked, **DCAD VectorSpace** selects all objects on the specified layer. Choose the layer from the pop-up menu.



Figure 159.- Select palette - Layers menu

Object(s) with attributes. If this option is checked, **DCAD VectorSpace** selects all objects with the Pen and Fill attributes that you specify. Use the individual options to select the attributes you want to include in the selection criteria. The first column contains Pen attributes, and the second column contains Fill attributes.

For example, to include arrowheads in the selection criteria, check the arrowhead checkbox and choose the arrowhead example from the pop-up palette.

Clones of the selected object. If this option is checked, **DCAD VectorSpace** selects all copies of the selected object, regardless of how the copies were added to the document. This option is available only when an object is selected.

Add to selection. When this option is checked and you click the Select button, **DCAD VectorSpace** leaves selected any objects that are currently selected, and then adds to the selection any objects that meet the current selection criteria in the Select palette.

Select All

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+A
Windows Shortcut: Ctrl+A

The Select All command selects all visible, unlocked objects in the current Draft or Sculpt mode window.

Note: You can't select objects in Render mode.



- You can select 3D objects in Draft mode and 2D objects in Sculpt mode by choosing the correct option in the View Options submenu, or the View Options pop-up menu.

To use the Select All command: Choose Select All in the Edit menu, press Ctrl+A (Windows), or Cmd+A (Mac OS).

Show Clipboard / Hide Clipboard

Modes: Draft, Sculpt, Render

The Show Clipboard command displays the contents on the system Clipboard in a floating window. The Hide Clipboard command removes the Clipboard window from the screen.

When you choose the Show Clipboard command, a window displays the current Clipboard contents so you can see what's stored on the Clipboard without interrupting your work.

You can ensure that you're pasting the correct selection by displaying the Clipboard before choosing the Paste command. Also, before choosing the Cut or Copy commands, you can display the Clipboard to avoid accidentally replacing a selection that you want to keep.

To use the Show Clipboard command: To display the system Clipboard, choose Show Clipboard in the Edit menu.

If the Clipboard window is open but not active, you can choose Show Clipboard to bring the Clipboard window to the front and make it active.

When the Clipboard window is the active window, the Show Clipboard command is not available, and the Hide Clipboard command appears in the Edit menu. You can choose this command to hide the system Clipboard.

To use the Hide Clipboard command: To hide the Clipboard window, choose Hide Clipboard in the Edit menu.

Undo

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Z
Windows Shortcut: Ctrl+Z

The Undo command cancels the most recent editing action.


To undo an action, you must choose Undo immediately after you perform the action. You can cancel only the most recent action with the Undo command.

Almost any editing action or command can be canceled with the Undo command. However, you usually cannot cancel any action that doesn't change objects in the document. The following are some actions that can't be canceled with the Undo command:

- saving a file
- changing the view magnification
- opening a palette
- adjusting the settings in a dialog box
- opening a file
- importing a file

If an action cannot be undone, *Can't Undo* appears in the Edit menu in place of the Undo command.


To use the Undo command: To cancel your last editing action, choose Undo in the Edit menu, press Ctrl+Z (Windows), or press Cmd+Z (Mac OS).

Note: When a command can be canceled, the Undo command appears in the menu as *Undo command name*, where *command name* is the name of the command just performed. 

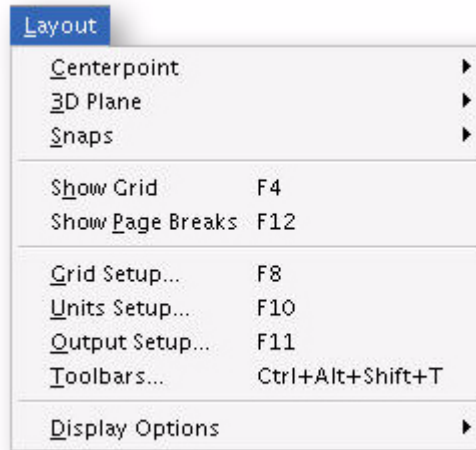
Restoring a canceled action with Redo

After you choose Undo, Redo replaces Undo in the Edit menu until you perform another editing action. The Redo command lets you restore an action canceled with Undo.

To use the Redo command: To reinstate a canceled action, choose Redo in the Edit menu, press Ctrl+Z (Windows), or press Cmd+Z (Mac OS) immediately after choosing Undo.

Note: When you can redo a command, "Redo *command name*" appears in the Edit menu, where *command name* is the name of the command you can reinstate. 

Layout menu commands



In this chapter:

- Centerpoint submenu
- Display Options submenu
- Grid Setup
- Hide Grid / Show Grid
- Output Setup
- Show Page Breaks
- Snaps submenu
- 3D Axis submenu
- 3D Plane submenu
- Toolbars
- Units Setup

Layout menu commands

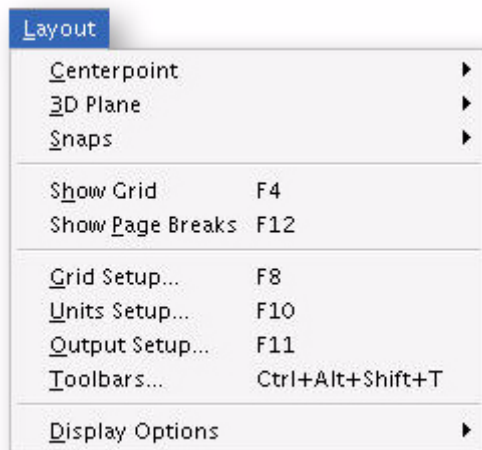



Figure 160.- Layout menu commands

Layout menu commands let you set up a document's drawing scale, measurement units, toolbars, and out-

put settings. You can also define, save, and select extrusion planes in Draft and Sculpt modes.

The Layout menu contains six commands: Hide Grid, Show Page Breaks, Grid Setup, Units Setup, Output Setup, and Toolbars.

The Layout menu also contains five submenus: Centerpoint, 3D Plane, 3D Axis, Snaps, and Display Options.

Note: The 3D Plane and 3D Axis submenus replace each other in the Layout menu depending on the current extrusion method. 

This chapter describes the commands and submenus that appear in the Layout menu. The commands and submenus are listed in this chapter in alphabetical order.

Centerpoint submenu

Modes: Draft, Sculpt

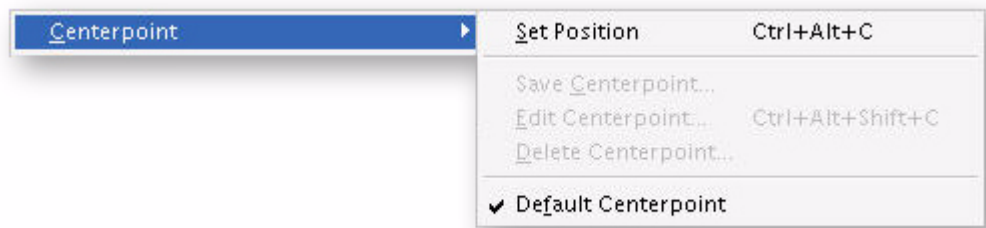


Figure 161.- Centerpoint submenu

A Centerpoint is a reference point in a **DCAD VectorSpace** document. The Centerpoint

submenu contains commands to set, activate, save, and delete Centerpoints. The submenu also contains the names of saved custom Centerpoints.

This section describes the following Centerpoint submenu commands:

Custom Centerpoint. Appears in the Centerpoint submenu if a custom Centerpoint is active.

Default Centerpoint. Activates the default Centerpoint, which is the Absolute Origin of the **DCAD VectorSpace** workspace.

Delete Centerpoint. Lets you delete custom Centerpoints that you have saved.

Edit Centerpoint. Lets you edit the coordinates of the active custom Centerpoint.

Save Centerpoint. Saves the active custom Centerpoint so you can select it again.

Set Position. Lets you set a custom Centerpoint at any location in the document.

Working with Centerpoints

A Centerpoint is a point of reference in a **DCAD VectorSpace** document. Usually, a Centerpoint is the zero point from which coordinates and distances are calculated. A Centerpoint appears on screen as a **red** circled cross (**figure 162**).



Figure 162.- The Centerpoint (enlarged view)

Custom Centerpoint

Modes: Draft, Sculpt

When “Custom Centerpoint” appears in the Centerpoint submenu, it means that a custom Centerpoint,

In a new **DCAD VectorSpace** document, the Centerpoint is the Absolute Origin of the document, at the Cartesian coordinates $X=0$, $Y=0$, $Z=0$ (in 3D space). This Centerpoint is the default Centerpoint, which you can return to by choosing the Default Centerpoint command.

You can set new Centerpoints in a document so you can refer to other points as “virtual” origins. You can also assign other coordinates to a custom Centerpoint, so that you can refer to these coordinates without working at the actual coordinate location in the document.

When you activate a Centerpoint, the coordinates of objects in the document can change, because the positions of objects are defined relative to the active Centerpoint.

One Centerpoint is always active in a document. You can activate a different Centerpoint by choosing Default Centerpoint, or the name of a saved Centerpoint, in the Centerpoint submenu. You can set a new Centerpoint by choosing the Set Position command.

When you set a Centerpoint, and then save it, the Centerpoint’s name appears in the Centerpoint submenu in every view in Draft and Sculpt modes.

Note: After you choose a Centerpoint in the Centerpoint submenu, you can’t choose Undo to return to the previous Centerpoint.



which you set using the Set Position command, is active.

“Custom Centerpoint” appears until you activate another Centerpoint by choosing the Default Centerpoint command, or the name of a saved Centerpoint.

If the custom Centerpoint is active, and you save it, the name you specify appears at the bottom of the Centerpoint submenu, a check mark indicates that

this is the active Centerpoint, and “Custom Centerpoint” no longer appears.

Be sure to save a custom Centerpoint if you want to activate it again. For more information, see **Save Centerpoint**, page 207.

Default Centerpoint

The Default Centerpoint command activates the default Centerpoint.

When you create a **DCAD VectorSpace** document, a check mark next to the Default Centerpoint command in the Centerpoint submenu indicates that the default Centerpoint is active.

The default Centerpoint is the Absolute Origin for the **DCAD VectorSpace** workspace, at $X=0$, $Y=0$,

$Z=0$. The coordinates of the default Centerpoint can't be changed.

To activate the default Centerpoint: Choose Default Centerpoint in the Centerpoint submenu. **DCAD VectorSpace** activates the default Centerpoint and centers it in the active window.

Note: After you choose a Centerpoint in the Centerpoint submenu, you can't choose Undo to return to the previous Centerpoint.



Delete Centerpoint

Modes: Draft, Sculpt

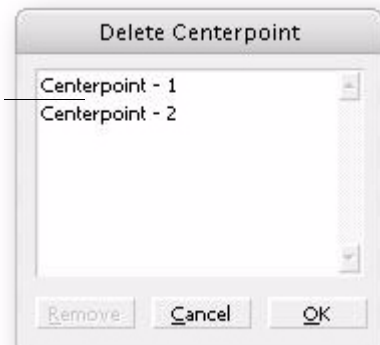
The Delete Centerpoint command lets you delete Centerpoints that you have saved.

To delete a Centerpoint

1. Choose Delete Centerpoint in the Centerpoint submenu. The Delete Centerpoint dialog box appears.
2. Select the names of Centerpoints that you want to delete from the document.
 - To select (or deselect) a contiguous range of Centerpoints, press Shift and click the first and last Centerpoints' names.
 - To select (or deselect) several non-contiguous Centerpoints, press Ctrl (Windows) or

Cmd (Mac OS) and click each Centerpoint's name.

List of saved Centerpoints



3. To remove the selected Centerpoints, click Remove.

4. To permanently delete the removed Centerpoints, click OK.

Edit Centerpoint

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+C
Windows Shortcut: Ctrl+Alt+Shift+C

The Edit Centerpoint command lets you edit the Cartesian coordinates of a saved Centerpoint. This command is not available until you save a Centerpoint.

In addition, the Edit Centerpoint command can be used to determine a Centerpoint's true coordinate location.

Using the Edit Centerpoint command

Editing a Centerpoint lets you use a small drawing area, but also refer to a "virtual" Centerpoint that simulates a larger drawing area. With this technique, you don't need to separate structures or elements of a project by their true distances apart just to ensure accurate coordinates across the document.

For example, if you want to draw two structures separated by 1 mile in the same document, you can put the first structure at the default Centerpoint (the Absolute Origin). Then, set a custom Centerpoint nearby, and use the Edit Centerpoint command to assign "virtual" coordinates to the custom Centerpoint. You can draw the second structure, using the edited Centerpoint as the reference point, without having to work at the true coordinate location of the second structure.

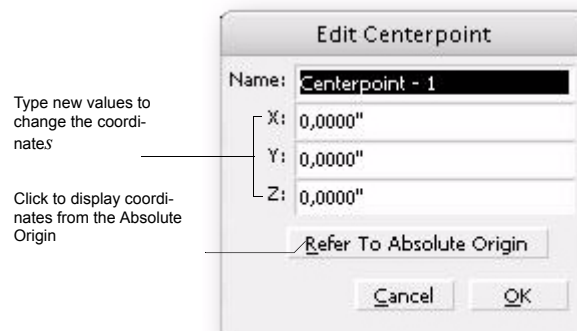
To edit a Centerpoint

1. In the Centerpoint submenu, choose the saved Centerpoint you want to edit. This activates the saved Centerpoint, which **DCAD VectorSpace** centers in the window.

2. Choose Edit Centerpoint in the Centerpoint submenu in the Layout menu. The Edit Centerpoint dialog box appears. You can change the Centerpoint's name or coordinates by typing in the text boxes.

- The first time you choose the Edit Centerpoint command for a custom Centerpoint, the coordinates are X=0, Y=0, Z=0. Changing these values doesn't move the Centerpoint relative to objects in the document or to the Absolute Origin. However, the Centerpoint's new coordinates are the reference point for object coordinates and measurements when the Centerpoint is active.
- To display the Centerpoint's true coordinates relative to the Absolute Origin, click "Refer to Absolute Origin." The coordinates appear in the X, Y, and Z text boxes.

3. Click OK to implement the settings



Save Centerpoint

Modes: Draft, Sculpt

After you set a custom Centerpoint using the Set Position command, you can save the Centerpoint. The names of saved Centerpoints appear at the bottom of the Centerpoint submenu. Saved Centerpoints are available in Draft and Sculpt mode and in all views.

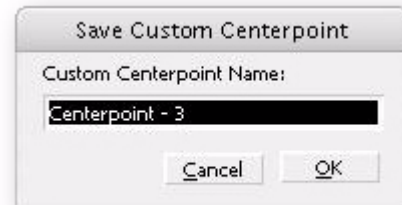
If a saved Centerpoint is active, a check mark appears next to its name in the Centerpoint submenu.

Using saved Centerpoints let you quickly display various parts of a plan by activating the saved Centerpoints using the Centerpoint submenu.

To save a Centerpoint

1. Use the Set Position command to set a Centerpoint.

2. Choose Save Centerpoint in the Centerpoint submenu. The Save Custom Centerpoint dialog box appears.



3. To change the default name, type a different name in the text box.
4. Click OK to save the Centerpoint. The Centerpoint's name appears at the bottom of the Centerpoint submenu.

Set Position

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+C
Windows Shortcut: Ctrl+Alt+C

The Set Position command lets you set Centerpoints in **DCAD VectorSpace** documents.

Every document has a default Centerpoint, which is the document's Absolute Origin, at X=0, Y=0, and Z=0. A Centerpoint that you set with the Set Position command is a virtual origin, which initially has the coordinates X=0, Y=0, Z=0.

A custom Centerpoint's virtual coordinates can also be changed, by using the Edit Centerpoint command; see **Edit Centerpoint**, page 206 for more information.

While you can set more than one Centerpoint in a document, only one is active at a time. The active Centerpoint has the coordinates X=0, Y=0, Z=0 (unless you change them). This makes the active Centerpoint the origin of a user-defined coordinate system.

When you create a custom origin, you don't lose the Absolute Origin. To see a Centerpoint's true coordinates, choose the Centerpoint, and then choose the Edit Coordinates command. Click the button "Refer to Absolute Origin" to see the actual coordinates of the Centerpoint.

The Set Position command has many practical uses. For example, rather than moving an entire drawing to the default Centerpoint, you can create a Centerpoint to accommodate the drawing. Also, you can

create several Centerpoints for different areas of a large plan. This makes it easy to switch to these areas by activating saved Centerpoints.



Figure 163.- Set Position

To set a Centerpoint

1. With a Draft mode or Sculpt mode window active, choose Set Position in the Centerpoint submenu in the Layout menu.
2. The pointer becomes a cross followed by a shadow Centerpoint. Click to place the Centerpoint. (If Snap to Grid, Snap to Objects, or Snap Objects are active, the pointer snaps to the nearest grid, object, or snap point.)

When you set a Centerpoint, it becomes the document’s origin, and is centered in the document window.

Display Options submenu

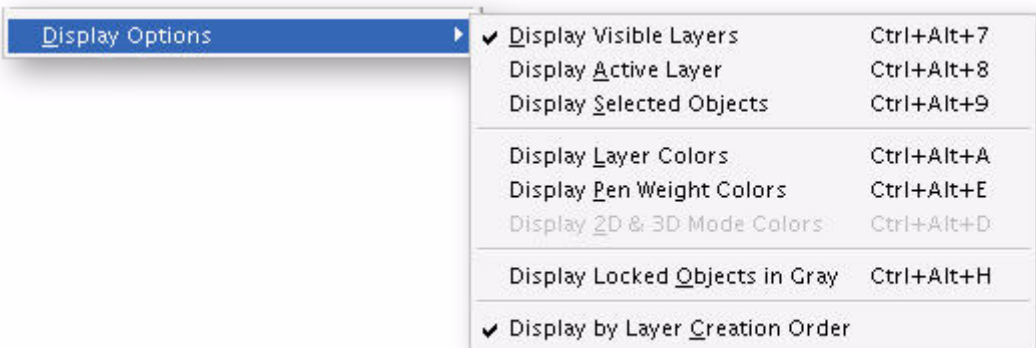


Figure 164.- Display Options submenu

The Display Options submenu contains commands that let you visually organize a document based on display criteria. These actions are for display purposes only and are independent of any attributes you’ve applied to objects in a document.

You can organize objects based on Rapidograph color-coding information. You can also distinguish objects based on layers or dimensions. You can dis-

play selected objects only, visible layers only, or layers in their creation order.

To avoid confusion, keep these issues in mind when working with the Display Options submenu:

- These commands are active or inactive. If a command is active, a check mark appears next to the command in the Display Options submenu.

- Activating one of these commands overrides other attributes assigned to objects, such as Pen or Fill colors. When you deactivate the command, assigned attributes reappear.
- These commands affect the active document window only.
- Not every command in the Display Options submenu can be active at the same time. This section explains which commands can be active simultaneously.
- Because the Display Options submenu commands affect the visibility of objects, they can affect the appearance of renderings.

The Display Options submenu contains the following commands:

Display Visible Layers. Displays objects on visible layers.

Display Active Layer. Displays objects on the active layer only.

Display Selected Objects. Displays selected objects only.

- If you activate one of these commands, **DCAD VectorSpace** deactivates the other two.
- The Display Options pop-up menu on the Status bar shows the active display command.



Figure 165.- The Display Options pop-up menu

Display Layer Colors. Displays objects based on layer colors in the Layer Manager.

Display Pen Weight Colors. Displays 2D objects in colors based on the Rapidograph pen color standard.

Display 2D & 3D Mode Colors. Lets you override the red-blue display when you activate a 2D and 3D design environment.

- If you activate one of the above three commands, **DCAD VectorSpace** deactivates the other two.

Display Locked Objects in Gray. Displays all locked objects with gray Pen color.

Display by Layer Creation Order. Displays objects based on the absolute order in which the layers were created in the Layer Manager.

Note: The Display Options submenu commands are described in this section in the order they appear in the submenu, not alphabetically.



Display Visible Layers

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+7
Windows Shortcut: Ctrl+Alt+7

The Display Visible Layers command displays or hides objects on visible layers in the active document window. To change which layers are visible, use the Layer Manager command.

To show objects on all visible layers, choose Display Visible Layers in the Display Options pop-up menu on the Status bar or the Display Options submenu. Objects on visible layers become visible. This deactivates Display Active Layer and Display Selected Objects, if either command was active.

Display Active Layer

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+8
Windows Shortcut: Ctrl+Alt+8

Display Active Layer displays objects on the active layer only, in the active document window.

To show objects on the active layer only, choose Display Active Layer in the Display Options pop-up

menu on the Status bar, or the Display Options sub-menu.

Choosing this command deactivates Display Visible Layers and Display Selected Objects, if either command was active.

Display Selected Objects

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+9
Windows Shortcut: Ctrl+Alt+9

This command displays only the objects that are selected and are on visible layers, in the active document window.

To show selected objects on visible, unlocked layers only, choose Display Selected Objects in the Display Options pop-up menu on the Status bar, or the Display Options submenu. This deactivates Display Visible Layers and Display Active Layer, if either command was active.

Display Layer Colors

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+A
Windows Shortcut: Ctrl+Alt+A

The Display Layer Colors command displays all objects that are on visible layers using the layers' colors as the colors of objects.

For more information on assigning layer colors, refer to **Layer Manager**, page 102.

To display all visible objects in the colors assigned to their layers, choose Display Layer Colors in the Display Options submenu.

To hide layer colors when this command is active, you can choose Display Layer Colors again to deactivate the command, or choose Display Pen Weight Colors, or Display 2D & 3D Mode colors.

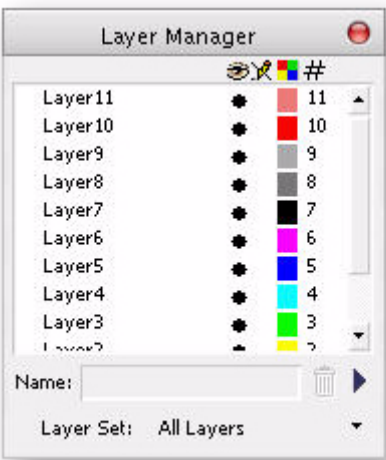


Figure 166.- Display Layer Colors

Display Pen weight colors

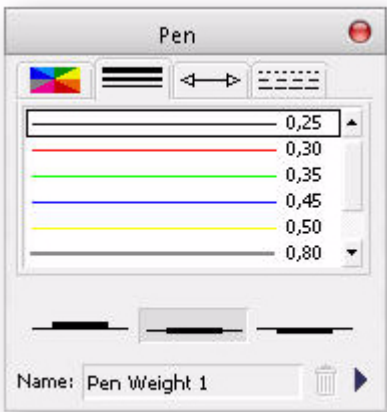
Mode: Draft
Mac OS Shortcut: Cmd+Opt+E
Windows Shortcut: Ctrl+Alt+E

The Display Pen Weight Colors command displays objects with the colors associated with the objects' Pen weights. This command does not affect 3D objects.

To use Display Pen Weight Colors, in Draft mode, choose Display Pen Weight Colors in the Display Options submenu. **DCAD VectorSpace** shows the Rapidograph pen colors of 2D objects.

To hide the pen colors, deactivate Display Pen Weight Colors, or activate Display Layer Colors, or Display 2D & 3D Mode Colors.

DCAD VectorSpace assigns Pen weight colors based on the Rapidograph pen color standards. Rapidograph pen weights are measured in millimeters; to see how colors and pen weights are related, you can open the Pen palette and choose Display Pen Weight Colors.



The Pen tab in the Pen palette displays Rapidograph pen colors if Display Pen Weight Colors is active

Figure 167.- Pen tab displaying Pen weight colors

The following table summarizes the Rapidograph pen colors.

Table 3: Rapidograph™ Color Code









Color		Pen	
Beige		0.25 mm	.0098 in
Yellow		0.30 mm	.0118 in
Gray		0.35 mm	.0138 in
Brown		0.45 mm	.0177 in

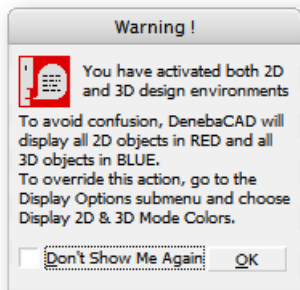
Table 3: Rapidograph™ Color Code

Color		Pen	
Red		0.50 mm	.0197 in
Green		0.80 mm	.0315 in
Orange		1.20 mm	.0472 in
Blue		1.80 mm	.0709 in

Display 2D & 3D Mode Colors

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+D
Windows Shortcut: Ctrl+Alt+D

Whenever you display 2D and 3D objects at the same time (by using the commands in the View Options submenu), **DCAD VectorSpace** activates Display 2D & 3D Mode Colors. This causes 2D objects to appear in red, and 3D objects to appear in blue, to distinguish the objects types.



This message appears when **DCAD VectorSpace** activates the Display 2D & 3D Mode Colors command. This happens whenever 2D and

When the Display 2D & 3D Mode Colors command is active, the command has a checkmark in the Display Options submenu. However, while the command might be active, if you have not chosen to display both 2D and 3D objects, the command appears dimmed in the submenu to indicate that it is not available.

To show 2D & 3D Mode colors: To show 2D objects in red and 3D objects in blue, choose Display 2D & 3D Mode Colors in the Display Options submenu (if the command isn't already active). This deactivates Display Pen Weight Colors or Display Layer Colors, if either was active.

To hide 2D & 3D mode colors: Choose Display 2D & 3D Mode Colors in the Display Options submenu to deactivate the command, so that 2D and 3D objects appear with their assigned colors.

Display Locked Objects in Gray

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+H
Windows Shortcut: Ctrl+Alt+H

The Display Locked Objects in Gray command displays objects that are on locked layers with gray outlines. This command affects the active document window only.

You can lock layers using the Layer Manager. You can also lock objects using the View Options sub-

menu, by choosing “View 2D & Lock 3D Objects” or “View 3D & Lock 2D Objects.” When you lock 2D or 3D objects this way, **DCAD VectorSpace** activates the Display Locked Objects in Gray command.

To display locked objects in Gray: Choose Display Locked Objects in Gray in the Display Options submenu. All objects on locked layers then appear with gray outlines.

Display by Layer Creation Order

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+Shift+C
Windows Shortcut: Ctrl+Alt+Shift+C

The Display by Layer Creation Order command shows objects on visible, unlocked layers based on the original order in which the layers were created in the Layer Manager.

This command is in effect by default. Choosing the command turns the option on or off.

To display objects by layer creation order:

Choose Display by Layer Creation Order in the Display Options submenu. When you activate this command, **DCAD VectorSpace** displays objects based on the original layer creation order, regardless of how you’ve reordered layers in the Layer Manager.

Grid Setup

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+G
Windows Shortcut: F8

The Grid Setup command lets you configure the **DCAD VectorSpace** grid. You can also do this using the Snap Grid action button.



The grid spacing reflects the current units and measurement system. You can specify the current units and measurement system in the Units Setup dialog box.

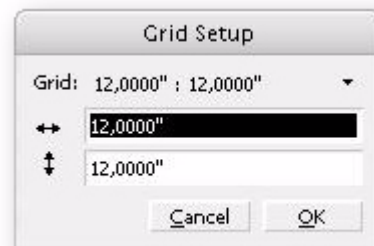


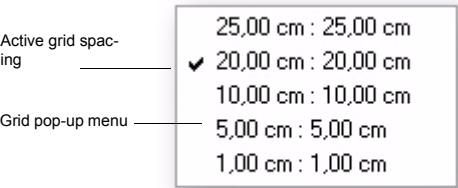
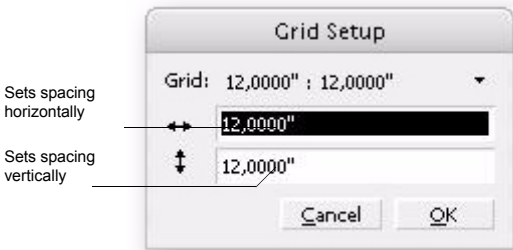
Figure 168.- Grid Setup Dialog

Use the text boxes in the Grid Setup dialog box to set up the spacing of the dots in the grid. For example, you can make the horizontal spacing of the grid 10 units horizontally, and 15 units vertically.

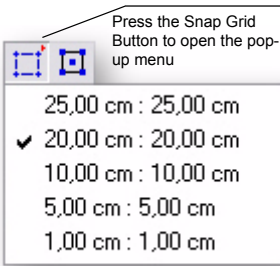
The drawing vector and the pointer snap to the grid if Snap to Grid is active.

To use the Grid Setup command

- 1. Choose Grid Setup in the Layout menu. The Grid Setup dialog box appears.
- 2. In the Grid pop-up menu, choose the grid setting that you want to change. The choices in the Grid pop-up menu vary, depending on the current units and measurement system.
- 3. To specify custom spacing for the grid, type spacing values in the text boxes.
- 4. Click OK to implement the grid setup.



To use the Snap Grid button: Press the Snap Grid button on the Attributes bar and choose the grid spacing you want in the pop-up menu. **DCAD VectorSpace** resets the grid spacing



Note: If you click the Snap Grid button, you activate or deactivate the Snap to Grid command.



Hide Grid / Show Grid

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+G
Windows Shortcut: F7

The Hide Grid command hides the grid when it is displayed in Draft Mode and Sculpt mode windows. The Show Grid command displays the grid in Draft and Sculpt windows.

Only one of these commands is available in the Layout menu at a time. When the Hide Grid command appears in the menu, the Show Grid command is active. When the Show Grid command appears, the Hide Grid command is active.

Note: The drawing vector can snap to the dots in the grid, even if the grid is hidden, if the Snap to Grid command is active.



If the grid scale or magnification is too low, **DCAD VectorSpace** won't show the dots in the grid, even if Show Grid is in effect.

To use the Hide Grid command: Choose Hide Grid in the Layout menu. **DCAD VectorSpace** hides the grid.

To use the Show Grid command: Choose Show Grid in the Layout menu. **DCAD VectorSpace** displays the grid.

Output Setup

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+Shift+O
Windows Shortcut: F11

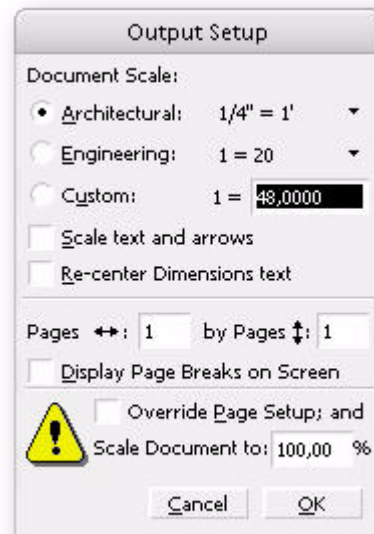


Figure 169.- Output Setup Dialog

The Output Setup command lets you set up a **DCAD VectorSpace** project for final output. Although you can configure Output Setup options in Draft, Sculpt, and Render modes, you can print or plot in Draft mode only.

Many factors affect document output, such as your Printer Setup (Windows) or Page Setup (Mac OS) configuration, and the selected printer or plotter driver. When you output a document,

Document Scale area

In this area, you can select a preset Architectural output scale or an Engineering output scale from the pop-up menus, or specify a custom scale value.

Architectural. Select this option to choose an architectural output scale in the pop-up menu.

Engineering . Select this option to choose an engineering output scale in the pop-up menu.

Custom . Select this option to use a custom output scale. Type the scale value in the “1=” text box.



Figure 170.- Custom output option

Scale text & arrows. Select this option to scale text and arrows (along with all other objects in the document) when you change the output scale of a document.

This option is primarily used when you import DWG or DXF files. **DCAD VectorSpace** imports these files at 1:1 scale. If you want to output the document at any other scale, you must change the scale in the Document Scale area. If you do not change the output scale, the document's scale remains set at 1:1. A docu-

DCAD VectorSpace lets you permanently override the scaling factor in the Printer/Page Setup dialog.

To use the Output Setup dialog box

1. Choose Output Setup in the Layout menu. The Output Setup dialog box appears.
2. Configure the options, which are explained in this section, and then click OK to make them take effect.

ment with an output scale set at 1:1 might be very large because the objects will print at actual size.

Once you select a new output scale from the Document Scale area, you can select the “Scale text & arrows” option so that the text and arrows are output at the same scale as the rest of the document.

If you do not select “Scale text and arrows,” but you change the output scale, all objects in the document will be output at the scale you choose, but text and arrows will be output at 1:1 scale.

Every time you open the Output Setup dialog box, the “Scale text & arrows” checkbox is not selected. You must select the option each time you change the output scale of a document to scale the text and arrows.

To see what happens to text and arrows in a DWG or DFX document when you change the output scale from 1:1, select the “Display Page Breaks on Screen” option in the Output Setup dialog box. With this option selected, you can see the change in document scale in relation to the printable area.

For example, select 3/4"=1' in the Architectural pop-up menu in the Document Scale area. Do not select the “Scale text & arrows” option.

When you click OK, the dialog box closes. Objects in the document change scale, but text and arrows do not. The text and arrows become too large for the document, and they are no longer in the correct locations.

If you select 3/4"=1' in the Architectural pop-up menu, and select the "Scale text & arrows" option, you see that objects, text, and arrows change scale, and that text and arrows appear in their correct locations.

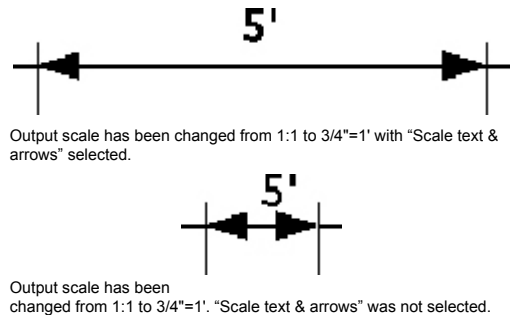


Figure 171.- Scaling text and arrows

Pages area

In the Pages Area, you can specify the number of horizontal and vertical pages to output. You can also choose to display or hide page breaks on screen

Pages. Type the number of horizontal pages you want to print from the document.

by Pages. Type the number of vertical pages you want to print from the document.

Display Page Breaks on Screen. Select this option to show page breaks on screen. Page breaks appear on screen as gray rectangles. If you don't see the current page break on screen after choosing this command and clicking OK, try reducing the view magnification.

Type the number of horizontal and vertical pages



Figure 172.- Page options

Overriding Printer/Page Setup document scaling

In **DCAD VectorSpace**, you can override the current scaling factor specified in the Printer/Page Setup dialog box. Overriding the Page Setup scaling can produce unexpected results when used improperly.

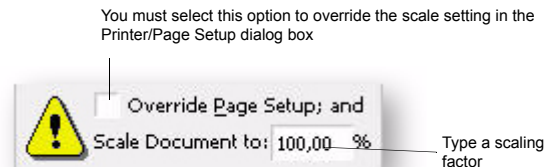


Figure 173.- Output scaling options

To override output scaling in the Printer/Page Setup dialog box

1. To override the current scaling factor in the Printer/Page Setup dialog box, click the "Override Printer/Page Setup" check box.

Note: Important: You must select this option to override the scale setting in the Printer/



Page Setup dialog, although **DCAD VectorSpace** lets you type override percentages in the “Scale Document to” box even without this option selected.

2. To scale a document to the output percentage you want, type the percentage in the “Scale Document to” text box.
3. To implement the setting, click OK.

Show Page Breaks

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+B
Windows Shortcut: F12

The Show Page Breaks command displays or hides non-printing gray rectangles that represent page boundaries on screen.

Note: You can choose Show Page Breaks in Sculpt mode. However, **DCAD VectorSpace** prints only in Draft mode, and prints the contents of the current Draft window only. 

DCAD VectorSpace determines the current page boundaries based on the paper size and the printable area. Page breaks appear in the active document window and the current view only.

The Show Page Breaks command is active or inactive. If the command is active, page breaks appear on screen, and a check mark appears next to the command in the Layout menu. Otherwise, page breaks do not appear and no check mark appears.

DCAD VectorSpace displays as many page break borders as the number of pages you specify in the Output Setup dialog box. By using Show Page Breaks, you can see how **DCAD VectorSpace** will divide the document into pages when you print it.

To make page breaks visible: Choose Show Page Breaks in the Layout menu when the command is not active.

To hide page breaks: Choose Show Page Breaks in the Layout menu when the command is active.

Snaps submenu



Figure 174.- Snaps submenu

By using the commands in the Snaps submenu, you can restrict the movement of objects and the drawing vector in various ways.

You can snap the drawing vector to the grid, to the snap points of 2D and 3D objects, and to snap objects made with the Create Snap Objects com-

mand. In many cases, restricting the drawing vector's movement makes it easier to draw precisely.

The following Snaps submenu commands are described in this section:

Create Snap Objects . Lets you make custom grids by converting 2D objects to snap objects.

Snap to Grid . Restricts the drawing vector and objects to the grid, even if the grid is not visible.

Snap to Objects. Restricts the drawing vector and objects to the snap points of objects in a drawing, even if snap points are not displayed. All 2D and 3D objects contain snap points.

The Snap to Grid and Snap to Objects commands are active or inactive. When active, a check mark

appears next to the command in the Snaps submenu. Otherwise, no check mark appears.

You can activate the Snap to Grid and Snap to Objects commands by clicking the Snap Grid button and the Snap to Objects button.



These commands are not mutually exclusive; You can activate them simultaneously. This lets you snap to the grid, to objects, to snap objects, to all, or to none.

Create Snap Objects

Modes: Draft

The Create Snap Objects command creates snap grids from selected objects. For example, to create a radial grid, draw several concentric circles and convert them to snap objects. You can move or delete the original objects, and the snap points remain visible on screen and act as a custom grid. Custom snap points don't print.

To use the Create Snap Objects command:

1. Select the 2D object that you want to make into a snap object.
2. Choose Create Snap Objects in the Snaps submenu. The Create Snap objects dialog box appears:



3. Click OK to make the selected object a snap object.

Notice that the object's snap points are visible, even though the original object is deselected. You can move or delete the original object, but the snap points remain visible on screen.

Additionally, you can move, resize, and reshape the snap points grid as you would any 2D object.

To delete the snap points, select them and press Delete.

To set the number of snap points in objects

1. Choose Preferences in the Edit menu. The Preferences dialog box opens. Click the Drawing tab to bring it to the front, if necessary.

2. In the “# of Snap Pts” text box, type the number of snap points for snap objects.
3. To implement the settings, click OK.

Snap to Grid

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+\
Windows Shortcut: Ctrl+\
Windows Shortcut: Ctrl+Alt+\
Windows Shortcut: Ctrl+Alt+V

The Snap to Grid command causes the drawing vector and objects to snap to the dots in the grid, even if the grid is hidden.

When Snap to Grid is not active, the drawing vector moves freely, even if the grid is visible.

When you create a new document, **DCAD VectorSpace** activates Snap to Grid by default.

To activate Snap to Grid: Choose Snap to Grid in the Snaps submenu. **DCAD VectorSpace** restricts the movement of the drawing vector and objects to the dots in the grid.

- If you have Snap to Objects active in addition to Snap to Grid, **DCAD VectorSpace** also snaps the drawing vector to the snap points of objects.

To deactivate Snap to Grid: Choose Snap to Grid in the Snaps submenu when the command is active.

Snap to Objects

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+\
Windows Shortcut: Ctrl+Alt+\
Windows Shortcut: Ctrl+Alt+V

The Snap to Objects command causes the drawing vector and objects to snap to the snap points in 2D and 3D objects.

To activate Snap to Objects: Choose Snap to Objects in the Snaps submenu.

- If Snap to Grid is active in addition to Snap to Objects, **DCAD VectorSpace** also restricts the movement of the drawing vector to the dots in the grid.

To deactivate Snap to Objects: Choose Snap to Objects in the Snaps submenu when Snap to Objects is active.

3D Axis submenu

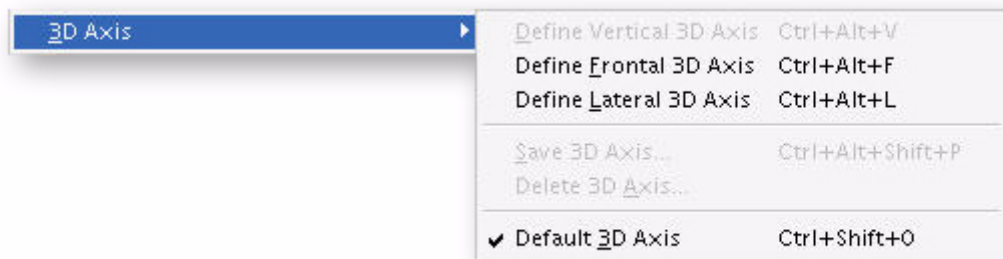


Figure 175.- 3D Axis submenu

The 3D Axis commands let you set, save, and delete spin extrusion axes. This section describes the commands that appear in the 3D Axis submenu:

Custom 3D Axis. In the 3D Axis pop-up menu, and the 3D Axis submenu, this command represents the last axis you set for spin extrusions, even if you didn't save it. Refer to **Custom 3D Axis**, page 222 for more information.

Default 3D Axis. Selects the default axis for spin extrusions. Refer to **Default 3D Axis**, page 222 for more information.

Define Lateral 3D Axis. Lets you set an axis in Left view for spin extrusions. Refer to **Define Lateral 3D Axis**, page 224 for more information.

Define Frontal 3D Axis. Lets you set an axis in Front view for spin extrusions. Refer to **Define Frontal 3D Axis**, page 224 for more information.

Define Vertical 3D Axis. Lets you set an axis in Top view for spin extrusions. Refer to **Define Vertical 3D Axis**, page 224 for more information.

Delete 3D Axis. Deletes a saved spin extrusion axis. Refer to **Delete 3D Axis**, page 226 for more information.

Save 3D Axis. Saves an axis for spin extrusions. Refer to **Save 3D Axis**, page 227 for more information.

Working with spin extrusion Axes

The 3D Axis submenu appears in the Layout menu when you select the Spin extrusion method.

A spin extrusion axis is an axis around which 2D objects extrude when you use the Spin extrusion method. A spin extrusion axis appears on screen as a horizontal or vertical gray line. **DCAD VectorSpace**

lets you set up to 255 spin extrusion axes for each view.

You can set a spin extrusion axis in all views in **DCAD VectorSpace**, including Relative Views. You use a spin extrusion axis in the same view (Top, Bottom, Front, Back, Left, or Right) from which you choose Define Frontal 3D Axis, Define Vertical 3D

Axis, or Define Lateral 3D Axis. For example, if you choose Define Frontal 3D Axis in Top view to set a spin extrusion axis in Front view, you use the spin extrusion axis in Top view.

Keep these issues in mind when working with the commands in the 3D Axis:

- It's best to display the Info bar and the Status bar before you begin working with spin extrusion axes. To do this, choose Toolbars in the Layout menu.
- There's always a spin extrusion axis active in each view. The active spin extrusion axis can be the default spin extrusion axis, a spin extrusion axis that you set, or a spin extrusion axis you have saved.
- The first time you select the Spin extrusion method, the default spin extrusion axis appears. The default spin extrusion axis passes through the Absolute Origin, even if a Centerpoint you set is active. For more information on Centerpoints, refer to **Centerpoint submenu**, page 203.
- The extrusion format buttons on the far right of the status bar (Front Cap, Back Cap, and Sides) are not available when you select the Spin extrusion method. These buttons do not affect spin extrusions.
- You can't spin extrude an object that overlaps, crosses, or intersects a spin extrusion axis.

Custom 3D Axis

Modes: Draft, Sculpt

Custom 3D Axis appears as in the 3D Axis submenu, and the 3D Axis pop-up menu, to let you choose the previous spin extrusion axis you set in the current view (if you didn't save it using the Save 3D Axis command).

Until you create a spin extrusion axis in a view, Custom 3D Axis doesn't appear in the 3D Axis submenu, or the 3D Axis pop-up menu. If you save a spin extrusion axis, Custom 3D Axis disappears from the 3D Axis pop-up menu and the 3D Axis submenu. It reappears when you create another spin extrusion axis using the Define Frontal 3D Axis,

Define Vertical 3D Axis, or Define Lateral 3D Axis commands.

Also, if you select a spin extrusion axis you've saved, or the default spin extrusion axis, Custom 3D Axis disappears from the 3D Axis submenu.

Custom 3D Axis reappears when you set another spin extrusion axis.

In addition, when you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if Custom 3D Axis is active. If so, Custom 3D Axis appears in the 3D Axis pop-up menu on the Status bar, and a check mark appears next to Custom 3D Axis in the 3D Axis submenu.

Default 3D Axis

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+O
Windows Shortcut: Ctrl+Shift+O

The Default 3D Axis command activates the default spin extrusion axis for the current view.

The default spin extrusion axis passes through the Absolute Origin in Top, Bottom, Front, Back, Left, and Right views. On screen, the default extrusion axis appears as a vertical gray line. The default extrusion axis appears on screen the first time you select the Spin extrusion method.

The Default 3D Axis command appears in the 3D Axis pop-up menu, and the 3D Axis submenu, only when you select the Spin extrusion method.

If you set a new spin extrusion axis, the default spin extrusion axis still passes through the Absolute Origin, and you can activate it by choosing the Default 3D Axis command.

Setting a spin extrusion axis

A spin extrusion axis is the axis around which 2D objects extrude when you use the Spin extrusion method.

DCAD VectorSpace provides three commands for setting a spin extrusion axis: Define Frontal 3D Axis, Define Vertical 3D Axis, and Define Horizontal 3D Axis. Each command is explained in this section.

When you choose a Define 3D Axis command, you move the pointer to set the coordinates of the spin extrusion axis in Front, Left, or Top view. The coordinates you choose set the position of objects extruded into 3D space.

When you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if the default spin extrusion axis is active by displaying Default 3D Axis in the 3D Axis pop-up menu on the Status bar, and placing a check mark next to the Default 3D Axis command in the 3D Axis submenu.

To activate the default 3D Axis

1. Choose the view with the default spin extrusion axis you want to activate.
2. Choose Default 3D Axis in the 3D Axis pop-up menu on the Status bar, or in the 3D Axis submenu.

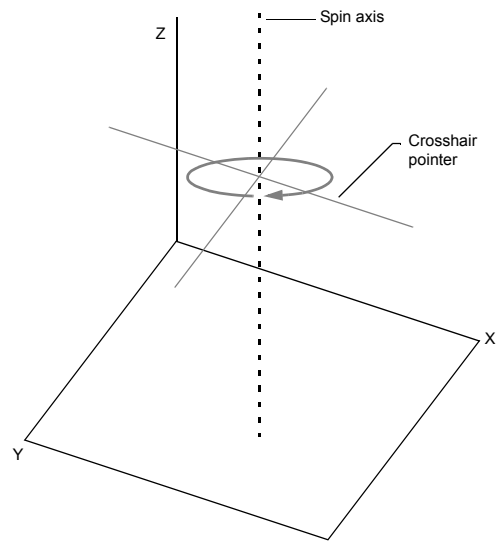


Figure 176.- A Spin extrusion axis

Define Frontal 3D Axis

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+F
Windows Shortcut: Ctrl+Alt+F

The Define Frontal 3D Axis command lets you set a spin extrusion axis in Front view.

The Define Frontal 3D Axis command is available in Top, Bottom, Left, or Right view.

If the document window is set to Top or Bottom view when you choose Define Frontal 3D Axis, you'll create a vertical spin extrusion axis.

If the document window is set to Left or Right view when you choose Define Frontal 3D Axis, you'll create a horizontal spin extrusion axis.

Using Define Frontal 3D Axis temporarily switches the document window to Front view so you can set a spin extrusion axis in Front view. After you set the spin extrusion axis, **DCAD VectorSpace** switches the document window to the original view (Top, Bottom, Left, or Right), and activates the spin extrusion axis you set.

To use the Define Frontal 3D Axis command, refer to **To use the Define 3D Axis command**, page 225.

Define Lateral 3D Axis

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+L
Windows Shortcut: Ctrl+Alt+L

The Define Lateral 3D Axis command lets you set a spin extrusion axis in Left view.

The Define Lateral 3D Axis command is available in Top, Bottom, Front, or Back view.

Whether the document window is set to Top, Bottom, Front, or Back view when you choose Define Lateral 3D Axis, you'll create a horizontal spin extrusion axis.

Using Define Lateral 3D Axis temporarily switches the document window to Left view so you can set the spin extrusion axis in Left view. After you set the spin extrusion axis, **DCAD VectorSpace** switches the document window to the original view (Top, Bottom, Front, or Back), and activates the spin extrusion axis you set.

To use the Define Lateral 3D Axis command, refer to **To use the Define 3D Axis command**, page 225.

Define Vertical 3D Axis

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+V
Windows Shortcut: Ctrl+Alt+V

The Define Vertical 3D Axis command lets you set a spin extrusion axis in Top view.

The Define Vertical 3D Axis command is available in Front, Back, Left, or Right view.

Whether the document window is set to Front, Back, Left, or Right view when you choose Define Vertical 3D Axis, you'll create a vertical spin extrusion axis.

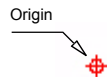
Using Define Vertical 3D Axis temporarily switches the document window to Top view so you can place the spin axis in Top view. After placing the spin axis, **DCAD VectorSpace** switches to the original view (Front, Back, Left, or Right), and activates the Custom 3D Axis.

To use the Define Vertical 3D Axis command, refer to "To use the Define 3D Axis command," next.

To use the Define 3D Axis command

Use this procedure to set a 3D Axis in Front, Left, or Top view.

1. Choose a Define 3D Axis command in the 3D Axis submenu. You can choose Define Frontal 3D Axis, Define Vertical 3D Axis, or Define Lateral 3D Axis. Which commands are available depends on the current view.



- Refer to **Define Frontal 3D Axis**, page 224 for the views in which this command is available.
- Refer to **Define Lateral 3D Axis**, page 224 for the views in which this command is available.
- Refer to **Define Vertical 3D Axis**, page 224 for the views in which this command is available.

2. **DCAD VectorSpace** switches to the view in which you set the 3D Axis. A spin pointer appears. To help you place the 3D axis, a full-screen crosshair follows the spin pointer.

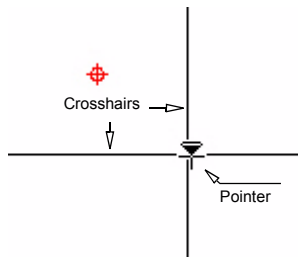


Figure 177.- Set Spin Axis - I

3. Move the pointer to the coordinates where you want to set the spin axis.

4. Click to set the 3D Axis. **DCAD VectorSpace** switches the document window to the original view, activates the spin extrusion axis you set, and displays a vertical or horizontal gray line on screen.

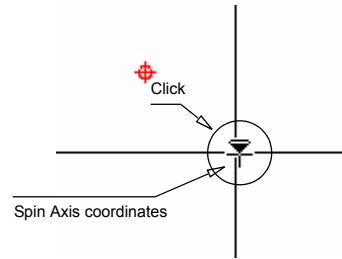


Figure 178.- Set Spin Axis - II

Defining an angled spin extrusion axis

By setting up a Relative View, you can set a spin extrusion axis in the Relative View to make objects appear non-parallel or non-perpendicular in orthogonal views.

For example, to make a satellite dish appear angled, you can set an extrusion axis in a Relative View. You can then use the spin extrusion axis to extrude the dish in the Relative View, and it will appear angled in orthogonal views.

To set a spin extrusion axis in a Relative View

1. Set up a Relative View. To do this, refer to **Relative View submenu**, page 91.
2. Choose a Define 3D Axis command, and place a 3D Axis. To do this, refer to **To use the Define 3D Axis command**, page 225.
3. Draw and extrude the object you want to appear slanted.

4. Choose Default Relative View in the Relative View submenu, or the Relative View pop-up menu on the Status bar.

In the default Relative View, the object is slanted based on the spin extrusion axis you set in the Relative View.

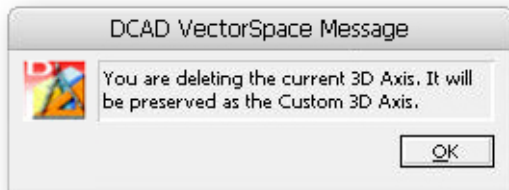
Delete 3D Axis

Modes: Draft, Sculpt

The Delete 3D Axis command deletes a spin extrusion axis. This command is available after you save a spin extrusion axis in a particular view.

When you delete a spin extrusion axis, its name disappears from the 3D Axis pop-up menu on the Status bar, and the 3D Axis submenu.

If you try to delete the active spin extrusion axis, a warning message appears. Click OK in the message box to continue.



When you click OK, **DCAD VectorSpace** maintains the current (active) spin extrusion axis, and displays Custom 3D Axis.

To use the Delete 3D Axis command

1. Choose Delete 3D Axis in the 3D Axis submenu. The Delete 3D Axis dialog appears.

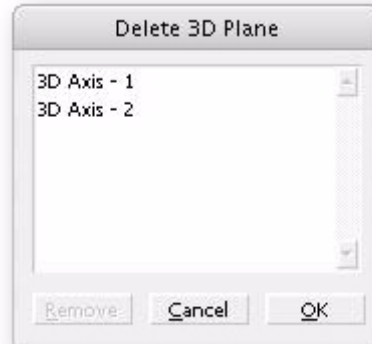


Figure 179.- Delete 3D Axis

2. In the dialog box, select the name of the spin extrusion axis (or axes) you want to delete.
 - To select (or deselect) a continuous range of spin extrusion axes, press Shift and click the names of the first and last spin extrusion axis.
 - To select (or deselect) several non-contiguous spin extrusion axes, press Ctrl (Windows) or Cmd (Mac OS) and click the name of each spin extrusion axis.
3. To remove the spin extrusion axis, click Remove.
4. To delete the selected spin extrusion axis, click OK. To close the dialog box and keep the axis, click Cancel.

To use the Delete 3D Axis command

1. Choose Delete 3D Axis in the 3D Axis submenu. The Delete 3D Axis dialog appears.

-
2. In the dialog box, select the name of the spin extrusion axis (or axes) you want to delete.
 - To select (or deselect) a continuous range of spin extrusion axes, press Shift and click the names of the first and last spin extrusion axis.
 - To select (or deselect) several non-contiguous spin extrusion axes, press Ctrl (Win-

dows) or Cmd (Mac OS) and click the name of each spin extrusion axis.

3. To remove the spin extrusion axis, click Remove.
4. To delete the selected spin extrusion axis, click OK. To close the dialog box and keep the axis, click Cancel.

Save 3D Axis

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+P
Windows Shortcut: Ctrl+Alt+Shift+P

The Save 3D Axis command lets you save a spin extrusion axis you set. This command is available only after you set an extrusion axis.

When you save an extrusion axis, its name appears in the 3D Axis pop-up menu on the Status bar, and at the bottom of the 3D Axis submenu.

To avoid confusion, keep in mind that “Custom 3D Axis” in the 3D Axis submenu is not the same as saving a spin extrusion axis with the Save 3D Axis command.

When you choose Define Frontal 3D Axis, Define Vertical 3D Axis, or Define Horizontal 3D Axis, you set a spin extrusion axis. When **DCAD VectorSpace** switches you back to the original view, **DCAD VectorSpace** activates “Custom 3D Axis” in the 3D Axis pop-up menu, and the 3D Axis submenu.

When you use the Save 3D Axis command, by contrast, **DCAD VectorSpace** saves the last extrusion axis you set and adds its name to the 3D Axis pop-up menu, and the 3D Axis submenu.

After you save an extrusion axis, **DCAD VectorSpace** removes Custom 3D Axis from

the 3D Axis pop-up menu, and the 3D Axis submenu until you set another extrusion axis.

To use the Save 3D Axis command

1. Use the Define Vertical 3D Axis, Define Frontal 3D Axis, or Define Lateral 3D Axis command in the 3D Axis submenu to set an extrusion axis.
2. Choose Save 3D Axis in the 3D Axis submenu. The Save 3D Axis dialog box opens.
3. Type a name for the extrusion axis in the text box.
4. To save the spin extrusion axis, click OK. In the current view only, **DCAD VectorSpace** adds the name of the extrusion axis to the 3D Axis pop-up menu on the Status bar, and to the bottom of the 3D Axis submenu.

Selecting a saved extrusion axis

Before you select a spin extrusion axis that you’ve saved, make sure you’re in the same view you were in when you chose Define Frontal 3D Axis, Define Horizontal 3D Axis, or Define Vertical 3D Axis.

In each view, the names of the saved spin extrusion axes appear in the 3D Axis pop-up menu on the Status bar, and at the bottom of the 3D Axis submenu.

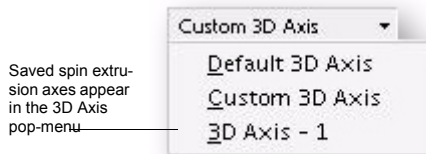


Figure 180.- Save 3D Axis

When you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if a spin extrusion axis that you’ve saved is active.

When active, its name appears in the 3D Axis pop-up menu on the Status bar, and a check mark appears next to its name in the 3D Axis submenu.

To activate a saved spin extrusion axis

1. Choose the view in which you set a spin extrusion axis that has been saved.
2. To activate the spin extrusion axis, choose its name in the 3D Axis pop-up menu, or in the 3D Axis submenu.

3D Plane submenu

Modes: Draft, Sculpt

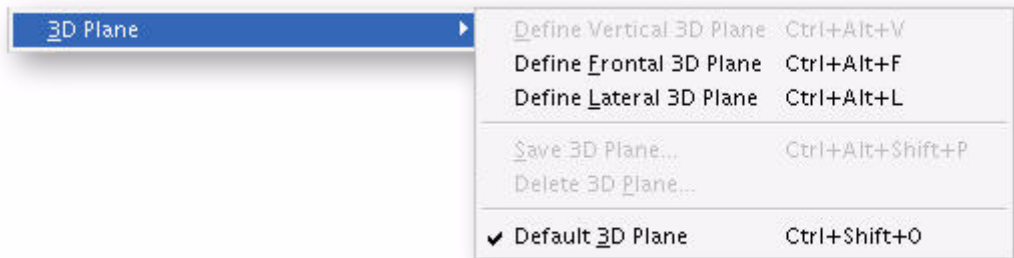


Figure 181.- 3D Plane submenu

The 3D Plane commands let you set, save, and delete extrusion planes, which are a fundamental tool for construction of 3D models in **DCAD VectorSpace**. This section describes the commands that appear in the 3D Plane submenu:

Define Frontal 3D Plane. Lets you set a pair of extrusion planes from Front view. Refer to **Define Frontal 3D Plane**, page 232 for more information.

Define Lateral 3D Plane. Lets you set a pair of extrusion planes from Left view. Refer to

Define Lateral 3D Plane, page 232 for more information.

Define Vertical 3D Plane. Lets you set a pair of extrusion planes from Top view. Refer to **Define Vertical 3D Plane**, page 233 for more information.

Save 3D Plane. Saves a set of extrusion planes. Refer to **Save 3D Plane**, page 238 for more information.

Delete 3D Plane. Deletes a set of saved extrusion planes. Refer to **Delete 3D Plane**, page 237 for more information.

Default 3D Plane. Selects the default set of extrusion planes for the current view. Refer to **Default 3D Plane**, page 230 for more information.

Custom 3D Plane. Appears in the 3D Plane pop-up menu representing the last set of extrusion planes you set (if you didn't save them). Refer to **Custom 3D Plane**, page 230 for more information.

Working with Extrusion planes

The 3D Plane submenu appears in the Layout menu when you select the Linear or Sweep extrusion method. This submenu replaces the 3D Axis submenu, which appears when you select the Spin extrusion method.

In **DCAD VectorSpace**, 3D Planes refer to a pair of extrusion planes that limit the range of an extrusion in 3D space.

For example, if you draw a circle in Draft mode, Top view, to create a cylinder using the Linear extrusion method, the active extrusion planes define the cylinder's height and position in 3D space.

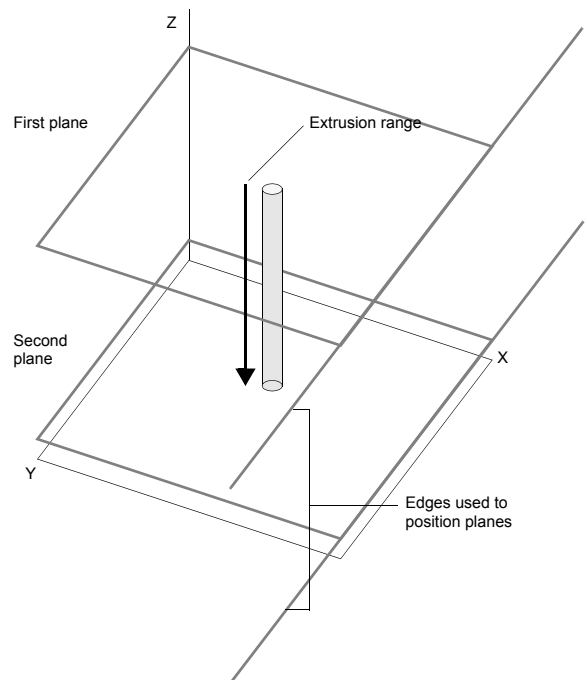


Figure 182.- Linear extrusion planes

You use the Define 3D Plane commands to create extrusion planes for all views in **DCAD VectorSpace**, including Relative Views. However, extrusion planes can be used only in the view in which you define them. For example, if you create a set of extrusion planes for Front view, you can't use the extrusion planes to extrude objects in Back view or Left view.

Keep these issues in mind when working with extrusion planes:

- It's best to display the Info bar and the Status bar before you begin working with extrusion planes. To do this, choose Toolbars in the Layout menu.
- In each view, **DCAD VectorSpace** lets you create up to 255 sets of extrusion planes.
- Extrusion planes are view-dependent, but mode-independent. When you create a set of extrusion planes, you can use them in the view in which

Define Frontal 3D Plane, Define Lateral 3D Plane, or Define Vertical 3D Plane was chosen. The current mode, by contrast, is not relevant. For example, you can't create a set of extrusion planes in Draft Mode, Top view, and then use them in Draft mode, Front view. However, you can use the same set of extrusion planes in Sculpt mode, Top view.

- In each view, there's always a set of extrusion planes active. When you change views, the active set of extrusion planes changes.

Custom 3D Plane

Modes: Draft, Sculpt

Custom 3D Plane appears in the 3D Plane submenu, and the 3D Plane pop-up menu on the Status bar, to let you choose the last set of extrusion planes you created in the current view (if you didn't save the set with the Save 3D Plane command).

In each view, Custom 3D Plane is available only after you define a set of extrusion planes.

After defining extrusion planes for a view, Custom 3D Plane appears in the 3D Plane submenu, and the 3D Plane pop-up menu (to show that the set of extrusion planes you defined is active).

In each view, after you define a set of extrusion planes, Custom 3D Plane is active in the 3D Plane

pop-up menu and the 3D Plane submenu until you choose the Default 3D Plane command, activate a saved set of extrusion planes, or define another set of extrusion planes. If you take one of these actions, Custom 3D Plane disappears from the 3D Plane pop-up menu, indicating that the previously defined set of extrusion planes is no longer active. Custom 3D Plane reappears when you define another set of extrusion planes.

When you define a set of extrusion planes, you replace the previous set of extrusion planes. To save a set of extrusion planes, use the Save 3D Plane command in the 3D Plane submenu. You should save any set of extrusion planes that you want to use more than once.

Default 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+O
Windows Shortcut: Ctrl+Shift+O

For each view in **DCAD VectorSpace**, you can activate the default set of extrusion planes by choosing the Default 3D Plane command in the 3D Plane sub-

menu, or in the 3D Plane pop-up menu on the Status bar.

Note: The extrusion range of the default set of extrusion planes for new **DCAD VectorSpace** documents is 10



sion range of the default set of extrusion planes for the current view.

In each view, the default set of extrusion planes remains active until you create a set of extrusion planes using a Define 3D Plane command.


When the default set of extrusion planes is active, Default 3D Plane appears in the 3D Plane pop-up menu, and a check mark appears next to the Default 3D Plane command in the 3D Plane submenu.

Defining Extrusion planes

This section explains how to use the 3D Plane commands to set up extrusion planes. It also explores the concept of extrusion planes.

Extrusion is the process of creating a 3D object by adding a third dimension to a 2D object.

When you use the Linear extrusion method, 2D objects are extruded to a specific depth. The depth is controlled by the active set of extrusion planes in the current view.

Note: A Sweep extrusion requires the definition of a Sweep path in addition to a set of extrusion planes. This discussion of extrusion planes assumes that you're working with the Linear extrusion method. 

The active set of extrusion planes controls extrusion depth. In addition, the planes set the positions of the ends, or caps, of extruded objects. Whether the extrusion planes are parallel or inclined determines if the ends of extruded objects are flat or slanted.

In **DCAD VectorSpace**, you have two ways of creating a 3D object: In Draft mode, you can draw a 2D object, and then extrude the object. In Sculpt mode, you can define an object's contours in two dimensions, and **DCAD VectorSpace** extrudes the object automatically based on the active set of extrusion planes.

To use the Default 3D Plane command

1. Choose the view with the default set of extrusion planes you want to activate.
2. Choose Default 3D Plane in the 3D Plane submenu, or in the 3D Plane pop-up menu. **DCAD VectorSpace** activates the default set of extrusion planes for that view.

Extrusion planes and the Cartesian coordinate system

In any coordinate system, the current view determines which dimension is added to an extruded object. For example, if you create an object in Top view, and then extrude the object, **DCAD VectorSpace** adds a Z dimension. If you create an object in Front view, **DCAD VectorSpace** adds a Y dimension, and so on.

When you begin working with extrusion planes, it's probably easiest to work in the Cartesian coordinate system. This lets you refer to X, Y, and Z Cartesian information on the Info bar. In turn, this helps you understand why creating a set of extrusion planes requires you to temporarily switch to Top, Front, or Left view.

For example, suppose you want to define extrusion planes for Top view, to extrude an object to a specific height. When you draw an object in Top view, you draw along the X and Y axes; this is shown in the text boxes on the Info bar.

When you extrude the object, you'll be adding height along the Z axis. However, you can't draw

using the Z axis in Top view; you can draw using the X and Y axes only.

To set extrusion planes along the Z axis, you must choose Define Frontal 3D Plane, or Define Lateral 3D Plane. This temporarily switches the document window to Front view or Left view.

In Front view or Left view, you can set the first and second extrusion planes along the Z axis. This operation defines the extrusion range.

Although you can set the extrusion planes in Front or Left view, what's important is that you're setting the extrusion planes along the Z axis in both cases. The only difference is the view you use to position the planes. For example, suppose you want to extrude an object you intend to draw in Top view, to a specific height. By choosing Define Frontal 3D Plane, you can view a Front elevation of the your model while you set the extrusion planes. By choosing Define Lateral 3D Plane, you can view a Left elevation.

When **DCAD VectorSpace** switches back to Top view, the extrusion range is displayed numerically at the far right of the Info bar.

Define Frontal 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+P
Windows Shortcut: Ctrl+Alt+P

The Define Frontal 3D Plane command lets you set a pair of extrusion planes from Front view. To choose Define Frontal 3D Plane, you must start from Top, Bottom, Left, or Right view.

When you choose Define Frontal 3D Plane, **DCAD VectorSpace** switches the active document window to Front view. This lets you set a pair of parallel or inclined extrusion planes. The range between the extrusion planes is the extrusion depth.

- If the window shows Top view or Bottom view when you choose the command, the planes you set in Front view appear as horizontal lines that you can angle up or down.
- If the window shows Left view or Right view when you choose the command, the planes you set in Front view appear as vertical lines that you can angle left or right.

To avoid confusion when using Define Frontal 3D Plane, remember that you're defining a pair of extrusion planes in Front view so you can extrude objects in the original view (Top, Bottom, Left, or Right).

After you define extrusion planes in Front view, **DCAD VectorSpace** switches to the original view. Custom 3D Plane appears in the 3D Plane submenu and the 3D Plane pop-up menu. To save extrusion planes, use the Save 3D Plane command.

- To set parallel extrusion planes,
- To set inclined extrusion planes

Define Lateral 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+L
Windows Shortcut: Ctrl+Alt+L

The Define Lateral 3D Plane command lets you set a pair of extrusion planes in Left view. To choose Define Lateral 3D Plane, you must be working in Top, Bottom, Front, or Back view.

When you choose Define Lateral 3D Plane, **DCAD VectorSpace** switches the active document window to Left view. This lets you define a pair of parallel or inclined extrusion planes. The range between the extrusion planes is the extrusion depth.

- If the window shows Top or Bottom view when you choose the command, the planes you set in

Left view appear as horizontal lines that you can angle up or down.

- If the window shows Front or Back view when you choose the command, the planes you set in Left view appear as vertical lines that you can angle left or right.

To avoid confusion when using Define Lateral 3D Plane, remember that you're defining a pair of extrusion planes in Left view so you can extrude objects in the original view (Top, Bottom, Front, or Back).

After you define extrusion planes in Left view, **DCAD VectorSpace** switches to the original view. Custom 3D Plane appears in the 3D Plane submenu and the 3D Plane pop-up menu. To save extrusion planes, use the Save 3D Plane command.

- To set parallel extrusion planes.
- To set inclined extrusion planes.

Define Vertical 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+V
Windows Shortcut: Ctrl+Alt+V

The Define Vertical 3D Plane command lets you set a pair of extrusion planes from Top view. This command is available when the active window shows Front, Back, Left, or Right view.

When you choose Define Vertical 3D Plane, **DCAD VectorSpace** switches the active document window to Top view. This lets you define a pair of parallel or inclined extrusion planes. The range between extrusion planes is the extrusion depth.

- If you are in Front or Back view when you choose the command, the planes you set in Top view are horizontal lines.

- If you are in Left or Right view when you choose the command, the planes you set in Front view are vertical lines.

To avoid confusion when using Define Vertical 3D Plane, remember that you're defining a pair of extrusion planes in Top view so you can extrude objects in the original view (Front, Back, Left, or Right).

After you define extrusion planes in Top view, **DCAD VectorSpace** switches to the original view. Custom 3D Plane appears in the 3D Plane submenu and the 3D Plane pop-up menu. To save extrusion planes, use the Save 3D Plane command.

- To set parallel extrusion planes.
- To set inclined extrusion planes.

Defining parallel extrusion planes

Before defining extrusion planes, the extrusion method must be set to Linear or Sweep. Also, the view must be the one in which you want to draw 3D objects.

For example, if you want to draw walls in Top view, the Draft or Sculpt window should show Top view.

1. Choose Define Frontal 3D Plane, Define Lateral 3D Plane, or Define Vertical 3D Plane. The available commands depend on the current view.

- Refer to **Define Frontal 3D Plane**, page 232 for the views in which you can use this command.
- Refer to **Define Lateral 3D Plane**, page 232 for the views in which you can use this command.
- Refer to **Define Vertical 3D Plane**, page 233 for the views in which you can use this command.

-
2. **DCAD VectorSpace** switches to the view in which you set the planes. The pointer is a cross. A line that follows the pointer represents the first extrusion plane.
 3. Move the pointer and click to set the position of the first plane. The first plane is restricted to moving horizontally or vertically, depending on the command you're using.
 4. Move the pointer and click to set the position of the second extrusion plane. (The vector indicates the extrusion depth if you keep the vector perpendicular to the extrusion planes.)
 5. **DCAD VectorSpace** switches to the original view, and Custom 3D Plane appears in the Status bar to indicate that the set of extrusion planes you just defined is active.

Defining inclined extrusion planes

Setting extrusion planes at angles lets you create complex 3D shapes easily. You can incline the first extrusion plane, the second extrusion plane, or both.

1. Choose Define Frontal 3D Plane, Define Lateral 3D Plane, or Define Vertical 3D Plane.
 - Refer to **Define Frontal 3D Plane**, page 232 for the views in which you can use this command.
 - Refer to **Define Lateral 3D Plane**, page 232 for the views in which you can use this command.
 - Refer to **Define Vertical 3D Plane**, page 233 for the views in which you can use this command.

2. **DCAD VectorSpace** switches to the view in which you set the planes. The pointer is a cross. A line that follows the pointer represents the first extrusion plane.
3. Move to the rotation point for the first inclined plane and begin dragging. The plane begins rotating; the drawing vector indicates the rotation angle.
 - If you do not want to angle the first plane, move the pointer to position the plane, and then click. Next, proceed to step 6.
4. Drag to adjust the angle of the first extrusion plane. The drawing vector is the lever that rotates the plane. If you lengthen the vector, the plane rotates less when you move the mouse.
5. When the plane is angled as you want, release the mouse button to set the angle.
6. Move to the point of rotation for the second extrusion plane. As you move the pointer, the drawing vector extends from the first plane's rotation point.
 - If you do not want to angle the second plane, move the pointer to position the plane, and then click. **DCAD VectorSpace** switches to the original view.
7. Begin dragging to set the point of rotation for the second plane. Begin moving the pointer and the plane begins rotating; the drawing vector indicates the rotation angle.
8. Release the mouse button to set the second extrusion plane at the specified angle. **DCAD VectorSpace** switches to the original view, and Custom 3D Plane appears on the Status bar to indicate the planes you just set are active.

Defining horizontal extrusion planes

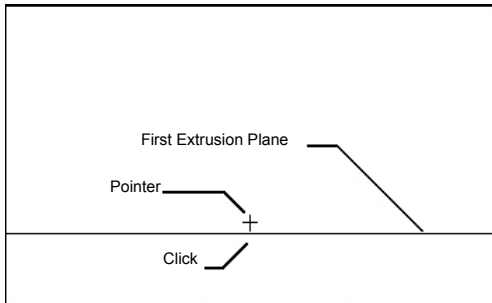


Figure 183.- Defining horizontal extrusion planes - I

1. Move the pointer to position the first extrusion plane, and then click to set the plane in the specified position.

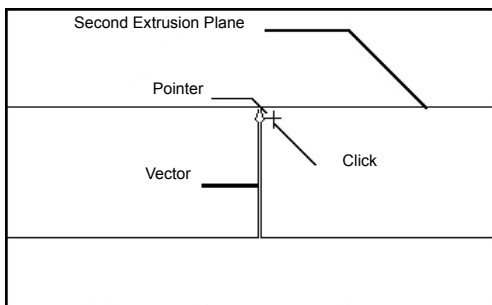


Figure 184.- Defining horizontal extrusion planes - II

2. Move the pointer to position the second extrusion plane. Click where you want to position the second extrusion plane.

Defining vertical extrusion planes

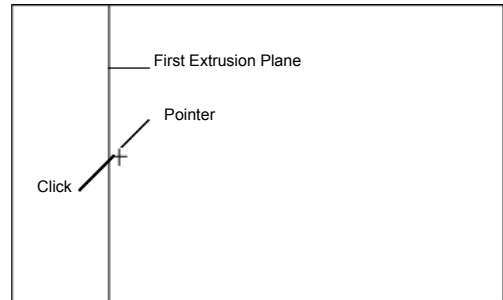


Figure 185.- Defining vertical extrusion planes - I

3. Move the pointer to position the first extrusion plane, and then click to set the plane in the specified position.

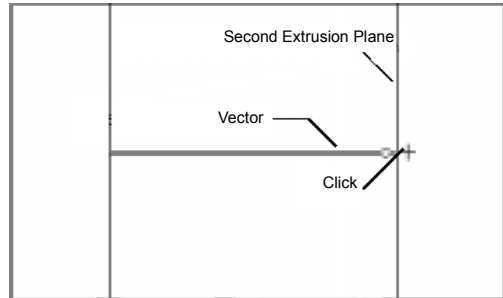


Figure 186.- Defining vertical extrusion planes - II

4. Move the pointer to position the second extrusion plane. Click where you want to position the second extrusion plane.

Setting inclined extrusion planes

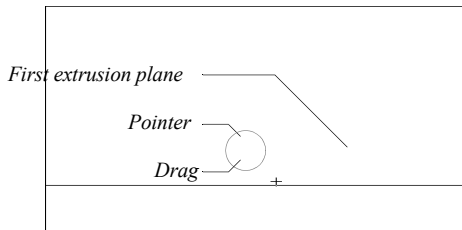


Figure 187.- Setting inclined extrusion planes - I

1. Move the pointer to position the first plane, and begin dragging.

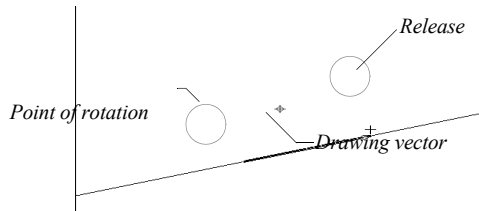


Figure 188.- Setting inclined extrusion planes - II

2. Continue dragging to incline the first plane, and then release the mouse button.

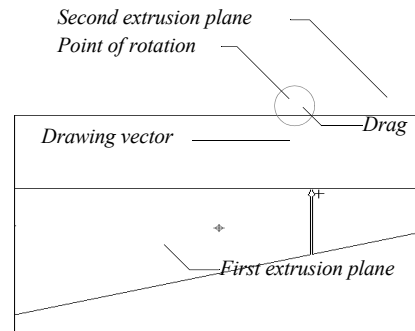


Figure 189.- Setting inclined extrusion planes - III

3. Move the pointer to position the second plane. Drag to set the second point of rotation.

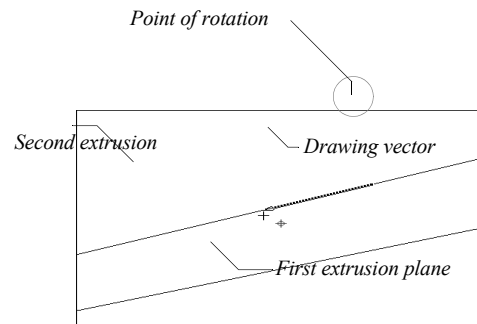


Figure 190.- Setting inclined extrusion planes - IV

4. When the second plane is at the angle you want, release the mouse button.

Notes on defining extrusion planes

You can define extrusion planes from Left (Define Lateral 3D Plane), Front (Define Frontal 3D Plane) or Top (Define Vertical 3D Plane). You choose a command in the view where you will draw, and **DCAD VectorSpace** switches to the view where you

set the extrusion planes. For the extrusion shown at right, for example, start in Front View, choose Define Lateral 3D Plane, set the planes in Left view, and draw the object in Front view.

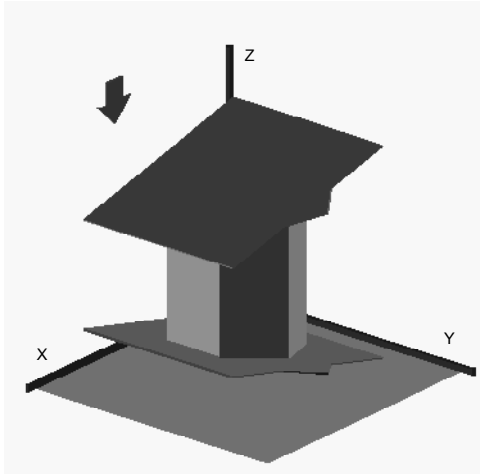


Figure 191.- Object drawn in Top view - Extrusion planes set in Front view

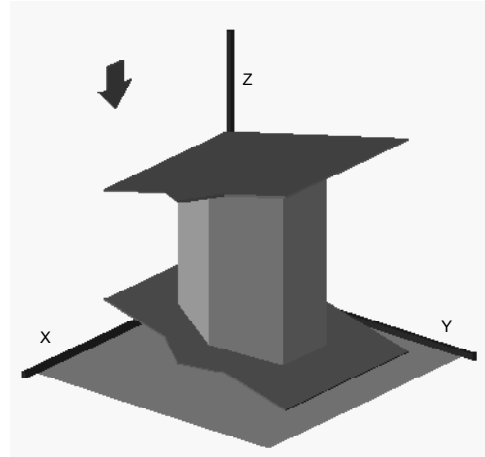


Figure 193.- Object drawn in Top view - Extrusion planes set in Left view

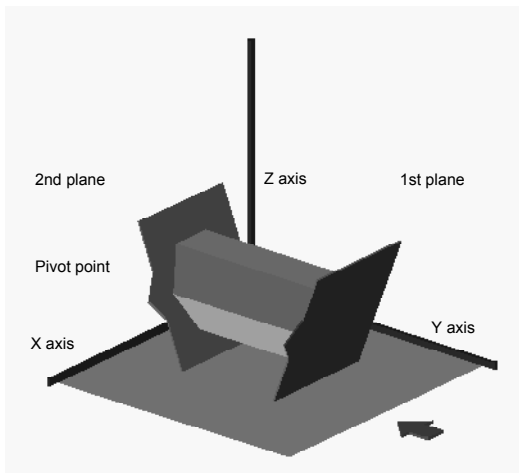


Figure 192.- Object drawn in Front view - Extrusion planes set in Left view - (Planes inclined left and right)

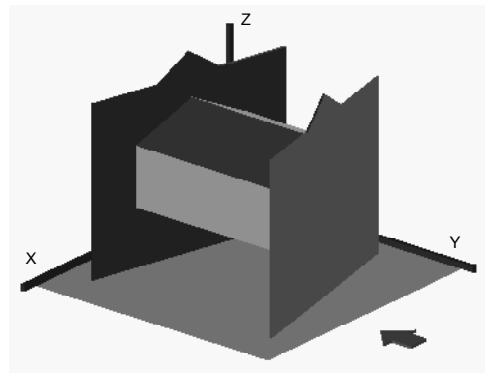


Figure 194.- Object drawn in Front view - Extrusion planes set in Top view

Delete 3D Plane

Modes: Draft, Sculpt

The Delete 3D Plane command deletes a saved set of extrusion planes. When you delete a set of extrusion

planes, the set's name disappears from the 3D Plane pop-up menu and the 3D Plane submenu.

To use the Delete 3D Plane command

1. Choose Delete 3D Plane in the 3D Plane submenu in the Layout menu. The Delete 3D Plane dialog box appears.

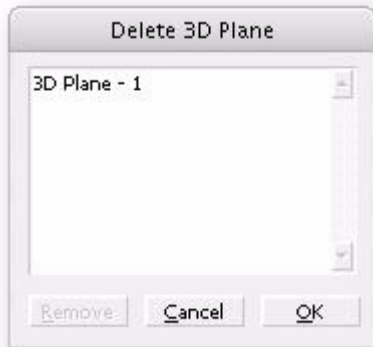


Figure 195.- Delete 3D Plane

2. In the dialog box, select extrusion planes you want to delete.
 - To select (or deselect) a continuous range of extrusion planes, press Shift and click the first and last set of extrusion planes.

Save 3D Plane

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+P
Windows Shortcut: Ctrl+Alt+Shift+P

After defining extrusion planes, you can save them as a named set.

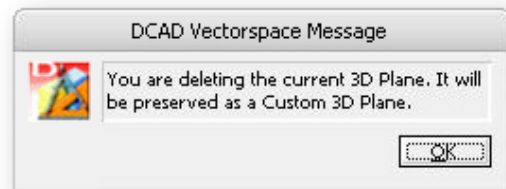
In each view, named extrusion planes appear in the 3D Plane submenu, and in the 3D Plane pop-up menu on the Status bar.

You can use saved extrusion planes in the view for which they were created; if you save a set of extru-

- To select (or deselect) several non-contiguous sets of extrusion planes, press Ctrl (Windows) or Cmd (Mac OS) and click each set of extrusion planes.

3. To remove the extrusion planes, click Remove. To permanently delete the extrusion planes, click OK. To close the dialog box and keep the extrusion planes, click Cancel.

If you try to delete the active set of extrusion planes, a message appears. Click OK to continue.

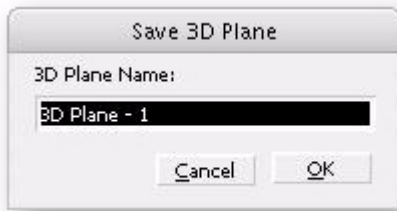


DCAD VectorSpace maintains the deleted set of extrusion planes, and activates Custom 3D Plane. Refer to **Custom 3D Plane**, page 230 for more information.

sion planes in Top view, you can use them in Top view only.

To save extrusion planes

1. Use the Define Vertical 3D Plane, Define Frontal 3D Plane, or Define Lateral 3D Plane command in the 3D Plane submenu to define a set of extrusion planes.
2. Choose Save 3D Plane in the 3D Plane submenu in the Layout menu. The Save 3D Plane dialog box appears.



3. Type a name for the extrusion planes in the text box.
4. Click OK. In the current view only, **DCAD VectorSpace** adds the name of the extrusion planes to the 3D plane pop-up menu on the Status bar, and to the bottom of the 3D Plane submenu.

Working with saved extrusion planes

In each view, the names of saved sets of extrusion planes appear at the bottom of the 3D Plane submenu, and in the 3D Plane pop-up menu on the Status bar.

If saved extrusion planes are active, their name appears in the 3D Plane pop-up menu on the Status bar.

To use saved extrusion planes

1. Choose the view with the saved extrusion planes you want to use.
2. Choose the name of the set of extrusion planes in the 3D Plane submenu, or in the 3D Plane pop-up menu on the Status bar.

Toolbars

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+T
Windows Shortcut: Ctrl+Alt+Shift+T

You can use the Toolbars command to display or hide **DCAD VectorSpace**'s toolbars.

Four toolbars are available. The Action buttons, Info bar, and Status bar appear below the menu bar. The Help bar appears at the bottom of the screen.

Action buttons. Provides quick access to commands and common editing features, such as reshape mode, extrusion methods, path editing, Rotate, Mirror, Scale, and Align.

Info bar. Shows coordinate information for pointer movements. You can use the Info Bar to enter coordinates when you create objects and perform other operations. You can also change

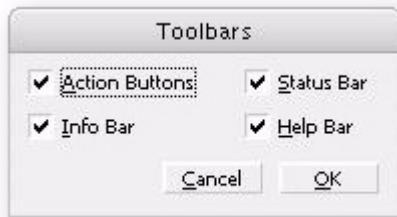
coordinate systems using the Coordinate System pop-up menu.

Status bar. Lets you select Extrusion formats and options in pop-up menus. The Status bar contains five pop-up menus: View Options, Display Options, 3D Planes (or 3D Axes), Sections, and Relative Views.

Help bar. Displays tips and instructions for using tools and commands. It also displays prompts for actions, file information, rendering progress, boolean vector progress, and memory status.

To show or hide toolbars

1. Choose Toolbars in the Layout menu. The Toolbars dialog box opens. Active toolbars have a checkmark in their checkboxes.



2. To hide an active toolbar, deselect its checkbox. To display a toolbar, select the checkbox.
3. Click OK to implement the toolbar settings. Click Cancel to leave the current toolbar setup the same.

Units Setup

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+Shift+U
Windows Shortcut: Ctrl+Alt+Shift+U



The Units Setup command configures the units and measurement system for a **DCAD VectorSpace** project. For example, when you use a dimensioning tool, the dimensions use the units and measurement system specified in the Units Setup dialog box.

To use the Units Setup command

Choose Units Setup in the Layout menu. The Units Setup dialog box appears. Choose the options you

want (described next), and then click OK to implement the settings.

System . Lets you choose a measurement system for the active document. You can choose the US (English) measurement system, or the Metric measurement system.

Linear. Lets you choose the units for the measurement system. For example, if you chose Metric in the System pop-up menu, you can choose kilometers, meters, centimeters, or millimeters in the Linear pop-up menu.

Angle Origin . Lets you specify the angle origin for your the document.

Angles are measured from 0 to 360 degrees, except in the Gradient coordinate system, in which a circle is divided into 400 degrees. By using the Angle Origin text box you, you can specify a new origin for angles and angular measurements in **DCAD VectorSpace**.

Accuracy . Lets you specify the decimal precision for the project. **DCAD VectorSpace** allows precision up to 16 decimal places.

Click the “Fixed” check box to suppress values smaller than the assigned number of decimal places.

Scientific Notation . If you select this option, numbers are displayed in scientific notation.

Show Unit Marks. When this option is selected, **DCAD VectorSpace** includes the current measurement units in dimensions. If you select the US measurement system, and a combination of feet and inches in the Linear pop-up menu, Show Unit Marks is not available. In addition, if

you click the Show Unit Marks check box, and then choose a combination of feet and inches in the Linear pop-up menu, **DCAD VectorSpace** deselects this option.

Default. Click the Default button to set the current settings as the default settings for new documents.

Object menu commands



In this chapter:

- Align
- Arrange submenu
- Chain
- Combine submenu
- Copy To Layer
- Group
- Extrude submenu
- Path submenu
- Position submenu
- Scale
- Send To Layer
- Trims submenu
- Unchain
- Ungroup

Object menu commands



The Object menu and the corresponding Action buttons provide a many functions for manipulating objects in **DCAD VectorSpace**.

In general, you must select one or more objects before you can choose a command in the Object menu (or use an Action button to apply an Object menu command).

The Object menu contains the following commands: Align, Scale, Chain, Unchain, Group, and Ungroup.

The Object menu also contains several submenus. The commands in the submenus let you arrange objects, copy or send them to layers, configure extrusion options, change the position of objects, manipulate object paths, trim object shapes, and combine objects using Boolean operations.

Align

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Y
Windows Shortcut: Ctrl+Y

To quickly and precisely position objects in **DCAD VectorSpace**, you can use the Align palette, or the Align action button.

The Align palette is a floating palette. It's designed to stay on screen while you work, making it easy to access these features.

You can align selected objects horizontally or vertically. Or, you can equally distribute selected objects within a specified area.

As a reference point for alignment and distribution, **DCAD VectorSpace** uses the objects' bounding rectangles. You can align or distribute objects in separate or combined operations.

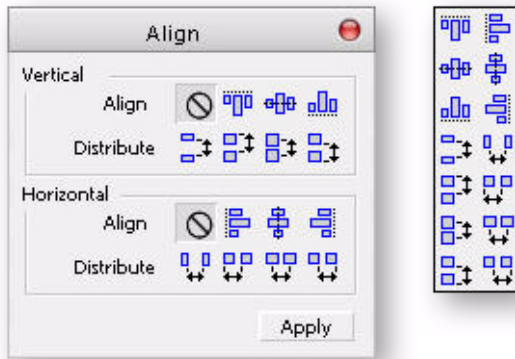


Figure 196.- Align palette and action buttons

To use the Align palette

1. Select the objects you want to align.
2. Choose Align in the Object menu, Ctrl+Y (Windows), or Cmd+Y (Mac OS). The Align palette appears.
3. In the Align palette, choose how you want to align and distribute the objects. Click to select one option button in the Vertical section and one in the Horizontal section.

Align options

When you align or distribute selected objects, **DCAD VectorSpace** aligns or distributes the objects relative to each other using the objects' bounding rectangles.

When you use the Align palette, you can combine horizontal and vertical alignment and distribution. However, you cannot combine vertical alignment and vertical distributions, or horizontal alignment and horizontal distribution.

4. Click Apply. **DCAD VectorSpace** aligns or distributes the objects in the specified manner.

Align action buttons

You can quickly select alignment and distribution options using the Action buttons in the Attributes bar. The last Align action button that you used appears in the home position in the Attributes bar. You can click this button to apply the same alignment option to selected objects.

Using the Align action buttons, you can apply one alignment or distribution option at a time to selected objects.

To use the Align action buttons

1. Select the objects you want to align or distribute.
2. Click the Align action button or press the button and drag to select an alignment option. **DCAD VectorSpace** arranges the selected objects.









Vertical alignment and distribution

When you align objects vertically, **DCAD VectorSpace** moves the selected objects in a vertical direction to line them up relative to each other.

As a reference point for aligning the objects, **DCAD VectorSpace** uses the objects' bounding rectangles. You can align the top, bottom or center of selected objects. You can also specify no vertical alignment.

When you distribute objects vertically, **DCAD VectorSpace** equally spaces the objects you select relative to each other. You distribute objects based on the inside, top, center, or bottom of the objects' bounding rectangles.

Table 4: Vertical alignment and distribution options

Option	Procedure
	No alignment To specify no vertical alignment, select this button
	Top vertical alignment To line up the tops of selected objects by moving them vertically on-screen, select this button. This operation lines up the top of each object along an invisible horizontal line that passes through the top of each object.
	Centered vertical alignment To line up the centers of selected objects by moving them vertically on-screen, select this button. This operation lines up the center of each object along an invisible horizontal line that passes through the center of each object.
	Bottom vertical alignment To line up the bottoms of selected objects by moving them vertically on-screen, select this button. This operation lines up the bottom of each object along an invisible horizontal line that passes through the bottom of each object.
	Inside vertical distribution To equalize the space between the inside edges of selected objects by moving them vertically on-screen, select this button. This distributes the inside edges of the objects along invisible horizontal lines that pass through the inside edge of each object.
	Top vertical distribution To equalize the space between the top edges of selected objects by moving them vertically on-screen, select this button. This distributes the inside edges of the objects along invisible horizontal lines that pass through the top edge of each object.
	Centered vertical distribution To equalize the space between the centers of selected objects by moving them vertically on-screen, select this button. This distributes the centers of the objects along invisible horizontal lines that pass through the center of each object.
	Bottom vertical distribution To equalize the space between the bottom edges of selected objects by moving them vertically on-screen, select this button. This distributes the bottom edges of the objects along invisible horizontal lines that pass through the bottom edge of each object.

Horizontal alignment and distribution

When you align objects horizontally, **DCAD VectorSpace** moves objects in a horizontal direction to line the objects up.

As a reference point for aligning the objects, **DCAD VectorSpace** uses the objects' bounding rectangles. When aligning objects horizontally, you can align the left, center or right sides of the objects. You can also specify no horizontal alignment.

When you distribute objects horizontally, **DCAD VectorSpace** equally spaces the selected objects relative to each other. You can distribute objects based on the left, center, or right sides of the objects. Or, you can distribute the right sides of objects with the left sides of adjacent objects.

The following table summarizes horizontal alignment and distribution options.

Table 5: Horizontal alignment and distribution options









Option		Procedure
	No horizontal alignment	To specify no horizontal alignment, select this button
	Left horizontal alignment	To line up the left sides of selected objects by moving them horizontally on-screen, select this button. This lines up the left side of each object along an invisible vertical line that passes through the left side of each object.
	Centered horizontal alignment	To line up the centers of selected objects by moving them horizontally on-screen, select this button. This lines up the center of each object along an invisible vertical line that passes through the center of each object.
	Right horizontal alignment	To line up right sides of selected objects by moving them horizontally on-screen, select this button. This lines up the right side of each object along an invisible vertical line that passes through the right side of each object.
	Inside horizontal distribution	To equalize the space between the inside edges of selected objects by moving them horizontally on-screen, select this button. This distributes the inside edges of the objects along invisible vertical lines that pass through the inside edge of each object.
	Left horizontal distribution	To equalize the space between the left edges of selected objects by moving them horizontally on-screen, select this button. This distributes the left edges of the objects along invisible vertical lines that pass through the left edge of each object.

Table 5: Horizontal alignment and distribution options (Continued)

Option	Procedure
 <p>Centered horizontal distribution</p>	<p>To equalize the space between the centers of selected objects by moving them horizontally on-screen, select this button. This distributes the centers of the objects along invisible vertical lines that pass through the center of each object.</p>
 <p>Right horizontal distribution</p>	<p>To equalize the space between the right edges of selected objects by moving them horizontally on-screen, select this button. This distributes the right edges of the objects along invisible vertical lines that pass through the right edge of each object.</p>

Arrange submenu

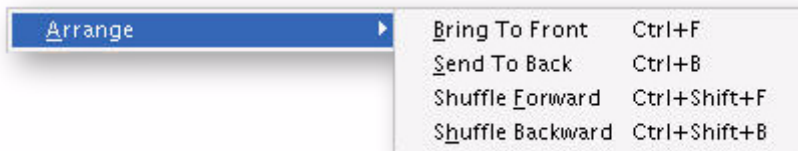


Figure 197.- Arrange submenu

The Arrange submenu contains commands that change the stacking order of objects on a layer.

Bring To Front. Moves the selected objects to the front of the current layer's stacking order. The objects you bring to the front maintain their stacking order relative to each other, but are in front of all other objects.

Send to Back. Moves the selected objects to the back of the current layer's stacking order. The objects you send to the back maintain their stacking order relative to each other, but are behind all other objects.

Shuffle Forward. Moves each of the selected objects one step towards the front of the current layer's stacking order.

Shuffle Backward. Moves each of the selected objects one step towards the back of the current layer's stacking order.

To use the Arrange submenu

1. Select the object or objects you want to move in the stacking order.
2. To arrange the object or objects, choose *command name* in the Arrange submenu, where *command name* is the name of the Arrange submenu command you want to choose.

Bring to Front

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+F
Windows Shortcut: Ctrl+F

By using the Bring to Front command, you can move selected objects to the front of the current layer's stacking order. In **DCAD VectorSpace**, every layer has a stacking order. The stacking order influences the way objects relate to each other on the layer. Objects in the front of the stack obscure objects in the back of the stack.

When you draw a new object on a layer, it gets placed in the “front” of the stack. Existing objects then move toward the “back.” If you paste an object from the Clipboard, it appears in the front of the stack.

Unless you rearrange the objects on a layer using the commands in the Arrange submenu, the most recent object is always in the “front,” and the oldest object is in the “back.” This means stacking order is an important consideration when using the commands in the Combine submenu (Punch from Front, Punch from Back, Punch from Front & Trim, Punch from Back & Trim) to create Boolean objects.

Send to Back

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+L
Windows Shortcut: Ctrl+L

By using the Send to Back command, you can move selected objects to the back of the current layer's stacking order. In **DCAD VectorSpace**, every layer has a stacking order. The stacking order influences the way objects relate to each other on the layer. Objects in the front of the stack obscure objects in the back of the stack.

To use the Bring to Front command

1. Select the object you want to move to the front.
2. Choose Bring to Front in the Arrange submenu. **DCAD VectorSpace** moves the object to the front of the current layer's stacking order.

Layer order versus stacking order

To avoid confusion, remember the internal stacking order for objects on a layer differs from the order of layers themselves. In **DCAD VectorSpace**, you can create up to 255 layers for each view (Top, Bottom, Front, Back, Left, Right, or relative) in Draft mode. Using the Layer Manager, you can change the order of layers. If you do this, it changes the relation of objects in your project. In the Layer Manager, objects on higher layers block objects on lower layers, regardless of the internal stacking order of the objects on any particular layer. To remove an object from a layer and send it to a different layer, use the Send to Layer command in the Object menu. To send a copy of an object to another layer, use the Copy to Layer command.

When you draw a new object on a layer, it gets placed in the “front” of the stack. Existing objects then move toward the “back.” If you paste an object from the Clipboard, it appears in the front of the stack.

Unless you rearrange the objects on a layer using a command in the Arrange submenu, the most recent object is always in the “front,” and the oldest object is in the “back.” This means stacking order can be an important consideration when using the commands in the Combine submenu (Punch from Front, Punch

from Back, Punch from Front & Trim, Punch from Back & Trim) to create Boolean objects.

To use the Send to Back command

1. Select the object you want to move to the back.
2. Choose Send to Back in the Arrange submenu. **DCAD VectorSpace** moves the object to the back of the current layer's stacking order.

Layer order versus stacking order

To avoid confusion, remember the internal stacking order for objects on a layer differs from the order of

layers themselves. In **DCAD VectorSpace**, you can create up to 255 layers for each view (Top, Bottom, Front, Back, Left, Right, or relative) in Draft mode. Using the Layer Manager, you can change the order of layers. If you do this, it changes the relation of objects in your project. In the Layer Manager, objects on higher layers block objects on lower layers, regardless of the internal stacking order of the objects on any particular layer. To remove an object from a layer and send it to a different layer, use the Send to Layer command in the Object menu. To send a copy of an object to another layer, use the Copy to Layer command.

Shuffle Backward

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+L
Windows Shortcut: Ctrl+Shift+L

By using the Shuffle Backward command, you can move selected objects one step backward in the current layer's stacking order. In **DCAD VectorSpace**, every layer has a stacking order. The stacking order influences the way objects relate to each other on the layer. Objects in the front of the stack obscure objects in the back of the stack.

When you draw a new object on a layer, it gets placed in the "front" of the stack. Existing objects then move toward the "back." If you paste an object from the Clipboard, it appears in the front of the stack.

Unless you rearrange the objects on a layer using a command in the Arrange submenu, the most recent object is always in the "front," and the oldest object is always in the "back." This means the stacking order on a layer can be an important consideration when using the commands in the Combine submenu (Punch from Front, Punch from Back, Punch from

Front & Trim, Punch from Back & Trim) to create Boolean objects.

To use the Shuffle Backward command

1. Select the object you want to move one step backward in the stacking order.
2. Choose Shuffle Backward in the Arrange submenu.

Layer order versus stacking order

To avoid confusion, remember the internal stacking order for objects on a layer differs from the order of layers themselves. In **DCAD VectorSpace**, you can create up to 255 layers for each view (Top, Bottom, Front, Back, Left, Right, or relative) in Draft mode. Using the Layer Manager, you can change the order of layers. If you do this, it changes the way objects in your project obscure each other. In the Layer Manager, objects on higher layers block objects on lower layers, regardless of the internal stacking order of the objects on any particular layer. To remove an object

from a layer and send it to a different layer, use the Send to Layer command in the Object menu. To

send a copy of an object to another layer, use the Copy to Layer command.

Shuffle Forward

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+F
Windows Shortcut: Ctrl+Shift+F

By using the Shuffle Forward command, you can move selected objects one step forward in the current layer's stacking order. In **DCAD VectorSpace**, every layer has a stacking order. The stacking order influences the way objects relate to each other on the layer. Objects in the front of the stack obscure objects in the back of the stack.

When you draw a new object on a layer, it gets placed in the "front" of the stack. Existing objects then move toward the "back." If you paste an object from the Clipboard, it appears in the front of the stack.

Unless you rearrange the objects on a layer using the commands in Arrange submenu, the most recent object is always in the "front" of the stack," and the oldest object is in the "back." This means stacking order can be an important consideration when you use the commands in the Combine submenu (Punch from Front, Punch from Back, Punch from Front & Trim, Punch from Back & Trim) to create Boolean objects.

To use the Shuffle Forward command

1. Select the object you want to move one step forward in the stacking order.
2. Choose Shuffle Forward in the Arrange submenu. **DCAD VectorSpace** moves the object one step backward in the stacking order for the current layer.

Layer order versus stacking order

To avoid confusion, remember the internal stacking order for objects on a layer differs from the order of layers themselves.

In **DCAD VectorSpace**, you can create up to 255 layers for each view (Top, Bottom, Front, Back, Left, Right, or relative) in Draft mode. Using the Layer Manager, you can change the order of layers. If you do this, it changes the relation of objects in your project. Objects on higher layers block objects on lower layers, regardless of the internal stacking order of the objects on any particular layer.

To remove an object from a layer and send it to a different layer, use the Send to Layer command in the Object menu. To send a copy of an object to another layer, use the Copy to Layer command.

Chain

Mode: Draft
Mac OS Shortcut: Cmd+H
Windows Shortcut: Ctrl+H

The Chain command connects selected lines, arcs,

and open polylines to form a single polygon or polyline. This command is useful for creating shapes by drawing individual segments first.

For example, you can draw a shape that contains an arc, a line, and a B-spline curve, arrange their endpoints so they touch, and chain them to create one object. In addition, you can use the Chain command to re-connect objects that you unchained with the Unchain command.

The Chain command can't be used to connect objects that are not touching each other, such as parallel lines, or closed objects.

To use the Chain command

1. Select the objects you want to chain. An endpoint of each object you want to chain must touch at least one endpoint of another selected object.
2. Choose Chain in the Object menu. **DCAD VectorSpace** joins the selected segments at the endpoints.

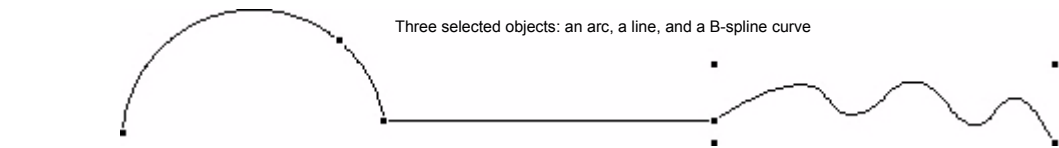


Figure 198.- Chaining objects - I

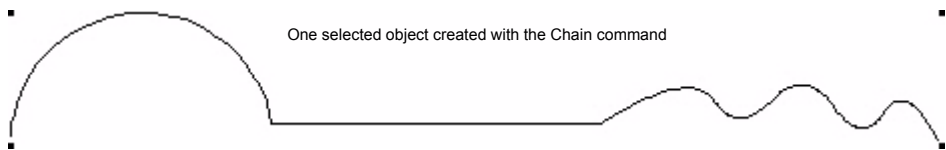


Figure 199.- Chaining objects - II

Combine submenu

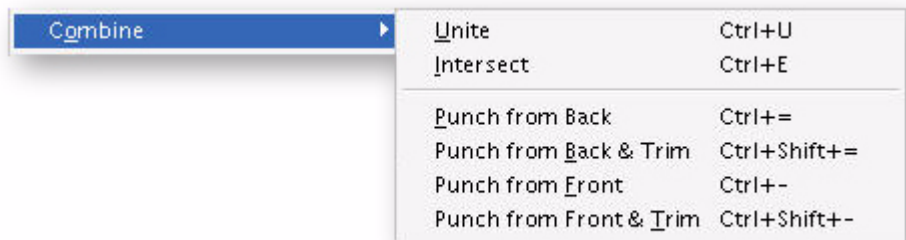


Figure 200.- Combine submenu

The Combine submenu in the Object menu contains commands that let you combine 2D or 3D objects to create complex shapes without losing the ability to

edit the original objects. In **DCAD VectorSpace**, these are referred to as *Boolean operations*.

If you have the Preference “Show boolean outlines” selected, the shape of the combined object remains visible as you reshape its constituent objects. For example, you can combine a rectangle and a six-sided polygon to create a bay window in a wall. Later, if you decide the window should be in a different place and a different size, the Reshape action button (or the Reshape command) displays the original rectangle and polygon for editing. In addition, when the preference “Show Boolean outlines” is on, the outline of Boolean objects is displayed in red.

DCAD VectorSpace has six Boolean operations:

Unite. Lets you create a new object from the outline of multiple objects in Draft and Sculpt.

Intersect. Lets you create a new object from the overlapping area of multiple objects. This hides the parts of the objects outside the intersection.

Punch from Front. The Punch from Front command knocks holes in the object at the back of the stacking order using the objects in front.

Intersect

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+E
Windows Shortcut: Ctrl+E

By using the Intersect command, you can create a new object from the overlapping area of multiple objects. The parts of the objects outside the intersection are then hidden. The Intersect command is available in Draft and Sculpt modes.

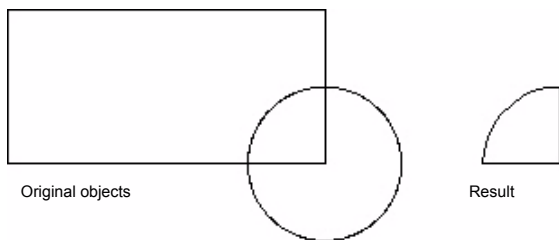


Figure 201.- Result of Intersect command

If necessary, you can use the Reshape command in the Edit menu to reshape an object you create with the Intersect command.

To use the Intersect command

1. Select the objects you want to combine with the Intersect command. The objects must overlap.

2. Choose Intersect in the Combine submenu (or click the Intersect action button). **DCAD VectorSpace** finds the overlapping area of the shapes and removes the rest.

To reshape combined objects

You can use the Reshape command in the Edit menu to edit objects combined with the Intersect command.

1. Select the combined objects you want to reshape.
2. Choose Reshape in the Edit menu (or click the Reshape action button). The original shapes of the constituent objects that comprise the intersected Boolean object reappear.
3. Use the Selection tool to move, resize, and reshape the objects. If you have the Preference “Show boolean outlines” on, the shape of the intersected object will be visible as you reshape its constituent objects.
4. When you are done editing the shapes, click outside the selection to reapply the Intersect operation and end Reshape mode.

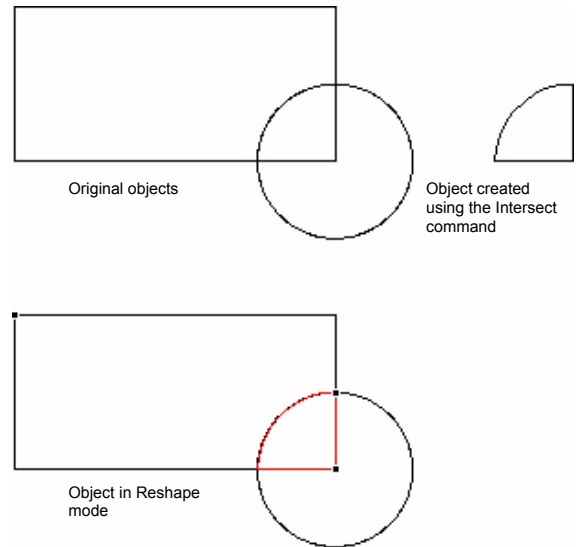


Figure 202.- Reshape applied to combined objects

Intersecting when objects have different attributes

If you intersect objects with different attributes, such as Fill colors, hatches, or Surface materials, the new object takes on the attributes of the rearmost object in the stacking order of the objects being combined. When two objects overlap, you can tell which object is rearmost in the stacking order because objects in the “front” obscure objects in the “back.”

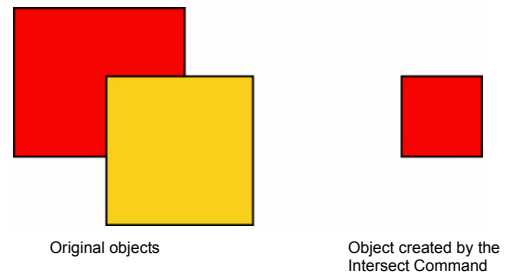


Figure 203.- Intersecting when objects have different attributes

Intersecting objects on different layers

If you intersect objects on different layers, **DCAD VectorSpace** places the intersected object on the currently active layer. For example, if you inter-

sect an object on Layer 1 and an object on Layer 3, but Layer 2 is the active layer, the intersected object is placed on Layer 2. In addition, if the objects you're intersecting have different attributes, the intersected object takes on the attributes of the object on the currently active layer.

Punch from Back

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+=
Windows Shortcut: Ctrl+=

By using the Punch from Back command, you can take an object at the front of the stacking order and use it to “knock out” (or punch) a hole in all of the overlapping objects behind it.



To avoid confusion, remember the Punch from Back command does not refer to Back view. It refers to taking an object at the front of the object creation order and using it to knock a hole through objects behind it.

If necessary, you can use the Reshape command to reshape objects formed with the Punch from Back command.

When you use the Punch from Back command on Sculpt mode objects, it's often easier to see the results of the operation in Render mode.

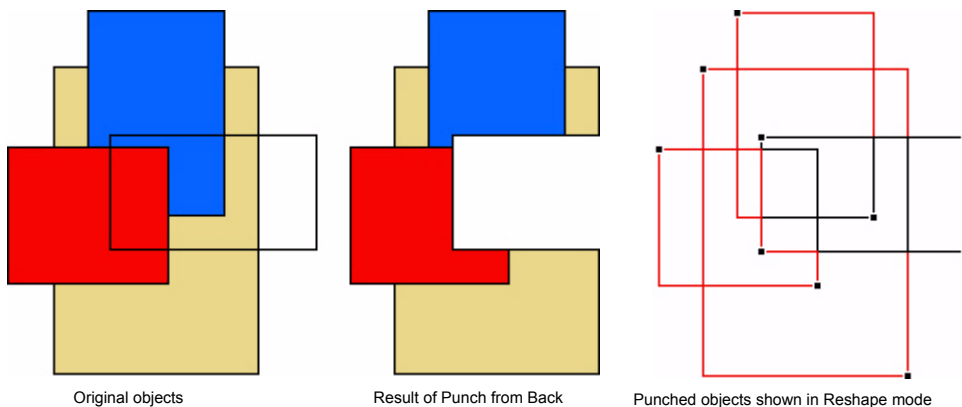


Figure 204.- Punch from Back

To use the Punch from Back command

1. Make sure the object you want to use to punch through objects is at the front of the object hierarchy. If necessary, select the object and choose
2. Select the objects you want to combine with the Punch from Back command.

Bring to Front in the Arrange submenu to bring it to the front of the hierarchy.

- All overlapping selected objects will be affected.
 - Non-overlapping objects won't be affected by the punch operation.
3. Choose Punch from Back in the Combine submenu. **DCAD VectorSpace** removes the front object from each of the objects behind it.
 3. Use the Selection tool to move, resize, and reshape the objects.
 - If “Show boolean outlines” is selected in the Preferences dialog box, the shape of the combined object remains visible as you reshape its constituent objects.
 4. When you are done editing the shapes, click outside the selection to reapply the combine operation and end Reshape mode.

To reshape combined objects

You can use the Reshape command in the Edit menu to edit shapes created with the Punch from Back command.

1. Select the punched shape you want to edit.
2. Choose Reshape in the Edit menu or click the Reshape action button. The original front object removed from the back objects reappears.

Applying Punch from Back to objects on different layers

If you combine objects on different layers with the Punch from Back command, **DCAD VectorSpace** places the combined object on the currently active layer. For example, if you punch an object on Layer 3 through an object on Layer 2, and Layer 2 is the active layer, the new object is placed on Layer 2.

Punch from Back & Trim

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+=
Windows Shortcut: Ctrl+Shift+=

By using the Punch from Back & Trim command, you can use an object in the front of the stacking order to “knock out” a hole in all of the overlapping objects behind it.



When you use Punch From Back & Trim, **DCAD VectorSpace** doesn't recall the original objects when you put the resulting object in Reshape mode, because non-overlapping areas of the front object are “trimmed” to fit the shape of the punched object. There is no difference between “Punch from Back” and “Punch from Back & Trim” when no part of the front object extends past the outlines of the back objects.

Punch from Back & Trim is available in Draft and Sculpt only. However, when you use this command on Sculpt mode objects, it's often easier to see the results of the operation in Render.

To avoid confusion, remember the Punch from Back & Trim command does not refer to Back view. It refers to taking the object at the front of the stacking order, and using it to knock holes in objects behind it.

To use the Punch from Back & Trim command

1. Make sure the object you want to use to punch through objects is in front. If necessary, select the object and choose Bring to Front in the Arrange submenu.

2. Select the objects you want to combine with the Punch from Back & Trim command. All selected objects directly behind the front object will be affected. Non-overlapping objects stay the same.
3. Choose Punch from Back & Trim in the Combine submenu. **DCAD VectorSpace** removes

the front object from each of the objects behind it.

To edit combined objects

In Reshape mode, you can see how this command “trims” areas of objects that don't overlap the back object

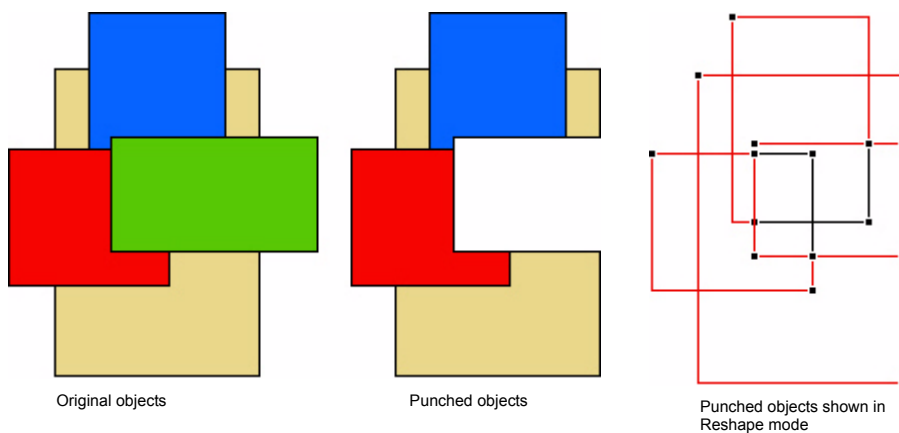


Figure 205.- Punch from Back & Trim

1. Select an object to which you applied the “Punch from Back & Trim” command.
2. Choose Reshape in the Edit menu, or click the Reshape action button.
3. Use the Selection tool to move, resize, and reshape the objects.
4. When you are done editing the shapes, click outside the selection to reapply the “Punch from Back & Trim” operation and end Reshape mode.

Applying Punch From Back & Trim to objects on different layers

If you combine objects on different layers with the Punch from Back & Trim command, **DCAD VectorSpace** places the combined object on the currently active layer. For example, if you punch an object on Layer 3 through an object on Layer 2, and Layer 2 is the active layer in the Layer Manager, the new object is placed on Layer 2.

Punch from Front

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+-
Windows Shortcut: Ctrl+-

The Punch from Front command knocks holes in the object at the back of the stacking order using the objects in front.



Unlike Punch from Back, which uses the front object to punch one hole through all objects behind it, Punch from Front can cut several holes from the back object.

When you use the Punch from Front command on Sculpt mode objects, it's often easier to see the results of the operation in Render mode.

To avoid confusion, remember the Punch from Front command has no relation to Front view. Rather, it refers to taking objects at the front of the object creation order and using them to knock holes through the object at the back of it.

If necessary, you can use the Reshape command to reshape objects formed with the Punch from Front command.

To use the Punch from Front command

1. Make sure the object you want to punch holes is at the back of the stacking order. If necessary, select the object and choose Send to Back in the Arrange submenu.
2. Select the objects you want to combine. All selected objects in front will punch holes in the back object. If a front object doesn't overlap the back object, the object will disappear.
3. Choose Punch from Front in the Combine submenu. **DCAD VectorSpace** removes the front objects from the back object.

To reshape combined objects

You can use the Reshape command in the Edit menu to edit shapes created with the Punch from Front command.

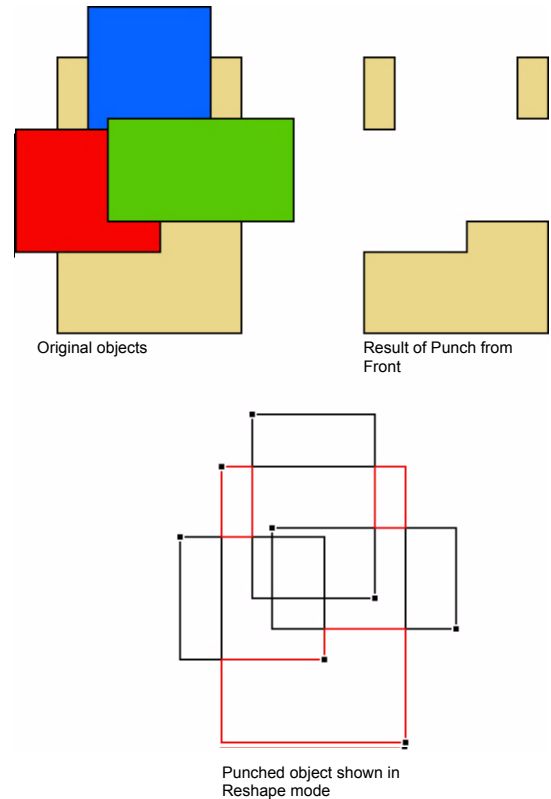


Figure 206.- Punch from Front

1. Select the object you punched holes in.
2. Choose Reshape in the Edit menu, or click the Reshape action button. The original shapes that punched the holes in the back object reappear.
3. Use the Selection tool to move, resize, and reshape the objects.
4. When you are done editing the shapes, click outside the selection to reapply the “Punch from Front” operation and end Reshape mode.

Punch from Front & Trim

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+-
Windows Shortcut: Ctrl+Shift+-

The “Punch from Front & Trim” command knocks holes in the object at the back of the stacking order using the objects in the front, similar to “Punch from Front.” However, unlike “Punch from Front,” areas that don't overlap the back object are permanently deleted, and cannot be recalled in Reshape mode.



If all objects in front are completely overlapped by the back object, there is no difference in between “Punch from Front & Trim” and “Punch from Front.”

Punch from Front & Trim is available in Draft and Sculpt modes only. However, when you use this command on Sculpt mode objects, it's often easier to see the results of the operation in Render mode.

To avoid confusion, remember the Punch from Front & Trim command does not refer to Front view. Rather, it refers to taking objects at the front of the object creation order and using them to knock holes through the object in the back of it.

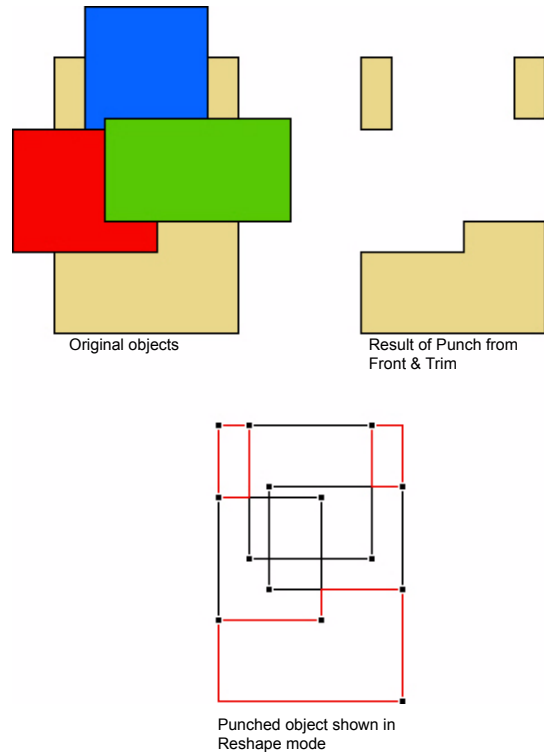


Figure 207.- Punch From Front & Trim

To use the Punch from Front & Trim command

1. Make sure the object you want to punch holes in is behind the objects that will make the holes. If necessary, select the object and choose Send to Back in the Arrange submenu.
2. Select the objects you want to combine. If a front object doesn't overlap the back object, the object will disappear.
3. Choose Punch from Front & Trim in the Combine submenu. **DCAD VectorSpace** removes the front objects from the back object.

To edit combined objects

In Reshape mode, you can see how this command “trims” areas of objects that don’t overlap the back object.

1. Select an object to which you applied the “Punch from Front & Trim” command.
2. Choose Reshape in the Edit menu, or click the Reshape action button.
3. Use the Selection tool to move, resize, and reshape the objects.
4. When you are done editing the shapes, click outside the selection to reapply the “Punch from

Front & Trim” operation and end Reshape mode.

Applying Punch From Front & Trim to objects on different layers

If you combine objects on different layers with the Punch from Front & Trim command, **DCAD VectorSpace** places the combined object on the currently active layer. For example, if you punch an object on Layer 3 through an object on Layer 2, and Layer 2 is the active layer in the Layer Manager, the new object is placed on Layer 2.

Unite

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+U
Windows Shortcut: Ctrl+U

By choosing the Unite command, you can create a new object from the outline of multiple selected objects. The Unite command is available in Draft and Sculpt modes only.



The Unite command provides a simple and powerful way to create complex shapes. After uniting objects, they become one, composite object that you can move, resize, edit and offset as a single object.

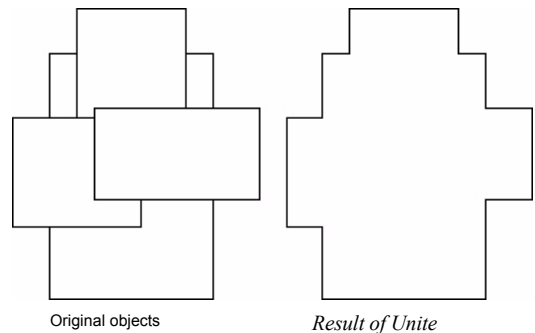


Figure 208.- The Unite command

If necessary, you can use the Reshape command in the Edit menu to reshape an object created with the Unite command.

To use the Unite command

1. Select the objects you want to combine with the Unite command. The objects must overlap.
2. Choose Unite in the Combine submenu (or click the Unite action button). **DCAD VectorSpace**

finds the union of the shapes and removes interior lines.

To reshape combined objects

You can use the Reshape command in the Edit menu to edit objects combined with the Unite command.

1. Select the combined object you want to reshape.
2. Choose Reshape in the Edit menu (or click the Reshape action button). The original shapes of the constituent objects that comprise the united Boolean object reappear.
3. Use the Selection tool to move, resize, and reshape the objects. If you have the Preference “Show boolean outlines” on, the shape of the combined object remains visible as you reshape its constituent objects.
4. When you are done editing the shapes, click outside the selection to reapply the Unite operation and end Reshape mode.

Uniting objects with different attributes

If you unite objects on the same layer with different attributes, such as fill colors, hatches, or materials, the new object takes on the attributes of the rearmost object in the stacking order. When two objects overlap, you can tell which object is rearmost in the

stacking order because objects in the “front” obscure objects in the “back.”

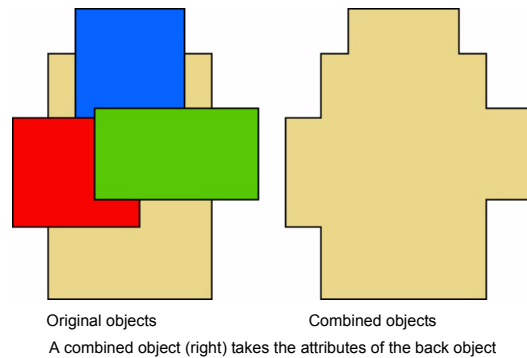


Figure 209.- Attributes of combined objects

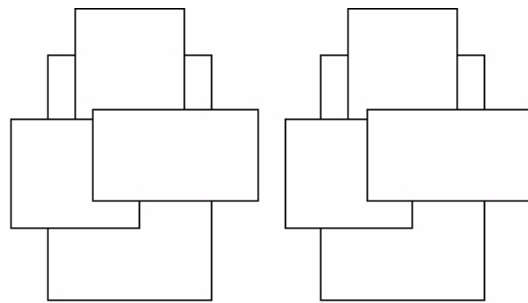
Uniting objects on different layers

If you unite objects on different layers, **DCAD VectorSpace** places the united object on the currently active layer. For example, if you unite an object on Layer 1 and an object on Layer 3, but Layer 2 is the active layer in the Layer Manager, the united object is placed on Layer 2. In addition, if the objects you’re uniting have different attributes, the united object takes on the attributes of the object on the currently active layer.

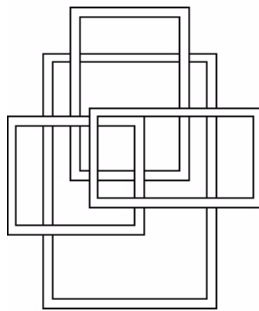
Offsetting complex shapes

When you want to offset a complex shape, keep in mind that shapes created with the Double Polyline tool combine differently than single-line shapes. Although a double polyline acts like a line, it behaves like a polygon when combined with other objects.

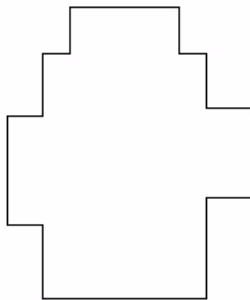
Rather than creating objects with the Double Polyline tool, and then combining them with the Unite command, it’s easier to combine basic single-line objects, and then offset the path of the combined object.



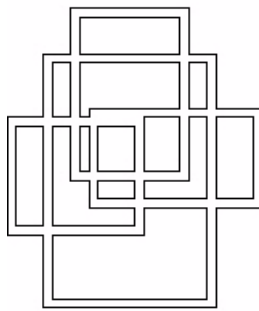
Original object



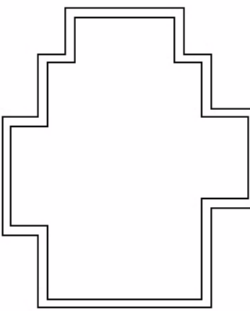
Offset



Unite



Unite



Join

Figure 210.- Combining double polyline objects

Copy To Layer

Mode: Draft, Sculpt

By using the Copy To Layer command in the Object menu, you can copy objects from one layer to

another. This command duplicates selected objects and places them in the same position on the specified layer.

The Copy to Layer command does not use the system Clipboard and will not change the Clipboard contents.

To copy objects to another layer

1. Select the object or objects you want to copy to another layer.
2. In the Object menu, open the Copy To Layer submenu, and choose the layer to which you want to copy the selection. In the submenu, all

the layers for the current view are listed. The active layer has a check mark next to it. You can copy objects to visible layers only. After you select a layer, **DCAD VectorSpace** copies the selection and places the duplicate in the same position as the original.

Although you can copy an object to the same layer, the Duplicate command in the Edit menu is better for this purpose.

Group

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+G
Windows Shortcut: Ctrl+G

By using the Group command, you can unite separate objects that you want to keep together as a single unit. This command is available in Draft and Sculpt modes only.

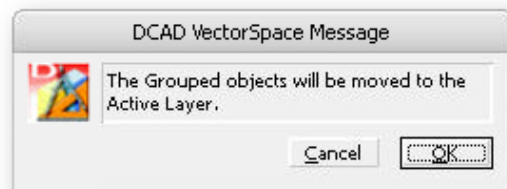
You can group objects that are themselves part of a grouped object. You can group 2D objects with other 2D objects, and group 3D objects with other 3D objects. As long as the objects you want to group are visible in a Draft or Sculpt mode window, it doesn't matter whether you're working in Draft or Sculpt mode for purposes of grouping objects. However, you cannot group a 2D object with a 3D object.

If you group objects on the same layer, it might affect the stacking order of the objects on that layer. For example, suppose you have three overlapping 2D objects in Draft mode with different fill colors. If you group the front and back objects, the grouped object moves to the front of the stacking order, and the middle object moves to the back.

To use the Group command

1. Select the objects you want to group.
2. Choose Group in the Object menu, press Ctrl+G (Windows), or Cmd+G (Mac OS). **DCAD VectorSpace** unites the selected objects into one unit and replaces the bounding rectangles of the individual objects with a single bounding rectangle.

If you group objects on different layers, a message box appears to tell you that some objects will be moved to the active layer. Click OK to complete the operation and close the dialog box.



Grouping objects on different layers places the grouped object on the active layer in the Layer Manager.

Extrude submenu

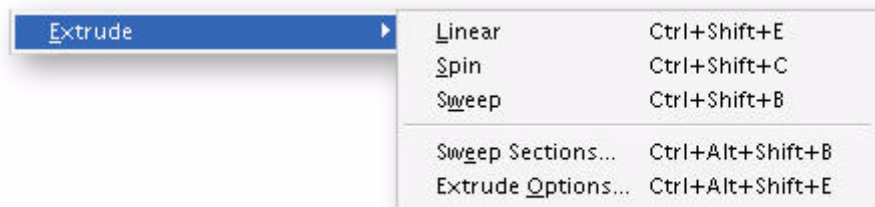


Figure 211.- Extrude submenu

Commands in the Extrude submenu in the Object menu affect the creation of 3D objects.

You can use the Linear, Spin, and Sweep commands to create 3D objects that are based on 2D objects you have drawn in Draft mode. These commands also have associated Action buttons. You can use the

Action buttons to set the current extrusion method for drawing 3D objects directly in Sculpt mode, or for extruding 2D objects into 3D objects in Draft mode.

Also, in Draft mode, you can use the Action buttons to extrude selected 2D objects into 3D objects.

Extrude Options

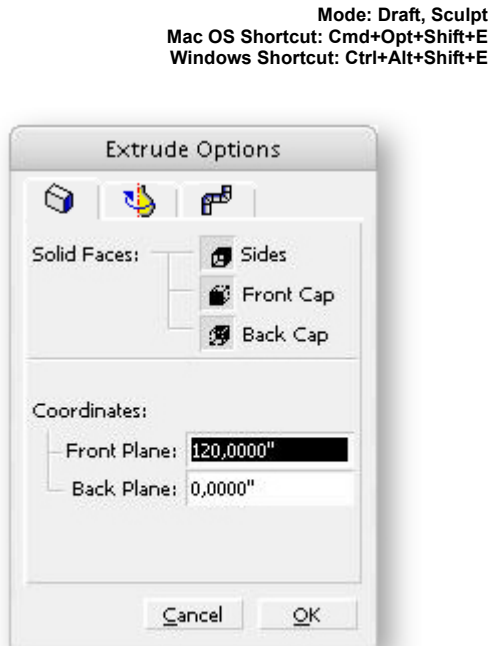


Figure 212.- Extrude Options

You can use the Extrude Options command to access the Extrude options dialog box. Or, you can double-click one of the Extrude action buttons to access the Extrude Options dialog box.

Before you extrude a 2D object in Draft mode, or create a 3D object in Sculpt mode, you can choose the Extrude Options command to configure the extrusion settings.

The Extrude Options dialog box organizes settings on three tabs. To bring a tab to the front, click the tab.

- The tab marked with a Linear extrusion icon contains Linear extrusion settings.
- The tab marked with a Spin extrusion icon contains Spin extrusion settings.
- The tab marked with a Sweep extrusion icon contains Sweep extrusion settings.



To use the Extrude Options command

1. Choose the Extrude Options command in the Object menu. The Extrude Options dialog box appears.
2. Configure the settings in the dialog box. To change tabs, click the icon at the top of the tab to bring the tab to the front.
3. To make the new settings take effect, click OK.

Solid Faces



Figure 213.- Solid Faces

In the Extrude Options dialog box, the Extrusion Format buttons appear on each tab under the label Solid Faces; these buttons duplicate the operation of the Extrusion Format buttons on the Status bar.

When you activate the Extrusion Formats using the Extrude Options dialog box, you also activate the corresponding Extrusion Format buttons in the Status bar.

If you have the Status bar turned off, you can change the Extrusion Formats using the Extrude Options dialog box.

You can see these buttons on all three tabs in the Extrude Options dialog box. You can turn these buttons on and off when you're using the Linear or

Sweep tabs. The extrusion format buttons also appear on the Spin tab, but they do not affect spin extrusions.

When you open a new **DCAD VectorSpace** document, all three Extrusion Format buttons are turned on. This configuration produces solid objects. For more information on the extrusion format buttons, refer to **Extrusion formats**, page 88. To see an illustration of how the extrusion format buttons affect objects, see **Extrusion formats**, page 91.

Linear extrusion tab

A Linear extrusion icon appears at the top of the Linear extrusion tab.

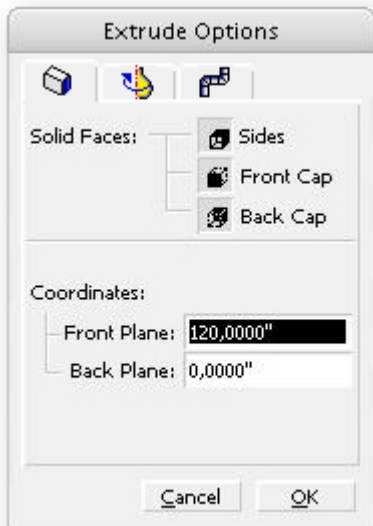


Figure 214.- Linear extrusion dialog

Coordinates. You can change the coordinates of the default extrusion planes by entering new values in the Front Plane and Back Plane text boxes.

Front Plane refers to the first plane you set. Back Plane refers to the second plane you set.

When you open a new **DCAD VectorSpace** document, the default extrusion planes are set to extrude objects from 0 to 10 feet.

In metric units the default Front Plane is 3.048 meters and the default Back Plane is 0.000 meters.

When you enter new values in the Coordinates text boxes, you change the extrusion range of the default 3D extrusion planes for the current document only.

Spin extrusion tab

A Spin extrusion icon appears at the top of the Spin extrusion tab.

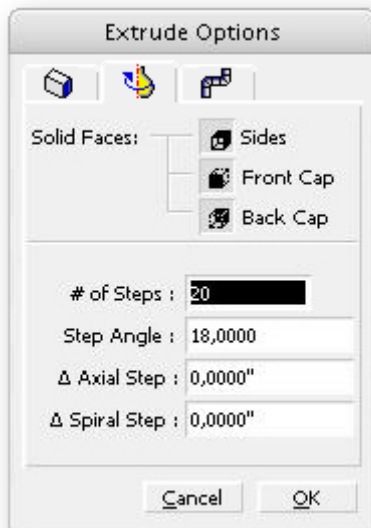


Figure 215.- Spin extrusion dialog

Note: The extrusion format icons (Sides, Front Cap, and Back Cap) appear on this tab, but do not affect spin extrusions.



of Steps. You can enter a value in the # of Steps text box to specify the number of sides an object will have once you spin extrude it.

of Steps works in conjunction with Step Angle to create complete or partial spins around the spin axis.

When you open the Extrude Options text box for the first time in a new document, the default value in the # of Steps text box is 20. This means the object will spin through 20 steps.

When you open the Extrude Options dialog box for the first time in a new document, the default value in the Step Angle text box is 18. This means each step will spin through 18-degrees.

With the # of Steps set to 20 and the Step angle set to 18, the object spins 360 degrees around the spin axis, and the completed object has 20 equal sides.

If you type 10 in the # of Steps text box, and enter 18 in the Step Angle text box, the completed object is extruded 180 degrees around the spin axis and has 10 equal sides.

Step Angle. You can enter a value in the Step Angle text box to specify the number of degrees an object will spin around the 3D axis.

Step Angle works in conjunction with # of Steps to create complete or partial spins around the spin extrusion axis.

You can determine if you are creating an object that completes a spin around the 3D axis by multiplying the step angle by the number of sides.

For example, if the Step Angle is 18 degrees and the # of Steps is 20, you know that the object spins around the axis 360 degrees.

If you change the Step Angle to nine degrees, and leave the number of sides at 20, the object spins 180 degrees.

Δ Axial Step. You can enter a value in the Δ Axial Step text box to specify the direction and offset of an object as it spins around and parallel to the spin axis.

When you enter a positive number in the Δ Axial Step text box, the object spins around the 3D axis and in the positive direction parallel to the spin axis.

When you enter a negative number in the Δ Axial Step text box, the object spins around the spin axis and in the negative direction parallel to the spin axis.

Δ Spiral Step. You can enter a value in the Δ Spiral Step text box to specify the spiral offset of an object from the spin axis.

When you enter a positive number in the Δ Spiral Step text box, the object spins out, or away, from the spin axis.

When you enter a negative number in the Δ Spiral Step text box, the object spins in, or towards the spin axis.

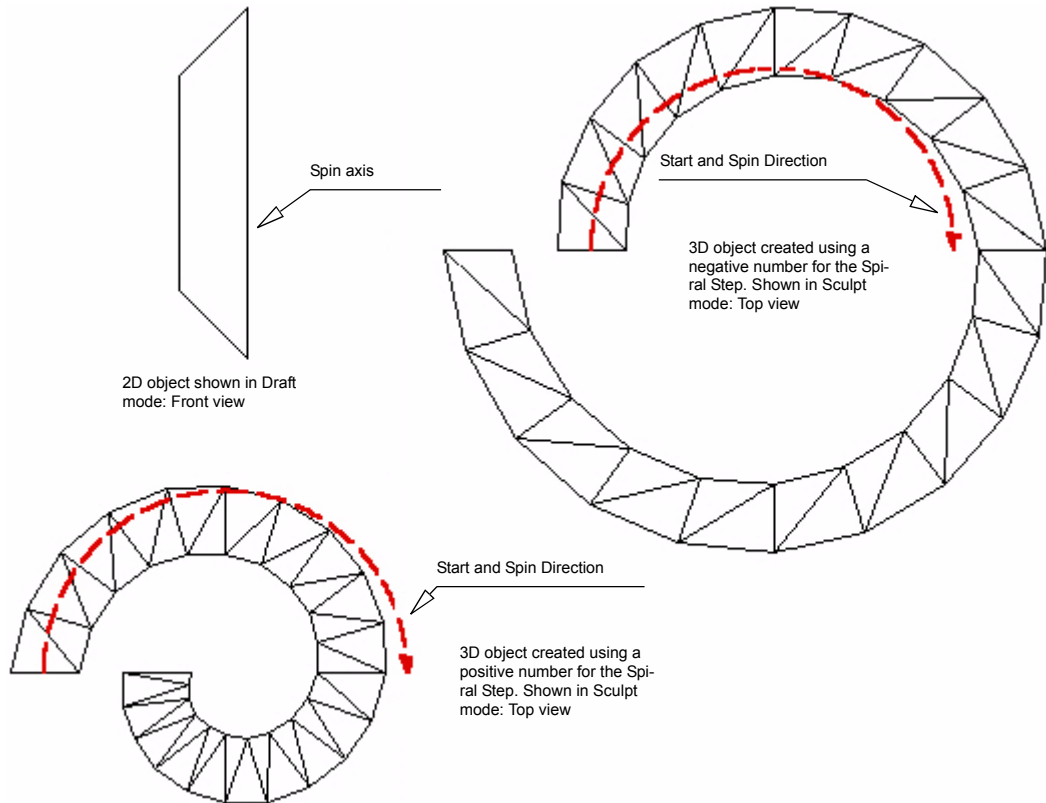


Figure 216.- Spiral steps in Spin extrusions

The following figures illustrate several spin extrusion configurations. They were created using the

same Draft mode object and the same spin axis, but different spin extrusion configurations.

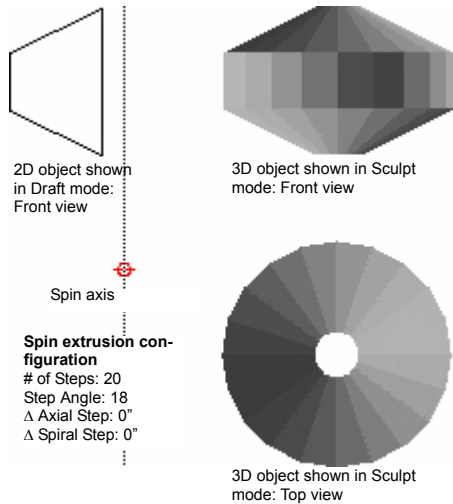


Figure 217.- Spin extrusion

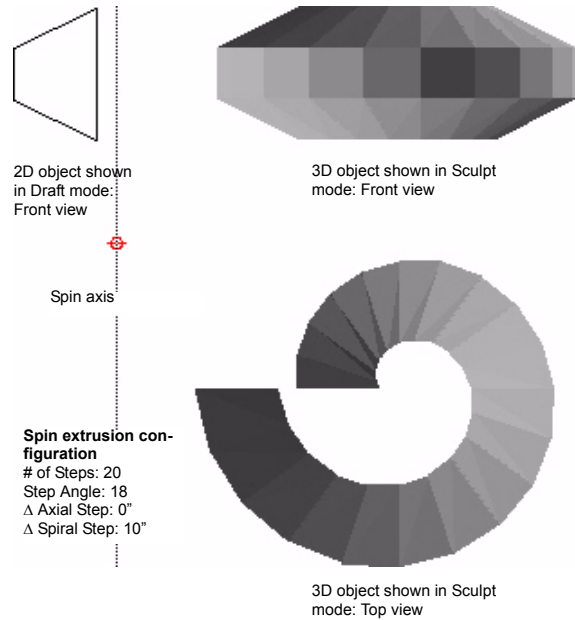


Figure 219.- Spin extrusion with Spiral Step

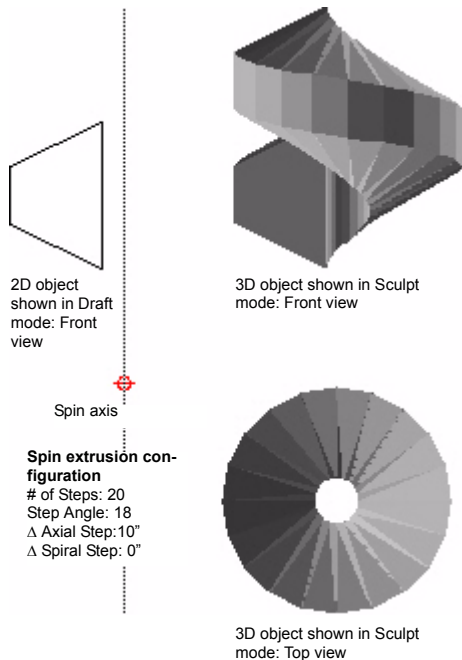


Figure 218.- Spin extrusion with Axial Step

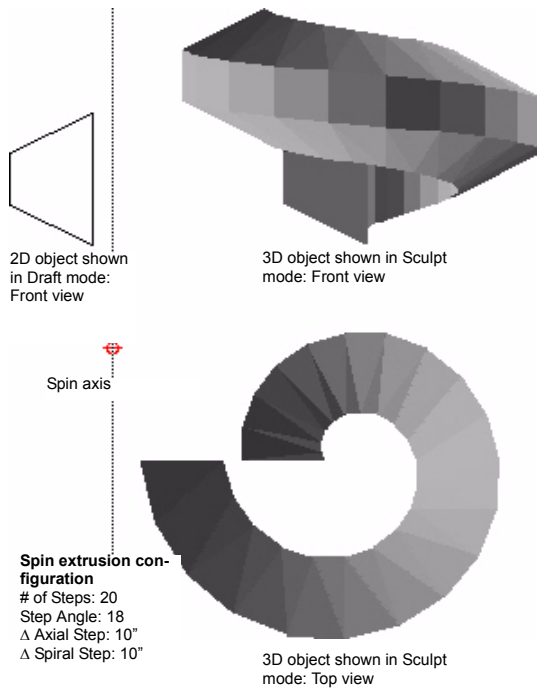


Figure 220.- Spin extrusion with Axial and Spiral step

Sweep extrusion tab

A Sweep extrusion icon appears at the top of the Sweep extrusion tab.



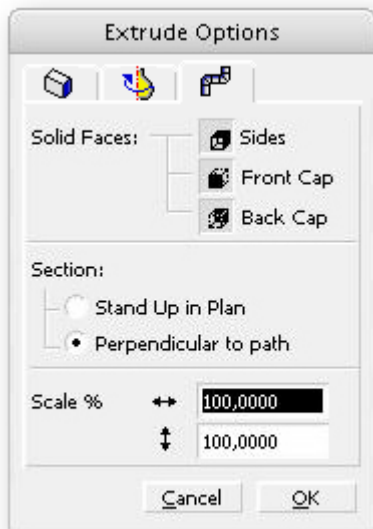


Figure 221.- Sweep extrusion dialog

Section

You can choose the way **DCAD VectorSpace** extrudes a sweep section by selecting Stand Up in Plan or Perpendicular to path.

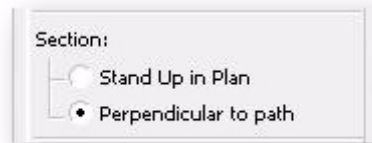


Figure 222.- Section Mode

Stand Up in Plan. Click the Stand Up in Plan button if you want the sweep section to be perpendicular to the plan.

When you use this option, the end caps of the extruded object are also perpendicular to the plan.

The plan in this case is defined as Top view. No matter which view you work in, a sweep extrusion extrudes the sweep section to be perpendicular to Top view.

Perpendicular to path. Click the Perpendicular to path button if you want the sweep section to be perpendicular to the path you use to create the extrusion.

When you use this option, the end caps of the extruded object are also perpendicular to the path.

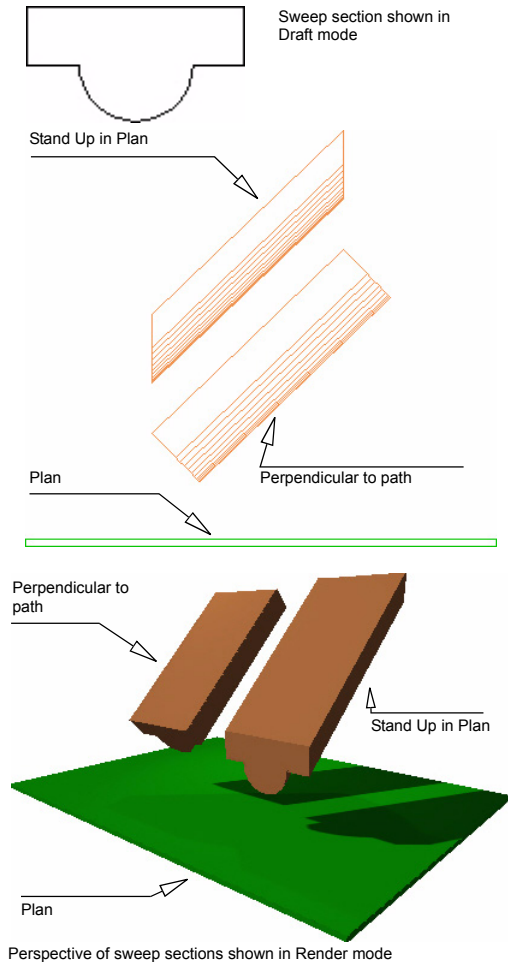


Figure 223.- Sweep extrusions options

Scale%

You can enlarge or reduce a sweep section, as it sweeps along a path, by using the Scale% option. If you change the percent values in the Scale% text boxes, you are changing the proportion of the second end cap of the extrusion as it relates to the first end cap.

For example, if you type 50 percent in the horizontal text box, and type 50 percent in the vertical text box, the extrusion proportionally reduces itself along the path by half. The edges of the finished extrusion's second end cap are 50 percent smaller than the first end cap's sides.

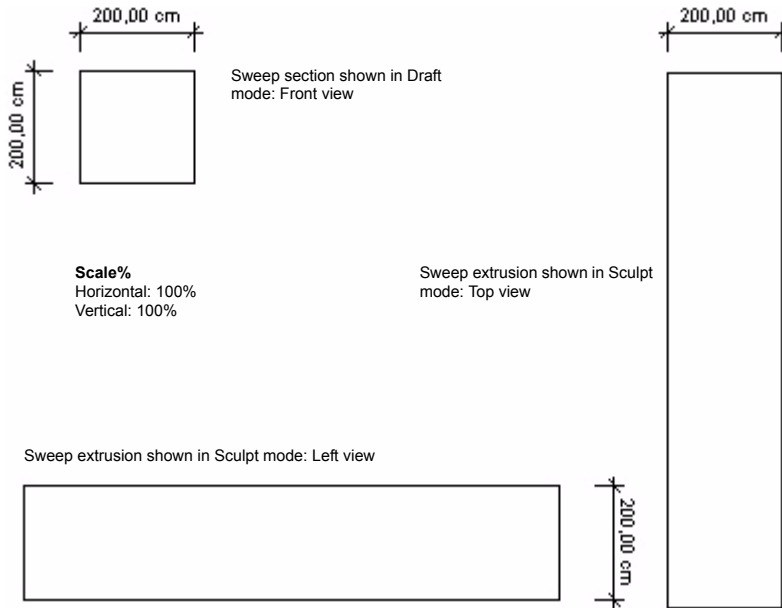


Figure 224.- Scale% option

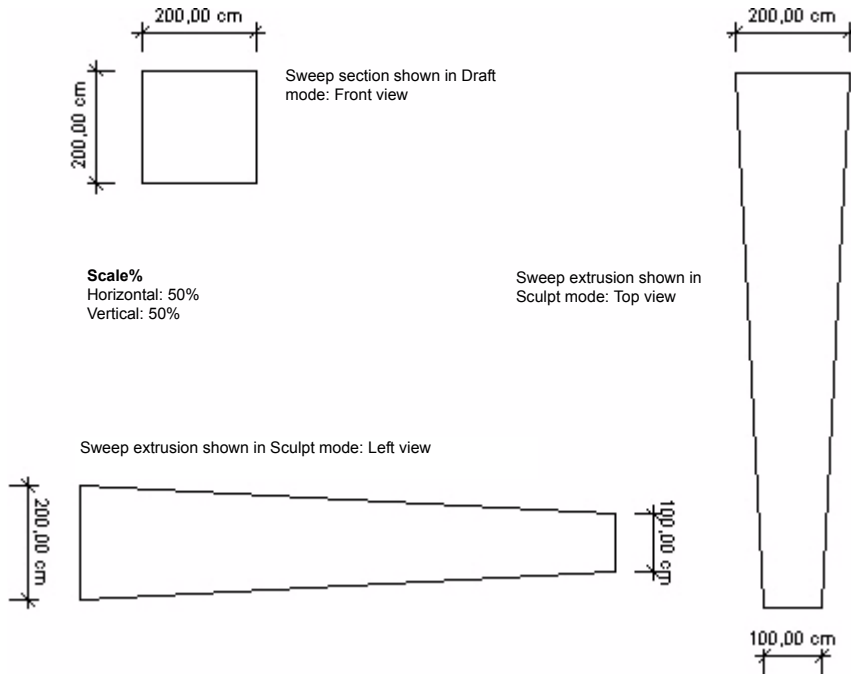


Figure 225.- Scale% option

Linear

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+E
Windows Shortcut: Ctrl+Alt+E

In Draft mode, you can create a 3D object by extruding a 2D object by choosing the Linear command.



In Sculpt mode, you can change the current extrusion method to the Linear extrusion method by choosing the Linear command.

In Draft mode . The Linear command extrudes an object between the first and second planes that define the 3D extrusion.

To create a 3D object using the Linear extrusion method, you first draw an object, and then choose the Linear command to extrude it.

For example, to create a cube, you draw a rectangle, and then choose the Linear command to extrude the object into a cube.

In Sculpt mode . You can choose the Linear command to change the current extrusion method to the Linear extrusion method. You do not have to use the command if the current extrusion method is Linear. The Extrude action button displays the Linear Extrude icon when Linear is the current extrusion method.

Once you set the extrusion method to Linear, you do not have to use the command again. Any object you create in Sculpt mode will be a Linear extrusion, until you choose another extrusion method.

To create a 3D object in Sculpt mode using the Linear extrusion method, you first choose the Linear command, if necessary, and then draw the object.

For example, to draw a cube, you choose the Linear command to change the current extrusion method to Linear before you draw the rectangle. Then, when you draw the rectangle, **DCAD VectorSpace** extrudes it into a cube.

Action buttons . In Draft and Sculpt mode, you can use the Linear Extrude action button to change the current extrusion method to the Linear extrusion method.

Additionally, in Draft mode, you can use the Action button to extrude 2D objects into 3D objects.

The Linear Extrude action button is located with the Extrude action buttons. To use the Extrude action buttons you must have the Action buttons turned on. You can turn on Action buttons by choosing the Toolbars command in the Layout menu.

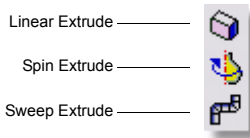


Figure 226.- The Extrude action buttons

To extrude objects in Draft mode

1. Open or activate a Draft mode window.
 - Before you extrude an object, you might want to open and tile a Sculpt mode window also, so you can see the 3D object appear.

- You can use the Extrude Options command to change the extrusion configuration before you extrude the object.

2. Select the 2D object you want to extrude.

3. You can select a saved set of extrusion planes from the 3D Plane pop-up menu in the Status bar. Or, you can define a new set of planes for the extrusion using one of the 3D Plane commands in 3D Plane submenu in the Layout menu.

- If you do not specify the extrusion planes, **DCAD VectorSpace** uses the active set of planes.

4. Choose the Linear command in the Extrude submenu. Or, click the Linear Extrude action button if it is visible. The 3D object is extruded.

- If the current extrusion method is not Linear, you can select the Linear Extrude action button from the Extrude action buttons. Note that when you select the Action button this way, you also change the current extrusion method to the Linear extrusion method. The Extrude action button displays the Linear Extrude icon.

- Choosing the Linear command does not change the current extrusion method.

To use the Linear extrusion method in Sculpt mode

1. Open or activate a Sculpt mode window.
2. If the current extrusion method is not Linear, choose the Linear command in the Extrude submenu. The Linear extrusion method is the current extrusion method. The Extrude action button displays the Linear Extrude icon.
 - You can also select Linear Extrude from the Extrude action buttons.

Using Action buttons to choose extrusion methods

1. Open or activate a Draft or Sculpt window.
2. Select the Linear Extrude action button from the Extrude action buttons. The Linear extrusion method is the current extrusion method. The Extrude action button displays the Linear Extrude icon.



- In Draft mode, selecting the Linear Extrude action button, with an object selected, changes the current extrusion method to Linear and extrudes the object. Selecting the Linear Extrude action button with no object selected changes the extrusion method only.
- In Sculpt, selecting the Linear Extrude action button, with an object selected, changes the current extrusion method to Linear but does not affect the object.

Spin

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+C
Windows Shortcut: Ctrl+Alt+C

In Draft mode, you can create a 3D object by extruding a 2D object by choosing the Spin command.



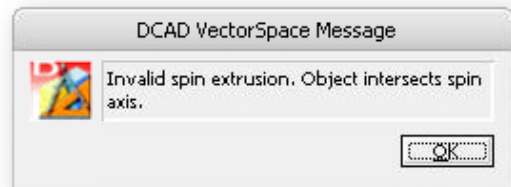
In Sculpt mode, you can change the current extrusion method to the Spin extrusion method by choosing the Spin command.

In Draft mode. The Spin command creates a 3D object by rotating a selected object in steps around a spin extrusion axis.

To create a 3D object using the Spin extrusion method, you draw the cross section of an object in 2D and then choose the Spin command to extrude it.

For example, to create a sphere, you draw an arc so that its endpoints touch the spin extrusion axis, and then choose the Spin command to extrude the object into a sphere.

You can't use the Spin command to extrude objects that overlap, cross, or intersect a spin extrusion axis. If you attempt to extrude an object that overlaps a spin extrusion axis, **DCAD VectorSpace** displays a message:



Click OK to close the dialog, and then draw an object that doesn't cross the spin extrusion axis. For more information on spin extrusion axes, refer to the **3D Axis submenu**, page 101.

In Sculpt mode. You can choose the Spin command to change the current extrusion method to the Spin extrusion method. You do not have to use the command if the current extrusion method is Spin. The Extrude action button displays the Spin Extrude icon when Spin is the current extrusion method.

Once you set the extrusion method to Spin, you do not have to use the command again. Any object you create in Sculpt mode will be a Spin extrusion, until you choose another extrusion method.

To create a 3D object in Sculpt mode using the Spin extrusion method, you first choose the Spin

command, if necessary, and then draw the object.

For example, to draw a sphere, you choose the Spin command to change the current extrusion method to Spin before you draw the arc. Then, when you draw the arc, **DCAD VectorSpace** extrudes it into a sphere.

Action buttons . In Draft and Sculpt mode, you can use the Spin Extrude action button to change the current extrusion method to the Spin extrusion method.

Additionally, in Draft mode, you can use the Action button to extrude 2D objects into 3D objects.

The Spin Extrude action button is located with the Extrude action buttons. To use the Extrude action buttons you must have the Action buttons turned on. You can turn on Action buttons by choosing the Toolbars command in the Layout menu.

To extrude objects in Draft mode

1. Open or activate a Draft mode window.
 - Before you extrude an object, you might want to open and tile a Sculpt mode window also, so you can see the 3D object appear.
 - You can use the Extrude Options command to change the extrusion configuration before you extrude the object.
2. Select the 2D object you want to extrude.
3. You can select a saved spin extrusion axis from the 3D Axis pop-up menu in the Status bar. Or, you can define a new axis for the extrusion using one of the 3D Axis commands in the 3D Axis submenu in the Layout menu.
 - If you want to define a spin extrusion axis using one of the 3D Axis commands, the

Spin extrusion method must be the current extrusion method. If it is not the current method, select the Spin Extrude action button to change the current extrusion method to Spin.

- If you do not select a spin extrusion axis, the object is extruded around the active axis.
4. Choose the Spin command in the Extrude submenu. Or, click the Spin Extrude action button if it is visible. The 3D object is extruded.
 - If the current extrusion method is not Spin, you can select the Spin Extrude action button from the Extrude action buttons. Note that when you select the Action button this way, you also change the current extrusion method to the Spin extrusion method. The Extrude action button displays the Spin Extrude icon.
 - Choosing the Spin command does not change the current extrusion method.

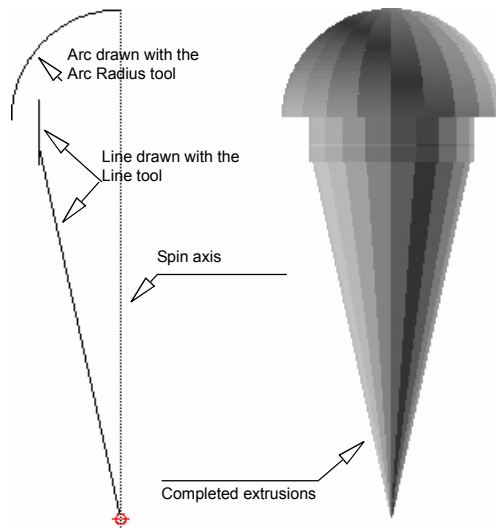


Figure 227.- Examples of Spin extrusions in Sculpt mode

To use the Spin extrusion method in Sculpt mode

1. Open or activate a Sculpt mode window.
2. If the current extrusion method is not Spin, choose the Spin command in the Extrude submenu. The Spin extrusion method is the current extrusion method. The Extrude action button displays the Spin Extrude icon.
 - You can also select the Spin Extrude action button from the Extrude action buttons.



Using Action buttons to choose extrusion methods

1. Open or activate a Draft or Sculpt mode window.

2. Select the Spin Extrude action button from the Extrude action buttons. The Spin extrusion method is the current extrusion method. The Extrude action button displays the Spin Extrude icon.

- In Draft mode, selecting the Spin Extrude action button, with an object selected, changes the current extrusion method to Spin and extrudes the object. Selecting the Spin Extrude action button with no object selected changes the extrusion method only.
- In Sculpt mode, selecting the Spin Extrude action button, with an object selected, changes the current extrusion method to Spin but does not affect the object.

Sweep

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+B
Windows Shortcut: Ctrl+Alt+B

In Draft mode, you can create a 3D object by extruding a 2D object by choosing the Sweep command.



In Sculpt mode, you can change the current extrusion method to the Sweep extrusion method by choosing the Sweep command.

In Draft mode . The Sweep command extrudes a predefined cross section of an object along a path. You can refer to “Creating a sweep section” under the Sweep Sections command on pagina 282 for more information on how to create a section.

To create a 3D object using the Sweep extrusion method, you first draw an object, the path, and then choose the Sweep Extrude command to extrude the section along the path.

Running base moulding around a room is a good example of how to use a Sweep extrusion. A cross section of a base moulding can be extruded along the perimeter of a room with the Sweep command.



Figure 228.- Cross section of a base moulding

In Sculpt mode . You can choose the Sweep command to change the current extrusion method to the Sweep extrusion method. You do not have to use the command if the current extrusion method is Sweep. The Extrude action button displays the Sweep Extrude icon when Sweep is the current extrusion method.

Once you set the extrusion method to Sweep, you do not have to use the command again. Any object you create in Sculpt mode will be a Sweep extrusion, until you choose another extrusion method.

To create a 3D object in Sculpt mode using the Sweep extrusion method, you first choose the Sweep command, if necessary, and then draw the object.

For example, to draw the base moulding, you choose the Sweep command to change the current extrusion method to Sweep before you draw the object that will be the Sweep path. Then, when you draw the object, **DCAD VectorSpace** extrudes it into the base moulding.

Action buttons . In Draft and Sculpt mode, you can use the Sweep Extrude action button to change the current extrusion method to the Sweep extrusion method.

Additionally, in Draft mode, you can use the Action button to extrude 2D objects into 3D objects.

The Sweep Extrude action button is located with the Extrude action buttons. To use the Extrude action buttons you must have the Action buttons turned on. You can turn on Action buttons by choosing the Toolbars command in the Layout menu.

To extrude objects in Draft mode

1. Make sure you are working in the document that contains the section you want to extrude.
2. Open or activate a Draft mode window.
 - Before you extrude an object, you might want to open and tile a Sculpt mode window also, so you can see the 3D object appear.

- You can use the Extrude Options command to change the extrusion configuration before you extrude the object.
3. You can select a saved set of extrusion planes from the 3D Plane pop-up menu in the Status bar. Or, you can define a new set of planes for the extrusion using one of the 3D Plane commands in 3D Plane submenu in the Layout menu.
 - If you do not select extrusion planes, **DCAD VectorSpace** uses the active set of planes, and extrudes the section on the lower active plane.
 4. You can select the section you want to extrude using the Sweep Sections command in the Extrude submenu. If you do not specify a section, **DCAD VectorSpace** extrudes the current section.
 - Refer to **Sweep Sections**, page 281 for information on how to use the Sweep Sections command.
 5. Select or create an object you want the section to sweep along. In other words, create a path for the section to follow.
 - An example of this would be to select a wall you to which you want to apply a base moulding. The extrusion will follow the outline of the wall.
 - When you extrude a section, **DCAD VectorSpace** places the new 3D object on the lower extrusion plane. If the Info bar is visible, you can determine which is the lower extrusion plane by looking at the values in the text boxes at the far right of the Info bar. The smaller number indicates which plane is the lower extrusion plane.
 6. Choose the Sweep command in the Extrude submenu. Or, click the Sweep Extrude action but-

ton if it is visible. The currently selected section is extruded along the path.

- If you clicked the Sweep Extrude action button, the Sweep Section palette opens at the same time the object is extruded.

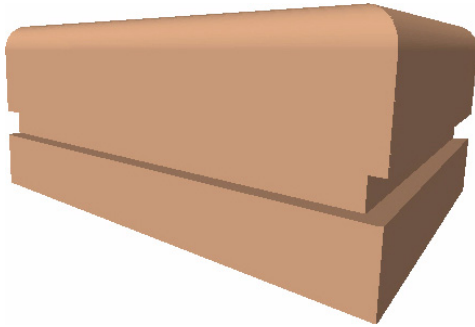


Figure 229.- Rendering of extruded section

- If the current extrusion method is not Sweep, you can select the Sweep Extrude action button from the Extrude action buttons. Note that when you select the Action button this way, you also change the current extrusion method to the Sweep extrusion method. The Extrude action button displays the Sweep Extrude icon. Also, when you select the Action button, the Sweep Sections palette opens.
- Choosing the Sweep command does not change the current extrusion method.

To use the Sweep extrusion method in Sculpt mode

1. Open or activate a Sculpt mode window.

Sweep Sections

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+W
Windows Shortcut: Ctrl+Alt+Shift+W

The Sweep Sections command opens the Sweep Sec-

2. If the current extrusion method is not Sweep, choose the Sweep command in the Extrude submenu. The Sweep extrusion method is the current extrusion method. The Extrude action button displays the Sweep Extrude icon and the Sweep Sections palette opens.



- You can also select the Sweep Extrude action button from the Extrude action buttons.

Using Action buttons to choose extrusion methods

1. Open or activate a Draft or Sculpt mode window.
2. Select the Sweep Extrude action button from the Extrude action buttons. The Sweep extrusion method is the current method. The Extrude action button displays the Sweep Extrude icon and the Sweep Sections palette opens.
 - In Draft mode, selecting the Sweep Extrude action button, with an object selected, changes the current extrusion method to Sweep and extrudes the object. Selecting the Sweep Extrude action button with no object selected changes the extrusion method only.
 - In Sculpt mode, selecting the Sweep Extrude action button, with an object selected, changes the current extrusion method to Sweep but does not affect the object.

tions palette. In the palette, you can select from saved sections you want to extrude along a path.

You must work in the document that contains the original section object you want to extrude.

If you edit the original section object, the Sweep Sections palette reflects the revision.

If you delete the original section object, it disappears from the Sweep Sections palette.

To use the Sweep Sections command

1. Make sure you are working in the document that contains the section you want to view.
2. Open or activate a Draft or Sculpt mode window.
3. Choose the Sweep Sections command in the Extrude submenu. The Sweep Sections palette opens. The Sweep Sections palette displays the available sweep sections.
 - If you have not created any sweep sections, the palette is empty.

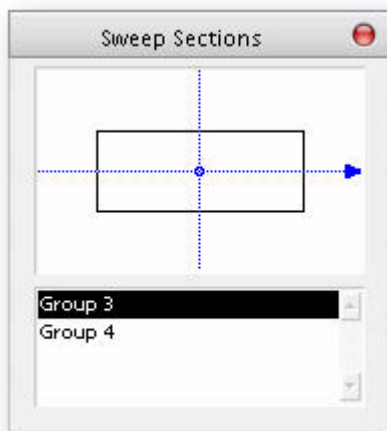
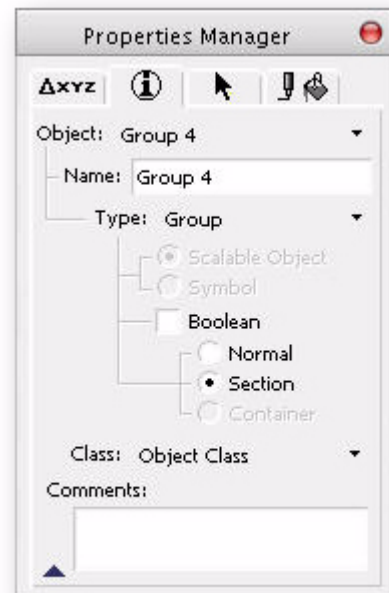


Figure 230.- Sweep Sections Palette

To create a sweep section

1. Open or activate a Draft mode window. Set the window to the view you want to work in.
 - Because you can create a sweep section in one view and use it another, you can work in any view when you create the sweep section.
2. Create an object using any of the object drawing tools in the toolbox. You can also create more than one object and group them.
3. Double-click the object, or group of objects. The Properties Manager appears. Click the Information tab to bring it to the front.



Type a name and select the Section checkbox to make a selected object a sweep section

4. Type a name for the section in the Name text box. Click the Section checkbox. The object is now a section. You can close the Properties Manager.

5. To change the location of the insertion point of the new section, select the original object and use the Reshape command.

It is important to know the location of the section's insertion point. The section sweeps along the path and is placed, on the lower active plane, at its insertion point.

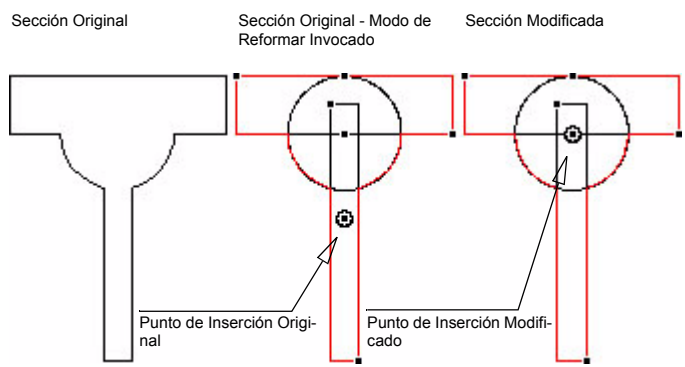


Figure 231.- Change the insertion point of a sweep section

Path submenu

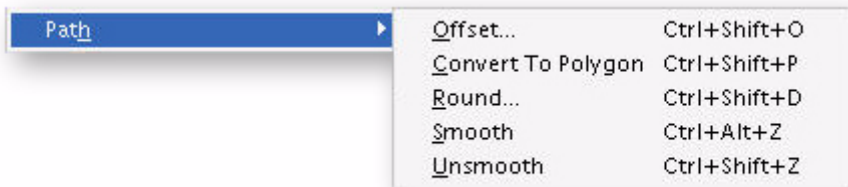


Figure 232.- Path submenu

The Path submenu in the Object menu contains commands that let you change the shape or structure of an object's outline, or *path*.

You can use the Path submenu to create an offset path, smooth or unsmooth a path, and convert an object to a polygon.

Convert To Polygon

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+P
Windows Shortcut: Ctrl+Shift+P

In **DCAD VectorSpace**, objects such as ovals, rectangles, and regular polygons have special attributes and editing fea-



tures. For example, in Reshape mode, a regular polygon has two handles that let you specify the size and rotation of the polygon. Regardless how you move these handles, the polygon maintains its basic shape and proportions.

By using the Convert to Polygon command, you can distort, skew, or completely reshape a specialized object. This command removes an object's specialized editing features, and lets you freely edit the shape using its control points. For shapes with curves, the number of control points depends on the setting in the Preferences dialog box. More control points makes the curved shapes appear smoother.

The Convert to Polygon command is available in Draft and Sculpt modes only. However, you can use the Convert to Polygon command on Wireframe and Hidden Line renderings pasted into Draft mode, or if

you use the Copy View to Draft command to copy a Hidden Line rendering into a Draft mode window.

To use the Convert to Polygon command

1. Select the object or objects you want to convert to polygons.
2. Choose Convert To Polygon in the Path submenu.

To see the difference between a regular object in reshape mode and a polygon, draw an oval, select it, then choose Reshape in the Edit menu. Notice it has two handles that let you control the size of the oval. While still in Reshape mode with the oval selected, choose Convert To Polygon in the Path submenu. The oval now has several control points; when you drag a point, it distorts the shape in a way you can control.

Offset

Mode: Draft
Mac OS Shortcut: Cmd+Shift+O
Windows Shortcut: Ctrl+Shift+O

In Draft mode, you can change any line or polygon to a parallel polyline using the Offset command in the Path submenu, or the Offset Path action button.



This feature is especially useful for creating walls of a specific thickness from polygons and other shapes. The Offset command is not available in Sculpt and Render modes.

To use the Offset command

Use this procedure to apply or change the offset for any object.

1. Select the objects you want to offset. You can select objects that already have offset paths.

2. Click the Offset Path action button, or choose Offset in the Path submenu. The Offset dialog box appears.
3. In the Width text box, type the amount of space you want between the parallel polylines. For drawings of walls, this value equals the thickness of the walls.
4. In the Offset text box, type an offset amount. To make the offset path appear to the right of the original path, enter a positive number. To make the offset path appear to the left of the original path, enter a negative number
 - For example, to create an 4-inch thick wall offset to the right of the original path, type 4" in the Width text box and 8" in the Offset text box.
5. To offset the path, click OK

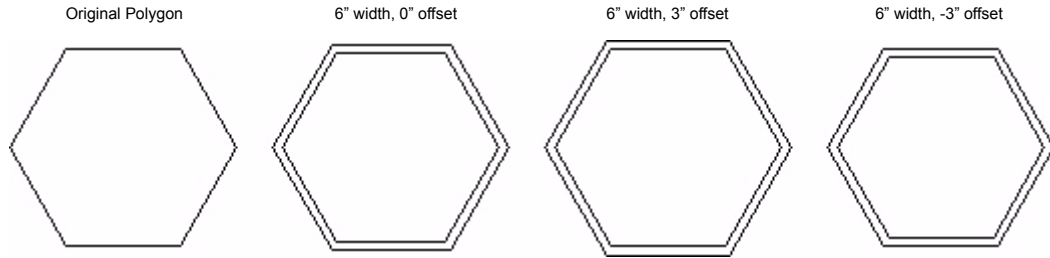


Figure 233.- Offset shapes

Round

Mode: Draft
Mac OS Shortcut: Cmd+Shift+D
Windows Shortcut: Ctrl+Shift+D

By using the Round command, you can change an object's sharp corners to rounded corners with a specific radius. This command is available in Draft mode only.



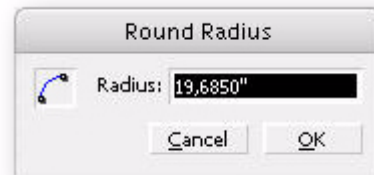
You can apply the Round command to any object with at least one vertex, including Wireframe and Hidden Line renderings pasted into a Draft mode window, or brought into Draft mode using the Copy View to Draft submenu. When using the Round command, **DCAD VectorSpace** rounds only an object's corners. The radius is in the current units in the Units Setup dialog box.

Although you can round objects with smooth corners, the rounding effect is more pronounced on object's with sharp corners. Keep in mind that rounding an object automatically converts the shape to a polyline or polygon; this eliminates any special properties the object might have had in Reshape mode.

To use the Round command

1. Select the objects for which you want to smooth corners.

2. Click the Round action button, or choose Round in the Path submenu. The Round Radius dialog box opens.



3. In the dialog box, type a number to set the radius of the rounded corner. A larger radius creates more rounded corners. A smaller number creates less rounded corners.
4. Click OK to smooth corners of objects.

When rounding parallel polylines, keep in mind that **DCAD VectorSpace** considers the end caps to be corners, and applies the radius to them.

To round corners but leave end caps flat: draw a polyline shape first, apply the Round command, then use the Offset command to add thickness.

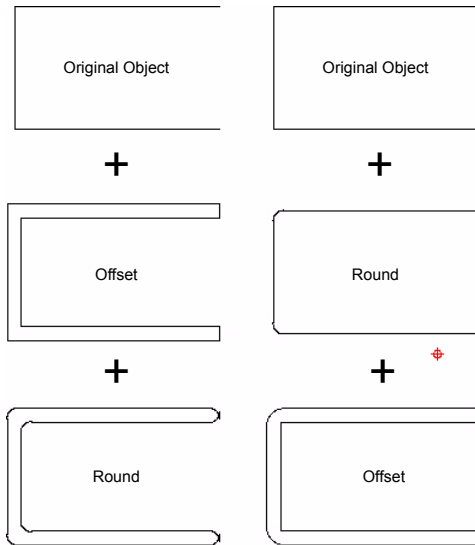


Figure 234.- Offset + Round Vs. Round + Offset

Smooth

Mode: Draft
Mac OS Shortcut: Cmd+Shift+Y
Windows Shortcut: Ctrl+Shift+Y

By using the Smooth command, you can change polygons and polylines to B-Spline curves. Unlike the Round command, the Smooth command changes all straight lines to curves. The Smooth command is available in Draft mode only.



In addition, the Smooth command will work on any object with at least one vertex. Although you can use the Smooth command on shapes that contain curves, the “smoothing” effect is more pronounced on shapes with sharp corners. Also, smoothing an object converts the shape to a polyline or polygon, remov-

ing any special properties the object has in Reshape mode.

To create smooth objects

1. Select the object (or objects) you want to convert to B-Spline curves.
2. Click the Smooth action button, or choose Smooth in the Path submenu.
DCAD VectorSpace smooths the object.
 - To create rounded parallel polylines, you should first work with basic, single-line shapes, smooth them, then offset them to create parallel polylines. Smoothing polylines might produce unexpected results.

Unsmooth

Mode: Draft
Mac OS Shortcut: Cmd+Shift+Z
Windows Shortcut: Ctrl+Shift+Z

The Unsmooth command is used to convert B-Spline curves to polylines. Unsmooth can reverse the effects of applying the Smooth command on an object. This command is available in Draft mode only.

To unsmooth objects

1. Select the objects that you want to convert from B-Spline curves to polylines.
2. Choose Unsmooth in the Path submenu.
DCAD VectorSpace straightens all curves.

Position submenu

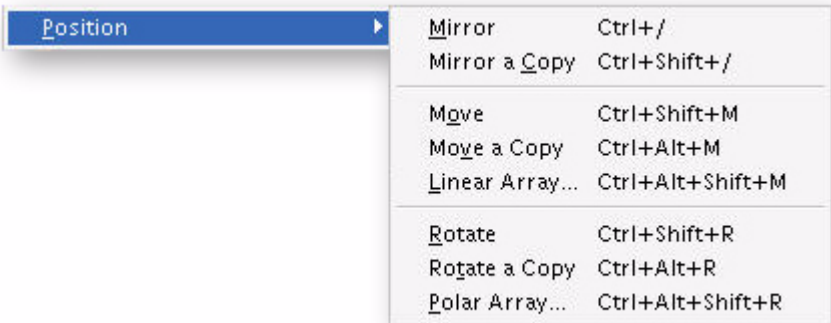


Figure 235.- Position submenu

The position submenu contains commands that let you reposition objects by rotating, mirroring, and

arraying them. You can create duplicates of an object with Position submenu commands, or simply reposition the original selected objects.

Linear Array

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+M
Windows Shortcut: Ctrl+Alt+Shift+M

By using the Linear Array command in the Position submenu, you can make multiple, evenly-spaced copies of a



selection. You can decide how many copies to make and the distance between each copy. In addition, you can also specify the total area that you want the duplicates to fill, and **DCAD VectorSpace** evenly distributes the objects inside this area.

The Linear Array can make many tasks easy. For example, you can place several windows along a wall, add trusses to a roof, and so on.

To use the Linear Array command

To make using this command easier, read and follow the hint lines in the Help bar.

1. Select the object or objects you want to copy and distribute.
2. Choose Linear Array in the Position submenu (or click the Linear Array action button).
3. Depending on how you want to distribute objects, do one of the following:
 - To specify the distance between copies, drag from the selected objects in the direction you want to place the first copy; an outline of the selection follows the pointer. Release the mouse button when the outline is in the position you want.
 - To specify the area that you want the copies to fill, drag from the selection in the direction you want to place the last copy; an outline of the selection follows the pointer. Release the mouse button when the outline is in the position you want.

The Linear Array dialog box appears.

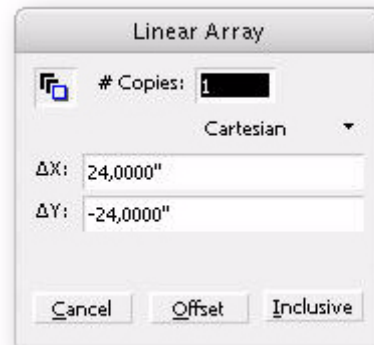


Figure 236.- Linear Array dialog box - Draft Mode

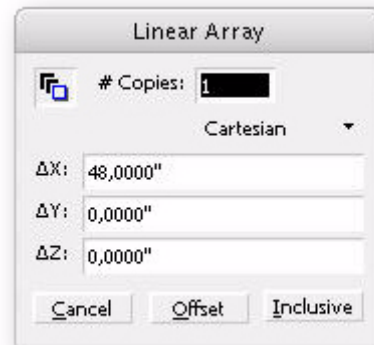


Figure 237.- Linear Array dialog box - Sculpt Mode

4. In the Linear Array dialog box, type the number of copies you want to place in the “# of Copies” text box.
5. To change the coordinate system, choose an option in the pop-up menu.
 - Depending on the coordinate system you’re working in, the three text boxes in the Linear Array dialog box show the distance you dragged the mouse. These distances are shown in the values of the current coordinate system. For example, if you’re working in a cartesian coordinate system, the

distance that you dragged the mouse is shown in the delta x, y, and z text boxes.

6. To distribute the objects within the area you defined, click Inclusive. To separate each copy by the distance you defined, click Offset.

Mirror

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+I
Windows Shortcut: Ctrl+I

The Mirror command in the Position submenu lets you flip selected objects 180 degrees around an axis you specify.



You can set the axis at any angle and distance from the selected objects. In addition, you can set constraints for the axis using the Snaps pop-up menu.

The Mirror command is available in Draft and Sculpt modes only when you have objects selected.

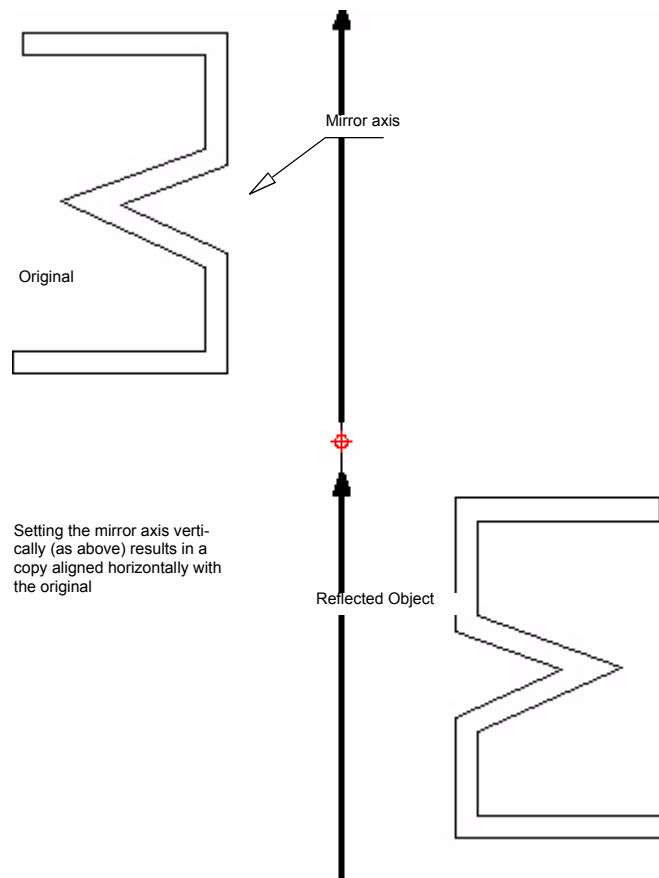


Figure 238.- Using the Mirror command

To use the Mirror command

1. Select the object (or objects) you want to flip.
2. Choose Mirror in the Position submenu (or click the Mirror action button). A new pointer followed by a vertical line appears. The line is the axis around which **DCAD VectorSpace** will flip the object.
3. Click to anchor the axis at a point; you should try to anchor the axis at the point you want to mirror the object around. Depending on how you want to mirror the object, using the Snaps pop-up menu might make it easier to anchor the


axis exactly where you want it. After you click to anchor the axis, the axis starts rotating.

4. Move the pointer where you want to place the second anchor for the axis. As you move the pointer, you can see the angle of the axis change. When the axis is in the position you want, click to set the second anchor point. **DCAD VectorSpace** moves and flips the selected object around the axis.

Note: Working in a Polar coordinate system can make it easier to define precise angles with the pointer.



Mirror a Copy

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+/
Windows Shortcut: Ctrl+Shift+/


The Mirror a Copy command in the Position submenu lets you flip a duplicate set of selected objects 180 degrees around an axis that you set. The axis can be at any angle and distance from the selected objects, and you can set constraints for the axis using the Snaps pop-up menu.

The Mirror a Copy command is available in Draft and Sculpt modes only and you must have an object selected to use this command.

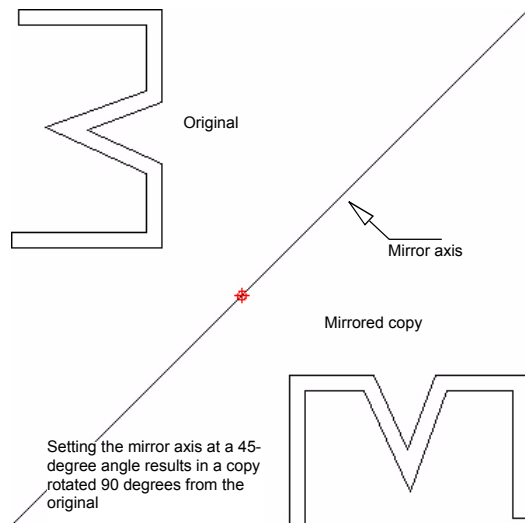


Figure 239.- Using the Mirror a Copy command

To use the Mirror a Copy command

To make using this command easier, refer to the hint line instructions on the Help bar.

1. Select the object or objects you want to flip and duplicate.

2. Choose Mirror a Copy in the Position submenu (or click the Mirror a Copy action button). A new pointer followed by a vertical line appears. The line is the axis around which **DCAD VectorSpace** will flip the duplicate objects.
3. Click to anchor the axis at a point; you should try to anchor the axis at the exact point you want to flip the objects around. Depending on how you want to duplicate and mirror the objects, using the Snaps pop-up menu might make it eas-

ier to anchor the axis exactly where you want it. After you click to anchor the axis, the axis starts rotating at the point you click.

4. Move the pointer where you want to place the second anchor for the axis. As you move the pointer, you can see the angle of the axis change. When the axis is in the position you want, click to set the second anchor point. **DCAD VectorSpace** duplicates the selected objects and flips them around the axis.

Move

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+M
Windows Shortcut: Ctrl+Shift+M

You can change the position of selected objects by using the Move command in the Position submenu (or the Move action button). The Move command is available in Draft and Sculpt modes only. You must have an object selected to use this command.



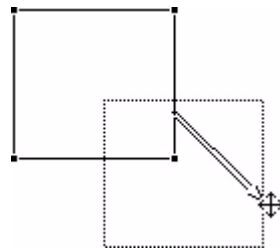
Although you can perform the same action using the Selection tool, the Move command is easier to use for large selections because it requires less precision with the mouse.

To use the Move command

When you use the Move command, you can get help by reading the hint line at the bottom of your screen.

1. Select the object (or objects) you want to move.
2. Choose Move in the Position submenu (or click the Move action button). A new pointer appears.

3. Click to set the first anchor point of the drawing vector you'll use to move the object. You don't have to click the object itself; you can set the first anchor point in any location in your drawing.
4. Drag to where you want to move the objects. The drawing vector extends from the anchor point and an outline of the selection follows the pointer. You don't have to touch the selection with the pointer, although this might make it easier to see what you are doing. Release the mouse button where you want to place the objects.



The drawing Vector shows the relative movement of the reference point

Figure 240.- Using the Move command

Move a Copy

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+M
Windows Shortcut: Ctrl+Alt+M

The Move a Copy command is used to place a copy of selected objects at a location you specify. The original objects stay in their positions.



The Move a Copy command is available in Draft and Sculpt mode only. To use this command, you must have objects selected.

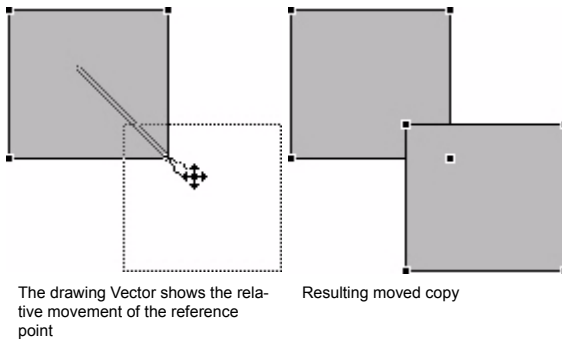


Figure 241.- Using the Move a Copy command

Polar Array

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+R
Windows Shortcut: Ctrl+Alt+Shift+R

The Polar Array command lets you make evenly spaced copies of objects distributed radially from one another by a specific distance and angle. You can use this command in Draft and Sculpt modes.



When using the Polar Array command in Draft mode, the last text box in the Polar Array dialog box appears dimmed. In Sculpt mode, by contrast, this

To use the Move A Copy command

1. Select the objects you want to move and copy.
2. Choose Move a Copy in the Position submenu (or click the Move a Copy action button). A new pointer appears.
3. Click to set the first anchor point of the drawing vector you'll use to move the copies. You don't have to click the objects you're copying themselves; you can set the point in any location in the drawing. Once you set the first anchor point, the drawing vector extends from this point, and outlines of the objects you're moving follow the pointer.
4. Drag in the direction you want to place the duplicates of the objects; outlines of the selection follow the pointer. Release the mouse button where you want to copy the objects.

text box is active and it lets you enter a radial displacement for the radial copies of 3D objects along a third axis. This has several useful applications, such as making it easy to make a spiral staircase out of a simple Sculpt mode object.

To use the Polar Array command

1. Select the object or objects you want to copy and distribute radially.
2. Click the Polar Array action button, choose Polar Array in the Position submenu, press

Ctrl+Alt+Shift+R (Windows), or Cmd+Opt+Shift+R. The pointer changes to a crosshair.

3. Click to set the center of rotation. This is often the corner of the object you're copying, or near the corner of an entire selection, but it can be anywhere in your document. After you set the center of rotation, the drawing vector extends from the center of rotation (the point you click).
4. Drag the drawing vector and then click. This sets the baseline of rotation. Don't confuse the baseline of rotation with the "baseline" of your object (or objects); they're not the same thing. After you define the baseline of rotation, a second drawing vector appears. You define the angle of rotation for your object by creating an angle between this drawing vector and the baseline of rotation.

Note: You can bypass defining a baseline of rotation by clicking the Polar Array action button, and then double-clicking on the rotation center with the rotation pointer. This displays the Polar Array dialog box. You can then enter information for the Polar Array immediately. If you do this, proceed to step 6 below.



5. To specify the angle of rotation, drag the drawing vector from the center of rotation to a new position in your document. This is the angle of rotation for your object: the rotation angle is defined as the angle between the rotation baseline and the point you click with the drawing vector.
6. After defining the angle of rotation, the Polar Array dialog box opens.

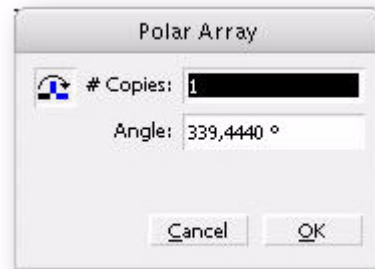


Figure 242.- Polar Array dialog box - Draft Mode

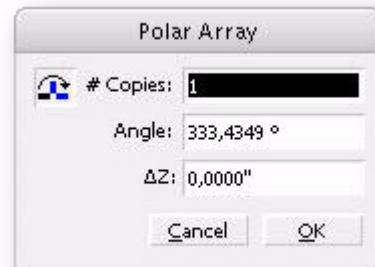


Figure 243.- Polar Array dialog box - Sculpt Mode

7. In the Number text box, enter the number of copies you want to spin radially around the center of rotation.
8. In the angle text box, enter the number of degrees you want to rotate each copy. The number of degrees you rotate each copy also sets the distance between the objects in the polar array.
 - If you're working in Draft mode, click OK to create the polar array. Click Cancel to leave your object unchanged.
 - If you're working in Sculpt mode you can displace copies of the objects in your polar array along the vertical axis (specified in the Units Setup dialog box). In the ΔX, ΔY, or ΔZ text box, enter the displacement along the vertical axis in the current units.

Click OK to create the polar array. Click Cancel to leave your object unchanged.

Note: Depending on the current view, you'll see a ΔX , ΔY , or ΔZ text box on the Polar Array dialog box.



Rotate

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+R
Windows Shortcut: Ctrl+Shift+R

By using the Rotate command, you can precisely rotate selected objects a specific number of degrees. You can use the Rotate command in Draft and Sculpt modes.



To use the Rotate command, you first set the center of rotation for your objects. You can then visually specify a baseline of rotation, and from this baseline, rotate your objects in 2D or 3D space. **DCAD VectorSpace** then shows you the exact degrees of rotation for verification before completing the operation.

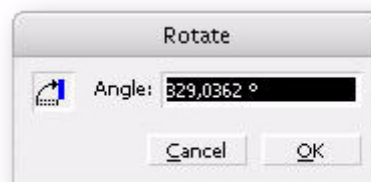
To use the Rotate command

To make using the Rotate command easier, follow the hint line instructions in the Help bar.

1. Select the object (or objects) you want to rotate.
2. Choose Rotate in the Position submenu (or click the Rotate action button). A new pointer appears.
3. Click to set the center of rotation. This is often the corner of the object you're rotating, or near the corner of an entire selection, but it can be anywhere in your document. After you set the center of rotation, the drawing vector extends from the center of rotation (the point you click).
4. Drag the drawing vector and then click. This sets the baseline of rotation. Don't confuse the baseline of rotation with the "baseline" of your

object (or objects); they're not the same thing. After you define the baseline of rotation, a second drawing vector appears. You define the angle of rotation for your object by creating an angle between this drawing vector and the baseline of rotation.

- You can bypass defining a baseline of rotation by clicking the Rotate action button, and then double-clicking on the rotation center with the rotation pointer. This displays the Rotate dialog box. You can then enter an angle of rotation immediately. If you do this, proceed to step 6 below.
5. To specify the angle of rotation, drag the drawing vector from the center of rotation to a new position in your document. This is the angle of rotation for your object. Again, the rotation angle is defined as the angle between the rotation baseline and the point you click with the drawing vector.
 - Working in a Polar coordinate system can make it easier to define precise angles with the drawing vector.
 6. After defining the angle of rotation, the Rotate dialog box opens.



- In the dialog box, you can verify the exact number of the degrees of rotation. The number in the Angle text box shows you the degrees of rotation you defined relative to the baseline of rotation.
7. To change the degrees of rotation, type a new value in the Angle text box.
 8. To rotate the selection, click OK. Click Cancel to leave the objects as they were.

Rotate a Copy

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+R
Windows Shortcut: Ctrl+Alt+R

By using the Rotate A Copy command, you can precisely rotate copies of selected objects a specific number of degrees. You can use the Rotate A Copy command in Draft and Sculpt modes.

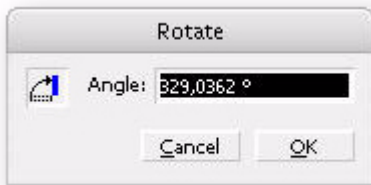


To use the Rotate A Copy command, you first set the center of rotation for your object. You can then visually specify a baseline of rotation, and from this baseline, rotate a copy of your object in 2D or 3D space. **DCAD VectorSpace** then shows you the exact degrees of rotation for verification before completing the operation.

To use the Rotate a Copy command

To make using the Rotate A Copy command easier, follow the hint line instructions in the Help bar.

1. Select the object (or objects) you want to rotate.
2. Choose Rotate in the Position submenu (or click the Rotate action button). A new pointer appears.
3. Click to set the center of rotation. This is often the corner of the object you're rotating a copy of, or near the corner of an entire selection, but it can be anywhere in your document. After you set the center of rotation, the drawing vector extends from the center of rotation (the point you click).
4. Drag the drawing vector and then click. This sets the baseline of rotation. Don't confuse the baseline of rotation with the "baseline" of your object (or objects); they're not the same thing. After you define the baseline of rotation, a second drawing vector appears. You define the angle of rotation for your object you're copying by creating an angle between this drawing vector and the baseline of rotation.
 - You can bypass defining a baseline of rotation by clicking the Rotate A Copy action button, and then double-clicking on the rotation center with the rotation pointer. This displays the Rotate dialog box. You can then enter an angle of rotation immediately. If you do this, proceed to step 6 below.
5. To specify the angle of rotation, drag the drawing vector from the center of rotation to a new position in your document. This is the angle of rotation for your object. Again, the rotation angle is defined as the angle between the rotation baseline and the point you click with the drawing vector.
 - Working in a Polar coordinate system can make it easier to define precise angles with the drawing vector.
6. After defining the angle of rotation, the Rotate dialog box opens.



7. In the dialog box, you can verify the exact number of the degrees of rotation. The number in the Angle text box shows you the degrees of rotation you defined relative to the baseline of rotation.
8. To change the degrees of rotation, type a new value in the Angle text box.
9. To rotate the selection, click OK. Click Cancel to leave the objects as they were.

Scale

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+Y
Windows Shortcut: Ctrl+Shift+Y

You can change the size of selected objects relative to their current size by choosing the Scale command in the Object menu.



You can scale objects horizontally, vertically, or proportionally, based on a reference point you specify. This command is available in Draft and Sculpt modes only.

To use the Scale command

1. Select the object or objects you want to scale.
2. Choose Scale in the Object menu (or click the Scale action button). A new pointer appears.
3. Click in the document where you want to set the reference point for scaling. The Scale dialog box opens.
 - In general, the reference point is a corner of the selection that you want to remain sta-

tionary as the rest of the selection resizes. However, the reference point can be anywhere in the document.

4. In the Scale dialog box, type percentages by which you want to scale the selection. You can type different values for horizontal and vertical scaling, or the same values to scale proportionally.
5. Click OK to scale the selection, or Cancel to close the dialog box without changing the selection.

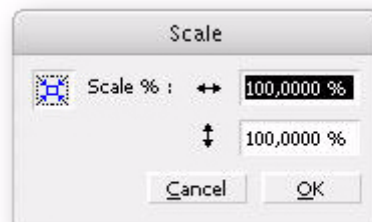


Figure 244.- Scale dialog box

Send To Layer

Mode: Draft, Sculpt

By using the Send To Layer command in the Object menu, you can move objects from one layer to another. This command removes selected objects from the current layer and places them in the same position on a layer you choose.

Also, you can move one or more selected objects from one layer to another using the Layer Manager; see **To send objects to a layer**, page 106.

This operation does not use the system Clipboard and will not change the contents of the Clipboard.

To use the Send to Layer command

1. Select the object or objects you want to send to another layer.
2. In the Object menu, open the Send To Layer submenu and choose the layer to which you want to send the selection.
 - In the submenu, all the layers for the current mode and view are listed. The active layer has a check mark next to it. You can send objects to visible layers only. After you select a layer, **DCAD VectorSpace** removes the selection from the current layer and places it in the same position on the layer you choose.

Trims submenu

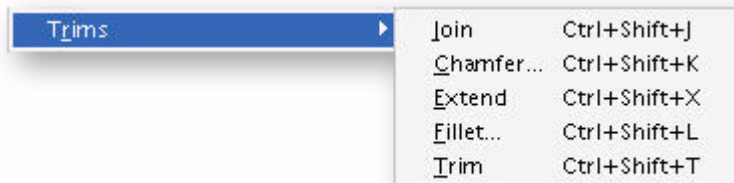


Figure 245.- Trims submenu

The Trims submenu contains commands that let you alter the paths of objects by trimming segments, chamfering the intersection of two lines, extending

separate objects to create an intersection, joining objects, and filleting objects.

Chamfer

Mode: Draft
Mac OS Shortcut: **Cmd+Shift+K**
Windows Shortcut: **Ctrl+Shift+K**

The Chamfer command lets you connect two non-parallel lines by joining them together with an angled line. The objects are combined into one object.



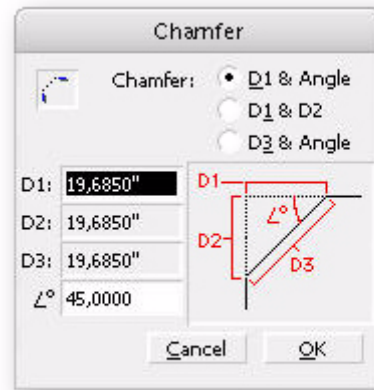
The lines you want to chamfer do not have to touch, and you can chamfer lines that intersect.

You can chamfer the corners of rectangles drawn with the Rectangle Diagonal, Rectangle Center to Corner, or Rectangle 3 Points tool.

When you select the Chamfer command, the Chamfer dialog box opens. You configure the chamfer settings using this dialog box.

To use the Chamfer command

1. Choose the Chamfer command in the Trims submenu. You can also use the Chamfer action button in the Attributes bar. The Chamfer pointer appears.
2. Click the first line you want to chamfer.
3. Move the pointer to the second line you want to chamfer. The drawing vector follows from the first line to the second line.
4. Click the second line. The Chamfer dialog box appears.



5. Select one of the Chamfer options. The Chamfer options are: D1 & Angle, D1 & D2, and D3 & Angle. These options determine the calculation method **DCAD VectorSpace** uses to create the chamfered corner. Once you select an option, type the values you want to use in the corresponding text boxes.
 - Select the D1 & Angle Chamfer option to enter new values in the D1 and Angle text boxes. The D2 and D3 text boxes are disabled. You can enter text only in the active text boxes.
 - Select the D1 & D2 Chamfer option to enter new values in the D1 and D2 text boxes. The D3 and Angle text boxes are disabled.
 - Select the D3 & Angle Chamfer Option to enter new values in the D3 and Angle text boxes. The D1 and D2 text boxes are disabled.
6. Click OK to chamfer the lines.
 - You can click Cancel to leave the drawing unchanged

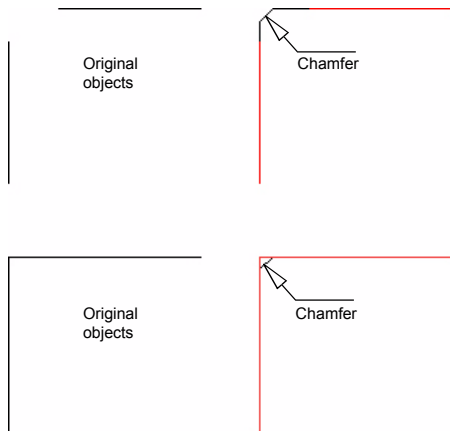


Figure 246.- Chamfer command

Extend

Mode: Draft
Mac OS Shortcut: **Cmd+Shift+X**
Windows Shortcut: **Ctrl+Shift+X**

You can use the Extend command to lengthen or shorten a line so that it meets another line. The lines can be two ends of the same open-sided object, or two separate lines. **DCAD VectorSpace** extends each line so that they meet, but does not combine them into one object.



You cannot use this command on two parallel lines, closed objects, or parallel polylines. You can use this command on lines that intersect.

When two lines do not meet, **DCAD VectorSpace** lengthens the first line until it meets the second.

When two lines intersect, **DCAD VectorSpace** trims the first line you click to meet the other line.

Additionally, the Extend command divides a line into separate line segments. The line you want to divide intersects with the line that divides it.

To use the Extend command

1. Choose the Extend command in the Trims sub-menu. You can also use the Extend action button in the Attributes bar. The Extend pointer appears.
2. Click the line you want to extend or trim.
3. Move the pointer to the second line. This is the line the first line will meet. The drawing vector follows from the first line to the second line.
4. Click the second line. **DCAD VectorSpace** extends or trims the first line you click so it meets the second line.

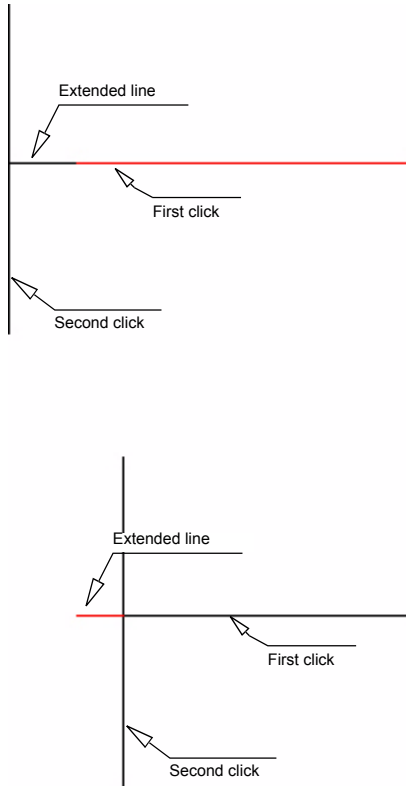


Figure 247.- Extending and/or trimming a line with the Extend command

To use the Extend command to divide a line

1. Choose the Extend command in the Trims submenu. You can also use the Extend action button in the Attributes bar. The Extend pointer appears.
2. Press and hold the Option key and click the line you want to divide.
3. While holding down the Option key, move the pointer to the line that intersects the first line. The drawing vector follows from the first line to the second line.
4. Click the second line. **DCAD VectorSpace** divides the first line where it intersects the second.

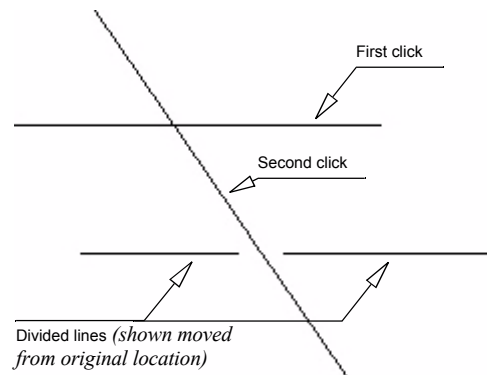


Figure 248.- Dividing a line with the Extend command

Fillet

Mode: Draft
Mac OS Shortcut: Cmd+Shift+T
Windows Shortcut: Ctrl+Shift+T

The Fillet command creates a convex line join between two lines. The lines can be two ends of the same open-sided object, or two separate lines. You can set



the radius of the rounded corner; if necessary, **DCAD VectorSpace** extends the lines so they can form the specified corner. The objects are combined into one object.

You cannot use this command on two parallel lines, closed objects, or parallel polylines.

To use the Fillet command

1. Choose the Fillet command in the Trims sub-menu. You can also use the Fillet action button in the Attributes bar. The Fillet pointer appears.
2. Click the first line you want to join.
3. Move the pointer to the second line you want to join. The drawing vector follows from the first line to the second line.
4. Click the second line. The dialog box opens.



5. In the Radius text box, specify the length of the radius for the rounded line join in the current units. You must enter a positive radius value. **DCAD VectorSpace** extends or trims the lines so their endpoints meet the endpoints of the radius corner.

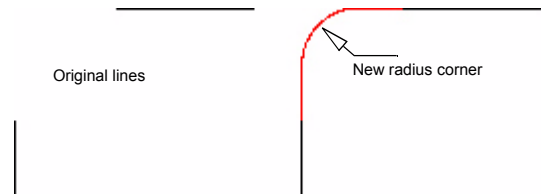


Figure 249.- Fillet command

Join

Mode: Draft
Mac OS Shortcut: Cmd+Shift+J
Windows Shortcut: Ctrl+Shift+J

The Join command connects two lines by extending or trimming them until they meet at a vertex. The lines can be two ends of the same open-sided object, or two separate lines. **DCAD VectorSpace** extends each line so that they meet, but does not combine them into one object.



You cannot use this command on two parallel lines, closed objects, or parallel polylines.

To use the Join command

1. Choose the Join command in the Trims sub-menu. You can also use the Join action button in the Attributes bar. The Join pointer appears.

2. Click the first line you want to join.
3. Move the pointer to the second line you want to join. The drawing vector follows from the first line to the second line.
4. Click the second line. **DCAD VectorSpace** extends or trims the lines so they meet at the vertex

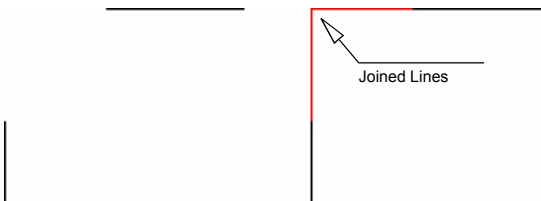


Figure 250.- Join command

Trim

Mode: Draft
Mac OS Shortcut: Cmd+Shift+I
Windows Shortcut: Ctrl+Shift+I

The Trim command clips, or trims, selected objects so they end at the cutting edge defined by other objects.



You can trim arcs, circles, lines, and open two-dimensional polylines. An object can be both a cutting edge and one of the objects being trimmed.

To use the Trim command

1. Choose the Trim command in the Trims submenu. You can also use the Trim action button in the Attributes bar. The Trim pointer appears.
2. Select one or more objects which will become cutting edges.
3. Move the pointer over the object to trim. The cutting edge will change color as the pointer moves over it.
4. Click the mouse button to trim the object.
5. If more than one object is selected, you can continue to trim their cutting edges.

6. Click outside the selected objects to complete the trim operation.

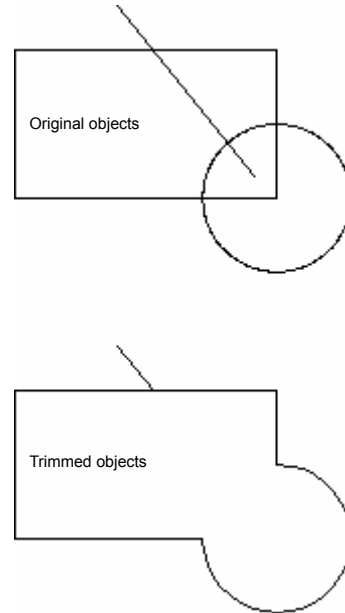


Figure 251.- Trim command

Unchain

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+H
Windows Shortcut: Ctrl+Shift+H

In Draft mode, the Unchain command in the Object menu separates the segments of selected objects into lines, arcs, and open polylines.

In addition, you can also use the Unchain command to unchain Chain Dimension objects, but not other dimension objects. This lets you separate a chain of

dimensions into separate parts that you can edit as individual dimension objects.

In Sculpt mode, the Unchain command separates the facets of 3D objects into individual objects

To use the Unchain command

1. Select the objects you want to unchain.

-
2. Choose Unchain in the Object menu.
DCAD VectorSpace separates the segments of the object at the endpoints

Ungroup

Mode: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+G
Windows Shortcut: Ctrl+Shift+G

By using the Ungroup command, you can separate objects united with the Group command. You can also use the Ungroup command to separate objects combined using any of the commands in the Combine submenu. This command is available in Draft and Sculpt modes only. If any of the objects in the group are themselves group objects, **DCAD VectorSpace** keeps them together as a group. If you want to ungroup them, use the Ungroup command again.

In addition, **DCAD VectorSpace** does not return ungrouped objects to their original position in the stacking order; the program retains the stacking order for the objects resulting from the group operation.

To use the Ungroup command

1. Select the group object you want to ungroup.
2. Choose Ungroup in the Object menu, press Ctrl+Shift+G (Windows), or Cmd+Shift+G (Mac OS). **DCAD VectorSpace** disunites the group, leaving the individual objects selected.

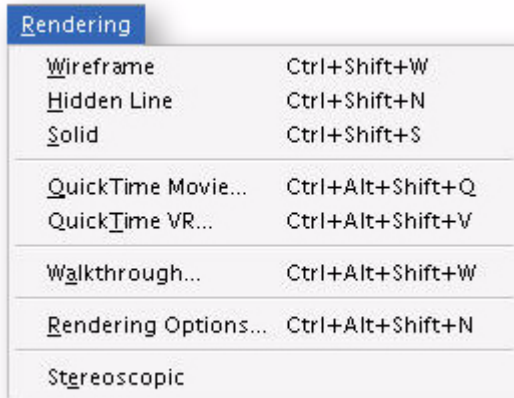
Rendering menu commands

Rendering	
<u>W</u> ireframe	Ctrl+Shift+W
<u>H</u> idden Line	Ctrl+Shift+N
<u>S</u> olid	Ctrl+Shift+S
<u>Q</u> uickTime Movie...	Ctrl+Alt+Shift+Q
Quick <u>T</u> ime VR...	Ctrl+Alt+Shift+V
<u>W</u> alkthrough...	Ctrl+Alt+Shift+W
<u>R</u> endering Options...	Ctrl+Alt+Shift+N
<u>S</u> tereoscopic	

In this chapter:

- About Render mode
- Hidden Line
- QuickTime Movie
- QuickTime VR
- Rendering Options
- Solid
- Stereoscopic
- Walkthrough
- Wireframe

Rendering menu commands



Rendering	
Wireframe	Ctrl+Shift+W
Hidden Line	Ctrl+Shift+N
Solid	Ctrl+Shift+S
QuickTime Movie...	Ctrl+Alt+Shift+Q
QuickTime VR...	Ctrl+Alt+Shift+V
Walkthrough...	Ctrl+Alt+Shift+W
Rendering Options...	Ctrl+Alt+Shift+N
Stereoscopic	

Figure 252.- Rendering menu commands

About Render mode

Render mode lets you view perspective and isometric views of a 3D model. You can also use Render mode to generate a variety of animated walkthroughs.

To begin working in Render mode, you open or activate a Render mode window.

The Rendering menu

When a Render mode window is active, the commands in the Rendering menu are available.

The Wireframe, Hidden Line, and Solid commands generate renderings in the Render mode window. The other Rendering menu commands generate renderings that are stored in QuickTime file formats.

Commands in the Rendering menu let you create renderings in a **DCAD VectorSpace** document. You can create Wireframe, Hidden Line, and Solid renderings of 3D objects in the document.

Other Rendering menu commands let you set up options for renderings, and create QuickTime movies, QuickTimeVR scenes, and stereoscopic renderings in movie and VR formats.

Wireframe. A rendering generated with the Wireframe command is a line drawing that displays the Pen colors assigned to 3D objects. The rendered objects appear with outlines only; no indication of surfaces is displayed. Because there is no surface color or shading, objects appear to be transparent. By default, Render mode windows display Wireframe renderings. When a Hidden Line or Solid rendering is displayed, you can choose the Wireframe command to generate a Wireframe rendering.

Hidden Line. A rendering generated with the Hidden Line command is a line drawing that displays objects as solids. You can generate Hidden Line renderings using the Hidden Line command.

Solid. A rendering generated with the Solid command is a photo-realistic image of 3D objects.

This type of rendering can include lighting effects, shadow casting, reflectivity, gloss, and transparency.

QuickTime Movie. This command saves photo-realistic animations of a 3D model in Apple Computer's QuickTime movie format. You can view QuickTime movie renderings outside of the **DCAD VectorSpace** environment using applications like QuickTime Player, available from www.apple.com.

QuickTime VR. The QuickTime VR command saves photo-realistic interactive pictures of a 3D model. You can view QuickTime VR scenes using player applications outside of the **DCAD VectorSpace** environment.

Walkthrough. The Walkthrough command creates an animated walkthrough of a wire frame rendering of a 3D model, using a path that you specify.

Rendering Options. The Rendering Options command opens the Rendering Options dialog box. You use this dialog box to set most rendering options, including frame size, rendering quality, lens angle, and background color, as well as settings for artificial lighting and sunlight.

The Render mode toolbox

The toolbox displayed when you activate a Render mode window contains five tools: Horizontal Focal Point, Vertical Focal Point, Dual Focal Point, Perspective Render, and Isometric Render tools.

Focal Point tools

The Focal Point tools establish the height, distance, and angle of a focal point, or camera, as it relates to the objects in a perspective. You can use these tools to adjust your view before rendering a scene.

Stereoscopic. You can use the Stereoscopic command with the Solid, QuickTime Movie, and QuickTime VR commands to create stereoscopic 3D renderings and movies. When viewed through red-blue 3D glasses on standard computer monitors, these renderings appear to have true 3D depth.

Background color in renderings

When you open a new Render mode window, the default background color is white. The grid that you use in Draft and Sculpt mode windows isn't visible in the Render mode window.

Solid renderings display a background color if you have not enabled artificial lighting in the Rendering Options dialog box. When you enable only artificial lighting, the background color is black. When you enable only sunlight, or both artificial lighting and sunlight, the background color is a color you select in the Rendering Options dialog box.

You can change the background color using the Background pop-up color palette in the Rendering Options dialog box.

Rendering tools

The Perspective Render and the Isometric Render tools let you select between the display of perspective and isometric views of the 3D model.

When you switch from one rendering view to another, the window displays a Wireframe rendering.

Hidden Line

Mode: Render
Mac OS Shortcut: Cmd+Shift+N
Windows Shortcut: Ctrl+Shift+N

The Hidden Line command generates line drawings that display objects as solids in the Render mode window. The objects do not have surface colors or shading, but surfaces are implied by the removal of hidden lines.

Hidden Line renderings display objects with their assigned Pen colors.

The Render mode window displays a Hidden Line rendering until you click in another window. When you click in another window, the Render window displays a Wireframe rendering.

Lighting in Hidden Line renderings

Because Hidden Line renderings are line drawings, they do not show lighting or shadows. However, you do see symbols that represent artificial light sources if you have placed artificial light sources in Sculpt mode.

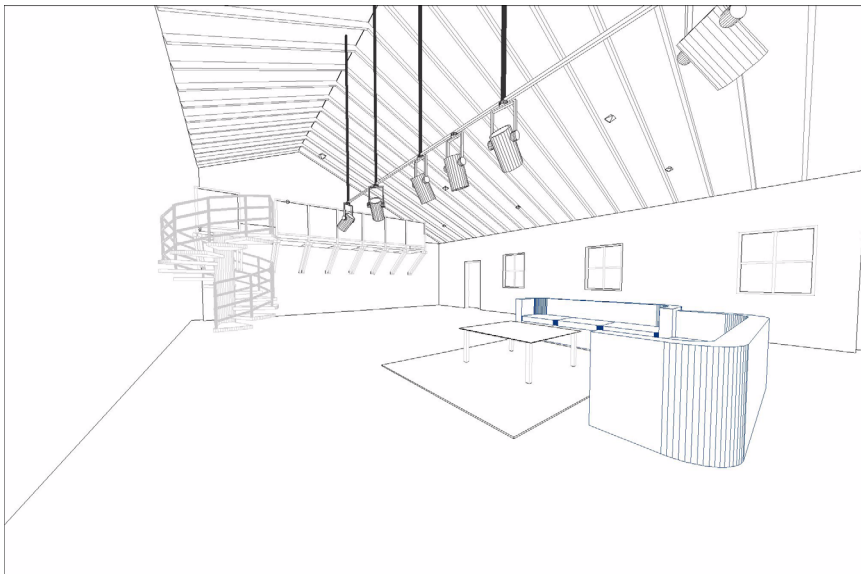


Figure 253.- A rendering generated with the Hidden Line command

To create a Hidden Line rendering

1. Create 3D objects and assign pen colors to the objects.
2. Open or activate a Render mode window. The window initially displays a Wireframe rendering.
3. Use the Focal Point tools to establish horizontal and vertical points of view and sight lines. If

you want to configure screen settings and lens angle for the rendering, choose Rendering Options in the Rendering menu.

4. Choose Hidden Line in the Rendering menu. **DCAD VectorSpace** generates a Hidden Line rendering. You can monitor the generation of the rendering by watching the progress indicators in the Help bar.

QuickTime Movie

Mode: Render
Mac OS Shortcut: Cmd+Opt+Shift+Q
Windows Shortcut: Ctrl+Alt+Shift+Q

Apple Computer's QuickTime technology lets you record and play digital movies. QuickTime software is an extension included with Mac OS system software and is also available for Windows systems.

DCAD VectorSpace creates QuickTime movies by "photographing" a 3D scene from the point of view of a "camera" moving along a path that you have defined.

QuickTime movies created in **DCAD VectorSpace** can display colors, Surface materials, artificial lighting, sunlight, and cast shadows to create a photo-realistic animation of an environment.

Camera Paths

Before creating a QuickTime movie, you must create and save a camera path. The camera path is the path from which the "camera" records the scene when you generate a QuickTime movie.

You create and save camera paths in Sculpt mode using the Camera Path tool. For more information, see **Camera Path tool**, page 96.

Testing camera paths

Before you generate a QuickTime Movie, you can use the Walkthrough command to check the camera path you intend to use for the movie.

The Walkthrough command generates animated wire frame renderings, called *walkthroughs*, using a defined camera path, which can also be used to gen-

erate a QuickTime movie. This is a quick and easy way for you to detect possible problems with a camera path.

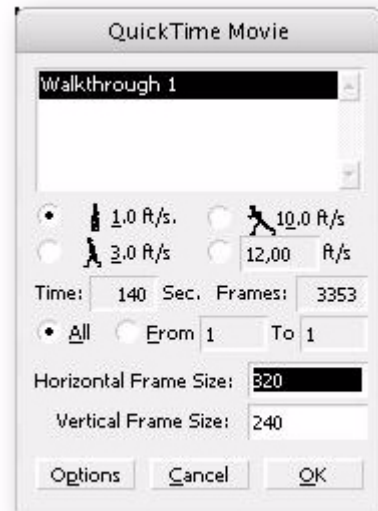
After viewing a walkthrough of a 3D model in Render mode, you can switch back to Sculpt mode to refine the camera path. You can revise the placement and angle of the cameras, the angle and direction of sight lines, and the shape of the path in Sculpt mode.

Once you fine-tune the camera path and view the finished walkthrough, you are ready to generate a QuickTime movie with the QuickTime movie command.

To generate a QuickTime movie rendering

1. Extrude 3D objects in Draft mode, or create 3D objects in Sculpt mode and apply Surface materials, to the objects, if desired.

- Without Surface materials, objects appear to be filled with their Pen colors in QuickTime movie renderings.
2. In Sculpt mode, place artificial lights in the model using the Light Source tools if you want to use artificial lighting. See **Light Source tools**, page 96 for more information.
 3. In Sculpt mode, use the Camera Path tool to create and save a camera path from which to “photograph” the QuickTime movie.
 4. Open or activate a Render mode window.
 5. Choose the Rendering Options command to access the Rendering Options dialog box. You can use the Lighting tab to enable artificial lighting and sunlight.
 - You can also configure screen settings and lens angle for a QuickTime movie rendering in the Rendering Options dialog box.
 6. Choose QuickTime Movie in the Rendering menu. The Walkthrough dialog box opens. Select the camera path, speed, and frame size in this dialog box; these options are described later in this section. When you finish, click OK to close the Walkthrough dialog box.
 - To configure settings for QuickTime compression, click the Options button in the Walkthrough dialog box.



7. Click OK. A Save As dialog box opens. Locate the folder or directory where you want to store the file, and type a file name in the Save as text box. Click Save to create the QuickTime movie file.

DCAD VectorSpace creates the QuickTime Movie frame by frame. You can monitor the generation of the movie by watching the progress bars in the Help bar (if the Help bar is displayed).

The time it takes to generate a movie varies. The number of artificial lights, the size of the texture mapping, and the type of antialiasing all affect the time it takes to generate a movie.

For example, generating a QuickTime movie with Antialiasing set to Best takes eight times longer than generating the same movie with Antialiasing set to Normal.

Walkthrough options

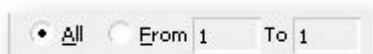
The following options appear in the Walkthrough dialog box. Use these options to specify settings before you generate a QuickTime movie. When you choose the QuickTime command, the Walkthrough dialog box appears.

Camera path. Select one of the saved camera paths from the list in the Walkthrough dialog box. If no camera paths appear in the scrolling list, you need to use the Camera Path tool in Sculpt mode to create and save a camera path.

Walkthrough speed. Select one of the preset walk-through speed radio buttons, or enter a walk-through speed in the text box. The lower the foot per second ratio, the slower the walkthrough speed, and the longer it takes to complete the walkthrough path.



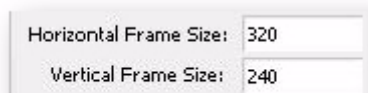
Frames to generate. Select an option to specify which frames of the walkthrough to generate in the QuickTime movie.



Click All to generate all frames based on the walkthrough path and walkthrough speed setting.

Click From to specify a range of frames. Type the starting frame number in the first text box and the ending frame number in the second text box.

Frame size. To specify the frame size of the QuickTime movie, type the horizontal and vertical frame measurement in pixels in the Horizontal Frame Size and Vertical Frame Size text boxes



The frame size settings have a direct effect on the amount of information in the QuickTime movie, and therefore on the storage space requirements of the movie.

For example, at a frame size of 200 x 200 pixels, each frame of the resulting QuickTime movie contains 40,000 pixels. If each pixel requires 1 byte of storage space, each frame of the movie contains about 39 KB of information.

At a frame size of 600 x 600 pixels, each movie frame contains 360,000 pixels. At 1 byte per pixel, each frame of the movie contains 351.5 KB of information.

QuickTime compression options¹. When you click the Options button in the Walkthrough dialog box, the Compression Settings dialog box appears.

In the Compressor area, choose the compression method and the number of colors. Use the Quality slider to fine-tune the compression method. Some compression methods let you adjust the quality and some do not.

1. The exact options will vary with the currently installed QuickTime™ software version. The illustrations in this document are for the 6.x English Language Version.

In the Motion area, select the number of frames per second from the pop-up menu or type the number of frames in the text box. Select the “Key frame every” checkbox and type the key frame interval in the text box to set up key frames.

Animation is typically created at 24 frames per second to produce a smooth and seamless movie. Compression settings, frame rates, and walkthrough options determine the file size of the movie. The higher the quality of the movie, the larger the file size.

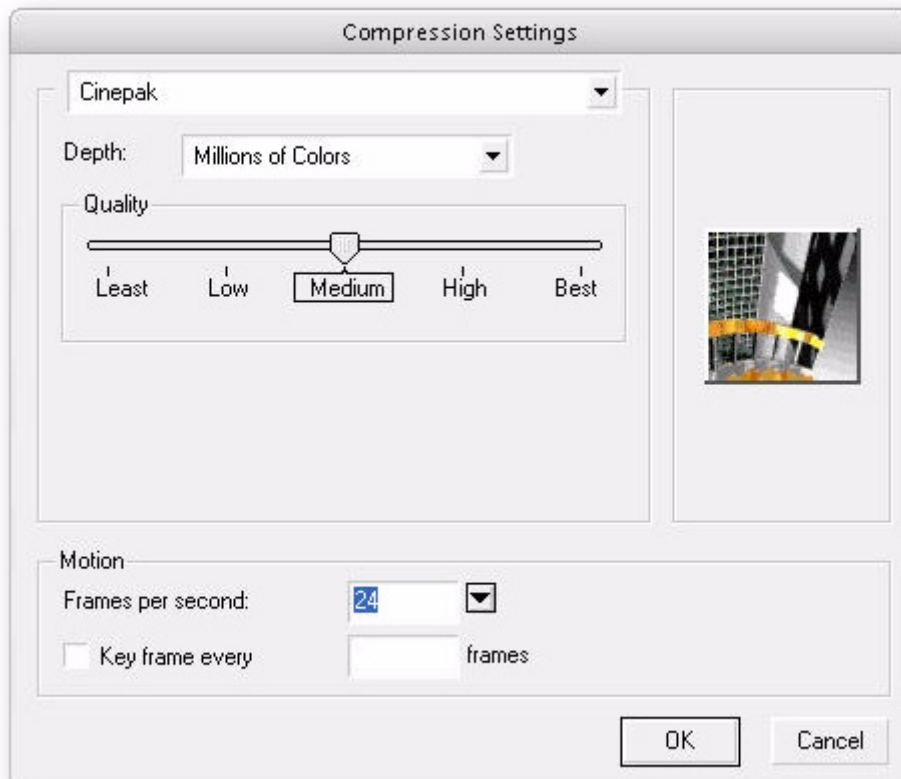


Figure 254.- QuickTime™ options dialog - Version 6.0 - USA

QuickTime VR

Mode: Render
Mac OS Shortcut: Cmd+Opt+Shift+V
Windows Shortcut: Ctrl+Alt+Shift+V

picture, one that you can move through and turn around in by panning left, right, up, or down.

The QuickTime VR command generates a navigable

QuickTime VR is a standard for creating and viewing photo-realistic environments and real world objects. Users interact with QuickTime VR content with a complete 360 degree perspective and control their viewpoint through the mouse in a realistic visual environment.

Before generating a QuickTime VR picture, you establish the location and position of a stationary camera. You can use the Focal Point tools in the Render mode toolbox to set the location and height of the camera.

For example, to give the impression of standing in the middle of a 3D model and turning 360 degrees, place the camera in the center of the 3D model using the Horizontal Focal point tool.

To set the height of the camera to eye level, use the Vertical Focal Point tool.

To use the QuickTime VR command

1. Extrude 3D objects in Draft mode, or create 3D objects in Sculpt mode and assign Pen colors and Surface materials.
2. In Sculpt mode, place artificial lights in the model using the Light Source tools. See **Light Source tools**, page 96 for more information.
3. Open or activate a Render mode window.
4. Set the camera position using the Focal Point tools.

5. Choose the Rendering Options command to access the Rendering Options dialog box. Select the Artificial Lighting tab, the middle tab, to enable artificial lighting and sunlight.
 - You can configure the other screen settings and lens angle of the rendering in the Rendering Options dialog box.
6. Choose the QuickTime VR command in the Rendering menu. The Save As dialog box appears.
7. In the Save As dialog box, locate the folder or directory where you want to store the file.
8. Type a file name in the Save as text box.
9. Select the file location, enter a file name and click Save. **DCAD VectorSpace** generates a QuickTime VR picture. You can monitor the generation of the picture by watching the Progress bars in the Help bar.

The time it takes to create the picture can vary. The amount of artificial lights, the size of the texture mapping and the type of antialiasing all affect the time it takes to generate a QuickTime VR picture.

For example, generating a QuickTime VR picture with Antialiasing set to Best takes eight times longer than generating the same picture with the Antialiasing set to Normal.

Rendering Options

Modes: Draft, Sculpt, Render

The Rendering Options command lets you configure lens angle, units, and background color of Wireframe, Hidden Line, and Solid renderings, as well as QuickTime movies and QuickTime VR scenes.

Rendering Options also lets you configure the antialiasing, resolution and lighting parameters for Solid renderings, QuickTime movies, and QuickTime VR scenes. Also, the frame size of a Solid rendering can be specified in the Rendering Options dialog box.

The Rendering Options command is available whenever any **DCAD VectorSpace** document window is open.

Before you generate a rendering, movie, or VR picture, you can choose the Rendering Options command to configure the settings. The Rendering Options dialog box organizes settings on three tabs. To bring a tab to the front, click the tab.

- The tab marked with a camera icon contains the Screen settings.



- The tab marked with a light bulb icon contains the Lighting settings.



- The tab marked with the sun icon contains the Sunlight settings.



To use the Rendering Options command

1. Choose the Rendering Options command in the Rendering menu. The Rendering Options dialog box appears.
2. Configure the settings in the dialog box. To change tabs, click the icon at the top of the tab to bring the tab to the front.
3. To make the new settings take effect, click OK. To leave the last saved settings unchanged, click Cancel.

Screen tab

A camera icon appears at the top of the Screen tab in the Rendering Options dialog box.

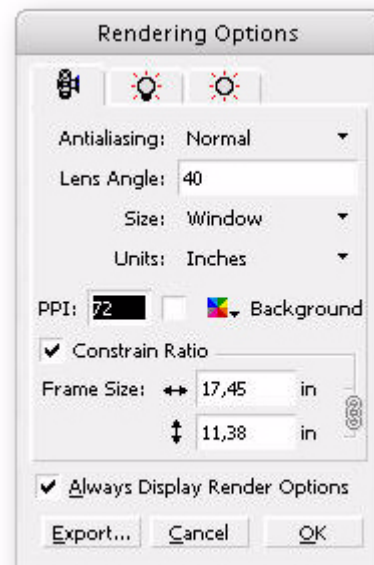


Figure 255.- Rendering Options - Screen

Antialiasing

Antialiasing reduces the jagged appearance of diagonal lines or edges in an image. **DCAD VectorSpace** offers three choices of antialiasing that affect the quality of Solid renderings, QuickTime movies, or QuickTime VR scenes: Normal, Better, and Best.

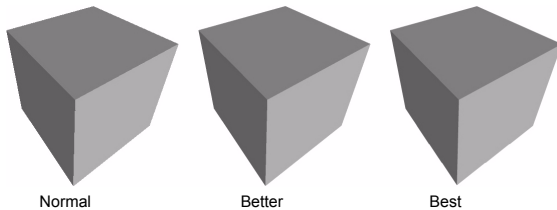


Figure 256.- Antialiasing options

Normal. Choose Normal in the Antialiasing pop-up menu to render the scene with the least amount of antialiasing. Normal renders the quickest of the three options.

When quality is not as important as how quickly **DCAD VectorSpace** generates an image, choose Normal.

Better. The Better option generates a rendering, movie, or VR picture that has smoother edges than one generated with Normal antialiasing. Better takes four times longer to generate an image than one generated with Normal antialiasing.

Choose the Better command in the Antialiasing pop-up menu when you need increased quality in a rendering, movie, or VR picture.

Best . The Best option requires eight times longer to generate a rendering, movie, or VR picture than one generated with Normal antialiasing. Best antialiasing is the smoothest and most realistic type of antialiasing. Choose Best in the Antialiasing pop-up menu when you need the highest quality finished product.

Lens Angle

Lens Angle defines the depth of field of a rendering, QuickTime movie, or QuickTime VR picture. Type a value in the Lens Angle text box to change the current setting.

The higher the number, the shallower the depth of field. A shallower depth of field brings objects closer to the camera.

This option is not available when you are in Draft or Sculpt mode.

Size

The Size option lets you choose the frame size of a Solid rendering. You can choose from a Custom, Window, or preset frame size.

This option is not available when you are in Draft or Sculpt mode.

Window. Choose the Window command in the Size pop-up menu to generate a Solid rendering to fit the Render mode window.

Custom. Choose Custom in the Size pop-up menu to enter your own values in the Frame Size text boxes. If the Constrain Ratio check box is selected, the frame size you enter will have the same proportions as the current frame size.

There are five preset frame sizes. They are measured in pixels. When you choose one of these, the values are shown in the Frame Size text boxes.

Units

The Units pop-up menu lets you choose the unit of measurement of the frame size. You can choose

from Pixels, Inches, or Centimeters. You can see the current type of units displayed next to the Frame Size text boxes.

For example, choose the Inches command in the Units pop-up menu. Look at the Frame Size text boxes. There is an “in” next to the boxes. Now when you enter values in the frame Size text boxes, you enter the values in inches.



PPI (Resolution)

For digital images, resolution measures the size of the pixels that make up the image, expressed as pixels per inch (ppi). This applies to digital images from any source, whether scanned, created on computer, or captured by a digital camera.

The resolution of an image tells you how much digital information the image contains. Each pixel making up the image is a dot of solid color, and the smaller the pixels, the finer the image appears.

Higher resolutions results in larger images that take up more memory. Larger images make your document files larger. Also, the larger the image, the longer **DCAD VectorSpace** takes to generate and save the rendering.

When you set the ppi in the Rendering Options dialog box, you are setting the image resolution for a Solid rendering as it relates to the output resolution.

You determine the ppi by choosing the halftone screen frequency you will use for printing.

To change the resolution, type a new value in the PPI text box.

Change the ppi, after you determine the halftone screen frequency, when you are exporting a Solid rendering for printing. Leave the ppi set to 72 ppi if you are generating renderings to view on screen.

You might need to create QuickTime movies or QuickTime VR pictures at a higher resolution if the images will be enlarged and you need to maintain the screen resolution. In that case, calculate the final image size to calculate the required resolution based on the amount of pixel information needed.

Background

The Background pop-up color palette lets you pick a background color for the Render mode window.

The current background color appears in the box. You can choose a preset or custom color from the pop-up color palette.

To change the background color: press the pop-up color palette and drag to the color in the grid that you want to use. To select a custom color, drag to the “Other...” area at the bottom of the grid.

Choosing a custom color

When you select “Other...” in the pop-up color palette, the applicable operating system’s Color Picker appears. This dialog box lets you specify custom colors.

Constrain Ratio

If you check this option, the values you enter in the Frame Size text boxes are proportional to those of the current values.

For example, a frame size of 4" wide by 8" high is twice as high as it is wide. If Constrain Ratio is checked and you enter 5" in the width text box, the height changes to 10".

You can also enter 10" in the height text box. The width changes to 5".

This option is not available when you are in Draft or Sculpt mode.

Frame Size

Frame size refers to the finished image size, in the Render mode window, of a Solid rendering.

The Frame Size text boxes show the current frame size in the units you specify.

"Pix" means the units are shown in pixels. "In" means the units are shown in inches. And "cm" means the units are shown in centimeters.

You can enter a custom frame size in the Frame Size text boxes.

To enter custom frame sizes, choose the Custom command in the Size pop-up menu, then type new values in the Frame Size text boxes.

You can not enter custom frame sizes when you are in Draft or Sculpt mode.

Always Display Render Options

If you check this option, the Rendering Options dialog box appears whenever you choose the Solid or QuickTime VR command.

Export

Choose the Export command to access the Save dialog box. You can then save a Solid rendering as a PICT file.

PICT is a standard Mac OS graphics file format, that supports 2D objects, raster images, and text. It does not support 3D objects.

This command is not available when you are in Draft or Sculpt mode.

To use the Export command

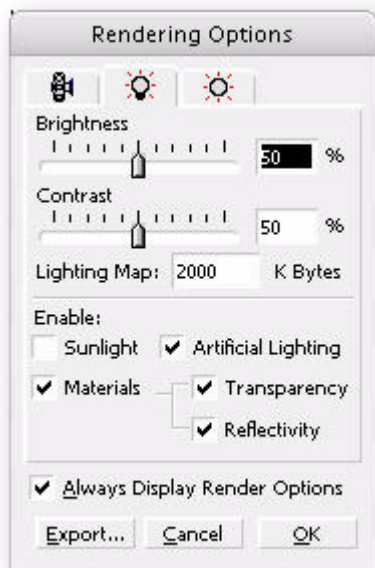
1. Open or activate a Render mode window.
2. Choose the Rendering Options command. The Rendering options dialog box appears.
3. Configure the screen and lighting settings in the Rendering Options dialog box.
4. Click the Export button in the Rendering Options dialog box. A Save dialog box appears.
5. In the Save dialog box, locate the folder or directory where you want to store the file.
6. Type a file name in the Save text box.
7. Click Save to store the file on disk. **DCAD VectorSpace** creates the Solid rendering. You can monitor the generation of the rendering by watching the Progress bars in the Help bar.

The time and system memory it takes to export a rendering varies depending on a number of factors. The

number of artificial lights, reflectivity and transparency effects, texture mapping, and the type of anti-aliasing all affect the time and memory it takes to generate and save a Solid rendering.

Lighting tab

A light bulb icon appears at the top of the Lighting tab in the Rendering Options dialog box.



Brightness and Contrast

You can adjust the brightness and contrast of a Solid rendering, QuickTime movie, or QuickTime VR picture. Brightness refers to the lightness of an image. Contrast is the difference in brightness between two pixels.

Memory requirements and exporting

In general, you should allocate as much memory as possible to **DCAD VectorSpace** before you export a high resolution or complex Solid rendering to disk.

Because the Brightness and Contrast options adjust all pixels equally, you should avoid using these controls to lighten an image that appears too dark, because the image can lose shadow detail.

- Enter a value from 0-400 in the Brightness text box. Higher values can wash out midtones and shadows. Lower values can dull highlights.
- Enter a value from 0-100 in the Contrast text box. Increasing contrast moves the color values of pixels to the extremes of the brightness spectrum. Decreasing contrast moves color values toward medium gray.

Lighting Map

The Lighting Map is the amount of memory, (RAM), dedicated to calculating the lighting in a Solid rendering, QuickTime movie, or QuickTime VR picture. The more RAM you dedicate to calculate the lighting, the smoother the shadows.

DCAD VectorSpace uses the amount of RAM you specify to calculate the lighting one light at a time. For example, if the Lighting Map is set to 2000 kb and you have 10 artificial lights in a rendering, **DCAD VectorSpace** uses 2000 kb of RAM for the first light, finishes the calculation and releases the RAM. It then uses 2000 kb of RAM for the second light, and so on.

To use Lighting Map: Enter a value in the Lighting Map text box to specify how much memory

DCAD VectorSpace will use to calculate the lighting.

Artificial Lighting

If you select this option, **DCAD VectorSpace** calculates the lighting map of the artificial lights in a Solid rendering, QuickTime movie, or QuickTime VR picture. You can see lighting and cast shadows in the rendered image when you enable artificial lighting if you have placed artificial lighting in the model.

You place artificial lights in a model using the Light Source tools in Sculpt mode. See **Light Source tools**, page 96 for more information.

An image or movie takes longer to generate with artificial lighting enabled.

You can enable Artificial Lighting by itself, or with Sunlight.

When you create a new document, Artificial Lighting is selected.

Sunlight

If you select this option, **DCAD VectorSpace** calculates the lighting map of the sunlight in a Solid rendering, QuickTime movie, or QuickTime VR picture. You can see lighting and cast shadows in the rendered image when you enable sunlight.

An image or movie takes longer to generate with Sunlight enabled. You can use Sunlight by itself, or also select Artificial Lighting.

Materials

If you select this option, **DCAD VectorSpace** displays Surface materials in a Solid rendering, QuickTime movie or QuickTime VR picture.

An image or movie takes longer to generate with Materials. However, if you do not select Materials, the image or movie displays objects as solids using their Pen colors as surface colors.

When you create a new drawing, Materials is selected.

Transparency. If you check this option, **DCAD VectorSpace** displays transparent Surface materials realistically.

When you create a new Surface material using the Material Editor, you can specify how much transparency the material has.

You can check Transparency only if you have already checked Materials.

Reflectivity. If you check this option, **DCAD VectorSpace** displays the reflectivity of Surface materials realistically.

When you create a new Surface material using the Material Editor, you can specify how much reflectivity the material has.

You can select Reflectivity only if you have already selected the Materials option.

Sunlight tab

A sun icon appears at the top of the Sunlight tab in the Rendering Options dialog box.

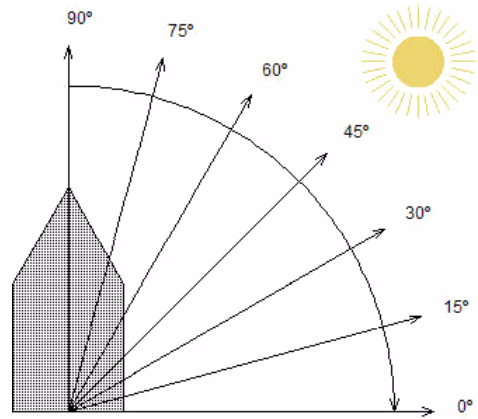


Figure 257.- Right Ascension

Azimuth. The sun's direction refers to the number of degrees related to north, south, east, and west as they appear on a compass. North is 0, east is 90, south is 180 and west is 270 degrees.

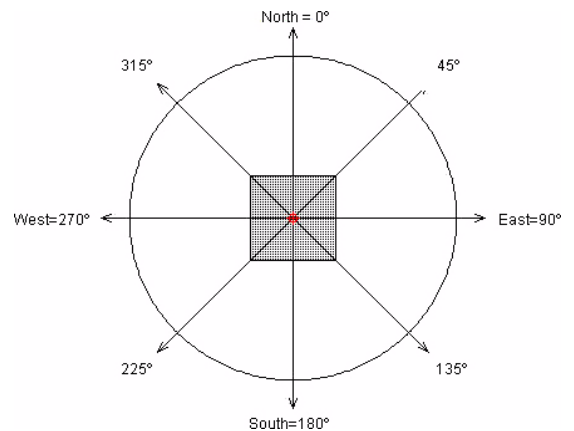


Figure 258.- Azimuth

Sun Position

Click the Sun Position button to customize the position of the sun. You can enter values for the sun's angular height and direction.

Right Ascension. The sun's angular height is the height and angle, in degrees, of the sun overhead.

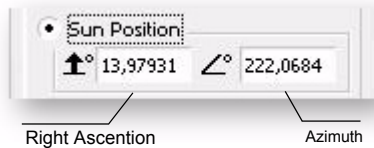


Figure 259.- Sun Position

To use Sun Position

1. Click the Sun Position button.
2. Type the number of degrees that represents the sun's angular height in the first text box.
3. Type the number of degrees that represents the sun's direction in the second text box.

Clicking the Sun Position button turns off Global Position.

Global Position

Click the Global Position button to choose from a list of cities and their predefined sun positions.

You can change the month, day, and time of day for the city you choose. **DCAD VectorSpace** calculates the angular height and direction of the sun for that city based on the new configuration.

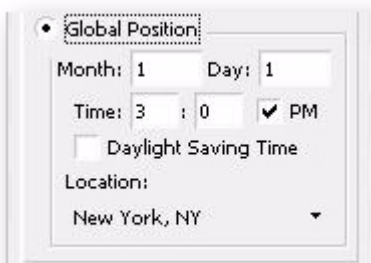


Figure 260.- Global Position

The Sun Position's text boxes display the sun's angular height and direction in degrees. When you use Global Position, the sun's height and direction are preset values that can't be changed.

Month. To change the month, type a new number, from 1-12, that corresponds to the month, in the Month text box.

DCAD VectorSpace calculates the sun position in relation to the month you specify.

Time. To change the time of day, type the new time of day in the Time text box. Make sure you type AM or PM after the time in the text box. If you don't type AM or PM, the time displays as AM.

DCAD VectorSpace calculates the sun position in relation to the time of day you specify.

Daylight Saving Time. Check this box to change the time of day to daylight-saving time.

Location pop-up menu. The Location pop-up menu lets you choose from a list of cities and their predefined global positions. You use this command whenever you use Global Position.

You can also use the following commands in the Location pop-up menu to define, edit, or delete a location.

Define Location: Choose the Define Location command to add a new city and its global position to the list of locations. Once you add a location, you can use it in any drawing.

Edit Location: You can edit the global position of the selected location in the Location pop-up menu by choosing the Edit Location command. In the Add Location dialog box, change the settings as necessary and click OK.

Delete Location: Choose the Delete Location command to delete a city from the list of locations.

To define a new global position location

1. Choose the Define Location command in the Location pop-up menu. The Define Location dialog box opens.
2. Enter the following information about the location you are defining:
 - Type the name of the location you are defining in the name text box.
 - Type the latitude in degrees in the Latitude text box. Select the N check box for latitudes in the northern hemisphere.
 - Type the longitude, in degrees, in the Longitude text box. Select the E check box for longitudes in the eastern hemisphere.

- Type a time zone in the Time Zone text box. Select the check box labeled “+” for times ahead of GMT.
 - Note that if the Mac OS Map control panel is installed in your System folder, you can use it to obtain location information.
3. Click OK to accept the values you entered. The new location appears in the Location pop-up menu.

To delete a global position location

1. Choose the Delete Location command in the Location pop-up menu. A dialog box appears.
2. Select the city you want to delete and click Remove. The city disappears from the list.
3. Click OK to accept the deletion. Click Cancel to leave the list unchanged.

When you add a global position location, the settings you enter in this dialog box affect the position of sunlight and shadows when you select that location for Solid renderings with sunlight enabled.

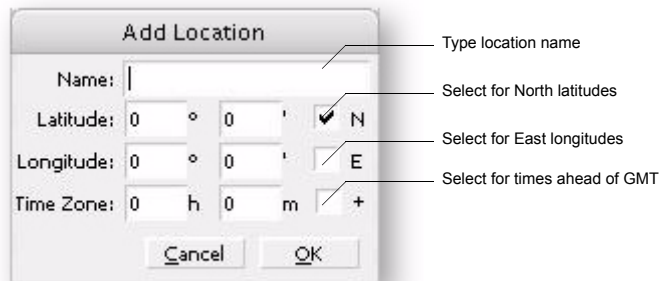


Figure 261.- Add Location dialog box

Solid

Mode: Render
Mac OS Shortcut: Cmd+Shift+S
Windows Shortcut: Ctrl+Shift+S

The Solid command generates realistic renderings in the Render mode window. Solid renderings can dis-

play lighting effects, cast shadows, and textured Surface materials.

To render a 3D model as a Solid rendering, choose the Solid command in the Rendering menu.

A Solid rendering displays an object's assigned pen color or Surface material. If an object has both a pen color and Surface material, you can check the Materials option in the Rendering Options dialog box to render its Surface material in a Solid rendering.

A Solid rendering displays objects that have only pen colors and objects that have both pen colors and Surface materials.

Lighting

Solid renderings can display artificial lighting and cast shadows if you have placed light sources in the model. You place artificial lighting in a model in Sculpt using the Light Source tools.

You can use sunlight in addition to artificial lighting, or as the only lighting in a Solid rendering.

Artificial lighting will generate a realistic image because of the light and cast shadows that fall across objects. However, a rendering with artificial light will take longer to generate because **DCAD VectorSpace** calculates the light and shadows as well as the texture mapping of Surface materials.

A Solid rendering with both sunlight and artificial lighting also takes longer to generate than a rendering with no lighting because **DCAD VectorSpace** calculates the light and shadows as well as the texture mapping of Surface materials.

You can generate a Solid rendering much quicker if you disable both artificial lighting and sunlight. When lighting is not enabled, there are no shadows cast in the rendering. However, this method lets you see the position, Surface materials and colors of objects quickly.

To use the Solid command

1. Extrude 3D objects in Draft mode, or create 3D objects in Sculpt mode and assign pen colors and Surface materials.
2. In Sculpt mode, place artificial lights in the model using the Light Source tools.
3. Open or activate a Render mode window.
4. To view the Solid rendering from another perspective, change the location of the focal point using the Focal Point tools in the toolbox.
5. Choose the Rendering Options command to access the Rendering Options dialog box. Select the middle tab to enable artificial lighting and sunlight.
 - You can configure the other screen settings and lens angle of the rendering in the Rendering Options dialog box.
6. To create a Solid rendering, choose the Solid command in the Rendering menu. **DCAD VectorSpace** generates a Solid rendering. You can monitor the generation of the rendering by watching the Progress bars in the Help bar.

Rendering time and memory requirements

The amount of time and system memory it takes to produce a Solid rendering depends on a number of factors: the number of artificial lights, reflectivity and transparency effects, texture mapping, and the type of antialiasing.

For example, generating a Solid rendering with antialiasing set to Best takes eight times longer and requires more system memory than generating the same rendering with antialiasing set to Normal. Similarly, rendering a scene at 300 ppi resolution takes significantly more time and memory than rendering the same scene at 72 ppi resolution.

Before you generate a complex or high resolution Solid rendering, you should allocate as much system memory as possible to **DCAD VectorSpace**. Otherwise, the program might not be able to complete the rendering. Refer to **Allocating memory to DCAD VectorSpace**, page 325.

If you try to start a rendering with insufficient system memory allocated, **DCAD VectorSpace** displays a message.

Click OK to close the message box, and then allocate more system memory to **DCAD VectorSpace**.

If **DCAD VectorSpace** can't complete a Solid rendering because an insufficient amount of memory is allocated to the program, a message appears. You can click OK in the message box to complete the rendering on disk.

If you click OK, **DCAD VectorSpace** lets you export the Solid rendering to your hard disk as a PICT file. Refer to "To export a Solid rendering," next.

Note: This operation is equivalent to using the Export option in the Rendering Options dialog box. For more information on exporting, see **Export**, page 318.



If you click Cancel, **DCAD VectorSpace** creates a low-resolution version of the Solid rendering, which requires less memory.

If there is insufficient memory to store a low resolution version of the rendering, **DCAD VectorSpace** displays a message that there isn't enough memory to create a low-resolution copy of the rendering.

To export a Solid rendering

1. Specify a location for the Solid rendering in the directory dialog box.
2. Type a name for the rendering in the text box, and then click Save to export the rendering to the specified location.

Allocating memory to DCAD VectorSpace

Memory allocation is only available for the Mac OS. Windows 98/NT's memory management automatically compensates for application memory requirements. To allocate memory to **DCAD VectorSpace** (Mac OS), close the application, select the program's icon, and then choose Get Info in the File menu in the Mac OS Finder. To adjust the amount of memory allocated to **DCAD VectorSpace**, change the setting in the Preferred size text box.



Figure 262.- Rendering created with the Solid command

Stereoscopic

You can use the Stereoscopic command in conjunction with the Solid, QuickTime Movie and QuickTime VR commands to create a different kind of rendering or movie.

This command produces renderings and movies with objects that have the appearance of three dimensions.

Stereoscopic rendering is a process that generates a rendering that appears to be truly 3D by having a depth in addition to a height and width when you view it with the Stereoscopic 3D glasses.

In this process, the objects are first rendered with their pen color or Surface materials. A blue and red transparent overlay of the object is offset from the original object.

You need to view the on screen result with the Stereoscopic 3D glasses to see the illusion of depth that this process creates

To use the Stereoscopic command:

1. Open or activate a Render mode window.
2. Choose Stereoscopic in the Rendering menu. A check mark appears next to the command. This means the command is active and will affect any Solid rendering, movie or VR picture you generate.
3. Choose Solid, QuickTime Movie, or QuickTime VR in the Rendering menu.
DCAD VectorSpace generates the Stereoscopic rendering or movie. You can monitor the generation of the rendering by watching the Progress bars in the Help bar.

The Render mode window displays the Stereoscopic Solid rendering until you click in either a Draft or Sculpt mode window. Once you click in another window, the Solid rendering reverts to a Wireframe rendering.

Walkthrough

Mode: Render
Mac OS Shortcut: Cmd+Opt+Shift+K
Windows Shortcut: Ctrl+Alt+Shift+K

The Walkthrough command lets you view a walk-through path through a wire frame representation of a 3D model.

The Render mode window displays the wire frame objects in a walkthrough in their assigned Pen colors.

The walkthrough path is also referred to as the camera path. You create and save a camera path in Sculpt mode using the Camera Path tool.

Using the Walkthrough command is the quickest way for you to view a camera path.

To use the Walkthrough command

1. Extrude 3D objects in Draft mode, or create 3D objects in Sculpt mode and apply Pen colors and Surface materials.
2. In Sculpt mode use the Camera Path tool to create and save the camera path.
3. Open or activate a Render mode window.
4. Choose the Rendering Options command to access the Rendering Options dialog box. You can configure the screen settings and lens angle of the walkthrough in the Rendering Options dialog box.
5. Choose the Walkthrough command in the Rendering menu. The Walkthrough dialog box appears.
6. Select one of the saved walkthrough paths from the list in the Walkthrough dialog box. You can change the settings in this dialog box to speed up or slow down the walkthrough. You can also change the frame size of the walkthrough window.
7. Select one of the preset walkthrough speed radio buttons or enter a walkthrough speed in the text box. The lower the feet per second ratio, the slower the walkthrough, and therefore, the slower the QuickTime movie.
 - The time and number of frames it takes to create the walkthrough are shown below the walkthrough speed buttons.
 - Select All to view the entire walkthrough. Or, specify only the frames you want to see by entering the frame numbers in the text boxes.
 - You can also specify the frame size of the walkthrough by entering values in the horizontal and vertical frame size text boxes.
 - A larger frame size and a slower walkthrough speed results in a longer, slower walkthrough.
8. Click OK to generate the walkthrough. **DCAD VectorSpace** generates the wire frame walkthrough.

Wireframe

Mode: Render
Mac OS Shortcut: Cmd+Shift+W
Windows Shortcut: Ctrl+Shift+W

To render a 3D model as a Wireframe rendering, choose the Wireframe command in the Rendering menu.

Once you render a 3D model using either the Hidden Line or Solid commands, you can use the Wireframe

command to view the rendering as a Wireframe rendering again.

By default a Render mode window displays a Wireframe rendering of the 3D objects in the document. A Wireframe rendering is a line drawing that uses the pen color assigned to objects. Only the outline of an object appears with no indication of its surfaces. Because there is no surface color or shading, objects appear transparent.

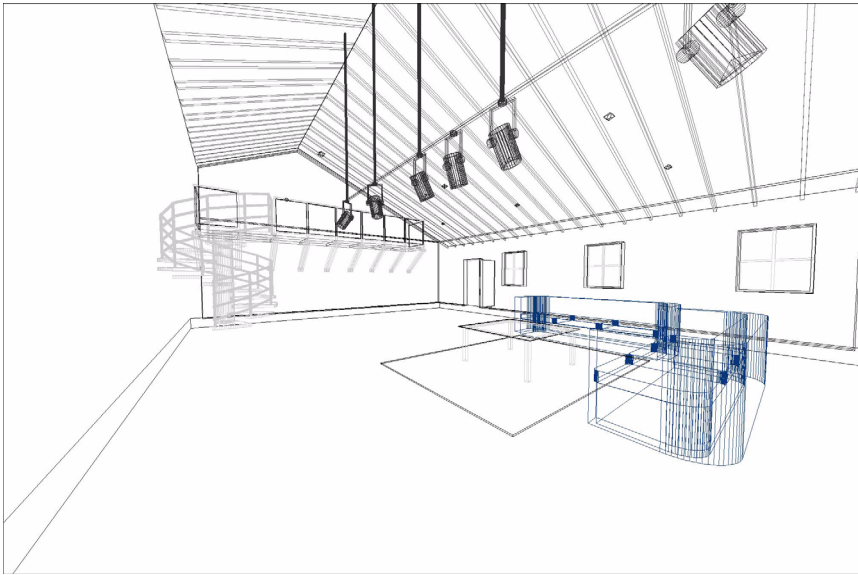


Figure 263.- A rendering generated with the Wireframe command

Lighting

You don't see lighting or cast shadows in a Wireframe rendering. If you have placed artificial lights in your rendering, you see the symbols, drawn in their assigned pen color, that represent the artificial light sources.

To use the Wireframe command

1. Extrude 3D objects in Draft mode, or create 3D objects in Sculpt mode and apply pen colors and Surface materials.
2. Open or activate a Render mode window.
3. To view the Wireframe rendering from another perspective, change the location of the focal

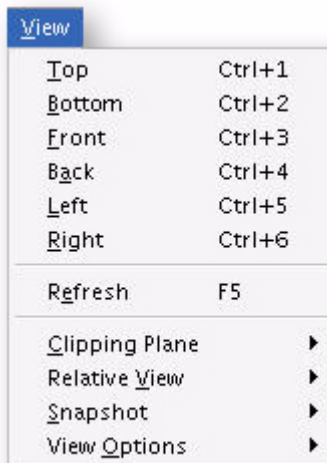
point using the Focal Point tools in the toolbox. Refer to **Render tools**, page 87 for more information on the Focal Point tools.

- If you need to configure the screen settings and lens angle of the rendering choose the

Rendering Options command in the Rendering menu.

4. To create a Wireframe rendering, choose the Wireframe command in the Rendering menu. **DCAD VectorSpace** generates a Wireframe rendering.

View menu commands



In this chapter:

- Orthogonal View commands
- Clipping Plane submenu
- Refresh
- Relative View submenu
- Snapshot submenu
- View Options submenu

View menu commands

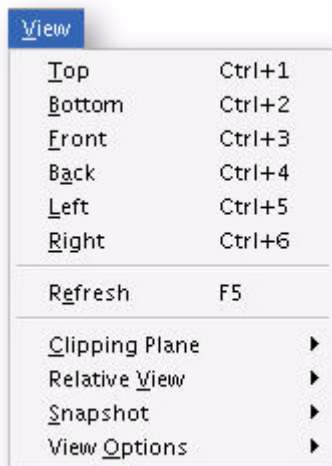


Figure 264.- View menu commands

The View menu contains commands that let you change the way you see the **DCAD VectorSpace** workspace.

You can change the way you see objects, redraw the screen, clip objects so only certain areas are visible, and create Relative Views using commands in the View menu.

Some of the View menu commands are also available from pop-up menus in the Status bar, when the Status bar is displayed. These pop-up menus also show the current state of some view options. To display the Status bar, use the Toolbars command in the Layout menu.

Orthogonal View commands

The first six commands in the View menu — Top, Bottom, Front, Back, Left, and Right — let you select a view for an active Draft or Sculpt mode window. When you choose a View command, you change your orientation to the drawing.

These six View commands are described below in menu order. The remaining commands in the View menu are described in alphabetical order following this section.

Top

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+1
Windows Shortcut: Ctrl+1

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace. Top view is commonly referred to as a “plan” view.

To choose Top view

1. Before choosing Top view, activate a Draft or Sculpt mode window.
2. Choose Top in the View menu, press Ctrl+1 (Windows), or press Cmd+1 (Mac OS). In the active Draft or Sculpt window,

DCAD VectorSpace shows the **DCAD VectorSpace** workspace from the top.

Bottom

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+2
Windows Shortcut: Ctrl+2

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace.

To choose Bottom view

1. Before choosing Bottom view, activate a Draft or Sculpt mode window.
2. Choose Bottom in the View menu, press Ctrl+2 (Windows), or press Cmd+2 (Mac OS). In the active Draft or Sculpt window, **DCAD VectorSpace** shows the **DCAD VectorSpace** workspace from the bottom.

Front

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+3
Windows Shortcut: Ctrl+3

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace. Front view is an elevation view.

To choose Front view

1. Before choosing Front view, activate a Draft or Sculpt mode window.
2. Choose Front in the View menu, press Ctrl+3 (Windows), or press Cmd+3 (Mac OS). In the active Draft or Sculpt window, **DCAD VectorSpace** shows the **DCAD VectorSpace** workspace from the front.

Back

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+4
Windows Shortcut: Ctrl+4

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace. Back view is an elevation view.

To choose Back view

1. Before choosing Back view, activate a Draft or Sculpt mode window.
2. Choose Back in the View menu, press Ctrl+4 (Windows), or press Cmd+4 (Mac OS). In the active Draft or Sculpt window, **DCAD VectorSpace** shows the **DCAD VectorSpace** workspace from the back.

Left

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+5
Windows Shortcut: Ctrl+5

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace. Left view is an elevation view.

To choose Left view

1. Before choosing Left view, activate a Draft or Sculpt mode window.
2. Choose Left in the View menu, press Ctrl+5 (Windows), or press Cmd+5 (Mac OS). In the active Draft or Sculpt window, **DCAD VectorSpace** shows the **DCAD VectorSpace** workspace from the left.

Right

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+6
Windows Shortcut: Ctrl+6

DCAD VectorSpace provides six standard views of your work: Top, Bottom, Front, Back, Left, and Right. These are orthogonal views of the **DCAD VectorSpace** workspace. Right view is an elevation view.

To choose Right view

1. Before choosing Right view, activate a Draft or Sculpt mode window.
2. Choose Right in the View menu, press Ctrl+6 (Windows), or press Cmd+6 (Mac OS). In the active Draft or Sculpt window, **DCAD VectorSpace** shows the **DCAD VectorSpace** workspace from the right.

Clipping Plane submenu

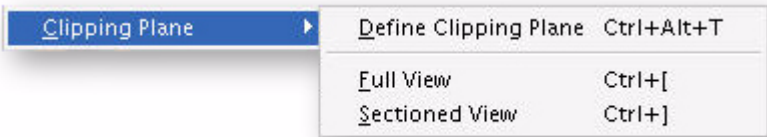


Figure 265.- Clipping Plane submenu

The Clipping Plane submenu commands let you view particular sections of your project, activate defined clipping planes, and deactivate clipping planes.

Define Clipping Plane

Modes: Sculpt, Render

You can use the Define Clipping Plane command to view a section of your project.

Clipping planes create a section of an object by “slicing through” the object at the location of each clipping plane.

To set clipping planes in Sculpt mode

1. Choose Define Clipping Plane in the View menu. **DCAD VectorSpace** changes to a Front view if you were in Top or Bottom view or to Top view if you were in an elevation view.
2. Move the pointer to set the location of the first clipping plane. A line follows the pointer. This line is one of the clipping planes.
3. Click to set the location of the clipping plane.
4. Move the pointer to set the location of the second clipping plane. A second line, parallel to the first, follows the pointer. This line represents the second clipping plane.
5. Click to set the location of the second clipping plane. **DCAD VectorSpace** returns to the original view. **DCAD VectorSpace** displays the objects and parts of objects that occupy the space between the two clipping planes.

To set clipping planes in Render mode

1. Choose Define Clipping Plane in the View menu. **DCAD VectorSpace** changes to a Sculpt mode window set to Front view.
2. Move the pointer to set the location of the first clipping plane. A line, perpendicular to the ver-

tical angle of the camera focal point, follows the pointer. This line is one of the clipping planes.

- The angle of the clipping plane is defined by the angle of the vertical focal point. (You define the vertical focal point using the Vertical Focal point tool in Render mode.) The focal point is represented by a circle with an X. A red line indicates the vertical angle of the focal point. The clipping plane is perpendicular to the vertical angle.

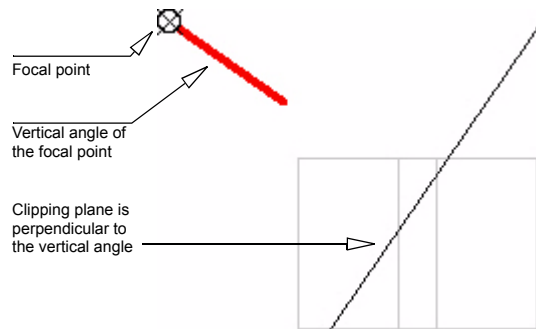
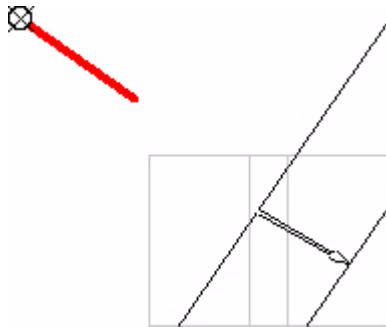


Figure 266.- Set first clipping plane

3. Click to set the location of the clipping plane.
4. Move the pointer to set the location of the second clipping plane. A second line, parallel to the first, follows the pointer. This line represents the second clipping plane.
5. Click to set the location of the second clipping plane. The active window returns to Render mode. **DCAD VectorSpace** displays the objects and parts of objects that occupy the space between the two clipping planes.



The Render mode window changes to Front view in Sculpt mode to set the clipping planes in a cube.

Figure 267.- Set second clipping plane

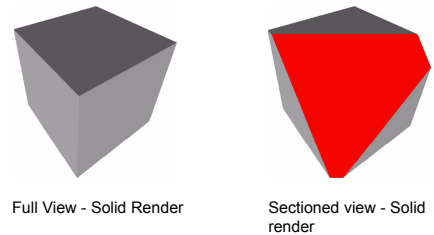


Figure 268.- Clipping planes in Render mode

If you change the focal point after setting clipping planes, **DCAD VectorSpace** activates Full View in the Sections submenu. This displays the entire rendering. By choosing Sectioned View in the Sections pop-up menu, you can view a clipped section of your rendering from the sightline orientation defined by the new focal point you set. The orientation of the clipping planes is now perpendicular to the new sight line.

Full View

Modes: Sculpt, Render
Mac OS Shortcut: Cmd+[
Windows Shortcut: Ctrl+[

You can use the Full View command to deactivate clipping planes. Once clipping planes are deactivated, you can reactivate them at any time using the Sectioned View command in the Clipping Plane sub-

menu. This command works the same way in Sculpt mode and Render mode. This command is also available in the Sections pop-up menu on the Status bar.

To deactivate clipping planes: Choose Full View in the Clipping Plane submenu, press Ctrl+[(Windows), or press Cmd+[(Mac OS).

Sectioned View

Modes: Sculpt, Render
Mac OS Shortcut: Cmd+]
Windows Shortcut: Ctrl+]

You can use the Sectioned View command to activate clipping planes. Once clipping planes are activated, you can deactivate them at any time using the Full View command in the Clipping Plane submenu.

This command works the same way in Sculpt and Render mode. This command is also available in the Sections pop-up menu on the Status bar.

To activate clipping planes: Choose Sectioned View in the Clipping Plane submenu, press Ctrl+] (Windows), or press Cmd+] (Mac OS).

Refresh

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+K
Windows Shortcut: F5

view magnification, or change the stacking order for objects.

By using the Refresh command, you can refresh the display in the active Draft or Sculpt document window and redraw all visible objects on-screen. This might be necessary when you scroll or change the

To use the Refresh command: Choose Refresh in the View menu, press F5 (Windows), or press Cmd+K (Mac OS). **DCAD VectorSpace** redraws all visible objects in the active document window.

Relative View submenu

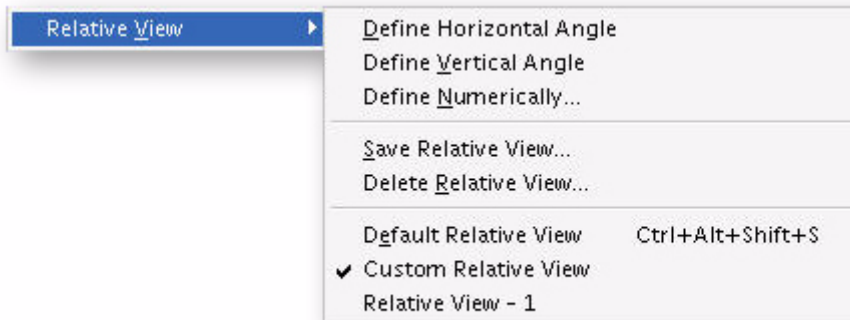


Figure 269.- Relative View submenu

In addition to the six standard orthogonal views, **DCAD VectorSpace** can show a project from non-standard views based on angles you define graphically or numerically. These non-orthogonal views are called *Relative Views*. Because Relative Views are non-orthogonal, they can be used to integrate various parts of your project from non-orthogonal perspectives. In other words, Relative Views let you view 3D objects from angles that are not parallel to any axis in a standard view.

A Relative View can be thought of as a separate project workspace, which is relative to the

DCAD VectorSpace workspace. When you activate a Relative View, you can draw objects, create layer sets, define extrusion planes, and generally work in a workspace related to, but independent of the **DCAD VectorSpace** workspace. You can relate the work you do in a Relative View to the **DCAD VectorSpace** workspace by choosing Default Relative View. (The **DCAD VectorSpace** workspace is the default Relative View.) In the default Relative View, you can view objects drawn in a Relative View based on the Relative View's specified angle.

While Relative Views can be created, activated, or deactivated only in Sculpt mode, they affect the way you see your project in both Draft and Sculpt modes. To see a Relative View affect objects in Draft mode,

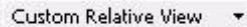
you must set your View Options to show 2D and 3D objects. This functions in a manner similar to the six standard views which act independently in Draft mode like separate drawings.

Custom Relative View

Custom Relative View appears in the Relative View submenu as the last custom Relative View you defined, even if you didn't save it using the Save Relative View command.

Until you define a Relative View in a view, Custom Relative View won't appear in the Relative View submenu, or the Relative View pop-up menu. If you save a Relative View, Custom Relative View disappears from the Relative View pop-up menu, and the Relative View submenu.

Mode: Sculpt

A screenshot of a software interface showing a dropdown menu with the text "Custom Relative View" and a downward-pointing arrow.

Also, if you select a saved Relative View or the Default Relative View, Custom Relative View disappears from the Relative View pop-up menu, and the Relative View submenu.

Custom Relative View reappears when you define another Relative View.

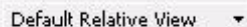
In addition, when you activate a Draft mode or Sculpt mode window, **DCAD VectorSpace** shows you if Custom Relative View is active. If so, Custom Relative View appears in the Relative View pop-up menu on the Status bar. Also, a check mark appears next to Custom Relative View in the Relative View submenu.

Default Relative View

The Default Relative View command selects the Default Relative View. The Default Relative View command appears in the Relative View pop-up menu when you select it, or until you define a Relative View

In addition, when you activate a Sculpt mode window, **DCAD VectorSpace** shows you if the Default Relative View command is active. If so, Default Rel-

Mode: Sculpt
Mac OS Shortcut: Cmd+Opt+Shift+O
Windows Shortcut: Ctrl+Alt+Shift+O

A screenshot of a software interface showing a dropdown menu with the text "Default Relative View" and a downward-pointing arrow.

ative View appears in the Relative View pop-up menu on the Status bar, and a check mark appears next to the command's name in the Relative View submenu.

To use the Default Relative View command

1. If necessary, open and activate a Sculpt mode window.
2. To activate the Default Relative View, choose Default Relative View in the Relative View pop-up menu on the Status bar or in the Relative View submenu.

Define Horizontal Angle

Mode: Sculpt

You can use the Define Horizontal Angle command to create a Relative View. You define the Relative View by choosing a point and angle to view the document.

To create a Relative View using Define Horizontal Angle

1. Choose the Define Horizontal Angle command in the Relative View submenu. **DCAD VectorSpace** changes to Top view and the pointer changes to a Relative View pointer.
 - After using the Define Horizontal Angle command, the document window remains set to Top view, regardless of the view in which you chose the command.

2. Place the pointer where you want to set the Relative point¹.
3. Click to set the point. The Relative View sight line is represented by the drawing vector as it extends and revolves around the set point. A cone of vision also extends from the set point.
4. Click to set the horizontal direction of the sight line.

You now view the objects in the window from the horizontal angle of the point you set.

-
1. Camera Position with respect to the Plan base plane.

Define Numerically

Mode: Sculpt

You can use the Define Numerically command to create a Relative View. You define the Relative View by entering numbers for the horizontal and vertical angle from which you want to view the objects in your document.

To define a Relative View numerically

1. Choose Define Numerically in the Relative View submenu. The Relative View dialog box opens.

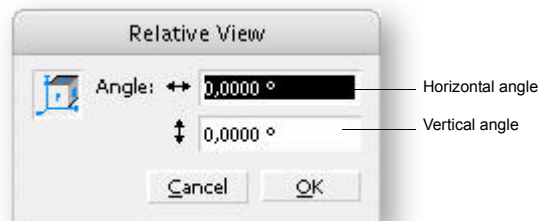


Figure 270.- Defining a Relative View numerically

2. Type the Relative View's horizontal and vertical angles in the text boxes (**figure 270**), and then Click OK.

You now view the objects in the window from the vertical and horizontal angles you set.

Define Vertical Angle

Mode: Sculpt

You can use the Define Vertical Angle command to create a Relative View. You define the Relative View by choosing a point and angle to view the document.

To create a Relative View using Define Vertical Angle

1. Choose the Define Vertical Angle command in the Relative View submenu. **DCAD VectorSpace** changes to Right view and the pointer changes to a Relative View pointer.
 - After using the Define Vertical Angle command, the document window is set to Top

view, regardless of the view in which you chose the command.

2. Place the pointer where you want to set the Relative point.
3. Click to set the point. The relative view sight line is represented by the drawing vector as it extends and revolves around the set point. A cone of vision also extends from the set point.
4. Click to set the vertical direction of the sight line. **DCAD VectorSpace** switches to Top view.

You now view the objects in the window from the vertical angle of the point you set.

Delete Relative View

Modes: Sculpt

The Delete Relative View command deletes saved Relative Views. When you delete a Relative View, its name disappears from the Relative View pop-up menu on the Status bar, and the Relative View submenu.

If you try to delete the active Relative View, a warning message appears. In this case, **DCAD VectorSpace** maintains the current Relative View as the Custom Relative View.

To use the Delete Relative View command

1. Choose Delete Relative View in the Relative View submenu. The Delete Relative View dialog box appears.
2. In the dialog box, click the names of the Relative Views you want to delete.
 - To select (or deselect) a continuous range of Relative Views, press Shift and click the first and last Relative Views' names.
 - To select (or deselect) several non-contiguous Relative Views, press Ctrl (Windows)



or Cmd (Mac OS) and click each Relative View's name.

3. To remove the Relative Views, click Remove.
4. To permanently delete the removed Relative Views, click OK.

Save Relative View

Mode: Sculpt

The Save Relative View command saves a Relative View. When you save a Relative View, the names of Relative Views appear in the Relative View pop-up menu on the Status bar, and at the bottom of the Relative View submenu.



For example, when you define a Relative View, you create a “custom” Relative View, and it appears in the Relative View pop-up menu as Custom Relative View. You can then use the Save Relative View command to save the Custom Relative View with an assigned name.

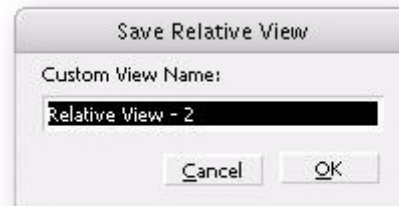
To avoid confusion, remember Custom Relative View in the Relative View submenu *is not* the same thing as a *saved* “custom” Relative View. Anytime you define a Relative View, you *create* a new “custom” Relative View. Custom Relative View is the last Custom Relative View you created, whether you saved it or not.

When you use the Save Relative View command, **DCAD VectorSpace** saves the Relative View with a name you assign, and adds it to the Relative View pop-up menu. Having saved the Relative View with an assigned name, **DCAD VectorSpace** then removes Custom Relative View from the Relative View pop-up menu, and the Relative View submenu until you define another Relative View.

If you click Cancel, removed Relative Views are restored and **DCAD VectorSpace** closes the dialog box.

To use the Save Relative View command

1. If necessary, open or activate a Sculpt mode window.
2. If necessary, create a Relative View. Custom Relative View appears in the Relative View pop-up menu.
3. Choose Save Relative View in the Relative View submenu. The Save Relative View dialog box opens.



4. Type a name for the Relative View in the text box. In general, the name should try to indicate the purpose and function of the Relative View.
5. To save the Relative View, click OK. **DCAD VectorSpace** adds the name you assign to the Relative View to the Relative View pop-up menu on the Status bar. It also lists its name at the bottom of the Relative View submenu.
 - To close the dialog box and not save the Relative View, click Cancel.

Selecting a saved Relative View

The names of saved Relative Views appear in the Relative View pop-up menu on the Status bar, and at the bottom of the Relative View submenu.

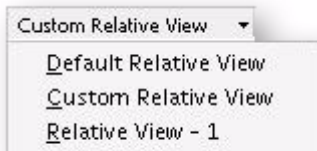


Figure 271.- Saved Relative Views

In **DCAD VectorSpace**, there's always a Relative View active; it can be the Default Relative View, Custom Relative View or a saved Relative View. Once you save



a Relative View, it appears in the Relative View pop-up menu.

In addition, when you activate a Sculpt mode window, **DCAD VectorSpace** shows you if a saved Relative View is active. If so, the name of the Relative View appears in the Relative View pop-up menu on the Status bar, and a check mark appears next to the command's name in the Relative View submenu.

To select a saved Relative View

1. If necessary, open or activate a Sculpt mode window.
2. To select a saved Relative View, choose *saved Relative View* in the Relative View pop-up menu, or in the Relative View submenu, where *saved Relative View* is the assigned name of the Relative View you want to select.

Snapshot submenu

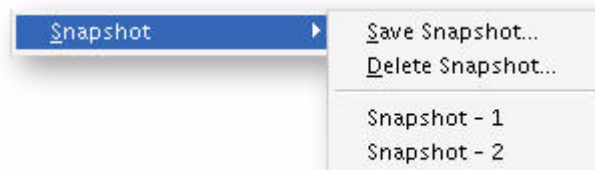


Figure 272.- Snapshot submenu

To make viewing and navigating easier, you can take “snapshots” of a drawing. A snapshot records the zoom level and visible area of the active window.

After you save snapshots, you can choose one in the Snapshot submenu to return to the same view of a drawing.

The commands in the Snapshot submenu let you save, use, and delete snapshots. These commands are available in Draft, Sculpt, and Render modes.

save Snapshot

Modes: Draft, Sculpt, Render

The Save Snapshot command remembers the current zoom level and the part of the document visible in the active window.

The Save Snapshot command lets you save snapshots that show different areas of your drawing at different zoom levels.

When you save a snapshot, you give it a name; the name appears at the bottom of the Snapshot submenu. By choosing the name in the submenu, it's easy to switch to different areas of a drawing at different zoom levels. You can even use snapshots to change modes and views.

Saving snapshots in Render mode lets you easily preserve Focal Point positions (camera angles) for viewing renderings. After using the Save Snapshot command, you can make multiple changes that affect a rendering, without having to reconfigure camera angles.

Choosing snapshots

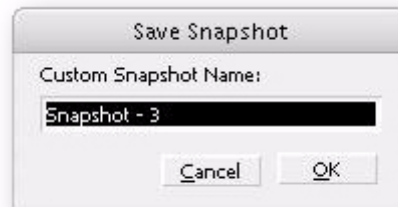
You must save a snapshot with the Save Snapshot command before you can choose the snapshot from the Snapshot submenu.

You can choose a saved snapshot in any mode or view. Keep in mind that **DCAD VectorSpace** will

The Snapshot submenu appears in the View menu in all modes. This section describes the Snapshot submenu commands.

To use the Save Snapshot command

1. Choose Save Snapshot in the Snapshot submenu. The Save Snapshot dialog box appears.



2. Type a name for the snapshot. The name can contain up to 24 characters.
 - If you intend to save many snapshots taken in different modes and views, it's important to assign names that indicates the mode and view of each snapshot. Otherwise, it will be hard to know whether choosing a particular snapshot will change the mode or view of the active window.
3. Click OK. **DCAD VectorSpace** saves the snapshot, and adds its name to the bottom to the Snapshot submenu in the View menu.

switch the active window to the mode and view in which the snapshot was taken.

To choose a snapshot: Choose *saved snapshot* in the Snapshot submenu, where *saved snapshot* is the name of the snapshot you want to use.

DCAD VectorSpace switches the active window to the zoom level and visible area “remembered” by the snapshot. If necessary,

DCAD VectorSpace also switches to the mode and view in which you took the Snapshot.

Delete Snapshot

Modes: Draft, Sculpt, Render

The Delete Snapshot command lets you delete snapshots you have saved with the Save Snapshot command.

The Delete Snapshot command is not available if no saved snapshots exist in the document.

Note: You cannot use the Undo command to restore snapshots that you have deleted with the Delete Snapshot command.



To use the Delete Snapshot command

1. Choose Delete Snapshot in the Snapshot submenu. The Delete Snapshot dialog box appears.
2. In the dialog box, select the name of the Snapshot (or snapshots) you want to delete. When you select a snapshot, the name is highlighted and the Remove button becomes available.
 - To select (or deselect) a continuous range of snapshots, press Shift and click the first and last snapshots' names.
 - To select (or deselect) several non-contiguous snapshots, press Ctrl (Windows) or Cmd (Mac OS) and click each snapshot's name.

3. To remove the selected snapshots from the list, click Remove.
4. To permanently delete the snapshots removed from the list, click OK. The Delete Snapshot dialog box closes and **DCAD VectorSpace** removes the snapshots' names from the Snapshot submenu.
 - If you decided to close the dialog box without deleting the snapshots marked for deletion, click Cancel.

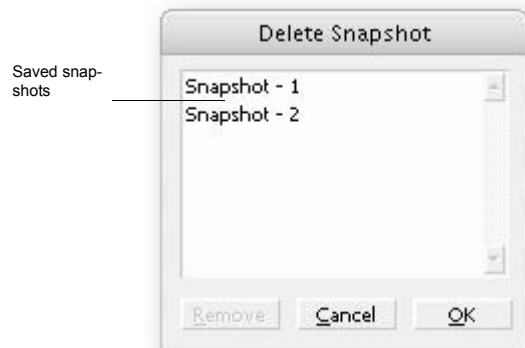


Figure 273.- Delete Snapshot dialog box

View Options submenu

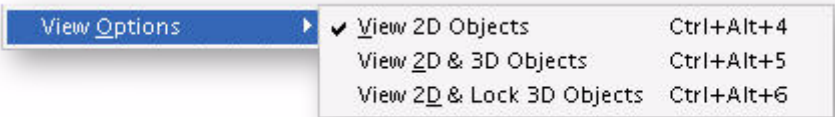


Figure 274.- View Options submenu - Draft Mode

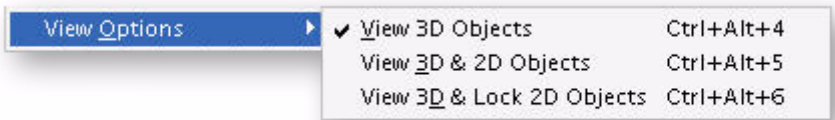


Figure 275.- View Options submenu - Sculpt Mode

The commands in the View Options submenu make the Draft and Sculpt environment more flexible, because they let you view 2D and 3D objects in windows that are set to either mode.

The View Options submenu appears in the View menu. Also, when the Status bar is displayed, the View Options pop-up shows the active command and lets you choose View Options commands.

View Options in Draft mode

To choose View 2D Objects, View 2D & 3D Objects, or View 2D & Lock 3D Objects, you must have a Draft mode window active.

Choosing a View Options command affects the active window only. If you have multiple Draft windows open, you need to activate each one to change its View Options.

The active View Option appears in the View Options pop-up menu at the left end of the Status bar. Addi-

In Draft mode, the View Options display 2D objects only, 2D and 3D objects, or 2D and 3D objects with 3D objects locked.

In Sculpt mode, the View Options display 3D objects only, 3D and 2D objects, and 3D and 2D objects with 2D objects locked.

tionally, a check appears next to the active View Option in the View Options submenu.

When you choose a View Option, a dialog box appears to remind you that you've activated a 2D and 3D design environment. 2D objects are displayed in red and 3D objects are displayed in blue. This overrides all other display options for the objects in that window.

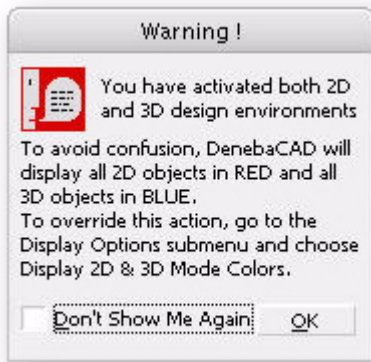
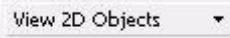


Figure 276.- Warning dialog box

View 2D Objects

Mode: Draft
Mac OS Shortcut: Cmd+Opt+4
Windows Shortcut: Ctrl+Alt+4

View 2D Objects displays 2D objects only.



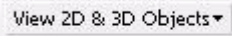
To view 2D objects only:

Choose View 2D Objects in the View Options menu, press Ctrl+Alt+4 (Windows), or press Cmd+Opt+4 (Mac OS). Or, choose View 2D Objects in the pop-up menu at the left end of the Status bar.

View 2D & 3D Objects

Modes: Draft
Mac OS Shortcut: Cmd+Opt+5
Windows Shortcut: Ctrl+Alt+5

View 2D & 3D Objects displays 2D objects in red and 3D objects in blue.

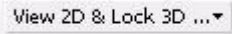


To display 2D and 3D objects: Choose View 2D & 3D Objects in the View Options submenu, press Ctrl+Alt+5 (Windows), or press Cmd+5 (Mac OS). Or, choose View 2D & 3D Objects in the pop-up menu at the left end of the status bar.

View 2D & Lock 3D Objects

Mode: Draft
Mac OS Shortcut: Cmd+Opt+6
Windows Shortcut: Ctrl+Alt+6

View 2D & Lock 3D Objects displays 2D objects in red and 3D objects in blue, with 3D objects locked. You can't move, delete, or edit locked 3D objects.



To view 2D and locked 3D objects: Choose View 2D & Lock 3D Objects in the View Options menu, press Ctrl+Alt+6 (Windows), or press Cmd+Opt+6 (Mac OS). Or, choose View 2D & Lock 3D Objects in the Pop-up menu at the left end of the Status bar.

After choosing this command, you can choose Display Locked Objects in Gray in the Display Options submenu to display locked 3D objects in gray instead of blue.

View Options in Sculpt mode

To choose View 3D Objects, View 3D & 2D Objects, or View 3D & Lock 2D Objects, you must have a Sculpt mode window active.

Choosing a View Options command affects the active window only. If you have multiple Sculpt windows open, you need to activate each one to change its View Options.

The active View Option appears in the View Options pop-up menu at the left end of the Status bar. Additionally, a check appears next to the active View Option in the View Options submenu.

When you choose a View Option, a dialog box appears (**figure 276**) to remind you that you've activated a 2D and 3D design environment. 2D objects are displayed in red and 3D objects are displayed in blue. This overrides all other display options for the objects in that window.

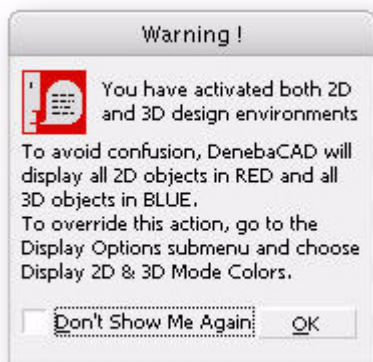


Figure 277.- Warning dialog box

View 3D Objects

View 3D Objects displays 3D objects only.

Mode: Sculpt
Mac OS Shortcut: Cmd+Opt+4
Windows Shortcut: Ctrl+Alt+4

View 3D Objects ▼

To view 3D objects only: Choose

View 3D Objects in the View Options submenu, press Ctrl+Alt+4 (Windows), or press Cmd+Opt+4 (Mac OS). Or, choose View 3D Objects in the pop-up menu at the left end of the Status bar.

View 3D & 2D Objects

View 3D & 2D Objects displays 2D objects in red and 3D objects in blue.

Mode: Sculpt
Mac OS Shortcut: Cmd+Opt+5
Windows Shortcut: Ctrl+Alt+5

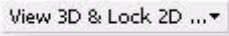
View 3D & 2D Objects ▼

To view 3D and 2D objects: Choose View 3D & 2D Objects in the View Options submenu, press Ctrl+Alt+5 (Windows), or press Cmd+Opt+5 (Mac OS). Or, choose View 3D & 2D Objects in the pop-up menu at the left end of the Status bar.

View 3D & Lock 2D Objects

Mode: Sculpt
Mac OS Shortcut: Cmd+Opt+6
Windows Shortcut: Ctrl+Alt+6

View 3D & Lock 2D Objects displays 2D objects in red and 3D objects in blue, with 2D objects locked. You can't move, delete, or edit locked 2D objects.



To view 3D and locked 2D objects: Choose View 3D & Lock 2D Objects in the View Options submenu, press Ctrl+Alt+6 (Windows), or press Cmd+Opt+6 (Mac OS). Or, choose View 3D & Lock 2D Objects in the pop-up menu at the left end of the Status bar.

After choosing this command, you can choose Display Locked Objects in Gray in the Display Options submenu to display locked 2D objects in gray instead of red.

Window menu commands



In this chapter:

- Using Show / Hide window commands
- Hide Draft / Show Draft
- Hide Sculpt / Show Sculpt
- Hide Render / Show Render
- Tile
- Analysis Manager
- Class Manager
- Layer Manager
- Tool Manager
- DCAD VectorSpace Tool Palettes
- Properties Manager
- DCAD VectorSpace tools and settings

Window menu commands



Figure 278.- Window menu commands

Commands in the Window menu let you manage multiple windows to draft, model, and render your drawings. Commands in this menu also display palettes that let you manage objects and information in a **DCAD VectorSpace** document.

Show and Hide window commands

The first part of this chapter describes how to use the Show and Hide commands in the Window menu to manage Draft, Sculpt, and Render windows (see “Using Show / Hide window commands,” next).

Palette commands

The Window menu contains several commands that display palettes for managing objects, layers, and data. The following commands, and the associated palettes, are described later in this chapter:

Analysis Manager. Displays a palette for data analysis (see **Analysis Manager**, page 357).

Class Manager. Displays a palette for managing Classes and class data (see **Class Manager**, page 365).

Layer Manager. Displays a palette for managing layers in Draft and Sculpt mode (see **Layer Manager**, page 367).

Properties Manager. Displays a palette containing editable object data for modifying and managing objects (see **Properties Manager**, page 391).

Using Show / Hide window commands

The three commands that appear at the top of the Window menu let you manage Draft, Render, and Sculpt windows. You use these windows for 2D

drafting, 3D modeling, and rendering in **DCAD VectorSpace**.

Show Draft / Hide Draft. Opens a Draft mode window or closes the same window.

Show Sculpt / Hide Sculpt . Opens a Sculpt mode window or closes the same window.

Show Render / Hide Render. Opens a Render mode window or closes the same window.

Each of the window management commands begins with the word *Show* or *Hide*. When you use one of the Show commands, the command is replaced by a Hide command. Each open window has a corresponding Hide command.

For example, if you open Draft and Render windows for a document, the following commands appear in the Window menu:

Hide *name*-Draft-Top
Show Sculpt
Hide *name*-Render

The *name* that appears in the command is the name of the document. Before you save a document with a different name, the word *untitled* appears as the document's name.

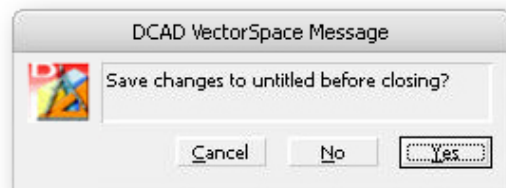
Each Show or Hide command also includes the mode and the view that the window is set to. For example, a window in Draft mode in Top view would have a corresponding menu command of **Hide *untitled*-Draft-Top**.

When you create a new document, **DCAD VectorSpace** opens a single Draft mode window. In this case, the first command in the Window menu is Hide *name*-Draft-Top, which lets you hide the Draft window. The other two commands let you open a Sculpt mode window and a Render mode window for the document (**figure**).

Closing windows and documents

Each Hide command in the Window menu closes a single window, the same as clicking the window's close box. This is in contrast to the Close command in the File menu. The Close command closes the current document and all of its open windows.

However, if you use a Hide command when only one document window is open, **DCAD VectorSpace** closes the document, the same as if you used the Close command. If the document has been changed but has not been saved, **DCAD VectorSpace** asks if you want to save the changes before closing the document.



To save changes before closing the document, click Save. To close the document without saving changes, click Don't Save. To continue working in the document without closing the window, click Cancel.

Using multiple windows

You can open up to three windows to view a document in different modes — Draft, Sculpt, and Render — and different views — Top, Bottom, Front, Back, Left, and Right.

When you open a new window, or click a window to make it active, **DCAD VectorSpace** switches to the mode of that window. The program operates in one

mode at a time. Switching modes requires only that you switch to (or open) a window in a different mode.

For example, if you are working in Draft mode, and you choose the Show Sculpt command to open a Sculpt window, this makes the new Sculpt mode window active and switches you to working in Sculpt mode.

Changing modes in **DCAD VectorSpace** changes the tools available in the toolbox, as well as changing the available menu commands and the available Action buttons (if the Action buttons are displayed).

Changing window modes

As mentioned previously, you can change modes by opening a new window or switching to another open window. However, you can also change modes by using the Mode pop-up menu at the bottom of a window to change the window's mode (**figure 279**).

You need to use this technique if you want to have more than one Draft, Sculpt, or Render window open at one time. By choosing a mode from a window's mode pop-up menu, you change the mode of that window, and the mode in which you are working, without affecting other open windows.

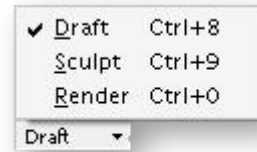


Figure 279.- Window mode pop-up menu

If you change the mode of any open windows, the Hide commands in the Window menu will correspond to the modes of the open windows. In other words, if there are three Sculpt mode windows open, the three commands at the top of the Window menu will be Hide Sculpt commands.

Tiling windows

By default, **DCAD VectorSpace** arranges open windows so they do not overlap. This feature is called “Auto-tile windows.” You can change this preference setting in the Preferences dialog box. If you deselect the “Auto-tile windows” checkbox, each new window that you open will fill the drawing window area.

You can use the Tile command in the Window menu to arrange open windows so they do not overlap.

Hide Draft / Show Draft

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+1
Windows Shortcut: Ctrl+Alt+1

The Show Draft command opens a Draft mode window. The Hide Draft command closes the Draft mode window.

The Show Draft command is available if you have not opened a Draft mode window for the current

document. The Hide Draft command is available if a Draft mode window is open for the current document.

To open a Draft window: Choose Show Draft in the Window menu. **DCAD VectorSpace** opens a Draft mode window in Top view.

To close a Draft mode window: Choose Hide Draft in the Window menu or click the Window's close box. **DCAD VectorSpace** closes the Draft mode window.

If you use the Hide Draft command when only one document window is open, **DCAD VectorSpace** closes the document, or asks if you want to close the document if it has not been saved. To save changes before closing the document, click Save.

Hide Sculpt / Show Sculpt

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+2
Windows Shortcut: Ctrl+Alt+2

The Show Sculpt command opens a Sculpt mode window. The Hide Sculpt command closes the Sculpt mode window.

The Show Sculpt command is available if you have not opened a Sculpt mode window for the current document. The Hide Sculpt command is available if a Sculpt mode window is open for the current document.

To open a Sculpt window: Choose Show Sculpt in the Window menu. **DCAD VectorSpace** opens a Sculpt mode window in Top view.

To close a Sculpt mode window: Choose Hide Sculpt in the Window menu or click the window's close box. **DCAD VectorSpace** closes the Sculpt mode window.

If you use the Hide Sculpt command when only one document window is open, **DCAD VectorSpace** closes the document, or asks if you want to close the document if it has not been saved. To save changes before closing the document, click Save.

Hide Render / Show Render

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+Opt+3
Windows Shortcut: Ctrl+Alt+3

The Show Render command opens a Render mode window. The Hide Render command closes the Render mode window.

The Show Render command is available if you have not opened a Render mode window for the current document. The Hide Render command is available if a Render mode window is open for the current document.

To open a Render window: Choose Show Render in the Window menu and **DCAD VectorSpace** opens a Render mode window.

To close a Render mode window: Choose Hide Render in the Window menu or click the window's close box. **DCAD VectorSpace** closes the Render mode window.

If you use the Hide Render command when only one document window is open, **DCAD VectorSpace** closes the document, or asks if you want to close the document if it has not been saved. To save changes before closing the document, click Save.

Tile

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+T
Windows Shortcut: Ctrl+T

The Tile command fits open windows within the screen area and arranges them so they don't overlap.

With two windows open, Tile places one window on the left and the other on the right of the screen. With three windows open, the Tile command puts one window on the left and the other two windows on the right of the screen. If you're working with Draft, Sculpt, and Render windows open, **DCAD VectorSpace** puts the Draft window on the left, the Sculpt window on the top right, and the Render window on the bottom right.

You can also use the Tile command to reposition document windows if you change the resolution of your monitor while you work.

To use the Tile command: Choose Tile in the Window menu, press Ctrl+T (Windows) or press Cmd+T (Mac OS).

Auto-tiling preference

By default, **DCAD VectorSpace** arranges windows as if you had chosen the Tile command whenever you open a new window.

This behavior is controlled by the "Auto-tiling windows" option in the Preferences dialog box. As long as this option is selected, you do not need to use the Tile command. If you deselect the "Auto-tiling windows" option, you can use the Tile command to arrange multiple windows.

Analysis Manager

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Shift+I
Windows Shortcut: F3

The Analysis Manager command displays the Analysis Manager. You can use the Analysis Manager to create summary reports on the objects in a **DCAD VectorSpace** document. You can export this information as a text file and then use a spreadsheet or database application to make calculations and print reports.

The Analysis Manager can remain open while you work. It floats on the desktop, appearing in front of drawing windows.

To display the Analysis Manager: Choose Analysis Manager in the Window menu, press F3 (Windows), or Cmd+Shift+I (Mac OS). **DCAD VectorSpace** displays the Analysis Manager. When first displayed, the Analysis Manager appears in a two-column format.

To close the Analysis Manager: Click the close box at the upper-left corner of the Analysis Manager.

displaying data in the analysis manager

The Analysis Manager window (**figure 280**) contains a row of pop-up menu buttons near the top. Below the menus is a resizeable scrolling list area where report data is displayed.

You can think of the Analysis Manager as a report generator and data display window that is organized like a spreadsheet.

To create a report in the Analysis Manager, you select data types from the pop-up menus and choose the Update command. The scrolling list area displays object data in rows and columns.

Data field menus

Continuing the spreadsheet metaphor, the column headings in the Analysis Manager are data types that you choose from the pop-up menus. For example, if you choose the data type “Tool” in the “Data Field 1:” pop-up menu, the list area displays in the first column the names of tools used in the document.

Data rows

Each row displays information on one object or a collection of objects. A row in the Analysis Manager

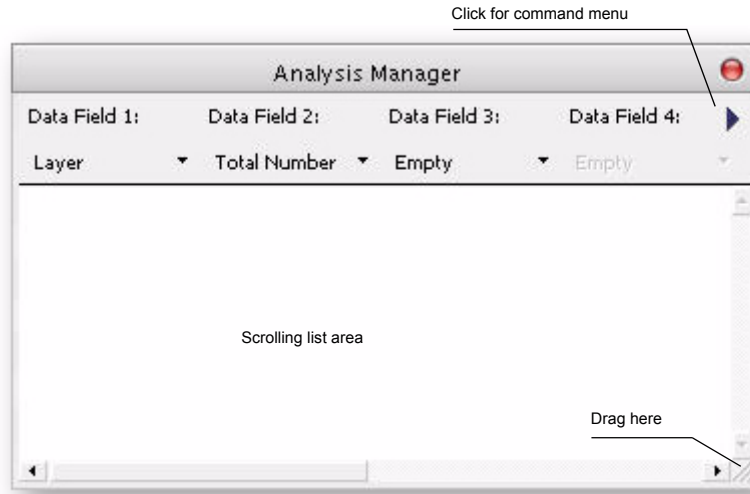
is similar to a record in a database. For example, if you choose a Class name as the first column heading, each row displays the name of a Class object defined in the document. If the next column displays the “Total” data type, each row displays the total number of associated objects.

The Analysis Manager window

When you first open the Analysis Manager, two pop-up menu buttons appear above the scrolling list. You can expand the manager by dragging the lower-right corner of the window to the right. As you expand the window, additional pop-up menu buttons appear.

You can also use the horizontal scroll bar at the bottom of the Analysis Manager to view columns to the right of those visible in the window.

The labels above the buttons identify the pop-up menus (from left to right) as Data Field 1, Data Field 2, Data Field 3, and so on through Data Field 8. When the manager window is fully extended, eight buttons appear.



Drag the corner to extend the Analysis Manager or use the scroll bar to view additional columns.

Figure 280.- Using the Analysis Manager window

Analysis Manager commands

A pop-up menu in the Analysis Manager contains commands to update the items displayed; to save the current report; and to select objects in the document based on a selected item in the scrolling list.

This pop-up menu is located under the arrow button at the upper-right corner of the Analysis Manager, as shown in (figure 281).



Figure 281.- Analysis Manager commands

The following commands appear in the pop-up menu:

Update. Choose the Update command to update the items displayed in the scrolling list. You need to choose this command whenever you change a data field.

Save. Choose Save to save the current listing in a text file.

Select. Choose Select to select objects in the document based on the row of data that is selected in the scrolling list.

To use the Analysis Manager

1. Choose Analysis Manager in the Window menu to display the Analysis Manager.
2. Extend the Analysis Manager to the right by dragging the lower-right corner if necessary. You can extend the window to display up to eight columns of data.

3. In the Data Field 1 pop-up menu (above the first column on the left), choose the data item you want to display.
4. To display additional columns of data, choose data items from the other Data Field pop-up menus.
5. Choose Update in the pop-up menu under the arrow button. The Analysis Manager updates the data displayed in the scrolling list area.

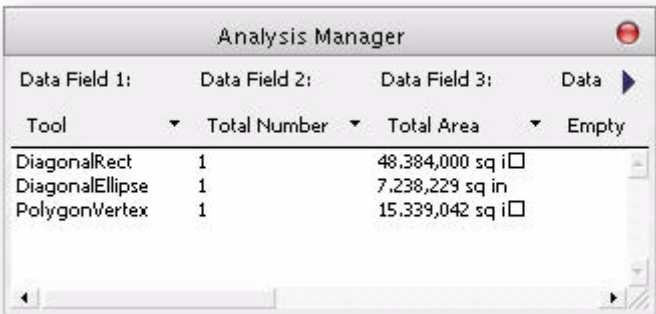
Exporting data from the Analysis Manager

Once you compile a report in the Analysis Manager, you can export the data as a tab-delimited text file.

Exporting the Analysis Manager data lets you work with the data in any spreadsheet or database program that can import tab-delimited text.

You can use the calculation and data analysis features of a spreadsheet or database program to manipulate Analysis Manager data.

For example, you can use an Analysis Manager report in a spreadsheet program to calculate a project's cost of materials. You can do this by multiplying a column of price data by the item totals in another column.



Data Field 1:	Data Field 2:	Data Field 3:	Data
Tool	Total Number	Total Area	Empty
DiagonalRect	1	48.384,000 sq i	<input type="checkbox"/>
DiagonalEllipse	1	7.238,229 sq in	
PolygonVertex	1	15.339,042 sq i	<input type="checkbox"/>

Figure 282.- An Analysis Manager report

When you select a different heading or modify the document, the window in the Analysis manager clears. So, to keep a report visible in the Analysis Manager window, make sure you're finished with the report before making changes.

To export an Analysis Manager report

1. Compile a report in the Analysis Manager by following the steps under **To use the Analysis Manager**, page 359.

2. Choose Save in the pop-up menu under the arrow button. A directory dialog box appears.
3. Select a location for saving the exported report and type a file name in the "Save a copy in" text box.
4. Click Save to save the report file.

Selecting objects with the Analysis Manager

You can use the Analysis Manager to select objects in a document. This feature can help you identify a particular item or to select a series of objects so you can apply a command to the entire selection.

When you use the Select feature in the Analysis Manager, you can make a selection based on one row in the Analysis Manager scrolling list.

- If you highlight a row that describes a collection of objects (such as a Class or Container) and choose the Select command in the pop-up menu, **DCAD VectorSpace** selects all the objects in the collection.
- If you highlight a row that describes one object, **DCAD VectorSpace** selects that one object when you choose the Select command. You can

then highlight a different row and choose Select again to add to the current selection.

To select objects with the Analysis Manager

1. Compile a report in the Analysis Manager by following the steps under **To use the Analysis Manager**, page 359.
2. Click a row of data you want to use to make a selection. The row you click becomes highlighted.
3. Choose Select in the pop-up menu under the arrow button.
4. To make additional selections, click another row of data to highlight the row, and choose Select in the pop-up menu under the arrow button. **DCAD VectorSpace** selects the objects described by the highlighted row, adding these objects to the current selection.

Selecting data types

The pop-up menus in the Analysis Manager define the column headings for the display of data in the scrolling list area. The first pop-up menu defines the data type for the first column from the left in the scrolling list. The next pop-up menu defines the data type for the next column of the scrolling list, and so on.

You can select or change the data displayed in any column by choosing a data type from the pop-up menu above the column.

Each pop-up menu contains four items: Empty, Computing, General, and Object Class.

Choosing Empty turns off the display of data in a column and all columns to the right. The pop-up menus to the right of the “Empty” column are dimmed and not available. Data won’t appear in these columns when you choose the Update command.

The other three items — Computing, General, and Object Class — display submenus of data types. Drag to a data type in the pop-up submenu to choose it. The data type you choose appears in the pop-up menu button until you choose another data type.

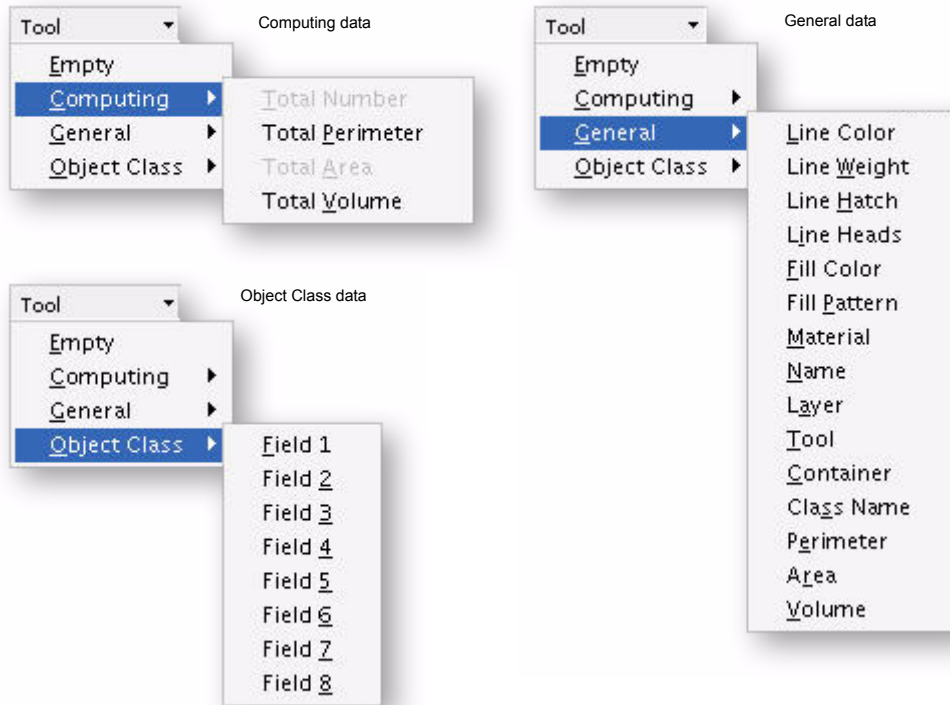


Figure 283.- Data categories in the Analysis Manager

The data types available in the pop-up menus are described below.

Computing data types

The Computing submenu contains four data types: Total Number, Total Perimeter, Total Area, and Total Volume.

- If you select a computing value in a column, the pop-up menu for the next column allows only the use of the remaining computing values. If you select all computing values, you can't make anymore selections.

Total Number. Counts the number of items listed in each row and displays the total count.

Total Perimeter. Calculates the total perimeter measurement of the objects listed in each row and displays the perimeter measurement. If an object is a polygon, its perimeter is computed. If the object is a group, the sum of the perimeters of the individual objects is displayed.

Total Area. Calculates the total area of the objects listed in each row and displays the area measurement. If an object is a polygon, its area is computed. If the object is a group, the sum of the areas of the individual objects is displayed. If an object is an open polyline, its area is zero.

Total Volume. Calculates the total volume of the objects listed in each row and displays the volume measurement. Volume is computed for 3D objects only.

General data types

The General submenu contains the following data types: Line Color, Line Weight, Line Hatch, Line Heads, Fill Color, Fill Pattern, Name, Surface material, Layer, Tool, Container, Class Name, Perimeter, Area, and Volume.

Line Color. This data type displays the numeric RGB color values of an object's Pen color. This data is formatted as RGB: nnn,nnn,nnn (three, three-digit numbers). These numbers are the color values of the red, green, and blue components of the object's Pen color. The color values are measured on a scale of 0 to 100 percent. For example, the data for a pure red Pen color appears as RGB:100,000,000, indicating that the Pen color is 100 percent red, zero percent green, and zero percent blue in the RGB color system.

This method of displaying color data is also used on the Pen color tab in the Pen palette.

Line Weight. This data type displays the Pen weight of an object. The data appears as Pen:n. The number following Pen is the position of the object's Pen weight in the Pen weight tab, counting from the top of the tab. The same number appears at the bottom of the tab when you select a Pen weight in the Pen palette.

Line Hatch. This data type displays the name of the Fill hatch assigned to an object. The name of the Fill hatch also appears in the Name box on the Fill hatch tab.

Line Heads. This data type identifies the Arrowheads assigned to an object. The data appears as two numbers separated by a comma. The first number identifies the Arrowhead at the first endpoint of the line; the second number identifies the Arrowhead at the second endpoint of the line. The number 0 indicates that no Arrowhead is assigned. Numbers 1 and higher indicate the Arrowhead's position in the Arrowhead tab of

the Pen palette, counting from the top of the tab. For example, if a line has no Arrowhead at its first endpoint, and the Arrowhead at the line's second endpoint is the third Arrowhead from the top of the tab, this data appears as 0,3.

Fill Color. This data type identifies the numeric RGB color values of an object's Fill color. This data is formatted as RGB: nnn,nnn,nnn (three, three-digit numbers). These numbers are the color values of the red, green, and blue components of the object's Fill color. The color values are measured on a scale of 0 to 100 percent. For example, the data for a pure blue Pen color appears as RGB:000,000,100, indicating that the Pen color is zero percent red, zero percent green, and 100 percent blue in the RGB color system.

This method of displaying color data is also used on the Fill color tab in the Fill palette.

Fill Pattern. This data type displays the name of a selected object's Fill pattern, if one has been applied to the object. When you view a Fill pattern in the Fill palette, the pattern's name appears in the Name text box.

Surface material. This data type displays the name of a selected object's Surface material, if one has been applied to the object. The name of a Surface material appears in the Properties Manager when the object is selected.

Name. This data type displays the name of an individual object. **DCAD VectorSpace** assigns a name to every object when it is created, based on the object type and a number. The name of an object appears in the Properties Manager when the object is selected. You can change the object's name by typing in the Name text box on the Info tab in the Properties Manager.

Layer. This data type displays the name of the layer containing an object. You can assign layer names in the Layer Manager.

Tool. This data type displays an abbreviation that identifies the tool used to create an object. The following table lists the tool abbreviations that appear in the Analysis Manager and the corresponding **DCAD VectorSpace** tool names.

These tool data type abbreviations also appear in the Tool text box on the Tool tab in the Properties Manager, to identify the tool that created a selected object, and also in **DCAD VectorSpace**'s Parametric Text Format (PTF) language.

Table 6: DCAD VectorSpace tools and settings

Tool data type abbreviation	DCAD VectorSpace Tool name	Tool data type abbreviation	DCAD VectorSpace Tool name
3PointsArc	Arc 3 Points	3PointsCircle	Circle 3 Points
CenterEllipse	Ellipse Center to Corner	CenterRadiusArc	Arc Radius
CenterRadiusCircle	Circle Radius	CenterRect	Rectangle Center to Corner
CenterRoundRect	Rounded Rectangle Center to Corner	DiagonalEllipse	Ellipse Diagonal
DiagonalRect	Rectangle Diagonal	DiagonalRoundRect	Rounded Rectangle Diagonal
DirectLightSource	Omnidirectional Light Source	ElliptArc	Arc Elliptical
FreeEllipse	Ellipse 3 Points	FreeRect	Rectangle 3 Points
LightSource	Directional Light Source	Line	Line
OffsetPoly	Double Polyline	Polyline	Single Polyline
QB_Spline	Curve	PolygonMidpoint	Polygon Midpoint
PolygonVertex	Polygon Vertex	Text	Text
ChainDimm	Chain Dimension	BaselineDimm	Baseline Dimension
LeaderDimm	Leader Dimension	DoubleLeaderDimm	Constrained Dimension
AngleDimm	Angle Dimension	Walkthrough	Camera Path
VectorText	Text Rotated		

Container. The Container data type lets you construct reports based on the container objects you have defined in a document.

Containers are 2D objects created in Draft mode that define areas within their borders. You designate an object as a container by selecting the

object and then selecting the Container check box in the Properties Manager.

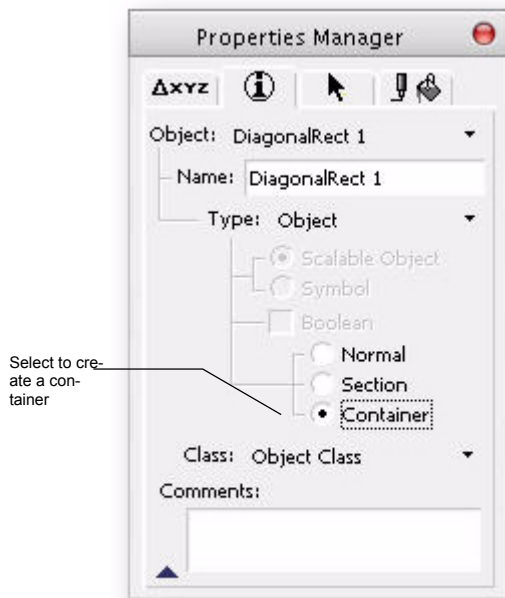


Figure 284.- Making a Container

When you use the Container data type, the Analysis Manager reports on all objects within the

Container object. For example, if six rectangles are inside a polygon that is a Container, and you display the Container data type and the Total Number data type (which is in the Computing submenu) in the Analysis Manager, the two columns will display the Container name and the number 6, because the Container holds six objects.

Class Name. This data type displays the name of an object class that you have defined in the document. You define classes using the Class Manager.

Perimeter. This data type displays the measurement of the perimeter of all objects.

Area. This data type displays the measurement of the area covered by all objects.

Volume. This data type displays the volume of all objects. **DCAD VectorSpace** calculates volume for 3D objects only.

Object Class categories

The Object Class submenu displays eight data fields. These data fields are based on the fields you define for an object class using the Class Manager.

Class Manager

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+Opt+I
Windows Shortcut: Shift+F3

The Class Manager command displays the Class Manager. The Class Manager is a dialog box you use to create Classes and define fields in a Class.

To create a Class

1. Choose Class Manager in the Window menu, press Shift+F3 (Windows), or Cmd+Opt+I

(Mac OS). **DCAD VectorSpace** displays the Class Manager dialog box.

2. Choose New in the pop-up menu below the right-arrow button. **DCAD VectorSpace** displays the Class Editor.
3. Type a name for the Class in the Class Name text box.

4. Enter a field name in the field text boxes you want to use. Each field name becomes a category that you can quantify.
 - For example, if you created a Class called “chair” that you applied to certain objects in your plan, you could enter values for the categories you have defined for the chair Class. Some category names for a chair Class might be: manufacturer, model, serial number, price, and color.
5. Click OK to close the Class Editor and return to the Class Manager.

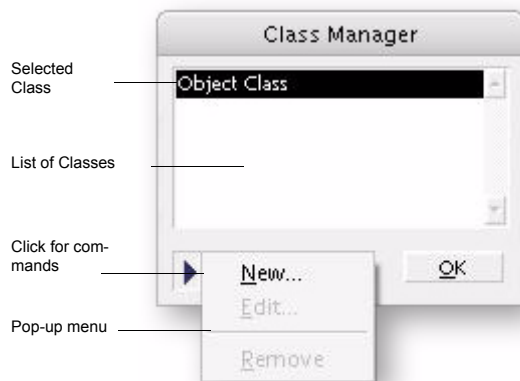


Figure 285.- Class Manager

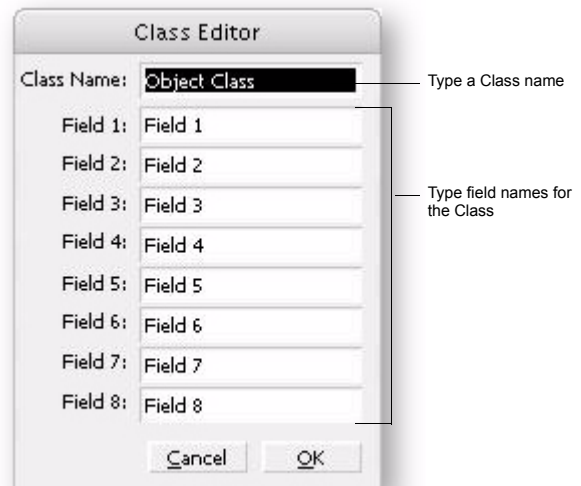
To edit a Class

1. Choose Class Manager in the Window menu, press Shift+F3 (Windows), or Cmd+Opt+I (Mac OS). **DCAD VectorSpace** displays the Class Manager dialog box.
2. Select the Class you want to edit.
3. Choose Edit in the pop-up menu below the right-arrow button. **DCAD VectorSpace** displays the Class Editor with the information for the selected Class in the text box and fields.

4. You can enter new information in any of the fields or add new fields to the Class.
5. Click OK to close the Class Editor and return to the Class Manager.

To remove a Class

1. Choose Class Manager in the Window menu, Ctrl+Alt+I (Windows), or Cmd+Opt+I (Mac OS). **DCAD VectorSpace** displays the Class Manager dialog box.
2. Select the Class you want to remove.
3. Choose Remove in the pop-up menu below the right-arrow button. When you choose Remove, **DCAD VectorSpace** deletes the class only if there are no objects in the document that belong to the selected Class. Otherwise, **DCAD VectorSpace** displays a warning that you cannot delete the Class.
4. Click OK to close the Class Editor and return to the Class Manager.



Copying Class items to other documents

When you paste an object that has been assigned to a Class to another document, **DCAD VectorSpace** treats the object in one of two ways:

- If the object's Class name exists in the new document, **DCAD VectorSpace** transfers the object's class field data to the new document.
- If the object's Class name doesn't exist in the new document, **DCAD VectorSpace** creates the object's class, its Class fields, and then transfers the object's Class field data to the new document.

Organizing Library Objects and Symbols

The Class Manager makes it easy to organize Library Objects and Symbols. You can create custom classes, and then use the Info tab in the Properties Manager to insert information in fields you define for a Class.

This helps keep your project organized by making it easy to obtain information about all of the Library Objects and Symbols in a Class.

To use the Class Manager with Library Objects and Library Symbols

1. Use the Class Manager to create a Class for a Library Object or Library Symbol. To do this, read **To create a Class**, page 365.
2. Select (or create) a Library Object or Library Symbol.
3. Press Shift+F3 (Windows) or Cmd+Opt+I (Mac OS) to open the Properties Manager, or choose Properties Manager in the Window menu. Click the Info tab to bring it to the front.
4. Click the triangle to expand the Info tab.
5. Type the data you want to assign to the object in the text boxes in the Class Manager.

To help keep your project organized, use this procedure for all Library Objects and Symbols.

Layer Manager

Modes: Draft, Sculpt, Render
Mac OS Shortcut: Cmd+B
Windows Shortcut: Ctrl+B

The Layer Manager command displays the Layer Manager. Using the Layer Manager, you can create and manage flexible layer structures in **DCAD VectorSpace** documents.

The Layer Manager command is available whenever a **DCAD VectorSpace** document is open. The Layer

Manager is a floating palette — a dialog box that can remain open in any mode.

Layers help you organize a project. You can use the Layer Manager to add layers, delete layers, name layers, assign colors to layers, create layer sets, and change the order of layers. You can also hide, lock, and protect layers with passwords.

Layers in Draft and Sculpt modes

Draft and Sculpt modes have significantly different

layer structures; this distinction is very important.

-
- In Draft mode, you can create six independent layer structures. In each view (Top, Bottom, Front, Back, Left, and Right) you can create up to 255 layers for 2D objects.
 - In Sculpt mode, you can create one layer structure only for all six views. You can create up to 255 layers in Sculpt mode.

Draft mode layers

In Draft mode, you can create up to 255 layers in each view — Top, Bottom, Front, Back, Left, and Right.

To visualize the layer structure in Draft mode, imagine 256 layers of acetate overlaying each side of a cube. The sides of the cube correspond to the standard views of the **DCAD VectorSpace** workspace.

As you draw 2D objects, you can put them on different layers to organize your drawing.

Keep in mind that there is a layer sequence or stacking order for layers in Draft mode. Objects on layers that are higher in the stack obscure objects on lower layers. However, don't confuse the stacking order of layers in the Layer Manager with the stacking order of objects on each individual layer.

As you change views in Draft mode, the list of layers in the Layer Manager also changes.

For example, create 10 layers in Top view in Draft mode, and **DCAD VectorSpace** adds 10 new layers, numbered from Layer 0 to Layer 10, to the Layer Manager. Switch to Front view, and the layer list contains only Layer 0 if there are no other layers in Front view. If there are other layers in Front view, the Layer Manager displays the layer structure of Front view.

Sculpt mode layers

Sculpt mode is a 3D modeling environment in which you work with 3D objects. You can create up to 255 Sculpt mode layers. These layers function as a single layer structure in the Layer Manager for all six views in Sculpt mode.

For example, create 15 layers in Top view in Sculpt mode. The same layers exist in Bottom, Front, Back, Left, and Right views. Switch from one view to another, and you will see the same layer list in the Layer Manager.

Layers in Sculpt mode can help you organize 3D objects in your model in the same way that layers in Draft mode assist you in organizing a plan or elevation.

You can place elements of a 3D model on different layers in Sculpt mode. For example, you can create layers for walls, furniture, electrical fixtures, and plumbing. This gives you the flexibility that layers offer in the 2D environment in the 3D environment as well.

In Sculpt mode as well as Draft mode, you can lock and unlock layers, hide or show layers, assign colors to layers, and rearrange layers in the Layer Manager.

Layer order in Sculpt mode

The effect that layers have on the spatial arrangement of objects in Sculpt mode is more subtle than in Draft mode. Moving a layer higher in sequence in the Layer Manager does not make 3D objects on that layer obscure 3D objects on a “lower” layer.

However, the sequence of layers in Sculpt mode is significant when you combine 3D objects using Combine submenu commands. For these operations,

layer sequence influences the way objects combine in the same way that stacking order affects the resulting shapes when you combine 2D objects.

Using the layer manager

Although Draft and Sculpt modes have different layer structures, the procedures for using the Layer Manager to create and organize layers are the same in both modes.

The Layer Manager displays a layer list for the active document window. You can expect the layer list to change as you change mode or view.

To open the Layer Manager: Choose Layer Manager in the Window menu, or use the Layers pop-up menu at the bottom of the window. The Layer Manager appears.

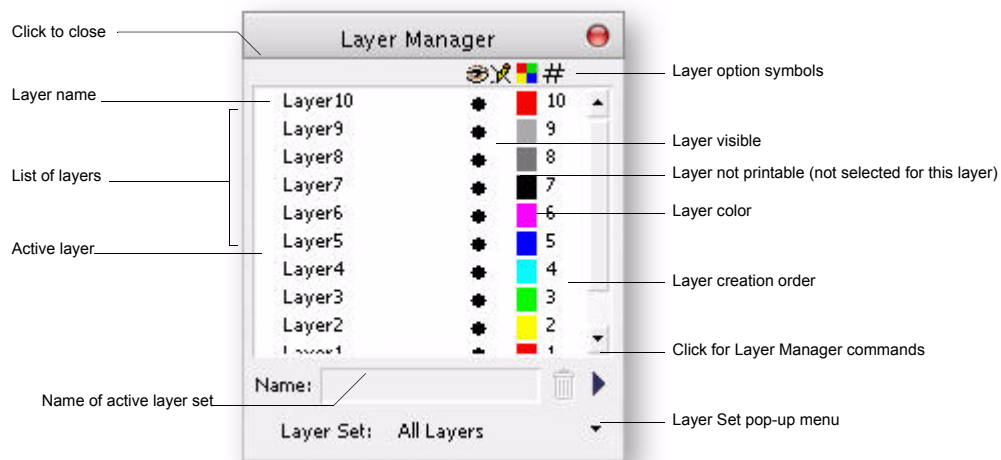


Figure 286.- Layer Manager

Layer Manager window

The Layer Manager windows floats, or appears in front of, all drawing windows. When you first open the Layer Manager, it appears in the center of the screen.

The Layer Manager window can appear in front of or behind other palettes, such as the toolbox. To bring the Layer Manager to the front of other palettes, click the Layer Manager window.

If the Layer Manager is already open, the Layer Manager command does not bring the Layer Manager to the front of other palettes.

When the Layer Manager first appears, the layer list shows the last layers created (those with higher creation order numbers) and no layer name is selected in the layer list. The layer list also indicates the active layer and a selected object's layer.

- One layer in the layer list has a check mark to indicate that it is the active layer.
- If an object is selected, a gray box encloses the name of the layer of the selected object. If more than one object is selected, the gray box encloses the layer name of the selected object that's highest in the layer sequence.

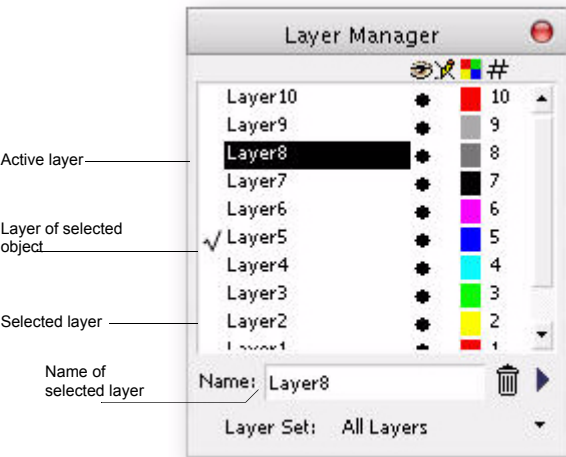


Figure 287.- Layer status indicators

Activating and Selecting Layers

The active layer

Only one layer at a time is the active layer, which can also be called the current layer.

- The active layer has a check mark next to its name in the Layer Manager.
- When you create a new object, it is on the active layer.

Note: More than one layer can be visible, and objects on many layers can be selected and printed. The layer called active is the one on which you draw new objects.



When you combine objects on different layers with Boolean operations, **DCAD VectorSpace** also places the combined object on the active layer.

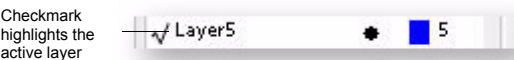


Figure 288.- Active layer indicator

Selecting layers

You can select one or more layers in the Layer Manager to configure layer options. When you select a layer, its name is highlighted in the Layer Manager.

The active layer does not have to be among a selection of multiple layers, unless you are creating a layer set.

Usually, you select a layer when you want to change its name, or change options in the Layer Options dialog box. Also, you can select multiple layers in the

Layer Manager to delete the layers or define them as a layer set.

To select or deselect a layer: Click the name of the layer in the layer list.

- To select (or deselect) a continuous range of layers, press Shift and click the first and last layers' names.
- To select (or deselect) several non-contiguous layers, press Ctrl (Windows) or Cmd (Mac OS) and click each layer's name.



Figure 289.- Selected layers in the Layer Manager

Reordering layers in the Layer Manager

You can change the order of layers shown in the layer list in the Layer Manager.

When you move a layer higher in the layer list, you reposition that layer higher in the sequence of layers.

- In Draft mode, objects on higher layers block objects that they overlap on lower layers.
- In Sculpt mode, objects on higher layers are considered higher in the sequence of objects when you apply Combine submenu commands to them.

To reorder a layer. Drag a layer to move it up or down in the list of layers in the Layer Manager.

- You can drag one layer at a time in the layer list.
- When you drag a layer, it appears underlined in the layer list until you drop it into a new position.



Figure 290.- Changing layer order

Moving and copying objects in the Layer Manager

When the Layer Manager is open, you can use it to quickly move or copy selected objects to any visible layer. Using the Layer Manager is an alternative to using the Copy to Layer and Send to Layer submenus in the Object menu.

To copy objects to a layer

1. Select the objects you want to copy. You can select multiple objects on one or more layers.
2. Press Option and click the name of the layer where you want to copy the selected objects.

- A message asks you to confirm the copy operation. Click Yes in the message box to copy the selected objects to the layer you clicked.
- If the layer you click isn't visible, a message tells you that you can't copy objects to a layer that isn't visible. Click OK in the message box to continue.

To send objects to a layer

1. Select the objects you want to send. You can select multiple objects on one or more layers.

2. Press Control and click the name of the layer to which you want to send the selected objects.
 - A message asks you to confirm the operation. Click Yes in the message box to send the selected objects to the layer you clicked.

Note: If the layer you click isn't visible, a message tells you that you can't transfer objects to a layer that isn't visible. Click OK in the message box to continue.



Layer options

You can hide layers, lock layers, assign colors to layers, and change layer names. You can configure these layer options in the Layer Manager.

The scrolling layer list displays the status of several layer options in columns to the right of the layer names. Symbols at the top of the columns identify these options.

DCAD VectorSpace assigns numbers to layers according to their creation order. The far right column in the layer list displays the creation order number of each layer. If you rearrange layers, this column still shows each layer's order in the creation sequence.



Figure 291.- Layer option symbols

Layer names

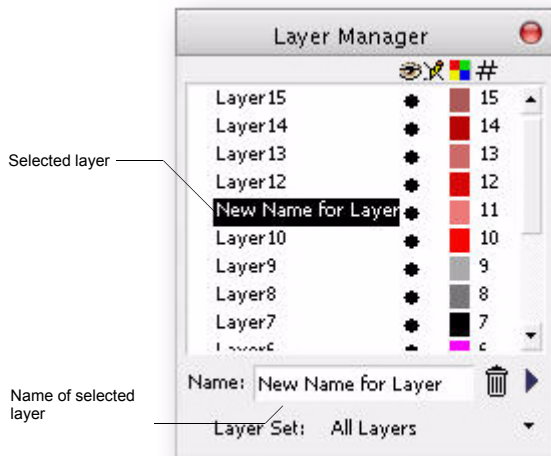
DCAD VectorSpace assigns names to layers in the form *Layer#* when layers are created. You can change the layer names using the Layer Manager.

Layer names appear in the second column in the layer list. When a layer is selected, its name appears

in the Name text box in the Layer Manager. When no layer is selected, the text box is blank.

To change a layer's name

1. Click a layer name in the layer list to select the layer. The name of the selected layer is highlighted, and its name appears in the Name text box in the Layer Manager.
2. Click in the Name text box to edit the layer's name.
 - To replace the name, double-click in the text box to highlight the existing name.
3. Type a new name for the layer in the Name text box. A layer name can be 29 characters or less.
 - If you try to type more than 29 characters, a message tells you that you can't type any more characters. Click OK in the message box to return to the Layer Manager.
 - You can type any characters, including spaces and Mac OS special characters (such as Option+8 for a bullet [•]), for a layer name. If you type only spaces, you will not be able to see the layer name in the layer list.
 - If you type no characters in the text box and press Enter, a message tells you that empty names are not allowed. Click OK to return to the Layer Manager and type a new name.
4. Press Enter, or select another layer in the layer list to apply the new layer name.



Visible layer option

To hide or display a layer and all objects on the layer, you can change the visible option in the Layer Manager. New layers are visible when you create them.

With the Layer Manager open, you can use the visible layer option to quickly display or hide different parts of your plan or model, such as walls, floors, or furniture. This makes it easy to isolate the elements you want to edit.

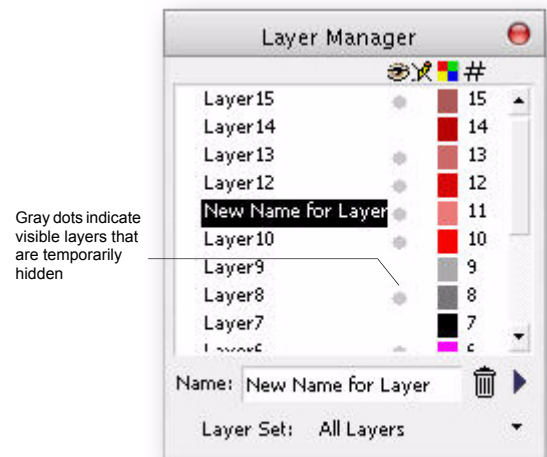
Printing. When a layer is not visible, none of the objects on the layer are printed when you print the document.

To set a layer's visible option: Click in the Visible column.

- A black dot in the column indicates that the layer and its objects are visible.
- No black dot indicates that the layer and its objects are not visible.

- A gray dot indicates that the layer is set to be visible, but is temporarily hidden because Display Active Layer is in effect.

Note: When you make a layer not visible, any selected objects on the layer are deselected.



In addition to the Visible option in the Layer Manager, you can hide objects using the Display Options submenu.

For example, when you choose Display Active Layer, **DCAD VectorSpace** displays objects on the active layer only. When you choose Display Selected Object, **DCAD VectorSpace** displays only selected objects on any layer.

Locked layer option

By locking a layer, you can prevent changes to the layer's objects. You cannot select, move, delete, or edit objects on locked layers.

In the Layer Manager, the column under the pencil symbol indicates whether a layer and its objects are locked.

To set a layer's locked option: Click in the Locked column. You can't lock the active layer.

- A black dot in the column indicates that the layer and its objects are locked.
- No black dot indicates that the layer and its objects are not locked.

Layer color option

DCAD VectorSpace assigns colors to layers when you create them. You can change a layer's color in the Layer Manager.

The Display Layer Colors command in the Display options submenu lets you distinguish objects on different layers.

The layer list shows each layer's color in the column under the color block.

To change a layer's color

1. Click the layer's color in the Color column. A color dialog box appears.

Using Layer Manager commands

You can choose several commands from a pop-up menu in the Layer Manager. These commands let you create and delete layers and layer sets, select objects based on layers, and assign options to layers.

2. Click in the color wheel, or enter color values in the text boxes to specify a color.
3. Click OK to assign the color to the corresponding layer and return to the Layer Manager.

Clicking in the Color column lets you change a single layer's color. You can change the color of multiple layers by using the Layer Options command in the Layer Manager.

Layer creation order

When you create layers, **DCAD VectorSpace** assigns a number to each layer based on its creation order. **DCAD VectorSpace** maintains the creation order numbers for all layers, no matter where you move layers in the layer list. Therefore, you can't change the creation order numbers displayed in the far right column in the layer list.

You can use the command "Display by Layer Creation Order" in the Display Options submenu to display objects in the drawing windows based on the original creation order of their layers.

To use a Layer Manager command: Press the arrow button near the bottom-right corner of the Layer Manager. Drag into the menu to choose a command.

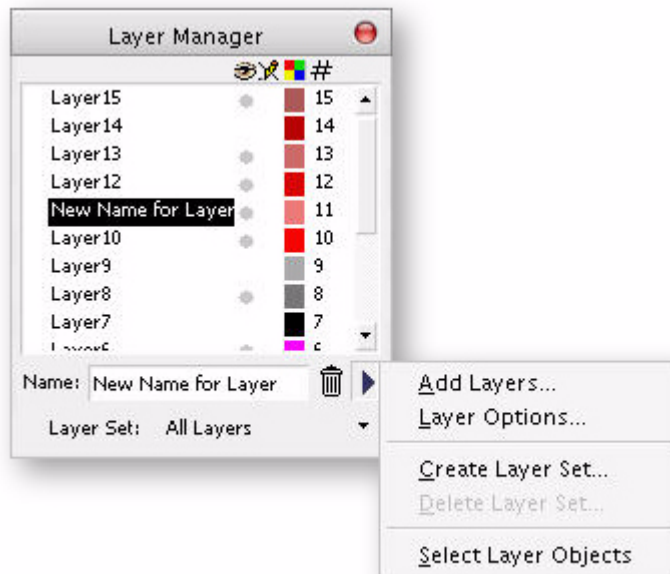


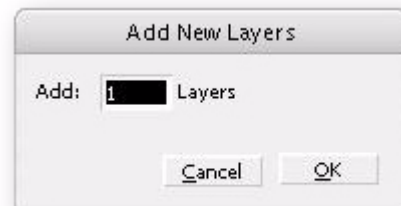
Figure 292.- The Layer Manager pop-up menu

Adding and deleting layers

You can add layers to each of the six views in Draft mode, and to any view (all views share the same layers) in Sculpt mode.

To add layers

1. Select the mode in which you want to add layers (Draft or Sculpt) by activating the appropriate window.
 - In Draft mode, go to the view in which you want to use the new layers. In Sculpt mode, you can use any view.
2. Press the arrow button in the Layer manager and choose Add Layers in the pop-up menu. The Add New Layers dialog box appears.
3. In the text box, type the number of new layers you want to create. You can create up to 255 layers.
 - Because one layer always exists, you can type up to 255 in the text box if no other layers have been added.
 - If you type a number greater than the number of layers that **DCAD VectorSpace** can create, a message appears. Click OK in the



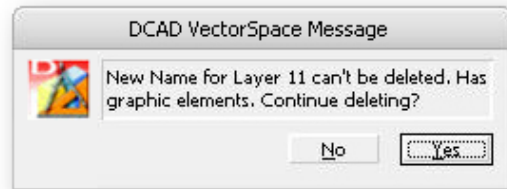
message box to return to the Add New Layers dialog box.



4. Click OK. **DCAD VectorSpace** adds the specified number of layers to the document and updates the layer list in the Layer Manager.

To delete layers

1. In the Layer Manager, select the layers that you want to delete.
2. Click the Trash icon in the Layer Manager. **DCAD VectorSpace** deletes the selected layers, unless one of the following situation occurs:
 - If you try to delete a layer that contains objects, a warning message appears. If you want to delete the layer whose name appears in the message, click No to return to the drawing. Then delete all of the objects on that layer. If you want to delete only the selected layers that do not contain objects, click Yes. If you click Yes and other layers contain objects, the warning message appears for each of these layers.
 - If you try to delete the active layer, a warning message appears. If you want to delete selected layers other than the active layer, click Yes. If you do not want to delete any layers, click No.



Setting layer options in the Layer Options dialog box

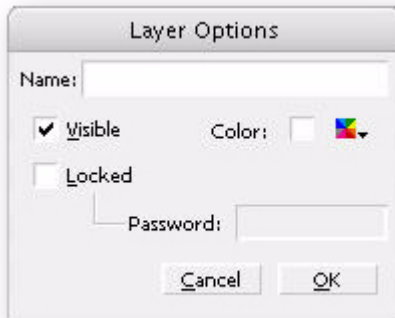
In addition to using the layer list in the Layer Manager to set options for layers, you can set layer options in the Layer Options dialog box. This dialog box lets you set options, such as visibility, for multiple layers at once.

Also, you need to use the Layer Options dialog box if you want to use password protection for layers or change a layer's password.

To use the Layer Options command

1. In the Layer Manager, select the layers whose options you want to change.
2. In the Layer Manager, press the arrow button and choose Layer Options in the pop-up menu.
 - To change options for a single layer, you can double-click the layer.
3. The Layer options dialog box appears. Depending on the options you want to change, do the following.
 - In the Name text box, type a name for the selected layers. If multiple layers are selected, you apply the same name to the layers.
 - To make objects on the selected layers visible, click the Visible checkbox.

- To lock objects on the selected layer, click the Locked checkbox. **DCAD VectorSpace** locks the objects on that layer, and activates the Password text box.
- To assign a color to selected layers, press the color pop-up menu and drag into the color palette to select a color.



- To password protect a layer, select the Locked checkbox and type a password in the Password text box. A dialog box appears. To confirm the password, type the same password, and click OK. To return to the Layer Options dialog box without reconfirming the password, click Cancel. When you password protect a layer, a lock icon appears in the Locked column in the Layer Manager.



4. To implement the settings in the Layer Options dialog box, click OK.

Changing options for a layer locked with a password

When a layer has been locked and protected with a password, you can change the password or unlock the layer only if you type the correct password when prompted to by **DCAD VectorSpace**.

However, you can change other options for a layer locked with a password by using the columns in the Layer Manager. By clicking in the appropriate column, you can change a layer's color or visibility. You can also drag a layer to change its position in the layer list.

To unlock a password-protected layer in the Layer Manager

1. Click in the Locked column for the layer you want to change.
2. A dialog box prompts you to enter the layer's password.
3. Type the correct password in the message box and click OK. The dialog box closes. In the Layer Manager, the lock symbol disappears from the Locked column for the layer.

To unlock password-protected layers using the Layer Options dialog box

You can use the following procedure to remove or change the password assigned to one or more layers, and to unlock one or more layers that have been password protected.

1. Select one or more layers and choose Layer Options from the pop-up menu in the Layer Manager.

2. A dialog box prompts you to enter the layer's password.
3. Type the correct password in the message box and click OK. The Layer Options dialog box appears.

- The password is removed. To assign a password, follow the procedure **To use the Layer Options command**, page 376.
- To unlock the layer, deselect the Locked checkbox.

4. Click OK to implement the Layer Options settings and close the dialog box.

Using layer sets

DCAD VectorSpace lets you create layer sets that you can activate in the Layer Manager. When you activate a layer set, the layers in that set are the only ones that appear in the Layer Manager. Objects on layers that are not in the active set are not visible in the drawing windows.

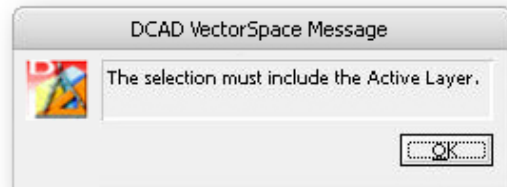
A layer set is a subset of the total number of layers you create in the Layer Manager. When you create a layer set, you should assign it a name that indicates its purpose. **DCAD VectorSpace** updates the layer list in the Layer Manager to display the layers that are included in the layer set. The layer set's name appears in the Layer Set pop-up menu at the bottom of the Layer Manager.

Layer sets have many applications. For example, suppose you create 12 layers in Draft mode, Top view for 12 different elements of your plan. You might put walls, electrical outlets, and plumbing, on three of the layers.

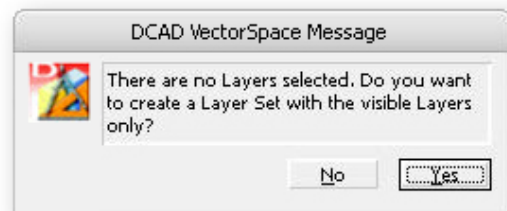
When you want to work with only the wall, electrical, and plumbing layers, you can create a layer set out of those layers. When you choose this layer set in the Layer Set pop-up menu, **DCAD VectorSpace** hides objects on layers not included in the set, and shows only the layer set in the Layer Manager.

You must include the active layer when you create a layer set. The active layer is the layer in the Layer

Manager with a check mark next to its name. Otherwise, this message appears:



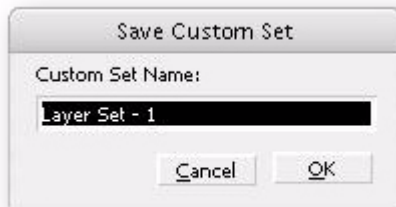
You must select layers before you can create a layer set. Otherwise, a message appears, asking you if you want to make a layer set from visible layers. If you often want to make layer sets from the currently visible layers, this can be a useful shortcut.



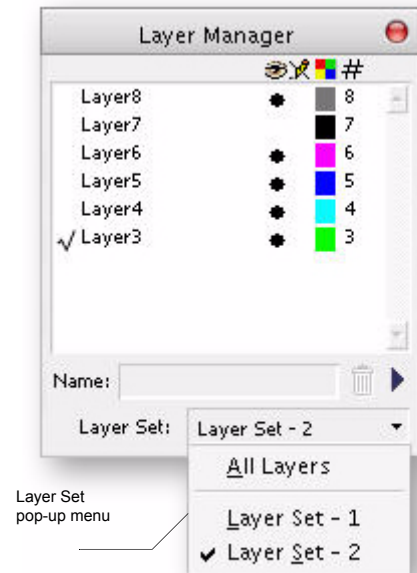
To create a layer set

1. In the Layer Manager, select the layers you want to make into a set.

2. Choose the Create Layer Set command. A dialog box appears.



3. Type a name for the layer set in the text box. In general, you should try to assign a name that indicates the purpose of the set.
4. Click OK to save the selected layers as a layer set. The name of the layer set appears in the Layer Set pop-up menu in the Layer Manager.




Working with layer sets

You can display one layer set at a time in the Layer Manager. When you display a layer set, its name appears in the Layer Set pop-up menu. If you open the Layer Set pop-up menu, a check mark appears next to the current layer set.

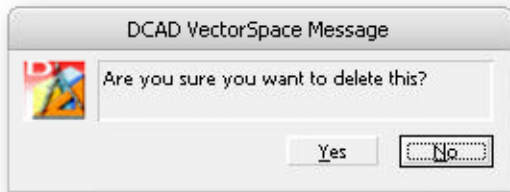
To select a layer set: Choose *layer set* in the Layer Set pop-up menu where *layer set* is the name of the set you want to select. In the Layer Manager, **DCAD VectorSpace** displays the layers in that set only.

Figure 293.- Layer Set pop-up menu

To delete a layer set

Note: **LAYER AND OBJECTS** represented by a Layer Set **ARE NOT DELETED** when you delete the set. Only the Layer association information is actually deleted. 

1. In the Layer Set pop-up menu at the bottom of the Layer Manager, choose the layer set you want to delete (you can't delete the All Layers set). **DCAD VectorSpace** activates the layer set you select.
2. Press the arrow button in the Layer Manager, and choose Delete Layer Set in the pop-up menu. A message appears.



3. Click Yes to delete the selected layer set. The layer set name disappears from the Layer Set pop-up menu.

Note: You cannot use the Undo command to restore a layer set once you delete it.



Using the Layer Manager to select objects

When the Layer Manager is displayed, you can select objects based on the layer structure in Draft and Sculpt modes.

To use the Select Layer Objects command

1. In the Layer Manager, select one or more layers containing the objects you want to select. The

layers you select become highlighted in the layer list. You don't have to select the active layer.

2. Press the arrow button and choose Select Layer Objects in the pop-up menu. On the visible, unlocked layers that are highlighted in the layer list, **DCAD VectorSpace** selects all objects.

Tool Manager

Mode: Draft, Sculpt

This version of **DCAD VectorSpace** includes a new feature: Parametric Tools. The use and management of these new tools requires the addition of a new palette: The Parametric Tool Manager. A few definitions are in order before proceeding:

Parametric Tool. A tool whose execution and results are regulated by one or more user modifiable parameters.

Tool Folder. A folder within the **DCAD VectorSpace** installation folder that con-

tains the **DCAD VectorSpace** parametric tool files.

Tool Materials Folder. A folder within the **DCAD VectorSpace** installation folder that contains any materials file as that may be required and/or used by the **DCAD VectorSpace**.

To open the Parametric Tool Manager Palette:

Select the Windows > Tools Manager... Option.

DCAD VectorSpace displays the Parametric Tool Manager.

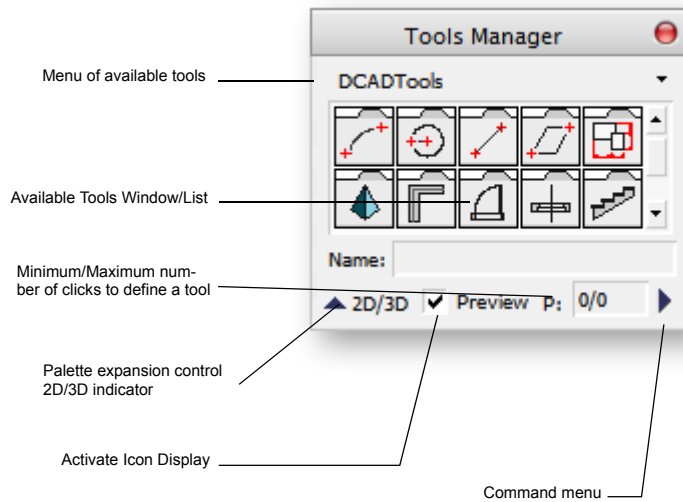


Figure 294.- Tool Manager

Several display and control areas appear in the Tool Manager palette:

Available Tools Window/List. Contains a display/list of the available **DCAD VectorSpace** parametric tools. The window reflects the folder/file hierarchy of the Tool Folder:

Note: If the Show Icons option is active the tools will be identified by a descriptive icon and folders are identified by conventional folder icons.

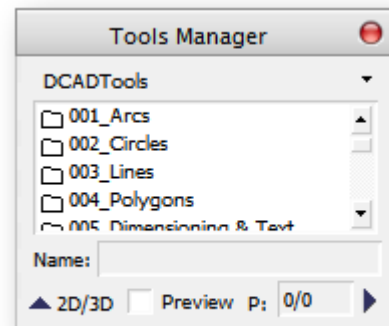




Figure 295.- Tool Manager - List View

- Individual tools are marked with the  standard file icon:
- Folders that contain families of tools  are marked with the standard folder icon:

To select a DCAD VectorSpace Tool: •Click on the tool's icon.

Note: You may need to use the scroll bar controls if the desired icon is not visible.



To open a DCAD VectorSpace tool folder: Double click on the desired folder's icon in the available tools display area.

Note: You may need to use the scroll bar controls if the desired folder is not visible.



The Available Tools menu will show the name of the folder that contains the folder/tools displayed in the list.

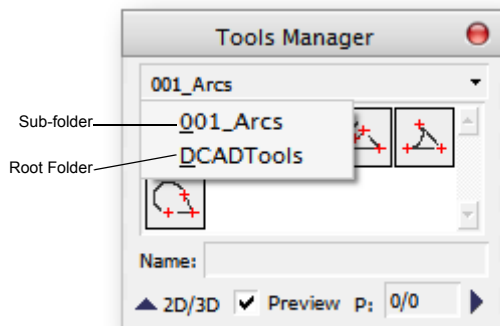


Figure 296.- Available Tools menu

Available Tools menu. This menu always shows the name of the folder that contains the tools and/or folders displayed in the manager. When the menu is opened the open folder hierarchy will be displayed in reverse order.¹

To rise in the tool folder hierarchy

1. If the Tool Manager Palette is closed, select the Windows > Tool Manager... option.
2. Open the Available Tools menu and select the name of the folder you desire to open.

1. The last name in the menu list options is the root **DCAD VectorSpace** tools folder.

DCAD VectorSpaceTool Parameters

In regular use, parametric tools require the input of one or more values (parameters) that will control the shape, size, location, material, etc. of the object created by the selected tool.

To show the modifiable parameters of a parametric tool: Click on the expansion control in the lower left corner of the tool palette.

The palette will open to show a list with all the available parameters for the selected tool, as well as an area where the modifiable parameter's values may be input.

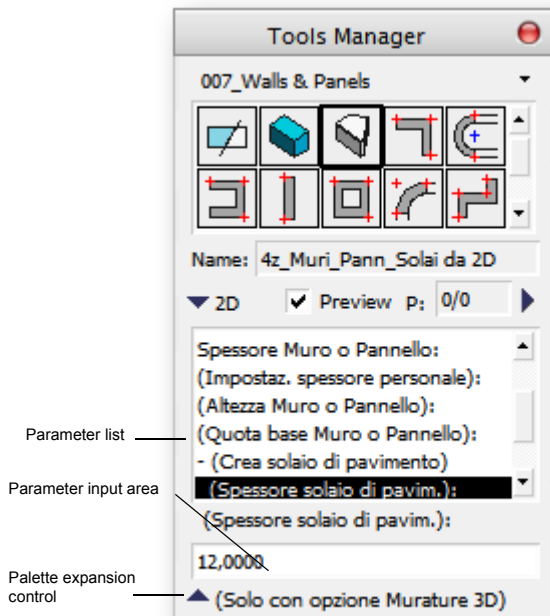


Figure 297.- Tool Manager - Parameters

Parameter value types

There are several parameter value types and several ways to input them.

Logic or Boolean Values. •Are those that admit only two state values of the On/Off, True/False, Yes/No types

These values are input by checking or clearing the checkbox that appears in the parameter input area.



Figure 298.- Logic or Boolean parameters

Type-in values. •Are numerical or text values typed into a text box in the parameter input area. Below this box a hint will be offered with the range and/or units of the expected values.



Figure 299.- Type-in parameters

Menu-List Values. These are selected from a pop-down menu list.

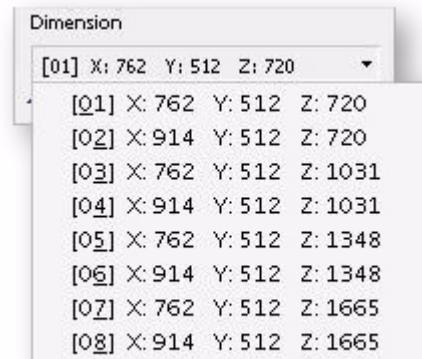


Figure 300.- Menu-List Values

Note: Most parameter values will have a default value that will be inserted when no particular value is input by the user.



Help Images

Besides the Available Tools list and the selected tool's parameter list, the tools palette may show, at the tool designer's sole judgement some kind of help image to aid in the use of the selected tool.

To show help images for the selected tool: Click on the expansion control in the lower left corner of the tool palette.

the palette will expand again to show any available help images for the selected tool.

Note: If the tool designer has not provided any help images, the help area will appear empty.

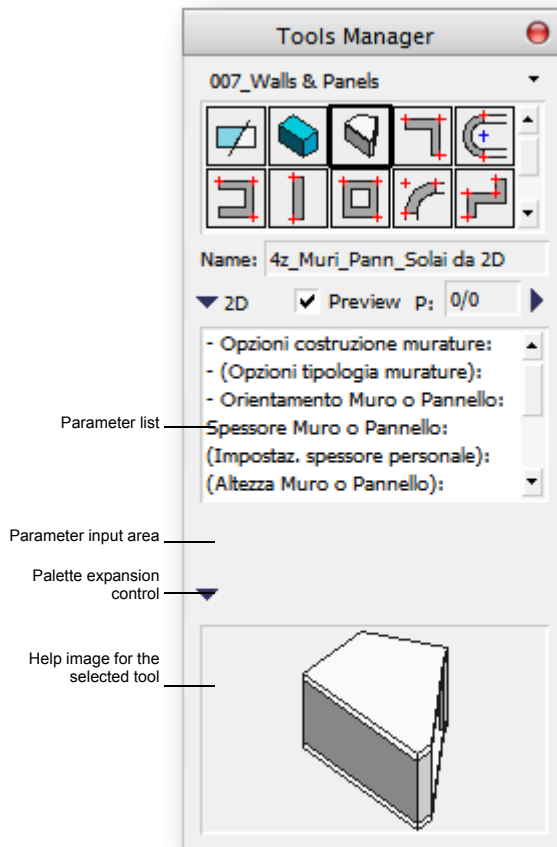


Figure 301.- Tool Manager - Help Images

To Hide help images for the selected tool:

Click on the close control.



Using the DCAD VectorSpace parametric tools

Note: The instructions given here are of a General Nature. Each available tool has individual use instructions supplied either in the Included **Tools Manual** or in the support documents supplied by the vendor for third party tools.



To use a parametric tool

1. If the Tool Manager palette is closed, select Windows > Tool Manager...

The Tool manager palette is displayed.

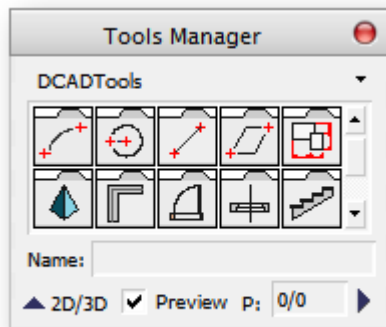


Figure 302.- Tool manager palette

- If the Show Icons option is active, the palette will show icons of the available tools.
2. If necessary, open the folder that contains the desired tool. See: **To open a DCAD VectorSpace tool folder**, page 382
 3. Click on the desired tool's icon
 - The tool's name will be displayed.
 - In the lower left corner of the palette you will see the expression **2D/3D** if the tool is available in both draft and sculpt modes.
 4. If the parameter list and input area is not open, click on the expansion control in the lower left corner of the palette.

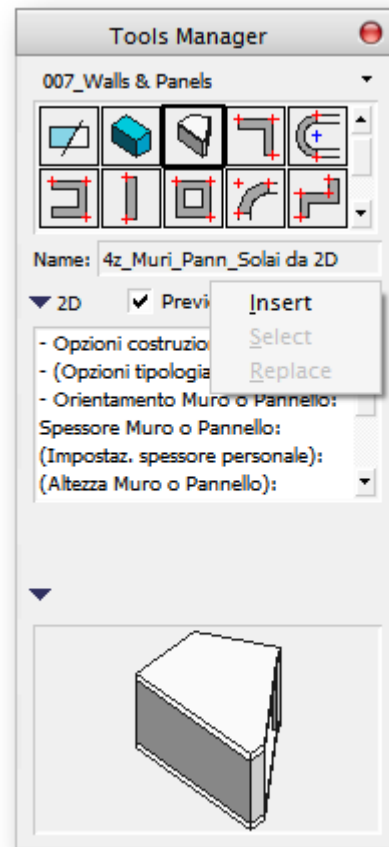


Figure 303.- Tool Manager - Insert

5. Select the parameter to be modified from the list of available parameters.
6. Insert the value required for the selected parameter. See **Parameter value types** on page 383..
7. Repeat steps 5 and 6 for any other parameter that requires value input or modification.
8. Select Insert in the palette's command menu.

Note: If the tool does not require definition of creation points and/or vectors, the tool will be immediately applied.



9. Move the cursor from the palette to the working area. The cursor will now take the shape of a cross.
10. Click on the location of all the required creation points for the tool.

Note: The number of points required will be shown in the **Pts.** box in the palette.



The value will be shown in the format **n/m** where **n** is the minimum and **m** is the maximum number of points required.

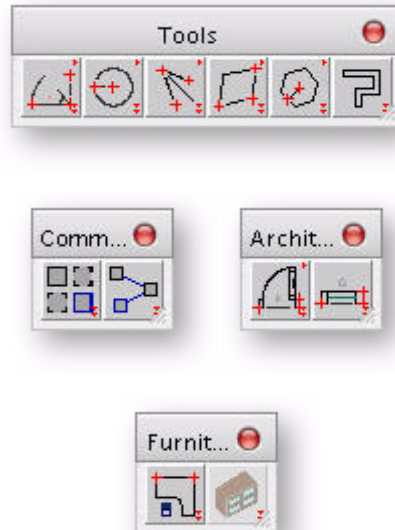
The required position and definition order of the creation points are usually illustrated by the help images displayed in the palette.

11. Once finished, the tool will draw or execute its defined function.

DCAD VectorSpace Tool Palettes

DCAD VectorSpace Tools can also be held in specialized floating tool palettes, similar to the standard tool palettes.

The available¹ palettes are selected from the DCAD Palettes submenu of the Windows Menu.



1. The actual available DCAD Tool Palettes in your installation may be different from those shown here. Ask your salesperson or **DCAD VectorSpace** representative for details

Figure 304.- DCAD VectorSpace Tool Palettes - a sampling

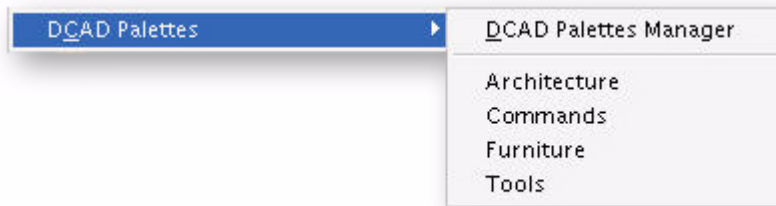



Figure 305.- DCAD VectorSpace Tool Palettes menu

To show/Hide a DCAD Tool Palette: Select the desired palette's name from the Palette submenu in the Windows menu.

Note: The active palettes will appear with a checkmark to the left of their names in the menu listing. 

To close an open palette: Click on the close box in the palette's title bar



Figure 306.- DCAD VectorSpace Tool Palettes - close box


From the DCAD Palettes menu you may also open the DCAD Palettes Manager Dialog, that you may use for several other functions regarding palette availability and visibility.



Figure 307.- DCAD VectorSpace Tool Palettes Manager

To show/hide several DCAD Tool Palettes

1. Select the DCAD Palettes... option from the Windows menu.
2. On the menu listing, click to the left of the name or names of the palettes you want to show or hide.

Note: This action is a toggle: clicking on an open (marked) palette closes it and vice versa. 

3. Open palettes will appear checkmarked on the menu listing

DCAD palettes may be relocated or reshaped to your likes and needs

To move a DCAD Tool Palette: Click on its title bar and drag it wherever you wish

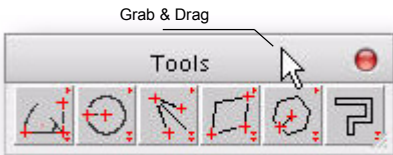


Figure 308.- DCAD VectorSpace Tool Palettes -Title bar

You may use the lower right corner of a DCAD tool palette to reshape to your liking and convenience.



Figure 309.- DCAD VectorSpace Tool Palettes - Reshape cursor

To reshape a DCAD Tool Palette

1. Clic and hold the cursor on the lower left corner of tha palette. A reshape cursor will appear.
2. Drag the cursor until the palette has the shape you desire and release the mouse button.

The palette will shrink tightly to contain the tool icons in the smaller possible area for the selected configuration.

Note: If necessary, move the palette to any desired location.

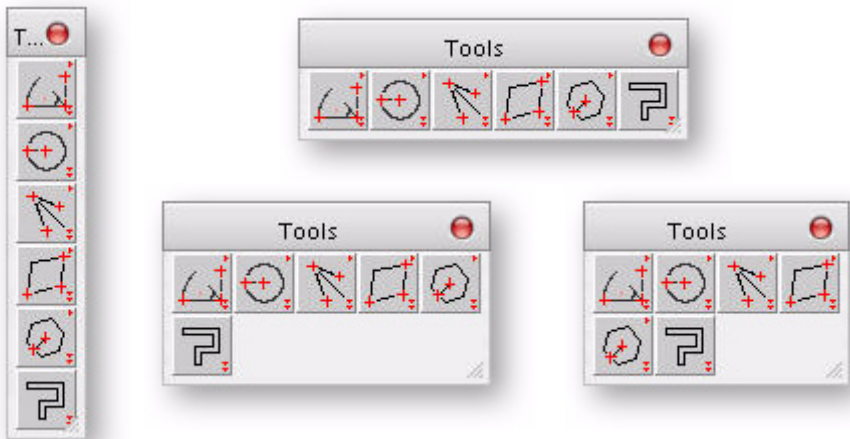


Figure 310.-DCAD VectorSpace Tool Palettes - Several shapes for a **DCAD VectorSpace** tool palette

Using the DCAD VectorSpace Tool Palettes

With some differences, the instruments housed in the DCAD VectorSpace tool palettes are used in the same form as those contained in the DCAD VectorSpace Tool Manager.

Note: Only those tools allowed in the active drawing mode (2D/3D) will be enabled in the palettes. All other tools will be disabled (greyed-out).

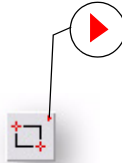


To use a DCAD VectorSpace tool from a palette

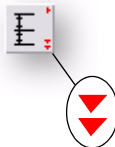
1. Click on the icon of the tool you want to use.
2. Follow the procedure for the selected tool, as described later in this same document (See **Basic Tool Sets**, page 13).

DCAD VectorSpace Parametric Tool Icons

A triangle in the top right corner of the tool icon indicates that a Menu Instruments will open up if the icon is pressed. The displayed bar groups similar Instruments. Drag along the open bar and click on the desired tool. The last selected tool will be visible in the palette.



An icon with double triangle in the bottom-right corner offers access to the tool's Parameter Dialog. To open this dialog, double Click on the icon.



To select a tool from the icon menu

1. Click and hold the mouse button on the icon.
A graphic menu opens from this icon



Figure 311.- DCAD VectorSpace Tool Palettes - Tool Menu

2. Move the cursor along the displayed icon bar to the tool icon you want to enable, and click there.
3. The selected instrument will be enabled and ready for immediate use.

To set the Parameters for a DCAD VectorSpace Parametric Tool

1. Double click on the tool's icon.

The DCAD VectorSpace Tool Parameter Dialog will appear.

Note: The dialog is similar to that of the **Tool Manager**, page 380. However, it does not provide means to select other tools.



2. Set the tool parameters as required for the selected instrument.

Follow the procedure for the selected instrument, as described later on in this document (See **Basic Tool Sets**, page 13)

3. Click on the OK button to close the dialog and set the tool parameters.

The set parameters will remain enabled until expressly modified.

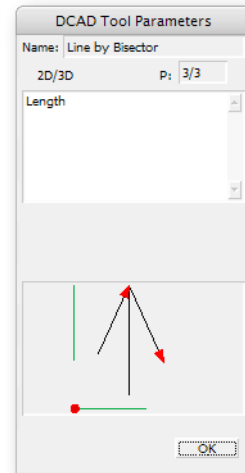


Figure 312.- DCAD VectorSpace Tools parameter dialog.

Selecting open DCAD VectorSpace documents

When you have more than one **DCAD VectorSpace** document open at once, you can switch from one document to another using the Window menu.

At the bottom of the Window menu, the names of all open **DCAD VectorSpace** documents appear. A check mark appears next to the active document.

To select an open DCAD VectorSpace document:

Choose *document name* in the Window menu, where *document name* is the name of the document you want to open.

The active document

When multiple documents are open, only one document is active at a time. Any commands that you choose, attributes that you select, and other operations that you perform in **DCAD VectorSpace** apply to the active document only.

The one exception to this rule is that some operations affect the entire program, so they do not apply to the active document only. These operations include changes you make to settings in the Preferences dialog box.

Properties Manager

Modes: Draft, Sculpt
Mac OS Shortcut: Cmd+I
Windows Shortcut: F4

The Properties Manager is a versatile palette that displays information about selected objects and lets you edit an object's settings and coordinates.

The Properties Manager is a floating palette that can remain on screen while you work.

Whenever you create or select an object, **DCAD VectorSpace** updates the information displayed in the Properties Manager.

You can use the Properties Manager to do any of the following:

- View settings, options, attributes, and coordinates for an object by selecting the object when the Properties Manager is open.
- Change the settings, options, data, or coordinates of a selected object by editing these items in the Properties Manager.
- Create Library Objects, Library Symbols, Sweep Sections, and Containers by setting options in the Properties Manager.

- Create a database by entering data for selected objects in the text boxes in the Properties Manager. Then use the Analysis Manager to display reports using the data that you've entered.

Common and unique options

The Properties Manager has many options and settings in common with other parts of the **DCAD VectorSpace** interface. For example, you can view and edit coordinate data in the Info bar, and the same data appears on the Coordinates tab in the Properties Manager. When you double-click the Chain Dimension tool in the toolbox, a dialog box of options appear; the same options appear on the Tool tab in the Properties Manager when you select a chain dimension object.

Some options and settings are unique to the Properties Manager. These settings include object names and the text in dimension objects, which **DCAD VectorSpace** sets when the objects are created. To change the settings, you must use the Properties Manager when the object you want to change is selected.

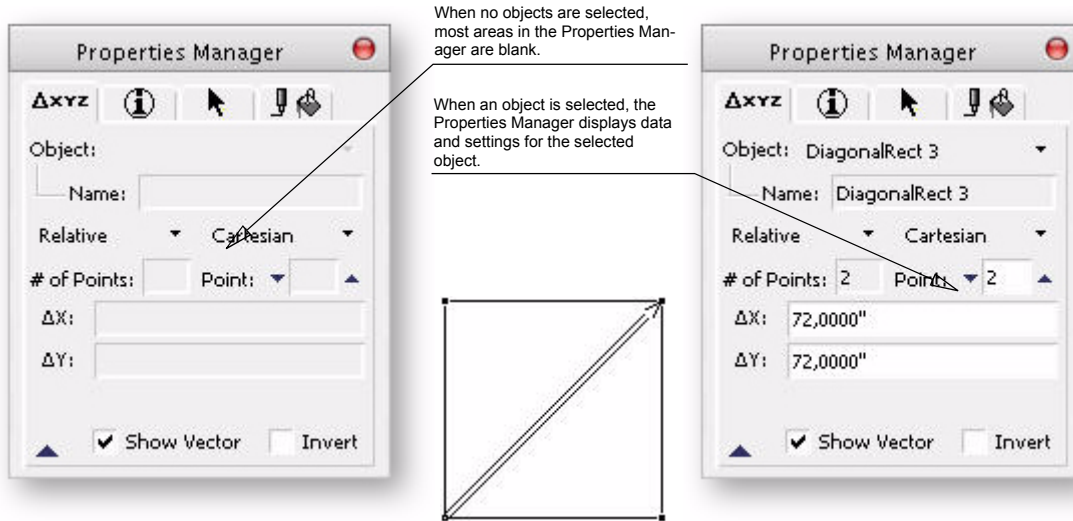


Figure 313.- Properties Manager

Displaying the Properties Manager

Properties Manager command. Choose Properties Manager in the Window menu, press F4 (Windows), or Cmd+I (Mac OS) to display the Properties Manager.

Note: If the Properties Manager is already displayed, choosing the Properties Manager command does not close the Properties Manager.

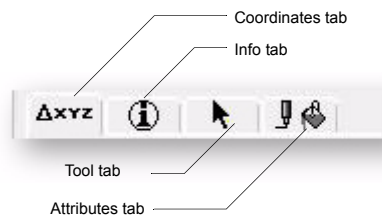


Double-clicking an object. If you double-click an object in the Draft or Sculpt window, DCAD VectorSpace selects the object and displays the Properties Manager (if it isn't already on screen). Each tab in the Properties Manager displays data regarding the object that you double-clicked.

Closing the Properties Manager. Click the Close box at the upper-left corner of the Properties Manager to remove the Properties Manager from the screen.

Tabs in the Properties Manager

The Properties Manager contains four tabs: Coordinates, Info, Tool, and Attributes. A symbol at the top of each tab identifies its function. Each tab displays settings or options for the currently selected object.



Default tab. The Coordinates tab is active each time you display the Properties Manager. To use another tab, click the tab to bring it to the front of the Properties Manager.

Δxyz

The following sections in this chapter describe each tab in the Properties Manager.

Attributes tab. This tab displays Pen color, Fill pattern, and other attributes for the selected object. The settings on this tab are not editable. See pagina 394 for information about this tab.



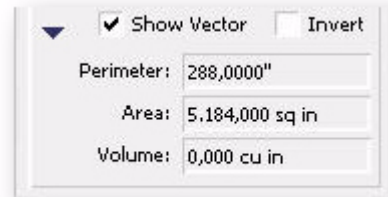
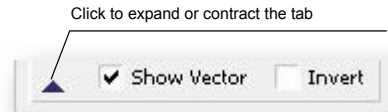
Coordinates tab. This tab displays the selected object's name, and the coordinates of its creation points. You can choose the coordinate system used to display this data, and you can edit the position of creation points. See pagina 397 for information about this tab.



Info tab. This tab lets you edit settings for the selected object, including its name. You can use the Info tab to designate a Library Object, Library Symbol, Sweep Section, or Container object. You also use this tab to assign an object to a Class, and to enter data for Analysis Manager reports. See pagina 402 for information about this tab.



Tool tab. This tab shows the data type of the tool that created the selected object. When expanded, the Tool tab displays tool-specific settings, such as those used to create a dimension object. See pagina 404 for information about this tab.



The expanded Coordinates tab displays Perimeter, Area, and Volume of the selected object

Expanding the Properties Manager

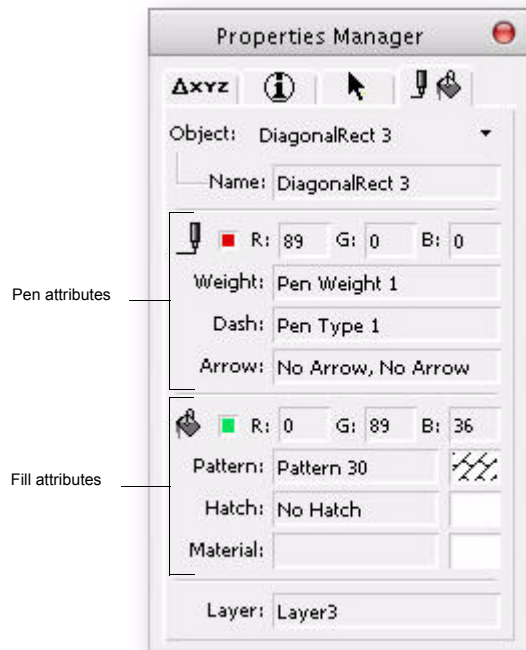
The Properties Manager can be expanded to display additional data or options when the Coordinates tab, Info tab, or Tool tab is active; the Attributes tab doesn't expand.



To show or hide expanded tabs: Click the triangle at the bottom-left of the tab in the Properties Manager.

Attributes tab

You can use the Attributes tab of the Properties Manager to view the attributes of selected objects.

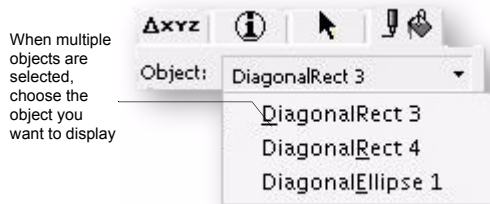


The Attributes tab displays the name, Pen and Fill settings, and layer name of the selected object

Figure 314.- The Attributes tab

To view an object's attributes: Do one of the following to display in the Properties Manager the attributes of an object:

- Double-click the object whose attribute settings you want to view. This selects the object and displays the Properties Manager. Click the Attributes tab to view the attributes settings of the object.
 - If the Properties Manager is displayed, and the Attributes tab is active, select the object whose attributes you want to view.
 - Select the object whose attributes you want to view. Choose Properties Manager in the Window menu, press F4 (Windows), or Cmd+I (Mac OS), and then click the Attributes tab.
-
- ### Using the Object pop-up menu
- When multiple objects are selected in the document, you can use the Object pop-up menu to pick one object; its attribute settings are then displayed on the Attributes tab.
- The Object pop-up menu contains the names of all objects that are currently selected in the document. When you choose an object's name in the pop-up menu, a gray bounding box appears around the object in the document, and the Attributes tab displays its attribute settings.
-
- ### To view attributes if multiple objects are selected
- If multiple objects are selected, the Attributes tab displays settings of one object at a time.
1. Select the objects whose attribute settings you want to view.
 2. Choose Properties Manager in the Window menu to display the Properties Manager and click the Attributes tab to bring it to the front, if necessary.
 3. In the Object pop-up menu at the top of the tab, choose the name of an object to display its attribute settings.



Settings displayed on the Attributes tab

Attribute settings appear on the Attributes tab of the Properties Manager when an object is selected. These settings are not editable in the Properties Manager. To change the attributes of selected objects, use the Attributes buttons on the Attributes bar, or the Pen palette and Fill palette.

Name. The name of the selected object appears in the Name box. **DCAD VectorSpace** assigns names when you create objects using tool data types and object creation order. To change an object's name, use the Name text box on the Info tab in the Properties Manager. See **Info tab**, page 402 for more information.

Pen attribute settings

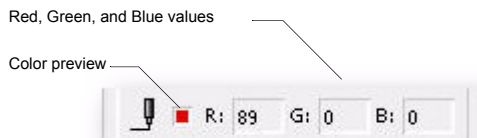


The Pen area of the Attributes tab displays the Pen color values, Pen weight index, Pen style index, and Arrowhead indexes.

Figure 315.- Pen attributes settings

Pen color. The RGB color values of the selected object's Pen color appear at the top of the Pen area. A small preview box next to the Pen icon displays the Pen color.

Pen color is an attribute of 2D objects and 3D objects.



Pen weight. The Weight text box in the Pen area displays the Pen weight of the selected object as an index value. The index value corresponds to the position of the object's Pen weight in the Pen weight palette, with 1 indicating the Pen weight setting at the top of the palette, 2 indicating the next Pen weight setting, and so on.

Pen weight is an attribute of 2D objects only. When a 3D object is selected, the Pen weight text box is blank.

Arrowhead. The Arrow text box in the Pen area displays the Arrowhead settings of the selected object as two index values separated by a comma. The first value represents the Arrowhead at the object's first endpoint; the second value represents the Arrowhead at the object's second endpoint.

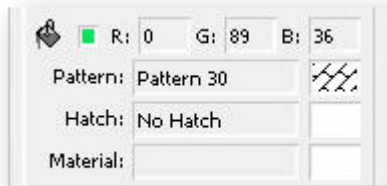
The Arrow index values correspond to the position of the object's Arrowhead in the Arrowhead palette, with 1 indicating the Arrowhead at the top of the palette, 2 indicating the next lower Arrowhead, and so on. A zero index value indicates that no Arrowhead appears at the object's corresponding endpoint.

Arrowheads are an attribute of 2D objects only. When a 3D object is selected, the Arrow text box is blank.

Pen style. The Dash text box displays the Pen style setting of the selected object as an index value. The Dash index values correspond to the position of the object's Pen style in the Pen style palette, with 1 indicating the Pen style at the top of the palette (the default undashed Pen style), 2 indicating the next Pen style, and so on.

Pen style is an attribute of 2D objects only. When a 3D object is selected, the Dash text box is blank.

Fill attribute settings



The Fill area of the Attributes tab displays Fill color values, Fill pattern index, Fill hatch name, and Surface material name for the selected object.

Fill color. The RGB color values of the selected object's Fill color appear at the top of the Fill area. A small preview box next to the Bucket icon displays the Fill color.

Fill color is an attribute of 2D objects only. When a 3D object is selected, the RGB text boxes display the number zero and the preview box is blank.

Fill pattern. The Pattern text box in the Fill area displays a Fill pattern index value if the selected object is a 2D object with a Fill pattern. The index value corresponds to the position of the

object's Fill pattern in the Fill pattern palette, with zero indicating the first pattern tile at the upper-left corner of the palette (the no Fill pattern tile), and 1 indicating the Fill pattern in the next position in the Fill pattern palette, and so on.

A small preview box next to the Pattern text box displays the Fill pattern.

Fill pattern is an attribute of 2D objects only. When a 3D object is selected, the Pattern text box is blank.

Fill hatch. The Hatch text box in the Fill area displays the name of the Fill hatch assigned to an object if the selected object is a 2D object with a Fill hatch.

A small preview box next to the Hatch text box displays the Fill hatch.

Fill hatch is an attribute of 2D objects only. When a 3D object is selected, the Hatch text box is blank.

Surface material. The Material text box displays the name of an object's Surface material when a 3D object that has a Surface material is selected.

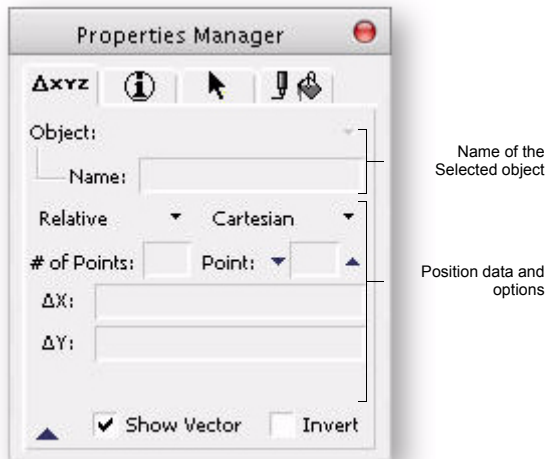
A small preview box next to the Material text box displays the Surface material.

Surface material is an attribute of 3D objects only. When a 2D object is selected, the Material text box is blank.

Layer. Displays the name of the selected object's layer. This information is not editable in the Properties Manager; use the Layer Manager to arrange objects on layers and assign names to layers. See **Layer Manager**, page 367 for more information.

Coordinates tab

You can use the Coordinates tab of the Properties Manager to view and edit position data for a selected object.



To view an object's position data: Do one of the following to display data for an object:

- Double-click the object. This selects the object and displays the Properties Manager, with the Coordinates tab in front.
- Select the object and choose Properties Manager in the Window menu, press F4 (Windows), or Cmd+I (Mac OS).
- If the Properties Manager is displayed and the Coordinates tab is active, just select the object whose data you want to view.

Coordinates tab options

The Coordinates tab provides a variety of functions for displaying and editing position data for selected objects.

- You can display position data for the selected object's creation points using any coordinate system.
- You can display creation point position data using relative or absolute coordinates.
- The Show Vector option lets you display a drawing vector that corresponds to the position data displayed on the Coordinates tab.
- The Invert option lets you reverse the order of an object's creation points for displaying posi-

tion data; this also reverses the direction of the drawing vector.

The next sections describe how to use the options and controls that appear on the Coordinates tab.

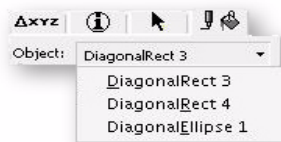
Using the Object pop-up menu

The settings and data displayed on the Coordinates tab apply to one object selected in the document. The Object pop-up menu and the Name text box display the name of the selected object.

The Object pop-up menu also lets you choose one object when multiple objects are selected in the document. In this case, the Object pop-up menu contains the names of all the selected objects. When you choose an object's name from the pop-up menu, the Coordinates tab displays its data.

If the Show Vector checkbox is selected, the drawing vector indicates which object is displayed on the Coordinates tab.

Name box. The name of the object chosen in the Object pop-up menu also appears in the Name box. You can't edit the name in the Name box. To change the name of an object, use the Info tab in the Properties Manager. See **Info tab**, page 402 for more information.



To choose from multiple selected objects

1. Select the objects whose coordinates you want to view and choose Properties Manager in the Window menu to display the Properties Manager, if necessary.
2. In the Object pop-up menu at the top of the tab, choose the name of an object to display its position data.
3. To display another object's data, choose the object's name in the Object pop-up menu.

Coordinates data area

The coordinates data area is under the Name box on the Coordinates tab. You can use the options in this

area to display position data for any one of the points that define the selected object.

The coordinates of the current point appear in the text boxes. The pop-up menu on the left switches between relative and absolute coordinate data. The pop-up menu on the right specifies the coordinate system for the point data.

The coordinates text boxes and pop-up menus are explained in more detail later in this section.

Position data “points” . The “points” referred to on the Coordinates tab are creation points or vertices of the selected object.

- For a 2D object, a “point” is a creation point.
- For a 2D object that has been converted to a polygon, a “point” is a vertex of the polygon.
- For a 3D object, a “point” is a vertex of a polygonal section of the 3D object.

of Points. When you select an object, the “# of Points” box shows the object's total number of points. This value is not editable.

The number of points an object contains depends on the object type and mode.

For example, a rectangle drawn with the Rectangle 3 Points tool has three creation points, so “3” appears in the “# of Points” box when it is selected.

A cube, drawn as a rectangle in Sculpt mode, has eight vertices, so “8” appears in the “# of Points” box when the cube is selected.

Point. The Point text box displays the number that identifies the current point. The position data that appears in the coordinates text boxes applies to the current point.

You can use the Point box to set any point in the selected object as the current point. To change the current point, type a number in the text box, or click the arrow buttons to change the current number.

Click the arrow button on the left of the box to select the next lower-numbered point. Click the arrow button on the right of the box to select the next higher-numbered point. When point 1 is the current point, the position data displayed is always absolute.

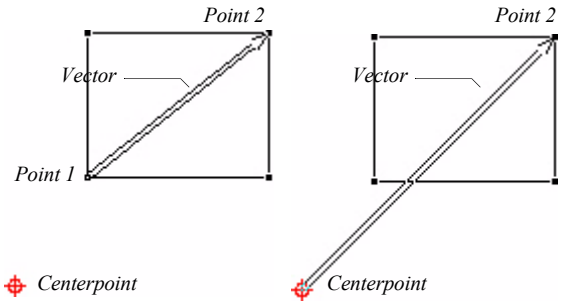
- Coordinates are measured from the document's Centerpoint, rather than a previous point in the selected object.
- "Absolute" appears in the pop-up menu, which is dimmed to indicate that the Relative option is not available.

Show Vector. When the Show Vector checkbox is selected on the Coordinates tab, a drawing vector appears in the document. The vector points to the current point specified in the Point text box. The origin of the vector arrow depends on whether absolute or relative data is displayed.

- For absolute data, the vector points from the Centerpoint to the current point.
- For relative data, the vector points from the previous point to the current point.

Invert. In the numbering of points, the "previous" point depends on how the object was drawn, and whether the Invert option is selected.

- If Invert is not selected, the previous point is the point that was defined in the object prior to the current point.
- If Invert is selected, the order of the points is reversed: The "previous" point is the point that was defined in the object after the current point.



When relative data is displayed, the vector runs from the previous point (Point 1) to the current point (Point 2).

When absolute data is displayed, the vector runs from the Centerpoint to the current point (Point 2).

Relative and Absolute data

To refer position data to the document's Centerpoint or to another creation point, you can choose Relative or Absolute in the pop-up menu on the Coordinates tab.

When Show Vector is selected, an arrow visually represents absolute or relative position vectors.

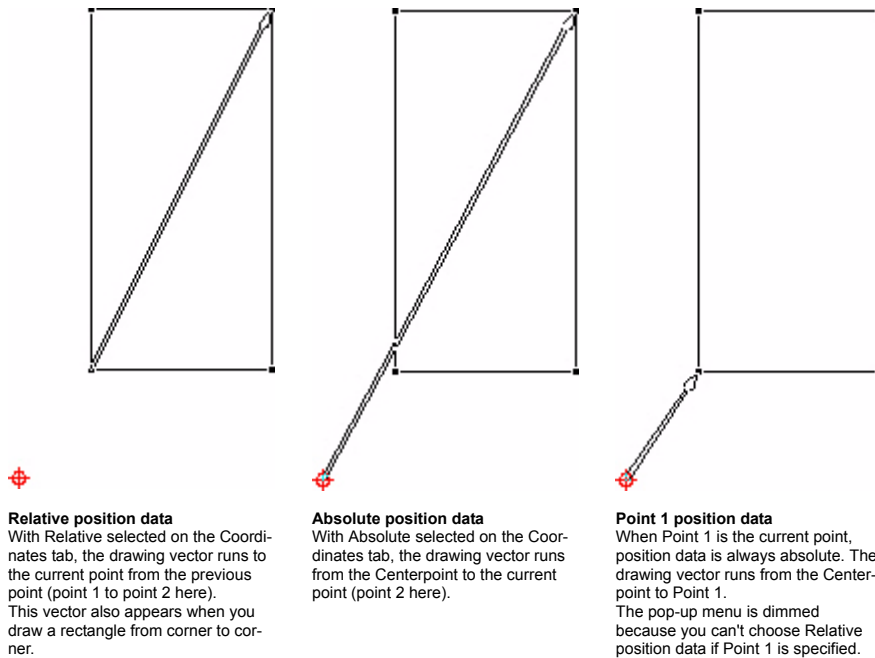
Relative position data is expressed as the change in distance, coordinates, or angle from the previous point to the current point. If relative data is displayed, the delta symbol (Δ) precedes the labels of the text boxes.

By default, the Coordinates tab displays relative position data, with Point 2 set as the current point. Each time you open the Properties Manager, it returns to the Relative setting and Point 2.

Absolute position data is expressed as the distance, coordinates, or angle measured from the document's Centerpoint to the current point.

When an object's first point is the current point (1 appears in the Point text box), the displayed position data is always absolute. The pop-up displays Abso-

lute, and the menu is dimmed to indicate that the Relative option is not available.



Editing position data

The text boxes on the Coordinates tab display the coordinates of the current point of the selected object, based on the current coordinate system.

The text box labels change to reflect the current coordinate system and view.

When a 2D object is selected, two text boxes display position data on the Coordinates tab. When a 3D object is selected, three text boxes appear.

Note: A third text box appears if you select a dimension object. The third text box lets you edit the dimension text without changing the object.



You can edit the data in the text boxes. Changing a value changes the length or position of the vector, and, consequently, the position of the current point.

To edit position data in the text boxes

1. To change a value, select the text and type a new value in the text box.
2. Press the Tab or Enter key to input the new data. **DCAD VectorSpace** moves the current point to the new coordinates, and the drawing vector reflects the new position data.

Relative Views and absolute position data

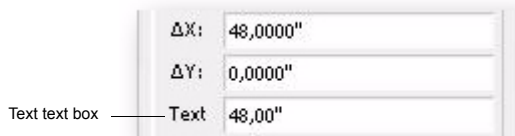
When you switch from an orthogonal view to a Relative View, the absolute position data, for each point

of an object, changes. This is because in a Relative View, the axes rotate around the document's Center-point, but the object does not. The absolute relationship of the object to the axes changes based on this rotation. The relative position data, the relative measurements between points in an object, do not change.

Editing dimension text

A text box labeled "Text" appears on the Coordinates tab when a dimension object is selected. You can type new text in this text box to replace the dimension text of the selected dimension object. Entering a new numerical value does not change the length of the dimension line.

You can enter letters or numbers in the text box.



To use the Text text box

1. Type a numeric value in the Text text box. Or, type a word or short phrase.
2. Press the Tab key to replace the dimension object's text with the new data.

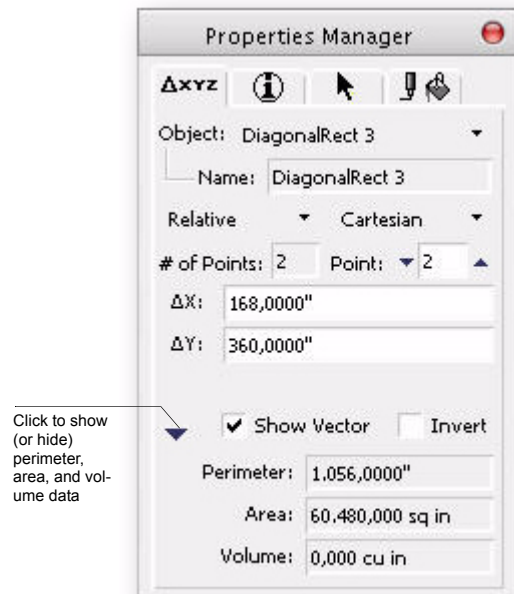
Perimeter, area, and volume data

Expanding the Coordinates tab displays perimeter, area and volume text boxes. Click the triangle at the lower-left corner of the tab to expand or contract the tab.

2D objects. When a 2D object is selected, the object's perimeter and area data are displayed; the Volume text box displays zero. The area and volume data are displayed as zero when a line is selected, and the perimeter measurement is the same as the length of the line.

3D objects. When a 3D object is selected, the object's area and volume data are displayed; the Perimeter text box displays zero.

You cannot edit the values in the Perimeter, Area, or Volume text boxes.

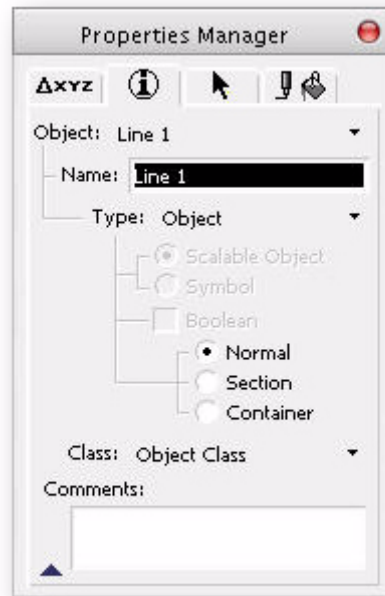


Info tab

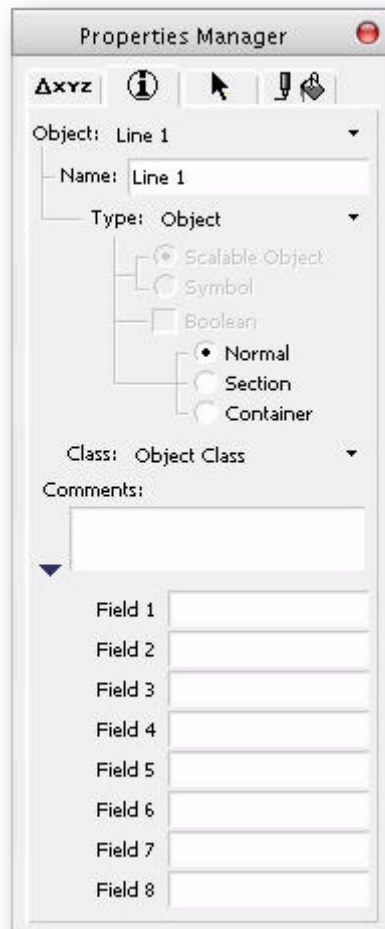
You can use the Info tab of the Properties Manager to set and view information about selected objects.

To set object information with the Info tab

1. Select the objects for which you want to change or view information.
2. If necessary, open the Properties Manager by double-clicking an object or by choosing the Properties Manager in the Window menu.
3. Click the Info tab. The Properties Manager now displays the Info tab options.
4. Choose the options you want. The options take effect immediately.
5. You can close the Properties Manager when you are done changing options or you can leave it open while you work.



The Info tab when a line is selected



The expanded Info tab showing the class fields

Info tab options

Object. If you have multiple objects selected, you can choose which object's information is displayed on the Info tab by choosing the object's name in the Object pop-up menu.

DCAD VectorSpace displays a gray bounding box around the object whose name is selected in the Object pop-up menu on the Info tab.

Name. You can view and change the name of an object using the Name text box on the Info tab. To execute the Name change, press the Tab key or the Enter key after typing the new name.

DCAD VectorSpace gives each object a default name based on the tool used to create the object and the order in which the objects are created.

Library type. Select the Library Type checkbox to make the current object a Library item.

Object. Choose the Object option to make the current object a Library Object. This option is available only if you first select the Library option.

Symbol. Select this option if you want the selected object to be a Library Symbol. This option is available only if you first select the Library option.

Boolean. Select this option to designate the last object in the Library group as a subtractive boolean shape, which will punch through objects when you use a Combine command. This option is available only if you first select the Library option.

Section. You can select this option to make the selected object, or group of objects, available as a sweep section.

Container. Select the Container option to make the current object a container object. You can obtain information on the objects inside a container object in the Analysis Manager.

Class. You can choose a class for the selected object from the Class pop-up menu. You set up classes in the Class Manager. For more information, see **Class Manager**, page 365.

Comments. You can type comments in the Comments text box that you want associated with the selected object.

Fields. If you expand the Info tab by clicking on the arrow at the bottom-left corner of the dialog box, **DCAD VectorSpace** displays the class fields. You can enter class information in the fields. The field names are set in the Class Manager.

Tool tab

You can use the Tool tab of the Properties Manager to view the tool settings of selected objects.



To view tool settings with the Tool tab

1. Select the objects for which you want to view settings.

2. If necessary, open the Properties Manager by double-clicking an object or by choosing the Properties Manager in the Window menu.
3. Click the Tool tab, and click the arrow to expand the tab. The Properties Manager displays the settings of the selected object.
4. You can close the Properties Manager when you are done changing options or you can leave it open while you work.

Tool tab options

The options that appear on the Tool tab in the Properties Manager are described in this section.

Object. If you have multiple objects selected, you can choose which object's information is dis-

- played on the Tool tab from the object’s names in the Object pop-up menu.

DCAD VectorSpace displays a gray bounding box around the object whose name is selected in the Object pop-up menu on the Tool tab.

Name. You can view the name of an object using the Name box on the Tool tab.

DCAD VectorSpace gives each object a default name based on the tool used to create the object and the order in which the objects are created.

You can change the object name using the Info tab of the Properties Manager. For more information, see **Info tab**, page 402.

Tool. The Tool text box displays a tool data type abbreviation that identifies the tool that created the selected object. These tool data types are
- listed in the “DCAD VectorSpace tools and settings,” next.

Settings. If you expand the Tool tab by clicking the arrow in the bottom-left corner of the dialog box, **DCAD VectorSpace** displays the tool settings of the selected object. You can view and change the settings. The settings available for each tool appear in the table, “DCAD VectorSpace tools and settings,” next.

A tool’s settings correspond to the settings in the dialog box for that tool. To open a tool’s dialog box, double-click the tool icon in the tool-box.

Not all tools have a dialog box of options. A downward pointing double-arrow in the lower-right corner of a tool icon indicates the tool has a dialog box.

DCAD VectorSpace tools and settings

The following table lists all **DCAD VectorSpace** tools. The table shows each tool’s name and data type. The data type is the name **DCAD VectorSpace** assigns to objects created by the tool.

The Settings column lists settings that appear on the expanded Tool tab in the Properties Manager, when an object created by the tool is selected.

Table 7: DCAD VectorSpace tools and settings

Tool name	Data type	Settings
Arc 3 Points	3PointsArc	None
Circle 3 Points	3PointsCircle	None
Ellipse Center to Corner	CenterEllipse	None
Arc Radius	CenterRadiusArc	None
Circle Radius	CenterRadiusCircle	None
Rectangle Center to Corner	CenterRect	None
Rounded Rectangle Center to Corner	CenterRoundRect	Radius of Rectangle Corner (Draft mode)

Table 7: DCAD VectorSpace tools and settings (Continued)

Tool name	Data type	Settings
Ellipse Diagonal	DiagonalEllipse	None
Rectangle Diagonal	DiagonalRect	None
Rounded Rectangle Diagonal	DiagonalRoundRect	Radius of Rectangle Corner (Draft mode)
Omnidirectional Light Source	DirectLightSource	Power, Size (Sculpt mode)
Arc Elliptical	ElliptArc	None
Ellipse 3 Points	FreeEllipse	None
Rectangle 3 Points	FreeRect	None
Directional Light Source	LightSource	Power, Size, Angle (Sculpt mode)
Line	Line	None
Double Polyline	OffsetPoly	Width, Offset (Draft mode)
Single Polyline	Polyline	None
Curve	QB_Spline	None
Polygon Midpoint	PolygonMidpoint	Number of Sides (Draft mode)
Polygon Vertex	PolygonVertex	Number of Sides (Draft mode)
Text	Text	None
Chain Dimension	ChainDimm	Chain Dimension dialog box.
Baseline Dimension	BaselineDimm	Baseline Dimension dialog box.
Leader Dimension	LeaderDimm	Leader Dimension dialog box
Constrained Dimension	DoubleLeaderDimm	Constrain dimension dialog box
Angle Dimension	AngleDimm	Angle Dimension dialog box
Camera Path	Walkthrough	None
Text Rotated	VectorText	None

Appendices



Glossary



In this chapter:

- Glossary

Glossary

Absolute Origin. The coordinates $X=0$, $Y=0$, $Z=0$ in the Cartesian coordinate system. This is the default Centerpoint for a new document and for the **DCAD VectorSpace** workspace. The Absolute Origin can never be changed. See **Custom Centerpoint** on page 412.

Action Buttons. The group of icons in a row at the right on the Attributes bar. Action buttons are shortcuts for choosing commands. You click an action button to execute the associated command, or press the button to open a toolbar of related action buttons.

Active Document Window. The Draft, Sculpt, or Render mode window with **DCAD VectorSpace**'s focus. The Info bar and Status bar display information related to the active document window.

Alignment. To horizontally or vertically line up objects with the Align command or the Align action buttons.

Analysis Manager. A palette that lets you display summary reports of objects and other information in a **DCAD VectorSpace** document. The Analysis Manager compiles information from preset object data and Classes defined in the Class Manager. Analysis Manager reports can be exported in tab-delimited form.

Array. Copies of an object positioned a set distance from each other or within a specified distance from the original object.

Arrowhead. A line terminator shape such as an arrow, circle, or witness line that can be applied to lines from the Arrow tab in the Pen palette.

Attributes. Graphical modifiers such as color and line width that can be applied to an object. See **Pen Color** on page 415., **Pen Weight**, page 415, **Pen Style**, page 415, **Arrowhead**, page 411, **Fill**

Color, page 414, **Fill Pattern**, page 414, **Fill Hatch**, page 414, and **Surface Material**, page 417.

Attributes Bar. A bar near the top of the screen containing buttons that display the Pen palette and Fill palette. The Action buttons appear on the right end of the Attributes bar. When the Text tool is selected, text controls appear in the Attributes bar.

Attributes Cluster. The group of buttons at the left end of the Attributes bar, which let you apply attributes from the Pen and Fill palettes.

Axis. A reference line from which distances or angles are measured. **DCAD VectorSpace** utilizes X, Y, and Z axes to draw 3D objects. See **Spin Extrusion Axis** on page 417.

Back View. One of six orthogonal views in Draft and Sculpt modes. Back view shows the **DCAD VectorSpace** workspace from the back. This is an elevation view.

Boolean Object. Two or more objects combined into a single object using a command in the Combine submenu.

Bottom View. One of six orthogonal views in Draft and Sculpt modes. Bottom view shows the **DCAD VectorSpace** workspace from the bottom.

Bounding Box. An invisible rectangle that defines the boundaries of a selected object in Draft and Sculpt modes. The bounding box is shown on screen by tiny black handles located at the corners of a selected object.

Centerpoint. A reference point in a document at the Cartesian coordinates $X=0$, $Y=0$, $Z=0$. You can set Centerpoints and save Centerpoints so you

can assign the X=0, Y=0, Z=0 coordinates to various locations in a document as you work.

Class. A classification that you can define and then assign to objects as a way of categorizing information about a project. Classes are defined in the Class Manager with up to eight data fields for each Class.

Class Manager. A dialog used to define classes of objects. In the dialog box, you can enter a Class name and up to eight fields of information for that Class. Classes appear in the Properties Manager and can also be used in the Analysis Manager.

Clipboard. A part of the Mac OS operating system that stores objects cut or copied in any program. The Show Clipboard command in **DCAD VectorSpace** displays the Clipboard contents.

Clipping Planes. Planes defined in Sculpt mode or Render mode that limit the view of a document so objects between the planes are visible and other objects are not visible.

Combined Object. Two or more objects combined into a single shape using the commands in the Combine submenu.

Constrain. To restrict the movement of the pointer and the drawing vector to a certain direction or type of movement. For example, to snap the pointer to 15-degree intervals by pressing the Shift key when moving an object with the Selection tool. When you constrain the drawing vector, you can also restrict an object to a shape, such as a perfect circle or square, when drawing or editing.

Container. An object defined as a container in the Properties Manager. Containers can be used to display information in the Analysis Manager about objects within their boundaries.

Coordinate System. A method of specifying the positions of points in space by reference to fixed points, lines, or planes. **DCAD VectorSpace** provides six coordinate systems: Cartesian, Polar, Relational, Bearing, Geographic, and Gradient.

Coordinates. Two numbers that identify the location of a point in space in a given dimension by its distance from a set point. The current coordinate system determines whether coordinates are expressed as linear or angular measurements.

Copy. A command that copies selected objects or text and places the data on the Clipboard.

Creation Points. The points that define an object, such as the endpoints of a line or the opposite corners of a rectangle. Creation points are visible in reshape mode and when they are selected with the Point Selection tool.

Custom Centerpoint. The last Centerpoint set by a user using the Set Position command designating the coordinates x=0, y=0, z=0 in a drawing.

Custom Relative View. The last Relative View defined by a user in Sculpt mode.

Custom 3D Axis. The last spin extrusion axis set by a user in the current view in Draft mode or Sculpt mode.

Custom 3D Plane. The last set of extrusion planes defined by a user in the current view in Draft mode or Sculpt mode.

Current Attributes. The attributes applied to a new object that is created with a drawing tool.

Current Layer. In Draft or Sculpt mode, the layer on which a newly created object appears. Because Draft layers and Sculpt layers are separate, each mode has its own current layer when the mode is active.

Default. A setting for object attributes, tool functions, window options, or operations that are in

effect when you start a **DCAD VectorSpace** work session.

Default Centerpoint. The Centerpoint that is in effect when you create a new document or choose the Default Centerpoint command.

Default Spin Axis. The spin extrusion axis that is in effect when you create a new document or choose the Default 3D Axis command.

Default Extrusion Planes. The extrusion planes in effect when you create a new document or choose the Default 3D Plane command.

Default Relative View. The Relative View that is in effect when you create a new document or choose the Default Relative View command.

DCAD VectorSpace Workspace. An infinite 3D space for construction of 3D models, and a related 2D space for construction of 2D objects and working drawings. These spaces can be viewed from various perspectives in Draft and Sculpt mode windows.

ΔX . Delta X; the change in the value represented by X, such as the horizontal coordinate of a point.

ΔY . Delta Y; the change in the value represented by Y, such as the vertical coordinate of a point.

ΔZ . Delta Z; the change in the value represented by Z, such as the coordinate of a point.

Dialog Box. A window displayed to report or request information. You use dialog boxes to choose options, specify values, and start and cancel operations.

Dimension Object. An object containing dimensions created with a Dimension tool.

Document Scale. A ratio of the size of objects in a drawing to the actual size in the physical world represented by the drawing.

Drawing Vector. A vector represented by a gray arrow on screen in **DCAD VectorSpace**. The

drawing vector indicates the vector from the absolute origin to a point, or from one creation point to the next, when you draw, move, reshape, rotate, extrude, resize or otherwise manipulate an object's position.

Draft Mode. The mode of **DCAD VectorSpace** when a Draft mode window is active. In Draft mode you can create 2D objects and assemble working drawings based on the 2D and 3D objects in a document.

Draft Mode Window. Any window showing your work in Draft mode.

Duplicate. To make an exact copy of an object with the Duplicate command. Also, the object resulting from duplication.

Endpoint. Either of two points that define the ends of a line segment, a polyline, or an arc.

Extrude. The process of adding a third dimension to a 2D object using the Linear, Spin, or Sweep extrusion method.

Extrusion Format. A setting that controls which parts of a 2D object are extruded into 3D. The extrusion format can be set using three buttons in the Status bar.

Extrusion Method. The procedure used to extrude 2D objects, either Linear, Spin, or Sweep, which affects the resulting 3D shape. In Sculpt mode, you can select the extrusion method by selecting an Extrusion action button, or choosing the Linear, Spin, or Sweep command in the Extrude submenu. In Draft mode, you can select the extrusion method by selecting an Extrusion action button. If you do this without an object selected, you select the extrusion method only. If you do this with an object selected, you select the extrusion method, and extrude the object in the process. You can't select the extrusion method in Draft mode using the Linear, Spin, and Sweep commands.

Extrusion Planes. A set of two planes, parallel or not, that define the boundaries of linear extrusions. The planes are identified by creation order as first and second, or by position in a particular view as upper and lower. Some objects, such as walkthrough paths and light sources, are always drawn on the upper or lower extrusion plane.

Fill Color. A color on the Fill Color tab of the Fill palette, which can be applied to the interior of a 2D object.

Fill Hatch. A hatch pattern on the Fill Hatch tab of the Fill palette, which can be applied to the interior of a 2D object.

Fill Palette. A floating window containing four types of attributes — colors, patterns, hatches, and Surface materials — that can be applied to objects.

Fill Pattern. A pixel-based pattern on the Fill Pattern tab of the Fill palette, which can be applied to the interior of a 2D object.

Fit To Window. A command that changes the magnification of a document so that all objects appear within the active Draft or Sculpt window.

First Plane. The plane you set first, regardless of position, when you set extrusion planes.

Front View. One of six orthogonal views in Draft and Sculpt modes. Front view shows the **DCAD VectorSpace** workspace from the front. This is an elevation view.

Grid. A pattern of evenly spaced dots in horizontal and vertical rows. The pointer and objects can be made to snap to the grid dots, whether or not they are visible. The Grid Setup command can be used to set the grid spacing.

Group. (*v.*) To associate two or more objects so they behave as a unified object; (*n.*) the resulting object.

Handles. Small black squares displayed at the corners of an object's bounding box when the object is selected. Also, similar squares that define parts of walkthrough paths and control points on curve objects.

Help Bar. The area at the bottom of the screen that displays messages about tools, commands, and procedures based on the position of the pointer and the currently selected tool.

Hidden Line Rendering. A type of rendering displayed in the Render mode window in which 3D objects appear as solids without any shading.

Horizontal Focal Point. A point set with the Horizontal Focal Point tool in the Render mode window. The point defines the distance and the horizontal direction of the sight line from the viewer to the objects to be rendered.

Info Bar. An area at the top of the screen containing the coordinate system pop-up menu and a set of text boxes. In the text boxes, you can view and enter coordinates for creating and modifying objects, planes, and axes.

Insertion Point. (1.) A point on a library object that can snap to other objects. (2.) The vertical blinking line that indicates where text you type will appear in a document or dialog box. See **Sweep Insertion Point** on page 417.

Layer. A virtual drawing overlay used to segregate objects in Draft and Sculpt modes. Draft mode can contain up to 256 layers per view, or 1,536 total. Sculpt mode can contain up to 256 layers that are part of all views.

Layer Manager. A floating palette in which you can create, arrange, select, and configure options for drawing layers.

Layer Structure. The overall organization of layers in a **DCAD VectorSpace** document. You can name layers, reorder layers, and assign colors to layers. Each layer has an absolute number which designates the order in which it was created.

Layer Set. A subset of the total number of layers. Each view in Draft mode has separate layers and layer sets. Sculpt mode has layers and layer sets shared by all views. Only one layer set can be active. Layers in non-active layer sets do not appear in the Layer Manager. Objects on layers in non-active layer sets do not appear in a drawing. Layer sets can be defined and named in the Layer Manager.

Left View. One of six orthogonal views in Draft and Sculpt modes. Left view shows the **DCAD VectorSpace** workspace from the left. This is an elevation view.

Library Object. An object that has been designated as a Library Object in the Properties Manager. Library Objects can contain a combination of 2D and 3D objects.

Linear Array. Copies of an object arranged a set distance from each other or distributed over a specified distance.

Linear Extrusion. A method of adding a third dimension to a 2D object by extending the object along a single axis.

Message Box. A window that displays information and asks for a response from the user before continuing.

Midpoint. The point on a line segment or curvilinear arc that divides the object into two parts of equal length.

Mode. See **Draft Mode** on page 413. **Sculpt Mode**, page 416, and **Render Mode**, page 416.

Mode Pop-up Menu. A pop-up menu that lets you set the active document window to Draft, Sculpt, or Render mode.

Object. An item that can be selected in a **DCAD VectorSpace** Draft or Sculpt window, including 2D and 3D shapes such as lines, rectangles, Boolean objects, cubes, cylinders,

dimensions, text, pasted renderings, and views copied to Draft mode.

Page Breaks. The boundaries, which can be displayed on screen, between individual pages of a document when it is printed.

Palette. A type of dialog box that can remain open. For example, you apply attributes to objects from the Pen and Fill palettes.

Panned Zoom. A method of changing the view that lets you position a rectangle on screen to select the view and zoom level.

Paste. To insert the Clipboard contents into the active window with the Paste command. In **DCAD VectorSpace**, you can paste objects into Sculpt windows, and you can paste objects and renderings into Draft windows.

Pen Color. A color on the Pen Color tab of the Pen palette, which can be applied to the outlines of a 2D or 3D object.

Pen Palette. A floating window that contains Pen colors, Pen Weights, Pen styles, and Arrowheads, which can be applied to lines and the outlines of objects.

Pen Style. A pattern of dashes made of solid lines and blank spaces, which can be applied to the outlines of 2D objects.

Pen Weight. The thickness of a line or the outline of a 2D object, which can be set from the Pen Weight tab of the Pen palette.

PICT. A standard Mac OS graphics file format that supports vector objects, raster images, and formatted text.

Polar Array. Radial copies of an object that are separated from one another by a specific distance and angle.

Polygon. A closed 2D shape bounded by three or more lines or segments.

Polyline. An open shape drawn by setting endpoints of connected line segments, using the Single Polyline tool or Double Polyline tool.

Preferences . Settings that users can adjust with the Preferences command, which control the operation of **DCAD VectorSpace**'s tools and other features.

Properties . Aspects of an object's identity, including size, coordinates, the tool used to create it, its attributes, name, Class, and status as a container, Library Object or Symbol. The Properties Manager lets you view and edit information about a selected object's properties.

Properties Manager. A palette that displays information about a selected object. You can display an object's attributes, position, name, creation points and class in the Properties Manager, and use it to designate a selected object as a Library Object, Library Symbol, Container, or Sweep Section.

QuickTime. A Mac OS technology, installed as a system extension, used for recording and reproducing digital movies. QuickTime is used with **DCAD VectorSpace** to create animated walk-throughs of renderings.

Quicktime Movie. A digital animation file created in **DCAD VectorSpace** from a walkthrough path of a rendering.

QuickTime VR. A Mac OS technology used with **DCAD VectorSpace** to create rendered scenes that can be viewed in 360-degree perspective.

Refresh. Redisplaying the screen contents by choosing the Refresh command in the View menu.

Relative View. A plane set at any position as a window through which the user views a drawing. A Relative View lets you work on any surface in a drawing as if the surface were parallel to the computer screen.

Render. To create a picture of the 3D objects in a document in a Render mode window with the Wireframe, Hidden Line, or Solid commands.

Render Mode. The mode in which **DCAD VectorSpace** operates when a Render window is active. Render mode is used to create Wireframe, Hidden Line, and Solid renderings of the 3D objects in a document.

Render Mode Window. Any window showing your work in Render mode.

Reshape Mode. A mode initiated by the Reshape command, or the use of the Point Selection tool, that allows you to reposition creation points or vertices of selected objects.

Right View. One of six orthogonal views in Draft and Sculpt modes. Right view shows the workspace from the right. This is an elevation view.

Rotate . To change an object's orientation by moving it around a specified point with the Rotate command.

Scale-dependent. An object in a **DCAD VectorSpace** document whose size measurement is relative to the scale set for the document. Nearly all objects, except text and dimension objects, are scale-dependent.

Scale-independent. An object, such as text or a dimension, which maintains a particular size measurement regardless of the scale set for the document.

Sculpt Mode. The mode in which **DCAD VectorSpace** operates when a Sculpt window is active. Sculpt mode can be used to create and view 3D objects and to set up lighting and walkthroughs.

Sculpt Mode Window. Any window showing your work in Sculpt mode.

Second Plane. The plane you set second, regardless of position, when you define a set of extrusion planes.

Snap . To limit the movement of the drawing vector, the pointer, or an object to a specific location in a drawing by using various constraints.

DCAD VectorSpace provides multiple methods of constraining: the Snaps pop-up menu, and the Snap to Grid, Snap to Objects, and Create Snap Objects commands.

Snap Points. The points on the outline of an object that can attract the pointer so it snaps to the exact position of the point.

Snaps Menu. A menu that appears in the drawing window when you press the pointer on an object and press the Control key. The commands in the menu let you constrain the pointer and drawing vector to align objects when you draw them.

Solid Rendering. A rendering created when you choose Solid in the Rendering menu. A Solid rendering shows objects as solids shaded with either their Pen colors or Surface materials.

Spin Extrusion Axis. A line around which a 2D object is rotated to create a 3D object using Spin extrusion method.

Spin Extrusion. A method of extending a 2D object into three dimensions by rotating the object around a Spin extrusion axis.

Status Bar . An area at the top of the screen that displays five pop-up menus from which you choose display options, Full View or Sectioned View, extrusion planes, and Relative Views.

Surface Material. A pixel-based image that can be applied to 3D objects and displayed in a Solid rendering to give the appearance of real-world surfaces, such as wood, glass, and metal.

Sweep Extrusion . A method of extruding a 2D object into three dimensions by extending the object along a specified path.

Sweep Insertion Point. A point on a Sweep section that follows the Sweep path when using the

Sweep extrusion method to create a 3D object from a 2D Sweep section.

Sweep Section . A 2D object designated in the Properties Manager for extrusion into three dimensions using Sweep extrusion method.

Sweep Path. A path along which a Sweep section can be extruded.

Symbols. Objects that have been grouped and saved as Symbols in the Properties Manager. You can access Symbols on the Symbols tab in the Library palette. You can designate only 2D objects as Symbols. Unlike Library Objects, Symbols are scale independent.

Text Objects. An object created with a text tool that contains text. Text objects are scale independent.

3D Axis. See **Spin Extrusion Axis** on page 417..

3D Objects . Objects defined in three dimensions. 3D objects have width, height, and depth. 3D objects can be created by extruding 2D objects in Draft mode, or by drawing objects in Sculpt mode. Only 3D objects can be rendered.

3D Plane . See **Extrusion Planes** on page 414.

Tile . To arrange multiple windows of an active document so two or more windows do not overlap.

Tools. Items used to create objects and set points of view in **DCAD VectorSpace**. Tools are represented by icons in the toolbox.

Toolbars . Optional drawing and information elements that can be displayed on screen, including the Action buttons, Info bar, Status bar, and Help bar, using the Toolbars command.

Toolbox . A floating palette from which you can select tools to draft, model, and render in **DCAD VectorSpace**.

Top View. One of six orthogonal views in Draft and Sculpt modes. Top view shows the

DCAD VectorSpace workspace from the top. This is the plan view.

2D Objects. Objects defined in two dimensions. They have width and height, but no depth.

Units . The smallest named unit of measurement from which all calculations are based in the document.

View. One of the six orthogonal views of the **DCAD VectorSpace** workspace, designated Top, Bottom, Front, Back, Left, or Right.

View Options Mode. The mode that determines if 2D and 3D objects are displayed in Draft and Sculpt modes.

Vertex. A point of intersection of two vectors, or a point on a polygon.

Vertical Focal Point . A point of view specified by the height of a camera and the vertical angle of

its sight lines, which determines the view of 3D objects seen in a rendering.

Walkthrough. A type of animated rendering made by recording the views along a specified path through the 3D space of a **DCAD VectorSpace** document.

Wireframe Rendering. A rendering created in the Render mode window when you choose the Wireframe command in the Rendering menu. A Wireframe rendering shows 3D objects as transparent outlines.

Zoom. To change the view of a drawing by changing the view magnification. Changing magnification changes only the appearance on screen, not the actual size of the objects in the drawing.

Parametric Text Format (PTF)

In this chapter:

- Introduction
- Creating and using PTF files
- PTF Reference
- Simple Object descriptions
- Boolean Object descriptions
- Grouped Object descriptions
- Container descriptions
- Dimension Object descriptions



Parametric Text Format (PTF)

Parametric Text Format (PTF) is **DCAD VectorSpace**'s plain text language interface. PTF lets you save the contents of **DCAD VectorSpace** documents in files that are compatible with external programs such as spreadsheets, word processors, and programming language text editors.

You also can create PTF files for import into **DCAD VectorSpace** using such programs. The import feature lets you import objects as well as execute scripted commands.

As an added feature, saving a **DCAD VectorSpace** file under the Parametric Text Format may also serve as a backup tool or to create internet-safe transportable files.

Introduction

PTF files can be created in several ways:

Quick and easy. You can use **DCAD VectorSpace**'s Save As command in the File menu to create a PTF file from a **DCAD VectorSpace** document. The PTF file describes in plain text the objects in the **DCAD VectorSpace** document, and can later be imported, with or without modifications, into another **DCAD VectorSpace** document.

Pros: Fast and easy. Ensures file transportability even in tough environments such as the Internet.

Cons: Resulting file is flat. Modifications are difficult because objects are hard to locate within the file.

Slow and dirty . You can use a text editor to write, line by line, the commands required to create a collection of objects.

Pros: A text editor is probably the most common tool in any computer environment.

- Ensures file transportability even in tough environments such as the Internet.

Cons: Resulting file is flat.

- Modifications are difficult because objects are hard to locate within the file.

- Error-prone.

- Files are hard to debug.

- This method, while viable, is not recommended.

Smart and savvy. You can use a spreadsheet application to create every command required to reproduce a given collection of objects.

Pros: Besides text editors, a spreadsheet application is probably the most common tool in any computer environment.

- You can use your spreadsheet knowledge to create functions and macros to automate your object design process, effectively improving your professional productivity.

- Ensures file transportability even in tough environments such as the Internet.

- Files are easy to debug because you have a better control at the source.

- Builds your self esteem and ego.

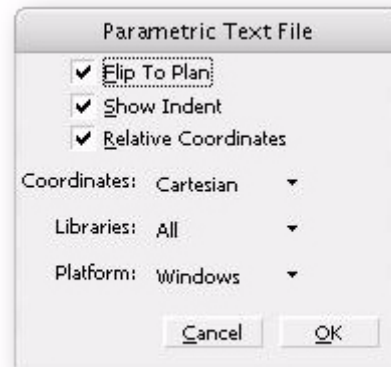
Cons: Knowledge of spreadsheet operations is required.

Creating and using PTF files

You create PTF files by using the Save As command in the File menu. This allows you to save an object, a group of objects, or a complete document using the PTF file format.

To create a simple PTF file in DCAD VectorSpace

1. Draw a line in a new **DCAD VectorSpace** document.
2. Choose Save As in the File menu.
3. Type a name for the file in the Save As text box.
4. In the File Format pop-up menu, select PTF. **DCAD VectorSpace** adds “.PTF” to the file’s name.
5. Choose a location to save the file, and then click Save.
6. A message appears, warning that saving documents in other formats can result in lost data. Click Save in the message box to continue.



7. The Parametric Text File dialog box appears.
8. Click OK to use the default settings and save the PTF file.

To view and modify the PTF file

1. Launch your favorite spreadsheet program.
2. Choose Open in the File menu. In the dialog box that appears, select the PTF file that you saved and click Open. The information in the PTF file appears in the spreadsheet.

	A	B	C	D	E
1	Begin PTF				
2	Distance Units	DecInches			
3	Angular Units	DecDegrees			
4	Coordinates	Cartesian			
5	VectorCoordSys	XY	dXdY		
6	View	Top			
7	Mode	Draft			
8	Layer #	0			
9	Pen Color (R G B)	0	0	0	
10	Line Type (Thick Dash Eccen)	1	1	0	
11	Arrow Heads (Begin End)	0	0		
12	Fill Color (R G B)	0	0	0	
13	Fill Pattern	0			
14	Object	DiagonalRect			
15		Name	DiagonalRect 1		
16		# Points	2		
17		Pt# X Y	1 -3.720.000	120.000	
18		Pt# dX dY	2 1.800.000	-960.000	
19	Layer #	11			
20	Object	DiagonalRect			
21		Name	DiagonalRect 2		
22		# Points	2		
23		Pt# X Y	1 1.320.000	1.560.000	
24		Pt# dX dY	2 2.400.000	-1.560.000	
25	Object	Line			
26		Name	Line 2		
27		# Points	2		
28		Pt# X Y	1 -2.400.000	-120.000	
29		Pt# dX dY	2 1.320.000	600.000	
30	Object	Line			
31		Name	Line 3		
32		# Points	2		
33		Pt# X Y	1 -2.400.000	240.000	
34		Pt# dX dY	2 840.000	360.000	
35	End PTF				

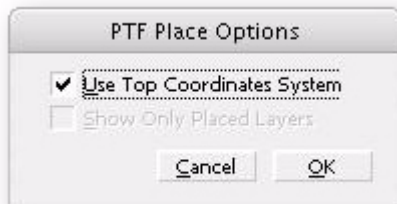
3. Change the value of the X coordinate (cell D17 in the example) to the value you want. In this case, we'll change the value from -3.720.000 to

0. In your spreadsheet, you can use formulas to define this value.

-
4. Choose Save As in the File menu and save a copy of the file as a tab-delimited text file.

To insert the edited PTF file into DCAD VectorSpace

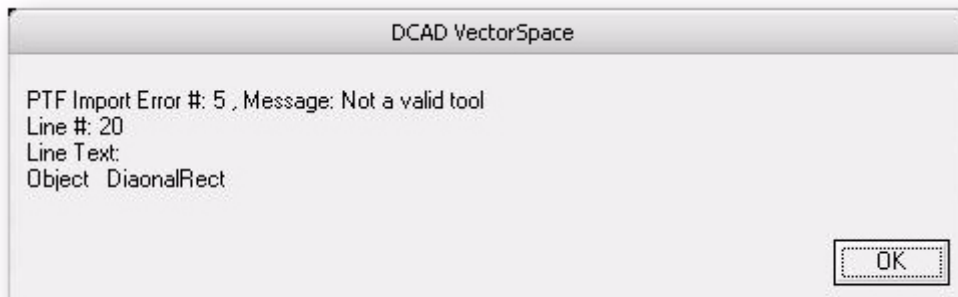
1. Launch **DCAD VectorSpace**.
2. Choose Import in the File menu. The PTF Place Options dialog box appears. Click OK to implement the default settings and import the file. Notice that the line you've drawn appears in a new position on screen.



In addition to changing position data, you can change color, dash settings, line thickness, and any other parameter in the description of an object by editing a PTF file.

Error messages. If you change something in the PTF file so that **DCAD VectorSpace** can't interpret the file correctly, an error message appears. If this happens, note that the message lists the line in the file where the error occurs. Following the label "Line Text," the message box displays the text of the line containing the error.

Click OK in the message box to continue. Then, check the line in the PTF file that was listed in the error message.



Options for saving PTF files

You have several options you can choose when you save files in the PTF file format:

Flip to Plan. Uses the Cartesian coordinate system in Top view. Positive coordinates are up and right, negative coordinates are down and left. If

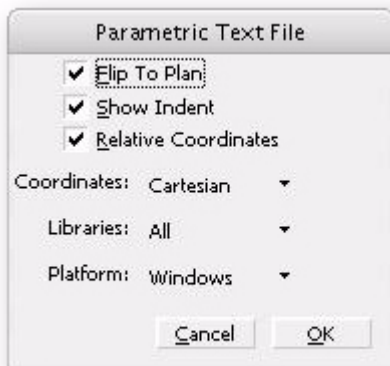
this option is not selected, **DCAD VectorSpace** uses the current view.

Show Indent. Saves the text tabs in the file to show the hierarchy of objects. If this option is not selected commands and object descriptions will not be indented.

Relative Coordinates. Choose this option to define points by their relationship to the first point in the object or command. If you clear this check box, all coordinates will be saved as absolute and refer to a common fixed origin point

Coordinates pop-up menu. Choose the coordinate system you want **DCAD VectorSpace** to use when saving the PTF file.

Libraries pop-up menu. Choose which Library Objects and Symbols you want to include in the PTF file. You can include all Library Objects and Symbols listed in the Library palette, Library Objects and Symbols used in the document only, or no Objects and Symbols.



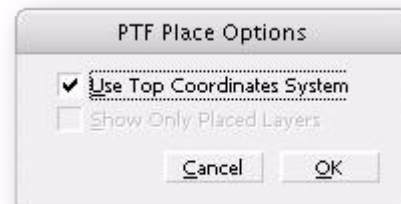
Options for saving PTF files appear in the Parametric Text File dialog box

PTF Place Options

When importing a PTF format file, you have two options:

Use Top Coordinates System. Uses the Cartesian coordinate system in Top view. Positive coordinates are up and right, negative coordinates are down and left.

Show Only Placed Layers. Displays objects in the drawing that belong to imported layers only.



Options for importing PTF files appear in the PTF Place Options dialog box

Creating PTF files with a text editor

Just fire up your text editor and type away! Keep the following issues in mind:

PTF is not case-sensitive. “Fill Pattern,” “FILL PATTERN” and “fILL pATTERN” all represent the same information.

The field separator is the Tab character. Always use the Tab key to separate commands from

their parameters, and the parameters from each other.

Space to the left is irrelevant. The following two samples are the same, even though the space to the left is different.

Although space to the left is not relevant, it helps organize your information. Notice that the

second sample is easier to read and follow than the first one.

```
Begin PTF
Distance Units DecInches
Angular Units DecDegrees
View Top
Mode Draft
Layer # 0
Pen Color (R G B) 89 0 0
Line Type (Thick Dash Eccen) 1 1 0
Arrow Heads (Begin, End) 0 0
Fill Color (R G B) 0 0 0
Fill Pattern 0
Object DiagonalRect
Name DiagonalRect 1
# Points 2
Pt# X Y 1 -228.000 144.000
Pt# DX DY 2 192.000 -96.000
End PTF
```

```
Begin PTF
Distance Units DecInches
Angular Units DecDegrees
View Top
Mode Draft
Layer # 0
Pen Color (R G B) 89 0 0
Line Type (Thick Dash Eccen) 1 1 0
Arrow Heads (Begin, End) 0 0
Fill Color (R G B) 0 0 0
Fill Pattern 0
Object DiagonalRect
Name DiagonalRect 1
# Points 2
Pt# X Y 1 -228.000 144.000
Pt# DX DY 2 192.000 -96.000
End PTF
```

Space above “Begin PTF” is irrelevant. To annotate or describe your work, you can use as many lines as you want above the “Begin PTF” command.

Space below “End PTF” is irrelevant. To annotate or describe your work, you can use as many

lines as you want below the “End PTF” command.

Empty lines are irrelevant. You can insert blank lines as needed. In general, this makes PTF files easier to read and follow.

Creating PTF files in a spreadsheet program

Using a spreadsheet program is by far the smartest and easiest way to generate PTF text files.

Because the final file structure is the same, the same issues apply when you use a spreadsheet to create a PTF file as when you create a PTF file with a text editor.

You can use all of the available spreadsheet functions to generate values and strings which can then be used to create and modify **DCAD VectorSpace** objects.

When you finish creating or modifying a PTF file, remember to save the file in tab-delimited text format.

PTF Reference

This section describes the commands and object descriptions that are implemented in the PTF file format.

- **Simple Object descriptions** begin on page 430.
- **Boolean Object descriptions** begin on page 436.
- **Grouped Object descriptions** begin on page 436.
- **Container descriptions** begin on page 439.
- **Dimension Object descriptions** begin on page 439.

The PTF file structure

When you save a file in PTF format, it appears in spreadsheet applications as shown under “Sample PTF file structure,” next. The exact appearance depends on the spreadsheet you use.

The PTF information is arranged in lines, with keywords and parameters separated from each other by tab characters.

There are three general areas in a PTF file: a Header, a Body, and a Footer.

The PTF Header. The PTF Header contains commands that identify the beginning of the PTF

file. It sets values that will affect the entire **DCAD VectorSpace** document. The PTF Header can be set one time only.

The PTF Body. The PTF Body contains all of the other commands that relate to object creation and manipulation, and to the **DCAD VectorSpace** work environment settings.

The PTF Footer. The PTF Footer contains a single line that identifies the end of the PTF file:

End PTF

Sample PTF file structure

	DecInches		
	DecDegrees		
	Top		
	Draft		
	0		
	89	0	0
	1	1	0
	0	0	
	0	0	0
	0		
	DiagonalRect		
	DiagonalRect 1		
	2		
	1	-228.000	144.000
	2	192.000	-96.000
	0	40	100
	DiagonalRect		
	DiagonalRect 2		
	2		
	1	-84.000	84.000
	2	180.000	-84.000
	0	0	0
	DiagonalRect		
	DiagonalRect 3		
	2		
	1	60.000	12.000
	2	204.000	-84.000

Typographic conventions

Several typographic conventions are used in the PTF Reference section to distinguish commands, parameters, and related information.

Commands and keywords. These words must be typed as shown (although they are not case-sensitive). Commands and keywords tell

DCAD VectorSpace to create objects, use specific settings, and apply commands.

Commands and keywords are shown in `mono-space` type:

Line Type (Thick Dash Eccen)

Parameters. Parameters are the values or data used by commands. In some cases, parameters are

optional. In other cases, as noted in the text, a missing parameter is assumed to be zero.

Most parameters shown in this section are merely “metasymbols” in the PTF descriptions. In other words, the parameters shown are placeholders to be replaced by actual data or values.

Parameter metasymbols are shown in *italic* type:

Num_Points_Integer

Data. Data used in this section represent actual numbers or other values that you specify. For example, when coordinates appear in an object description, they represent actual coordinates that you specify in a PTF object description. Examples of actual values that can be used are shown in roman type.

General syntax for object descriptions

The following syntax is used for object descriptions in PTF format. Keywords are separated from param-

eters, and parameters are separated from each other, by a tab character.

```
Keywords Parameters

Object Tool_Name
Name Default_Name | User_Name
# Points Num_Points_Integer
Pt# X Y Ordinal_Integer X_Real Y_Real
Pt# DX DY Ordinal_Integer dX_Real dY_Real
Pt# D A Ordinal_Integer Distance_Real Angle_Real
Pt# DD DA Ordinal_Integer dDistance_Real dAngle_Real
```

Parameter definitions

The parameters used in object descriptions and other commands are represented by the following meta-

symbols (metasymbols are terms that will be replaced by actual parameter values in a PTF file):


Tool_Name	The name of the tool used to generate the object
Default_Name	The object name assigned by DCAD VectorSpace
User_Name	An object name assigned by the user
Num_Points_Integer	The number of creation points in the object
Ordinal_Integer	An integer indicating the position of the point within the object definition list
X_Real, Y_Real	Coordinate real values (absolute coordinates)

Distance_Real	Distance real value
Angle_Real	Angle real value
dDistance_Real	Change in distance real value (relative to previous point)
dAngle_Real	Change in angle real value (relative to previous point)
n	An integer value
a b c ...	Coordinate value

Notes

When creating PTF documents using text editors or spreadsheet applications you can use the *User_Name* parameter when naming objects. The *Default_Name* parameters are used by **DCAD VectorSpace** when you save a **DCAD VectorSpace** document in PTF format.

In PTF keywords and parameters, point coordinates can be expressed as absolute coordinates (*XY*), relative coordinates (*dXdY*), absolute distance and angle (*DA*) or relative distance and angle (*dD dA*).

Note: The letter “D” or “d” is used in place of the delta symbol to indicate a relative distance or angle. For example, *dX_Real* is a relative X coordinate value. 

In a PTF file, an object’s definition ends when the indicated number of points (*Num_Points_Integer*) is read, or when another object description is initiated, or when a general or particular attribute command is encountered.

If the number of points read is different than the number of points specified by the *Num_Points_Integer* parameter, the object is not drawn and an error message is generated.

Simple Object descriptions

Simple objects are objects you would create in **DCAD VectorSpace** using a single tool, without additional object operations.

Simple Object descriptions lets you create these same objects in PTF files. A Simple Object description starts with the *Object* keyword, followed by

keywords for the object's name, number of points,
and the point coordinates.

Simple Object descriptions (Sheet 1 of 5)

3PointsArc	<p>Describes an arc drawn by the Arc 3 Points tool, defined by three points: two endpoints and a point on the arc's periphery.</p> <p>Object 3PointsArc Name 3PointsArc <i>n</i> # Points 3 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY 3 <i>e f</i></p>
3PointsCircle	<p>Describes a circle drawn by the Circle 3 Points tool, defined by three points on its periphery.</p> <p>Object 3PointsCircle Name 3PointsCircle <i>n</i> # Points 3 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY 3 <i>e f</i></p>
CenterEllipse	<p>Describes an ellipse or circle drawn by the Ellipse Center to Corner tool, defined by its center point and one corner of its bounding rectangle.</p> <p>Object CenterEllipse Name CenterEllipse <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
CenterRadiusArc	<p>Describes an arc drawn by the Arc Radius tool, defined by three points: its center, a starting point on the periphery and an ending point on its periphery</p> <p>Object CenterRadiusArc Name CenterRadiusArc <i>n</i> # Points 3 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY 2 <i>e f</i></p>
CenterRadiusCircle	<p>Describes an ellipse or circle drawn by the Circle Radius tool, defined by two points: its center and a point on its periphery.</p> <p>Object CenterRadiusCircle Name CenterRadiusCircle <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>

Simple Object descriptions (Sheet 2 of 5)

CenterRect	<p>Describes a rectangle drawn by the Rectangle Center to Corner tool, defined by two points: the center point and one corner point.</p> <p>Object CenterRect Name CenterRect <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
CenterRoundRect	<p>Describes a rounded rectangle drawn by the Rounded Rectangle tool, defined by two points: its center and one of its corners.</p> <p>Object CenterRoundRect Name CenterRoundRect <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
DiagonalEllipse	<p>Describes an ellipse or circle drawn by the Ellipse Diagonal tool, defined by two opposite corners of its bounding rectangle.</p> <p>Object DiagonalEllipse Name DiagonalEllipse <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
DiagonalRect	<p>Describes a rectangle drawn by the Rectangle Diagonal tool, defined by two opposite corner points.</p> <p>Object DiagonalRect Name DiagonalRect <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
DiagonalRoundRect	<p>Describes a rounded rectangle drawn by the Rounded Rectangle Diagonal tool, defined by two opposite corner points.</p> <p>Object DiagonalRoundRect Name DiagonalRoundRect <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
DirectLightSource	<p>Describes a directional light source drawn by the Directional Light tool, defined by its position and a point located on its illumination axis. The Power setting defaults to 100. You cannot define the Power (brightness) setting.</p> <p>Object DirectLightSource Name DirectLightSource <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>

Simple Object descriptions (Sheet 3 of 5)

FreeRect	<p>Describes a rectangle drawn by the Rectangle 3 Points tool, defined by the end points of one side and an end point of the opposite side.</p> <p>Object FreeRect Name FreeRect <i>n</i> # Points 3 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY 3 <i>e f</i></p>
LightSource	<p>Describes a light source drawn by the Omnidirectional Light tool, defined by its position. The Power setting defaults to 100. You cannot define the Power (brightness) setting.</p> <p>Object LightSource Name LightSource <i>n</i> # Points 1 Pt# X Y 1 <i>a b</i></p>
Line	<p>Describes a line drawn by the Line tool, defined by two endpoints.</p> <p>Object Line Name Line <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
PolygonVertex	<p>Describes a polygon drawn by the Polygon Vertex tool, defined by two endpoints.</p> <p>Object PolygonVertex Name PolygonVertex <i>n</i> #Sides 6 # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
PolygonMidPoint	<p>Describes a polygon drawn by the Polygon Midpoint tool, with six sides.</p> <p>Object PolygonMidpoint Name PolygonMidpoint <i>n</i> #Sides 6 # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></p>
QB_Spline	<p>Describes a curve drawn by the Curve tool, defined by 5 points. The first and last points are the endpoints and the other points define the curvature of the curve.</p> <p>Object QB_Spline Name QB_Spline <i>n</i> # Points <i>n</i> Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY <i>n e f</i></p>

Simple Object descriptions (Sheet 4 of 5)

OffsetPoly	<p>Describes an offset polyline drawn by the Double Polyline tool, defined by “n” points. The Poly Width parameter defines the distance between the parallel lines. The Offset parameter defines the distance from the center of the parallel lines to the line described by the set points. The Poly Ends parameter must be set to Close Close.</p> <p>Object OffsetPoly Name OffsetPoly <i>n</i> Poly Ends Close Close Poly Width / Offset 4.00 0.00 # Points 5 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY <i>n e f</i> #Lines Eccen List <i>n a b c d</i></p>
Polyline	<p>Describes a polyline drawn by the Single Polyline tool, defined by its “n” endpoints.</p> <p>Object Polyline Name Polyline <i>n</i> # Points <i>n</i> Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Pt# DX DY <i>n e f</i></p>
3DElement	<p>Describes a three-dimensional object defined by “n” points. DCAD VectorSpace must be set to Sculpt mode before you define any 3D object.</p> <p>Object 3DElement Name 3DElement <i>n</i> # Points 4 Pt# X Y Z 1 <i>a b c</i> Pt# DX DY DZ 2 <i>d e f</i> Pt# DX DY DZ 3 <i>g h i</i> Pt# DX DY DZ <i>n j k l</i> #Face #Pts List <i>n n1 n2 n3</i></p>

Simple Object descriptions (Sheet 5 of 5)

2DLibrary	<div>Describes a 2D Library Object.</div> <div>Object Group Name Object Name ObjectLibrary HiddenBoolean Insertion Point <i>XY</i> # Objects 2 Pen Color (R G B) <i>rgb</i> Line Type (Thick Dash Eccen) 1 1 0 Arrow Heads (Begin End) 0 0 Fill Color (R G B) 0 0 0 Fill Pattern 0 Object DiagonalRect Name DiagonalRect <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i> Object DiagonalEllipse Name DiagonalEllipse <i>n</i> # Points 2 Pt# X Y 1 <i>a b</i> Pt# DX DY 2 <i>c d</i></div>
3DLibrary	<div>Describes a 3D Library Object.</div> <div>Object 3DElement # Points <i>n</i> Pt# X Y Z 1 <i>a b c</i> Pt# DX DY DZ 2 <i>d e f</i> Pt# DX DY DZ 3 <i>d e f</i> Pt# DX DY DZ <i>n</i> <i>d e f</i> #Face #Pts List 1 <i>1 3 2</i> #Face #Pts List 2 <i>1 4 3</i> #Face #Pts List 3 <i>1 2 3</i> #Face #Pts List 4 <i>2 1 4</i> #Face #Pts List 5 <i>2 3 4</i> #Face #Pts List <i>n</i> <i>3 4 2</i></div>

Boolean Object descriptions

Boolean Object descriptions specify composite objects derived from the application of a Boolean operation to several objects.

Boolean object descriptions

```
Object Boolean
Name Boolean_Element_Name
Boolean Mode Boolean_Mode_String*
# Objects n
Pen Color (R G B) R G B
Line Type (Thick Dash Eccen) T D E
Arrow Heads (Begin End) B E
Fill Color (R G B) R G B
Fill Pattern FP
Object Object_Definition_1
Object Object_Definition_2
Object Object_Definition_n
```

* *Boolean_Mode_String* can be one of five values: None, Add, Subtract, Intersect, or Hide

Grouped Object descriptions

Grouped Object descriptions specify composite objects derived from the grouping of simple objects. A grouped object can be one of the following types:

- Simple group
- Section group
- Library Object group
- Library Symbol group

Library Objects and Library Symbols contained in PTF files can be loaded into standard **DCAD VectorSpace** documents and used in exactly

the same way as Library Objects and Library Symbols that are contained in standard **DCAD VectorSpace** documents.

PTF Libraries

When you add a Library Object or Library Symbol to a **DCAD VectorSpace** document, the directory dialog box includes a pop-up menu you can use to select the type of library host file to use.

The directory dialog box also includes a “Show All Files” checkbox.

Grouped Object descriptions (Sheet 1 of 2)

Group	Object Group
	Name <i>Group_Name</i>
	# Objects <i>n</i>
	Object <i>Object_Definition_1</i>
	Object <i>Object_Definition_2</i>
	Object <i>Object_Definition_n</i>
<hr/>	
Group: Library	Object Group
	Name Library 1
	Object Library
	Insertion Point -4.20 2.70
	# Objects 2
	Pen Color (R G B) 0 0 0
	Line Type (Thick Dash Eccen) 1 1 0
	Arrow Heads (Begin End) 0 0
	Fill Color (R G B) 0 0 0
	Fill Pattern 0
	Object DiagonalRect
	Name DiagonalRect 1
	# Points 2
	Pt# X Y 1 -5.40 4.00
	Pt# DX DY 2 1.80 -2.00
	Object DiagonalEllipse
	Name DiagonalEllipse 1
	# Points 2
	Pt# X Y 1 -4.40 2.60
	Pt# DX DY 2 1.40 -1.20

Grouped Object descriptions (Sheet 2 of 2)

Group: Symbol

Object Group
Name Symbol 1
SymbolLibrary
Insertion Point 3.10 2.30
Objects 3
Object DiagonalEllipse
Name DiagonalEllipse 2
Points 2
Pt# X Y 1 2.20 3.20
Pt# DX DY 2 1.80 -1.80
Object Line
Name Line 1
Points 2
Pt# X Y 1 3.10 4.10
Pt# DX DY 2 0.00 -3.60
Object Line
Name Line 1
Points 2
Pt# X Y 1 1.30 2.30
Pt# DX DY 2 3.60 0.00

Group: Section

Object Group
Name Section 3
Section
Insertion Point -4.30 -2.50
Objects 3
Object DiagonalEllipse
Name DiagonalEllipse 2
Points 2
Pt# X Y 1 -5.20 -1.60
Pt# DX DY 2 1.80 -1.80
Object Line
Name Line 1
Points 2
Pt# X Y 1 -4.30 -0.70
Pt# DX DY 2 0.00 -3.60
Object Line
Name Line 1
Points 2
Pt# X Y 1 -6.10 -2.50
Pt# DX DY 2 3.60 0.00

Container descriptions

A Container is a non-printing object used to group unrelated objects for reporting purposes. Any object can be used as a Container. In the example below, a DiagonalRect is used as a Container.

Container	Object DiagonalRect
	Name <i>Object_Name_String</i>
	Container
	# Points 2
	Pt# X Y 1 <i>XY</i>
	Pt# DX DY 2 <i>Dx Die</i>

Dimension Object descriptions

Dimension Object descriptions specify dimension objects that can be drawn with the Dimension tools in **DCAD VectorSpace**.

Dimension object descriptions (Sheet 1 of 3)

ChainDimm	Describes a dimension drawn by the Chain Dimension tool.
	Object ChainDimm
	Name ChainDimm 1
	Dimm Arrowhead 8
	Witness (Position Length) 1 2
	Dimm Text (Font Size Face Just) 3 9 0 1
	Dimm Distances (A B C D E) 1.6 3.2 1.6 1.6 1.6
	Dimm Precision (Dec Places Told) 2 0.000 0.000
	# Points 4
	Pt# X Y 1 -7.80 3.20
	Pt# DX DY 2 2.40 0.00
	Pt# DX DY 3 2.00 0.00
	Pt# DX DY 4 2.20 0.00
	Dimm Line -7.80 4.20 6.60 0.00
	Dimm Label# Dh Dv Text 1 0.83 0.16 2.40
	Dimm Label# Dh Dv Text 2 0.63 0.16 2.00
	Dimm Label# Dh Dv Text 3 0.73 0.16 2.20

Dimension object descriptions (Sheet 2 of 3)

BaseLineDimm

Describes a dimension drawn by the Baseline Dimension tool.

Object BaseLineDimm
Name BaseLineDimm 1
Dimm Arrowhead 8
Witness (Position Length) 1 2
Dimm Text (Font Size Face Just) 3 9 0 1
Dimm Distances (A B C D E) 1.6 3.2 1.6 1.6 1.6
Dimm Precision (Dec Places +Tol -Tol) 2 0.000 0.000
Points 4
Pt# X Y 1 -7.80 0.00
Pt# DX DY 2 2.40 0.00
Pt# DX DY 3 2.00 0.00
Pt# DX DY 4 2.20 0.00
Dimm Line -7.80 0.60 6.60 0.00
Dimm Label# Dh Dv Text 1 0.83 0.16 2.40
Dimm Label# Dh Dv Text 2 1.83 0.16 4.40
Dimm Label# Dh Dv Text 3 2.93 0.16 6.60

LeaderDimm

Describes a dimension drawn by the Leader Dimension tool.

Object LeaderDimm
Name LeaderDimm 1
Dimm Arrowhead 8
Dimm Text (Font Size Face Just) 3 9 0 1
Dimm Distances (A B C D E) 1.6 0.0 0.0 0.0 0.0
Dimm Precision (Dec Places +Tol -Tol) 2 0.000 0.000
Points 2
Pt# X Y 1 -7.80 -1.20
Pt# DX DY 2 6.60 0.00
Dimm Label# Dh Dv Text 1 2.93 0.16 6.60

DoubleLeaderDimm

Describes a dimension drawn by the Constrained Dimension tool.

Object DoubleLeaderDimm
Name DoubleLeaderDimm 1
Dimm Arrowhead 8
Dimm Text (Font Size Face Just) 3 9 0 1
Dimm Distances (A B C D E) 1.6 0.0 0.0 0.0 0.0
Dimm Precision (Dec Places +Tol -Tol) 2 0.000 0.000
Points 2
Pt# X Y 1 -7.80 -2.20
Pt# DX DY 2 6.60 0.00
Dimm Label# Dh Dv Text 1 2.93 0.16 6.60

Dimension object descriptions (Sheet 3 of 3)

AngleDimm	Describes a dimension drawn by the Angle Dimension tool. The angle measured is between two lines. The first two points define the first line. The second set of points define the second line.
	Object AngleDimm
	Name AngleDimm 2
	# Points 4
	Pt# X Y 1 1.80 0.00
	Pt# DX DY 2 4.80 0.00
	Pt# DX DY 3 -2.00 2.80
	Pt# DX DY 4 1.63 -0.96

How to...



How to...

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