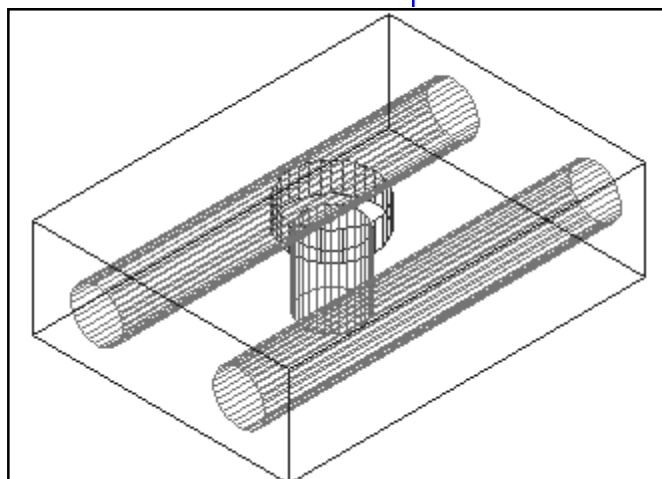
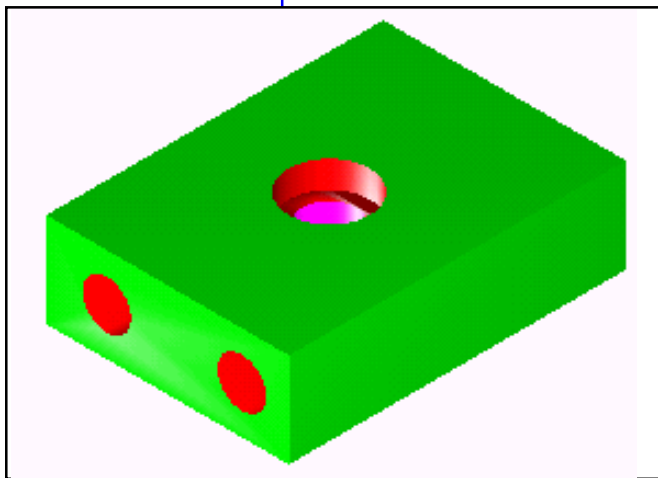


QuickTutor

An Introductory
SilverScreen Modeling
Tutorial



Solid Modeler



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Revision 3 Version 8.01 092105

Constructing a 3D Model

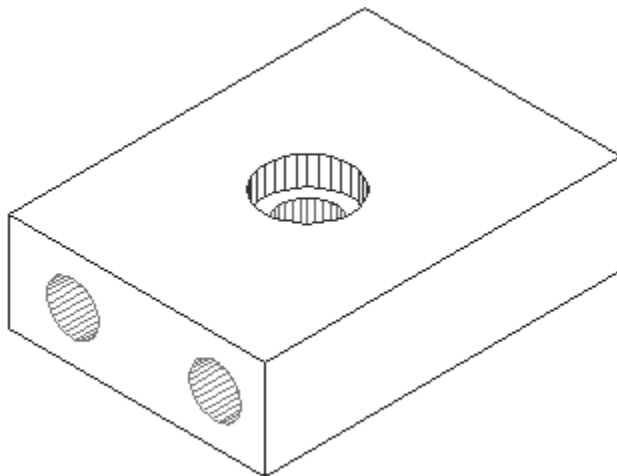
This portion of QuickSilver is an exercise to introduce you to constructing a 3-dimensional model. The activity is intended to introduce you to some of the basic modeling commands available with SilverScreen.

Prior to starting the model, you need to have installed and started SilverScreen. Load SilverScreen and make sure the STANDARD, CONTEXT, SCREEN TABS, ZOOM and XYZ toolbars are displayed. If those toolbars are not displayed, select **T**ools **T**oolbars from the menu bar and check those toolbars in the dialog box. Select **OK**. Note that your screen may appear different than those illustrated due to the placement of the toolbars. A command can be cancelled by pressing **ESC** or by selecting CANCEL from the OPTIONS menu (click right mouse button).

If you have previously started the software and began a drawing, select the command **F**ile **C**lear **a**ll before beginning the exercise. Answer "YES" when prompted "Clear all drawings?". This completely clears SilverScreen of all drawings and resets many of the system's defaults.

Finished Drawing

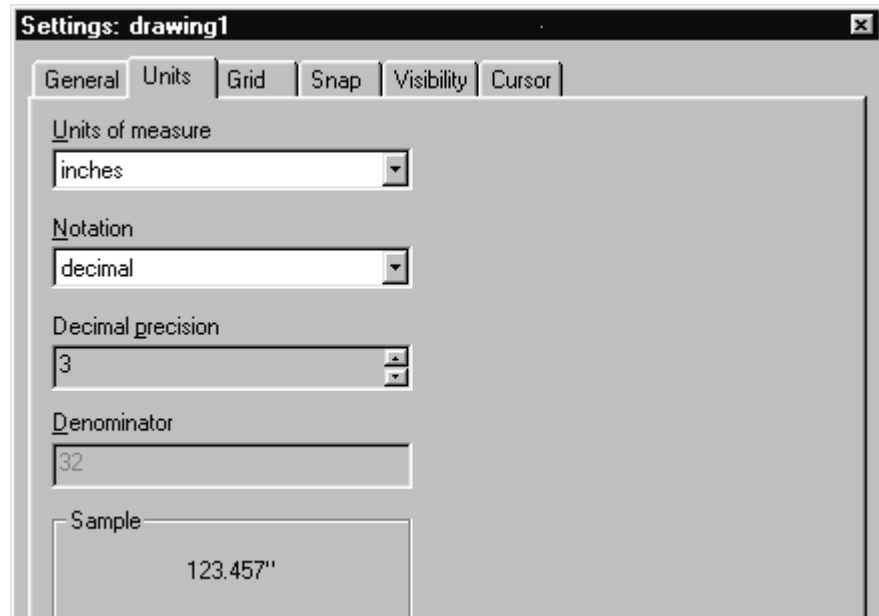
The example below illustrates the finished drawing.



Setup

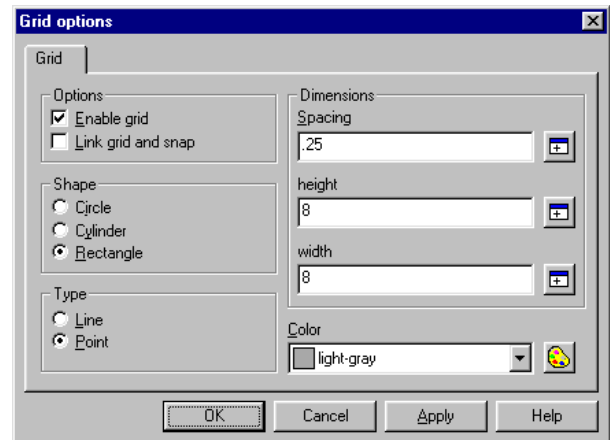
Prior to starting, you want to establish the initial settings that are the best for completion of the model. First, select **E**dit **D**rawing **S**ettings... to establish the appropriate working units.

A dialog box displays options for changing many of the drawing settings. First select the UNITS tab to set the drawing units.



If it is not currently set, set the UNITS OF MEASURE to INCHES and the NOTATION to DECIMAL. Next, select the GRID tab and set the following:

Options	Enable Grid
Shape	Rectangle
Type	Point
Dimensions	
Spacing	.25
Height	8
Width	8
Color	Light-gray



Select the SNAP tab, and set the SPACING to .25. Do not enable the snap at this time. Snap spacing can be quickly altered during the drawing using the increment (insert) and decrement (delete) keys or by using the right mouse button to click on the SNAP button on the status bar or the SNAP setting in the XYZ toolbar.

Select **OK** after the settings are correct.

Zoom the graphics window to a position that fills the window with the grid by selecting the ZOOM GRID tool from the ZOOM TOOLBAR.



Zoom Visible - zooms to extents of currently displayed geometry

Zoom Drawing - displays entire drawing

Zoom Block - zooms to extents of selected block

Zoom Object - zooms to extents of selected object

Zoom Symbol - zooms to extents of selected symbol

Zoom Area - zooms to area indicated within the current view

Zoom Grid - zooms to extents of grid

Zoom Named Group - zooms to extents of selected group

Zoom Q-Group - zooms to extents of current quick group

Zoom in - zooms in relative to center of view

Zoom out - zooms out relative to center of view

The ARROW TRIAD cursor is displayed in the graphics window. This cursor is comprised of three “legs,” each extending along one of the major axes. The color of the axis corresponds to the color of the triad “leg”.

The appearance of the ARROW TRIAD can be more easily seen when displayed in an isometric view. Use the mouse pointer to select the isometric command. If the mouse pointer is not displayed, press the ESC key or click the right mouse button and select CANCEL.

**View
Isometric**

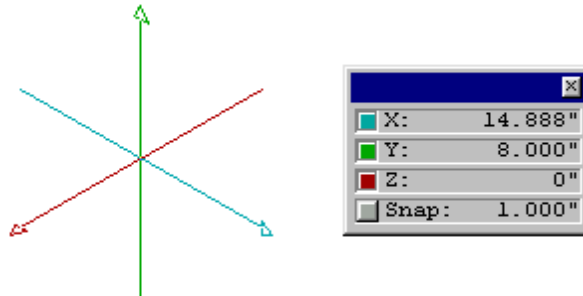
When the dialog box displayed, enter the following:

Front/Rear	front
Left/Right	right
Top/Bottom	top

Select OK after completing the panel.

Essentially, this command changes your viewing vantage point relative to the “world” x, y, and z-axes. If the arrow triad does not appear to have three distinct lines, select **Edit Drawing settings** and go to the CURSOR tab. Change the colors of each triad. You can also use the CURSOR TYPE tool on the DRAW TOOLS toolbar to change the style of the cursor.

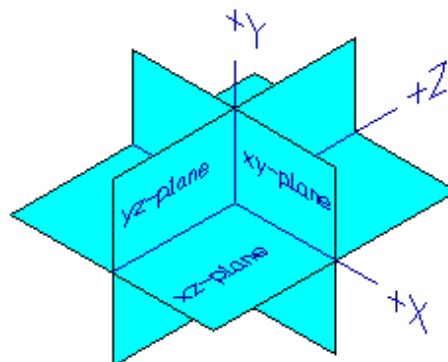
The arrow triad and triad cursors are true 3-D cursor with the color of each TRIAD “leg” corresponding to the color displayed next the X:, Y:, Z: indicators in the XYZ toolbar.



Pressing the arrows keys on the keyboard automatically switches to the ENTRY MODE and moves the triad. You can also activate the ENTRY MODE by pressing the RIGHT mouse button and selecting **M**ove cursor. Press the **ESC** key to return to the OPTION MODE and display of the mouse pointer.

Holding the shift key while moving the mouse or using the minus (-) and plus (+) keys moves the TRIAD along the z-axis. Experiment by moving the cursor and observing the change in the XYZ TOOLBAR. Note, you may need to press the option button (right) on the pointing device to activate the cursor in the draw mode. After you've completed your experimentation, press **CTRL C** to center the cursor in the window.

The grid is currently positioned on the xy-plane of the "world" x, y, and z-axes. When SilverScreen is initially loaded, you are viewing the drawing from the front face view. In that view, the "world" axes are positioned such that the x-axis is horizontal, the y-axis vertical, and the z-axis moving toward and away from the viewing plane. If the view is changed to the right side of the drawing, the "world" z-axis becomes horizontal, the y-axis remains unchanged, and the x-axis moves toward and away from the viewing plane.



A NOTE ABOUT USING FRACTIONS

Although this tutorial is in decimal, SilverScreen lets you enter fractional values. Each value in a fraction is interpreted in terms of the current unit of measure. Entering $1/4$ means 1" divided by 4" if the current unit of measure is inches. If the current unit is feet, it would be 1' divided by 4'. You can add the notation as part of the entry, but note that any value in the fraction that does not have a notation is interpreted in terms of the current unit of measure. You can also mix notations. To assure all elements in a fraction are interpreted in the same notation, precede the fraction with the "_" (underscore).

For example, if the current unit of measure is set to feet, entering $1/4$ " is interpreted as 1' divided by 4". In essence, this would be the same as entering 3". Assuming the same current unit of measure is set to feet, entering $_{1/4}$ " would be 1" divided by 4". The "_" underscore indicates that all values are to use the same notation. The following are some examples:

<i>Current unit of measure</i>	<i>Fraction</i>	<i>Evaluation</i>	<i>Equivalent</i>
feet	$1/4$	1 foot divided by 4 feet	.25 feet or 3 inches
feet	$1/4$ "	1 foot divided by 4 inches	.33 feet or 4 inches
feet	$_{1/4}$ "	1 inch divided by 4 inches	.25 inches
feet	$_{1/4}$	1 foot divided by 4 feet	.25 feet or 3 inches
inch	$1/4$	1 inch divided by 4 inches	.25 inches
inch	$1/4$ '	1 inch divided by 4 feet	.020833 (1/48) inch
inch	$_{1/4}$ '	1 foot divided by 4 feet	.25 feet or 3 inches

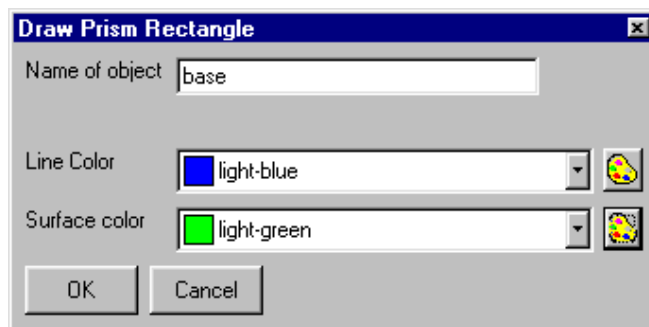
Draw the Basic Shape

SilverScreen allows you to create solids in several ways. One method is to draw a 2D shape and then "sweep" the item to create a 3D shape. The alternative is to use the "draw solid" commands that draw the 3D shape.

Use the Draw Solid command to draw the basic shape. Select the command.

**Draw
Solid
Prism
Rectangle**

The Draw Prism dialog box is displayed.



In the displayed dialog box, set the parameters to the following:

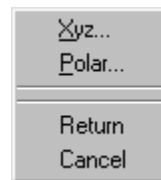
Name of object	base
Line Color	light-blue
Surface Color	light-green

SilverScreen draws all items in objects. If you do not name an object, the name is automatically provided (obj1, obj2, obj3, etc.). Once the object is created, the name of the current object is displayed in the context toolbar.

Colors are either selected by using the pull-down menu to select from the basic colors or using the color palette button to display a full array of colors.

After entering the object name and selecting the colors, select **OK**.

You are next prompted to "mark the corner of the prism." Instead of using the cursor to indicate the first corner of the prism, display the keyboard entry dialog by pressing the right mouse button and selecting XYZ.



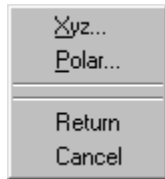
The XYZ option displays the following dialog box.



The dialog allows you to position the start of the prism at an absolute coordinate position of 0,0,0. Click in the X entry area and type **0** (zero). Next, press the tab key and enter a **0** in the Y entry area. Tab again and enter a **0** for the Z entry. Make sure SPACE is set to WORLD and MODE is set to ABSOLUTE. Next, select **OK**.

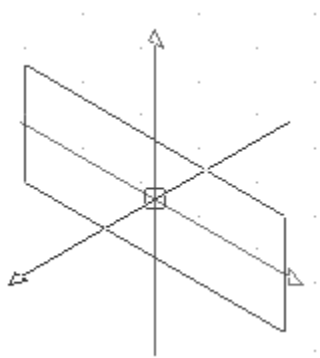
The first point of the prism should appear in the lower left corner of the grid. Move the mouse to interactively see the second point. Again, use the XYZ entry to enter the second point. To do this, press the right mouse button and select XYZ.

A key-in dialog can be accessed in several ways: 1) pressing the right mouse button and selecting XYZ, 2) typing "x", "y", or "z," 3) typing the coordinate position in the format x,y,z or 4) typing "=" (equal sign).



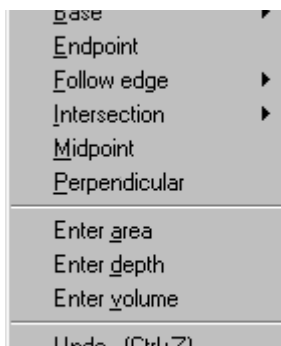
Click in the X entry area and type **4.5**. Next, press the tab key or "Y" key and enter a **1.75** in the Y entry area. You can ignore the Z entry since there is no change from the first point. Make sure SPACE is set to WORLD and MODE is set to ABSOLUTE. Next, select **OK**.

The face of the prism is completed and the cursor is positioned in the middle of the shape.



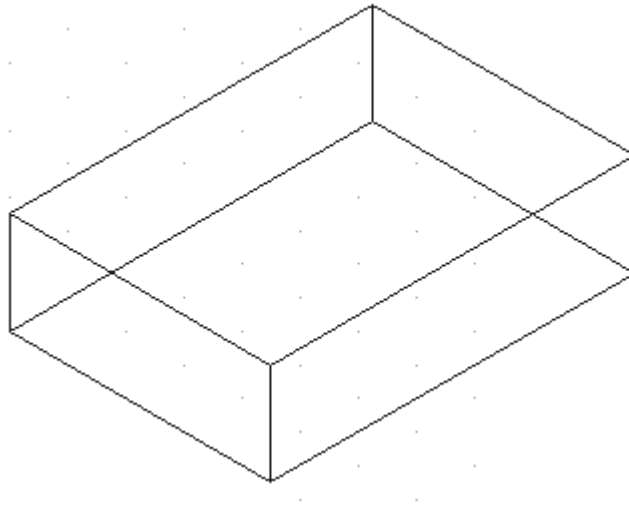
The depth axis (z-axis) can be done by accessing the XYZ dialog (right mouse button) or by moving the cursor interactively. The cursor is moved by using the "+" and "-" keys on the keyboard or by pressing and holding the SHIFT key while moving the mouse. Try both options to see the prism being drawn. Move the box in the negative direction along the z-axis. You can note a negative values by looking at the XYZ toolbar.

Press the right mouse button and select ENTER DEPTH. Note that the ENTER DEPTH option does not display until you have established a direction for the prism.



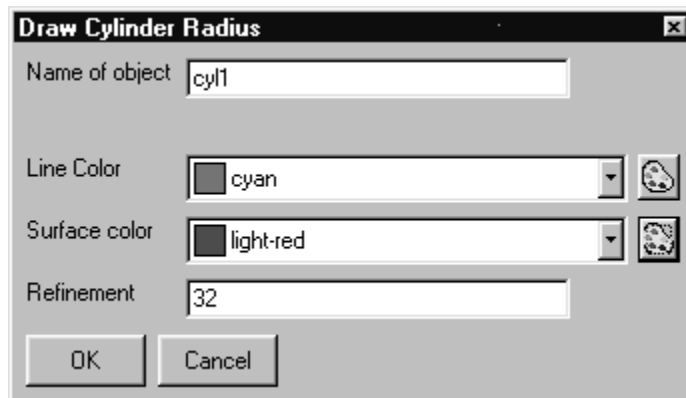
Enter a depth of **5**.

This completes the drawing of the prism.



Holes in Front Face

There are several methods for creating holes. Select the **Draw Solid Cylinder Radius** command.

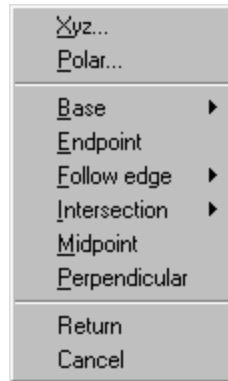


In the displayed dialog box, set the parameters to the following:

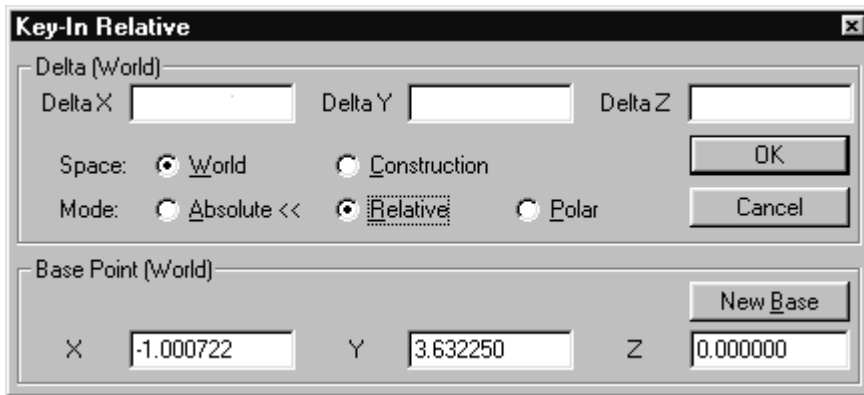
Name of object	cyl1
Line Color	cyan
Surface Color	light-red
Refinement	32

After entering the parameters, select **OK**.

You are prompted to mark the center of the cylinder. As in the previously drawn item, the position could be entered using the keyboard. In this case, the position is located using a combination of the mouse and keyboard entry. Press the right mouse button and select XYZ.



After selecting the XYZ option, a dialog box is displayed.



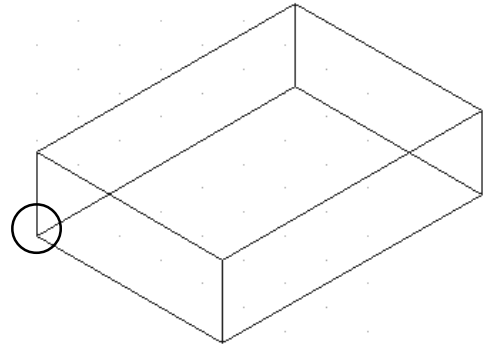
Specify a movement in the WORLD SPACE. Indicate that the movement is to be RELATIVE rather than absolute. Notice that the dialog changes for the RELATIVE mode. An absolute measurement, as was done for the previous shape, is a position relative to 0,0,0. A relative move is a move from a designated base position. The values for the current base point represent the current position of the cursor. Indicate the desired base position by selecting the NEW BASE button in the dialog box.

When you are prompted to "Select the new base", press the "E" key or select the right mouse button and select ENDPOINT.



After selecting the ENDPOINT option, click near the lower left corner of the shape as indicated below.

Click here to indicated new base position



After indicating the new base point that will be used to determine the new position for the center of the cylinder, enter the delta positions to indicate the distance to move relative to the base point.

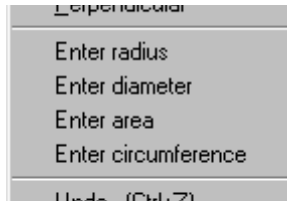
Key-In Relative		
Delta (World)		
Delta X	1.125	Delta Y .875
Delta Z		
Space:	<input checked="" type="radio"/> World	<input type="radio"/> Construction
Mode:	<input type="radio"/> Absolute <<	<input checked="" type="radio"/> Relative
	<input type="radio"/> Polar	
		OK
		Cancel
Base Point (World)		
X	0.000000	Y 0.000000
Z	0.000000	
		New Base

The new base point is the same position as used to start the model. Enter a DELTA X of **1.125** and a DELTA Y of **.875**. This indicates that you want to position the center of the cylinder a distance of 1.125 along the x-axis and a distance of .875 along the y-axis from the base point.

You can move from the DELTA X to the DELTA Y entry area by pressing the TAB key or the comma. The comma allows you to enter values in the format x,y,z.

After entering the parameters, select **OK**. The center of the cylinder should appear and you can begin to interactively draw the radius of the cylinder.

Click the right mouse button and select ENTER RADIUS to specify the cylinder's radius.

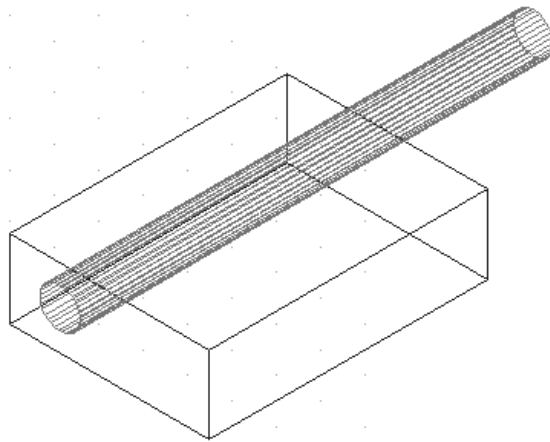


A dialog allows you to enter the cylinder's radius.



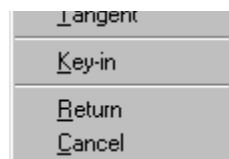
Enter a radius of **.45**. Select **OK**.

To specify the depth of the cylinder, hold the shift key and move the mouse until the cylinder passes through and beyond the first shape.

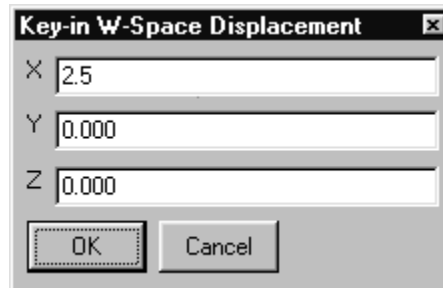


A second cylinder can be copied from the first cylinder by selecting the **Structure Copy Single Objects**. Click on the cylinder just completed. Once the cylinder is selected, it should be briefly highlighted in another color.

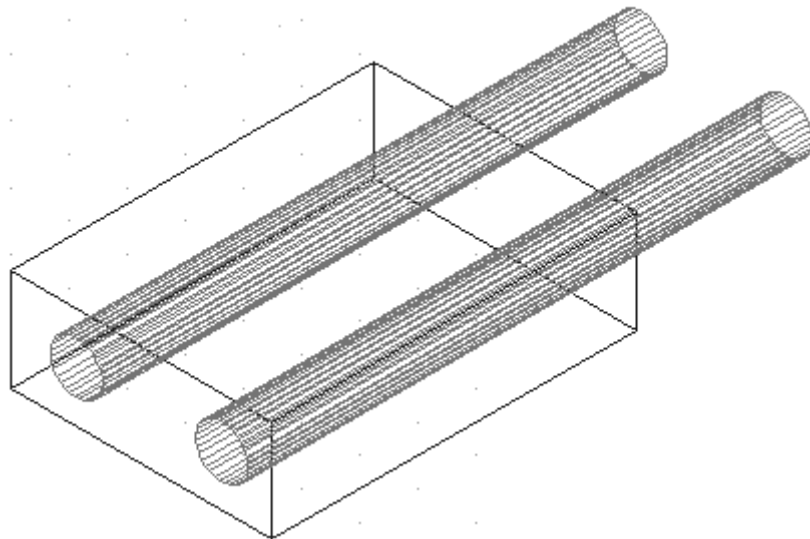
Click the right mouse button and select KEY-IN.



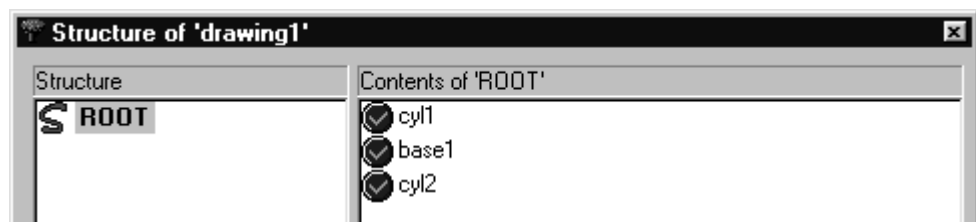
This allows you to specify the distance to copy along each of axis.



Enter a displacement on the x-axis of **2.5**. Select **OK**.

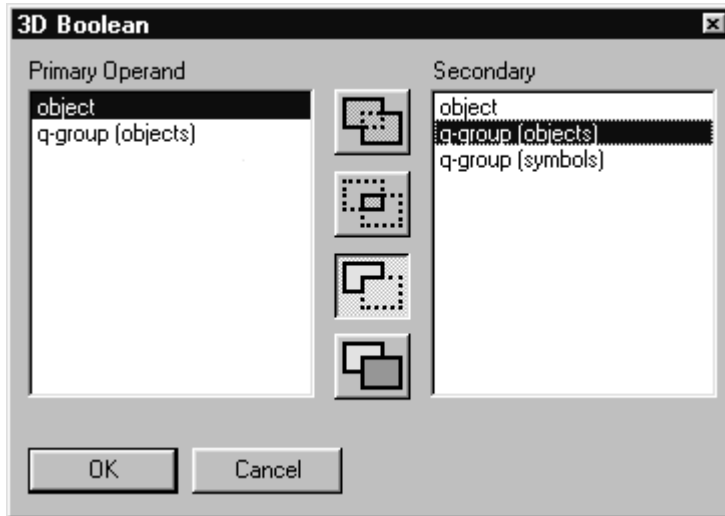


Click on the TREE icon in the CONTEXT toolbar to see the current drawing structure.







The contents section indicates there are three objects (cyl1, base1, and cyl2) that are all valid solids. Select DONE in the structure dialog box.

The Boolean operation of difference can be used to remove the cylinders from the first drawn shape. Select the **Geometry 3D Boolean...** command.



Select the Boolean difference option.

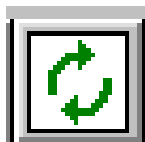
	Union	Join one solid to another solid that is the total volume of the two.
	Intersection	A new solid is created from the volume common to two other solids.
	Difference	Subtract the volume of one solid from the volume of another solid.
	Trim	Remove from a solid the volume of a second solid and retain the second solid.

In the PRIMARY OPERAND area, select **OBJECT**. In SECONDARY, select **Q-GROUP (OBJECTS)**. This allows you to subtract several objects (secondary) from a single primary object.

Select **OK**.

When prompted for the first operand, pick the prism. Next, pick the two cylinders. When you have completed the selection process, click the right mouse button and select **FINISHED WITH BUILD**.

After the operation is completed, press **F7** to refresh the display or select the **REFRESH** tool on the **STANDARD TOOLBAR**.



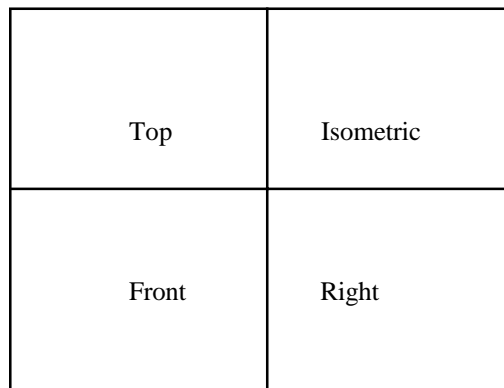
Hole in Top Face

To draw the hole in the top face, it is necessary to position the construction space or C-SPACE relative to the top face. The C-SPACE represents SilverScreen's drawing space.

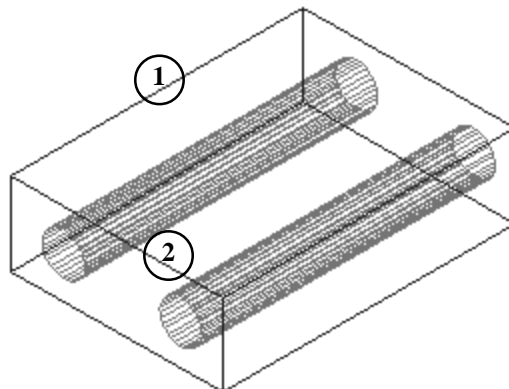
Prior to positioning the construction space, change the view to show a split window showing four different views of the model.

Window Split Four-way

This displays the top, front, isometric, and right views of the model.



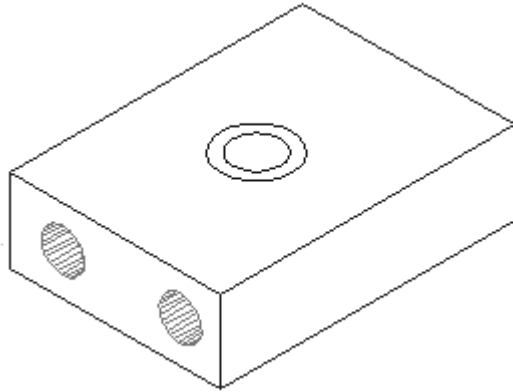
To position the construction space, select **Draw Tools C-space Align Primitive**. When prompted to PICK PRIMITIVE, select the top surface of the shape in the isometric window as indicated by 1 below.



SilverScreen highlights and indicates that there are two potential surfaces that can be selected. You are prompted to select the desired surface. Select the surface indicated by 2 above. The triad becomes positioned at the base of the newly positioned construction space.

You will also notice that the W-SPACE/C-SPACE button on the status bar is automatically switched to C-SPACE indicating the construction space is the current space.

The next step is to draw two holes on the top face. One hole represents the through hole and the second the counterbore portion.

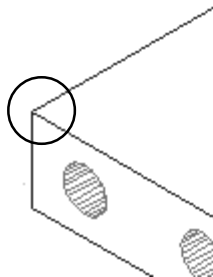


Select the **Structure New Object** and create a new object called "circ1."

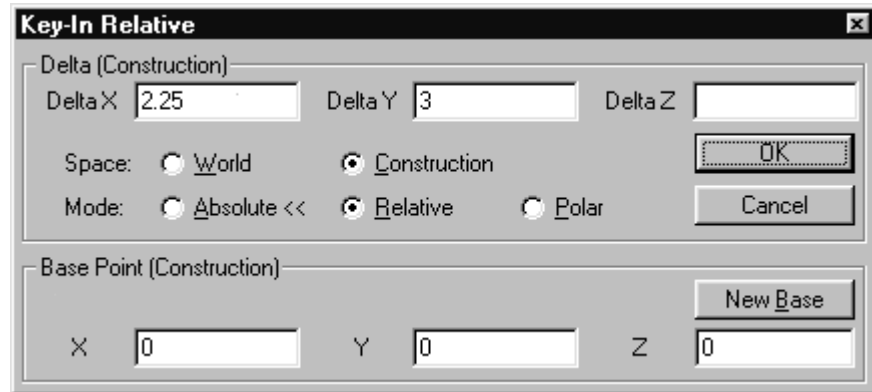


You can also select the NEW OBJECT tool from the STRUCTURE toolbar (**T**ools **T**oolbars).

Select the command **Draw Circle Radius**. Click the right mouse button and select XYZ. Select NEW BASE. When prompted to indicated new base position, press the right mouse button and select endpoint. This should put the base point at 0,0,0 of the constuctions space. Select the upper left corner of the shape as indicated.



In the dialog box, enter the position of the circle center as a DELTA X of **2.25** and a DELTA Y of **3**.



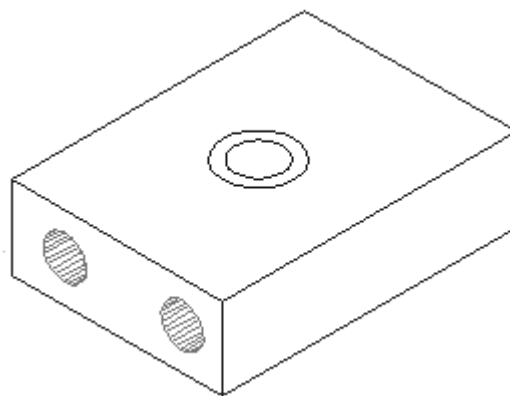
Make sure the SPACE is set to CONSTRUCTION and MODE is set to RELATIVE. Select **OK**.

Move the mouse to begin to establish the circle. Once the circle appears, click the right mouse button and select **Enter Diameter**. Enter a diameter of **1** and then select **OK**.

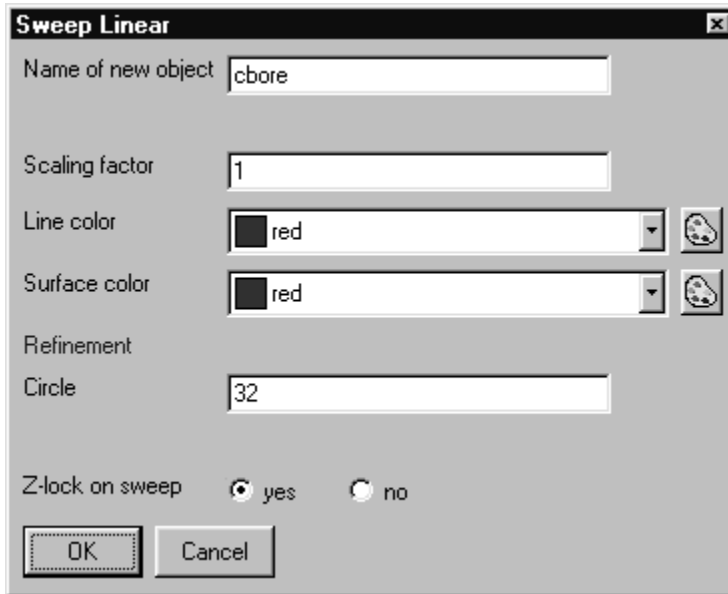
Select the NEW OBJECT tool or **Structure New Object** and create a new object called "bore1."

Again, select the command **Draw Circle Radius**. Click the right mouse button and select **Center**. SilverScreen displays the center of all circles and arcs. Locate the center of the previous circle and click on it with the left mouse button. Move the mouse to begin to establish the circle. Once the circle appears, click the right mouse button and select **Enter Diameter**. Enter a diameter of **1.5** and then select **OK**.

Select the **Geometry Sweep Linear Objects** command. When prompted to pick object, select the outer circle that you just completed.



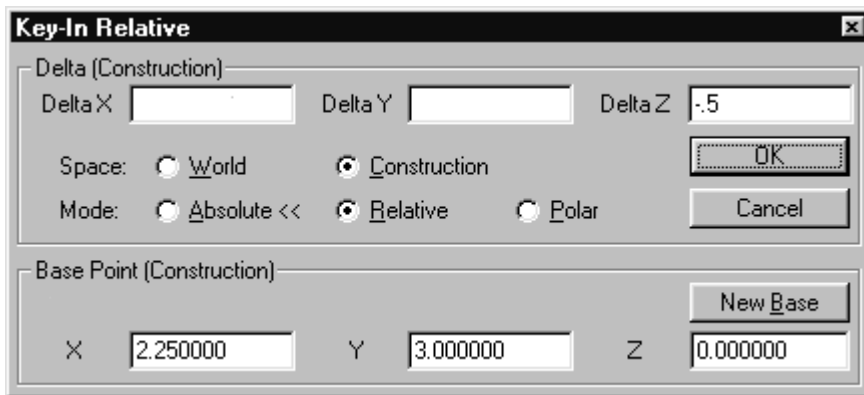
Once you selected the outer circle, a dialog box is displayed.



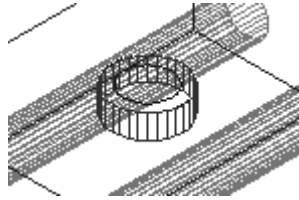
Name the object "cbore." Set the line and surface colors to "red." Set the Z-lock to "yes." The Z-lock option forces the sweep to move along the z-axis only. This makes it easier to sweep an item that is not offset.

Select **OK**.

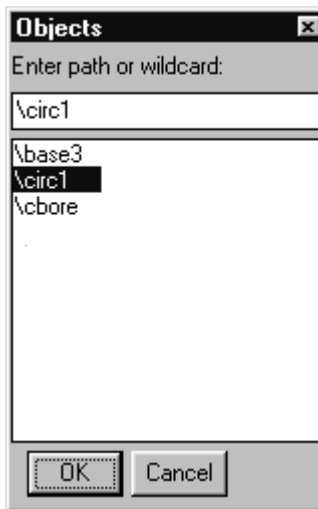
You are next prompted to mark the base point. Click the right mouse button and select **Center**. Pick the center for the circle selected. When prompted to mark the target point, click the right mouse button and select XYZ.



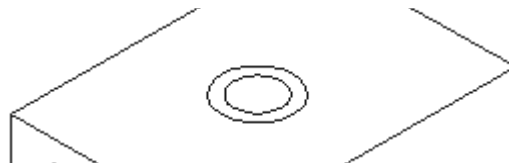
Enter a DELTA Z of **-.5**. This sweeps the circle to a depth of .5. Select **OK**.



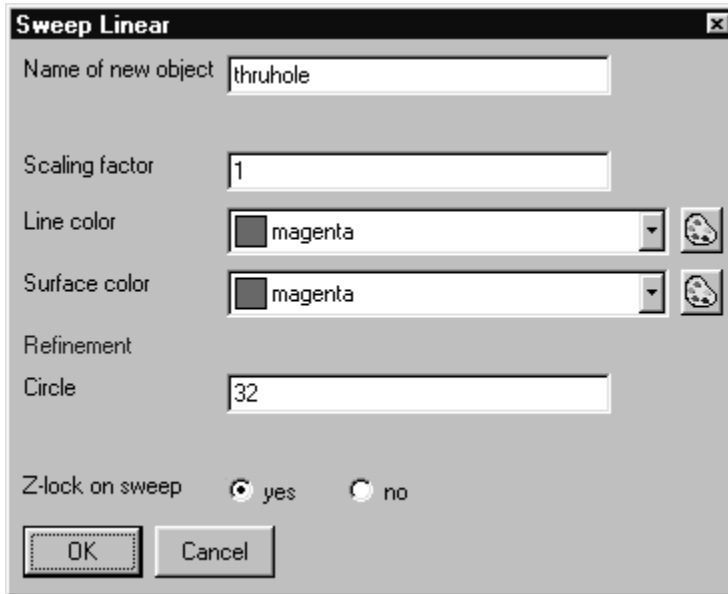
Select the **Geometry Sweep Linear Objects** command. When prompted to pick object, click the right mouse button and select **List Objects**. Select the object "circ1."



This selects the inner circle.

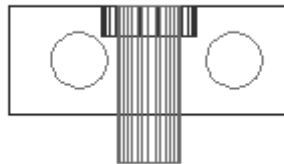


Once you selected the inner circle, a dialog box is displayed.

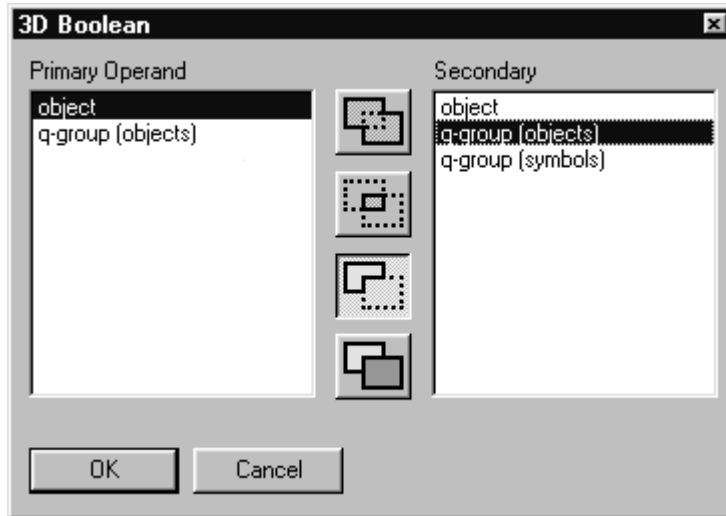


Name the object "thruhole." Set the line and surface colors to "magenta." Set the Z-lock to "yes." Select **OK**.

You are next prompted to mark the base point. Click the right mouse button and select **Center**. Pick the center for the circle selected. When prompted to mark the target point, hold the shift key and position the cursor so the cylinder passes through the prism.



The Boolean operation of difference can be used to remove the cylinders from the first drawn shape. Select the **Geometry 3D Boolean...** command.



Select the Boolean difference option. In the PRIMARY OPERAND area, select a **OBJECT**. In SECONDARY, select **Q-GROUPS (OBJECTS)**. This allows you to subtract several objects (secondary) from a single primary object.

Select **OK**.

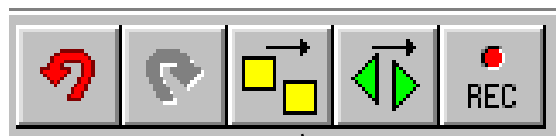
When prompted for the first operand, pick the prism. Next, pick the two cylinders just completed. If you made a mistake in the selection, you can right click the mouse and select UNDO. When you have completed the selection process, click the right mouse button and select FINISHED WITH BUILD.

After the operation is completed, select the REFRESH tool or press **F7** to refresh the display.

Use the left mouse button to click on the GRID option on the status bar. This disable the grid.

Select the **Render Hidden surface removal...** command. Select **OK**.

After rendering the current window, click the mouse within one of the other windows. From the STANDARD toolbar, select the REPEAT COMMAND tool.



Repeat command tool

Repeat the operation until each windows is rendered.