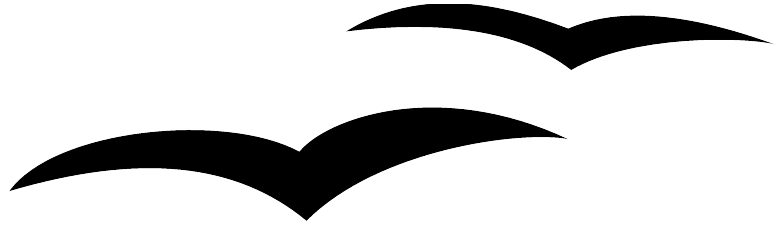


Editing Objects Part I



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Overview

This document describes the tools and functions that let you modify existing drawings.

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Acknowledgments

Thanks to Daniel Carrera, Carol Leather and Jean Hollis Weber for reviewing this chapter.

Modifications and updates

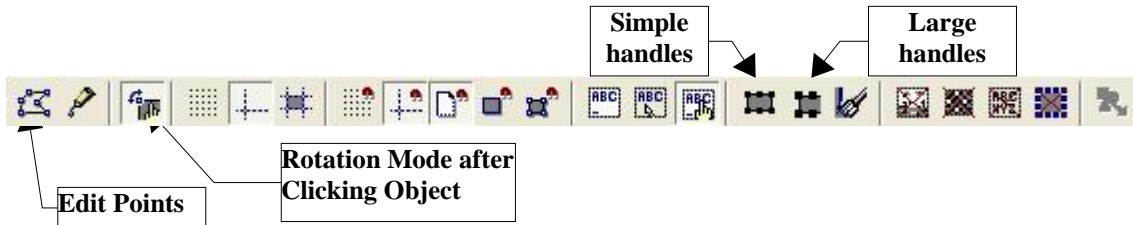
<i>Version</i>	<i>Date</i>	<i>Description of Change</i>
1.0	16 November 2004	First published edition

Editing Objects

In this chapter, we shall look at the tools and functions that let you modify existing drawings. All of the functions apply to the selected object or group of objects. The selected object differentiates itself from any others by small colored squares or circles located around the object (this is also true when several objects are selected simultaneously). In the rest of this document, we call these points *handles*.

These handles form a rectangular frame that is just big enough to contain the object. Where several objects are selected, the frame around them corresponds to the smallest rectangle that can contain all of the objects. This frame is called the *selection rectangle*.

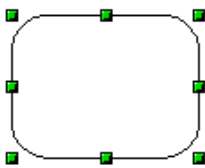
If the Option Bar is displayed, it is possible to change the size of the handles using two buttons: 'Simple Handles' shows the handles as flat squares, and 'Large Handles' shows the handles in a larger size. You can combine the effects obtained by pressing on both buttons. You can thus have large handles having a 3-D shape or small handles having no 3-D shape. This illustration shows the location of the handles and other buttons:



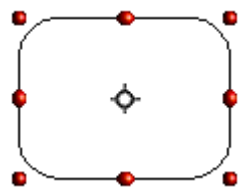
Selection modes

There are three selection modes.

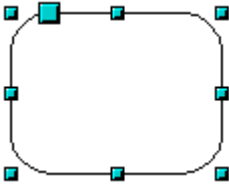
Selections used to move or change size are indicated by small green squares. This is the default selection mode when the Edit Points button is not pressed.



Selections for rotating objects are indicated by small red circles and a symbol representing the center of rotation.



Selections for the Edit Points mode are indicated by blue squares. An extra, larger handle also appears on most drawings. When the Edit Points button is pressed, this is the default mode.



The default mode for selecting objects is set by the activation or deactivation of the Edit Points button .

Changing the selection mode

To go from one mode to another, you can do the following:

Choose the Edit Points button from the Options Bar to switch from simple selection mode to Edit Points mode. You can also use the keyboard shortcut $F8^1$ (Edit Points).

Press the Rotate button from the Main Toolbar to activate the rotation mode for a selected object.

By choosing the *Rotation Mode after Clicking Object* button from the Options Bar, you can cycle through normal and rotation modes just by clicking on the object. This could be more convenient than clicking the object, then clicking the Rotate button from the Main Toolbar.

Selecting Objects

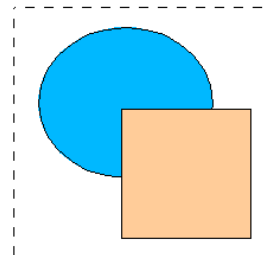
Direct selection

To select an object, the easiest way is to click directly on it. For objects that are not filled, you have to click directly on the object's outline to select it.

Selection by framing

You can select several objects by dragging a large rectangle around the objects with the select button:

For an object to be selected, it must be entirely within the rectangle.



¹ Keyboard shortcuts can be configured by the user (Tools > Configure > Keyboard).

Selecting hidden objects

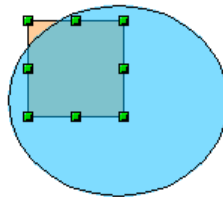
When objects are located behind others, they can still be selected. To select an object that is covered by another object, hold down *Alt* and click the object. To select an object that is covered by several objects, hold down *Alt* and click through the objects until you reach the required underlying object. To cycle through the objects in reverse order, hold down *Alt+Shift* when you click.

There may be some variation in the use of the Alt key on different operating systems. For example, in my Linux system, the Alt key does not function as described here.

To select an object that is covered by another object using the keyboard, press *Tab* to cycle through the objects. To cycle through the objects in reverse order, press *Shift+Tab*.

The easiest method is to use the *Tab* key to cycle through the objects, stopping at the object you wish to select. (This may not be practical if you have a large number of objects in your drawing.) When you click on your selected object, its outline will appear briefly through the objects on top of the selected object.

In the illustration below, the square located beneath the circle was selected in this way (the circle was made transparent in order to see the square):



Arranging objects

In a complex drawing, you may have objects stacked up, one on top of the other. You can rearrange stacked objects by clicking **Modify > Arrange** and selecting the appropriate **Bring Forward** or **Send Back** options, or by right-clicking the object and picking **Arrange** from the context menu. A keyboard shortcut is *Shift+Ctrl++* to bring an object to the top, and *Shift+Ctrl+-* to send an object to the bottom.

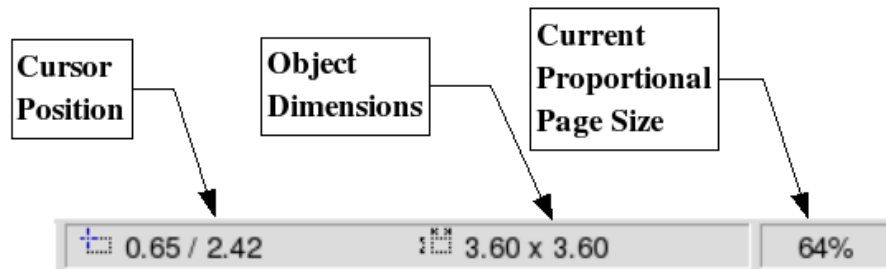
Selecting several objects

In order to select or deselect several objects one by one, press the *Shift* key and click on the various objects to be selected or deselected.

Moving and Dynamically Adjusting the Size of an Object

There are several ways of moving or changing the size of an object. The method described here will be called *dynamic* in the sense that it is carried out using the mouse.

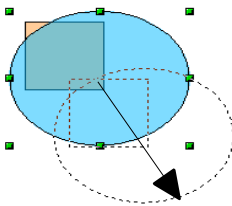
When you dynamically change an object, remember to check the left hand area of the status bar at the bottom of your screen. This shows detailed information about the ongoing manipulation. For example, during a resizing manipulation, you will see the following information displayed:



The information displayed changes when the mouse is moved.

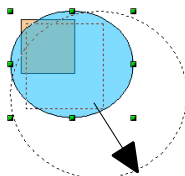
Dynamic movement of objects

To move an object, select it and then click within the selection frame and hold down the left mouse button while moving the mouse. In order to drop the object at its new location, let go of the mouse button. During movement, the shape of the object appears as dotted lines to help with repositioning.



Dynamic size modification of objects

In order to change the size of an object (or group of selected objects) with the mouse, you need to move one of the handles located around the selection. As shown in the following illustration, the outline of the resulting new object appears as a dotted line.



The results will differ depending on which handle you use. If you choose a corner handle you will resize the object along two axes at the same time. If, on the other hand, you use a side handle the objects will only be resized along one axis.

Note: If you press the *Shift* key at the same time as you carry out the resizing operation, the size change will be carried out symmetrically with respect to the two axes, which enables you to keep the height/length ratio of the object. With the *Alt* key, the object is resized symmetrically starting from its center.

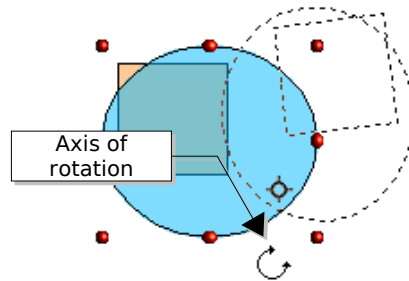
Rotating an Object

Rotation of an object lets you slant an object along an axis. In order to do this dynamically, you use the red handles, as with changing the size of the object.

Rotation works in a slightly different way for 3-D objects (since the rotation occurs in 3D space and not in one plane).

To rotate an object (or a group of objects), drag the red corner handle points of the selection with the mouse. The mouse cursor takes the shape of an arc of a circle with two arrows at each end. As with the preceding operations, a dotted outline of the object being rotated appears and the current angle of rotation is dynamically shown in the status bar.

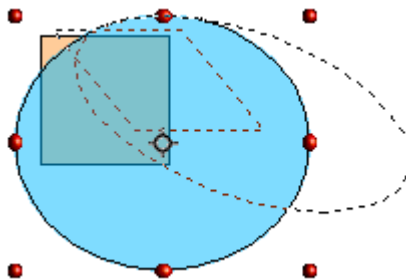
Rotations are made about an axis which is displayed as a small symbol. You can move the axis of rotation with the mouse, as shown below:



If you hold down the *Shift* key during the rotation, the operation will be carried out in increments of 15°.

Inclination

To incline or slant an object, use the red handles located on one of the edges of the selected object. The inclination axis is shown as the nearest handle to the opposite edge:



This operation functions in the same manner as rotation in that you can set the inclination to occur as steps of 15° by pressing the *Shift* key during movement of the handle.

Editing Object Points

Draw offers a complete set of tools that let you accurately edit the contour of an object. As we shall see, the functions related to editing points work substantially in the same way as on curves. To make the most of these tools, you'll have to convert your objects into curves, as will be described later on.

Direct operation

Some objects can be manipulated in '**Edit Points**' mode without having to convert them into curves. When you do this you act directly on the properties of the object. The objects involved are defined by the presence of one or more extra handle points. When you manipulate this handle (which is generally larger in size than the other selection handles), you will obtain various effects. The mouse cursor takes the shape of a folded hand when it passes over one of these points. Here is the complete list of the objects concerned.

Rectangle or square.

In this example, you can make the corners more or less rounded.

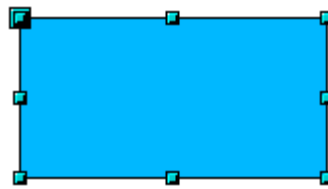


Figure 1 - Simple Rectangle

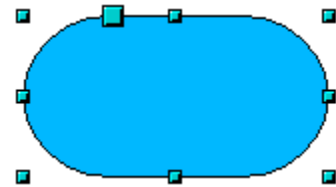


Figure 2 - Rounded Rectangle

Arcs or ellipses.

In this example, you can change the associated angles. Arcs have two control handles.

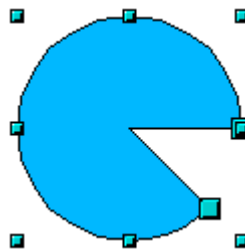


Figure 3 - Pie

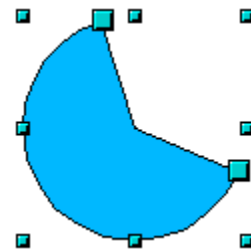


Figure 4 - Moving control points in the pie

Circular or elliptical segments.

In this example, you can change the position of the edge of the segment.

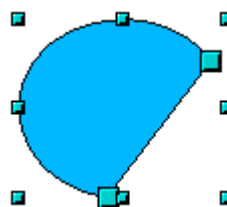


Figure 5 - Circular Segment

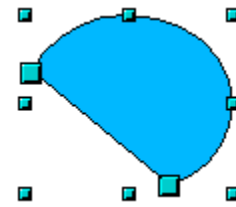


Figure 6 - Moving control points of the segment

How curves work

Editing curves works on the basis of a method called Bezier curves². The complete study of such curves goes beyond this particular work. We shall cover the basics of this quite powerful method of editing the contour of an object.



figure 7 - Definition of a tangent

Editing a point in a Bezier curve uses several mechanisms as represented in the drawing on the left: The main point is called the junction point. Two tangents project from this point, enabling manipulation of the curve that passes through the junction point. The basic idea is that, around the junction point, the two sides of the curve 'flatten' out more or less along the tangent depending upon the size and position of the tangent.

You can create all manner of shapes by moving either the junction point itself, or one or both of the round handle points at either end of the tangent.

The Bezier Curve Toolbar

When you work in edit point mode, the object bar changes as shown in Figure 8.



Figure 8 - Edit Points Toolbar

On this toolbar, some buttons can be pressed or not. Their behavior is then different. The role of the three buttons enabling you to choose the type of tangent will be described in the following chapter. They are the sixth, seventh, and eighth buttons in the toolbar. The functioning of the other remaining buttons will be described in relation to working examples.

The three kinds of tangent

Three buttons in the toolbar let you select the type of tangent and convert from one type to another. Only one of these buttons can be depressed at any given time.



Figure 9 - Symmetrical Definition

The button lets you work with a symmetrical tangent. Any movement of one or the other of the handles will be carried over symmetrically to the other one.



The button lets you separate the lengths of the two parts of a tangent. In the drawing opposite, you can clearly see that the

² Bezier curves were invented by Pierre Bézier, an engineer working with the Renault car manufacturer, who developed the technique in the 1960s. The technology was intended to make modeling the surface of vehicles easier.

curve is flatter on the longest side of the tangent. This kind of tangent is known as a smooth junction. This button is not to be confused with the preceding one, since their representations are fairly similar.

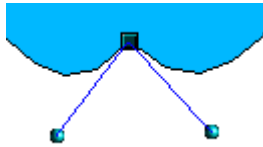


Figure 11 - Inflexion Point

It is also possible to completely detach both sides of the tangent. In this case, the central point is known as the *inflexion point*. Using this technique, you can draw spikes and troughs in objects. Use the button to create an inflexion point around the selected point.

Examples

The following examples start from a filled circle. As mentioned earlier, in order to use the Edit Points mode, you need to convert the object to a curve. This can be done on the selected object by clicking the right mouse button or by choosing **Modify > Convert > To Curve** from the Menu Bar.

You will notice that after conversion, the handles located in the corners of the rectangle have disappeared. This behavior is normal in that the handles which are used in Edit Points mode are located along the trace of the drawn object.

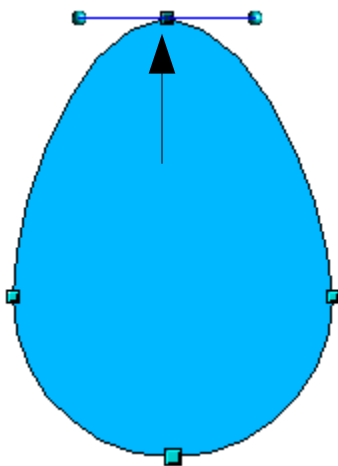


Figure 12 - Moving a junction point

The Move Points mode is the default mode when editing points. If it hasn't been activated, click on the button. When this mode is active, the mouse cursor has the following shape when it is hovered over an edit point:



Movement of the junction point is one of the easiest manipulations to do. The drawing opposite illustrates how an egg can be drawn very easily by starting from a circle and dragging the the top edit point upwards.

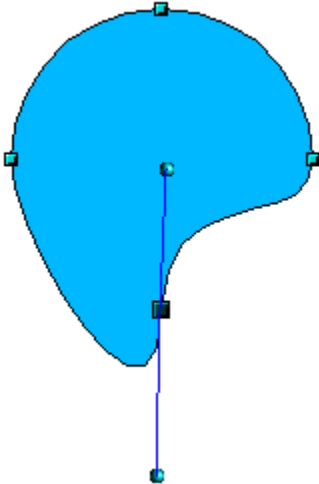


Figure 13 - Rotating a tangent

To change the location of the tangents, just move the circular handles at each end. The mouse cursor will then look like this:

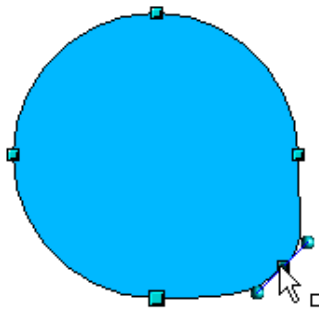
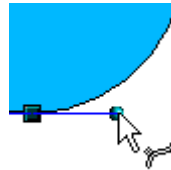


Figure 14 - Adding an edit point to a curve

This button lets you add an extra point to an existing curve. Just click with the left mouse button on the curve at the spot where you want to insert a point and then move the mouse slightly, in any direction, while holding down the button. If you just click, the new point will not be added.

The tangent attributes that are associated with the new point will depend on the buttons that are pressed in the toolbar.

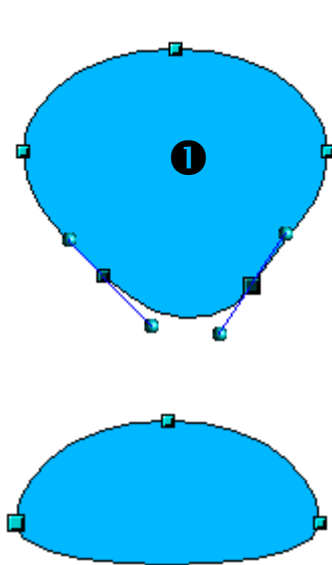


Figure 15 - Deleting points from a curve

This button has the opposite effect: it subtracts one or more points from the curve. The resulting curve will stretch itself automatically around the remaining points after subtraction.

Firstly, select one or more points to delete.

You can select several points by holding down the *Shift* key (❶).

Then click on the button. The selected points disappear from the curve that will then reform around the remaining points (❷).

Note: You can also delete the selected points using the *Del* key on your keyboard.

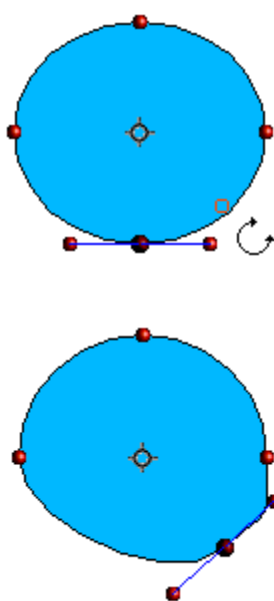


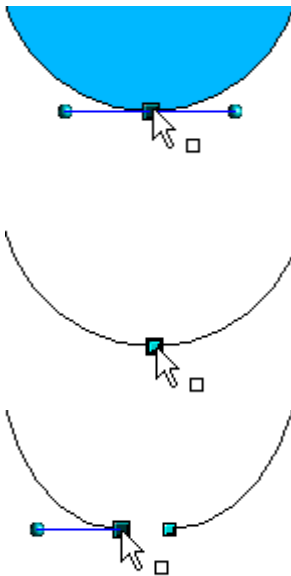
Figure 16 - Moving a point on a curve

The object rotation button can be used in Edit Point mode. In this case, it can be used to move a point around the contour of an object.

Switch into rotation mode by clicking on the button. You will notice that in rotation mode, all of the tangent points become red dots.

Select the point to be moved and then drag it around the contour while keeping the left mouse button pressed down (❶). When you let go of the mouse button, the point will be moved to the new position (❷).

If you move one of the handles located at the end of the tangents during rotation, you will make the object rotate in exactly the same way as with the usual rotation operations.

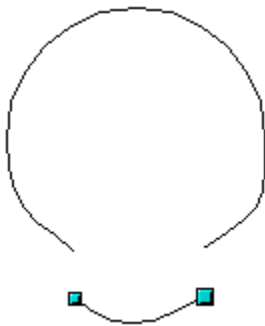


This button lets you cut a curve at the height of the selected handle. If the object is filled, it will be emptied insofar as the curve that represented the edge is no longer closed.

Check that you have selected the correct handle (❶), press on the button (❷) and notice that the object is no longer filled. You can then check by moving the point, that the curve has indeed been separated (❸).

Note: if you have an open curve, the start point of the curve is larger than the others.

Figure 17 - Slicing a curve



You can also separate a curve at several points simultaneously. Just keep the *Shift* key pressed down and select all of the points at which the cut should occur.

Figure 18 - Moving a segment

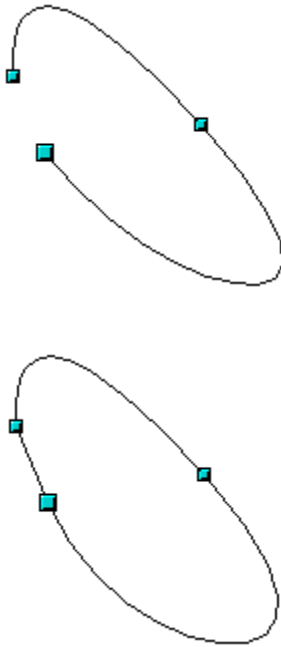


Figure 19 - Closing an open curve

The button lets you close an existing curve. Select an open curve and click on this icon to close it.

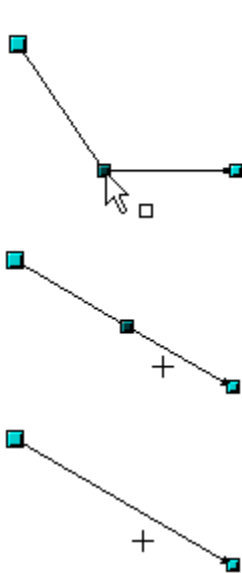


Figure 20 - Using the 'select points' switch

The Select Points button functions as a switch. It works as follows.

If you have two points linked together by a straight line (you don't need to have a curve between the points) and you insert a new point between them that is set at an angle to the initial straight line (and hence the two endpoints), you will have a drawing similar to that illustrated in ❶.

If the Select Points switch is deactivated, and you move the point you've just inserted, to bring it back close to its initial position in the straight line, you will have a drawing similar to that illustrated in ❷.

If the switch is activated, moving the point back towards the axis of the initial straight line will cause the line to snap into place and the new point will be hidden from view (as illustrated in ❸). The new point will not have physically disappeared however, and you can bring it back into view by just dragging the mouse cursor (represented by a cross-hair) away from the axis of the straight line.