

Chapter III-3 — Drawing

Lines and Arrows Tool

You can use the Lines tool to draw lines by clicking at the desired starting point and then dragging to the desired ending point. Press Shift while drawing to constrain the line to be vertical or horizontal.

If you click and hold on the Lines icon, you get a pop-up menu that takes you to a dialog where you can specify the line numerically. You see a similar dialog if you use the arrow tool to double-click a line. It allows you to change the properties of the line.

The dash pattern pop-up palette is the same as the one used for graph traces. You can adjust the dash patterns by use of the Dashed Lines command in the Misc menu.

The arrow fatness parameter is the desired ratio of the width of the arrow head to its length.

The line thickness and arrow length parameters are specified in terms of points and may be fractional.

Line start and end coordinates depend on the chosen coordinate system. See **Drawing Coordinate Systems** on page III-66 for detailed discussion. Programmers should note that the ends of a line are *centered* on the start and end coordinates. This is more obvious when the line is very thick.

Rectangle, Rounded Rectangle, Oval

The Rectangle, Rounded Rectangle, and Oval tools create objects that are defined by an enclosing rectangle. Click and hold on the appropriate icon to invoke a dialog where you can specify the object numerically. You see a similar dialog if you use the arrow tool to double-click the object.

Press Shift while initially dragging out the object to create a square or circle. If you press Shift while resizing the object with the arrow tool, you constrain the object in the horizontal, vertical, or diagonal directions depending on how close the cursor is to one of these directions. Thus, when you Shift-drag along a diagonal the sides are constrained to equal length, but if you Shift-drag along a horizontal or vertical direction, the object is resized along only one of these directions. If instead you hold down Option (*Macintosh*) or Alt (*Windows*), dragging along a diagonal resizes the object proportionally.

The Erase fill mode functions by filling the area with the current background color of the window. The fill background color is used only when a fill pattern other than Solid or Erase is chosen.

An object is always drawn inside the mathematical rectangle defined by its coordinates no matter how thick the lines. This differs from straight lines which are centered on their coordinates.

To adjust the corners of a rounded rectangle, double-click the object and edit the RRect Radius setting in the resulting dialog. Units are in points.

Arcs and Circles

To draw an arc or a circle by center and radius, click and hold on the Oval icon and choose Draw Arc from the resulting pop-up menu. Click and drag to define the center and the radius or start angle. Click again without moving the mouse to create a circle or move and click to define the stop angle for an arc. A variety of click and click-drag methods are supported and experimentation is encouraged.

To edit an arc, click and hold on the Oval icon in the draw tool panel and then choose Edit Arc from the resulting pop-up menu. If necessary, click on an arc to select it. You can then drag the origin, radius, start angle, and stop angle.

To change the appearance of an arc, double click to get to the Modify Arc dialog. Unlike Ovals, Arcs honor the current dash pattern and arrowhead setting in the same way as polygons and Beziers. The center of an arc or circle can be in any coordinate system (see **Drawing Coordinate Systems** on page III-66) but the radius is always in points.

Polygon Tool

The polygon tool creates or edits drawing objects called polygons and, in graphs, it can create or edit waves. For details, see **Drawing Polygons and Bezier Curves** on page III-69.