X range. Select the Autoscale Only Visible Data checkbox to have Igor use only the data included within the horizontal range for autoscaling. This checkbox is available only if the selected axis is a vertical axis.

Overall Graph Properties

You can specify certain overall properties of a graph by choosing Modify Graph from the Graph menu. This brings up the Modify Graph dialog. You can also get to this dialog by double-clicking a blank area outside the plot rectangle.

Normally, X axes are plotted horizontally and Y axes vertically. You can reverse this behavior by checking the "Swap X & Y Axes" checkbox. This is commonly used when the independent variable is depth or height. This method swaps X and Y for all traces in the graph. You can cause individual traces to be plotted vertically by selecting the "Swap X & Y Axes" checkbox in the New Graph and Append Traces dialogs as you are creating your graph.

Initially, the graph font is determined by the default font which you can set using the Default Font item in the Misc menu. The graph font size is initially automatically calculated based on the size of the graph. You can override these initial settings using the "Graph font" and "Font size" settings. Igor uses the font and size you specify in annotations and axis labels unless you explicitly set the font or size for an individual annotation or label.

Initially, the graph marker size is automatically calculated based on the size of the graph. You can override this using the "Marker size" setting. You can set it to "auto" (or 0 which is equivalent) or to a number from -1 to 99. Use -1 to make a graph subwindow get is default font size from its parent. Igor uses the marker size you specify unless you explicitly set the marker size for an individual wave in the graph.

The "Use comma as decimal separator" checkbox determines whether dot or comma is used as the decimal separator in tick mark labels.

Graph Margins

The margin is the distance from an outside edge of the graph to the edge of the plot area of the graph. The plot area, roughly speaking, is the area inside the axes. See **Graph Dimensions** on page II-288 for a definition. Initially, Igor automatically sets each margin to accommodate axis and tick mark labels and exterior textboxes, if any. You can override the automatic setting of the margin using the Margins settings. You would do this, for example, to force the left margins of two graphs to be identical so that they align properly when stacked vertically in a page layout. The Units pop-up menu determines the units in which you enter the margin values.

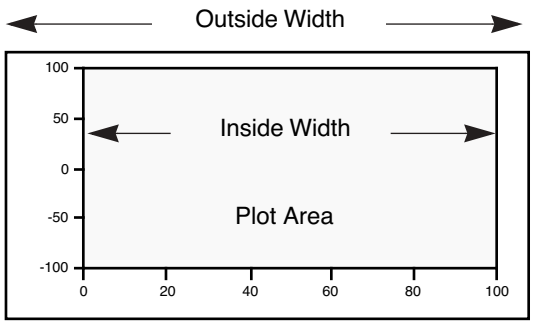
You can also set graph margins interactively. If you press Option (*Macintosh*) or Alt (*Windows*) and position the cursor over one of the four edges of the plot area rectangle, you will see the cursor change to this shape:  . Use this cursor to drag the margin. You can cause a margin to revert to automatic mode by dragging the margin all the way to the edge of the graph window or beyond. If you drag to within a few pixels of the edge, the margin will be eliminated entirely. If you double click with this cursor showing, Igor displays the Modify Graph dialog with the corresponding margin setting selected.

If you specify a margin for a given axis, the value you specify solely determines where the axis appears. Normally, dragging an axis will adjust its offset relative to the nominal automatic location. If, however, a fixed margin has been specified then dragging the axis will drag the margin.

Graph Dimensions

The Modify Graph dialog provides several ways of controlling the width and height of a graph. Usually you don't need to use these. They are intended for certain specialized applications.

These techniques are powerful but can be confusing unless you understand the algorithms, described below, that Igor uses to determine graph dimensions.



The graph can be in one of five modes with respect to each dimension: auto, absolute, per unit, aspect, or plan. These modes control the width and height of the **plot area** of the graph. The plot area is the shaded area in the illustration. The width mode and height mode are independent.

In this graph, the axis standoff feature, described in the **Modifying Axes** section on page II-306, is off so the plot area extends to the center of the axis lines. If it were on, the plot area would extend only to the inside edge of the axis lines.

Auto mode automatically determines the width or height of the plot area based on the outside dimensions of the graph and other factors that you specify using Igor's dialogs. This is the normal default mode which is appropriate for most graphing jobs. The remaining modes are useful for special purposes such as matching the axis lengths of two or more graphs or replicating a standard graph or a graph from a journal.

If you select any mode other than auto, you are putting a constraint on the width or height of the plot area which also affects the outside dimensions of the graph. If you adjust the outside size of the graph, by dragging the window's size box, by tiling, by stacking or by using the MoveWindow operation, Igor first determines the outside dimensions as you have specified them and then applies the constraints implied by the width/height mode that you have selected. A graph dimension can be changed by dragging with the mouse only if it is auto mode.

With **Absolute** mode, you specify the width or height of the plot area in absolute units; in inches, centimeters or points. For example, if you know that you want your *plot area* to be exactly 5 inches wide and 3.5 inches high, you should use those numbers with an absolute mode for both the width and height.

If you want the *outside* width and height to be an exact size, you must also specify a fixed value for all four margins. For instance, setting all margins to 0.5 inches in conjunction with an absolute width of 5 inches and a height of 3.5 inches yields a graph whose outside dimensions will be 6 inches wide by 4.5 inches high.

The **Aspect** mode maintains a constant aspect ratio for the plot area. For example, if you want the width to be 1.5 times longer than the height, you would set the width mode to aspect and specify an aspect ratio of 1.5.

The remaining modes, per unit and plan, are quite powerful and convenient for certain specialized types of graphs, but are more difficult to understand. You should expect that some experimentation will be required to get the desired results.

In **Per unit** mode, you specify the width or height of the plot area in units of length per axis unit. For example, suppose you want the plot width to be one inch per 20 axis units. You would specify 1/20 = 0.05 inches per unit of the bottom axis. If your axis spanned 60 units, the plot width would be three inches.

Igor allows you to select a horizontal axis to control the vertical dimension or a vertical axis to control the horizontal direction, but it is very unlikely that you would want to do that.

In **Plan** mode, you specify the length of a unit in the horizontal dimension as a scaling factor times the length of a unit in the vertical dimension, or vice versa. The simplest use of plan scaling is to force a unit in one dimension to be the same as in the other, such as would be appropriate for a map. To do this, you select plan scaling for one dimension and set the scaling factor to 1.

Until you learn how to use the per unit and plan modes, it is easy to create a graph that is ridiculously small or large. Since the size of the graph is tied to the range of the axes, expanding, shrinking or autoscaling the graph makes its size change.

Applying plan or aspect mode to both the X and Y dimensions of a graph is a bad idea. Interactions between the dimensions cause huge or tiny graphs, or other bizarre results. The Modify Graph dialog does not allow both dimensions to be plan or aspect, or a combination of the two. However, the ModifyGraph operation permits it and it is left to you to refrain from doing this.