Xmgr User Guide

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The draft xmgr user guide

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1 Introduction

xmgr is an XY plotting tool for workstations or X-terminals using X. A few of its features are:

- User defined scaling, tick marks, labels, symbols, line styles, colors.
- Batch mode for unattended plotting.
- Read and write parameters used during a session.
- Polynomial regression, splines, running averages, DFT/FFT, cross/auto-correlation.
- Hardcopy support for PostScript, HP-GL, and FrameMaker .mif format.

While xmgr has a convenient point-and-click interface, most parameter settings and operations are available through a command line interface (found in 3.3.3Data/Commands).

1.1 Terminology

1.1.1 Sets

Sets are collections of points, with optional associated values at these points. The associated values can be used to display error bars, high-low open-close plots and several other features. Sets are connected to a graph, and, by default, there are 30 sets per graph. Each set is numbered from 0 to the maximum number of sets less one. The number of points in a set is limited by the size of virtual memory and are numbered from 1 to N where N is the total number of points in the set. Operations to manipulate sets are found in A.6Data/Set operations, and features such as line styles, symbol types, and others can be changed from 3.4.7 **Graph/Symbols**.

1.1.2 Graphs

Graphs are the collection of data sets, tick marks, titles, etc. drawn to display the data. By default, there are 10 graphs with each graph owning 30 sets (both the number of graphs and the number of sets are adjustable via command line parameters). Operations on graphs are found in the 3.3.9 **Graphs/Graph operations** popup.

There are numerous popups accessible through Graphs pulldown menu that allow the manipulation of graph parameters. Most graph operations work on what is referred to as the 'current graph', marked by small filled rectangles at the corners of one graph. The 10 graphs available by default in this version of xmgr are numbered from 0 to 9.

1.1.3 Regions

Regions are sections of the graph defined by the interior or exterior of a polygon, or a half plane defined by a line. A region defined by a line can be above, below, to the right, or left of the line. Defining regions and operations on points inside regions are found in 3.3.8 Data/Region operations.

1.1.4 Parameters

Parameters are the settings of symbols, line styles, colors, fonts, etc. used to define graphs and the display of the active sets.

1.2 Installation

To install xmgr, refer to the document INSTALL found in the xmgr distribution. This will describe the details to successfully install xmgr.

1.3 Comments and bug reports

For bug reports, comments, etc., use the "Help/Comments" on-line report facility.

The home of xmgr sources and documentation is
`<http://plasma-gate.weizmann.ac.il/Xmgr/>`http://plasma-gate.weizmann.ac.il/Xmgr/

1.4 Copyright

2 Using xmgr

2.1 Execution

The interactive **xmgr** program is called **xmgr**, if used in batch mode, **grbatch**. If **grbatch** is not found, contact your system administrator, or see the section on installation. For grbatch to work properly it is important that it be called **grbatch** as it is the name that distinguishes **xmgr** from **grbatch**. They are the same program, but when executed as **grbatch**, the X interface is not initialized and **grbatch** terminates at the end of execution without user intervention.

Please note that **grbatch** does not read the any X resource files, so that it can be run from dumb terminals and over phone lines. Don't expect resource settings used for **xmgr** to work for **grbatch**. See the section on setting defaults using a `<#defaults>` **.xmgrrc** file.

2.2 Command line parameters

-autoscale *x* or *y* or *xy*

Autoscale the x axis, y axis, or both axes, overiding the settings for axes scaling and tick mark spacing given in any parameter file specified by the -p option.

Example:

```
xmgr -autoscale x -p params.par data.dat
```

Reads parameters from params.par and data from data.dat, but overrides any settings for the X axis found in the parameter file.

-noauto

y or *y* or *xy*

Suppress autoscaling on the given axis (axes). Use this when a data file has imbedded commands that provide axes scaling and tick mark spacing.

-arrange

rows columns

Arrange graphs in column major order starting from the lower left corner in a grid *rows* by *columns*. For example, -*arrange 2 2* will position the first four graphs (0, 1, 2, 3) in a 2x2 matrix of graphs starting with graph 0 in the lower left corner of the plotting surface. This function is not as complete as the similar function found in *Graph/Graph operations/Arrange* `<graphops.html#arrange>` and gives a sightly different result.

Example:

```
xmgr -arrange 2 2
```

Creates a 2x2 matrix of graphs.

-rows

rows Arrange the first *rows graphs* in *rows* rows.

-cols

columns

Arrange the first *columns* graphs in *columns* columns.

-results

results_file

Write the results of regression and anything else that gets written to the results popup to file *results_file*.

-device

device_number

Set the hardcopy device to *device_number*. The device numbering follows:

- 1 .. PostScript landscape
- 2 .. PostScript portrait
- 3 .. FrameMaker .mif landscape
- 4 .. FrameMaker .mif portrait
- 5 .. HPGL landscape
- 6 .. HPGL portrait
- 7 .. InterLeaf landscape
- 8 .. InterLeaf portrait

Example:

```
xmgr -device 2
```

Sets the hardcopy device to PostScript portrait.

-eps

Tell the PostScript driver to produce EPS.

-printfile

graphics_output_file

Write the graphics output to file *graphics_output_file* rather than spool graphics data to a printer.

-fixed

width height

-portrait

-landscape

-free

Set the dimensions of the drawing area. Presently, there is no connection between the hardcopy drivers and these settings. This means that the printer needs to be set to conform to the dimensions of the drawing area.

- -free - allow the drawing area to be resized (no scrollbars will appear).
- -fixed *width height* - set the drawing area to have dimensions *width and height*
- -portrait - set the drawing area to be 8.5x11 in portrait.
- -landscape - set the drawing area to be 8.5x11 in landscape.

-batch

batch_file

Execute the commands in *batch_file* on startup. This command line switch is not the same as executing xmgr in batch mode as **grbatch**.

-noask

Assume the answer is yes to all requests, This means that files will be overwritten without asking if they exist, and, if Exit is selected in the GUI, **xmgr** will exit abruptly. This option can be used to overwrite existing files in batch mode. Be careful.

-graph

graph_number

Make *graph_number* the current graph. *Graph_number* is an integer between 0 and maxgraph-1 (by default maxgraph, the maximum number of graphs, is 10).

For example, to activate four graphs and read data to each graph:

```
xmgr -arrange 2 2 data0.dat -graph 1 data1.dat -graph 2 data2.dat -graph 3
data3.dat
```

This command creates 4 graphs arranged in a 2x2 matrix, and reads a file into each graph.

-graphtype

graph_type

Set the current graph type to *graph_type*. Where *graph_type* is one of:

- xy linear scaling along both x and y.
- logx linear scaling in y, log scaling in x.,
- logy linear scaling in x, log scaling in y.
- logxy log scaling in both x and y.
- bar vertical bar chart.
- hbar horizontal bar chart.
- stackedbar vertical stacked bar chart.
- stackedhbar horizontal stacked bar chart.

-type

data_set_type

The format of the next data source is *data_set_type*. Where *data_set_type* is one of **xydx** (XY data with error bars along X), **xydy** (XY data with error bars along Y), **xydxdx** (XY data with error bars along X of differing values), **xydydy** (XY data with

error bars along Y of differing values), **xydxdy** (error bars along X and Y), **xyr** (a circle drawn at XY of radius R) and **xyhilo** (XY data with high-low open-close data). This setting remains in effect until a new format type is specified.

-ihl

IHL_formatted_file

Assume *IHL_formatted_file* or the next source of data is in IHL format (a local format).

-nxy

The format of the next data source is X1, Y1, Y2, ..., Yn.

-xydx

The format of the next data source is X Y DX

-xydy

The format of the next data source is X Y DY

-xydxdx

The format of the next data source is X Y DX1 DX2

-xydydy

The format of the next data source is X Y DY1 DY2

-xydxdy

The format of the next data source is X Y DX DY

-xyz

The format of the next data source is X Y Z where Z is a value drawn as text at X, Y.

-xyr

The format of the next data source is X Y R, where a circle of radius R is drawn at X, Y.

-xybox

The format of the next data source is XMIN YMIN XMAX YMAX VALUE, where (XMIN, YMIN) is the lower lefthand corner of a rectangle and (XMAX, YMAX) are the upper righthand corner of a rectangle. VALUE is an integer used to specify the color to use to fill the rectangle. To set the fill, use Graph/Symbols and set the fill style to anything but None.

-boxplot

The format of the next data source is X AVG

-ihl

The format of the next data souce is in IHL format, this format leads to a data set of type XY.

-hilo

The format of the next data source is X HIGH LOW OPEN CLOSE, where a symbol denoting the open, close, the high and the low values for an observation is drawn at X.

-netcdf

netCDF file

-netcdfxy [

xvar or *"null"] yvar*

Where *xvar* and *yvar* are the names of the variables to read. if *xvar* == "null", then load the index of yvar. These command line options may be used to read variables from a netCDF file. For example:

```
xmgr -netcdf t.nc -netcdfxy null y
```

Reads y from t.nc and loads to X the index (starting from 1).

```
xmgr -netcdf t.nc -netcdfxy x y -netcdfxy x1 y1
```

Reads x and y from t.nc, then x1 and y1 from the same file. 2 sets are created, both of type XY, one with (x, y), the other composed of (x1, y1).

another example reading data from 2 CDF files:

```
xmgr -netcdf t.nc -netcdfxy x y -netcdf t2.nc -netcdfxy x1 y1
```

-saveall

filename

Write all active sets to *filename*.

-wd

Set the current working directory. This option can be used to read files from several different directories. For example:

```
xmgr -wd examples mlo.dat -wd ../moredat brw.d hilo.dat
```

Unfortunately, this option not allow wild cards, as they are expanded in the current directory only.

-image

X_window_dump_file

Read the window dump file *X_window_dump_file*. The format is the same as generated by xwd or Frame's capture utility.

-imagexy

X Y

Set the upper lefthand corner position of the image at screen coordinates (X, Y). Note that screen coordinates have as their origin the upper lefthand corner of the drawing area and positive, increasing Y points down.

-block

Assume the format of the next data file is block data. No sets are formed by reading block data, and only one set of block data is allowed in an active session. To create sets from the block data, use Edit/Block data.

-bxy

col1:col2

Create sets from a previously read block data. Using -bxy col1:col2, will create a set using the current set type (default is XY) and using column *col1* and column *col2* from the most recently read set of block data. *Col1* and *col2* are integers indicating the numbers of the columns - column numbers start from 1. For example:

```
xmgr -block block.d -bxy 1:4 -bxy 2:6
```

will read block.d and generate 2 sets of type XY using columns 1 and 4 for the first set, and 2 and 6 for the second set.

```
xmgr -block block.d -type xydy -bxy 1:3:4
```

will read block.d and generate a set of type XYDY (an XY set with error bars) using column 1 and 3 for X and Y, and column 4 for the error bars.

-log

x or y or xy

Set the current graph type to logarithmic depending the the string x or y or both axes by xy.

-parameter

parameter_file

-p

parameter_file

Read the parameter file parameter_file.

-pexec

parameter_string

Interpret *parameter_string* as a parameter setting.

-result

result_file

Write results from regression to result_file

-rvideo

Exchange the color indices for black and white.

-mono

Limit colors to black and white, affects the display only.

-dc

Allow double click canvas operations, overriding any application default setting.

-nodc

Disallow double click canvas operations.

-redraw

Redraw the entire page if xmgr receives an Expose event.

-noredraw

Do not redraw the entire page when Expose events are received.

-maxcolors

number_of_colors

Set the maximum number of colors allocated. For example:

```
xmgr -maxcolors 18 -pexec "cmap 17,255,0,255"
```

Sets the maximum number of colors to 18 and sets color 17 to cyan. Colors 0-15 are set to the defaults, color 16 is undefined (the actual color will vary).

-freecolors

Attempt to free colors which are assigned a different colormap entry. See **nofreecolors** below. This is the default behavior.

-nofreecolors

Doesn't attempt to free colors which are assigned a different colormap entry. Use this if one of the colors you use is the same as one of the button or border colors and you subsequently change that color. This shouldn't be a problem unless you're really unlucky. Using this switch can cause you to eat up all the colors in your colormap if you change colors a lot during a session. This is equivalent to setting the X resource

`<#freeColorsXR>`**XMgr.freeColors** to false.

-world

xmin ymin xmax ymax

Set the scaling of the axes for the current graph. The X axis will run from *(xmin, xmax)* the Y axis from *(ymin, ymax)*

-view

xmin ymin xmax ymax

Set the viewport of the current graph to a rectangle described by

(xmin, ymin) and *(xmax, ymax)*.

-source

data_source

Set source for the next data file, the argument takes on the following values:

- **disk** - Data file is on disk.
- **pipe** - Read from a pipe.
- **stdin** - xmgr is in a pipe, read from standard input.

The source setting stays in effect until the next -source command is given.

-pipe

Read from standard input and plot each set when the end of the set is seen. Use the -pipe option to monitor the results coming from a model or other data stream.

-remove

Erase the most recently read file. Use this option when using xmgr to read a temporarily constructed file that is not needed once read. Note that this option does not request confirmation.

-legend load

For each data set read, make the set legend label the same as the filename the data set originated.

-seed

seed_value

Initialize the random number generator using seed *seed_value*. This value is used in a call to the math library function srand48().

-GXinvert

-GXxor

GXinvert and GXxor set the type of graphics operation used to draw rubberband lines and draw the graph focus markers. In a colormapped display, the xor of a source and destination pixel may not generate a color visible on the drawing area. The default is to use xor to draw rubberband lines, if the lines don't show, try -GXinvert. This draw mode can be set via X resource settings (see below).

-maxplot

number_of_sets

Set the maximum number of data sets per graph. *Number_of_sets* must be greater than 30. If -maxplot is used in conjunction with -maxgraph, then the -maxplot setting must precede the -maxgraph setting.

-maxgraph

number_of_graphs

Set the maximum number of graphs per session. *Number_of_graphs* must be greater than 10. If -maxgraph is used in conjuction with -maxplot, then -maxplot must precede the use of -maxgraph.

-nonl

Activate the Non-linear curve fitting module. WARNING, this module is a prototype and should not be used for analysis.

-digit

Activate the Digitizing module. WARNING, this module is a prototype and should not be used for analysis.

-usage

Display a brief explanation of command line settings

data_files

The files or commands in the case of a pipe from which data are read.

2.3 Setting xmgr defaults

On startup xmgr will look for a **.xmgrrc** file in the users' home directory allowing changes to the default behavior of xmgr. The construction of the xmgr default file is the same as for a parameter file.

2.4 Setting xmgr X defaults

The following X resource settings are supported:

- XMgr.invertDraw: False

  Use GXinvert to draw rubberband lines and the graph focus markers if this resource is set to True.

- XMgr.reverseVideo: False

  A boolean resource used to exchange the color indices for black and white.

- XMgr.maxSets: 30

  Set the number of sets per graph.

- XMgr.maxGraphs: 10

  Set the number of graphs.

- XMgr.maxColors: 17

  Set the number of colors allocated. There is no support in the graphical portion of the user interface for more than 16.

- XMgr.verifyAction: No

  Applies to the Pick set operations and allows an opportunity to accept or cancel any operation performed.

- XMgr.allowDoubleClick: Yes

  When Yes, allow double clicks on the canvas to bring up various popups depending on the location of the pointer when the double click occurs. Double clicking to the right of a graph brings up the View/Ticks popup set to the Y-axis, below the graph brings up the View/Ticks popup set to the X-axis, inside the graph brings up the files popup if no sets are active or the View/Symbols popup set to the set nearest the pointer. Double clicking above the graph brings up the View/Title-subtitle popup, to the right of the graph, the View/Legend popup.

  The command line option to set this resource is -dc or -nodc.

- XMgr.autoscaleOnRead: No

  When this resource is Yes or True, allow autoscaling to occur each time a set is read from the File/Read sets popup.

- XMgr.backingstore: No

  Have xmgr handle backing store if the server doesn't.

  The command line option for this is -bs or -nobs.

- XMgr.freeColors: True

  See documentation for the command line option `<#freeColorsSW>`**-nofreecolors**. Using that command line switch is equivalent to setting this resource to false.

It is also possible to customize menus by assigning key accelerators to any item.

The list below describes the menu labels and related X resources. For example, in order to make xmgr popup the Non-linear curve fitting by pressing Control+F, you would add the following two lines

XMgr*transformationsMenu.nonLinearFit.acceleratorText: Ctrl+F

XMgr*transformationsMenu.nonLinearFit.accelerator: Ctrl<Key>f

to your .Xresources file (the file which is read when an X session starts; it could be .Xdefaults, .Xsession or some other file - ask your system administrator when in doubt).

- XMgr*fileMenu.open Open...
- XMgr*fileMenu.save Save
- XMgr*fileMenu.saveAs Save as...
- XMgr*fileMenu.describe Describe...
  - XMgr*readMenu.sets Sets...
  - XMgr*readMenu.netCDF NetCDF...
  - XMgr*readMenu.parameters Parameters...
  - XMgr*readMenu.blockData Block data...
  - XMgr*readMenu.image Image...

  - XMgr*writeMenu.sets Sets...
  - XMgr*writeMenu.parameters Parameters...
- XMgr*fileMenu.clearAll Clear all
- XMgr*fileMenu.print Print
- XMgr*fileMenu.printerSetup Printer setup...
- XMgr*fileMenu.exit Exit
- XMgr*dataMenu.status Status...
- XMgr*dataMenu.results Results...
- XMgr*dataMenu.commands Commands...
  - XMgr*transformationsMenu.evaluateExpression Evaluate expression...
  - XMgr*transformationsMenu.loadValues Load values...
  - XMgr*transformationsMenu.loadEvaluate Load & evaluate...
  - XMgr*transformationsMenu.histograms Histograms...
  - XMgr*transformationsMenu.fourierTransforms Fourier transforms...
  - XMgr*transformationsMenu.runningAverages Running averages...
  - XMgr*transformationsMenu.regression Regression...
  - XMgr*transformationsMenu.nonLinearFit Non-linear curve fitting...
  - XMgr*transformationsMenu.diffrences Differences...

  - XMgr*transformationsMenu.seasonalDifferences Seasonal differences...
  - XMgr*transformationsMenu.integration Integration...
  - XMgr*transformationsMenu.correlation Cross/auto correlation...
  - XMgr*transformationsMenu.interpolation Interpolation...
  - XMgr*transformationsMenu.splines Splines...
  - XMgr*transformationsMenu.samplePoints Sample points...
  - XMgr*transformationsMenu.digitalFilter Digital filter...
  - XMgr*transformationsMenu.linearConvolution Linear convolution...
  - XMgr*transformationsMenu.geometricTransforms Geometric transforms...

- XMgr*dataMenu.pointOperations Point operations...
  - XMgr*setOperationsMenu.pickOperations Pick operations...
  - XMgr*setOperationsMenu.activate Activate...
  - XMgr*setOperationsMenu.deactivate De-activate...
  - XMgr*setOperationsMenu.reactivate Re-activate...
  - XMgr*setOperationsMenu.setLength Set length...
  - XMgr*setOperationsMenu.changeType Set type...
  - XMgr*setOperationsMenu.copy Copy...
  - XMgr*setOperationsMenu.move Move...
  - XMgr*setOperationsMenu.dropPoints Drop points...
  - XMgr*setOperationsMenu.join Join...
  - XMgr*setOperationsMenu.split Split...
  - XMgr*setOperationsMenu.kill Kill...
  - XMgr*setOperationsMenu.killAll Kill all
  - XMgr*setOperationsMenu.Sort Sort...
  - XMgr*setOperationsMenu.reverse Reverse...
  - XMgr*setOperationsMenu.coalesce Coalesce...
  - XMgr*setOperationsMenu.swap Swap...
  - XMgr*setOperationsMenu.pack Pack...

- XMgr*transformationsMenu.editCreateSet Edit/create set...
  - XMgr*regionOpearationsMenu.define Define...
  - XMgr*regionOpearationsMenu.evaluate Evaluate...
  - XMgr*regionOpearationsMenu.clear Clear...
  - XMgr*regionOpearationsMenu.extractPoints Extract points...
  - XMgr*regionOpearationsMenu.extractSets Extract sets...

  - XMgr*regionOpearationsMenu.deletePoints Delete points...
  - XMgr*regionOpearationsMenu.killSets Kill sets...
  - XMgr*regionOpearationsMenu.reportOn Report on...
  - XMgr*regionOpearationsMenu.areaPerimeter Area/perimeter...

  - XMgr*graphOperationsMenu.activate Activate...
  - XMgr*graphOperationsMenu.copy Copy...
  - XMgr*graphOperationsMenu.swap Swap...
  - XMgr*graphOperationsMenu.kill Kill...
  - XMgr*graphOperationsMenu.focus Focus...
  - XMgr*graphOperationsMenu.show Show...
  - XMgr*graphOperationsMenu.setType Set type...
  - XMgr*graphOperationsMenu.arrange Arrange...
  - XMgr*graphOperationsMenu.overlay Overlay...
  - XMgr*graphOperationsMenu.invertFlipAxes Invert/flip axes...

- XMgr*transformationsMenu.blockData Block data...
- XMgr*transformationsMenu.hotLinks Hot links...
- XMgr*plotMenu.worldScaling World scaling...
- XMgr*plotMenu.viewport Viewport...
- XMgr*plotMenu.autoscale Autoscale...
- XMgr*plotMenu.titles Titles...
- XMgr*plotMenu.tickLabelsMarks Tick labels/tick marks...
- XMgr*plotMenu.frame Frame...
- XMgr*plotMenu.symbols Symbols...
- XMgr*plotMenu.errorBars Error bars...
- XMgr*plotMenu.legends Legends...
- XMgr*plotMenu.stringsThings Strings & things...
- XMgr*plotMenu.timeStamp Time stamp...

  - XMgr*pageMenu.free Free
  - XMgr*pageMenu.landscape Landscape
  - XMgr*pageMenu.portrait Portrait
  - XMgr*pageMenu.fixed Fixed

  - XMgr*pageMenu.size Size...
  - XMgr*viewMenu.locatorBar Locator bar
  - XMgr*viewMenu.statusBar Status bar
  - XMgr*viewMenu.toolBar Tool bar
  - XMgr*viewMenu.setLocatorFixedPoint Set locator fixed point
  - XMgr*viewMenu.clearLocatorFixedPoint Clear locator fixed point
  - XMgr*viewMenu.locatorProps Locator props...

- XMgr*optionsMenu.draw Draw...
- XMgr*optionsMenu.workingDirectory Working directory...
- XMgr*optionsMenu.misc Misc...
- XMgr*helpMenu.onContext On context
- XMgr*helpMenu.userGiude User Guide
- XMgr*helpMenu.faq FAQ
- XMgr*helpMenu.changes Changes
- XMgr*helpMenu.comments Comments
- XMgr*helpMenu.about About...

2.5 Environment variables

- GR_HOME

  Set the location of xmgr. This will be where help files, auxillary programs, and examples are located. If you are unable to find the location of this directory, contact your system administrator.

- GR_PS_PRSTR

  Set the command string to use for spooling to a PostScript printer. The default (unless changed during the build process) is "lpr -h".

- GR_MIF_PRSTR

  Set the command string to use for printing the FrameMaker .mif format. The default (unless changed during the build process) is "cat < acegr.mif > ", i.e., output is to a file.

- GR_HPGL_PRSTR

  Set the command string to use for spooling to an HPGL capable printer or plotter.

- GR_HDEV

  Select the hardcopy device.

  The device numbering is as follows:

  - 1. PostScript landscape
  - 2. PostScript portrait
  - 3. FrameMaker interchange format (.mif) landscape
  - 4. FrameMaker interchange format (.mif) portrait.
  - 5. HPGL landscape
  - 6. HPGL portrait
  - 7. Interleaf landscape
  - 8. Interleaf portrait

- GR_EDITOR

Set the name of the editor to use in Data/Edit-Create set. The default is vi.

2.6 Batch printing

Executing xmgr as **grbatch** suppresses the initialization of the graphical user interface and allows hardcopy plots to be made without intervention.

3 Guide to menus and popups

3.1 Main panel

There are 5 main areas in the display, the menu bar at the top, the locator bar just below, the toolbar along the lefthand side of the display, the status bar at the bottom, and the drawing area where graphics are drawn. The following items describe the locator bar, the toolbar, and the status bar.

- **Tool bar**

  The toolbar runs along the lefthand side of the display, and provides functions to manipulate the axes scaling of active graphs, by scrolling and mouse powered zooms.

  - Draw

    Click on **Draw** to freshenup the drawing area with the current set of graphs, parameters and active sets. Most operations perform an automatic redraw, this may be undesirable in the cases where the sets are large or there are several active graphs. By playing with the options in **Graph/Draw options** and using the **Draw** button, much of the tedium associated with slow redraw rates can be alleviated. If you feel something should have happened after performing an operation, press this button to force a draw operation to freshenup the display. If the X display being used does not do backing store, then **Draw** will give a clean picture if the graphics get damaged when overlaid by popups or other applications.

  - Zoom

    Zoom

- Autoscale

  Click on Autoscale to generate a default scaling for both the X and Y axes in the current graph.
- Expand

  Click on Expand to incrementally zoom in on the data.
- Shrink

  Click on Shrink to incrementally zoom out from the data.
- Page left

  Click on Left to incrementally shift the axes to the left.
- Page right

  Click on Right to incrementally shift the axes to the right.
- Page down

  Click on Down to incrementally shift the axes down.
- Page up

  Click on Up to incrementally shift the axes up.
- Auto ticks

  Using any of the buttons that affect the scale of the axes, it is likely that unpleasing tickmarks will result. By clicking on AutoT, the tick spacing will be set using the current autoscaling parameters (set in Graph/Autoscale).
- Auto scale on a picked set

  Click on AutoO then click near a point in the set of interest to autoscale the current graph with respect to the selected set's bounding box.
- Zoom X

  Select a Zoom line used to scale the X axis of the current graph.
- Zoom Y

  Select a Zoom line used to scale the Y axis of the current graph.
- Auto X

  Autoscale the X axis only.
- Auto Y

  Autoscale the Y axis only.
- Push 'n zoom

  Save the current graph's axes scales and tickmark settings, and prepare for a zoom. This function can be used to zoom in on an area of interest, then restore the previous graph scale.
- Push

  Save the current graph's axes scales and tickmark settings for later retrieval. Use Pop to restore.
- Pop

  Restore the current graph's axes scale saved from the most recent use of Push.
- Cycle

  Cycle allows the contents of the current graph's world stack to be displayed in stack order. The contents of the stack are unaffected.

  - Stack depth

    Report on the current depth of the stack. Each graph has its own stack.

  - Current world

    When cyling through the current graph's worl stack, display the position in the stack.

  - Exit

    Exit xmgr.

- Locator bar The Locator bar, found directly under the main menu bar, displays the current graph and the position of the pointer. To set properties of the locator display text, see **View/Locator props**.

- Status bar The Status bar, at the bottom of the display, reports on items of interest and provides a line of help when the mouse is used in any operation.

3.2 File

Read data from disk or pipes, read variables from netCDF or HDF files, read and write plot parameters, read block data, write one or more xmgr datasets, set the current working directory, set the printer options, print (hardcopy), and exit.

3.2.1 Open

Open an existing binary or ascii xmgr file, abandoning the current plot.

3.2.2 Save

Save the current plot using the last specified name and save format.

3.2.3 Save as

Select the name and format for saving the current plot.

3.2.4 Describe

Add a text description to a plot. This will only be saved if binary format is used.

3.2.5 Read sets

Read one or more data sets. The list item at the top of the popup displays the contents of the current directory. Select a file or directory by clicking on the item with the right mouse button. The selection is placed in the text item labeled 'File:' and checked to see if it is a directory or a file. Selecting a directory causes xmgr to change to the new directory and reload the file list with the contents of the new directory. Selecting a file does nothing until the 'Accept' button is pressed or $< \text{return} >$ is entered. Before

'Accept'ing the file, the items describing the file type, file source, and the graph in which to read the data need to be properly set. The type of data file can be one of several formats:

- A 2 column multi-data set file. Sets are separated by a line containing non-numeric characters, that are neither comment lines (lines with a '#' in column 1) nor parameter lines (lines beginning with an '@'). The sets generated from this file type are all of type XY.
- A multi column data file. X is assumed to be in the first column, and Y1, Y2, ..., up to Y30 in the remaining columns. The sets generated with this data file format are all of type XY.
- IHL format. A 3 column data file with the first line an integer value with the number of points to follow.
- Binary format. - not defined as of this writing.
- X Y DX format. A 3 column data file consisting of X, Y and a quantity used to form an error bar parallel to the X-axis, i.e., the point will be plotted with an error bar at (X+-DX, Y).
- X Y DY format. A 3 column data file consisting of X, Y and a quantity used to form an error bar parallel to the Y-axis, i.e., the point will be plotted with an error bar at (X, Y+-DY).
- X Y DX1 DX2 format. A 4 column data file consisting of X, Y, and the errors in X. The error bar riser is drawn from (X+DX1,Y) to (X-DX2,Y). If both DX1 and DX2 are >0 then the error bar will bracket the datum. If DX2 is <0 and DX1 >0 the error bars are drawn to the right of the datum. Likewise, if DX1 <0 and DX2 >0 the error bar is drawn to the left of the datum.

  There are 4 cases for the error bars' position with respect to the datum:

  - 1. DX1 >0 and DX2 >0 ... Error bars bracket the datum.
  - 2. DX1 >0 and DX2 <0 ... Error bars are drawn to the right of the datum.
  - 3. DX1 <0 and DX2 >0 ... Error bars are drawn to the left of the datum.
  - 4. DX1 <0 and DX2 <0 ... Error bars bracket the datum, but reversed from case 1.
- X Y DY1 DY2 format. A 4 column data file consisting of X, Y, and the errors in Y. The error bar riser is drawn from (X, Y+DY1) to (X, Y-DY2). If both DY1 and DY2 are >0 then the error bar will bracket the datum. If DY2 is <0 and DY1 >0 the error bars are drawn to the right of the datum. Likewise, if DY1 <0 and DY2 >0 the error bar is drawn to the left of the datum. There are 4 cases for the error bars' position with respect to the datum:
  - 1. DY1 >0 and DY2 >0 ... Error bars bracket the datum.
  - 2. DY1 >0 and DY2 <0 ... Error bars are drawn above the datum.
  - 3. DY1 <0 and DY2 >0 ... Error bars are drawn below the datum.
  - 4. DY1 <0 and DY2 <0 ... Error bars bracket the datum, but reversed from case 1.
- X Y DX DY format. A 4 column data file consisting of X, Y, and the errors in X and Y. The error bar risers are drawn from (X+DX, Y) to (X-DX, Y) and (X, Y+DY) to (X, Y-DY).

- X Y Z format. A 3 column data file consisting of X, Y, Z. Sets with this type are drawn with the Z value in text at (X, Y).
- X Y R format. A 3 column data file consisting of X, Y, R. Sets with this type are drawn with a circle of radius R at (X, Y).
- X HI LO OPEN CLOSE format. A 5 column data file consisting of the high, low, open and close values for an observation at X. A data set of this type uses the line style, line width and line color for a normal set when the symbol is drawn.

Read from: sets the source of the data, either a disk file or a pipe. In the case of a pipe, the information provided by the file filter item is not used, as the 'file' in this case will be a command as typed at the UNIX prompt.

Read to graph: selects a particular graph to serve as the repository for the incoming data. The 'Current' graph is the graph that has the focus, and can be any of the available graphs. If you aren't sure which graph is current, the locator item on the main panel displays the current graph number.

Selecting **Autoscale on read:** forces an autoscale of the target graph each time a set is read.

Note: Data are read into the next available set. All data are assumed to be delimited by tabs or blanks.

For the xy, xydx, xydy, xydxdx, xydydy, xydxdy, xyz, xyr data file formats, sets are separated by a line containing non-numeric characters, that are neither comment lines (lines with a '#' in column 1) nor parameter lines (lines beginning with an '@'). Data files can have imbedded comments by placing a '#' in the first column of the comment line. Plot parameters can be set by placing a '@' in the first column of the line followed immediately by the parameter name and setting. See the command line reference for a description of plot parameters and other commands that may be placed in a data file using the '@' character. Comment lines and parameter lines can occur at any place in the data file, and are not used to indicate data set separators. I recommend a single '&' on a line to use as a data set separator.

Press **Accept** to read the data. If the read was successful, the graph of the data is drawn using the current plot scaling parameters. If the data lies outside the current plotting limits, the new set(s) will not be visible until the plotting limits are changed by autoscaling or manually through the *View/Define world popup* `<graphs.html#world>`.

Press **Cancel** to close the popup.

Open the *Status popup* `<#status>` to get information on the state of sets. If reading the file generates more than 10 errors you'll be prompted by an alert requesting whether or not you'd like to continue. These errors generally arise when an attempt is made to read a text file - xmgr relies on the interpretive capabilities of sscanf() to parse the data. xmgr will read data sets until there are no more sets available, after the maximum number of sets have been used, you'll need to free some sets using the [Kill] or [Kill all] items in the Edit/Set operations pullright.

3.2.6 Read netCDF

File/Read netCDF

Select X: Select Y:

netCDF file:

Load to set:

Autoscale on read

Accept Files... Update Query Done

————————————————

Enter the name of the netCDF file in the text item labelled **netCDF file:** then click on "Update" (note that if -netcdf [filename] was used on the command line, this step is not needed, as the lists will be loaded automatically). This will read the names of all one dimensional variables into the two scrolled lists. The leftmost list is for X and the rightmost for Y. There is an additional item in the X list called INDEX (I'm hoping here that no one names a variable INDEX, maybe I need to change this) that indicates that for X, use the index of the Y variable (numbering starts from 1).

Select on a variable from the X list to use for X and select a variable from the Y list (only single selections for now).

If information about the selected variables is desired, click on Query.

Select a set using "Load to set:" - the default is to load to the next available set.

If things look OK, click on Accept to read the data and load the set. Use "Autoscale on read" to set/unset autoscaling after a successful read.

To read data from a new CDF file, enter the filename, or use File... to scan the directory. Click on Update to freshenup the X and Y selection lists.

Note: Presently, only sets of type XY are created.

Note: xmgr scans and replaces commas with blanks and the 'D' in Fortran double precision exponential formats with 'e'.

3.2.7 Read parameters

Enter the parameter file name on the line labeled "File:", press "Accept" to read a saved state of adjustable parameters, legends, strings, etc, to the graph selected by the 'Read to graph' cycle. As the graph number is saved in the parameter file this isn't used at the present time.

3.2.8 Read block data

Select the data source, either Disk or Pipe and enter the block data file name in the text item labeled "File:" to read a data set in block data file format. The block data file format consists of columns of data. For example, the following is a block data file consisting of 4 columns:

```
1   2   3   4   5
6   7   8   9  10
11 12  13  14  15
```

After reading the file of block data, the popup will close if no errors were found, and the Edit/Block data popup will take its place. Use the functions in the Edit/Block data popup to create sets from the block data.

NOTE: All items are assumed delimited by spaces or tabs. There is presently a 30 column limit. Only one set of block data per session, i.e., reading another set of block data will obliterate the previous set of block data.

3.2.9 Write sets

Write one or all sets to disk. Select the set to write using the cycle displaying the set numbers (there is an item for selecting all active sets). The item denoted "Format" is the C language format string that will be used to format the data for output - the default should work well for most cases. Enter the file name on the line labeled "File:" and press the button marked [Accept], to write the data. The item, 'Imbed parameters,' causes xmgr to write not only the data, but the parameters describing the graph or graphs as well.

A complete dump of the contents of xmgr may be accomplished by selecting all sets, imbed parameters, and all active graphs. The file generated this way can then be read as a normal data file, and should recreate the originating environment.

3.2.10 Write parameters

Select the graph from which to save the parameters. This can be the current graph, any particular graph, or all active graphs. Enter the parameter file name on the line labeled "Write parameters to", press "Accept" to write the current state of adjustable parameters, legends, strings, etc. A prompt will appear if the action would overwrite an existing file. allowing the operation to be cancelled.

3.2.11 Clear all

Kill all sets, graphs, and annotative text, lines, and boxes. After performing this action, it will be necessary to activate a graph using View/Graphs/Activate graphs.

3.2.12 Print

Generate a hardcopy of the current plot on the device specified in the File/Printer setup popup.

3.2.13 Printer setup

Set the hardcopy device parameters. Select the device, where to print (either the printer or a file), and the string to use as a spooling command for the print job, or file name if output is directed to disk. Click on the 'Accept' button to make the selections above current, or 'Done' to close the popup and cancel the operation. If the selection is accepted, the next time File/Print is selected, hardcopy output will be to the selected device. Click on the 'Print' button to accept the settings and print a hardcopy.

3.2.14 Exit

Click on the Exit button to terminate the session with xmgr.

3.3 Data operations

Access the command line interpreter, describe the status of data sets, graphs and regions, display results of computations and other operations, perform transformations, set operations, point operations, region operations, block data management.

3.3.1 Status

When the selection for **Display** is **Regions**, no operations are provided at the present time.

3.3.2 Results

Display the results of the regression routine and the output of the 'Write' button in File/ Status in the monitor window.

3.3.3 Commands

Command driven version of the interface to xmgr. Here, commands are typed at the 'Command:' text item and executed when < return > is entered. The command will be parsed and executed, and if no errors are found, the command line is placed in the history list. Items in the history list can be recalled by simply clicking on them with the left mouse button. Save a history list by clicking on the 'Save...' button popping up the 'Save commands' popup. Clicking on 'Read...' will open the 'Read commands' popup and allows previously stored commands to be loaded into the history list for future access. 'Clear' empties the history list. 'Replay' cycles through each item in the history list and executes each instruction in the list. See the command line reference for a description of the command line syntax.

3.3.4 Transformations

NOTE: Some of these operations generate new sets, if you run out of sets use Data/Set operations (described below) to kill unneeded sets. Also, the scaling of the world coordinate system may be inappropriate for the results of many of these operations. Use the Status popup to determine the appropriate scaling factors to use in "Define world" (above), or use "Autoscale..." (in View/Autoscale above). Most functions operate on active sets only.

Evaluate expressions Evaluates a formula defined in infix fashion.

Select the set on which the formula will operate, (set must be active, use File/Status to find the current state of sets). If you desire the result be loaded to a new set rather than overwriting the set used for computations, use the panel cycle denoted 'Result to' to inform xmgr you'd like the result placed in a new set (if there is one). A new set is created only if a single set is selected from step 1. If 'All sets' are selected then the results will overwrite all active sets.

Enter the formula, the syntax is:

(x,y,a,b,c,d)=<expression>

where (x,y,a,b,c,d) are defined as the x and y of the currently selected set and a,b,c,d are scratch arrays that can be used to perform operations between sets. Case is ignored, so X=COS(X) is correct.

Click on **Accept** when you are satisfied with everything.

Variables:

- a == reference to scratch array
- b == reference to scratch array
- c == reference to scratch array
- d == reference to scratch array

Functions:

- abs(x) == absolute value
- acos(x) == arccosine
- acosh(x) == hyperbolic arccosine
- asin(x) == arcsine
- asinh(x) == hyperbolic arcsine
- atan(x) == arctangent
- atanh(x) == hyperbolic arctangent
- atan2(y,x) == Fortran ATAN2
- ceil(x) == greatest integer function
- cos(x) == cosine
- cosh(x) == hyperbolic cosine
- deg == 180.0/PI
- dx == span of world coordinate system in x
- dy == span of world coordinate system in y
- erf(x) == error function
- erfc(x) == complement of error function

- exp(x) == eˆx
- floor(x) == least integer function
- index == the index of the current point in the selected set
- int(x) == truncation
- invn(p) == inverse of standard normal (p in [0,1])
- invt(p,id) == inverse of Student's t with id degrees of freedom
- irand(n) == random integer less than n
- lgamma(x) == log of gamma function
- ln(x) == natural log (should be log)
- log(x) == log base 10 (should be log10)
- max(x,y) == returns greater of x and y
- min(x,y) == returns lesser of x and y
- mod(x,y) == mod function (also x % y)
- norm(x) == gaussian density function
- normp(x) == cumulative gaussian density (-inf,x)
- pi == constant PI
- rad == PI/180.0
- rand == pseudo random number distributed uniformly on (0.0,1.0)
- rnorm(xbar,s) == psuedo random number distributed N(xbar,s)
- sin(x) == sine function
- sin(x) == hyperbolic sine
- sqr(x) == xˆ2
- sqrt(x) == xˆ0.5
- tan(x) == tangent function
- tanh(x) == hyperbolic tangent
- x == currently selected set X
- y == currently selected set Y

Note: See pars.yacc for the yacc grammer.

Examples:

y=-y

y=x*cos(2*x*PI/100)+sqr(x)

x=(index>10)*(x-5)+(index<=10)*x

If the index of the current point is greater than 10 then x=x-5 else x=x. Conditionals evaluate to 0 if false, anything else is true.

a=y

Store y of the current set into scratch array "a". You may now select another set and perform the operation y=somefunctionof(a)

Restrictions:

Load values Load a sequence to (x,y) or (a,b,c,d).

Load and evaluate Evaluate parametric functions.

Enter the functions to be used to define X and Y.

Select the independant variable (x,y,a,b,c,d).

Enter the start, stop and the number of points items.

Press the button **Apply** to evaluate the functions and load the result to a new set.

Histogram Compute a frequency histogram.

Select the set.

Enter the width of a bin (all bin widths are the same).

Enter the minimum and maximum values of the portion of the data you wish histoed (sic). Note that Xmin and Xmax refer to the RANGE (or Y) of the set, not the domain (or X).

Press **Accept** to compute the histogram.

Fourier Compute the Discrete Fourier transform.

Select the set

Select the type of data window, the default is the rectangular window, i.e., the data are transformed unmodified. The data windows are defined as follows:

None

Use the default rectangular window

Triangular

1.0 - |(i-0.5*(N-1))/(0.5*(N-1))|

Hanning

0.5 * [1-cos(2*pi*i/(N-1))]

Welch

1-((i-0.5*(N-1))/(0.5*(N+1)))^2

Hamming

0.54-0.46*cos(2*pi*i/(N-1))

Blackman

0.42-0.5*cos(2*pi*i/(N-1))+0.08*cos(4*pi*i/(N-1))

Parzen

1.0 - |(i-0.5*(N-1))/(0.5*(N+1))|

Select the form of the output, magnitude (spectrum), phase, or the coefficients. The spectrum is computed by sqrt(x*x + y*y) where x, y are the coefficients computed by the DFT or FFT. Only N/2 values (representing frequencies 0 to PI) are loaded to the resulting set.

If the magnitude or phase is selected, then the next item, 'X = ', determines what values should be loaded to X. The index runs from 0 to n/2, the frequency is the cyclical ith fourier frequency, the period is the reciprocal of the frequency with the period of the 0th fourier frequency plotted at T+delt, where T is the total length of the data and delt is the sampling interval.

Select transform or inverse transform.

Select real or complex data.

If real is selected, then the data to be transformed is assumed to be in Y, X is assumed equally spaced and is ignored. If complex is selected then the real part is assumed to be in X and the imaginary part in Y.

Press DFT (for small data sets whose length is not a power of 2) - or FFT (for data sets whose length is a power of 2).

Click on **Window only** to generated a windowed version of the data in a new set.

NOTE: Small for the DFT is < 1000 points. The DFT is O(N**2) and can be quite time consuming to compute for large N.

Running averages Compute a running average, median, minimum, maximum, or standard deviation.

Select the method.

Select the set.

Set the length of the running method in the text item marked **Length**, it must be less than the set length.

Click on **Accept**.

Regression Perform linear or polynomial regression.

Select the set.

Select the degree of fit.

Select fitted curve or residuals to load.

Press the button marked "Regress".

A set is loaded (if there is one) with the resulting curve and a summary of the statistical results are written to the **Result** popup.

Notes:

The fitting techniques used by xmgr are as follows:

For linear fits (y=ax+b) a straightforward least squares procedure is used. For exponential and power fits, the function to fit is linearized, it is important to note that the statistics generated refer to the parameters of the linearized function and not the original function.

Non-linear curve fitting

1. Select the set you would like to approximate.
2. The unknown parameters to fit are labelled A0 to A9 (case insensitive). Type in the function using the parameters, starting with A0.
3. Enter the number of parameters.
4. Adjust the tolerance.
5. Choose initial values (1 default) and specify bounds (if required) for the parameters.
6. Specify what you would like to view

   Fitted values
   Value of approximating function at abscissa of selected set

   Residuals
   Error in approximating function at abscissca of selected set

   Function
   Approximating function at abscissa defined by **Start**, **Stop** and **# of points**
7. Run the fitting routine by specifying the number of convergence steps you wish to perform (5/20/100).
8. **Load** the values to a new set if **autoload** not selected.
9. Look at the results and repeat any of the above steps until satisfied. Results will continue to be loaded to the same newly created set.
10. Press **Accept** to make the new set permanent or **Cancel** to destroy it.

Differences Numerical differentiation.

Select the set.

Select the method - one of forward, backward, or centered difference. Assumes unevenly spaced data, increasing in X.

Click on **Accept**.

A set is loaded (if there is one) with the resulting curve.

Seasonal differences Difference a set by a given lag.

Select the set.

Enter the value for the lag. Assumptions are evenly spaced data, increasing in X.

Press the button marked **Accept**.

Use **Pick** to use the mouse to select the set by clicking near a point in the set as displayed in the drawing area.

A set is loaded (if there is one) with the resulting curve.

Integration Numerical integration.

Select the set.

Select the form of the results, the item marked **cumulative sum** will construct a set composed of the current value of the integral at a given X. Sum only reports just the value on the next line. Assumes unevenly spaced data, increasing in X.

Press the button marked **Integrate**.

A set is loaded (if there is one) with the resulting curve if **cumulative sum** is chosen.

X-corr Cross/auto-correlation

Select both sets (use the same set if autocorrelation is desired).

Select the lag, N/3 is a reasonable value (your mileage may vary).

Select bias - generally this will not make any difference for large data sets with lags << the length of the set, I was just curious. The difference is division by N (biased) or N-lag (unbiased). A set is loaded (if there is one) with the resulting curve.

Interpolation Create a new set by performing interpolation on one set at abscissas from another set. All sets are in the current graph. This will allow pointwise mathematical operations to be performed between the new set and the set providing the abscissas using the *command interpreter* `<data.html#commands>`.

Choose the set on which to interpolate which will provide the Y values. Select a second set which will provide the X values for the new set.

The interpolation method can be a cubic or Akima spline or linear.

Spline Compute a spline fit to a set

Select the set.

Select the starting value of X for the fitted curve.

Select the ending value of X.

Select the number of samples. The spline curve will be evaluated at X+i*(MaxX - MinX)/Nsteps for each i in (0, Nsteps-1).

Select the type of the spline. It could be either plain cubic one or Akima spline. The latter should be prefered when approximating sufficiently non-smooth series.

Press "Spline"

A set is loaded (if there is one) with the resulting curve.

Notes: The code to compute the spline is a literal translation of the code in FMM.

Sample Sample a set pointwise or by a logical expression.

Select the set.

Select the type of sample, either Start/step or Logical expression. If Start/step is selected then enter the starting index to begin the sample.

Select the number of points to skip between samples in **Step**. If **Logical expression** is selected, enter the expression in the text item denoted **Expr:**. Values of the expression not equal to zero are interpreted as TRUE, and the point is accepted. Any expression evaluating to zero will result in the point being ignored.

Digital filter Apply a digital filter to a set.

Select the set to be filtered

Select the set with the filter weights.

Linear convolution Perform convolution of 2 sets.

Geometric transformations Apply rotations, scaling, and translations to a set.

Select the order in which to apply the transformations.

Press the button **Apply** to perform the transformation.

Press the **Reset** to reset values and return to the identity transformation.

Press the **Reset** to reset values and return to the identity transformation.

Restrictions: Only the set X and Y are transformed, additional vectors attached to a set, such as error bars, are not transformed.

3.3.5 Point operations

Operations in **Point operations** use the pointer to query sets about points, delete points in a set, and move points. In all cases where interaction is required, pressing the right mouse button with the pointer in the drawing area cancels the operation.

Find points Report on a point in a set

Click on **Find points**.

Position the pointer close to the data point to identify.

Press the left mouse button.

The set, the location in the set, and (X, Y) for the datum nearest to the pointer will be displayed in a popup. Press the right mouse button to shut off the **Find point** feature.

Tracker Track points in a set.

Visit each point of a set in a sequential manner. Click nearest the set to track, and use the left mouse button to go forward through the set and the middle mouse button to go backwards through the set. The right mouse button exits tracking.

Delete points Press **Delete point** with the left mouse button to activate.

Position the pointer close to the data point to delete.

Press the left mouse button.

Add points Add points to a set. Select the set and press **Add points** to append points to the selected set by clicking on the location where the point is desired. This can be used to (crudely) digitize data from pages pasted on the screen.

Move points Press **Move** with the left mouse button to activate.

Position the pointer close to the data point to move.

Press the left mouse button.

Move the pointer to the new location and press the left mouse button again to register the point's new location.

Move X only Click on **Move X only** to activate.

Position the pointer close to the data point to move.

Press the left mouse button.

Move the pointer to the new location and press the left mouse button again to register the point's new location.

Move Y only Click on **Move Y only** to activate.

Position the pointer close to the data point to move.

Press the left mouse button.

Move the pointer to the new location and press the left mouse button again to register the point's new location.

Distance, dy/dx, angle Click on **Distance, dy/dx, angle** to activate.

Position the pointer close to the starting point. Press the left mouse button. Click again at another point to form a straight line. The results are the distance, slope, and the angle from horizontal.

Goto Enter the X, Y of the point to go to, and press **Goto point** to have the pointer warp to that position on the drawing area.

3.3.6 Set operations

Set operations allow sets to be created, destroyed, written to disk, sorted.

Pick ops Pick ops use the point in a set nearest to the location of the pointer when clicked to select the set for the chosen operation. The nearest point is determined by the Euclidian distance which can be very different from the point that is visually closer. As long as there are sets with points, the operation will always be performed, which means that a bit of care should be exercised using these operations.

- Kill nearest set

  Kill the set nearest the pointer.

- Copy nearest set

  Select a set to copy with one click, and the destination, which may be in another graph, with another click.

- Move nearest set

  Select a set to move with one click, and the destination, which may be in another graph, with another click.

- Reverse nearest set

  Select a set to reverse by clicking near a point in a set. The result is that the order of the points is reversed (point N becomes point 1, and point 1 becomes point number N, etc.).

- De-activate nearest set

  Select a set to deactivate by clicking near a point in a set. The result is that the set will act as if undefined for most operations, and will not be drawn even if the line or symbol selections would cause it to be drawn. The data are not destroyed, and the set can be reactivated using the functions in File/Status or Data/Set ops.

- Join nearest sets

  Click near a point in one set to use for the join, then click again near a point in another set to select the second set. The second set will be appended to the end of the first set.

- Delete range in nearest set

  Click near a point in one set to use for the start of the range to delete, then again near the point at the end of the range to delete. The result is that all points between the 2 selected points will be removed from the set, including the 2 points selected.

- Cancel operation

  Cancel any operation in progress.

The remaining items in the Set ops toolbox allow sets to be created, destroyed, written to disk, moved, sorted, deactivated, reactivated.

Activate Make a set active and able to participate in operations.

To activate a set, select the set number, specify the number of points in the set and click on "Accept."

Deactivate Make a set inactive and unable to participate in operations. The data associated with a deactivated set are still available and all plot parameters associated with the set are unchanged. Use the Re-activate set item below to make the set known to xmgr again. This item is include for those situations where a set is to be ignored temporarily, but needed later in the session.

Select the set to Deactivate.

Press the button marked **Accept**.

Re-activate Undo the effect of Deactivate.

Select the set to Reactivate, it is a no-op to Reactivate an unused set.

Press the button marked **Accept**.

Set length Set the length of a set.

Select the set.

Fill in the item marked Length.

Press the button marked **Accept**.

Change Set type Set the type of a set.

Select the set

Select the type to set

Press the button marked "Accept"

Copy Copy one set to another in a possibly different graph.

Select the set to copy from.

Select the set to copy to.

Select the graph to receive the copy.

Press the button marked **Accept**.

Move Move one set to another in a possibly different graph.

Select the set to move from.

Select the set to move to.

Select the graph to receive the set.

Press the button marked **Accept**

Swap Exchange one set with another.

Select the sets and the graphs these sets reside.

Click on **Accept**.

The contents of the sets plus all parameters associated with the display of the sets are exchanged.

Drop points Drop points from a set.

Select the set.

Fill in the items "Start drop" and "End drop".

Press the button marked **Accept**.

NOTE: Points in a set are numbered from 1 to N, where N is the number of points in the set (as opposed to sets which are numbered from 0).

Join Merge 2 sets together.

Select the set that will be appended.

Select the set accepting the previous set.

Press the button marked **Accept** to append the first set to the second.

Split Divide a set into other sets.

Select the set to split.

Enter the length of the resulting sets (say N).

Press the button marked **Accept** to divide the selected set into (length of selected set) / N sets with the remainder to the last set.

The first set will be the set selected to split and will contain the first N points.

Kill Eliminate a set.

Select the set to kill or All to kill every active set.

To save the parameter settings, toggle 'Preserve parameters.'

Press the button **Accept**.

NOTE: This operation is final.

Kill all Kill all active sets.

This is an action item, you'll be asked if it is OK to kill all active sets.

Sort sort x or y of a set.

Select set to sort.

Select which component (x or y) as a key.

Select the order of the sort.

Press the button marked **Accept** to sort the set in place.

Write set(s) Write a set(s) to disk.

Select the set to write or "All" for all sets.

Fill in the format to use to write, syntax is C, default is "%lf %lf".

Fill in the item marked "Write to file" with the filename to write.

Press the button marked **Accept**.

Note: A complete dump of xmgr may be accomplished by selecting All sets, All active graphs and toggling Imbed parameters. The generated file may be read as a normal data file and will contain the necessary information to completly reconstruct all graphs in the current session.

Reverse order Exchange points in a set.

Select set to reverse.

Press the button marked **Accept** to reverse the order of a set.

Coalesce sets Merge active sets to an inactive set.

Select set to receive points from all active sets. This selected set should not be an active set.

Press the button marked **Accept** to merge all sets to the selected set.

Pack sets Move sets so that the set structure in the current graph has no gaps.

During the course of several operations on sets, gaps can form in the set structure. This can result cause problems when doing a Save all, as the actual location, i.e. set number, of the set is not retained in the Save file. For example after several operations that create and delete sets, the active sets are numbered:

0, 3, 4, 5, 9

Following a Pack, the active sets will be numbered:

0, 1, 2, 3, 4.

Press the button marked **Accept** to pack all sets in the current graph.

3.3.7 Edit/Create set operations

Edit/Create set operations allow sets to be created using a formula or text editor or edited in a spreadsheet-like fashion.

Edit Edit is used to alter an existing set by invoking a spreadsheet-like editor. Values are updated by pressing return or when leaving a cell. Several buttons appear on the widget:

- Add

  Add a point to a set by copying the currently edited cell and appending it directly afterwards
- Delete

  Delete the current point.
- Props...

  Change the format, precision and column widths of the table.
- Update

  Refresh the display. This is useful if the set type changes or the number of points changes.

Formula See *Load & evaluate* `<trans.html#leval>`

Manual Create a new set by invoking a text editor.

3.3.8 Region operations

Define region Define a region of interest on a graph or graphs.

Select the region, there are 5.

Select the type of region:

Inside polygon

Points inside a closed, non-intersecting polygon are considered inside the region.

Outside polygon

Points outside a closed, non-intersecting polygon are considered inside the region.

Above, below, to the left, and to the right

Regions defining a half-plane, points inside the half-plane are considered in the region.

Select the type of linkage, either a particular graph or all graphs, the default is the current graph.

Press **Accept** to make the pointer ready for the region definition. In the polygonal region type, define the region by successive clicks with the left mouse button, use the right mouse button to register the polygon. In the line case, define the line by clicking on the beginning point and end point of the line.

Evaluate in region Evaluate an expression applied to points within a region.

Select the region to use.

Enter the expression, regions are referred to by Rn.x or Rn.y where 'n' is the number of the region to use. Functions available are the same as those in 'Evaulate expressions' described above.

Examples:

R0.X = R0.X - 1

Clear region Remove a defined region.

Select the region to remove and press 'Apply'.

Extract points Extract points from a region to a set

Select the region to use.

Select the set to receive the points.

Select the graph to put the set.

Click on **Accept** to combine all points within the specified region to the specified set and graph.

Delete points Delete points in a region.

Select the region to use.

Click on **Accept** to delete all points in all sets within the specified region.

Area/perimeter Compute the area and perimeter of a region. This item doesn't belong here as it does not use the region structures. Click on **Area** or **Perimeter** and use the mouse to define the region. The area or perimeter will be displayed in the text items **Area =** or **Perimeter =** whichever the case may be. Use the right mouse button to close the region.

3.3.9 Graph operations

Activate Make a graph eligible for receiving the graph focus and other operations. Select the graph to activate and press **Accept**.

Copy Copy a graph to another graph.

Select the graph to copy from and the graph to copy to and press **Accept**.

Note: Copying a graph will automatically conceal one of the graphs as they will both have the same viewport settings. Some adjustments in the viewport settings of either or both graphs will be required for each graph to be displayed in a non-overlapping manner.

Swap Exchange two graphs.

Select the first graph then the second and press **Accept** to exchange the contents of the two graphs. This can be used to adjust the order in which graphs are drawn, as graphs are drawn in numerical order starting with graph 0.

Kill Make a graph inactive and free all storage associated with sets. Select the graph to kill and press **Accept**.

Focus Set the graph focus, the focus policy and toggle the display of focus markers. Select the graph to have the focus, the focus policy, and the toggle for the focus markers and press **Accept**.

Note: Most operations in xmgr act on the current graph. Not noticing which graph has the current focus can be a source of frustration when working with xmgr - if you plan to work extensively with a particular graph, it might be useful to set the focus policy to **Set** to fix xmgr's notion of the current graph.

Show Toggle the display of a one or more graphs.

Select which graph or graphs to show, then press **Accept**. The default is to show all active graphs.

This item can relieve some of the drudgery when working with multiple graphs, especially when some of the graphs contain large data sets.

Set graph type Set the current graph type to XY, log-linear, linear-log, log-log, bar or stacked bar. Select the graph type, and press **Accept**.

Note: As of this writing, very little is done to ensure that the data are acceptable for log plots.

Arrange graphs Place several graphs in a non-overlapping manner.

Select the number of rows and the number of columns, the packing method, the vertical and horizontal spacing between graphs in viewport coordinates, the start of the first graph in viewport coordinates, and how wide and how tall each graph should be. Graphs are laid out in column major order starting from the lower left. So, given 3 columns and 2 rows the graphs will be laid out as follows:

```
1   3   5

0   2   4
```

Given 3 colums and 3 rows:

```
2   5   8

1   4   7

0   3   6
```

Note that graphs are numbered from 0.

The packing selection packs the graphs vertically, horizontally or both. Use this item when there are several graphs with the same X or Y axis scaling so graphs on the outside of the packing arrangement provide the tick and axis labelling for all graphs in that row or column. In the 3x3 example above,selecting packing 'both', graphs 3, 6 will have X-axis tick labels, and graphs 1, 2 will have Y-axis tick labels. Graphs 4, 5, 7, 8 will have neither X or Y axis tick labels, while graph 0 will have both.

Note that the graph width is computed using the number of columns, horizontal gap, X starting location and packing whenever the number of columns is selected. Likewise, the graph height is recomputed using the number of rows, packing, vertical gap and starting Y value whenever the number of rows is selected. New values for the rows and columns need not be chosen for the computation to occur.

If the number of graphs chosen is decreased, the higher number graphs will still be displayed. They must be *killed* `<#kill>` or *not shown* `<#show>` to be removed.

Overlay Overlay one graph onto another. This can be used to plot sets of different scale in what will appear to be the same graph.

Invert/flip axes Reverse the direction of the X or Y axes or exchange the X and Y axes.

Image Read and place an X window dump file on the drawing area. At the present time, only one image per session is allowed.

3.3.10 Block data

Create sets from block data. Select the type of set and the columns to use for each vector of the new set. Press **Accept** to create the set. Note that reading block data does not affect the scaling of the graph so when a set is created using this popup, the set may not appear within the graph's scaling limits - use AS (Autoscale) to set the scale of the graph if needed (or use View/Define world).

3.3.11 Hot links

To be written...

3.4 Plot functions

The selections in the Plot pulldown menu allow the modification of plot parameters. There are popups for setting the scaling of the axes, the number of tick marks to display, legends, writing annotative text, and drawing objects such as lines and boxes.

xmgr uses 3 coordinate systems in drawing a graph. These are the world, viewport, and device coordinate systems (following Foley and Van Dam). The world coordinates system is the one in which the data are defined and constitutes the user's coordinate system. The viewport coordinate system (in xmgr), is a rectangle defined by the points (0.0, 0.0) or the lower left corner of the device and (1.0, 1.0) or the upper right corner of the device. The pipeline for drawing objects on the screen or hardcopy device is a pair of linear transformations that carry points in world coordinates to the viewport and then on to the device coordinate system. The upshot is that an object located in world coordinates can be drawn in various parts of the screen or hardcopy device depending on the scaling while an object located in viewport coordinates remains in the same spot regardless of the world scaling. Strings, lines, boxes, and the graph legend can be located in either world or viewport coordinates.

3.4.1 World scaling

Define the world coordinate system by filling in the items Xmin, Xmax, Ymin, and Ymax. The plot is drawn in world coordinates in a rectangle described by the two points (Xmin, Ymin), (Xmax, Ymax). The input is scanned for arithmetic expressions so setting Xmin = -PI and Xmax = PI is legal input (see the section on transformations for a description of the syntax and available functions). The tick spacing can also be set in this popup by filling in the items for the major and minor spacing for each axis. 'Update world/ticks' is used, when, occasionally, the state of the items used to define the world scaling get out of sync with what is actually used to draw the graph, clicking on this item synchronizes the internal values with the displayed values. Press the button marked **Accept** to inform xmgr of the changes.

Note: make sure Xmin < Xmax and Ymin < Ymax.

3.4.2 Viewport

Define the viewport by filling in the items Xmin, Xmax, Ymin, Ymax. Viewport coordinates run from (0.0,0.0), the lower left corner of the screen or hardcopy device, to (1.0,1.0), the upper right corner of the screen or hardcopy device. Press the button marked **Accept** to make the change to the new viewport. Press the **Pick view** button to use the mouse to define the viewport. Take the mouse to the lower left corner of the desired viewport and press the left button (there is no need to hold the button down). A rubberband box will show you the current size of the viewport you may select. When you are satisfied with the view, press the left mouse button again to activate the new viewport.

Press the button marked **Close** to close the **Viewport** popup.

The viewport can also be changed by double clicking on the focus markers (or where they would be placed if not shown). The new location is chosen by clicking the first mouse button.

3.4.3 Autoscale

Use the Autoscale popup to set parameters associated with autoscaling. Select the axis to scale, or none. Selecting none allows the autoscale type and the number of ticks to create to be set but no autoscaling is done. Select the particular set to use or All. The Autoscale type sets the method of autoscaling, either Heckbert or fixed. Heckbert uses a method based on routines posted to the net by Paul Heckbert and generates nice looking tick spacing, but alters the scaling of the axes. The fixed option uses the minimum and maximum values in the set (or over all sets) to set the scale of the axes. Select the number of tick marks to use for defining the tickmark spacing (in the case of Heckbert scaling, these settings are advisory only). The item labeled **Apply to:** allows the autoscaling of the current graph, or all active graphs.

3.4.4 Title/subtitle

The title and subtitle are strings that appear centered at the top of the plot. Fill in the items indicated and press the button marked **Accept**. To change the font, color, or character size used for titles use the items from the popup denoted **Props...**.

3.4.5 Ticks/tick labels

Set the spacing and type of major and minor tick marks, definition of axes labels, and toggle features associated with the drawing of the graph axes.

The top item, **Edit**, selects the axis for which the feature selections will apply. There are two axes defined for each co-ordinate direction, the primary axis and the zero axis. The primary axis will be used the most, the zero axis is, by default, turned off. The button to the right of the **Edit** item labelled **Props...** allows the axis to be offset by a specified amount in viewport co-ordinates. The item **Axis label** accepts the definition of the label to be used when drawing the axis. Various properties of the label may be set in the popup just below labeled **Axis label props...**.

The two items 'Major tick spacing' and 'Minor tick spacing' set the spacing of major and minor ticks. Tick labels are drawn based on the setting for the major tick spacing. These items are duplicated in the 'Define world' popup described previously. Fill in the appropriate blanks and press **Accept** to refresh the display. The units are positive deltas starting with the world minimums. Input is run through the scanner so expressions are allowed. The are special symbols **dx** and **dy** for setting a prescribed number of tick marks. Dx is the distance along the X-axis and dy is the distance along the Y-axis, as defined in the current window of the world coordinate system. Typing at **Major tick spacing** "dx/10" will give 10 major tickmarks.

Tick labels, tick marks, the axis bar, may be toggled by the check boxes. Properties for each of these can be set by the **Props...** popups associated with each item.

Properties for tick labels are:

Font

Which font to use when drawing the labels.

Color

Which color to use.

Line width

Width of line to use when drawing the label.

Char size

Size of characters to use.

Format

Decimal, exponential, power, general plus several time and date formats. To use the time and date formats, the data are required to be in Julian Date format, the long version. Two auxillary programs, jul2greg and greg2jul, are available with the distribution to assist in the conversion from Julian to Gregorian date formats.

Stagger

each tick label may be offset with respect to its neighbor, the levels of staggering ranging from 0 to 3, This is especially useful with some of the time and date formats.

Precision

sets the number of places to display to the right of the decimal point for the labels.

Skip every

tick labels are drawn at every major tick mark, use the skip factor to circumvent this.

Start labels at

Graph minimum, or specified. To start the labels at some other point than the graph minimum, fill in the text item to the immediate right with the value where tick labels are to begin. There is a similar item in the property sheet for tick marks that can be used to set where the major tick marks begin. between these two, there should be sufficient flexibility.

Stop labels at

same as above only works at the other end of the axis.

Layout

allows the tick labels to be drawn horizontally, vertically, or a specified angle (in degrees).

Draw tick labels

which side of the graph to draw tick labels, either the normal side (the bottom of the graph in the case of the X-axis, or to the left of the graph in the case of the Y-axis), The opposite side, or both. This can be handy when using multiple axes, or overlaying graphs with differing scales.

Sign

allows the numerical value of the label to be displayed as is, as its absolute value, or negated. This can be used to effectively reverse the sense of the axis (negate), or reflect the axis about zero (absolute value).

Apply to

Override the selected axis from the Ticks/tick label popup, causing the settings to be selected for all axes in the current graph, the current axis for all graphs, or all axes in all graphs.

Press the button **Accept** when everything is OK, or **Close** to close the popup.

Properties for tick marks are:

Tick mark direction

in, out, or both. Which direction the ticks point.

Tick marks on

Which side of the graph to draw ticks. The normal side is the bottom of the graph in the case of the X-axis, or to the left of the graph in the case of the Y-axis, the default is to draw ticks on both sides.

Major tick length

sets the length of major tick marks

Minor tick length

sets the length of minor tick marks

Major grid lines

a check box that when toggled on, grid lines will be drawn at the settings for major tick marks.

Minor grid lines

a check box that when toggled on, grid lines will be drawn at the settings for minor tick marks.

Color, line width, and line style

These items set the characteristics of the lines use to draw ticks and grid lines.

Apply to

allows the axis select in the Ticks/tick label popup to be overidden, causing the settings to be selected for all axes in the current graph, the current axis for all graphs, or all axes in all graphs.

Press the button **Accept** when everything is OK, or **Cancel** to close the popup.

Properties for the axis bar are:

Color, line width, and line style items set the characteristics of the lines use to draw ticks and grid lines.

Press the button ‘Accept’ when everything is OK, or ‘Cancel’ to close the popup.

IMPORTANT NOTE FOR LOG PLOTS: When log scaling is selected for a particular axis or axes, the meaning of major and minor ticks changes slightly. Major ticks should be set to integer values. Use minor ticks to set the number of interdecade tickmarks, these should be set to integer values ranging from 0 (no interdecade tickmarks) to 5. A value of 1 will draw each interdecade position, 2 will skip every other position, etc.

3.4.6 Frame

The frame is the box drawn around the clipping region of the graph, and the region inside. Items in the frame popup are:

Frame

Turn the frame on or off.

Style

Either ‘closed’ or ‘open.

Color

Set the color of the line drawn around the graph.

Line width

Set the width of the line around the graph.

Line style

Set the line style of the line.

Fill graph background

Toggle the filling of the frame.

Background color

The color with which to fill the frame.

Press **Accept** to register the settings, **Close** to close the popup.

3.4.7 Symbols

The items in the symbols popup allow the selection of symbols, lines, and fill style to be used when drawing a set.

Items in the symbols popup are:

Select set

The set or sets to which the following items will apply. Mulitple selections may be activated.

Symbol:

Symbol

Select the symbol to use, or none for no symbol.

Fill

Select the fill option, none, filled, or opaque. The opaque option allows the symbol to be filled with the background color (white as of this writing) overwriting the line used to connect each point.

Size

Set the size of the symbol.

Char

select a character to use instead of a symbol (not active)

Skip

select the number of points to skip when drawing symbols

Line:

Style

select the line style for the lines connecting the points in the set.

Width

select the line width for the lines.

Color

the color to use when drawing lines.

Fill:

Fill

select the type of fill, none, as polygon, to y=0.0, x=0.0, x=graph Xmin, x=graph Xmax, y=graph Ymin, y=graph Ymax.

Fill using

either Color or Pattern.

Color

select the color to use, or none.

Pattern

select the pattern to use or none There are three additional buttons in this popup that can be used to set the colors, symbols, and line widths in an incremental fashion, avoiding the need to specify a each.

Misc:

Legend

A string defining the legend to use for this set

Select

Allow single or multiple choices in **Select set**

All colors

Assign a different color to each set

All symbols

Assign different symbols to each set

All widths

Cyclically Assign different line widths to each set

All line styles

Cyclically assign different line styles to each set

B/W

Make all line colors black

Misc:

Legend

A string defining the legend to use for this set

Select

Allow single or multiple choices in **Select set**

All colors

Assign a different color to each set

All symbols

Assign different symbols to each set

All widths

Cyclically Assign different line widths to each set

All line styles

Cyclically assign different line styles to each set

B/W

Make all line colors black

NOTE: There are limits on how large a set can be for the fill to operate correctly. The limit for the display is approximately 8000 points, for the hardcopy drivers, this limit drops to around 800-1000.

Symbols descriptions:

- 1. No symbol

- 2. Dot
- 3. Circle
- 4. Square
- 5. Diamond
- 6. Triangle up
- 7. Triangle left
- 8. Triangle down
- 9. Triangle right
- 10. Plus
- 11. X
- 12. Star
- 13. Impulse at X
- 14. Impulse at Y
- 15. Vertical line at X
- 16. Horizontal line at Y
- 17. Histogram X
- 18. Histogram Y
- 19. Stair step X
- 20. Stair step Y
- 21. Bar X
- 22. Bar Y
- 23. Range
- 24. Location
- 25. Set #
- 26. Set #, location
- 27. Bar and whisker (not active as of this writing)
- 28. Segments
- 29. Character

- 30. String (not active as of this writing)
- 31. Hi low X
- 32. Hi low Y
- 33. Open/close X
- 34. Open/close Y

NOTE: symbols 16-29 do not appear in the legends

3.4.8 Error bars

Error bars are created by reading in the data as a set with error bars (see Files above). Properties of error bars are set by opening the 'Error bar props' popup.

Size

Set the length of the error bar.

Line width

Set the line width of the error bar.

Line style

Set the line style of the error bar.

Riser

Toggle the display of the line connecting the error bar with the data point.

Riser line width

Set the width of the riser.

Riser line style

Set the riser line style.

Display

Toggle the display of the error bar.

3.4.9 Legends

Legend items:

Legend on/off

toggle the display of the graph legend

Legend location type

Select the coordinate system to use when interpreting the legend x, and legend y items described below. Either the world or viewport coordinates. Legends placed in viewport coordinates make the legends stay put as the plot scale changes. Legends placed in world co-ordiantes will float as the graph scaling is

changed.

Legend gap

specify the vertical gap between legend entries

Legend length

specify how long the line representing the set should be.

Legend X

X value of legend location

Legend Y

Y value of legend location

Font

specify the font for the legend labels

Frame

toggle a box drawn around the legend. The three items below set the line color, line width, and line style of the box.

Fill frame

toggle the fill of the box around the legend. The frame fill will obliterate anything beneath, grid lines, sets, etc. Set the type of fill either color or pattern and the corresponding color or pattern.

Clicking **Place** is a convenient method of placing the legend on the canvas. After pressing this button, move the mouse pointer to the desired location and press again with the left button. The location will be in world or viewport coordinates as selected above.

Press **Load comments** to make the set comment (generally the file name from where the set originated) the legend label. This affects all active sets in the current graph.

Press

Edit... to edit legend labels.

- To edit a label, click on the desired set and enter the label in the **Label** area. Press return to enter the change in the set list and then press **Accept** to apply it to the graph.
- **Place** allows one to specify the location of the legend using the mouse as above.
- **Load comments** will make the set comments the legend labels.

- **Strip labels** will remove the leading component of a pathname and leave only the basename.

Press the button marked **Accept** to register the legend settings.

Press the button marked **Close** to close the popup.

3.4.10 Strings & Things

The numbers of strings, lines, boxes and ellipses are fixed, open Help/About to see what the limits are for your version of xmgr.

To define a text string to be drawn on the canvas:

Select font, pen, justification, rotation (in integer degrees [0,360]), size. Press the button marked "Text" to activate the text writing routines. Move the mouse to the canvas and press the left mouse button at the desired location and type away. It is possible to use

control codes `<fonts.html>` to change fonts within the string. Press <return> to advance to the next line - the right mouse button to stop. Each line of text is a separate object. The text cursor does not behave properly for rotated strings. To redefine string parameters you'll need to press the right button to leave text mode - adjust the parameters and press "Text" again to inform xmgr of the changes and resume writing. See below for an explanation of world/viewport positioning.

To click on a text string, the cursor must be placed near the origin of the text string. The origin will be the lower left corner of the string for left justified strings, the right side for right justified strings and in the center for center

justification.

NOTE: It is necessary to press <return> to register the string.

Edit string

Click on the string you want to edit. A cursor will appear at the end of the string which may be moved using the left and right arrow keys. Anything typed will be inserted at the cursor and backspacing will delete the character before the cursor. In addition, the following control characters have special meanings:

ˆa - Move editing cursor to beginning of string

ˆe - Move editing cursor to end of string

ˆu - Delete beginning of string to cursor

ˆk - Delete to end of string

To define a line, box or ellipse to be drawn on the canvas:

Set the properties of the object you want to draw by slecting box/line/ellipse props...

The cycle "Position in: World | viewport coordinates" allows the object position to be defined in the world coordinate system or viewport coordinates. In World coordinates, the object position and aspect ratio on the display change as the plot is re-scaled. Specifying the object in viewport coordinates will force the object to remain in the same place and retain the same aspect ratio as the plot scale is changed.

When the cursor turns to crosshairs, the two points defining the object may be specified. A line is defined by its end points while a box is defined by its opposing corners. An ellipse is defined by the opposing corners of the rectangle enclosing it.

Selecting an object

For the following three operations, one must select an object. This is performed by clicking the left mouse button near one of the defining points of an object. Only objects associated with the current graph will be selected. Objects are associated with the graph that was active at the time of their creation. The defining points of objects are given below

box

corners

ellipses

corners of bounding box

line

end points

text

origin (justification dependent)

Move object:

To move a line, box, ellipse or string:

Press the button marked "Move", this should change the cursor to the "move" cursor.

Select the object to be moved. The object will now be drawn with the first point used to define the object under the cursor.

Move the cursor to the new location and press the left mouse button.

Delete object:

Press the button marked "Delete", this should change the cursor to a bullseye cursor.

Select the object to be deleted.

Edit object:

Click on edit and then select an object.

The attributes of an object may be changed after it has been defined by clicking on the object. Editing may be used to redefine a line, box, ellipse or string.

The **World<->View** button is used to interchange between world and viewport specification of object placement. The object will remain at the same spot when converted from one coordinate system to the other.

NOTE:

The right mouse button cancels all operations (true throughout xmgr with respect to mouse operations).

3.4.11 Time stamp

Set the display of a string containing the current time. This string is updated each time the graph is redrawn.

3.5 Options

3.5.1 Page

Set the dimensions of the drawing area. Presently, there is no connection between the hardcopy drivers and these settings. This means that the printer needs to be set to conform to the dimensions of the drawing area if WYSIWYG is required.

Free

Allow the drawing area to be resized to fit the main xmgr window (no scrollbars will appear).

Landscape

Set the drawing area dimensions to landscape, generally this will be larger than the window allocated for xmgr, and scroll bars will appear.

Portrait

Set the drawing area dimensions to portrait, generally this will be larger than the window allocated for xmgr, and scroll bars will appear.

Fixed

Set the drawing area dimensions to a specified number of pixels, if the drawing area is larger than the xmgr window, then scollbars will appear.

Size...

Open a popup that allows the dimensions of the drawing area to be set to a specified number of pixels in both directions, this only appies when the drawing area orientation is set to **Fixed**.

3.5.2 View

Set the display of the status bar, tool bar, locator bar, and properties associated with the display of the pointer position in the Locator bar.

- Status bar

  Toggle the visibility of the Status bar that appears at the bottom of the display.

- Tool bar

  Toggle the visibility of the Tool bar at the left of the display.

- Locator bar

  Toggle the visibility of the Locator bar, at the top of the display.

- Set fixed point

  Select this item, then click on the drawing area to set the posistion of the fixed point. To set the position more precisely, use the Locator props popup described below. When the fixed point is set, and the display format is (DX, DY), (DIST), or (R, Theta) then give the location relative to the fixed point.

- Clear fixed point

  Set the fixed point to (0.0, 0.0).

- Locator props

Set properties associated with the display of the pointer position in the locator bar.

The choice item at the top of the popup, **Locator: ON/OFF** toggles the continuous update of the pointer as it moves across the drawing area. **Locator display type** is a choice item the sets the display of the position. There are several options:

- [**X,Y**] The default, display the position in the coordinate system of the current graph.
- [**DX, DY**] Display the delta in X and Y of the position of the mouse relative to the fixed point, or (0, 0) if no fixed point has been selected. The position is given relative to the scaling of the current graph. DX = (CX - FX) and DY = (CY - FY).
- [**Distance**] Display the position of the mouse as the distance from the fixed point, or (0, 0) if no fixed point has been selected. The distance is computed as SQRT((FX - CX)^2 + (FY - CY)^2) where (FX, FY) are the coordinates of the fixed point, and (CX, CY) is the posisiotn of the pointer.
- [**R, Theta**] Display the position of the mouse in polar coordinates (R, Theta) relative to the fixed point, or (0, 0) if no fixed point has been selected. R = SQRT((FX - CX)^2 + (FY - CY)^2) and Theta = ATAN2(DY, DX).
- [**VX, VY**] Display the position of the mouse in viewport coordinates. This position is independant of the scaling of the current graph.

- [**SX, SY**] Display the position of the mouse in screen coordinates. This position is independant of the scaling of the current graph.

The next two categories in the popup set the format and fixed point positions for each coordinate direction and, as they are identical, only setting the format and position of X is described here. The description for Y is identical save that ordinate is replaced by abscissa.

Format X: is a choice item selecting the format of the display of the X position of the pointer. There are several selections here:

- Decimal
- Exponential
- Power (displayed as Decimal)
- General
- DD-MM-YY
- MM-DD-YY
- MM-YY
- MM-DD
- Month-DD
- DD-Month
- Month (abrev.)
- Month
- Day of week (abrev.)
- Day of week
- Day of year
- HH:MM:SS.s
- MM-DD HH:MM:SS.s
- MM-DD-YY HH:MM:SS.s
- Degrees (lon)
- DD MM' (lon)
- DD MM' SS.s (lon)
- MM' SS.s (lon)
- Degrees (lat)

- DD MM' (lat)
- DD MM' SS.s (lat)
- MM' SS.s (lat)

The Date format requires that the axis be scaled with respect to the long form of the Julian date. The Degrees format is for latitude and longitude. Below the equator latitudes are negative. Longitude is assumed positive east of Greenwich and negative to the west.

Precision X: sets the number of places to display to the right of the decimal point.

Fixed point X: defines the position of the ordinate of the Locator fixed point.

If everything looks OK, click on **Accept** to register the selections, **Reset** to restore the startup values, and **Close** to close the popup.

3.5.3 Draw options

Set the amount of scrolling, linked scrolling (scrolling the current graph scrolls all graphs), automatic redraw, and whether the screen is erased before refreshing the screen.

3.5.4 Working directory

Set the working directory. Any file selection popup will start in the selected directory.

3.5.5 Misc.

- Debug level: Set the debug level.
- Verify Pick sets operations: If on, when using Pick ops, Set the debug level.
- Allow double clicks on canvas: If on, double clicks on the drawing area are meaningful.
- Allow autoscale on read: When a read is performed, autoscale the current graph.

A Command interpreter reference and parameter file format

A.1 Introduction

xmgr provides a command line interface and the ability to save plot parameters in a file for later retrieval. The syntax for the command line interpreter and parameter files is the same. It is instructive to read a parameter file into the command line interpreter and press the 'Replay' button to verify this feature.

A.2 Reference

Case is ignored by the command line interpreter.

Description of parameters:

color integer value from 0 to 29.

string double quote enclosed character string.

integer any integer >= 0

number any floating point value >= 0.0

expr any expression (includes negative floating point values)

onoff ON or OFF

torf TRUE or FALSE

setnum Set descriptor in the form Sn where n is the number of the set.

graphno Graph descriptor in the form Gn where n is the number of the graph.

direction One of UP, DOWN, LEFT, RIGHT, IN, OUT.

opchoice One of TOP, BOTTOM, LEFT, or RIGHT.

formatchoice One of:

- DECIMAL - 0.0
- EXPONENTIAL - 0e+-0
- POWER - 1010
- GENERAL - varies between 0.0 and 0e+0

- DDMMYY - requires data in Julian date format
- MMDDYY - requires data in Julian date format
- MMYY - requires data in Julian date format
- MMDD - requires data in Julian date format
- MONTHDAY - requires data in Julian date format
- DAYMONTH - requires data in Julian date format
- MONTHS - requires data in Julian date format
- MONTHL - requires data in Julian date format
- DAYOFWEEKS - requires data in Julian date format
- DAYOFWEEKL - requires data in Julian date format
- DAYOFYEAR - requires data in Julian date format
- HMS - requires data in Degrees format
- MMDDHMS - requires data in Degrees format
- MMDDYYHMS - requires data in Degrees format
- DEGREESLON - requires data in Degrees format
- DEGREESMMLON - requires data in Degrees format
- DEGREESMMSSLON - requires data in Degrees format
- MMSSLON - requires data in Degrees format
- DEGREESLAT - requires data in Degrees format
- DEGREESMMLAT - requires data in Degrees format
- DEGREESMMSSLAT - requires data in Degrees format
- MMSSLAT - requires data in Degrees format
  The **Julian date format** is the long form. There are 2 programs in the subdirectory aux/ that can be used to convert data from Gregorian to Julian and vice versa. The **Degrees format** is for latitude and longitude. Below the equator latitudes are negative. Longitude is assumed positive east of Greenwich and negative to the west.

A.3 EXIT

Abruptly leave xmgr.

A.4 Devices

In the discussion to follow, printer refers to one of:

- PSMONOP - PostScript portrait.
- PSMONOL - PostScript landscape

- MIFP - Maker Interchange Format portrait.
- MIFL - Maker Interchange Format landscape.
- HPGLP - HPGL portrait.
- HPGLL - HPGL landscape.
- FILE - print to a file rather than to the device.
- HARDCOPY - the current hardcopy device.

- PRINT *printer string*

  Set the printer command string to string.

  Example:

  print psmonop "lpr -Pps"

- PRINT TO HARDCOPY

  Spool hardcopy output to the printer. This command sets the output destination, but does not generate a hardcopy, see the HARDCOPY command.

- PRINT TO FILE

  Spool hardcopy output to a file, using the current value of the printer file string (see PRINT TO string above). This command sets the output destination, but does not generate a hardcopy, see the HARDCOPY command.

- PRINT TO FILE string

  Spool hardcopy output to a file named string. This command sets the output destination, but does not generate a file, see the HARDCOPY command.

  Example:

  print to file "hardcopy.out"

- PRINT TO printer

  Set the hardcopy device to printer.

- HARDCOPY

  Print to the current hardcopy device or file.

- DEVICE integer

  Set the screen device to integer. At the present time 0 (the X server) is the only value.

A.5 Display

- REDRAW

  Refresh the display.

- AUTO REDRAW onoff

  Toggle the automatic redrawing of the display.

- BACKGROUND COLOR color

  Set the background color of the drawing area.

- CMAP color, integer, integer, integer

  Set the RGB values of a colormap entry. The value of color ranges from 2 to 29, The three integer values following the color number are values from 0 to 255 and represent red, green, and blue resp. Colors 0 and 1 are black and white (reversed if the -rvideo command line option was selected), and cannot be changed. See the `<usage.html#freeColorsSW>`

```
-nofreecolors
```

  command line switch if you have problems with button or background colors changing.

  Example:

  To set colormap entry 5, use

  cmap 5, 0, 0, 255

  This sets color 5 to solid blue.

- PAGE direction

  Page left, right, up, down, in. out.

- PAGE integer

  Set the amount of scrolling, and integer value giving the amount of scroll in percent of the graph scaling. For example:

  PAGE 100

  would set the amount to scroll left, right, up, down to 100 percent of the graph axis scaling.

- PAGE INOUT integer

  Set the amount to increase or decrease the graph scaling when using the In/Out buttons on the main panel. An integer value expressing the percent to expand or shrink.

- LINK PAGE onoff

  Toggle linked scrolling. Linked scrolling affects the scroll buttons on the main panel, when linked scrolling is on, all graphs are scrolled simultaneously. Linked scrolling OFF makes scrolling affect the current graph only.

A.6 Set operations

- ACTIVATE setnum number

  Activate a set in the current graph and set the length

- COPY setnum TO setnum

  Copy a set to another set

- COPY graphno.setnum TO graphno.setnum

  Copy a set from a particular graph to a set in another graph

  Example

  copy g0.s0 to g1.s5

- MOVE *setnum* TO *setnum*

  Move a set to another set.

  Example

  move s0 to s1

- MOVE *graphno.setnum*TO *graphno.setnum*

  Move a set from a particular graph to a set in another graph

  Example

  move g0.s0 to g1.s5

- KILL setnum

  Kill a set. Plot parameters are set to their default values.

- setnum POINT expr, expr

- graphno.setnum POINT expr, expr

  Add a point to a set, create the set if the set is inactive. The first version adds a point to set setnum in the current graph, the second adds a point to setnum in the graph graphno.

A.7 Block data

- The two block data commands allow block data to be read and sets formed from the

  active set of block data.

- READ BLOCK string

  Read a file of block data from file string.

- BLOCK xytype string

  Create a set of type xytype using columns coded in string. String describes columns as: "c1:c2:..."

  Where c1, c2, ... are the numbers of the columns to use in the construction of the set from the block data.

Examples:

Create a set with error bars using x from column 1, y from column 2 and the errors in column 5:.

read block "block2.dat"

block xydy "1:2:5"

Create an XY type data set from columns 7 and 2.

block xy "7:2"

A.8 Graph operations

- KILL graphno

  Kill graph graphno.

- KILL GRAPHS

  Kill all graphs and sets, but not annotative text, lines, and boxes.

- FLUSH

  Kill all graphs, sets, and annotation.

A.9 Transformations

- LOAD VAR setnum, expr, expr

  Load a set sequentially

- REGRESS (setnum, number)

  Regress a set where number is the degree of the fit in the range 1-5.

- DIFFERENCE (setnum, number)
- DIFF (setnum, number)

  Difference a set using the method specified by number.

  - 0 - forward difference.
  - 1 - backward difference
  - 2 - centered difference

- INTEGRATE (setnum)
- INT (setnum)

  Integrate a set using a trapezoid rule.

- XCOR (setno1, setno2, BIASED | UNBIASED, lag)

  Creates a new set in the first available spot with the cross/auto-correlation data of sets setno1 and setno2 (for auto-corralation, enter the same setnumber twice). The 'lag' must be a integer, $0 < \text{lag} <$ length_of_set1&2 that specifies the maximum shift to use. The number of datapoints in the resulting set will therefore be equal to 'lag'. See also *this* `<trans.html#xcorr>`.

- splinetype(setnum, start, stop, integer)

  Draw a spline. splinetype is one of:

  - SPLINE - plain cubic spline
  - ASPLINE - Akima spline

- ffttype(setnum, integer)

  Compute a DFT either forward or inverse, using the DFT or FFT. ffttype is one of:

  - DFT - compute the DFT using the definition.
  - FFT - compute the DFT using an FFT.
  - INVDFT - compute the inverse DFT.
  - INVFFT - compute the inverse using the FFT.

- runtype(setnum, number)

  Compute a running average, standard deviation, median, maximum, or minimum. runtype is one of the following:

  - RUNAVG - running average.
  - RUNSTD - running standard deviation.
  - RUNMED - running median.
  - RUNMAX - running maximum.
  - RUNMIN - running minimum.

- HISTO(setnum, xmin, binw, integer)

  Compute a histogram using set setnum. Xmin is the minimum value, binw the bin width, and the integer is how many bins to create.

A.10 Autoscaling

- AUTOSCALE

  Autoscale the current graph

- AUTOSCALE setnum

  Autoscale the current graph on a particular set

- AUTOSCALE XAXES

  Autoscale the X-axis and the axis at Y = 0 in the current graph.

- AUTOSCALE YAXES

  Autoscale the Y-axis and the axis at X = 0 in the current graph.

- AUTOSCALE torf

  Suppress autoscaling on startup. Use this command in a data file that uses imbedded parameter settings to set the axes scaling.

A.11 Graph focus

- FOCUS graphno

  Set the current graph to graphno.

- FOCUS SET

  Focus fixed on the current graph.

- FOCUS onoff

  Turn the drawing of the focus indicators on or off.

- FOCUS FOLLOWS

  Focus follows the pointer.

- FOCUS CLICK

  Set the focus by clicking on a graph.

A.12 Locator

- LOCATOR onoff

  Turn the locator on the front panel on or off.

A.13 IO

- SOURCE sourcetype

  Set the source (disk or pipe) for reading XY data sets.

- READ string

  Read an XY data set.

- READ BATCH string

  Read a batch file.

- READ xytype string

  Read a data set of a particular type.

- READ xytype sourcetype string

  Read a data set of type xytype from source sourcetype.

- GETP string

  Read a parameter file.

- PUTP string

  Write a parameter file.

A.14 Boxes

- NOTE: Boxes, used or not, are numbered from 0 to the maximum number of boxes. This is also true of lines and strings.
- WITH BOX

  Get the next available box and make it current. A box needs to be current before any of the following commands will apply.
- WITH BOX integer

  Get the box numbered integer and make it the current box
- BOX onoff

  Toggle the display of the current box.
- BOX expr, expr, expr, expr

  Set the location of the box in world or viewport coordinates depending on the value of BOX LOCTYPE. The 4 values represent xmin, ymin, xmax, ymax respectively.
- BOX LOCTYPE worldview

  Set the location type of the next box created. World or viewport coordinates.
- BOX graphno

  If the LOCTYPE is WORLD, set the graph to use.
- BOX LINESTYLE integer

  Set the line style to use for the next box created.
- BOX LINEWIDTH integer

  Set the line width of the next box created.
- BOX COLOR integer

  Set the color to use for the box lines.
- BOX FILL filltype

  Set the type of fill to either COLOR or PATTERN.
- BOX FILL COLOR integer

  Set the color to use to fill the next box created.
- BOX FILL PATTERN integer

  Set the pattern to use for the next box created.
- BOX DEF

  Define the current box using the values set above.
- CLEAR BOX

  Remove all boxes

A.15 Lines

- xmgr uses an array of a data type called lines internally to hold the definition of lines. The actual construction of this data type is not important, but it is important to note that lines, used or not, are numbered from 0 to the maximum number of lines.
- WITH LINE

  Make the next available line the current line.
- WITH LINE integer

  Make line integer the current line.
- LINE onoff

  Toggle the display of the current line.
- LINE expr, expr, expr, expr

  Set the location of the current line created. The four expressions represent (X1, Y1), (X2, Y2) respectively.
- LINE LOCTYPE worldview

  Set the location type of the current line created. World or viewport coordinates.
- LINE graphno

  If the line LOCTYPE is WORLD, set the graph to use for scaling.
- LINE LINEWIDTH integer

  Set the line width of the current line created.
- LINE LINESTYLE integer

  Set the line style of the current line created.
- LINE COLOR integer

  Set the color of the current line created.
- LINE ARROW integer

  Define a line with or without arrow(s) and where they are located.

  - 0 - no arrow
  - 1 - arrow at start of line
  - 2 - arrow at end of line
  - 3 - arrow at both ends.
- LINE ARROW SIZE number

  Set the size of the current line's arrowhead.

- LINE DEF

  Define a line using the current set of line settings.

- CLEAR LINE

  Remove all lines.

A.16 Strings

- xmgr uses an array of a data type called plotstr internally to hold the definition of strings. The actual construction of this data type is not important, but it is important to note that strings, used or not, are numbered from 0 to the maximum number of strings.

- WITH STRING

  Get the next available string

- WITH STRING integer

  Get the particular string numbered integer.

- STRING onoff

  Toggle the display opf the current string.

- STRING expr, expr

  Location of the string, in world or viewport coordinates depending on the value of LOCTYPE.

- STRING LOCTYPE worldview

  Set the location type of the string, either world or viewport coordiantes. If the setting is WORLD, then the strings position is affected by changes in the axes scaling, if VIEW, then the string is fixed to that spot in viewport coordinates.

- STRING graphno

  Set the graph to uses for scaling when the LOCTYPE is WORLD.

- STRING LINEWIDTH integer

  Set the line width of the current string.

- STRING COLOR integer

  Set the color of the current string.

- STRING ROT integer

  Set the rotation of the current string from-360 to 360 in degrees

- STRING FONT integer

  Set the font of the current string.

- STRING JUST integer

  Set the justification for the current string. 0 is left justified, 1 is right justified, and 2 is centered.

- STRING CHAR SIZE number

  Set the character size of the current string.

- STRING DEF string

  Define the current string using the values set above.

- CLEAR STRING

  Remove all strings

A.17 World

- WORLD xmin, ymin, xmax, ymax

  Set the scaling limits for the current graph.

- WORLD XMIN xmin
- WORLD XMAX xmax
- WORLD YMIN ymin
- WORLD YMAX ymax

A.18 World stack

- PUSH

  Push the current graph scaling limits and tick spacing onto the graph's world stack.

- POP

  Pop the current graph's world stack and set the new scaling limits and tick spacing from the new stack top.

- CYCLE

  Cycle through the current graph's world stack.

- STACK integer

  Set the current graph's scaling limits and tick spacing to the value at position integer of the current graph's world stack.

- STACK WORLD expr, expr, expr, expr TICK expr, expr, expr, expr

  Push specific values onto the current graph's world stack - primarily for use in paramter files generated by xmgr.

- CLEAR STACK

  Clear the current graph's world stack.

A.19 Viewport

- VIEW xmin, ymin, xmax, ymax

  Set the current graph's viewport (where on the device the graph is displayed).

- VIEW XMIN expr
- VIEW XMAX expr
- VIEW YMIN expr
- VIEW YMAX expr

A.20 Title and subtitle

- TITLE string

  Set the graph title.

- TITLE FONT integer

  Set the font for the graph title.

- TITLE SIZE number

  Set the character size for the graph title.

- TITLE COLOR integer

  Set the color for the graph title.

- SUBTITLE string

  Set the graph subtitle.

- SUBTITLE FONT integer

  Set the font for the graph subtitle.

- SUBTITLE SIZE number

  Set the character size for the graph subtitle.

- SUBTITLE COLOR integer

  Set the color for the graph subtitle.

A.21 Sets

- Setnum, in the following descriptions, refer to the symbolic name of each set, i.e., the letter 's' followed by the integer number of the set. S0 would refer to set 0, s1 to set 1, etc. The following commands for setting set parameters have two prefixes, GRAPHS

  and SETS, that allow the setting to be made for all graphs, all sets, or a given set in all graphs. So, to set the line width for set 0 to be 3 in all graphs that have a set 0 active, the command would be:

graphs s0 linewidth 3

Likewise, to set the line width for all sets in the current graph, give the command:

sets linewidth 3

To set the line width for all sets in all graphs to 3, execute:

graphs sets linewidth 3

- setnum ON
- setnum IGNORE

  Toggle the active/inactive status of sets. This can be used to force xmgr to ignore a set(s), even though data are still attached to the set. For example, assuming S0 is an active set:

  S0 ignore

  will allow xmgr to ignore S0 for all purposes, except any operation that kills a set. Autoscaling will ignore this set, etc - in effect, S0 is dead. To bring it back to life:

  S0 on

  will reintroduce the set with its data intact. This operation may be performed in either Edit/Set operations/De-activate or in the File/Status popup.

- setnum TYPE xytype

  Set the type of set setnum to xytype, where xytype is one of xy, xydx, xydy, xydxdx, xydydy, xydxdy, xyz, xyr, or xyhilo

- setnum FONT integer

  Set the font to use when the set type is xyz.

- setnum PREC integer

  Set the precision when the set type is xyz.

- setnum FORMAT formatchoice

  Set the format to use when the set type is xyz.

- setnum SYMBOL integer

  Set the symbol for the set.

- setnum SYMBOL SIZE number

  Set the size of the symbol.

- setnum SYMBOL CHAR integer

  Set the character to use when using the symbol type character. The value is the decimal representation of the character using the ASCII collating sequence.

- setnum LINESTYLE integer

  Set the lines style for the set.

- setnum LINEWIDTH integer

  Set the line width for the set.

- setnum COLOR integer

  Set the color to use to draw the lines and symbol.

- setnum FILL integer

  Set the type of fill for the set.

- setnum FILL WITH COLOR

  Set the type of fill for the set.

- setnum FILL WITH PATTERN

  Set the type of fill for the set.

- setnum FILL COLOR integer

  Set the color for the fill if the fill selected is color.

- setnum FILL PATTERN integer

  Set the color for the fill if the fill selected is color.

- setnum SKIP integer

  Set the number of points to skip before placing a symbol.

- setnum ERRORBAR TYPE opchoice

  Set the the error bar display type. Opchoice is one of RIGHT, LEFT, or BOTH if the error bar type is xydx or xydxdx, or TOP, BOTTOM, or BOTH if the type is xydy or

  xydydy. The default in either case is BOTH, i.e. display both error bars.

- setnum ERRORBAR LENGTH number

  Set the length of the error bar.

- setnum ERRORBAR LINEWIDTH integer

  Set the line width for the error bar.

- setnum ERRORBAR LINESTYLE integer

  Set the linestyle for the error bar.

- setnum ERRORBAR RISER onoff

  Toggle the display of the error bar riser.

- setnum ERRORBAR RISER LINESTYLE integer

  Set the line style for the error bar riser.

- setnum ERRORBAR RISER LINEWIDTH integer

  Set the line width for the error bar riser.

- setnum COMMENT string

  Set the comment string for the set.

A.22 Legend

- LEGEND onoff

  Toggle display of the legend.

- LEGEND LOCTYPE worldview

  Position the legend in either world or viewport coordinates.

- LEGEND VGAP integer

  Set the vertical gap between legend entries in characters.

- LEGEND HGAP integer

  Specify the gap between the display of the symbol and the legend label in units of characters.

- LEGEND LENGTH integer

  Set the length of the legend in units of characters.

- LEGEND expr, expr

  Set the location of the legend.

- LEGEND X1 expr

  Set the X value of the location.

- LEGEND Y1 expr

  Set the Y value of the legend.

- LEGEND FONT integer

  Set the font to use for the legend labels.

- LEGEND CHAR SIZE number

  Set the size of the characters in the legend label.

- LEGEND LINEWIDTH integer

  Set the line width to use to draw the legend labels.

- LEGEND COLOR integer

  Set the color of the legend labels.

- LEGEND BOX onoff

  Toggle the display of the bounding box for the legend.

- LEGEND BOX FILL onoff

  Toggle the filling of the bounding box for the legend.

- LEGEND BOX LINEWIDTH integer

  Set the line width to use to draw the bound box for the legend.

- LEGEND BOX LINESTYLE integer

  Set the line style to use to draw the bound box for the legend.

- LEGEND BOX COLOR integer

  Set the color of the legend bounding box.

- LEGEND BOX FILL COLOR integer

  Set the color to use for the filled legend bounding box.

- LEGEND BOX FILL PATTERN integer

  Set the pattern to use for the filled legend bounding box.

- LEGEND BOX FILL WITH colpat

  Set the type of fill for the bounding box, either COLOR or PATTERN.

- LEGEND STRING integer string

  Set the legend label for setnum integer.

A.23 Graph frame

- FRAME onoff

  Toggle the display of the current graph's frame.

- FRAME TYPE number

  Set the type of frame for the current graph:

  - 0 = rectangle
  - 1 = Lines along the left and bottom of the graph.

- FRAME LINESTYLE number

  Set the line style of the current graph's frame.

- FRAME LINEWIDTH number

  Set the width of the line for the current graph's frame.

- FRAME COLOR number

  Set the color of the current graph's frame.

- FRAME FILL onoff

  Toggle the fill of the graph frame.

- FRAME BACKGROUND COLOR number

  Set the color to use for filling the current graph's frame.

A.24 Graph axes

- The are two axes in each coordinate direction. In the case of the X coordinate direction, there is one that follows the world scaling, one at Y = 0 and another that may be used to display an alternate scale. The names used by xmgr to refer to these axes are, XAXIS, ZEROXAXIS, respectively. Likewise along Y there is the YAXIS, ZEROYAXIS. There are names that can be used to refer to all the axes along a coordinate direction or to both directions or to all graphs, these being AXES (both coordinate directions, current graph), XAXES (along X in the current graph), YAXES (along Y in the current graph), and preceeding these with the key word GRAPHS, will cause the setting to be made throughout all the active graphs. In the following descriptions, axis refers to the choices described above.
- axis onoff

  Toggle the display of the axis or axes referred to by axis.
- axis COLOR integer

  Set the color for the axis or axes specified by axis.
- axis LINEWIDTH integer

  Set the line width for the axis or axes specified by axis.
- axis LINESTYLE integer

  Set the line style for the axis or axes specified by axis.
- axis FONT integer

  Set the font to use for text for the axis or axes specified by axis.
- axis CHAR SIZE number

  Set the character size for text for the axis or axes specified by axis.

A.25 Tick marks

- axis TICK MAJOR onoff
- axis TICK MINOR onoff
- axis TICK MAJOR expr

  Set the tick spacing for major tick marks.
- axis TICK MINOR expr

  Set the spcing for minor tick marks.
- axis TICK OFFSETX number

  Set the amount to offset the axis, in viewport coordinates in the X direction.
- axis TICK OFFSETY number

  Set the amount to offset the axis in viewport coordinates in the Y direction.

- axis TICK ALT onoff

  Toggle the use of the alternate map for the axis scaling.

- axis TICK MIN number

  Specifiy the minimum value to use for the alternate map.

- axis TICK MAX number

  Specify the maximum value to use for the altermate map.

- axis TICK DEFAULT number

  Set the default number of ticks to use when autoscaling.

- axis TICK inout

  Set the display of tick marks to IN, OUT, or BOTH.

- axis TICK SIZE number

  Set the size of tick marks.

- axis TICK MAJOR SIZE number

  Set the size of major tick marks.

- axis TICK MINOR SIZE number

  Set the size of minor tick marks.

- axis TICK COLOR number

  Set the color to use for tick marks.

- axis TICK MAJOR COLOR number

  Set the color to use for major tick marks.

- axis TICK MINOR COLOR number

  Set the color to use for minor tick marks.

- axis TICK MAJOR LINEWIDTH number

  Set the line width to use for grid lines at major tick marks.

- axis TICK MAJOR LINESTYLE number

  Set the line style to use for grid lines at major tick marks.

- axis TICK MINOR LINEWIDTH number

  Set the line width to use for grid lines at minor tick marks.

- axis TICK MINOR LINESTYLE number

  Set the line width to use for grid lines at minor tick marks.

- axis TICK MAJOR GRID onoff

  Toggle the display of grid lines at major tick marks.

- axis TICK MINOR GRID onoff

  Toggle the display of grid lines at minor tick marks.

- axis TICK OP opchoice

  Set the display of tick marks on the axis to LEFT, RIGHT, or BOTH if the axis is in the X direction, or TOP, BOTTOM, or BOTH if the axis is in the Y direction. The default is BOTH in either case.

- axis TICK TYPE AUTO

  Use the values for major and minor spacing for draw the tick marks. See the next it for tick marks at specified locations.

- axis TICK TYPE SPEC

  Use specified values for drawing tick marks. These values are for major tick marks only.

- axis TICK SPEC integer

  Give the number of specified tick marks.

- axis TICK number, expr

  Set the value of specified tick mark number integer to value, expr.

A.26 Tick labels

- axis TICKLABEL PREC integer

  Set the number of places to the right of the decimal point when drawing tick lables.

- axis TICKLABEL FORMAT format

  Set the format to use for drawing tick labels.

- axis TICKLABEL LAYOUT HORIZONTAL

  Set the angle of the axis tick labels to be horizontal.

- axis TICKLABEL LAYOUT VERTICAL

  Set the angle of the axis tick labels to be vertical.

- axis TICKLABEL SPEC

  Specifiy the use of the specified tick label angle.

- axis TICKLABEL ANGLE number

  Specifiy the angle to use for drawing the tick labels in degrees from 0 to 360.

- axis TICKLABEL JUST justify

  Sepcifiy the type of justification to use when drawing the tick label.

- axis TICKLABEL SKIP integer

  Set the number of major tick marks to skip before drawing a tick lablel.

- axis TICKLABEL STAGGER integer

  Set the number of characters to use to offset the tick labels.

- axis TICKLABEL OP opchoice

  Set the side(s) to draw tick labels, LEFT, RIGHT, or BOTH for tick labels in the Y direction and TOP, BOTTOM, or BOTH for tick labels in the X direction. The default is LEFT for the Y axis tick labels and BOTTOM for the X axis tick labels.

- axis TICKLABEL SIGN signchoice

  Set the function to uise on the numeric value used to create the tick mark label. One of NORMAL, ABSOLUTE, or NEGATE. The default is NORMAL, i.e., no transformation is applied. ABSOLUTE indicates that the absolute value of the tick label location is used, NEGATE is the negative of the tick mark location. The latter two can be used to achieve a reversal of axis or a reflection effect of the axes. Of course, the data will need to be transformed also.

- axis TICKLABEL START expr

  Set the value to use to begin drawing tick lables.

- axis TICKLABEL STOP expr

  Set the value to stop drawing tick labels.

- axis TICKLABEL START TYPE SPEC

  Use the specified starting value for drawing tick mark labels.

- axis TICKLABEL STOP TYPE SPEC

  Use the specified stopping value for drawing tick mark labels.

- axis TICKLABEL START TYPE AUTO

  Use the graph minimum to use as the starting point for drawing tick labels, this is the default.

- axis TICKLABEL STOP TYPE AUTO

  Use the graph maximum as the stopping point for drawing tick mark labels. This is the default.

- axis TICKLABEL VGAP number

- axis TICKLABEL HGAP number

- axis TICKLABEL CHAR SIZE number

  Set the size of characters to use when drawing the tick mark labels.

- axis TICKLABEL FONT integer

  Set the font to use when drawing tick mark labels.

- axis TICKLABEL COLOR integer

  Set the color to use for drawing tick mark labels.

- axis TICKLABEL LINEWIDTH integer

  Set the line width to use for drawing tick mark labels.

- axis TICKLABEL TYPE AUTO

  Use the values of major tick marks for position the tick mark labels.

- axis TICKLABEL TYPE SPEC

  Specify the tick mark label to use at each major tick mark.

- axis TICKLABEL integer, string Set the value for the integer'th tick mark label.

A.27 Axes label strings

- axis LABEL string

  Set the text string to use for the axis label.

- axis LABEL LAYOUT PERP

  Set the layout of the axis label to be perpendicular to the axis.

- axis LABEL LAYOUT PARA

  Set the layout of the axis label to be parallel to the axis.

- axis LABEL CHAR SIZE number

  Set the character size of the text used for the axis label.

- axis LABEL FONT integer

  Set the font to use for the axis label.

- axis LABEL COLOR integer

  Set the color to use for the axis label.

- axis LABEL LINEWIDTH integer

  Set the line width to use for drawing the axis label. Axes bar

- axis BAR onoff

  Toggle the display of the axis bar. The dfault is OFF.

- axis BAR COLOR integer

  Set the color to use for the axis bar.

- axis BAR LINEWIDTH integer

  Set the line width to use when drawing the axis bar.

- axis BAR LINESTYLE integer

  Set the line style to use for drawing the axis bar.

A.28 Graphs

- WITH graphno

  Set the current graph to graphno.

- graphno onoff

  Set graphno on or off.

- graphno AUTOSCALE TYPE AUTO

  Set the method of autoscaling to a type developed by Paul Heckbert. This method makes nice tick spacing, but fiddles with scales of the axes.

- graphno AUTOSCALE TYPE SPEC

  Set the method of autoscaling to use the minimum and maximum values of the data.

- graphno HIDDEN torf

  Toggle the display of graphno.

- graphno TYPE graphtype

  Set the type of graphno to graphtype, where graphtype is one of:

  - XY - Linear scaling on both X and Y axes (the default).
  - BAR - bar chart.
  - STACKEDBAR - stacked bar chart.
  - LOGX - logarithmic X axis, linear Y axis.
  - LOGY - linear X axis, logarithmic Y axis.
  - LOGXY - Log-log graph.

- graphno FIXEDPOINT onoff

  Toggle the use of the graph fixed point, i.e., the point used as a reference for the locator display.

- graphno FIXEDPOINT XY number, number

  Set the value of the graph fixed point.

- graphno FIXEDPOINT TYPE number

  Set the type of display for the locator on the main panel.

- graphno FIXEDPOINT FORMAT format format

  Select the format to use for both X and Y in the locator display.

- graphno FIXEDPOINT PREC integer, integer

  Set the number of places to display to the right of the decimal point in the locator display for both X and Y.

B Hot keys

When the pointer focus is on the canvas (where the graph is drawn), there are some shortcuts to activate several actions. They are:

- ˆA - autoscale plot
- ˆB - draw a box (using the current settings for boxes)
- ˆD - delete an object (string, line, or box)
- ˆN - move an object (string, line, or box)
- ˆP - draw a line (using the current settings for lines)
- ˆV - set the viewport with the mouse
- ˆW - write a string (using the current settings for strings)
- ˆX - exit (abruptly) xmgr.
- ˆZ - enable zoom

C Double clicks

When activiated, double clicking on parts of the canvas will invoke certain popups.

left of graph frame

y axis label/ticks `<plot.html#ticks>`

below graph frame

x axis label/ticks `<plot.html#ticks>`

on focus markers

move selected viewport corner

within graph frame

Edit nearest set

symbols `<plot.html#symbols>` or *Read sets* `<file.html#readsets>` if none active

right of graph frame

Legend `<plot.html#legends>`

above graph frame

Titles/subtitles `<plot.html#title>`

This behaviour can be turned on or off in the *Options/Misc menu* `<options.html#misc>`.

D Fonts

To change fonts within a string preceed the font number listed below by a backslash. To turn subscripting or superscripting on or off use \s for subscripts and \S for superscripting. Font selection is current for the remainder of the string or until the next font change. Subscripts and superscripts remain for the remainder of the string or until \N is seen. To

print a backslash use \\. To backspace use \b. To begin underlining use \u, to stop underlining use \U. \+ increases the size of the characters and \- decreases the size of the characters.

xmgr uses the Hershey fonts to draw text on the screen, but PostScript fonts for hardcopy. There are discrepancies between the two sets of fonts and of this writing, there are problems with the mapping of Greek and special characters.

Font # Font

- 0 .... Complex Roman on screen, maps to Times-Roman.
- 1 .... Triplex Roman on screen, maps to Times-Bold.
- 2 .... Complex Italic on screen, maps to Times-Italic.
- 3 .... Triplex Italic on screen, maps to Times-BoldItalic.
- 4 .... Simplex on screen, maps to Helvetica.
- 5 .... Duplex on screen, maps to Helvetica-Bold
- 6 .... Complex Italic on screen, maps to Helvetica-Oblique.
- 7 .... Triplex Italic on screen, maps to Helvetica-BoldOblique.
- 8 .... Simplex Greek on screen, maps to the lower 128 characters
  of the Symbol font.
- 9 .... Symbols on screen, maps to the upper 128 characters of the Symbol font.
- x .... Special symbols

Summary of other special commands

- + ... increase size
- - .... decrease size
- b .... backspace length of previous character
- c .... begin using upper 128 characters of set
- C .... stop using upper 128 characters of set
- s .... begin subscripting

- S .... begin superscripting
- u .... begin underline
- U .... stop underline
- N .... return to normal

Example:

\0F\sX\N(\8e\0) = sin(\8e\0)*e\S(-X)\N*cos(\8e\0)

prints roughly FX(e) = sin(e)*e -X*cos(e)

using font 0 and e prints as epsilon from the Simplex Greek font.

Use the upper 128 characters for accented characters. The upper character set not display on the screen correctly but will print.

NOTE: Special characters are mapped to the keyboard, the present mapping is not very well organized and may change.