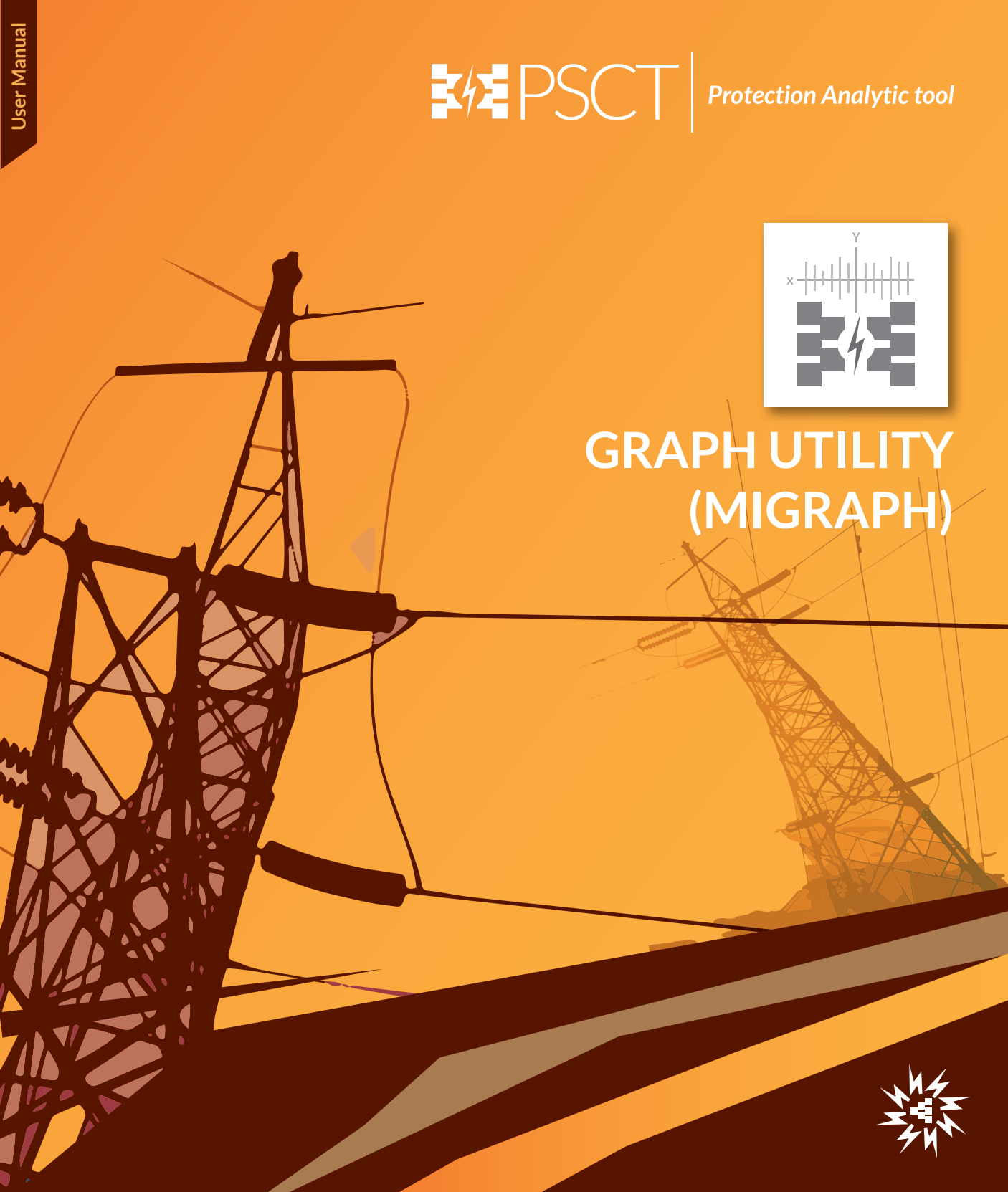
User Manual

PSCT | Protection Analytic tool



GRAPH UTILITY (MIGRAPH)

Table of Contents

1 Graph Utility

Graph utility is a module of MiP-PSCT to view the results of MiP-PSCT applications in linear, semilog and logs scale. The input to this module is the binary file/s generated from MiP-PSCT applications. The selected graph from the binary file can be stored as graph files “grp”. Here window is split into two panes. In the first pane, the graph is plotted and the second pane contains a list having all the variables extracted from the binary file. X and Y-axis variables has to be selected from the list to plot the graph.

A sample of MiGraph application is shown below.

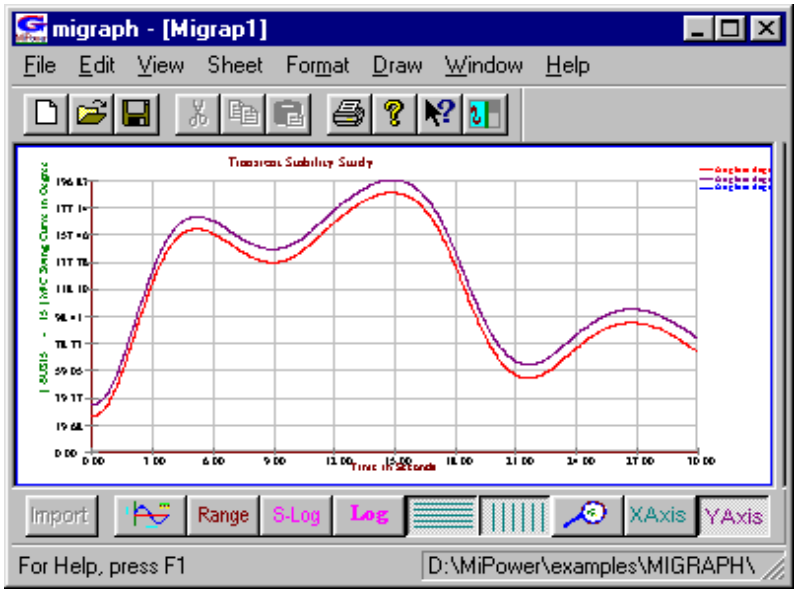


Figure 5.1: Sample Graph

Features

1. MiGraph enables the user to view Graph Data on a sheet; where in the titles of the graphs can be changed.
2. The graph ranges can be changed.
3. Multiple X and Y columns can be selected. If C1, C2, C3 and C4 are the sets of points available, then C1 vs. C2 and C3 vs. C4 can be plotted on the same graph.
4. All the curves plotted can be viewed in a splitter window, which helps the user to keep track of the curves plotted.
5. When the user selects the curves to be plotted, the dependent axis curve names appear in the colour of the plot.
6. Two level Zoom is provided.
7. The curves can be traced.
8. The x-y co-ordinates can be read by placing the cursor on the graph
9. The following entities can be formatted -
10. Curves - the colour, thickness, symbols to appear on curves, the number of symbols to appear on a curve, title and font.
11. Background colour.

12. Axis - Alignment (top, bottom, middle), colour, thickness, orientation of axis labels, precision of axis labels, number of ticks, colour of ticks.
13. Grid Lines - colour and number of lines.
14. User defined text can be added in the form of text boxes. These can be moved anywhere on the screen, formatted and deleted. The curve title can also be moved and formatted like any other text.
15. The graph area can be defined in physical sizes. This helps the user to restrict the graph to a particular paper size (ex. 8.5" by 11.5"). The plot margins plot area and border margins can be formatted. Module supports printing.
16. The graph can be printed on the top/bottom/middle/complete portion of the paper.
17. The graphs can be saved and retrieved from user defined files.
18. The curves can be viewed as points or continuous
19. Similar graphs can be plotted at single click

1.1 File

The File menu offers the following commands:

1.1.1 Creating a New Document

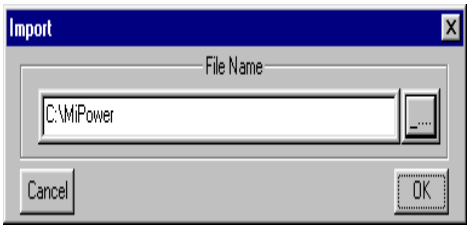
Use **"File > New"** to create a new document in Graph Utility. Select the type of new file you want to create in the File New dialog box. If the file extension is not provided, a default extension of "grp" is assumed.

Shortcuts

Keys: CTRL+N Toolbar: 

1.1.2 Import

Use "**File Import**" or button on the toolbar located in the left-bottom corner of the Graph utility Window. On selecting this option, a dialog will be popped up as shown. On this dialog, click on the Browse button to select the file with extensions either **"bin"** or **"txt"**. After selecting the file, click Open button on the File open dialog. This command will make you to import files in **txt** or **bin** format. Txt/Bin files should be obtained from **MiP-PSCT** application programs or should be created in the same format.



The input text file format for the Graph utility is as below:

Line 1	Title of the Graph
Line 2	No. of Columns

If no. of. columns are equal to 5. Line 3 to 7 is column variable names say C1,….,C5. Next five lines i.e., lines 8 to 12 are units corresponding to the column variables edited above. After editing this text, edit the 5 columns in the following fashion

C1	C2	C3	C4	C5

1.1.3 File Open Command

Use **"File > Open"** menu option to open an existing grp document in a new window. More than one document can be opened at a time. Use the Window menu to switch among the multiple open documents.

Shortcuts

Keys: CTRL+O Toolbar: 

1.1.4 Close document

Use **"File > Close"** to close all windows currently opened in the active document. Make sure to save, if you close a document without saving, you lose all changes made since the last time you saved it. Before closing an untitled document, Graph utility displays the Save as dialog box and suggests that you name and save the document.

You can also close a document by using the Close icon on the document's window.

1.1.5 Save document

Use **"File > Save"** to save the active document to its current name and directory. When you save a document for the first time, Graph utility displays the Save As dialog box to name your document. If you want to change the name and directory of an existing documents before you save it, choose the Save As command.

Shortcuts

Keys: CTRL+S Toolbar: 

1.1.6 Save as document

Use **"File > Save as"** to save and name the active document. Graph utility displays the Save As dialog box to name your document. To save a document with its existing name and directory, use the Save command.

1.1.7 Save as Image

Use **"File > Save as Image"** to save the plotted graph. Graph utility displays the Save Graph as an Image dialog box to name your document. To save an image with jpg format give name and directory, use the Save button.

1.1.8 Print

Use **"File > Print"** to print a document. This command presents a Print dialog box, where you may specify the range of pages to be printed, the number of copies, the destination printer, and other printer setup options.

Shortcuts 

Keys: CTRL+P Toolbar:

1.1.9 Print Preview

Use **"File > Print Preview"** to display the active document, as it would appear when printed. When you choose this command, the main window will be replaced with a print preview window in which one or two pages will be displayed in their printed format. The print preview toolbar offers you with

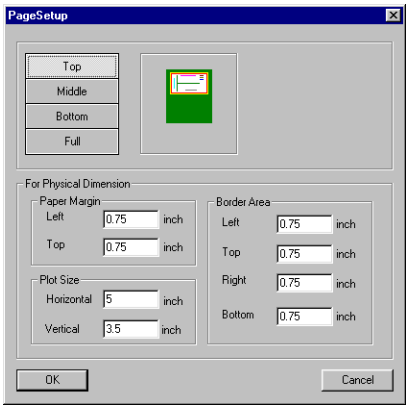
options to view either one or two pages at a time; move back and forth through the document; zoom in and out of pages; and initiate a print job.

1.1.10 Print Set up

Use **"File > Print set up"** to select a printer and a printer connection. This command presents a Print Setup dialog box, where you specify the printer and its connection.

1.1.11 Page Setup

Use **"File > Page Set up"** to set the page margin and graph position in the print. On selecting this option the dialog box shown will be popped-up. On this dialog box, graph position while printing can be fixed by clicking either Top or Middle or Bottom or Full. On selecting one of the four options previews of the graph placement while printing can be viewed. To change the border area and margins, type the values in the respective edit boxes.



1.1.12 Exit

Use "**File > Exit"** to end your Graph utility session. You can also use the Close command on the application Control menu. Graph utility prompts you to save documents with unsaved changes.

Shortcuts Mouse: Double-click the application's Control menu button.

Keys: ALT+F4

1.2 Edit

The Edit menu offers the following commands:

1.2.1 Copy

Select "Edit-> Copy" to copy the contents of the text box to clip board. In key board use Ctrl+C option

1.2.2 Paste

Select "Edit-> Paste" to paste the copied contents to the text box. In key board use Ctrl+V option to paste in the text box.

1.2.3 Delete Text Box

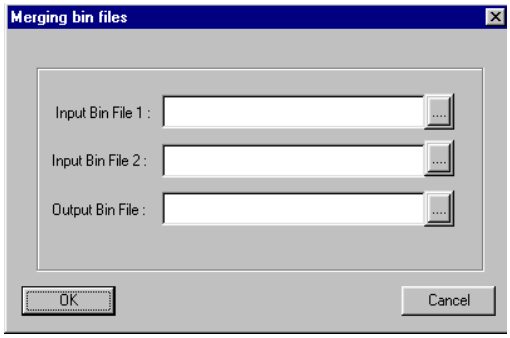
Use **"Edit > Delete Text Box"** to delete a text box, select the text box and then use the option.

1.2.4 Merge (Merges two binary files)

Select **"Edit >Merge",** to merge two *.bin file into one bin file.

Requirements:

1. The simulation time of two input bin files should be same.
2. The time step of both the input bin files should be same.



The merging of two bin file is useful in plotting graphs of different case studies together in one graph.

On selecting this menu option, a dialog box will be popped up as shown.

On this dialog click on the buttons to select bin files. After browsing the three bin files, click OK button. The two input bin files will be combined and written in the third bin file. This combined bin file can be imported to plot the graphs.

1.2.5 Overcurrent Relay

PowerRCD the relay co-ordination module of MiP-PSCT generates MiGraph compatible binary files. When MiGraph is invoked through the Database Manager the phase relay co-ordination curve binary file is automatically imported and corresponding columns are displayed in the second pane. The relay co-ordination graphs are plotted by selecting the required columns. (Note: for each relay select new independent group from the second pane). The plotted curve X and Y column numbers are displayed in the list box. MiGraph provides curve changes by

Change Setting

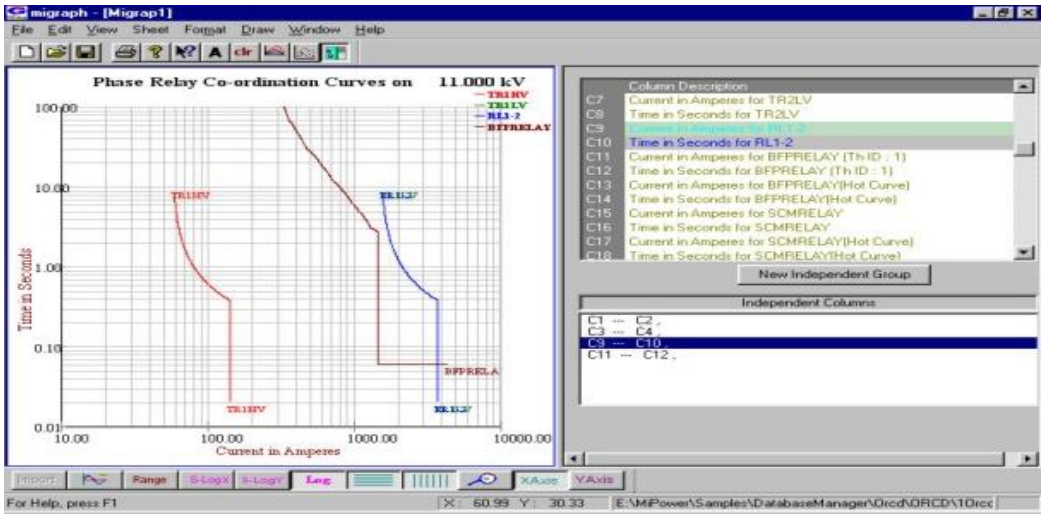
Change Base

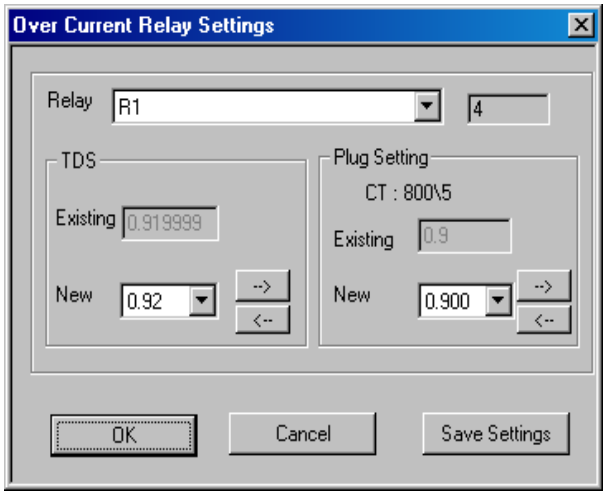
Complete relay curves can be plotted on Graph

1.2.5.1 Change Setting

Steps to move the co-ordination curve

Graph utility provides a unique feature by which the co-ordination curves can be moved horizontally (by changing the plug setting) or vertically (by changing the time dial setting) from the second pane list box where the X and Y column numbers are displayed. To move the curve, double click on the Independent groups as shown in the diagram below.





Modify relay settings: From main menu select Edit > Overcurrent relay->Change settings which opens the Relay setting window. Select relay and click on > New settings button to change TDS and Plug setting. CT ratio will be displayed.

Save Settings: Saves the new settings to the database.

OK: With the updated settings relay curve appear on the graph and dialog closes.

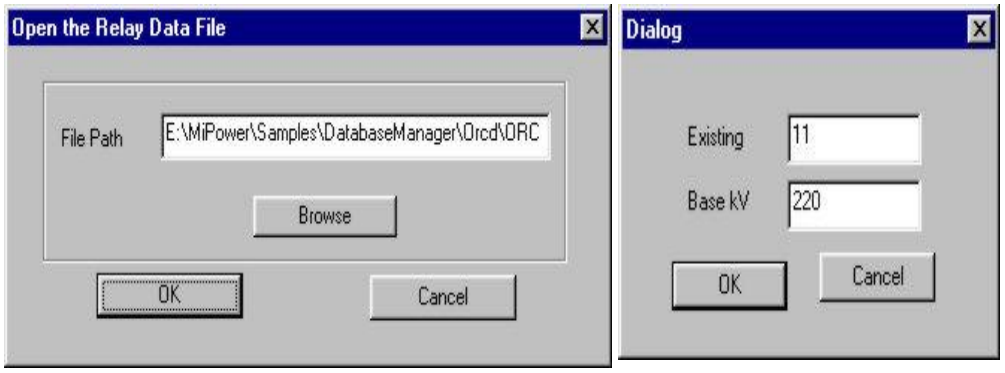
Cancel: Without change in relay settings dialog closes.

This option can be selected by clicking right mouse button on the relay curve select Over current Relay > Change Setting

1.2.5.2 Changing the base kV for curves

The relay co-ordination curves are generated on a common kV base. MiGraph provides an option to view the curves on a different voltage.

Use **"Edit > Overcurrent Relay >> change base**" to change relay base kV for curves. Open the Relay Data. File dialog appears, give the file name and click OK. The following dialog appears. It displays the existing base, give new kV base. All the curves are now plotted on new kV base. Even the curves, which are not plotted, are converted to new kV base. The main bin or text file is not modified



This option can be selected by clicking right mouse button on the relay curve select Over current Relay > Change Base

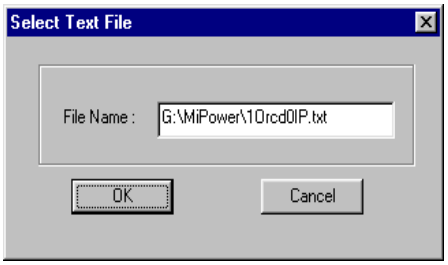
1.2.6 Write

The plots displayed can be written to a text or dxf file using this option

1.2.6.1 To Text file

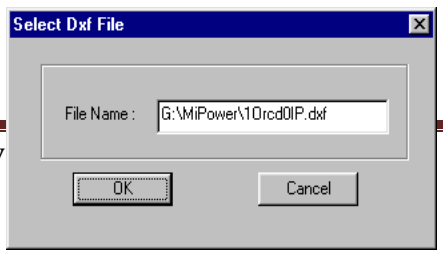
Use **"Edit > Write >> To Text file"** to convert the binary file (.bin) to text file(.txt) format.

Conversion procedure: Select X-axis and Y-axis variables using x-axis and y-axis buttons. After selecting the variables, choose this menu option. On choosing this menu option, a dialog box prompting for the file name appears. Select the file name and file path where it has to be stored. This text file can be opened through Notepad as well as MiGraph.



1.2.6.2 To DXF file

Use **"Edit > Write >> To DXF file"** to convert the displayed plot to dxf file(.dxf) format.



Conversion procedure:

1. Give the output dxf file name.
2. Click OK to convert to Dxf file
3. Open the file in AutoCAD

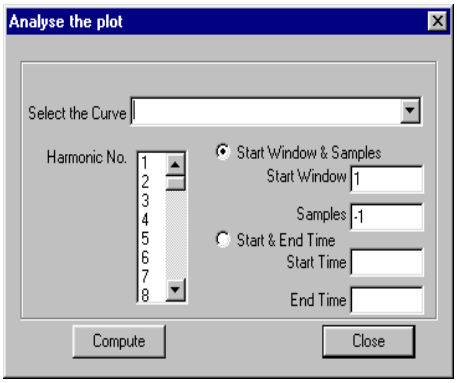
1.2.7 Clear Graphs

Use "Edit > Clear Graphs" or 

from toolbar buttons to remove graphs from the display. New x axis and y-axis selections should be made for plotting another set of curves. This option can be used when large numbers of curves are to be plotted from the same binary file

1.2.8 Analyse Graphs

MiGraph supports fourier analysis of selected graphs. Select the curve for which fourier analysis has to be done. Select the harmonic number from the list box. Select the inputs like either start from start window and number of samples or Start and End time. Click on compute to do the fourier analysis of the selected curve.



A sample output is as shown below

```
-----------------------------------------
Fourier Analysis results
-----------------------------------------
Start Window              : 1
No. of Samples            : 32
Positive minimum(All samples): 0.382680
Positive maximum(All samples): 1.000000
Negative minimum(All samples): -0.382680
Negative maximum(All samples): -1.000000
Average(from start window)   : 0.000000
-----------------------------------------
Harmonic Order            : 3
Magnitude                 : 0.000000
```

RMS Value : 0.000000
Thetha : 90.000000

1.2.9 Math Operations

Math operations can be performed on the selected curves. The new curve points obtained is

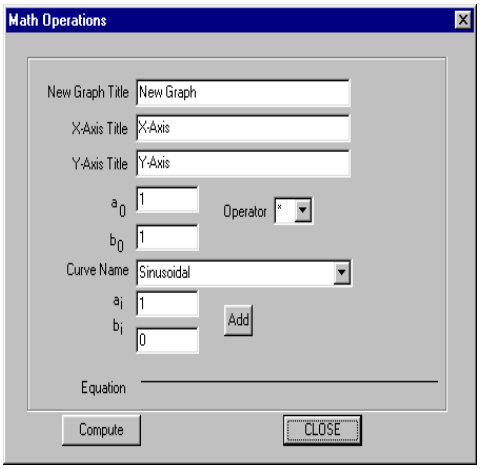
= (a0+/*b0 x old curve point)

(a1+/*b1 x old curve point)

Select the Curve, Give new graph title, x-axis title, y-axis title, a0, b0, a1 and b1.

Click on add button, to add/modify the mathematical symbols

Click on compute to create the new graph file. Save it in a new file. Open this file in MiGraph.

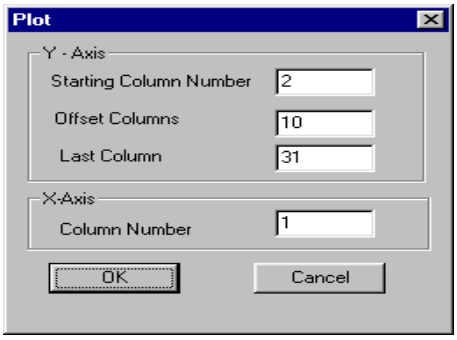


1.2.10 Column Selection

Often it is necessary to plot many curves to observe the variations in the system. A facility to plot all the related curve in a single click is provided. This option enables the Selection of columns with given offset. Select - Edit-Column Selections or click on the following dialog box appears.

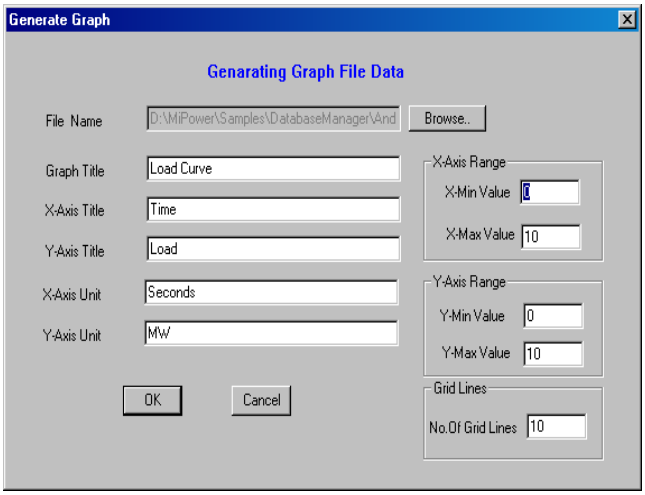
Select the x-axis column number. Y axis starting column number, off set columns (by default it is 10 which is appropriate for Transient stability graphs generated by MiP-PSCT) and the last column number.

Click Ok to plot the selected curves.



1.2.11 Source Name

The data source for the curves is a binary file. The option to change the source file is provided so that by changing the source file, it would allow to reuse the same graph definition file for a whole series of studies. For example, if 30 studies are done and for all of them you need to look at the same parameters (say voltages) you need only to copy the grp file to a new filename. Open the new grp file and change the source data file and without having to go through the process of selection again immediately get the same set of parameters graphed from the new source data file.



1.2.12 Generate Graph Point

This option is used to generate graph data file and to view the graph. Follow the steps

Open a new file in Migraph.

Select option from main menu **Edit > Generate Graph Point > Graph Data.** Following Dialog box will open.

File Name: Give the file name to save the Graph Data text file by using the browse button.

Graph Title: Give name for the graph

X - Axis Title: Give title for the X-axis

Y - Axis Title: Give title for the Y-axis

X-Axis unit: Give the unit for X-axis

Y -Axis unit: Give the unit for Y-axis

X-Axis range: Give minimum range value and maximum range value

Y-Axis range: Give minimum range value and maximum range value

No. of Grid Lines: Mention the no. of grid lines. Click on OK.

Graph with the given details will be opened.

Double click LMB (Left Mouse Button) on the graph. Double click will go on generating points.

Now select menu option **Edit > Generate Graph** to view the graph.

Generated graph file can be saved with '.grp' extension.

1.2.13 Delete Curve

In relay graph select the relay curve and click right mouse button (RMB) and select delete curve option from the menu. Or select menu Edit->delete curve option to delete the selected relay curve

1.2.14 Delete fault line

In relay graph option to delete the fault line is available by selecting the fault line and click right mouse button (RMB) and select delete fault line option from the menu. Or select menu Edit->delete fault line option to delete the selected fault line

1.3 View

The View menu offers the following commands:

1.3.1 Toolbar

Use "**View ∧Toolbar"** to display and hide the Toolbar, which includes buttons for some of the most common commands in MiGraph, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

1.3.2 Draw Tool box

Use **"View™Drawing Tool bar"** to show or hide the basic drawing toolbar. This option will be either ON/OFF. If this option is ON, the toolbar is shown at left by default. Else the toolbar is hidden. The commands interfaced to the buttons placed on the toolbar from top to bottom order are: -

Object Selection

Line

Rectangle

Round Rectangle

Square

Diamond

Ellipse

Circle

Arc

Chord

Pie

Semi-Circle

Sine Wave

Polyline

Polygon

1.3.3 Status Bar

Use **"View ∧ status Bar"** to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. A check mark appears next to the menu item when the Status Bar is displayed.

1.3.4 Symbol

Use "**View ∧ Symbol"** to shows or hide the symbol over the curve. To view symbol over the curve on choosing this option, each curve is assigned a symbol and curve is redrawn. This option helps while printing through a black & white printer.

1.3.5 Caption

Use **"View ∧ Caption"** option to view the relay name on the curve. This feature is recommended only for relay co-ordination curves.

1.3.6 Zoom

Use "View ∧ Zoom" or select on  the toolbar to zoom the window. With this, it will be enlarged to a default scale.

1.3.7 Trace

Use **"View ∧ Trace"** to track the curves drawn. Press right arrow key to move forward. The curve value at that point is shown. Press left arrow key to move back. To jump between different curves use either up arrow or down arrow keys

1.3.8 Semilog –X

Use "View ∧ Semilog-X" or the semilog-x tool bar button present at the left bottom of the screen to plot the graph in a semilog scale, i.e., X-axis in logarithm scale.

1.3.9 Semilog -Y

Use **"View ∧ Semilog-Y"** or the button provided on the left bottom toolbar on the screen to plot the graph in a semilog scale, i.e., Y-axis in logarithm scale. Log

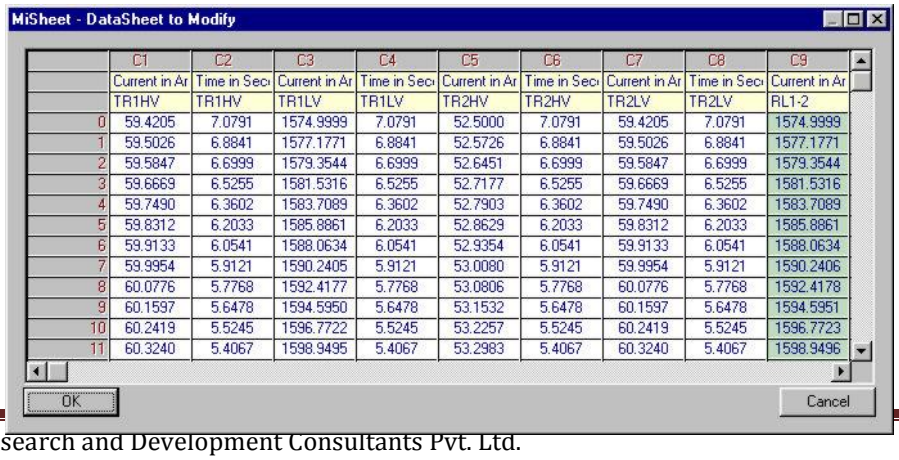
Use **"View ∧ Log"** or from toolbar button provided on the left bottom of the screen to plot the graph in log scale, i.e., both X and Y-axis in logarithm scale

1.3.10 Points

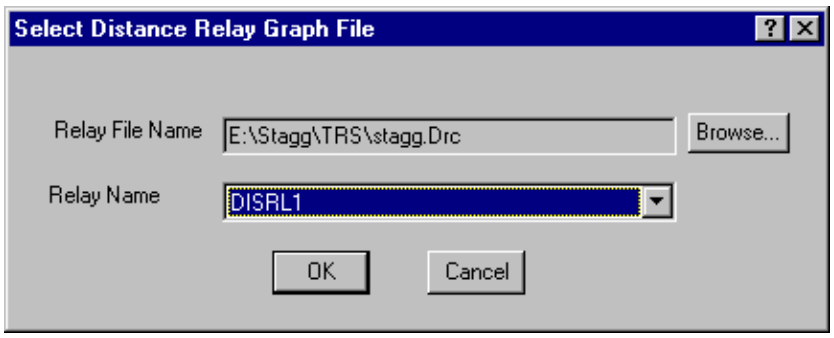
Use"View->Points" or from  toolbar to view the graph as poles and zeroes instead of continuous curve.

1.3.11 MiSheet

Use "**View ∧ Misheet"** to display the sheet where the data (text matter) can be modified. This will pop up a sheet as shown. For large input file this operation is not recommended since it slows down the operation.



	C1	C2	C3	C4	C5	C6	C7	C8	C9
	Current in Ar	Time in Sec	Current in Ar	Time in Sec	Current in Ar	Time in Sec	Current in Ar	Time in Sec	Current in Ar
	TR1HV	TR1HV	TR1LV	TR1LV	TR2HV	TR2HV	TR2LV	TR2LV	RL1-2
0	59.4205	7.0791	1574.9999	7.0791	52.5000	7.0791	59.4205	7.0791	1574.9999
1	59.5026	6.8841	1577.1771	6.8841	52.5726	6.8841	59.5026	6.8841	1577.1771
2	59.5847	6.6999	1579.3544	6.6999	52.6451	6.6999	59.5847	6.6999	1579.3544
3	59.6669	6.5255	1581.5316	6.5255	52.7177	6.5255	59.6669	6.5255	1581.5316
4	59.7490	6.3602	1583.7089	6.3602	52.7903	6.3602	59.7490	6.3602	1583.7089
5	59.8312	6.2033	1585.8861	6.2033	52.8629	6.2033	59.8312	6.2033	1585.8861
6	59.9133	6.0541	1588.0634	6.0541	52.9354	6.0541	59.9133	6.0541	1588.0634
7	59.9954	5.9121	1590.2405	5.9121	53.0080	5.9121	59.9954	5.9121	1590.2406
8	60.0776	5.7768	1592.4177	5.7768	53.0806	5.7768	60.0776	5.7768	1592.4178
9	60.1597	5.6478	1594.5950	5.6478	53.1532	5.6478	60.1597	5.6478	1594.5951
10	60.2419	5.5245	1596.7722	5.5245	53.2257	5.5245	60.2419	5.5245	1596.7723
11	60.3240	5.4067	1598.9495	5.4067	53.2983	5.4067	60.3240	5.4067	1598.9496



1.3.12 Physical

When the Physical menu item is checked, the graph can be viewed in the original size irrespective of the window size. When unchecked, the graph will resize automatically to fit to the window size.

1.3.13 Distance Relay

To plot distance relay characteristics follow the steps.

While invoking Graph from transient stability analysis dialog, select Line option

On MiGraph select the required line's R in pu along X-axis and X in pu along Y-axis. Then click plot button on MiGraph screen or select menu option Sheet >Plot.

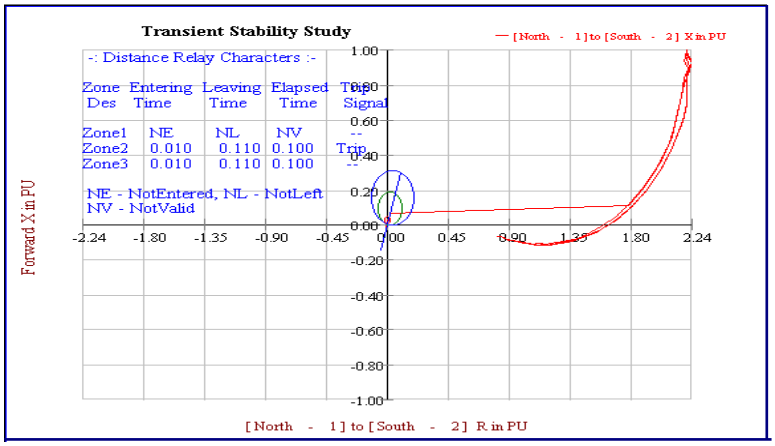
Then select **View > Distance Relay** to invoke the Select Distance Relay Graph File dialog. Choose the Relay name from the combo box and click on OK to plot the corresponding distance relay characteristics on the graphs

Distance relay zone wise entering time, Leaving time, Elapsed time and trip signal values are displayed on a text box on the left side of the graph.

To plot the Distance relay characters from other file

Click on browse and choose the corresponding. Drc file and choose the relay name corresponding to the relay for which the characteristic is required.

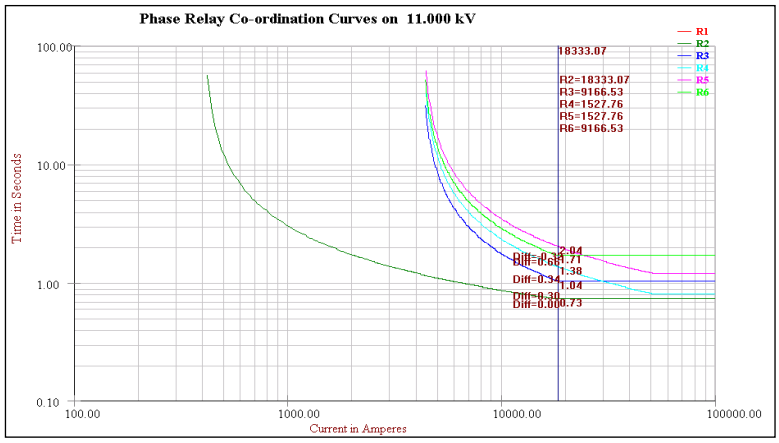
A sample characteristic graph is shown below.



1.3.14 Normalised Curve

Select this option from menu View Normalised Curves or click on tool bar 

with this option, for a particular fault current, the operating time (along with discrimination time) and the fault current seen by backup relays are displayed on the graph. The fault line can be selected and moved. With the fault line intersecting the curves will show fault current seen by the relays and the discrimination time between the relays



1.4 Sheet

1.4.1 Plot

Use **"Sheet ∧**  **Plot"** or from the toolbar button present at the left bottom of the screen to update the plots in the view. By clicking this button, whole graph will be redrawn again depending on the current selection/setting. If no variable is selected to draw by default program selects the first variable as X-axis and second variable as Y-axis variable and curve is drawn.

1.4.2 X-axis

Use "Sheet ∧ X-axis" or 

from the toolbar button present at the left bottom of the screen to select the independent X-axis. To select the X axis column in the sheet view (right second pane). By default first column will be selected for independent axis or the user can select anyone from the list.

1.4.3 Y-axis

Use **"Sheet ∧ Y-** 

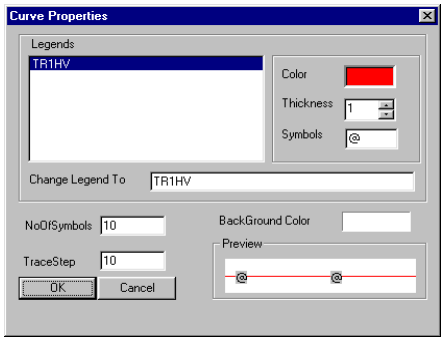
axis" or from the toolbar button present at the left bottom of the screen to select the dependent Y-axis. To select the Y axis column in the sheet view (right second pane). By default, first column will be selected for independent axis or the user can select anyone from the list.

1.4.4 To get the multiple independent axis

Use **"Sheet ∧ Multi X-Y"** to select multiple groups of dependent and independent columns. User is able to select new groups by pressing the **new independent group button** (displayed in right second pane after the selection of **Multi X-Y**). Each group will be having one independent and any number of dependents can be selected.

1.5 Format

The format menu offers following commands



1.5.1 Curve

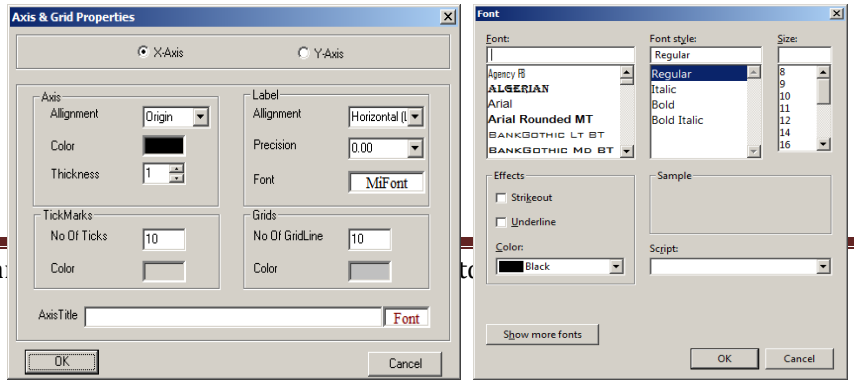
Use **"Format ∧ Curve"** to change curve attributes. On selecting this option, a dialog box will be popped up as shown. On the dialog box select one legend of the curves listed to change the different attributes of the curve. Curve color can be changed by clicking the box to the right of the text color. On clicking this Box, Color dialog box will be popped up. The curve legend can be changed.

1.5.2 Background

Use "**Format ∧ Background"** to change background color of the graph. On selecting this option, a dialog box is popped up as shown. Select any of the colors available on the dialog box and click OK button to observe the changes.

1.5.3 Axis

Use "Format ∧ Axis" to format either X or Y-axis. On selecting this option, a dialog box is



popped up as shown. On this dialog, check X-axis button if X-axis has to be formatted. Check Y-axis button if Y-axis has to be changed. After selecting the axis, attributes like thickness, color, alignment of the axis, color, alignment, precision of the axis label, font size, style, color. Number of tick marks, number of grid lines and color of them can also be changed for each of the axis. After making the desired changes click, OK button to the see the changes. If CANCEL button is clicked, changes are ignored.

1.5.4 Text box

Use **"Format ∧ Text box"** to change font color, style and size of a text. On selecting this option, a dialog box is popped up as shown. Select the desired font types, font color, and font size and click OK to get the desired changes.

1.5.5 Range

Use **"Format ∧ Range"** or 

from the left bottom screen toolbar to change the range. This will display a dialog box to change the min and max value of the X & Y-axis with number of tick marks required. To perform this operation, choose menu option Format->Range or click button provided on the toolbar. On the dialog box change either X-axis minimum and maximum values or Y-axis minimum and maximum values and click OK. On clicking OK button, the curves will redraw to the specified range.

1.6 Draw

This menu offers following options

1.6.1 Text Box

Use **"Draw ∧ Text Box"** or  from the toolbar and click on the screen where the text box should be drawn. On releasing the Left mouse Button, a text editor dialog is popped up in which the text can be edited. To modify or delete the text double click on the text box to invoke the text editor dialog

1.6.2 Grid

1.6.2.1 X-axis

Use **"Draw ∧ Grid ∧X-axis"** command or  toolbar button from the left bottom screen, the grids parallel to X axis will be displayed. This depends on the current scale setting i.e. whether linear or log.

1.6.2.2 Y-axis

Use **"Draw ∧ Grid ∧Y-axis"** command or  toolbar button from the left bottom screen, the

grids parallel to Y axis will be displayed. This depends on the current scale setting i.e. whether linear or log.

1.6.3 Line Graph

Use "**Draw ∧ Line Graph"** command or toolbar button from the top screen, the Line graph will be displayed.

1.6.4 Bar Graph

Use "**Draw ∧ Bar Graph"** command or toolbar button from the top screen, the Bar graph will be displayed.

1.6.5 Stacked Bar Graph

Use "Draw ∧ Stacked Bar Graph" command or toolbar button from the top screen, the Stacked Bar graph will be displayed.

1.6.6 Pie Graph

Use **"Draw ∧ Pie Graph"** command or toolbar button from the top screen, the Pie graph will be displayed.

1.6.7 3D Bar Graph

Use "**Draw ∧ 3D Bar Graph"** command or toolbar button from the top screen, the 3D Bar graph will be displayed.

1.6.8 3D Stacked Bar Graph

Use "Draw ∧ 3D Stacked Bar Graph" command or toolbar button from the top screen, the 3D Stacked Bar graph will be displayed.

1.6.9 3D Pie Graph

Use **"Draw ∧ 3D Pie Graph"** command or toolbar button from the top screen, the 3D Pie graph will be displayed.

1.6.10 Line Graph (Tape Graph)

Use **"Draw ∧ 3D Stacked Bar Graph"** command or toolbar button from the top screen, the Line graph (Tape Graph) will be displayed.

1.6.11 Selection

- If this selection mode is ON, then user can carry out operations like move, resize cut, copy and paste etc.
- If this selection mode is OFF, then user can carry out operations like panning, zooming and to note the details of an object (in which layer it is, thickness etc.)

1.6.12 Slant Line

Use **"Draw™Horz/Vert Line"** OR  from a Draw toolbar on the LHS of the screen. This option is used to draw a line between start point to end point and to fit inside a rectangle formed by start point and end point. The line can be resized by dragging the handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. If the Orthogonal flag is ON, the line will be drawn in Horizontal / Vertical fashions only. Turn OFF the Orthogonal flag to draw a line at any desired angle.

1.6.13 Rectangle

Use **"Draw™Rectangle"** OR  from the Draw toolbar on the LHS of the screen. This option is used to draw a rectangle between start point to end point and to fit inside a rectangle formed by start point and end point. The rectangle can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.14 Round Rectangle

Use **"Draw™Round Rectangle"** OR from the Draw toolbar on the LHS of the screen. This option is used to draw a round rectangle between start point to end point and to fit inside a rectangle formed by start point and end point. The round rectangle can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.15 Square

Use "Draw™Square" OR from the Draw toolbar on the LHS of the screen. This option is used to draw a square between start point to end point and to fit inside a rectangle formed by start point and end point. The square can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving.

1.6.16 Diamond

Use **"Draw™Diamond"** OR  from Draw toolbar on the LHS of the screen. The option is used to draw a diamond between start point to end point and to fit inside a rectangle formed by start point and end point. The diamond can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.17 Ellipse

Use **"Draw™Ellipse"** OR from Draw toolbar on the LHS of the screen. This option is used to draw an ellipse from start point to end point and to fit inside a rectangle formed by start point and

end point. The ellipse can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.18 Circle

Use "Draw™Circle" OR  from Draw toolbar on the LHS of the screen. This option is used to draw a circle from start point to end point and to fit inside a rectangle formed by start point and end point. The circle can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.19 Arc

Use "Draw™Arc" OR from Draw toolbar on the LHS of the screen. The option is used to draw an arc from start point to end point and to fit inside a rectangle formed by start point and end point. The arc can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.20 Chord

Use **"Draw™Chord"** OR from Draw toolbar on the LHS of the screen. This option is used to draw a chord from start point to end point and to fit inside a rectangle formed by start point and end point. The chord can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.21 Pie

Use **"Draw™Pie"** OR from Draw toolbar on the LHS of the screen. This option is used to draw a pie from start point to end point and to fit inside a rectangle formed by start point and end point. The pie can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.22 Semicircle

Use **"Draw™Semicircle"** OR from Draw toolbar on the LHS of the screen. This option is used to draw a semi-circle from start point to end point and to fit inside a rectangle formed by start point and end point. The semi-circle can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.23 Sine Wave

Use **"Draw™Sine wave"** OR from Draw toolbar on the LHS of the screen. This option is used to draw a sine wave from start point to end point and to fit inside a rectangle formed by start point and end point. The sine wave can be resized by dragging a handle on the rectangle box. The handles are highlighted whenever an object is selected for resizing or moving. Procedure is similar to slant line drawing.

1.6.24 Polyline

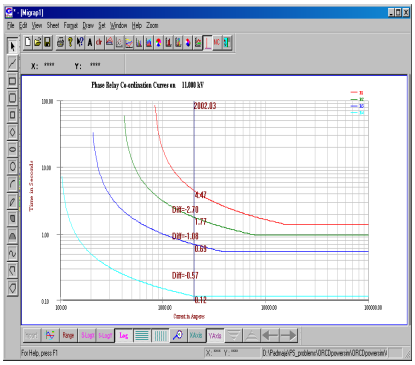
Use **"Draw™Polyline"** OR from Draw toolbar on the LHS of the screen. To draw a Polyline from start point to intermediate points till endpoint and to fit inside a rectangle formed by a polygon points. The Polyline can be resized by dragging a handle placed along the polygon points.The handles are highlighted whenever an object is selected for resizing or moving. If the Orthogonal flag is ON, polygon will be drawn with straight lines. Orthogonal flag is OFF to draw a Polyline with inclined lines. With Orthogonal mode ON, when a point is touched to move, the cursor shape is changed to plus and the touched point is aligned in X or Y direction with respect to previous point depending on whether the distance along X or Y direction is more. Procedure is similar to slant line drawing.

1.6.25 Polygon

Use **"Draw™Polygon"** OR from Draw toolbar on the LHS of the screen. This option is used to draw a polygon from start point to intermediate points till end point and to fit inside a rectangle formed by polygon points. The polygon can be resized by dragging a handle placed along the polygon points. The handles are highlighted whenever an object is selected for resizing or moving. If the Orthogonal flag is ON, polygon will be drawn with straight lines (Horizontal / Vertical lines only). Orthogonal flag is OFF to draw a polygon with inclined lines. With Orthogonal mode ON, when a point is touched to move, the cursor shape is changed to plus and the touched point is aligned in X or Y direction with respect to previous point depending on whether the distance along X or Y direction is more.

1.6.26 Fault Line:

Select the option from tool bar  or Menu option Draw-> Fault Line. This draws a perpendicular line on the graph. When it is moved on the relay graph it shows Fault current at the top. For that fault current at relay intersection points shows relay operating time and the discrimination time of relays curve.



1.7 Set Menu

1.7.1 Orthogonal Mode

This Option is used as a control parameter while drawing an object, object resize and moving object(s). The usage is either ON or OFF, If the flag is ON, the status bar pane text is set to "Ortho" else the pane is blank. A part of status bar showing the Ortho flag ON is shown in figure.

Usage while drawing an Object

When the flag is ON and while drawing a connecting line between any two points, the two points are joined by a Horizontal or Vertical line based on whether distance between two points is more along X axis or Y axis.

age while resizing an Object

When an object is selected for resizing, if user tries to move any handle with the mode ON, the handle is moved either along X axis or Y axis based on the maximum movement is along X axis or Y axis. The rectangle object is redrawn as a square and an ellipse object is redrawn as a circle.

Line 5: Usage while moving object(s)

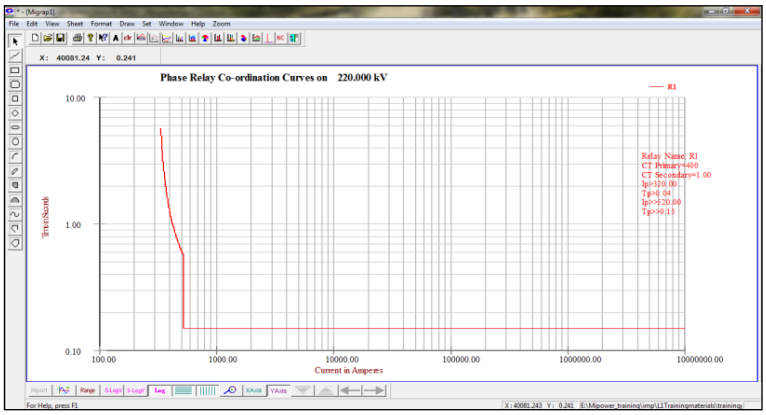
Select Object or Objects to move only one object or a group of objects. Holding down mouse LMB on one of the selected object move the mouse to desired location. The selected objects are moved either X or Y direction, depending on the maximum amount of X or Y displacement.

1.7.2 Rotate

Rotates the selected object by 90 degrees in clockwise direction

Relay setting details in Graph

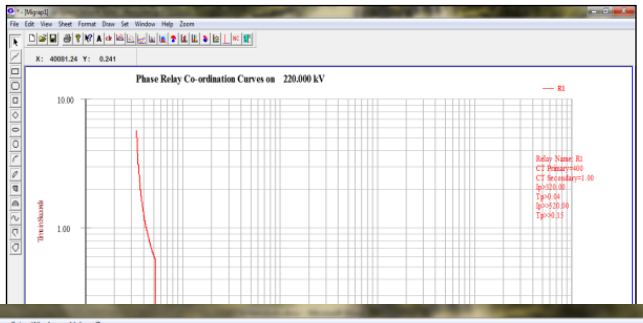
Click on a relay displays the relay details like over current and instantaneous setting details on the graph these text boxes can be moved to required location in the graph

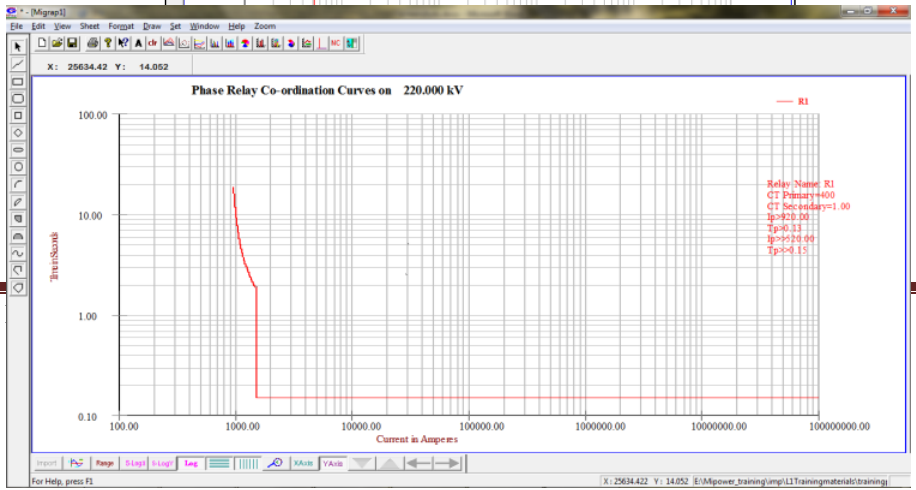


1.8 Relay Curve Dragging

With the above option, by clicking and dragging the particular relay curve, the change in settings of particular relay is displayed. However with this option the setting given in data field of particular relay remains unchanged.

Step 1

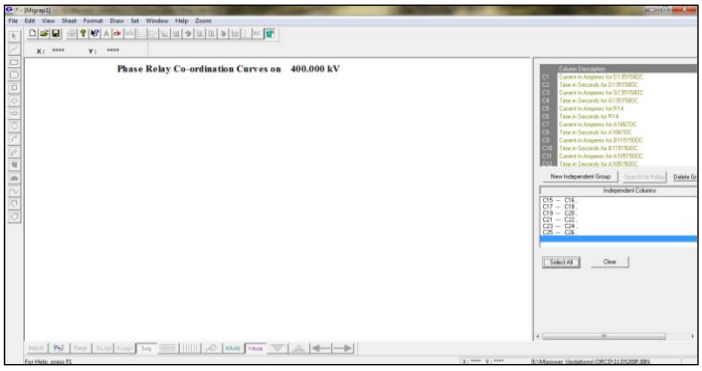




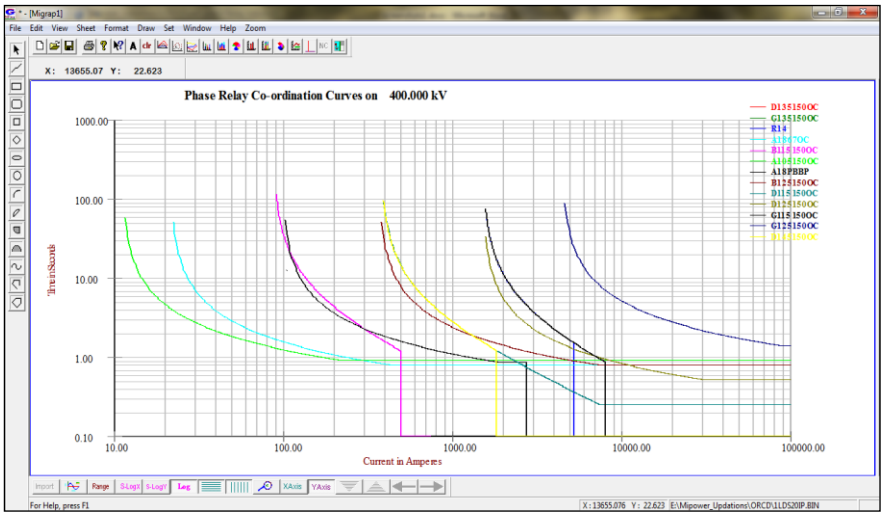
Step 2

1.9 Provision for selection of all relay pairs displayed in relay graph.

Step 1



Step 2



Note: The “select all” option considers only 20 relay pairs at a time.

Option to clear relay groups and clear the selection of all relays present in the graph are provided.

1.10 Window

The Window menu offers the following commands, which enable you to arrange multiple views of multiple documents in the application window:

1.10.1 New Window

Use this command to open a new window with the same contents as the active window. You can open multiple document windows to display different parts or views of a document at the same time. If you change the contents in one window, all other windows containing the same document reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

1.10.2 Cascade

Use this command to arrange multiple opened windows in an overlapped fashion.

1.10.3 Tile

Use this command to arrange multiple opened windows in a non-overlapped fashion.

1.10.4 Arrange Icons

Use **"Tile ∧ Arrange Icons"** command to arrange the icons for minimized windows at the bottom of the main window. If there is an open document window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this document window.

1.10.5 Split

Use **"Tile ∧ Split"** command to split the active window into panes. You may then use the mouse or the keyboard arrows to move the splitter bars. When you are finished, press the mouse button or enter to leave the splitter bars in their new location. Pressing escape keeps the splitter bars in their original location.

1.10.6 Window

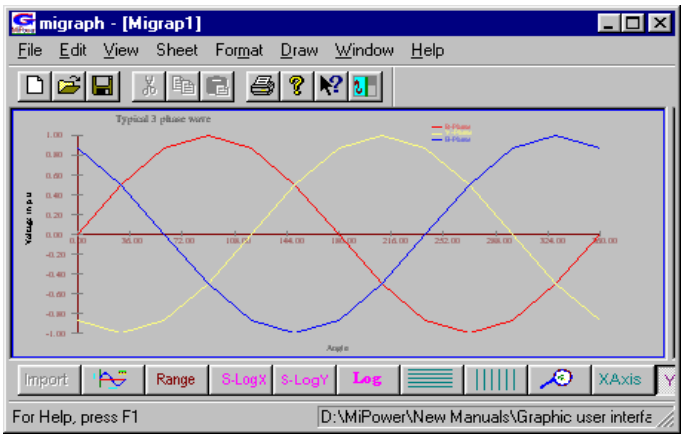
Graph utility displays a list of currently opened document windows at the bottom of the Window menu. A check mark appears in front of the document name of the active window. Choose a document from this list to make its window active.

1.11 Show 2ndPane

Use the toolbar button to show/hide the second pane. The pane is not view if no file is imported.

Example

Create the following text file using ASCII file editor tool or Notepad and plot the graph by selecting X-axis as angle and Y-axis as R-Y-B phase voltages.



Typical 3 phase wave

4

Angle

R-Phase

Y-Phase

B-Phase

Angle in degrees

Voltage in p.u

Voltage in p.u

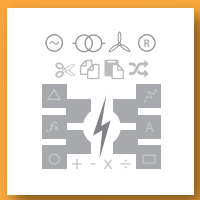
Voltage in p.u

0	0.0	-0.866	0.866	
30	0.5	-1.0	0.5	
60	0.866	-0.866	0	
90	1.0	-0.5	-0.5	
120		0.866	0	-0.866
150		0.5	0.5	-1.0
180		0	0.866	-0.866
210		-0.5	1.0	-0.50
240		-0.866	0.866	0
270		-1.0	0.5	0.5
300		-0.866	0	0.866
330		-0.5	-0.5	1.0
360		0	-0.866	0.866

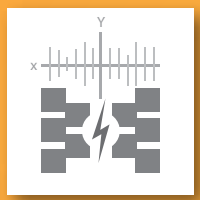
The result is as shown above.

Protection Suite

PSCT | *Protection Analytic tool*



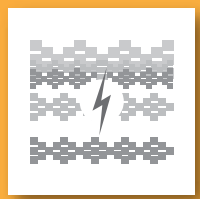
Power System Network Editor



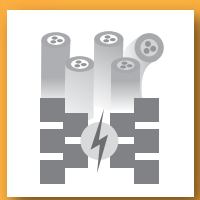
Graph Utility

Free Programmable Block

Database Manager



COMTRADE Viewer



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