

POWER SYSTEM NETWORK EDITOR



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1 Power System Network Editor

Power System Network Editor is a general-purpose graphic user interface designed to create a power system single line diagram and any other general diagram using the preliminary drawing elements. MiP-PSCT's Network Editor is equipped with tools and features designed to make the creation of the network easy. The commands to select the various options are configured as menu items. Easy selection and editing of the network components using toolbars help the user for faster creation of the single line diagram. Further grouping of the objects, copying, moving and deleting commands are provided for faster creation of the single line diagram. The user can selectively set the toolbars to show/hide. Whenever a mouse cursor is placed on any of the toolbar buttons, tool tips are highlighted. The toolbars are dockable except the power system element toolbar.

Multi-layer technique is used for placing the drawing objects in different layers. Unlimited layers are supported by the package. A network can be edited in several different layers, so that the HV network for instance, is in one layer, and the MV network is in other layer. The user can edit the object layer after placement. The user can replace the power system analysis results on to a particular layer only. The user has the option to view only the selected layer objects. The objects belonging to other layer are hidden from the user. This facilitates the user to take print / plot of the layer wise diagram with / without results.

The drawing object can be selected by clicking a left mouse button (LMB) on it. The selected object will be redrawn with a tracker surrounding the object. The user can perform an edit or delete or move operation on the selected objects. The editing operations are like changing the line styles, line colour, fill styles, fill colour, text font, text colour, etc.

To invoke **Power System Network Editor**, Double click on the icon to left of the **Power System Network Editor** on the MiP-PSCT main screen.

1.1 File Menu

File Menu offers the following options

1.1.1 Creating a New document

Use "**File→New**" to create a new document in **Power System Network Editor**. 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 "**gui**" is assumed.

Shortcuts

Keys: CTRL+N Toolbar:



1.1.2 Close Document

Use "**File→Close**" to close all windows currently opened in the active document. Make sure to save, as if you close a document without saving, you lose all changes made since the last time you saved it. Before closing an untitled document, Power System Network Editor 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.

1.1.3 File Open Command

Use "**File→Open**" menu option to open an existing gui 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 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, Power System Network Editor displays the Save As dialog box so as 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:



1.1.5 Save as Document

Use **"File→Save as"** to save and name the active document. Power System Network Editor displays the Save As dialog box to name your document. To save a document with its existing name and directory, use the Save command.

1.1.6 Save as Image

Use **"File→Save as Image"** to save & name the active document as image. Power system Network Editor displays the Save Graph as an Image dialog box to name your document as bmp.

Results of studies like Load flow, Short circuit etc. can be plotted on the diagram in network editor. These plots can be saved as image (*.bmp or *.jpg) by selecting the option **File→Save As Image**

1.1.7 Save Snapshot

Once the diagram and the database are finalized, it may be required to do study for different cases and store the results for further analysis and for printing purposes.

Power system network editor provides an option to store the diagram status and the results plotted as snap shots. A snap shot can be stored, loaded, deleted or modified. This will be extremely helpful during dynamic simulation wherein the change in status and circuits are not stored in the database (however, it can be saved explicitly by saving it as a new contingency).

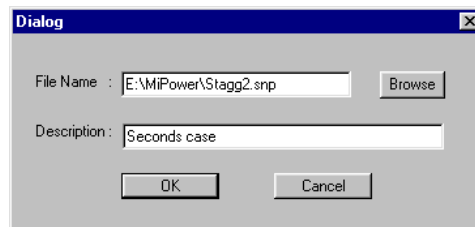
This facility avoids storing of data in the database. However, if the study for this case has to be done at a later stage then it has to be stored in the database. This snap shot can be used for storing the results.


To store a snap shot:

Select a contingency or dynamic simulation.

Perform the load flow analysis by changing the status or number of circuits.

Insert a text box to describe this case. The same text can be used for describing different cases.



To store the results and status, select save snap shot from File menu or select from  the toolbar.

The following dialog box appears.

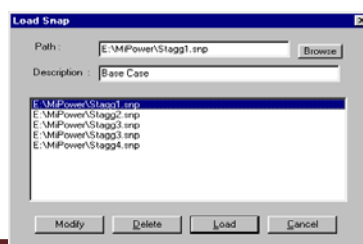
Give the file name and description for this case.

Click Ok to save the snap shot.

Continue the dynamic simulation and the required results can be stored as snap shots.

1.1.8 Load Snapshot

To load the snap shot file select Load Snap shot from file menu or select from the toolbar. The following dialog box appears



Click on –

Load – to retrieve a stored snap shot.

Delete – to delete the association of the selected snaps shot with this GUI and delete the corresponding snap shot file.

Modify – to change the path or the description of selected snap shot.

Browse – to select a different *. Snap file

Cancel to stop the loading process.

Double click on the selection to load the snap shot. The description of the current snap is displayed on the status bar.

Note:

Snapshots should be used after freezing the network configuration and when there are no more additions to the diagram.

If network is modified, the snapshots should be created once again to reflect the modifications made.

1.1.9 Import From Gut File

The advantage of GUT file format is that the user can generate a MiGui diagram from the ASCII file. This option can be selected from the main menu **File > Import from Gut file**.

1.1.10 Export to Gut File

Open a “Gui” file in Network Editor. Then select the option from main menu **File > Export to Gut File**. This opens save as dialog box. Give the file name. The “*.Gut” file can be open in the notepad.

1.1.11 Convert to AutoCAD

Open a GUI and select the option **File > Convert to AutoCAD** which opens dialog box. Select the folder and type a file name which saves the file with .dxf extension. This new file can be opened in AutoCAD. All the elements will be converted to AutoCAD except the bmp present in the GUI file.

1.1.12 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.

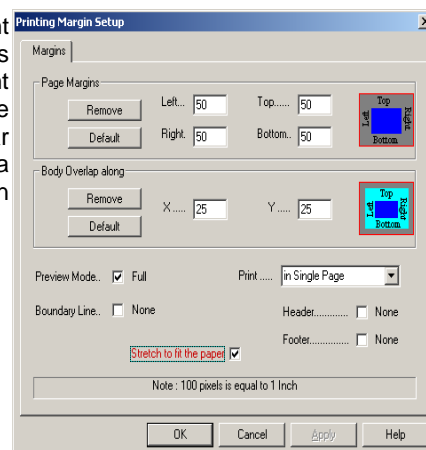
Shortcuts

Keys: CTRL+P Toolbar:



1.1.13 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.



1.1.14 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.

1.1.15 Print Info

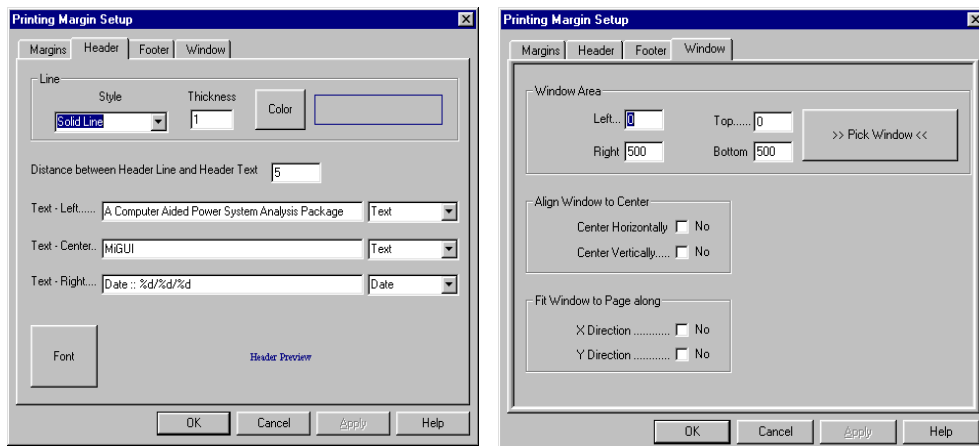
Use **"File->Print Info"** to set /remove the margin, border, header, footer, and single page, multiple page or custom view before printing. Use **Print Info** for better printing results.

The module supports printing and plotting of the drawings generated using Power System Network Editor. The module supports all the printer/plotter drivers installed in the system. The **Print set-up** dialog can be used to configure the printer and its settings. The properties are derived from the printer driver. The standard settings like paper size, paper orientations, printer scaling, quality of print, etc. can be configured. In addition to the standard settings, settings of margins, header and footer

information can be provided using print info property pages. The user can specify the left, top, right and bottom margins of the paper size. If the printing is in parts, then the user can specify the overlapping area for each page along X and Y direction.

The user can configure the style for the header and footer. The figure shows the header dialog page. The same properties hold good for the footer information also. The header consists of 3 text information which are used to display the information at left, centre and right of the margin. Each of the text can be Nothing / User specified text / Page number / Matrix Number / Date / Time. The user can configure the header line colour, thickness and style, header text font and header text colour. Similarly configuring can be done for footer

also by selecting footer dialog page. Apart from printing of the whole document either in parts or on a single page, the user can specify the portion of the diagram in the form of a window. The control parameters for the window will be shown in figure. The selected window can be placed in centre along X or/and Y direction. The selected portion can also be made to fit the page size along X or/and Y direction.



1.1.16 Exit

Use **File->Exit** to end your Power System Network Editor session. You can also use the Close command on the application Control menu. Power System Network Editor prompts you to save documents with unsaved changes.

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

Keys: ALT+F4


1.2 Edit Menu

Edit menu offers the following options

1.2.1 Cut

Use “**Edit->Cut**” to remove the currently selected data from the document and put it on the clipboard. This command is unavailable if there is no data currently selected.

Cutting data to the clipboard replaces the contents previously stored there.

Keys: CTRL+X Toolbar: 

1.2.2 Copy


Use “**Edit->Copy**” to copy the currently selected data of the document and put it on the clipboard. This command is unavailable if there is no data currently selected.

Keys: CTRL+C 

Copying data to the clipboard replaces the contents previously stored there.

1.2.3 Paste

Use “**Edit->Paste**” menu command to insert a copy of the clipboard contents at the insertion point. This command is unavailable if the clipboard is empty.

Keys: CTRL+V Toolbar: 

1.2.4 Paste with Connections

Use “**Edit->Paste with connections**” menu command to insert a copy of the clipboard contents at the insertion point with connections of power system elements. This command is unavailable if the clipboard is empty.

1.2.5 Paste Special

Use “**Edit->Paste Special**” menu command to insert a copy of the clipboard contents at the insertion point with connections of power system elements with new identity. This command is unavailable if the clipboard is empty.

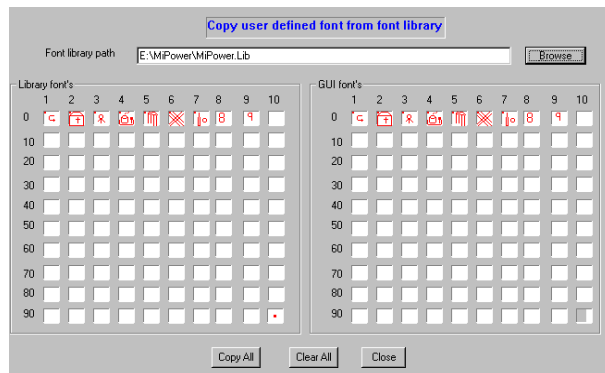
1.2.6 Copy Font Library

The option **Edit-> Copy Font Library** opens the dialog as shown below. Browse for the font library. Copy the font from Font's library to gui font.

Copy All: From font's library all will copy to GUI font.

Clear all: This option will clear the library To copy a single font from library-to-GUI:

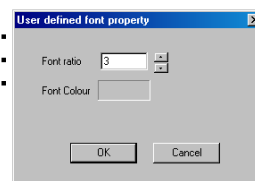
Browse for the path from where the library has to be copied



Select the font from the library by a single click and paste it to the GUI file click on the colour to change the font colour

1.2.7 Userdef Font Property

The option Edit->Font Property is used to change the selected font on the GUI. Double click on the colour



1.2.8 Userdef Font Shape

This option is selected to change the font shape. Any shape can be drawn with any colour

Colour: Colour can be changed

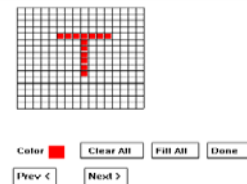
Clear All: clear the grid

Fill All: Fills the complete grid


Done: Double click will take the control to the Font Library where the font is stored.

Prev<: Take the control to the previous font no.


Next>: Take the control to the next font no.



1.2.9 Undo

Use this option to repeat the previous actions. You can use this button  from the tool bar.

1.2.10 Redo

Use this option when you did not want to undo an action. You can use this  button from the tool bar.

1.2.11 Undelete

Use “**Edit->Undelete**” menu command to undelete the last element deleted. The Undelete command traces to previous delete one at a time.

Keys: CTRL+U

1.2.12 Delete

Use “**Edit->Delete**” to remove the selected object(s) from the document. When an object is selected, tracker is drawn around the drawing object. Select delete option from the menu item

Edit->Delete or  from a toolbar button.

1.2.13 Line and Fill Style

Use “**Edit→Line and Fill Style**” or from the toolbar to edit the line and fill styles used to draw objects. The newly selected line/fill styles and colour can be previewed inside a preview box. The line and fill properties that are editable are -

Line style can be set to NULL for not showing a line around the object.

Line style can be set to other styles by clicking a mouse on the choice. The styles are valid only for a one point thickness.

Line thickness can be set from 1 to 50. The line thickness more than 1 is effective only for a solid line style.

Line color can be set to any of the RGB mixture value.

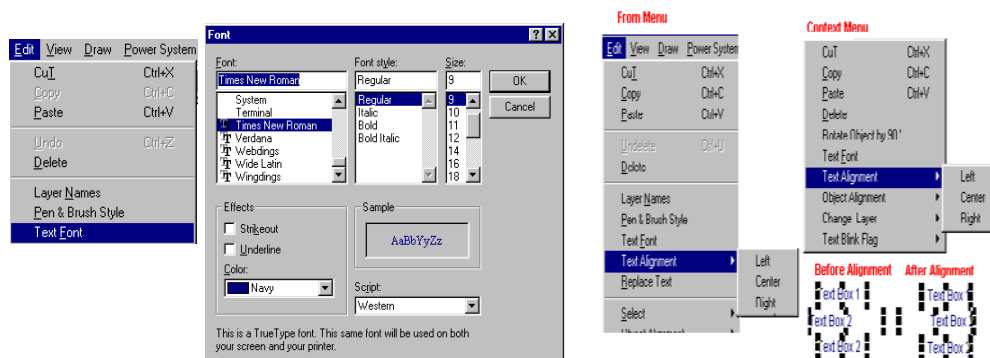
Fill style can be set to NULL for not filling the enclosed region.

Fill style can be set to other styles by clicking a mouse on the choice.

Fill color can be set to any of the RGB mixture value.

1.2.14 Text Font

Use “**Edit→Text Font**” to change the text font used to write the text inside a textbox. The same option can be selected through a context menu item Text Font. Add the textboxes whose text font are to be changed in to the selection list. Then select the text font. A general text font selection dialog box is shown to the user. Choose the options for text style, size, colour, etc... and select OK to accept the new font, CANCEL to ignore the selection. All the selected text boxes are redrawn with new text font, if OK is selected.



1.2.15 Text Alignment

Use “**Edit→Text Alignment**” to change the textbox alignment to either left-right-centre of the bounding rectangle. The same option can be selected through a context menu item Text Alignment

1.2.16 Replace Text

Use “**Edit→Replace Text**” to search and replace text. The

features are Replacement can be done only in a particular layer or

in all the layers Object string or display string

Move to the first

occurrence Move to the

last occurrence Find

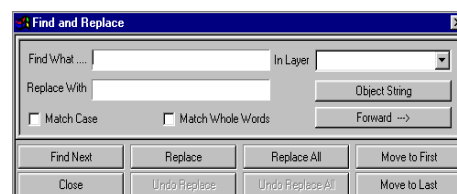
Next

Replace/

Replace all

Match case

Match whole words



1.2.17 Select

Use “Edit→Select” to select object(s) within a document to perform operations like Changing object(s) line and fill styles
Move object(s) to new location
Delete object(s) from a document

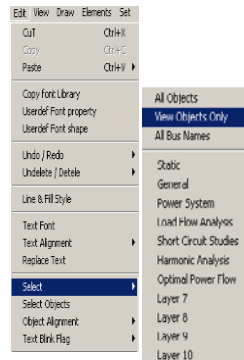
Resizing of object (applicable during only one Object selection)

When an object is selected, tracker is highlighted around the selected drawing object. To select one object at a time, click mouse LMB on desired object. The previously selected object is deselected and a new object, which is intersected with the mouse click point, is selected. If the mouse click position is not on any of the objects, the selection list is cleared.

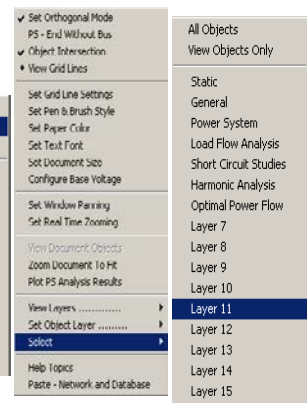
Objects can be selected in different ways like all objects, only view objects and layer-wise.

To make Multiple Object(s) selection, draw a tracker rectangle around the objects. The objects, which are intersected with the tracker rectangle, are selected and a tracker is shown around each of the selected objects. This can be done by holding SHIFT key and single clicking on the objects which are to be grouped. To deselect double click on the object holding the SHIFT key.

With Menu item



With Context Menu



1.2.18 Select Objects

This option can be used to globally select any object in GUI.

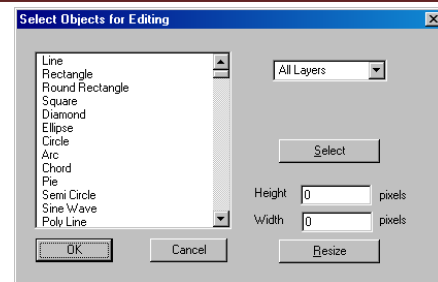
This opens a dialog box to modify the selected object's properties. Select object from the list box. Then click on

Select: This selects objects in the single line diagram

Height: Edit object's height in pixels

Width: Edit object's width in pixels.

Resize: Selected object's height and width will be modified.



1.2.19 Object Alignment

Use “Edit→Object Alignment” to change the object alignment to either left-right-top-bottom-horizontal-vertical. The option can be selected either from a menu item **Edit→Object Alignment→**. The same option can be selected through a context menu item **Edit→Object Alignment**.

Add the objects which are to be aligned in to the selection list, and then select the alignment choice; the objects are redrawn at new aligned location. The reference for the justification is taken as the object with largest size. The object can be aligned to either

Left - All objects left position is made equal to the largest object left.

Right - All object right position is made equal to the largest object right.

Top - All objects top position is made equal to the largest object top.

Bottom - All objects bottom position is made equal to the largest object bottom.

Horizontal - All objects centre is made equal to the largest object centre along Y axis.

Vertical - All objects centre is made equal to the largest object centre along X axis.

Equalise - All objects size is made equal to the largest object size.

With Menu item



With Context Menu



1.2.20 Text Blink Flag

Use “**Edit→Text Blink Flag→**” to provide a blinking effect. Add the textboxes whose blink flag are to be changed in to the selection list, and then select the text blink flag, All the selected text boxes are redrawn with new text blinking effect

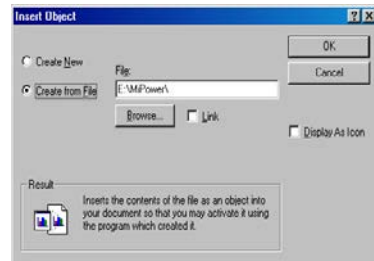
1.2.21 Insert New Object

Use this option to insert a new object into the document

Create New: Inserts a selected object type into the document

Display as icon: Inserted object will be displayed as an icon

Create from File: Browse for the file which is to be inserted.



The contents of the file is inserted as an object into the document so that you may activate it using the program which may create it

1.2.22 Link

The picture will be linked to the file so that changes to the file will be reflected in the document.

1.2.23 Restore

Use “**Edit→Restore**” to restore the deleted Power System Elements in the Power system Network Editor. The deleted elements will be dumped into Dumpster (which is analogous to “Recycle Bin” in windows). This option is used to restore the selected elements from Dumpster.

1.2.24 Empty Trash

Use “**Edit→Empty Trash**” to Clear or Empty the Contents of the Dumpster (recycle bin). All the deleted elements of the Power System Network Editor will be in the recycle bin

1.2.25 Group

Use “**Edit→Group**” to group the selected objects. Select the objects you want by holding down shift as you click each object.

1.2.26 Ungroup

Use “**Edit→Ungroup**” to ungroup the grouped objects.

1.2.27 Line Status

Use “**Edit→Line Status**” option to open or close the lines which are drawn from Draw Tool Box. Line Status has following opening options for lines

Open

Close

From end open

To end open

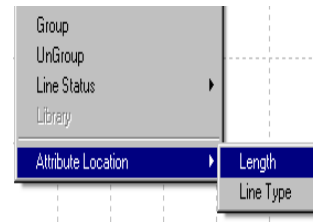
1.2.28 Library

This option can be selected from the main menu **Edit -> Library** or select the power system element (by holding Ctrl key and single click of Left Mouse Button) and right click will open the popup, in that select Library option . This opens the element library form.

1.2.29 Attribute Location

This option can be selected from the main menu **Edit -> Attribute Location**. Length and line Type attributes can be moved or relocated with this option.

To move the attribute of the particular element, select the element on GUI and then select **Edit > Attribute Location > Length/Line Type**. If length is selected on click of mouse on GUI length of the line will be moved.



1.3 View Menu

The View Menu offers the following options:

1.3.1 Tool Bar

Use “**View->Toolbar**” to show or hide the general-purpose toolbar. This option will be either ON/OFF. If this option is ON, the toolbar is shown at the top by default else the toolbar is hidden.

The toolbar is dockable, i.e., it can be placed at any location on the screen. The commands interfaced to the buttons placed on the toolbar from left to right order are –



New	Open a new document
Open	Open an existing document
Save	Save a current document
Cut	Remove the object from document and place it in a clip board
Copy	Copy the contents of selection to clipboard
Paste	Paste the clipboard contents at user specified location
Print	Print the current document
Undo	Repeat the last action
Redo	Redo operation
Set Brush	Set / Modify the line and brush styles to be used for drawing objects
Rotate	Rotate the selected object by 90 degrees
Delete	Delete the object from the document
Grid Lines	Show / Hide the horizontal and vertical grid lines
Real Time Zooming	Set the document zoom factor in real time
Orthogonal Mode	Set Ortho mode to draw the lines only horizontal / vertical.
Display Code	Control option to place a power system display code
Object Intersection	Toggle for selecting the objects, 0 – Enclose, 1 – Intersection.
PS (End with Bus / Without Bus)	If ON drawing ends with connection on the bus, if OFF drawing ends without connection on the bus
Locate a Bus	Search for a bus by its number or name
Find & Replace	Finds and replaces the specified text
Save snapshot	Stores the diagram status and results
Load snapshot	Opens the stored snapshot file
About	Shows the about dialog box
Context Sensitive Help	Selection for Context sensitive help
Energy connectivity	Select to View Energy Connectivity
Trash	Toggle the view between the trash and the document
Attributes	ON/OFF the Attributes shown on the SLD for lines and transformers
Set Active Contingency Schedule	Opens current Schedule and contingency dialog
Set Auto Save Option	Opens the Auto save option dialog
Full Screen	View of full screen by switching off the tool bars
View Element Property	On and off of element Property window

1.3.2 Drawing Toolbar

Use “**View→Drawing Toolbar**” 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. This toolbar is dockable, i.e., it can be placed at any location on the screen. 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

Place a textbox

User Define Object

Formula

1.3.3 Power System Element Toolbar

Use “**View→Power System Element Toolbar**” to show or hide the power system elements toolbar. This option will be either ON/OFF. If this option is ON, the toolbar is shown at right by default. Else the toolbar is hidden. The toolbar is non-dockable i.e., it can't be moved. The commands interfaced to the buttons placed on the toolbar from left to right order are –

SHUNT

Bus

Generator

Utility

Wind Generator

Motor

Load

Cyclic Load

Shunt Reactor

Shunt Capacitor

Solar PV Plant

SERIES

Transmission Line

2Winding Transformer

3Winding Transformer

4Winding Transformer

Series Resistor

Series Reactor

Series Capacitor

Bus Coupler – Open

Bus Coupler – Closed

ETA

Inst. Current Source

Impulse Current Source

RMS Current Source

Inst. Voltage Source

Impulse Voltage Source

RMS Voltage Source

Lightning Arrester

Delta Connected Load

Arc Fault

Vacuum CB Closed

Metal Oxide Varistor

Spark Gap

Shunt Resistor

HVDC

HVDC Rectifier

HVDC Inverter

DC Link

Filter

FACTS

Shunt Fact Device

Static VAR Comp

Unified Power Flow Controller

Thyristor Controlled Series Capacitor

Static Phase Shifter

PROTECTION

Current Transformer

Potential Transformer

CVT

Relay

Fuse

Voltmeter

Ammeter

Multimeter

Measurement Data

SYMBOL

Star

Star-Grounded

Delta

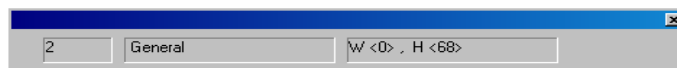
Ground

Neutral Grounding Resistor

Isolator – Open
 Isolator – Closed
 Breaker – Open
 Breaker – Closed
 LV Breaker
 Four Winding Transformer
 Dynamic Link
 Bounded Text
 Battery
 Power System Block

1.3.4 Object Dialog Bar

Use “**View→Object Dialog Bar**” option to show or hide the object property dialog bar. The option will be either ON/OFF. If the option is ON the dialog bar is shown at the bottom by default else the dialog bar is hidden. The dialog bar is dockable, i.e., it can be placed at any location on the screen. The contents of the dialog bar will be visible only when the object selection list is not empty. The dialog bar has 3 panes. The object information shown at different panes are -



First pane - Object ID given by the program, it indicates the serial number of the object count placed in the document. The long integer value maintained should be unique in a document.

Second pane - The layer name at which the object is placed is displayed.

Third pane - Currently selected object Width and Height in Pixels.

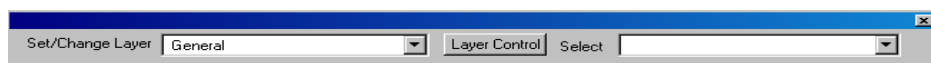
1.3.5 Contingency- Schedule Dialog bar.



The option is used to show or hide the Contingency-Schedule Dialog bar. The option will be either ON/OFF. If the option is ON the status bar is shown at the bottom by default else the Contingency-Schedule Dialog bar is hidden. This dialog bar is non-dockable, i.e., it can't be moved.

1.3.6 Layer Control Toolbar

Use “**View→Layer Control Toolbar**” to show or hide the status bar. This option will be either ON/OFF. If the option is ON, the layer control bar is shown at the top by default. Else the layer control bar is hidden. The status bar is non-dockable, i.e., it can't be moved.



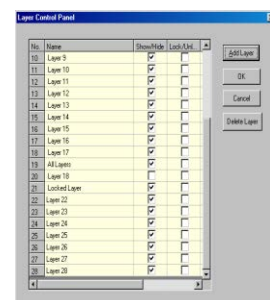
Set/Change layer: Selected objects can be changed to another layer.

Layer control: On selection of this button opens the layer control panel which is as shown below. Selected layers can be ON/OFF, locked/Unlocked

Add layer: On selection of this button adds one more layer to the layer control panel

Delete Layer: Deletes the selected layer from the layer control panel

Select: Selection of objects can be done from the selected drop down list.



1.3.7 Name Plate

Use “**View→Name Plate**” to insert a nameplate of standard format Requirements to use this option are:

Make sure your document size is fixed.

Create a text file in the following format:

Line 1: Logo path

Line 2: Company name Line1

Line 3: Company name Line2

Line 4: Job number

Line 5: Drawing Number

After selecting this option “Nameplate”, Power System Network Editor automatically inserts borderlines and few default texts (like Description, Approved, Reviewed, Job No, and Dwg. No, Rev, Date etc.) and then “File Open” dialog box appears in which you have to select the text file in which you have specified above lines of data. After selecting the text file, program inserts the text other than the Logo path. It inserts Logo into the document if Logo is found at specified path. If the Logo is not found at the specified path, a message is popped-up reporting to check the path and the Logo is not inserted. All the data read from text files are placed in Layer14.

1.3.8 Status Bar

Use “**View→Status bar**” to show or hide the status bar. This option will be either ON/OFF. If the option is ON, the status bar is shown at the bottom by default. Else the status bar is hidden. The status bar is non-dockable, i.e., it can't be moved. The status bar has 6 panes. The information shown at different panes are -

First pane - Menu options/toolbar status and other status information.

Second pane - Current document, scale factor. By default it is 1.0 i.e., 1: 1 zoom.

Third pane - Mouse cursor X and Y position on screen in pixels.

Fourth pane - Current rotation angle in degree, when object selection list is empty. If the object is selected, selected object angle is displayed.

Fifth pane - If Orthogonal mode is On, Ortho is displayed. Else blank is displayed.

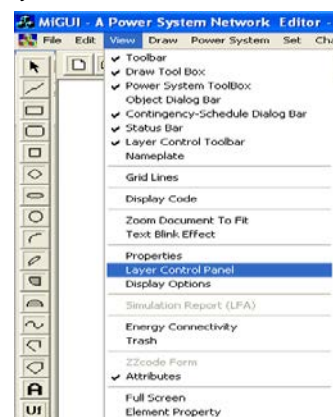
Sixth pane - If Caps lock is On, Cap is displayed. Else blank is displayed.

1.3.9 Layer Control Panel


Use “**View→Layer**” to view object(s) within a document which are all user specified layer(s). By default all the layer view flags are set to ON, so that all objects present in different layers can be viewed simultaneously. To hide the objects present in a particular layer, turn off the view flag for a particular layer.

For example to hide the objects in General layer.

Select the menu option **View→Layer→General** to deactivate the view flag for the General layer. The objects present in the General layer are not drawn during next paint message.



1.3.10 Grid Lines

Use “**View→Grid Lines**” or  toolbar to show the grid lines along X and Y direction and X axis and Y axis centre lines. The grid lines are available only for view and not for printing. The flag can be turned ON/OFF. Turn ON the Flag to view the grid lines. The distance between grid lines along X and Y directions can be set independently. The grid line can be shown either with a dot line / dash line style and colour can be set using the menu option **Set→Gridlines**.

1.3.11 Display Code

When the user views the power system analysis results for a particular case, the display code (ZZLPXX-XX.) is replaced by a numerical value of the analysis results. Use “**View→Display Code**” to view back the code text of each of the display codes present in the system. Once this option is selected all the numerical values are replaced with display code text.

1.3.12 Zoom Document to Fit

Select “**View→Zoom Document to Fit**” to view the complete diagram on a single page

1.3.13 Text Blink Effect

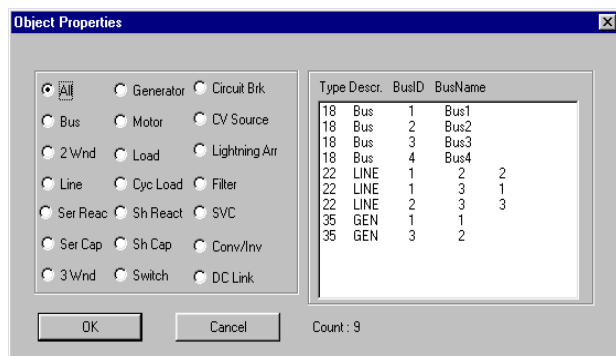
Select “**View→Text Blink Effect**” to view the blinking effect for the textbox whose mode is set for blinking. The textboxes which are set for blinking mode starts blinking at the frequency depending on the time set for the timer through **Set→Text blink Rate**.

1.3.14 Properties

Use “**View → Properties**” to find and select an element in the single line diagram

A dialog box as shown below appears

From the list box, select the element and click OK. The element is located and selected.



1.3.15 Layer Control Panel

Select “**View→ Layer Control Panel**” which opens the layer control panel. Selected layers can be ON/OFF. For details refer Layer Control Tool Bar.

1.3.16 Display Options

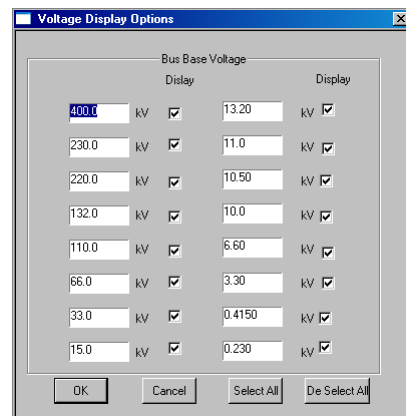
Voltage levels can be ON/OFF by checking display check box.

OK: Saves the changes and displayed on the document.

Cancel: Ignores the changes to display options

Select All: Selects all the base voltages and all buses displayed on the document.

De Select All: De selects all the base voltages and buses will not be displayed on the document.



1.3.17 Simulation Report (LFA)

Select “**View→Simulation Report (LFA)**” to see the load flow results during dynamic simulation of load flow analysis.

1.3.18 Energy Connectivity

Select “**View→Energy Connectivity**” to check Continuity of the Single Line Diagram. The parts connected and De-Energized appear in different colours.

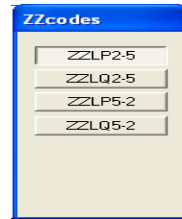
1.3.19 Trash

Select “View→Trash” to check the contents of dumpster (recycle bin). All the deleted elements of power system network editor will be in trash.

1.3.20 ZZ Code Form

This option is used to View the display code associated with any power system element or other general drawing tools with which a power system elements associated.

The display code will be displayed in a form and the code can be placed on the GUI by clicking on the corresponding code and placing it on the GUI.




1.3.21 Attributes

This option can be selected from the main menu **View > Attributes**. On selection of this, Length and Line Type will be displayed on the single line diagram if the GUI is connected with the database.

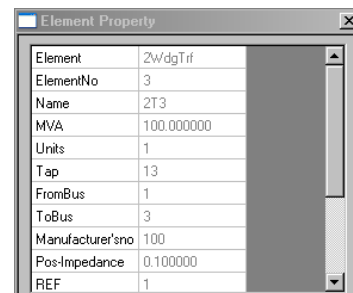
1.3.22 Full Screen

Select “**View→ Full Screen**” With this option SLD is viewed in full screen with more drawing area. Tool bars will disappear.

This option can be selected from the tool bar  “Full Screen”

1.3.23 Element Property

Select “**View→ Element Property**” This option can be selected from toolbar View element property. For the database connected GUI or network by default this option is enabled. Click on Power system element will show the element property window. User can place this window on any part of the screen.




1.4 Draw Menu

Draw menu offers the following options:

1.4.1 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.)

1.4.2 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 points 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.

Procedure:

Set the object layer from the menu item **Set→Object Layer** to which line is to be placed. Set the orthogonal mode On/Off

Select the Option from a menu item **Draw→Line** or from a


Toolbar Place the cursor at desired location, click mouse LMB

Holding down the mouse LMB move the cursor to new location. As the cursor is dragged, the line is redrawn from selected starting point to end point as a preview of line.


Release the mouse LMB to accept line.

Use the resize handles shown outside for resizing


1.4.3 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 points 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.


1.4.4 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.


1.4.5 Square

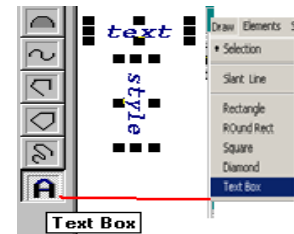
Use “**Draw→Square**” OR  from the Draw toolbar on the LHS of the screen. This option is used to draw a square between start point to end point and to fit inside a rectangle formed by start point and end point. The square can be resized by dragging a handle on the rectangle box. The handles are highlighted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

1.4.6 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.

1.4.7 Text Box

Use “**Draw→Text Box**” OR  from Draw toolbar on the LHS of the screen. This option is used to place a textbox at a user-selected point. The textbox will be resized automatically as the user inserts a character into the textbox string. The handles are highlighted whenever an object is selected for resizing or moving. The text is aligned to the vertical centre with respect to the textbox rectangle. To modify the textbox string, select only one textbox for modification, use backspace key to delete the last character from a string.



Procedure:

Set the object layer from a menu item **Set→Object Layer** to which textbox has to be placed. Select the Option from a menu item **Draw→Text Box** or from a Toolbar

Indicate the textbox location by clicking mouse LMB

Key in the character string to display inside the textbox Use Backspace key to modify/delete the character.

Click mouse RMB to cancel the option.

Use the resize handles shown outside for resizing Text Box Alignment

The textbox can be aligned with respect to its border, the alignment facilities

are Left - selected textbox rectangle left positions are made same

Right - selected textbox rectangle right positions are made same

Top - selected textbox rectangle top positions are made same

Bottom - selected textbox rectangle bottom positions are made


same

Horizontal - selected textbox rectangles are justified horizontally with respect to


center Vertical - selected textbox rectangles are justified vertically with respect to

center Equalise - all textbox rectangles are made equal to the first object


1.4.8 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.


1.4.9 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.


1.4.10 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.


1.4.11 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.


1.4.12 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.


1.4.13 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.

1.4.14 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.

1.4.15 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.

1.4.16 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.

Procedure:

Set the object layer from a menu item **Set→Object Layer** to which polygon has to be placed. Set the orthogonal mode On/Off

Select the Option from a menu item **Draw→Polygon** or from a Toolbar

Place the cursor at desired location, click mouse LMB

Move the cursor to new location. As the cursor is dragged, a line is redrawn from start point to new point as a preview of polygon.

Click mouse LMB to accept a point for polygon.

Double click mouse LMB to complete the polygon.

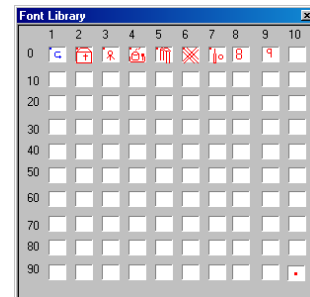
Click mouse RMB to erase the incomplete polygon.

Use the resize handles shown outside for resizing

1.4.17 User Def Font

On selection of this, opens the font Library form as shown below
Double click on any one cell which opens 16x16 grid in which user can draw any shape as shown in the figure, which will be saved in the font library.

For Details Refer Section 2.2.8 User Def Font shape



1.4.18 Formula

This option is used to do mathematical operations like, addition, subtraction, multiplication, division of two or more zzcodes. When plotting load flow analysis these are replaced by its equivalent values. The mathematical formulas supported are

add

subtract

multiply

divide

sin

cos

tan

asin

acos

atan

exp

pow

In
log
sort

1.5 Elements Menu

Elements menu offers following options

SHUNT



Shunt Elements

- Bus
- Generator
- Utility
- Wind Generator
- Motor
- Load
- Cyclic Load
- Shunt Reactor
- Shunt Capacitor
- Solar PV Plant

Drawing – Select a shunt element and double click on the selected bus. If the element is connected, the display code appears.

Rotation - Select an object, click the rotate button. Object is rotated in the steps of 90 degrees. The point connected with a bus is not disturbed during rotation.

Resizing - Use the two points shown around for resizing. Increase the distance between the two points to inflate object symbol OR decrease the distance between two points to deflate object symbol.

Moving - If the orthogonal mode is ON, object can be moved along X or Y direction only. Turn OFF Orthogonal Mode to move in any direction. If the bus is placed vertical and the object is placed horizontal, the object can be moved along and up to the bus top/bottom with Ortho ON. If the bus is placed horizontal and the object is placed vertical, the object can be moved along and up to the bus left/right with Ortho ON. If the Ortho is OFF, the object can be placed at any location, the connecting line to the bus is inclined.

Place - If the user tries to place a Shunt element not on a bus, an error message is popped up and the shunt element is not accepted

Resize - The Shunt element can be resized at any time by dragging the handle.

1.5.1 Bus



Use “**Elements->Shunt Elements->Bus**” OR from Power System toolbar on the RHS of the screen. This option is used to draw a bus between start point to end point. The bus is drawn either horizontal or vertical depending on the difference between the down point and mouse point is moved along X or Y direction. The bus can be resized at any time by dragging a handle shown on the two ends of a bus. The handles are highlighted whenever an object is selected for resizing or moving. To select a bus, click mouse LMB on it. If the Orthogonal flag is ON, the bus can be moved along X or Y direction only, Orthogonal flag is OFF to move in any direction.

Procedure:

Set the object layer from a menu item **Set→Object Layer** to where bus has to be placed. Click on the bus icon. Voltage selection tool bar appears.

Select the voltage level for bus.

Place the cursor at desired location, click mouse LMB.

Holding down the mouse LMB move the cursor to new location. As the cursor is dragged, the bus is redrawn from down point to new point as a preview of bus.

Release the mouse LMB to accept bus.

Use the resize handles shown outside for resizing

Note:

When a bus is selected for moving the power system elements connections to a bus are also selected for moving.

To select a Bus alone, click mouse LMB on a bus by holding down CTRL key.

1.5.2 Generator

Use “**Elements→Shunt Elements→Generator**” OR from Power System toolbar on the RHS of the screen to draw a generator. The handles are highlighted whenever an object is selected for resizing or moving. To select a generator, click mouse LMB on it. If the display code flag is ON, the code to show generator real and reactive power flows are placed in line with the generator. Place the code by moving it to the desired location if required. If the user tries to place a generator other than on a bus, an error message is popped up and generator connection is not accepted.

1.5.3 Utility

Use “**Elements →Shunt Elements→Utility**” OR from Power System toolbar on the RHS of the screen to draw a Utility. The handles are highlighted whenever an object is selected for resizing or moving. To select a Utility, click mouse LMB on it. If the display code flag is ON, the code to show Utility real and reactive power flows are placed in line with Utility. Place the code by moving it to the desired location if required. If the user tries to place a Utility other than on a bus, an error message is popped up and Utility connection is not accepted.

1.5.4 Wind Generator

Use “**Elements →Shunt Elements→Wind Generator**” OR from Power System toolbar on the RHS of the screen to draw a wind generator. The handles are highlighted whenever an object is selected for resizing or moving. To select a wind generator, click mouse LMB on it. If the display code flag is ON, the code to show wind generator real and reactive power flows are placed in line with the wind generator. Place the code by moving it to the desired location if required. If the user tries to place a wind generator other than on a bus, an error message is popped up and wind generator connection is not accepted.


1.5.5 Motor

Use “**Elements →Shunt Elements→ Motor**” OR from Power System toolbar on the RHS of the screen to draw an Induction motor. The handles are highlighted whenever an object is selected for resizing or moving. To select a motor, click mouse LMB on it. If the display code flag is ON, the code to show motor real and reactive power flows are placed in line with the motor. Place the code by moving it to the desired location if required. If the user tries to place a motor other than on a bus, an error message is popped up and motor connection is not accepted.


1.5.6 Load

Use “**Elements →Shunt Elements→ Load**” OR from Power System toolbar on the RHS of the screen to draw a load. The handles are highlighted whenever an object is selected for resizing or moving. To select a load, click mouse LMB on it. If the display code flag is ON, the codes to show load real and reactive power flows are placed in line with the load. Place the code by moving it to the desired location if required. If the user tries to place a load other than on a bus, an error message is popped up and load connection is not accepted.


1.5.7 Cyclic Load

Use “**Elements →Shunt Elements→Cyclic Load**” OR  from Power System toolbar on the RHS of the screen to draw a cyclic load. The handles are highlighted whenever an object is selected for resizing or moving. To select a cyclic load, click mouse LMB on it. If the display code flag is ON, the code to show cyclic load real and reactive power flows are placed in line with the cyclic load. Place the code by moving it to the desired location if required. If the user tries to place a cyclic load other than on a bus, an error message is popped up and cyclic load connection is not accepted.


1.5.8 Shunt Reactor

Use “**Elements →Shunt Elements→Shunt Reactor**” OR from  Power System toolbar on the RHS of the screen to draw a shunt reactor. The handles are highlighted whenever the object is selected for resizing or moving. To select a reactor, click mouse LMB on it. If the display code flag is ON, the code to show reactor real and reactive power flows are placed in line with the reactor. Place the code by moving it to the desired location if required. If the user tries to place a reactor other than on a bus, an error message is popped up and reactor connection is not accepted.

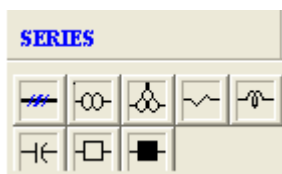
1.5.9 Shunt Capacitor

Use “**Elements →Shunt Elements→Shunt Capacitor**” OR  from Power System toolbar on the RHS of the screen to draw a shunt capacitor. The handles are highlighted whenever the object is selected for resizing or moving. To select a capacitor, click mouse LMB on it. If the display code flag is ON, the code to show capacitor real and reactive power flows are placed in line with the capacitor. Place the code by moving it to the desired location if required. If the user tries to place a capacitor other than on a bus, an error message is popped up and capacitor connection is not accepted.

1.5.10 Solar PV

Use “**Elements →Shunt Elements→Solar PV**” OR  from Power System toolbar on the RHS of the screen to draw a solar PV generator. The handles are highlighted whenever an object is selected for resizing or moving. To select a wind generator, click mouse LMB on it. If the display code flag is ON, the code to show wind generator real and reactive power flows are placed in line with the solar PV generator. Place the code by moving it to the desired location if required. If the user tries to place a solar PV generator other than on a bus, an error message is popped up and solar PV generator connection is not accepted.

SERIES



Series Elements

- Transmission Line
- Two winding Transformer
- Three winding Transformer
- Series Resistor
- Series Reactor
- Series Capacitor
- Bus Coupler - Open
- Bus Coupler - Closed

Drawing – Drop the series element in-between the buses. Automatically a connecting line starts following the mouse pointer. Move the mouse on to a bus and double click to connect From side connection. Another connecting line automatically starts towards the To side connection. Drag the mouse towards the TO side connection and double click on the bus to establish the TO side

connection. If connection is accepted, the **Display Code** appears. Keeping the orthogonal mode ON, connecting line segments can be drawn either horizontal or vertical only. Orthogonal mode is OFF to draw a connecting line inclined at any angle.

Rotation – Select the object and click the rotate button. Object is rotated in steps of 90 degrees. Connecting points to bus remain same.


Moving - If the orthogonal mode is ON, line can be moved along X or Y direction only. Orthogonal mode is OFF to move in any direction. When a line is moved, the segment points are also moved by the displaced amount, except the points, which are lying, on the buses at both ends.

Editing - If the orthogonal mode is ON, the point touched for moving is aligned with respect to previous point. The alignment can be along X or Y direction depending on the distance between the two points along X or Y direction.


Connectivity - If the user tries to place a series element, connected to a same bus or elements other than transformer on to a different voltage level, an error message is popped up and connection is not accepted.

Resize - The series element can be resized at any time by dragging a handle.

1.5.11 Transmission Line

Use “**Elements →Series Elements→Transmission Line**” OR  from Power System toolbar on the RHS of the screen to draw a transmission line between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a line, click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show line from end and to end flows are placed beside the line. Move the display code to desired location if required.

1.5.12 Two Winding Transformer

Use “**Elements →Series Elements→Two Winding Transformer**” OR  from Power System toolbar on the RHS of the screen to draw a two winding transformer between two different buses. The transformer can be resized at any time by dragging a handle shown at the two edges of a transformer. The handles highlight whenever an object is selected for resizing or moving. To select a transformer, click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show transformer from end and to end flows and transformer tap value are placed beside the transformer. Place the code by moving it to the desired location if required. If the user tries to place a transformer connected to a same bus, an error message is popped up and connection is not accepted

Procedure:

Set the object layer from a menu item **Set→Object Layer** to which transformer has to be

placed. Set the orthogonal mode On/Off, so as to draw horizontal / vertical segments.

Set the display code On/Off, so as to place display code or not.

Set the transformer orientation angle with rotate button. The current object angle can be viewed on the status bar pane.

Select the option from the menu item **Power system→Series Elements→2 Winding Transformer** or from the Toolbar

Place the cursor at desired location, click mouse LMB. The transformer is drawn at a specified location with a default size and orientation. The connection starts with From end side.

Move the mouse to new location. As the cursor is dragged a line is shown which connects the transformer from end side and the mouse point as a preview of segment. Click mouse LMB to accept a segment.

Repeat the above procedure to establish number of segments

When the cursor is moved near the bus, the bus is highlighted

Place mouse cursor on the Bus and double click mouse LMB to accept from end bus. The From end bus should be a high voltage bus.

If double clicked position is on a bus, the From end connection is accepted and further connection is transferred to 'To End' side. Else an error message is shown to user and the double clicked point is considered as a segment.

The procedure followed for From end side should be followed for To end connection also.

If the To end bus indicated is same as From end bus, again the connection is not accepted and an error message is shown to the user.

If the display code is ON, codes are placed adjacent to transformer.

Use the resize handles for resizing / adjusting the segment(s) position.

Note:

No limitation on number of segments used on either side of a transformer.


Click mouse RMB to ignore the drawing before establishing both end connections.

No association exists between the display codes and power system elements.

The points connected with a bus can be moved only along the bus.

If the database is connected to the GUI, two winding transformer will be drawn with winding configuration

1.5.13 Three Winding Transformer

Use “**Elements → Series Elements → Three Winding Transformer**” OR  from Power System toolbar on the RHS of the screen to draw a three winding transformer between three different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a transformer click mouse LMB on it. Place the display code with the help of textbox to display the power system study results. If the user tries to place a transformer connected between same buses, an error message is popped up and connection is not accepted.

If the database is connected to the GUI, three winding transformer will be drawn with winding configuration.

Procedure:

Set the object layer from a menu item **Set→Object Layer** to which transformer is to be placed. Set the orthogonal mode On/Off, so as to draw horizontal / vertical segments.

Set the display code On/Off, so as to place the display code or not.

Set the transformer orientation angle with the help of the rotate button, the current angle can be viewed on a status bar pane.

Select the option from a menu item **Power system→3 Winding Transformer** or from a Toolbar

Place the cursor at desired location. Click mouse LMB. The transformer is drawn at a specified location with a default size and orientation. The connection starts with primary end.

Move the mouse to new location. As the cursor is dragged, a line is shown which connects the transformer primary end side and the mouse point as a preview of segment. Click mouse LMB to accept the segment.

Repeat the above procedure to establish number of segments

Place the mouse cursor on a Bus and double click mouse LMB to accept the primary bus. The primary bus should be a high voltage bus.

If double clicked position is on a bus, the primary end connection is accepted and further connection is transferred to secondary side. Else an error message is shown to user and the double clicked point is considered as a segment.


The procedure followed for primary end side should be followed for secondary and tertiary end connections also.

If the secondary end bus indicated is same as primary end bus, again the connection is not accepted and an error message is shown to the user.


If the tertiary end bus indicated is same as primary end bus or secondary end bus, the connection is not accepted and an error message is shown to the user.

Use the resize handles shown outside for resizing / adjusting the segment(s) position.


1.5.14 Series Resistor

Use “**Elements →Series Elements→ Resistor**” OR  from Power System toolbar on the RHS of the screen to draw a series resistor between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a resistor click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show resistor From end and To end flows are placed beside the resistor. Move the display code to desired location if required.


1.5.15 Series Reactor

Use “**Elements →Series Elements→ Reactor**” OR from  Power System toolbar on the RHS of the screen to draw a series reactor between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a reactor click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show reactor From end and To end flows are placed beside the reactor. Move the display code to desired location if required.


1.5.16 Series Capacitor

Use “**Elements →Series Elements→ Capacitor**” OR from  Power System toolbar on the RHS of the screen to draw a series capacitor between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a capacitor click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show capacitor From end and To end flows are placed beside the capacitor. Move the display code to desired location if required.

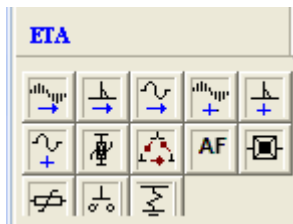
1.5.17 Bus Coupler Open

Use “**Elements →Series Elements→Bus Coupler Open**” OR  from Power System toolbar on the RHS of the screen to draw a bus coupler with open status between two different buses. The coupler can be resized at any time by dragging the handle shown at the two edges of a coupler. The handles are highlighted whenever an object is selected for resizing or moving. To select a coupler, click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show coupler from end and to end power flows are placed beside the coupler. Place the code by moving it to the desired location if required. If the user tries to place a coupler connected to a same bus, an error message is popped up and connection is not accepted.

1.5.18 Bus Coupler Closed

Use “**Elements →Series Elements→Bus Coupler Closed**” OR  from Power System toolbar on the RHS of the screen to draw a bus coupler with closed status between two different buses. The coupler can be resized at any time by dragging a handle shown at the two edges of a coupler. The handles are highlighted whenever an object is selected for resizing or moving. To select a coupler click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show coupler from end and to end flows are placed beside the coupler. Place the code by moving it to the desired location if required. If the user tries to place a coupler connected to a same bus, an error message is popped up and connection is not accepted.

ETA




Electromagnetic transient analysis (ETA) elements


- Instantaneous current source
- Impulse current source
- RMS current source
- Instantaneous voltage source
- Impulse voltage source
- RMS voltage source
- Lightning arrestor
- Delta connected load
- Arc Fault
- Vacuum circuit breaker - open

- Vacuum circuit breaker – closed
- Metal Oxide Varistor
- Spark Gap
- Shunt Resistor


1.5.19 Instantaneous Current Source

Use “**Elements →ETA elements→Instantaneous Current Source**” OR  from Power System toolbar on the RHS of the screen to draw an instantaneous current source. Double click on the selected bus. The current source can be resized at any time by dragging the handle shown at the two edges of a current source. The handles are highlighted whenever an object is selected for resizing or moving. To select a current source, click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and current source connection is not accepted.


1.5.20 Impulse Current Source

Use “**Elements →ETA Elements→Impulse Current Source**” OR  from power System toolbar on the RHS of the screen to draw an impulse current source. The current source can be resized at any time by dragging a handle shown at the two edges of a current source. The handles are highlighted whenever an object is selected for resizing or moving. To select a current source, click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and current source connection is not accepted.


1.5.21 RMS Current Source

Use “**Elements →ETA Elements→RMS Current Source**” OR  from Power System toolbar on the RHS of the screen to draw a RMS current source. The current source can be resized at any time by dragging a handle shown at the two edges of a current source. The handles are highlighted whenever an object is selected for resizing or moving. To select a current source click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and current source connection is not accepted.


1.5.22 Instantaneous Voltage Source

Use “**Elements →ETA Elements→Instantaneous Voltage Source**” OR  from Power System toolbar on the RHS of the screen to draw an Instantaneous Voltage source. The voltage source can be resized at any time by dragging a handle shown at the two edges of a voltage source. The handles are highlighted whenever an object is selected for resizing or moving. To select a voltage source click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and voltage source connection is not accepted.

1.5.23 Impulse Voltage Source

Use “**Elements →ETA Elements→Impulse Voltage Source**” OR  from Power System toolbar on the RHS of the screen to draw an Impulse Voltage source. The voltage source can be resized at any time by dragging a handle shown at the two edges of a voltage source. The handles are highlighted whenever an object is selected for resizing or moving. To select a voltage source click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and voltage source connection is not accepted.

1.5.24 RMS Voltage Source

Use “**Elements →ETA Elements→RMS Voltage Source**” OR  from Power System toolbar on the RHS of the screen to draw an RMS Voltage source. The voltage source can be resized at any time by dragging a handle shown at the two edges of a voltage source. The handles are highlighted whenever an object is selected for resizing or moving. To select a voltage source click mouse LMB on it. If the user tries to place a current source other than on a bus, an error message is popped up and voltage source connection is not accepted.

1.5.25 Lightning Arrestor



Use “**Elements →ETA Elements→Lightning Arrestor**” OR from Power System toolbar on the RHS of the screen to draw a lightning arrestor (LAR). The LAR can be resized at any time by dragging a handle shown at the two edges of a LAR. The handles are highlighted whenever an object is selected for resizing or moving. To select a LAR, click mouse LMB on it. If the user tries to place a LAR other than on a bus, an error message is popped up and LAR connection is not accepted.

1.5.26 Delta Connected Load



Use “**Elements →ETA Elements→Delta Connected Load**” OR from Power System toolbar on the RHS of the screen to draw a delta connected load. The load can be resized at any time by dragging a handle shown at the two edges of a load. The handles are highlighted whenever an object is selected for resizing or moving. To select a load click mouse LMB on it. If the user tries to place a load other than on a bus, an error message is popped up and load is not accepted.

1.5.27 Arc Fault



Use “**Elements →ETA Elements→Arc Fault**” OR from Power System toolbar on the RHS of the screen to draw an Arc Fault. The handles are highlighted whenever an object is selected for resizing or moving. To select an Arc Fault, click mouse LMB on it. If the display code flag is ON, the code to show Arc fault real and reactive power flows are placed in line with the Arc fault. Place the code by moving it to the desired location if required. If the user tries to place an Arc Fault other than on a bus, an error message is popped up and Arc Fault connection is not accepted.

1.5.28 Vacuum Circuit Breaker-open



Use “**Elements →ETA Elements→Vacuum Circuit Breaker-open**” OR from Power System toolbar on the RHS of the screen to draw a vacuum circuit breaker (VCB) with open status. The VCB can be resized at any time by dragging a handle shown at the two edges of a VCB. The handles are highlighted whenever an object is selected for resizing or moving. To select a VCB, click mouse LMB on it. If the user tries to place a VCB connected to a same bus, an error message is popped up and connection is not accepted. Switching - Select a VCB. Click the right mouse button with mouse cursor on the VCB. Select **Status→Close**, to close VCB. Else **Status→Open**, to open VCB. The same option is available with a menu item **Change→Status→Open/Close**

1.5.29 Vacuum Circuit Breaker-closed



Use “**Elements →ETA Elements→Vacuum Circuit Breaker-closed**” OR from Power System toolbar on the RHS of the screen to draw a vacuum circuit breaker (VCB) with closed status. The VCB can be resized at any time by dragging a handle shown at the two edges of a VCB. The handles are highlighted whenever an object is selected for resizing or moving. To select a VCB click mouse LMB on it. If the user tries to place a VCB connected to the same bus, an error message is popped up and the connection is not accepted

1.5.30 Metal Oxide Varistor



Use “**Elements →ETA Element→MOV**” OR from Power System toolbar on the RHS of the screen to draw a MOV between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a MOV click mouse LMB on it. When both end connections are accepted.


1.5.31 Spark Gap



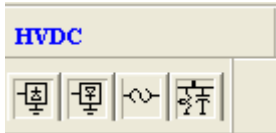
Use “**Elements →ETA Element→Spark Gap**” OR from Power System toolbar on the RHS of the screen to draw a Spark Gap between two different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a Spark Gap click mouse LMB on it. When

both end connections are accepted.

1.5.32 Shunt Resistor

Use “**Elements →ETA Elements→Shunt Resistor**” OR from  Power System toolbar on the RHS of the screen to draw a shunt resistor. The handles are highlighted whenever the object is selected for resizing or moving. To select a resistor, click mouse LMB on it. If the display code flag is ON, the code to show resistor real and reactive power flows are placed in line with the resistor. Place the code by moving it to the desired location if required.


HVDC



HVDC Elements


- HVDC Rectifier
- HVDC Inverter
- DC Link
- Filter

1.5.33 HVDC Rectifier

Use “**Elements →HVDC Elements→HVDC Rectifier**” OR from  Power System toolbar on the RHS of the screen to draw a HVDC rectifier. The rectifier can be resized at any time by dragging a handle shown at the two edges of the rectifier. The handles are highlighted whenever an object is selected for resizing or moving. To select a rectifier, click mouse LMB on it. If the user tries to place a rectifier not on a bus, an error message is popped up and rectifier is not accepted.


Switching - Select a rectifier. Select the option from the menu item as **Edit→Change HVDC Element→Inverter** or the context menu item as **Change HVDC Element→Inverter** to change from rectifier to inverter and vice-versa. The option is valid only for HVDC elements.

1.5.34 HVDC Inverter

Use “**Elements →HVDC Elements→HVDC Inverter**” OR from  Power System toolbar on the RHS of the screen to draw a HVDC inverter. The inverter can be resized at any time by dragging a handle shown at the two edges of inverter. The handles are highlighted whenever an object is selected for resizing or moving. To select an inverter, click mouse LMB on it. If the user tries to place an inverter not on a bus, an error message is popped up and inverter is not accepted.

Switching - Select an inverter. Select the option from the menu item as **Edit→Change HVDC Element→rectifier** or the context menu item as **Change HVDC Element→rectifier** to change from inverter to rectifier and vice-versa. The option is valid only for HVDC elements.

1.5.35 DC Link

Use “**Elements →HVDC Elements→DC Link**” OR from  Power System toolbar on the RHS of the screen to draw a DC Link between two HVDC convertor stations. The link can be resized at any time by dragging a handle shown at the two edges of a link. The handles are highlighted whenever an object is selected for resizing or moving. To select a link, click mouse LMB on it. When both the end connections are accepted and if the display code flag is ON, the code to show link from end and to end flows are placed beside the link. Place the code by moving it to the desired location if required. If the user tries to place a link connected to same HVDC convertor station, an error message is popped up and connection is not accepted.

Procedure:

Set the object layer from the menu item **Set→Object Layer** to which DC link is to be placed. Set the orthogonal mode On/Off, so as to draw horizontal / vertical segments.

Set the display code On/Off, so as to place the code or not.

Set the link orientation angle with a rotate button. The current object angle can be viewed on a status bar pane.

Select the option from a menu item **Power system→HVDC Elements→DC Link** or from a power system Toolbar

Place the cursor at desired location, click mouse LMB. The link is drawn at that location with default size and orientation. The connection starts with From end side.

Move the mouse to new location. As the cursor is dragged, a line is shown which connects the link From end side and the mouse point as a preview of segment. Click mouse LMB to accept a segment.

Repeat the above step to establish number of segments

Place a mouse cursor on a HVDC rectifier/Inverter and the double click mouse LMB to accept the from end connection.

If double clicked position is on a HVDC rectifier /Inverter, the From end connection is accepted and further connection is transferred to To end side. Else an error message is shown to user and the double clicked point is considered as a segment.

The procedure followed for From end side connection should be followed for to end connection also.

If the To end HVDC equipment indicated is same as from end HVDC equipment, again the connection is not accepted and an error message is popped up.

If the display code is ON, codes are placed adjacent to DC Link.

Use the resize handles shown outside for resizing / adjusting the segment(s) position.

Note:


No limitation on number of segments used on either side of a DC Link.

Click mouse RMB to ignore the drawing before establishing both end connections.

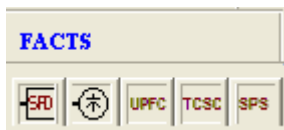
No association exists between the display codes and power system elements.

The points connected with a HVDC equipment can be moved only along HVDC rectifier /Inverter.

1.5.36 Filter

Use “**Elements→HVDC Element→Filter**” OR  from Power System toolbar on the RHS of the screen to draw a filter connected to a bus. The filter can be resized at any time by dragging the handle shown at the two edges of the filter. The handles are highlighted whenever an object is selected for resizing or moving. To select a filter click mouse LMB on it. If the display code flag is ON, the code to show filter real and reactive power flows are placed in line with the filter. Place the code by moving it to the desired location, if required. If the user tries to place a filter other than on a bus, an error message is popped up and filter connection is not accepted.


FACTS



FACTS

- Shunt FACTS Device (SFD)
- Static VAR Compensator (SVC)
- Unified Power Flow controller (UPFC)
- Thyristor controlled series capacitor (TCSC)
- Static Phase Shifter (SPS)
- FACTS Generic

1.5.37 FACTS Generic

Use “**Elements→FACTS→FACTS Generic**” OR  from Power System toolbar on the RHS of the screen to draw FACTS between two different buses. The handles are highlighted whenever

an object is selected for resizing or moving. To select a FACTS click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show FACTS From end and To end flows are placed beside the FACTS. Move the display code to desired location if required.

Following are the series facts devices

FACTS

Generic--



from power system tool bar

Unified Power flow Controller



-from power system tool bar

Thyristor Controlled Series



Capacitor -from power system tool bar

Static Phase Shifter



- from power system tool bar

Use **Power System > Series Elements >> FACTS >> FACTS Generic** OR from Power System toolbar on the RHS of the screen to draw FACTS between two different buses.



The handles are highlighted whenever an object is selected for resizing or moving. To select a FACTS click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show FACTS From end and To end flows are placed beside the FACTS. Move the display code to desired location if required.

Drawing – Drop the series element in-between the buses. Automatically a connecting line starts following the mouse pointer. Move the mouse on to a bus and double click to connect From side connection. Another connecting line automatically starts towards the To side connection. Drag the mouse towards the TO side connection and double click on the bus to establish the TO side connection. If connection is accepted, the Display Code appears. Keeping the orthogonal mode ON, connecting line segments can be drawn either horizontal or vertical only. Orthogonal mode is OFF to draw a connecting line inclined at any angle.

Rotation – Select the object and click the rotate button. Object is rotated in steps of 90 degrees; Connecting points to bus remain same.

Moving - If the orthogonal mode is ON, line can be moved along X or Y direction only. Orthogonal mode is OFF to move in any direction. When a line is moved, the segment points are also moved by the displaced amount, except the points, which are lying, on the buses at both ends.


Editing - If the orthogonal mode is ON, the point touched for moving is aligned with respect to previous point. The alignment can be along X or Y direction depending on the distance between the two points along X or Y direction.

Connectivity - If the user tries to place a series element, connected to a same bus or elements other than transformer on to a different voltage level, an error message is popped up and connection is not accepted.


Resize - The series element can be resized at any time by dragging a handle.

The same procedure is followed for UPF, TCSC and SPS.

1.5.38 Shunt Facts Device

Use “**Elements →Shunt Elements→Shunt Facts Device**” OR  from Power System toolbar on the RHS of the screen to draw a shunt facts device. The handles are highlighted whenever an object is selected for resizing or moving. To select a shunt facts device, click mouse LMB on it. If the display code flag is ON, the code to show shunt fact device real and reactive power flows are placed in line with the shunt facts device. Place the code by moving it to the desired location if required. If the user tries to place a shunt facts device other than on a bus, an error message is popped up and shunt facts device connection is not accepted.

1.5.39 Static VAR Compensator

Use “**Elements →ETA Elements→Static VAR Compensator**” OR  from Power System toolbar on the RHS of the screen to draw a static VAR compensator (SVC). The SVC can be resized at any time by dragging a handle shown at the two edges of a SVC. The handles are highlighted whenever an object is selected for resizing or moving. To select a SVC, click mouse LMB on it. If the display code flag is ON, the code to show SVC real and reactive flows are placed in line with the SVC. Place the code by moving it to the desired location if required. If the user tries to place a SVC other than on a bus, an error message is popped up and SVC connection is not accepted.

PROTECTION



Protection Elements

- Current Transformer
- Potential Transformer
- Capacitive Voltage Transformer (CVT)
- Relay
- Fuse
- **Meters**
 - Ammeter
 - Voltmeter
 - Multimeter
 - Measurement Data

1.5.40 Current Transformer



Use “**Elements → Accessories → Current Transformer**” OR from Power System toolbar on the RHS of the screen to place a current transformer at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a current transformer, click mouse LMB on it. Connect the relay to the CT and while placing it terminates on CT. If the GUI is connected to the database, CT ratio appears along with the CT.

1.5.41 Potential Transformer



Use “**Elements → Accessories → Potential Transformer**” OR from Power System toolbar on the RHS of the screen to place a Potential transformer at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Potential transformer, click mouse LMB on it.

1.5.42 Relay



Use “**Power System → Accessories → Relay**” OR from Power System toolbar on the RHS of the screen to place a Relay at desired location. The handles are highlighted whenever an object is selected for resizing or moving. This will terminate on CT while drawing. To select a Relay, click mouse LMB on it.

1.5.43 Fuse



Use “**Power System → Accessories → Fuse**” OR from Power System toolbar on the RHS of the screen to place a Fuse at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Fuse, click mouse LMB on it.


1.5.44 Capacitive Voltage Transformer




Use “**Power System → Shunt Elements → Capacitive Voltage Transformer**” OR from Power System toolbar on the RHS of the screen to draw a CVT. The handles are highlighted whenever an object is selected for resizing or moving. To select a CVT, click mouse LMB on it. If the display code flag is ON, the code to show CVT real and reactive power flows are placed in line with the CVT.

Place the code by moving it to the desired location if required. If the user tries to place a CVT other than on a bus, an error message is popped up and CVT connection is not accepted.


1.5.45 Voltmeter

Use “**Power System→Meters→Voltmeter**” OR  from Power System toolbar on the RHS of the screen to place a voltmeter symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a voltmeter, click mouse LMB on it.

1.5.46 Ammeter

Use “**Power System→Meters→Ammeter**” OR  from Power System toolbar on the RHS of the screen to place a voltmeter symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a voltmeter, click mouse LMB on it.

1.5.47 Multimeter

Use “**Power System→Meters→Multimeter**” OR  from Power System toolbar on the RHS of the screen to place a Multimeter at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Multimeter, click mouse LMB on it.

Drawing-Drop the Meter element where the meter should be drawn. Automatically a connecting line starts following the mouse pointer. Move the mouse on to a bus/Meter/power system element and double click to connect to the element. By default the meter connections are drawn in green dotted line. User can change the properties if required.


Rotation - Select a meter. Click the rotate button. Meter is rotated in steps of 90 degrees.

Resizing - Use the 8 points shown around the symbol for resizing. Increase the distance between the handles to inflate symbol OR decrease the distance between handles to deflate symbol.

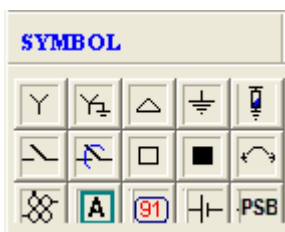
Moving - If the orthogonal mode is ON, meter can be moved along X or Y direction only. Orthogonal mode is OFF to move in any direction.

Resize - The meter can be resized at any time by dragging a handle shown around a meter

1.5.48 Measurement Data

Use “**Elements →Protection→Meters-> Measurement Data** ” OR  from Power System toolbar on the RHS of the screen to place a Measurement Data at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Measurement Data, click mouse LMB on it. If the GUI is connected to the database, Measurement Data form will open.

SYMBOLS



- Four Winding Transformer
- Isolator open
- Isolator closed
- Breaker Open
- Breaker Closed
- LV Breaker

- Star
- Star Ground
- Delta
- Ground
- Neutral Grounding Resistor
- Dynamic Link
- Bounded Text
- Battery
- Battery Charger
- Capacitor Bank
- Power System Block (PSB)
- Non-Directional IDMT
- Directional IDMT
- Distance – Mho Characteristic
- Distance – Quad Characteristic

Drawing – Select one of the symbols from the power system toolbar or from menu option “**Power system**→**symbol**”. Place mouse pointer at the location, where symbol has to be drawn and click left mouse button to draw the selected symbol.


Rotation - Select a symbol. Click the rotate button. Symbol is rotated in steps of 90 degrees.

Resizing - Use the 8 points shown around the symbol for resizing. Increase the distance between the handles to inflate symbol OR decrease the distance between handles to deflate symbol.

Moving - If the orthogonal mode is ON, symbol can be moved along X or Y direction only. Orthogonal mode is OFF to move in any direction.

Resize - The symbol can be resized at any time by dragging a handle shown around a symbol.

1.5.49 Four Winding Transformer

Use “**Elements** →**Four Winding Transformer**” OR  from Power System toolbar on the RHS of the screen to draw a four winding transformer between four different buses. The handles are highlighted whenever an object is selected for resizing or moving. To select a transformer, click mouse LMB on it. Place the display code with the help of textbox to display the power system study results. If the user tries to place a transformer connected between same buses, an error message is popped up and connection is not accepted.

Procedure:

Set the object layer from a menu item **Set**→**Object Layer** to which transformer is to be placed. Set the orthogonal mode On/Off, so as to draw horizontal / vertical segments.

Set the display code On/Off, so as to place a code or not.

Set the transformer orientation angle with help of the rotate button. The current angle can be viewed on a status bar pane.

Select the option from a menu item **Power system**→**4 Winding Transformer** or from a Toolbar

Place the cursor at desired location. Click mouse LMB. The transformer is drawn at a specified location with a default size and orientation. The connection starts with primary end.

Move the mouse to new location. As the cursor is dragged, a line is shown which connects the transformer primary end side and the mouse point as a preview of segment. Click a mouse LMB to accept a segment.

Repeat the above step to establish number of segments

Place the mouse cursor on a Bus and double click mouse LMB to accept a primary connection.

If double clicked position is on a bus, the primary end connection is accepted and further connection is transferred to secondary side. Else an error message is shown to user and a double clicked point is considered for a segment.

The steps followed to connect primary end side should be followed for secondary, tertiary and fourth winding end connection also.

If the secondary end bus indicated is same as primary end bus, again the connection is not accepted and an error message is shown to the user.

If the tertiary end bus indicated is same as primary end bus or secondary end bus, the connection is not accepted and an error message is shown to the user.

If the fourth winding bus indicated is same as primary end bus or secondary end bus or tertiary end bus, the connection is not accepted and an error message is shown to the user.

Use the resize handles shown outside for resizing / adjusting the segment(s) position.

Note:

Click mouse RMB to ignore the drawing before establishing connection.

No association exists between the display codes and power system elements.

The points connected with a bus can be moved only along the bus.

Breakers

Isolator open

Isolator closed

Switching - To select the coupler, click the right mouse button with the mouse cursor on the coupler. Select the **Status→Close**, to close bus coupler. Else Status→Open, to open bus coupler. The same option is available with the menu item **Edit→Status→Open/Close**.

Rotation - Select the coupler. Click on the rotate button. Coupler is rotated by 90 degrees. Connecting points on the bus remain without any modifications.


Drawing - Keeping the orthogonal mode ON, connecting line segments can be drawn either horizontal or vertical only. Turn OFF orthogonal mode to draw a connecting line inclined at any angle.

Moving - If the orthogonal mode is ON, coupler can be moved along X or Y direction only. Turn OFF to move in any direction. When a coupler is moved, the segment points are also moved by the displaced amount except the points, which are lying, on the buses at both ends.

Editing - If the orthogonal mode is ON, the point touched for moving is aligned with respect to previous point. The alignment can be along X or Y direction depending on the distance between the two points is more along X or Y direction.


1.5.50 Isolator Open




Use “**Power System→Breakers→Bus Coupler Open**” OR  from Power System toolbar on the RHS of the screen to draw an Isolator with open status between two different buses. The isolator can be resized at any time by dragging the handle shown at the two edges of an isolator. The handles are highlighted whenever an object is selected for resizing or moving. To select an isolator click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show isolator from end and to end flows are placed beside the isolator. Place the code by moving it to the desired location if required. If the user tries to place an isolator connected to a same bus, an error message is popped up and connection is not accepted.

1.5.51 Isolator Closed




Use “**Power System→Breakers→Bus coupler open**” OR  from Power System toolbar on the RHS of the screen to draw an Isolator with closed status between two different buses. The isolator can be resized at any time by dragging a handle shown at the two edges of an isolator. The handles are highlighted whenever an object is selected for resizing or moving. To select an isolator click mouse LMB on it. When both end connections are accepted and if the display code flag is ON, the code to show isolator from end and to end flows are placed beside the isolator. Place the code by moving it to the desired location if required. If the user tries to place an isolator connected to a same bus, an error message is popped up and connection is not accepted.

1.5.52 Star

Use “**Power System→Symbols→Star**” OR  from Power System toolbar on the RHS of the screen to place a Star symbol at desired location. The handles are highlighted whenever the object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.


Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Star** Grounded, Delta, and Ground..... or the context menu item as Change Symbol Type Star Grounded, Delta, Ground ... to change from one type to other and vice-versa. This option is valid only for symbols.

1.5.53 Star Grounded

Use “**Power System→Symbols→Star grounded**” OR  from Power System toolbar on the RHS of the screen to place a Star Grounded symbol at desired location. The handles are highlighted whenever the object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.


Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Star**, Delta, and Ground..... or the context menu item as Change Symbol Type Star, Delta, Ground, to change from one type to other and vice-versa. This option is valid only for symbols.

1.5.54 Delta

Use “**Power System→Symbols→Delta**” OR  from Power System toolbar on the RHS of the screen to place a Delta symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.


Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Star**, Star Grounded, Ground ... or the context menu item as Change Symbol Type Star, Star Grounded, Ground, to change from one type to other and vice-versa. This option is valid only for symbol(s).

1.5.55 Ground


Use “**Power System→Symbols→Ground**” OR  from Power System toolbar on the RHS of the screen to place a Ground symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Star**, Star Grounded, Deltaor the context menu item as Change Symbol Type Star, Star Grounded, Delta, to change from one type to other and vice-versa. This option is valid only for symbols.

1.5.56 Neutral Grounding Resistor


Use “**Power System→Symbol→Neutral Grounding Resistor**” OR  from Power System toolbar on the RHS of the screen to place a neutral grounding resistor symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it.

1.5.57 Breaker – Open

Use “**Power System→Symbols→Breaker Open**” OR  from Power System toolbar on the RHS of the screen to place a breaker - open symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Breaker close** , or the context menu item as Change Symbol Type→ Breaker close, to change from one type to other and vice-versa. This option is valid only for power system symbols.


1.5.58 Breaker – Closed

Use “**Power System→Symbols→Breaker Closed**” OR  from Power System toolbar on the RHS of the screen to place a breaker - closed symbol at desired location. The handles are


highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

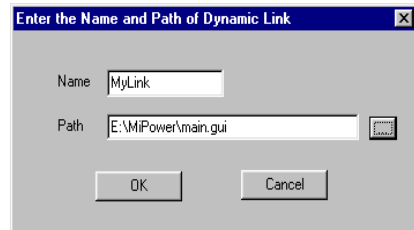
Switching - Select a Symbol. Select the option from a menu item as **Change→Symbol Type→Breaker open,** or the context menu item as **Change→Symbol Type→Breaker open,** to change from one type to other and vice-versa. This option is valid only for power system symbols.

1.5.59 LV Breaker

Use **“Power System→Symbols→LV Breaker”** OR  from Power System toolbar on the RHS of the screen to place a LV breaker - closed symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

1.5.60 Dynamic Link


Use **“Power System→Symbols→Dynamic Link”** OR  from Power System toolbar on the RHS of the screen to place a dynamic link at desired location. The following dialog box appears. The handles



are highlighted whenever an object is selected for resizing or moving.

Enter the name of the link and select the network file, which should be opened when you click on the dynamic link. To edit a dynamic link, hold CTRL and double click on the link.


1.5.61 Bounded Text

Use **“Power System→Symbols→Bounded Text”** OR  from Power System toolbar on the RHS of the screen to place a bounded text. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. To edit the bounded shape and the text, hold CTRL and double click on the symbol.

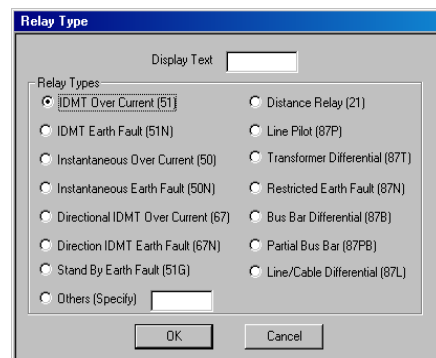
1.5.62 Capacitor Bank

Use **“Power System→Symbols→Capacitor Bank”** place a capacitor bank at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it.

1.5.63 Non -Directional IDMT

Use **“Power System→Relay→Non -Directional IDMT”** OR  from Power System toolbar on the RHS of the screen to place a non-directional IDMT relay symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

Switching - Select a Symbol. Select the option from a menu item as **Change→Relay Type→Directional IDMT,** Distance Relay-Mho, or the context menu item as **Change→Relay Type→Directional IDMT,** Distance Relay-Mho, to change from one type to other and vice-versa. This option is valid only for relay symbols.




1.5.64 Directional IDMT

Use **“Power System→Relay→Directional IDMT”** OR  from Power System toolbar on the RHS

of the screen to place a directional IDMT relay symbol at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.


Switching - Select a Symbol. Select the option from a menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, or the context menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, to change from one type to other and vice-versa. This option is valid only for relay symbols.

1.5.65 Distance Relay – Mho

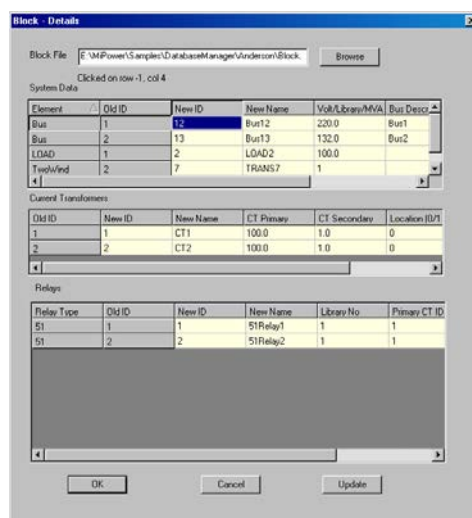
Use “**Power System→Relay→Distance Relay - Mho**” OR  from Power System toolbar on the RHS of the screen to place, a distance relay - mho characteristic symbol at desired location. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

Switching - Select a Symbol. Select the option from a menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, or the context menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, to change from one type to other and vice-versa. This option is valid only for relay symbols.

1.5.66 Distance Relay –Quad

Use “**Power System→Relay→Distance Relay - Quad**” OR  from Power System toolbar on the RHS of the screen to place a distance relay - quadrilateral characteristic symbol at desired location. To select a symbol, click mouse LMB on it. The user can change the symbol from one to other, without deleting the existing symbol.

Switching - Select a Symbol. Select the option from a menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, or the context menu item as **Change→Relay Type→Directional IDMT**, **Distance Relay-Mho**, to change from one type to other and vice-versa. This option is valid only for relay symbols.



Block Details

Block File: E:\MIPower\System\Database\Manager\Undercon\Block

System Data

Element	Old ID	New ID	New Name	Volt/Busbar/MVA	Bus Descr
Bus	1	12	Bus12	220.0	Bus1
Bus	2	13	Bus13	132.0	Bus2
LOAD	1	2	LOAD2	100.0	
Trans/line	2	7	TRANS7	1	

Current Transformers


Old ID	New ID	New Name	CT Primary	CT Secondary	Location (B/T)
1	1	CT1	100.0	1.0	0
2	2	CT2	100.0	1.0	0

Relays


Relay Type	Old ID	New ID	New Name	Library No	Primary CT ID
S1	1	1	S1Relay1	1	1
S1	2	2	S1Relay2	1	1

Buttons: OK, Cancel, Update


1.5.67 Battery

Use “**Power System→Battery**” OR  from Power System toolbar on the RHS of the screen to place a Battery at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Battery, click mouse LMB on it.

1.5.68 Battery Charger

Use “**Power System→Battery Charger**” OR  from Power System toolbar on the RHS of the screen to place a Battery Charger at desired location. The handles are highlighted whenever an object is selected for resizing or moving. To select a Battery Charger, click mouse LMB on it.

1.5.69 Power System Block

Use “**Power System→Insert Block**” This option inserts a Power system block into the existing Network and database. Select this option from menu Power system->Insert Block or select from the power system toolbar . This opens the Block-Details dialog box. Browse for the network or SLD file which is to be inserted. Give new ID for the elements present in the block and click on Update button. The block (SLD) with new IDS inserted in the opened SLD and the database is also updated with new block. Provision is provided to insert the block with CTs and relays. This is useful when same block is to be inserted repeatedly in the existing network. Block inserted in the network is shown below. Inserted block is highlighted.

Element: Elements present in the block which is to be inserted are displayed.

Old ID: Element IDs of the inserted block are displayed

New IDs: New IDs are appeared. User can also specify new IDs for the elements.

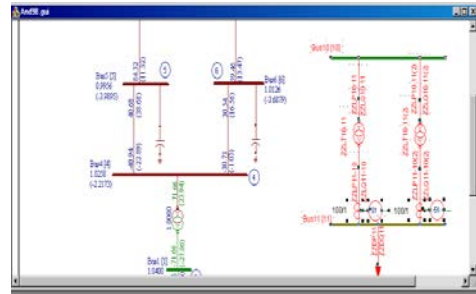
New Name: New names are appeared. User can also specify new name for the elements

Vol/library/MVA: Voltage / Library no/ MVA rating of the element is to be specified

Bus Description: Bus details can be entered.

Current Transformer: New ID, New Name, CT Primary, CT Secondary and CT location for the inserted block is displayed.

Relays: Relay type and OLD ID, New ID, New name of the inserted block will be displayed. User can also enter the details.



Update: Inserts the block into the database

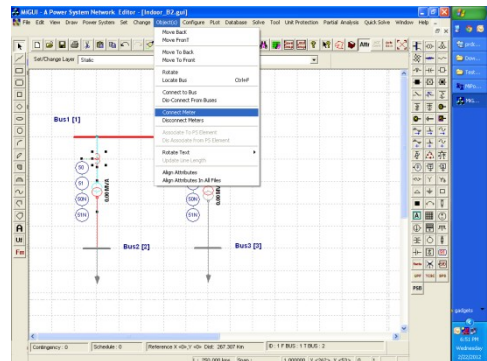
OK: Inserts the block in the opened network and close the screen

Cancel: Without inserting block close the dialog.

For relays updates with insert block option follow the procedure

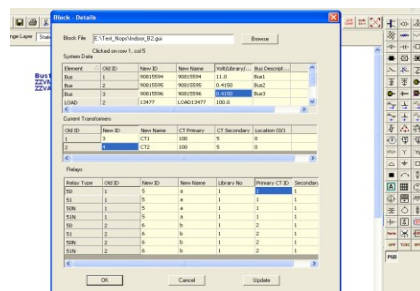
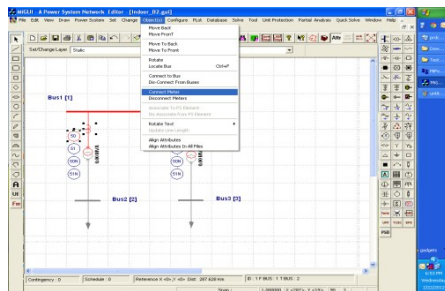
Select the transformer without ZZ codes and CT and connect them using connect meter option.

Select CT and Relay and connect them using connect meter option.



Insert the block and update the data. A sample data shown below.

Note: Relay primary CT ID's should be the Old CT ID's. Secondary CT ID's are used for Distance Relay for other relays let it be default.

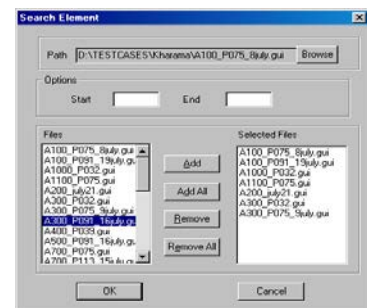


1.5.70 Create Search Index

An option to search the Bus name in all the open GUI's or GUI's in a directory is provided. This option will be useful when there are many sub-networks associated with the same database.

Open a new GUI. Select menu option Create > Search

Index. A Search Element dialog box appears. Browse for the directory where all GUIs related to the same database are located. Select a GUI. All networks presented in the directory will be listed. Select the GUIs and click Add button

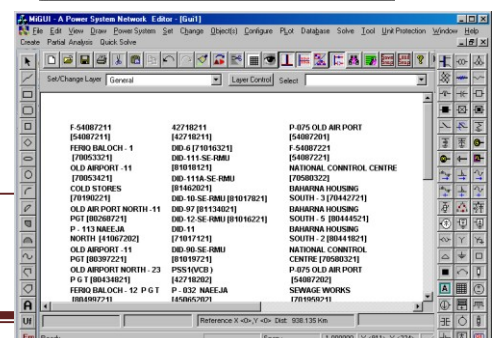


Add – to add a file from the Files list box to Selected Files list box.

Add All – to add all the files to Selected Files list box.

Remove – to remove a file from Selected Files list box.

Remove All – to remove all the files from Selected Files list box.



OK – to List the bus names presented in the selected networks

Cancel – to cancel the search index process

Bus numbers presented in the selected Networks will appear on the GUI file which is opened. Choose the bus number to be searched from the selected networks. The respective Network with highlighted bus number will be opened.

Start: Select some GUIs and that will appear in selected list. Enter no (starting bus no) in start field

End: Enter Ending bus number in this field. Bus numbers ended with that number will be available in the GUI from the selected GUIs.

1.6 Set Menu

The Set menu offers the following commands:

1.6.1 Set/Modify a Default Line & Fill Style

Use “**Set→Pen & Fill Style**” or with a toolbar to set the default line and fill styles to be used while drawing objects... The selected choices are highlighted with a radio button style. The selected styles and colour can be previewed inside a preview box. The line and fill properties are used as -

Line style can be set to NULL for not showing a line around the object

Line style can be set to other styles by clicking a mouse on the choice. The styles are valid only for 1 pt thickness.;

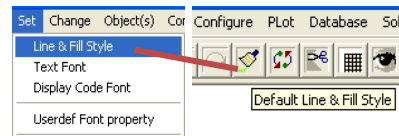
Line thickness can be set from 1 to 50. The line thickness more than 1 is effective only for a solid line style.

Line color can be set to any of the RGB mixture value.

Fill style can be set to NULL for not filling the enclosed region.

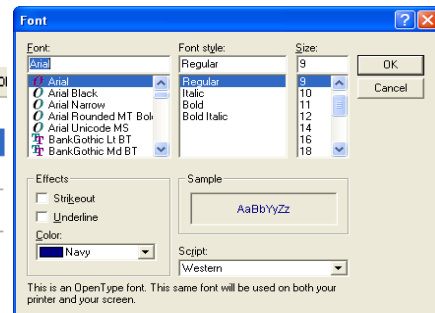
Fill style can be set to other styles by clicking a mouse on the choice.

Fill color can be set to any of the RGB mixture value.



1.6.2 Set/Modify a Default Text Font

This option is used to set the default text font used to write the text inside a textbox. The option can be selected from the menu item “**Set→Text Font**”. A general text font selection dialog box is shown to the user. Choose the options for text style, size, colour, etc... and select OK to accept the new font, and CANCEL to ignore the selection. All the text boxes, which are added newly to the document, are drawn with the set font. By Default the following options are set for a text font -

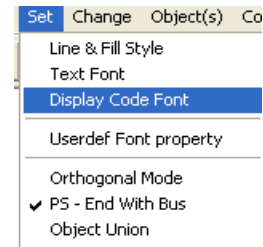


Description	Style Name
Font	Arial
Font Style	Regular
Font Size	9
Effects - Strikeout	FALSE
Effects - Underline	FALSE
Text Color	Navy Blue
Script	Western

1.6.3 Set/Modify a Default Display Code Font

This option is used to set the default text font used to write the text inside a textbox. The option can be selected from the menu item **Set->Display Code Font**. A general text font selection dialog box is shown to the user. Choose the options for text style, size, colour, etc... and select OK to accept the new font, CANCEL to ignore the selection. All the text boxes, which are added newly to the document, are drawn with the set font. By Default the following options are set for a text font-

Description	Style Name
Font	Times New Roman
Font Style	Regular
Font Size	9
Effects - Strikeout	FALSE
Effects - Underline	FALSE
Text Color	Navy Blue - RGB(0,0,128)
Script	Western



1.6.4 Set UserDef Font Property

Use this option to set User defined Font. For details Refer section 2.2.7.

1.6.5 Set/Modify a Mode to Draw Horizontal or Vertical Lines (OrthoMode)

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

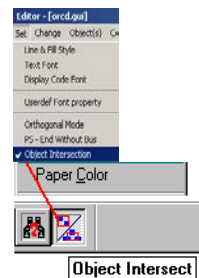
When the flag is ON and while drawing a connecting line between any two points, the two points are joined by a Horizontal or Vertical line based on whether distance between two points is more along X axis or Y axis.

Usage 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.

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.

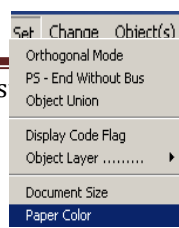


1.6.6 Set an Object Union/ Intersection Mode

This option is used to set mode while selecting the objects for editing. The option can be selected from the menu item **Set->Object Union/Intersection**. If the option is Object Union, then the Objects are selected which are enclosed within a selection rectangle. Else if the option is Object intersection, then the objects which are intersect with the selection rectangle are selected in to the list.

1.6.7 Set/Modify Default Background/Paper Colour

This option is used to set/modify the background/paper colour. The paper colour is used only for the usage of viewing and is not available for Printing. The option can be selected from a menu item **Set->Paper Colour**. When the option is selected, a general-purpose colour selection dialog box is shown to the user. Select the desired colour from the already existing selection list OR mix the RGB to the desired level. Select OK to accept the selection and CANCEL to ignore the selection. When a new colour is accepted for the paper, the application calls the paint message to draw the objects with the new paper colour.



shown to the user. Select the desired colour from the already existing selection list OR mix the RGB to the desired level. Select OK to accept the selection and CANCEL to ignore the selection. When a new colour is accepted for the paper, the application calls the paint message to draw the objects with the new paper colour.

1.6.8 Set/Modify Flag to Place the Display Code

This Option is used to place the display code to show the power system study results on the single line diagram. The flag can be turned ON/OFF. Turn ON the Flag to place the display code for each of the power system elements after completing their drawing. For example after establishing the connection for a transformer between the two buses the display code is placed at the from side and to side to represent the real and reactive power flows. Tap display code is placed above the transformer symbol. When the user wants to view the particular case results, the code is replaced by the numerical value obtained from the power system analysis.



1.6.9 Set/Modify Default Object Layer to Place New Object(s)

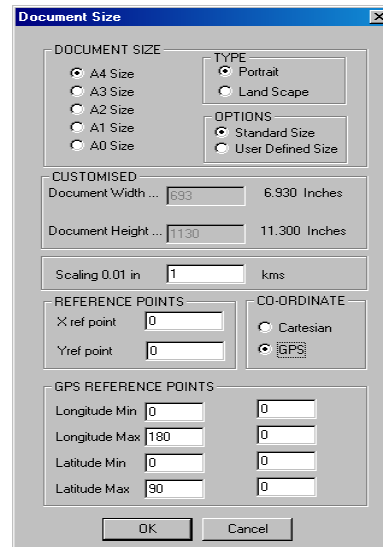
This option is used to set a default layer to which a drawing object is to be placed. The option can be selected with a menu option "**Set→Object Layer**" →Static, To show/hide the objects present in a particular layer refer View Layer Objects.

For, if the default layer is set to General, then all the objects added to the document are placed in General layer.

1.6.10 Set/Modify Document/Paper size

Use this option to set/modify the document size. The option is selected with a menu item "**Set→Document Size**". A dialog box is shown to the user to enter the new width and height of the document in the respective edit boxes in pixels.

The document origin is at the left-top corner of the screen. The horizontal and vertical scroll bars are visible depending on the width and height of the document and the view window. If the view window is sufficient to accommodate the whole document, the scroll bars are removed from the view. When the width of the document is increased, the document is extended towards right. When the height of the document is increased, the document is extended towards bottom. The existing document objects positions will not be modified with width or height modification.



User has the option to set scaling

Note: If the document size is reduced compared to the previous size, the document objects lying outside the document area are not visible. However they are existing in the document.

By default the document size is set to Width - 850 pixels = 8.50 inches and Height - 1100 pixels = 11.0 inches

Options:

Standard Size: Standard width and Height depending on the selection of paper size (A4/A3/A2/A1/A0) will be set.

User Defined Size: User can specify the width and height of the document.

Reference Points :User has two options Cartesian and GPS. For Cartesian X and Y coordinates details are to be entered

For GPS co-ordinates Longitude min and max in degree minute and Latitude min and max in degree minute are to be entered.

1.6.11 Set/Modify Distance between Grid Lines, Colour and Line Styles

This option is used to set/modify the grid line style setting. The user can select any RGB colour mixture for the grid line. The line style supported for the grid lines are only two, namely, dotted line and dashed line. The distance between successive grid lines can be set independently along X and Y direction in pixels. When OK is selected, the modifications are in effect. Otherwise the

modifications are ignored. The grid lines can be toggled from view/hide using the option **View→Grid Lines**. When the view grid lines option is ON, then only the grid lines are visible.

1.6.12 Set/Modify Flag to Zoom the Document

This Option is used to zoom the document along X or Y direction. The flag can be turned ON/OFF. Turn ON the Flag to perform real time zooming. Click mouse LMB. The mouse cursor shape is changed to zooming mode. Holding down the LMB drag the mouse cursor to the right of the down point to increase zooming level. Else to the left of down point to decrease the zooming level. The whole document is zoomed to the zooming factor set by the user. The current zoom factor can be viewed on the status bar pane. To get the zooming factor of 1.0 (Normal view) double click the mouse LMB with the Real time zoom flag ON. To continue working turn OFF the flag.

1.6.13 Arrow Properties

This option is used to set the width and height of the arrow to be used for lines. When the option is selected, a dialog box is shown to the user. Select the Arrow Style to change and change the width and height value for it. Switch to other style and modify the values. The modified values are accepted once OK button is selected else ignored. By default, all arrow styles have a width of 20 pixels and height of 6 pixels.

Arrow Style

This Option is used to select the arrow style to be used to place on lines. By default the option is set to no arrow. Select other than no arrow to draw an arrow along the line based on the arrow location specified. The options available with this are Set Arrow to -

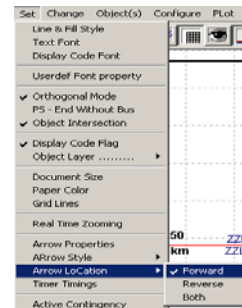
No Arrow

Triangle Shaped Arrow

Arrow shaped Arrow

Ellipse Shaped Arrow

Diamond Shaped Arrow



1.6.14 Arrow Location

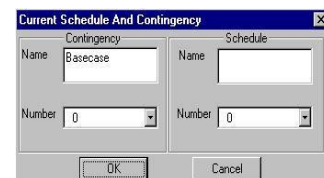
This Option is used to select the location of the arrow on the line drawn. By default the option is set to forward. The arrow is placed on a line only if the arrow style is other than No Arrow.

Select the Location as -

Forward - to place arrow from Start point towards End point.

Reverse - to place arrow from End point towards Start point.

Both - to place arrow along both directions.



1.6.15 Timer Timings /Text Blinking Frequency

This Option is used to set the text blinking frequency. By default the blinking time is set to 500 milliseconds. Edit a new value for blinking time. Select OK to accept the changes and Cancel to ignore the changes. Set the blink on/off using the option **Edit →Text Blink flag**.

1.6.16 Active Contingency

Use "**Set→Active Contingency**" to select the contingency. The network is updated and set to the selected contingency case. Further any study can be done for this contingency.

1.6.17 Dynamic Simulation

During the study, it is often required to see what happens if certain system configuration is changed (open/close and number of circuits) and see the results immediately, instead of changing the data in the database and exclusively solving using solve menu and then plot the results. To obtain this objective the Dynamic simulation option is provided. Here you can open, close or change the number of circuits for the elements and observe the results immediately. Note that in this case, the

database is not modified and the changes are not saved in the database. If a certain configuration is to be saved you can do it by saving it as contingency. The present network configuration will be saved in the database as a contingency. The steps to perform dynamic simulation are -

Open the network.

Select the required contingency (or may be Base case itself).

Do the normal load flow and plot the results on the network.

Select "**Set→Dynamic Simulation**". Initial condition is established and the network

is Now ready for the action of opening, closing or changing the number of circuits.

Select an element, right click, selects Element Status open, close or circuits.

After selection, the results will be plotted on the network.

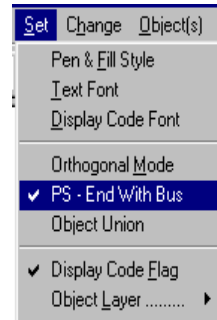
At any point of time during simulation you can see the load flow report by selecting

"**View→simulation Report (LFA)**"

The same procedure can be continued for other elements also.

If a certain configuration is to be saved you can do so, by saving the contingency.

Note: When the dynamic simulation option is set, add/modify/editing of the network data or the display attributes is not possible



1.6.18 PS-End With Bus

This option is selected from main menu **Set →PS-End with Bus** or click on PS (End with bus / without bus) button on tool bar. When the button is on, power system elements will be connected to the buses and the ZZ code with connecting bus numbers will appear along with power system elements on the single line diagram. When the button is off elements will not be connected to the buses and the ZZ code with zero number will appear on the single line diagram (SLD).

1.6.19 On Line

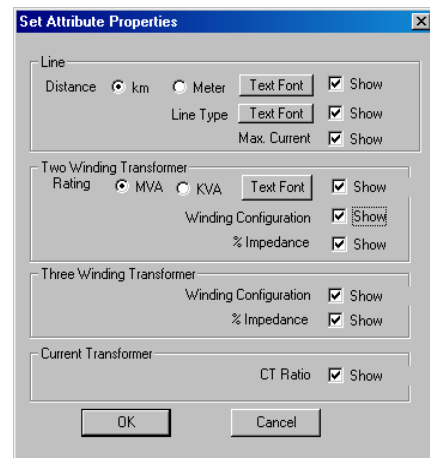
Set →On line > ACD File

To check this option, follow the steps.

From main menu select Plot > Load Flow Analysis.
Browse for the lfa.acd file.

Set On Line > ACD file.

If any change in the acd file, will be plotted on the Single Line Diagram.



1.6.20 Attribute Properties

Use "**Set→ Attribute Properties**" In this option line and two winding and three winding transformer attributes can be set. When the Single line diagram is connected to database, Line Distance and Line Type and Transformer rating, % impedance, Units in parallel will appear on the SLD. These attributes properties can be set. By using the check box. Attributes can be show or hide.

For Line: Option to set line distance in km or meter and Text colour, size and font. Line type font can be set.

For Transformer: Rating can be specified in MVA or KVA.

Current Transformer: CT ratio of all CTs will appear on SLD

1.6.21 Substation Code

This is for the network Connected with the database. Select option Set-> Substation Code which sets the flag and the buses drawn will take the substation tag for the bus numbers. For details refer database manager options->Substation Code.

1.7 Change Menu

The Change menu offers following options

1.7.1 Object(s) Layer

This option is used to change the object layer from one to other. The option can be selected from the context menu item **"Change→Layer"** →Static,For further details on how to view context menu options see context menu.

1.7.2 Arrow Style

This option is used to change the object Arrow style from one to other. The option can be selected from the menu item **"Change→Arrow Style"** →Triangle, or from Context Menu Option **"Arrow Style"** →Triangle, for further details on how to view context menu options, see context menu.

When an option is selected on already drawn line, the line is redrawn with the arrow style selected.

1.7.3 Arrow Location

This option is used to change the object Arrow location from one to other. The option can be selected from the menu item **"Change→Arrow Location"** →Forward, or from Context Menu Option **"Arrow Location"** →Forward, For further details on how to view context menu options, see context menu. When the option is selected on already drawn line, the line is redrawn with the arrow style at the specified arrow location.

1.7.4 Element Status

This option is used to change the element representation from open-close-open-.... The option can be selected either from the menu item **"Change→Status"** →Open, Close, From end open, to end open, circuits. The same option can be selected through a context menu item **"Status"** →Open or Close, From end open, to end open, circuits. For further details on how to view context menu options see context menu. When the option Open/Close is selected on already opened/closed breaker, the option is ignored. Else the object is redrawn with the new option. If the status is open it is shown in grey\ the element breakers are open.

1.7.5 Switching of HVDC Element

This option is used to change the HVDC element representation from rectifier-inverter- rectifier. The option can be selected either from the menu item **"Change→HVDC Element"** → rectifier or Inverter. The same option can be selected through a context menu item **"Change HVDC Element"** → rectifier or Inverter. When the option rectifier/Inverter is selected on the rectifier /Inverter, the option is ignored. Else the object is redrawn with the new option.

1.7.6 Relay Symbol Type

This option is used to change the relay element representation from Directional-Non-Directional-Mho-Quadrilateral-Directional. The option can be selected either from the menu item **"Change→Relay Symbol Type"** →..... The same option can be selected through the context menu item **"Change Relay Type"** →.....

The relay representation can be changed from Directional IDMT to either

Non-Directional IDMT

Distance relay with Mho characteristic

Distance relay with quadrilateral characteristic and vice-versa.

1.7.7 Symbol Type

This option is used to change the symbol representation from Star - Star Grounded – Delta –Ground – Breaker Open- Breaker Closed

The option can be selected either from the menu item **"Change→Symbol Type"** →..... The same option can be selected through the context menu item **"Change Symbol Type"** →.....

The symbol representation can be changed from Star to either

Star-Grounded
 Delta
 Ground
 Breaker Open
 Breaker Closed and vice-versa.

1.7.8 Element ID

Select this option to change the element ID. Element ID is a unique ID which links the network elements to the database elements. Care has to take while changing the element number. As far as possible avoid changing the ID manually. Always update this from database.

1.7.9 Relay

Select this option to change the relay type from the existing to any of the following types

IDMT Over current
 IDMT Earth Fault
 Instantaneous Over current
 Instantaneous Earth fault
 Directional Over current
 Directional Earth fault
 Stand by earth fault

1.7.10 Bus Data

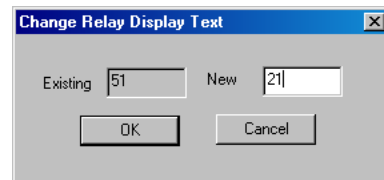
Enter old Bus No, Bus name, New Bus No and New Bus Name in a text file and save it. Select **Change→ Bus Data** option to change the bus no and bus name in a GUI document.

1.7.11 Change relay Display Text

Select the relay and then use this option to change the text of the relay. A dialog appears with existing text. Enter the new text.

OK: Accepts the change of text and closes the dialog

Cancel: Closing the dialog without change in the text.



1.7.12 Meters Connecting Line

Select a meter connecting line in the network and then use this option which opens the Line & Fill style dialog. Required Line style and colour can be changed.

1.7.13 Relay

Select a relay and can be changed to Over current or Distance or Unit Protection

Over current Relay	IDMT Over current
	IDMT Earth Fault
	Inst. Over current
	Inst Earth Fault
	Directional IDMT Over current
	Directional IDMT Earth Fault
	Stand by Earth Fault
Distance Relay	
Unit Protection	Line Pilot
	Transformer Differential
	Restricted Earth Fault
	Partial Busbar
	Busbar Differential

1.8 Object(s) menu

The Object(s) menu offers the following commands:

1.8.1 Move Back

This option is used to push a selected object to back by one level. The choice can be selected with the menu option "**Object→Move Back**". When more than one object exists one above the other, it is very difficult to select an object, which lies at the bottom. With this option the user can select only the object just below the selected object. It is not possible to select an object, which lies, more than one level below the selected object.

1.8.2 Move Front

This option is used to push a selected object to front by one level. The choice can be selected with the menu option "Object→Move Front". When more than one object exists one above the other, it is very difficult to select an object, which lies at the bottom. With this option the user can push the selected object to one level above. It is not possible to bring an object, which lies, more than one level to front.

1.8.3 Move To Back

This option is used to push a selected object to back of all the overlapped objects. The choice can be selected with the menu option "**Object→Move To Back**". When more than one object exists one above the other, it is very difficult to select an object, which lies at the bottom. When a top object is selected and pushed to the back, the previous object comes to top and the selected object goes to the end.

1.8.4 Move To Front

This option is used to push a selected object to front of all the overlapped objects. The choice can be selected with the menu option "**Object→Move To Front**". When more than one object exists one above the other, it is very difficult to select an object, which lies at the bottom. When a bottom object is selected and pushed to the front, the previous object goes back and the selected object comes front.

1.8.5 Rotate

This option is used to rotate a selected object(s) by multiples of 90 degrees (i.e., the object can be drawn at an angle of 0, 90, 180, 270 degrees). The current drawing object angle can be set with the menu option "**Object→Rotate**". The current drawing object angle is shown on the status bar pane. When an object is selected for rotation the current object angle at which it is placed in the document is updated on to the status bar pane.

1.8.6 Locate Bus

This option is used to trace a bus through its number or name or any text object. The option can be selected with the menu option "**Object→Locate Bus**" or through the toolbar. When the option is selected, a dialog box is shown to the user to enter a bus number (integer) or a bus name (string) in an edit box. As the user starts entering the letters the combo box gets filled up with the names of buses and dynamic links. User can select from the combo box. The program searches for the bus presence in the document. If found the view is scrolled to the position such that the object is at the middle of the client area, else the option is ignored. The dialog box buttons are used to trace –

Object String→Specify the integer value to search for a bus number. Specify the text to search for bus name. If the first button string is "**Display string**" irrespective of the digit or text, the user value is treated as text to search in display code strings.

Start- Start for locating a bus with a given number or name

Go To First- Go to beginning of the drawing objects list.

Next- Trace for the next bus with the same number or name (forward direction).

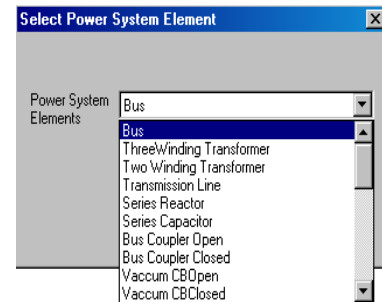
Previous- Trace for the previous bus with the same number or name (backward direction)

Go To Last - Go to the end of the drawing object list

Close - End searching operation.

1.8.7 Connect to Bus

The Option is used to connect a selected power system object to a bus. At least one selection should be bus. The choice can be selected with a menu option **Object→Connect to bus**

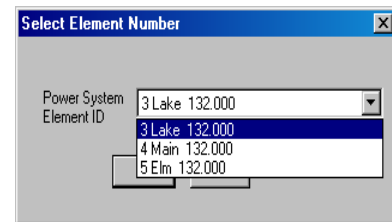


1.8.8 Disconnect from Buses

The Option is used to dis -connect a selected power system from its buses. After disconnecting from the existing buses it can be again reconnected to any other buses. The choice can be selected with a menu option **Object→Dis-connect from buses**.

1.8.9 Connect Meters

The Option is used to connect a selected meter object to any power system object. Atleast one selection should be Meter. The choice can be selected with a menu option **Object→Connect Meters**.



1.8.10 Disconnect Meters

The Option is used to dis -connect selected meters. After disconnecting it can be again reconnected to any other meters or power system objects. The choice can be selected with a menu option **Object→Dis-connect Meters**

1.8.11 Associate To PS Element

This option is used to associate any general-purpose drawing element with a power system element in the database.

Select the general-purpose drawing element & on click of this option a dialog will pop up as shown below, which displays the entire power system element to which we can associate to the drawing element.

Select the power system element type to which you want to associate the drawing element. On selection of the element type, a dialog will pop up which displays the list of selected element type in the database as shown.

Choose the element to which you want to associate the drawing element.

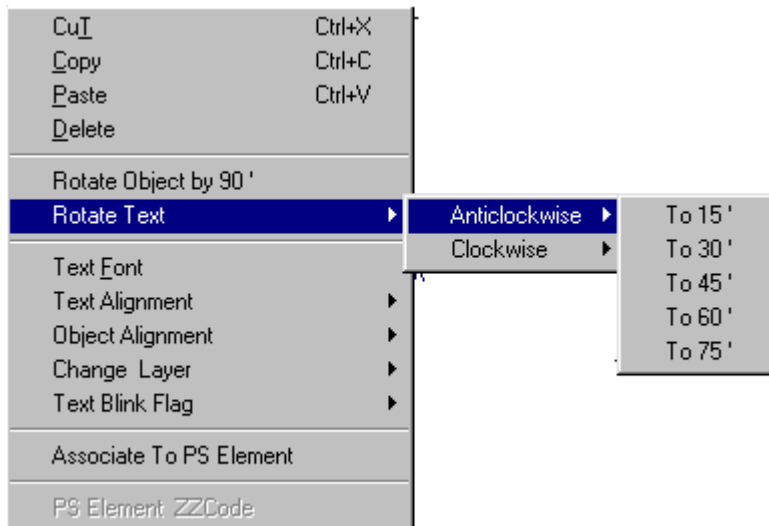
Note: To associate general purpose drawing element, the GUI document must be connected with database & Configure->Draw from database option must be checked.

1.8.12 Dis Associate from PS Element

This option is used to dis-associate a general purpose drawing object from the database, which is associated with the database.

1.8.13 Rotate Text

This option is selected from main menu **Object→Rotate Text→Clockwise or Object→Rotate Text→Anticlockwise**. This option is used to rotate a text by an angle of 15', 30', 45' and 60' clockwise or anticlockwise with reference to 0'.



1.8.14 Update Line Length

Use this option to change the length of associated line in database. Give new line length & save it.

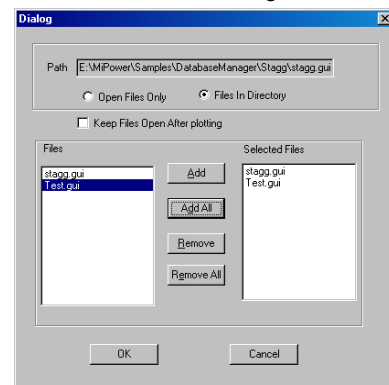
1.8.15 Align Attributes

When the line or transformer is moved attributes remain in original place. Then use this option to align the attributes with the element (line or transformer).

1.8.16 Align Attributes in All files

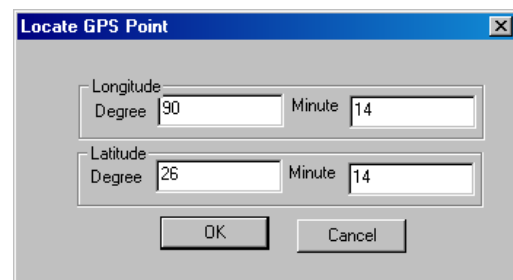
Attributes can be aligned in all opened GUI files or in all files which are in the same folder

Aligned GUI files kept open after plotting option is selected



1.8.17 Locate GPS Point

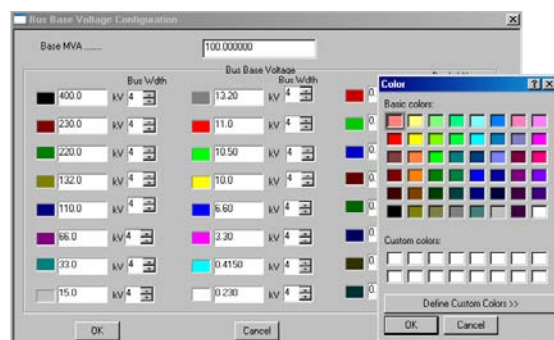
This option is used to locate a GPS point in GUI. Give inputs for latitude and longitude and click OK. It will scroll to the particular point on the GPS map



1.9 Configure

1.9.1 Configure Base Voltage

Before starting the creation of network, the voltage levels in the network must be configured against the user defined colors and bus thickness. These colors and the thickness are used while drawing a bus with a specified voltage level. The



configuration dialog box is as shown below. Keeping the voltage levels constant against each voltage level, the colour code and the thickness can be specified.

1.9.2 Configure Save Contingency

Steps to create, save and activate a contingency is as follows To create and save contingency

Rules:

Contingency can be saved and activated, only if the network is connected to the database.

Steps:

Open the single line diagram for which contingency has to be created. By default the diagram is in base case where all the elements are closed

To open an element, select the element click the right mouse button the following menu appears

Select Element Status,

Open – to open the

element on both ends

Close – to close the

element

From end open and to end open is valid only for transmission lines.

Opening of the elements can be done by multiple selections also. Select all the elements to be opened, click the mouse right button, and select element status and open. All the selected elements will be opened.

To save contingency – Select Configure→Save Contingency from the main menu. Enter appropriate number and name. Click OK to save the contingency.

The present contingency number is displayed in the status bar.

To activate a contingency – Select Set→Active contingency from the main menu. The following dialog box appears. Select the appropriate case. The network is updated and set to the selected contingency case.

The contingency can be created either using the editor or directly from the database. In both the cases the set active contingency command works.

Selection of the contingency case in the database reflects in the single line diagram also.

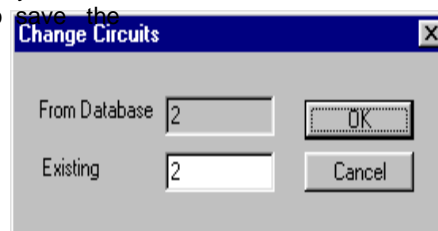
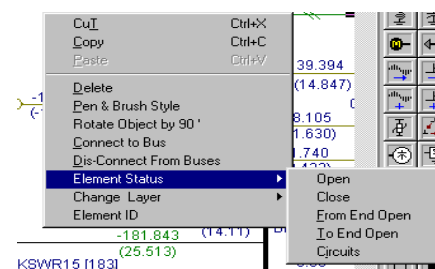
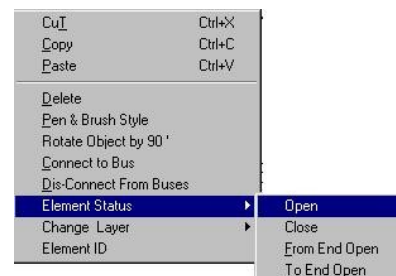
The element status is updated accordingly in the network. The contingency number is displayed in the status bar

Change in number of Circuits Contingency

The number of circuits for the power system element can be changed and saved as contingency. The procedure to change the number of circuits is as follows –

Select the element for which the number of circuits is to be modified (use with control key pressed to select only power system elements).

Right click (holding the control button to select only power system elements), the following menu appears. Select **Element Status→Circuits**.



The number of circuits available from the database is displayed. In the Existing edit box enter the number of circuits (increase or decrease the number of circuits). Click OK to change the number of circuits.

Change the number of circuits for all the required elements and save it as a contingency.

To do the study for this contingency, **Set→Active Contingency** in Network Editor, select this contingency, and perform the study.

1.9.3 Configure Sub Database

This option is provided to get the sub database for a sub-network associated with the central (Main) database. This option can be used when user wants to create individual database for each sub-network, which was associated with centralized database.

The steps to

create Sub

database –

Open one of the

sub-network

Configure > Sub

Database

A dialog box appears

In the Destination edit box database

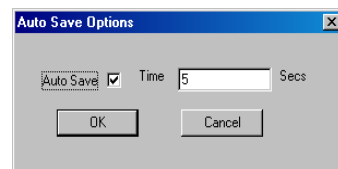
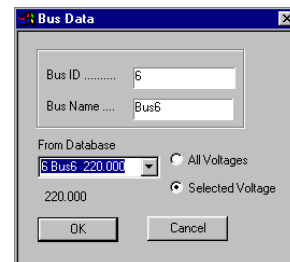
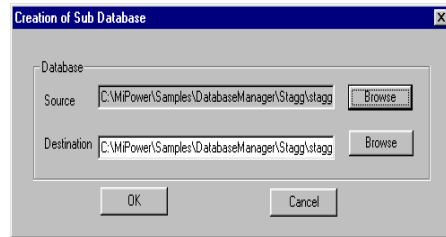
name can be changed. Then Click on →

OK.

On Ok a message box appears prompting the user to open the new database in the database manager.

Invoke “**Database Manager**” and open the newly created database (sub database).

Select **Options → Create Sub Database**. The database retaining only the specified buses (i.e., the buses available in the network) is generated. Close the database. This database can be used for analysing the sub network.

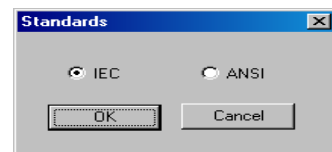


1.9.4 Configure Draw from Database

Select menu **Configure→Draw from Database**. This option is used to draw the single line diagram for the already existing database.

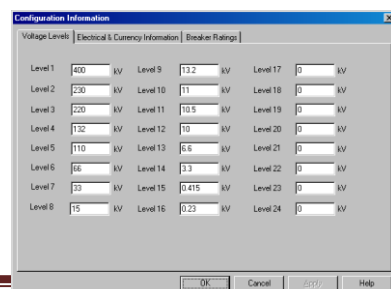
1.9.5 Configure Save Options

This option is used to save the opened file automatically by setting the time and Auto Save check box. This option can be set by selecting **Configure→Save Options**.



1.9.6 Configure Standards

This option can be used to view the power system network in **IEC** standards or **ANSI** standards. This option can be selected from main menu **Configure → Standards**.



1.9.7 Configure Network configuration

For details Refer to Chapter 3 section 3.2. In this section configure information dialog is explained in detail.

1.9.8 Configure Schedule

Select menu **Configure→ Schedule**. Schedule can be created or added by this option. For details refer Chapter 3 section 3.3.2 configure contingency and schedule

1.10 Plot

1.10.1 Plot Load Flow Analysis

This Option is used to plot Load analysis results on the single line diagram. This can be selected with the menu item **“Plot→Load Flow Analysis”**. When this is selected, a dialog box is popped up to select the different options.

The different options are -

Plot File: Plot file can be selected through browse option.

Results Layer: The layer name to which the results of the analysis have to be replaced. For example if the results layer is General, then the textbox which are placed in the layer General and having the display code ZZ..... Will be replaced by the corresponding numerical value obtained from the study. Voltage display.

Voltage Unit: Voltage Unit for display. Select kV/Angle or PU/Angle

Precision: Number of characters to be used for voltage display. By default 6 characters are used which includes the dot operator.

Low Value Colour: If the voltage value goes below the low value, then the voltage value is displayed with the colour specified. This gives an indication to the user about low voltage bus(s). Double click mouse LMB to configure a different colour for it.

Normal Value Colour: If the voltage value lies within the low value and high value, then the voltage value is displayed with the colour specified. This gives an indication to the user about normal voltage bus(s). Double click mouse LMB to configure a different colour for it.

High Value Colour: If the voltage value goes above the high value, then the voltage value is displayed with the colour specified. This gives an indication to the user about high voltage bus(s). Double click mouse LMB to configure a different colour for it.

Magnitude option and **angle** option are provided either to plot the magnitude and angle or not.

Power Flow Display

Flow Unit: Power flow Unit for display. Select MW/Mvar, MVA/Angle, Amp/Angle, Impedance R/X, Kw/Kvar or Kva/Angle.

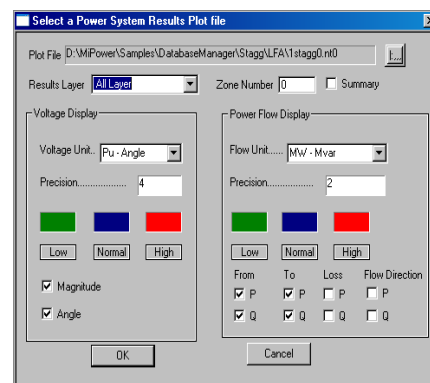
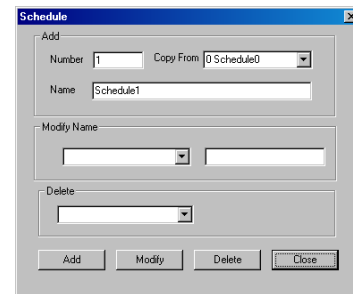
Precision: Number of characters to be used for power flow display. By default 6 characters are used which includes the dot operator.

Low Value Colour: If the MVA loading of the line is below 25%, then the power flow value is displayed with the colour specified. This gives an indication to the user about lightly loaded lines. Double click mouse LMB to configure a different colour for it.

Normal Value Colour: If the MVA loading of the line is between 25% and 100%, then the power flow value is displayed with the colour specified. This gives an indication to the user about normally loaded lines. Double click mouse LMB to configure a different colour for it.

High Value Colour: If the MVA loading of the line is above 100%, then the power flow value is displayed with the colour specified. This gives an indication to the user about heavily loaded lines. Double click mouse LMB to configure a different colour for it.

From P and Q and To P and Q and Loss P and Q options provided to select which flows are to be



plotted on to the network. Any combination can be selected.

About Display codes in details

Table 1: Display Codes for Load Flow and Fault Analysis

SN	Code	Load Flow Analysis	Fault Analysis
1.	ZZVMx	Voltage magnitude in pu at bus 'x'.	Fault level magnitude or post fault bus voltage magnitude in PU
2.	ZZVAX	Voltage angle in degrees at bus 'x'.	Fault level angle/voltage angle
3.	ZZLPx-y	P flow from node x to node y.	Forward fault flow magnitude
4.	ZZLQx-y	Q flow from node x to node y	Forward fault flow angle in degrees.
5.	ZZLPy-x	P flow from node y to node x	Reverse fault flow magnitude.
6.	ZZLQy-x	Q flow from node y to node x	Reverse fault flow angle in degrees.
7.	ZZLLx-y	Line loading from node x to y	-
8.	ZZLTx-y	Transformer tap	-
8.	ZZGPx	Generator real power at node x	Fault quantity injected to bus x by generator.
9.	ZZGQx	Generator reactive power at node x	Fault angle in degrees.
10.	ZZDPx	Load real power at node x	Fault quantity injected to bus x by load.
11.	ZZDQx	Load reactive power at node x	Fault angle in degrees.
12.	ZZDCx	Load compensation at node x	-
13.	ZZCPx	Capacitor real power at node x	Fault quantity injected to bus x by capacitor.
14.	ZZCQx	Capacitor reactive at node x	Fault angle in degrees.
15.	ZZRPx	Inductor real power at node x	Fault quantity injected to bus x by inductor.
16.	ZZRQx	Inductor reactive power at node x	Fault angle in degrees.
17.	ZZHVx	HVDC converter voltage	-
18.	ZZHPx	HVDC real power	Fault quantity injected to bus x by HVDC.
19.	ZZHQx	HVDC reactive power	Fault angle in degrees.
20.	ZZHTx	HVDC transformer tap	-
21.	ZZKPx-y	DC power from x to y	-
22.	ZZKCx-y	DC current from x to y	-
23.	ZZKPy-x	DC power from y to x	-
24.	ZZKCy-x	DC current from y to x	-
25.	ZZFISLAND n	Frequency of island n computed from load flow.	-
26.	ZZGPT	Total real power generation	-
27.	ZZGQT	Total reactive power generation	-
28.	ZZRPT	Total shunt reactor real power injection	-
29.	ZZRQT	Total shunt reactor reactive power injection	-
30.	ZZCPT	Total shunt capacitor real power injection	-

Note:

If **T** in the above list (26-30) is followed by **n**, where **n** is the zone number, value refers to particular zone. ex., ZZDPT5 gives the total real power load for zone 5.

If more than one line is connected between two buses the code should be written in the following way -

ZZLPx-y(**n**) where **n** is the line number starting from the first line connected between the buses x and y

If the three phase load flow or harmonic analysis results are to be superimposed on the single line

diagram, ZZ is followed by phase or sequence value index as below:

A	A Phase	ZZAVMx
B	B Phase	ZZBVMx
C	C Phase	ZZCVMx
1	Positive sequence	ZZ1VMx
2	Negative sequence.	ZZ2VMx
0	Zero sequence	ZZ0VMx

Table 2: Display Codes for Relay Co-ordination

SN	Code	Relay Co-ordination
1.	ZZPPSname	Phase plug setting in amperes.
2.	ZZPTSname	Phase time dial setting.
3.	ZZPISname	Phase instantaneous setting in amperes.
4.	ZZEPSname	Earth plug setting in amperes.
5.	ZZETSname	Earth time dial setting.
6.	ZZEISname	Earth instantaneous setting in amperes.
7.	ZZPFCname	Phase fault current sensed by the relay.
8.	ZZEFCname	Earth fault current sensed by the relay.
9.	ZZPOTname	Phase fault operating time.
10.	ZZEOTname	Earth fault operating time .

Note: where 'name' is the relay name. The fault current sensed by the relay and operating times for these currents are generated only if the simulation option is greater than 1.

Table 3: Display Codes for Notation used for display

SN	Code	Load Flow Analysis	Short Circuit studies
1.	ZZNOTE1	Display Notation	Display Notation
2.	ZZNOTE2	Sign convention for injection into bus	Fault level at bus
3.	ZZNOTE3	Sign convention for drawl from bus	Fault contribution
4.	ZZNOTE4	Voltage magnitude and angle units	Fault level units
5.	ZZNOTE5	Line flow units	Fault contribution units

1.10.2 Plot Short Circuit Study

After the execution of short circuit study, results can be plotted on the SLD. Either Fault MVA or Fault current can be plotted.

Summary Checked: Summary will be plotted

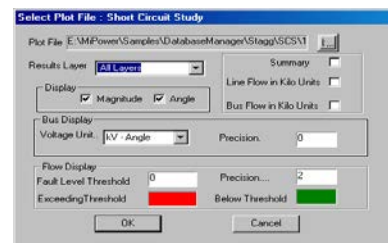
Voltage Unit display: Voltage Unit for display. Select kV/Angle or PU/Angle

Precision: Number of characters to be used for voltage display.

Voltage display. By default 6 characters are used which includes the dot operator.

Flow in Kilo units : Line flow and bus flow in kilo units displayed in SLD

Fault Level threshold: Set the threshold value Flows exceeding the threshold value displayed in red colour. Flows below threshold value displayed in green colour.

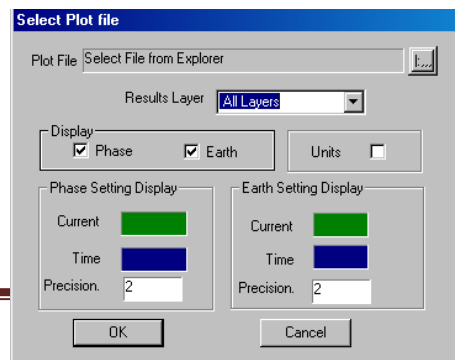


1.10.3 Plot Relay Co-ordination

This option is used to plot the Relay Co-ordination study results by selecting ".acd" file. Phase and earth relay settings of Current and time in different colour can be plotted on SLD

Plot File: From browse select the .acd file which is stored in ORCD folder. By default this file is selected by the program

Results Layer: Normally static layer from the drop down list is to be selected for plotting the results. By



default program will select the static layer

Display: Phase and Earth: User has an option to plot relay co-ordination results for Phase co-ordination and Earth Co-ordination

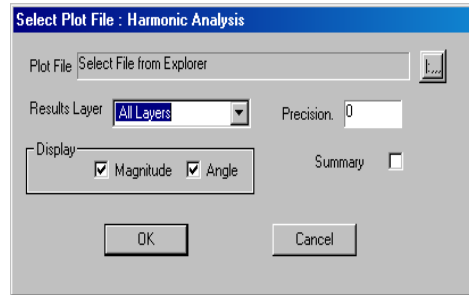
Units: This can be on / off

Phase setting Display and Earth setting Display : Current and time settings for phase and earth can be plotted on the diagram(GUI). Current and Time display colours can be set by the user

Precision: Number of characters to be used for power flow display. By default 6 characters are used which includes the dot operator.

Ok: Closes the dialog and plot the results on GUI

Cancel: Closes the dialog without plotting



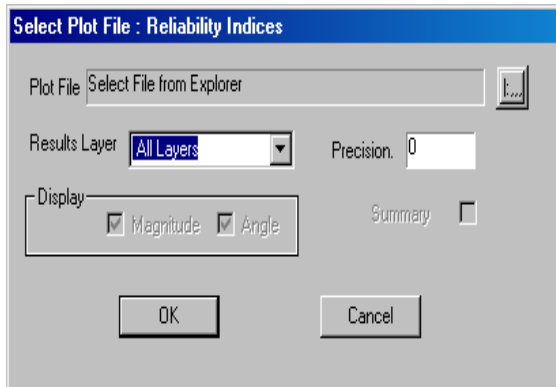
1.10.4 Plot Harmonic Analysis

This option is used to plot the harmonic study results by selecting ".acd" file

Total harmonic distortion factors for different buses will be plotted on the GUI

1.10.5 Plot Reliability Indices

This option is used to plot the reliability study results. This option is used to plot the Reliability study results by selecting ".acd" file



1.10.6 Plot Three phase Load Flow

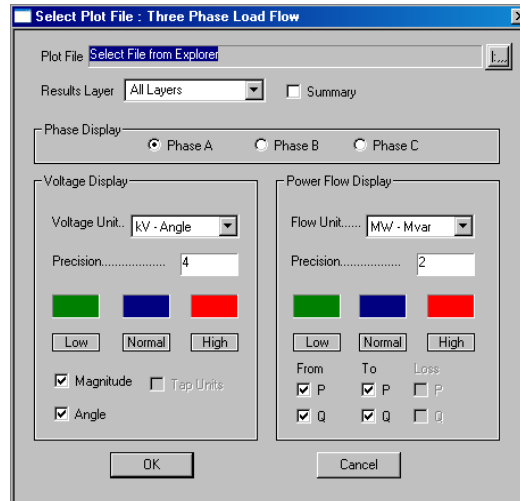
Plot option is similar to Load flow study plotting.

Phase Display: Selected phase (Phase A or Phase B or Phase C) results will be displayed Voltage display.

Voltage Unit: Voltage Unit for display. Select kV/Angle or PU/Angle

Precision: Number of characters to be used for voltage display. By default 6 characters are used which includes the dot operator.

Low Value Colour : If the voltage value goes below the low value, then the voltage value is displayed with the colour specified. This gives an indication to the user about low voltage bus(s). Double click mouse LMB to configure a different colour for it.



Normal Value Colour: If the voltage value lies within the low value and high value, then the voltage value is displayed with the colour specified. This gives an indication to the user about normal voltage bus(s). Double click mouse LMB to configure a different colour for it.

High Value Colour: If the voltage value goes above the high value, then the voltage value is displayed with the colour specified. This gives an indication to the user about high voltage bus(s). Double click mouse LMB to configure a different colour for it.

Magnitude option and **angle** option are provided either to plot the magnitude and angle or not.

Power Flow Display

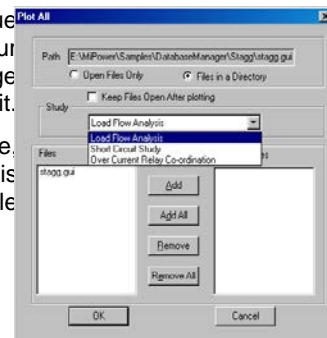
Flow Unit : Power flow Unit for display. Select MW/Mvar, MVA/Angle, Amp/Angle, Impedance R/X, Kw/Kvar or Kva/Angle.

Precision Number of characters to be used for power flow display. By default 6 characters are used which includes the dot operator.

Low Value Colour: If the MVA loading of the line is below 25%, then the power flow value is displayed with the colour specified. This gives an indication to the user about lightly loaded lines. Double click mouse LMB to configure a different colour for it.

Normal Value Colour: If the MVA loading of the line is between 25% and 100%, then the power flow value is displayed with the colour specified. This gives an indication to the user about normally loaded lines. Double click mouse LMB to configure a different colour for it.

High Value Colour: If the MVA loading of the line is above 100%, then the power flow value is displayed with the colour specified. This gives an indication to the user about heavily loaded lines. Double click mouse LMB to configure a different colour for it.



1.10.7 Plot All Files

An option to plot the results in all the open GUI's or GUI's in a directory is provided. This option will be useful when there are many sub-networks associated with the same database (in the current version database association is not checked).

Select the menu option **Plot → Plot All files**

A dialog box appears

All the networks present in the directory will be listed. Add the files wherein load flow results are to be plotted.

Files in a Directory: Study results will be plotted in the selected files presented in the directory

Open Files Only: Study results will be plotted in the files, which are currently open.

Keep the Files open after plotting: Check this to keep the files open after plotting the results.

Uncheck to close the files after plotting the results. The currently active file will not be closed.

Study: User can select required study results to be plotted in the selected files.

Click on

Add – to add a file from the Files list box to Selected Files list box.

Add All – to add all the files to Selected Files list box.

Remove – to remove a file from Selected Files list box.

Remove All – to remove all the files from Selected Files list box.

OK – to plot the results

Cancel – to cancel the plotting

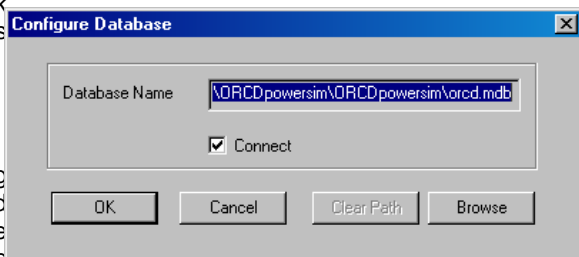
1.11 Database

1.11.1 Database Configure

The steps involved to associate and work with the database from the network editor is as follows –

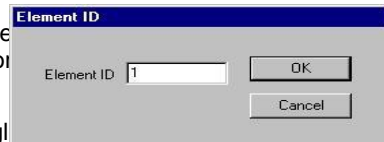
Before starting the new single line diagram, select **Database → Configure**

When configure is selected the following dialog box appears. Browse to the desired directory and specify the name of the database to be associated with this single line diagram



A database with user defined name is created. Configure the Electrical information (refer database manager manual for further details). Click OK.

In the Network Editor, configure the base voltages for the single line diagram.



Standard Library check boxes are provided. If they are checked standard libraries (transmission lines, transformers, generators and Relay libraries) are included in the new database.

Start drawing the network. On completion of drawing an element a dialog box prompting the user for the element ID appears. Enter the element ID.

Rules

Each element of a particular type should have unique ID. (eg. No two different transformers shall have same ID).

Two elements of same type can have identical ID's in a network when the two elements are physically same but for presentation purpose is drawn at two different locations. In this case there will be only one data in the database

Two different types of elements can have same ID (eg. A line and a transformer can have same ID number)

Once the element ID is given and corresponding data is updated in the database, **do not change the element ID**. If the ID is changed the link between the database and the element for which the ID is changed will be lost.

Click OK. If the database is connected, the corresponding form appears. The data that is passed to the database from the network is grayed. It is not possible to edit that data. For example, if a transformer is drawn, the transformer form appears in add mode. The element number, from bus and to bus is grayed as shown below. Enter the remaining data. Enter the library details also (for

details refer: database manager manual). Save the record. After saving an element record the control is transferred back to network editor. But when a library is saved the **To Network** button on the bottom toolbar should be selected to pass control back to the network editor.

Draw the remaining diagram, the above step is repeated for each element.

To edit: Double click on the element. Corresponding data form appears. Modify if required and save.

Note: To edit bus data, hold down CTRL key and double click.

To Delete: Select the element and select delete from the edit menu. If a corresponding element exists in the database, the user is prompted with the message "Delete this record ?". Chose the

required response. Note that the element may be present in the database but not in the single line diagram or vice versa.

To associate an existing database with an existing single line diagram.

Rules:

The bus numbers in the single line diagram should be proper. Check the bus numbers associated with each bus.

The elements should be actually connected between the two buses. (There is a possibility that only representation is done without actually connecting it to the buses). If not connected, the element ID will be set to 0.

Steps:

Open the single line diagram

Configure the database, by selecting the existing database. This will automatically connect to the database.

In Database Manager, select **Options→Update Network** from the main menu. The following dialog box appears. Click on start to update the network, OK to close the dialog box. When updating is completed a message appears. Click Ok. Now check the elements for the element ID's. All elements ID's will be updated. If not updated, check the bus numbers and connectivity information.



1.11.2 Database Connect

When the network is configured and a database is associated select this option connects to explicitly connect to the database. Network will get connected to the database automatically even if this option is not selected

1.11.3 Database Disconnect

When the network is configured and a database is associated, select this option disconnects to explicitly disconnect from the database.

1.11.4 Set All

This option is provided to set the database name for many sub-networks associated with the same database. This option can be used when all the networks and database are copied to a new location or when a different database is to be associated with many sub-networks.

The steps to modify the database name are –

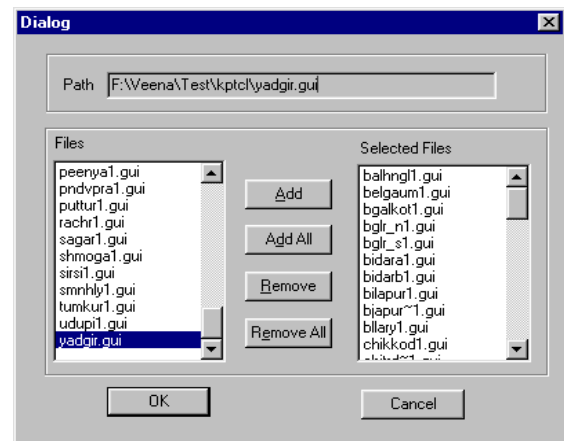
Open one of the sub-networks

Configure new/modified database

Select – Database – Set All

The following dialog box appears

Select the files for which the database name is to be modified.



Click on

Add – To add a file to the Selected Files list box

Add All – To add all the files to the Selected Files list box

Remove – To remove a file from Selected Files list box

Remove All - To remove all the files from Selected Files list box

Ok - to modify the database associated with the selected networks

Cancel – to cancel the database name association modification operation.

1.11.5 Copy Libraries

This option is used to copy libraries from one database to another database. For this GUI should be connected with database. For details refer Database manager (chapter 3) menu options-> Database >> Copy libraries

1.12 Solve Menu

The following power system study can be performed through power system network editor

- Load flow analysis
- Short circuit study
- Over current relay co-ordination
- Distance relay co-ordination
- Transient stability
- Dynamic stability
- Sub-synchronous resonance
- Network reduction
- Voltage Instability
- Harmonic Analysis
- Electromagnetic transient analysis
- Three phase load flow analysis
- Reliability Indices
- Observability Analysis
- State Estimation
- Arc Flash Analysis

For details, please refer Database Manager - Solve Menu

1.13 Tool Menu

- For the following option details refer chapter **Database Manager - Tools Menu**
- Present Worth
- Cost analysis
- MIS
- Batch Mode load flow analysis
- Batch mode contingency creation
- Batch mode for load curves
- Distribution Analysis
- Energy loss computations
- Update Breaker ratings
- Update De-rated MVA Rating

- Update Real Time data
- Transformer Check
- View
- Report Writer

1.13.1 GPS Interface

This option helps to draw the single line diagram according to geographical positioning of points and draw the network. Select from the main menu **Tool --> GPS**. Following dialog will open.

GPS diagram can be generated from GPS file or from the database.

Generate from database

Open the GUI and configure the database which have GPS coordinates

Set menu, Option->Document Size->Select GPS radio button-> select document size as per the requirements and enter the maximum and minimum values of latitude and longitude ->click on ok

Select GPS interface-> Generate from DB option

Check Show connection option in order to show line and load connection otherwise only buses will be displayed

Select Bus name or number to be displayed in GUI and execute

To locate a GPS Point: Select menu Objects->Locate GPS Point. Give inputs for latitude and longitude->ok. It will scroll to the particular latitude and longitude.

Bus and Load Symbol Reference: for symbol selection option for font no, colour and ratio set from the existing library. For details refer section 2.2.7 and 2.2.8.

Line Distance: It gives distance between the two points by calculating the distance from GPS coordinates

Generate From file will have following procedure

Open a new GUI file

Browse for GPS input file, Connection data file and load data file

Give no of pixels/km

Select Load symbol reference

Execute and Click on GUI button to view the network.

GPS Input File: Browse for the GPS input file. Edit will open the file. Sample File format is given below

Waypoints	hddd°mm.mmm'	BERI-03			
	Latitude	Longitude	Time	Symbol	Alt
APP2	13°33.540'	77°2.842'	392083201	01	923
UI	13°34.308'	77°2.952'	392083201	02	898
OPP3	13°34.617'	77°1.892'	392083201	01	813
KPP-17	13°33.603'	77°3.582'	392083201	01	850
KBP-14	13°33.467'	77°3.495'	392083201	03	844
KBP-13	13°33.357'	77°3.493'	392083201	03	848
KBP-271	13°33.443'	77°3.265'	392083201	03	840
KBP-272	13°33.520'	77°3.218'	392083201	03	838
KBP-29	13°33.445'	77°3.227'	392083201	03	836
KBP-24	13°33.490'	77°3.275'	392083201	03	841
KPP	13°34.023'	77°3.303'	392083201	01	839
KBP-RD	13°33.823'	77°3.542'	392083201	03	845
KBRI	13°33.718'	77°3.263'	392083201	02	851
CBP-55	13°34.203'	77°3.573'	392083201	03	847
CXBP	13°34.115'	77°3.578'	392083201	04	845
CXBP	13°34.070'	77°3.603'	392083201	04	848
CBP-56	13°34.160'	77°3.695'	392083201	03	849
CBP-361	13°34.110'	77°3.760'	392083201	03	845
CBP-362	13°34.060'	77°3.797'	392083201	03	847
CBP-34	13°34.138'	77°3.917'	392083201	03	840

Connection

Data file: Browse for the connection data file. Sample file format is given below.

The first line represents the number of connection points.

The name of the from and to connection points as in the GPS input file 4

From Pole	To Pole	Line Library No
P1	P2	2
P2	P3	2
P3	P4	2
P4	P5	2

Load Data File: Browse for the load data file. Sample file format is given

below Pole No	DTC	MW	MVAR
P31	DTC-1	212.5	131.695
P34	DTC-2	212.5	131.695
P40	DTC-3	85	52.678
P42	DTC-4	85	52.678
P44	DTC-5	212.5	131.695

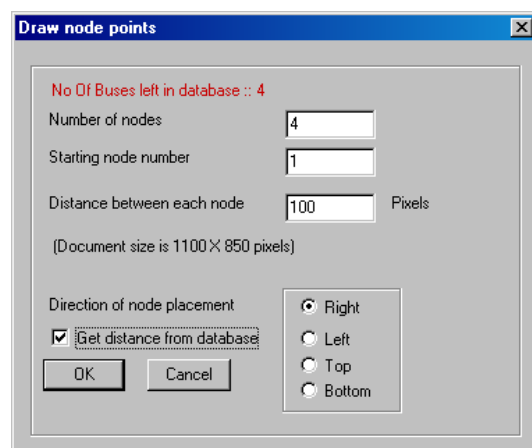
Save: Changes will be saved.

Font symbol, Font colour, ratio can be modified. No of pixels/km and reference shift along X and Y can be given. All these details can be saved by clicking **Save** button

Execute: Click this button opens a dialog as shown below. Click OK

Done: It takes the control to GUI

File Format: Opens the GPS file format details file.



1.13.2 Draw Reference Points

This option is used for distribution network. To use this option follow the given steps.

Open new GUI document

Configure database to the GUI document

Select Configure > Draw from database option from main menu

By using free hand tool place a point on the gui document and **associate** with database element. Now select **Tool > Draw Reference point** option. Following dialog will open

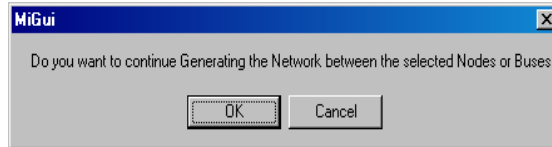
Number of Nodes: Enter number of points or buses.

Starting node number: Enter starting node number

Distance between each node: Enter distance between each node in pixels.

Direction of node placement: select direction of node placement with the given option

Get distance from database: Check this to get distance on GUI document. Click **OK** button to place the references points on GUI document.



1.13.3 Draw Distribution Network

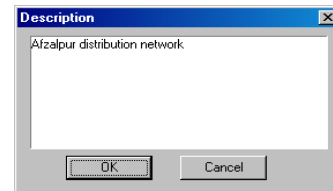
After placing the reference points on the GUI document select **Tool > Distribution Network** option to draw the network. Following dialog will appear. Click OK button. Distribution network with distance will appear on the GUI document.

1.13.4 Switching Optimization

Consider closed distribution network. Select switching optimization option, which shows which line, is to be opened.

1.13.5 Description

Select this option from Tool-> Description. Following dialog will open. Enter the details of the network and click OK button.

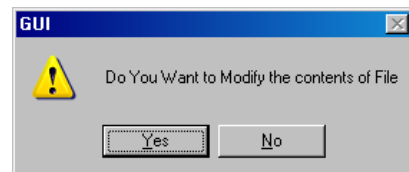


1.13.6 Draw from File

Provide network elements coordinates in a text file. Then select **Tool-> Draw From File** to draw the network.

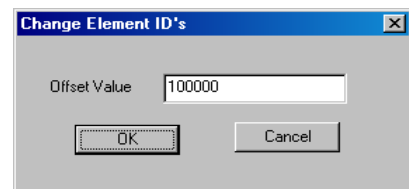
1.13.7 Change Draw Text File

To modify the contents of the Draw text file use this option.



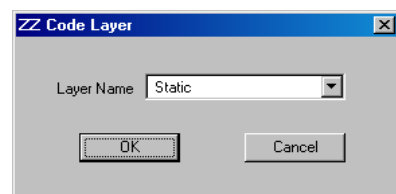
1.13.8 Change Element IDs

This option is used to modify the power system element IDs present in the active GUI document. Give the offset (starting) value and then click OK button.



1.13.9 Generate ZZ codes

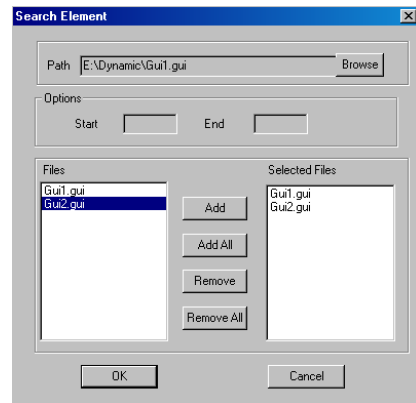
This option will list the ZZ codes for the power system elements present on the active GUI document. Select the appropriate generated code and place it on the element.



1.13.10 Create Dynamic Links to NOP's

This is useful when No of GUIs with NOPs is more and link them. Same lines with connected buses are in different GUIs with the same database.

Configure the GUI with database. From tool select menu option Tool->Create Dynamic links to NOPs. Following dialog with listing of all GUIs present in that folder.



Add All: Adds all files from file list box to Selected files List box

Remove: Removes a file from Selected files list box

Remove All: Removes all files from selected files list box

OK: Updates the changes and closes the dialog

Cancel: Closes the dialog without updates

Refer Database manager (Chapter 3) menu Tools->Automatic normal opening point creation

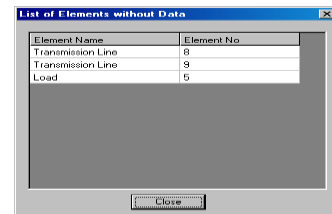
1.13.11 Update Dynamic Link

Update dynamic Links: After creating dynamic links, select Tool->Update dynamic link. a text box appears on the GUI with File name. Double click on the text box will open the GUI with NOP

Refer Database Manager (Chapter 3) Menu Tools->Update NOP

1.13.12 Elements Not Connected to Database

To use this option select a gui and configure it to database. Select option Tools-> Elements Not Connected to Database. This shows the list of elements which are present only in GUI and not in database.



1.13.13 Unit Protection

The following unit protection study can be performed through power system network editor.

Transformer Differential

Restricted Earth Fault

Line Pilot

Bus Bar Differential

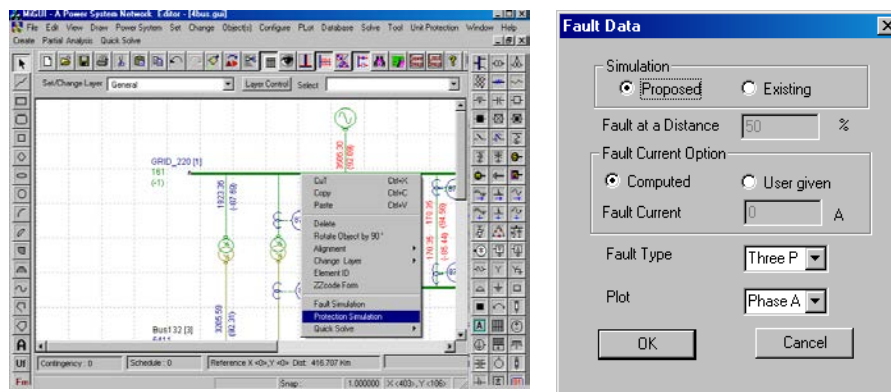
Line Differential

Protection Report

These topics are covered in detail in Database Manager Chapter-3 Menu Unit Protection

1.13.14 Protection Simulation:

Over current co-ordination can be simulated and the relays tripping sequence can be viewed on SLD. Relay Network which is connected to the database, right click on the bus from the drop down list select Protection Simulation which opens the Fault Data screen

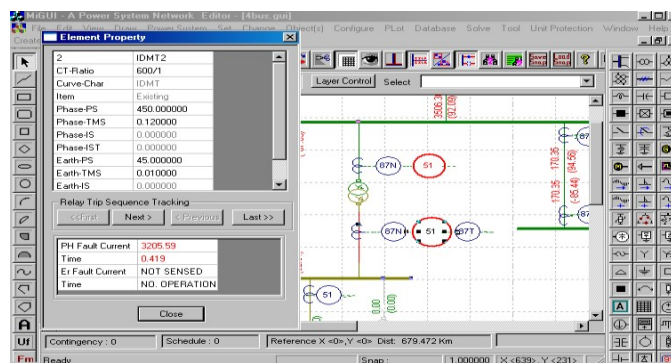


Simulation: Existing or proposed settings to be considered for simulation

Fault Current option: Program considers by default, computed settings for simulation. For user given fault current also simulation can be done.

Fault Type: Three phase, SLG, LL or LLG fault can be selected from the drop down list

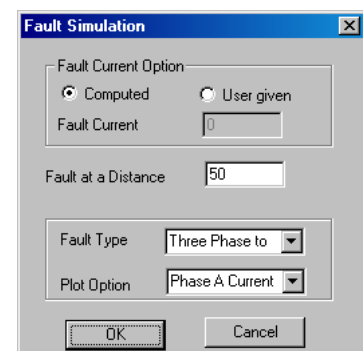
Plot: PhaseA, PhaseB, PhaseC, positive sequence, Negative sequence or Neutral can be selected from the drop down list. Element Property window with CT, Relay details and Relay trip sequence tracking will appear on Network (SLD) as shown below. After the relay operation, tripped section appears in grey colour.



1.13.15 Fault Simulation:

Short circuit analysis for the selected bus can be executed and plotted on the SLD. Right click on any bus from the drop down list. Select Fault simulation which opens the Fault simulation window. Select fault type and plot option from the drop down list. Then click OK button which simulates SCS and plot the results on SLD showing fault symbol at the faulted bus. Option is provided for user given fault current simulation and computed fault current simulation.

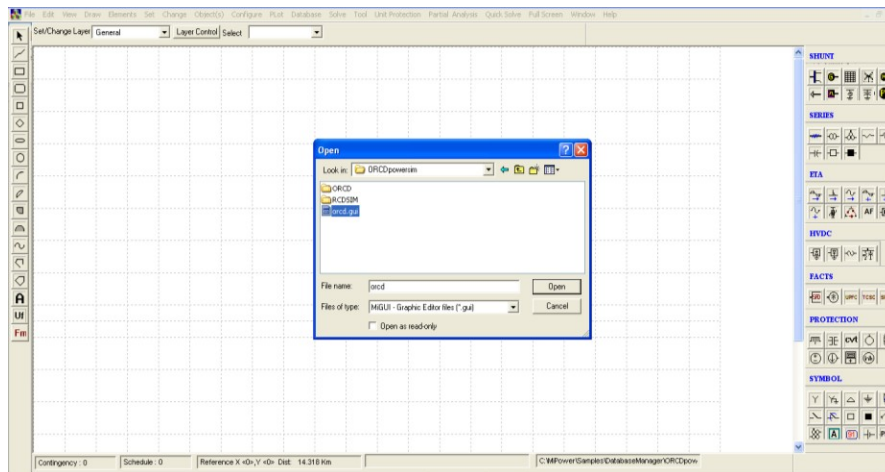
Select line and right click which opens the fault simulation window with fault at a distance field enabled. User has the option to enter % of the line to simulate short circuit studies.



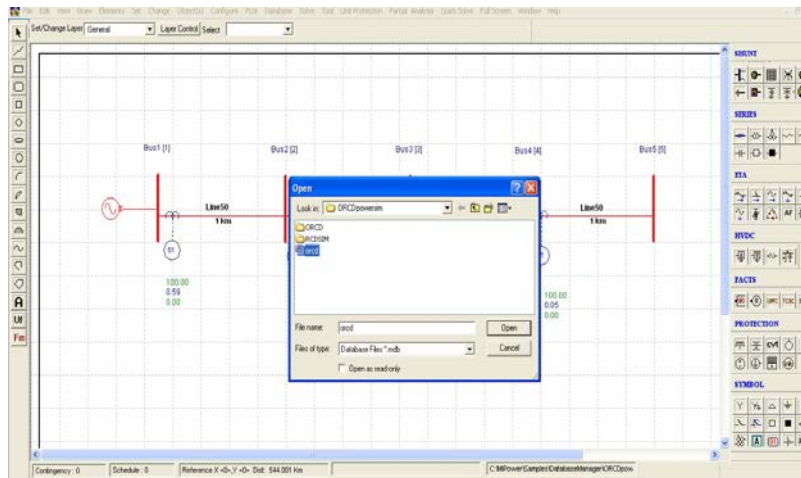
1.13.16 Disturbance Analysis (Single file analysis):

Single file analysis (disturbance analysis) procedure is explained in the following steps

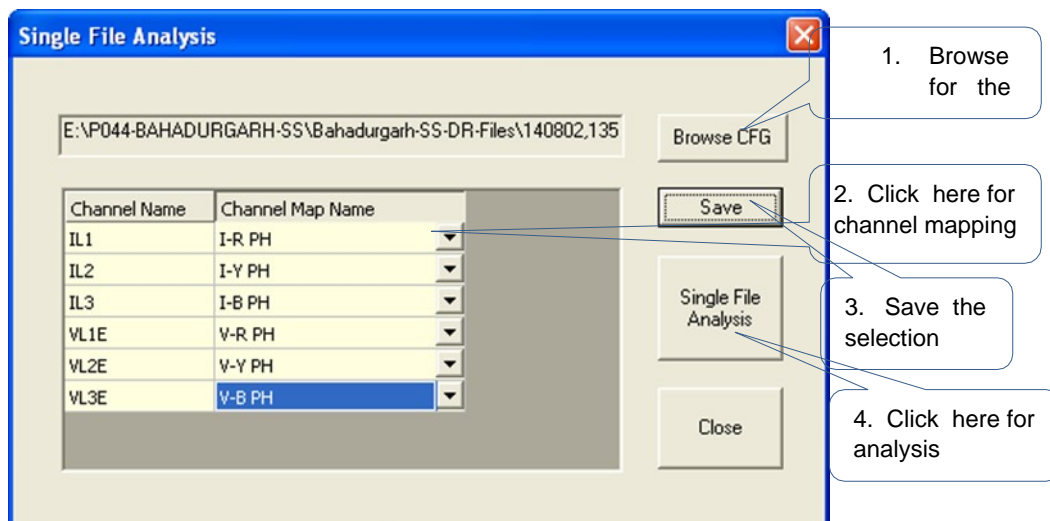
1. Select the .GUI file from the data folder. The following screen appears:



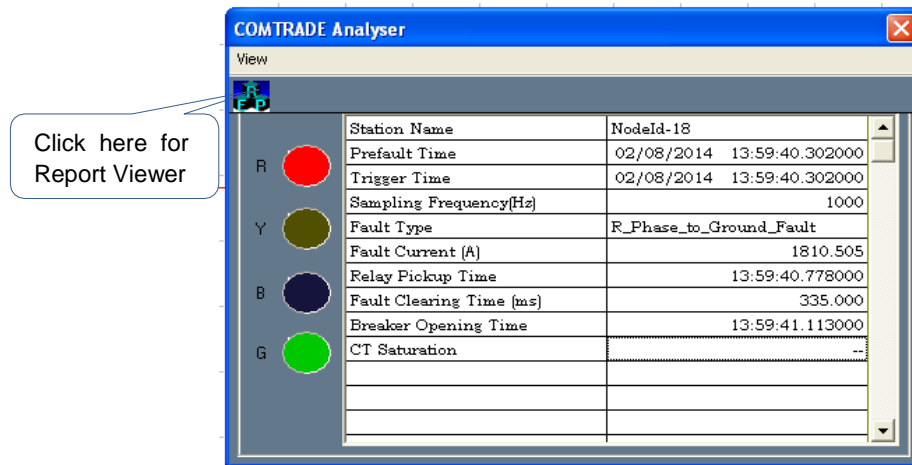
2. GUI file opens Configure the database by selecting menu option **Database-> Configure**.



3. Here select a **Relay** and right click and select **Disturbance analysis**. Following dialog opens. Browse for .cfg file. Select phase voltage and current for channel mapping
4. Save the options and click on Single File Analysis button.



5. The following screen appears. Click on Report Viewer.



6. The report file opens as shown below.

File Edit Format View Help

RELAY TYPE: NON DIRECTIONAL OVER CURRENT RELAY

Waveform Analysis

Type of Fault : R Phase to Ground Fault

Fault Current (A) : 1810.505

Fault Voltage (kV) : 94.052

Relay Pickup Time : 13:59:40.778000

Fault Clearing Time (ms) : 335.000

Breaker Opening Time : 13:59:41.113000

Auto Reclosure : No Auto Reclosure

AR Dead Time (ms) : 0.000

CT Saturation : --

Relay Operating Time From Settings (ms): 0.335

SUMMARY OF ANALOG CHANNELS

ChannelNo	ChannelName	Unit	RmsMax	RmsMin	Positive Peak (Inst)	Negative Peak (Inst)
1	Ix	A	1861.160077	0.000000	2547.302400	-3303.01
2	Iy	A	461.908896	0.260668	659.865600	-645.120
3	Iz	A	364.838015	0.514917	512.409600	-516.096
4	Vx	V	127.328711	62.005917	180.887516	-180.793
5	Vy	V	129.173859	121.783085	181.189404	-181.208
6	Vz	V	128.010237	121.579860	181.849784	-182.321

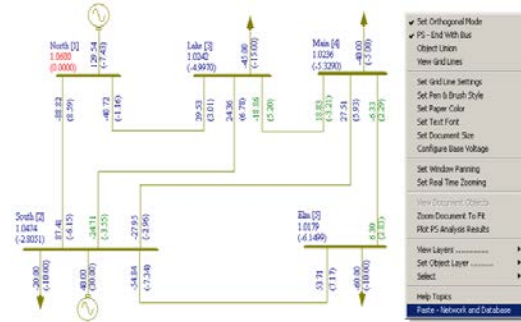
ANALOG CHANNEL STATES INFORMATION

Channels	Pre Fault (rms)	Fault (rms)	Post Fault
1-Ix (A)	351.585 (-116.060)	1810.505 (172.776)	0.261 (
2-Iy (A)	368.812 (123.861)	449.275 (129.750)	0.752 (
3-Iz (A)	364.466 (2.394)	307.536 (2.228)	1.207 (

1.13.17 Copy & Paste Network and Database

Elements:

This option is to be used for the network connected with database. Select the network to be copied and right click the mouse button and select copy option or Ctrl+C. Then click on the screen and right click the mouse button and select paste-Network and database option as shown below. Copied object will be pasted at the cursor point.



Change element ID's dialog appears. If the option is Default, element ID's will be given by the program. If the option is user defined, then the ID's will be taken from the offset value specified by the user.

Substation: Substation code for the selected buses can be replaced which were entered in Bus no. fields (from, to, new code i.e. value). Like that element IDs can be changed

Replace: Type the substation name which can be replaced by new name which is to be typed in by text box. It replaces Bus names and element names

OK: Updates the selection and closes the window

Cancel: Without changes close the window.

Network with new element ID's copied to GUI file and also the database is updated with copied elements.

Partial Analysis

This option will be useful when there are many sub-networks associated with the same database.

Over Current Relay co-ordination can be simulated for selected relays or over current relays present in the opened network. Option is there to select all relays present in the database. Graph option is there to view phase relay curves or earth export: Opens Over current relay coordination report

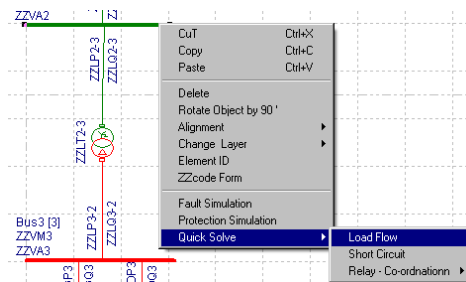
Custom Report: Opens custom report

Execute: Relay co-ordination program will be executed

Graph: Co-ordination graph can be plotted

OK – To simulate the relay co-ordination

Cancel – To cancel the simulation



1.14 Quick Solve

Following studies can be executed from this menu option and results will be plotted after the execution. This option can be obtained from control menu option (i.e. hold control and select a bus) of a bus and then right click RMB (Right Mouse button) from the list select Quick Solve option.

Load flow: Load flow will be executed with the options provided in LFA study info screen and the results are plotted on the SLD. This option will take last load flow case options

Short Circuit Study: Short Circuit study will be executed with the options provided in SCS study info screen and output options and the results are plotted on the SLD

Relay Co-ordination: Over current and Distance relay co-ordination can be executed without going

1.14.1 Window Menu

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

1.14.2 New command

Use “**Window→ New**” 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.

1.14.3 Cascade command

Use “**Window→ Cascade**” command to arrange multiple opened windows in an overlapped fashion.

1.14.4 Tile command

Use “**Window→ Tile**” this command to arrange multiple opened windows in a non-overlapped fashion.

1.14.5 Arrange Icons Command

Use “**Window→ Arrange Icons**” 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.

1.14.6 Window 1, 2...

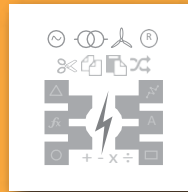
MiGUI displays a list of currently open document windows at the bottom of the Window menu. A check mark appears in front of the document name of the active window. Choose a document from this list to make its window active.

1.15 Help

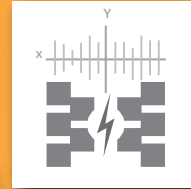
To explore help provided in the **Power system Network editor**, use menu options “**Help → Help Topics**”



 **PSCT** | Protection Analytic tool



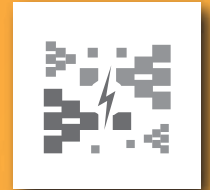
**Power System
Network Editor**



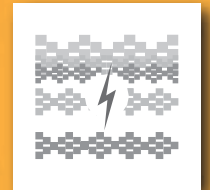
Graph Utility



Database Manager



**Free Programmable
Block**



**COMTRADE
Viewer**



LPC/CPC



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