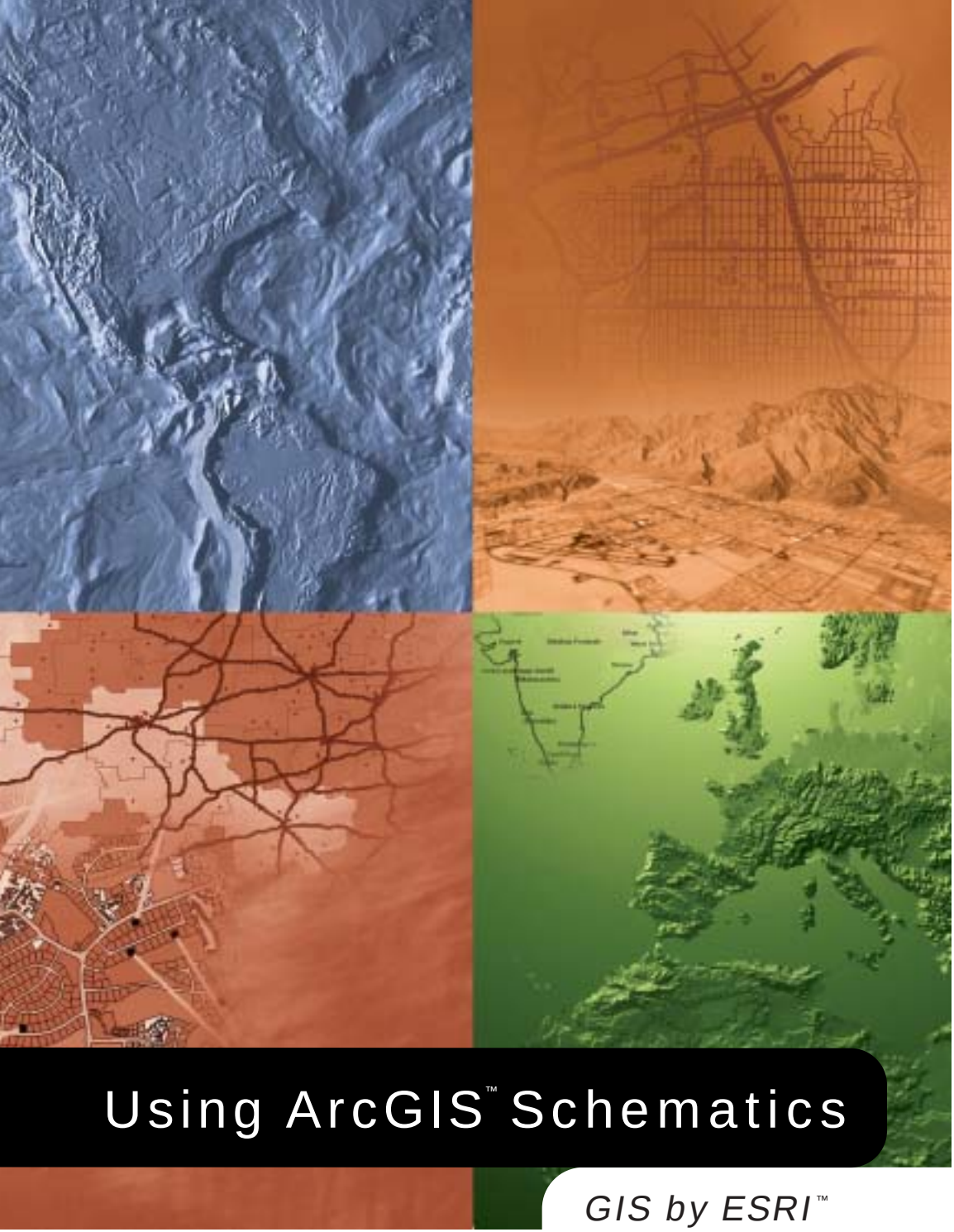

# Using ArcGIS™ Schematics

*GIS by ESRI™*

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# Quick-Start Tutorial

This tutorial allows you to rapidly connect to and visualize existing geodatabase facility information in the ESRI® ArcGIS™ Schematics application and use some of the powerful ArcGIS Schematics layout tools to generate various schematic representations of the network data.

Using a default definition and connection scheme (workspace parameters ".ini" file), anyone can quickly connect to their ArcGIS data from within the integrated ArcGIS Schematics environment.

## ➢ Installing ArcGIS Schematics

When you install ArcGIS Schematics, all of the necessary references to the ArcGIS Schematics toolbars, which will then be accessible from any ArcMap™ session, will be created.

If the seven ArcGIS Schematics toolbars do not appear in the Toolbars tab, you can access them by clicking the Tools menu and clicking Customize, then clicking the Toolbars tab and clicking the Add from file button. Select the NgSpatialToolbars22.dll file from the C:\arcgis\arcexe82\Schematics\Bin directory. The seven ArcGIS Schematics toolbars should then appear in the Toolbars tab list; checking each of the toolbar names displays them in ArcMap.

If the Schematic menu does not appear in the Menus tab, click the Tools menu and click Customize, then click the Commands tab and click the Menus category. Then click Schematic from the Commands list and drag it to the Menu tab.

## ➢ Operation Modes

ArcGIS Schematics provides support for the product in three operational modes: CGM-Automatic, CGM-Default, and DocINDB. The mode of the project dictates the type of symbology used, either ArcMap symbols or user-defined CGM symbology. It is suggested that user-defined CGM symbology be generated using the symbol editor included with ArcGIS Schematics since the CGM format files used by ArcGIS Schematic add some custom data to the published format.

The installation of ArcGIS Schematics delivers two different parameters file designed to offer two different sets of behaviors, connection schemes, and customization choices to the production of schematic network diagrams. This tutorial will describe both but will only illustrate the use of the one requiring the least amount of initial configuration to produce results.

Under the product installation directory (by default, C:\arcgis\arcexe82\Schematics), there is a directory named Templates that holds sample workspace connection files, which will allow you to work in either of the two operational modes.

The Session_DocCGM folder holds the predefined workspace parameters file associated with working in DocCGM mode. This mode allows you to open a workspace that utilizes existing ArcMap symbology and topology in the creation of new ArcGIS Schematics documents. The steps necessary to create a new ArcGIS Schematics document using this connection method are described below.

For reference, the Session_DocCGM folder contains the parameters file with the name NGSTmpDCGM22 and extensions of ini, par, mdl, and ctx. There are three subdirectories—CGM, GraphicBackup, and GraphicFolder—which contain the symbology rules, backup documents, and document files when saved. When new sessions and documents are created, a Microsoft® Access database called MySchematic.mdb is created. This database holds the decoded coordinate geometry, network topology, and symbology rules from the associated features in the project geodatabase. You should make a new copy of this template directory in another location if you intend to create several workspace sessions from multiple geodatabases. Otherwise, the MySchematic.mdb file will contain decoded information from a number of sources.

## ➢ Starting an ArcMap Session and Referencing the ArcGIS Schematics Tools

Launch ArcMap and load an existing document or create a new document. Load network data from a geodatabase. *If the dataset does not include network data, then the ArcGIS Schematics data tools will not perform any useful function, and you may not be able to create any new documents*. If you have features that could participate in a network but have no network defined, quit ArcMap and open an ArcCatalog™ session and see the online Help in ArcCatalog for creating a new network from existing feature class data.

## ➢ Creating a New Schematic Document Type from Existing ArcMap Data

Using the standard ArcMap tools, build a selection set or run a trace, which produces a set of features that you would like to manipulate in ArcGIS Schematics. A simple electric network example would be to run a connected trace from an isolated area of the network by setting necessary barriers and flags with the Utility Network Analysis toolbar tools.

## ➢ Open Schematic Session

Select the "Open Schematic Session" command ("Schematic > Session/Workspace > Open Schematic Session" menu) and choose the "C:\arcgis\arcexe82\Schematics\Templates\Session_DocCGM\NGSTmpDCGM22.ini" workspace parameters file found in the location previously discussed. This will create all of the necessary session data to view and manipulate your network and to create new ArcGIS Schematics documents.

## ➢ New Document from Selection

With a selection set active in ArcMap, click the Generate Document from ArcMap Selection Set command. A form will open asking for the new document name. The document creation is controlled by the workspace configuration file as is the operation to define geometry types and link those types to the selected ArcMap element's definitions.

The new document will not only contain the elements from the selection set, but the existing symbology rules from the ArcMap session will be copied as well.

## ➢ New Document from Last Trace

Like the selection set method, if an ArcMap trace operation (with results displayed as a drawing) was just run, the Generate Document From ArcMap Trace Results command will create a new document containing the elements from the selected trace. This also contains the symbology from the ArcMap session and the behavior of the ArcMap objects. If the trace results are defined to be returned as a selection set, only the Generate Document From ArcMap Selection Set command will be available.

The schematic document that is created as a result of either operation can be manipulated with the schematic layout tools to generate a number of different types of schematic documents. For information on using these tools, see the section "ArcGIS Schematics Toolbars and Menus" in this book.

## ➢ Save Document

The operation of creating a new document from the active ArcMap selection set or tracing result will result in decoded information about the features in the selection set or trace result being stored in the local MySchematic database. Even if the generated document is not saved (by using the Save Document command), your new document will be retained and can be opened after closure. If your document is saved using the Save Document command, the position of the nodes and links from the network layout as displayed are retained in the GraphicFolder directory in the ArcGIS Schematics graphic database format.

This database is independent of the MySchematic database. When a saved document is reopened, the graphic database is synchronized with the application's database (MySchematic) and the modifications (objects created or removed) introduced in the latter are then reflected.

## ➢ Quick Start Summary

1. Start ArcMap and load data from a geodatabase.
2. Select or trace some objects in ArcMap.
3. Menu: "Schematic > Session / Workspace > Open Schematic Session", and select (open) C:\arcgis\arcexe82\Schematics\Templates\Session_DocCGM\NGSTmpDCGM22.ini.
4. Use the Generate Document from ArcMap Selection Set tool or the Generate Document From ArcMap Trace Results command to generate the ArcGIS Schematics document associated with the current ArcMap selection set or trace result set.
5. Increase the symbol sizes as required and select the desired layout type.
6. If you want to store your current network layout, save your new document before closing it. If not, your document will reopen with the default geographic coordinates, meaning that all changes introduced in the document since it was created (node and link positions) will not be taken into account.

# ArcGIS Schematics Overview

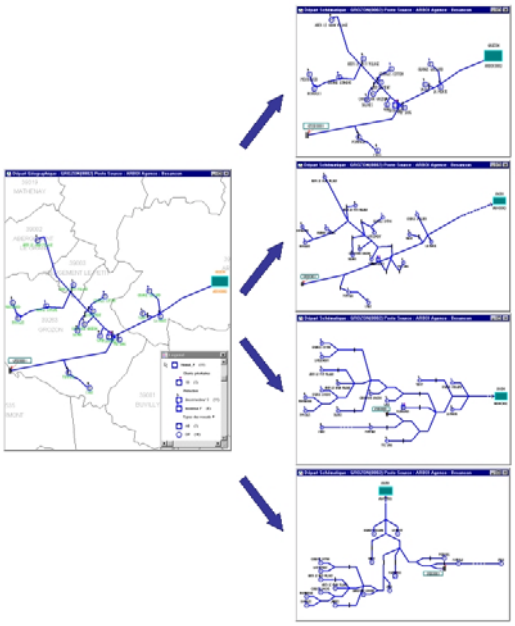
ArcGIS Schematics is a software solution integrated with ESRI geographic information system (GIS) software, allowing network geographic and schematic representations to be visualized and controlled in the same environment. ArcGIS Schematics delivers powerful tools that let you automatically generate a graphic representation of your network using its associated database information. It is also a high-end development platform that you can use to rapidly build a variety of custom graphic applications for your network information system. With its advanced functionalities, network graphs and diagrams can be produced on the fly.

ArcGIS Schematics allows you to generate views and analyze networks in geographical, schematic, and geoschematic layouts. ArcGIS Schematics is a Windows-based solution that meets the utility industry's need for schematically viewing and manipulating network data.

Powered by a set of configuration files and its data-driven graphics philosophy, ArcGIS Schematics is able to generate schematics from the current state of the GIS network data. This means that ArcGIS Schematics offers a high degree of flexibility and is not limited by the evolution of the data model and by changing database locations.

Included with the ArcGIS Schematics product is ArcGIS Schematics Designer, a graphical user interface (GUI)-based design tool that supports configuration and customization of ArcGIS Schematics; ArcGIS Schematics Designer allows workspace parameters file building.

Also included with ArcGIS Schematics is a set of standard schematic layout algorithms ready to use with network data. ArcGIS Schematics can be customized to support user-specific layout algorithms. Following is an example of the schematic layout algorithms available with ArcGIS Schematics (geoschematic, orthogonal, hierarchical, backbone, grid layout). The screenshots below are a set of example schematic views that can be generated from ArcGIS data using ArcGIS Schematics.



# Schematic Concepts and Definitions

## ➢ GIS and Schematic Definitions

**GIS**

A GIS displays features in their real-world positions, and the feature coordinates are described by a coordinate system. Due to this, a GIS operator cannot control where to place features in relation to one another, since this is determined by their real-world locations. Oftentimes in a networked system such as those used by a distribution utility, it is more important to know what devices are upstream and downstream of one another rather than how far apart they are from each other. In such cases, a layout that emphasizes connectivity rather than positional accuracy is preferred.

**Schematics**

Schematics are a way to display a network so that the connectivity of the features is maintained while making the best use of the available screen real estate and white space. The nodes of the network are positioned according to a predetermined set of rules governing optimal positioning and layout to emphasize clarity and legibility in the display without regard to a reference coordinate system.

## ➢ ArcGIS Schematics Views of a Network

ArcGIS Schematics provides a number of preconfigured schematic layout generation tools, as well as the utilities and environment, which allows the development of custom layout algorithms.

**Geographic Representation**
The real-world spatial positions are used in displaying the facility layout, such as in a GIS map. This can result in displays that are difficult to read in areas where the proximity between features is too crowded or distant to intelligibly display the symbols and their annotation at the desired scale. It does however, give an accurate representation of where the facilities are in real-world terms.

**Geoschematic Representation**
The relative spatial positions of features are maintained though the reference system is dropped. Detailed information can be displayed in the view or plot without requiring the user to zoom in and out of the display. The overall effect of a geoschematic layout is to normalize the spacing of the node features while still maintaining some of the original spatial relationships between the facilities.

**Schematic Representation**
The network connectivity is maintained and the nodes are positioned according to a set of rules that dictate their relative positions to create a patterned layout where the distances between nodes are normalized. This also includes managing and minimizing the amount of white space around adjacent nodes. The relative position of the nodes is not maintained, and the reference system is dropped. Spatial coordinate values are replaced by those generated from the layout algorithms.

## ➢ ArcGIS Schematics Objects Overview

**Session**
A session exists only when an ArcGIS Schematics project (.ini file) is open in ArcMap. No more than one session can be open at a time in ArcMap. To open a session from ArcMap, the user must open the .ini parameters file. This file stores the main ArcGIS workspace parameters of the schematic project (i.e., the default parameters for the graphical display of the schematic objects, the schematic document type, and graphic objects that will be available in the application).

**Document Type**
A document type behaves as the template for the display properties of a network and is assigned to one workspace. The ArcGIS Schematics graphic objects are associated with document types and are displayed in "Documents". More than one document type can be defined for a project. Typically, one document type is defined for a specific view of the network. For example, a document type is defined for a schematic of the electric network of primaries and switches and a second document type is defined for a schematic of the internal schema (inside plant) of the devices.

**Document**
A document is a structure that is an implementation of a document type and exists only when an ArcGIS Schematics project is open in ArcMap. A network, made up of nodes and links, is displayed in a document. One or more documents of a document type can exist in a project. Various schematic layout algorithms can represent the same network.

**View**
A document can create many views, but it is not possible for it to exist without a view. All views of a document will display the same network in the same geographic or schematic position with each view differing only in its zoom level or symbol size. A selected object in one view will be selected in all open views created from the same document.

**Network Graphic Types**
ArcGIS Schematics defines three graphic classes: nodes, links, and drawings. The graphic objects are displayed in an ArcGIS Schematics view. A graphic type holds the common properties of one graphic object's type in a project. The common properties of a graphic are stored and defined by the graphic type. The graphic object exists only in runtime.

**Node Class**
An ArcGIS junction is implemented as a node graphic in an ArcGIS Schematics project. The node represents a device or other point feature of a network. It is displayed as a symbol and is assigned graphic (color, fill style, etc.), geometric (scaling factor, rotation, etc.) and visual (visibility, highlighting, etc.) parameters. Nodes can have geographic, semigeographic, or graph coordinates. The coordinate system is independent of the graphic display window. For ease of viewing, if many nodes are displayed in a small region, ArcGIS Schematics will reduce the number of nodes displayed. This is known as a compaction node. A set of nodes can have a binding—logical and hierarchical—relationship, which means that certain rules will apply when these nodes are manipulated (e.g., moving or deleting a parent node will cause the associated child node to be moved or deleted accordingly).

**Link Class**
An ArcGIS edge is implemented as a link graphic in an ArcGIS Schematics project. The link represents an edge of a network. A link can be composed of any number of link points that define its path. A link is represented either by a direct single line segment or by several line segments passing

through one or more link points. A link graphic corresponds to one ArcGIS edge. There is an exception when querying complex edges; in this case an ArcGIS Schematics link corresponds to one ArcGIS network segment. The path between two link points may be graphically broken. Line patterns (based on feature attributes) and line styles (color, style, width) can be applied to links to refine their graphical display. A link can display direction by placing arrows at its start and endpoints. A link can be modified to automatically bypass nodes if it passes through one or more nodes.

**Drawing Class**
Drawings are used to add nonnetworked graphics information to the ArcGIS Schematics view. Examples of a drawing include title blocks, neatlines, text, and north arrows.

**Flag Model**
A flag model is a generic object used to create flags that are automatically placed on network graphic objects. Each flag model template defines the flag display parameters and includes the reference to the flag symbol and the location of the flag on the network graphic object (distance, angle, and size).

**Flag**
A flag is a graphic object attached to a network node or link graphic object. It can contain annotations associated with that object. A flag is automatically inserted on and attached to an object according to the rules defined in the workspace parameters file (.ini). A flag exists only in run time. One or more flags can be attached to the same object. When an object is moved, its associated flag or flags are automatically moved. However, moving a flag does not move the object but causes its connecting pole to be redrawn.

# ArcGIS Schematics Toolbars and Menus

All ArcGIS Schematics commands can be launched

- Either via one of the items available in the Schematic menu
- Or via one or the other of the following toolbars:

### "Schematic Session / Workspace" toolbar, "Schematic >Session / Workspace" menu

The "Session / Workspace" commands function to open and close the link between ArcMap and the current ArcGIS Schematics parameters file, which controls the behavior of ArcGIS Schematics functionality and appearance of data within ArcGIS Schematics windows.

### "Schematic Document Management" toolbar, "Schematic > Document Management" menu

These commands manage the information held within the document environment of ArcGIS Schematics. They allow the user to transfer data from the ArcMap environment to the ArcGIS Schematics environment and back and to create, edit, refresh, and delete ArcGIS Schematics documents.

### "Schematic Window / View" toolbar, "Schematic > Window / View" menu

The window and view controls allow the user to manipulate the display of data within the custom data window environment of ArcGIS Schematics. These tools function similarly to standard ArcMap functions with similar buttons and names. They are necessary because they are used to manage the viewing of data within a custom application where ArcMap tools will not function.

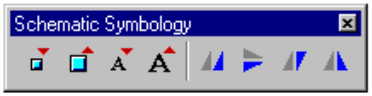
### "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu

Feature selection tools manage the active selection set of data within the combined ArcGIS Schematics / ArcMap environment.

### "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" menu

These tools allow the user to manipulate and transform the data elements that have been created in the schematic environment.

### "Schematic Symbology" toolbar, "Schematic > Symbology" menu




The Schematic Symbology controls allow the user to increase or decrease the size of the symbols and text fonts within the ArcGIS Schematics data windows on the fly, without adjusting the existing workspace parameters file. They also allow the user to mirror its symbols.

### "Schematic Layout" toolbar, "Schematic > Layout" menu

The Schematic Layout tools allow the user to select from a number of prebuilt layout algorithms to generate their schematics from the original geographic datasets or to transform schematic data from one layout type to another.

## ➢ "Schematic Session / Workspace" Commands

### "Open Schematic Session" command

[ in "Schematic Session / Workspace" toolbar, "Schematic > Session / Workspace" Menu ]

**Purpose** To open an existing schematic session through its associated parameters file. Generally, for most ArcMap users, the parameters file will have been designed with a particular set of ArcMap project data in mind. Each session, controlled by its parameters file, will only provide schematic view access to the feature classes that have been defined in that parameters file. For this reason, there may be several parameters file and projects/sessions defined for any one Geodatabase dataset.

**Prerequisite** None except to be running in an ArcMap session. Only one session can be open at a time.

**Description** This command is the entry point into using the ArcGIS Schematics tools.
When the command is invoked, ArcGIS Schematics searches for a parameters file (with an .ini extension) that matches the name of the current ArcMap document that data is open.

This (default) parameters file is expected to be found in the current application directory. If a workspace parameters file is not found by this method, a dialog box opens asking the user to select a workspace parameters file to open. Most ArcMap users will have to go through the dialog box to open the appropriate configuration parameters file given the unlikely nature that the current document name will match the desired Session parameters file.

When a session file is opened, all of the predefined schematic views referenced in the workspace are restored to their last saved position and display state (scale, text and symbol sizes, etc.). See “Save Schematic Session” command for the rules and results of saving a session.

### “Close Schematic Session” command

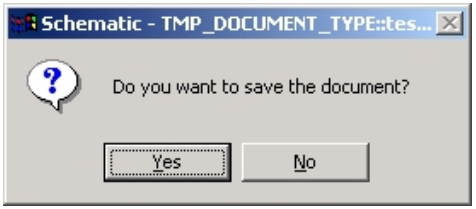
[ in "Schematic Session / Workspace" toolbar, "Schematic > Session / Workspace" Menu ]

**Purpose** To close the currently active schematic session and its related workspace parameters file.

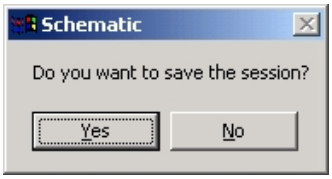
**Prerequisite** A schematic session must be open.

**Description** This command closes the currently active schematic session. Closing the session closes the open parameters file, all open documents, and views.

If you have changed a document since the beginning of the session and have not saved it yet, you are asked if you want to save the changes. The type and name of that document are specified in the dialog box header bar:




The system prompts you in turn to save each of the documents that were modified during the session.
If you have not saved the current schematic session, a dialog box prompts you to do so before closing:




**See Also**

- About session saving: “Save Schematic Session” command, described below
- About document saving: “Save Document” command

### “Save Schematic Session” command

[ in "Schematic Session Workspace" toolbar, "Schematic > Session Workspace" Menu ]

**Purpose** To save the currently active schematic session, including any open documents and views.

**Prerequisite** A schematic session must be open.

**Description** This command saves all open schematic views with their characteristics (document name, window size and position, zoom factor, text and symbol sizes). The next time the session is opened, all the views will be restored to the display state they were saved in.

Note 1: The content of the documents (position of the graphic objects, page layout) is not saved. Only the position of the schematic windows and their current display state are saved.

Note 2: If you did not save the documents that were open when the session was last saved, the layout of the graphic objects in these documents is not restored when the session is opened: the objects associated with the documents positioned based on their database coordinates. When you save a schematic session, you save the current position and display state of the schematic windows, but their contents, which make up the documents, are not saved.

**See Also**

"Save Document" command

## "Schematic Document Management" Commands

### "Generate Document from ArcMap Selection Set" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]

**Purpose** To generate a schematic document from the set of objects selected in ArcMap.

**Prerequisite** A set of objects must first be selected in ArcMap.

**Description** This command creates a new schematic document containing the set of objects from the current ArcMap selection set. The selection set in ArcMap may have been built with the Select features tool, as a type of trace result, or through the query tools.

ArcGIS Schematics provides support in three operational modes: CGM-Automatic, CGM-Default, and DocINDB. The mode of the project dictates the type of symbology used, either ArcMap symbols or user-defined CGM. It is suggested that user-defined CGM symbology is generated using the symbol editor included with ArcGIS Schematics, since the CGM format files used by ArcGIS Schematics add some custom data to the published format.

The symbology of the features in the new schematic document will be driven by the operation mode in the current workspace session, which is driven by the behavior built into the active workspace session parameters file.

Workspace parameters file with the "DocCGM" mode behavior defined will display new schematic objects with the same symbology as was found in the ArcMap display at document generation time.

Workspace parameters file with the "DocDB" mode behavior defined will control symbology by reading the feature classID of the inbound features and will look for a corresponding symbol object in the CGM symbol library folder for the project.

Activating this command opens the ArcGIS Schematics "Document" dialog box, allowing you to name the document and specify the parameters, which control the build mode of the schematic.

**See Also**
“Generate document from ArcMap Trace Result” command.

### "Generate Document from ArcMap Trace Result" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]

**Purpose** To generate a schematic document from the set of objects selected or highlighted by a trace operation in ArcMap.

**Prerequisite** A set of objects must first be selected or highlighted in the ArcMap window as the result of a trace operation.

**Description** This command generates a schematic document containing the set of objects selected or highlighted in the ArcMap window following a trace operation.

Depending on the connection mode stored within the project parameters file (DocInDB, DocCGM), the schematic views generated will
- Use default CGM symbols to display the ArcGIS Schematics objects according to their associated feature classID
or
- Take the currently used ArcMap symbology into account to display the associated objects.

Clicking this button brings up the ArcGIS Schematics "Document" dialog box, allowing you to name the document and specify the document schematic creation parameters.

**See Also**
“Generate document from ArcMap Selection Set” command.

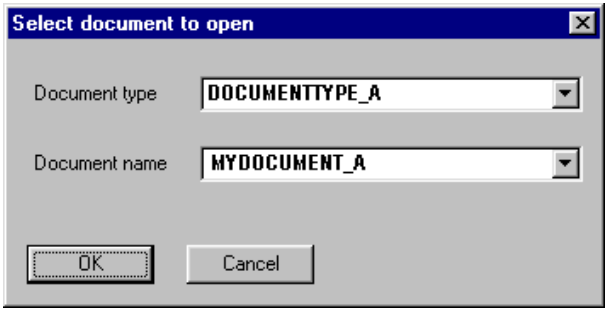
### "Open Document Form" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]

**Purpose** To open a document.

**Prerequisite** A schematic session must be open.

**Description** This command brings up a predefined ArcGIS Schematics dialog box where you can choose the type and the name of the document you want to manipulate.




**Note:** The documents available from the dropdown lists are defined in the workspace parameters file by the Data Administrator. You select them by their type and name.
- If the document selected was saved during a previous session, it is loaded and restored with the page layout as it existed when it was saved.
- If objects relating to this document were created or removed in the database since it was last saved, these modifications are reflected in the display (those objects that were removed no longer appear in the document, and those that were created are displayed).

**Caution**: This last remark does not apply to the ArcGIS Schematics document types used to generate schematic views following a trace or a selection operation in ArcMap. Documents defined with this type are not automatically refreshed and reconciled with the database when they are opened. For database modifications to appear in the document when loaded, it is necessary to manually perform the update using the command "Update Document" .

### "New View" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]

**Purpose** To open a new view for the active document.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command allows you to create a new schematic view associated with the active schematic view and comprising all the graphic objects contained in the latter.

All the commands for selecting, moving, and positioning graphic objects (accessed through ArcGIS Schematics "Schematic Feature Selection", "Feature Selection Manipulation", and "Schematic Layout" toolbars) executed in either view are also executed in the other view. View operations alone (Zoom, Fit, etc.) executed in either one of the views are not reflected in the other.

At the time the new view is created, all the graphic objects that are then visible in the other view are also displayed in the new view.

Once opened, the view can be tiled using the "Tile Views Horizontally" or "Tile Views Vertically" command.

### "Refresh Document" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]
**Purpose** To update the active document relative to the application's database.

**Prerequisite** This function applies to the active schematic view.

**Description** This command updates all the objects in the active document relative to the information stored in the application's database. Any object creation, removal, or modification in the application's database is reflected in the network display. All of the active document graphic object attributes, properties, and graphic positions are restored to the last saved database settings.

### "Delete Document" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" Menu ]
**Purpose** To remove a stored document from MySchematic database.

**Prerequisite** A schematic session must be open, and a schematic view previously generated in CGM-mode or DB-mode must be active.

**Description** This command removes the currently opened document previously generated from an ArcMap selection set or trace result from MySchematic database. The deletion is permanent. Schematic layout definition files associated with this document are also deleted from the proprietary database in the "GraphicFolder" where they normally reside.

### "Save Document" command

[ in "Schematic Document Management" toolbar, "Schematic > Document Management" menu ]
**Purpose** To save the active document.

**Prerequisite** This function can be accessed from an active schematic view.

**Description** This command updates the information stored in the ArcGIS Schematics proprietary graphic database relative to the active schematic view. All the changes introduced in the document since it was opened or last saved (node and link positions, etc.) are taken into account and saved in the graphic database.

**Note:** This ArcGIS Schematics graphic database is a fully proprietary database, entirely independent of the application's database. When you reopen a document, the graphic database is synchronized with the application's database, and the modifications (objects created or removed, notably) introduced in the latter are then reflected. That graphic database is stored in the "GraphicFolder" directory declared in the parameters file associated with the currently open session.

**See Also**
"Save Schematic Session" command

### "Export to Shape Files" command

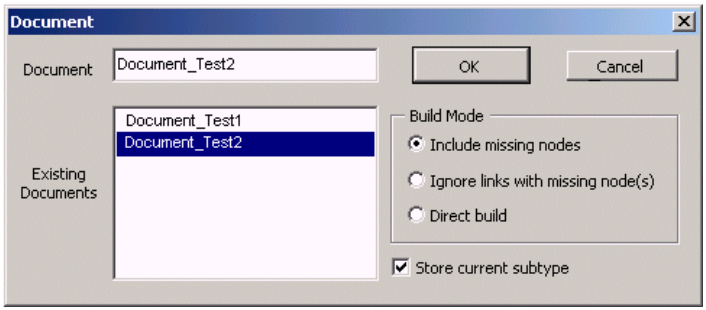
[ in "Schematic Document Management" toolbar, "Schematic > Document Management" Menu ]
**Purpose** To export the current view to ESRI shapefiles.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command brings up a predefined ArcGIS Schematics form where you can define the directory in which the shapefiles related to the currently opened view will be generated. If shapefiles already exist in the chosen directory, ArcGIS Schematics asks if the existing files must be overwritten or not. When the directory is set, ArcGIS Schematics exports the currently opened view into shape files. Shapefile results are stored in the chosen directory: one shapefiles set is built for each graphic object type; each shapefiles set is named according to the associated graphic type name.

## APPENDICES: The ArcGIS Schematics "Document" form

When you ask to generate a new schematic document from the current ArcMap selected feature set or trace result, the ArcGIS Schematics Document form automatically opens:




This dialog box allows you to

- Name the document ArcGIS Schematics will generate (in the Document text field) or select an existing file to be overwritten (from the Existing Documents display list area).

- Specify the parameters for the schematic creation phase using the buttons provided in the Build Mode area.

The ArcMap selection set may not be complete from a connectivity perspective (a link may have been selected with no origin and/or end node), so ArcGIS Schematics offers three modes to correct this during document generation:

- The "*Include missing nodes*" mode will add the origin and/or end nodes for the selected link elements coming from ArcMap that have none.
- The "*Ignore links with missing node(s)*" mode will drop from the schematic generation any link element that does not have a corresponding origin and end node.
- The "*Direct build*" mode will not perform a node checking operation during the build operation and will translate the schematic "as is" with the following condition. Links that are missing an origin and/or end node are displayed in the schematic window. New nodes are automatically generated by ArcGIS Schematics at the 0,0 coordinate location to represent the origin (or the end) nodes for those links that are missing one or both nodes.

Lastly, the option to

- 'Store current subtype' copies the subtype of the ArcInfo™ objects to the MySchematic database for later use in the document.

Once the schematic buildup parameters are selected and the OK button is clicked, ArcGIS Schematics generates the corresponding document. The objects created in the schematic window are linked to the objects in the ArcMap window and stored in the current MySchematic database.

**Note:**

If a specific page layout had been applied to the existing document (positioning of the objects using ArcGIS Schematics layout algorithms, for instance), the position of the objects represented in the existing document that still appear in the ArcMap selection or trace result is retained.

## ➢ "Schematic Window / View" Commands

### "Zoom In Mode" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To enable the "physical zoom in" (or standard) mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command allows you to zoom in on a location or on an area in the active view in standard mode. The physical, or standard, zoom in function magnifies all the objects in the view (texts, symbols, etc.).

After activating the button, clicking a location or dragging the mouse from one location to another anywhere in the active schematic view causes the location or the defined area to be zoomed in on. Note that this button can also be used to enable the zoom in mode in the ArcMap window.

**See Also**
"Logical Zoom In Mode" command
"Zoom Out Mode" command

### "Zoom Out Mode" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To enable the "physical zoom out" (or standard) mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This mode allows you to perform a standard zoom out centered on a location in the active view. Note that this button can also be used to enable the zoom out mode in the ArcMap window.

**See Also**
"Logical Zoom Out Mode" command
"Zoom In Mode" command

### "Logical Zoom In Mode" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To enable the "logical zoom in" (or constant scale) mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This mode allows you to zoom in on a location or on an area in the active view in constant scale mode. The logical, or constant scale zoom in function, lets you zoom in on an area without magnifying the objects. This mode is very convenient to thin out the view of a thickly populated area. After activating the button, clicking a location or dragging the mouse from one location to another anywhere in the active schematic view causes the location or the defined area to be zoomed in on. Note that this button can also be used to enable the zoom in mode in the ArcMap window.

**See Also**
"Zoom In Mode" command
"Logical Zoom Out Mode" command

### "Logical Zoom Out Mode" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To enable the "logical zoom out" (or constant scale) mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This mode allows you to perform a constant scale zoom out centered on a location in the active view. Note that this button can also be used to enable the zoom out mode in the ArcMap window.

**See Also**
"Zoom Out Mode" command
"Logical Zoom In Mode" command

### "Fit All" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To fit all objects into the active schematic view window.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command fits all the active view objects into that view. You can use it to reset the view to its full display state after zooming in or out.

**See Also**
“Fit Selected Set” command

### "Fit Selected Set" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To fit all the selected set graphic objects into the active schematic view window.

**Prerequisite** For this command to be available, a schematic session must be open, a schematic view window must be active, and at least one graphic object must be selected in that window.

**Description** This command causes the selected set to be zoomed in on or out, as applicable.

**See Also**
“Fit All” command

### "Pan Mode" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To enable the pan mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** After activating this button, press and hold the left mouse button anywhere in the view, then drag the mouse over the window to move the whole display area in the cursor direction. Note that this button can also be used to enable the pan mode in the ArcMap window.

### "Repaint" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To repaint the objects in all the schematic views of the current schematic session.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command refreshes the graphics in all the schematic views that are open by clearing the screen of all unwanted marks following object removals or displacements.

### "Show/Hide Legend" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To turn legend display on or off for the active document.

**Prerequisite** This function can be accessed from an active schematic view.

**Description** This command shows or hides the legend (table of contents) in a subwindow of the active schematic view window. The button remains depressed while the legend is displayed. Clicking the icon button while it is depressed turns off legend display in the active view window and returns the icon to its standard state.

### "Print View" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To print the currently active schematic view window contents.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command prints the contents of the active schematic view on the default printer declared with Windows® Printer Manager. Clicking this button automatically opens the default printer configuration dialog box.

### "Tile Views Vertically" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View"Menu ]
**Purpose** To arrange all open schematic view windows as nonoverlapping vertical tiles.

**Prerequisite** This function is available as soon as a schematic session is open and a schematic view is active.

**Description** This command arranges all open schematic view windows as nonoverlapping horizontal tiles.

**See Also**
"Cascade Views" command
"Tile Views Horizontally" command

### "Tile Views Horizontally" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]
**Purpose** To arrange all open schematic view windows as nonoverlapping horizontal tiles.

**Prerequisite** This function is available as soon as a schematic session is open and a schematic view is active.

**Description** This command arranges all open schematic view windows as nonoverlapping horizontal tiles.

**See Also**
"Cascade Views" command
"Tile Views Vertically" command

## "Cascade Views" command

[ in "Schematic Window / View" toolbar, "Schematic > Window / View" Menu ]

**Purpose** To arrange all open schematic view windows as overlapping tiles.

**Prerequisite** This function is available as soon as a schematic session is open and a schematic view is active.

**Description** This command arranges all open schematic view windows as overlapping tiles.

**See Also**

"Tile Views Horizontally" command
"Tile Views Vertically" command

## ➢ "Schematic Feature Selection" Commands

### "Selection Mode" command

[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]
**Purpose** To enable the "Selection" mode.

**Prerequisite** This command is available provided a schematic session is open and a schematic view is active.

**Description** Once the "Select" mode is enabled, you can select any type of graphic object (nodes, links, etc.) by selecting and dragging with the left mouse button.

**See Also**
“Edit/Move Mode” command

### "Select Hierarchy" command

[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]
**Purpose** To select a hierarchy of objects starting from a parent node.

**Prerequisite** This command can be accessed if a schematic session is open, a schematic view is active, and one or several node type objects are selected in that view.

**Description** This allows you to select all of the subtrees associated with the parent nodes selected in the view.

**Note:** Provided that a stream is set in the geodatabase, the select operation is computed taking the direction of the links in the database into account. All the links starting from the root node first chosen as well as the end nodes defining these links (the child nodes) are selected. The process is iterated for each of the child nodes detected, and so on, until the entire subtree is selected.

### "Select in ArcMap" command

[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]
**Purpose** To select schematic selection set objects in an ArcMap window.

**Prerequisite** A schematic session must be open, at least one schematic view must be active, and there must be objects selected in the corresponding schematic view window.

**Description** This command finds all the Geodatabase objects that are associated with the graphic objects selected in the active schematic view and selects them accordingly in the associated ArcMap windows. **Note:** The Geodatabase view centers automatically on the selection if the "ZoomToSelectedInArcInfo" method is applied in the project parameters file.

**See Also**
"Select in Schematic Views" command

### "Select in Schematic Views" command

[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]
**Purpose** To select ArcMap selection set objects in schematic views.

**Prerequisite** A schematic session must be open, at least one schematic view must be active, and there must be objects selected in the corresponding ArcMap window.

**Description** This command finds all the graphic objects that are associated with the Geodatabase objects selected in the active ArcMap window and selects them accordingly in the associated schematic window or windows. **Note:** The schematic view or views are automatically centered on the selection if the "ZoomToSelectedInNGO" method is applied in the project parameters file.

**Note:** This command automatically selects the schematic graphic objects associated with the Geodatabase objects in all the schematic documents already open (where they must already exist) where these objects are displayed.

**See Also**
"Select in ArcMap" command

### "Copy to Clipboard" command
[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]
**Purpose** To copy the selected graphic objects to the Clipboard.

**Prerequisite** For this command to be available, a schematic session must be open, and a schematic view must be active with at least one graphic object selected.

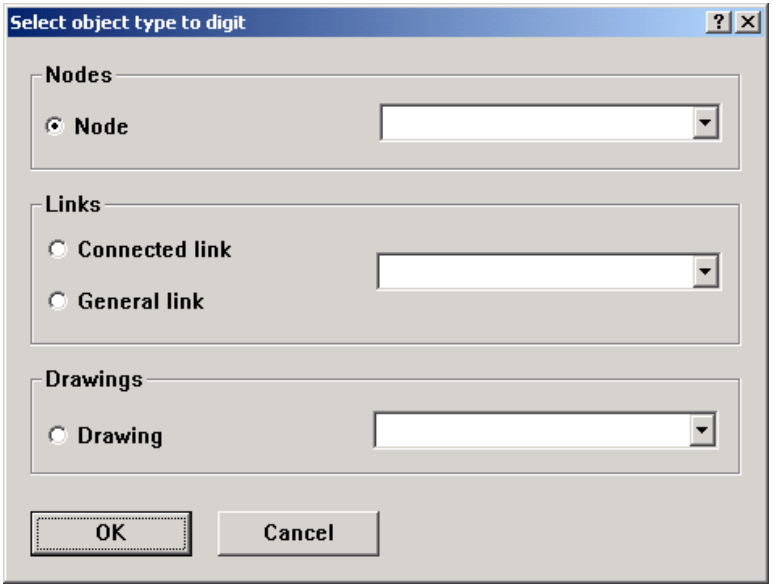
**Description** This command copies the selected objects into memory for subsequent pasting. Any new Copy operation clears the previous copy from the Clipboard.

### "Open Create Object Form" command
[ in "Schematic Feature Selection" toolbar, "Schematic > Feature Selection" menu ]

**Purpose** To enable the digitize mode for graphic object creation.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command opens the “Select object type to digit” form that allows you to create nodes, links, or drawings by digitizing them.




If you want to digitize nodes or drawings, you must select the type of node or drawing you want to create.

If you want to digitize links, you must specify whether you want to create links that are to be connected to existing origin and end nodes (“Connected link” option) or to create links independently of any existing nodes (“General link” option).

## ➢ "Schematic Feature Manipulation" Commands

### "Align Horizontally" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To align the selected nodes horizontally.

**Prerequisite** A schematic view must be active, and there must be at least two selected nodes in that view.

**Description** This command arranges a given set of nodes along the same horizontal axis. The first node selected is used for reference.

**See Also**
"Align Vertically" command

### "Align Vertically" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To align the selected nodes vertically.

**Prerequisite** A schematic view must be active, and there must be at least two selected nodes in that view.

**Description** This command arranges a given set of nodes along the same vertical axis. The first node selected is used for reference.

**See Also**
"Align Horizontally" command

### "Bypass Nodes" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu]
**Purpose** To reposition the links in a selected set so as to prevent them from crossing nodes.

**Prerequisite**: A schematic session must be open, and a schematic view window must be active.

**Description**: This command allows you to modify the route of a set of links. Those that go through one or more nodes are repositioned (if possible) so that the nodes can be bypassed. Intermediate points are inserted on the link paths. If no selected set has been defined in the active schematic view, then the command applies to all objects in the view.

### "Remove Link Points" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To remove all link points from selected links.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command lets you remove all the link points from the links selected in the active schematic view. If no link is selected in the active schematic view, the command removes all the link points from all the links in the view.

### "Find Tree" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]

**Purpose** To find the tree associated with the selected node in the active schematic view.

**Prerequisite** A schematic session must be open, a schematic view must be active, and one node must be selected in the view.

**Description** This command highlights the tree associated with the node selected in the active schematic view. The algorithm applies the tree detection (directed graph, locked links) and highlight parameters as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**

“Algorithm Parameters Form, the ‘Loop/Path/Tree’ Tab"
“Algorithm Parameters Form, the ‘Highlight’ Tab"

### "Find Loops" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]

**Purpose** To find existing loops for the graph in the active view.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command searches the schematic layout for any existing loops and highlights them in the active schematic view. The algorithm applies the loop detection method (directed graph, locked links) and highlight parameters as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**

“Algorithm Parameters Form, the ‘Loop/Path/Tree’ Tab”
“Algorithm Parameters Form, the ‘Highlight’ Tab"

### "Find Shortest Path" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]

**Purpose** To find the shortest path between two selected nodes in the active schematic view.

**Prerequisite** A schematic session must be open, a schematic view must be active, and two nodes must be selected in the view.

**Description** This command highlights the shortest path route between two selected nodes in the active schematic view. By default, ArcGIS Schematics computes the shortest path showing the lowest number of links. The algorithm applies the shortest path detection method (directed graph, locked links) and highlight parameters as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**

“Algorithm Parameters Form, the ‘Loop/Path/Tree’ Tab"
“Algorithm Parameters Form, the ‘Highlight’ Tab"

### "Remove Algorithms Graphic Effects" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]

**Purpose** To remove all highlighting effects from the loops, path, or tree found by an algorithm.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** To highlight the loops, shortest path, or node-associated tree found by an algorithm, ArcGIS Schematics uses a number of graphic effects (color, line width, line style, etc.). Clicking this button removes these graphic effects.

**See Also**
“Algorithm Parameters Form, the ‘Highlight’ Tab"

### "Edit/Move Mode" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To enable the "Select and Move" mode.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Once this mode is enabled, you can select one or more graphic objects in a schematic view and move them by clicking and dragging with the left mouse button depressed.

### "Move Labels" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To move any label.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Once this command is enabled, you can select one label related to any graphic object in a schematic view and move it by clicking and dragging with the left mouse button depressed.

### "Remove Objects" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To delete the selected graphic objects.

**Prerequisite** This command can be accessed when a schematic session is open and when one or more graphic objects are selected in the currently active schematic view.

**Description** Clicking this button deletes the selected objects in the active view. A node is deleted only if it is connected to no links or if its connected links are also currently selected when the command is applied.

### "Collapse Hierarchy" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To collapse objects hierarchically, starting from a given node.

**Prerequisite** To access this function, a schematic session must be open, a schematic view must be active, and there must be a node selected in that view. This node will serve as the root node for the collapse operation.

**Description** This command allows you to simplify the graphical representation of your network by hierarchically collapsing a whole tree structure starting from a selected root node. The links connecting the collapse root node to the other nodes are displayed in a different color to show the relationship between the collapsed nodes and those other nodes.

**Note:** The collapse operation is computed taking the direction of the links in the database into account. All the links starting from the root node first selected as well as the end nodes associated with these links (the child nodes) are collapsed. The process is then iterated for each of the child nodes detected, and so on, until the entire subtree is collapsed.

**See Also**
"Collapse Selected Set" command

### "Collapse Selected Set" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To collapse a selected set.

**Prerequisite** To access this function, a schematic session must be open, a schematic view must be active, and there must be one or more graphic objects selected in that view.

**Description** This command allows you to simplify the graphical representation of your network by collapsing the selected object or the set of selected objects into a single node called collapse root node. The links connecting the latter to the other nodes are displayed in a different color to show the relationship between the collapsed objects and those other nodes.

Note that a collapse root node can itself be collapsed with other nodes.

**See Also**
"Collapse Hierarchy" command

### "Expand All" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To expand a selected collapse root node in a single operation.

**Prerequisite** To access this function, one or more collapsed root nodes must be selected in the active schematic window.

**Description** This command allows you to fully expand one or more given collapse root nodes, whether they are a part of a set collapsed with the hierarchy or selected set functions.

**See Also**
“Expand by Level” command

### "Expand by Level" command

[ in "Schematic Feature Manipulation" toolbar, "Schematic > Feature Manipulation" Menu ]
**Purpose** To expand a set of collapsed nodes based on their hierarchical level from the initial root node used during the collapse.

**Prerequisite** To access this function, one or several collapsed root nodes must be selected in the active schematic window.

**Description** This command lets you expand one or more given collapsed root nodes by one-level increments.

You will find it useful to expand collapsed nodes resulting from a hierarchical collapse operation. Expanding the root collapse node frees the first-level child nodes that can in turn be expanded to uncollapse the next tree level, and so forth. Expanding a selected set collapsed node always expands all the nodes in the initial collapse operation.

**See Also**
“Expand All” command

## ➢ "Schematic Symbology" Commands

### "Decrease Symbol Sizes" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" menu ]
**Purpose** To decrease symbol sizes.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Decreases the size of all the symbols in the active view.

**See Also**
"Increase Symbol Sizes" command
"Decrease Text Sizes" command

### "Increase Symbol Sizes" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" menu ]
**Purpose** To increase symbol sizes.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Increases the size of all the symbols in the active view.

**See Also**
"Decrease Symbol Sizes" command
"Increase Text Sizes" command

### "Decrease Text Sizes" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" menu ]
**Purpose** To decrease text sizes.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Decreases the size of all the text in the active view.

**See Also**
"Increase Text Sizes" command
"Decrease Symbol Sizes" command

### "Increase Text Sizes" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" menu ]
**Purpose** To increase text sizes.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** Increases the size of all the text in the active view.

**See Also**
"Decrease Text Sizes" command
"Increase Symbol Sizes" command

### "No Mirroring" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" Menu ]
**Purpose** To cancel any symmetry effects applied to the currently active schematic view.

**Prerequisite** A schematic view must be active.

**Description** This command cancels the symmetry effects applied to all the objects selected in the active view. If no object is selected, then all the objects in the view are processed.

All the symmetry effects generated by programming or through the use of properties or after clicking either one of the following three buttons (Y axis mirroring, X axis mirroring, and XY axis mirroring) are cancelled.

### "X Axis Mirroring" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" Menu ]
**Purpose** To horizontally mirror the objects in the currently active schematic view.

**Prerequisite** A schematic view must be active.

**Description** This command horizontally mirrors all the objects selected in the active view. If no object is selected, then all the objects in the view are mirrored.

**See Also**
"No Mirroring" command

### "Y Axis Mirroring" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" Menu ]
**Purpose** To vertically mirror the objects in the currently active schematic view.

**Prerequisite** A schematic view must be active.

**Description** This command vertically mirrors all the objects selected in the active view. If no object is selected, then all the objects in the view are mirrored.

**See Also**
"No Mirroring" command

### "XY Axis Mirroring" command

[ in "Schematic Symbology" toolbar, "Schematic > Symbology" Menu ]
**Purpose** To vertically and horizontally mirror the objects in the currently active schematic view.

**Prerequisite** A schematic view must be active.

**Description** This command mirrors all the objects selected in the active view both vertically and horizontally. If no object is selected, then all the objects in the view are mirrored.

**See Also**
"No Mirroring" command

## ➢ "Schematic Layout" Commands

### "Open Algorithms Parameters Form" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" menu ]
**Purpose** To open the Algorithm Parameters form.

**Prerequisite** This form is available even if the session is closed. In this case, it only lets you change the default algorithm parameters. If a schematic session is open and if a view is active, this form also allows you to change parameters and directly apply the algorithms on the active view.

**Description** This command brings up the Algorithm Parameters form. The form box can be left open while the various algorithms are being used so that applicable parameters can be easily set.
This form includes eight tabs:

- Highlight tab (details about Highlight parameters)
- Loop/Path/Tree tab (details about Loop/Path/Tree parameters)
- Orthogonal tab (details about Orthogonal Layout parameters)
- Backbone tab (details about Backbone Layout parameters)
- Hierarchical tab (details about Hierarchical Layout parameters)
- Grid tab (details about Magnetic Algorithm parameters)
- Rotation tab (details about Rotation Algorithm parameters)
- Nodes Separation tab (details about Nodes Separation Algorithm parameters)

### "Backbone Layout" command

[ in "Schematic layout" toolbar, "Schematic > Layout" Menu ]
**Purpose** To lay out the loops around a chosen backbone geometry.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command executes an algorithm that arranges the nodes and links in the active schematic view according to the chosen backbone geometry. The nodes belonging to the main backbone are arranged hierarchically. The algorithm applies the graphic object layout parameters (type of backbone representation, locked links, etc.) as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Backbone Layout Tab”

### "Orthogonal Layout" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" menu ]
**Purpose** To lay out the nodes and links orthogonally.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command executes an algorithm that arranges orthogonally the nodes and links in the active schematic view. The algorithm applies the graphic object layout parameters (horizontal and vertical step, break point distance, etc.) as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Orthogonal Layout Tab”

### "Hierarchical Layout" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" menu ]
**Purpose** To lay out the nodes and links hierarchically.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command executes an algorithm that arranges hierarchically all the nodes and links in the active schematic view or in the active schematic view selected set. The algorithm applies the graphic object layout parameters (tree orientation, page layout, link display, spacing between levels and nodes, etc.) as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Hierarchical Layout Tab”

### "Grid Layout" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" menu ]
**Purpose** To lay out the nodes so that they snap onto an active magnetic grid point.

**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command executes an algorithm that lays out the nodes in the active schematic view or in the active view selected set relative to a magnetic grid. The algorithm applies the grid layout parameters (grid origin X and Y coordinates, horizontal and vertical grid step, filter bounds, etc.) as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Grid Tab”

### "Separate Nodes" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" Menu ]
**Purpose** To separate nodes that are visually very close or near to overlapping.

**Prerequisite** A schematic session must be open and a schematic view must be active.

**Description** This command executes an algorithm that separates nodes in the active schematic view or in the active view selected set. The algorithm applies the node separation parameters (number of iterations, weight of the attraction factor, etc.) as specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Nodes Separation Tab”

### "Rotate Tree" command

[ in "Schematic Layout" toolbar, "Schematic > Layout" Menu ]
**Purpose** To rotate the tree associated with the node selected in the active schematic view. To access this function, one node must be selected in the active schematic window.

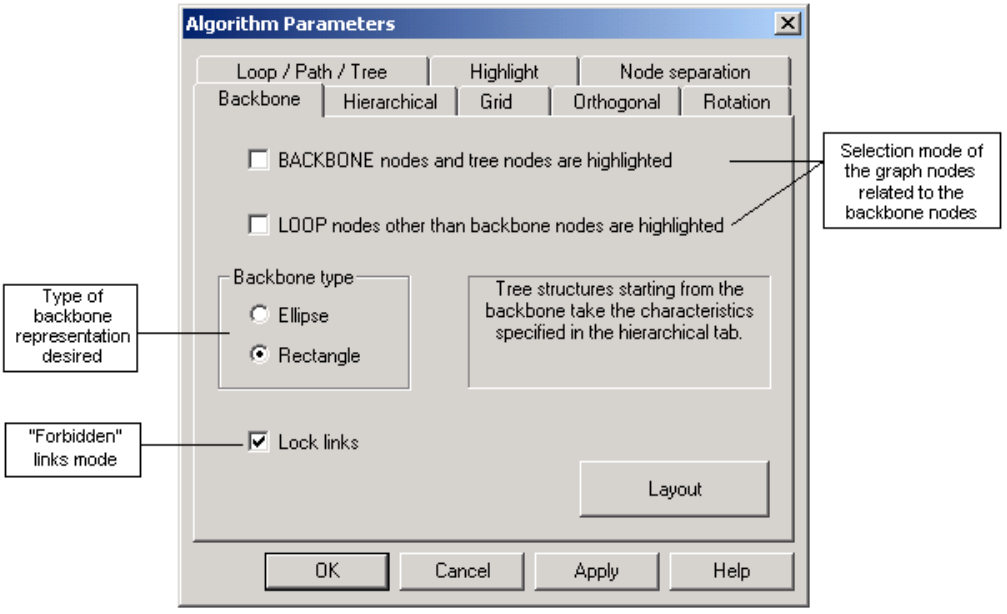
**Prerequisite** A schematic session must be open, and a schematic view must be active.

**Description** This command rotates the tree associated with the node selected in the active schematic view. The value for the rotation angle as well as the other parameters applied by the algorithm (rotation of the tree nodes, locked links, etc.) is specified in the corresponding tab of the Algorithm Parameters Form.

**See Also**
“Algorithm Parameters Form, the Rotation Tab”

# Details about ArcGIS Schematics Algorithms Parameters

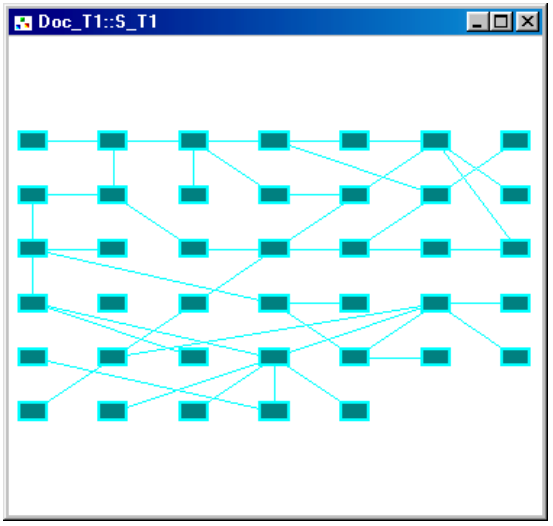
## ➢ Algorithm Parameters Form, The Backbone Tab



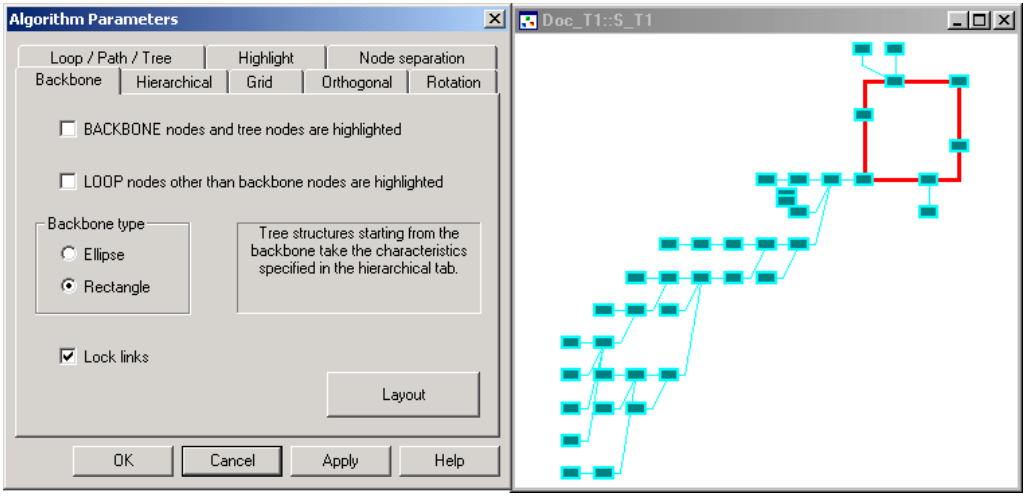
Illustrations of the Backbone Layout algorithm:

**Backbone layout illustration #1:**

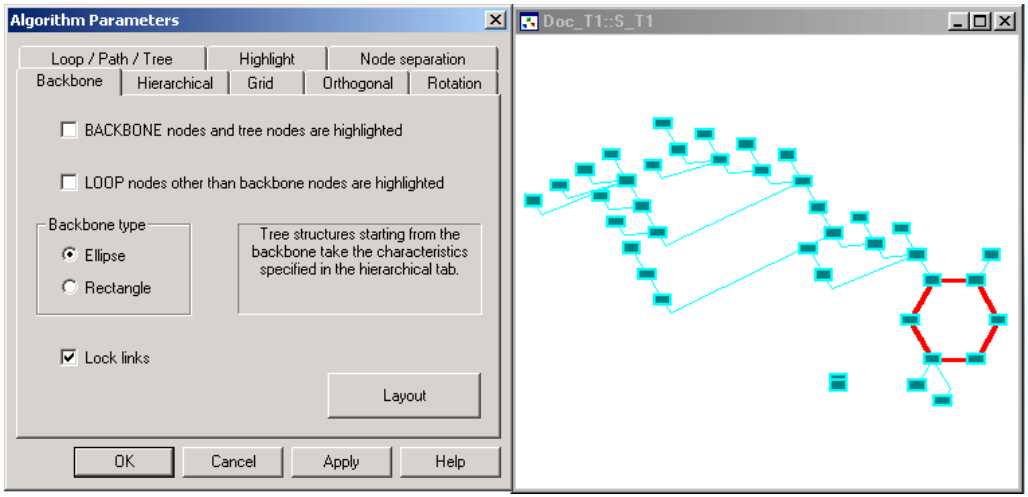
The screenshot below shows the schematic view state before launching the "Backbone Layout" algorithm:



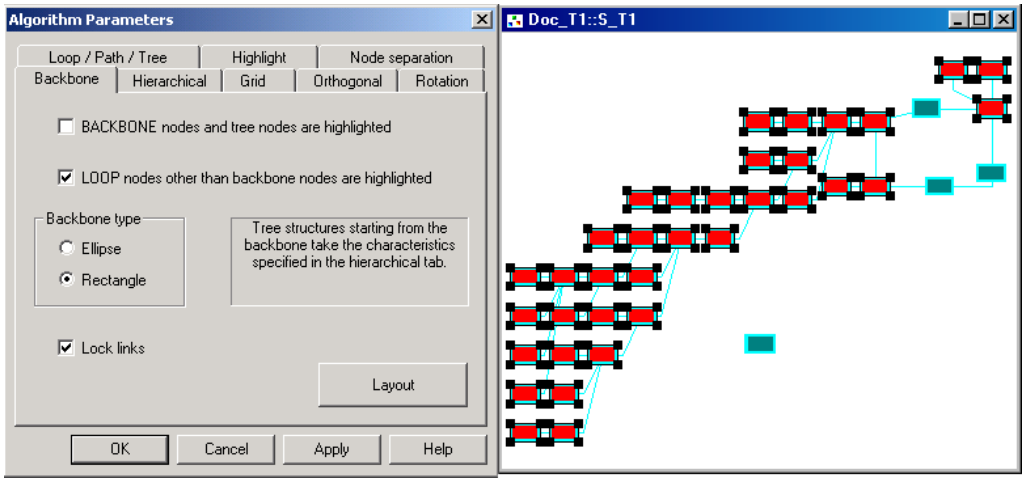

1) Result of the "Rectangle" type Backbone Layout algorithm:



2) Result of the "Ellipse" type Backbone Layout algorithm:



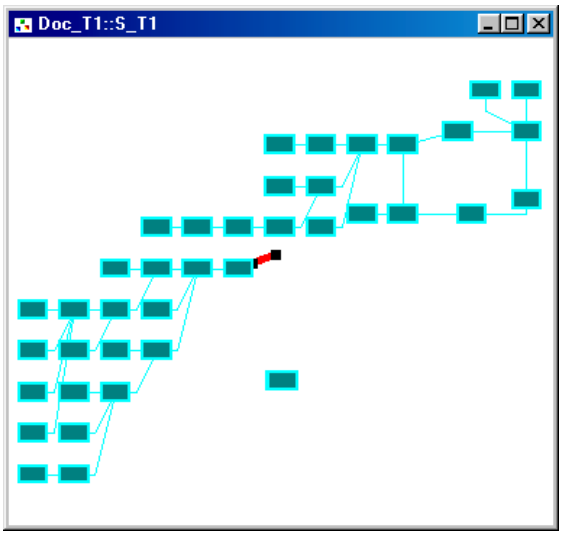

3) Result of the Backbone Layout algorithm with the option LOOP nodes other than backbone nodes are highlighted enabled. To the exception of the backbone nodes, the algorithm selects all the nodes in the graph that may be reached from these backbone nodes.




**Backbone layout illustration #2:**

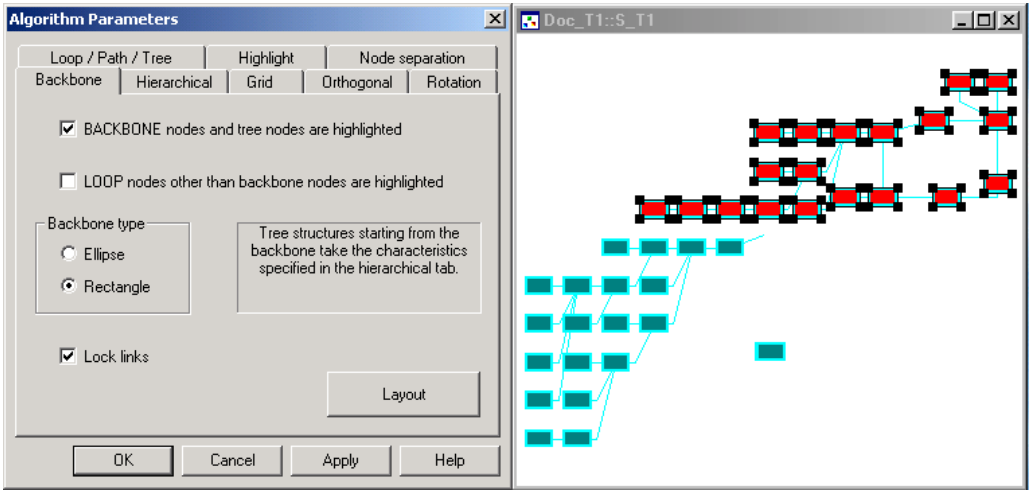
1) In the previous example, all the graph nodes were connected. Now consider a graph in which this is not the case. To that end, one of the links in your graph can be disconnected.

The screenshot below shows the schematic view state before launching the "Backbone Layout" algorithm. The selected link in red is a disconnected link.




2) Result of the Backbone Layout algorithm with the option BACKBONE nodes and tree nodes are highlighted enabled. Here, the algorithm selects all the nodes in the graph that may be reached from these backbone nodes along with the backbone nodes themselves.

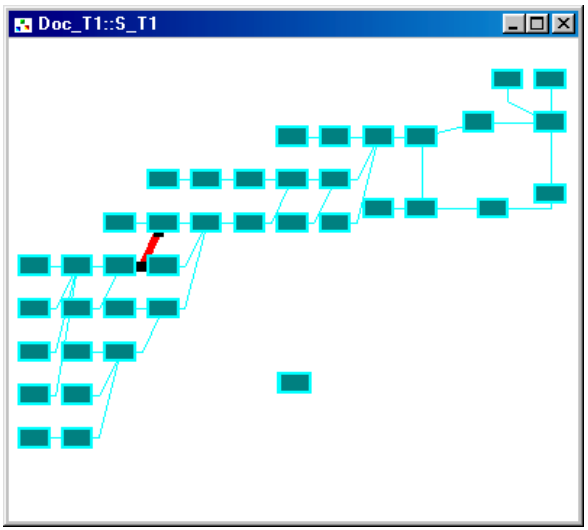
Note that the nodes in the subgraph starting from the disconnected link are not selected.



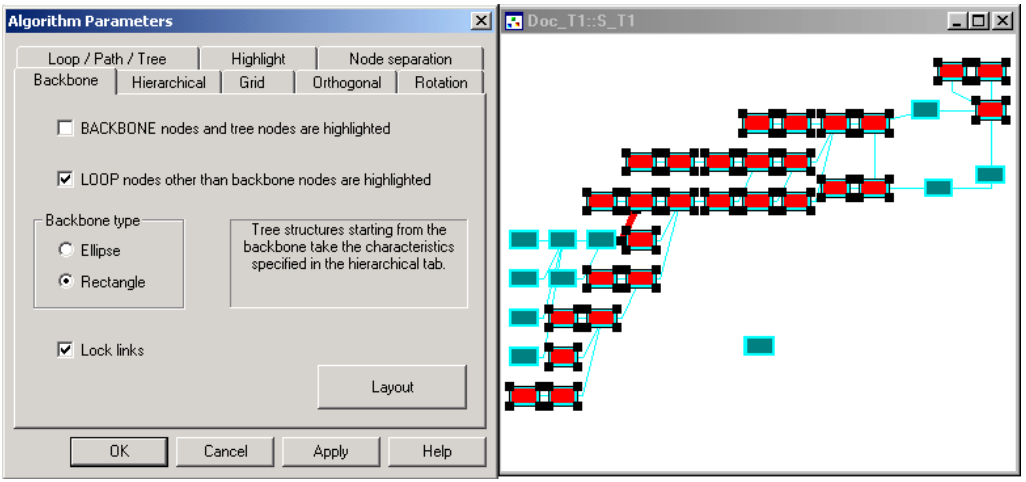

**Backbone layout illustration #3:**

1) Now you will go back to your graph such as it was before disconnecting the link. You will exemplify the backbone Layout algorithm with the "Lock links" mode enabled. To that end, select a link in the graph.

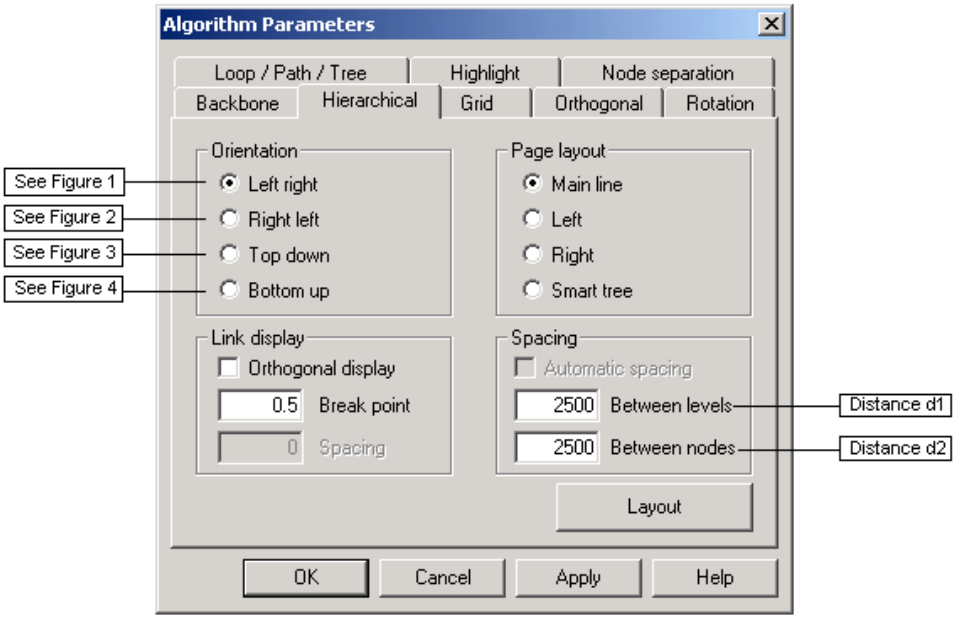
The screenshot below shows the schematic view state before launching the "Backbone Layout" algorithm. The selected link in red will be considered a lock link.




2) The nodes of the subtree starting from the "forbidden" link are not selected by the algorithm.



## ➢ Algorithm Parameters Form, The Hierarchical Tab




Different orientation modes:

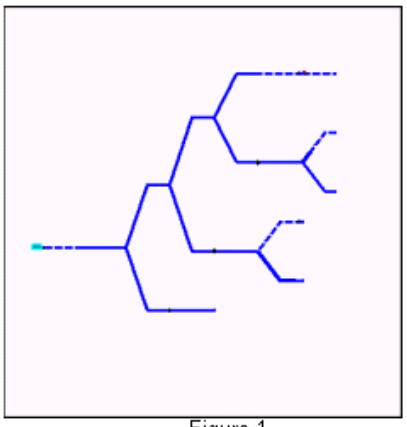


Figure 1

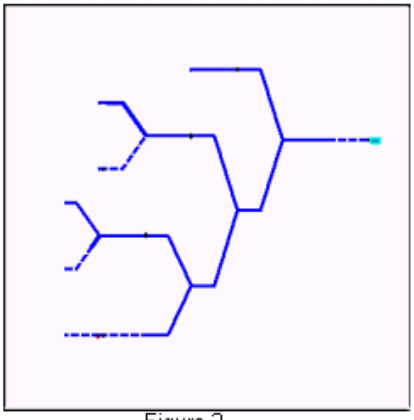


Figure 2

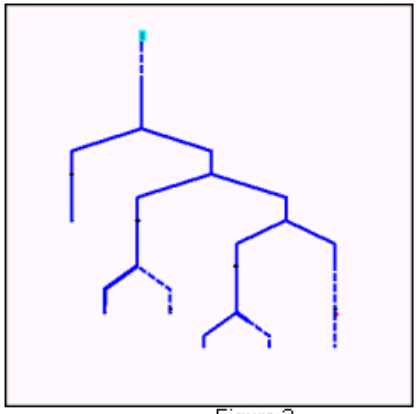


Figure 3

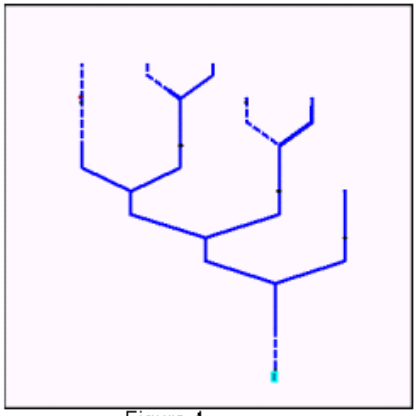
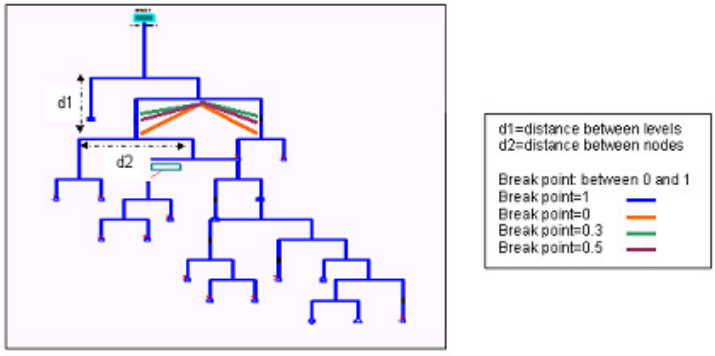


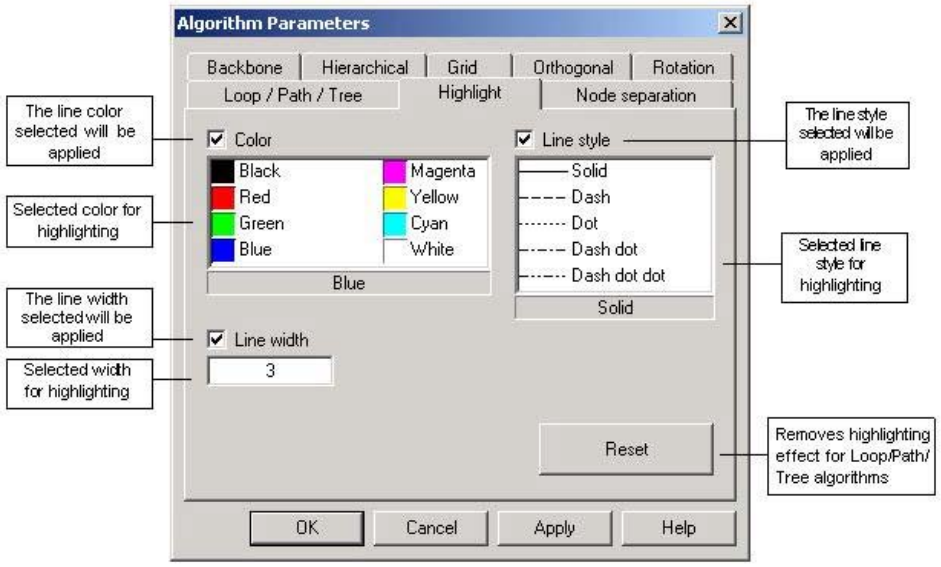
Figure 4

Spacing parameters:

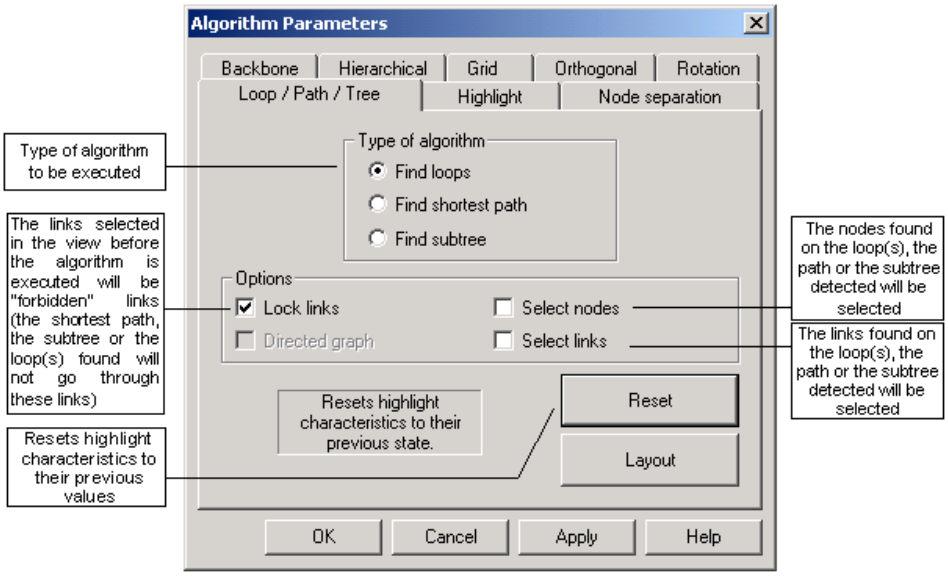


## ➢ Algorithm Parameters Form, The Highlight Tab

This tab must be used to define the highlight parameters for loop, path, and tree representations.

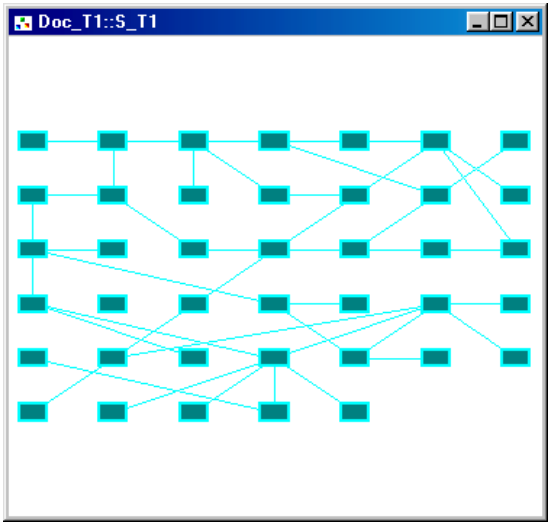


## ➢ Algorithm Parameters Form, The Loop/Path/Tree Tab

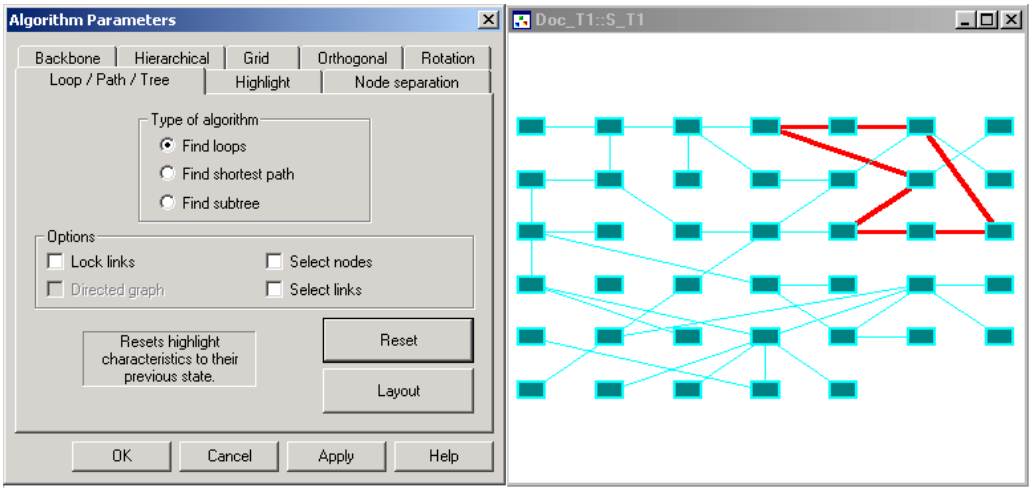



> Illustration of the Find Loops algorithm in a graph:

The screenshot below shows the schematic view state before launching the Find Loops algorithm:



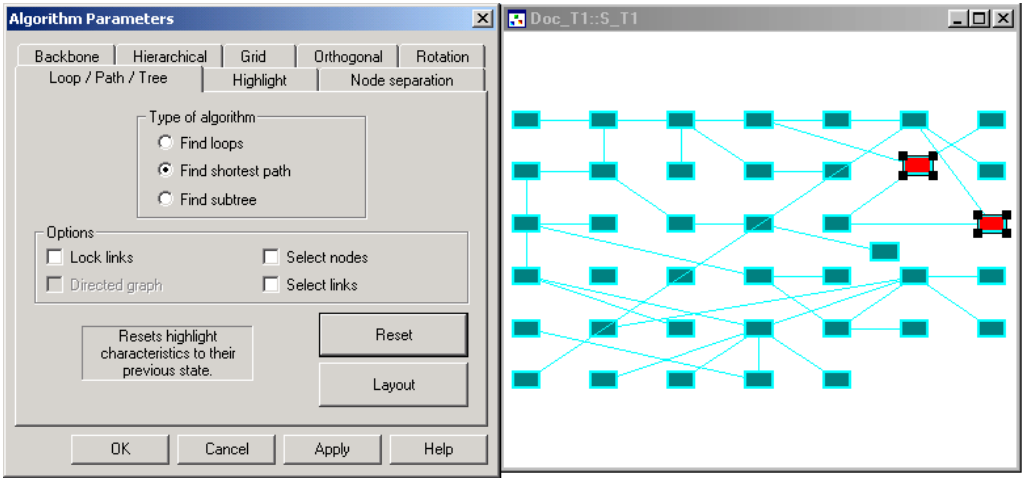
The graph contains a loop. The loop is shown by the algorithm.



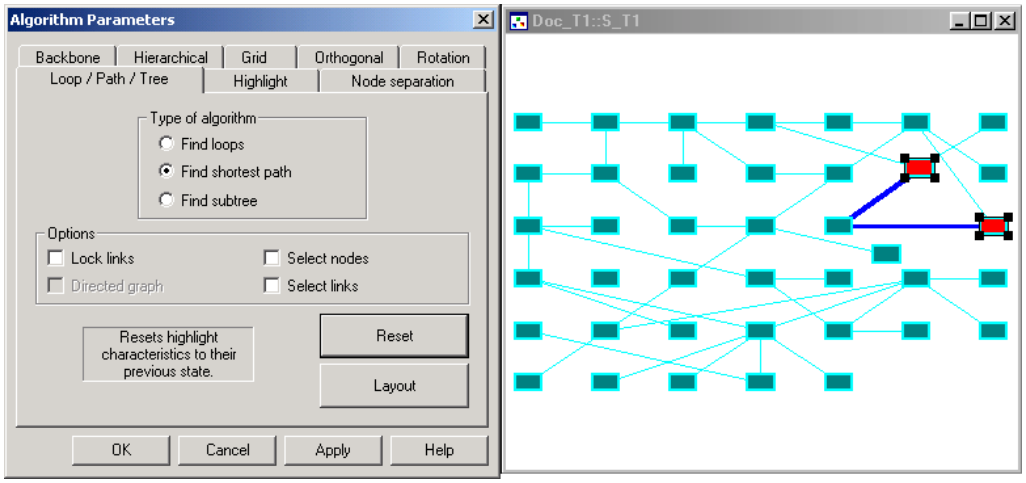

> Illustration of the Find Shortest Path algorithm in a graph:

**Example 1: Highlighting of the shortest path between two nodes in the graph**

1) Selection of the From and To nodes

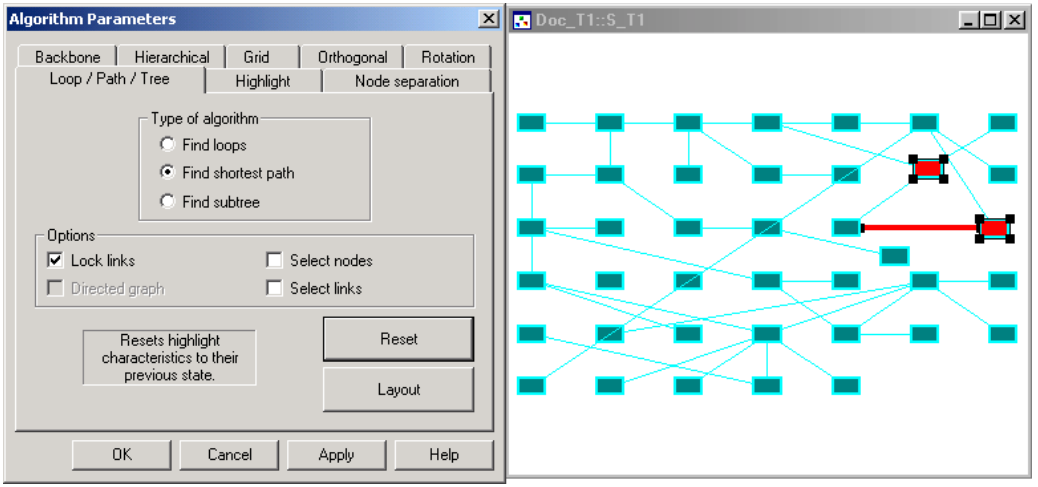


2) Execution of the algorithm and highlighting of the shortest path

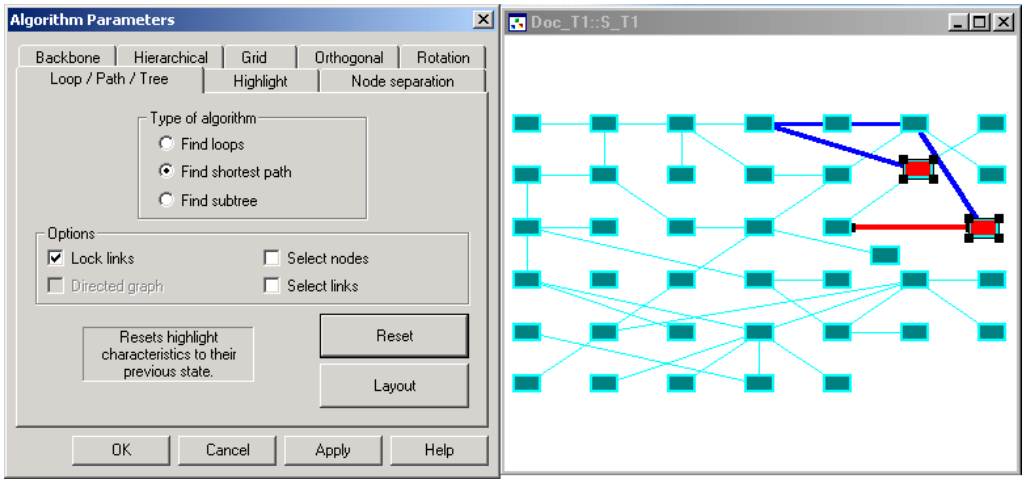



**Example 2: Highlighting of the shortest path between two nodes in the graph with a forbidden link selected**

1) Selection of the From and To nodes and of the forbidden link (the Lock links mode must be enabled):

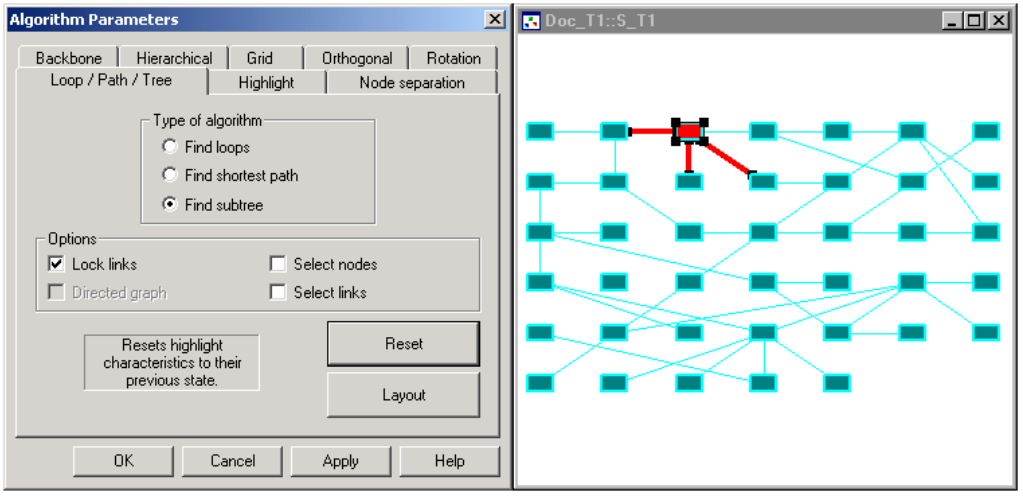


2) Execution of the algorithm and highlighting of the shortest path, avoiding the forbidden link:

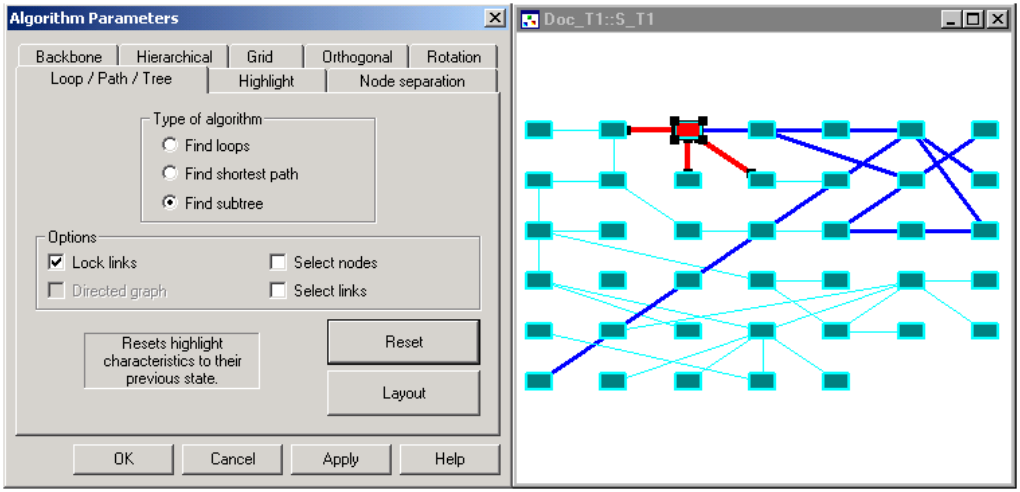



> Illustration of the Find Tree algorithm

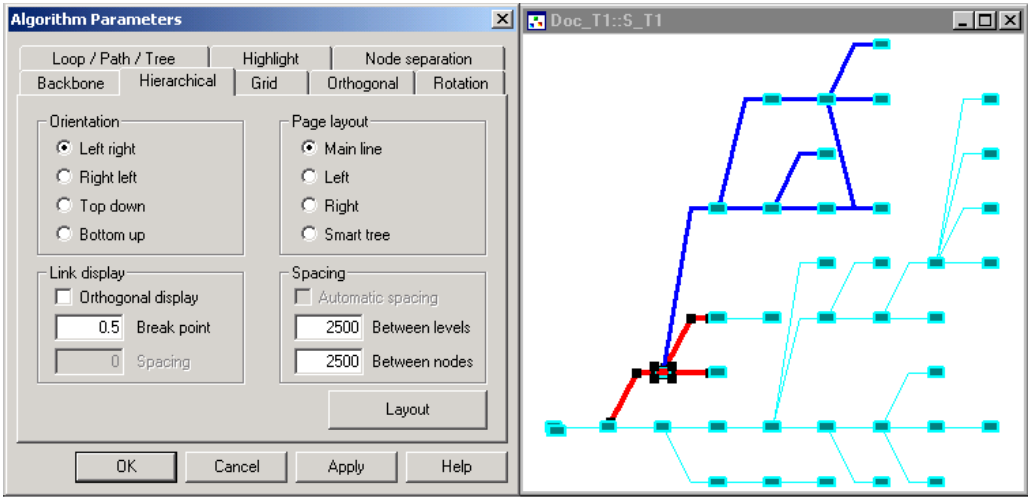
1) Selection of the root node and of the links to be discarded from the resulting tree detected (the Lock links mode must be enabled):



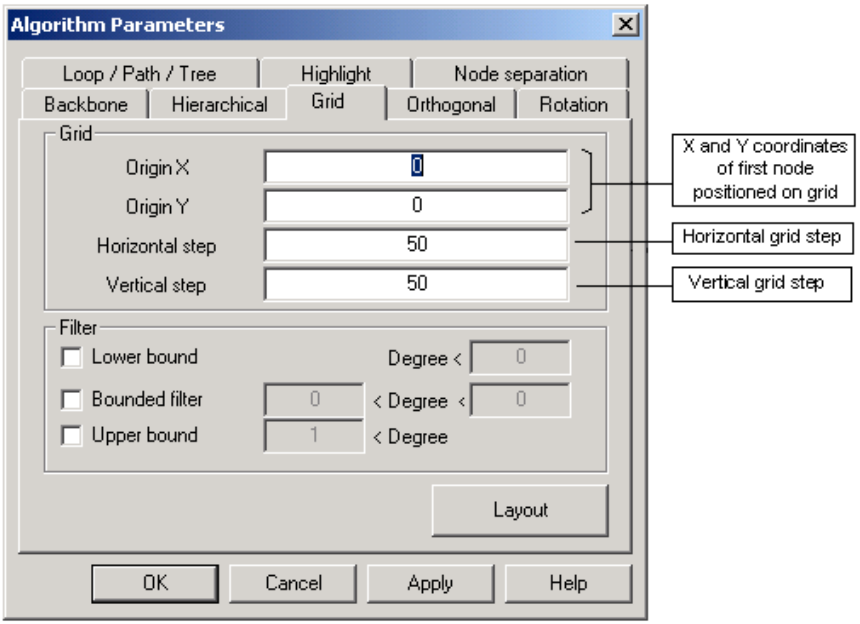
2) Execution of the algorithm and highlighting of the subtree:




3) Launching the Hierarchical Layout algorithm allows the subtree just detected and highlighted to be more clearly evidenced:

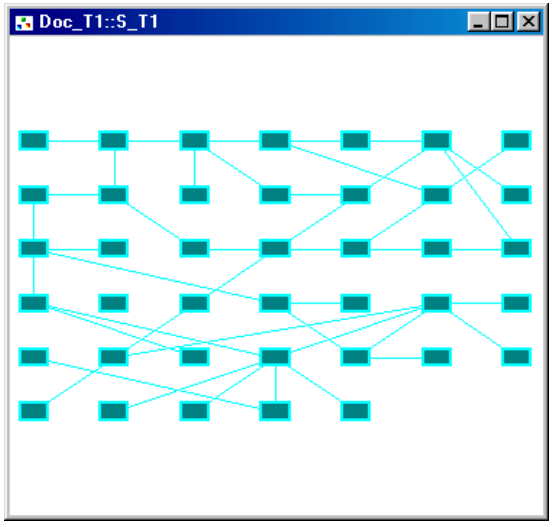


## ➢ Algorithm Parameters Form, The Grid Tab

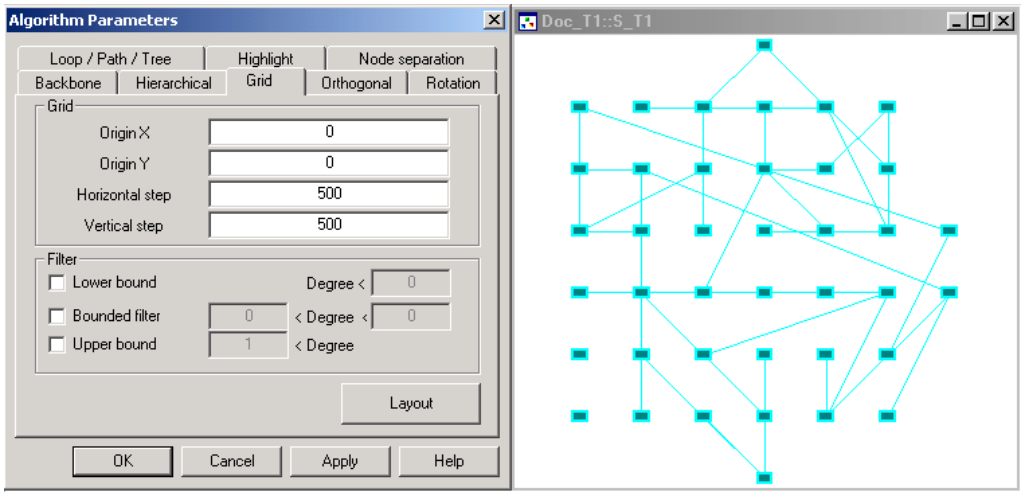



> Illustration of the Grid Layout algorithm:

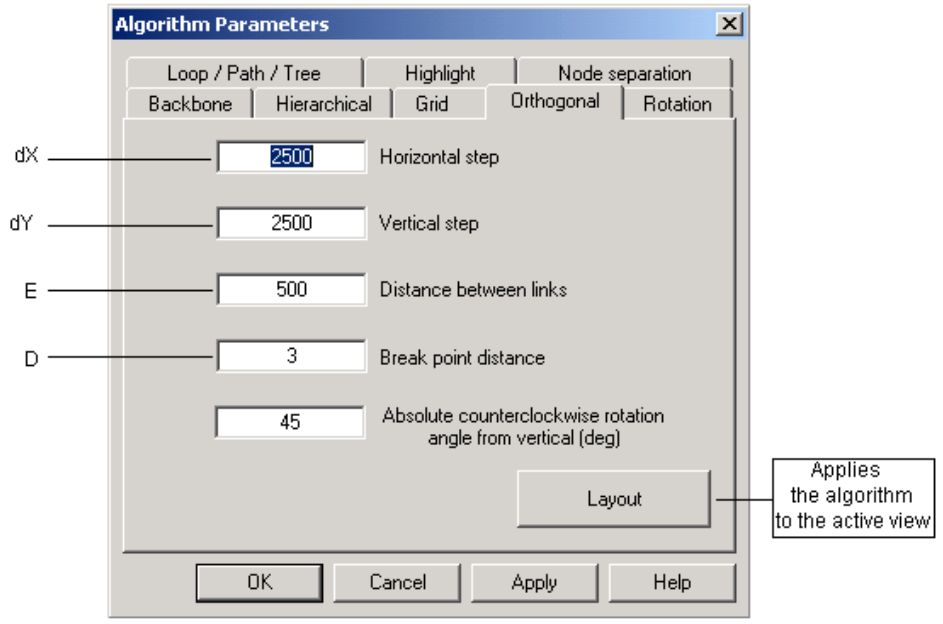
The screenshot below shows the schematic view state before launching the Magnetic Layout algorithm:

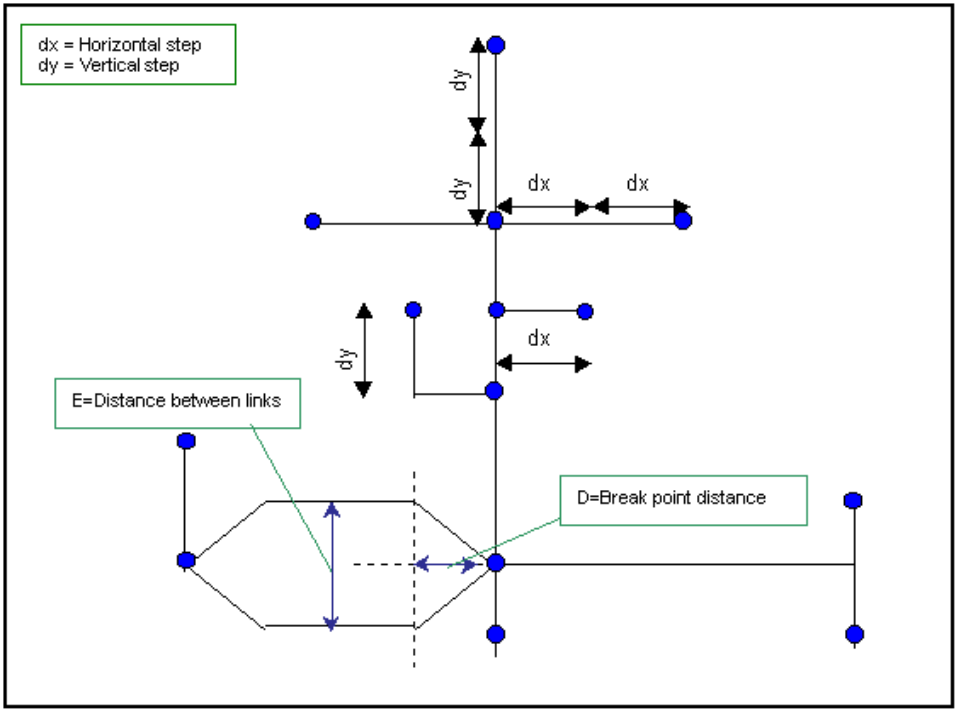


Resulting graph layout:



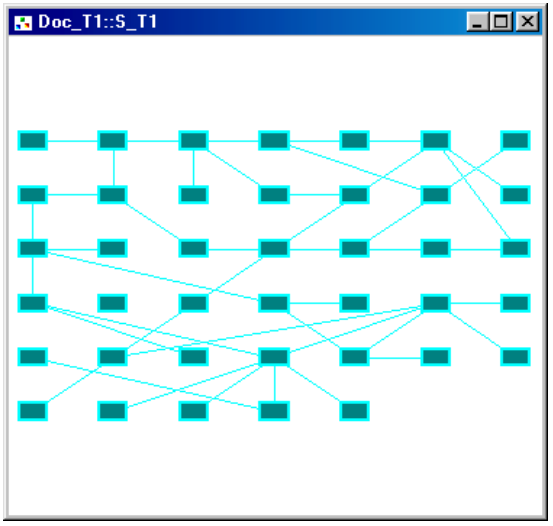
## ➢ Algorithm Parameters Form, The Orthogonal Tab



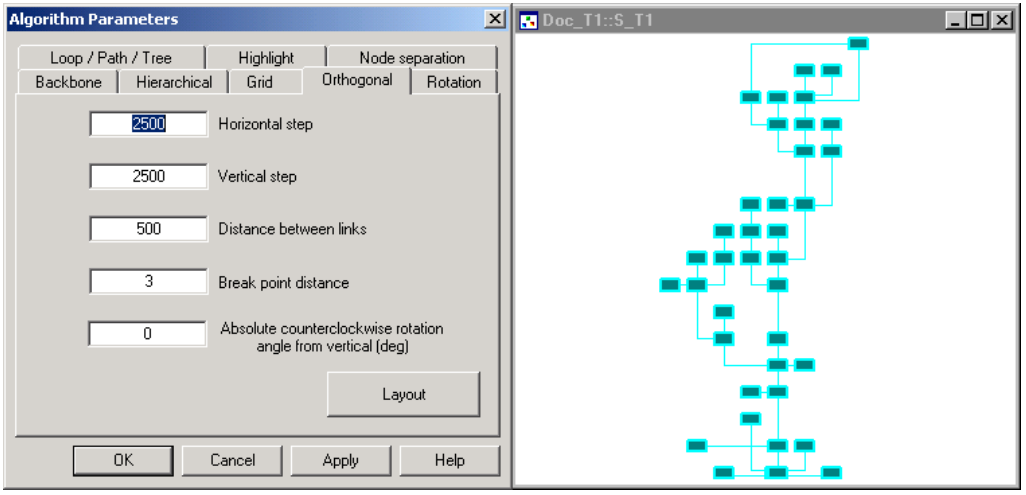



> Illustration of the Orthogonal Layout algorithm:

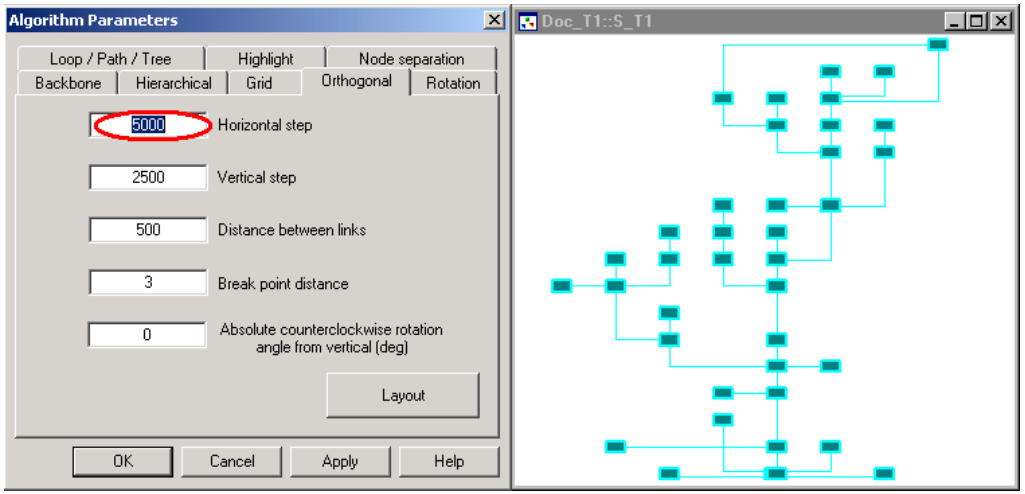
The screenshot below shows the schematic view state before launching the Orthogonal Layout algorithm:



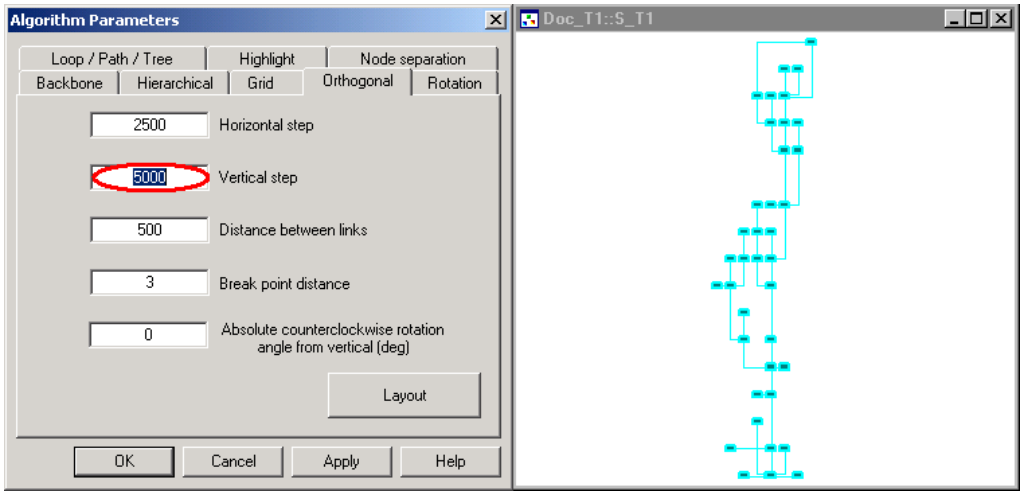

1) Execution of the Orthogonal Layout algorithm:



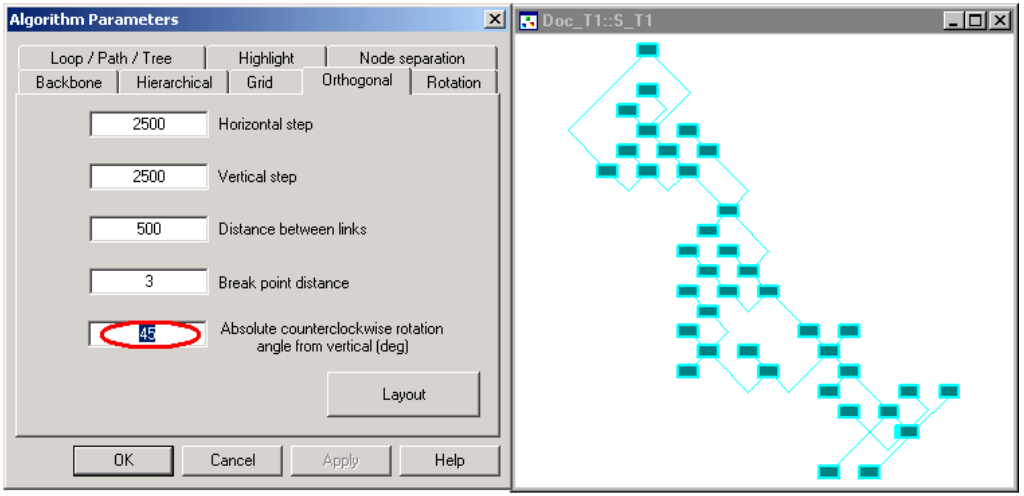
2) Increasing the horizontal step:



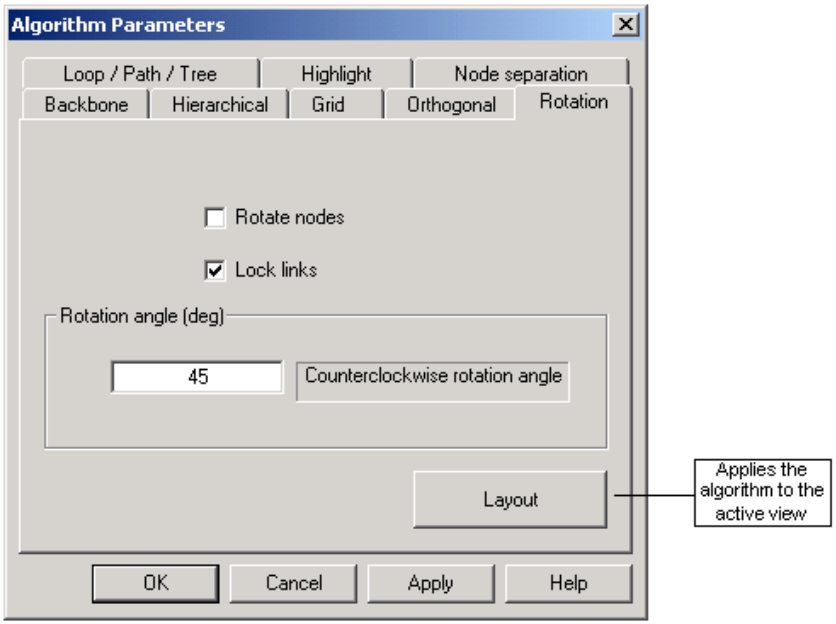

3) Increasing the vertical step:



4) Applying a rotation angle:

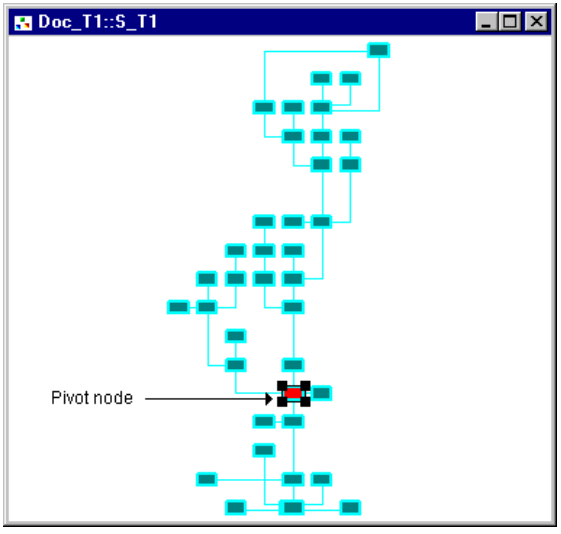


## ➢ Algorithm Parameters Form, The Rotation Tab

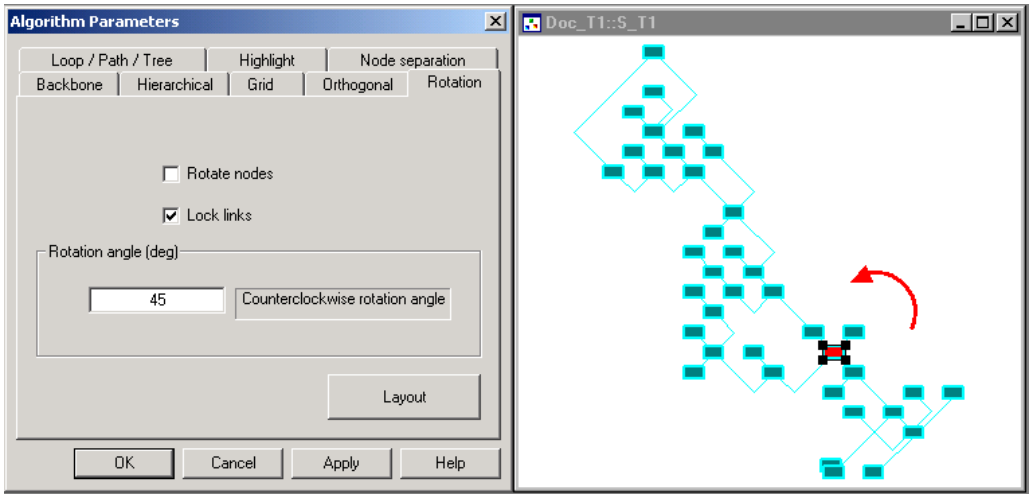



> Illustration of the Rotate Tree algorithm with the Lock links mode disabled:

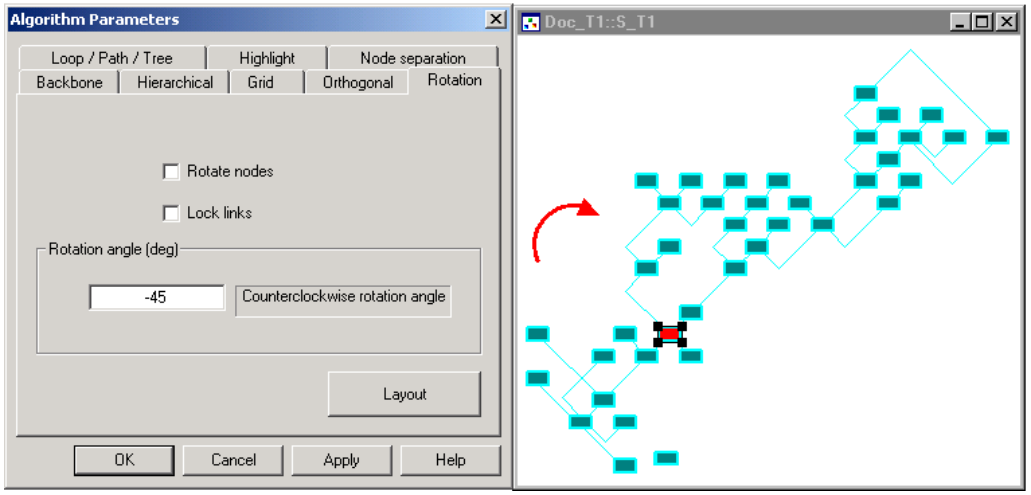
**Initial tree layout**



**Example 1:** Applying a 45°counterclockwise rotation angle

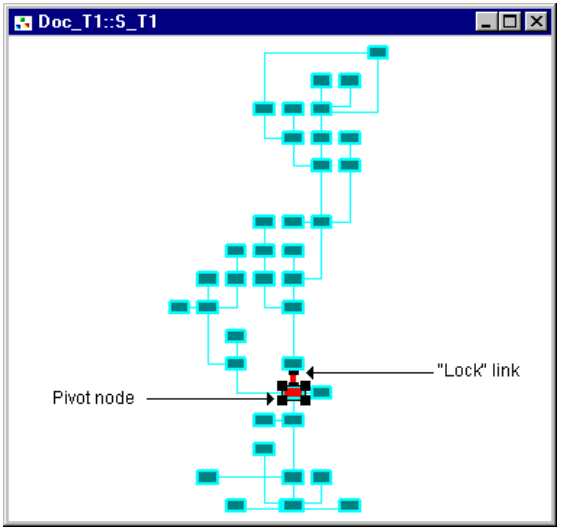



**Example 2:** Applying a 45° clockwise rotation angle

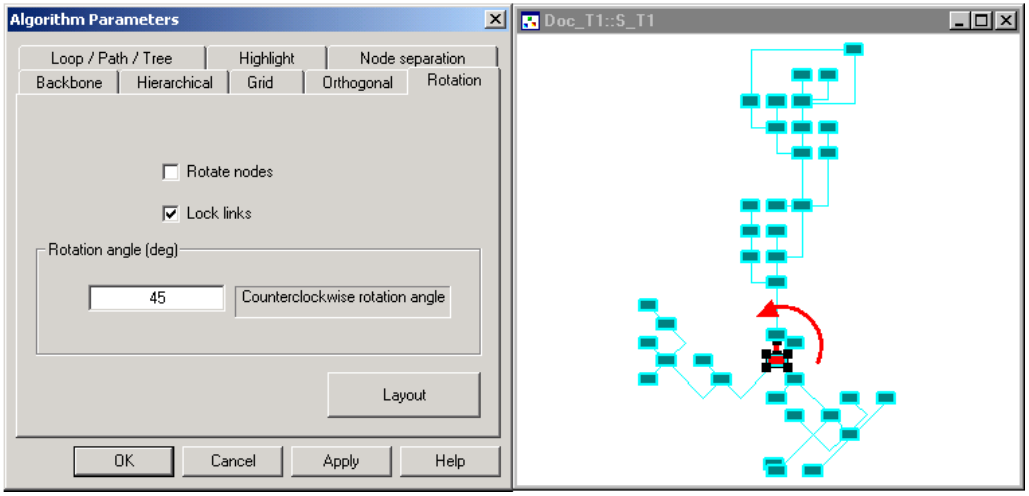


> Illustration of the Rotate Tree algorithm with the Lock links mode enabled:

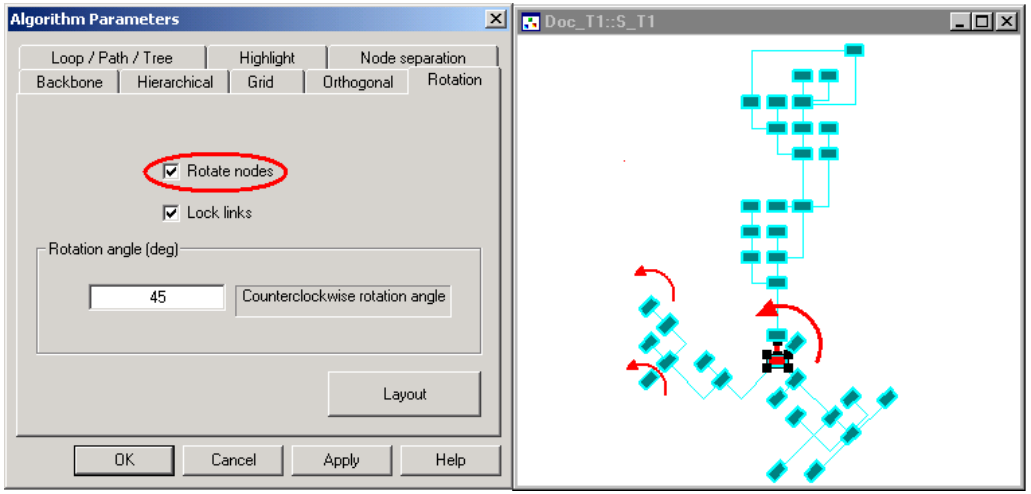
**Initial tree layout**



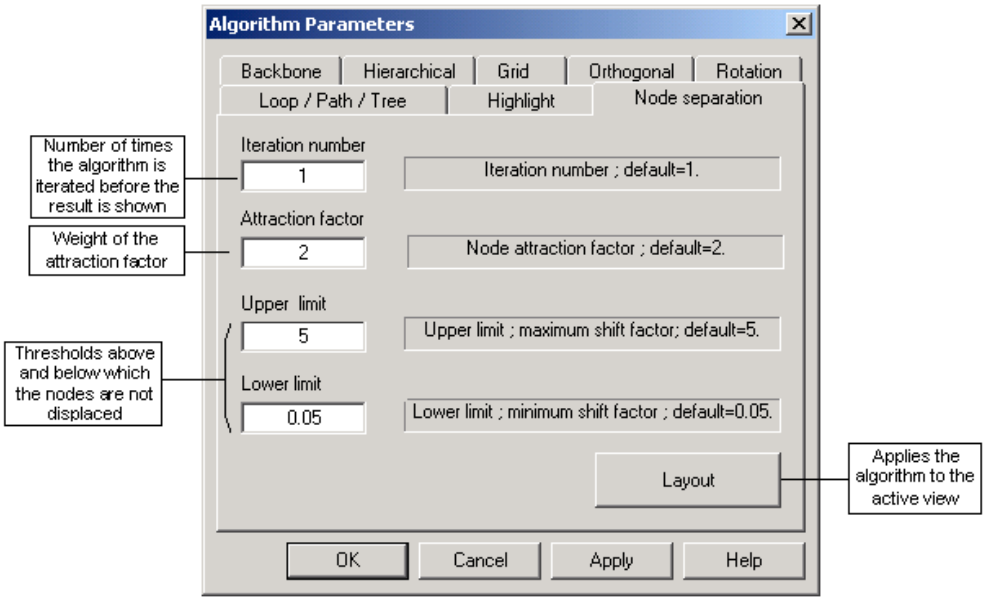

**Example 1:** Applying a 45°counterclockwise rotation angle; the nodes in the subtree starting from the forbidden link are not rotated.



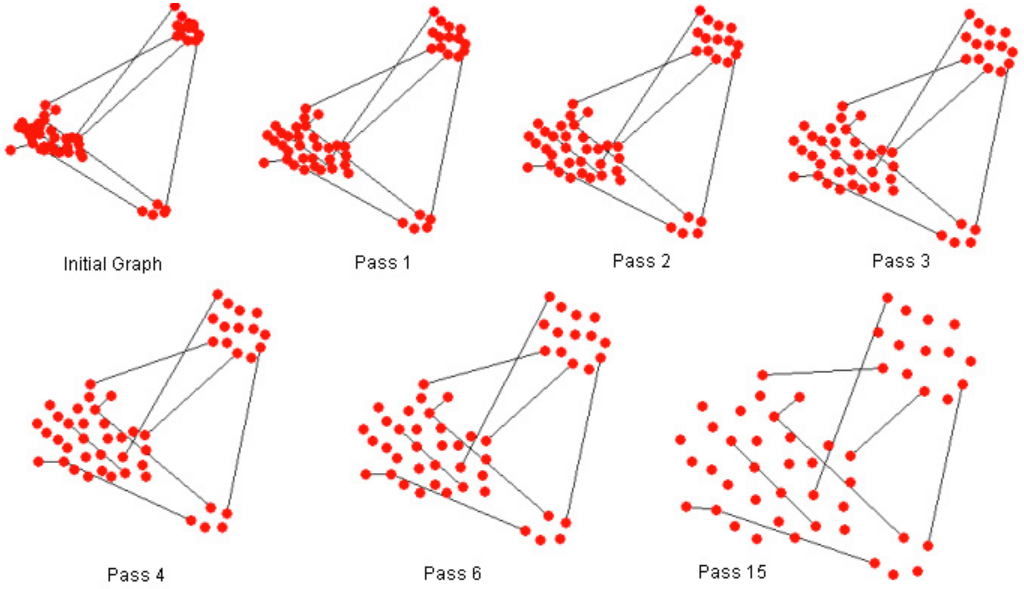
**Example 2:** Applying a 45°counterclockwise rotation angle and using the Rotate nodes option; here the nodes in the rotating subtree are also rotated by the angle specified.



## ➢ Algorithm Parameters Form, The Nodes Separation Tab




**Example of node displacement after each single pass:**



# ArcGIS Schematics Keyboard Shortcuts and Behaviors

## ➢ Selecting objects in schematic views

Click the Select Tool button in the ArcGIS Schematics Schematic Feature Selection toolbar and move the mouse over to a schematic view. The following table lists the various selection operations you can perform.

| | Operation | Result |
|---|---|---|
| | Single object selection | To select an object, click the object with the left mouse button. |
| | Global object selection | To select a group of objects, click the location where you want to begin selecting - away from any object, keep pressing the mouse button while dragging a selection rectangle around the objects you want to select. When you release the button, the objects are selected. |
| | Multiple select/unselect | Press the 'shift' key and single select or global select the objects while keeping the 'shift' key pressed:<br>- Selected objects are deselected<br>- Unselected objects are selected |
| | Unselect | If the 'shift' key is not pressed while selecting a new object, or group of objects, the then currently selected objects are removed from the selection. |
| | Unselect all | Click in the window away from any object to deselect all of the currently selected objects. |
| | Highlighting | When an object is selected, its bounding box is displayed with handles showing on its four corners. |

## ➢ Moving objects in schematic views

Click the Select/MoveTool button in the ArcGIS Schematics Schematic Feature Manipulation toolbar and move the mouse over to a schematic view. The following table lists the various selection and move operations you can perform.

| | Operation | Result |
|---|---|---|
| | Moving a single object | Single select an object, click the selected object, keep the mouse button pressed while dragging the mouse in the desired direction. The object is dropped at the mouse button release location. |
| | Moving a group of objects | Select a group of objects (global or multiple select), click **one of the objects thus selected**, keep the mouse button pressed while dragging the mouse in the desired direction. The selected group is dropped at the mouse button release location. |
| | Modifying a link path | Click a point on the link path using the left mouse button, keep the button pressed while dragging the mouse in the desired direction. Release the button. If the chosen point is an intermediate point, it will be repositioned at the mouse button release location. If it is not so, a new intermediate point will be created at that location.<br>If the resulting intermediate point is aligned with the previous point and with the following point, it will be removed. |
| ←↑→↓ | Moving objects using the keyboard arrows | If you select an object or a group of objects, you can move them by 10-pixel increments using the keyboard arrows. |
| (ctrl) ←↑→↓ | Moving objects using the keyboard arrows while pressing the **Ctrl** key | If you select an object or a group of objects, you can move them by one-pixel increments using the keyboard arrows while pressing the **Ctrl** key. |

## ➢ ArcGIS Schematics Keyboard Shortcuts

The following shortcut functions are available in a schematic view:

| | Operation | Result |
|---|---|---|
| ‡ | Fast Zoom in | Clicking anywhere in a schematic view and pressing this key performs a zoom-in operation centered on the view. |
| ‡ | Fast Zoom out | Clicking anywhere in a schematic view and pressing this key performs a zoom-out operation centered on the view. |
| (Ctrl) + ‡ | Slow Zoom in | Clicking anywhere in a schematic view while keeping the **Ctrl** + ‡ keys pressed performs a zoom-in operation centered on the view. |
| (Ctrl) + ‡ | Slow Zoom out | Clicking anywhere in a schematic view while keeping the **Ctrl** + ‡ keys pressed performs a zoom-out operation centered on the view. |
| ←↑→↓ | Pan | Clicking anywhere in a schematic view and pressing either of these keys scrolls the view contents in the corresponding arrow direction. |
| (Ctrl) + ←↑→↓ | Slow Pan | Clicking anywhere in a schematic view and using the keyboard arrows while pressing the **Ctrl** key allows you to move the view contents by one-pixel increments. |
| (Ctrl) + (Alt) | Removing link points | While in "Select and Move" mode, keeping the **Ctrl and Alt** keys pressed and clicking an intermediate link point automatically removes that link point. |
| (Ctrl) | Disconnecting links | While in "Select and Move" mode, keeping the **Ctrl** key pressed and clicking and dragging the first (or the last) link segment in the view automatically disconnects the link from its origin (or end) node.<br>Note: the updating of the databases following this operation can be programmed in the "Template" file via the event "OnConnectionChange". |
| (Ctrl) + (c) | Copying selected objects to the Clipboard | Selecting the graphic objects you wish to copy and pressing the **Ctrl and c** keys automatically copies the objects to the Clipboard. |

## ➢ ArcGIS Schematics predefined behaviors

A certain number of predefined behaviors are provided for the standard ArcGIS Schematics session. The behaviors available are listed in the table below.

| **Graphic Object-related Behaviors** | |
|---|---|
| **Action** | **Behavior** |
| Right-clicking a node or a link | Brings up a popup menu allowing:<br>- The ArcGIS Schematics "NgGraphicEffects" predefined form to be opened ("Symbology" item). Choosing this item lets you redefine the clicked graphic object symbol or graphic effects.<br>- The ArcMap "Show Attributes" predefined form to be displayed or not ("Identify" item) |
| Double-clicking a node or a link using the left mouse button | Automatically selects the corresponding object in the ArcMap window |
| **View-related Behaviors** | |
| **Action** | **Behavior** |
| Right-clicking anywhere in a schematic view background | Brings up a popup menu allowing:<br>- The schematic legend subwindow to be displayed on or off ("Legend" item)<br>- Graphic objects to be repositioned according to their database coordinates ("Initial Position" item).<br>- The currently opened view contents to be exported in the shape format ("Export shape" item)<br>- The currently opened view to be deleted ("Delete document" item) |
| Pressing the **Esc** key | Enables the "Select" mode |
| Pressing the **F3** key | Fits all the objects in the view |
| Pressing the **F4** key | Fits all the objects selected in the view |
| Pressing the **F5** key | The nodes selected in the view or all the nodes in the view are rotated by 45° in a clockwise direction |
| Pressing the **F6** key | The nodes selected in the view or all the nodes in the view are rotated by 45° in a counterclockwise direction |
| Pressing the **Shift+F6** key | The nodes selected in the view or all the nodes in the view are rotated by 1° in a counterclockwise direction |

| Legend Entry-related Behaviors | |
|---|---|
| **Action** | **Behavior** |
| Double-clicking a legend entry using the left mouse button | Automatically selects the objects associated with that legend entry |
| Right-clicking a legend entry corresponding to a group | Brings up a popup menu allowing:<br>- The ArcGIS Schematics "NgGraphicEffects" predefined form to be opened ("Symbology" item). Choosing this item lets you redefine the associated graphic objects symbol or graphic effects. If no graphic objects are selected in the view, the modified graphic effects are taken into account for all the graphic objects associated with the legend entry. If a set of graphic objects is selected, the modifications only concern the selected objects associated with the legend entry.<br>- The associated graphic objects to be:<br>. Visible or not ("Visibility" item)<br>. Selectable or not ("Selectability" item)<br>. Detectable or not ("Detectability" item)<br>. Movable or not ("Mobility" item)<br>. Resizable or not ("Resizability" item) |
| Right-clicking a legend entry corresponding to a property | Brings up a popup menu allowing:<br>- The property graphic effects to be enabled or not ("Property enable" item). In the case of a textual property, this item is not available.<br>- The property label to be displayed or not ("Label display" item).<br>- The ArcGIS Schematics "NgGraphicEffects" predefined form to be opened ("Label Symbology" item). Choosing this item lets you redefine the label effects related to the associated graphic objects. If no graphic objects are selected in the view, the modified effects are taken into account for all the labels related to the graphic objects associated with the property legend entry. If a set of graphic objects is selected, the modifications only concern the selected object labels associated with the legend entry. |
| Right-clicking a legend entry corresponding to a property filter | Brings up a popup menu allowing:<br>- The ArcGIS Schematics "NgGraphicEffects" predefined form to be opened ("Label Symbology" item). Choosing this item lets you redefine the label effects related to the associated graphic objects. If no graphic objects are selected in the view, the modified effects are taken into account for all the labels related to the graphic objects associated with the property filter legend entry. If a set of graphic objects is selected, the modifications only concern the selected object labels associated with the legend entry. |

Note that all these behaviors are fully customizable and can be tailored to suit your needs.

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