

MagnifiCAD v1.0

User's Manual

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MagnifiCAD was developed by Anders Granli.

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1.0 Introduction

Welcome to the first version of MagnifiCAD. MagnifiCAD is a computer-aided design program, which allows you to produce drawings in 2D with the help of a variety of tools. MagnifiCAD supports different line styles, hatching, colors, and can exchange files with other CAD packages supporting the DXF file format.

1.1 System Requirements

MagnifiCAD requires:

- An Amiga with Workbench 3.0 or above.
- 500K free memory.

The size of the projects is limited only by how much free memory you have in your Amiga.

1.2 Registration

MagnifiCAD is a ShareWare program and may be distributed freely. No charge may be taken other than the cost of distribution. This version was released 14.06.95, and is restricted to 2D drawing. To become a registered user of MagnifiCAD and get the latest version, please send \$15 to:

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Comments, wishes for the next version & bug reports for this version are welcome, preferably by e-mail. For more information about registration, printed manuals for the program and the next version of MagnifiCAD, please mail me.

1.3 Drawing elements and their representation

MagnifiCAD has four different types of drawing elements: polylines, arcs, text and symbols.

The polylines and the arcs are the common drawing elements, they are the real elements that make up a drawing. The other two types, text and symbols, play a supporting role in a drawing.

A polyline is a series of connected line segments, and may be open or closed. A polyline may consist of only one line segment. A special polyline type, the rectangle, is constrained to preserve its rectangular shape.

An arc is represented by the parameters that are used to generate it, not by line segments such as in polylines. An arc can be open (a partial circle) or closed (a full circle or ellipse). Text elements consists of a character string and can only be placed horizontally.

Symbols are elements composed of several other elements and are useful for repetitions. When the symbols are created, they are placed in a library of symbols, from which they may be retrieved and repeatedly placed in a drawing as many times as necessary.

2.0 Screen Elements

The default MagnifiCAD screen setup consists of two windows: the Tools Palette and a Project Window. In addition to these, other palettes can also be displayed.

2.1 The Tools Palette

The tools palette contains all the tools you use to draw and modify entities.

2.2 The Project Window

The Project Window consists of several components, such as:

The Window Border - where the projects name and the current layer will be displayed, and where you can resize and move the window as a normal Intuition window.

The Coordinates and Snap Bar - where you can see the current coordinate, the angle, and select different types of snaps to be applied to the input points.

The Drawing Field - where the projects elements will be shown.

The Project Window Border

The border of the project window contains the name of the current project, the current working layer, and scrollers used to move the current view. There are two scrollers, one for vertical and one for horizontal movement.

The Project Window Coordinates and Snap bar

The coordinates and snap bar contains information about the current input point and the tools to affect the input points.

Coordinates

The coordinate gadgets shows the coordinates of the current position on screen. This will be absolute values, except when in the middle of a drawing operation, when the coordinates will be relative to the first input point. The user can also type in values in these gadgets, instead of using the mouse to select points.

The angle gadget shows the current angle. This angle will be measured from the rightmost end of a circle, except when in the middle of some drawing operations, when it will be measured from the

line between the first and second input point.

Snap gadgets

The snap modes determine how the input points will be selected. The modes are divided into three groups, called **Grid Snap**, **Directional Snap** and **Object Snap**. See section 10.0 for more information about snap types.

The Project Window Drawing Field

The drawing field is where you build up your project or drawing. The current drawing mode is selected and shown in the Tools Palette.

The current coordinate is shown and the snap mode is selected in the Coordinates and Snap Bar.

3.0 Types of drawing tools

The tool palette contains all the tools you need to draw. The tools are divided into **modifiers** and **operators**.

The modifier tools are the **element generation modifiers** and the **self/copy** modifiers.

The operators are the element generation tools, pick/delete tools, geometric transformations and attribute assignments.

3.1 The drawing modifiers

The modifier groups occupy one row in the tools palette each.

The Element Generation Modifiers

These modifiers occupy the first row of the tools palette. They determine which type of element the

drawing operators will generate. The two types are Line mode and Enclosure Mode.

The Self/Copy Modifiers

These modifiers occupy the eight row of the tools palette. They determine whether geometric transformations will be applied to the original object or a copy of the object.

3.2 The drawing operators

The second group in the tools palette contains the drawing tools. These generate line or enclosure elements, depending on the active element generation modifier.

Draw Polyline

These tools draw open or closed polylines. This may be polylines or polyarcs.

Draw Polygon

These tools draw polygons. This may be rectangle, 3-point rectangles or n-sided polygons.

Draw Arc

These tools draws open or closed arcs. This may be arcs, circles or ellipses.

Pick

This tool is used to select elements. It allows elements to be prepicked, so that an operation may be applied to an element afterwards.

Delete

This tool is used to delete elements.

Geometric Transformations

These tools are used to apply geometric transformations to elements. The available transformations are move and rotate. They operate either on the selected elements or copies of these. This is determined by the current state of the Self/Copy modifiers.

Attribute Assignment

These tools are used to assign attributes to drawn elements. The available attributes are color, line style, line weight, hatch and layer.

4.0 Generating elements

The drawing tools are used to create different drawing elements.

4.1 Object types

Line objects

When Line Mode is selected, all elements will be generated with simple lines making up the element.

Enclosure objects

When Enclosure Mode is selected, all elements will be generated with two parallel lines all the time, making a kind of enclosure.

This is very useful for drawing walls etc.

4.2 Drawing Lines

Polylines

It draws a sequence of lines, linked to each other, by selecting a sequence of points. After the first point is selected, the first line segment will be rubberbanded. The next selected point will end the first segment and begin rubberbanding another.

The sequence is terminated by double-clicking the mouse.

Double-clicking to end the polyline will draw an open shape, with the endpoint where you double-clicked the mouse. You can hold down either of the **shift** keys on your keyboard while double-clicking to make a closed shape.

The point where you double-clicked will then be joined to the starting point of the polyline, closing the shape.

Polycurves

This tool is used to draw curved lines.

Clockwise Arcs

It draws an arc using three input points. The first point is the center of the arc. The second point defines the start point and the third defines the end point of the arc.

A circle will be rubberbanded when you have selected the center, and it will change to an arc when you select the start point.

The number of segments the arc consists of, can be changed in the Circle/Ellipse/Arc Options requester.

Counter-clockwise Arcs

The counter-clockwise arcs is drawn as the clockwise arcs, except that they are drawn in counter-clockwise direction.

The number of segments the arc consists of, can be changed in the Circle/Ellipse/Arc Options requester.

4.3 Drawing Circles and Ellipses

Circles

It draws a circle from two input points. The first point is the center, and the second point is the radius. The circle is rubberbanded after you have selected the center point.

The number of segments the circle consists of, can be changed in the Circle/Ellipse/Arc Options requester.

The Circle/Ellipse/Arc Options Requester

This requester handles the options for the circle, ellipse and arc tools.

Of Segments The number of segments required can be entered in this numeric field. The number must be greater than 6. The default number of sides is 48.

Ellipses

It draws an ellipse from two input points. The first point is the center, and the second point is any point on the circumference of the ellipse. After the center point is selected, the ellipse is rubber-banded.

The number of segments the ellipse consists of, can be changed in the Circle/Ellipse/Arc Options requester.

4.4 Drawing polygonal Polylines

Rectangle

It draws a rectangle from two input points that represents two diagonally opposite corners of the rectangle. After the first point is selected, the rectangle will be rubber banded until you select the second point.

The input points can be any pair of opposite corners of the rectangle. The rectangle may be a square or a plain rectangle.

The sides of the rectangle are restricted to being parallel with the x and y axes of the coordinate system.

3 Point Rectangle

It draws a rectangle from three input points. The first point represents one corner of the rectangle, the second determines the angle of one of the rectangle sides, and the third is the corner point opposite of the first.

The rectangle will be rubber-banded after selecting the first 2 points.

The rectangle may be a square or a plain rectangle.

Polygon

It draws a polygon from two input points. These points represent the center of the polygon and the radius of the circle the polygon is inscribed in.

When you select the center point, the polygon will be rubber banded until you select the radius and direction. By default this tool creates a hexagonal shape.

The number of sides the created polygon will have can be changed in the Polygon Options

requester. You invoke this requester by holding down either of the **shift** keys while selecting this tool.

The Polygon Options Requester

This requester handles the options for the polygon tool.

Of Segments The number of sides required can be entered in this numeric field. The number must be greater than 2. The default number of sides is 6.

4.5 Drawing Text

Text

The Text Tool draws text. You specify one input point, which is the start position of the text. When selected, a requester will pop up and let you type the text. Press Return and OK in the requester, and the text will be displayed.

The Text can be moved and copied as other elements, but not rotated. It will always be drawn parallel with the x-axis.

The Font and String can be changed in Entity Info requester.

5.00 Picking

When the user wants to edit an object, that is, apply a transformation or delete it, the object must be picked.

5.1 Prepick and Postpick

An object may be prepicked or postpicked. Using Prepick, select the object (using the Pick Tool) first, and then apply the operation. With Postpick, you can select an operation, and then pick the objects to be affected.

5.2 The Pick Tool

Pick

The Pick Tool allows you to select elements on screen by various methods.

You can select one or more elements with this tool.

- Clicking on any part of an element selects it.
- Clicking on any part of an entity, while holding down the SHIFT key, selects this in addition to any already selected elements.
- Clicking outside any element deselects all elements.
- Clicking and holding down the left mouse button while dragging the mouse produces a rectangle. All elements within this selection rectangle will be selected when you release the button.

When an element is selected, it is highlighted in the current selection color.

5.3 Unpicking

To unpick or deselect objects, click outside any objects in the project window while in Pick Mode.

6.0 Delete

Delete is used when an element is to be erased from the project.

6.1 The Delete Tool

Delete

This tool deletes the selected element or elements.

It works with both the prepick and postpick methods. With the postpick method, the Delete Tool is selected first, and then the entities are selected and deleted.

With the prepick method, all the elements are selected first, and when the Delete Tool is selected, all selected elements are deleted. Selected elements can also be deleted by pressing the 'Del' button on the keyboard.

7.0 Geometric Transformations

The Geometric Transformations operate on an element to change its geometry. The Self/Copy modifiers affect the transformations.

7.1 The Self/Copy Modifiers

The Self/Copy modifiers control whether the transformations are applied to the selected object or to a copy of it.

Self

When the Self mode is active, all geometric transformations will be applied to the selected element.

Copy

When the Copy mode is active, all geometric transformations will be applied to a copy of the selected element.

A new copy of the selected element is made for each subsequent mouse click.

7.2 The Geometric Transformation Tools

Move

The Move Tool allows you to move one or more entities. The entities must be pre-picked with the pick tool.

To move the selected entities, select a point as your reference. This point can be anywhere, but preferably it is one of the entities points. When this point is selected, you can drag the entity or entities to the destination point and click to move.

Rotate

The Rotate Tool allows you to rotate one or more entities. The entities must be pre-picked with the pick tool.

To rotate the selected entities, select a point as your reference. The entities will be rotated around this point. When selected, you can drag the entities to their new positions and click to end the operation.

7.3 Transforming Objects

All elements support both the transformations above, except the Text element. This can only be moved, not rotated. If a rotation is applied to a Text element, only the starting point of the Text will be rotated/moved.

8.0 Element Attributes

All the drawing elements have attributes that can be set and changed. These attributes are color, line style, line weight, hatch and the layer they are in.

Some elements are affected by all these attributes, and some are affected by some of them, as shown in the table below.

<TABLE>

8.1 Setting the element attributes

When new elements are drawn, they will have the attributes currently set. These attributes are color, line style and line weight. They will also be placed in the currently active layer. The hatch attribute must be set explicitly. After an element has been drawn, these attributes may be changed by using the attribute setting tools, found at the bottom of the Tools Palette.

Color

This tool changes the color of the selected element to the current selected color.

The currently selected color can be changed by selecting a new color in the Color Palette.

Line Style

This tool changes the line style of the selected element to the current selected line style.

The currently selected line style can be changed in the Line Menu.

Line Weight

This tool changes the line weight (or line width) of the selected element to the current selected line weight.

The currently selected line style can be changed in the Line Menu.

Hatch

This tool allows you to hatch elements on screen by selecting them by the same methods as in Pick.

The elements will be hatched with the currently selected hatch type, which can be selected in the Hatch Palette.

Layer

This tool lets you change the layer of the selected element to the current layer.

The current layer can be changed in the Layers requester.

Set All

This tool lets you change all the attributes of an element.

This means that the Color, Line Style, Line Weight, Hatch and Layer of the entity will be set to the current values.

9.0 Symbols

Symbols are used in a drawing to represent elements that are repetitioned. They can be used to standard symbolic representation like doors, windows, furniture, etc. in drawings.

Symbols are not affected by the hatch attribute, and they may not be rotated.

9.1 Creating and Placing Symbols

Create Symbol

This creates a symbol from the currently selected entities. This tool works only with prepicked elements.

The symbol will be saved in a symbol file with the name the user supplies.

Place Symbol

This tool is used to place a symbol in a project. A requester appears and lets the user select the appropriate symbol. This symbol is loaded and the user may move it around and place it in the project window.

9.2 Exploding Symbols

Explode Symbol

This tool is used to explode a symbol into its different elements. A symbol must be selected for this tool to be effective. When selecting this tool, the symbol will be replaced by the individual elements that form the symbol. These elements can then be edited by themselves.

10.0 The Snap Modes

The Snap modes determine what happens to the input coordinates, if they are adjusted (snapped), and to where. When an input point is snapped, the actual coordinate recorded is changed to fit the current snap mode.

10.1 Grid snap

The grid snap snaps the input point to the closest point on the reference grid.

Grid Snap Switch

Toggles the grid snap mode on and off. When Grid Snap mode is on, snapping occurs to the closest point on the reference grid, as defined in the Grid Settings requester.

Note that this mode may be overruled by the directional or object snap modes.

10.2 Directional snap

The directional snap modes snaps the input coordinate to the closest direction (by angle).

None

Turns off any directional snap.

Note that the directional snap modes may be overruled by the object snap modes.

Orthogonal

When orthogonal snapping is active, snapping occurs to a line parallel with either the x or y axis.

Note that the directional snap modes may be overruled by the object snap modes.

Orthogonal 45

When orthogonal 45 snapping is active, snapping occurs to a line 45 degrees to either the x or y axis.

Note that the directional snap modes may be overruled by the object snap modes.

10.3 Object snap

The object snap modes snaps to the closest point in an element.

None

Turns off any object snap.

Point

When snap to point is active, snapping occurs to the closest point which is in an element.

Note that the object snap modes overrules all other snap modes.

Midpoint

When snap to midpoint is active, snapping occurs to the closest midpoint which is on a line in an element.

This mode will also snap to the center of circles, ellipses and arcs.

Note that the object snap modes overrules all other snap modes.

11.0 The Menus

From the menus the user can access all the functions not covered in the tools palette.

11.1 Project Menu

The Project Menu contains everything that has to do with opening and closing projects and files.

New

This opens a new project. If the current open project is changed, you will be asked if you want to save before opening a new project.

New Window

This opens a new window unto the current project.

NOT AVAILABLE IN THE CURRENT VERSION.

Open...

This displays the filerequester and lets the user select a new project to load.

If the current open project is changed, you will be asked if you want to save before opening a new project.

Close

Closes the current project.

If the current open project is changed, you will be asked if you want to save before opening a new project.

Save

Saves the current project with the current filename.

Save as

Opens a save requester and allows you to type in a new name for this project, and saves it under this name.

Print Setup...

Displays the Print Setup requester and lets you print the current project.

The Print Setup Requester

This requester lets you change the print setup settings.

Print Scale - The scale of the printed drawing.

Print Direction - Sets the printing to either Landscape or Portrait.

Print Type - Determines what part of the project that is to be printed. If Extents, everything will be printed. If Current View, the part of the project that is shown in the project window will be printed.

Options:

Print Grid - If checked, print the reference grid.

Print Axis - If checked, print the reference axis.

Print - Print with the current options.

Preview - Show a preview of the printout.

Print

Prints the current project with the selections set in the Print Setup requester.

About

This displays the 'About' requester, where you can see the program credits and information about how much memory that is available.

Quit

This quits MagnifiCAD.

If the current open project is changed, you will be asked if you want to save before the program ends.

11.2 Edit Menu

The items in the Edit Menu lets you cut and paste elements in a project and between different projects. It also has an item for selecting all elements in a project.

Cut

This deletes the selected elements from the project and stores them in the clipboard, ready for a Paste operation. The clipboard can hold any number of elements.

If there are old elements in the clipboard (from another Cut or Copy operation), they will be replaced by the new elements.

Copy

This copies the selected elements into the clipboard, replacing anything already there. It is the same as Cut, except it does not delete the elements from the project.

Paste

This pastes a copy of the elements in the clipboard into the project. The elements to be copied will be follow the position of the mouse until the mouse is clicked to position them. The elements will not be removed from the clipboard, so the Paste command can be used many times to paste many copies of the same elements into the project.

The contents of the clipboard will not be deleted when closing a project and opening a new one, so

it can be used for copying elements from one project to another.

Select All

This selects all the elements in a project. Elements in a layer that is not shown will not be selected.

11.3 View Menu

The items in the view menu lets you change the view you have of the project, zoom in and out, and save a specific view for later.

Zoom In

This lets you zoom in by drawing a rectangle which defines the bounds of the zoom.

Zoom In By Factor

This calculates a new view based on the values in the Zoom Settings requester.

It zooms in by the number set in the Zoom Factor gadget in the Zoom Settings requester.

Zoom All

This zooms out until all elements are fully visible in the current project window.

Zoom Out By Factor

This calculates a new view based on the values in the Zoom Settings requester.

It zooms out by the number set in the Zoom Factor gadget in the Zoom Settings requester.

Pan

This lets you move the current view by drawing a line with the length and direction that the view moves.

Redraw

This redraws the project with the current view.

Save View

This lets you type in a name for the current view and saves it in the view list.

Views...

Shows the view list and lets you select a new view.

Coordinates and Snap Bar

Show or hide the Coordinates and Snap Bar. When the Coordinates and Snap Bar is shown, this item will be marked.

Text Information Bar

Show or hide the Text Information Bar. When the Text Information Bar is shown, this item will be marked.

Tools Palette

Show or hide the Tools Palette. When the Tools Palette is shown, this item will be marked.

Color Palette

Show or hide the Color Palette. When the Color Palette is shown, this item will be marked.

Color Palette

This requester lets you select the current color. Select a color to make it the current selected color.

Hatch Palette

Show or hide the Hatch Palette. When the Hatch Palette is shown, this item will be marked.

Hatch Palette

This requester lets you select the current hatch. There are 16 different hatches available, from plain solid to a brick-like hatch.

Select the one you require by clicking on it. It will be depressed to show that it is selected.

11.4 Information Menu

The Information Menu contains items that shows the user information about the project, its layers, and its elements.

Project...

This displays the Project requester. In this requester you can change the name of the project and the file type.

The Project Requester

This requester lets you change the project name and file type.

Name - The project's name.

File Type - The file type the project is saved in. The file types currently supported are:

MagnifiCAD

AutoCAD DXF 2D

For more information about these filetypes, see Appendix A.

Layers...

This displays the Layers requester. In this requester you can change number, name and status for each layer.

You change the active layer by clicking in the list of layers.

The Layers Requester

This requester shows the layer list of the current project. You can add or delete layers, and change layer attributes.

Layer List:

List - The list of the project's layers.

Add - Add a new layer to the layer list.

Delete - Delete the currently selected layer.

Current Layer:

Number - The layers number.

Name - The layers name.

State - The layers state, either Show or Hide. When Show is selected, the layer's entities will be drawn.

Entities...

This displays the Entity Info requester, which shows information about the selected entity. You can change information from this Entity Info requester.

If there is more than one entity selected, selecting this item will do nothing.

The Entity Info Requester

This requester shows some information about the selected entity.

All entities:

Type - This shows the entity type. This can not be changed.

Layer - This shows the current layer the element is drawn in. Type in a new existing layer number to change the element's layer.

Text:

String - The text that is drawn. This can be changed by editing the string.

Change Font... - Set a font specifically for this element. The font will be selected from the fonts requester.

Symbol:

Name - The name of symbol. This can be changed by typing a new name.

Select Font...

This displays the font requester and allows you to change another font than the default one to use as the selected entities text.

11.5 Symbols Menu

The Symbols menu contains items to let you create, place and explode symbols.

Place Symbol

Shows a requester, allowing you to choose the symbol you want to place in the project.

The symbol automatically follows the mouse pointer so you can move it around the screen and place it wherever you like.

Create Symbol

This saves the selected entities as one symbol, with the filename you enter in the save requester.

Explode

A symbol must be selected for this option to have any effect.

The symbol will be exploded into its different entities.

11.6 Settings Menu

The items in the settings menu lets you change all the settings in MagnifiCAD, and save this in a preference file.

Show Grid

Selecting this item will toggle it on or off. When on, the grid, as defined by Set Grid, will be displayed.

Screen Mode...

This displays the screenmode-requester and lets the user change screen resolution etc.

The screen modes currently supported by MagnifiCAD is:

- HIRES
- HIRES INTERLACE
- SUPERHIRES
- SUPERHIRES INTERLACE

Both PAL and NTSC modes are available.

Grid...

This shows the Grid Settings requester and lets you change the grid settings.

The Grid Settings Requester

This requester shows the grid settings.

Grid Spacing - The spacing of the points or lines in the reference grid. If the spacing equals less

than 2 pixels on the screen in the current view, they will not be drawn.

Type - When set to Dot grid, only the points in the reference grid will be drawn. When set to Line grid, continuous lines will be drawn as the reference grid.

Units...

This shows the Units Settings requester and lets you change the units settings.

The Units Settings Requester

This requester shows the Units settings.

Units - The base units which all measures are made in. The base unit is used when calculating scale.

Zoom...

This shows the Zoom Settings requester and lets you change the zoom settings. They affect how the view is zoomed when using one of the zoom commands.

The Zoom Settings Requester

This requester shows the zoom settings.

Zoom Factor - This is the factor that is used in calculating new views when selecting Zoom In By Factor or Zoom Out By Factor.

Always Zoom By Factor - When checked, the Zoom Factor is used in all zooming operations, i.e. Zoom All and Zoom In. These operations will then always scale by Zoom Factor.

Load Settings...

This lets you change the settings by loading a previously saved settings file from disk.

Save Settings

This saves the settings in the currently defined file.

Save Settings as...

This saves the settings in a file with a filename selected by the user.

11.7 Lines Menu

In this menu you can select the current Line Style and the current Line Weight (LINE WEIGHT NOT SUPPORTED IN THIS VERSION).

A selection mark will show the current Line Style and the current Line Weight.

11.8 Help Menu

In this menu you can get help from the online help included in MagnifiCAD.

Help

This opens the online help and displays the main help page. From this page you can select different topics.

Using MagnifiCAD Help

This shows the 'help about help' page, where the different ways of getting help are listed.

Index

This shows the help index, with an entry for all topics and keywords on which there is information in the online help section.

Appendix A: Using MagnifiCAD with other CAD programs

MagnifiCAD can be used in conjunction with other CAD type programs, both on the Amiga and on other platforms. Use one of the supported file formats to transfer a project into another program.

Supported File Formats

The only currently supported file format is the DXF drawing files.

AutoCAD DXF 2D

MagnifiCAD reads and writes AutoCAD DXF files. This is the most standard filetype for CAD drawings, and may be imported into a variety of packages.

The supported entities are:

LINE
POLYLINE
CIRCLE
ARC
TEXT

MagnifiCAD reads the HEADER section, the TABLES section (currently, the only table supported is LAYER), and the ENTITY section, and skips the rest.

Appendix B - Speed and Memory Issues

MagnifiCAD is supposed to work decently on an unexpanded A1200, but it will be rather slow. To speed things up a bit, there are several things that can be done.

- Select the normal HIRES screenmode, without interlace.
- Close the color and hatch palettes.

MagnifiCAD runs with just 300K free memory, but allocates memory for each element added to a project. An unexpanded A1200 has 2 megabytes of memory. This should be enough for many projects. If you run out of memory, try closing other programs that are running and choose a screenmode with low resolution.

The amount of free memory available can be checked by choosing **About** in the Project menu.

Appendix C - Keyboard Shortcuts

All keyboard shortcuts consists of pressing the Amiga Key(**A**) and another key, as shown in the table below.

<u>Key (A+)</u>	<u>Does</u>	
A	Save as...	(Project Menu)
C	Copy	(Edit Menu)
H	Help	(Help Menu)
I	Entity Info	(Information Menu)
L	Layers	(Information Menu)
N	New	(Project Menu)
O	Open	(Project Menu)
P	Print	(Project Menu)
Q	Quit	(Project Menu)
R	Redraw	(View Menu)
S	Save	(Project Menu)
V	Paste	(Edit Menu)
W	Views	(View Menu)
X	Cut	(Edit Menu)

Appendix D - Index

<PLACE INDEX HERE>

