

Sigraph

Version 8.0.0.1

Oasys

Oasys Ltd

13 Fitzroy Street
London
W1T 4BQ
Telephone: +44 (0) 20 7755 3302
Facsimile: +44 (0) 20 7755 3720

Central Square
Forth Street
Newcastle Upon Tyne
NE1 3PL
Telephone: +44 (0) 191 238 7559
Facsimile: +44 (0) 191 238 7555

e-mail: oasys@arup.com
Website: <http://www.oasys-software.com/>

Oasys Sigraph

© Oasys Ltd. 2006

All rights reserved. No parts of this work may be reproduced in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems - without the written permission of the publisher.

Products that are referred to in this document may be either trademarks and/or registered trademarks of the respective owners. The publisher and the author make no claim to these trademarks.

While every precaution has been taken in the preparation of this document, the publisher and the author assume no responsibility for errors or omissions, or for damages resulting from the use of information contained in this document or from the use of programs and source code that may accompany it. In no event shall the publisher and the author be liable for any loss of profit or any other commercial damage caused or alleged to have been caused directly or indirectly by this document.

This document has been created to provide a guide for the use of the software. It does not provide engineering advice, nor is it a substitute for the use of standard references. The user is deemed to be conversant with standard engineering terms and codes of practice. It is the users responsibility to validate the program for the proposed design use and to select suitable input data.

Printed: July 2006

Table of Contents

Part I About Sigraph	3
1 Applications	3
2 Features	3
Part II Working with Sigraph	5
1 Some Basic Concepts	5
Preferences	5
Toolbars	5
File Formats	6
2 Working with the Gateway	6
Data Tab	6
Right-click menu	6
3 Working with Graphic View	7
Scaling and Zooming the Image	7
Scaling to Fit.....	7
Zooming and Panning.....	7
Output of the Graphic Images	7
Printing from Graphic View.....	7
Copying the Graphic Image to the Clipboard.....	8
Saving the Graphic Image to File.....	8
4 Working with Table View	8
Part III Toolbars and Keyboard Accelerators	10
1 Toolbars	10
Standard Toolbar	10
Sigraph Toolbar	10
View Toolbar	10
Operations toolbar	10
2 Keyboard Accelerators	12
Part IV Dialogs and Wizards	14
1 Welcome to Sigraph	14
2 Titles	14
3 Units	15
4 Graph Settings	15
5 Curve Draw Order	15
6 Data Options	15
7 Curve Options	15

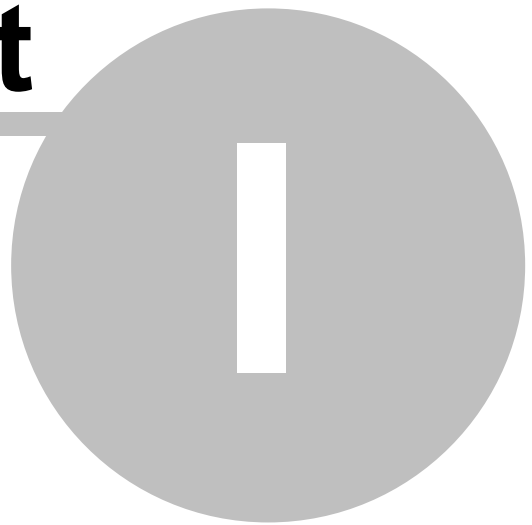
Part V Output Options	17
1 Graphical Output	17
2 Tabular Output	17
Part VI Sigraph Operations	19
1 Arithmetic	19
2 Mathematical	19
3 Calculus	19
4 General	20
5 Seismic options	20
Part VII Save and Export Options	23
1 Graphic View Save Options	23
2 Data Export Options	23
Index	24

Foreword

This is just another title page
placed between table of contents
and topics

About Sigraph

Part



1 About Sigraph

Sigraph is a program for generation, manipulation and graphical display of tabular x-y data.

More:

[Applications](#)

[Features](#)

1.1 Applications

Although specifically oriented towards processing of seismic records, Sigraph can transform, manipulate and plot any numerical data in specific format.

The data may be real - scalar, vector or tensor, or complex scalar. A large number of options are provided to all transformation of the data. There are straight forward manipulation of the records by:

- Arithmetic addition, subtraction, multiplication or division by another curve or a constant, square root or shifting, etc.
- Differentiation or integration
- Interpolation

In addition there are options which relate more directly to seismic analysis: For appropriate time or frequency data, fast Fourier transforms (FFT) and inverse FFT can be performed. Response spectrum can be calculated and manipulated for a given time acceleration history and synthetic time histories generated.

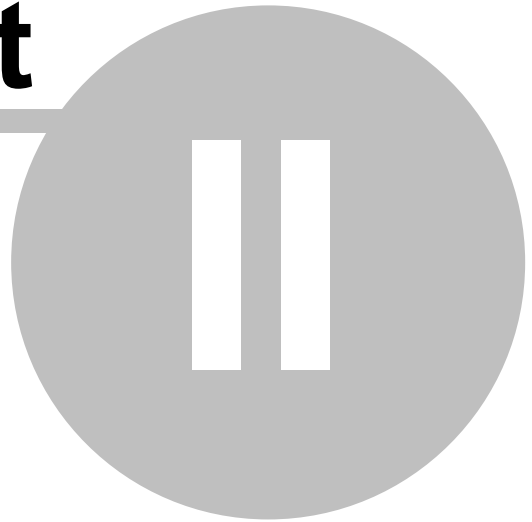
1.2 Features

The options available in Sigraph are:

- Plotting Options - The user has control over the way the graph is to be displayed. The axis type can be set as linear or log on either axis. Individual curves may be included or excluded from display. Symbols can be used to identify the data points. Axis position, annotation, ticks etc. can be specified for either axis. Border, Grid, legend can also be included.
- Manipulation and Transformation - Sigraph allows new data to be generated from existing data. For more details about the various operations that can be performed using Sigraph, see [Sigraph Operations](#).
- Import/ Export options - Sigraph provides the option to import the data generated from other programs. It can read txt, [cur](#) and [gfd](#) file formats. The data can also be exported to txt, [cur](#) and HTML file formats.

Working with Sigraph

Part



2 Working with Sigraph

[Some Basic Concepts](#)
[Working with the Gateway](#)
[Working with Graphic View](#)
[Working with Table View](#)

2.1 Some Basic Concepts

[Preferences](#)
[Toolbars](#)
[File Formats](#)

2.1.1 Preferences

In many cases the user will want to be able to have preferred settings. These settings or 'Preferences' are stored between one session of Sigraph and the next. The settings include current version checking on startup, show tips on startup, print parameters and company information.

Preferences are set in the 'Preferences' dialog available from the 'Tools | Preferences' (Ctrl+F7) menu command.

Check for current version on startup

This will check to see if the current version of the program is being run. This can be disabled where there is a slow network connection.

Show welcome to Sigraph

The 'Welcome to Sigraph' dialog can be enabled/disabled if required.

Company Info

Opens the Company Information dialog to set up your company name and logo that appear on printed output.

Page Setup

Opens the Page Setup dialog allowing the style of output for printed text and graphics to be selected.

If 'Calculation Sheet Layout' is selected the page is formatted as a calculation sheet with details inserted in the page header. If 'Logo' is selected the company logo is inserted in the top left corner of the page. If 'Border' is selected this gives a border but no header information. If 'Clipped' is selected the output is clipped leaving a space for the logo. This has no effect on text output.

2.1.2 Toolbars

Many of the commonly used commands are available on toolbars. All toolbars can be either docked (attached to the main frame) or floating. The toolbars can be switched on and off from the 'View | Toolbars' menu command. Hovering the mouse over a toolbar button will display a small window (tool tip) with the name of the command.

Toolbars are covered in detail in the [Toolbars and Keyboard Accelerators](#) section.

2.1.3 File Formats

The native file format for Sigraph is a 'sig' file which is a variant of a csv file. Data in other formats (GdGraf/GdUte 'gfd', 'gfa' files, T/HIS curve 'cur' files and 'txt' or 'csv' files) can be read or imported using 'File | Import' menu command.

There are options to save the data, both graphical and tabular, to other file formats. These are described in detail in the [Save and Export Options](#) sections.

2.2 Working with the Gateway

The Gateway gives access to the input data and to the output views available.

The Gateway behaves like a toolbar in that it can be displayed or hidden and, when displayed, can be docked onto an edge of the GSA window or floating anywhere on the screen. When floating it is displayed on top of any other view. When docked the part of the screen that is available for other views excludes that occupied by the Gateway. The content of the Gateway always relates to the current model. There is never more than one Gateway displayed even if there is more than one model open.

The Gateway can be opened and closed using the 'View | Gateway' (Alt+0) menu command. 'Gateway' is also available on the Sigraph toolbar.

The Gateway has two tabs: 'Data' which gives access to the data editing, 'Views' for viewing graphical data and tabulated data.

Double clicking on an item will open the appropriate table view or dialog for data input.

More:

[Right-click menu](#)

[Data Tab](#)

[Views Tab](#)

2.2.1 Data Tab

The Data tab in the Gateway provides access to:

- Titles
- Units
- Curves

The 'Curves' item contains all the input and output curves. The right-click menu provides various options to manage individual curves.

Double-clicking the item in the Data tab opens the related data view.

2.2.2 Right-click menu

Clicking the right mouse button when the cursor is pointing at an item in the Gateway displays a floating menu that relates to that item. The list of options is longest when on the "curves" items. Individual curves can be edited (style or data), copied, deleted, etc.

The hide option allows individual curves to be hidden or made visible. These work in conjunction with the "Hide All Curves" and "Show All Curves" options. Any curve which is visible is indicated with an asterisk beside the name in the Gateway.

The property option gives information about that curve. This displays a note field associated with a curve which is generated by a number of the "Operations" options.

2.3 Working with Graphic View

Graphic View allows the user view the curves graphically.

Graphic View may be opened using the `Data | Graph` menu command or by clicking the 'Graphic View' button of the Sigraph toolbar.

More:

[Scaling and Zooming the Image](#)

[Printing from Graphic View](#)

[Output of the Graphic Images](#)

2.3.1 Scaling and Zooming the Image

[Scaling to Fit](#)

[Zooming and Panning](#)

2.3.1.1 Scaling to Fit

The contents of the Graphic View may be rescaled to fit the extent of its window by selecting Graph | Rescale' from the menu, or by clicking the 'Rescale' button on the [Graphic Toolbar](#).

2.3.1.2 Zooming and Panning

Zooming and panning affect the scale and the mid-point of the diagram displayed in the Graphic View.

Zooming:

- **Dragging a rectangle** in the window causes the image to be zoomed and panned to result in that rectangle filling the Window. Only when the aspect ratios of the rectangle and window are identical will this be exact; otherwise the scale is such that **at least** all of the rectangle remains visible.
- **Shft+Click** pans. The image is panned to result in the point clicked on being at the mid-point of the view.

Dragging:

- **Ctrl+Drag** up and down zooms in and out respectively.
- **Shft+Drag** pans the image.

Intellimouse wheel:

- **Rolling the mouse wheel** forwards and backwards zooms in and out respectively.
- **Drag with the mouse wheel** (or middle button) held down pans the image.
- **Ctrl+Drag with the mouse wheel** (or middle button) held down operates as Ctrl+Drag.

2.3.2 Output of the Graphic Images

[Copying the Graphic Image to the Clipboard](#)

[Saving the Graphic Image to File](#)

2.3.2.1 Printing from Graphic View

The graphic image may be printed by giving the `File | Print` (Ctrl+P) menu command. The printed image may be previewed by giving the `File | Print Preview` menu command. `Print` button is also available on the [Standard toolbar](#).

The underlying graphics code used for printing and print previewing is different to that used for

display to the screen. This may occasionally cause subtle differences between the screen image and the printed image.

When printing to a monochrome device, lines, text and symbols are automatically output in black and in-fill is converted to a shade of grey by the program. (The various printers and printer drivers interpret colours differently, sometimes even to the extent of ignoring some colours.)

2.3.2.2 Copying the Graphic Image to the Clipboard

When the Graphic View is active the `Edit | Copy` (Ctrl+C) menu command copies the current image to the clipboard in both bitmap and Windows Meta-File (WMF) format. The application to which the image is pasted will automatically select its preferred format.

The image copied to the clipboard is as currently displayed, including scaling.

The WMF image includes the whole of the model, regardless of the current zoom setting.

2.3.2.3 Saving the Graphic Image to File

The graphic image can be saved to file in various file formats. All are obtained by right-clicking on the Graphic view.

The following file formats are available.

DXF

The image saved is as currently displayed, including dimensions and text. DXF files can be read by various CAD packages. (N.B. `Print by case` is ignored when saving to DXF.)

JPEG

JPEG (Joint Photographic Experts Group) files are best for images that contain a lot of colour filling. For this type of image the JPEG quality factor need not be set very high. For line drawings the PNG format is recommended. JPEGs are widely supported by all paint packages and web browsers. They are also useful for including in Microsoft Word documents.

PNG

PNG (Portable Network Graphic) files are best for images that contain mainly simple lines, text or white space. The image quality is good, and the file size is small. PNGs are supported by professional paint packages and most web browsers. They are also useful for including in Microsoft Word documents.

WMF

WMF (Windows Metafiles) files are the native format supported by Microsoft, however their file size is much greater than PNGs or JPEGs, and WMFs are not supported by web browsers. WMFs can be useful for including in Microsoft Word documents, but PNGs and JPEGs still produce a much smaller Word document when saved. A benefit is that the WMF format adds the company logo to the image, which may be desirable.

Note that the WMF image includes the whole of the currently drawn model, regardless of the current zoom setting.

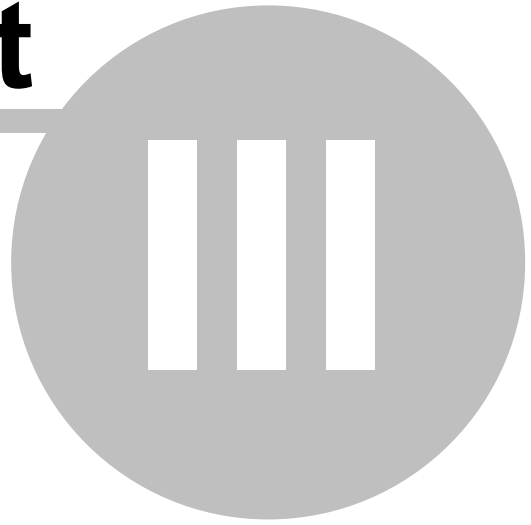
2.4 Working with Table View

Table View may be used to view input curve data and results in tabular format. New curve data can be added or existing data can be modified in table view.

'Table View' may be opened using the `Data | Table` menu command. `Data Table` button is also available on the Sigraph toolbar.

Toolbars and Keyboard Accelerators

Part



3 Toolbars and Keyboard Accelerators

[Keyboard Accelerators](#)
[Toolbars](#)

3.1 Toolbars

[Standard Toolbar](#)
[Sigraph Toolbar](#)
[View Toolbar](#)
[Operations Toolbar](#)

3.1.1 Standard Toolbar

The standard toolbar handles the common Windows options:

New - create a new document

Open - open an existing file

Save - save the data to file

Copy - copy the data and place on the clipboard

Print Preview - preview the current view

Print - print the current view

About - open a dialog providing version information about Sigraph's components

3.1.2 Sigraph Toolbar

The Sigraph toolbar provides access to the following Sigraph options:

Gateway - show or hide the Gateway

Graphic view - open Graphic view

Data table - open table view

Wizard - provide options to edit data type, units and labels of curve. Enabled only in table view.

3.1.3 View Toolbar

The view toolbar governs the appearance of the graphical display.

Rescale - shrink/expand the contents of the graphic view to fit the current extent of the view's window.

Curve Options - open curve options dialog to edit display settings for individual curves.

Graph Options - open Graph settings dialog to edit the graph options and axis options.

3.1.4 Operations toolbar

There are two operations toolbar - General Operations toolbar and Specific Operations toolbar. These provides access to various data manipulation operations.

The General Operations toolbar provides access to the following operations:

Add
Subtract
Multiply
Divide
Factor
Shift
Sum
Mean
Square Root
Power
Reciprocal
Normalise
Modulus
Logarithm (ln)
Logarithm (log)
Differentiate
Integrate

The Specific operations toolbar handles the following operations:

Interpolate
Least Squares
Base-Line Correction
Running RMS
Response Spectrum
Power Spectral Density
Filter
Spectrum Broadening
FFT
Inverse FFT
Reset Limits
Period-Frequency Exchange

See also:

[Sigraph Operations](#)

3.2 Keyboard Accelerators

Key	Action
Alt+0	Gateway
Ctrl+A	Select All
Ctrl+C	Copy
Ctrl+V	Paste
Ctrl+N	New
Ctrl+O	Open
Ctrl+P	Print
Ctrl+S	Save
Ctrl+W	Wizard
Ctrl+X	Cut
F1	Help
Ctrl+F7	Preferences
Esc	Quit
Tab	Next Cell
Return	Next Cell
Delete	Delete
Home	Beginning of entry
Ctrl+Home	Move to beginning of table
End	End of entry
Ctrl+End	Move to end of table
Page Up	Scroll Up
Page Down	Scroll Down
↑Up	Row Up
←Left	Column Left
→Right	Column Right
↓Down	Row Down

Dialogs and Wizards

Part



IV

4 Dialogs and Wizards

[Welcome to Sigraph](#)

[Titles](#)

[Units](#)

[Graph Settings](#)

[Curve Draw Order](#)

4.1 Welcome to Sigraph

The Welcome to Sigraph dialog is displayed on entry to Sigraph and is designed to assist the user to get started quickly. In addition to allowing the user to select what he wants to do the dialog displays a 'Did you know...' tip.

Create a new data file

This option creates a new data file.

Work on your own

This allows the user to exit from the dialog and work on his own. This is the same as selecting 'Cancel'.

Open an existing file

This activates the 'File Open' dialog, allowing the user to select a file to open

Select recent file

This allows the user to open a file that has recently been opened in Sigraph. The selection is made from the list of files shown.

Show this dialog on Startup

The 'Welcome to Sigraph' dialog can be disabled if required.

4.2 Titles

The **Titles** window allows the user to enter the job details. By default the job details of the previous job are used.

Job Number

This is the job number, which can be any alphanumeric string.

Initials

The initials of the user used on printed output.

Last Edit Date

Today for new input; when last edited for retrieved files.

Job Title

The title of the job.

Subtitle

The subtitle that this model relates to.

Calc Heading

Specific to this model.

The above items are reproduced in the title block at the head of all printed information for the calculations. The fields should therefore be used to provide as many details as possible to identify the individual calculation runs.

An additional field for Notes has also been included to allow the entry of a detailed description of the calculation.

Paste Bitmap

Allows a bitmap graphic to be stored.

Remove Bitmap

Removes the bitmap and leave a blank area.

Copy Bitmap

This places a copy of the bitmap graphic on the clipboard.

4.3 Units

The units for various physical quantities can be set using the Units dialog. This can be accessed from 'Data | Units' menu command.

4.4 Graph Settings

The Graph Settings dialog allows the user to change the graphical display. It contains two tab:

- Graph options
- Axis Options

Graph Options tab allows the user to change the Graph Title, show/hide axes, border, grid and legend. The curve style of individual curves can be modified by double clicking the corresponding curve in the 'Edit curve Style' listbox. This opens the '[Curve Options](#)' dialog to edit the data.

Axis Options dialog allows to change the axes labels, scale (linear or log), position etc.

4.5 Curve Draw Order

The Curve Draw Order allows the order in which the curves are drawn to be adjusted. This can be accessed from 'Graph | Draw order' menu.

4.6 Data Options

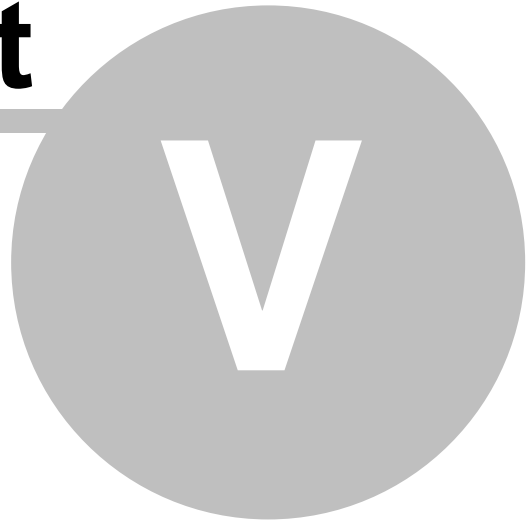
The Data Options dialog allows the user to edit the data type, units and labels of any curve. This can be accessed by selecting the 'Wizard' button on the [Sigraph toolbar](#) or by selecting 'Wizard' from context menu in the table view.. The data type can be edited when the curve does not contain any data ie when a new curve is created.

4.7 Curve Options

The Curve Options dialog allows to edit the display style and title of the curve. The user can show/hide individual curves using this dialog. This can be accessed from the 'Curve Options' button on the View toolbar.

Output Options

Part



5 Output Options

The input curves as well as the output curves can be presented both graphically and in tabular form.

More:

[Graphical Output](#)

[Tabular Output](#)

5.1 Graphical Output

The graphical output comprises a dimensioned plot of the various curves. The component of the curve to be drawn can be selected from the 'Curve Options' dialog. The individual curves can be hidden or shown. The order of drawing the curves can be changes from the 'Graph | Draw Order' command menu.

See also:

[Graphic View](#)

5.2 Tabular Output

Tabular view of the data may be opened by clicking the 'Data Table' button of the Sigraph toolbar, or by selecting 'Data | Table' from the main menu.

The 'Wizard' button of the Sigraph toolbar allows the user to modify the labels and units of the curve. For new curve, the data type can also be set using the Wizard.

Sigraph Operations

Part



VI

6 Sigraph Operations

The initial data consists of set(s) of (x,y) curve coordinates. The y values may be real, complex or tensor.

The mathematical operations which Sigraph can perform on this data are grouped into separate menus. These operations can be accessed from 'Operations' menu command.

More:

[Arithmetic](#)

[Mathematical](#)

[Calculus](#)

[General](#)

[Seismic options](#)

6.1 Arithmetic

Sigraph can perform the following arithmetic operations.

- Add
- Subtract
- Multiply
- Divide
- Shift
- Factor

Arithmetic operations are of the form:

[Input 1] [Operator] [Input 2] → [Output]

For operations '**Shift**' and '**Factor**', [Input 2] should be a constant. For other operations, [Input 2] should be a curve containing the same number of points, the same data type, and the same x values.

6.2 Mathematical

Sigraph can perform the following mathematical operations.

- Sum
- Mean
- Square Root
- Power -
- Reciprocal
- Normalise
- Modulus
- Logarithm (ln)
- Logarithm (log)

The operations '**Sum**' and '**Mean**' take a list of curves as input and produce a single new curve whose ordinates are the sum and mean of the corresponding ordinates in the original curves.

6.3 Calculus

Calculus menu provides the following operations.

- Differentiate
- Integrate

Differentiation: The output is the derivative of the input curve. For this to work, the x values must be monotonically increasing. A three-point numerical differentiation is used.

Integration: The value of the integral of a specified curve between x_{\min} and x_{\max} is calculated using the trapezoidal rule for numerical integration.

6.4 General

General operations include the following.

- Interpolate
- Least Square Fit
- Running RMS
- FFT
- Inverse FFT
- Filter
- Power Spectral Density
- Reset limits

Interpolation: The program calculates the y-coordinates at intermediate points in sub-intervals between those initially specified. These are located on a new curve by linear interpolation.

Least Square Fit: A least-squares fit is made through a series of points. An option allows this curve to be used for base line correction.

Running RMS: calculates the root mean square value over an interval.

FFT and Inverse FFT: Both Fourier and inverse Fourier transforms can be performed. Fourier transforms produce complex curves and Inverse Fourier transforms require complex curves as input.

Filter: allows a high or low pass filter to be applied to time-history data.

Power Spectral Density: calculates power spectral density from Fourier (real and imaginary) coefficients. The power Spectral Density (PSD) is a measure of the significance of different frequencies in a time history. To calculate a PSD from a time history, the user must first perform an FFT. The Fourier components are then used to calculate the PSD.

Reset Limits: sets the limits of the curve within a rectangular frame whose edge boundaries are parallel to the axes defined by the user as x_{\min} (left), x_{\max} (right), y_{\min} (bottom) and y_{\max} (top).

6.5 Seismic options

The following operations are available in Seismic operations menu:

- Base-line Correction
- Period/frequency Exchange
- Spectrum Broadening
- Response Spectrum
- Synthetic Time-history Generator

Base-line Correction: With base line correction, new curve(s) are created with the ordinates of the best fitting straight line, subtracted from the corresponding ordinates of the curve(s). The relevance of base line correction in seismology is in base line correction of digital accelerograms to compensate for drift.

Period/frequency Exchange: Data can be changed from a function of period to one of frequency.

Spectrum Broadening: Allows calculated response spectra to be broadened in accordance with US NRC rules, for use as design spectra.

Response Spectrum: The output is the response spectrum for a given acceleration time history. To calculate a response spectrum, an acceleration time history with equal time steps is required. The response is calculated at various periods which may be either specified or a standard set of 30 or 70 periods used. Furthermore, a damping ratio up to 100% is required. For the response of structures subject to seismic excitation, 5% damping is often used.

Synthetic Time-history Generator: Allows a synthetic time-history to be generated that matches a particular response spectrum. The user selects a starting time history, a target response spectrum and damping. Sigraph calculates the response spectrum and FFT of the starting time-history. The frequency response is compared with the target spectrum and the spectral values are adjusted up or down in proportion to the difference in the target and actual response spectra. An inverse FFT is then used to generate a new time history. This procedure continues until the match between the spectrum for the generated time history and the target spectrum is within an acceptable (user-specified) tolerance.

Save and Export Options

Part

VII

7 Save and Export Options

[Graphic View Save Options](#)
[Output View Output Options](#)

7.1 Graphic View Save Options

When working in Graphic Views it is convenient to be able to save an image of the displayed graphic for transfer to some other graphics or CAD package. The graphic image can be saved directly from Graphic Views in the following file formats:

- **WMF** (Windows Metafiles) — The native format supported by Microsoft
- **PNG** (Portable Network Graphic) — Best for images that contain mainly simple lines, text or white space.
- **JPEG** (Joint Photographic Experts Group) — Best for images that contain a lot of colour filling.
- **DXF** — For output to CAD packages.

See also:

[Saving the Graphic Image to File](#)

7.2 Data Export Options

Individual curves can be selected to be exported to different file formats. Sigraph supports the following export formats.

- **TXT**—tab delimited files
- **CUR**—T/HIS (Time-History) curve files
- **HTML**—web pages for display in browsers

The export option can be selected from 'File | Export' menu.

Index

A

About Siggraph 3
Add 19
Applications 3
Axis Options 15

C

Concepts 5
Copying the Graphic Image to the Clipboard 8
Curve Options 15

D

Data Options 15
Data tab 6
data type 15
Dialogs 14
Dialogs and Wizards 14
Divide 19

E

Exporting Results 23
Export 23

F

Factor 19
Features 3
File Formats 6

G

Gateway 10
General Operations Toolbar 10
Getting started with Siggraph 5
Graph options 15
Graph Settings 15
Graphic View Save Options 23

Graphical Output 17
Graphics 7

I

Import/ Export options 3
Introduction 5

K

Keyboard Accelerators 12

L

Labels 15

M

Manipulation and Transformation 3
Multiply 19

O

Opening Files 6
Operations 19
Operations Toolbar 10
Output 17
Output of the Graphic Images 7
Output Options 17
Output View Export Options 23

P

Panning 7
Plotting 3
Plotting Options 3
Preferences 5
Printing from Graphic Views 7

S

Save and Export options 23
Save Image 23
Saving Files 6
Saving graphic views 23
Saving the Graphic Image to File 8

Scaling and Zooming the Image 7
Scaling to Fit 7
Shift 19
Sigraph 3
Sigraph operations 19
Sigraph Toolbar 10
Some Basic Concepts 5
Specific Operations Toolbar 10
Standard Toolbar 10
Starting to use Sigraph 5
Subtract 19

T

T/HIS curve files 23
Table 8
Tabular Output 17
Titles 14
Toolbars 5, 10
Toolbars and Keyboard Accelerators 10

U

Units 15

V

View Toolbar 10

W

Welcome to Sigraph 14
Wizard 10, 15
Working with Graphic Views 7
Working with Sigraph 5
Working with Table View 8

Z

Zooming 7
Zooming and Panning 7

Endnotes 2... (after index)

