Welcome to GenStat® for Windows® 12th Edition. Whether you are new to GenStat, an existing GenStat user, or simply trying the software, this guide is intended to get you up and running with GenStat as quickly and smoothly as possible.

GenStat is a complete and comprehensive general statistics package developed by VSN International Ltd (VSNi). The user friendly menus are essential for the more inexperienced user while the powerful, flexible command language make GenStat a must for the more experienced statistics user.

This guide will take you through the fundamental ‘Getting Started’ steps:

1 Screen tour - finding your way around
2 Working with data
3 Working with GenStat menus
4 Working with Graphs
5 Working with GenStat commands
6 GenStat Documentation and Help
7 Training and Support

We hope you enjoy using GenStat 12th Edition. If you have any questions, comments or queries relating to the software please contact us. All help and contact references are available on the back page of this guide.

Happy GenStatting!

The GenStat Team
Throughout this guide, font types and icons are used to highlight particular features. The key to these is included here for clarification.

The Information button highlights facts and tips associated with GenStat features.

Small capitals indicates a GenStat menu option. The Pipe character '|' indicates a submenu.

Small Times Roman capitals dictate GenStat commands.

**EXAMPLE DATA SETS**

The examples used throughout make use of data files that are distributed with GenStat. These can be found in 2 locations (<gendir> is the folder in which GenStat is installed on your PC):

The files in the data folder accompany the Introduction book, available in PDF format through the **HELP|GenStat Guides** menu.

GenStat comes complete with a suite of GenStat language programs to help you learn the GenStat command language, which are in the examples folder. The **TOOLS|WORKING DIRECTORY** menu option provides a simple method of accessing the Data folder within GenStat.
The GenStat interface adopts a multiple-window approach. This means that you can have a number of different types of windows open at any one time. These can be:

1. **GenStat Spreadsheets**
   To edit or manipulate your data.

2. **Graphics Window**
   To display your data visually.

3. **Text Windows**
   GenStat provides several default text windows:
   - **Output Window**: With the exception of high-resolution graphics, all GenStat output will be displayed here.
   - **Input Log**: This is the audit trail where GenStat keeps a record of all menu analyses and GenStat commands submitted. This window is minimized on start-up and is read only.
   - **Event Log**: The event log is closed on start-up and keeps a record of any faults, warnings or session interruptions.

![Figure 1.1: The GenStat Interface](image)
**MENU LAYOUT**

GenStat menus give you access to a wide range of statistical techniques in an easy-to-use form. GenStat collates all available menus in a logical way (Figure 1.2).

- **FILE** menu: open and save data, output and session files.
- **EDIT** menu: copy, paste and bookmark items.
- **VIEW** menu: change aspects of the current view.
- **RUN** menu: execute instructions written in GenStat command language.
- **DATA** menu: input, view and manipulate data.
- **SPREAD** menu: display, edit and manipulate data using a GenStat spreadsheet.
- **GRAPHICS** menu: display data visually.
- **STATS** menu (Figure 1.3): perform a statistical analysis.
- **TOOLS** menu: change various aspects of your working environment; toolbars, colours, fonts etc.
- **WINDOW** menu: select from all open GenStat windows.
- **HELP** menu: browse GenStat Help.

For further details on working with GenStat menus please see Section 3.

**GENSTAT TOOLBARS**

The GenStat toolbars provide quick shortcuts to many commonly used functions. GenStat provides three main types of toolbar; the Standard toolbar for general functions, the Spreadsheet toolbar for use when working with GenStat spreadsheets and the Active Spreadsheet toolbar.

When the cursor is placed on a toolbar button its function is displayed in a tool-tip (Figure 1.4). When a function is not available, the corresponding toolbar button will be disabled and the image dimmed.

Buttons can be added or removed from toolbars using the **TOOLS|CUSTOMIZE TOOLBAR** menu (Figure 1.5).
GenStat's extensive data import and manipulation facilities ensure that getting your data ready for analysis is easy.

DATA STRUCTURES
An ‘identifier’ is the name given to a particular data structure in GenStat. The first character of an identifier must be a letter; any others can be either letters or digits. Only the first 32 characters are significant; subsequent characters are ignored.

GenStat supports a wide range of special data structures:

- **SCALAR** holds a single number.
- **VARIATE** holds a series of numbers.
- **TEXT** holds a series of character strings (or lines of text).
- **FACTOR** holds a series of group allocations (using a pre-defined set of numbers or strings to indicate the groups).
- **TABLE** holds a table (to store tabular summaries like means, totals etc).
- **POINTER** holds a series of identifiers (e.g. to represent a set of structures).
- **MATRIX** holds a rectangular matrix.
- **SYMMETRIC-MATRIX** holds a symmetric matrix.
- **DIAGONAL-MATRIX** holds a diagonal matrix.

A number of more specialised structures are also supported; please see the GenStat Help system for a complete list.

DATA STORAGE
GenStat stores data centrally in the Data Core which is stored dynamically in your PC’s RAM. Only structures that are listed in the Data Core can be used for analysis. You can display the data available in the Data Core in the Data Pane. The Data Pane works in a similar fashion to Windows Explorer except that each folder ‘holds’ different kinds of data structures. Figure 2.1 illustrates the data displayed subsequent to importing the Ant.xls data, detailed overleaf.

IMPORTING DATA FROM FILES
GenStat supports a wide range of data formats; for example, MS Excel and various other spreadsheet and statistics applications.
**Importing from Excel® Spreadsheets or Other Statistics Applications**

When importing data into GenStat, the default assumption is that the data are arranged in rectangular format, with one variable per column. An example can be seen in Figure 2.2. This Excel® file, Ant.xls, holds data from a two-way factorial design experiment and can be found in the `<gendir>`\Data folder.

The simplest way of importing data stored in a data file into GenStat is to use the FILE|OPEN menu. After you have browsed to select the file of interest, GenStat's Excel® import wizard will give you extra help to select and import your data (Figure 2.3).

By default, your data will be displayed in a GenStat spreadsheet. (Figure 2.4).

If you do not want your data to be displayed in a GenStat spreadsheet, you can use the DATA|LOAD|DATA FILE menu instead. Here your data will simply be read directly to the Data Core.

![Figure 2.2: Ant data in MS Excel.](Image)

![Figure 2.3: The Excel® import wizard.](Image)

![Figure 2.4: Imported data displayed in a GenStat spreadsheet.](Image)
**Importing from ASCII Files**

You cannot use the **FILE|OPEN** menu to read in data stored in text (or ASCII) format. GenStat cannot distinguish between text data and a text command file. The **FILE|OPEN** menu defaults to a command file so will display your data in a text window rather than a spreadsheet. To read in text data, use the **DATA|LOAD|ASCII** menu option.

For more details on importing data from data files, please see Chapter 2 of the Introduction book, available in PDF format from the **HELP|GENSTAT GUIDES** menu.

**IMPORTING DATA FROM DATABASES**

GenStat includes Open DataBase Connectivity (ODBC) facilities that allow you to import data from any database for which you have the Windows® driver installed on your PC. The simplest way to do this is to run a database query using the **SPREAD|NEW|ODBC QUERY** menu (Figure 2.5).

Select or create a Data Source Name (DSN) that points to your database.

Select the database field(s) to import.

Specify any data filter required.

Run the query to import data. You can save the query to a file here; this will quickly allow you to regenerate the database import at a later date.

For more details on working with databases, please see the GenStat Help system.
WORKING WITH GENSTAT SPREADSHEETS

The GenStat spreadsheet provides a facility for displaying, entering, editing and manipulating data. It can contain various types of data structures, according to the spreadsheet type (Figure 2.6).

As data are stored centrally, any changes you make to data in a GenStat spreadsheet will not be reflected in an analysis until you send the changes to the Data Core (Page 5). To do this you need to update the server from the spreadsheet. By default, GenStat will do this automatically for you whenever you click outside the spreadsheet window (Figure 2.7). You can also do this manually using the SPREAD|UPDATE menu.

Whenever data is updated from a GenStat spreadsheet to the Data Core, a summary of the changes is displayed in the Output window (Figure 2.7).

Inconsistencies with Spreadsheet Applications

The GenStat spreadsheet is an extremely powerful data editing tool that offers many common data manipulation tools; filtering, sorting, calculations etc. There are some fundamental differences between how a spreadsheet works in GenStat compared to a spreadsheet application such as Excel®. For example:

- In Excel®, the focus is on the workbook and all results are displayed within the workbook. In GenStat, data are one aspect of the analysis; there are a range of other windows for displaying output of results and graphs, and for the specification of the analysis or editing of command scripts.

- In GenStat, data can be obtained from other sources that need not be displayed in spreadsheet format but which can be directly read into the Data Core.

- In GenStat, if a cell in a column is changed, the change will NOT be reflected automatically in other columns calculated from it. However, when data on the sheet is updated to the Data Core you will be prompted to re-calculate these columns. Alternatively, columns can be re-calculated using the SPREAD|CALCULATE|RECALCULATE menu (Figure 2.8).

For more details on working with GenStat spreadsheets, please see Chapter 4 of the Introduction book, available in PDF format through the HELP|GENSTAT GUIDES|INTRODUCTION menu.
Data columns calculated from other columns in a GenStat spreadsheet will have a yellow band in the column name. This provides a visual aid for identifying columns that may need recalculating.

Figure 2.8: Recalculating columns in a GenStat spreadsheet.
GenStat menus provide a quick way of accessing a wide range of facilities. A typical GenStat menu contains a range of field, list and check-boxes from which you select and/or supply choices appropriate for your analysis.

The following example uses the <gendir>\Data\Ant.xls data and illustrates an analysis of a two-way factorial design using the ANALYSIS OF VARIANCE menu.

1. Select the appropriate menu for your analysis (Figure 3.1). For this example you could choose a general ANOVA menu or, you could choose the ONE-AND TWO-WAY DESIGN menu, illustrated here.

2. Select the appropriate design or analysis from your chosen menu (Figure 3.2).

3. Select the data to use for the analysis by completing the menu field boxes (Figure 3.2).

Whenever you place the cursor in a field box, the available data list box will only display data that is appropriate for that field. For example, when you place the cursor in the Y-VARIATE field box of the ANALYSIS OF VARIANCE menus, only data vectors containing continuous data will be displayed (Figure 3.2).

When the cursor is moved to the TREATMENT STRUCTURE field box, only categorical data structures (or factors) will be displayed as it is inappropriate to supply a continuous variable here.

In addition, once the y-variate (or response variable) has been defined, only vectors of the same length will be displayed in subsequent field boxes.

These are common features in GenStat menus, designed to help you avoid inappropriate analysis requests.
4 Click on the **OPTIONS** button to access the **OPTIONS** menu. Here you can select output to display for the analysis (Figure 3.3).

5 Click on the **RUN** button to process the analysis. All standard output will be displayed in the Output window (Figure 3.4).

6 Click on the **FURTHER OUTPUT** button to display additional output or model diagnostics (Figure 3.5).

7 Select the model statistics (if any) you wish to save for future use through the **SAVE** button.

The **SAVE** menu (Figure 3.6) saves the selected model statistics to the GenStat Data Core. This means that you can graph the statistics or use them in calculations at a later date.
With the **SAVE** menu (Figure 3.6) you save results to the GenStat Data Core. If you also select the **DISPLAY IN SPREADSHEET** check box, you can display your results in either a new or existing GenStat spreadsheet.

### ADDITIONAL MENU FEATURES

The menu options illustrated in the previous example are common to most GenStat menus. The following options can also be found on most menus:

- Close the current menu without running the analysis.
- Revert to the default menu settings.
- The push-pin icons dictate the behaviour of the menu after running an analysis. With the pin vertical, GenStat will keep the menu open after running an analysis. With the push-pin horizontal, GenStat will close down the menu after analysis.
- Restore names into edit fields and dialog settings.
- Clear the data fields and menu settings.
- Access menu dialog help.

**Figure 3.6:** Saving results to the GenStat Data Core using the **SAVE** menu.
4 - Working with Graphs

GenStat graphics provide you with the tools you need to explore your data visually. Whether you choose one of the many standard plots available, or whether you check your analysis assumptions using the diagnostic plotting facilities, the tools you need are a mouse click away.

CREATING GRAPHS

Creating high-quality graphs in GenStat could not be simpler. The data used here to illustrate the process are taken from the GenStat spreadsheet file `<gendir>\Data\Iris.gsh`:

1. Select the plot you need from the list displayed in the GRAPHICS menu (Figure 4.1).

2. Select the data to be plotted from the drop down lists on the menu (Figure 4.2). Once you have selected your data, click NEXT to continue.

3. If you know the plotting features you want on your graph; colours, symbols etc., you can set them in the ATTRIBUTES menu. (Figure 4.3).

   Once you are happy with the choices you have made, click on the FINISH button to produce the graph (Figure 4.5).

If you are unsure which kind of plot is appropriate for your data, the Graphics Wizard, accessed through the GRAPHICS|CREATE GRAPH menu provides previews of each type of plot to help you choose (Figure 4.4).

Once you have selected the plot you need from those displayed, you will be presented with the same menu as if you had selected the plot directly from the GRAPHICS menu.
The GenStat Graphics Viewer
Graphical output is treated differently from text output in GenStat – it does not appear in the Output window. Instead, high-resolution graphical output is displayed in the GenStat Graphics Viewer (Figure 4.5).

The GenStat Graphics Viewer is a program that runs independently of GenStat and displays graphical output. It is started automatically when a graph is generated, and you can switch between GenStat and the graphics viewer at any time. The graphical images are produced in a vector format which is scaled to fit the current size of the viewer window. This means that the full resolution can be maintained if the window is resized or the graph is printed.

When using GenStat, the graphics viewer can be raised to the top of the display at any time by clicking on the graphics toolbar button, .

If you wish to identify the value of any point on a graph, click on the DATA INFO tool button, then click on the point of interest. The point coordinates will be displayed on-screen within a tool-tip (Figure 4.6).

For more details of the menus and tool buttons available on the GenStat Graphics Viewer, please see the GenStat Graphics Viewer HELP menu.

EDITING GRAPHS
The GenStat graphics format includes extensive meta-information about the plot and the data contained within it. This allows many aspects to be edited interactively on screen.

The GenStat Graphics Viewer operates in two modes; View and Edit.
By default, when you produce a graph, View mode is invoked (Figure 4.5). To edit any feature of the graph, double-click on the plot. This will open the graph in Edit mode (Figure 4.7).

In the Edit mode, the window title will change to ‘GenStat Graphics Editor’, the toolbar and menus will change and the background colour should change to indicate the new mode. You leave Edit mode by using either SAVE AND CLOSE or CLOSE respectively to retain or discard any changes.

There are two aspects of GenStat graphs that can be changed in the graphics editor; the view and the actual appearance of the graph.

**Changing the Graph View**

To alter the view, click on the button. For two dimensional graphs, this mode allows you control zoom aspects of the display. In three dimensional displays, this also allows you to rotate your graphs and control the viewing angle (Figure 4.8). Simply press and hold the left-mouse button over the graph to activate these features.

**Changing the Graph Appearance**

To alter the appearance of the graph, click on the button – you will change to Pick mode (Figure 4.9). In Pick mode, you can edit the appearance of the individual graph items such as symbols and axes.

For example, to change the colours of the symbols used, double click on the left-mouse button on a point in the graph. The appropriate options menu will be displayed (Figure 4.10). Simply select the new settings you require and select either OK or APPLY to make the changes.
For more details on the Graphics Viewer and Editor, please see the GenStat Help system.

## EXPORTING GRAPHS

GenStat graphics can be exported and used in external systems such as word processors. There are two ways to do this:

1. Simply Copy-and-Paste the graph from GenStat into your document. To copy a GenStat graph to the clipboard use the **EDIT|COPY** menu option. When you Copy-and-Paste, the graph is stored on the clipboard in Windows Enhanced Metafile format. This means that you will not lose resolution when you resize the image in your document.

2. Save your graph to a graphics file and import this into your document. A range of common graphical formats are supported (Figure 4.11). Simply select the **FILE|SAVE AS** option of the graphics viewer, choose the graphics format required and supply a file name.

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Figure 4.10: Editing plot symbol attributes.

Figure 4.11: Exporting GenStat graphs.

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From 2D to 3D, visualizing your data in GenStat is easy.
In addition to the pull-down menu system, GenStat provides a programming language that offers greater power and flexibility in working practice. With the GenStat language you can run audit trails as programs to replicate analyses, extend GenStat by developing your own statistical techniques, and attach libraries of routines that you have developed in GenStat.

**COMMAND STATEMENT SYNTAX**

GenStat commands are called directives and take the following form:

```
DIRECTIVE [ OPTION1= ; OPTION2= ; … ] PARAMETER1= ; PARAMETER2= ; …
```

Where,

**DIRECTIVE**

A standard form of instruction / statement in the GenStat language, requesting a particular action or analysis. All GenStat directives have the same syntax.

**OPTION**

Options specify arguments that are global within a GenStat statement; i.e. they apply to all the items in the parameter list(s). Often, but not always, options have default values and so need not be specified.

**PARAMETER**

Parameters specify parallel lists of arguments for a statement.

For example:

```
PRINT X
```

will print the values of the variable X to the GenStat Output window, using the GenStat printing defaults. However, by including an option called `MISSING` and a parameter called `DECIMALS`;

```
PRINT[ MISSING='-999' ] X; DECIMALS=1
```

the values of the variable X will be printed to the GenStat Output window, to one decimal place, replacing any missing values in the data with the code -999. For more details on GenStat directives, please see the Directives manual, available through the `HELP|REFERENCE MANUAL|DIRECTIVES` menu option.

**PROCEDURES**

A ‘procedure’ in GenStat is a structure that contains GenStat statements and which fulfils the role of the subroutine in the GenStat language. The syntax of a procedure looks the same as a GenStat directive.

For more details on writing and using procedures, please see the Syntax and Data Management manual, available through the `HELP|GENSTAT GUIDES|SYNTAX AND DATA MANAGEMENT` menu option.
USING COMMANDS INTERACTIVELY
You can execute commands in GenStat using the RUN menu. You can construct the required GenStat statements in a new text window or have them contained in a previously prepared text file. To execute the commands, simply select the appropriate RUN|SUBMIT menu option (Figure 5.1).

Figure 5.1: The RUN menu.

USING COMMANDS IN BATCH MODE
You can execute GenStat commands in batch mode. That is, you can bypass the Windows interface completely. This can be an advantage when PC memory is in short supply. To do this, use the GenBatch.exe executable that is supplied in the <gendir>\bin folder.

For example, if your GenStat command program is contained in the file ‘c:\mywork\mycoms.gen’, you could type the following at the DOS prompt in a Windows DOS box:

>GENBATCH C:\MYWORK\MYCOMS.GEN C:\MYWORK\MYCOMS.OUT

GenBatch will place the results from your command file in the text output file called ‘mycoms.out’.

Please see the GenStat Help system for more details on the GenBatch program.
The **HELP** menu (Figure 6.1), and other help facilities available provide a host of information to help you make the most of GenStat.

**ONLINE HELP**

GenStat online help is in HTML format, is searchable and gives you access to all aspects of GenStat. GenStat command language statements are indicated in the help system by upper case letters.

**MENU HELP**

Each GenStat menu has a **HELP** button, ☰, that gives direct access to details on how to use the selected menu and what information is required for each field box.

**GENSTAT ON THE WEB**

If you have an internet connection, clicking on the **GENSTAT ON THE WEB** option (Figure 6.1) will open the GenStat home page in your default browser. Here you can view the latest developments, downloads and additional information about GenStat.

**TUTORIALS**

A suite of movie style tutorials are supplied for your convenience. These can be accessed through the **HELP|TUTORIALS** menu. Currently these cover the following tasks:

1. Getting Started – Screen Tour
2. Importing data from Excel®
3. Importing data from Access® via ODBC
4. Linear Regression
5. Analysis of Variance

We suggest that new users run through the first tutorial to familiarise themselves with the GenStat interface.

**CONTEXT SENSITIVE HELP**

In any GenStat text window, highlight any word or phrase for which you would like help.
some additional information. Press the F1 key on your keyboard and the context sensitive help facility will take you to the appropriate section of the GenStat Help system. The Help system includes details on GenStat facilities plus a glossary of common statistical terms. Where more than one Help entry applies, GenStat will display all entries (Figure 6.2).

**GenStat command language help**

In addition to the online Help facilities, GenStat offers further help specifically aimed at assisting you to use the GenStat command language to its full potential:

1. The HELP|EXAMPLES menu option gives access to a wide range of example statistical and graphical analyses programmed in GenStat code. Many of the examples are taken from standard statistical text books.

2. The HELP|PROCEDURE SOURCE menu option gives access to the GenStat code underpinning the procedures contained in the Procedure Library supplied and installed with GenStat. This is a useful feature if you wish to develop your own procedures or modify an existing procedure to your own specifications.

**GenStat documentation**

GenStat documentation (Figure 6.3) comprises eleven individual books, separated into two families; the Guides (Introduction, Syntax and Data Management, Statistics, Guide to Anova and Design, Guide to REML, Guide to Regression, Nonlinear and Generalized Linear Models, Analysis of Microarray Data, Guide to Spreadsheet and Guide to Survey Analysis) and the Reference Manual (Summary, Directives, Procedure Library and New Features). The Guides give background help on the GenStat interface and statistical techniques available in GenStat while the Reference Manuals deal solely with the GenStat command language and its usage. All volumes are provided in PDF format through the HELP menu.

[Adobe Acrobat Reader is required to view GenStat documentation in PDF format. In the event that you do not have this software on your computer, it is included in the GenStat installation procedure for your convenience.]
There is rich functionality in GenStat. To help you realise its full benefits, VSNi offer a range of training solutions.

**TRAINING COURSES**

VSNi offers a range of courses in both software specific and statistics based subjects.

**BESPOKE TRAINING**

You may not think it but often a bespoke course, workshop or seminar offers the best value for money; particularly for small or large groups. We build the sessions totally around your needs and crucially, your experience.

**1:1 Coaching**

If the course you need is not available at a date to suit you, why not contact us to arrange some 1:1 GenStat coaching?

**GenStat Trainers**

VSNi trainers don’t just know the software; they all have strong statistical backgrounds. Add in their expert training skills and all the essential elements are there for you to maximise your learning potential.

In addition to our own training staff, VSNi works closely with other external certified trainers. These are trainers who have been observed training by us and given the VSN seal of approval. When choosing to train with a certified trainer you can rest assured that not only does your trainer have a sound knowledge of GenStat and statistics – but they also appreciate how people learn. This is vital in helping you optimise your learning potential.

The first step is to establish your particular training requirement; we can help here too. Why not contact the Training Team at training@genstat.co.uk for an informal discussion about your training need?

**Consultancy**

Having problems deciding the best statistical approach to fully understand your data? Would a customised GenStat menu or additional GenStat functionality be helpful within your organisation?

Why not contact the VSNi Consultancy Team at consultancy@genstat.co.uk to see how our statisticians and development team can help.
VSNi offer an annual Technical Support and Maintenance policy to GenStat users. Supported users can take advantage of the following features.

2. Access to technical support from the GenStat development team.
3. Two additional license keys for GenStat; one for a laptop PC and one for a home desktop PC. This allows much greater flexibility in where you work.
4. In the event that your PC is upgraded, replaced or stolen, VSNi will issue you with a replacement license, free of charge. Non-supported users are entitled to one free replacement key per version. Thereafter, a £50 administration fee is levied for each replacement key requested.

All email correspondence with VSNi should be sent to support@genstat.co.uk. Alternatively you can telephone +44 (0)1442 450230. This will ensure that your call is officially logged and tracked.

To subscribe to the GenStat Technical Support and Maintenance policy, please contact sales@genstat.co.uk.

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