

This file consists of Appendix D to **MacAnova User's Guide** by Gary W. Oehlert and Christopher Bingham, issued as part of a revision of Technical Report Number 617, School of Statistics, University of Minnesota, August 1998, describing Version 4.07 of MacAnova.

This manual is Copyright © 1998 Gary W. Oehlert and Christopher Bingham, all rights reserved.

Fonts used in this manual are Palatino, Courier, and Symbol.

For information concerning MacAnova, write University of Minnesota, Department of Applied Statistics, 352 Classroom Office Building, 1994 Buford Avenue, St. Paul, MN 55108-6042.



## Appendix D Windows™ version of MacAnova on an IBM™ Compatible

**D.1 Introduction** This appendix summarizes features special to the Windows version of MacAnova. See Appendix C for information on DOS versions.

The Windows version of MacAnova runs under Windows 95, Windows NT and Windows 3.1 with Win32s. It does not run under Windows 3.1 without Win32s installed. It has the full range of MacAnova commands. The files produced by `save()` and readable by `restore()` (Sec. 2.17, 7.7) are compatible with the DOS versions (see Appendix C). The executable file is named `MACANOWX.EXE`.

In the discussion below, it is assumed that `MACANOWX.EXE` is in directory `C:\MACANOVA`.

**D.1.1 MacAnova windows** All input and non-graphics output occurs in an editable, scrollable window, referred to below as a *command/output* window. On starting up MacAnova, the window is named **Untitled 1**. You can use items on the **File** menu (See Sec. D.3.1) to save the contents of a window in a file or to create a new window containing text previously written to a file. If you save the contents of the window in a file, the window name changes to the file name.

The line or lines immediately after the last `Cmd>` prompt are collectively known as the *command line*. When the insertion point is at the end of the command line, pressing Enter adds an end-of-line character and executes the line unless there is an incomplete quoted string (Sec. 2.5) or compound command (Sec. 9.2.1). If you press Enter when the insertion point is *not* at the end of the command line, the line is broken but will not execute. No matter where the insertion point is, when you press Shift+Enter or Ctrl+Enter, an end-of-line character is added at the end of the command line, executing the line unless a string or compound command is incomplete. If you have selected text before the prompt, Shift+Enter or Ctrl+Enter copies the selected text to the end of the command line before an end-of-line character is added. Because of this feature, you don't need to move back to the end of the line to execute it. Instead of Shift+Enter or Ctrl+Enter you can use F6.

MacAnova allows up to about 30,000 characters in a command/output window. If the window gets too full, a new command window named **Untitled n**, where **n** is an integer, is opened after giving you a chance to save the one you are currently using. Whether or not you save it, the current window is not destroyed, just made inactive. You can have up to eight such windows at any one time, although only the front most one is active.

There can also be up to eight graph windows created by graphics commands such as `boxplot()`, `plot()`, `lineplot()` and `chplot()` (Sec. 2.15, 8.5). When a graph window is in front, pressing Enter brings the most recently displayed command/output window to the front. You can switch to graph window 2, say, by pressing Ctrl+F2 whether a command/output or graph window is in front.

You can also use submenu **Windows** and **Graph** on the **Windows** menu (Sec. D.3.3) to change windows. Under Windows 95 you can also switch windows by clicking on

the appropriate icon on the Task Bar at the bottom of the screen.

**D.1.2 File names** You can use “/” to separate directories in file path names instead of “\”, usual DOS character. Because MacAnova treats “\” specially (see Sec. 2.5), you must use “\\” to include a “\” in a file or path name. Thus

"C:/macanova/macanova.mac" is equivalent to "C:\\macanova\\macanova.mac".

**D.2 Launching MacAnova** Under Windows 95, if MacAnova was installed using the Windows installer distributed with MacAnova, you can start it by selecting item **MacAnova for Windows** under item **MacAnova** under **Programs** on the **Start** menu. You may also want to put a short cut to folder **Windows\\Start Menu\\Programs\\ MacAnova** on the desk top. Then, after opening this shortcut, you can double click on the MacAnova for Windows icon.

Under Windows 3.1, if MacAnova has been installed using the Windows installer distributed with MacAnova, there will be a Program Group named MacAnova under the Program Manager. After clicking on the MacAnova program group to open it, you can start up MacAnova by double clicking on the MacAnova for Windows icon.

**D.2.1 Launching Windows MacAnova at the DOS prompt** Under Windows 95, but not Windows 3.1, you can start up MacAnova for Windows at the DOS prompt by typing

```
macanowx
```

This will work if the current directory is C:\\MACANOVA (or wherever MACANOWX.EXE is installed), or if that directory is in the search path.

**D.3 Menus** There are four menus, **File**, **Edit**, **Windows**, and **Help**, at the top of each window. Many of the items on the menus can be selected from the keyboard by a Ctrl key combination. For instance, pressing Ctrl together with S (notated Ctrl+S below and on the menu item itself) selects **Save Window** on the **File** menu. Most menus have different entries depending on whether a command/output or a graphics window is in front.

**D.3.1 The File menu** The following items are available on the **File** menu when a command/output window is in front.

**Open...** creates a new window and loads the contents of a previously saved output window, or any plain text file that is not too big, into the current window. It brings up a dialog box for you to select the file. You can select **Open...** from the keyboard by pressing Ctrl+O. If the file is too big for all of it to fit, enough lines are omitted from its beginning so that the remainder will fit.

**Save Window** saves the front command/output window in a file. The first time you save it, you are asked to provide a name in a dialog box. The name of the window then changes to the file name. Subsequent use of **Save Window** saves the contents of the window to this file without asking you anything. The file written may be printed or edited using any word processor such as Microsoft Word or text editor such as Note Pad. You can select **Save Window** from the keyboard by pressing Ctrl+S. Note that

**Save Window** saves only the text in the window and not the actual variables. See menu item **Save Workspace...** below.

**Save Window As...** is like **Save Window**, except it always brings up a dialog box for you to enter a file name.

**Page Setup...** brings up a dialog box that allows you to select a printer and specify such things as paper size and printing orientation (portrait or landscape).

**Print Window...** prints the command/output window. You can select **Print Window...** from the keyboard by pressing Ctrl+P.

**Interrupt** interrupts any executing command and prints a new prompt. A few commands ignore it, so it may not work instantly. You can select **Interrupt** from the keyboard by pressing Ctrl+I.

**Restore Workspace...** allows you to restore a workspace previously saved by `save()` or `asciisave()`. Selecting **Restore Workspace...** brings up a dialog box for you to select the file, exactly as if you had typed `restore( " " )` (Sec. 2.17, 7.7). You can select **Restore Workspace...** from the keyboard by pressing Ctrl+R.

**Save Workspace...** saves the current workspace in a file (Sec. 2.17). If the workspace has not been saved previously on the current run, this item brings up a dialog box for you to name the file, exactly as if you had typed `save( " " )`. If the workspace has been saved previously on the run either using the menu or directly typing a `save( )` command, **Save Workspace...** saves the workspace in the same file, with the same options, exactly as if you had typed `save( )`. You can select **Save Workspace...** from the keyboard by pressing Ctrl+K. This provides a quick and easy way to play it safe, saving your workspace by pressing Ctrl+K every few minutes to minimize your losses in case of a crash. See Sec. 2.17, 7.7.

**Save Workspace As...** brings up a dialog box for you to name the file, exactly as if you had typed `save( " " )`, even if you have previously saved the workspace.

**Quit** terminates MacAnova. Alternatively you can type `quit`, `bye`, `stop`, `exit` or `end`. A dialog box normally appears to give you a chance to save your workspace and any command/output windows. You can select **Quit** from the keyboard by pressing Ctrl+Q. If, after pulling down the **File** menu, you press the Alt key while selecting **Quit**, MacAnova quits unconditionally and does not ask you about saving things.

The following items are available on the **File** menu when a graphics window is in front.

**Interrupt** interrupts any executing command and prints a new prompt in the active command/output window but does not bring that window to the front. There may be some delay before the interrupt actually occurs. You can select **Interrupt** from the keyboard by pressing Ctrl+I.

**Go On** has no effect unless after you have just drawn a graph with `pause:T` as one of

the plotting command arguments (Sec. 8.5.2). Selecting **Go On** ends the pause and allows MacAnova to continue. When it is active you can select **Go On** from the keyboard by pressing Enter. If you use the mouse to switch to a command/output window when `pause:T` is in effect, you will not be able to do anything until you bring the graphics window back to the front and select **Go On**.

**Print Graph ...** prints the graphics window. You can select **Print Graph ...** from the keyboard by pressing Ctrl+P.

**Quit** terminates MacAnova, giving you a chance to save files unless you are pressing the Alt key.

**D.3.2 The Edit menu** This differs depending on whether a command/output or a graphics window is in front.

The following items are available on the **Edit** menu when a command/output window is in front.

The first menu item is generally referred to as **Undo** or **Redo** and you can select it by pressing Ctrl+Z. It is actually labelled one of **Undo Output**, **Undo Typing**, **Undo Paste**, **Undo Cut**, **Redo Output**, **Redo Typing** or **Can't Undo** and provides a limited facility for undoing your previous action. Immediately after executing a command line, **Undo Output** deletes any output back to the end of the just executed command line. This is useful if you made a typing error. Hit Ctrl+Z, make the correction, and press Shift+Enter or function key F6 to rerun the command. If instead, you immediately select **Redo Output** again, the deleted output is restored. Similarly, after typing anything, **Undo Typing** deletes what you have typed or, if your typing deleted something, restores it. After pasting something (**Paste** on the **Edit** menu), **Undo Paste** removes what was pasted and restores anything that may have been deleted. After cutting a selection (**Cut** on the **Edit** menu), **Undo Cut** restores what was deleted.

**Cut**, **Copy**, and **Paste** do just what you expect. **Cut** copies what is selected to the clipboard and deletes it from the window. **Copy** copies what is selected to the clipboard without deleting it. **Paste** replaces what is selected with the contents of the clipboard. If nothing is selected, **Cut** and **Copy** have no effect, and **Paste** inserts the clipboard contents at the insertion point. You can select **Cut**, **Copy**, or **Paste** from the keyboard by pressing Ctrl+X, Ctrl+C, or Ctrl+V, respectively.

**Copy to End** When text is selected, **Copy to End** inserts a copy of the selected text at the end of the command line. You can then edit it, if necessary, before executing it. You can select **Copy to End** from the keyboard by pressing function key F5.

**Execute** works differently depending on whether or not any text before the start of the command line has been selected using the mouse. When no such text has been selected, an end-of-line character is added to the end of the command line and the insertion point is moved there. This executes the line unless there is an incomplete quoted string (Sec. 2.5) or compound command (Sec. 9.2.1). When text has been selected

*before* the start of the command line, **Execute** copies it to the end of the command line followed by an end-of-line character; in most cases this executes the entire command line including what was copied. This provides a quick way to re-execute previous commands. You can select **Execute** from the keyboard by pressing function key F6, Shift+Enter or Ctrl+Enter.

**Up History** and **Down History** recall previous commands to the command line where they can be executed, possibly after modification. Each selection of **Up History** moves backward one command line while each later selection of **Down History** moves forward. Pressing F7 activates **Up History**; pressing F8 activates **Down History**. Instead of F7 and F8, you can use Ctrl+ and Ctrl+ . The number of lines you can go back is controlled by option `history`. See Sec. 8.1.3, 8.8.2 and B.6.4.

When a graphics window is in front, **Copy** is the only available item on the **Edit** menu. Selecting **Copy** puts a copy of the graph to the clipboard in a form which many other Windows programs can use. If you switch to a word processor or graph program window, you may be able to paste the graph there. You can select **Copy** from the keyboard by pressing Ctrl+C.

**D.3.3 The Windows menu** This differs depending on whether a command/output or a graphics window is active.

The following items are present on the **Windows** menu when either type of window is active.

**Hide** hides the front window; it can be made visible again by selecting its entry on its menu. **Hide** is not active when the front window is the only command/output window. In Windows 95, a hidden window is not listed on the Task Bar.

**Close** closes the front window, removing it entirely. You are given a chance to save the contents of a command/output window being closed. If the window is the only command/output window, you are also given a chance to save the workspace and then MacAnova will be terminated. You may select **Close** from the keyboard by pressing Ctrl+W. If, after pulling down the **Windows** menu with a command/output window in front, you select **Close** while pressing the Alt key, the window is closed without asking about saving things.

**Graphs** displays a submenu with entries **Graph 1**, **Graph 2**, ..., **Graph 8**. If a graph window exists, selecting its entry brings the window to the front. You may select **Graph 2**, say, from the keyboard by pressing Ctrl+F2.

**Windows** displays a submenu with an entry corresponding to each existing command/output window. Selecting an entry brings the corresponding window to the front and makes it the active window.

The following items are present on the **Windows** menu only when a command/output window is active.

**New Window** creates a new command/output window with name **Untitled n**

where  $n$  is an integer, and adds its name to the **Windows** submenu. You can have up to 8 such windows open at any one time. The only other way a new command/output window is created by selecting **Open** on the **File** menu, or when a new window is automatically created because an existing window has overflowed (Sec. D.1.1). You may select **New Window** from the keyboard by pressing Ctrl+N.

**Set Font** brings up a dialog box allowing you to set the type and size of the font used in the current command/output window. It does not affect the font used in any other window. You should restrict your choice to fonts having equal widths for all characters, including spaces and punctuation.

**Scroll To Top** scrolls to the start of the text, but does not change the selection point. You can select **Scroll To Top** from the keyboard by pressing Ctrl+T.

**Go To End** scrolls to the end of the text in the command/output window and moves the selection point there. You can select **Go To End** from the keyboard by pressing Ctrl+E.

**Go To Prompt** moves the insertion point to the beginning of the command line, immediately after the prompt, scrolling the command/output window if necessary to bring the prompt into view. You can select **Go To Prompt** from the keyboard by pressing Ctrl+A.

**D.3.4 The Help menu** This has two items, **About** and **Help**.

**About** brings up a dialog box that includes information about the version of MacAnova you are running, as well as some tips for help topics.

**Help** displays a dialog box containing a very brief summary of how to use command `help()`, the same information as is printed when you type “`help()`”.

**D.4 Graph windows** When a plotting command is executed, a new graph window is created, up to a maximum of eight. These are named **Graph 1**, **Graph 2**, ..., **Graph 8**. You can bring a graph window to the front by clicking on any part of it or by selecting it on the **Graphs** submenu of the **Windows** menu (Sec. D.3.3). You can also bring **Graph 2**, say, to the front by pressing Ctrl+F2.

If all eight graph windows are already in use when you try to plot something, MacAnova brings up a dialog box saying “Too many graphics windows open; close one”. Before any more plots can be made, you will have to close at least one graph window. After you have closed a window, type `showplot()` and the graph you wanted will appear there. Alternatively, you can direct the plot to a specific window by, for example,

```
Cmd> showplot(window:3) # see Sec. 8.5.2; 'wind' works also
```

If the window specified is in use, its contents will be replaced. `window:0` specifies that the plot will be drawn in the window most recently drawn in. Keyword `window` can be abbreviated to `wind`.

When a graph window is in front, selecting **Copy** on the **Edit** menu (Ctrl+C) copies the

entire graph to the Clipboard. From there it can be pasted into a word processor or graphics editor window.

When `file:fileName` is an argument to a plotting command, PostScript™ is written to the named file (see Sec. 8.5.4). As always, `fileName` can be "", bringing up a dialog box for you to name the file. With the right program, the file can be printed directly on a printer that recognizes PostScript.

**D. 5 Location of files** All files associated with MacAnova should be in the same folder or directory as `MACANOWX.EXE`, the MacAnova for Windows executable file. The most important of these are the help files `MacAnova.hlp` and the start up file `MacAnova.ini` (see Sec. 7.8.1). In addition, the macro files distributed with MacAnova, `MacAnova.mac`, `Tser.mac` and `Design.mac` should also be in this same folder along with the additional help files `Design.hlp` and `Tser.hlp`. If any macro or help files are somewhere else, say in directory `C:\MacAnova\Macros`, you should add the following line to startup file `MacAnova.ini` (see Sec. 2.11.6).

```
adddatapath("c:/MacAnova/Macros/")
```

Your own data or macro files can be in any directory although you may want to add a similar line to your start up file so that MacAnova can find them.

Files created by `save()`, `asciisave()` or `spool()` can be placed in any directory.

**D.6 Other features** You can interrupt whatever MacAnova is doing by pressing, perhaps because you made a mistake or it is taking too long. You can run other programs at the same time as MacAnova.

**D.6.1 Interrupting MacAnova** You interrupt MacAnova by selecting **Interrupt** on the **File** menu or by pressing `Ctrl+I`. This terminates the current command, possibly after a delay, prints

```
***** Interrupt *****
```

and returns to the prompt level.

**D.6.2 Running other programs while in MacAnova** When running under Windows or Windows 95, you can start up programs in other windows while you are in MacAnova. Such a program runs “in parallel” with MacAnova and has no effect on the running of MacAnova or what MacAnova prints. You can transfer text lines to and from another program **Cut**, **Copy** and **Paste** on the **Edit** menu. You can transfer a graph to another program using **Copy** on the **Edit** menu.

In MacAnova for Windows, `shell()` and shell escapes (lines starting with “!”) do not yet work as described in Sec. 8.7. `shell(command)` and `shell(command,interact:F)` do not work at all.

Under Windows 95, `shell(command,interact:T)` does work, as does a line of the form `! command`. However, unless the command being executed is interactive, say an editor, you do not get an opportunity to see any output since the DOS window created immediately closes.



Under Windows 3.1, `shell(command,interact:T)` does not work correctly. It starts up a DOS window, but does not execute the command. The same is true of a line starting with `!`.

**D.6.3 Editing Macros** When you are writing and debugging a macro (see Sec. 9.3 and 9.4), it is convenient to be able to modify it without shutting down MacAnova. There are several ways this can be done. Both the ways described for the Macintosh version in Sec. B.6.3 are equally applicable to the Windows version. Alternatively, the Windows version has the same pre-defined macro `edit` described in Sec. C.5.3. It works under Windows 95, but not under Windows 3.1.

**D.6.4 Using keys to move around the command/output window** You can use the arrow keys ( `←` , `→` , `↑` or `↓` ) to move the insertion point in the obvious way. Pressing `Ctrl+←` or `Ctrl+→` moves left or right a word at a time. If you hold the shift key down while moving with the arrow keys, everything the cursor moves over is selected.

Items **Scroll To Top** and **Go To End** on the **Windows** menu scroll to the start or end of the Command window, respectively. They are selected by `Ctrl+T` or `Ctrl+Home` and `Ctrl+E` or `Ctrl+End`, respectively. **Go To End** puts the insertion point at the end; **Scroll To Top** does not move the insertion point. Pressing `Home` or `End` moves to the start or end of the current line.

The `Page Up` and `Page Down` keys scroll back and forward a screenful moving the insertion point as well (this differs from the behavior of `Page Up` and `Page Down` on a Macintosh).

Finally, **Go To Prompt** (`Ctrl+A`) on the **Windows** menu moves the insertion point to immediately after the prompt, before the command line if anything has already been typed.

**D.6.5 Recalling previous commands** See menu items **Up History** and **Down History** in Sec. D.3.2. The number of commands that are remembered is determined by the value of option `history` (see Sec. 8.1.3); the default value is 100.

**D.6.6 “Console” input under Windows** You can use `CONSOLE` in place of a file name on functions `vecread()`, `matread()` and `macroread()`. For example,

```
Cmd> vecread(CONSOLE)
```

prints a line of instructions and then brings up a dialog box in which you can enter text. You can type anything that can be read by `vecread()`. When you press `Enter` or click on **OK**, what you have typed is passed on to `vecread()`, and the dialog box reappears. This keeps happening until you type `!`. To input character data, you can use keyword phrases `bywords:T`, `byline:T` or `bychars:T` as an additional argument to `vecread()` (see Sec. 7.2).

Instead of `vecread(CONSOLE)` you can use pre-defined macro `console`:

```
Cmd> x <- console(stop:"$",skip:"#")
```

As illustrated, you can use `vecread()` keyword phrases with `console`.

After `matread(CONSOLE)`, the same dialog box appears. You should first type the header line as described in Sec. 7.1 and press Enter or click on OK. Each time the dialog box reappears, type one line of data in the format described in Sec. 7.1. If there are any missing data, you first need to enter a comment line of the form, say,

) MISSING -9999

and then enter -9999 in place of any missing value.

After `macroread(CONSOLE)`, you first type the header line as described in Sec. 7.5.1, followed by the text of the macro.

**D.7 Command line arguments** When launching MACANOWX at the DOS prompt under Windows 95, you can use any of the command line<sup>1</sup> options described in Sec. C.6. You can edit the MacAnova icon's "properties" as described in Sec. C.6 so your own defaults will be used when you click on the icon to launch MacAnova. You can also define an environmental variable `MACANOVA` to set the default values of the command line options. See Sec. 7.8.2.

**D.8 Non-interactive mode** MACANOWX has no purely non-interactive mode. You can achieve somewhat the same effect by creating a file containing all the commands to be executed and then using `batch()` to execute them. See Sec. 7.6. For true non-interactive use of MacAnova, use the extended memory DOS version (MACANODJ). See Sec. C.7.

## D.9 Miscellaneous information

**D.9.1 Compilers** The Windows version of MacAnova is compiled under version 5.02 of Borland C++. The windowing features are based on version 1.68 of the wxWin cross-platform windowing interface developed by Dr. Julian Smart, Artificial Intelligence Applications Institute, The University of Edinburgh. wxWin is Copyright (c) 1995 Artificial Intelligence Applications Institute. The WxWin home page is

<http://web.ukonline.co.uk/julian.smart/wxwin/>

Version 1.68 of WxWind can be retrieved by anonymous ftp from the MacAnova ftp site:

<ftp://ftp.stat.umn.edu/pub/macanova/src/wxwin168.tar.gz>

**D.9.2 Distribution of Windows version of MacAnova** The Windows version is distributed in the form of self extracting archive (SEA) files. Files specific to MACANOWX are in a SEA file with name of the form `MVmmnWXR.EXE` where `mmn` is the version number (407 for version 4.07) and `r` is a single integer release number. SEA file `MVmmnAUr.EXE`, containing auxilliary files such as help and macro files, is also needed. In addition, `MVmmnAUr.EXE` creates directory Userfun containing files related to user functions – externally compiled programs callable by function `User()`.

MACANOWX can be installed under Windows or Windows 95 using installer program `WINSTALL.EXE` together with install script file `INSTALL.INF` and archive extractor `LHA_E.EXE`. These are part of the standard distribution of MacAnova. See file

<sup>1</sup>This is the command line at the DOS prompt, not the line where you enter MacAnova commands.

## MacAnova Version 4.07

INSTALL.TXT distributed with MacAnova for installation instructions.

You can obtain the most recent release of all versions through the MacAnova home page with URL

<http://www.stat.umn.edu/~gary/macanova/macanova.home.html>.

If you prefer to use ftp, the Macintosh files are in

<ftp://ftp.stat.umn.edu/pub/macanova/dos>.

Diskettes and this manual are available for nominal cost in the University of Minnesota Bookstore on the St. Paul Campus.