

This file consists of Appendix C 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.

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Appendix C DOS versions of MacAnova on an IBM™ Compatible

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

There are two versions of MacAnova that run under MSDOS™ on IBM™ compatible computers – an extended memory version (MACANODJ) and a limited memory version (MACANOBC). They both have the full range of MacAnova commands and use the same help and macro files and files produced by `save()` (Sec. 2.17, 7.7) are compatible. The executable files are `MACANODJ.EXE` and `MACANOBC.EXE`.

In the discussion below, it is assumed that either `MACANODJ.EXE`, `MACANOBC.EXE` or both are in directory `C:\MACANOVA`.

C.1.1 Extended memory version (MACANODJ) `MACANODJ.EXE` runs in “protected mode” and requires a 80386 or better processor. It can access all available memory and in fact uses “virtual memory” on the hard disk when necessary so that the size of variables is limited only by disk capacity. It is compatible with VGA and EGA graphics devices among others. Keyword phrase `screendump:fileName` on plotting commands allows you to create PCX files which can be edited under Windows and included in word processor documents. This version is henceforth referred to simply as `MACANODJ`.

`MACANODJ` has command editing implemented using the arrow keys and keyboard editor commands based on either the Emacs or Vi editor commands (Emacs and Vi are Unix editors). See Sec. C 5.4.

You can use `shell()` and command lines starting with “!” to execute DOS commands or other programs. See. Sec. 8.7. `shell(cmd, keep:T)` returns output from the program executed. You must use `shell(cmd, interact:T)` if the program executed requires any input. When in doubt, use `interact:T`. Currently `shell()` is a little “flaky”, sometimes locking the computer up.

Macro `edit` is predefined to allow easy editing of macros and data without exiting Macanova. See Sec. C.5.3 below. Because `edit` uses `shell()`, it may not be completely reliable.

C.1.2 Limited memory version (MACANOBC) `MACANOBC.EXE` runs in “real mode” on almost any PC compatible (80286, 80386, 80486, Pentium) with sufficient memory and a hard disk. It does not use extended memory and the size of individual variables is limited to about 65000 bytes (8125 REAL items). It can draw high resolution plots on a variety of graphics modes (CGA, EGA, VGA, 8514 and Hercules). Keyword `screendump` is not available on plotting commands, and hence there is no easy way to save high resolution graphs. This version is referred to simply as `MACANOBC` below. There is little reason to use `MACANOBC` unless you have an old computer which does not have extended memory.

`MACANOBC` has no command editing using the arrow keys.

MACANOBc can execute DOS commands by prefixing the line with “!” in the first position after the prompt or by using the command `shell()`. However, memory limitations greatly restrict what you can actually do. `shell(cmd,keep:T)` is not implemented and `shell(cmd,interact:F)` is the same as `shell(cmd,interact:T)`.

Because of a limitation of DOS, no line you type can have more than 128 characters. This means you should normally continue a line by typing “\” followed by Enter, rather than allowing the line to “wrap”. See Sec. 2.8.

C.1.3 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”.

C.2 Launching MacAnova This section describes how the DOS versions of MacAnova are started up under DOS, Windows or Windows 95. In the following `macanoXX` is either `macanodj` (extended memory) or `macanobc` (limited memory).

C.2.1 Launching MacAnova at the DOS prompt You start up MacAnova for an interactive run by typing

```
macanoXX                [macanodj or macanobc]
```

at the DOS prompt.

See Sec. C.6 for information on optional command line arguments. See Sec. C.7 for information on running MacAnova in non-interactive mode.

C.2.2 Launching MacAnova in Windows and Windows 95 Under Windows 95, if MacAnova was installed using the Windows installer distributed with MacAnova, a MacAnova item will be under **Programs** on the **Start** menu. Among its sub items are **MacAnova for DOS Extended Memory** and **MacAnova for DOS Limited Memory**. You can start up MacAnova by selecting one of these sub items. 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 appropriate 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 appropriate item in its window.

C.3 Graphics Both DOS versions of MacAnova support high resolution graphs which fill the entire screen. After each plot, MacAnova pauses with the plot on the screen until you hit RETURN, at which point the plot is erased and you are returned to the `Cmd>` prompt.

After launching either DOS version under Windows or Windows 95, when the high resolution screen is displayed, pressing Alt PrintScreen copies the displayed graph to the

clipboard from which it can be pasted into a Word Perfect or other program's window.

If `file:fileName` is an argument on any plotting command, a PostScript™ representation of the plot is written to the named file. For example, after displaying a graph, typing

```
showplot(file:"myplot.ps")
```

will write a PostScript description of the graph on file `myplot.ps`. This can be printed on a PostScript printer provided it is sent to the printer as raw PostScript. See Sec. 8.5.4. If both `file:fileName` and `ps:F` are arguments to a plotting command, "dumb" plots that can be printed on a line printer are written to the file. See Sec. 2.15.7.

C.3.1 Graphics in the extended memory version MACANODJ supports a number of graphics modes, including CGA, EGA and VGA.

If you include keyword phrase `screendump:fileName` (for example, `screendump:"plot1.pcx"`) as an argument to a plotting command, a representation of the plot is written to the file in PCX format. Some programs can read such files to insert a graph into a document.

C.3.2 Graphics in limited memory version MACANOBBC supports CGA, EGA, VGA, 8514, and Hercules graphics adaptors among others. Drivers for these are available in files such as `CGA.BGI` and `HERC.BGI` which are distributed with MacAnova. They are Copyrighted by Borland and cannot be resold. They should be placed in the same directory as `MACANOBBC.EXE`.

Keyword `screendump` is not available on plotting commands, and hence there is no easy way to save a displayed high resolution graph other than using Alt PrintScreen under Windows and Windows 95 or creating a PostScript file as described in Sec. C.3.

C. 4 Location of files All files associated with MacAnova should be in the same directory as the MacAnova application itself (`MACANOBBC.EXE` or `MACANODJ.EXE`). The most important of these are the help file `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. If they 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 folder 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.

C.5 Other features

C.5.1 Interrupting MacAnova In both DOS versions, you can interrupt MacAnova by pressing Ctrl+C (Ctrl key together with C). This terminates the current command, possibly after a delay, prints

*** INTERRUPT ***

and returns to the prompt level.

C.5.2 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, just as you can with most DOS programs. Such a program runs “in parallel” with MacAnova and has no effect on the running of MacAnova or what MacAnova prints. In a Windows 95 DOS window, you can transfer lines to and from another program by using the cut and paste tools at the top of the window.

In MACANODJ, `shell()` and shell escapes (lines starting with “!”) usually work as described in Sec. 8.7 although unexplained crashes have sometimes been experienced. Keyword phrases `interact:T` and `keep:T` are both implemented.

In MACANOBC, `shell()` and shell escapes are implemented but are limited to commands that need very little memory. Indeed under Windows 95, even the simplest commands may require too much memory. Keyword `interact` is ignored and all shell commands are run interactively. Keyword phrase `keep:T` is not implemented and its use is an error.

C.5.3 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. Under Windows or Windows 95, one way to do this is to start up a word processor or text editor in another window, enter the macro there in a format that is readable by `macroread()` (see Sec. 7.5.1), write it as a text file and then, after returning to MacAnova, reading it from the file using `macroread()`. When a change is needed, switch over to the editor, make the change, save the file again, return to MacAnova and reread it.

Alternatively, MACANODJ has pre-defined macro `edit`. This writes a macro to be edited to a temporary file, then uses `shell()` run an editor (default is `EDIT`), and then reads the edited temporary file back in. You can do the following to create a new macro:

```
Cmd> mynewmacro <- edit()
```

When the editor starts up, replace line 2 of the file with your macro, save the file and exit from the editor.

To edit an existing macro do either of the following:

```
Cmd> mymacro <- edit(mymacro)
```

or

```
Cmd> edit(mymacro, T)
```

When the editor starts up, make any needed changes, save the file and exit from the editor. If you want to preserve the current version, use `mymacro1<-edit(mymacro)`.

To use a different editor, assign the name of the editor to CHARACTER variable `EDITOR`. For example, after

```
Cmd> EDITOR <- "jove"
```

the editor used will be jove.

C.5.4 Editing the current command line In MACANODJ you can use the left and right arrow keys and various Ctrl key combinations to edit the current line before it is executed. Here are some of the standard keyboard editing commands.

Key	Action
Ctrl+A	Move to left end of line
Ctrl+E	Move to right end of line
Ctrl+B	Move back (left) one character
Ctrl+F	Move forward (right) one character
Delete	Delete character before cursor
Ctrl+D	Delete character after cursor
Esc Delete	Delete word before cursor
Esc d	Delete word after cursor
Esc b	Skip word backward
Esc f	Skip word forward
Esc u	Change following word to upper case
Esc l	Change following word to lower case

Ctrl+A means the Ctrl key is pressed while pressing A, and Esc d means the Esc key is pressed *followed* by d. These are based on Emacs (a Unix editor, now available for DOS/Windows) editing commands. It is also possible to customize it to use commands based on Unix editor Vi. The special file for customizing keymaps must be C:\MACANOVA\INPUTRC.

In MACANOBC, the only way to edit the current line is by backspacing and retyping.

C.5.5 Recalling and editing previous commands In MACANODJ (but not MACANOBC) you can recall previous commands for editing and re-execution using arrow keys. Pressing moves back through previous commands; moves forward after moving backward. When you have found the line you want you can edit it as described in Sec. C.5.4. See Sec. 8.8.2.

C.5.6 “Console” input in DOS versions You can use CONSOLE in place of a file name on functions `vecread()`, `matread()`, `read()` and `macroread()`. For example,

```
Cmd> x <- vecread(CONSOLE)
Type numbers or '?' separated by spaces and terminated by '!'
Input> 3.4 ? 4.9
Input> 11.1 1.5 !

Cmd> x
(1)          3.4          MISSING          4.9          11.1          1.5
```

See Sec. 2.11.1 for information on `vecread()`.

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)` and `macroread(CONSOLE)`, the messages printed are

```
Type header, followed by data
```

or

```
Type header, followed by macro
```

You then type a data set or a macro in the form prescribed in Sec. 7.1 and 7.5.1, complete with a header lines, any necessary comment lines, and, for a macro, a trailing line of the form `%name%`.

C.6 Command line arguments There are several command line¹ arguments you can use to customize a particular run. To use these at the DOS prompt, you would type

```
macanoXX options
```

where *options* consists one or more of `-q`, `-e`, various *file options* (Sec. C.6.1), various *path options* (Sec. C.6.2) or *other options* (Sec. C.6.3).

You can start up MACANODJ or MACANOBC with any of the command line options by selecting **Run** on the Windows 95 Start menu or the Windows 3.1 File Manager File menu and then entering, say,

```
C:\macanova\macanoXX -q -mpath c:\macanova\macros
```

This assumes that MacAnova has been installed in directory `C:\MACANOVA`.

You can also edit the “properties” associated with MacAnova so that any of the command line options are automatically set. In Windows 3.1 you select the icon and press Alt+Enter (the Alt and Enter keys together). On Windows 95, you need to find Folder `C:\Windows\Start Menu\Programs\MacAnova`, select the appropriate icon, then press Alt+Enter, and then select the Programs or Shortcut tab. You can then edit the command line to include any desired command line arguments.

Another way to insure that any of the command line options are automatically set is to suitably define environmental variable `MACANOVA` in your `AUTOEXEC.BAT` file. See Sec. 7.8.2 for details.

If `-q` is present on the command line, no startup message will be printed.

If `-e Expr` is present on the command line, where `Expr` is a MacAnova expression or command, `Expr` will be executed immediately after MacAnova starts up, before anything else is done. This allows you to set variables, including file names and data set names, before a batch file is executed. Usually, `Expr` will need to be quoted as in

```
macanoXX -e "n <- 30"
```

Alternatively, you can evaluate just one command by

```
macanoXX -eq Expr
```

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

MacAnova will execute `Expr`, print the result, and immediately quit. This enables you to use MacAnova as a calculator at the DOS prompt. Use of `-batch` (see below) is incompatible with use of `-eq`.

C.6.1 File options These are `-f initFile`, `-restore saveFile`, `-batch batchFile`, `-help helpFile`, `-macro macroFile`, and `-data dataFile`, where each must be a valid file name. You can use `/` instead of `\` in path names.

`-f initFile`

File `initFile` is executed silently as a batch file at startup instead of the default initialization file `MACANOVA.INI`. See Sec. 7.8.1.

`-restore saveFile` or `-r saveFile`

The equivalent of `restore("saveFile")` is executed at startup and `MACANOVA.INI` is not read. See Sec. 2.17 and 7.8.1.

`-batch batchFile` or `-b batchFile`

The equivalent of `batch("batchFile")` is executed after initialization. See Sec. 7.6.

`-help helpFile` or `-h helpFile`

Help information will be taken from file `helpFile` rather than the default help file.

`-data dataFile` or `-d dataFile`

Pre-defined CHARACTER variable `DATAFILE` will have `"dataFile"` as value instead of a default value. `DATAFILE` is used by pre-defined macro `getdata` to make it easy to read data from a standard file of data sets. See Sec. 2.11.4.

`-macro macroFile` or `-m macroFile`

`"macroFile"` will be added to the beginning of pre-defined CHARACTER vector `MACROFILES`. This results in pre-defined macro `getmacros` searching `macroFile` before the standard macro files. You can accomplish the same thing after starting MacAnova by `addmacrofile("macroFile")`. See Sec. 7.5.3 and 7.5.4.

C.6.2 Path options These are `-home homePath`, `-dpath dataPath` and `-mpath macroPath`, where each must be a valid directory name. You can use `/` instead of `\` in path names.

`-home homePath`

Predefined CHARACTER variables `HOME` will have `"homePath"` as value instead of a default value. `HOME` is used to expand file names of the form `"~/filename"`. For instance, when `HOME` is `"c:/dataDir"`, `"~/filename"` is expanded to `"c:/dataDir/fileName"`. See Sec. 2.11.6.

`-dpath dataPath` or `-dp dataPath`

Predefined CHARACTER variable `DATAPATH` will be set to `"dataPath"` and `"dataPath"` will be made the first element of predefined vector `DATAPATHS`.

When you attempt to read a file, say using `vecread()`, `matread()` or `macroread()`, if the file is not found in the default directory or folder (see files), MacAnova will search in the directories or folders in `DATAPATHS`. If this option is

not used, the default is the value of HOME (see -home above). See Sec. 2.11.6.

-mpath macroPath or -mp macroPath

"macroPath" will be added to predefined CHARACTER vector DATAPATHS. See discussion of -dpath above. If both -dpath and -mpath are used, DATAPATHS will include both path names.

Note that, even if you don't use -data, -macro, -home, -dpath or -mpath, the default values of DATAFILE, MACROFILES and DATAPATHS can be changed in the start up file (Sec. 7.8.1). The help file can also be changed by including, say, help(file:"special.hlp") (see Sec. 8.6.1) in the start up file.

C.6.3 Other options These are -prompt Prompt, -bprompt BPrompt, -l Nlines, -w Ncols and -history Nhist, where Nlines, Ncols and Nhist are integers.

-prompt Prompt

This sets the default prompt to Prompt. If Prompt includes any spaces or ">" it should be quoted (-prompt "What> ").

-bprompt BatchPrompt

This is meaningful only with -b (Sec. C.6.1). BatchPrompt will replace the batch file name in input commands that are echoed to output. If BatchPrompt includes any spaces or ">" it should be quoted.

-l Nlines

This pre-defines option height to be Nlines, where Nlines is either 0 or an integer at least 5. See Sec. 8.2. Long output will pause every Nlines lines with Nlines = 0 meaning no pausing. It also affects the number of lines used in "dumb" plots (see Sec. 2.15.7).

-w Ncols

This pre-defines option width to be Ncols, where Ncols is an integer at least 20. See Sec. 8.2. Ncols will be the assumed screen width in characters and affects the number of values printed per line and the width of "dumb" plots.

-history Nhist or -hist Nhist (not valid for MACANOBC)

This pre-defines option history to be Nhist, a non-negative integer. This limits to Nhist the number of previous command lines that can be saved and recalled. The default value is 100.

C.7 Non-interactive mode At the DOS prompt, when commands.txt is a text file containing MacAnova commands as they might be typed,

```
macanoXX options < commands.txt > output.txt
```

runs MACANOBC or MACANODJ in non-interactive mode. Input will be taken from commands.txt and output will be written to file output.txt, just as it would have appeared on the screen. There should be no plotting commands unless keyword phrase dumb:T is used (see Sec. 2.15.7). Optional command line arguments options are described in Sec. C.6.

C.8 Miscellaneous information

C.8.1 Compilers The extended memory DOS version of MacAnova (MACANODJ) is compiled using a version of Gnu gcc developed by D. J. Delorie. Because it runs in protected mode it requires a 80386 or better processor.

The limited memory DOS version of MacAnova (MACANOBC) is compiled under version 4.5 of Borland C++.

C.8.2 Distribution of DOS versions of MacAnova The DOS versions are distributed in the form of self extracting archive (SEA) files. Files specific to MACANODJ are in a SEA file with name of the form `MVmmnnDJr.EXE` where *mmnn* is the version number (405 for version 4.05) and *r* is a single integer release number. Files specific to MACANOBC are in `MVmmnnBCr.EXE`. SEA file `MVmmnnAUr.EXE`, containing auxilliary files such as help and macro files, is needed for either version. In addition, `MVmmnnAUr.EXE` creates directory Userfun containing files related to user functions – externally compiled programs callable by function `User()`.

Either or both DOS versions can be installed under Windows or Windows 95 using install program `WINSTALL.EXE` together with install script file `INSTALL.INF`. They can also be installed using DOS file `DINSTALL.BAT`.

See file `INSTALL.TXT` distributed with MacAnova for installation instructions.

You can obtain the most recent release of any of these 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. The manual is available in portable document format (PDF) in

<ftp://ftp.stat.umn.edu/pub/macanova/docs/manual>.