

This file consists of the Table of Contents of **MacAnova User's Guide** by Gary W. Oehlert and Christopher Bingham, issued as 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.



Table of Contents

| | |
|--------------------------------------------------------------|------|
| Preface | i |
| 1. Introduction | |
| 1.1 What is MacAnova? | 1-1 |
| 1.2 Comments on Version 4.07 | 1-2 |
| 1.3 Conventions in this manual | 1-4 |
| 1.4 Disclaimer | 1-4 |
| 1.5 Acknowledgments | 1-4 |
| 1.6 How to contact the authors | 1-6 |
| 2. The Basics | |
| 2.1 Getting Started | 2-1 |
| 2.2 Quitting | 2-1 |
| 2.3 Functions and macros | 2-2 |
| 2.4 Variables | 2-3 |
| 2.5 Data types – REAL, LOGICAL and CHARACTER | 2-3 |
| 2.6 Shapes of variables – scalars, vectors, matrices, arrays | 2-4 |
| 2.7 Missing values | 2-5 |
| 2.8 Introduction to MacAnova syntax | 2-5 |
| 2.8.1 Spaces and comments | 2-6 |
| 2.8.2 Keywords | 2-6 |
| 2.8.3 Arithmetic expressions | 2-6 |
| 2.8.4 Comparison operators and logical operators | 2-7 |
| 2.8.5 Bit-wise operations on integers | 2-8 |
| 2.8.6 Mathematical functions and transformations | 2-10 |
| 2.8.7 Assignment of values to variables | 2-12 |
| 2.8.8 Arithmetic assignment operators | 2-13 |
| 2.8.9 print(), write(), list(), listbrief() and delete() | 2-13 |
| 2.8.10 Vectors – vector(), enter and enterchars | 2-15 |
| 2.8.11 Using subscripts with vectors | 2-16 |
| 2.8.12 rep() and run() | 2-18 |
| 2.8.13 Matrices and matrix() | 2-19 |
| 2.8.14 Using subscripts with matrices | 2-20 |
| 2.8.15 Arrays – array() | 2-21 |
| 2.8.16 Structures – structure() | 2-23 |
| 2.8.17 Matrix subscripts | 2-25 |
| 2.9 Getting help – help() and usage() | 2-26 |
| 2.9.1 Using the help() wild card characters – “*” and “?” | 2-27 |
| 2.9.2 Using help() index keys | 2-27 |
| 2.9.3 Getting help on macros – macrouseage() | 2-28 |
| 2.10 Operations with vectors, matrices, and arrays | 2-28 |
| 2.10.1 Transformations | 2-28 |
| 2.10.2 Arithmetic with vectors, matrices and arrays | 2-29 |

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------|------|
| 2.10.3 Matrix transposition | 2-30 |
| 2.10.4 Matrix multiplication | 2-31 |
| 2.10.5 Matrix inversion and linear equation solving | 2-32 |
| 2.10.6 Other matrix functions – det(), trace(), hconcat(),vconcat(), diag(), dmat(), nrows(), ncols(), select(), reverse() | 2-33 |
| 2.11 Reading data from a file | 2-35 |
| 2.11.1 vecread() | 2-36 |
| 2.11.2 readcols | 2-38 |
| 2.11.3 matread() and read() | 2-39 |
| 2.11.4 getdata | 2-41 |
| 2.11.5 inforead() | 2-41 |
| 2.11.6 HOME, DATAPATHS and adddatapath | 2-42 |
| 2.12 Simple statistics | 2-43 |
| 2.12.1 describe() | 2-43 |
| 2.12.2 boxplot(), vboxplot, stemleaf() and hist | 2-46 |
| 2.12.3 sort(), rank(), rankits(), halfnorm(), and grade() | 2-51 |
| 2.12.4 sum(), prod(), max(), min() | 2-54 |
| 2.12.5 Computing correlations – cor() | 2-55 |
| 2.12.6 Student's <i>t</i> related functions – tval(), t2val(), tint(), t2int() and twotailt | 2-56 |
| 2.12.7 P-values and cumulative distributions functions – cumxxx() functions | 2-58 |
| 2.12.8 Probability points and inverse cumulatives – invxxx() functions | 2-62 |
| 2.12.9 Grouping data in class intervals – bin() | 2-63 |
| 2.13 Random numbers – runi(), rnorm(), rbin() and rpoi() | 2-65 |
| 2.13.1 Random number “seeding” – setseeds() and getseeds() | 2-66 |
| 2.13.2 Generating other random variables | 2-66 |
| 2.14 More on rep() and run() | 2-67 |
| 2.15 Making graphs | 2-68 |
| 2.15.1 plot() | 2-69 |
| 2.15.2 lineplot() | 2-70 |
| 2.15.3 chplot() | 2-71 |
| 2.15.4 Equally spaced x values | 2-73 |
| 2.15.5 Graphics keywords | 2-73 |
| 2.15.6 colplot and rowplot | 2-73 |
| 2.15.7 Low resolution plots | 2-74 |
| 2.16 Using spool() to save output | 2-74 |
| 2.17 Using save() and restore() to preserve work between sessions | 2-76 |
| 3. Linear Models | |
| 3.1 Introduction to GLM commands | 3-1 |
| 3.2 Response and independent variables in linear models | 3-2 |
| 3.3 Variates and factors – factor() and makefactor | 3-3 |
| 3.4 Specifying a model | 3-4 |
| 3.4.1 Transforming “on-the-fly” | 3-6 |
| 3.4.2 Model shortcuts: *, ^, /, – and –* | 3-7 |


| | |
|----------------------------------------------------------------------------------------------|------|
| 3.4.3 Shortcuts for polynomial and periodic regressions . . . | 3-8 |
| 3.5 Error terms | 3-8 |
| 3.6 Side effect variables | 3-9 |
| 3.7 GLM keywords | 3-9 |
| 3.8 anova() and regress() output | 3-11 |
| 3.9 Balanced and unbalanced data | 3-15 |
| 3.10 Parametrization and degrees of freedom | 3-16 |
| 3.11 Marginal (Type III) sums of squares | 3-18 |
| 3.12 Cell by cell statistics using tabs() and cellstats() | 3-19 |
| 3.13 Estimated ANOVA effects and their standard errors – coefs() and secoefs() | 3-20 |
| 3.13.1 Estimated regression coefficients and their standard errors – regcoefs | 3-22 |
| 3.14 Leaving out lower order terms | 3-23 |
| 3.15 Empty cells | 3-24 |
| 3.16 Estimating contrasts – contrast() | 3-27 |
| 3.16.1 Contrasts for each level of a factor | 3-31 |
| 3.17 Residuals – resid, resvsyhat, resvsrankits, resvsindex | 3-32 |
| 3.18 Predicted values – regpred(), yhat, predtable(), glmpred() and glmltable() | 3-35 |
| 3.19 Faster ANOVA calculation – fastanova() | 3-38 |
| 3.20 Selection of a subset of X-variables – screen() | 3-39 |
| 3.21 Power and sample size – power(), power2() and samplesize() | 3-42 |
| 3.22 Multivariate linear models – manova() | 3-45 |
| 3.23 Weighted analyses – keyword weights and side effect variable WTDRESIDUALS | 3-48 |
| 3.24 Retrieving information about a GLM analysis | 3-49 |
| 3.24.1 modelvars() and varnames() | 3-49 |
| 3.24.2 xvariables() | 3-50 |
| 3.24.3 xrows() | 3-51 |
| 3.24.4 modelinfo() | 3-52 |
| 3.24.5 Decoding modelinfo(bitmodel:T) | 3-55 |
| 4. Generalized linear models and robustness | |
| 4.1 Alternatives to Least Squares | 4-1 |
| 4.2 Generalized Linear Model Commands | 4-1 |
| 4.2.1 Analysis of Deviance Table | 4-2 |
| 4.2.2 Side effect variables | 4-3 |
| 4.2.3 Keywords | 4-4 |
| 4.2.4 logistic() and probit() | 4-5 |
| 4.2.5 poisson() and ipf() | 4-7 |
| 4.2.6 glmfit() | 4-7 |
| 4.3 Robust regression – robust() | 4-8 |
| 5. Time Series related functions | |
| 5.1 Introduction | 5-1 |
| 5.2 Functions useful in frequency domain time series analysis | 5-1 |

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 5.2.1 The DFT (Discrete Fourier Transform) | 5-1 |
| 5.2.2 Continuous Fourier transform of a finite series | 5-3 |
| 5.2.3 Representation of Real, Hermitian, and Complex Series | 5-3 |
| 5.2.4 Functions for manipulating Complex and Hermitian series – hconj(), cconj(), hreal(), creal(), himag(), cimag(), cpolar(), hpolar(), crect(), hrect(), htoc(), ctoc(), cmplx() | 5-5 |
| 5.2.5 padto() and rotate() | 5-9 |
| 5.2.6 Elementwise products of Complex and Hermitian series – hprdh(), hprshj(), cprdc(), cprdcj() | 5-10 |
| 5.2.7 Discrete Fourier Transforms – rft(), hft() and cft() | 5-10 |
| 5.2.8 Convolver series using the DFT and function convolve() | 5-12 |
| 5.3 Functions related to time domain time series analysis | 5-14 |
| 5.3.1 Moving average and autoregressive operators | 5-14 |
| 5.3.2 movavg() | 5-16 |
| 5.3.3 autoreg() | 5-17 |
| 5.3.4 yulewalker() and partacf() | 5-18 |
| 5.3.5 toeplitz() | 5-19 |
| 5.3.6 Finding zeros of polynomials – polyroot() | 5-20 |
| 5.4 Macros useful in time series analysis | 5-21 |
| 5.4.1 Plotting against time – tsplot | 5-22 |
| 5.4.2 Plotting against frequency – ffplot | 5-23 |
| 5.4.3 Computing auto-covariances – autocov | 5-25 |
| 5.4.4 Removing a polynomial trend – detrend | 5-26 |
| 5.4.5 Using tapers (data windows) – costaper and compza | 5-27 |
| 5.4.6 Smoothing periodograms – compfa and spectrum | 5-29 |
| 5.4.7 Smoothing cross-periodograms – compfa and crsspectrum | 5-33 |
| 5.4.8 Multi-taper spectrum estimation – multitaper | 5-35 |
| 5.4.9 Autoregressive spectrum estimation – arspectrum and burg | 5-37 |
| 6. Other functions | |
| 6.1 Linear model computations using swp() | 6-1 |
| 6.1.2 Computing a more accurate cross product matrix – bcprd() | 6-4 |
| 6.2 Computation of eigenvalues and eigenvectors | 6-5 |
| 6.2.1 Ordinary eigenvalues and eigenvectors – eigenvals() and eigenvectors() | 6-5 |
| 6.2.2 Eigenvalues and eigenvectors of a tridiagonal matrix – trideigen() | 6-7 |
| 6.2.3 Relative eigenvectors and eigenvalues of a symmetric matrix – releigenvals() and releigen() | 6-8 |
| 6.3 Singular value decomposition – svd() | 6-10 |
| 6.4 QR decomposition – qr() | 6-11 |
| 6.5 Cholesky decomposition – cholesky() | 6-13 |
| 6.6 Working with triangular matrices – triupper(), trilower() and triunpack() | 6-13 |
| 6.7 Cluster analysis | 6-15 |
| 6.7.1 Hierarchical analysis – cluster() | 6-15 |

| | |
|---------------------------------------------------------------------|------|
| 6.7.2 K-means analysis – kmeans() | 6-19 |
| 6.8 Factor rotation – rotation() | 6-22 |
| 7. Files | |
| 7.1 Format of data readable by matread() and read() | 7-1 |
| 7.1.1 REAL and LOGICAL data | 7-5 |
| 7.1.2 CHARACTER data | 7-6 |
| 7.1.3 Structures | 7-6 |
| 7.1.4 Labels and notes | 7-7 |
| 7.1.5 matread() and read() keywords | 7-8 |
| 7.2 Reading CHARACTER data from files | 7-8 |
| 7.3 “Reading” from CHARACTER variables | 7-11 |
| 7.3.1 “Decoding” a CHARACTER variable | 7-12 |
| 7.3.2 Finding ASCII codes for a CHARACTER variable – getascii() | 7-12 |
| 7.4 Writing data to the screen and to files | 7-14 |
| 7.4.1 print() and write() | 7-15 |
| 7.4.2 matprint() and matwrite() | 7-17 |
| 7.4.3 putascii() | 7-20 |
| 7.5 Macro files | 7-21 |
| 7.5.1 macroread() and the format of macro files | 7-21 |
| 7.5.2 macrowrite() | 7-23 |
| 7.5.3 getmacros | 7-24 |
| 7.5.4 addmacrofile | 7-25 |
| 7.6 Executing commands in a file – batch() | 7-25 |
| 7.7 Additional options on save() and restore() | 7-27 |
| 7.8 Customizing MacAnova | 7-29 |
| 7.8.1 Using a start up file | 7-29 |
| 7.8.2 Environmental variable MACANOVA | 7-30 |
| 8. Advanced Features | |
| 8.1 MacAnova options | 8-1 |
| 8.1.1 getoptions() | 8-1 |
| 8.1.2 setoptions() | 8-2 |
| 8.1.3 List of available options | 8-3 |
| 8.2 Treatment of errors | 8-7 |
| 8.3 Creating CHARACTER variables | 8-8 |
| 8.3.1 Building custom CHARACTER variables – paste() | 8-9 |
| 8.3.2 Formatting paste() output | 8-9 |
| 8.3.3 Creating CHARACTER vectors using paste() | 8-11 |
| 8.3.4 Creating CHARACTER variables using putascii() | 8-11 |
| 8.4 Coordinate labels | 8-12 |
| 8.4.1 Adding labels to a variable – setlabels() | 8-12 |
| 8.4.2 Retrieving labels from a variable – getlabels() and haslabels | 8-16 |
| 8.4.3 Transforming labels | 8-17 |
| 8.4.4 Propagation of labels | 8-18 |
| 8.5 More on plotting | 8-20 |

| | |
|--------------------------------------------------------------------------------------------------|------|
| 8.5.1 Keywords affecting appearance and bounds | 8-20 |
| 8.5.2 Other graphics keywords | 8-21 |
| 8.5.3 Replotting graphs and GRAPH variables | 8-23 |
| 8.5.4 Writing graphs to a file | 8-25 |
| 8.6 More on help() and usage() | 8-26 |
| 8.6.1 Using more than one help file | 8-26 |
| 8.6.2 Finding what's new | 8-27 |
| 8.7 Running other programs from within MacAnova | 8-28 |
| 8.7.1 shell() | 8-28 |
| 8.7.2 shell() keyword phrases interact:T and keep:T | 8-29 |
| 8.7.3 Lines starting with "!" | 8-29 |
| 8.8 Recalling previous commands | 8-30 |
| 8.8.1 Macros redo and REDO | 8-30 |
| 8.8.2 Keyboard and menu recall | 8-30 |
| 8.8.3 gethistory() and sethistory() | 8-31 |
| 8.9 "Notes" attached to variables | 8-32 |
| 8.9.1 attachnotes(), appendnotes(), getnotes() and hasnotes | 8-33 |
| 9. Programming MacAnova | |
| 9.1 Working with structures | 9-1 |
| 9.1.1 Creating structures – structure(), strconcat() and split() | 9-1 |
| 9.1.2 Getting information about a structure – ncomps() and compnames() | 9-5 |
| 9.1.3 Changing a structure – changestr() | 9-5 |
| 9.2 Compound commands, conditional commands, and looping commands | 9-6 |
| 9.2.1 Compound commands | 9-6 |
| 9.2.2 Conditional commands – if, elseif and else | 9-7 |
| 9.2.3 Looping – for and while | 9-9 |
| 9.2.4 Escaping from loops – break and breakall | 9-11 |
| 9.2.5 Skipping to the end of a loop | 9-12 |
| 9.3 Macros | 9-13 |
| 9.3.1 Creating macros | 9-14 |
| 9.3.2 Argument substitution | 9-14 |
| 9.3.3 The use of temporary variables and \$\$ | 9-16 |
| 9.3.4 Other expanding macro symbols | 9-18 |
| 9.3.5 In-line and out-of line-macros | 9-19 |
| 9.3.6 Using delete(result,return:T) in a macro | 9-20 |
| 9.4 Functions useful in macros | 9-21 |
| 9.4.1 Functions unique() and match() | 9-21 |
| 9.4.2 Checking the characteristics of variables – isxxxx() functions | 9-22 |
| 9.4.3 Other miscellaneous functions – anymissing(), nameof(), error() and gettime() | 9-24 |
| 9.4.4 Keywords in macros – using \$k and \$K | 9-25 |
| 9.4.5 Checking and evaluating keyword phrase arguments – keyvalue() | 9-27 |

| | | |
|------------|---------------------------------------------------------------|-------|
| 9.4.6 | Checking and evaluating non-keyword arguments – argvalue() | 9-28 |
| 9.4.7 | Properties checked by keyvalue() and argvalue() | 9-29 |
| 9.5 | Indirect evaluation of MacAnova commands | 9-30 |
| 9.5.1 | evaluate() | 9-30 |
| 9.5.2 | Indirect references using <<...>> | 9-30 |
| 9.6 | Analysis of macro regs | 9-31 |
| 9.7 | User functions | 9-33 |
| 9.7.1 | loadUser() | 9-33 |
| 9.7.2 | User() | 9-33 |
| 9.7.3 | User function arguments and returned values | 9-34 |
| 9.7.4 | Passing integer arguments – aslong() | 9-36 |
| 10. | Examples of Linear Model Analyses | |
| 10.1 | Introduction | 10-1 |
| 10.2 | Simple descriptive statistics | 10-1 |
| 10.3 | Simple linear regression | 10-3 |
| 10.4 | Multiple linear regression | 10-5 |
| 10.5 | One way ANOVA | 10-6 |
| 10.6 | Polynomial regression | 10-8 |
| 10.7 | Variance stabilizing transformations | 10-9 |
| 10.8 | Randomized complete block | 10-13 |
| 10.8.1 | Multiple comparisons | 10-14 |
| 10.8.2 | Randomized block with data missing | 10-17 |
| 10.9 | Latin squares | 10-18 |
| 10.10 | Balanced incomplete blocks | 10-18 |
| 10.11 | Analysis of covariance | 10-19 |
| 10.12 | Factorial models | 10-22 |
| 10.13 | Factorial designs with confounding | 10-26 |
| 10.14 | Fractional factorial designs | 10-27 |
| 10.15 | Split plot designs | 10-29 |
| 10.16 | Multivariate analysis of variance | 10-30 |
| 10.16.1 | Multivariate test statistics | 10-33 |
| 10.16.2 | MANOVA canonical variables | 10-34 |
| 10.17 | Repeated measures designs | 10-35 |
| 10.18 | Logistic regression | 10-40 |
| 10.19 | Poisson regression | 10-41 |
| 10.20 | Robust regression | 10-42 |
| 11. | Summary of Usage | |
| 11.1 | Commands, functions and macros | 11-1 |
| 11.2 | Operators | 11-16 |
| 11.2.1 | Arithmetic operators | 11-16 |
| 11.2.2 | Comparison operators | 11-16 |
| 11.2.3 | Logical operators | 11-17 |
| 11.2.4 | Matrix operators | 11-17 |
| 11.2.5 | Bitwise operators | 11-17 |

| | |
|----------------------------------------------------------------------------------------------------------------------|-------|
| 11.2.6 Assignment operators | 11-18 |
| 11.3 Control syntax elements | 11-18 |
| 11.3.1 Syntax elements for conditional execution | 11-18 |
| 11.3.2 Syntax elements for looping | 11-18 |
| 11.3.3 Syntax elements for leaving a loop | 11-19 |
| 11.3.4 Syntax element for skipping to the end of a loop | 11-19 |
| 11.4 Some differences from S-Plus | 11-19 |
| References | Ref-1 |
| Appendix A Commands and Macros Grouped by Topic | A-1 |
| Appendix B MacAnova on a Macintosh | |
| B.1 Introduction | B-1 |
| B.1.1 MacAnova windows | B-1 |
| B.1.2 Versions for different types of Macintoshes | B-1 |
| B.1.3 File names | B-2 |
| B.2 Launching MacAnova | B-2 |
| B.3 Menus | B-2 |
| B.3.1 The  and Help menus | B-3 |
| B.3.2 The File menu | B-3 |
| B.3.3 The Edit menu | B-5 |
| B.3.4 The Windows menu | B-7 |
| B.3.5 The Command menu | B-9 |
| B.3.6 The Options menu | B-11 |
| B.3.7 The Font menu | B-14 |
| B.4 Graph windows | B-15 |
| B.5 Location of files | B-16 |
| B.6 Other features | B-16 |
| B.6.1 Interrupting MacAnova | B-16 |
| B.6.2 Running other programs while in MacAnova | B-16 |
| B.6.3 Editing Macros | B-16 |
| B.6.4 Using keys to move around the command/output window | B-17 |
| B.6.5 Recalling previous commands | B-18 |
| B.6.6 "Console" input on the Macintosh | B-18 |
| B.7 Non-interactive mode | B-19 |
| B.8 Miscellaneous information | B-20 |
| B.8.1 Compilers | B-20 |
| B.8.2 Distribution of MacAnova for Macintosh | B-20 |
| Appendix C DOS versions of MacAnova on an IBM™ Compatible | |
| C.1 Introduction | C-1 |
| C.1.1 Extended memory version (MACANODJ) | C-1 |
| C.1.2 Limited memory version | C-1 |
| C.2 Launching MacAnova | C-2 |
| C.2.1 Launching MacAnova at the DOS prompt | C-2 |

| | |
|--------------------------------------------------------------|-----|
| C.2.2 Launching MacAnova in Windows and Windows 95 | C-2 |
| C.3 Graphics | C-2 |
| C.3.1 Graphics in the extended memory version | C-3 |
| C.3.2 Graphics in the limited memory version | C-3 |
| C.4 Location of files | C-3 |
| C.5 Other features | C-3 |
| C.5.1 Interrupting MacAnova | C-3 |
| C.5.2 Running other programs while in MacAnova | C-4 |
| C.5.3 Editing Macros | C-4 |
| C.5.4 Editing the current command line | C-4 |
| C.5.5 Recalling and editing previous commands | C-4 |
| C.5.6 "Console" input in DOS MacAnova | C-4 |
| C.6 Command line arguments | C-6 |
| C.6.1 File options | C-6 |
| C.6.2 Path options | C-7 |
| C.6.3 Other options | C-7 |
| C.7 Non-interactive mode | C-8 |
| C.8 Miscellaneous information | C-8 |
| C.8.1 Compilers | C-8 |
| C.8.2 Distribution of DOS versions of MacAnova | C-8 |

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

| | |
|------------------------------------------------------------------------|-----|
| D.1 Introduction | D-1 |
| D.1.1 MacAnova windows | D-1 |
| D.1.1 File names | D-2 |
| D.2 Launching MacAnova | D-2 |
| D.2.1 Launching Windows MacAnova at the DOS prompt | D-2 |
| D.3 Menus | D-2 |
| D.3.1 The File menu | D-2 |
| D.3.2 The Edit menu | D-4 |
| D.3.3 The Windows menu | D-5 |
| D.3.4 The Help menu | D-6 |
| D.4 Graph windows | D-6 |
| D.5 Location of files | D-7 |
| D.6 Other features | D-7 |
| D.6.1 Interrupting MacAnova | D-7 |
| D.6.2 Running other programs while in MacAnova | D-7 |
| D.6.3 Editing Macros | D-8 |
| D.6.4 Using keys to move around the command/output window | D-8 |
| D.6.5 Recalling previous commands | D-8 |
| D.6.6 "Console" input under Windows | D-8 |
| D.7 Command line arguments | D-9 |
| D.8 Non-interactive mode | D-9 |
| D.9 Miscellaneous information | D-9 |
| D.9.1 Compilers | D-9 |

| | |
|------------------------------------------------------------------------|-----|
| D.9.2 Distribution of Windows version of MacAnova | D-9 |
| Appendix E Unix™ version of MacAnova (non Motif) | |
| E.1 Introduction | E-1 |
| E.2 Launching MacAnova | E-1 |
| E.3 Graphics | E-1 |
| E.4 Location of files | E-2 |
| E.4.1 Changing the default file locations | E-3 |
| E.5 Other features | |
| E.5.1 Interrupting MacAnova | E-3 |
| E.5.2 Running other programs while in MacAnova | E-3 |
| E.5.3 Editing Macros | E-3 |
| E.5.4 Editing the current command line | E-4 |
| E.5.5 Recalling and editing previous commands | E-4 |
| E.5.6 “Console” input in Unix MacAnova | E-4 |
| E.5.7 Viewing data and macros | E-4 |
| E.6 Command line arguments | E-4 |
| E.7 Non-interactive mode | E-4 |
| E.8 Miscellaneous information | E-4 |
| E.8.1 Compilers | E-4 |
| E.8.2 Distribution of Unix versions of MacAnova | E-4 |
| Appendix F Motif version of MacAnova | |
| F.1 Introduction | F-1 |
| F.2 Launching MacAnova | F-1 |
| F.3 Menus | F-1 |
| F.3.1 The File menu | F-1 |
| F.3.2 The Edit menu | F-1 |
| F.3.3 The Windows menu | F-2 |
| F.3.4 The Help menu | F-2 |
| F.4 Graph windows | F-2 |
| F.5 Location of files | F-2 |
| F.6 Other features | F-2 |
| F.6.1 Interrupting MacAnova | F-2 |
| F.6.2 Running other programs while in MacAnova | F-2 |
| F.6.3 Editing Macros | F-2 |
| F.6.4 Using keys to move around the command/output window | F-3 |
| F.6.5 Recalling previous commands | F-3 |
| F.6.6 “Console” input under Windows | F-3 |
| F.6.7 Viewing data and macros | F-3 |
| F.7 Command line arguments | F-3 |
| F.8 Non-interactive mode | F-3 |
| F.9 Miscellaneous information | F-3 |
| F.9.1 Compilers | F-3 |
| F.9.2 Distribution of MacAnova | F-3 |

