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1 OF 2
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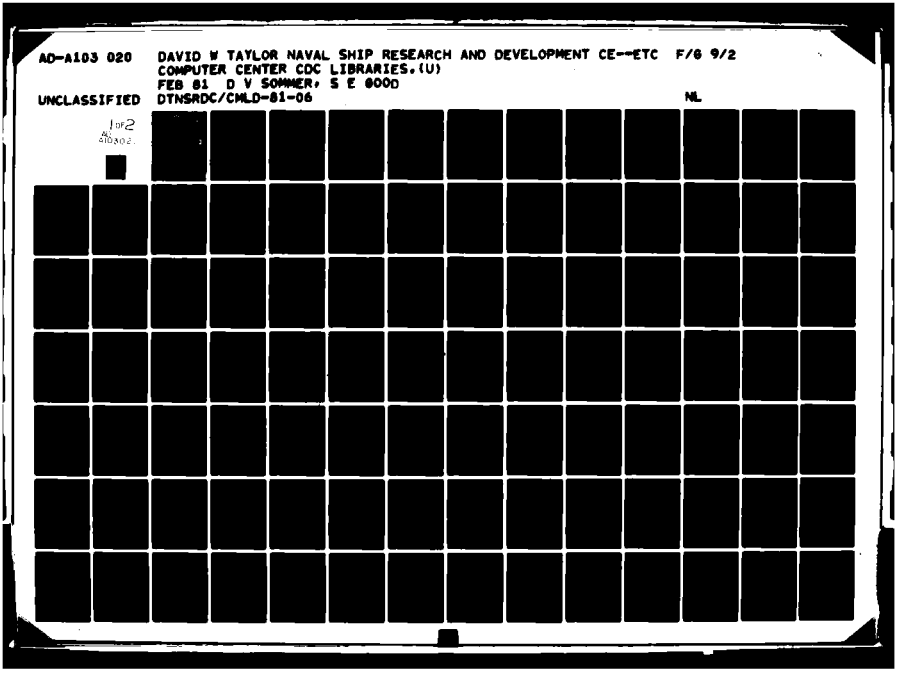

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COMPUTER CENTER CDC LIBRARIES

by

David V. Sommer

and

Sharon E. Good

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Computation, Mathematics and Logistics Department
Departmental Report

February 1981

CMLD-81-06

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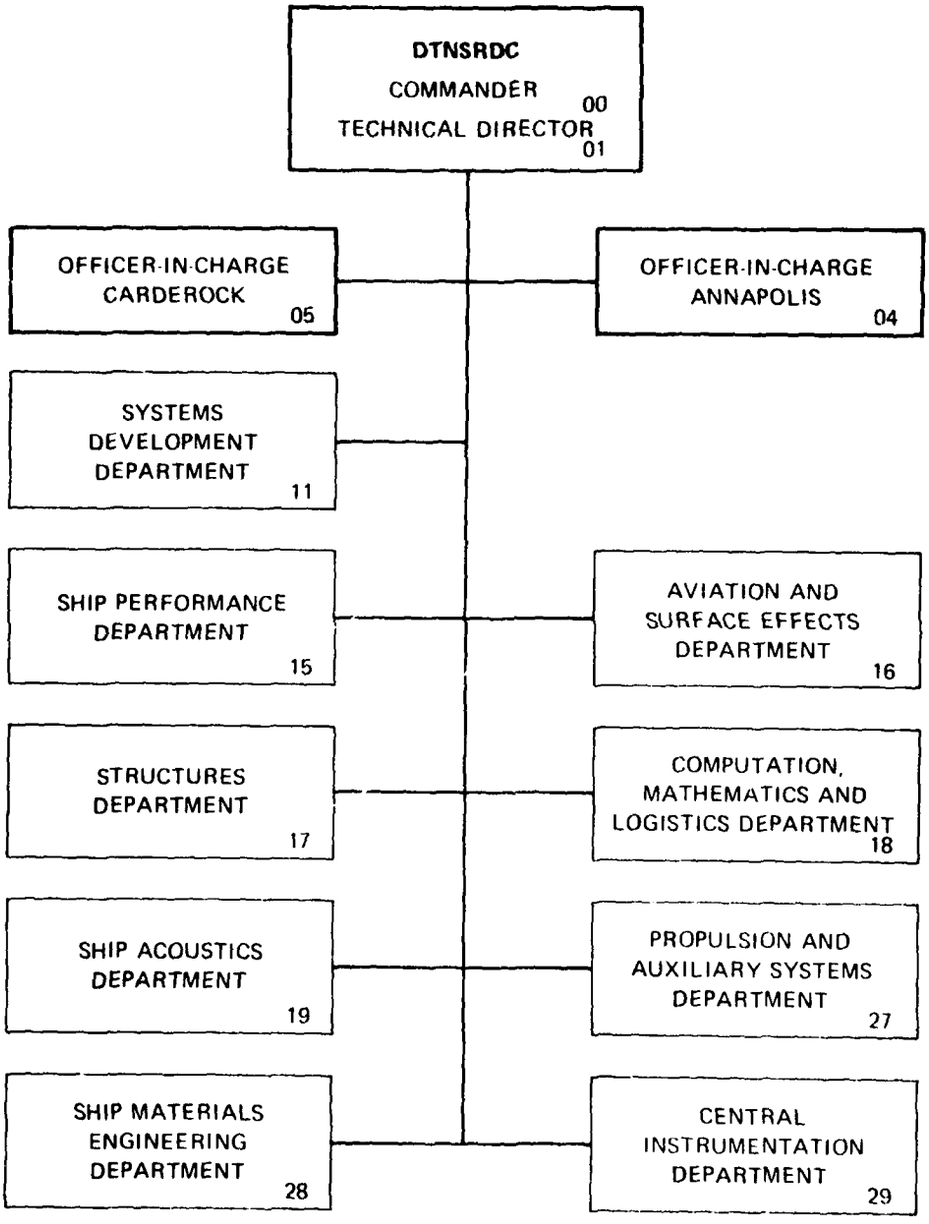

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Computer Center CDC Libraries (CLIB) Manual is a cross reference volume for many subprograms, programs, utilities and procedures available on the CDC 6000/Cyber 74 computers at DTNSRDC. CLIB lists the routines by functional category and alphabetically, by library, with descriptive titles.

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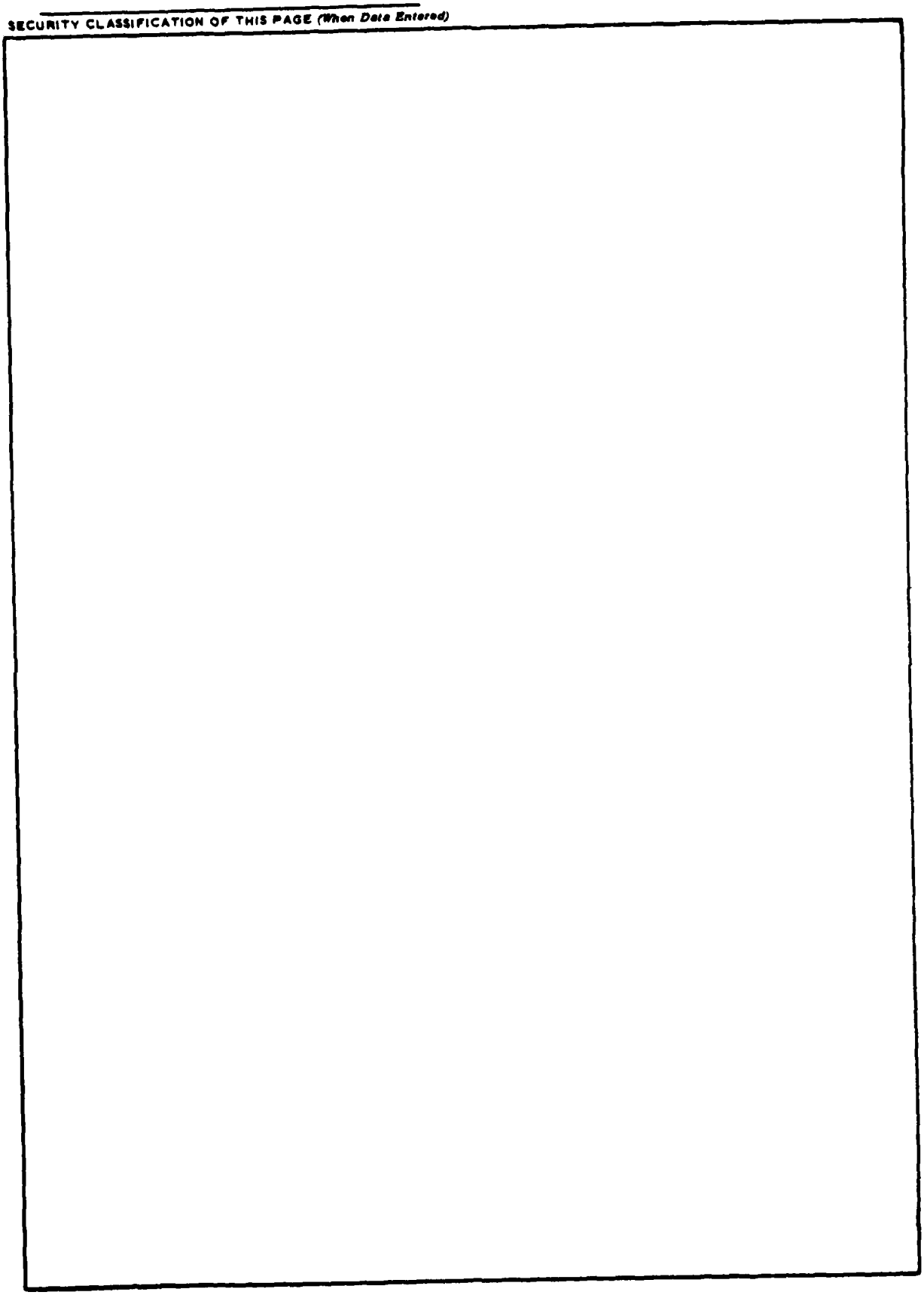

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*
*
* COMPUTER CENTER CDC LIBRARIES *
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BY
DAVID V SOMMER
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USER SERVICES BRANCH

CODE 1892

COMPUTATION, MATHEMATICS AND LOGISTICS DEPARTMENT
DEPARTMENTAL REPORT

FEBRUARY 1981 CMLD-81-06

THROUGH REVISION 0 (FEB 1981)

TABLE OF CONTENTS

***** INTRODUCTION *****

THE COMPUTER CENTER MAKES AVAILABLE ON THE CDC COMPUTERS, IN ADDITION TO THE NOS/BE OPERATING SYSTEM, A WIDE VARIETY OF BOTH SCIENTIFIC AND UTILITY PROGRAMS, SUBPROGRAMS AND CATALOGUED PROCEDURES. MOST OF THE ROUTINES ARE MAINTAINED IN LIBRARIES ON PERMANENT FILES AND MAY BE INVOKED BY THE APPROPRIATE (LOADER) CONTROL CARDS. A FEW PROGRAMS ARE AVAILABLE AS INDEPENDENT PERMANENT FILES.

THE CLIB-SERIES OF MANUALS CONSISTS OF THE FOLLOWING, WHICH DESCRIBE THE CONTENTS OF THE VARIOUS CDC 6000 LIBRARIES MAINTAINED BY THE COMPUTER CENTER:

CLIB - COMPUTER CENTER CDC LIBRARIES	CMLD-81-06
CLIB/N - COMPUTER CENTER CDC LIBRARIES/NSRDC (SUBPROGRAMS)	CMLD-81-07
CLIB/P - COMPUTER CENTER CDC LIBRARIES/PROCFIL (PROCEDURES)	CMLD-81-08
CLIB/U - COMPUTER CENTER CDC LIBRARIES/UTILITY (PROGRAMS)	CMLD-81-09
CLIB/M - COMPUTER CENTER CDC LIBRARIES/MNSRDC (PROGRAMS)	

THIS MANUAL, CLIB, IS A CROSS-REFERENCE MANUAL WHICH DESCRIBES ALL THE LIBRARIES AND INDICATES A SOURCE FOR MORE COMPLETE DOCUMENTATION ON HOW TO USE THE ROUTINES IN THE LIBRARIES. REFERENCES MAY BE TO OTHER PUBLISHED BOOKS, MACHINE-READABLE DOCUMENTATION OR MASTER COPIES ON FILE IN USER SERVICES. THE OTHER MANUALS IN THIS SERIES CONTAIN MACHINE-READABLE DOCUMENTS.

ALL REFERENCE MATERIAL IS AVAILABLE FOR PERUSAL IN USER SERVICES (CARDEROCK: BLDG 17, ROOM 100, (202) 227-1907; ANNAPOLIS: BLDG 100, ROOM 2-J, (301) 267-3343). COPIES OF THE CLIB-SERIES MAY BE OBTAINED FROM USER SERVICES.

*** HOW TO USE THIS MANUAL ***

THE ROUTINES ARE CLASSIFIED IN ONE OR MORE FUNCTIONAL CATEGORIES (SEE PAGE 1-3 FOR A LIST OF CATEGORIES). THEY ARE LISTED, BEGINNING ON PAGE 1-6, UNDER THE VARIOUS CATEGORIES. EACH ENTRY IN THIS LIST INDICATES THE TYPE OF ROUTINE, THE LIBRARY (IF ANY) WHERE IT MAY BE FOUND, AND THE LOCATION OF THE DETAILED DOCUMENT WHICH DESCRIBES ITS USE.

THE ROUTINES LISTED IN THIS MANUAL ARE DIVIDED BY TYPE (PROGRAM, SUBPROGRAM OR CATALOGUED PROCEDURE), IN CHAPTERS 2, 3 AND 4, RESPECTIVELY. THESE CHAPTERS DESCRIBE THE VARIOUS LIBRARIES AVAILABLE AND LIST THE ROUTINES IN EACH LIBRARY (WITH A DESCRIPTIVE TITLE) ALPHABETICALLY.

*** HOW TO PRINT INDIVIDUAL DOCUMENTS ***

INDIVIDUAL DOCUMENTS FOR MANY ROUTINES MAY BE PRINTED BY ONE OF THE FOLLOWING:

1) FOR LIBRARIES NSRDC, PROCFIL, UTILITY, MNSRDC, OTHER*:

```
JOBNAME,....
CHARGE,....
BEGIN,DOCGET,,<LIBRARY>,,<ROUTINE>,OUTPUT.
```

2) FOR LIBRARIES ARLNALG, EISPACK, FUNPACK, IMSL, MINPACK:

```
JOBNAME,MT1,....
CHARGE,....
BEGIN,DOCTAPE,,<LIBRARY>,<ROUTINE>,OUTPUT.
```

WHERE <LIBRARY> IS THE LIBRARY CONTAINING THE ROUTINE
<ROUTINE> IS THE NAME OF THE ROUTINE WHOSE DOCUMENTATION IS DESIRED.

* - PSEUDO-LIBRARY 'OTHER' IS A COLLECTION OF MISCELLANEOUS DOCUMENTS NOT PRINTED IN ANY MANUAL (SEE PAGE 2-11).

*** FUNCTIONAL CATEGORIES ***

THE FOLLOWING FUNCTIONAL CATEGORIES ARE USED AT DTNSRDC. THOSE PRECEDED BY AN ASTERISK (*) ARE LOCAL DTNSRDC CATEGORIES. ALL OTHERS ARE FROM THE VIM (THE CDC USERS GROUP) LIST.

A0 ARITHMETIC ROUTINES
A1 REAL NUMBERS
A2 COMPLEX NUMBERS
A3 DECIMAL
A4 I/O ROUTINES

B0 ELEMENTARY FUNCTIONS
B1 TRIGONOMETRIC
B2 HYPERBOLIC
B3 EXPONENTIAL AND LOGARITHMIC
B4 ROOTS AND POWERS

C0 POLYNOMIALS AND SPECIAL FUNCTIONS
C1 EVALUATION OF POLYNOMIALS
C2 ROOTS OF POLYNOMIALS
C3 EVALUATION OF SPECIAL FUNCTIONS (NON-STATISTICAL)
C4 SIMULTANEOUS NON-LINEAR ALGEBRAIC EQUATIONS
C5 SIMULTANEOUS TRANSCENDENTAL EQUATIONS
* C6 ROOTS OF FUNCTIONS

D0 OPERATIONS ON FUNCTIONS AND SOLUTIONS OF DIFFERENTIAL EQUATIONS
D1 NUMERICAL INTEGRATION
D2 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS
D3 NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS
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E4 MINIMIZING OR MAXIMIZING A FUNCTION

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F1 VECTOR AND MATRIX OPERATIONS
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F3 DETERMINANTS
F4 SIMULTANEOUS LINEAR EQUATIONS

G0 STATISTICAL ANALYSIS AND PROBABILITY
G1 DATA REDUCTION (COMMON STATISTICAL PARAMETERS)
G2 CORRELATION AND REGRESSION ANALYSIS
G3 SEQUENTIAL ANALYSIS
G4 ANALYSIS OF VARIANCE
G5 TIME SERIES
G6 SPECIAL FUNCTIONS (INCLUDES RANDOM NUMBERS AND PDF'S)
* G7 MULTIVARIATE ANALYSIS AND SCALE STATISTICS
* G8 NON-PARAMETRIC METHODS AND STATISTICAL TESTS
* G9 STATISTICAL INFERENCE

H0 OPERATIONS RESEARCH TECHNIQUES, SIMULATION & MANAGEMENT SCIENCE
H1 LINEAR PROGRAMMING
H2 NON-LINEAR PROGRAMMING
H3 TRANSPORTATION AND NETWORK CODES
H4 SIMULATION MODELING
H5 SIMULATION MODELS
H6 CRITICAL PATH PROGRAMS
H8 AUXILIARY PROGRAMS
H9 COMBINED

I0 INPUT
I1 BINARY
I2 OCTAL
I3 DECIMAL
I4 BCD (HOLLERITH)
I9 COMPOSITE

J0 OUTPUT
J1 BINARY
J2 OCTAL
J3 DECIMAL
J4 BCD (HOLLERITH)
J5 PLOTTING
J7 ANALOG
J9 COMPOSITE

K0 INTERNAL INFORMATION TRANSFER
K1 EXTERNAL-TO-EXTERNAL
K2 INTERNAL-TO-INTERNAL (RELOCATION)
K3 DISK
K4 TAPE
K5 DIRECT DATA DEVICES

L0 EXECUTIVE ROUTINES
L1 ASSEMBLY
L2 COMPILING
L3 MONITORING
L4 PREPROCESSING
L5 DISASSEMBLY AND DERELATIVIZING
L6 RELATIVIZING
L7 COMPUTER LANGUAGE TRANSLATORS

M0 DATA HANDLING
M1 SORTING
M2 CONVERSION AND/OR SCALING
M3 MERGING
M4 CHARACTER MANIPULATION
M5 SEARCHING, SEEKING, LOCATING
M6 REPORT GENERATORS
M9 COMPOSITE

N0 DEBUGGING
N1 TRACING AND TRAPPING
N2 DUMPING
N3 MEMORY VERIFICATION AND SEARCHING
N4 BREAKPOINT PRINTING

O0 SIMULATION OF COMPUTERS AND DATA PROCESSORS (INTERPRETERS)
O1 OFF-LINE EQUIPMENT (LISTERS, REPRODUCERS, ETC.)
O3 COMPUTERS
O4 PSEUDO-COMPUTERS
O5 SOFTWARE SIMULATION OF PERIPHERALS
O9 COMPOSITE

P0 DIAGNOSTICS (HARDWARE MALFUNCTION)

Q0 SERVICE OR HOUSEKEEPING, PROGRAMMING AIDS
Q1 CLEAR/RESET
Q2 CHECKSUM ACCUMULATION AND CORRECTION
Q3 FILE MANIPULATION
Q4 INTERNAL HOUSEKEEPING, SAVE, RESTORE, ETC.
Q5 REPORT GENERATOR SUBROUTINES
Q6 PROGRAM DOCUMENTATION: FLOW CHARTS, DOCUMENT STANDARDIZATION
Q7 PROGRAM LIBRARY UTILITIES

R0 LOGIC AND SYMBOLIC
R1 FORMAL LOGIC
R2 SYMBOL MANIPULATION
R3 LIST AND STRING PROCESSING
R4 TEXT EDITING

S0 INFORMATION RETRIEVAL

T0 APPLICATIONS AND APPLICATION-ORIENTED PROGRAMS
T1 PHYSICS (INCLUDING NUCLEAR)
T2 CHEMISTRY
T3 OTHER PHYSICAL SCIENCES (GEOLOGY, ASTRONOMY, ETC.)
T4 ENGINEERING
T5 BUSINESS DATA PROCESSING
T6 MANUFACTURING (NON-DATA) PROCESSING AND PROCESS CONTROL
T7 MATHEMATICS AND APPLIED MATHEMATICS
T8 SOCIAL AND BEHAVIORAL SCIENCES AND PSYCHOLOGY
T9 BIOLOGICAL SCIENCES
T10 REGIONAL SCIENCES (GEOGRAPHY, URBAN PLANNING)
T11 COMPUTER ASSISTED INSTRUCTION

U0 LINGUISTICS AND LANGUAGES

V0 GENERAL PURPOSE UTILITY SUBROUTINES
V1 RANDOM NUMBER GENERATORS
V2 COMBINATORIAL GENERATORS: PERMUTATIONS, COMBINATIONS & SUBSETS
* V3 STANDARD AND SPECIAL PROBLEMS

X0 DATA REDUCTION
X1 RE-FORMATTING, DECOMMUTATION, ERROR DIAGNOSIS
X2 EDITING
X3 CALIBRATION
X4 EVALUATION
X5 ANALYSIS (TIME-SERIES ANALYSIS)
X6 SIMULATION (GENERATE TEST DATA FOR DATA REDUCTION SYSTEM)

Y0 INSTALLATION MODIFICATION
Y1 INSTALLATION MODIFICATION LIBRARY
Y2 NEWPL TAPE OF INSTALLATION MODIFICATIONS

Z0 ALL OTHERS

*** LIST OF ROUTINES BY FUNCTIONAL CATEGORY ***

THE FOLLOWING IS A LIST OF ROUTINES DISCUSSED IN THE CLIB SERIES OF MANUALS. EACH ROUTINE APPEARS UNDER THE CATEGORY(IES) TO WHICH IT HAS BEEN ASSIGNED.

EACH ENTRY HAS THE FOLLOWING FORM:

NAME/TYPE/LIB/DOC/

WHERE NAME IS THE ROUTINE NAME
(MAY BE ABBREVIATED TO FIT INTO 7 CHARACTERS (SPSS))

TYPE IS THE KIND OF ROUTINE
- D - MAIN PROGRAM ACTIVATED BY A DATA CARD (SPSS)
- M - MAIN PROGRAM
- P - PROCEDURE
- S - SUBPROGRAM

LIB IS THE LIBRARY CONTAINING THE ROUTINE
(THE NUMBER IN PARENTHESES FOLLOWING EACH LIBRARY NAME BELOW IS THE PAGE IN THIS MANUAL WHERE THE LIBRARY IS DISCUSSED)
- A - ARLNALG (3-2)
- B - BIMED (2-1)
- C - BIMEDP (2-3)
- D - SANDIA (3-67)
- E - EISPACK (3-4)
- F - FUNPACK (3-8)
- I - IMSL (3-10)
- K - MINPACK (3-36)
- L - LINPACK (3-33)
- M - MSL (3-37)
- N - NSRDC (3-57)
- P - PROCFIL (4-1)
- R - MNSRDC (2-4)
- S - SPSS (2-5)
- T - PASCAL (2-12)
- U - UTILITY (2-7)
- BLANK - NOT IN A LIBRARY

DOC INDICATES THE MANUAL WHERE THE ROUTINE IS DOCUMENTED
- M - CLIB/MNSRDC (PROGRAMS)
- N - CLIB/NSRDC (SUBPROGRAMS)
- P - CLIB/PROCFIL (PROCEDURES)
- R - CCRM (COMPUTER CENTER REFERENCE MANUAL) (MAY CONTAIN ENOUGH INFORMATION TO USE THE ROUTINE OR A FURTHER REFERENCE.)
- U - CLIB/UTILITY (PROGRAMS)
- * - USER SERVICES MAY HAVE THE DOCUMENT
- BLANK - FOR DOCUMENTATION LOCATION, SEE THE DISCUSSION OF THAT LIBRARY IN THIS MANUAL

A0 ARITHMETIC ROUTINES

FAFRAC	/S/M/ /	HCF	/S/M/ /	VDCPS	/S/I/ /
FFRAC	/S/M/ /	ICOMN	/S/N/*/		
FMFRAC	/S/M/ /	LCM	/S/M/ /		

A1 REAL NUMBERS

AMCON	/S/M/ /	ISUMIT	/S/N/N/	SUMIT	/S/N/N/
DASUM	/S/I/ /	NFILL	/S/N/N/		

A2 COMPLEX NUMBERS

CADR	/S/M/ /	COMBES	/S/M/ /	MULLP	/S/M/ /
CBAREX	/S/M/ /	CPDIV	/S/M/ /	POLYMUL	/M/R/M/
CCOMPE	/S/M/ /	CPOLRT	/S/M/ /	PSI	/S/N/*/
CCONGR	/S/M/ /	CPTRAN	/S/M/ /	SASUM	/S/I/ /
CDERIV	/S/M/ /	CQDIV	/S/M/ /	SCASUM	/S/I/ /
CFBSUM	/S/M/ /	CREV	/S/M/ /	SUBDIA	/S/M/ /
CGITRF	/S/M/ /	CSBR	/S/M/ /	VALVEC	/S/M/ /
CGLESM	/S/M/ /	CSHRNK	/S/M/ /	VECORD	/S/M/ /
CINPRD	/S/M/ /	ELRH1C	/S/I/ /	ZAFUJ	/S/M/ /
CINT	/S/M/ /	ELRH2C	/S/I/ /	ZAFUM	/S/M/ /
CITERF	/S/M/ /	ELZHC	/S/I/ /	ZAFUR	/S/M/ /
CLDIV	/S/M/ /	ELZVC	/S/I/ /	ZCOUNT	/S/M/ /
CMPINV	/S/N/N/	HARM	/S/M/ /	ZCPOLY	/S/I/ /
CMPYR	/S/M/ /	HELP	/S/M/ /	ZQADC	/S/I/ /
CNSLVL	/S/M/ /	HELP	/S/N/N/	ZQADR	/S/I/ /

B0 ELEMENTARY FUNCTIONS

DNRM2	/S/I/ /

B1 TRIGONOMETRIC

COTAN	/S/N/*/	SICI	/S/M/ /		

B3 EXPONENTIAL AND LOGARITHMIC

CBAREX	/S/M/ /

B4 ROOTS AND POWERS

DPROOT	/S/N/N/	PROOT	/S/N/N/	SUMPS	/S/M/ /

C1 EVALUATION OF POLYNOMIALS

ADR	/S/M/ /	CQDIV	/S/M/ /	PARFAC	/S/M/ /
APOWR	/S/N/*/	CREV	/S/M/ /	PDIV	/S/M/ /
BPOWR	/S/N/*/	CSBR	/S/M/ /	POLDIV	/S/N/*/
CADR	/S/M/ /	CSHRNK	/S/M/ /	POWR1	/S/N/*/
CCOMPE	/S/M/ /	DERIV	/S/M/ /	POWR2	/S/N/*/
CDERIV	/S/M/ /	EVREAL	/S/M/ /	PROD2	/S/N/*/
CLDIV	/S/M/ /	FMULT1	/S/M/ /	PTRAN	/S/M/ /
CMPYR	/S/M/ /	HIFAC	/S/N/*/	QDIV	/S/M/ /
CNSLVL	/S/M/ /	IBCEVU	/S/I/ /	REV	/S/M/ /
COMPEV	/S/M/ /	ICSEVU	/S/I/ /	SBR	/S/M/ /
COSEVL	/S/M/ /	LDIV	/S/M/ /	SHRINK	/S/M/ /
CPDIV	/S/M/ /	MPYR	/S/M/ /	SINEVL	/S/M/ /
CPTRAN	/S/M/ /	NSLVL	/S/M/ /		

C2 ROOTS OF POLYNOMIALS

CINT	/S/M/ /	MULLP	/S/M/ /	ZCPOLY	/S/I/ /
CPOLRT	/S/M/ /	NROOTS	/S/N/*/	ZPOLR	/S/I/ /
DPROOT	/S/N/N/	POLYMUL	/M/R/M/	ZQADC	/S/I/ /
HELP	/S/M/ /	PROOT	/S/M/ /	ZQADR	/S/I/ /
HELP	/S/N/N/	PROOT	/S/N/N/	ZRPOLY	/S/I/ /
INT	/S/M/ /	QUART	/S/N/*/		

C3 EVALUATION OF SPECIAL FUNCTIONS (NON-STATISTICAL)

AI	/S/N/*/	COMBES	/S/M/ /	GAMMA	/S/N/N/
ALGAMA	/S/I/ /	COMBES	/S/N/*/	HANKEL	/S/M/ /
BEJY0	/S/N/*/	DAW	/S/F/ /	LOGGAM	/S/M/ /
BEJY1	/S/N/*/	EI	/S/F/ /	LOGGAM	/S/N/*/
BESEI0	/S/F/ /	ELF	/S/M/ /	MERFCI	/S/I/ /
BESEI1	/S/F/ /	ELIEM	/S/F/ /	MERFI	/S/I/ /
BESEK0	/S/F/ /	ELIE1	/S/F/ /	MMBSI0	/S/I/ /
BESEK1	/S/F/ /	ELIKM	/S/F/ /	MMBSI1	/S/I/ /
BESI0	/S/F/ /	ELIK1	/S/F/ /	MMBSJ0	/S/I/ /
BESI1	/S/F/ /	ELIPE	/S/F/ /	MMBSJ1	/S/I/ /
BESJ0	/S/F/ /	ELIPK	/S/F/ /	MMBSK0	/S/I/ /
BESJ1	/S/F/ /	ELK	/S/M/ /	MMBSK1	/S/I/ /
BESK0	/S/F/ /	ELLI	/S/N/*/	MMBSYN	/S/I/ /
BESK1	/S/F/ /	ELLIP	/S/N/*/	MMDAS	/S/I/ /
BESNIS	/S/M/ /	EL3	/S/M/ /	MMDEI	/S/I/ /
BESNKS	/S/M/ /	EONE	/S/F/ /	MMDELE	/S/I/ /
BESSI	/S/N/N/	ERF	/S/I/ /	MMDELK	/S/I/ /
BESSJ	/S/N/N/	ERF	/S/M/ /	MMKELD	/S/I/ /
BESSK	/S/N/N/	ERF	/S/N/*/	MMKELO	/S/I/ /
BESSY	/S/N/N/	ERFC	/S/I/ /	MMKEL1	/S/I/ /
BESY	/S/F/ /	ERFINV	/S/M/ /	MMPSI	/S/I/ /
BSJ	/S/M/ /	ERROR	/S/N/*/	NBESJ	/S/M/ /
BSJ	/S/N/N/	EXPEI	/S/F/ /	PSI	/S/F/ /
CBSF	/S/N/*/	EXPINT	/S/N/*/	PSI	/S/N/*/
CEI3	/S/N/*/	FRESNEL	/S/N/N/	RBESY	/S/M/ /
CELLI	/S/N/N/	GAMAIN	/S/M/ /	SNCNDN	/S/N/N/
CEL3	/S/M/ /	GAMCAR	/S/N/N/	VCONVO	/S/I/ /
CHEBEV	/S/M/ /	GAMMA	/S/I/ /	YNU	/S/F/ /
CHTOL	/S/M/ /	GAMMA	/S/M/ /		

C4 SIMULTANEOUS NON-LINEAR ALGEBRAIC EQUATIONS

HYBRD	/S/K/ /	NEWT	/S/M/ /	RQNWT	/S/M/ /
HYBRD1	/S/K/ /	NONLIQ	/S/M/ /	ZSYSTM	/S/I/ /
HYBRJ	/S/K/ /	NRSG	/S/M/ /		
HYBRJ1	/S/K/ /	QNWT	/S/M/ /		

C5 SIMULTANEOUS TRANSCENDENTAL EQUATIONS

QNWT	/S/M/ /	RQNWT	/S/M/ /

C6 ROOTS OF FUNCTIONS

ROOTER	/S/N/*/	ZANLYT	/S/I/ /	ZREAL1	/S/I/ /
ZAFUJ	/S/M/ /	ZBRENT	/S/I/ /	ZREAL2	/S/I/ /
ZAFUM	/S/M/ /	ZCOUNT	/S/M/ /		
ZAFUR	/S/M/ /	ZFALSE	/S/I/ /		

D0 OPERATIONS ON FUNCTIONS AND SOLUTIONS OF DIFFERENTIAL EQUATIONS

PADE /S/M/ /	RATL /S/M/ /	

D1 NUMERICAL INTEGRATION

DBCEVU /S/I/ /	HERMIT /S/M/ /	SICI /S/M/ /
DBCQDU /S/I/ /	LAGRAN /S/M/ /	SIMP /S/N/*/
DBLINT /S/I/ /	LAGUER /S/M/ /	SIMPRC /S/M/ /
DCADRE /S/I/ /	LEGEND /S/M/ /	SIMPUN /S/N/N/
DCSQDU /S/I/ /	PARBL /S/M/ /	TRGINT /S/M/ /
FGI /S/N/*/	QUAD /S/M/ /	UNCSPL /S/M/ /
FNOL3 /S/N/*/	QUADG /S/N/N/	XFIL /S/N/*/
GMI /S/M/ /	ROMBG /S/M/ /	

D2 NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

DE /S/D/ /	DREBS /S/I/ /	FNOL3 /S/N/*/
DEROOT /S/D/ /	DTPTB /S/I/ /	KUTMER /S/N/N/
DGEAR /S/I/ /	DVERK /S/I/ /	STEP /S/D/ /

D3 NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

BLCKDQ /S/M/ /	LINBVP /S/M/ /	RKINIT /S/M/ /
BVP /S/M/ /	NRKVS /S/M/ /	
DRATEX /S/M/ /	NRKVSH /S/M/ /	

D4 NUMERICAL DIFFERENTIATION

CDERIV /S/M/ /	DERIV /S/M/ /	LAGDIF /S/M/ /
DCSEVU /S/I/ /	DIFTAB /S/M/ /	TRGDIF /S/M/ /

E0 INTERPOLATION AND APPROXIMATIONS

COSEVL /S/M/ /	SINEVL /S/M/ /	ZSRCH /S/I/ /

E1 TABLE LOOK-UP AND INTERPOLATION

ACFI /S/M/ /	ICSCCU /S/I/ /	RICH /S/M/ /
AITKEN /S/M/ /	ICSICU /S/I/ /	SEARCH /S/M/ /
ATSM /S/M/ /	ICSPLN /S/I/ /	SINSER /S/M/ /
CRDTAB /S/N/*/	IQHSCU /S/I/ /	TBLU1 /S/M/ /
DISCOT /S/N/N/	IQHSCV /S/I/ /	TBLU2 /S/M/ /
FRMRAN /S/N/*/	IRATCU /S/I/ /	TBLU3 /S/M/ /
FRMRA2 /S/N/*/	LAGINT /S/M/ /	TERP1 /S/M/ /
HRMT1 /S/M/ /	NRICH /S/M/ /	TERP2 /S/M/ /
HRMT2 /S/M/ /	ORTHON /S/M/ /	TERP3 /S/M/ /
IBCIEU /S/I/ /	PRICH /S/M/ /	

E2 CURVE FITTING

BSUBHT /S/M/ /	FFT3D /S/I/ /	LSQHTS /S/M/ /
CCONGR /S/M/ /	FFT5 /S/N/N/	LSQSIT /S/M/ /
CDECOM /S/M/ /	FHRNEW /S/M/ /	LSQSUB /S/N/*/
CFQME /S/M/ /	FITLIN /S/M/ /	OPLSA /S/N/N/
CHEBAP /S/M/ /	FLGNEW /S/M/ /	ORTHFT /S/M/ /
CHEBEV /S/M/ /	FLINV /S/I/ /	PLAGR /S/M/ /
COMCUB /S/M/ /	FLSQFY /S/M/ /	PLRG /M/R/M/
CTLLF /S/I/ /	FOURAP /S/M/ /	POLYN /S/N/N/
CUBIC2 /S/M/ /	FOURI /S/M/ /	PRONY /S/M/ /
CURV /S/M/ /	GMHAS /S/N/*/	RFFT /S/N/N/
DIFTAB /S/M/ /	GMI /S/M/ /	RFSN /S/N/N/
FCGM2 /S/M/ /	IBCICU /S/I/ /	SPLFIT /S/N/*/
FCLSQ /S/M/ /	ICSFKU /S/I/ /	SPLINE /S/M/ /
FDLSQ /S/M/ /	ICSVKU /S/I/ /	SQFIT /S/N/*/
FFT /S/N/N/	IFLSSQ /S/I/ /	SQRSL /S/L/ /
FFTCC /S/I/ /	ITRLSQ /S/M/ /	SURFS /S/M/ /
FFTRC /S/I/ /	LINWOOD/M/ /R/	UNCSPL /S/M/ /
FFT2C /S/I/ /	LSQHTM /S/M/ /	

E3 SMOOTHING

ICSMOU /S/I/ /	MILN2 /S/M/ /	SMOOTH /S/M/ /
ICSSCU /S/I/ /	SIGSMT /S/M/ /	SMOOTH /S/N/*/
ICSSV /S/I/ /	SMOCUB /S/M/ /	

E4 MINIMIZING OR MAXIMIZING A FUNCTION

CHKDER /S/K/ /	LMSTR1 /S/K/ /	ZXGSN /S/I/ /
LMDER /S/K/ /	MIGEN /S/M/ /	ZXGSP /S/I/ /
LMDER1 /S/K/ /	MINMAX /S/N/*/	ZXMIN /S/I/ /
LMDIF /S/K/ /	MINRAT /S/M/ /	ZXSSQ /S/I/ /
LMDIF1 /S/K/ /	ZSCNT /S/I/ /	
LMSTR /S/K/ /	ZXCGR /S/I/ /	

F0 OPERATIONS ON MATRICES, VECTORS & SIMULTANEOUS LINEAR EQUATIONS

SGECO /S/L/ /

F1 VECTOR AND MATRIX OPERATIONS

BALANC /S/E/ /	LEQ2C /S/I/ /	USCRDM /S/I/ /
BALANC /S/M/ /	LEQ2S /S/I/ /	USMNMX /S/I/ /
BANDR /S/E/ /	LU1 /S/A/ /	USRDM /S/I/ /
BCHSDC /S/M/ /	LU2 /S/A/ /	USRDV /S/I/ /
BDCWNP /S/M/ /	LU3 /S/A/ /	USWBM /S/I/ /
BDECOM /S/M/ /	LU4 /S/A/ /	USWBS /S/I/ /
BDTRGI /S/I/ /	LU5 /S/A/ /	USWFM /S/I/ /
BDTRGO /S/I/ /	LU6 /S/A/ /	USWFV /S/I/ /
BMD10S /M/B/ /	MATINS /S/N/N/	USWSM /S/I/ /
CAXPY /S/I/ /	MINFIT /S/E/ /	VABMXF /S/I/ /
CBAL /S/E/ /	ORTHES /S/E/ /	VABMXS /S/I/ /
CCOPY /S/I/ /	ORTHO /S/A/ /	VABSMF /S/I/ /
CDECOM /S/M/ /	ORTHO2 /S/A/ /	VABSMS /S/I/ /
CDOTC /S/I/ /	ORTRAN /S/E/ /	VCONVO /S/I/ /
CDOTU /S/I/ /	PRDSUM /S/M/ /	VCVTBF /S/I/ /
CHSDEC /S/M/ /	QZHES /S/E/ /	VCVTCH /S/I/ /
CINPRD /S/M/ /	QZIT /S/E/ /	VCVTFB /S/I/ /
COMHES /S/E/ /	RAYLGH /S/M/ /	VCVTFQ /S/I/ /

F1 VECTOR AND MATRIX OPERATIONS (CONTINUED)

CORTH /S/E/ /	RLSUBM /S/I/ /	VCVTFS /S/I/ /
CSCAL /S/I/ /	RLSUM /S/I/ /	VCVTHC /S/I/ /
CSSCAL /S/I/ /	SAXPY /S/I/ /	VCVTQF /S/I/ /
CSWAP /S/I/ /	SCHDC /S/L/ /	VCVTQS /S/I/ /
CZDOTC /S/I/ /	SCHDD /S/L/ /	VCVTSF /S/I/ /
CZDOTU /S/I/ /	SCHEX /S/L/ /	VCVTSQ /S/I/ /
DAXPY /S/I/ /	SCHUD /S/L/ /	VHSH2C /S/I/ /
DCBHT /S/M/ /	SCNRM2 /S/I/ /	VHSH2R /S/I/ /
DCOPY /S/I/ /	SCOPY /S/I/ /	VHSH3R /S/I/ /
DCWNE /S/M/ /	SDOT /S/I/ /	VHS12 /S/I/ /
DCWNP /S/M/ /	SDSDOT /S/I/ /	VIP /S/M/ /
DDOT /S/I/ /	SGBCO /S/L/ /	VIPA /S/M/ /
DECOM /S/M/ /	SGBFA /S/L/ /	VIPD /S/M/ /
DROT /S/I/ /	SGEFA /S/L/ /	VIPDA /S/M/ /
DROTG /S/I/ /	SMTVX /S/M/ /	VIPDS /S/M/ /
DROTM /S/I/ /	SMVX /S/M/ /	VIPRFF /S/I/ /
DROTMG /S/I/ /	SNRM2 /S/I/ /	VIPRSS /S/I/ /
DSCAL /S/I/ /	SPBCO /S/L/ /	VIPS /S/M/ /
DSDOT /S/I/ /	SPBFA /S/L/ /	VMULBB /S/I/ /
DSWAP /S/I/ /	SPDCOM /S/M/ /	VMULBF /S/I/ /
EBALAC /S/I/ /	SPOCO /S/L/ /	VMULBS /S/I/ /
EBALAF /S/I/ /	SPOFA /S/L/ /	VMULFB /S/I/ /
ELMHES /S/E/ /	SPPCO /S/L/ /	VMULFF /S/I/ /
ELTRAN /S/E/ /	SPPFA /S/L/ /	VMULFM /S/I/ /
FABSV /S/M/ /	SQRDC /S/L/ /	VMULFP /S/I/ /
FCOMB /S/M/ /	SQRSL /S/L/ /	VMULFQ /S/I/ /
FIGI /S/E/ /	SROT /S/I/ /	VMULFS /S/I/ /
FIGI2 /S/E/ /	SROTG /S/I/ /	VMULQB /S/I/ /
FIP /S/A/ /	SROTM /S/I/ /	VMULQF /S/I/ /
FMMX /S/M/ /	SROTMG /S/I/ /	VMULQQ /S/I/ /
FMTMX /S/M/ /	SSCAL /S/I/ /	VMULQS /S/I/ /
FMTR /S/M/ /	SSICO /S/L/ /	VMULSB /S/I/ /
FMTVCX /S/M/ /	SSIFA /S/L/ /	VMULSF /S/I/ /
FMTVX /S/M/ /	SSPCO /S/L/ /	VMULSQ /S/I/ /
FMVCX /S/M/ /	SSPFA /S/L/ /	VMULSS /S/I/ /
FMVX /S/M/ /	SSVDC /S/L/ /	VNRMFI /S/I/ /
FNORM1 /S/M/ /	SSWAP /S/I/ /	VNRMF1 /S/I/ /
FPUR /S/M/ /	STRCO /S/L/ /	VNRMF2 /S/I/ /
HSSN /S/M/ /	SUBDIA /S/M/ /	VNRMS1 /S/I/ /
HTRIDI /S/E/ /	SUBDIR /S/M/ /	VNRMS2 /S/I/ /
HTRID3 /S/E/ /	SVD /S/A/ /	VPOLYF /S/I/ /
ICAMAX /S/I/ /	SVD /S/E/ /	VTPROF /S/I/ /
IDAMAX /S/I/ /	TRED1 /S/E/ /	VTPROS /S/I/ /
INRPRD /S/M/ /	TRED2 /S/E/ /	VTRAN /S/I/ /
ISAMAX /S/I/ /	TRED3 /S/E/ /	VUABQ /S/I/ /
ITERIN /S/M/ /	TRIDI /S/M/ /	VUAFB /S/I/ /
LEQT1B /S/I/ /	TRI1 /S/A/ /	VUAFQ /S/I/ /
LEQT1C /S/I/ /	TRI2 /S/A/ /	VUAFS /S/I/ /
LEQT2B /S/I/ /	TRI3 /S/A/ /	VUASB /S/I/ /
LEQ1S /S/I/ /	TRI4 /S/A/ /	VUASQ /S/I/ /

F2 EIGENVALUES AND EIGENVECTORS

BAC1	/S/A/ /	EIGRS	/S/I/ /	RECOV1	/S/M/ /
BAC2	/S/A/ /	EIGSYM	/S/M/ /	RECOV2	/S/M/ /
BAKVEC	/S/E/ /	EIGVCH	/S/M/ /	REDSY1	/S/M/ /
BALBAK	/S/E/ /	EIGZC	/S/I/ /	REDSY2	/S/M/ /
BANDV	/S/E/ /	EIGZF	/S/I/ /	REDUC	/S/E/ /
BANEIG	/S/M/ /	EIG5	/S/M/ /	REDUC1	/S/A/ /
BISEC	/S/A/ /	ELMBAK	/S/E/ /	REDUC2	/S/E/ /
BISECT	/S/E/ /	ELRH1C	/S/I/ /	RG	/S/E/ /
BQR	/S/E/ /	ELRH2C	/S/I/ /	RGG	/S/E/ /
CBABK2	/S/E/ /	ELZHC	/S/I/ /	RITZIT	/S/A/ /
CG	/S/E/ /	ELZVC	/S/I/ /	RNQL1	/S/A/ /
CH	/S/E/ /	EQRH1F	/S/I/ /	RS	/S/E/ /
CINVIT	/S/E/ /	EQRH3F	/S/I/ /	RSB	/S/E/ /
COMBAK	/S/E/ /	EQRT1S	/S/I/ /	RSG	/S/E/ /
COMLR	/S/E/ /	EQRT2S	/S/I/ /	RSGAB	/S/E/ /
COMLR2	/S/E/ /	EQRT3S	/S/I/ /	RSGBA	/S/E/ /
COMQR	/S/E/ /	EQZQF	/S/I/ /	RSP	/S/E/ /
COMQR2	/S/E/ /	EQZTF	/S/I/ /	RST	/S/E/ /
CORTB	/S/E/ /	EQZVF	/S/I/ /	RT	/S/E/ /
DEIG	/S/M/ /	HQR	/S/E/ /	SEPAR	/S/M/ /
DTSHFT	/S/M/ /	HQR2	/S/E/ /	SEPAR2	/S/M/ /
EBALAC	/S/I/ /	HTRIBK	/S/E/ /	SIMP	/S/M/ /
EBALAF	/S/I/ /	HTRIB3	/S/E/ /	SYMLR	/S/M/ /
EBBCKC	/S/I/ /	IMQL1	/S/A/ /	SYMQR	/S/M/ /
EBBCKF	/S/I/ /	IMTQLV	/S/E/ /	TCDIAG	/S/M/ /
EHBCKF	/S/I/ /	IMTQL1	/S/E/ /	TINVIT	/S/E/ /
EHBCKH	/S/I/ /	IMTQL2	/S/E/ /	TQLRAT	/S/E/ /
EHESSC	/S/I/ /	INIT	/S/A/ /	TQL1	/S/E/ /
EHESSF	/S/I/ /	INVIT	/S/E/ /	TQL2	/S/E/ /
EHOBKS	/S/I/ /	LATNTR	/S/M/ /	TRBAK1	/S/E/ /
EHOUSH	/S/I/ /	ORTBAK	/S/E/ /	TRBAK3	/S/E/ /
EHOUSS	/S/I/ /	QREIGN	/S/M/ /	TRIDIB	/S/E/ /
EIGBS	/S/I/ /	QZABX	/S/A/ /	TSTURM	/S/E/ /
EIGCC	/S/I/ /	QZVAL	/S/E/ /	VALVEC	/S/M/ /
EIGCH	/S/I/ /	QZVEC	/S/E/ /	VARAH1	/S/N/*/
EIGCHK	/S/M/ /	RATQR	/S/E/ /	VARAH2	/S/N/*/
EIGCO1	/S/M/ /	REBAK	/S/E/ /	VECTOR	/S/M/ /
EIGIMP	/S/M/ /	REBAKA	/S/A/ /		
EIGRF	/S/I/ /	REBAKB	/S/E/ /		

F3 DETERMINANTS

BPDSOM	/S/M/ /	LITWNE	/S/M/ /	SPITRM	/S/M/ /
DETERM	/S/M/ /	LITWNP	/S/M/ /	SPITRS	/S/M/ /
GAUSS	/S/N/N/	MATINS	/S/N/N/	SPODI	/S/L/ /
LESWNE	/S/M/ /	PDITRM	/S/M/ /	SPPDI	/S/L/ /
LESWNP	/S/M/ /	PDITRS	/S/M/ /	SSIDI	/S/L/ /
LINSYS	/S/M/ /	SGBDI	/S/L/ /	SSPDI	/S/L/ /
LINV3F	/S/I/ /	SGEDI	/S/L/ /	STRDI	/S/L/ /
LINV3P	/S/I/ /	SPBDI	/S/L/ /		

F4 SIMULTANEOUS LINEAR EQUATIONS

BFBANP /S/M/ /
BFBSUM /S/M/ /
BITERM /S/M/ /
BITRFM /S/M/ /
BITRNP /S/M/ /
BITRPD /S/M/ /
BITWNP /S/M/ /
BLESOM /S/M/ /
BLSWNP /S/M/ /
BMAM /S/N/*/
BPDITM /S/M/ /
BPDSFB /S/M/ /
BPDSOM /S/M/ /
BSUBHT /S/M/ /
CCONGR /S/M/ /
CFBSUM /S/M/ /
CGAUSS /S/N/N/
CGITRF /S/M/ /
CGLESM /S/M/ /
CITERF /S/M/ /
CMPINV /S/N/N/
FBSUBM /S/M/ /
FBSUBS /S/M/ /
FCGM2 /S/M/ /
GAUSS /S/N/N/
GITRFM /S/M/ /
GITRFS /S/M/ /
GLESOM /S/M/ /
GLESOS /S/M/ /
IMPR1 /S/A/ /
IMPR2 /S/A/ /
INVERS /S/M/ /
INVITR /S/M/ /
ITERFM /S/M/ /
ITERFS /S/M/ /
ITRPDM /S/M/ /
ITRPDS /S/M/ /
ITRSPM /S/M/ /
ITRSPS /S/M/ /
LEQS1 /S/A/ /
LEQS2 /S/A/ /
LEQS3 /S/A/ /
LEQS4 /S/A/ /
LEQS5 /S/A/ /
LEQS6 /S/A/ /
LEQT1B /S/I/ /
LEQT1C /S/I/ /
LEQT1F /S/I/ /
LEQT1P /S/I/ /
LEQT2B /S/I/ /
LEQT2F /S/I/ /
LEQT2P /S/I/ /
LEQ1PB /S/I/ /
LEQ1S /S/I/ /
LEQ2C /S/I/ /
LEQ2PB /S/I/ /
LEQ2S /S/I/ /
LESWNE /S/M/ /
LESWNP /S/M/ /
LGINF /S/I/ /
LINSYS /S/M/ /
LINV1F /S/I/ /
LINV1P /S/I/ /
LINV2F /S/I/ /
LINV2P /S/I/ /
LINV3F /S/I/ /
LINV3P /S/I/ /
LIN1PB /S/I/ /
LIN2PB /S/I/ /
LITWNE /S/M/ /
LITWNP /S/M/ /
LLBQF /S/I/ /
LLSQF /S/I/ /
LSQHTM /S/M/ /
LSQHTS /S/M/ /
LSQSIT /S/M/ /
LSVDB /S/I/ /
LSVDF /S/I/ /
LUDAPB /S/I/ /
LUDATF /S/I/ /
LUDECP /S/I/ /
LUELMF /S/I/ /
LUELMP /S/I/ /
LUELPB /S/I/ /
LUREFF /S/I/ /
LUREFP /S/I/ /
LUREPB /S/I/ /
MAM /S/N/*/
MAM200 /S/N/*/
MATINS /S/N/N/
OFIMA3 /S/I/ /
ORIMP /S/A/ /
ORSOL /S/A/ /
PDITRM /S/M/ /
PDITRS /S/M/ /
PDLSOM /S/M/ /
PDLSOS /S/M/ /
PDSFBM /S/M/ /
PDSFBS /S/M/ /
QR1 /S/M/ /
RQNWT /S/M/ /
SCONG /S/M/ /
SGBSL /S/L/ /
SGEDI /S/L/ /
SGESL /S/L/ /
SGTSL /S/L/ /
SPBSL /S/L/ /
SPDFBM /S/M/ /
SPDFBS /S/M/ /
SPDSOM /S/M/ /
SPDSOS /S/M/ /
SPITRM /S/M/ /
SPITRS /S/M/ /
SPODI /S/L/ /
SPOSL /S/L/ /
SPPDI /S/L/ /
SPPSL /S/L/ /
SPTSL /S/L/ /
SQRDC /S/L/ /
SSIDI /S/L/ /
SSISL /S/L/ /
SSPDI /S/L/ /
SSPSL /S/L/ /
STRDI /S/L/ /
STRSL /S/L/ /
TRDCNP /S/M/ /
TRDCOM /S/M/ /
TRDFBM /S/M/ /
TRDSOM /S/M/ /
TRDSUB /S/M/ /
TRDWNP /S/M/ /
TRILOM /S/M/ /
TRILOS /S/M/ /
TRIUPM /S/M/ /
TRIUPS /S/M/ /
TRLOIN /S/M/ /
TRUPIN /S/M/ /

G0 STATISTICAL ANALYSIS AND PROBABILITY

```
BMD01S /M/B/ /      BMD12S /M/B/ /      USLEAP /S/I/ /
BMD03S /M/B/ /      BMD13S /M/B/ /      USTREE /S/I/ /
BMD09S /M/B/ /      BMD14S /M/B/ /      ZRMN   /S/M/ /
BMD10S /M/B/ /      EDIT   /D/S/ /
BMD11S /M/B/ /      OMNITAB/M/ /R/
```

G1 DATA REDUCTION (COMMON STATISTICAL PARAMETERS)

```
AGGREGA/D/S/ /      BMDP1D /M/C/ /      FILTER /S/M/ /
AGLMOD /S/I/ /      BMDP2D /M/C/ /      FREQUEN/D/S/ /
AMEANS /S/I/ /      BMDP3D /M/C/ /      GTMNT  /S/I/ /
AORDR  /S/I/ /      BMDP4D /M/C/ /      MULT RE/D/S/ /
BDCOU1 /S/I/ /      BMDP5D /M/C/ /      OP1RAY /S/M/ /
BDCOU2 /S/I/ /      BMDP6D /M/C/ /      OP2RAY /S/M/ /
BDLTV  /S/I/ /      BMDP7D /M/C/ /      REPORT /D/S/ /
BECOR  /S/I/ /      BMDP8D /M/C/ /      SSPAND /S/I/ /
BECORI /S/I/ /      BMDP9D /M/C/ /      SSPBLK /S/I/ /
BECOVM /S/I/ /      BMD01D /M/B/ /      SSRAND /S/I/ /
BECVL  /S/I/ /      BMD04D /M/B/ /      SSRBLK /S/I/ /
BECVLI /S/I/ /      BMD05D /M/B/ /      SSSAND /S/I/ /
BEGRPS /S/I/ /      BMD06D /M/B/ /      SSSBLK /S/I/ /
BEIGRP /S/I/ /      BMD07D /M/B/ /      SSSCAN /S/I/ /
BEIUGR /S/I/ /      BMD10D /M/B/ /      SSSEST /S/I/ /
BELBIN /S/I/ /      BMD11D /M/B/ /      STUTEE /S/N/*/
BELPOS /S/I/ /      BMD13D /M/B/ /      T-TEST /D/S/ /
BEMDP  /S/I/ /      BREAKDO/D/S/ /      USBOX  /S/I/ /
BEMIRI /S/I/ /      CONDESC/D/S/ /      USHIST /S/I/ /
BEMIRO /S/I/ /      DLETE  /S/M/ /      USHIUT /S/I/ /
BEMMI  /S/I/ /      DSCRPT /S/M/ /      USHV1  /S/I/ /
BEMMO  /S/I/ /      DSCRP2 /S/M/ /
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G2 CORRELATION AND REGRESSION ANALYSIS

```
BECTR  /S/I/ /      CBNRHO /S/I/ /      RLFOTH /S/I/ /
BEMIRI /S/I/ /      CORCOV /S/M/ /      RLFOTW /S/I/ /
BEMIRO /S/I/ /      G3SLS  /D/S/ /      RLGQMI /S/I/ /
BESRB  /S/I/ /      LSQHTM /S/M/ /      RLGQMO /S/I/ /
BESRN  /S/I/ /      LSQHTS /S/M/ /      RLINCF /S/I/ /
BMDP1R /M/C/ /      LSQSIT /S/M/ /      RLINPF /S/I/ /
BMDP2R /M/C/ /      NONLINE/D/S/ /      RLLAV  /S/I/ /
BMDP3R /M/C/ /      NONPAR /D/S/ /      RLLMV  /S/I/ /
BMDP4R /M/C/ /      OFRESI /S/I/ /      RLMUL  /S/I/ /
BMDP5R /M/C/ /      PARTIAL/D/S/ /      RLONE  /S/I/ /
BMDP6R /M/C/ /      PEARSON/D/S/ /      RLOPDC /S/I/ /
BMD01R /M/B/ /      PLOT   /D/S/ /      RLPOL  /S/I/ /
BMD02D /M/B/ /      REGRESS/D/S/ /      RLPRDI /S/I/ /
BMD02R /M/B/ /      RLCOMP /S/I/ /      RLPRDO /S/I/ /
BMD03D /M/B/ /      RLDCQM /S/I/ /      RLRES  /S/I/ /
BMD03R /M/B/ /      RLDCVA /S/I/ /      RLSEP  /S/I/ /
BMD04R /M/B/ /      RLDCW  /S/I/ /      RLSTP  /S/I/ /
BMD05R /M/B/ /      RLDOPM /S/I/ /      RSMITZ /S/I/ /
BMD06R /M/B/ /      RLEAP  /S/I/ /      SCATTER/D/S/ /
BMD07R /M/B/ /      RLFITI /S/I/ /      TETRACH/D/S/ /
BMD09M /M/B/ /      RLFITO /S/I/ /
BMD12D /M/B/ /      RLFOR  /S/I/ /
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G3 SEQUENTIAL ANALYSIS

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SURVIVA/D/S/ /
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G4 ANALYSIS OF VARIANCE

ABIBN /S/I/ /
ACRDAN /S/I/ /
ACTRST /S/I/ /
AFACN /S/I/ /
AFACT /S/I/ /
AGBACP /S/I/ /
AGLMOD /S/I/ /
AGVACL /S/I/ /
AGXPM /S/I/ /
ALSQAN /S/I/ /
AMEANS /S/I/ /
ANCOV1 /S/I/ /
ANESTE /S/I/ /
ANESTU /S/I/ /
ANOVA /D/S/ /
ANOVA1 /S/N/*/
ANOVA2 /S/N/*/
AORDR /S/I/ /
ARCBAN /S/I/ /
ASNKMC /S/I/ /
BMDP1V /M/C/ /
BMDP2V /M/C/ /
BMDP7D /M/C/ /
BMD01V /M/B/ /
BMD02V /M/B/ /
BMD03V /M/B/ /
BMD04V /M/B/ /
BMD05V /M/B/ /
BMD06V /M/B/ /
BMD07V /M/B/ /
BMD08V /M/B/ /
BMD09V /M/B/ /
BMD10V /M/B/ /
BMD11V /M/B/ /
BMD12V /M/B/ /
BRTLTT /S/M/ /
MANOVA /D/S/ /
NOVACOM/M/ /R/
ONEWAY /D/S/ /

G5 TIME SERIES

BMD01T /M/B/ /
BMD02T /M/B/ /
BMD03T /M/B/ /
BMD04T /M/B/ /
BMD05T /M/B/ /
FFTCC /S/I/ /
FFTRC /S/I/ /
FFTSC /S/I/ /
FFT2C /S/I/ /
FFT3D /S/I/ /
FTARPS /S/I/ /
FTAUTO /S/I/ /
FTCAST /S/I/ /
FTCMP /S/I/ /
FTCROS /S/I/ /
FTCRXY /S/I/ /
FTFPS /S/I/ /
FTFREQ /S/I/ /
FTGEN /S/I/ /
FTKALM /S/I/ /
FTMPS /S/I/ /
FTMXL /S/I/ /
FTRDIF /S/I/ /
FTTRN /S/I/ /
FTWEIN /S/I/ /
FTWENM /S/I/ /
FTWENX /S/I/ /
HARM /S/M/ /
SPECTRA/D/S/ /

G6 SPECIAL FUNCTIONS (INCLUDES RANDOM NUMBERS AND PDF'S)

BETAR /S/M/ /
BMDP1S /M/C/ /
BOXJENK/M/ /R/
CHIDST /S/M/ /
CHIPRB /S/M/ /
CHIRAB /S/M/ /
CHIRUD /S/M/ /
CHSQO /S/M/ /
CONRAY /S/M/ /
EXRAND /S/M/ /
GFIT /S/I/ /
GGAMR /S/I/ /
GGBN /S/I/ /
GGBNR /S/I/ /
GGBTR /S/I/ /
GGCAY /S/I/ /
GGCHS /S/I/ /
GGDA /S/I/ /
GGDT /S/I/ /
GGEOT /S/I/ /
GGEXN /S/I/ /
GGEXT /S/I/ /
GGHPR /S/I/ /
GGMAR /S/I/ /
GGMTN /S/I/ /
GGNLG /S/I/ /
GGNML /S/I/ /
GGNPM /S/I/ /
GGNQF /S/I/ /
GTPBC /S/I/ /
GTPKP /S/I/ /
GTPL /S/I/ /
GTPOK /S/I/ /
GTPR /S/I/ /
GTPST /S/I/ /
GTRN /S/I/ /
GTRTN /S/I/ /
GTTRT /S/I/ /
GTTT /S/I/ /
IAOC /S/N/N/
IDAYWEK/S/N/N/
IRAND /S/M/ /
MDBETA /S/I/ /
MDBETI /S/I/ /
MDBIN /S/I/ /
MDBNOR /S/I/ /
MDCH /S/I/ /
MDCHI /S/I/ /
MDCHN /S/I/ /
MDFD /S/I/ /
MDFDRE /S/I/ /
MDFI /S/I/ /
MDGAM /S/I/ /
MDGC /S/I/ /
MDGCI /S/I/ /
MDHYP /S/I/ /
MDNOR /S/I/ /
MDNRIS /S/I/ /
PBINOM /S/M/ /
PCHY /S/M/ /
PFDIST /S/M/ /
PGEOM /S/M/ /
PGMMA /S/M/ /
PHYPGE /S/M/ /
PIBETA /S/M/ /
PIBIN /S/M/ /
PICHI /S/M/ /
PICHY /S/M/ /
PIEXP /S/M/ /
PIFDIS /S/M/ /
PIGAMA /S/M/ /
PIGEO /S/M/ /
PIHYPG /S/M/ /
PILGNM /S/M/ /
PINCH /S/M/ /
PINORM /S/M/ /
PIPOIS /S/M/ /
PIRAYL /S/M/ /
PIS /S/M/ /
PIT /S/M/ /
PITRNM /S/M/ /
PIUNF /S/M/ /
PIUNFD /S/M/ /
PIWEBL /S/M/ /
PLGNRM /S/M/ /
PNBIN /S/M/ /
PNORM /S/M/ /

G6 SPECIAL FUNCTIONS (INCLUDES RANDOM NUMBERS AND PDF'S) (CONTINUED)

GGNSM /S/I/ /	MDSMR /S/I/ /	PORAND /S/M/ /
GGPON /S/I/ /	MDSTI /S/I/ /	PRAYL /S/M/ /
GGPOS /S/I/ /	MDTD /S/I/ /	PRBEXP /S/M/ /
GGSPH /S/I/ /	MDTN /S/I/ /	PRBUNF /S/M/ /
GGSTA /S/I/ /	MDTNF /S/I/ /	PTDIST /S/M/ /
GGTRA /S/I/ /	MDTPS /S/I/ /	PTRNRM /S/M/ /
GGUBFS /S/I/ /	MMPSI /S/I/ /	PUNFD /S/M/ /
GGUBS /S/I/ /	MSMRAT /S/I/ /	PWEBL /S/M/ /
GGUBT /S/I/ /	NDEFT /S/I/ /	RAND /S/M/ /
GGUD /S/I/ /	NDKER /S/I/ /	RANNUM /S/N/*/
GGUW /S/I/ /	NDMPLE /S/I/ /	RUNSAB /S/M/ /
GGVCR /S/I/ /	NONPAR /D/S/ /	RUNSUD /S/M/ /
GGWIB /S/I/ /	NRAND /S/M/ /	URAND /S/M/ /
GTDDU /S/I/ /	NRML /S/M/ /	USPC /S/I/ /
GTD2T /S/I/ /	NRMNO /S/M/ /	USPDF /S/I/ /
GTNOR /S/I/ /	PBETA /S/M/ /	XIRAND /S/M/ /

G7 MULTIVARIATE ANALYSIS AND SCALE STATISTICS

AFACT /S/I/ /	BMD06S /M/B/ /	ODNORM /S/I/ /
BMDP1M /M/C/ /	BMD07M /M/B/ /	OFCOEF /S/I/ /
BMDP2M /M/C/ /	BMD07S /M/B/ /	OFCOMM /S/I/ /
BMDP3M /M/C/ /	BMD08M /M/B/ /	OFHARR /S/I/ /
BMDP4M /M/C/ /	BMD08S /M/B/ /	OFIMAG /S/I/ /
BMDP6M /M/C/ /	BMD09M /M/B/ /	OFPRI /S/I/ /
BMDP7M /M/C/ /	BMD10M /M/B/ /	OFPROT /S/I/ /
BMD01M /M/B/ /	CANCORR/D/S/ /	OFROTA /S/I/ /
BMD02M /M/B/ /	DISCRIM/D/S/ /	OFSCHN /S/I/ /
BMD03M /M/B/ /	FACTOR /D/S/ /	OFSCOR /S/I/ /
BMD04M /M/B/ /	GUTTMAN/D/S/ /	OPRINC /S/I/ /
BMD04S /M/B/ /	JFACTOR/D/S/ /	OTMLNR /S/I/ /
BMD05M /M/B/ /	OCDIS /S/I/ /	RELIABI/D/S/ /
BMD05S /M/B/ /	OCLINK /S/I/ /	
BMD06M /M/B/ /	ODFISH /S/I/ /	

G8 NON-PARAMETRIC METHODS AND STATISTICAL TESTS

BMDP1F /M/C/ /	NBQT /S/I/ /	NMKSF /S/I/ /
BMDP3S /M/C/ /	NBSDL /S/I/ /	NMKTS /S/I/ /
BMD02S /M/B/ /	NBSIGN /S/I/ /	NMRANK /S/I/ /
BMD08D /M/B/ /	NDKER /S/I/ /	NMTIE /S/I/ /
BMD09D /M/B/ /	NDMPLE /S/I/ /	NONPAR /D/S/ /
CROSSTA/D/S/ /	NHEXT /S/I/ /	NPAR /D/S/ /
NAK1 /S/I/ /	NHINC /S/I/ /	NRBHA /S/I/ /
NAWNRP /S/I/ /	NKS1 /S/I/ /	NRWMD /S/I/ /
NAWRPE /S/I/ /	NKS2 /S/I/ /	NRWRST /S/I/ /
NAWRPU /S/I/ /	NMCC /S/I/ /	SUMMARY/D/S/ /
NBCYC /S/I/ /	NMKEN /S/I/ /	

G9 STATISTICAL INFERENCE

AGVACL /S/I/ /	BENSON /S/I/ /	CTRBYC /S/I/ /
ASNKMC /S/I/ /	BEPAT /S/I/ /	GTCN /S/I/ /
BEMNON /S/I/ /	BEPET /S/I/ /	OIND /S/I/ /
BEMSON /S/I/ /	CTPR /S/I/ /	

H1 LINEAR PROGRAMMING

ARRIBA /M/ /R/	ZX3LP /S/I/ /		
ZX0LP /S/I/ /	ZX4LP /S/I/ /		

H3 TRANSPORTATION AND NETWORK CODES

PERTC /M/ /R/	PERTIME/M/ /R/		

H4 SIMULATION MODELING

GPSS /M/ /R/	SIMII5 /M/ /R/		
MIMIC /M/ /R/	SIMI5 /M/ /R/		

I0 INPUT

FASTIN /S/N/*/			

I2 OCTAL

OFMTDE /S/N/N/	OFMTV /S/N/N/		

I3 DECIMAL

CRDTAB /S/N/*/	USRDM /S/I/ /		
USCRDM /S/I/ /	USRDV /S/I/ /		

I4 BCD (HOLLERITH)

ICOM /S/N/*/	ICOMN /S/N/*/	IFMTV /S/N/N/	

I9 COMPOSITE

START /S/M/ /			

J1 BINARY

CV029 /M/U/U/	CV029 /P/P/P/		

J2 OCTAL

PRTFL /S/N/N/			

J3 DECIMAL

USLEAP /S/I/ /	USWBS /S/I/ /	USWFV /S/I/ /	
USWBM /S/I/ /	USWFM /S/I/ /	USWSM /S/I/ /	

J4 BCD (HOLLERITH)

BANNER /M/U/U/	BANR6 /S/N/N/	LINE6 /S/N/N/	
BANNERS/M/U/U/	COMQ /P/P/P/	LINE8 /P/P/P/	
BANNERS/P/P/P/	COPYSF /M/ /R/	LINE8 /S/N/N/	
BANNER3/M/U/U/	ICOM /S/N/*/	PM /P/P/P/	
BANNER6/M/U/U/	ICOMN /S/N/*/	PRTIME /S/N/N/	
BANR /S/N/N/	LINE6 /P/P/P/	REPORT /D/S/ /	

J5 PLOTTING

BMDP5D /M/C/ /	PLOTMY /S/N/*/	USHV1 /S/I/ /	
BMDP6D /M/C/ /	PLOTPR /S/N/N/	USPC /S/I/ /	
BMDP7D /M/C/ /	PLOTXY /S/N/*/	USPDF /S/I/ /	
BMD05D /M/B/ /	SCATTER/D/S/ /	USPLT /S/I/ /	
CALCOMP/S/ /R/	SCCALC /S/ /R/	USSLF /S/I/ /	
CALC3D /P/P/P/	TEKTRNX/S/ /R/	USTREE /S/I/ /	
DISSPLA/S/ /R/	USBOX /S/I/ /	XPLOT /S/M/ /	
HSTGRM /S/M/ /	USHIST /S/I/ /	XYPLOT /S/M/ /	
PLOT /D/S/ /	USHIUT /S/I/ /		

J9 COMPOSITE

HEXDMP /M/U/U/	PRUDMP /M/U/U/	TAPDMP /M/U/U/

K1 EXTERNAL-TO-EXTERNAL

COPYE /M/ /R/	COPYS /P/P/P/	PFTRAN1/P/P/P/
COPYF /M/ /R/	COPYSEL/M/U/U/	PROMNT /M/U/U/
COPYR /M/ /R/	COPYSF /M/ /R/	RECADD1/P/P/P/
COPYRE /M/U/U/	CVT360 /M/ /R/	RECDEL1/P/P/P/
COPYRM /M/ /R/	DOCUMNT/M/U/U/	RECGET1/P/P/P/
COPYS /M/ /R/	PFTRANS/M/ /R/	RECREP1/P/P/P/

K2 INTERNAL-TO-INTERNAL (RELOCATION)

CCOPY /S/I/ /	MFETCH /S/N/N/	SAXPY /S/I/ /
CSWAP /S/I/ /	MOVECM /S/N/N/	SCOPY /S/I/ /
DCOPY /S/I/ /	MOVEIT /S/N/N/	SSWAP /S/I/ /
DSWAP /S/I/ /	MSET /S/N/N/	SWAP /S/N/N/
GETRA /S/N/N/	RCPA /S/N/N/	

K3 DISK

COPYL /M/ /R/	PROS2R /P/P/P/	UPDGET /P/P/P/
COPYLIB/M/U/U/	PRUDMP /M/U/U/	UPDGETS/P/P/P/
COPYLIB/P/P/P/	SELDUMP/P/P/P/	UPDGETT/P/P/P/
COPYN /M/ /R/	TRANPAK/P/P/P/	UPDREPL/P/P/P/
GETOBJ /M/U/U/	UPDADD /P/P/P/	
NEWNAME/M/U/U/	UPDDELE/P/P/P/	

K4 TAPE

AUDPFT /M/U/U/	COPYBFR/M/ /R/	SELLOAD/P/P/P/
B7700S /P/P/P/	COPYBLK/P/P/P/	TAPDMP /M/U/U/
B7700U /P/P/P/	HEXDMP /M/U/U/	

L0 EXECUTIVE ROUTINES

ANYLIB /P/P/P/	LIBPROA/P/P/P/	NOGO /P/P/P/
ANYPRO /P/P/P/	LIBSET1/P/P/P/	PROGRAM/P/P/P/
ANYPROS/P/P/P/	LIBSET2/P/P/P/	SEGLD /P/P/P/
BIGLOAD/P/P/P/	MNSRDC /P/P/P/	S2K260 /P/P/P/
DISPOST/P/P/P/	MYPRO /P/P/P/	UTILITY/P/P/P/
LIBPRO /P/P/P/	MYPROS /P/P/P/	

L2 COMPILING

ALGOL /M/ /R/	PASCAL /M/T/R/	RUNPAS /P/P/P/
BASIC /M/ /R/	PL1 /M/ /R/	RUNSEQ /P/P/P/
COBOL /M/ /R/	RUN /M/ /R/	RUNTS /P/P/P/
FTN /M/ /R/	RUNBAS /P/P/P/	SNOBOL /M/ /R/
FTN5 /M/ /R/	RUNFTN /P/P/P/	
MNF /M/ /*/	RUNMNF /P/P/P/	

L3 MONITORING

COMPASS/M/ /R/

L4 PREPROCESSING

RATFOR /M/ /*/	TIDY /M/ /R/

L7 COMPUTER LANGUAGE TRANSLATORS

F45 /M/ /R/ LCS /M/ /R/

M0 DATA HANDLING

COMPAR /M/U/U/	EQU60 /S/N/N/	SWAP /S/N/N/
COMPSTR/S/N/N/	MASKIT /S/N/N/	

M1 SORTING

ASORT /S/N/N/	QSORT1 /S/N/N/	VARORD /S/M/ /
ASORTMV/S/N/N/	SORT /P/P/P/	VECORD /S/M/ /
AUDIT /P/P/P/	SORTCZ /P/P/P/	VSRTA /S/I/ /
AUDSORT/M/U/U/	SORTMRG/M/ /R/	VSRTM /S/I/ /
BMD14S /M/B/ /	SSORT /S/N/N/	VSRTP /S/I/ /
DEKSORT/M/U/U/	SSORTF /S/N/N/	VSRTR /S/I/ /
HSTGRM /S/M/ /	SSORTI /S/N/N/	VSRTU /S/I/ /
QSORT /S/N/N/	SSORTL /S/N/N/	

M2 CONVERSION AND/OR SCALING

BMD09S /M/B/ /	DATFMT /S/N/N/	MONTH /S/N/N/
BMD12S /M/B/ /	GETHOUR/S/N/N/	NEWDAT /S/N/N/
BMD13S /M/B/ /	HEX3 /S/N/N/	TIDY /M/ /R/
BR2CCL /P/P/P/	IHMS /S/N/N/	UNHEX3 /S/N/N/
CVT360 /M/ /R/	IROMAN /S/N/N/	WEKDAY /S/N/N/
CV029 /M/U/U/	ISEC /S/N/N/	WRITE /M/ /R/
CV029 /P/P/P/	JGDATE /S/N/N/	
DATCNV /S/N/N/	JULIAN /S/N/N/	

M3 MERGING

SORTMRG/M/ /R/

M4 CHARACTER MANIPULATION

ADJL /S/N/N/	GETCHR /S/N/N/	REPLHI /S/N/N/
ADJR /S/N/N/	GETPRM /S/N/*/	REPLLO /S/N/N/
ASCDC /M/U/U/	IBUNP /S/N/N/	REPLNE /S/N/N/
ASHIFT /S/N/N/	IPAKLFT/S/N/N/	SBYT /S/N/N/
CENTER /S/N/N/	ISTAPE /S/N/N/	SEMICO /S/N/N/
CHFILL /S/N/N/	LBYT /S/N/N/	SETREW /S/N/N/
CHNGSEQ/S/N/N/	LEFTADJ/S/N/N/	SHIFTA /S/N/N/
CONTRCT/S/N/N/	MOVCHAR/S/N/N/	SKWEZL /S/N/N/
COPYEXT/M/U/U/	MOVSTR /S/N/N/	SKWEZR /S/N/N/
EXPAND /S/N/N/	MXGET /S/N/N/	TRAILBZ/S/N/N/
EXPRM /S/N/N/	PARGET /S/N/N/	VALDAT /S/N/N/
EXTBIT /S/N/N/	PUTCHA /S/N/N/	VFILL /S/N/N/
EXTPRM /S/N/N/	PUTCHR /S/N/N/	ZBLANK /S/N/N/
FBINRD /S/N/N/	REPLAC /S/N/N/	ZEROFL /S/N/N/
GETCHA /S/N/N/	REPLACM/S/N/N/	ZEROS /S/N/N/

M5 SEARCHING, SEEKING, LOCATING

AMAXE /S/N/N/	GETLIB /S/N/N/	LASTCH /S/N/N/
AMINE /S/N/N/	ICAMAX /S/I/ /	LASTWRD/S/N/N/
FINDC /S/N/N/	IDAMAX /S/I/ /	MAXE /S/N/N/
FINDW /S/N/N/	IDIGIT /S/N/N/	MINE /S/N/N/
FINDWRD/S/N/N/	IFINDCH/S/N/N/	NFILLT /S/N/N/
GETCHA /S/N/N/	ISAMAX /S/I/ /	NUMVAR /S/N/N/
GETCHR /S/N/N/	LASTC /S/N/N/	VALIDT /S/N/N/

M6 REPORT GENERATORS

PR2UP /M/U/U/	QU /M/ /R/	SCORE /M/ /R/

N0 DEBUGGING

ALTIME /S/N/N/	MONERR /S/F/ /	
ELTIME /S/N/N/	PRTIME /S/N/N/	

N2 DUMPING

DMPA /S/N/N/	DUMPCPA/S/N/N/	RECOVRD/S/N/N/
DMPCPA /S/N/N/	DUMPFL /S/N/N/	TAPDMP /M/U/U/
DMPFIL /M/U/U/	HEXDMP /M/U/U/	
DUMPA /S/N/N/	PRUDMP /M/U/U/	

O1 OFF-LINE EQUIPMENT (LISTERS, REPRODUCERS, ETC.)

CARDS /M/U/U/	LIST /P/P/P/	PROALL /P/P/P/
CARDS2 /M/U/U/	LISTCMP/M/U/U/	PRODOC /P/P/P/
COPYEXT/M/U/U/	LISTEOI/M/U/U/	PROLIST/P/P/P/
COPYRE /M/U/U/	LISTN /M/U/U/	PR2UP /M/U/U/
COPYSEL/M/U/U/	LISTZ /M/U/U/	RECDOC /P/P/P/
CV029 /M/U/U/	LIST1 /M/U/U/	TIDBITS/P/P/P/
CV029 /P/P/P/	LIST2 /M/U/U/	UPDDOC /P/P/P/
DOCDATE/P/P/P/	LIST3 /M/U/U/	UPDLIST/P/P/P/
DOCDOC /P/P/P/	LIST4 /M/U/U/	WARNING/S/N/N/
FRAME /M/U/U/	MANUAL /M/U/U/	WRITE /M/ /R/
GETREV /M/U/U/	MANUAL /P/P/P/	
LINERL /M/U/U/	PAGEPRT/M/U/U/	

P0 DIAGNOSTICS (HARDWARE MALFUNCTION)

UERTST /S/I/ /		

Q0 SERVICE OR HOUSEKEEPING, PROGRAMMING AIDS

AC /S/N/N/	GETFIT /S/N/N/	OVLNAME/S/N/N/
ALTIME /S/N/N/	GETLFNS/S/N/N/	PFRC /S/N/N/
AUDIT /P/P/P/	GETLGO /S/N/N/	PRTFL /S/N/N/
AUDPFT /M/U/U/	GETLIB /S/N/N/	PTIM /M/U/U/
BANNER /M/U/U/	GETPROD/P/P/P/	REDUCE /S/N/N/
BANNERS/M/U/U/	GODROP /S/N/N/	ROUTERC/S/N/N/
BANNERS/P/P/P/	HERE /S/N/N/	SEND /P/P/P/
BANNER3/M/U/U/	IBL /S/N/N/	SKPSTAT/S/ / /
BANNER6/M/U/U/	IDID /S/N/N/	S2KRNM /M/U/U/
BANR /S/N/N/	ISITCNF/S/N/N/	TIMLEFT/S/N/N/
BANR6 /S/N/N/	JOBNAME/S/N/N/	UHELP /S/I/ /
BDT /P/P/P/	JOBORG /S/N/N/	UHELP1 /S/I/ /
BUFSIZE/S/N/N/	JOBTIME/M/U/U/	UHELP2 /S/I/ /
CALCIBL/M/U/U/	LINER /M/U/U/	UHELP3 /S/I/ /
CBLFMT /M/U/U/	LINERL /M/U/U/	UHELP4 /S/I/ /
COMQ /P/P/P/	MACHINE/S/ / /	WHATLIB/M/U/U/
DFDATIM/M/U/U/	MEMUSED/S/N/N/	WHATLIB/P/P/P/
EDIT /M/ /R/	MFRAME /S/N/N/	WHICHMF/M/U/U/
ELTIME /S/N/N/	MFX /P/P/P/	WHICHOS/M/U/U/
EOFAD /M/U/U/	NORERUN/P/P/P/	ZPFPUT /S/N/N/
FRAME /M/U/U/	NUMEXEC/S/N/N/	ZRTPUT /S/N/N
FTNRFL /S/N/N/	NUMVAR /S/N/N/	

Q1 CLEAR/RESET

UERSET /S/I/ /	UGETIO /S/I/ /

Q3 FILE MANIPULATION

ANYLIB /P/P/P/	LIBSET1/P/P/P/	SEGLD /P/P/P/
ANYPRO /P/P/P/	LIBSET2/P/P/P/	SKPFIL /S/ / /
ANYPROS/P/P/P/	MNSRDC /P/P/P/	S2K260 /P/P/P/
BIGLOAD/P/P/P/	MYPRO /P/P/P/	UNLOAD /S/N/N/
CLUNLD /S/N/N/	MYPROS /P/P/P/	UPDLIST/P/P/P/
DISPOST/P/P/P/	NOGO /P/P/P/	UTILITY/P/P/P/
EOI /M/U/U/	PROGRAM/P/P/P/	ZPFUNC /S/N/N/
LIBPRO /P/P/P/	REQUEST/S/N/N/	ZSYSEQ /S/N/N/
LIBPROA/P/P/P/	ROUTE /S/N/N/	

Q4 INTERNAL HOUSEKEEPING, SAVE, RESTORE, ETC.

ADDEXT /P/P/P/	PFRSTOR/P/P/P/	PURGEN /P/P/P/
DBUTIL /M/ /R/	PHC /P/P/P/	RENAMAC/P/P/P/
PAC /P/P/P/	PLC /P/P/P/	SELDUMP/P/P/P/
PAHC /P/P/P/	PRTIME /S/N/N/	SELLOAD/P/P/P/
PALC /P/P/P/	PURGALL/P/P/P/	

Q5 REPORT GENERATOR SUBROUTINES

REPORT /D/S/ /

Q6 PROGRAM DOCUMENTATION: FLOW CHARTS, DOCUMENT STANDARDIZATION

DOC /M/U/U/	DOCLIST/P/P/P/	MTDOC /M/U/U/
DOCADD /P/P/P/	DOCREPL/P/P/P/	PFDOC /M/U/U/
DOCDAT /M/U/U/	DOCTAPE/P/P/P/	PGMTAPE/P/P/P/
DOCDELE/P/P/P/	DOCUMNT/M/U/U/	PROGDOC/M/U/U/
DOCFILE/P/P/P/	EXECARD/M/U/U/	PURPOSE/M/U/U/
DOCGET /P/P/P/	LGOTREE/P/P/P/	TAPLIST/M/U/U/
DOCIT /M/U/U/	MANYDOC/M/U/U/	UNDOCIT/M/U/U/

Q7 PROGRAM LIBRARY UTILITIES

BINDEX /M/U/U/	LISTCMP/M/U/U/	SORTUP /M/U/U/
COPYL /M/ /R/	PROADD /P/P/P/	UPDADD /P/P/P/
COPYLIB/P/P/P/	PRODELE/P/P/P/	UPDATE /M/ /R/
COPYN /M/ /R/	PROGET /P/P/P/	UPDDELE/P/P/P/
DECK /M/U/U/	PROHDR /P/P/P/	UPDGET /P/P/P/
DECKLST/M/U/U/	PROMNT /M/U/U/	UPDGETS/P/P/P/
DEKSORT/M/U/U/	PRONAM /P/P/P/	UPDGETT/P/P/P/
EDITLIB/M/ /R/	PROREPL/P/P/P/	UPDREPL/P/P/P/
ITEMIZE/M/ /R/	PROS2R /P/P/P/	
LISTBIN/M/U/U/	REDECK /M/U/U/	

R1 FORMAL LOGIC

COUPLE /S/N/N/

R3 LIST AND STRING PROCESSING

PROSE /M/ /R/	SNOBOL /M/ /R/

R4 TEXT EDITING

EDITOR /M/ /R/	NETED /M/ /*/	RNF /M/ /*/

S0 INFORMATION RETRIEVAL

ACCTRPT/M/ /R/	DOCUMNT/M/U/U/	PURPOSE/M/U/U/
ADPCOST/M/ /R/	EXECARD/M/U/U/	QQ /M/ /R/
AUDIT /P/P/P/	GETREV /M/U/U/	QU /M/ /R/
AUDPFT /M/U/U/	GRIPE /P/P/P/	RIQS /M/ /R/
AUDSORT/M/U/U/	MANUAL /M/U/U/	SHARP /M/ /R/
CCNOTE /P/P/P/	MANYDOC/M/U/U/	S2K260 /M/ /R/
DBUTIL /M/ /R/	MARS /M/ /R/	TAPLIST/M/U/U/
DDL /M/ /R/	PAGEPRT/M/U/U/	VENUS /M/ /R/
DMS170 /M/ /R/	PROGDOC/M/U/U/	VENUS /P/P/P/
DOCDAT /M/U/U/	PROMNT /M/U/U/	

T4 ENGINEERING

ARDCFT /S/N/*/	ECAP /M/ /R/	NASTRAN/M/ /R/
CIVCO /M/ /R/	ELBOW /M/ /R/	STRESS /M/ /R/

T6 MANUFACTURING (NON-DATA) PROCESSING AND PROCESS CONTROL

APT /M/ /R/		

V1 RANDOM NUMBER GENERATORS

EXRAND /S/M/ /	NRMNO /S/M/ /	RNDMIZ /S/N/N/
IRAND /S/M/ /	PORAND /S/M/ /	URAND /S/M/ /
NRAND /S/M/ /	RAND /S/M/ /	XIRAND /S/M/ /
NRML /S/M/ /	RANNUM /S/N/*/	

X5 ANALYSIS (TIME-SERIES ANALYSIS)

BOXJENK/M/ /R/	SPECTRA/D/S/ /	SURVIVA/D/S/ /

Z0 ALL OTHERS

PASCLIB/S/T/R/	PTOOLS /M/T/R/	SSP /S/ /R/

***** PROGRAMS *****

THE COMPUTER CENTER CURRENTLY MAINTAINS FOUR LIBRARIES OF MAIN PROGRAMS IN ABSOLUTE FORM:

1) BIMED - SOME OF THE BMD BIOMEDICAL STATISTICAL PROGRAMS
2) BIMEDP - SOME OF THE BMDP BIOMEDICAL STATISTICAL PROGRAMS
3) MNSRDC - LOCALLY WRITTEN AND/OR SUPPORTED SCIENTIFIC PROGRAMS
4) UTILITY - LOCALLY WRITTEN AND/OR SUPPORTED UTILITIES

THERE ARE ALSO SOME MAIN PROGRAMS, INCLUDING SPSS AND CVT360, WHICH ARE MAINTAINED IN SEPARATE FILES.

*** BIMED ***

THE FOLLOWING IS A LIST OF THE UCLA BIOMEDICAL STATISTICAL PROGRAMS. THOSE WITH AN ASTERISK (*) ARE AVAILABLE IN LIBRARY 'BIMED'. SOME OF THE OTHERS MAY BE ADDED IF REQUESTED.

REFERENCE: "BMD BIOMEDICAL COMPUTER PROGRAMS", W. J. DIXON, EDITOR, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, 1973.

BMD01D		SIMPLE DATA DESCRIPTION
BMD02D		CORRELATION WITH TRANSGENERATION
BMD03D	*	CORRELATION WITH ITEM DELETION
BMD04D		ALPHANUMERIC FREQUENCY COUNT
BMD05D	*	GENERAL PLOT INCLUDING HISTOGRAM
BMD06D		DESCRIPTION OF STRATA
BMD07D		DESCRIPTION OF STRATA WITH HISTOGRAMS
BMD08D		CROSS-TABULATION WITH VARIABLE STACKING
BMD09D		CROSS-TABULATION, INCOMPLETE DATA
BMD10D		DATA PATTERNS FOR DICHOTOMIES
BMD11D		DATA PATTERNS FOR POLYCHOTOMIES
BMD12D		ASYMMETRIC CORRELATION WITH MISSING DATA
BMD13D		T PROGRAM
BMD01M		PRINCIPAL COMPONENT ANALYSIS
BMD02M		REGRESSION ON PRINCIPAL COMPONENTS
BMD03M		FACTOR ANALYSIS
BMD04M		DISCRIMINANT ANALYSIS FOR TWO GROUPS
BMD05M	*	DISCRIMINANT ANALYSIS FOR SEVERAL GROUPS
BMD06M		CANONICAL ANALYSIS
BMD07M		STEPWISE DISCRIMINANT ANALYSIS
BMD08M		FACTOR ANALYSIS
BMD09M		CANONICAL CORRELATION ANALYSIS
BMD10M		IDENTIFICATION OF OUTLIERS

BMD01R		SIMPLE LINEAR REGRESSION
BMD02R		STEPWISE REGRESSION
BMD03R	*	MULTIPLE REGRESSION WITH CASE COMBINATIONS
BMD04R	*	PERIODIC REGRESSION AND HARMONIC ANALYSIS
BMD05R	*	POLYNOMIAL REGRESSION
BMD06R		ASYMPTOTIC REGRESSION
BMD07R	*	NON-LINEAR LEAST SQUARES
BMD01S		LIFE TABLE AND SURVIVAL RATE
BMD02S		CONTINGENCY TABLE ANALYSIS
BMD03S		BIOLOGICAL ASSAY: PROBIT ANALYSIS
BMD04S		GUTTMAN SCALE PREPROCESSOR
BMD05S		GUTTMAN SCALE # 1
BMD06S		GUTTMAN SCALE # 2, PART 1
BMD07S		GUTTMAN SCALE # 2, PART 2
BMD08S		GUTTMAN SCALE # 2, PART 3
BMD09S		TRANSGENERATION
BMD10S		TRANSPOSITION OF LARGE MATRICES
BMD11S		LIFE TABLE AND SURVIVAL RATE (NO. 2)
BMD12S		OPEN-ENDED TRANSGENERATION
BMD13S		MULTIPASS TRANSGENERATION
BMD14S		GENERALIZED SORTING ROUTINE
BMD01T		AMPLITUDE AND PHASE ANALYSIS
BMD02T		AUTOCOVARIANCE AND POWER SPECTRAL ANALYSIS
BMD03T		TIME SERIES SPECTRUM ESTIMATION
BMD04T		MULTIPLE TIME SERIES SPECTRAL ANALYSIS
BMD05T		TIME-LOCKED AVERAGING
BMD01V		ANALYSIS OF VARIANCE FOR ONE-WAY DESIGN
BMD02V		ANALYSIS OF VARIANCE FOR FACTORIAL DESIGN
BMD03V		ANALYSIS OF COVARIANCE FOR FACTORIAL DESIGN
BMD04V		ANALYSIS OF COVARIANCE WITH MULTIPLE COVARIATES
BMD05V		GENERAL LINEAR HYPOTHESIS
BMD06V		GENERAL LINEAR HYPOTHESIS WITH CONTRASTS
BMD07V		MULTIPLE RANGE TESTS
BMD08V		ANALYSIS OF VARIANCE
BMD09V		ANALYSIS OF COVARIANCE
BMD10V		GENERAL LINEAR HYPOTHESIS (NO. 2)
BMD11V		MULTIVARIATE GENERAL LINEAR HYPOTHESIS
BMD12V	*	MULTIVARIATE ANALYSIS OF VARIANCE AND COVARIANCE

*** BIMEDP ***

THE FOLLOWING IS A LIST OF THE UCLA BIOMEDICAL STATISTICAL PROGRAMS (P-SERIES). ALL ARE AVAILABLE IN LIBRARY 'BIMEDP'.

REFERENCE: "BMDP BIOMEDICAL COMPUTER PROGRAMS", W. J. DIXON, EDITOR, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, 1975.
-OR-
"BMDP-77 BIOMEDICAL COMPUTER PROGRAMS P-SERIES",W. J. DIXON, EDITOR, UNIVERSITY OF CALIFORNIA PRESS, BERKELEY, 1975.

BMDP1D	SIMPLE DATA DESCRIPTION
BMDP2D	FREQUENCY COUNT ROUTINE
BMDP3D	T TEST AND T-SQUARED ROUTINE
BMDP4D	ALPHANUMERIC FREQUENCY COUNT ROUTINE
BMDP5D	UNIVARIATE PLOTTING
BMDP6D	BIVARIATE PLOTTING
BMDP7D	DESCRIPTION OF STRATA WITH HISTOGRAMS AND ANALYSIS OF VARIANCE
BMDP8D	MISSING VALUE CORRELATION
BMDP9D	MULTIDIMENSIONAL DATA DESCRIPTION
BMDP1F	TWO-WAY CONTINGENCY TABLES
BMDP1M	CLUSTER ANALYSIS ON VARIABLES
BMDP2M	CLUSTER ANALYSIS ON CASES
BMDP3M	BLOCK CLUSTERING
BMDP4M	FACTOR ANALYSIS
BMDP6M	CANONICAL CORRELATION ANALYSIS
BMDP7M	STEPWISE DISCRIMINANT ANALYSIS
BMDP1R	MULTIPLE LINEAR REGRESSION
BMDP2R	STEPWISE REGRESSION
BMDP3R	NONLINEAR REGRESSION
BMDP4R	REGRESSION ON PRINCIPAL COMPONENTS
BMDP5R	POLYNOMIAL REGRESSION
BMDP6R	PARTIAL CORRELATION AND MULTIVARIATE REGRESSION
BMDP1S	MULTIPASS TRANSFORMATION
BMDP3S	NONPARAMETRIC STATISTICS
BMDP1V	ONE-WAY ANALYSIS OF VARIANCE AND COVARIANCE
BMDP2V	ANALYSIS OF VARIANCE AND COVARIANCE, INCLUDING REPEATED MEASURES

*** MNSRDC ***

THE COMPUTER CENTER MAINTAINS SOME LOCALLY WRITTEN AND/OR SUPPORTED SCIENTIFIC PROGRAMS IN THE PUBLIC ACCESS LIBRARY CALLED 'MNSRDC'. PROGRAMS IN THE LIBRARY MAY BE EXECUTED IN ONE OF THE FOLLOWING WAYS:

A) ATTACH,MNSRDC.
LIBRARY,MNSRDC. OR LDSET,LIB=MNSRDC.
PROG,<PARAMETERS>. WHERE PROG IS THE DESIRED PROGRAM

B) BEGIN,MNSRDC,,PROG,<PARAMETERS>.

REFERENCE: CLIB/M. BECAUSE THERE ONLY TWO ROUTINES IN MNSRDC, ONLY A COMPUTER COPY OF THE MANUAL IS AVAILABLE. WHEN THERE IS A SUFFICIENT NUMBER OF ROUTINES IN MNSRDC, CLIB/M WILL BE PUBLISHED FORMALLY. ADDITIONS TO THE LIBRARY ARE WELCOME.

LIBRARY 'MNSRDC' CONTAINS THE FOLLOWING PROGRAMS:

PLRG POLYNOMIAL REGRESSION (IBM SSP SAMPLE PROGRAM MODIFIED)

POLYMUL ROOTS OF A POLYNOMIAL WITH COMPLEX COEFFICIENTS BY MULLER'S METHOD

*** SPSS ***

STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (SPSS) IS AN OPEN-ENDED INTEGRATED SYSTEM OF STATISTICAL PROGRAMS EMBEDDED IN A SINGLE CONTROL PROGRAM. THE CDC 6000 VERSION WAS OBTAINED FROM NORTHWESTERN UNIVERSITY AND IS MAINTAINED BY ONE OF OUR CUSTOMERS (THE CONSTRUCTION ENGINEERING RESEARCH LABORATORY (CERL), COMPUTER SERVICES BRANCH). SPSS IS A BATCH SYSTEM WRITTEN MOSTLY IN FORTRAN. THIS PACKAGE (VERSION 8) IS MORE VERSATILE THAN THE BIMED ROUTINES (PAGE 2-1), SINCE MANY DIFFERENT STATISTICS CAN BE PERFORMED ON THE SAME DATA IN ONE RUN.

REFERENCES: "SPSS, SECOND EDITION", NIE, HULL, JENKINS, STEINBRENNER AND BENT, MCGRAW-HILL, 1975.

"SPSS PRIMER", KLECKA, NIE AND HULL, MCGRAW-HILL, 1975.

"SPSS UPDATE", HULL, NIE, MCGRAW-HILL, INC., 1979.

THE FOLLOWING DOCUMENTS MAY BE PRINTED:

BEGIN,DOCGET,,SPSS,,ALL,OUTPUT.	VERSION 8/7 DIFFS (13 PAGES)
BEGIN,DOCGET,,SPSSV8,,ALL,OUTPUT.	MCGRAW-HILL UPDATE (67 PAGES)

'SPSS' CONTAINS THE FOLLOWING DATA-CARD-CALLABLE PROCEDURES:

AGGREGATE	DESCRIPTIVE GROUP STATISTICS FOR SPECIFIED VARIABLES WRITTEN TO RAW OUTPUT FILE
ANOVA	ONE- TO FIVE-WAY ANALYSIS OF VARIANCE AND COVARIANCE FOR FACTORIAL DESIGNS
BREAKDOWN	DESCRIPTIVE STATISTICS ON SUBGROUPS
CANCORR	CANONICAL CORRELATION ANALYSIS AND TESTS OF STATISTICAL SIGNIFICANCE
CONDESCRIPTIVE	DESCRIPTIVE STATISTICS FOR CONTINUOUS (UNGROUPED) VARIABLES
CROSSTABS	2-WAY TO N-WAY JOINT FREQUENCY DISTRIBUTION, CONTINGENCY TABLES AND RELATED MEASURES OF ASSOCIATION
DISCRIMINANT	MULTIPLE DISCRIMINANT ANALYSIS IN STEPWISE OR DIRECT MODE
FACTOR	FACTOR ANALYSIS BY ONE OF FIVE DIFFERENT METHODS
FREQUENCIES	ONE-WAY FREQUENCY DISTRIBUTIONS WITH DESCRIPTIVE STATISTICS
GUTTMAN	UP TO 50 SEPARATE GUTTMAN SCALES BY VARIANT OF GOOD ENOUGH TECHNIQUE

G3SLS	GENERALIZED AND 3-STAGE LEAST SQUARES ESTIMATES OF THE PARAMETERS OF A SYSTEM OF SIMULTANEOUS STOCHASTIC EQUATIONS
JFACTOR	JORESKOG FACTOR ANALYSIS FOR GENERALIZED LEAST SQUARES, MAXIMUM LIKELIHOOD, AND UNWEIGHTED LEAST SQUARES
MANOVA	MULTIVARIATE ANALYSIS OF VARIANCE AND COVARIANCE WITH UNEQUAL CELL FREQUENCIES
MULT RESPONSE	FREQUENCY AND CROSSTABULATION TABLES FOR MULTIPLE RESPONSE VARIABLES
NONLINEAR	NONLINEAR REGRESSION BY MINIMIZING SUMS OF SQUARES
NONPAR CORR	SPEARMAN AND/OR KENDALL RANK-ORDER CORRELATION COEFFICIENTS AND LEVEL OF SIGNIFICANCE
NPAR TESTS	13 NONPARAMETRIC STATISTICAL TESTS
ONEWAY	ONE-WAY ANALYSIS OF VARIANCE WITH RANGE TESTS
PARTIAL CORR	UP TO 25 SETS OF PARTIAL CORRELATIONS OF ANY ORDER OR COMBINATION - LEAST SQUARES REGRESSION IN MULTIPLE OR STEPWISE MODE
PEARSON CORR	PEARSON PRODUCT-MOMENT (ZERO-LEVEL) CORRELATION COEFFICIENTS AND LEVEL OF SIGNIFICANCE
PLOT	BIVARIATE PLOTS FOR CALCOMP
REGRESSION	MULTIPLE REGRESSION ANALYSIS BY FORWARD INCLUSION, BACKWARD ELIMINATION OR STEPWISE SOLUTION METHOD
RELIABILITY	COEFFICIENTS OF RELIABILITY AND OTHER SUMMARY STATISTICS FOR EVALUATING MULTIPLE ITEM SCALES
REPORT	FLEXIBLE REPORT GENERATOR WITH SUMMARY AND COMPOSITE STATISTICS
SCATTERGRAM	SCATTER DIAGRAM OF DATA POINTS AND SIMPLE REGRESSION
SPECTRAL	SPECTRAL ANALYSIS USING FOURIER METHODS TO REPRESENT A TIME SERIES
SUMMARY TABLES	TABLES (PERCENTAGES AND OPTIONAL CELL COUNTS) WHICH SUMMARIZE RELATIONSHIPS BETWEEN INDEPENDENT VARIABLE AND A NUMBER OF DICHOTOMOUS DEPENDENT VARIABLES
SURVIVAL	SURVIVAL ANALYSIS AND LIFE EXPECTANCIES - EVALUATE TIME INTERVAL BETWEEN STARTING AND TERMINAL EVENTS
TETRACHORIC	TETRACHORIC CORRELATION COEFFICIENTS BETWEEN DICHOTOMOUS VARIABLES
T-TEST	STUDENT'S T AND PROBABILITY LEVELS TESTS ON SAMPLE MEANS

<RESERVED FOR FUTURE EXPANSION OF SPSS>

*** UTILITY ***

THE COMPUTER CENTER MAINTAINS SOME LOCALLY WRITTEN AND/OR SUPPORTED UTILITIES IN THE PUBLIC ACCESS LIBRARY CALLED 'UTILITY'. PROGRAMS IN THIS LIBRARY MAY BE EXECUTED IN ONE OF THE FOLLOWING WAYS:

A) ATTACH,UTILITY.
LIBRARY,UTILITY. OR LDSET,LIB=UTILITY.
PROG,<PARAMETERS>. WHERE PROG IS THE DESIRED PROGRAM

B) BEGIN,UTILITY,,PROG,<PARAMETERS>.

REFERENCES: ALL OF THESE PROGRAMS ARE DOCUMENTED IN CLIB/U, WHICH MAY BE OBTAINED FROM USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCGET' (SEE PAGE 1-2).

LIBRARY 'UTILITY' CONTAINS THE FOLLOWING PROGRAMS:

ASCDC	CONVERT 7-BIT ASCII FILE TO 6-BIT CDC AND VICE VERSA
AUDPFT	PRODUCE MINI-AUDIT OF USER PFDUMP TAPES CREATED BY SELDUMP OR PRIVATE PACK PFDUMP
AUDSORT	SORT OUTPUT FROM USER AUDIT
BANNER	PRINT A BANNER (PAGE)
BANNERS	PRINT 1 TO 8 BANNERS ON ONE PAGE
BANNER3	PRINT 3 BANNERS ON ONE PAGE (LETTERS ARE 10 LINES HIGH)
BANNER6	PRINT 1-6 BANNERS ON ONE PAGE (LETTERS ARE 6 LINES HIGH)
BINDEX	GIVE LIST AND SORTED LIST OF OUTPUT OF EDITLIB 'LISTLIB' AND 'CONTENT' DIRECTIVES
CALCIBL	CALCULATE BEST BLOCK LENGTHS (I.E., MINIMUM TIME REQUIRED FOR RANDOM ACCESS AND MINIMUM BUFFER SIZE) FOR INDEX SEQUENTIAL FILE
CARDS	REPRODUCE A BCD DECK WITH MODIFICATONS. (FIELDS MAY BE MOVED, DELETED, INTERCHANGED, GANG PUNCHED AND/OR SEQUENCED)
CARDS2	REPRODUCE A BCD DECK WITH MODIFICATIONS. (FIELDS MAY BE COPIED, MOVED, DELETED, INTERCHANGED, GANG PUNCHED AND/OR SEQUENCED.)
CBLFMT	REFORMAT A COBOL SOURCE PROGRAM TO ENHANCE ITS READABILITY, THEREBY MAKING IT EASIER TO UNDERSTAND AND MODIFY
COMPAR	COMPARE TWO TEXT FILES AND REPORT ANY DIFFERENCES

COPYEXT	COPY UNIT RECORDS (ZERO BYTE TERMINATED) EXTRACTING SPECIFIED COLUMNS AND OPTIONALLY MOVING THEM AND OPTIONALLY ADD EDITOR SEQUENCING
COPYLIB	FROM AN EDITLIB LISTLIB LISTING, CREATE SORTED (OR UNSORTED) DIRECTIVES TO COPY AN EDITLIB USER LIBRARY
COPYRE	COPY AND REARRANGE FILE OF ZERO BYTE TERMINATED RECORDS (150 CHARACTERS MAXIMUM PER RECORD; FILE PROCESSED IN CORE)
COPYSEL	COPY AND REARRANGE FILE OF ZERO BYTE TERMINATED RECORDS (150 CHARACTERS MAXIMUM PER RECORD; FILE PROCESSED DIRECTLY)
CV029	CONVERT TO 029 PUNCH CODE
DECK	LIST UPDATE 'SOURCE' FILE DECK/COMDECK NAMES, SEQUENCE NUMBER AND NUMBER OF CARDS
DECKLST	LIST UPDATE 'SOURCE' FILE DECK/COMDECK NAMES, SEQUENCE NUMBER, NUMBER OF CARDS, NUMBER OF LINES AND PAGES (IF COLUMN 1 CARRIAGE CONTROL IS USED). (LIST CONTENTS OF A DOCUMENTATION FILE)
DEKSORT	SORT IDENT AND DECK LISTINGS FROM UPDATE OUTPUT FILE
DFDATIM	PUT DATE/TIME INTO DAYFILE
DMPFIL	DUMP FIRST N WORDS OF EACH LOGICAL RECORD IN M FILES
DOC	PREPARE (SUB)PROGRAM AND CATALOGUED PROCEDURE DOCUMENTATION
DOCDAT	LIST DOCUMENT NAMES, DATES AND PAGE NUMBERS
DOCIT	ADD PAGING TO ONE OR MORE DOCUMENTS
DOCUMNT	MAINTAIN A FILE OF DOCUMENTS
EOFAD	ADD OR DELETE EOF'S TO/FROM A FILE (THRU EOI)
EOI	POSITION A FILE AT END-OF-INFORMATION (EOI)
EXECARD	EXTRACT EXECUTE CARD PARAMETER/SUBPROGRAM USAGE/PROCEDURE USAGE INFORMATION FROM DOCUMENTATION FILES (WHICH WERE PREPARED IN THE FORMAT GENERATED BY PROGRAM 'DOC')
FRAME	PRINT A FRAME FOR LINING UP PRINTOUTS
GETOBJ	EXTRACT ONE OBJECT MODULE FROM A SEQUENTIAL OBJECT FILE OR AN EDITLIB USER LIBRARY
GETREV	EXTRACT ALL PAGES FROM A MANUAL WHICH WERE MODIFIED AFTER USER-SPECIFIED DATE
HEXDMP	DUMP 9-TRACK TAPE IN HEXADECIMAL FORMAT
JOBTIME	PUT JOB CP EXECUTION TIME TO THIS POINT INTO DAYFILE

LINER	COUNT LINES AND PAGES OF A FILE HAVING FIRST CHARACTER CARRIAGE CONTROL
LINERL	LIST A DOCUMENT (CARRIAGE CONTROL IN COLUMN 1, ZERO BYTE TERMINATED RECORDS) WITH RECORD COUNT AND COUNT OF LINES ON EACH PAGE. LIST THRU END-OF-INFORMATION.
LISTBIN	LIST BINARY MODULES AND PROCEDURES IN ONE OR MORE FILES
LISTCMP	LIST AN UPDATE COMPILE FILE, EACH DECK BEGINNING ON A NEW PAGE WITH A BANNER PAGE PRECEDING IT
LISTEOI	LIST A FILE INSERTING *EOR, *EOF, *EOI WHERE APPROPRIATE
LISTN	NUMBERED LIST OF ONE FILE OF ZERO-BYTE TERMINATED RECORDS
LISTZ	LIST ZERO-BYTE TERMINATED RECORDS WITH RECORD NUMBER AND LENGTHS (USER MAY SPECIFY MAXIMUM NUMBER OF CHARACTERS TO READ (DEFAULT: 140) AND PRINT (DEFAULT: 110)
LIST1	LIST (CENTERED) ONE COPY OF CARDS (UP TO 90 CHARACTERS) HAVING CARRIAGE CONTROL IN COLUMN 1. OPTIONALLY PRINT CARD, PAGE AND LINE COUNTS AND LINE LENGTHS.
LIST2	SINGLE/DOUBLE SPACE LISTING, 6 OR 8 LINES PER INCH, WITH OPTIONAL SKIP OVER PERFORATION AT BOTTOM OF PAGE (FIRST 120 CHARACTERS)
LIST3	LIST FIRST (UP TO 90-CHARACTER, ZERO BYTE TERMINATED) RECORD IN EACH LOGICAL RECORD THROUGH EOI
LIST4	LIST UNIT RECORDS, THRU EOI, WHICH HAVE '1' IN COLUMN 1
MANUAL	EXTRACT REVISION PAGES FROM A MANUAL
MANYDOC	EXTRACT (PRINT) TWO OR MORE DOCUMENTS FROM A DOCUMENT FILE
MTDOC	CREATE DOCUMENTATION TO DESCRIBE THE CONTENTS OF A MAGNETIC TAPE
NEWNAME	RENAME A SIMPLE ABSOLUTE MODULE
PAGEPRT	PRINT SELECTED PAGE(S) FROM A DOCUMENT
PFDOC	CREATE PERMANENT FILE DOCUMENTATION
PROGDOC	EXTRACT (PRINT) ONE OR ALL DOCUMENT(S) FROM A DOCUMENT FILE
PROMNT	MAINTAIN AN ALPHABETICAL, SEQUENTIAL PROCEDURE FILE
PRUDMP	OCTAL AND CHARACTER DUMP OF DISK FILE BY RELATIVE PRU NUMBER

PR2UP	REFORMAT A SINGLE-COLUMN REPORT FILE COMPOSED OF 60-CHARACTER LINES INTO A DOUBLE-COLUMN FORMAT HAVING A MAXIMUM TOTAL LINE LENGTH OF 132 PRINTABLE CHARACTERS (PLUS 1 POSITION FOR CARRIAGE CONTROL). THE OUTPUT WILL BE SUITABLE FOR PRINTING EITHER ON A LINE PRINTER OR ON XEROX 8-1/2 X 11 PAPER.
PTIM	PRINT CPA, CPB, CPA+CPB, IO AND PP TIMES SINCE START OF JOB OR INTERCOM SESSION
PURPOSE	EXTRACT PURPOSE INFORMATION FROM DOCUMENTATION FILES (WHICH WERE PREPARED IN THE FORMAT GENERATED BY PROGRAM 'DOC')
REDECK	CHANGE AN UPDATE COMPILE FILE BACK INTO A SOURCE FILE
SORTUP	GENERATE UPDATE DIRECTIVES TO SORT OLDPL
S2KRNM	RENAME ACCOUNT NUMBER ON CATALOGED S2000 DATA BASE FILES
TAPDMP	DUMP SELECTED PORTIONS OF A 7-TRACK MAGNETIC TAPE WRITTEN IN AN UNKNOWN DENSITY AND/OR MODE. IT IS CONTROLLED BY A SERIES OF FREE-FIELD CONTROL CARDS CONTAINING ORDERS FOR THE DUMPING, SKIPPING OR BACKSPACING OF RECORDS OR FILES.
TAPLIST	PREPARE TWO LISTS FROM MAGTAPEDOCUMENTATION FILE: 1) LIST OF TAPE NUMBER, LABEL, DENSITY, REMARKS AND DESCRIPTION FOR EACH TAPE DOCUMENTED IN FILE 2) LIST OF TAPE NUMBERS AND LABELS
UNDOCIT	REMOVE THE PAGING WHICH WAS ADDED TO DOCUMENT(S) BY PROGRAM 'DOCIT'
WHATLIB	LIST LIBRARIES SPECIFIED ON LAST LIBRARY CARD
WHICHMF	TELL TELETYPE USER WHICH MAINFRAME HE IS USING
WHICHOS	TELL TELETYPE USER WHICH OPERATING SYSTEM HE IS USING

*** PROGRAMS NOT IN LIBRARIES ***

SEVERAL PROGRAMS WHICH ARE NOT IN LIBRARIES ARE LISTED BELOW. (SEE THEIR INDIVIDUAL DOCUMENTS FOR ATTACH AND EXECUTE INFORMATION.)

INDIVIDUAL DOCUMENTS MAY BE PRINTED BY:

BEGIN,DOCGET,,OTHER,,<PROG>,OUTPUT.

WHERE <PROG> IS THE NAME OF THE PROGRAM WHOSE DOCUMENTATION IS DESIRED. THE LENGTH OF EACH DOCUMENT IS GIVEN IN PARENTHESES.

ACCTRPT	PROVIDE JOB ORDER MANAGER WITH COMPUTER ACCOUNTING STATUS INFORMATION (3)
ADPCOST	PROVIDE JOB ORDER MANAGER WITH COMPUTER ACCOUNTING STATUS INFORMATION (2)
CCL	CYBER CONTROL LANGUAGE REFERENCE GUIDE (39)
COPYBFR	RECREATE A CDC 'RANDOM' FILE FROM DATA COPIED EARLIER TO A SEQUENTIAL FILE, OR COPY A RANDOM FILE (2)
COPYE	COPY A FILE TO END-OF-INFORMATION (2)
COPYF	COPY BINARY OR CODED FILES (2)
COPYR	COPY BINARY OR CODED RECORDS (2)
COPYRM	COPY AND CONVERT RECORDS ON SEQUENTIAL (SQ) FILES FROM ONE RECORD TYPE AND BLOCK STRUCTURE TO ANOTHER (3)
COPYS	A GENERAL PURPOSE UTILITY FROM NORTHWESTERN UNIVERSITY WHICH PROVIDES A LARGE VARIETY OF COPY OPERATIONS FOR SEQUENTIAL OR RANDOM FILES (4)
COPYSF	COPY FILES OR RECORDS WITH OPTIONAL SHIFT TO RIGHT (3)
CVT360	CONVERT DOUBLE PRECISION S/360 FORTRAN PROGRAMS TO SINGLE PRECISION CDC FORTRAN (1)
EDIT	A UTILITY TO SIMPLIFY AND AUTOMATE THE USE OF UPDATE, PRELOAD AND TSKLOAD (2)
GRIPE	ALLOW USER TO MAKE GRIPES OR SUGGESTIONS DIRECTLY TO THE COMPUTER (3)
MNF	MINNESOTA FORTRAN (MNF) IS AN ALTERNATIVE COMPILER WHICH COMPILES FASTER THAN FTN, INCLUDES STRUCTURED PROGRAMMING FEATURES, AND HAS MORE DIAGNOSTICS AND SIMPLER DEBUG FACILITIES (10)
NETED	TEXT EDITOR (MODELLED AFTER THE STANDARD ARPANET EDITOR) (25)

PFTRANS TRANSFER FILES BETWEEN THE CDC 6700/6600 AND THE CYBER 74 AND VICE VERSA (2)

PROSE A TEXT PROCESSOR (31)

PURGALL PURGE (ALL OF) THE FILES OF SPECIFIED AC AND ID (2)

RATFOR CONVERT RATIONAL FORTRAN TEXT INTO CDC FTN TEXT (12)

RENAMAC RENAME CATALOGED ACCOUNT NUMBER. USE WHEN ALL FILES CATALOGED UNDER A GIVEN JOB ORDER NUMBER ARE TO BE CHANGED TO ANOTHER JOB ORDER NUMBER (2)

RNF TEXT PROCESSOR (45)

SNOBOL SNOBOL4 - VERSION 3.10 - USER'S GUIDE (37)

WRITE CHARACTER CONVERSION FOR DOCUMENTS CREATED BY PROSE (10)

** PASCAL **

DOCUMENTS DESCRIBING THE PASCAL 6000 VERSION 3 SYSTEM MAY BE PRINTED BY:

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BEGIN,DOCGET,,PASCAL,,<DOC>,OUTPUT.
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WHERE <DOC> IS:

PASCAL PASCAL 6000 COMPILER RELEASE 3 (92)

PASCLIB PASCAL LIBRARIES (COMPILE-TIME: PSRCLIB; RUN-TIME: PASCLIB) (77)

PTOOLS SEVEN DOCUMENTS DESCRIBING EIGHT TOOLS FOR PASCAL PROGRAMS (34)

***** SUBPROGRAMS *****

THE COMPUTER CENTER MAINTAINS SEVERAL LIBRARIES OF SUBPROGRAMS IN RELOCATABLE OBJECT FORM. THIS CHAPTER DESCRIBES THE FOLLOWING LIBRARIES AND LISTS THE CONTENTS OF EACH WITH DESCRIPTIVE TITLES (REFERENCES ARE GIVEN FOR THE WRITE-UPS):

ARLNALG - AEROSPACE RESEARCH LABORATORIES LINEAR ALGEBRA LIBRARY
EISPACK - SOLVE EIGENVALUE AND EIGENVECTOR PROBLEMS
FUNPACK - SPECIAL FUNCTIONAL SUBROUTINE PACKAGE FROM ARGONNE NATIONAL LABORATORY
IMSL - INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES PACKAGE
LINPACK - SOLVE SYSTEMS OF SIMULTANEOUS LINEAR EQUATIONS
MINPACK - SOLVE NON-LINEAR EQUATIONS AND NON-LINEAR LEAST SQUARES PROBLEMS
MSL - CDC MATH SCIENCE LIBRARY
NSRDC - DTNSRDC WRITTEN AND/OR SUPPORTED SCIENTIFIC AND UTILITY SUBROUTINES
SANDIA - ORDINARY DIFFERENTIAL EQUATION SOLVERS FROM SANDIA LABORATORIES

THESE ROUTINES ARE USED PRIMARILY WITH FTN, MNF OR RATFOR PROGRAMS AND MOST ARE CODED IN FTN.

TO ACCESS ANY LIBRARY:

```
ATTACH,<LIB>.
LDSET,LIB=<LIB>.          OR        LIBRARY,<LIB>.
LGO.                      OR OTHER LOAD AND EXECUTE CARD(S)
```

FOR EXAMPLE,

```
JOBNAME.
CHARGE,....
FTN.
ATTACH,NSRDC.
LDSET,LIB=NSRDC.
LGO.
'    7/8/9     EOR
        PROGRAM TEST (INPUT=128, OUTPUT=128)
        ...
        CALL ANOVA1 (...)
        ...
        END
'    7/8/9     EOR
    (DATA CARDS)
"    6/7/8/9   EOI
```

INDIVIDUAL MACHINE-READABLE DOCUMENTS, WHEN AVAILABLE, MAY BE PRINTED (SEE PAGE 1-2).

ARLNALG

THE AEROSPACE RESEARCH LABORATORIES (ARL) LINEAR ALGEBRA LIBRARY IS A COLLECTION OF 34 SUBROUTINES FOR SOLUTIONS TO LINEAR SYSTEMS AND DETERMINATION OF EIGENVALUES AND EIGENVECTORS OF REAL SYMMETRIC MATRICES. SOME OF THESE ROUTINES ARE SPECIFICALLY OPTIMIZED FOR THE CDC 6000 SERIES COMPUTERS.

REFERENCES: THE ARL LINEAR ALGEBRA LIBRARY HANDBOOK, NIKOLAI AND TSAO, AEROSPACE RESEARCH LABORATORIES, DAYTON, OHIO, JULY 1974, ARL TR 74-0106.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'ARLNALG' INCLUDE:

BAC1	EIGENVECTORS OF A SYMMETRIC MATRIX FROM THOSE OF ITS TRIDIAGONAL FORM
BAC2	EIGENVECTORS OF A SYMMETRIC MATRIX FROM THOSE OF ITS TRIDIAGONAL FORM
BISEC	EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX BY THE BISECTION METHOD
FIP	FAST INNER PRODUCT EVALUATION OPTIMIZED FOR THE CDC 6000
IMPR1	ITERATIVE IMPROVEMENT TO MACHINE ACCURACY OF THE SOLUTION X OF AX = B OBTAINED USING SUBROUTINE LEQS1
IMPR2	ITERATIVE IMPROVEMENT TO MACHINE ACCURACY OF THE SOLUTION X OF AX = B OBTAINED USING SUBROUTINE LEQS2
IMQL1	EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX
INIT	EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX BY INVERSE ITERATION
LEQS1	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU1
LEQS2	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU2
LEQS3	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU3
LEQS4	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU4
LEQS5	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU5
LEQS6	SOLUTION OF A LINEAR SYSTEM GIVEN A TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY LU6

LU1	LU FACTORIZATION OF A REAL SQUARE MATRIX
LU2	LU FACTORIZATION OF A REAL SQUARE MATRIX BY THE CROUT METHOD WITH ACCUMULATING INNER PRODUCTS
LU3	LU FACTORIZATION OF A REAL SQUARE MATRIX
LU4	LU FACTORIZATION OF A REAL BAND MATRIX A TOGETHER WITH THE NUMBER OF POSITIVE EIGENVALUES IF A IS SYMMETRIC
LU5	CHOLESKY FACTORIZATION OF A POSITIVE DEFINITE REAL SYMMETRIC MATRIX
LU6	CHOLESKY FACTORIZATION OF A POSITIVE DEFINITE REAL SYMMETRIC BAND MATRIX
ORIMP	ITERATIVE IMPROVEMENT OF THE SOLUTION X OF AX = B OBTAINED USING SUBROUTINE ORSOL
ORSOL	LEAST SQUARES SOLUTION OF A LINEAR SYSTEM GIVEN AN ORTHOGONAL-TRIANGULAR FACTORIZATION OF THE COEFFICIENT MATRIX PRODUCED BY SUBROUTINE ORTHO
ORTHO	ORTHOGONAL TRANSFORMATION OF A GIVEN GENERAL M BY N MATRIX A TO UPPER TRIANGULAR FORM
ORTHO2	ORTHOGONAL TRANSFORMATION OF A GENERAL M BY N MATRIX A TO UPPER TRIANGULAR FORM AND THE SOLUTION OF THE ASSOCIATED LINEAR LEAST SQUARES PROBLEM
QZABX	SOLUTION OF THE GENERALIZED MATRIX EIGENVALUE PROBLEM USING THE QZ ALGORITHM
REBAKA	RECOVERY OF EIGENVECTORS OF GENERALIZED SYMMETRIC EIGENVALUE PROBLEM FROM THOSE OF STANDARD FORM PRODUCED BY REDUC1
REDUC1	REDUCTION OF THE GENERALIZED SYMMETRIC EIGENVALUE PROBLEM TO STANDARD FORM
RITZIT	ITERATIVE COMPUTATION OF EIGENVALUES LARGEST IN MAGNITUDE AND CORRESPONDING EIGENVECTORS OF A REAL SYMMETRIC MATRIX
RNQL1	EIGENVALUES OF A REAL SYMMETRIC TRIDIAGONAL MATRIX
SVD	SINGULAR VALUE DECOMPOSITION OF A REAL RECTANGULAR MATRIX
TRI1	FAST HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX
TRI2	COMPACT HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX
TRI3	FAST HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX FOR THE QL ALGORITHM
TRI4	HOUSEHOLDER TRIDIAGONAL FORM OF A REAL SYMMETRIC MATRIX FOR THE QL ALGORITHM

EISPACK

THE EIGENSYSTEM PACKAGE FROM ARGONNE NATIONAL LABORATORY IS A COLLECTION OF 70 SUBROUTINES TO SOLVE EIGENVECTOR AND EIGENVALUE PROBLEMS. ROUTINES IN THIS PACKAGE ARE OFTEN SUPERIOR IN SPEED AND ACCURACY TO SIMILAR ROUTINES IN OTHER PACKAGES.

REFERENCES: LECTURE NOTES IN COMPUTER SCIENCE, VOLUME 6, "MATRIX EIGENSYSTEM ROUTINES - EISPACK GUIDE", SMITH, ET AL, SPRINGER-VERLAG, BERLIN-HEIDELBERG-NEW YORK, 1974.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'EISPACK' INCLUDE:

BAKVEC	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY FIGI
BALANC	BALANCE A REAL GENERAL MATRIX
BALBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT REAL MATRIX TRANSFORMED BY BALANC
BANDR	REDUCE A REAL SYMMETRIC BAND MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS
BANDV	DETERMINE SOME EIGENVECTORS OF A REAL SYMMETRIC BAND MATRIX OR SOLVE BAND EQUATIONS
BISECT	DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
BQR	DETERMINE SOME EIGENVALUES OF A REAL SYMMETRIC BAND MATRIX
CBABK2	BACK TRANSFORM THE EIGENVECTORS OF THAT COMPLEX MATRIX TRANSFORMED BY CBAL
CBAL	BALANCE A COMPLEX GENERAL MATRIX
CG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX GENERAL MATRIX
CH	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX
CINVIT	DETERMINE THOSE EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES
COMBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY COMHES
COMHES	REDUCE A COMPLEX GENERAL MATRIX TO COMPLEX UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS
COMLR	DETERMINE THE EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX

COMLR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX
COMQR	DETERMINE THE EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX
COMQR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HESSENBERG MATRIX
CORTB	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY CORTH
CORTH	REDUCE A COMPLEX GENERAL MATRIX TO UPPER HESSENBERG FORM USING UNITARY TRANSFORMATIONS
ELMBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ELMHES
ELMHES	REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS
ELTRAN	ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ELMHES
FIGI	TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX
FIGI2	TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE DIAGONAL TRANSFORMATIONS
HQR	DETERMINE THE EIGENVALUES OF A REAL UPPER HESSENBERG MATRIX
HQR2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX
HTRIBK	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRIDI
HTRIB3	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRID3
HTRIDI	REDUCE A COMPLEX HERMETIAN MATRIX TO A REAL SYMMETRIC TRIDIAGONAL MATRIX USING UNITARY TRANSFORMATIONS
HTRID3	REDUCE A COMPLEX HERMETIAN MATRIX, STORED AS A SINGLE SQUARE ARRAY, TO A REAL SYMMETRIC TRIDIAGONAL MATRIX USING UNITARY TRANSFORMATIONS
IMTQLV	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
IMTQL1	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
IMTQL2	DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX
INVIT	DETERMINE THOSE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES

MINFIT	COMPUTE THE SINGLUAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX AND THE SOLUTION OF A RELATED LINEAR LEAST SQUARES PROBLEM
ORTBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ORTHES
ORTHES	REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ORTHOGONAL TRANSFORMATIONS
ORTRAN	ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ORTHES
QZHES	SIMULTANEOUSLY REDUCE ONE OF A PAIR OF REAL GENERAL MATRICES TO UPPER HESSENBERG FORM AND THE OTHER TO UPPER TRIANGULAR FORM USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS
QZIT	REDUCE ONE OF A PAIR OF REAL MATRICES FROM UPPER HESSENBERG TO QUASI-UPPER TRIANGULAR FORM WHILE MAINTAINING THE UPPER TRIANGULAR FORM OF THE OTHER USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS
QZVAL	EXTRACT THE GENERALIZED EIGENVALUES OF A REAL MATRIX SYSTEM WITH ONE MATRIX IN QUASI-UPPER TRIANGULAR FORM AND THE OTHER IN UPPER TRIANGULAR FORM USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS
QZVEC	DETERMINE THE GENERALIZED EIGENVECTORS OF A REAL MATRIX SYSTEM WITH ONE IN QUASI-UPPER TRIDIAGONAL FORM AND THE OTHER IN UPPER TRIANGULAR FORM USING BACK SUBSTITUTION
RATQR	DETERMINE SOME EXTREME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
REBAKB	BACK TRANSFORM THE EIGENVECTORS OF THAT DERIVED SYMMETRIC MATRIX DETERMINED BY REDUC2
REBAK	BACK TRANSFORM THE EIGENVECTORS OF THAT DERIVED SYMMETRIC MATRIX DETERMINED BY REDUC OR REDUC2
REDUC	REDUCE A CERTAIN GENERALIZED SYMMETRIC EIGENPROBLEM TO THE STANDARD SYMMETRIC EIGENPROBLEM USING CHOLSKY DECOMPOSITION
REDUC2	REDUCE CERTAIN GENERALIZED SYMMETRIC EIGENPROBLEMS TO STANDARD SYMMETRIC EIGENPROBLEMS USING CHOLSKY DECOMPOSITION
RG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL GENERAL MATRIX
RGG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL GENERAL GENERALIZED EIGENPROBLEM A*X = (LAMBDA)*B*X
RS	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX

RSB	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC BAND MATRIX
RSG	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM A*X = (LAMBDA)*B*X
RSGAB	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM A*B*X = (LAMBDA)*X
RSGBA	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS FOR THE REAL SYMMETRIC GENERALIZED EIGENPROBLEM B*A*X = (LAMBDA)*X
RSP	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC PACKED MATRIX
RST	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC TRIDIAGONAL MATRIX
RT	DRIVER SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A CERTAIN REAL TRIDIAGONAL MATRIX
SVD	COMPUTE THE SINGULAR VALUE DECOMPOSITION OF AN ARBITRARY REAL RECTANGULAR MATRIX
TINVIT	DETERMINE SOME EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX
TQLRAT	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
TQL1	DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
TQL2	DETERMINE THE EIENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX
TRBAK1	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED1
TRBAK3	BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED3
TRED1	REDUCE A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS
TRED2	RETURN A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE ORTHOGONAL TRANSFORMATIONS
TRED3	REDUCE A REAL SYMMETRIC MATRIX, STORED AS A ONE-DIMENSIONAL ARRAY, TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS
TRIDIB	DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
TSTURM	DETERMINE SOME EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX

FUNPACK

SPECIAL FUNCTIONAL SUBROUTINE PACKAGE FROM ARGONNE NATIONAL LABORATORY CONTAINING 24 USER-CALLABLE ROUTINES FOR BESSEL FUNCTIONS, DAWSON'S INTEGRAL, ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND AND EXPONENTIAL INTEGRAL.

REFERENCES: MASTER DOCUMENTS ON FILE IN USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'FUNPACK' INCLUDE:

BESEI0	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, EXP(-ABS(X))*I0(X)
BESEI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, EXP(-ABS(X))*I1(X)
BESEK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, EXP(X)*K0(X), FOR REAL, POSITIVE X
BESEK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, EXP(X)*K1(X), FOR REAL, POSITIVE X
BESI0	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, I0(X)
BESI1	FUNCTION TO CALCULATE MODIFIED BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, I1(X)
BESJ0	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ZERO, J0(X)
BESJ1	FUNCTION TO CALCULATE BESSEL FUNCTIONS OF THE FIRST KIND OF ORDER ONE, J1(X)
BESK0	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ZERO, K0(X), FOR REAL, POSITIVE X
BESK1	COMPUTE MODIFIED BESSEL FUNCTIONS OF THE SECOND KIND OF ORDER ONE, K1(X), FOR REAL, POSITIVE X
BESY	SUBROUTINE TO COMPUTE BESSEL FUNCTIONS OF THE SECOND KIND OF NON-NEGATIVE ORDER,)-SUB-NU(X), FOR REAL, POSITIVE X (SEE YNU)
DAW	FUNCTION TO COMPUTE DAWSON'S INTEGRAL FOR ALL REAL ARGUMENTS

EI	COMPUTE EXPONENTIAL INTEGRAL, EI(X)
ELIE1	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, E(CAY**2)
ELIEM	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, E(1-ETA)
ELIK1	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, K(CAY**2)
ELIKM	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, K(1-ETA)
ELIPE	COMPUTE COMPLETE COMPLETE ELLIPTIC INTEGRALS OF THE SECOND KIND, E(CAYSQ)
ELIPK	COMPUTE COMPLETE ELLIPTIC INTEGRALS OF THE FIRST KIND, K(CAYSQ)
EONE	COMPUTE EXPONENTIAL INTEGRAL, E-SUB-1(X)
EXPEI	COMPUTE EXPONENTIAL INTEGRAL, EXP(-X)*EI(X)
MONERR	ERROR HANDLING FACILITIES, INCLUDING USER INTERACTION, FOR FUNPACK
PSI	FUNCTION TO COMPUTE LOGARITHMIC DERIVATIVE OF THE GAMMA FUNCTION FOR REAL ARGUMENTS
YNU	FUNCTION TO COMPUTE BESSEL FUNCTIONS OF THE SECOND KIND OF NON-NEGATIVE REAL ORDER, Y-SUB-NU(X), FOR REAL, POSITIVE X (SEE BESY)

IMSL (PROPRIETARY)

THE INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES PACKAGE (EDITION 8) CONTAINS OVER 450 SUBROUTINES IN THE FOLLOWING AREAS:

- A - ANALYSIS OF EXPERIMENTAL DESIGN DATA
- B - BASIC STATISTICS
- C - CATEGORIZED DATA ANALYSIS
- D - DIFFERENTIAL EQUATIONS, QUADRATURE, DIFFERENTIATION
- E - EIGENANALYSIS
- F - FORECASTING, ECONOMETRICS, TIME SERIES
- G - GENERATION AND TESTING OF RANDOM NUMBERS, GOODNESS OF FIT
- I - INTERPOLATION, APPROXIMATION AND SMOOTHING
- L - LINEAR ALGEBRAIC EQUATIONS
- M - MATHEMATICAL AND STATISTICAL SPECIAL FUNCTIONS
- N - NONPARAMETRIC STATISTICS
- O - OBERVATION STRUCTURE
- R - REGRESSION ANALYSIS
- S - SAMPLING
- U - UTILITY FUNCTIONS
- V - VECTOR-MATRIX ARITHMETIC
- Z - ZEROS AND EXTREMA, LINEAR PROGRAMMING

REFERENCES: THE IMSL LIBRARY, VOLUMES 1 AND 2.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'IMSL' INCLUDE:

ABIBN	ANALYSIS OF BALANCED INCOMPLETE BLOCK AND BALANCED LATTICE DESIGNS
ACRDAN	ANALYSIS OF ONE-WAY CLASSIFICATION DESIGN DATA
ACTRST	CONTRAST ESTIMATES AND SUMS OF SQUARES
AFACN	FULL FACTORIAL PLAN ANALYSIS
AFACT	SUMS OF SQUARES, MEAN SQUARES, DEGREES OF FREEDOM, AND MEANS FOR ALL EFFECTS IN A FULL FACTORIAL PLAN, ALLOWING REPLICATION ON OPTION
AGBACP	ANALYSIS OF BALANCED COMPLETE EXPERIMENTAL DESIGN STRUCTURE DATA
AGLMOD	GENERAL LINEAR MODEL ANALYSIS
AGVACL	ONE OR TWO-SIDED INTERVAL ESTIMATE OF A VARIANCE COMPONENT
AGXPM	EXPECTED MEAN SQUARES FOR BALANCED COMPLETE DESIGN MODELS
ALGAMA	EVALUATE THE LOG (BASE E) OF THE ABSOLUTE VALUE OF THE GAMMA FUNCTION (GLGAMA=ALGAMA)

ALSQAN	ANALYSIS OF LATIN SQUARE DESIGN DATA
AMEANS	PREPARATION OF A SET OF UNBALANCED DATA FOR ANALYSIS BY THE METHOD OF UNWEIGHTED MEANS
ANCOV1	COVARIANCE ANALYSIS FOR ONE-WAY CLASSIFICATION DESIGN DATA
ANESTE	ANALYSIS OF COMPLETELY NESTED DESIGN DATA WITH EQUAL NUMBERS IN THE SUBCLASSES
ANESTU	ANALYSIS OF COMPLETELY NESTED DESIGN DATA WITH UNEQUAL NUMBERS IN THE SUBCLASSES
AORDR	REORDERING OF THE DATA OBTAINED FROM ANY BALANCED COMPLETE EXPERIMENTAL DESIGN
ARCBAN	ANALYSIS OF TWO-WAY CLASSIFICATION DESIGN DATA
ASNKMC	STUDENT-NEWMAN-KEULS MULTIPLE COMPARISON TEST
BDCOU1	TALLY OF OBSERVATIONS INTO A ONE-WAY FREQUENCY TABLE
BDCOU2	TALLY OF OBSERVATIONS INTO A TWO-WAY FREQUENCY TABLE
BDLTV	PRODUCE LETTER-VALUE SUMMARY
BDTRGI	TRANSGENERATION OF THE COLUMNS OF A MATRIX (IN-CORE VERSION)
BDTRGO	TRANSGENERATION OF THE COLUMNS OF A MATRIX (OUT-OF-CORE VERSION)
BECOR	ESTIMATES OF MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFICIENTS (OUT-OF-CORE VERSION)
BECORI	ESTIMATES OF MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFICIENTS (IN-CORE VERSION)
BECOVM	MEANS AND VARIANCE-COVARIANCE MATRIX
BECTR	TETRACHORIC CORRELATION COEFFICIENT ESTIMATION
BECVL	VARIANCES AND COVARIANCES OF LINEAR FUNCTIONS (OUT-OF-CORE VERSION)
BECVLI	VARIANCES AND COVARIANCES OF LINEAR FUNCTIONS (IN-CORE VERSION)
BEGRPS	MOMENTS ESTIMATION FOR GROUPED DATA WITH AND WITHOUT SHEPPARDS CORRECTIONS
BEIGRP	ESTIMATION OF BASIC STATISTICAL PARAMETERS USING GROUPED DATA
BEIUGR	ESTIMATION OF BASIC STATISTICAL PARAMETERS USING UNGROUPED DATA
BELBIN	INTERVAL ESTIMATE OF THE PARAMETER P OF THE BINOMIAL DISTRIBUTION

BELPOS INTERVAL ESTIMATE OF THE PARAMETER LAMBDA OF THE POISSON DISTRIBUTION

BEMDP MEDIAN POLISH OF A TWO-WAY TABLE

BEMIRI ESTIMATES OF MEANS, SIMPLE REGRESSION COEFFICIENTS, THEIR INTERCEPTS, STANDARD ERRORS OF THE REGRESSION COEFFICIENTS, AND STANDARD DEVIATIONS FOR ARRAYS WHICH CONTAIN MISSING VALUES (IN-CORE VERSION)

BEMIRO ESTIMATES OF MEANS, SIMPLE REGRESSION COEFFICIENTS, THEIR INTERCEPTS, STANDARD ERRORS OF THE REGRESSION COEFFICIENTS, AND STANDARD DEVIATIONS FOR ARRAYS WHICH CONTAIN MISSING VALUES (OUT-OF-CORE VERSION)

BEMMI ESTIMATES OF MEANS, STANDARD DEVIATIONS, CORRELATION COEFFICIENTS, SKEWNESS AND KURTOSIS FROM A DATA MATRIX CONTAINING MISSING OBSERVATIONS (IN-CORE VERSION)

BEMMO ESTIMATES OF MEANS, STANDARD DEVIATIONS, CORRELATION COEFFICIENTS, SKEWNESS AND KURTOSIS FROM A DATA MATRIX CONTAINING MISSING OBSERVATIONS (OUT OF CORE VERSION)

BEMNON LOCATION (MEAN) INFERENCES USING A SAMPLE FROM A NORMAL POPULATION WITH KNOWN VARIANCE

BEMSON MEAN AND VARIANCE INFERENCES USING A SAMPLE FROM A NORMAL POPULATION

BENSON VARIANCE INFERENCES USING A SAMPLE FROM A NORMAL POPULATION WITH KNOWN MEAN

BEPAT MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH UNEQUAL VARIANCES

BEPET MEAN AND VARIANCE INFERENCES USING SAMPLES FROM EACH OF TWO NORMAL POPULATIONS WITH EQUAL VARIANCES

BESRB BISERIAL AND POINT-BISERIAL CORRELATION COEFFICIENTS FOR A QUALITATIVELY DICHOTOMIZED VARIABLE AND A NUMERICALLY MEASURABLE AND CLASSIFIED VARIABLE

BESRN BISERIAL CORRELATION COEFFICIENT FOR A QUALITATIVELY DICHOTOMIZED VARIABLE AND A NUMERICALLY OR QUALITATIVELY CLASSIFIED VARIABLE

CAXPY COMPUTE A CONSTANT TIMES A VECTOR PLUS A VECTOR, ALL COMPLEX (VBLA=CAXPY)

CBNRHO ESTIMATION OF THE BIVARIATE NORMAL CORRELATION COEFFICIENT USING A CONTINGENCY TABLE

CCOPY COPY A VECTOR X TO A VECTOR Y, BOTH COMPLEX (VBLA=CCOPY)

CDOTC COMPUTE COMPLEX DOT PRODUCT USING CONJUGATED VECTOR COMPONENTS (VBLA=CDOTC)

CDOTU	COMPUTE COMPLEX DOT PRODUCT USING UNCONJUGATED VECTOR COMPONENTS (VBLA=CDOTU)
CSCAL	COMPUTE A COMPLEX CONSTANT TIMES A COMPLEX VECTOR (VBLA=CSCAL)
CSSCAL	COMPUTE A REAL CONSTANT TIMES A COMPLEX VECTOR (VBLA=CSSCAL)
CSWAP	INTERCHANGE VECTORS X AND Y, BOTH COMPLEX (VBLA=CSWAP)
CTLLF	LOG-LINEAR FIT OF CONTINGENCY TABLE
CTPR	COMPUTE EXACT PROBABILITIES FOR CONTINGENCY TABLES
CTRBYC	ANALYSIS OF A CONTINGENCY TABLE
CZDOTC	COMPUTE COMPLEX DOT PRODUCT USING CONJUGATED VECTOR COMPONENTS (AND DOUBLE PRECISION ACCUMULATION) (VBLA=CZDOTC)
CZDOTU	COMPUTE COMPLEX DOT PRODUCT USING UNCONJUGATED VECTOR COMPONENTS (AND DOUBLE PRECISION ACCUMULATION) (VBLA=CZDOTU)
DASUM	COMPUTE DOUBLE PRECISION SUM OF ABSOLUTE VALUES (VBLA=DASUM)
DAXPY	COMPUTE A CONSTANT TIMES A VECTOR PLUS A VECTOR, ALL DOUBLE PRECISION (VBLA=DAXPY)
DBCEVU	BICUBIC SPLINE MIXED PARTIAL DERIVATIVE EVALUATOR
DBCQDU	BICUBIC SPLINE QUADRATURE
DBLINT	NUMERICAL INTEGRATION BY ADAPTIVE ROMBERG METHOD (OVER A RECTANGLE)
DCADRE	NUMERICAL INTEGRATION OF A FUNCTION USING CAUTIOUS ADAPTIVE ROMBERG EXTRAPOLATION
DCOPY	COPY A VECTOR X TO A VECTOR Y, BOTH DOUBLE PRECISION (VBLA=DCOPY)
DCSEVU	CUBIC SPLINE FIRST AND SECOND DERIVATIVE EVALUATOR
DCSQDU	CUBIC SPLINE QUADRATURE
DDOT	COMPUTE DOUBLE PRECISION DOT PRODUCT (VBLA=DDOT)
DGEAR	DIFFERENTIAL EQUATION SOLVER - VARIABLE ORDER ADAMS PREDICTOR CORRECTOR METHOD OR GEARS METHOD
DNRM2	COMPUTE THE EUCLIDEAN LENGTH OR L2 NORM OF A DOUBLE PRECISION VECTOR (VBLA=DNRM2)
DREBS	DIFFERENTIAL EQUATION SOLVER - BURLISCH-STOER EXTRAPOLATION METHOD

DROT	APPLY GIVENS PLANE ROTATION (DOUBLE PRECISION) (VBLA=DROT)
DROTG	CONSTRUCT GIVENS PLANE ROTATION (DOUBLE PRECISION) (VBLA=DROTG)
DROTM	APPLY A MODIFIED GIVENS PLANE ROTATION (DOUBLE PRECISION) (VBLA=DROTM)
DROTMG	CONSTRUCT A MODIFIED GIVENS PLANE ROTATION (DOUBLE PRECISION) (VBLA=DROTGM)
DSCAL	COMPUTE A DOUBLE PRECISION CONSTANT TIMES A DOUBLE PRECISION VECTOR (VBLA=DSCAL)
DSDOT	COMPUTE SINGLE PRECISION DOT PRODUCT USING DOUBLE PRECISION ACCUMULATION (VBLA=DSDOT)
DSWAP	INTERCHANGE VECTORS X AND Y, BOTH DOUBLE PRECISION (VBLA=DSWAP)
DTPTB	MULTIPLE SHOOTING METHOD (BOUNDARY VALUE)
DVERK	DIFFERENTIAL EQUATION SOLVER - RUNGE KUTTA-VERNER FIFTH AND SIXTH ORDER METHOD
EBALAC	BALANCE A COMPLEX GENERAL MATRIX AND ISOLATE EIGENVALUES WHENEVER POSSIBLE
EBALAF	BALANCE A REAL MATRIX IN THE EUCLIDEAN NORM
EBBCKC	BACK TRANSFORMATION OF THE EIGENVECTORS OF A BALANCED COMPLEX MATRIX TO FORM THE EIGEN- VECTORS OF THE ORIGINAL MATRIX
EBBCKF	BACK TRANSFORMATION OF THE EIGENVECTORS OF A BALANCED REAL MATRIX TO FORM THE EIGEN- VECTORS OF THE ORIGINAL MATRIX
EHBCKF	BACK TRANSFORMATION OF THE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX TO FORM THE EIGENVECTORS OF THE ORIGINAL MATRIX
EHBCKH	BACK TRANSFORMATION OF THE EIGENVECTORS OF A REAL SYMMETRIC TRIDIAGONAL MATRIX OBTAINED FROM THE HOUSEHOLDER REDUCTION OF A HERMITIAN MATRIX
EHESSC	REDUCTION OF A GENERAL COMPLEX MATRIX TO COMPLEX UPPER HESSENBERG FORM
EHESSF	REDUCTION OF A NONSYMMETRIC MATRIX TO UPPER HESSENBERG FORM BY ORTHOGONAL TRANSFORMATIONS
EHOBKS	BACK TRANSFORMATION TO FORM THE EIGENVECTORS OF THE ORIGINAL SYMMETRIC MATRIX FROM THE EIGENVECTORS OF THE TRIDIAGONAL MATRIX
EHOUSH	REDUCTION OF A COMPLEX HERMITIAN MATRIX TO REAL SYMMETRIC TRIDIAGONAL FORM

EHOUSS	REDUCTION OF A SYMMETRIC MATRIX TO SYMMETRIC TRIDIAGONAL FORM USING A HOUSEHOLDER REDUCTION
EIGBS	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A BAND SYMMETRIC MATRIX
EIGCC	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A COMPLEX GENERAL MATRIX
EIGCH	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX
EIGRF	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL GENERAL MATRIX IN FULL STORAGE MODE
EIGRS	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL SYMMETRIC MATRIX IN SYMMETRIC STORAGE MODE
EIGZC	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF THE SYSTEM A*X=LAMBDA*B*X WHERE A AND B ARE COMPLEX MATRICES
EIGZF	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF THE SYSTEM A*X=LAMBDA*B*X WHERE A AND B ARE REAL MATRICES
ELRH1C	EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX
ELRH2C	EIGENVALUES AND EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX AND BACKTRANS- FORMATION OF THE EIGENVECTORS
ELZHC	REDUCE TWO COMPLEX MATRICES, A AND B, SIMUL- TANEOUSLY, A TO UPPER HESSENBERG AND B TO UPPER TRIANGULAR FORM
ELZVC	CALCULATE THE EIGENVALUES AND, OPTIONALLY, EIGENVECTORS OF THE SYSTEM A*Z=LAMBDA*B*Z WHERE COMPLEX MATRIX A IS UPPER HESSENBERG AND COMPLEX MATRIX B IS UPPER TRIANGULAR
EQRH1F	EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES
EQRH3F	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX
EQRT1S	SMALLEST OR LARGEST M EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX
EQRT2S	EIGENVALUES AND (OPTIONALLY) EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX USING THE QL METHOD
EQRT3S	THE SMALLEST (OR LARGEST) EIGENVALUES OF A TRIDIAGONAL MATRIX IN ALGEBRAIC VALUE WHOSE SUM EXCEEDS A GIVEN VALUE
EQZQF	HESSENBERG REDUCTION FOR THE GENERALIZED EIGENVALUE PROBLEM A*X=LAMBDA*B*X. REDUCTION OF A TO UPPER HESSENBERG FORM AND B TO UPPER TRIANGULAR FORM

EQZTF	EXPLICIT QZ ITERATION FOR THE GENERALIZED EIGENVALUE PROBLEM A*X=LAMBDA*B*X WHERE A IS IN UPPER HESSENBERG FORM AND B IS UPPER TRIANGULAR. A IS REDUCED TO QUASI-UPPER TRIANGULAR FORM WHILE KEEPING MATRIX B UPPER TRIANGULAR
EQZVF	EIGENVALUES AND OPTIONALLY, EIGENVECTORS OF THE GENERALIZED EIGENVALUE PROBLEM A*Z=LAMBDA*B*Z WHERE B IS UPPER TRIANGULAR AND A IS QUASI-UPPER TRIANGULAR.
ERF	EVALUATE THE ERROR FUNCTION (MERF=ERF)
ERFC	EVALUATE THE COMPLEMENTED ERROR FUNCTION (MERRC=ERFC)
FFTCC	FAST FOURIER TRANSFORM OF A COMPLEX VALUED SEQUENCE
FFTRC	FAST FOURIER TRANSFORM OF A REAL VALUED SEQUENCE
FFTSC	SINE AND COSINE TRANSFORMS OF A REAL VALUED SEQUENCE
FFT2C	FAST FOURIER TRANSFORM OF A COMPLEX VALUED SEQUENCE OF LENGTH EQUAL TO A POWER TWO
FFT3D	FAST FOURIER TRANSFORM OF A COMPLEX VALUED ARRAY
FLINV	INVERSE LAPLACE TRANSFORM OF A COMPLEX FUNCTION
FTARPS	PRELIMINARY ESTIMATION OF THE AUTOREGRESSIVE PARAMETERS IN AN ARIMA STOCHASTIC MODEL
FTAUTO	MEAN, VARIANCE, AUTOCOVARIANCES, AUTOCORRELATIONS, AND PARTIAL AUTOCORRELATIONS FOR A STATIONARY TIME SERIES
FTCAST	TIME SERIES FORECASTS AND PROBABILITY LIMITS USING AN ARIMA (BOX-JENKINS) MODEL
FTCMP	NON-SEASONAL ARIMA (BOX-JENKINS) STOCHASTIC MODEL ANALYSIS FOR A SINGLE TIME SERIES WITH FULL PARAMETER ITERATION AND MAXIMUM LIKELIHOOD ESTIMATION
FTCROS	MEANS, VARIANCES, CROSS-COVARIANCES, AND CROSS-CORRELATIONS FOR TWO MUTUALLY STATIONARY N CHANNEL TIME SERIES
FTCRXY	CROSS-COVARIANCE OF TWO MUTUALLY STATIONARY TIME SERIES
FTFPS	FAST FOURIER TRANSFORM ESTIMATES OF POWER SPECTRA AND CROSS SPECTRA OF TIME SERIES
FTFREQ	SINGLE OR MULTICHANNEL TIME SERIES ANALYSIS IN THE TIME AND FREQUENCY DOMAINS
FTGEN	GENERATION OF A TIME SERIES FROM A GIVEN ARIMA (BOX-JENKINS) STOCHASTIC MODEL

FTKALM	KALMAN FILTERING
FTMPS	PRELIMINARY ESTIMATION OF THE MOVING AVERAGE PARAMETERS IN AN ARIMA STOCHASTIC MODEL
FTMXL	MAXIMUM LIKELIHOOD ESTIMATION OF AUTOREGRESSIVE AND MOVING AVERAGE PARAMETERS IN AN ARIMA (BOX-JENKINS) STOCHASTIC MODEL
FTRDIF	TRANSFORMATIONS, DIFFERENCES AND SEASONAL DIFFERENCES OF A TIME SERIES FOR MODEL IDENTIFICATION
FTTRN	PRELIMINARY PARAMETER ESTIMATES FOR A UNIVARIATE TRANSFER FUNCTION MODEL
FTWEIN	WIENER FORECAST FOR A STATIONARY STOCHASTIC PROCESS
FTWENM	MULTICHANNEL WIENER FORECAST
FTWENX	MAXIMUM LIKELIHOOD PARAMETER ESTIMATES FOR A MULTICHANNEL, SINGLE OUTPUT TIME SERIES MODEL
GAMMA	EVALUATE THE GAMMA FUNCTION
GFIT	CHI-SQUARED GOODNESS OF FIT TEST
GGAMR	ONE PARAMETER GAMMA RANDOM DEVIATE GENERATOR, AND USABLE AS THE BASIS FOR TWO PARAMETER GAMMA, EXPONENTIAL, CHI-SQUARED, CHI, BETA, T, AND F DEVIATE GENERATION
GGBN	BINOMIAL RANDOM DEVIATE GENERATOR
GGBNR	NEGATIVE BINOMIAL RANDOM DEVIATE GENERATOR
GGBTR	BETA RANDOM DEVIATE GENERATOR
GGCAY	CAUCHY RANDOM DEVIATE GENERATOR
GGCHS	CHI-SQUARED RANDOM DEVIATE GENERATOR
GGDA	GENERAL DISCRETE DISTRIBUTION RANDOM DEVIATE GENERATOR USING ALIAS METHOD
GGDT	GENERAL DISCRETE DISTRIBUTION RANDOM DEVIATE GENERATOR USING TABLE LOOKUP
GGEOT	GEOMETRIC RANDOM DEVIATE GENERATOR
GGEXN	EXPONENTIAL RANDOM DEVIATE GENERATOR
GGEXT	RANDOM DEVIATE GENERATOR FOR MIXTURE OF TWO EXPONENTIALS
GGHPR	HYPERGEOMETRIC RANDOM DEVIATE GENERATOR
GGMAR	ONE PARAMETER GAMMA RANDOM DEVIATE GENERATOR WITH EXTENSIONS
GGMTN	MULTINOMIAL RANDOM DEVIATE GENERATOR

GGNLG	LOG-NORMAL RANDOM DEVIATE GENERATOR
GGNML	NORMAL OR GAUSSIAN RANDOM DEVIATE GENERATOR
GGNPM	NORMAL RANDOM DEVIATE GENERATOR VIA THE POLAR METHOD
GGNQF	NORMAL RANDOM DEVIATE GENERATOR - FUNCTION FORM OF GGNML
GGNSM	MULTIVARIATE NORMAL RANDOM DEVIATE GENERATOR WITH GIVEN COVARIANCE MATRIX
GGPON	POISSON RANDOM DEVIATE GENERATOR WHERE THE POISSON PARAMETER CHANGES FREQUENTLY
GGPOS	POISSON RANDOM DEVIATE GENERATOR WHERE THE POISSON PARAMETER DOES NOT CHANGE OFTEN
GGSPH	GENERATION OF UNIFORM RANDOM DEVIATES FROM THE SURFACE OF THE UNIT SPHERE IN 3 OR 4 SPACE
GGSTA	STABLE DISTRIBUTION RANDOM DEVIATE GENERATOR
GGTRA	TRIANGULAR DISTRIBUTION RANDOM DEVIATE GENERATOR
GGUBFS	BASIC UNIFORM (0,1) RANDOM NUMBER GENERATOR - FUNCTION FORM OF GGUBS
GGUBS	BASIC UNIFORM (0,1) PSEUDO-RANDOM NUMBER GENERATOR
GGUBT	UNIFORM (0,1) PSEUDO-RANDOM NUMBER GENERATOR USING ALTERNATE MULTIPLIER
GGUD	DISCRETE UNIFORM RANDOM NUMBER GENERATOR
GGUW	UNIFORM (0,1) RANDOM NUMBER GENERATOR WITH SHUFFLING
GGVCR	GENERAL CONTINUOUS DISTRIBUTION RANDOM DEVIATE GENERATOR
GGWIB	WEIBULL RANDOM DEVIATE GENERATOR
GTCN	SAMPLE SIZE OR NUMBER OF CLASS INTERVALS DETERMINATION FOR CHI-SQUARED TEST APPLICATIONS
GTDDU	D-SQUARE TALLY
GTD2T	THE D-SQUARE TEST
GTMNT	MOMENTS AND STANDARDIZED MOMENTS OF UNIFORM RANDOM NUMBERS
GTNOR	TEST FOR NORMALITY OF RANDOM DEVIATES
GTPBC	COUNT OF THE NUMBER OF ZERO BITS IN A GIVEN SUBSET OF A REAL WORD
GTPKP	PROBABILITY DISTRIBUTION OF N ELEMENTS INTO TWO EQUI-PROBABLE STATES

GTPL	POKER TEST TALLY OF HAND TYPES AND STATISTICS
GTPOK	PERFORM THE POKER TEST
GTPR	TALLY OF COORDINATES OF PAIRS (OR LAGGED PAIRS) OF RANDOM NUMBERS
GTPST	PAIRS TEST OR GOODS SERIAL TEST
GTRN	RUNS TEST
GTRTN	TALLY OF NUMBER OF RUNS UP AND DOWN
GTTRT	TALLY FOR TRIPLETS TEST
GTTT	TRIPLETS TEST
IBCEVU	BICUBIC SPLINE EVALUATOR
IBCICU	BICUBIC SPLINE TWO-DIMENSIONAL COEFFICIENT CALCULATOR
IBCIEU	BICUBIC SPLINE TWO-DIMENSIONAL INTERPOLATOR
ICAMAX	FIND THE SMALLEST INDEX OF THE MAXIMUM MAGNITUDE OF A COMPLEX VECTOR (VBLA=ICAMAX)
ICSCCU	INTERPOLATION BY CUBIC SPLINES (EASY TO USE)
ICSEVU	EVALUATION OF A CUBIC SPLINE
ICSFKU	LEAST SQUARES APPROXIMATION BY CUBIC SPLINES - FIXED KNOTS
ICSICU	INTERPOLATORY APPROXIMATION BY CUBIC SPLINES WITH ARBITRARY SECOND DERIVATIVE END CONDITIONS
ICSMOU	ONE-DIMENSIONAL DATA SMOOTHING BY ERROR DETECTION
ICSPLN	INTERPOLATION BY CUBIC SPLINES WITH PERODIC END CONDITIONS
ICSSCU	CUBIC SPLINE DATA SMOOTHER WITH USER SUPPLIED PARAMETER
ICSSCV	CUBIC SPLINE DATA SMOOTHER (EASY TO USE)
ICSVKU	LEAST SQUARES APPROXIMATION BY CUBIC SPLINES - VARIABLE KNOTS
IDAMAX	FIND THE SMALLEST INDEX OF THE MAXIMUM MAGNITUDE OF A DOUBLE PRECISION VECTOR (VBLA=IDAMAX)
IFLSQ	LEAST SQUARES APPROXIMATION WITH USER SUPPLIED BASIS FUNCTIONS
IQHSCU	ONE-DIMENSIONAL QUASI-CUBIC HERMITE INTERPOLATION
IQHSCV	SMOOTH SURFACE FITTING WITH IRREGULARLY DISTRIBUTED DATA POINTS (INTERPOLATION)

IRATCU	RATIONAL WEIGHTED CHEBYCHEV APPROXIMATION OF A CONTINUOUS FUNCTION
ISAMAX	FIND THE SMALLEST INDEX OF THE MAXIMUM MAGNITUDE OF A SINGLE PRECISION VECTOR (VBLA=ISAMAX)
LEQT1B	LINEAR EQUATION SOLUTION - BAND STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEQT1C	MATRIX DECOMPOSITION, LINEAR EQUATION SOLUTION - SPACE ECONOMIZER SOLUTION - COMPLEX MATRICES
LEQT1F	LINEAR EQUATION SOLUTION - FULL STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEQT1P	LINEAR EQUATION SOLUTION - POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEQT2B	LINEAR EQUATION SOLUTION - BAND STORAGE MODE - HIGH ACCURACY SOLUTION
LEQT2F	LINEAR EQUATION SOLUTION - FULL STORAGE MODE - HIGH ACCURACY SOLUTION
LEQT2P	LINEAR EQUATION SOLUTION - POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION
LEQ1PB	LINEAR EQUATION SOLUTION - POSITIVE DEFINITE SYMMETRIC BAND MATRIX - BAND SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEQ1S	LINEAR EQUATION SOLUTION - INDEFINITE MATRIX - SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LEQ2C	LINEAR EQUATION SOLUTION - COMPLEX MATRIX - HIGH ACCURACY SOLUTION
LEQ2PB	LINEAR EQUATION SOLUTION - POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION
LEQ2S	LINEAR EQUATION SOLUTION - INDEFINITE MATRIX - SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION
LGINF	GENERALIZED INVERSE OF REAL MATRIX
LINV1F	INVERSION OF A MATRIX - FULL STORAGE MODE - SPACE ECONOMIZER SOLUTION
LINV1P	INVERSION OF MATRIX - POSITIVE DEFINITE - SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LINV2F	INVERSION OF A MATRIX - FULL STORAGE MODE - HIGH ACCURACY SOLUTION
LINV2P	INVERSION OF A MATRIX - POSITIVE DEFINITE - SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION

LINV3F	IN PLACE INVERSE, EQUATION SOLUTION, AND/OR DETERMINANT EVALUATION - FULL STORAGE MODE
LINV3P	IN PLACE INVERSE, EQUATION SOLUTION, POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE
LIN1PB	INVERSION OF A MATRIX - POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE - SPACE ECONOMIZER SOLUTION
LIN2PB	INVERSION OF MATRIX - POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE - HIGH ACCURACY SOLUTION
LLBQF	SOLUTION OF LINEAR LEAST SQUARES - HIGH ACCURACY
LLSQF	SOLUTION OF A LINEAR LEAST SQUARES PROBLEM
LSVDB	SINGULAR VALUE DECOMPOSITION OF A BIDIAGONAL MATRIX
LSVDF	SINGULAR VALUE DECOMPOSITION OF A REAL MATRIX
LUDAPB	DECOMPOSITION OF A POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE
LUDATF	L-U DECOMPOSITION BY THE CROUT ALGORITHM WITH OPTIONAL ACCURACY TEST
LUDECP	DECOMPOSITION OF A POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE
LUELMF	ELIMINATION PART OF SOLUTION OF AX=B (FULL STORAGE MODE)
LUELMP	ELIMINATION PART OF THE SOLUTION OF AX=B - POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE
LUELPB	ELIMINATION PART OF SOLUTION OF AX=B - POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE
LUREFF	REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - FULL STORAGE MODE
LUREFP	REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - POSITIVE DEFINITE MATRIX - SYMMETRIC STORAGE MODE
LUREPB	REFINEMENT OF SOLUTION TO LINEAR EQUATIONS - POSITIVE DEFINITE BAND SYMMETRIC MATRIX - BAND SYMMETRIC STORAGE MODE
MDBETA	BETA PROBABILITY DISTRIBUTION FUNCTION
MDBETI	INVERSE BETA PROBABILITY DISTRIBUTION FUNCTION
MDBIN	BINOMIAL PROBABILITY DISTRIBUTION FUNCTION
MDBNOR	BIVARIATE NORMAL PROBABILITY DISTRIBUTION FUNCTION
MDCH	CHI-SQUARED PROBABILITY DISTRIBUTION FUNCTION

MDCHI	INVERSE CHI-SQUARED PROBABILITY DISTRIBUTION FUNCTION
MDCHN	NON-CENTRAL CHI-SQUARED PROBABILITY DISTRIBUTION FUNCTION
MDFD	F PROBABILITY DISTRIBUTION FUNCTION
MDFDRE	F PROBABILITY DISTRIBUTION FUNCTION (INTEGER OR FRACTIONAL DEGREES OF FREEDOM)
MDFI	INVERSE F PROBABILITY DISTRIBUTION FUNCTION
MDGAM	GAMMA PROBABILITY DISTRIBUTION FUNCTION
MDGC	GENERAL CONTINUOUS PROBABILITY DISTRIBUTION FUNCTION
MDGCI	INVERSE OF GENERAL CONTINUOUS PROBABILITY DISTRIBUTION FUNCTION
MDHYP	HYPERGEOMETRIC PROBABILITY DISTRIBUTION FUNCTION
MDNOR	NORMAL OR GAUSSIAN PROBABILITY DISTRIBUTION FUNCTION
MDNRIS	INVERSE STANDARD NORMAL (GAUSSIAN) PROBABILITY DISTRIBUTION FUNCTION
MDSMR	KOLMOGOROV-SMIRNOV STATISTICS ASYMPTOTIC PROBABILITY DISTRIBUTION FUNCTION
MDSTI	INVERSE OF A MODIFICATION OF STUDENTS T PROBABILITY DISTRIBUTION FUNCTION
MDTD	STUDENTS T PROBABILITY DISTRIBUTION FUNCTION
MDTN	NON-CENTRAL T PROBABILITY DISTRIBUTION FUNCTION
MDTNF	INTEGRAL RELATED TO CALCULATION OF NON- CENTRAL T AND BIVARIATE NORMAL PROBABILITY DISTRIBUTION FUNCTIONS
MDTPS	CUMULATIVE PROBABILITY AND, OPTIONALLY, INDIVIDUAL TERMS OF THE POISSON PROBABILITY DISTRIBUTION FUNCTION
MERFCI	INVERSE COMPLEMENTED ERROR FUNCTION
MERFI	INVERSE ERROR FUNCTION
MMBSI	MODIFIED BESSEL FUNCTION OF THE FIRST KIND OF ORDER ZERO
MMBSI1	MODIFIED BESSEL FUNCTION OF THE FIRST KIND OF ORDER ONE
MMBSJ	BESSEL FUNCTION OF THE FIRST KIND OF ORDER ZERO
MMBSJ1	BESSEL FUNCTION OF THE FIRST KIND OF ORDER ONE
MMBSK	MODIFIED BESSEL FUNCTION OF THE SECOND KIND OF ORDER ZERO

MMBSK1	MODIFIED BESSEL FUNCTION OF THE SECOND KIND OF ORDER ONE
MMBSYN	BESSEL FUNCTION OF THE SECOND KIND OF NON- NEGATIVE REAL FRACTIONAL ORDER FOR REAL POSITIVE ARGUMENTS
MMDAS	DAWSON INTEGRAL
MMDEI	EXPONENTIAL INTEGRALS
MMDELE	COMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND
MMDELK	COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
MMKELD	DERIVATIVES OF THE KELVIN FUNCTIONS (BER,BEI, KER, AND KEI) OF ORDER ZERO
MMKEL	KELVIN FUNCTIONS OF THE FIRST KIND, (BER,BEI), AND OF THE SECOND KIND, (KER,KEI), OF ORDER ZERO
MMKEL1	KELVIN FUNCTIONS OF THE FIRST KIND, (BER,BEI), AND OF THE SECOND KIND, (KER,KEI), OF ORDER ONE
MMPSI	LOGARITHMIC DERIVATIVE OF THE GAMMA FUNCTION
MSMRAT	RATIO OF THE ORDINATE TO THE UPPER TAIL AREA OF THE STANDARDIZED NORMAL (GAUSSIAN) DISTRIBUTION
NAK1	KRUSKAL-WALLIS TEST FOR IDENTICAL POPULATIONS
NAWNRP	WILSONS ANOVA (2 OR 3 WAY DESIGNS) WITHOUT REPLICATES
NAWRPE	WILSONS ANOVA (1, 2, OR 3 WAY DESIGNS) WITH EQUAL REPLICATION
NAWRPU	WILSONS ANOVA (1, 2, OR 3 WAY DESIGNS) WITH UNEQUAL REPLICATION
NBCYC	NOETHERS TEST FOR CYCLICAL TREND
NBQT	COCHRAN Q TEST
NBSDL	COX AND STUART SIGN TEST FOR TRENDS IN DISPERSION AND LOCATION
NBSIGN	SIGN TEST (FOR PERCENTILES)
NDEST	EVALUATE PROBABILITY DENSITY FUNCTION AT SPECIFIED POINTS
NDKER	NONPARAMETRIC PROBABILITY DENSITY FUNCTION (ONE DIMENSIONAL) ESTIMATION BY KERNEL METHOD
NDMPLE	NONPARAMETRIC PROBABILITY DENSITY FUNCTION (ONE DIMENSIONAL) ESTIMATION BY PENALIZED LIKELIHOOD METHOD
NHEXT	FISHERS EXACT METHOD FOR 2 BY 2 TABLES
NHINC	INCLUDANCE TEST

NKS1	KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST
NKS2	KOLMOGOROV-SMIRNOV TWO-SAMPLE TEST
NMCC	CALCULATE AND TEST THE SIGNIFICANCE OF THE KENDALL COEFFICIENT OF CONCORDANCE
NMKEN	KENDALLS TEST FOR CORRELATION (RANK CORRELATION COEFFICIENT)
NMKSF	FREQUENCY DISTRIBUTION OF K AND THE PROBABILITY OF EQUALLING OR EXCEEDING K, WHERE K, THE TOTAL SCORE FROM THE KENDALL RANK CORRELATION COEFFICIENT CALCULATIONS, AND N, THE SAMPLE SIZE, ARE GIVEN
NMKTS	K-SAMPLE TRENDS TEST AGAINST ORDERED ALTERNATIVES
NMRANK	NUMERICAL RANKING
NMTIE	TIE STATISTICS, GIVEN A SAMPLE OF OBSERVATIONS
NRBHA	BHAPKAR V TEST
NRWMD	WILCOXON SIGNED RANK TEST
NRWRST	WILCOXONS RANK-SUM TEST
OCDIS	PAIRWISE EUCLIDEAN DISTANCE BETWEEN COLUMNS OF A MATRIX
OCLINK	PERFORM A SINGLE-LINKAGE OR COMPLETE-LINKAGE HIERARCHICAL CLUSTER ANALYSIS GIVEN A SIMILARITY MATRIX
ODFISH	LINEAR DISCRIMINANT ANALYSIS METHOD OF FISHER FOR REDUCING THE NUMBER OF VARIABLES
ODNORM	MULTIVARIATE NORMAL LINEAR DISCRIMINANT ANALYSIS AMONG SEVERAL KNOWN GROUPS
OFCOEF	COMPUTE A MATRIX OF FACTOR SCORE COEFFICIENTS FOR INPUT TO IMSL ROUTINE OFSCOR
OFCOMM	COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO A COMMON FACTOR MODEL BY UNWEIGHTED OR GENERALIZED LEAST SQUARES, OR BY MAXIMUM LIKELIHOOD PROCEDURES
OFHARR	TRANSFORMATION OF UNROTATED FACTOR LOADING MATRIX TO OBLIQUE AXES BY HARRIS-KAISER METHOD
OFIMAG	COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO AN IMAGE MODEL
OFIMA3	LEAST SQUARES SOLUTION TO THE MATRIX EQUATION AT = B
OFPRI	COMPUTE AN UNROTATED FACTOR LOADING MATRIX ACCORDING TO A PRINCIPAL COMPONENT MODEL

OFPROT	OBLIQUE TRANSFORMATION OF THE FACTOR LOADING MATRIX USING A TARGET MATRIX, INCLUDING PIVOT AND POWER VECTOR OPTIONS
OFRESI	COMMUNALITIES AND NORMALIZED FACTOR RESIDUAL CORRELATION MATRIX CALCULATION
OFROTA	ORTHOGONAL ROTATION OF A FACTOR LOADING MATRIX USING A GENERALIZED ORTHOMAX CRITERION, INCLUDING QUARTIMAX, VARIMAX, AND EQUAMAX
OFSCHN	ORTHOGONAL TRANSFORMATION OF THE FACTOR LOADING MATRIX USING A TARGET MATRIX
OFSCOR	COMPUTE A SET OF FACTOR SCORES GIVEN THE FACTOR SCORE COEFFICIENT MATRIX
OIND	WILKS TEST FOR THE INDEPENDENCE OF K SETS OF MULTI-NORMAL VARIATES
OPRINC	PRINCIPAL COMPONENTS OF A MULTIVARIATE SAMPLE OF OBSERVATIONS
OTMLNR	MAXIMUM LIKELIHOOD ESTIMATION FROM GROUPED AND/OR CENSORED NORMAL DATA
RLCOMP	GENERATION OF AN ORTHOGONAL CENTRAL COMPOSITE DESIGN
RLDCQM	DECODING OF A QUADRATIC REGRESSION MODEL
RLDCVA	VARIANCE ESTIMATES FOR DECODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS
RLDCW	VARIANCES OF CODED ORTHOGONAL POLYNOMIAL REGRESSION COEFFICIENTS. FOR USAGE IN CONJUNCTION WITH IMSL ROUTINES RLFOTH AND RLFOTW, AND PROVIDED TO PREPARE INPUT FOR IMSL ROUTINE RLDCVA.
RLDOPM	COEFFICIENT DECODER FOR AN ORTHOGONAL POLYNOMIAL REGRESSION MODEL
RLEAP	LEAPS AND BOUNDS ALGORITHM FOR DETERMINING A NUMBER OF BEST REGRESSION SUBSETS FROM A FULL REGRESSION MODEL
RLFITI	PURE REPLICATION ERROR DEGREES OF FREEDOM AND SUM OF SQUARES (IN-CORE VERSION)
RLFITO	PURE REPLICATION ERROR DEGREES OF FREEDOM AND SUM OF SQUARES (OUT-OF-CORE VERSION)
RLFOR	FIT A UNIVARIATE CURVILINEAR REGRESSION MODEL USING ORTHOGONAL POLYNOMIALS WITH OPTIONAL WEIGHTING (EASY TO USE VERSION)
RLFOTH	FIT A UNIVARIATE CURVILINEAR REGRESSION MODEL USING ORTHOGONAL POLYNOMIALS

RLFOTW	FIT A UNIVARIATE CURVILINEAR REGRESSION MODEL USING ORTHOGONAL POLYNOMIALS WITH WEIGHTING
RLGQMI	CENTERING OF INDEPENDENT VARIABLE SETTINGS AND GENERATION OF CENTERED SQUARE AND CROSS PRODUCT TERMS (IN-CORE VERSION)
RLGQMO	CENTERING OF INDEPENDENT VARIABLE SETTINGS AND GENERATION OF UNCENTERED SQUARE AND CROSS PRODUCT TERMS (OUT-OF-CORE VERSION)
RLINCF	RESPONSE CONTROL USING A FITTED SIMPLE LINEAR REGRESSION MODEL
RLINPF	INVERSE PREDICTION USING A FITTED SIMPLE LINEAR REGRESSION MODEL
RLLAV	LINEAR REGRESSION USING LEAST ABSOLUTE VALUES CRITERION
RRLMV	LINEAR REGRESSION USING LEAST MINIMAX
RLMUL	MULTIPLE LINEAR REGRESSION ANALYSIS
RLONE	ANALYSIS OF A SIMPLE LINEAR REGRESSION MODEL
RLOPDC	RESPONSE PREDICTION USING AN ORTHOGONAL POLYNOMIAL REGRESSION MODEL
RLPOL	GENERATE ORTHOGONAL POLYNOMIALS WITH THE ASSOCIATED CONSTANTS AA AND BB
RLPRDI	CONFIDENCE INTERVALS FOR THE TRUE RESPONSE AND FOR THE AVERAGE OF A SET OF FUTURE OBSERVATIONS ON THE RESPONSE (IN-CORE VERSION)
RLPRDO	CONFIDENCE INTERVALS FOR THE TRUE RESPONSE AND FOR THE AVERAGE OF A SET OF FUTURE OBSERVATIONS ON THE RESPONSE (OUT-OF-CORE VERSION)
RLRES	PERFORM A RESIDUAL ANALYSIS FOR A FITTED REGRESSION MODEL
RLSEP	SELECTION OF A REGRESSION MODEL USING A FORWARD STEPWISE ALGORITHM, AND COMPUTATION OF THE USUAL ANALYSIS OF VARIANCE TABLE ENTRIES - EASY TO USE VERSION
RLSTP	REGRESSION MODEL SELECTION USING A FORWARD STEPWISE ALGORITHM WITH RESULTS AVAILABLE AFTER EACH STEP
RLSUBM	RETRIEVAL OF A SYMMETRIC SUBMATRIX FROM A MATRIX STORED IN SYMMETRIC STORAGE MODE BY RLSTP
RLSUM	REORDERING OF THE ROWS AND CORRESPONDING COLUMNS OF A SYMMETRIC MATRIX STORED IN SYMMETRIC STORAGE MODE
RSMITZ	LEAST SQUARES FIT OF THE NON-LINEAR REGRESSION MODEL Y(I) = ALPHA+BETA*GAMMA**X(I)+E(I)

SASUM	COMPUTE SINGLE PRECISION SUM OF ABSOLUTE VALUES (VBLA=SASUM)
SAXPY	COMPUTE A CONSTANT TIMES A VECTOR PLUS A VECTOR, ALL SINGLE PRECISION (VBLA=SAXPY)
SCASUM	COMPUTE COMPLEX SUM OF ABSOLUTE VALUES (VBLA=SCASUM)
SCNRM2	COMPUTE THE EUCLIDEAN LENGTH OR L2 NORM OF A COMPLEX VECTOR (VBLA=SCNRM2)
SCOPY	COPY A VECTOR X TO A VECTOR Y, BOTH SINGLE PRECISION (VBLA=SCOPY)
SDOT	COMPUTE SINGLE PRECISION DOT PRODUCT (VBLA=SDOT)
SDSDOT	COMPUTE SINGLE PRECISION DOT PRODUCT AND ADD A CONSTANT USING DOUBLE PRECISION ACCUMULATION (VBLA=SDSDOT)
SNRM2	COMPUTE THE EUCLIDEAN LENGTH OR L2 NORM OF A SINGLE PRECISION VECTOR (VBLA=SNRM2)
SROT	APPLY GIVENS PLANE ROTATION (SINGLE PRECISION) (VBLA=SROT)
SROTG	CONSTRUCT GIVENS PLANE ROTATION (SINGLE PRECISION) (VBLA=SROTG)
SROTM	APPLY A MODIFIED GIVENS PLANE ROTATION (SINGLE PRECISION) (VBLA=SROTM)
SROTMG	CONSTRUCT A MODIFIED GIVENS PLANE ROTATION (SINGLE PRECISION) (VBLA=SROTMG)
SSCAL	COMPUTE A SINGLE PRECISION CONSTANT TIMES A SINGLE PRECISION VECTOR (VBLA=SSCAL)
SSPAND	SIMPLE RANDOM SAMPLING WITH PROPORTION DATA-INFERENCES REGARDING THE POPULATION PROPORTION AND TOTAL
SSPBLK	STRATIFIED RANDOM SAMPLING WITH PROPORTION DATA - INFERENCES REGARDING THE POPULATION PROPORTION AND TOTAL
SSRAND	SIMPLE RANDOM SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL USING RATIO OR REGRESSION ESTIMATION
SSRBLK	STRATIFIED RANDOM SAMPLING WITH CONTINUOUS DATA-INFERENCES REGARDING THE POPULATION MEAN AND TOTAL USING RATIO OR REGRESSION ESTIMATION
SSSAND	SIMPLE RANDOM SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL
SSSBLK	STRATIFIED RANDOM SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL

SSSCAN	SINGLE STAGE CLUSTER SAMPLING WITH CONTINUOUS DATA - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL
SSSEST	TWO-STAGE SAMPLING WITH CONTINUOUS DATA AND EQUISIZED PRIMARY UNITS - INFERENCES REGARDING THE POPULATION MEAN AND TOTAL
SSWAP	INTERCHANGE VECTORS X AND Y, BOTH SINGLE PRECISION (VBLA=SSWAP)
UERSET	SET MESSAGE LEVEL FOR IMSL ROUTINE UERTST
UERTST	PRINT A MESSAGE REFLECTING AN ERROR CONDITION
UGETIO	TO RETRIEVE CURRENT VALUES AND TO SET NEW VALUES FOR INPUT AND OUTPUT UNIT IDENTIFIERS
UHELP	DISPLAY METHODS OF OBTAINING INFORMATION ON IMSL CONVENTIONS REGARDING VARIOUS SUBJECTS AND PROVIDE A MEANS FOR INDIVIDUAL SITES TO SUPPLY USERS WITH SITE SPECIFIC INFORMATION
UHELP1	WRITE INFORMATION REGARDING IMSL CONVENTIONS AND NOTATION TO AN OUTPUT FILE
UHELP2	WRITE INFORMATION REGARDING IMSL INPUT AND OUTPUT CONVENTIONS
UHELP3	WRITE INFORMATION REGARDING IMSL ERROR DETECTING FACILITIES
UHELP4	WRITE INFORMATION REGARDING MATRIX/VECTOR STORAGE MODES USED IN IMSL SUBROUTINES
USBOX	PRINT BOXPLOT
USCRDM	READ A MATRIX (OPTIONAL SEQUENCE CHECK)
USHIST	PRINT A HISTOGRAM (VERTICAL)
USHIUT	PRINT A HISTOGRAM, PLOTTING TWO FREQUENCIES WITH ONE BAR OF THE HISTOGRAM (VERTICAL)
USHV1	PRINT A HISTOGRAM (HORIZONTAL)
USLEAP	PRINT RESULTS OF THE BEST-REGRESSIONS ANALYSIS PERFORMED BY IMSL ROUTINE RLEAP
USMNMX	DETERMINATION OF THE MINIMUM AND MAXIMUM VALUES OF A VECTOR
USPC	PRINT A SAMPLE PDF, A THEORETICAL PDF AND CONFIDENCE BAND INFORMATION WITH OPTIONAL PLOT
USPDF	PLOT OF TWO SAMPLE PROBABILITY DISTRIBUTION FUNCTIONS AGAINST THEIR SPECTRA
USPLT	PRINTER PLOT OF UP TO TEN FUNCTIONS
USRDM	READ A MATRIX

USRDV	READ A VECTOR
USSLF	PRINT STEM AND LEAF DISPLAY
USTREE	PRINT A BINARY TREE (WHICH MAY REPRESENT THE OUTPUT OF A CLUSTERING ALGORITHM IN CHAPTER O)
USWBM	PRINT A MATRIX STORED IN BAND STORAGE MODE
USWBS	PRINT A MATRIX STORED IN BAND SYMMETRIC STORAGE MODE
USWFM	PRINT A MATRIX STORED IN FULL STORAGE MODE
USWFV	PRINT A VECTOR
USWSM	PRINT A MATRIX STORED IN SYMMETRIC STORAGE MODE
VABMXF	MAXIMUM ABSOLUTE VALUE OF THE ELEMENTS OF A VECTOR OR A SUBSET OF THE ELEMENTS OF A VECTOR (FULL STORAGE MODE)
VABMXS	MAXIMUM ABSOLUTE VALUE OF THE ELEMENTS OF A ROW OR COLUMN OF A MATRIX STORED (SYMMETRIC STORAGE MODE)
VABSMF	SUM OF THE ABSOLUTE VALUES OF THE ELEMENTS OF A VECTOR OR A SUBSET OF A VECTOR (FULL STORAGE MODE)
VABSMS	SUM OF THE ABSOLUTE VALUES OF THE ELEMENTS OF A ROW (OR COLUMN) OF A MATRIX STORED (SYMMETRIC STORAGE MODE)
VBLA	PACKAGE OF 38 LINEAR ALGEBRA ROUTINES
VCONVO	VECTOR CONVOLUTION
VCVTBF	STORAGE MODE CONVERSION OF MATRICES (BAND TO FULL STORAGE MODE)
VCVTCH	STORAGE MODE CONVERSION OF MATRICES (FULL COMPLEX TO HERMITIAN)
VCVTFB	STORAGE MODE CONVERSION OF MATRICES (FULL TO BAND STORAGE MODE)
VCVTFQ	STORAGE MODE CONVERSION (FULL TO BAND SYMMETRIC STORAGE MODE)
VCVTFS	STORAGE MODE CONVERSION OF MATRICES (FULL TO SYMMETRIC)
VCVTHC	STORAGE MODE CONVERSION OF MATRICES (HERMITIAN TO FULL COMPLEX)
VCVTQF	STORAGE MODE CONVERSION (BAND SYMMETRIC TO FULL STORAGE MODE)
VCVTQS	STORAGE MODE CONVERSION (BAND SYMMETRIC TO SYMMETRIC STORAGE MODE)
VCVTSF	STORAGE MODE CONVERSION OF MATRICES (SYMMETRIC TO FULL)

VCVTSQ	STORAGE MODE CONVERSION (SYMMETRIC TO BAND SYMMETRIC STORAGE MODE)
VDCPS	DECOMPOSE AN INTEGER INTO ITS PRIME FACTORS
VHSH2C	COMPLEX HOUSEHOLDER TRANSFORMATION TO ZERO A SINGLE ELEMENT OF A MATRIX
VHSH2R	REAL HOUSEHOLDER TRANSFORMATION TO ZERO A SINGLE ELEMENT OF A MATRIX
VHSH3R	REAL HOUSEHOLDER TRANSFORMATION TO ZERO TWO ELEMENTS OF A MATRIX
VHS12	REAL HOUSEHOLDER TRANSFORMATION - COMPUTATION AND APPLICATIONS
VIPRFF	VECTOR INNER PRODUCT OF TWO VECTORS OR SUBSETS OF TWO VECTORS
VIPRSS	VECTOR INNER PRODUCT OF TWO VECTORS EACH OF WHICH IS PART OF SOME MATRIX STORED IN SYMMETRIC MODE
VMULBB	MATRIX MULTIPLICATION (BAND STORAGE MODE)
VMULBF	MATRIX MULTIPLICATION (BAND BY FULL MATRICES)
VMULBS	MATRIX MULTIPLICATION (BAND BY SYMMETRIC
VMULFB	MATRIX MULTIPLICATION (FULL BY BAND MATRICES)
VMULFF	MATRIX MULTIPLICATION (FULL STORAGE MODE)
VMULFM	MATRIX MULTIPLICATION OF THE TRANSPOSE OF MATRIX A BY MATRIX B (FULL STORAGE MODE)
VMULFP	MATRIX MULTIPLICATION OF MATRIX A BY THE TRANSPOSE OF MATRIX B (FULL STORAGE MODE)
VMULFQ	MATRIX MULTIPLICATION (FULL BY BAND SYMMETRIC MATRICES)
VMULFS	MATRIX MULTIPLICATION (FULL BY SYMMETRIC MATRICES)
VMULQB	MATRIX MULTIPLICATION (BAND SYMMETRIC BY BAND MATRICES)
VMULQF	MATRIX MULTIPLICATION (BAND SYMMETRIC BY FULL MATRICES)
VMULQQ	MATRIX MULTIPLICATION (BAND SYMMETRIC STORAGE MODE)
VMULQS	MATRIX MULTIPLICATION (BAND SYMMETRIC BY SYMMETRIC MATRICES)
VMULSB	MATRIX MULTIPLICATION (SYMMETRIC BY BAND MATRICES)
VMULSF	MATRIX MULTIPLICATION (SYMMETRIC BY FULL MATRICES)
VMULSQ	MATRIX MULTIPLICATION (SYMMETRIC BY BAND SYMMETRIC MATRICES)

VMULSS	MATRIX MULTIPLICATION (SYMMETRIC STORAGE MODE)
VNRMFI	INFINITY-NORM MATRICES (FULL STORAGE MODE)
VNRMF1	1-NORM OF MATRICES (FULL STORAGE MODE)
VNRMF2	EUCLIDEAN-NORM OF MATRICES (FULL STORAGE MODE)
VNRMS1	1-NORM OF MATRICES (SYMMETRIC STORAGE MODE)
VNRMS2	EUCLIDEAN-NORM OF MATRICES (SYMMETRIC STORAGE MODE)
VPOLYF	MATRIX POLYNOMIAL (FULL STORAGE MODE)
VSRTA	SORTING OF ARRAYS BY ALGEBRAIC VALUE
VSRTM	SORTING OF ARRAYS BY ABSOLUTE VALUE
VSRTP	SORTING OF ARRAYS BY ABSOLUTE VALUE - PERMUTATIONS RETURNED
VSRTR	SORTING OF ARRAYS BY ALGEBRAIC VALUE - PERMUTATIONS RETURNED
VSRTU	INTERCHANGE THE ROWS OR COLUMNS OF A MATRIX USING A PERMUTATION VECTOR SUCH AS THE ONE OBTAINED FROM IMSL ROUTINES VSRTP OR VSRTR
VTPROF	TRANSPOSE PRODUCT OF MATRIX (FULL STORAGE MODE)
VTPROS	TRANSPOSE PRODUCT OF A MATRIX (SYMMETRIC STORAGE MODE)
VTRAN	TRANSPOSE A RECTANGULAR MATRIX
VUABQ	MATRIX ADDITION (BAND + BAND SYMMETRIC MATRICES)
VUAFB	MATRIX ADDITION (FULL + BAND MATRICES)
VUAFQ	MATRIX ADDITION (FULL + BAND SYMMETRIC MATRICES)
VUAFS	MATRIX ADDITION (FULL + SYMMETRIC MATRICES)
VUASB	MATRIX ADDITION (SYMMETRIC + BAND MATRICES)
VUASQ	MATRIX ADDITION (SYMMETRIC + BAND SYMMETRIC MATRICES)
ZANLYT	ZEROS OF AN ANALYTIC COMPLEX FUNCTION USING THE MULLER METHOD WITH DEFLATION
ZBRENT	ZERO OF A FUNCTION WHICH CHANGES SIGN IN A GIVEN INTERVAL (BRENT ALGORITHM)
ZCPOLY	ZEROS OF A POLYNOMIAL WITH COMPLEX COEFFICIENTS (JENKINS-TRAUB)
ZFALSE	ZERO OF A FUNCTION GIVEN AN INTERVAL CONTAINING THE ZERO

ZPOLR	ZEROS OF A POLYNOMIAL WITH REAL COEFFICIENTS (LAGUERRE)
ZQADC	ZEROS OF A QUADRATIC WITH COMPLEX COEFFICIENTS
ZQADR	ZEROS OF A QUADRATIC WITH REAL COEFFICIENTS
ZREAL1	THE REAL ZEROS OF A REAL FUNCTION - TO BE USED WHEN INITIAL GUESSES ARE POOR
ZREAL2	THE REAL ZEROS OF A REAL FUNCTION - TO BE USED WHEN INITIAL GUESSES ARE GOOD
ZRPOLY	ZEROS OF A POLYNOMIAL WITH REAL COEFFICIENTS (JENKINS-TRAUB)
ZSCNT	SOLVE SYSTEM OF NONLINEAR EQUATIONS BY SECANT METHOD
ZSRCH	GENERATE POINTS IN AN N DIMENSIONAL SPACE
ZSYSTM	DETERMINATION OF A ROOT OF A SYSTEM OF N SIMULTANEOUS NONLINEAR EQUATIONS IN N UNKNOWNS
ZXCGR	A CONJUGATE GRADIENT ALGORITHM FOR FINDING THE MINIMUM OF A FUNCTION OF N VARIABLES
ZXGSN	ONE-DIMENSIONAL UNIMODAL FUNCTION MINIMIZATION USING THE GOLDEN SECTION SEARCH METHOD
ZXGSP	ONE-DIMENSIONAL UNIMODAL FUNCTION MINIMIZATION USING THE GOLDEN SECTION SEARCH METHOD - DATA PARAMETERS SPECIFIED
ZXMIN	MINIMUM OF A FUNCTION OF N VARIABLES USING A QUASI-NEWTON METHOD
ZXSSQ	MINIMUM OF THE SUM OF SQUARES OF M FUNCTIONS IN N VARIABLES USING A FINITE DIFFERENCE LEVENBERG-MARQUARDT ALGORITHM
ZX0LP	SOLVE THE LINEAR PROGRAMMING PROBLEM (PHASE ONE OR PHASE TWO) VIA THE REVISED SIMPLEX ALGORITHM
ZX3LP	SOLVE THE LINEAR PROGRAMMING PROBLEM VIA THE REVISED SIMPLEX ALGORITHM (EASY TO USE VERSION)
ZX4LP	SOLVE THE LINEAR PROGRAMMING PROBLEM VIA THE REVISED SIMPLEX ALGORITHM USING ORTHOGONAL DECOMPOSITION (EASY TO USE VERSION)

LINPACK

LINPACK IS A PACKAGE OF 40 SUBROUTINES TO ANALYZE AND SOLVE VARIOUS CLASSES OF SYSTEMS OF SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS WHICH WAS OBTAINED FROM ARGONNE NATIONAL LABORATORY. BESIDE THE SINGLE PRECISION PACKAGE VERSIONS FOR COMPLEX OR DOUBLE PRECISION EXIST. ROUTINES ARE INCLUDED FOR GENERAL, BANDED, SYMMETRIC INDEFINITE, SYMMETRIC POSITIVE DEFINITE, TRIANGULAR, AND TRIDIAGONAL SQUARE MATRICES PLUS LEAST SQUARE PROBLEMS AND QR AND SINGLE VALUE DECOMPOSITIONS OF RECTANGULAR MATRICES. THE PACKAGE ALSO INCLUDES 11 BASIC LINEAR ALGEBRA SUBPROGRAMS.

REFERENCE: "LINPACK USERS' GUIDE", J. J. DONGARA, J. R. BUNCH, C. D. MOLER, G. W. STEWART, SIAM, 1979.

ROUTINES IN LIBRARY 'LINPACK' INCLUDE:

SCHDC COMPUTES THE CHOLESKY DECOMPOSITION OF A POSITIVE DEFINITE MATRIX. A PIVOTING OPTION ALLOWS THE USER TO ESTIMATE THE CONDITION OF A POSITIVE DEFINITE MATRIX OR DETERMINE THE RANK OF A POSITIVE SEMIDEFINITE MATRIX.

SCHDD DOWNDATES AN AUGMENTED CHOLESKY DECOMPOSITION OR THE TRIANGULAR FACTOR OF AN AUGMENTED QR DECOMPOSITION.

SCHEX UPDATES THE CHOLESKY FACTORIZATION A = TRANS(R)*R OF A POSITIVE DEFINITE MATRIX A OF ORDER P UNDER DIAGONAL PERMUTATIONS OF THE FORM TRANS(E)*A*E WHERE E IS A PERMUTATION MATRIX.

SCHUD UPDATES AN AUGMENTED CHOLESKY DECOMPOSITION OF THE TRIANGULAR PART OF AN AUGMENTED QR DECOMPOSITION.

SGBCO FACTORS A REAL BAND MATRIX BY GAUSSIAN ELIMINATION AND ESTIMATES THE CONDITION OF THE MATRIX.

SGBDI COMPUTES THE DETERMINANT OF A BAND MATRIX USING THE FACTORS COMPUTED BY SGBCO OR SGBFA.

SGBFA FACTORS A REAL BAND MATRIX BY ELIMINATION.

SGBSL SOLVES THE REAL BAND SYSTEM A * X = B OR TRANS(A) * X = B USING THE FACTORS COMPUTED BY SGBCO OR SGBFA.

SGECO FACTORS A REAL MATRIX BY GAUSSIAN ELIMINATION AND ESTIMATES THE CONDITION OF THE MATRIX.

SGEDI COMPUTES THE DETERMINANT AND INVERSE OF A MATRIX USING THE FACTORS COMPUTED BY SGECO OR SGEFA.

SGEFA FACTORS A REAL MATRIX BY GAUSSIAN ELIMINATION.

SGESL	SOLVES THE REAL SYSTEM A * X = B OR TRANS(A) * X = B USING THE FACTORS COMPUTED BY SGECO OR SGEFA.
SGTSL	GIVEN A GENERAL TRIDIAGONAL MATRIX AND A RIGHT HAND SIDE WILL FIND THE SOLUTION.
SPBCO	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX STORED IN
SPBDI	COMPUTES THE DETERMINANT OF A REAL SYMMETRIC POSITIVE DEFINITE BAND MATRIX USING THE FACTORS COMPUTED BY SPBCO OR SPBFA.
SPBFA	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX STORED IN BAND FORM.
SPBSL	SOLVES THE REAL SYMMETRIC POSITIVE DEFINITE BAND SYSTEM A*X = B USING THE FACTORS COMPUTED BY SPBCO OR SPBFA.
SPOCO	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX AND ESTIMATES THE CONDITION OF THE MATRIX.
SPODI	COMPUTES THE DETERMINANT AND INVERSE OF A CERTAIN REAL SYMMETRIC POSITIVE DEFINITE MATRIX (SEE BELOW) USING THE FACTORS COMPUTED BY SPOCO, SPOFA OR SQRDC.
SPOFA	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX.
SPOSL	SOLVES THE REAL SYMMETRIC POSITIVE DEFINITE SYSTEM A * X = B USING THE FACTORS COMPUTED BY SPOCO OR SPOFA.
SPPCO	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX STORED IN PACKED FORM AND ESTIMATES THE CONDITION OF THE MATRIX.
SPPDI	COMPUTES THE DETERMINANT AND INVERSE OF A REAL SYMMETRIC POSITIVE DEFINITE MATRIX USING THE FACTORS COMPUTED BY SPPCO OR SPPFA.
SPPFA	FACTORS A REAL SYMMETRIC POSITIVE DEFINITE MATRIX STORED IN PACKED FORM.
SPPSL	SOLVES THE REAL SYMMETRIC POSITIVE DEFINITE SYSTEM A * X = B USING THE FACTORS COMPUTED BY SPPCO OR SPPFA.
SPTSL	GIVEN A POSITIVE DEFINITE TRIDIAGONAL MATRIX AND A RIGHT HAND SIDE WILL FIND THE SOLUTION.
SQRDC	USES HOUSEHOLDER TRANSFORMATIONS TO COMPUTE THE QR FACTORIZATION OF AN N BY P MATRIX X. COLUMN PIVOTING BASED ON THE 2-NORMS OF THE REDUCED COLUMNS MAY BE PERFORMED AT THE USERS OPTION.
SQRSL	APPLIES THE OUTPUT OF SQRDC TO COMPUTE COORDINATE TRANSFORMATIONS, PROJECTIONS, AND LEAST SQUARES SOLUTIONS.

SSICO	FACTORS A REAL SYMMETRIC MATRIX BY ELIMINATION WITH SYMMETRIC PIVOTING AND ESTIMATES THE CONDITION OF THE MATRIX.
SSIDI	COMPUTES THE DETERMINANT, INERTIA AND INVERSE OF A REAL SYMMETRIC MATRIX USING THE FACTORS FROM SSIFA.
SSIFA	FACTORS A REAL SYMMETRIC MATRIX BY ELIMINATION WITH SYMMETRIC PIVOTING.
SSISL	SOLVES THE REAL SYMMETRIC SYSTEM A * X = B USING THE FACTORS COMPUTED BY SSIFA.
SSPCO	FACTORS A REAL SYMMETRIC MATRIX STORED IN PACKED FORM BY ELIMINATION WITH SYMMETRIC PIVOTING AND ESTIMATES THE CONDITION OF THE MATRIX.
SSPDI	COMPUTES THE DETERMINANT, INERTIA AND INVERSE OF A REAL SYMMETRIC MATRIX USING THE FACTORS FROM SSPFA, WHERE THE MATRIX IS STORED IN PACKED FORM.
SSPFA	FACTORS A REAL SYMMETRIC MATRIX STORED IN PACKED FORM BY ELIMINATION WITH SYMMETRIC PIVOTING.
SSISL	SOLVES THE REAL SYMMETRIC SYSTEM A * X = B USING THE FACTORS COMPUTED BY SSPFA.
SSVDC	REDUCES A REAL NXP MATRIX X BY ORTHOGONAL TRANSFORMATIONS U AND V TO DIAGONAL FORM.
STRCO	ESTIMATES THE CONDITION OF A REAL TRIANGULAR MATRIX.
STRDI	COMPUTES THE DETERMINANT AND INVERSE OF A REAL TRIANGULAR MATRIX.
STRSL	SOLVES SYSTEMS OF THE FORM T * X = B OR TRANS(T) * X = B WHERE T IS A TRIANGULAR MATRIX OF ORDER N.

MINPACK

MINPACK IS A PACKAGE OF 23 FORTRAN SUBPROGRAMS (11 ARE USER-CALLABLE) TO SOLVE NON-LINEAR EQUATIONS AND NON-LINEAR LEAST SQUARES PROBLEMS. IT WAS OBTAINED FROM ARGONNE NATIONAL LABORATORY.

REFERENCES: ANL-80-74

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCTAPE' (SEE PAGE 1-2).

USER-CALLABLE ROUTINES IN LIBRARY 'MINPACK' INCLUDE:

CHKDER	CHECK THE GRADIENTS OF M NONLINEAR FUNCTIONS IN N VARIABLES, EVALUATED AT A POINT X, FOR CONSISTENCY WITH THE FUNCTIONS THEMSELVES
HYBRD	FIND A ZERO OF A SYSTEM OF N NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE POWELL HYBRID METHOD
HYBRD1	FIND A ZERO OF A SYSTEM OF N NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE POWELL HYBRID METHOD
HYBRJ	FIND A ZERO OF A SYSTEM OF N NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE POWELL HYBRID METHOD
HYBRJ1	FIND A ZERO OF A SYSTEM OF N NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE POWELL HYBRID METHOD
LMDER	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT ALGORITHM
LMDER1	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT ALGORITHM
LMSTR	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT WHICH USES MINIMAL STORAGE
LMSTR1	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT ALGORITHM WHICH USES MINIMAL STORAGE
LMDIF	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT ALGORITHM
LMDIF1	MINIMIZE THE SUM OF THE SQUARES OF M NON-LINEAR FUNCTIONS IN N VARIABLES BY A MODIFICATION OF THE LEVELBERG-MARQUARDT ALGORITHM

MSL (PROPRIETARY)

THE CDC MATH SCIENCE LIBRARY CONTAINS OVER 300 NUMERICAL MATHEMATICAL ROUTINES COVERING THE FOLLOWING EIGHT AREAS:

- .PROGRAMMED ARITHMETIC
- .ELEMENTARY FUNCTIONS
- .POLYNOMIALS AND SPECIAL FUNCTIONS
- .ORDINARY DIFFERENTIAL EQUATIONS
- .INTERPOLATION, APPROXIMATION AND QUADRATURE
- .LINEAR ALGEBRA
- .PROBABILITY, STATISTICS AND TIME SERIES
- .NONLINEAR EQUATION SOLVERS

REFERENCE: MATH SCIENCE LIBRARY, VOLUMES 1-8, CDC PUBLICATION NUMBER 60327500.

ROUTINES IN LIBRARY 'MSL' INCLUDE:

ACFI	SINGLE CONTINUED FRACTION INTERPOLATION ON TABULAR DATA WITH ARBITRARY SPACING
ADR	ADD COEFFICIENTS OF LIKE POWERS OF TWO REAL POYLNOMIALS
AITKEN	AITKEN'S INTERPOLATION OF ORDER N-1 (ORDER RANGE FROM 1-9)
AMCON	PROVIDE CERTAIN MACHINE AND MATHEMATICAL CONSTANTS AS SINGLE PRECISION NUMBERS OF MAXIMUM ACCURACY
ATSM	SELECT A SUBTABLE ORDERED, ACCORDING TO PROXIMITY, OF THOSE POINTS THAT HAVE ABSCISSAE CLOSEST TO A GIVEN VALUE, FROM A MONOTONE ORDERED TABLE
BALANC	BALANCE A COMPLEX MATRIX BY THE USE OF DIAGONAL SIMILARITY TRANSFORMATIONS
BANEIG	DETERMINE A SPECIFIED NUMBER OF THE SMALLEST EIGENVALUES AND ASSOCIATED EIGENVECTORS OF THE ALGEBRAIC EIGENVALUE PROBLEM A*VI=LAMBDA*B*VI WHERE A IS A SYMMETRIC, NONNEGATIVE DEFINITE, NARROW BAND MATRIX AND B IS A POSITIVE DEFINITE DIAGONAL MATRIX
BCHSDC	DECOMPOSE A REAL, SYMMETRIC POSITIVE BAND MATRIX INTO (BANDED) UPPER AND LOWER TRIANGULAR FACTORS
BDCWNP	DECOMPOSE A BANDED MATRIX INTO BANDED LOWER AND UPPER TRIANGULAR FACTORS WITH NO PIVOTING
BDECOM	DECOMPOSE A BANDED MATRIX B INTO BANDED LOWER AND UPPER TRIANGULAR FACTORS L AND U, WITH IMPLICIT EQUILIBRATION AND PARTIAL PIVOTING
BESNIS	EVALUATE A TABLE FOR THE BESSEL FUNCTION I(X) FOR N=0,1,2,3,...,J-1
BESNKS	EVALUATE A TABLE OF VALUES OF THE BESSEL FUNCTION K(X)

BETAR	COMPUTE INCOMPLETE BETA RATIO (OF THE INCOMPLETE BETA FUNCTION AT X,P,Q TO THE COMPLETE BETA FUNCTION AT P,Q)
BFBANP	SOLVE LY=B AND UX=Y BY BACK SUBSTITUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND, L AND U ARE LOWER AND UPPER TRIANGULAR FACTORS, POSSIBLY OBTAINED FROM BDCWNP
BFBSUM	SOLVE LY=B AND UX=Y BY BACK SUBSTITUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND, L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM BDECOM
BITERM	SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT FOR SYSTEMS HAVING A BAND COEFFICIENT MATRIX
BITRFM	SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX
BITRNP	SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX
BITRPD	SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT, GIVEN THE TRIANGULAR DECOMPOSITION
BITWNP	SOLVE, WITH ITERATIVE REFINEMENT, A SYSTEM OF LINEAR EQUATIONS HAVING A BAND COEFFICIENT MATRIX
BLCKDQ	SOLVE A SYSTEM OF FIRST ORDER DIFFERENTIAL EQUATIONS AT A POINT B, GIVEN THE (INITIAL) VALUES AT A POINT A
BLESOM	SOLVE A SYSTEM OF N LINEAR EQUATIONS (WITH M RIGHT-HAND SIDES), HAVING A BAND COEFFICIENT MATRIX
BLSWNP	SOLVE A SYSTEM OF LINEAR EQUATIONS (WITH SEVERAL RIGHT-HAND SIDES), HAVING A BAND COEFFICIENT MATRIX, USING NO PIVOTING
BPDITM	SOLVE A SYSTEM OF LINEAR EQUATIONS WITH ITERATIVE REFINEMENT - A BANDED, SYMMETRIC SYSTEM WITH POSITIVE DEFINITENESS
BPDSFB	SOLVE LY=B AND LTX=Y BY BACK SUBSTIUTIONS - WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND L AND LT ARE THE LOWER TRIANGULAR FACTOR AND ITS TRANSPOSE POSSIBLY OBTAINED FROM BCHSDC
BPDSOM	SOLVE A POSITIVE DEFINITE SYMMETRIC BAND SYSTEM OF EQUATIONS HAVING M RIGHT-HAND SIDES
BRTLTT	COMPUTE THE TEST STATISTIC FOR BARTLETT'S TEST OF HOMOGENEITY OF A GROUP OF VARIANCE ESTIMATES AND DETERMINE THE PROBABILITY OF OBTAINING A VALUE FOR THE TEST STATISTIC LESS THAN THAT OBSERVED
BSJ	EVALUATE THE SPHERICAL BESSEL FUNCTION J(X) FOR N=-1,0,...,I
BSUBHT	FIND A LEAST SQUARES SOLUTION TO AN OVERDETERMINED SYSTEM THAT HAS BEEN DECOMPOSED USING HOUSEHOLDER TRANSFORMATIONS

BVP	SOLVE NONLINEAR P-POINT BOUNDARY VALUE PROBLEM IN ORDINARY DIFFERENTIAL EQUATIONS
CADR	ADD COEFFICIENTS OF LIKE POWERS OF TWO COMPLEX POLYNOMIALS
CBAREX	EVALUATE C**R FOR C A COMPLEX NUMBER AND R A REAL NUMBER
CCOMPE	EVALUATE A POLYNOMIAL HAVING COMPLEX COEFFICIENTS AT A COMPLEX POINT
CCONGR	SOLVE THE RECTANGULAR SYSTEM AX-BAR=B-BAR IN THE LEAST SQUARES SENSE, IF NO EXACT SOLUTION EXISTS - A, B-BAR, X-BAR ARE COMPLEX
CDECOM	DECOMPOSE A COMPLEX SQUARE MATRIX INTO POWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING AND ROW EQUILIBRATION
CDERIV	GIVEN THE COMPLEX COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COMPLEX COEFFICIENTS OF THE DERIVATIVE POLYNOMIAL
CEL3	COMPUTE THE COMPLETE ELLIPTIC INTEGRAL OF THE THIRD KIND
CFBSUM	SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS WITH COMPLEX ELEMENTS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM CDECOM
CFQME	CONSTRUCT THE MINIMAX POLYNOMIAL THROUGH A DISCRETE, WEIGHTED, SET OF POINTS
CGITRF	SOLVE A COMPLEX SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDE COMPLEX COLUMN VECTORS WITH ITERATIVE REFINEMENT
CGLESM	SOLVE A COMPLEX SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES
CHEBAP	FIND A CLOSE APPROXIMATION TO A MINIMAX FIT OF A GIVEN FUNCTION OVER A GIVEN INTERVAL
CHEBEV	EVALUATE A CHEBYCHEV POLYNOMIAL AT A GIVEN POINT
CHIDST	PERFORM THE CHI-SQUARE DISTRIBUTION TEST
CHIPRB	COMPUTE THE PROBABILITY OF OBTAINING A VALUE OF CHI-SQUARE WHICH IS LESS THAN OR EQUAL TO THE GIVEN VALUE CHI-SQUARE
CHIRAB	PERFORM A CHI-SQUARE TEST FOR RUNS ABOVE AND BELOW ZERO - TESTS HYPOTHESIS THAT A SAMPLE OF RANDOM VARIABLES IS OBTAINED FROM A POPULATION WHICH IS SYMMETRICALLY DISTRIBUTED ABOUT ZERO
CHIRUD	PERFORM THE CHI-SQUARE TEST FOR RUNS UP AND DOWN
CHSDEC	DECOMPOSE A POSITIVE DEFINITE SYMMETRIC MATRIX INTO A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE

CHSQO	FUNCTION TO COMPUTE THE VALUE OF CHI-SQUARE WHEN GIVEN THE EXPECTED AND OBSERVED FREQUENCIES
CHTOL	EVALUATE THE DISTANCE OF A POINT TO A LINE
CINPRD	COMPUTE THE INNER PRODUCT OF TWO VECTORS HAVING COMPLEX COEFFICIENTS IN DOUBLE PRECISION
CINT	GIVEN THE COMPLEX COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COEFFICIENTS OF THE INTEGRAL POLYNOMIAL
CITERF	SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS HAVING COMPLEX ELEMENTS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM CDECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION
CLDIV	DIVIDE A POLYNOMIAL WITH COMPLEX COEFFICIENTS BY THE LINEAR EXPRESSION (X+B) WHERE B IS COMPLEX
CMPYR	FIND THE PRODUCT OF TWO POLYNOMIALS WHEN ANY OF THE COEFFICIENTS ARE COMPLEX
CNSLVL	ESTIMATE THE ERROR PERFORMED IN THE EVALUATION OF A COMPLEX POLYNOMIAL IN THE NEIGHBORHOOD OF ONE OF ITS ROOTS
COMBES	COMPUTE A TABLE OF BESSEL FUNCTIONS OF THE FIRST AND SECOND KINDS FOR COMPLEX ARGUMENT AND ORDERS
COMCUB	FIND THE SLOPES AT A GIVEN SET OF POINTS OF THE CUBIC SPLINE PASSING THROUGH THE POINTS
COMPEV	EVALUATE A REAL POLYNOMIAL AT A COMPLEX POINT
CONRAY	PERFORM ARITHMETIC OPERATIONS ON THE OBSERVATIONS OF ONE VARIABLE IN A MULTIPLEXED DATA ARRAY AND A SPECIFIED CONSTANT
CORCOV	COMPUTE EITHER THE AUTOCORRELATION COEFFICIENTS OR THE AUTOVARIANCE COEFFICIENTS FOR ONE OF THE VARIABLES IN A MULTIPLEXED DATA ARRAY
COSEVL	EVALUATE A COSINE POLYNOMIAL AT A GIVEN POINT
CPDIV	PROVIDE THE QUOTIENT AND REMAINDER OBTAINED BY DIVIDING ONE POLYNOMIAL BY ANOTHER - COEFFICIENTS MAY BE COMPLEX
CPOLRT	FIND ALL ROOTS OF AN NTH DEGREE POLYNOMIAL HAVING COMPLEX COEFFICIENTS
CPTRAN	COORDINATE TRANSLATION SUCH THAT THE POLYNOMIAL P(X) BECOMES P(X+T) - P(X) MAY HAVE COMPLEX COEFFICIENTS.

CQDIV	DIVIDE THE COMPLEX POLYNOMIAL BY THE QUADRATIC EXPRESSION (X**2+B*X+C), B AND C COMPLEX
CREV	REVERSE THE ORDER OF POLYNOMIAL COEFFICIENTS IN AN ARRAY - COEFFICIENTS MAY BE COMPLEX
CSBR	SUBTRACT COEFFICIENTS OF LIKE POWERS OF TWO POLYNOMIALS - COEFFICIENTS MAY BE COMPLEX
CSHRNK	COMPUTE THE COEFFICIENTS OF THE POLYNOMIAL P(AX) FROM THE COEFFICIENTS OF THE POLYNOMIAL P(X) - COMPLEX COEFFICIENTS
CUBIC2	FIT A CUBIC TO TWO POINTS, GIVEN THE SLOPE AT EACH
CURV	EVALUATE THE MERIT FUNCTION FOR A GIVEN DATA SET
DCBHT	REDUCE A GIVEN MATRIX TO UPPER TRIANGULAR FORM BY HOUSEHOLDER TRANSFORMATIONS
DCWNE	DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING BUT WITHOUT ROW EQUILIBRATION
DCWNP	DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITHOUT PIVOTING
DECOM	DECOMPOSE A SQUARE MATRIX INTO LOWER AND UPPER TRIANGULAR MATRICES WITH PARTIAL PIVOTING AND ROW EQUILIBRATION
DEIG	SOLVE FOR THE EIGENVALUES AND RIGHT EIGENVECTORS OF THE DYNAMICAL SYSTEM AX..+BX.+CX=0 WHERE A, B, C ARE REAL, BUT OTHERWISE GENERAL, MATRICES
DERIV	GIVEN THE REAL COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE REAL COEFFICIENTS OF THE DERIVATIVE POLYNOMIAL
DETERM	CALCULATE THE DETERMINANT OF A SQUARE MATRIX IN THE FORM D1*(2**D2) USING THE INFORMATION FROM THE SUBROUTINE DECOM
DIFTAB	DIFFERENTIATE NUMERICALLY A FUNCTION GIVEN AS A TABLE WITH EQUISPACED ARGUMENTS
DLETE	REMOVE SPECIFIED OBSERVATIONS FROM A DATA ARRAY
DRATEX	SOLVE NUMERICALLY INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS
DSCRPT	COMPUTE MEANS, STANDARD DEVIATIONS, VARIANCES, AND COEFFICIENTS OF SKEWNESS AND KURTOSIS FOR MULTIPLEXED DATA ARRAYS
DSCRP2	DETERMINE THE MEDIAN, MINIMUM, MAXIMUM AND RANGE FOR EITHER A SINGLE VARIABLE IN A MULTIPLEXED DATA ARRAY OR ALL THE VARIABLES IN A MULTIPLEXED DATA ARRAY
DTSHFT	FURNISH A GUESS OF AN EIGENVALUE TO A COMPLEX HESSENBERG MATRIX

EIGCHK GIVEN AN APPROXIMATE EIGENVALUE/EIGENVECTOR PAIR OF A REAL SYMMETRIC MATRIX A, AND THE MATRIX, AND ESTIMATES OF THE CLOSEST EIGENVALUES TO THE GIVEN EIGENVALUE, PROVIDE ERROR BOUNDS AND POSSIBLY REFINEMENT OF THE EIGENVALUE

EIGCO1 GIVEN AN APPROXIMATION TO AN EIGENVALUE OF A REAL MATRIX HAVING REAL AND DISTINCT ROOTS, CONVERGE TO THE EIGENVALUE-EIGENVECTOR PAIR WHOSE EIGENVALUE IS NEAREST TO THIS APPROXIMATION

EIGIMP REFINE THE EIGENVECTORS OBTAINED FROM SUBROUTINE EIGVCH (WIELANOT INVERSE ITERATION)

EIGSYM FIND ALL EIGENVECTORS OF A REAL, SYMMETRIC MATRIX - SUBSET OF EIGENVECTORS MAY ALSO BE FOUND

EIGVCH COMPUTE THE EIGENVECTORS CORRESPONDING TO A REAL EIGENVALUE OF A REAL UPPER HESSENBERG MATRIX

EIG5 FIND ALL, OR OPTIONALLY A SUBSET OF THE EIGENVALUES OF A GENERAL, REAL-ELEMENTED MATRIX

ELF EVALUATE THE INCOMPLETE ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND

ELK EVALUATE THE COMPLETE ELLIPTIC INTEGRAMS OF THE FIRST AND SECOND KIND

EL3 COMPUTE THE ELLIPTIC INTEGRAL OF THE THIRD KIND

ERF COMPUTE THE ERROR FUNCTION

ERFINV FIND THE INVERSE ERROR FUNCTION - COMPUTE THE UPPER LIMIT OF THE INTEGRAL IN THE ERROR FUNCTION

EVREAL EVALUATE A POLYNOMIAL HAVING REAL COEFFICIENTS AT A REAL VALUE OF THE INDEPENDENT VARIABLE

EXRAND GENERATE RANDOM NUMBERS HAVING A NEGATIVE EXPONENTIAL DISTRIBUTION

FABSV COMPUTE THE VALUE OF THE MODULUS OF A VECTOR

FAFRAC ADD TWO FRACTIONS AND EXPRESS THE RESULT AS A FRACTION IN IT'S LOWEST FORM

FBSM SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND U AND L ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM

SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS, WHERE B IS A COLUMN VECTOR, AND U AND L ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM

SOLVE RECTANGULAR EQUATION SYSTEM AX-BAR=B-BAR IN THE LEAST SQUARES SENSE, IF NO EXACT SOLUTION EXISTS - A, X-BAR, B-BAR (COMPLEX)

FCLSQ	CONSTRUCT A LEAST SQUARE POLYNOMIAL OF A SPECIFIED DEGREE WHOSE GRAPH APPROXIMATES A SET OF DATA POINTS
FDLSQ	CONSTRUCT A LEAST SQUARE POLYNOMIAL APPROXIMATION OF SOME PRE-ASSIGNED DEGREE TO A SET OF DATA POINTS WITH GIVEN WEIGHT WHERE THE POLYNOMIAL IS CONSTRAINED AT N POINTS AND THE DERIVATIVE IS ALSO CONSTRAINED AT THE FIRST M OF THE N POINTS WHERE M <= N
FFRAC	CHANGE A VECTOR WITH FRACTIONAL COMPONENTS INTO ONE WITH INTEGER COMPONENTS TIMES A SCALAR FRACTION
FHRNEW	CONSTRUCT THE HERMETIAN POLYNOMIAL OF DEGREE N+M+1 THROUGH N+1 COORDINATES WITH DERIVATIVES AT THE FIRST M+1 POINTS
FILTER	COMPUTE THE OUTPUTS FROM A MOVING AVERAGE -- AUTOGRESSIVE FILTER - BOTH INPUT AND OUTPUT ARRAYS MAY BE MULTIPLEXED ARRAYS
FITLIN	FIND THE BEST FIT LINE - MINIMIZE THE SUM OF THE SQUARES OF THE PEPENDICULAR DISTANCES FROM THE POINTS TO THE LINE
FLGNEW	CONSTRUCT THE NTH DEGREE LAGRANGIAN THROUGH N+1 COORDINATES X(I), AF(I)
FLSQFY	FIND A LEAST SQUARES POLYNOMIAL OF SPECIFIED DEGREE WHOSE GRAPH APPROXIMATES A SET OF DATA POINTS
FMFRAC	MULTIPLY TWO FRACTIONS AND EXPRESS THE RESULT AS A FRACTION IN ITS LOWEST TERMS
FMMX	MATRIX-MATRIX MULTIPLICATION
FMTMX	MULTIPLY THE TRANSPOSE OF A MATRIX BY A MATRIX ON THE RIGHT
FMTR	TRANSPOSE AN M BY N MATRIX
FMTVCX	MULTIPLY THE TRANSPOSE OF A COMPLEX MATRIX ON THE RIGHT BY A COMPLEX VECTOR
FMTVX	MULTIPLY THE TRANSPOSE OF A MATRIX BY A VECTOR
FMULT1	MULTIPLY A GIVEN NTH DEGREE POLYNOMIAL BY A GIVEN LINEAR FACTOR TO GIVE AN (N+1)TH DEGREE POLYNOMIAL
FMVCX	MULTIPLY A COMPLEX MATRIX ON THE RIGHT BY A COMPLEX VECTOR
FMVX	MATRIX-VECTOR MULTIPLICATION
FNORM1	NORMALIZE A VECTOR
FOURAP	FIND THE LEAST SQUARES APPROXIMATING TRIGONOMETRIC POLYNOMIAL TO A SET OF GIVEN DATA HAVING EQUISPACED ABSCISSAE

FOURI	FIND AN INTERPOLATING TRIGONOMETRIC POLYNOMIAL TO A SET OF DATA HAVING EQUISPACED ABSCISSAE
FPUR	SUBTRACT FROM A VECTOR ITS COMPONENT ALONG ANOTHER VECTOR
GAMAIN	COMPUTE THE INCOMPLETE GAMMA FUNCTION
GAMMA	EVALUATE THE GAMMA FUNCTION OF A REAL ARGUMENT X
GITRFM	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES WITH ITERATIVE REFINEMENT
GITRFS	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SODE WITH ITERATIVE REFINEMENT
GLESOM	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING M RIGHT-HAND SIDES
GLESOS	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE
GMI	EVALUATE NUMERICALLY A SINGLE, DOUBLE OR M-TUPLE (M.LE.10) INTEGRAL OF AN ARBITRARY INTEGRAND BETWEEN ARBITRARY LIMITS
HANKEL	EVALUATE THE COMPLEX-VALUED HANKEL FUNCTION OF THE FIRST OR SECOND KIND FOR REAL ARGUMENT AND INTEGER ORDER
HARM	COMPUTE A FINITE DISCRETE COMPLEX FOURIER TRANSFORM OF A ONE-, TWO- OR THREE-DIMENSIONAL ARRAY OF COMPLEX FOURIER AMPLITUDES
HCF	FIND THE HIGHEST COMMON FACTOR OF TWO INTEGERS
HELP	CALCULATE THE ROOTS OF A POLYNOMIAL HAVING COMPLEX COEFFICIENTS
HERMIT	EVALUATE THE INTEGRAL OF E**(-X**2)F(X)DX FROM NEGATIVE TO POSITIVE INFINITY WITH F(X) A REAL FUNCTION OF ONE VARIABLE
HRMT1	PERFORM INTERPOLATION, GIVEN A VALUE OF THE INDEPENDENT VARIABLE AND A TABLE OF CORRESPONDING VALUES OF THE INDEPENDENT AND DEPENDENT VARIABLE AND ITS DERIVATIVE - EXTRAPOLATION IS ALLOWED
HRMT2	PERFORM HERMITE INTERPOLATIONS, GIVEN AN ARRAY OF VALUES OF THE INDEPENDENT VARIABLE, AND A TABLE OF CORRESPONDING VALUES OF THE INDEPENDENT AND THE DEPENDENT VARIABLE AND ITS DERIVATIVE
HSSN	REDUCE A GENERAL REAL MATRIX TO AN UPPER HESSENBERG FORM BY A SIMILARITY TRANSFORMATION AND PROVIDE THE ELEMENTS IF THE TRANSFORMATION MATRIX
HSTGRM	DETERMINE THE NUMBER OF OBSERVATIONS OF A RANDOM VARIABLE WHICH LIE IN USER SPECIFIED INTERVALS - USED FOR DISTRIBUTION TESTS AND FOR PLOTTING HISTOGRAMS

INRPRD COMPUTE THE INNER PRODUCT OF TWO VECTORS

INT GIVEN THE REAL COEFFICIENTS OF A POLYNOMIAL, COMPUTE THE COEFFICIENTS OF THE INTEGRAL POLYNOMIAL

INVERS FIND THE INVERSE OF A SQUARE MATRIX USING DECOM AND FBSUBM

INVITR FIND THE INVERSE OF A SQUARE MATRIX WITH ITERATIVE REFINEMENT

IRAND GENERATE RANDOM INTEGERS BETWEEN TWO GIVEN VALUES - EACH OF THE INTEGERS BETWEEN THE GIVEN LIMITS HAS AN EQUAL PROBABILITY OF OCCURRING

ITERFM SOLVE LY=B AND LX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN INTERATIVE REFINEMENT, WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITERFS SOLVE LY=B AND LX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN INTERATIVE REFINEMENT, WHERE B IS A COLUMN VECTOR, AND L AND U ARE LOWER AND UPPER TRIANGULAR MATRICES OBTAINED FROM DECOM - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITERIN PERFORM THE ITERATIVE REFINEMENT FOR THE INVERSE OF A SQUARE MATRIX

ITRLSQ PERFORM THE ITERATIVE REFINEMENT OF A LEAST SQUARES SOLUTION OBTANED FROM THE SUBROUTINE BSUBHT

ITRPDM SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN ITERATIVE REFINEMENT FOR A POSITIVE DEFINITE SYSTEM AX=B (B IS A MATRIX CONSISTING OF M COLUMN VECTORS AND L AND U ARE THE LOWER TRIANGLE MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITRPDS SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH AN ITERATIVE REFINEMENT FOR A POSITIVE DEFINITE SYSTEM AX=B (B IS A COLUMN VECTOR AND L AND U ARE THE LOWER TRIANGLE MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITRSPM SOLVE LY=B AND DLTX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT (WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS, AND L AND LT ARE A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, D IS A DIAGONAL MATRIX, OBTAINED FROM SPDCOM) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

ITRSPS SOLVE LY=B AND DLTX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS WITH ITERATIVE REFINEMENT (WHERE B IS A COLUMN VECTOR, AND L AND LT ARE A LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, D IS A DIAGONAL MATRIX, OBTAINED FROM SPDCOM) - PROVIDE THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX AND THE NUMBER OF CORRECT DIGITS IN THE FIRST COMPUTED SOLUTION

LAGDIF DIFFERENTIATE NUMERICALLY A TABULAR FUNCTION, AT ANY POINT

LAGINT PERFORM LAGRANGIAN INTERPOLATION AT A GIVEN ABSCISSA

LAGRAN EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE VARIABLE, GIVEN THE ARRAYS OF THE INDEPENDENT AND THE DEPENDENT VARIABLES

LAGUER EVALUATE THE INTEGRAL OF F(X)DX FROM A TO E**-X WITH F(X) A REAL FUNCTION OF ONE VARIABLE AND E**-X THE WEIGHTING FN

LATNTR FIND THE EIGENVALUES (REAL AND COMPLEX) OF A REAL MATRIX

LCM FIND THE LEAST COMMON MULTIPLE OF TWO INTEGERS

LDIV DIVIDE A POLYNOMIAL WITH REAL COEFFICIENTS BY THE LINEAR EXPRESSION (X+B) - B IS REAL

LEGEND EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE VARIABLE OVER A FINITE INTERVAL, WHEN THE FUNCTION GENERATOR IS GIVEN

LESWNE SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH PARTIAL PIVOTING BUT WITHOUT ROW EQUILIBRATION - PROVIDE DATA FOR CALCULATING THE DETERMINANT

LESWNP SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITHOUT PIVOTING

LINBVP SOLVE NUMERICALLY LINEAR P-POINT BOUNDARY POINT PROBLEMS IN N FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS

LINSYS SOLVE GENERAL SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS - PROVIDE THE DATA TO EVALUATE READILY THE DETERMINANT OF THE COEFFICIENT MATRIX

LITWNE SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH ITERRATIVE REFINEMENT, WITH PARTIAL PIVOTING, WITHOUT ROW EQUILIBRATION - PROVIDE THE DATA FOR CALCULATING THE DETERMINANT AND THE DATA FOR ESTIMATING THE CONDITION NUMBER OF THE COEFFICIENT MATRIX

LITWNP	SOLVE A GENERAL SYSTEM OF LINEAR EQUATIONS HAVING ONE RIGHT-HAND SIDE WITH ITERATIVE REFINEMENT AND WITHOUT PIVOTING
LOGGAM	COMPUTE THE NATURAL LOGARITHM OF THE GAMMA FUNCTION FOR COMPLEX ARGUMENT
LSQHTM	SOLVE LINEAR LEAST SQUARES PROBLEMS FOR AN OVERDETERMINED SYSTEM WITH K RIGHT-HAND SIDES BY HOUSEHOLDER TRANSFORMATIONS
LSQHTS	SOLVE LINEAR LEAST SQUARES PROBLEMS FOR AN OVERDETERMINED SYSTEM WITH ONE RIGHT-HAND SIDE BY HOUSEHOLDER TRANSFORMATIONS
LSQSIT	SOLVE LINEAR LEAST SQUARES PROBLEMS BY HOUSEHOLDER TRANSFORMATION, USING ITERATIVE REFINEMENT
MIGEN	FIND A MINIMAX FUNCTION APPROXIMATION TO A SET OF POINTS IN TERMS OF A LINEAR COMBINATION OF A PRESCRIBED SET OF FUNCTIONS
MILN2	SMOOTH A SET OF DATA BY AN AVERAGING PROCESS
MINRAT	FIND A MINIMAX RATIONAL FUNCTION APPROXIMATION OF GIVEN DEGREE TO A SET OF POINTS
MPYR	FIND THE PRODUCT OF TWO POLYNOMIALS WHEN THE COEFFICIENTS ARE ALL REAL
MULLP	FIND ALL ZEROS OR A SINGLE ZERO OF A POLYNOMIAL HAVING COMPLEX COEFFICIENTS
NBESJ	COMPUTE BESSEL FUNCTIONS OF FIRST KIND FOR REAL ARGUMENT AND INTEGER ORDERS
NEWT	SOLVE A SYSTEM OF NON-LINEAR EQUATIONS
NONLIQ	SOLVE A SYSTEM OF NON-LINEAR ALGEBRAIC EQUATIONS
NRAND	GENERATE PSEUDO-RANDOM NUMBERS WHICH ARE NORMALLY DISTRIBUTED AND STORE VALUES IN A MULTIPLEXED ARRAY
NRICH	ENRICH A SET OF POINTS BY ADDING POINTS ON AN INTERPOLATING CURVE THROUGH THE GIVEN POINTS
NRKVS	SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AT A POINT A
NRKVSH	SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AT A POINT A
NRML	GENERATE PSEUDO-RANDOM NUMBERS HAVING A NORMAL DISTRIBUTION
NRMNO	GENERATE NORMALLY DISTRIBUTED PSEUDO-RANDOM NUMBERS WITH A CONVENIENT WAY OF HANDLING THE TAIL OF THE DISTRIBUTION - STORE THOSE NUMBERS IN A MULTIPLEXED DATA ARRAY

NRSG	SOLVE M BY N SYSTEM OF NON-LINEAR EQUATIONS
NSLVL	ESTIMATE THE ERROR PERFORMED IN THE EVALUATION OF A REAL POLYNOMIAL AT A COMPLEX POINT IN THE NEIGHBORHOOD OF ONE OF ITS ROOTS
OP1RAY	PERFORM ONE OF NINE POSSIBLE TRANSFORMATIONS ON THE OBSERVATIONS OF A SINGLE VARIABLE IN A MULTIPLEXED DATA ARRAY
OP2RAY	PERFORM AN ARITHMETIC OPERATION (+, -, *, /, **) ON THE CORRESPONDING OBSERVATIONS OF TWO VARIABLES STORED IN MULTIPLEXED DATA ARRAYS
ORTHFT	FIT A GIVEN SET OF POINTS WITH A LINEAR COMBINATION OF PRESCRIBED GENERAL FUNCTIONS OF LINEARLY INDEPENDENT VARIABLE(S)
ORTHON	GIVEN A SET OF N LINEARLY INDEPENDENT REAL VECTORS OF DIMENSION M, CONSTRUCT A SET WHICH SPANS THE SAME SUBSPACE AND WHOSE VECTORS ARE ORTHONORMAL WITH RESPECT TO A DEFINED INNER PRODUCT
PADE	APPROXIMATE FUNCTIONS WHICH HAVE MACLAURIN SERIES EXPANSIONS BY RATIONAL FUNCTIONS USING PADE APPROXIMATIONS
PARBL	EVALUATE THE INTEGRAL OF A BOUNDED REAL FUNCTION OF ONE REAL VARIABLE OVER A FINITE INTERVAL
PARFAC	RESOLVE A RATIONAL FUNCTION INTO PARTIAL FRACTIONS
PBETA	COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FVOM A BETA DISTRIBUTION
PBINOM	COMPUTE THE CUMULATIVE PROBABILITY FOR THE BINOMIAL DISTRIBUTION
PCHY	COMPUTE THE CUMULATIVE PROBABILITY FOR THE CAUCHY DISTRIBUTION
PDITRM	SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS AX=B HAVING M RIGHT-HAND SIDES
PDITRS	SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS AX=B HAVING ONE RIGHT-HAND SIDE
PDIV	PROVIDE THE QUOTIENT AND REMAINDER OBTAINED BY DIVIDING ONE POLYNOMIAL BY ANOTHER - COEFFICIENTS ARE REAL
PDLSOM	SOLVE A POSITIVE DEFINITE SYSTEM AX=B HAVING M RIGHT-HAND SIDES USING THE CHOLESKY DECOMPOSITION
PDLSOS	SOLVE A POSITIVE DEFINITE SYSTEM AX=B HAVING ONE RIGHT-HAND SIDE USING THE CHOLESKY DECOMPOSITION

PDSFBM SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM AX=B - B IS A MATRIX OF M COLUMN VECTORS AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC

PDSFBS SOLVE LY=B AND UX=Y BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM AX=B - B IS A COLUMN VECTOR AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE OBTAINED FROM CHSDEC

PFDIST COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM AN F- (VARIANCE-RATIO) DISTRIBUTION

PGEOM COMPUTE THE CUMULATIVE PROBABILITY FOR THE GEOMETRIC DISTRIBUTION

PGMMA COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A GAMMA DISTRIBUTION

PHYPGE COMPUTE THE CUMULATIVE PROBABILITY FOR THE HYPERGEOMETRIC DISTRIBUTION

PIBETA DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A BETA DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIBIN DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A BINOMIAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PICHI DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A CHI-SQUARE DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PICHY DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A CAUCHY DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIEXP DETERMINE THE VALUE OF AN EXPONENTIALLY DISTRIBUTED RANDOM VARIABLE WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIFDIS DETERMINE THE VALUE OF A RANDOM VARIABLE FROM AN F DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIGAMA DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A GAMMA DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIGEO DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A GEOMETRIC DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PIHYPG DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A HYPERGEOMETRIC DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PILGNM DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A LOG-NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PINBIN DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A NEGATIVE BIMONIAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN

PINORM	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIPOIS	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A POISSON DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIRAYL	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A RAYLEIGH DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIT	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A STUDENT'S T DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PITRNM	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A TRUNCATED NORMAL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIUNF	DETERMINE THE VALUE OF A UNIFORMLY DISTRIBUTED, RANDOM VARIABLE WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIUNFD	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A UNIFORM DISCRETE DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PIWEBL	DETERMINE THE VALUE OF A RANDOM VARIABLE FROM A WEIBULL DISTRIBUTION WHEN THE CUMULATIVE PROBABILITY IS GIVEN
PLAGR	FORMS AND READS, AT A GIVEN STATION X, THE POLYNOMIAL PASSING THROUGH ALL OF A GIVEN SET OF POINTS
PLGNRM	COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A LOG-NORMAL DISTRIBUTION
PNBIN	COMPUTE THE CUMULATIVE PROBABILITY FOR THE NEGATIVE BINOMIAL DISTRIBUTION
PNORM	COMPUTE THE CUMULATIVE PROBABILITY FOR A NORMAL DISTRIBUTION
POIS	COMPUTE THE CUMULATIVE PROBABILITY FOR THE POISSON DISTRIBUTION
PORAND	GENERATE RANDOM INTEGERS HAVING THE POISSON DISTRIBUTION
PRAYL	COMPUTE THE CUMULATIVE PROBABILITY FOR THE RAYLEIGH DISTRIBUTION
PRBEXP	DETERMINE THE PROBABILITY OF OBTAINING A VARIABLE HAVING VALUE = X0 FROM A POPULATION HAVING AN EXPONENTIAL DISTRIBUTION
PRBUNF	DETERMINE THE PROBABILITY OF OBTAINING A VARIABLE HAVING VALUE = X0 FROM A POPULATION HAVING A UNIFORM DISTRIBUTION
PRDSUM	COMPUTE THE INNER PRODUCT OF TWO VECTORS AND ADD IT TO AN INCOMING VALUE C
PRICH	ENRICH A GIVEN ARRAY WHICH DEFINES A CURVE BY INSERTING POINTS SO AS TO OPTIMIZE THE MERIT FUNCTION DEFINED IN CURV

PRONY	CONSTRUCT AN APPROXIMATION WHICH IS THE SUM OF A PRESCRIBED NUMBER OF EXPONENTIALS TO A SET OF N DATA POINTS
PROOT	FIND ALL REAL AND COMPLEX ROOTS OF A POLYNOMIAL WITH REAL COEFFICIENTS BY THE METHOD OF BAIRSTOW-NEWTON
PTDIST	COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A T- (STUDENT'S) DISTRIBUTION
PTRAN	COORDINATE TRANSLATION SUCH THAT POLYNOMIAL P(X) BECOMES P(X+T) - P(X) HAS REAL COEFFICIENTS
PTRNRM	COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A TRUNCATED NORMAL DISTRIBUTION IN THE RANGE BETWEEN A AND B
PUNFD	COMPUTE THE CUMULATIVE PROBABILITY FOR THE DISCRETE UNIFORM DISTRIBUTION
PWEBL	COMPUTE THE PROBABILITY OF OBTAINING A RANDOM VARIABLE HAVING A VALUE LESS THAN OR EQUAL TO X FROM A WEIBULL DISTRIBUTION
QDIV	DIVIDE A REAL POLYNOMIAL BY THE QUADRATIC EXPRESSION (X**2+B*X+C), B AND C REAL
QNWT	SOLVE SYSTEMS OF NON-LINEAR ALGEBRAIC OF TRANSCENDENTAL EQUATIONS
QREIGN	FIND ALL EIGENVALUES OF A COMPLEX MATRIX
QR1	PERFORM A SINGLE, COMPLEX QR-ITERATON ON A MATRIX IN UPPER HESSENBERG FORM, HAVING REAL SUBDIAGONAL ELEMENTS
QUAD	PERFORM NUMERICAL QUADRATURE ON BOTH WELL-BEHAVED AND POORLY-BEHAVED FUNCTIONS
RAND	GENERATE UNIFORMLY DISTRIBUTED OR NORMALLY DISTRIBUTED RANDOM NUMBERS
RATL	COMPUTE THE COEFFICIENTS OF THE LEAST SQUARES APPROXIMATION TO A SET OF DISCRETE DATA BY A RATIONAL FUNCTION
RAYLGH	COMPUTE THE RAYLEIGH QUOTIENT FOR REAL SYMMETRIC MATRICES
RBESY	COMPUTE BESSEL FUNCTION OF SECOND KIND FOR POSITIVE REAL ARGUMENT AND INTEGER ORDERS
RECOV1	RECOVER EIGENVECTORS AFTER A REDUCTION USING A TRIANGULAR MATRIX IN THE SIMILARITY TRANSFORMATION
RECOV2	RECOVER EIGENVECTORS OF THE EIGENPROBLEMS BAY=LAMBDAY OR YTAB=LAMBDAYT, WHERE A, B ARE REAL, SYMMETRIC AND B IS POSITIVE DEFINITE

REDSY1	REDUCE THE EIGENPROBLEM (A-LAMBDAB)X=0 TO A STANDARD SYMMETRIC PROBLEM (P-LAMBDAI)Z=0 - A MUST BE REAL SYMMETRIC, B MUST BE REAL SYMMETRIC POSITIVE DEFINITE TO ALLOW THE DECOMPOSITION B=LLT
REDSY2	REDUCE TO STANDARD FORM THE EIGENPROBLEMS (AB-LAMBDAI)X=0 OR (BA-LAMBDAI)Y=0, WHERE A, B ARE REAL SYMMETRIC AND B IS POSITIVE DEFINITE
REV	REVERSE THE ORDER OF REAL POLYNOMIAL COEFFICIENTS IN AN ARRAY
RICH	ENRICH A GIVEN CURVE DEFINED BY AN ARRAY OF POINTS SO AS TO SATISFY A SPECIFIED CHORD HEIGHT TOLERANCE
RKINIT	SOLVE A SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AT A POINT B WITH INITIAL VALUES GIVEN AS A POINT A
ROMBG	EVALUATE THE INTEGRAL OF A REAL FUNCTION OF ONE REAL VARIABLE OVER A FINITE INTERVAL USING ROMBERG INTEGRATION
RQNWT	USES QNWT TO SOLVE SYSTEMS OF NONLINEAR, ALGEBRAIC OR TRANSCENDENTAL EQUATIONS (IT APPEARS TO BE USEFUL IN THAT IT DOES NOT GIVE UP ON DIFFICULT PROBLEMS AS EASILY AS OTHER MSL SUBROUTINES - QNWT SOLVED 34 OF 40 TEST CASES, RQNWT SOLVED ALL 40)
RUNSAB	COUNT THE NUMBER OF RUNS ABOVE AND BELOW ZERO OF DIFFERENT LENGTHS AND THE EXPECTED NUMBER OF RUNS FOR A SAMPLE WHICH IS RANDOMLY SELECTED FROM A POPULATION SYMMETRICALLY DISTRIBUTED ABOUT ZERO
RUNSUD	COUNT THE RUNS UP AND DOWN OF DIFFERENT LENGTHS IN A SAMPLE AND DETERMINE THE EXPECTED NUMBER OF RUNS OF DIFFERENT LENGTHS FOR A RANDOM SAMPLE
SBR	SUBTRACT COEFFICIENTS OF LIKE POWERS OF TWO REAL POLYNOMIALS
SCONG	SOLVE THE EQUATION SYSTEM AX-BAR=B-BAR BY THE CONJUGATE GRADIENT METHOD - DESIGNED TO BE USED WHEN THE MATRIX A IS LARGE BUT HAS MANY ZERO ELEMENTS
SEARCH	USED IN THE TBLU PACKAGE TO PERFORM A BINARY TABLE SEARCH
SEPAR	FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX
SEPAR2	FIND A SUBSET OF EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX
SHRINK	COMPUTE THE COEFFICIENTS OF THE POLYNOMIAL P(AX) FROM THE COEFFICIENTS OF THE POLYNOMIAL P(X) - REAL COEFFICIENTS
SICI	EVALUATE THE SINE AND COSINE INTEGRALS
SIGSMT	PERFORM SMOOTHING OF A TRIGONOMETRIC SERIES BY USE OF LANCZOS SIGMA-FACTORS

SIMP	TRANSFORM EIGENVECTORS OF AN UPPER HESSENBERG MATRIX H, WHERE H=(P**-1)AP, TO EIGENVECTORS OF THE SIMILAR MATRIX A
SIMPRC	EVALUATE THE INTEGRAL OF ANY FUNCTION Y=F(X) BETWEEN THE LIMITS A AND B USING SIMPSON'S RULE
SINEVL	EVALUATE A SINE POLYNOMIAL AT A GIVEN POINT
SINSER	INTERPOLATE A SET OF N (ABSCISSA,ORDINATE)-PAIRS
SMOCUB	PERFORM SMOOTHING
SMOOTH	COMPUTE A VECTOR OF SMOOTHED FUNCTION VALUES GIVEN VECTORS OF ARGUMENT AND CORRESPONDING FUNCTION VALUES
SMTVX	MULTIPLY THE TRANSPOSE OF A LARGE, SPARSE MATRIX BY A VECTOR
SMVX	MATRIX-VECTOR MULTIPLICATION WHEN THE MATRIX IS LARGE AND SPARSE
SPDCOM	DECOMPOSE A POSITIVE DEFINITE SYMMETRIC MATRIX WITHOUT USING THE SQUARE ROOT ROUTINE
SPDFBM	SOLVE LY=B AND X=Y BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM AX=B (B IS A MATRIX OF M COLUMN VECTORS, AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, AND D THE DIAGONAL MATRIX OBTAINED FROM SPDCOM)
SPDFBS	SOLVE LY=B AND X=Y BY FORWARD AND BACKWARD SUBSTITUTIONS FOR A POSITIVE DEFINITE SYSTEM AX=B (B IS A COLUMN VECTOR, AND L AND U ARE THE LOWER TRIANGULAR MATRIX AND ITS TRANSPOSE, AND D THE DIAGONAL MATRIX OBTAINED FROM SPDCOM)
SPDSOM	SOLVE A POSITIVE DEFINITE SYSTEM AX=B HAVING M RIGHT-HAND SIDES WITHOUT USING THE SQUARE ROOT ROUTINE
SPDSOS	SOLVE A POSITIVE DEFINITE SYSTEM AX=B HAVING ONE RIGHT-HAND SIDE WITHOUT USING THE SQUARE ROOT ROUTINE
SPITRM	SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS WITHOUT USING THE SQUARE ROOT ROUTINE WITH ITERATIVE REFINEMENT
SPITRS	SOLVE A POSITIVE DEFINITE SYSTEM OF LINEAR EQUATIONS WITHOUT USING THE SQUARE ROOT ROUTINE WITH ITERATIVE REFINEMENT
SPLINE	CONSTRUCT A 5TH DEGREE SPLINE INTERPOLATING A SET OF EQUISPACED DATA
START	READ IN AND LIST INPUT DATA WHICH IS TO BE ENRICHED BY USING OTHER MSL ROUTINES
SUBDIA	REDUCE A COMPLEX MATRIX TO UPPER HESSENBERG FORM BY SIMILARITY TRANSFORMATIONS, USING UNITARY MATRICES
SUBDIR	REDUCE A REAL MATRIX TO UPPER HESSENBERG FORM

SUMPS	COMPUTE DOUBLE PRECISION SUMS OF THE POWERS OF OBSERVATIONS
SURFS	FIT A SMOOTH SURFACE WITH CONTINUOUS FIRST PARTIAL DERIVATIVES TO A SET OF POINTS DEFINED OVER A RECTANGULAR GRID
SYMLR	FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX
SYMQR	FIND ALL EIGENVALUES OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX
TBLU1	TABLE SEARCH AND INTERPOLATION WITH ONE INDEPENDENT VARIABLE
TBLU2	TABLE SEARCH AND INTERPOLATION WITH TWO INDEPENDENT VARIABLES
TBLU3	TABLE SEARCH AND INTERPOLATION WITH THREE INDEPENDENT VARIABLES
TCDIAG	COMPUTE PARTIAL OR COMPLETE EIGENSYSTEMS OF HERMETIAN MATRICES
TERP1	POLYNOMIAL INTERPOLATION FOR ONE INDEPENDENT VARIABLE
TERP2	POLYNOMIAL INTERPOLATION FOR TWO INDEPENDENT VARIABLES
TERP3	POLYNOMIAL INTERPOLATION FOR THREE INDEPENDENT VARIABLES
TRDCNP	PERFORM TRIANGULAR DECOMPOSITION OF A TRIDIAGONAL MATRIX WITHOUT PIVOTING
TRDCOM	PERFORM TRIANGULAR DECOMPOSITION OF A TRIDIAGONAL MATRIX WITH PARTIAL PIVOTING
TRDFBM	PERFORM BACK SUBSTITUTION
TRDSOM	SOLVE A TRIDIAGONAL SYSTEM OF EQUATIONS USING TRIANGULAR DECOMPOSITION WITH PARTIAL PIVOTING AND BACK SUBSTITUTION
TRDSUB	PERFORM BACK SUBSTITUTION
TRDWNP	SOLVE A TRIDIAGONAL SYSTEM OF EQUATIONS USING TRIANGULAR DECOMPOSITION WITHOUT PIVOTING AND BACK SUBSTITUTION
TRGDIF	DIFFERENTIATE FORMALLY A TRIGONOMETRIC POLYNOMIAL
TRGINT	INTEGRATE FORMALLY A TRIGONOMETRIC POLYNOMIAL
TRIDI	REDUCE A REAL, SYMMETRIC MATRIX TO TRIDIAGONAL FORM BY USE OF HOUSEHOLDER'S REDUCTION
TRILOM	SOLVE A LOWER TRIANGULAR SYSTEM LX=B WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS
TRILOS	SOLVE A LOWER TRIANGULAR SYSTEM LX=B WHERE B IS A SINGLE COLUMN VECTOR
TRIUPM	SOLVE AN UPPER TRIANGULAR SYSTEM UX=B WHERE B IS A MATRIX CONSISTING OF M COLUMN VECTORS

TRIUPS	SOLVE AN UPPER TRIANGULAR SYSTEM UX=B WHERE B IS A SINGLE COLUMN VECTOR
TRLOIN	INVERT A LOWER TRIANGULAR MATRIX
TRUPIN	INVERT AN UPPER TRIANGULAR MATRIX
UNCSPL	CONSTRUCT A NONLINEAR CUBIC SPLINE WITH CONTINUOUS SECOND DERIVATIVE THROUGH A GIVEN SET OF DATA
URAND	GENERATE UNIFORMLY DISTRIBUTED PSEUDO-RANDOM NUMBERS WITH THE SPECIFIED UPPER AND LOWER LIMITS AND STORE VALUES AS ONE VARIABLE IN A MULTIPLEXED DATA ARRAY
VALVEC	FIND ALL (OR A SUBSET OF) EIGENVECTORS OF A COMPLEX MATRIX
VARORD	ARRANGE THE OBSERVATIONS OF ONE OF THE VARIABLES IN A MULTIPLEXED DATA ARRAY SO THAT THESE OBSERVATIONS ARE STORED IN INCREASING ORDER
VECORD	ORDER A SET OF COMPLEX NUMBERS ACCORDING TO MAGNITUDE, EITHER INCREASING OR DECREASING
VECTOR	GIVEN A GOOD APPROXIMATION TO AN EIGENVALUE OF A REAL, SYMMETRIC TRIDIAGONAL MATRIX, FIND THE CORRESPONDING EIGENVECTOR AND TRANSFORM THE RESULT ACCORDING TO STORED INFORMATION ABOUT THE ORIGINAL, FULL MATRIX
VIP	COMPUTE THE INNER PRODUCT OF TWO VECTORS
VIPA	COMPUTE THE INNER PRODUCT OF TWO VECTORS AND ADD IT TO AN INCOMING VALUE C
VIPD	COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION
VIPDA	COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION AND ADD IT TO AN INCOMING VALUE C
VIPDS	COMPUTE THE INNER PRODUCT OF TWO VECTORS WITH DOUBLE PRECISION ACCUMULATION AND SUBTRACT IT FROM AN INCOMING VALUE C
XIRAND	GENERATE RANDOM FLOATING POINT NUMBERS BETWEEN TWO GIVEN VALUES - EACH OF THE FLOATING POINT NUMBERS BETWEEN THE GIVEN LIMITS HAS AN EQUAL PROBABILITY OF OCCURRING
XPLOT	PRINTER PLOT OF UP TO 5 VARIABLES OR SETS OF DATA (ORDINATE) IN THE ORDER IN WHICH THE VALUES ARE STORED (ABSCISSA)
XYPLOT	PRINTER PLOT OF UP TO 5 ORDINATE VARIABLES VERSUS A SINGLE ABSCISSA VARIABLE WHERE THE NUMBER OF VALUES FOR THE ABSCISSA IS THE SAME AS THE NUMBER OF VALUES FOR EACH OF THE ORDINATE VARIABLES
ZAFUJ	FIND N ZEROS OF AN ARBITRARY COMPLEX-VALUED FUNCTION OF A COMPLEX VARIABLE

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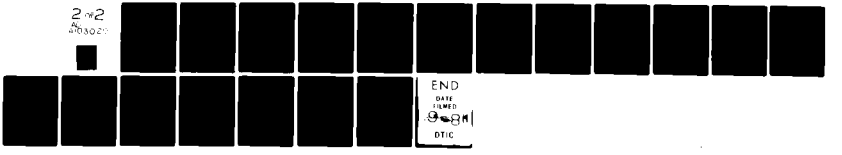

ZAFUM	FIND N ZEROS OF AN ARBITRARY COMPLEX-VALUED FUNCTION OF A COMPLEX VARIABLE
ZAFUR	FIND N ZEROS OF AN ARBITRARY REAL-VALUED FUNCTION OF A REAL VARIABLE
ZCOUNT	COUNT THE NUMBER OF TIMES A FUNCTION F(Z) CIRCLES THE ORIGIN AS Z TRANSVERSES ANY CONTOUR MADE UP OF STRAIGHT LINE SEGMENTS IN A COMPLEX PLANE, AND HENCE THE NUMBER OF ZEROS OF F(Z) WITHIN CLOSED CONTOURS (IF THERE ARE POLES WITHIN THE CONTOUR THEN THE PHRASE "NUMBER OF ZEROS" SHOULD BE REPLACED BY "NUMBER OF ZEROS - NUMBER OF POLES")
ZRNM	COMPUTE THE MEAN VALUE OF A SET OF OBSERVATIONS AND SUBTRACTS THE MEAN FROM EACH OF THE OBSERVATIONS

NSRDC

'NSRDC' IS A LIBRARY OF DTNSRDC WRITTEN AND/OR SUPPORTED SCIENTIFIC AND UTILITY SUBPROGRAMS.

REFERENCES: MOST OF THESE ROUTINES ARE DOCUMENTED IN CLIB/N, WHICH MAY BE OBTAINED FROM USER SERVICES. OTHER EXISTING DOCUMENTS ARE ON FILE IN USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCGET' (SEE PAGE 1-2).

ROUTINES IN LIBRARY 'NSRDC' INCLUDE:

AC	GET ACCOUNT NUMBER FOR THIS JOB
ADJL	LEFT ADJUST A LINE OF WORDS LEAVING ONE SPACE BETWEEN WORDS
ADJR	RIGHT ADJUST A LINE OF WORDS LEAVING ONE SPACE BETWEEN WORDS
AI	AIRY FUNCTION INTEGRAL
ALTIME	OBTAIN CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE START OF JOB (OR INTERCOM SESSION)
AMAXE	FIND MAXIMUM VALUE OF AN ARRAY (ALSO CONTAINS MAXE)
AMINE	FIND MINIMUM VALUE OF AN ARRAY (ALSO CONTAINS MINE)
ANOVA1	ONE-WAY ANALYSIS OF VARIANCE WITH UNEQUAL N
ANOVA2	TWO-WAY ANALYSIS OF VARIANCE WITH EQUAL N
APOWR	EXPONENTIATION OF POWER SERIES - ONE VARIABLE
ARDCFT	PROPERITES OF U.S. STANDARD ATMOSPHERE (1962)
ASHIFT	SHIFT EACH WORD OF AN ARRAY
ASORT	FTN ALPHANUMERIC SORT
ASORTMV	SORT 2-DIMENSIONAL ARRAY USING A FAST ARRAY MOVING SUBROUTINE
BANR	PRINT A BANNER (LETTERS ARE 10 LINES HIGH, LINES ARE 110 CHARACTERS LONG)
BANR6	PRINT A BANNER (LETTERS ARE 6 LINES HIGH, LINES ARE 80 CHARACTERS LONG)
BEJY0	ZERO-ORDER BESSEL FUNCTIONS FOR REAL ARGUMENTS
BEJY1	FIRST ORDER BESSEL FUNCTIONS FOR REAL ARGUMENTS
BESSI	MODIFIED BESSEL FUNCTION OF THE FIRST KIND

BESSJ	BESSEL FUNCTION OF THE FIRST KIND
BESSK	MODIFIED BESSEL FUNCTION OF THE SECOND KIND
BESSY	BESSEL FUNCTION OF THE SECOND KIND
BMAN	SOLVE SYSTEM AX=B FOR BANDED SYMMETRIC MATRICES
BPOWR	EXPONENTIATION OF POWER SERIES IN TWO VARIABLES
BSJ	SPHERICAL BESSEL FUNCTION
BUFSIZE	PRINT MESSAGE IN DAYFILE FOR EACH FILE SPECIFIED INDICATING BUFFER SIZE AND WHETHER BUFFER IS CURRENTLY ALLOCATED
CBSF	COMPLEX BESSEL FUNCTION FOR LARGE ARGUMENT
CCALL	EXIT PROGRAM AND EXECUTE ONE OR MORE CONTROL CARD
CEI3	COMPLETE ELLIPTIC INTEGRAL OF THE THIRD KIND
CELLI	COMPLETE AND INCOMPLETE ELLIPTIC INTEGRALS OF THE FIRST AND SECOND KIND
CENTER	CENTER A CHARACTER STRING WITHIN AN OUTPUT FIELD
CFILL	FILL AREA WITH ALTERNATING FIELDS OF SPECIFIED CHARACTER AND BLANKS
CGAUSS	COMPLEX SOLUTION OF SIMULTANEOUS EQUATIONS AND DETERMINANT BY ITERATIVE GAUSSIAN ELIMINTAION
CHFILL	FILL (PORTION OF) AN ARRAY WITH A CHARACTER
CHNGSEQ	ALLOW COBOL4 USER TO DEFINE A COLLATING SEQUENCE
CLUNLD	CLOSE AND UNLOAD A FILE
CMPINV	COMPLEX MATRIX INVERSION
COMBES	BESSEL FUNCTIONS FOR COMPLEX ARGUMENT AND ORDER
COMPSTR	COMPARE TWO CHARACTER STRINGS
CONTRCT	SQUEEZE ARRAY OF 1R-FORMAT CHARACTERS TO LEFT (SEE EXPAND)
COTAN	COTANGENT FUNCTION
COUPLE	LOGICALLY CONNECT TWO WORDS
CRDTAB	READ TABLES FOR FRMRAN AND FRMRA2 INTERPOLATION
DATCNV	CONVERT DATE FORMATS (USES INTEGERS)
DATFMT	CONVERT DATE FORMATS (USES CHARACTER STRINGS)

DISCOT	SINGLE OR DOUBLE INTERPOLATION
DMPA	CALLABLE OCTAL AND CHARACTER DUMP OF SPECIFIED PORTION OF USER'S FIELD LENGTH (FL) (BY ACTUAL LOCATION) (NO HEADINGS ARE PROVIDED)
DMPCPA	DUMP JOB CONTROL POINT AREA
DPROOT	FIND ALL ROOTS OF A REAL DOUBLE PRECISION POLYNOMIAL
DUMPA	GIVE OCTAL AND CHARACTER DUMP OF USER-SPECIFIED AREA
DUMPCPA	EXPANDED DUMP OF JOB CONTROL POINT AREA
DUMPFL	CALLABLE OCTAL AND CHARACTER DUMP OF SPECIFIED PORTION OF USER'S FIELD LENGTH (FL) (BY ACTUAL LOCATION)
ELLI	ELLIPTIC INTEGRAL
ELLIP	ELLIPTIC INTEGRAL
ELTIME	OBTAIN CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE LAST CALL TO ELTIME
EQU60	LOGICAL COMPARE OF TWO ARRAYS
ERROR	*ERROR FUNCTION*
EXPAND	EXPAND CHARACTER STRING INTO ARRAY OF 1R-FORMAT WORDS (SEE CONTRCT)
EXPINT	EXPONENTIAL INTEGRAL
EXPRM	EXTRACT NEXT PARAMETER FROM EXECUTE CARD
EXTBIT	EXTRACT BITS FROM A WORD
EXTPRM	EXTRACT NEXT PARAMETER FROM USER-SUPPLIED PARAMETER STRING
FASTIN	READ AND UNPACK DATA PREPARED ON THE XDS-910 A/D CONVERSION SYSTEM
FBINRD	UNPACK AN INPUT ARRAY (N BITS PER INPUT CHARACTER INTO CDC WORD)
FFT	FAST FOURIER TRANSFORM FOR COMPLEX TABULATED FUNCTION
FFT5	FAST FOURIER TRANSFORM
FGI	FORTRAN GAUSSIAN INTEGRATION
FINDC	FIND PRESENCE OR ABSENCE OF SPECIFIED CHARACTER IN AN ARRAY (USER SPECIFIES RELATIONAL OPERAND)
FINDW	FIND PRESENCE OR ABSENCE OF SPECIFIED WORD IN AN ARRAY (USER SPECIFIES RELATIONAL OPERAND)

FINDWRD	FIND SPECIFIED WORD IN AN ARRAY
FNOL3	INTEGRATE SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS
FRESNEL	EVALUATE FRESNEL INTEGRALS
FRMRAN	LINEAR TABLE INTERPOLATION (ONE OR TWO INDEPENDENT VARIABLES)
FRMRA2	LINEAR TABLE INTERPOLATION (MULTIPLE INDEPENDENT VARIABLES)
FTNRFL	GET/SET CORE SIZE
GAMCAR	COMPLEX GAMMA FUNCTION OF A COMPLEX ARGUMENT HAVING POSITIVE REAL PART
GAMMA	INCOMPLETE OR COMPLETE GAMMA FUNCTION
GAUSS	SIMULTANEOUS EQUATION SOLUTION WITH DETERMINANT BY ITERATIVE GAUSSIAN ELIMINATION
GETCHA	EXTRACT CHARACTER FROM SPECIFIED POSITION IN AN ARRAY
GETCHR	EXTRACT CHARACTER FROM SPECIFIED POSITION IN A WORD
GETFIT	GET SPECIFIED FIT ADDRESS
GETHOUR	FOR A SPECIFIED PERIOD OF TIME (UP TO 2 HR 59 MIN 59 SEC) DETERMINE WHICH HOUR IS OCCUPIED THE LONGEST
GETLFNS	GET ACTUAL LOCAL FILE NAMES (FOR FTN)
GETLGO	EXTRACT FIRST 10 CHARACTERS OF ALL EXECUTE CARD PARAMETERS
GETLIB	GET SYSTEM LIBRARY NAME FROM CODE IN CONTROL POINT AREA
GETRA	GET PROGRAM COMMUNICATION REGION (RA+0 THRU RA+77B)
GMHAS	HARMONIC ANALYSIS
GODROP	ISSUE USER-SPECIFIED GO/DROP MESSAGE
HELP	COMPLEX ZEROES OF REAL OR COMPLEX POLYNOMIAL
HERE	GET TERMINAL ID FOR THIS JOB
HEX3	SQUEEZE 3-CHARACTER HEX INTO 12 BITS
HIFAC	HIGHEST COMMON FACTOR OF TWO POLYNOMIALS
IAOC	COUNT ONE-BITS IN SPECIFIED WORD
IBL	CALCULATE BEST BLOCK LENGTH (MIN TIME REQ'D FOR RANDOM ACCESS AND MINIMUM BUFFER SIZE) FOR INDEX SEQUENTIAL FILES

IBUNP	UNPACK 12-BIT BYTES FROM ARRAY
ICOM	INTERACTIVE COMMUNICATOR (SYMBOLIC) -- READ RESPONSE AND COMPARE WITH LIST OF VALID RESPONSES
ICOMN	INTERACTIVE COMMUNICATOR (INTEGER NUMERIC) -- READ NUMBER AND TEST TO SEE IF IN SPECIFIED RANGE
IDAYWEK	FUNCTION TO DETERMINE THE DAY OF THE WEEK FOR ANY DATE FROM 10/15/1582 THRU 02/28/4000
IDID	GET USER INITIALS (AND INTERCOM USER ID) FROM CHARGE CARD OR LOGIN
IDIGIT	CHECK FOR DIGITS IN A FIELD WITHIN A WORD
IFINDCH	FIND FIRST OCCURRENCE OF SPECIFIED CHARACTER IN ARRAY
IFMTV	FAST I-FORMAT DECODE OF VARIABLE LENGTH INPUT
IHMS	CONVERT SECONDS TO ' HH.MM.SS.' (SEE ISEC)
IPAKLFT	SQUEEZE LEFT AND REMOVE ZEROS (00B) AND BLANKS (55B), RETURN NUMBER OF CHARACTERS
IROMAN	CONVERT ROMAN NUMBERS TO INTEGER
ISEC	CONVERT HH.MM.SS TO SECONDS (SEE IHMS)
ISITCNF	TEST FOR CONNECTED FILE
ISTAPE	GENERATE TAPE NAME 'TAPENN'
ISUMIT	SUM ELEMENTS OF INTEGER ARRAY
JGDATE	CONVERT ANY GREGORIAN DATE TO A JULIAN DATE AND VICE VERSA (MULTI-YEAR)
JOBNAME	GET NOS/BE JOB NAME FOR THIS JOB
JOBORG	GET JOB ORIGIN (BATCH, INTERCOM, GRAPHICS, MULTI-USER)
JULIAN	CONVERT ANY GREGORIAN DATE TO A JULIAN DATE AND VICE VERSA (SINGLE YEAR)
KUTMER	INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS USING THE KUTTA-MERSON FOURTH-ORDER, SINGLE-STEP METHOD
LASTCH	FIND LAST NON-BLANK CHARACTER IN ARRAY

LASTWRD	FIND LAST WORD OF ARRAY WHICH CONTAINS A NON-BLANK CONTAINS A NON-BLANK
LBYT	EXTRACT VARIABLE LENGTH BYTE
LEFTADJ	SQUEEZE LEFT AND REMOVE BLANKS AND OOB (USER MAY SUPPLY TRAILING FILL CHARACTER)
LINE6	SET PRINT FILE TO 6 LINES PER INCH
LINE8	SET PRINT FILE TO 8 LINES PER INCH
LOGGAM	LOGARITHM OF GAMMA FUNCTION FOR COMPLEX ARGUMENT
LSQSUB	GENERAL WEIGHTED LEAST SQUARES FIT
MAM	SOLVE SYMMETRIC SYSTEM OF LINEAR EQUATIONS
MAM200	SOLVE 200 SYMMETRIC LINEAR EQUATIONS
MASKIT	DYNAMIC MASK GENERATOR
MATINS	MATRIX INVERSE WITH SIMULTANEOUS EQUATION SOLUTION AND DETERMINANT
MAXE	FIND MAXIMUM VALUE OF AN ARRAY (ALSO CONTAINS AMAXE)
MEMUSED	PRINT MESSAGE IN DAYFILE GIVING FIELD LENGTH IN USE AT TIME OF CALL TO THIS ROUTINE
MFETCH	FETCH A SINGLE WORD FROM USER'S FL (SEE MSET)
MFRAME	OBTAIN THE MACHINE AND MAINFRAME RUNNING THE PROGRAM
MINE	FIND MINIMUM VALUE OF AN ARRAY (ALSO CONTAINS AMINE)
MINMAX	GENERALIZED NONLINEAR ITERATOR
MONTH	FROM A DATE (MM/DD/YY) FIND THE MONTH AND RETURN FULL SPELLING AND 3- OR 4-CHARACTER ABBREVIATION
MOVCHAR	MOVE ONE CHARACTER FROM ONE STRING TO ANOTHER
MOVECM	MOVE WORDS FROM ONE AREA IN CORE TO ANOTHER
MOVEIT	MOVE AN ARRAY (MOVLEV REPLACEMENT WHICH CALLS MOVECM)
MOVSTR	MOVE A STRING OF CHARACTERS FROM ONE ARRAY TO ANOTHER
MSET	SET A SINGLE WORD IN USER'S FL (SEE MFETCH)
MXGET	EXTRACT (RIGHT-JUSTIFIED, ZERO-FILLED) 0-10 6-BIT CHARACTERS FROM 60-BIT WORDS
NEWDAT	ADD/SUBTRACT SPECIFIED NUMBER OF DAYS TO/FROM A GIVEN DATE

NFILL	FILL ELEMENTS 1 THRU N OF AN ARRAY WITH THE VALUES 1 THRU N, RESPECTIVELY
NFILLT	TEST AN ARRAY FOR THE PRESENCE OF THE INTEGERS 1 THRU N IN ELEMENTS 1 THRU N, RESPECTIVELY
NROOTS	REAL AND COMPLEX ROOTS OF REAL POLYNOMIAL
NUMEXEC	GET NUMBER OF EXECUTE CARD PARAMETERS WHICH WERE USED IN THIS EXECUTION OF THE PROGRAM
NUMVAR	DETERMINE NUMBER OF ARGUMENTS IN CALL TO SUBPROGRAM
OFMTDE	FAST O-FORMAT DECODE
OFMTV	FAST O-FORMAT DECODE OF VARIABLE LENGTH INPUT
OPLSA	ORTHOGONAL POLYNOMIAL LEAST SQUARE APPROXIMATION
OVLNAME	GET NAME OF FILE CURRENTLY BEING EXECUTED
PARGET	GET ALL PARAMETERS OF USER-SUPPLIED PARAMETER STRING
PFRC	SUPPLY DESCRIPTION OF PERMANENT FILE FUNCTION RETURN CODE
PLOTMY	PRINTER PLOT - MULTIPLE CURVES
PLOTPR	PRINTER PLOT - MULTIPLE CURVES
PLOTXY	PRINTER PLOT - SINGLE CURVE
POLDIV	POLYNOMIAL DIVISION
POLYN	LEAST SQUARES POLYNOMIAL FIT
POWR1	1 TERM IN EXPONENTIATION OF POWER SERIES - ONE VARIABLE
POWR2	1 TERM IN EXPONENTIATION OF POWER SERIES - TWO VARIABLES
PROD2	1 TERM IN PRODUCT OF POWER SERIES - TWO VARIABLES
PROOT	FIND ALL ROOTS OF A REAL PLOYNOMIAL
PRTFL	PRINT CURRENT FL (OR PUT INTO DAYFILE)
PRTIME	GET AND PRINT CPA, CPB, CP, PP, IO AND WALL CLOCK TIMES SINCE LAST CALL AND PRINT USER-SUPPLIED MESSAGE
PSI	COMPLEX PSI FUNCTION
PUTCHA	INSERT CHARACTER INTO SPECIFIED POSITION IN AN ARRAY
PUTCHR	INSERT CHARACTER INTO SPECIFIED POSITION IN A WORD

QSORT	IN-CORE ASCENDING SORT FOR REAL ARRAYS LARGER THAN 500 WORDS
QSORT1	IN-CORE ASCENDING SORT WITH RE-ORDERING OF ASSOCIATED ARRAY (FOR REAL ARRAYS LARGER THAN 500 WORDS)
QUADG	INTEGRAL BY GAUSS-LEGENDRE 10-POINT QUADRATURE
QUART	REAL OR COMPLEX ROOTS OF QUARTIC
RANNUM	NORMALLY DISTRIBUTED RANDOM NUMBERS
RCPA	READ (A PORTION OF) CONTROL POINT AREA
RECOVRD	ON RECOVERY, PRINT EXCHANGE JUMP PACKAGE, RA+0 THRU RA+77B
REDUCE	REDUCE FL TO MINIMUM -OR- REQUEST ADDITIONAL FL RELATIVE TO START OF BLANK COMMON
REPLAC	REPLACE ONE CHARACTER WITH ANOTHER IN AN ARRAY
REPLACM	REPLACE SEVERAL CHARACTERS WITH OTHER CHARACTERS
REPLHI	REPLACE ALL CHARACTERS GREATER THAN SPECIFIED CHARACTER WITH NEW CHARACTER
REPLLO	REPLACE ALL CHARACTERS LESS THAN SPECIFIED CHARACTER WITH NEW CHARACTER
REPLNE	REPLACE ALL CHARACTERS (EXCEPT SPECIFIED CHARACTER) WITH A SPECIFIED CHARACTER
REQUEST	CALLABLE REQUEST COMMAND
RFFT	FAST FOURIER TRANSFORM FOR REAL TABULATED DATA
RFSN	REVERSE FAST FOURIER TRANSFORM
RNDMIZ	EMULATE BASIC LANGUAGE 'RANDOMIZE' STATEMENT (CAN BE USED TO GUARANTEE FIRST CALL TO RANF WILL RESULT IN A DIFFERENT NUMBER WITH EACH EXECUTION OF A PROGRAM)
ROOTER	GENERAL ROOT FINDER
ROUTE	CALLABLE ROUTE COMMAND
ROUTERC	SUPPLY DESCRIPTION OF ROUTE RETURN CODE
SBYT	STORE VARIABLE LENGTH BYTE
SEMICO	REPLACE DISPLAY CODE 00B WITH 77B (SEMI-COLON)
SETREW	CONVERT ALPHABETIC REWIND OPTION INTO RM OPEN AND CLOSE CODES

SHIFTA	SHIFT ARRAY A SPECIFIED NUMBER OF BITS (CROSSING OVER WORD BOUNDARIES)
SIMP	SIMPSON'S RULE INTEGRATION
SIMPUN	SIMPSON'S RULE INTEGRATION - UNEQUAL INTERVALS
SKWEZL	SQUEEZE LEFT AND REMOVE BLANKS AND 00B
SKWEZR	SQUEEZE RIGHT AND REMOVE BLANKS AND 00B
SMOOTH	LEAST SQUARES POLYNOMIAL SMOOTHING
SNCNDN	JACOBIAN ELLIPTIC FUNCTION
SPLFIT	SPLINE CURVE FIT
SQFIT	POLYNOMIAL LEAST SQUARE FIT
SSORT	FTN SHELL SORT
SSORTF	FTN CALLABLE SHELL SORT FOR TWO-DIMENSIONAL ARRAYS
SSORTI	FTN CALLABLE SHELL SORT FOR TWO-DIMENSIONAL ARRAYS
SSORTL	FTN LOGICAL SHELL SORT
STUTEE	STUDENT'S T DISTRIBUTION
SUMIT	SUM ELEMENTS OF REAL ARRAY
SWAP	SWAP TWO ARRAYS
TIMLEFT	DETERMINE CP (AND IO) TIME LEFT SINCE START OF BATCH JOB OR INTERCOM COMMAND
TRAILBZ	CHANGE TRAILING BLANKS TO ZEROS (00B)
UNHEX3	SPREAD 2 CHARACTERS INTO 3 HEX DIGITS
UNLOAD	UNLOAD A FORTRAN FILE
VALDAT	LOGICAL FUNCTION TO VALIDATE A DATE FORMAT
VALIDT	VALIDATE AN ARRAY TO SEE THAT EACH ELEMENT IS ONE OF A USER-SPECIFIED LIST
VARAH1	EIGENVALUES AND EIGENVECTORS OF A GENERAL REAL MATRIX
VARAH2	IMPROVED ESTIMATES AND BOUNDS FOR EIGENSYSTEM OF A GENERAL REAL MATRIX
VFILL	FILL AN ARRAY WITH USER-SPECIFIED WORD
WARNING	FTN-CALLABLE 'WARNING' CONTROL CARD

WEKDAY	DETERMINE THE DAY OF THE WEEK FOR ANY GREGORIAN DATE FROM OCTOBER 15, 1582 THRU FEBRUARY 28, 4000
XFIL	FILON'S METHOD FOR INTEGRALS WITH SIN AND COS
ZBLANK	CHANGE BLANKS TO 00B AND VICE VERSA
ZEROFL	ZERO FIELD LENGTH (SECURITY EOJ)
ZEROS	REPLACE BLANKS WITH (DISPLAY CODE) ZEROS, MULTIPLE FIELDS
ZPFPUT	PUT USER-SPECIFIED PARAMETERS INTO ARRAY FOR LATER CALL TO ZPFUNC
ZPFUNC	CALLABLE PERMANENT FILE FUNCTIONS
ZRTPUT	PUT USER-SPECIFIED PARAMETERS INTO ARRAY FOR LATER CALL TO ROUTE
ZSYSEQ	FORTRAN CALLABLE SYSTEM CALL

SANDIA

'SANDIA' IS A LIBRARY OF ORDINARY DIFFERENTIAL EQUATION SOLVERS OBTAINED FROM SANDIA LABORATORIES THROUGH THE ARGONNE CODE CENTER.

REFERENCE: SEE USER SERVICES.

ROUTINES IN LIBRARY 'SANDIA' INCLUDE:

DE	ORDINARY DIFFERENTIAL EQUATION SOLVER (DRIVER)
DEROOT	INTEGRATES AN INITIAL VALUE PROBLEM FOR ORDINARY DIFFERENTIAL EQUATIONS UNTIL A ROOT IS LOCATED (DRIVER)
STEP	ADAM'S INTEGRATION (USED DE AND DEROOT BUT MAY BE CALLED BY THE USER)

*** SUBPROGRAMS IN SYSTEM LIBRARIES ***

THE FOLLOWING SUBPROGRAMS ARE IN SYSTEM LIBRARIES. SEE THE INDIVIDUAL DOCUMENTS FOR EXECUTE INFORMATION.

INDIVIDUAL DOCUMENTS MAY BE PRINTED BY:

BEGIN,DOCGET,,OTHER,,<RTN>,OUTPUT.

WHERE <RTN> IS THE NAME OF THE ROUTINE WHOSE DOCUMENTATION IS DESIRED. THE LENGTH OF EACH DOCUMENT IS GIVEN IN PARENTHESES.

MACHINE	GET THE 4-WORD SYSTEM BATCH HEADING
SKPFIL	REPOSITION A SEQUENTIAL FILE FORWARD OR BACKWARD A SPECIFIED NUMBER OF UNITS (FOR EXISTING RECORDS ONLY)
SKPSTAT	GET THE STATUS OF THE LAST CALL TO 'SKPFIL'

***** CATALOGUED PROCEDURES *****

A CATALOGUED PROCEDURE IS A SET OF CONTROL CARDS WHICH ACCOMPLISH A TASK. THE COMPUTER CENTER MAINTAINS ONE LIBRARY OF PROCEDURES. THIS CHAPTER DESCRIBES THIS LIBRARY AND LISTS ITS CONTENTS WITH DESCRIPTIVE TITLES.

MOST PROCEDURES ARE EXECUTED BY:

BEGIN,<PROCNAME>,<PROCFIL>,<PARAMETERS>.

WHERE <PROCNAME> IS THE PROCEDURE NAME
<PROCFIL> IS THE PROCEDURE FILE
(OMITTED IF 'PROCFIL')
<PARAMETERS> IS 0 OR MORE PARAMETERS FOR THE PROCEDURE.

*** PROCFIL ***

'PROCFIL' IS A LIBRARY OF GENERAL-PURPOSE PROCEDURES WRITTEN AT DTNSRDC. THEY ARE EXECUTED BY:

BEGIN,<PROCNAME>,,<PARAMETERS>.

REFERENCES: CLIB/P, WHICH MAY BE OBTAINED FROM USER SERVICES.

MACHINE-READABLE DOCUMENTATION MAY BE PRINTED USING PROCEDURE 'DOCGET' (SEE PAGE 1-2). MOST DOCUMENTS ARE 1 OR 2 PAGES LONG.

THE FOLLOWING PROCEDURES ARE AVAILABLE:

ADDEXT	MODIFY PRIVATE PACK DUM FILE FOR LEVEL 508 DUMPF/LOADPF
ANYLIB	EXECUTE A PROGRAM ON ANY EDITLIB USER LIBRARY
ANYPRO	EXECUTE A PROCEDURE ON ANY CATALOGUED RANDOM PROCEDURE FILE
ANYPROS	EXECUTE A PROCEDURE ON ANY CATALOGUED SEQUENTIAL PROCEDURE FILE
AUDIT	SORTED USER AUDIT
BANNERS	PRINT A PAGE WITH 1 TO 8 BANNERS
BDT	PRINT A BANNER PAGE WITH DATE AND TIME
BIGLOAD	CREATE AN ABSOLUTE FILE WHICH WILL ALLOW SOME LARGE PROGRAMS TO LOAD IN LESS CORE THAN NORMALLY NEEDED
BR2CCL	CONVERT SEQUENTIAL (UNIVERSITY OF WASHINGTON) BEGIN/REVERT PROCEDURE FILE TO SEQUENTIAL (CDC-SUPPORTED) CYBER CONTROL LANGUAGE FILE AND, OPTIONALLY, CATALOG THE CCL FILE

B7700S	PREPARE 9-TRACK EBCDIC TAPE TO MOVE A SINGLE CARD-IMAGE PERMANENT FILE FROM THE CDC 6000 TO THE BURROUGHS B7700
B7700U	PREPARE 9-TRACK EBCDIC TAPE TO MOVE A SINGLE DECK OR ALL DECKS IN AN UPDATE LIBRARY FROM THE CDC 6000 TO THE BURROUGHS B7700
CALC3D	THREE-D PROCEDURE FOR CALCOMP PLOTTERS
CCNOTE	PRINT A COMPUTER CENTER NOTE OR THE CCN INDEX
COMQ	PREPARE AND ROUTE A FILE TO THE MICROFICHE QUEUE
COPYBLK	REBLOCK STRANGER TAPES TO SCOPE STANDARD FILES (BOTH UNBLOCKED CARD AND PRINT LINE IMAGE TAPES AND BLOCKED STRANGER TAPES)
COPYLIB	CONDENSE (AND SORT) AN EDITLIB USER LIBRARY PRESERVING AL, FL, FLO VALUES. BINDEX AND LISTBIN LISTS ARE PROVIDED.
COPYS	ATTACH, EXECUTE AND RETURN THE RIQSCOPYS PROGRAM
CV029	CONVERT TO 029 PUNCH CODE
DISPOST	INVOKE THE TEKTRONIX POSTPROCESSOR
DOCADD	ADD ONE DOCUMENT TO A DOCUMENTATION FILE
DOCDATE	LIST DOCUMENT NAMES (ON *DECK CARDS) TOGETHER WITH THE DOCUMENT DATE AND PAGE NUMBERS (FROM BOTTOM LINE OF EACH PAGE)
DOCDELE	DELETE ONE DOCUMENT FROM A DOCUMENTATION FILE
DOCDOC	LIST DOCUMENTATION FOR PROCEDURES DOCADD, DOCDATE, DOCDELE, DOCDOC, DOCFILE, DOCGET, DOCLIST, DOCREPL
DOCFILE	ATTACH A DOCUMENTATION FILE
DOCGET	GET (EXTRACT) SPECIFIED DOCUMENT FROM A DOCUMENTATION FILE
DOCLIST	LIST DOCUMENT NAMES (ON *DECK) CARDS IN A DOCUMENTATION FILE
DOCREPL	REPLACE ONE DOCUMENT IN A DOCUMENTATION FILE
DOCTAPE	EXTRACT (PRINT) ONE OR ALL DOCUMENTS FROM A DOCUMENT FILE ON TAPE
GETPROD	GET PRODUCTS FILE(S) FOR NOS/BE LEVELS 461, 439, 434, 420, 414, 410, 406, 401, 380
GRIPE	ALLOW USER TO MAKE GRIPES OR SUGGESTIONS DIRECTLY TO THE COMPUTER

LGOTREE	GENERATE CROSS-REFERENCE LISTS AND TREE STRUCTURE FROM BINARY RELOCATABLE OBJECT FILE
LIBPRO	EXECUTE A PROCEDURE ON LIBRARY 'PROCFIL' CATALOGED UNDER ANY ID
LIBPROA	EXECUTE A PROCEDURE ON ANY CATALOGUED PROCEDURE LIBRARY
LIBSET1	CREATE SIMPLE ABSOLUTE USING ONE EDITLIB LIBRARY
LIBSET2	CREATE SIMPLE ABSOLUTE USING TWO EDITLIB LIBRARIES
LINE6	SET PRINT FILE TO 6 LINES PER INCH
LINE8	SET PRINT FILE TO 8 LINES PER INCH
LIST	LIST A PERMANENT FILE
MANUAL	PRINT ONE COPY OF A MANUAL OR ITS REVISION PAGES
MFX	LIST THE MACHINE BEING USED
MNSRDC	EXECUTE A PROGRAM ON EDITLIB USER LIBRARY 'MNSRDC'
MYPRO	EXECUTE A PROCEDURE ON SEQUENTIAL FILE 'PROCFIL' CATALOGED UNDER ANY ID
MYPROS	EXECUTE A PROCEDURE ON SEQUENTIAL FILE 'PROCFILS' CATALOGED UNDER ANY ID
NOGO	CREATE SIMPLE ABSOLUTE FROM RELOCATABLE
NORERUN	INSURE THAT A BATCH JOB CANNOT BE RERUN BY OPERATOR TYPE-IN
PAC	PURGE ALL CYCLES OF A FILE
PAHC	PURGE ALL HIGH CYCLES OF A FILE WHILE RETAINING THE LOW CYCLE
PALC	PURGE ALL LOW CYCLES OF A FILE WHILE RETAINING THE HIGH CYCLE
PFRSTOR	CREATE A FILE OF DIRECTIVES TO RESTORE PERMANENT FILES
PFTRAN1	INVOKE PFTRANS TO TRANSFER ONE FILE
PGMTAPE	EXTRACT A SOURCE PROGRAM FROM TAPE
PHC	PURGE HIGH CYCLE OF A FILE WHILE RETAINING THE LOW CYCLE
PLC	PURGE LOW CYCLE OF A FILE WHILE RETAINING THE HIGH CYCLE
PM	CREATE CERTAIN PRINT MESSAGE (PM) RECORDS

PROADD	ADD ONE PROCEDURE TO A SEQUENTIAL PROCEDURE FILE
PROALL	LIST PROCEDURE NAMES, PROCEDURE HEADERS AND THE PROCEDURES IN A SEQUENTIAL PROCEDURE FILE (COMBINES PRONAM, PROHDR AND PROLIST)
PRODELE	DELETE ONE PROCEDURE FROM A SEQUENTIAL PROCEDURE FILE
PRODOC	LIST DOCUMENTATION FOR PROCEDURES PROADD, PROALL, PRODELE, PRODOC, PROGET, PROHDR, PROLIST, PRONAM, PROREPL, PROS2R
PROGET	GET (EXTRACT) ONE PROCEDURE FROM A SEQUENTIAL PROCEDURE FILE
PROGRAM	EXECUTE A CATALOGED PROGRAM (NOT IN A LIBRARY)
PROHDR	LIST PROCEDURE HEADERS IN A PROCEDURE FILE
PROLIST	LIST PROCEDURE(S) IN A SEQUENTIAL PROCEDURE FILE
PRONAM	LIST NAMES OF PROCEDURES IN A SEQUENTIAL PROCEDURE FILE
PROREPL	REPLACE ONE PROCEDURE IN A SEQUENTIAL PROCEDURE FILE
PROS2R	CONVERT SEQUENTIAL PROCEDURE FILE TO RANDOM EDITLIB USER LIBRARY
PURGALL	PURGE PERMANENT FILES OF SPECIFIED AC AND ID
PURGEN	GENERATE PROCEDURE 'PUR' TO PURGE SEVERAL FILES WITH COMMON KERNEL
RECADD1	ADD ONE OR MORE LOGICAL RECORDS TO A FILE
RECDEL1	DELETE ONE OR MORE LOGICAL RECORDS FROM A FILE
RECDOC	LIST DOCUMENTATION FOR PROCEDURES RECADD1, RECDEL1, RECDOC, RECGET1, RECREP1
RECGET1	EXTRACT ONE OR MORE LOGICAL RECORDS FROM A FILE
RECREP1	REPLACE ONE OR MORE LOGICAL RECORDS IN A FILE
RENAMAC	RENAME AC FIELD ON PERMANENT FILES
RUNBAS	COMPILE AND EXECUTE BASIC PROGRAM (SIMILAR TO EDITOR RUN,BAS FOR USE OUTSIDE OF EDITOR)
RUNFTN	COMPILE AND EXECUTE FTN PROGRAM (SIMILAR TO EDITOR RUN,FTN FOR USE OUTSIDE OF EDITOR)
RUNMNF	COMPILE AND EXECUTE MNF PROGRAM UNDER INTERCOM

RUNPAS	COMPILE AND EXECUTE PASCAL PROGRAM UNDER INTERCOM
RUNSEQ	COMPILE AND EXECUTE FTN,SEQ PROGRAM
RUNTS	COMPILE AND EXECUTE FTN,TS PROGRAM
SEGLD	CREATE A SEGLOAD ABSOLUTE FILE
SELDUMP	CREATE BACKUP DUMP TAPE OF THE USER PERMANENT FILE OF AN ACCOUNT NUMBER
SELLOAD	RESTORE SELECTED ROUTINES FROM A BACKUP DUMPF TAPE
SEND	SEND MESSAGES TO AN INTERCOM USER WHO IS NOT LOGGED IN; LIST MESSAGES
SORT	INVOKE SORTMRG TO SORT UP TO 5 'DISPLAY' FIELDS USING 'COBOL6' COLLATING SEQUENCE
SORTCZ	INVOKE SORTMRG TO SORT UP TO 5 'DISPLAY' FIELDS IN BT=C,RT=Z RECORDS USING 'COBOL6' COLLATING SEQUENCE ('FILE' CARDS NOT REQUIRED)
S2K260	ATTACH FILES FOR S2000 (VERSION 2.60) NATURAL LANGUAGE, FORTRAN, OR COBOL PRECEDURAL LANGUAGE INTERFACE
TIDBITS	LIST FILE OF TIDBITS (HINTS ON IMPROVED COMPUTER USAGE)
TRANPAK	COPY CONTENTS FROM ONE DEVICE SET TO ANOTHER FOR BACKUP
UPDADD	ADD ONE DECK TO AN UPDATE LIBRARY
UPDDELE	DELETE ONE DECK FROM AN UPDATE LIBRARY
UPDDOC	LIST DOCUMENTATION FOR PROCEDURES UPDADD, UPDDELE, UPDDOC, UPDGET, UPDLIST, UPDREPL
UPDGET	EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,C) AND, OPTIONALLY, ADD EDITOR SEQUENCING
UPDGETS	EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,S) AND, OPTIONALLY, ADD EDITOR SEQUENCING
UPDGETT	EXTRACT ONE DECK FROM AN UPDATE LIBRARY (UPDATE,T) AND, OPTIONALLY, ADD EDITOR SEQUENCING
UPDLIST	LIST DECK/COMDECK NAMES IN UPDATE LIBRARY WITH COUNT OF RECORDS IN EACH DECK/COMDECK
UPDREPL	REPLACE ONE DECK IN AN UPDATE LIBRARY
UTILITY	EXECUTE A PROGRAM ON EDITLIB USER LIBRARY 'UTILITY'
VENUS	ATTACH AND EXECUTE ONE OF THE VENUS RETRIEVAL PROGRAMS
WHATLIB	LIST LIBRARIES SPECIFIED IN LAST 'LIBRARY' COMMAND

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1	1804	AVRUNIN, L.
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2	1809.3	HARRIS, D.
1	182	CAMARA, A. W.
1	184	SCHOT, J. W.
1	185	CORIN, T.
1	187	ZUBKOFF, M. J.
1	189	GRAY, G. R.
1	189.1	HIBBERT, D.
1	189.2	HAYDEN, H. P.
1	189.3	COOPER, A. E.
150	1892.1	STRICKLAND, J. D.
20	1892.2	SOMMER, D. V.
1	1892.3	MINOR, L. R.
1	1894	SEALS, W.
1	1896	GLOVER, A.
1	1896.2	DENNIS, L.
1	522	LIBRARY, CARDEROCK
1	522.2	LIBRARY, ANNAPOLIS


FILME
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