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ELLPACK CONTROL CARD PROCEDURES :

XEQ ELLPACK

XEQ GETELL

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Abstract

This document describes how to run ELLPACK jobs and to obtain copies of ELLPACK source programs on Purdue's CDC computer system. In most cases, only one control card is required to perform each of these tasks. In addition, several options allowing the testing of new ELLPACK modules or the temporary modification of old ones are available.

ELLPACK, a research tool for partial differential equations software, is described in [1,2].

XEQ ELLPACK

The batch control card used to run ELLPACK programs is

XEQ(ELLPACK, ID=CIB, optional parameters)

where "optional parameters" is a list of items selected from any of the sets below. (The XEQ processor is a control card macro processor. It expands the control card macro in the file named ELLPACK saved under user id CIB. See [3]). In what follows we assume that the reader is familiar with the description of the sequence of events in the execution of ELLPACK programs given in the ELLPACK User's Guides [1,2].

Parameter Set A : Running ELLPACK Programs

I=file => the user's ELLPACK input program is on the given local file (default=INPUT)
L=file => place listing of ELLPACK control program (the FORTRAN main program generated by the Preprocessor) on the specified local file (default=OUTPUT)
EFL=n => use n (octal) words of core in compiling the ELLPACK control program (default=55000)
PLOT => cause any plotting done by ELLPACK to be routed to the Versatec electrostatic printer. This must be specified if plotting output is desired.

Parameter Set B : Modifying the Preprocessor

PM=file => the specified local file contains Modify directives to be applied to Preprocessor routines before execution (see [5])
PFL=n => use n (octal) words of core in compiling the modified Preprocessor routines (default=55000)
PL=file => place compilation listing of modified Preprocessor routine on the specified local file
E=n => set the MNF compiler message level to n during all compilations done in this run (see [4])
XR=n => set the MNF compiler cross reference table level to n during all compilations in this run (see [4])
PB=file => load the binary decks (object modules) in the specified file along with the

Preprocessor
 (the file should contain compiled versions
 of modified Preprocessor routines)

PMAP => generate a load map for the Preprocessor
 execution

NOLOAD => must be specified if a change is being made
 to the Preprocessor main program

Parameter Set C : Modifying the Modules

N=file => the specified local file contains FORTRAN
 subprograms to be compiled and executed
 along with the modules
 (If routines in 'file' are also in the
 ELLPACK library, the routines in 'file'
 are used)

EM=file => the specified local file contains Modify
 directives to be applied to ELLPACK
 modules routines before execution

EFL=n => (see set A)

EL=file => place the compilation listing of all added
 or modified ELLPACK module routines on the
 specified local file

E=n => (see set B)

XR=n => (see set B)

EB=file => load the binary decks (object modules) in
 the specified file along with the ELLPACK
 modules (The file should contain compiled
 versions of modified module routines).

MAP => generate load map for module execution

Parameter Set D : Others

NODAY => suppress listing of dayfile (control cards)

NOLIST => suppress all output except listing of
 control program and output of modules

If more than one of the files specified on the XEQ card
 is INPUT, then these records should appear in the input
 stream in the order PM, PB, I, EM, N, EB. The following
 files are rewound and used as scratch files: HEADER, ASSIGN,
 MODSEQ, PNCH, LGO, DATA, FORT, ELLPGM, ELLGO, PLOT, COMPILE,
 SAVE. In addition, the following permanent file names
 should be considered as reserved words: ELLPK77, SOURCE7,
 PRELIB7, BINARY7.

Examples

1. XEQ(ELLPACK, ID=CIB)

This card simply executes the ELLPACK program on the INPUT file.

2. XEQ(ELLPACK, ID=CIB, I=EXAMPL, MAP, PLOT, EFL=65000)

This card executes the ELLPACK program in the local file EXAMPL. The ELLPACK control program generated by the Preprocessor is compiled with a field length of 65000 (octal) words (this is required, for instance, when user-specified routines are very long). A load map is generated before execution and plotting output is routed to the electrostatic printer.

3. XEQ(ELLPACK, ID=CIB, PM=INPUT, NOLOAD, PFL=6000, PL=0)

```
7/8/9 (end of record)
*DECK, PPMAIN
... modifications ...
*DECK, PPOUTP
... modifications ...
7/8/9 (end of record)
* ELLPACK INPUT PROGRAM
```

```
OUTPUT. PLOT-ERROR
END.
6/7/8/9 (end of file)
```

This control card sequence applies modifications to the Preprocessor decks PPMAIN and PPOUTP, compiles them with a field length of 60000 (octal) words (the compilation listing is suppressed) and then runs the ELLPACK program on INPUT file. NOLOAD is specified since the Preprocessor routine PPMAIN is modified.

4. XEQ(ELLPACK, ID=CIB, I=PROB, N=STAR, NOLIST, MAP)

This card causes the ELLPACK program on the local file PROB to be processed by the Preprocessor and then the FORTRAN routines in the local file STAR are compiled along with the generated ELLPACK control program. This would be useful, for instance, if a new version of the five point star module (with the same calling sequence as the current one) were being tested. No compilation listing would be produced, although a load map would be.

XEQ GETELL

This section describes how to easily obtain copies of ELLPACK source programs on the Purdue CDC system. Only one batch control card is needed to do this; it is

```
XEQ(GETELL, ID=CIB, parameters)
```

where one or more of the parameters from the list below may appear. (The XEQ processor executes the control card macro located in the file GETELL in user id CIB.)

Parameters

```
PREPROS => get Preprocessor
DOMAIN  => get domain processor
PURDUE  => get Purdue modules
PURDUES => get Purdue modules (ELLPACK 78)
YALE    => get Yale modules
TEXAS   => get Texas modules (including ITPACK)
LINPACK => get LINPACK modules
BANK    => get Randy Bank's modules
SEWELL  => get Granville Sewell's modules
OUTPUT7 => get ELLPACK 77 output modules
OUTPUT8 => get ELLPACK 78 output modules
I=file  => get modules put on compile file by the
          Modify directives on the given file.
          See [5] for a description of Modify
          and Appendix 3 of this document for
          a description of Modify deck names.
```

The following two parameters allow listings of the obtained routines to be easily generated. Note that listing or compiling large collections of modules, e. g. PURDUE or TEXAS, may require large amounts of tracks, I/O units and pages of output.

```
LIST     => produce a source listing of the obtained
          routines
COMPILE  => produce a compilation listing of the
          obtained routines.
          the parameter CFL=xxxxx gives the field
          length for the compilation. default is 55000.
```

After the XEQ procedure has been executed the local file CODE contains the requested source programs.

Examples

1. XEQ(GETELL, ID=CIB, OUTPUT, LIST)

This card produces a source listing of all output modules in ELLPACK 77.

2. XEQ(GETELL, ID=CIB, DOMAIN, COMPILE, CFL=65000)

This card produces a compilation listing of the ELLPACK domain processor. A field length of 65000 (octal) words is used for the compilation.

3. XEQ(GETELL, ID=CIB, I=INPUT)
PFILES, PUT, STRCOPY, X=CODE.
7/8/9 (end of record)
*EDIT, STAR5
6/7/8/9 (end of file)

This sequence of control cards saves a copy of the ELLPACK module routine STAR5 in the users PFILE file STRCOPY.

References

- [1] J. R. Rice, ELLPACK 77 User's Guide, Purdue University Computer Science Department Report CSD-TR 289, Sept. 13, 1978.
- [2] J. R. Rice, ELLPACK 78 User's Guide -- Preliminary Version, Purdue University Computer Science Department Report CSD-TR 306, May 9, 1979.
- [3] R. C. Scwabel, XEQ Reference Manual, Purdue University Computer Center Document L3 XEQ, June 1977.
- [4] M. J. Frisch and L. A. Liddiard (eds.), MNF (MiNnesota Fortran) Reference Manual for CDC 6000/7000/Cyber Series Computers, University Computer Center, University of Minnesota, 1976.
- [5] Modify Reference Manual, Purdue University Computer Center Document VO-MODIFY, December 1975.

Appendix 1 : The ELLPACK Macro

Note : The character † is an ampersand

```
' IF,STR,NODAY,1
DISABLE,PLIST.
' IF,STR,NOLIST,3
' SET,EL=0
' SET,PL=0
' SET,L=0
REWIND,HEADER,ASSIGN,MODSEQ,PNCH,LGO.
REWIND,DATA,FORT,ELLPGM,ELLGO,PLOT.
IF(FILE(ELLPK77,DR))
ELSE.
FILES,ELLPK77,T=R.
ATTACH,PRELIB7,ELLPK77.
ATTACH,BINARY7,ELLPK77.
ENDIF.
IF(FILE(SOURCE7,EX))
ELSE.
' SET,GETSRC=NO
' IF,DEF,PM,1
' SET,GETSRC=YES
' IF,DEF,EM,1
' SET,GETSRC=YES
' IFEQ,†GETSRC,YES,1
FILUP(OPEN,SOURCE7,ELLPK77)
ENDIF.
' IF,DEF,PM,3
MODIFY(P=SOURCE7,N=0,C=COMPILE,I=†PM,U,L=†PL=OUTPUT)
RFL,†PFL=55000.
MNF,N,R=†XR=0,I=COMPILE,L=†PL=OUTPUT,E=†E=3.
' IF,STR,PMAP,1
MAP,PART.
CLEAR,C.
' IF,STR,NOLOAD
' ELSE,1
GET(PRELIB7,LGO,NR) REL/BB.-ELLPCK
' IF,DEF,PB,1
COPYBF,†PB,LGO.
LOAD,LGO,PRELIB7,MNLIB,RUNLIB.
EXECUTE,ELLPCK,HEADER,ASSIGN,MODSEQ,†I=INPUT,OUTPUT,PNCH,
DATA,FORT.

' IF,STR,PMAP,1
MAP,OFF.
REWIND,HEADER,DATA,ASSIGN,MODSEQ,FORT.
COPYBF,HEADER,ELLPGM,1,CON,DER,DEF.
COPYBF,DATA,ELLPGM,1,CON,DER,DEF.
COPYBF,ASSIGN,ELLPGM,1,CON,DER,DEF.
COPYBF,MODSEQ,ELLPGM,1,CON,DER,DEF.
COPYBF,FORT,ELLPGM,1,CON,DER,DEF.
```



```
REWIND, ELLPGM.  
RFL, ↑EFL=55000.  
MNF, N, R=↑XR=0, I=ELLPGM, B=ELLGO, L=↑L=OUTPUT, E=↑E=3.  
'SET, MORE=NO  
'IF, DEF, EM, 1  
'SET, MORE=YES  
'IF, DEF, N, 1  
'SET, MORE=YES  
'IFEQ, ↑MORE, YES, 1  
REWIND, ELLPGM.  
'IF, DEF, EM, 2  
MODIFY (P=SOURCE7, N=0, C=COMPILE, I=↑EM, L=↑EL=OUTPUT, U)  
COPYBF, COMPILE, ELLPGM, 1, CON, DER, DEF.  
'IF, DEF, N, 1  
COPYBR, ↑N, ELLPGM, 1, CON, DER, DEF.  
'IFEQ, ↑MORE, YES, 3  
REWIND, ELLPGM.  
RFL, ↑EFL=55000.  
MNF, N, R=↑XR=0, I=ELLPGM, B=ELLGO, L=↑EL=OUTPUT, E=↑E=3.  
'IF, STR, MAP, 1  
MAP, PART.  
'IF, DEF, EB, 1  
COPYBF, ↑EB, ELLGO.  
CLEAR, C.  
ENABLE, PLIST.  
LOAD, ELLGO, BINARY7, MNFLIB, RUNLIB.  
EXECUTE, , ↑I=INPUT, OUTPUT, PLOT, SAVE, SCRATCH.  
'IF, STR, PLOT, 1  
EPLOT.  
TRMSG, NA. ELLPACK-EXECUTION-COMPLETE  
GOTO, END.  
PROCEED.  
TRMSG, NA. ELLPACK-EXECUTION-FAILED?  
-END.  
PROCEED.
```

Appendix 2 : The GETELL Macro

Note : The character † is an ampersand

```
REWIND,COMPILE.
IF(FILE(ELLPK77,DR))
ELSE.
FILES,ELLPK77,T=R.
ENDIF.
IF(FILE(SOURCE7,EX))
ELSE.
FILUP(OPEN,SOURCE7,ELLPK77)
ENDIF.
'IF,STR,PREPROS,3
PFILES,GET,PPNAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=PPNAME,C=CODE,LS.
RETURN,PPNAME.
'IF,STR,PURDUE,3
PFILES,GET,PUNAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=PUNAME,C=CODE,LS.
RETURN,PUNAME.
'IF,STR,PURDUE8,3
PFILES,GET,P8NAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=P8NAME,C=CODE,LS.
RETURN,P8NAME.
'IF,STR,TEXAS,3
PFILES,GET,TXNAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=TXNAME,C=CODE,LS.
RETURN,TXNAME.
'IF,STR,DOMAIN,3
PFILES,GET,DMNAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=DMNAME,C=CODE,LS.
RETURN,DMNAME.
'IF,STR,YALE,3
PFILES,GET,YANAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=YANAME,C=CODE,LS.
RETURN,YANAME.
'IF,STR,BANK,3
PFILES,GET,BANAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=BANAME,C=CODE,LS.
RETURN,BANAME.
'IF,STR,LINPACK,3
PFILES,GET,LINAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=LINAME,C=CODE,LS.
RETURN,LINAME.
'IF,STR,SEWELL,3
PFILES,GET,SENAME,ID=CIB.
MODIFY,NR,P=SOURCE7,I=SENAME,C=CODE,LS.
RETURN,SENAME.
'IF,STR,OUTPUT7,3
PFILES,GET,O7NAME,ID=CIB.
```

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```
MODIFY, NR, P=SOURCE7, I=O7NAME, C=CODE, LS.  
RETURN, O7NAME.  
'IF, STR, OUTPUT8, 3  
FILES, GET, O8NAME, ID=CIB.  
MODIFY, NR, P=SOURCE7, I=O8NAME, C=CODE, LS.  
RETURN, O8NAME.  
'IF, DEF, I, 1  
MODIFY, NR, P=SOURCE7, I=↑I, C=CODE, LS.  
REWIND, CODE.  
'IF, STR, COMPILE, 2  
RFL, ↑CFL=55000.  
MNF, N, I=CODE, P, E=0.  
'IF, STR, LIST, 1  
COPYSEF, CODE, OUTPUT, 1, RI.  
ENDIF.
```

Appendix 3 : Modify Deck Names

The ELLPACK Modify source library is made up of "decks", each deck containing one FORTRAN routine (with a few exceptions). Each Modify deck name is the same as the name of the FORTRAN subprogram that it contains. Thus, for example, the Modify deck STARS contains the FORTRAN subroutine STARS. There are two exceptions:

1. The Preprocessor

The Preprocessor deck names each have the prefix PP followed by the first four characters of the FORTRAN subprogram contained in the deck. The Preprocessor main program is contained in the deck PPMAIN and the Preprocessor's block data subprogram is in the deck Ppdata. The Preprocessor decks are: PPAXRI, PPBCRI, PPBOUN, PPBREA, PPCLOS, PPDISC, PPDOMA, PPDPLI, PPEQUA, PPFORT, PPGRID, PPHEAD, PPHOLE, PPINDE, PPINTP, PPINTV, PPKEYB, PPKEYM, PPKEY2, PPMAIN, PPMATC, PPMIXB, PPMODN, PPOPTI, PPOUTP, PPPARA, PPREAD, PPREC8, PPSEGN, PPSEQU, PPSOLU.

2. The Domain Processor

All deck names in the domain processor have the prefix DM. Several FORTRAN subprograms are contained in each deck. The deck names are: DMBWAL, DMCHAN, DMFILL, DMMAIN, DMNEIG.

On the following pages is a list of all subprograms in the March 1979 version of ELLPACK organized by modules.

DOMAIN
MODULES

DOMAIN
DCOORD
BACK
CHANGE
BCOORD
DBACK
REGULA
BCOORD
SECANT
BCOORD
LOCATE
FILL
EXPAND
LOCATE
NEIGH
BCOORD
ISETG

DISCRETIZATION
MODULES

1. DYKANDOU-CG

DGDRU
DCG
DCGCG
DCGMUL
GMA
KPICK
EIGEN
GMERR
TCHKC
POSTCG
PRECG
DCGMUL
TEVAL
DCGCG
DCGSC
PEREIG
TRIEIG
DCGCG
BCOND

2. DYKANDOU-CG1

DGDRU
DCG
DCGCG
DCGMUL
GMA
KPICK
EIGEN
GMERR
TCHKC
POSTCG
PRECG
DCGMUL
TEVAL
DCGCG
DCGSC
PEREIG
TRIEIG
DCGCG
BCOND
R121
R110

3. FFT 9-POINT

FFT9
DISCRT
EQSOL
CRED
EVENRD
FETCHX
FOUR
KFOLD
NEG
TFOLD
ZERO
ODDRD
STOREX
RGHTSD
BCOND
PDERHS
SETF

4. MARCHING ALGORITHM

GMDRU
GMA
GMASRT
PARTN
ROOTSC
OL
ROOTSG
BANDR
OL
STEP1
MARCH1
MARCH3
TRI1
STEP2
TRI1
TRI2
STEP3
TRI1
TRI2
STEP4
MARCH1
MARCH2
TRI1
GMABC
GMADSC
BCOND
TCHKC
GMAS
GMASRT
PARTN
PINUIT
PROJ
STEP1
MARCH1
MARCH3
TRI1
STEP2
TRI1
TRI2
STEP3
TRI1
TRI2
STEP4
MARCH1
MARCH2
TRI1
TINUIT
KPICK
EIGEN
GMERR
TCHKC

5. HODIE-ACDEF

HOACDE

6. HODIE-ACF

HOACF
HOLR9A
ALPHAS
ABASIS
PDE
BETAS
BBASIS
PDE
SNGSOL
DIRBC9
BCOND
ENDPCS
H9DFEQ
PDERHS

7. HODIE-HELMHOLTZ

HOHELM
HODSUP
DCOEFS
PDE
DIRBC9
BCOND
ENDPCS
PDERHS

8. HODIE 27-POINT 3D

HOLR27
PCUBED
BCOND
PDERHS

9. P3-C1 COLLOCATION

P3C1C0
BASE
BOUND
BCOND
DBASE
DDBASE
PDE
PDERHS
P3C1C1
BCUBCO
BASE
DBASE
DDBASE
PDERHS
BDHOMG
TRUE

10. P3-C1 GALERKIN

P3C1GH
HGALEQ
BASE
BDHONG
BICUBH
PDE
PDERHS
DBASE
TRUE

11. 5-POINT STAR

STARS
BNDEDS
BCOND
BNDFCS
ELIMDS
BNDFCS
INTEQS
PDE
PDERHS
SELF5
PDE
BCOND

12. 9-POINT STAR

STAR9

13. 7-POINT 3D

SYM7PT
PNT3D
BCOND
PDE

14. TEST DISCRETIZATION

TESTDI

15. 2DEPEP

TWDEP
TWMAN
FE
F
PDE
CB
BCOND
PDE
GENREG
INTR
FB
BCOND
MEJOR
SPLT
FB
BCOND
XYS
ECCORD
PDC

INDEXING
MODULES

1. NATURAL

NATORD

2. NESTED DISECTION

NESTDI

3. RED-BLACK

RBNDX

4. YALE RCM

RCMDRU

5. TEST INDEXING

TESTIN

6. YALE MIN DEG

YSMPD
ODRU
ORDER

SOLUTION
MODULES

1. BAND SOLVE

BNDSOL

2. YALE ENVELOPE

ENUDRU

3. JACOBI CG

JCG
ECHOBT
ITICK
ITJCG
CHGCON
ETGUAL
DETERM
ITERM
PARCON
SUOT
SPMPY
SOMPY
SUM3
TSTSTP
SUOT
ITOCK
SCAL
SPDTF
SODTF
SCOPY
SRRM2
SPMPY
SOMPY
SUM3
UNSCAL
SPDTF
SODTF
UFILL

4. JACOBI SI

JSI
ECHOBT
ITICK
ITJSI
CHGSI
CHCOPY
SUOT
SRRM2
ITERM
PARSI
SRRM2
SCOPY
SPMPY
SOMPY
SUM2
SUM3
TSTSTP
SUOT
ITOCK
SCAL
SPDTF
SODTF
SCOPY
SRRM2
UNSCAL
SPDTF
SODTF
UFILL

5. LINPACK BAND

LPBAND
SGRBA
SRRM2
SCOPY
SRRM2
UNSCAL
SPDTF
SODTF
UFILL

LPKSRR
 SPDFG
 SDOT
 SPDM
 SAXPY
 SOUTU

7. REDUCED SYSTEM CG
 RSCG
 ECHOUT
 ITICK
 ITOCK
 ITRSCG
 CHGCON
 EIGUAL
 DETERM
 ITERM
 PARCON
 SDOT
 SPUTU
 SOUTU
 SUM3
 TSTSTP
 SDOT
 SAXPY
 SCAL
 SPDTF
 SODTF
 SCOPY
 SNRM2
 SPUTU
 SOUTU
 SUM3
 UNSCAL
 SPDTF
 SODTF
 VFILL

8. REDUCED SYSTEM SI

NSSI
 ECHOUT
 ITICK
 ITOCK
 ITRSSI
 CHGSI
 CHEBY
 SDOT
 SNRM2
 ITERM
 PARSI
 SAXPY
 SCOPY
 SPUTU
 SOUTU
 SUM3
 TSTCHG
 TSTSTP
 SDOT
 SAXPY
 SCAL
 SPDTF
 SODTF
 SCOPY
 SNRM2
 SPUTU
 SOUTU
 UNSCAL
 SPDTF
 SODTF
 VFILL

9. SPARSE GE - PRINTING

SPYOUT
 ITRSI
 RES101

SOR
 ECHOUT
 ITICK
 ITOCK
 ITRSOR
 ITERM
 SAXPY
 SCOPY
 SDOT
 SPDFG
 SOFGS
 TAU
 SCAL
 SPDTF
 SODTF
 SNRM2
 UNSCAL
 SPDTF
 SODTF
 VFILL

11. SYMMETRIC SOR CG

SSORCG
 BETA
 SDOT
 SPUTU
 SOUTU
 ECHOUT
 ITICK
 ITOCK
 ITRSCG
 CHGCON
 EIGUAL
 DETERM
 ITERM
 OMEG
 BETA
 SDOT
 SPUTU
 SOUTU
 SDOT
 SPMPY
 SOMPY
 OMEGCHG
 PARCON
 SDOT
 SAXPY
 SCOPY
 SPBGS
 SOBGS
 SPFGS
 SOFGS
 SUM2
 SUM3
 TSTSTP
 SDOT
 OMEG
 BETA
 SDOT
 SPUTU
 SOUTU
 SDOT
 SPMPY
 SOMPY
 SCAL
 SPDTF
 SODTF
 SCOPY
 SNRM2
 UNSCAL
 SPDTF
 SODTF
 VFILL

10. SYMMETRIC SOR SI

SSORSI
 BETA
 SDOT
 SPUTU
 SOUTU
 ECHOUT
 ITICK
 ITOCK
 ITRSI
 CHGSI
 CHEBY
 SDOT
 SNRM2
 ITERM
 OMEG
 BETA
 SDOT
 SPUTU
 SOUTU
 SDOT
 SPMPY
 SOMPY
 OMEGCHG
 PARSI
 SAXPY
 SCOPY
 SDOT
 SPBGS
 SOBGS
 SPFGS
 SOFGS
 SUM2
 SUM3
 TSTCHG
 TSTSTP
 SDOT
 OMEG
 BETA
 SDOT
 SPUTU
 SOUTU
 SDOT
 SPMPY
 SOMPY
 SCAL
 SPDTF
 SODTF
 SCOPY
 SNRM2
 UNSCAL
 SPDTF
 SODTF
 VFILL

13. SYMMETRIC BAND

SYMBND

14. TEST SOLUTION

TESTSO

13. YALE SPARSE

YSMPS
CDRU
NRDC
NSFC
NRQC
NNFC
NNSC
NDRU
NNF
NNS
NSF
SDRU
SNF
SNS
SSF
TDRU
TRK

--- OUTPUT
MODULES

1. CONTOUR PLOT

CONTUR
AXIS
CCONTR
DRAW
NUMBER
PLOT
FILLD
IGET
MARK1
NUMBER
PLOT
SYMBOL

2. CONTOUR PLOT

CONT78

3. MAXIMUM

FMCMAK

4. MAXIMUM

FMAX78

5. TABLE OF VALUES

TABLER

6. TABLE OF VALUES

TABL78

7. PLOT THE DOMAIN

DOMPLT
AXIS
BCOORD
DATE
LINE
SCALE
SYMBOL

8. THE ERROR

ERROR
SOLUT
BCOND
CGAPRH
BASE
DBASE
DDBASE
COLAPR
BASE
DBASE
DDBASE
QUADRD
NEARST
QUADRT
NEARST
TESTEV
UUAL5
BCOND
UUNK5
UUAL7
BCOND
TRUE

9. THE ERROR

ERRD78

10. PLOT THE REGION
AND THE GRID LINES

REGPLT
AXIS
LINE
PLOT
SCALE

11. THE RESIDUAL

RESID
BCOND
CDXU
CDYU
PDE
PDERHS
SOLUT
BCOND
CGAPRH
BASE
DBASE
DDBASE
COLAPR
BASE
DBASE
DDBASE
QUADRD
NEARST
QUADRT
NEARST
TESTEV
UUAL5
BCOND
UUNK5
UUAL7
BCOND

12. THE RESIDUAL

RES178

13. THE COMPUTED SOLUTION

SOLUT
BCOND
CGAPRH
BASE
DBASE
DDBASE
COLAPR
BASE
DBASE
DDBASE
QUADRD
NEARST
QUADRT
NEARST
TESTEV
UUAL5
BCOND
UUNK5
UUAL7
BCOND

14. THE COMPUTED SOLUTION

SOLU78

15. THE TRUE SOLUTION

TRUE78
TRUE

16. THE TRUE SOLUTION

TRUE78

--- INTERFACE
MODULES

1. FOR BAND SOLVE

BNDSTR
BAND78

2. FOR ITPACK

INTITP
APXLINK
BLDMAT
SPELM
SOFLM
SPEIN
SOFIN
SPINI
SOFIN
SPSIJ
SOSIJ
DEFAULT

3. FOR LINKACK BAND

LBSTR
BAND78

4. FOR LINKACK SPD BAND

LSBSTR
BAND78

5. FOR SPACK GL

SPSTR
SPACK78

