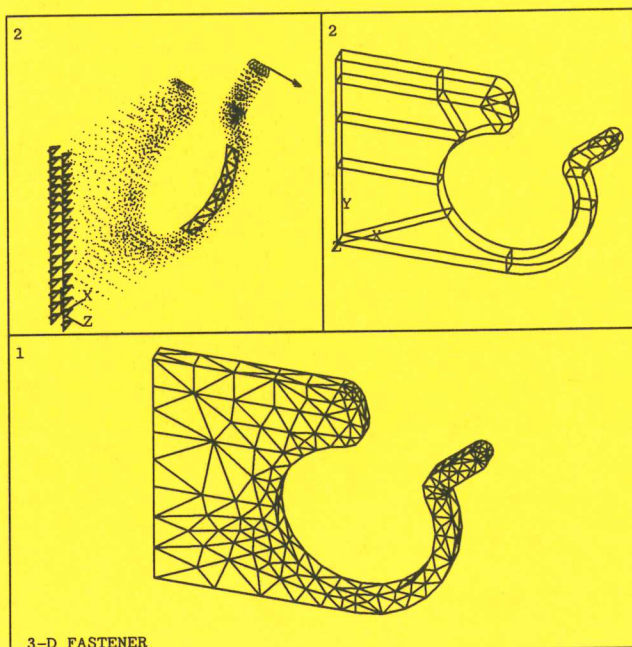




ANSYS[®] COMMAND REFERENCE GUIDE

Rev. 4.4



This booklet conveniently lists the ANSYS input commands that may be used for typical engineering analyses. Included are General ANSYS commands and commands for the PREP7, PREP6, POST1, POST26-30, AUX, /OPT modules. Module names and User's Manual Section numbers are shown in parentheses in the module title. For a detailed explanation of each command refer to the ANSYS Revision 4.4 User's Manual.

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General ANSYS Commands

General Slash Commands (3.1)

```

/INTER
/GET,N,Fname,Ext,Dir
/SAVE,N,Fname,Ext
/DELETE,Fname,Ext,Dir
/FILE,Lab (Lab = ALL, OPEN, or blank)
/COPY,NFROM,NTO,LREC,NFILE,NORF,NORT
/CREATE,Fname,Ext,Dir
/LIST,Fname,Ext,LSTRT,LEND
/FDELE,N,KEY
/PREPn (n=7 or 6)
/SOLVE
/LOAD,KAN
/BUCKLE,TOTMA,KSUB,KEXPM,KPMOD,KPSTR,KFSUB,NRMDF,KVIRT
/FREQ,TOTMA,KSUB,KEXPM,KPMOD,KSSTF,KFSUB,NRMDF,KVIRT
/LNTRAN,TOTMA,KNODM,KSSTF,NRMDF,KVIRT
/LNFREQ,NMODE
/HARMIC,TOTMA,KPPHA,KSSTF,NRMDF,KVIRT
/HRFREQ,NMODE,KPPHA,KSPAC
/SUBSTR,TOTMA,MFILE,MNUM,KMGEN,KPMAT,KSSTF,NRMDF,KVIRT
/STRESS,SENUM,,MSUP,KIMG
/POSTn (n=1-30)
/AUXn (n=1-15)
/OPT
/GEOM
/DATA
/CORE,HSS,AXS,VS
/TIME
/STATUS
/EOF
/TITLE (Follow with , and up to 73 characters)
/COM (Follow with , and up to 75 characters)
/NOLIST and /GOLIST
/NOPR and /GOPR
/CHECK and /EXEC
/SYS,String
/INPUT,Fname,Ext,Dir
/OUTPUT,Fname,Ext,Dir
/REWIND,Fname,Ext,Dir

```

Graphics Display Slash Commands (App.P)

```

/SHOW,Fname,Ext,VECT,NCPL
/WINDOW,WN,XMIN,XMAX,YMIN,YMAX,NCOPY
/VIEW,WN,XV,YV,ZV
/ANGLE,WN,THETA,Label*
/VUP,WN,Label*
/AUTO,WN
/USER,WN (Removes /AUTO for user scaling)
/FOCUS,WN,XF,YF,ZF
/DIST,WN,DVAL
/RATIO,WN,RATOX,RATOY
/ZOOM,WN,Lab (Lab=OFF to remove zoom specs.)
/VCOE,WN,PHI (0.0 - parallel, 45.0 - perspective)
/DSCALE,WN,DMULT
/VSCALE,WN,VRATIO
/CONTOUR,WN,NCONT,VMIN,VINC,VMAX
/CVAL,WN,V1,V2,V3,V4,V5,V6,V7,V8
/CLABEL,WN,KEY (0,1 - show labels, -1 - no labels)
/TLABEL,XLOC,YLOC,Text (64 characters max.)
/SSCALE,WN,SMULT
/TYPE,WN,KEY (0 - standard, 1 - sect., 2 or 3 - hidden)
/EDGE,WN,KEY (0 - elem. outlines, 1 - edge outlines)
/GLINE,WN,STYLE (0 - solid, 1 - dash, -1 - none)
/NORMAL,WN,KEY (0 - both faces, 1 - top, -1 - bottom)
/GRAPH,Label*,KEY

```

```

/SHRINK,RATIO (0.0 to 0.5)
/MDIV,NDIV (For mesh APLOT and VPLOT)
/PNUM,Label*,KEY
/NUMBER,NKEY (0 - color and num., -1 - neither)
/PBC,Label*,KEY
/PSYMB,Label*,KEY
/CMAP,Fname,Ext
/SEG,Label*
/TLOCAL,WN,KEY
/ERASE
/NOERASE (Removes /ERASE setting)
/PLOFF,NOTRI,NOFRM,NODOC,NOTLE
/PSTAT,WN
/RESET

```

- * Labels for /ANGLE are: XS,YS,ZS
- * Labels for /VUP are: Y,-Y,X,-X,Z,-Z
- * Labels for /GRAPH are: GRID,LOGX,LOGY,LABX,LABY
- * Labels for /PNUM are: NODE,ELEM,MAT,TYPE,REAL,LOC,ESYS,TNOD,QNOD,KP01,LINE,AREA,VOLU,SVAL
- * Labels for /PBC are: TMAS,RMAS,TDIS,RDIS,FORC,MOME,PRES,NTEM,HFLO,HCOE,TBUL,CP,CE,PATH,ALL
- * Labels for /PSYMB are: CS,NDIR,ESYS,LDIR
- * Labels for /SEG are: SINGL, MULTI, DELET, OFF

Parameters (3.0.8)

```

*SET,Name,VALUE (or Name=VALUE)
*GET,Name,Lab**,NLAB
*ABBR,Name,String
*STATUS

** Valid PREP7 labels for *GET are: KAN,CSYS,MAT,TYPE,REAL,ESYS,NDMN,NDMX,ELMN,ELMX,KPMN,KPMX,LSMN,LSMX,ARMN,ARMX,VLMN,VLMX,MXND,MXEL,MXKP,MXLS,MXAR,MXVL,NX,NY,NZ,KX,KY,KZ,EN1,EN2,...EN8,KPNE,LK1,LK2,AL1,AL2,AL3,AL4,VA1,VA2,...VA6
Valid POST1 labels for *GET are: KAN,NDMN,NDMX,ELMN,ELMX,MXND,MXEL,NX,NY,NZ,EN1,EN2,...EN8,TIME,FREQ,LOAD,ITER,MAX,MIN,SSUM,FSUM,PMIN,PMAX,PLAS,KCAL,LDI,PLR,CRR,TI,LDI,PLR,CRR,TI,TOV, any NSORT or ESORT labels
Valid POST26 labels for *GET are: VMIN,VMAX,IMIN,IMAX,LAST

```

Macro (3.0.8)

```

*CREATE,Fname and *END
*LIST,Fname,Ext,Dir
*CFOPEN,Fname
*CFWRITE,Command
*CFCLOS
*GO,Base (Base - :Lab,STOP)
*IF,VAL1,Oper**,VAL2,Base (Base - :Lab,STOP)
*UFILE,Fname,Ext,Dir
*USE,Name,ARG1,ARG2,ARG3 (etc. to ARG9)

```

- ** Valid operations for *IF are: EQ, NE, LT, GT, LE, GE, ABLT, ABGT

Repeat Command (3.0.8)

```
RPNnnn,VINC1,VINC2,VINC3 (to VINC12)
```

PREP7 - General Analysis Data Generator

ELEMENT TYPE (ETYPE) MODULE (3.3.1)

KAN,KEY (-1,0,1,2,3,4,5,6, or 7)
 ET, ITYPE, JSTIF, KOP1, KOP2, KOP3, KOP4, KOP5, KOP6, INOPR
 KEYOPT, ITYPE, KNUM, VALUE
 ETLIST, ITYP1, ITYP2, INC
 ETDELE, ITYP1, ITYP2, INC
 DOF, Lab1*, Lab2...Lab10 (Use if JSTIF = 50)

* Valid labels are:
 UX, UY, UZ, ROTX, ROTY, ROTZ, TEMP, PRES, VOLT, MAG

OPTIONS (OPTION) MODULE (3.3.2)

TREF, VALUE
 KNL,KEY (0 - No nonlin. mat., 1 - Use nonlin. mat.)
 KYPOST,KEY (0 - Write post, -1 - suppress post)
 ALPHAD, VALUE
 BETAD, VALUE
 GAMMA, GVAL, NEQIT
 KRSTRT,KEY (0 - New analysis, N - restart)
 TOFFST, VALUE
 KAY*, NUM, KEY

* See the following for KAY values

STATIC (KAN=0) Analysis

KAY,3,0 - No modification of displ. (recommended)
 5 - Average displacements of last two iter.
 -5 - Extrapolate disp. of last two iterations
 KAY,6,0 - Small deflection analysis
 1 - Large deflection analysis
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,9,0 - Let program choose the Newton-Raphson option
 1 - Use the full Newton-Raphson
 2 - Use the modified Newton-Raphson
 3 - Use the initial-stiffness Newton-Raphson
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

MODE-FREQUENCY (KAN=2) Analysis

KAY,1,0 - Use reduced Householder or reduced subspace
 -1 - Use full subspace
 KAY,2,N - Expand first N modes of each load step
 -1 - Expansion is done at the load step level
 KAY,3,0 - Do not print reduced mode shapes
 1 - Print all reduced mode shapes
 N - Print only first N reduced mode shapes
 KAY,7,0 - Use reduced Householder for mode extraction
 P - Use subspace to extract first P modes
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

FULL HARMONIC RESPONSE (KAN=3) Analysis

KAY,3,0 - Print complex disp. as real and imaginary
 1 - Print as amplitudes and phase angles
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

NONLINEAR TRANSIENT DYNAMIC (KAN=4) Analysis

KAY,3,0 - No modification of displ. (recommended)
 5 - Average displ. of last two static iter.
 -5 - Extrapolate disp. of last two static iter.
 KAY,5,0 - Initial velocity defined by first two
 iters. and initial accel. defined to be zero
 2 - Initial velo. and accel. are zero
 KAY,6,0 - Small deflection analysis
 1 - Large deflection analysis
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,9,0 - Let program choose the Newton-Raphson option
 1 - Use the full Newton-Raphson
 2 - Use the modified Newton-Raphson
 3 - Use the initial-stiffness Newton-Raphson
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

LIN. TRANS. DYNAMIC (KAN=5) Analysis (Disp. Pass)

KAY,1,0 - Include damping, if any, in analysis
 1 - Ignore damping, even though defined
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

HARMONIC RESPONSE (KAN=6) Analysis (Disp. Pass)

KAY,3,0 - Print complex disp. as real and imaginary
 1 - Print as amplitudes and phase angles
 KAY,8,0 - No stress stiffening included in analysis
 1 - Include stress stiffening in analysis
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

SUBSTRUCTURE (KAN=7) Analysis (Generation Pass)

KAY,2,0 - Write superelement matrices on File8
 N - Write superelement matrices on FileN
 KAY,5,0 - Write superelement as matrix 1 on file
 N - Write superelement as matrix N on file
 KAY,6,0 - Generate stiffness (or conduct.) matrix
 2 - Generate stiffness and mass
 3 - Generate stiff., mass, and damp. matrices
 KAY,7,0 - Do not print matrices or load vectors
 1 - Print matrices and load vectors
 2 - Print load vectors but not matrices
 KAY,8,0 - No stress stiff. included in generation
 1 - Include stress stiffening in generation
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

HEAT TRANSFER (KAN=-1) Analysis

KAY,3,0 - No temperature modification (recommended)
 5 - Average temps. of last two static iter.
 -5 - Extrapolate disp. of last two static iter.
 KAY,4,0 - Use extrapolated temperatures for transient
 10 - Do not use extrapolated temperatures
 KAY,10,0 - In-core wave-front equation solution
 1 - Virtual wave-front equation solution

MATERIAL (MATER) MODULE (3.3.3)

MP,Lab*,MAT,C0,C1,C2,C3,C4, (If constant, use only C0)
 MPTEMP,STLOC,T1,T2,T3,T4,T5,T6
 MPRTGEN,STLOC,NUM,TSTRT,TINC
 MPDATA,Lab*,MAT,STLOC,C1,C2,C3,C4,C5,C6
 MPTRES,Lab*,MAT
 MPDRES,Lab*,MATF,Lab*,MATT
 MPPLLOT,Lab*,MAT,TMIN,TMAX,PMIN,PMAX
 NL,MAT,STLOC,C1,C2,C3,C4,C5,C6
 NLTAB,MAT,FORM
 NLX,Oper,STXLC,X1,X2,X3,X4,X5,X6
 NLY,Oper,STYLC,T,Y1,Y2,Y3,Y4,Y5,Y6
 NLCOPY,MATF,MATT
 NL SIZE,MAX
 MPLIST,MAT1,MAT2,INC,Lab*
 MPDELE,Lab*,MAT1,MAT2,INC
 MPF ILE,NIN,NOUT
 MPREAD
 MPWRITE

* Lab names are EX,EY,EZ,ALPX,ALPY,ALPZ,NUXY,NUYZ,NUXZ,
 PRXY,PRYZ,PRXZ,DENS,MU,KXX,KYY,KZZ,C,HF,VISC,DAMP,
 RSVX,RSVY,RSVZ,EMIS,GXY,GYZ,GXZ (+ PLAS,BH,BHL
 NB,MH for MPPLLOT AND MPLIST of NL data)

REAL CONSTANT (RCON) MODULE (3.3.4)

R,NSET,R1,R2,R3,R4,R5,R6
 RMORE,R7,R8,R9,R10,R11,R12
 (Repeat RMORE command for additional constants)
 RMODIF,NSET,STLOC,V1,V2,V3,V4,V5,V6
 RSIZE,RMAX
 RDELE,NSET1,NSET2,NINC
 RLIST,NSET1,NSET2,NINC

COORDINATE SYSTEM (CDSYS) MODULE (3.3.5)

LOCAL,KCN,KCS,XC,YC,ZC,THXY,THYZ,THXZ,PAR1,PAR2
 CLOCAL,KCN,KCS,XL,YL,ZL,THXY,THYZ,THXZ,PAR1,PAR2
 CS,KCN,KCS,NORIG,NXAX,NXYPL,PAR1,PAR2
 CSKP,KCN,KCS,PORIG,PXAXS,PXYPL,PAR1,PAR2
 CSYS,KCN
 CSCIR,KCN,KTHET,KPHI
 CENTER,NODE,NODE1,NODE2,NODE3,RADIUS
 NROTAT,NODE1,NODE2,NINC
 DSYS,KCN
 CSLIST,KCN1,KCN2,KCINC
 CSDELE,KCN1,KCN2,KCINC

NODE (NODE) MODULE (3.3.6)

N,NODE,X,Y,Z,THXY,THYZ,THXZ
 FILL,NODE1,NODE2,NFILL,NSTRT,NINC,ITIME,INC,SPACE
 QUAD,NODE1,NINTR,NODE2,NFILL,NSTRT,NINC,PKFAC
 NGEN,ITIME,INC,NODE1,NODE2,NINC,DX,DY,DZ,SPACE
 SYMM,NCOMP,INC,NODE1,NODE2,NINC
 TRANS,KCNT0,INC,NODE1,NODE2,NINC
 NSCALE,INC,NODE1,NODE2,NINC,RX,RY,RZ
 NMODIF,NODE,X,Y,Z,THXY,THYZ,THXZ
 NLIST,NODE1,NODE2,NINC
 NDELE,NODE1,NODE2,NINC
 MOVE,NODE,KC1,X1,Y1,Z1,KC2,X2,Y2,Z2
 (Input three locations and three 999 values)
 SOURCE,X,Y,Z

ELEMENT (ELEM) MODULE (3.3.7)

E,I,J,K,L,M,N,O,P
 EMORE,Q,R,S,T,U,V,W,X
 (Repeat EMORE command for nodes Y,Z,A,B, if desired)
 EMODIF,IEL,STLOC,I1,I2,I3,I4,I5,I6,I7,I8
 EGEN,ITIME,NINC,IEL1,IEL2,IEINC,MINC,TINC,RINC,CINC
 ESYM,INODE,NINC,IEL1,IEL2,IEINC
 EMID
 ESURF
 EWAVE
 EDELE,IEL1,IEL2,INC
 ELIST,IEL1,IEL2,INC,NNKEY,RKEY
 MAT,MAT
 TYPE,ITYPE
 REAL,NSET
 ESYS,KCN
 EN,IEL,I,J,K,L,M,N,O,P
 ENGEN,IINC,ITIME,NINC,IEL1,IEL2,IEINC,MINC,TINC,RINC,
 CINC
 ENSYM,IINC,INODE,NINC,IEL1,IEL2,IEINC

DISPLAY (PLOT) MODULE (3.3.8)

NPLOT
 EPLOT
 CROSS,NODE1,NODE2,NINC
 HEIGHT,HEIGHT
 IMMED,KEY,NBELL (KEY: 1 - immediate display)
 ERASE

MESH GENERATION (MESH) MODULE (3.3.9)

K,NPT,X,Y,Z
 KNODE,NPT,NODE
 KFILL,NP1,NP2,NFILL,NSTRT,NINC,SPACE
 KGEN,ITIME,NP1,NP2,NINC,DX,DY,DZ,KINC
 KSYMM,NCOMP,NP1,NP2,NINC,KINC
 KTRAN,KCNT0,NP1,NP2,NINC,KINC
 KSCALE,KINC,NP1,NP2,NINC,RX,RY,RZ
 KSCON,NPT,DELR,KCTIP,NTHET,RRAT
 KOVS,NPT,SIZE,FACT
 KMODIF,NPT,X,Y,Z
 KMOVE,NPT,KC1,X1,Y1,Z1,KC2,X2,Y2,Z2
 KDELE,NP1,NP2,NINC
 KSUM
 KLIST,NP1,NP2,NINC
 KPLOT,NP1,NP2,NINC
 L,P1,P2,NDIV,SPACE,XV1,YV1,ZV1,XV2,YV2,ZV2
 LARC,P1,P2,PC,RAD,NDIV,SPACE
 CIRCLE,PCENT,RAD,PAXIS,PZERO,ARC,NSEG

SPLINE,P1,P2,P3,P4,P5,P6,XV1,YV1,ZV1,XV6,YV6,ZV6
 LDIV,NL1,RATIO,PDIV,NDIV,KEEP
 LCOMB,NL1,NL2,KEEP
 LINTER,NL1,NL2,PINT
 LFLLT,NL1,NL2,RAD,PCENT
 LTAN,NL1,P3,XV3,YV3,ZV3
 L2TAN,NL1,NL2
 LANG,NL1,P3,ANG,PHIT
 L2ANG,NL1,NL2,ANG1,ANG2,PHIT1,PHIT2
 LAREA,P1,P2,NAREA
 LAINT,NA1,NA2,PINT1,PINT2,KASUB
 LGEN,ITIME,NL1,NL2,NINC,DX,DY,DZ,KINC
 LSYMM,NCOMP,NL1,NL2,NINC,KINC
 LTRAN,KCNT0,NL1,NL2,NINC,KINC
 LDVS,NL1,SIZE,NDIV,SPACE,KFORCE
 LDVA,KUNSL,REXT,RINT
 LMODIF,NL1,P1,P2,NDIV,SPACE,XV1,YV1,ZV1,XV2,YV2,ZV2
 LDELE,NL1,NL2,NINC,KSWP
 LSUM
 LLIST,NL1,NL2,NINC
 LPLOT,NL1,NL2,NINC

A,P1,P2,P3,P4
 AGEN,ITIME,NA1,NA2,NINC,DX,DY,DZ,KINC
 AOFFST,NAREA,DIST,KINC
 AROTAT,NL1,NL2,NL3,NL4,NL5,NL6,PAX1,PAX2,ARC,NSEG
 ADRAG,NL1,NL2,---NL6,NLP1,NLP2,---NLP6
 AFLLT,NA1,NA2,RAD
 ASUB,NA1,P1,P2,P3,P4
 ARSYM,NCOMP,NA1,NA2,NINC,KINC
 ATRAN,KCNT0,NA1,NA2,NINC,KINC
 AL,L1,L2,L3,L4,L5,L6,L7,L8,L9,L10
 ADELE,NA1,NA2,NINC,KSWP
 AATT,MAT,REAL,TYPE,ESYS
 ASUM
 ALIST,NA1,NA2,NINC
 APLOT,NA1,NA2,NINC

V,P1,P2,P3,P4,P5,P6,P7,P8
 VGEN,ITIME,NV1,NV2,NINC,DX,DY,DZ,KINC
 VROTAT,NA1,NA2,NA3,NA4,NA5,NA6,PAX1,PAX2,ARC,NSEG
 VDRAG,NA1,NA2,---NA6,NLP1,NLP2,---NLP6
 VSYMM,NCOMP,NV1,NV2,NINC,KINC
 VTRAN,KCNT0,NV1,NV2,NINC,KINC
 VA,A1,A2,A3,A4,A5,A6,A7,A8,A9,A10
 VDELE,NV1,NV2,NINC,KSWP
 VATT,MAT,REAL,TYPE,ESYS
 VSUM
 VLIST,NV1,NV2,NINC
 VPLOT,NV1,NV2,NINC

ELSIZE,SIZE,NDIV,KSHAP,KSTR
 KMESH,NP1,NP2,NINC
 LMESH,NL1,NL2,NINC
 AMESH,NA1,NA2,NINC
 VMESH,NV1,NV2,NINC
 KCLEAR,NP1,NP2,NINC
 LCLEAR,NL1,NL2,NINC
 ACLEAR,NA1,NA2,NINC
 VCLEAR,NV1,NV2,NINC
 MODMSH,Lab

KD,NPT,Lab*,DISP,CDISP,KYFLD,Lab2,---Lab6
 KNT,NPT,Lab*,TEMPR,,KYFLD,Lab2,---Lab4
 KF,NPT,Lab*,FORCE,CFORC
 KHFLOW,NPT,Lab*,RATE,CRATE
 KT,NPT,TEMP,FLUEN
 KQ,NPT,VALUE
 LSBC,NL1,NA1

LABC,NL1,NA1
 LPSF,NL1,PRESS,,SLKCN,SLDIR,SLZER,SLOPE
 LCVSF,NL1,HCOEF,TBULK,SLKCN,SLDIR,SLZER,SLOPE
 ASBC,NA1
 AABC,NA1
 APSF,NA1,PRESS,,SLKCN,SLDIR,SLZER,SLOPE
 ACVSF,NA1,HCOEF,TBULK,SLKCN,SLDIR,SLZER,SLOPE
 SBCTRA
 SBCDELE,Cname,N1,Lab*
 SBCLIST,Cname,N1,N2,NINC

* Valid labels for KD are:
 UX,UY,UZ,ROTX,ROTY,ROTZ,ALL
 Valid labels for KNT are:
 TEMP,PRES,VOLT,MAG,ALL
 Valid labels for KF are: FX,FY,FZ,MX,MY,MZ
 Valid labels for KHFLOW are: HEAT,FLOW,AMPS,FLUX

TABLET DIGITIZING (DIGIT) MODULE (3.3.10)

DSET,NODE1,NODE2,NODE3,DDEV
 DSURF,KCN,XSURF,YSURF,ZSURF
 (999 values must be input for two surface coordinates)
 DIG,NODE1,NODE2,NINC
 DMOVE,NODE1,NODE2,NINC

COUPLED D.O.F. (COUP) MODULE (3.3.11)

CP,NSET,Lab*,NODE1,NODE2 (etc. to NODE9)
 CPNGEN,NSET,Lab*,NODE1,NODE2,NINC
 CPLGEN,NSETF,Lab1*,Lab2,Lab3,Lab4,Lab5
 CPSGEN,ITIME,INC,NSET1,NSET2,NINC
 CPLIST,NSET1,NSET2,NINC
 CPDELE,NSET1,NSET2,NINC
 CPSIZE,MAX

* Valid labels for CP, CPNGEN, and CPLGEN are:
 UX,UY,UZ,ROTX,ROTY,ROTZ,TEMP,PRES,VOLT,MAG

CONSTRAINT EQUATION (CEQN) MODULE (3.3.12)

CE,NEQN,CONST,NODE1,Lab1*,C1...NODE3,Lab3,C3
 CERIG,MASTE,SLAVE,TYPE (0 - Full, 1 - Partial)
 CEINTF,TOLER
 CELIST,NEQN1,NEQN2,NINC
 CEDELE,NEQN1,NEQN2,NINC
 CESIZE,MAX

* Valid labels for CE are:
 UX,UY,UZ,ROTX,ROTY,ROTZ,TEMP,PRES,VOLT,MAG

MASTER D.O.F. (MAST) MODULE (3.3.13)

M,NODE,Lab1*,NEND,NINC,Lab2,Lab3,Lab4,Lab5,Lab6
 MGEN,ITIME,INC,NODE1,NODE2,NINC
 TOTAL,NTOT,NRMDF
 MLIST,NODE1,NODE2,NINC
 MDELE,NODE,Lab1*,NEND,NINC,Lab2,Lab3,Lab4,Lab5,Lab6

* Valid labels for M and MDELE are:
 UX,UY,UZ,ROTX,ROTY,ROTZ,ALL

GAP CONDITION (GAP) MODULE (3.3.14)

GP, NODE1, NODE2, Lab*, STIF, GAP
 GPLIST, GAP1, GAP2, GINC
 GPDELE, GAP1, GAP2, GINC

* Valid labels for GP are FX, FY, FZ, MX, MY, MZ

LOAD OPTION (LOPTION) MODULE (3.3.15)

TIME, TIME, DTMAX
 DTIME, ITS
 ITER, NITTER, NPRINT, NPOST
 CONV, KEY (Alt. to neg. NITTER)
 LPRINT, KEY (0 - Summary, 1 - summary and loads)
 PRDIS, FREQ, NODE1, NODE2, NINC
 PRSTR, FREQ, ITYP1, ITYP2... ITY10
 PRNF, FREQ, ITYP1, ITYP2... ITY10
 PRRF, FREQ
 PODISP, FREQ
 POSTR, FREQ, ITYP1, KED1, ITYP2... ITYP5, KED5
 PONF, FREQ, ITYP1, ITYP2... ITY10
 PORF, FREQ

 SLOAD, KEY (0 - full file, 1 - /LOAD restart file)
 LSFIL, NIN, NOUT, KDATA
 LCOPY, LSET1, LSET2
 LREAD, LSET
 LWRITE
 KBC, KEY (0 - Ramp, 1 - Step)
 KRF, KEY (0, 2 - Reac. Force, 1 - Node Force, -1 - None)
 KSE, KEY (0 - No Print, 1 - Print Strain Energy)
 KUSE, KEY (0 - Automatic [K], 1 - old [K], -1 - new)
 KTEMP, LSTP, ITER, TIME (LSTP: 0 - TUNIF; -1 - T, TE, or Q)

TUNIF, TEMP
 ACEL, ACELX, ACELY, ACELZ
 OMEGA, OMEGX, OMEGY, OMEGZ, KSPIN
 DOMEA, DOMGX, DOMGY, DOMGZ
 CGLOC, XLLOC, YLOC, ZLOC
 CGOMGA, CGOMX, CGOMY, CGOMZ
 DCGOMG, DCGOX, DCGOY, DCGOZ
 CYCLE, NSECT, NINC, NEDGE, KCLOS
 CNVR, PLCR, CRCR, LDCR, DLIM, NDCNV, ITLIM
 MODE, MODE, ISYM

EXTMOD, FREQB, FREQE (For KAN=1 and 2 only)
 EXMODE, FREQB, FREQE, SIGNF (For KAN=2 only)
 FREQ, FREQ1, FREQ2... FREQ8 (For KAN=2 only)
 SV, DAMP, SV1, SV2... SV8 (For KAN=2 only)
 SVTYP, KSV, FACT (0- Vel, 1- Force, 2- Acc, 3- Disp, 4- PSD)
 SED, SEDX, SEDY, SEDZ (For KAN=2 only)
 MCOMB, KTYPE (For KAN=2 only)
 ROCK, CGX, CGY, CGZ, OMX, OMY, OMZ (For KAN=2 only)

DMPRAT, RATIO (For KAN=2, 3, 5 and 6 only)
 HARFRQ, FREQB, FREQE, PHASE (For KAN=3 and 6 only)
 MDAMP, STLOC, V1, V2, --V6 (For KAN=5 and 6 only)
 LVSCAL, FACT (For KAN=5 and 6 only)
 NSTRES, NUM (For KAN=5, 6, 7 Stress Passes only)
 STRSET, LSTP, ITER, TIME (For KAN=5, 6, 7 Stress Passes)

LOAD (LOAD) MODULE (3.3.16)

D, NODE, Lab*, DISP, CDISP, NEND, NINC, Lab2, Lab3... Lab6
 SYMBC, KCN, NORML, LOCAT, TOLER
 ASYMBC, KCN, NORML, LOCAT, TOLER
 F, NODE, Lab*, FORCE, CFORC, NEND, NINC
 P, NODE1, NODE2, PRESS, , N1END, N1INC, NODE3, NODE4
 PSF, KCN, NORML, LOCAT, PRESS, , TOLER, SLDIR, SLZER, SLOPE,
 SLKCN
 NT, NODE, Lab*, TEMPR, , NEND, NINC, Lab2, ---Lab4 (For KAN=-1)
 HFLOW, NODE, Lab*, RATE, CRATE, NEND, NINC (KAN=-1 mainly)
 CV, NODE1, NODE2, HCOEF, TBULK, N1END, N1INC, NODE3, NODE4
 CVSF, KCN, NORML, LOCAT, HCOEF, TBULK, TOLER, SLDIR, SLZER,
 SLOPE, SLKCN
 LSCALE, DFACT, FFACT, PFACT, BFACT
 ILIST**, NODE1, NODE2, NINC
 IDELETE**, NODE, Lab*, NEND, NINC
 JDELETE**, NODE1, NODE2, N1END, N1INC, NODE3, NODE4

* Valid labels for D and DDELETE are:

ALL, UX, UY, UZ, ROTX, ROTY, ROTZ

Valid labels for F and FDELETE are: FX, FY, FZ, MX, MY, MZ

Valid labels for NT and NTDELETE are:

ALL, TEMP, PRES, VOLT, MAG

Valid labels for HFLOW and HFDELETE are: HEAT, FLOW,
 AMPS, FLUX

** ILIST names are:

DLIST, FLIST, PLIST, NTLIST, HFLIST, CVLIST

IDELETE names are: DDELETE, FDELETE, NTDELETE, HFDELETE

JDELETE names are: PDELETE, CVDELETE

NODAL TEMPERATURE (NTEMP) MODULE (3.3.17)

T, NODE, TEMP, FLUEN
 TGEN, ITIME, INC, NODE1, NODE2, NINC, DELT, DELF
 TSCALE, FACT, FFACT
 TLIST, NODE1, NODE2, NINC
 TDELETE, NODE1, NODE2, NINC
 TREAD, LSTP, ITER, TIME
 TSIZE, MAX

NODAL HEAT GENERATION (NHGEN) MODULE (3.3.18)

Q, NODE, VALUE
 QGEN, ITIME, INC, NODE1, NODE2, NINC, DELO
 QSCALE, FACT
 QLIST, NODE1, NODE2, NINC
 QDELETE, NODE1, NODE2, NINC

WAVE REORDER (ORDER) MODULE (3.3.20)

WSTART, NODE1, NODE2, NINC, ITIME, INC
 WMORE, NODE1, NODE2, NINC, ITIME, INC
 WERASE
 WFRONT, KPRNT (0 - current max., 1 - current history)
 WAVES
 WSORT, Lab, KORD, WHERE (Lab: X, Y, Z)

ELEMENT PRESSURE (EPRESS) MODULE (3.3.21)

EP, IEL, IFACE, PRESS, , IEND, INC
 EPGEN, ITIME, INC, IEL1, IEL2, IEINC, IFACE
 EPLIST, IEL1, IEL2, INC
 EPDELETE, IEL1, IEL2, INC, IFACE
 EC, IEL, IFACE, HCOEF, TBULK, IEND, INC
 ECGEN, ITIME, INC, IEL1, IEL2, IEINC, IFACE
 ECLIST, IEL1, IEL2, INC
 ECDELETE, IEL1, IEL2, INC, IFACE

ELEMENT TEMPERATURE (ETEMP) MODULE (3.3.22)

TE, IEL, T1, T2, T3, T4, T5, T6
 TEMORE, T7, T8, T9, T10, T11, T12
 (Repeat TEMORE command for additional temperatures)
 TEGEN, ITIME, INC, IEL1, IEL2, IEINC
 TELIST, IEL1, IEL2, INC
 TEDELE, IEL1, IEL2, INC
 TESIZE, MAX

QE, IEL, Q1
 QEGEN, ITIME, INC, IEL1, IEL2, IEINC
 QELIST, IEL1, IEL2, INC
 QEDELE, IEL1, IEL2, INC

RESELECT (RSEL) MODULE (3.3.23)

NRSEL, Lab*, VMIN, VMAX, VINC, KABS
 NSEL, Lab*, VMIN, VMAX, VINC, KABS
 NASEL, Lab*, VMIN, VMAX, VINC, KABS
 NUSEL, Lab*, VMIN, VMAX, VINC, KABS
 NELEM
 NKPOI
 NLINE, NKEY (NKEY: 0 - interior only, 1 - all)
 NAREA, NKEY (NKEY: 0 - interior only, 1 - all)
 NVOLU, NKEY (NKEY: 0 - interior only, 1 - all)
 NINV
 NALL (Restores all nodes)

ERSEL, Lab*, VMIN, VMAX, VINC, KABS
 ESEL, Lab*, VMIN, VMAX, VINC, KABS
 EASEL, Lab*, VMIN, VMAX, VINC, KABS
 EUSEL, Lab*, VMIN, VMAX, VINC, KABS
 ENODE, EKEY (EKEY: 0 - any, 1 - only)
 ELINE
 EAREA
 EVOLU
 EINV
 EALL (Restores all elements)

KPRSEL, Lab*, VMIN, VMAX, VINC, KABS
 KPSEL, Lab*, VMIN, VMAX, VINC, KABS
 KPASEL, Lab*, VMIN, VMAX, VINC, KABS
 KPUSEL, Lab*, VMIN, VMAX, VINC, KABS
 KPINV
 KPNODE
 KPLS
 KPALL (Restores all keypoints)

LSRSEL, Lab*, VMIN, VMAX, VINC
 LSSEL, Lab*, VMIN, VMAX, VINC, KSWP
 LSASEL, Lab*, VMIN, VMAX, VINC
 LSUSEL, Lab*, VMIN, VMAX, VINC
 LSINV
 LSKP, LSKEY (LSKEY: 0 - any, 1 - only)
 LSAR
 LSALL (Restores all line segments)

ARRSEL, Lab*, VMIN, VMAX, VINC
 ARSEL, Lab*, VMIN, VMAX, VINC, KSWP
 ARASEL, Lab*, VMIN, VMAX, VINC
 ARUSEL, Lab*, VMIN, VMAX, VINC
 ARINV
 ARLS, ARKEY (ARKEY: 0 - any, 1 - only)
 ARVL
 ARALL (Restores all areas)

VLRSEL, Lab*, VMIN, VMAX, VINC
 VLSEL, Lab*, VMIN, VMAX, VINC, KSWP

VLASEL, Lab*, VMIN, VMAX, VINC
 VLUSEL, Lab*, VMIN, VMAX, VINC
 VLINV
 VLAR, VLKEY (VLKEY: 0 - any, 1 - only)
 VLALL (Restores all volumes)

CM, Name, Lab*, VMIN, VMAX, VINC
 CMGRP, Name, Cnam1, Cnam2, Cnam3, ---Cnam10
 CMLIST, Name
 CMDELE, Name
 CMRSEL, Name
 CMSEL, Name
 CMASEL, Name
 CMUSEL, Name

* Valid labels for NRSEL, NSEL, NASEL, NUSEL are: NODE,
 X, Y, Z, EXT, THXY, THYZ, THXZ, M, CP, CE,
 D, NT, F, HFL0, T, Q, PICK

Valid labels for ERSEL, ESEL, EASEL, EUSEL are: ELEM,
 TYPE, STIF, MAT, REAL, ESYS, EP, EC, TE, QE, PICK

Valid labels for xxRSEL, xxASEL, xxUSEL, xxSEL for xx =
 KP: KPOI, PICK, X, Y, Z LS: LINE, PICK, EXT
 AR: AREA, PICK, MAT, TYPE, REAL, ESYS, EXT
 VL: VOLU, PICK, MAT, TYPE, REAL, ESYS

Valid labels for CM are: VOLU, AREA, ELEM

PIPE (PIPE) MODULE (3.3.24)

PUNIT, KOPT
 PSPEC, MAT, DNOM, SCHED, OD, TK
 PFLUID, DENS
 PINSUL, DENS, ITK
 PCORRO, CTK
 POPT, Lop1*
 PTEMP, TAVE, TOUT
 PPRES, PRESS
 PDRAG, PX1, PY1, PZ1, H1, PX2, PY2, PZ2, H2, KCORD
 BRANCH, NODE, X, Y, Z
 RUN, DX, DY, DZ, NDIV, NEND, ESTRT, EINC
 TEE, NCENT, TYPE, ELEM, EINC, L1, L2, L3
 BEND, NEL1, NEL2, RAD, NDIV, ESTRT, EINC
 MITER, NEL1, NEL2, RAD, NDIV, ESTRT, EINC
 REDUCE, NLOC, LENG, ELEM
 VALVE, NLOC, LENG, MASS, SIF, FLEX, ARINS, ELEM
 FLANGE, NLOC, LENG, MASS, SIF, FLEX, ARINS, ELEM
 BELLOW, NLOC, LENG, STIFF, FLEX, ELEM
 PSPRNG, NLOC, TYPE, K, DX, DY, DZ, ELEM
 PGAP, NLOC, K, DX, DY, DZ, GAP, ELEM
 PLPRES, KPRES, KDRAG

* Valid labels are: B31.1 or NC

GEOMETRY WRITE (GWRITE) MODULE (3.3.25)

NFILE, NIN, NOUT
 EFILE, IIN, IOUT
 NWRITE
 EWRITE

GEOMETRY READ (GREAD) MODULE (3.3.26)

NFILE, NIN, NOUT
 EFILE, IIN, IOUT
 NRRANG, NMIN, NMAX
 ERRANG, IMIN, IMAX
 NREAD
 EREAD

MISCELLANEOUS COMMAND (MISC) MODULE (3.3.27)

NUMSTR, Label*, VALUE
 NUMOFF, Label*, VALUE
 NUMCMP, Label*
 NUMMRG, Label*, TOLER
 SAVE
 RESUME, ..., NOPAR
 CDWRITE, NOUT
 AFLIST
 CHECK, SELE, LEVL
 AFWRITE, NOUT, DLIST, , NOCHK
 SFWRITE
 IGES, NOUT
 FINISH

* Labels for NUMSTR are: NODE, ELEM, KPOI, LINE, AREA, VOLU
 Labels for NUMOFF are: NODE, ELEM, KPOI, LINE, AREA, VOLU,
 MAT, TYPE, REAL, COUP, CEQN
 Labels for NUMCMP are: Same as NUMOFF plus ALL
 Labels for NUMMRG are: NODE, ELEM, KPOI, MAT, TYPE, REAL,
 COUP, CEQN, ALL

PREP6 – Load Step Data Generator (5.6)**DEFINE (DEFINE) MODULE**

NTABLE, N
 NSTEPS, LMAX
 FILL, NTAB, LSTRT, LSTOP, LINC, VALUE, DVAL
 COS, NTAB, LSTRT, LSTOP, LINC, AMPL, ANG, SHIFT
 SIGMOI, NTAB, LSTRT, LSTOP, LINC, AMPL, FACT, SHIFT
 EXP, NTAB, LSTRT, LSTOP, LINC, AMPL, FACT, SHIFT
 DATA, NTAB, LSTRT, LSTOP, LINC, IPER, NFILE
 COPY, NTO, NFROM, LSTRF, LSTPF, LSTRT, NREPT, LINC
 COMBIN, NRES, NT1, NT2, NT3, FACT1, FACT2, FACT3
 MULT, NRES, NT1, NT2, FACT
 DIVIDE, NRES, NT1, NT2, FACT
 INT1, NRES, NTY, NTX, C1
 INT2, NRES, NTY, NTX, C1, C2
 DER1, NRES, NTY, NTX
 DER2, NRES, NTY, NTX
 FOURIE, NRES, MODE, ISYM, CURVE, THETA, NDESC
 FEVAL, NRES, LSTRT, LSTOP, LINC, DSTRT, DINC

PRINT (PRINT) MODULE

PRSTEP, LSTRT, LSTOP, LINC
 LINES, N
 PRVAR, NT1, NT2, NT3, NT4, NT5, NT6

DISPLAY (PLOT) MODULE

PLSTEP, LSTRT, LSTOP, LINC
 RANGE, YMIN, YMAX
 XVAR, NTX
 PLVAR, NT1, NT2, NT3, NT4, NT5, NT6

WRITE (WRITE) MODULE

LGR1, Lab*, NT, VALUE
 KTEMP, NT1, VAL1, NT2, VAL2
 LGR2, Lab*, NODE, NT1, NT2, NEND, NINC, VAL1, VAL2
 EP, IEL, IFACE, NT1, NT2, IEND, INC, , VAL1, VAL2
 FILE, NF
 NLIST, LN
 LFWRITE, LSTRT, LSTOP

* LGR1 Lab names for LOPT module commands are:
 NITTER, NPRINT, NPOST, LPRINT, PODISP, POSTR, PORF,
 TIME, ACLX, ACLY, ACLZ, OMGX, OMGY, OMGZ, FROB, FROE,
 KUSE, PLCR, CRCR, MODE, ISYM, LVSCAL
 LGR2 Lab names for D command of LOAD module are:
 UX, UY, UZ, ROTX, ROTY, ROTZ, PRES, TEMP, VOLT, MAG
 LGR2 Lab names for F command of LOAD module are:
 FX, FY, FZ, MX, MY, MZ, FLOW, HEAT, AMPS, FLUX

POST1 – General Database Postprocessor (6.1)**DEFINE (DEFINE) MODULE**

NFILE, Fname, Ext, KZERO
 STORE, Lab1, Lab2, Lab3, Lab4, Lab5*
 STRESS, Lab*, JUSTIF, ITEM (Lab - any four char. ref. name)
 LAYER, NUM (STIF46, 91, 99 only)
 FULL, KEY (0 - basic geom., 1 - cyclic, 2 - periodic)
 LCLIM, MAX
 LCASE, NUM
 SETG
 SET, LSTEP, ITER, NSECT, KIMG, TIME

* Valid labels for STORE: REAL, DISP, STRES, NFORC, RFORC
 Valid labels for STRESS: Any 4-char. name or SENE,
 KENE, VOLU, ENRM, THER, MAGN, TG, TF, EF, JS, HMAG, BMAG, FMAG

SELECT (SELECT) MODULE

NRSEL, Lab*, VMIN, VMAX, VINC, KABS
 NSEL, Lab*, VMIN, VMAX, VINC, KABS
 NASEL, Lab*, VMIN, VMAX, VINC, KABS
 NUSEL, Lab*, VMIN, VMAX, VINC, KABS
 NELEM
 NINV
 NALL (Restores all nodes)
 ERSEL, Lab*, IMIN, IMAX, IINC, KABS
 ESEL, Lab*, IMIN, IMAX, IINC, KABS
 EASEL, Lab*, IMIN, IMAX, IINC, KABS
 EUSEL, Lab*, IMIN, IMAX, IINC, KABS
 ENODE, EKEY (EKEY: 0 - any, 1 - only)
 EINV
 EALL (Restores all elements)

* Valid labels for NRSEL, NSEL, NASEL, and NUSEL are:
 NODE, PICK, EXT, X, Y, Z, EXT, DISP, ROT, UX, ---ROTZ, TEMP, PRES,
 VOLT, MAG, SX, SY, SZ, SXY, SYZ, SXZ, SIG1, SIG2, SIG3, SI, SIGE
 Valid labels for ERSEL, ESEL, EASEL, and EUSEL are:
 ELEM, PICK, TYPE, STIF, MAT, REAL, ESYS, Add'l. "STRESS" Lab

SORT (SORT) MODULE

NSORT, Lab*, ORDER, KABS, NUMB
 NUSORT (Restores original nodal order)
 ESORT, Lab*, ORDER, KABS, NUMB
 EUSORT (Restores original element order)

* Valid labels for NSORT are: X, Y, Z, DISP, ROT, UX, UY,
 ---ROTZ, PRES, TEMP, VOLT, MAG, SX, SY, ---SIG3, SI, SIGE
 Valid labels for ESORT are: Add'l. "STRESS" Lab

PRINT (PRINT) MODULE

NLINES, NUM
 NLIST
 ELIST
 RLIST
 GLOBAL, KEY (0 - nodal coord., 1 - global coord.)
 PRDISP
 PRRFOR
 PRESTR, Lab (Lab: (blank), BMAG)
 Shell, Lab. (Use TOP, MID, or BOT)
 AVPRIN, KEY (0 - principal avg., 1 - component avg.)
 PRNSTR, Lab (Lab: (blank), ALL, COMP, PRIN, or BMAG)
 PRSTRS, Lab1, Lab2, ---Lab10*
 PRVECT, Lab1*, Lab2, Lab3, LabP
 PRPATH, NODE1, NODE2, Lab*
 PRSECT, NODE1, NODE2, RHO, KBR
 PREFOR
 PRTEMP
 PRITER

* Valid labels for PRSTRS are: (blank), TG, TF, EF, JS, HMAG,
 BMAG, FMAG, GRP1, GRP2, GRP3, GRP4, Add'l "STRESS" labels
 Valid Lab1 labels for PRVECT are: DISP, FVEL, PDIR,
 TF, TG, EF, JS, HMAG, BMAG, FMAG
 Valid labels for PRPATH are: SX, SY, SZ, SXY, SYZ, SXZ,
 SIG1, SIG2, SIG3, SI, SIGE, UX, UY, ---ROTZ, TEMP, PRES,
 VOLT, MAG, Additional "STRESS" labels

DISPLAY (PLOT) MODULE

NPLOT
 EPLT
 PLDISP, KUND (0 - basic, 1 - +undispl., 2 - +und.edge)
 ANIM, NCYCL, KCYCL
 Shell, Lab. (Use TOP, MID, or BOT)
 AVPRIN, KEY (0 - principal avg., 1 - component avg.)
 PLNSTR, Lab*, KAVG
 PLVECT, Lab1**, Lab2, Lab3, LabP
 PLLS, LabI, LabJ
 FRAME, SMIN, SMAX, LENG
 PLPATH, NODE1, NODE2, Lab*
 PLSECT, NODE1, NODE2, RHO, Lab*, KBR

* Valid labels for Lab are: SX, SY, SZ, SXY, SYZ, SXZ, SIG1,
 SIG2, SIG3, SI, SIGE, UX, UY, ---ROTZ, TEMP, PRES, VOLT, MAG,
 BX, BY, BZ, BSUM, Lab (from additional "STRESS" items)
 ** Valid labels for Lab are: DISP, FVEL, PDIR,
 TF, TG, EF, JS, HMAG, BMAG, FMAG

COORDINATE SYSTEM (CDSYS) MODULE

CS, KCN, KCS, NORIG, NXAX, NXYPL, PAR1, PAR2
 LOCAL, KCN, KCS, XC, YC, ZC, THXY, THYZ, THXZ, PAR1, PAR2
 CSYS, KCN
 DSYS, KCN
 CSLIST, KCN1, KCN2, KCINC
 CSDELE, KCN1, KCN2, KCINC

NODE (NODE) MODULE

TRANS, KCNTO, , NODE1, NODE2, NINC

CALCULATION (CALC) MODULE

SPOINT, NODE, X, Y, Z
 NFORCE
 FSUM (Included in NFORCE request)
 TALLOW, TEMP1, TEMP2, TEMP3, TEMP4, TEMP5, TEMP6
 SALLOW, STRS1, STRS2, STRS3, STRS4, STRS5, STRS6
 SFACT, TYPE (0 - none, 1 - S.F., 2 - M.S.)
 SFCALC, LabR, LabS, LabT, TYPE (0, 1 - S.F., 2 - M.S.)
 SABS, KEY
 SADD, LabR, Lab1, Lab2, FACT1, FACT2, CONST
 SMULT, LabR, Lab1, Lab2, FACT1, FACT2
 SMAX, LabR, Lab1, Lab2, FACT1, FACT2
 SMIN, LabR, Lab1, Lab2, FACT1, FACT2
 SEXP, LabR, Lab1, Lab2, EXP1, EXP2
 SSUM
 DADD, LabR, Lab1, Lab2, FACT1, FACT2, CONST
 LPATH, NODE1, NODE2, ---, NODE10
 PDEF, INTR, LabR, Lab
 PDEF, Oper*, LabRX, LabRY, LabRZ
 PCALC, Oper*, LabR, Lab1, Lab2, FACT1, FACT2, CONST
 PDOT, LabR, LabX1, LabY1, LabZ1, LabX2, LabY2, LabZ2
 PCROSS, LabXR, --LabZR, LabX1, LabY1, LabZ1, LabX2, LabY2, LabZ2
 PVIEW, Oper*, Lab1, Lab2, ---Lab6
 PRANGE, LINC, VMIN, VMAX
 VDOT, LabR, LabX1, LabY1, LabZ1, LabX2, LabY2, LabZ2
 VCROSS, LabXR, --LabZR, LabX1, LabY1, LabZ1, LabX2, LabY2, LabZ2
 KCALC, KPLAN, MAT, KCSYM, KLOCPR

- * Valid Oper labels for PDEF are: NORM, TANG, RAD1, STAT, CLEAR, SAVE
- * Valid Oper labels for PCALC are: ADD, MULT, DIV, EXP, DER1, INTG
- * Valid Oper labels for PVIEW are: PRINT, PLOT

LOAD CASE CALCULATION (LCCALC) MODULE

LCZERO, LCASE
 LCABS, KEY (0 - algebraic, 1 - absolute)
 LCFACT, FACT1, FACT2, FACT3, ---FACT10
 LCADD, LCRES, LCAS1, LCAS2, LCAS3, ---LCAS10
 LCMULT, LCRES, LCAS1, LCAS2, FACT
 LCSQRT, LCRES
 LCSRSS, LCRES, LCAS1, LCAS2, LCAS3, ---LCAS10
 LCMAX, LCRES, LCAS1, LCAS2, LCAS3, ---LCAS10
 LCMIN, LCRES, LCAS1, LCAS2, LCAS3, ---LCAS10

FATIGUE (FATI) MODULE

FTSIZE, MXLOC, MXEV, MXLOD
 FE, NEV, CYCLE, FACT, Title
 FELIST, NEV1, NEV2, NINC
 FL, NLOC, NODE, SCFX, SCFY, SCFZ, Title
 FLLIST, NLOC1, NLOC2, NINC
 FSSECT, NODE1, NODE2, RHO, NEV, NLOD, KBR
 FSNODE, NODE, NEV, NLOD
 FS, NODE, NEV, NLOD, STITM, C1, C2, C3, C4, C5, C6
 FSLIST, NLOC1, NLOC2, NINC, NEV, NLOD
 FSDELE, NLOC, NEV, NLOD
 FSPLLOT, NLOC, NEV, ITEM
 FP, STITM, C1, C2, C3, C4, C5, C6
 FPLIST
 FTCALC, NLOC, NODE
 FTWRITE, NOUT

PIPE (PIPE) MODULE

STRPIP
 PSEVAL, EQOPT, LCSPPR, LCSB1, LCSB2, LCTMP, NOPR

MISCELLANEOUS (MISC) MODULE

SAVE
 RESUME
 RESET
 FINISH

POST26 - Time-History Results (6.26)**DEFINE (DEFINE) MODULE**

NUMVAR,NV
 FILE,N (usually 12 or 10)
 TIME,TMIN,TMAX
 TVAR,KEY (0 - Time, 1 - Cumulative iteration number)
 NSTORE,N
 DISP,NVAR,NODE,Lab*,LNAME
 ESTR,NVAR,ELEM,ITEM*,INAME
 NFORCE,NVAR,ELEM,NODE,Lab*,LNAME
 RFORCE,NVAR,NODE,Lab*,LNAME
 GPNF,NVAR,NODE1,NODE2,Lab*,NAME
 SAVE
 RESET

* Valid labels for DISP are:
 UX,UY,UZ,ROTX,ROTY,ROTZ,TEMP,PRES,VOLT,MAG
 Valid items for ESTR are: 1 to N
 Valid labels for NFORCE and RFORCE are:
 FX,FY,FZ,MX,MY,MZ,HEAT,FLOW,AMPS,FLUX
 Valid labels for GPNF: FX,FY,FZ,MX,MY,MZ

OPERATION (OPER) MODULE

ADD,IR,IA,IB,IC,NAME1,NAME2,,FACTA,FACTB,FACTC
 PROD,IR,IA,IB,IC,NAME1,NAME2,,FACTA,FACTB,FACTC
 QUOT,IR,IA,IB,,NAME1,NAME2,,FACTA,FACTB
 ABS,IR,IA,,NAME1,NAME2,,FACTA
 SQRT,IR,IA,,NAME1,NAME2,,FACTA
 LARGE,IR,IA,IB,IC,NAME1,NAME2,,FACTA,FACTB,FACTC
 SMALL,IR,IA,IB,IC,NAME1,NAME2,,FACTA,FACTB,FACTC
 DERIV,IR,IY,IX,,NAME1,NAME2,,FACT
 INT1,IR,IY,IX,,NAME1,NAME2,,FACTY,FACTX,CONST
 CLOG,IR,IA,,NAME1,NAME2,,FACTA,FACT
 NLOG,IR,IA,,NAME1,NAME2,,FACTA,FACT
 EXP,IR,IA,,NAME1,NAME2,,FACTA,FACT
 CONJUG,IR,IA,,NAME1,NAME2,,FACT
 REAL,IR,IA,,NAME1,NAME2,,FACT
 IMAGIN,IR,IA,,NAME1,NAME2,,FACT
 DATA,IR,LSTRT,LSTOP,LINC,NAME1,NAME2,NPER,NFILE
 FILL,IR,LSTRT,LSTOP,LINC,VALUE,DVAL
 PSDTYP,KTYPE
 PSDDAT,IR,FREQ1,PSD1,FREQ2,PSD2,---FREQ5,PSD5
 PSDCAL,IR,IA,IB,IC,NAME1,NAME2,,FACTA
 PSDPRT
 RESP,IR,LFTAB,LDTAB,ITYP,RATIO,DTIME,TMN,TMX

PRINT (PRINT) MODULE

EXTREM,NVAR1,NVAR2,NINC
 PRTIME,TMIN,TMAX
 NPRINT,N
 LINES,N
 PRCPLX,KEY (0 - Real & Imag, 1 - Ampl & Ph Ang)
 PRVAR,NVAR1,NVAR2,NVAR3,NVAR4,NVAR5,NVAR6

DISPLAY (PLOT) MODULE

PLTIME,TMIN,TMAX
 YRANGE,YMIN,YMAX
 XRANGE,XMIN,XMAX
 SPREAD,VALUE (0.0 to 1.0)
 XVAR,N
 PLCLPX,KEY (0 - Ampl, 1 - Ph Ang, 2 - Real, 3 - Imag)
 PLVAR,NVAR1,NVAR2,NVAR3...NVAR9

POST27 - Post Data File Operations (6.27)**DEFINE (DEFINE) MODULE**

STORE,Lab1*,Lab2,Lab3
 ERASE,Lab1*,Lab2,Lab3
 ZERO
 INFILE,NIN
 ALGEB,LSTP,ITER,FACT
 ABSOL,LSTP,ITER,FACT,KSIGN
 MULT,LSTP1,ITER1,LSTP2,ITER2,FACT
 SQUARE,LSTP,ITER,FACT
 SORT
 SRSS,LSTP,ITER,FACT
 COMPAR,LSTP,ITER,FACT,Lab*
 OUTFIL,NOUT
 WRITE

* Valid labels for STORE and ERASE are:
 DISP,VELO,ACEL,EDATA,RFOR
 Valid labels for COMPAR are:
 ABMX (default),ABMN,ALMX,ALMN

PRINT (PRINT) MODULE

PROPT,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab10
 ERPROP,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab10
 NRANGE,NMIN,NMAX
 NLIST,N1,N2,N3,N4,N5...N12
 ERANGE,IMIN,IMAX
 ELIST,I1,I2,I3,I4,I5...I12
 ETYPE,I1,I2,I3,I4,I5...I12
 MTYPES,M1,M2,M3,M4,M5...M12
 SCAN,ITYP,ITEM,VALT,VALB,KEY
 RRANGE,NMIN,NMAX
 RLIST,N1,N2,N3,N4,N5...N12
 PFILE,NFILE,LSTP1,ITER1,LSTP2,ITER2

* Valid labels are: DISP,VELO,ACEL,EFOR,
 ECCSTR,ENCSTR,ECPSTR,ENPSTR,ENFOR,RFOR,
 EDATA (where EDATA is all six E___ labels)

POST29 - 2-D Harmonic Solid Postprocessor (6.29)**DEFINE (DEFINE) MODULE**

SET,LS1,IT1,FACT1,LS2,IT2,FACT2,...FACT4
CIRC,ANGLE

CALCULATION (CALC) MODULE

GRANGE,XMIN,XMAX,YMIN,YMAX
NRANGE,NMIN,NMAX
NLIST,N1,N2,N3,N4,N5...N12
NGLIST,NSTRT,NSTOP,NINC
ERANGE,IMIN,IMAX
ELIST,I1,I2,I3,I4,I5...I12
EGLIST,ISTRT,ISTOP,INC
ETYPES,I1,I2,I3,I4,I5...I12
MTYPES,M1,M2,M3,M4,M5...M12
STORE,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab12
ERASE,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab12
SALLOW,TEMP1,STRS1,TEMP2,STRS2...TEMP5,STRS5

* Valid labels are: SX,SY,SZ,SXY,SYZ, SXZ,
SIG1,SIG2,SIG3,SI,SIGE,SURF,DISP,TEMP

PRINT (PRINT) MODULE

COORD,KEY
PRDISP,NSTRT,NSTOP,NINC,Lab*,VMIN,VMAX,KABS
PRSTRS,NSTRT,NSTOP,NINC,Lab*,VMIN,VMAX,KABS
PRSFAC,NSTRT,NSTOP,NINC,Lab*,VMIN,VMAX,KABS
PRSURF,ISTRT,ISTOP,INC,NUMB*,VMIN,VMAX,KABS
PRTEMP,NSTRT,NSTOP,NINC,Lab*,VMIN,VMAX,KABS

* Valid scan labels for PRDISP are: (blank),UX,UY,UZ
Valid scan labels for PRSTRS or PRSFAC are:
(blank),SX,SY,SZ,SXY,SYZ, SXZ,SIG1,SIG2,SIG3,SI,SIGE
Valid scan numbers for PRSURF are:
0 to 22 are surface stress items stored.
Valid scan labels for PRTEMP are - (blank),TEMP

DISPLAY (PLOT) MODULE

PGRANG,XMIN,XMAX,YMIN,YMAX
PNRANG,NMIN,NMAX
PNLIST,N1,N2,N3,N4,N5...N12
PNGLIS,NSTRT,NSTOP,NINC
PERANG,IMIN,IMAX
PELIST,I1,I2,I3,I4,I5...I12
PEGLIS,ISTRT,ISTOP,INC
PETYPE,I1,I2,I3,I4,I5...I12
PMTYPE,M1,M2,M3,M4,M5...M12
PLDISP,KUND (0 - basic, 1 - +undispl., 2 - +und.edge)
PLSTRS,Lab1*
PLSFAC,Lab1*
PLTEMP,Lab1*

* Valid labels for PLSTRS or PLSFAC are:
SX,SY,SZ,SXY,SYZ, SXZ,SIG1,SIG2,SIG3,SI,SIGE
Valid labels for PLTEMP are: TEMP

WRITE (WRITE) MODULE

WERANG,NELMN,NELMX
FILE,NF
OUT

POST30 - 2-D Harmonic Shell Postprocessor (6.30)**DEFINE (DEFINE) MODULE**

SET,LS1,IT1,FACT1,LS2,IT2,FACT2,...FACT4
CIRC,ANGLE

CALCULATION (CALC) MODULE

GRANGE,XMIN,XMAX,YMIN,YMAX
NRANGE,NMIN,NMAX
NLIST,N1,N2,N3,N4,N5...N12
NGLIST,NSTRT,NSTOP,NINC
ERANGE,IMIN,IMAX
ELIST,I1,I2,I3,I4,I5...I12
EGLIST,ISTRT,ISTOP,INC
ETYPES,I1,I2,I3,I4,I5...I12
MTYPES,M1,M2,M3,M4,M5...M12
STORE,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab12
ERASE,Lab1*,Lab2,Lab3,Lab4,Lab5...Lab12

* Valid labels are:
SDRS,SBNS,SBTS,STPS, (S is meridional dir.)
SDRT,SBNT,SBTT,STPT, (T is THETA (Hoop) dir.)
SXYB,SXYT, (B is Bottom, T is Top)
SIG1,SIG2,SIG3,SI,SIGE, (Bottom and Top)
DISP

PRINT (PRINT) MODULE

COORD,KEY
PRDISP,NSTRT,NSTOP,NINC,Lab*,VMIN,VMAX,KABS
PRCSTR,ISTRT,ISTOP,INC,Lab*,VMIN,VMAX,KABS
PRPSTR,ISTRT,ISTOP,INC,Lab*,VMIN,VMAX,KABS

* Valid scan labels for PRDISP are:
(blank),UX,UY,UZ,ROTZ
Valid scan labels for PRCSTR are:
(blank),SDRS,SBNS,SBTS,STPS,SDRT,SBNT,
SBTT,STPT,SXYB,SXYT
Valid scan labels for PRPSTR are:
(blank),SIG1,SIG2,SIG3,SI,SIGE

DISPLAY (PLOT) MODULE

PGRANG,XMIN,XMAX,YMIN,YMAX
PNRANG,NMIN,NMAX
PNLIST,N1,N2,N3,N4,N5...N12
PNGLIS,NSTRT,NSTOP,NINC
PERANG,IMIN,IMAX
PELIST,I1,I2,I3,I4,I5...I12
PEGLIS,ISTRT,ISTOP,INC
PETYPE,I1,I2,I3,I4,I5...I12
PMTYPE,M1,M2,M3,M4,M5...M12
PLDISP,KUND (0 - basic, 1 - +undisplaced)

WRITE (WRITE) MODULE

WERANG,NELMN,NELMX
FILE,NF
OUT

AUX1 – Post Data File (App.D.1)

SRANGE, LSTP1, ITER1, LSTP2, ITER2
COPY, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
NOFSET, N
RENUM, NIN, NOUT
SCOMB, LSTP1, ITER1, LSTP2, ITER2
ECOMB, IMIN1, IMAX1, IMIN2, IMAX2
COMBIN, NIN1, NIN2, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
RECORD, NG1, NG2, NG3, NG4, NG5
BCDCNV, NIN, NOUT
BINCNV, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
NOFSET, N
NNUM, NOLD, NNEW
NGEN, NTOTL, NINCO, NINCN, NSTRT
NLIST
CNVDSP, NIN, NOUT
CNVRFRR, NIN, NOUT, PHASE
CNVTEM, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
CBDSP, NIN1, NIN2, NOUT, KSHS
TMPINT, NIN1, NIN2, NOUT, KSHS

SRANGE, LSTP1, ITER1, LSTP2, ITER2
RECORD, NG1, NG2, NG3, NG4, NG5
HEADER, KEY
NRANGE, NMIN, NMAX
ERANGE, IMIN, IMAX
DUMP, NIN

AUX2 – Blocked Binary File Dump (App.D.2)

RANGE, REC1, REC2
DUMP, NIN, KEY

AUX3 – Temperature File (App.D.3)

SRANGE, LSTP1, ITER1, LSTP2, ITER2
COPY, NIN, NOUT

SCOMB, LSTP1, ITER1, LSTP2, ITER2
SFACT, FACT1, FACT2, CONST
ADD, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
HEADER, KEY
DLIMIT, NLINE
DUMP, NFILE

AUX4 – Substructure Matrix File (App.D.4)

MRANGE, MATR1, MATR2
RFKEY, IRFL
REFLEC, NIN, NOUT

MRANGE, MATR1, MATR2
NNUM, NOLD, NNEW
NGEN, NTOTL, NINCO, NINCN, NSTRT
NLIST
RENUM, NIN, NOUT

MRANGE, MATR1, MATR2

COPY, NIN, NOUT

MRANGE, MATR1, MATR2
LRANGE, LV1, LV2
CNVRLV, NIN, NOUT

MRANGE, MATR1, MATR2
DUMP, NIN, KEY

AUX5 – Substructure Displacement File (App.D.5)

SRANGE, LSTP1, ITER1, LSTP2, ITER2
RFKEY, IRFL
REFLEC, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
NNUM, NOLD, NNEW
NGEN, NTOTL, NINCO, NINCN, NSTRT
NLIST
RENUM, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
COPY, NIN, NOUT

SRANGE, LSTP1, ITER1, LSTP2, ITER2
HEADER, KEY
DLIMIT, NLINE
DUMP, NIN

AUX6 – Substr. Cyclic Symmetry Matrix (App.D.6)

ANGLE, THETA, THETAR
FILE, NIN, NOUT
NEDGE, NRIGH, NLEFT, NREND, NINC
NSUBST, MATRIX
NLIST, NRSTR, NREND, NINC
CREATE

AUX7 – Substr. Cyclic Symmetry Displ. (App.D.7)

ANGLE, THETA, THETAR
NEDGE, NRIGH, NLEFT, NREND, NINC
NLIST, NRSTR, NREND, NINC
CREATE

AUX9 – Auxiliary Mode Calculation (App.D.9)

MRANGE, MSTRT, MEND, MINC
NAVY, KPRNT

AUX11 – Geometry File (App.D.11)

ERANGE, IMIN, IMAX
ELIST, I1, I2
EGLIST, ISTRT, ISTOP, INC
HEADER, KEY
EDATA, NHEAD, NTEMP, NPRES, NRCON
DISP, KEY
DUMP, NIN

ERANGE, IMIN, IMAX
ELIST, I1, I2
EGLIST, ISTRT, ISTOP, INC
EPARAM, ITEM, VALUE
NODE, ITEM, VALUE
REAL, ITEM, VALUE
COORD, ITEM, VALUE
TEMP, ITEM, VALUE
PRES, ITEM, VALUE

RCON, ITEM, VALUE
CHANGE, NIN, NOUT

ERANGE, IMIN, IMAX
ELIST, I1, I2
EGLIST, ISTRT, ISTOP, INC
DELETE, NIN, NOUT

AUX12 - Substr. Radiation Matrix Gen. (App.D.12)

NFILE, Fname, Ext
EFILE, Fname, Ext
MFILE, Fname, Ext
EMIS, MAT, EVALU
STEF, VALUE
GEOM, K2D
VTYPE, NOHID, NZONE
SPACE, NODE
MPRINT, KEY
WRITE

AUX13 - Reduced Displacement File (App.D.13)

SRANGE, ITER1, ITER2
COPY, NIN, NOUT

SRANGE, ITER1, ITER2
BCDCNV, NIN, NOUT
BINCNV, NIN, NOUT

SRANGE, ITER1, ITER2
RECORD, NODOF, NOMTR
DLIMIT, NLINE
DUMP, NIN

AUX15 - Input File Translator (App.D.15)

FILE, NOUT, NIN
FTYPE, Lab
LCASE, ICASE, CSID, LSID, PSID, TSID
Name, KEY

/OPT - Design Optimization (App. 0)

OPVAR, Name, Type, MIN, MAX, TOLER
OPEQN, KFOBJ, KFSV, KWGHT, KOPPR, INOPT
OPLIST, SET1, SET2, LKEY
OPSORT, Lab, KEY
PRVAR, LAB1, LAB2, (To LAB10)
YRANGE, YMIN, YMAX
XRANGE, XMIN, XMAX
XVAR, LAB
PLVAR, LAB1, LAB2, (To LAB10)
OPOUT, NOUT
OPADD, NRES, NUM1, NUM2, C1, C2
OPFILE, NFILE
OPCOPY, NFROM
RUN, NUMB
OPRUN, NITR, FOLD, FRAND, NRAND, NINFS, KOPRDS
OPSEL, NSEL
*GET, Name, Lab, NLAB
RESUME

Element Library (Ch.4)

The following section lists a selected set of real constants (R) and key options (K) for each element. Other real constants and key options may be available (see Chapter 4 of User's Manual for complete lists).

STIF1 2-D SPAR
R AREA, INITIAL STRAIN

STIF2 2-D 6-NODE TRIANGULAR SOLID
K (3) 0-PLANE STRESS, 1-AXISYM., 2-PLANE STRAIN
(5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
(6) 0-NO SURFACE STRESS PRINT, 4-SURFACE PRINT

STIF3 2-D ELASTIC BEAM
R AREA, IZZ, HEIGHT, SHEARZ, INITIAL STRAIN
K (5) 0-NO INTERMED. PRINT, 1-INTERMED. PRINT
(6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF4 3-D ELASTIC BEAM
R AREA, IZZ, IYY, TKZ, TKY, THETA,
INITIAL STRAIN, IXX, SHEARZ, SHEARY
K (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF5 3-D MULTI-FIELD SOLID
K (1) 0-UX, UY, UZ, TEMP, VOLT, MAG, ---, 10-MAG

STIF6 SURFACE EFFECT ELEMENT
R BLANKS(7), EN
K (1) 0-UX, UY, UZ, ---, 8-TEMP
(2) 0-ALL PRES, 1-POS. PRES, 2-NEG. PRES
(5) 0-NORMAL PRESSURE, 1-ARBITRARY PRESSURE

STIF7 JOINT ELEMENT
R K1, K2, K3, K4, CT, TF, MASS, IMASS, TLOAD, START,
STOPL, STOPU, ROT, C1, C2, C3, C4
K (1), (3), (4) CONTROL SWITCHES (SEE SECT. 4.7 OF U.M.)

STIF8 3-D SPAR
R AREA, INITIAL STRAIN

STIF10 3-D TENSION-ONLY SPAR
R AREA, INITIAL STRAIN
K (3) 0-TENSION-ONLY (CABLE), 1-COMPRESS.-ONLY (GAP)

STIF12 2-D INTERFACE
R THETA, KN, INTF, START, KS
K (2) 0-STANDARD GAP, 1-CIRCULAR GAP
(4) 0-INTF INTERFERENCE, 1-NODE INTERFERENCE

STIF13 2-D MULTI-FIELD SOLID
K (1) 0-MAG, 2-TEMP, 3-UX, UY, 4-UX, UX, TEMP, MAG
(3) 0-PLANE STRAIN, 1-AXISYM., 2-PLANE STRESS

STIF14 SPRING-DAMPER
R K, CV1, CV2
K (3) 0-3-D LONG., 1-3-D TORSION, 2-2-D LONG.

STIF15 2-D THERMAL-FLUID SOLID
R FBX, FBY
K (3) 0-PLANE, 1-AXISYMMETRIC
(4) 0-NO PENALTY FUNCTION, 1-PENALTY FUNCTION

STIF16 ELASTIC STRAIGHT PIPE
R OD, TKWALL, ---
K (6) 0-NO MEMBER FORCE PRINT, 2-MEMBER FORCE PRINT

STIF17 ELASTIC PIPE TEE
 R OD1,TK1,MAT1,FLEX1,---
 K (6) 0-NO MEMBER FORCE PRINT, 2-MEMBER FORCE PRINT

STIF18 ELASTIC CURVED PIPE (ELBOW)
 R OD,TKWALL,RADCUR,---
 K (6) 0-NO MEMBER FORCE PRINT, 2-MEMBER FORCE PRINT

STIF20 PLASTIC STRAIGHT PIPE
 R OD,TKWALL,---
 K (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF21 GENERALIZED MASS
 R MASS,---
 K (3) 2 - 3-D MASS, 4 - 2-D MASS

STIF23 2-D PLASTIC BEAM
 R AREA,IZZ,HEIGHT,---
 K (4) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF24 3-D THIN-WALLED PLASTIC BEAM
 R Y,Z,TK,-----, DX1,DX2,SHEARZ,SHEARY
 K (1) 0-NO CROSS-SECTION PRINT, 1-PRINT CROSS-SECT.
 (3) 0-AXES, 1-CENTROID, 2-SHEAR CTR. AT NODES
 (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF25 AXISY. HARMONIC STRUCTURAL SOLID
 K (4) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF26 2-D CONTACT SURFACE ELEMENT
 R STIFF (IF ST. LINE SURFACE)
 STIFF,R,KARC (IF CIRC. SURF.)

STIF27 STIFFNESS, DAMPING, OR MASS MATRIX
 R K1,K2,-----,K36,---
 K (3) 2-MASS, 4-STIFFNESS, 5-DAMPING MATRIX

STIF30 3-D ISOPAR. ACOUSTIC FLUID
 K (2) 0-STRUCTURE AT INTERFACE, 1-NO STRUCTURE

STIF31 RADIATION LINK
 R AREA,FORM FACTOR,EMISSIVITY,SBC
 K (6) 0-NO HEAT FLOW PRINT, 1-HEAT FLOW PRINT

STIF32 2-D HEAT CONDUCTING BAR
 R AREA

STIF33 3-D HEAT CONDUCTING BAR
 R AREA

STIF34 CONVECTION LINK
 R AREA,EN,CC

STIF35 2-D 6-NODE TRIANGULAR THERMAL SOLID
 K (3) 0-PLANE, 1-AXISYMMETRIC

STIF37 CONTROL ELEMENT
 R STIF,DAMP,MASJ,ONVAL,OFFVAL,PRELOAD,
 MASI,STAT,C1,C2,C3,C4,FSLIDE
 K (3) 0-UX, 2-UY, 3-UZ, 4-ROTX, 5-ROTY, 6-ROTZ,
 7-PRES, 8-TEMP
 (4),(5) CONTROL SWITCHES (SEE SECT. 4.37 OF U.M.)

STIF38 DYNAMIC FLUID COUPLING
 R R2,R1,L,---
 K (6) 0-Y FLOW, 1-X FLOW, 3-Z FLOW

STIF39 NONLINEAR FORCE-DEFLECTION ELEMENT
 R D1,F1,D2,F2,D3,F3,-----,D20,F20
 K (3) 0-UX, 2-UY, 3-UZ, 4-ROTX, 5-ROTY, 6-ROTZ,
 7-PRES, 8-TEMP

STIF40 COMBINATION ELEMENT
 R K1,C,M,GAP,FSLIDE,K2
 K (3) 0-UX, 2-UY, 3-UZ, 4-ROTX, 5-ROTY, 6-ROTZ,
 7-PRES, 8-TEMP
 (6) 0-MASS AT NODE I, 1-AT I AND J, 2-AT J

STIF41 MEMBRANE SHELL
 R TK(I),TK(J),TK(K),TK(L),THETA,EFS
 K (4) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (5) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT
 (6) 0-NO EDGE STRESS PRINT, 1-EDGE STRESS PRINT

STIF42 2-D ISOPARAMETRIC SOLID
 K (3) 0-PLANE STRESS, 1-AXISYM., 2-PLANE STRAIN
 (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF43 PLASTIC QUADRILATERAL SHELL
 R TK(I),TK(J),TK(K),TK(L),THETA
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT

STIF44 3-D TAPERED UNSYMMETRICAL BEAM
 R AREA1,IZ1,IY1,TKZB1,TKYB1,IX1,---
 K (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF45 3-D ISOPARAMETRIC SOLID
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF46 8-NODE LAYERED SOLID
 R - NL,LSYM,LP1,LP2,---

STIF50 SUPERELEMENT (OR SUBSTRUCTURE)

STIF51 PLASTIC AXISYMMETRIC CONICAL SHELL
 R TK(I),TK(J)
 K (4) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF52 3-D INTERFACE
 R KN,GAP,START,KS

STIF54 2-D TAPERED UNSYMMETRICAL BEAM
 R AREA1,IZ1,HYT1,HYB1,---
 K (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF55 2-D ISOPARAMETRIC THERMAL SOLID
 K (3) 0-PLANE, 1-AXISYMMETRIC

STIF57 ISOPARAMETRIC QUADRILATERAL THERMAL SHELL
 R TK(I),TK(J),TK(K),TK(L),THETA

STIF59 IMMERSED PIPE/CABLE
 R DO,TWALL,CD,CM,RHO0,FSD,CENMPL,C1,CB,CT,ISTR,---
 K (1) 0-PIPE, 1-CABLE, 2-PIPE TWIST
 (6) 0-NO MEMBER FORCE PRINT, 2-MEMBER FORCE PRINT
 (7) 0-NO HYDRODYNAMIC INTEGR. PRINT, 1- PRINT

STIF60 PLASTIC CURVED PIPE (ELBOW)
 R OD,TKWALL,R.OF.CURV,---
 K (6) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT

STIF61 AXISY. HARMONIC CONICAL SHELL
 R TK(I),TK(J)
 K (4) 0-NO MEMBER FORCE PRINT, 1-MEMBER FORCE PRINT
 (6) 0-MID PRINT, 1-MID AND END PRINT

STIF63 ELASTIC QUADRILATERAL SHELL
 R TK(I),TK(J),TK(K),TK(L),EFS,THETA,RMI,CTOP,CBOT
 K (5) 0-CENTROID, 2-NODAL STRESS PRINT

STIF64 3-D ANISOTROPIC SOLID
 K (4) 0-[D] INPUT INVERTED, 1-INVERT [D] INPUT
 (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT

STIF65 3-D REINFORCED CONCRETE SOLID
 R MAT1,VR1,THETA1,PHI1,MAT2,---PHI3
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT

STIF66 TRANSIENT THERMAL-FLOW PIPE
 R D,A,HP,G,LA,AI,AJ,C,W

STIF67 2-D THERMAL-ELECTRICAL SOLID
 K (3) 0-PLANE, 1-AXISYMMETRIC

STIF68 THERMAL-ELECTRICAL LINE ELEMENT
 R AREA

STIF69 3-D THERMAL-ELECTRICAL SOLID

STIF70 ISOPARAMETRIC THERMAL SOLID

STIF71 LUMPED THERMAL MASS
 R THERMAL CAPACITANCE,A1,A2,A3,A4,A5,A6

STIF75 AXISY. HARMONIC THERMAL SOLID

STIF77 2-D 8-NODE ISOPARAMETRIC THERMAL SOLID
 K (3) 0-PLANE, 1-AXISYMMETRIC

STIF78 AXISY. 8-NODE HARMONIC THERMAL SOLID

STIF79 2-D FLUID ELEMENT
 K (3) 0-PLANE, 1-AXISYMMETRIC

STIF80 3-D FLUID ELEMENT

STIF81 AXISY. HARMONIC FLUID ELEMENT

STIF82 2-D 8-NODE ISOPARAMETRIC SOLID
 K (3) 0-PLANE STRESS, 1-AXISYM., 2-PLANE STRAIN
 (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF83 AXISY. 8-NODE HARMONIC STRUCTURAL SOLID
 K (4) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF84 2-D HYPERELASTIC SOLID
 K (1) 0-4 NODE QUAD, 1-8 NODE QUAD
 (2) 0-MOONEY MATL, 1-BLATZ-KO MATL
 (3) 0-PLANE STRAIN, 1-AXISYMMETRIC

STIF85 CRACK TIP SOLID
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT

STIF86 3-D HYPERELASTIC SOLID
 K (2) 0-MOONEY MATL, 1-BLATZ-KO MATL

STIF87 3-D 10-NODE TETRAHEDRAL THERMAL SOLID

STIF90 3-D 20-NODE ISOPARAMETRIC THERMAL SOLID

STIF91 8-NODE LAYERED SHELL
 R MAT,THETA,TK(I),TK(J),TK(K),TK(L),---
 K (3) NL-NUMBER OF LAYERS
 (6) 0-NO INTERLAMINAR SHEAR, 1-INTERLAMINAR SHEAR

STIF92 3-D 10-NODE TETRAHEDRAL SOLID
 K (5) 0-CENTROID, 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 4-SURFACE PRINT

STIF93 8-NODE ISOPARAMETRIC SHELL
 R TK(I),TK(J),TK(K),TK(L),THETA
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT

STIF95 3-D 20-NODE ISOPARAMETRIC SOLID
 K (5) 0-CENTROID, 1-INTEGR. PT., 2-NODAL STRESS PRINT
 (6) 0-NO SURFACE STRESS PRINT, 1-SURFACE PRINT

STIF97 20-NODE ISOPARAMETRIC MAG-THER-EL. SOLID

STIF98 TETRAHEDRAL MULTI-FIELD SOLID
 K (1) 0-UX,UY,UZ,TEMP,VOLT,MAG, - - -, 10-MAG

STIF99 8-NODE LAYERED SHELL
 R - NL,LSYM,LP1,LP2,EFS,---

Typical Input Procedure (3.2)

The following procedure is a guide for defining input data for a basic analysis. Since commands may be input in any logical order, other procedures may be equally suitable. The square brackets [] represent commands that are typically used for that step. The modules associated with the commands are shown in parentheses ().

Preprocessing Procedure: The following steps assume that the PREP7 preprocessor is selected with the /PREP7 command.

- 1) Define initial analysis data. (ETYPE)
 - 1.1) Define title [/TITLE,--].
 - 1.2) Select analysis type [KAN,--].
 - 1.3) Select element types [ET,--].
- 2) Select analysis options [TREF,--], [KAY,--], etc., if desired. (OPTION)
- 3) Define linear material property values [EX,--], etc. for the materials to be referenced in Steps 5.a.4 or 5.b.9. This step may also be done after the model is generated, if desired. For nonlinear material properties, set nonlinear key [KNL,--] and define properties [NL,--]. Material properties may be displayed [MPLOT,--]. (MATER)
- 4) Define real constant values [R,--] for the sets to be referenced in Steps 5.a.4 or 5.b.9. This step may also be done after the model is generated, if desired. (RCON)
- 5) Generate model geometry. Either, or both, of the following methods may be used.

Direct Generation Method:

 - 5.a.1) Define coordinate systems [CSYS,--], [LOCAL,--], etc. (CDSYS)
 - 5.a.2) Define nodes [N,--], [NGEN,--], etc. (NODE) If digitizing hardware is available, the commands of the DIGIT module may also be used.
 - 5.a.3) Display nodes [NPLLOT], if desired. (PLOT)
 - 5.a.4) Assign type reference number [TYPE,--], real constant set reference number [REAL,--], material reference number [MAT,--], and element coordinate system number [ESYS,--] to the elements to be generated. Type numbers refer to the element types defined in Step 1.3. Material numbers refer to the materials defined in Step 3 (or to be defined later). Real constant numbers refer to the real constant sets defined in Step 4 (or to be defined later). Element coordinate system numbers refer to the local coordinate systems defined in Step 5.a.1. (ELEM)

- 5.a.5) Generate elements [E,--], [EGEN,--], etc. (ELEM)
 - 5.a.6) Display elements [EPLLOT]. (PLOT)
- Mesh Module Method: (All commands refer to the MESH module, except where noted)
- 5.b.1) Define coordinate systems as in Step 5.a.1.
 - 5.b.2) Select coordinate system [CSYS,--] for keypoint location and define keypoints [K,--].
 - 5.b.3) Display keypoints [KPLLOT,--].
 - 5.b.4) Select coordinate system [CSYS,--] for line and area shapes.
 - 5.b.5) Generate volumes [V,--], areas [A,--], and lines [L,--] as desired.
 - 5.b.6) Display volumes [VPLOT,--], areas [APLOT,--], and lines [LPLOT,--].
 - 5.b.7) Generate additional lines and keypoints from line operations [LDIV,--], [LINTER,--], [LFILLT,--], [LTAN,--], etc.
 - 5.b.8) Define loads directly to solid model [KD,--], [KNT,--], etc., if desired.
 - 5.b.9) Assign mesh spacing to lines [LMOD,--], [LDVS,--], [LDVA,--].
 - 5.b.10) Select element size and shape [ELSIZ,--].
 - 5.b.11) Assign element type, real constant set, material reference numbers, and element coordinate system numbers as described in Step 5.a.4.
 - 5.b.12) Generate mesh for volumes [VMESH,--], areas [AMESH,--], and lines [LMESH,--].
 - 5.b.13) Display nodes as in Step 5.a.3 and display elements as in Step 5.a.6.
- 6) Define coupled degrees of freedom [CP,--], if any. (COUP)
 - 7) Define linear constraint equations [CE,--], if any. (CEQN)
 - 8) If KAN=1,2,5,6, or 7 (i.e. a reduced analysis), master degrees of freedom [M,--], [TOTAL,--], etc., may be defined. (MASTER)
 - 9) If KAN=5 and a gap condition nonlinearity is to be used, define gap specification [GP,--]. (GAP)
 - 10) Begin load step data. (LOPTION)
 - 10.1) Begin load step data. Set number of iterations and print and post data controls [ITER,--].

- 10.2) Set time value [TIME,--] if time dependent analysis (transient, dynamic, or creep).
- 10.3) If more than one iteration is defined, select ramp or step boundary condition change [KBC,--].
- 10.4) Set reaction force output key [KRF,--] if reaction forces are to be printed or postprocessed.

11) Define constraints and loads. (LOAD)

Structural Analysis (KAN#-1) Loads:

- 11.a.1) Define displacement constraints [D,--], [SYMB,--], etc.
- 11.a.2) Define acceleration and angular velocity loads [ACEL,--], [OMEGA,--], etc., if any. (LOPTION)
- 11.a.3) Define nodal force loads [F,--], if any.
- 11.a.4) Define nodal pressure loads [P,--], if any. If pressure face is not unique, use alternate element pressure loads [EP,--]. (EPRESS)

Thermal Analysis (KAN=-1) Loads:

- 11.b.1) Define temperature constraints [NT,--], if any.
- 11.b.2) Define nodal heat flows [HFLOW,--], if any.
- 11.b.3) Define nodal convections [CV,--], if any. If convection face is not unique, use alternate element convection loads [EC,--]. (EPRESS)

12) Define temperature or internal heat gen. loads.

Structural Analysis (KAN#-1) Temperatures:

Set temperature key [KTEMP,--]. If temperatures are uniform, define uniform temperature value [TUNIF,--]. (LOPTION) If a nodal temperature distribution is to be used, define nodal temperatures [T,--]. (LOAD) If element temperatures are to be used, define element temperatures [TE,--]. (ETEMP)

Thermal Analysis (KAN=-1) Internal Heat Generations:

If internal heat generation is to be used, set key [KTEMP,--]. (LOPTION) Define internal heat generation rates [Q,--], if any. (NHGEN)

- 13) Reorder elements [WAVE,--] if the generated order is not suitable. (ORDER)

(If more than one load step is to be defined, issue LWRITE command and repeat Steps 10 to 12. Issue LWRITE command after each load step, including the last. The LWRITE command may be omitted if there is only one load step.)

- 14) Write analysis file [AFWRITE,--]. Data written to File27, by default. (MISC) Exit PREP7 by issuing FINISH command. Re-enter PREP7, if desired, by issuing the /PREP7 command followed by the RESUME command.

Solution Procedure:

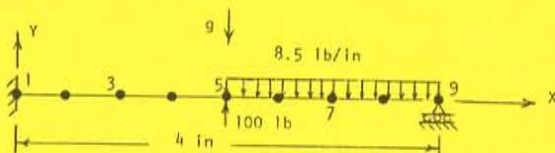
- 1) If analysis check is desired, set check option [/CHECK].
- 2) Switch input to analysis file [/INPUT,27] for data prepared by PREP7.
- 3) Terminate load steps and solution phase by issuing FINISH command.

Postprocessing Procedure:

- 1) Select postprocessor [/POST1], [/POST26], or etc.
- 2) Enter postprocessing data for that processor.
- 3) Exit postprocessor by issuing FINISH command.
- 4) Select another postprocessor, if desired, and repeat postprocessing steps.

Static Analysis Example (3.5)

The following example shows a Static analysis of a beam structure for given boundary conditions.



```

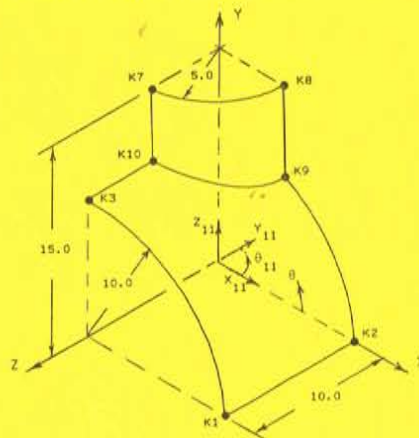
/PRP7
/TITLE, PR-16, BEAM DEFLECTION EXAMPLE
ET,1,3
MP,EX,1,30E6
MP,DENS,1,.00073
R,1,.13,.0014,.36
N,1
N,9,4
FILL
E,1,2
EGEN,8,1,1
ITER,1,1,1
ACEL,,386.4
D,1,ALL
.9,UY
F,5,FY,100
P,5,6,8.5,.8
/PBC,ALL,1
NPLOT
/PNUM,ELEM,1
EPLOT
AFWRITE
FINISH
/INPUT,27
FINISH
/POST1
SET,1,1
PLDISP,1
FINISH
  
```

- * BEGIN PREP7 PREPROCESSING
- * DEFINE ELEMENT TYPE
- * DEFINE MODULUS OF ELASTICITY
- * DEFINE MASS DENSITY PROPERTY
- * DEFINE REAL CONSTANTS
- * DEFINE NODE 1
- * DEFINE NODE 9
- * FILL BETWEEN PREVIOUS TWO NODES
- * DEFINE ELEMENT 1
- * GENERATE 8 ELEMENTS (TOTAL)
- * DEFINE ITERATION CONTROLS
- * DEFINE Y ACCELERATION
- * CONSTRAIN ALL DISPLAC. AT NODE 1
- * CONSTRAIN UY DISPLAC. AT NODE 9
- * DEFINE FORCE OF 100
- * DEFINE PRESSURE OF 8.5
- * ALL BOUNDARY CONDITION DISPLAY KEY
- * PRODUCE NODE DISPLAY
- * INCLUDE ELEMENT NUMBERS ON DISPLAY
- * PRODUCE ELEMENT DISPLAY
- * WRITE ANALYSIS FILE
- * TERMINATE PREP7 ROUTINE
- * SUBMIT ANALYSIS FILE FOR SOLUTION
- * TERMINATE SOLUTION PHASE
- * BEGIN POSTPROCESSING PHASE
- * DEFINE DATA SET
- * DISPLAY DISPLACED SHAPE
- * TERMINATE POST1 ROUTINE

EXAMPLE

Solid Modeling Example (3.5)

The following example shows a model generation using Solid Modeling. Only the input necessary to generate the nodes and elements are shown.

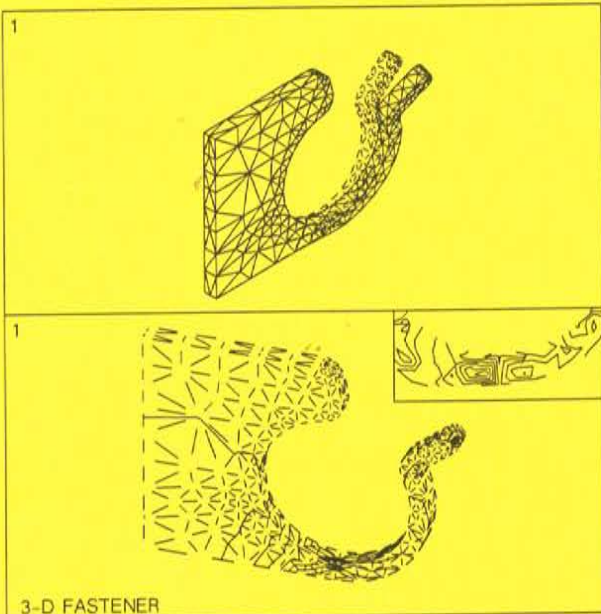


```

/PRP7
/TITLE, PR-19B, INTERSECTING SHELL MODEL GENERATION
C*** MESH MODULE GENERATION PROCEDURE
ET,1,63
LOCAL,11,1,.....,-90
CSYS,1
K,1,10,.10
K,2,10
KGEN,2,1,2,1,.90
A,1,2,4,3
CSYS,11
K,5,5,-90
K,6,5
KGEN,2,5,6,....,15
A,5,6,8,7
/VIEW,,1,1,1
/PNUM,AREA,1
APLOT
LPLOT
LAINT,1,2
C*** DEFINE NEW AREAS USING INTERSECTION LINE
CSYS,1
A,1,2,9,9
A,1,9,10,3
CSYS,11
A,10,9,8,7
ELSZ,2.5,,1
AMESH,3,4
REAL,2
ELSZ,2,,1
AMESH,5
NPLOT
/PNUM,ELEM,1 $CSYS,0
WFRONT
WSORT,Y
C***
EPLOT
FINISH
  
```

- * BEGIN PREP7 PREPROCESSING
- * DEFINE TYPE 1 TO BE STIF63
- * DEFINE LOCAL CYL. C.S. 11
- * RESET ACTIVE C.S. TO 1
- * KEYPOINT 1 HAS R=10.0, Z=10.0
- * GENERATE KEYPOINTS 3 AND 4
- * DEFINE FIRST AREA
- * DEFINE SECOND AREA
- * SET ISOMETRIC VIEW
- * ADD AREA NUMBERS TO DISPLAY
- * DISPLAY AREAS
- * DISPLAY LINE SEGMENTS
- * GENERATE INTERSECTION LINE
- * DEFINE TRIANGULAR AREA
- * SELECT ELEM LENGTH AND SHAPE
- * MESH HORIZONTAL CYLINDER
- * CHANGE REAL CONST REFERENCE
- * MESH VERTICAL CYLINDER
- * FORM NUMBERED NODE DISPLAY
- * REQUEST WAVE FRONT CHECK
- * REORDER ELEMENTS BASED ON ASCENDING Y VALUE
- * FORM NUMBERED ELEMENT DISPLAY
- * TERMINATE PREP7 ROUTINE

EXAMPLE



3-D FASTENER

The ANSYS program can be used on mainframes to microcomputers. Further information can be obtained from:



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P.O. Box 65
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TWX 510-690-8655

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