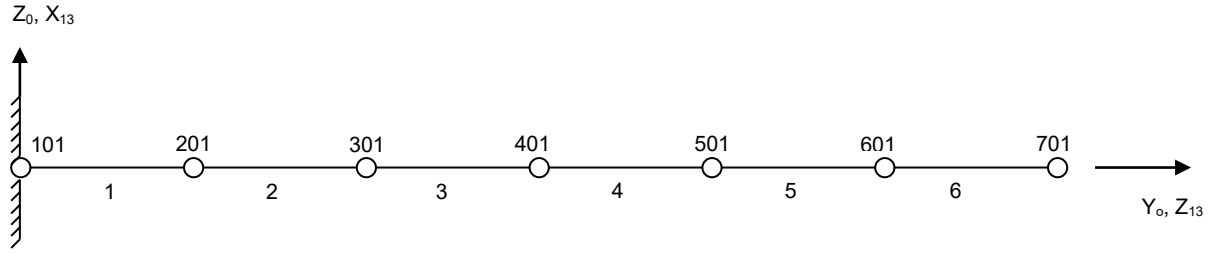
7 Appendix A: MYSTRAN Sample Problem

This example problem shows the input and output for a simple rod with 7 grids and 6 elements. The rod is subjected to loads in two subcases as described below:



The basic coordinate system is the X_0, Y_0, Z_0 system shown (with X_0 in the direction of Y_o cross Z_0). In addition, rectangular coordinate system X_{13}, Y_{13}, Z_{13} (with X_{13} in the same direction as Z_0) is also shown and will be used in the input data in order to help explain the use of coordinate systems. The basic system does not have to be defined explicitly. It is implied through the model grid coordinates and any other coordinate systems (other than basic) which might be referenced in field 3 of the Bulk Data GRID entry. Coordinate system 13 must be defined via a CORD2R Bulk data entry.

The grid point IDs are 101-701 and the rod element IDs are 1-6. The total length is 60 inches consisting of 6 elements of 10 inches each. All of the rods have the same cross-sectional area of 0.6 inch^2. The material is aluminum with a Young's modulus of 1x10^7. The model is constrained at the left end. Several loads are applied in two subcases.

Subcase 35 consists of a 120 lb load at grid 701

$$P = \begin{Bmatrix} P_{101} \\ P_{201} \\ P_{301} \\ P_{401} \\ P_{501} \\ P_{601} \\ P_{701} \end{Bmatrix} = \begin{Bmatrix} 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 120. \end{Bmatrix}$$

Subcase 8 consists of a 240 lb load at grid 201, a 150. Lb load at grid 301 and a 200 lb load at grid 401

$$P = \begin{Bmatrix} P_{101} \\ P_{201} \\ P_{301} \\ P_{401} \\ P_{501} \\ P_{601} \\ P_{701} \end{Bmatrix} = \begin{Bmatrix} 0. \\ 240. \\ 150. \\ 200. \\ 0. \\ 0. \\ 0. \end{Bmatrix}$$

The output, which includes an echo of the input data deck, is shown on the following pages. Note the following about the OUTPUT:

- The input data consists of everything from the ID entry through the ENDDATA entry, and consists of the Executive Control, Case Control and Bulk Data Decks. Entries that begin with a $ sign (and have anything after $ in the entry) are commentary and are ignored.

    - The Executive Control Deck begins with the optional ID entry, has the mandatory SOL entry (1 for statics) and ends with the mandatory CEND entry. All Executive Control entries are free field in that they may be anywhere within the 80 columns of an entry.

    - The Case Control Deck begins with the entry following CEND (which in this case is a TITLE Case Control entry) and ends with the mandatory BEGIN BULK entry. The entries in between can be in any order that makes sense. That is, if there are no subcases, the data can be in any order. When there are subcases, as is the case for this example, the entries between one SUBCASE entry and another apply only to that subcase. Anything “above” the subcase level pertains to all subcases, unless overridden in a subcase. All Case Control entries are free field.

        - The SPC = 19 entry requests that a Bulk Data SPC (or SPC1, SPCADD) with set ID = 19 be used in defining the single point constraints for the model.

        - The following three entries request various outputs (displacements, etc) with ALL meaning that displacements for all grids (DISP = ALL), applied loads for all grids (OLOAD = ALL) and forces of single point constraint (SPCF = ALL). As these are “above” the subcase ;evel, they apply to all subcases (unless a subcase requests output of the same type for a different set of grids or elements)

        - Subcase 35 (the first subcase in Case Control) is defined with its own subtitle and with LOAD = 191 requesting that a Bulk Data entry with set ID of 191 define the loads for this subcase (which requires that the load be defined on a LOAD, FORCE, MOMENT, GRAV od PLOAD2 Bulk Data entry). In this case, Bulk Data entry FORCE with a set ID od 191 contains the load definition for this subcase. Element engineering force and stress output is requested for this subcase (in addition to the requests above the subcase level). .

        - Subcase 8 (the second subcase in Case Control) is defined with its own subtitle (notice the order doesn’t matter) and requesting load set 26 in Bulk Data to define the load. There is also another output request (for nodal element forces) for set 98. Set 98 is defined as 2,5. Since set 98 output is requested as element forces, the 2,5 is interpreted as the element numbers for which nodal element forces will be output in this subcase only. If the request had been above the subcase level (as DISP = ALL, etc) the request would have been honored for both subcases.

    - The Bulk Data Deck begins with the entry immediately following BEGIN BULK and ends with the mandatory ENDDATA entry. The logical entries in between can be in any order with the exception that any one logical entry must be in order. Thus the MAT1 logical entry, which has one parent entry and one continuation entry must be entered together and in the order shown.

- Coordinate system 13 is defined on the CORD2R Bulk Data entry with 13 as the coordinate system ID in field 2. The reference system in field 3 is, in this case, the basic system. It does not have to be. Coordinate system 13 could use some other coordinate system as its reference, and so on. However, the last system in the chain would have to have the basic system as its reference. The nine real numbers on the remainder of the CORD2R logical entry describe three points in coordinates of the reference (basic) system. The first three numbers are the coordinates of the origin of coordinate system 13, which is at the origin of the basic system. The next three numbers are the coordinates of a point on the Z_{13} axis, which is in the direction of the Y_0. The next three numbers (on the continuation entry) are the coordinates of a point in the $X_{13} – Z_{13}$ plane. Thus it is seen that this CORD2R entry describes coordinate system 13 as seen on the figure above.

- The seven grid points of the model are defined on the GRID entries. Note that field 3 (coordinate systems for grid coordinates) is blank indicating the basic coordinate system for grid locations for all seven grids. Field 7, the global coordinate system for each grid is also the basic system for grids 101 through 601. Grid 701, however uses coordinate system 13 as its global system. Field 8 of the GRID entries is for “permanent” single point constraints. Note that 13456 are the permanent single point constraints for grids 101 - 601. Since the rod can only take axial load and torque, only global degrees of freedom that are for displacement along the rod, or rotation about its axis can possibly have stiffness. Since grids 101 - 601, have the basic system as global, degrees of freedom 1346 will be singular and must therefore be removed via single point constraints at these grids. In addition, since the PROD entry has zero torsional constant (field 4 of PROD is blank), there will be no stiffness for global degree of freedom 5 at grids 101 - 601. Thus, field 7 of the grid 101 - 601 entries have 13456 constrained. These constraints do not have to appear on the GRID entry, they can be on SPC (or SPC1) entries as well. Because they appear on the GRID entry these constraints will be used regardless of whether an SPC = SID entry appears in Case Control. Grid 701, on the other hand, uses coordinate system 13 as its global coordinate system. Thus, by the same reasoning as above, global degrees of freedom 12456 are taken as permanent single point constraints.

- The connection entries for the rod elements are the six CROD’s whose element IDs are indicated in field 2. Field 3 (with 16 in it) is the property ID and points to the PROD, ID = 16) for the rod elements properties, which are all the same in this example. Fields 4 and 5 give the grids to which the elements are attached.

- The PROD 16 entry points to a material entry (ID = 20) in field 3 and gives the rod cross-sectional area in field 4.

- The material properties are defined on the MAT1 with ID = 20. Only Young’s modulus is needed for this example but a material density of 0.1 is also entered in field 6.

- Case Control had a request for single point constraint set. The SPC entry, with set ID 19, specifies the remaining constraint of zero displacement in global degree of freedom 2 at grid 101. This could have been included with the constraints specified in field 7 of the GRID 101 entry, in which case the SPC = 19 would not have been needed in Case Control.

- Case Control had a request for load set 191 for subcase 35. The FORCE Bulk Data entry with ID = 191 is the ID requested for this subcase and defines a 120 lb load at grid 701. The coordinate system for this load definition is coordinate system 13 (indicated by the 13 in field 4). Since the components of the load vector are 0., 0., 1. (fields6-8) this indicates a force in the Z_{13} direction which is along the axis of the rod.

- Case Control also had a request for load set 26 for subcase 8. As shown above, this loading condition has axial loads on three grid points. As such, these could have been defined using three FORCE Bulk Data entries, all with set ID = 26. However, the LOAD (load combining) Bulk Data entry will be used for illustrative purposes. The LOAD entry has set ID = 26 which is the ID requested for this subcase. It defines a load that is a linear combination of load sets 39, 5 and 178, where the loads for sets 39, 5 and 178 are specified on the FORCE Bulk Data entries below the LOAD 26 entry. The linear combination on LOAD 26 is:

$$P_{set\,26} = 2(4P_{set\,39} + 3P_{set\,5} + P_{set\,178}) = \begin{Bmatrix} 0. \\ 240. \\ 150. \\ 200. \\ 0. \\ 0. \\ 0. \end{Bmatrix}$$

- The PARAM GRDPNT 101 requests that the Grid Point Weight Generator calculate the total model mass properties relative to grid point 101.

- The PARAM PRTDOF 1 requests printing of the degree of freedom table.

- The ENDDATA signifies the end of the Bulk Data Deck.

- The remainder of the output for the sample problem is shown on the pages following the ENDDATA

  - The next of page lists some informational messages printed out as MYSTRAN executes.

  - The degree of freedom table is printed as requested via the Bulk Data PARAM PRTDOF entry. It shows the degree of freedom numbers for each of the displacement sets and is in internal degree of freedom order. Note on this listing that the A-set (analysis set) has six degrees of freedom and these are the axial degrees of freedom of the rod at the “free” grids, namely 201 – 701. Note that for grids 201 – 601, the A-set degree of freedom is in the “2” direction. This is the global “2” direction for these grids, which is the basic Y_0 system. Note also that grid 701 has its A-set degree of freedom as “3” which, since the global system for this grid is coordinate system 13, is in the Z_{13} direction

  - The Grid Point Weight Generator (GPWG) calculates the model total mass properties and prints them. In this example problem, 0.1 was the “mass” density on the MAT1 Bulk data entry. This happens to be the weight density of the aluminum material of which the rod is made. Thus, the units for the GPWG output are lb.

- The following couple of pages list some informational messages printed out as MYSTRAN executes.

- The remainder of the output shows the items requested in Case Control for each subcase. The output shows the subcase number at the beginning of each subcases' output. The output values are easily verified as being correct with some simple hand calculations. Note the following:

    - Displacement, applied load and constraint force output are for grids and all have headings "T1", etc, where

        T1 is translation in the global X direction of that grid

        T2 is translation in the global Y direction of that grid

        T3 is translation in the global Z direction of that grid

        R1 is rotation about the global X axis

        R2 is rotation about the global Y axis

        R3 is rotation about the global Z axis

    - Grids 201 – 601 have T2 displacements since they use the basic system as global and T2 is in the Y_0 direction. Grid 701, however, uses coordinate system 13 as global and has T3 displacement since T3 is in the Z_{13} direction

    - Element engineering forces and stresses are output in the local element coordinate system for each element. See Figure 3-2 for the rod element local axes.

    - Element node forces are output in the same format as grid point displacements, that is, forces at the grids in global coordinate directions

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   119150503

 MYSTRAN Version  2.06  Jan 19 2006 by Dr Bill Case

 >> MYSTRAN BEGIN:  1/19/2006 at 15: 5: 3. 15 The input file is EXAMPLE1.DAT

 >> LINK  1 BEGIN

ID ROD SAMPLE PROBLEM FOR USERS MANUAL
SOL 1
CEND
TITLE = ROD WITH AXIAL LOADS IN 2 SUBCASES
ECHO  = UNSORT
SPC   = 19
DISP     = ALL
OLOAD    = ALL
SPCF     = ALL
SUBCASE 35
  SUBTITLE = 120 LB LOAD ON GRID 701
  ELFORCE  = ALL
  STRESS   = ALL
  LOAD = 191
SUBCASE 8
  SET 98 = 2,5
  LOAD = 26
  ELFORCE(NODE) = 98
  SUBTITLE = 240 LB ON GRID 201 + 150 LB ON GRID 301 + 200 LB ON GRID 401
BEGIN BULK
$
CORD2R  13      0       0.      0.      0.      0.      1.      0.      +CORD13
+CORD13 0.      0.      1.
$
GRID    701             0.      60.     0.      13      12456
GRID    601             0.      50.     0.              13456
GRID    501             0.      40.     0.              13456
GRID    401             0.      30.     0.              13456
GRID    301             0.      20.     0.              13456
GRID    201             0.      10.     0.              13456
GRID    101             0.      0.      0.              13456
$
CROD    1       16      101     201
CROD    2       16      201     301
CROD    3       16      301     401
CROD    4       16      401     501
CROD    5       16      501     601
CROD    6       16      601     701
$
PROD    16      20      .6
$
MAT1    20      1.+7            .33     .1      1.                      +MAT1
 *INFORMATION: MAT1 ENTRY       20 HAD FIELD FOR G  BLANK. MYSTRAN CALCULATED G  =  3.759398E+06
```

```
+MAT1   10000.  10000.  10000.
$
SPC1    19      2       101
$
FORCE   191     701     13      120.    0.      0.      1.
$
LOAD    26      2.0     4.0     39      3.0     5       1.0     178
FORCE   39      201     0       30.     0.      1.      0.
FORCE   5       301     13      25.     0.      0.      1.
FORCE   178     401     0       100.    0.      1.      0.
$
PARAM   GRDPNT  101
PARAM   PRTDOF  1
DEBUG   200     1
$
ENDDATA
```

```
*INFORMATION: SPARSE MATRICES ARE STORED IN SYM    FORMAT

*INFORMATION: BANDIT WAS CALLED TO RESEQUENCE THE GRIDS AND HAS RETURNED WITH ERROR  =        0

*INFORMATION: FILE EXAMPLE1.SEQ
              CONTAINING THE BULK DATA SEQGP CARD IMAGES (NEEDED FOR AUTO GRID POINT SEQUENCING REQUESTED BY
              THE USER VIA PARAM GRIDSEQ BANDIT  ), DOES NOT EXIST

              IT MAY BE THAT BANDIT FOUND THAT NO RESEQUENCING WAS NEEDED OR DUE TO ERROR IN RUNNING BANDIT.

              MAKE SURE BANDIT HAS RUN SUCCESSFULLY (CHECK FILE BANDIT.OUT IN THE DIRECTORY WHERE MYSTRAN.EXE RESIDES).

*INFORMATION: SUBR AUTO_SEQ_PROC DID NOT SEQUENCE ALL OF THE        7 GRIDS. ONLY        0 GRIDS WERE SEQUENCED.
              MYSTRAN WILL DEFAULT TO A SEQUENCE THAT IS IN GRID NUMERICAL ORDER
```

DEGREE OF FREEDOM TABLE SORTED ON GRID POINT (TDOF)
(Before any AUTOSPC)

EXTERNAL GRD-COMP NUMBER	INTERNAL GRD-COMP NUMBER	DOF NUMBER FOR DISPLACEMENT SET: G	M	N	SA	SB	SG	SZ	SE	S	F	O	A	R	L
101-1	1-1	1	0	1	0	0	1	1	0	1	0	0	0	0	0
-2	-2	2	0	2	0	1	0	2	0	2	0	0	0	0	0
-3	-3	3	0	3	0	0	2	3	0	3	0	0	0	0	0
-4	-4	4	0	4	0	0	3	4	0	4	0	0	0	0	0
-5	-5	5	0	5	0	0	4	5	0	5	0	0	0	0	0
-6	-6	6	0	6	0	0	5	6	0	6	0	0	0	0	0
201-1	2-1	7	0	7	0	0	6	7	0	7	0	0	0	0	0
-2	-2	8	0	8	0	0	0	0	0	0	1	0	1	0	1
-3	-3	9	0	9	0	0	7	8	0	8	0	0	0	0	0
-4	-4	10	0	10	0	0	8	9	0	9	0	0	0	0	0
-5	-5	11	0	11	0	0	9	10	0	10	0	0	0	0	0
-6	-6	12	0	12	0	0	10	11	0	11	0	0	0	0	0
301-1	3-1	13	0	13	0	0	11	12	0	12	0	0	0	0	0
-2	-2	14	0	14	0	0	0	0	0	0	2	0	2	0	2
-3	-3	15	0	15	0	0	12	13	0	13	0	0	0	0	0
-4	-4	16	0	16	0	0	13	14	0	14	0	0	0	0	0
-5	-5	17	0	17	0	0	14	15	0	15	0	0	0	0	0
-6	-6	18	0	18	0	0	15	16	0	16	0	0	0	0	0
401-1	4-1	19	0	19	0	0	16	17	0	17	0	0	0	0	0
-2	-2	20	0	20	0	0	0	0	0	0	3	0	3	0	3
-3	-3	21	0	21	0	0	17	18	0	18	0	0	0	0	0
-4	-4	22	0	22	0	0	18	19	0	19	0	0	0	0	0
-5	-5	23	0	23	0	0	19	20	0	20	0	0	0	0	0
-6	-6	24	0	24	0	0	20	21	0	21	0	0	0	0	0
501-1	5-1	25	0	25	0	0	21	22	0	22	0	0	0	0	0
-2	-2	26	0	26	0	0	0	0	0	0	4	0	4	0	4
-3	-3	27	0	27	0	0	22	23	0	23	0	0	0	0	0
-4	-4	28	0	28	0	0	23	24	0	24	0	0	0	0	0
-5	-5	29	0	29	0	0	24	25	0	25	0	0	0	0	0
-6	-6	30	0	30	0	0	25	26	0	26	0	0	0	0	0
601-1	6-1	31	0	31	0	0	26	27	0	27	0	0	0	0	0
-2	-2	32	0	32	0	0	0	0	0	0	5	0	5	0	5
-3	-3	33	0	33	0	0	27	28	0	28	0	0	0	0	0
-4	-4	34	0	34	0	0	28	29	0	29	0	0	0	0	0
-5	-5	35	0	35	0	0	29	30	0	30	0	0	0	0	0
-6	-6	36	0	36	0	0	30	31	0	31	0	0	0	0	0
701-1	7-1	37	0	37	0	0	31	32	0	32	0	0	0	0	0
-2	-2	38	0	38	0	0	32	33	0	33	0	0	0	0	0
-3	-3	39	0	39	0	0	0	0	0	0	6	0	6	0	6
-4	-4	40	0	40	0	0	33	34	0	34	0	0	0	0	0
-5	-5	41	0	41	0	0	34	35	0	35	0	0	0	0	0
-6	-6	42	0	42	0	0	35	36	0	36	0	0	0	0	0
TOTAL NUMBER OF DOF:		42	0	42	0	1	35	36	0	36	6	0	6		

O U T P U T F R O M G R I D P O I N T W E I G H T G E N E R A T O R

REFERENCE POINT IS GRID POINT 101

TOTAL MASS = 3.600000E+00

	X	Y	Z
C.G. LOCATION :	0.000000E+00	3.000000E+01	0.000000E+00

(RELATIVE TO REFERENCE POINT IN BASIC COORDINATE SYSTEM)

M.O.I. MATRIX - ABOUT REFERENCE POINT IN BASIC COORDINATE SYSTEM

4.380000E+03	0.000000E+00	0.000000E+00
0.000000E+00	0.000000E+00	0.000000E+00
0.000000E+00	0.000000E+00	4.380000E+03

M.O.I. MATRIX - ABOUT C.G. IN BASIC COORDINATE SYSTEM

1.140000E+03	0.000000E+00	0.000000E+00
0.000000E+00	0.000000E+00	0.000000E+00
0.000000E+00	0.000000E+00	1.140000E+03

M.O.I. MATRIX - ABOUT C.G. IN PRINCIPAL DIRECTIONS

0.000000E+00	0.000000E+00	0.000000E+00
0.000000E+00	1.140000E+03	0.000000E+00
0.000000E+00	0.000000E+00	1.140000E+03

TRANSFORMATION FROM BASIC COORDINATES TO PRINCIPAL DIRECTIONS

0.000000E+00	1.000000E+00	0.000000E+00
1.000000E+00	0.000000E+00	0.000000E+00
0.000000E+00	0.000000E+00	1.000000E+00

```
*INFORMATION: LTERM_MGGE ESTIMATE OF THE NUMBER OF NONZEROS IN MASS MATRIX MGGE IS   =          468

*INFORMATION: NUMBER OF NONZERO TERMS IN THE MGG MASS MATRIX IS                      =            7

*INFORMATION: NUMBER OF NONZERO TERMS IN THE MGG MASS MATRIX IS                      =            7

*INFORMATION: MAX NUMBER OF NONZERO TERMS IN A ROW OF THE G-SET MASS MATRIX          =            1

*INFORMATION: LTERM_KGG ESTIMATE OF THE NUMBER OF NONZEROS IN STIFF MATRIX KGG IS    =          468

*INFORMATION: NUMBER OF NONZERO TERMS IN THE KGG STIFFNESS MATRIX IS                 =           13


*INFORMATION: MAX NUMBER OF NONZERO TERMS IN A ROW OF THE G-SET STIFFNESS MATRIX     =            2

*INFORMATION: NUMBER OF GRID POINTS                                                  =            7
*INFORMATION: NUMBER OF G SET DEGREES OF FREEDOM (NDOFG)                             =           42


>> LINK  1 END

>> LINK  2 BEGIN

*INFORMATION: BASED ON PARAMETER AUTOSPC_NSET =  1 MYSTRAN IS CHECKING KNN TO SEE IF THERE ARE NULL ROWS THAT SHOULD BE AUTOSPC'd


*INFORMATION: MYSTRAN FOUND NO N-SET DOF's THAT WERE SINGULAR AND THAT WERE NOT ALREADY MEMBERS OF THE S-SET


*INFORMATION: AUTOSPC Summary, Overall: after identification of all AUTOSPC's

                              AUTOSPC_RAT = 1.000000E-06

                    Number of DOF's identified for AUTOSPC in component  1         =            0
                    Number of DOF's identified for AUTOSPC in component  2         =            0
                    Number of DOF's identified for AUTOSPC in component  3         =            0
                    Number of DOF's identified for AUTOSPC in component  4         =            0
                    Number of DOF's identified for AUTOSPC in component  5         =            0
                    Number of DOF's identified for AUTOSPC in component  6         =            0
                                                                                     ------------
                    Total number of DOF's identified overall                       =            0

*INFORMATION: NUMBER OF  M SET DEGREES OF FREEDOM (NDOFM)                           =            0
*INFORMATION: NUMBER OF  N SET DEGREES OF FREEDOM (NDOFN)                           =           42
*INFORMATION: NUMBER OF  S SET DEGREES OF FREEDOM (NDOFS)                           =           36
*INFORMATION: NUMBER OF SA SET DEGREES OF FREEDOM (NDOFSA)                          =            0
*INFORMATION: NUMBER OF  F SET DEGREES OF FREEDOM (NDOFF)                           =            6
*INFORMATION: NUMBER OF  O SET DEGREES OF FREEDOM (NDOFO)                           =            0
*INFORMATION: NUMBER OF  A SET DEGREES OF FREEDOM (NDOFA)                           =            6
*INFORMATION: NUMBER OF  R SET DEGREES OF FREEDOM (NDOFR)                           =            0
*INFORMATION: NUMBER OF  L SET DEGREES OF FREEDOM (NDOFL)                           =            6
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```
>> LINK  2 END


>> LINK  3 BEGIN

*INFORMATION: NUMBER OF SUPERDIAGONALS IN THE UPPER TRIANGLE OF MATRIX       KLL   =           1

*INFORMATION: MAXIMUM DIAGONAL TERM IN MATRIX         KLL                          =  1.200000E+06 Occurs in row/col no.        1
*INFORMATION: MINIMUM DIAGONAL TERM IN MATRIX         KLL                          =  6.000000E+05 Occurs in row/col no.        6
*INFORMATION: RATIO OF MAX TO MIN DIAGONALS IN MATRIX         KLL                  =  2.000000E+00

*INFORMATION: MAX RATIO OF MATRIX DIAGONAL TO FACTOR DIAGONAL FOR MATRIX         KLL =  1.897367E+03 Occurs in row/col no.        6


*INFORMATION: FOR INTERNAL SUBCASE NUMBER       1 EPSILON ERROR ESTIMATE           =  1.421085E-15 Based on U'*(K*U - P)/(U'*P)

*INFORMATION: FOR INTERNAL SUBCASE NUMBER       2 EPSILON ERROR ESTIMATE           =  1.104361E-15 Based on U'*(K*U - P)/(U'*P)


>> LINK  3 END


>> LINK  5 BEGIN


>> LINK  5 END


>> LINK  9 BEGIN
```

SUBCASE 35
ROD WITH AXIAL LOADS IN 2 SUBCASES
120 LB LOAD ON GRID 701

D I S P L A C E M E N T S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	2.000000E-04	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	4.000000E-04	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	6.000000E-04	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	8.000000E-04	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	1.000000E-03	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	1.200000E-03	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	1.000000E-03	1.200000E-03	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	1.000000E-03	1.200000E-03	0.000000E+00	0.000000E+00	0.000000E+00

SUBCASE 35
ROD WITH AXIAL LOADS IN 2 SUBCASES
120 LB LOAD ON GRID 701

A P P L I E D F O R C E S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	0.000000E+00	1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	0.000000E+00	1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00

APPLIED FORCE TOTALS: not printed since all grids do not have the same global coordinate system

SUBCASE 35
ROD WITH AXIAL LOADS IN 2 SUBCASES
120 LB LOAD ON GRID 701

S P C F O R C E S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	-1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	-1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	1.200000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

SPC FORCE TOTALS: not printed since all grids do not have the same global coordinate system

SUBCASE 35
ROD WITH AXIAL LOADS IN 2 SUBCASES
120 LB LOAD ON GRID 701

E L E M E N T E N G I N E E R I N G F O R C E S
F O R E L E M E N T T Y P E R O D

Element ID	Axial Force	Torque	Element ID	Axial Force	Torque	Element ID	Axial Force	Torque
1	1.200000E+02	0.000000E+00	2	1.200000E+02	0.000000E+00	3	1.200000E+02	0.000000E+00
4	1.200000E+02	0.000000E+00	5	1.200000E+02	0.000000E+00	6	1.200000E+02	0.000000E+00

SUBCASE 35
ROD WITH AXIAL LOADS IN 2 SUBCASES
120 LB LOAD ON GRID 701

E L E M E N T S T R E S S E S I N L O C A L E L E M E N T C O O R D I N A T E S Y S T E M
F O R E L E M E N T T Y P E R O D

Element ID	Axial Stress	Safety Margin	Torsional Stress	Safety Margin	Element ID	Axial Stress	Safety Margin	Torsional Stress	Safety Margin
1	2.000000E+02	4.90E+01	0.000000E+00		2	2.000000E+02	4.90E+01	0.000000E+00	
3	2.000000E+02	4.90E+01	0.000000E+00		4	2.000000E+02	4.90E+01	0.000000E+00	
5	2.000000E+02	4.90E+01	0.000000E+00		6	2.000000E+02	4.90E+01	0.000000E+00	

SUBCASE 8
ROD WITH AXIAL LOADS IN 2 SUBCASES
240 LB ON GRID 201 + 150 LB ON GRID 301 + 200 LB ON GRID 401

D I S P L A C E M E N T S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	9.833333E-04	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	1.566667E-03	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	1.900000E-03	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	1.900000E-03	1.900000E-03	0.000000E+00	0.000000E+00	0.000000E+00

SUBCASE 8
ROD WITH AXIAL LOADS IN 2 SUBCASES
240 LB ON GRID 201 + 150 LB ON GRID 301 + 200 LB ON GRID 401

A P P L I E D F O R C E S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	2.400000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	1.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	2.000000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	2.400000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	2.400000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

APPLIED FORCE TOTALS: not printed since all grids do not have the same global coordinate system

SUBCASE 8
ROD WITH AXIAL LOADS IN 2 SUBCASES
240 LB ON GRID 201 + 150 LB ON GRID 301 + 200 LB ON GRID 401

S P C F O R C E S
(in global coordinate system at each grid)

GRID	COORD SYS	T1	T2	T3	R1	R2	R3
101	0	0.000000E+00	-5.900000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
201	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
301	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
401	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
501	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
601	0	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
701	13	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	-5.900000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	5.900000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

SPC FORCE TOTALS: not printed since all grids do not have the same global coordinate system

SUBCASE 8
ROD WITH AXIAL LOADS IN 2 SUBCASES
240 LB ON GRID 201 + 150 LB ON GRID 301 + 200 LB ON GRID 401

E L E M N O D A L F O R C E S I N G L O B A L C O O R D S
F O R E L E M E N T T Y P E R O D

Element ID	Grid Point	T1	T2	T3	R1	R2	R3
2	201	0.000000E+00	-3.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
	301	0.000000E+00	3.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
5	501	0.000000E+00	-2.273737E-13	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
	601	0.000000E+00	2.273737E-13	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MAX (for output set):		0.000000E+00	3.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
MIN (for output set):		0.000000E+00	-3.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00
ABS (for output set):		0.000000E+00	3.500000E+02	0.000000E+00	0.000000E+00	0.000000E+00	0.000000E+00

>> LINK 9 END

>> MYSTRAN END : 1/19/2006 at 15: 5: 3.8. The output file is:
EXAMPLE1.F06
MYSTRAN terminated normally. Total CPU time = 1.56E-01 seconds