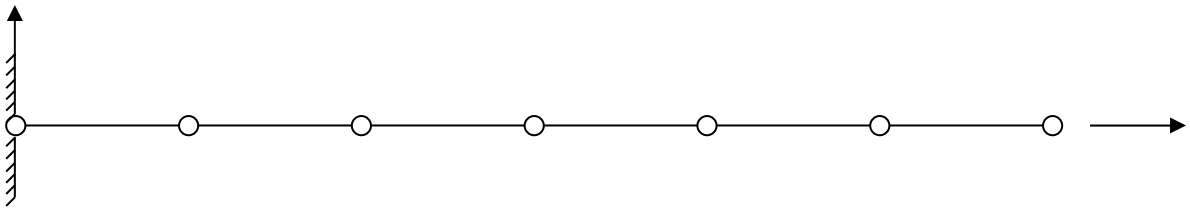
7 Appendix A: MYSTRAN Sample Problem



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```
+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
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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

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*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
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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:

MYSTRAN terminated normally. Total CPU time = 1.56E-01 seconds