F

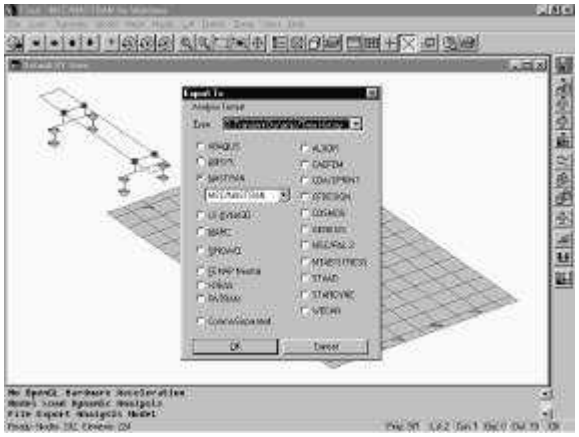
BRIDGE-TRUCK DYNAMIC INTERACTION USING MSC/NASTRAN

Models for Static, Modal, Transient Response (Direct and Modal), Frequency Response (Direct and Modal), Random Response, Non-linear static and Non-linear Transient can be written, read or the standard printed output file can be read for postprocessing. The File Export Analysis Model command allows to write a model into a file that can be read by NASTRAN (*nast682.exe*). This file contains three required sections : Executive Control, Case Control, and Bulk Data. Caseco and Bulk sections are input through text files with a field format defined in Quick Reference Guide (MSC/NASTRAN for Windows 1998). This Appendix gives examples of these two files to be written in the bridge-truck interaction model.

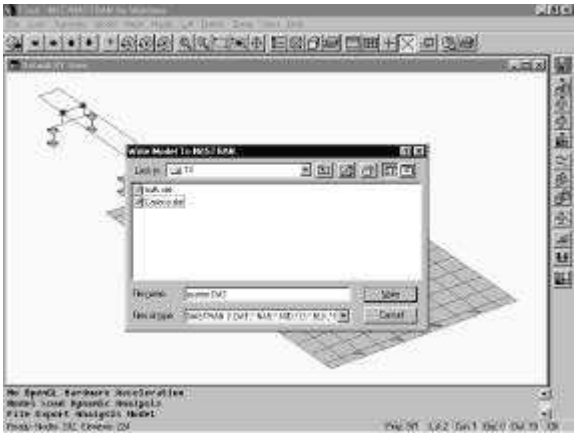
F.1 GENERATION OF MSC/NASTRAN INTERACTION MODEL

The dialog boxes that are displayed when chosing the File Export command are described first.

- *Analysis Format* (Figure F.1(a)). Choose analysis type *3.Transient Dynamic/ Time History* and *MSc/NASTRAN* model. Press *OK*.
- *Write model to NASTRAN* (Figure F.1(b)). Write name of file, i.e. *test.dat*. Press *Write.*
- *NASTRAN Analysis Control* (Figure F.2(a)). Make sure the correct analysis type (Transient dynamic), load set and constraint set are selected. Press *Advanced*.
- *NASTRAN Dynamic Analysis. Direct Solution* Type. Press *OK*.
- *NASTRAN Executive and Solution Control* (Figure F.2(b)). Press *OK*.

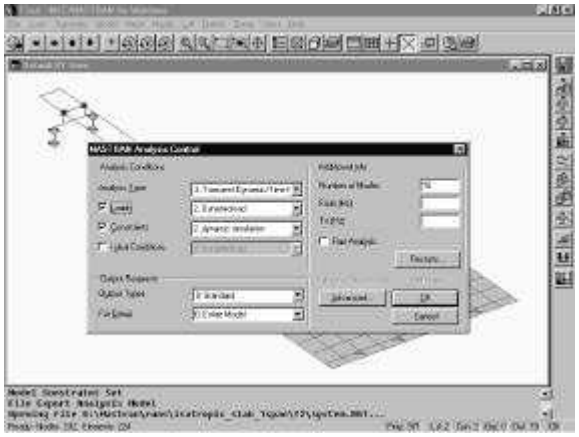


(a) Analysis Format

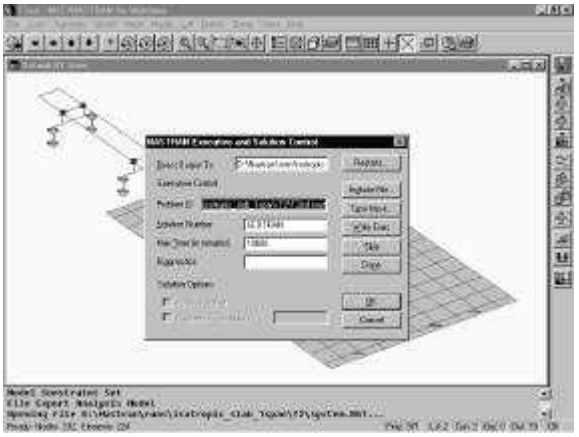


(b) Write Model to

Figure F.1 – Export to a File



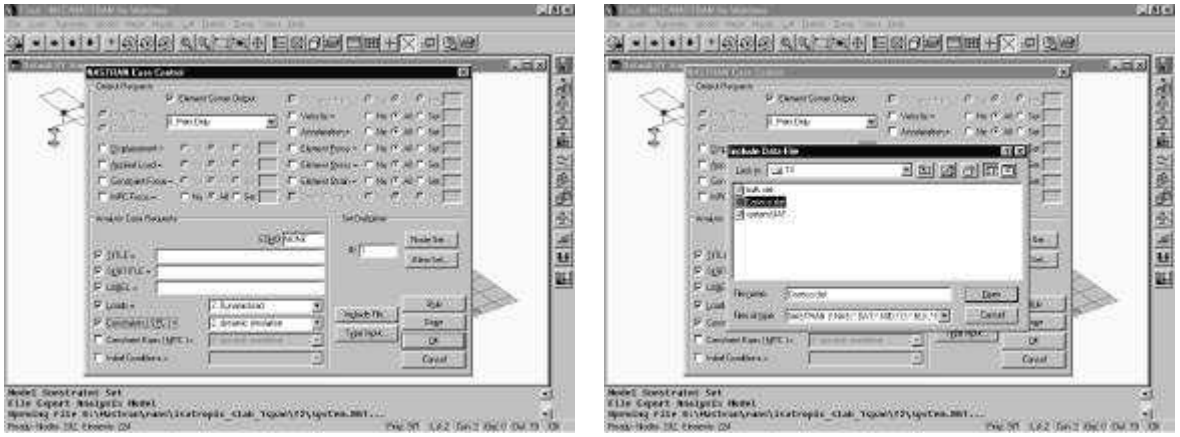
(a) Analysis Control



(b) Executive and Solution Control

Figure F.2 – Analysis, Executive and Solution Control

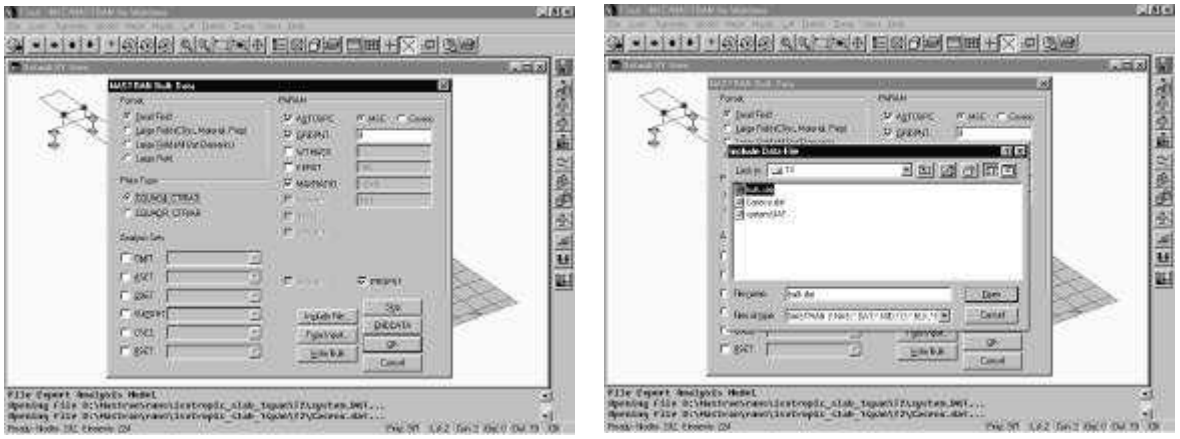
- *NASTRAN Caseco Control*. There are two parts: Output and Analysis Case Request. In the first part, *0. Print Only* must be selected and all other ticks in boxes relating to output requests must be removed (Figure F.3(a)). In the second part, choose *Include File*, and select *caseco.dat* file (Figure F.3(b)). Press *Open*. Press *OK*.



(a) Output Request (b) Analysis Case Request

Figure F.3 – Caseco Section

- *NASTRAN Bulk Data Section* (Figure F.4(a)). Select *Include File*, select the adequate *bulk.dat* for this interaction (Figure F.4(b)), press *Open*, press *OK*. *Exit and Save.*



(a) Bulk options (b) Include File

Figure F.4 – Bulk Data Section

F.2 CASE CONTROL

After the Executive Control is finished, a dialog box appears in case of a structural analysis, which is divided into three readily understable areas : (1) Set definition, (2) Analysis Case Requests, and (3) Output Requests.

Usually ouput for all nodes/elements are required. If the output is to be limited, A NASTRAN SET must be defined to select the corresponding node or element IDs. The NASTRAN output must always be read into the original MSC/N4W model. MSC/N4W will read many types of NASTRAN output, including :

- DISPLACEMENT – Displacements/Eigenvectors
- VELOCITY – Velocities
- ACCELERATION – Accelerations
- MPCFORCES – Multipoint Constraint Forces
- SPCFORCES – Constraint Forces
- OLOAD – Applied Loads
- FORCE – Element Forces
- STRESS – Element Stresses (Linear and Nonlinear)
- STRAIN – Element Strains (Linear and Nonlinear)
- ESE – Element Strain Energy ,....

In addition, MSC/N4W will also read Complex Output, in both Magnitude/Phase or Real/Imaginary format, for most of the above structural types. An example of Case Control input file is given in Table F.1.

Table F.1 – *Caseco.dat* file

```
$ Input Specification
NONLINEAR=2
K2GG=STIF
PARAM,COUPMASS,1
$ SET- Definition of points and elements where output is required
SET 1 = 300000,301000,185
SET 2 = 19,20,59,60,99,100,139,140,179,180,219,220,259
$ Output Specification
DISPLACEMENT(SORT1) = 1
VELOCITY(SORT1) = 1
ACCELERATION(SORT1) = 1
FORCE(SORT1) = 1
STRESS(SORT1) = 2
STRAIN(SORT1) = 2
```

F.3 BULK DATA ENTRY

The Bulk data file contains the interaction forces between bridge and truck models. These forces are based on a Lagrange multiplier technique described in Section 6.2. Bulk files are generated for some given characteristics of the models through code developed by the author. An example of input and the corresponding bulk file for a single-vehicle event planar model is listed next.

Table F.2 shows the input file for the generation of the *bulk.dat* for a planar single vehicle. The format of this file is printed automatically through enquiries on the computer screen (Section 6.3).

Table F.2 – Input file for planar single vehicle model

```
Analysis_type:(1)1-D_or_(3)3-D
1
Total_Number_vehicles
1
Number_axles
2
Axle_Spacing_from_first_axle:
0
5
Axle_loads[Nw]:
10000
20000
Number_speed_points
2
Time_speed_relationship(sec-m/s)
0
20
20
20
Total_Number_Nodes_in_Path:
5
Nodes_Id_coordinates_path
10
0
11
1
12
2
13
3
14
4
```

Table F.2 (continuation)

```
Approach_Length(m):
10
Road_Profile_Type:1)Theoretical,2)Measured,3)Flat
3
Geometric_mean_spatial_Frequency[a]
0
Minimum_frequency(Hz):
1
Maximum_frequency(Hz):
20
Number_frequencies:
100
```

The preceding input file produces the *bulk.dat* file listed in Table F.3.

Table F.3 – Bulk file for spatial model of two-vehicle event in Table F.2.

$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
SPOINT	400000								
SPOINT	402000								
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
SPOINT	500000								
SPOINT	502000								
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
SPOINT	100001	THRU	100005						
=	*2000	=	*2000						
SPOINT	200001	THRU	200005						
=	*2000	=	*2000						
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
DMIG	STIF	0	6	1	1				
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
DMIG	STIF	100001			100001		1		
=	=	*1	=	=	*1	=	=		
3									
DMIG	STIF	102001			102001		1		
=	=	*1	=	=	*1	=	=		
3									
DMIG	STIF	200001			200001		1		
=	=	*1	=	=	*1	=	=		
3									
DMIG	STIF	202001			202001		1		
=	=	*1	=	=	*1	=	=		
3									
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
DMIG	STIF	400000			400000		0		
DMIG	STIF	402000			402000		0		
DMIG	STIF	500000			500000		1		

Table F.3 (continuation)

DMIG	*STIF*	*502000*			*502000*		*1*		
DMIG	*STIF*	*300000*	*3*		*400000*		*1*		
DMIG	*STIF*	*302000*	*3*		*402000*		*1*		
$.....	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*
DAREA	*100001*	*100001*		*1*					
TLOAD2	*100001*	*100001*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*0*							
DAREA	*110001*	*100001*		*-1199.99*					
TLOAD2	*110001*	*110001*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*2*							
DAREA	*120001*	*100001*		*15999.98*					
TLOAD2	*120001*	*120001*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*3*							
DAREA	*102001*	*102001*		*1*					
TLOAD2	*102001*	*102001*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*0*							
DAREA	*112001*	*102001*		*-1199.99*					
TLOAD2	*112001*	*112001*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*2*							
DAREA	*122001*	*102001*		*15999.98*					
TLOAD2	*122001*	*122001*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*3*							
DAREA	*100002*	*100002*		*1*					
TLOAD2	*100002*	*100002*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*0*							
DAREA	*110002*	*100002*		*-1199.99*					
TLOAD2	*110002*	*110002*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*2*							
DAREA	*120002*	*100002*		*15999.98*					
TLOAD2	*120002*	*120002*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*3*							
DAREA	*130002*	*100002*		*1199.999*					
TLOAD2	*130002*	*130002*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*2*							
DAREA	*140002*	*100002*		*-15999.9*					
TLOAD2	*140002*	*140002*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*3*							
DAREA	*102002*	*102002*		*1*					
TLOAD2	*102002*	*102002*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*0*							
DAREA	*112002*	*102002*		*-1199.99*					
TLOAD2	*112002*	*112002*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*2*							
DAREA	*122002*	*102002*		*15999.98*					
TLOAD2	*122002*	*122002*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*3*							
DAREA	*132002*	*102002*		*1199.999*					

Table F.3 (continuation)

TLOAD2	*132002*	*132002*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*2*							
DAREA	*142002*	*102002*		*-15999.9*					
TLOAD2	*142002*	*142002*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*3*							
DAREA	*100003*	*100003*		*1*					
TLOAD2	*100003*	*100003*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*0*							
DAREA	*110003*	*100003*		*-1200*					
TLOAD2	*110003*	*110003*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*2*							
DAREA	*120003*	*100003*		*16000.04*					
TLOAD2	*120003*	*120003*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*3*							
DAREA	*130003*	*100003*		*1199.999*					
TLOAD2	*130003*	*130003*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*2*							
DAREA	*140003*	*100003*		*-15999.9*					
TLOAD2	*140003*	*140003*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*3*							
DAREA	*102003*	*102003*		*1*					
TLOAD2	*102003*	*102003*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*0*							
DAREA	*112003*	*102003*		*-1200*					
TLOAD2	*112003*	*112003*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*2*							
DAREA	*122003*	*102003*		*16000.04*					
TLOAD2	*122003*	*122003*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*3*							
DAREA	*132003*	*102003*		*1199.999*					
TLOAD2	*132003*	*132003*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*2*							
DAREA	*142003*	*102003*		*-15999.9*					
TLOAD2	*142003*	*142003*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*3*							
DAREA	*100004*	*100004*		*1*					
TLOAD2	*100004*	*100004*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*0*							
DAREA	*110004*	*100004*		*-1199.99*					
TLOAD2	*110004*	*110004*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*2*							
DAREA	*120004*	*100004*		*15999.98*					
TLOAD2	*120004*	*120004*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*3*							
DAREA	*130004*	*100004*		*1200.002*					
TLOAD2	*130004*	*130004*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*2*							

Table F.3 (continuation)

DAREA	*140004*	*100004*		*-16000*					
TLOAD2	*140004*	*140004*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*3*							
DAREA	*102004*	*102004*		*1*					
TLOAD2	*102004*	*102004*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*0*							
DAREA	*112004*	*102004*		*-1199.99*					
TLOAD2	*112004*	*112004*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*2*							
DAREA	*122004*	*102004*		*15999.98*					
TLOAD2	*122004*	*122004*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*3*							
DAREA	*132004*	*102004*		*1200.002*					
TLOAD2	*132004*	*132004*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*2*							
DAREA	*142004*	*102004*		*-16000*					
TLOAD2	*142004*	*142004*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*3*							
DAREA	*130005*	*100005*		*1199.999*					
TLOAD2	*130005*	*130005*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*2*							
DAREA	*140005*	*100005*		*-15999.9*					
TLOAD2	*140005*	*140005*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*3*							
DAREA	*132005*	*102005*		*1199.999*					
TLOAD2	*132005*	*132005*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*2*							
DAREA	*142005*	*102005*		*-15999.9*					
TLOAD2	*142005*	*142005*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*3*							
$.....	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*
DAREA	*200001*	*200001*		*-9.99999*					
TLOAD2	*200001*	*200001*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*1*							
DAREA	*210001*	*200001*		*199.9999*					
TLOAD2	*210001*	*210001*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*2*							
DAREA	*202001*	*202001*		*-9.99999*					
TLOAD2	*202001*	*202001*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*1*							
DAREA	*212001*	*202001*		*199.9999*					
TLOAD2	*212001*	*212001*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*2*							
DAREA	*200002*	*200002*		*-9.99999*					
TLOAD2	*200002*	*200002*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*1*							
DAREA	*210002*	*200002*		*199.9999*					

Table F.3 (continuation)

TLOAD2	*210002*	*210002*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*2*							
DAREA	*220002*	*200002*		*9.999998*					
TLOAD2	*220002*	*220002*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*1*							
DAREA	*230002*	*200002*		*-199.999*					
TLOAD2	*230002*	*230002*		*0*	*0.5*	*0.55*	*0*	*0*	
	0	*2*							
DAREA	*202002*	*202002*		*-9.99999*					
TLOAD2	*202002*	*202002*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*1*							
DAREA	*212002*	*202002*		*199.9999*					
TLOAD2	*212002*	*212002*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*2*							
DAREA	*222002*	*202002*		*9.999998*					
TLOAD2	*222002*	*222002*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*1*							
DAREA	*232002*	*202002*		*-199.999*					
TLOAD2	*232002*	*232002*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*2*							
DAREA	*200003*	*200003*		*-10*					
TLOAD2	*200003*	*200003*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*1*							
DAREA	*210003*	*200003*		*200.0003*					
TLOAD2	*210003*	*210003*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*2*							
DAREA	*220003*	*200003*		*9.999998*					
TLOAD2	*220003*	*220003*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*1*							
DAREA	*230003*	*200003*		*-199.999*					
TLOAD2	*230003*	*230003*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*2*							
DAREA	*202003*	*202003*		*-10*					
TLOAD2	*202003*	*202003*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*1*							
DAREA	*212003*	*202003*		*200.0003*					
TLOAD2	*212003*	*212003*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*2*							
DAREA	*222003*	*202003*		*9.999998*					
TLOAD2	*222003*	*222003*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*1*							
DAREA	*232003*	*202003*		*-199.999*					
TLOAD2	*232003*	*232003*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*2*							
DAREA	*200004*	*200004*		*-9.99999*					
TLOAD2	*200004*	*200004*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*1*							

Table F.3 (continuation)

DAREA	*210004*	*200004*		*199.9999*					
TLOAD2	*210004*	*210004*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*2*							
DAREA	*220004*	*200004*		*10.00001*					
TLOAD2	*220004*	*220004*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*1*							
DAREA	*230004*	*200004*		*-200*					
TLOAD2	*230004*	*230004*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*2*							
DAREA	*202004*	*202004*		*-9.99999*					
TLOAD2	*202004*	*202004*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*1*							
DAREA	*212004*	*202004*		*199.9999*					
TLOAD2	*212004*	*212004*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*2*							
DAREA	*222004*	*202004*		*10.00001*					
TLOAD2	*222004*	*222004*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*1*							
DAREA	*232004*	*202004*		*-200*					
TLOAD2	*232004*	*232004*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*2*							
DAREA	*200005*	*200005*		*9.999998*					
TLOAD2	*200005*	*200005*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*1*							
DAREA	*210005*	*200005*		*-199.999*					
TLOAD2	*210005*	*210005*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*2*							
DAREA	*202005*	*202005*		*9.999998*					
TLOAD2	*202005*	*202005*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*1*							
DAREA	*212005*	*202005*		*-199.999*					
TLOAD2	*212005*	*212005*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*2*							
$.....	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*
NOLIN2	*2*	*11*	*3*	*-1*	*100002*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*12*	*3*	*-1*	*100003*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*13*	*3*	*-1*	*100004*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*10*	*5*	*-1*	*200001*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*11*	*5*	*-1*	*200002*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*12*	*5*	*-1*	*200003*		*400000*		
=	*=*	*=*	*=*	*=*	**2000*	*=*	**2000*		
NOLIN2	*2*	*13*	*5*	*-1*	*200004*		*400000*		

Table F.3 (continuation)

=	=	=	=	=	*2000	=	*2000		
NOLIN2	2	14	5	-1	200005		400000		
=	=	=	=	=	*2000	=	*2000		
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
NOLIN2	2	400000		1	100002		11	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	100003		12	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	100004		13	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	200001		10	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	200002		11	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	200003		12	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	200004		13	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	400000		1	200005		14	5	
=	=	*2000	=	=	*2000	=	=	=	
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
NOLIN2	2	500000		1	100002		11	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	100003		12	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	100004		13	3	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	200001		10	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	200002		11	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	200003		12	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	200004		13	5	
=	=	*2000	=	=	*2000	=	=	=	
NOLIN2	2	500000		1	200005		14	5	
=	=	*2000	=	=	*2000	=	=	=	
$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....	$.....
DAREA	10	10	3	10000					
TLOAD2	10	10		0	0.5	0.55	0	0	
	0	0							
DAREA	10010	10	3	-199999					
TLOAD2	10010	10010		0	0.5	0.55	0	0	
	0	1							
DAREA	2010	10	3	20000					
TLOAD2	2010	2010		0	0.75	0.8	0	0	
	0	0							

Table F.3 (continuation)

DAREA	*12010*	*10*	*3*	*-399999*					
TLOAD2	*12010*	*12010*		*0*	*0.75*	*0.8*	*0*	*0*	
	0	*1*							
DAREA	*11*	*11*	*3*	*199999.9*					
TLOAD2	*11*	*11*		*0*	*0.5*	*0.6*	*0*	*0*	
	0	*1*							
DAREA	*10011*	*11*	*3*	*-399999*					
TLOAD2	*10011*	*10011*		*0*	*0.55*	*0.6*	*0*	*0*	
	0	*1*							
DAREA	*2011*	*11*	*3*	*399999.9*					
TLOAD2	*2011*	*2011*		*0*	*0.75*	*0.85*	*0*	*0*	
	0	*1*							
DAREA	*12011*	*11*	*3*	*-799999*					
TLOAD2	*12011*	*12011*		*0*	*0.8*	*0.85*	*0*	*0*	
	0	*1*							
DAREA	*12*	*12*	*3*	*200000*					
TLOAD2	*12*	*12*		*0*	*0.55*	*0.65*	*0*	*0*	
	0	*1*							
DAREA	*10012*	*12*	*3*	*-400000*					
TLOAD2	*10012*	*10012*		*0*	*0.6*	*0.65*	*0*	*0*	
	0	*1*							
DAREA	*2012*	*12*	*3*	*400000.1*					
TLOAD2	*2012*	*2012*		*0*	*0.8*	*0.9*	*0*	*0*	
	0	*1*							
DAREA	*12012*	*12*	*3*	*-800000*					
TLOAD2	*12012*	*12012*		*0*	*0.85*	*0.9*	*0*	*0*	
	0	*1*							
DAREA	*13*	*13*	*3*	*200000*					
TLOAD2	*13*	*13*		*0*	*0.6*	*0.7*	*0*	*0*	
	0	*1*							
DAREA	*10013*	*13*	*3*	*-399999*					
TLOAD2	*10013*	*10013*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*1*							
DAREA	*2013*	*13*	*3*	*400000.1*					
TLOAD2	*2013*	*2013*		*0*	*0.85*	*0.95*	*0*	*0*	
	0	*1*							
DAREA	*12013*	*13*	*3*	*-799999*					
TLOAD2	*12013*	*12013*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*1*							
DAREA	*14*	*14*	*3*	*199999.9*					
TLOAD2	*14*	*14*		*0*	*0.65*	*0.7*	*0*	*0*	
	0	*1*							
DAREA	*2014*	*14*	*3*	*399999.9*					
TLOAD2	*2014*	*2014*		*0*	*0.9*	*0.95*	*0*	*0*	
	0	*1*							
$.....	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*
DLOAD	*999*	*1*	*1*	*100001*	*1*	*110001*	*1*	*120001*	

Table F.3 (continuation)

	1	*102001*	*1*	*112001*	*1*	*122001*	*1*	*100002*	
	1	*110002*	*1*	*120002*	*1*	*130002*	*1*	*140002*	
	1	*102002*	*1*	*112002*	*1*	*122002*	*1*	*132002*	
	1	*142002*	*1*	*100003*	*1*	*110003*	*1*	*120003*	
	1	*130003*	*1*	*140003*	*1*	*102003*	*1*	*112003*	
	1	*122003*	*1*	*132003*	*1*	*142003*	*1*	*100004*	
	1	*110004*	*1*	*120004*	*1*	*130004*	*1*	*140004*	
	1	*102004*	*1*	*112004*	*1*	*122004*	*1*	*132004*	
	1	*142004*	*1*	*130005*	*1*	*140005*	*1*	*132005*	
	1	*142005*	*1*	*200001*	*1*	*210001*	*1*	*202001*	
	1	*212001*	*1*	*200002*	*1*	*210002*	*1*	*220002*	
	1	*230002*	*1*	*202002*	*1*	*212002*	*1*	*222002*	
	1	*232002*	*1*	*200003*	*1*	*210003*	*1*	*220003*	
	1	*230003*	*1*	*202003*	*1*	*212003*	*1*	*222003*	
	1	*232003*	*1*	*200004*	*1*	*210004*	*1*	*220004*	
	1	*230004*	*1*	*202004*	*1*	*212004*	*1*	*222004*	
	1	*232004*	*1*	*200005*	*1*	*210005*	*1*	*202005*	
	1	*212005*	*1*	*10*	*1*	*10010*	*1*	*2010*	
	1	*12010*	*1*	*11*	*1*	*10011*	*1*	*2011*	
	1	*12011*	*1*	*12*	*1*	*10012*	*1*	*2012*	
	1	*12012*	*1*	*13*	*1*	*10013*	*1*	*2013*	
	1	*12013*	*1*	*14*	*1*	*2014*			
$.....	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*	*$.....*