

N84 15592

NASA/MSFC NASTRAN AUXILIARY I/O ROUTINES

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ABSTRACT

Since the initial installation of NASTRAN on the UNIVAC 1100/82 computer at the Marshall Space Flight Center (MSFC), a number of "local" codes have been incorporated as "user routines." This paper describes four of these codes and how interested users may obtain additional information.

INTRODUCTION

The MAP elements supplied by COSMIC/NASTRAN contain the user subroutine names OUTPT4, DUMOD3, etc., along with corresponding dummy subroutines. Locally generated "user routines" are compiled and the relocatable elements are copied over the dummy relocatables for mapping into the COSMIC/NASTRAN system. Several local codes have been generated for the MSFC computer installations by BCSS and its predecessors and incorporated into NASTRAN in this manner.

The routines were written in the FORTRAN V language as used with standard COSMIC/NASTRAN. All of the appropriate links were mapped using the MAP elements supplied with the COSMIC/NASTRAN package.

The "user routines" are described in the following format: 1) purpose of routine or function, 2) installation of routine into standard COSMIC/NASTRAN, 3) example showing use of the routine. Note that the routine names used in the text differ from the DMAP "calling" names.

BACKGROUND/REQUIREMENTS

- OUTPT4 - This module was written to create FORTRAN-written, unformatted user tapes containing banded matrix data recovered from NASTRAN matrix data blocks as requested by the user via the OUTPUT4 DMAP instruction. The data is in a simple compact, convenient form and contains no special labeling codes.
- INPT4 - Companion module to OUTPT4, reads matrix data blocks from OUTPT4 tapes.
- DUMOD3 - This module was created to convert NASTRAN tabular data blocks into matrix data block format for convenience in manipulation and output, especially by OUTPT4. The element or gridpoint identification data is also recovered and output separately.

INPTT3 - This routine uses coding supplied by Rockwell International (RI) for reading matrix data in that company's customary format into NASTRAN matrix data blocks. The RI data is in a compact Fortran-formatted coded form, which appears to have quite widespread acceptance in the aerospace field.

PFDR - Print File Data Retrieval post processor originally written to extract OUTPT4 data from the NASTRAN print file, it is particularly useful when data output is required from more than one link execution as occurs frequently during substructure recovery procedures. In such cases, the normal output files are rewound after each link has been executed, thus ensuring that subsequent executions of the output modules will overwrite earlier ones. The print file is, of course, rewind inhibited. The program has now been generalized to extract all types of data. The user is required to provide header information to enable the program to find the data on the NASTRAN print file.

IMPLEMENTATION

1. **OUTPT4** - Outputs selected matrices to binary file INP1.
 - A. Entry Point - OUTPT4; SUBROUTINE: WRTAPE
 - B. NASTRAN Link: LINK14
 - C. DMAP Calling Sequence: OUTPUT4 I1,I2,I3,I4,I5//V,N,P1/V,N,P2 \$
 - D. Input Data Blocks: Ii - Any matrix data block which the user desires to be written on NASTRAN file INP1. Purged data blocks are ignored. Up to five data blocks may be output.
 - E. Output Data Blocks: None.
 - F. Method: The OUTPT4 routine checks to determine whether the matrix data block is purged. If it is not, a call is made to subroutine WRTAPE, which writes each column of the matrix onto the user tape INP1. Parameters P1 and P2 provide controls corresponding to those in the standard OUTPT2 module (q.v.).
 - G. Example: A comprehensive example of OUTPT4 and INPTT4 usage is provided as part of the description for the latter routine.

2. INPTT4 - reads matrix data from an OUTPT4 file assigned to INP2 into a specified matrix data block.

A. Entry Point: INPTT4.

B. NASTRAN Link: LINK2.

C. DMAP Calling Sequence:

INPUTT4 /MDB,,,,/V,N,P1/V,N,P2/V,N,P3 \$

D. Input Data Blocks: None.

E. Output Data Blocks:

MDB - Matrix data block to be loaded with data from user file INP2.

F. Method: Retrieves one matrix from user file INP2 for each call to the routine. This file may be the INP1 file generated by the OUTPT4 routine or a similar user-written FORTRAN file. The required format for this file and usage of parameters P1, P2 and P3 are described in the OUTPUT4 documentation.

G. Examples: The use of both INPTT4 and OUTPT4 is illustrated in the DMAP ALTER sequence of Figure 1. Two matrices are read from a file previously created by OUTPT4 and subsequently printed using the MATPRN module (Figure 2). The OUTPT4 listing is shown in Figure 3.

H. Notes:

1. The primary use of this routine is to enable the user to obtain NASTRAN generated matrices in a FORTRAN binary format for subsequent use in user-written Fortran programs. Similarly formatted matrices created by NASTRAN OUTPT4 or by user-written Fortran programs can be read into NASTRAN data blocks by using the companion INPTT4 module.
2. The order of retrieval of matrix data blocks must be in the order which they were written.
3. Matrices output by OUTPT4 will be written on file INP1. This tape must be assigned as INP2 in subsequent NASTRAN runs when using INPTT4 to recover the matrices. Parameter usage is discussed in the user documentation.

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DMAP ALTER SEQUENCE FOR INPTT4
AND OUTPT4

```
IC RI OWRITER
APP      DISPLACEMENT
SGL     1,0
DIAG 8
TIME 150
$
$      INPUTS KG,MO INTO KORB,MOR0
ALTER 30
INPUTT4/KORB,,,,/C,N,193/C,N,193/C,N,2 $
CHKFNT KORB $
MATPRN KORB,,,,// $
OUTPUT4 KORB,,,,//C,N,1/C,N,1 $
EXIT
ENDALTER
CEND
```

FIGURE 1

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MATRIX AFTER INPTT4 EXECUTION

MATRIX NAME (GJNO MAPL ID) J IS A REAL		193 COLUMN X		193 ROW RECTANG		MATRIX.	
COLUMA	I	NO.S	1 THRU	193	1	THRU	193
1.7908e+05	-1.07880e+05	1.53271e+03	6.38503e+02	8.54264e+03	6.40303e+04	-2.67360e+03	6.44992e+03
1.54788e+06	-8.70712e+04	6.09992e+06	1.53621e+04	-3.93861e+04	-1.17151e+04	-5.08013e+02	1.479319e+04
6.35558e+03	2.48374e+03	3.49068e+03	1.63617e+03	6.73577e+03	1.31630e+03	3.31632e+04	2.17698e+03
3.12670e+03	-7.35477e+03	3.61542e+03	-6.31748e+03	-2.46843e+03	9.47095e+03	-9.34969e+03	2.66353e+03
-7.65216e+03	-5.18667e+03	7.57949e+02	7.68268e+03	1.72016e+02	-1.03655e+03	-1.54797e+01	1.12780e+02
1.57521e+02	-2.14741e+03	1.23374e+03	1.35838e+03	9.99146e+02	-4.34284e+02	-5.69905e+03	1.04996e+03
1.55533e+03	3.42184e+02	5.19558e+02	1.05538e+03	-5.76688e+02	-6.72748e+02	-1.94999e+03	-2.32552e+02
1.41890e+02	-1.03484e+03	2.48042e+03	2.92930e+03	1.90114e+02	9.18117e+02	-6.01263e+02	-1.57162e+02
-1.18709e+03	-2.84481e+03	1.12829e+02	-6.79756e+02	3.72826e+02	1.82791e+03	6.50141e+02	7.58985e+02
3.50209e+03	-2.03717e+02	-6.93611e+02	1.12829e+02	1.76353e+02	-6.95085e+02	1.10413e+02	-5.87702e+02
2.186138e+02	8.63029e+02	1.44420e+03	2.77059e+03	-4.56488e+03	-6.25713e+03	1.35373e+02	-4.06849e+02
6.52806e+00	-2.66957e+01	1.17155e+02	7.17144e+01	4.72418e+01	2.41548e+01	1.71118e+01	2.71173e+02
-5.159895e+1	5.72646e+01	7.65008e+00	6.06188e+01	-6.28618e+02	2.68492e+01	1.95195e+00	-5.90909e+01
6.74758e+01	-5.07283e+02	-2.04308e+00	4.26489e+01	-6.28618e+02	5.32595e+01	2.81099e+01	-4.23244e+01
-1.14581e+01	6.76566e+01	1.68200e+01	-1.03797e+00	7.22356e+00	6.62835e+00	6.08687e+01	-4.13691e+00
1.37047e+00	1.36248e+01	2.49711e+00	5.64631e+00	6.62835e+00	1.17787e+00	1.37658e+00	1.73934e+00
2.54312e+00	-2.44182e+01	-6.91156e+00	-7.98025e+01	3.133635e+01	1.83149e+01	2.70936e+00	-2.37244e+01
-9.50665e+01	1.153397e+01	-3.86587e+00				-1.01071e+02	1.52410e+02

COLUMA	2	NO.S	1 THRU	193	1	THRU	193
1.07880e+05	7.80277e+04	3.76717e+02	8.84821e+01	-2.72850e+01	-7.29513e+04	9.10128e+02	-7.01900e+03
1.54788e+06	4.59887e+04	-7.19049e+04	-1.48634e+06	3.32303e+04	1.24812e+04	5.92197e+02	-1.31631e+04
6.35558e+03	-8.08012e+02	-3.31926e+03	1.43461e+06	-6.19309e+03	-4.03644e+02	-1.12777e+04	1.11155e+02
3.12670e+03	1.96333e+03	3.65384e+03	8.98311e+03	2.11688e+02	7.11670e+07	6.84641e+00	-6.13917e+01
1.27005e+01	2.45759e+02	-1.54587e+02	-4.74248e+00	6.88339e+03	2.70197e+02	1.21255e+02	-2.85700e+01
1.44660e+02	1.59067e+03	3.65443e+00	5.31798e+03	-1.40102e+02	-2.94866e+01	-6.48983e+02	3.85135e+02
-1.19341e+03	7.54506e+01	-2.32582e+02	-2.17128e+02	5.34791e+07	6.00126e+02	1.87724e+00	-9.79095e+01
-2.77598e+01	7.64807e+01	-1.16145e+03	-6.15585e+00	9.02779e+01	-2.03166e+02	6.40158e+01	3.02324e+02
1.09045e+03	3.26210e+02	-2.62532e+01	7.14940e+01	-1.01601e+03	-2.87024e+00	-4.45504e+01	6.51335e+00
-6.63792e+01	1.64437e+02	8.16692e+02	2.69200e+02	3.63744e+01	1.53209e+02	-1.78678e+02	1.76795e+01
2.81872e+02	1.65164e+02	2.54502e+02	3.04523e+01	6.49037e+01	2.33094e+02	-9.15338e+02	4.76248e+01
6.37332e+01	-1.31266e+00	-6.14650e+00	-7.15140e+00	5.44258e+01	8.11120e+01	-1.44444e+02	-5.93256e+02
5.46702e+00	3.10629e+01	9.73273e+01	1.01889e+01	1.74398e+01	5.71775e+01	1.19183e+02	-1.11022e+02
-4.82208e+01	-5.16205e+01	-5.29243e+00	-8.81727e+01	1.14181e+02	-7.37161e+02	-2.55992e+01	3.76031e+02
2.62315e+02	-2.18811e+02	-6.29304e+01	-1.84526e+01	3.51927e+00	-1.93752e+01	-7.101170e+00	-1.99816e+02
-5.67461e+02	-4.13375e+02	3.14742e+00	6.38691e+01	-3.70058e+01	1.29357e+00	8.01655e+02	-5.01695e+01
1.37898e+00	3.97398e+01	-6.87433e+00	-1.90822e+00	-1.87545e+00	1.00701e+00	-5.46232e+01	-2.47013e+00
		2.15088e+00	8.09710e+01	-1.33223e+01	-6.64966e+01	1.47764e+00	1.17811e+01
						6.78766e+00	6.42061e+01

FIGURE 2

OUTPT4 MATRIX LISTING

PARMIB ACRO UNPACKED AND WRITTEN ON TAPE.

LINK FILE NAME 101
NO. COLS = 193
TR = 2
FORM = 2

LINK CLM IF TIME 36594
LINK SYST SUFFLE 1795
USABLE ON CORE=36799

COLUMN 1

179085710091004	10780210091004	151270864006004	15026991153003	784548881010004	84361030038000
287300589823004	884920611720004	6213361179810005	71919833247000	1387679524006007	4707124837770005
6199420879383005	153820618493005	3538612843212005	17150029528005	508812766001003	1479387001415005
936272128090004	484385921837004	6155562810045004	2683737834851004	249067710229004	1436165989188005
873577449507004	133610131829004	3316116335123004	217698285805004	1003403916202004	3281135544283004
262607272587004	219972836083004	3819821717613004	521748175276004	208303549123003	997095144585003
634685550318002	266353439176002	1127796933001003	2277640245831004	76C215949887002	516660528283003
7576491185106003	320177878104002	1720181949917003	1036549019198004	359766209903002	3827717573765003
699186367001003	434525456503001	1575210126383003	123737009868003	123373009868003	3154370013309003
1155033701681003	342184287081003	519537603696001	1099955249227004	7692423286508003	332201195678001
1149979041866004	292929736316002	1574162593593003	1099955249227004	7692423286508003	332201195678001
1601817434624004	13278627081003	190116267656003	1099955249227004	7692423286508003	332201195678001
118708072906004	183786057421002	141496985516003	938117301457003	483262761805002	3155117815884003
104506682165004	28480864976002	6891812339853002	759880257905001	2980821643000002	6366511909023002
85C141C981659003	108712763755002	4566714262409002	6797578736842002	440150928321002	186887172531002
893162840005003	386948183181002	1783267388937003	5506377595388003	3002993971338002	203719876633003
565895949355003	1018658121785003	594183189289003	6430286811313003	3106118246679003	537762324492003
2190384510756003	251849991134003	506683883190003	808493300542003	282403722346003	5869800583078003
1172551697132003	48388644371001	1444196155122002	2776589668988002	1369168779965002	282720791828002
63726856793003	638538818738002	87417920807001	4478702665002	4528063623569000	2669566232168002
1172551697132003	71719386388000	87417920807001	23887855460002	471117368701002	271172706186002
280895625057003	4792569061435001	589646557873002	576457006672002	7850061358559001	606184260005002
4767580151427002	2269520454096000	145185059938001	5969092999711000	210490580339001	140611609004002
281493938697002	4232443730466001	2043088751106001	4786956574718002	9821556386116001	532551448833002
1681995507568002	1037971864893001	113848393641002	629197936927001	5145811078310000	676566240258000
1739339361986001	1040246369173001	7235715963554001	1329366150297001	8008865243988000	616893796987001
62997910870001	1177864923164001	1370916371773001	1132657768068001	2997107900626001	5866377378249001
264311222749001	284181133835000	8209519518192001	17802286811586001	3374939218008000	2088798443471000
270935489868001	1018658121785003	481155850387001	2248704336703003	3183359485950002	163159032340000
3963873142709001	1018658121785003	481155850387001	2248704336703003	3068653232321008	115948372998002

COLUMN 2

179085710091004	780277362575005	378716728733003	4948021335461002	3728946494643004	2295130713837005
287300589823004	747859833060004	599746367673005	10229168055025005	1255108212040007	45986944544005
6199420879383005	1463494061051005	3323032622675005	1748811827817005	1921970300994003	1336306178872005

FIGURE 3

3. DUMOD3

A. Entry Point: DUMOD3

B. NASTRAN Link: LINK7

C. DMAP Calling Sequence:

DUMMOD3 TDB,,,,,,/MDB,,,,,,/C,N,P1/C,N,0 \$

D. Input Data Blocks:

TDB NASTRAN Table Data Block.

E. Output Data Blocks:

MDB NASTRAN Matrix Data Blocks.

F. Method: Converts tabular data blocks into matrix data block format. Up to eight data blocks may be converted. The tables are mapped into a P1 x 8 matrix and the grid point/element ID's into array LTLID which is listed and punched on cards.

G. Examples: The example illustrates how the SPCFORCE (OQG table) can be reformatted using the DMAP sequence shown in Figure 4. The LTLID array of gridpoint ID numbers is shown in Figure 5. Figure 6 shows the NASTRAN SPCFORCE output and Figure 7 shows the corresponding DUMOD3 matrix, IFLOAD, as output using OUTPT4.

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DUMOD3 AND OUTPT4 DMAP INSTRUCTIONS

```

120 DUMMOD3 006.....//IFLOAD.....//C,N,100/C,N,0 $
121 CHKPNT IFLOAD $
122 OUTPUT4 IFLOAD.....//C,N,0/C,N,1 $
  
```

FIGURE 4

LTLID (ELEMENT/GRIDPOINT ID) ARRAY PRINTED AND PUNCHED BY DUMOD3

```

BXOT *NASTRAN-LINK7
*** DIAG 8 MESSAGE --- TRAILER FOR DATA BLOCK IFLOAD = 1
201 6 2 800 2 1 237 2962
LUCKY YOU - MISSION ACCOMPLISHED

LTLID ARRAY FOLLOWS
50100 50200 50300 50400 200300 200700 201000 201300 201700 202100 205370 206000 206400
207500 207600 207700 208000 208500 208800 209200 210500 211200 211300 211800 211900 213400
213700 214100 214800 215900 217500 218200 219700 220100 220200 220500 220700 220800 222900
221000 221200 221600 221700 222000 222200 222500 227900 228300 228700 229300 229400 230000
260100 260200 260300 260400 260500 260600 260700 260800 260900 261000 262100 262200 300100
300200 300300 300400 300500 300600 300700 300800 300900 301000 301100 301200 301300 301400
301500
  
```

FIGURE 5

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
501	6	-1.206404-05	1.199143-04	1.613954-04	.0	.0	.0
502	6	4.743631-06	-2.396741-04	-1.591604-04	.0	.0	.0
503	6	1.039475-05	1.796075-04	1.850083-04	.0	.0	.0
504	6	-4.584176-06	-4.991144-05	1.962456-05	.0	.0	.0
2003	6	4.776796-04	-4.597919-03	-2.678502-05	.0	.0	.0
2007	6	8.541583-03	4.224124-03	3.366251-05	.0	.0	.0
2010	6	-2.066444-03	-1.081322-02	-3.450337-05	.0	.0	.0
2013	6	-8.890361-04	-1.502390-02	7.701640-05	.0	.0	.0
2017	6	3.489469-03	2.208440-02	3.170490-04	.0	.0	.0
2021	6	1.604019-03	-1.295724-03	-6.565984-06	.0	.0	.0
2053	6	4.066217-03	-6.056302-03	-3.244750-05	.0	.0	.0
2060	6	-2.663704-03	2.597022-02	-1.893663-04	.0	.0	.0
2064	6	-5.511136-03	3.506613-02	-6.132162-05	.0	.0	.0
2075	6	-2.132384-04	-1.438704-02	1.652450-05	.0	.0	.0
2076	6	6.916324-03	5.005876-03	3.090334-06	.0	.0	.0
2077	6	-1.568421-02	-1.470724-02	-1.176732-05	.0	.0	.0
2080	6	1.702856-02	-2.640372-03	2.055777-06	.0	.0	.0
2085	6	-7.705988-04	5.992521-03	4.369031-05	.0	.0	.0
2088	6	-6.792754-03	-1.247024-02	6.746242-05	.0	.0	.0
2092	6	-5.295667-03	-1.091623-02	-1.549079-04	.0	.0	.0
2105	6	3.217898-03	2.227146-03	3.284419-05	.0	.0	.0
2112	6	2.620365-04	-2.459823-02	8.146604-05	.0	.0	.0
2113	6	3.677660-03	-1.458527-02	4.641478-05	.0	.0	.0
2118	6	-4.814373-03	-1.145327-02	1.504774-05	.0	.0	.0
2119	6	3.294460-03	9.743377-03	-4.582586-05	.0	.0	.0
2134	6	-6.645710-03	2.721332-02	-3.776112-05	.0	.0	.0
2137	6	5.345116-03	1.546585-02	-5.719251-06	.0	.0	.0
2141	6	5.601469-03	8.156471-03	-1.156974-04	.0	.0	.0
2148	6	-8.004943-03	-5.453392-03	-3.785817-05	.0	.0	.0
2159	6	-1.881301-03	-2.715342-02	-4.199450-05	.0	.0	.0
2175	6	-4.314905-03	1.686265-02	3.37852-05	.0	.0	.0
2182	6	-1.063962-02	-1.892261-02	1.335583-06	.0	.0	.0
2197	6	6.898105-03	-4.473658-03	5.992265-06	.0	.0	.0
2201	6	-1.200352-03	-1.297658-02	-6.877478-05	.0	.0	.0
2202	6	-1.789929-03	-2.374511-03	5.776044-05	.0	.0	.0
2205	6	1.422485-03	2.387991-03	-3.556397-06	.0	.0	.0
2207	6	4.545874-03	-1.132318-02	3.139352-05	.0	.0	.0
2208	6	4.605546-03	1.341997-02	3.141458-05	.0	.0	.0
2209	6	-3.969116-03	1.414541-02	-6.278013-05	.0	.0	.0
2210	6	5.832229-04	1.905805-02	-2.440898-05	.0	.0	.0
2212	6	-1.365599-03	-3.370628-02	-1.437631-06	.0	.0	.0
2216	6	4.266109-04	-1.273158-02	1.448176-05	.0	.0	.0
2217	6	-6.719694-04	-6.144261-03	-2.363826-05	.0	.0	.0
2220	6	3.261426-05	9.935439-03	2.497232-05	.0	.0	.0
2222	6	-2.091690-03	8.261046-03	-2.354926-05	.0	.0	.0

NASTRAN SFCFORCE OUTPUT LISTING
FIGURE 6

MATRIX IFLOAD UNPACKED AND WRITTEN ON TAPE.

GINO FILL NAME= 1D3
 NO. COLS. = 6
 NO. ROWS = 800
 TYPE = 1
 FORM = 2

OPEN CORE LENGTH= 113066
 GINO SYSTEM BUFFER= 1795
 USABLE OIEN CORE=*****

COLUMN	1	2	N= 62P
-.12068036-04	.1619576-03	.11991427-03	.00000000
.47436311-05	-.15916036-03	-.23967435-03	.00000000
-.10394751-04	.1650830-03	.17550747-03	.00000000
-.45541763-05	.14628855-04	-.46911438-04	.00000000
-.7767962-03	-.2675019-04	-.45909189-02	.00000000
-.85415825-02	.33662506-04	-.42241237-02	.00000000
-.20664438-02	-.34503365-04	-.10813224-01	.00000000
-.86903608-03	-.77016397-04	-.15023900-01	.00000000
.34894688-02	.3174697-03	.22094805-01	.00000000
.10049189-02	-.65659636-05	-.12767244-02	.00000000
.40662169-02	-.32447500-04	-.60563016-02	.00000000
-.226637043-02	.18936626-03	-.25970218-01	.00000000
-.25511363-02	.61321623-04	.35056128-01	.00000000
-.2132383-03	.16528504-04	-.14357036-01	.00000000
.6163244-02	.30903344-05	.50058757-02	.00000000
-.15889205-01	-.11767310-04	-.147017240-01	.00000000
-.17028559-01	.20552766-05	-.26493725-02	.00000000
-.77059880-03	.43690311-04	.59925207-02	.00000000
-.67927536-02	.67462422-04	-.12473242-01	.00000000
-.52956668-02	-.15490786-03	-.10916224-01	.00000000
.32178978-02	.32844188-04	.22221459-02	.00000000
.26263655-03	.81866044-04	-.25998233-01	.00000000
.36776596-02	.46414777-04	.14585273-01	.00000000
-.48143731-02	.15047738-04	-.11453275-01	.00000000
.32948604-02	-.4585860-04	.97433770-02	.00000000
-.66457099-02	-.37861124-04	.27213320-01	.00000000
.53451161-02	.57192513-05	.35465854-01	.00000000
-.56018686-02	-.11569742-03	.81564706-02	.00000000
-.40049429-02	-.37698167-04	-.58533918-02	.00000000
-.11813013-02	-.41944500-04	-.27153418-01	.00000000
-.43149046-02	-.33878517-04	.16862650-01	.00000000
.68981051-02	.13395834-05	-.18922612-01	.00000000
-.17899293-07	.59922645-05	-.44736578-02	.00000000
-.12003521-02	-.68774773-04	-.12976578-01	.00000000
-.14228848-02	.57760480-04	-.23785111-02	.00000000
.45458743-02	-.35563966-05	.23879906-02	.00000000
.40059464-02	.31393525-04	-.11323180-01	.00000000
-.39691163-02	.31414590-04	.13419978-01	.00000000
.56322291-03	-.62760133-04	.14145413-01	.00000000
	-.284408977-04	.19058050-01	.00000000

FIGURE 7

OUTPT4 LISTING OF DUMOD3 MATRIX FORMATTED SPCFORCE TABLE

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4. INPTT3 - Reads matrix data from an RI-formatted file assigned to INPT into specified matrix data blocks.

A. Entry Point: INPTT3.

B. NASTRAN Link: LINK2

C. DMAP Calling Sequence:

```
INPUTT3  KO,MO,,,/KX,MX,,,/C,N,-1/C,N,0/C,N,0 $
```

D. Input Data Blocks: RI formatted matrices from file INPT.

E. Output Data Blocks: All NASTRAN matrix data blocks.

F. Method: Reads the matrices from an RI-formatted data file into NASTRAN matrix data blocks. Up to five matrices may be read.

G. Examples: Figure 8 shows the DMAP ALTER sequence required for loading two matrices into the Normal Modes Analysis Rigid Format and adding them into the mass and stiffness matrices. The diagnostic messages printed by NASTRAN to indicate successful completion of the INPUTT3 instruction are shown in Figure 9.

H. Notes: The file INPT must be assigned containing the RI-formatted data.

INPUTT3 DMAP ALTER SEQUENCE

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```

ID RI ORBITER
APP DISPLACEMENT
SOL 3,0
TIME 150
$
$ INPUTS KO, MO INTO KORB, MORB
ALTER 36
INPUTT3 KO,MO,,,/KORB,MORB,,,/C,N,-1/C,N,0/C,N,0 $
CHKPNT KORB,MORB $
$
$ FORMS KF1, MF1 AND ADDS KORB, MORB FORMING KFF, MFF
ALTER 71,72
EQUIV KNN,KF1/SINGLE/MNN,MF1/SINGLE $
CHKPNT KF1,MF1 $
ALTER 74,75
SCE1 USET,KNN,MNN,,,/KF1,KFS,,,MF1,, $
CHKPNT KFS,KF1,MF1 $
ALTER 76
ADDS KF1,KORB,,,/KFF $
CHKPNT KFF $
ADDS MF1,MORB,,,/MFF $
CHKPNT MFF $
ENDALTER
CEND
    
```

FIGURE 8

NASTRAN MESSAGE TO DENOTE INPUTT3 MATRIX ENTRY

```

@XQT NASTRAN*NASTRAN.LINK2
DATA BLOCK KO FOUND WHILE SEARCHING FOR MORB
MATRIX BLOCK MORB IS OF SIZE 797 BY 797 AND TYPE 6

*** DIAG 8 MESSAGE -- TRAILER FOR DATA BLOCK MORB = 797 797
DATA BLOCK MO FOUND WHILE SEARCHING FOR MORB
MATRIX BLOCK MORB IS OF SIZE 797 BY 797 AND TYPE 6

*** DIAG 8 MESSAGE -- TRAILER FOR DATA BLOCK MORB = 797 797
    
```

FIGURE 9

5. PFDR - Print File Data Retrieval post processor

A. Method:

Repeated executions of OUTPUT4 and other output modules within a single NASTRAN run (especially in DMAP Looping) will cause previously written matrix data blocks on INP1 to be overwritten by subsequent calls to the output module. This being a system characteristic, the problem could not be resolved internally. The matrices were preserved in their entirety, however, when written by OUTPUT4 onto the NASTRAN print file. Hence, the print file is saved for subsequent input to a post-processor which extracts the matrices and writes them to a single file, which may be copied to tape for later processing. This approach enables the user to obtain the results of a number of output requests in a single run.

B. Input to PFDR:

The input to the post-processor is simply the NASTRAN printout file itself. This file can be obtained by the instruction @BRKPT PRINT\$/FILENAME on the UNIVAC computer. This instruction simply diverts the symbolic print data to the previously assigned file FILENAME, which can then be read by PFDR.

C. The PFDR Post-Processor:

The NASTRAN print file is converted to ASCII code to enable it to be read by the post-processor. The data "key phrase" is input to the post-processor. If no "key" is given, the processor automatically defaults to OUTPUT4 data.

D. Output Data:

The output data will contain the OUTPUT4 matrices or the particular data identified by the key phrase. This data is usually copied to tape for subsequent use. The data formats are described in the user documentation.

E. Implementation:

PFDR is currently not available on the MSFC IBM system.

F. Example: A sample runstream is shown in Figure 10.

E. Examples

PFDR SAMPLE RUNSTREAM

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```
S  
S----- PRINT FILE DATA RETRIEVAL -----  
S  
@DELETE,C PRXXXX.  
@DELETE,C OPXXXX.  
@CAT,P PRXXXX,F7I/POS/200  
@ASG,A PRXXXX.  
@BRKPT PRINTS/PRXXXX  
@XQT *NASTRAN.LINK1  
-----  
(NASTRAN RUN)  
-----  
@BRKPT PRINTS  
@USE 31,OPXXXX.  
@ED,UQ PRXXXX.  
EXIT  
@ASG,A C*NASTRAN.  
@PRT,TC C*NASTRAN.  
@XQT C*NASTRAN.X  
@ED,UP OPXXXX.  
EXIT  
@ASG,TJ OP4TP,U9S,SAVE04 . PALIIF  
@COPY,GMC OPXXXX.,OP4TP.  
@COPY,GMC OPXXXX.,OP4TP.  
@FREE OP4TP.  
@FREE PRXXXX.  
@FREE OPXXXX.  
@SYM PRXXXX.,,MHSP  
@SYM OPXXXX.,,MHSP
```

KEY:

- PRXXXX - FILE TO WHICH PRINTOUT IS DIVERTED
- OPXXXX - FILE TO WHICH EXTRACTED DATA IS WRITTEN
- 31 - ALTERNATE PRINT FILE DYNAMICALLY ATTACHED TO OPXXXX
- C*NASTRAN.X - EXECUTABLE ELEMENT OF PFDR
- OP4TP - TAPE TO WHICH OPXXXX IS COPIED
- MHSP - DENOTES PHYSICAL UNIT FOR PRINTER

FIGURE 10

SUMMARY

The MSFC COSMIC/NASTRAN Auxiliary I/O routines provide useful, additional capabilities for input and output of various matrices and tables between external files and NASTRAN. The PFDR print file post-processor allows the user to extract any type of data that is available from the NASTRAN print file. These routines are in frequent use on the MSFC UNIVAC 1100 and IBM systems.

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Prospective users may obtain further information from AH33/W. E. Galloway, NASA, MSFC, AL, Telephone: 205-453-2294.