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MODAL COUPLING PROCEDURES ADAPTED TO NASTRAN ANALYSIS OF THE 1/8-SCALE SHUTTLE STRUCTURAL DYNAMICS MODEL

Volume I – Technical Report

by

J. Zalesak

July 1975

Final Report – Prepared Under Contract No. NAS 1-10635-21

by

Grumman Aerospace Corporation
Bethpage, New York 11714

Langley Research Center
Hampton, Virginia 23665

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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ABSTRACT

A dynamic substructuring analysis, utilizing the component modes technique, of the 1/8 scale Space Shuttle Orbiter finite element model is presented. The analysis was accomplished in 3 phases, using NASTRAN RIGID FORMAT 3 (Level 15.5.1), with appropriate Alters, on the IBM 360-370 (Model 165). The Orbiter was divided into 5 substructures, each of which was reduced to interface degrees of freedom and generalized normal modes. The reduced substructures were then coupled in Phase 2 to yield the first 23 symmetric free-free orbiter modes. The eigenvectors in the original grid point degree of freedom lineup were then recovered in Phase 3. A comparison is then made with an analysis which was performed with the same model using the direct coordinate elimination approach under NASA contract NAS 1-10635-12 (Reference 1). Eigenvalues were extracted using the inverse power method.

INTRODUCTION

This portion of task NAS 1-10635-21 was undertaken to develop a modal synthesis approach to the substructuring procedure for analyzing the elements of the NASTRAN finite element model previously generated for the 1/8-scale shuttle dynamic model. This model consists of an orbiter and two solid rocket boosters all attached to a central external tank. Photographs of the assembled model are shown in Figs. 1 and 2 (NASA Langley photos L73 6687 and L73 6688). The NASTRAN (NASA Structural Analysis) finite element representation of the orbiter model is described in Reference 1. The NASTRAN finite element representation for the external tank and solid rocket boosters are described in References 2 and 3, respectively. A statistical description of these finite element models is shown on Table 1, which lists the number of grid points used, the number and types of members, and the degrees of freedom (DOF) remaining after reducing the number of independent coordinates.

This reduction is accomplished by imposing single point constrants (SPC) or multiple point constrants (MPC), or by assuming certain coordinates have no forces applied to them. The latter approach is called Guyan, after its originator (Reference 4).

The overall analysis flow, in Fig. 3-1 in Volume II of Reference 1, represents the originally proposed analysis for the combined total vehicle. The Orbiter was divided into five substructures: fuselage, cargo doors, fin, wing, and payload. The external tank was divided into two substructures: the LOX tank and the aft portion of the external tank (consisting of the inter-bank skirt, LH_2 tank, and aft tank skirt). The SRB originally was to be handled as a single unit (consisting of the forward skirt, propellant cylinder

and propellant, and the aft skirt), however, after computer storage problems were encountered, it was divided into two substructures as shown in Figs. 16 and 17 of Reference 3.

Referring to Fig. 3-2 in Volume II of Reference 1, observe that each of the five Orbiter substructures was analyzed to produce reduced mass and stiffness matrices for selected dynamic degrees of freedom (DOF's) and interface attachment points. Modes for these substructures were then obtained with the interfaces held. An exception is the fuselage, which was analyzed in a free-free condition. This approach aided in checking and understanding the behavior of the combined Orbiter vehicle. Next, the five substructure stiffness and mass matrices were merged to form the total Orbiter mass and stiffness matrices. These matrices were again reduced to yield final stiffness and mass matrices that were used in the modal analysis. This procedure of first merging the mass and stiffness matrices, then obtaining the eigenvalues, is called the direct method in this report.

Several technical problems arose during the study which prevented the completion of the proposed overall analysis, namely:

- The Orbiter analysis was completed at the same time that initial test results were made available. A rather poor correlation was shown to exist for the Orbiter alone
- The computer time required to analyze the hydroelastic model for the External Tank proved to be excessive
- The computer time required to analyze the viscoelastic model for the Solid Rocket Booster as a single model was high.

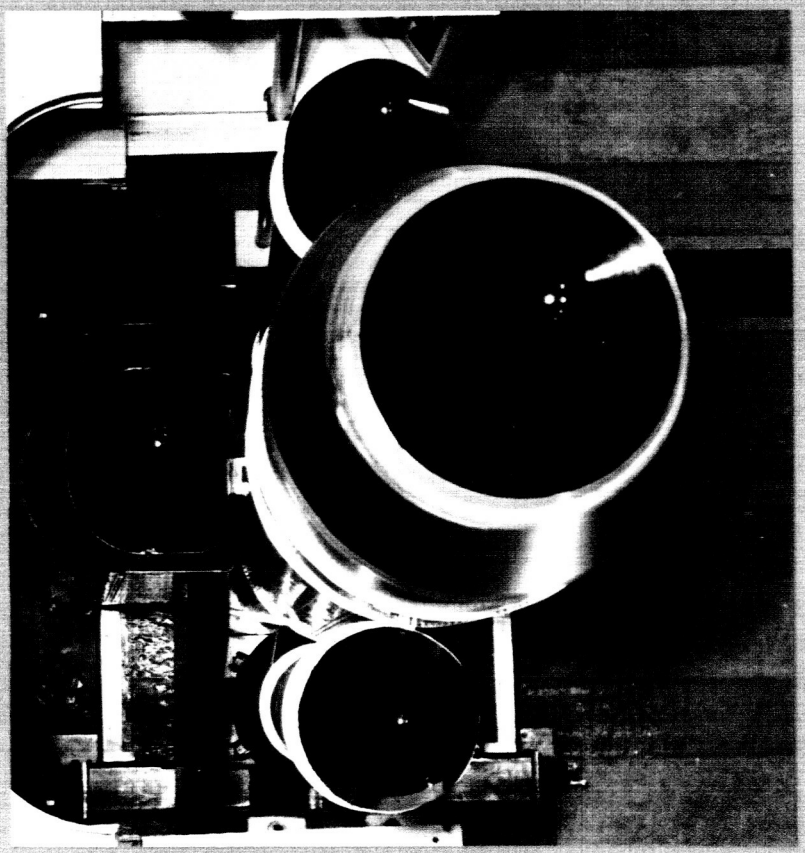

Fig. 1 Assembled 1/8-Scale Shuttle Model (View Looking Down)

Fig. 2 Assembled 1/8-Scale Shuttle Model (Side View)

Table 1 Statistical Description of 1/8-Scale Orbiter - Model II - Symmetric Case
Comparison Between Modal Synthesis and Direct Elimination Approach

COMPONENT	NO. GRID POINTS	NO. CBAR	NO. CQDMEM2	NO. CSHEAR	NO. CROD	NO. CTRMEM	NO. CELAS2 *	TOTAL NO. OF MEMBERS	MODAL SYNTHESIS: DOF AFTER SPC & MPC	MODAL SYNTHESIS: DOF AFTER GUYAN	MODAL SYNTHESIS: REDUCED SET: INTERFACE DOF	MODAL SYNTHESIS: REDUCED SET: COMPONENT MODES	DIRECT APPROACH: DOF AFTER SPC & MPC	DIRECT APPROACH: DOF AFTER GUYAN (REDUCED SET)
Fuselage	490	72	133	330	842	7	1	1385	1301	292	83	57	1301	238
Wing	83	--	-	104	133	-	-	237	245	214	35	28	245	155
Cargo Doors	134	13	28	64	92	-	-	197	320	224	26	35	320	26
Fin	62	--	24	22	65	-	3	114	102	84	11	7	99	23
Payload	14	8	-	-	-	-	2	10	26	26	3	12	24	24
Total 1/2 Orbiter	783	93	185	520	1132	7	6	1943	1994	840	158	139	1989	466
PHASE 2 COUPLING: Modal Synthesis	78	139 Scalar Points to Define Component Modes							223	223				
PHASE 2 COUPLING: Direct Approach	192	125 Plotel Elements for Plotting											397	362

NOTES: *In direct approach springs were included in coupling run.

The two major problems encountered (lack of correlation of analysis and test data for the orbiter; excessive computer time requirements for coupling the total vehicle) forced a decision to abandon the original overall analysis flow. Consequently, basic effort was redirected to rectifying the Orbiter analysis to obtain correlation with test results. The analytical and experimental investigations undertaken are described in References 1 and 5. These resulted in revised orbiter finite element representations which provided good agreement between analysis and test. In response to the problem of excessive computer time a two-pronged study was undertaken under task NAS1-10635-21 to find a means for improving the efficiency of the hydroelastic analysis and to develop procedures for using modal coupling for combining the NASTRAN substructure models. The latter effort is the subject of this report.

Much of the terminology describing the work done herein originates in the NASTRAN system and is described in detail in Reference 6.

ORBITER FINITE ELEMENT MODEL

The Orbiter finite element model used in the analysis was the Model II version developed in NASA contract NAS1-10635-12 (Reference 1). The Orbiter was divided into five substructures (fuselage, wing, cargo doors, fin and payload). The Model II statistics on number of GRID points and types of finite elements are listed on Table 1. Also in Table 1 are the degree of freedom statistics for the modal synthesis and direct approaches. The NASTRAN Bulk Data for the various substructures are listed in Volume II.

SUBSTRUCTURING PROCEDURE

The substructuring technique employed in the analysis of the Orbiter is known as the component modes or modal synthesis approach. The general theory is presented in Appendix A. The technique employed is essentially the same as presented by [illegible] in Reference 7, which is similar but not identical to Hurty's method described in Reference 8. The type of analysis chosen uses constraint and normal modes exclusively, and the eigenvectors need not be normalized in any particular manner. To provide for a more reliable analysis, procedures to assess the validity of the steps in assembling the model were incorporated in the Direct Matrix Abstraction Procedure (DMAP) alter statements. These checks are inserted to insure that the constraints applied by MPC's and SPC's (multipoint and single point constraints) do not induce spurious loads or reactions into the structural model. Steps are also incorporated to demonstrate that SPC's do not result in loss of mass in the modal. The transformation matrices, such as G_o, are checked to see if there is any deterioration in accuracy due to round-off or ill-conditioning. The reduced stiffness matrix (after reduction) is checked for equilibrium. The reduced mass is converted to a rigid body mass (or weight) matrix so that it could be compared to the original matrix (MO matrix which is output from module GPWG (Grid Point Weight Generator)) before reduction. A more detailed description of the checks is presented in Appendix A. The NASTRAN steps for these procedures are shown in Appendix B1.

The theory was incorporated into NASTRAN Rigid Format 3 via Alters. A detailed description of the Alters can be found in Appendix B1, while the actual IBM listing of Alters are in Volume II, Appendix B2. The analysis was performed

in three phases, as shown in Fig. 3, for the schematic diagram of the analysis flow. The three phases are similar to those proposed by R. Guyan in Reference 9. A brief description of the three phases is as follows:

- PHASE 1 - Component modes with interface fixed are calculated. The interface degrees of freedom are defined on SUPORT cards (r-set). The interface supports can be determinate or indeterminate. Calculation of component generalized and reduced interface matrices (stiffness and mass) are performed and put on tape. Phase 1 is done for each substructure.

- PHASE 2 - In this phase all uncoupled interface points are defined on GRID cards. The same GRID cards from Phase 1 can be used. All degrees of freedom except at the interface are defined on SPC cards. All component modes found in Phase 1 are defined by unique scalar point numbers. Higher frequency modes not considered essential can be put on SPC cards. The generalized and reduced interface matrices from Phase 1 runs are then merged into an uncoupled pseudo-structure-g lineup. The g-set consists of (6 x GRID POINTS + SCALAR POINTS) degrees of freedom. The common interface degrees of freedom are coupled using MPC cards. The coupled structure can now proceed through the normal reduction process to yield system normal modes. A tape is created for each substructure containing final eigenvectors in the substructure lineup which will be input to Phase 3.

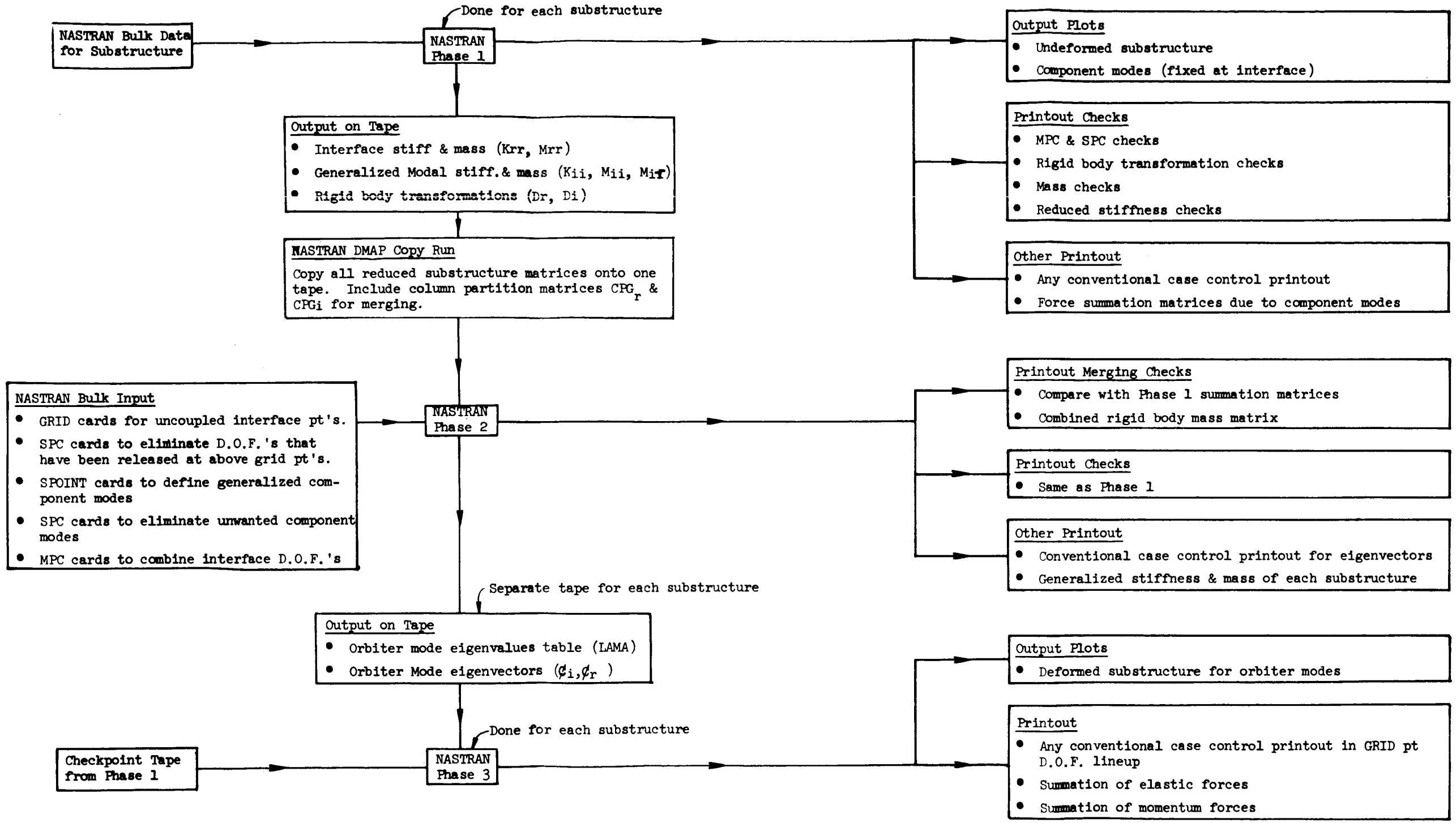

Fig. 3 Flow Diagram for NASTRAN Substructuring (Component Modes Method) to Obtain Orbiter Normal Modes

- PHASE 3 - Retrieval of final detailed substructure mode shape (eigenvectors) in original substructure GRID POINT designation. Phase 3 is done for each substructure.

RESULTS AND DISCUSSION

Results of the analysis are presented and discussed in this section. Where possible, the results were compared to results obtained for the same model using the direct coordinate elimination approach, which was performed under NASA contract NAS 1-10635-12 (Reference 1).

PHASE I COMPONENT MODES RESULTS

Although component modes were obtained in the direct method for checking purposes, the modes for this phase were either free-free, or restrained but without including the effects of the interface springs. Therefore, the only substructure that could be compared was the wing, and here the difference in frequencies was less than 1%.

Initially, in the modal approach, all but the massless degrees of freedom were retained to obtain component modes. The wing, which was the first substructure analyzed with this approach, yielded modes considered spurious. For example, Fig. 4 shows a fictitious mode caused by retaining dynamic coordinates at grid point directions connected by the minimal rods. The minimal rods were provided to prevent singularities in the idealization, since they separated shear panels not capable of resisting direct stress. These modes disappeared when the appropriate degrees of freedom were omitted by GUYAN reduction.

Omitting only the massless and fictitious degrees of freedom worked well with all substructures, except the fuselage. Here, additional coordinates had to be omitted, since the number retained in the direct method was an upper limit, if excessive computer time was to be avoided.

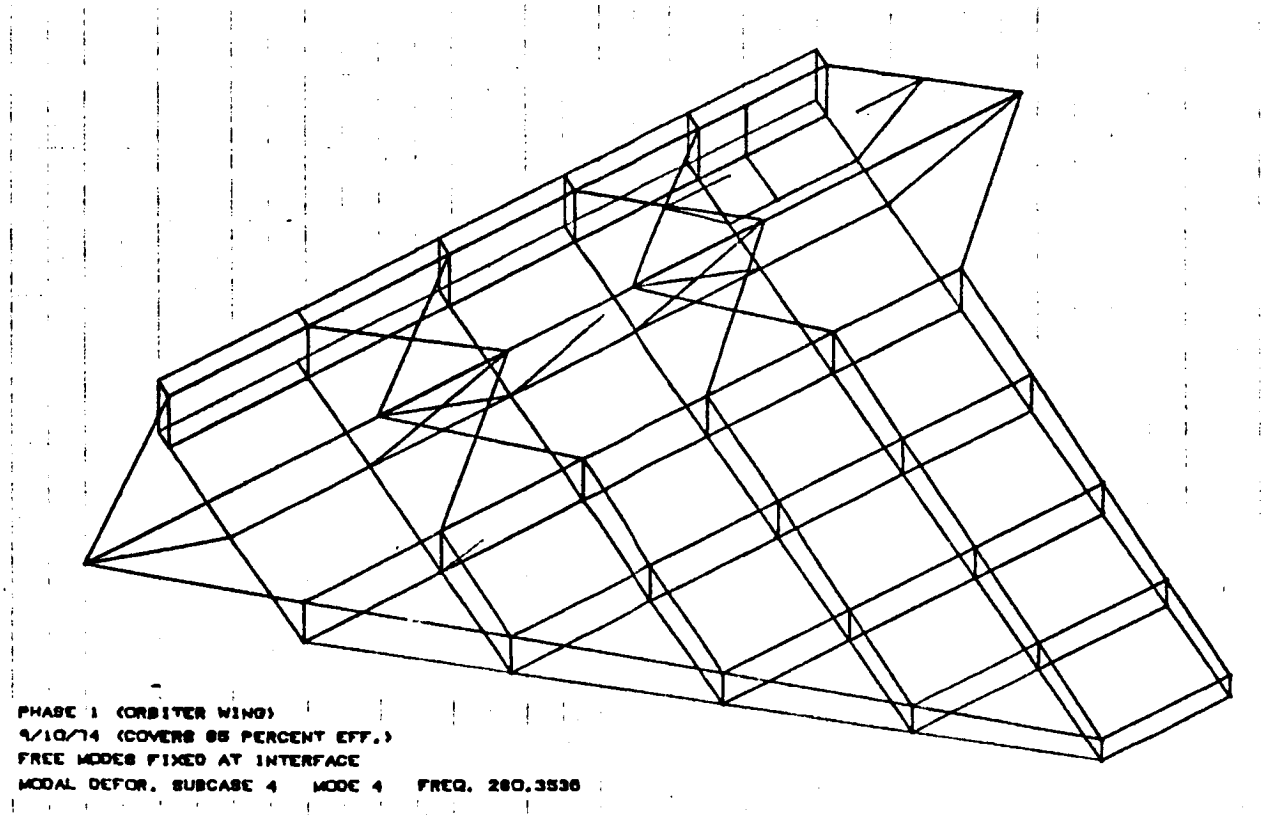

Fig. 4 Fictitious Wing Mode Caused by Not Omitting Degrees of Freedom in Direction of Minimal Rod Line

Component mode plots are presented in Volume II. They contain 57 fuselage modes, 20 wing modes, 35 cargo door modes, 7 fin modes and 12 payload modes. A closer examination of these plots uncovered some deficiencies in the Model II idealization of the wing.

The 6th wing component mode (404.5 Hz) in Appendix B6 demonstrated that this idealization had practically no lateral resistance at the interstage station. These flaws are shown in Fig. 5, which also indicates the fix-up to be taken. This error should not affect the total Orbiter system modes, but it would certainly affect a total Shuttle analysis, where the inclined interstage link would produce force componenets in the lateral direction.

The 10th and 11th wing component modes (599.4 and 613.6 Hz) in Appendix B6 revealed the other flaw indicated in Fig. 5. The above modes disappeared when the wing was rerun through Phase 1 with the indicated modifications. Table 2 contains comparison of frequencies before and after the modification. Figures 6 through 15 show plots of the modes of the revised wing. Comparison of the modal plots before and after modification show that the "kinks" have disappeared. The revised wing was not used in the Orbiter analysis, since comparison of results with the same model that was used in direct method analysis was the objective. The final orbiter results (first 23 modes) indicated that only the first 3 wing component modes played a significant part for most orbiter modes (Refer to Table 5). The small difference (3%) in frequencies for the first 3 modes (Table 2) would not have influenced the Orbiter results appreciably.

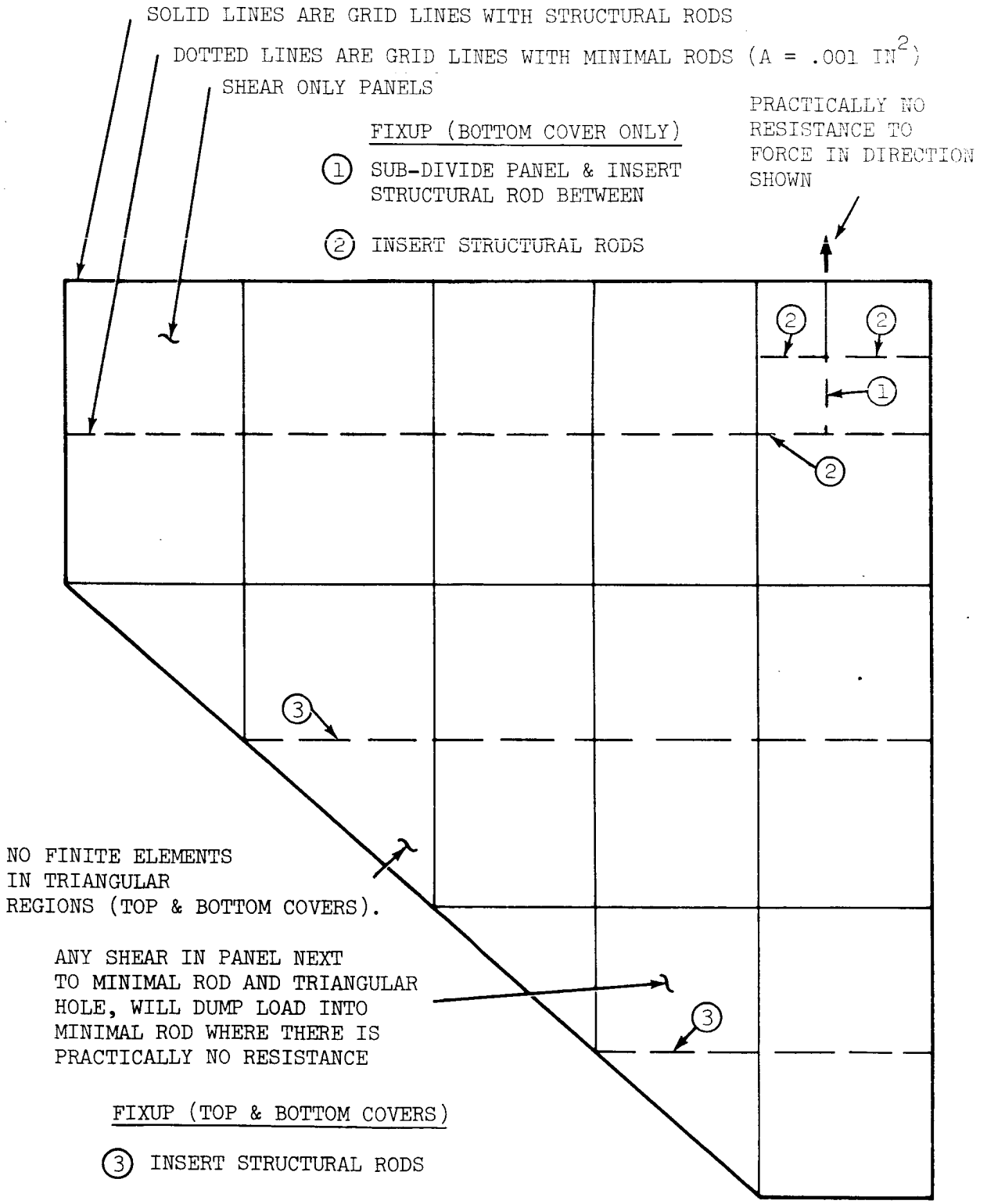

Fig. 5 Flaws in Model II Idealization (Bottom Wing Cover Shown)

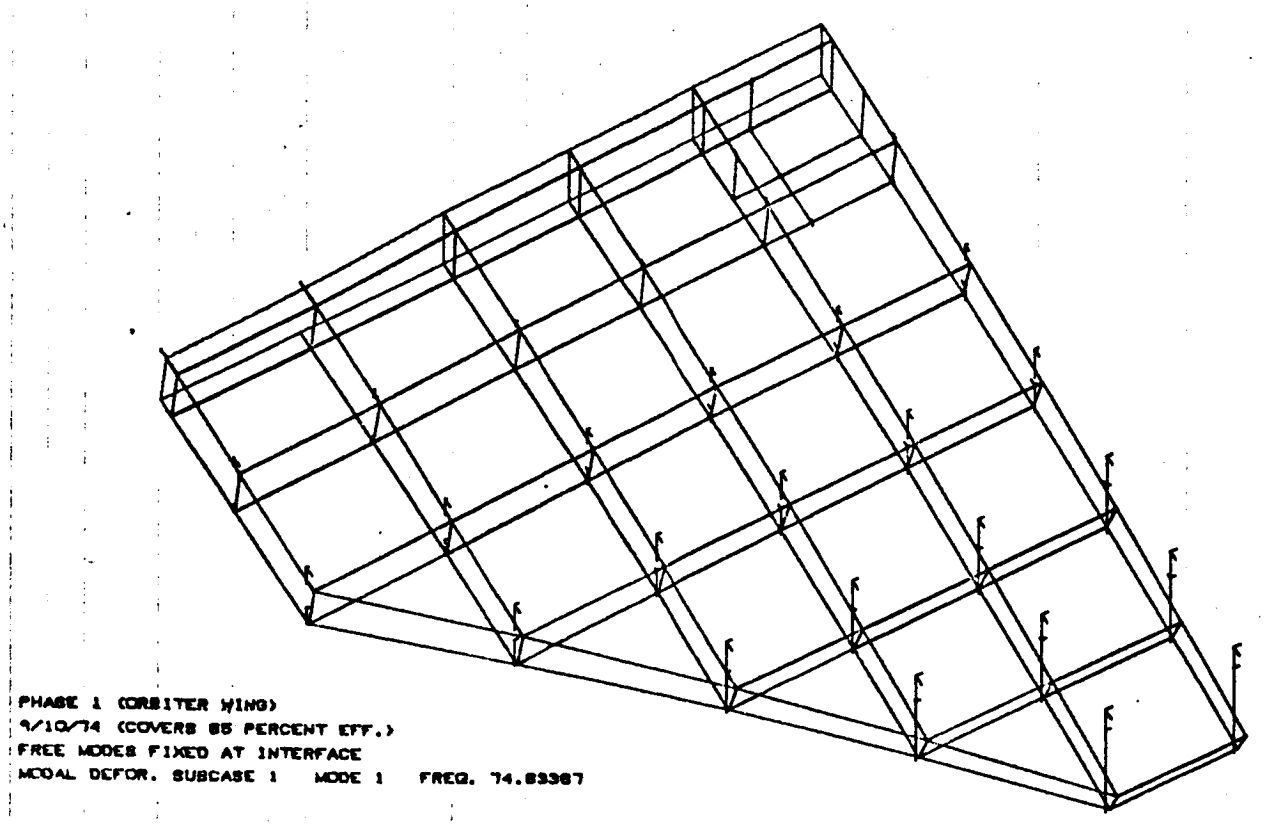

Fig. 6 Revised Wing (Mode 1)

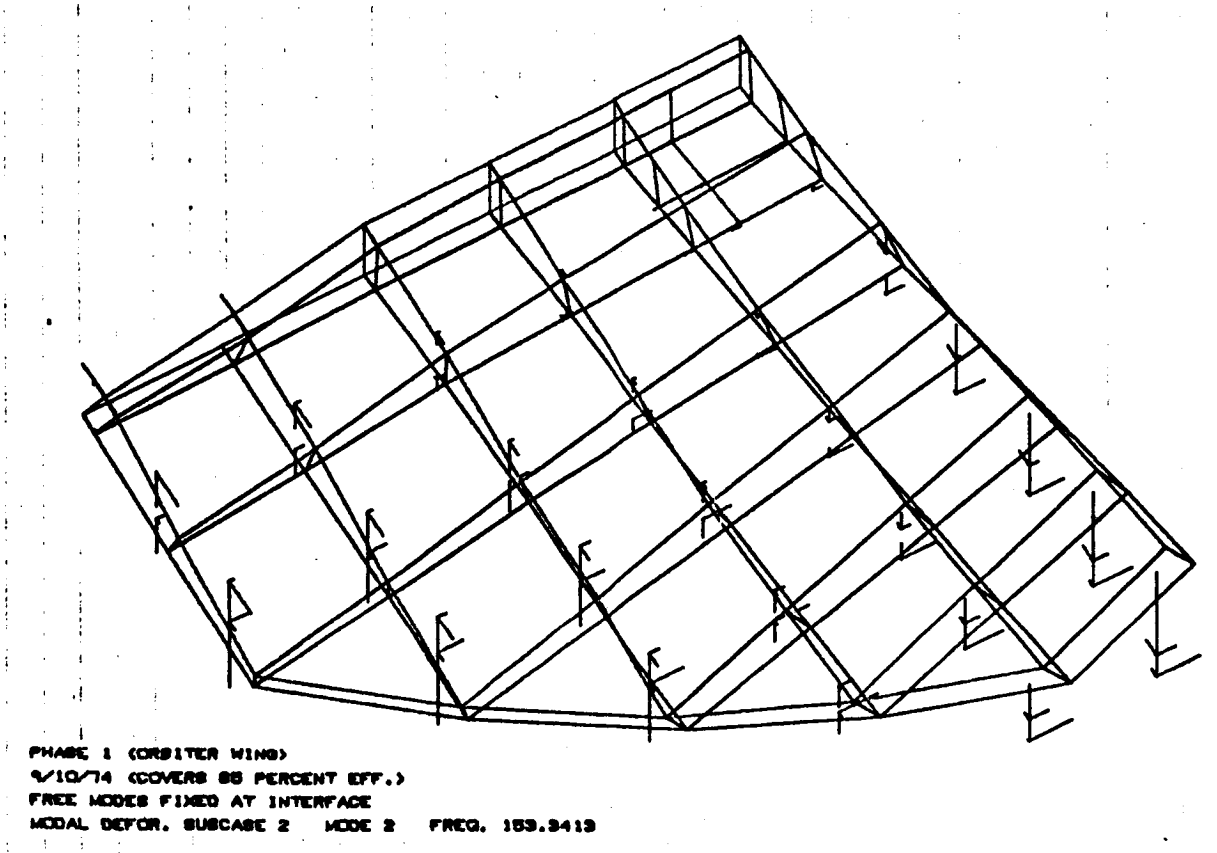

Fig. 7 Revised Wing (Mode 2)

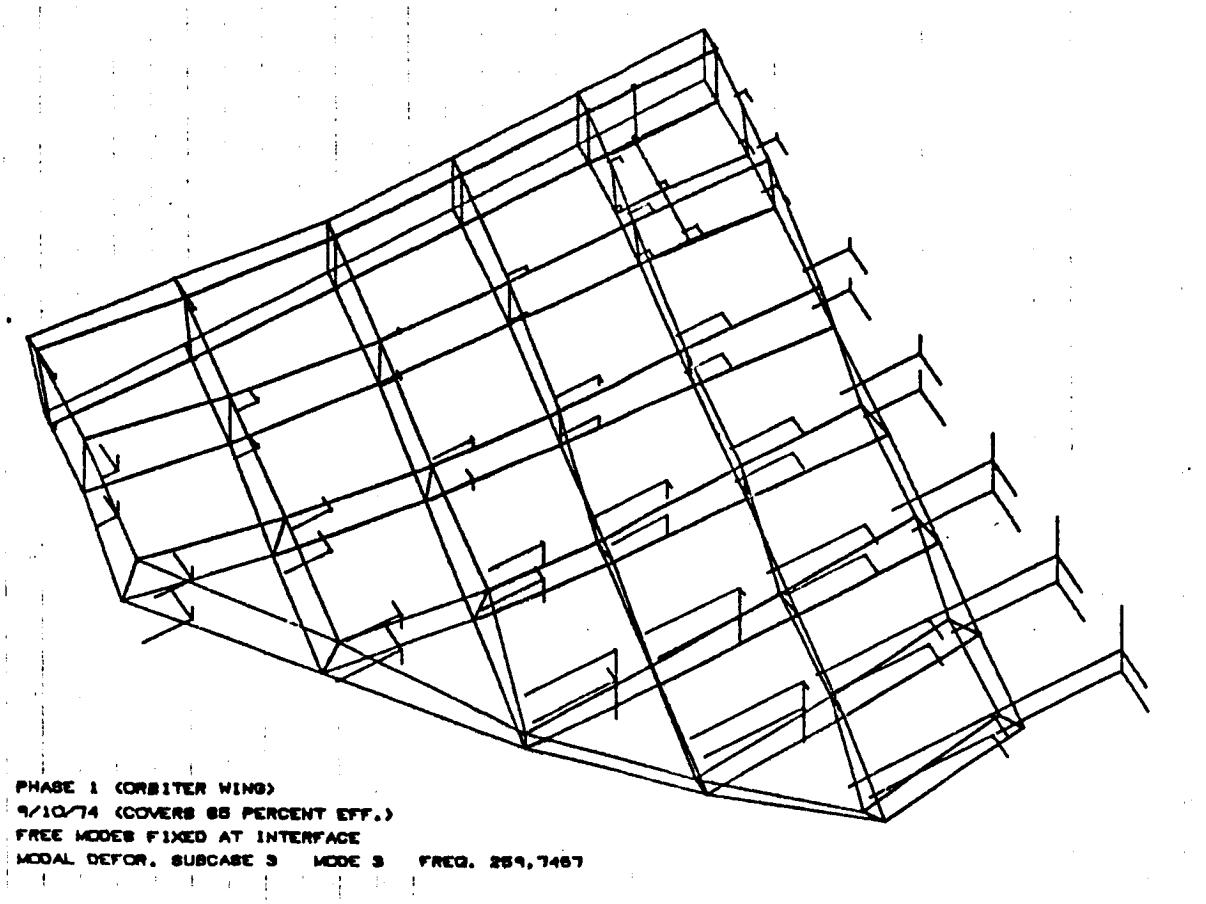

Fig. 8 Revised Wing (Mode 3)

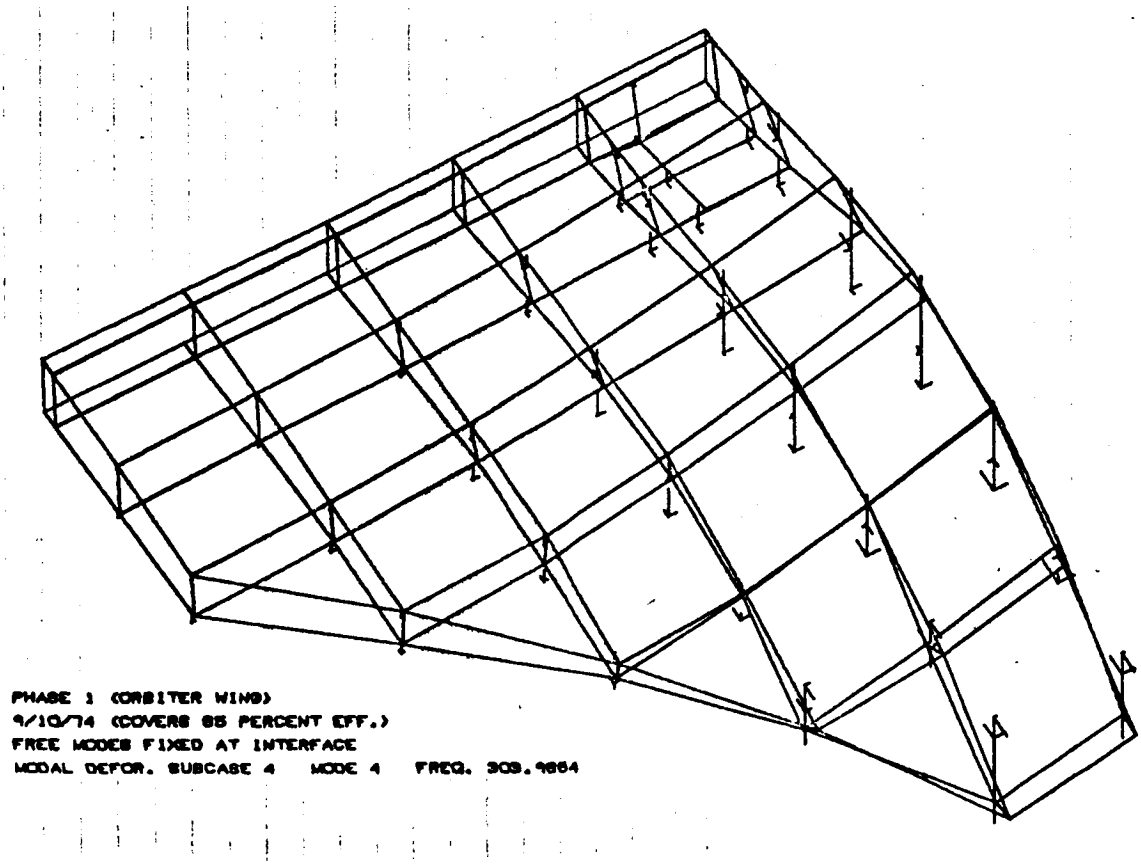

Fig. 9 Revised Wing (Mode 4)

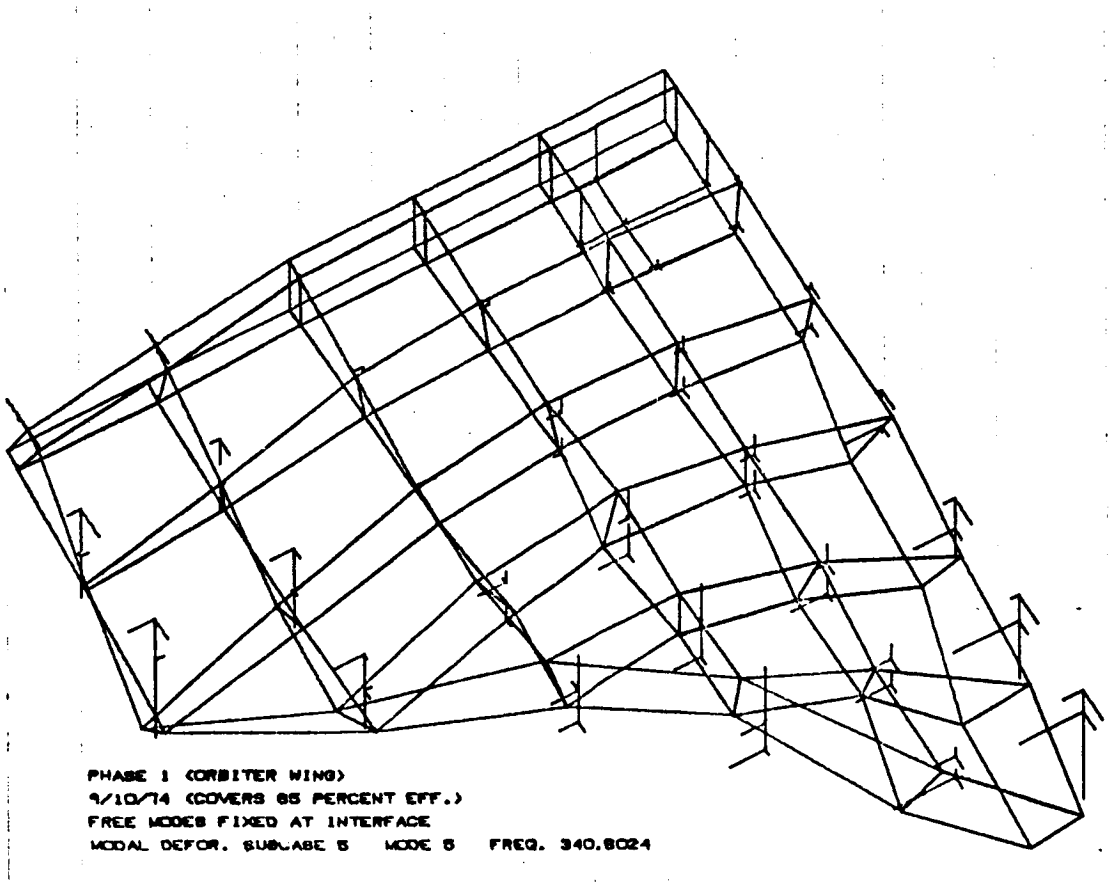

Fig. 10 Revised Wing (Mode 5)

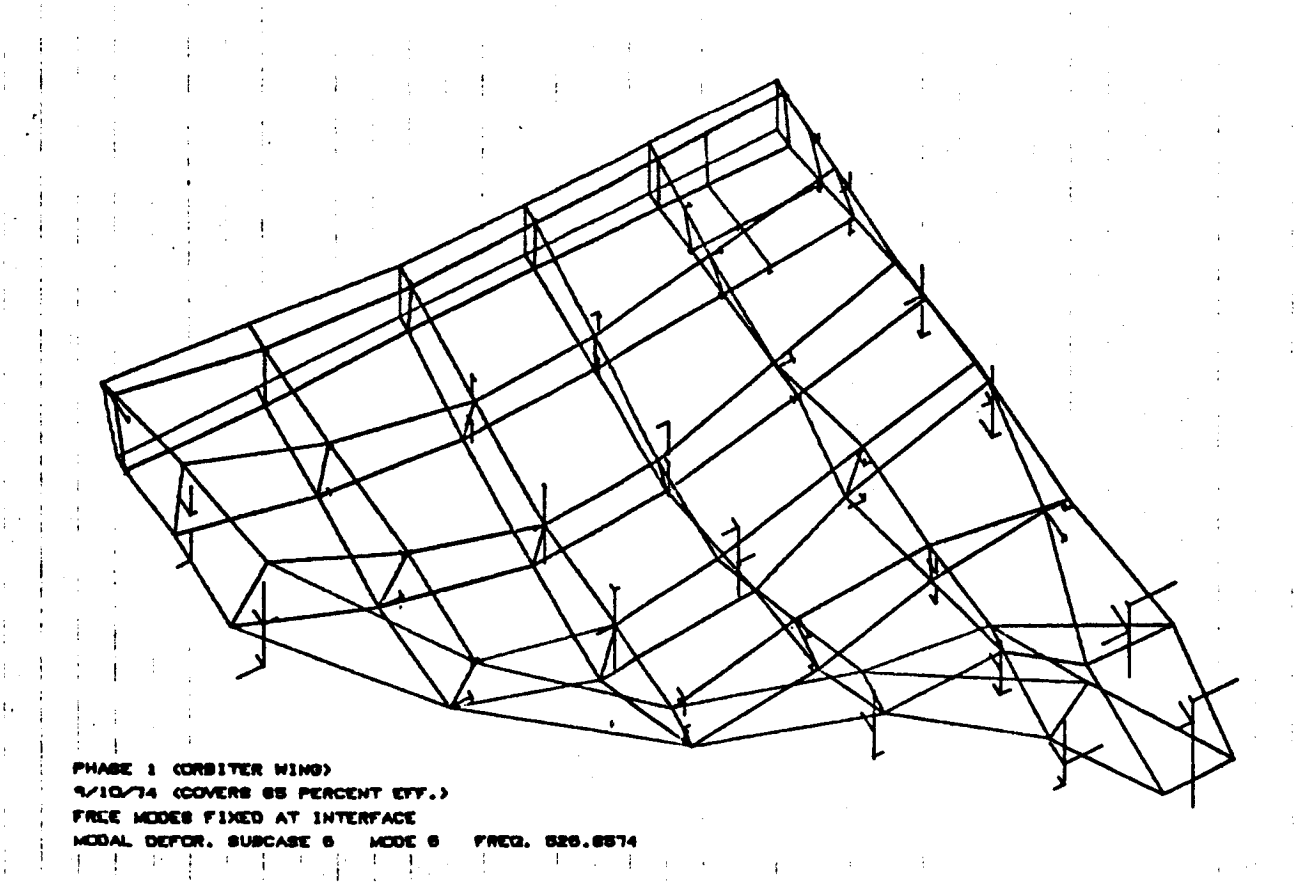

Fig. 11 Revised Wing (Mode 6)

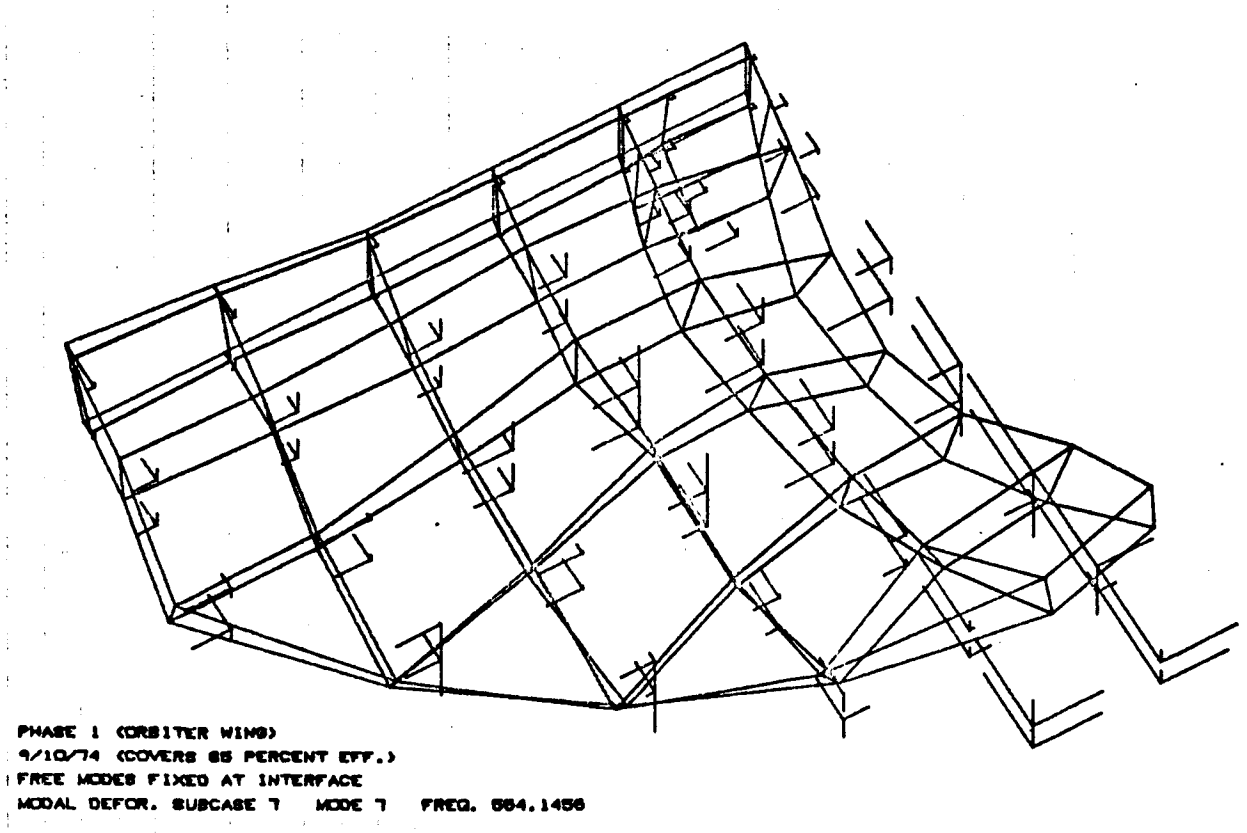

Fig. 12 Revised Wing (Mode 7)

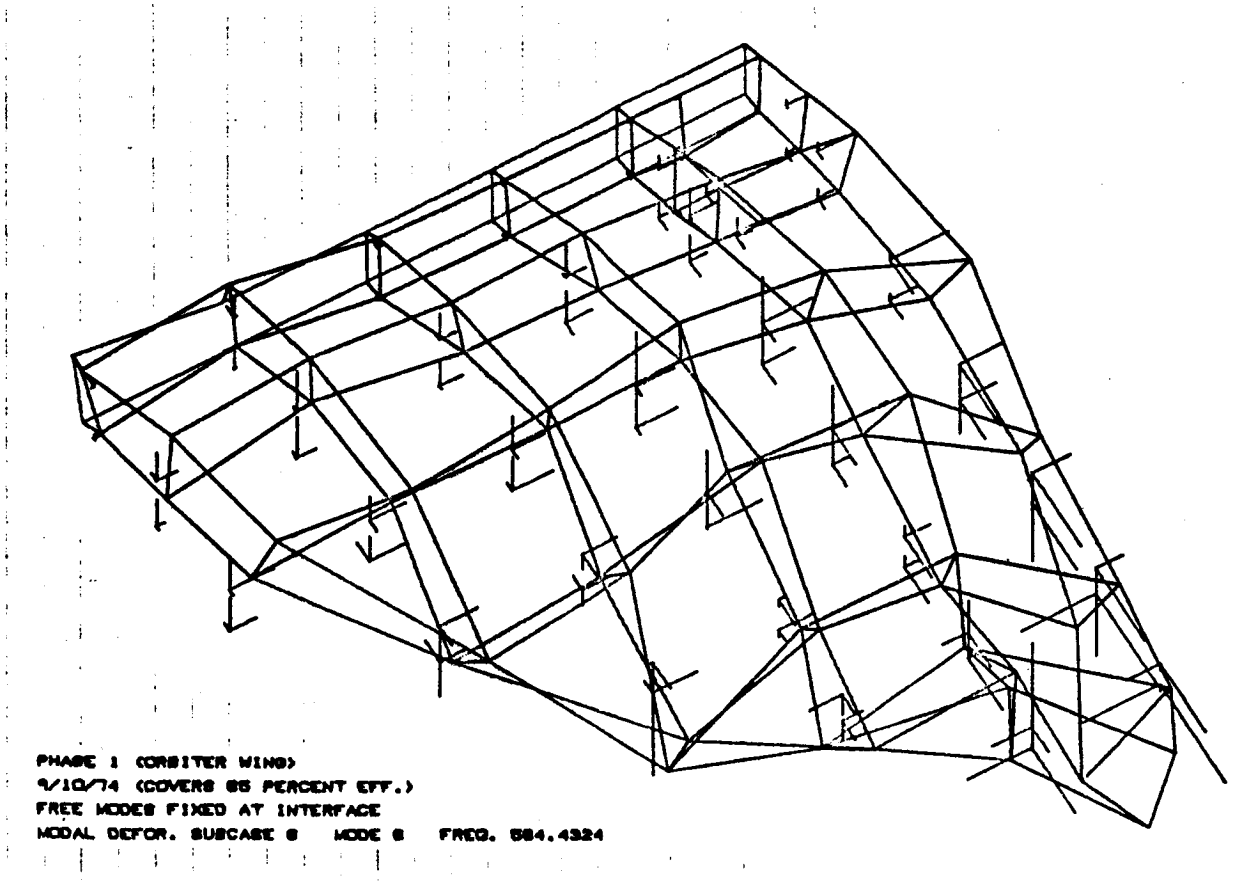

Fig. 13 Revised Wing (Mode 8)

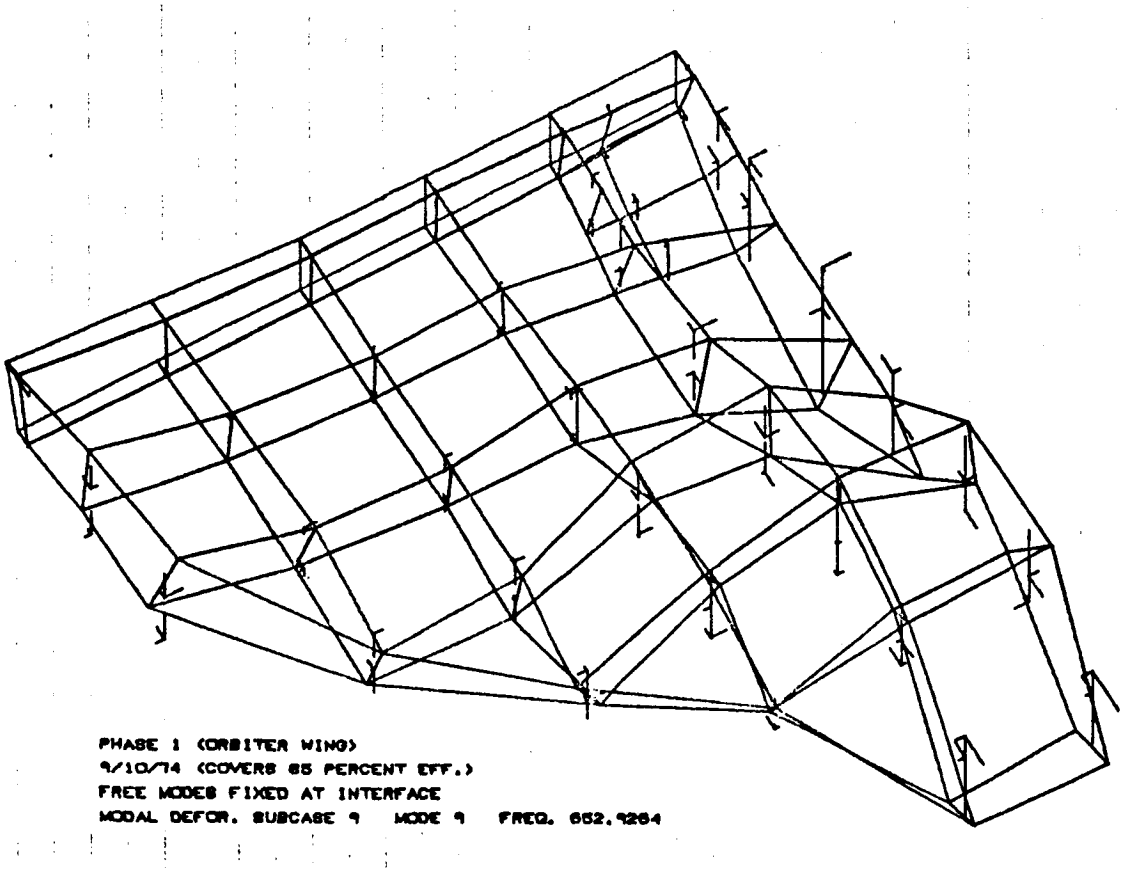

Fig. 14 Revised Wing (Mode 9)

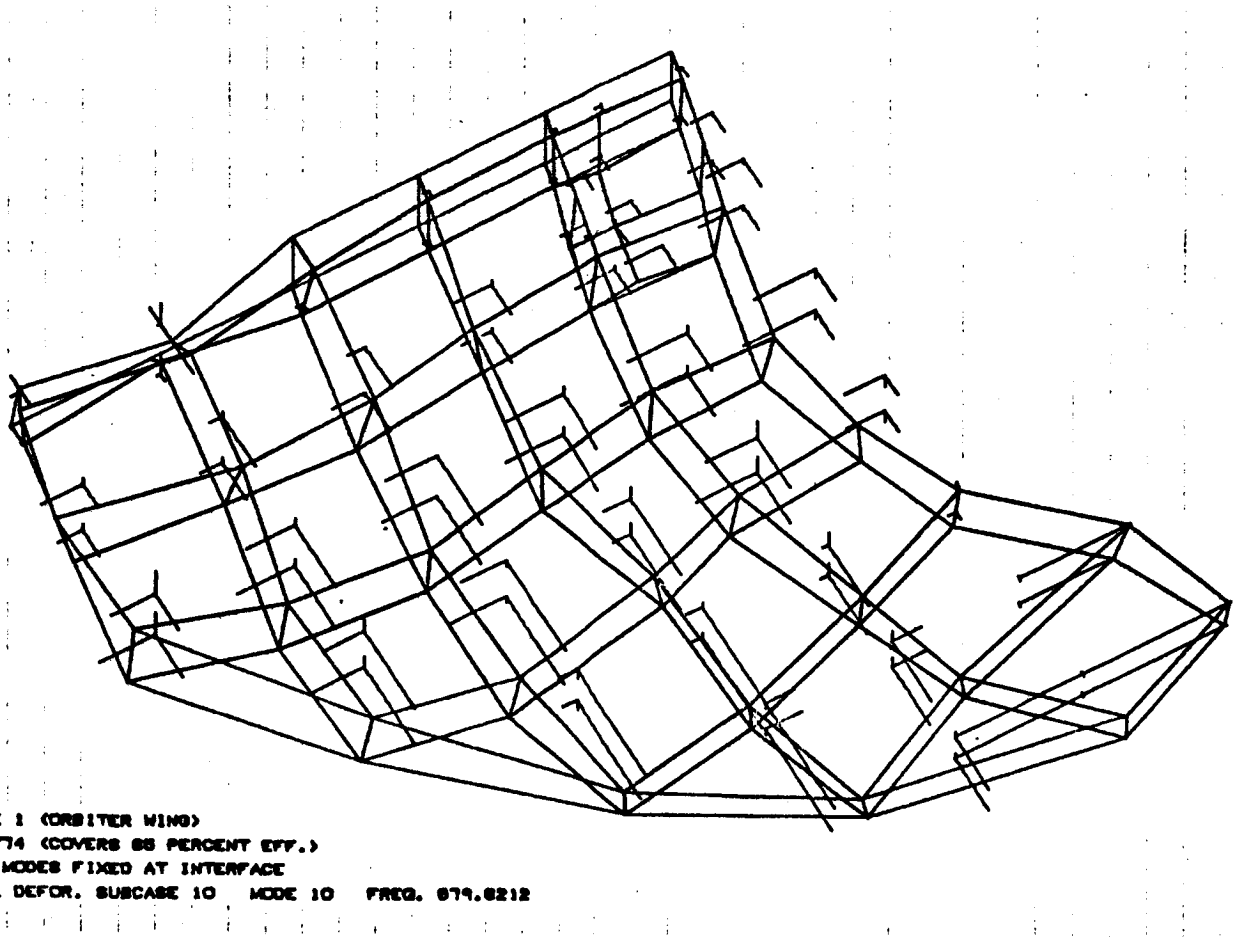

Fig. 15 Revised Wing (Mode 10)

Table 2 Wing Substructure Component Modes Comparison of Model II (Before and After Fix-up)

MODE	FREQ BEFORE FIX-UP HZ	FREQ* AFTER FIX-UP HZ	COMPONENT MODE DESCRIPTION
1	74.5	74.8	1st Vert. Bend.
2	148.5	153.3	1st Torsion
3	254.9	259.7	1st Lateral Bend.
4	298.4	304.0	2nd Vert. Bend.
5	330.4	340.8	2nd Torsion
6	404.5	-	Local Lateral at Interstage due to Idealization Error
7	517.0	526.9	Combined 2nd Vert. Bend & Torsion
8	542.1	564.1	2nd Lateral Bend.
9	568.9	584.4	Combined 2nd Lateral Bend & Vert. Bend
10	599.4	-	Caused by Idealization Error at Triangular Cutouts
11	613.6	-	Caused by Idealization Error at Triangular Cutouts
12	648.2	652.9	3rd Vert. Bend.
13	663.5	679.8	3rd Lateral Bend.

*Fix-up version not used in overall analysis

FINAL SYSTEM ORBITER RESULTS (SYMMETRIC MODES)

Table 3 shows good correlation between the Modal Synthesis and direct method, and verifies the analytical eigenvalues for the 1/8-scale Model II Orbiter. The door modes which are apparent in the Modal approach were completely overlooked in the direct method because no dynamic degrees of freedom were included on the door. Although the door mass is small, the door Longeron, which is the only door structure working in the symmetric case was flexible enough in bending to cause lower frequency modes. Table 4 shows the contribution to the Orbiter System generalized stiffness and mass of each substructure. As can be seen, the door contribution is small for the overall Orbiter modes. Table 5 shows the contribution factors (generalized modal coordinate values) of the substructure component modes to the Orbiter Sym. free-free modes. Table 6 gives the major contributing component modes and an attempt to classify them. Plots of the final Orbiter modes were obtained from a Phase 3 run for each substructure. Therefore, plots of the total Orbiter on one sheet could not be obtained. Instead, individual substructure plots were obtained which were of different scale. The plots are shown in Appendixes B14 through B18. As a final check, Table 7 shows the summation of relative momentum forces of each substructure for each mode and should demonstrate momentum balance (Sum = 0 for the Orbiter).

Because the door motion was prominent in the combined Orbiter modes, it was decided to rectify the discontinuity between the door longeron and shell at the interior strap locations. This can also be seen in the Model II door component mode plots (Appendix B8). This was done by reverting back to a Model I door shell where a shell grid line was incorporated at the interior

strap stations. The subdivided panels were made of CQUAD2 elements. This revised door was run through Phase I to obtain component modes. The results of this run are presented in Table 8 and the modes plotted in Figs. 16 through 27. From Table 8 the sensitivity of the door can be seen, when some of the skin is made effective to resist the door longeron bending. The frequencies on the average were higher and the sequence of some of the modes was changed. This revised door was not incorporated into the overall analysis since, as previously stated, the purpose was to compare two methods for the same model.

Actually, the door should be idealized into a finer grid (station-wise) to correctly represent the skin contribution to the bending stiffness of the door longeron, which will materially affect the mode frequency. This would also help if an Orbiter anti-symmetric analysis were to be performed, where the shear in the door panels is transferred through the door longeron and straps to the fuselage. The anti-symmetric torsion test case (Reference 1) on the 1/8-scale Orbiter proved that the Model II door longeron was too flexible since the analysis gave twice the torsional influence coefficient.

Table 3 Comparison of Analytical Results Between Substructuring Methods for Symmetrical Free-Free Normal Modes (1/8-Scale Model II)

MODE	COMPONENT MODES METHOD FREQ. (HZ)	DIRECT COORDINATE ELIMINATION METHOD FREQ. (HZ)	DESCRIPTION
1	0	0	Rigid Body Mode
2	0	0	Rigid Body Mode
3	0	0	Rigid Body Mode
4	44.1	44.2	1st Fuselage Bending
5	45.3	-	1st Cargo Door Component Mode
6	51.3	-	2nd Cargo Door Component Mode
7	54.4	54.4	1st Wing Bend vs. Payload Vert.
8	62.7	63.0	1st Wing Bend & Payload Vert. vs. Aft Fus. Vert.
9	66.9	-	3rd Cargo Door Component Mode
10	76.7	-	4th Cargo Door Component Mode
11	83.1	80.2	Fin Pitch & Payload 1st Bend vs. Fus. 1st Fus. Bending
12	104.7	103.4	Fuselage 2nd Bend vs. Payload Vert. + Fin Pitch
13	115.8	115.9	Fus. Nose Fore-Aft vs. Payload Fore-Aft
14	122.2	121.5	Fus. Aft End Pitch vs. Fus. Nose Fore-Aft + Wing Torsion & Fin Pitch
15	129.9	-	5th Cargo Door Component Mode
16	130.2	-	6th Cargo Door Component Mode
17	142.1	139.7	Wing 1st Torsion vs. Fus. 2nd Bend
18	159.8	-	7th Cargo Door Component Mode
19	166.3	-	8th Cargo Door Component Mode
20	171.7	170.9	Wing Torsion vs. Fus. 2nd Bending + Payload 1st Bend.
21	186.4	185.0	Fus. 2nd Bend + Wing Fore-Aft vs. Payload Bending & Pitching
22	190.2	-	9th Cargo Door Component Mode
23	224.0	-	10th Cargo Door Component Mode

Table 4 Substructure Contribution to Generalized Stiffness and Mass of Orbiter for Symmetric Free-Free Modes (1/8-Scale Model II)

ORBITER MODE		FUSELAGE		WING		CARGO DOORS		FIN		PAYLOAD		ORBITER	
NO.	FREQ. HZ	k/k_{or}	m/m_{or}	k/k_{or}	m/m_{or}	k/k_{or}	m/m_{or}	k/k_{or}	m/m_{or}	k/k_{or}	m/m_{or}	k_{or}	m_{or}
4	44.1	.75	.53	.06	.07	.07	.03	.09	.28	.03	.09	18216	.2371
5	45.3	.08	0	0	0	.92	1.00	0	0	0	0	519	.0064
6	51.3	.09	0	0	0	.91	1.00	0	0	0	0	836	.0081
7	54.4	.47	.12	.25	.45	.01	.01	04	09	.23	.33	9171	.0784
8	62.7	.45	.17	.28	.41	.04	.07	.08	.12	.15	.23	7848	.0506
9	66.9	.33	.04	.01	.01	.56	.81	.08	.11	.02	.03	2460	.0139
10	76.7	.26	.02	0	0	.74	.98	0	0	0	0	1777	.0077
11	83.1	.34	.34	.05	.14	.11	.10	.37	.32	.13	.10	7812	.0286
12	104.7	.40	.38	.05	.02	.04	.05	.05	.03	.46	.51	50338	.1164
13	115.8	.68	.47	.03	.04	.03	.02	0	0	.26	.47	112708	.2128
14	122.2	.59	.52	.27	.34	.02	.01	.07	.05	.05	.08	38644	.0655
15	129.9	.02	0	.02	0	.96	1.00	0	0	0	0	975	.0015
16	130.2	.03	0	.01	0	.90	.90	0	0	.06	.10	1058	.0016
17	142.1	.37	.37	.39	.38	.09	.09	.02	.02	.13	.13	14939	.0187
18	159.8	.05	0	0	0	.94	1.00	0	0	.01	0	2174	.0022
19	166.3	.07	0	0	0	.93	1.00	0	0	0	0	2781	.0025
20	171.7	.53	.40	.26	.44	.03	.04	.01	0	.17	.12	110953	.0953
21	186.4	.70	.59	.14	.26	.03	.05	0	.01	.13	.09	45506	.0332
22	190.2	.01	0	0	0	.99	1.00	0	0	0	0	3183	.0022
23	224.0	.02	0	0	0	.98	1.00	0	0	0	0	4727	.0024

k = substructure generalized stiffness matrix = $\phi^T K \phi$

m = substructure generalized mass matrix = $\phi^T M \phi$

Table 5 Contribution Factors (Generalized Modal Coordinate Values) of Substructure Component Modes to Orbiter Symmetrical Free-Free Modes (1/8-Scale Model II)

SUBSTRUCTURE	COMPONENT MODE	*1 ORBITER SYSTEM MODE NO.																			
		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Fuselage	1	.28	-	-	-.15	-.10	-.03	-	.06	-.54	-.57	-.07	-	-	.22	.03	-	-.51	1.00	-	.02
	2	-	-	-	-	-	-	-	-	-.06	.50	-.21	-	-	-	-	-	-.41	-.06	-	-
	3	.02	-	-	-	-	-	-	.05	-.18	.07	.05	-	-	.15	-	-	.31	-.08	-	-
	4	.02	-	-	-	-	-	-	.03	.06	.02	-.13	-	-	-.05	-	-	.09	.05	-	-
	5	-	-	-	-	-	-	-	-	-.06	-.07	-.03	-	-	.02	-	-	-.21	.16	-	-
	6	-	-	-	-	-	-	-	-	.02	-	-	-	-	-.02	-	-	.05	-.10	-	-
	7	-	-	-	-	-	-	-	-	-.02	-.02	.11	-	-	.05	-	-	-.05	-.07	-	-
	8	-	-	-	-	-	-	-	-.02	.08	-	-.02	-	-	-.06	-	-	-.08	.03	-	-
	9	-	-	-	-	-	-	-	.02	-.04	-	.02	-	-	.04	-	-	-	-.02	-	-
	10	-	-	-	-	-	-	-	-	.02	-	-	-	-	-	-	-	-	-.02	-	-
	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.04	.02	-	-
	12	-	-	-	-	-	-	-	-	-	-	-.02	-	-	-	-	-	-	-	-	-
	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.02	-.03	-	-
	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.02	-	-	-
Wing	1	.18	-	.03	1.0	-1.0	-.09	-	-.22	.36	-.45	-.38	-.02	.02	.34	-	-	.23	.10	-	-
	2	.07	-	-	.02	-	-	-	.13	-.09	.41	.82	.04	-.03	-.62	-	.02	-1.0	.30	-	-
	3	-	-	-	-	-	-	-	-	-	-	.03	-	-	-.04	-	-	.55	.30	-	-
	4	-	-	-	-	-	-	-	-	.02	-	-	-	-	-	-	-	-.03	.04	-	-
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-.02	-	-	.07	.09	-	-
	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.02	-	-	-
Cargo Doors	1	-.19	-1.0	-	-	-	-	.05	-.03	.08	-.11	-.06	-	-	-.04	-	-	-	.09	-.05	.02
	2	-.09	-	-1.0	.39	.05	-.05	.20	.06	.21	-.09	.03	-	-	-.03	-	.09	.17	-.03	-	-
	3	.29	-	-	-	.49	-1.0	-.22	-.76	.64	.17	-.37	-	-	-.31	.17	-	-.27	.12	-.03	-
	4	.05	-	.04	-.07	-	-.21	1.0	-.05	.56	.25	-	-	-	-.17	.04	-.31	.13	-.06	-	-.12
	5	.03	-	-	-	.03	-	-	.10	-	.12	.43	-1.0	-.20	-.37	-	-	-.17	.22	-	-
	6	.03	-	-	-.02	-	-	-	.08	-1.0	-1.0	-.23	-.17	1.0	-1.0	-.04	-	.17	-.50	-	-
	7	.02	-	-	-	.02	-.03	-	-	-.09	-.04	.10	-	-	.27	-1.0	-.07	-.84	.16	-.03	-
	8	-	-	-	-	-	-	.04	-	-.07	-.03	-.03	-	-	.08	-.04	1.0	-.16	-.44	-	-.11
	9	-	-	-	-	-	-	-	-	-.04	-	-	-	-	.05	-	-	.07	.03	1.0	-
	10	-	-	-	-	-	-	-	-	-	-.05	-	-	-	-	-	-.03	-.12	.12	-	-1.0
	11	-	-	-	-	-	-	-	-	-	.06	-	-	-	-.02	-	-	.14	-.05	-	-
	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-.03	-	-
Fin	1	-.75	-	-	-.37	-.45	-.26	-.05	1.0	.94	.15	-1.0	-	-	-.28	-.02	.02	.69	.22	-	-
	2	-	-	-	-	-	-	-	-	-	-	.03	-	-	.02	-	-	-.02	.04	-	-
Payload	1	-.16	-	-	.32	.22	-.05	-	.21	-.70	-.36	-.11	-	-	.06	-	-	-.11	-.04	-	-
	2	.03	-	-	-	.07	.02	-	.05	.57	-.30	.05	-	.03	.17	.02	-	-.65	.16	-	-
	3	.02	-	-	-	-	-	-	-	-.14	-.69	-.18	-	-.02	-.12	-	-	-.25	-.31	-	-
	4	-	-	-	-	-	-	-	-	-	-.02	-	-	-	-	-	-	.02	-	-	-

*1. Orbiter Modes 1 to 3 are rigid body modes.

2. Factor of 0.01 or less are not listed.

Table 6 Substructure Component Modes (Symmetrical Case) 1/8-Scale Model II

SUBSTRUCT.	MODE NO	FREQ. HZ	MODE DESCRIPTION (FIXED AT INTERFACE)
Fuselage	1	86.9	Nose Pitching Mode
	2	162.5	Nose Fore-Aft Translation Mode
	3	245.6	Mid Section 1st Bending Component Mode
	4	270.6	Aft End Vert. Bend.
	5	280.8	Mid Section 2nd Bending Component Mode
	6	333.8	Nose Vert. Bend.
	7	339.9	Aft Frame Mode
	8	378.9	Mid Section 3rd Bending Component Mode
	9	391.6	Mid Section 4th Bending Component Mode
	10	439.8	Aft End Vertical Translation Mode
	11	448.2	Mid Section 5th Bending Component Mode
	12	498.0	Local Thrust Bar Translation Mode
	17	633.8	Nose & Mid Section Bending Mode
	24	839.0	Local Thrust Bar Axial Mode
Wing	1	74.5	1st Vert. Bending
	2	148.5	1st Torsion
	3	254.9	1st Lateral Bend.
	4	298.4	2nd Vert. Bending
	5	330.4	2nd Torsion
	8	542.1	2nd Lateral Bend.
			Cantilevered Modes
Cargo Drs.	1	47.5	1st Vert. Bend.
	2	53.5	2nd Vert. Bend.
	3	79.7	3rd Vert. Bend.
	4	89.9	4th Vert. Bend.
			Continuous Door Longeron Beam Modes on 6 Supports
	5	130.5	Local Aft Frame Mode
	6	131.0	Local Fwd Frame Mode
	7	163.6	1st Lateral Bend.
	8	174.1	2nd Lateral Bend.
	9	190.8	3rd Lateral Bend.
	10	226.0	4th Lateral Bend.
			Continuous Door Longeron Beam Modes on Flexible Frame Supports
	11	314.9	Fore-Aft Translation Mode (Supported at strap interface)
	12	477.7	Fore-Aft Axial Mode
Fin	1	77.6	Pitching Mode
	2	420.9	Vertical Mode
			NOTE: Fin on vert. interface springs
Payload	1	64.3	1st Vert. Bending
	2	131.2	Pitching (some 1st Vert. Bend.)
	3	163.3	Pitching & 2nd Vert. Bend.
	4	373.0	2nd Vert. Bending
			Simple supported modes on vertical interface springs

Table 7 Summation of Substructure Momentum Forces About Basic Origin For Orbiter Symmetric Free-Free Modes (1/8-Scale Model II)

ORBITER MODE		FUSELAGE			WING			CARGO DOORS			FIN			PAYLOAD		
NO.	FREQ. HZ	ΣF_x	ΣF_z	ΣM_y	ΣF_x	ΣF_z	ΣM_y	ΣF_x	ΣF_z	ΣM_y	ΣF_x	ΣF_z	ΣM_y	ΣF_x	ΣF_z	ΣM_y
4	44.1	-.008	.074	-7.85	.015	-.022	3.76	.002	-.006	.90	-.021	.014	-4.31	.011	-.059	7.50
5	45.3	0	-.001	.05	0	0	- .02	0	0	- .04	0	0	.02	0	0	- .02
6	51.3	-.001	-.001	.04	0	-.001	.22	0	0	- .06	0	0	.01	.001	.003	- .20
7	54.4	-.018	-.019	- .47	.002	-.041	6.40	-.001	0	- .02	-.007	.003	-1.26	.024	.057	-4.66
8	62.7	-.025	-.039	4.05	-.004	.022	-3.63	0	-.006	.73	-.007	.002	- .94	.026	.021	- .21
9	66.9	.001	-.005	.76	0	.002	- .29	0	.009	-1.02	-.003	.001	- .55	.002	-.008	1.10
10	76.7	0	-.002	.28	0	0	- .04	.001	0	- .05	-.001	0	- .07	0	.001	- .12
11	83.1	-.018	-.006	-1.06	0	-.005	.42	-.001	.003	- .48	.007	-.004	1.44	.013	.012	- .32
12	104.7	-.033	.051	-9.90	.004	.005	- .37	0	.001	- .05	.005	-.001	.60	.024	-.056	9.71
13	115.8	.093	-.024	7.15	.001	-.007	1.14	.006	.001	.40	0	-.001	.19	-.105	.031	-8.88
14	122.2	.005	.002	.23	.013	-.009	1.53	-.001	.001	- .19	-.001	.005	- .97	-.015	.001	- .59
15	129.9	-.001	-.001	.06	0	0	+ .06	0	.001	- .15	0	0	.01	0	0	.01
16	130.2	.001	.001	- .07	0	0	- .05	0	-.001	.04	0	0	- .02	-.001	0	.10
17	142.1	.011	-.006	.83	-.009	.003	- .73	-.001	.001	- .20	0	.002	- .30	-.001	0	.40
18	159.8	.001	-.001	.08	-.001	0	- .03	0	.001	- .10	0	0	- .02	0	0	.08
19	166.3	-.001	0	- .04	.001	0	.01	0	0	.02	0	0	.01	0	0	0
20	171.7	-.021	-.019	1.38	.042	.002	2.03	.006	.001	.38	0	-.002	.32	-.028	.017	-4.11
21	186.4	-.011	-.006	- .05	.019	.006	.05	-.002	-.002	0	-.001	-.002	.22	-.006	.003	- .23
22	190.2	0	.001	- .06	0	0	- .01	0	-.001	.06	0	0	0	0	0	0
23	224.0	-.001	0	- .05	0	0	- .03	.001	0	.08	0	0	0	0	0	0

*[illegible] mass x normalized eigenvector.

Table 8 Cargo Door Substructure Component Modes (Symmetrical Case) Comparison of Model II (Before and After Fix-up)

BEFORE FIX-UP		AFTER FIX-UP		DESCRIPTION
MODE	FREQ. HZ	MODE	FREQ. HZ	
1	47.5	1	50.2	1st Vert. Bend Component Mode
2	53.5	2	58.5	2nd Vert. Bend Component Mode
3	79.7	4	124.1	3rd Vert. Bend Component Mode
4	89.9	3	116.1	4th Vert. Bend Component Mode
5	130.5	5	131.0	Local Aft Frame Mode
6	131.0	6	131.2	Local Fwd Frame Mode
7	163.6	10	388.9	1st Lat. Door Long. Bend.
8	174.1	11	450.2	2nd Lat. Door Long. Bend.
9	190.8	7	200.4	3rd Lat. Door Long. Bend.
10	226.0	8	228.0	4th Lat. Door Long. Bend.
11	314.9	9	316.8	Fore-Aft Translation
12	477.7	12	487.6	Fore-Aft Axial

*Note: Fix-up version not used in overall analysis.

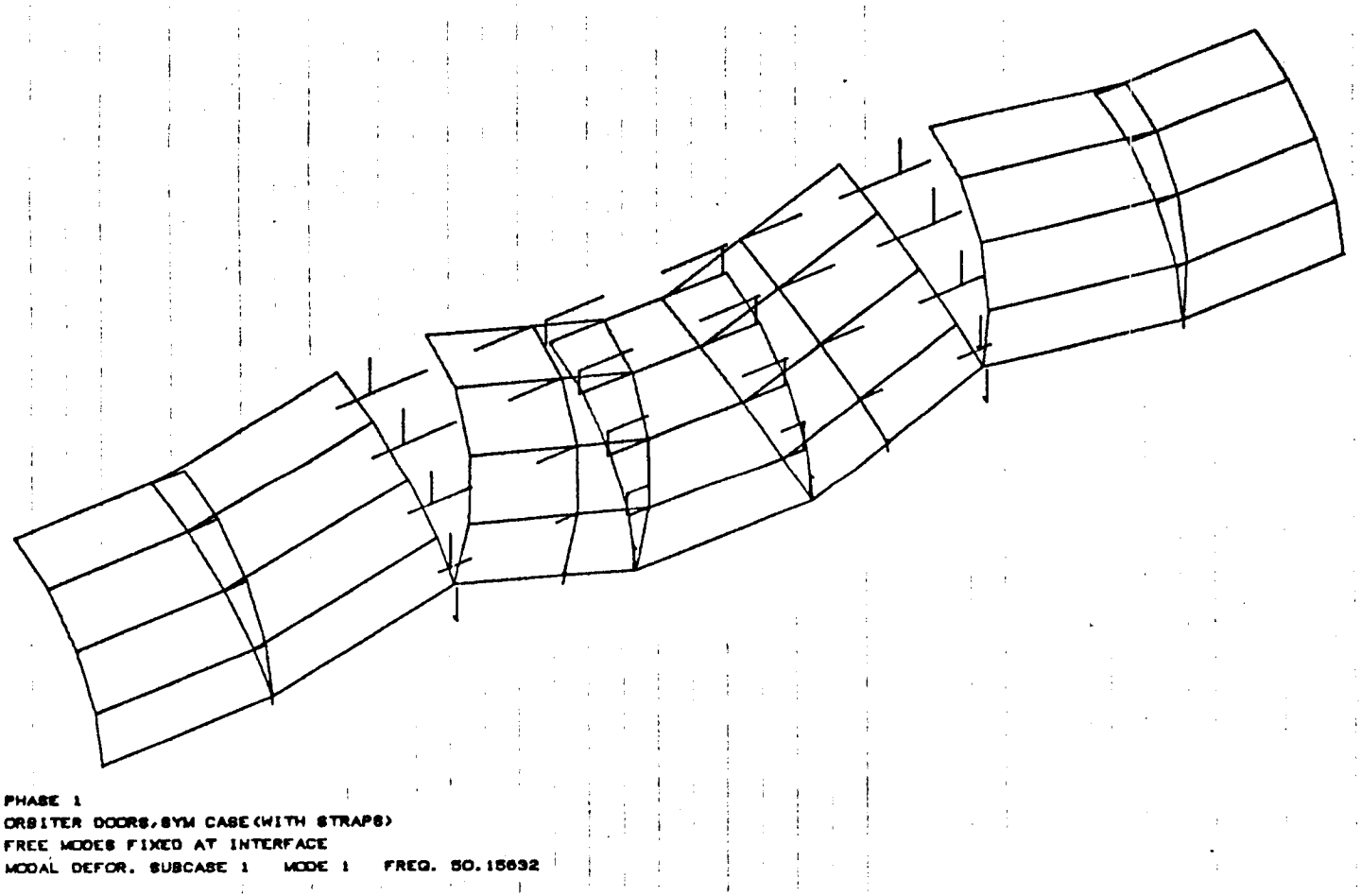

Fig. 16 Revised Cargo Door (Mode 1)

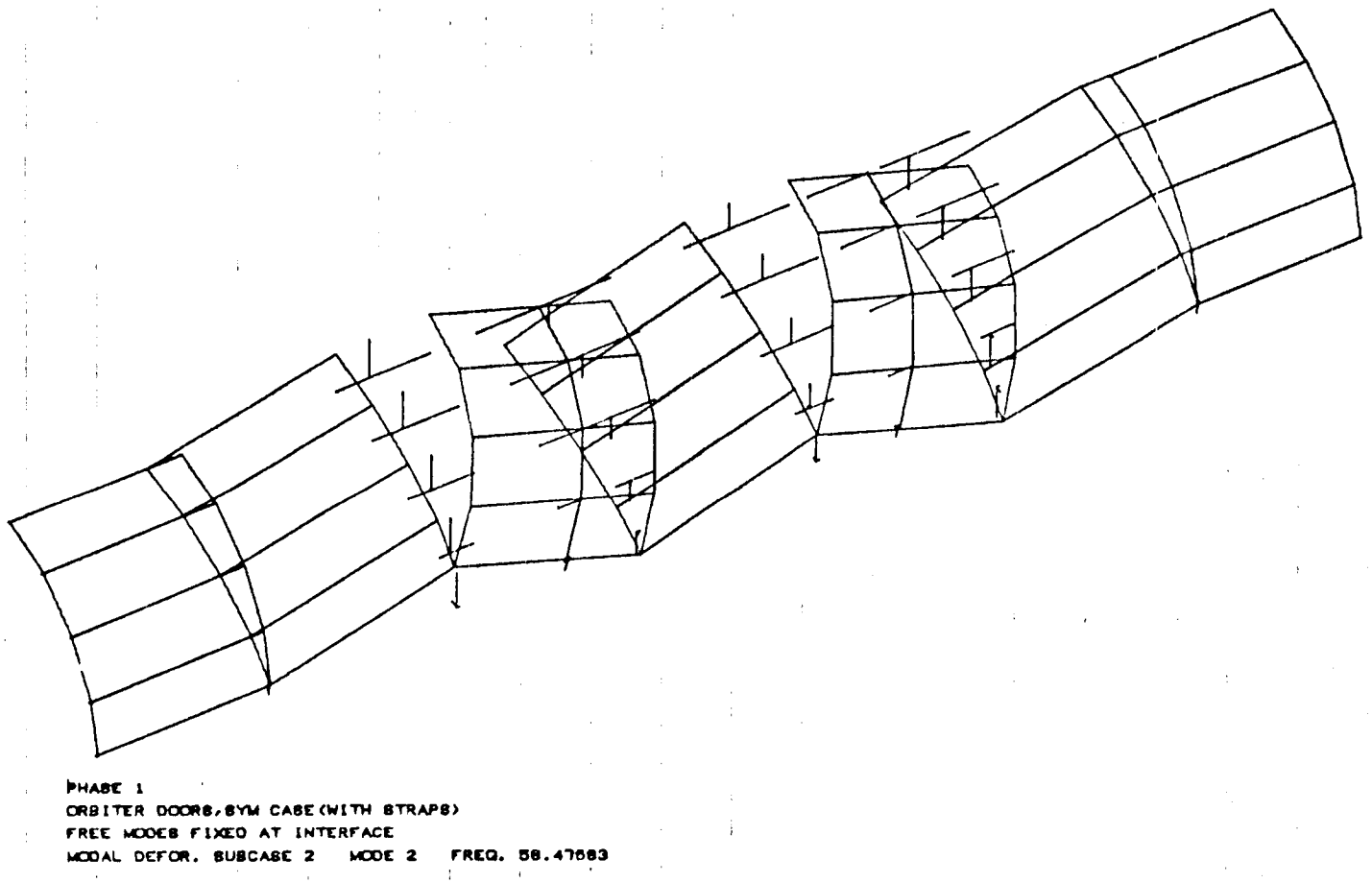

Fig. 17 Revised Cargo Door (Mode 2)

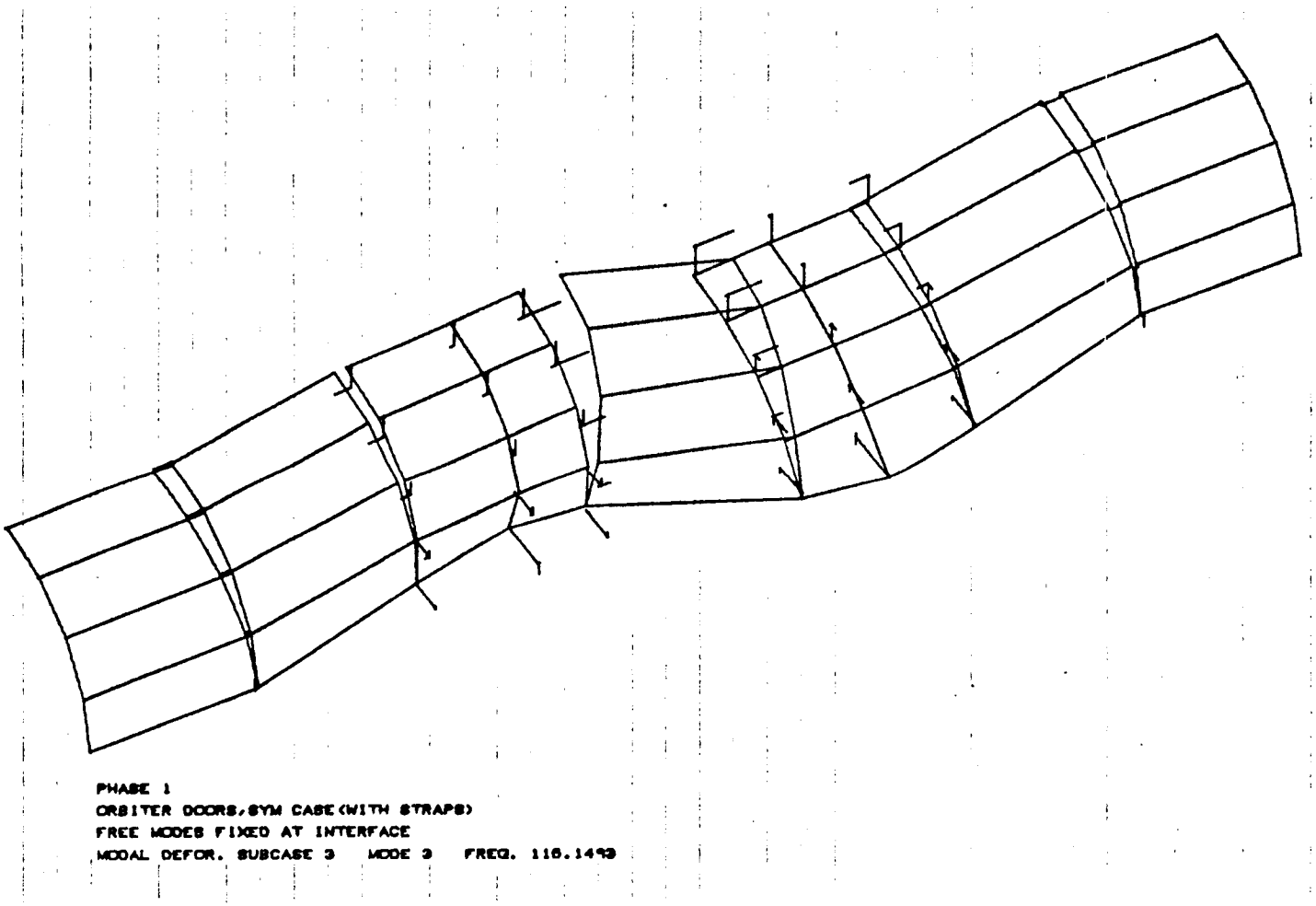

Fig. 18 Revised Cargo Door (Mode 3)

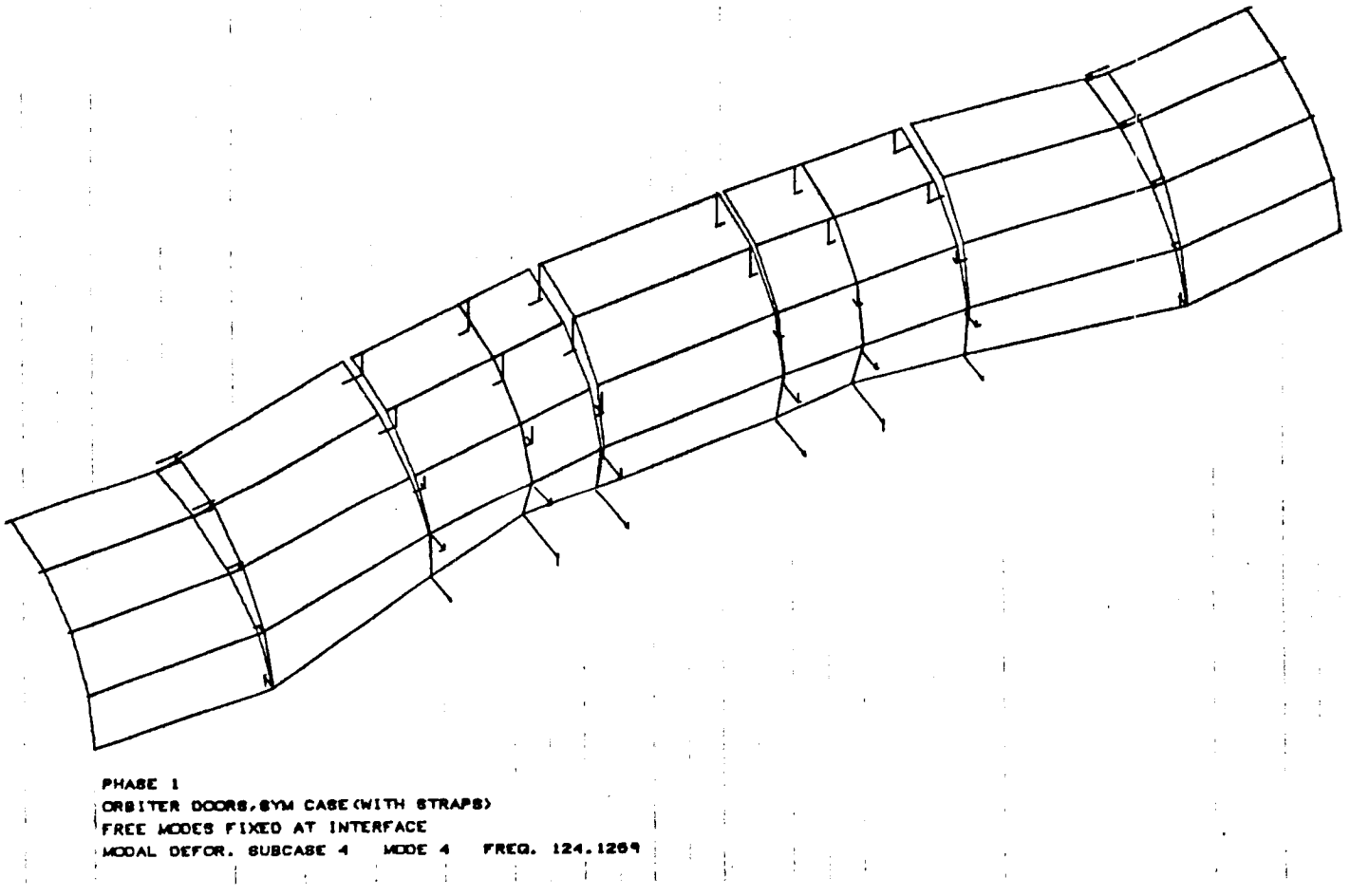

Fig. 19 Revised Cargo Door (Mode 4)

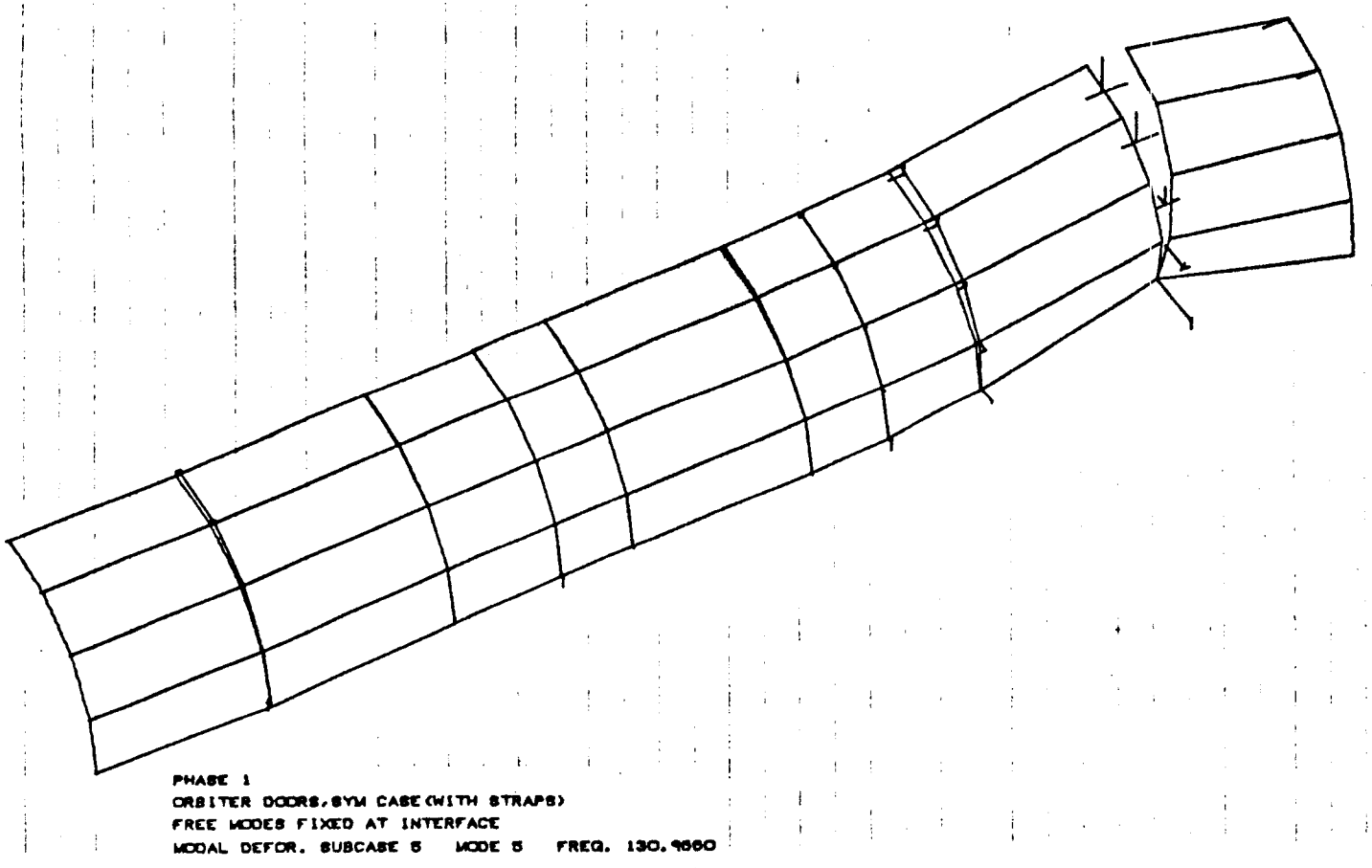

Fig. 20 Revised Cargo Door (Mode 5)

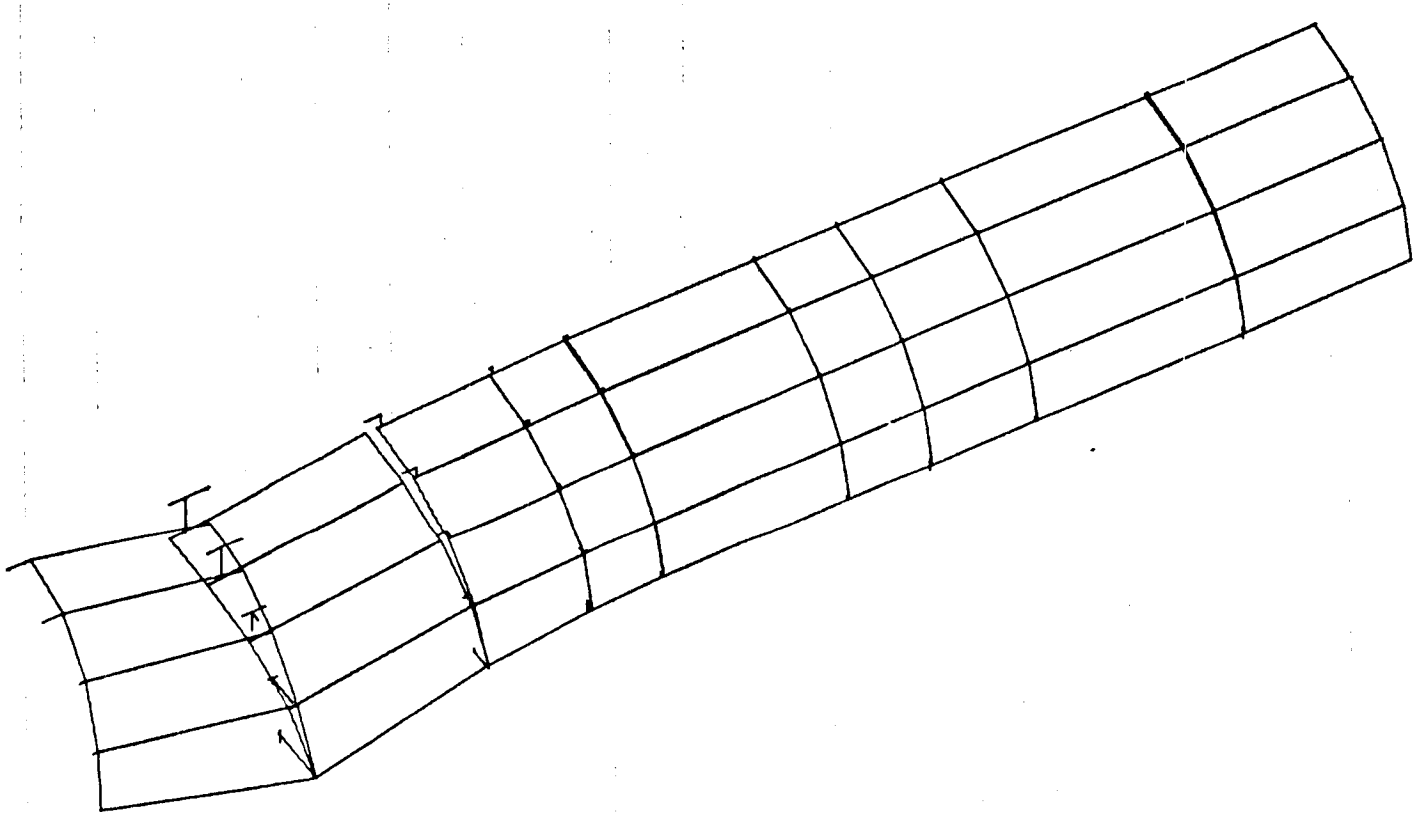

Fig. 21 Revised Cargo Door (Mode 6)

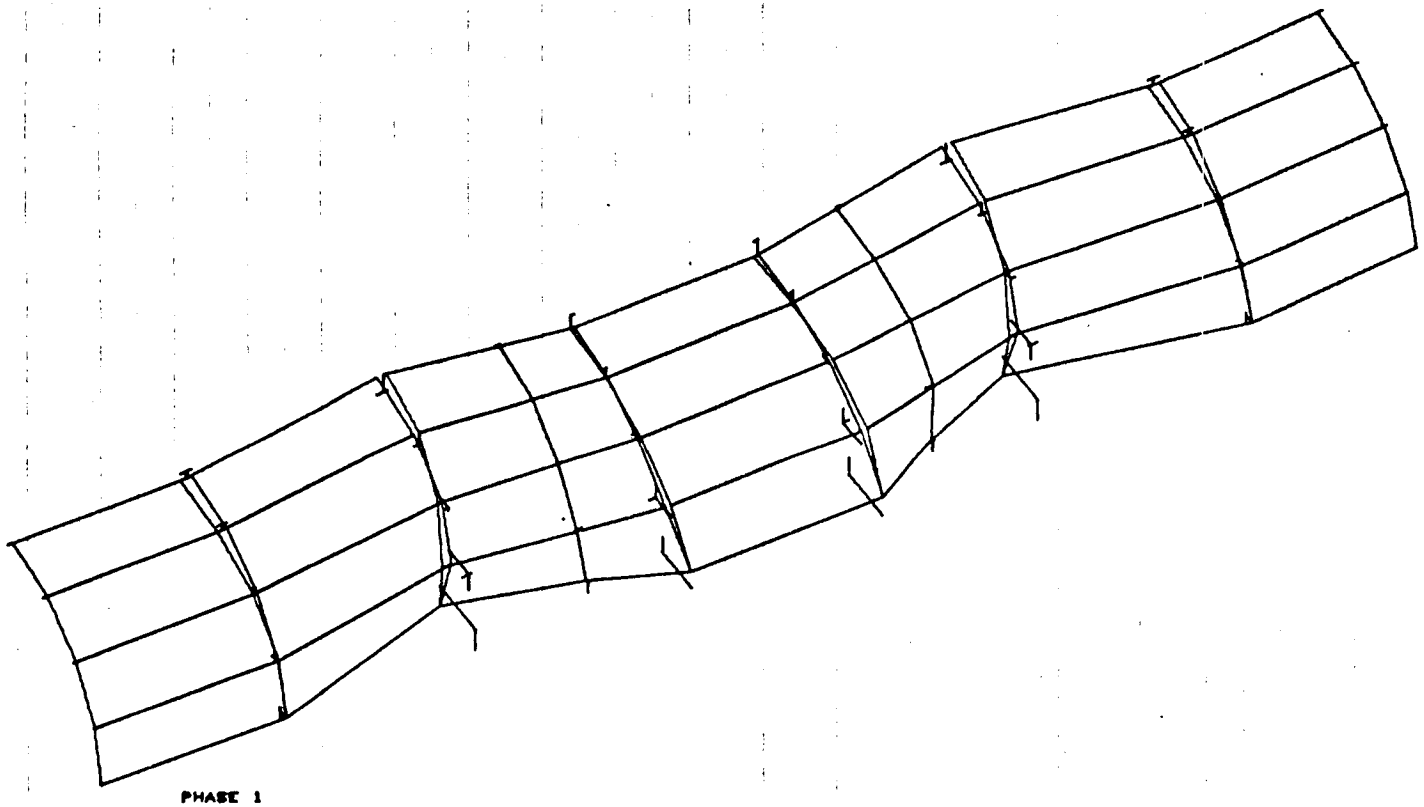

Fig. 22 Revised Cargo Door (Mode 7)

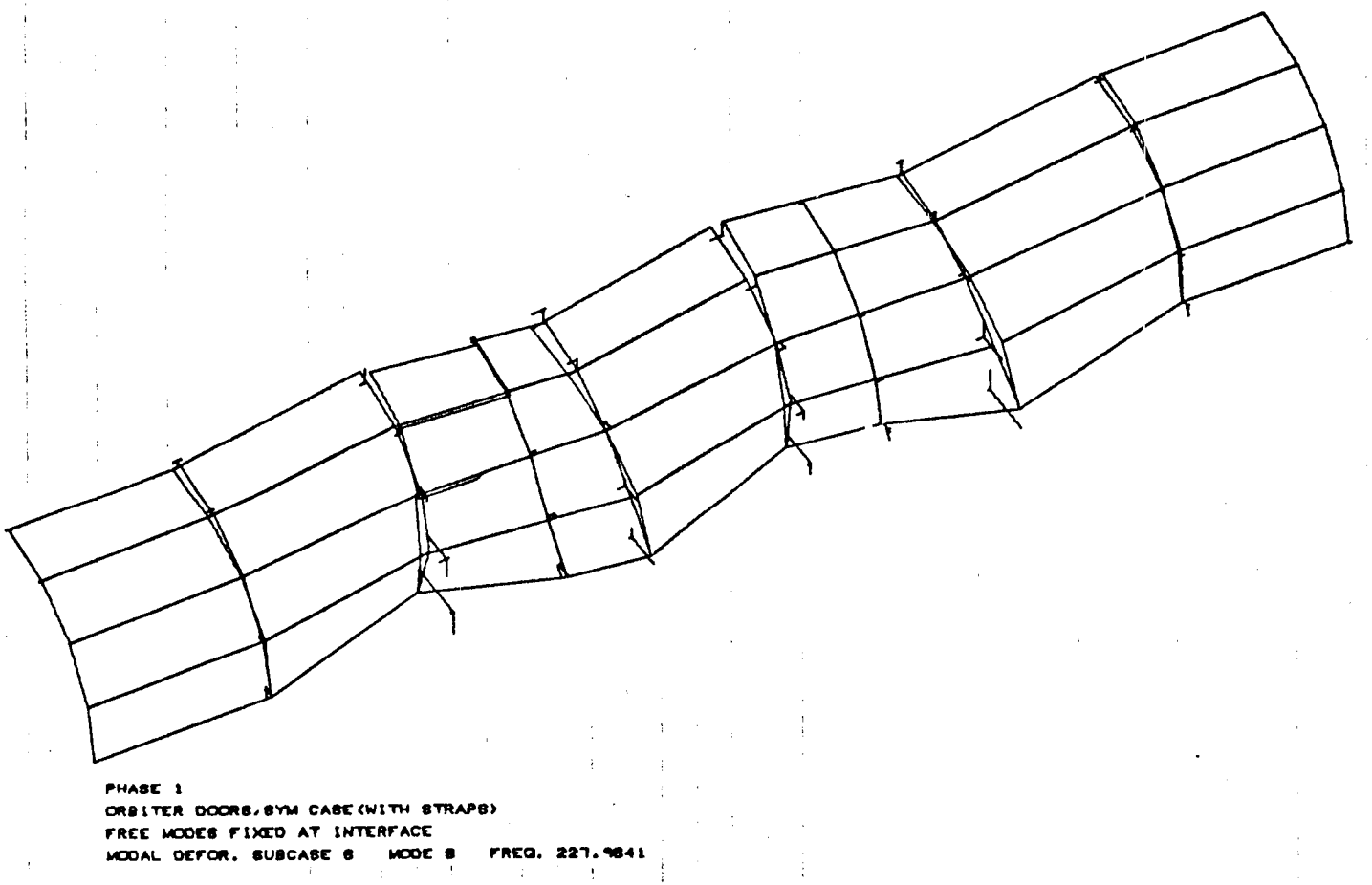

Fig. 23 Revised Cargo Door (Mode 8)

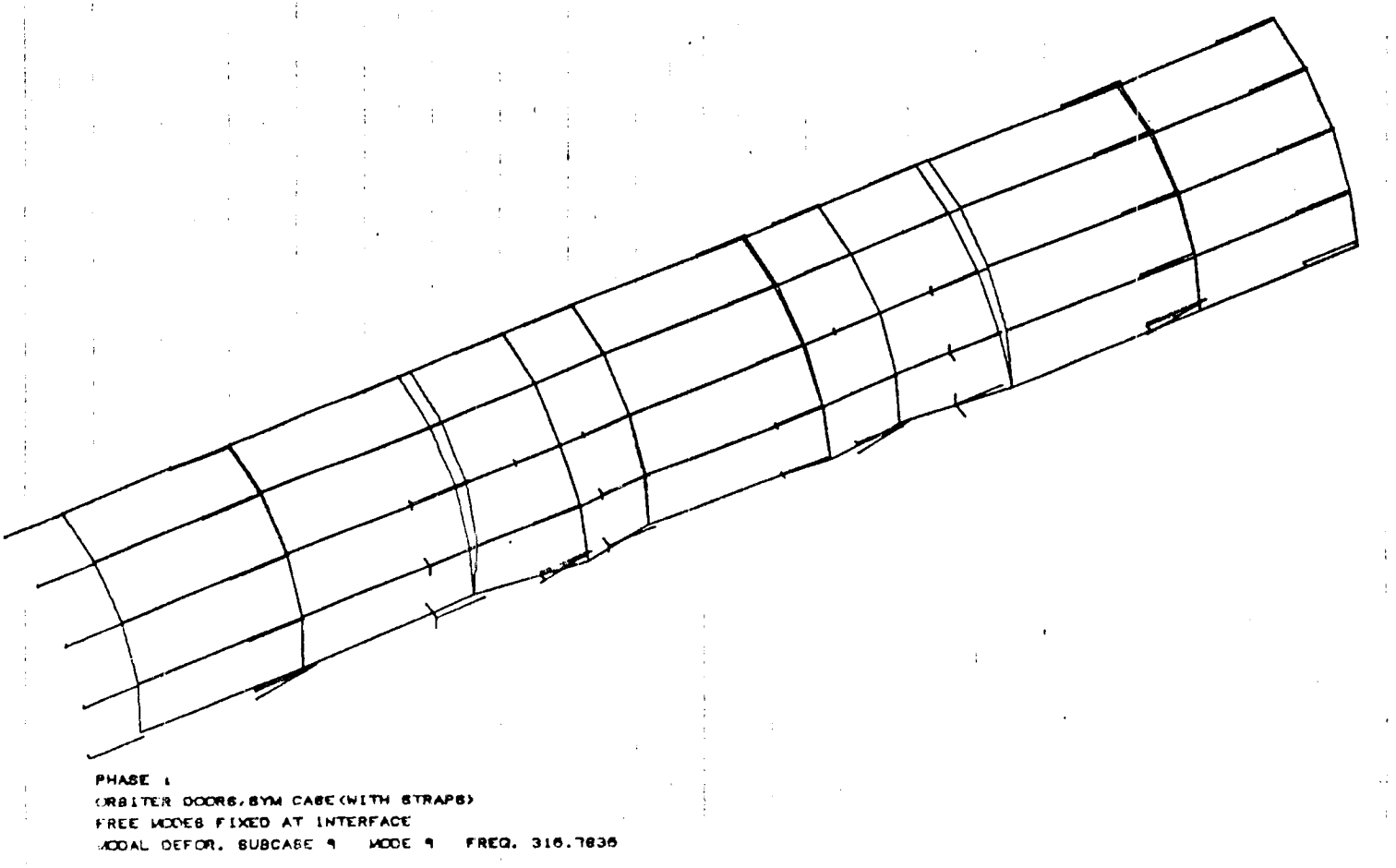

Fig. 24 Revised Cargo Door (Mode 9)

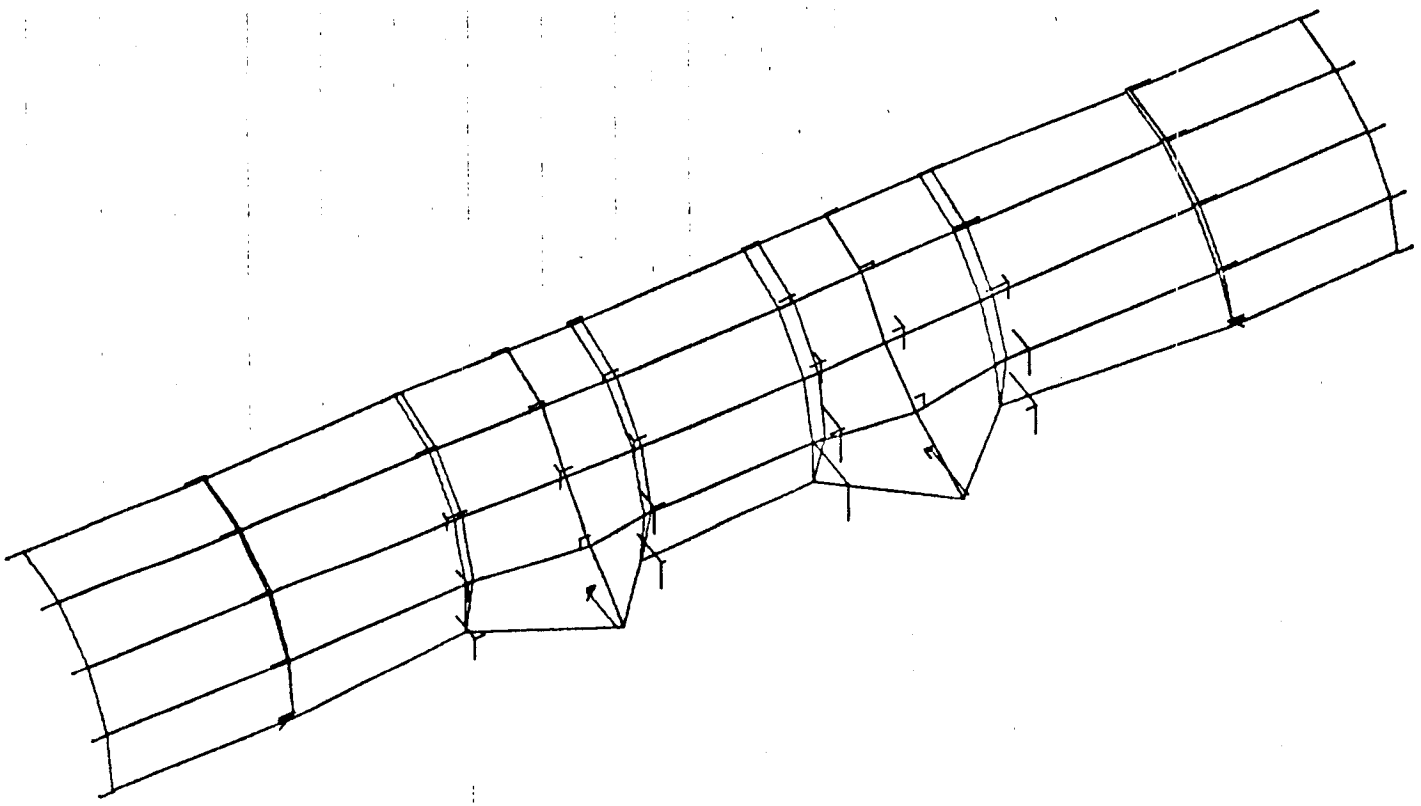

Fig. 25 Revised Cargo Door (Mode 10)

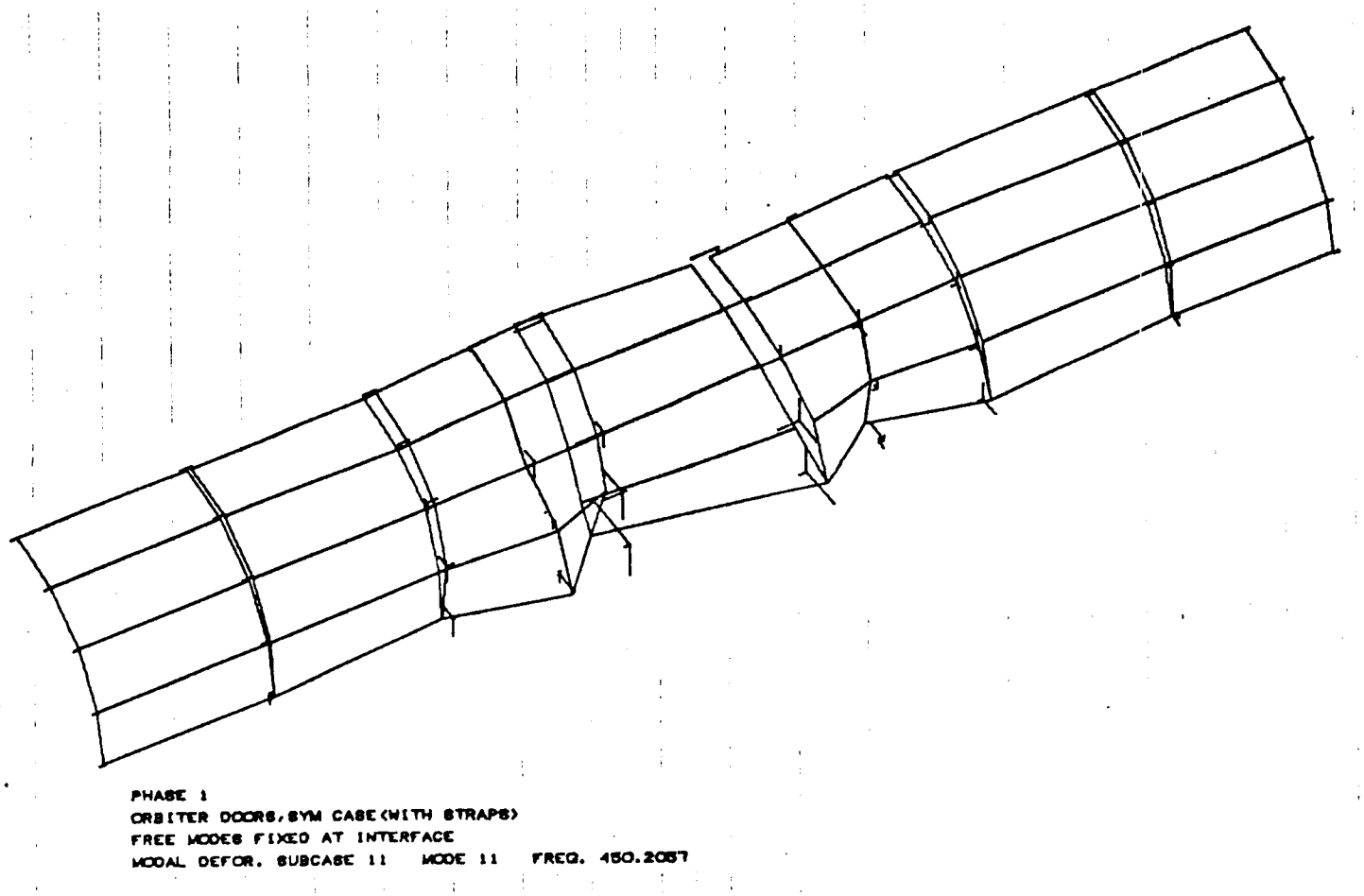

Fig. 26 Revised Cargo Door (Mode 11)

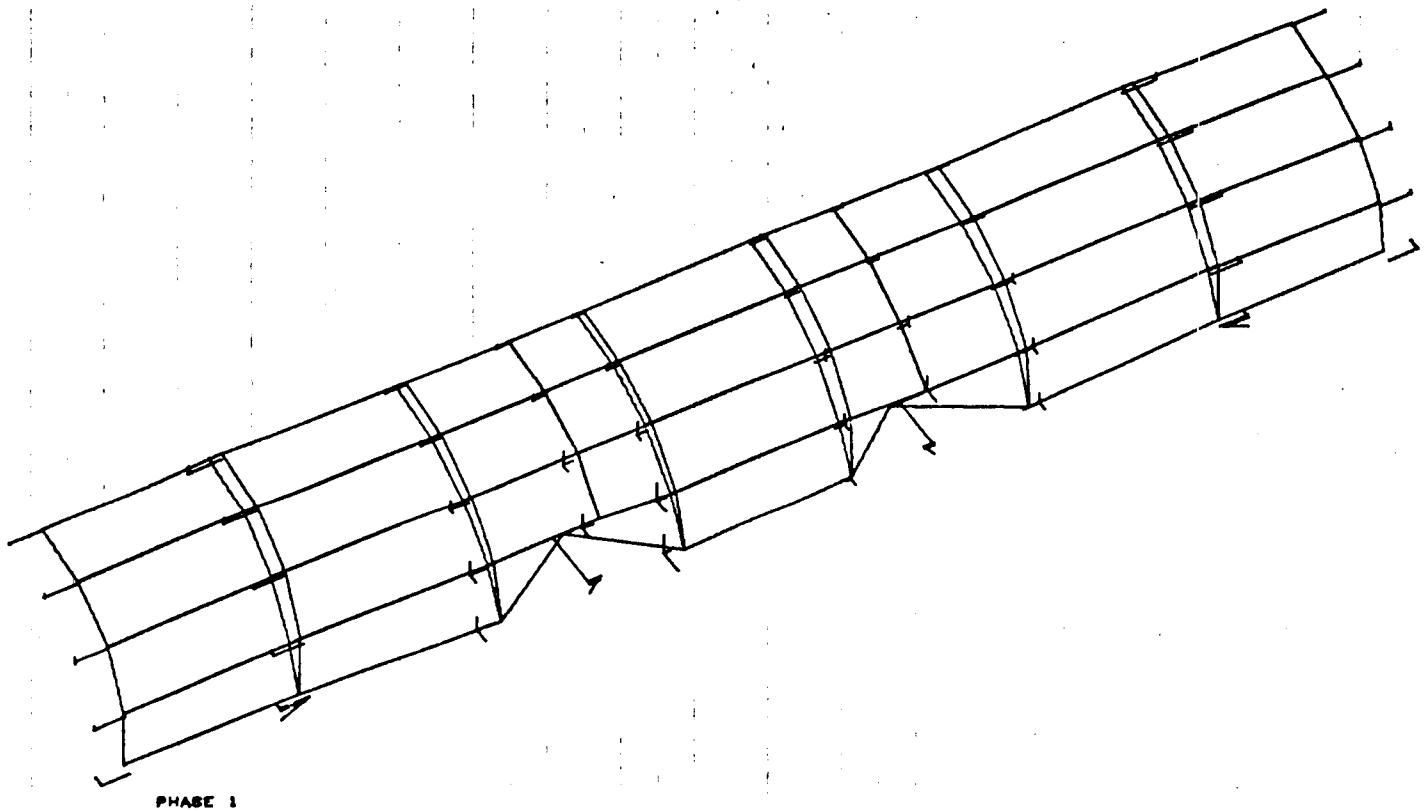

Fig. 27 Revised Cargo Door (Mode 12)

COMPUTING TIME

It seems logical in the Modal Synthesis method to keep as many dynamic degrees of freedom as possible in obtaining component modes. Thus approximations brought about by GUYAN reduction are eliminated. This approach worked rather well with the smaller substructures, where only massless degrees of freedom and those along fictitious nodal lines were eliminated by GUYAN reduction. The large fuselage substructure could not be treated in the same way. It took 24 Central Processing Unit (CPU) minutes or 284 system minutes to obtain 1 mode with 614 degrees of freedom. Nine (9) (CPU) minutes or 115 system minutes were spent in the Real Eigenvalue Analysis (READ) module alone. It was therefore decided to keep approximately the same number of dynamic degrees of freedom that was used in the direct approach to compute component modes. Although there was no choice, this was compounding the lack of accuracy since in modal synthesis accuracy is lost by carrying only a reduced number of component modes into the coupling run. Table 9 shows a comparison of computing time to obtain Orbiter Symmetric modes for the two methods. The time spent in the READ module in system minutes per mode extraction as a function of the dynamic degrees of freedom is plotted in Fig. 28. As can be seen in the figure, there is a great need to incorporate into NASTRAN a more efficient eigenvalue extraction program, especially if one has to calculate higher modes for a large problem. For higher modes there should be more dynamic degrees of freedom (less Guyan reduction) in calculating component modes, and more component modes must be extracted in Phase 1.

From Table 9, the direct method is more economical, if one is to solve for only the lower modes of the Orbiter. The advantage of the component modes approach lies in the Phase 2 or coupling run, if more substructures were to be

coupled to the Orbiter (total Shuttle). For example, the Phase 2 results (Refer to Table 5) shows that only about 40 component modes were important in computing the first 23 system modes. The unimportant component modes in Phase 2 could be eliminated, thus reducing the dynamic degrees of freedom from 220 to 121. From Fig. 28, it is evident that eigenvalue solutions in relatively short time can be obtained up to about 360 degrees of freedom. This leaves approximately 250 degrees of freedom for the added reduced substructures (external tanks and SRB) to be solved within a reasonable time for the real lower modes.

Table 9 Computing Time to Obtain Orbiter Symmetric Modes
Comparison Between Modal Synthesis and Direct
Elimination Method

RUN	RUN DESCRIPTION	MODAL SYNTHESIS								DIRECT APPROACH							
		TOT. TIME		TIME IN READ MODULE						TOT. TIME		TIME IN READ MODULE					
		CPU MIN	SYS MIN	DYNAMIC DOF	NO. OF MODES	FREQ. RANGE (HZ)	CPU MIN	SYS MIN	SYS. MIN. PER MODE	CPU MIN	SYS MIN	DYNAMIC DOF	NO. OF MODES	FREQ. RANGE (HZ)	CPU MIN	SYS MIN	SYS. MIN. PER MODE
1	Fuselage - Phase 1 (Altered R.F. 3)	81	435	209	57	87 → 1571	61	212	3.7	18	102	235	8	0 → 246	6.5	28	3.5
2	Wing - Phase 1 (Altered R.F. 3)	12	56	179	28	74 → 1216	8	22	0.8	2	12	120	4	74 → 332	.7	4	1.0
3	Cargo Doors - Phase 1 (Altered R.F. 3)	9	45	198	35	48 → 2046	5	20	0.6	2	11	23	15	0 → 2006	.04	0.5	0.03
4	Fin - Phase 1 (Altered R.F. 3)	2	8	73	7	78 → 4226	.5	2	0.3	1.5	8	14	4	281 → 3348	.02	0.5	0.1
5	Payload - Phase 1 (Altered R.F. 3)	1	8	23	12	64 → 4622	.3	5	0.4	0.7	5	21	4	81 → 1021	.02	0.5	0.1
6	Copy Run - Consolidate Phase 1 Tapes onto 1 Tape (DMAP)	.1	1	-	-	-	-	-	-	.1	1	-	-	-	-	-	-
7	Orbiter - Phase 2 (Altered R.F. 3)	19	109	220	23	0 → 224	17	60	2.6	22	145	362	13	0 → 185	15	96	7.4
8	Fuselage - Phase 3 (Altered R.F. 3)	6	35														
9	Wing - Phase 3 (Altered R.F. 3)	3	12														
10	Cargo Doors - Phase 3 (Altered R.F. 3)	2	9														
11	Fin - Phase 3 (Altered R.F. 3)	2	7														
12	Payload - Phase 3 (Altered R.F. 3)	1	5														
	Total Time - Phase 1, 2, 3	138	732				93	321									
	Total Time - Phase 1, 2	124	664				93	321		46	284				22	130	

OBSERVATIONS AND RECOMMENDATIONS

The three phase modal coupling procedures adapted to NASTRAN may be summarized as follows:

- The finite element model is divided into convenient substructures. All interface degrees of freedom between elements are retained in the analysis
- Phase 1 consists of calculating modes for each substructure restrained at the interface points. This phase also includes a series of check calculations to guard against spurious forces, loss of mass, or ill-conditioning during the matrix reduction process
- Phase 2 consists of assembling the substructure models together. In this phase the interface points are merged and the modes considered unnecessary to represent the various substructures are eliminated

  Check calculations are made to test the merged interface stiffness and mass matrices. The eigenvectors and eigenvalues for the combined system are calculated
- Phase 3 consists of retrieval of the final detailed mode shape for each substructure from individual tapes prepared during Phase 2.

This method was applied successfully to the 1/8-scale shuttle model orbiter. Comparison between results from modal coupling and those from the direct substructure merging method previously used indicated good agreement. Spurious modes of the cargo bay doors found here were probably also present in the other method but were not revealed since no dynamic degrees of freedom were assigned to them.

The method can be used to reduce the dynamic degrees of freedom for the orbiter, and to add the modes of the external tank and solid rocket booster while limiting the problem size to about 350 degrees of freedom, which should permit a real eigenvalue analysis of the combined shuttle.

Using Modal Synthesis and a harmonic reduction technique developed by Robert Coppolino (Reference 2) for the hydro-elastic tanks, it is possible to reduce the final dynamic degrees of freedom for that substructure down to approximately 350. Lower real eigenvalues could then be extracted within a reasonable time.

Regrettably, the total 1/8-scale model of the shuttle could not be analyzed because of limited time available, and only the Orbiter was analyzed to test the Modal Synthesis procedure developed in this report.

Damping was not included in the modal synthesis procedure, since it is only considered significantly large in the SRB substructure, which was not included in this analysis. This would necessitate incorporating modal synthesis procedures into Rigid Format 7, which uses the complex eigenvalue module CEAD. It is doubtful if the total Shuttle model could be reduced to only 150 meaningful dynamic degrees of freedom, as required, to have the complex eigenvalues extracted within a reasonable time. The 150 figure is based upon experience in analyzing the Solid Rocket Booster (SRB), Reference 3. Twelve (12) complex eigenvalues for 116 dynamic degrees of freedom were obtained, which took about 6.3 system minutes per mode in the CEAD (Complex Eigenvalue Analysis) module. This is about six times as long as a comparable problem required in the READ (Real Eigenvalue Analysis) module. Referring to Fig. 28, we can see the system minutes per mode for the CEAD module will rise rather sharply compared to the READ module as the number of dynamic degrees of freedom increases.

It is therefore strongly recommended that before a modal synthesis (sub-structuring) procedure is adopted to yield complex eigenvalues, a more efficient complex eigenvalue extraction program be developed.

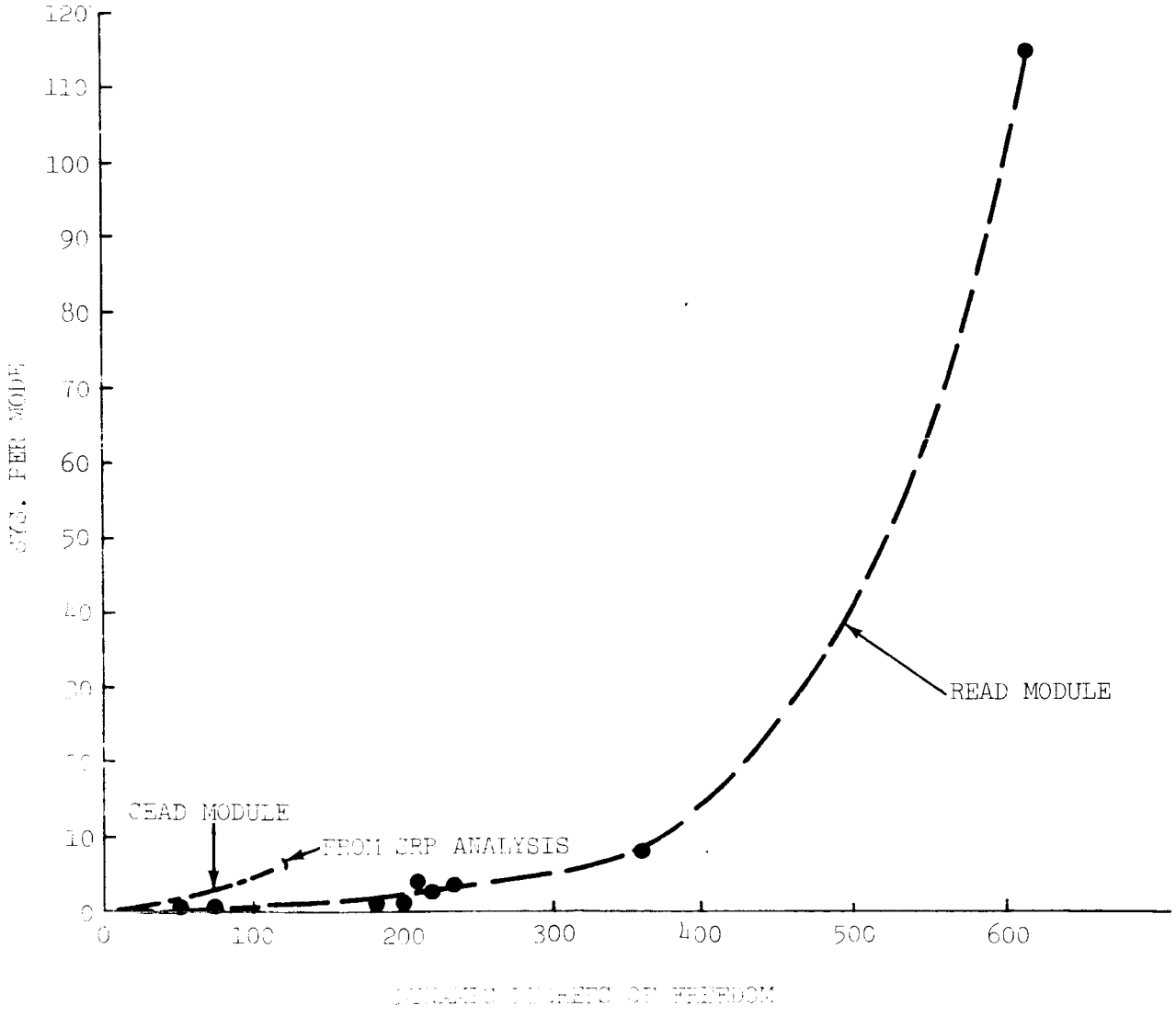

Fig. 28 Average Time Spent in READ Module Extracting 1 Mode

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Appendix A
NASTRAN COMPONENT MODES ANALYSIS GENERAL THEORY

APPENDIX A NASTRAN COMPONENT MODES ANALYSIS - GENERAL THEORY

Phase 1 - Representing Part of a Substructure by Normal Vibration Modes

The equations of motion for a substructure (after GUYAN reduction, if any) are

$$\{F_a\} = [M_{aa}] \{\ddot{u}_a\} + [K_{aa}] \{u_a\} \qquad 1)$$

where $\{F_a\} = \{0\}$

Or, letting $\{P_a\}$ represent the vector of Inertia forces, then

$$[K_{aa}] \{u_a\} = \{P_a\} \qquad 2)$$

where

$$\{P_a\} = - [M_{aa}] \{\ddot{u}_a\} \qquad 3)$$

Partition eq. 2 into interior and interface degrees of freedom (l and r sets)

$$\left[\begin{array}{c|c} K_{ll} & K_{lr} \\ \hline K_{lr}^T & K_{rr} \end{array}\right] \left\{\begin{array}{c} u_l \\ \hline u_r \end{array}\right\} = \left\{\begin{array}{c} P_l \\ \hline P_r \end{array}\right\} \qquad 4)$$

The substructure displacements may be represented as the superposition of displacements relative to the interface and those due to interface motion, as follows:

$$\{u_a\} = \{\bar{u}_a\} + \{\overset{*}{u}_a\} = \begin{Bmatrix} \bar{u}_\ell \\ 0 \end{Bmatrix} + \begin{Bmatrix} \overset{*}{u}_\ell \\ u_r \end{Bmatrix} \qquad 5)$$

where $\{\bar{u}_\ell\}$ is the vector of displacements relative to u_r (i.e., with $\{u_r\} = \{0\}$), and $\{\overset{*}{u}_\ell\}$ is the vector of displacements due to $\{u_r\}$. The $\{\bar{u}_\ell\}$ displacements are due to $\{P_\ell\}$ with $\{u_r\} = \{0\}$, while the $\{\overset{*}{u}_\ell\}$ displacements are due to $\{u_r\}$ with $\{P_\ell\} = \{0\}$.

The relationship between $\{\overset{*}{u}_\ell\}$ and $\{u_r\}$ may be determined from the upper partition of Eq. 4 as

$$\{\overset{*}{u}_\ell\} = [G_\ell]\{u_r\} \qquad 6)$$

where

$$[G_\ell] = -[K_{\ell\ell}]^{-1} \times [K_{\ell r}] \qquad 7)$$

combining eq. 5 and 6 gives

$$\begin{Bmatrix} u_\ell \\ \hline u_r \end{Bmatrix} = \left[\begin{array}{c|c} I_\ell & G_\ell \\ \hline 0 & I_r \end{array}\right] \begin{Bmatrix} \bar{u}_\ell \\ \hline u_r \end{Bmatrix} \qquad 8)$$

where I_ℓ and I_r are unit matrices.

Partitioning eq 1 into interior and interface degree of freedom, gives

$$\begin{Bmatrix} F_\ell \\ F_r \end{Bmatrix} = \left[\begin{array}{c|c} M_{\ell\ell} & M_{\ell r} \\ \hline M_{\ell r}^T & M_{rr} \end{array}\right] \begin{Bmatrix} \ddot{u}_\ell \\ \ddot{u}_r \end{Bmatrix} + \left[\begin{array}{c|c} K_{\ell\ell} & K_{\ell r} \\ \hline K_{\ell r}^T & K_{rr} \end{array}\right] \begin{Bmatrix} u_\ell \\ u_r \end{Bmatrix} \qquad 9)$$

where $\begin{Bmatrix} F_\ell \\ F_r \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$

holding the interface fixed and writing the upper partition of eq. 9 for the relative displacements $\{\bar{u}_\ell\}$, gives

$$[M_{\ell\ell}]\{\ddot{\bar{u}}_\ell\} + [K_{\ell\ell}]\{\bar{u}_\ell\} = \{0\} \qquad 10)$$

The corresponding real eigenvalue problem is

$$[K_{\ell\ell}]\{\phi_\ell\}_i = \lambda_i \times [M_{\ell\ell}]\{\phi_\ell\}_i \qquad 11)$$

letting

$$\{\bar{u}_\ell\} = [\phi_\ell]\{\xi_i\} \qquad 12)$$

where

$$[\phi_\ell] = \left[\{\phi_\ell\}_1 \; \{\phi_\ell\}_2 \text{ ----- } \{\phi_\ell\}_R\right]$$

and $\{\xi_i\}$ = vector of modal displacements, Eq. 8 may be rewritten as

$$\begin{Bmatrix} u_\ell \\ u_r \end{Bmatrix} = \begin{bmatrix} \phi_\ell & G_\ell \\ 0 & I_r \end{bmatrix} \begin{Bmatrix} \xi_i \\ u_r \end{Bmatrix} \qquad 13)$$

It should be noted that $[\phi_\ell]$ contains a reduced number of modes, i.e., the number of columns of $[\phi_\ell]$ is less than ℓ, which is the number of degrees of freedom in eq. 10.

The generalized modal forces, as shown on page 14.1-3 of Reference 10, can be expressed as:

$$\begin{Bmatrix} F_i \\ F_r \end{Bmatrix} = \begin{bmatrix} \phi_\ell^T & 0 \\ G_\ell^T & I_r \end{bmatrix} \begin{Bmatrix} F_\ell \\ F_r \end{Bmatrix} \qquad 14)$$

Substitution of first Eq. 14 then Eq. 13 into Eq. 9, and using Eq. 7, yields the following reduced matrix equation of motion in terms of the generalized modal and interface coordinates.

$$\begin{Bmatrix} F_i \\ F_r \end{Bmatrix} = \begin{bmatrix} M_{ii} & M_{ir} \\ Mir^T & M_{rr} \end{bmatrix} \begin{Bmatrix} \ddot{\xi}_i \\ \ddot{u}_r \end{Bmatrix} + \begin{bmatrix} K_{ii} & 0 \\ 0 & K_{rr} \end{bmatrix} \begin{Bmatrix} \xi_i \\ u_r \end{Bmatrix} \qquad 15)$$

where

$$\left[K_{ii}\right] = \left[\phi_\ell\right]^T \left[K_{\ell\ell}\right] \left[\phi_\ell\right] \qquad 16)$$

$$\left[K_{rr}\right] = \left[K_{\ell r}\right]^T \left[G_\ell\right] + \left[K_{rr}\right] \qquad 17)$$

$$\left[Mii\right] = \left[\phi_\ell\right]^T \left[M_{\ell\ell}\right] \left[\phi_\ell\right] \qquad 18)$$

$$\left[M_{ir}\right] = \left[\phi_\ell{}^T\right] \left(\left[M_{\ell\ell}\right] \left[G_\ell\right] + \left[M_{\ell r}\right] \right) \qquad 19)$$

$$\left[M_{rr}\right] = \left[G_\ell{}^T\right] \left(\left[M_{\ell\ell}\right] \left[G_\ell\right] + \left[M_{\ell r}\right] \right) + \left[M_{\ell r}{}^T\right] \left[G_\ell\right] + \left[M_{rr}\right] \qquad 20)$$

The resulting matrices from Eq. 16 to 20 will be input to Phase 2, to be coupled to other substructures.

K_{ii} and M_{ii} are the generalized modal stiffness and mass matrices and should be diagonal matrices. In the actual NASTRAN computations, small off-diagonal non-zero terms will occur. The following relationship should exist between the corresponding diagonal elements

$$k_{ii} = \lambda_i \quad m_{ii} \qquad 21)$$

K_{rr} and M_{rr} are the static reduced interface stiffness and mass matrices, when the interior degrees of freedom are released. $-[M_{ir}]\{\ddot{u}_r\}$ would represent the generalized modal forces, due to interface accelerations.

PHASE 1 - INCORPORATED CHECKS

The checks incorporated are all based on a matrix EQg, which can be extracted from the GPWG module. The NASTRAN module GPWG has been modified (Appendix B2) to output this matrix, which expresses the static load summations for each unit g-set load. This procedure is forced when the parameter WTMASS, in the general calling sequence of GPWG (NASTRAN Programmer's Manual (NPM) 4.29), is set to 0.0. For all other values of WTMASS, module GPWG performs as outlined in the NPM. EQg is a 6 x g matrix, where g is equal to 6 times the number of grid points in the problem. It should be noted, that only grid points should be used in the problem when extracting this matrix, since scalar points have no geometry. Therefore, in Phase 1, only grid points are used. The 6 rows of EQg correspond to the ΣF_x, ΣF_y, ΣF_z, ΣM_x, ΣM_y, and ΣM_z load summations respectively about a reference point specified by the parameter GRDPNT. An example of extracting EQg from GPWG is as follows:

```
GPWG BGPDT,CSTM,EQEXIN,/EQg/V,Y,GRDPNT=-1/C,N,0.0 $
```

where

$$\{F_{REF}\} = \underset{6xg}{[EQ_g]}\{F_g\} \qquad \text{STATIC EQUILIBRIUM} \qquad (22)$$

As indicated for equations 13 and 14, the following transformation holds

$$\{u_g\} = \underset{gx6}{[D_g]}\{u_{REF}\} \qquad \text{KINEMATIC CONTINUITY} \qquad (23)$$

where

$$\left[D_g\right] = \left[EQ_g\right]^T \qquad 24)$$

and $\{U_{REF}\}$ is the vector of 6 rigid body motions of the reference point and $\{u_g\}$ contains all g-set displacements.

Matrix D_g is equal to the D matrix discussed in the NASTRAN Programmers Manual, Section 4.29.

Matrix D_g can be partitioned into the various NASTRAN subsets by using column partitioning vectors generated by the VEC instruction. The subsets of D_g are as follows

$$\begin{Bmatrix} u_m \\ u_n \end{Bmatrix} = \begin{bmatrix} D_m \\ D_n \end{bmatrix} \Leftarrow \underset{gx6}{\left[D_g\right]} \left\{ u_{REF} \right\} \qquad 25)$$

$$\begin{Bmatrix} u_s \\ u_f \end{Bmatrix} = \begin{bmatrix} D_s \\ D_f \end{bmatrix} \Leftarrow \underset{nx6}{\left[D_n\right]} \left\{ u_{REF} \right\} \qquad 26)$$

$$\begin{Bmatrix} u_o \\ u_a \end{Bmatrix} = \begin{bmatrix} D_o \\ D_a \end{bmatrix} \Leftarrow \underset{fx6}{\left[D_f\right]} \left\{ u_{REF} \right\} \qquad 27)$$

$$\begin{Bmatrix} u_\ell \\ u_r \end{Bmatrix} = \begin{bmatrix} D_\ell \\ D_r \end{bmatrix} \Leftarrow \underset{ax6}{\left[D_a\right]} \left\{ u_{REF} \right\} \qquad 28)$$

MULTIPOINT CONSTRAINT CHECK

The NASTRAN program forms the matrix Gm from the MPC bulk input.

$$\left\{u_m\right\} = \left[G_m\right]\left\{u_n\right\} \qquad 29)$$

The displacements $\{u_n\}$ can be related to rigid body motion at the reference point by D_n in Eq. 25.

$$\{u_m\} = [G_m][D_n]\{u_{REF}\} \qquad 30)$$

Equation 30 should be equal to

$$\{u_m\} = [D_m]\{u_{REF}\} \qquad 31)$$

or

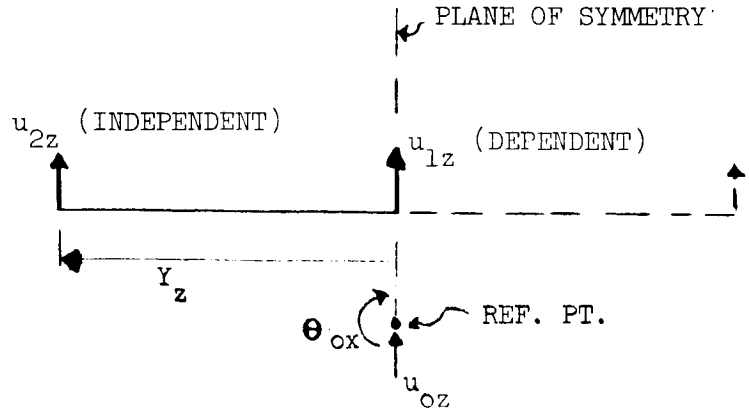
$$([G_m][D_n] - [D_m])\{u_{REF}\} = \{0\}$$

or

$$[MPCCK]_{mx6} = [G_m][D_n] - [D_m] = [0] \qquad 32)$$

When performing symmetrical or anti-symmetrical analyses, MPCCK may contain non-zero terms if the dependent degree of freedom is on the plane of symmetry and the independent degree of freedom is off the plane of symmetry. In this case, the non-zero term will be a difference in coordinates between the 2 points.

For example:



$$u_{iz} = \underset{1x1}{[G_m]}\, u_{zz} \quad , \qquad [G_m] = [1]$$

$$u_{zz} = \underset{1x6}{[D_n]}\{u_{REF}\} \quad , \qquad [D_n] = [0\,|\,0\,|\,1\,|\,Y2\,|\,0\,|\,0]$$

$$u_{iz} = \underset{1x6}{[D_m]}\{u_{REF}\} \qquad [D_m] = [0\,|\,0\,|\,1\,|\,0\,|\,0\,|\,0]$$

$$\therefore \quad [MPCCK] = [G_m][D_n] - [D_m] = [0\,|\,0\,|\,0\,|\,Y2\,|\,0\,|\,0]$$

(Y2: Non-zero)

The six columns pertain to rigid body motion at the reference point ($u_{ox}, u_{oy}, u_{oz}, \theta_{ox}, \theta_{oy}, \theta_{oz}$). The non-zero term is caused by an anti-symmetric motion θ_{ox}, which doesn't apply to the illustrative symmetrical case. The terms under the symmetrical motions u_{ox}, u_{oz}, & θ_{oy} in this case should always be zero.

The succeeding checks to be developed on the following pages will also follow the same rule. That is, when performing symmetric or anti-symmetrical analyses only the three related columns are appropriately looked at in the check matrix.

SINGLE-POINT CONSTRAINT (SPC) CHECK

An SPC check is developed which is based upon the following assumption. The only degrees of freedom to be included in this set will be those that have no stiffness and those that are symmetrical or anti-symmetrical boundary constraints at the plane of symmetry. Any other supports that a structure might have are included in the r-set (SUPORT card). Appropriate ALTERS, to change the condition that the r-set by statically determinate, have been made to prevent a FATAL ERROR.

The following matrix is formed in NASTRAN

$$\{F_s\} = [K_{fs}]^T \{u_f\} \qquad 33)$$

The displacements $\{u_f\}$ can be related to rigid body motion at the reference point by $[D_f]$ in eq. 26.

$$\{F_s\} = [\text{SPCCK}]\{u_{REF}\} \qquad 34)$$

where

$$[\underset{5x6}{\text{SPCCK}}] = [K_{fs}]^T [D_f] \qquad 35)$$

$[\text{SPCCK}]$ should be **null.** For symmetrical or antisymmetrical analyses only the appropriate three columns will be zero.

SINGLE-POINT CONSTRAINT MASS CHECK

When mass is generated from member densities, mass may inadvertantly be assigned to SPC degrees of freedom. This mass will be lost in calculating vibration modes, unless they happen to be at sym. or anti boundary constraints. SPC inertia forces can be written as:

$$\{F_s\} = [M_{ss}]\{\ddot{u}_s\} \qquad 36)$$

where $[M_{ss}]$ is a symmetrical partition of $[M_{nn}]$.

The accelerations $\{\ddot{u}_s\}$ can be related to rigid body accelerations at the reference point by $[D_s]$ in eq. 26.

$$\{F_s\} = [MSPC]\{u_{REF}\} \quad 37)$$

where

$$[MSPC]_{5x6} = [M_{ss}][D_s] \quad 38)$$

$[MSPC]$ should be null. For symmetric or anti-symmetric analyses only the appropriate 3 columns will be zero. If they are not, the degree of freedom in question should be MPC'ed, to prevent loss of mass.

OTHER TRANSFORMATION CHECKS

Checks similar to the MPC check (eq. 32) are performed for the NASTRAN generated transformation matrices $[G_o]$ and $[G_\ell]$, where $[G_\ell] = -[K_{\ell\ell}]^{-1}[K_{\ell r}]$. This was done mainly to determine how far equilibrium has deteriorated due to ill-conditioning or round-off. The checks are:

$$[0] = [GOCHK] = [G_o][D_a] - [D_o] \quad 39)$$

$$[0] = [GLCHK] = [G_\ell][D_r] - [D_\ell] \quad 40)$$

For symmetric or anti-symmetric analyses only the appropriate 3 columns should be zero.

REDUCED INTERFACE STIFFNESS CHECK

The static interface stiffness from eq. 17 states

$$\{F_r\} = [K_{rr}]\{u_r\} \quad 41)$$

Relating $\{u_r\}$ to rigid body motion by $[D_r]$ (eq. 28).

$$\{0\} = \underset{\ell_{Null}}{[KRRCK]}\{u_{REF}\} = [K_{rr}][D_r]\{u_{REF}\} \quad (42)$$

For symmetric or anti-symmetric analyses only the appropriate 3 columns should be zero.

RIGID BODY MASS MATRIX CHECK

The reduced interface mass can be converted to a rigid body mass matrix. This can be compared with the $[MO]$ matrix, which is printed output from the GPWG module. For symmetric or anti-symmetric analyses, only the symmetric or anti-symmetric terms should be compared. This check ensures that no mass has been lost in the reduction process. $[M_{rr}]$ is converted to a rigid body matrix as follows:

$$\underset{6x6}{[MORR]} = [D_r]^T \times [M_{rr}] \times [D_r] \quad (43)$$

MATRICES GENERATED IN PHASE 1 NECESSARY FOR PHASE 2 CHECKS

In Phase 2, the basic matrix EQg (eq. 22) cannot be extracted from the GPWG module, because the Phase 1 component modes (or generalized coordinates) will be defined in Phase 2 as scalar points. Therefore, it is necessary to generate matrices in Phase 1 which can be used for Phase 2 checks.

We already have a matrix $[D_r]$ (eq. 28) to define the interface motion due to rigid body motion at the reference point. This matrix will be input to Phase 2.

$$\{u_r\} = [Dr]\{u_{REF}\} \quad 44)$$

We must now find a similar matrix for the generalized modal coordinates, which will be written as

$$\{\xi_i\} = [D_i]\{u_{REF}\} \quad 45)$$

Inverting $[Kii]$ in eq. 15 yields

$$\{\xi_i\} = [K_{ii}]^{-1}\{F_i\} \quad 46)$$

The generalized forces, $\{Fi\}$, is defined in eq. 14 as

$$\{F_i\} = [\phi_\ell]^{-T}\{F_\ell\} \quad 47)$$

The generated NASTRAN matrix $[K_{\ell\ell}]$ defines

$$\{F_\ell\} = [K_{\ell\ell}]\{u_\ell\} \quad 48)$$

Converting $\{U_\ell\}$ to rigid body motion by $[D_\ell]$ in eq. 28 gives

$$\{F_\ell\} = [K_{\ell\ell}][D_\ell]\{u_{REF}\} \quad 49)$$

Since $[K_{\ell\ell}]$ is large $\{F_\ell\}$ can be defined another way by using the upper partition of the stiffness matrix in eq. 9)

$$\{F_\ell\} = [K_{\ell\ell}]\{u_\ell\} + [K_{\ell r}]\{u_r\} \quad 50)$$

Converting the displacements to rigid body displacements will set $\{F_\ell\} = \{0\}$

$$\{0\} = [K_{\ell\ell}][D_\ell]\{u_{REF}\} + [K_{\ell r}][D_r]\{u_{REF}\} \quad 51)$$

or

$$[K_{\ell\ell}][D_\ell] = -[K_{\ell r}][D_r] \quad 52)$$

Therefore, substituting 52 into 49 yields

$$\{F_\ell\} = -[K_{\ell r}][D_r]\{u_{REF}\} \quad 53)$$

Combining eq. 46, 47 and 53 gives

$$\{\xi_i\} = -[K_{ii}]^{-1}[\phi_\ell]^T[K_{\ell r}][Dr]\{u_{REF}\} \quad 54)$$

Equating 54 to 45 yields

$$[D_i] = -[K_{ii}]^{-1}[\phi_\ell]^T[K_{\ell r}][D_r] \quad 55)$$

This matrix will be input to Phase 2.

The column partition vectors used for merging substructures in Phase 2 now seems to be the only unchecked hand data. These vectors are somewhat inconvenient to prepare and are subject to human errors. Certain matrices will now be generated in Phase 1 so that they can be compared with the merged matrices in Phase 2. They are:

$$\{F_{REF}\} = [D_i]^T[K_{ii}]\{\xi_i\} = [SUMK_{ii}]_{6xi}\{\xi_i\} \quad 56)$$

$$\{F_{REF}\} = [D_i]^T [M_{ii}] \{\ddot{\xi}_i\} = \underset{6xi}{[SUMMii]} \{\xi_i\} \quad 57)$$

$$\{F_{REF}\} = [D_r]^T [M_{ir}]^T \{\ddot{\xi}_i\} = \underset{6xi}{[SUMMri]} \{\xi_i\} \quad 58)$$

$[SUMKii]$ gives the summation of interior elastic forces about a reference point due to unit generalized modal displacements.

$[SUMMii]$ gives the summation of negative interior inertia forces about a reference point due to unit generalized modal accelerations.

$[SUMMri]$ gives the summation of negative interface inertia forces about a reference point due to unit generalized modal accelerations.

Phase 2 - Coupling Substructures' Reduced Dynamic Equations and Solving for Free-Free Modes

The equations of motion of the combined uncoupled substructures can now be written in the following form:

$$[M_{gg}] \{\ddot{u}_g\} + [K_{gg}] \{u_g\} = \{F_g\} \quad 59)$$

where $\{Fg\} = \{0\}$

or

$$\left[\begin{array}{c|c} MGG_r & MGG_{ri} \\ \hline MGG_{ir} & MGG_i \end{array}\right] \left\{\begin{array}{c} \ddot{u} \\ \hline \ddot{\xi} \end{array}\right\} + \left[\begin{array}{c|c} KGG_r & 0 \\ \hline 0 & KGG_i \end{array}\right] \left\{\begin{array}{c} u \\ \hline \xi \end{array}\right\} = \left\{\begin{array}{c} F_u \\ \hline F_\xi \end{array}\right\} \quad 60)$$

where $\left\{\begin{array}{c} F_u \\ F_\xi \end{array}\right\} = \left\{\begin{array}{c} 0 \\ 0 \end{array}\right\}$

$\{u\}$ represents all of the uncoupled interface or junction point degrees of freedom. The interface or junction points are defined by GRID cards, thereby creating 6 degrees of freedom at each junction point. The unwanted d.o.f. (those that have been eliminated in Phase 1) will be SPC'ed out subsequently in the reduction process. The lineup of $\{u\}$ is

$$\{u\} = \begin{Bmatrix} u^1 \\ u^2 \\ \vdots \\ u^N \end{Bmatrix}$$ where N = no. of substructures

$\{u^i\}$ would contains 6 x (number of substructure i junction pts).

$\{\xi\}$ represents all of the uncoupled generalized modal coordinates obtained in Phase 1. These coordinates will be defined by scalar points. Any unwanted generalized coordinate (those representing higher modes) can be SPC'ed out subsequently in the reduction process. The lineup of $\{\xi\}$ is

$$\{\xi\} = \begin{Bmatrix} \xi^1 \\ \xi^2 \\ \vdots \\ \xi^N \end{Bmatrix}.$$

The column partition vectors used to merge the substructures can be thought of as transformation matrices for the sake of presentation. For example:

$$[K_{gg}^j] = [T_{gr}^j][K_{rr}^j][T_{gr}^j]^T$$

will merge the j^{th} substructure interface stiffness from Phase 1 into the Phase 2 g-lineup. Therefore, the mass and stiffness matrices in eq. 59 are generated by

$$[M_{gg}] = \sum_{j=1}^{N} \Big([T_{gr}^j][M_{rr}^j][T_{gr}^j]^T + [T_{gi}^j][M_{ii}^j][T_{gi}^j]^T + [T_{gi}^j][M_{ir}^j][T_{gr}^j]^T + [T_{gr}^j][M_{ir}^j]^T[T_{gi}^j]^T \Big)$$

$$[K_{gg}] = \sum_{j=1}^{N} \left([T_{gr}^{j}][K_{rr}^{j}][T_{gr}^{j}]^{T} + [T_{gi}^{j}][K_{ii}^{j}][T_{gi}^{j}]^{T} \right)$$

where N = number of substructures.

Similarly the kinematic matrix similar to eq. 23) can be generated

$$[D_g] = \sum_{j=1}^{N} \left([T_{gr}^{j}][D_r^{j}] + [T_{gi}^{j}][D_i^{j}] \right) \qquad 61)$$

In order to partition the merged matrices of eq 59) into that of eq 60), we need a column partition vector defining the generalized coordinates in terms of the g-set lineup. This is obtained by adding up the substructures' partition vectors which merged the substructure generalized coordinates into the Phase 2 lineup.

$$\{CP_{gi}\} = \sum_{j=1}^{N} \{CP_{gi}^{j}\} \qquad 62)$$

We can now perform some checks on the merged matrices in eq. 60) after first partitioning $[D_g]$

$$\begin{Bmatrix} u \\ \xi \end{Bmatrix} = \begin{bmatrix} DG_r \\ DG_i \end{bmatrix} \{u_{REF}\} \Leftarrow [D_g]\{u_{REF}\} \qquad 63)$$

MERGED INTERFACE STIFFNESS CHECK

$$[0] = [KGGRCK] = [KGG_r][DG_r] \qquad 64)$$

For symmetric or anti-symmetric analyses only the 3 appropriate columns should be zero.

MERGED RIGID BODY MASS MATRIX CHECK

$$\left[MOGG_r \right] = \left[DG_r \right]^T \left[MGG_r \right] \left[DG_r \right] \qquad 65)$$

this matrix should be equal to

$$\left[MOGG_r \right] = \sum_{j-1}^{N} \left[MORR^j \right] \qquad 66)$$

or equal to the sum of the substructures' rigid body mass matrices given in eq. 43.

FORCE SUMMATION CHECKS ON MERGED MATRICES

$$\underset{6x\,\S}{\left[SUMKGG_i \right]} = \left[DG_i \right]^T \left[KGG_i \right] = \left[SUMK_{ii}^1 \;\vdots\; \text{------} \;\vdots\; SUMK_{ii}^N \right]$$

$$\underset{6x\,\S}{\left[SUMMGG_i \right]} = \left[DG_i \right]^T \left[MGG_i \right] = \left[SUMM_{ii}^1 \;\vdots\; \text{------} \;\vdots\; SUMM_{ii}^N \right]$$

$$\underset{6\times\S}{\left[SUMMG_{ri} \right]} = \underbrace{\left[DG_r \right]^T \left[MGG_{ri} \right]}_{\text{Merged Matrices}} = \underbrace{\left[SUMM_{ri}^1 \;\vdots\; \text{------} \;\vdots\; SUMM_{ri}^N \right]}_{\substack{\text{Phase 1 Matrices} \\ \text{eq 56} \rightarrow 58}}$$

PHASE 2 CONTINUATION

After the merging checks are performed, the dynamic problem stated in eq. 59) will be reduced in the normal RIGID FORMAT 3 fashion to obtain a real eigenvalue solution. Continuity at the interface between structures are described by MPC's and the rigid body supports described by a SUPORT card. The checks incorporated in Phase 1 are incorporated in Phase 2 (Equations 25 thru 43 are still valid in Phase 2).

The system eigenvalues and eigenvectors are recovered in the original substructure lineups and put on individual substructure tapes so that grid point displacement can be obtained and plotted for the system modes in Phase 3.

The eigenvectors for a typical reduced substructure would be

$$\begin{Bmatrix} \xi_i \\ u_r \end{Bmatrix}^j = \begin{bmatrix} \phi_i^j \\ \phi_r^j \end{bmatrix} \{\xi\} \qquad (67)$$

Each substructures' system modal stiffness and mass is also calculated and printed out in this phase. This gives us the contribution of each substructure to the total modal stiffness and mass.

For more detailed description of all operations performed in all three phases, see Appendix B1.

Appendix B1
NASTRAN COMPONENT MODES ANALYSIS ALTERS TO RIGID FORMAT 3- PHASES 1, 2, & 3

APPENDIX B1 NASTRAN COMPONENT MODES ANALYSIS - ALTERS TO RIGID FORMAT 3, PHASES 1, 2, AND 3

REGULAR BULK PARAMETER USED - PHASE 1

GRDPNT - - - - This parameter should always be used. It causes the rigid body mass matrix MO to be printed out, which can be compared with the matrix MORR discussed in ALTER 75,84.

WTMASS - - - - Converts generated weight to mass. In the 1/8 scale model, the weight was in lbs., therefore WTMASS = .002588. The MO matrix was thus a rigid body weight matrix (see GRDPNT above). If mass was generated directly (densities in mass units), WTMASS would be 1.0 and the MO matrix would be a rigid body mass matrix.

NEW BULK PARAMETERS - PHASE 1

TPNAME - - - - Label name of INPT, where reduced substructure matrices are outputted for Phase 2.

MASSC - - - - Converts mass to weight. The default incorporated is MASSC = 386.4 #/in/sec^2, which converts mass to lbs., which is consistent with the parameter WTMASS = .002588. Therefore, the matrices MO and MORR will be in consistent units (see GRDPNT above). If WTMASS = 1.0, MASSC = 1.0. In order to have MO and MORR consistent MASSC should be the reciprocal of WTMASS.

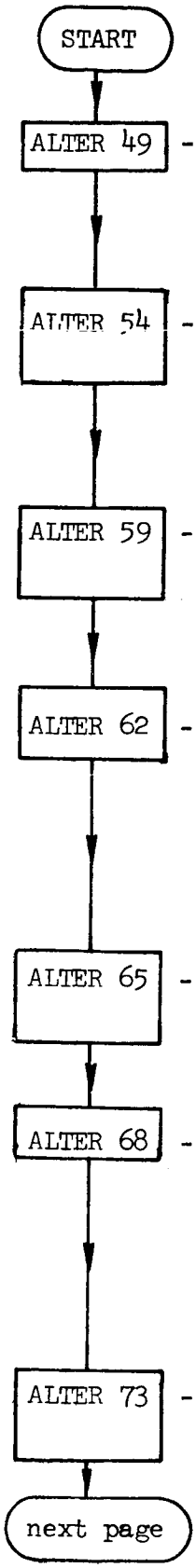
PHASE 1 ASSUMPTIONS

1. Any zero-stiffness degrees of freedom and symmetrical or anti-symmetrical boundary constraints at the model plane of symmetry are included in the Single Point Constraint set (SPC). No other degrees of freedom are included in this set.
2. Each substructure should reference the same origin on the GRDPNT parameter card and also reference the same basic coordinate system.
3. No scalar points should be used in this phase.

4. Interface or junction point degrees of freedom are defined by SUPORT cards (r-set).

5. The component modes obtained in this phase are with the interface fixed. These modes can be plotted.

ALTERS INCORPORATED - PHASE 1 (GENERAL FLOW)



ALTER 49 - - - - Changes mass at GRID points to weight $[W_{gg}] = [M_{gg}] \times$ MASSC (Default = 386.4 #/in/sec^2) PRINT & CHKPNT

ALTER 54 - - - - Obtains from modified module GPWG, basic matrix necessary for subsequent built-in checks. Also purges matrices generated in ALTER 59, if no MPC's.

ALTER 59 - - - - Performs MPC check.

ALTER 62 - - - - Insert
- EQUIV D_n, D_f/SINGLE
- PURGE CPn^s_f, D_s, SPCCK, M_{ss}, W_{ss}, WSPC/SINGLE
- CHKPNT CPn^s_f, D_s, D_f, SPCCK, M_{ss}, W_{ss}, WSPC

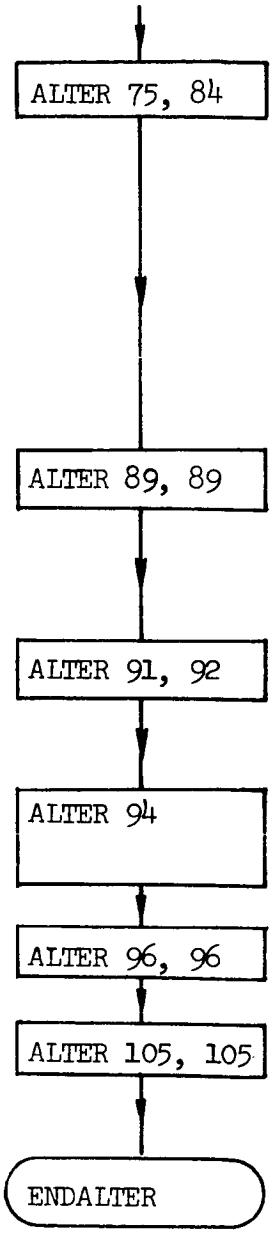
Equivalences and purges matrices generated in ALTER 65, if no SPC's

ALTER 65 - - - - Performs SPC checks

ALTER 68 - - - - Insert
- EQUIV D_f, D_a/OMIT
- PURGE CPf^o_a, D_o, GOCHK/OMIT
- CHKPNT CPf^o_a, D_o, D_a, GOCHK

Equivalences and purges matrices generated in ALTER 73, if no OMITS

ALTER 73 - - - - Performs check on G_o transformation matrix.



ALTER 75, 84 - - - Replaces Rigid Body Modules. The condition that the SUPORT card define rigid body supports has been eliminated. The SUPORT card now defines the interface d.o.f. This alter also performs a rigid body transformation check and reduced interface stiffness check. Also prints out a rigid body weight matrix to check if mass was lost in the reduction process.

ALTER 89, 89 - - - Obtains free modes fixed at interface

Insert { READ $K_{\ell\ell}$, $M_{\ell\ell}$,,, EED,,CASECC/LAML, ϕ_ℓ, M_i,
OEIGS/C,N,MODES/V,N,NEIGV

ALTER 91, 92 - - -

Insert { CHKPNT ϕ_ℓ, LAML
OFP LAML, OEIGS,,,,//V,N, CARDNO

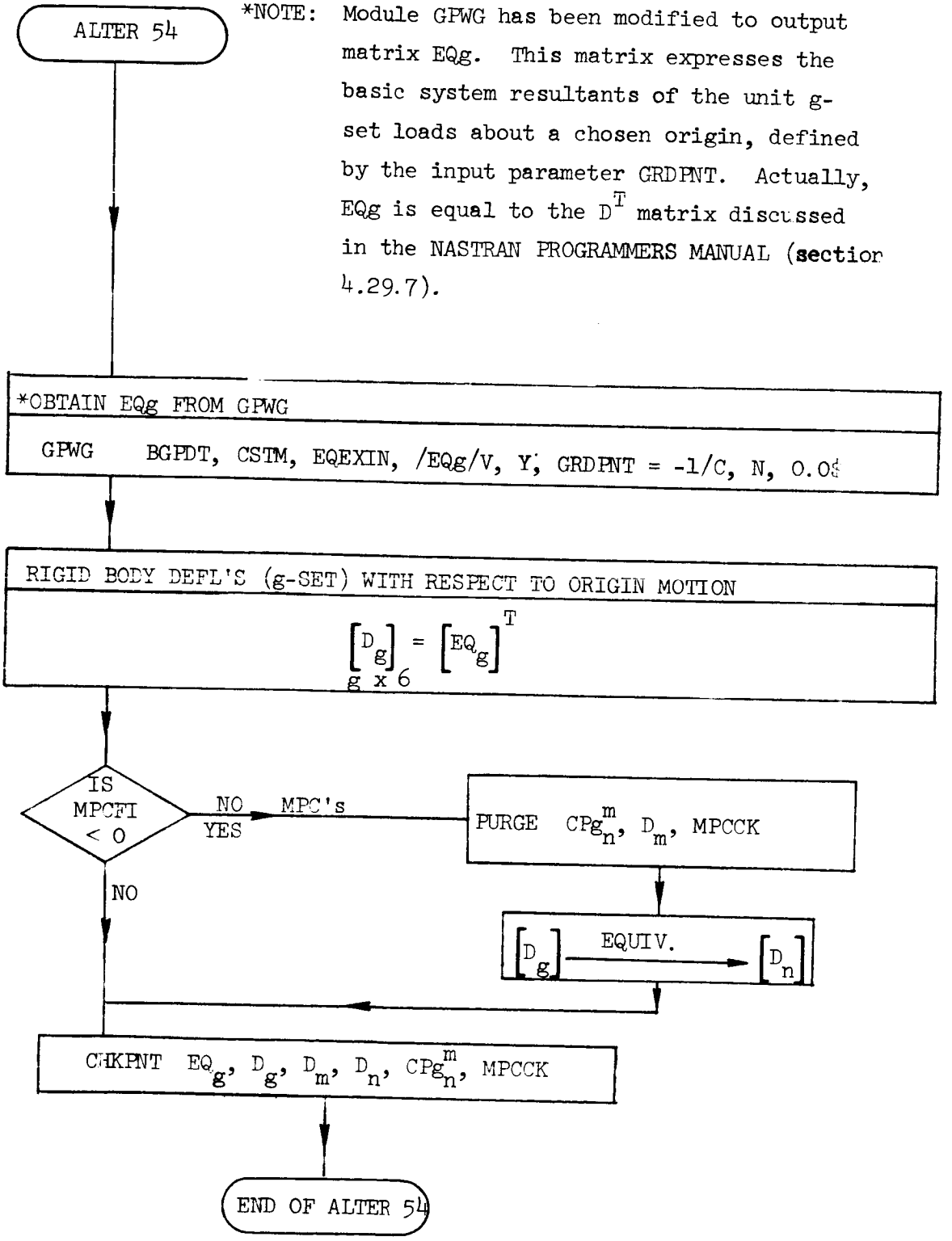
ALTER 94 - - - Generates generalized modal stiffness and mass matrices and puts necessary matrices for PHASE 2 on tape INPT.

ALTER 96, 96 - - - Delete CHKPNT statement

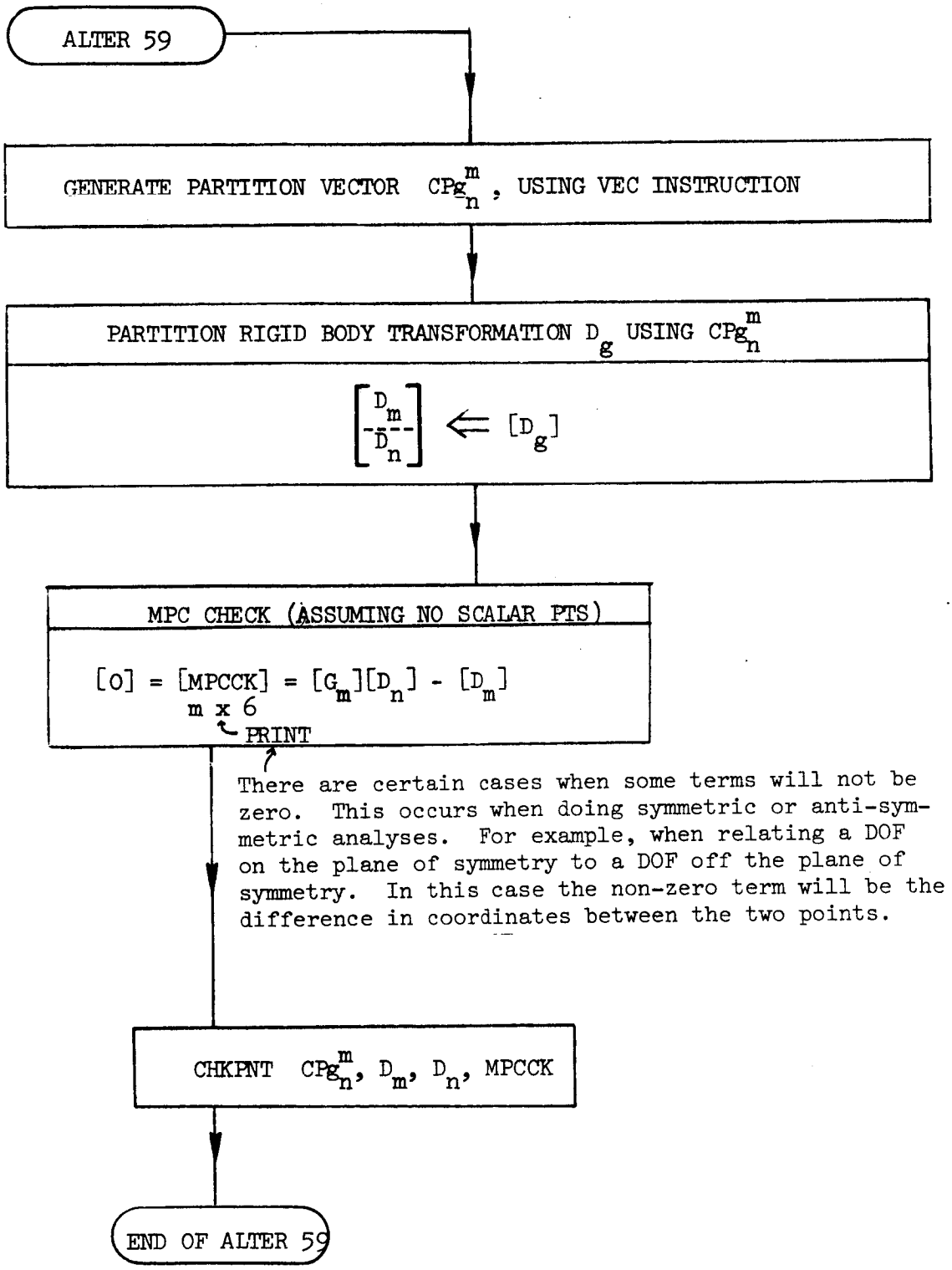
ALTER 105, 105 - - - Replace LAMA by LAML in calling sequence for SDR2 module.

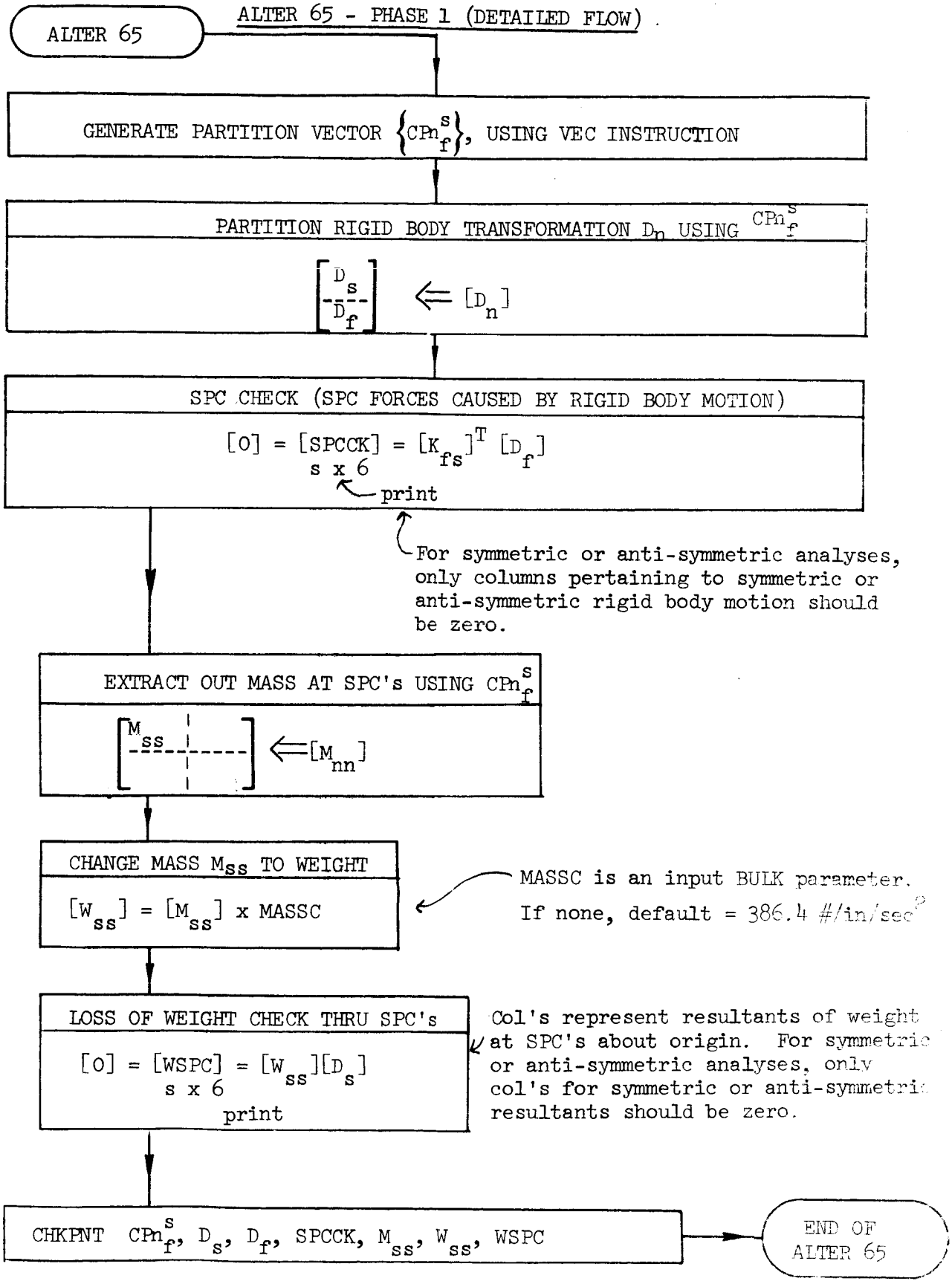
ENDALTER

ALTER 54 - PHASE 1 (DETAILED FLOW)

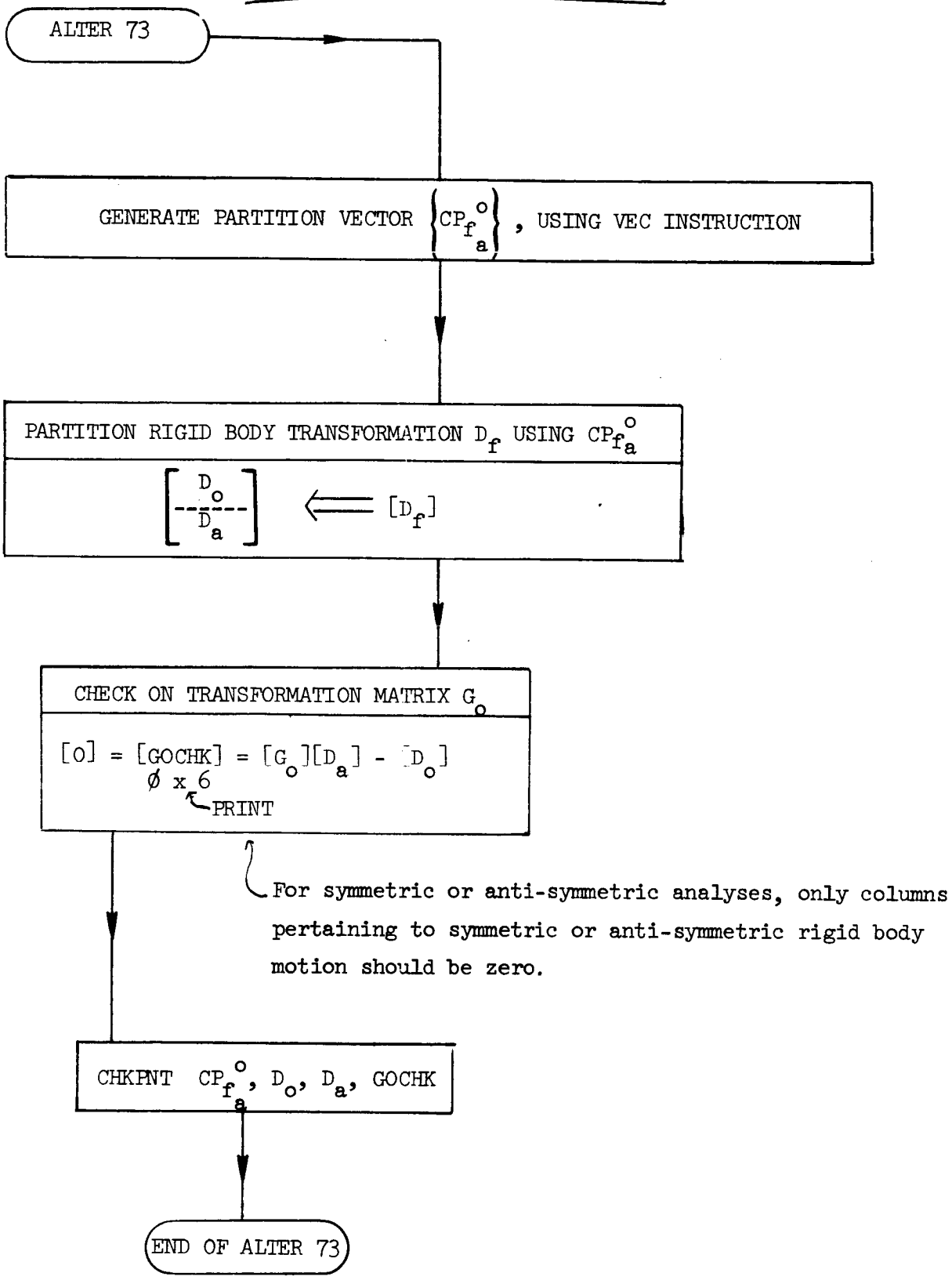


ALTER 59 - PHASE 1 (DETAILED FLOW)

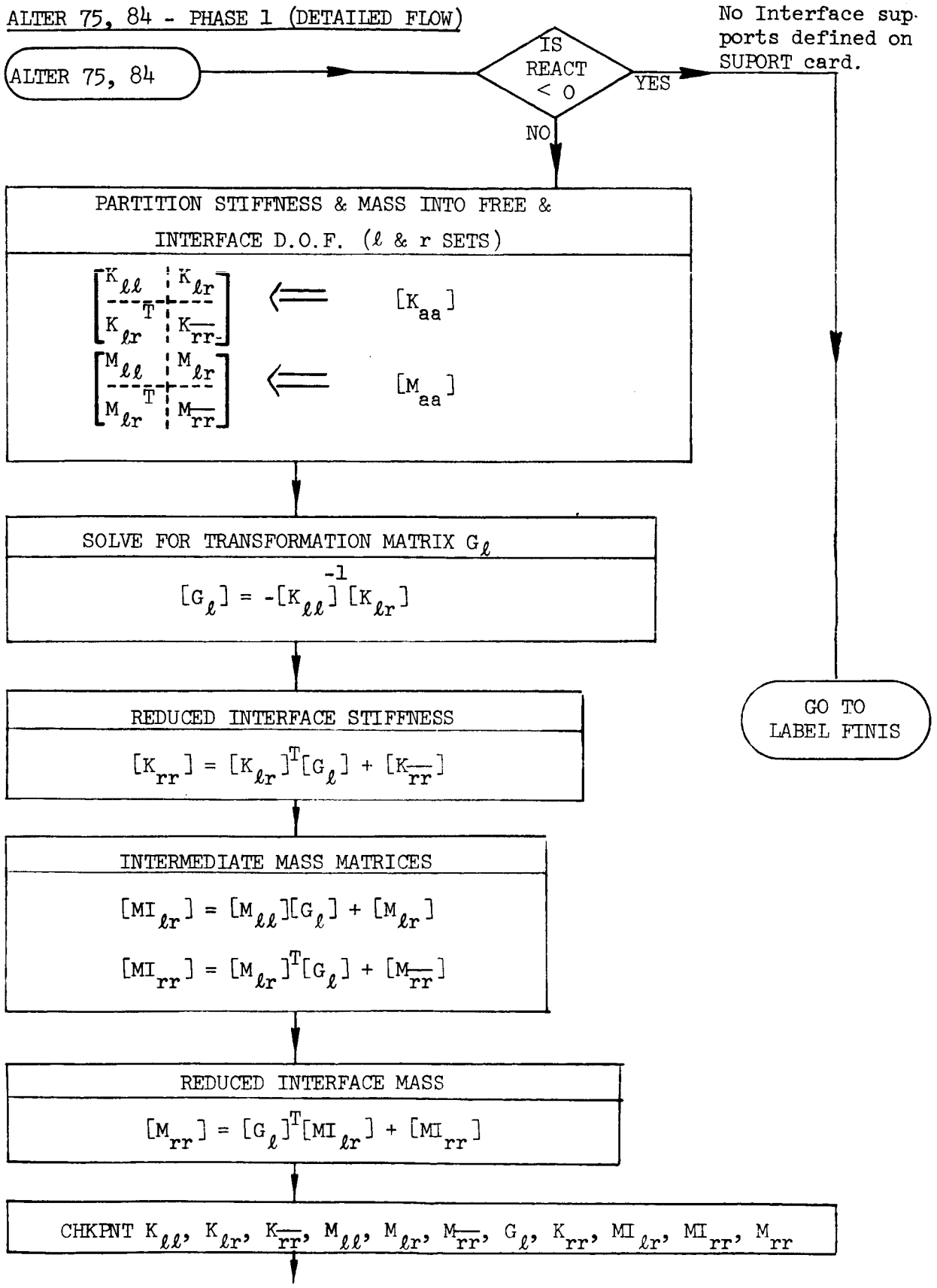


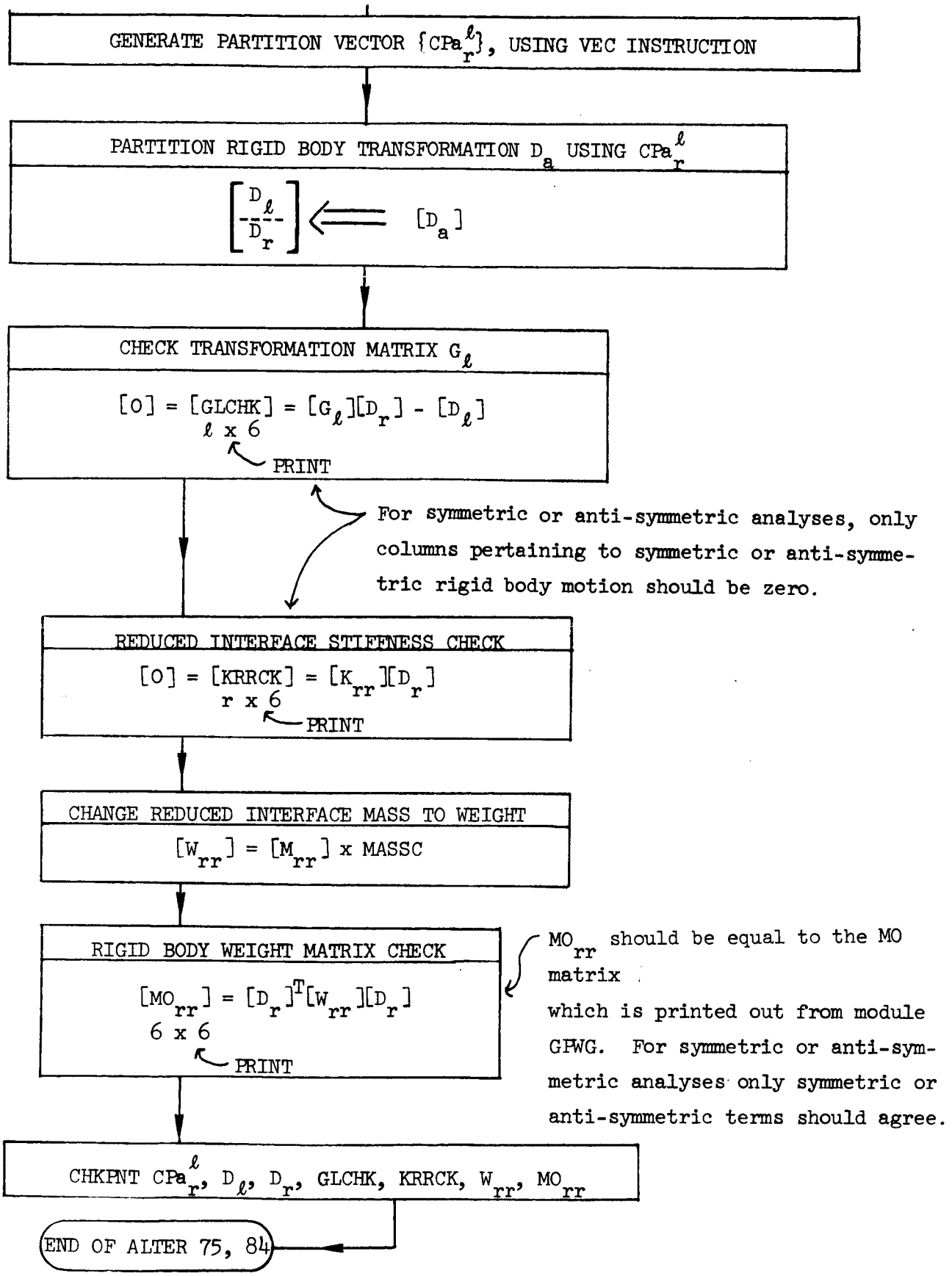

ALTER 65
ALTER 65 - PHASE 1 (DETAILED FLOW)
GENERATE PARTITION VECTOR $\{CPn_f^s\}$, USING VEC INSTRUCTION
PARTITION RIGID BODY TRANSFORMATION D_n USING CPn_f^s
$\begin{bmatrix} D_s \\ D_f \end{bmatrix} \Leftarrow [D_n]$
SPC CHECK (SPC FORCES CAUSED BY RIGID BODY MOTION)
$[O] = [SPCCK] = [K_{fs}]^T [D_f]$
s x 6
print
For symmetric or anti-symmetric analyses, only columns pertaining to symmetric or anti-symmetric rigid body motion should be zero.
EXTRACT OUT MASS AT SPC's USING CPn_f^s
$\begin{bmatrix} M_{ss} & \\ & \end{bmatrix} \Leftarrow [M_{nn}]$
CHANGE MASS M_{ss} TO WEIGHT
$[W_{ss}] = [M_{ss}]$ x MASSC
MASSC is an input BULK parameter.
If none, default = 386.4 #/in/sec²
LOSS OF WEIGHT CHECK THRU SPC's
$[O] = [WSPC] = [W_{ss}][D_s]$
s x 6
print
Col's represent resultants of weight at SPC's about origin. For symmetric or anti-symmetric analyses, only col's for symmetric or anti-symmetric resultants should be zero.
CHKPNT CPn_f^s, D_s, D_f, SPCCK, M_{ss}, W_{ss}, WSPC
END OF ALTER 65

ALTER 73 - PHASE 1 (DETAILED FLOW)

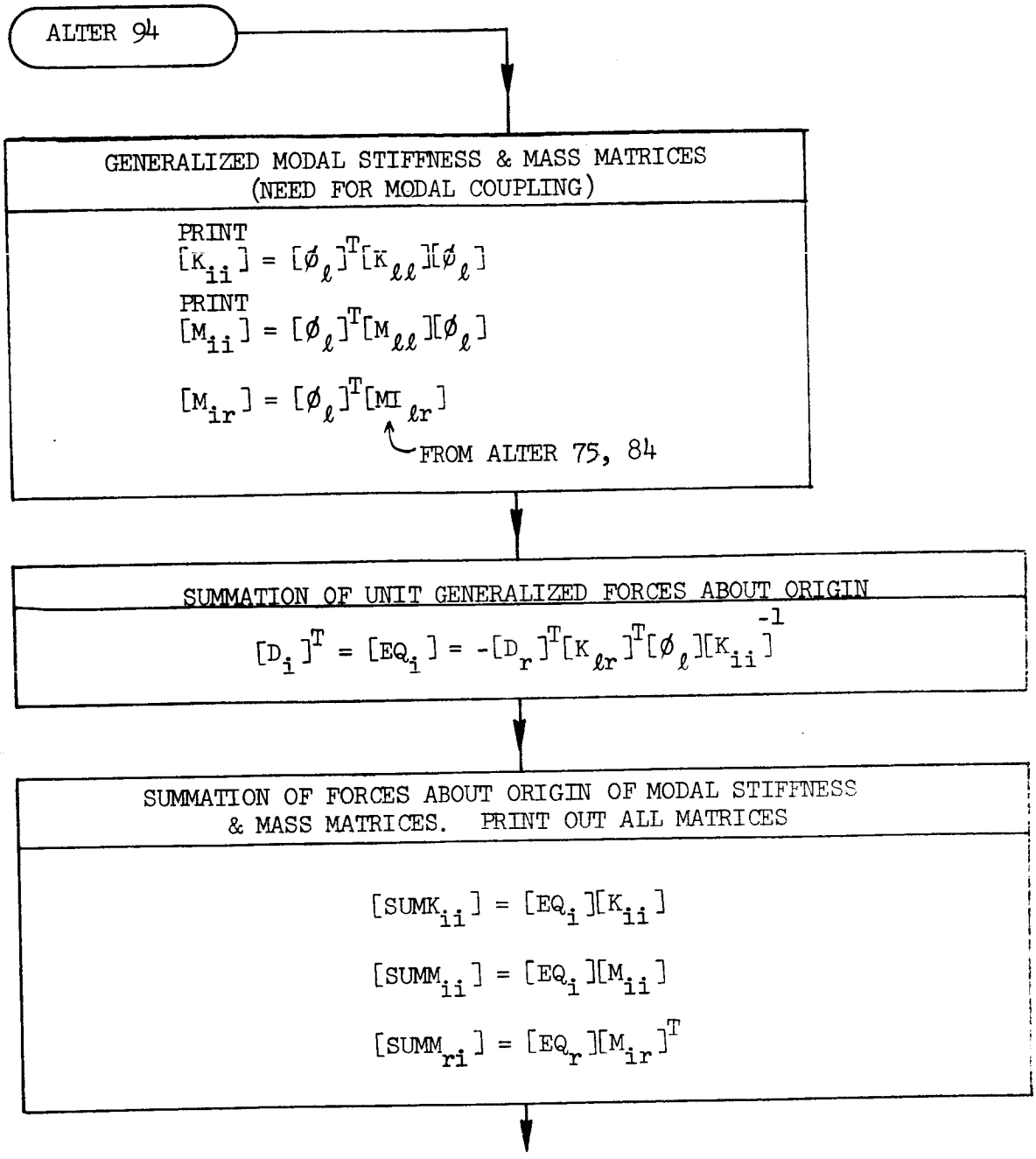


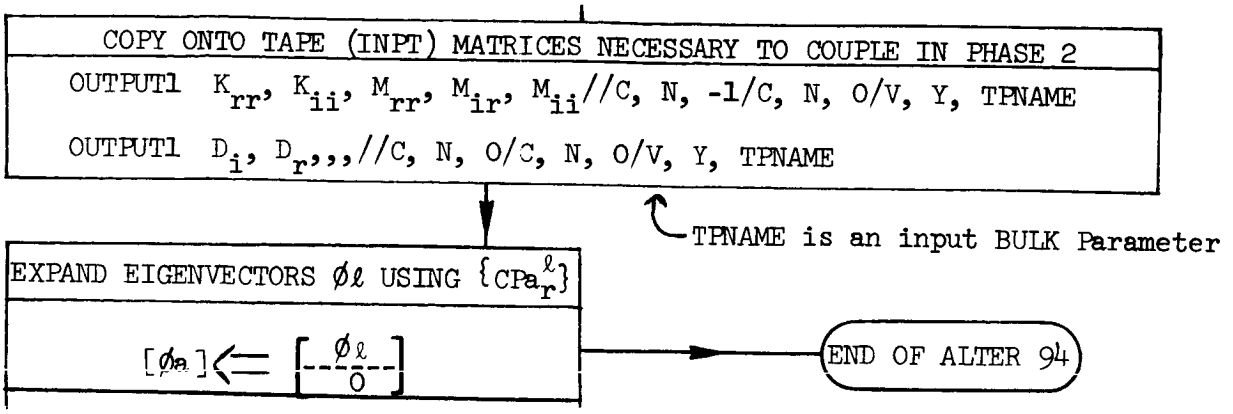
ALTER 75, 84 - PHASE 1 (DETAILED FLOW)




GENERATE PARTITION VECTOR $\{CPa_r^{\ell}\}$, USING VEC INSTRUCTION
PARTITION RIGID BODY TRANSFORMATION D_a USING CPa_r^{ℓ}
$\left[\frac{D_{\ell}}{D_r}\right] \Longleftarrow [D_a]$
CHECK TRANSFORMATION MATRIX G_{ℓ}
$[0] = [GLCHK] = [G_{\ell}][D_r] - [D_{\ell}]$
ℓ x 6
PRINT
For symmetric or anti-symmetric analyses, only columns pertaining to symmetric or anti-symmetric rigid body motion should be zero.
REDUCED INTERFACE STIFFNESS CHECK
$[0] = [KRRCK] = [K_{rr}][D_r]$
r x 6
PRINT
CHANGE REDUCED INTERFACE MASS TO WEIGHT
$[W_{rr}] = [M_{rr}]$ x MASSC
RIGID BODY WEIGHT MATRIX CHECK
$[MO_{rr}] = [D_r]^T[W_{rr}][D_r]$
6 x 6
PRINT
MO_{rr} should be equal to the MO matrix which is printed out from module GPWG. For symmetric or anti-symmetric analyses only symmetric or anti-symmetric terms should agree.
CHKPNT CPa_r^{ℓ}, D_{ℓ}, D_r, GLCHK, KRRCK, W_{rr}, MO_{rr}
END OF ALTER 75, 84

ALTER 94 - PHASE 1 (DETAILED FLOW)





NEW BULK PARAMETERS - PHASE 2

NOSUB - - - - - Number of reduced substructures (on tape INPT) to be coupled.

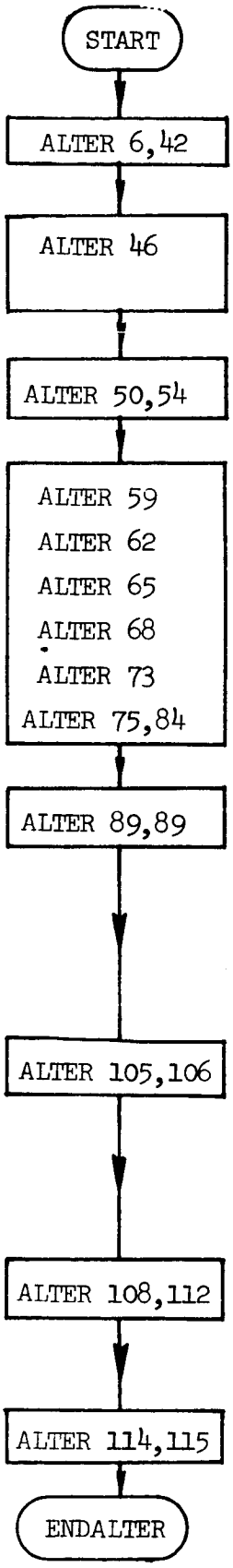
TPNAME - - - - - Label name of INPT which contains the reduced substructure matrices plus column partition vectors for merging. It is also the common label name of INP1, INP2, etc., where the final substructures system eigenvalues and eigenvectors are outputted, which will be used for Phase 3.

MASSC - - - - - Same as in Phase 1.

PHASE 2 ASSUMPTIONS

1. Interface or junction point degrees of freedom are defined on GRID cards with the released DOF in Phase 1 SPC'd out.
2. Substructure component modes are defined as scalar points.
3. Continuity at junction points between substructures are accomplished with MPC's.
4. SUPORT card in this phase defines the usual rigid body statically determinate supports.
5. The Phase 1 tapes are assumed to have been consolidated onto 1 tape by a DMAP run, which will be input to this run. This tape also contains the column partition vectors necessary for merging.
6. Free-free modes are obtained in this phase. Plots are not obtained in this phase.

ALTERS INCORPORATED - PHASE 2 (GENERAL FLOW)



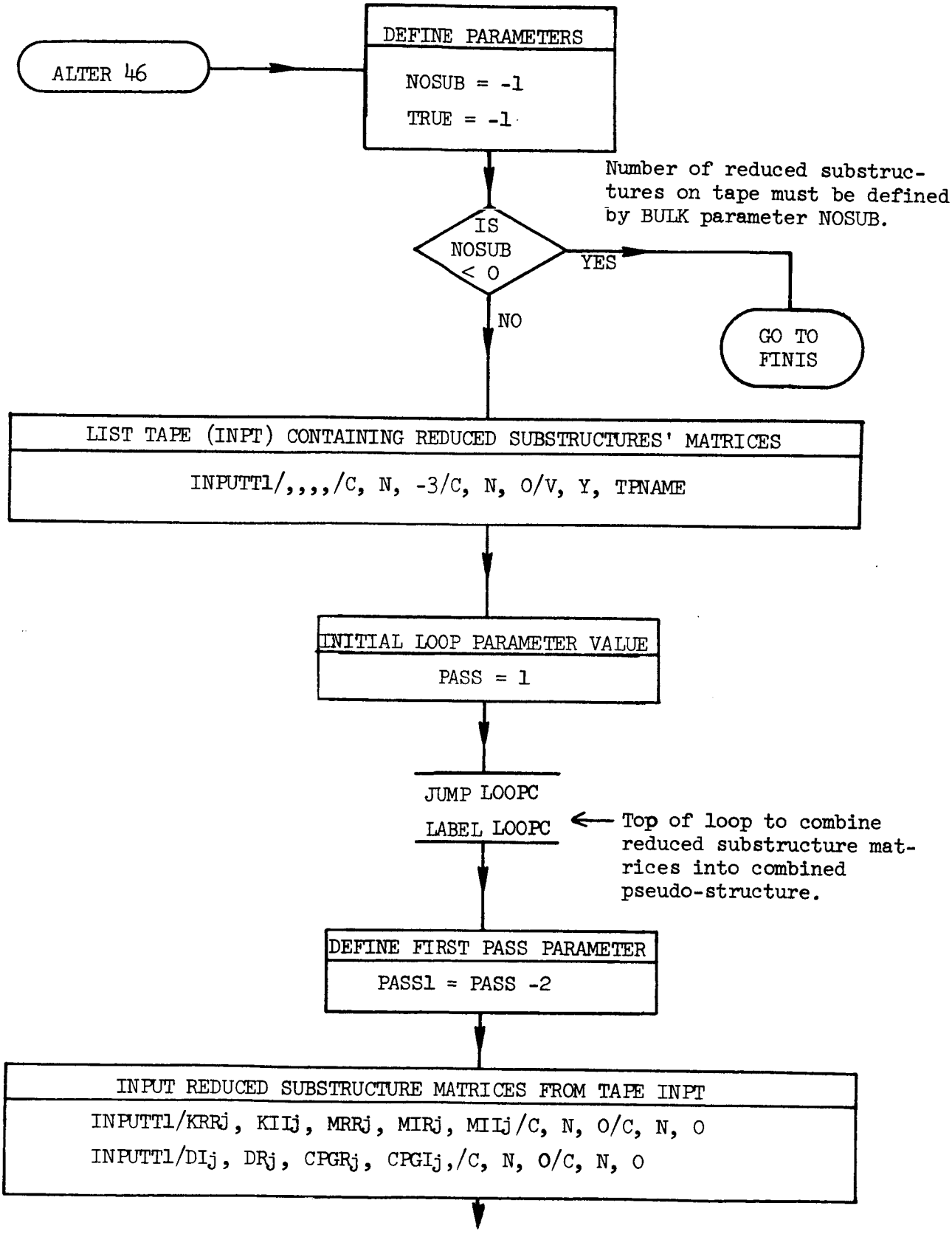
- ALTER 6,42 - - - - Deleted (No member input in this phase)
- ALTER 46 - - - - Contains DMAP loop to combine reduced substructures
- ALTER 50,54 - - - - Deleted (No member input in this phase)
- ALTER 59, ALTER 62, ALTER 65, ALTER 68, ALTER 73, ALTER 75,84 - - - - Same as Phase 1 Alters

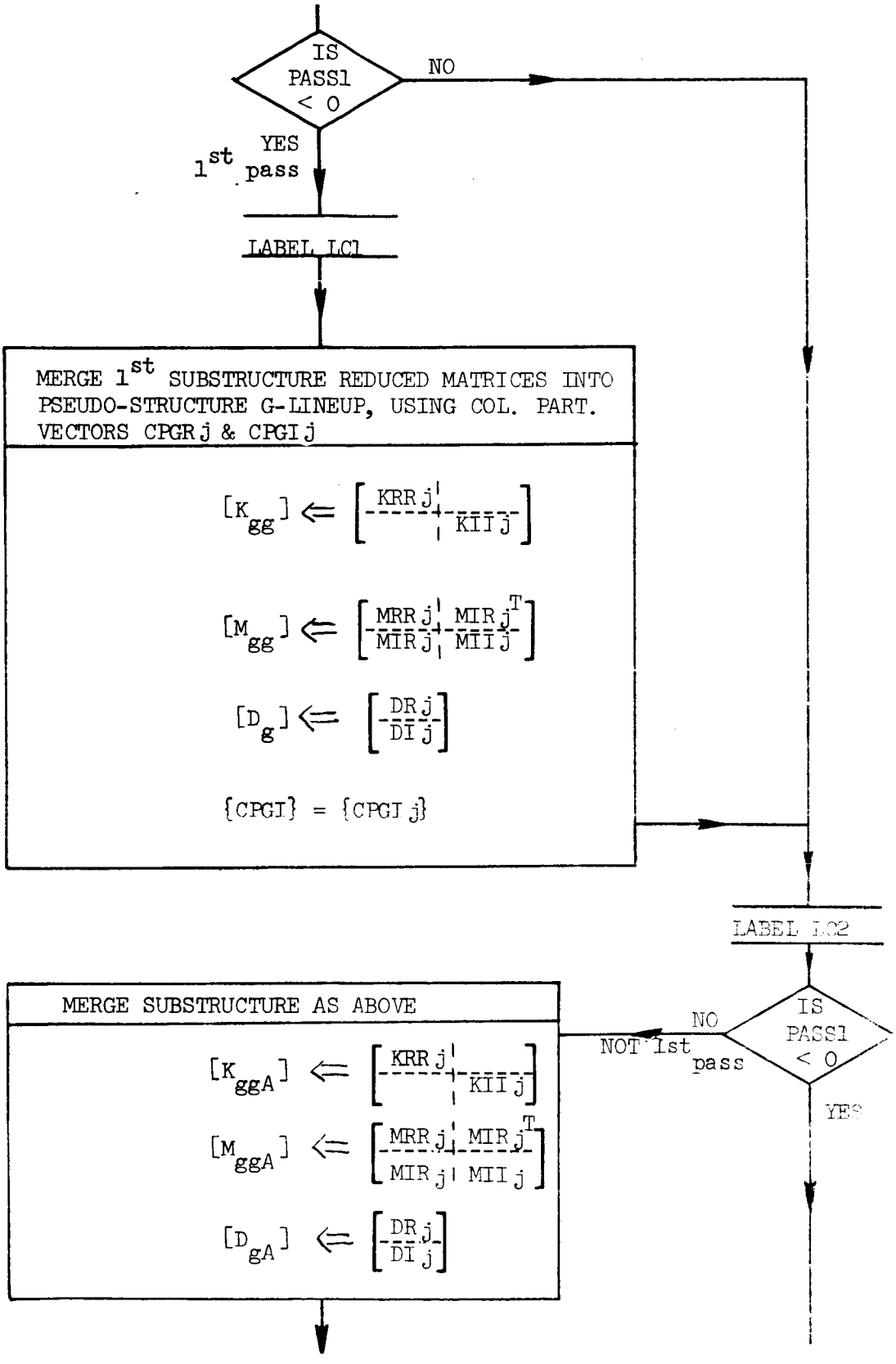
  NOTE: SUPORT card in Phase 2 defines rigid body supports.
- ALTER 89,89 - - - - Obtain free-free modes

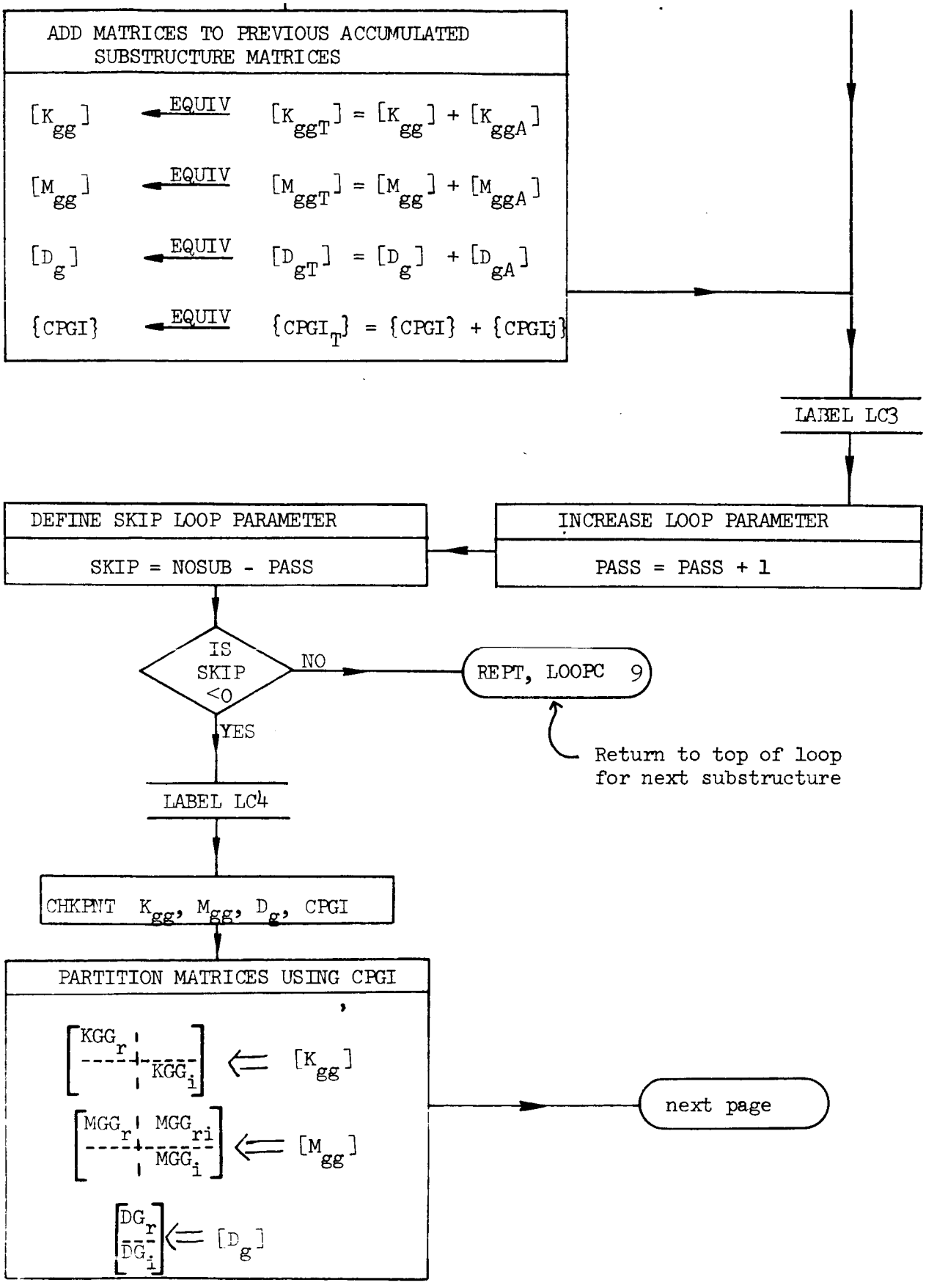
  Insert { READ K_{aa}, M_{aa}, M_{rr}, G_{ℓ}, EED, USET, CASECC/ LAMA, ϕa, M_i, OEIGS/C, N, MODES/V, N, NEIGV
- ALTER 105,106 - - - - Revise SDR2 (no members defined)

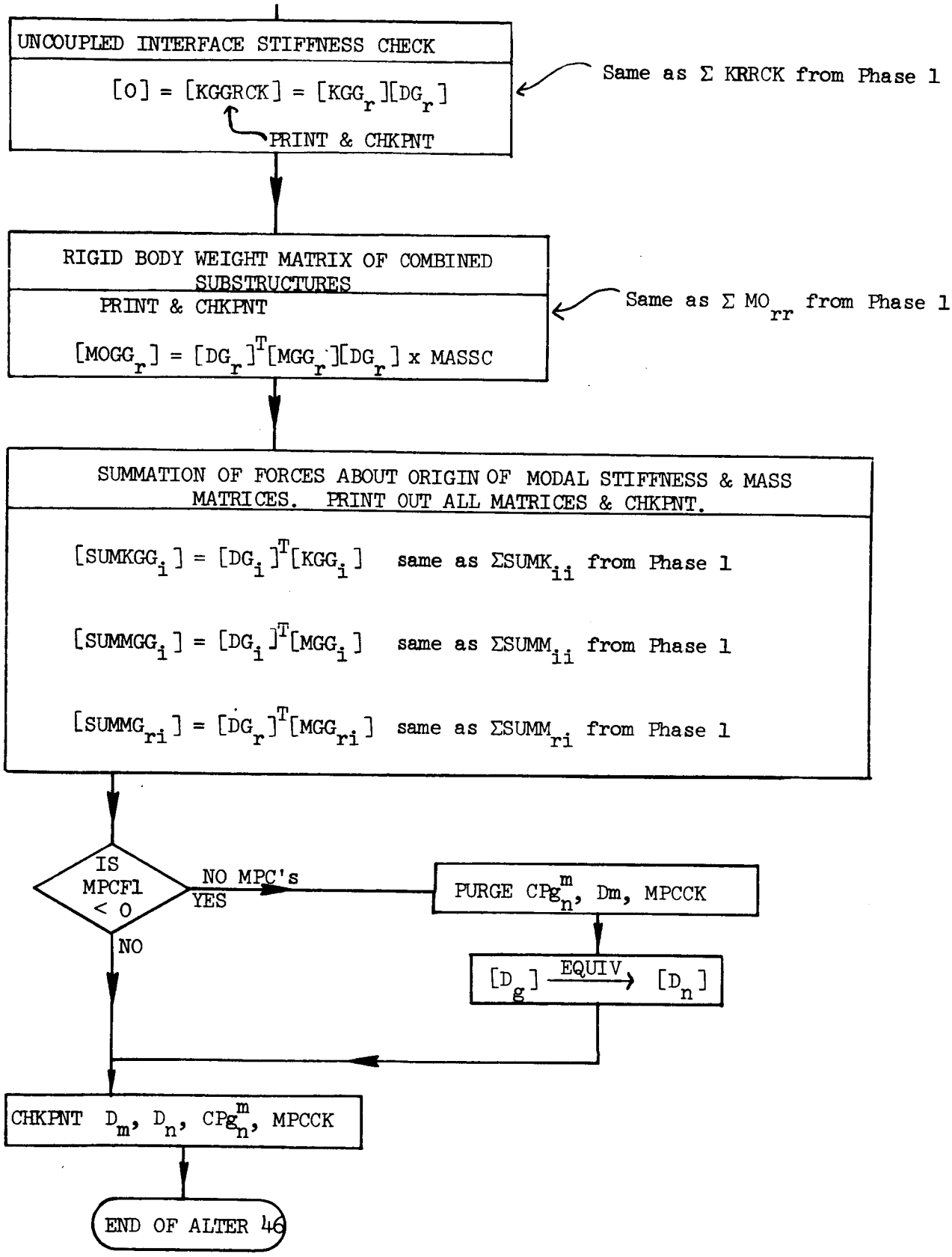
  Insert { SDR2 CASECC, CSTM,,,EQEXIN, SIL,,,BGPDP, LAMA,, ϕg,,/,,OPHIG,,,/C, N, REIG
  OFP OPHIG,,,,,//V, N, CARDNO
- ALTER 108,112 - - - - Extracts out eigenvalues and eigenvectors for each reduced substructure and puts them on separate tapes. These tapes are then used in Phase 3.
- ALTER 114,115 - - - - Delete error message

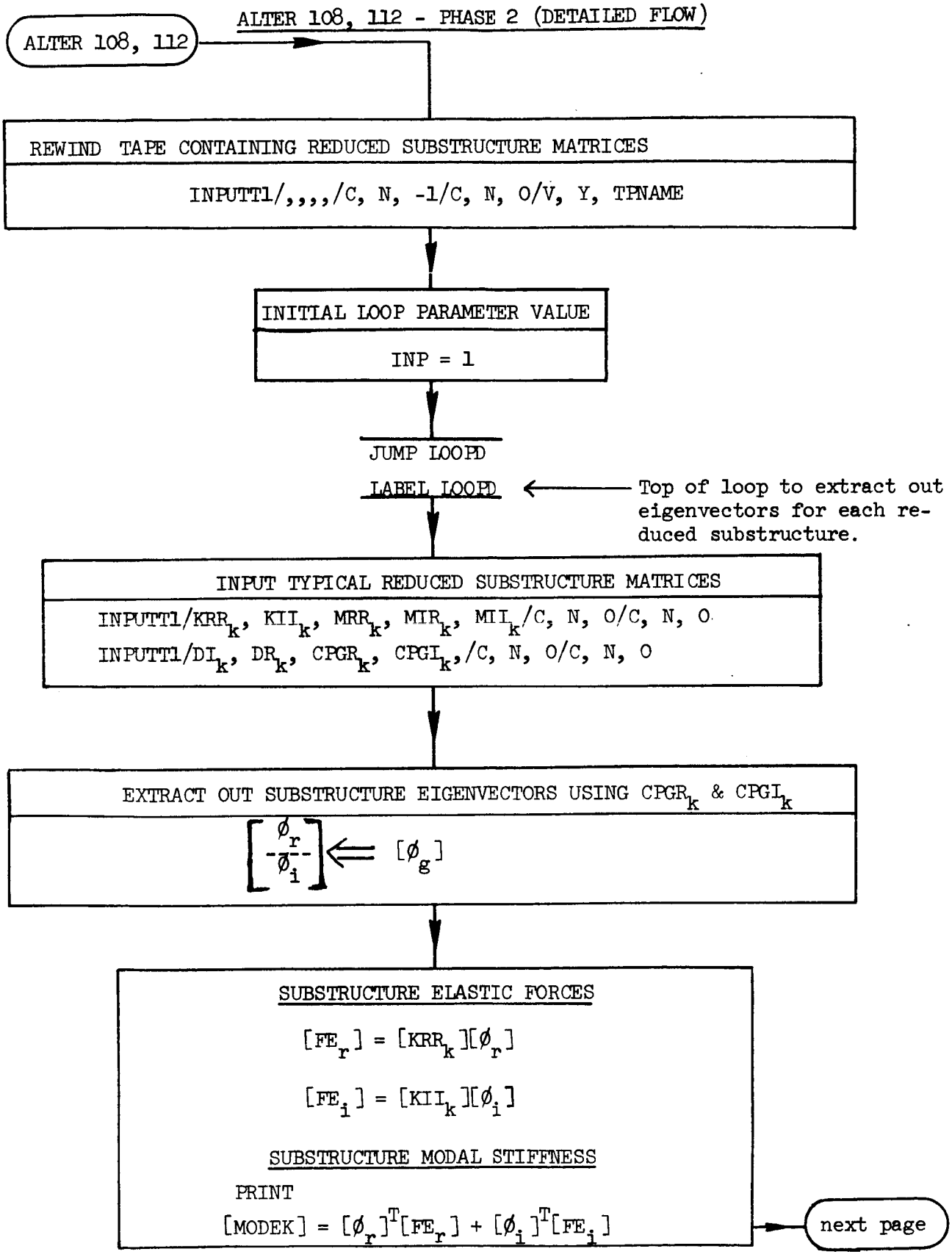
ALTER 46 - PHASE 2 (DETAILED FLOW)

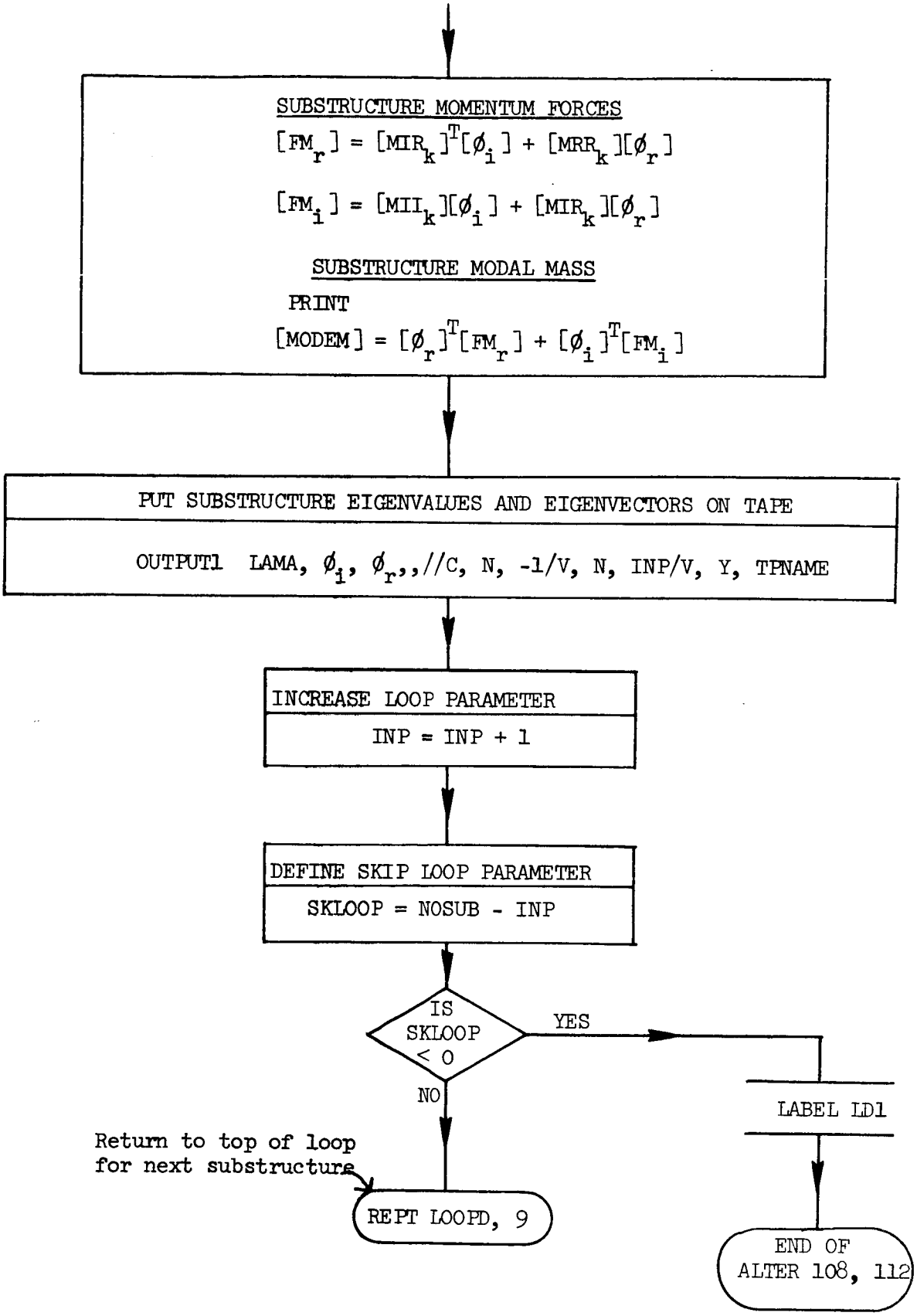



IS PASS1 < 0
NO
YES
1st pass
LABEL LC1
MERGE 1st SUBSTRUCTURE REDUCED MATRICES INTO PSEUDO-STRUCTURE G-LINEUP, USING COL. PART. VECTORS CPGR j & CPGI j
[Kgg] ⇐ [KRR j | KII j]
[Mgg] ⇐ [MRR j | MIR j^T / MIR j | MII j]
[Dg] ⇐ [DR j / DI j]
{CPGI} = {CPGI j}
LABEL LC2
IS PASS1 < 0
NO
NOT 1st pass
YES
MERGE SUBSTRUCTURE AS ABOVE
[KggA] ⇐ [KRR j | KII j]
[MggA] ⇐ [MRR j | MIR j^T / MIR j | MII j]
[DgA] ⇐ [DR j / DI j]


ADD MATRICES TO PREVIOUS ACCUMULATED SUBSTRUCTURE MATRICES
[Kgg] ← EQUIV [KggT] = [Kgg] + [KggA]
[Mgg] ← EQUIV [MggT] = [Mgg] + [MggA]
[Dg] ← EQUIV [DgT] = [Dg] + [DgA]
{CPGI} ← EQUIV {CPGIT} = {CPGI} + {CPGIj}
LABEL LC3
DEFINE SKIP LOOP PARAMETER
SKIP = NOSUB - PASS
INCREASE LOOP PARAMETER
PASS = PASS + 1
IS SKIP <0
NO
REPT, LOOPC 9
Return to top of loop for next substructure
YES
LABEL LC4
CHKPNT Kgg, Mgg, Dg, CPGI
PARTITION MATRICES USING CPGI
KGGr
KGGi
⇐ [Kgg]
MGGr MGGri
MGGi
⇐ [Mgg]
DGr
DGi
⇐ [Dg]
next page


UNCOUPLED INTERFACE STIFFNESS CHECK
[O] = [KGGRCK] = [KGG$_r$][DG$_r$]
PRINT & CHKPNT
Same as Σ KRRCK from Phase 1
RIGID BODY WEIGHT MATRIX OF COMBINED SUBSTRUCTURES
PRINT & CHKPNT
[MOGG$_r$] = [DG$_r$]^T[MGG$_r$][DG$_r$] x MASSC
Same as Σ MO$_{rr}$ from Phase 1
SUMMATION OF FORCES ABOUT ORIGIN OF MODAL STIFFNESS & MASS MATRICES. PRINT OUT ALL MATRICES & CHKPNT.
[SUMKGG$_i$] = [DG$_i$]^T[KGG$_i$] same as ΣSUMK$_{ii}$ from Phase 1
[SUMMGG$_i$] = [DG$_i$]^T[MGG$_i$] same as ΣSUMM$_{ii}$ from Phase 1
[SUMMG$_{ri}$] = [DG$_r$]^T[MGG$_{ri}$] same as ΣSUMM$_{ri}$ from Phase 1
IS MPCF1 < 0
NO MPC's
YES
NO
PURGE CPg$_n^m$, Dm, MPCCK
[D$_g$] EQUIV [D$_n$]
CHKPNT D$_m$, D$_n$, CPg$_n^m$, MPCCK
END OF ALTER 46


ALTER 108, 112 - PHASE 2 (DETAILED FLOW)
ALTER 108, 112
REWIND TAPE CONTAINING REDUCED SUBSTRUCTURE MATRICES
INPUTT1/,,,,/C, N, -1/C, N, O/V, Y, TPNAME
INITIAL LOOP PARAMETER VALUE
INP = 1
JUMP LOOPD
LABEL LOOPD
Top of loop to extract out eigenvectors for each reduced substructure.
INPUT TYPICAL REDUCED SUBSTRUCTURE MATRICES
INPUTT1/KRR_k, KII_k, MRR_k, MIR_k, MII_k/C, N, O/C, N, O
INPUTT1/DI_k, DR_k, CPGR_k, CPGI_k,/C, N, O/C, N, O
EXTRACT OUT SUBSTRUCTURE EIGENVECTORS USING CPGR_k & CPGI_k
[φr / φi] ⇐ [φg]
SUBSTRUCTURE ELASTIC FORCES
[FEr] = [KRRk][φr]
[FEi] = [KIIk][φi]
SUBSTRUCTURE MODAL STIFFNESS
PRINT
[MODEK] = [φr]T[FEr] + [φi]T[FEi]
next page


SUBSTRUCTURE MOMENTUM FORCES
$[FM_r] = [MIR_k]^T[\phi_i] + [MRR_k][\phi_r]$
$[FM_i] = [MII_k][\phi_i] + [MIR_k][\phi_r]$
SUBSTRUCTURE MODAL MASS
PRINT
$[MODEM] = [\phi_r]^T[FM_r] + [\phi_i]^T[FM_i]$
PUT SUBSTRUCTURE EIGENVALUES AND EIGENVECTORS ON TAPE
OUTPUT1 LAMA, ϕ_i, ϕ_r,,,//C, N, -1/V, N, INP/V, Y, TPNAME
INCREASE LOOP PARAMETER
INP = INP + 1
DEFINE SKIP LOOP PARAMETER
SKLOOP = NOSUB - INP
IS SKLOOP < 0
YES
NO
LABEL LD1
Return to top of loop for next substructure
REPT LOOPD, 9
END OF ALTER 108, 112

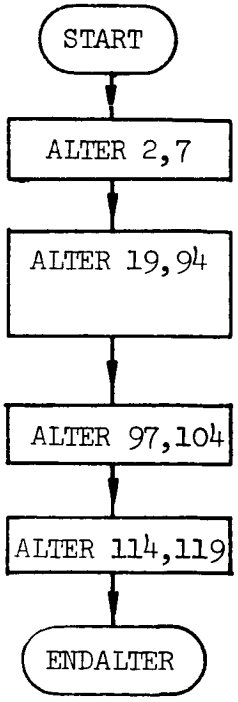
NEW BULK PARAMETER - PHASE 3

TPNAME2 - - - - - Label name of INPT which contains final substructure system eigenvalues and eigenvectors from Phase 2.

PHASE 3 ASSUMPTIONS

1. Checkpoint tape from Phase 1 is used in this phase. Also, a tape from Phase 2 containing final reduced system eigenvectors.
2. The final full system eigenvectors are recovered in this phase and can be plotted.

ALTERS INCORPORATED - PHASE 3 (GENERAL FLOW)

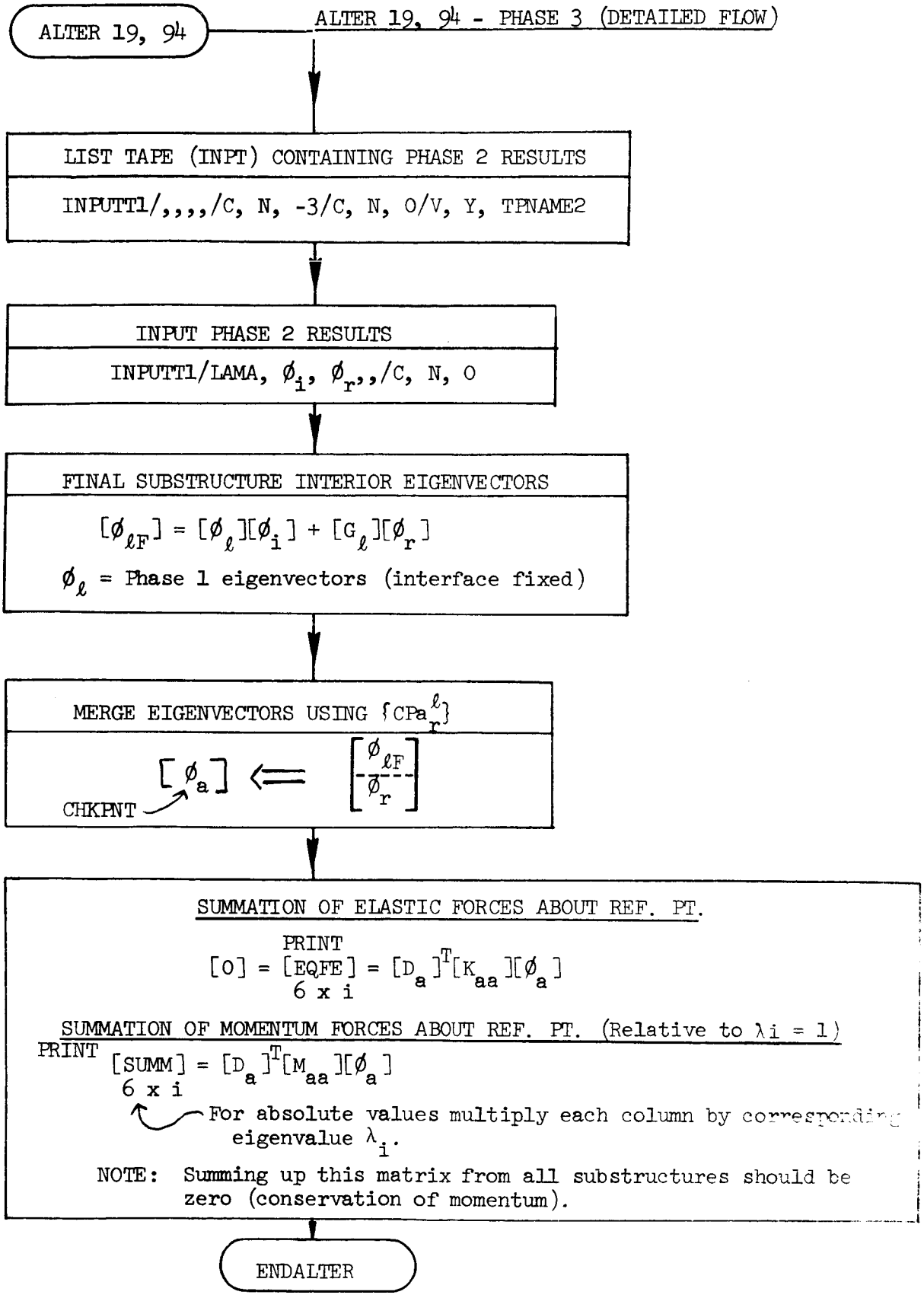


- - - - - Deleted (done in Phase 1 - on CHKPNT tape).

- - - - - Deletes part done in Phase 1, and inputs Phase 2 results to obtain final a-set eigenvectors.

- - - - - Deletes part done in Phase 1.

- - - - - Delete error messages.


ALTER 19, 94
ALTER 19, 94 - PHASE 3 (DETAILED FLOW)
LIST TAPE (INPT) CONTAINING PHASE 2 RESULTS
INPUTT1/,,,,/C, N, -3/C, N, 0/V, Y, TPNAME2
INPUT PHASE 2 RESULTS
INPUTT1/LAMA, ϕ_i, ϕ_r,,/C, N, 0
FINAL SUBSTRUCTURE INTERIOR EIGENVECTORS
$[\phi_{\ell F}] = [\phi_\ell][\phi_i] + [G_\ell][\phi_r]$
ϕ_ℓ = Phase 1 eigenvectors (interface fixed)
MERGE EIGENVECTORS USING $\{CPa_r^\ell\}$
$[\phi_a] \Longleftarrow \left[\frac{\phi_{\ell F}}{\phi_r}\right]$
CHKPNT
SUMMATION OF ELASTIC FORCES ABOUT REF. PT.
PRINT
$[0] = [EQFE] = [D_a]^T[K_{aa}][\phi_a]$
6 x i
SUMMATION OF MOMENTUM FORCES ABOUT REF. PT. (Relative to λi = 1)
PRINT
$[SUMM] = [D_a]^T[M_{aa}][\phi_a]$
6 x i
For absolute values multiply each column by corresponding eigenvalue λ_i.
NOTE: Summing up this matrix from all substructures should be zero (conservation of momentum).
ENDALTER

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

PHASE 1

```
ID PHASE1 FUSSRIC
RESTART PHASE1 ,FUSSRIC , 9/27/74, 8966,
        1,   XVPS     ,    FLAGS = 0,   REEL =  1,   FILE =      7
        2,   REENTER AT DMAP SEQUENCE NUMBER     2
$ END OF CHECKPOINT DICTIONARY
APP       DISP
SOL       3,0
CHKPNT    YES
TIME      90
DIAG      7,8,13,14,19,21,22
$ SUBSTRUCTURING BY COMPONENT NORMAL MODES ANALYSIS
$ PHASE 1 ALTERS TO RIGID FORMAT 3
ALTER 49   $ CHANGE MASS TO WEIGHT
ADD       MGG,/WGG/C,Y,MASSC=(386.4,0.0)
MATGPR    GPL,USET,SIL,WGG//C,N,G
CHKPNT    WGG
ALTER 54   $ GPWG HAS BEEN MODIFIED TO OUTPUT MATRIX EOG
$  EOG= BASIC RESULTANTS OF UNIT G-SET LOADS ABOUT CHOSEN ORIGIN
$  CHOSEN ORIGIN DEFINED BY PARAMETER GRDPNT IN BULK(DEFAUT=BASIC ORIGIN
GPWG      BGPDT,CSTM,EQEXIN,/EOG/V,Y,GRDPNT=-1/C,N,0.0 $
TRNSP     EOG/DG   $ DG=RIGID BODY DEFL'S DUE TO ORIGIN DEFL'S
PURGE     CPGMN,DM,MPCCK/MPCF1
EQUIV     DG,DN/MPCF1
CHKPNT    EOG,DG,DM,DN,CPGMN,MPCCK
ALTER 59
VEC       USET/CPGMN/C,N,G/C,N,M/C,N,N
PARTN     DG,,CPGMN/DM,DN,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD     GM,DN,DM/MPCCK/C,N,0/C,N,1/C,N,-1 $                MPC CHECK
MATGPR    GPL,USET,SIL,MPCCK//C,N,M
CHKPNT    CPGMN,DM,DN,MPCCK
ALTER 62
EQUIV     DN,DF/SINGLE
PURGE     CPNSF,DS,SPCCK,MSS,WSS,WSPC/SINGLE
CHKPNT    CPNSF,DS,SPCCK,MSS,WSS,WSPC,DF
ALTER 65
VEC       USET/CPNSF/C,N,N/C,N,S/C,N,F
PARTN     DN,,CPNSF/DS,DF,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD     KFS,DF,/SPCCK/C,N,1/C,N,1/C,N,0 $                  SPC CHECK
$  SPC'S RESERVED FOR ZERO STIFFNESS & SYM.OR ANTI BOUNDARY D.O.F.
$  SPC F'S=0 FOR SYM. OR ANTI RIGID BODY ORIGIN DEFL'S
MATGPR    GPL,USET,SIL,SPCCK//C,N,S
UPARTN    USET,MNN/MSS,,,/C,N,N/C,N,S/C,N,F
ADD       MSS,/WSS/C,Y,MASSC=(386.4,0.0)   $ WEIGHT AT SPC'S
MPYAD     WSS,DS,/WSPC/C,N,0/C,N,1/C,N,0 $
$  WSPC EQUIV TO SPC INERTIA F'S DUE TO RIGID BODY ORIGIN DEFL'S
$  SHOULD BE ZERO FOR SYM.OR ANTI ORIGIN DEFL'S(OTHERWISE MASS IS LOST)
MATGPR    GPL,USET,SIL,WSPC//C,N,S
CHKPNT    CPNSF,DS,DF,SPCCK,MSS,WSS,WSPC
ALTER 68
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
EQUIV   DF,DA/OMIT
PURGE   CPFOA,DO,GOCHK/OMIT
CHKPNT  CPFOA,DO,GOCHK,DA
ALTER 73
VEC     USET/CPFOA/C,N,F/C,N,O/C,N,A
PARTN   DF,,CPFOA/DO,DA,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD   GO,DA,DO/GOCHK/C,N,O/C,N,1/C,N,-1 $              GO CHECK
MATGPR  GPL,USET,SIL,GOCHK//C,N,O
CHKPNT  CPFOA,DO,DA,GOCHK
ALTER 75,84
COND    FINIS,REACT $ THERE MUST SUPORT CARD DEFINING INTERFACE D.O.F.
UPARTN  USET,KAA/KLL,,KLR,KRRB/C,N,A/C,N,L/C,N,R
SOLVE   KLL,KLR/GL/C,N,1/C,N,-1 $
MPYAD   KLR,GL,KRRB/KRR/C,N,1 $                INTERFACE STIFF.
UPARTN  USET,MAA/MLL,,MLR,MRRB/C,N,A/C,N,L/C,N,R
MPYAD   MLL,GL,MLR/MILR/C,N,0 $
MPYAD   MLR,GL,MRRB/MIRR/C,N,1 $
MPYAD   GL,MILR,MIRR/MRR/C,N,1 $               REDUCED INTERFACE MASS
CHKPNT  KLL,KLR,KRRB,MLL,MLR,MRRB,GL,KRR,MILR,MIRR,MRR
VEC     USET/CPALR/C,N,A/C,N,L/C,N,R
PARTN   DA,,CPALR/DL,DR,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD   GL,DR,DL/GLCHK/C,N,O/C,N,1/C,N,-1 $      GL CHECK
MATGPR  GPL,USET,SIL,GLCHK//C,N,L
MPYAD   KRR,DR,/KRRCK/C,N,O/C,N,1/C,N,0 $    INTERFACE STIFF.CHECK
MATGPR  GPL,USET,SIL,KRRCK//C,N,R
ADD     MRR,/WRR/C,Y,MASSC=(386.4,0.0) $
TRNSP   DR/EQR
SMPYAD  EQR,WRR,DR,,,/MORR/C,N,3/C,N,1/C,N,0 $ RIGID BODY WT. MATRIX
MATPRN  MORR,,,,// $
CHKPNT  CPALR,DL,DR,EQR,GLCHK,KRRCK,WRR,MORR
ALTER 89,89     $ OBTAIN FREE MODES FIXED AT INTERFACE
READ    KLL,MLL,,,EED,,CASECC/LAML,PHIL,MI,OEIGS/C,N,MODES/V,N,NEIGV
ALTER 91,92
CHKPNT  PHIL,LAML
OFP     LAML,OEIGS,,,,//V,N,CARDNO
ALTER 94
$ GENERATE MODAL STIFF. & MASS MATRICES
TRNSP   PHIL/TPHIL
SMPYAD  TPHIL,KLL,PHIL,,,/KII/C,N,3/C,N,1/C,N,0 $
SMPYAD  TPHIL,MLL,PHIL,,,/MII/C,N,3/C,N,1/C,N,0 $
MATPRN  KII,MII,,,// $
MPYAD   TPHIL,MILR,/MIR/C,N,0/C,N,1/C,N,0 $
$ SUMMATION OF UNIT GENERALIZED FORCES ABOUT ORIGIN
MPYAD   TPHIL,KLR,/KIR/C,N,0/C,N,1/C,N,0 $
SOLVE   KII,KIR/GI/C,N,1/C,N,-1 $
MPYAD   GI,DR,/DI/C,N,0/C,N,1/C,N,0 $
TRNSP   DI/EQI
$ SUMMATION MATRICES
MPYAD   EQI,KII,/SUMKII/C,N,0/C,N,1/C,N,0 $
MPYAD   EQI,MII,/SUMMII/C,N,0/C,N,1/C,N,0 $
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
      MPYAD     MIR,DR,/TUMMRI/C,N,0/C,N,1/C,N,0 $
      TRNSP     TUMMRI/SUMMRI
      MATPRN    EQI,SUMKII,SUMMII,SUMMRI,// $
      $ COPY NECESSARY MATRICES ON TAPE INPT FOR PHASE 2
      OUTPUT1   KHP,KII,MRR,MIR,MII//C,N,-1/C,N,0/V,Y,TPNAME
      OUTPUT1   DI,DR,,,//C,N,0/C,N,0/V,Y,TPNAME
      $ EXPAND PRE-COUPLING EIGENVECTORS INTO A-SET
      MERGE     PHIL,,,,,CPALR/PHIA/C,N,1/C,N,2/C,N,2
      ALTER 96,96
      ALTER 105,105
      SDR2      CASECC,CSTM,MPT,DIT,EQEXIN,SIL,,,BGPDP,LAML,QG,PHIG,EST,/,OQG1,
                OPHIG,OES1,OLF1,PPHIG/C,N,REIG $
      ENDALTER
      CEND
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

PHASE 2

```
ID PHASE2,SMOD2
APP        DISP
SOL        3,0
CHKPNT YES
TIME       40
DIAG       7,9,13,14,19,21,22
$ SUBSTRUCTURING BY COMPONENT NORMAL MODES ANALYSIS
$ PHASE 2 ALTERS TO RIGID FORMAT 3
ALTER 6,42
ALTER 46  $ COMBINE SUBSTRUCTURES
PARAM   //C,N,NOP/V,Y,NOSUB#-1
PARAM   //C,N,NOP/V,N,TRUE#-1
COND    FINIS,NOSUB    $ NO.OF SUBSTRUCTURES ON TAPE MUST BE DEFINED
INPUTT1 /,,,,/C,N,-1/C,N,0/V,Y,TPNAME $ LIST TAPE INPT AND REWIND
PARAM   //C,N,NOP/V,N,PASS#1 $ INITIAL LOOP PASS PARAMETER
JUMP    LOOPC
LABEL   LOOPC  $ TOP OF LOOP
PARAM   //C,N,SUB/V,N,PASS1/V,N,PASS/C,N,2
INPUTT1 /KBBJ,KIIJ,M33J,MIBJ,MIIJ/C,N,0/C,N,0 $
INPUTT1 /DIIJ,DBBJ,CBGBJ,CBGIJ,/C,N,0/C,N,0 $
TRNSP   MIBJ/MBIJ
MERGE,  ,,,KBBJ,CBGBJ,/KGG1/C,N,-1/C,N,2/C,N,6
MERGE,  ,,,KIIJ,CBGIJ,/KGG2/C,N,-1/C,N,2/C,N,6
MERGE,  ,,,M33J,CBG3J,/MGG1/C,N,-1/C,N,2/C,N,6
MERGE,  ,,,MIIJ,CBGIJ,/MGG2/C,N,-1/C,N,2/C,N,6
MERGE,  ,,,MIBJ,CBG3J,CBGIJ/MGG3/C,N,1/C,N,2/C,N,6
MERGE,  ,,,MBIJ,CBGIJ,CBGBJ/MGG4/C,N,1/C,N,2/C,N,6
MERGE,  ,DBJ,,,,CBGBJ/DGG1/C,N,1/C,N,2/C,N,2
MERGE,  ,DIJ,,,,CBGIJ/DG2/C,N,1/C,N,2/C,N,2
COND    LC1,PASS1 $ SKIP TO LC1 IF FIRST PASS
JUMP    LC2
LABEL   LC1
ADD     KGG1,KGG2/KGG
ADD5    MGG1,MGG2,MGG3,MGG4,/MGG
ADD     DG1,DG2/DG
ADD     CBGIJ,/CBGI
LABEL   LC2
COND    LC3,PASS1 $ SKIP TO LC3 IF FIRST PASS
ADD     KGG1,KGG2/KGGA
ADD5    MGG1,MGG2,MGG3,MGG4,/MGGA
ADD     DG1,DG2/DGA
ADD     KGG,KGGA/KGGT
EQUIV   KGGT,KGG/TRUE
ADD     MGG,MGGA/MGGT
EQUIV   MGGT,MGG/TRUE
ADD     DG,DGA/DGT
EQUIV   DGT,DG/TRUE
ADD     CBGI,CBGIJ/CBGIT
EQUIV   CBGIT,CBGI/TRUE
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
LABEL   LC3
PARAM   //C,N,ADD/V,N,PASS/V,N,PASS/C,N,1
PARAM   //C,N,SUB/V,N,SKIP/V,Y,NOSUB/V,N,PASS
COND    LC4,SKIP $ SKIP OUT OF LOOP IF NO MORE SUBSTRUCTURES
REPT    100PC,9
LABEL   LC4
CHKPNT KGG,MGG,DG,CPGI
$ PARTITION INTO INTERFACE & COMPONENT MODES SETS
PARTN   KGG,CPGI,/KGGR,,,KGGI/C,N,-1 $
PARTN   MGG,CPGI,/MGGR,MGGIR,MGGRI,MGGI/C,N,-1 $
PARTN   DG,,CPGI/DGR,DGI,,/C,N,1 $
MPYAD   KGGR,DGR,/KGGRCK/C,N,0/C,N,1/C,N,0
MATGPR  GPL,USET,SIL,KGGRCK//C,N,G
ADD     MGGR,/WGGR/C,Y,MASSC*386.4,0.0< $
TRNSP   DGR/DGRT
SMPYAD  DGRT,WGGR,DGR,,,,/MDGGR/C,N,3/C,N,1/C,N,0
MPYAD   DGI,KGGI,/SUMKGGI/C,N,1/C,N,1/C,N,0
MPYAD   DGI,MGGI,/SUMMGGI/C,N,1/C,N,1/C,N,0
MPYAD   DGRT,MGGRI,/SUMMGRI/C,N,0/C,N,1/C,N,0
MATPRN  MDGGR,SUMKGGI,SUMMGGI,SUMMGRI,// $
CHKPNT KGGRCK,MDGGR,SUMKGGI,SUMMGGI,SUMMGRI
PURGE   CPGMN,DM,MPCCK/MPCFI
EQUIV   DG,DN/MPCFI
CHKPNT DM,DN,CPGMN,MPCCK
ALTER 50,54
ALTER 59
VEC     USET/CPGMN/C,N,G/C,N,M/C,N,N
PARTN   DG,,CPGMN/DM,DN,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD   GM,DN,DM/MPCCK/C,N,0/C,N,1/C,N,-1 $                    MPC CHECK
MATGPR  GPL,USET,SIL,MPCCK//C,N,M
CHKPNT  CPGMN,DM,DN,MPCCK
ALTER 62
EQUIV   DN,DF/SINGLE
PURGE   CPNSF,DS,SPCCK,MSS,WSS,WSPC/SINGLE
CHKPNT  CPNSF,DS,SPCCK,MSS,WSS,WSPC,DF
ALTER 65
VEC     USET/CPNSF/C,N,N/C,N,S/C,N,F
PARTN   DN,,CPNSF/DS,DF,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD   KFS,DF,/SPCCK/C,N,1/C,N,1/C,N,0 $                       SPC CHECK
$  SPCAS RESERVED FOR ZERO STIFFNESS & SYM.OR ANTI BOUNDARY D.O.F.
$  SPC FORCES FOR SYM. OR ANTI RIGID BODY ORIGIN DEFLAS
MATGPR  GPL,USET,SIL,SPCCK//C,N,S
UPARTN  USET,MNN/MSS,,,/C,N,N/C,N,S/C,N,F
ADD     MSS,/WSS/C,Y,MASSC*386.4,0.0< $ WEIGHT AT SPCAS
MPYAD   WSS,DS,/WSPC/C,N,0/C,N,1/C,N,0 $
$  WSPC EQUIV TO SPC INERTIA FOR DUE TO RIGID BODY ORIGIN DEFLAS
$  SHOULD BE ZERO FOR SYM.OR ANTI ORIGIN DEFLAS*OTHERWISE MASS IS LOST<
MATGPR  GPL,USET,SIL,WSPC//C,N,S
CHKPNT  CPNSF,DS,DF,SPCCK,MSS,WSS,WSPC
ALTER 68
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N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

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EQUIV    DE,DA/OMIT
PURGE    CPEDA,DD,GOCHK/OMIT
CHKPNT   CPEDA,DD,GOCHK,DA
ALTER 73
VEC      USET/CPEDA/C,N,E/C,N,D/C,N,A
PARTN    DE,,CPEDA/DD,DA,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD    GO,DA,DD/GOCHK/C,N,0/C,N,1/C,N,-1 $              GO CHECK
MATGPR   GPL,USET,SIL,GOCHK//C,N,0
CHKPNT   CPEDA,DD,DA,GOCHK
ALTER 75,84
COND     FINIS,REACT $ THERE MUST SUPORT CARD DEFINING RIGIDBODY D.O.F.
JPARTN   USET,KAA/KLL,,KLR,KRR3/C,N,A/C,N,L/C,N,R
SOLVE    KLL,KLR/GL/C,N,1/C,N,-1 $
MPYAD    KLR,GL,KRR3/KRR/C,N,1 $              RIGIDBODY STIFF.
MATGPR   GPL,USET,SIL,KRR/C,N,R
JPARTN   USET,MAA/MLL,,MLR,MRR3/C,N,A/C,N,L/C,N,R
MPYAD    MLL,GL,MLR/MIRR/C,N,0 $
MPYAD    MLR,GL,MRR3/MIRR/C,N,1 $
MPYAD    GL,MIRR,MRR/MRR/C,N,1 $
CHKPNT   KLL,KLR,KRR3,MLL,MLR,MRR3,GL,KRR,MILR,MIRR,MRR
VEC      USET/CPALR/C,N,A/C,N,L/C,N,R
PARTN    DA,,CPALR/DL,DR,,/C,N,1/C,N,2/C,N,2/C,N,2 $
MPYAD    GL,DR,DL/GLCHK/C,N,0/C,N,1/C,N,-1 $      GL CHECK
MATGPR   GPL,USET,SIL,GLCHK//C,N,L
MPYAD    KRR,DR,/KRRCK/C,N,0/C,N,1/C,N,0 $    RIGIDBODY STIFF.CHECK
MATGPR   GPL,USET,SIL,KRRCK//C,N,R
ADD      MRR,/MRR/C,Y,MASSC#2386.4,0.0< $
TRNSP    DR/EDR
SMPYAD   EDR,MRR,DR,,,/MDRR/C,N,3/C,N,1/C,N,0 $ RIGID BODY WT. MATRIX
MATPRN   MDRR,,,,// $
CHKPNT   CPALR,DL,DR,EDR,GLCHK,KRRCK,MRR,MDRR
ALTER 88,88
READ     KAA,MAA,MRR,GL,EED,USET,CASECC/LAMA,PHIA,MI,OEIGS/C,N,MODES/
         V,N,NEIGV $
ALTER 105,106
SDR2     CASECC,CSTM,,,EDEXIN,SIL,,,BGPDP,LAMA,,PHIG,,/,,DPHIG,,,/
         C,N,REIG $
DEF      DPHIG,,,,,//V,N,CARDNO
ALTER 109,113 $ EXTRACTS OUT SUBSTRUCT.EIGENVECTORS FOR PHASE 3
INPUTT1  /,,,,/C,N,-1/C,N,0/V,Y,IPNAME $ REWINDS INPT
PARAM    //C,N,NOP/V,N,INP#1 $
JUMP     LOOPD
LABEL    LOOPD
INPUTT1  /KRRK,KLLK,MRRK,MIRK,MLLK/C,N,0/C,N,0 $
INPUTT1  /DLK,DRK,CPGRK,CPGLK,/C,N,0/C,N,0 $
PARTN    PHIG,,CPGRK/,PHIR,,/C,N,1 $
PARTN    PHIG,,CPGLK/,PHIL,,/C,N,1 $
MPYAD    KRRK,PHIR,/PFR3/C,N,0/C,N,1/C,N,0
MPYAD    KLLK,PHIL,/PFL/C,N,0/C,N,1/C,N,0
MPYAD    DRK,PFR,/EQPFR1/C,N,1/C,N,1/C,N,0
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
MPYAD   DIK,EEI,EOEE1/EOEE/C,N,1
MPYAD   PHIR,EER,/MODEK1/C,N,1/C,N,1/C,N,0
MPYAD   PHII,EEI,MODEK1/MODEK/C,N,1
MATPRN EOEE,MODEK,,,// $
MPYAD   MRRK,PHIR,/EMR1/C,N,0/C,N,1/C,N,0
MPYAD   MIRK,PHII,EMR1/EMR/C,N,1
MPYAD   MIRK,PHIR,/EMI1/C,N,0/C,N,1/C,N,0
MPYAD   MIIK,PHII,EMI1/EMI/C,N,0
MPYAD   DIK,EMI,/SUMEM1/C,N,1/C,N,1/C,N,0
MPYAD   DRK,EMR,SUMEM1/SUMEM/C,N,1
MPYAD   PHII,EMI,/MODEM1/C,N,1/C,N,1/C,N,0
MPYAD   PHIR,EMR,MODEM1/MODEM/C,N,1
MATPRN SUMEM,MODEM,,,// $
OUTPUT1 LAMA,PHII,PHIR,,,//C,N,-1/V,N,INP/V,Y,TPNAME
PARAM   //C,N,ADD/V,N,INP/V,N,INP/C,N,1 $
PARAM   //C,N,SUB/V,N,SKLOOP/V,Y,NOSUB/V,N,INP
COND    LBL,SKLOOP
REPT    100PD,9
LABEL   101
ALTER 114,116
ENDALTER
CEND
```

N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

```
      148,   MORR     ,   FLAGS = 0,   REEL =  1,   FILE =    95
      149,   XVPS     ,   FLAGS # 0,   REEL #  1,   FILE #    96
      150,   REENTER AT DMAP SEQUENCE NUMBER    89
      151,   EED      ,   FLAGS = 0,   REEL =  1,   FILE =    97
      152,   XVPS     ,   FLAGS = 0,   REEL =  1,   FILE =    98
      153,   REENTER AT DMAP SEQUENCE NUMBER    93
      154,   PHIL     ,   FLAGS = 0,   REEL =  1,   FILE =    99
      155,   LAML     ,   FLAGS # 0,   REEL =  1,   FILE =   100
      156,   XVPS     ,   FLAGS # 0,   REEL #  1,   FILE #   101
      157,   REENTER AT DMAP SEQUENCE NUMBER   100
      158,   SIL      ,   FLAGS = 4,   REEL =  1,   FILE =    13
      159,   SIP      ,   FLAGS # 4,   REEL #  1,   FILE #    13
      160,   BGPDT    ,   FLAGS = 4,   REEL =  1,   FILE =    12
      161,   BGPDP    ,   FLAGS = 4,   REEL =  1,   FILE =    12
      162,   XVPS     ,   FLAGS # 0,   REEL #  1,   FILE #   102
$ END OF CHECKPOINT DICTIONARY
APP       DISP
SOL       3,0
TIME      20
DIAG      7,8,13,14,19,21,22
$ SUBSTRUCTURING BY COMPONENT NORMAL MODES ANALYSIS
$ PHASE 3 ALTERS TO RIGID FORMAT 3
ALTER 2,7
ALTER 19,94
INPUTT1 /,,,,/C,N,-3/C,N,0/V,Y,TPNAME2
INPUTT1 /LAMA,PHIL,PHIR,,/C,N,0 $
MPYAD   GL,PHIR,/PHLF1/C,N,0/C,N,1/C,N,0
MPYAD   PHIL,PHIL,PHLF1/PHILF/C,N,0 $
MERGE   PHILF,PHIR,,,,CPALR/PHIA/C,N,1/C,N,2/C,N,2
CHKPNT  PHIA
$ SUMMATION OF ELASTIC FORCES ABOUT REFERENCE POINT
SMPYAD  DA,KAA,PHIA,,,/EQEE/C,N,3/C,N,1/C,N,1/C,N,2/C,N,1 $
$ SUMMATION OF MOMENTUM FORCES ABOUT REF. PT. (RELATIVE TO EIGENVALUE=1.
SMPYAD  DA,MAA,PHIA,,,/SUMM/C,N,3/C,N,1/C,N,1/C,N,2/C,N,1 $
MATPRN  EQEE,SUMM,,,// $
ALTER 97,104
ALTER 114,119
ENDALTER
CEND
```

PHASE 3

```
      MODIFIED                                                          
      SUBROUTINE GPWG                                                   00000010
C                                                                       00000020
C     GRID POINT WEIGHT GENERATOR                                       00000030
C                                                                       00000040
C     INPUTS--BGPDT,CSTM,    EQEXIN,MGG                                 00000050
C                                                                       00000060
C     OUTPUTS-- OGPWG                                                   00000070
C                                                                       00000080
C     PARAMETERS -- POINT,WTMASS                                        00000090
C                                                                       00000100
      INTEGER BGPDT,CSTM,    EQEXIN,OGPWG,SCR1,SCR2,SCR3,SCR4,POINT     00000110
      COMMON //POINT,WTMASS                                             00000120
      DATA  BGPDT,CSTM,    EQEXIN,MGG/101,102,103,104    /              00000130
      DATA  OGPWG /201/                                                 00000140
      DATA  SCR1,SCR2,SCR3,SCR4 /301,302,303,304/                       00000150
C                                                                       00000160
C     FORM D MATRIX XTRANSPOSED                                         00000170
C     IP # POINT                                                        00000180
C                                                                       00000190
COMMENT***IF WTMASS#0.0 THEN OGPWG#DT**********************************
      IF(WTMASS.NE.0.0)GOTO 100                                         
      CALL GPWG1A(POINT,BGPDT,CSTM,EQEXIN,OGPWG,NOGO)                   
      GOTO 10                                                           
  100 CONTINUE                                                          
      CALL GPWG1A(POINT,BGPDT,CSTM,EQEXIN,SCR3,NOGO)                    00000200
C                                                                       00000210
C     CHECK FOR AN ALL SCALAR PROBLEM AND A STUPID USER                 00000220
C                                                                       00000230
      IF(NOGO .EQ. 0) GO TO 10                                          00000240
C                                                                       00000250
C     COMPUTE MZERO#  DT*MGG*D                                          00000260
C                                                                       00000270
      CALL TRANP1(SCR3,SCR1,2,SCR2,SCR4,0,0,0,0,0,0)                    00000280
      CALL SSG2B(MGG,SCR1,0,SCR2,0,1,1,SCR3)                            00000290
      CALL SSG2B(SCR1,SCR2,0,SCR4,1,1,1,SCR3)                           00000300
C                                                                       00000310
C     M-ZERO IS ON SCR4                                                 00000320
C                                                                       00000330
C                                                                       00000340
C     FORM OUTPUT  STUFF                                                00000350
C                                                                       00000360
      IF(POINT .EQ. 0) IP # 0                                           00000370
      CALL GPWG1B(SCR4,OGPWG,WTMASS,IP)                                 00000380
   10 RETURN                                                            00000390
      END                                                               00000400
```

C A S E C O N T R O L D E C K E C H O

```
CARD
COUNT
    1      TITLE = PHASE 1 (ORBITER FUSELAGE-SYMM CASE) MODEL 2
    2      SUBTITLE = SKINS HALF EFF.LONG.,85( EFF.TRANS.AT WING(G=2/3EFF.)
    3      MPC = 401
    4      SPC = 301
    5      METHOD   = 1
    6      MAXLINES = 50000
    7      VECTOR       = ALL
    8      SUBCASE 1
    9      LABEL    = FREE MODES FIXED AT INTERFACE
   10      MODES = 45
   11      OUTPUT(PLOT)
   12      SET 40 = INCLUDE 2200 THRU 2293,2630 THRU 2647,2656 THRU 2659,
   13                       2706 THRU 2708,2717,2699
   14      SET 41 = INCLUDE 2600 THRU 2629,2648 THRU 2655,2700 THRU 2705
   15      SET 42 = INCLUDE 2300 THRU 2432
   16      PLOTTER CALCOMP 765,105
   17      AXES    =MY,X,Z
   18      VIEW    = 30.0,45.0,0.0
   19      MAXIMUM  DEFORMATION 5.0
   20      FIND SCALE,ORIGIN 40,SET 40
   21      PLOT MODAL DEFORMATION 1 THRU 45,SET 40,SHAPE,VECTOR XYZ
   22      PLOT MODAL DEFORMATION 1 THRU 45,SET 42,SHAPE,VECTOR XYZ
   23      BEGIN BULK
```

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED,XSORT WILL RE-ORDER DECK.

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1	.. 2	.. 3	.. 4	.. 5	.. 6	.. 7	.. 8	.. 9	.. 10 .
1-	ASET1	1	1516	1800						
2-	ASET1	1	1926							
3-	ASET1	3	160	1505	1506	1613	1614			
4-	ASET1	3	241	301	506	1701	1801	1833	1901	
5-	ASET1	3	2001							
6-	ASET1	13	101	111	131	151	166	201	219	
7-	ASET1	13	242	501	601	701	801	901	911	
8-	ASET1	13	1001	1011	1101	1111	1201	1221	1301	
9-	ASET1	13	1321	1401	1406	1601	1606	1706	1821	
10-	ASET1	13	2011	2026						
11-	ASET1	23	229	232	235	238				
12-	ASET1	23	1823	1827	1831	1835				
13-	ASET1	123	110	115	120	127	156	158	206	
14-	ASET1	123	224	230	236	305	318	505	605	
15-	ASET1	123	618	705	718	805	818	905	923	
16-	ASET1	123	1005	1023	1105	1115	1123	1205	1212	
17-	ASET1	123	1220	1305	1312	1320	1405	1410	1418	
18-	ASET1	123	1502	1510	1605	1610	1705	1710	1718	
19-	ASET1	123	1806	1808	1812	1824	1838	1905	1918	
20-	ASET1	123	1922	2005	2010	2014	2029	2030	2041	
21-	ASET1	123	2105	2106	2110	2114				
22-	ASET1	135	760	1161						
23-	ASET1	1235	518	1618						
24-	ASET1	123456	2200							
25-	CBAR	181	181	151	152	166			2	
26-	CBAR	182	181	152	153	169			2	
27-	CBAR	183	181	153	154	168			2	
28-	CBAR	184	181	154	155	167			2	
29-	CBAR	185	181	155	156	158			2	
30-	CBAR	186	181	156	157	151			2	
31-	CBAR	187	181	157	158	166			2	
32-	CBAR	188	181	158	159	166			2	
33-	CBAR	189	181	159	160	166			2	
34-	CBAR	190	181	160	161	166			2	
35-	CBAR	191	181	161	162	166			2	
36-	CBAR	192	181	162	163	166			2	
37-	CBAR	193	181	163	164	166			2	
38-	CBAR	194	194	158	167	156			2	
39-	CBAR	195	194	167	168	154			2	
40-	CBAR	196	194	168	169	153			2	
41-	CBAR	197	194	169	166	152			2	
42-	CBAR	198	181	166	165	158			2	
43-	CBAR	199	181	165	151	157			2	
44-	CBAR	463	463	305	310	.0	1.0	.0	1	&463
45-	&463			0.0	.575	0.0	0.0	.575	0.0	
46-	CBAR	464	464	310	312	.0	1.0	.0	1	&464
47-	&464			0.0	.575	0.0	0.0	.575	0.0	
48-	CBAR	465	465	312	314	.0	1.0	.0	1	&465
49-	&465			0.0	.575	0.0	0.0	.575	0.0	
50-	CBAR	466	466	314	316	.0	1.0	.0	1	&466

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
51-	&466			0.0	.575	0.0	0.0	.575	0.0	
52-	CBAR	467	467	316	318	.0	1.0	.0	1	&467
53-	&467			0.0	.575	0.0	0.0	.575	0.0	
54-	CBAR	1231	181	1221	1206	1212			2	
55-	CBAR	1232	181	1206	1201	1210			2	
56-	CBAR	1927	1927	1905	1918	.0	1.0	.0	1	&1927
57-	&1927			0.0	.75	0.0	0.0	.75	0.0	
58-	CBAR	1928	1928	1918	1919	.0	1.0	.0	1	&1928
59-	&1928			0.0	.75	0.0	0.0	.75	0.0	
60-	CBAR	1929	1929	1919	1920	.0	1.0	.0	1	&1929
61-	&1929			0.0	.75	0.0	0.0	.75	0.0	
62-	CBAR	1930	1930	1920	1921	.0	1.0	.0	1	&1930
63-	&1930			0.0	.75	0.0	0.0	.75	0.0	
64-	CBAR	1931	1931	1921	1922	.0	1.0	.0	1	&1931
65-	&1931			0.0	.75	0.0	0.0	.75	0.0	
66-	CBAR	2101	2101	2101	2102	2110			2	
67-	CBAR	2102	2102	2102	2103	2110			2	
68-	CBAR	2103	2103	2103	2104	2110			2	
69-	CBAR	2104	2104	2104	2105	2110			2	
70-	CBAR	2105	2105	2105	2106	.0	1.0	.0	1	
71-	CBAR	2106	2106	2106	2107	.0	1.0	.0	1	
72-	CBAR	2107	2107	2107	2108	.0	1.0	.0	1	
73-	CBAR	2108	2108	2108	2109	.0	1.0	.0	1	
74-	CBAR	2109	2109	2109	2110	.0	1.0	.0	1	
75-	CBAR	2110	2110	2110	2111	.0	1.0	.0	1	
76-	CBAR	2111	2111	2111	2112	.0	1.0	.0	1	
77-	CBAR	2112	2112	2112	2113	2101			2	
78-	CBAR	2113	2113	2113	2114	2101			2	
79-	CBAR	2114	2114	2114	2115	2101			2	
80-	CBAR	2502	2502	243	318	.0	1.0	.0	1	
81-	CBAR	2503	2502	318	518	.0	1.0	.0	1	
82-	CBAR	2504	2502	518	618	.0	1.0	.0	1	
83-	CBAR	2505	2502	618	718	.0	1.0	.0	1	
84-	CBAR	2506	2502	718	760	.0	1.0	.0	1	
85-	CBAR	2507	2502	760	818	.0	1.0	.0	1	
86-	CBAR	2508	2502	818	923	.0	1.0	.0	1	
87-	CBAR	2509	2502	923	1023	.0	1.0	.0	1	
88-	CBAR	2510	2502	1023	1123	.0	1.0	.0	1	
89-	CBAR	2511	2502	1123	1161	.0	1.0	.0	1	
90-	CBAR	2512	2502	1161	1220	.0	1.0	.0	1	
91-	CBAR	2513	2502	1220	1320	.0	1.0	.0	1	
92-	CBAR	2514	2502	1320	1418	.0	1.0	.0	1	
93-	CBAR	2515	2502	1418	1510	.0	1.0	.0	1	
94-	CBAR	2516	2502	1510	1618	.0	1.0	.0	1	
95-	CBAR	2517	2502	1618	1718	.0	1.0	.0	1	
96-	CBAR	2519	2502	1718	1824	.0	1.0	.0	1	
97-	CBAR	2713	2713	1924	1922	.0	1.0	.0	1	
98-	CBAR	2722	181	1821	1930	1801			2	
99-	CBAR	2723	181	1930	1924	1901			2	
100-	CBAR	2724	181	1930	1929	1901			2	

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
101-	CBAR	2725	181	1929	1922	1905			2	&BM2725
102-	&BM2725		6							
103-	CBAR	2726	181	1927	1926	1930			2	
104-	CBAR	2727	181	1926	1925	1930			2	
105-	CBAR	2728	181	1925	1924	1930			2	
106-	CBAR	2729	181	1924	1923	1930			2	
107-	CBAR	2730	181	1923	1922	1930			2	&BM2730
108-	&BM2730		6							
109-	CELAS2	20200	148000.	230	1	243	1			
110-	CONM2	400	301	0	.39					
111-	CONM2	500	501	0	.14					
112-	CONM2	900	919	0	.16					
113-	CONM2	1000	1019	0	.16					
114-	CONM2	1300	1316	0	.16					
115-	CONM2	1400	1414	0	.16					
116-	CONM2	1500	1506	0	.16					
117-	CONM2	1600	1614	0	.16					
118-	CONM2	1800	1800	0	2.25					
119-	CONM2	2000	2200	0	26.15					&OHMS
120-	&OHMS	44.4		232.2			219.5			
121-	CONM2	2031	2011	0	.13					
122-	CONM2	2032	2014	0	.33					
123-	CONM2	2033	2026	0	.22					
124-	CONM2	2034	2029	0	.12					
125-	CONROD	101	101	102	1	.023000			.014	
126-	CONROD	102	102	103	1	.023000			.014	
127-	CONROD	103	103	104	1	.023000			.014	
128-	CONROD	104	104	105	1	.023000			.014	
129-	CONROD	105	105	110	1	.023000			.014	
130-	CONROD	109	111	112	1	.072000			.790	
131-	CONROD	110	112	113	1	.072000			.790	
132-	CONROD	111	113	114	1	.072000			.790	
133-	CONROD	112	114	115	1	.072000			.790	
134-	CONROD	113	116	117	1	.194000				
135-	CONROD	114	117	118	1	.154000				
136-	CONROD	115	118	119	1	.154000				
137-	CONROD	116	119	120	1	.154000				
138-	CONROD	122	128	129	1	.040000				
139-	CONROD	123	130	131	1	.020000				
140-	CONROD	124	101	106	11	.056000				
141-	CONROD	129	106	111	11	.056000				
142-	CONROD	133	110	115	11	.023000				
143-	CONROD	138	115	120	11	.023000				
144-	CONROD	143	120	125	11	.023				
145-	CONROD	146	125	127	11	.023000			.0200	
146-	CONROD	147	126	128	1	.016000				
147-	CONROD	148	127	129	1	.039400			.0100	
148-	CONROD	149	128	130	1	.009300				
149-	CONROD	150	129	131	1	.033000			.0090	
150-	CONROD	201	201	202	1	.059200			.0233	

S O R T E D _ B U L K _ D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
151-	CONROD	202	202	203	1	.059200			.0233	
152-	CONROD	203	203	204	1	.059200			.0233	
153-	CONROD	204	204	205	1	.059200			.0233	
154-	CONROD	205	205	206	1	.059200			.0233	
155-	CONROD	216	219	220	1	.095000			.0174	
156-	CONROD	217	220	221	1	.095000			.0174	
157-	CONROD	218	221	222	1	.095000			.0174	
158-	CONROD	219	222	223	1	.095000			.0174	
159-	CONROD	220	223	224	1	.095000			.0174	
160-	CONROD	223	228	229	1	.040000				
161-	CONROD	224	229	230	1	.040000				
162-	CONROD	225	231	232	1	.040000				
163-	CONROD	226	232	233	1	.040000				
164-	CONROD	227	234	235	1	.040000				
165-	CONROD	228	235	236	1	.040000				
166-	CONROD	229	237	238	1	.040000				
167-	CONROD	230	238	239	1	.040000				
168-	CONROD	231	240	241	1	.040000				
169-	CONROD	232	241	242	1	.040000				
170-	CONROD	233	201	207	11	.056000				
171-	CONROD	238	206	212	11	.055400				
172-	CONROD	239	207	213	11	.056000				
173-	CONROD	244	212	218	11	.055400				
174-	CONROD	245	213	219	11	.056000				
175-	CONROD	250	218	224	11	.055400				
176-	CONROD	254	224	227	11	.055400			.0200	
177-	CONROD	255	225	228	1	.035100				
178-	CONROD	256	226	229	1	.020000				
179-	CONROD	257	227	230	1	.034600			.0200	
180-	CONROD	258	228	231	1	.035100				
181-	CONROD	259	229	232	1	.020000				
182-	CONROD	260	230	233	1	.047500			.0186	
183-	CONROD	261	231	234	1	.035100				
184-	CONROD	262	232	235	1	.020000				
185-	CONROD	263	233	236	1	.047500			.0186	
186-	CONROD	264	234	237	1	.035100				
187-	CONROD	265	235	238	1	.020000				
188-	CONROD	266	236	239	1	.047500			.0186	
189-	CONROD	267	237	240	1	.035100				
190-	CONROD	268	238	241	1	.020000				
191-	CONROD	269	239	242	1	.047500			.0186	
192-	CONROD	301	301	302	1	.172000			.0687	
193-	CONROD	302	302	303	1	.172000			.0687	
194-	CONROD	303	303	304	1	.172000			.0697	
195-	CONROD	304	304	305	1	.172000			.0716	
196-	CONROD	305	306	307	1	.172000				
197-	CONROD	306	307	308	1	.172000				
198-	CONROD	307	308	309	1	.172000				
199-	CONROD	308	309	310	1	.172000				
200-	CONROD	309	311	312	1	.091000				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
201-	CONROD	310	313	314	1	.091				
202-	CONROD	311	315	316	1	.091				
203-	CONROD	312	317	318	1	.032000				
204-	CONROD	313	301	306	1	.062500				
205-	CONROD	314	302	307	1	.125000				
206-	CONROD	315	303	308	1	.125000				
207-	CONROD	316	304	309	1	.129				
208-	CONROD	317	305	310	1	.129000			.0618	
209-	CONROD	318	309	311	1	.115				
210-	CONROD	319	310	312	1	.115000			.0494	
211-	CONROD	320	311	313	1	.104000				
212-	CONROD	321	312	314	1	.104000			.0430	
213-	CONROD	322	313	315	1	.092				
214-	CONROD	323	314	316	1	.092000			.0363	
215-	CONROD	324	315	317	1	.078				
216-	CONROD	325	316	318	1	.078000			.0285	
217-	CONROD	451	406	407	1	.172000				
218-	CONROD	452	407	408	1	.172000				
219-	CONROD	453	408	409	1	.172000				
220-	CONROD	454	409	310	1	.172000				
221-	CONROD	455	301	302	1	.172000			.0687	
222-	CONROD	456	302	303	1	.172000			.0687	
223-	CONROD	457	303	304	1	.172000			.0687	
224-	CONROD	458	304	305	1	.172000			.0687	
225-	CONROD	459	301	406	1	.062500				
226-	CONROD	460	302	407	1	.125000				
227-	CONROD	461	303	408	1	.125000				
228-	CONROD	462	304	409	1	.125000				
229-	CONROD	501	501	502	1	.172000			.0513	
230-	CONROD	502	502	503	1	.172000			.0687	
231-	CONROD	503	503	504	1	.172000			.0687	
232-	CONROD	504	504	505	1	.172000			.0618	
233-	CONROD	505	506	507	1	.172000				
234-	CONROD	506	507	508	1	.172000				
235-	CONROD	507	508	509	1	.172000				
236-	CONROD	508	509	510	1	.172000				
237-	CONROD	509	511	512	1	.091000				
238-	CONROD	510	513	514	1	.091000				
239-	CONROD	511	515	516	1	.091000				
240-	CONROD	512	517	518	1	.032000				
241-	CONROD	513	501	506	1	.100000				
242-	CONROD	514	502	507	1	.125000				
243-	CONROD	515	503	508	1	.125000				
244-	CONROD	516	504	509	1	.129000				
245-	CONROD	517	505	510	1	.129000			.0618	
246-	CONROD	518	509	511	1	.115000				
247-	CONROD	519	510	512	1	.115000			.0494	
248-	CONROD	520	511	513	1	.104000				
249-	CONROD	521	512	514	1	.104000			.0430	
250-	CONROD	522	513	515	1	.092000				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
251-	CONROD	523	514	516	1	.092000			.0363	
252-	CONROD	524	515	517	1	.078000				
253-	CONROD	525	516	518	1	.078000			.0285	
254-	CONROD	602	602	603	1	.172000			.1140	
255-	CONROD	603	603	604	1	.172000			.0687	
256-	CONROD	604	604	605	1	.172000			.0618	
257-	CONROD	605	606	607	1	.172000				
258-	CONROD	606	607	608	1	.172000				
259-	CONROD	607	608	609	1	.172000				
260-	CONROD	608	609	610	1	.172000				
261-	CONROD	609	611	612	1	.091000				
262-	CONROD	610	613	614	1	.091000				
263-	CONROD	611	615	616	1	.091000				
264-	CONROD	612	617	618	1	.032000				
265-	CONROD	613	601	606	1	.062500				
266-	CONROD	614	602	607	1	.125000				
267-	CONROD	615	603	608	1	.125000				
268-	CONROD	616	604	609	1	.125000				
269-	CONROD	617	605	610	1	.129000			.0618	
270-	CONROD	618	609	611	1	.116000				
271-	CONROD	619	610	612	1	.116000			.0494	
272-	CONROD	620	611	613	1	.104000				
273-	CONROD	621	612	614	1	.104000			.0430	
274-	CONROD	622	613	615	1	.092000				
275-	CONROD	623	614	616	1	.092000			.0363	
276-	CONROD	624	615	617	1	.078000				
277-	CONROD	625	616	618	1	.078000			.0285	
278-	CONROD	702	702	703	1	.172000			.1140	
279-	CONROD	703	703	704	1	.172000			.0687	
280-	CONROD	704	704	705	1	.172000			.0618	
281-	CONROD	705	706	707	1	.172000				
282-	CONROD	706	707	708	1	.172000				
283-	CONROD	707	708	709	1	.172000				
284-	CONROD	708	709	710	1	.172000				
285-	CONROD	709	711	712	1	.091000				
286-	CONROD	710	713	714	1	.091000				
287-	CONROD	711	715	716	1	.091000				
288-	CONROD	712	717	718	1	.032000				
289-	CONROD	713	701	706	1	.062500				
290-	CONROD	714	702	707	1	.125000				
291-	CONROD	715	703	708	1	.125000				
292-	CONROD	716	704	709	1	.129000				
293-	CONROD	717	705	710	1	.129000			.0618	
294-	CONROD	718	709	711	1	.116000				
295-	CONROD	719	710	712	1	.116000			.0501	
296-	CONROD	720	711	713	1	.104000				
297-	CONROD	721	712	714	1	.104000			.0430	
298-	CONROD	722	713	715	1	.092000				
299-	CONROD	723	714	716	1	.092000			.0363	
300-	CONROD	724	715	717	1	.078000				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
301-	CONROD	725	716	718	1	.078000			.0285	
302-	CONROD	802	802	803	1	.172000			.1140	
303-	CONROD	803	803	804	1	.172000			.0687	
304-	CONROD	804	804	805	1	.172000			.0618	
305-	CONROD	805	806	807	1	.172000				
306-	CONROD	806	807	808	1	.172000				
307-	CONROD	807	808	809	1	.172000				
308-	CONROD	808	809	810	1	.172000				
309-	CONROD	809	811	812	1	.090000				
310-	CONROD	810	813	814	1	.090000				
311-	CONROD	811	815	816	1	.090000				
312-	CONROD	812	817	818	1	.032000				
313-	CONROD	813	801	806	1	.062500				
314-	CONROD	814	802	807	1	.125000				
315-	CONROD	815	803	808	1	.125000				
316-	CONROD	816	804	809	1	.129000				
317-	CONROD	817	805	810	1	.129000			.0618	
318-	CONROD	818	809	811	1	.116000				
319-	CONROD	819	810	812	1	.116000			.0501	
320-	CONROD	820	811	813	1	.104000				
321-	CONROD	821	812	814	1	.104000			.0430	
322-	CONROD	822	813	815	1	.092000				
323-	CONROD	823	814	816	1	.092000			.0363	
324-	CONROD	824	815	817	1	.078000				
325-	CONROD	825	816	818	1	.078000			.0285	
326-	CONROD	902	902	903	1	.056000			.0428	
327-	CONROD	903	903	904	1	.056000			.0259	
328-	CONROD	904	904	905	1	.056000			.0438	
329-	CONROD	909	911	912	1	.012000				
330-	CONROD	910	912	913	1	.056000				
331-	CONROD	911	913	914	1	.056000				
332-	CONROD	912	914	915	1	.056000				
333-	CONROD	913	916	917	1	.090000				
334-	CONROD	914	918	919	1	.090000				
335-	CONROD	915	920	921	1	.090000				
336-	CONROD	916	922	923	1	.032000				
337-	CONROD	917	901	911	11	.109000				
338-	CONROD	918	902	912	1	.040000				
339-	CONROD	919	903	913	1	.040000				
340-	CONROD	920	904	914	1	.132000				
341-	CONROD	921	905	910	1	.135000			.0438	
342-	CONROD	922	910	915	1	.123000			.0438	
343-	CONROD	927	914	916	1	.115000				
344-	CONROD	928	915	917	1	.115000			.0493	
345-	CONROD	929	916	918	1	.103000				
346-	CONROD	930	917	919	1	.103000			.0427	
347-	CONROD	931	918	920	1	.092000				
348-	CONROD	932	919	921	1	.092000			.0363	
349-	CONROD	933	920	922	1	.080000				
350-	CONROD	934	921	923	1	.080000			.0292	

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
351-	CONROD	1002	1002	1003	1	.058000			.0439	
352-	CONROD	1003	1003	1004	1	.058000			.0265	
353-	CONROD	1004	1004	1005	1	.058000			.0436	
354-	CONROD	1005	1011	1012	1	.012000				
355-	CONROD	1006	1012	1013	1	.058000				
356-	CONROD	1007	1013	1014	1	.058000				
357-	CONROD	1008	1014	1015	1	.058000				
358-	CONROD	1009	1016	1017	1	.090000				
359-	CONROD	1010	1018	1019	1	.090000				
360-	CONROD	1011	1020	1021	1	.090000				
361-	CONROD	1012	1022	1023	1	.032000				
362-	CONROD	1013	1001	1011	11	.109000				
363-	CONROD	1014	1002	1012	1	.040000				
364-	CONROD	1015	1003	1013	1	.040000				
365-	CONROD	1016	1004	1014	1	.132000				
366-	CONROD	1017	1005	1010	1	.135000			.0436	
367-	CONROD	1018	1010	1015	1	.123000			.0436	
368-	CONROD	1027	1014	1016	1	.115000				
369-	CONROD	1028	1015	1017	1	.115000			.0493	
370-	CONROD	1029	1016	1018	1	.103000				
371-	CONROD	1030	1017	1019	1	.103000			.0427	
372-	CONROD	1031	1018	1020	1	.092000				
373-	CONROD	1032	1019	1021	1	.092000			.0363	
374-	CONROD	1033	1020	1022	1	.080000				
375-	CONROD	1034	1021	1023	1	.080000			.0292	
376-	CONROD	1102	1102	1103	1	.060000			.0462	
377-	CONROD	1103	1103	1104	1	.060000			.0272	
378-	CONROD	1104	1104	1105	1	.030			.0452	
379-	CONROD	1105	1111	1112	1	.012000				
380-	CONROD	1106	1112	1113	1	.060000				
381-	CONROD	1107	1113	1114	1	.060000				
382-	CONROD	1108	1114	1115	1	.030				
383-	CONROD	1109	1116	1117	1	.090000				
384-	CONROD	1110	1118	1119	1	.090000				
385-	CONROD	1111	1120	1121	1	.090000				
386-	CONROD	1112	1122	1123	1	.032000				
387-	CONROD	1114	1101	1111	11	.109000				
388-	CONROD	1115	1102	1112	1	.040000				
389-	CONROD	1116	1103	1113	1	.040000				
390-	CONROD	1117	1104	1114	1	.135000				
391-	CONROD	1119	1105	1110	1	.135000			.0452	
392-	CONROD	1120	1110	1115	1	.123000			.0452	
393-	CONROD	1121	1114	1116	1	.115000				
394-	CONROD	1122	1115	1117	1	.115000			.0493	
395-	CONROD	1123	1116	1118	1	.103000				
396-	CONROD	1124	1117	1119	1	.103000			.0427	
397-	CONROD	1125	1118	1120	1	.092000				
398-	CONROD	1126	1119	1121	1	.092000			.0363	
399-	CONROD	1127	1120	1122	1	.080000				
400-	CONROD	1128	1121	1123	1	.080000			.0292	

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
401-	CONROD	1202	1202	1203	1	.172000			.1140	
402-	CONROD	1203	1203	1204	1	.172000			.0687	
403-	CONROD	1204	1204	1205	1	.086			.0618	
404-	CONROD	1205	1206	1207	1	.060				
405-	CONROD	1206	1207	1208	1	.172000				
406-	CONROD	1207	1208	1209	1	.172000				
407-	CONROD	1208	1210	1209	1	.086				
408-	CONROD	1209	1211	1212	1	.090000				
409-	CONROD	1210	1213	1214	1	.090000				
410-	CONROD	1211	1215	1216	1	.090000				
411-	CONROD	1212	1217	1218	1	.090000				
412-	CONROD	1213	1219	1220	1	.032000				
413-	CONROD	1214	1201	1206	11	.109000				
414-	CONROD	1215	1202	1207	1	.125000				
415-	CONROD	1216	1203	1208	1	.125000				
416-	CONROD	1217	1204	1209	1	.135000				
417-	CONROD	1218	1205	1210	1	.135000			.0618	
418-	CONROD	1219	1209	1211	1	.123000				
419-	CONROD	1220	1210	1212	1	.123000			.0550	
420-	CONROD	1221	1211	1213	1	.115000				
421-	CONROD	1222	1212	1214	1	.115000			.0493	
422-	CONROD	1223	1213	1215	1	.103000				
423-	CONROD	1224	1214	1216	1	.103000			.0427	
424-	CONROD	1225	1215	1217	1	.092000				
425-	CONROD	1226	1216	1218	1	.092000			.0363	
426-	CONROD	1227	1217	1219	1	.080000				
427-	CONROD	1228	1218	1220	1	.080000			.0292	
428-	CONROD	1229	1206	1221	11	.109				
429-	CONROD	1302	1302	1303	1	.172000			.1140	
430-	CONROD	1303	1303	1304	1	.172000			.0687	
431-	CONROD	1304	1304	1305	1	.086			.0618	
432-	CONROD	1305	1306	1307	1	.060000				
433-	CONROD	1306	1307	1308	1	.172000				
434-	CONROD	1307	1308	1309	1	.172000				
435-	CONROD	1308	1309	1310	1	.086				
436-	CONROD	1309	1311	1312	1	.090000				
437-	CONROD	1310	1313	1314	1	.090000				
438-	CONROD	1311	1315	1316	1	.090000				
439-	CONROD	1312	1317	1318	1	.090000				
440-	CONROD	1313	1319	1320	1	.032000				
441-	CONROD	1314	1301	1306	11	.109000				
442-	CONROD	1315	1302	1307	1	.125000				
443-	CONROD	1316	1303	1308	1	.125000				
444-	CONROD	1317	1304	1309	1	.135000				
445-	CONROD	1318	1305	1310	1	.135000			.0618	
446-	CONROD	1319	1309	1311	1	.123000				
447-	CONROD	1320	1310	1312	1	.123000			.0550	
448-	CONROD	1321	1311	1313	1	.115000				
449-	CONROD	1322	1312	1314	1	.115000			.0493	
450-	CONROD	1323	1313	1315	1	.103000				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
451-	CONROD	1324	1314	1316	1	.103000			.0427	
452-	CONROD	1325	1315	1317	1	.092000				
453-	CONROD	1326	1316	1318	1	.092000			.0363	
454-	CONROD	1327	1317	1319	1	.080000				
455-	CONROD	1328	1318	1320	1	.080000			.0292	
456-	CONROD	1329	1306	1321	11	.109				
457-	CONROD	1402	1402	1403	1	.060000			.0231	
458-	CONROD	1403	1403	1404	1	.060000			.0139	
459-	CONROD	1404	1404	1405	1	.030			.0304	
460-	CONROD	1405	1407	1408	1	.060000			.0231	
461-	CONROD	1406	1408	1409	1	.060000			.0139	
462-	CONROD	1407	1409	1410	1	.030			.0304	
463-	CONROD	1408	1411	1412	1	.090000				
464-	CONROD	1409	1413	1414	1	.090000				
465-	CONROD	1410	1415	1416	1	.090000				
466-	CONROD	1411	1417	1418	1	.032000				
467-	CONROD	1412	1401	1406	11	.109000				
468-	CONROD	1413	1402	1407	1	.040000				
469-	CONROD	1414	1403	1408	1	.040000				
470-	CONROD	1415	1404	1409	1	.132000				
471-	CONROD	1416	1405	1410	1	.132000			.0304	
472-	CONROD	1417	1409	1411	1	.115000				
473-	CONROD	1418	1410	1412	1	.115000			.0493	
474-	CONROD	1419	1411	1413	1	.103000				
475-	CONROD	1420	1412	1414	1	.103000			.0427	
476-	CONROD	1421	1413	1415	1	.092000				
477-	CONROD	1422	1414	1416	1	.092000			.0363	
478-	CONROD	1423	1415	1417	1	.080000				
479-	CONROD	1424	1416	1418	1	.080000			.0292	
480-	CONROD	1501	1501	1502	1	.140000				
481-	CONROD	1502	1503	1504	1	.091000				
482-	CONROD	1503	1505	1506	1	.091000				
483-	CONROD	1504	1507	1508	1	.091000				
484-	CONROD	1505	1509	1510	1	.032000				
485-	CONROD	1506	1501	1503	1	.115000				
486-	CONROD	1507	1502	1504	1	.115000			.0493	
487-	CONROD	1508	1503	1505	1	.103000				
488-	CONROD	1509	1504	1506	1	.103000			.0427	
489-	CONROD	1510	1505	1507	1	.092000				
490-	CONROD	1511	1506	1508	1	.092000			.0363	
491-	CONROD	1512	1507	1509	1	.080000				
492-	CONROD	1513	1508	1510	1	.080000			.0292	
493-	CONROD	1602	1602	1603	1	.060000			.0231	
494-	CONROD	1603	1603	1604	1	.060000			.0139	
495-	CONROD	1604	1604	1605	1	.030			.0304	
496-	CONROD	1606	1607	1608	1	.060000			.0231	
497-	CONROD	1607	1608	1609	1	.060000			.0139	
498-	CONROD	1608	1609	1610	1	.030			.0304	
499-	CONROD	1609	1611	1612	1	.091000				
500-	CONROD	1610	1613	1614	1	.091000				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
501-	CONROD	1611	1615	1616	1	.091000				
502-	CONROD	1612	1617	1618	1	.032000				
503-	CONROD	1613	1601	1606	11	.109000				
504-	CONROD	1614	1602	1607	1	.040000				
505-	CONROD	1615	1603	1608	1	.040000				
506-	CONROD	1616	1604	1609	1	.132000				
507-	CONROD	1617	1605	1610	1	.132000			.0304	
508-	CONROD	1618	1609	1611	1	.115000				
509-	CONROD	1619	1610	1612	1	.115000			.0493	
510-	CONROD	1620	1611	1613	1	.103000				
511-	CONROD	1621	1612	1614	1	.103000			.0427	
512-	CONROD	1622	1613	1615	1	.092000				
513-	CONROD	1623	1614	1616	1	.092000			.0363	
514-	CONROD	1624	1615	1617	1	.080000				
515-	CONROD	1625	1616	1618	1	.080000			.0292	
516-	CONROD	1702	1702	1703	1	.060000			.0231	
517-	CONROD	1703	1703	1704	1	.060000			.0139	
518-	CONROD	1704	1704	1705	1	.030			.0304	
519-	CONROD	1705	1706	1707	1	.060000			.0139	
520-	CONROD	1706	1707	1708	1	.060000			.0139	
521-	CONROD	1707	1708	1709	1	.060000			.0139	
522-	CONROD	1708	1709	1710	1	.030			.0304	
523-	CONROD	1709	1711	1712	1	.091000				
524-	CONROD	1710	1713	1714	1	.091000				
525-	CONROD	1711	1715	1716	1	.091000				
526-	CONROD	1712	1717	1718	1	.032000				
527-	CONROD	1713	1701	1706	11	.100000				
528-	CONROD	1714	1702	1707	1	.040000				
529-	CONROD	1715	1703	1708	1	.040000				
530-	CONROD	1716	1704	1709	1	.132000				
531-	CONROD	1717	1705	1710	1	.132000			.0304	
532-	CONROD	1718	1709	1711	1	.115000				
533-	CONROD	1719	1710	1712	1	.115000			.0493	
534-	CONROD	1720	1711	1713	1	.103000				
535-	CONROD	1721	1712	1714	1	.103000			.0427	
536-	CONROD	1722	1713	1715	1	.092000				
537-	CONROD	1723	1714	1716	1	.092000			.0363	
538-	CONROD	1724	1715	1717	1	.080000				
539-	CONROD	1725	1716	1718	1	.080000			.0292	
540-	CONROD	1801	1801	1802	1	.060000			.0139	
541-	CONROD	1802	1802	1803	1	.060000			.0139	
542-	CONROD	1803	1803	1804	1	.060000			.0139	
543-	CONROD	1804	1804	1805	1	.060000			.0139	
544-	CONROD	1805	1805	1806	1	.030			.014	
545-	CONROD	1806	1801	1807	1	.090000				
546-	CONROD	1807	1802	1808	1	.040000				
547-	CONROD	1808	1803	1809	1	.040000				
548-	CONROD	1809	1804	1810	1	.040000				
549-	CONROD	1810	1805	1811	1	.023000				
550-	CONROD	1811	1806	1812	1	.023000			.0140	

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
551-	CONROD	1812	1807	1808	1	.060000			.0139	
552-	CONROD	1813	1808	1809	1	.060000			.0139	
553-	CONROD	1814	1809	1810	1	.060000			.0139	
554-	CONROD	1815	1810	1811	1	.060000			.0139	
555-	CONROD	1816	1811	1812	1	.030			.014	
556-	CONROD	1817	1811	1813	1	.045000				
557-	CONROD	1818	1812	1814	1	.045000			.0184	
558-	CONROD	1819	1813	1814	1	.040000				
559-	CONROD	1820	1813	1815	1	.050000				
560-	CONROD	1821	1814	1817	1	.050000			.0214	
561-	CONROD	1822	1815	1817	1	.040000				
562-	CONROD	1823	1815	1818	1	.056000				
563-	CONROD	1824	1817	1820	1	.056000			.0251	
564-	CONROD	1825	1818	1819	1	.040000				
565-	CONROD	1826	1819	1820	1	.040000				
566-	CONROD	1827	1818	1822	1	.062000				
567-	CONROD	1828	1819	1823	1	.020000				
568-	CONROD	1829	1820	1824	1	.062000			.0287	
569-	CONROD	1830	1821	1822	1	.061000			.0216	
570-	CONROD	1831	1822	1823	1	.061000			.0215	
571-	CONROD	1832	1823	1824	1	.040000			.0216	
572-	CONROD	1833	1821	1825	1	.020000				
573-	CONROD	1834	1822	1826	1	.060000				
574-	CONROD	1835	1823	1827	1	.040000				
575-	CONROD	1836	1824	1828	1	.065000			.0430	
576-	CONROD	1837	1825	1826	1	.013000				
577-	CONROD	1838	1826	1827	1	.025000				
578-	CONROD	1839	1827	1828	1	.040000				
579-	CONROD	1840	1826	1830	1	.070000				
580-	CONROD	1841	1827	1831	1	.040000				
581-	CONROD	1842	1828	1832	1	.070000			.0439	
582-	CONROD	1843	1829	1830	1	.030000				
583-	CONROD	1844	1830	1831	1	.030000				
584-	CONROD	1845	1831	1832	1	.040000				
585-	CONROD	1846	1829	1833	1	.020000				
586-	CONROD	1847	1830	1834	1	.065000				
587-	CONROD	1848	1831	1835	1	.040000				
588-	CONROD	1849	1832	1836	1	.065000			.0430	
589-	CONROD	1850	1833	1834	1	.040000				
590-	CONROD	1851	1834	1835	1	.040000				
591-	CONROD	1852	1833	1837	1	.020000				
592-	CONROD	1853	1834	1838	1	.060000				
593-	CONROD	1854	1835	1836	1	.040000				
594-	CONROD	1855	1837	1838	1	.055000			.0310	
595-	CONROD	1856	1838	1836	1	.060000			.0430	
596-	CONROD	1901	1901	1902	1	.057000			.0280	
597-	CONROD	1902	1902	1903	1	.033000			.0092	
598-	CONROD	1903	1903	1904	1	.060000			.0140	
599-	CONROD	1904	1904	1905	1	.03			.014	
600-	CONROD	1905	1901	1906	1	.020000				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
601-	CONROD	1906	1902	1907	1	.037000				
602-	CONROD	1907	1903	1908	1	.057000				
603-	CONROD	1908	1904	1909	1	.040000				
604-	CONROD	1909	1906	1910	1	.020000				
605-	CONROD	1910	1907	1911	1	.037000				
606-	CONROD	1911	1908	1912	1	.057000				
607-	CONROD	1912	1909	1913	1	.040000				
608-	CONROD	1913	1910	1911	1	.032000				
609-	CONROD	1914	1911	1912	1	.007600				
610-	CONROD	1915	1912	1913	1	.015200				
611-	CONROD	1916	1910	1914	1	.020000				
612-	CONROD	1917	1911	1915	1	.037000				
613-	CONROD	1918	1912	1916	1	.057000				
614-	CONROD	1919	1913	1917	1	.040000				
615-	CONROD	1920	1914	1915	1	.052000			.0280	
616-	CONROD	1921	1915	1916	1	.028000			.0065	
617-	CONROD	1922	1916	1917	1	.060000			.0140	
618-	CONROD	1923	1917	1918	1	.03			.014	
619-	CONROD	1924	1906	1907	1	.036000				
620-	CONROD	1925	1907	1908	1	.012000				
621-	CONROD	1926	1908	1909	1	.024000				
622-	CONROD	2001	2001	2002	1	.018000			.0222	
623-	CONROD	2002	2002	2003	1	.018000			.0222	
624-	CONROD	2003	2003	2004	1	.018000			.0222	
625-	CONROD	2004	2004	2005	1	.018000			.0222	
626-	CONROD	2005	2005	2010	1	.080000			.0284	
627-	CONROD	2006	2010	2015	1	.080000			.0284	
628-	CONROD	2007	2011	2012	1	.145000				
629-	CONROD	2008	2012	2013	1	.145000				
630-	CONROD	2009	2013	2014	1	.145000				
631-	CONROD	2010	2014	2015	1	.192000			.0244	
632-	CONROD	2011	2015	2020	1	.080000			.0284	
633-	CONROD	2012	2014	2019	1	.033200				
634-	CONROD	2013	2011	2016	1	.014800				
635-	CONROD	2014	2020	2025	1	.080000			.0284	
636-	CONROD	2015	2019	2024	1	.033200				
637-	CONROD	2016	2016	2021	1	.014800				
638-	CONROD	2017	2025	2030	1	.080000			.0284	
639-	CONROD	2018	2024	2029	1	.033200				
640-	CONROD	2019	2021	2026	1	.014800				
641-	CONROD	2020	2030	2029	1	.088000			.0168	
642-	CONROD	2021	2029	2028	1	.088000				
643-	CONROD	2022	2028	2027	1	.088000				
644-	CONROD	2023	2027	2026	1	.078000				
645-	CONROD	2024	2030	2035	1	.080000			.0284	
646-	CONROD	2025	2035	2039	1	.080000			.0284	
647-	CONROD	2026	2039	2042	1	.080000			.0284	
648-	CONROD	2027	2042	2041	1	.120000			.0284	
649-	CONROD	2028	2041	2040	1	.120000			.0404	
650-	CONROD	2029	2041	2037	1	.050000				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
651-	CONROD	2030	2024	2025	1	.080000				
652-	CONROD	2500	120	160	11	.104000				
653-	CONROD	2501	160	230	11	.104000				
654-	CONROD	2551	1115	1212	11	.0576				
655-	CONROD	2552	1212	1312	11	.057600				
656-	CONROD	2553	1312	1410	11	.057600				
657-	CONROD	2554	1410	1502	11	.057600				
658-	CONROD	2555	1502	1610	11	.057600				
659-	CONROD	2556	1610	1710	11	.0576				
660-	CONROD	2558	1710	1812	11	.057600				
661-	CONROD	2559	1812	1918	11	.057600				
662-	CONROD	2560	1918	2010	11	.046400				
663-	CONROD	2561	101	151	11	.054500				
664-	CONROD	2562	151	201	11	.054500				
665-	CONROD	2565	501	601	11	.069000				
666-	CONROD	2566	601	701	11	.069000				
667-	CONROD	2567	701	801	11	.069				
668-	CONROD	2569	801	901	11	.069000				
669-	CONROD	2570	901	1001	11	.087500				
670-	CONROD	2571	1001	1101	11	.087500				
671-	CONROD	2572	1101	1201	11	.0875				
672-	CONROD	2574	1201	1301	11	.087500				
673-	CONROD	2575	1301	1401	11	.087500				
674-	CONROD	2576	1401	1601	11	.0875				
675-	CONROD	2578	1601	1701	11	.0875				
676-	CONROD	2580	305	505	11	.072				
677-	CONROD	2581	505	605	11	.072				
678-	CONROD	2582	605	705	11	.072				
679-	CONROD	2583	705	805	11	.072				
680-	CONROD	2585	805	905	11	.072				
681-	CONROD	2586	905	1005	11	.072				
682-	CONROD	2587	1005	1105	11	.072				
683-	CONROD	2588	1105	1205	11	.060				
684-	CONROD	2590	1205	1305	11	.0460				
685-	CONROD	2591	1305	1405	11	.0460				
686-	CONROD	2592	1405	1505	11	.046				
687-	CONROD	2594	1605	1705	11	.046				
688-	CONROD	2596	1705	1806	11	.0460				
689-	CONROD	2597	1806	1905	11	.0460				
690-	CONROD	2598	1905	2005	11	.0460				
691-	CONROD	2599	2005	2105	11	.0460				
692-	CONROD	2642	1721	1722	1	.042000				
693-	CONROD	2643	1706	1722	11	.042000				
694-	CONROD	2644	1722	1808	11	.042000				
695-	CONROD	2647	1206	1306	1	.01				
696-	CONROD	2660	115	158	11	.095				
697-	CONROD	2661	158	224	11	.095				
698-	CONROD	2662	111	166	11	.0915				
699-	CONROD	2663	166	219	11	.0915				
701-	CONROD	2696	1723	1724	1	.02				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
701-	CONROD	2697	1721	1723	1	.04				
702-	CONROD	2698	1722	1724	1	.04				
703-	CONROD	2709	1821	1930	11	.048500				
704-	CONROD	2710	1930	1934	11	.048500				
705-	CONROD	2711	1934	2026	11	.074500				
706-	CONROD	2712	1933	2029	11	.045000				
707-	CONROD	2714	1922	1932	11	.060100				
708-	CONROD	2715	1932	2030	11	.049800				
709-	CONROD	2716	1936	2011	11	.034000				
710-	CONROD	2717	1721	1935	11	.128000				
711-	CONROD	2718	1935	2014	11	.420000				
712-	CONROD	2719	1936	1935	11	.033200				
713-	CONROD	2720	1934	1936	11	.0148				
714-	CONROD	2721	1933	1935	11	.0332				
715-	CONROD	2800	911	1011	11	.0875				
716-	CONROD	2801	1011	1111	11	.0875				
717-	CONROD	2802	1111	1221	11	.0875				
718-	CONROD	2804	1221	1321	11	.0875				
719-	CONROD	2805	1321	1406	11	.0875				
720-	CONROD	2806	1406	1516	11	.0875				
721-	CONROD	2807	1516	1606	11	.0875				
722-	CONROD	2808	1606	1706	11	.0875				
723-	CONROD	2810	206	305	11	.072				
724-	CONROD	10001	243	318	101	.046				
725-	CONROD	10002	318	518	101	.047				
726-	CONROD	10003	518	618	101	.049				
727-	CONROD	10004	618	718	101	.052				
728-	CONROD	10005	718	760	101	.053				
729-	CONROD	10006	760	818	101	.054				
730-	CONROD	10007	818	923	101	.056				
731-	CONROD	10008	923	1023	101	.058				
732-	CONROD	10009	1023	1123	101	.059				
733-	CONROD	10010	1123	1161	101	.061				
734-	CONROD	10011	1161	1220	101	.063				
735-	CONROD	10012	1220	1320	101	.068				
736-	CONROD	10013	1320	1418	101	.070				
737-	CONROD	10014	1418	1510	101	.070				
738-	CONROD	10015	1510	1618	101	.070				
739-	CONROD	10016	1618	1718	101	.070				
740-	CONROD	10017	1718	1824	101	.070				
741-	CONROD	10020	1115	1212	104	.020				
742-	CONROD	10021	1212	1312	104	.055				
743-	CONROD	10022	1312	1410	104	.070				
744-	CONROD	10023	1410	1502	104	.070				
745-	CONROD	10024	1502	1610	104	.070				
746-	CONROD	10025	1610	1710	104	.070				
747-	CONROD	10026	1710	1812	104	.070				
748-	CONROD	10030	206	305	102	.120				
749-	CONROD	10031	305	505	102	.120				
750-	CONROD	10032	505	605	102	.120				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
751-	CONROD	10033	605	705	102	.120				
752-	CONROD	10034	705	805	102	.120				
753-	CONROD	10035	805	905	102	.120				
754-	CONROD	10036	905	1005	102	.120				
755-	CONROD	10037	1005	1105	102	.120				
756-	CONROD	10038	1105	1205	102	.105				
757-	CONROD	10039	1205	1305	102	.078				
758-	CONROD	10040	1305	1405	102	.065				
759-	CONROD	10041	1405	1605	102	.065				
760-	CONROD	10042	1605	1705	102	.065				
761-	CONROD	10043	1705	1806	102	.065				
762-	CONROD	10044	1806	1905	102	.065				
763-	CONROD	10045	1905	2005	102	.065				
764-	CONROD	10046	2005	2105	102	.065				
765-	CONROD	10050	501	601	103	.065				
766-	CONROD	10051	601	701	103	.065				
767-	CONROD	10052	701	801	103	.065				
768-	CONROD	10053	801	901	103	.065				
769-	CONROD	10054	901	1001	103	.065				
770-	CONROD	10055	1001	1101	103	.065				
771-	CONROD	10056	1101	1201	103	.065				
772-	CONROD	10057	1201	1301	103	.065				
773-	CONROD	10058	1301	1401	103	.065				
774-	CONROD	10059	1401	1601	103	.065				
775-	CONROD	10060	1601	1701	103	.065				
776-	CONROD	10061	1101	1102	105	.12				
777-	CONROD	10062	1102	1103	105	.12				
778-	CONROD	10063	1103	1104	105	.12				
779-	CONROD	10064	1104	1105	105	.09				
780-	CONROD	10071	1201	1202	106	.12				
781-	CONROD	10072	1202	1203	106	.12				
782-	CONROD	10073	1203	1204	106	.12				
783-	CONROD	10074	1204	1205	106	.12				
784-	CONROD	10081	1301	1302	107	.08				
785-	CONROD	10082	1302	1303	107	.08				
786-	CONROD	10083	1303	1304	107	.08				
787-	CONROD	10084	1304	1305	107	.04				
788-	CONROD	10091	1401	1402	108	.12				
789-	CONROD	10092	1402	1403	108	.12				
790-	CONROD	10093	1403	1404	108	.12				
791-	CONROD	10094	1404	1405	108	.12				
792-	CONROD	10101	1601	1602	109	.11				
793-	CONROD	10102	1602	1603	109	.11				
794-	CONROD	10103	1603	1604	109	.11				
795-	CONROD	10104	1604	1605	109	.11				
796-	CONROD	10111	1701	1702	110	.11				
797-	CONROD	10112	1702	1703	110	.11				
798-	CONROD	10113	1703	1704	110	.11				
799-	CONROD	10114	1704	1705	110	.11				
800-	CONROD	10122	1802	1803	111	.11				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
801-	CONROD	10123	1803	1804	111	.11				
802-	CONROD	10124	1804	1805	111	.055				
803-	CONROD	10125	1805	1806	111	.055				
804-	CONROD	10131	1901	1902	112	.11				
805-	CONROD	10132	1902	1903	112	.11				
806-	CONROD	10133	1903	1904	112	.11				
807-	CONROD	10134	1904	1905	112	.08				
808-	CONROD	10151	1406	1516	1	.017				
809-	CONROD	10152	1407	1517	1	.017				
810-	CONROD	10153	1516	1606	1	.017				
811-	CONROD	10154	1517	1607	1	.017				
812-	CONROD	10155	1606	1706	1	.017				
813-	CONROD	10156	1607	1707	1	.017				
814-	CONROD	10160	1811	1812	113	.040				
815-	CONROD	10161	1914	1915	113	.043				
816-	CONROD	10162	1915	1916	113	.043				
817-	CONROD	10163	1916	1917	113	.043				
818-	CONROD	10164	1917	1928	113	.043				
819-	CONROD	10165	1928	1918	113	.043				
820-	CONROD	10166	1807	1808	113	.043				
821-	CONROD	10167	1808	1809	113	.087				
822-	CONROD	10168	1809	1810	113	.087				
823-	CONROD	10169	1810	1811	113	.087				
824-	CONROD	10170	1709	1708	114	.089				
825-	CONROD	10171	1708	1707	114	.089				
826-	CONROD	10172	1707	1706	115	.044				
827-	CONROD	10173	1606	1607	115	.088				
828-	CONROD	10174	1607	1608	115	.088				
829-	CONROD	10175	1608	1609	115	.088				
830-	CONROD	10176	1406	1407	115	.044				
831-	CONROD	10177	1407	1408	115	.044				
832-	CONROD	10178	1408	1409	115	.044				
833-	CONROD	10179	1609	1610	116	.070				
834-	CONROD	10180	1409	1410	117	.026				
835-	CONROD	10181	1709	1710	118	.070				
836-	CONROD	20001	212	310	1	.001				
837-	CONROD	20002	218	312	1	.001				
838-	CONROD	20003	224	314	1	.001				
839-	CONROD	20004	227	316	1	.001				
840-	CONROD	20005	310	510	1	.001				
841-	CONROD	20006	312	512	1	.001				
842-	CONROD	20007	314	514	1	.001				
843-	CONROD	20008	316	516	1	.001				
844-	CONROD	20009	510	610	1	.001				
845-	CONROD	20010	512	612	1	.001				
846-	CONROD	20011	514	614	1	.001				
847-	CONROD	20012	516	616	1	.001				
848-	CONROD	20013	610	710	1	.001				
849-	CONROD	20014	612	712	1	.001				
850-	CONROD	20015	614	714	1	.001				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
851-	CONROD	20016	616	716	1	.001				
852-	CONROD	20017	710	810	1	.001				
853-	CONROD	20018	712	812	1	.001				
854-	CONROD	20019	714	814	1	.001				
855-	CONROD	20020	716	816	1	.001				
856-	CONROD	20025	810	910	1	.001				
857-	CONROD	20026	812	917	1	.001				
858-	CONROD	20027	814	919	1	.001				
859-	CONROD	20028	816	921	1	.001				
860-	CONROD	20029	910	1010	1	.001				
861-	CONROD	20030	915	1015	1	.001				
862-	CONROD	20031	917	1017	1	.001				
863-	CONROD	20032	919	1019	1	.001				
864-	CONROD	20033	921	1021	1	.001				
865-	CONROD	20034	1010	1110	1	.001				
866-	CONROD	20035	1015	1115	1	.001				
867-	CONROD	20036	1017	1117	1	.001				
868-	CONROD	20037	1019	1119	1	.001				
869-	CONROD	20038	1021	1121	1	.001				
870-	CONROD	20039	1110	1210	1	.001				
871-	CONROD	20040	1117	1214	1	.001				
872-	CONROD	20041	1119	1216	1	.001				
873-	CONROD	20042	1121	1218	1	.001				
874-	CONROD	20047	1210	1310	1	.001				
875-	CONROD	20048	1214	1314	1	.001				
876-	CONROD	20049	1216	1316	1	.001				
877-	CONROD	20050	1218	1318	1	.001				
878-	CONROD	20051	1314	1412	1	.001				
879-	CONROD	20052	1316	1414	1	.001				
880-	CONROD	20053	1318	1416	1	.001				
881-	CONROD	20054	1412	1504	1	.001				
882-	CONROD	20055	1414	1506	1	.001				
883-	CONROD	20056	1416	1508	1	.001				
884-	CONROD	20057	1504	1612	1	.001				
885-	CONROD	20058	1506	1614	1	.001				
886-	CONROD	20059	1508	1616	1	.001				
887-	CONROD	20060	1612	1712	1	.001				
888-	CONROD	20061	1614	1714	1	.001				
889-	CONROD	20062	1616	1716	1	.001				
890-	CONROD	20066	1712	1814	1	.001				
891-	CONROD	20067	1714	1817	1	.001				
892-	CONROD	20068	1716	1820	1	.001				
893-	CONROD	20069	202	302	1	.001				
894-	CONROD	20070	203	303	1	.001				
895-	CONROD	20071	204	304	1	.001				
896-	CONROD	20072	302	502	1	.001				
897-	CONROD	20073	303	503	1	.001				
898-	CONROD	20074	304	504	1	.001				
899-	CONROD	20075	502	602	1	.001				
900-	CONROD	20076	503	603	1	.001				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
901-	CONROD	20077	504	604	1	.001				
902-	CONROD	20078	602	702	1	.001				
903-	CONROD	20079	603	703	1	.001				
904-	CONROD	20080	604	704	1	.001				
905-	CONROD	20081	702	802	1	.001				
906-	CONROD	20082	703	803	1	.001				
907-	CONROD	20083	704	804	1	.001				
908-	CONROD	20084	201	301	1	.001				
909-	CONROD	20085	301	501	1	.001				
910-	CONROD	20087	802	902	1	.001				
911-	CONROD	20088	803	903	1	.001				
912-	CONROD	20089	804	904	1	.001				
913-	CONROD	20090	902	1002	1	.001				
914-	CONROD	20091	903	1003	1	.001				
915-	CONROD	20092	904	1004	1	.001				
916-	CONROD	20093	1002	1102	1	.001				
917-	CONROD	20094	1003	1103	1	.001				
918-	CONROD	20095	1004	1104	1	.001				
919-	CONROD	20096	1102	1202	1	.001				
920-	CONROD	20097	1103	1203	1	.001				
921-	CONROD	20098	1104	1204	1	.001				
922-	CONROD	20102	1202	1302	1	.001				
923-	CONROD	20103	1203	1303	1	.001				
924-	CONROD	20104	1204	1304	1	.001				
925-	CONROD	20105	1302	1402	1	.001				
926-	CONROD	20106	1303	1403	1	.001				
927-	CONROD	20107	1304	1404	1	.001				
928-	CONROD	20108	1402	1602	1	.001				
929-	CONROD	20109	1403	1603	1	.001				
930-	CONROD	20110	1404	1604	1	.001				
931-	CONROD	20114	1602	1702	1	.001				
932-	CONROD	20115	1603	1703	1	.001				
933-	CONROD	20116	1604	1704	1	.001				
934-	CONROD	20120	1702	1802	1	.001				
935-	CONROD	20121	1703	1803	1	.001				
936-	CONROD	20122	1704	1804	1	.001				
937-	CONROD	20124	1408	1608	1	.001				
938-	CONROD	20125	1409	1501	1	.001				
939-	CONROD	20126	1501	1609	1	.001				
940-	CONROD	20127	1608	1708	1	.001				
941-	CONROD	20128	1609	1709	1	.001				
942-	CONROD	20129	1708	1809	1	.001				
943-	CONROD	20130	1709	1810	1	.001				
944-	CONROD	20131	1807	1914	1	.001				
945-	CONROD	20132	1808	1915	1	.001				
946-	CONROD	20133	1809	1916	1	.001				
947-	CONROD	20134	1810	1917	1	.001				
948-	CONROD	20135	1811	1928	1	.001				
949-	CONROD	20136	1516	1517	1	.020				
950-	CONROD	20151	601	602	1	.015				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
951-	CONROD	20152	701	702	1	.015				
952-	CONROD	20153	801	802	1	.015				
953-	CONROD	20154	901	902	1	.015				
954-	CONROD	20155	1001	1002	1	.015				
955-	CONROD	20161	1801	1901	1	.001				
956-	CONROD	20162	1802	1902	1	.001				
957-	CONROD	20163	1803	1903	1	.001				
958-	CONROD	20164	1804	1904	1	.001				
959-	CONROD	20165	1901	2001	1	.001				
960-	CONROD	20166	1902	2002	1	.001				
961-	CONROD	20167	1903	2003	1	.001				
962-	CONROD	20168	1904	2004	1	.001				
963-	CONROD	20169	2001	2101	1	.001				
964-	CONROD	20170	2002	2102	1	.001				
965-	CONROD	20171	2003	2103	1	.001				
966-	CONROD	20172	2004	2104	1	.001				
967-	CORD1R	2	2001	2040	2101					
968-	CORD2R	1	0	-81.5683.0	35.5985	-80.2278.0		57.5136	&C1	
969-	&C1	68.25	0.0	48.432						
970-	CQDMEM2	161	10161	101	102	107	106	0.0		
971-	CQDMEM2	162	10162	102	103	108	107	0.0		
972-	CQDMEM2	163	10163	103	104	109	108	0.0		
973-	CQDMEM2	164	10164	104	105	110	109	0.0		
974-	CQDMEM2	165	10165	106	107	112	111	0.0		
975-	CQDMEM2	166	10166	107	108	113	112	0.0		
976-	CQDMEM2	167	10167	108	109	114	113	0.0		
977-	CQDMEM2	168	10168	109	110	115	114	0.0		
978-	CQDMEM2	169	10169	111	112	117	116	0.0		
979-	CQDMEM2	170	10170	112	113	118	117	0.0		
980-	CQDMEM2	171	10171	113	114	119	118	0.0		
981-	CQDMEM2	172	10172	114	115	120	119	0.0		
982-	CQDMEM2	173	10173	116	117	122	121	0.0		
983-	CQDMEM2	174	10174	117	118	123	122	0.0		
984-	CQDMEM2	175	10175	118	119	124	123	0.0		
985-	CQDMEM2	176	10176	119	120	125	124	0.0		
986-	CQDMEM2	177	10177	124	125	127	126	0.0		
987-	CQDMEM2	270	10270	201	202	208	207	0.0		
988-	CQDMEM2	271	10271	202	203	209	208	0.0		
989-	CQDMEM2	272	10272	203	204	210	209	0.0		
990-	CQDMEM2	273	10273	204	205	211	210	0.0		
991-	CQDMEM2	274	10274	205	206	212	211	0.0		
992-	CQDMEM2	275	10275	207	208	214	213	0.0		
993-	CQDMEM2	276	10276	208	209	215	214	0.0		
994-	CQDMEM2	277	10277	209	210	216	215	0.0		
995-	CQDMEM2	278	10278	210	211	217	216	0.0		
996-	CQDMEM2	279	10279	211	212	218	217	0.0		
997-	CQDMEM2	280	10280	213	214	220	219	0.0		
998-	CQDMEM2	281	10281	214	215	221	220	0.0		
999-	CQDMEM2	282	10282	215	216	222	221	0.0		
1000-	CQDMEM2	283	10283	216	217	223	222	0.0		

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1001-	CQDMEM2	284	10284	217	218	224	223	0.0		
1002-	CQDMEM2	285	10285	222	223	226	225	0.0		
1003-	CQDMEM2	286	10286	223	224	227	226	0.0		
1004-	CQDMEM2	2040	12040	2001	2002	2007	2006	0.0		
1005-	CQDMEM2	2041	12041	2002	2003	2008	2007	0.0		
1006-	CQDMEM2	2042	12042	2003	2004	2009	2008	0.0		
1007-	CQDMEM2	2043	12043	2004	2005	2010	2009	0.0		
1008-	CQDMEM2	2044	12044	2006	2007	2012	2011	0.0		
1009-	CQDMEM2	2045	12045	2007	2008	2013	2012	0.0		
1010-	CQDMEM2	2046	12046	2008	2009	2014	2013	0.0		
1011-	CQDMEM2	2047	12047	2009	2010	2015	2014	0.0		
1012-	CQDMEM2	2048	12048	2011	2012	2017	2016	0.0		
1013-	CQDMEM2	2049	12049	2012	2013	2018	2017	0.0		
1014-	CQDMEM2	2050	12050	2013	2014	2019	2018	0.0		
1015-	CQDMEM2	2051	12051	2014	2015	2020	2019	0.0		
1016-	CQDMEM2	2052	12052	2016	2017	2022	2021	0.0		
1017-	CQDMEM2	2053	12053	2017	2018	2023	2022	0.0		
1018-	CQDMEM2	2054	12054	2018	2019	2024	2023	0.0		
1019-	CQDMEM2	2055	12055	2019	2020	2025	2024	0.0		
1020-	CQDMEM2	2056	12056	2021	2022	2027	2026	0.0		
1021-	CQDMEM2	2057	12057	2022	2023	2028	2027	0.0		
1022-	CQDMEM2	2058	12058	2023	2024	2029	2028	0.0		
1023-	CQDMEM2	2059	12059	2024	2025	2030	2029	0.0		
1024-	CQDMEM2	2060	12060	2026	2027	2032	2031	0.0		
1025-	CQDMEM2	2061	12061	2027	2028	2033	2032	0.0		
1026-	CQDMEM2	2062	12062	2028	2029	2034	2033	0.0		
1027-	CQDMEM2	2063	12063	2029	2030	2035	2034	0.0		
1028-	CQDMEM2	2064	12064	2031	2032	2037	2036	0.0		
1029-	CQDMEM2	2065	12065	2032	2033	2038	2037	0.0		
1030-	CQDMEM2	2066	12066	2033	2034	2039	2038	0.0		
1031-	CQDMEM2	2068	12068	2036	2037	2041	2040	0.0		
1032-	CQDMEM2	2069	12069	2037	2038	2042	2041	0.0		
1033-	CQDMEM2	2200	12200	102	152	151	101	0.0		
1034-	CQDMEM2	2201	12201	103	153	152	102	0.0		
1035-	CQDMEM2	2202	12202	104	154	153	103	0.0		
1036-	CQDMEM2	2203	12203	105	155	154	104	0.0		
1037-	CQDMEM2	2204	12204	109	155	156	110	0.0		
1038-	CQDMEM2	2205	12205	152	202	201	151	0.0		
1039-	CQDMEM2	2206	12206	153	203	202	152	0.0		
1040-	CQDMEM2	2207	12207	154	204	203	153	0.0		
1041-	CQDMEM2	2208	12208	155	205	204	154	0.0		
1042-	CQDMEM2	2209	12209	156	206	205	155	0.0		
1043-	CQDMEM2	2300	12300	110	156	158	115	0.0		
1044-	CQDMEM2	2301	12301	115	158	160	120	0.0		
1045-	CQDMEM2	2302	12302	120	160	161	125	0.0		
1046-	CQDMEM2	2303	12303	125	161	162	127	0.0		
1047-	CQDMEM2	2304	12304	127	162	163	129	0.0		
1048-	CQDMEM2	2305	12305	129	163	164	131	0.0		
1049-	CQDMEM2	2306	12306	156	206	218	157	0.0		
1050-	CQDMEM2	2307	12307	157	218	224	158	0.0		

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1051-	CQDMEM2	2308	12308	158	224	227	159	0.0		
1052-	CQDMEM2	2309	12309	159	227	230	160	0.0		
1053-	CQDMEM2	2310	12310	160	230	233	161	0.0		
1054-	CQDMEM2	2311	12311	161	233	236	162	0.0		
1055-	CQDMEM2	2312	12312	162	236	239	163	0.0		
1056-	CQDMEM2	2313	12313	163	239	242	164	0.0		
1057-	CQDMEM2	2403	12403	1812	1918	1919	1814	0.0		
1058-	CQDMEM2	2404	12404	1814	1919	1920	1817	0.0		
1059-	CQDMEM2	2405	12405	1817	1920	1921	1820	0.0		
1060-	CQDMEM2	2406	12406	1820	1921	1922	1824	0.0		
1061-	CQDMEM2	2407	12407	1824	1922	1923	1828	0.0		
1062-	CQDMEM2	2408	12408	1828	1923	1924	1832	0.0		
1063-	CQDMEM2	2409	12409	1832	1924	1925	1836	0.0		
1064-	CQDMEM2	2410	12410	1836	1925	1926	1838	0.0		
1065-	CQDMEM2	2411	12411	1838	1926	1927	1837	0.0		
1066-	CQDMEM2	2413	12413	1918	2010	2015	1919	0.0		
1067-	CQDMEM2	2414	12414	1919	2015	2020	1920	0.0		
1068-	CQDMEM2	2415	12415	1920	2020	2025	1921	0.0		
1069-	CQDMEM2	2416	12416	1921	1931	1932	1922	0.0		
1070-	CQDMEM2	2417	12417	1931	2025	2030	1932	0.0		
1071-	CQDMEM2	2418	12418	1922	2030	2035	1923	0.0		
1072-	CQDMEM2	2419	12419	1923	2035	2039	1924	0.0		
1073-	CQDMEM2	2420	12420	1924	2039	2042	1925	0.0		
1074-	CQDMEM2	2421	12421	1925	2042	2041	1926	0.0		
1075-	CQDMEM2	2422	12422	1926	2041	2040	1927	0.0		
1076-	CQDMEM2	2424	12424	2010	2106	2107	2015	0.0		
1077-	CQDMEM2	2425	12425	2015	2107	2108	2020	0.0		
1078-	CQDMEM2	2426	12426	2020	2108	2109	2025	0.0		
1079-	CQDMEM2	2427	12427	2025	2109	2110	2030	0.0		
1080-	CQDMEM2	2428	12428	2030	2110	2111	2035	0.0		
1081-	CQDMEM2	2429	12429	2035	2111	2112	2039	0.0		
1082-	CQDMEM2	2430	12430	2039	2112	2113	2042	0.0		
1083-	CQDMEM2	2431	12431	2042	2113	2114	2041	0.0		
1084-	CQDMEM2	2432	12432	2041	2114	2115	2040	0.0		
1085-	CQDMEM2	2648	12650	112	169	166	111	.0		
1086-	CQDMEM2	2649	12650	169	220	219	166	.0		
1087-	CQDMEM2	2650	12650	115	158	167	114	0.0		
1088-	CQDMEM2	2651	12651	114	167	168	113	0.0		
1089-	CQDMEM2	2652	12652	113	168	169	112	0.0		
1090-	CQDMEM2	2653	12653	158	224	222	167	0.0		
1091-	CQDMEM2	2654	12654	167	222	221	168	0.0		
1092-	CQDMEM2	2655	12655	168	221	220	169	0.0		
1093-	CQDMEM2	2656	12656	101	151	165	106	0.0		
1094-	CQDMEM2	2657	12657	106	165	166	111	0.0		
1095-	CQDMEM2	2658	12658	151	201	207	165	0.0		
1096-	CQDMEM2	2659	12659	165	207	219	166	0.0		
1097-	CQDMEM2	2700	12700	1821	1930	1929	1822	0.0		
1098-	CQDMEM2	2701	12701	1822	1929	1922	1824	0.0		
1099-	CQDMEM2	2702	12702	1930	1934	1933	1929	0.0		
1100-	CQDMEM2	2703	12703	1929	1933	1932	1922	0.0		

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1101-	CQDMEM2	2704	12704	1934	2026	2029	1933	0.0		
1102-	CQDMEM2	2705	12705	1933	2029	2030	1932	0.0		
1103-	CSHEAR	178	10178	126	127	129	128			
1104-	CSHEAR	179	10179	128	129	131	130			
1105-	CSHEAR	287	10287	225	226	229	228			
1106-	CSHEAR	288	10288	226	227	230	229			
1107-	CSHEAR	289	10289	228	229	232	231			
1108-	CSHEAR	290	10290	229	230	233	232			
1109-	CSHEAR	291	10291	231	232	235	234			
1110-	CSHEAR	292	10292	232	233	236	235			
1111-	CSHEAR	293	10293	234	235	238	237			
1112-	CSHEAR	294	10294	235	236	239	238			
1113-	CSHEAR	295	10295	237	238	241	240			
1114-	CSHEAR	296	10296	238	239	242	241			
1115-	CSHEAR	351	10351	301	302	307	306			
1116-	CSHEAR	352	10352	302	303	308	307			
1117-	CSHEAR	353	10353	303	304	309	308			
1118-	CSHEAR	354	10354	304	305	310	309			
1119-	CSHEAR	355	10355	309	310	312	311			
1120-	CSHEAR	356	10356	311	312	314	313			
1121-	CSHEAR	357	10357	313	314	316	315			
1122-	CSHEAR	358	10358	315	316	318	317			
1123-	CSHEAR	401	10401	301	302	407	406			
1124-	CSHEAR	402	10402	302	303	408	407			
1125-	CSHEAR	403	10403	303	304	409	408			
1126-	CSHEAR	404	10404	304	305	310	409			
1127-	CSHEAR	551	10551	501	502	507	506			
1128-	CSHEAR	552	10552	502	503	508	507			
1129-	CSHEAR	553	10553	503	504	509	508			
1130-	CSHEAR	554	10554	504	505	510	509			
1131-	CSHEAR	555	10555	509	510	512	511			
1132-	CSHEAR	556	10556	511	512	514	513			
1133-	CSHEAR	557	10557	513	514	516	515			
1134-	CSHEAR	558	10558	515	516	518	517			
1135-	CSHEAR	651	10651	601	602	607	606			
1136-	CSHEAR	652	10652	602	603	608	607			
1137-	CSHEAR	653	10653	603	604	609	608			
1138-	CSHEAR	654	10654	604	605	610	609			
1139-	CSHEAR	655	10655	609	610	612	611			
1140-	CSHEAR	656	10656	611	612	614	613			
1141-	CSHEAR	657	10657	613	614	616	615			
1142-	CSHEAR	658	10658	615	616	618	617			
1143-	CSHEAR	751	10751	701	702	707	706			
1144-	CSHEAR	752	10752	702	703	708	707			
1145-	CSHEAR	753	10753	703	704	709	708			
1146-	CSHEAR	754	10754	704	705	710	709			
1147-	CSHEAR	755	10755	709	710	712	711			
1148-	CSHEAR	756	10756	711	712	714	713			
1149-	CSHEAR	757	10757	713	714	716	715			
1150-	CSHEAR	758	10758	715	716	718	717			

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1151-	CSHEAR	851	10851	801	802	807	806			
1152-	CSHEAR	852	10852	802	803	808	807			
1153-	CSHEAR	853	10853	803	804	809	808			
1154-	CSHEAR	854	10854	804	805	810	809			
1155-	CSHEAR	855	10855	809	810	812	811			
1156-	CSHEAR	856	10856	811	812	814	813			
1157-	CSHEAR	857	10857	813	814	816	815			
1158-	CSHEAR	858	10858	815	816	818	817			
1159-	CSHEAR	951	10951	901	902	912	911			
1160-	CSHEAR	952	10952	902	903	913	912			
1161-	CSHEAR	953	10953	903	904	914	913			
1162-	CSHEAR	954	10954	904	905	915	914			
1163-	CSHEAR	959	10959	914	915	917	916			
1164-	CSHEAR	960	10960	916	917	919	918			
1165-	CSHEAR	961	10961	918	919	921	920			
1166-	CSHEAR	962	10962	920	921	923	922			
1167-	CSHEAR	1040	11040	1001	1002	1012	1011			
1168-	CSHEAR	1041	11041	1002	1003	1013	1012			
1169-	CSHEAR	1042	11042	1003	1004	1014	1013			
1170-	CSHEAR	1043	11043	1004	1005	1015	1014			
1171-	CSHEAR	1048	11048	1014	1015	1017	1016			
1172-	CSHEAR	1049	11049	1016	1017	1019	1018			
1173-	CSHEAR	1050	11050	1018	1019	1021	1020			
1174-	CSHEAR	1051	11051	1020	1021	1023	1022			
1175-	CSHEAR	1140	11140	1101	1102	1112	1111			
1176-	CSHEAR	1141	11141	1102	1103	1113	1112			
1177-	CSHEAR	1142	11142	1103	1104	1114	1113			
1178-	CSHEAR	1143	11143	1104	1105	1115	1114			
1179-	CSHEAR	1145	11145	1114	1115	1117	1116			
1180-	CSHEAR	1146	11146	1116	1117	1119	1118			
1181-	CSHEAR	1147	11147	1118	1119	1121	1120			
1182-	CSHEAR	1148	11148	1120	1121	1123	1122			
1183-	CSHEAR	1240	11240	1201	1202	1207	1206			
1184-	CSHEAR	1241	11241	1202	1203	1208	1207			
1185-	CSHEAR	1242	11242	1203	1204	1209	1208			
1186-	CSHEAR	1243	11243	1204	1205	1210	1209			
1187-	CSHEAR	1244	11244	1209	1210	1212	1211			
1188-	CSHEAR	1245	11245	1211	1212	1214	1213			
1189-	CSHEAR	1246	11246	1213	1214	1216	1215			
1190-	CSHEAR	1247	11247	1215	1216	1218	1217			
1191-	CSHEAR	1248	11248	1217	1218	1220	1219			
1192-	CSHEAR	1340	11340	1301	1302	1307	1306			
1193-	CSHEAR	1341	11341	1302	1303	1308	1307			
1194-	CSHEAR	1342	11342	1303	1304	1309	1308			
1195-	CSHEAR	1343	11343	1304	1305	1310	1309			
1196-	CSHEAR	1344	11344	1309	1310	1312	1311			
1197-	CSHEAR	1345	11345	1311	1312	1314	1313			
1198-	CSHEAR	1346	11346	1313	1314	1316	1315			
1199-	CSHEAR	1347	11347	1315	1316	1318	1317			
1200-	CSHEAR	1348	11348	1317	1318	1320	1319			

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1201-	CSHEAR	1440	11440	1401	1402	1407	1406			
1202-	CSHEAR	1441	11441	1402	1403	1408	1407			
1203-	CSHEAR	1442	11442	1403	1404	1409	1408			
1204-	CSHEAR	1443	11443	1404	1405	1410	1409			
1205-	CSHEAR	1444	11444	1409	1410	1412	1411			
1206-	CSHEAR	1445	11445	1411	1412	1414	1413			
1207-	CSHEAR	1446	11446	1413	1414	1416	1415			
1208-	CSHEAR	1447	11447	1415	1416	1418	1417			
1209-	CSHEAR	1540	11540	1501	1502	1504	1503			
1210-	CSHEAR	1541	11541	1503	1504	1506	1505			
1211-	CSHEAR	1542	11542	1505	1506	1508	1507			
1212-	CSHEAR	1543	11543	1507	1508	1510	1509			
1213-	CSHEAR	1640	11640	1601	1602	1607	1606			
1214-	CSHEAR	1641	11641	1602	1603	1608	1607			
1215-	CSHEAR	1642	11642	1603	1604	1609	1608			
1216-	CSHEAR	1643	11643	1604	1605	1610	1609			
1217-	CSHEAR	1644	11644	1609	1610	1612	1611			
1218-	CSHEAR	1645	11645	1611	1612	1614	1613			
1219-	CSHEAR	1646	11646	1613	1614	1615	1615			
1220-	CSHEAR	1647	11647	1615	1616	1618	1617			
1221-	CSHEAR	1740	11740	1701	1702	1707	1706			
1222-	CSHEAR	1741	11741	1702	1703	1708	1707			
1223-	CSHEAR	1742	11742	1703	1704	1709	1708			
1224-	CSHEAR	1743	11743	1704	1705	1710	1709			
1225-	CSHEAR	1744	11744	1709	1710	1712	1711			
1226-	CSHEAR	1745	11745	1711	1712	1714	1713			
1227-	CSHEAR	1746	11746	1713	1714	1716	1715			
1228-	CSHEAR	1747	11747	1715	1716	1718	1717			
1229-	CSHEAR	1860	11860	1801	1802	1808	1807			
1230-	CSHEAR	1861	11861	1802	1803	1809	1808			
1231-	CSHEAR	1862	11862	1803	1804	1810	1809			
1232-	CSHEAR	1863	11863	1804	1805	1811	1810			
1233-	CSHEAR	1864	11864	1805	1806	1812	1811			
1234-	CSHEAR	1865	11865	1811	1812	1814	1813			
1235-	CSHEAR	1866	11866	1813	1814	1817	1815			
1236-	CSHEAR	1867	11867	1815	1817	1820	1818			
1237-	CSHEAR	1868	11868	1818	1819	1823	1822			
1238-	CSHEAR	1869	11869	1819	1820	1824	1823			
1239-	CSHEAR	1870	11870	1821	1822	1826	1825			
1240-	CSHEAR	1871	11871	1822	1823	1827	1826			
1241-	CSHEAR	1872	11872	1823	1824	1828	1827			
1242-	CSHEAR	1873	11873	1826	1827	1831	1830			
1243-	CSHEAR	1874	11874	1827	1828	1832	1831			
1244-	CSHEAR	1875	11875	1829	1830	1834	1833			
1245-	CSHEAR	1876	11876	1830	1831	1835	1834			
1246-	CSHEAR	1877	11877	1831	1832	1836	1835			
1247-	CSHEAR	1878	11878	1833	1834	1838	1837			
1248-	CSHEAR	1879	11879	1834	1835	1836	1838			
1249-	CSHEAR	1940	11940	1901	1902	1907	1906			
1250-	CSHEAR	1941	11941	1902	1903	1908	1907			

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1251-	CSHEAR	1942	11942	1903	1904	1909	1908			
1252-	CSHEAR	1943	11943	1906	1907	1911	1910			
1253-	CSHEAR	1944	11944	1908	1909	1913	1912			
1254-	CSHEAR	1945	11945	1910	1911	1915	1914			
1255-	CSHEAR	1946	11946	1911	1912	1916	1915			
1256-	CSHEAR	1947	11947	1912	1913	1917	1916			
1257-	CSHEAR	1948	11948	1904	1905	1918	1917			
1258-	CSHEAR	2210	12210	202	302	301	201			
1259-	CSHEAR	2211	12210	203	303	302	202			
1260-	CSHEAR	2212	12210	204	304	303	203			
1261-	CSHEAR	2213	12210	206	305	304	204			
1262-	CSHEAR	2214	12210	302	502	501	301			
1263-	CSHEAR	2215	12210	303	503	502	302			
1264-	CSHEAR	2216	12210	304	504	503	303			
1265-	CSHEAR	2217	12210	305	505	504	304			
1266-	CSHEAR	2218	12210	502	602	601	501			
1267-	CSHEAR	2219	12210	503	603	602	502			
1268-	CSHEAR	2220	12210	504	604	603	503			
1269-	CSHEAR	2221	12210	505	605	604	504			
1270-	CSHEAR	2222	12210	602	702	701	601			
1271-	CSHEAR	2223	12210	603	703	702	602			
1272-	CSHEAR	2224	12210	604	704	703	603			
1273-	CSHEAR	2225	12210	605	705	704	604			
1274-	CSHEAR	2226	12210	702	802	801	701			
1275-	CSHEAR	2227	12210	703	803	802	702			
1276-	CSHEAR	2228	12210	704	804	803	703			
1277-	CSHEAR	2229	12210	705	805	804	704			
1278-	CSHEAR	2234	12210	802	902	901	801			
1279-	CSHEAR	2235	12210	803	903	902	802			
1280-	CSHEAR	2236	12210	804	904	903	803			
1281-	CSHEAR	2237	12210	805	905	904	804			
1282-	CSHEAR	2238	12210	902	1002	1001	901			
1283-	CSHEAR	2239	12210	903	1003	1002	902			
1284-	CSHEAR	2240	12210	904	1004	1003	903			
1285-	CSHEAR	2241	12210	905	1005	1004	904			
1286-	CSHEAR	2242	12210	1002	1102	1101	1001			
1287-	CSHEAR	2243	12210	1003	1103	1102	1002			
1288-	CSHEAR	2244	12210	1004	1104	1103	1003			
1289-	CSHEAR	2245	12210	1005	1105	1104	1004			
1290-	CSHEAR	2246	12210	1102	1202	1201	1101			
1291-	CSHEAR	2247	12210	1103	1203	1202	1102			
1292-	CSHEAR	2248	12210	1104	1204	1203	1103			
1293-	CSHEAR	2249	12210	1105	1205	1204	1104			
1294-	CSHEAR	2254	12210	1202	1302	1301	1201			
1295-	CSHEAR	2255	12210	1203	1303	1302	1202			
1296-	CSHEAR	2256	12210	1204	1304	1303	1203			
1297-	CSHEAR	2257	12210	1205	1305	1304	1204			
1298-	CSHEAR	2258	12210	1302	1402	1401	1301			
1299-	CSHEAR	2259	12210	1303	1403	1402	1302			
1300-	CSHEAR	2260	12210	1304	1404	1403	1303			

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1301-	CSHEAR	2261	12210	1305	1405	1404	1304			
1302-	CSHEAR	2262	12210	1402	1602	1601	1401			
1303-	CSHEAR	2263	12210	1403	1603	1602	1402			
1304-	CSHEAR	2264	12210	1404	1604	1603	1403			
1305-	CSHEAR	2265	12210	1405	1605	1604	1404			
1306-	CSHEAR	2270	12210	1602	1702	1701	1601			
1307-	CSHEAR	2271	12210	1603	1703	1702	1602			
1308-	CSHEAR	2272	12210	1604	1704	1703	1603			
1309-	CSHEAR	2273	12210	1605	1705	1704	1604			
1310-	CSHEAR	2279	12210	1703	1803	1802	1702			
1311-	CSHEAR	2280	12210	1704	1804	1803	1703			
1312-	CSHEAR	2281	12210	1705	1806	1804	1704			
1313-	CSHEAR	2282	12210	1802	1902	1901	1801			
1314-	CSHEAR	2283	12210	1803	1903	1902	1802			
1315-	CSHEAR	2284	12210	1804	1904	1903	1803			
1316-	CSHEAR	2285	12210	1806	1905	1904	1804			
1317-	CSHEAR	2286	12210	1902	2002	2001	1901			
1318-	CSHEAR	2287	12210	1903	2003	2002	1902			
1319-	CSHEAR	2288	12210	1904	2004	2003	1903			
1320-	CSHEAR	2289	12210	1905	2005	2004	1904			
1321-	CSHEAR	2290	12210	2002	2102	2101	2001			
1322-	CSHEAR	2291	12210	2003	2103	2102	2002			
1323-	CSHEAR	2292	12210	2004	2104	2103	2003			
1324-	CSHEAR	2293	12210	2005	2105	2104	2004			
1325-	CSHEAR	2314	12320	206	305	310	212			
1326-	CSHEAR	2315	12320	212	310	312	218			
1327-	CSHEAR	2316	12320	218	312	314	224			
1328-	CSHEAR	2317	12320	224	314	316	227			
1329-	CSHEAR	2318	12320	227	316	318	243			
1330-	CSHEAR	2319	12320	305	505	510	310			
1331-	CSHEAR	2320	12320	310	510	512	312			
1332-	CSHEAR	2321	12320	312	512	514	314			
1333-	CSHEAR	2322	12320	314	514	516	316			
1334-	CSHEAR	2323	12320	316	516	518	318			
1335-	CSHEAR	2324	12320	505	605	610	510			
1336-	CSHEAR	2325	12320	510	610	612	512			
1337-	CSHEAR	2326	12320	512	612	614	514			
1338-	CSHEAR	2327	12320	514	614	616	516			
1339-	CSHEAR	2328	12320	516	616	618	518			
1340-	CSHEAR	2329	12320	605	705	710	610			
1341-	CSHEAR	2330	12320	610	710	712	612			
1342-	CSHEAR	2331	12320	612	712	714	614			
1343-	CSHEAR	2332	12320	614	714	716	616			
1344-	CSHEAR	2333	12320	616	716	718	618			
1345-	CSHEAR	2334	12320	705	805	810	710			
1346-	CSHEAR	2335	12320	710	810	812	712			
1347-	CSHEAR	2336	12320	712	812	814	714			
1348-	CSHEAR	2337	12320	714	814	816	716			
1349-	CSHEAR	2338	12320	716	816	818	718			
1350-	CSHEAR	2344	12320	805	905	910	810			

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1351-	CSHEAR	2345	12320	810	910	917	812			
1352-	CSHEAR	2346	12320	812	917	919	814			
1353-	CSHEAR	2347	12320	814	919	921	816			
1354-	CSHEAR	2348	12320	816	921	923	818			
1355-	CSHEAR	2349	12320	905	1005	1010	910			
1356-	CSHEAR	2350	12320	910	1010	1015	915			
1357-	CSHEAR	2351	12320	915	1015	1017	917			
1358-	CSHEAR	2352	12320	917	1017	1019	919			
1359-	CSHEAR	2353	12320	919	1019	1021	921			
1360-	CSHEAR	2354	12320	921	1021	1023	923			
1361-	CSHEAR	2355	12320	1005	1105	1110	1010			
1362-	CSHEAR	2356	12320	1010	1110	1115	1015			
1363-	CSHEAR	2357	12320	1015	1115	1117	1017			
1364-	CSHEAR	2358	12320	1017	1117	1119	1019			
1365-	CSHEAR	2359	12320	1019	1119	1121	1021			
1366-	CSHEAR	2360	12320	1021	1121	1123	1023			
1367-	CSHEAR	2361	12320	1105	1205	1210	1110			
1368-	CSHEAR	2362	12320	1110	1210	1212	1115			
1369-	CSHEAR	2363	12320	1115	1212	1214	1117			
1370-	CSHEAR	2364	12320	1117	1214	1216	1119			
1371-	CSHEAR	2365	12320	1119	1216	1218	1121			
1372-	CSHEAR	2366	12320	1121	1218	1220	1123			
1373-	CSHEAR	2373	12320	1205	1305	1310	1210			
1374-	CSHEAR	2374	12320	1210	1310	1312	1212			
1375-	CSHEAR	2375	12320	1212	1312	1314	1214			
1376-	CSHEAR	2376	12320	1214	1314	1316	1216			
1377-	CSHEAR	2377	12320	1216	1316	1318	1218			
1378-	CSHEAR	2378	12320	1218	1318	1320	1220			
1379-	CSHEAR	2379	12320	1312	1410	1412	1314			
1380-	CSHEAR	2380	12320	1314	1412	1414	1316			
1381-	CSHEAR	2381	12320	1316	1414	1416	1318			
1382-	CSHEAR	2382	12320	1318	1416	1418	1320			
1383-	CSHEAR	2383	12320	1410	1502	1504	1412			
1384-	CSHEAR	2384	12320	1412	1504	1506	1414			
1385-	CSHEAR	2385	12320	1414	1506	1508	1416			
1386-	CSHEAR	2386	12320	1416	1508	1510	1418			
1387-	CSHEAR	2387	12320	1502	1610	1612	1504			
1388-	CSHEAR	2388	12320	1504	1612	1614	1506			
1389-	CSHEAR	2389	12320	1506	1614	1616	1508			
1390-	CSHEAR	2390	12320	1508	1616	1618	1510			
1391-	CSHEAR	2391	12320	1610	1710	1712	1612			
1392-	CSHEAR	2392	12320	1612	1712	1714	1614			
1393-	CSHEAR	2393	12320	1614	1714	1716	1616			
1394-	CSHEAR	2394	12320	1616	1716	1718	1618			
1395-	CSHEAR	2399	12320	1710	1812	1814	1712			
1396-	CSHEAR	2400	12320	1712	1814	1817	1714			
1397-	CSHEAR	2401	12320	1714	1817	1820	1716			
1398-	CSHEAR	2402	12320	1716	1820	1824	1718			
1399-	CSHEAR	2412	12412	1905	2005	2010	1918			
1400-	CSHEAR	2423	12412	2005	2105	2106	2010			

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1401-	CSHEAR	2600	12600	1407	1517	1516	1406			
1402-	CSHEAR	2601	12600	1408	1608	1607	1407			
1403-	CSHEAR	2602	12600	1409	1609	1608	1408			
1404-	CSHEAR	2603	12600	1410	1502	1501	1409			
1405-	CSHEAR	2605	12600	1517	1607	1606	1516			
1406-	CSHEAR	2609	12600	1502	1610	1609	1501			
1407-	CSHEAR	2610	12600	1607	1707	1706	1606			
1408-	CSHEAR	2611	12600	1608	1708	1707	1607			
1409-	CSHEAR	2612	12600	1609	1709	1708	1608			
1410-	CSHEAR	2613	12600	1610	1710	1709	1609			
1411-	CSHEAR	2621	12600	1708	1809	1808	1707			
1412-	CSHEAR	2622	12600	1709	1810	1809	1708			
1413-	CSHEAR	2623	12600	1710	1812	1810	1709			
1414-	CSHEAR	2625	12600	1808	1915	1914	1807			
1415-	CSHEAR	2626	12600	1809	1916	1915	1808			
1416-	CSHEAR	2627	12600	1810	1917	1916	1809			
1417-	CSHEAR	2628	12600	1811	1928	1917	1810			
1418-	CSHEAR	2629	12600	1812	1918	1928	1811			
1419-	CSHEAR	2630	12630	901	1001	1011	911			
1420-	CSHEAR	2631	12631	1001	1101	1111	1011			
1421-	CSHEAR	2632	12632	1101	1201	1221	1111			
1422-	CSHEAR	2634	12634	1201	1301	1306	1206			
1423-	CSHEAR	2635	12635	1301	1401	1406	1321			
1424-	CSHEAR	2636	12636	1401	1601	1606	1406			
1425-	CSHEAR	2638	12638	1601	1701	1706	1606			
1426-	CSHEAR	2640	12640	1701	1721	1722	1706			
1427-	CSHEAR	2641	12641	1721	1802	1808	1722			
1428-	CSHEAR	2646	12634	1206	1306	1321	1221			
1429-	CSHEAR	2699	12640	1721	1722	1724	1723			
1430-	CSHEAR	2706	12706	1934	2026	2011	1936			
1431-	CSHEAR	2707	12707	1933	2029	2014	1935			
1432-	CSHEAR	2708	12708	2011	2014	1935	1936			
1433-	CTRMEM	180	10180	123	124	126	0.0			
1434-	CTRMEM	297	10297	221	222	225	0.0			
1435-	CTRMEM	2067	12067	2034	2035	2039	0.0			
1436-	CTRMEM	2070	12070	2038	2039	2042	0.0			
1437-	CTRMEM	2278	12278	1701	1702	1802	0.0			
1438-	CTRMEM	2620	12620	1707	1808	1706	0.0			
1439-	CTRMEM	2645	12620	1321	1407	1406	.0			
1440-	EIGR	1	INV	1.0	1500.	45			1.0-4	&EIG1
1441+	&EIG1	MAX								
1442-	GRID	*101		0		46.7500		.0		&15001
1443-	*15001		50.3000	0						
1444-	GRID	*102		0		46.7500		-1.6757		&15002
1445-	*15002		50.3000	0						
1446-	GRID	*103		0		46.7500		-4.2686		&15003
1447-	*15003		50.3000	0						
1448-	GRID	*104		0		46.7500		-7.4000		&15004
1449-	*15004		50.3000	0						
1450-	GRID	*105		0		46.7500		-9.8784		&15005

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1451-	*15005		51.2177	0						
1452-	GRID	*106		0		46.7500		.0		&15006
1453-	*15006		53.4909	0						
1454-	GRID	*107		0		46.7500		-1.6836		&15007
1455-	*15007		53.4987	0						
1456-	GRID	*108		0		46.7500		-4.2765		&15008
1457-	*15008		53.5007	0						
1458-	GRID	*109		0		46.7500		-7.4079		&15009
1459-	*15009		53.5114	0						
1460-	GRID	*110		0		46.7500		-11.0000		&15010
1461-	*15010		53.5286	0						
1462-	GRID	*111		0		46.7500		.0		&15011
1463-	*15011		56.7000	0						
1464-	GRID	*112		0		46.7500		-1.6526		&15012
1465-	*15012		56.7000	0						
1466-	GRID	*113		0		46.7500		-4.2851		&15013
1467-	*15013		56.7000	0						
1468-	GRID	*114		0		46.7500		-7.3968		&15014
1469-	*15014		56.7000	0						
1470-	GRID	*115		0		46.7500		-11.0000		&15015
1471-	*15015		56.7000	0						
1472-	GRID	*116		0		46.7500		.0		&15016
1473-	*15016		59.8140	0						
1474-	GRID	*117		0		46.7500		-1.6614		&15017
1475-	*15017		59.8012	0						
1476-	GRID	*118		0		46.7500		-4.2743		&15018
1477-	*15018		59.8036	0						
1478-	GRID	*119		0		46.7500		-7.4259		&15019
1479-	*15019		59.7947	0						
1480-	GRID	*120		0		46.7500		-11.0000		&15020
1481-	*15020		59.7917	0						
1482-	GRID	*121		0		46.7500		.0		&15021
1483-	*15021		61.7486	0						
1484-	GRID	*122		0		46.7500		-1.6861		&15022
1485-	*15022		61.9758	0						
1486-	GRID	*123		0		46.7500		-3.4975		&15023
1487-	*15023		62.2045	0						
1488-	GRID	*124		0		46.7500		-7.4380		&15024
1489-	*15024		62.7470	0						
1490-	GRID	*125		0		46.7500		-10.0940		&15025
1491-	*15025		63.3500	0						
1492-	GRID	*126		0		46.7500		-5.0116		&15026
1493-	*15026		64.7821	0						
1494-	GRID	*127		0		46.7500		-7.0000		&15027
1495-	*15027		66.7757	0						
1496-	GRID	*128		0		46.7500		-3.4538		&15028
1497-	*15028		67.3699	0						
1498-	GRID	*129		0		46.7500		-3.9549		&15029
1499-	*15029		68.4550	0						
1500-	GRID	*130		0		46.7500		.0		&15030

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1501-	*15030		67.7724 0							
1502-	GRID	*131	0			46.7500		.0		&15031
1503-	*15031		69.1287 0							
1504-	GRID	*151	0			55.3750		.0		&15032
1505-	*15032		49.4750 0							
1506-	GRID	*152	0			55.3750		-1.7051		&15033
1507-	*15033		49.4750 0							
1508-	GRID	*153	0			55.3750		-4.3000		&15034
1509-	*15034		49.4750 0							
1510-	GRID	*154	0			55.3750		-7.4000		&15035
1511-	*15035		49.4750 0							
1512-	GRID	*155	0			55.3750		-10.2000		&15036
1513-	*15036		49.9250 0							
1514-	GRID	*156	0			55.3750		-11.7500		&15037
1515-	*15037		51.0750 0							
1516-	GRID	*157	0			55.3750		-11.7500		&15038
1517-	*15038		53.9960 0							
1518-	GRID	*158	0			55.3750		-11.7500		&15039
1519-	*15039		56.7000 0							
1520-	GRID	*159	0			55.3750		-11.7500		&15040
1521-	*15040		59.2465 0							
1522-	GRID	*160	0			55.3750		-11.7500		&15041
1523-	*15041		61.1459 0							
1524-	GRID	*161	0			55.3750		-10.8742		&15042
1525-	*15042		65.3167 0							
1526-	GRID	*162	0			55.3750		-7.9194		&15043
1527-	*15043		69.0944 0							
1528-	GRID	*163	0			55.3750		-4.3917		&15044
1529-	*15044		71.3092 0							
1530-	GRID	*164	0			55.3750		.0		&15045
1531-	*15045		72.1000 0							
1532-	GRID	*165	0			55.3750		.0		&15046
1533-	*15046		53.0750 0							
1534-	GRID	*166	0			55.3750		.0		&15047
1535-	*15047		56.7000 0							
1536-	GRID	*167	0			55.3750		-7.4000		&15048
1537-	*15048		56.7000 0							
1538-	GRID	*168	0			55.3750		-4.3000		&15049
1539-	*15049		56.7000 0							
1540-	GRID	169	0 55.375	-1.7		56.7 0				
1541-	GRID	*201	0			64.0000		.0		&15050
1542-	*15050		48.6500 0							
1543-	GRID	*202	0			64.0000		-1.6829		&15051
1544-	*15051		48.6500 0							
1545-	GRID	*203	0			64.0000		-4.2673		&15052
1546-	*15052		48.6500 0							
1547-	GRID	*204	0			64.0000		-7.3920		&15053
1548-	*15053		48.6500 0							
1549-	GRID	*205	0			64.0000		-10.4767		&15054
1550-	*15054		48.6500 0							

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1551-	GRID	*206	0			64.0000		-12.5000		&15055
1552-	*15055		48.6500	0						
1553-	GRID	*207	0			64.0000		.0		&15056
1554-	*15056		52.5961	0						
1555-	GRID	*208	0			64.0000		-1.6731		&15057
1556-	*15057		52.6058	0						
1557-	GRID	*209	0			64.0000		-4.2771		&15058
1558-	*15058		52.6116	0						
1559-	GRID	*210	0			64.0000		-7.3621		&15059
1560-	*15059		52.6059	0						
1561-	GRID	*211	0			64.0000		-10.4669		&15060
1562-	*15060		52.6206	0						
1563-	GRID	*212	0			64.0000		-12.5000		&15061
1564-	*15061		52.5961	0						
1565-	GRID	*213	0			64.0000		.0		&15062
1566-	*15062		53.8978	0						
1567-	GRID	*214	0			64.0000		-1.6698		&15063
1568-	*15063		53.9278	0						
1569-	GRID	*215	0			64.0000		-4.2742		&15064
1570-	*15064		53.9136	0						
1571-	GRID	*216	0			64.0000		-7.3789		&15065
1572-	*15065		53.9283	0						
1573-	GRID	*217	0			64.0000		-10.4836		&15066
1574-	*15066		53.9430	0						
1575-	GRID	*218	0			64.0000		-12.5000		&15067
1576-	*15067		53.9382	0						
1577-	GRID	*219	0			64.0000		.0		&15068
1578-	*15068		56.7000	0						
1579-	GRID	*220	0			64.0000		-1.6622		&15069
1580-	*15069		56.7000	0						
1581-	GRID	*221	0			64.0000		-4.2863		&15070
1582-	*15070		56.7000	0						
1583-	GRID	*222	0			64.0000		-7.3913		&15071
1584-	*15071		56.7000	0						
1585-	GRID	*223	0			64.0000		-10.4756		&15072
1586-	*15072		56.7000	0						
1587-	GRID	*224	0			64.0000		-12.5000		&15073
1588-	*15073		56.7000	0						
1589-	GRID	*225	0			64.0000		-7.4252		&15074
1590-	*15074		59.2577	0						
1591-	GRID	*226	0			64.0000		-10.4705		&15075
1592-	*15075		59.2312	0						
1593-	GRID	*227	0			64.0000		-12.5000		&15076
1594-	*15076		59.2465	0						
1595-	GRID	*228	0			64.0000		-8.4512		&15077
1596-	*15077		62.4208	0						
1597-	GRID	*229	0			64.0000		-10.5000		&15078
1598-	*15078		62.5000	0						
1599-	GRID	*230	0			64.0000		-12.5000		&15079
1600-	*15079		62.5000	0						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1601-	GRID	*231	0			64.0000		-7.8125		&15080
1602-	*15080		65.6948	0						
1603-	GRID	*232	0			64.0000		-9.7007		&15081
1604-	*15081		66.5181	0						
1605-	GRID	*233	0			64.0000		-11.5485		&15082
1606-	*15082		67.2835	0						
1607-	GRID	*234	0			64.0000		-5.9811		&15083
1608-	*15083		68.4469	0						
1609-	GRID	*235	0			64.0000		-7.4247		&15084
1610-	*15084		69.9247	0						
1611-	GRID	*236	0			64.0000		-8.8389		&15085
1612-	*15085		71.3389	0						
1613-	GRID	*237	0			64.0000		-3.2648		&15086
1614-	*15086		70.2620	0						
1615-	GRID	*238	0			64.0000		-4.0181		&15087
1616-	*15087		72.2007	0						
1617-	GRID	*239	0			64.0000		-4.7835		&15088
1618-	*15088		74.0485	0						
1619-	GRID	*240	0			64.0000		.0		&15089
1620-	*15089		70.9247	0						
1621-	GRID	*241	0			64.0000		.0		&15090
1622-	*15090		73.0000	0						
1623-	GRID	*242	0			64.0000		.0		&15091
1624-	*15091		75.0000	0						
1625-	GRID	243	0	64.0	-12.5	62.5	0			
1626-	GRID	*301	0			68.2500		.0		&15092
1627-	*15092		48.4320	1						
1628-	GRID	*302	0			68.2500		-1.7054		&15093
1629-	*15093		48.4320	0						
1630-	GRID	*303	0			68.2500		-4.3339		&15094
1631-	*15094		48.4320	0						
1632-	GRID	*304	0			68.2500		-7.0226		&15095
1633-	*15095		48.4320	0						
1634-	GRID	*305	0			68.2500		-12.5000		&15096
1635-	*15096		48.4320	0						
1636-	GRID	*306	0			68.2500		.0		&15097
1637-	*15097		52.4251	0						
1638-	GRID	*307	0			68.2500		-1.7144		&15098
1639-	*15098		52.4267	0						
1640-	GRID	*308	0			68.2500		-4.3428		&15099
1641-	*15099		52.4203	0						
1642-	GRID	*309	0			68.2500		-8.1150		&15100
1643-	*15100		52.4086	0						
1644-	GRID	*310	0			68.2500		-12.5000		&15101
1645-	*15101		52.4051	0						
1646-	GRID	*311	0			68.2500		-8.5561		&15102
1647-	*15102		53.9993	0						
1648-	GRID	*312	0			68.2500		-12.5000		&15103
1649-	*15103		53.9902	0						
1650-	GRID	*313	0			68.2500		-9.3238		&15104

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1651-	*15104		56.7178 0							
1652-	GRID	*314	0			68.2500		-12.5000		&15105
1653-	*15105		56.6989 0							
1654-	GRID	*315	0			68.2500		-10.0320		&15106
1655-	*15106		59.3754 0							
1656-	GRID	*316	0			68.2500		-12.5000		&15107
1657-	*15107		59.3678 0							
1658-	GRID	*317	0			68.2500		-10.8750		&15108
1659-	*15108		62.5000 0							
1660-	GRID	*318	0			68.2500		-12.5000		&15109
1661-	*15109		62.5000 0							
1662-	GRID	*406	0			68.2500		.0		&15111
1663-	*15111		52.4186 0							
1664-	GRID	*407	0			68.2500		-1.7540		&15112
1665-	*15112		52.3976 0							
1666-	GRID	*408	0			68.2500		-4.3177		&15113
1667-	*15113		52.4151 0							
1668-	GRID	*409	0			68.2500		-7.0225		&15114
1669-	*15114		52.3956 0							
1670-	GRID	*501	0			78.0000		.0		&15115
1671-	*15115		47.9330 0							
1672-	GRID	*502	0			78.0000		-1.6881		&15116
1673-	*15116		47.9330 0							
1674-	GRID	*503	0			78.0000		-4.2606		&15117
1675-	*15117		47.9330 0							
1676-	GRID	*504	0			78.0000		-6.8931		&15118
1677-	*15118		47.9330 0							
1678-	GRID	*505	0			78.0000		-12.5000		&15119
1679-	*15119		47.9330 0							
1680-	GRID	*506	0			78.0000		.0		&15120
1681-	*15120		51.9330 0							
1682-	GRID	*507	0			78.0000		-1.6527		&15121
1683-	*15121		51.9336 0							
1684-	GRID	*508	0			78.0000		-4.2853		&15122
1685-	*15122		51.9241 0							
1686-	GRID	*509	0			78.0000		-7.9433		&15123
1687-	*15123		51.9633 0							
1688-	GRID	*510	0			78.0000		-12.5000		&15124
1689-	*15124		51.9321 0							
1690-	GRID	*511	0			78.0000		-8.5093		&15125
1691-	*15125		54.0470 0							
1692-	GRID	*512	0			78.0000		-12.5000		&15126
1693-	*15126		54.0226 0							
1694-	GRID	*513	0			78.0000		-9.2431		&15127
1695-	*15127		56.7517 0							
1696-	GRID	*514	0			78.0000		-12.5000		&15128
1697-	*15128		56.7555 0							
1698-	GRID	*515	0			78.0000		-9.9562		&15129
1699-	*15129		59.3965 0							
1700-	GRID	*516	0			78.0000		-12.5000		&15130

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1701-	*15130		59.4285	0						
1702-	GRID	*517		0		78.0000		-10.7751		&15131
1703-	*15131		62.5223	0						
1704-	GRID	*518		0		78.0000		-12.5000		&15132
1705-	*15132		62.5000	0						
1706-	GRID	*601		0		87.5000		.0		&15133
1707-	*15133		47.4460	0						
1708-	GRID	*602		0		87.5000		-1.7202		&15134
1709-	*15134		47.4460	0						
1710-	GRID	*603		0		87.5000		-4.3001		&15135
1711-	*15135		47.4460	0						
1712-	GRID	*604		0		87.5000		-6.7200		&15136
1713-	*15136		47.4460	0						
1714-	GRID	*605		0		87.5000		-12.5000		&15137
1715-	*15137		47.4460	0						
1716-	GRID	*606		0		87.5000		.0		&15138
1717-	*15138		51.4458	0						
1718-	GRID	*607		0		87.5000		-1.7297		&15139
1719-	*15139		51.4364	0						
1720-	GRID	*608		0		87.5000		-4.2897		&15140
1721-	*15140		51.4415	0						
1722-	GRID	*609		0		87.5000		-7.7896		&15141
1723-	*15141		51.4431	0						
1724-	GRID	*610		0		87.5000		-12.5000		&15142
1725-	*15142		51.4458	0						
1726-	GRID	*611		0		87.5000		-8.5012		&15143
1727-	*15143		54.1956	0						
1728-	GRID	*612		0		87.5000		-12.5000		&15144
1729-	*15144		54.1856	0						
1730-	GRID	*613		0		87.5000		-9.2334		&15145
1731-	*15145		56.9085	0						
1732-	GRID	*614		0		87.5000		-12.5000		&15146
1733-	*15146		56.8858	0						
1734-	GRID	*615		0		87.5000		-9.9471		&15147
1735-	*15147		59.5410	0						
1736-	GRID	*616		0		87.5000		-12.5000		&15148
1737-	*15148		59.5657	0						
1738-	GRID	*617		0		87.5000		-10.7919		&15149
1739-	*15149		62.6759	0						
1740-	GRID	*618		0		87.5000		-12.5000		&15150
1741-	*15150		62.5000	0						
1742-	GRID	*701		0		97.0000		.0		&15151
1743-	*15151		46.9600	0						
1744-	GRID	*702		0		97.0000		-1.6855		&15152
1745-	*15152		46.9600	0						
1746-	GRID	*703		0		97.0000		-4.2938		&15153
1747-	*15153		46.9600	0						
1748-	GRID	*704		0		97.0000		-6.6413		&15154
1749-	*15154		46.9600	0						
1750-	GRID	*705		0		97.0000		-12.5000		&15155

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1751-	*15155		46.9600	0						
1752-	GRID	*706		0		97.0000		.0		&15156
1753-	*15156		50.9729	0						
1754-	GRID	*707		0		97.0000		-1.6575		&15157
1755-	*15157		50.9796	0						
1756-	GRID	*708		0		97.0000		-4.3061		&15158
1757-	*15158		50.9985	0						
1758-	GRID	*709		0		97.0000		-7.6970		&15159
1759-	*15159		51.0114	0						
1760-	GRID	*710		0		97.0000		-12.5000		&15160
1761-	*15160		51.0130	0						
1762-	GRID	*711		0		97.0000		-8.4841		&15161
1763-	*15161		54.0749	0						
1764-	GRID	*712		0		97.0000		-12.5000		&15162
1765-	*15162		54.1030	0						
1766-	GRID	*713		0		97.0000		-9.2284		&15163
1767-	*15163		56.8177	0						
1768-	GRID	*714		0		97.0000		-12.5000		&15164
1769-	*15164		56.8116	0						
1770-	GRID	*715		0		97.0000		-9.9318		&15165
1771-	*15165		59.4605	0						
1772-	GRID	*716		0		97.0000		-12.5000		&15166
1773-	*15166		59.4802	0						
1774-	GRID	*717		0		97.0000		-10.7593		&15167
1775-	*15167		62.5638	0						
1776-	GRID	*718		0		97.0000		-12.5000		&15168
1777-	*15168		62.5000	0						
1778-	GRID	*760		0		102.1200		-12.5000		&15178
1779-	*15178		62.5000	0						
1780-	GRID	*801		0		106.5000		.0		&15179
1781-	*15179		46.4730	0						
1782-	GRID	*802		0		106.5000		-1.7001		&15180
1783-	*15180		46.4730	0						
1784-	GRID	*803		0		106.5000		-4.3001		&15181
1785-	*15181		46.4730	0						
1786-	GRID	*804		0		106.5000		-6.5200		&15182
1787-	*15182		46.4730	0						
1788-	GRID	*805		0		106.5000		-12.5000		&15183
1789-	*15183		46.4730	0						
1790-	GRID	*806		0		106.5000		.0		&15184
1791-	*15184		50.4730	0						
1792-	GRID	*807		0		106.5000		-1.7191		&15185
1793-	*15185		50.4447	0						
1794-	GRID	*808		0		106.5000		-4.2991		&15186
1795-	*15186		50.4523	0						
1796-	GRID	*809		0		106.5000		-7.5991		&15187
1797-	*15187		50.4565	0						
1798-	GRID	*810		0		106.5000		-12.5000		&15188
1799-	*15188		50.4530	0						
1800-	GRID	*811		0		106.5000		-8.5761		&15189

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1801-	*15189		53.9918	0						
1802-	GRID	*812		0		106.5000		-12.5000		&15190
1803-	*15190		53.9929	0						
1804-	GRID	*813		0		106.5000		-9.3093		&15191
1805-	*15191		56.7483	0						
1806-	GRID	*814		0		106.5000		-12.5000		&15192
1807-	*15192		56.7328	0						
1808-	GRID	*815		0		106.5000		-10.0219		&15193
1809-	*15193		59.3649	0						
1810-	GRID	*816		0		106.5000		-12.5000		&15194
1811-	*15194		59.3527	0						
1812-	GRID	*817		0		106.5000		-10.8767		&15195
1813-	*15195		62.4608	0						
1814-	GRID	*818		0		106.5000		-12.5000		&15196
1815-	*15196		62.5000	0						
1816-	GRID	*901		0		116.0000		.0		&15197
1817-	*15197		45.9860	0						
1818-	GRID	*902		0		116.0000		-1.7199		&15198
1819-	*15198		45.9860	0						
1820-	GRID	*903		0		116.0000		-4.3200		&15199
1821-	*15199		45.9860	0						
1822-	GRID	*904		0		116.0000		-6.4000		&15200
1823-	*15200		45.9860	0						
1824-	GRID	*905		0		116.0000		-12.5000		&15201
1825-	*15201		45.9860	0						
1826-	GRID	*910		0		116.0000		-12.5000		&15202
1827-	*15202		49.9860	0						
1828-	GRID	*911		0		116.0000		.0		&15203
1829-	*15203		51.5000	0						
1830-	GRID	*912		0		116.0000		-1.7576		&15204
1831-	*15204		51.5000	0						
1832-	GRID	*913		0		116.0000		-4.3176		&15205
1833-	*15205		51.5000	0						
1834-	GRID	*914		0		116.0000		-7.8776		&15206
1835-	*15206		51.5000	0						
1836-	GRID	*915		0		116.0000		-12.5000		&15207
1837-	*15207		51.5000	0						
1838-	GRID	*916		0		116.0000		-8.5656		&15208
1839-	*15208		53.9786	0						
1840-	GRID	*917		0		116.0000		-12.5000		&15209
1841-	*15209		53.9659	0						
1842-	GRID	*918		0		116.0000		-9.2480		&15210
1843-	*15210		56.7000	0						
1844-	GRID	*919		0		116.0000		-12.5000		&15211
1845-	*15211		56.7000	0						
1846-	GRID	*920		0		116.0000		-10.0431		&15212
1847-	*15212		59.4539	0						
1848-	GRID	*921		0		116.0000		-12.5000		&15213
1849-	*15213		59.4458	0						
1850-	GRID	*922		0		116.0000		-10.8527		&15214

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1851-	*15214		62.4512	0						
1852-	GRID	*923		0		116.0000		-12.5000		G15215
1853-	*15215		62.5000	0						
1854-	GRID	*1001		0		119.0000		.0		G15216
1855-	*15216		45.8330	0						
1856-	GRID	*1002		0		119.0000		-1.7227		G15217
1857-	*15217		45.8330	0						
1858-	GRID	*1003		0		119.0000		-4.2668		G15218
1859-	*15218		45.8330	0						
1860-	GRID	*1004		0		119.0000		-6.3301		G15219
1861-	*15219		45.8330	0						
1862-	GRID	*1005		0		119.0000		-12.5000		G15220
1863-	*15220		45.8330	0						
1864-	GRID	*1010		0		119.0000		-12.5000		G15221
1865-	*15221		49.8330	0						
1866-	GRID	*1011		0		119.0000		.0		G15222
1867-	*15222		51.5000	0						
1868-	GRID	*1012		0		119.0000		-1.7317		G15223
1869-	*15223		51.5000	0						
1870-	GRID	*1013		0		119.0000		-4.2958		G15224
1871-	*15224		51.5000	0						
1872-	GRID	*1014		0		119.0000		-7.8816		G15225
1873-	*15225		51.5000	0						
1874-	GRID	*1015		0		119.0000		-12.5000		G15226
1875-	*15226		51.5000	0						
1876-	GRID	*1016		0		119.0000		-8.5667		G15227
1877-	*15227		53.9523	0						
1878-	GRID	*1017		0		119.0000		-12.5000		G15228
1879-	*15228		53.9459	0						
1880-	GRID	*1018		0		119.0000		-9.2480		G15229
1881-	*15229		56.7000	0						
1882-	GRID	*1019		0		119.0000		-12.5000		G15230
1883-	*15230		56.7000	0						
1884-	GRID	*1020		0		119.0000		-10.0176		G15231
1885-	*15231		59.2985	0						
1886-	GRID	*1021		0		119.0000		-12.5000		G15232
1887-	*15232		59.3145	0						
1888-	GRID	*1022		0		119.0000		-10.8639		G15233
1889-	*15233		62.4221	0						
1890-	GRID	*1023		0		119.0000		-12.5000		G15234
1891-	*15234		62.5000	0						
1892-	GRID	*1101		0		125.5000		.0		G15235
1893-	*15235		45.5000	0						
1894-	GRID	*1102		0		125.5000		-1.7172		G15236
1895-	*15236		45.5000	0						
1896-	GRID	*1103		0		125.5000		-4.2931		G15237
1897-	*15237		45.5000	0						
1898-	GRID	*1104		0		125.5000		-6.2499		G15238
1899-	*15238		45.5000	0						
1900-	GRID	*1105		0		125.5000		-12.5000		G15239

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1901-	*15239		45.5000	0						
1902-	GRID	*1110		0		125.5000		-12.5000		015241
1903-	*15241		49.5000	0						
1904-	GRID	*1111		0		125.5000		.0		015242
1905-	*15242		51.5000	0						
1906-	GRID	*1112		0		125.5000		-1.7553		015243
1907-	*15243		51.5000	0						
1908-	GRID	*1113		0		125.5000		-4.3311		015244
1909-	*15244		51.5000	0						
1910-	GRID	*1114		0		125.5000		-7.8654		015245
1911-	*15245		51.5000	0						
1912-	GRID	*1115		0		125.5000		-12.5000		015246
1913-	*15246		51.5000	0						
1914-	GRID	*1116		0		125.5000		-8.5805		015247
1915-	*15247		53.9715	0						
1916-	GRID	*1117		0		125.5000		-12.5000		015248
1917-	*15248		53.9662	0						
1918-	GRID	*1118		0		125.5000		-9.3168		015249
1919-	*15249		56.7024	0						
1920-	GRID	*1119		0		125.5000		-12.5000		015250
1921-	*15250		56.6818	0						
1922-	GRID	*1120		0		125.5000		-10.0525		015251
1923-	*15251		59.3335	0						
1924-	GRID	*1121		0		125.5000		-12.5000		015252
1925-	*15252		59.3176	0						
1926-	GRID	*1122		0		125.5000		-10.9111		015253
1927-	*15253		62.4630	0						
1928-	GRID	*1123		0		125.5000		-12.5000		015254
1929-	*15254		62.5000	0						
1930-	GRID	*1161		0		129.0000		-12.5000		015265
1931-	*15265		62.5000	0						
1932-	GRID	*1201		0		135.0000		.0		015267
1933-	*15267		45.5000	0						
1934-	GRID	*1202		0		135.0000		-1.7800		015268
1935-	*15268		45.5000	0						
1936-	GRID	*1203		0		135.0000		-4.3201		015269
1937-	*15269		45.5000	0						
1938-	GRID	*1204		0		135.0000		-6.3001		015270
1939-	*15270		45.5000	0						
1940-	GRID	*1205		0		135.0000		-12.5000		015271
1941-	*15271		45.5000	0						
1942-	GRID	*1206		0		135.0000		.0		015272
1943-	*15272		49.5000	0						
1944-	GRID	*1207		0		135.0000		-1.7728		015273
1945-	*15273		49.5000	0						
1946-	GRID	*1208		0		135.0000		-4.3527		015274
1947-	*15274		49.5000	0						
1948-	GRID	*1209		0		135.0000		-7.3528		015275
1949-	*15275		49.5000	0						
1950-	GRID	*1210		0		135.0000		-12.5000		015276

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
1951-	*15276		49.5000	0						
1952-	GRID	*1211		0		135.0000		-7.9193		G15277
1953-	*15277		51.5000	0						
1954-	GRID	*1212		0		135.0000		-12.5000		G15278
1955-	*15278		51.5000	0						
1956-	GRID	*1213		0		135.0000		-8.5672		G15279
1957-	*15279		53.9925	0						
1958-	GRID	*1214		0		135.0000		-12.5000		G15280
1959-	*15280		53.9799	0						
1960-	GRID	*1215		0		135.0000		-9.2959		G15281
1961-	*15281		56.7102	0						
1962-	GRID	*1216		0		135.0000		-12.5000		G15282
1963-	*15282		56.7198	0						
1964-	GRID	*1217		0		135.0000		-10.0244		G15283
1965-	*15283		59.3679	0						
1966-	GRID	*1218		0		135.0000		-12.5000		G15284
1967-	*15284		59.3398	0						
1968-	GRID	*1219		0		135.0000		-10.8543		G15285
1969-	*15285		62.4852	0						
1970-	GRID	*1220		0		135.0000		-12.5000		G15286
1971-	*15286		62.5000	0						
1972-	GRID	*1221		0		135.0000		.0		G15287
1973-	*15287		51.5000	0						
1974-	GRID	*1301		0		141.7500		-0.0000		G15288
1975-	*15288		45.5000	0						
1976-	GRID	*1302		0		141.7500		-1.7201		G15289
1977-	*15289		45.5000	0						
1978-	GRID	*1303		0		141.7500		-4.2803		G15290
1979-	*15290		45.5000	0						
1980-	GRID	*1304		0		141.7500		-6.2200		G15291
1981-	*15291		45.5000	0						
1982-	GRID	*1305		0		141.7500		-12.5000		G15292
1983-	*15292		45.5000	0						
1984-	GRID	*1306		0		141.7500		.0000		G15293
1985-	*15293		49.5000	0						
1986-	GRID	*1307		0		141.7500		-1.7173		G15294
1987-	*15294		49.5000	0						
1988-	GRID	*1308		0		141.7500		-4.2971		G15295
1989-	*15295		49.5000	0						
1990-	GRID	*1309		0		141.7500		-7.3172		G15296
1991-	*15296		49.5000	0						
1992-	GRID	*1310		0		141.7500		-12.5000		G15297
1993-	*15297		49.5000	0						
1994-	GRID	*1311		0		141.7500		-7.8558		G15298
1995-	*15298		51.5000	0						
1996-	GRID	*1312		0		141.7500		-12.5000		G15299
1997-	*15299		51.5000	0						
1998-	GRID	*1313		0		141.7500		-8.5435		G15300
1999-	*15300		54.0160	0						
2000-	GRID	*1314		0		141.7500		-12.5000		G15301

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2001-	*15301		54.0195	0						
2002-	GRID	*1315	0			141.7500		-9.2480		&15302
2003-	*15302		56.7000	0						
2004-	GRID	*1316	0			141.7500		-12.5000		&15303
2005-	*15303		56.7000	0						
2006-	GRID	*1317	0			141.7500		-9.9659		&15304
2007-	*15304		59.3486	0						
2008-	GRID	*1318	0			141.7500		-12.5000		&15305
2009-	*15305		59.3591	0						
2010-	GRID	*1319	0			141.7500		-10.8262		&15306
2011-	*15306		62.4921	0						
2012-	GRID	*1320	0			141.7500		-12.5000		&15307
2013-	*15307		62.5000	0						
2014-	GRID	*1321	0			141.7500		.0		&15308
2015-	*15308		51.5000	0						
2016-	GRID	*1401	0			144.7500		.0		&15309
2017-	*15309		45.5000	0						
2018-	GRID	*1402	0			144.7500		-1.7051		&15310
2019-	*15310		45.5000	0						
2020-	GRID	*1403	0			144.7500		-4.3000		&15311
2021-	*15311		45.5000	0						
2022-	GRID	*1404	0			144.7500		-6.2500		&15312
2023-	*15312		45.5000	0						
2024-	GRID	*1405	0			144.7500		-12.5000		&15313
2025-	*15313		45.5000	0						
2026-	GRID	*1406	0			144.7500		.0000		&15314
2027-	*15314		51.5000	0						
2028-	GRID	*1407	0			144.7500		-1.7051		&15315
2029-	*15315		51.5000	0						
2030-	GRID	*1408	0			144.7500		-4.3000		&15316
2031-	*15316		51.5000	0						
2032-	GRID	*1409	0			144.7500		-7.8560		&15317
2033-	*15317		51.5000	0						
2034-	GRID	*1410	0			144.7500		-12.5000		&15318
2035-	*15318		51.5000	0						
2036-	GRID	*1411	0			144.7500		-8.5506		&15319
2037-	*15319		54.0569	0						
2038-	GRID	*1412	0			144.7500		-12.5000		&15320
2039-	*15320		54.0337	0						
2040-	GRID	*1413	0			144.7500		-9.2480		&15321
2041-	*15321		56.7000	0						
2042-	GRID	*1414	0			144.7500		-12.5000		&15322
2043-	*15322		56.7000	0						
2044-	GRID	*1415	0			144.7500		-9.9791		&15323
2045-	*15323		59.4427	0						
2046-	GRID	*1416	0			144.7500		-12.5000		&15324
2047-	*15324		59.4426	0						
2048-	GRID	*1417	0			144.7500		-10.8098		&15325
2049-	*15325		62.5343	0						
2050-	GRID	*1418	0			144.7500		-12.5000		&15326

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2051-	*15326		62.5000	0		150.3750		-7.8560		&15328
2052-	GRID	*1501		0						
2053-	*15328		51.5000	0		150.3750		-12.5000		&15329
2054-	GRID	*1502		0						
2055-	*15329		51.5000	0		150.3750		-8.5558		&15330
2056-	GRID	*1503		0						
2057-	*15330		54.0337	0		150.3750		-12.5000		&15331
2058-	GRID	*1504		0						
2059-	*15331		54.0439	0		150.3750		-9.2480		&15332
2060-	GRID	*1505		0						
2061-	*15332		56.7000	0		150.3750		-12.5000		&15333
2062-	GRID	*1506		0						
2063-	*15333		56.7000	0		150.3750		-9.9939		&15334
2064-	GRID	*1507		0						
2065-	*15334		59.3964	0		150.3750		-12.5000		&15335
2066-	GRID	*1508		0						
2067-	*15335		59.3944	0		150.3750		-10.8368		&15336
2068-	GRID	*1509		0						
2069-	*15336		62.4944	0		150.3750		-12.5000		&15337
2070-	GRID	*1510		0						
2071-	*15337		62.5000	0		150.3750		.0		&15343
2072-	GRID	*1516		0						
2073-	*15343		51.5000	0		150.3750		-1.7051		&15344
2074-	GRID	*1517		0						
2075-	*15344		51.5000	0		153.3750		-0.0000		&15347
2076-	GRID	*1601		0						
2077-	*15347		45.5000	0		153.3750		-1.7051		&15348
2078-	GRID	*1602		0						
2079-	*15348		45.5000	0		153.3750		-4.3000		&15349
2080-	GRID	*1603		0						
2081-	*15349		45.5000	0		153.3750		-6.2500		&15350
2082-	GRID	*1604		0						
2083-	*15350		45.5000	0		153.3750		-12.5000		&15351
2084-	GRID	*1605		0						
2085-	*15351		45.5000	0		153.3750		-0.0000		&15352
2086-	GRID	*1606		0						
2087-	*15352		51.5000	0		153.3750		-1.7051		&15353
2088-	GRID	*1607		0						
2089-	*15353		51.5000	0		153.3750		-4.3000		&15354
2090-	GRID	*1608		0						
2091-	*15354		51.5000	0		153.3750		-7.8560		&15355
2092-	GRID	*1609		0						
2093-	*15355		51.5000	0		153.3750		-12.5000		&15356
2094-	GRID	*1610		0						
2095-	*15356		51.5000	0		153.3750		-8.5302		&15357
2096-	GRID	*1611		0						
2097-	*15357		53.9960	0		153.3750		-12.5000		&15358
2098-	GRID	*1612		0						
2099-	*15358		53.9960	0		153.3750		-9.2480		&15359
2100-	GRID	*1613		0						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2101-	*15359		56.7000	0						
2102-	GRID	*1614		0		153.3750		-12.5000		&15360
2103-	*15360		56.7000	0						
2104-	GRID	*1615		0		153.3750		-9.9410		&15361
2105-	*15361		59.3813	0						
2106-	GRID	*1616		0		153.3750		-12.5000		&15362
2107-	*15362		59.3750	0						
2108-	GRID	*1617		0		153.3750		-10.7792		&15363
2109-	*15363		62.4747	0						
2110-	GRID	*1618		0		153.3750		-12.5000		&15364
2111-	*15364		62.5000	0						
2112-	GRID	*1701		0		162.0000		.0000		&15382
2113-	*15382		45.5000	0						
2114-	GRID	*1702		0		162.0000		-1.7051		&15383
2115-	*15383		45.5000	0						
2116-	GRID	*1703		0		162.0000		-4.3000		&15384
2117-	*15384		45.5000	0						
2118-	GRID	*1704		0		162.0000		-6.2500		&15385
2119-	*15385		45.5000	0						
2120-	GRID	*1705		0		162.0000		-12.5000		&15386
2121-	*15386		45.5000	0						
2122-	GRID	*1706		0		162.0000		.0000		&15387
2123-	*15387		51.5000	0						
2124-	GRID	*1707		0		162.0000		-1.7051		&15388
2125-	*15388		51.5000	0						
2126-	GRID	*1708		0		162.0000		-4.3000		&15389
2127-	*15389		51.5000	0						
2128-	GRID	*1709		0		162.0000		-7.8560		&15390
2129-	*15390		51.5000	0						
2130-	GRID	*1710		0		162.0000		-12.5000		&15391
2131-	*15391		51.5000	0						
2132-	GRID	*1711		0		162.0000		-8.5065		&15392
2133-	*15392		53.9960	0						
2134-	GRID	*1712		0		162.0000		-12.5000		&15393
2135-	*15393		53.9960	0						
2136-	GRID	*1713		0		162.0000		-9.2337		&15394
2137-	*15394		56.7570	0						
2138-	GRID	*1714		0		162.0000		-12.5000		&15395
2139-	*15395		56.7000	0						
2140-	GRID	*1715		0		162.0000		-9.9185		&15396
2141-	*15396		59.3983	0						
2142-	GRID	*1716		0		162.0000		-12.5000		&15397
2143-	*15397		59.3750	0						
2144-	GRID	*1717		0		162.0000		-10.7578		&15398
2145-	*15398		62.4953	0						
2146-	GRID	*1718		0		162.0000		-12.5000		&15399
2147-	*15399		62.5000	0						
2148-	GRID	*1721		0		165.2500		-1.2315		&15402
2149-	*15402		45.5000	0						
2150-	GRID	*1722		0		165.2500		-1.2315		&15403

S O R T E D _ B U L K _ D A T A _ E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2151-	*15403		51.5000	0						
2152-	GRID	*1723	0			165.2500		.0		G15405
2153-	*15405		45.5000	0						
2154-	GRID	*1724	0			165.2500		.0		G15404
2155-	*15404		51.5000	0						
2156-	GRID	1800	0	165.25	.0	45.5	1			
2157-	GRID	*1801	0			166.5000		.0		G15406
2158-	*15406		45.5000	0						
2159-	GRID	*1802	0			166.5000		-1.7051		G15407
2160-	*15407		45.5000	0						
2161-	GRID	*1803	0			166.5000		-4.3000		G15408
2162-	*15408		45.5000	0						
2163-	GRID	*1804	0			166.5000		-6.2500		G15409
2164-	*15409		45.5000	0						
2165-	GRID	*1805	0			166.5000		-9.4000		G15410
2166-	*15410		45.5000	0						
2167-	GRID	*1806	0			166.5000		-12.5000		G15411
2168-	*15411		45.5000	0						
2169-	GRID	*1807	0			166.5000		.0		G15412
2170-	*15412		51.5000	0						
2171-	GRID	*1808	0			166.5000		-1.7051		G15413
2172-	*15413		51.5000	0						
2173-	GRID	*1809	0			166.5000		-4.3000		G15414
2174-	*15414		51.5000	0						
2175-	GRID	*1810	0			166.5000		-7.8560		G15415
2176-	*15415		51.5000	0						
2177-	GRID	*1811	0			166.5000		-9.4000		G15416
2178-	*15416		51.5000	0						
2179-	GRID	*1812	0			166.5000		-12.5000		G15417
2180-	*15417		51.5000	0						
2181-	GRID	*1813	0			166.5000		-8.6140		G15418
2182-	*15418		53.9960	0						
2183-	GRID	*1814	0			166.5000		-12.5000		G15419
2184-	*15419		53.9960	0						
2185-	GRID	*1815	0			166.5000		-7.7630		G15420
2186-	*15420		56.7000	0						
2187-	GRID	*1817	0			166.5000		-12.5000		G15421
2188-	*15421		56.7000	0						
2189-	GRID	*1818	0			166.5000		-6.9200		G15422
2190-	*15422		59.3750	0						
2191-	GRID	*1819	0			166.5000		-10.5000		G15423
2192-	*15423		59.3750	0						
2193-	GRID	*1820	0			166.5000		-12.5000		G15424
2194-	*15424		59.3750	0						
2195-	GRID	*1821	0			166.5000		.0		G15425
2196-	*15425		62.5000	0						
2197-	GRID	*1822	0			166.5000		-5.9360		G15426
2198-	*15426		62.5000	0						
2199-	GRID	*1823	0			166.5000		-10.5000		G15427
2200-	*15427		62.5000	0						

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2201-	GRID	*1824	0			166.5000		-12.5000		&15428
2202-	*15428		62.5000	0						
2203-	GRID	*1825	0			166.5000		.0		&15429
2204-	*15429		64.9000	0						
2205-	GRID	*1826	0			166.5000		-5.1800		&15430
2206-	*15430		64.9000	0						
2207-	GRID	*1827	0			166.5000		-9.7007		&15431
2208-	*15431		66.5181	0						
2209-	GRID	*1828	0			166.5000		-11.5485		&15432
2210-	*15432		67.2835	0						
2211-	GRID	*1829	0			166.5000		.0		&15433
2212-	*15433		69.9247	0						
2213-	GRID	*1830	0			166.5000		-3.5980		&15434
2214-	*15434		69.9247	0						
2215-	GRID	*1831	0			166.5000		-7.4247		&15435
2216-	*15435		69.9247	0						
2217-	GRID	*1832	0			166.5000		-8.8389		&15436
2218-	*15436		71.3389	0						
2219-	GRID	*1833	0			166.5000		.0		&15437
2220-	*15437		73.0000	0						
2221-	GRID	*1834	0			166.5000		-2.8190		&15438
2222-	*15438		72.4000	0						
2223-	GRID	*1835	0			166.5000		-4.0181		&15439
2224-	*15439		72.2007	0						
2225-	GRID	*1836	0			166.5000		-4.7835		&15440
2226-	*15440		74.0485	0						
2227-	GRID	*1837	0			166.5000		.0		&15441
2228-	*15441		75.0000	0						
2229-	GRID	*1838	0			166.5000		-2.0000		&15442
2230-	*15442		75.0000	0						
2231-	GRID	*1901	0			170.7500		.0		&15444
2232-	*15444		45.5000	0						
2233-	GRID	*1902	0			170.7500		-1.7051		&15445
2234-	*15445		45.5000	0						
2235-	GRID	*1903	0			170.7500		-4.3000		&15446
2236-	*15446		45.5000	0						
2237-	GRID	*1904	0			170.7500		-6.2500		&15447
2238-	*15447		45.5000	0						
2239-	GRID	*1905	0			170.7500		-12.5000		&15448
2240-	*15448		45.5000	0						
2241-	GRID	*1906	0			170.7500		.0		&15449
2242-	*15449		47.3300	0						
2243-	GRID	*1907	0			170.7500		-1.7051		&15450
2244-	*15450		47.3300	0						
2245-	GRID	*1908	0			170.7500		-4.3000		&15451
2246-	*15451		47.3300	0						
2247-	GRID	*1909	0			170.7500		-6.7398		&15452
2248-	*15452		47.3300	0						
2249-	GRID	*1910	0			170.7500		.0		&15453
2250-	*15453		50.3300	0						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2251-	GRID	*1911	0			170.7500		-1.7051		&15454
2252-	*15454		50.3300	0						
2253-	GRID	*1912	0			170.7500		-4.3000		&15455
2254-	*15455		50.3300	0						
2255-	GRID	*1913	0			170.7500		-7.5428		&15456
2256-	*15456		50.3300	0						
2257-	GRID	*1914	0			170.7500		.0		&15457
2258-	*15457		51.5000	0						
2259-	GRID	*1915	0			170.7500		-1.7051		&15458
2260-	*15458		51.5000	0						
2261-	GRID	*1916	0			170.7500		-4.3000		&15459
2262-	*15459		51.5000	0						
2263-	GRID	*1917	0			170.7500		-7.8560		&15460
2264-	*15460		51.5000	0						
2265-	GRID	*1918	0			170.7500		-12.5000		&15461
2266-	*15461		51.5000	0						
2267-	GRID	*1919	0			170.7500		-12.5000		&15462
2268-	*15462		53.9960	0						
2269-	GRID	*1920	0			170.7500		-12.5000		&15463
2270-	*15463		56.7000	0						
2271-	GRID	*1921	0			170.7500		-12.5000		&15464
2272-	*15464		59.3750	0						
2273-	GRID	*1922	0			170.7500		-12.5000		&15465
2274-	*15465		63.4400	0						
2275-	GRID	*1923	0			170.7500		-11.5485		&15466
2276-	*15466		67.2635	0						
2277-	GRID	*1924	0			170.7500		-8.8389		&15467
2278-	*15467		71.3389	0						
2279-	GRID	*1925	0			170.7500		-4.7835		&15468
2280-	*15468		74.0485	0						
2281-	GRID	*1926	0			170.7500		-2.0000		&15469
2282-	*15469		75.0000	0						
2283-	GRID	*1927	0			170.7500		.0		&15470
2284-	*15470		75.0000	0						
2285-	GRID	*1928	0			170.7500		-9.4000		&15471
2286-	*15471		51.5000	0						
2287-	GRID	*1929	0			170.7500		-5.9360		&15472
2288-	*15472		63.4400	0						
2289-	GRID	*1930	0			170.7500		.0		&15473
2290-	*15473		63.4400	0						
2291-	GRID	*1931	0			173.9539		-12.5000		&15474
2292-	*15474		59.3750	0						
2293-	GRID	*1932	0			173.9539		-12.5000		&15475
2294-	*15475		63.1484	0						
2295-	GRID	*1933	0			173.9539		-6.7057		&15476
2296-	*15476		64.1484	0						
2297-	GRID	*1934	0			173.9539		.0		&15477
2298-	*15477		64.1484	0						
2299-	GRID	*1935	0			175.5633		-5.1493		&15478
2300-	*15478		51.2737	0						

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2301-	GRID	*1936	0			175.5633		.0		&15479
2302-	*15479		51.9237	0						
2303-	GRID	*2001	0			180.0090		.0		&15480
2304-	*15480		45.5000	0						
2305-	GRID	*2002	0			180.0090		-1.7051		&15481
2306-	*15481		45.5000	0						
2307-	GRID	*2003	0			180.0090		-4.3000		&15482
2308-	*15482		45.5000	0						
2309-	GRID	*2004	0			180.0090		-6.2500		&15483
2310-	*15483		45.5000	0						
2311-	GRID	*2005	0			180.0090		-12.5000		&15484
2312-	*15484		45.5000	0						
2313-	GRID	*2006	0			179.219034		.0		&15485
2314-	*15485		51.5000	2						
2315-	GRID	*2007	0			179.219034		-1.7051		&15486
2316-	*15486		51.5000	2						
2317-	GRID	*2008	0			179.219034		-4.3000		&15487
2318-	*15487		51.5000	2						
2319-	GRID	*2009	0			179.219034		-6.2500		&15488
2320-	*15488		51.5000	2						
2321-	GRID	*2010	0			179.219034		-12.5000		&15489
2322-	*15489		51.5000	0						
2323-	GRID	*2011	0			178.890408		.0		&15490
2324-	*15490		53.9960	0						
2325-	GRID	*2012	0			178.890408		-1.7051		&15491
2326-	*15491		53.9960	2						
2327-	GRID	*2013	0			178.890408		-4.3000		&15492
2328-	*15492		53.9960	2						
2329-	GRID	*2014	0			178.890408		-6.4000		&15493
2330-	*15493		53.9960	0						
2331-	GRID	*2015	0			178.890408		-12.5000		&15494
2332-	*15494		53.9960	0						
2333-	GRID	*2016	0			178.534397		.0		&15495
2334-	*15495		56.7000	2						
2335-	GRID	*2017	0			178.534397		-1.7051		&15496
2336-	*15496		56.7000	2						
2337-	GRID	*2018	0			178.534397		-4.3000		&15497
2338-	*15497		56.7000	2						
2339-	GRID	*2019	0			178.534397		-6.7460		&15498
2340-	*15498		56.7000	2						
2341-	GRID	*2020	0			178.534397		-12.5000		&15499
2342-	*15499		56.7000	0						
2343-	GRID	*2021	0			178.182203		.0		&15500
2344-	*15500		59.3750	2						
2345-	GRID	*2022	0			178.182203		-1.7051		&15501
2346-	*15501		59.3750	2						
2347-	GRID	*2023	0			178.182203		-4.3000		&15502
2348-	*15502		59.3750	2						
2349-	GRID	*2024	0			178.182203		-7.0890		&15503
2350-	*15503		59.3750	2						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2351-	GRID	*2025	0			178.182203		-12.5000		&15504
2352-	*15504		59.3750	0						
2353-	GRID	*2026	0			177.45188		.0		&15505
2354-	*15505		64.9220	0						
2355-	GRID	*2027	0			177.45188		-1.7051		&15506
2356-	*15506		64.9220	2						
2357-	GRID	*2028	0			177.45188		-4.3000		&15507
2359-	*15507		64.9220	2						
2359-	GRID	*2029	0			177.45188		-7.8000		&15508
2360-	*15508		64.9220	0						
2361-	GRID	*2030	0			177.45188		-12.5000		&15509
2362-	*15509		64.9220	0						
2363-	GRID	*2031	0			177.140962		.0		&15510
2364-	*15510		67.2835	2						
2365-	GRID	*2032	0			177.140962		-1.7051		&15511
2366-	*15511		67.2835	2						
2367-	GRID	*2033	0			177.140962		-4.3000		&15512
2368-	*15512		67.2835	2						
2369-	GRID	*2034	0			177.140962		-8.1823		&15513
2370-	*15513		67.2835	2						
2371-	GRID	*2035	0			177.140962		-11.5485		&15514
2372-	*15514		67.2835	0						
2373-	GRID	*2036	0			176.607024		.0		&15515
2374-	*15515		71.3389	2						
2375-	GRID	*2037	0			176.607024		-1.7051		&15516
2376-	*15516		71.3389	2						
2377-	GRID	*2038	0			176.607024		-4.3000		&15517
2378-	*15517		71.3389	2						
2379-	GRID	*2039	0			176.607024		-8.8389		&15518
2380-	*15518		71.3389	0						
2381-	GRID	*2040	0			176.1250		.0		&15519
2382-	*15519		75.0000	0						
2383-	GRID	*2041	0			176.1250		-2.0000		&15520
2384-	*15520		75.0000	0						
2385-	GRID	*2042	0			176.250276		-4.7835		&15521
2386-	*15521		74.0485	0						
2387-	GRID	*2101	0			186.2500		.0		&15522
2388-	*15522		45.5000	0						
2389-	GRID	*2102	0			186.2500		-1.7051		&15523
2390-	*15523		45.5000	0						
2391-	GRID	*2103	0			186.2500		-4.3000		&15524
2392-	*15524		45.5000	0						
2393-	GRID	*2104	0			186.2500		-6.2500		&15525
2394-	*15525		45.5000	0						
2395-	GRID	*2105	0			186.2500		-12.5000		&15526
2396-	*15526		45.5000	0						
2397-	GRID	*2106	0			185.4630		-12.5000		&15527
2398-	*15527		51.5000	0						
2399-	GRID	*2107	0			185.1320		-12.5000		&15528
2400-	*15528		53.9960	0						

S O R T E D B U L K D A T A E C H O

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CARD
COUNT      .  1  ..  2  ..  3  ..  4  ..  5  ..  6  ..  7  ..  8  ..  9  .. 10  .
2401-      GRID   *2108          0                184.7810       -12.5000       &15529
2402-      *15529                56.7000 0
2403-      GRID   *2109          0                184.4300       -12.5000       &15530
2404-      *15530                59.3750 0
2405-      GRID   *2110          0                183.6930       -12.5000       &15531
2406-      *15531                64.9220 0
2407-      GRID   *2111          0                183.3820       -11.5485       &15532
2408-      *15532                67.2835 0
2409-      GRID   *2112          0                182.8480       -8.8389        &15533
2410-      *15533                71.3389 0
2411-      GRID   *2113          0                182.4910       -4.7835        &15534
2412-      *15534                74.0485 0
2413-      GRID   *2114          0                182.3660       -2.0000        &15535
2414-      *15535                75.0000 0
2415-      GRID   *2115          0                182.3660       .0             &15536
2416-      *15536                75.0000 0
2417-      GRID   2200    0      171.687 -11.960670.4918 0
2418-      MAT1   1       1.0567         .3
2419-      MAT1   2       1.0567         .3      .1
2420-      MAT1   4       1.0567         .3
2421-      MAT1   6       1.0567         .3
2422-      MAT1   8       1.0567         .3      .1
2423-      MAT1   11      1.0567         .3      .1
2424-      MAT1   12      1.0567         .3
2425-      MAT1   16      1.0567         .3      .1
2426-      MAT1   18      3.0067         .3      .264
2427-      MAT1   26      7.066          .3      .1
2428-      MAT1   28      3.0067         .3
2429-      MAT1   36      7.066          .3      .1
2430-      MAT1   46      7.066          .3      .1
2431-      MAT1   101     10.566         .3
2432-      MAT1   102     10.566         .3
2433-      MAT1   103     10.566         .3
2434-      MAT1   104     10.566         .3
2435-      MAT1   105     17.8766        .3
2436-      MAT1   106     16.2966        .3
2437-      MAT1   107     14.5066        .3
2438-      MAT1   108     15.4366        .3
2439-      MAT1   109     17.8766        .3
2440-      MAT1   110     14.1966        .3
2441-      MAT1   111     10.566         .3
2442-      MAT1   112     15.4366        .3
2443-      MAT1   113     10.566         .3
2444-      MAT1   114     14.4066        .3
2445-      MAT1   115     18.0766        .3
2446-      MAT1   116     19.9566        .3
2447-      MAT1   117     23.1066        .3
2448-      MAT1   118     15.2266        .3
2449-      MPC    100     213     1      4.1039  207     1      -2.8022        &M213X
2450-      &M213X         219     1      -1.3017
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S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2451-	MPC	100	223	1	5.1087	222	1	-2.0244		&M223X
2452-	&M223X		224	1	-3.0843					
2453-	MPC	100	243	2	1.0	230	2	-1.0		
2454-	MPC	100	243	3	1.0	230	3	-1.0		
2455-	MPC	100	910	2	5.514	905	2	-1.514		&M910Y
2456-	&M910Y		915	2	-4.0					
2457-	MPC	100	1010	2	5.667	1005	2	-1.667		&M1010Y
2458-	&M1010Y		1015	2	-4.0					
2459-	MPC	100	1110	2	6.000	1105	2	-2.000		&M1110Y
2460-	&M1110Y		1115	2	-4.0					
2461-	MPC	100	1516	3	8.625	1406	3	-3.0		&M1516Z
2462-	&M1516Z		1606	3	-5.625					
2463-	MPC	100	1517	3	8.625	1407	3	-3.0		&M1517Z
2464-	&M1517Z		1607	3	-5.625					
2465-	MPC	100	1805	1	6.25	1804	1	-3.1		&M1805X
2466-	&M1805X		1806	1	-3.15					
2467-	MPC	100	1823	1	6.564	1822	1	-2.0		&M1823X
2468-	&M1823X		1824	1	-4.564					
2469-	MPC	100	1824	4	1.0	1823	3	-.5		&1824MX
2470-	&1824MX		1824	3	.5					
2471-	MPC	100	1828	1	1.0	2200	1	-1.0		&48
2472-	&48		2200	5	3.2083	2200	6	0.4121		
2473-	MPC	100	1828	2	1.0	2200	2	-1.0		&49
2474-	&49		2200	4	-3.2083	2200	6	5.187		
2475-	MPC	100	1828	3	1.0	2200	3	-1.0		&50
2476-	&50		2200	4	-.4121	2200	5	-5.187		
2477-	MPC	100	1832	1	1.0	2200	1	-1.0		&45
2478-	&45		2200	5	-0.8471	2200	6	3.1217		
2479-	MPC	100	1832	2	1.0	2200	2	-1.0		&46
2480-	&46		2200	4	.8471	2200	6	5.187		
2481-	MPC	100	1832	3	1.0	2200	3	-1.0		&47
2482-	&47		2200	4	-3.1217	2200	5	-5.187		
2483-	MPC	100	1928	3	4.644	1917	3	-3.1		&M1928Z
2484-	&M1928Z		1918	3	-1.544					
2485-	MPC	100	1931	2	7.439	1921	2	-4.2351		&M1931FY
2486-	&M1931FY		2025	2	-3.2039					
2487-	MPC	100	2035	1	1.0	2200	1	-1.0		&54
2488-	&54		2200	5	3.2083	2200	6	0.4121		
2489-	MPC	100	2035	2	1.0	2200	2	-1.0		&55
2490-	&55		2200	4	-3.2083	2200	6	-5.454		
2491-	MPC	100	2035	3	1.0	2200	3	-1.0		&56
2492-	&56		2200	4	-.4121	2200	5	5.454		
2493-	MPC	100	2039	1	1.0	2200	1	-1.0		&51
2494-	&51		2200	5	-0.8471	2200	6	3.1217		
2495-	MPC	100	2039	2	1.0	2200	2	-1.0		&52
2496-	&52		2200	4	.8471	2200	6	-4.920		
2497-	MPC	100	2039	3	1.0	2200	3	-1.0		&53
2498-	&53		2200	4	-3.1217	2200	5	4.920		
2499-	MPC	101	1701	1	1.0	1701	3	-.01699		&M1701XS
2500-	&M1701XS		1800	1	-1.00187	1801	3	-.04417		

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2501-	MPC	101	1721	1	1.0	1701	3	-.01699		&M1721XS
2502-	&M1721XS		1800	1	-1.00187	1801	3	-.04417		
2503-	MPC	101	1721	3	1.0	1701	3	-.27778		&M1721ZS
2504-	&M1721ZS		1801	3	-.72222					
2505-	MPC	101	1723	1	1.0	1721	1	-1.0		
2506-	MPC	101	1724	1	1.0	1722	1	-1.0		
2507-	MPC	101	1800	3	1.0	1701	3	-.27830		&M1800ZS
2508-	&M1800ZS		1800	1	-.06116	1801	3	-.72358		
2509-	MPC	101	1801	1	1.0	1701	3	-.01699		&M1801XS
2510-	&M1801XS		1800	1	-1.00187	1801	3	-.04417		
2511-	MPC	101	1802	1	1.0	1701	3	-.01699		&M1802XS
2512-	&M1802XS		1800	1	-1.00187	1801	3	-.04417		
2513-	MPC	101	1802	3	1.0	1801	3	-1.0		
2514-	MPC	102	1721	1	1.0	1701	2	.37892		&M1721XA
2515-	&M1721XA		1800	2	-.37892					
2516-	MPC	102	1721	2	1.0	1800	2	-1.0		
2517-	MPC	102	1721	3	1.0	1802	3	-.72225		
2518-	MPC	102	1801	2	1.0	1800	2	-1.38462		&M1801YA
2519-	&M1801YA		1701	2	.38462					
2520-	MPC	102	1802	1	1.0	1701	2	.52465		&M1802XA
2521-	&M1802XA		1800	2	-.52465					
2522-	MPC	102	1802	2	1.0	1800	2	-1.38462		&M1802YA
2523-	&M1802YA		1701	2	.38462					
2524-	MPCADD	401	100	101						
2525-	MPCADD	402	100	102						
2526-	PARAM	GRDPNT	0							
2527-	PARAM	TPNAME	FUSSP1							
2528-	PARAM	WTMASS	.002588							
2529-	PBAR	181	12	.001	.001					
2530-	PBAR	194	28	.001	.001					
2531-	PBAR	463	2	.232	.0422	.0	.0	.0		
2532-	PBAR	464	2	.232	.0422	.0	.0	.0		
2533-	PBAR	465	2	.232	.0422	.0	.0	.0		
2534-	PBAR	466	2	.232	.0422	.0	.0	.0		
2535-	PBAR	467	2	.232	.0422	.0	.0	.0		
2536-	PBAR	1927	2	.103	.0343	.0	.0	.0		
2537-	PBAR	1928	2	.103	.0343	.0	.0	.0		
2538-	PBAR	1929	2	.103	.0343	.0	.0	.0		
2539-	PBAR	1930	2	.103	.0343	.0	.0	.0		
2540-	PBAR	1931	2	.103	.0343	.0	.0	.0		
2541-	PBAR	2101	2	.0992	.0325	.001	.001	.0		
2542-	PBAR	2102	2	.0992	.0325	.001	.001	.0		
2543-	PBAR	2103	2	.0992	.0325	.001	.001	.0		
2544-	PBAR	2104	2	.0992	.0325	.001	.001	.0		
2545-	PBAR	2105	2	.1048	.0355	.001	.001	.0		
2546-	PBAR	2106	2	.1048	.0355	.001	.001	.0		
2547-	PBAR	2107	2	.1048	.0355	.001	.001	.0		
2548-	PBAR	2108	2	.1048	.0355	.001	.001	.0		
2549-	PBAR	2109	2	.1048	.0355	.001	.001	.0		
2550-	PBAR	2110	2	.1048	.0355	.001	.001	.0		

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2551-	PBAR	2111	2	.1048	.0355	.001	.001	.0		
2552-	PBAR	2112	2	.1048	.0355	.001	.001	.0		
2553-	PBAR	2113	2	.1048	.0355	.001	.001	.0		
2554-	PBAR	2114	2	.1048	.0355	.001	.001	.0		
2555-	PBAR	2502	2	.10	.0465	.002	.0	.0		
2556-	PBAR	2713	2	.0649	.03	.0	.0	.0		
2557-	PQDMEM2	10161	6	.04000						
2558-	PQDMEM2	10162	6	.04000						
2559-	PQDMEM2	10163	6	.04000						
2560-	PQDMEM2	10164	6	.04000						
2561-	PQDMEM2	10165	6	.04000						
2562-	PQDMEM2	10166	6	.04000						
2563-	PQDMEM2	10167	6	.04000						
2564-	PQDMEM2	10168	6	.04000						
2565-	PQDMEM2	10169	6	.04000						
2566-	PQDMEM2	10170	6	.04000						
2567-	PQDMEM2	10171	6	.04000						
2568-	PQDMEM2	10172	6	.04000						
2569-	PQDMEM2	10173	6	.04000						
2570-	PQDMEM2	10174	6	.04000						
2571-	PQDMEM2	10175	6	.04000						
2572-	PQDMEM2	10176	6	.04000						
2573-	PQDMEM2	10177	6	.04000						
2574-	PQDMEM2	10270	6	.04000						
2575-	PQDMEM2	10271	6	.04000						
2576-	PQDMEM2	10272	6	.04000						
2577-	PQDMEM2	10273	6	.04000						
2578-	PQDMEM2	10274	6	.04000						
2579-	PQDMEM2	10275	6	.04000						
2580-	PQDMEM2	10276	6	.04000						
2581-	PQDMEM2	10277	6	.04000						
2582-	PQDMEM2	10278	6	.04000						
2583-	PQDMEM2	10279	6	.04000						
2584-	PQDMEM2	10280	6	.04000						
2585-	PQDMEM2	10281	6	.04000						
2586-	PQDMEM2	10282	6	.04000						
2587-	PQDMEM2	10283	6	.04000						
2588-	PQDMEM2	10284	6	.04000						
2589-	PQDMEM2	10285	6	.04000						
2590-	PQDMEM2	10286	6	.04000						
2591-	PQDMEM2	12040	6	.03200						
2592-	PQDMEM2	12041	6	.03200						
2593-	PQDMEM2	12042	6	.03200						
2594-	PQDMEM2	12043	6	.03200						
2595-	PQDMEM2	12044	6	.03200						
2596-	PQDMEM2	12045	6	.03200						
2597-	PQDMEM2	12046	6	.03200						
2598-	PQDMEM2	12047	6	.03200						
2599-	PQDMEM2	12048	6	.03200						
2600-	PQDMEM2	12049	6	.03200						

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2601-	PQDMEM2	12050	6	.03200						
2602-	PQDMEM2	12051	6	.03200						
2603-	PQDMEM2	12052	6	.03200						
2604-	PQDMEM2	12053	6	.03200						
2605-	PQDMEM2	12054	6	.03200						
2606-	PQDMEM2	12055	6	.03200						
2607-	PQDMEM2	12056	6	.03200						
2608-	PQDMEM2	12057	6	.03200						
2609-	PQDMEM2	12058	6	.03200						
2610-	PQDMEM2	12059	6	.03200						
2611-	PQDMEM2	12060	6	.03200						
2612-	PQDMEM2	12061	6	.03200						
2613-	PQDMEM2	12062	6	.03200						
2614-	PQDMEM2	12063	6	.03200						
2615-	PQDMEM2	12064	6	.03200						
2616-	PQDMEM2	12065	6	.03200						
2617-	PQDMEM2	12066	6	.03200						
2618-	PQDMEM2	12068	6	.03200						
2619-	PQDMEM2	12069	6	.03200						
2620-	PQDMEM2	12200	8	.02000						
2621-	PQDMEM2	12201	8	.02000						
2622-	PQDMEM2	12202	8	.02000						
2623-	PQDMEM2	12203	8	.02000						
2624-	PQDMEM2	12204	8	.02000						
2625-	PQDMEM2	12205	8	.02000						
2626-	PQDMEM2	12206	8	.02000						
2627-	PQDMEM2	12207	8	.02000						
2628-	PQDMEM2	12208	8	.02000						
2629-	PQDMEM2	12209	8	.02000						
2630-	PQDMEM2	12300	8	.02000						
2631-	PQDMEM2	12301	8	.02000						
2632-	PQDMEM2	12302	8	.02000						
2633-	PQDMEM2	12303	8	.02000						
2634-	PQDMEM2	12304	8	.02000						
2635-	PQDMEM2	12305	8	.02000						
2636-	PQDMEM2	12306	8	.02000						
2637-	PQDMEM2	12307	8	.02000						
2638-	PQDMEM2	12308	8	.02000						
2639-	PQDMEM2	12309	8	.02000						
2640-	PQDMEM2	12310	8	.02000						
2641-	PQDMEM2	12311	8	.02000						
2642-	PQDMEM2	12312	8	.02000						
2643-	PQDMEM2	12313	8	.02000						
2644-	PQDMEM2	12403	8	.02000						
2645-	PQDMEM2	12404	8	.02000						
2646-	PQDMEM2	12405	8	.02000						
2647-	PQDMEM2	12406	8	.02000						
2648-	PQDMEM2	12407	8	.02000						
2649-	PQDMEM2	12408	8	.02000						
2650-	PQDMEM2	12409	8	.02000						

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2651-	PQDMEM2	12410	8	.02000						
2652-	PQDMEM2	12411	8	.02000						
2653-	PQDMEM2	12413	8	.02000						
2654-	PQDMEM2	12414	8	.02000						
2655-	PQDMEM2	12415	8	.02000						
2656-	PQDMEM2	12416	8	.02000						
2657-	PQDMEM2	12417	8	.02000						
2658-	PQDMEM2	12418	8	.02000						
2659-	PQDMEM2	12419	8	.02000						
2660-	PQDMEM2	12420	8	.02000						
2661-	PQDMEM2	12421	8	.02000						
2662-	PQDMEM2	12422	8	.02000						
2663-	PQDMEM2	12424	8	.02000						
2664-	PQDMEM2	12425	8	.02000						
2665-	PQDMEM2	12426	8	.02000						
2666-	PQDMEM2	12427	8	.02000						
2667-	PQDMEM2	12428	8	.02000						
2668-	PQDMEM2	12429	8	.02000						
2669-	PQDMEM2	12430	8	.02000						
2670-	PQDMEM2	12431	8	.02000						
2671-	PQDMEM2	12432	8	.02000						
2672-	PQDMEM2	12650	18	.375						
2673-	PQDMEM2	12651	18	.375						
2674-	PQDMEM2	12652	18	.375						
2675-	PQDMEM2	12653	18	.375						
2676-	PQDMEM2	12654	18	.375						
2677-	PQDMEM2	12655	18	.375						
2678-	PQDMEM2	12656	8	.02000						
2679-	PQDMEM2	12657	8	.02000						
2680-	PQDMEM2	12658	8	.02000						
2681-	PQDMEM2	12659	8	.02000						
2682-	PQDMEM2	12700	8	.01600						
2683-	PQDMEM2	12701	8	.01600						
2684-	PQDMEM2	12702	8	.01600						
2685-	PQDMEM2	12703	8	.01600						
2686-	PQDMEM2	12704	8	.01600						
2687-	PQDMEM2	12705	8	.01600						
2688-	PSHEAR	10178	6	.04000						
2689-	PSHEAR	10179	6	.04000						
2690-	PSHEAR	10287	6	.04000						
2691-	PSHEAR	10288	6	.04000						
2692-	PSHEAR	10289	6	.04000						
2693-	PSHEAR	10290	6	.04000						
2694-	PSHEAR	10291	6	.04000						
2695-	PSHEAR	10292	6	.04000						
2696-	PSHEAR	10293	6	.04000						
2697-	PSHEAR	10294	6	.04000						
2698-	PSHEAR	10295	6	.04000						
2699-	PSHEAR	10296	6	.04000						
2700-	PSHEAR	10351	6	.12500						

S O R T E D B U L K D A T A E C H O

CARD COUNT	. 1	.. 2	.. 3	.. 4	.. 5	.. 6	.. 7	.. 8	.. 9	.. 10 .
2701-	PSHEAR	10352	6	.12500						
2702-	PSHEAR	10353	6	.12500						
2703-	PSHEAR	10354	6	.21600						
2704-	PSHEAR	10355	6	.09100						
2705-	PSHEAR	10356	6	.09100						
2706-	PSHEAR	10357	6	.09100						
2707-	PSHEAR	10358	6	.09100						
2708-	PSHEAR	10401	6	.12500						
2709-	PSHEAR	10402	6	.12500						
2710-	PSHEAR	10403	6	.12500						
2711-	PSHEAR	10404	6	.12500						
2712-	PSHEAR	10551	6	.12500						
2713-	PSHEAR	10552	6	.12500						
2714-	PSHEAR	10553	6	.12500						
2715-	PSHEAR	10554	6	.21600						
2716-	PSHEAR	10555	6	.09100						
2717-	PSHEAR	10556	6	.09100						
2718-	PSHEAR	10557	6	.09100						
2719-	PSHEAR	10558	6	.09100						
2720-	PSHEAR	10651	6	.12500						
2721-	PSHEAR	10652	6	.12500						
2722-	PSHEAR	10653	6	.12500						
2723-	PSHEAR	10654	6	.21600						
2724-	PSHEAR	10655	6	.09100						
2725-	PSHEAR	10656	6	.09100						
2726-	PSHEAR	10657	6	.09100						
2727-	PSHEAR	10658	6	.09100						
2728-	PSHEAR	10751	6	.12500						
2729-	PSHEAR	10752	6	.12500						
2730-	PSHEAR	10753	6	.12500						
2731-	PSHEAR	10754	6	.21600						
2732-	PSHEAR	10755	6	.09100						
2733-	PSHEAR	10756	6	.09100						
2734-	PSHEAR	10757	6	.09100						
2735-	PSHEAR	10758	6	.09100						
2736-	PSHEAR	10851	6	.12500						
2737-	PSHEAR	10852	6	.12500						
2738-	PSHEAR	10853	6	.12500						
2739-	PSHEAR	10854	6	.21600						
2740-	PSHEAR	10855	6	.09100						
2741-	PSHEAR	10856	6	.09100						
2742-	PSHEAR	10857	6	.09100						
2743-	PSHEAR	10858	6	.09100						
2744-	PSHEAR	10951	6	.04000						
2745-	PSHEAR	10952	6	.04000						
2746-	PSHEAR	10953	6	.04000						
2747-	PSHEAR	10954	6	.13100						
2748-	PSHEAR	10959	6	.09100						
2749-	PSHEAR	10960	6	.09100						
2750-	PSHEAR	10961	6	.09100						

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2751-	PSHEAR	10962	6	.09100						
2752-	PSHEAR	11040	6	.04000						
2753-	PSHEAR	11041	6	.04000						
2754-	PSHEAR	11042	6	.04000						
2755-	PSHEAR	11043	6	.13100						
2756-	PSHEAR	11048	6	.09100						
2757-	PSHEAR	11049	6	.09100						
2758-	PSHEAR	11050	6	.09100						
2759-	PSHEAR	11051	6	.09100						
2760-	PSHEAR	11140	6	.04000						
2761-	PSHEAR	11141	6	.04000						
2762-	PSHEAR	11142	6	.04000						
2763-	PSHEAR	11143	6	.13100						
2764-	PSHEAR	11145	6	.09100						
2765-	PSHEAR	11146	6	.09100						
2766-	PSHEAR	11147	6	.09100						
2767-	PSHEAR	11148	6	.09100						
2768-	PSHEAR	11240	6	.12500						
2769-	PSHEAR	11241	6	.12500						
2770-	PSHEAR	11242	6	.12500						
2771-	PSHEAR	11243	6	.21600						
2772-	PSHEAR	11244	6	.09100						
2773-	PSHEAR	11245	6	.09100						
2774-	PSHEAR	11246	6	.09100						
2775-	PSHEAR	11247	6	.09100						
2776-	PSHEAR	11248	6	.09100						
2777-	PSHEAR	11340	6	.12500						
2778-	PSHEAR	11341	6	.12500						
2779-	PSHEAR	11342	6	.12500						
2780-	PSHEAR	11343	6	.21600						
2781-	PSHEAR	11344	6	.09100						
2782-	PSHEAR	11345	6	.09100						
2783-	PSHEAR	11346	6	.09100						
2784-	PSHEAR	11347	6	.09100						
2785-	PSHEAR	11348	6	.09100						
2786-	PSHEAR	11440	6	.04000						
2787-	PSHEAR	11441	6	.04000						
2788-	PSHEAR	11442	6	.04000						
2789-	PSHEAR	11443	6	.13100						
2790-	PSHEAR	11444	6	.09100						
2791-	PSHEAR	11445	6	.09100						
2792-	PSHEAR	11446	6	.09100						
2793-	PSHEAR	11447	6	.09100						
2794-	PSHEAR	11540	6	.09100						
2795-	PSHEAR	11541	6	.09100						
2796-	PSHEAR	11542	6	.09100						
2797-	PSHEAR	11543	6	.09100						
2798-	PSHEAR	11640	6	.04000						
2799-	PSHEAR	11641	6	.04000						
2800-	PSHEAR	11642	6	.04000						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2801-	PSHEAR	11643	6	.13100						
2802-	PSHEAR	11644	6	.09100						
2803-	PSHEAR	11645	6	.09100						
2804-	PSHEAR	11646	6	.09100						
2805-	PSHEAR	11647	6	.09100						
2806-	PSHEAR	11740	6	.04000						
2807-	PSHEAR	11741	6	.04000						
2808-	PSHEAR	11742	6	.04000						
2809-	PSHEAR	11743	6	.13100						
2810-	PSHEAR	11744	6	.09100						
2811-	PSHEAR	11745	6	.09100						
2812-	PSHEAR	11746	6	.09100						
2813-	PSHEAR	11747	6	.09100						
2814-	PSHEAR	11860	6	.04000						
2815-	PSHEAR	11861	6	.04000						
2816-	PSHEAR	11862	6	.04000						
2817-	PSHEAR	11863	6	.04000						
2818-	PSHEAR	11864	6	.08000						
2819-	PSHEAR	11865	6	.04000						
2820-	PSHEAR	11866	6	.04000						
2821-	PSHEAR	11867	6	.04000						
2822-	PSHEAR	11868	6	.04000						
2823-	PSHEAR	11869	6	.04000						
2824-	PSHEAR	11870	6	.04000						
2825-	PSHEAR	11871	6	.04000						
2826-	PSHEAR	11872	6	.04000						
2827-	PSHEAR	11873	6	.04000						
2828-	PSHEAR	11874	6	.04000						
2829-	PSHEAR	11875	6	.04000						
2830-	PSHEAR	11876	6	.04000						
2831-	PSHEAR	11877	6	.04000						
2832-	PSHEAR	11878	6	.04000						
2833-	PSHEAR	11879	6	.04000						
2834-	PSHEAR	11940	6	.08000						
2835-	PSHEAR	11941	6	.04000						
2836-	PSHEAR	11942	6	.04000						
2837-	PSHEAR	11943	6	.04000						
2838-	PSHEAR	11944	6	.04000						
2839-	PSHEAR	11945	6	.08000						
2840-	PSHEAR	11946	6	.04000						
2841-	PSHEAR	11947	6	.04000						
2842-	PSHEAR	11948	6	.04000						
2843-	PSHEAR	12210	26	.025						
2844-	PSHEAR	12320	36	.020						
2845-	PSHEAR	12412	16	.020						
2846-	PSHEAR	12600	46	.020						
2847-	PSHEAR	12630	16	.02000						
2848-	PSHEAR	12631	16	.02000						
2849-	PSHEAR	12632	16	.02000						
2850-	PSHEAR	12634	16	.02000						

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2851-	PSHEAR	12635	16	.02000						
2852-	PSHEAR	12636	16	.02000						
2853-	PSHEAR	12638	16	.02000						
2854-	PSHEAR	12640	16	.04000						
2855-	PSHEAR	12641	16	.04000						
2856-	PSHEAR	12706	16	.01600						
2857-	PSHEAR	12707	16	.03200						
2858-	PSHEAR	12708	16	.03200						
2859-	PTRMEM	10180	4	.04000						
2860-	PTRMEM	10297	4	.04000						
2861-	PTRMEM	12067	4	.03200						
2862-	PTRMEM	12070	4	.032						
2863-	PTRMEM	12278	8	.02500						
2864-	PTRMEM	12620	8	.02000						
2865-	SPC1	200	1	107	THRU	109				
2866-	SPC1	200	1	116	THRU	119				
2867-	SPC1	200	1	121	THRU	124				
2868-	SPC1	200	1	126	128	130				
2869-	SPC1	200	1	208	THRU	211				
2870-	SPC1	200	1	214	THRU	217				
2871-	SPC1	200	1	225	226	228	229	231	232	
2872-	SPC1	200	1	234	235	237	238	240	241	
2873-	SPC1	200	1	506	THRU	509				
2874-	SPC1	200	1	511	513	515	517			
2875-	SPC1	200	1	606	THRU	609				
2876-	SPC1	200	1	611	613	615	617			
2877-	SPC1	200	1	706	THRU	709				
2878-	SPC1	200	1	711	713	715	717			
2879-	SPC1	200	1	806	THRU	809				
2880-	SPC1	200	1	811	813	815	817			
2881-	SPC1	200	1	912	THRU	914				
2882-	SPC1	200	1	916	918	920	922			
2883-	SPC1	200	1	1012	THRU	1014				
2884-	SPC1	200	1	1016	1018	1020	1022			
2885-	SPC1	200	1	1112	THRU	1114				
2886-	SPC1	200	1	1116	1118	1120	1122			
2887-	SPC1	200	1	1207	THRU	1209				
2888-	SPC1	200	1	1211	1213	1215	1217	1219		
2889-	SPC1	200	1	1307	THRU	1309				
2890-	SPC1	200	1	1311	1313	1315	1317	1319		
2891-	SPC1	200	1	1411	1413	1415	1417			
2892-	SPC1	200	1	1503	1505	1507	1509			
2893-	SPC1	200	1	1611	1613	1615	1617			
2894-	SPC1	200	1	1711	1713	1715	1717			
2895-	SPC1	200	1	1813	1815	1818	1819			
2896-	SPC1	200	1	1825	THRU	1827				
2897-	SPC1	200	1	1829	THRU	1831				
2898-	SPC1	200	1	1833	THRU	1835				
2899-	SPC1	200	1	1906	THRU	1913				
2900-	SPC1	200	1	2006	THRU	2009				

SORTED BULK DATA ECHO

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2901-	SPC1	200	1	2012	2013	2027	2028			
2902-	SPC1	200	1	2016	THRU	2019				
2903-	SPC1	200	1	2021	THRU	2024				
2904-	SPC1	200	1	2031	THRU	2034				
2905-	SPC1	200	1	2036	THRU	2038				
2906-	SPC1	200	4	243	518	618	718	760	818	
2907-	SPC1	200	4	923	1023	1123	1161	1220	1320	
2908-	SPC1	200	4	1418	1510	1618	1718			
2909-	SPC1	200	5	1922						
2910-	SPC1	200	6	1930						
2911-	SPC1	200	46	1821	1934					
2912-	SPC1	200	56	151	THRU	169				
2913-	SPC1	200	56	305	310	312	314	316		
2914-	SPC1	200	56	1201	1206	1221				
2915-	SPC1	200	56	1905	1918	1919	1920	1921		
2916-	SPC1	200	56	1923	THRU	1927				
2917-	SPC1	200	56	1929						
2918-	SPC1	200	456	101	THRU	131				
2919-	SPC1	200	456	201	THRU	230				
2920-	SPC1	200	456	231	THRU	242				
2921-	SPC1	200	456	301	THRU	304				
2922-	SPC1	200	456	501	THRU	517				
2923-	SPC1	200	456	601	THRU	617				
2924-	SPC1	200	456	701	THRU	717				
2925-	SPC1	200	456	801	THRU	817				
2926-	SPC1	200	456	901	THRU	905				
2927-	SPC1	200	456	910	THRU	922				
2928-	SPC1	200	456	1001	THRU	1005				
2929-	SPC1	200	456	1010	THRU	1022				
2930-	SPC1	200	456	1101	THRU	1105				
2931-	SPC1	200	456	1110	THRU	1122				
2932-	SPC1	200	456	1202	THRU	1205				
2933-	SPC1	200	456	1207	THRU	1219				
2934-	SPC1	200	456	1301	THRU	1319				
2935-	SPC1	200	456	1321	1516	1517				
2936-	SPC1	200	456	1401	THRU	1417				
2937-	SPC1	200	456	1501	THRU	1509				
2938-	SPC1	200	456	1601	THRU	1617				
2939-	SPC1	200	456	1701	THRU	1717				
2940-	SPC1	200	456	1721	THRU	1724				
2941-	SPC1	200	456	1800						
2942-	SPC1	200	456	1801	THRU	1815				
2943-	SPC1	200	456	1817	THRU	1820				
2944-	SPC1	200	456	1822	THRU	1823				
2945-	SPC1	200	456	1825	THRU	1838				
2946-	SPC1	200	456	1901	THRU	1904				
2947-	SPC1	200	456	1906	THRU	1917				
2948-	SPC1	200	456	1928	1935	1936				
2949-	SPC1	200	456	1931	THRU	1933				
2950-	SPC1	200	456	2001	THRU	2042				

S O R T E D B U L K D A T A E C H O

CARD COUNT	1	2	3	4	5	6	7	8	9	10
2951-	SPC1	200	1456	306	THRU	309				
2952-	SPC1	200	1456	311	313	315	317			
2953-	SPC1	200	1456	406	THRU	409				
2954-	SPC1	201	2	101	106	111	116	121	130	
2955-	SPC1	201	2	131	201	207	213	219		
2956-	SPC1	201	2	240	THRU	242				
2957-	SPC1	201	2	301	306	406				
2958-	SPC1	201	2	501	506	601	606	701	706	
2959-	SPC1	201	2	801	806	901	911	1001	1011	
2960-	SPC1	201	2	1101	1301	1321	1401	1406		
2961-	SPC1	201	2	1111						
2962-	SPC1	201	2	1601	1606	1516				
2963-	SPC1	201	2	1701	1706	1723	1724	1800		
2964-	SPC1	201	2	1721	1802					
2965-	SPC1	201	2	1801	1807	1821	1825	1829	1833	
2966-	SPC1	201	2	1837	1901	1906	1910	1914		
2967-	SPC1	201	2	1934	1936	2001	2006	2011	2016	
2968-	SPC1	201	2	2021	2026	2031	2036	2040		
2969-	SPC1	201	24	151	164	166	165	1201	1221	
2970-	SPC1	201	24	1927	1930					
2971-	SPC1	201	246	2101	2115					
2972-	SPC1	202	3	116	121	130	213	240	241	
2973-	SPC1	202	3	306	406	506	606	706	806	
2974-	SPC1	202	3	1825	1829	1833	1906	1910		
2975-	SPC1	202	3	2006	2016	2021	2031	2036		
2976-	SPC1	202	13	101	106	111	131	165		
2977-	SPC1	202	13	151	164	166	201	207	219	
2978-	SPC1	202	13	242	301	501	601	701	1101	
2979-	SPC1	202	13	801	901	911	1001	1011		
2980-	SPC1	202	13	1111	1401	1406	1516	1601	1606	
2981-	SPC1	202	13	1201	1206	1221	1301	1306	1321	
2982-	SPC1	202	13	1701	1706	1723	1724			
2983-	SPC1	202	13	1800	1801	1807	1837			
2984-	SPC1	202	13	1901	1914	1927	1936			
2985-	SPC1	202	13	2001	2011	2026	2040			
2986-	SPC1	202	135	1821	1930	1934				
2987-	SPC1	202	135	2101	2115					
2988-	SPCADD	301	200	201						
2989-	SPCADD	302	200	202						
2990-	SUPORT	229	23	232	23	235	23	238	23	
2991-	SUPORT	241	3	301	3	506	3	518	135	
2992-	SUPORT	760	135	1105	123	1115	13	1161	135	
2993-	SUPORT	1205	123	1212	13	1405	123	1410	123	
2994-	SUPORT	1505	3	1506	3	1613	3	1614	3	
2995-	SUPORT	1516	1	1606	1	1605	123	1610	123	
2996-	SUPORT	1618	135	1705	123	1710	123	1800	1	
2997-	SUPORT	1823	23	1827	23	1831	23	1835	23	
2998-	SUPORT	1833	3	1905	123	1918	123	1838	123	
2999-	SUPORT	1926	1	2041	123	2114	123			
	ENDDATA									