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SPAR IMPROVED STRUCTURE/FLUID DYNAMIC ANALYSIS CAPABILITY

PHASE II - FINAL REPORT

CONTRACT NAS8-34975

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FOREWORD

This final report presents the results of work performed under Contract NAS8-34975 for the National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Huntsville, Alabama. This work was performed by personnel in the Product Engineering & Development Section of the Lockheed-Huntsville Research & Engineering Center and two subcontractors. The Computational Mechanics Company, Inc., Austin, Texas, served as subcontractor to Lockheed during the first phase of this effort, and Softcom Systems, Inc., Huntsville, Alabama, served as subcontractor during the second phase.

The period of performance for this study was from August 1982 through June 1984. The MSFC Contracting Officer's Representative for this study was Larry A. Kiefling, ED22.

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1. INTRODUCTION

SPAR (Structural Performance Analysis and Redesign) is a widely used general purpose structural analysis finite element code. SPAR has been developed over the past several years under contract to NASA-Marshall Space Flight Center and NASA-Langley Research Center. Development is currently being done by Lockheed.

This contract consisted of two phases. The objective of the first phase was to adapt or develop an efficient and general method of analyzing a coupled dynamic system of flowing fluid and elastic structure. The results of this phase are documented in an interim report (Ref. 1), issued in August 1983. J. T. Oden of The Computational Mechanics Company, Inc., Austin, Texas, served as subcontractor to Lockheed during this phase.

The objective of the second phase was to improve the operation of SPAR by improving efficiency, user features, and documentation. M. L. Pearson of Softcom Systems, Inc., Huntsville, Alabama, served as subcontractor to Lockheed during this phase. This report contains a summary of the work performed during the second phase of the contract.

Improvements were made in the SPAR graphics processors, particularly in the area of user interaction. All error codes in the program were documented, including recommended corrective action where appropriate. A SPAR processor/subroutine cross reference was included also.

2. SPAR UPDATES

2.1 GENERAL

Several improvements were made in the SPAR graphics processors during this study. The conversion of PLTB to the MSFC Univac Tektronix Graphics system was completed. This provides a means for updating and improving the Tektronix version of this processor, PLTB/TEK. Also, additional stress display capability was added to both versions.

The improved versions of PLTB and PLTB/TEK reside in the MSFC Tape Library on reel #24402. The absolute programs are on file 1, the PLTB/TEK symbolics and relocatables are on file 6, and the PLTB symbolics and relocatables are on file 7.

Both PLTB and PLTB/TEK may be used with SPAR 15C.

2.2 PLTB/TEK

Several improvements were made in the user interface to PLTB/TEK. The principal features of the new version are:

- Completes frame automatically without requiring user to input the next command.
- Provides an automatic hardcopy and frame advance option. (OPTION 30)
- Sounds bell and waits for user to enter a "RETURN" before clearing screen.

- Utilizes entire screen area for single view plot specifications with the longer dimension in the horizontal direction.
- Provides a choice of four character sizes for "large" characters on 4014 models. (Frame labeling is done with the selected "large" character size.)
- Provides RESET for operation on 4010 models.

Resets

RESET NDEV=4010 (for 4010 models)

RESET NDEV=4014 (for 4014 models without enhanced graphics)

Note: Defaults to 4014 models with enhanced graphics.

RESET CHRS=n (defaults to 2)

Note: This reset applies to 4014 models with enhanced graphics only.

CHARACTER SIZE 1	Optional "large" character size
CHARACTER SIZE 2	Default "large" character size (Options 10, 12, etc.)
CHARACTER SIZE 3	Optional "large" character size
CHARACTER SIZE 4	"Small" character size (Options 11, 13, 15, etc.) (May also be selected for "large" character size, CHRS=4)

2.3 LAMINATE STRESS DISPLAY

Stress display capability for E33 and E43 elements with laminate section properties was added to both PLTB and PLTB/TEK.

The format of the control statement to cause stress or internal load data to be displayed is as follows:

LAMINATE = SX/div, node, layer, TXY,...

Notes

- "/div" may be omitted.
- "node" and "layer" must be present for stress displays (SX, SY, TXY). (No default exists for "layer".)
- "node" and "layer" may be omitted for internal load (stress resultant) displays. ("layer" is meaningless for internal load displays.)
- Principal stress quantities are not available for laminate sections.

3. ERROR CODE DOCUMENTATION

3.1 GENERAL

This section contains a tabulation of the error messages produced by the SPAR processors. The messages are grouped by processor and arranged in alphabetical order within each processor group. The symbolic name of the SPAR routine that produces the message is indicated along with the name of the file in which the routine resides.

Except for messages which are self explanatory, a brief explanation of the error is given, along with recommended corrective action where appropriate.

Messages which are produced by two or more routines within a single processor are listed only once under that processor heading, but the filename and symbolic name are given for each routine within that processor which may generate the message.

Identical messages which may be produced by two or more processors are listed under each processor heading. Messages which are generated by various SPAR utility routines, and therefore, may arise from any or all processors, are listed under the heading "All Routines" at the beginning of the section.

Many of the error codes are documented in the SPAR Reference Manual (Ref. 2), and are repeated here in order to provide a complete error code document.

3.2 ALL PROCESSORS

Error Message	Spar Routine

ERROR IN INPUT FORMAT. REC/WORD/CHAR= x x x — R2.READER/9
KK= x x x x x x
FATAL ERROR. NERR, N=DECO n

FATAL ERROR. NERR, N=XXXX x — R2.FIN/10

This message is often preceded by an explanatory message. Descriptions of specific messages of this form are given in the individual processor sections.

FATAL ERROR. NERR, N=NSG n — R2.NTOC/9

An attempt was made to reference a non-existent SPAR library n.

FATAL ERROR. NERR, N=OWRT n — R2.DAL/9

An attempt was made to overwrite a TOC entry for a data set not present in library n.

FATAL ERROR. NERR, N=RIND n — R2. RDIND/7

The maximum number of data sets allowed for library n has been reached. The normal limit is 2048 data sets per library.

INOPERABLE DATA SET. — R2.PRLINE/9

This message is followed by a TOC line printout of the faulty data set.

INPUT DATA ERROR. RECORD n — R2.ERMSG1/1
card image echo

This message indicates an error in input record n. If multiple records are placed on a card image via use of colons (:), the "n" refers to the input "record" number and not the card image number. An echo of the data record containing the error is printed out.

Error Message	Spar Routine
LIB READ ERROR. NU,L,KORE,IERR= x x x x NAME= XXXX XXXX x x	R2.DAL/9

An attempt to access a data set was unsuccessful.
The symbols are defined as follows:

NU = SPAR library

L = Data set block length (if the data set exists)

KORE = Core space available for loading the data set.

IERR = Error code
-1 - data set is incomplete (or absent)
1 - minor error in data set
2 - core space is insufficient to load data set.

NAME = Data set name

This message may be followed by

FATAL ERROR. NERR, N=RERR x

**RESET ERROR. IMAGE FOLLOWS. Card image echo FATAL ERROR. NERR, N=RESE n	R2.RSET/8

An error is present on the above RESET command.

Error Message	Spar Routine
** RIO ERR. NU,IWR,IOP,KSHFT,L,ISTAT= x x x x x x INDEX= x x x x x x x	R2.RIO/9

An error occurred during an I/O transmission.
The parameters have the following meanings:

NU = SPAR library.

IWR = 1, if writing; 2, if reading.

IOP = Addressing mode indicator.

KSHFT = Addressing parameter.

L = Number of words in the requested transmission.

ISTAT = I/O Status Code
See: SPERRY UNIVAC SERIES 1100 Executive System
Volume 2 EXEC Manual, page C-19
for code descriptions.

INDEX = Parameters used in diagnosis.

TAPE READ ERROR. NTAPE,L,IO,ISTAT,NWT= x x x x x FATAL ERROR. NERR, N=TAPE n	R2.TIO/6

An error occured during a tape I/O transmission.
For description of I/O status codes (ISTAT),
see: SPERRY UNIVAC SERIES 1100 Executive System
Volume 2 EXEC Manual, page C-19.

3.3 TAB

Error Message	Spar Routine
BEND STIFFNESS MATRIX SINGULAR, ENTRY x	R3.F1T13/11 (ASA)
******COORDINATE INPUT ERRO.. I, J, JLOCAL, JOINT = x x x x	R3.F1T051/8 (XBLOCK)
CORE INADEQUATE TO FORM QJ(3,3,JT). AVAIL, REQ= x x	R3.AQJJT/7
ERROR IN SPECIFICATION OF JOINT ELIMINATION ORDER JOINT= x ORDER= x	R3.F1T17/11 (SEQGEN)
ERROR, K=1 NOT ALLOWED The global frame is always 1; therefore, alternate reference frames must start with 2.	R3.F1T04/10 (AQ)
*** ERROR. JOINT REFERENCE FRAME ASSIGNMENT PRECLUDES SYMMETRY OR ANTI-SYMMETRY CONSTRAINT. JOINT= x.	R3.F1T15B/10 (SASCON)
***ERRORS IN INPUT PREVENT CALCULATION OF QJ(3,3,JT) One of the following data sets is marked in error as a result of input data errors: ALTR BTAB 2 4 JLOC BTAB 2 5 JREF BTAB 2 6	R3.AQJJT/7
x ERRORS IN ELIM ORDER SPECIFICATION	R3.F1T17/11 (SEQGEN)
*** FATAL ERROR IN ABOVE DATA	R3.F1T08/7 (ARL2)
FATAL ERROR. NAME,N=xxxx x Card out of sequence. Trying to read section property continuation card.	R3.F1T09/15 (ABA)
FATAL ERROR. NERR, N=INCD n	R3.INCARD/7

Error Message	Spar Routine
FATAL ERROR. NERR, N=JT n Invalid number of joints, n, on 'START' card.	R3.STRTAB/10
FATAL ERROR. NERR, N=KORE n Core space too small by n words.	R3.STRTAB/10
FATAL ERROR. NERR, N=NREF n	R3.INCARD/7
FATAL ERROR. NERR, N=SA x	R3.F1T/15 (RDTAB)
FATAL ERROR. NERR, N=XJDF x Illegal joint motion component, x, specified on 'START' card.	R3.STRTAB/10
*** FATAL INPUT ERROR. NEGATIVE INDEX OR INSUFFICIENT CORE. NAME= xxxx	R3.F1T/15 (RDTAB)
ILLEGAL DATA. JOINT, NJ, JUMP= x x x Illegal rigid mass input data.	R3.F1T18/12 (ARMASS)
***ILLEGAL INPUT DATA BELOW	R3.F1T07/10 (AMREF)
***ILLEGAL JOINT, x	R3.F1T06/9 (AJREF)
ILLEGAL MATERIAL INDEX, x. K= x Illegal material index specified for K-th section.	R3.F1T13/11 (ASA)
INPUT DATA ERROR, RECORD x card image echo Error in constraint definition data.	R3.F1T15/10 (ACON) or R3.F1T15A/9

Error Message	Spar Routine
INPUT ERROR, JO= x Input data card is out of order.	R3.F1T051/8 (XBLOCK)
***INPUT FORMAT ERROR (FATAL) Card missing or out of sequence. Trying to read intrinsic stiffness matrix continuation card.	R3.R1T10/10 (ADSK)
JOINT x NOT SPECIFIED IN INPUT LIST	R3.F1T17/11 (SEQGEN)
MEMB STIFFNESS MATRIX SINGULAR, ENTRY x	R3.F1T13/11 (ASA)
SA ENTRY x, ERROR CODE xx Code	R3.F1T13/11 (ASA)

W1 (or W3) - Structural weight data given for section not previously defined.

W2 - Structural weight data not in real form.

The following apply only to record 1:

W4 - k not in integer form.

W5 - Trailing data not in real form.

The following apply only to records 2 and 3:

D1 - Empty record.

D2 - Too many words in record.

D3 - Non-real data in record.

The following apply only to LAMINATE section layer input:

C1 - Record contains other than 3, 9, or 15 words.

C2 - No layers defined, or singular stiffness matrix.

C3 - Number of layers exceeds maxnl.

TAB

Error Message	Spar Routine
*** SI SYNTAX ERROR.	R3.SI/6
UNKNOWN FORMAT, xxxx Invalid shell section property format type in SA.	R3.F1T13/11 (ASA)
UNRECOGNIZABLE DATA SKIPPED. INPUT DATA ERROR, RECORD x card image echo	R3.MPTAB/15
WARNING. I1 CHANGED TO 1 BY PROGRAM. I1 WAS x.	R3.F1T07/10 (AMREF)
*** WARNING. ERRORS IN SOURCE DATA A data set marked in error was encountered.	R3.F1T/15 (RDTAB)
*** WARNING. x SETS OF DATA MISSING, ARRAY xxxx	R3.F1T/15 (RDTAB)

3.4 ELD

Error Message	Spar Routine
ERROR, ELEMENT TYPE xxxx FATAL ERROR. NERR, N=TTE n	R3.TTE/14

n=2 - LRTED block length is too small.
=3 - Core space is insufficient.
=4 - Core space is insufficient to read data set.

*ERROR: NIJ,NGRP,INDEX, NSECT= xxxx x x x	R3.TTE1/14

Invalid section property reference, NSECT.

FATAL ERROR. NERR, N=ELD2 1	R3.F1E1/14

Invalid MAJOR/NODES for EXPE, TEXP elements.

FATAL ERROR type n m	R3.F1E3/14

Invalid data in element input data for group n element m. Usually an invalid joint number, material reference, etc.

INCORRECT NI IN DATA SET xxxx xxxx	R3.TTE/14

INPUT DATA ERROR, RECORD n card image echo	R3.F1E3/14

An error of some type occurred on input record n.
A variety of input errors can result in this message, e.g. illegal joint numbers, incorrect no. of nodes, etc.
An echo of the input data record follows the message.

INPUT DATA ERROR, RECORD x card image echo FATAL ERROR. NERR,N =ELD n	R3.MPELD/15

n=0 - Unrecognizable element type.
=2 - Error in experimental element type data.

MAX. OF x GROUPS EXCEEDED.	R3.F1E1/14
*** WARNING. ILLEGAL GROUP NO. CHANGED FROM x TO y	R3.F1E1/14

3.5 E

Error Message	Spar Routine
**CORE INADEQUATE. LE3= 1	R5.EXDEM/15

Reset core to a larger value.

CORE SPACE INSUFFICIENT TO GENERATE E-FILE. KORE= n M1-8= x x x x x x x x x x FATAL ERROR. NERR, N=KORE n	R5.F3A/14

Reset core to a larger value.

CORE SPACE INSUFFICIENT TO GENERATE E-FILE. TYPE= xxxx FATAL ERROR. NERR, N=KORE n	R5.F3B/14

Reset core to a larger value.

CURVED BEAM INPUT ERROR. RADIUS, CHORD= x x GROUP, INDEX, J1, J2= x x x x	R5.F32A/15
EFILE CANNOT BE FORMED. ERRORS IN ELEMENT TYPE xxxx	R5.F3B/14
*** ELEMENT GEOMETRY CHECK, ERROR CODE= m, IERR= n TYPE, GROUP, INDEX= xxxx x x	R5.GELDC/12
ELEMENT GEOMETRY ERROR SUMMARY	R5.GESMRY/12

ERROR CODE	ERROR FLAG	TEST VALUE	ERROR COUNT	TEST DESCRIPTION
1	x	x	n	MINIMUM LENGTH OF BOUNDARY
2	x	x	n	MINIMUM ANGLE BETWEEN BOUNDARIES
3	x	x	n	WARPED 4-NODE SURFACE
4	x	x	n	EXCESSIVELY WARPED 4-NODE SURFACE
5	x	x	n	UNACCEPTABLE PROPORTIONS
6	x	x	n	IRREGULAR 6-NODE SOLID
7	x	x	n	SURFACE R-MATRIX NOT ORTHOGONAL
8	x	x	n	MINIMUM LOCAL Z-COORDINATES, SOLIDS

ERRORS IN R-MATRIX, ELEMENT CONNECTING NODES x x x x R= "matrix printout" R*R-TRANSPOSE= "matrix printout" ABOVE ERROR IN ELEMENT CONNECTING JOINTS x x x x	R5.F3DX/12

Error Message	Spar Routine
ERRORS IN SURFACE R-MATRIX R= "matrix printout" R*R-TRANSPOSE= "matrix printout"	R5.GE2D/14
EXCESSIVE ERROR IN R-MATRIX CALCULATIONS, EXECUTION WILL BE TERMINATED. CHECK ORIENTATION SPECIFICATIONS.	R5.F32A3/1 (RPOINT)
FATAL ERROR. NERR, N=E n n=1 - Error in element data from TAB. =2 - Error in beam orientation (MREF) data from TAB. =3 - Error in beam rigid link (BRL) data from TAB.	R5.F3B/14
FATAL ERROR. NERR, N=IERR 1	R5.F3A/14
FATAL ERROR. NERR, N=TYPE ltype	R5.F3B/14
FATAL ERRORS PREVENT FURTHER EXECUTION FATAL ERROR. NERR, N=IERR ierr	R5.F3A/14
ILLEGAL SECTION TYPE xxxx GROUP,INDEX,NSECT,TYPE= x x x x ABOVE ERROR IN ELEMENT CONNECTING JOINTS x x x x	R5.F34A/14
ILLEGAL ZERO-LENGTH ELEMENT. TYPE CODE, NGRP, INDEX, J1, J2, LENGTH= x x x x x x	R5.F32A/15
LENGTH OF SIDE x x= x FOR ACCEPTABLE PROPORTIONS, MAX. LENGTH= x	R5.GEFACE/12
LENGTH OF SIDE x x= x MINIMUM LENGTH= x	R5.GEFACE/12
POINT 2-NODE ELEMENT HAS FINITE LENGTH. NGRP, INDEX, J1, J2, LENGTH= x x x x x	R5.F32A/15

Error Message	Spar Routine
SIN OF THE ANGLE AT JOINT n= x SIN OF MINIMUM ANGLE= x	R5.GEFACE/12
TRIANGULAR FACES ARE NOT PARALLEL	R5.GE3D/14
****** WARNING- R MATRIX CALCULATIONS INACCURATE. CHECK ORIENTATION SPECIFICATIONS. R ROWS= x x x x x x x x x RR= ROWS= x x x x x x x x x	R5.F32A3/1 (RPOINT)
ABOVE ERROR REFERS TO ELT CONNECTING JOINTS n m	
********** WARNING- SIGNIFICANT NUMERICAL INACCURACIES IN R-MATRIX COMPUTATION. SUBSTANTIAL SOLUTION ERRORS PROBABLE. CHECK MEMBER AXIS ORIENTATION DATA IN INPUT.	R5.F32A4/1 (DIRCOS)
ABOVE ERROR REFERS TO ELT CONNECTING JOINTS n m	
WARPED 4-NODE SURFACE, X34= x TEST VALUE= x	R5.GEFACE/12
Z COORDINATES OF NODES n-m MUST BE GREATER THAN x	R5.GE3D/14

3.6 EKS

Error Message	Spar Routine
*** ADDITIONAL CORE REQUIRED FOR ELEMENT K, NEED = n	RJ.K2D/11A
ARRAY TOO LARGE FOR FLUSH BUFFER RTN, ID, NWDS, LRFLSH= xxxx xxxx n m	RJ.FILER/12
*** CORE INSUFFICIENT TO GENERATE ELT K AND S. TYPE, LR3, KREM= xxxx len k The amount of additional core needed is len-k.	R5.F3KEX/15
ERROR n, xxxx x x	R5.F3KEX/15
*** INSUFFICIENT CORE FOR COMPUTING H n PROVIDED m REQUIRED	RJ.HGEN/11
** K3D ERROR, INV n Singular element matrix.	RJ.K3D01/13
NON-POSITIVE DEFINITE K, CURVED BEAM. NERR, ROW= n	R5.K21/15
*** WARNING, H MATRIX IS SINGULAR, ISING = n	RJ.HGEN/11

3.7 MN

Error Message	Spar Routine
ARRAY TOO LARGE FOR FLUSH BUFFER RTN, ID, NWDS, LRFLSH = xxxx xxxx n m	RJ.FILER/12
ERROR: xxxx n m, MATERIAL= x n=1 - Problem with material index. =2 - Too many layers. This message is followed by FATAL ERROR. NERR, N=name n where name = NF3D, PRNL, or TK3D.	R5.NF3D/15 R5.PRNLSS/15 R5.TK3D/15
FATAL ERROR. NERR, N=CONS n n=1 - NONL CONS n m data set is in error. =3 - NONL CONS n m data set is missing.	R5.NLMCLD/15
FATAL ERROR. NERR, N=INSS 1 Insufficient core to execute MN.	R5.INNLSS/15
FATAL ERROR. NERR, N=MN n n=1 - Error in NLSS data set. =2 - Insufficient core to execute MN. =3 - Error associated with NF FORC n m data set. =1000 - Unrecognized input data card.	R5.MPMN/15
FATAL ERROR. NERR, N=TRMC ier A tabulation of error codes follows. Code 1 - STRE CURV n m data set is in error. 2 - AIN dimension is not divisible by 2. 3 - Insufficient core. 4 - Poissons ratio is greater than .5. 5 - Adjacent strains are equal. 6 - Illegal code number. 7 - Initial E is zero.	R5.TRMCO/15

3.8 TOPO

Error Message	Spar Routine
CORE INSUFFICIENT TO PROCESS FILE 7 Reset core to a larger value.	R4.F4B/11 (WNU7)
CORE SPACE INADEQUATE FOR MFILE CONSTRUCTION I45,ITRY,LB4,LT2,KORE= x x x x x Reset core to a larger value.	R4.TOPOEX/12
CORE SPACE INSUFFICIENT. STAGE n (JOINT m) J= x ELEMENTS OR PSEUDO-ELEMENTS INTERCONNECT THE FOLLOWING JOINTS x x x x x x x x x x Reset core to a larger value.	R4.F4C3/1 (EXCON)
FINAL ACCUMULATOR SIZE INSUFFICIENT, N= n INCREASE ESTIMATED NO. OF ELEMENTS (LAPROX) AND RE-RUN. NELS= n J, LRNG(J), JADR(J)= x x x	R4.F4A/13 (ELSORT)
ILLEGAL JOINT NUMBER, x x x x x x x x	R4.F4A/13 (ELSORT)
JOINT ELIM SEQ ERROR CODE= Error in joint elimination sequence generated in TAB. Unable to execute TOPO.	R4.TOPOEX/12
KCON EXCEEDS LIMIT OF n STAGE= i JOINT= j Reset core to a larger value.	R4.F4C1/1 (ELCON)
KMAP ACCUMULATOR SIZE EXCEEDED, JOINT n Reset LRKMAP to a larger value (default is 896).	R4.F4C/12 (KMAP)
KSUB EXCEEDS LIMIT OF n STAGE= x, J= x, K= x Reset MAXSUB to a larger value (default is 1000).	R4.F4C2/1 (ELSUB)

Error Message	Spar Routine
M-FILE ACCUMULATOR SIZE EXCEEDED, JOINT n	R4.F4D/12 (PRECON)
Reset LRAMAP to a larger value (default is 1792).	
SORTING BLOCK LENGTH INSUFFICIENT, N= n	R4.F4A/13
INCREASE ESTIMATED NO. OF ELEMENTS (LAPROX) AND RE-RUN.	(ELSORT)

3.9 K

Error Message	Spar Routine
K ALLOCATION. CORE, N1-7= x x x x x x m FATAL ERROR. NERR, N=KORE n Insufficient core. Available = n, required = m.	R6.SMLD
*** K FILE FLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x FATAL ERROR. NERR, N=INV 0 Reset LREC to a larger value (default is 2240).	R6.ASKEX/12 R6.DASKEX/12

3.10 M

Error Message	Spar Routine
*** K FILE BLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x Reset LREC to a larger value (default is 2240).	R6.ASMEX/15
M ALLOCATION. CORE, N1-7= x x x x x x x m FATAL ERROR. NERR, N=KORE n Insufficient core. Available = n, required = m.	R6.SMLD/15
..WARNING.. WRONG ELEMENT DIMENSION INPUT INTO CMQP MASS MATRIX CAN NOT BE OBTAINED.	R6.M64/5
..WARNING.. WRONG ELEMENT DIMENSION INPUT INTO CMTP MASS MATRIX CAN NOT BE OBTAINED.	R6.M63/5

3.11 KG

Error Message	Spar Routine
*** K FILE BLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x	R6.ASKGEX/13
Reset LREC to a larger value (default is 2240).	
KG ALLOCATION. CORE, N1-7= x x x x x x x m FATAL ERROR. NERR, N=KORE n	R6.SMLD/15
Insufficient core. Available = n, required = m.	
..WARNING.. WRONG ELEMENT DIMENSION INPUT INTO GQP, STIFFNESS MATRIX CAN NOT BE OBTAINED.	R6.GQP/5
..WARNING.. WRONG ELEMENT DIMENSION INPUT INTO GTP, STIFFNESS MATRIX CAN NOT BE OBTAINED.	R6.GTP/5

3.12 INV

Error Message	Spar Routine
*** A-FILE BLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x	R6.AFEX/6 R6.DPAFEX/8
Reset LRA to a larger value (default is 3584).	
*** CORE INSUFFICIENT TO EXECUTE REDUCTION SEQUENCE. AVAIL/REQ= x x SIZE INDEX= x FATAL ERROR. NERR, N=KORE n	R6.AFLD/9
*** MFILE/KMAP INCONSISTENCY	R6.AFEX/6
The AMAP data set being used by INV is inconsistent with the assembled system matrix to be factored. Check RESET controls to confirm KLIB, ILIB, and K values. Re-execute TOPO if the required AMAP data set is not available.	
NEGATIVE DIAG TERM. JOINT/COMPONENT=x x	R6.RED/8 R6.REDDP/8
*** WARNING. SYSTEM K SINGULAR. JOINT/COMPONENT= x x	R6.RED/8 R6.REDDP/8

3.13 AUS

Error Message	Spar Routine
ADDITIONAL CORE REQUIRED= n FATAL ERROR. NERR, N=KREQ n Core is too small by n words.	R9.SSPREP/8
ARG ERROR n , WORD i=xxxxxx INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ARG o	R2.ARGS/9
CORE AVAILABLE, REQUIRED= x x Insufficient core. Reset to larger value.	R9.SVEC3/10
CORE AVAIL/REQ= x x Insufficient core. Reset to larger value.	R9.LGGL/10
*DATA OUT OF ORDER, N= n FATAL ERROR. NERR, N=NORD n	R9.TITL/9
ERROR. NO BOUNDARY NODES. FATAL ERROR. NERR, N=NOBN o	R9.SSPREP/8
ERROR. OUT-OF-RANGE TRANSMISSION PARAMETERS.	R9.SVEC3/10
*ERROR. EXISTING ARRAY MUST NOT BE EXTENDED.	R9.SVEC3/10
*ERROR. NO SOURCE NAMED.	R9.SVEC3/10
*ERROR. NON-EXISTENT ELEMENT. n m n - group m - index	R9.ELDA/14

Error Message	Spar Routine
FATAL ERROR. NERR, N=CORE n Core is too small by n words.	R9.ELDATA/12 R9.PWR/9 R9.RDMAT/9 R9.RIGI/9 R9.SPROD/10 R9.SSUM/8
FATAL ERROR. NERR, N=KORE n Insufficient core. In TITL, n indicates required data space in words. In UNION, n indicates number of words by which core is too small.	R9.TITL/9 R9.UNION/9
FATAL ERROR. NERR, N=MAXN n Too many names, n.	R9.PRP2/9
*ILLEGAL OPERATION. xxxx xxxx FATAL ERROR. NERR, N=ELDA 2	R9.ELDATA/12
ILLEGAL OPERATION, NX, NY= x x FATAL ERROR. NERR, N=ILLE 0	R9.XTY/9
ILLEGAL Q INPUT, JOINTS= x x	R9.LGGL/10
ILLEGAL VECTOR INPUT	R9.LGGL/10
INCOMPATIBILITY. LX,LY, TYPES= x x x x	R9.XTY/9
**INCOMPATIBILITY.IN SVV. N/N. L/L= x x x x	R9.SVV/8
INCOMPATIBLE MATRICES INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ERR 0	R9.RDMAT/9

Error Message	Spar Routine
**INCOMPATIBLE MATRICES. J/NSA/NSB= x x x FATAL ERROR. NERR, N=INCO j	R9.S11/8 R9.S21/18 R9.S22/18
INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ILEG 0	R9.MPAUS/10
INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ILLE 0	R9.SPROD/10
INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=VLD 0	R9.VLD/9
*LIMIT OF x LOOP LIMIT RECORDS EXCEEDED INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=LOOP i	R9.RLOOP/13
*NON-EXISTENT DATA BLOCK. n FATAL ERROR. NERR, N=NEXD n	R9.TITL/9
*NON-EXISTENT VECTOR nv INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ERR 0	R9.RDMAT/9
RMAT CORE AVAIL/REQ= m n Insufficient core Reset to larger value.	R9.RMAT/9

Error Message	Spar Routine
** RMAT FATAL ERROR ierr	R9.RMAT/9

This message may arise from RPROD, RTRAN, or RINV.
A tabulation of error codes follows.

Code

1 - X not rectangular
2 - X not real
3 - Y not real
4 - Y not rectangular
5 - X,Y not conformable for multiplication (RPROD)
6 - X not square (RINV)

This message is followed by:

INPUT DATA ERROR, RECORD n
card image echo

SINGULARITY, ISING= i INPUT DATA ERROR, RECORD n card image echo	R9.RMAT/9
TERM n, BLOCK LENGTH INCOMPATIBILITY. 11 12 FATAL ERROR. NERR, N=INCO 0	R9.UNION/9
TRAN ERROR. NO OF SOURCE, DEST BLOCKS= x x	R9.SVEC3/10
*UNKNOWN LOAD TYPE xxxx FATAL ERROR. NERR, N=ELDA 1	R9.ELDATA/12
XTY. CORE AVAIL/REQ= m n FATAL ERROR. NERR, N=CORE n	R9.XTY/9

Insufficient core
Reset to larger value.

3.14 DCU

Error Message	Spar Routine
ERROR, EMPTY LIB. n NON-EXISTENT ELEMENT REFERENCED. CARD m FATAL ERROR. NERR, N=IDCO m Library n is empty.	R2.IDCODE/8
**ERROR IN FOLLOWING STATEMENT. CHANGE (n) XXXX XXXX x x TO XXXX XXXX x x	R2.MPDCU/11
ILLEGAL COMMAND. XXXX This message may be followed by: FATAL ERROR. NERR, N=TLLE x	R2.MPDCU/11
INSUFFICIENT CORE. LB,KORE= n m FATAL ERROR. NERR, N=KORE n Core space is insufficient. Core available = m. Core required = n. Reset core to 15000 + n.	R2.CORCHK/6
NON-EXISTENT ELEMENT REFERENCED. CARD m FATAL ERROR. NERR, N=IDCO m Element referenced on input record m not found.	R2.IDCODE/8

3.15 VPRT

Error Message	Spar Routine
FATAL ERROR. NERR, N=CORE n	R7.MPVPRT/11

Insufficient core.
Reset core such that data space contains n words.

3.16 EQNF

Error Message	Spar Routine
FATAL ERROR. NERR, N=EFIL O	R7.ALEIJ/9
XXXX EFIL x x data set missing or in error.	
FATAL ERROR. NERR, N=IERR O	R7.LDEQNF/12
NODA TEMP x x data set missing or in error, or NODA PRES x x data set missing or in error.	
FATAL ERROR. NERR, N=KORE n	R7.EXEQNF/13
Insufficient core. Reset core such that data space contains n words.	

3.17 SSOL

Error Message	Spar Routine
*ADDITIONAL CORE REQ= n FATAL ERROR. NERR, N=ERR n	R7.DSLD/9
Increase core by n words.	
FATAL ERROR. NERR, N=CORE n	R7.DSLD/9
Insufficient core. Increase core by n words.	
*FATAL ERRORS IN LOAD INPUT. FATAL ERROR. NERR, N=ERR 0	R7.DSLD/9
*INPUT LOAD BLOCK SIZE ERROR. x x FATAL ERROR. NERR, N=ERR 0	R7.DSLD/9
*NO LOAD INPUT. FATAL ERROR. NERR, N=ERR 0	R7.DSLD/9

3.18 GSF

Error Message	Spar Routine
FATAL ERROR. NERR, N=EMAX n	R8.INSTS/9
Too many element group control cards given.	
KORE,JDJT,LSBLK,LE3= x x x x FATAL ERROR. NERR, N=KORE n	R8.GSFEX/15
Insufficient core. Reset to a larger value.	
NON-EXISTENT GROUPS. x x	R8.INSTS/9

3.19 PSF

Error Message	Spar Routine
FATAL ERROR. NERR, N=SA nsect	R8.SPRT/12

A TAB/ELD inconsistency is indicated.
No laminate shell section property (SA) table entry
was found for section nsect, indexed by an E33/E43
element for which stresses were desired.

3.20 EIG

Error Message	Spar Routine

** CORE INADEQUATE FOR RR SOL. AVAIL/REQ/N= k m n R9.EIGLD/9
FATAL ERROR. NERR, N=KREQ m

k is the core available.
m is the core required.
n is the number of modes.

CORE REQ FOR DSOL= m, AVAILABLE= n R9.EIGLD/9
FATAL ERROR. NERR, N=CORE m

Insufficient core. m words of data space are required.

FATAL ERROR. NERR, N=LVEC l R9.EIGLD/9

Block length, l, of data set used for initial approximation (default VIBR MODE 1 1) is inconsistent with the number of joints in the model.

FATAL ERROR. NERR, N=MXRT n R9.EIGLD/9

Too many modes, n.

3.21 DR

Error Message	Spar Routine
ARG ERROR x , WORD i=xxxxxx INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ARG 0	R2.ARGS/9
An error is present in input record n.	
**BTA1 ERROR. DATA REQ OUT-OF-RANGE, ARRAY x	R7.BTA1/9
CORE AVAILABLE, REQUIRED= m n FATAL ERROR. NERR, N=CORE n	R7.TR1/9
Reset core such that data space contains n words.	
**CORE AVAIL, REQ= m n	R7.BTB/9
Insufficient core. Reset core such that data space contains n words.	
CORE INADEQUATE. CORE, NTRANS= m n FATAL ERROR. NERR, N=ERR 0	R7.BTX/9
Data space required is n words.	
*ERROR. INCOMPATIBLE XTF,A,DTEX,TIME.	R7.TR1/9
*ERROR. INCOMPATIBLE XTMR,QR2,DTEX,TIME.	R7.TR1/9
FATAL ERROR. NERR, N=INIT 0	R7.TR1/9
IQX XXXX x x or IQX1 XXXX x x data set is in error.	
FATAL ERROR. NERR, N=IQR 0	R7.TR1/9
IQR XXXX x x data set is in error.	

Error Message	Spar Routine
INPUT DATA ERROR, RECORD x card image echo FATAL ERROR. NERR, N=ERR 0 An error was incountered on input record x.	R2.GIDA/9 R7.MPDR/9
**INPUT DATA INCONSISTENT.	R7.BTB/9
INSUFFICIENT CORE. AVAIL, REQ= m n FATAL ERROR. NERR, N=CORE n Reset core such that data space contains n words.	R7.DTEX/10
Y=XXX MUST FOLLOW T=XXX FATAL ERROR. NERR, N=ERR 0	R7.BTX/9

3.22 PLTA

Error Message		Spar Routine
WARNING	FIRST SPEC COMMAND HAS NOT BEEN READ. THE FOLLOWING CARDS WILL BE IGNORED.	RP.GPF02/12 (GPFCON)
WARNING	INVALID MARGIN. DEFAULT VALUE OF 0.12 WILL BE USED.	RP.GPF02/12 (GPFCON)
WARNING	THE ABOVE SPECIFICATION IS MARKED IN ERROR. NERR1= x NERR2= x	RP.GPF02/12 (GPFCON)
WARNING	THE FOLLOWING CARD FOLLOWS A LINES OR ELEMENTS COMMAND. CARD WILL BE IGNORED.	RP.GPF02/12 (GPFCON)
WARNING	TOO MANY ENTRIES SPECIFIED FOR xxxx ARRAY. PROCESSING TERMINATED AT n ENTRIES.	RP.GPF10/9 (PROCOM)
WARNING	TOO MANY TEXT CARDS. THE FOLLOWING CARDS WILL BE IGNORED.	RP.GPF02/12 (GPFCON)
WARNING	REPEATED COMMAND. THE FOLLOWING CARD WILL REPLACE PREVIOUS DATA.	RP.GPF02/12 (GPFCON)
*** ERROR ***	DATA ASSOCIATED WITH ABOVE COMMAND IS IN ERROR. PROCESSING OF COMMAND WILL BE TERMINATED.	RP.GPF02/12 (GPFCON)
*** ERROR ***	INSUFFICIENT CORE KORE= xxx KREQ= xxx	RP.GGSLD/12
*** ERROR ***	INVALID SPEC ID. THE FOLLOWING CARDS WILL BE IGNORED.	RP.GPF02/12 (GPFCON)
*** ERROR ***	LINES COMMAND OUT OF ORDER. THE FOLLOWING CARD WILL BE IGNORED.	RP.GPF02/12 (GPFCON)

Error Message		Spar Routine
*** ERROR ***	SPEC ID EXCEEDS MAXIMUM NUMBER OF SPECIFICATIONS. MXSPEC= n THE FOLLOWING CARDS WILL BE IGNORED.	RP.GPF02/12 (GPFCON)
*** ERROR ***	xxxx VALUE OF n IS OUT OF RANGE. MAX= m PROCESSING OF COMMAND WILL BE TERMINATED.	RP.GPF10/9 (PROCOM)
*** ERROR SUMMARY ***	THE FOLLOWING SPECIFICATIONS ARE MARKED IN ERROR.	RP.GPF02/12 (GPFCON)

3.23 PLTB

Error Message	Spar Routine
DNORM NOT GIVEN	RP.MPPLTB/M
FATAL ERROR. NERR, N=CORE n	RP.SDPXQT/11

Insufficient core. Increase data space by n words.

FATAL ERROR. NERR, N=SSNC 0	RP.SD02/12 (SDPLAY)

Error encountered while retrieving stresses.

INCOMPLETE STRESS FILE INPUT. itype igroup index kx1 kx2	RP.SD03/11B (SFETCH)

Re-execute GSF and compute stresses for all elements.
Only complete element stress data sets may be plotted.

INPUT DATA ERROR, RECORD n card image echo	RP.MPPLTB/M
INSUFFICIENT CORE STORAGE CORE AVAILABLE = kore CORE REQUIRED = kreq FATAL ERROR. NERR, N=CORE kreq	RP.GPLXQT/10
INSUFFICIENT CORE STORAGE FOR DEFORMED STRUC PLOTS. CORE AVAILABLE = kore CORE REQUIRED = kreq	RP.GPLXQT/10
MODE/EVAL DATA INCONSISTENT n m FATAL ERROR. NERR, N=INCO n	RP.LDPLTB/M
N= n. ILLEGAL L1,L2= 11 12 FATAL ERROR. NERR, N=ILLE n	RP.LDPLTB/M

Error in CASES (or VECTORS) statement. Either $case_1$ or $case_2$ is out of range, or $case_2$ is less than $case_1$.

NO STRESS/LOAD QUANTITIES DEFINED.	RP.SD02/12 (SDPLAY)

Error Message	Spar Routine
TOO MANY STRESS/LOAD QUANTITIES n	RP.STRLST/10
A maximum of 10 stress quantities may be plotted.	
WARNING SPEC n IS NOT PRESENT ON GPS FILE	RP.L602/12 (PLTR) RP.SD02/12 (SDPLAY)
WARNING SPEC n WILL NOT BE PLOTTED. ERROR TYPE = x	RP.L602/12 (PLTR) RP.SD02/12 (SDPLAY)

3.24 PXY

Error Message	Spar Routine
PXY ERROR NO. icode	RP.EXPXY/15

A tabulation of error codes follows.

Code

```
 301 - BOUNDARY, parameters not floating point numbers.
 302 -     "       h2 .LT. h1
 303 -     "       v2 .LT. v1

 621 - XAXIS or YAXIS, ndigits not integer.
 622 -    "          "    dxtic     "  floating point.
 631 -    "          "    ndigits   "  integer.
 632 -    "          "    mintics   "     "
 633 -    "          "    maxtics   "     "

 801 - XLIMITS or YLIMITS, syntax error.
 811 -     "           "     xleft or ybottom not floating point.
 812 -     "           "     xbottom or ytop   "     "        "

1101 - XYSCALE, illegal syntax or rxy value.

1201 - TEXT, source data set unavailable.

1301 - TPOSITION, plateral not integer.
1302 -      "       pvertical "     "

1401 - X or Y, source data set not available.

1601 - FONT, unknown font identifer.

3004 - INITIALIZE, FONT, illegal font code.

3101 - PLOT, command syntax error.

3201 - PLOT CURVE, either X or Y not defined.
3202 -  "     "    not preceded by INITIALIZE.
3204 -  "   TEXT, FONT, illegal font code.
3205 -  "     "    POSITION, illegal plateral.
3206 -  "     "       "          "    pvertical.

3241 - PLOT CURVE # n, illegal font.

3301 - PLOT CONSTANT X or Y, no xi's or yi's.
3302 -  "       "     illegal syntax.
3303 -  "       "     some xi or yi not floating point.

10000 - Unrecognizable command.
```

Error Message — Spar Routine

Each message of the above type is followed by the sequence:

```
INPUT DATA ERROR, RECORD  n
card image echo
FATAL ERROR. NERR, N=EXPX  icode
```

FATAL ERROR. NERR, N=XYLD n — RP.XYLD/15

n=1 - X or Y, invalid source data set vector specified.
=2 - Same as 1
=3 - X or Y, insufficient core to load source data set.

INPUT DATA ERROR, RECORD x — RP.GIDA/9
card image echo

An error was encountered on input record x.

3.25 SYN

Error Message	Spar Routine
n ADDITIONAL CORE LOCATIONS REQUIRED FATAL ERROR. NERR, N=CORE n	RA.LDSS/11A
FATAL ERROR. NERR, N=CORE n Core is too small by n words.	RA.LDSS/11A RA.LDSYN/11
FEF INCONSISTENCY, SSM/SSK FATAL ERROR. NERR, N=FEF 0	RA.LDSS/11A
ILLEGAL INPUT. xxxx n m FATAL ERROR. NERR, N=ILLE 0 n and/or m negative or greater than number of joints.	RA.LDSS/11A
INPUT DATA ERROR, RECORD n FATAL ERROR. NERR, N=ILLE 0	RA.LDSS/11A
INPUT DATA ERROR, RECORD n ILLEGAL CONNECTION xxxx FATAL ERROR. NERR, N=CONN j j is negative or greater than total number of joints.	RA.LDSS/11A
REL CONSTRAINT INPUT ERROR. JT6,LB,IERR= x x x FATAL ERROR. NERR, N=REL 0	RA.LDSYN/11
SUBSTRUCTURE xxxx, ILLEGAL NRF= n FATAL ERROR. NERR, N=NRF 0	RA.LDSS/11A
SUBSTRUCTURE CANNOT BE PROCESSED ADDRESS EXCEEDS UNIVAC LIMIT BY n LOCATIONS FATAL ERROR. NERR, N=CORE j	RA.LDSS/11A

3.26 STRP

Error Message	Spar Routine
DET= x COL= n Singular matrix, column n.	RA.STCHOL/8
ERROR. NO ROOTS EXIST ABOVE LOWER FREQUENCY LIMIT LOWER FREQUENCY LIMIT = x LARGEST FREQUENCY = x	RA.HAS/10 (HOUSE)
ILLEGAL I,J= i j IREC, K= i k FATAL ERROR. NERR, N=ILLE 0	RA.IO/9
NO ROOTS EXIST IN FREQUENCY LIMIT	RA.HAS/10 (HOUSE)
SINGULAR MASS MATRIX ENCOUNTERED AT LEVEL n	RA.KLVT/10

3.27 SSBT

Error Message	Spar Routine
CORE AVAIL/REQ= m n FATAL ERROR. NERR, N=CORE n	RA.SBB/10A

Insufficient core. Reset to larger value.

CORE AVAIL/REQ (APPROX)= m n FATAL ERROR. NERR, N=CORE n	RA.SBA/11

Insufficient core. Reset to larger value.

FATAL ERROR. NERR, N=ERR 1	RA.SBA/11

Error in RELC x x x data set.

FATAL ERROR. NERR, N=ERR 2	RA.SBA/11

Error in SYN ECON x x data set,
or SYN LOCJ x x data set.

FATAL ERROR. NERR, N=ERR icode	RA.SBB/10A

Error codes 11-21 originate in subroutine SBB.
A tabulation of these error codes follows.

Code

```
11 - Problem with SYS  JMG    x  x  data set.
12 -    "       "   JLOC xxxx x  x  data set.
13 -    "       "   BNQ  xxxx x  x  data set.
14 -    "       "   BNPC xxxx x  x  data set.
15 -    "       "   BN   xxxx x  x  data set.
16 -    "       "   BNF  xxxx x  x  data set.
17 -    "       "   FEF  xxxx x  x  data set.
18 -    "       "   ALTR xxxx x  x  data set.
19 - n1 specified on MODES command is negative.
20 - n2     "      "   "       "    is less than n1.
21 - n2     "      "   "       "    is greater than NMODES.
```

3.28 FSM

Error Message	Spar Routine
FG ALLOCATION. CORE, N1-7= x x x x x x x M FATAL ERROR. NERR, N=KORE n	R6.LDFGKM/12
Insufficient core. Available = n, required = m.	
*** K FILE BLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x	R6.SPFGKM/12
Reset LREC to a larger value (default is 2240).	

3.29 CEIG

Error Message	Spar Routine
n ADDITIONAL CORE REQD. FOR RAYLEIGH-RITZ	RC.CRRITZ/12
ERROR IN RAYLEIGH-RITZ n MODES COMPUTED	RC.RSEL1/13
FATAL ERROR. NERR, N=CORE n	RC.LDCEIG/12
Insufficient core. n indicates required data space in words.	
FATAL ERROR. NERR, N=CORE -2	RC.GOCEIG/12
Insufficient core. Reset to a larger value.	
INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ILLE 0	RC.LDCEIG/12
INPUT RVEC,IVEC,RVAL,IVAL INCONSISTENT FATAL ERROR. NERR, N=INCO modes	RC.LDCEIG/12
LCBD NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.LCBD/12
LCBG NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.LCBG/12
NORMRI NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.NORMRI/12
** SINGULAR MATRIX, N, ROW, ZERO= n m xxx	RC.ASET2/12
SYSM NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.SYSM/12
** UNSTABLE SPINNING STRUCTURE. EXIT CEIG	RC.ROOTS/13

Error Message	Spar Routine
XTRANS NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.XTRANS/12
XTYD NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.XTYD/12
XTYG NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.XTYG/12
XUEVL NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.XUEVL/12

3.30 SM

Error Message	Spar Routine
*** ADDITIONAL CORE REQUIRED FOR ELEMENT K, NEED = n	RJ.K2D/11A
n ADDITIONAL CORE REQUIRED IN DPN	RM.DPN/12
xxxx ALLOCATION. CORE, N1-8= x x x x x x x x FATAL ERROR. NERR, N=CORE n	RM.LDDKDM/13

CM insufficient to begin Phase 2(b).
Increase data space by n words.

CM INSUFFICIENT TO ENTER XPARA FATAL ERROR. NERR, N=SMA 1000	RM.GOSMA/13

CM insufficient to begin Phase 2(a).

*ERROR IN TVEC LINE x FATAL ERROR. NERR, N=SMX1 n	RM.GOSMX1/12

n=1 - J .LT. 1 in a TVEC data set.
=2 - J .GT. JT in a TVEC data set.
=3 - K .LT. 1 in a TVEC data set.
=4 - K .GT. JDF in a TVEC data set.

Where JT and JDF are the number of joints and the number of degrees of freedom per joint, respectively.

FATAL ERROR. NERR, N=DM n	RM.DMFORM/13

n=1 - RMAS data set not present or in error.
=2 - NJ .NE. JT, or NI .NE. JDF in RMAS.
=3 - RMAS in error.
=4 - Illegal RMAS item referenced in a PARA data set.
=5 - Same as 4.

Where JT and JDF are the number of joints and the number of degrees of freedom per joint, respectively.

Error Message	Spar Routine
FATAL ERROR. NERR, N=DP 1	RM.GOSMB/12
CM insufficient to complete Phase 3.	
FATAL ERROR. NERR, N=DPX n	RM.DPX/13
n=1 - NI or NJ incorrect in DPLI data set. =2 - Same as 1. =3 - Illegal limits specified in DPLI.	
FATAL ERROR. NERR, N=LDSM n	RM.LDSM/13
n=1 - NPARAS .LT. 1. =2 - Neither TVAL nor TVEC present, or NI in TVAL .NE. 2, or NI in TVEC .NE. 4. =3 - CM insufficient to begin Phase 1.	
FATAL ERROR. NERR, N=SMA 1	RM.GOSMA/13
CM insufficient to begin Phase 2(c).	
FATAL ERROR. NERR, N=SMB 1	RM.GOSMB/12
CM insufficient to begin Phase 3.	
FATAL ERROR. NERR, N=SMC n	RM.GOSMC/14
n=1 or 2 - CM insufficient to complete Phase 4.	
FATAL ERROR. NERR, N=SMX n	RM.GOSMX/12
n=1 or 2 - CM insufficient to complete Phase 1.	
FATAL ERROR. NERR, N=TCOL 1	RM.TCOL/13
CM insufficient to complete Phase 2(c).	

Error Message	Spar Routine
FATAL ERROR. NERR, N=XPAR n	RM.XPARA/13

n=1 - Non-existent table referenced in a PARA data set.
=2 - CM insufficient to complete Phase 2(a).
=3 - Non-existent item referenced in a PARA data set.
=4 - Same as 3.
=100 - Same as 1.

FATAL ERROR. NERR, N=YPAR n	RM.YPARA/12

Same codes as XPAR.

INPUT DATA ERROR, RECORD n card image echo FATAL ERROR. NERR, N=ILLE 0	RM.SPMX/12
*** INSUFFICIENT CORE FOR COMPUTING H n PROVIDED m REQUIRED	RJ.HGEN/11
K ERROR xxxx ELEMENT x x	RM.EXDKDM/13
*** K FILE BLOCK SIZE INSUFFICIENT. STAGE, JOINT, CONRNG, LRECA= x x x x	RM.EXDKDM/13

Reset LREC to a larger value (default is 2240).

KB ERROR xxxx ELEMENT x x	RM.EXDKDM/13
NON-POSITIVE DEFINITE K, CURVED BEAM. NERR, ROW= n	R5.K21/15
PARAMETER DEFINITION ERROR N3PARA,IPARA,N4,LINE,XP,ITEM1,ITEM2= x x x x xxxxx x x	RM.XPARA/13 RM.YPARA/12
** SINGULAR SXX MATRIX. ROW, ZERO= i xxx	RM.DPC/12

Error Message	Spar Routine
SPMX NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n Increase data space by n words.	RM.SPMX/12
*** WARNING, H MATRIX IS SINGULAR, ISING = n	RJ.HGEN/11
XPARA NEEDS n ADDITIONAL WORDS OF CM	RM.XPARA/13
XTYG NEEDS n ADDITIONAL WORDS OF CM FATAL ERROR. NERR, N=CORE n	RC.XTYG/12

4. PROGRAM FILE DOCUMENTATION

This section contains information on the SPAR program file contents, processor file requirements, and subroutine/processor cross reference data.

Table 4-1 lists each SPAR program file by number (order in which it resides on the tape), along with its file name and the processor main programs it contains.

Table 4-2 lists the SPAR processors in alphabetical order along with the file containing the MAP symbolic element, the file containing the main program, and other files (if any) required for collecting (@MAP'ing) that processor.

Table 4-3 lists the SPAR routines in alphabetical order by subroutine name. Main programs are listed by processor name preceded by MP, e.g. MPAUS. For each routine, the name of the file containing the routine, names of the symbolic and relocatable elements, and the processors which use the routine are listed.

Table 4-1

SPAR PROGRAM FILE CONTENTS

File Seq #	File Name	Processors Contained (main programs)					
1	SPAR15C						
2	R2	DCU					
3	R3	TAB	ELD				
4	R4	TOPO	PAMAP	PKMAP	STRP		
5	R5	E	EKS	PRTE	MN		
6	R6	K	KG	INV	M	PS	FSM
7	R7	EQNF	SSOL	VPRT	DR		
8	R8	GSF	PSF				
9	R9	AUS	EIG				
10	RA	SSBT	STRP	SYN			
11	RC	CEIG					
12	RJ						
13	RM	SM					
14	RP	PLTA	PLTB	PXY			
15	T1						
16	T2	TGEO					
17	T3	SSTA					
18	T4	TRTA					

Table 4-2

SPAR PROCESSOR CROSS REFERENCE

Processor	File Containing Map Symbolic	File Containing Main Program	Other Files Required
AUS	R2	R9	R7,R8
CEIG	R2	RC	R7,R9,RJ
DCU	R2	R2	
DR	R2	R7	
E	R2	R5	R7,RJ
EIG	R2	R9	R7
EKS	R2	R5	RJ
ELD	R2	R3	
EQNF	R2	R7	R6,R8
FSM	R2	R6	
GSF	R2	R8	R7
INV	R2	R6	
K	R2	R6	RJ
KG	R2	R6	
M	R2	R6	RJ
MN	R2	R5	R7,RJ
PAMAP	R2	R4	
PKMAP	R2	R4	
PLTA	R2	RP	R5
PLTB	R2	RP	R7,R8
PRTE	R2	R5	
PS	R2	R6	
PSF	R2	R8	
PXY	R2	RP	
SM	R2	RM	R5,R6,RC,RJ
SSBT	R2	RA	R8
SSOL	R2	R7	R9
SSTA	T3	T3	R2,T1
STRP	R2	RA	R4
SYN	R2	RA	
TAB	R2	R3	R5,R7
TGEO	T2	T2	R2,T1
TOPO	R2	R4	
TRTA	T4	T4	R2,T1
VPRT	R2	R7	

Table 4-3

SPAR SUBROUTINE CROSS REFERENCE

Name	File	Symbolic	Relocatable	Processors
ABA	R3	F1T09/15	F1T09/M	TAB
ABC	R3	F1T11/9	F1T11/M	TAB
ABD	R3	F1T12/7	F1T12/M	TAB
ACON	R3	F1T15/10	F1T15/M	TAB
ADDF36	R7	ADDF36/12	ADDF36/M	EQNF MN
ADDH	R6	ADDH/3	ADDH/M	K SM
ADSK	R3	F1T10/10	F1T10/M	TAB
ADVANC	RP	ADVANC/15	ADVANC/M	PXY
AFEX	R6	AFEX/6	AFEX/M	INV
AFGO	R6	AFGO/7	AFGO/M	INV
AFLD	R6	AFLD/9	AFLD/M	INV
AGEN	RJ	AGEN/9	AGEN/M	EKS SM
AJREF	R3	F1T06/9	F1T06/M	TAB
ALEIJ	R7	ALEIJ/9	ALEIJ/M	EQNF
ALFCNT	RP	ALFCNT/15	ALFCNT/M	PXY
ALIO	R2	ALIO/9	ALIO/M	DR
AMAT	R3	F1T02/11B	F1T02/M	TAB
AMREF	R3	F1T07/10	F1T07/M	TAB
ANSW	R3	F1T03/7	F1T03/M	TAB
AQ	R3	F1T04/10	F1T04/M	TAB
AQJJT	R3	AQJJT/7	AQJJT/M	TAB
ARGS	R2	ARGS/9	ARGS/M	AUS DR
ARL2	R3	F1T08/7	F1T08/M	TAB
ARMASS	R3	F1T18/12	F1T18/M	TAB
ASA	R3	F1T13/11	F1T13/M	TAB
ASB	R3	F1T14/7	F1T14/M	TAB
ASET2	RC	ASET2/12	ASET2/M	CEIG
ASG	R2	ASG/3TRK	ASG/M	*All
ASKEX	R6	ASKEX/12	ASKEX/M	K
ASKGEX	R6	ASKGEX/13	ASKGEX/M	KG
ASKGGO	R6	ASKGGO/9	ASKGGO/M	KG
ASKGO	R6	ASKGO/7	ASKGO/M	K
ASMEX	R6	ASMEX/15	ASMEX/M	M
ASMGO	R6	ASMGO/7	ASMGO/M	M
ASMQJ	R3	ASMQJ/7	ASMQJ/M	TAB
ATD	RJ	ATD/9	ATD/M	EKS SM
ATEXT	R3	F1T01/10	F1T01/M	TAB
BACKSL	R7	BACKSL/8	BACKSL/M	AUS SSOL EIG CEIG
BARKG	R6	BARKG/7	BARKG/M	KG

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
BEAMKG	R6	BEAMKG/5	BEAMKG/M	KG
BEAMT	R6	BEAMT/5	BEAMT/M	M KG EQNF
BEGIN	RP	BEGIN/15	BEGIN/M	PXY
BFLUSH	RP	BFLUSH/11	BFLUS	PLTB
BFLUSH	RP	BFLUSH/15	BFLUSH/15	PXY
BIGLAB	RP	L6010/V70E	L6010/M	PLTB
BLIO	RA	BLIO/10	BLIO/M	SSBT
BLKDAT	R2	BDAL/7	BDAL/M	*All
BNF	R9	BNF/8	BNF/M	AUS
BTA	R7	BTA/9	BTA/M	DR
BTA1	R7	BTA1/9	BTA1/M	DR
BTA2	R7	BTA2/9	BTA2/M	DR
BTA3	R7	BTA3/9	BTA3/M	DR
BTB	R7	BTB/9	BTB/M	DR
BTX	R7	BTX/9	BTX/M	DR
BWO2	RJ	BWO2/13	BWO2/M	EKS MN
BWO3	RJ	BWO3/12	BWO3/M	EKS MN
CARDSA	R3	CARDSA/11	CARDSA/M	TAB
CBABK2	RC	CBABK2/12	CBABK2/M	CEIG
CBAL	RC	CBAL/12	CBAL/M	CEIG
CLVT	R9	CLVT/5	CLVT/M	EIG
CMEXPE	R6	CMEXPE/12	CMEXPE/M	M
COMHES	RC	COMHES/12	COMHES/M	CEIG
COMLR2	RC	COMLR2/12	COMLR2/M	CEIG
COP	R2	COP/6	COP/M	DCU
CORCHK	R2	CORCHK/6	CORCHK/M	DCU
CPUTIM	R2	CPUTIM/1	CPUTIM/M	*All
CRDPLT	RP	L6015/V70I	L6015/M	PLTB
CRRITZ	RC	CRRITZ/12	CRRITZ/M	CEIG
CUBIC	RP	L6011/V70E	L6011/M	PLTB
CXA	RJ	CXA/9	CXA/M	EKS SM
CXTYD	RC	CXTYD/12	CXTYD/M	CEIG
CXTYG	RC	CXTYG/12	CXTYG/M	CEIG
CYLQ	R5	F32A1/1	F32A1/M	TAB E PLTA
DAL	R2	DAL/9	DAL/M	*All
DASKEX	R6	DASKEX/12	DASKEX/M	K
DATIM	R2	DATIM/7	DATIM/M	*All
DAX	R2	DAX/9	DAX/M	DR
DCROW	R8	DCROW/12	DCROW/M	PSF
DECODE	R2	DECODE/1	DECODE/M	TAB INV AUS SYN SSBT VPRT
DEIGEN	R9	DEIGEN/5	DEIGEN/M	EIG
DEL	R2	DEL/7	DEL/M	TOPO DCU
DELOC	RP	DELOC/1	DELOC/M	PLTA
DEVICE	R2	DEVICE/1	DEVICE/M	*All
DI1	R9	DI1/9	DI1/M	AUS

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
DIRCOS	R5	F32A4/1	F32A4/M	E
DIRX	RC	DIRX/12	DIRX/M	CEIG
DMEXPE	R5	DMEXPE/12	DMEXPE/M	E
DMFORM	RM	DMFORM/13	DMFORM/M	SM
DMTEX	RC	DMTEX/14	DMTEX/M	CEIG SM
DMULT	R7	DMULT/8	DMULT/M	AUS SSOL EIG
DMULTX	R7	DMULTX/8	DMULTX/M	AUS SSOL EIG
DOTTED	RP	L6020/V70J	L6020/M	PLTB
DOTV	RP	DOTV/M	DOTV/M	PLTB
DPAFEX	R6	DPAFEX/8	DPAFEX/M	INV
DPC	RM	DPC/12	DPC/M	SM
DPCHOL	R9	DPCHOL/6	DPCHOL/M	EIG
DPN	RM	DPN/12	DPN/M	SM
DPTRN3	R6	DPTRN3/12	DPTRN3/M	K
DPTRN6	R6	DPTRN6/12	DPTRN6/M	K
DPX	RM	DPX/13	DPX/M	SM
DSCALE	RP	GPF04/V70I	GPF04/M	PLTA
DSGO	R7	DSGO/9	DSGO/M	SSOL
DSLD	R7	DSLD/9	DSLD/M	SSOL
DSMUL	RC	DSMUL/12	DSMUL/M	CEIG SM
DSUM	RJ	DSUM/11	DSUM/M	EKS SM MN
DSX	R7	DSX/9	DSX/M	SSOL
DTEX	R7	DTEX/10	DTEX/M	DR
DTX1	R7	DTX1/9	DTX1/M	DR
ECHO	R2	ECHO/8	ECHO/M	*All
EIGEX	R9	EIGEX/8	EIGEX/M	EIG
EIGGO	R9	EIGGO/7	EIGGO/M	EIG
EIGLD	R9	EIGLD/9	EIGLD/M	EIG
EIGSOL	RA	EIGN/8	EIGN/M	STRP
EISPAK	RC	EISPAK/13	EISPAK/M	CEIG
ELCON	R4	F4C1/1	F4C1/M	TOPO
ELDA	R9	ELDA/14	ELDA/M	AUS
ELDATA	R9	ELDATA/12	ELDATA/M	AUS
ELEFIL	RP	ELEFIL/1	ELEFIL/M	----
ELEPLT	RP	L606/12	L606/M	PLTB
ELESTR	RP	GPF03/V70L	GPF03/M	PLTA
ELSORT	R4	F4A/13	F4A/M	TOPO
ELSUB	R4	F4C2/1	F4C2/M	TOPO
ENCODE	R2	ENCODE/1	ENCODE/M	TAB SYN
ENUMBR	RP	L6019/V70K	L6019/M	PLTB
ERABT	R2	ERABT/6	ERABT/M	*All
ERMSG1	R2	ERMSG1/8	ERMSG1/M	*All
EVCHEK	R9	EVCHEK/5	EVCHEK/M	EIG
EXCON	R4	F4C3/1	F4C3/M	TOPO
EXDEM	R5	EXDEM/15	EXDEM/M	E

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
EXDKDM	RM	EXDKDM/13	EXDKDM/M	SM
EXEQNF	R7	EXEQNF/13	EXEQNF/M	EQNF
EXPLCT	RA	EXPLCT/11	EXPLCT/M	SYN
EXPND1	R9	EXPND1/8	EXPND1/M	EIG
EXPXY	RP	EXPXY/15	EXPXY/M	PXY
EXVPRT	R7	EXVPRT/9	EXVPRT/M	VPRT
EXXMAP	R6	EXXMAP/11	EXXMAP/M	XMAP
F1E1	R3	F1E1/14	F1E1/M	ELD
F1T15A	R3	F1T15A/9	F1T15A/M	TAB
F32A	R5	F32A/15	F32A/M	E
F34A	R5	F34A/14	F34A/M	E
F3A	R5	F3A/14	F3A/M	E
F3B	R5	F3B/14	F3B/M	E
F3DX	R5	F3DX/12	F3DX/M	E
F3GO	R5	F3GO/12	F3GO/M	E
F3KEX	R5	F3KEX/15	F2KEX/M	EKS
F3KGO	R5	F3KGO/12	F3KGO/M	EKS
F3KLD	R5	F3KLD/12A	F3KLD/M	EKS
FEUSE	RA	FEUSE/9	FEUSE/M	SYN
FIL3	R7	FIL3/12	FIL3/M	EQNF
FILER	RJ	FILER/12	FILER/M	EKS MN
FIN	R2	FIN/10	FIN/M	*All
FINAL	RJ	FINAL/12	FINAL/M	MN
FINSYN	RA	FINSYN/11	FINSYN/M	SYN
FJF	R7	FJF/15	FJF/M	EQNF
FLDEF	R3	F1E3/14	F1E3/M	ELD
FORWRD	R7	FORWRD/8	FORWRD/M	AUS SSOL EIG CEIG
FRAMEV	RP	TEK	TEK	-----
FRHEX	RJ	FRHEX/15	FRHEX/M	MN
FRI	RC	FRI/12	FRI/M	CEIG
FRMAVN	RP	L601D/V70J	L601D/M	PLTB
FS3D	RJ	FS3D/15	FS3D/M	MN
FSBTMP	RA	FSBTMP/8	FSBTMP/M	STRP
FSUBMP	RA	FSUBMP/8	FSUBMP/M	STRP
G3D	R5	G3D/12	G3D/M	E
GAUSS1	RJ	GAUSS1/12	GAUSS1/M	E EKS M MN
GCYLQ	R5	F32A2/1	F32A2/M	TAB E PLTA
GE2D	R5	GE2D/14	GE2D/M	E
GE3D	R5	GE3D/14	GE3D/M	E
GEFACE	R5	GEFACE/12	GEFACE/M	E
GELDG	R5	GELDG/12	GELDG/M	E
GESMRY	R5	GESMRY/12	GESMRY/M	E
GGSGO	RP	GGSGO/9	GGSGO/M	PLTA
GGSLD	RP	GGSLD/12	GGSLD/M	PLTA
GIDA	R2	GIDA/9	GIDA/M	DR PXY

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
GK2DP	R6	GD2DP/4	GD2DP/M	K
GL	R8	GL/4	GL/M	AUS EQNF GSF SSBT
GOALFA	RP	GOALFA/15	GOALFA/M	PXY
GOALPH	RP	GOALPH/11	GOALP	PLTB
GOCEIG	RC	GOCEIG/12	GOCEIG/M	CEIG
GODEM	R5	GODEM/8	GODEM/M	E
GOEQNF	R7	GOEQNF/9	GOEQNF/M	EQNF
GOFGKM	R6	GOFGKM/11	GOFGKM/M	FSM
GOSMA	RM	GOSMA/13	GOSMA/M	SM
GOSMB	RM	GOSMB/12	GOSMB/M	SM
GOSMC	RM	GOSMC/14	GOSMC/M	SM
GOSMX	RM	GOSMX/12	GOSMX/M	SM
GOSMX1	RM	GOSMX1/12	GOSMX1/M	SM
GOSMX2	RM	GOSMX2/12	GOSMX2/M	SM
GOSMX3	RM	GOSMX3/12	GOSMX3/M	SM
GOSS	RA	GOSS/11	GOSS/M	SYN
GOSTRP	RA	GOSTRP/9A	GOSTRP/M	STRP
GOSYN	RA	GOSYN/11	GOSYN/M	SYN
GOVEC	RP	GOVEC/15	GOVEC/M	PXY
GOXMAP	R6	GOXMAP/11	GOXMAP/M	XMAP
GPFCON	RP	GPF02/12	GPF02/M	PLTA
GPLXQT	RP	GPLXQT/10	GPLXQT/M	PLTB
GQM	R6	GQM/5	GQM/M	KG
GQP	R6	GQP/5	GQP/M	KG
GSBTMP	RA	GSBTMP/8	GSBTMP/M	STRP
GSFEX	R8	GSFEX/15	GSFEX/M	GSF
GSFLD	R8	GSFLD/11	GSFLD/M	GSF
GSUBMP	RA	GSUBMP/8	GSUBMP/M	STRP
GTM	R6	GTM/5	GTM/M	KG
GTP	R6	GTP/5	GTP/M	KG
HAFMPY	RA	HAFMPY/8	HAFMPY/M	STRP
HAFTMP	RA	HAFTMP/8	HAFTMP/M	STRP
HEXNL	RJ	HEXNL/15	HEXNL/M	MN
HFB1	R6	HFB1/11	HFB1/M	FSM
HGEN	RJ	HGEN/11	HGEN/M	EKS SM
HGEND	RJ	HGEND/11	HGEND/M	EKS SM
HMBGEN	RJ	HMBGEN/11	HMBGEN/M	EKS SM
HOUSE	RA	HAS/10	HAS/M	STRP
HQT	R6	HQT/1	HQT/M	K SM
HSBTMP	RA	HSBTMP/8	HSBTMP/M	STRP
HSUBMP	RA	HSUBMP/8	HSUBMP/M	STRP
IAM	RA	IAM/8	IAM/M	STRP
ICSF	R2	ICSF/2	ICSF/M	*All
IDCODE	R2	IDCODE/8	IDCODE/M	DCU
IDCOM	R2	IDCOM/7	IDCOM/M	TAB ELD

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
IDCOM1	R2	IDCOM1/8	IDCOM1/M	AUS VPRT
IFONT	RP	IFONT/15	IFONT/M	PXY
INCARD	R3	INCARD/7	INCARD/M	TAB
INEXT	R9	INEXT/9	INEXT/M	AUS
INF1	R2	INF1/6	INF1/M	*All
INITAL	RJ	INITAL/12	INITAL/M	EKS MN
INLIB	RP	INLIB/1	INLIB/M	PLTA
INLOC	RP	INLOC/1	INLOC/M	PLTA
INMK	RA	INMK/10	INMK/M	STRP
INNLSS	R5	INNLSS/15	INNLSS/M	MN
INSTS	R8	INSTS/9	INSTS/M	GSF
INTCA	R7	INTCA/9	INTCA/M	DR
INVT3	RJ	INVT3/15	INVT3/M	MN
INZ	R4	INZ/4	INZ/M	TOPO STRP
IO	RA	IO/9	IO/M	STRP
ISBTMP	RA	ISBTMP/8	ISBTMP/M	STRP
ISUBMP	RA	ISUBMP/8	ISUBMP/M	STRP
ITHEX	RJ	ITHEX/13	ITHEX/M	EKS
ITHEXM	RJ	ITHEXM/12	ITHEXM/M	E M
ITQUAD	RJ	ITQUAD/11	ITQUAD/M	EKS SM MN
ITTET	RJ	ITTET/12	ITTET/M	EKS
IVT	R6	IVT/5	IVT/M	M KG
JF2	R8	JF2/9	JF2/M	GSF
JNEXT	R9	JNEXT/9	JNEXT/M	AUS
JRMK	R4	JRMK/8	JRMK/M	TOPO
JTCSTR	RA	JTCSTR/11	JTCSTR/M	SYN
K21	R5	K21/15	K21/M	EKS SM
K24	R5	K24/1	K24/M	EKS SM
K2D	RJ	K2D/11A	K2D/M	EKS SM
K3D00	RJ	K3D00/13	K3D00/M	EKS MN
K3D01	RJ	K3D01/13	K3D01/M	EKS
K3DNL	RJ	K3DNL/15	K3DNL/M	MN
KALPH	R2	KALPH/7	KALPH/M	*All
KEXP	R2	DYNEXP/6	DYNEXP/M	*All
KEXPE	R5	KEXPE/12	KEXPE/M	EKS
KG34	R6	KG34/10	KG34/M	KG
KGEXPE	R6	KGEXPE/12	KGEXPE/M	KG
KLAM	R3	KLAM/11	KLAM/M	TAB
KLER1	RP	L6014/V70E	L6014/M	PLTB
KLVT	RA	KLVT/10	KLVT/M	STRP
KMAP	R4	F4C/12	F4C/M	TOPO
KOP	R2	KOP/7	KOP/M	DCU
LABELH	RP	LABELH/15	LABELH/M	PXY
LABELV	RP	LABELV/15	LABELV/M	PXY
LABL	RP	L608/10	L608/M	PLTB

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
LADJ	R2	LADJ/6	LADJ/M	*All
LAM	R3	LAM/11	LAM/M	TAB
LCARD	R3	LCARD/14	LCARD/M	ELD
LCBD	RC	LCBD/12	LCBD/M	CEIG
LCBG	RC	LCBG/12	LCBG/M	CEIG
LDCEIG	RC	LDCEIG/12	LDCEIG/M	CEIG
LDDEM	R5	LDDEM/8	LDDEM/M	E
LDDKDM	RM	LDDKDM/13	LDDKDM/M	SM
LDEQNF	R7	LDEQNF/12	LDEQNF/M	EQNF
LDFGKM	R6	LDFGKM/12	LDFGKM/M	FSM
LDPLTB	RP	LDPLTB/M	LDPLTB/M	PLTB
LDSM	RM	LDSM/13	LDSM/M	SM
LDSS	RA	LDSS/11A	LDSS/M	SYN
LDSTRP	RA	LDSTRP/10	LDSTRP/M	STRP
LDSYN	RA	LDSYN/11	LDSYN/M	SYN
LDXMAP	R6	LDXMAP/11	LDXMAP/M	XMAP
LG	R8	LG/4	LG/M	AUS EQNF GSF SSBT
LGGL	R9	LGGL/10	LGGL/M	AUS
LINE1	RP	LINE1/15	LINE1/M	PXY
LINPLT	RP	L609/V70L	L609/M	PLTB
LIO	R2	LIO/8	LIO/M	*All
LOCATE	RA	LOCATE/8	LOCATE/M	SYN
LOCMK	RA	LOCMK/11	LOCMK/M	SYN
LSTRAN	R6	LSTRAN/5	LSTRAN/M	----
LTOC	R2	LTOC/7	LTOC/M	*All
M32	R6	M32/5	M32/M	M
M33	R6	M33/5	M33/M	M
M34	R6	M34/5	M34/M	M
M3D01	RJ	M3D01/12	M3D01/M	E M
M62	R6	M62/5	M62/M	M
M62CUR	R6	M62CUR/15	M62CUR/M	M
M63	R6	M63/5	M63/M	M
M64	R6	M64/5	M64/M	M
MAJTYP	RP	MAJTYP/13	MAJTYP/M	PLTB
MATCH	R2	MATCH/7	MATCH/M	*All
MATRIX	RA	MATRIX/11B	MATRIX/M	SYN
MFTX2	R8	MFTX2/4	MFTX2/M	GSF
MKSTR	RA	MKSTR/11	MKSTR/M	SYN
MONTOR	RP	L604/12	L604/M	PLTB
MOVEXY	RP	MOVEXY/15	MOVEXY/M	PXY
MPAUS	R9	MPAUS/10	MPAUS/M	AUS
MPCEIG	RC	MPCEIG/12	MPCEIG/M	CEIG
MPDCU	R2	MPDCU/11	MPDCU/M	DCU
MPDR	R7	MPDR/9	MPDR/M	DR
MPE	R5	F3/8	F3/M	E

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
MPEIG	R9	MPEIG/8	MPEIG/M	EIG
MPEKS	R5	F3K/7	F3K/M	EKS
MPELD	R3	MPELD/15	MPELD/M	ELD
MPEQNF	R7	MPEQNF/9	MPEQNF/M	EQNF
MPFSM	R6	MPFGKM/11	MPFGKM/M	FSM
MPGSF	R8	GSFMP/9	GSFMP/M	GSF
MPINV	R6	AF/7	AF/M	INV
MPK	R6	ASK/7	ASK/M	K
MPKG	R6	ASKG/7	ASKG/M	KG
MPKMAP	R4	PF5/12	PF5/M	PKMP
MPM	R6	ASM/8	ASM/M	M
MPMFIL	R4	PF4/11	PF4/M	PAMP
MPMN	R5	MPMN/15	MPMN/M	MN
MPPLTA	RP	MPGGS/9	MPGGS/M	PLTA
MPPLTB	RP	MPPLTB/M	MPPLTB/M	PLTB
MPPRTE	R5	PF3/11	PF3/M	PRTE
MPPS	R6	PRTSM/9	PRTSM/M	PS
MPPSF	R8	PSFMP/7	PSFMP/M	PSF
MPPXY	RP	MPPXY/15	MPPXY/M	PXY
MPSM	RM	MPSM/12	MPSM/M	SM
MPSSBT	RA	MPSSBT/10	MPSSBT/M	SSBT
MPSSOL	R7	DS/7	DS/M	SSOL
MPSTRP	RA	MPSTRP/8	MPSTRP/M	STRP
MPSYN	RA	MPSYN/8	MPSYN/M	SYN
MPTAB	R3	MPTAB/15	MPTAB/M	TAB
MPTOPO	R4	TOPOMP/7	TOPOMP/M	TOPO
MPVPRT	R7	MPVPRT/11	MPVPRT/M	VPRT
MPXMAP	R6	MPXMAP/11	MPXMAP/M	XMAP
MTEX	RC	MTEX/14	MTEX/M	CEIG SM
MULMX	R9	MULMX/8	MULMX/M	EIG
MULTEX	R7	MULTEX/8	MULTEX/M	AUS SSOL EIG
NCALNA	RJ	NCALNA/11	NCALNA/M	EKS SM
NDEP	RJ	NDEP/15	NDEP/M	MN
NDEP2	RJ	NDEP2/15	NDEP2/M	MN
NEN	R2	NEN/6	NEN/M	*All
NEWX	R9	NEWX/8	NEWX/M	EIG
NF3D	R5	NF3D/15	NF3D/M	MN
NFBEAM	R7	NFBEAM/15	NFBEAM/M	EQNF
NFSHEL	R7	NFSHEL/11	NFSHEL/M	EQNF
NLMCLD	R5	NLMCLD/15	NLMCLD/M	MN
NODPLT	RP	L605/V70L	L605/M	PLTB
NORM	R9	NORM/9	NORM/M	AUS
NORMRI	RC	NORMRI/12	NORMRI/M	CEIG
NPRS	R7	NPRS/14	NPRS/M	EQNF
NSECTS	R2	NSECTS/6	NSECTS/M	*All

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
NTOC	R2	NTOC/9	NTOC/M	*All
NWORDS	R2	NWORDS/6	NWORDS/M	*All
OP1	R9	OP1/8	OP1/M	AUS SSOL CEIG SM
OPN1	R5	OPN1/15	OPN1/M	MN
OUTF1	R3	OUTF1/7	OUTF1/M	TAB
OUTSOL	RA	OUTSOL/9	OUTSOL/M	STRP
OUTZ	R4	OUTZ/4	OUTZ/M	TOPO STRP
P44	R8	P44/8	P44/M	PSF
PACK46	RP	L608A/V70H	L608A/M	PLTB PXY
PEJECT	R3	PEJECT/10	PEJECT/M	TAB
PF3A	R5	PF3A/11	PF3A/M	PRTE
PFB1	R6	PFB1/12	PFB1/M	FSM
PLAMS	R8	PLAMS/11	PLAMS/M	PSF
PLREAD	RP	PLREAD/9	PLREAD/M	----
PLT3D	RP	PLT3D/12	PLT3D/M	PLTB
PLTCLS	RP	PLTCLS/M	PLTCLS/M	PLTB
PLTEXT	RP	L6018/V70L	L6018/M	PLTB
PLTOPN	RP	PLTOPN/M	PLTOPN/M	PLTB
PLTR	RP	L602/12	L602/M	PLTB
PRECON	R4	F4D/12	F4D/M	TOPO
PREOPT	RP	PREOPT/10	PREOPT/M	PLTB
PREPEL	R5	PREPEL/11	PREPEL/M	E
PREXT	R7	PREXT/9	PREXT/M	DR
PRIN3D	R8	PRIN3D/12	PRIN3D/M	PSF
PRINT1	R2	PRINT1/9	PRINT1/M	DCU
PRINV	R6	PRINV/9	PRINV/M	PS
PRLINE	R2	PRLINE/9	PRLINE/M	*All
PRNLS1	R5	PRNLS1/15	PRNLS1/M	MN
PRNLSS	R5	PRNLSS/15	PRNLSS/M	MN
PROCOM	RP	GPF10/9	GPF10/M	PLTA
PRP2	R9	PRP2/9	PRP2/M	AUS
PRT34	R8	PRT34/11	PRT34/M	PSF
PRTHST	R9	PRTHST/6	PRTHST/M	EIG
PRTVEC	R9	PRTVEC/5	PRTVEC/M	EIG
PS21	R8	PS21/10	PS21/M	PSF
PS22	R8	PS22/8	PS22/M	PSF
PS23	R8	PS23/8	PS23/M	PSF
PS24	R8	PS24/11	PS24/M	PSF
PS3D	R8	PS3D/12	PS23/M	PSF
PSFEX	R8	PSFEX/12	PSFEX/M	PSF
PSFLD	R8	PSFLD/12	PSFLD/M	PSF
PSM	R6	PSM/9	PSM/M	PS
PSMDP	R6	PSMDP/9	PSMDP/M	PS
PSN	R8	PSN/11	PSN/M	PSF
PSPACE	RP	PSPACE/12A	PSPACE/M	PLTB

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
PTAB1	R2	PTAB1/9	PTAB1/M	DCU
PUP	R7	PUP/8	PUP/M	TAB AUS EQNF GSF PLTB MN E
PWR	R9	PWR/9	PWR/M	AUS
QGENP	RF	GPF09/V70I	GPF09/M	PLTA
QH	R6	QH/1	QH/M	K SM
QTEQ	RA	QTEQ/11	QTEQ/M	SYN
RANF	R9	RANF/7	RANF/M	EIG CEIG
RATIOS	RF	L6013/V70E	L6013/M	PLTB
RBINT	R7	RBINT/9	RBINT/M	DR
RBVEC	R9	RBVEC/7	RBVEC/M	AUS
RDIND	R2	RDIND/7	RDIND/M	*All
RDMAT	R9	RDMAT/9	RDMAT/M	AUS
RDTAB	R3	F1T/15	F1T/M	TAB
REAC	R7	REAC/9	REAC/M	SSOL
READ	R2	READ/7	READ/M	*All
READD	RA	READD/9	READD/M	STRP
READER	R2	READER/9	READER/M	*All
REC	RA	REC/11	REC/M	SYN
RECMAD	RA	DMAT/10	DMAT/M	STRP
RECMAT	R9	RECMAT/5	RECMAT/M	EIG
RED	R6	RED/8	RED/M	INV
REDDP	R6	REDDP/8	REDDP/M	INV
REPOSZ	RA	REPOSZ/9	REPOSZ/M	STRP
RGEN	RJ	RGEN/9	RGEN/M	EKS SM
RIFIN	RC	RIFIN/12	RIFIN/M	CEIG
RIGI	R9	RIGI/9	RIGI/M	AUS
RINV	R9	RINV/9	RINV/M	AUS
RIO	R2	RIO/9	RIO/M	*All
RLOOP	R9	RLOOP/13	RLOOP/M	AUS
RMAT	R9	RMAT/9	RMAT/M	AUS
RMBT	R3	RMBT/11	RMBT/M	TAB
RMP	R8	RMP/10	RMP/M	FSM GSF
ROOTS	RC	ROOTS/13	ROOTS/M	CEIG
RPOINT	R5	F32A3/1	F32A3/M	E
RPRO	R9	RPRO/9	RPRO/M	AUS
RRINZ	R4	RRINZ/4	RRINZ/M	TOPO STRP
RRMK	R9	RRMK/7	RRMK/M	EIG
RROUTZ	RA	RROUTZ/9	RROUTZ/M	STRP
RSEL1	RC	RSEL1/13	RSEL1/M	CEIG
RSET	R2	RSET/8	RSET/M	*All
RTRA	R9	RTRA/9	RTRA/M	AUS
RTV	RF	RTV/9	RTV/M	PLTB
RWINDZ	R4	RWINDZ/6	RWINDZ/M	TOPO STRP
S11	R9	S11/8	S11/M	AUS
S1V	R9	S1V/8	S1V/M	AUS

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
S21	R9	S21/8	S21/M	AUS
S22	R9	S22/8	S22/M	AUS
S2V	R9	S2V/8	S2V/M	AUS
SASCON	R3	F1T15B/10	F1T15B/M	TAB
SBA	RA	SBA/11	SBA/M	SSBT
SBA1	RA	SBA1/10	SBA1/M	SSBT
SBA2	RA	SBA2/10	SBA2/M	SSBT
SBB	RA	SBB/10A	SBB/M	SSBT
SBB1	RA	SBB1/10	SSB1/M	SSBT
SCLPLT	RP	L6012/V70I	L6012/M	PLTB
SCNTOC	R9	SCNTOC/9	SCNTOC/M	AUS
SCOMP	R8	SCOMP/13	SCOMP/M	GSF
SDPLAY	RP	SD02/12	SD02/M	PLTB
SDPXQT	RP	SDPXQT/11	SDPXQT/M	PLTB
SE21	R8	SE21/15	SE21/M	PSF
SECT2	R3	F1T091/12	F1T091/M	TAB
SEQGEN	R3	F1T17/11	F1T17/M	TAB
SETFNT	RP	SETFNT/15	SETFNT/M	PXY
SFETCH	RP	SD03/11B	SD03/M	PLTB
SHADE	RP	L607/V70L	L607/M	PLTB
SHRINK	R9	SHRINK/8	SHRINK/M	AUS
SI	R3	SI/6	SI/M	TAB
SKEWP	R7	SKEWP/9	SKEWP/M	EQNF GSF
SLABL	RP	SD05/10	SD05/M	PLTB
SMLD	R6	SMLD/15	SMLD/M	K M KG
SMSB	R8	SMSB/11	SMSB/M	PSF PLTB
SMSPDP	RC	SMSPDP/12	SMSPDP/M	CEIG SM
SMUL	RC	SMUL/12	SMUL/M	CEIG SM
SMULT	R7	SMULT/8	SMULT/M	AUS SSOL EIG
SNEW	RJ	SNEW/15	SNEW/M	MN
SNEW2	RJ	SNEW2/15	SNEW2/M	MN
SPECIO	RP	SPECIO/1	SPECIO/M	PLTA
SPFGKM	R6	SPFGKM/12	SPFGKM/M	FSM
SPMOVE	RM	SPMOVE/12	SPMOVE/M	SM
SPMX	RM	SPMX/12	SPMX/M	SM
SPROD	R9	SPROD/10	SPROD/M	AUS
SPRT	R8	SPRT/12	SPRT/M	PSF
SPTRN3	R6	SPTRN3/12	SPTRN3/M	K M KG FSM
SPTRN6	R6	SPTRN6/12	SPTRN6/M	K M KG
SQUARE	R9	SQUARE/5	SQUARE/M	EIG
SRTOS	R8	SRTOS/11	SRTOS/M	PSF
SS1V	R9	SS1V/8	SS1V/M	AUS
SS2V	R9	SS2V/8	SS2V/M	AUS
SSHL	RP	SSHL/11	SSHL/M	PLTB
SSMK	R9	SSMK/5	SSMK/M	AUS

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
SSPREP	R9	SSPREP/8	SSPREP/M	AUS
SSTM	RJ	SSTM/12A	SSTM/M	EKS SM MN
SSUM	R9	SSUM/8	SSUM/M	AUS
STATIO	R2	STATIO/7	STATIO/M	*All
STCHOL	RA	STCHOL/8	STCHOL/M	STRP
STEXPE	R8	STEXPE/12	STEXPE/M	GSF
STORE	RA	STORE/8	STORE/M	STRP
STORS	RJ	STORS/11	STORS/M	K SM
STORS3	R6	STORS3/12	STORS3/M	K
STRDIA	RA	STRDIA/8A	STRDIA/M	STRP
STRK2D	R8	STRK2D/11C	STRK2D/M	GSF
STRLST	RP	STRLST/10	STRLST/M	PLTB
STRNE	RJ	STRNE/12	STRNE/M	EKS MN
STRPRT	RA	STRPRT/10	STRPRT/M	STRP
STRS21	R8	STRS21/15	STRS21/M	GSF
STRS3D	R8	STRS3D/13	STRS3D/M	GSF
STRSYM	RA	STRSYM/8	STRSYM/M	STRP
STRTAB	R3	STRTAB/10	STRTAB/M	TAB
SVEC2	R9	SVEC2/9	SVEC2/M	AUS
SVEC3	R9	SVEC3/10	SVEC3/M	AUS
SVV	R9	SVV/8	SVV/M	AUS
SYMINV	RJ	SYMINV/14	SYMINV/M	EKS CEIG SM MN
SYMVRT	RJ	SYMVRT/11	SYMVRT/M	EKS SM
SYSM	RC	SYSM/12	SYSM/M	CEIG
T3D01	R7	T3D01/12	T3D01/M	EQNF
T3D02	R7	T3D02/12A	T3D02/M	EQNF
TCB	RJ	TCB/9	TCB/M	EKS SM
TCLOCK	R2	TCLOCK/7	TCLOCK/M	*All
TCOL	RM	TCOL/13	TCOL/M	SM
TCOL1	RM	TCOL1/13	TCOL1/M	SM
TDMBRN	R7	TDMBRN/14	TDMBRN/M	EQNF
TERMIN	RP	TERMIN/15	TERMIN/M	PXY
TFB1	R6	TFB1/12	TFB1/M	FSM
TGEN	RJ	TGEN/11	TGEN/M	EKS SM
THAFMP	RA	THAFMP/8	THAFMP/M	STRP
THSBMP	RA	THSBMP/8	THSBMP/M	STRP
TIC1	RP	TIC1/15	TIC1/M	PXY
TIC2	RP	TIC2/15	TIC2/M	PXY
TIC3	RP	TIC3/15	TIC3/M	PXY
TINT	R7	TINT/9	TINT/M	DR
TIO	R2	TIO/6	TIO/M	DCU
TITL	R9	TITL/9	TITL/M	AUS
TK3D	R5	TK3D/15	TK3D/M	MN
TKU	RJ	TKU/11	TKU/M	K SM
TLAB1	RP	TLAB1/15	TLAB1/M	PXY

Table 4-3 (Continued)

Name	File	Symbolic	Relocatable	Processors
TOCO	R2	TOCO/9	TOCO/M	ELD AUS EQNF SSOL GSF MN
TOPOEX	R4	TOPOEX/12	TOPOEX/M	TOPO
TOPOLD	R4	TOPOLD/9	TOPOLD/M	TOPO
TR1	R7	TR1/9	TR1/M	DR
TR1A	R7	TR1A/9	TR1A/M	DR
TRAML1	RA	TRAML1/11	TRAML1/M	SYN
TRAML2	RA	TRAML2/11	TRAML2/M	SYN
TRAN3	R6	TRAN3/5	TRAN3/M	SM
TRAN6	R6	TRAN6/5	TRAN6/M	SM
TRGEN	RA	TRGEN/8	TRGEN/M	SYN
TRI	RA	TRI/11	TRI/M	SYN
TRIL	RJ	TRIL/11	TRIL/M	K SM
TRIL3	R6	TRIL3/12	TRIL3/M	K
TRIMUL	RJ	TRIMUL/11	TRIMUL/M	K SM
TRINV6	R3	TRINV6/11B	TRINV6/M	TAB
TRIOUT	RJ	TRIOUT/11	TRIOUT/M	K SM
TRIPRO	R7	TRIPRO/9	TRIPRO/M	EQNF GSF
TRISQ3	R6	TRISQ3/11	TRISQ3/M	FSM
TRMC	RJ	TRMC/15	TRMC/M	MN
TRMCO	R5	TRMCO/15	TRMCO/M	MN
TSUBMP	RA	TSUBMP/8	TSUBMP/M	STRP
TT10X3	RJ	TT10X3/9	TT10X3/M	EKS SM
TT6X3	RJ	TT6X3/9	TT6X3/M	EKS SM
TTE	R3	TTE/14	TTE/M	ELD
TTE1	R3	TTE1/14	TTE1/M	ELD
TTGEN	RJ	TTGEN/9	TTGEN/M	EKS SM
TX2N	R5	TX2N/7	TX2N/M	EKS SM
TXPR	R2	TXPR/9	TXPR/M	TAB PSF PLTB
U3D	R8	U3D/12	UED/M	GSF
UBEND	R8	UBEND/11	UBEND/M	GSF
UEVAL	R7	UEVAL/8	UEVAL/M	AUS SSOL EIG CEIG
ULOC3	R5	ULOC3/15	ULOC3/M	MN
UMBRN	R8	UMBRN/11C	UMBRN/M	GSF
UNION	R9	UNION/9	UNION/M	AUS
VIEWST	RP	GPF06/V70J	GPF06/M	PLTA
VLD	R9	VLD/9	VLD/M	AUS
VMISES	RJ	VMISES/15	VMISES/M	MN
VR2	R8	VR2/15	VR2/M	GSF PSF
WARPT	RJ	WARPT/11	WARPT/M	EKS SM
WNU7	R4	F4B/11	F4B/M	TOPO
WR	R2	WR/7	WR/M	*All
WRTIND	R2	WRTIND/7	WRTIND/M	*All
WRTJKC	R3	F1T15C/1	F1T15C/M	TAB
XBLOCK	R3	F1T051/8	F1T051/M	TAB
XKALER	RP	L603	L603/M	PLTB

Table 4-3 (Concluded)

Name	File	Symbolic	Relocatable	Processors
XLIO	R9	XLIO/9	XLIO/M	AUS
XPARA	RM	XPARA/13	XPARA/M	SM
XPRNT	R9	XPRNT/5	XPRNT/M	EIG
XSI	RP	XSI/9	XSI/M	PLTA
XTRANS	RC	XTRANS/12	XTRANS/M	CEIG
XTY	R9	XTY/9	XTY/M	AUS
XTYD	RC	XTYD/12	XTYD/M	CEIG
XTYG	RC	XTYG/12	XTYG/M	CEIG SM
XUEVL	RC	XUEVL/12	XUEVL/M	CEIG
XXMN	R5	XXMN/15	XXMN/M	MN
XY1	RP	XY1/15	XY1/M	PXY
XY2	RP	XY2/15	XY2/M	PXY
XY3	RP	XY3/15	XY3/M	PXY
XY3S	RP	XY3S/15	XY3S/M	PXY
XY4	RP	XY4/15	XY4/M	PXY
XY5	RP	XY5/15	XY5/M	PXY
XY6	RP	XY6/15	XY6/M	PXY
XY7	RP	XY7/15	XY7/M	PXY
XYEXT	RP	XYEXT/15	XYEXT/M	PXY
XYLD	RP	XYLD/15	XYLD/M	PXY
XYTEXT	RP	XYTEXT/15	XYTEXT/M	PXY
YPARA	RM	YPARA/12	YPARA/M	SM
ZRMP	R8	ZRMP/12	ZRMP/M	EQNF GSF

5. REFERENCES

1. Oden, J.T., and M.L. Pearson, "SPAR Improved Structure/Fluid Dynamic Analysis Capability," LMSC-HREC TR D867285, August 1983.

2. Whetstone, W.D., "SPAR Structural Analysis System Reference Manual - System Level 13A. Volume 1 - Program Execution" NASA CR-158970-1, December 1978.