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TRACE TRAJECTORY ANALYSIS AND ORBIT DETERMINATION PROGRAM. VOLUME VII. USER'S GUIDE, PART B: APPENDICES (REISSUE B)

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Aerospace Corporation

Prepared for:

Space and Missile Systems Organization

31 May 1974

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AD-783729

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER SAMSO-TR-71-141, Vol. VII Reissue B, Part B	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TRACE Trajectory Analysis and Orbit Determination Program Volume VII: Usage Guide Part B: Appendices		5. TYPE OF REPORT & PERIOD COVERED
		6. TR-0059(9320)-1, Vol VII Reissue B, Part B
7. AUTHOR(s) Willard D. Downs III, Robert H. Prislin, Dennis C. Walker, and Robert J. Mercer		8. CONTRACT OR GRANT NUMBER(s) F04701-70-C-0059 F04701-72-C-0073 F04701-73-C-0074
9. PERFORMING ORGANIZATION NAME AND ADDRESS The Aerospace Corporation El Segundo, Calif. 90245		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Space and Missile Systems Organization Air Force Systems Command Los Angeles, Calif. 90045		12. REPORT DATE 31 May 1974
		13. NUMBER OF PAGES 391
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Batch Least Squares
Coordinate and Timekeeping Systems
Covariance Analysis
Data Generation
Ephemeris Generation
Multiple Arc Fitting
Orbit Determination
Powered Flight

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The TRACE Trajectory Analysis and Orbit Determination Program is a general-purpose orbital analysis program. It was written and continues to be developed specifically to assist technical personnel in the analysis and design of satellite orbits and tracking systems. Volume VII is intended to serve as in input usage guide that defines all input required to perform TRACE functions such as trajectory generation, data/observation generation, orbit determination, and statistical analysis. A comprehensive

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19. KEY WORDS (Continued)

Recursive Filter
Sequential Batch
Simultaneous Vehicle
TRACE
TRACE66
Trajectory Analysis
Vehicle Attitude

20. ABSTRACT (Continued)

description for each specific input item is given, and input data structures are shown. The Usage Guide is published in two parts, A and B.

The TRACE documentation series is summarized as follows:

Volume I:	General Program Objectives, Description, and Summary
Volume II:	Coordinate and Timekeeping Systems with Associated Transformations
Volume III:	Trajectory Generation Equations and Methods
Volume IV:	Measurement Data Generation and Observational Measurement Partials
Volume V:	Differential Correction Procedure and Techniques
Volume VI:	Orbital Statistics via Covariance Analysis
Volume VII:	Usage Guide, Parts A and B
Volume VIII:	Not to be published
Volume IX:	Detailed Program Structure
Volume X:	Lunar Gravity Analysis
Volume XI:	LGA Data Processor
Volume XII:	Sequential Least Squares Procedures and Techniques

PREFACE

Certain volumes of the TRACE documentation series were published by The Aerospace Corporation as Technical Operating Reports. Volume III: Trajectory Generation Equations and Methods was published as TOR-0066(9320)-2, Vol. III, and Volume V: Differential Correction Procedure and Techniques was published as TOR-0066(9320)-2, Vol. V.

Volume I: General Program Objectives, Description, and Summary was published as TR-0059(9320)-1, Vol. I, and Volume X: Lunar Gravity Analysis was published as TR-0059(9320)-1, Vol. X. Future volumes in this series will be published as Technical Reports.

This report is published in two parts, A and B.

The TRACE Program could not have been developed to its present status without the assistance of many people working in the fields of astrodynamics and software design. The authors acknowledge with gratitude and analysis and/or programming efforts of A. B. Bierman, R. J. Farrar, W. A. Feess, E. H. Fletcher, R. B. Freund, T. P. Gabbard, C. G. Gibson, P. T. Gray, P. T. Guttman, J. A. Pearson, C. M. Price, W. F. Rearick, N. W. Rhodus, A. J. Rusick, L. J. Tedeschi, L. Wong, and K. R. Young. In addition, consultations with W. T. Kyner, A. Troesch, and H. H. Wertz have led to many significant improvements and added capabilities in the program.

This report supersedes the appendices to TR-0059(9320)-1, Vol. VII, 30 June 1971. NR at

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APPENDIX A

DESCRIPTION OF THE GENERAL-PURPOSE INPUT ROUTINE GAIL1

A.1 FUNCTION AND CAPABILITIES

A.1.1 Purpose and Description

The purpose of GAIL1* is to read a set of Hollerith punched data and/or header cards into core with one FORTRAN call statement. To achieve this, the data fields are converted to binary, while the header information is stored in Hollerith code; each piece of the data is converted and stored according to a specific conversion code. These data may be integers, real variables, arrays, alphanumeric data (short or long headers), matrices, or end-of-case indications.

The data cards can be printed as received, or they can be placed on a scratch I/O device and then listed when an end of file (EOF) is detected on the input file.

The subroutine will always return control to the driver program except in the case of tape errors, system malfunctions, or completely erroneous punched data cards that disobey all FORTRAN I/O format rules. Therefore, the user must supply and test a status cell after an exit from the subroutine to determine which of the following occurred:

- Normal end of case
- Some type of error
- End of file reached on the input device

---

*GAIL1 was originally developed by R. B. Gladson of The Aerospace Corporation for the CDC 6000 computer series. It has been modified for IBM 360 and 370 computer series.

A. 1. 2 Method

All data fields are converted according to FORTRAN I/O format specifications. Real variables are converted by the F specification, whether or not the exponent (E or D) is included with the variable. Integers are converted by the I format, and alphanumeric data by the A format. This allows for alternate methods of entering real variables and integers from the FORTRAN standards. This variety of methods (Sec. A. 1. 3. 7) enables the user to enter numbers in a manner more reasonable and mathematical than did previous input routines.

A. 1. 3 Usage

A. 1. 3. 1 Data Card Format

The data card format consists of three fields, each containing three subfields; a conversion code; a location; and a value (as in the following example):

1	2	7	27	28	33	53	54	59	79	80
C_1	L_1	V_1	C_2	L_2	V_2	C_3	L_3	V_3		seq

Subfield	Data Field 1	Data Field 2	Data Field 3
Conversion Code (C_i)	1	27	53
Location (L_i)	2-6	28-32	54-58
Value (V_i)	7-26	33-52	59-78

Columns 79 and 80 are not processed by the routine and can be used for card sequencing if the user desires. The conversion code (C_i) is one of the alphabetic characters (Sec. A. 1. 3. 7); it specifies the type of conversion to be used on the value field. The location subfield specifies the cell in which the converted value subfield is to be stored.

A. 1. 3. 2 Header Card Format

The header card format consists of a conversion code in Column 1, a sequence number in Columns 2 through 6, and any Hollerith information in Columns 7 through 78. Columns 79 and 80 are not used.

A. 1. 3. 3 Decimal Points

The use of a decimal point is valid in both integer and real variable entries; however, it is not mandatory to enter one. If the decimal point is missing from an entry, it is assumed to be at the right of the last digit punched in the value field; for example:

321. = 321 = 321E0

A. 1. 3. 4 Signs

If signs (+ or -) are used, they are placed in a column by themselves and immediately precede the value. Overpunches are not valid; e. g. :

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		+7.1621

Valid

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		$\bar{7}$.1621

Invalid

A. 1.3.5 Values (V_i Subfield)

It is not necessary for the entire subfield to be filled, since the first blank following the first nonblank denotes the end of the value. Superfluous low-order zeros should be omitted.

If alphanumeric information is entered, it is stored in core as it appears in the value subfield. Thus, for this type of data entry, leading blanks are retained. If they appear, the blanks themselves are also stored in core.

A. 1.3.6 Location (L_i Subfield)

The location is specified by either a variable, an array name, or the element subscripts in a single-dimension array or matrix.

A. 1.3.6.1 Variable, Array, or Matrix Name

If the location contains at least one nonnumeric character that is not a comma as the third character, it is interpreted as a variable, array, or matrix name. The contents of the value subfield are stored in the cell for the variable or in the first cell of the array or matrix. This location then becomes the origin of all numeric and matrix element locations that follow until another variable, array, or matrix name is encountered. Care must be taken to enter an array or matrix name before entering numeric or matrix element locations.

A. 1. 3. 6. 2 Single Numeric Entry

If a location contains a single numeric value, the entry is treated as a subscript. With its previously established origin, this subscript is used to compute the location in which the entry in the value subfield is stored. For instance, if the established origin is NAME and the value in the location subfield of the input is 6, the entry in the value subfield is stored in cell NAME(6). (Single numeric entries must be left-justified, and leading zeros are optional.) In the following example,

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	NAME	3.716
	6	6.173

legitimate numeric entries would be shown as:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	5	
	12	
	03	

and illegitimate numeric entries would be shown as:

1 27 53	2 28 54	7 33 59	
C	LOCATION	VALUE	
	1		- Not a valid subscript.
	30 1 1		- Store as 30.
	1 1		- Not recognized as a relative address; it is flagged as an error.

The symbol 1 indicates 1 space between digits, and n indicates n spaces.

A. 1.3.6.3 Matrix Element Entry

A matrix element is stored by specifying two separate two-digit numeric entries, separated by a comma, in the location subfield. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	03, 04	-3.17

-3.17 goes to element (3,4) of the matrix

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	15, 01	+7.38

+7.38 goes to element (15,1) of the matrix

The elements are stored in the column major sort by using the formula

$$\text{ØRIGIN}\left((j - 1)I + i\right)$$

where I is the total number of rows in the matrix and (i, j) is the element in question.

A. 1.3.6.4 Blank Location

If the location is left blank, the entry in the value subfield is stored in the cell immediately following the one in which the last value was stored. Thus, an entire array may be entered by using a name in the location subfield for the initial entry and leaving location subfields blank for the subsequent value subfield entries. The following is an example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	XYZ	4.0
		5.1
		6.2

4.0 stored in XYZ(1)
5.1 stored in XYZ(2)
6.2 stored in XYZ(3)

A. 1.3.7 Conversion Code (C_i Subfield)

The entry in the conversion code subfield specifies the method of converting the data in the value subfield. Care should be taken to apply the proper code with each item of data; if the proper code is not applied, a premature termination will occur in a FORTRAN format statement. The eight conversion codes currently available are described in the following subsections.

A. 1.3.7.1 Blank: Real Variable

The number in the value subfield is converted to and stored as a real variable. Entries can be made to the value subfield by any of four methods: Three of them are in the normal FORTRAN E, D, and F types of real variable input formats, e.g.:

1 27 53	2 28 54	7 33 59	
C	LOCATION	VALUE	
		3.615	= 3.615
		.3615E01	= 3.615
		3615E-03	= 3.615
		3615D-03	= 3.615
		.3615D01	= 3.615

The fourth method allows for the input of real variables in scientific nomenclature ($a \times 10^b$). The number is written in the value subfield and is followed by an X, then by a 10, and then by the power of ten to which the number is to be scaled (a sign must precede the exponent). Some examples follow:

- $14200 = 1.4200 \times 10^4$ is input as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		1.4200X10+4

or, in the normal mode, as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		14200

or as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		1.4200E4

- $.00762 = .762 \times 10^{-2}$ is input as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		.762X10-2

A. 1.3.7.2 I: Integer

The number in the value subfield is converted to a fixed-point integer. A decimal point is allowable; if it is used, only the integer portion is converted. Before the value is converted by the FORTRAN I format, the decimal point and any digit(s) to the right are stripped off; e.g.:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
I		71.35

is stored as 71.

A. 1.3.7.3 D: Short Header (20 Characters)

The contents of the value subfield are interpreted as 20 alphanumeric characters. They are stored in two consecutive cells in ascending order, beginning at the location specified by the location subfield. The characters are stored in the same relative positions as in the value subfield; thus, leading, trailing, and embedded blanks are legitimate. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
D		ABC①DEF②GHIJ④234

is stored in two consecutive words, with ABC①DEF②G in the first word, and HIJ④234 in the second.

A. 1.3.7.4 H: Long Header (72 Characters)

A card with an H in Column 1 is considered a long header card. If the location subfield is blank, the card is ignored (treated as a comments card). If the location subfield contains a left-justified integer 1, Columns 7 through 78 of the card are stored directly in seven consecutive words in ascending core storage.

The H conversion code is the only one for which a numeric location subfield is mandatory. If the location subfield is not blank or the integer 1, the header is not stored, an error comment is printed, and the error termination procedure is invoked.

A. 1. 3. 7. 5 <u>L: Sparse Matrix Input Definition</u>

This input specifies only that matrix elements may be following, either on the same and/or on subsequent cards. It does not store any items of data; it only warns the subroutine that matrix elements might be stored and indicates where. The location subfield must contain the name of the matrix in which the items are to be located in core.

The value subfield must contain two-digit integers separated by a comma. The entries are the size of the matrix [I_{max} and J_{max}], and the comma must be the third character of the subfield. If it is not, an error comment is printed, and an error flag set.

The I_{max} and J_{max} values are retained to compute the successive subscripted locations of the matrix elements until they are redefined. Blank location subfields may follow this definition if successive elements of the matrix are to be loaded. It must be remembered that the matrix is stored in column major. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
L	GØØD	03, 07

indicates that a 3 × 7 matrix GØØD is being defined and that following data values are to be stored in GØØD until another symbolic location name is encountered. Storage is to be made according to GØØD $\left((j - 1)I + i\right)$.

A. 1.3.7.6 M: Full Matrix Input Definition

The use of this conversion code is identical to that of L, except that the entire matrix is preset to zero before any of the elements are loaded. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
M	GØØD	03, 07

presets the 3 × 7 matrix GØØD to zero; it is prepared to store the matrix elements following it until another symbolic location name is encountered.

A. 1.3.7.7 B: Octal

The value subfield is converted as a logical word. It is not necessary to include leading zeros, but the first octal digit must always occupy the left-most position in the subfield. If fewer than 20 digits are input, the value will be right-justified in the memory location. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
B		123

is stored as 00000000000000000123_8 in core.

A. 1.3.7.8 E: End of Case

This defines the end of case, when control is returned to the object program from which it was called. The rest of the subfield and the remaining fields on the card are ignored.

A. 2 ERROR COMMENTS

The input errors that the subroutine can recognize are listed in Table A-1. In each case, an appropriate error comment is printed, the remaining cards in the data set are scanned until an E conversion code is found, and the run is terminated. The errors are not listed in any specific order.

Table A-1. Errors Recognizable by Input Subroutine

Error Message	Type of Input Error
HEADER CARD NO. EXCEEDS MAXIMUM NO. ALLOWABLE.	If the location subfield is not blank or the integer 1, the card is not stored; it is printed as shown, and the error termination procedure takes over.
← Card Image (80 Characters) →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FROM BLANK LOCATION FIELD. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	The first value input had a blank location subfield, and no symbolic origin had been established.
← Field in Error →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FOR A MATRIX ELEMENT. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	A matrix element is to be stored, but no location definition of the matrix has been made by a previous M or L card.
← Field in Error →	
MATRIX SIZE UNDEFINED.	A matrix element is to be stored, but no size definition of the matrix has been made by a previous M or L card.
← Field in Error →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FOR NUMERIC LOCATION FIELD. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	The first value input had a numeric location subfield. No symbolic origin had been established before this point.
← Field in Error →	
UNDEFINED SYMBOL USED IN LOCATION FIELD.	A symbol not previously defined was used in the location subfield.
← Field in Error →	
MISSING COMMA IN MATRIX DEFINITION.	During an attempt to define a matrix (M or L conversion code), the third character in the value subfield was not a comma.
← Field in Error →	
ILLEGAL CONVERSION CODE.	An undefined conversion code was entered.
← Field in Error →	
INVALID CHARACTER IN VALUE FIELD.	There is an invalid character in the value field.
← Field in Error →	

A. 3 SAMPLE GAIL1 INPUT FORM

A sample GAIL1 input form is shown below.

6600 INPUT DATA

PROGRAMMER ____________ KEYPUNCHED ________ VERIFIED ________ DATE ________ PAGE ____ OF ____

1	2	7	77

	1 27 5.	2 28 54	7 33 59
SYMBOL	C	LOCATION	VALUE

	1 27 53	2 28 54	7 33 59
SYMBOL	C	LOCATION	VALUE

AEROSPACE FORM 3770 REV 5-67

B. TRACE DATA DECK STRUCTURE EXAMPLES

FIGURES

APPENDIX B

TRACE DATA DECK STRUCTURE EXAMPLES

B.1 ORBIT DETERMINATION RUN (ITIN=2)

B.1.1 Single-Vehicle with OBSERVATION Card Input

The deck setup for an orbit determination run for one vehicle is shown in Fig. B-1. All observational measurements are input in the OBSERVATION block.

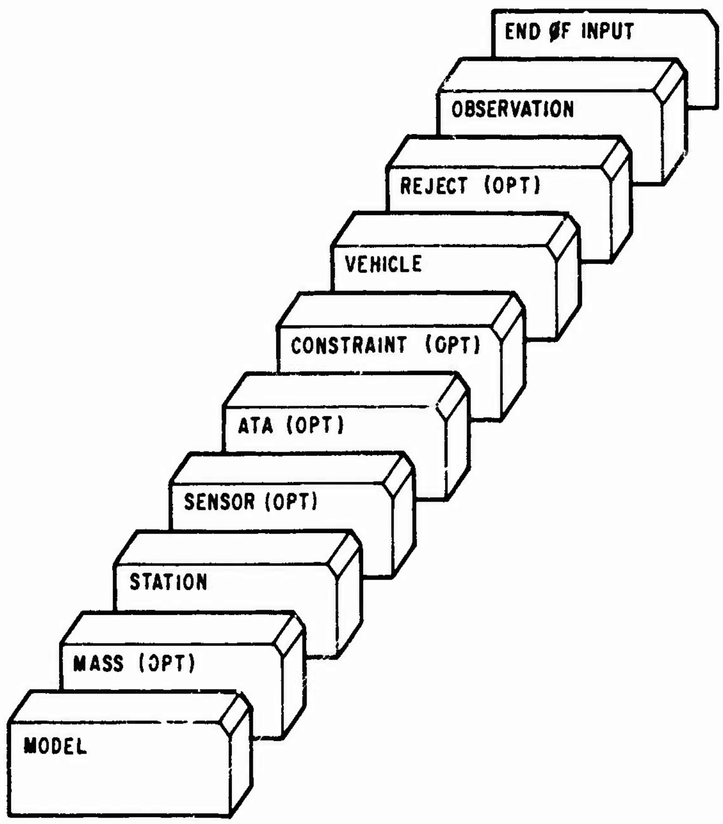


Fig. B-1. Deck Setup for a Single-Vehicle Orbit Determination Run with OBSERVATION Card Input

B.1.2 Multiple-Arc with OBSERVATION Card Input

The deck setup for an orbit determination of more than one vehicle in which measurements from the many vehicles are used (but each observation is associated with only one vehicle) is shown in Fig. B-2. In this case, only one model group (MODEL, MASS, STATION, SENSOR, ATA, and CONSTRAINT data blocks) is input; it is followed by the VEHICLE blocks for all vehicles, and then by pairs of REJECT and OBSERVATION blocks for each vehicle.

Each OBSERVATION card should have a vehicle number (Sec. 15), and VEHID and BTIME are required in each VEHICLE block. For convenience, in the VEHICLE block, the input data not overridden carries over from one vehicle to the next (characteristic of GAIL1 input).

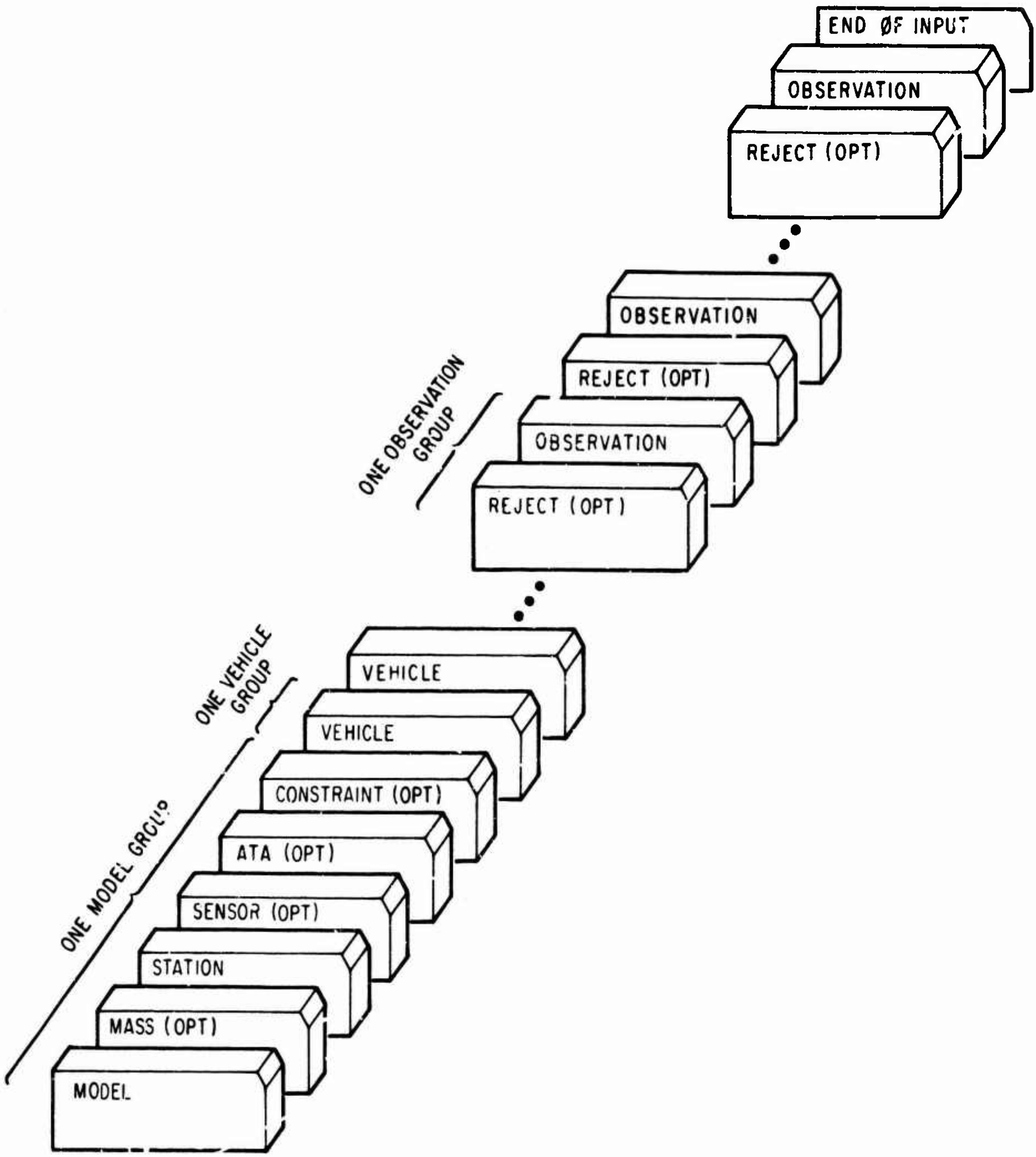


Fig. B-2. Deck Setup for a Multiple-Arc Orbit Determination Run with OBSERVATION Card Input

B.1.3 Single-Vehicle with Card Image Observation File Input

The deck setup for an orbit determination run for one vehicle, using observational measurements found on a card image observation file (TAPE4) is shown in Fig. B-3. This setup is indicated by the input item BCDIN≠0 (Sec. 11.2.1) in the VEHICLE data block and the fact that the OBSERVATION card is followed by the END ØF INPUT card.

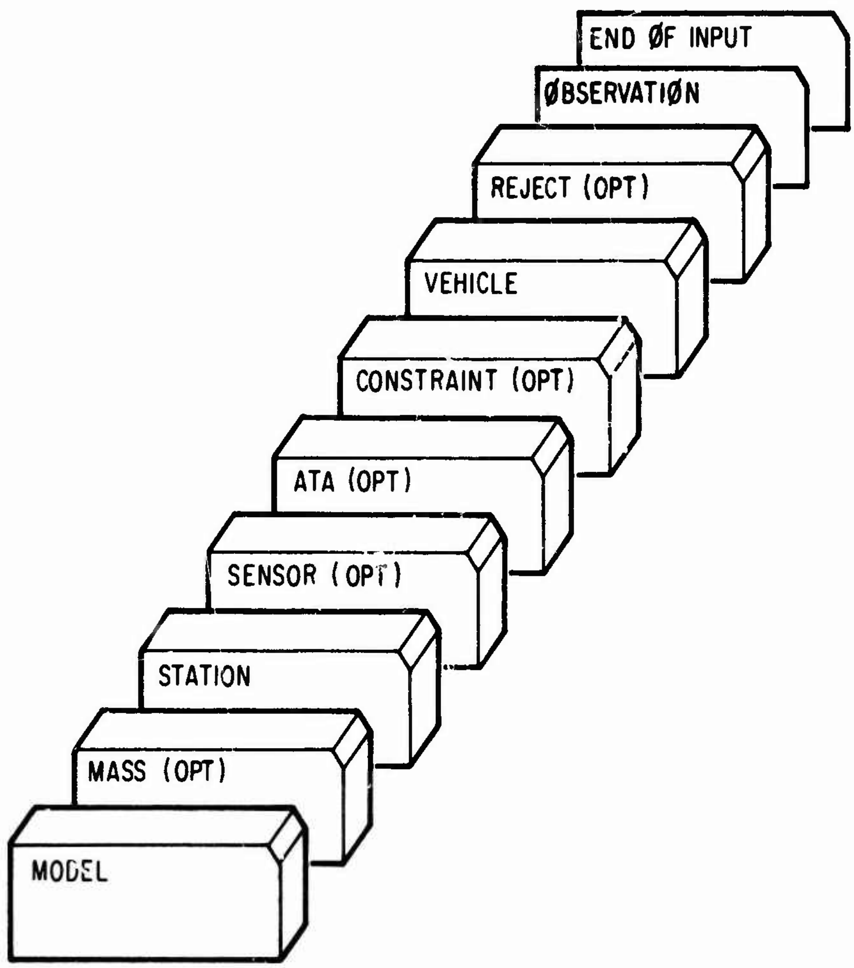


Fig. B-3. Deck Setup for a Single-Vehicle Orbit Determination Run with Card Image Observation File Input

B.1.4 Multiple-Arc with Card Image Observation File Input

In an orbit determination run with observational measurements from several vehicles (each item of data is associated with only one vehicle), the data deck requires only one set of model group data blocks (Fig. B-4). For each vehicle there must be a VEHICLE block followed by the pairs of REJECT and OBSERVATION blocks.

In the VEHICLE block, input data not overridden will carry over from one vehicle to the next. BTIME is required in each VEHICLE block to show the last integration time (more than likely, the last observation time). VEHID, which should match the vehicle number on the observation card images for that vehicle, is also required.

For this case, observations are input by the card image observation file (TAPE4). This is indicated by BCDIN≠0 (Sec. 11.2.1) and by a single ØBSERVATIØN card for each vehicle.

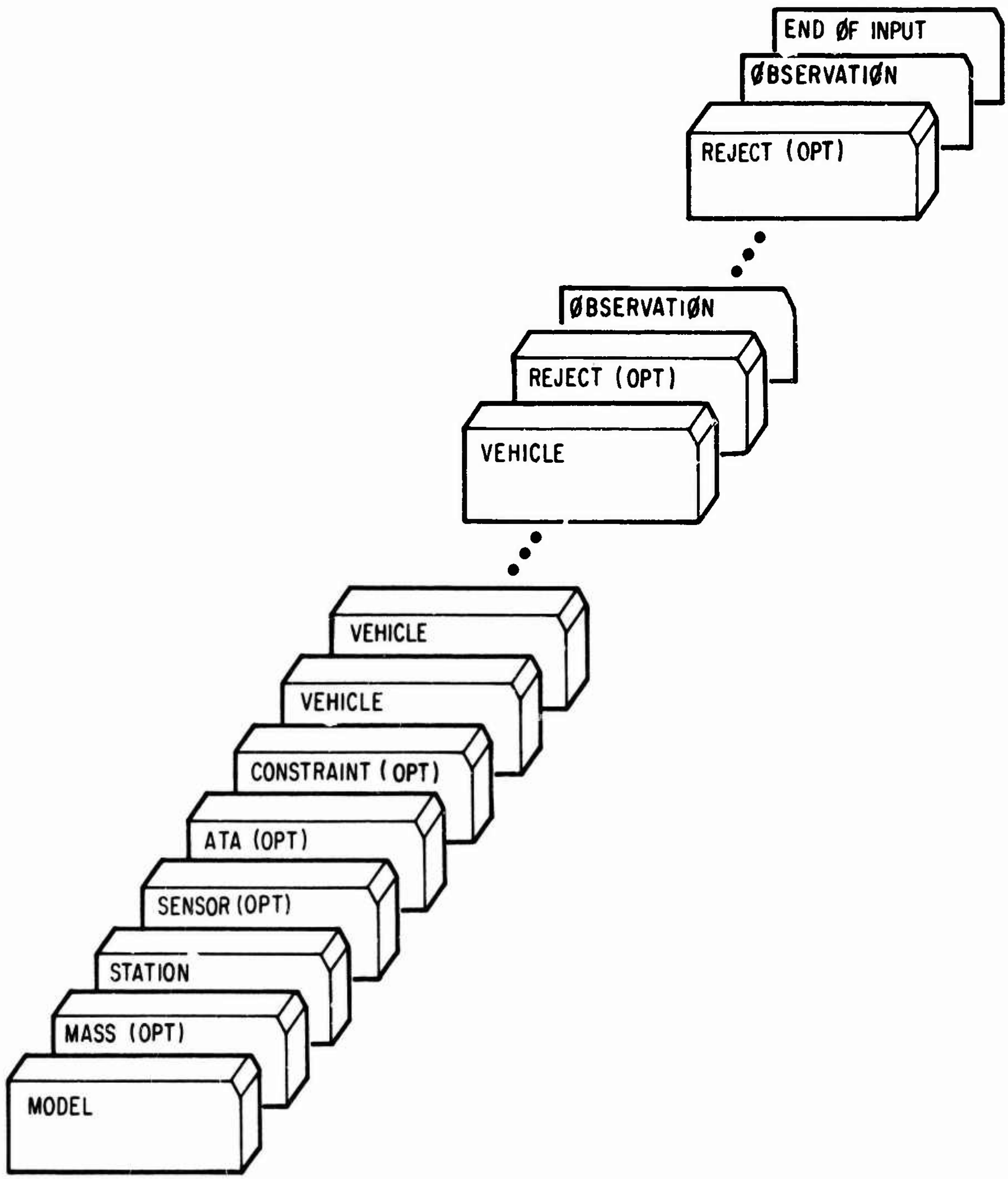


Fig. B-4. Deck Setup for a Multiple-Arc Orbit Determination Run with Card Image Observation File Input

B.1.5 Single-Vehicle Differential Correction with Binary Observation File Input

Orbit determination for one vehicle with an input binary observation file (TAPE3) requires one model group of input data blocks and the VEHICLE block only from the vehicle group (Fig. B-5). The input item BTIME (Sec. 11.2.1) in the VEHICLE block contains the last observation time (or a later time) on the file. This time is considered in determining the final integration time. Note that no REJECT or OBSERVATION data blocks are allowed when a binary observation file is used.

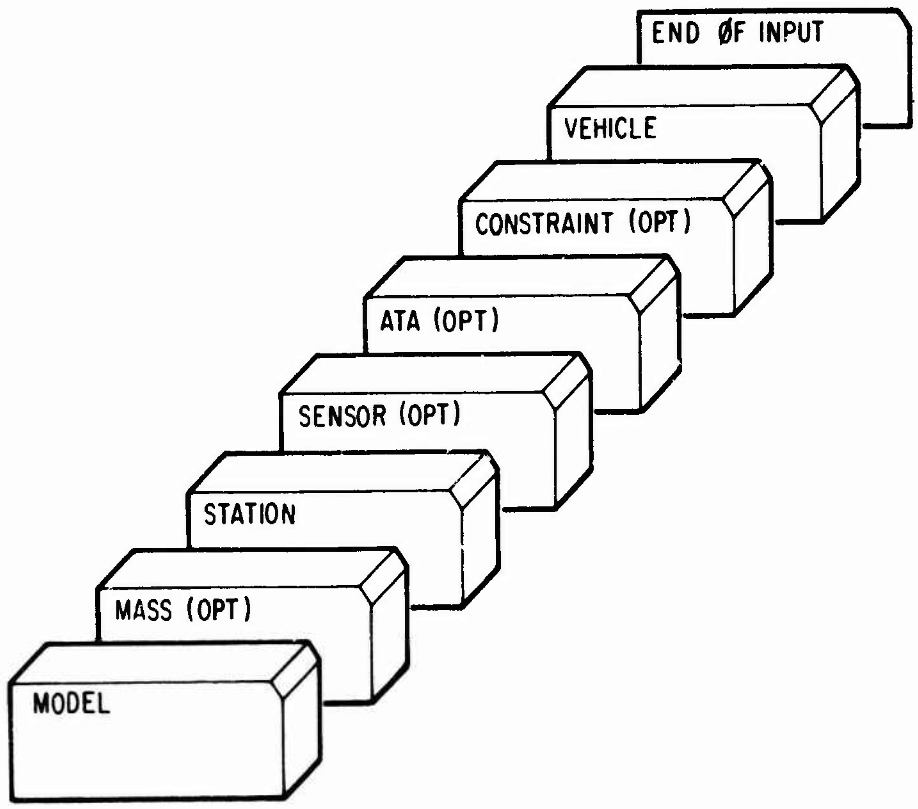


Fig. B-5. Deck Setup for a Single-Vehicle Differential Correction Run with Binary Observation File Input

B.1.6 Multiple-Arc with Binary Observation File Input

The deck setup for a multiple-arc orbit determination run with binary file observation input is shown in Fig. B-6. Observational measurements from many vehicles are used, but each item of data is associated with only one vehicle. One model group is input, and one VEHICLE block per vehicle is input. Each VEHICLE block contains the input item BTIME (Sec. 11.2.1), which indicates the last observation time (or a later time) on the binary observation file (TAPE3) for this vehicle. These times are considered in determining the final integration time for each vehicle.

Since all vehicles are assumed to be independent, a complete set of appropriate VEHICLE data should be provided for each. Input data not overridden is carried from one vehicle to the next. Again, note that no REJECT or OBSERVATION data blocks are allowed when a binary observation file is used.

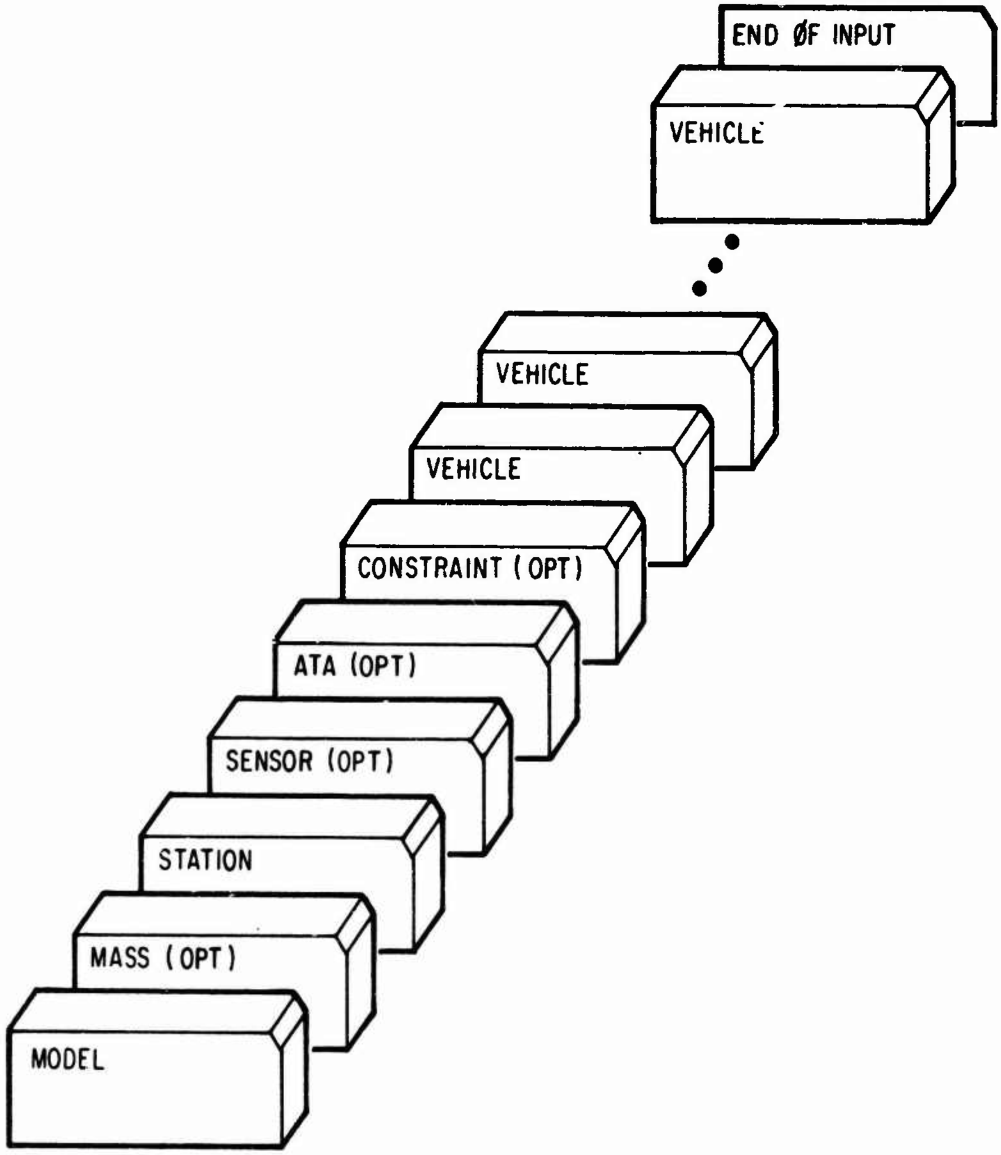


Fig. B-6. Deck Setup for a Multiple-Arc Orbit Determination Run with Binary Observation File Input

B.2 EPHEMERIS GENERATION RUN (ITIN=3)

B.2.1 Single-Vehicle

The deck setup for a single-vehicle ephemeris generation run (Fig. B-7) consists of the following: the MODEL and the (optional) MASS data blocks from the model group and the VEHICLE block. The VEHICLE block must contain the input item PTIM (Sec. 11.3.1.1), which indicates the print times and the final integration time.

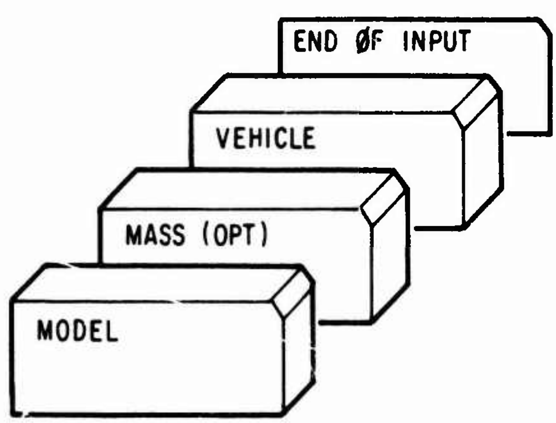


Fig. B-7. Deck Setup for a Single-Vehicle Ephemeris Generation Run

B.2.2 Multiple-Arc

The deck setup for an ephemeris generation run with several vehicles (Fig. B-8) consists of one set of MODEL and the (optional) MASS data blocks and one block of VEHICLE data per vehicle. The input item PTIM (Sec. 11.3.1.1) is specified in each VEHICLE block to indicate the print times and the final integration time for each vehicle. In the VEHICLE block, input data not overridden is carried over from one vehicle to the next.

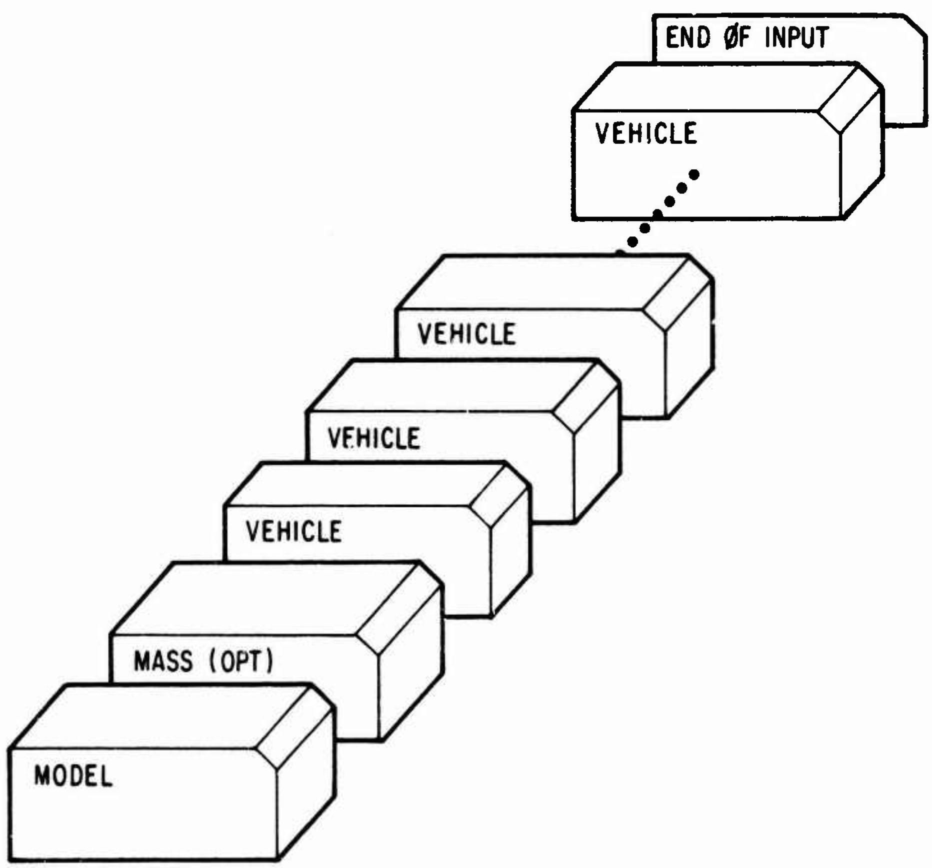


Fig. B-8. Deck Setup for a Multiple-Arc Ephemeris Generation Run

B.3 MEASUREMENT DATA GENERATION RUN (ITIN=4)

B.3.1 Single-Vehicle

The deck setup for a single-vehicle measurement data generation run (ITIN=4) requires one set each of the model and vehicle groups of input data blocks, including MODEL, STATION, VEHICLE, DATA GENERATION, and the optional MASS and SENSOR blocks (Fig. B-9).

The DATA GENERATION input block includes both DATA GENERATION I and II cards (Sec. 12) unless the VEHICLE block contains the input item JRIST=1 (Sec. 11.4.1). In this case, the DATA GENERATION II cards are omitted.

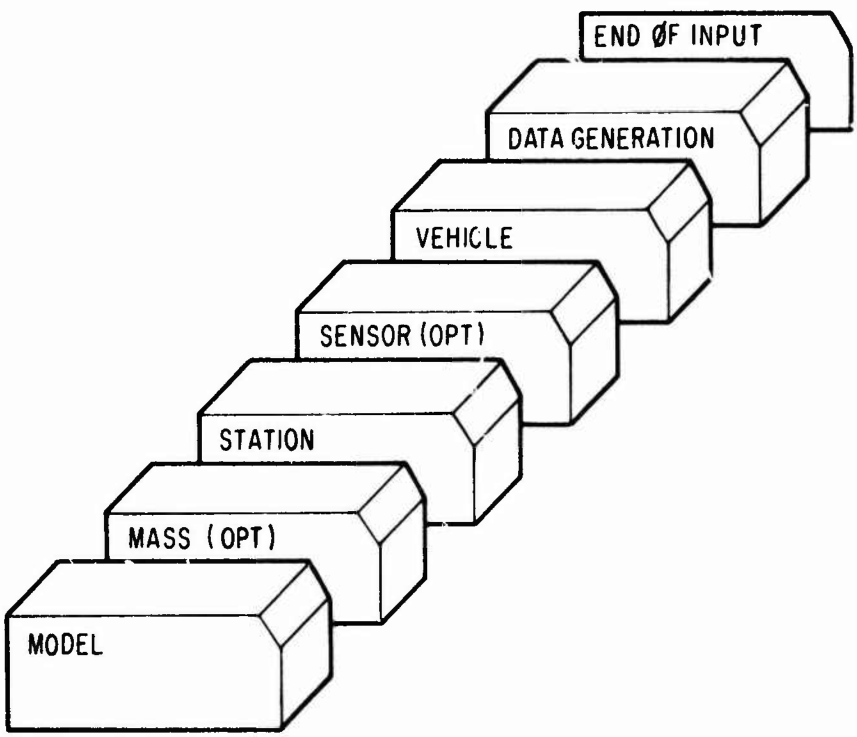


Fig. B-9. Deck Setup for a Single-Vehicle Data Generation Run

B.3.2 Multiple-Arc

The multiple-arc data generation deck (Fig. B-10) contains one set of model group data blocks and one set per vehicle of the vehicle group data blocks (VEHICLE and DATA GENERATION cards). If the VEHICLE block contains the input item JRIST=1 (Sec. 11.4.1), the DATA GENERATION II cards are omitted from the DATA GENERATION data block (Sec. 12).

Note that all vehicles are assumed to be independent; therefore, a complete set of VEHICLE and DATA GENERATION blocks should be provided for each vehicle. For convenience, in the VEHICLE block, input data not overridden is carried over from one vehicle to the next.

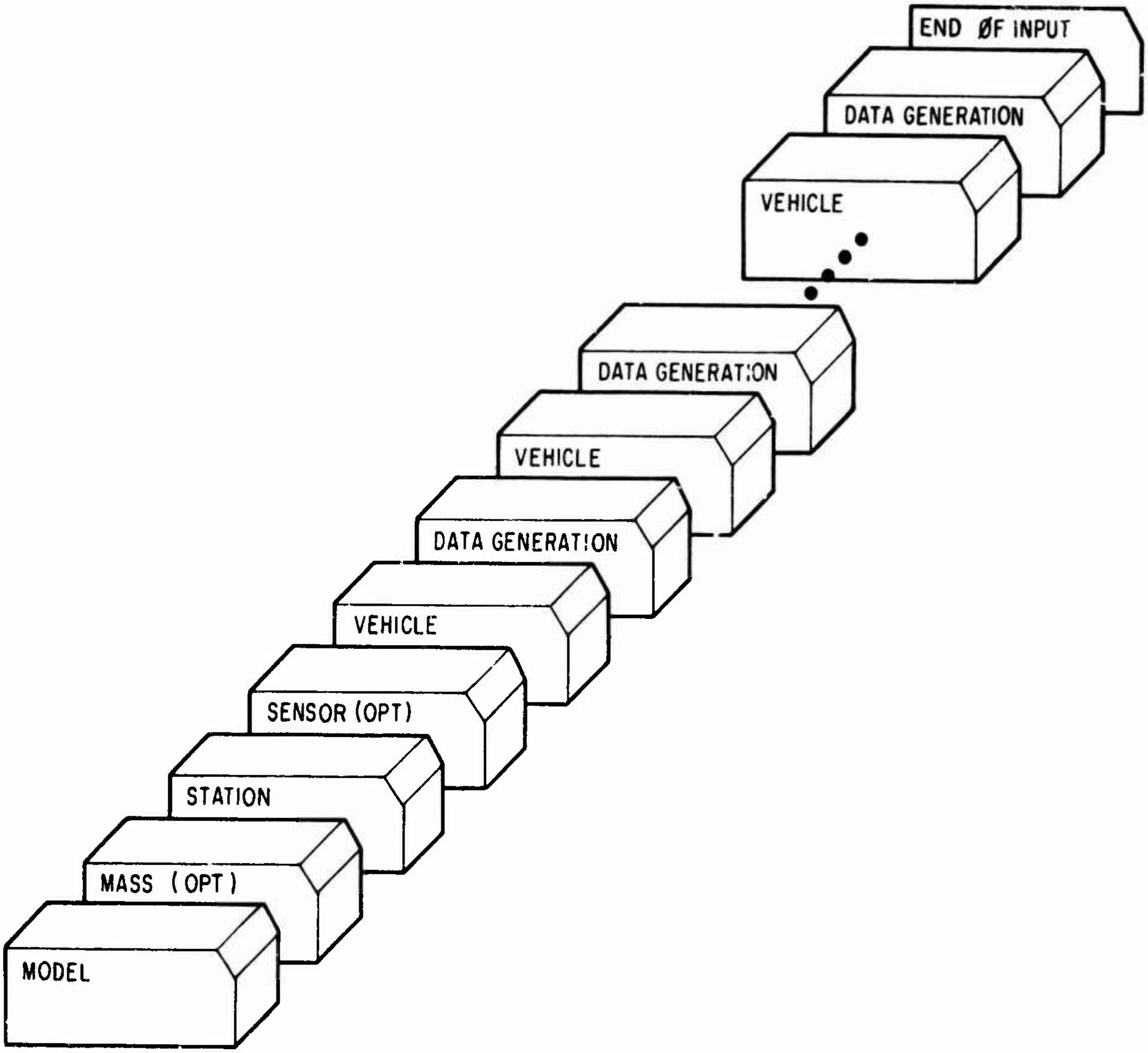


Fig. B-10. Deck Setup for a Multiple-Arc Data Generation Run

B.4 COVARIANCE ANALYSIS RUN (ITIN=5)

Deck setups for single-vehicle covariance analysis runs always contain the same basic model groups of input data blocks (MODEL, MASS, STATION, SENSOR, ATA, and COVQ), whereas the vehicle data blocks (VEHICLE and DATA GENERATION) and observation data blocks (REJECT and OBSERVATION) are variable. Various deck setups for covariance runs are shown in Figs. B-11 through B-15.

Input/output options are specified in the MODEL data block by input items ØPBØX and PRCØV (Sec. 2.5.1). The model P/Q parameter specifications are found in the input items ØPRAM, MPRAM, and GPRAM (Sec. 2.1.5).

A priori input for the normal matrix A^TA or the variance-covariance matrix $(A^TA)^{-1}$ is specified in the ATA data block (Sec. 6). A priori input for Q-parameters is specified via the COVQ data block (Sec. 8).

Vehicle-dependent P- and Q-parameters and the print schedule are specified by input items VPRAM (Sec. 11.1.14) and PTIM (Sec. 11.5.1).

Observational measurement times may be specified by:

- OBSERVATION cards
- Card image observation file (TAPE4)
- Binary observation file (TAPE3)
- DATA GENERATION data block input.

When the observational measurement times are specified by card image tape or card images, measurement times may be rejected by inputs to the REJECT data block.

In case of an update to an input A^TA or $(A^TA)^{-1}$ matrix, no measurement times are required [ØPBØX(D) and ØPBØX(E), Sec. 2.5.1].

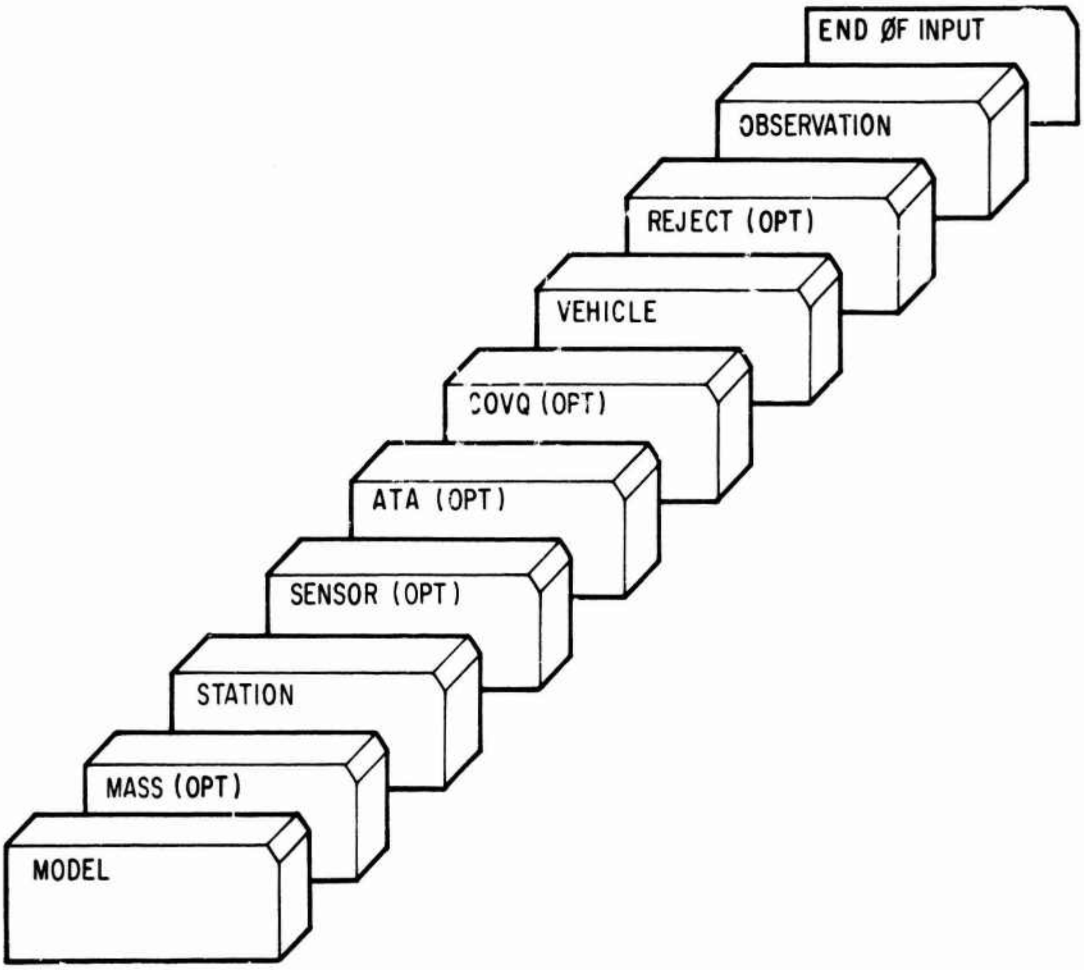


Fig. B-11. Deck Setup for a Covariance Analysis Run with OBSERVATION Card Input

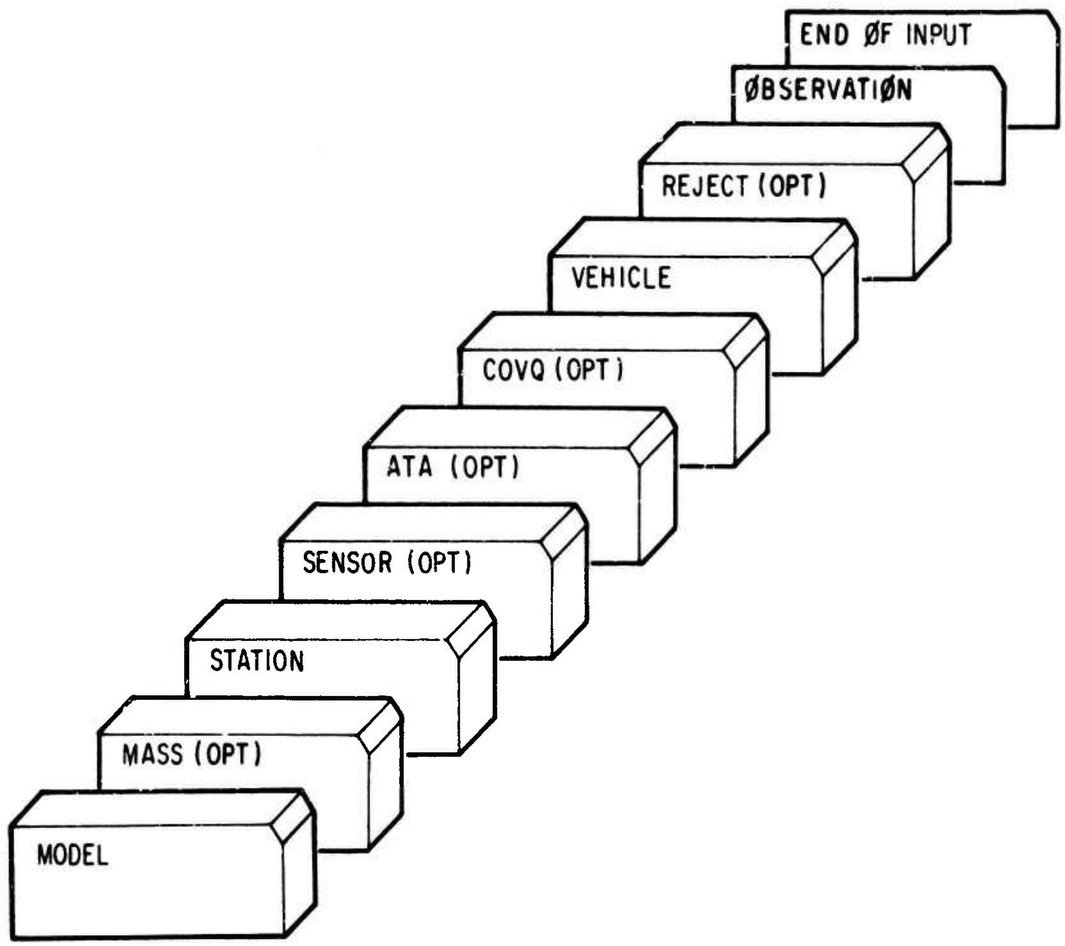


Fig. B-12. Deck Setup for a Covariance Analysis Run with Card Image Observation File Input

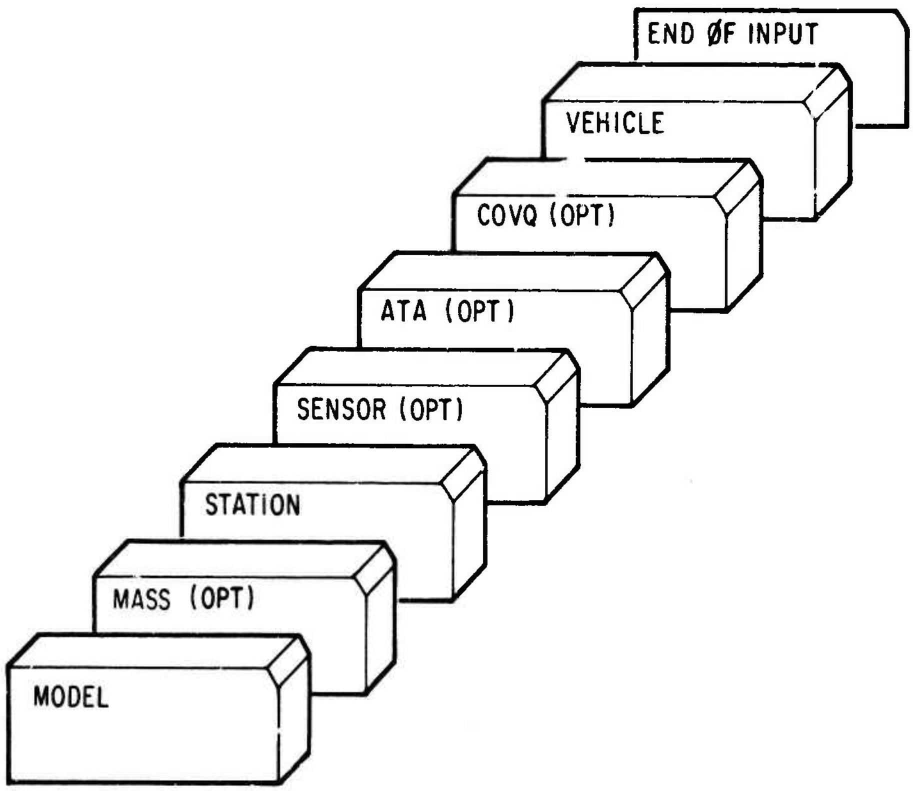


Fig. B-13. Deck Setup for a Covariance Analysis Run with Binary Observation File Input

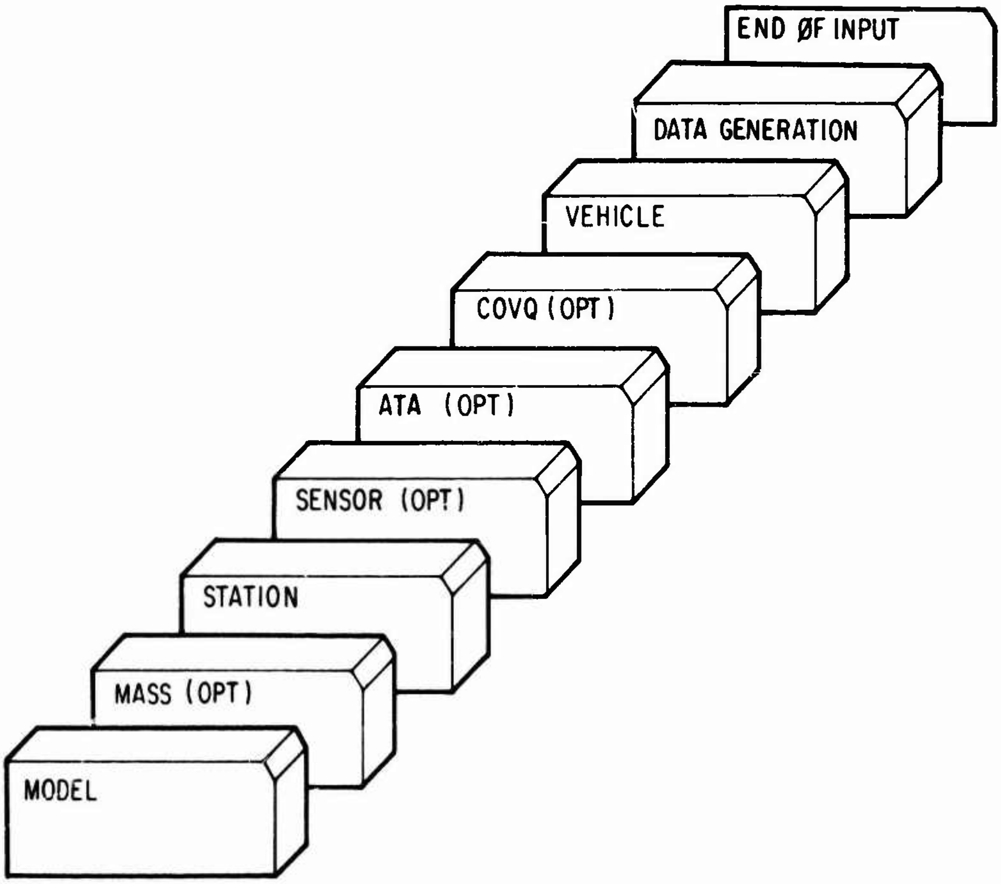


Fig. B-14. Deck Setup for a Covariance Analysis Run with Data Simulation

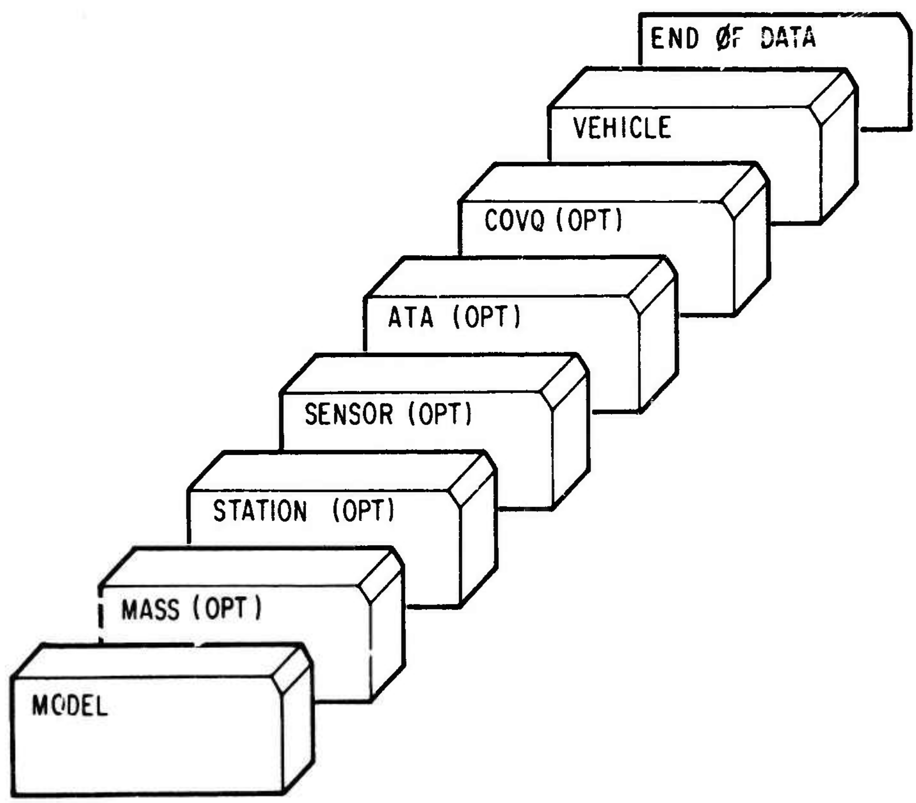


Fig. B-15. Deck Setup for a Covariance Analysis Update Only Run

B.5 MULTIPLE ITINERARY

B.5.1 Ephemeris and Data Generation (ITIN=34)

The deck setup for a case in which an ephemeris generation and a data generation are desired for the same vehicle, using the same model group blocks, is shown in Fig. B-16. Included in the MODEL and VEHICLE data blocks are all input items required for both the ephemeris generation and the data generation runs. Even though an ephemeris generation run does not require STATION, SENSOR, or DATA GENERATION input blocks, they are included in the deck setup because a data generation run does require them.

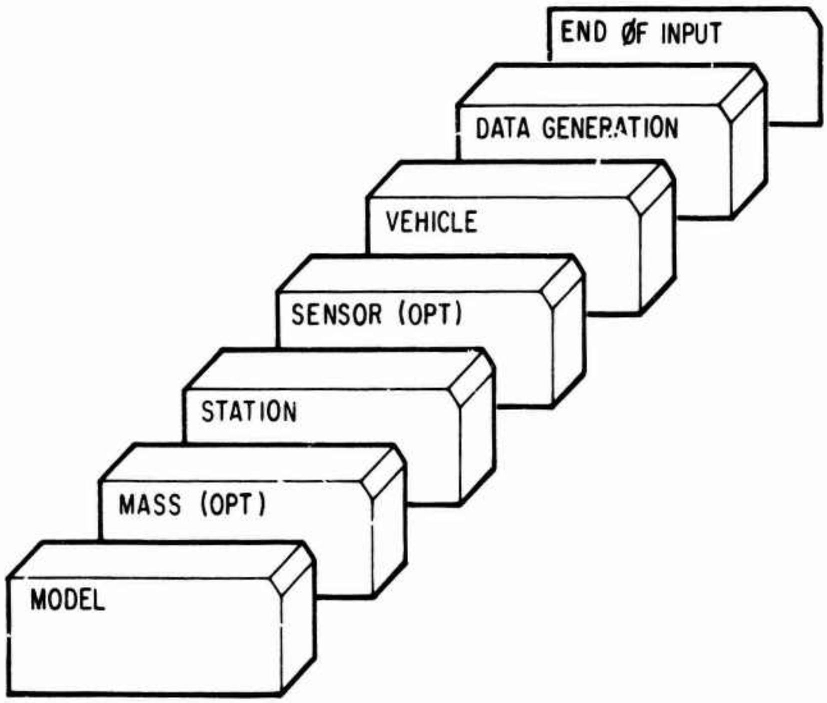


Fig. B-16. Deck Setup for a Multiple-Itinerary Run (ITIN = 34)

B.5.2 Multiple Itinerary (ITIN=3452345)

The deck setup for Example B (Sec. 1.4.1) is shown in Fig. B-17. In this case, the initial ITIN functions 3, 4, and 5 cause the generation of the nominal ephemeris, the look angles, and the covariance analysis, respectively. Reconstruction takes place starting from the nominal initial values. When the iterations terminate, the trajectory for the converged solution is used to repeat the three processing functions.

The MODEL and VEHICLE data blocks contain the necessary input items for all functions. The STATION cards are necessary for ITIN functions 2, 4, and 5. The optional ATA data block can contain A^TA or $(A^TA)^{-1}$ (Sec. 6). It is used for the orbit determination and/or the covariance analysis functions. The DATA GENERATION cards are necessary to generate the look angles, and the OBSERVATION block contains the measurements used in the covariance analysis and orbit determination steps.

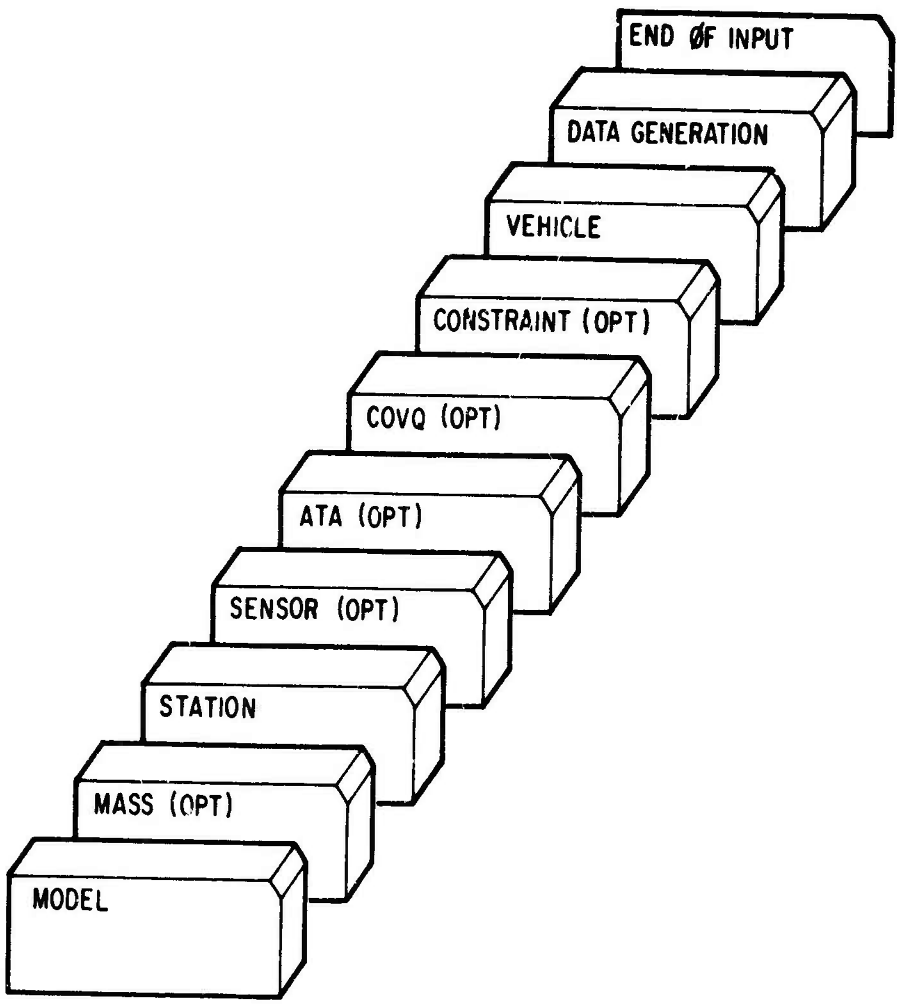


Fig. B-17. Deck Setup for a Multiple-Itinerary Run (ITIN = 3452345)

B.5.3 Multiple Itinerary (ITIN=323)

The deck setup for Example A (Sec. 1.4.1) is shown in Fig. B-18. A trajectory is generated from the input initial conditions, and an ephemeris is generated and output. Then, another trajectory is reconstructed from the observational data, and comparable ephemeris output is printed. The VEHICLE data specifies the nominal initial conditions for the trajectory, the amount of printed output, and the vehicle parameters to be differentially corrected in the reconstruction.

The observational measurements can be input by cards, card image file, or binary observation file (Sec. 11.2.1). If a card image file is used, the OBSERVATION block consists of a single card, with ØBSERVATIØN in Columns 1 through 11. If the binary observation file is used, no REJECT or OBSERVATION data blocks are allowed.

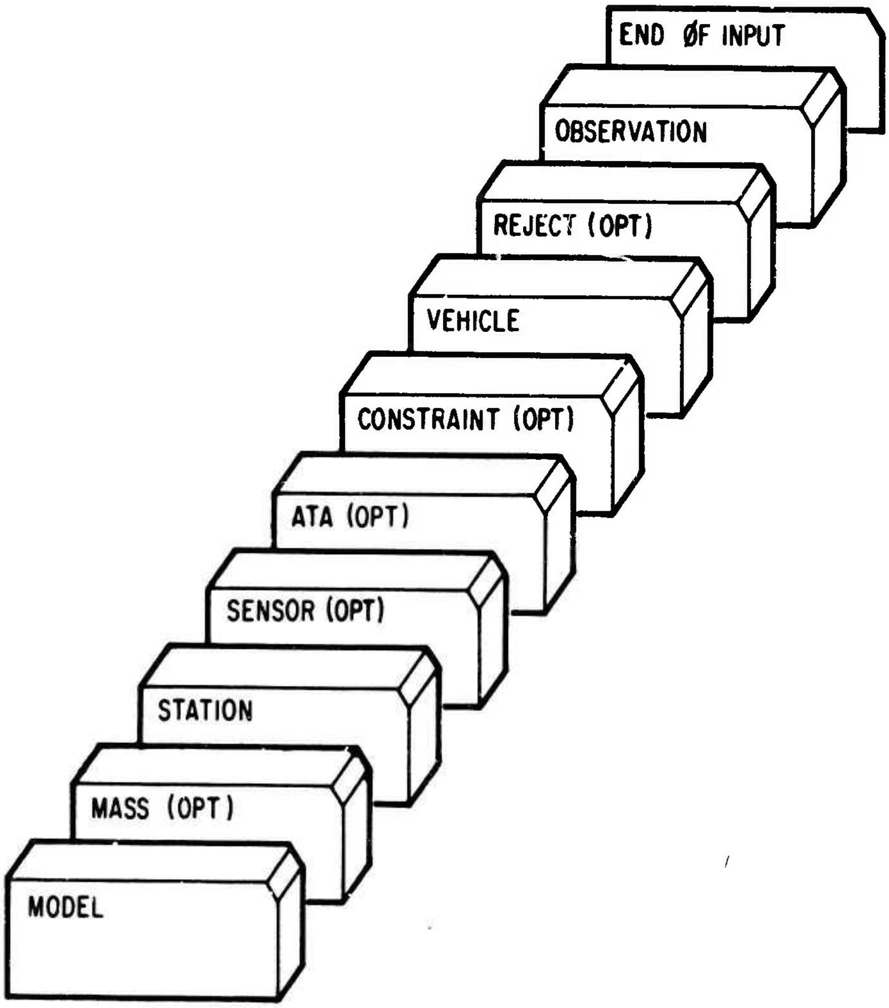


Fig. B-18. Deck Setup for a Multiple-Itinerary Run (ITIN = 323)

B.6 STACKED CASES (ITIN=34 FOLLOWED BY ITIN=2)

This data deck setup is used for Cases A and B of Appendix C (Fig. B-19). In Case A, an ephemeris is generated, and observational measurements are simulated. These measurements are written on a card image observation file (TAPE4) and are then used in the orbit determination run of Case B. Note that in the first case, from the MODEL block to the first END ØF INPUT, the data block setup is as described in Secs. B.2.1 and B.3.1. The VEHICLE data also includes input item ETAPE≠0 (Sec. 11.4.1), so the observational measurements are written on the card image observation file.

The ITIN=2 function is considered an entirely new case because nothing is retained from the first case; new model, vehicle, and observation group inputs are therefore included. The STATION input must be repeated, and the ØBSERVATIØN card must be followed by the END ØF INPUT card. Input item BCDIN≠0 (Sec. 11.2.1), specified in the second VEHICLE block, indicates that the observations are on the card image observation file, and BTIME (Sec. 11.2.1) indicates the time of the last observation.

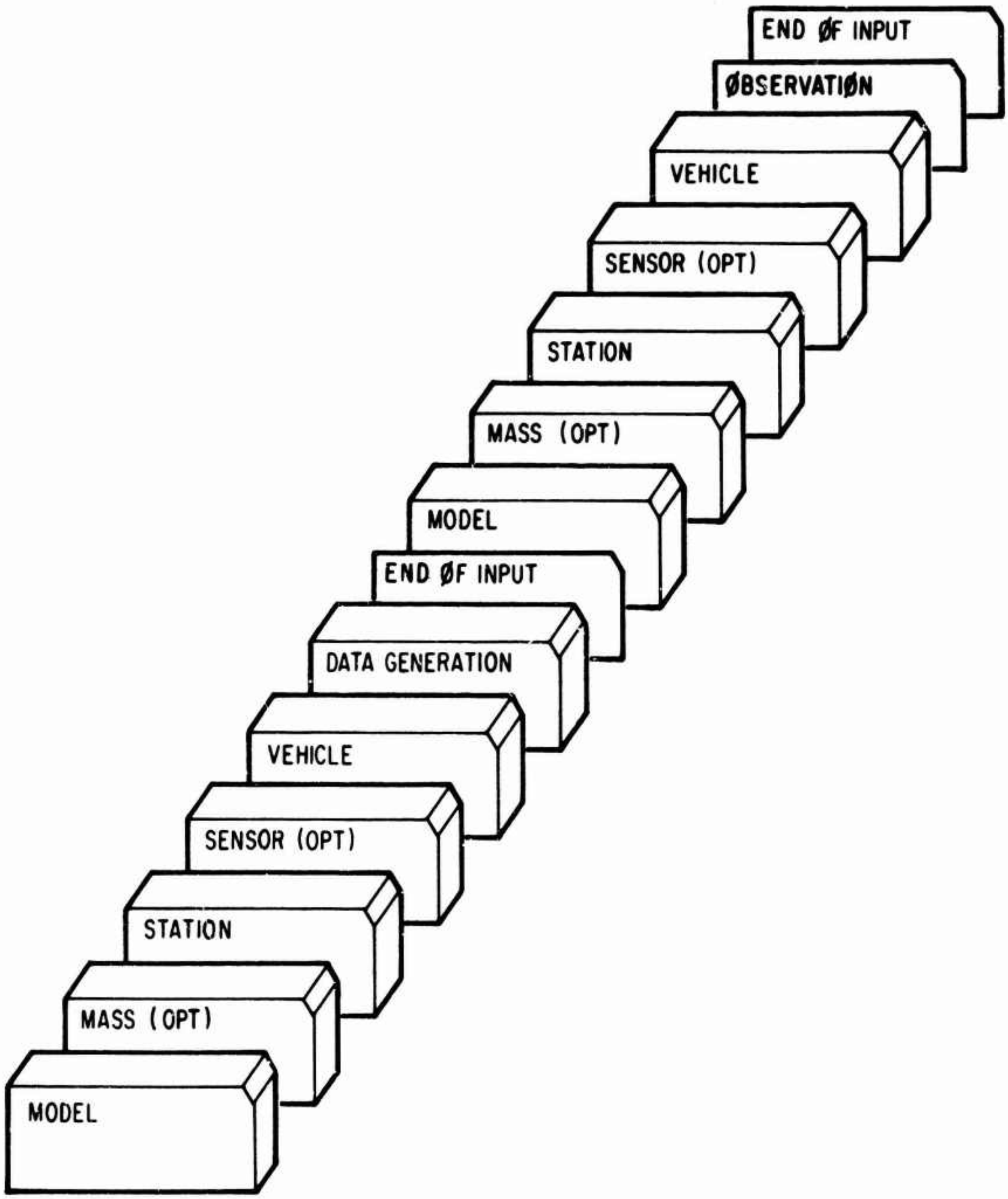


Fig. B-19. Deck Setup for Stacked Cases (ITIN = 34, ITIN = 2)

B.7 SIMULTANEOUS VEHICLES

B.7.1 Orbit Determination (ITIN=2, MULTV≠0)

The deck setup is shown (Fig. B-20) for many vehicles in simultaneous orbit that have the same model. The VEHICLE data blocks are input sequentially. Each requires a VEHID (Sec. 11.1.2) and the final integration time specified by BTIME (Sec. 11.2.1), but the integration times of the first vehicle must span those of any subsequent vehicles. Since the REJECT cards are time-dependent, not vehicle-dependent, only one block is input.

Only one OBSERVATION block, containing the measurements from all vehicles, can be input. In this case, actual OBSERVATION cards are shown. If this data were input by the card image observation file (TAPE4), the block of cards would be replaced by a single OBSERVATION card. If it were input by the binary observation file (TAPE3), there would be no REJECT or OBSERVATION data blocks.

The optional ATA block may contain an A^TA or $(A^TA)^{-1}$ matrix (Sec. 6). If MULTV=2 or 3, the STAGE data block (Sec. 14) is optional, and if MULTV=2, the DEWM data block (Sec. 7) is optional.

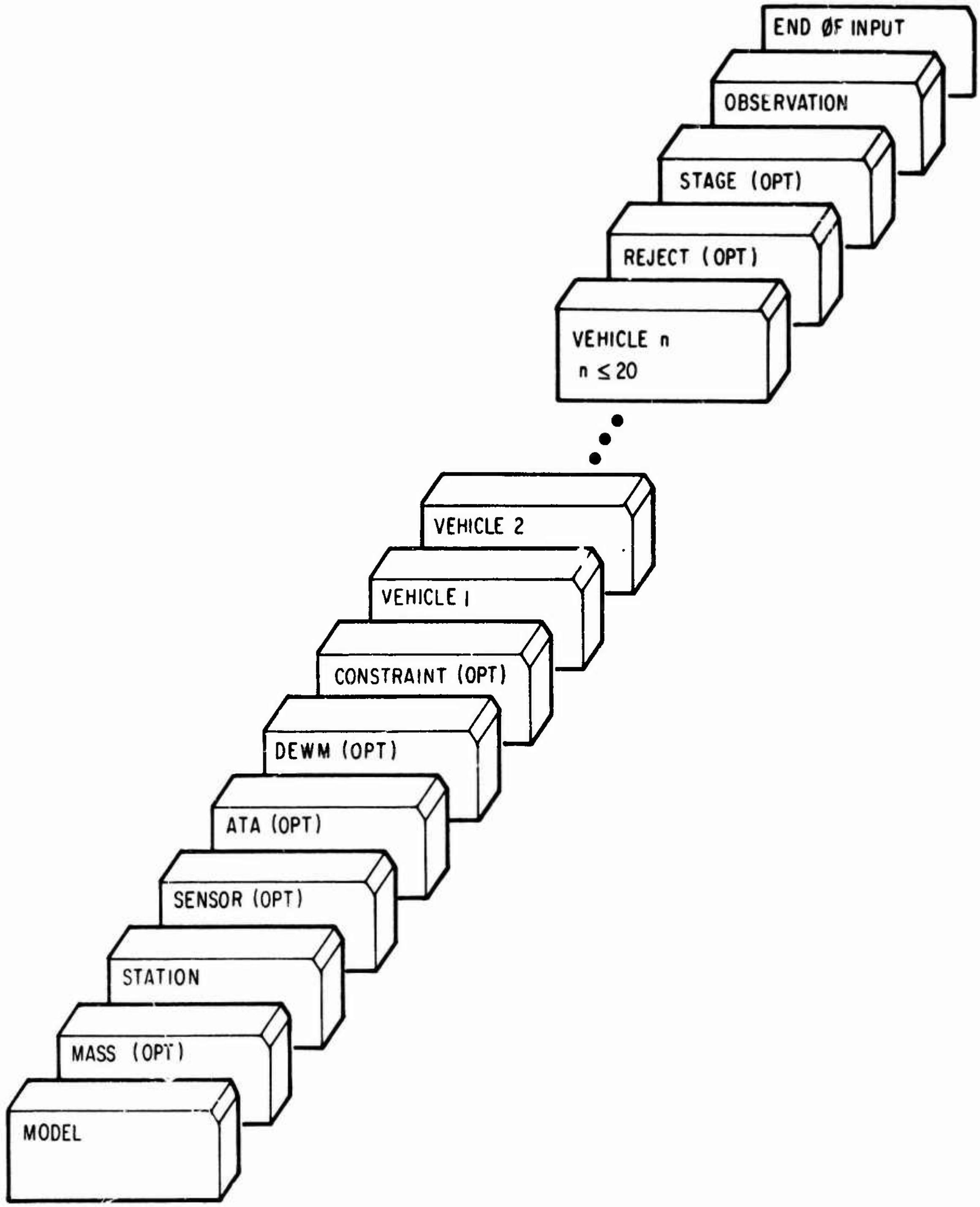


Fig. B-20. Deck Setup for a Simultaneous-Vehicle Differential Correction Run with OBSERVATION Card Input

B.7.2 Data Generation (ITIN=4, MULTV≠0)

The deck setup for generating data for vehicles simultaneously in orbit that have the same model is illustrated in Fig. B-21. Each VEHICLE data block contains a VEHID (Sec. 11.1.2).

Only one DATA GENERATION block is input; it contains DATA GENERATION I (Sec. 12.1) and II (Sec. 12.2.2) cards.

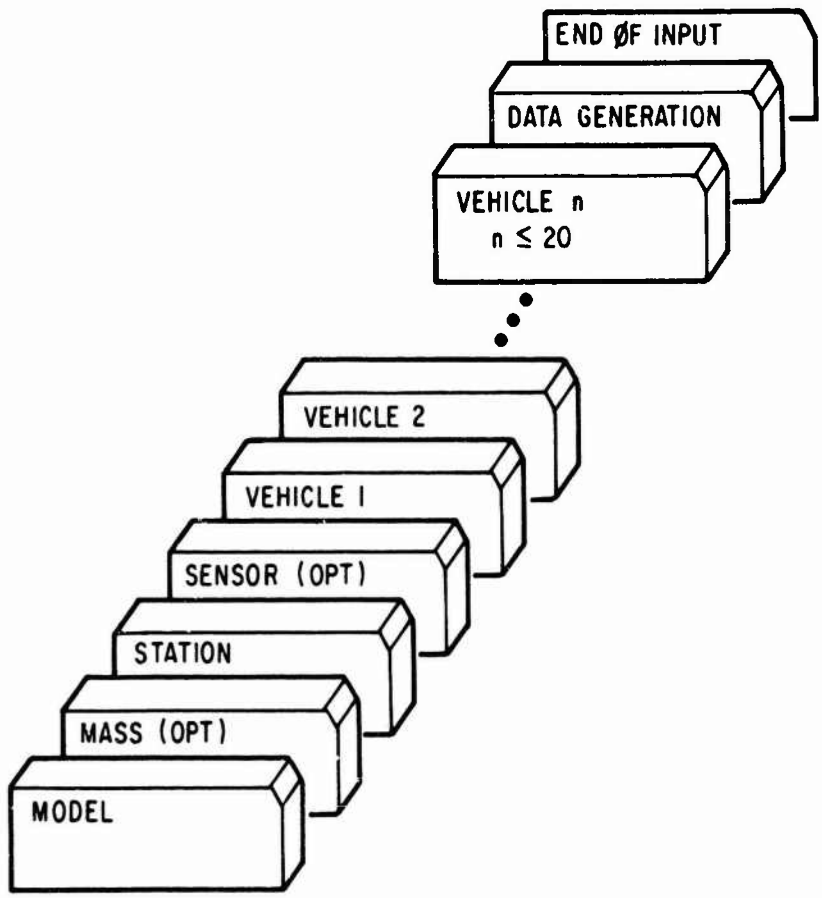


Fig. B-21. Deck Setup for a Simultaneous-Vehicle Data Generation Run

B.7.3 Covariance Analysis (ITIN=5, MULTV=1,2)

The deck setup for a simultaneous-vehicle covariance analysis run (Fig. B-22) is basically the same as that for a single vehicle (Sec. B.4). The main difference is that, since the vehicles are in simultaneous orbit, all VEHICLE data blocks are input before the DATA GENERATION, REJECT, or OBSERVATION data blocks.

Each vehicle requires a VEHID (Sec. 11.1.2), and the first requires the input of PTIM (Sec. 11.5.1). The integration times of the first vehicle must span those of any subsequent vehicles.

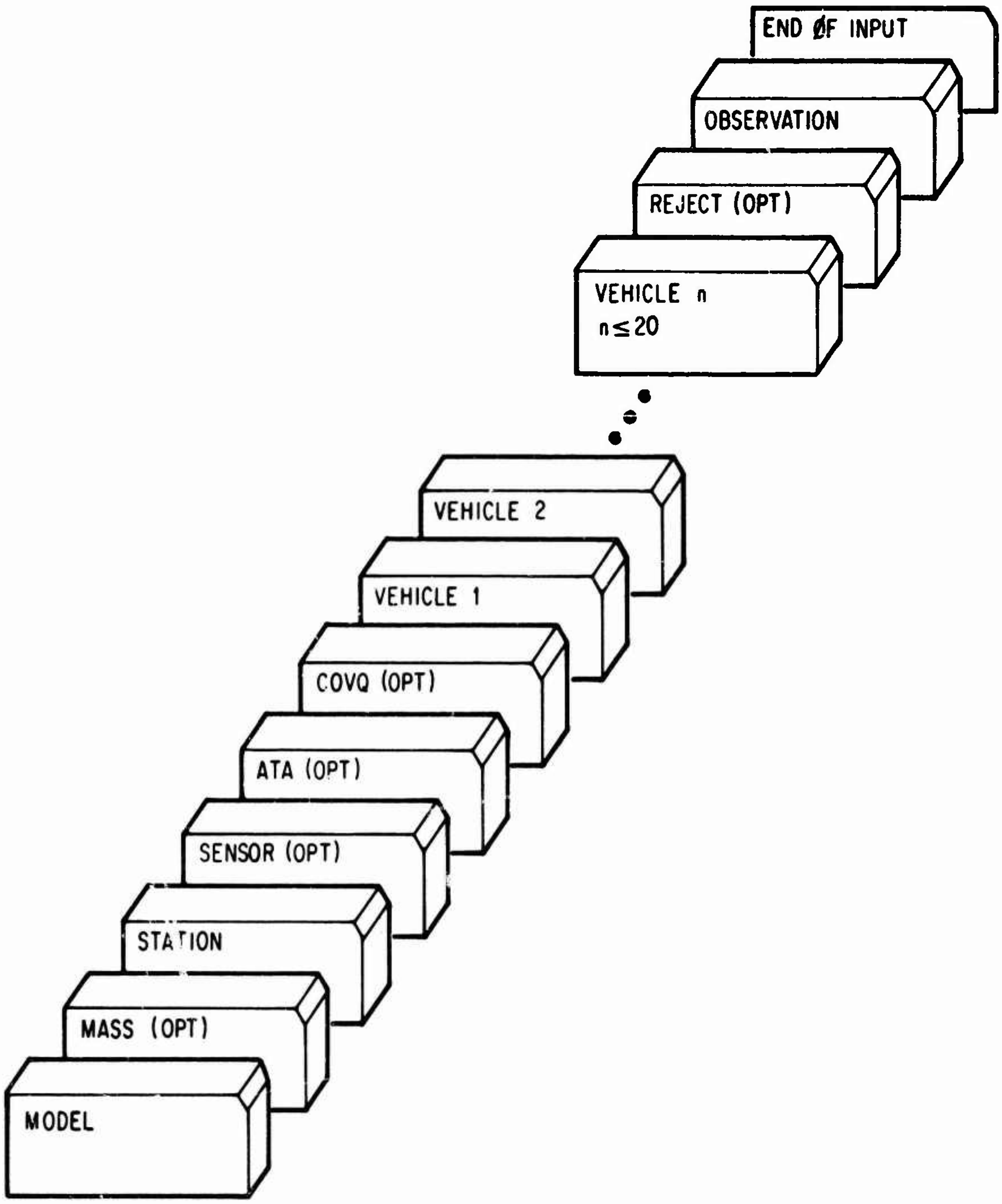


Fig. B-22. Deck Setup for a Simultaneous-Vehicle Covariance Analysis Run with OBSERVATION Card Input

C. SAMPLE OUTPUT DESCRIPTIONS

TABLES

APPENDIX C

SAMPLE OUTPUT DESCRIPTIONS

C.1 INTRODUCTION

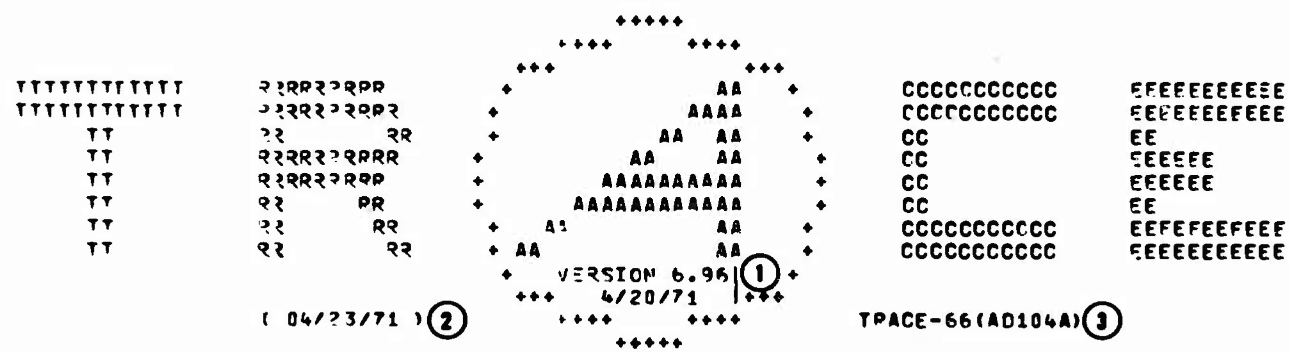
The printed output produced by the TRACE Program is described here for typical differential correction, ephemeris generation, data generation, and covariance analysis runs. The samples that follow are of actual output listings, annotated to reference specific portions of the output data. Wherever applicable, the output items described are cross-referenced to the corresponding input definition section in this document. If an item occurs in more than one sample listing, a citation is given only for the first appearance.

The sample test cases included here are:

- Test Case A — ECI single-vehicle ephemeris generation and simulated measurement data generation run (ITIN = 34)
- Test Case B — ECI single-vehicle orbit determination run (ITIN = 2)
- Test Case C — ECI simultaneous-vehicle covariance analysis run (ITIN = 5)
- Test Case D — MCI single-vehicle ephemeris generation run (ITIN = 3)
- Test Case E — ECI single-vehicle, powered flight ephemeris generation run (ITIN = 3).
- Test Case F — ECI simultaneous-vehicle orbit determination run (ITIN = 2)
- Test Case G — ECI simultaneous-vehicle data generation run (ITIN = 4)

The symbol ~~~~ , used throughout the sample output, indicates that some output has been omitted. Note that many output pages without descriptive interruption have been included only to provide continuity. Cases A through D were run on TRACE Version 6.96 and Cases E through G on Version 7.27.

C.2 TEST CASE A: ECI SINGLE-VEHICLE EPHEMERIS GENERATION AND SIMULATED MEASUREMENT DATA GENERATION RUN (ITIN = 34)



ITEM	DESCRIPTION	REFERENCE SECTION
1	Identification number of the program version and its date	
2	Date on which run is made	
3	Program identification for accounting purposes: AD104A is the Aerospace IPD (Information Processing Division) identification number	

Preceding page blank

```
MODEL DATA
INFOPM1                     INTERM4                  MTERMS04,60                CARD   1
D      02,00                       1082.76E-5                0                  CARD   2
D      03,00                       -2.693E-6                 0                  CARD   3
D      04,00                       -1.56E-6                  0                  CARD   4
D      02,02                       1.544E-6                    -0.765E-6        CARD   5   4
DITIN 34                                                                        CARD   6
 RSPLT5                                                                         CARD   7
 H0    2.0                   HMIN 2.0                 HMAX 2.0                  CARD   8
END                                                                             CARD   9

******************************************** LUNAR GRAVITY MODEL ********************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7313995407E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2   5
          ***SPHERICAL MOON***

******************************************** EARTH GRAVITY MODEL ********************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076535841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
            NO NORMALIZATION WITH    4 TERMS.
          N   M       CNM              SNM        **   N   M        CNM              SNM                 6
          2   0    1.08276000E-03   0.            **   4   0   -1.56000000E-06   0.
          3   0   -2.69300000E-06   0.            **   2   2    1.54400000E-06  -7.65000000E-07

******************************************** PHYSICAL CONSTANTS ********************************************

GM(ER**3/MIN**2)     =   5.530393500E-03   OMEGE(RAD/MIN) =  4.375269100E-03   GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)   =   0.                OMEGA(RAD/MIN) =  4.375269100E-03   GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)    =   6.802326500E-05   OMEGL(RAD/MIN) =  0.                AM(ER)       =  2.725062770E-01
FPET(FT/ER)          =   2.092573800E+07   ERKM(KM/ER)    =  6.378164900E+03   ERNM(NM/ER)  =  3.443933600E+03   7
FTKM(FT/KM)          =   3.281839300E+03   FTNM(FT/NM)    =  6.076115500E+03   AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)     =   3.217400000E+01   DGREE(DEG)     =  5.729577951E+01   SLT          =  2.820176300E+03
CKEP                 =   1.000000000E-07   F              =  3.352329869E-03   PI           =  3.141592654E+00

******************************************** INPUT/OUTPUT CONVERSION FACTORS ********************************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48752300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03   8
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the input MODEL data:	
	NFØRM, NTERM, TERMS (geopotential inputs)	2.1.2.2
	ITIN (function indicator)	2.1
	RSPLT (rise/set plot indicator)	2.4.1.1
	H0, HMIN, HMAX (numerical integration inputs)	2.1.4
5	Lunar gravity model, including the moon's gravitational constant in three unit systems. In this case, the moon's gravity model is spherical	2.1.2 2.1.1
6	Earth's gravity model, including the earth's gravitational constant in three unit systems. In this case, the gravity model is expressed by a spherical harmonic expansion with C and S coefficients, and there is no normalization	2.1.2 2.1.1
7	Input physical constants and OMEGL:	
	OMEGL (lunar rotation rate)	2.1.1
8	Input/output conversion factors for distance, velocity, and acceleration; always using er, er/min, and er/min^2 internally	2.1.1

```
******************************************* INTEGRATION INPUTS *******************************************

 IFORM =    1               ICENT  =    1               NSTEP =    2
 NPCMP =    0               IR     =    8               ER     = 1.00000000E-10   9
 HMIN  = 2.00000000E+00     HMAX   = 2.00000000E+03     HO     = 2.00000000E+00

******************************************* SPECIAL OPTIONS *******************************************

 TAPE2  =    0     TAPE7  =    0     TELEM  =    0     PTAPE  =    0     NPDOT  =     0   10
 PRHO   =    0     NODPR  =    0     CLASS  =    0     LEMSP  =    0     PTNS   =10000

******************************************* CRASH ALTITUDE *******************************************

 ECI CRASH ALTITUDE(FT) =   3.000000000E+05        MCI CRASH ALTITUDE(FT) =   3.000000000E+03   11

******************************************* STATION LOCATIONS *******************************************
STATION    SIG  REF  PA-REF  DATUM  TYPE      LATITUDE        LONGITUDE        HEIGHT          P    Q
                                                 X                Y               Z
                                               RADIUS          LATITUDE        LONGITUDE

 001        0    1     1      -0     -0    3.48000000E+01   2.39500000E+02   6.00000000E+02             12
 004        0    1     1      -0     -0    5.76000000E+01   2.07800000E+02   4.26000000E+02
 005        0    1     1      -0     -0    2.16000000E+01   2.01700000E+02   9.41000000E+02
 006        0    1     1      -0     -0    4.29000000E+01   2.88350000E+02   7.84000000E+02
 009        0    1     1      -0     -0    7.55000000E+01   2.91400000E+02   3.96000000E+02
ENTER SEGMENT 01 AT     78.3 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS    78.3 CP SECS.,    228.4 PP SECS.  13
```

ITEM	DESCRIPTION	REFERENCE SECTION
9	Integration inputs and ICENT	2.1.4
	ICENT (central force term evaluation indicator)	
10	Special options:	
	TAPE2	2.1.4
	PRHØ	2.1.2.4
	TAPE7	2.1.3
	NØDPR	2.1.4
	TELEM	2.1.4
	CLASS	2.2.1, 2.4.1.6, 2.5.1
	LEMSP	2.1.4
	NPDØT≡INTEG(13) (the period decay rate is printed at every integration step)*	
	PTNS=n≡INTEG(16) (the trajectory equations are printed every n integration steps)	
11	ECI and MCI crash altitudes at which to stop integrating	2.1.4
12	Printout of the station locations as input. If CLASS ≠ 0, the actual locations are left blank	4
13	Program segment identification. Frequently, when different segments are entered, a remark is printed indicating the segment and its time of entry (from the beginning of the run). The amount of time taken for the segment last executed is also printed	

*Information Processing Division, TRACE66 Orbit Determination Program, Vol. III: Trajectory Generation Equations and Methods, TOR-0066(9320)-2, Vol. III, The Aerospace Corp., El Segundo, Calif. (25 April 1970). This report is Ref. 2 of Part A.

```
******************************************************** VEHICLE DATA ********************************************************

    H1      70-170                                                                                  CARD   1
    IVEHID1                    IYEAR 1964              IMNTH 8                                      CARD   2
    IDAY   16                  TZNE 0                  HR    0                                      CARD   3
     MIN   727                 SEC  0                  IICTYP2                                      CARD   4
     IC    351.5               2    0                  3     90                                     CARD   5
     4     354.475             5    21351065.          6     25855.914                              CARD   6   (14)
    IIDRAG1                    DRAS .0116                                                           CARD   7
    IETAPE4                                                                                         CARD   8
    DPRCDEX                                                                                         CARD   9
     PTIM 0                    2    1                  3     760                                    CARD  10
     4    40                   5    1320                                                            CARD  11
    END                                                                                             CARD  12

   DATA GENERATION I
STATION  INTERVAL  MIN.ELE.  MAX.ELE.   MAX.RANGE      START TIME          STOP TIME       AZIMUTH1  AZIMUTH2
          (SEC.)    (DEG.)    (DEG.)     (N.MI.)     DA  HR   MIN       DA  HR   MIN      (DEG.)    (DEG.)
  001     60.00     -0.00     -0.00      -0.         -0  -0 -0.0000     -0  22 -0.0000    -0.0      -0.0
  004     60.00     -0.00     -0.00      -0.         -0  -0 -0.0000     -0  22 -0.0000    -0.0      -0.0
  005     60.00     -0.00     -0.00      -0.         -0  -0 -0.0000     -0  22 -0.0000    -0.0      -0.0
  006     60.00     -0.00     -0.00      -0.         -0  -0 -0.0000     -0  22 -0.0000    -0.0      -0.0
  009     60.00     -0.00     -0.00      -0.         -0  -0 -0.0000     -0  22 -0.0000    -0.0      -0.0
                                                                                                           (15)
   DATA GENERATION II
STATION
          RNG    R.D    R      E.D    LAT    HI-    VAR    ATT    GEO    ASN    TWD    TNT
          AZT    P.D    Q      RDD    LON    DOP    KAP    XYZ    HRA    ADD    AXY    GCR
          ELF    Q.D    A.D    UJV    SUR    LOK    ASP    TOP    U,V    EDD    LMN    SPR
  001 *X  X  X*       *      *      *      *      *      *      *      *      *      *      *
  004 *X  X  X*       *      *      *      *      *      *      *      *      *      *      *
  005 *X  X  X*       *      *      *      *      *      *      *      *      *      *      *
  006 *X  X  X*       *      *      *      *      *      *      *      *      *      *      *
  009 *X  X  X*       *      *      *      *      *      *      *      *      *      *      *

70-170 (16)
     EPOCH                                          INITIAL CONDITIONS
   YR/MO/DAY          X,Y,Z,DX,DY,DZ          A,D,B,A,R,V             A,F,I,O,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC       2.11221173338E+07       3.51600000000E+02       2.16545058487E+07       1.38625022642E-02
 1964/ 8/16          -3.11902823323E+06       0.                      1.40128272088E-02      -2.04703623737E-03
 0.              (17) 0.                      9.00000000000E+01       9.55250000000E+01       6.74602827921E-02   (18)
 0.                  -3.63661425026E+02       3.54475000000E+02       3.51599999932E+02       3.51600000000E+02
 7.27000000000E+02   -2.46271357763E+03       2.13510650000E+07       3.61314213347E-11      -1.60895386758E-01
 0.                   2.57357947412E+04       2.58559140000E+04       6.38058777822E+02       1.08958142631E+00

NO PLANETARY PERTURBATIONS. (19)

 ** ATMOSPHERE MODEL **   LOCKHEED (20)                        TIME              CDA/W                W/CDA
                                                    7.27000000E+02 (21) 1.16000000E-02 (22) 8.62068966E+01 (23)
      D1  =  5.93000000E+00   D2 = -1.56840000E+01   FLUX =  0. (24)
```

ITEM	DESCRIPTION	REFERENCE SECTION
14	Card images of the input VEHICLE data:	
	H1	11.1.1
	VEHID	11.1.2
	YEAR, MNTH, DAY, TZNE, HR, MIN, SEC	11.1.3
	ICTYP, IC	11.1.4
	IDRAG	11.1.8
	DRAG	11.1.9
	ETAPE	11.4.1
	PRCDE	11.3.1.2
	PTIM	11.3.1.1
15	Output from the DATA GENERATION I and II cards	12
16	Printout of the VEHICLE input H1 header card	11.1.1
17	Epoch time	11.1.3
18	Trajectory initial conditions are printed in four coordinate frames based on BCI coordinates. The initial condition values shown are the results of transformations applied to the input values. The transformation for the input coordinate set (in this case, α, δ, β, A, r, and v) consists of the conversion from decimal to octal numbers, the conversion of units from ft, deg, and sec to er, rad, and min; and the performance of the corresponding inverse conversions for output. The three other types of element sets require coordinate system transformations, in addition to the number and unit system transformations noted above. Accuracy of the values printed is therefore subject to numerical truncation roundoff errors Quantities in the left-hand column are position and velocity components in the basic vernal equinox coordinate system in ft and ft/sec. The second column gives the usual ADBARV spherical system coordinates (i.e., Type 2 initial conditions) in ft, ft/sec, and deg. The third column contains orbit semimajor axis, eccentricity, inclination, right ascension of ascending node, argument of perigee, and time of last perigee passage in MME. Other units are ft and deg. The right-hand column gives the vehicle coordinates in the f and g element set (valid for orbits such that $0 \le e < 1$) (Refs. 1 and 2)	11.1.4
19	Names of any solar system bodies included in the computation of perturbative accelerations	2.1.2.3
20	Identification of the atmospheric model to be used	11.1.8
21	Time at which to initially use the C_D A/W indicated in the next column in MME	11.1.9
22	The reciprocal of the ballistic coefficient C_D A/W	11.1.9
23	Ballistic coefficient W/C_DA.	11.1.9
24	The D1, D2, and flux expressions for the Lockheed atmospheric density model (for this case)	2.1.2.4.1

```
*****************************************************************************************************

ENTER SEGMENT 10 AT     78.8 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .5 CP SECS.,     3.5 PP SECS.
          TRAJECTORY INTEGRATION FOR CASE    1 25

IVEP        0      ICENT      1      IDRAG      1      ALPHG    5.662162703E+00   CDAW 1.160000000E-02
JVEP        0      JNORM      1      IR         8      ALG-DEG  3.244180258E+02   ER   1.000000000E-10
MVEP        0      MAJOR      0      ISRP       0      TJDATE   2.438623500E+06   HMIN 2.000000000E+00
KVEP        0      NMASS      0      NEQS       3      TSTART   7.270000000E+02   HMAX 2.000000000E+00  26
LVEP        0      NT         4      RECMP      0      TSTOP    1.320000000E+03   H0   2.000000000E+00
IDENTX      1      JNORMX     0      NMASSX     0      FLIGHT   5.930000000E+02   NTX  0.
                                     NASA       0      SSTEP    1.000000000E+02   SORD 1.500000000E+00

                                            * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE        ASSOCIATED QUANTITIES                                27
    727.0000 TZERO
   1320.0000 TSTOP

        ***  TRAJECTORY START 28

        * * * * * * * * * * * * * * * * * * * *    ECI 29 * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    78.93100

                T  =       727.000000          H  =            .250000        NSTEP  =            0

                 2.112201788379E+07           -3.636604250256E+02           -3.049966727469E+01  30
                -3.119028238232E+06           -2.462703577627E+03            4.503734134821E+00
                 0.                            2.573579474117E+04           -1.368599519737E-03


   FORCES        MAGNITUDE      X      Y      Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.083040E+01-3.049970E+01 4.503503E+00 1.174270E-04-3.083040E+01 1.455570E-04 2.851445E-04
 ATMOSPHERIC   1.504282E-03 3.413128E-05 2.311366E-04-1.486027E-03 1.344411E-17-1.501618E-03-8.948284E-05  31
 TOTAL         3.083040E+01-3.049967E+01 4.503734E+00-1.368600E-03-3.083040E+01-1.356061E-03 1.956617E-04
```

ITEM	DESCRIPTION	REFERENCE SECTION
25	Remark indicating the relative number of the vehicle being integrated (not VEHID)	
26	Quantities associated with the current vehicle (Table C-1)	
27	Event table, including times to start and stop integrating	
28	Start of integration	
29	Integration frame for the current vehicle (in this case, ECI)	
30	Time T; step size H; number of integration steps from NSTEP to T; and position, velocity, and acceleration components in Columns 1, 2, and 3, respectively, for this event (epoch) print (in MME, min, ft, ft/sec, and ft/sec^2)	
31	Forces at T	

Table C-1. Definitions of Initialized Integration Quantities

Symbol	Definition	Reference Section
IVEP	Number of C and S parameters (GPRAM)	2.1.5.2
JVEP	Number of other model parameters (ØPRAM)	2.1.5.3
MVEP	Number of mass parameters (MPRAM)	2.1.5.1
KVEP	Number of vehicle-dependent parameters (VPRAM)	11.1.14
LVEP	Number of delayed parameters (i.e., THRUST, DRAG, etc.)	11.1.14
ICENTX	Central force flag for the moon	
ICENT	Central force flag for the earth	
JNORM	Normalization for the earth gravity model	2.1.2.2
MAJOR	Flag for the integration of the variational equations	
NMASS	Number of masses in the earth gravity model	
NT	Number of terms in the earth gravity model	2.1.2.2
JNORMX	Normalization for the lunar gravity model	2.1.2.2
IDRAG	Flag indicating the atmospheric model used	11.1.8
IR	Ratio of Runge-Kutta to Cowell step size (H0/IR)	2.1.4
ISRP	Flag for solar radiation pressure	2.1.2.6
NEQS	Total number of equations to be integrated	
RECMP	Flag for recomputation of perturbations	2.1.4
NMASSX	Number of masses in the lunar gravity model	
NASA	Coordinate and timekeeping transformation option flag	2.1.4

Table C-1. Definitions of Initialized Integration Quantities (Continued)

Symbol	Definition	Reference Section
ALPHG	Right ascension of Greenwich (rad at midnight of epoch day)	
ALG-DEG	Right ascension of Greenwich (deg at midnight of epoch day)	
TJDATE	Julian date of epoch day	
TSTART	Trajectory start time (MME)	
TSTOP	Trajectory stop time (MME)	
FLIGHT	Duration of flight (TSTOP-TSTART, min)	
SSTEP	Number of integration steps specified per rev when the regularized time variable is used	11.1.6
CDAW	Reciprocal of the ballistic coefficient	
ER	Error control in integration ($ER = 1.^{-S}$, where S is the number of significant figures)	2.1.4
HMIN	Minimum absolute step size for integration	2.1.4
HMAX	Maximum absolute step size for integration	2.1.4
H0	Initial integration step size: A negative value indicates backward integration	2.1.4
NTX	Number of terms in the lunar gravity model	2.1.2.2
SORD	Power of the regularization transformation	11.1.6
CPAW	Solar radiation pressure coefficient	11.1.4
UTD	Correction that relates iteration time to ephemeris time, sec	2.1.4

```
*              STEP    DOUBLED          T  =    739.250000      H  =        .500000      NSTEP  =       48  32
*              STEP    DOUBLED          T  =    755.250000      H  =       1.000000      NSTEP  =       79
   NODF  T  =  7.715056082307E+02  -2.174312233991E+07  3.220848060321E+06   9.155402131023E-02  33
        DT  =  1.000000000000E+00   3.538916113278E+02  2.392365839274E+03  -2.499914410018E+04
   NODF  T  =  8.160132498351E+02   2.111878462148E+07 -3.138242581735E+06   1.057768166002E-01
        DT  =  1.000000000000E+00  -3.676358013866E+02 -2.462617183232E+03   2.573513801870E+04
   NODF  T  =  8.605088844192E+02  -2.173661142815E+07  3.240165570270E+06   9.162694120100E-02
        DT  =  1.000000000000E+00   3.545031738123E+02  2.392907285641E+03  -2.500214730405E+04
   NODF  T  =  9.050141615666E+02   2.111560357750E+07 -3.157478550731E+06   1.052970851538E-01
        DT  =  1.000000000000E+00  -3.715253959224E+02 -2.462027934117E+03   2.573440021394E+04
   NODF  T  =  9.495001485512E+02  -2.173012707833E+07  3.259487366782E+06   9.058326290414E-02
        DT  =  1.000000000000E+00   3.550446520700E+02  2.392890505067E+03  -2.500511078411E+04
   NODF  T  =  9.940033497145E+02   2.111248671667E+07 -3.176721703786E+06   1.070233889849E-01
        DT  =  1.000000000000E+00  -3.753122137674E+02 -2.460866515690E+03   2.573357343278E+04
   NODF  T  =  1.038480034411E+03  -2.172366357365E+07  3.278795075491E+06   8.716727127885E-02
        DT  =  1.000000000000E+00   3.555426278197E+02  2.392411765957E+03  -2.500804218916E+04
   NODF  T  =  1.082981321138E+03   2.110940072490E+07 -3.195953658598E+06   1.088429841835E-01
        DT  =  1.000000000000E+00  -3.790299919716E+02 -2.459392224658E+03   2.573269351510E+04
   NODF  T  =  1.127448861730E+03  -2.171717340606E+07  3.298071998920E+06   7.865032799414E-02
        DT  =  1.000000000000E+00   3.560585150084E+02  2.391835442467E+03  -2.501098583350E+04
   NODF  T  =  1.171948128798E+03   2.110628623951E+07 -3.215162695717E+06   1.065998435399E-01
        DT  =  1.000000000000E+00  -3.827440448012E+02 -2.458042725758E+03   2.573181925916E+04
   NODF  T  =  1.216406397356E+03  -2.171059451433E+07  3.317312624163E+06   6.158998121460E-02
        DT  =  1.000000000000E+00   3.566534977233E+02  2.391583030237E+03  -2.501399732251E+04
   NODF  T  =  1.260903287159E+03   2.110309216343E+07 -3.234350508507E+06   9.425052306976E-02
        DT  =  1.000000000000E+00  -3.865133472910E+02 -2.457180753738E+03   2.573099833463E+04
   NODF  T  =  1.305351938197E+03  -2.170388589968E+07  3.336525691455E+06   3.443219649954E-02
        DT  =  1.000000000000E+00   3.573531955035E+02  2.391889239496E+03  -2.501711161410E+04

                T  =     1320.250000       H  =       1.000000       NSTEP  =       644

                 -1.067370314174E+07       2.175825556370E+04         1.478330439997E+01
                  3.489613873940E+06      -2.098591769807E+03        -4.744146117512E+00   34
                 -1.859775240439E+07      -1.277447810391E+04         2.520901666549E+01

   FORCES       MAGNITUDE      X        Y       Z      ( EXTERNAL  UNITS )     RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL   2.960655E+01 1.478331E+01-4.744146E+00 2.520901E+01-2.960652E+01 3.882527E-02 7.125906E-03
ATMOSPHERIC    5.699119E-06-4.914114E-06 2.914771E-07 2.851771E-06 6.484690E-08-5.685813E-06 1.827404E-07   35
TOTAL          2.960655E+01 1.478330E+01-4.744146E+00 2.520902E+01-2.960652E+01 3.881958E-02 7.126088E-03
```

ITEM	DESCRIPTION	REFERENCE SECTION
32	Change in step size, indicated by a remark, the time of change, the new step size, and the number of integration steps to this time	
33	Nodal crossing showing the time (MME) and position components on the first line and the step size (min) and velocity components (ft/sec) on the second line	
34	Event detection print (Item 30)	
35	Forces at time T	

```
***  TRAJECTORY TERMINATION (36)

***  THIS CASE TOOK      1.805  SECONDS TO INTEGRATE A SPAN OF    593.2500  MINUTES  ***
     ***  FROM        727.000  TO       1320.250  MINUTES FROM MIDNIGHT OF EPOCH  ***    (37)
ENTER SEGMENT 50 AT     80.7 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     1.9 CP SECS.,     9.0 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
36	Remark at trajectory termination	
37	Number of seconds to integrate the time span of the current vehicle	

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	ME,MM,ST,DT	X,Y,Z,R	DX,DY,DZ,V	LAT,...	ALPHA,...	REV,...	REMARKS
MO/DAY/YR	MIN FROM EPOCH	X (FT)	DX (FT/SEC)	LATITUDE (DEG)	ALPHA (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	DY (FT/SEC)	LONGITUDE(DEG)	DELTA (DEG)	PERIDD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	DZ (FT/SEC)	ALTITUDE (NM)	BETA (DEG)	PER-DECAY	.
	STEP SIZE(MIN)	R (FT)	V (FT/SEC)	S-VEH-LAT(DEG)	AZIMUTH(DEG)	NOD-RES	.

30

* * * ECI TRAJECTORY * * * 30

ITEM	DESCRIPTION	REFERENCE SECTION
38	TRACE ephemeris output key. Date column includes the current month, day, year, hour, minute, and second. The next column contains the times from epoch and midnight of current date and the current step size. The following columns contain the components and magnitude of the radius vector from body center to satellite (ft) and the components and magnitude of the velocity vector (ft/sec). LAT contains the latitude, longitude, altitude, and subvehicle latitude; ALPHA is self-explanatory; and REV always contains the rev count plus (at an ascending node) the period for one revolution, the period-decay rate, and the nodal regression. The remarks column is used to indicate the reason for printing (if other than the print time vector)	11.3.1
39	The integration frame for this vehicle	11.1.6

```
***  CASE      1 (40)
***  70-170 (41)


***  EPOCH PRINT

DATE,...   ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V         LAT,...        ALPHA,...       REV,...
 8/16/64         0.00000    2.11220179E+07    -3.63550425E+02    0.00000000   351.59999959     .02333
 12/ 7         727.00000   -3.11302824E+06    -2.46270358E+03  204.93437636     0.00000000    0.00000
 0.00000     43620.00000    0.                 2.57357947E+04   69.99982      90.00000000    0.00000
                  .25000    2.13510650E+07     2.58559140E+04    0.00000000   354.47499959    0.00000   (42)
  A   =  2.16545058E+07     MEAN ANOM   =    3.60000000E+02    APOGEE   =   3.61381331E+03
  E   =  1.40128272E-02     ECCENTRIC   =    3.60000000E+02    HEIGHT   =   1.69879706E+02
  I   =  9.55250000E+01     TRUE ANOM   =    3.60000000E+02    PERIGEE  =   3.51393342E+03
  O   =  3.51600000E+02     KEPL PER    =    8.89412222E+01    HEIGHT   =   6.99998225E+01
  U   =  3.61314213E-11     ANOM PER    =    8.90919493E+01    O-DOT    =   8.51446431E-01
 TAU  =  6.38058778E+02     NODL PER    =    8.90175033E+01    U-DOT    =  -4.21677378E+00

***  REQUESTED PRINTS (43)

DATE,...   ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V         LAT,...        ALPHA,...       REV,...
 8/16/64         0.00000    2.11220179E+07    -3.63550425E+02    0.00000000   351.59999959    1 00000   ASC NODE
 12/ 7         727.00000   -3.11302824E+06    -2.46270358E+03  204.93437636     0.00000000    0 00000          (44)
 0.00000     43620.00000    0.                 2.57357947E+04   69.99982      90.00000000    0.00000
                  .25000    2.13510650E+07     2.58559140E+04    0.00000000   354.47499959    0.00000

DATE,...   ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V         LAT,...        ALPHA,...       REV,...
 8/16/64        73.00000   -1.54411960E+07    -1.76837291E+04   45.25874547   177.13628383    1.37408
 12/40         760.00000    7.72413983E+05     4.32536701E+03   22.19807322    45.06635191    0.00000   (45)
 0.00000     45600.00000    1.54363530E+07    -1.74819005E+04  164.46761      89.43019977    0.00000
                 1.00000    2.18838176E+07     2.52399240E+04   45.24996466   187.82931795    0.00000

DATE,...   ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V         LAT,...        ALPHA,...       REV,...
 8/16/64        44.50561   -2.17431223E+07     3.53894348E+02   -.00000609   171.57394639    1.50000   DSC NODE
 12/51         771.50561    3.22084829E+06     2.39236543E+03   13.75145825    -.00000605    0.00000
 30.33659    46290.33659   -2.32091378E+00    -2.49991441E+04  173.57223      89.99888575    0.00000
                 1.00000    2.19903829E+07     2.51158488E+04   -.00000609   185.52555726    0.00000
```

ITEM	DESCRIPTION	REFERENCE SECTION
40	Number of the case on the trajectory file (TAPE2)	
41	Printing the input VEHICLE H1 header card	11.1.1
42	Epoch print (Item 38) plus three other columns. The first contains the classical elements a, e, i, Ω, ω, and τ in ft, deg, and MME. The second column contains the mean, eccentric, and true anomalies in deg and the Keplerian, anomalistic, and nodal periods in min. The last contains the radial distance and height above the oblate earth at both perigee and apogee in nmi. The nodal regression rate $\dot{\Omega}$ and the rate of advance of the line of apsides $\dot{\omega}$ are printed in deg/day	11.1.4
43	Output requested by PRCDE and PTIM follows	11.3.1.1 11.3.1.2
44	Ascending node print (Item 38)	
45	Print requested by PTIM (Item 38)	11.3.1.1

```
DATE,...    ME,MM,ST,DT     X,Y,Z,R          DX,DY,DZ,V        LAT,...       ALPHA,...      REV,...
 8/16/64      533.90328   2.11030922E+07  -3.86509399E+02   -.00000908  351.28640839   7.00000   ASC NODE
 21/ 0       1260.90328  -3.23435018E+06  -2.45718136E+03  70.77953188    -.00000902  88.95515
 54.19710   75654.19710  -3.36225350E+00   2.57309983E+04     69.74369   90.02172268   -.01166
                1.00000   2.13495087E+07   2.58509459E+04   -.00000908  354.47846382   -.05220

DATE,...    ME,MM,ST,DT     X,Y,Z,R          DX,DY,DZ,V        LAT,...       ALPHA,...      REV,...
 8/16/64      553.00000   3.79739708E+06  -2.48359677E+04  77.70761100  325.17057615   7.21919
 21/20       1280.00000  -2.64257032E+06   3.29827419E+03  39.87645005   77.62732148   0.00000
  0.00000   76800.00000   2.10921800E+07   5.24858129E+03    120.95062   89.20585407   0.00000
                1.00000   2.15937032E+07   2.55978810E+04  77.70489301  333.35817387   0.00000

DATE,...    ME,MM,ST,DT     X,Y,Z,R          DX,DY,DZ,V        LAT,...       ALPHA,...      REV,...
 8/16/64      578.35194  -2.17038859E+07   3.57354474E+02   -.00000287  171.26037154   7.50000   DSC NODE
 21/45       1305.35194   3.33652580E+06   2.39188904E+03 239.61090808    -.09000285   0.00000
 21.11633   78321.11633  -1.09188644E+00  -2.50171116E+04    170.02827   89.97667859   0.00000
                1.00000   2.19588494E+07   2.51337365E+04   -.00000287  185.52164962   0.00000

DATE,...    ME,MM,ST,DT     X,Y,Z,R          DX,DY,DZ,V        LAT,...       ALPHA,...      REV,...
 8/16/64      593.00000  -1.11983977E+07   2.15332700E+04 -57.64199647  162.54791699   7.66081
 22/ 0       1320.00000   3.52054757E+06  -2.02713773E+03 227.22641232  -57.46778205   0.00000
  0.00000   79200.00000  -1.84033097E+07  -1.31505126E+04    156.78157   90.64933992   0.00000
                1.00000   2.18284258E+07   2.53125855E+04 -57.63441492  190.29659789   0.00000

DATE,...    ME,MM,ST,DT     X,Y,Z,R          DX,DY,DZ,V        LAT,...       ALPHA,...      REV,...
 8/16/64      593.25000  -1.08737031E+07   2.17582556E+04 -58.61936726  162.20745342   7.66358   PST-EVNT
 22/ 0       1320.25000   3.48950387E+06  -2.09859177E+03 226.82327764  -58.44804353   0.00000
 15.00000   79215.00000  -1.85977524E+07  -1.27744781E+04    156.24617   90.65737993   0.00000
                1.00000   2.18240956E+07   2.53182358E+04 -58.61193680  190.58496505   0.00000
   A  =   2.16900275E+07     MEAN ANOM  =   2.42343660E+02   APOGEE  =   3.61624033E+03
   E  =   1.30320787E-02     ECCENTRIC  =   2.41586307E+02   HEIGHT  =   1.72322910E+02
   I  =   9.55158746E+01     TRUE ANOM  =   2.41030959E+02   PERIGEE =   3.52319860E+03
   D  =   3.51255664E+02     KEPL PER   =   8.91501580E+01   HEIGHT  =   7.92811798E+01
   U  =   3.57853864E+02     ANOM PER   =   8.90042174E+01   D-DOT   =   8.45137218E-01
 TAU  =   1.26022945E+03     NODL PER   =   8.89399172E+01   U-DOT   =  -4.19310098E+00

          ***  END OF TRAJECTORY  *** 47

ENTER SEGMENT 60 AT     82.0 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS     1.2 CP SECS.,     5.7 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
46	Post-event prints. In this case, the event was termination. The output contains the items described in the ephemeris output key (Item 38) and the three additional columns in Item 42	
47	A remark indicating the end of the trajectory ephemeris	

```
* VEHICLE CASE    1 *
   * * DATA GENERATION FOR VEHID     1 * *   (48)

                                              ************
                                              AUG. 16,1964  (49)
                                              ************

005  RISE    AT  12  HR   9  MIN   25.84 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH = 171.88 DEGREES (50)
   005 12 HR  9 MIN 60.00 SEC   5.5794568E+02(RNG)  1.7220949E+02(AZI)  2.7696341E+00(ELE) (51)
   005 12 HR 10 MIN 60.00 SEC   3.0839567E+02(RNG)  1.7349298E+02(AZI)  1.1207660E+01(ELE)
   005 12 HR 11 MIN 60.00 SEC   8.8448078E+01(RNG)  1.8787277E+02(AZI)  5.7359071E+01(ELE)
005  MAX EL AT  12  HR  12  MIN   10.67 SEC       ELEVATION =   79.53 DEGREES,   AZIMUTH = 261.09 DEGREES (52)
   005 12 HR 12 MIN 60.00 SEC   2.2308304E+02(RNG)  3.4729586E+02(AZI)  1.8427180E+01(ELE)
   005 12 HR 13 MIN 60.00 SEC   4.6962138E+02(RNG)  3.4946770E+02(AZI)  5.8783741E+00(ELE)
   005 12 HR 14 MIN 60.00 SEC   7.2045819E+02(RNG)  3.5019139E+02(AZI)  5.8590576E-01(ELE)
005  SET     AT  12  HR  15  MIN    8.65 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH = 350.26 DEGREES (53)
005  TOTAL VISIBILITY OF PASS =     5.71 MIN. OF STAT. =      5.71 MIN. OF VEH. =       5.71 MIN. PASS =   1 (54)

004  RISE    AT  12  HR  18  MIN   13.00 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH = 217.13 DEGREES
   004 12 HR 18 MIN 60.00 SEC   5.6327235E+02(RNG)  2.2792592E+02(AZI)  2.8602274E+00(ELE)
   004 12 HR 19 MIN 60.00 SEC   5.3398100E+02(RNG)  2.4905712E+02(AZI)  6.3954642E+00(ELE)
004  MAX EL AT  12  HR  20  MIN   52.02 SEC       ELEVATION =    7.79 DEGREES,   AZIMUTH = 273.67 DEGREES
   004 12 HR 20 MIN 60.00 SEC   5.0416915E+02(RNG)  2.7756269E+02(AZI)  7.7513384E+00(ELE)
   004 12 HR 21 MIN 60.00 SEC   5.8891714E+02(RNG)  3.0319002E+02(AZI)  5.7174502E+00(ELE)
   004 12 HR 22 MIN 60.00 SEC   7.4975958E+02(RNG)  3.2004020E+02(AZI)  2.4155542E+00(ELE)
004  SET     AT  12  HR  23  MIN   44.72 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH = 328.24 DEGREES
004  TOTAL VISIBILITY OF PASS =     5.53 MIN. OF STAT. =      5.53 MIN. OF VEH. =      11.24 MIN. PASS =   1

009  RISE    AT  15  HR  27  MIN   48.62 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH =  25.05 DEGREES
   009 15 HR 27 MIN 60.00 SEC   9.6357395E+02(RNG)  2.7676197E+01(AZI)  3.2563539E-01(ELE)
   009 15 HR 28 MIN 60.00 SEC   9.0680157E+02(RNG)  4.2787894E+01(AZI)  1.5396814E+00(ELE)
009  MAX EL AT  15  HR  29  MIN   36.13 SEC       ELEVATION =    1.75 DEGREES,   AZIMUTH =  52.44 DEGREES
   009 15 HR 29 MIN 60.00 SEC   9.1169530E+02(RNG)  5.8771469E+01(AZI)  1.6615190E+00(ELE)
   009 15 HR 30 MIN 60.00 SEC   9.7715671E+02(RNG)  7.3590588E+01(AZI)  6.8709926E-01(ELE)
009  SET     AT  15  HR  31  MIN   26.30 SEC       ELEVATION =    0.00 DEGREES,   AZIMUTH =  79.35 DEGREES
```

ITEM	DESCRIPTION	REFERENCE SECTION
48	Identification of the vehicle (Item 40) for which the program is simulating measurements (and its VEHID)	11.1.2
49	Date on which the data to follow applies	
50	Rise message. The time at which the vehicle becomes visible from a particular location is obtained by interpolation and is printed in hr, min, and sec (the elevation and local azimuth angles are printed in deg)	4 12
51	Simulated data showing the station; the time of day in hr, min, and sec; and the measurements generated, as indicated by the DATA GENERATION II card (Item 15). The time results from incrementing the START by Δt; both are found on the DATA GENERATION I card	12
52	Maximum elevation point. The time of the maximum elevation angle is obtained by interpolation and is printed, with the corresponding elevation and azimuth angles, in deg	
53	Set message. When the vehicle is no longer visible from a station, the time of invisibility is obtained by interpolation and is printed, with the corresponding elevation and azimuth angles, in deg	12
54	Duration message. After each pass, a message is printed giving the elapsed time of visibility for the pass in min and the current totals for station and vehicle. The number of the pass for the station is also printed	

********** VISIBILITY SUMMARY **********

STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION	STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION	STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION
001	1	8.34	004	1	5.53	005	1	5.71
006	2	14.09	009	5	33.35			

TOTAL NUMBER OF PASSES WERE 10. TOTAL VISIBILITY TIME FOR THE VEHICLE WAS 67.03 MIN.

55

ITEM	DESCRIPTION	REFERENCE SECTION
55	Visibility Summary. After the data for the spans indicated by the DATA GENERATION I cards has been generated, a summary is printed. It includes the number of passes and the total visibility time for each station and vehicle	12

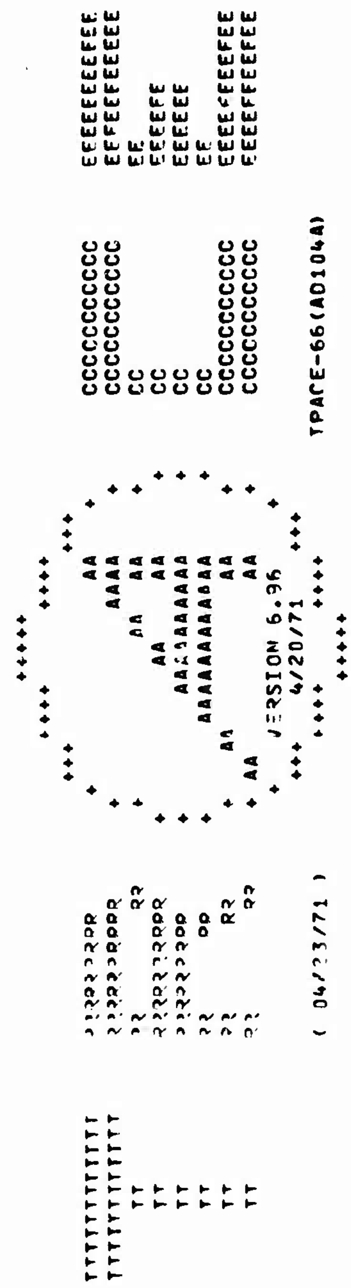
DY	HR	MN	001	004	005	006	009
16	12	5					
15	12	10			R		
16	12	15			S		
16	12	20		R			
16	12	25		S			
16	12	30					
16	12	35					
15	12	40					
16	12	45					
16	12	50					
16	12	55					
15	13	0					
15	13	5					
16	13	10					
16	13	15					
15	13	20					
16	13	25					
16	13	30					
16	13	35					
16	13	40					
16	13	45					
16	13	50					
16	13	55					
16	14	0					
16	14	5					
15	14	10					
16	14	15					
15	14	20					
16	14	25					
16	14	30					
15	14	35					
16	14	40					
15	14	45					
16	14	50					
15	14	55					
15	15	0					
16	15	5					
15	15	10					
15	15	15					
15	15	20					

CONT'D NEXT COLUMN

DY	HR	MN	001	004	005	006	009
16	15	25					
15	15	30					X
15	15	35					
15	15	40					
15	15	45					
16	15	50					
15	15	55					
16	16	0					
16	16	5					
16	16	10					
15	16	15					
16	16	20					
16	16	25					
16	16	30					
15	16	35					
16	16	40					
16	16	45					
16	16	50					
16	16	55					R
16	17	0					S
16	17	5					
16	17	10					
16	17	15					
16	17	20					
16	17	25					
16	17	30					
15	17	35					
16	17	40					
16	17	45					
16	17	50					
16	17	55					
15	18	0					
16	18	5					
16	18	[illegible]					
16	18	15					
16	18	20					
16	18	25					R
16	18	30				R	S
16	18	35				+	
16	18	40				S	

ITEM	DESCRIPTION	REFERENCE SECTION
56	<u>Rise-set printer plot.</u> When RSPLT is input$\neq 0$, the passes are given in a printer plot, using RSPLT as the scale. On the page shown, R means rise, S means set, X stands for rise and set in the same interval, and a + indicates continued visibility	2.4.1.1

C.3 TEST CASE B: ECI SINGLE-VEHICLE ORBIT DETERMINATION RUN (ITIN = 2)



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```
MODEL DATA                                                                                    CARD   1
DITIN 2                                                                                       CARD   2
IKSIG 1                      I2     2                      I3     3                           CARD   3
 SIGMA100                     2     .1                      3     .1                          CARD   4
INFORM1                      INTERM4                       MTERMS04,60                        CARD   5
D       02,00                       1082.76E-5                    0                           CARD   6  (1)
D       03,00                       -2.693E-6                     0                           CARD   7
D       04,00                       -1.56E-6                      0                           CARD   8
D       02,02                       1.544E-6                      -0.765E-6                   CARD   9
 H0     2.0                   HMIN 2.0                      HMAX 2.0                          CARD  10
IMAXIT2                                                                                       CARD  11
 GPLOT6.                      2     15.                                                       CARD  12
END

****************************************** LUNAR GRAVITY MODEL *******************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7313996407E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2
        ***SPHERICAL MOON***

****************************************** EARTH GRAVITY MODEL *******************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076538841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
           NO NORMALIZATION WITH    4 TERMS.
       N   M        CNM                SNM          **   N   M        CNM                SNM
       2   0   1.08276000E-03    0.                 **   4   0  -1.56000000E-06    0.
       3   0  -2.69300000E-06    0.                 **   2   2   1.54400000E-06   -7.65000000E-07

***************************************** PHYSICAL CONSTANTS ******************************************

GM(ER**3/MIN**2)     =  5.533393500E-03    OMEGE(RAD/MIN) =  4.375269100E-03  GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)   =  0.                 OMEGA(RAD/MIN) =  4.375269100E-03  GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)    =  6.802326500E-05    OMEGL(RAD/MIN) =  0.               AM(ER)       =  2.725062770E-01
ERFT(FT/ER)          =  2.092573900E+07    ERKM(KM/ER)    =  6.378164900E+03  ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)          =  3.280839900E+03    FTNM(FT/NM)    =  6.076115500E+03  AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)     =  3.217403000E+01    DGREE(DEG)     =  5.729577951E+01  SLT          =  2.320176300E+03
SKEP                 =  1.000003000E-07    F              =  3.352329869E-03  PI           =  3.141592654E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	<u>Card images of the input MODEL data</u>. Those emphasized here are associated with a differential correction run, the others having been discussed earlier:	
	ITIN	2.1
	MAXIT	2.2.2
	GPLOT	2.2.1
	KSIG, SIGMA	2.2.6

```
******************************************* INPUT/OUTPUT CONVERSION FACTORS ******************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48762300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03

******************************************* INTEGRATION INPUTS ********************************************

 IFORM =    1              ICENT =    1              NSTEP =   2
 NPCMP =    0              IR    =    8              ER     = 1.00000000E-10
 HMIN   = 2.00000000E+00   HMAX   = 2.00000000E+00   HO     = 2.00000000E+00

******************************************* SPECIAL OPTIONS ***********************************************

 TAPE2  =     0     TAPE7  =     0     TELEM  =     0     PTAPE  =     0     NPODT  =     0
 PRHO   =     0     NODPR  =     0     CLASS  =     0     LEMSP  =     0     PTNS   =10000

******************************************* CRASH ALTITUDE ************************************************

 ECI CRASH ALTITUDE(FT) =   3.000000000E+05          MCI CRASH ALTITUDE(FT) =   3.000000000E+03

******************************************** STATION LOCATIONS *******************************************
STATION     SIG  REF  RA-REF  DATUM  TYPE        LATITUDE          LONGITUDE         HEIGHT        P     Q
                                                    X                  Y               Z
                                                  RADIUS           LATITUDE        LONGITUDE

 001         0    1     1      -0     -0     3.48000000E+01   2.39500000E+02  6.00000000E+02
 004         0    1     1      -0     -0     5.75000000E+01   2.07800000E+02  4.26000000E+02
 005         0    1     1      -0     -0     2.15000000E+01   2.01700000E+02  9.41000000E+02
 006         0    1     1      -0     -0     4.29000000E+01   2.88350000E+02  7.84000000E+02
 009         0    1     1      -0     -0     7.65000000E+01   2.91400000E+02  3.96000000E+02

ENTER SEGMENT 01 AT     87.3 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS    87.3 CP SECS.,    256.8 PP SECS.

********************************************** VEHICLE DATA **********************************************

      IVEHID1                IYEAR 1964            IMNTH 8                      CARD   1
      IDAY   16               TZNF 0                HR   0                      CARD   2
       MIN   727              SEC  0               IICTYP2                      CARD   3
       IC    351.5            2    0                3     90.005                CARD   4
       4     354.5            5    21351000         6     25856.                CARD   5
       5     21360000                                                           CARD   6
      IIDRAG1                 DRAG .011                                         CARD   7
       DRAG .01                                                                 CARD   8
      MVPPAM04,60                                                               CARD   9
      D      ALPHA                 1.                  0                        CARD  10
      D      DELTA                 1.                  0                        CARD  11
      D      BETA                  1.                  0                        CARD  12
      D      AZ                    1.                  0                        CARD  13
      D      R                     100000              0                        CARD  14
      D      V                     10                  0                        CARD  15
      D      DRAG                  .01                 0                        CARD  15
      IBCOIN4                                                                   CARD  17
      END                                                                       CARD  18
```

2

ITEM	DESCRIPTION	REFERENCE SECTION
2	Card images of the input VEHICLE data. The data emphasized here are those for a differential correction run, the others having been discussed earlier:	
	VPRAM	11.1.14
	BCDIN	11.2.1

** OBSERVATIONS **

STAPASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
0050001	64	8	16	12	10	0.0100	1	0	3.39014234E+06	1.72209494E+02	2.76963411E+00	38623	43800.000	1	
0050001	64	8	16	12	11	0.0100	1	0	1.87384769E+06	1.73492976E+02	1.12076600E+01	38623	43860.000	1	
0050001	64	8	16	12	12	0.0100	1	0	5.37420728E+05	1.87872771E+02	5.73590711E+01	38623	43920.000	1	
0050001	64	8	16	12	13	0.0100	1	0	1.35547828E+06	3.47295855E+02	1.84271805E+01	38623	43980.000	1	
0050001	64	8	16	12	14	0.0100	1	0	2.85347371E+05	3.49467701E+02	5.87837413E+00	38623	44040.000	1	
0050001	64	8	16	12	15	0.0100	1	0	4.37758711E+06	3.50191395E+02	5.85905759E-01	38623	44100.000	1	
0040001	64	8	16	12	19	0.0100	1	0	4.03011936E+05	2.27925924E+02	2.86022743E+00	38623	44340.000	1	
0040001	64	8	16	12	20	0.0100	1	0	3.24453020E+06	2.49067115E+02	6.39546421E+00	38623	44400.000	1	
0040001	64	8	16	12	21	0.0100	1	0	3.06338996E+06	2.77562694E+02	7.75133841E+00	38623	44460.000	1	
0040001	64	8	16	12	22	0.0100	1	0	3.57832848E+06	3.03190025E+02	5.71745024E+00	38623	44520.000	1	
0040001	64	8	16	12	23	0.0100	1	0	4.55562572E+05	3.20040201E+02	2.41555425E+00	38623	44580.000	1	
0090001	64	8	16	15	28	0.0100	1	0	5.85478650E+06	2.76761965E+01	3.25635390E-01	38623	55680.000	1	
0090001	64	8	16	15	29	0.0100	1	0	5.50983100E+06	4.27878936E+01	1.53968145E+00	38623	55740.000	1	
0090001	64	8	16	15	30	0.0100	1	0	5.53956587E+06	5.87714689E+01	1.66151901E+00	38623	55800.000	1	
0090001	64	8	16	15	31	0.0100	1	0	5.93731692E+05	7.35905880E+01	6.87099257E-01	38623	55860.000	1	
0090002	64	8	16	15	57	0.0100	1	0	4.88932835E+06	3.17928740E+01	3.24975259E+00	38623	61020.000	1	
0090002	64	8	16	15	58	0.0100	1	0	4.13176431E+05	4.86814080E+01	6.40911377E+00	38623	61080.000	1	
0090002	64	8	16	15	59	0.0100	1	0	3.82064868E+05	7.06168216E+01	8.13172504E+00	38623	61140.000	1	
0090002	64	8	16	17	0	0.0100	1	0	4.06008072E+05	9.29956332E+01	7.28281979E+00	38623	61200.000	1	
0090002	64	8	16	17	1	0.0100	1	0	4.76570178E+05	1.10695971E+02	4.62626881E+00	38623	61260.000	1	
0090002	64	8	16	17	2	0.0100	1	0	5.76533468E+05	1.23037331E+02	1.49506641E+00	38623	61320.000	1	
0090003	64	8	16	18	25	0.0100	1	0	5.17267297E+05	2.36501782E+01	2.04242981E+00	38623	66300.000	1	
0090003	64	8	16	18	26	0.0100	1	0	3.84061613E+05	3.20603692E+01	7.36520897E+00	38623	66360.000	1	
0090003	64	8	16	18	27	0.0100	1	0	2.67930231E+06	4.87761502E+01	1.50081673E+01	38623	66420.000	1	
0090003	64	8	16	18	28	0.0100	1	0	2.01680569E+05	8.45829217E+01	2.30015375E+01	38623	66480.000	1	

3

ITEM	DESCRIPTION	REFERENCE SECTION
3	Observations. Each line represents one OBSERVATION card (or card image) containing the station pass identification, the last two digits of the year; the month, day, hour, minute, and second; the data set type; the covariance code; three measurements; the system time in seconds from midnight; the vehicle identification (which should be the same as the input VEHID); and any pertinent message If the observations are input by binary tape, nothing is printed at this point	11.2.1 15 11.1.2

```
     EPOCH                                          INITIAL CONDITIONS
   YR/MO/DAY          X,Y,Z,DX,DY,DZ        A,D,B,A,R,V           A,F,I,O,U,TAU         AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC        2.11253788414E+07    3.51500000000E+02    2.16730437072E+07     1.42983433809E-02
 1964/ 8/16           -3.15721902173E+05    0.                   1.44441834610E-02    -2.04739161253E-03
 0.                    0.                   9.00050000000E+01    9.55000000000E+01     6.73737489112E-02
 0.                   -3.68531052086E+02    3.54500000000E+02    3.51499999932E+02     3.51510035590E+02
 7.27000000000E+02    -2.45053350318E+03    2.13600000000E+07    3.51162206121E-01    -1.62725471159E-01
 0.                    2.57353640070E+04    2.58560000000E+04    6.38028929616E+02     1.08882155148E+00

NO PLANETARY PERTURBATIONS.

 ** ATMOSPHERE MODEL **   LOCKHEED                          TIME             CDA/W           W/CDA
                                                       7.27000000E+02    1.00000000E-02    1.00000000E+02
         D1  =  5.83000000E+00   D2 = -1.56840000E+01   FLUX =  0.

*******************************************************************************************************

THESE ARE THE   7 PARAMETERS IN THE PARAM MATRIX.    7 ARE P PARAMETERS AND   0 ARE Q PARAMETERS

              NAME    P/Q   CURRENT VALUE         BOUND                SIGMA                 CONVERSION
   0001       ALPHA    P    3.51500000E+02       1.00000000E+00      0.                      5.72957795E+01
   0001       DELTA    P    0.                   1.00000000E+00      0.                      5.72957795E+01
   0001       BETA     P    9.00050000E+01       1.00000000E+00      0.                      5.72957795E+01   (4)
   0001       AZ       P    3.54500000E+02       1.00000000E+00      0.                      5.72957795E+01
   0001       R        P    2.13600000E+07       1.00000000E+05      0.                      2.09257380E+07
   0001       V        P    2.58560000E+04       1.00000000E+01      0.                      3.48762300E+05
   0001       DRAG     P    1.00000000E-02       1.00000000E-02      0.                      1.00000000E+00
ENTER SEGMENT 10 AT     88.2 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .9 CP SECS.,      3.7 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP         0      IDENT       1      IDRAG      1      ALPHG    5.662162703E+00  CDAW 1.000000000E-02
JVEP         0      JNORM       1      IR         9      ALG-DEG  3.244180258E+02  ER   1.000000000E-10
MVEP         0      MAJOR       1      ISRP       0      TJDATE   2.438623500E+06  HMIN 2.000000000E+00
KVEP         7      NMASS       0      NEQS      24      TSTART   7.270000000E+02  HMAX 2.000000000E+00
LVEP         0      NT          4      RECMP      0      TSTOP    1.303000000E+03  H0   2.000000000E+00
IDENTX       1      JNOPMX      0      NMASSX     0      FLIGHT   5.760000000E+02  NTX  0.
                                       NASA       0      SSTEP    1.000000000E+02  SORD 1.500000000E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	<u>Parameter list</u> indicating the quantities to be differentially corrected. Shown in tabular form are the name, P- or Q- parameter indicator, current value, input bound and sigma, and input/output conversion factor for each	2.1.5 5 11.1.14

```
                                   * PREDETERMINED EVENT TABLE *
TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   727.0000 TZERO
  1303.0000 TSTOP

      ***  TRAJECTORY START

      * * * * * * * * * * * * * * * * * * * *    ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS   88.39200

              T  =        727.000000          H  =            .250000          NSTEP  =              0

                  2.112537894141E+07         -3.685310520857E+02         -3.046630747846E+01
                 -3.157219021728E+06         -2.450633503183E+03          4.553085330712E+00
                  0.                          2.573696400698E+04         -9.269647818762E-04

ALPHA             1.508758303287E-01          7.026658280390E-03         -7.831510004013E-04
                  1.009540444471E+00         -1.056682594666E-03         -5.241378230337E-03
                  0.                          0.                         -1.097983001491E-19

DELTA            -0.                         -7.298456764874E-02          7.796797467675E-08
                 -0.                          1.090761671814E-02         -1.165239188860E-08
                  1.020752529732E+00         -6.469626029979E-06         -5.282946063561E-03

BETA              0.                         -7.332203652761E-02          1.784801233243E-07
                  0.                          1.095867875294E-02         -2.667557346189E-08
                  0.                         -6.439841155098E-06          1.576498526150E-11

AZ                0.                          1.090761671814E-02         -2.679811016287E-08
                  0.                          7.298456764874E-02         -1.793040486660E-07
                  0.                          7.105664137797E-03         -6.686192638061E-09

R                 9.890158633619E-01          0.                          1.025158804091E-02
                 -1.478034111296E-01          0.                         -1.545030064381E-03
                  0.                          0.                          8.273446422207E-05

V                 0.                         -1.425321210109E-02          9.054266773255E-08
                  0.                         -9.478007051295E-02          6.029741570225E-07
                  0.                          9.953961945770E-01         -4.823534210103E-06

DRAG              0.                          0.                          4.179048465007E-07
                  0.                          0.                          2.785612136380E-06
                  0.                          0.                         -1.796317601821E-05
```

5

ITEM	DESCRIPTION	REFERENCE SECTION
5	Variational equations $\partial \underline{r}/\partial p$, $\partial \dot{\underline{r}}/\partial p$, and $\partial \ddot{\underline{r}}/\partial p$ at epoch in internal units (er, min, rad). They are also printed at trajectory termination	

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  FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  3.080465E+01-3.046633E+01 4.552923E+00 1.171816E-04-3.080465E+01 1.451160E-04 2.844807E-04
ATMOSPHERIC   1.056906E-03 2.329158E-05 1.619134E-04-1.044146E-03 9.154040E-08-1.056032E-03-6.290061E-05
TOTAL         3.080465E+01-3.046631E+01 4.553085E+00-9.269648E-04-3.080465E+01-9.099163E-04 2.215801E-04


*                STEP    DOUBLED         T  =    738.500000      H  =       .500000      NSTEP  =         45
*                STEP    DOUBLED         T  =    755.000000      H  =      1.000000      NSTEP  =         77
    NODE  T  =   7.715583520317E+02  -2.176582988905E+07   3.262980232285E+06   -3.728897320902E-02
         DT  =   1.000000000000E+00   3.537911412926E+02   2.379231048850E+03   -2.497833032549E+04
    NODE  T  =   8.161292664234E+02   2.112218520803E+07  -3.175314737377E+06   -5.806079124474E-02
         DT  =   1.000000000000E+00  -3.725292228421E+02  -2.455571977882E+03    2.573654906246E+04
    NODE  T  =   8.605792101579E+02  -2.176031672252E+07   3.282341969531E+06   -8.851345013355E-02
         DT  =   1.000000000000E+00   3.543221992190E+02   2.373711998480E+03   -2.498046437024E+04
    NODE  T  =   9.052495437519E+02   2.111904558180E+07  -3.195441448025E+06   -1.089142397749E-01
         DT  =   1.000000000000E+00  -3.764451039999E+02  -2.450006458669E+03    2.573605532061E+04
    NODE  T  =   9.497914183655E+02  -2.175484343843E+07   3.301710920733E+06   -8.255062273435E-02
         DT  =   1.000000000000E+00   3.547775373964E+02   2.379635130283E+03   -2.498254698085E+04
    NODE  T  =   9.943614921564E+02   2.111597154074E+07  -3.214574854071E+06   -9.254330858625E-02
         DT  =   1.000000000000E+00  -3.802618536119E+02  -2.448869768818E+03    2.573547481009E+04
    NODE  T  =   1.038895652446E+03  -2.174940212352E+07   3.321068564613E+06   -3.594279181329E-02
         DT  =   1.000000000000E+00   3.551846390693E+02   2.379099125130E+03   -2.498458774175E+04
    NODE  T  =   1.083465655387E+03   2.111292961254E+07  -3.233696657703E+06   -2.891419523730E-02
         DT  =   1.000000000000E+00  -3.840137775150E+02  -2.447423489211E+03    2.573484356653E+04
    NODE  T  =   1.127992265585E+03  -2.174394390575E+07   3.340398114736E+06   -2.690685863653E-04
         DT  =   1.000000000000E+00   3.556059319688E+02   2.378469760292E+03   -2.498603224190E+04
    NODE  T  =   1.172562116777E+03   2.110985991176E+07  -3.252795144273E+06    4.289666407977E-02
         DT  =   1.000000000000E+00  -3.877669615493E+02  -2.446106012514E+03    2.573422081092E+04
    NODE  T  =   1.217081055379E+03  -2.173840712948E+07   3.359694127784E+06    2.373125585496E-02
         DT  =   1.000000000000E+00   3.561029504792E+02   2.378167572974E+03   -2.498873582126E+04
    NODE  T  =   1.261650421331E+03   2.110671169950E+07  -3.271871947250E+06    9.209807904329E-02
         DT  =   1.000000000000E+00  -3.915807895113E+02  -2.445278165376E+03    2.573365461179E+04

            T  =       1303.000000          H  =          1.000000        NSTEP  =         625

             -2.128523953293E+07          -5.058055711570E+03          2.816695826715E+01
              2.851378919969E+06           3.152604890545E+03         -3.773118593270E+00
              4.702934850006E+06          -2.440058016364E+04         -6.204912227728E+00
```

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ALPHA        -1.362342841631E-01    -9.088436656835E-03    6.484328686607E-04
             -1.017212811139E+00    -1.449786187164E-02    4.845908917901E-03
              3.071138860762E-04     7.194849538475E-06   -1.329310329866E-06

DELTA        -2.223629979567E-01     6.923775588704E-02    1.090259254687E-03
              3.486708901093E-02    -1.076005899338E-02   -1.648846072365E-04
             -1.029532701896E+00    -1.573248918873E-02    4.892409574229E-03

BETA         -5.950846829238E-01     2.127862353480E-01    6.238380127628E-03
              4.991370083584E-01    -2.670819115936E-02   -2.836879481173E-03
             -4.166991554943E+00    -6.517231652939E-02    1.904434799678E-02

AZ            2.073376608690E-02    -9.399691661485E-03   -9.550779774932E-05
              1.633887159981E-01    -7.026605970557E-02   -7.787934028991E-04
             -6.352352065773E-03    -7.178167747321E-03    2.945430374262E-05

R             2.257134554561E+01    -8.641203558093E+00   -1.469266634679E-01
             -1.577246371543E+01     1.141847806475E+00    8.041463864069E-02
              1.256600101207E+02     2.064367198044E+00   -5.882053793044E-01

V             2.921875566344E+02    -1.160413882949E+02   -2.075062236619E+00
             -2.102582031205E+02     1.524962195263E+01    1.093134873450E+00
              1.689179548620E+03     2.854457430755E+01   -7.873182542686E+00

DRAG         -1.788350615598E-01     8.611654347690E-02    1.902624164764E-03
              1.512410902734E-01    -1.119862927215E-02   -8.612346895912E-04
             -1.262487928033E+00    -2.316321440878E-02    5.765712037801E-03

  FORCES       MAGNITUDE      X         Y         Z      ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  2.908805E+01 2.916696E+01-3.773118E+00-6.204916E+00-2.908805E+01-1.798890E-02-1.910441E-03
ATMOSPHERIC   3.519705E-06 6.741910E-07-6.553724E-07 3.391796E-06-1.217397E-08-3.513011E-06 2.166337E-07
TOTAL         2.908805E+01 2.916696E+01-3.773119E+00-6.204912E+00-2.908805E+01-1.799241E-02-1.910224E-03


      ***  TRAJECTORY TERMINATION


      ***  THIS CASE TOOK      6.931  SECONDS TO INTEGRATE A SPAN OF     576.0000  MINUTES  ***
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*** FROM 727.000 TO 1303.000 MINUTES FROM MIDNIGHT OF EPOCH ***

ENTER SEGMENT 20 AT 95.3 SECONDS. EXECUTION TIME FOR SEGMENT 10 WAS 7.1 CP SECS., 11.2 PP SECS.

OBSERVATION RESIDUALS

STAPASS	YEAR	MO	DY	HR	MN	SEC							MJD	ST
0050001	1964	8	15	12	10	1.0000	7.2193E+02	RNG	-5.7748E-01	AZ	-1.5353E-01	EL	38623	43800.000
0050001	1964	8	15	12	11	1.0000	-1.3801E+03	RNG	-1.0051E+00	AZ	-2.6681E-01	EL	38623	43860.000
0050001	1964	8	15	12	12	1.0000	-1.2039E+04	RNG	-3.1996E+00	AZ	2.7212E-01	EL	38623	43920.000
0050001	1964	8	15	12	13	1.0000	-6.9736E+03	RNG	1.2433E+00	AZ	-2.9075E-01	EL	38623	43980.000
0050001	1964	8	15	12	14	1.0000	-3.8206E+03	RNG	5.5980E-01	AZ	-1.7049E-01	EL	38623	44040.000
0050001	1964	8	15	12	15	1.0000	-2.5545E+03	RNG	3.4055E-01	AZ	-1.1805E-01	EL	38623	44100.000
0040001	1964	8	15	12	19	1.0000	-1.7570E+04	RNG	-1.1783E-01	AZ	-9.4941E-02	EL	38623	44340.000
0040001	1964	8	15	12	20	1.0000	-1.7816E+04	RNG	-8.9713E-03	AZ	-1.1780E-01	EL	38623	44400.000
0040001	1964	8	15	12	21	1.0000	-1.3983E+04	RNG	1.4065E-01	AZ	-1.4985E-01	EL	38623	44460.000
0040001	1964	8	15	12	22	1.0000	-7.2055E+03	RNG	1.7872E-01	AZ	-1.6847E-01	EL	38623	44520.000
0040001	1964	8	15	12	23	1.0000	-1.4351E+03	RNG	1.3477E-01	AZ	-1.5095E-01	EL	38623	44580.000
0090001	1964	8	15	15	28	1.0000	-1.2982E+05	RNG	3.4447E+00	AZ	2.2904E-01	EL	38623	55680.000
0090001	1964	8	15	15	29	1.0000	-4.0641E+04	RNG	3.9272E+00	AZ	-2.7394E-02	EL	38623	55740.000
0090001	1964	8	15	15	30	1.0000	5.8452E+04	RNG	3.9207E+00	AZ	-3.4042E-01	EL	38623	55800.000
0090001	1964	8	15	15	31	1.0000	1.4832E+05	RNG	3.4197E+00	AZ	-5.9195E-01	EL	38623	55860.000
0090002	1964	8	15	16	57	1.0000	-3.5218E+05	RNG	4.9318E+00	AZ	1.0259E+00	EL	38623	61020.000
0090002	1964	8	15	16	58	1.0000	-2.2774E+05	RNG	7.0022E+00	AZ	7.8108E-01	EL	38623	61080.000
0090002	1964	8	15	16	59	1.0000	-3.7413E+04	RNG	8.5014E+00	AZ	-2.1927E-02	EL	38623	61140.000
0090002	1964	8	15	17	0	1.0000	1.7160E+05	RNG	7.7989E+00	AZ	-1.0276E+00	EL	38623	61200.000
0090002	1964	8	15	17	1	1.0000	3.2728E+05	RNG	5.5789E+00	AZ	-1.4818E+00	EL	38623	61260.000
0090002	1964	8	15	17	2	1.0000	4.1849E+05	RNG	3.7989E+00	AZ	-1.4921E+00	EL	38623	61320.000
0090003	1964	8	15	18	25	1.0000	-6.8546E+05	RNG	2.8032E+00	AZ	1.9257E+00	EL	38623	66300.000
0090003	1964	8	15	18	26	1.0000	-6.4581E+05	RNG	4.9128E+00	AZ	2.5937E+00	EL	38623	66360.000
0090003	1964	8	15	18	27	1.0000	-5.3708E+05	RNG	9.9494E+00	AZ	3.7369E+00	EL	38623	66420.000
0090003	1964	8	15	18	28	1.0000	-2.2054E+05	RNG	1.9821E+01	AZ	2.6701E+00	EL	38623	66480.000
0090003	1964	8	15	18	29	1.0000	2.3744E+05	RNG	1.7870E+01	AZ	-4.3390E+00	EL	38623	66540.000
0090003	1964	8	15	18	30	1.0000	5.7607E+05	RNG	8.3089E+00	AZ	-4.4874E+00	EL	38623	66600.000
0090003	1964	8	15	18	31	1.0000	6.5874E+05	RNG	3.9667E+00	AZ	-3.1298E+00	EL	38623	66660.000
0090003	1964	8	15	18	32	1.0000	7.[illegible]64E+05	RNG	2.1718E+00	AZ	-2.3600E+00	EL	38623	66720.000
0060001	1964	8	15	18	33	1.0000	-7.1[illegible]59E+05	RNG	1.8713E+00	AZ	1.9399E+00	EL	38623	66780.000
0060001	1964	8	15	18	34	1.0000	-7.0566E+05	RNG	3.0210E+00	AZ	2.6756E+00	EL	38623	66840.000
0060001	1964	8	15	18	35	1.0000	-5.5270E+05	RNG	5.8862E+00	AZ	4.4637E+00	EL	38623	66900.000
0060001	1964	8	15	18	36	1.0000	-4.3949E+05	RNG	1.5855E+01	AZ	8.5635E+00	EL	38623	66960.000
0060001	1964	8	15	18	37	1.0000	9.2051E+04	RNG	2.9397E+01	AZ	-4.7912E+00	EL	38623	67020.000
0060001	1964	8	15	18	38	1.0000	5.8605E+05	RNG	9.2096E+00	AZ	-1.0165E+01	EL	38623	67080.000

6

CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
6	<u>Observation residuals.</u> Each line corresponds to one input observation set or card and contains the station-pass identification in year, month, day, hour, minute, and second; three pairs of measurement residuals and identification; the modified Julian date; and the system time in seconds from midnight The residuals are the unnormalized differences between the input measurements (modified by bias and/or refraction corrections) and the corresponding values for the same measurement types computed from the integrated trajectory position at the observation time. The observation names are abbreviated as follows:	

RNG	Range	CM3	Three-way cumulative doppler
AZ	Azimuth	DOP	Doppler
EL	Elevation	TWD	Two-way doppler
TRA	Topocentric right ascension	SRR	SGLS range rate
TD	Topocentric declination	AX	X-antenna
THA	Topocentric hour angle	AY	Y-antenna
GRA	Geocentric right ascension	CC3	JPL two- or three-way doppler
GD	Geocentric declination	TNT	Tranet doppler
U	u	GCR	Geoceiver range difference
V	v	V2	Vehicle-vehicle range
H	Height	V2D	Vehicle-vehicle range rate
X	$\hat{x}$	S2	Station-vehicle-vehicle range
Y	$\hat{y}$	S2D	Station-vehicle-vehicle range rate
Z	$\hat{z}$	S3	Station-vehicle-vehicle-vehicle range
P	P		
Q	Q	S3D	Station-vehicle-vehicle-vehicle range rate
RD	Range rate		
PD	P rate	V3	Vehicle-vehicle-vehicle range
QD	Q rate	TDA	Time difference of arrival
ACC	Accelerometer	TØA	Time of arrival
CM1	One-way cumulative doppler	N	Time-of-arrival counter

0060001	1964	8	16	18	39	1.0000	7.0286E+05	RNG	2.9163E+00	AZ	-5.2355E+00	EL	38623	67140.000
0060001	1964	8	16	18	40	1.0000	7.3429E+05	RNG	1.1680E+00	AZ	-3.3119E+00	EL	38623	67200.000
0060001	1964	8	16	18	41	1.0000	7.4494E+05	RNG	5.2410E-01	AZ	-2.4719E+00	EL	38623	67260.000
0090004	1964	8	16	19	54	1.0000	-9.2242E+05	RNG	3.9277E-02	AZ	3.1053E+00	EL	38623	71640.000
0090004	1964	8	16	19	55	1.0000	-9.1014E+05	RNG	-5.0427E-02	AZ	5.2478E+00	EL	38623	71700.000
0090004	1964	8	16	19	56	1.0000	-8.4236E+05	RNG	-8.0807E-01	AZ	1.4012E+01	EL	38623	71760.000
0090004	1964	8	16	19	57	1.0000	-2.1213E+05	RNG	-9.8093E+01	AZ	2.1983E+01	EL	38623	71820.000
0090004	1964	8	16	19	58	1.0000	7.5414E+05	RNG	-3.4655E+00	AZ	-2.1948E+01	EL	38623	71880.000
0090004	1964	8	16	19	59	1.0000	8.8836E+05	RNG	-1.2950E+00	AZ	-7.2931E+00	EL	38623	71940.000
0090004	1964	8	16	20	0	1.0000	9.1358E+05	RNG	-7.5093E-01	AZ	-4.0585E+00	EL	38623	72000.000
0090004	1964	8	16	20	1	1.0000	9.2012E+05	RNG	-5.3110E-01	AZ	-2.9022E+00	EL	38623	72060.000
0060002	1964	8	16	20	2	1.0000	-6.5857E+05	RNG	-6.0141E+00	AZ	1.6043E+00	EL	38623	72120.000
0060002	1964	8	16	20	3	1.0000	-5.1788E+05	RNG	-8.1363E+00	AZ	1.4180E+00	EL	38623	721[illegible]0.000
0060002	1964	8	16	20	4	1.0000	-3.0667E+05	RNG	-1.0234E+01	AZ	8.5309E-01	EL	38623	72240.000
0060002	1964	8	16	20	5	1.0000	-4.0119E+04	RNG	-1.1161E+01	AZ	-1.0546E-01	EL	38623	72300.000
0060002	1964	8	16	20	6	1.0000	2.2402E+05	RNG	-1.0283E+01	AZ	-1.0364E+00	EL	38623	72360.000
0060002	1964	8	16	20	7	1.0000	4.3282E+05	RNG	-8.3794E+00	AZ	-1.5689E+00	EL	38623	72420.000
0090005	1964	8	16	21	22	1.0000	-1.0705E+06	RNG	-3.6137E+00	AZ	3.1091E+00	EL	38623	76920.000
0090005	1964	8	16	21	23	1.0000	-1.0197E+06	RNG	-6.6744E+00	AZ	4.3194E+00	EL	38623	76980.000
0090005	1964	8	16	21	24	1.0000	-8.6449E+05	RNG	-1.4787E+01	AZ	6.6335E+00	EL	38623	77040.000
0090005	1964	8	16	21	25	1.0000	-3.6017E+05	RNG	-3.2194E+01	AZ	5.1185E+00	EL	38623	77100.000
0090005	1964	8	16	21	26	1.0000	4.5302E+05	RNG	-2.7804E+01	AZ	-6.4851E+00	EL	38623	77160.000
0090005	1964	8	16	21	27	1.0000	8.7611E+05	RNG	-1.2828E+01	AZ	-6.4116E+00	EL	38623	77220.000
0090005	1964	8	16	21	28	1.0000	1.0081E+06	RNG	-6.4230E+00	AZ	-4.3884E+00	EL	38623	77280.000
0010001	1964	8	16	21	33	1.0000	-1.0512E+06	RNG	3.8996E+00	AZ	2.7464E+00	EL	38623	77580.000
0010001	1964	8	16	21	34	1.0000	-1.0094E+06	RNG	6.0810E+00	AZ	3.4880E+00	EL	38623	77640.000
0010001	1964	8	16	21	35	1.0000	-9.0848E+05	RNG	1.0721E+01	AZ	4.8261E+00	EL	38623	77700.000
0010001	1964	8	16	21	36	1.0000	-6.3781E+05	RNG	2.1169E+01	AZ	5.9965E+00	EL	38623	77760.000
0010001	1964	8	16	21	37	1.0000	-1.9800E+03	RNG	3.1735E+01	AZ	-7.3969E-01	EL	38623	77820.000
0010001	1964	8	16	21	38	1.0000	6.7253E+05	RNG	2.0250E+01	AZ	-8.5494E+00	EL	38623	77880.000
0010001	1964	8	16	21	39	1.0000	9.6476E+05	RNG	9.2024E+00	AZ	-6.7311E+00	EL	38623	77940.000
0010001	1964	8	16	21	40	1.0000	1.0652E+06	RNG	4.5307E+00	AZ	-4.7156E+00	EL	38623	78000.000

TOTAL EDIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
001	8	RNG	8.6E+05	8.6E+03	-1.1E+05	8	AZ	1.6E+01	1.6E+02	1.3E+01	8	EL	5.2E+00	5.2E+01	-4.6E-01
004	5	RNG	1.3E+04	1.3E+02	-1.2E+04	5	AZ	1.3E-01	1.3E+00	6.5E-02	5	EL	1.4E-01	1.4E+00	-1.4E-01
005	6	RNG	6.0E+03	6.0E+01	-4.3E+03	6	AZ	1.5E+00	1.5E+01	-4.4E-01	6	EL	2.2E-01	2.2E+00	-1.2E-01
006	15	RNG	5.6E+05	5.6E+03	-4.0E+04	15	AZ	1.1E+01	1.1E+02	1.0E+00	15	EL	4.3E+00	4.3E+01	-4.8E-01
009	33	RNG	6.4E+05	6.4E+03	3.4E+03	33	AZ	2.0E+01	2.0E+02	-2.6E+00	33	EL	6.9E+00	6.9E+01	1.1E-01

ENTER SEGMENT 30 AT 97.1 SECONDS. EXECUTION TIME FOR SEGMENT 20 WAS 1.8 CP SECS., 9.8 PP SECS.

ITEM	DESCRIPTION	REFERENCE SECTION
7	Edit summary. The RMS of the residuals for each measurement type from each station is computed by the residuals editor. Included in the printout are the station identification, the number of residuals included in the RMS (i.e., the total number for that station and type minus the number deleted by the editor on this iteration), the RMS, the RMS divided by the input weighting sigma, and the mean value of the residuals. The measurement type indicators are the same as those used for residuals (Item 6) Because of storage constraints, the residuals editor accumulates residuals and makes editing checks only for the first 6 measurement types for the first 30 stations	2.2.4

ITERATION NUMBER 1 8
201 OBSERVATIONS WERE USED IN THIS SOLUTION 9
CURRENT SOLUTION IS BEST SO FAR 10
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	BOUND	NEW VALUE	SIGMA
0001	ALPHA	3.51499999999996E+02	3.29208724E-01	1.00000000E+00	3.51829208723992E+02	1.25190034E-04
0001	DELTA	0.	1.13160500E-01	1.00000000E+00	1.13160499953416E-01	2.10518024E-04
0001	BETA	9.00049999999992E+01	-2.26835100E-01	1.00000000E+00	8.97781648996747E+01	9.19896850E-05
0001	AZ	3.54499999999996E+02	6.64006620E-02	1.00000000E+00	3.54566400661983E+02	7.31252969E-05
0001	R	2.13599999999998E+07	-1.23030829E+04	1.00000000E+05	2.13476969170890E+07	5.73271117E+01
0001	V	2.58559999999998E+04	-5.17544231E-01	1.00000000E+01	2.58554824557692E+04	7.08926739E-02
0001	DRAG	1.00000000000000E-02	-8.77565717E-03	1.00000000E-02	1.22434282701928E-03	8.45819835E-06

11

CORRECTIONS HITTING BOUNDS. 5 ITERATIONS USED IN FINDING Z 12

RMS FOR THIS SOLUTION = 3.4716713914E+03 13

PREDICTED RMS FOR NEXT SOLUTION = 4.8322106976E+02 14

XT((ATA)X) = 2.37501378E+09 XT(ATB) = 2.37561893E+09 RATIO = 9.99745266E-01 15

CORRELATION MATRIX DETERMINANT = 7.26217525E-07 16

0001 ALPHA	0001 DELTA	0001 BETA	0001 AZ	0001 R	0001 V	0001 DRAG
1.000000000						
.177635916	1.000000000					
-.122165667	-.533863245	1.000000000				
.460579679	.205133632	-.234238491	1.000000000			
.169899883	.850313741	-.615787104	.161605940	1.000000000		
-.167882861	-.845366506	.632669139	-.162982940	-.999457483	1.000000000	
.165362253	.449753863	.058309304	.072642556	.406561987	-.378328785	1.000000000

17

ENTER SEGMENT 40 AT 97.3 SECONDS. EXECUTION TIME FOR SEGMENT 30 WAS .2 CP SECS., 2.6 PP SECS.

ITEM	DESCRIPTION	REFERENCE SECTION
8	Iteration number. TRACE makes the differential correction, or orbit determination, by computing a series of differential corrections of the parameters selected by the user. The iteration number is advanced each time a set is recomputed and indicates the number of times the orbit determination algorithm has been performed	2.2.2
9	Observation count. The number of individual measurements included in the current (best) least squares computation is indicated	
10	Convergence indicator. If the weighted RMS for all residuals is less than that for any previous iteration, the correction process is converging, and the message shown is printed. If the current RMS is greater than the smallest RMS obtained on previous iterations, the message CURRENT ITERATION IS NOT GOOD (SOS X.XXXXXXXXE±XX) is printed at this point.	2.2.2
11	The current solution is shown, one parameter per line, starting with the name (Item 4). If the iteration has been successful (i.e., if the overall RMS has been lowered), the current value is the parameter value used in the integration, partial derivatives, and residuals computations just completed. For the first iteration, it is the input value of the parameter. If an iteration is bad, the value produced for the lowest RMS is recovered from memory and is printed as the current value The correction, the solution of the system of normal equations associated with the current (best) iteration, is also shown on the line, as is the bound, the current value of the number used to limit the correction size. In general, these bounds are automatically increased on a good iteration and decreased on a bad one. The last two columns contain the new value (correct value plus correction) to be used for the next iteration and the a priori sigma for the parameter	2.2.3
12	Indications that the correction sizes have been controlled by solving the system so that the constraint of the bounds is satisfied. The number of iterations to determine the Lagrange multiplier z is also shown. If the normal equations were solved without applying the bounds, nothing would be printed at this point	
13	RMS. The quantity to be minimized in the differential correction process is the RMS of the normalized residuals for the current iteration	
14	Predicted RMS. If the fitting process is converging in a completely linear manner, this will be the RMS on the next iteration; it may be compared with the current RMS (Item 13) to measure the degree to which the process has already converged	
15	The equation being solved is $A^T W A \Delta P = A^T W B$; therefore, the solution should also satisfy $\Delta P^T A^T W A \Delta P = \Delta P^T A^T W B$. By comparing the ratio of the two sides of the preceding equation to 1, an estimation of the quality of the matrix inversion may be obtained and, implicitly, of the normal matrix conditioning. This comparison is valid only when bounds are not hit	
16	Determinant of the correlation matrix	
17	Correlation matrix, the correlation coefficients for the parameter set. These values are computed directly from the covariance matrix (i.e., the inverse normal matrix). Row sequence is the same as column sequence	

```
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   2. ****

 YEAR/MO/DY           X          ALPHA             A              AF          MEAN ANOMOLY    APOGEE RADIUS
     HR/MIN           Y          DELTA             E              AG        ECCENTRC ANOM    APOGEE HEIGHT
    SECONDS           Z           BETA             I               N         TRUE ANOMOLY    PERIGEE RADIUS
   LATITUDE        XDOT        AZIMUTH             O               L        KEPLERIAN PER    PERIGEE HEIGHT
  LONGITUDE        YDOT         RADIUS             U             CHI          ANOMALY PER             O-DOT
     HEIGHT        ZDOT       VELOCITY           TAU             PSI         NODAL PERIOD             U-DOT

 1964/ 8/16    21130951.238   351.829208313   21646835.097  .0131185024774     15.42829991       3613.73818
     12/ 7    -3034021.391       .113160500   .01435106322 -.0058187548808     15.65011327        170.65518   18
  0.0000000       42162.172   89.778164900   95.433588709  .0674961437126     15.87348122       3511.48367
   .1139230    -293.1917405  354.566400251  351.839972422  351.508462446      88.8339674         68.40067
205.1635851   -2430.4413683  21347696.917  344.240189981  -.15608012581      89.0346349      .8384569822
    69.4456    25739.2581881  25855.4924558    723.1903256  1.08849975398      98.9701739     -4.2288007596

ENTER SEGMENT 10 AT     97.5 SECONDS.  EXECUTION TIME FOR SEGMENT 40 WAS      .2 CP SECS.,      8.4 PP SECS.

         TRAJECTORY INTEGRATION FOR CASE   1

IVEP       0      ICENT      1      IDRAG       1      ALPHG   5.662162703E+00  CDAW 1.224342827E-03
JVEP       0      JNORM      1      IR          8      ALG-DEG 3.244180258E+02  ER   1.000000000E-10
MVEP       0      MAJOR      1      ISRP        0      TJDATE  2.438623500E+06  HMIN 2.000000000E+00
KVEP       7      VMASS      0      NEQS       24      TSTART  7.270000000E+02  HMAX 2.000000000E+00
LVEP       0      VT         4      RECMP       0      TSTOP   1.303000000E+03  HO   2.000000000E+00
ICENTX     1      JNORMX     0      NMASSX      0      FLIGHT  5.760000000E+02  NTX  0.
                                    NASA        0      SSTEP   1.000000000E+02  SORO 1.500000000E+00

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
   727.0000 TZERO
  1303.0000 TSTOP

     ***  TRAJECTORY START

     * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    97.69200

               T  =       727.000000          H  =          .250000        NSTEP  =          0

                2.113035123784E+07            -2.991917404612E+02           -3.052702432160E+01
               -3.034021390711E+06            -2.430441368898E+03            4.382852174980E+00
                4.216217155988E+04             2.573925818813E+04           -5.077158946111E-02
```

ITEM	DESCRIPTION	REFERENCE SECTION
18	Initial conditions and characteristics for the next iteration are fully explained in the epoch print (Item 42) of the previous case	

```
ALPHA          1.449839349170E-01        6.968761729401E-03        -7.538634032513E-04
               1.009816738373E+00       -8.578672077264E-04        -5.251821922072E-03
               0.                        0.                         5.072796977429E-10

DELTA         -1.994334437437E-03       -7.305254656714E-02         1.013851645742E-05
               2.863538731332E-04        1.048902088865E-02        -1.455639639366E-06
               1.020162539830E+00        1.412718155228E-04        -5.288997732691E-03

BETA           0.                       -7.338613986721E-02         2.910517841854E-08
               0.                        1.050946047628E-02        -4.167985675079E-09
               0.                        1.393241626287E-04        -5.589291141101E-11

AZ             0.                        1.047523697341E-02        -4.189457598863E-09
               0.                        7.305409839516E-02        -2.924014878256E-08
               0.                        7.019930643232E-03        -1.055755549733E-09

R              9.898458823081E-01        0.                         1.027953859891E-02
              -1.421240615554E-01        0.                        -1.478110678485E-03
               1.975022023389E-03        0.                         3.530004569560E-05

V              0.                       -1.157169435817E-02         1.249910573710E-08
               0.                       -9.400100628776E-02         9.763856698858E-08
               0.                        9.955048501673E-01        -7.860128671986E-07

DRAG           0.                        0.                         4.833824156621E-07
               0.                        0.                         3.688586245117E-06
               0.                        0.                        -2.390669173616E-05

 FORCES       MAGNITUDE      X       Y      Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.084011E+01-3.052703E+01 4.382825E+00-6.060145E-02-3.084011E+01 3.353302E-04 2.680478E-04
ATMOSPHERIC   1.721854E-04 3.440109E-06 2.625072E-05-1.701378E-04-6.617043E-07-1.718791E-04-1.024360E-05
TOTAL         3.084011E+01-3.052702E+01 4.382852E+00-6.077159E-02-3.084011E+01 1.634510E-04 2.578042E-04

*             STEP    DOUBLED          T  =     737.000000      H  =        .500000      NSTEP  =        39
*             STEP    DOUBLED          T  =     752.500000      H  =       1.000000      NSTEP  =        69
  NODE    T = 7.716776901297E+02   -2.174592635526E+07   3.128044651412E+06    8.185382931127E-02
         DT = 1.000000000000E+00    4.363066536235E+02   2.341032215047E+03   -2.501100242896E+04
  NODE    T = 8.159439381329E+02    2.112807778157E+07  -3.048921452957E+06   -8.866507996913E-03
         DT = 1.000000000000E+00   -2.531640783088E+02  -2.437807435119E+03    2.573986349851E+04
```


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NODE	T =	8.606439784949E+02	-2.174307672354E+07	3.147574109853E+06	6.346098681070E-02
	DT =	1.000000000000E+00	4.367489585501E+02	2.341259412302E+03	-2.501008063800E+04
NODE	T =	9.049131125587E+02	2.112480922144E+07	-3.067826874256E+06	-3.145012691736E-02
	DT =	1.000000000000E+00	-2.570751312713E+02	-2.437496916786E+03	2.574034521037E+04
NODE	T =	9.496085345421E+02	-2.174027955617E+07	3.167115480898E+06	4.731287274225E-02
	DT =	1.000000000000E+00	4.371065454945E+02	2.340929513896E+03	-2.501069558271E+04
NODE	T =	9.938809223148E+02	2.112160903266E+07	-3.086737009815E+06	-5.239012997875E-02
	DT =	1.000000000000E+00	-2.609021288274E+02	-2.436611139646E+03	2.574074086916E+04
NODE	T =	1.038572072318E+03	-2.173752250007E+07	3.186650039577E+06	2.199408100714E-02
	DT =	1.000000000000E+00	4.374054250921E+02	2.340136166310E+03	-2.501046135307E+04
NODE	T =	1.082847949403E+03	2.111844585457E+07	-3.105634339711E+06	-6.394101090157E-02
	DT =	1.000000000000E+00	-2.646769896776E+02	-2.435406138572E+03	2.574108312266E+04
NODE	T =	1.127534984272E+03	-2.173475444553E+07	3.206160942905E+06	6.063245481935E-03
	DT =	1.000000000000E+00	4.377056630312E+02	2.339242337792E+03	-2.501022825244E+04
NODE	T =	1.171814316422E+03	2.111526079807E+07	-3.124507502435E+06	-8.286088097144E-02
	DT =	1.000000000000E+00	-2.684624881963E+02	-2.434319116268E+03	2.574143064371E+04
NODE	T =	1.216497109383E+03	-2.173191504376E+07	3.225642388976E+06	1.378241885715E-06
	DT =	1.000000000000E+00	4.380669398760E+02	2.338670267869E+03	-2.501004494494E+04
NODE	T =	1.260779610736E+03	2.111200155498E+07	-3.143357829477E+06	-9.022722714296E-02
	DT =	1.000000000000E+00	-2.723159956769E+02	-2.433715458936E+03	2.574183413167E+04

T = 1303.500000 H = 1.000000 NSTEP = 620

	-2.158139373011E+07	-2.936560141066E+03	2.857982066037E+01
	2.941602320333E+06	2.820751815171E+03	-3.895256928281E+00
	2.928955390395E+06	-2.478242573033E+04	-3.867091391020E+00
ALPHA	-1.405703253351E-01	-8.112355054985E-03	6.694580358838E-04
	-1.031332567536E+00	-8.414333182920E-03	4.916945383847E-03
	3.631775052101E-04	5.226738622887E-06	-1.632595318533E-06
DELTA	-1.387830212820E-01	7.056569936537E-02	6.574985670973E-04
	2.129733488308E-02	-1.054634674355E-02	-1.009645314532E-04
	-1.047049174250E+00	-9.559078210560E-03	4.977361441106E-03
BETA	-3.140554057470E-01	1.967200090466E-01	3.662521752306E-03
	4.237426207680E-01	-2.575880859943E-02	-2.315171961345E-03
	-3.917007913912E+00	-3.740467308669E-02	1.832581016705E-02
AZ	9.128502328766E-03	-8.972395236228E-03	-3.906947413612E-05
	8.055012853788E-02	-7.104564900142E-02	-3.846045274812E-04
	-1.608908734680E-02	-7.046327340826E-03	7.587327516339E-05

```
R              1.144856139165E+01        -8.503537251800E+00        -1.009066847643E-01
              -1.359557914992E+01         1.144803978440E+00         7.112715583158E-02
               1.233937145524E+02         1.296812247239E+00        -5.802836860332E-01

V              1.452254490322E+02        -1.176498466858E+02        -1.520343930412E+00
              -1.862350275205E+02         1.574794788511E+01         1.000672309522E+00
               1.708331085917E+03         1.887705432857E+01        -8.008410938828E+00

DRAG          -9.783352270257E-02         1.255965284188E-01         2.186118776008E-03
               1.920342548582E-01        -1.663381409215E-02        -1.149855285102E-03
              -1.842454554114E+00        -2.315265667377E-02         8.525382604848E-03

  FORCES       MAGNITUDE     X        Y        Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  2.910213E+01 2.857983E+01-3.895257E+00-3.867092E+00-2.910213E+01-1.142734E-02-1.238510E-03
ATMOSPHERIC   4.495445E-07 4.833679E-08-7.803580E-08 4.400730E-07 7.376945E-10-4.486663E-07 2.807590E-08
TOTAL         2.910213E+01 2.857983E+01-3.895257E+00-3.867092E+00-2.910213E+01-1.142779E-02-1.238482E-03


     ***  TRAJECTORY TERMINATION


     ***  THIS CASE TOOK      6.885  SECONDS TO INTEGRATE A SPAN OF    576.5000  MINUTES  ***

         ***  FROM        727.000  TO       1303.500  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 20 AT    104.5 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     7.0 CP SECS.,    11.3 PP SECS.

OBSERVATION RESIDUALS

STAPASS  YEAR MO DY HR MN  SEC                                                                     MJD      ST
0050001  1964  8 16 12 10  0.0000  2.2688E+04    RNG    1.6215E+00   AZ   -3.3328E-01   EL   38623 43800.000
0050001  1964  8 16 12 11  0.0000  1.7605E+04    RNG    2.9479E+00   AZ   -8.0831E-01   EL   38623 43860.000
0050001  1964  8 16 12 12  0.0000 -6.9197E+03    RNG    9.3419E+00   AZ   -4.2212E+00   EL   38623 43920.000
0050001  1964  8 16 12 13  0.0000 -2.2796E+04    RNG   -4.0375E+00   AZ   -1.0205E+00   EL   38623 43980.000
0050001  1964  8 16 12 14  0.0000 -1.5651E+04    RNG   -1.9082E+00   AZ   -6.6809E-01   EL   38623 44040.000
0050001  1964  8 16 12 15  0.0000 -1.1783E+04    RNG   -1.2258E+00   AZ   -5.1925E-01   EL   38623 44100.000
0040001  1964  8 16 12 19  0.0000  3.0133E+04    RNG    1.0505E+00   AZ   -9.6596E-01   EL   38623 44340.000
0040001  1964  8 16 12 20  0.0000  4.3115E+04    RNG    1.0582E+00   AZ   -1.3543E+00   EL   38623 44400.000
0040001  1964  8 16 12 21  0.0000  5.8001E+04    RNG    6.1916E-01   AZ   -1.6029E+00   EL   38623 44460.000
```

0040001	1964	8	16	12	22	0.0000	6.5667E+04	RNG	9.8096E-02	AZ	-1.4357E+00	EL	38623	44520.000
0040001	1964	8	15	12	23	1.0000	6.8526E+04	RNG	-1.0875E-01	AZ	-1.1507E+00	EL	38623	44580.000
0090001	1964	8	16	15	28	0.0000	-6.1184E+03	RNG	3.0765E-01	AZ	-8.0133E-01	EL	38623	55680.000
0090001	1964	8	16	15	29	1.0000	-6.8573E+03	RNG	3.8295E-01	AZ	-8.4310E-01	EL	38623	55740.000
0090001	1964	8	16	15	30	1.0000	-2.7751E+03	RNG	4.4860E-01	AZ	-8.4095E-01	EL	38623	55800.000
0090001	1964	8	16	15	31	1.0000	5.2159E+03	RNG	4.8157E-01	AZ	-7.9429E-01	EL	38623	55860.000
0090002	1964	8	15	16	57	1.0000	1.5211E+03	RNG	1.1618E-01	AZ	-1.0148E+00	EL	38623	61020.000
0090002	1964	8	16	16	58	1.0000	-8.4432E+03	RNG	1.4354E-01	AZ	-1.1552E+00	EL	38623	61080.000
0090002	1964	8	16	16	59	1.0000	-1.3558E+04	RNG	2.1954E-01	AZ	-1.2119E+00	EL	38623	61140.000
0090002	1964	8	15	17	0	0.0000	-1.0744E+04	RNG	3.0655E-01	AZ	-1.1336E+00	EL	38623	61200.000
0090002	1964	8	16	17	1	1.0000	-2.2753E+03	RNG	3.5173E-01	AZ	-9.7480E-01	EL	38623	61260.000
0090002	1964	8	15	17	2	1.0000	7.9316E+03	RNG	3.6114E-01	AZ	-8.1401E-01	EL	38623	61320.000
0090003	1964	8	16	18	25	1.0000	2.0690E+04	RNG	1.9155E-01	AZ	-1.0434E+00	EL	38623	66300.000
0090003	1964	8	15	18	26	1.0000	6.6799E+03	RNG	1.6136E-01	AZ	-1.3589E+00	EL	38623	66360.000
0090003	1964	8	15	18	27	1.0000	-1.1036E+04	RNG	9.5496E-02	AZ	-1.8453E+00	EL	38623	66420.000
0090003	1964	8	15	18	28	1.0000	-2.8892E+04	RNG	2.1144E-02	AZ	-2.2312E+00	EL	38623	66480.000
0090003	1964	8	15	18	29	1.0000	-2.6325E+04	RNG	1.2254E-01	AZ	-1.9183E+00	EL	38623	66540.000
0090003	1964	8	15	18	30	1.0000	-1.1609E+04	RNG	2.1121E-01	AZ	-1.3912E+00	EL	38623	66600.000
0090003	1964	8	15	18	31	1.0000	1.8438E+03	RNG	2.4202E-01	AZ	-1.0271E+00	EL	38623	66660.000
0090003	1964	8	15	18	32	1.0000	1.3292E+04	RNG	2.5305E-01	AZ	-7.9993E-01	EL	38623	66720.000
0060001	1964	8	16	18	33	1.0000	-7.6649E+04	RNG	-7.9060E-02	AZ	-5.3474E-01	EL	38623	66780.000
0060001	1964	8	15	18	34	1.0000	-8.8371E+04	RNG	-9.8217E-02	AZ	-5.9098E-01	EL	38623	66840.000
0050001	1964	8	16	18	35	0.0000	-1.0111E+05	RNG	1.1402E-02	AZ	-5.5867E-01	EL	38623	66900.000
0060001	1964	8	15	18	36	1.0000	-1.0593E+05	RNG	1.1116E+00	AZ	-4.8610E-04	EL	38623	66960.000
0060001	1964	8	16	18	37	1.0000	-4.1937E+04	RNG	3.7652E+00	AZ	-1.5507E+00	EL	38623	67020.000
0060001	1964	8	15	13	38	1.0000	3.2485E+04	RNG	2.1183E+00	AZ	-1.8626E+00	EL	38623	67080.000
0060001	1964	8	15	18	39	1.0000	6.4311E+04	RNG	1.2775E+00	AZ	-1.2035E+00	EL	38623	67140.000
0060001	1964	8	16	18	40	1.0000	8.1036E+04	RNG	9.1514E-01	AZ	-8.3730E-01	EL	38623	67200.000
0060001	1964	8	15	18	41	1.0000	9.2000E+04	RNG	7.2426E-01	AZ	-6.2982E-01	EL	38623	67260.000
0090004	1964	8	15	19	54	1.0000	9.9279E+03	RNG	4.3546E-01	AZ	-1.2301E+00	EL	38623	71640.000
0090004	1964	8	16	19	55	1.0000	-8.4590E+03	RNG	5.2603E-01	AZ	-1.7714E+00	EL	38623	71700.000
0090004	1964	8	15	19	56	1.0000	-4.2404E+04	RNG	7.3920E-01	AZ	-2.8249E+00	EL	38623	71760.000
0090004	1964	8	15	19	57	1.0000	-8.3158E+04	RNG	-6.8495E-01	AZ	-1.1511E+00	EL	38623	71820.000
0090004	1964	8	15	19	58	1.0000	-3.2978E+04	RNG	-1.8402E-01	AZ	-2.2512E+00	EL	38623	71880.000
0090004	1964	8	15	19	59	1.0000	-7.7099E+03	RNG	3.8521E-03	AZ	-1.4418E+00	EL	38623	71940.000
0090004	1964	8	16	20	0	1.0000	7.9660E+03	RNG	8.2113E-02	AZ	-1.0324E+00	EL	38623	72000.000
0090004	1964	8	15	20	1	1.0000	2.0179E+04	RNG	1.2390E-01	AZ	-8.0225E-01	EL	38623	72060.000
0060002	1964	8	15	20	2	1.0000	-4.1328E+04	RNG	-5.1514E-01	AZ	-6.0920E-01	EL	38623	72120.000
0060002	1964	8	15	20	3	1.0000	-2.7966E+04	RNG	-7.4698E-01	AZ	-7.0650E-01	EL	38623	72180.000
0060002	1964	8	15	20	4	1.0000	-4.9266E+03	RNG	-9.2915E-01	AZ	-8.1586E-01	EL	38623	72240.000
0060002	1964	8	15	20	5	1.0000	2.5070E+04	RNG	-9.3451E-01	AZ	-8.9165E-01	EL	38623	72300.000
0060002	1964	8	15	20	6	1.0000	5.4716E+04	RNG	-7.5563E-01	AZ	-8.8289E-01	EL	38623	72360.000
0060002	1964	8	15	20	7	1.0000	7.8674E+04	RNG	-5.1917E-01	AZ	-8.0346E-01	EL	38623	72420.000

```
0090005   1964   8 16 21 22   1.0000 -6.6495E+03    RNG    5.5421E-01    AZ    -1.0323E+00    EL    38623 76920.000
0090005   1964   8 16 21 23   1.0000 -2.4423E+04    RNG    6.1460E-01    AZ    -1.3509E+00    EL    38623 76980.000
0090005   1964   8 16 21 24   1.0000 -4.7316E+04    RNG    5.6663E-01    AZ    -1.7782E+00    EL    38623 77040.000
0090005   1964   8 16 21 25   1.0000 -6.0912E+04    RNG   -9.2395E-02    AZ    -2.0151E+00    EL    38623 77100.000
0090005   1964   8 16 21 26   1.0000 -3.5964E+04    RNG   -4.7476E-01    AZ    -1.9004E+00    EL    38623 77160.000
0090005   1964   8 16 21 27   1.0000 -8.7365E+03    RNG   -2.9727E-01    AZ    -1.4333E+00    EL    38623 77220.000
0090005   1964   8 16 21 28   1.0000  1.0382E+04    RNG   -1.4865E-01    AZ    -1.0838E+00    EL    38623 77280.000
0010001   1964   8 16 21 33   1.0000 -1.1744E+05    RNG    2.6720E-02    AZ    -3.7427E-01    EL    38623 77580.000
0010001   1964   8 16 21 34   1.0000 -1.2718E+05    RNG    1.5447E-01    AZ    -3.6870E-01    EL    38623 77640.000
0010001   1964   8 16 21 35   1.0000 -1.3317E+05    RNG    5.9531E-01    AZ    -2.7821E-01    EL    38623 77700.000
0010001   1964   8 16 21 36   1.0000 -1.1933E+05    RNG    1.9884E+00    AZ    -1.2593E-01    EL    38623 77760.000
0010001   1964   8 16 21 37   1.0000 -5.0370E+04    RNG    3.6456E+00    AZ    -9.2945E-01    EL    38623 77820.000
0010001   1964   8 16 21 38   1.0000  2.9855E+04    RNG    2.6054E+00    AZ    -1.4173E+00    EL    38623 77880.000
0010001   1964   8 16 21 39   1.0000  7.4482E+04    RNG    1.8260E+00    AZ    -1.1119E+00    EL    38623 77940.000
0010001   1964   8 16 21 40   1.0000  9.8614E+04    RNG    1.2881E+00    AZ    -8.2896E-01    EL    38623 78000.000

TOTAL EDIT SUMMARY

STA     N TYP    RMS    RMS/SIG     MEAN      N TYP    RMS    RMS/SIG     MEAN      N TYP    RMS    RMS/SIG     MEAN
001     8 RNG 1.0E+05  1.0E+03  -4.3E+04      8 AZ  2.0E+00  2.0E+01   1.5E+00      8 EL  8.0E-01  8.0E+00  -6.8E-01
004     5 RNG 5.5E+04  5.5E+02   5.3E+04      5 AZ  7.2E-01  7.2E+00   5.4E-01      5 EL  1.3E+00  1.3E+01  -1.3E+00
005     6 RNG 1.7E+04  1.7E+02  -3.0E+03      6 AZ  4.5E+00  4.5E+01   1.1E+00      6 EL  1.8E+00  1.8E+01  -1.3E+00
006    15 RNG 6.8E+04  6.8E+02  -4.0E+03     15 AZ  1.3E+00  1.3E+01   3.6E-01     15 EL  9.4E-01  9.4E+00  -8.3E-01
009    33 RNG 2.6E+04  2.6E+02  -1.2E+04     33 AZ  3.6E-01  3.6E+00   1.9E-01     33 EL  1.4E+00  1.4E+01  -1.3E+00

ENTER SEGMENT 30 AT    106.3 SECONDS.  EXECUTION TIME FOR SEGMENT 20 WAS     1.7 CP SECS.,     10.0 PP SECS.

ITERATION NUMBER      2
  201 OBSERVATIONS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS BEST SO FAR
CURRENT SOLUTION IS

NAME               CURRENT VALUE          CORRECTION         BOUND              NEW VALUE             SIGMA
0001     ALPHA     3.51829203723992E+02  -2.26699461E-01   1.50000000E+00   3.51602509263401E+02   1.20826357E-04
0001     DELTA     1.13160493953416E-01  -1.05599386E-01   1.50000000E+00   7.56111375938326E-03   2.02968458E-04
0001     BETA      8.97781643996747E+01   2.15475537E-01   1.50000000E+00   8.99936404363975E+01   8.98199728E-05
0001     AZ        3.54566401661983E+02  -9.16232540E-02   1.50000000E+00   3.54474777407950E+02   7.36258673E-05
0001     R         2.13476963170890E+07   5.46936314E+03   1.50000000E+05   2.13531662862318E+07   5.47662656E+01
0001     V         2.58554824557692E+04  -2.40599258E+00   1.50000000E+01   2.58530764631926E+04   6.77420654E-02
0001     DRAG      1.22434282701928E-03   8.29721686E-03   1.50000000E-02   9.52155968620821E-03   6.02311948E-06

RMS FOR THIS SOLUTION          =     3.0655522484E+02
```

PREDICTED RMS FOR NEXT SOLUTION = 9.7959735872E+00

XT((ATA)X) = 1.88699091E+07 XT(ATB) = 1.88699091E+07 RATIO = 1.00000000E+00

CORRELATION MATRIX DETERMINANT = 8.39750581E-07

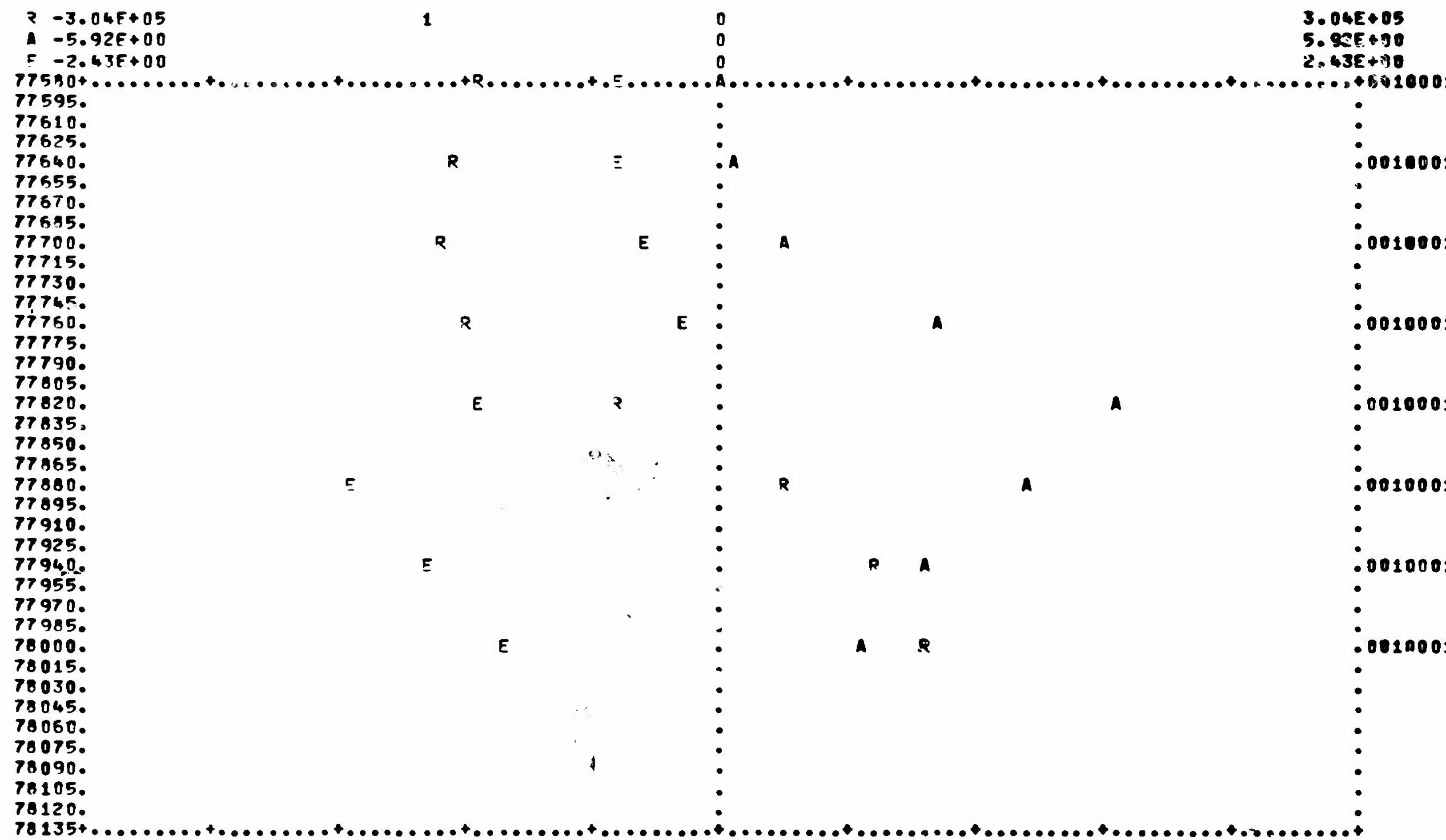
0001 ALPHA	0001 DELTA	0001 BETA	0001 AZ	0001 R	0001 V	0001 DRAG
1.000000000						
.126707585	1.000000000					
-.095784306	-.524526749	1.000000000				
.469347141	.172114292	-.281620817	1.000000000			
.105068389	.837164667	-.604628379	.113595954	1.000000000		
-.103952302	-.831937276	.621176562	-.115757375	-.999467638	1.000000000	
.009335237	-.329568072	.538698927	-.090391574	-.511015911	.536827303	1.000000000

ENTER SEGMENT 40 AT 106.4 SECONDS. EXECUTION TIME FOR SEGMENT 30 WAS .2 CP SECS., 2.7 PP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 3. ****

YEAR/MO/DY HR/MIN SECONDS LATITUDE LONGITUDE HEIGHT	X Y Z XDOT YDOT ZDOT	ALPHA DELTA BETA AZIMUTH RADIUS VELOCITY	A E I O U TAU	AF AG N L CHI GST	MEAN ANOMOLY ECCENTRC ANOM TRUE ANOMOLY KEPLERIAN PER ANOMALY PER NODAL PERIOD	APOGEE RADIUS APOGEE HEIGHT PERIGEE RADIUS PERIGEE HEIGHT O-DOT U-DOT
1964/ 8/16	21124233.035	351.602508852	21653940.572	.0137249932016	.45143749	3613.28299
12/ 7	-3118410.042	.007561114	.01389049192	-.0021378323792	.45779644	169.35013
0.0000000	2817.893	89.993640436	35.525222544	.0674629243904	.46420017	3514.27767
.0076121	-364.0479416	354.474776997	351.603240608	351.598074400	88.9377396	70.34480
204.9368856	-2462.4712545	21353156.286	359.543396168	-.16083438689	89.0784160	.8515526064
70.3456	25732.9607125	25853.0764632	726.8884727	1.08959477675	89.0140698	-4.2171138077

END OF LEAST SQUARES PROCESS - MAXIMUM ITERATIONS (2) REACHED. 10

ITEM	DESCRIPTION	REFERENCE SECTION
19	Indication of the reason for ending the least-squares process. In this case, it was because the maximum number of iterations had been reached. Other reasons for ending the process could be convergence or the lack of additional computer running time	2.2.2

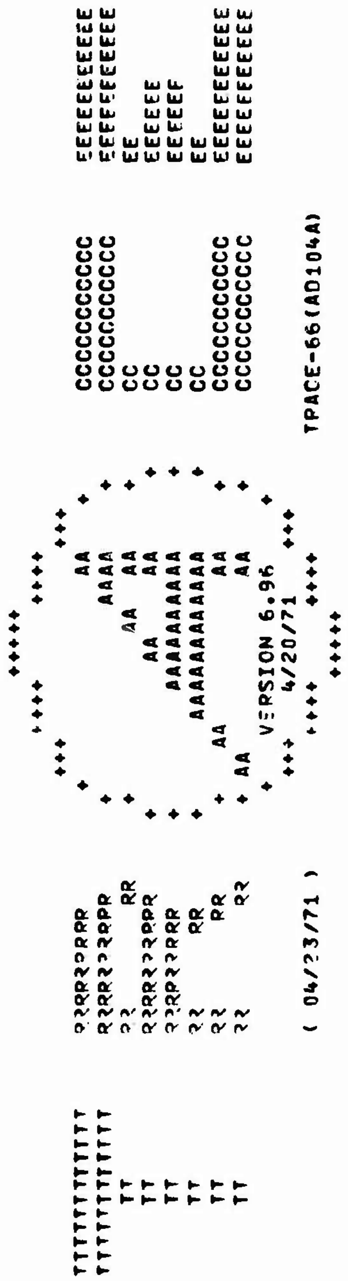

R -3.04E+05
A -5.92E+00
E -2.43E+00
1
0
0
0
3.04E+05
5.92E+00
2.43E+00
77580
77595.
77610.
77625.
77640.
77655.
77670.
77685.
77700.
77715.
77730.
77745.
77760.
77775.
77790.
77805.
77820.
77835.
77850.
77865.
77880.
77895.
77910.
77925.
77940.
77955.
77970.
77985.
78000.
78015.
78030.
78045.
78060.
78075.
78090.
78105.
78120.
78135
.0010001
.0010001
.0010001
.0010001
.0010001
.0010001
.0010001
.0010001

ITEM	DESCRIPTION	REFERENCE SECTION
20	An example of the printer plot of the measurement residuals for the last iteration if GPLOT is input ≠ 0 Its order is by station input, then by measurement encounter	2.2.1 11.1.2 15
	Each page contains a maximum of six different measurements for a station. The first six, or fewer, lines contain the measurement type identifiers and the ranges of the residuals (the maximum negative value, a zero, and the maximum positive value) for the measurement types encountered first. The first line also has the VEHID printed between the maximum negative value and the zero. The identifiers and corresponding measurements are shown as follows (note that since only one character can be used as an identifier, some are repeated):	

R	Range	3	Three-way cumulative doppler
A	Azimuth	*	Range rate
E	Elevation	*	Doppler
1	Topocentric right ascension	*	Two-way doppler
2	Topocentric declination	S	SGLS range rate
3	Topocentric hour angle	+	X-antenna
4	Geocentric right ascension	-	Y-antenna
5	Geocentric declination	J	JPL two- or three-way doppler
U	u	T	Tranet doppler
V	v	G	Geoceiver range difference
H	Height	V	Vehicle-vehicle range
X	x	+	Vehicle-vehicle range rate
Y	y	2	Station-vehicle-vehicle range
Z	z	-	Station-vehicle-vehicle range rate
R	Range		
P	P	3	Station-vehicle-vehicle-vehicle range
Q	Q		
D	Range rate	)	Station-vehicle-vehicle-vehicle range rate
7	P rate		
8	Q rate	(	Vehicle-vehicle-vehicle range
9	Accelerometer	D	Time difference of arrival
1	One-way cumulative doppler	O	Time of arrival

The left-hand column contains the system time in sec, incremented by GPLOT(2); the measurement identifiers are used to show the placement of the residual. In the far right-hand margin, the station-pass identification is shown.

C.4 TEST CASE C: ECI SIMULTANEOUS-VEHICLE COVARIANCE ANALYSIS RUN (ITIN = 5)



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MODEL DATA                                                                              CARD  1
H1     DATA RELAY SATELLITE                                                             CARD  2
 MULTV1                                                                                 CARD  3
DOPBOX20110109           DPRCOVCXX    RXX                                               CARD  4
DTTIN 5                                                                                 CARD  5
MOPRAM04,60                                                                             CARD  6
D      GM        0            0                      1.096677E-8                        CARD  7
MGPRAM06,60                                                                             CARD  8
D01,0102,00      0          03,010               05,012.236E-8                          CARD  9
H      MVS 5,6 MODEL---NO NORMALIZATION                                                 CARD 10
 GM    .5533393362E-2       OMEGE.43752695E-2    OMEGA.43752695E-2                      CARD 11
 ERFT 20925741.             DF     20925741.                                            CARD 12
INFOPM1                                                                                 CARD 13
INTEPM24                                                                                CARD 14
MTERMS04,60                                                                             CARD 15
D      02,00                 -.10826371E-2            0                                 CARD 16
D      03,00                 +2.5663791E-5            0                                 CARD 17
D      04,00                 +1.62E-6                 0                                 CARD 18
D      05,00                 +1.32665E-7              0                                 CARD 19
D      06,00                 -6.49E-7                 0                                 CARD 20
D      02,02                 +1.56852217E-06          -8.97210795E-07                   CARD 21
D      03,01                 +2.09543973E-06          +1.62018557E-07                   CARD 22
D      03,02                 +2.45926844E-07          -2.66420655E-07                   CARD 23
D      03,03                 +7.66938326E-08           0.0                              CARD 24
D      04,01                 -5.78695599E-07          -4.64855128E-07                   CARD 25
D      04,02                 +7.37902535E-08          +1.58760806E-07                   CARD 26
D      04,03                 +5.31876720E-08          +4.18329853E-09                   CARD 27
D      04,04                 -6.53285555E-09          +2.37178570E-09                   CARD 28
D      05,01                 -4.28174235E-08          +2.56904982E-08                   CARD 29
D      05,02                 +1.21376037E-07          -2.75119005E-08                   CARD 30
D      05,03                 -2.01509731E-08          +4.95514785E-09                   CARD 31
D      05,04                 0                        0                                 CARD 32
D      05,05                 0                        0                                 CARD 33
D      06,01                 -1.41448651E-07          +9.42988666E-08                   CARD 34
D      06,02                 +3.73837758E-09          -4.73526613E-08                   CARD 35
D      06,03                 +2.48806140E-09          +7.25686409E-09                   CARD 36
D      06,04                 +4.92117593E-10          -1.89273502E-09                   CARD 37
D      06,05                 -8.87768432E-11          -2.98614379E-10                   CARD 38
D      06,06                 0                        0                                 CARD 39
IKSIG 1                I2    2                  I3    3                                 CARD 40
I4     19              I5    58                 I6    61                                CARD 41
 SIGMA10.              2     .01146             3     .01146                            CARD 42
 4     .2              5     10.                6     10.                               CARD 43
DPANDP X  X                                                                             CARD 44
END                                                                                     CARD 44
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. The inputs used during a covariance analysis run are emphasized here. The input item MULTV indicates that simultaneous vehicles are used:	
	MULTV	2.1.6
	ØPBOX, PRCØV, PANDR	2.5.1
	ITIN	2.1
	ØPRAM	2.1.5.3
	GPRAM	2.1.5.2
	KSIG, SIGMA	2.5.3

```
****************************************** LUNAR GRAVITY MODEL ******************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7314003854E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2
          ***SPHERICAL MOON***

****************************************** EARTH GRAVITY MODEL ******************************************

GM = 5.5303936200E-03 ER**3/MIN**2  = 1.4076545201E+16 FT**3/SEC**2  = 3.9860319162E+14 M**3/SEC**2
             NO NORMALIZATION WITH  24 TERMS.
          N    M        CNM               SNM          **    N    M        CNM            SNM
          2    0   -1.08263700E-03    0.               **    5    2    1.21376037E-07  -2.75119005E-08
          3    0    2.56637900E-06    0.               **    6    2    3.73837758E-09  -4.73526613E-08
          4    0    1.62000000E-06    0.               **    3    3    7.66938326E-08   0.
          5    0    1.32665000E-07    0.               **    4    3    5.31876720E-08   4.18329853E-09
          6    0   -5.49000000E-07    0.               **    5    3   -2.01509731E-08   4.95514785E-09
          3    1    2.09543973E-06    1.62018557E-07   **    6    3    2.48806140E-09   7.25686409E-09
          4    1   -5.78696599E-07   -4.64855128E-07   **    4    4   -6.53285565E-09   2.37176570E-09
          5    1   -4.28174235E-08    2.56904982E-08   **    5    4    0.               0.
          6    1   -1.41448551E-07    9.47988666E-08   **    6    4    4.92117588E-10  -1.89273502E-09
          2    2    1.56852217E-06   -8.97210795E-07   **    5    5    0.               0.
          3    2    2.45926844E-07   -2.66420655E-07   **    6    5   -8.87768432E-11  -2.98614379E-10
          4    2    7.37902536E-08    1.58760806E-07   **    6    6    0.               0.

****************************************** PHYSICAL CONSTANTS ******************************************

GM(ER**3/MIN**2)     =  5.530393620E-03   OMEGE(RAD/MIN)  =  4.375269500E-03   GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)   =  0.                OMEGA(RAD/MIN)  =  4.375269500E-03   GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)    =  6.802326500E-05   OMEGL(RAD/MIN)  =  0.                AM(ER)       =  2.725062770E-01
ERFT(FT/ER)          =  2.092574100E+07   ERKM(KM/ER)     =  6.378164900E+03   ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)          =  3.280839900E+03   FTNM(FT/NM)     =  6.076115500E+03   AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)     =  3.217400000E+01   DGREE(DEG)      =  5.729577951E+01   SLT          =  2.820176300E+03
CKEP                 =  1.000000000E-07   F               =  3.352329869E-03   PI           =  3.141592654E+00

****************************************** INPUT/OUTPUT CONVERSION FACTORS ******************************
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DF(I/O-ER) =  2.09257410E+07   VF(I/O-ER/MIN) =  3.48762308E+05   AF(I/O-ER/MIN**2) =  5.81278508E+03

******************************************* INTEGRATION INPUTS ********************************************

  IFORM  =   1              ICENT  =   1            NSTEP =   2
  NPCMP  =   0              IR     =   8            ER    = 1.00000000E-10
  HMIN   = 1.56250000E-02   HMAX   = 6.40000000E+01 HO    = 1.00000000E+00

******************** ******************** SPECIAL OPTIONS ********************************************

  TAPE2  =   0    TAPE7  =   0    TELEM  =   0    PTAPE  =   0    NPDOT  =   0
  PRHO   =   0    NODPR  =   0    CLASS  =   0    LEMSP  =   0    PTNS   =10000

******************************************* CRASH ALTITUDE ********************************************

  ECI CRASH ALTITUDE(FT) =   3.00000000E+05        MCI CRASH ALTITUDE(FT) =   3.00000000E+03

******************************************* STATION LOCATIONS ********************************************
STATION    SIG   REF   RA-REF   DATUM   TYPE        LATITUDE          LONGITUDE         HEIGHT         P     Q
                                                        X                 Y                Z
                                                     RADIUS           LATITUDE         LONGITUDE

   1        -0    -0     -0       0       0      4.30000000E+01   -9.30000000E+01   5.00000000E+02
   2        -0    -0     -0       0       0      4.30000000E+01   -9.30000000E+01   5.00000000E+02
   3        -0    -0     -0       0       0      4.30000000E+01   -9.30000000E+01   5.00000000E+02

******************************************* SENSOR PARAMETERS ********************************************

STAPASS PARAMETER P-Q   INITIAL VALUE           BOUND            SIGMA
  1      LAT       Q    -0.                3.60000000E+02   1.37000000E-04
  1      LONG      Q    -0.                3.60000000E+02   1.87000000E-04
  1      ALT       Q    -0.                1.00000000E+10   5.00000000E+01
  1      RBIA      Q    -0.                1.00000000E+10   1.00000000E+02
  1      ABIA      Q    -0.                3.60000000E+02   2.00000000E-01
  1      EBIA      Q    -0.                3.60000000E+02   2.00000000E-01
  2      LAT       Q    -0.                3.60000000E+02   1.37000000E-04
  2      LONG      Q    -0.                3.60000000E+02   1.87000000E-04
  2      ALT       Q    -0.                1.00000000E+10   5.00000000E+01
  2      RBIA      Q    -0.                1.00000000E+10   1.00000000E+02
  3      LAT       Q    -0.                3.60000000E+02   1.37000000E-04
  3      LONG      Q    -0.                3.60000000E+02   1.87000000E-04
  3      ALT       Q    -0.                1.00000000E+10   5.00000000E+01
  3      RBIA      Q    -0.                1.00000000E+10   1.00000000E+02
```

2

ITEM	DESCRIPTION	REFERENCE SECTION
2	Sensor parameter information. Each line contains the station and pass identification, parameter name, P- or Q-parameter indicator, initial value, bound, and sigma	5

```
ENTER SEGMENT 01 AT    110.7 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS   110.7 CP SECS.,    337.7 PP SECS.

********************************************** VEHICLE DATA **********************************************

      IYEAR 1969                IMNTH 8                  IDAY  22                   CARD   1
       TZNE 0                    HR   0                  MIN   0                    CARD   2
       SEC  0                   IICTYP3                  IVEHID1                    CARD   3
       IC   1.3834434E8               8.01520E-2               10.                  CARD   4
            -140.                     180.                     -7.18E2              CARD   5
      MVPRAM04,60                                                                   CARD   6
      0     X                         1.E10                    1.E7                 CARD   7
      0     Y                         1.E10                    1.E7                 CARD   8   3
      0     Z                         1.E10                    1.E7                 CARD   9
      0     DX                        1.E10                    1.E3                 CARD  10
      0     DY                        1.E10                    1.E3                 CARD  11
      0     DZ                        1.E10                    1.E3                 CARD  12
       PTIM 0                         1                        0                    CARD  13
            15                        30                                            CARD  14
       DRAG 0                                                                       CARD  15
      END                                                                           CARD  16

     EPOCH                                    INITIAL CONDITIONS
   YR/MO/DAY          X,Y,Z,DX,DY,DZ       A,D,B,A,R,V          A,E,I,O,U,TAU         AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC    -1.14512224488E+08   2.19975207933E+02   1.38344340000E+08   6.14005836449E-02
 1969/ 8/22        -9.60061635294E+07  -4.19511075994E-03   8.01529000000E-02   5.15212910005E-02
 0.                -1.09412622380E+04   8.99978948803E+01   1.00000000000E+01   4.17761658205E-03
 0.                 5.88925582835E+03   8.00000008710E+01  -1.40000000000E+02   2.19971722355E+02
 0.                -7.02517993470E+03   1.49433038892E+08   1.80000000000E+02  -5.62366289025E-02
 0.                 1.61641425299E+03   9.30855966659E+03  -7.18000000000E+02  -6.70202045299E-02

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **
```

ITEM	DESCRIPTION	REFERENCE SECTION
3	Card images of the input VEHICLE data. The items used by a simultaneous-vehicle or covariance analysis run are emphasized	
	VEHID	11.1.2
	VPRAM	11.1.14
	PTIM	11.5.1

```
******************************************** VEHICLE DATA ********************************************

      IVEHID2                                                                                   CARD   1
      ITCTYP3                                                                                   CARD   2
       TC     1.38334198E8              0                        5                              CARD   3
              75                        180                      -7.71343693E2                  CARD   4
      END                                                                                       CARD   5

     EPOCH                                           INITIAL CONDITIONS
   YR/MO/DAY            X,Y,Z,DX,DY,DZ         A,D,B,A,R,V             A,E,I,O,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC         4.06703434460E+06      8.83143155734E+01       1.38334198000E+08      -8.27566114034E-15    4
 1969/ 8/22             1.38245315589E+08      1.15423120500E+00       0.                     -1.06388505267E-13
 0.                     2.78671742142E+06      9.00000000000E+01       5.00000000000E+00       4.17807601469E-03
 0.                    -1.00473057857E+04      8.51347337324E+01       7.50000000000E+01       8.83639549683E+01
 0.                     2.78333870503E+02      1.38334198000E+08       1.80000000000E+02       4.21732323555E-02
 0.                     8.55373878177E+02      1.00874919013E+04      -7.71343693000E+02       1.13002835519E-02

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

******************************************** VEHICLE DATA ********************************************

      IVEHID3                                                                                   CARD   1
      IICTYP3                                                                                   CARD   2
       IC     1.38334198E8              0                        0                              CARD   3
              75.5                      180                      -7.18E2                        CARD   4
      END                                                                                       CARD   5

******************************************** OBSERVATIONS ********************************************

     EPOCH                                           INITIAL CONDITIONS
   YR/MO/DAY            X,Y,Z,DX,DY,DZ         A,D,B,A,R,V             A,E,I,C,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC         3.46553508933E+07      7.54915147128E+01       1.38334198000E+08      -2.24851579148E-14
 1969/ 8/22             1.33922796431E+08      0.                      0.                     -8.22551413022E-14
 0.                     0.                     9.00000000000E+01       0.                      4.17807601469E-03
 0.                    -9.76580732694E+03      8.99999996107E+01       7.55000000000E+01       7.54915147128E+01
 0.                     2.52715256980E+03      1.38334198000E+08       1.80000000000E+02       0.
 0.                     0.                     1.00874919013E+04      -7.18000000000E+02      -0.
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the input VEHICLE data for the second vehicle and the printout of the initial conditions, perturbation remark, and atmospheric model (repeated for each vehicle used in the simultaneous-vehicle run). Note that inputs not overridden carry over from vehicle to vehicle. In this example, the VPRAM matrix carries over	Case A: Items 17, 18, 19, and 20

NO PLANETARY PERTURBATIONS.

** NO ATMOSPHERE MODEL **

****

THESE ARE THE 34 PARAMETERS IN THE PARAM MATRIX. 18 ARE P PARAMETERS AND 16 ARE Q PARAMETERS

	NAME	P/Q	CURRENT VALUE	BOUND	SIGMA	CONVERSION
0001	X	P	-1.14512224E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	Y	P	-9.60051535E+07	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	Z	P	-1.09412622E+04	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	DX	P	5.38925583E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0001	DY	P	-7.02517998E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0001	DZ	P	1.51641425E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	X	P	4.06703434E+06	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	Y	P	1.38245316E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	Z	P	2.78671742E+06	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	DX	P	-1.00473058E+04	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	DY	P	2.78336871E+02	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	DZ	P	8.55375878E+02	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	X	P	3.46539509E+07	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	Y	P	1.33922796E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	Z	P	0.	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	DX	P	-9.76580733E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	DY	P	2.22715257E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	DZ	P	0.	1.00000000E+10	1.00000000E+03	3.48762300E+05
3	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
3	ALT	Q	5.00000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07
3	LONG	Q	-9.30000000E+01	3.60000000E+02	1.87000000E-04	5.72957795E+01
3	LAT	Q	4.30000000E+01	3.60000000E+02	1.37000000E-04	5.72957795E+01
2	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
2	ALT	Q	5.00000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07
2	LONG	Q	-9.30000000E+01	3.60000000E+02	1.87000000E-04	5.72957795E+01
2	LAT	Q	4.30000000E+01	3.60000000E+02	1.37000000E-04	5.72957795E+01
1	EBIA	Q	-0.	3.60000000E+02	2.00000000E-01	5.72957795E+01
1	ABIA	Q	-0.	3.60000000E+02	2.00000000E-01	5.72957795E+01
1	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
1	ALT	Q	5.00000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07

```
     1     LONG      Q  -9.30000000E+01     3.50000000E+02     1.87000000E-04     5.72957795E+01
     1     LAT       Q   4.30000000E+01     3.60000000E+02     1.37000000E-04     5.72957795E+01
           GM        Q   5.53039362E-03     0.                 1.09667700E-08     1.00000000E+00
           02,00 C   Q  -1.38263700E-03     0.                 2.23600000E-08     1.00000000E+00

ENTER SEGMENT 10 AT   111.6 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .8 CP SECS.,     4.5 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP        1      ICENT      1      IDRAG       0      ALPHG    5.761750222E+00  CDAW 0.
JVEP        1      JNORM      1      IR          8      ALG-DEG  3.301239703E+02  ER   1.000000000E-10
MVEP        0      MAJOR      1      ISRP        0      TJDATE   2.440455508E+06  HMIN 1.562500000E-02
KVEP        6      NMASS      0      NEQS       27      TSTART   0.               HMAX 6.400000000E+01
LVEP        0      NT        24      RECMP       0      TSTOP    3.000000000E+01  HO   1.000000000E+00
ICENTX      1      JNORMX     0      NMASSX      0      FLIGHT   3.000000000E+01  NTX  0.
                                     NASA        0      SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
     0.0000 TZERO
    30.0000 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS  111.70100


                  T   =          0.000000         H   =          .125000        NSTEP   =          0

                  -1.145122244879E+08          5.889255828347E+03         4.830829047242E-01
                  -9.600516352941E+07         -7.025179984701E+03         4.050130141915E-01
                  -1.094126223805E+04          1.616414252985E+03         4.614415693159E-05

  02,00 C          0.                          0.                        -2.444496288923E-06
                   0.                          0.                        -2.349446786235E-06
                   0.                          0.                        -7.000904861358E-10

  GM               0.                          0.                         1.502752099719E-02
                   0.                          0.                         1.259895871988E-02
                   0.                          0.                         1.435431228069E-06

  X                1.000010000000E+00          0.                         1.156849534924E-05
```

```
                  0.                          0.                          2.243161066230E-05
                  0.                          0.                          2.555248807894E-09

     Y            0.                          0.                          2.243161066230E-05
                  1.000000000000E+00          0.                          3.619483449938E-06
                  0.                          0.                          2.142254137494E-09

     Z            0.                          0.                          2.555248807894E-09
                  0.                          0.                          2.142254137494E-09
                  1.000000000000E+00          0.                         -1.518797879918E-05

     DX           0.                          1.000000000000E+03          0.
                  0.                          0.                          0.
                  0.                          0.                          0.

     DY           0.                          0.                          0.
                  0.                          1.000000000000E+00          0.
                  0.                          0.                          0.

     DZ           0.                          0.                          0.
                  0.                          0.                          0.
                  0.                          1.000000000000E+00          0.

  FORCES        MAGNITUDE      X          Y          Z      ( EXTERNAL UNITS )      RADIAL       IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  6.304004E-01 4.830829E-01 4.050130E-01 4.614416E-05-6.304004E-01-3.420336E-08-6.976752E-09
TOTAL         6.304004E-01 4.830829E-01 4.050130E-01 4.514416E-05-6.304004E-01-3.420336E-08-6.976752E-09


  NODE  T =     1.128141086950E-01    -1.144723439480E+08    -9.605370662137E+07    -1.227973594797E-10
       DT =     1.250000000000E-01     5.892525173075E+03    -7.022437834961E+03     1.616414409103E+03
*               STEP    DOUBLED          T  =      3.250000    H  =      .250000    NSTEP  =        25
*               STEP    DOUBLED          T  =      7.500000    H  =      .500000    NSTEP  =        41
*               STEP    DOUBLED          T  =     15.000000    H  =     1.000000    NSTEP  =        57

                  T  =        30.000000          H  =        1.000000         NSTEP  =          71

                 -1.031537926263E+08          6.717059485659E+03          4.358762082148E-01
                 -1.079671375801E+06         -6.249427521532E+03          4.562150451684E-01
                  2.892052284940E+06          1.605453243475E+03         -1.222115672862E-02
```

02,J0 C	-1.067305128407E-03	-7.009771297779E-05	-2.232865286960E-06
	-9.641153728447E-04	-6.572210958654E-05	-2.339382147550E-06
	2.767132854346E-05	2.780059370108E-06	1.864451829015E-07
GM	6.562098262833E+00	4.310346463120E-01	1.373717558371E-02
	5.927637541327E+00	4.041346684247E-01	1.439248707537E-02
	-5.693159818645E-02	-5.734773176488E-03	-3.870978531235E-04
X	1.004477955644E+00	2.747868019029E-04	6.820129799268E-06
	1.019931600779E-02	6.827010123838E-04	2.297611316839E-05
	-9.630530433524E-05	-9.522323254205E-06	-6.182057231257E-07
Y	1.019532349771E-02	6.821857296951E-04	2.290744045517E-05
	1.002335995225E+00	1.860943686471E-04	8.890457780075E-06
	-9.024715473606E-05	-9.252425235328E-06	-6.452862051509E-07
Z	-9.588813321212E-05	-9.452713086250E-06	-6.089286477563E-07
	-8.989650187419E-05	-9.194015111649E-06	-6.375017710560E-07
	9.931726272075E-01	-4.546772525530E-04	-1.509178751809E-05
DX	3.004034250283E+01	1.003725452967E+00	1.993488181183E-04
	1.022935151825E-01	1.025315636076E-02	6.853948449331E-04
	-1.432054419944E-03	-1.883767774393E-04	-1.838115336730E-05
DY	1.022743425880E-01	1.025006160901E-02	6.848790387747E-04
	3.002754670061E+01	1.003149681995E+00	2.616909180022E-04
	-1.372021153866E-03	-1.865284733097E-04	-1.922631782016E-05
DZ	-1.429954035661E-03	-1.879587038032E-04	-1.831147254788E-05
	-1.370257148254E-03	-1.861776660532E-04	-1.916784830180E-05
	2.993159056583E+01	9.931714844961E-01	-4.548297409590E-04

FORCES	MAGNITUDE	X	Y	Z (EXTERNAL UNITS)	RADIAL	IN-TRACK	CROSS-TRACK
GEOPOTENTIAL	6.310860E-01	4.358762E-01	4.562150E-01	-1.222116E-02	-6.310860E-01	-1.739166E-07	-7.744879E-07
TOTAL	6.310860E-01	4.358762E-01	4.562150E-01	-1.222116E-02	-6.310860E-01	-1.739166E-07	-7.744879E-07

*** TRAJECTORY TERMINATION

```
***  THIS CASE TOOK      1.129  SECONDS TO INTEGRATE A SPAN OF     30.0000  MINUTES  ***

       ***  FROM             0.000  TO          30.000  MINUTES FROM MIDNIGHT OF EPOCH  ***

     TRAJECTORY INTEGRATION FOR CASE   2

IVEP       1       ICENT       1       IDRAG       0     ALPHG    5.761750222E+00  CDAW 0.
JVEP       1       JNORM       1       IR          8     ALG-DES  3.301239703E+02  ER   1.000000000E-10
MVEP       0       MAJOR       1       ISRP        0     TJDATE   2.440455500E+06  HMIN 1.562500000E-02
KVEP       6       NMASS       0       NEQS       27     TSTART   0.               HMAX 6.400000000E+01
LVEP       0       NT         24       RECMP       0     TSTOP    3.000000000E+01  H0   1.000000000E+00
IDENTY     1       JNORMX      0       NMASSX      0     FLIGHT   3.000000000E+01  NTX  0.
                                       NASA        0     SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                     * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
     0.0000 TZERO
    30.0000 TSTOP

     ***  TRAJECTORY START

     * * * * * * * * * * * * * * * * * * * *    ECI   * * * * * * * * * * * * * * * * * * * *
SEG1  ENTRY TIME IS   112.85300

                T  =          0.000000          H  =          .125000          NSTEP  =          0

                4.067034344601E+06          -1.004730578571E+04          -2.162744150928E-02
                1.382463155891E+08           2.783368705028E+02          -7.351517941123E-01
                2.786717421420E+06           8.553758781768E+02          -1.482002055073E-02

 02,00 C        0.                           0.                           1.274437767438E-07
                0.                           0.                           4.332058961582E-06
                0.                           0.                           2.623271566750E-07

 GM             0.                           0.                          -6.727765114806E-04
                0.                           0.                          -2.286876416886E-02
                0.                           0.                          -4.610143886837E-04

 X              1.000000000000E+00           0.                          -1.909406277137E-05
                0.                           0.                           1.687467803763E-06
                0.                           0.                           3.401905643118E-08
```

```
Y              0.                        0.                        1.687467803763E-06
               1.000000000000E+00        0.                        3.821588824887E-05
               0.                        0.                        1.156376870886E-06

Z              0.                        0.                        3.401905643118E-08
               0.                        0.                        1.156376870886E-06
               1.000000000000E+00        0.                       -1.912181747751E-05

DX             0.                        1.000000000000E+00        0.
               0.                        0.                        0.
               0.                        0.                        0.

DY             0.                        0.                        0.
               0.                        1.000000000000E+00        0.
               0.                        0.                        0.

DZ             0.                        0.                        0.
               0.                        0.                        0.
               0.                        1.000000000000E+00        0.

 FORCES        MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK     CROSS-TRACK
GEOPOTENTIAL   7.356192E-01-2.162744E-02-7.351518E-01-1.482002E-02-7.356192E-01  9.718920E-08-1.118119E-06
TOTAL          7.356192E-01-2.162744E-02-7.351518E-01-1.482002E-02-7.356192E-01  9.718920E-08-1.118119E-06


*              STEP   DOUBLED          T  =     3.250000     H  =     .250000     NSTEP  =      25
*              STEP   DOUBLED          T  =     7.500000     H  =     .500000     NSTEP  =      41
*              STEP   DOUBLED          T  =    15.000000     H  =    1.000000     NSTEP  =      57

                 T  =       30.000000         H  =        1.000000        NSTEP  =          71

              -1.400121703040E+07       -9.999653462887E+03        7.445408033301E-02
               1.375556473079E+08       -1.043534496067E+03       -7.314849971285E-01
               4.298012445426E+06        8.214176207192E+02       -2.285719126977E-02

02,00 C       -2.802572537901E-05       -4.741633923443E-06       -4.483036949437E-07
               1.952925550034E-03        1.303970673860E-04        4.372298978955E-06
               1.395939607512E-04        1.001955722892E-05        4.050207347041E-07

GM             1.482672897244E-01        2.508374932340E-02        2.373017363729E-03
```

	-1.031835027654E+01	-6.892533705414E-01	-2.314441681329E-02
	-2.461874755292E-01	-1.772837401649E-02	-7.246686026364E-04
X	9.914272990064E-01	-5.680081449113E-04	-1.839421018251E-05
	-3.635617942318E-04	-6.145012900747E-05	-5.744386322036E-06
	-1.073532393402E-05	-1.785119061049E-06	-1.795199097829E-07
Y	-3.693731264649E-04	-6.241723129230E-05	-5.873111043707E-06
	1.017234659492E+00	1.149388370508E-03	3.829710369053E-05
	6.163371735316E-04	4.427394692864E-05	1.793490631172E-06
Z	-1.086745890223E-05	-1.807819928568E-06	-1.824349837512E-07
	6.158462534138E-04	4.[illegible]49907E-05	1.782610832439E-06
	9.914119190898E-01	-5.715525417284E-04	-1.892465283486E-05
DX	2.991448216747E+01	9.915082636154E-01	-5.550210678596E-04
	-9.267732775470E-03	-1.485972548969E-03	-1.732620244910E-04
	-2.567657963390E-04	-4.299783690502E-05	-5.414942578455E-06
DY	-9.296852322778E-03	-1.491780883369E-03	-1.742291272889E-04
	3.017196880907E+01	1.017148866298E+00	1.135887758193E-03
	6.627238215817E-03	7.092581074666E-04	5.341831321044E-05
DZ	-2.574248749686E-04	-4.312937141402E-05	-5.436843357366E-06
	6.624732105526E-03	7.087671875916E-04	5.333657382664E-05
	2.991409287218E+01	9.914167476987E-01	-5.710390014654E-04

```
 FORCES        MAGNITUDE     X     Y     Z   ( EXTERNAL UNITS )      RADIAL       IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  7.356196E-01 7.445408E-02-7.314850E-01-2.285719E-02-7.356196E-01 5.249624E-08-1.712987E-06
TOTAL         7.356196E-01 7.445408E-02-7.314850E-01-2.285719E-02-7.356196E-01 5.249624E-08-1.712987E-06
```

*** TRAJECTORY TERMINATION

*** THIS CASE TOOK 1.132 SECONDS TO INTEGRATE A SPAN OF 30.0000 MINUTES ***

*** FROM 0.000 TO 30.000 MINUTES FROM MIDNIGHT OF EPOCH ***

TRAJECTORY INTEGRATION FOR CASE 3

```
IVEP        1      ICENT       1      IDRAG       0      ALPHG    5.761750222E+00  CDAW 0.
JVEP        1      JNORM       1      IR          8      ALG-DEG  3.301239703E+02  ER   1.000000000E-10
MVEP        0      MAJOR       1      ISRP        0      TJDATE   2.440455500E+06  HMIN 1.562500000E-02
KVEP        6      NMASS       0      NEQS       27      TSTART   0.               HMAX 6.400000000E+01
LVEP        0      NT         24      RECMP       0      TSTOP    3.000000000E+01  H0   1.000000000E+00
ICENTX      1      JNORMX      0      NMASSX      0      FLIGHT   3.000000000E+01  NTX  0.
                                      NASA        0      SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE       ASSOCIATED QUANTITIES
     0.0000 TZERO
    30.0000 TSTOP

       ***  TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG1* ENTRY TIME IS  114.00500

                    T  =        0.000000          H  =          .125000        NSTEP  =           0

                     3.465535083333E+07          -9.765807326943E+03          -1.842899424245E-01
                     1.339227954313E+08           2.527152569800E+03          -7.121605279939E-01
                     0.                           0.                          -1.006964949376E-08

  02,00 C            0.                           0.                           1.088179954344E-06
                     0.                           0.                           4.205110486071E-06
                     0.                           0.                           0.

  GM                 0.                           0.                          -5.732806837653E-03
                     0.                           0.                          -2.215356242819E-02
                     0.                           0.                          -3.132420288982E-10

  X                  1.000000000000E+00           0.                          -1.553911309570E-05
                     0.                           0.                           1.392937542766E-05
                     0.                           0.                          -4.344817468047E-13

  Y                  0.                           0.                           1.392937542766E-05
                     1.000000000000E+00           0.                           3.468423879095E-05
                     0.                           0.                           1.386397852185E-12

  Z                  0.                           0.                          -4.344817468047E-13
```

```
                   0.                          0.                          1.386397862185E-12
                   1.000000000000E+00          0.                         -1.914512569526E-05

DX                 0.                          1.000000000000E+00          0.
                   0.                          0.                          0.
                   0.                          0.                          0.

DY                 0.                          0.                          0.
                   0.                          1.000000000000E+00          0.
                   0.                          0.                          0.

DZ                 0.                          0.                          0.
                   0.                          0.                          0.
                   0.                          1.000000000000E+00          0.

  FORCES       MAGNITUDE      X       Y      Z     ( EXTERNAL UNITS )       RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL   7.356191E-01-1.842899E-01-7.121605E-01-1.006965E-08-7.356191E-01 1.746302E-07-1.006965E-08
TOTAL          7.356191E-01-1.842899E-01-7.121605E-01-1.006965E-08-7.356191E-01 1.746302E-07-1.006965E-08


*              STEP    DOUBLED         T  =      3.250000      H  =       .250000     NSTEP  =         25
*              STEP    DOUBLED         T  =      7.500000      H  =       .500000     NSTEP  =         41
*              STEP    DOUBLED         T  =     15.000000      H  =      1.000000     NSTEP  =         57

                T  =         30.000000         H  =         1.000000          NSTEP  =          71

                   1.682930795167E+07         -1.001256909845E+04         -8.949604214476E-02
                   1.373065756953E+08          1.227201690960E+03         -7.301551530551E-01
                  -1.628942753407E-02         -1.807336948206E-05         -9.983033663556E-09

D2,00 C            4.070847007474E-04          2.437527762037E-05          5.342934860491E-07
                   1.916533328183E-03          1.286730581928E-04          4.385942515055E-06
                   5.917821148882E-14          7.662493042071E-15          7.272527446215E-16

GM                -2.144625248825E+00         -1.284151381294E-01         -2.814794016769E-03
                  -1.009679711925E+01         -6.778813727344E-01         -2.310621656102E-02
                  -1.414727134905E-07         -9.464543733016E-09         -3.197602452963E-10

X                  9.925332133491E-01         -5.102966186224E-04         -1.812069354333E-05
                   5.257032258425E-03          3.161725696603E-04          7.080467209392E-06
```

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```
                    -2.214233915733E-10       -1.557665160814E-11       -5.973181391956E-13

Y                    5.251231741357E-03        3.152017735133E-04        6.951250815456E-06
                     1.016137602155E+00        1.092830260297E-03        3.807937322965E-05
                     6.144238208723E-10        4.061547379242E-11        1.317067303713E-12

Z                   -2.215154120324E-10       -1.559210221234E-11       -5.994337175659E-13
                     6.146077081433E-10        4.064573851100E-11        1.321091280946E-12
                     9.913970555523E-01       -5.727059617717E-04       -1.898043935721E-05

DX                   2.992313041991E+01        9.921252091104E-01       -5.470746835051E-04
                     4.732637541441E-02        4.205822502993E-03        2.093005529613E-04
                    -2.353651543415E-09       -2.482414436165E-10       -1.823644774703E-11

DY                   4.729770487385E-02        4.199991983422E-03        2.083297562321E-04
                     3.016339232585E+01        1.016551615658E+00        1.129608695166E-03
                     6.088616203347E-09        6.031274802870E-10        3.939547750913E-11

DZ                  -2.354115772231E-09       -2.483360037071E-10       -1.825260519300E-11
                     6.089525257188E-09        6.033090279937E-10        3.942566661087E-11
                     2.991332110278E+01        9.913970528152E-01       -5.727063261363E-04

 FORCES        MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )      RADIAL       IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  7.356195E-01-8.949604E-02-7.301552E-01-9.983034E-09-7.356195E-01 1.746305E-07-1.006966E-08
TOTAL         7.356195E-01-8.949604E-02-7.301552E-01-9.983034E-09-7.356195E-01 1.746305E-07-1.006966E-08


      ***  TRAJECTORY TERMINATION

      ***  THIS CASE TOOK      1.137  SECONDS TO INTEGRATE A SPAN OF     30.0000  MINUTES  ***

          ***  FROM          0.000  TO         30.000  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 21 AT    115.1 SECONDS. EXECUTION TIME FOR SEGMENT  10 WAS     3.5 CP SECS.,     17.8 PP SECS.
RUNNING TIME FOR SEG21 WILL INCLUDE THAT FOR SEG22,SEG23, AND SEG24.
  1      1969  8 22   0 15  0.0000
 PARTIALS FOR RNG     -7.521539222E-01     -6.574089152E-01     -9.396491570E-02     -1.125646282E+01     -9.839002780E+00
                      -1.411202182E+00      0.                   0.                   0.                   0.
                        0.                  0.                   0.                   0.                   0.            5
                        0.                  0.                   0.                   0.                   0.
                        0.                  0.                   0.                   0.                   0.
                        0.                  0.                   0.                   1.000000000E+00     -6.211610330E-01
                        2.461772464E-01     7.055398750E-01     -2.196830241E+00      3.571280823E-04
```

ITEM	DESCRIPTION	REFERENCE SECTION
5	Partial derivatives of the measurement (in this case, range) with respect to all parameters at the observation time shown on the first line. The partials are printed across the page in the order shown in the parameter list. The units are internal units	Case B: Items 4 and 6

```
PARTIALS FOR AZ      -1.273004078E-01   1.367271389E-01   6.170396870E-02  -1.911401324E+00   2.053488895E+00
                      9.256146215E-01   0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                1.000000000E+00   0.                0.
                      1.336087338E+00  -7.641923509E-01  -1.422546047E-02   2.454676206E-06
PARTIALS FOR EL       2.153833637E-02  -4.558491113E-02   1.456813612E-01   3.239806600E-01  -6.855916569E-01
                      2.197711353E+00   0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                1.000000000E+00   0.                0.               -1.210363503E-01
                     -3.437678833E-01  -9.905326916E-01  -3.125024284E-02   5.415401331E-06
 1       1969  8 22   0 15  0.0000
PARTIALS FOR RD       1.970208850E-03  -3.045492045E-03   7.317243200E-04  -7.174194756E-01  -6.986737655E-01
                     -8.333085099E-02   0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                0.                0.               -3.402956952E-04
                      5.439230197E-04  -6.497490595E-04  -2.931598728E-01   4.764305084E-05
 2       1969  8 22   0 15  0.0000
PARTIALS FOR S2      -4.000359060E-01  -9.131539810E-01  -6.015897430E-03  -5.972374313E+00  -1.377284910E+01
                     -1.234851861E-01   4.127522528E-01   1.923351610E+00  -6.161133578E-02   6.198561629E+00
                      2.876754710E+01  -9.281750174E-01   0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.                1.000000000E+00   6.908732761E-01   3.450543492E-01
                     -5.473487325E-01   0.                0.                0.                0.
                      0.                0.               -6.927454010E+00   1.257255710E-03
 3       1969  8 22   0 15  0.0000
PARTIALS FOR S3      -4.000359060E-01  -9.131539810E-01  -8.015897430E-03  -5.972374313E+00  -1.377284910E+01
                     -1.234851861E-01  -5.921544118E-01   9.957147359E-01   1.221985379E-01  -8.895918843E+00
                      1.499335783E+01   1.834238643E+00   1.206307960E+00   9.034322187E-01  -2.062590273E-01
                      1.810305479E+01   1.349817808E+01  -3.098335541E+00   1.000000000E+00   7.610603832E-01
                      2.078613361E-01  -5.821478754E-01   0.                0.                0.
                      0.                0.                0.                0.                0.
                      0.                0.               -7.504468632E+00   1.371840296E-03
```

```
1       1969  8 22   0 30  0.0000
PARTIALS FOR RNG     -7.239983371E-01     -7.043704192E-01     -8.284206452E-02     -2.151174800E+01     -2.095512844E+01
                     -2.438621696E+00      0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   1.000088000E+00     -6.261657134E-01
                      2.542955378E-01      6.967349549E-01     -8.801036486E+00      1.429921570E-03
PARTIALS FOR AZ      -1.339567919E-01      1.293945144E-01      6.413813284E-02     -4.032607118E+00      3.903575530E+00
                      1.932937857E+00      0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   1.000000000E+00      0.                   0.
                      1.337987002E+00     -8.033169574E-01     -1.141122308E-01      1.974999381E-05
PARTIALS FOR EL       2.616631961E-02     -4.455868047E-02      1.446315547E-01      7.918326578E-01     -1.339988130E+00
                      4.358805120E+00      0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   1.000000000E+00      0.                   0.                  -1.205585864E-01
                     -3.572115119E-01     -9.825893909E-01     -9.930010515E-02      1.883168186E-05
1       1969  8 22   0 30  0.0000
PARTIALS FOR RD       1.732949712E-03     -3.215008508E-03      7.509020606E-04     -6.495953331E-01     -7.832947976E-01
                     -6.151972554E-02      0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   0.                   0.                  -3.269296243E-04
                      5.331415433E-04     -6.572105216E-04     -5.875671028E-01      9.541199671E-05
2       1969  8 22   0 30  0.0000
PARTIALS FOR S2      -3.524175881E-01     -9.456698769E-01     -5.228423657E-03     -1.034918947E+01     -2.825902750E+01
                     -1.533281764E-01      2.891369076E-01      1.969842606E+00     -5.808483389E-02      8.727462689E+00
                      5.842804729E+01     -1.775742642E+00      0.                   0.                   0.
                      0.                   0.                   0.                   0.                   0.
                      0.                   0.                   1.000000000E+00      6.878153668E-01      3.450487537E-01
                     -5.511776058E-01      0.                   0.                   0.                   0.
                      0.                   0.                  -2.773499914E+01      5.035852028E-03
3       1969  8 22   0 30  0.0000
PARTIALS FOR S3      -3.524175881E-01     -9.456698769E-01     -5.228423657E-03     -1.034918947E+01     -2.825902750E+01
                     -1.533281764E-01     -6.438696961E-01      9.646372947E-01      1.428068129E-01     -1.942595224E+01
                      2.858904687E+01      4.297560896E+00      1.139284829E+00      9.977219123E-01     -2.285098509E-01
                      3.423873422E+01      2.949266130E+01     -6.894942466E+00      1.000000000E+00      7.610603879E-01
```

```
2.078613613E-01     -5.821478526E-01     0.                  0.                  0.
0.                  0.                   0.                  0.                  0.
0.                  0.                  -3.002859224E+01     5.495521975E-03
```

TOTAL EDIT SUMMARY

STA	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN
1	2 RNG	1.4E+08	1.4E+07	-1.4E+08	2 AZ	1.5E+02	1.4E+04	1.6E+02	2 EL	3.8E+01	3.3E+03	-3.8E+01
	2 RD	1.8E+02	8.8E+02	1.7E+02								
2	2 S2	4.1E+08	4.1E+07	-4.1E+08								
3	2 S3	4.5E+08	4.5E+07	-4.5E+08								

8

ENTER SEGMENT 72 AT 115.9 SECONDS. EXECUTION TIME FOR SEGMENT 21 WAS .7 CP SECS., 12.7 PP SECS

ITEM	DESCRIPTION	REFERENCE SECTION
6	Edit summary. The restriction to the first 6 measurement types encountered for the first 30 stations still holds	Case B: Item 7

```
*****************************************************************
*                                                               *
*  SIMULTANEOUS VEHICLE COVARIANCE ANALYSIS INPUT AND OUTPUT OPTIONS  *
*                                                               *
*****************************************************************
```

```
************************************************
*                                              *
*               OPBOX OPTIONS                  *
************************************************
*                                              *
* A  SQRT OF OIAGONAL OF FULL ATA INVERSE INPUT *
* C  PRINT DP/DQ                               *
* D  NORMAL COVAR. ANALYSIS, OBSERVATIONS INPUT *
* E  NORMAL UPDATE - OUTPUT IS REAL TIME       *
* F  GENERATE PLOT TAPE                        *
* H  PRINT ENTIRE INTER-SATELLITE COV. MATRIX  *
*                                              *
************************************************
*                                              *
*               PRCOV OPTIONS                  *
************************************************
*                                              *
* A  C(P), CORRELATION ANO SQRT OF OIAGONAL    *
* B  PRINT C(X)  AT CURRENT TIME WITH P EFFECTS *
* C  PRINT C(OP) AT CURRENT TIME FOR P EFFECTS *
* G  PRINT CORRELATION ANO SQRT OF DIAGONAL    *
* H  PRINT C(X)  AT CURRENT TIME WITH P+Q EFFECTS*
* I  PRINT C(OP) AT CURRENT TIME FOR P+Q EFFECTS *
*                                              *
************************************************
```

7

ITEM	DESCRIPTION	REFERENCE SECTION
7	Indicates input/output options requested by ØPBØX and PRCØV for the simultaneous-vehicle error analysis run	2.5.1

```
ENTER SEGMENT 73 AT   116.3 SECONDS.  EXECUTION TIME FOR SEGMENT 72 WAS      .4 CP SECS.,    10.5 PP SECS.

          COVARIANCE MATRICES AT     0.                MINUTES FROM MIDNIGHT OF EPOCH DATE

               ATA(INVERSE) FOR      P      PARAMETERS

           0001 X       0001 Y       0001 Z       0001 DX      0001 DY      0001 DZ      0002 X       0002 Y
           0002 Z       0002 DX      0002 DY      0002 DZ      0003 X       0003 Y       0003 Z       0003 DX
           0003 DY      0003 DZ
0001 X     1.00000E+14
0001 Y     0.           1.00000E+14
0001 Z     0.           0.           1.00000E+14
0001 DX    0.           0.           0.           1.00000E+06
0001 DY    0.           0.           0.           0.           1.00000E+06
0001 DZ    0.           0.           0.           0.           0.           1.00000E+06
0002 X     0.           0.           0.           0.           0.           0.           1.00000E+14
0002 Y     0.           0.           0.           0.           0.           0.           0.           1.00000E+14

0002 Z     0.           0.           0.           0.           0.           0.           0.           0.
           1.00000E+14
0002 DX    0.           0.           0.           0.           0.           0.           0.           0.
           0.           1.00000E+06
0002 DY    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           1.00000E+06
0002 DZ    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           1.00000E+06
0003 X     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           1.00000E+14
0003 Y     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           1.00000E+14
0003 Z     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           1.00000E+14
0003 DX    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           1.00000E+06
0003 DY    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           0.
           1.00000E+06
0003 DZ    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           0.
           0.           1.00000E+06
```

ITEM	DESCRIPTION	REFERENCE SECTION
8	Time statement, determined by PTIM, that applies to items 9 through 14. Valid until another time statement is made	
9	$(A^T A)^{-1}$ for P-parameters, identified by parameter name (PRCØV (A) = C). This is the covariance matrix of P-parameters, based on measurement uncertainties (observation weights) only	

CORRELATION MATRIX

0001 X	1.000																	
0001 Y	0.000	1.000																
0001 Z	0.000	0.000	1.000															
0001 DX	0.000	0.000	0.000	1.000														
0001 DY	0.000	0.000	0.000	0.000	1.000													
0001 DZ	0.000	0.000	0.000	0.000	0.000	1.000												
0002 X	0.000	0.000	0.000	0.000	0.000	0.000	1.000											
0002 Y	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000										
0002 Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000									
0002 DX	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000								
0002 DY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
0002 DZ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
0003 X	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
0003 Y	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000				
0003 Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
0003 DX	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
0003 DY	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	
0003 DZ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

10

SQRT DIAG	1.000000E+07	1.000000E+07	1.000000E+07	1.000000E+03	1.000000E+03	1.000000E+03
	1.000000E+07	1.000000E+07	1.000000E+07	1.000000E+03	1.000000E+03	1.000000E+03
	1.000000E+07	1.000000E+07	1.000000E+07	1.000000E+03	1.000000E+03	1.000000E+03

11

PIVOT RATIOS

1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00
1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00
1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00

12

ITEM	DESCRIPTION	REFERENCE SECTION
10	Correlation matrix for P-parameters, i.e., the matrix of Item 9 normalized to 1s on the diagonal (PRCØV(A) = C)	2.5.1
11	Square roots of the diagonal elements of $(A^TA)^{-1}$ (Item 9) in the order shown in the header of Item 9	2.5.1
12	Pivot ratios encountered in the inversion of A^TA are determined by referencing the original diagonal elements of the A^TA matrix to the diagonal element used in pivoting that particular row and column. These will be printed if Items 9, 10, or 11 are printed	

DPJQ MATRIX

	3 RBIA 1 EBIA	3 ALT 1 ARIA	3 LONG 1 RBIA	3 LAT 1 ALT	2 RPIA 1 LONG	2 ALT 1 LAT	2 LONG GM	2 LAT 02,00
0001 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.

13

ATA(INVERSE) FOR P AND Q PARAMETERS 14

0001 X	0001 Y	0001 Z	0001 DX	0001 DY	0001 DZ	0002 X	0002 Y
0002 Z	0002 DX	0002 DY	0002 DZ	0003 X	0003 Y	0003 Z	0003 DX
0003 DY	0003 DZ						

ITEM	DESCRIPTION	REFERENCE SECTION
13	The $\partial P/\partial Q$ matrix printed when ØPBØX(C) = 1; P and Z represent P- and Q-parameter lists, respectively	2.5.1
14	Indicates that the next covariance matrix printed will include the effects of the Q-parameters. Since PRCØV(G)=B, the $(A^T A)^{-1}$ matrix is not printed, but the correlation matrix (Item 10) is	2.5.1

```
            CORRELATION MATRIX

0001 X        1.000
0001 Y        0.000   1.000
0001 Z        0.000   0.000   1.000
0001 DX       0.000   0.000   0.000   1.000
0001 DY       0.000   0.000   0.000   0.000   1.000
0001 DZ       0.000   0.000   0.000   0.000   0.000   1.000
0002 X        0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Y        0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Z        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DX       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DY       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DZ       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000

0003 X        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              1.000
0003 Y        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              0.000   1.000
0003 Z        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              0.000   0.000   1.000
0003 DX       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              0.000   0.000   0.000   1.000
0003 DY       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              0.000   0.000   0.000   0.000   1.000
0003 DZ       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
              0.000   0.000   0.000   0.000   0.000   1.000

SQRT DIAG      1.000000E 07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03
               1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03   (15)
               1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03

        STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT     0.              MMOED (16)
```

ITEM	DESCRIPTION	REFERENCE SECTION
15	Square roots of the diagonal elements of the $(A^TA)^{-1}$ matrix, with the Q-parameter effects included	
16	Indicates time of the state covariance matrix partitions, as indicated by PRCØV(B) through (F) and PRCØV(H) through (L)	2.5.1

```
CARTESIAN    FOR      P      PARAMETERS     VEHICLES    1   AND    1
  1.0000000E+14  0.              0.              0.              0.              0.
                 1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                  1.0000000E+14   0.              0.              0.
  0.0000000      1.0000000E+07                   1.0000000E+05   0.              0.
  0.0000000      0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000      0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000      0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000      0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
```

(17)

```
ORBIT PLNE   FOR      P      PARAMETERS     VEHICLES    1   AND    1
  1.0000000E+14  5.4719543E-01   1.6784568E-03   0.              0.              0.
                 1.0000000E+14  -6.2500000E-02   0.              0.              0.
  1.0000000E+07                  1.0000000E+14   0.              0.              0.
   .0000000      1.0000000E+07                   1.0000000E+06   4.5966431E-09   1.4961188E-10
   .0000000      0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000      0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000      0.0000000       0.0000000        .0000000       1.0000000E+03
  0.0000000      0.0000000       0.0000000        .0000000        .0000000       1.0000000E+03
```

(18)

```
CARTESIAN    FOR    P AND Q  PARAMETERS     VEHICLES    1   AND    1
  1.0000000E+14  0.              0.              0.              0.              0.
                 1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                  1.0000000E+14   0.              0.              0.
  0.0000000      1.0000000E+07                   1.0000000E+06   0.              0.
  0.0000000      0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000      0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000      0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000      0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
```

(19)

```
ORBIT PLNE   FOR    P AND Q  PARAMETERS     VEHICLES    1   AND    1
  1.0000000E+14  5.4719543E-01   1.6784568E-03   0.              0.              0.
                 1.0000000E+14  -6.2500000E-02   0.              0.              0.
  1.0000000E+07                  1.0000000E+14   0.              0.              0.
   .0000000      1.0000000E+07                   1.0000000E+06   4.5966431E-09   1.4961188E-10
   .0000000      0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000      0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000      0.0000000       0.0000000        .0000000       1.0000000E+03
  0.0000000      0.0000000       0.0000000        .0000000        .0000000       1.0000000E+03
```

(20)

```
CARTESIAN    FOR      P      PARAMETERS     VEHICLES    2   AND    2
  1.0000000E+14  0.              0.              0.              0.              0.
                 1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                  1.0000000E+14   0.              0.              0.
```

ITEM	DESCRIPTION	REFERENCE SECTION
17	Cartesian covariance matrix for Satellite i with respect to itself in an upper triangular format. The lower triangular matrix printed is the normalized correlation matrix. The top item of each column is the square root of the diagonal element (of that column) in the unnormalized matrix. It is identified as a P-parameter matrix, indicating that only the effects of measurement uncertainties are included	2.5.1 [ØPBØX(H), PRCØV(B)]
18	Orbit plane matrices (Item 17)	2.5.1 [ØPBØX(H), PRCØV(C)]
19	Cartesian matrices (Item 17), but including both P- and Q-parameter effects	2.5.1 [ØPBØX(H), PRCØV(H)]
20	Orbit plane matrices (Item 17), but including both P- and Q-parameter effects	2.5.1 [ØPBØX(H), PRCØV(I)]

```
 0.0000000      1.0000000E+07                  1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                  1.0000000E+06  0.
 0.0000000      0.0000000      0.0000000      1.0000000E+03                  1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR      P       PARAMETERS     VEHICLES     2   AND    2
 1.0000000E+14  1.6601563E-02  0.             0.             0.             0.
                1.0000000E+14 -3.1250000E-02  0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
  .0000000      1.0000000E+07                 1.0000000E+06  2.9103830E-10 -1.1641532E-10
  .0000000      -.0000000      1.0000000E+07                 1.0000000E+06 -4.6566129E-10
 0.0000000      0.0000000      0.0000000      1.0000000E+03                  1.0000000E+06
 0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

CARTESIAN    FOR    P AND Q  PARAMETERS     VEHICLES     2   AND    2
 1.0000000E+14  0.             0.             0.             0.             0.
                1.0000000E+14  0.             0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
 0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
 0.0000000      0.0000000      0.0000000      1.0000000E+03                  1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR    P AND Q  PARAMETERS     VEHICLES     2   AND    2
 1.0000000E+14  1.6601563E-02  0.             0.             0.             0.
                1.0000000E+14 -3.1250000E-02  0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
  .0000000      1.0000000E+07                 1.0000000E+06  2.9103830E-10 -1.1641532E-10
  .0000000      -.0000000      1.0000000E+07                 1.0000000E+06 -4.6566129E-10
 0.0000000      0.0000000      0.0000000      1.0000000E+03                  1.0000000E+06
 0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

CARTESIAN    FOR      P       PARAMETERS     VEHICLES     3   AND    3
 1.0000000E+14  0.             0.             0.             0.             0.
                1.0000000E+14  0.             0.             0.             0.
```

```
  1.0000000E+07                   1.0000000E+14   0.              0.              0.
  0.0000000       1.0000000E+07                   1.0000000E+06   0.              0.
  0.0000000       0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000       0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03

ORBIT PLNE   FOR      P      PARAMETERS     VEHICLES     3   AND    3
  1.0000000E+14   0.              0.              0.              0.              0.
                  1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                   1.0000000E+14   0.              0.              0.
  0.0000000       1.0000000E+07                   1.0000000E+06   0.              0.
  0.0000000       0.0000000       1.0000000E+07                   1.0000000E+05   0.
  0.0000000       1.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03

CARTESIAN    FOR  P AND Q  PARAMETERS     VEHICLES     3   AND    3
  1.0000000E+14   0.              0.              0.              0.              0.
                  1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                   1.0000000E+14   0.              0.              0.
  0.0000000       1.0000000E+07                   1.0000000E+06   0.              0.
  0.0000000       0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000       0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03

ORBIT PLNE   FOR  P AND Q  PARAMETERS     VEHICLES     3   AND    3
  1.0000000E+14   0.              0.              0.              0.              0.
                  1.0000000E+14   0.              0.              0.              0.
  1.0000000E+07                   1.0000000E+14   0.              0.              0.
  0.0000000       1.0000000E+07                   1.0000000E+06   0.              0.
  0.0000000       0.0000000       1.0000000E+07                   1.0000000E+06   0.
  0.0000000       0.0000000       0.0000000       1.0000000E+03                   1.0000000E+06
  0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
  0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       1.0000000E+03
```

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1 (21)

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ITEM	DESCRIPTION	REFERENCE SECTION
21	The matrices described in Items 17 through 20 for Satellites i and j. Since they are asymmetrical, they are printed entirely and as S_{ij}. The matrices of Items 17 through 20 are variance-covariance matrices of particular satellite state vectors in the indicated coordinate systems; the matrices here are intersatellite covariance matrices	

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CAPTESIAN FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

```
0.              0.              0.              0.              0.              0.

 CORRELATION
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000

COVARIANCE MATRICES AT     1.500000000E+01    MINUTES FROM MIDNIGHT OF EPOCH DATE


    ATA(INVERSE) FOR     P     PARAMETERS

            0001 X       0001 Y       0001 Z       0001 DX      0001 DY      0001 DZ      0002 X       0002 Y
            0002 Z       0002 DX      0002 DY      0002 DZ      0003 X       0003 Y       0003 Z       0003 DX
            0003 DY      0003 DZ
0001 X      3.53120E+11
0001 Y     -3.95845E+11 4.60113E+11
0001 Z     -5.69830E+10-4.98050E+10 7.98815E+11
0001 DY    -3.91601E+08 4.38308E+08 6.34054E+07 4.34672E+05
0001 DY     4.38931E+08-5.10171E+08 5.54214E+07-4.57127E+05 5.66192E+05
0001 DZ     6.31783E+07 5.52199E+07-8.85759E+08-7.03628E+04-6.15027E+04 9.83064E+05
0002 X      5.33716E+08-6.29350E+08 1.25965E+08-5.82422E+05 6.87427E+05-1.36915E+05 7.60206E+13
0002 Y     -2.40359E+08 2.96756E+08-5.27310E+07 1.47751E+05-1.88544E+05 2.55990E+04-1.59975E+13 4.30231E+12

0002 Z     -1.30249E+07 1.63585E+07-7.93590E+06 1.18188E+04-1.50363E+04 8.05975E+03 4.45137E+12 2.19633E+12
            9.91881E+13
0002 DX    -1.13203E+04 1.32332E+04-2.35961E+03 1.26326E+01-1.48246E+01 2.63953E+00-2.19683E+08-1.43406E+08
            3.94952E+07 9.93174E+05
0002 DY     3.25854E+04-3.67383E+04-2.57392E+03-3.72067E+01 4.20588E+01 2.56069E+00-1.45203E+08-8.58606E+08
            1.99298E+07-1.30267E+03 9.92470E+05
0002 DZ    -2.02065E+03 2.31452E+03 2.47115E+00 2.21733E+00-2.53874E+00-9.66537E-03 3.98806E+07 1.99271E+07
           -7.31579E+06 3.59396E+02 1.82549E+02 9.99932E+05
0003 X      7.95618E+08-9.14109E+08 6.95473E+07-9.34992E+05 1.07601E+06-9.15048E+04 3.12931E+13-6.90444E+12
           -5.98683E+12 2.78551E+08-6.49518E+07-5.41541E+07 5.08940E+13
0003 Y     -7.22552E+08 8.31115E+08 2.34831E+05 7.52724E+05-8.75885E+05-1.33712E+04 2.33184E+13-5.15376E+12
           -4.58690E+12 2.11923E+08-4.39960E+07-4.12697E+07-3.60614E+13 7.19750E+13
0003 Z     -2.12015E+06-7.63588E+06 6.25016E+07 1.13195E+04-2.09989E+03-6.68831E+04-5.36032E+12 1.18309E+12
            1.01227E+12-4.75526E+07 1.01820E+07 9.19850E+06 8.31580E+12 6.27613E+12 9.86246E+13
0003 DX     2.45174E+04-2.82214E+04 1.56221E+03-2.76669E+01 3.18611E+01-1.86213E+00 2.83191E+08-6.25285E+07
           -5.32841E+07 2.47599E+03-4.95056E+02-4.89451E+02-4.35216E+08-3.32488E+08 7.56176E+07 9.95984E+05
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0003 DY    -1.81126E+03 2.10196E+03 7.25944E+01 1.67363E+00-1.93421E+00-1.75161E-01 2.11548E+08-4.67322E+07
           -4.11377E+07 1.83381E+03-4.01785E+02-3.65425E+02-3.25158E+08-2.46756E+08 5.53336E+07-3.00220E+03
            9.97878E+05
0003 DZ    -2.08183E+03 2.34371E+03 1.87233E+02 2.38779E+00-2.69468E+00-1.85846E-01-4.74797E+07 1.04823E+07
            9.10055E+06-4.31756E+02 9.38095E+01 9.10051E+01 7.51766E+07 5.69381E+07-1.27453E+07 6.77993E+02
            4.93611E+02 9.99365E+05

                CORRELATION MATRIX


0001 X        1.000
0001 Y        -.982    1.000
0001 Z        -.107    -.082    1.000
0001 DX      -1.000     .981     .108    1.000
0001 DY        .982   -1.000     .082    -.982    1.000
0001 DZ        .107     .082   -1.000    -.108    -.082    1.000
0002 X         .000    -.000     .000    -.000     .000    -.000    1.000
0002 Y        -.000     .000    -.000     .000    -.000     .000    -.885    1.000
0002 Z        -.000     .000    -.000     .000    -.000     .000     .051     .106    1.000
0002 DX       -.000     .000    -.000     .000    -.000     .000    -.025    -.069     .004    1.000
0002 DY        .000    -.000    -.000    -.000     .000     .000    -.017    -.416     .002    -.001    1.000
0002 DZ       -.000     .000     .000     .000    -.000    -.000     .005     .010    -.001     .000     .000    1.000

0003 X         .000    -.000     .000    -.000     .000    -.000     .503    -.467    -.084     .039    -.009    -.008
              1.000
0003 Y        -.000     .000     .000     .000    -.000    -.000     .315    -.293    -.054     .025    -.005    -.005
              -.596    1.000
0003 Z        -.000    -.000     .000     .000    -.000    -.000    -.062     .057     .010    -.005     .001     .001
               .117     .074    1.000
0003 DX        .000    -.000     .000    -.000     .000    -.000     .033    -.030    -.005     .002    -.000    -.000
              -.061    -.039     .008    1.000
0003 DY       -.000     .000     .000     .000    -.000    -.000     .024    -.023    -.004     .002    -.000    -.000
              -.046    -.029     .006    -.003    1.000
0003 DZ       -.000     .000     .000     .000    -.000    -.000    -.005     .005     .001    -.000     .000     .000
               .011     .007    -.001     .001     .000    1.000

SQRT DIAG     5.942389E+05   5.783160E+05   8.937646E+05   6.592966E+02   7.524574E+02   9.914957E+02
              8.718980E+06   2.074201E+06   9.959324E+06   9.990364E+02   9.962281E+02   9.999658E+02
              7.134002E+06   8.483807E+06   9.930989E+06   9.979902E+02   9.989384E+02   9.999427E+02

PIVOT RATIOS
              1.000000E+00   3.121352E+00   5.822979E+04   5.573979E+02   9.647004E+09   7.167872E+07
```

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         1.031872E+00    2.757727E+06    1.807008E+10    4.199575E+09    3.748249E+10    1.520903E+08
         4.494169E+11    5.827161E+11    4.195380E+10    1.175047E+10    6.545311E+09    3.455491E+08

A PIVOT RATIO EXCEEDS 10**5.
CHECK ATA MATRIX FOR ILL CONDITIONING.   (22)


         DPDQ MATRIX

           3   RBIA      3   ALT       3   LONG      3   LAT       2   RBIA      2   ALT       2   LONG      2   LAT
           1   EBIA      1   ABIA      1   RBIA      1   ALT       1   LONG      1   LAT           GM            02,00
0001 X    -2.36834E-05-7.81713E-06-2.60310E+00 1.26256E+00-7.75560E-06 3.84250E-05 7.80648E-01 4.05204E+00
          -2.80096E+05 1.12494E+06 7.51958E-01-3.70436E-01 1.66467E+06-3.85520E+05 3.40657E+07-5.53076E+03
0001 Y    -4.10495E-05-1.71352E-05-4.49197E+00 7.54816E+00-5.93667E-05-4.68304E-05-6.66842E+00 1.18154E+01
           7.38315E+05-1.33785E+06 6.57451E-01-5.49701E-01-1.98414E+06 4.63045E+05 2.99101E+07-4.85482E+03
0001 Z     7.21551E-06 4.44211E-06 1.09315E-01-2.69904E+00 7.25517E-06 2.64153E-06 3.68664E-02-7.18194E-01
          -2.21382E+06-5.85306E+05 9.49669E-02 5.75163E-01-1.35239E+04 2.66546E+06 8.82286E+06-1.48121E+03
0001 DX    1.04622E-07 5.76326E-08 5.99734E-03-1.23686E-02 8.69107E-08 4.44900E-08 1.00548E-02-1.59178E-02
          -5.84716E+01 8.43196E+01-5.42129E-06 1.84740E-05 1.34747E+02-1.09208E+01-7.66387E+04 1.24547E+01
0001 DY   -1.37459E-08-2.10187E-08-2.45183E-03 2.23575E-03 6.48182E-09 1.15911E-09-3.30283E-03 5.41580E-03
          -4.22238E+01 5.27573E+01-5.01474E-06 1.33685E-05 8.67424E+01-2.40302E+00-6.69553E+04 1.08783E+01
0001 DZ   -1.59490E-09-4.67495E-09-1.29763E-04 1.26740E-03-1.64569E-09 2.88080E-09 3.74166E-04-3.84703E-04
          -2.70105E+01 4.09516E+00-7.35124E-07 8.87116E-06 1.50068E+01 2.30606E+01-9.62948E+03 1.56446E+00
0002 X     2.33352E-01 1.83193E-01 1.83504E+04-5.10754E+04-2.09430E-01-1.44624E-01-2.61938E+04 4.14898E+04
          -2.19788E+04 3.09389E+04-3.78264E-02 3.07754E-02 4.55747E+04-1.16827E+04-5.14906E+06 1.11816E+03
0002 Y    -5.35631E-02-4.11798E-02-4.16692E+03 1.12764E+04-4.68654E-01-3.23975E-01-5.91370E+04 9.37507E+04
           2.59103E+05-3.73458E+05 4.72482E-01-3.79354E-01-5.45564E+05 1.50665E+05 5.45878E+07-1.03153E+04
0002 Z    -4.75240E-02-3.68741E-02-3.65852E+03 1.03891E+04 3.68497E-02 2.55568E-02 4.60286E+03-7.32752E+03
           5.79101E+03-8.25393E+03 1.02692E-02-8.29786E-03-1.21035E+04 3.22602E+03 1.72902E+06-3.30763E+02
0002 DX    2.20449E-06 1.69336E-06 1.67152E-01-4.61607E-01-1.88484E-06-1.32622E-06-2.37883E-01 3.75423E-01
          -1.55103E-01 2.16187E-01-2.62990E-07 2.14921E-07 3.18425E-01-7.93249E-02-4.69598E+01 1.10034E-02
0002 DY   -4.31831E-07-3.20196E-07-3.77475E-02 8.52043E-02-4.09296E-06-2.93216E-06-5.42572E-01 8.26088E-01
           2.28683E+00-3.25725E+00 4.26399E-06-3.40614E-06-4.75493E+00 1.32453E+00 4.96229E+02-8.77074E-02
0002 DZ   -4.33566E-07-3.30549E-07-3.33537E-02 9.18057E-02 3.37760E-07 2.32458E-07 4.28123E-02-6.74839E-02
           5.49158E-02-7.95535E-02 9.71464E-08-7.85397E-08-1.16436E-01 3.14686E-02 1.55675E+01-2.70867E-03
0003 X    -4.10956E-01-3.13569E-01-3.13871E+04 8.70410E+04 1.73981E-01 1.19927E-01 2.20038E+04-3.49852E+04
           1.12986E+05-1.63136E+05 2.05307E-01-1.64980E-01-2.38342E+05 6.57237E+04 2.93490E+07-5.65024E+03
0003 Y    -3.09614E-01-2.31324E-01-2.32935E+04 6.45937E+04 1.33126E-01 9.21630E-02 1.68738E+04-2.66749E+04
           8.51453E+04-1.23118E+05 1.58579E-01-1.26715E-01-1.79513E+05 5.06713E+04 2.12793E+07-4.17091E+03
0003 Z     6.94281E-02 5.39569E-02 5.35700E+03-1.50055E+04-3.04045E-02-2.10249E-02-3.85076E+03 6.09083E+03
          -1.95080E+04 2.80804E+04-3.65622E-02 2.91738E-02 4.09382E+04-1.15718E+04-4.96318E+06 9.50472E+02
0003 DX   -3.88795E-06-2.88580E-06-2.91864E-01 8.11457E-01 1.54838E-06 1.06605E-06 1.94912E-01-3.10914E-01
           9.99090E-01-1.43312E+00 1.87305E-06-1.49468E-06-2.08575E+00 5.86508E-01 2.77277E+02-5.54448E-02
```

ITEM	DESCRIPTION	REFERENCE SECTION
22	A remark printed when the $A^T A$ matrix is inverted if a pivot ratio exceeds 10^5. It hints that the $A^T A$ may be ill-conditioned	

```
0003 DY    -2.87436E-06-2.16387E-06-2.14964E-01 5.16675E-01 1.26298E-06 8.74711E-07 1.59626E-01-2.53642E-01
            7.37147E-01-1.05381E+00 1.38986E-06-1.10765E-06-1.53908E+00 4.35296E-01 1.95535E+02-3.65703E-02
0003 DZ     6.59625E-07 5.08626E-07 5.07943E-02-1.40773E-01-2.62087E-07-1.81147E-07-3.31229E-02 5.25211E-02
           -1.69743E-01 2.41374E-01-3.07621E-07 2.47328E-07 3.53863E-01-9.60879E-02-5.05561E+01 9.41950E-03

              ATA(INVERSE) FOR  P AND Q  PARAMETERS

            0001 X      0001 Y      0001 Z      0001 DX     0001 DY     0001 DZ     0002 X      0002 Y
            0002 Z      0002 DX     0002 DY     0002 DZ     0003 X      0003 Y      0003 Z      0003 DX
            0003 DY     0003 DZ

              CORRELATION MATRIX

0001 X       1.000
0001 Y       -.978   1.000
0001 Z       -.091   -.112   1.000
0001 DX      -.920    .882    .101   1.000
0001 DY       .920   -.918    .077   -.981   1.000
0001 DZ       .101    .073   -.887   -.107   -.082   1.000
0002 X        .000   -.000    .000   -.000    .000   -.000   1.000
0002 Y       -.015    .018   -.007   -.001   -.001   -.000   -.884   1.000
0002 Z       -.000    .000   -.000   -.000   -.000    .000    .051    .106   1.000
0002 DX       .000   -.000    .000    .000   -.000    .000   -.025   -.069    .004   1.000
0002 DY      -.000    .000   -.000   -.000    .000   -.000   -.017   -.415    .002   -.001   1.000
0002 DZ      -.000    .000   -.000    .000   -.000   -.000    .005    .010   -.001    .000    .000   1.000

0003 X       -.002    .002   -.001   -.000    .000   -.000    .503   -.466   -.084    .039   -.009   -.008
             1.000
0003 Y       -.001    .002   -.001    .000   -.000   -.000    .315   -.292   -.054    .025   -.005   -.005
             -.596   1.000
0003 Z        .000   -.000    .000    .000    .000   -.000   -.062    .057    .010   -.005    .001    .001
              .117    .074   1.000
0003 DX      -.000    .000   -.000   -.000    .000   -.000    .033   -.030   -.009    .002   -.000   -.000
             -.051   -.039    .008   1.000
0003 DY      -.000    .000   -.000   -.000   -.000   -.000    .024   -.023   -.004    .002   -.000   -.000
             -.046   -.029    .006   -.003   1.000
0003 DZ       .000   -.000    .000    .000   -.000    .000   -.005    .005    .001   -.000    .000    .000
              .011    .007   -.001    .001    .000   1.000

SQRT DIAG     6.378695E+05   7.439833E+05   1.004285E+06   6.596158E+02   7.525788E+02   9.915107E+02
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0.718984E+06	2.076192E+06	9.959324E+06	9.990364E+02	9.962284E+02	9.999658E+02
7.134112E+06	8.483860E+06	9.930992E+06	9.979902E+02	9.989385E+02	9.999427E+02

STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT 1.500000000E+01 MMOED

CARTESIAN FOR P PARAMETERS VEHICLES 1 AND 1

3.2175496E+08	-3.6067085E+00	-5.1024804E+07	2.2082945E+04	1.6678030E+04	2.4263728E+03
	4.1914982E+08	-4.5297136E+07	-2.7074724E+04	-1.9063559E+04	-3.4465145E+03
1.7937529E+04		7.2700942E+08	6.2252845E+03	5.4383081E+03	4.6664559E+03
-.9821182	2.0473149E+04		4.3609561E+05	-4.8883923E+05	-7.0230478E+04
-.1070885	-.0820075	2.6979426E+04		5.6810087E+05	-6.1300055E+04
.0019318	-.0020026	.0003494	6.6037536E+02		9.8642773E+05
.0012336	-.0012072	.0002574	-.9021153	7.5372467E+02	
.0001362	-.0001695	.0001741	-.1070705	-.0020047	9.9319068E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 1 AND 1

3.7777930E+06	3.7919996E+07	7.0223517E+07	-2.3640455E+03	3.2425201E+02	6.0705633E+02
	7.3241417E+00	-3.6698800E+06	-4.4261641E+04	6.1262670E+03	4.3502473E+03
2.9627340E+03		7.2760224E+08	-5.2678386E+02	4.2365401E+01	3.9236209E+03
.4729304	2.7063152E+04		1.1898322E+04	5.1393048E+04	9.5165149E+04
.8787046	-.0050272	2.6974103E+04		9.9268444E+05	-4.9926390E+03
-.0073151	-.0149936	-.0001790	1.0907943E+02		9.8604146E+05
.0001098	.0002272	.0000016	.4720854	9.9633551E+02	
.0002053	.0001619	.0001465	.8785925	-.0050463	9.9299620E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 1 AND 1

6.2200139E+10	-7.1403303E+10	1.6742602E+09	4.5846001E+06	3.3563025E+06	5.5123725E+05
	8.6384210E+10	-3.2655184E+10	-5.6863541E+06	-4.1999294E+06	-8.4880572E+05
2.4939956E+05		2.1393226E+11	3.0695054E+06	2.5054640E+05	1.5101347E+06
-.9741042	2.9391192E+05		4.3647236E+05	-4.0855900E+05	-7.0169303E+04
.0145141	-.2402132	4.6252812E+05		5.6030829E+05	-6.1341510E+04
.0278250	-.0292845	.0100450	6.6066055E+02		9.0644313E+05
.0178514	-.0189554	.0071855	-.9809513	7.5306225E+02	
.0022254	-.0029077	.0033047	-.1069383	-.0019269	9.9319843E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 1 AND 1

2.6822083E+09	1.1571932E+10	2.1456425E+10	-7.2146624E+05	9.0954600E+04	1.8545159E+05
	1.5695296E+11	3.4073570E+10	-9.5157091E+06	1.3155750E+06	1.1250127E+06
5.1790041E+04		2.0298145E+11	-2.3165101E+06	3.1210067E+05	1.3087766E+06

.5641743	3.9604666E+05		1.2473137E+04	5.1313587E+04	9.5096076E+04
.0199946	.1954444	4.5053463E+05		9.9269543E+05	-4.9831336E+03
-.1247332	-.2151330	-.0460383	1.1168320E+02		9.8605522E+05
.0019177	.0033340	.0005953	.4611439	9.9634102E+02	
.0035051	.0028606	.0029254	.8574802	-.0050367	9.9300313E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 2

7.6105349E+13	-1.6288492E+13	4.5017469E+12	3.1628196E+08	-3.0290905E+08	1.3216039E+07
	3.5903182E+12	2.2519239E+12	-6.7715842E+07	6.7798093E+07	1.0688901E+07
8.7238379E+06		9.9558389E+13	1.7985559E+07	7.3707056E+07	4.1820151E+08
-.9853870	1.8948135E+06		9.9762234E+05	-1.3567849E+03	5.4543889E+01
.0517171	.1131100	9.9778350E+06		9.8498301E+05	5.4700879E+01
.0362981	-.0357800	.0018047	9.9881046E+02		9.9797595E+05
-.0349857	.0350526	.0074431	-.0013687	9.9246310E+02	
.0015155	.0055469	.0419553	.0000547	.0000552	9.9898746E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 2

5.0255705E+12	1.9042156E+13	2.9388060E+12	8.3808996E+07	7.6922440E+07	1.2424508E+07
	7.4169309E+13	-2.9536344E+12	3.1663350E+08	2.9974764E+08	-1.1871329E+07
2.2418007E+06		1.0005308E+14	5.5407029E+07	-1.2868180E+07	4.1872493E+08
.9862954	8.6121605E+06		9.8510818E+05	1.8315264E+03	2.3123263E+02
.1310526	-.0342860	1.0002953E+07		9.9749443E+05	-6.3530632E+01
.0376662	.0370427	.0055808	9.9252616E+02		9.9797868E+05
.0343559	.0349488	-.0012881	.0018476	9.9874643E+02	
.0055478	-.0013798	.0419025	.0002332	-.0000637	9.9898883E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 2

7.6105407E+13	-1.6283194E+13	4.5017313E+12	3.1528212E+08	-3.0292179E+08	1.3215736E+07
	3.5987853E+12	2.2521128E+12	-6.7717793E+07	6.7951823E+07	1.0692555E+07
8.7238413E+06		9.9558393E+13	1.7985515E+07	7.3710470E+07	4.1820160E+08
-.9842692	1.6970465E+06		9.9762234E+05	-1.3568203E+03	5.4543046E+01
.0517169	.1183798	9.9778952E+06		9.8498580E+05	5.4767227E+01
.0362981	-.0357389	.0018047	9.9881046E+02		9.9797595E+05
-.0349871	.0360918	.0074435	-.0013688	9.9246451E+02	
.0015164	.0056421	.0419553	.0000547	.0000552	9.9898746E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 2

5.0341812E+12	1.9042550E+13	2.9387430E+12	8.3963136E+07	7.6918836E+07	1.2424516E+07
	7.4159327E+13	-2.9536373E+12	3.1664063E+08	2.9974748E+08	-1.1871329E+07

2.2436981E+06		1.0005908E+14	5.5405890E+07	-1.2868154E+07	4.1872493E+08
.9854816	8.6121616E+06		9.8511097E+05	1.8314611E+03	2.3123278E+02
.1309390	-.0342860	1.0002953E+07		9.9749443E+05	-6.3530635E+01
.0377035	.0370435	.0055507	9.9252757E+02		9.9797868E+05
.0343252	.0348488	-.0012881	.0018476	9.9874643E+02	
.0055431	-.0013798	.0419025	.0002332	-.0000637	9.9898883E+02

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 3

5.0629232E+13	-3.6557197E+13	8.4278945E+12	1.4277494E+08	-4.9555185E+08	3.5499598E+07
	7.2805002E+13	6.4011415E+12	3.4237504E+07	1.1819530E+09	2.7160446E+07
7.1154221E+06		9.8986190E+13	6.1108247E+07	1.3776983E+08	4.1398887E+08
-.6021277	8.5326433E+06		9.9620641E+05	-1.7982528E+03	2.5247148E+02
.1190505	.0754026	9.9491804E+06		1.0037179E+06	5.7554781E+02
.0201037	.0040202	.0061537	9.9810141E+02		9.9796212E+05
-.0695155	.1392645	.0138217	-.0017983	1.0018572E+03	
.0049942	.0031864	.0416528	.0002532	.0005751	9.9898054E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 3

5.8638558E+13	3.8077557E+13	7.8605884E+12	1.0612888E+09	1.4011883E+08	3.3304398E+07
	6.4795676E+13	-7.0862562E+12	6.6990658E+08	2.6343999E+08	-2.9811547E+07
7.6575818E+06		9.8986190E+13	1.4674912E+08	-3.4343804E+07	4.1398887E+08
.6177334	8.0436383E+06		1.0027977E+06	3.8494283E+03	6.1253480E+02
.1031754	-.0884818	9.9491804E+06		9.9712662E+05	-1.4070627E+02
.1383996	.0831058	.0147293	1.0013979E+03		9.9796212E+05
.0183243	.0327741	-.0034568	.0030496	9.9856228E+02	
.0043536	-.0037072	.0416528	.0006123	-.0001411	9.9898054E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 3

5.0630830E+13	-3.6555984E+13	8.4276196E+12	1.4278605E+08	-4.9552519E+08	3.5498540E+07
	7.2806923E+13	6.4009328E+12	3.4245938E+07	1.1819727E+09	2.7159649E+07
7.1155344E+06		9.8986237E+13	6.1106336E+07	1.3776539E+08	4.1398905E+08
-.6020944	8.5325973E+06		9.9620649E+05	-1.7980722E+03	2.5246418E+02
.1190447	.0753997	9.9491827E+06		1.0037183E+06	5.7553082E+02
.0201050	.0040211	.0061535	9.9810144E+02		9.9796212E+05
-.0695108	.1382659	.0138212	-.0017982	1.0018574E+03	
.0049940	.0031863	.0416528	.0002532	.0005751	9.9898054E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 3

5.8639947E+13	3.8075304E+13	7.8603321E+12	1.0613136E+09	1.4011235E+08	3.3303411E+07

	6.4737806E+13	-7.0860351E+12	6.6988348E+08	2.6344511E+08	-2.9810664E+07
7.6576725E+06		9.8986237E+13	1.4674439E+08	-3.4341956E+07	4.1398985E+08
.6177004	8.0497084E+06		1.0027981E+06	3.0493235E+03	6.1251675E+02
.1031708	-.0884781	9.9491527E+06		9.9712664E+05	-1.4070227E+02
.1384013	.0831022	.0147288	1.0013981E+03		9.9796212E+05
.0183233	.0327744	-.0034567	.0030495	9.9856229E+02	
.0043535	-.0037071	.0416528	.0006123	-.0001410	9.9898054E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

8.9345990E+06	-1.0596512E+07	2.6064191E+06	-5.7085902E+05	6.7375314E+05	-1.3448435E+05
-1.0831504E+08	1.2823172E+08	-2.9982556E+07	1.1551890E+05	-1.5208875E+05	2.8172856E+04
-2.4000922E+06	2.8437946E+06	-6.8108335E+05	1.3843679E+04	-1.7347943E+04	8.0536665E+03
2.4704883E+01	-2.9352397E+01	7.6393884E+00	1.5411378E+01	-1.8101439E+01	3.2920418E+00
-1.9641803E+03	2.3264094E+03	-5.5121137E+02	-3.5973200E+01	4.0461576E+01	2.8325075E+00
-4.6799327E+01	5.5381141E+01	-1.2793777E+01	2.2038050E+00	-2.5225904E+00	-3.9131161E-02

CORRELATION

.0000571	-.0031868	-.0000134	.0000014	-.0001103	-.0000026
-.0000593	.0033055	.0000139	-.0000014	.0001145	.0000027
.0000111	-.0005865	-.0000025	.0000003	-.0000206	-.0000005
-.0000991	.0000923	.0000021	.0000234	-.0000549	.0000033
.0001025	-.0001065	-.0000023	-.0000240	.0000541	-.0000034
-.0000155	.0000150	.0000008	.0000033	.0000029	-.0000080

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-2.9585977E+06	-1.7071423E+08	-3.8553223E+05	2.1637573E+04	2.2444095E+05	-6.0226233E+03
-4.2530105E+05	-7.8662167E+06	-1.4692637E+05	4.4653358E+04	8.8274587E+05	-2.0269566E+04
6.5781894E+04	1.2632631E+06	-2.4304708E+03	-2.4454433E+03	-5.6316699E+04	5.9439000E+03
-1.6285789E+02	-3.0901438E+03	-1.4150869E+01	-1.4279296E+00	-5.3534847E+01	1.2191114E+01
3.7535057E+00	7.2419108E+01	-3.1988955E-01	-1.0963108E+00	-2.1573836E+01	3.6749856E-01
2.3497174E-02	-2.5852197E-01	3.8244596E-01	2.4532861E-01	6.4853808E+00	-9.6722833E-01

CORRELATION

-.0013488	-.0000167	.0000022	-.0000554	.0000013	.0000000
-.0028138	-.0000338	.0000047	-.0001150	.0000027	-.0000000
-.0000064	-.0000006	-.0000000	-.0000005	-.0000000	.0000000
.0000885	.0000475	-.0000022	-.0000132	-.0000101	.0000023

.0001005	.0001029	-.0000057	-.0000541	-.0000217	.0000065
-.0000027	-.0000024	.0000006	.0000124	.0000004	-.0000010

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

1.7929353E+09	-2.2310125E+09	1.2508071E+09	-4.2283156E+05	7.8356927E+05	-1.1023855E+05
-2.1709684E+10	2.6947660E+10	-1.4682790E+10	-1.6705065E+06	-1.4765808E+06	-2.6216529E+05
-4.8132437E+08	5.9814394E+08	-3.3032415E+08	-2.5820093E+04	-4.6767197E+04	1.5830111E+03
4.9646370E+03	-6.1954654E+03	3.5873131E+03	1.5822968E+01	-1.7795963E+01	3.3600461E+00
-3.9380451E+05	4.8912853E+05	-2.6849246E+05	-6.8400543E+01	1.6411591E+01	-2.4491887E+00
-9.3774215E+03	1.1633327E+04	-6.2961399E+03	1.4329710E+00	-3.0941809E+00	-1.6421889E-01

CORRELATION

.0008241	-.0458860	-.0001334	.0000199	-.0015910	-.0000376
-.0005701	.0453310	.0002040	-.0000211	.0016768	.0000396
.0003100	-.0157337	-.0000715	.0000078	-.0005849	-.0000136
-.0000734	-.0013329	-.0000039	.0000240	-.0001043	.0000022
.0001131	-.0010325	-.0000052	-.0000236	.0000219	-.0000041
-.0000127	-.0001391	.0000002	.0000034	-.0000025	-.0000002

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-2.7339520E+09	-3.6620775E+10	-8.4749913E+09	2.2333139E+06	-8.1314371E+04	-2.6946647E+05
-1.2979681E+08	-1.6937524E+09	-4.2657753E+08	1.4698314E+05	8.6860064E+05	-3.2641239E+04
2.0074590E+07	2.7073002E+08	6.1238609E+07	-1.8794398E+04	-5.4056464E+04	7.8838342E+03
-4.9700173E+04	-6.6323391E+05	-1.5541071E+05	3.8629511E+01	-5.9072546E+01	7.4095292E+00
1.1454750E+03	1.5511296E+04	3.4602115E+03	-2.0329611E+00	-2.1444342E+01	4.7838349E-01
7.1896143E+00	-3.6703656E+01	9.4110508E+01	2.4743495E-01	6.4850854E+00	-9.6693755E-01

CORRELATION

-.0235277	-.0002910	.0000388	-.0009669	.0000221	.0000001
-.0412113	-.0004966	.0000583	-.0016872	.0000392	-.0000001
-.0083839	-.0001099	.0000136	-.0003475	.0000077	.0000002
.0083125	.0001528	-.0000168	.0003485	-.0000182	.0000022
-.0000354	.0001012	-.0000054	-.0000597	-.0000216	.0000065
-.0001209	-.0000038	.0000008	.0000075	.0000005	-.0000010

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-4.7072220E+07	5.5719171E+07	-1.2973433E+07	-9.5853022E+05	1.1031335E+06	-9.3143039E+04
-3.5747314E+07	4.2308831E+07	-9.8167056E+06	7.6735628E+05	-8.8119579E+05	-1.3701253E+04
8.0924852E+06	-9.5814814E+06	2.2473430E+06	1.3403693E+04	-4.5173460E+03	-6.7029143E+04
-3.2652510E+02	3.8683540E+02	-9.2290060E+01	-2.1487343E+01	2.4755126E+01	-1.5277315E+00
-7.6135239E+02	9.0141211E+02	-2.1116079E+02	5.5762458E+00	-6.4083330E+00	-5.7775986E-01
3.0752677E+01	-3.6479753E+01	9.0181460E+00	2.3323757E+00	-2.6832796E+00	1.3464129E-01

CORRELATION

-.0003688	-.0002336	.0000453	-.0000182	-.0000424	.0000017
.0003825	.0002422	-.0000470	.0000189	.0000439	-.0000018
-.0000676	-.0000426	.0000084	-.0000034	-.0000078	.0000003
-.0002040	.0001362	.0000020	-.0000328	.0000084	.000003
.0002057	-.0001370	-.0000005	.0000329	-.0000085	-.000007
-.0000132	-.0000016	-.0000068	-.0000015	-.0000006	.000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-3.6119072E+06	-6.8997043E+07	-6.9181319E+04	3.1336702E+04	8.5621658E+05	-1.8235477E+05
3.2605450E+06	6.2210135E+07	9.9138303E+04	6.2719971E+04	1.6428049E+06	-1.9951150E+05
6.6836049E+05	1.2723825E+07	3.5376742E+04	-7.3386461E+03	6.6245082E+02	-6.8107833E+04
-6.6810547E+01	-1.2718436E+03	-3.5651900E+00	6.6506855E-02	2.0495404E+00	-1.2271795E+00
1.4944146E+01	2.8159102E+02	2.3602907E+00	1.2980074E+00	3.3492600E+01	-4.4945657E+00
2.5914387E+00	4.8434593E+01	5.9594340E-01	1.3417492E-01	3.5220987E+00	-4.8467717E-01

CORRELATION

-.0001532	.0001367	.0000227	-.0000225	.0000051	.0000009
-.0003329	.0002856	.0000473	-.0000469	.0000104	.0000018
-.0000003	.0000005	.0000001	-.0000001	.0000001	.0000000
.0000375	.0000714	-.0000068	.0000006	.0000119	.0000012
.0001122	.0002048	.0000001	.0000021	.0000337	.0000035
-.0000240	-.0000250	-.0000069	-.0000012	-.0000045	-.0000005

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-9.4338096E+09	1.1707609E+10	-6.3640370E+09	-1.7344136E+06	5.2775640E+05	-2.1919405E+05
-7.1635924E+09	8.8857466E+09	-4.8224169E+09	1.7832682E+05	-1.3179879E+06	-1.0934715E+05
1.6221027E+09	-2.0137731E+09	1.0991525E+09	1.4688048E+05	9.4469452E+04	-4.5321068E+04

-6.5476689E+04	8.1352974E+04	-4.4829563E+04	-2.6881528E+01	2.0754286E+01	-2.4072221E+00
-1.5260734E+05	1.8944432E+05	-1.0332328E+05	-6.9801579E+00	-1.5720116E+01	-2.6195112E+00
6.1720029E+03	-7.6819708E+03	4.3192140E+03	2.8421303E+00	-2.3050970E+00	2.1819919E-01

CORRELATION

-.0053160	-.0033663	.0006537	-.0002630	-.0006108	.0000246
.0055981	.0035444	-.0006887	.0002773	.0006434	-.0000262
-.0019337	-.0012219	.0002389	-.0000971	-.0002230	.0000093
-.0003689	.0000316	.0000223	-.0000408	-.0000105	.0000043
.0000984	-.0002049	.0000126	.0000276	-.0000208	-.0000031
-.0000310	-.0000129	-.0000046	-.0000024	-.0000026	.0000002

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.1022504E+09	-1.4794515E+10	-3.4006298E+09	9.2481217E+05	7.3269624E+05	-2.8865861E+05
9.9505863E+08	1.3342984E+10	3.0768329E+09	-7.4310476E+05	1.7542074E+06	-1.0358416E+05
2.0396584E+08	2.7297776E+09	6.3352011E+08	-1.7220284E+05	2.3454186E+04	-4.8460640E+04
-2.0388803E+04	-2.7286356E+05	-6.3333280E+04	1.6546038E+01	-2.2868040E-01	-3.1911187E+00
4.5606331E+03	6.0430028E+04	1.4460859E+04	-2.3557267E+00	3.3997695E+01	-4.0569125E+00
7.9086116E+02	1.0424517E+04	2.5428107E+03	-4.9554400E-01	3.6091494E+00	-4.0898026E-01

CORRELATION

-.0027793	.0023868	.0003958	-.0003931	.0000882	.0000153
-.0048782	.0041853	.0006928	-.0006880	.0001530	.0000263
-.0009857	.0008484	.0001413	-.0001404	.0000321	.0000056
.0010814	-.0008266	-.0001550	.0001479	-.0000211	-.0000040
.0000960	.0002187	.0000024	-.0000002	.0000342	.0000036
-.0000380	-.0000130	-.0000049	-.0000032	-.0000041	-.0000004

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

3.1709093E+13	-7.0437679E+12	-6.0675963E+12	1.2982352E+08	-1.3570345E+08	-2.7988726E+07
2.3788979E+13	-5.2853328E+12	-4.6791397E+12	1.0170649E+08	-9.7512713E+07	-2.1305368E+07
-5.4229338E+12	1.2042102E+12	1.0245682E+12	-2.2138259E+07	2.2273272E+07	4.7706077E+06
2.2762675E+08	-5.0548372E+07	-4.3062959E+07	9.0087824E+02	-8.6890320E+02	-2.0952304E+02
5.1910930E+08	-1.1537144E+08	-1.0112271E+08	2.1737610E+03	-2.1477007E+03	-4.5707086E+02
-2.1875391E+07	4.8618707E+06	4.2641136E+06	-9.8858506E+01	9.3499668E+01	1.8132437E+01

CORRELATION

.5108290	.3195837	-.0624798	.0261421	.0593944	-.0025101
-.5224418	-.3271035	.0638776	-.0267280	-.0607751	.0025685
-.0854628	-.0549602	.0103208	-.0043240	-.0101159	.0004278
.0182671	.0119339	-.0022278	.0009037	.0021723	-.0000991
-.0192156	-.0115150	.0022557	-.0008772	-.0021600	.0000943
-.0039375	-.0024995	.0004800	-.0002061	-.0004567	.0000182

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-7.7038152E+12	-2.9331922E+13	-3.0946338E+12	-1.2612934E+08	-1.2118719E+08	-1.2869571E+07
7.0200599E+12	2.6802400E+13	2.6861559E+12	1.1953547E+08	1.0570563E+08	1.1696893E+07
1.4244650E+12	5.4397275E+12	5.3697096E+11	2.3170555E+07	2.1596085E+07	2.3862947E+06
-1.4528942E+08	-5.5441033E+08	-5.7692753E+07	-2.3652476E+03	-2.2481974E+03	-2.4034054E+02
3.3283377E+07	1.2717354E+08	1.2047332E+07	4.7293946E+02	4.7016263E+02	6.5628846E+01
5.7537103E+06	2.1953896E+07	2.2966167E+06	9.7430944E+01	9.6399917E+01	7.6318236E+00

CORRELATION

-.4487632	.3890160	.0638557	-.0647188	.0148681	.0025692
-.4456811	.3856208	.0634560	-.0642854	.0147880	.0025518
-.0404007	.0333600	.0053355	-.0057595	.0012062	.0002298
-.0165952	.0149616	.0023464	-.0023797	.0004772	.0000983
-.0158456	.0131482	.0021734	-.0022479	.0004714	.0000966
-.0016823	.0014546	.0002401	-.0002402	.0000658	.0000076

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

3.1708788E+13	-7.0400897E+12	-6.0675145E+12	1.2982267E+08	-1.3563666E+08	-2.7987139E+07
2.3785748E+13	-5.2857404E+12	-4.6791277E+12	1.0170585E+08	-9.7462013E+07	-2.1304163E+07
-5.4228814E+12	1.2035774E+12	1.0245541E+12	-2.2138113E+07	2.2261783E+07	4.7703346E+06
2.2762463E+08	-5.0522799E+07	-4.3062391E+07	9.0087235E+02	-8.6843889E+02	-2.0551200E+02
5.1910437E+08	-1.1531191E+08	-1.0112139E+08	2.1737473E+03	-2.1466199E+03	-4.5704517E+02
-2.1875131E+07	4.8594540E+06	4.2640600E+06	-9.8857949E+01	9.3455788E+01	1.8131394E+01

CORRELATION

.5108159	.3195785	-.0624791	.0261419	.0593938	-.0025101
-.5215451	-.3255439	.0637589	-.0266830	-.0606723	.0025642
-.0854603	-.0549591	.0103207	-.0043240	-.0101158	.0004278
.0182657	.0119337	-.0022278	.0009037	.0021723	-.0000991
-.0192068	-.0115089	.0022545	-.0008767	-.0021589	.0000943

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      -.0039372      -.0024993       .0004800      -.0002061      -.0004567       .0000182


    ORBIT PLNE   FOR   P AND Q  PARAMETERS    VEHICLES    3   AND    2

      COVARIANCE
     -7.7003770E+12 -2.9391763E+13 -3.0946592E+12 -1.2606707E+08 -1.2118864E+08 -1.2869568E+07
      7.0169590E+12  2.6802257E+13  2.6861788E+12  1.1947931E+08  1.0570694E+08  1.1696890E+07
      1.4238306E+12  5.4396981E+12  5.3697565E+11  2.3159065E+07  2.1596353E+07  2.3862941E+06
     -1.4522600E+08 -5.5440740E+08 -5.7693221E+07 -2.3640991E+03 -2.2482243E+03 -2.4034048E+02
      3.3269319E+07  1.2717289E+08  1.2048036E+07  4.7268483E+02  4.7015859E+02  6.5628833E+01
      5.7512874E+06  2.1953784E+07  2.2966346E+06  9.7387060E+01  9.6400943E+01  7.6318213E+00

      CORRELATION
      -.4481783       .3895119       .0637832      -.0646358       .0148492       .0025659
      -.4455734       .3855153       .0634855      -.0642851       .0147879       .0025518
      -.0404006       .0333600       .0053956      -.0057596       .0012062       .0002298
      -.0165858       .0149544       .0023453      -.0023786       .0004769       .0000982
      -.0153456       .0131483       .0021734      -.0022479       .0004714       .0000966
      -.0015823       .0014546       .0002401      -.0002402       .0000658       .0000076

     COVARIANCE MATRICES AT     3.000000000E+01     MINUTES FROM MIDNIGHT OF EPOCH DATE


        ATA(INVERSE) FOR      P      PARAMETERS

      0001 X       0001 Y       0001 Z       0001 DX      0001 DY      0001 DZ      0002 X       0002 Y
      0002 Z       0002 DX      0002 DY      0002 DZ      0003 X       0003 Y       0003 Z       0003 DX
      0003 DY      0003 DZ
0001 X   2.74180E+08
0001 Y  -2.37417E+08 2.61562E+08
0001 Z  -6.54772E+08 2.37305E+08 3.50382E+09
0001 DX -8.69884E+04 3.07262E+04 4.66406E+05 7.26134E+01
0001 DY  5.22055E+04-3.35431E+04-1.89425E+05-3.14774E+01 1.63858E+01
0001 DZ  4.64280E+05-1.97044E+05-2.31868E+06-3.43168E+02 1.43736E+02 1.71392E+03
0002 X  -1.85173E+07 1.56370E+07 4.16309E+07 1.12133E+04-7.75487E+03-3.86454E+04 5.06787E+13
0002 Y  -5.03252E+07 6.64376E+07-1.32954E+07-3.29124E+03-3.08653E+03-1.07060E+03-1.43006E+13 4.16315E+12

0002 Z  -1.71157E+05 1.25592E+06-5.48692E+06-1.46479E+03 7.28113E+02 4.45781E+03 3.62444E+12 2.34449E+12
         9.85472E+13
0002 DX  3.60854E+01-3.37343E+02 1.54137E+03 4.13523E-01-2.07000E-01-1.26241E+00 4.50141E+08-2.20514E+08
         3.29638E+08 8.72337E+05
0002 DY  3.44505E+03-2.84389E+03-8.04082E+03-2.22292E+00 1.52633E+00 7.52866E+00 3.84385E+09-1.08679E+09
```

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           -3.51[illegible]3E+07-3.70372E+04 2.99027E+05
0002 DZ    -4.55852E+01 1.17303E+02-3.13700E+02-3.47468E-02 3.84016E-02 2.48984E-01-1.53085E+08 4.02533E+07
           -7.89603E+07 3.16345E+04 1.41218E+04 9.92108E+05
0003 X     -3.55108E+07 3.76503E+07 3.94439E+07 1.08078E+04-9.44705E+03-4.10669E+04 2.38545E+13-6.74867E+12
           -2.80187E+12-9.38355E+08 1.92545E+09 2.31143E+08 3.02421E+13
0003 Y     -2.10340E+07 3.00351E+07-1.71637E+07-4.61548E+03 5.65540E+01 9.35131E+03 1.29090E+13-4.16280E+12
           -8.14749E+12 1.82341E+09 8.53245E+08-4.43865E+08-2.15923E+13 5.10374E+13
0003 Z      4.70780E+06-6.84365E+06 4.56746E+06 1.17826E+03-7.34020E+01-2.62447E+03-2.97035E+12 9.60224E+11
            1.89887E+12-4.32574E+08-1.95242E+08 1.06393E+08 4.82736E+12 1.12205E+13 9.74309E+13
0003 DX     2.26548E+02 2.89296E+02-3.03924E+03-9.25889E-01 4.48828E-01 2.57250E+00-1.95255E+08 1.84893E+07
           -4.61286E+08 1.73355E+05-2.31394E+04-4.23551E+04 1.48221E+09-2.47399E+09 5.85095E+08 7.55464E+05
0003 DY     2.48501E+02 2.56374E+02-3.00774E+03-9.25977E-01 4.53270E-01 2.56631E+00-2.46944E+08 3.39029E+07
           -4.46317E+08 1.71585E+05-3.29838E+04-4.19965E+04 1.58233E+09-2.35980E+09 5.67950E+08-2.42572E+05
            7.58917E+05
0003 DZ    -6.15863E+01-5.62169E+01 7.06221E+02 1.94413E-01-1.07191E-01-6.03533E-01 5.68677E+07-7.54846E+06
            1.06012E+08-4.07343E+04 7.69474E+03 9.95464E+03-3.80461E+08 5.58212E+08-1.34627E+08 5.74956E+04
            5.72059E+04 9.86+48E+05

               CORRELATION MATRIX


0001 X        1.000
0001 Y        -.887     1.000
0001 Z        -.658      .249     1.000
0001 DX       -.617      .223      .325     1.000
0001 DY        .779     -.512     -.791     -.913     1.000
0001 DZ        .677     -.294     -.946     -.973      .858     1.000
0002 X        -.000      .000      .000      .000     -.000     -.000     1.000
0002 Y        -.001      .002     -.000     -.000     -.000     -.000     -.985     1.000
0002 Z        -.000      .000     -.000     -.000      .000      .000      .051      .116     1.000
0002 DX        .000     -.000      .000      .000     -.000     -.000      .068     -.116      .036     1.000
0002 DY        .000     -.000     -.000     -.000      .001      .000      .987     -.974     -.006     -.073     1.000
0002 DZ       -.000      .000     -.000     -.000      .000      .000     -.022      .020     -.008      .034      .026     1.000

0003 X        -.000      .000      .000      .000     -.000     -.000      .609     -.601     -.051     -.183      .640      .042
              1.000
0003 Y        -.000      .000     -.000     -.000      .000      .000      .254     -.286     -.115      .274      .218     -.062
              -.550     1.000
0003 Z         .000     -.000      .000      .000     -.000     -.000     -.042      .048      .019     -.047     -.036      .011
               .089      .159     1.000
0003 DX        .000      .000     -.000     -.000      .000      .000     -.032      .010     -.053      .214     -.061     -.049
               .310     -.398      .068     1.000
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```
0003 DY       .000      .000     -.000     -.000      .000      .080     -.040      .019     -.052      .211     -.069     -.048
              .330     -.379      .066     -.320     1.000
0003 DZ      -.000     -.000      .000      .000     -.000     -.000      .008     -.004      .011     -.044      .014      .010
             -.070      .079     -.014      .067      .066     1.000

SQRT DIAG    1.655839E+04        1.617287E+04        5.919305E+04        8.521352E+00        4.047937E+00        4.139949E+01
             7.118896E+06        2.040379E+06        9.927094E+06        9.339897E+02        5.468333E+02        9.960463E+02
             5.499283E+06        7.144043E+06        9.870707E+06        8.691744E+02        8.711585E+02        9.932010E+02

PIVOT RATIOS
             1.000000E+00        4.816559E+00        2.595729E+02        1.104760E+01        8.856481E+03        4.384970E+05
             1.084038E+00        1.706543E+03        2.332865E+05        3.553952E+05        9.176784E+08        8.817966E+08
             5.163285E+11        4.367208E+11        9.103338E+10        3.629283E+10        2.861656E+10        2.029161E+09

A PIVOT RATIO EXCEEDS 10**5.
CHECK ATA MATRIX FOR ILL CONDITIONING.


             DPDQ MATRIX

            3  RBIA      3  ALT       3  LONG      3  LAT       2  RBIA      2  ALT       2  LONG      2  LAT
            1  EBIA      1  ABIA      1  RBIA      1  ALT       1  LONG      1  LAT          GM            02,00
0001 X     -1.36186E-07-9.82418E-08-1.07344E-02 2.77248E-02-7.90281E-08-5.34169E-08-1.28714E-02 1.69283E-02
           -3.04655E+05 1.12220E+06 7.04946E-01-3.32361E-01 1.67562E+06-3.88605E+05-7.37786E+08 1.19618E+05
0001 Y      2.42393E-07 1.77291E-07 1.86347E-02-5.04820E-02 2.33144E-07 1.66317E-07 2.80470E-02-4.42651E-02
            7.74029E+05-1.33554E+06 7.17292E-01-7.00006E-01-1.99861E+06 4.68807E+05 9.83876E+08-1.59587E+05
0001 Z      1.30531E-07 1.04323E-07 9.37512E-03-2.42138E-02-7.53989E-08-3.95194E-08-3.99831E-03 1.77770E-02
           -2.25138E+06-5.66948E+05 7.90663E-02 7.00460E-01-2.17880E+01 2.65776E+06-2.39037E+00 3.90565E+04
0001 DX     5.24020E-11 4.36571E-11 3.99190E-06-1.11526E-05-1.41389E-11-7.45217E-12-1.27020E-06 3.95540E-06
           -4.95094E+01 7.98241E+01 1.56679E-05 1.76723E-06 1.22609E+02-1.68258E+01 4.87537E+05-7.90119E+01
0001 DY    -3.35414E-11-3.04562E-11-3.03000E-06 7.44403E-05-3.54277E-12-5.29331E-12-1.12258E-06-1.46189E-07
           -6.01379E+01 6.02504E+01-3.46392E-05 3.89463E-05 1.02787E+02 2.23995E+00-7.78884E+05 1.26362E+02
0001 DZ    -2.26479E-10-1.67423E-10-1.64880E-05 4 52137E-05-1.58214E-11-1.82432E-11-4.33584E-06-5.18667E-07
            9.27173E+00-1.91976E+01 7.74036E-06-1 16702E-05 1.53276E-02 2.88572E+01 1.78814E+05-2.93748E+01
0002 X      1.88921E-01 1.39187E-01 1.43891E+04-4.03207E+04-2.20610E-01-1.60751E-01-2.80761E+04 4.08919E+04
            7.70703E+04-1.10193E+04 1.45223E-01-1.08223E-01-3.43916E+04-2.38224E+04 1.33414E+08-4.29233E+03
0002 Y     -5.59664E-02-4.16028E-02-3.95103E+03 1.18111E+04-4.72274E-01-3.26487E-01-5.96598E+04 9.46643E+04
            2.59128E+05-3.66515E+05 4.69449E-01-3.77849E-01-5.38421E+05 1.52401E+05 1.43130E+08-2.51173E+04
0002 Z     -5.25513E-02-3.93329E-02-3.95516E+03 1.07647E+04 1.87907E-02 1.27759E-02 2.26058E+03-3.89874E+03
            3.12906E+03-1.57148E+04 1.93967E-03-3.13514E-03-2.12576E+04 9.00187E+03 1.37964E+07-5.05363E+03
0002 DX     1.68880E-07 3.60608E-07 6.53070E-03-2.86625E-02 2.57045E-06 2.10727E-06 3.28304E-01-3.78436E-01
           -7.64613E-01 4.36583E+00-2.08567E-06 1.80642E-06 5.72372E+00-2.99631E+00-2.96219E+03 1.29209E+00
0002 DY     1.48873E-05 1.09119E-05 1.11541E+00-3.17868E+00-2.71561E-06-5.92073E-07-3.27181E-01 1.10693E+00
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         -1.48013E+01 5.67442E-01-2.40011E-05 1.00242E-05 4.86647E+00 6.40969E+00-2.33805E+04 2.54448E-01
0002 DZ  -2.02159E-07-1.98434E-07-1.49435E-02 5.38782E-02-9.93411E-07-7.70007E-07-1.25535E-01 1.59639E-01
          3.41740E-01-1.14939E+00 5.58461E-07-5.11778E-07-1.56746E+00 6.65707E-01 1.12404E+03-3.63706E-01
0003 X   -4.52332E-01-3.45528E-01-3.39708E+04 9.50312E+04 2.45970E-01 1.68943E-01 3.07509E+04-4.87076E+04
          1.64714E+05-1.27533E+05 3.04479E-01-2.35827E-01-2.06857E+05 2.24005E+04 9.86071E+07 4.10602E+03
0003 Y   -3.12820E-01-2.35001E-01-2.33405E+04 6.64257E+04 6.25801E-02 3.91121E-02 8.00472E+03-1.48663E+04
          1.11264E+05-1.85811E+05 2.01251E-01-1.64122E-01-2.67674E+05 8.59450E+04 1.26004E+00-2.98046E+00
0003 Z    7.75337E-02 5.98831E-02 6.06188E+03-1.67792E+04-6.11210E-03-3.06940E-03-7.56864E+02 1.71574E+03
         -2.55452E+04 4.29593E+04-4.08348E-02 3.43725E-02 6.23106E+04-1.05604E+04-3.65000E+07 0.27783E+03
0003 DX  -2.85308E-06-2.37326E-06-2.44175E-01 5.30212E-01-7.73917E-06-5.67014E-06-9.75341E-01 1.39904E+00
         -6.21898E-02-6.75362E+00 2.09376E-07-5.39953E-07-8.58990E+00 4.97702E+00 4.75360E+03-2.40246E+00
0003 DY   1.53581E-06 1.06196E-06 8.23593E-02-3.68984E-01-4.02431E-06-3.09770E-06-5.07052E-01 6.53160E-01
         -2.74237E-01-6.62721E+00 8.18641E-07-9.57218E-07-8.28604E+00 5.23600E+00 1.72556E+03-1.04086E+00
0003 DZ   4.76837E-07 3.81470E-07 4.06354E-02-1.10296E-01 1.71264E-06 1.25716E-06 2.15830E-01-3.07555E-01
          8.04524E-02 1.53335E+00 3.27587E-07-1.03958E-07 1.96453E+00-1.09846E+00-1.07498E+03 5.61272E-01
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ATA(INVERSE) FOR P AND Q PARAMETERS

```
0001 X    0001 Y    0001 Z    0001 DX   0001 DY   0001 DZ   0002 X    0002 Y
0002 Z    0002 DX   0002 DY   0002 DZ   0003 X    0003 Y    0003 Z    0003 DX
0003 DY   0003 DZ
```

CORRELATION MATRIX

0001 X	1.000											
0001 Y	-.966	1.000										
0001 Z	.012	-.270	1.000									
0001 DX	.852	-.904	.323	1.000								
0001 DY	.855	-.945	.471	.776	1.000							
0001 DZ	-.053	.087	-.140	-.493	.103	1.000						
0002 X	-.001	.001	-.002	-.001	-.002	-.000	1.000					
0002 Y	-.041	.044	-.016	-.040	-.042	.004	-.984	1.000				
0002 Z	-.000	.000	.000	-.000	-.000	.000	.051	.116	1.000			
0002 DX	.001	-.001	-.000	.001	.001	-.000	.068	-.116	.036	1.000		
0002 DY	.002	-.003	.005	.003	.004	.000	.987	-.973	-.006	-.073	1.000	
0002 DZ	-.000	.000	-.000	-.000	-.000	.000	-.022	.020	-.000	.034	.026	1.000
0003 X	-.006	.007	-.005	-.006	-.007	.001	.609	-.601	-.051	-.183	.640	.042
	1.000											
0003 Y	-.006	.006	-.002	-.006	-.006	.001	.254	-.285	-.115	.274	.218	-.062

```
               -.550    1.000
0003 Z          .001    -.001     .000      .001      .001     -.000     -.042      .048      .019     -.047     -.036      .011
                .089     .159    1.000
0003 DX        -.001     .001     .000     -.001     -.001      .000     -.032      .010     -.053      .214     -.061     -.049
                .310    -.398     .068     1.000
0003 DY        -.001     .001     .000     -.001     -.001      .000     -.040      .019     -.052      .211     -.069     -.048
                .330    -.379     .066     -.320     1.000
0003 DZ         .000    -.000    -.000      .000      .000     -.000      .008     -.004      .011     -.044      .014      .010
               -.070     .079    -.014      .067      .066     1.000

SQRT DIAG       2.331531E+05     3.093228E+05     4.680919E+05     2.062853E+01     1.750148E+01     4.161849E+01
                7.118913E+06     2.042353E+06     9.927094E+06     9.339901E+02     5.468413E+02     9.960463E+02
                5.499440E+06     7.144174E+06     9.870712E+06     8.691755E+02     8.711595E+02     9.932011E+02

            STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT     3.000000000E+01    MMOED

          CARTESIAN    FOR       P      PARAMETERS     VEHICLES     1  AND    1
            1.9378948E+08 -1.8778916E+08 -9.2356584E+07  4.2205168E+04 -3.3341856E+03 -1.5358588E+05
                           1.9162336E+08  9.1805733E+06 -2.4879282E+04 -5.0279636E+03  6.4513164E+04
            1.3920829E+04                 7.1258805E+08 -1.5345976E+05  7.0338859E+04  7.7506512E+05
            -.9744986      1.3842809E+04                 7.2405166E+01 -3.1832935E+01 -3.4423029E+02
            -.2485329       .0243443      2.6694345E+04                 1.6839958E+01  1.4584082E+02
             .3562999      -.2112170      -.6756013      8.5091225E+00                 1.7256827E+03
            -.0583652      -.0885110       .6421342      -.9116359      4.1036518E+00
            -.2655849       .1121873       .6989377      -.9738315       .8555160      4.1541338E+01

          ORBIT PLNE   FOR       P      PARAMETERS     VEHICLES     1  AND    1
            7.5416975E+06  1.8191153E+07  6.8709125E+07  5.9283546E+03 -2.2023952E+03  7.5866952E+04
                           3.6526704E+08 -1.2824916E+07 -2.4087103E+04  2.3470338E+03 -1.9970407E+04
            2.7462151E+03                 7.2519215E+08  7.5337464E+03 -2.4320681E+04  8.0396694E+05
             .3465935      1.9111961E+04                 1.7323869E+01 -4.0186420E+00  1.6865922E+02
             .3290804      -.0249185      2.6929392E+04                 7.9231670E+00 -4.9077642E+01
             .5186533      -.3028007       .6721435      4.1621952E+00                 1.7896808E+03
            -.2849125       .0436279      -.3208483      -.3430105      2.8148121E+00
             .6530257      -.0246998       .7057061       .9578552      -.4121416      4.2304619E+01

          CARTESIAN    FOR  P AND Q  PARAMETERS     VEHICLES     1  AND    1
            6.9493670E+10 -7.1830395E+10  4.2433111E+09  4.2629431E+06  4.4721147E+06 -1.3030894E+06
                           7.7301799E+10 -2.9825505E+10 -4.6071619E+06 -5.0536823E+06  1.4814488E+06
            2.6361652E+05                 2.1202344E+11  1.9324431E+06  3.8624062E+06 -1.1995292E+06
```

-.9800333	2.7803201E+05		3.4519835E+02	2.7106465E+02	-4.3066653E+02
.0349575	-.2329706	4.6046104E+05		3.6431550E+02	3.9940895E+01
.8703673	-.8918757	.2258814	1.8579514E+01		1.7619041E+03
.8887948	-.9523012	.4394679	.7643631	1.9087051E+01	
-.1177634	.1259406	-.0620523	-.5522244	.0498526	4.1975041E+01

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 1 AND 1

2.6202313E+09	1.1432274E+10	2.1031839E+10	-7.5854122E+05	-1.6429767E+05	-1.5345161E+05
	1.5434906E+11	3.3389114E+10	-9.8017970E+06	-6.6493119E+05	-1.8663139E+06
5.1188135E+04		2.0124362E+11	-2.4816375E+06	-1.3476150E+05	-5.6679600E+05
.5673726	3.9363569E+05		6.3680297E+02	4.0897672E+01	2.8767719E+02
.9158828	.1830788	4.4860854E+05		1.7995868E+01	-3.5179945E+01
-.5872281	-.9857535	-.2192140	2.5234955E+01		1.8166191E+03
-.7566154	-.3981950	-.7081282	.3820407	4.2421537E+00	
-.0703347	-.1112393	-.0296434	.2674675	-.1945704	4.2621815E+01

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 2

5.4232313E+13	-8.0642703E+12	3.9686477E+12	1.5211476E+09	3.4773012E+09	-1.4371358E+08
	1.2933865E+12	2.4813391E+12	-2.1902841E+08	-5.2168989E+08	4.5161370E+07
7.3642592E+06		9.9779704E+13	3.4338042E+08	1.0481017E+08	7.6011696E+08
-.9625553	1.1375362E+06		8.5404882E+05	-7.6397188E+04	2.9573657E+04
.0539501	.2183734	9.9889791E+06		2.6136268E+05	1.4363980E+04
.2235120	-.2083502	.0371974	9.2414762E+02		9.8564079E+05
.9235150	-.8970681	.0205239	-.1617016	5.1123642E+02	
-.0196556	.0339892	.0766479	.0322353	.0283005	9.9279444E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 2

3.6829691E+12	1.3463305E+13	3.9702101E+12	-8.2344615E+08	4.5444216E+08	7.1922790E+07
	5.1631479E+13	-6.9103222E+11	-3.2118127E+09	1.8109750E+09	1.5259108E+08
1.9191063E+06		9.9991558E+13	3.8165580E+08	-4.5264635E+08	7.7204580E+08
.9763272	7.1855048E+06		2.8421278E+05	1.3576694E+05	2.2111891E+04
.2068868	-.0096174	9.9995779E+06		8.2789488E+05	-2.2259905E+04
-.8048489	-.8384383	.0715926	5.3311611E+02		9.8894463E+05
.2602507	.2759922	-.0497496	.2798882	9.0988729E+02	
.0375851	.0213543	.0776382	.0417079	-.0246008	9.9445695E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 2

5.4232538E+13	-8.0635165E+12	3.9686515E+12	1.5211418E+09	3.4772715E+09	-1.4371197E+08
	1.3017608E+12	2.4816414E+12	-2.1911644E+08	-5.2169022E+08	4.5184722E+07

7.3642744E+06		9.9779717E+13	3.4377671E+08	1.8481321E+08	7.6011794E+08
-.9595855	1.1409473E+06		8.5404987E+05	-7.6397725E+04	2.9573381E+04
.0539502	.2177471	9.9889798E+06		2.6136848E+05	1.4364187E+04
.2235106	-.2078106	.0371970	9.2414819E+02		9.8564067E+05
.9235960	-.8943767	.0205243	-.1617088	5.1124218E+02	
-.0196564	.0338902	.0766479	.0322329	.8283004	9.9279447E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 2

3.6905235E+12	1.3461816E+13	3.9703971E+12	-8.2343386E+08	4.5453006E+08	7.1938398E+07
	5.1631930E+13	-6.9106564E+11	-3.2117847E+09	1.8189572E+09	1.5258771E+08
1.9210735E+06		9.9991562E+13	3.8165557E+08	-4.5264418E+08	7.7204618E+08
.9752153	7.1855362E+06		2.8421865E+05	1.3576699E+05	2.2111861E+04
.2066847	-.0096179	9.9995781E+06		8.2789591E+05	-2.2259723E+04
-.8040045	-.8384187	.0715920	5.3312168E+02		9.8894466E+05
.2600344	.2759881	-.0497493	.2798853	9.0938785E+02	
.0375557	.0213538	.0776382	.0417074	-.0246006	9.9445697E+02

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 3

3.7245357E+13	-2.3810105E+13	5.3646343E+12	2.3848586E+09	8.6035994E+08	-3.2538613E+08
	4.6287769E+13	1.3549892E+13	-2.5138399E+09	-2.8103371E+08	5.4426187E+08
6.1029793E+05		9.8460349E+13	7.0947847E+08	9.2211095E+08	7.8328052E+08
-.5734378	6.8035115E+06		6.9611045E+05	-2.9547439E+05	5.7171170E+04
.0885855	.2007114	9.9227188E+06		7.2506712E+05	5.8256413E+04
.4683604	-.4428589	.0856378	8.3433234E+02		9.8897333E+05
.1655576	-.0455105	.1091348	-.4159026	8.5158873E+02	
-.0538173	.0807693	.0715598	.0691846	.0690758	9.9044898E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 3

4.0403480E+13	2.4137076E+13	1.4101305E+13	-4.4124417E+09	2.1674425E+09	5.0864285E+08
	4.3131646E+13	-3.6762375E+12	-1.2067573E+09	2.5450611E+09	3.8918487E+08
6.3563732E+06		9.8460349E+13	1.8015768E+09	-5.9282378E+08	7.8328052E+08
.5796429	6.5673927E+06		6.5327743E+05	2.9822430E+05	6.4779147E+04
.2235824	-.0554140	9.9227188E+06		7.6790014E+05	-4.9658983E+04
-.0858857	-.2273412	.1248834	8.0825579E+02		9.8097333E+05
.3891220	.4422347	-.0680857	.4097628	8.7629912E+02	
.0795224	.0598198	.0715598	.0809204	-.8572159	9.9044098E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 3

3.7248213E+13	-2.3808235E+13	5.3642157E+12	2.3848819E+09	8.6043756E+08	-3.2531024E+08

	4.6289908E+13	1.3549412E+13	-2.5137905E+09	-2.8093463E+08	5.4425434E+08
6.1031314E+06		9.8460456E+13	7.0946735E+08	9.2208869E+08	7.0328222E+08
-.5733652	6.3035687E+06		6.9611223E+05	-2.9547162E+05	5.7170863E+04
.0885773	.2005995	9.9227242E+06		7.2507207E+05	5.8255964E+04
.4683543	.4428394	.0836953	8.3433341E+02		9.8097338E+05
.1655679	-.0484922	.1091318	-.4158968	8.5151164E+02	
-.0538156	.0807663	.0715500	.0691841	.0690750	9.9044100E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 3

4.0406066E+13	2.4195296E+13	1.4101377E+13	-4.4113075E+08	2.1674032E+09	5.0063408E+08
	4.3132055E+13	-3.6759404E+12	-1.2068248E+09	2.5450780E+09	3.8910804E+08
6.3565756E+06		9.8460456E+13	1.0015534E+09	-5.9201545E+08	7.0328222E+08
.5795723	6.5674999E+06		6.5328301E+05	2.9022200E+05	6.4778664E+04
.2235668	-.0564076	9.9227242E+06		7.6790130E+05	-4.9658733E+04
-.0858605	-.2273492	.1248799	8.0825925E+02		9.8097338E+05
.3891022	.4422301	-.0680847	.4097575	8.7629978E+02	
.0795186	.0538193	.0715500	.0809194	-.0572156	9.9044100E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

3.1232090E+06	2.9449001E+05	-2.9135322E+07	1.1909740E+04	-8.1240811E+03	-4.0640668E+04
-5.7815657E+07	5.3950272E+07	-5.3566248E+06	-6.9105460E+03	-1.5820805E+03	1.2684075E+04
-3.1591471E+06	2.9093619E+06	2.7709021E+06	-1.5894972E+03	7.7654782E+02	4.8814804E+03
8.1295620E+02	-7.7942765E+02	-4.5706182E+02	3.0540392E-01	-1.2608278E-01	-8.9877067E-01
-1.6500722E+03	1.0481929E+03	5.3717277E+03	-2.3378132E+00	1.4914903E+00	7.6940044E+00
-2.1045612E+02	2.0354249E+02	1.0370347E+02	-7.3030366E-02	2.8508172E-02	2.1078724E-01

CORRELATION

.0000305	-.0036511	-.0000227	.0000632	-.0002319	-.0000152
.0000029	.0038091	.0000210	-.0000609	.0001481	.0000148
-.0001482	-.0001764	.0000104	-.0000185	.0003936	.0000039
.0001901	-.0007139	-.0000187	.0000388	-.0005374	-.0000086
-.0002688	-.0003389	.0000189	-.0000332	.0007109	.0000070
-.0001328	.0002684	.0000118	-.0000234	.0003623	.0000051

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-3.2101955E+06	-8.2249597E+07	1.2148580E+07	6.4650181E+03	-2.4010691E+03	1.7431795E+04

3.2847022E+06	1.1240000E+07	2.8084919E+07	2.5264149E+03	-6.8370488E+03	4.1128104E+04
-3.5453554E+04	-2.1195159E+06	8.0711496E+05	2.2524963E+02	-1.8921858E+02	1.2019700E+03
4.8391383E+02	-1.0633869E+03	5.6521594E+03	6.9654083E-01	-1.3624322E+00	8.0928454E+00
-4.3420236E+01	-9.4392402E+02	7.0660722E+01	6.7854990E-02	-1.0115450E-02	1.1438717E-01
-1.1312092E+01	-1.6093321E+02	-2.8776739E+01	6.7724037E-03	8.0499974E-03	-4.1385660E-02

CORRELATION

-.0005031	.0001665	-.0000013	.0003305	-.0000174	-.0000041
-.0022425	.0000818	-.0000111	-.0001050	-.0000543	-.0000085
.0002351	.0001451	.0000030	.0003937	.0000029	-.0000011
.0008094	.0007845	.0000054	.0003139	.0000179	.0000016
-.0004445	-.0003380	-.0000067	-.0009079	-.0000039	.0000029
.0002147	.0001353	.0000028	.0003588	.0000030	-.0000010

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-1.3072635E+09	2.1359723E+09	-6.6122571E+09	-1.2402219E+05	-2.0094045E+05	3.9787840E+04
-2.2436245E+10	2.4484244E+10	-1.2137929E+10	-1.4625283E+06	-1.6254091E+06	4.8064544E+05
-9.6219838E+08	9.7711148E+08	8.6431540E+07	-5.8759995E+04	-5.8768303E+04	1.9494230E+04
2.6993597E+05	-2.8155152E+05	3.8531765E+04	1.6887681E+01	1.7622769E+01	-5.5625344E+00
-1.6868081E+05	4.5522667E+04	1.0621093E+06	-3.2982160E+00	8.4643878E+00	8.4311686E-01
-7.1151417E+04	7.4590888E+04	-1.3059782E+04	-4.4690406E+00	-4.6981252E+00	1.4661769E+00

CORRELATION

-.0006734	-.0745954	-.0003654	.0011080	-.0012516	-.0002719
.0010432	.0771838	.0003518	-.0010962	.0003203	.0002702
-.0019500	-.0231040	.0000188	.0000905	.0045118	-.0000286
-.0009054	-.0653929	-.0003166	.0009835	-.0003472	-.0002423
-.0014295	-.0746377	-.0003082	.0009991	.0008674	-.0002479
.0001285	.0100362	.0000465	-.0001434	.0000393	.0000352

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-2.3483103E+09	-3.4215789E+10	-5.5318356E+09	2.1612656E+06	1.3376933E+05	4.1591467E+05
1.0115464E+09	6.9751266E+09	6.6956334E+09	-4.4987975E+05	-6.8392068E+04	-6.8014209E+04
-4.9714549E+07	-8.4327316E+08	-5.1046140E+07	5.3131244E+04	2.5493703E+03	1.0595635E+04
1.0160626E+05	-1.1027380E+04	1.0679947E+06	-1.1199628E+00	-7.8125594E+00	2.8602480E+00
-2.8950820E+04	-3.9853282E+05	-8.0973104E+04	2.5223731E+01	1.6773461E+00	4.8419719E+00
-5.8540882E+03	-7.1116741E+04	-2.1668442E+04	4.5093504E+00	3.5281451E-01	8.3781869E-01

CORRELATION

-.0238804	.0027502	-.0000371	.0037233	-.0006216	-.0001150
-.0452468	.0024664	-.0002142	-.0000525	-.0011135	-.0001817
-.0064189	.0020771	-.0000114	.0044656	-.0001984	-.0000486
.0445822	-.0024810	.0002106	-.0000832	.0010985	.0001797
.0164144	-.0022437	.0000525	-.0034545	.0004346	.0000836
.0050796	-.0002221	.0000249	.0001259	.0001249	.0000198

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.8155415E+07	2.2403560E+07	-3.1441182E+07	9.4384103E+03	-8.7797011E+03	-3.6094135E+04
-3.1930248E+07	3.2469390E+07	2.5006973E+06	-5.8862105E+03	6.2647240E+02	1.4014430E+04
7.2395136E+06	-7.3253214E+06	-8.6192885E+05	1.4623386E+03	-2.2015746E+02	-3.7037926E+03
-1.2687544E+03	1.0757745E+03	1.8883336E+03	-9.3378403E-01	5.2499057E-01	2.9673554E+00
-1.8737562E+03	1.7466359E+03	1.4683316E+03	-8.5921878E-01	4.0581661E-01	2.5799959E+00
2.2010438E+02	-1.8054485E+02	-3.7750439E+02	1.8071642E-01	-1.0520995E-01	-5.7435009E-01

CORRELATION

-.0002137	-.0033371	.0000524	-.0001092	-.0001581	.0000160
.0002653	.0003448	-.0000533	.0000931	.0001482	-.0000132
-.0001930	.0000138	-.0000033	.0000846	.0000646	-.0000143
.0001817	-.0061017	.0000173	-.0001315	-.0001186	.0000214
-.0003506	.0000224	-.0000054	.0001533	.0001161	-.0000259
-.0001424	.0003496	-.0000090	.0000856	.0000729	-.0000140

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.8796040E+06	-4.8154533E+07	7.1111316E+06	3.7491541E+03	-1.4087183E+03	9.8390697E+03
4.0708517E+06	2.7940878E+07	2.7021943E+07	1.3369839E+03	-6.6890432E+03	3.9255811E+04
2.7938005E+05	3.9912867E+06	-2.6314635E+06	-9.2257022E+02	5.5496434E+02	-3.8400340E+03
7.5987196E+01	-2.4121402E+03	2.1344342E+03	3.8671669E-01	-5.0272685E-01	3.0474027E+00
-1.2724545E+02	1.0238537E+03	-1.8987311E+03	-2.7790057E-01	4.5328522E-01	-2.7459871E+00
-2.8814194E+01	2.1453347E+02	-4.2035352E+02	-5.9881533E-02	1.0134343E-01	-5.9979105E-01

CORRELATION

-.0001077	.0002257	.0000103	.0000342	-.0000529	-.0000106
-.0003964	.0002226	.0000527	-.0001562	.0000611	.0000113
.0000415	.0001528	-.0000098	.0000981	-.0000805	-.0000158

.0001417	.0000409	-.0000223	.0001150	-.0000762	-.0000145
-.0000787	-.0003618	.0000199	-.0002210	.0001830	.0000364
.0000366	.0001413	-.0000091	.0000891	-.0000741	-.0000143

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-9.5888520E+09	1.1192143E+10	-1.1247665E+10	-6.6512593E+05	-0.0355705E+05	2.1838300E+05
-1.1928532E+10	1.2872958E+10	-5.2511087E+09	-7.6930121E+05	-0.4270991E+05	2.5208294E+05
2.6795368E+09	-2.0882031E+09	1.1505800E+09	1.7271647E+05	1.8873897E+05	-5.6904837E+04
-3.2072065E+05	3.0054090E+05	2.3016841E+05	-1.0177074E+01	-1.5040705E+01	5.9550021E+00
-5.8692160E+05	5.9899544E+05	2.7939600E+04	-3.5947322E+01	-3.6327432E+01	1.1715756E+01
5.1360163E+04	-4.6009381E+04	-5.5700899E+04	2.7895226E+00	2.2222067E+00	-0.9428201E-01

CORRELATION

-.0059599	-.0056508	.0010244	-.0014502	-.0026147	.0001967
.0065958	.0068052	-.0010469	.0012956	.0025301	-.0001671
-.0040024	-.0015762	.0002518	.0006199	.0000713	-.0001223
-.0058657	-.0050065	.0009360	-.0011727	-.0022722	.0001516
-.0068980	-.0064893	.0009965	-.0009947	-.0022351	.0001175
.0008525	.0008824	-.0001356	.0001701	.0003278	-.0000215

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.3652682E+09	-2.0015227E+10	-3.1479570E+09	1.2640391E+06	7.7789851E+04	2.4249670E+05
1.5311329E+09	1.4049993E+10	8.1955842E+09	-8.9739305E+05	-9.8561522E+04	-1.5405704E+05
2.5948243E+08	4.0713392E+09	4.4981908E+08	-2.5683337E+05	-1.4303279E+04	-5.0211404E+04
-2.5822972E+04	-8.6223096E+05	2.0917799E+05	5.3069577E+01	8.1263956E-01	1.1342264E+01
-1.2095153E+04	2.8987493E+05	-2.8701045E+05	-1.7699408E+01	1.3286231E+00	-4.4402149E+00
-3.2930006E+03	5.8256275E+04	-6.6786493E+04	-3.5504179E+00	3.3208189E-01	-8.9645641E-01

CORRELATION

-.0041959	.0045545	.0005109	-.0006241	-.0002696	-.0000650
-.0079991	.0054340	.0010423	-.0027101	.0008380	.0001494
-.0011039	.0027817	.0001011	.0005769	-.0087301	-.0001503
.0078802	-.0054148	-.0010257	.0026411	-.0003004	-.0001421
.0028818	-.0035377	-.0003417	.0002370	.0003574	.0000790
.0008951	-.0005504	-.0001187	.0003292	-.0001109	-.0000212

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

2.2099148E+13	-3.4395954E+12	-3.3545699E+12	-8.2197762E+08	1.7413755E+09	1.8014646E+08
1.6565361E+13	-2.8034893E+12	-9.9709359E+12	2.0249311E+09	7.2744922E+08	-4.3770901E+08
-3.7197699E+12	6.3182045E+11	2.2769325E+12	-4.7166368E+08	-1.5958532E+08	1.0321171E+08
1.4906768E+07	-1.9471392E+07	-5.5782561E+08	1.9200818E+05	-4.0939931E+04	-4.1525955E+04
4.7325437E+08	-9.3138514E+07	-7.0281540E+08	2.0080918E+05	-1.0478753E+04	-4.3489009E+04
1.8933087E+07	2.9428271E+05	1.0211158E+08	-3.6748088E+04	9.3734118E+03	7.9424510E+03

CORRELATION

.4917049	.3306273	-.0509045	.0024261	.0754704	.0025958
-.4954505	-.3628895	.0559755	-.0205160	-.0961557	.0002612
-.0550267	-.1457183	.0229720	-.0669327	-.0826287	.0103211
-.1157393	.3220593	-.0514352	.2490229	.2551838	-.0401481
.5581215	.2091451	-.0314587	-.0959812	-.0240713	.0185117
.0297320	-.0648027	.0104770	-.0501327	-.0514436	.0080773

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-5.4445418E+12	-1.9471883E+13	8.5829534E+12	7.2253027E+08	-2.0234636E+09	-2.7125238E+08
5.1369829E+12	1.9600803E+13	3.6226599E+11	-1.7454422E+09	-9.0223646E+08	-1.0475984E+08
1.0755021E+12	3.8074465E+12	1.9408642E+12	-1.0774311E+08	4.9247107E+08	6.6711463E+07
-1.6579252E+08	-5.1997125E+08	-7.2071049E+08	-3.9331202E+04	-2.2307450E+05	-2.8941321E+04
1.8166733E+07	-5.1116869E+06	4.6981564E+08	5.7072649E+04	1.6355908E+05	2.0914424E+04
1.5489345E+06	-1.0483846E+07	1.0331038E+08	1.3286883E+04	3.6105381E+04	4.6071216E+03

CORRELATION

-.4463267	.4075830	.0564783	-.1068851	.0108025	.0000149
-.4263255	.4153590	.0534006	-.0895310	-.0008118	-.0014731
-.1350350	.0055164	.0195506	-.0891724	.0536160	.8104312
.2132185	-.4985293	-.0203675	-.0912781	.1221670	.0251636
-.3498633	-.1509871	.0545459	-.3033287	.2051326	.0408641
-.0429119	-.0150404	.0067506	-.0360067	.0239998	.0846775

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

2.2099656E+13	-3.4359649E+12	-3.3544447E+12	-8.2201590E+08	1.7413449E+09	1.8015669E+08
1.6565725E+13	-2.8044183E+12	-9.9708343E+12	2.0248845E+09	7.2745509E+08	-4.3769665E+08

-3.7199508E+12	6.3090745E+11	2.2768961E+12	-4.7165319E+08	-1.5958678E+08	1.0320893E+08
1.4904914E+07	-1.9391267E+07	-5.5782101E+08	1.9200696E+05	-4.0937866E+04	-4.1525639E+04
4.7326349E+08	-9.2952797E+07	-7.0280726E+08	2.0080692E+05	-1.0477024E+04	-4.3488413E+04
1.8933926E+07	2.8074875E+05	1.0211094E+08	-3.6747896E+04	9.3729922E+03	7.9424010E+03

CORRELATION

.4917030	.3306263	-.0509055	.0024258	.0754714	.0025959
-.4934355	-.3612718	.0557274	-.0203600	-.0956767	.0002484
-.0550233	-.1467125	.0229716	-.0669320	-.0826275	.0103210
-.1457424	.3220442	-.0514340	.2490209	.2551799	-.0401478
.5580916	.2031397	-.0314586	-.0959752	-.0240669	.0185107
.0297330	-.0647994	.0104768	-.0501323	-.0514427	.0080773

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-5.4401219E+12	-1.9472752E+13	-8.5828540E+12	7.2253794E+08	-2.0234121E+09	-2.7124325E+08
5.1339354E+12	1.9601572E+13	3.6219315E+11	-1.7454148E+09	-9.0227242E+08	-1.0476644E+08
1.0745013E+12	3.8076181E+12	1.9408418E+12	-1.0774571E+08	4.9246061E+08	6.6709613E+07
-1.6559894E+08	-5.1999950E+08	-7.2070555E+08	-3.9328983E+04	-2.2307227E+05	-2.8940939E+04
1.8099837E+07	-5.1079851E+06	4.6981484E+08	5.7070717E+04	1.6355833E+05	2.0914303E+04
1.5353686E+06	-1.0483338E+07	1.0331001E+08	1.3286445E+04	3.6105230E+04	4.6070975E+03

CORRELATION

-.4454935	.4059175	.0563732	-.1066505	.0107517	.0008069
-.4263290	.4153667	.0534027	-.0895350	-.0008112	-.0014730
-.1350289	.0055152	.0195604	-.0891714	.0536157	.0104311
.2132117	-.4955082	-.0203677	-.0912716	.1221615	.0251625
-.3498430	-.1503905	.0545447	-.3033242	.2051314	.0400639
-.0429091	-.0150412	.0067504	-.0360061	.0239996	.0046775

* *

```
** A BINARY PLOT FILE HAS BEEN GENERATED ON TAPE12
 WITH THE FOLLOWING COMMENTS AND RECORD FORMAT **

WORD   PARAMETER              MIN VALUE       MAX VALUE
  1    TIME(MIN)              0.              3.00000E+01

 ** ATA INVERSE WITH P-PARAMETER EFFECTS **
  2 0001        X             1.65584E+04     1.00000E+07
  3 0001        Y             1.61729E+04     1.00000E+07
  4 0001        Z             5.91930E+04     1.00000E+07
  5 0001        DX            8.52135E+00     1.00000E+03
  6 0001        DY            4.04794E+00     1.00000E+03
  7 0001        DZ            4.13995E+01     1.00000E+03
  8 0002        X             7.11830E+06     1.00000E+07
  9 0002        Y             2.04038E+06     1.00000E+07
 10 0002        Z             9.92709E+06     1.00000E+07
 11 0002        DX            3.33330E+02     1.00000E+03
 12 0002        DY            5.46833E+02     1.00000E+03
 13 0002        DZ            3.96046E+02     1.00000E+03
 14 0003        X             5.49328E+06     1.00000E+07
 15 0003        Y             7.14404E+06     1.00000E+07
 16 0003        Z             9.87071E+06     1.00000E+07
 17 0003        DX            8.69174E+02     1.00000E+03
 18 0003        DY            8.71158E+02     1.00000E+03
 19 0003        DZ            3.93201E+02     1.00000E+03

 * C(X)   P - PARAMETER EFFECTS *
 20   1         X             1.39208E+04     1.00000E+07
 21   1         Y             1.38428E+04     1.00000E+07
 22   1         Z             2.65343E+04     1.00000E+07
 23   1         DX            3.50912E+00     1.00000E+03
 24   1         DY            4.10355E+00     1.00000E+03
 25   1         DZ            4.15413E+01     1.00000E+03

 * C(CP) P - PARAMETER EFFECTS *
 26   1         R             2.74522E+03     1.00000E+07
 27   1         T             1.91120E+04     1.00000E+07
 28   1         C             2.69234E+04     1.00000E+07
 29   1         DR            4.16220E+00     1.00000E+03
 30   1         DT            2.81481E+00     1.00000E+03
 31   1         DC            4.23045E+01     1.00000E+03
```

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```
* C(X)  P - PARAMETER EFFECTS *
32  2        X          7.36426E+06    1.00000E+07
33  2        Y          1.13754E+06    1.00000E+07
34  2        Z          9.97730E+06    1.00000E+07
35  2        DX         9.24148E+02    1.00000E+03
36  2        DY         5.11236E+02    1.00000E+03
37  2        DZ         9.92734E+02    1.00000E+03

* C(CP) P - PARAMETER EFFECTS *
38  2        R          1.91911E+06    1.00000E+07
39  2        T          7.18550E+06    1.00000E+07
40  2        C          9.99358E+06    1.00030E+07
41  2        DR         5.33116E+02    1.00000E+03
42  2        DT         9.09887E+02    1.00000E+03
43  2        DC         9.94457E+02    1.00800E+03

* C(X)  P - PARAMETER EFFECTS *
44  3        X          6.10238E+06    1.00000E+07
45  3        Y          6.80351E+06    1.00000E+07
46  3        Z          9.92272E+06    1.00000E+07
47  3        DX         8.34332E+02    1.00000E+03
48  3        DY         8.51509E+02    1.00185E+03
49  3        DZ         9.90441E+02    1.00000E+03

* C(CP) P - PARAMETER EFFECTS *
50  3        R          6.35637E+06    1.00000E+07
51  3        T          6.56739E+06    1.00000E+07
52  3        C          9.92272E+06    1.00000E+07
53  3        DR         8.08256E+02    1.00140E+03
54  3        DT         8.76239E+02    1.00000E+03
55  3        DC         9.90441E+02    1.00000E+03

** ATA INVERSE WITH P+Q PARAMETER EFFECTS **
56 0001      X          2.33153E+05    1.00000E+07
57 0001      Y          3.09323E+05    1.00000E+07
58 0001      Z          4.68032E+05    1.00000E+07
59 0001      DX         2.06295E+01    1.00000E+03
60 0001      DY         1.75015E+01    1.00000E+03
61 0001      DZ         4.16185E+01    1.00000E+03
62 0002      X          7.11591E+06    1.00000E+07
63 0002      Y          2.04235E+06    1.00000E+07
64 0002      Z          9.92709E+06    1.00000E+07
65 0002      DX         9.33390E+02    1.00000E+03
```

23 CONT'D

66	0002	DY	5.46841E+02	1.00000E+03
67	0002	DZ	9.96046E+02	1.00000E+03
68	0003	X	5.49344E+06	1.00000E+07
69	0003	Y	7.14417E+06	1.00000E+07
70	0003	Z	9.87071E+06	1.00000E+07
71	0003	DX	9.59175E+02	1.00000E+03
72	0003	DY	8.71160E+02	1.00000E+03
73	0003	DZ	9.93201E+02	1.00000E+03
* C(X)	P+C PARAMETER EFFECTS *			
74	1	X	2.43490E+05	1.00000E+07
75	1	Y	2.78032E+05	1.00000E+07
76	1	Z	4.60460E+05	1.00000E+07
77	1	DX	1.85735E+01	1.00000E+03
78	1	DY	1.90871E+01	1.00000E+03
79	1	DZ	4.19750E+01	1.00000E+03
* C(OP)	P+C PARAMETER EFFECTS *			
80	1	P	5.11882E+04	1.00000E+07
81	1	T	3.93536E+05	1.00000E+07
82	1	C	4.48509E+05	1.00000E+07
83	1	DP	2.52350E+01	1.00000E+03
84	1	DT	4.24215E+00	1.00000E+03
85	1	DC	4.26218E+01	1.00000E+03
* C(X)	P+C PARAMETER EFFECTS *			
86	2	X	7.36427E+06	1.00000E+07
87	2	Y	1.14035E+06	1.00000E+07
88	2	Z	9.97790E+06	1.00000E+07
89	2	DX	9.24148E+02	1.00000E+03
90	2	DY	5.11242E+02	1.00000E+03
91	2	DZ	9.92734E+02	1.00000E+03
* C(OP)	P+C PARAMETER EFFECTS *			
92	2	P	1.02107E+06	1.00000E+07
93	2	T	7.18554E+06	1.00000E+07
94	2	C	3.39358E+06	1.00030E+07
95	2	DP	5.33122E+02	1.00000E+03
96	2	DT	3.09848E+02	1.00000E+03
97	2	DC	3.94457E+02	1.00000E+03

23

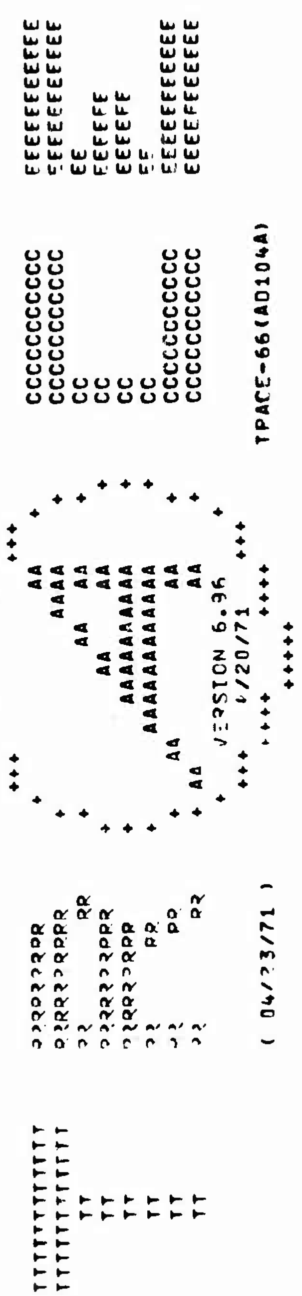
```
 * C(X)  P+C PARAMETER EFFECTS *
  98   3         X           6.10313E+06     1.00000E+07
  99   3         Y           6.80367E+06     1.00000E+07
 100   3         Z           9.92272E+06     1.00000E+07
 101   3         DX          8.34333E+02     1.00000E+03
 102   3         DY          8.51512E+02     1.00185E+03
 103   3         DZ          9.90441E+02     1.00000E+03

 * C(PP) P+C PARAMETER EFFECTS *
 104   3         P           6.35558E+06     1.00000E+07
 105   3         T           6.56750E+06     1.00000E+07
 106   3         C           9.92272E+06     1.00000E+07
 107   3         DP          9.08259E+02     1.00140E+03
 108   3         DT          8.76310E+02     1.00000E+03
 109   3         DC          9.90441E+02     1.00000E+03
```

23

ITEM	DESCRIPTION	REFERENCE SECTION
23	The record formats of TAPE12, containing the square roots of the diagonal elements of the matrices indicated. The minimum and maximum values on the tape for the computations are also printed	2.5.1 [ØPBØX(F)]

C.5 TEST CASE D: MCI SINGLE-VEHICLE EPHEMERIS GENERATION RUN (ITIN = 3)



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MODEL DATA
DITIN 3                                                                                   CARD   1
INFORM1                                                                                   CARD   2
INTERM0                                                                                   CARD   3
IPLANT1                     2    0                     21   1                             CARD   4
 22    .6944444444E-3       23   16.28810076           24   .6944444444E-3                CARD   5
 PLANT                      17   1.                    18   .6944444444E-3                CARD   6
 25    1.                   26   1.                    TAPE7-1                            CARD   7
 PLANT                      16   1.00002516                                               CARD   8   1
TICENM1                    ILNORM1                                                        CARD   9
 SGM   .6802328701E-4       AM   .27249217                                                CARD  10
INTL   1                                                                                  CARD  11
H      LUNAR MODEL                                                                        CARD  12
MTERMS04,60                                                                               CARD  13
D      02,00                     0.                         0.                            CARD  14
 H0    2                    HMIN 2                     HMAX 2                             CARD  15
END                                                                                       CARD  16

****************************************** LUNAR GRAVITY MODEL ******************************************

GM = 6.8023287010E-05 ER**3/MIN**2  = 1.7314002009E+14 FT**3/SEC**2  = 4.9027792902E+12 M**3/SEC**2
          NO NORMALIZATION WITH    1 TERMS.
     N   M       CNM              SNM          **   N    M        CNM               SNM
     2   0   0.              0.                **

****************************************** EARTH GRAVITY MODEL ******************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076538841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
     ***SPHERICAL EARTH***

****************************************** PHYSICAL CONSTANTS ******************************************

GM(ER**3/MIN**2)     =  5.530393500E-03   OMEGE(RAD/MIN)  =  4.375269100E-03  GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)   =  0.                OMEGA(RAD/MIN)  =  4.375269100E-03  GMLNG(DEG)   =  2.910030000E+02
SGM(ER**3/MIN**2)    =  6.802328701E-05   OMEGL(RAD/MIN)  =  0.               AM(ER)       =  2.724921700E-01
ERFT(FT/ER)          =  2.092573800E+07   ERKM(KM/ER)     =  6.378164900E+03  ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)          =  3.280839900E+03   FTNM(FT/NM)     =  6.076115500E+03  AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)     =  3.217400000E+01   DGREE(DEG)      =  5.729577951E+01  SLT          =  2.820176300E+03
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is on the variables associated with a run in the lunar integration mode:	
	PLANT	2.1.3
	ICENM LNØRM, NTL	2.1.2.2
	SGM, AM	2.1.1

```
CKEP                = 1.000000000E-07    F              = 3.352329869E-03  PI           = 3.141592654E+00

***************************************** INPUT/OUTPUT CONVERSION FACTORS ********************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48762300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03

***************************************** INTEGRATION INPUTS *********************************************

  IFORM =   1              ICENT =   1              NSTEP =   2
  NPCMP =   0              IR    =   8              ER     = 1.00000000E-10
  HMIN  = 2.00000000E+00   HMAX  = 2.00000000E+00   HO     = 2.00000000E+00

***************************************** SPECIAL OPTIONS ************************************************

  TAPE2  =    0     TAPE7  =   -1     TELEM  =    0     PTAPE  =    0     NPDOT  =    0
  PRHO   =    0     NODPR  =    0     CLASS  =    0     LEMSP  =    0     PTNS   =10000

***************************************** CRASH ALTITUDE *************************************************

  ECI CRASH ALTITUDE(FT) =   3.000000000E+05          MCI CRASH ALTITUDE(FT) =   3.000000000E+03

ENTER SEGMENT 01 AT   121.7 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS   121.7 CP SECS.,   430.1 PP SECS.

********************************************* VEHICLE DATA ***********************************************

      IVEHID1                                                                          CARD   1
      IYEAR 1967              IMNTH 4                 IDAY  18                         CARD   2
       TZNE 0                  HR   0                  MIN  2.4688333333E3             CARD   3
       SEC  0                                                                          CARD   4
      IICTYP-11                IC   1.10617555345      2    -4.8269172572              CARD   5
       3    -3.3136952336      4    -1.885658509E-3    5    1.010441446E-2             CARD   6
       6    7.05817720489E-3                                                           CARD   7
       PHASE1                                                                          CARD   8
       PTIM 1                  2    2                  3    0                          CARD   9
       4    720.               5    2.8428333333E3                                     CARD  10
       6    30.                7    2876.                                              CARD  11
       6    30.                7    3876.                                              CARD  12
       6    30.                7    800.                                               CARD  13
      DPRCDEX                                                                          CARD  14
      DPRCDE  X      X                                                                 CARD  15
      END                                                                              CARD  16
```

(2)

ITEM	DESCRIPTION	REFERENCE SECTION
2	Card images of the input VEHICLE data. The variables associated with a lunar integration run are emphasized:	
	ICTYP	11.1.4
	PHASE	11.1.6

***** HYPERBOLIC ORBIT. F AND G ELEMENT SET IS UNAVAILABLE AT PRESENT. *****

EPOCH	INITIAL CONDITIONS			
YR/MO/DAY	X,Y,Z,DX,DY,DZ	A,D,B,A,R,V	A,E,I,O,U,TAU	AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC	2.31475398135E+07	2.82907487377E+02	-1.07315621590E+07	0.
1967/ 4/18	-1.01005805572E+08	-3.37887309789E+01	1.09681141984E+00	0.
0.	-6.93415182702E+07	1.77947341526E+02	3.87507025093E+01	0.
0.	-6.57645633490E+02	6.97802462480E+01	3.39391443309E+02	0.
2.46883333330E+03	3.52403882722E+03	1.24685322263E+08	9.09284281807E+01	0.
0.	2.46162611579E+03	4.34867242779E+03	2.88904557605E+03	0.

THE FOLLOWING BODIES ARE USED FOR PLANETARY PERTURBATIONS
MOON

** NO ATMOSPHERE MODEL **

****

****

** PLANETARY TAPE CONSTANTS **

BODY	MASS(EM)	DIST. SCALE FACTOR(ER)	VEL. SCALE FACTOR(ER/MIN)
SUN	3.32951300E+05	2.34548550E+04	1.62881008E+01
MOON	1.22999000E-02	1.00002516E+00	6.94444444E-04
VENUS	8.14979000E-01	1.00000000E+00	1.00000000E+00
MARS	1.07821000E-01	6.94444444E-04	1.00000000E+00
JUPITER	3.17887000E+02	2.34548650E+04	0.
SATURN	9.51290000E+01	2.34548550E+04	0.

*** PLUS ***

NUTATION(RAD) = 1.000000000E+00   NUTATION RATE(RAD/MSDYS) = 6.944444444E-04

3

ITEM	DESCRIPTION	REFERENCE SECTION
3	A table of planetary constants, as preset or input, and of options requiring the planetary ephemeris tape. In this case, the options are moon perturbations and eclipsing	2.1.3 11.3.1.2

```
****************************************** ECLIPSING CONSTANTS ******************************************

RE =  1.00000000E+00      RS =  1.09121800E+02      RM =  2.72506300E-01      ERAU =  2.34548650E+04 4

*******************************************************************************************************
**** PLANETARY EPHEMERIS FILE INITIALIZED WITH    6 BODY(IES). 5

*******************************************************************************************************

ENTER SEGMENT 10 AT    122.3 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .5 CP SECS.,     3.6 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP       0       ICENT       1       IDRAG       0       ALPHG    3.585328504E+00  CD4W 0.
JVEP       0       JNORM       1       IR          8       ALG-DEG  2.054241915E+02  ER   1.000000000E-10
MVEP       0       MAJOR       0       ISRP        0       TJDATE   2.439598500E+06  HMIN 2.000000000E+00
KVEP       0       NMASS       0       NEQS        3       TSTART   2.468833333E+03  HMAX 2.000000000E+00
LVEP       0       NT          0       RECMP       0       TSTOP    3.268833333E+03  HO   2.000000000E+00
ICENTX     1       JNORMX      1       NMASSX      0       FLIGHT   8.000000000E+02  NTX  0.
                                       NASA        0       SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                                * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE        ASSOCIATED QUANTITIES
   2468.8333 TZERO
   3268.8333 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * *     MCI  * * * * * * * * * * * * * * * * * * * *6
SEG12 ENTRY TIME IS   122.45500

     PRECESSION MATRIX FROM MEE-EPOCH TO MEE-DATE
     9.9999999999933E-01      1.0494516030427E-06      4.5619121073485E-07
    -1.0494516030427E-06      9.9999999999944E-01     -2.3937529677164E-13   7
    -4.5619121073485E-07     -2.3937530062820E-13      9.9999999999989E-01

     SELENOGRAPHIC MATRIX FROM MEE-DATE TO MF-DATE
     8.5791576365784E-01      5.1353198153613E-01     -1.6292525578576E-02
    -4.8065053901101E-01      7.9097178531435E-01     -3.7860096960385E-01   8
    -1.8153677808800E-01      3.3263875116427E-01      9.2541658696247E-01
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	The constants for the determination of eclipsing, requested by PRCDE(H), are the radii of the earth, sun, and moon (in er) and the number of er/au (au = astronomical unit)	11.3.1
5	Indicates the planetary ephemeris file TAPE7 has been initialized (i. e., read) to the date of epoch, with two bodies (sun and moon)	16
6	Output comment specifying the coordinate system in which the numerical integration will be performed	11.1.6
7	Precession matrix used to rotate from MEE of midnight day of epoch to MEE of current date, printed whenever LEMSP = 0	2.1.4
8	Selenographic matrix from MEE to MF, printed when LEMSP = 0	2.1.4

```
MCI  VECTORS  AT  T  =     2468.833333        H  =          .250000       NSTEP  =            0

                       2.314753981350E+07        -6.576466334896E+02        -3.433679901877E-04
                      -1.010058059718E+08         3.524038827223E+03         8.731074964758E-03
                      -6.934131827016E+07         2.461626115785E+03         6.079749704093E-03    (1)

ECI  VECTORS
                      -9.393036259099E+08        -2.605945998745E+03         7.263048026485E-03
                       5.322930504899E+08         9.355392952157E+02         3.726008404297E-03
                       3.230944691360E+08         1.226209106591E+03         2.978264333485E-03

  FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK     CROSS-TRACK
SELENOPOTENTI 1.113696E-02-2.067551E-03 9.021985E-03 6.193624E-03-1.113696E-02 3.469447E-17 1.387779E-16
OTHER BODIES  1.752257E-03 1.724183E-03-2.909101E-04-1.138740E-04 6.190841E-04 1.611891E-03-2.982365E-04
TOTAL         1.054485E-02-3.433680E-04 8.731075E-03 6.079750E-03-1.051788E-02 1.611891E-03-2.982365E-04

*             STEP   DOUBLED        T  =  2475.333333     H  =        .500000      NSTEP  =        25
*             STEP   DOUBLED        T  =  2483.833333     H  =       1.000000      NSTEP  =        41
*             STEP   DOUBLED        T  =  2500.833333     H  =       2.000000      NSTEP  =        57

   ***  CRASH  ***          ALTITUDE  =    -76344.0     TIME   =     2880.83333 (10)

SEG12 EXIT TIME IS  129.26430 TOTAL TIME IN SEG12 WAS    2.80800 SECONDS TO PROCESS     247 STEPS

MCI  VECTORS  AT  T  =     2880.833333        H  =         2.000000       NSTEP  =          247

                       3.791576050137E+06        -2.685598080283E+03        -3.687047484945E+00
                      -3.744330629623E+06         7.046579359872E+03         3.640811386103E+00
                      -1.803319931610E+06         4.555337144496E+03         1.754145097956E+00

ECI  VECTORS
                      -1.004436843417E+09        -4.440455848847E+03        -3.678980319840E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
9	The vectors $\underline{r}$, $\dot{\underline{r}}$, and $\ddot{\underline{r}}$ in the integration coordinate frame and in the ECI frame at epoch	Case A: Item 30
10	Indicates when and where the vehicle crashed into the moon	2.1.3 2.1.4

```
                    5.640676741008E+08          4.338720210350E+03          3.636268229247E+00
                    3.591575464330E+08          3.245180355422E+03          1.751256984947E+00

 FORCES       MAGNITUDE     X      Y      Z    ( EXTERNAL UNITS )       RADIAL       IN-TRACK     CROSS-TRACK
SELENOPOTENTI 5.470625E+00-3.587125E+00 3.640842E+00 1.754169E+00-5.470625E+00 7.203194E-09 4.973799E-14
OTHER BODIES  8.737533E-05 7.797226E-05-3.102316E-05-2.433802E-05 8.100298E-05 2.806469E-05-1.689197E-05
TOTAL         5.470544E+00-3.547047E+00 3.640811E+00 1.754145E+00-5.470544E+00 2.807190E-05-1.689197E-05

     ***  VEHICLE CRASHED

     ***  THIS CASE TOOK       2.876  SECONDS TO INTEGRATE A SPAN OF    412.0000  MINUTES  ***

        ***  FROM        2468.833  TO       2880.833  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT    125.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     3.0 CP SECS.,    49.1 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
11	Remark giving reason for termination (in this case, because the vehicle crashed)	

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	MF,MM,ST,DT	X,Y,Z,R	DX,DY,DZ,V	LAT,...	ALPHA,...	REV,...	REMARKS
MO/DAY/YR	MIN FROM EPOCH	X (FT)	DX (FT/SEC)	LATITUDE (DEG)	ALPHA (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	DY (FT/SEC)	LONGITUDE(DEG)	DELTA (DEG)	PERIOD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	DZ (FT/SEC)	ALTITUDE (NM)	BETA (DEG)	PER-DECAY	.
	STEP SIZE(MIN)	R (FT)	V (FT/SEC)	S-VEH-LAT(DEG)	AZIMUTH(DEG)	NOD-REG	.
	DIST TO MOON(ER)	LAT-MOON(DEG)	LON-MOON(DEG)	LAT-EARTH(DEG)	LON-EARTH(DEG) 12		.

```
* * * * * * * * * * * * * * * * * * * * * * * *
*                                              *
*       SPECIAL OUTPUT OPTIONS REQUESTED       *
*                                              *
* C  APOGEE-PERIGEE                            *
* J  MOON - FIX                                *
*                                              *
* * * * * * * * * * * * * * * * * * * * * * * *
```
13

* * *   MCI TRAJECTORY   * * *

ITEM	DESCRIPTION	REFERENCE SECTION
12	Key to additional ephemeris output provided in lunar runs	
13	Special output options requested by PRCDE	11.3.1.2

```
***   CASE     1
***


***   EPOCH PRINT

DATE,...     ME,MM,ST,DT          X,Y,Z,R          DX,DY,DZ,V           LAT,...         ALPHA,...       REV,...   MCI
 4/19/67         0.00000     2.31475398E+07   -6.57546633E+02   -33.78873098   282.90748738       .77972
 17/ 8        2468.83333    -1.01006806E+08    3.52403883E+03   -77.09251221   -33.78873098      0.00000
50.00000     61730.00000    -6.93415183E+07    2.46162612E+03    19582.12025   177.94734153      0.00000
                  .25000     1.24685322E+08    4.34967243E+03   -33.78873098    69.78024625      0.00000

           CLASSICAL ELEMENTS    ( A,E,I,O,U,TAU )
 -1.07315622E+07    1.09681142E+00    3.87507025E+01    3.39391443E+02    9.09284292E+01    2.60926066E+03

DATE,...     ME,MM,ST,DT          X,Y,Z,R          DX,DY,DZ,V           LAT,...         ALPHA,...       REV,...   MF
 4/19/67         0.00000     8.09356508E+07   -2.94728354E+03   -12.17957226   311.64849893       .86253
 17/ 8        2468.83333    -9.10722076E+07    3.05296783E+03   -48.35150066   -12.17957226      0.00000
50.00000     61730.00000    -2.63056484E+07    9.54549037E+02    19582.12025   177.65893199      0.00000
                  .25000     1.24685322E+08    4.34951224E+03   -12.17957226   282.52768331      0.00000
                53.16398     1.89276533E+01    4.23325212E+01    -6.56148470    -6.51581120

           CLASSICAL ELEMENTS    ( A,E,I,O,U,TAU )
 -1.07267055E+07    1.12438170E+00    1.62595798E+02    2.68132925E+02    1.05503772E+02    2.61038237E+03

***   REQUESTED PRINTS

DATE,...     ME,MM,ST,DT          X,Y,Z,R          DX,DY,DZ,V           LAT,...         ALPHA,...       REV,...   MCI
 4/19/67         0.00000     2.31475398E+07   -6.57546633E+02   -33.78873098   282.90748738       .77972
 17/ 8        2468.83333    -1.01006806E+08    3.52403883E+03   -77.09251221   -33.78873098      0.00000
50.00000     61730.00000    -6.93415183E+07    2.46162612E+03    19582.12025   177.94734153      0.00000
                  .25000     1.24685322E+08    4.34857243E+03   -33.78873098    69.78024625      0.00000

DATE,...     ME,MM,ST,DT          X,Y,Z,R          DX,DY,DZ,V           LAT,...         ALPHA,...       REV,...   MF
 4/19/67         0.00000     8.09356508E+07   -2.94728354E+03   -12.17957226   311.64849893       .86253
 17/ 8        2468.83333    -9.10722076E+07    3.05296783E+03   -48.35150066   -12.17957226      0.00000
50.00000     61730.00000    -2.63056484E+07    9.54549037E+02    19582.12025   177.65893199      0.00000
                  .25000     1.24685322E+08    4.34951224E+03   -12.17957226   282.52768331      0.00000
                53.16398     1.89276533E+01    4.23325212E+01    -6.56148314    -6.52038602
```

(14)

ITEM	DESCRIPTION	REFERENCE SECTION
14	Epoch print in lunar mode in MCI and MF (moon-fixed) coordinate frames (Item 38 of Case A plus one line at the end of the MF output, as in Item 12 of this case). The classical elements in MCI and MF coordinate frames are also shown	

```
DATE,...    ME,MM,ST,DT      X,Y,Z,R            DX,DY,DZ,V           LAT,...        ALPHA,...      REV,...   MF
 4/20/67      411.83356    5.32324080E+06   -6.08367879E+03    -3.31007435   333.16785725     .94144    *CRASH*
  0/ 0       2880.66689   -2.02552741E+06    6.09263787E+03   -20.83214234    -3.31007435    0.00000
40.01336       40.01336   -3.29409986E+05    1.58840219E+03       .49376    154.94370509    0.00000
                2.00000    5.70509989E+06    8.75525015E+03    -3.31007435    72.21872601    0.00000
               67.87118   -1.61428184E+01    1.24793857E+02     5.78130875   175.80364851

            CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.08498492E+07   1.11275053E+00   1.80769519E+01   3.49374042E+02   1.88718229E+02   2.60561349E+03

DATE,...    ME,MM,ST,DT      X,Y,Z,R            DX,DY,DZ,V           LAT,...        ALPHA,...      REV,...   MC1
 4/20/67      412.00000    3.79157606E+06   -2.68559808E+03   -18.70238820   315.36187188     .86771    PRE-EVNT
  0/ 0       2880.83333   -3.74408062E+06    7.04557936E+03   -44.63812771   -18.70238820    0.00000
50.00000       50.00000   -1.80390993E+06    4.55533714E+03      -12.56592   154.62950533    0.00000
                2.00000    5.62574778E+06    8.81009729E+03   -18.70238820    55.93435572    0.00000

            CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.07774001E+07   1.11430955E+00   3.83112676E+01   3.40732834E+02   8.76630660E+01   2.60846103E+03

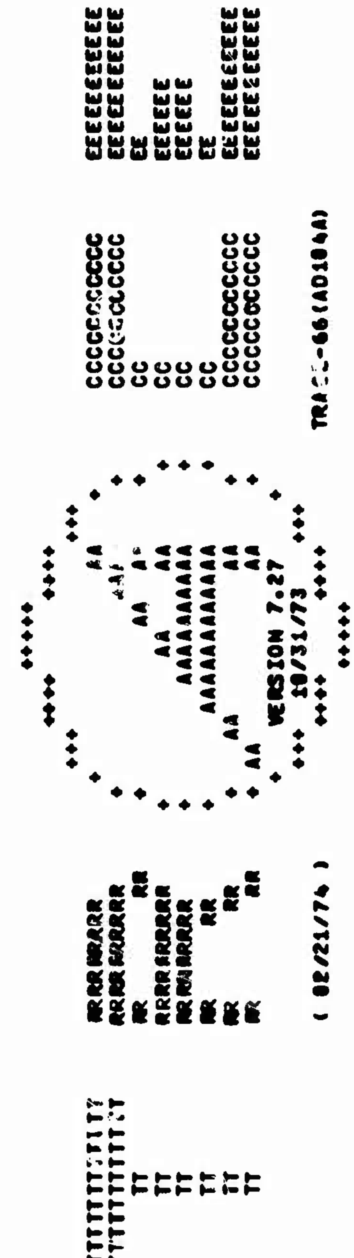
DATE,...    ME,MM,ST,DT      X,Y,Z,R            DX,DY,DZ,V           LAT,...        ALPHA,...      REV,...   MF
 4/20/67      412.00000    5.26223684E+06   -6.13368611E+03    -3.19484061   339.52754951     .94247    PRE-EVNT
  0/ 0       2880.83333   -1.96458627E+06    6.11193076E+03   -20.47245007    -3.19484061    0.00000
50.00000       50.00000   -3.13531907E+05    1.59145781E+03      -12.56592   154.71321546    0.00000
                2.00000    5.62574778E+06    8.80400709E+03    -3.19484061    72.20012514    0.00000
               57.92550    1.74346113E+01    3.03008926E+02    -6.41658430    -6.21646446

            CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.08498490E+07   1.11277339E+00   1.80751758E+01   3.49375107E+02   1.88710806E+02   2.60561375E+03

            ***  VEHICLE CRASHED

            ***  END OF TRAJECTORY  ***
```

C.6 TEST CASE E: ECI SINGLE-VEHICLE POWERED FLIGHT EPHEMERIS GENERATION RUN (ITIN = 3)



```
MODEL DATA
H1     TRPX MODEL                                                                    CARD  1
INFORM1                 INTERMS                MTERMS04,69                           CARD  2
D      J2,0                  -1.08827E-3             0.                              CARD  3
D      J3,0                  2.693E-6                0.                              CARD  4
D      J4,0                  1.6E-6                  0.                              CARD  5
 CRASH0.                 HMIN 0.00390625       H0    0.015625                        CARD  6
 LEMSP0                  GM   0.55309362E-2    IPTNS 100                             CARD  7
 ER    1.E-11           INPCMP1                DITIN 3                               CARD  8
END                                                                                  CARD  9

******************************************* EARTH  GRAVITY MODEL *************************************

 GM =  .5530936200E-02 ER**3/MIN**2  =  .1407792018E+17 FT**3/SEC**2  =  .3986422981E+15 M**3/SEC**2
             NO NORMALIZATION WITH    3 TERMS.
       N    M         CNM              SNM          **    N    M        CNM              SNM
       2         -.108270  0E-02    0.              **    4    0     .1400000000E-05    0.
       3          .269300  0E-05    0.              **
--

*************************************** GENERAL PERTURBATIONS GRAVITY MODEL *******************************

 GM =  .5530417744E-02 ER**3/MIN**2  =  .1407660655E+17 FT**3/SEC**2  =  .3986049304E+15 M**3/SEC**2

                     **** ZONAL HARMONICS ****

 EJ2 =  .1082549000E-02       EJ3 =-.2435000000E-05       EJ4 = -.1232000000E-05

******************************************* PHYSICAL CONSTANTS ********************************************

 GM(ER**3/MIN**2)    =   .5530936200E-02    OMEGE(RAD/MIN)  =   .4375269110E-02   GMLAT(DEG)   =   .7830000000E+02
 GMKM(KM**3/SEC**2)  =  0.                  OMEGA(RAD/MIN)  =   .4375269110E-02   GMLNG(DEG)   =   .2910000000E+03
 SGM(ER**3/MIN**2)   =   .69 23265 E-04     OMEGL(RAD/MIN)  =  0.                 AM(ER)       =   .2725316277E+00
 ERFT(FT/ER)         =   .2092573 E+08      ERKM(KM/ER)     =   .6378164000E+04   ERNM(NM/ER)  =   .3443933360E+04
 FTKM(FT/KM)         =   .3280839900E+03    FTNM(FT/NM)     =   .6076115500E+04   AE(ER)       =   .1000000000E+01
 GSUBJ(FT/SEC**2)    =   .321740  E+02      DGREE(DEG)      =   .5729577950E+02   SLT(ER/MIN)  =   .2820176300E+04
 CKEP                =   .10 00000 E-11     F               =   .3352329870E-02   PI           =   .3141592650E+01
```

①

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is given to the variables associated with a powered flight run (ITIN = 3), the others having been discussed earlier:	
	NPCMP, PTNS, ER, CRASH	2.1.4

```
******************************************* INPUT/OUTPUT CONVERSION FACTORS *********************************

 OF(I/O-ER) =   .21925738E+08   VF(I/O-ER/MIN) =   .34876230E+06   AF(I/O-ER/MIN**2) =   .58127959E+04

******************************************* INTEGRATION INPUTS **********************************************

                         ICENT  =   1               NSTEP =   2
 NPCMP =   1             IP     =   8               ER    =  .10000000E-10
 HMIN  =  .39062500E-02  HMAX   =  .64000000E+02    HC    =  .15625000E-01

******************************************* SPECIAL OPTIONS *************************************************

 TAPE2  =   0     TAPE7  =   0     TELEM  =   0     PTAFE  =   0     NFDOT  =   0
 PRHO   =   0     NODPR  =   0     CLASS  =   0     LEMSF  =   0     PTNS   =  100

******************************************* CRASH ALTITUDE TABLE ********************************************
                                                   (IN FT)

 ECI CRASH ALTITUDE =   0.                                  MCI CRASH ALTITUDE =   .30000000E+04

********************************** INTERPLANETARY CRASH ALTITUDES TABLE *************************************
                                                   (IN FT)

 BODY(1) CRASH ALTITUDE =   .30000000E+06          BODY(2) CRASH ALTITUDE =   0.
 BODY(3) CRASH ALTITUDE =   .30000000E+04          BODY(4) CRASH ALTITUDE =   0.
 BODY(5) CRASH ALTITUDE =  0.                      BODY(6) CRASH ALTITUDE =   0.
 BODY(7) CRASH ALTITUDE =  0.

ENTER SEGMENT 01 AT    12.6 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS    12.6 CP SECS.
```

2

ITEM	DESCRIPTION	REFERENCE SECTION
2	Crash altitude table. ECI and MCI crash altitudes at which to stop integrating for the sun and moon, respectively	2.1.3 2.1.4
	Interplanetary crash altitude table. Crash altitudes at which to stop integrating for solar system bodies	2.1.3

```
****************************************** VEHICLE DATA FOR CASE  1 ******************************************
IV  ED3C2                                                                                CARD  1
IYE   1971            IMNTH 1                        IDAY   1                            CARD  2
 HR    0               MIN  0                         SEC   0                            CARD  3
IICTYP4                AL    99.9932723962302          CL    0.                          CARD  4
 IC    0.              2     0.                       3     90.                          CARD  5
 4     90.             5     2.0925738E7              6     1525.92892397                CARD  6
IIDRAG3               IKDRAG-1                                                           CARD  7
 DRAG 80.                    0.                             0.                           CARD  8
       80.                   0.                             0.                           CARD  9
       80.                   0.                             0.                           CARD 10
       80.                   0.                             0.                           CARD 11
       80.                   0.                             0.                           CARD 12
       80.                   0.                             0.                           CARD 13
       80.                   0.                             0.                           CARD 14
       50.                   0.                             0.                           CARD 15
DPRCDE  X   X          ALTFR1                        2     65.8313210075                 CARD 16
 PTIM 0                2     1                       3     0                             CARD 17
 4     10.             5     60.                                                         CARD 18
 DALPH0.0 2568050     IIOTPF0                        POWER1.                             CARD 19
INPFRP3                                                                                  CARD 20
MFFRP 16,15                  1.                            291.666666667                 CARD 21
       600 .                 400000.                       2400.0                        CARD 22
       0                     0                             0                             CARD 23
       0                     .1666666666666          01,022.                             CARD 24
       291.666666666         6000.                         376000.                       CARD 25
       240 .                 0                             0                             CARD 26
       -5.                   0                             -.183333333333333             CARD 27
 01,032.                     291.666666666                 6000.                         CARD 28
       -373600.              2400.                         0                             CARD 29
       0                     0                             0                             CARD 30
       -.2775133333         01,042.                        291.666666666                 CARD 31
       600 .                 -360038.197683                2400.                         CARD 32
       1                     0                             .0                            CARD 33
       0                     -1.83333333             01,051.                             CARD 34
       54                    600 .                         -136000.                      CARD 35
       3757                  0                             0                             CARD 36
       0                     0                             -1.84333333                   CARD 37
 01,061.                     0.                            600 .                         CARD 38
       -133764.              0                             0                             CARD 39
       0                     0                             0                             CARD 40
       -1.86666666          01,071.                        300.                          CARD 41
       600 .                 115485.                       750.0                         CARD 42
       0                     0                             0                             CARD 43
       0.                    -4.11666666             01,081.                             CARD 44
       0.                    600 .                         10000.                        CARD 45
       0.                    0.                            0.                            CARD 46
       0.                    0.                            -60.                          CARD 47
 CDAS 0                2     0                       3     .22                           CARD 48
 4     .3              5     .21                     6     .6                            CARD 49
 7     .17             8     1.15                    9     .55                           CARD 50
 10    2.5             11    .45                     12    12.0                          CARD 51
 13    .38             14    0.                      15    0.                            CARD 52
END                                                                                      CARD 53
```

3

ITEM	DESCRIPTION	REFERENCE SECTION
3	Card images of input VEHICLE data. Emphasis is given to the variables associated with a powered flight run (ITIN = 3), the others having been discussed earlier:	
	AL, DL, IØTPF, NPFRP, PFRP, DALPH, KDRAG	11.1.5
	ALTPR	11.3.1.2
	CDAS	11.1.8

```
     EPOCH                                          INITIAL  CONDITIONS
   YR/MO/DAY           X,Y,Z,DX,DY,DZ        A,D,B,A,R,V           A,E,I,O,U,TAU         AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC       -.36312964377E+07    .39993272396E+02    .10491016770E+08    .17293193251E+00
 1971/  1/  1          .2067825554 5E+03   0.                  .99653832592E+00   -.98141957265E+00
 0.                   0.                   .90100000000E+02    .50536733943 8E-12  .21534909238E+00
 0.                   -.15027777375E+04    .90100000000E+02    .27999327240E+03    .99993272396E+02
 0.                   -.26477 3 31E+03     .20325738000E+08    .36000000000E+03   -.47433638210E-14
 0.                   -.13459535204E-10    .15259289240E+04   -.14973863691E+02    .76512639055E-15

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

***************************************************************************************************************

ENTER SEGMENT 02 AT     12.8 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .2 CP SECS.

ENTER SEGMENT 1  AT     12.8 SECCNDS.  EXECUTION TIME FCR SEGMENT  2 WAS      .0 CP SECS.

 ******************************  TRAJECTORY INTEGRATICN FOR CASE   1   *************************************

IVEP          0       ICENT        1      IDRAG       3      ALPHG     .1745211183E+01  CDAW   .8200000000E+02
JVEP          0       JNORM        1      IR          9      ALG-DEG   .9999327 24E+02  ER     .1000000000E-10
MVEP          0       MAJOR        0      ISRF        0      TJDATE    .2440952590E+07  HMIN   .1953125000E-02
KVEP          0       NMASS        0      NEQS        3      TSTART  0.                 HMAX   .6400000000E+02
LVEP          0       NT           3      RECMP       2      TSTOP     .6000000000E+02  HJ     .1250000000E+00
ICENTX        1       JNORMX       0      NMASSX      0      FLIGHT    .6000000000E+02  NTX   0.
                                          NASA        0      SSTEP     .1000000000E+03  SORC   .1500000000E+01
                                          NRING       0      CPAW    0.                 UTD    .3500000000E+02
                                          IFORM       0
```
④

ITEM	DESCRIPTION	REFERENCE SECTION
4	Quantities associated with the current vehicle (Table C-1)	

Table C-1. Definitions of Initialized Integration Quantities

Symbol	Definition	Reference Section
IVEP	Number of C and S parameters (GPRAM)	2.1.5.2
JVEP	Number of other model parameters (ØPRAM)	2.1.5.3
MVEP	Number of mass parameters (MPRAM)	2.1.5.1
KVEP	Number of vehicle-dependent parameters (VPRAM)	11.1.14
LVEP	Number of delayed parameters (i.e., THRUST, DRAG, etc.)	11.1.14
ICENTX	Central force flag for the moon	
ICENT	Central force flag for the earth	
JNORM	Normalization for the earth gravity model	2.1.2.2
MAJOR	Flag for the integration of the variational equations	
NMASS	Number of masses in the earth gravity model	
NT	Number of terms in the earth gravity model	2.1.2.2
JNORMX	Normalization for the lunar gravity model	2.1.2.2
IDRAG	Flag indicating the atmospheric model used	11.1.8
IR	Ratio of Runge-Kutta to Cowell step size (H0/IR)	2.1.4
ISRP	Flag for solar radiation pressure	2.1.2.6
NEQS	Total number of equations to be integrated	
RECMP	Flag for recomputation of perturbations	2.1.4
NMASSX	Number of masses in the lunar gravity model	
NASA	Coordinate and timekeeping transformation option flag	2.1.4

Table C-1. Definitions of Initialized Integration Quantities (Continued)

Symbol	Definition	Reference Section
ALPHG	Right ascension of Greenwich (rad at midnight of epoch day)	
ALG-DEG	Right ascension of Greenwich (deg at midnight of epoch day)	
TJDATE	Julian date of epoch day	
TSTART	Trajectory start time (MME)	
TSTOP	Trajectory stop time (MME)	
FLIGHT	Duration of flight (TSTOP-TSTART, min)	
SSTEP	Number of integration steps specified per rev when the regularized time variable is used	11.1.6
CDAW	Reciprocal of the ballistic coefficient	
ER	Error control in integration (ER = $1.^{-S}$, where S is the number of significant figures)	2.1.4
HMIN	Minimum absolute step size for integration	2.1.4
HMAX	Maximum absolute step size for integration	2.1.4
H0	Initial integration step size: A negative value indicates backward integration	2.1.4
NTX	Number of terms in the lunar gravity model	2.1.2.2
SORD	Power of the regularization transformation	11.1.6
CPAW	Solar radiation pressure coefficient	11.1.4
UTD	Correction that relates iteration time to ephemeris time, sec	2.1.4

```
                                 * PREDETERMINED EVENT TABLE *
TIME(MME)     TYPE        ASSOCIATED QUANTITIES
     0.0000 TZERO
                          AL                 OL
                           .59993272E+02      0.

STAGE        T,ST,SDT       TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                            AZ                    BETA
NO. 1           0.000000     .16666667E+00      .29166667E+03    CONSTANT
                0.000000    0.                  .60000000E+04         0.
               10.000000    0.                  .40000000E+06         0.
PRIMARY                     0.                  .24000000E+04         0.
                            0.                  .80000000E+02         0.
                            0.                 0.                     0.

STAGE        T,ST,SDT       TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                            AZ                    BETA
NO. 2            .166667     .18333333E+00      .29166667E+03    CONSTANT
               10.000000    0.                  .60000000E+04         0.
                1.000000    0.                  .37600000E+06        -.50000000E+01
SECONDARY                   0.                  .24000000E+04         0.
                            0.                  .80000000E+02         0.
                            0.                 0.                     0.

STAGE        T,ST,SDT       TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                            AZ                    BETA
NO. 3            .183333     .27751333E+00      .29166667E+03    CONSTANT
               11.000000    0.                  .60000000E+04         0.
                5.650800    0.                  .37360000E+06         0.
SECONDARY                   0.                  .24000000E+04         0.
                            0.                  .80000000E+02         0.
                            0.                 0.                     0.

STAGE        T,ST,SDT       TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                            AZ                    BETA
NO. 4            .277513     .18333333E+01      .29166667E+03    GRAVITY TURN
               16.650800    0.                  .60000000E+04         0.
               93.349200    0.                  .36003808E+06         0.
SECONDARY                   0.                  .24000000E+04         0.
                            0.                  .80000000E+02         0.
                            0.                 0.                     0.
```

5

CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
5	Quantities associated with the predetermined event table (Table C-2)	

Table C-2. Definitions of Predetermined Event Table Quantities

Symbol	Definition	Reference Section
TZERØ	Time to start integration	
AL	Right ascension of launch α_L, deg	11.1.15
DL	Declination of launch δ_L, deg	11.1.15
STAGE	Stage number	11.1.15
T	Start time of this stage, minutes from epoch	11.1.15
ST	Start time t, sec	11.1.15
SDT	Δt, sec, where the start time of the next stage is $t + \Delta t$, min	11.1.15
TF	Termination time for this stage, minutes from epoch	
WF	Final weight, lb	11.1.15
DV	Achieved change in velocity during this stage, ft/sec	11.1.15
HF	Cutoff altitude for this stage, ft	11.1.15
AA	Cutoff angle of attack for this stage, deg	11.1.15
AZ	Roll axis azimuth at the start of this stage	11.1.15
ISP	Specific impulse, sec	11.1.15
AE	Exit area, ft^2	11.1.15
W0	Initial vehicle weight for this stage, lb	11.1.15
WD	Weight flow rate, lb/sec	11.1.15
DRAG	Drag reference area, C_DA or A	11.1.15
BETA	Roll axis pitch attitude at the start of this stage	11.1.15

Table C-2. Definitions of Predetermined Event Table Quantities (Continued)

Symbol	Definition	Reference Section
RATES	= CONSTANT; WR, WP, WY are constant throughout this stage	11.1.15
	= GRAVITY TURN; this is a gravity turn stage (Item 11)	
	= FREE FLIGHT: this is a free flight stage (Item 12)	
WR	Roll axis turning rate, deg/sec	
WP	Pitch axis turning rate, deg/sec	11.1.15
WY	Yaw axis turning rate, deg/sec	
LIFTZ	Constant lift reference area coefficient $C_{L_0}A$ or A	
LIFTAL	Lift slope reference area coefficient $C_{L_\alpha}A$ or A	
TSTØP	Time to stop integration (Item 5)	
PRIMARY[a]	Certain primary parameters (ISP, AE, W0, WD, DRAG, LIFTZ, and LIFTAL) are defined for a primary stage and are held constant until the next primary stage is reached	11.1.15
SECONDARY[b]	Secondary parameters (WR, WP, WY, TF, DV, HF, WF, AA, AZ, and BETA) can change at each secondary stage (for secondary stages occurring within a primary stage), while the primary parameters remain constant	11.1.15

[a]Primary parameters define the vehicle configuration.

[b]Secondary parameters control maneuvering of the vehicle specified by the primary parameters.

```
STAGE      T,ST,SDT       TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                          AZ                      BETA
NO. 5        1.833333      .18433333E+01       .54000000E+02    CONSTANT
           110.000000     0.                   .60000000E+04          0.
              .600000     0.                   .13600000E+06          0.
PRIMARY                   0.                   .37570000E+04          0.
                          0.                   .80000000E+02          0.
                          0.                 0.                       0.

STAGE      T,ST,SDT       TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                          AZ                      BETA
NO. 6        1.943333      .18666667E+01     0.                 FREE FLIGHT
           110.500000     0.                 0.                       0.
             1.400000     0.                   .13374580E+06          0.
PRIMARY                   0.                 0.                       0.
                          0.                   .80000000E+02          0.
                          0.                 0.                       0.

STAGE      T,ST,SDT       TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                          AZ                      BETA
NO. 7        1.866667      .41166667E+01       .30000000E+03    CONSTANT
           112.000000     0.                   .60000000E+04          0.
           135.000000     0.                   .11548500E+06          0.
PRIMARY                   0.                   .75000000E+03          0.
                          0.                   .80000000E+02          0.
                          0.                 0.                       0.

STAGE      T,ST,SDT       TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                          AZ                      BETA
NO. 8        4.116667      .50000000E+02     0.                 FREE FLIGHT
           247.000000     0.                 0.                       0.
          3353.000000     0.                   .10000000E+05          0.
PRIMARY                   0.                 0.                       0.
                          0.                   .50000000E+02          0.
                          0.                 0.                       0.

     60.0000 TSTOP
```

5

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```
***  TRAJECTORY START  8
***  POWERED FLIGHT

 * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    12.89900

 TSEC =          .000000     T  =        0.000000     H  =          .015625    NSTEP  =          0

                          X,Y,Z                             XD,YD,ZD                        XDD,YDD,ZDD

                   -.363129649770E+07              -.150277773754E+04              -.295181229789E+01
                    .206982555446E+08              -.264798324310E+03               .167521047208E+02
                   0.                              -.134595352040E-10              -.129863715188E-03


  FORCES         MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )         RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.220200E+01  5.588994E+00-3.171343E+01-1.298687E-04-3.220200E+01  1.143514E-18-1.298687E-04
ATMOSPHERIC   1.529623E-16  1.506416E-16  2.654412E-17  2.159191E-22  1.838109E-22-1.529623E-16  2.159191E-22
THRUST        4.921208E+01-8.539897E+00  4.846544E+01  0.              4.921208E+01-3.979039E-13-3.231174E-27
TOTAL         1.701008E+01-2.951802E+00  1.675200E+01-1.298687E-04  1.701008E+01-3.979029E-13-1.298687E-04
```

7

ITEM	DESCRIPTION	REFERENCE SECTION
6	Powered flight. This notation indicates that the vehicle is thrusting, i.e., that ISP and WD are nonzero. If ISP and WD are zero, the vehicle's trajectory is controlled by external forces only, i.e., the pull of the earth or the moon. In this case, the vehicle is considered to be in free flight.	
7	Trajectory print at the beginning of this stage: TSEC = time from epoch, sec T = time from epoch, min H = integration step size NSTEP = number of integration steps X, Y, Z = vehicle position at time t, ft XD, YD, ZD = vehicle velocity at time t, ft/sec XDD, YDD, ZDD = vehicle acceleration at time t, ft/sec^2	

```
STAGE               T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 1               0.000000     -.74343156E-07      0.                 .25492674E+03       -.17353254E+00
CONSTANT            0.000000      .23768946E-02      .36000000E+03      .43000000E+05        .98482814E+00
                    0.000000      .35465123E-08      .20925738E+08      .44000000E-04       0.
                                  .14695972E+02      .15259289E+04     0.                   0.
                                  .95351590E-05      .90000069E+02                          0.
                                                                                            0.
```

8

```
TSEC =      1.000000      T  =       .166667      H  =       .015625      NSTEP  =        11

                   X,Y,Z                        XD,YD,ZD                       XDD,YDD,ZDD

          -.364643054873E+07            -.153495603531E+04            -.350647446474E+01
           .206764966957E+08            -.815050274055E+02             .200344323840E+02
          -.648979943981E-02            -.129721395149E-02            -.129419077535E-03
```

9

```
 FORCES         MAGNITUDE     X        Y        Z      ( EXTERNAL  UNITS )      RADIAL        IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  3.219920E+01 5.610729E+00-3.171659E+01-1.298305E-04-3.219920E+01 1.104126E-10-1.298405E-04
ATMOSPHERIC   5.952140E-02 1.027157E-02-5.862842E-02 4.124370E-07-5.952132E-02 1.016091E-04 4.125050E-07
THRUST        5.259766E+01-9.127405E+00 5.179965E+01 0.            5.259764E+01-3.835217E-02-1.629603E-08
TOTAL         2.033896E+01-3.536404E+00 2.003443E+01-1.294181E-04 2.033893E+01-3.825056E-02-1.294443E-04
```

```
STAGE               T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 1                .166667      .90832625E+03     -.17888378E-07      .25611673E+03       -.17353254E+00
CONSTANT            10.000000     .23143607E-02      .36000000E+03      .37600000E+05        .98482814E+00
                    10.000000     .16820852E+00      .20926646E+08      .45615542E-04       0.
                                  .14219973E+02      .15371184E+04     0.                   0.
                                  .18720916E+03      .56033344E-01                          0.
                                                                                            0.
```

10

ITEM	DESCRIPTION	REFERENCE SECTION
8	Quantities associated with the powered flight output at the beginning of this stage (Table C-3)	
9	Trajectory print at the end of this stage	Item 7
10	Powered flight output at the end of this stage	Item 8

Table C-3. Definitions of Powered Flight Output Quantities

Symbol	Definition	Reference Section
T	Time from epoch, min	
ST	Time from epoch, sec	
STAU	Time from the beginning of this stage, sec	
H	Vehicle altitude, ft	
RHØ	Atmospheric density at altitude h, $slug/ft^3$	
MACH	Mach number (the ratio of the speed of the body to the speed of sound in the surrounding atmosphere)	11.1.15
P	Pressure at altitude h, lb/in^2	
VA	Absolute value of the relative velocity vector	
LAT	Vehicle geodetic latitude, deg	
LØNG	Vehicle geodetic longitude, deg	
R	Vehicle geocentric radius, ft	11.1.14
V	Vehicle velocity, ft/sec	11.1.14
AA	Angle of attack, deg	11.1.15
ISP	$(ISP_i \cdot \dot{W} - Ae\, P(h))/\dot{W}$, where ISP_i (in sec), $\dot{W}$, and Ae are input quantities for the i^{th} stage and P(h) is computed.	11.1.15
W	Current vehicle weight, lb	
CDAW	$C_D A/W$	
CLAW	$(C_{L_0} + C_{L_\alpha} \cdot \alpha)A/W$, where α is the angle of attack	11.1.15
XI	Roll axis = $\underline{\xi} = \begin{Bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \end{Bmatrix}$	11.1.15
WR	Roll axis turning rate, deg/sec	11.1.15
WP	Pitch axis turning rate, deg/sec	11.1.15
WY	Yaw axis turning rate, deg/sec	11.1.15

```
***  POWERED FLIGHT

     * * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    12.96800

 TSEC =        13.000000     T  =          .166667     H  =            .001953    NSTEP  =          11

                          X,Y,Z                             XD,YD,ZD                          XDD,YDD,ZDD

                   -.364648054873E+07               -.153495603531E+04               -.350641446474E+01
                    .206054966957E+08               -.815950274055E+02                .200344323840E+02
                   -.648979943981E-02               -.129721395149E-02               -.129418077535E-03


  FORCES        MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.219920E+01 5.610729E+00-3.173659E+01-1.298305E-04-3.219920E+01 1.104126E-10-1.298405E-04
 ATMOSPHERIC   5.952149E-02 1.027157E-02-5.862842E-02 4.124370E-07-5.952132E-02 1.016091E-04 4.125050E-07
 THRUST        5.259766E+01-9.127405E+00 5.179965E+01 0.              5.259764E+01-3.835217E-02-1.629603E-08
 TOTAL         2.033896E+01-3.506404E+00 2.003443E+01-1.294181E-04 2.033893E+01-3.825056E-02-1.294443E-04


 STAGE                   T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW          XI,WR,WP,WY
 NO. 2                    .166667       .90832625E+03       -.17888378E-07       .25611673E+03       -.17353254E+00
 CONSTANT               10.000000       .23143607E-02        .36000000E+03       .37600000E+06        .98482814E+00
                         0.000000       .16823852E+00        .20926646E+08       .45615542E-04       0.
                                        .14219973E+02        .15371184E+04      0.                   0.
                                        .18720916E+03        .56033344E-01                           -.50000000E+01
                                                                                                     0.

  NODE  T =     .173215222799E+00      -.364683744089E+07      .206964797969E+08      .620239748153E-03
       DT =     .195312500000E-02      -.153570390157E+04     -.772317138037E+02      .102815687043E+00
```

```
TSEC =        11.000000     T  =           .183333     H   =            .001953     NSTEP  =            20

                        X,Y,Z                              XD,YD,ZD                             XDD,YDD,ZDD

                 -.364801726553E+07               -.153848227290E+04              -.353462557153E+01
                  .206064252531E+08               -.613513300054E+02               .202080019221E+02
                  .759617574177E+00                .230317250271E+01               .461727981082E+01
  FORCES        MAGNITUDE      X       Y      Z      ( EXTERNAL UNITS )       RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219859E+01  5.612935E+00-3.170558E+01-1.310070E-04-3.219859E+01-1.961110E-07-1.298381E-04
ATMOSPHERIC   7.316337E-02  1.261795E-02-7.205949E-02-8.109075E-04-7.315575E-02  1.356065E-04-8.111105E-04
THRUST        5.298815E+01-9.160178E+00  5.198565E+01  4.618222E+00  5.278650E+01-3.536627E-02  4.618278E+00
TOTAL         2.102799E+01-3.534626E+00  2.020800E+01  4.617280E+00  2.351475E+01-3.523086E-02  4.617338E+00


STAGE                 T,ST,STAU      H,RHO,MACH,P,VA     LAT,LONG,R,W,AA    ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 2                  .183333      .110580660E+04       .20937778E-05      .25637126E+03      -.17287220E+00
CONSTANT             11.000000      .23009341E-02        .36000000E+03      .37360000E+05       .98108057E+00
                      1.000000      .186830945E+00       .20926844E+08      .45775654E-04       .87155743E-01
                                    .14118162E+02        .15397068E+04     0.                  0.
                                    .20779337E+03        .43653501E+01                         -.50000000E+01
                                                                                               0.

       ***  POWERED FLIGHT

       * * * * * * * * * * * * * * * * * * * *     ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.03790

TSEC =        11.000000     T  =           .183333     H   =            .000244     NSTEP  =            20

                        X,Y,Z                              XD,YD,ZD                             XDD,YDD,ZDD

                 -.364801726553E+07               -.153848227290E+04              -.353462557153E+01
                  .206064252531E+08               -.613513300054E+02               .202080019221E+02
                  .759617574177E+00                .230317250271E+01               .461727981082E+01


  FORCES        MAGNITUDE      X       Y      Z      ( EXTERNAL UNITS )       RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219859E+01  5.612935E+00-3.170558E+01-1.310070E-04-3.219859E+01-1.961110E-07-1.298381E-04
ATMOSPHERIC   7.316337E-02  1.261795E-02-7.205949E-02-8.109075E-04-7.315575E-02  1.356065E-04-8.111105E-04
THRUST        5.298815E+01-9.160178E+00  5.198565E+01  4.618222E+00  5.278650E+01-3.536627E-02  4.618278E+00
TOTAL         2.102799E+01-3.534626E+00  2.020800E+01  4.617280E+00  2.351475E+01-3.523086E-02  4.617338E+00
```

```
STAGE              T,SW,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY

NO. 3                 .183333     .11058060E+04      .20937778E-05      .25637126E+03     -.17287220E+00
CONSTANT            11.000000     .23009341E-02      .36000000E+03      .37360000E+05      .98198057E+00
                      0.000000    .18683094E+00      .20926844E+08      .45775654E-04      .87155743E-01
                                  .14118162E+02      .15397068E+04     0.                 0.
                                  .20779307E+03      .43653501E+01                        0.
                                                                                          0.

*          STEP   DOUBLED       T   =        .189681      H   =        .000488      NSTEP   =        45
*          STEP   DOUBLED       T   =        .197982      H   =        .000977      NSTEP   =        61
*          STEP   DOUBLED       T   =        .214583      H   =        .001953      NSTEP   =        77
*          STEP   DOUBLED       T   =        .247786      H   =        .003906      NSTEP   =        93

 TSEC =        16.653800      T   =           .277513      H   =            .003906      NSTEP   =           101

                         X,Y,Z                              XD,YD,ZD                            XDD,YDD,ZDD

                  -.365676933541E+07              -.155951933440E+04               -.391945831400E+01
                   .206064128510E+08               .590891818731E+02                .224672720221E+02
                   .885024034732E+02               .289348449908E+02                .481164709747E+01


  FORCES       MAGNITUDE      X        Y         Z      ( EXTERNAL UNITS )       RADIAL          IN-TRACK      CROSS-TRACK
GEOPOTENTIAL   3.219392E+01  5.625178E+00-3.169867E+01-2.663727E-04-3.219392E+01-2.470050E-06-1.302068E-04
ATMOSPHERIC    1.819448E-01  3.117549E-02-1.785510E-01-1.586009E-02-1.812516E-01  2.010433E-04-1.586599E-02
THRUST         5.539249E+01-9.575821E+00  5.434449E+01  4.827774E+00  5.518169E+01  2.458600E-02  4.827942E+00
TOTAL          2.330864E+01-3.919468E+00  2.246727E+01  4.811647E+00  2.289651E+01  2.478537E-02  4.811946E+00

STAGE              T,SW,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 3                 .277513     .26210510E+04      .24392663E-03      .25827539E+03     -.17287220E+00
CONSTANT            16.650800     .21998930E-02      .35999999E+03      .36003808E+06      .98198057E+00
                      5.650800    .30002963E+00      .20928359E+08      .46660853E-04      .87155743E-01
                                  .13356512E-02      .15609066E+04     0.                 0.
                                  .33193661E+03      .88776889E-01                        0.
                                                                                          0.
```

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      *** POWERED FLIGHT
      * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.17100

 TSEC =       16.653800     T  =          .277513     H  =          .000488    NSTEP  =          101

                         X,Y,Z                          XD,YD,ZD                        XDD,YDD,ZDD

                 -.765676933541E+07            -.155951933440E+04             -.391945641149E+01
                  .206654128512E+08             .590891818731E+02              .224672044732E+02
                  .885924034732E+02             .289348449908E+02              .481243101494E+01


  FORCES       MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219392E+01 5.625178E+00-3.169867E+01-2.663727E-04-3.219392E+01-2.470050E-06-1.302068E-04
ATMOSPHERIC   1.819448E-01 3.117549E-02-1.785510E-01-1.586009E-02-1.812516E-01 2.010433E-04-1.586599E-02
THRUST        5.539249E+01-9.575809E+00 5.434443E+01 4.828557E+00 5.518162E+01 2.460175E-02 4.828726E+00
TOTAL         2.330873E+01-3.419456E+00 2.246720E+01 4.812431E+00 2.289644E+01 2.480032E-02 4.812730E+00


STAGE                   T,ST,STAL     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,COAW,CLAW        XI,WR,WP,WY
NO. 4                    .277513      .26210510E+04        .24392663E-03       .25827539E+03      -.17287198E+00
GRAVITY TURN  11       16.653800      .21398930E-02        .35999999E+03       .36003808E+06       .98107935E+00
                        0.000000      .30002963E+00        .20928359E+08       .46660853E-04       .87169895E-01
                                      .13356512E+02        .15609466E+04      0.                  0.
                                      .33193661E+03        .88773158E-01                          -.48254883E+00
                                                                                                  0.

*          STEP    DOUBLED         T  =        .290209      H  =       .000977     NSTEP  =        126
*          STEP    DOUBLED         T  =        .306810      H  =       .001953     NSTEP  =        142
*          STEP    DOUBLED         T  =        .340013      H  =       .003906     NSTEP  =        158
*          STEP    DOUBLED         T  =        .406420      H  =       .007813     NSTEP  =        174
```

ITEM	DESCRIPTION	REFERENCE SECTION
11	Gravity turn. This notation indicates that the pitch plane is fixed, i.e., that the pitch axis is fixed throughout the stage (the vehicle's body orientation is defined by the roll, pitch, and yaw axes)	

```
TSEC =        37.041425     T  -          .617357     H   =          .007813    NSTEP   =          201

                          X,Y,Z                          XD,YD,ZD                        XDD,YDD,ZDD

                   -.268948050576E+07           -.165353137363E+04           -.523071513431E+01
                    .206128559857E+08            .599829537238E+03            .301543083636E+02
                    .251071623358E+04            .254268688923E+03            .180934763362E+02


  FORCES      MAGNITUDE      X       Y       Z     ( EXTERNAL UNITS )      RADIAL       IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.215672E+01 5.665668E+00-3.165367E+01-3.997464E-03-3.215672E+01-2.337933E-05-1.400003E-04
ATMOSPHERIC   1.865508E+00 3.057639E-01-1.766205E+00-5.168669E-01-1.792509E+00-7.503355E-02-5.112762E-01
THRUST        6.718376E+01-1.012215E+01 6.357418E+01 1.861434E+01 6.455557E+01 2.892963E+00 1.838115E+01
TOTAL         3.555301E+01-5.200715E+00 3.015431E+01 1.809348E+01 3.367635E+01 2.817906E+00 1.786973E+01


STAGE                 T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 4                  .617357      .14703844E+05      .69159383E-02      .27067544E+03     -.16673889E+00
GRAVITY TURN         37.041425      .15106449E-02      .35999984E+03      .31110058E+06      .94627297E+00
                     20.397625      .86695869E+00      .20940442E+08      .91145875E-04      .27706606E+00
                                    .83964901E+01      .17772490E+04     0.                 0.
                                    .91772245E+03      .16490276E+00                        -.55408289E+00
                                                                                            0.
```

```
TSEC =       83.916425     T  =         1.398607     H   =           .007813    NSTEP  =          301

                          X,Y,Z                               XD,YD,ZD                           XDD,YDD,ZDD

                  -.377394742125E+07                  -.198734950895E+04                  -.982785276440E+01
                   .206811551825E+08                   .252901478822E+04                   .568600526852E+02
                   .493111558635E+05                   .212483079985E+04                   .668531214065E+02


  FORCES        MAGNITUDE      X       Y      Z     ( EXTERNAL UNITS )        RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.190506E+01 5.727514E+00-3.138666E+01-7.520497E-02-3.190506E+01-3.003464E-04-2.128450E-04
ATMOSPHERIC   1.379395E+00 1.861784E-01-1.089365E+00-8.254415E-01-1.107023E+00-6.641848E-01-4.858907E-01
THRUST        1.132224E+02-1.574155E+01 8.933608E+01 6.775377E+01 9.986935E+01 5.473739E+01 3.950199E+01
TOTAL         8.831190E+01-9.827853E+00 5.686035E+01 6.685312E+01 5.785727E+01 5.410290E+01 3.901589E+01


STAGE                   T,ST,STAL    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY


NO. 4                    1.398607       .96995094E+05      .13529935E+00      .29120340E+03      -.13903212E+00
GRAVITY TURN            83.916425       .38200033E-04      .35999780E+03      .19860058E+06       .78903208E+00
                        67.265625       .35906091E+01      .21022733E+08      .17803128E-03       .59841328E+00
                                        .18530648E+00      .38549163E+04     0.                  0.
                                        .35503050E+04      .23619894E+00                         -.30692977E+00
                                                                                                  0.

            STEP    DOUBLED         T  =      1.429857      H   =       .015625      NSTEP   =        304
```

```
TSEC =      117.000000     T  =         1.833333    H   =          .015625    NSTEP   =          339

                    X,Y,Z                          XD,YD,ZD                      XDD,YDD,ZDD

              -.38296295676 9E+07          -.230522033241E+04          -.152283310936E+02
               .2076935 57828E+08           .436610387306E+04           .878655526931E+02
               .1320 1167426E+06            .441316756336E+04           .112924426454E+03


 FORCES       MAGNITUDE      X      Y      Z     ( EXTERNAL  UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.161173E+01 5.732095E+00-3.108796E+01-1.983311E-01-3.161173E+01-7.155289E-04-2.408080E-04
ATMOSPHERIC   1.096775E-01 1.343257E-02-7.891688E-02-7.497224E-02-8.051137E-02-7.022966E-02-2.479635E-02
THRUST        1.655963E+02-2.097406E+01 1.193315E+02 1.131977E+02 1.215666E+02 1.062614E+02 3.677242E+01
TOTAL         1.438895E+02-1.522853E+01 8.786555E+01 1.129244E+02 8.987438E+01 1.061905E+02 3.674738E+01


STAGE               T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 4                1.833333      .19414958E+06      .36051912E+00      .29165760E+03     -.12665776E+00
GRAVITY TURN       110.000000      .65685542E-06      .35999448E+03      .13600000E+06      .71880538E+00
                    93.349200      .61184691E+01      .21119885E+08      .24902211E-03      .68357636E+00
                                   .36276746E-02      .66221561E+04     0.                 0.
                                   .64560562E+04      .24337381E+00                        -.19060108E+00
                                                                                           0.
```

```
***  POWERED FLIGHT

     * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS   13.5°200

 TSEC =      11 .000010     T  =        1.833333    H  =          .001953    NSTEP  =        339

                         X,Y,Z                          XD,YD,ZD                       XDD,YDD,ZDD

                   -.382962956769E+07            -.230522033241E+04            -.332830650638E+00
                    .201693535782E+08             .436610387006E+04             .332979488901E+01
                    .132001167426E+06             .441316756336E+04             .325318098148E+02


  FORCES       MAGNITUDE     X      Y      Z      ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.161173E+01 5.732 95E+00-3.108706E+01-1.983311E-01-3.161173E+01-7.155289E-04-2.408080E-04
 ATMOSPHERIC   1.096775E-01 1.343257E-02-7.891688E-02-7.497224E-02-8.051137E-02-7.022966E-02-2.479635E-02
 THRUST        4.799042E+01-6.078358E+00 3.449577E+01 3.280511E+01 3.523045E+01 3.079494E+01 1.065678E+01
 TOTAL         3.270347E+01-3.328337E-01 3.329795E+00 3.253181E+01 3.538208E+00 3.072403E+01 1.063174E+01


 STAGE                  T,ST,STAU   H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW       XI,WR,WP,WY
 NO. 5                   1.833333    .19414958E+06    .36051912E+00     .53994207E+02    -.12665776E+00
 CONSTANT              110.000000    .65685542E-06    .35999448E+03     .13600000E+06     .71880538E+00
                         0.000000    .61184691E+01    .21119885E+08     .24902211E-03     .68357636E+00
                                     .36276746E-02    .66221561E+04    0.                 0.
                                     .64560562E+04    .24337381E+00                       0.
                                                                                          0.
```

```
TSEC =     11 .600000     T  =      1.843333     H  =         .001953    NSTEP  =       336

                 X,Y,Z                          XD,YD,ZD                      XDD,YDD,ZDD

          -.3831 127659 9E+07           -.230545103455E+04            -.43673 857491E+00
           .2037197387 54E+08            .436827993374E+04             .392689255161E+01
           .134654956746E+06             .443285237602E+04             .330872257944E+02


  FORCES        MAGNITUDE      X       Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.160329E+01  5.731847E+00-3.107841E+01-2.022339E-01-3.160329E+01-7.273982E-04-2.436814E-04
ATMOSPHERIC   1.003649CE-01 1.229866E-02-7.223698E-02-6.894616E-02-7.375664E-0  -6.460791E-02-2.271563E-02
THRUST        4.879982E+01-6.180076E+00 3.507758E+01 3.335841E+01 3.582877E+01 3.132469E+01 1.979313E+01
TOTAL         3.332230E+01-4.367309E-01 3.926883E+00 3.308723E+01 4.151811E+00 3.125926E+01 1.077017E+01


STAGE                 T,ST,STAL    H,RHO,MACH,P,VA    LAT,LCNG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 5                 1.843333     .19619408E+06      .36771767E+00      .53994827E+02      -.12665776E+00
CONSTANT            110.600000     .59038429E-06      .35999437E+03      .13374580E+06       .71880538E+00
                      .600000      .61531680E+01      .21122729E+08      .25306629E-03       .68350636E+00
                                   .32390085E-02      .66368030E+04     0.                  0.
                                   .64711681E+04      .27092423E+00                         0.
                                                                                            0.
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***  FREE FLIGHT (12)

     * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.566J0

 TSEC =        11 .600000     T  =          1.843333     H   =           .009244    NSTEP  =          336

                          X,Y,Z                              XD,YD,ZD                           XDD,YDD,ZDD

                  -.3831 1276599E+07             -.230545103455E+04                  .574414546184E+01
                   .2077197387 54E+08             .436827993374E+04                 -.311506933932E+02
                   .1346 4956746E+06              .443285237602E+04                 -.27118 0 30631E+00

  FORCES       MAGNITUDE      X        Y       Z     ( EXTERNAL UNITS )        RADIAL          IN-TRACK          CROSS-TRACK
 GEOPOTENTIAL  3.160320E+01  5.731847E+00-3.107841E+01-2.022339E-01-3.160320E+01-7.273982E-04-2.436814E-04
 ATMOSPHERIC   1.006490E-01  1.229866E-02-7.223688E-02-6.894616E-02-7.375664E-02-6.46 731E-02-2.271563E-02
 TOTAL         3.167703E+01  5.744145E+00-3.115069E+01-2.711800E-01-3.167695E+01-6.533531E-02-2.295931E-02

 STAGE                 T,ST,STAU    H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW           XI,WR,WP,WY
 NO. 6                  1.843333     .19699408E+06       .36771767E+00      0.                    -.12665776E+00
 FREE FLIGHT          110.630000     .59038429E-06       .35999437E+03        .13374580E+06        .71880539E+00
                         0.00 000    .61531680E+01       .21122729E+08        .25306629E-03        .68357636E+00
                                     .32390035E-02       .66368030E+04      0.                     0.
                                     .64711631E+04       .27092423E+00                             0.
                                                                                                   0.

 *               STEP    DOUBLED          T  =          1.849681      H   =           .009488     NSTEP  =        361
 *               STEP    DOUBLED          T  =          1.857982      H   =           .001977     NSTEP  =        377
```

ITEM	DESCRIPTION	REFERENCE SECTION
12	Free flight. This notation indicates that the vehicle is not thrusting; its acceleration is caused by external bodies only. When the vehicle is thrusting, i.e., when ISP and WD are nonzero, it is considered to be in powered flight	

```
TSEC =       112.000000     T  =        1.866667     H  =          .000977     NSTEP  =          386

                          X,Y,Z                        XD,YD,ZD                      XDD,YDD,ZDD

                 -.383423476890E+07          -.229741172949E+04            .574073159275E+01
                  .207789589512E+08           .432469532185E+04           -.311139471337E+02
                  .140860685853E+06           .443247766411E+04           -.264903787812E+00


 FORCES        MAGNITUDE     X      Y      Z      ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.158340E+01 5.731280E+00-3.105832E+01-2.113492E-01-3.158340E+01-7.543195E-04-2.527058E-0-
ATMOSPHERIC   7.779577E-02 9.451416E-03-5.563053E-02-5.355461E-02-5.677779E-02-5.015867E-02-1.765153E-02
TOTAL         3.164323E+01 5.740732E+00-3.111395E+01-2.649038E-01-3.164018E+01-5.092292E-02-1.790423E-02


STAGE                  T,ST,STAL    H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 6                   1.866667     .20360331E+06     .38454428E+00     0.                 -.12665776E+00
FREE FLIGHT           112.000000     .46115832E-06     .35999412E+03      .13374580E+05      .71880538E+00
                        1.400000     .61815487E+01     .21129338E+08      .25294121E-03      .68357636E+00
                                     .24818540E-02     .66051456E+04     0.                 0.
                                     .64388106E+04     .45772102E+00                        0.
                                                                                             0.
```

```
***   POWERED FLIGHT

      * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.79800

 TSEC =        112.000000      T  =         1.866667     H  =          .000122     NSTEP  =          386
                                X,Y,Z                            XO,YO,ZO                        XOO,YOO,ZOO

                         -.383423476890E+07          -.229741172949E+04          -.219675022102E+01
                          .207780589512E+08           .432469532185E+04           .139324201798E+02
                          .140861685853E+06           .443247766411E+04           .425736149216E+02


  FORCES        MAGNITUDE      X        Y        Z      ( EXTERNAL UNITS )        RADIAL          IN-TRACK       CROSS-TRACK
 GEOPOTENTIAL  3.158340E+01  5.731280E+00-3.105832E+01-2.113492E-01-3.158340E+01-7.543195E-04-2.527058E-04
 ATMOSPHERIC   9.009705E-02  1.094590E-02-6.442698E-02-6.202281E-02-6.575565E-02-5.810139E-02-2.044263E-02
 THRUST        6.268062E+01-7.938986E+00  4.505516E+01  4.284699E+01  4.603240E+01  4.022043E+01  1.386341E+01
 TOTAL         4.484920E+01-2.096760E+00  1.393242E+01  4.257361E+01  1.438325E+01  4.016158E+01  1.384271E+01


 STAGE                  T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,COAW,CLAW          XI,WR,WP,WY
 NO. 7                   1.866667      .20360331E+06       .38454428E+00       .29998015E+03       -.12665776E+00
 CONSTANT              112.000000      .46115832E-06       .35999412E+03       .11548500E+06        .71880538E+00
                         0.000000      .61815487E+01       .21129338E+08       .29293695E-03        .68357636E+00
                                       .24818540E-02       .66051456E+04      0.                   0.
                                       .64388106E+04       .45772102E+00                           0.
                                                                                                   0.

 *            STEP     DOUBLED         T   =        1.869840      H   =        .000244     NSTEP   =       411
 *            STEP     DOUBLED         T   =        1.873991      H   =        .000488     NSTEP   =       427
 *            STEP     DOUBLED         T   =        1.882292      H   =        .000977     NSTEP   =       443
 *            STEP     DOUBLED         T   =        1.898893      H   =        .001953     NSTEP   =       459
 *            STEP     DOUBLED         T   =        1.932096      H   =        .003906     NSTEP   =       475
```

```
TSEC =      118.563906     T  =        1.975065     H  =         .003906     NSTEP  =        486

                       X,Y,Z                        XD,YD,ZD                      XDD,YDD,ZDD

                 -.384922588343E+07           -.231285933147E+04           -.255743145381E+01
                  .238164958007E+08            .442215320756E+04            .160586177275E+02
                  .170602656257E+06            .471544839794E+04            .444626616191E+02


 FORCES        MAGNITUDE      X       Y       Z      ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.149106E+01 5.728487E+00-3.095460E+01-2.548245E-01-3.149156E+01-8.877133E-04-2.789860E-04
ATMOSPHERIC   3.031712E-02 3.596350E-03-2.125757E-02-2.131455E-02-2.172825E-02-2.006838E-02-6.653651E-03
THRUST        6.544814E+01-8.289515E+00 4.704447E+01 4.473886E+01 4.812664E+01 4.218989E+01 1.368571E+01
TOTAL         4.734288E+01-2.557431E+00 1.605862E+01 4.446266E+01 1.661385E+01 4.215893E+01 1.367877E+01


STAGE                 T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 7                 1.975065     .23451026E+06      .46506004E+00      .29999490E+03      -.12665776E+00
CONSTANT            118.503906     .13888424E-06      .35999289E+03      .11060767E+06       .71880538E+00
                      6.503906     .69724422E+01      .21160244E+08      .30164087E-03       .68357636E+00
                                   .63747380E-03      .68658729E+04     0.                  0.
                                   .67071013E+04      .15741246E+01                         0.
                                                                                            0.

*           STEP   DOUBLED         T  =       1.998503      H  =      .007813      NSTEP  =       491
*           STEP   DOUBLED         T  =       2.568815      H  =      .017625      NSTEP  =       563
*           STEP   DOUBLED         T  =       2.831315      H  =      .031250      NSTEP  =       582
```

```
TSEC =      18..378906    T  =        3.006315    H  =            .031250   NSTEP  =          586

                X,Y,Z                            XD,YD,ZD                         XDD,YDD,ZDD

          -.400011248067E+07            -.262491720264E+04              -.861493221388E+01
           .211276732021E+08             .631051391112E+04               .511206184833E+02
           .562599189677E+16             .827314231983E+04               .762791813285E+02


 FORCES         MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )        RADIAL         IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  3.047258E+01 5.666731E+00-2.993037E+01-7.995558E-01-3.047258E+01-2.527709E-03-4.387555E-04
ATMOSPHERIC   1.035905E-06 1.055633E-07-6.427877E-07-8.054691E-07-6.729490E-07-7.738386E-07-1.504130E-07
THRUST        1.127579E+02-1.428166E+01 8.105099E+01 7.707864E+01 8.428078E+01 7.361773E+01 1.383926E+01
TOTAL         9.222816E+01-8.614932E+00 5.112962E+01 7.627908E+01 5.389820E+01 7.361520E+01 1.383882E+01


STAGE                 T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XZ,WR,WP,WY
NO. 7                 3.006315      .58467941E+06      .15088004E+01      .30000000E+03     -.12665776E+00
CONSTANT            180.378906      .12012368E-11      .35997403E+03      .64200820E+05      .71889538E+00
                     68.378906      .12036283E+02      .21510369E+08      .47351420E-07      .68357636E+00
                                    .32685824E-07      .10731154E+05     0.                 0.
                                    .19640012E+05      .79260581E+01                         0.
                                                                                             0.
```

```
TSEC =      247.000000     T  =       4.116667    H  =        .031250    NSTEP  =        622

                  X,Y,Z                       XD,YD,ZD                     XDD,YDD,ZDD

           -.420902756395E+07          -.409508972969E+04          -.589822168895E+02
            .217466698666E+08           .148220688719E+05           .337494301321E+03
            .136229611196E+07           .181294576360E+05           .345867499614E+03


 FORCES        MAGNITUDE     X      Y      Z      ( EXTERNAL UNITS )      RADIAL       IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  2.862607E+01 5.429254E+00-2.805118E+01-1.762413E+00-2.862607E+01-5.154654E-03-3.617778E-04
ATMOSPHERIC   3.040219E-07 3.212708E-08-1.936998E-07-2.321154E-07-2.101540E-07-2.187214E-07-2.062929E-08
THRUST        5.085458E+02-6.441128E+01 3.655455E+02 3.476299E+02 3.917646E+02 3.229610E+02 2.890610E+01
TOTAL         4.868322E+02-5.898202E+01 3.374943E+02 3.456675E+02 3.631385E+02 3.223558E+02 2.890574E+01


STAGE                  T,ST,STAL    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 7                   4.116667      .12666302E+07      .35430573E+01      .33000000E+03     -.12665776E+00
CONSTANT              247.000000      .15694309E-13      .35992879E+03      .14235900E+05      .71889538E+00
                      135.000000      .26861893E+02      .22192103E+08      .21355813E-02      .68357636E+00
                                      .71212477E-09      .23772689E+05     0.                 0.
                                      .23745743E+05      .66601955E+01                        0.
                                                                                              0.
```

```
***  FREE FLIGHT

          * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    14.19900

 TSEC =        247.000000     T  =          4.116667     H  =           .003906    NSTEP  =          622

                             X,Y,Z                           XD,YD,ZD                         XDD,YDD,ZDD

                      -.420902756395E+07              -.409508972969E+04               .542925433743E+01
                       .217466698666E+08               .148220688719E+05              -.280511831564E+02
                       .136229621196E+07               .181294576360E+05              -.176241289538E+01


  FORCES       MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  2.862607E+01  5.429254E+00-2.805118E+01-1.762413E+00-2.862607E+01-5.154654E-03-3.617778E-04
ATMOSPHERIC   2.704845E-07  2.658307E-08-1.723323E-07-2.065102E-07-1.869714E-07-1.945937E-07-1.835362E-08
TOTAL         2.862607E+01  5.429254E+00-2.805118E+01-1.762413E+00-2.862607E+01-5.154849E-03-3.617962E-04


STAGE                    T,ST,STAU       H,RHO,MACH,P,VA     LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 8                     4.116667        .12666302E+07        .35430573E+01     0.                     -.12665776E+00
FREE FLIGHT             247.000000        .15694309E-13        .35992879E+03       .10000000E+05         .71860538E+00
                          0.000000        .26861883E+02        .22192103E+08       .19000000E-02         .68357636E+00
                                          .71212477E-09        .23772689E+05     0.                     0.
                                          .23745743E+05        .66601955E+01                            0.
                                                                                                        0.
*             STEP    DOUBLED          T  =        4.218229      H  =       .007813     NSTEP  =         647
*             STEP    DOUBLED          T  =        4.351042      H  =       .015625     NSTEP  =         663
*             STEP    DOUBLED          T  =        4.616667      H  =       .031250     NSTEP  =         679
*             STEP    DOUBLED          T  =        5.147917      H  =       .062500     NSTEP  =         695
*             STEP    DOUBLED          T  =        6.210417      H  =       .125000     NSTEP  =         711
```

```
TSEC =      455.125000    T  =       7.585417    H  =        .125000    NSTEP  =        722

                  X,Y,Z                      XD,YD,ZD                    XDD,YDD,ZDD

           -.495277400816E+07         -.309059259393E+04          .431202169556E+01
            .242816764386E+08          .976697315619E+04         -.211394267967E+02
            .507374050676E+07          .174450958375E+05         -.442721917503E+01


 FORCES       MAGNITUDE     X     Y     Z    ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK

GEOPOTENTIAL  2.202428E+01 4.312022E+00-2.113943E+01-4.427209E+00-2.202428E+01-9.645462E-03-6.898423E-04
ATMOSPHERIC   1.450350E-11 9.470552E-13-7.266496E-12-1.251610E-11-9.671156E-12-1.073070E-11-1.293165E-12
TOTAL         2.202428E+01 4.312022E+00-2.113943E+01-4.427209E+00-2.202428E+01-9.645462E-03-6.898423E-04


STAGE                  T,ST,STAL    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 8                   7.585417      .43718419E+07      .11647006E+02    0.                  -.12665776E+00
FREE FLIGHT           455.125000      .11611533E-17      .35963422E+03      .10000000E-05      .71889538E+00
                      208.125000      .22867990E+02      .25294744E+08      .19000000E-02      .68357636E+00
                                      .84622027E-13      .20230593E+05    0.                  0.
                                      .20215166E+05      .16602444E+02                        0.
                                                                                              0.

*              STEP    DOUBLED         T  =        8.335417       H  =        .250000       NSTEP  =       727
*              STEP    DOUBLED         T  =       16.585417       H  =        .500000       NSTEP  =       759
```

```
TSEC =      2885.125000     T  =        48.085417     H  =            .500000     NSTEP  =          822

                          X,Y,Z                                XD,YD,ZD                         XDD,YDD,ZDD

                   -.403230077577E+07               .321067992127E+04               .233621780400E+01
                    .114013367665E+08              -.156926695027E+05              -.660601992485E+01
                    .262898693199E+08              -.343549083446E+04              -.152583668317E+02


 FORCES         MAGNITUDE      X       Y       Z      ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  1.679033E+01  2.336218E+00-6.606020E+00-1.525837E+01-1.679033E+01-1.063766E-02-1.807568E-07
ATMOSPHERIC   2.083489E-14-5.170835E-15  1.969874E-14  4.394857E-15  1.247432E-14-1.665074E-14-1.112176E-15
TOTAL         1.679033E+01  2.336218E+00-6.606020E+00-1.525837E+01-1.679033E+01-1.063766E-02-1.807568E-07


STAGE                  T,ST,STAU     H,RHO,MACH,P,VA      LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 8                  48.085417     .80701690E+07        .65443395E+02      0.                    -.12665776E+00
FREE FLIGHT          2885.125000     .25697565E-20        .35742859E+03       .10000000E+05          .71889538E+00
                     2638.125000     .18424087E+02        .28937958E+08       .19000000E-02          .58357636E+00
                                     .25564904E-15        .16382031E+05      0.                    0.
                                     .16286782E+05        .14878560E+03                            0.
                                                                                                   0.


*                STEP   HALVED        T  =      58.116667      H  =        .031250      NSTEP  =        843
*                STEP   HALVED        T  =      58.337370      H  =        .001953      NSTEP  =        851
*                STEP   DOUBLED       T  =      58.385198      H  =        .003906      NSTEP  =        875
*                STEP   DOUBLED       T  =      58.452604      H  =        .007813      NSTEP  =        891
```

```
TSEC =      3521.687500     T  =       58.694792     H  =        .007813    NSTEP  =        922

                          X,Y,Z                          XD,YD,ZD                       XDD,YDD,ZDD

                   -.166732935561E+07           -.140043390622E+03          .341867385106E+01
                    .945211344875E+06            .396515264094E+03         -.769078914648E+01
                    .201907323820E+08           -.396445296446E+03         -.272822308426E+02


  FORCES        MAGNITUDE      X       Y       Z      ( EXTERNAL  UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219067E+01  2.562390E+00-1.452622E+00-3.205563E+01-3.219067E+01  7.514197E-03  5.882027E-03
ATMOSPHERIC   7.931473E+00  8.562898E-01-6.238167E+00  4.773396E+00  4.402453E+00-6.426181E+00  1.325098E+00
TOTAL         2.855093E+01  3.418680E+00-7.690789E+00-2.728223E+01-2.778822E+01-6.413667E+00  1.330980E+00


STAGE                     T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 8                     58.694792      .22711834E+05       .84768075E+02      0.                  -.12665770E+00
FREE FLIGHT             3521.687500      .11549419E-02       .35743894E+02       .10000000E+03       .71880538E+00
                        3274.687500      .63980809E+00       .20878888E+08       .99751885E-03       .68357636E+00
                                         .60269598E+01       .57793198E+03      0.                  0.
                                         .65624157E+03       .80313335E+02                          0.
                                                                                                    0.

*               STEP    DOUBLED          T  =      58.905729      H  =       .015625      NSTEP  =        948

   ***  CRASH  ***            ALTITUDE  =       -73.7      TIME  =       59.26510
```

```
TSEC =      3555.906250     T  =       59.265104    H  =          .015625    NSTEP  =          971

                           X,Y,Z                          XD,YD,ZD                      XDD,YDD,ZDD

                   -.167028474648E+07           -.445051684661E+02            .155285287701E+01
                    .952864961547E+06            .469037335772E+02           -.837465445471E+01
                    .207672681752E+08           -.799623060046E+03            .60656'861740E+00

  FORCES          MAGNITUDE      X        Y       Z      ( EXTERNAL UNITS )        RADIAL         IN-TRACK      CROSS-TRACK
GEOPOTENTIAL   3.226082E+01 2.575318E+00-1.469169E+00-3.212428E+01-3.226081E+01 9.535701E-03 1.316452E-03
ATMOSPHERIC    3.346699E+01-1.022455E+00-6.905486E+00 3.273084E+01 3.235781E+01-6.378252E+00 5.685878E+00
TOTAL          8.538977E+00 1.552863E+00-8.374654E+00 6.065609E-01 9.699672E-02-6.368716E+00 5.687195E+0'

STAGE                   T,ST,STAL    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 8                  59.265104     -.73664165E+02      .84744933E+02     0.                    -.12665776E+00
FREE FLIGHT          3555.906250      .23820223E-02      .35445970E+02      .19000000E+05         .71880538E+00
                     3318.906250      .73214200E+00      .20856108E+08      .13064905E-02         .68357676E+00
                                      .14735135E+02      .80223295E+03     0.                    0.
                                      .81760725E+03      .12160724E+03                           0.
                                                                                                 0.

          ***   VEHICLE CRASHED

          ***   THIS CASE TOOK       2.008   SECONDS TO INTEGRATE A SPAN OF      59.2651   MINUTES  ***

               ***   FROM           0.000   TO          59.265   MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT     14.9 SECONDS. EXECUTION TIME FOR SEGMENT  10 WAS      2.0 CP SECS
```

*** TRACE66 EPHEMERIS OUTPUT KEY ***

OATE,...	ME,MM,ST,DT	X,XD	X,XO - BF	ADBARV	LAT,...	REV,...	REMARK
YR/MO/DAY	MIN FROM EPOCH	X (FT)	X (FT)	ALPHA (OEG)	LATITUOE (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	Y (FT)	DELTA (OEG)	LONCITUOE(OEG)	PERIOO	.
SEC	SEC FROM MIDNIGHT	Z (FT)	Z (FT)	BETA (DEG)	ALTITUOE (NM)	PERIOO-OECAY	.
	STEP SIZE(MIN)	XO(FT/SEC)	XO(FT/SEC)	AZIMUTH(OEG)	S-VEH-LAT(DEG)	NOD-REG	.
IT	UTC - IT	YO(FT/SEC)	YD(FT/SEC)	R (FT)	I (DEG)		
	UT1 - IT	ZO(FT/SEC)	ZD(FT/SEC)	V (FT/SEC)	O (DEG)		

SPECIAL OUTPUT OPTICNS RECUESTEO

C APOGEE-PERIGEE
G SPECIAL ALTITUOES

*** ECI TRAJECTCRY ***

*** CASE 1
***

*** STAGE NO. 1 POWERED FLIGHT.

*** EPOCH PRINT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	0.00000	-.363129650E+07	.209257380E+08	99.99327240	0.00000000	.50000
0/ 0	0.00000	.206082555E+08	-.148686311E-06	0.00000000	360.00000000	0.00000
0.00000	0.00000	0.	0.	90.00000000	-.00000000	0.00000
	.01563	-.150277774E+04	-.121001230E-10	90.00000000	0.00000000	0.00000
IT	0.00000	-.264798324E+03	.953505180E-05	.20925738E+08	.00000000	
	0.00000	-.134595352E-10	-.134595352E-10	.15259289E+04	180.00000000	

A =	.10481007E+08	MEAN ANOM =	.18000000E+03	APOGEE =	.34439336E+04
E =	.99653893E+00	ECCENTRIC =	.18000000E+03	HEIGHT =	-.72759576E-10
I =	.50538039E-12	TRUE ANOM =	.18000000E+03	PERIGEE =	.59701863E+01
O =	.27999327E+03	KEPL PER =	.29947727E+02	HEIGHT =	-.34379634E+04
U =	.36000000E+03	ANOM PER =	.29923367E+02	D-DOT =	-.23468143E+07
TAU =	-.14973864E+02	NODL PER =	-.80903654E+04	U-DOT =	.46936286E+07

```
***  REQUESTED PRINTS

DATE,...  ME,MM,ST,DT,..         X,XD              X,XD - BF           ADBARV          LAT,.. BF          REV,...
71/ 1/ 1        0.00000   -.363129650E+07    .209257380E+08      99.99327240        0.00000000       .50000 DSC NODE
  0/ 0          0.00000    .206082555E+08   -.148686311E-06       0.00000000      360.00000000       0.00000
 0.00000        0.00000   0.                0.                   90.00000000       -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10      90.00000000        0.00000000       0.00000
IT              0.00000   -.264798324E+03    .953505180E-05     .209257385E+08       .00000914
                0.00000   -.134595352E-10   -.134595352E-10     .152592895E+04    180.00000000

DATE,...  ME,MM,ST,DT,..         X,XD              X,XD - BF           ADBARV          LAT,.. BF          REV,...
71/ 1/ 1         .00000   -.363129650E+07    .209257380E+08      99.99327240        0.00000000       .50000
  0/ 0          0.00000    .206082555E+08   -.148686311E-06       0.00000000      360.00000000       0.00000
 0.00000         .00000   0.                0.                   90.00000000       -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10      90.00000000        0.00000000       0.00000
IT              0.00000   -.264798324E+03    .953505180E-05     .209257385E+08       .00000914
                 .00000   -.134595352E-10   -.134595352E-10     .152592895E+04    180.00000000

DATE,...  ME,MM,ST,DT,..         X,XD              X,XD - BF           ADBARV          LAT,.. BF          REV,...
71/ 1/ 1         .00000   -.363129650E+07    .209257380E+08      99.99327240       -.00000000       .50000 BETA =90
  0/ 0           .00000    .206082555E+08   -.148686311E-06       -.00000000      360.00000000       0.00000
  .00000         .00000   -.951225345E-23   -.951221801E-23      90.00000000       -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10      90.00000000       -.00000000       0.00000
IT              0.00000   -.264798324E+03    .953505180E-05     .209257385E+08       .00000914
                0.00000   -.134596270E-10   -.134595352E-10     .152592895E+04    180.00000000


DATE,...  ME,MM,ST,DT,..         X,XD              X,XD - BF           ADBARV          LAT,.. BF          REV,...
71/ 1/ 1         .16667   -.364648055E+07    .209266463E+08     100.03505026       -.00000002       .50012 PRE-EVNT
  0/ 0           .16667    .206164967E+08   -.135198329E+01       -.00000002      359.99939712       0.00000
10.00000        1.00000   -.648979944E-02   -.648979944E-02      83.00445863        .1494128       0.00000
                 .01563   -.153495604E+04    .187208891E+03      90.00004871       -.00000002       0.00000
IT              0.00000   -.815050274E+02   -.319594589E+00     .209266465E+08       .00004871
                0.00000   -.129721395E-02   -.129721395E-02     .153711842E+04    179.97909818
```

** STAGE NO2 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.16667	-.364648055E+07	.209266463E+08	100.03505026	-.00000002	.50012 PST-EVNT
0/ 0	.16667	.206064967E+08	-.105198329E+01	-.00000002	359.99999712	0.00000
10.00000	10.00000	-.648979944E-02	-.648979944E-02	83.00445863	.14949128	0.00000
	.00195	-.153495604E+04	.187208891E+03	90.00004871	-.00000002	0.00000
IT	0.00000	-.815150274E+02	-.319594589E+00	.20926646E+08	.00004871	
	0.00000	-.129721395E-02	-.129721395E-02	.15371184E+04	179.97909818	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.16088	-.364594764E+07	.209265825E+08	100.03359944	-.00000010	1.00000 ASC NODE
0/ 0	.16088	.206065262E+08	-.944889931E+00	-.00000010	359.99999741	0.00000
9.65268	9.65268	-.380570178E-01	-.380570178E-01	83.26653577	.13899276	0.00000
	.00195	-.153374241E+04	.180131102E+03	89.98966829	-.00000010	0.00000
IT	.00000	-.884386592E+02	-.297220364E+00	.20926583E+08	.00468976	
	0.00000	.275116281E+00	.275116281E+00	.15362901E+04	.00127042	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.18333	-.364801727E+07	.209268438E+08	100.03922736	.00000209	1.00002 PRE-EVNT
0/ 0	.18333	.206064253E+08	-.140552410E+01	.00000208	359.99999615	0.00000
11.00000	11.00000	.759617574E+00	.759617574E+00	82.24440256	.18199226	0.00000
	.00195	-.153848227E+04	.207779937E+03	89.91350307	.00000209	0.00000
IT	.00000	-.613513300E+02	-.388646428E+00	.20926844E+08	.08649693	
	0.00000	.230317250E+01	.230317250E+01	.15397068E+04	359.99861851	

** STAGE NO3 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.18333	-.364801727E+07	.209268438E+08	100.03922736	.00000209	1.00002 PST-EVNT
0/ 0	.18333	.206064253E+08	-.140552410E+01	.00000208	359.99999615	0.00000
11.00000	11.00000	.759617574E+00	.759617574E+00	82.24440256	.18139226	0.00000
	.00324	-.153848227E+04	.207779937E+03	89.91350307	.00000209	0.00000
IT	0.00000	-.613513300E+02	-.388646428E+00	.20926844E+08	.08649693	
	0.00000	.230317250E+01	.230317250E+01	.15397068E+04	359.99861851	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.27751	-.365676934E+07	.209283591E+08	100.06282704	.00024393	1.00008 PRE-EVNT
0/ 0	.27751	.206064129E+08	-.497880143E+01	.00024229	359.99998637	0.00000
16.65080	16.65080	.885024035E+02	.885024035E+02	77.76944063	.43136952	0.00000
	.00391	-.155951933E+04	.330671819E+03	88.91321737	.00024393	0.00000
IT	0.00000	.590851819E+02	-.915797851E+00	.20928359E+08	1.08678265	
	0.00000	.289348450E+02	.289348450E+02	.15609966E+04	359.98721403	

** STAGE NO4 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.27751	-.365676934E+07	.209283591E+08	100.06282704	.00024393	1.00008 PST-EVNT
0/ 0	.27751	.216064129E+08	-.497880143E+01	.00024229	359.99998637	0.00000
16.65080	16.65080	.885024035E+02	.885024035E+02	77.76944963	.43136952	0.00000
	.00049	-.155951933E+04	.330671819E+03	88.91321737	.00024393	0.00000
IT	0.00000	.590891819E+02	-.915797851E+00	.20928359E+08	1.08678265	
	.00000	.239348450E+02	.239348450E+02	.15609066E+04	359.98721493	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.83333	-.382962957E+07	.211194722E+08	100.44733648	.36051912	1.00152 PRE-EVNT
0/ 1	1.83333	.207693536E+08	-.203619817E+04	.35810607	359.99447592	0.00000
50.00000	110.00000	.132001167E+06	.132001167E+06	44.39255546	31.95291160	0.00000
	.01563	-.230522033E+04	.471172581E+04	18.60042295	.36019673	0.00000
IT	0.00000	.436610387E+04	-.652191264E+02	.21119885E+08	71.39995367	
	.00000	.441316756E+04	.441316756E+04	.66221561E+04	359.87395734	

** STAGE NO5 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.83333	-.382962957E+07	.211194722E+08	100.44733648	.36051912	1.00152 PST-EVNT
0/ 1	1.83333	.207693536E+08	-.203619817E+04	.35810607	359.99447592	0.00000
50.00000	110.00000	.132001167E+06	.132001167E+06	44.39255546	31.95291160	0.00000
	.00195	-.230522033E+04	.471172581E+04	18.60042295	.36019673	0.00000
IT	0.00000	.436610387E+04	-.652191264E+02	.21119885E+08	71.39995367	
	.00000	.441316756E+04	.441316756E+04	.66221561E+04	359.87395794	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.84333	-.383101277E+07	.211222999E+08	100.44973745	.36771767	1.00154 PRE-EVNT
0/ 1	1.84333	.207719739E+08	-.207550356E+04	.36525644	359.99437005	0.00000
50.60000	110.60000	.134654957E+06	.134654957E+06	44.39599709	32.42135625	0.00000
	.00195	-.230545103E+04	.471396926E+04	18.52105861	.36769451	0.00000
IT	0.00000	.436827993E+04	-.657995004E+02	.21122729E+08	71.47933142	
	0.00000	.443285238E+04	.443285238E+04	.66368030E+04	359.87210867	

** STAGE N06 FREE FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.84333	-.383101277E+07	.211222999E+08	100.44973745	.36771767	1.00154 PST-EVNT
0/ 1	1.84333	.207719739E+08	-.207550356E+04	.36525644	359.99437005	0.00000
50.60000	110.60000	.134654957E+06	.134654957E+06	44.39593709	32.42105625	0.00000
	.00024	-.230545103E+04	.471396926E+04	18.52105861	.36769451	0.00000
IT	0.00000	.436827993E+04	-.657995004E+02	.21122729E+08	71.47933142	
	0.00000	.443285238E+04	.443285238E+04	.66368030E+04	359.87210867	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.86667	-.383423477E+07	.211288685E+08	100.45533689	.38454428	1.00158 PRE-EVNT
0/ 1	1.86667	.207780590E+08	-.216829048E+04	.38197044	359.99412018	0.00000
52.00000	112.00000	.140860686E+06	.140860686E+06	44.64680220	33.50879573	0.00000
	.00098	-.229741173E+04	.466979315E+04	18.52144592	.38451926	0.00000
IT	0.00000	.432469532E+04	-.667517840E+02	.21129338E+08	71.47898062	
	0.00000	.443247766E+04	.443247766E+04	.66051456E+04	359.86615682	

** STAGE N07 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.86667	-.383423477E+07	.211288685E+08	100.45533689	.38454428	1.00158 PST-EVNT
0/ 1	1.86667	.207780590E+08	-.216829048E+04	.38197044	359.99412018	0.00000
52.00000	112.00000	.140860686E+06	.140860686E+06	44.64680220	33.50879573	0.00000
	.00012	-.229741173E+04	.466979315E+04	18.52144592	.38451926	0.00000
IT	0.00000	.432469532E+04	-.667517840E+02	.21129338E+08	71.47898062	
	0.00000	.443247766E+04	.443247766E+04	.66051456E+04	359.86615682	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	2.50926	-.392502172E+07	.213229035E+08	100.69722986	.93713644	1.00304 ALTITUDE
0/ 2	2.50926	.209585412E+08	-.560987777E+04	.93076557	359.98432596	0.00000
30.55537	150.55537	.346419427E+06	.346419427E+06	48.79672439	65.83132101	0.00000
	.00781	-.242912805E+04	.549683473E+04	13.03154002	.93691791	0.00000
IT	0.00000	.513751109E+04	-.114406799E+03	.21325719E+08	77.06326025	
	0.00000	.632016311E+04	.632016311E+04	.84993614E+04	359.77110465	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	-.11667	-.420902756E+07	.221502326E+08	100.95404915	3.54305730	1.01010 PRE-EVNT
0/ 4	+.11667	.217466699E+08	-.275284719E+05	3.51940193	359.92879242	0.00000
7.00000	247.00000	.136229621E+07	.136229621E+07	46.33324252	208.46052340	0.00000
	.03125	-.409508973E+04	.153296421E+05	4.01470358	3.54169824	0.00000
IT	0.00000	.148220689E+05	-.430311423E+03	.22192103E+08	85.99298026	
	0.00000	.181294576E+05	.181294576E+05	.23772689E+05	359.68194109	

** STAGE NO8 FREE FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...	
71/ 1/ 1	4.11667	-.420902756E+07	.221502326E+08	100.95404915	3.54305730	1.01010	PS1-EVNT
0/ 4	4.11667	.217466699E+08	-.275284719E+05	3.51947193	359.92809242	0.00000	
7.00000	247.30000	.136229621E+07	.136229621E+07	46.33324252	208.46052340	0.00000	
	.00391	-.199508973E+04	.153296421E+05	4.01477358	3.54159824	0.00000	
IT	.00000	.148226689E+05	-.430311423E+03	.221921035E+08	85.39288026		
	0.00000	.181294576E+05	.181294576E+05	.23772689E+05	359.68194109		

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	10.00000	-.535725302E+07	.260410757E+08	101.87111104	16.27262178	1.04520
0/10	1.00000	.254656666E+08	-.285896245E+06	16.16941149	359.37099410	0.00000
0.00000	600.00000	.755101321E+07	.755101321E+07	50.30390244	1019.56372863	0.00000
	.25000	-.250593693E+04	.730032520E+04	4.17329894	16.24833785	0.00000
IT	.00000	.694337280E+04	-.955244885E+03	.27115257E+08	86.00253432	
	.00000	.167316140E+05	.167316140E+05	.18287620E+05	358.20997309	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	20.00000	-.626639554E+07	.276216554E+08	103.19523879	31.01306034	1.08696
0/20	20.00000	.269170814E+08	-.917136080E+06	30.84341104	355.09827732	0.00000
0.00000	1200.00000	.165032787E+08	.165032787E+08	65.13077897	1856.80055039	0.00000
	.50000	-.636203950E+03	-.137313681E+04	4.67150321	30.95347740	0.00000
IT	3.00000	-.152293522E+04	-.100535374E+04	.32189365E+08	85.98811216	
	0.00000	.129543823E+05	.129543823E+05	.13059101E+05	355.69736548	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	30.00000	-.620301387E+07	.248964075E+08	104.40571346	42.81886468	1.11891
0/30	30.00000	.241491464E+08	-.135186798E+07	42.62707544	356.89199746	0.00000
0.00000	1800.00000	.229489000E+08	.229489000E+08	88.80033478	2138.41488247	0.00000
	.50000	.897797859E+03	-.744067525E+04	5.45554045	42.74530274	0.00000
IT	1.00000	-.744407440E+04	-.345639678E+03	.33886733E+08	85.97824063	
	0.00000	.839962769E+04	.839962769E+04	.11252579E+05	353.18151679	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...	
71/ 1/ 1	30.46080	-.617982377E+07	.246872878E+08	104.47423928	43.34255598	1.12037	BETA =90
0/30	30.46080	.239400040E+08	-.136082056E+07	43.15051870	356.84491671	0.00000	
27.64828	1827.64828	.231779503E+08	.231779503E+08	89.99999998	2139.05619986	0.00000	
	.50000	.869667865E+03	-.768607748E+04	5.50227972	43.26888890	0.00000	
IT	1.00000	-.768434860E+04	-.331786151E+03	.33889990E+08	85.90722200		
	0.00000	.816887289E+04	.816887289E+04	.11248823E+05	352.99875142		

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DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        40.00000   -.532247715E+07    .189215416E+08     106.30196864       54.46367021     1.15147
 0/40           4..00000    .181991311E+08   -.122979671E+07      54.28147881      356.28131809     0.00000
 0.00000     2400.00000     .263696781E+08    .263696781E+08     113.01680808     1909.07518547     0.00000
                  .50000    .212152567E+04   -.123394318E+05       6.88479785       54.39869198     0.00000
IT               0.00000   -.122645884E+05    .825788879E+03     .32479179E+08       85.97384661
                  .00000    .275350575E+04    .275350575E+04     .12747658E+05      350.66392397

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        50.00000   -.364770982E+07    .102241106E+08     110.89338712       68.49908177     1.19104
 0/50           50.00000    .955571695E+07   -.291676494E+06      68.36754050      358.36589294     0.00000
 0.00000     3000.00000     .257909635E+08    .257909635E+08     128.77783877     1132.30783299     0.00000
                  .50000    .348247104E+04   -.165352889E+05      10.94809311       68.46658268     0.00000
IT               0.00000   -.164337566E+05    .233391386E+04     .27745113E+08       85.97558601
                  .00000   -.528348324E+04   -.528348324E+04     .17609973E+05      348.14763412

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        57.73839   -.176316900E+07    .194796138E+07     142.80980743       84.06318754     1.23782 ALTITUDE
 0/57           57.73839    .133784248E+07    .105073019E+07      84.02337916       28.34241935     0.00000
44.30322     3464.30322     .211408533E+08    .211408533E+08     133.94875247       65.83955548     0.00000
                  .50000    .465090148E+04   -.188284286E+05      42.27186987       84.06234386     0.00000
IT               0.00000   -.186539368E+05    .335071274E+04     .21256394E+08       85.97660146
                 0.00000   -.157932975E+05   -.157932975E+05     .24880283E+05      346.13242812

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        70.52121   -.532465122E+16    .198675710E+17     104.41408869       40.82340990     1.11341 BETA =90
 1/10           70.52121    .195474318E+17   -.355285970E+16      40.63314858      349.86113391     0.00000
31.27278     4231.27278     .173189692E+17    .173189692E+17      .00001183*320587.53125000     0.00000
                  .03125   -.337717893E+14    .133550268E+15       1.58747422       40.63314818     0.00000
IT                .00000    .131398287E+15   -.238824198E+14     .26594922E+17       41.77011922
                  .00000    .116418561E+15    .116418560E+15     .17877171E+15      275.96732881

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        58.49359   -.166539023E+07    .154898781E+07     150.56035928       84.78039672     1.24073 BETA =90
 0/58           58.49359    .939917806E+06    .112143972E+07      84.74542953       35.90365360     0.00000
29.61531     3509.61531     .207933952E+08    .207933952E+08      89.99999768        4.10932927     0.00000
                  .00781   -.181513069E+03    .592691162E+03     219.68206260       84.78035423     0.00000
IT               0.00000    .478851345E+03   -.147758025E+03     .20881146E+08       93.34636740
                 0.00000   -.361831513E+02   -.361831513E+02     .51337591E+03      176.42546380

DATE,...  ME,MM,ST,DT,..        X,XC              X,XD - BF           ADBARV            LAT,.. BF          REV,...
71/ 1/ 1        59.26355   -.167028459E+07    .156655643E+07     150.29613526       84.74496754     1.24061 *CRASH*
 0/59           59.26355    .952860555E+06    .111520467E+07      84.70975662       35.44641190     0.00000
15.81307     3555.81307     .207673427E+08    .207673427E+08     170.15115098        -.00000000     0.00000
                  .01563   -.446501753E+02    .143355999E+03     188.08188942       84.74496659     0.00000
IT               0.00000    .476852404E+02   -.937581765E+02     .20856181E+08       90.72249595
                 0.00000   -.799678312E+03   -.799678312E+03     .80234215E+03      207.61835725
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DATE,...  ME,MM,ST,OT,..        X,XO             X,XO - BF          ADBARV            LAT,.. BF       REV,...
71/ 1/ 1       59.26510  -.167028475E+07    .156656975E+07    150.29608254      84.74493305     1.24061 PRE-EVNT
  0/59         59.26510   .952864962E+06    .111519594E+07     84.70972190      35.44596989     0.00000
15.90625     3555.90625   .207672682E+08    .207672682E+08    170.19291151      -.01212356     0.00000
                 .01563  -.445051685E+02    .142585416E+03    187.86028726      84.74493222     0.00000
IT              0.00000   .469037336E+02   -.935627250E+02    .208561008E+08    90.72247930
                0.00000  -.799623060E+03   -.799623060E+03    .802232295E+03   207.61874875

         **   VEHICLE CRASHED

DATE,...  ME,MM,ST,OT,..        X,XD             X,XO - BF          ADBARV            LAT,.. BF       REV,...
71/ 1/ 1       59.26510  -.167028475E+07    .156656975E+07    150.29608254      84.74433305     1.24061 PRE-EVNT
  0/59         59.26510   .952864962E+06    .111519594E+07     84.70972190      35.44596983     0.00000
15.90625     3555.90625   .207672682E+08    .207672682E+08    170.19291151      -.01212356     0.00000
                 .01563  -.445051685E+02    .142585416E+03    187.86028726      84.74493222     0.00000
IT              0.00000   .469037336E+02   -.935627250E+02    .208561008E+08    90.72247930

                0.00000  -.799623060E+03   -.799623060E+03    .802232295E+03   207.61874875

  A  =   .10433128E+08    MEAN ANOM  =   .18493051E+03    APOGEE  =   .34340636E+04
  E  =   .93997235E+00    ECCENTRIC  =   .18246567E+03    HEIGHT  =   .15781792E+01
  I  =   .90722479E+02    TRUE ANOM  =   .18000917E+03    PERIGEE =   .47475385E-01
  O  =   .32246886E+03    KEPL PER   =   .29742324E+02    HEIGHT  =  -.34324379E+04
  U  =   .27523168E+03    ANOM PER   =   .29790353E+02    O-DOT   =   .46957538E+09
 TAU =   .43986596E+02    NCOL PER   =   .31748549E+08    U-DOT   =  -.18605385E+11

         ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT    15.3 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS     .4 CP SECS.
```

C.7 TEST CAST F: ECI SIMULTANEOUS-VEHICLE ORBIT DETERMINATION RUN (ITIN = 2)

TRACE-66(AD184A)

VERSION 7.27
10/31/73

(02/21/74)

```
MODEL DATA                                                                                   CARD  1
H     SCF MODEL                                                                              CARD  2
INFORM1                       INTERM41                  MTERMS04,60                          CARD  3
D     02,00                       -1.0827E-3                0.                               CARD  3
D     03,00                       2.676E-6                  0.                               CARD  4
D     04,00                       1.4E-6                    0.                               CARD  5
D     05,00                       2.8E-8                    0.                               CARD  6
D     06,00                       -3.7E-7                   0.                               CARD  7
D     07,00                       5.93E-7                   0.                               CARD  8
D     08,00                       -7.0E-8                   0.                               CARD  9
D     02,02                       1.537068E-6               -7.73676E-7                      CARD 10
D     03,01                       1.991856E-6               2.309483E-7                      CARD 11
D     03,02                       4.162717E-7               -2.318633E-7                     CARD 12
D     03,03                       9.20555E-8                1.36403E-7                       CARD 13
D     04,01                       -5.344208E-7              -4.181365E-7                     CARD 14
D     04,02                       9.32884E-8                9.90846E-8                       CARD 15
D     04,03                       5.056823E-8               4.233845E-10                     CARD 16
D     04,04                       -4.432373E-9              4.033772E-9                      CARD 17
D     05,01                       1.168464E-7               -1.424087E-7                     CARD 18
D     05,02                       4.3475E-8                 -5.451403E-8                     CARD 19
D     05,03                       3.028423E-9               3.45103E-9                       CARD 20
D     05,04                       -3.801453E-9              -2.025287E-9                     CARD 21
D     05,05                       -8.3892E-11               -1.648367E-9                     CARD 22
D     06,01                       -2.746737E-13             7.8695E-8                        CARD 23
D     06,02                       -2.000628E-8              -1.927374E-8                     CARD 24
D     06,03                       1.097921E-8               1.057274E-9                      CARD 25
D     06,04                       -1.158042E-9              -1.922802E-9                     CARD 26
D     06,05                       -1.424538E-10             -4.115213E-10                    CARD 27
D     06,06                       3.199373E-12              -5.391516E-11                    CARD 28
D     07,01                       9.22074E-8                6.81522E-8                       CARD 29
D     07,02                       4.564422E-8               6.000909E-9                      CARD 30
D     07,03                       5.555012E-9               -2.905979E-9                     CARD 31
D     07,04                       -2.9078E-10               -2.030027E-15                    CARD 32
D     07,05                       -2.003164E-11             -6.59091E-11                     CARD 33
D     07,06                       -3.15577E-11              5.2589E-11                       CARD 34
D     07,07                       1.625731E-12              -2.675614E-12                    CARD 35
D     08,01                       -1.013559E-7              -3.29912E-8                      CARD 36
D     08,02                       7.74717E-9                -3.09899E-9                      CARD 37
D     08,03                       -5.548181E-10             2.184649E-9                      CARD 38
D     08,04                       -8.95304E-11              4.924497E-11                     CARD 39
D     08,05                       1.458971E-11              -3.101689E-13                    CARD 40
```

1 CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is given to the variables associated with an SLS run (MULTV=2), the others having been discussed earlier:	
	MULTV, LPACK	2.2.11
	PANDR PATA, GPLØT, SSPR, MVET	2.2.11.1
	ELEDD, KEDIT, FEDIT, NEDIT	2.2.11.3
	JSGLS	2.2.11.4
	GMKM, ERKM, F, ØMEGE, ØMEGA, GSUB0, FTNM, FTKM, SLT, PI, DGREE	2.1.1
	MSGLS, FREQ, CNTI, ISGLS, PSGLS	2.2.9
	D1, D2	2.1.2.4.1
	CLASS	2.2.1
	LGT	2.2.5
	UTD, LEMSP	2.1.4
	ACØN, RCØN	2.2.2

```
D      08,06                  -6.224239E-13          1.858458E-11          CARD  41
D      08,07                  8.65738E-13           -3.585277E-13          CARD  42
D      08,08                  -1.858297E-13          1.202444E-13          CARD  43
  GMKM 398601.2          ERKM -6378.145         F   .3352891869E-2         CARD  44
  OMEGE.4375269088E-2    OMEGA.4375269088E-2    GSUBO.3208766404E+2        CARD  45
  FTNM 6076.115486       FTKM 3280.839895       SLT  2820.185179           CARD  46
  PI   3.1415926536      DGREE57.295779512           1.047197551216        CARD  47
IPSGLS2                  FREQ 1.779736E9        CNT1 1048754.              CARD  48
TISGLS0                 IJSGLS6                IPSGLS2                     CARD  49
  PLANT0                 CLASS1                ILGT  -1                    CARD  50
IPAXIT5                  ACON 0.                RCON 1.E-3                 CARD  51
  UTD   41.1579          PATA 3                DITIN 2                     CARD  52
IPULTV2                 DOP30X4001              LEMSP3                     CARD  53
  D1    7.18             D2   -15.738           FLUX 0.                    CARD  54
DFANDR             XX   DSSPR XX                                           CARD  55
  GPLOT4                      10               IKSIG 1                     CARD  56
I2      2               I3    3                I4    37                    CARD  57
  SIGMA20                2    0                 3    0                     CARD  58
  4     .1                                                                 CARD  59
IPVET 2                 ILPACK1                 ELEDO0                     CARD  60
  NEDIT5                 FEDIT5                 KEDIT.5                    CARD  61
END                                                                        CARD  62
```

```
******************************************** EARTH   GRAVITY MODEL ********************************************

GM =  .5530417752E-02 ER**3/MIN**2  =  .1407646853E+17 FT**3/SEC**2  =  .3986012000E+15 M**3/SEC**2
            NO NORMALIZATION WITH  41 TERMS.
```

N	M	CNM	SNM	**	N	M	CNM	SNM
2	0	-.10827000E-02	0.	**	4	3	.50568230E-07	.42338450E-09
3	0	.26760000E-05	0.	**	5	3	.30284230E-08	.34510300E-08
4	0	.14000000E-05	0.	**	6	3	.10979210E-07	.10572740E-08
5	0	.28000000E-07	0.	**	7	3	.55550120E-08	-.29059790E-08
6	0	-.37000000E-06	0.	**	8	3	-.35481810E-09	.21846490E-08
7	0	.59300000E-06	0.	**	4	4	-.44323730E-08	.40337720E-08
8	0	-.70000000E-07	0.	**	5	4	-.38014530E-08	-.20252870E-08
3	1	.19918560E-05	.23094830E-06	**	6	4	-.11580420E-08	-.19228020E-08
4	1	-.53442080E-06	-.41813650E-06	**	7	4	-.29178000E-09	-.20300270E-14
5	1	.11684640E-06	-.14240870E-06	**	8	4	-.89539400E-10	.49244970E-10
6	1	-.27462370E-12	.78695000E-07	**	5	5	-.83892000E-10	-.16493670E-08
7	1	.92207400E-07	.68152200E-07	**	6	5	-.14245380E-09	-.41152130E-09
8	1	-.10135590E-06	-.32991200E-07	**	7	5	-.20031640E-10	-.65909100E-10
2	2	.15370680E-05	-.77367600E-06	**	8	5	.14589710E-10	-.31036890E-12
3	2	.41627170E-06	-.23186330E-06	**	6	6	.31993730E-11	-.53915160E-10
4	2	.93288400E-07	.99084600E-07	**	7	6	-.31557700E-10	.32589000E-10
5	2	.43475900E-07	-.54514030E-07	**	8	6	-.62242390E-12	.18584580E-10
6	2	-.20006280E-07	-.19273740E-07	**	7	7	.16257310E-11	-.26756140E-11
7	2	.45644220E-07	.60009390E-08	**	8	7	.86573800E-12	-.35852770E-12
8	2	.77471700E-08	-.30989900E-08	**	8	8	-.18582970E-12	.12024440E-12
3	3	.92055500E-07	.13640300E-06	**				

```
****************************** GENERAL PERTURBATIONS GRAVITY MODEL ******************************

GM =  .5530417744E-02 ER**3/MIN**2  =  .1407646851E+17 FT**3/SEC**2  =  .3986011994E+15 M**3/SEC**2

                    **** ZONAL HARMONICS ****

EJ2 =  .1082549000E-02      EJ3 =-.2435000000E-05      EJ4 = -.1232000000E-05

****************************************** PHYSICAL CONSTANTS ******************************************

GM(ER**3/MIN**2)     =   .553041775E-02    OMEGE(RAD/MIN) =   .437526909E-02  GMLAT(DEG)    =   .783000000E+02
GMKM(KM**3/SEC**2)   =   .398601200E+06    OMEGA(RAD/MIN) =   .437526909E-02  GMLNG(DEG)    =   .291000000E+03
SGM(ER**3/MIN**2)    =   .680232650E-04    OMEGL(RAD/MIN) =  0.                AM(ER)        =   .272506277E+00
ERFT(FT/ER)          =   .209256726E+08    ERKM(KM/ER)    =   .637814599E+04  ERNM(NM/ER)   =   .344392279E+04
FTKM(FT/KM)          =   .328083989E+04    FTNM(FT/NM)    =   .607611549E+04  AE(ER)        =   .100000000E+01
GSUB0(FT/SEC**2)     =   .32°876640E+02    DGREE(DEG)     =   .572957795E+02  SLT(ER/MIN)   =   .282018318E+04
CKEP                 =   .100000000E-10    F              =   .335289187E-02  PI            =   .314159265E+01

****************************************** INPUT/OUTPUT CONVERSION FACTORS ******************************

DF(I/O-ER) =   .20925673E+08   VF(I/O-ER/MIN) =   .34876121E+06   AF(I/O-ER/MIN**2) =   .58126868E+04

****************************************** INTEGRATION INPUTS ******************************************

                          ICENT =    1             NSTEP =   2
  NPCMP =    0            IR    =    8             ER    =  .10000000E-09
  HMIN  =  .15625000E-01  HMAX  =  .64000000E+02   H0    =  .10000000E+01
```

```
******************************************** SPECIAL OPTIONS ************************************************
 TAPE2  =    0     TAPE7  =    0     TELEM  =    0     PTAPE  =    0     NPDOT  =    0
 PRHD   =    0     NODPR  =    0     CLASS  =    1     LEMSP  =    3     PTNS   =10100

****************************************** CRASH ALTITUDE TABLE ******************************************
                                           (IN FT)

 ECI CRASH ALTITUDE =     .300000000E+06            MCI CRASH ALTITUDE =     .300000000E+04

********************************* INTERPLANETARY CRASH ALTITUDES TABLE ***********************************
                                              (IN FT)

 BODY(1) CRASH ALTITUDE =     .300000000E+06            BODY(2) CRASH ALTITUDE =    0.
 BODY(3) CRASH ALTITUDE =     .300000000E+04            BODY(4) CRASH ALTITUDE =    0.
 BODY(5) CRASH ALTITUDE =    0.                         BODY(6) CRASH ALTITUDE =    0.
 BODY(7) CRASH ALTITUDE =    0.

********************************************* STATION LOCATIONS ******************************************
STATION     SIG   REF   RA-REF  DATUM   TYPE         LATITUDE          LONGITUDE          HEIGHT        P     Q
                                                         X                 Y                 Z
                                                       RADIUS           LATITUDE         LONGITUDE

  313       -0    -0      -0     -0      -0
  343       -0    -0      -0     -0      -0
  353       -0    -0      -0     -0      -0
  363       -0    -0      -0     -0      -0
  377       -0    -0      -0     -0      -0
  393       -0    -0      -0     -0      -0

************************************************ ATA INPUT ***********************************************

     AT4   6.64827257E+4      2    1.68260013E+4      3    4.72859549E+4           CARD   1
     4     5.61307652E+4      5    5.46561358E+3      6    5.75322855E+4           CARD   2
     7     1.40434853E+2      8    4.24344483E+1      9    1.11908831E+2           CARD   3
     10    3.04659013E-1      11   3.45640484E+1      12   6.18612704E+1           CARD   4
     13    2.05906071E+1      14   7.94214544E-2      15   8.79832056E-2           CARD   5
     16    6.77190160E+1      17   4.31726187         18   6.12078389E+1           CARD   6
     19    1.42139627E-1      20   1.78260973E-2      21   7.63605610E-2           CARD   7
     22    -4.67529268E-2     23   -1.03299161E-2     24   -2.65828841E-2          CARD   8
     25    -9.57123720E-5     26   -2.29471783E-5     27   -2.82007265E-5          CARD   9
     28    2.69009967E-7                                                         CARD  10
    END                                                                          CARD  11
```

(2)

(3)

ITEM	DESCRIPTION	REFERENCE SECTION
2	Printout of the station locations as input. If CLASS$\neq$0, the actual locations are left blank	4
3	Card images of the input A^TA matrix data. In this case, $(A^TA)^{-1}$ is input because ∅PB∅X(A)=4	6

```
****************************************************** DEWM INPUT ******************************************************

   MDWT 0                                                                   CARD  1
   ADWT 2               PTYP 1               OSDEWTYES                       CARD  2
   SDRG .0355           SDCG .0346            FERI 89.5                      CARD  3
   PSTSD28.CE-5         DPH  5.0              PRESOO                         CARD  4   4
   KDRS .3017           KDTS .3017            KDCS .3017                     CARD  5
  END                                                                       CARD  6

ENTER SEGMENT 01 AT      1.5 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS      1.5 CP SECS.

******************************************** VEHICLE DATA FOR CASE  1 ********************************************

  MVPRAM04,6                                                                CARD  1
  D     X                  20.                 0.                           CARD  2
  D     Y                  20.                 0.                           CARD  3
  D     Z                  20.                 0.                           CARD  4
  D     DX                 1.                  0.                           CARD  5
  D     DY                 1.                  0.                           CARD  6
  D     DZ                 1.                  0.                           CARD  7
  D     DRAG               .1                  0.                           CARD  8
  IIDRAG1             DRAG 9.21746269382517E-3 INCDAW0                      CARD  9
   START1970           2   6                   3   26                       CARD 10
   4    0              5   0                   6   2945.474                 CARD 11
   4    12             5   1                   6   17.18592                 CARD 12
  IVEHID6820         IYEAR 1970              IMNTH 6                        CARD 13
  IDAY  26            TZNE 0                   HR  12                       CARD 14
   MIN  1             SEC  17.18502          IICTYP4                        CARD 15   5
   IC   270.7883984    2   -.000551476         3   88.946165659             CARD 16
   4    198.847449630  5   21561464.324        6   25690.5594806            CARD 17
   FTIM 0.             2   1.                  3   721.18592                CARD 18
   4    0.             5   1000.                                            CARD 19
  INPKCK1             PKCK 2507.9064333333     2   1.                       CARD 20
   3    -.15717854     4   30.16990            5   .2307999                 CARD 21
   DNODE20.            2   9.                  3   43277.185                CARD 22
   4    48611.259      5   54044.693           6   59427.551                CARD 23
   7    64809.871      8   70191.651           9   75572.998                CARD 24
   10   80953.858      11  86334.067           12  5313.522                 CARD 25
   13   10693.093      14  16071.740           15  21449.836                CARD 26
   16   26827.276      17  32204.094           18  37580.475                CARD 27
   19   42956.330      20  48331.657           21  53706.294                CARD 28
   22   59080.318                                                           CARD 29
  END                                                                       CARD 30
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the deweighting inputs	7
5	Card images of the input VEHICLE data. Emphasis is on the variables associated with an SLS run (MULTV=2), the others having been discussed earlier:	
	START	11.2.2
	NCDAW	11.1.9
	NPKCK, PKCK	11.1.11
	DNØDE	11.2.3

INITIAL CONDITIONS

EPOCH YR/MO/DAY TZNE,HR,MIN,SEC	X,Y,Z,DX,DY,DZ	A,D,B,A,R,V	A,E,I,O,W,TAU	AF,AG,N,L,CHI,PSI
1970/ 6/26	.21469037556E+08	.53370435033E+01	.21800278170E+08	.12286862127E-01
0.	.19942843795E+07	-.55147600000E-03	.21406144937E-01	-.17528721006E-01
.12000000000E+02	-.20753064537E+03	.88946165659E+02	.10884744963E+03	.66784616507E-01
.10000000000E+01	.12377377639E+04	.19884744963E+03	.18530723175E+03	.31944959249E+01
.17185020000E+02	-.82186686159E+04	.21561464324E+08	.11972153345E+03	-.12931050634E+00
	-.24308976487E+05	.25690559481E+05	.70677066628E+03	-.13929146541E+01

NO PLANETARY PERTURBATIONS.

** NO ATMOSPHERE MODEL **

****

THESE ARE THE 13 PARAMETERS IN THE PARAM MATRIX. 7 ARE P PARAMETERS AND 6 ARE Q PARAMETERS

	NAME	P/Q	CURRENT VALUE	BOUND	SIGMA	CONVERSION
6820	X	P	.21469038E+08	.20000000E+02	0.	.20925673E+08
6820	Y	P	.19942844E+07	.20000000E+02	0.	.20925673E+08
6820	Z	P	-.20753065E+03	.20000000E+02	0.	.20925673E+08
6820	DX	P	.12377378E+04	.10000000E+01	0.	.34876121E+06
6820	DY	P	-.82186686E+04	.10000000E+01	0.	.34876121E+06
6820	DZ	P	-.24308976E+05	.10000000E+01	0.	.34876121E+06
6820	DRAG	P	.92174627E-02	.10000000E+00	0.	.10000000E+01
393	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
377	RBIA	Q	.14000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
363	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
353	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
343	RBIA	Q	.14800000E+04	.10000000E+05	.50000000E+02	.20925673E+08
313	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08

ENTER SEGMENT 02 AT 1.6 SECONDS. EXECUTION TIME FOR SEGMENT 1 WAS .1 CP SECS.

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```
****************************************************************************************************

                              **   DATA STAGING INPUT   **

                            TSTART                      TSTOP                          TUPDATE
LS/F  NDELTA  DELTA T  D  YR  MO  DY  HR  MN    SEC     YR  MO  DY  HR  MN    SEC     YR  MO  DY  HR  MN    SEC
-0.     -0.   -0.000   1  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  13  31   0.0000
-0.     -0.   -0.000   0  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  14  39   0.0000
-0.     -0.   -0.000   1  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  15   0   0.0000
-0.     -0.   -0.000   1  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  16  30   0.0000
-0.     -0.   -0.000   0  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  17  43   0.0000
-0.     -0.   -0.000   1  0   0   0   0   0   0.0000    0   0   0   0   0   0.0000   70   6  26  18   0   0.0000

****************************************************************************************************

**********************************OBSERVATIONS FOR CASE  1 ******************************************

                                    ** STAGE    1  **

                                    ** STAGE    2  **

                                    ** STAGE    3  **

STAPASS YR MO DY HR MN SECONDS T C     FIELD 1          FIELD 2          FIELD 3          MJD    ST        VEHID MESSAGE
393  16 70  6 26 14 39 20.0000 1 0  0.               1.11338000E+02  4.07300000E+00   40763  52760.000 6820
393  16 70  6 26 14 39 20.0000 0 0 -1.66357133E+04  0.               0.               40763  52760.000 6820
393  16 70  6 26 14 39 36.0000 1 0  0.               1.17219000E+02  5.09400000E+00   40763  52776.000 6820
393  16 70  6 26 14 39 36.0000 0 0 -1.46059925E+04  0.               0.               40763  52776.000 6820
393  16 70  6 26 14 40 28.0000 1 0  2.65523622E+06  1.42646000E+02  7.14700000E+00   40763  52828.000 6820
393  16 70  6 26 14 40 28.0000 0 0 -4.42319686E+03  0.               0.               40763  52828.000 6820
393  16 70  6 26 14 41 12.0000 1 0  2.71175853E+06  1.67816000E+02  6.69300000E+00   40763  52872.000 6820
393  16 70  6 26 14 41 12.0000 0 0  6.51818603E+03  0.               0.               40763  52872.000 6820
393  16 70  6 26 14 41 24.0000 1 0  2.80812664E+06  1.74087000E+02  6.17200000E+00   40763  52884.000 6820
393  16 70  6 26 14 41 24.0000 0 0  9.16173820E+03  0.               0.               40763  52884.000 6820
313  16 70  6 26 14 51 12.0000 1 0  1.54888780E+06  5.20920000E+01  1.51530000E+01   40763  53472.000 6820
313  16 70  6 26 14 51 12.0000 0 0 -2.20899318E+04  0.               0.               40763  53472.000 6820
313  16 70  6 26 14 51 44.0000 1 0  9.57660763E+05  8.00630000E+01  2.76470000E+01   40763  53504.000 6820
313  16 70  6 26 14 51 44.0000 0 0 -1.31763271E+04  0.               0.               40763  53504.000 6820
313  16 70  6 26 14 52 40.0000 1 0  1.29941929E+06  1.69412000E+02  1.96350000E+01   40763  53560.000 6820
313  16 70  6 26 14 52 40.0000 0 0  1.98337706E+04  0.               0.               40763  53560.000 6820
313  16 70  6 26 14 53  4.0000 1 0  1.82430118E+06  1.81266000E+02  1.27740000E+01   40763  53584.000 6820
313  16 70  6 26 14 53  4.0000 0 0  2.31371122E+04  0.               0.               40763  53584.000 6820
313  16 70  6 26 14 54  4.0000 1 0  3.29320539E+06  1.92343000E+02  4.29900000E+00   40763  53644.000 6820
313  16 70  6 26 14 54  4.0000 0 0  2.51645637E+04  0.               0.               40763  53644.000 6820
```

6

7

CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
6	Printout of the input STAGE data	14
	LS/F = M	
7	Observations. The observation printout is fully explained in Case B, Item 3	11.2.1 15 11.1.2

** STAGE 4 **

STA	PASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
393	17	70	6	26	16	7	20.0000	1	0	0.	1.15749000E+02	3.67500000E+00	40763	58040.000	6820	
393	17	70	6	26	16	7	20.0000	0	0	-2.13349341E+04	0.	0.	40763	58040.000	6820	
393	17	70	6	26	16	8	4.0000	1	0	2.78503609E+06	1.29323000E+02	7.10300000E+00	40763	58084.000	6820	
393	17	70	6	26	16	8	4.0000	0	0	-1.74967044E+04	0.	0.	40763	58084.000	6820	
393	17	70	6	26	16	8	28.0000	1	0	2.41137139E+06	1.40589000E+02	5.15200000E+00	40763	58108.000	6820	
393	17	70	6	26	16	8	28.0000	0	0	-1.36019328E+04	0.	0.	40763	58108.000	6820	
393	17	70	6	26	16	9	0.0000	1	0	2.10335958E+06	1.60903000E+02	1.11460000E+01	40763	58140.000	6820	
393	17	70	6	26	16	9	0.0000	0	0	-5.46453380E+03	0.	0.	40763	58140.000	6820	
393	17	70	6	26	16	10	4.0000	1	0	2.40062008E+06	2.05002000E+02	8.68500000E+00	40763	58204.000	6820	
393	17	70	6	26	16	10	4.0000	0	0	1.31430709E+04	0.	0.	40763	58204.000	6820	

** STAGE 5 **

** STAGE 6 **

STA	PASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
343	18	70	6	26	17	44	20.0000	1	0	2.72901903E+06	6.66380000E+01	5.88300000E+00	40763	63860.000	6820	
343	18	70	6	26	17	44	20.0000	0	0	-2.16764518E+04	0.	0.	40763	63860.000	6820	
343	18	70	6	26	17	44	40.0000	1	0	2.33840223E+06	7.44520000E+01	7.92400000E+00	40763	63880.000	6820	
343	18	70	6	26	17	44	40.0000	0	0	-1.83778783E+04	0.	0.	40763	63880.000	6820	
343	18	70	6	26	17	45	56.0000	1	0	1.70083990E+06	1.32517000E+02	1.27960000E+01	40763	63956.000	6820	
343	18	70	6	26	17	45	56.0000	0	0	4.92450460E+03	0.	0.	40763	63956.000	6820	
343	18	70	6	26	17	46	36.0000	1	0	2.16558399E+06	1.61521000E+02	8.87400000E+00	40763	63996.000	6820	
343	18	70	6	26	17	46	36.0000	0	0	1.64988081E+04	0.	0.	40763	63996.000	6820	
343	18	70	6	26	17	47	32.0000	1	0	3.29381890E+06	1.81541000E+02	3.41400000E+00	40763	64052.000	6820	
343	18	70	6	26	17	47	32.0000	0	0	2.23990942E+04	0.	0.	40763	64052.000	6820	

****

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```
ENTER SEGMENT 10 AT      1.7 SECONDS.  EXECUTION TIME FOR SEGMENT  2 WAS      .1 CP SECS.

 **********************************  TRAJECTORY INTEGRATION FOR CASE   1  **********************************


                                      * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    721.2864 TZERO
   1000.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      1.76890
 *                STEP   DOUBLED         T  =      725.161417      H  =         .250000      NSTEP  =         30
 *                STEP   DOUBLED         T  =      729.411417      H  =         .500000      NSTEP  =         46
   NODE  T =      .767215124957E+03   -.218988769959E+08   -.206721431610E+07   -.596669999758E-02
         DT =     .500000000000E+00   -.293957797174E+03    .814209479171E+04    .239278350350E+05
   NODE  T =      .811021379897E+03    .214626327053E+08    .205580494718E+07   -.156972048110E-02
         DT =     .500000000000E+00    .126203942993E+04   -.821494114192E+04   -.243083525139E+05
   NODE  T =      .856943296633E+03   -.218897494540E+08   -.213361809193E+07   -.100460622573E-02
         DT =     .500000000000E+00   -.319621427110E+03    .814270198243E+04    .238298363451E+05
   NODE  T =      .900745999142E+03    .214559397449E+08    .212517332048E+07   -.102826795647E-01
         DT =     .500000000000E+00    .128685765377E+04   -.821173714187E+04   -.243076958174E+05
 *                STEP   DOUBLED         T  =      944.911417      H  =        1.000000      NSTEP  =        476
   NODE  T =      .946662334323E+03   -.218804033990E+08   -.220038223137E+07    .920682420941E-02
         DT =     .100000000000E+01   -.344844680157E+03    .814299617733E+04    .238319337227E+05
   NODE  T =      .990460717663E+03    .214491984352E+08    .219036484338E+07   -.183453992340E+00
         DT =     .100000000000E+01    .131171317581E+04   -.820836995990E+04   -.243069111568E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       1.404  SECONDS TO INTEGRATE A SPAN OF     279.6250  MINUTES  ***

            ***  FROM        721.286  TO       1000.911  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     1.4 CP SECS.

ENTER SEGMENT 82 AT      3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
8	<u>Predetermined event table</u> indicating the first integration time span. This time span covers all stages	
	TSTART, TSTØP	11.2.2

```
*************************************************** STAGE  1 ***************************************************

STAPASS   YEAR MO DY HR MN  SEC                    RESIDUALS - EXTERNAL UNITS                    MME


          SUMMARY OF PREDICTED STATISTICS
 STA  TYP         RMS          TYP         RMS          TYP         RMS          TYP         RMS


PREDICTED RESIDUAL RMS =  0.

ENTER SEGMENT 83 AT      3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER     1
    0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME               CURRENT VALUE          CORRECTION       NEW VALUE              TOTAL CORR.     SIGMA
6820     X          .21469037555645E+08 -0.                .21469037555645E+08  0.              .25784244E+03
6820     Y          .19942843794999E+07 -0.                .19942843794999E+07  0.              .21745334E+03
6820     Z         -.20753064537446E+03 -0.               -.20753064537446E+03  0.              .23985989E+03
6820     OX         .12377377639201E+04 -0.                .12377377639201E+04  0.              .55195925E+00
6820     OY        -.82186686159199E+04 -0.               -.82186686159199E+04  0.              .29661963E+00
6820     DZ        -.24308976486797E+05 -0.               -.24308976486797E+05  0.              .27633415E+00
6820     ORAG       .92174626938252E-02 -0.                .92174626938252E-02  0.              .51866171E-03

NAME               SIGMA ZERO         SIGMA DEWT      TOTAL CORR.      T.C./SIGMAP      T.C./SIGMAD
6820     X          0.                 .25784244E+03  0.               0.               0.
6820     Y          0.                 .21745334E+03  0.               0.               0.
6820     Z          0.                 .23985889E+03  0.               0.               0.
6820     OX         0.                 .55195925E+00  0.               0.               0.
6820     OY         0.                 .29661963E+00  0.               0.               0.
6820     DZ         0.                 .27633415E+00  0.               0.               0.
6820     DRAG       0.                 .51866171E-03  0.               0.               0.

RESIDUAL  RMS =    0.
RESIDUAL  SOS =    0.
APRIORI   RMS =    0.
APRIORI   SOS =    0.

TOTAL     SOS =    0.
PREDICTED SOS =    0.
```

1

ITEM	DESCRIPTION	REFERENCE SECTION
	The current solution is shown one parameter per line, starting with the name (Test Case B, Item 4)	2.2.3
	The current value is the parameter value used in the integration, partial derivatives, and residuals computation just completed. For the first iteration, it is the input value of the parameter. If an iteration is bad, the value produced for the lowest RMS is recovered from memory and is printed as the current value	
	The correction is the least squares correction to be applied to the current value for the next iteration	
	The new value is the sum of the current value plus the correction. This value will be used on convergence of this stage and will be updated to the next stage for all nonvehicle parameters. The current value is used for the vehicle parameters	
	The total correction is the value used to correct the parameters at this stage. This value includes the current correction	
	SIGMA is the square root of the diagonal elements of the covariance matrix $(A^TA)^{-1}$ for the parameters at the end of this iteration	
	SIGMA ZERO is the square root of the diagonal elements of the initial $(A^TA)^{-1}$ before deweighting for this stage	
	SIGMA DEWT is the square root of the diagonal elements of the deweighted $(A^TA)^{-1}$ at the start of this iteration	
	T.C./SIGMA0 is the total correction/SIGMA ZERO	
	T.C./SIGMAD is the total correction/SIGMA DEWT	
	The current value, correction, new value, total correction and SIGMA are normal least squares output. SIGMA ZERO, SIGMA DEWT, T.C./SIGMA0, and T.C./SIGMAD are extended least squares output and are obtained when PANDR(15)≠0	2.2.11.1
	Residual RMS is the weighted root mean square residuals for the current iteration	2.2.4
	Residual SOS is the sum of squares of the normalized measurement residuals for the current iteration	
	A priori RMS is the weighted root mean square total of the parameter corrections for the previous iterations for the current stage	
	A priori SOS is the sum of the squares of the total parameter corrections for the previous iterations for the current stage	
	Total SOS is the sum of the residual SOS + a priori SOS	
	Predicted SOS is the predicted sum of the normalized measurement residuals squared	2.2.2

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.27234E-02							
6820 Y	.17085E-03	.52365E-03						
6820 Z	-.65088E-03	.16370E-03	.45841E-03					
6820 DX	-.84361E+00	.30592E-02	.35395E+00	.44390E+03				
6820 DY	-.20527E+00	-.43786E+00	-.20210E+00	-.84265E+02	.42806E+03			
6820 DZ	-.25873E+00	-.21456E+00	-.40959E+00	-.34107E+03	.41722E+03	.19966E+04		
6820 DRAG	.70767E+02	.79205E+01	.42212E+01	.34712E+04	-.21921E+05	-.64479E+05	.93397E+07	
ATB	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.66483E+05						
6820 Y	.16826E+05	.47286E+05					
6820 Z	.56131E+05	.54656E+04	.57532E+05				
6820 DX	.14043E+03	.42434E+02	.11191E+03	.30466E+00			
6820 DY	.34564E+02	.61861E+02	.20591E+02	.79421E-01	.87983E-01		
6820 DZ	.67719E+02	.43173E+01	.61208E+02	.14214E+00	.17826E-01	.76361E-01	
6820 DRAG	-.46753E-01	-.10330E-01	-.26583E-01	-.95712E-04	-.22947E-04	-.28209E-04	.26901E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.30010	1.00000					
6820 Z	.90759	.10479	1.00000				
6820 DX	.99676	.35355	.84528	1.00000			
6820 DY	.45193	.95918	.28941	.48510	1.00000		
6820 DZ	.95043	.07185	.92346	.93191	.21748	1.00000	
6820 DRAG	-.34960	-.09159	-.21368	-.33433	-.14916	-.19676	1.00000

ENTER SEGMENT 84 AT 3.3 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.
ATA INVERSE UPDATED TO 611.02 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.55687E+05						
6820 Y	.67521E+05	.21730E+06					
6820 Z	.20658E+06	.49044E+06	.14791E+07				
6820 DX	.32434E+03	.75470E+03	.21726E+04	.32479E+01			
6820 DY	.50349E+02	.15119E+03	.28152E+03	.44267E+00	.13083E+00		
6820 DZ	.52681E+02	.53557E+02	.20548E+03	.32502E+00	.35908E-01	.76683E-01	
6820 DRAG	-.45064E-01	-.15666E+0	-.45517E+00	-.66094E-03	-.77576E-04	-.30061E-04	.25901E-06

ITEM	DESCRIPTION	REFERENCE SECTION
10	$\underline{A^T A}$ is the current $A^T A$ matrix for this iteration $\underline{A^T B}$ is the right-hand side of the normal matrix equation for the generalized least squares (GLS) problem when a priori statistics are included in the GLS solution of the linear system. The equation to be solved is $$(C_0^{-1} + A^T W A)\Delta P = A^T W B$$ where $A = \frac{\partial O_c}{\partial P}$ W = observation weighting matrix P = vector of parameter corrections B = residual vector ($A^T W O_{mc}$) for the last iteration $\underline{A^T A \text{ inverse}}$ is the covariance for the parameter set at this iteration. It is the inverse of the $A^T A$ matrix above Correlation matrix, the correlation coefficients for the parameter set. These values are computed directly from the covariance matrix $\underline{A^T A \text{ inverse updated}}$ is the covariance for the parameter set updated to the time of the next iteration	

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.33140E+05					
-.28250E-18	.39768E+06				
0.	0.	.31481E+05			
.63892E-10	-.38779E+03	0.	.40832E+00		
-.38775E+02	.33054E-21	0.	-.74757E-13	.45369E-01	
0.	0.	.60694E-10	0.	0.	.43098E-01

11

PARAMETER SET COORDINATE SYSTEM

.76445E-10					
-.79472E-11	.15841E-09				
-.24448E-10	.25451E-09	.82090E-09			
-.17971E-11	.16992E-10	.50052E-10	.33296E-11		
.15439E-11	.17956E-11	.48041E-11	.28538E-12	.38366E-12	
.50051E-11	.48086E-12	.14962E-14	-.46504E-15	.56905E-14	.37105E-12

12

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21462602.415	5.482511795	21738793.913	.0122805196989	58.24461818	3664.19037
13/31	2060302.054	.0015549899	.0213429198 5	-.0174559177234	59.23505346	228.10053
1.2588030	583.249	88.948443245	108.847926486	.0667914375674	60.35334034	3511.04979
.0015603	1262.7637290	198.847926491	185.481982716	3.37162284 4	89.8318739	74.95996
248.4688068	-8214.8716254	21561236.311	119.645021943	-.13355668938	89.5929426	2.79256528 09
104.6003	-24308.3525001	25689.9725442	796.4870267	-1.3916269 2397	89.7251141	-2.06669 05725

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT 3.3 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

ITEM	DESCRIPTION	REFERENCE SECTION
11	Deweighting matrix in the orbit plane coordinate system (RTC). The values in this matrix are used to deweight the $A^T A$ matrix. This deweighting allows for the uncertainty in the unmodeled parameters. Units are external	
12	Parameter set coordinate system is the RTC deweighting matrix converted to the parameter set coordinate system (ECI). This converted matrix is added to the updated $A^T A$ inverse matrix. Units are external	

```
ENTER SEGMENT 10 AT      3.3 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.

 ***********************************  TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                             * PREDETERMINED EVENT TABLE *
 TIME(MME)      TYPE        ASSOCIATED QUANTITIES
    811.0210 TZERO
    882.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     3.36700
   NODE  T =       .811021329896E+03     .214626327051E+08     .205980494770E+07     .161588981064E-04
        DT =       .125000000000E+00     .126203943514E+04    -.821494114187E+04    -.243983525152E+05
 *               STEP    DOUBLED         T  =    814.895980     H  =       .250000     NSTEP  =        30
 *               STEP    DOUBLED         T  =    819.145980     H  =       .500000     NSTEP  =        46
   NODE  T =       .356943296636E+03    -.218897494550E+08    -.213361809386E+07    -.537143593949E-02
        DT =       .500000000000E+00    -.319621436737E+03     .814270198170E+04     .238298363442E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .483  SECONDS TO INTEGRATE A SPAN OF     71.1250  MINUTES  ***

            ***  FROM        811.021  TO        882.146  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      3.9 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .5 CP SECS.

ENTER SEGMENT 82 AT      3.9 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS       .1 CP SECS.
```

** STAGE 2 **

STAPASS YEAR MO DY HR MN SEC RESIDUALS - EXTERNAL UNITS MME

SUMMARY OF PREDICTED STATISTICS

STA	TYP	RMS	TYP	RMS	TYP	RMS	TYP	RMS

PREDICTED RESIDUAL RMS = 0.

ENTER SEGMENT 83 AT 3.9 SECONDS. EXECUTION TIME FOR SEGMENT 82 WAS .0 CP SECS.

ITERATION NUMBER 1
0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.21462602415330E+08	-0.	.21462602415330E+08	0.	.29859908E+03
6820	Y	.20600020544027E+07	-0.	.20600020544027E+07	0.	.53540718E+03
6820	Z	.58324941054139E+03	-0.	.58324941054139E+03	0.	.13559432E+04
6820	DX	.12627637289684E+04	-0.	.12627637289684E+04	0.	.19112453E+01
6820	DY	-.82148716253522E+04	-0.	-.82148716253522E+04	0.	.42129759E+00
6820	DZ	-.24308352500073E+05	-0.	-.24308352500073E+05	0.	.34901961E+00
6820	DRAG	.92174626938252E-02	-0.	.92174626938252E-02	0.	.58941494E-03

NAME		SIGMA ZERO	SIGMA DEWT	TOTAL CORR.	T.C./SIGMAO	T.C./SIGMAD
6820	X	.23598189E+03	.29859908E+03	0.	0.	0.
6820	Y	.46615033E+03	.53540718E+03	0.	0.	0.
6820	Z	.12161926E+04	.13559432E+04	0.	0.	0.
6820	DX	.18021846E+01	.19112453E+01	0.	0.	0.
6820	DY	.36169763E+00	.42129759E+00	0.	0.	0.
6820	DZ	.27691647E+00	.34901961E+00	0.	0.	0.
6820	DRAG	.51866171E-03	.58941494E-03	0.	0.	0.

RESIDUAL RMS = 0.
RESIDUAL SOS = 0.
APRIORI RMS = 0.
APRIORI SOS = 0.
TOTAL SOS = 0.
PREDICTED SOS = 0.

```
****** LEAST SQUARES PROCESS CONVERGED ******

ATA

              6820 X      682  Y      6820 Z      6820 DX     6820 DY     6820 DZ     6820 DRAG
6820 X      .16114E-02
6820 Y      .16088E-03  .36029E-04
6820 Z      .87962E-05  .51395E-06  .14740E-04
6820 DX     .32316E-02 -.35608E-02 -.10851E-01  .96554E+01
6820 DY    -.43220E+00 -.51557E-01 -.97442E-04 -.20794E+01  .12850E+03
6820 DZ    -.12583E+01 -.12158E+00 -.33604E-02 -.73308E+01  .33698E+03  .99553E+03
6820 DRAG   .93853E+02  .89820E+01 -.27226E+01  .18668E+04 -.25541E+05 -.75004E+05  .10104E+08
     ATB   -0.         -0.         -0.         -0.         -0.         -0.         -0.          0.

ATA INVERSE

              6820 X      6820 Y      6820 Z      6820 DX     6820 DY     6820 DZ     6820 DRAG
6820 X      .89161E+05
6820 Y      .64041E+05  .28666E+06
6820 Z      .19587E+06  .60989E+06  .18386E+07
6820 DX     .31122E+03  .87371E+03  .25379E+04  .36529E+01
6820 DY     .61616E+02  .16430E+03  .31659E+03  .47678E+00  .17749E+00
6820 DZ     .99219E+02  .57066E+02  .20549E+03  .32496E+00  .36601E-01  .12181E+00
6820 DRAG  -.45064E-01 -.15666E+00 -.45517E+00 -.66094E-03 -.77576E-04 -.30061E-04  .34741E-06

CORRELATION MATRIX

6820 X     1.00000
6820 Y      .40058 1.00000
6820 Z      .46377  .84009 1.00000
6820 DX     .54534  .85871  .97929 1.00000
6820 DY     .48980  .72839  .55419  .59212 1.00000
6820 DZ     .95204  .30538  .43422  .48716  .24891 1.00000
6820 DRAG  -.25605 -.49643 -.56953 -.58671 -.31241 -.14613 1.00000

ENTER SEGMENT 84 AT      4.0 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.
```

ATA INVERSE UPDATED TO 879.00 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.95809E+07						
6820 Y	.10097E+07	.18607E+06					
6820 Z	.13755E+06	.15107E+05	.88340E+05				
6820 DX	-.71989E+02	-.32306E+02	-.95064E+02	.11142E+00			
6820 DY	-.37018E+04	-.44852E+03	-.62902E+02	.49529E-01	.15454E+01		
6820 DZ	-.10880E+05	-.11553E+04	-.20265E+03	.13719E+00	.42122E+01	.12469E+02	
6820 DRAG	.13151E+01	.13110E+00	-.41728E-02	.10330E-04	-.49906E-03	-.14747E-02	.34741E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.26229E+05					
-.79673E+04	.38750E+06				
0.	0.	.24916E+05			
.15384E+02	-.37074E+03	0.	.37047E+00		
-.30689E+02	.93222E+01	0.	-.18000E-01	.35908E-01	
0.	0.	.57586E+01	0.	0.	.31734E-01

PARAMETER SET COORDINATE SYSTEM

.87797E-09					
.77093E-10	.64413E-10				
-.10427E-10	-.10049E-12	.59356E-10			
.34815E-11	-.11055E-11	-.39878E-11	.31126E-12		
-.16180E-10	-.84678E-12	-.13394E-12	-.79310E-13	.53885E-12	
-.47865E-10	-.44451E-11	.15397E-11	-.24524E-12	.83169E-12	.27518E-11

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	-861872.839	97.158392672	21737616.110	.0115440762591	330.12378221	3647.59745
14/39	6862499.928	71.116801417	.01957929700	-.0158140182847	329.55535415	211.36878
0.0000000	21220527.828	90.568518390	108.876805463	.0670736009855	328.98203717	3507.50556
71.2343408	25757.4037672	271.463539434	185.611644975	276.252855068	89.4539728	71.27589
323.1034043	2523.8380076	21370691.979	120.517427874	-.13677847464	89.6928160	2.8239257459
83.5838	-29.3564957	25880.4813975	796.9697671	-1.39206148348	89.7249242	-2.0800888599

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT 4.0 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT      4.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.

 *********************************** TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    879.0000 TZERO
    903.7449 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     4.04300
 *               STEP   DOUBLED         T  =    882.250000     H  =      .250000     NSTEP  =       25
 *               STEP   DOUBLED         T  =    889.250000     H  =      .500000     NSTEP  =       52
   NODE  T =      .900745999138E+03     .214559397444E+08     .212517332371E+07     -.122432195041E-04
        DT =      .500000000000E+00     .128685767449E+04    -.821173714214E+04     -.243076958233E+05

         ***  TRAJECTORY TERMINATION

         ***  THIS CASE TOOK       .253  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

             ***  FROM         879.000  TO         903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      4.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .3 CP SECS.

ENTER SEGMENT 82 AT      4.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS       .1 CP SECS.
```

STAGE 3

STA	PASS	YEAR MO DY HR MN SEC	RESIDUALS - EXTERNAL UNITS			MME
393	16	1970 6 26 14 39 20.0000	0.	.137560E+00 AZ	-.207868E-01 EL	879.333
		PREDICTED RESIDUALS	0.	0.	0.	
393	16	1970 6 26 14 39 19.2503	.116394E+02 SRR	0.	0.	879.321
		PREDICTED RESIDUALS	.139249E+02	0.	0.	
393	16	1970 6 26 14 39 36.0000	0.	.134860E+00 AZ	.422514E-02 EL	879.600
		PREDICTED RESIDUALS	0.	0.	0.	
393	16	1970 6 26 14 39 35.2492	.144143E+02 SRR	0.	0.	879.587
		PREDICTED RESIDUALS	.174253E+02	0.	0.	
393	16	1970 6 26 14 40 28.0000	-.568419E+03 RNG	.140222E+00 AZ	-.975779E-02 EL	880.467
		PREDICTED RESIDUALS	.563792E+03	0.	0.	
393	16	1970 6 26 14 40 27.2438	.236238E+02 SRR	0.	0.	880.454
		PREDICTED RESIDUALS	.294388E+02	0.	0.	
393	16	1970 6 26 14 41 12.0000	.487147E+03 RNG	.142777E+00 AZ	.214578E-01 EL	881.200
		PREDICTED RESIDUALS	.888521E+03	0.	0.	
393	16	1970 6 26 14 41 11.2384	.218359E+02 SRR	0.	0.	881.187
		PREDICTED RESIDUALS	.276626E+02	0.	0.	
393	16	1970 6 26 14 41 24.0000	.741683E+03 RNG	.118419E+00 AZ	.221082E-01 EL	881.400
		PREDICTED RESIDUALS	.118599E+04	0.	0.	
393	16	1970 6 26 14 41 23.2371	.194904E+02 SRR	0.	0.	881.387
		PREDICTED RESIDUALS	.248938E+02	0.	0.	
313	16	1970 6 26 14 51 12.0000	-.118038E+04 RNG	-.376398E-02 AZ	.173580E-01 EL	891.200
		PREDICTED RESIDUALS	.252318E+04	0.	0.	
313	16	1970 6 26 14 51 11.2533	.891136E+01 SRR	0.	0.	891.188
		PREDICTED RESIDUALS	.151941E+02	0.	0.	
313	16	1970 6 26 14 51 44.0000	-.580432E+03 RNG	.445570E-01 AZ	.362221E-01 EL	891.733
		PREDICTED RESIDUALS	.143692E+04	0.	0.	
313	16	1970 6 26 14 51 43.2484	.323296E+02 SRR	0.	0.	891.721
		PREDICTED RESIDUALS	.622789E+02	0.	0.	
313	16	1970 6 26 14 52 40.0000	.119407E+04 RNG	.765811E-02 AZ	-.827994E-03 EL	892.667
		PREDICTED RESIDUALS	.238760E+04	0.	0.	
313	16	1970 6 26 14 52 39.2320	.106648E+02 SRR	0.	0.	892.654
		PREDICTED RESIDUALS	.255109E+02	0.	0.	
313	16	1970 6 26 14 53 4.0000	.133058E+04 RNG	-.356187E-02 AZ	-.622461E-02 EL	893.067
		PREDICTED RESIDUALS	.274215E+04	0.	0.	
313	16	1970 6 26 14 53 3.2305	.299246E+01 SRR	0.	0.	893.054
		PREDICTED RESIDUALS	.901653E+01	0.	0.	
313	16	1970 6 26 14 54 4.0000	.137674E+04 RNG	-.296810E-01 AZ	-.967884E-02 EL	894.067
		PREDICTED RESIDUALS	.295458E+04	0.	0.	
313	16	1970 6 26 14 54 3.2296	-.186451E+00 SRR	0.	0.	894.054
		PREDICTED RESIDUALS	.154078E+01	0.	0.	

13

ITEM	DESCRIPTION	REFERENCE SECTION
13	Residuals - External Units. Each line corresponds to one input observation set or card and contains the station-pass identification in year, month, day, hour, minute, and second; three pairs of measurement residuals and identification; and the time in MME	

The residuals are the unnormalized differences between the input measurements (modified by bias and/or refraction corrections) and the corresponding values for the same measured types computed from the integrated trajectory position at the observation time. The observation names are abbreviated as follows:

RNG	Range	CM3	Three-way cumulative doppler
AZ	Aximuth	DOP	Doppler
EL	Elevation	TWD	Two-way doppler
TRA	Topocentric right	SRR	SGLS range rate
	ascension	AX	X-antenna
TD	Topocentric declination	AY	Y-antenna
THA	Topocentric hour angle	CC3	JPL two- or three-way doppler
GRA	Geocentric right ascension	TNT	Tranet doppler
GD	Geocentric declination	GCR	Geoceiver range difference
U	u	V2	Vehicle-vehicle range
V	v	V2D	Vehicle-vehicle range rate
H	Height	S2	Station-vehicle-vehicle range
X		S2D	Station-vehicle-vehicle range rate
Y		S3	Station-vehicle-vehicle-vehicle range
Z		S3D	Station-vehicle-vehicle-vehicle range rate
P	P	V3	Vehicle-vehicle-vehicle range
Q	Q	TDA	Time differences of arrival
RD	Range rate	TØA	Time of arrival
PD	P rate	N	Time-of-arrival counter
QD	Q rate	ACC	Accelerometer
CM1	One-way cumulative doppler		

Predicted residuals for each observation ($\emptyset$) = $\underline{r} \cdot ([C_0]\underline{r})$ where C_0 = reweighted initial covariance matrix $(A^T A)^{-1}$ for this iteration

$$\underline{r} = \frac{\partial \emptyset}{\partial \underline{P}}$$

$\underline{P}$ = parameter set

```
          SUMMARY OF PREDICTED STATISTICS
 STA  TYP          RMS         TYP        RMS          TYP        RMS        TYP        RMS

 313  RNG       .246498E+04  SRR       .311255E+02
 393  SRR       .234482E+02  RNG       .915407E+03

PREDICTED RESIDUAL RMS =    .2162231161E+03 (15)

ENTER SEGMENT 83 AT     4.5 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .1 CP SECS.

ITERATION NUMBER     1
   18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                CURRENT VALUE          CORRECTION       NEW VALUE              TOTAL CORR.      SIGMA
6820     X       -.86187283924646E+06   .26946076E+04  -.85917823167636E+06   .26946076E+04   .86664237E+01
6820     Y        .68624999275575E+07   .15963546E+03   .68626595639133E+07   .15963546E+03   .12336910E+02
6820     Z        .20220527827524E+08   .85484888E+03   .20221382676408E+08   .85484888E+03   .38966545E+02
6820     DX       .25757403767231E+05  -.87170446E+00   .25756532062771E+05  -.87170446E+00   .41930156E-01
6820     DY       .25208380076158E+04  -.10258623E+01   .25198121452701E+04  -.10258623E+01   .41057022E-01
6820     DZ      -.29056495734126E+02  -.31997651E+01  -.32256260839496E+02  -.31997651E+01   .85279079E-01
6820     DRAG     .92174626938252E-02   .24751907E-03   .94649817679362E-02   .24751907E-03   .41172570E-03

NAME                SIGMA ZERO      SIGMA DENT      TOTAL CORR.     T.C./SIGMAO     T.C./SIGMAD
6820     X        .30953062E+04   .31567975E+04   .26946076E+04   .87054636E+00   .85358898E+00
6820     Y        .43136182E+03   .46290205E+03   .15963546E+03   .37007322E+00   .34485796E+00
6820     Z        .29722097E+03   .33812934E+03   .85484888E+03   .28761339E+01   .25281713E+01
6820     DX       .33379986E+00   .38637129E+00  -.87170446E+00  -.26114389E+01  -.22561316E+01
6820     DY       .12431271E+01   .12692153E+01  -.10258623E+01  -.82522727E+00  -.80826505E+00
6820     DZ       .35311826E+01   .35782622E+01  -.31997651E+01  -.90614546E+00  -.89422321E+00
6820     DRAG     .58941494E-03   .58941494E-03   .24751907E-03   .41994028E+00   .41994028E+00

RESIDUAL   RMS =     .1334096648E+03
RESIDUAL   SOS =     .3203664959E+06
APRIORI    RMS =    0.
APRIORI    SOS =    0.
TOTAL      SOS =     .3203664959E+06
PREDICTED  SOS =     .1510687690E+02
```

(14)

ITEM	DESCRIPTION	REFERENCE SECTION
14	Summary of predicted statistics contains the station data type and the RMS value for each data type	Item 9
15	Predicted residual RMS is the resulting RMS value calculated from the RMS values of each data type	Item 14

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46287E-01							
6820 Y	.12552E-01	.35232E-01						
6820 Z	-.10536E-01	.28025E-01	.67521E-01					
6820 DX	.19273E+02	.37392E+01	-.16916E+02	.20191E+05				
6820 DY	.16079E+02	.20377E+02	.15566E+02	.90214E+04	.17560E+05			
6820 DZ	-.76409E+01	.13403E+02	.37019E+02	-.13102E+05	.61963E+04	.21591E+05		
6820 DRAG	-.42191E+03	.16306E+03	.99403E+03	-.44431E+06	-.57531E+05	.56580E+06	.29194E+08	
ATe	.10877E+03	-.36056E+01	-.85625E+02	.53025E+05	.14167E+05	-.50686E+05	-.16180E+07	.32037E+06

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75107E+02						
6820 Y	.50115E+01	.15220E+03					
6820 Z	.20719E+03	-.83866E+02	.15184E+04				
6820 DX	-.11061E+00	.25883E+00	-.10674E+01	.17581E-02			
6820 DY	-.84013E-01	-.37172E+00	.16065E+00	-.12867E-02	.16857E-02		
6820 DZ	-.34376E+00	.35833E+00	-.30283E+01	.31680E-02	-.16098E-02	.72725E-02	
6820 DRAG	-.11839E-02	-.16602E-02	-.54738E-02	-.38768E-05	.10326E-04	.23858E-06	.16952E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.04687	1.00000					
6820 Z	.61354	-.17446	1.00000				
6820 DX	-.30438	.50037	-.65329	1.00000			
6820 DY	-.23611	-.73388	.10041	-.74742	1.00000		
6820 DZ	-.46512	.34059	-.91132	.88597	-.45970	1.00000	
6820 DRAG	-.33180	-.32684	-.34118	-.22456	.61085	.00679	1.00000

ENTER SEGMENT 84 AT 405 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 2. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	Q-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	-859178.232	97.136379080	21737496.946	.0115444785030	339.05894482	3647.45825
14/39	6862659.563	71.117991789	.01954597749	-.0157724523242	329.49039975	211.21826
0.0000000	20221382.676	90.568645043	108.875801391	.0670741516302	328.91695641	3507.60554
71.2355249	25756.5320628	271.442104951	185.611994202	276.2698919869	89.4532373	71.36555
323.0810907	2519.8121453	21371443.584	120.589870828	-.13678442616	89.5929573	2.8238278269
83.7077	-32.2562608	25879.5177238	796.9865525	-1.39203486846	89.7241692	-2.0803574733

```
                    TOTAL EDIT SUMMARY

 STA    N TYP   RMS     RMS/SIG     MEAN      N TYP   RMS     RMS/SIG     MEAN      N TYP   RMS     RMS/SIG     MEAN
 313    5 RNG 1.2E+03 5.8E+01   4.3E+02     5 AZ  2.4E-02 0.          3.9E-03     5 EL  1.9E-02 0.          7.4E-03
 313    5 SRR 1.6E+01 1.6E+02   1.1E+01
 393    5 AZ  1.4E-01 0.        1.3E-01     5 EL  1.7E-02 0.          3.4E-03     5 SRR 1.9E+01 1.9E+02    1.8E+01
 393    3 RNG 6.1E+02 3.8E+01   2.2E+02

EXIT SEGMENT 84 AT       4.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
ENTER SEGMENT 10 AT      4.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

 **********************************  TRAJECTORY INTEGRATION FOR CASE   1  **********************************

                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE          ASSOCIATED QUANTITIES
    879.0000 TZERO
    903.7449 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      4.5710C
*                STEP    DOUBLED          T  =    882.250000      H  =        .250000      NSTEP  =        25
*                STEP    DOUBLED          T  =    889.250000      H  =        .500000      NSTEP  =        52
   NODE  T =      .900745091723E+03     .214557299934E+08     .212528979968E+07     -.144713230605E-04
           OT =     .500000000 00E+00     .128581880605E+04    -.821146697778E+04     -.243780029595E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .253  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

            ***  FROM        879.000  TO        903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      4.8 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .3 CP SECS.

ENTER SEGMENT 82 AT      4.9 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

(18)

ITEM	DESCRIPTION	REFERENCE SECTION
16	Total edit summary is fully explained in Case B, Item 7.	2.2.4

```
****************************************************  STAGE  3  ****************************************************

STAPASS   YEAR MO DY HR MN  SEC                  RESIDUALS - EXTERNAL UNITS                          MME

393  16   1970  6 26 14 39 20.0000  0.                     .107148E+00 AZ   -.398319E-01 EL    879.333
393  16   1970  6 26 14 39 19.2503  -.442553E-01 SRR  0.                    0.                 879.321
393  16   1970  6 26 14 39 36.0000  0.                     .989787E-01 AZ   -.158302E-01 EL    879.600
393  16   1970  6 26 14 39 35.2492   .305583E-01 SRR  0.                    0.                 879.587
393  16   1970  6 26 14 40 28.0000  -.146891E+02 RNG   .869654E-01 AZ   -.289018E-01 EL    880.467
393  16   1970  6 26 14 40 27.2438   .230042E-01 SRR  0.                    0.                 880.454
393  16   1970  6 26 14 41 12.0000  -.416428E+01 RNG   .904593E-01 AZ    .832230E-02 EL    881.200
393  16   1970  6 26 14 41 11.2384   .170665E-03 SRR  0.                    0.                 881.187
393  16   1970  6 26 14 41 24.0000   .352911E+01 RNG   .694075E-01 AZ    .106563E-01 EL    881.400
393  16   1970  6 26 14 41 23.2371  -.390290E-01 SRR  0.                    0.                 881.387
313  16   1970  6 26 14 51 12.0000   .222335E+02 RNG  -.291823E-01 AZ   -.133159E-01 EL    891.200
313  16   1970  6 26 14 51 11.2533  -.659466E-01 SRR  0.                    0.                 891.188
313  16   1970  6 26 14 51 44.0000   .246368E+02 RNG  -.382235E-01 AZ   -.974428E-02 EL    891.733
313  16   1970  6 26 14 51 43.2484   .368395E-01 SRR  0.                    0.                 891.721
313  16   1970  6 26 14 52 40.0000  -.189811E+02 RNG  -.334623E-01 AZ    .663150E-02 EL    892.667
313  16   1970  6 26 14 52 39.2320   .977509E-01 SRR  0.                    0.                 892.654
313  16   1970  6 26 14 53  4.0000  -.201657E+02 RNG  -.229135E-01 AZ   -.254060E-02 EL    893.067
313  16   1970  6 26 14 53  3.2305   .104250E-01 SRR  0.                    0.                 893.054
313  16   1970  6 26 14 54  4.0000  -.184706E+02 RNG  -.349994E-01 AZ   -.837636E-02 EL    894.067
313  16   1970  6 26 14 54  3.2296  -.538472E-03 SRR  0.                    0.                 894.054

ENTER SEGMENT 83 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .1 CP SECS.

ITERATION NUMBER     2
   18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME              CURRENT VALUE          CORRECTION         NEW VALUE                TOTAL CORR.        SIGMA
6820    X        -.859178231676636E+06    .35999910E+00   -.859177871677725E+06    .26949676E+04    .86647990E+01
6820    Y         .686265956300133E+07   -.15450372E+01    .686265801797610E+07    .15809042E+03    .12332311E+02
6820    Z         .202213826764008E+08    .87685625E+00    .202213835532640E+08    .85572574E+03    .38971069E+02
6820    DX        .257565321362771E+05    .40341242E-03    .257565324661830E+05   -.87139105E+00    .41930178E-01
6820    DY        .251981214527610E+04   -.33434910E-02    .251980880177900E+04   -.10292058E+01    .41030290E-01
6820    DZ       -.322562600830496E+02    .18162331E-02   -.322544445974350E+02   -.31979489E+01    .85289056E-01
6820    DRAG      .946498176708620E-02   -.40685814E-05    .946091318567690E-02    .24343049E-03    .41173917E-03
```

NAME		SIGMA ZERO	SIGMA LENT	TOTAL CORR.	T.C./SIGMAP	T.C./SIGMAD
6820	X	.30953062E+04	.31567975E+04	.26949676E+04	.87066266E+00	.85370302E+00
6820	Y	.43136182E+03	.46290205E+03	.15809042E+03	.36649145E+0	.34152024E+00
6820	Z	.2972209 E+03	.33812934E+03	.85572574E+03	.28790901E+01	.25397645E+01
6820	DX	.3337998 E+00	.38637129E+00	-.87130105E+00	-.26102503E+01	-.22550875E+01
6820	DY	.12431271E+01	.12692153E+01	-.10292058E+01	-.82791685E+00	-.51089935E+00
6820	DZ	.35311826E+01	.35782622E+01	-.31979489E+01	-.99563112E+00	-.89371563E+00
6820	DRAG	.58941494E-03	.58941494E-03	.24345049E-03	.41303753E+00	.41303753E+00

RESIDUAL RMS = .6734028811E+00
RESIDUAL SOS = .8162485924E+01
APRIORI RMS = .9997736082E+00
APRIORI SOS = .6996788883E+01
TOTAL SOS = .1515927481E+02
PREDICTED SOS = .1487141259E+02

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46320E-01							
6820 Y	.12528E-01	.35183E-01						
6820 Z	-.10610E-01	.27983E-01	.67555E-01					
6820 DX	.19313E+02	.37246E+01	-.16989E+02	.20240E+05				
6820 DY	.16069E+02	.20327E+02	.15509E+02	.90207E+04	.17517E+05			
6820 DZ	-.76831E+01	.13387E+02	.37054E+02	-.13147E+05	.61794E+04	.21619E+05		
6820 DRAG	-.41838E+03	.16168E+03	.98556E+03	-.43967E+06	-.57035E+05	.56051E+06	.28814E+08	
ATB	-.70171E-01	-.68118E-01	.16760E-01	-.57784E+02	-.55513E+02	.29092E+02	.13779E+04	.81625E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75679E+02						
6820 Y	.48999E+01	.15209E+03					
6820 Z	.20715E+03	-.84416E+02	.15187E+04				
6820 DX	-.11670E+00	.25894E+00	-.10677E+01	.17581E-02			
6820 DY	-.83529E-01	-.37126E+00	.16293E+00	-.12873E-02	.16835E-02		
6820 DZ	-.34426E+00	.35854E+00	-.30310E+01	.31672E-02	-.16091E-02	.72742E-02	
6820 DRAG	-.11803E-02	-.16532E-02	-.54754E-02	-.38724E-05	.10289E-04	.30184E-06	.16953E-06

```
CORRELATION MATRIX
6820 X      1.00000
6820 Y       .04585 1.00000
6820 Z       .61344 -.17565 1.00000
6820 DX    -.30470  .50075 -.65340 1.00000
6820 DY    -.23495 -.73372  .10189 -.74823 1.30000
6820 DZ    -.46584  .34088 -.91189  .88565 -.45982 1.00000
6820 DRAG  -.33084 -.32558 -.34123 -.22430  .60903  .00866 1.00000

ENTER SEGMENT 84 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   3. ****

 YEAR/MO/DY            X           ALPHA             A               AF       MEAN ANOMALY   APOGEE RADIUS
     HR/MIN            Y           DELTA             E               AG      ECCENTRC ANOM   APOGEE HEIGHT
    SECONDS            Z            BETA             I                N       TRUE ANOMALY  PERIGEE RADIUS
   LATITUDE         XDOT         AZIMUTH             O                L     KEPLERIAN PER  PERIGEE HEIGHT
  LONGITUDE         YDOT          RADIUS             U              CHI       ANOMALY PER           O-DOT
     HEIGHT         ZDOT        VELOCITY           TAU              PSI      NODAL PERIOD           U-DOT

 1970/ 6/26   -859177.872   97.136377710  21737497.734  .0115444430051   330.05906030      3647.45839
   14/39      6862658.018   71.117996552  .01954597823 -.0157724792175   329.49050718       211.21842
 0.0000050   20221383.553   96.568643087  108.875796568  .0670741479820   328.91777581      3507.60566
 71.2355296  25756.5324662  271.442112057 185.611985367  276.260794805     89.4532421        71.36569
323.0810893  2519.8088018   21371443.903  120.589749135  -.136734199932    89.6920622    2.8238267735
   83.7077    -32.2544446  25879.5177974   796.9865193  -1.39203476573     89.7241741   -2.0803583339

EXIT SEGMENT 84 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
```

```
ENTER SEGMENT 10 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.

**********************************  TRAJECTORY INTEGRATION FOR CASE   1  **********************************

                                    * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE        ASSOCIATED QUANTITIES
   879.0000 TZERO
   903.7449 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     5.07730
*               STEP   DOUBLED          T  =    882.250000     H  =      .250000    NSTEP  =       25
*               STEP   DOUBLED          T  =    889.250000     H  =      .500000    NSTEP  =       52
   NODE  T =     .900745093793E+03     .214557320665E+08     .212527764462E+07    -.729249300990E-05
        DT =     .000000000000E+00     .128583828185E+04    -.821146372638E+04    -.243980023908E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .255  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

            ***  FROM         879.000  TO        903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      5.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .3 CP SECS.

ENTER SEGMENT 82 AT      5.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

** STAGE 3 **

STA	PASS	YEAR	MO	DY	HR	MN	SEC	RESIDUALS - EXTERNAL UNITS			MME
393	16	1970	6	26	14	39	20.0000	0.	.107165E+00 AZ	-.398429E-01 EL	879.333
393	16	1970	6	26	14	39	19.2503	-.362891E-01 SRR	0.	0.	879.321
393	16	1970	6	26	14	39	36.0000	0.	.989952E-01 AZ	-.158431E-01 EL	879.600
393	16	1970	6	26	14	39	35.2492	.388371E-01 SRR	0.	0.	879.587
393	16	1970	6	26	14	40	28.0000	-.127559E+02 RNG	.869688E-01 AZ	-.289209E-01 EL	880.467
393	16	1970	6	26	14	40	27.2438	.275882E-01 SRR	0.	0.	880.454
393	16	1970	6	26	14	41	12.0000	-.221059E+01 RNG	.904432E-01 AZ	.830291E-02 EL	881.200
393	16	1970	6	26	14	41	11.2384	-.311691E-02 SRR	0.	0.	881.187
393	16	1970	6	26	14	41	24.0000	.543241E+01 RNG	.693073E-01 AZ	.106378E-01 EL	881.400
393	16	1970	6	26	14	41	23.2371	-.438627E-01 SRR	0.	0.	881.387
313	16	1970	6	26	14	51	12.0000	.231000E+02 RNG	-.290535E-01 AZ	-.133693E-01 EL	891.200
313	16	1970	6	26	14	51	11.2533	-.473738E-01 SRR	0.	0.	891.188
313	16	1970	6	26	14	51	44.0000	.264175E+02 RNG	-.380592E-01 AZ	-.988287E-02 EL	891.733
313	16	1970	6	26	14	51	43.2484	.734340E-01 SRR	0.	0.	891.721
313	16	1970	6	26	14	52	40.0000	-.170611E+02 RNG	-.335851E-01 AZ	.653932E-02 EL	892.667
313	16	1970	6	26	14	52	39.2320	.802365E-01 SRR	0.	0.	892.654
313	16	1970	6	26	14	53	4.0000	-.185782E+02 RNG	-.230127E-01 AZ	-.259586E-02 EL	893.067
313	16	1970	6	26	14	53	3.2365	-.338924E-03 SRR	0.	0.	893.054
313	16	1970	6	26	14	54	4.0000	-.171638E+02 RNG	-.350586E-01 AZ	-.840312E-02 EL	894.067
313	16	1970	6	26	14	54	3.2296	-.344210E-02 SRR	0.	0.	894.054

ENTER SEGMENT 83 AT 5.5 SECONDS. EXECUTION TIME FOR SEGMENT 82 WAS .1 CP SECS.

ITERATION NUMBER 3
18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	-.8591778716 7725E+06	.47835554E-03	-.85917787119919E+06	.26949660E+04	.86647932E+01
6820	Y	.6862658 179761E+07	-.15530498E-03	.68626580178207E+07	.15809026E+03	.12332326E+02
6820	Z	.2022138355 3264E+08	.37430598E-02	.20221383557007E+08	.85572948E+03	.38971078E+02
6820	DX	.25756532466183E+05	-.38323101E-05	.25756532462351E+05	-.87131488E+00	.41930145E-01
6820	DY	.25198068017790E+04	-.81119420E-07	.25198088016979E+04	-.10292059E+01	.41030546E-01
6820	DZ	-.32254444597435E+02	-.81730286E-05	-.32254452767464E+02	-.31979570E+01	.85289692E-01
6820	DRAG	.94609131856769E-02	-.55255057E-08	.94609076601712E-02	.24344497E-03	.41173920E-03

NAME		SIGMA ZERO	SIGMA DEWT	TOTAL CORR.	T.C./SIGMA0	T.C./SIGMAD
6820	X	.30953062E+04	.31567975E+04	.26949680E+04	.87066282E+00	.85370317E+00
6820	Y	.43136182E+03	.46290205E+03	.15809026E+03	.36649139E+00	.34151991E+00
6820	Z	.29722090E+03	.33812934E+03	.85572948E+03	.28791027E+01	.25307756E+01
6820	DX	.33379980E+00	.38637129E+00	-.87130488E+00	-.26102618E+01	-.22550974E+01
6820	DY	.12431271E+01	.12692153E+01	-.10292059E+01	-.82791691E+00	-.81089941E+00
6820	DZ	.35311826E+01	.35782622E+01	-.31979570E+01	-.90563343E+00	-.89371791E+00
6820	DRAG	.58941494E-03	.58941494E-03	.24344497E-03	.41302816E+00	.41302816E+00

RESIDUAL RMS = .6607756855E+00
RESIDUAL SOS = .7859241119E+01
APRIORI RMS = .1003895035E+01
APRIORI SOS = .7012536101E+01
TOTAL SOS = .1487177722E+02
PREDICTED SOS = .1487177717E+02

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46320E-01							
6820 Y	.12528E-01	.35193E-01						
6820 Z	-.10609E-01	.27983E-01	.67555E-01					
6820 DX	.19313E+02	.37247E+01	-.16989E+02	.20240E+05				
6820 DY	.16069E+02	.20328E+02	.15509E+02	.90208E+04	.17517E+05			
6820 DZ	-.76830E+01	.13387E+02	.37054E+02	-.13147E+05	.61704E+04	.21619E+05		
6820 DRAG	-.41838E+03	.16167E+03	.98555E+03	-.43966E+06	-.57036E+05	.56050E+06	.28914E+08	
ATB	-.29748E-04	-.20918E-04	-.88262E-06	-.23391E-01	-.23512E-01	.30988E-02	.41490E+00	.78592E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75079E+02						
6820 Y	.49000E+01	.15209E+03					
6820 Z	.20715E+03	-.84417E+02	.15187E+04				
6820 DX	-.11070E+00	.25894E+00	-.10677E+01	.17581E-02			
6820 DY	-.83529E-01	-.37127E+00	.16293E+00	-.12873E-02	.10835E-02		
6820 DZ	-.34426E+00	.35854E+00	-.30310E+01	.31672E-02	-.16091E-02	.72742E-02	
6820 DRAG	-.11803E-02	-.16532E-02	-.54754E-02	-.38723E-05	.10289E-04	.30196E-06	.16953E-06

```
CORRELATION MATRIX

6820 X       1.00000
6820 Y        .04586  1.00000
6820 Z        .61344  -.17565  1.00000
6820 DX      -.30469   .50075  -.65340  1.00000
6820 DY      -.23495  -.73372   .21190  -.74823  1.00000
6820 DZ      -.46594   .34688  -.91189   .88565  -.45982  1.00000
6820 DRAG    -.33084  -.32558  -.34123  -.22430   .60902   .00860  1.00000

ENTER SEGMENT 84 AT      5.5 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.

ATA INVERSE UPDATED TO        900.74 MINUTES FROM MIDNIGHT OF EPOCH

             6820 X        6820 Y        6820 Z        6820 DX       6820 DY       6820 DZ       6820 DRAG
6820 X        .75352E+04
5820 Y       -.14908E+04    .48176E+03
6820 Z        .60784E+04  -.14064E+04    .56034E+04
6820 DX       .13201E+02  -.25698E+01    .10604E+02    .23166E-01
6820 DY       .19277E+01  -.26673E+00    .15167E+01    .33877E-02    .65730E-03
6820 DZ       .51825E+01  -.13525E+01    .52459E+01    .99051E-02    .12298E-02    .52821E-02
6820 DRAG    -.23175E-01    .26550E-02  -.11955E-01  -.41516E-04  -.59657E-05  -.54047E-05    .16953E-06


G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820


ORBIT PLANE COORDINATE SYSTEM


   .78246E+04
  -.96415E+04    .13242E+05
  0.            0.            74329E+04
   .17437E+02  -.20776E+02  0.                .41201E-01
  -.91552E+01    .11281E+02  0.              -.20402E-01    .10712E-01
  0.            0.             .58474E+01   0.             0.              .10176E-01
```

PARAMETER SET COORDINATE SYSTEM

```
.16479E-1
.69271E-11   .19750E-10
.23336E-10   .63905E-11   .28857E-10
.22445E-11   .13550E-11   .26535E-11   .32562E-12
.54055E-12   .13236E-11   .49211E-12   .78111E-13   .97225E-13
.11590E-11   .34357E-12   .14681E-11   .15783E-12   .16999E-13   .87612E-13
```

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21455717.114	5.657183506	21797285.075	.0122857499983	58.23076095	3663.69784
15/ 0	2125373.124	.0007511100	.02127520963	-.0173693664702	59.32922068	227.60846
44.6943000	282 643	88.951419980	138.848776959	.0667983727789	60.33349092	3511.84967
.6007562	1286.1391971	198.848776950	185.656927094	3.553413457	89.8225473	74.96429
226.1519867	-8211.4289637	21560728.370	119.615715412	-.1373173594 5	89.6836302	2.7933472359
104.5167	-24308.3023914	25659.7312610	886.2034378	-1.3912335620 9	89.7157996	-2.0669831941

LEAST SQUARES PROCESS CONVERGED.

TOTAL ECIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
313	5	RNG	2.1E+01	1.0E+30	-6.6E-01	5	AZ	3.2E-02	0.	-3.2E-02	5	EL	8.9E-03	0.	-5.5E-03
313	5	SRR	5.3E-02	5.3E-01	2.1E-02										
393	5	AZ	9.1E-02	0.	9.1E-02	5	EL	2.4E-02	0.	-1.3E-02	5	SRR	3.3E-02	3.3E-01	-3.4E-03
393	3	RNG	8.1E+00	4.1E-01	-3.2E+00										

TYPE	SYMB	MINIMUM	CELTA	MEAN	MAXIMUM	STATION 313 PAGE 1
RNG	0	-.42227890E+02	.83141500E+00	-.65713998E+00	.40913610E+02	
AZ	1	-.42250725E-01	.20993823E-03	-.31753814E-01	-.21256903E-01	
EL	2	-.19483211E-01	.27881689E-03	-.55423665E-02	.83984781E-02	
SRR	3	-.77414398E-01	.19583505E-02	.23503126E-01	.11842065E+00	

```
53472.*.........*....3....*.2.......*...........*..........*.1........*.........0*..........*.........*
53482.*                                         *                                                     *
53492.*                                         *                                                     *
53502.*               1            2            *                        3    0                       *
53512.*                                         *                                                     *
53522.*                                         *                                                     *
53532.*                                         *                                                     *
53542.*                                         *                                                     *
53552.*                                         *                                                     *
53562.*                       0        1        *                           3         2               *
53572.*                                         *                                                     *
53582.*                     0        3          *       2                            1                *
53592.*                                         *                                                     *
53602.*                                         *                                                     *
53612.*                                         *                                                     *
53622.*                                         *                                                     *
53632.*                                         *                                                     *
53642.*                       0   1   3 2       *                                                     *
       ****************************************** END OF PLOT ******************************************
```

TYPE	SYMB	MINIMUM	CELTA	MEAN	MAXIMUM	STATION 393 PAGE 1
AZ	0	.65166506E-01	.50850711E-03	.93591862E-01	.11601722E+00	
EL	1	-.53078909E-01	.79891344E-03	-.13133237E-01	.26812435E-01	
SRR	2	-.69479148E-01	.13222093E-02	-.33686846E-02	.62741779E-01	
RNG	3	-.18091632E+02	.29927194E+00	-.31780344E+01	.11735563E+02	

```
52760.*.........*.......1..*....2....*..........*..........*..........*3.........*..........*..0.......*.........*
52770.*                                         *                                                     *
52780.*                                       1 *       3    0           2                            *
52790.*                                         *                                                     *
52800.*                                         *                                                     *
52810.*                                         *                                                     *
52820.*                                         *                                                     *
52830.*             3         1          0      *                  2                                  *
52840.*                                         *                                                     *
52850.*                                         *                                                     *
52860.*                                         *                                                     *
52870.*                                         2 3                    1                              *
52880.*        0        2                       *                        31                           *
       ****************************************** END OF PLOT ******************************************
EXIT SEGMENT 84 AT      5.6 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
```

17

ITEM	DESCRIPTION	REFERENCE SECTION
17	An example of the printer plot of the measurement residuals for the last iteration (see Case B, Item 20, for a full explanation)	2.2.1 11.1.2 15

```
ENTER SEGMENT 10 AT     5.6 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

*********************************  TRAJECTORY INTEGRATION FOR CASE   1  *********************************

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE         ASSOCIATED QUANTITIES
   879.0000 TZERO
  1621.2182 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      5.64200
 *                STEP   DOUBLED          T  =    882.250000        H  =        .250000      NSTEP  =         25
 *                STEP   DOUBLED          T  =    889.250000        H  =        .500000      NSTEP  =         52
   NODE  T =     .900745093793E+03     .214557320668E+08     .212527764464E+07     -.163423225258E-04
        DT =     .500000000000E+00     .128581828242E+04    -.821146372635E+04     -.143983023999E+05
 *                STEP   DOUBLED          T  =    944.750000        H  =       1.000000      NSTEP  =        162
   NODE  T =     .946658588135E+03    -.218803714357E+08    -.220050623323E+07      .125779257434E-01
        DT =     .100000000000E+01    -.345907455384E+03     .814245712192E+04      .238329373837E+05
   NODE  T =     .993458993524E+03     .214489766159E+08     .219946463927E+07     -.203249489554E+00
        DT =     .100000000000E+01     .131064337857E+04    -.820810237125E+04     -.243172204050E+05
   NODE  T =     .103636699922E+04    -.218706977040E+08    -.226695434615E+07     -.589911761112E-01
        DT =     .100000000000E+01    -.371226613584E+03     .814293963106E+04      .239341151012E+05
   NODE  T =     .108016391663E+04     .214421025123E+08     .225584277698E+07     -.863967201429E-01
        DT =     .100000000000E+01     .133502110587E+04    -.820410225153E+04     -.243065075936E+05
   NODE  T =     .112606552771E+04    -.218608987722E+08    -.233339815792E+07     -.188487221395E+00
        DT =     .100000000000E+01    -.396800041540E+03     .814245997901E+04      .238364978995E+05
   NODE  T =     .116985963199E+04     .214354461178E+08     .232115326113E+07      .183242366425E-01
        DT =     .100000000000E+01     .135985239073E+04    -.819960465312E+04     -.243954490028E+05
   NODE  T =     .121575653757E+04    -.218505799153E+08    -.239962263565E+07     -.349275773535E-03
        DT =     .100000000000E+01    -.421904305512E+03     .814166299668E+04      .238391830641E+05
   NODE  T =     .125954792133E+04     .214287958496E+08     .238612935950E+07     -.143720489610E+00
        DT =     .100000000000E+01     .138359662734E+04    -.819456219999E+04     -.243743612622E+05
   NODE  T =     .130543842259E+04    -.218400481221E+08    -.246518296583E+07     -.153969776460E-01
        DT =     .100000000000E+01    -.447494361867E+03     .814101306788E+04      .238419324156E+05
   NODE  T =     .134922819215E+04     .214216538875E+08     .245114069099E+07     -.134185454353E+00
        DT =     .100000000000E+01     .140705124634E+04    -.818982963950E+04     -.243933933899E+05
   NODE  T =     .139511939774E+04    -.218293480956E+08    -.253158939874E+07     -.190257516319E+00
        DT =     .100000000000E+01    -.473738187344E+03     .813998039347E+04      .239448042449E+05
```

```
NODE  T =   .143889773764E+04   .214142223518E+08   .251756189895E+07   .238869289165E-01
     DT =   .100000000000E+01   .143189662466E+04  -.818469744155E+04  -.243022798898E+05
NODE  T =   .148477523587E+04  -.218185158357E+08  -.259856294727E+07  -.426012096486E-02
     DT =   .100000000000E+01  -.499292763766E+03   .813948091130E+04   .235474219567E+05
NODE  T =   .152855981410E+04   .214068999360E+08   .258314669414E+07  -.139505778298E+00
     DT =   .100000000000E+01   .145653788076E+04  -.817937123994E+04  -.243110299933E+05
NODE  T =   .157443233033E+04  -.218372374883E+08  -.266469893192E+07  -.176961111494E-01
     DT =   .100000000000E+01  -.524418908623E+03   .813783967260E+04   .239502272862E+05
NODE  T =   .161821395867E+04   .213994585329E+08   .264837440794E+07  -.124191763445E+00
     DT =   .100000000000E+01   .148356649020E+04  -.817509952922E+04  -.242996054642E+05

   ***  TRAJECTORY TERMINATION

   ***  THIS CASE TOOK      .925  SECONDS TO INTEGRATE A SPAN OF    742.7500  MINUTES  ***

        ***  FROM      879.000  TO      1621.750  MINUTES FROM MIDNIGHT OF EPOCH  ***
                                *** TRACE66 EPHEMERIS OUTPUT KEY ***


DATE,...    ME,MM,ST,DT         X,XD          X,XD - BF     ADBARV           LAT,...          REV,...       REMARK

YR/MO/DAY   MIN FROM EPOCH      X (FT)        X (FT)        ALPHA   (DEG)    LATITUDE (DEG)   REV COUNT       .
HR/MIN      MIN FROM MIDNIGHT   Y (FT)        Y (FT)        DELTA   (DEG)    LONGITUDE(DEG)   PERIOD          .
SEC         SEC FROM MIDNIGHT   Z (FT)        Z (FT)        BETA    (DEG)    ALTITUDE (NM)    PERIOD-DECAY    .
            STEP SIZE(MIN)      XD(FT/SEC)    XD(FT/SEC)    AZIMUTH(DEG)     S-VEH-LAT(DEG)   NOD-REG         .
IT          UTC - IT            YD(FT/SEC)    YD(FT/SEC)    R       (FT)     I        (DEG)
            UT1 - IT            ZD(FT/SEC)    ZD(FT/SEC)    V   (FT/SEC)     O        (DEG)
```

*** ECI TRAJECTORY ***

*** CASE 1
***

*** EPOCH PRINT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	0.00000	-.859177872E+06	.552943353E+07	97.13607771	71.23532964	.24863
14/39	879.00000	.862658.2E+07	-.415447066E+07	71.11799655	323.08108931	0.00000
0.00000	52740.00000	.232213836E+08	.232213836E+08	90.56864309	83.70774013	0.00000
	.12500	.257565325E+05	-.164017950E+05	271.44211206	71.23274551	0.00000
IT	0.00000	.25198.883E+04	-.206658767E+05	.213714445E+08	108.87579657	
	1.00000	-.322544446E+02	-.322544446E+02	.25879518E+05	51.55699698	

A =	.21737498E+08	MEAN ANOM =	.33005906E+03	APOGEE =	.36474584E+04
E =	.19545978E-01	ECCENTRIC =	.32949051E+03	HEIGHT =	.21121842E+03
I =	.19887580E+03	TRUE ANOM =	.32891708E+03	PERIGEE =	.35076057E+04
O =	.18561199E+03	KEPL PER =	.89453242E+02	HEIGHT =	.71365690E+02
U =	.12058975E+03	ANOM PER =	.89692362E+02	O-DOT =	.28238268E+01
TAU =	.79698652E+03	NODL PER =	.89724174E+02	U-DOT =	-.20803583E+01

*** REQUESTED PRINTS

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	21.74509	.214557321E+08	-.149364771E+08	5.65692696	-.00000039	.50000 DSC NODE
15/ 0	90.74509	.212527759E+07	-.155488551E+08	-.00000039	226.15078160	0.00000
44.70563	5404.70563	-.147473157E+00	-.147473157E+00	88.95141266	104.51754274	0.00000
	.50000	.128560810E+04	-.744391549E+04	198.84877695	-.00000039	0.00000
IT	.00000	-.821146374E+04	.649884239E+04	.21560734E+08	108.84667950	
	.00000	-.243080024E+05	-.243080024E+05	.25689695E+05	46.15008174	

DELTA NODE = .013 DELTA V = -89.7141 18

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	111.45900	.214489767E+08	-.137216942E+08	5.83138148	-.00000693	1.50000 DSC NODE
16/30	990.45900	.219146382E+07	-.871272125E+07	-.00000689	203.83515595	0.00000
27.53971	59427.53971	-.259150097E+01	-.259150097E+01	88.95178468	104.48516846	0.00000
	1.00000	.131064051E+04	-.441879149E+04	198.85054353	-.00000693	0.00000
IT	.00000	-.820811268E+04	.833922557E+04	.21561537E+08	108.85038759	
	1.00000	-.243072204E+05	-.243072204E+05	.25689136E+05	23.83515821	

ITEM	DESCRIPTION	REFERENCE SECTION
18	Delta Node is the difference between the predicted node time and the input node time	2.2.11.1
	Delta V is the difference in velocity at the predicted and input node times	

```
DELTA NODE =     -.011   DELTA V =     -.0002

DATE,...  ME,MM,ST,DT,..       X,XD              X,XD - BF          ADBARV          LAT,.. BF       REV,...
70/ 6/26       201.16392   .214421628E+08   -.215528327E+08      6.00577563     -.00001394      2.50000 OSC NODE
 10/ 0        1080.16392   .225584116E+07   -.572707417E+06     -.00001295     181.52212002    89.70841
 9.83519     64859.83519  -.487416521E+01   -.487416521E+01     88.95319054    104.46935025     0.00000
                 1.00000   .133561531E+04   -.731338886E+03    198.85098714     -.00001394       .17480
IT                .00000  -.820410288E+04    .985501748E+04    .21560449E+08   108.84775333
                  .00000  -.243065077E+05   -.243065077E+05    .25688439E+05     1.52212444

DELTA NODE =     -.036   DELTA V =     -.0006

DATE,...  ME,MM,ST,DT,..       X,XD              X,XD - BF          ADBARV          LAT,.. BF       REV,...
70/ 6/26        29.85963   .214354463E+08   -.201570499E+08      6.18023193     -.00000957      3.50000 OSC NODE
 19/29        1169.85963   .232115205E+07    .765241429E+07     -.00001951     159.21125520    89.69853
51.57806     70191.57806  -.357663384E+01   -.357806384E+01     88.95336690    104.52033191     -.00988
                 1.00000   .135984799E+04    .316464178E+04    198.85088939     -.00000957       .17487
IT               0.00000  -.819966514E+04    .939449343E+04    .21560754E+08   108.84140924
                 0.00000  -.243054490E+05   -.243054490E+05    .25687304E+05   339.21125844

DELTA NODE =     -.073   DELTA V =     -.0012

DATE,...  ME,MM,ST,DT,..       X,XD              X,XD - BF          ADBARV          LAT,.. BF       REV,...
70/ 6/26       381.54792   .214287958E+08   -.157434689E+08      6.35351092     -.00000043      4.50000 OSC NODE
 20/59        1259.54792   .238602036E+07    .147319236E+08     -.00000043     136.90107593    89.69101
32.87528     75572.87528  -.159996576E+00   -.159996576E+00     88.95541135    104.59832840     -.00752
                 1.00000   .138359652E+04    .640159544E+04    198.84955597     -.00000043       .17449
IT                .00000  -.819456211E+04    .752649396E+04    .21561224E+08   108.83041044
                 0.00000  -.243043612E+05   -.243043612E+05    .25685933E+05   316.90107517

DELTA NODE =     -.123   DELTA V =     -.0020

DATE,...  ME,MM,ST,DT,..       X,XD              X,XD - BF          ADBARV          LAT,.. BF       REV,...
70/ 6/26       473.22819   .214216538E+08   -.837383837E+07      6.52865239      .00000493      5.50000 OSC NODE
 22/29        1349.22819   .245154134E+07    .196052934E+08      .00000480     114.59476720    89.68158
13.69145     80953.69145   .180533608E+01    .180533608E+01     88.95876518    104.64000019     -.00912
                 1.00000   .140725351E+04    .877935830E+04    198.84889739      .00000493       .17288
IT               0.00000  -.818982935E+04    .453185004E+04    .21561477E+08   108.81633541
                  .00000  -.243033933E+05   -.243033933E+05    .25684782E+05   294.59476556

70/ 6/26       559.89774   .214142223E+08   -.862508573E+06      6.70513675      .00000142      6.50000 OSC NODE
 23/58        1438.89774   .251756227E+07    .215444451E+08      .00001141      92.29255036    89.67197
53.86424     86333.86424   .531000907E+00    .531000907E+00     88.95938690    104.67714663     -.00991
                 1.00000   .143185722E+04    .934165309E+04    198.84831388      .00000142       .17518
IT                .00000  -.818409737E+04    .859814706E+03    .21561703E+08   108.79783419
                 0.00000  -.243022799E+05   -.243022799E+05    .25683465E+05   272.29254597
```

```
DELTA NODE =      -.203    DELTA V =       -.0034

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
70/ 6/27       649.55981    .214069201E+08    .737797002E+07      6.88028536       -.00070358      7.50000 DSC NODE
  1/28        1528.55981    .258304619E+07    .202606282E+08      -.00073366       69.99075918    89.66484
33.58890      5313.58890   -.137648336E+01   -.137648336E+01     88.95986531      104.75522760     -.00713
                 1.00000    .145653643E+04    .943119771E+04    198.84691285       -.00000368       .17673
IT               0.00000   -.817937142E+04   -.293925337E+04    .21562177E+08     108.84712996
                 0.00000   -.243010299E+05   -.243010299E+05    .25681972E+05     249.99075133

DELTA NODE =      -.233    DELTA V =       -.0039

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
70/ 6/27       739.21396    .213994588E+08    .145146072E+08      7.05498826       -.00001259      8.50000 DSC NODE
  2/58        1618.21396    .264837286E+07    .159460620E+08      -.00001251       47.69055222    89.65710
12.83771     10692.83771   -.470774157E+01   -.470774157E+01     88.96137226      104.84394478     -.00775
                 1.00000    .148056296E+04    .761035070E+04    198.84814915       -.00001259       .17475
IT               0.00000   -.817510032E+04   -.629802904E+04    .21562716E+08     198.84563644
                  .00000   -.242996155E+05   -.242996155E+05    .25680638E+05     227.69035648

DELTA NODE =      -.255    DELTA V =       -.0043


         **   TRAJECTORY TERMINATION


  A   =   .21783497E+08    MEAN ANOM  =   .69639794E+02   APOGEE  =   .36587057E+04
  E   =   .20530278E-01    ECCENTRIC  =   .70750326E+02   HEIGHT  =   .22279347E+03
  I   =   .10884909E+03    TRUE ANOM  =   .71864713E+02   PERIGEE =   .35114994E+04
  O   =   .18705511E+03    KEPL PER   =   .89737334E+02   HEIGHT  =   .75587163E+02
  U   =   .11848189E+03    ANOM PER   =   .89611976E+02   O-DOT   =   .27994103E+01
 TAU  =   .16033909E+04    NODL PER   =   .89644152E+02   U-DOT   =  -.20713653E+01

         ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT     6.8 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .2 CP SECS.
```

```
ENTER SEGMENT 10 AT      6.9 SECONDS.  EXECUTION TIME FOR SEGMENT 59 WAS       .3 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                        * PREDETERMINED EVENT TABLE *
TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   900.7449 TZERO
   993.4592 TSTOP

       ***   TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *     ECI   * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     6.85500
   NODE  T =      .900745093793E+03      .214557320664E+08      .212527764462E+07      .351589407213E-04
        DT =      .125000000000E+00      .128583828169E+04     -.821146372636E+04     -.243980023907E+05
*                 STEP    DOUBLED        T  =     904.744900      H  =       .250000     NSTEP  =         31
*                 STEP    DOUBLED        T  =     908.994900      H  =       .500000     NSTEP  =         47
*                 STEP    DOUBLED        T  =     944.994900      H  =      1.000000     NSTEP  =        118
   NODE  T =      .946658589387E+03     -.218803714253E+08     -.220050624666E+07     -.295738854977E-01
        DT =      .100000000000E+01     -.345907508787E+03      .814245711879E+04      .238320373956E+05
   NODE  T =      .990458993426E+03      .214489766135E+08      .219946465603E+07     -.125943905337E+00
        DT =      .100000000000E+01      .131364349429E+04     -.820810236293E+04     -.243072204145E+05

       ***   TRAJECTORY TERMINATION

       ***   THIS CASE TOOK       .473  SECONDS TO INTEGRATE A SPAN OF      93.2500  MINUTES  ***

           ***   FROM          900.745  TO        993.995  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      7.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .5 CP SECS.

ENTER SEGMENT 82 AT      7.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS       .1 CP SECS.
```

```
******************************************* STAGE  4 *******************************************

STAPASS   YEAR MO DY HR MN  SEC                  RESIDUALS - EXTERNAL UNITS                  MME

393  17   1970  6 26 16  7 20.0000  0.                  .778958E-01 AZ   -.104679E-01 EL   967.333
           PREDICTED RESIDUALS      0.                 0.                0.
393  17   1970  6 26 16  7 19.2528   .519859E+00 SRR  0.                0.                967.321
           PREDICTED RESIDUALS       .222550E+01      0.                0.
393  17   1970  6 26 16  8  4.0000   .448224E+03 RNG   .747379E-01 AZ   -.274641E-01 EL   968.067
           PREDICTED RESIDUALS       .679392E+03      0.                0.
393  17   1970  6 26 16  8  3.2507  -.140781E+00 SRR  0.                0.                968.054
           PREDICTED RESIDUALS       .501885E+01      0.                0.
393  17   1970  6 26 16  8 28.0000   .431812E+03 RNG   .927567E-01 AZ    .460399E-02 EL   968.467
           PREDICTED RESIDUALS       .528062E+03      0.                0.
393  17   1970  6 26 16  8 27.2486  -.624195E+00 SRR  0.                0.                968.454
           PREDICTED RESIDUALS       .775019E+01      0.                0.
393  17   1970  6 26 16  9  0.0000   .363879E+03 RNG   .756500E-01 AZ   -.770405E-02 EL   969.000
           PREDICTED RESIDUALS       .221027E+03      0.                0.
393  17   1970  6 26 16  8 59.2444  -.334749E+01 SRR  0.                0.                968.987
           PREDICTED RESIDUALS       .117638E+02      0.                0.
393  17   1970  6 26 16 10  4.0000   .673896E+02 RNG   .113288E+00 AZ    .338583E-01 EL   970.067
           PREDICTED RESIDUALS       .516391E+03      0.                0.
393  17   1970  6 26 16 10  3.2352  -.449521E+01 SRR  0.                0.                970.054
           PREDICTED RESIDUALS       .804813E+01      0.                0.

          SUMMARY OF PREDICTED STATISTICS
 STA  TYP        RMS          TYP        RMS          TYP        RMS          TYP        RMS

 393  SRR      .765986E+01   RNG      .513694E+03

PREDICTED RESIDUAL RMS =   .5960568927E+02

ENTER SEGMENT 83 AT     7.4 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS     .1 CP SECS.

ITERATION NUMBER     1
    9 MEASUREMENTS WERE USED IN THIS SOLUTION
```

CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.21455717113563E+08	-.46831099E+02	.21455670282464E+08	-.46831099E+02	.78929819E+02
6820	Y	.21253731238283E+07	-.20865087E+03	.21251644729618E+07	-.20865087E+03	.76947084E+02
6820	Z	.28264314373326E+03	.15964563E+01	.28423960005202E+03	.15964563E+01	.11451517E+03
6820	DX	.12861591976903E+04	-.19185345E+00	.12859673436397E+04	-.19185345E+00	.14809437E+00
6820	DY	-.82114289637110E+04	-.36884704E+00	-.82117978107534E+04	-.36884704E+00	.44335061E-01
6820	DZ	-.24308072381429E+05	-.18313993E-02	-.24308004212928E+05	-.18313993E-02	.93785791E-01
6820	DRAG	.94609076601712E-02	-.24678299E-03	.92141246731143E-02	-.24678299E-03	.32835328E-03

NAME		SIGMA ZERO	SIGMA OENT	TOTAL CORR.	T.C./SIGMAO	T.C./SIGMAD
6820	X	.86805251E+02	.12145175E+03	-.46831099E+02	-.53949616E+00	-.38559428E+00
6820	Y	.21949089E+02	.95551248E+02	-.20865087E+03	-.95061286E+01	-.21836540E+01
6820	Z	.74856045E+02	.13505311E+03	.15964563E+01	.21327019E-01	.11820952E-01
6820	DX	.15220332E+00	.25054331E+00	-.19185345E+00	-.12605076E+01	-.76574965E+00
6820	DY	.25647653E-01	.11173154E+00	-.36884704E+00	-.14381317E+02	-.33012195E+01
6820	DZ	.72678355E-01	.12624897E+00	-.18313993E-02	-.25198693E-01	-.14506251E-01
6820	DRAG	.41173925E-03	.49792486E-03	-.24678299E-03	-.59936724E+00	-.49562295E+00

RESIDUAL RMS = .2241036669E+02
RESIDUAL SOS = .4520020818E+04
APRIORI RMS = 0.
APRIORI SOS = 0.
TOTAL SOS = .4520020818E+04
PREDICTED SOS = .3056764551E+02

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.87892E+01							
6820 Y	.65287E+00	.49508E-01						
6820 Z	-.47921E+00	-.33768E-01	.30680E-01					
6820 DX	.12797E+04	.93528E+02	-.73020E+02	.18992E+06				
6820 DY	-.25357E+04	-.19105E+03	.13254E+03	-.36483E+06	.74119E+06			
6820 DZ	-.79119E+04	-.58664E+03	.43293E+03	-.11551E+07	.22793E+07	.71263E+07		
6820 DRAG	-.18049E+05	-.13499E+04	.98224E+03	-.26334E+07	.52186E+07	.16251E+08	.46454E+08	
ATB	.16412E+03	.12971E+02	-.63761E+01	.21334E+05	-.50032E+05	-.14254E+06	-.33427E+06	.45200E+[illegible]

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.62299E+04						
6820 Y	.15792E+04	.59209E+04					
6820 Z	.87227E+04	.20135E+04	.13114E+05				
6820 DX	.11196E+02	.42725E+01	.16196E+02	.21932E-01			
6820 DY	.30804E+01	.16927E+01	.45008E+01	.55049E-02	.19656E-02		
6820 DZ	.73431E+01	.22693E+01	.10233E+02	.13585E-01	.35492E-02	.87808E-02	
6820 DRAG	.14115E-02	-.42814E-04	.19356E-02	.32074E-05	.12856E-05	.16789E-05	.10782E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.26082	1.00000					
6820 Z	.96483	.22907	1.00000				
6820 DX	.95780	.37493	.95498	1.00000			
6820 DY	.88028	.49620	.88651	.83843	1.00000		
6820 DZ	.99282	.31472	.95359	.97892	.85432	1.00000	
6820 DRAG	.05446	-.00169	.05148	.06596	.09883	.05457	1.00000

ENTER SEGMENT 84 AT 7.5 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 2. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21455670.282	5.656644001	21797338.583	.0122907020147	58.25015728	3663.69455
15/ 0	2125164.473	.030755345	.02127289999	-.0173630330889	59.37827585	227.60F81
44.6940000	284.240	88.951761166	108.849501195	.0667981268134	60.36229594	3511.06657
.0007604	1285.9673436	198.849501195	185.656386129	3.553539325	89.5228781	74.97784
226.1505472	-8211.7978108	21560661.200	119.636995905	-.13779605544	89.6839588	2.7934261179
104.5057	-24308.3042128	25689.8112898	885.2085250	-1.39125344564	89.7161255	-2.0667979488

TOTAL EDIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
393	5	AZ	8.8E-02	0.	8.7E-02	5	EL	2.0E-02	0.	-1.4E-03	5	SRR	2.5E+00	2.5E+01	-1.3E+00
393	4	RNG	3.6E+02	1.8E+01	3.3E+02										

EXIT SEGMENT 84 AT 7.5 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT     7.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    900.7449 TZERO
    993.4592 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     7.55800
   NODE  T =      .900745094888E+03     .214556853175E+08     .212506845015E+07     .249001825045E-04
        DT =      .125000000000E+00     .123561444365E+04    -.821183276665E+04    -.243380042222E+05
*                STEP   DOUBLED         T  =     904.744900     H  =        .250000     NSTEP  =        31
*                STEP   DOUBLED         T  =     908.994900     H  =        .500000     NSTEP  =        47
*                STEP   DOUBLED         T  =     944.994900     H  =       1.000000     NSTEP  =       118
   NODE  T =      .946658421521E+03    -.218805759208E+08    -.220031937841E+07    -.296414957399E-01
        DT =      .100000000000E+01    -.346005828944E+03     .814268754826E+04     .238317650509E+05
   NODE  T =      .993459328121E+03     .214489503620E+08     .219025912335E+07    -.126176140433E+00
        DT =      .100000000000E+01     .131048471597E+04    -.820846337396E+04    -.243072204709E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .474  SECONDS TO INTEGRATE A SPAN OF      93.2500  MINUTES  ***

            ***  FROM         900.745  TO        993.995  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     8.0 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .5 CP SECS.

ENTER SEGMENT 82 AT     8.1 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
********************************************** STAGE  4 **********************************************

STAPASS   YEAR MO DY HR MN  SEC                    RESIDUALS - EXTERNAL UNITS                         MME

393  17   1970  6 26 16  7 29.0000  0.                   .765619E-01 AZ   -.119794E-01 EL    967.333
393  17   1970  6 26 16  7 19.2528  -.507401E-01 SRR  0.                  0.                 967.321
393  17   1970  6 26 16  8  4.0000   .425502E+01 RNG   .753160E-01 AZ   -.291289E-01 EL    968.067
393  17   1970  6 26 16  8  3.2507  -.119395E+00 SRR  0.                  0.                 968.054
393  17   1970  6 26 16  8 29.0000  -.378171E+00 RNG   .955793E-01 AZ    .285608E-02 EL    968.467
393  17   1970  6 26 16  8 27.2486   .341970E+00 SRR  0.                  0.                 968.454
393  17   1970  6 26 16  9  0.0000  -.269536E+01 RNG   .828947E-01 AZ   -.988464E-02 EL    969.000
393  17   1970  6 26 16  8 59.2444  -.[illegible]E+00 SRR  0.              0.                 968.987
393  17   1970  6 26 16 10  4.0000  -.701194E+01 RNG   .123622E+00 AZ    .301353E-01 EL    970.067
393  17   1970  6 26 16 10  3.2352  -.466441E-02 SRR  0.                  0.                 970.054

ENTER SEGMENT 83 AT     8.1 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS     .1 CP SECS.

ITERATION NUMBER     2
    9 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME             CURRENT VALUE           CORRECTION       NEW VALUE              TOTAL CORR.      SIGMA
6820    X         .21455672824642E+08    .92491652E-01    .21455670374955E+08   -.46738608E+02   .78930351E+02
6820    Y         .21251644729018E+07    .16091504E-01    .21251644890533E+07   -.20863478E+03   .76946620E+02
6820    Z         .28423961305202E+03    .87796232E-01    .28432739628369E+03    .16842526E+01   .11451511E+03
6820    DX        .12859673436397E+04    .24579873E-03    .12859675894384E+04   -.19160765E+00   .14809428E+00
6820    DY       -.82117978107534E+04    .50299954E-04   -.82117977604534E+04   -.36879674E+00   .44335549E-01
6820    DZ       -.24308004211828E+05    .12568941E-03   -.24308004087139E+05   -.17057099E-02   .93704834E-01
6820    DRAG      .92141246731143E-02    .88942603E-07    .92142136157169E-02   -.24669404E-03   .32834745E-03

NAME             SIGMA ZERO       SIGMA DEWT       TOTAL CORR.      T.C./SIGMA0      T.C./SIGMAD
6820    X         .86805251E+02    .12145175E+03   -.46738608E+02   -.53843065E+00   -.38483273E+00
6820    Y         .21949089E+02    .95551248E+02   -.20863478E+03   -.95053955E+01   -.21834856E+01
6820    Z         .74856045E+02    .13505311E+03    .16842526E+01    .22499687E-01    .12471039E-01
6820    DX        .15220332E+00    .25054331E+00   -.19160765E+00   -.12588927E+01   -.76476859E+00
6820    DY        .25647653E-01    .11173054E+00   -.36879674E+00   -.14379356E+02   -.33007693E+01
6820    DZ        .72678355E-01    .12624897E+00   -.17057099E-02   -.23469297E-01   -.13510684E-01
6820    DRAG      .41173920E-03    .49792486E-03   -.24669404E-03   -.59915122E+00   -.49544432E+00
```

```
RESIDUAL  RMS =      .1324313099E+01
RESIDUAL  SDS =      .1578424666E+02
APRIORI   RMS =      .1453812521E+01
APRIORI   SOS =      .1479499593E+02
TOTAL     SDS =      .3057924259E+02
PREDICTED SDS =      .3057910301E+02
```

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.87868E+01							
6820 Y	.65260E+00	.49481E-01						
6820 Z	-.47907E+00	-.33752E-01	.30672E-01					
6820 DX	.12793E+04	.93483E+02	-.72996E+02	.18985E+06				
6820 DY	-.25351E+04	-.19098E+03	.13251E+03	-.36473E+06	.74107E+06			
6820 DZ	-.79097E+04	-.58639E+03	.43280E+03	-.11547E+07	.22788E+07	.71243E+07		
6820 DRAG	-.18059E+05	-.13415E+04	.98279E+03	-.26348E+07	.52219E+07	.16261E+08	.46508E+08	
ATB	-.27693E-01	-.22579E-02	.10488E-02	-.36341E+01	.85895E+01	.24675E+02	.57351E+02	.15784E+02

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.62300E+04						
6820 Y	.15792E+04	.59208E+04					
6820 Z	.87208E+04	.20185E+04	.13114E+05				
6820 DX	.11196E+02	.42725E+01	.16196E+02	.21932E-01			
6820 DY	.30804E+01	.16927E+01	.45008E+01	.55048E-02	.19656E-02		
6820 DZ	.73431E+01	.22692E+01	.10233E+02	.13585E-01	.35491E-02	.87806E-02	
6820 DRAG	.14102E-02	-.43601E-04	.19339E-02	.32044E-05	.12792E-06	.16770E-05	.10781E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.26063	1.00000					
6820 Z	.96483	.22907	1.00000				
6820 DX	.95780	.37494	.95498	1.00000			
6820 DY	.88027	.49619	.86650	.83841	1.00000		
6820 DZ	.99282	.31472	.95358	.97631	.95429	1.00000	
6820 DRAG	.05441	-.00173	.05143	.06590	.00879	.05451	1.00000

ENTER SEGMENT 84 AT 8.2 SECCNDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 990.46 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	682^ Y	6820 Z	6820 DX	682C DY	6829 DZ	682^ DRAG
6820 X	.64488E+04						
6820 Y	.22545E+04	.70603E+04					
6820 Z	.10446E+05	.51398E+04	.21586E+05				
6820 DX	.14193E+02	.79367E+01	.25567E+02	.33597E-01			
6820 DY	.33610E+01	.25718E+01	.69484E+01	.85926E-02	.24916E-02		
6820 DZ	.71493E+01	.29442E+01	.12150E+02	.15859E-01	.38137E-02	.87277E-02	
6820 DRAG	-.67963E-02	-.14985E-02	-.27622E-03	-.13003E-04	-.15558E-05	.92745E-06	.10781E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.33140E+05					
-.28250E-18	.39768E+06				
0.	0.	.31481E+05			
.63892E-10	-.38775E+03	0.	.40832E+00		
-.38775E+02	.33054E-21	0.	-.74757E-13	.45369E-01	
0.	0.	.60694E-10	0.	0.	.43098E-01

PARAMETER SET COORDINATE SYSTEM

.76544E-1[illegible]					
-.84431E-11	.15836E-09				
-.25985E-10	.25440E-09	.82087E-09			
-.19090E-11	.16972E-10	.50821E-10	.33260E-11		
.15218E-11	.19085E-11	.51080E-11	.30326E-12	.38724E-12	
.50021E-11	.51035E-12	.47902E-15	-.55433E-15	.56828E-14	.37185E-12

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21448940.285	5.830716977	21796005.085	.0122908967746	58.37509577	3663.35866
16/30	2190322.224	.000496226	.02124174705	-.0173247199113	59.42292033	227.28738
27.5520000	186.731	88.9520558 37	108.851268834	.0668042571570	60.47652666	3513.96353
.0004996	1310.7168068	198.851268834	185.830547549	3.728592319	89.8146355	74.89225
203.8346400	-8208.4446951	21560485.867	119.522948988	-.1420292182	89.6757341	2.7942694148
104.4768	-24307.2205315	25689.2489736	975.8954835	-1.3908735027 4	89.7078954	-2.0668271786

LEAST SQUARES PROCESS CONVERGED.

TOTAL EDIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
393	5	AZ	8.8E-02	0.	8.7E-02	5	EL	2.0E-02	0.	-1.4E-03	5	SRR	2.5E+00	2.5E+01	-1.6E+00
393	4	RNG	3.6E+02	1.8E+01	3.3E+02										

```
TYPE  SYMB  MINIMUM          DELTA           MEAN            MAXIMUM          STATION 393   PAGE  1
 AZ    0     .57387975E-01   .58955283E-03   .86865617E-01   .11634326E+00
 EL    1    -.42231769E-01   .81594036E-03  -.14347512E-02   .39362267E-01
 SRR   2    -.55172833E+01   .77994378E-01  -.16175644E+01   .22821545E+01
 RNG   3     .20522196E+02   .61460753E+01   .32782596E+03   .63512972E+03
58040.3.........*.........*.........*.....0..1*.........*.........*.........*......2..*.........*........*
58050.*                                                 *                                                *
58060.*                                                 *                                                *
58070.*                                                 *                                                *
58080.*                1           0                    *                   2 3                          *
58090.*                                                 *                                                *
58100.*                                                 *                                                *
58110.*                                                 *       1  0 2    3                              *
58120.*                                                 *                                                *
58130.*                                                 *                                                *
58140.*                          2   0         1        *      3                                         *
58150.*                                                 *                                                *
58160.*                                                 *                                                *
58170.*                                                 *                                                *
58180.*                                                 *                                                *
58190.*                                                 *                                                *
58200.*        3   2                                    *                                          1 0   *
      ******************************************** END OF PLOT *******************************************
EXIT SEGMENT 84 AT      8.2 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
```

```
ENTER SEGMENT 10 AT     8.3 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                     * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE       ASSOCIATED QUANTITIES
   900.7449 TZERO
  1710.8623 TSTOP

       ***  TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     8.28500
  NODE  T =     .900745094888E+03     .214556853175E+08     .212506645015E+07     .249001825611E-04
       DT =     .125000000000E+00     .128561444365E+04    -.821183276665E+04    -.243080042222E+05
*                STEP   DOUBLED       T  =    904.744900     H  =      .250000     NSTEP  =      31
*                STEP   DOUBLED       T  =    908.994900     H  =      .500000     NSTEP  =      47
*                STEP   DOUBLED       T  =    944.994900     H  =     1.000000     NSTEP  =     118
  NODE  T =     .946658421520E+03    -.218805759200E+08    -.220031937633E+07    -.296384232863E-01
       DT =     .100000000000E+01    -.346005828829E+03     .814268754846E+04     .238317650506E+05
  NODE  T =     .990459328118E+03     .214489503552E+08     .219025912275E+07    -.126178562386E+00
       DT =     .100000000000E+01     .131048470487E+04    -.820846837513E+04    -.243372204715E+05
  NODE  T =     .103636736627E+04    -.218709584259E+08    -.226677558889E+07    -.190145021537E+00
       DT =     .100000000000E+01    -.371291710440E+03     .814315097110E+04     .238338023711E+05
  NODE  T =     .108016482728E+04     .214420970916E+08     .225564089033E+07     .249077166401E-01
       DT =     .100000000000E+01     .133489785183E+04    -.820446492012E+04    -.243065056935E+05
  NODE  T =     .112606667318E+04    -.218612060236E+08    -.233322742759E+07    -.287888275413E-01
       DT =     .100000000000E+01    -.396830883000E+03     .814267047935E+04     .238361445926E+05
  NODE  T =     .116986136344E+04     .214354619290E+08     .232095482429E+07    -.875129546175E-01
       DT =     .100000000000E+01     .135976454030E+04    -.819996368218E+04    -.243054449618E+05
  NODE  T =     .121575870823E+04    -.218509541784E+08    -.239946042615E+07     .134356494768E-01
       DT =     .100000000000E+01    -.421900819519E+03     .814186376282E+04     .238387888402E+05
  NODE  T =     .125955022108E+04     .214288330962E+08     .238582544738E+07    -.185496524660E+00
       DT =     .100000000000E+01     .138354463825E+04    -.819491723647E+04    -.243043549345E+05
  NODE  T =     .130544186680E+04    -.218404794534E+08    -.246502846690E+07    -.166951080178E+00
       DT =     .100000000000E+01    -.447456215326E+03     .814120437566E+04     .238414972547E+05
  NODE  T =     .134923230822E+04     .214217126726E+08     .245134928173E+07     .172003887558E-01
       DT =     .100000000000E+01     .140703523253E+04    -.819018057379E+04    -.243033845498E+05
  NODE  T =     .139511535951E+04    -.218298360286E+08    -.253144436226E+07    -.672241114136E-01
       DT =     .100000000000E+01    -.473664763942E+03     .814006251932E+04     .238443285028E+05
```

NODE	T =	.143890341775E+04	.214143930173E+08	.251737365455E+07	-.183251352040E-01
	DT =	.100000000000E+01	.143197618436E+04	-.818504387135E+04	-.243922684018E+05
NODE	T =	.148478197219E+04	-.218193607521E+08	-.259842659783E+07	.184823510083E-01
	DT =	.100000000000E+01	-.499183945199E+03	.813865422107E+04	.238469054249E+05
NODE	T =	.152855731776E+04	.214070028286E+08	.258286156986E+07	-.192848794083E+00
	DT =	.100000000000E+01	.145659338644E+04	-.817971391562E+04	-.243910155487E+05
NODE	T =	.157444108760E+04	-.218078394785E+08	-.266457146476E+07	-.166571505540E+00
	DT =	.100000000000E+01	-.524274479972E+03	.813800329923E+04	.238496698736E+05
NODE	T =	.161822351636E+04	.213995838503E+08	.264819264741E+07	.190298708107E-01
	DT =	.100000000000E+01	.148065841645E+04	-.817543636605E+04	-.242995880300E+05
NODE	T =	.166409599975E+04	-.217962812645E+08	-.273067911266E+07	-.468055256516E-01
	DT =	.100000000000E+01	-.550156266870E+03	.813757464437E+04	.234525181497E+05
NODE	T =	.170786971196E+04	.213917629830E+08	.271341376866E+07	-.793433913318E-01
	DT =	.100000000000E+01	.150503006250E+04	-.817111856921E+04	-.242982759545E+05

*** TRAJECTORY TERMINATION

*** THIS CASE TOOK .965 SECONDS TO INTEGRATE A SPAN OF 810.2500 MINUTES ***

*** FROM 900.745 TO 1710.995 MINUTES FROM MIDNIGHT OF EPOCH ***

ENTER SEGMENT 50 AT 9.3 SECONDS. EXECUTION TIME FOR SEGMENT 10 WAS 1.0 CP SECS

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	ME,MM,ST,DT	X,XD	X,XD - BF	ADBARV	LAT,...	REV,...	REMARK
YR/MO/DAY	MIN FROM EPOCH	X (FT)	X (FT)	ALPHA (DEG)	LATITUDE (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	Y (FT)	DELTA (DEG)	LONGITUDE(DEG)	PERIOD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	Z (FT)	BETA (DEG)	ALTITUDE (NM)	PERIOD-DECAY	.
	STEP SIZE(MIN)	XD(FT/SEC)	XD(FT/SEC)	AZIMUTH(DEG)	S-VEH-LAT(DEG)	NOD-REG	.
IT	UTC - IT	YD(FT/SEC)	YD(FT/SEC)	R (FT)	I (DEG)		
	UT1 - IT	ZD(FT/SEC)	ZD(FT/SEC)	V (FT/SEC)	O (DEG)		

* * * ECI TRAJECTORY * * *

```
*** CASE      1
***


*** EPOCH PRINT

DATE,...   ME,MM,ST,DT,..         X,XD              X,XD - BF             ADBARV            LAT,.. BF          REV,...
70/ 6/26         0.00000    .214556703E+08    -.149364904E+08       5.65664410          .00076044          .50000
 15/ 0         900.74490    .212516447E+07    -.155487417E+08        .00075574       226.15054724         0.00000
44.69400     54044.69400    .284239600E+03     .284239600E+03      88.95176117       104.50568781         0.00000
                  .12500    .128596734E+04    -.744424983E+04     198.84950120          .00076028         0.00000
IT                .00000    -.821179781E+04    .649898865E+04     .215606615E+08     108.84950120
                 0.00000    -.243080042E+05   -.243080042E+05     .256898115E+05      46.15028938

  A   =   .21797339E+08      MEAN ANOM   =   .58260157E+02     APOGEE   =   .36636945E+04
  E   =   .21272900E-01      ECCENTRIC   =   .59308276E+02     HEIGHT   =   .22760581E+03
  I   =   .10884950E+03      TRUE ANOM   =   .60362206E+02     PERIGEE  =   .35110666E+04
  O   =   .18565639E+03      KEPL PER    =   .89822878E+02     HEIGHT   =   .74977836E+02
  U   =   .11963700E+03      ANOM PER    =   .89683959E+02     O-DCT    =   .27934261E+01
 TAU  =   .88620852E+03      NODL PER    =   .89716126E+02     U-DCT    =  -.20667979E+01

***  REQUESTED PRINTS

DATE,...   ME,MM,ST,DT,..         X,XD              X,XD - BF             ADBARV            LAT,.. BF          REV,...
70/ 6/26          .00019    .214556853E+08    -.149365774E+08       5.65638613          .00000000          .50000 OSC NODE
 15/ 0         900.74509    .212506845E+07    -.155486657E+08        .00000000       226.15024052         0.00000
44.70569     54044.70569    .249001808E-04     .249685575E-04      88.95175381       104.50659261         0.00000
                  .12500    .128561444E+04    -.744424894E+04     198.84950119          .00000000         0.00000
IT               0.00000    -.821183277E+04    .649898959E+04     .215606675E+08     108.84953488
                  .00000    -.243080042E+05   -.243080042E+05     .256898005E+05      46.15024052

 DELTA NODE =        .013    DELTA V =     -89.7141

DATE,...   ME,MM,ST,DT,..         X,XD              X,XD - BF             ADBARV            LAT,.. BF          REV,...
70/ 6/26        89.71443    .214489506E+08    -.197217459E+08       5.83054327         -.00001264         1.50000 OSC NODE
 16/30         990.45333    .219025757E+07    -.871248832E+07       -.00001255       203.83443338         0.00000
27.55988     59427.55988    -.472287522E+01   -.472287522E+01      88.95205994       104.47743949         0.00000
                 1.00000    .131047915E+04    -.441872337E+04     198.85126884         -.00001263         0.00000
IT                .00000    -.820846896E+04    .883963313E+04     .215603490E+08     108.84877665
                 0.30000    -.243072205E+05   -.243072205E+05     .256892455E+05      23.834.3767
```

```
 DELTA NODE =       .009   DELTA V =    -89.7052

DATE,...  ME,MM,ST,DT,..         X,XD           X,XD - BF          ADBARV            LAT,.. BF       REV,...
70/ 6/26       179.41993   .214420973E+08  -.215528138E+08      6.00524419        -.00001096     2.50000 DSC NODE
 18/ 0        1080.16483   .225563950E+07  -.572420969E+06      -.00001088      181.52136040    89.70894
 9.88981     64809.88981  -.409559499E+01  -.409559499E+01     88.95338154      104.46438428     0.00000
                 1.00000   .133489282E+04  -.731134537E+03    198.85171352        -.00001096      .17481
IT               0.00000  -.820446546E+04   .985537073E+04  .215604145E+08      108.84372393
                 0.00000  -.243065057E+05  -.243065057E+05  .25688546E+05         1.52136411

 DELTA NODE =       .019   DELTA V =    -89.6963

DATE,...  ME,MM,ST,DT,..         X,XD           X,XD - BF          ADBARV            LAT,.. BF       REV,...
70/ 6/26       269.11646   .214354620E+08  -.201569164E+08      6.17970566        -.00000244     3.50000 DSC NODE
 19/29        1169.86136   .232095455E+07   .765274995E+07      -.00000242      159.21023533    89.69931
51.68184     70191.68184  -.912413357E+00  -.912413357E+00     88.95340062      104.51999436     -.00964
                 1.00000   .135976345E+04   .306496424E+04    198.85161678        -.00000244      .17488
IT               0.00000  -.819596379E+04   .939474601E+04  .215607485E+08      108.83489710
                 0.00000  -.243054449E+05  -.243054449E+05  .25687410E+05       339.21029616

 DELTA NODE =       .031   DELTA V =    -89.6886

DATE,...  ME,MM,ST,DT,..         X,XD           X,XD - BF          ADBARV            LAT,.. BF       REV,...
70/ 6/26       358.80582   .214288330E+08  -.157431650E+08      6.35298685         .00000435     4.50000 DSC NODE
 20/59        1259.55072   .238582606E+07   .147322709E+08       .00000433      136.89984942    89.69203
33.04319     75573.04319   .162767580E+01   .162767580E+01     88.95544874      104.60096574     -.00727
                 1.00000   .138354675E+04   .640200088E+04    198.85028451         .00000435      .17450
IT               0.00000  -.819491698E+04   .752659943E+04  .215612408E+08      108.82137302
                 0.00000  -.243043549E+05  -.243043549E+05  .25686038E+05       316.89984794

 DELTA NODE =       .045   DELTA V =    -89.6802

DATE,...  ME,MM,ST,DT,..         X,XD           X,XD - BF          ADBARV            LAT,.. BF       REV,...
70/ 6/26       448.48741   .214217126E+08  -.897332123E+07      6.52812849         .00000286     5.50000 DSC NODE
 22/29        1349.23231   .245134964E+07   .196055704E+08       .00000284      114.59321131    89.68316
13.93845     80953.93845   .106826385E+01   .106826385E+01     88.95872605      104.64604163     -.00887
                 1.00000   .140703647E+04   .877978738E+04    198.84962701         .00000286      .17280
IT               0.00000  -.819018042E+04   .453177263E+04  .215615145E+08      108.80471249
                 0.00000  -.243033845E+05  -.243033845E+05  .25684885E+05       294.59321034

 DELTA NODE =       .089   DELTA V =    -89.6688
```

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	538.15852	.214143030E+08	-.861778912E+06	6.70467415	-.00000194	6.50000 DSC NODE
23/58	1438.90342	.251737354E+07	.215445325E+08	-.00000103	92.29060370	89.67349
54.20508	86334.20508	-.389226012E+00	-.389226012E+00	88.95926901	104.68671713	-.00966
	1.00000	.143190578E+04	.984202325E+04	198.84874451	-.00000194	.17518
IT	0.00000	-.818104392E+04	.860547767E+03	.215617615E+08	108.84898509	
	.00000	-.243022684E+05	-.243022684E+05	.256835566E+05	272.29050495	

DELTA NODE = .138 DELTA V = -89.6603

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	627.82241	.214070031E+08	.737884687E+07	6.87976210	-.00001074	7.50000 DSC NODE
1/28	1528.56731	.258286027E+07	.202603940E+08	-.00001067	69.98134783	89.66661
34.03862	5314.03862	-.401596464E+01	-.401596464E+01	88.95966903	104.76339940	-.00688
	1.00000	.145658878E+04	.943143079E+04	198.84764484	-.00001074	.17673
IT	0.00000	-.817971359E+04	-.293868518E+04	.215622257E+08	108.84642285	
	0.00000	-.243010156E+05	-.243010156E+05	.256820070E+05	249.98835147	

DELTA NODE = .217 DELTA V = -89.6509

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	717.47862	.213995841E+08	.145154875E+08	7.05446814	-.00001198	8.50000 DSC NODE
2/58	1618.22352	.264819113E+07	.159453987E+08	-.00001190	47.68753614	89.65912
13.41117	10693.41117	-.447732963E+01	-.447732963E+01	88.96159726	104.86063567	-.00750
	1.00000	.148765295E+04	.761037231E+04	198.84887339	-.00001197	.17475
IT	0.00000	-.817543706E+04	-.629855848E+04	.215628118E+08	108.84221351	
	.00000	-.242995881E+05	-.242995881E+05	.256807340E+05	227.68764020	

DELTA NODE = .318 DELTA V = -89.6388

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	807.12481	.213917630E+08	.194805004E+08	7.22901183	-.00000266	9.50000 DSC NODE
4/27	1707.86971	.271341346E+07	.924555265E+07	-.00001264	25.38927320	89.64951
52.18270	16072.18270	-.994935475E+00	-.994935475E+00	88.96277893	104.91796446	-.00961
	1.00000	.150502887E+04	.465099874E+04	198.85016274	-.00000266	.17482
IT	0.00000	-.817111871E+04	-.871556180E+04	.215631166E+08	108.83369697	
	.00000	-.242982759E+05	-.242982759E+05	.256795350E+05	205.38927410	

DELTA NODE = .443 DELTA V = -89.6276

```
      **   TRAJECTORY TERMINATION

  A   =    .21784133E+08     MEAN ANOM  =    .64068895E+02    APOGEE  =    .36592199E+04
  E   =    .20643942E-01     ECCENTRIC  =    .65142122E+02    HEIGHT  =    .22332311E+03
  I   =    .10885036E+03     TRUE ANOM  =    .66220110E+02    PERIGEE =    .35111943E+04
  O   =    .18722902E+03     KEPL PER   =    .89741261E+02    HEIGHT  =    .75297496E+02
  U   =    .11837888E+03     ANOM PER   =    .89605599E+02    O-DOT   =    .27993325E+01
  TAU =    .16930237E+04     NODL PER   =    .89637770E+02    U-DOT   =   -.20706795E+01

      ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT       9.5 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .3 CP SECS.
ENTER SEGMENT 10 AT      9.5 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .3 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                      * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   990.4592  TZERO
  1067.0233  TSTOP

     ***   TRAJECTORY START

     * * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      9.56500
   NODE  T =     .990459328035E+03    .214489503527E+08    .219025916574E+07    .345415535802E-04
        DT =     .125000000000E+00    .131943502891E+04   -.820646836465E+04   -.243972205316E+05
 *               STEP   DOUBLED       T  =    994.459200    H  =     .250000    NSTEP  =       31
 *               STEP   DOUBLED       T  =    998.709200    H  =     .500000    NSTEP  =       47
 *               STEP   DOUBLED       T  =   1020.209200    H  =    1.000000    NSTEP  =       89
   NODE  T =     .103636736739E+04   -.218709586538E+08   -.226677558081E+07   -.996434377020E-01
        DT =     .100000000000E+01   -.371291430118E+03    .814315093846E+04    .238338021858E+05

     ***   TRAJECTORY TERMINATION

     ***   THIS CASE TOOK      .392  SECONDS TO INTEGRATE A SPAN OF      76.7500  MINUTES  ***

          ***  FROM        990.459  TO       1067.209  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .4 CP SECS.

ENTER SEGMENT 82 AT      10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
************************************************ STAGE  5 ************************************************

STAPASS   YEAR MO DY HR MN  SEC                  RESIDUALS - EXTERNAL UNITS                   MME


          SUMMARY OF PREDICTED STATISTICS
 STA  TYP          RMS          TYP          RMS          TYP          RMS          TYP          RMS


PREDICTED RESIDUAL RMS =  0.

ENTER SEGMENT 83 AT    10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER      1
    0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                 CURRENT VALUE           CORRECTION        NEW VALUE               TOTAL CORR.     SIGMA
6820    X            .21448940284574E+08 -0.                   .21448940284574E+08     0.              .19991533E+03
6820    Y            .21903222239458E+07 -0.                   .21903222239458E+07     0.              .27639606E+03
6820    Z            .18673059803602E+03 -0.                   .18673059803602E+03     0.              .61727697E+03
6820    DX           .13107168068238E+04 -0.                   .13107168068238E+04     0.              .66193016E+00
6820    DY          -.82084446951080E+04 -0.                  -.82084446951080E+04     0.              .22269565E+00
6820    DZ          -.24307220531520E+05 -0.                  -.24307220531520E+05     0.              .23207673E+00
6820    DRAG         .92142136157169E-02 -0.                   .92142136157169E-02     0.              .43152294E-03

NAME                 SIGMA ZERO     SIGMA DEWT     TOTAL CORR.     T.C./SIGMA0     T.C./SIGMAD
6820    X            .80304656E+02  .19991533E+03  0.              0.              0.
6820    Y            .84025871E+02  .27639606E+03  0.              0.              0.
6820    Z            .14692307E+03  .61727697E+03  0.              0.              0.
6820    DX           .18329584E+00  .66193016E+00  0.              0.              0.
6820    DY           .49916415E-01  .22269565E+00  0.              0.              0.
6820    DZ           .93422328E-01  .23207673E+00  0.              0.              0.
6820    DRAG         .32834745E-03  .43152294E-03  0.              0.              0.

RESIDUAL   RMS =    0.
RESIDUAL   SOS =    0.
APRIORI    RMS =    0.
APRIORI    SOS =    0.
TOTAL      SOS =    0.
PREDICTED  SOS =    0.
```

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.42654E-02							
6820 Y	.43729E-03	.72280E-04						
6820 Z	.35167E-04	.47189E-05	.31884E-04					
6820 DX	.86672E-01	-.15421E-03	-.27604E-01	.32051E+02				
6820 DY	-.11819E+01	-.12293E+00	-.12498E-01	-.23336E+02	.35021E+03			
6820 DZ	-.34489E+01	-.35443E+00	-.27134E-01	-.71543E+02	.95440E+03	.28076E+04		
6820 DRAG	.17261E+03	.17276E+02	-.52806E+03	.55206E+04	-.47603E+05	-.13977E+06	.12492E+08	
ATB	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.39966E+05						
6820 Y	-.14426E+04	.76395E+05					
6820 Z	-.93284E+03	.11654E+06	.38103E+06				
6820 DX	.26085E+00	.13180E+03	.39062E+03	.43815E+00			
6820 DY	.14467E+02	.16500E+02	.44227E+02	.45480E-01	.49593E-01		
6820 DZ	.43655E+02	.66731E+01	.12154E+02	.15792E-01	.45049E-02	.53860E-01	
6820 DRAG	-.67963E-02	-.14995E-02	-.27622E-03	-.13003E-04	-.15558E-05	.92745E-06	.18621E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	-.02611	1.00000					
6820 Z	-.00756	.68304	1.00000				
6820 DX	.00197	.72040	.95601	1.00000			
6820 DY	.32496	.26807	.32173	.30853	1.00000		
6820 DZ	.94492	.10403	.08484	.10280	.08716	1.00000	
6820 DRAG	-.07878	-.01256	-.00104	-.04552	-.01619	.00926	1.00000

ENTER SEGMENT 84 AT 10.1 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 1064.02 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.70452E+06						
6820 Y	-.31055E+05	.33116E+05					
6820 Z	-.29886E+06	.15288E+05	.16949E+06				
6820 DX	-.29719E+03	.18419E+00	.92422E+02	.16470E+00			
6820 DY	-.28220E+03	.16385E+02	.12679E+03	.11297E+00	.16428E+00		
6820 DZ	-.72500E+03	.38832E+02	.34171E+03	.29466E+00	.29239E+00	.81388E+00	
6820 DRAG	.14836E+00	-.61493E-02	-.63494E-01	-.77262E-04	-.64779E-04	-.15291E-03	.18621E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.29549E+05					
-.30492E+04	.39486E+06				
0.	0.	.28070E+05			
.84176E+01	-.38108E+03	0.	.38510E+00		
-.34574E+02	.35677E+01	0.	-.98490E-02	.40454E-01	
0.	0.	.46071E+01	0.	0.	.32204E-01

PARAMETER SET COORDINATE SYSTEM

.78319E-09					
-.24473E-10	.55341E-10				
-.29040E-09	.11061E-10	.18480E-09			
-.18272E-10	-.87267E-12	.32239E-11	.63768E-12		
-.16232E-10	.12518E-11	.67533E-11	.32176E-12	.59577E-12	
-.41458E-10	.20712E-11	.19294E-10	.82234E-12	.86483E-12	.25299E-11

```
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR NEXT DATA STAGE ****

 YEAR/MO/DY          X              ALPHA              A               AF            MEAN ANOMALY    APOGEE RADIUS
    HR/MIN           Y              DELTA              E               AG           ECCENTRIC ANOM   APOGEE HEIGHT
   SECONDS           Z              BETA               I               N             TRUE ANOMALY    PERIGEE RADIUS
  LATITUDE          XDOT           AZIMUTH             O               L            KEPLERIAN PER    PERIGEE HEIGHT
 LONGITUDE          YDOT           RADIUS              U              CHI            ANOMALY PER             O-DOT
    HEIGHT          ZDOT           VELOCITY           TAU             PSI            NODAL PERIOD            U-DOT

 1970/ 6/26     7592292.341     43.413755895    21743202.958   .0107336266829     355.75494988     3648.41715
    17/44       7183127.603     60.643103110    .01954638714  -.0163355596314     355.67040241      212.67450
 1.3979200     18581636.620     90.084563566    108.874728438  .0679477592187     355.58501467     3508.52480
 60.8072627   24094.8386435    221.289960530   185.982094698   299.062715447       89.4884613        72.78214
 222.9763031   -771.9219982    21319414.735   117.325670862   -.145777143569       89.6713960     2.8210805775
   73.5841     -9593.4692119   25944.8301693    975.5900679   -1.3910947471         89.7032075    -2.0786973148

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT      10.1 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
ENTER SEGMENT 1. AT     10.1 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

 ************************************  TRAJECTORY INTEGRATION FOR CASE   1  **************************************

                                 * PREDETERMINED EVENT TABLE *
 TIME(MPE)     TYPE        ASSOCIATED QUANTITIES
  1064.0233 TZERO
  1083.1645 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    10.14930
*                  STEP    DOUBLED            T  =  1067.273299      H  =        .250000      NSTEP  =        25
*                  STEP    DOUBLED            T  =  1071.523299      H  =        .500000      NSTEP  =        41
   NODE  T =        .1080164827998E+04    .2144209706730E+08    .2255640877770E+07    -.3095510678940E-02
         CT =       .5000000000000E+00    .1334898023190E+04   -.8204464949200E+04    -.2430650582450E+05

         ***  TRAJECTORY TERMINATION

         ***  THIS CASE TOOK        .213  SECONDS TO INTEGRATE A SPAN OF      19.5000  MINUTES  ***

              ***  FROM        1064.023  TO        1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     10.4 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT     10.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
*************************************************** STAGE 6 ***************************************************

STAPASS   YEAR MO DY HR MN  SEC                     RESIDUALS - EXTERNAL UNITS                          MME

343  18   1970  6 26 17 44 23.0000  -.101891E+04 RNG  -.753545E-02 AZ  -.124282E-01 EL   1064.333
           PREDICTED RESIDUALS       .872341E+03      0.               0.
343  18   1970  6 26 17 44 19.2525   .491889E+01 SRR  0.               0.                 1064.321
           PREDICTED RESIDUALS       .410377E+01      0.               0.
343  18   1970  6 26 17 44 40.0000  -.897623E+03 RNG  -.758193E-01 AZ  -.210287E-01 EL   1064.667
           PREDICTED RESIDUALS       .779368E+03      0.               0.
343  18   1970  6 26 17 44 39.2512   .791119E+01 SRR  0.               0.                 1064.654
           PREDICTED RESIDUALS       .637908E+01      0.               0.
343  18   1970  6 26 17 45 56.0000   .377287E+03 RNG   .266531E-01 AZ  -.524774E-01 EL   1065.933
           PREDICTED RESIDUALS       .341341E+03      0.               0.
343  18   1970  6 26 17 45 55.2392   .211965E+02 SRR  0.               0.                 1065.921
           PREDICTED RESIDUALS       .163673E+02      0.               0.
343  18   1970  6 26 17 46 36.0000   .997313E+03 RNG   .420406E-01 AZ  -.651275E-01 EL   1066.600
           PREDICTED RESIDUALS       .745360E+03      0.               0.
343  18   1970  6 26 17 46 35.2336   .103505E+02 SRR  0.               0.                 1066.587
           PREDICTED RESIDUALS       .809252E+01      0.               0.
343  18   1970  6 26 17 47 32.0000   .132342E+04 RNG  -.361294E-01 AZ  -.661090E-01 EL   1067.533
           PREDICTED RESIDUALS       .970787E+03      0.               0.
343  18   1970  6 26 17 47 31.2308   .298569E+01 SRR  0.               0.                 1067.521
           PREDICTED RESIDUALS       .244620E+01      0.               0.

          SUMMARY OF PREDICTED STATISTICS
 STA  TYP         RMS         TYP        RMS         TYP        RMS         TYP        RMS

 343  RNG      .772325E+03   SRR      .890966E+01

PREDICTED RESIDUAL RMS =   .6865373073E+02

ENTER SEGMENT 83 AT    10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS     .0 CP SECS.

ITERATION NUMBER     1
   10 MEASUREMENTS WERE USED IN THIS SOLUTION
```

CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.7592292341069 3E+07	.11517256E+04	.7593443066691 3E+07	.11507256E+04	.29649739E+02
6820	Y	.7183127632 6843E+07	-.18282883E+01	.71831257743959E+07	-.18282883E+01	.28396897E+02
6820	Z	.18581636620026E+08	-.83642102E+03	.18580800199004E+08	-.83642102E+03	.39504959E+02
6820	DX	.24094838643523E+05	-.20868619E+00	.24094629957333E+05	-.20868619E+00	.12497134E+00
6820	DY	-.77192199815084E+03	-.47311194E+00	-.77239501008648E+03	-.47301194E+00	.28259268E+00
6820	DZ	-.95904692109553E+04	-.14318469E+01	-.95919000578832E+04	-.14308469E+01	.21595331E+00
6820	DRAG	.92142136157169E-02	.14590979E-03	.93601234080069E-02	.14590979E-03	.40531016E-03

NAME		SIGMA ZERO	SIGMA DEWT	TOTAL CORR.	T.C./SIGMA0	T.C./SIGMAD
6820	X	.83935591E+03	.10234573E+04	.11507256E+04	.13709627E+01	.11243514E+01
6820	Y	.18197890E+03	.24845168E+03	-.18282883E+01	-.10046705E-01	-.73587279E-02
6820	Z	.41169340E+03	.50041317E+03	-.83642102E+03	-.20316600E+01	-.16714608E+01
6820	DX	.40583081E+00	.49220109E+00	-.20868619E+00	-.51421968E+00	-.42398563E+00
6820	DY	.40530984E+00	.48656132E+00	-.47301194E+00	-.11670379E+01	-.97215276E+00
6820	DZ	.90215315E+00	.10590583E+01	-.14308469E+01	-.15860355E+01	-.13510559E+01
6820	DRAG	.4315229-E-03	.43152294E-03	.14590979E-03	.33812755E+00	.33812755E+00

RESIDUAL RMS = .8777415238E+02
RESIDUAL SOS = .7704301827E+05
APRIORI RMS = 0.
APRIORI SOS = 0.
TOTAL SDS = .7704301827E+05
PREDICTED SDS = .6706947746E+01

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.29217E-01						
6820 Y	-.45035E-02	.19858E-01					
6820 Z	-.13208E-01	.59896E-02	.12439E-01				
6820 DX	.47193E+01	-.77598E+00	.20907E+01	.43095E+04			
6820 DY	.14339E+01	.15532E+01	-.87915E+00	-.18952E+03	.29649E+03		
6820 DZ	-.25336E+01	.64220E+00	-.59693E+00	-.19689E+04	.82272E+02	.93689E+03	
6820 DRAG	.86219E+02	.13425E+03	.30759E+03	.25321E+06	-.10100E+05	-.10545E+05	.25437E+08
ATB	.46653E+02	-.10948E+02	-.24734E+02	.57163E+04	.21626E+04	-.34013E+04	-.51695E+05	.77043E+05

```
ATA INVERSE

             6820 X      6820 Y      6820 Z      6820 DX     6820 DY     6820 DZ     6820 DRAG
6820 X      .87911E+03
6820 Y      .40469E+03  .80634E+03
6820 Z      .69344E+03 -.39026E+03  .15606E+04
6820 DX    -.17610E+01 -.17321E+00 -.26060E+01  .15618E-01
6820 DY    -.52524E+01 -.76136E+01  .23439E+01  .43912E-02  .79859E-01
6820 DZ    -.89767E+00  .65437E+00 -.31440E+01  .24655E-01 -.61675E-02  .45636E-01
6820 DRAG  -.17762E-02  .50442E-03 -.53197E-02 -.13125E-04 -.79211E-05 -.16935E-04  .16428E-06

CORRELATION MATRIX

6820 X      1.00000
6820 Y       .48066 1.00000
6820 Z       .59202 -.34789 1.00000
6820 DX     -.47525 -.04881 -.52785 1.00000
6820 DY     -.62687 -.94880  .20996  .12434 1.00000
6820 DZ     -.14020  .10671 -.36853  .91354 -.10106 1.00000
6820 DRAG   -.14780  .04383 -.33224 -.25912 -.06916 -.19348 1.00000

ENTER SEGMENT 84 AT     10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   2. ****

 YEAR/MO/DY             X            ALPHA              A                AF          MEAN ANOMALY   APOGEE RADIUS
     HR/MIN             Y            DELTA              E                AG         ECCENTRC ANOM   APOGEE HEIGHT
    SECONDS             Z             BETA              I                 N          TRUE ANOMALY  PERIGEE RADIUS
   LATITUDE          XDOT          AZIMUTH              O                 L         KEPLERIAN PER  PERIGEE HEIGHT
  LONGITUDE          YDOT           RADIUS              U               CHI           ANOMALY PER           O-DOT
     HEIGHT          ZDOT         VELOCITY            TAU               PSI          NODAL PERIOD           U-DOT

 1970/ 6/26      7593443.067     43.4039413599   21743146.308  .0107339327918   355.77927559      3648.44899
      17/44      7183125.774     60.640045934    .01955793658 -.0163491764333   355.69515102       212.70943
  1.3979200     16580800.199     90.084130697    108.875079899  .0670480122506   355.61020994      3508.47433
 60.8042163     24.94.6299573    221.286090669   185.982349502  299.065885031     89.-891116        72.73477
222.9719608     -772.3950101     21319094.951    117.304259930  -.14577756705     89.6707338     2.8211594F19
    73.5309    -9591.9000579     25943.1793895   975.5843667  -1.3911031170 3    89.7028441    -2.0786362754
                                 TOTAL EDIT SUMMARY

  STA     N TYP   RMS    RMS/SIG     MEAN      N TYP   RMS    RMS/SIG    MEAN       N TYP   RMS    RMS/SIG    MEAN
  343     5 RNG 9.7E+02 4.9E+01   1.6E+02      5 AZ  4.4E-02 0.        -1.0E-02     5 EL  4.9E-02 0.        -4.7E-02
  343     5 SRR 1.1E+01 1.1E+02   9.5E+00

EXIT SEGMENT 84 AT     10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
```

```
ENTER SEGMENT 10 AT    10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

********************************** TRAJECTORY INTEGRATION FOR CASE   1 **********************************

                                  * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
   1064.0233 TZERO
   1083.1645 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    10.57600
 *             STEP    DOUBLED          T  =  1067.273299     H  =       .250000     NSTEP  =        25
 *             STEP    DOUBLED          T  =  1071.523299     H  =       .500000     NSTEP  =        41
   NODE  T =      .108016365486E+04    .214420373113E+08    .225573039794E+07    -.303975478830E-02
        DT =      .500000000000E+00    .133527768483E+04   -.820457575669E+04    -.243064633952E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .214  SECONDS TO INTEGRATE A SPAN OF     19.5000  MINUTES  ***

            ***  FROM       1064.023  TO       1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT    10.8 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT    10.9 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

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************************************************************  STAGE  6  ************************************************************

STAPASS   YEAR MO DY HR MN  SEC                      RESIDUALS - EXTERNAL UNITS                              MME

343  18   1970  6 26 17 44 23.0000   .224450E+02 RNG  -.282965E-01 AZ   -.106395E-01 EL   1064.333
343  18   1970  6 26 17 44 19.2525   .527920E-01 SRR  0.                0.                1064.321
343  18   1970  6 26 17 44 40.0000   .157758E+02 RNG  -.104524E+00 AZ   -.186839E-01 EL   1064.667
343  18   1970  6 26 17 44 39.2512  -.334204E-01 SRR  0.                0.                1064.654
343  18   1970  6 26 17 45 56.0000  -.684252E+01 RNG  -.210743E-01 AZ   -.380046E-01 EL   1065.933
343  18   1970  6 26 17 45 55.2392   .457146E-01 SRR  0.                0.                1065.921
343  18   1970  6 26 17 46 36.0000  -.974236E+01 RNG   .154507E-01 AZ   -.504605E-01 EL   1066.600
343  18   1970  6 26 17 46 35.2336   .734993E-01 SRR  0.                0.                1066.587
343  18   1970  6 26 17 47 32.0000  -.472401E+01 RNG  -.461330E-01 AZ   -.567544E-01 EL   1067.533
343  18   1970  6 26 17 47 31.2318  -.582066E-01 SRR  0.                0.                1067.521

ENTER SEGMENT 83 AT     19.9 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS       .0 CP SECS.

ITERATION NUMBER      2
   10 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                CURRENT VALUE            CORRECTION          NEW VALUE                TOTAL CORR.        SIGMA
6820     X           .75934430666913E+07   -.17473217E+00      .75934428919591E+07    .11505509E+04     .29652415E+02
6820     Y           .71831257743959E+07   -.76528587E+00      .71831250091109E+07   -.25935742E+01     .28380447E+02
6820     Z           .18580801199004E+08   -.22954129E+00      .18580799969463E+08   -.83665056E+03     .39509778E+02
6820     DX          .24094629957333E+05    .22630740E-02      .24094632229407E+05   -.20642312E+00     .12498010E+00
6820     DY         -.77239501008648E+03    .10204461E-02     -.77239396964038E+03   -.47199149E+00     .28259769E+00
6820     DZ         -.95919005578832E+04    .34716790E-02     -.95918965862341E+04   -.14273752E+01     .21595791E+00
6820     DRAG        .93601234080069E-02   -.76051947E-06      .93593628885378E-02    .14514927E-03     .40531414E-03

NAME                SIGMA ZERO         SIGMA DEWT         TOTAL CORR.        T.C./SIGMA0        T.C./SIGMAD
6820     X           .83935591E+03     .10234573E+04      .11505509E+04      .13707545E+01     .11241806E+01
6820     Y           .18197899E+03     .24845163E+03     -.25935742E+01     -.14252060E-01    -.10438948E-01
6820     Z           .41169345E+03     .50041317E+03     -.83665056E+03     -.20322176E+01    -.16719196E+01
6820     DX          .40583091E+00     .49220109E+00     -.20642312E+00     -.50864328E+00    -.41938777E+00
6820     DY          .40530958E+00     .48655137E+00     -.47199149E+00     -.11645202E+01    -.97035550E+00
6820     DZ          .90215315E+00     .10590583E+01     -.14273752E+01     -.15821873E+01    -.13477778E+01
6820     DRAG        .43152294E-03     .43152294E-03      .14514927E-03      .33636514E+00     .33636514E+00

RESIDUAL  RMS =     .61401553528E+00
RESIDUAL  SOS =     .37701577759E+01
APRIORI   RMS =     .66494038778E+00
APRIORI   SOS =     .30950210368E+01
TOTAL     SOS =     .68651708116E+01
PREDICTED SOS =     .68551430059E+01
```

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.29198E-01							
6820 Y	-.44992E-02	.19864E-01						
6820 Z	-.13198E-01	.50833E-02	.12434E-01					
6820 DX	.47059E+01	-.37609E+00	.20929E+01	.43090E+04				
6820 DY	.14332E+01	.15533E+01	-.87924E+00	-.18967E+03	.29638E+03			
6820 DZ	-.25322E+01	.64200E+00	-.59786E+03	-.19687E+04	.82292E+02	.93680E+03		
6820 DRAG	.86061E+02	.13439E+03	.30760E+03	.25316E+06	-.10096E+05	-.10543E+06	.25438E+08	
ATB	.46266E-02	-.13627E-01	-.29084E-02	.18222E+01	-.10708E+01	-.93047E+00	-.11216E+02	.37792E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.87927E+03						
6820 Y	.40464E+03	.80545E+03					
6820 Z	.69369E+03	-.38972E+03	.15610E+04				
6820 DX	-.17610E+01	-.17305E+00	-.26069E+01	.15620E-01			
6820 DY	-.52532E+01	-.76096E+01	.23425E+01	.43922E-02	.79861E-01		
6820 DZ	-.89736E+00	.65443E+00	-.31448E+01	.24657E-01	-.61666E-02	.46638E-01	
6820 DRAG	-.17784E-02	.50270E-03	-.53233E-02	-.13125E-04	-.79253E-05	-.16948E-04	.16428E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.48083	1.00000					
6820 Z	.59210	-.34756	1.00000				
6820 DX	-.47519	-.04879	-.52793	1.00000			
6820 DY	-.62689	-.94880	.20980	.12436	1.00000		
6820 DZ	-.14013	.10678	-.36857	.91355	-.10104	1.00000	
6820 DRAG	-.14797	.04370	-.33242	-.2591	-.16919	-.19362	1.00000

ENTER SEGMENT 84 AT 10.9 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 3. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	7593442.892	43.409411209	21743146.599	.0107338089766	355.77973727	3648.44912
17/44	7183125.009	60.640047161	.019557961 63	-.0163492876864	355.69563177	212.71063
1.3979200	18580799.969	90.084121532	108.875078675	.0670480179052	355.61068986	3508.47429
60.8042175	24094.6322204	221.286989441	185.982347975	299.065864625	89.4881134	72.73489
222.9719584	-772.3939896	21319094.431	117.303779372	-.1457775267 0	89.6707356	2.8211591592
73.5308	-9591.8965862	25945.1801773	975.5842532	-1.3911930 8952	89.7028459	-2.0786364671

EXIT SEGMENT 84 AT 10.9 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT     11.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.

 *********************************** TRAJECTORY INTEGRATION FOR CASE   1  ***********************************

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   1064.0233 TZERO
   1083.1645 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    10.98900
 *              STEP   DOUBLED          T  =  1067.273299     H  =      .250000     NSTEP  =        25
 *              STEP   DOUBLED          T  =  1071.523299     H  =      .500000     NSTEP  =        41
   NODE  T =     .108016365706E+04     .214420405147E+08     .225573006533E+07    -.303506639194E-02
        DT =     .500000000000E+00     .133527982041E+04    -.820457356845E+04    -.243964682024E+05

         ***  TRAJECTORY TERMINATION

         ***  THIS CASE TOOK       .213  SECONDS TO INTEGRATE A SPAN OF     19.5000  MINUTES  ***

             ***  FROM      1064.023  TO      1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     11.2 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT     11.3 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

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***************************************************** STAGE 6 **************************************************

STAPASS   YEAR MO DY HR MN  SEC                  RESIDUALS - EXTERNAL UNITS                           MME

343  18   1970  6 26 17 46 20.0000   .229047E+02 RNG  -.282855E-01 AZ   -.106324E-01 EL   1064.333
343  18   1970  6 26 17 46 19.2525   .561860E-01 SRR  0.                0.                1064.321
343  18   1970  6 26 17 44 40.0000   .163067E+02 RNG  -.104513E+00 AZ   -.106781E-01 EL   1064.667
343  18   1970  6 26 17 46 39.2512  -.297533E-01 SRR  0.                0.                1064.654
343  18   1970  6 26 17 45 56.0000  -.622021E+01 RNG  -.210811E-01 AZ   -.380096E-01 EL   1065.933
343  18   1970  6 26 17 45 55.2392   .419391E-01 SRR  0.                0.                1065.921
343  18   1970  6 26 17 46 36.0000  -.931889E+01 RNG   .154376E-01 AZ   -.504660E-01 EL   1066.600
343  18   1970  6 26 17 46 35.2336   .685414E-01 SRR  0.                0.                1066.587
343  18   1970  6 26 17 47 32.0000  -.450345E+01 RNG  -.461437E-01 AZ   -.567614E-01 EL   1067.533
343  18   1970  6 26 17 47 31.2308  -.606428E-01 SRR  0.                0.                1067.521

ENTER SEGMENT 83 AT    11.3 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER     3
   10 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME             CURRENT VALUE           CORRECTION        NEW VALUE              TOTAL CORR.      SIGMA
6820    X         .75934428919591E+07    .60785110E-05     .75934428919652E+07    .11503509E+04    .29652406E+02
6820    Y         .71831250091100E+07    .10559320E-03     .71831250092156E+07   -.25934686E+01    .28380447E+02
6820    Z         .18580799969463E+08   -.26003321E-03     .18580799969203E+08   -.83665082E+03    .39509776E+02
6820    DX        .24094632221407E+05   -.10117911E-05     .24094632219395E+05   -.20642413E+00    .12498007E+00
6820    DY       -.77239398915238E+03   -.85849487E-06    -.77239399049887E+03   -.47199235E+00    .28259768E+00
6820    DZ       -.95918965862041E+04   -.27485479E-05    -.95918965889527E+04   -.14273780E+01    .21595792E+00
6820    DRAG      .93593628885378E-02    .42636614E-09     .93593633149939E-02    .14514970E-03    .40531414E-03

NAME             SIGMA ZERO      SIGMA DEWT       TOTAL CORR.      T.C./SIGMA0      T.C./SIGMAD
6820    X         .83935591E+03   .10234573E+04    .11505509E+04    .13707545E+01    .11241807E+01
6820    Y         .18197890E+03   .24845168E+03   -.25934686E+01   -.14251480E-01   -.10438523E-01
6820    Z         .41169340E+03   .50041317E+03   -.83665082E+03   -.20322182E+01   -.16719201E+01
6820    DX        .40583081E+00   .49220109E+00   -.20642413E+00   -.50864577E+00   -.41938962E+00
6820    DY        .40530984E+00   .48656132E+00   -.47199235E+00   -.11645223E+01   -.97005727E+00
6820    DZ        .90215315E+00   .10590583E+01   -.14273780E+01   -.15821903E+01   -.13477804E+01
6820    DRAG      .43152294E-03   .43152294E-03    .14514970E-03    .33636613E+0     .33636613E+00

RESIDUAL   RMS =     .6130680263E+00
RESIDUAL   SOS =     .3758524048E+01
APRIORI    RMS =     .6651072090E+00
APRIORI    SOS =     .3096573196E+01
TOTAL      SOS =     .6855097244E+01
PREDICTED  SOS =     .6855097243E+01

****** LEAST SQUARES PROCESS CONVERGED ******
```

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.29198E-01							
6820 Y	-.44992E-02	.19864E-01						
6820 Z	-.13198E-01	.50833E-02	.12434E-01					
6820 DX	.47059E+01	-.77679E+00	.20929E+01	.43090E+04				
6820 DY	.14332E+01	.15533E+01	-.87923E+00	-.18967E+03	.29630E+03			
6820 DZ	-.25322E+01	.64200E+00	-.59786E+00	-.19687E+04	.82292E+02	.93680E+03		
6820 DRAG	.86061E+02	.13439E+03	.30760E+03	.25316E+06	-.10096E+05	-.10543E+06	.25438E+08	
ATB	.41392E-05	-.15072E-05	-.23650E-05	.72438E-03	.10835E-03	-.49068E-03	-.12140E-01	.37585E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.87927E+03						
6820 Y	.40464E+03	.80545E+03					
6820 Z	.69369E+03	-.38972E+03	.15610E+04				
6820 DX	-.17610E+01	-.17305E+00	-.26069E+01	.15620E-01			
6820 DY	-.52532E+01	-.76096E+01	.23425E+01	.43922E-02	.79861E-01		
6820 DZ	-.89735E+00	.65443E+00	-.31448E+01	.24657E-01	-.61666E-02	.46638E-01	
6820 DRAG	-.17784E-02	.30270E-03	-.53233E-02	-.13125E-04	-.79253E-05	-.16948E-04	.16428E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.48083	1.00000					
6820 Z	.59210	-.34756	1.00000				
6820 DX	-.47519	-.04879	-.52793	1.00000			
6820 DY	-.62689	-.94880	.28980	.12436	1.00000		
6820 DZ	-.14013	.10676	-.36857	.91355	-.10104	1.00000	
6820 DRAG	-.14797	.04370	-.33242	-.25910	-.06919	-.19362	1.00000

ENTER SEGMENT 84 AT 11.3 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 1080.16 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.35499E+05						
6820 Y	.10500E+05	.45207E+05					
6820 Z	.39262E+05	.54209E+04	.46872E+05				
6820 DX	.72910E+02	.31827E+02	.79375E+02	.15238E+00			
6820 DY	.17093E+02	.35478E+02	.15014E+02	.42516E-01	.30491E-01		
6820 DZ	.37517E+02	.63646E+01	.43562E+02	.76353E-01	.14678E-01	.42439E-01	
6820 DRAG	-.33922E-01	-.11780E-01	-.25810E-01	-.67130E-04	-.16543E-04	-.19563E-04	.16428E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.43466E+04					
-.40126E+04	.40423E+04				
0.	0.	.41290E+04			
.99574E+01	-.86330E+01	0.	.25101E-01		
-.50857E+01	.46549E+01	0.	-.11651E-01	.59505E-02	
0.	0.	.49990E+01	0.	0.	.99104E-02

PARAMETER SET COORDINATE SYSTEM

.93055E-11					
.29501E-11	.10030E-10				
.86308E-11	.84679E-12	.92512E-11			
.12938E-11	.44673E-12	.11146E-11	.19853E-12		
.28967E-12	.75130E-12	.10441E-12	.43619E-13	.85921E-13	
.65715E-12	.56289E-13	.64756E-12	.91182E-13	-.42134E-15	.52310E-13

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21442108.010	6.004383877	21794563.777	.0122834546163	58.51440816	3662.97539
18/ 0	2255315.104	-.003266904	.02120243080	-.0172817768107	59.55167132	226.92318
9.8700000	-1229.335	88.952610047	108.852063768	.0668108839665	60.63468846	3518.87238
-.0032889	1333.7543378	198.852063799	186.005499332	3.900663117	89.3057269	74.82817
181.5205828	-8704.7343403	21560399.619	119.398763628	-.14627750850	89.5668466	2.7958204713
104.4612	-24306.4601608	25688.5299652	1065.5699717	-1.39045372068	89.6990060	-2.0671152148

LEAST SQUARES PROCESS CONVERGED.

TOTAL EDIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
343	5	RNG	1.4E+01	6.8E-01	3.8E+00	5	AZ	5.4E-02	0.	-3.7E-02	5	EL	3.9E-02	0.	-3.5E-02
343	5	SRR	5.3E-02	5.3E-01	1.5E-02										

```
TYPE  SYMB  MINIMUM           DELTA            MEAN              MAXIMUM          STATION 343   PAGE  1
 RNG .  0     -.22439559E+02    .52546681E+00    .38337818E+01    .30107122E+02
 AZ     1     -.11550817E+ 0    .15718191E-02   -.36917213E-01    .41673742E-01
 EL     2     -.70484692E-01    .71150079E-03   -.34909652E-01    .66539697E-03
 SRR    3     -.86777491E- 1    .20406317E-02    .15254093E-01    .11728568E+00
63860.*.........*......1..*.........*.........*.........*...1.....*.........3.........*..2..0...*.........*
63870.*                                                 *                                                 *
63880.*      1                    3                     *                     2 0                         *
63890.*                                                 *                                                 *
63900.*                                                 *                                                 *
63910.*                                                 *                                                 *
63920.*                                                 *                                                 *
63930.*                                                 *                                                 *
63940.*                                                 *                                                 *
63950.*                                                 *                                                 *
63960.*                              0              2   *        1   3                                    *
63970.*                                                 *                                                 *
63980.*                                                 *                                                 *
63990.*                                                 *                                                 *
64000.*                        0  2                     *                         3      1                *
64010.*                                                 *                                                 *
64020.*                                                 *                                                 *
64030.*                                                 *                                                 *
64040.*                                                 *                                                 *
64050.*            3     2              0         1     *                                                 *
      *********************************************** END OF PLOT ***************************************
EXIT SEGMENT 84 AT     11.4 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.
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ENTER SEGMENT 10 AT     11.4 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

 ********************************** TRAJECTORY INTEGRATION FOR CASE    1 **********************************

                                              * PREDETERMINED EVENT TABLE *
 TIME(MME)      TYPE         ASSOCIATED QUANTITIES
   1864.0233 TZERO
   1880.4973 TSTOP

         ***   TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     11.44500
 *                 STEP    DOUBLED               T   =   1067.273299       H   =        .250000       NSTEP   =         25
 *                 STEP    DOUBLED               T   =   1071.523299       H   =        .500000       NSTEP   =         41
   NODE   T =      .108016365706E+04      .214420405147E+08       .225573006533E+07      -.302834997348E-02
          DT =     .500000000000E+00      .133527982039E+04      -.820457386845E+04      -.243064602024E+05
 *                 STEP    DOUBLED               T   =   1099.023299       H   =       1.000000       NSTEP   =         95
   NODE   T =      .112606600411E+04     -.218610693671E+08      -.233331033150E+07      -.113569520133E-01
          DT =     .100000000000E+01     -.396555160884E+03       .814287966114E+04       .238361856031E+05
   NODE   T =      .116985971938E+04      .214353907077E+08       .232104421883E+07      -.116027430591E+00
          DT =     .100000000000E+01      .136012302726E+04      -.820007391001E+04      -.243054003159E+05
   NODE   T =      .121575741890E+04     -.218507760784E+08      -.239954049100E+07       .449425186410E-02
          DT =     .100000000000E+01     -.421652153901E+03       .814208078449E+04       .238388596710E+05
   NODE   T =      .125954842676E+04      .214287470693E+08       .238591508462E+07      -.168020966610E+00
          DT =     .100000000000E+01      .138387961519E+04      -.819502895014E+04      -.243043112346E+05
   NODE   T =      .130543978 24E+04     -.218402598802E+08      -.246510553981E+07      -.179400456070E+00
          DT =     .100000000000E+01     -.447234823581E+03       .814142907676E+04       .238415978844E+05
   NODE   T =      .134922918673E+04      .214216117478E+08       .245143920516E+07       .233712681070E-01
          DT =     .100000000000E+01      .140734666221E+04      -.819029397584E+04      -.243033419389E+05
   NODE   T =      .139511229908E+04     -.218295752978E+08      -.253151835767E+07      -.415919552178E-01
          DT =     .100000000000E+01     -.473470711191E+03       .814029471625E+04       .238444586609E+05
   NODE   T =      .143889929261E+04      .214141868977E+08       .251746397605E+07      -.782375450684E-01
          DT =     .100000000000E+01      .143219402548E+04      -.818515918341E+04      -.243022270766E+05
   NODE   T =      .148477776054E+04     -.218187587642E+08      -.259849755109E+07       .114598971397E-01
          DT =     .100000000000E+01     -.499017620021E+03       .813889361458E+04       .238470651492E+05
   NODE   T =      .152856200160E+04      .214068712948E+08       .258295234820E+07      -.175603220512E+00
          DT =     .100000000000E+01      .145685763952E+04      -.817983928043E+04      -.243009756176E+05
   NODE   T =      .157443554648E+04     -.218074960176E+08      -.266463922821E+07      -.180128986515E+00
          DT =     .100000000000E+01     -.524136099269E+03       .813824973796E+04       .238498592982E+05
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NODE  T =   .161821685088E+04    .213994367270E+08    .264828399292E+07    .243835445813E-01
     DT =   .100000000000E+01    .148089881692E+04   -.817555587226E+04   -.242995496028E+05
NODE  T =   .166408354981E+04   -.217958962602E+08   -.273074355062E+07   -.212157618508E-01
     DT =   .100000000000E+01   -.550046114581E+03    .813782797751E+04    .238527373047E+05
NODE  T =   .170786150670E+04    .213915999808E+08    .271350556792E+07   -.114127474058E+00
     OT =   .100000000000E+01    .150524649161E+04   -.817124063287E+04   -.242982391742E+05
NODE  T =   .175372245239E+04   -.217843490327E+08   -.279665859553E+07   -.932234178636E-02
     DT =   .100000000000E+01   -.575642917481E+03    .813756447812E+04    .238552246979E+05
NODE  T =   .179749767323E+04    .213834988072E+08    .277846378426E+07   -.131203734526E+00
     OT =   .100000000000E+01    .152916060097E+04   -.816674010473E+04   -.242971469914E+05

     ***  TRAJECTORY TERMINATION

     ***  THIS CASE TOOK      .872  SECONDS TD INTEGRATE A SPAN DF    737.0000  MINUTES  ***

          ***  FROM      1064.023  TD      1801.023  MINUTES FROM MIDNIGHT DF EPOCH  ***

ENTER SEGMENT 50 AT    12.3 SECONDS. EXECUTION TIME FOR SEGMENT  19 WAS     .9 CP SECS
                              *** TRACE66 EPHEMERIS OUTPUT KEY ***


DATE,...    ME,MM,ST,OT        X,XO          X,XD - BF     ADBARV          LAT,...           REV,...       REMARK

YR/MO/DAY   MIN FROM EPOCH     X (FT)        X (FT)        ALPHA  (DEG)    LATITUDE (DEG)    REV COUNT       .
HR/MIN      MIN FROM MIDNIGHT  Y (FT)        Y (FT)        DELTA  (DEG)    LONGITUDE(DEG)    PERIOD          .
SEC         SEC FROM MIDNIGHT  Z (FT)        Z (FT)        BETA   (DEG)    ALTITUDE (NM)     PERIOD-DECAY    .
            STEP SIZE(MIN)     XD(FT/SEC)    XD(FT/SEC)    AZIMUTH(DEG)    S-VEH-LAT(DEG)    NDD-REG         .
IT          UTC - IT           YD(FT/SEC)    YD(FT/SEC)    R       (FT)    I        (DEG)
            UT1 - IT           ZD(FT/SEC)    ZD(FT/SEC)    V   (FT/SEC)    O        (DEG)

                              * * *      ECI  TRAJECTORY      * * *
```

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*** CASE      1
***


*** EPOCH PRINT

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
70/ 6/26        0.00000    .759344289E+07   -.764806414E+07      43.40941121       60.80421747       .31365
 17/44       1064.02330    .718312501E+07   -.712494034E+07      60.64004716      222.97195840      0.00000
 1.39792    63841.39792    .185808000E+08    .185808000E+06      90.88412153       73.53092355      0.00000
                 .12500    .240946322E+05   -.246075916E+05     221.28608944       60.80078890      0.00000
IT              0.00000   -.772393990E+03    .151403765E+04     .21319994E+08      108.87507868
                0.00000   -.959189659E+04   -.959189659E+04     .25945180E+05        5.54499517

  A  =   .21743147E+08     MEAN ANOM   =    .35577974E+03    APOGEE   =   .36484491E+04
  E  =   .19557962E-01     ECCENTRIC   =    .35569563E+03    HEIGHT   =   .21270963E+03
  I  =   .10887508E+03     TRUE ANOM   =    .35561069E+03    PERIGEE  =   .35084743E+04
  O  =   .18598235E+03     KEPL PER    =    .89488113E+02    HEIGHT   =   .72734801E+02
  U  =   .11730378E+03     ANOM PER    =    .89670736E+02    O-DOT    =   .28211592E+01
 TAU =   .97558425E+03     NODL PER    =    .89702846E+02    U-DOT    =  -.20786365E+01

***  REQUESTED PRINTS

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
70/ 6/26       16.14036    .214420405E+08   -.215527613E+08       6.00549935         .00000006       .50000 DSC NODE
 18/ 3       1080.16366    .225573007E+07   -.572626326E+06        .00000006      181.52190964      0.00000
 9.81942    64809.81942    .230045380E-01    .230045380E-01      88.95264149      104.45724719      0.00000
                 .50000    .133527985E+04   -.731569387E+03     198.85206376         .00000006      0.00000
IT              0.00000   -.820457386E+04    .985550169E+04     .21560367E+08      108.84336396
                0.00000   -.243064602E+05   -.243064602E+05     .25688558E+05        1.52190962

 DELTA NODE =      -.052   DELTA V =      -.0009

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
70/ 6/26      105.83642    .214353908E+08   -.201569485E+08       6.17996209        -.00000288      1.50000 DSC NODE
 19/29       1169.85972    .232104389E+07    .765249304E+07       -.00000236      159.21096388      0.00000
51.58320    70191.58320   -.107809356E+01   -.107809356E+01      88.95279537      104.50992605      0.00000
                1.00000    .136012187E+04    .306461904E+04     198.85196623        -.00000288      0.00000
IT              0.00000   -.820007404E+04    .939502721E+04     .21560687E+08      108.85222696
                 .00000   -.243054003E+05   -.243054003E+05     .25687422E+05      339.21096455
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 DELTA NODE =      -.068    DELTA V =      -.0011

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF           ADBARV             LAT,.. BF          REV,...
70/ 6/26        195.52513   .214287473E+08   -.157433235E+08       6.35324341         -.00001173        2.50000 DSC NODE
 20/59         1259.54843   .238591366E+07    .147319911E+08       -.00001165       136.90068010       89.69142
32.90578      75572.90578  -.438376636E+01   -.438376636E+01      88.95481801       104.58844613        0.00000
                  1.00000   .138387453E+04    .640178899E+04     198.85063321         -.00001173         .17450
IT                0.00000  -.819502954E+04    .752698666E+04     .215611164E+08     108.84898891
                   .00000  -.243043113E+05   -.243043113E+05     .256860505E+05     316.90068497

 DELTA NODE =      -.092    DELTA V =      -.0015

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF           ADBARV             LAT,.. BF          REV,...
70/ 6/26        285.20589   .214216120E+08   -.897364123E+07       6.52839148         -.00001158        3.50000 DSC NODE
 22/29         1349.22919   .245143774E+07    .196053251E+08       -.00001150       114.59425589       89.68236
13.75138      80953.75138  -.432756937E+01   -.432756937E+01      88.95815109       104.63123814        -.00905
                  1.00000   .140734137E+04    .877973059E+04     198.84997498         -.00001157         .17289
IT                0.00000  -.819029459E+04    .453222152E+04     .215614240E+08     108.84274223
                  0.00000  -.243033420E+05   -.243033420E+05     .256848980E+05     294.59425981

 DELTA NODE =      -.107    DELTA V =      -.0018

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF           ADBARV             LAT,.. BF          REV,...
70/ 6/26        374.87599   .214141869E+08   -.862266509E+06       6.70494891         -.00000271        4.50000 DSC NODE
 23/58         1438.89929   .251746366E+07    .215444081E+08       -.00000269        92.29191156       89.67252
53.95759      86333.95759  -.101202333E+01   -.101202333E+01      88.95875949       104.66947350        -.00984
                  1.00000   .143219283E+04    .984213692E+04     198.84909180         -.00000271         .17519
IT                0.00000  -.818515932E+04    .861069873E+03     .215616560E+08     108.83250828
                  0.00000  -.243022270E+05   -.243022270E+05     .256835790E+05     272.29191248

 DELTA NODE =      -.109    DELTA V =      -.0018

DATE,...  ME,MM,ST,DT,..          X,XD            X,XD - BF           ADBARV             LAT,.. BF          REV,...
70/ 6/27        464.53870   .214068712E+08    .737823384E+07       6.88094863          .00000451        5.50000 DSC NODE
  1/28         1528.56200   .258295298E+07    .202604898E+08        .00000448        69.98936552       89.66946
33.72002       5313.72002   .168762171E+01    .168762171E+01      88.95920725       104.74867934        -.00706
                  1.00000   .145685981E+04    .943171991E+04     198.84799115          .00000451         .17674
IT                0.00000  -.817983090E+04   -.293826764E+04     .215621390E+08     108.81834109
                  0.00000  -.243009755E+05   -.243009755E+05     .256820850E+05     249.98996398
```

```
DELTA NODE =      -.102   DELTA V =      -.0017

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF         ADBARV          LAT,.. BF        REV,...
70/ 6/27      554.19355    .213994367E+08   .145148497E+08      7.05476158       .00010215      6.50000 DSC NODE
  2/58       1618.21685    .264828417E+07   .159457968E+08       .00000214     47.68950143     89.65779
13.01102    10693.01102    .804616523E+00   .804616523E+00     88.96119198    104.83843728      -.00767
                1.00000    .148089974E+04   .761081880E+04    198.84921886       .00000215       .17476
IT              0.00000   -.817555575E+04  -.629825321E+04    .215626835E+08  108.80199001
                0.00000   -.242995496E+05  -.242995496E+05    .256807496E+05  227.68960070

DELTA NODE =      -.082   DELTA V =      -.0014

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF         ADBARV          LAT,.. BF        REV,...
70/ 6/27      643.83821    .213916000E+08   .194799850E+08      7.22939829      -.00000283      7.50000 DSC NODE
  4/27       1707.86151    .271350525E+07   .924628832E+07      -.00000281     25.39162634     89.64801
51.69044    16071.69044   -.105712610E+01  -.105712610E+01     88.96243023    104.89325314      -.00978
                1.00000    .150524536E+04   .465155802E+04    198.85059759      -.00000283       .17482
IT              0.00000   -.817124078E+04  -.871542997E+04    .215630165E+08  108.85076564
                0.00000   -.242982392E+05  -.242982392E+05    .256795552E+05  205.39162729

DELTA NODE =      -.050   DELTA V =      -.0008

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF         ADBARV          LAT,.. BF        REV,...
70/ 6/27      733.47438    .213834991E+08   .215317973E+08      7.40324268      -.00001245      8.50000 DSC NODE
  5/57       1797.49768    .277846226E+07   .116429879E+07      -.00001237      3.09516673     89.63890
29.86058    21449.86058   -.465457882E+01  -.465457882E+01     88.96437666    104.93226575      -.00910
                1.00000    .152915515E+04   .996256937E+03    198.85127777      -.00001245       .17436
IT              0.00000   -.816674083E+04  -.982865865E+04    .215563253E+08  108.84890896
                0.00000   -.242971470E+05  -.242971470E+05    .256799499E+05  183.09517095

DELTA NODE =       .025   DELTA V =    -89.6236

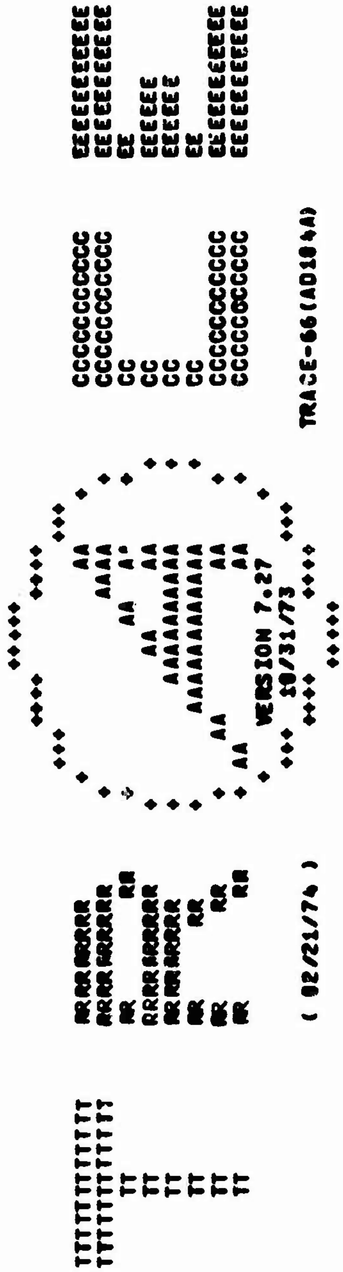

        **   TRAJECTORY TERMINATION


   A  =   .21780897E+08     MEAN ANOM  =   .69888710E+02    APOGEE   =   .36578764E+04
   E  =   .20420730E-01     ECCENTRIC  =   .70994953E+02    HEIGHT   =   .22200649E+03
   I  =   .10689225E+03     TRUE ANOM  =   .72104969E+02    PERIGEE  =   .35114730E+04
   O  =   .18740337E+03     KEPL PER   =   .89721271E+02    HEIGHT   =   .75603138E+02
   U  =   .11819828E+03     ANCM PER   =   .89595851E+02    O-DCT    =   .28010077E+01
 TAU  =   .17826052E+04     NODL PER   =   .89628018E+02    U-DCT    =  -.20714803E+01

        ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT     12.6 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .2 CP SECS.
```

C. 8 TEST CASE G: ECI SIMULTANEOUS-VEHICLE DATA GENERATION RUN (ITIN = 4)



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MODEL DATA
DITIN 4                   IMULTV2                   LEMSP1                    CARD   1
END                                                                           CARD   2     }(1)

****************************** GENERAL PERTURBATIONS GRAVITY MODEL *****************************

GM =  .5530417744E-02 ER**3/MIN**2  =  .1407660055E+17 FT**3/SEC**2  =  .3986049304E+15 M**3/SEC**2

                **** ZONAL HARMCNICS ****

EJ2 =  .1082549000E-02      EJ3 =-.2435000000E-05      EJ4 = -.1232000000E-05

***************************************** PHYSICAL CONSTANTS *****************************************

GM(ER**3/MIN**2)    =   .553039350E-02    OMEGE(RAD/MIN) =   .437526910E-02  GMLAT(DEG)   =   .783000000E+02
GMKM(KM**3/SEC**2)  =  0.                 OMEGA(RAD/MIN) =   .437526910E-02  GMLNG(DEG)   =   .291000000E+03
SGM(ER**3/MIN**2)   =   .680232650E-04    OMEGL(RAD/MIN) =  0.                AM(ER)       =   .272506277E+00
ERFT(FT/ER)         =   .209257380E+08    ERKM(KM/ER)    =   .637816490E+04  ERNM(NM/ER)  =   .344393360E+04
FTKM(FT/KM)         =   .328083990E+04    FTNM(FT/NM)    =   .607611550E+04  AE(ER)       =   .100000000E+01
GSUB0(FT/SEC**2)    =   .321740000E+02    DGREE(DEG)     =   .572957795E+02  SLT(ER/MIN)  =   .282017630E+04
CKEP                =   .100000000E-10    F              =   .335232987E-02  PI           =   .314159265E+01

***************************************** INPUT/OUTPUT CONVERSION FACTORS *****************************

DF(I/O-ER) =  .209257388+08   VF(I/O-ER/MIN) =  .34876230E+06   AF(I/O-ER/MIN**2) =  .58127050E+04

***************************************** INTEGRATION INPUTS *****************************************

                       ICENT =   1           NSTEP =   2
NPCMP =   0            IR    =   8           ER    =  .10000000E-09
HMIN  =  .15625000E-01 HMAX  =  .64000000E+02 H0   =  .10000000E+01

***************************************** SPECIAL OPTIONS ********************************************

TAPE2  =   0   TAPE7  =   0   TELEM  =   0   PTAPE  =   0   NPDOT  =   0
PRHO   =   0   NODPR  =   0   CLASS  =   0   LEMSP  =   1   PTNS   =10000
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data:	
	ITIN	2.1
	MULTV	2.1.4
	LEMSP	2.1.4

```
************************************** CRASH ALTITUDE TABLE ******************************************
                                         (IN FT)

  ECI CRASH ALTITUDE =     .300000000E+06            MCI CRASH ALTITUDE =    .300000000E+04

******************************* INTERPLANETARY CRASH ALTITUDES TABLE ************************************
                                         (IN FT)

  BODY(1) CRASH ALTITUDE =    .300000000E+06         BODY(2) CRASH ALTITUDE =   0.
  BODY(3) CRASH ALTITUDE =    .300000000E+04         BODY(4) CRASH ALTITUDE =   0.
  BODY(5) CRASH ALTITUDE =   0.                      BODY(6) CRASH ALTITUDE =   0.
  BODY(7) CRASH ALTITUDE =   0.

*************************************** STATION LOCATIONS ****************************************
STATION    SIG  REF  RA-RBF  DATUM  TYPE       LATITUDE        LONGITUDE       HEIGHT       P    Q
                                                  X                Y              Z
                                                RADIUS          LATITUDE       LONGITUDE

  VTS      -0    1     1      -0     -0      .34700000E+02   -.12050000E+03 -0.
  AND      -0    1     1      -0     -0      .38800000E+02   -.75800000E+02 -0.
  DUM      -0   -0    -0      -0     -0    -0.              -0.             -0.

ENTER SEGMENT 01 AT      .2 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS     .2 CP SECS.

************************************** VEHICLE DATA FOR CASE  1 **************************************

    IVEHID1                  IBTAPE3                IICTYP2                    CARD  1
    IYEAR -1973              IMNTH 1                IDAY  1                    CARD  2
     IC    -96.7506126             3.73445133             88.2988214           CARD  3
           86.6729057             134623991.            18361.7713             CARD  4
     PTIM  0                       1                    0                      CARD  5
           0                       240                                         CARD  6
    END                                                                        CARD  7
```

ITEM	DESCRIPTION	REFERENCE SECTION
2	Printout of station locations as input. If CLASS $\neq 0$, the actual locations are left blank. This example has a "dummy" station DUM, which is used to illustrate Data Set Types A and R	4 Item 4
3	Card images of input VEHICLE data. Emphasis is on the variable associated with simultaneous-vehicle data generation (ITIN=4), the others having been discussed earlier:	
	BTAPE	11.4

```
                                                   INITIAL  CONDITIONS
      EPOCH
   YR/MO/DAY            X,Y,Z,DX,DY,DZ          A,D,B,A,R,V             A,E,I,O,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC       -.15791181158E+08      -.96758612600E+02       .13833420868E+09       -.33262674454E-01
-1973/ 1/ 1           -.13340679577E+09       .37344513300E+01       .40008229570E-01       -.22217399798E-01
 0.                    .87683745275E+07       .88298821400E+02       .49999999902E+01        .41768749493E-02
 0.                    .10236583861E+05       .86672905700E+02       .21500001307E+03        .25993356923E+03
 0.                   -.14813643214E+04       .13462399100E+09       .35874044867E+03       -.25042896151E-01
 0.                    .61985084768E+03       .10361771300E+05      -.18426790668E+03       -.35764944855E-01

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

****************************************** VEHICLE DATA FOR CASE  2 ******************************************

    IVEHID3                                                                                   CARD    1
     IC    280.619783                22.9501321                77.0381996                     CARD    2
           72.448793                 166569812.                8201.03766                     CARD    3
    END                                                                                       CARD    4

                                                   INITIAL  CONDITIONS
      EPOCH
   YR/MO/DAY            X,Y,Z,DX,DY,DZ          A,D,B,A,R,V             A,E,I,O,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC        .28267416204E+08       .28061978300E+03       .13833121861E+09       -.22858036562E+00
-1973/ 1/ 1           -.15075769770E+09       .22950132100E+02       .29981105851E+00        .19400434856E+00
 0.                    .64950535290E+08       .77038199600E+02       .28600684287E+02        .41782100534E-02
 0.                    .76284803965E+04       .72448793000E+02       .22966614029E+03        .26000965736E+03
 0.                    .66307942090E+03       .16656981200E+09       .27001139933E+03       -.19439910442E+00
 0.                    .29365812037E+04       .82010376600E+04      -.47999867647E+03       -.16498361915E+00

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

****************************************** VEHICLE DATA FOR CASE  3 ******************************************

    IVEHID2                                                                                   CARD    1
     IC    -100.                     -28.6                     90.                            CARD    2
           90.                       96853470.                 13744.772                      CARD    3
    END                                                                                       CARD    4
```


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```
   DATA GENERATION I
STATION  INTERVAL  MIN.ELE.  MAX.ELE.   MAX.RANGE      START TIME         STOP TIME      AZIMUTH1  AZIMUTH2
           (SEC.)   (DEG.I    (DEG.)     (N.MI.)      DA  HR    MIN     DA   HR    MIN     (DEG.)    (DEG.)
  VTS      900.00    -0.00     -0.00     -0.          -0. -0. 15.0000   -0.  4. -0.0003     -0.0      -0.0
  AND      900.00    -0.00     -0.00     -0.          -0. -0. 15.0000   -0.  4. -0.0000     -0.0      -0.0
  DUM      900.00    -0.00     -0.00     -0.          -0. -0. 15.0000   -0.  4. -0.0007     -0.0      -0.0

   DATA GENERATION II

 * SIMULTANEOUS VEHICLE DATA GENERATION II KEY/HEADER     *

 * STA   -- PRIMARY STATION ID
 * STA 2 -- SECOND  STATION ID
 * STA 3 -- THIRD   STATION IC
 * T     -- OBSERVATION DATA SET TYPE - 1 7  J   K   L   M   N   O    P    Q   R   S  T  U
 * 01    -- OBSERVATION 1-------------- R RD V2  S2  S3  S3D V3  V3D TDOA TOA 3WR MP R2 A
 * 02    -- OBSERVATION 2-------------- A    V2D S2D                             RC E
 * 03    -- OBSERVATION 3-------------- E                                        RL TOP
 * V1    -- VEHICLE 1 ID NUMBER
 * V2    -- VEHICLE 2 ID NUMBER
 * V3    -- VEHICLE 3 ID NUMBER

STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA
      123                  2   123                  2/3  123                 2/3  123                  2/3

VTS 1 XXX   1                1  XX   3                   1 X       2
AND 7 X     1
DUM J XX    1    2           J X     2    3              J X       1    3
VTS K XX    2    3           K X     1    3              K X       1    2
AND L X     2    1    3      L X     1    2    3
VTS L X     2    3    1      L X     3    2    1
AND M X     2    3    1      M X     3    2    1
VTS M X     2    1    3      M X     1    2    3
DUM N X     1    3    2      O X     1    3    2
AND P X     2    3           P X     2    1
VTS Q X     1          AND   Q X     2          AND  Q X       3         AND
AND R X     1          VTS   R X     2          VTS  R X       3         VTS
DUM S X     1    3           S X     1    2

*****************************************************************************************************
```

(4)

ITEM	DESCRIPTION	REFERENCE SECTION
4	Simultaneous-vehicle DATA GENERATION II key/header printout	12.2.2
	The observation names are abbreviated as follows for each data set type:	15.1

1	R	Station-vehicle range	Q	TOA	Time difference of arrival of signal transmitted from vehicle to Station 1 minus vehicle to Station 2
	A[a]	Station-vehicle azimuth			
	E[a]	Station-vehicle elevation			
7	RD	Station-vehicle range rate	R	3WR	Time of signal transmitted from Station 1 to Vehicle 1 plus time from Vehicle 1 to Station 2
J	V2	Vehicle-vehicle range			
	V2D	Vehicle-vehicle range rate			
K	S2	Station-vehicle-vehicle range sum	S	MP	Time from Vehicle 1 to earth to Vehicle 2 minus time from Vehicle 1 to Vehicle 2
	S2D	Station-vehicle-vehicle range rate sum			
L	S3	Station-vehicle-vehicle-vehicle range sum	T	R2	Two-way range
M	S3D	Station-vehicle-vehicle-vehicle range rate sum		RC	C-band range currently not used
				RL	L-band range
N	V3	Vehicle-vehicle-vehicle range sum	U	A[b]	Vehicle-vehicle azimuth
O	V3D	Vehicle-vehicle-vehicle range rate sum		E[b]	Vehicle-vehicle elevation
P	TDOA	Time difference of arrival of two signals. Time from station to Vehicle 1 minus station to Vehicle 2 to Vehicle 1		TOP[b]	Topocentric

[a]Observation output for Data Set Type 1.

[b]Observation output for Data Set Type U. If TOP is entered, A and E contain vehicle-vehicle topocentric right ascension and declination.

Consider the following segments of DATA GENERATION II printout:

a

	STA	T	0:0:0 1:2:3	V 1	V 2	V 3	STA 2
1	VTS	1	XXX	1			
2	AND	7	X	1			
3	DUM	J	XX	1	2		
4	VTS	K	XX	2	3		
5	AND	L	X	2	1	3	
6	AND	M	X	2	3	1	
7	DUM	N	X	1	3	2	
8	AND	P	X	2	3		
9	VTS	Q	X	1			AND
10	AND	R	X	1			VTS
11	DUM	S	X	1	3		

b

	T	0:0:0 1:2:3	V 1	V 2	V 3	STA 2
1	1	XX	3			
2						
3	J	X	2	3		
4	K	X	1	3		
5	L	X	1	2	3	
6	M	X	3	2	1	
7	O	X	1	3	2	
8	P	X	2	1		
9	Q	X	2			AND
10	R	X	2			VTS
11	S	X	1	2		

c

	T	0:0:0 1:2:3	V 1	V 2	V 3	STA 2
1	1	X	2			
2						
3	J	X	1	3		
4	K	X	1	2		
5						
6						
7						
8						
9	Q	X	3			AND
10	R	X	3			VTS
11						

d

	T	0:0:0 1:2:3	V 1	V 2	V 3	STA 2

(1a) Station-vehicle R, A, E data generated between Station VTS and Vehicle 1 (ID No. 1).

(1b) Station-vehicle A, E data generated between Station VTS and Vehicle 1 (ID No. 3).

(1c) Station-vehicle R data generated between Station VTS and Vehicle 1 (ID No. 2).

(2a) Station-vehicle range rate data generated between Station AND and Vehicle 1 (ID No. 1).

(3a) Vehicle-vehicle range and range rate data generated between Vehicle 1 (ID No. 1) and Vehicle 2 (ID No. 2).

(7a) Vehicle-vehicle-vehicle range data generated between Vehicle 1 (ID No. 1), Vehicle 2 (ID No. 3), and Vehicle 3 (ID No. 2)

(9a) Time-of-arrival data generated between Vehicle 1 (ID No. 1) to Station VTS minus Vehicle 1 (ID No. 1) and Station AND.

(9b) Time-of-arrival data generated between Vehicle 1 (ID No. 2) to Station VTS minus Vehicle 1 (ID No. 2) and Station AND.

```
     EPOCH                                          INITIAL  CONDITIONS
   YR/MO/DAY           X,Y,Z,DX,DY,DZ          P,Q,B,A,R,V              A,E,I,O,U,TAU             AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC      -.14766293955E+08      .10000000000E+03       .13033313361E+09       -.52069000054E-01
-1973/ 1/ 1          -.83743814448E+08      .28600000000E+02       .29955342290E+00       -.29529797564E+00
 0.                  -.46362967502E+08      .90000000000E+02       .28600000000E+02        .41781232924E-02
 0.                   .13535958029E+05      .90000000000E+02       .35000000000E+03        .26000000000E+03
 0.                  -.23867546102E+04      .36853470000E+08       .27000000000E+03       -.44262365465E-01
 0.                  -.48498647259E-10      .13744772000E+05      -.14360514470E+04        .25102434855E+00

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

****************************************************************************************************

ENTER SEGMENT 02 AT       .4 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .1 CP SECS.
ENTER SEGMENT 10 AT       .4 SECONDS.  EXECUTION TIME FOR SEGMENT  2 WAS      .0 CP SECS.
```

```
********************************** TRAJECTORY INTEGRATION FCR CASE   1 ***********************************

        *** TRAJECTORY START

        * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .41100

        *** TRAJECTORY TERMINATION

        *** THIS CASE TOCK       .067  SECONDS TO INTEGRATE A SPAN OF    247.0000  MINUTES  ***

            *** FROM          0.000  TO        247.000  MINUTES FROM MIDNIGHT OF EPOCH  ***
********************************** TRAJECTORY INTEGRATION FOR CASE   2 ***********************************

        *** TRAJECTORY START

        * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .48200

        *** TRAJECTORY TERMINATION

        *** THIS CASE TOOK       .066  SECONDS TO INTEGRATE A SFAN OF    247.0000  MINUTES  ***

            *** FROM          0.000  TO        2 /.000  MINUTES FROM MIDNIGHT OF EPOCH  ***
********************************** TRAJECTOR' .NTEGRATION FOR CASE   3 ***********************************

        *** TRAJECTORY START

        * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .55500

        *** TRAJECTORY TERMINATION
        *** THIS CASE TOCK       .072  SECONDS TO INTEGRATE A SFAN OF    243.0000  MINUTES  ***

            *** FROM          0.000  TO        243.000  MINUTES FROM MIDNIGHT OF EPOCH  ***
ENTER SEGMENT 61 AT       .6 SECONDS.  EXECUTION TIME FCR SEGMENT 10 WAS      .3 CP SECS.
```

VTS		73	1	1	0	30	0.000000	L	.29998091E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	30	0.000000	Q	-.39000497E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	0	30	0.000000	Q	.34658442E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	0	30	0.000000	Q	.13038526E-03	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	0	30	0.000000	7	.26648065E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	30	0.000000	L	.32874355E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	M	.33732343E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	P	.10367035E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	30	0.000000	L	.23873526E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	P	.19616991E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	30	0.000000	M	-.11278630E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	30	0.000000	R	.24310022E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	30	0.000000	R	.30768046E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	30	0.000000	R	.18663151E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	30	0.000000	J	.73076107E+08	-.14185904E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	30	0.000000	S	.19426939E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	30	0.000000	N	.20813402E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	30	0.000000	O	-.11888149E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	30	0.000000	J	.73940690E+08	-.19868900E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	30	0.000000	S	.12098517E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	30	0.000000	J	.13575791E+09	-.10469559E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	0	45	0.000000	1	.11965843E+09	.13792611E+03	.46073076E+02	1	RAE	S-V1
VTS		73	1	1	0	45	0.000000	K	.19264435E+09	.27991368E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	K	.19339766E+09	.89170868E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	M	-.99126456E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	1	.15412109E+09	.96496525E+02	.51994251E+02	3	RAE	S-V1
VTS		73	1	1	0	45	0.000000	L	.36196053E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	1	.92951319E+08	.14787171E+03	.90053600E+01	2	RAE	S-V1
VTS		73	1	1	0	45	0.000000	M	.10519570E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	K	.22705153E+09	.27769871E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	L	.30003746E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	45	0.000000	Q	-.34202135E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	0	45	0.000000	Q	.31835940E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	0	45	0.000000	Q	.10569858E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	0	45	0.000000	7	.28826838E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	45	0.000000	L	.32783414E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	M	.15744040E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	P	.10352322E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	45	0.000000	L	.23663667E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	P	.19649460E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	45	0.000000	M	-.77122338E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	45	0.000000	R	.24365606E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	45	0.000000	R	.31020740E+00	0.	0.	3	3WR	S1V1-S1V2

ITEM	DESCRIPTION	REFERENCE SECTION
5	<u>DATA GENERATION II output</u>. Each line corresponds to a primary station, secondary station, year, month, day, hour, minute, second, data set type, generated observations, vehicle ID number, observation data abbreviations, and station and vehicle sequence numbers. The output description is:	Item 4

STA	ST2	Y	M	D	H	M	SEC	OT	OB1	OB2 (V3)	OB3 (V2)	V1		
Primary station ID	Secondary station ID	Year	Month	Day	Hour	Minute	Second	Observation type	Observation data for all data set types	Observation data for Data Set Types 1, J, K, T, and U V3 ID No. for Data Set Types L, M, N, and O Zero for other data set types	Observation data for Data Set Types 1 and T V2 ID No. for Data Set Types J, K, L, M, N, O, P, S, and U Zero for other data set types	V1 ID No.	Observation data sets	Station and vehicle sequence Nos.

STA	ST2	Y	M	D	H	M	SEC	OT	DB1	DB2 (V3)	DB3 (V2)	V1	5	
VTS		73	1	1	0	15	0.000000	1	.11908033E+09	.13875191E+03	.45901570E+02	1	RAE	S-V1
VTS		73	1	1	0	15	0.000000	K	.19232075E+09	.80385837E+02	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	K	.19317728E+09	.15435345E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	M	-.85357078E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	1	.15182447E+09	.96745079E+02	.49046996E+02	3	RAE	S-V1
VTS		73	1	1	0	15	0.000000	L	.36190448E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	1	.90991238E+08	.15616627E+03	.10431786E+02	2	RAE	S-V1
VTS		73	1	1	0	15	0.000000	M	.43460611E+03	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	K	.22697431E+09	-.20198590E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	L	.30021472E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	15	0.000000	Q	-.44255651E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	0	15	0.000000	Q	.37450345E-02	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	0	15	0.000000	Q	-.82450442E-03	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	0	15	0.000000	7	.24319331E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	15	0.000000	L	.32959550E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	M	.52080722E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	P	.10351092E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	15	0.000000	L	.23913938E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	P	.19553368E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	15	0.000000	M	-.14767996E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	15	0.000000	R	.24258108E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	15	0.000000	R	.30497605E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	15	0.000000	R	.18584647E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	15	0.000000	J	.73240415E+08	-.22264991E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	15	0.000000	S	.19231125E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	15	0.000000	N	.20922348E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	15	0.000000	O	-.12305741E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	15	0.000000	J	.74096949E+08	-.14868230E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	15	0.000000	S	.11999225E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	15	0.000000	J	.13598307E+09	-.10079242E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	0	30	0.000000	1	.11936148E+09	.13831957E+03	.45992510E+02	1	RAE	S-V1
VTS		73	1	1	0	30	0.000000	K	.19243759E+09	.17959777E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	30	0.000000	K	.19300217E+09	.12276780E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	30	0.000000	M	-.92418810E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	1	.15391717E+09	.96589686E+02	.50530271E+02	3	RAE	S-V1
VTS		73	1	1	0	30	0.000000	L	.36201577E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	1	.91846886E+08	.15199145E+03	.95632226E+01	2	RAE	S-V1
VTS		73	1	1	0	30	0.000000	M	.75184476E+03	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	K	.22690480E+09	.45436889E+02	.30000000E+01	2	R RD	S-V1-V2

AND	VTS	73	1	1	0	45	0.000000	R	.18795073E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	45	0.000000	J	.72985924E+08	-.58217159E+02	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	45	0.000000	S	.19606784E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	45	0.000000	N	.20708614E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	45	0.000000	O	-.11386526E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	45	0.000000	J	.73739227E+08	-.24895997E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	45	0.000000	S	.12239129E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	45	0.000000	J	.13410022E+09	-.10804354E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	0	0.000000	1	.11996958E+09	.13757347E+03	.46143506E+02	1	RAE	S-V1
VTS		73	1	1	1	0	0.000000	K	.19294123E+09	.37955802E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	K	.19346242E+09	.54729742E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	M	-.10548312E+04	.30800000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	1	.15513529E+09	.96467906E+02	.53439234E+02	3	RAE	S-V1
VTS		73	1	1	1	0	0.000000	L	.36174258E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	1	.94284293E+08	.14385130E+03	.87530414E+01	2	RAE	S-V1
VTS		73	1	1	1	0	0.000000	M	.13280911E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	K	.22739873E+09	.49024097E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	L	.30037339E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	0	0.000000	Q	-.29882326E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	0	0.000000	Q	.28987876E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	0	0.000000	Q	.19381818E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	0	0.000000	7	.30847196E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	0	0.000000	L	.32687064E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	M	-.18598518E+02	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	P	.10307188E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	0	0.000000	L	.23884228E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	P	.19624433E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	0	0.000000	M	-.41593905E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	0	0.000000	R	.24424555E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	0	0.000000	R	.31255447E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	0	0.000000	R	.18978006E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	0	0.000000	J	.72971656E+08	.26558766E+02	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	0	0.000000	S	.19770251E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	0	0.000000	N	.20618609E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	0	0.000000	O	-.10830021E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	0	0.000000	J	.73492846E+08	-.29826952E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	0	0.000000	S	.12418812E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	0	0.000000	J	.13311444E+09	-.11095609E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	15	0.000000	1	.12029327E+09	.13726335E+03	.46204090E+02	1	RAE	S-V1
VTS		73	1	1	1	15	0.000000	K	.19332685E+09	.47683223E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	K	.19349638E+09	.21002149E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	M	-.11145255E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	15	0.000000	1	.15605897E+09	.96507051E+02	.54865548E+02	3	RAE	S-V1

VTS		73	1	1	1	15	0.000000	L	.36136603E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	15	.000000	1	.95823086E+08	.13996870E+03	.87925600E+01	2	RAE	S-V1
VTS		73	1	1	1	15	0.000000	M	.15810508E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	15	0.000000	K	.22792704E+09	.67972399E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	L	.30036061E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	15	0.000000	Q	-.26059212E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	15	0.000000	Q	.26118474E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	15	0.000000	Q	.27597947E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	15	0.000000	7	.32702012E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	15	0.000000	L	.32585651E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	15	0.000000	M	-.19019439E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	15	0.000000	P	.10232534E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	15	0.000000	L	.23934514E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	15	1.000000	P	.19570019E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	15	0.000000	M	-.70568146E+02	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	15	0.000000	R	.24486553E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	15	0.000000	R	.31471958E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	15	0.000000	R	.19208750E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	15	0.000000	J	.73033572E+08	.11081460E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	15	0.000000	S	.19917089E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	15	0.000000	N	.20513752E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	15	0.000000	O	-.10247131E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	15	0.000000	J	.73203107E+08	-.34501548E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	15	0.000000	S	.12634566E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	15	0.000000	J	.13210395E+09	-.11355277E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	30	0.000000	1	.12062784E+09	.13699715E+03	.46255162E+02	1	RAE	S-V1
VTS		73	1	1	1	30	0.000000	K	.19379834E+09	.57015129E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	K	.19350101E+09	-.10091927E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	M	-.11694199E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	1	.15689138E+09	.96618204E+02	.56273520E+02	3	RAE	S-V1
VTS		73	1	1	1	30	0.000000	L	.36083569E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	1	.97543566E+08	.13625511E+03	.91034380E+01	2	RAE	S-V1
VTS		73	1	1	1	30	0.000000	M	.18092158E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	K	.22861470E+09	.84413893E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	L	.30178520E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	30	0.000000	Q	-.22750247E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	30	0.000000	Q	.23231238E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	30	0.000000	Q	.35110979E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	30	0.000000	7	.34385462E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	30	0.000000	L	.32479578E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	30	0.000000	M	-.35621730E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	30	0.000000	P	.10129909E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	30	0.000000	L	.24013366E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3

AND		73	1	1	1	30	0.000000	P	.19478731E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	30	0.000000	M	.25741756E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	30	0.000000	R	.24551276E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	30	0.000000	R	.31670091E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	30	0.000000	R	.19483468E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	30	0.000000	J	.73170498E+08	.15299603E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	30	0.000000	S	.20047196E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	30	0.000000	N	.20424163E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	30	0.000000	O	-.96633197E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	30	0.000000	J	.72873170E+08	-.38724718E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	30	0.000000	S	.12882793E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	30	0.000000	J	.13107113E+09	-.11593280E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	45	0.000000	1	.12097158E+09	.13677603E+03	.46297081E+02	1	RAE	S-V1
VTS		73	1	1	1	45	0.000000	K	.19435150E+09	.65807525E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	K	.19347966E+09	-.36374111E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	M	-.12179918E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	1	.15763189E+09	.96806760E+02	.57663450E+02	3	RAE	S-V1
VTS		73	1	1	1	45	0.000000	L	.36015758E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	1	.99421133E+08	.13273370E+03	.96605045E+01	2	RAE	S-V1
VTS		73	1	1	1	45	0.000000	P	.20133077E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	K	.22943874E+09	.98277818E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	L	.30281866E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	45	0.000000	Q	-.19969139E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	45	0.000000	Q	.20329035E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	45	0.000000	Q	.41849420E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	45	0.000000	7	.35892990E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	45	0.000000	L	.32369355E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	P	-.51437327E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	P	.10031453E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	45	0.000000	L	.24119277E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	P	.19352426E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	45	0.000000	P	.56203790E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	45	0.000000	R	.24618392E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	45	0.000000	R	.31849686E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	45	0.000000	R	.19797874E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	45	0.000000	J	.73379915E+08	.27168059E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	45	0.000000	S	.20160609E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	45	0.000000	N	.20339752E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	45	0.000000	O	-.91933707E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	45	0.000000	J	.72538074E+08	-.42276877E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	45	0.000000	S	.13159454E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	45	0.000000	J	.13031761E+09	-.11816177E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	0	0.000000	1	.12132278E+09	.13660084E+03	.46330219E+02	1	RAE	S-V1

VTS		73	1	1	2	0	0.000000	K	.19498087E+09	.73933390E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	K	.19343767E+09	-.55559274E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	M	-.12582170E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	I	.15827993E+09	.97079441E+02	.59035573E+02	3	RAE	S-V1
VTS		73	1	1	2	0	0.000000	L	.35933941E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	I	.10143150E+09	.12941968E+03	.10435959E+02	2	RAE	S-V1
VTS		73	1	1	2	0	0.000000	M	.21950644E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	K	.23037609E+09	.18960938E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	L	.30403419E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	0	0.000000	Q	-.17727309E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	0	0.000000	Q	.17414169E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	0	0.000000	Q	.47775516E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	0	0.000000	7	.37221258E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2	0	0.000000	L	.32255649E+09	.30000000E+01	.30000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	M	-.66429483E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	P	.98498121E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	0	0.000000	L	.24250527E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	P	.19193239E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	0	0.000000	M	.83899815E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	0	0.000000	R	.24687563E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	0	0.000000	R	.32010604E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	0	0.000000	R	.20147407E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	0	0.000000	J	.73658093E+08	.34560303E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	0	0.000000	S	.20257490E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	0	0.000000	N	.20260269E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	0	0.000000	O	-.85705472E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2	0	0.000000	J	.72114887E+08	-.44929014E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	0	0.000000	S	.13460225E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	0	0.000000	J	.12894459E+09	-.12026578E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	15	0.000000	I	.12167973E+09	.13647218E+03	.46354953E+02	1	RAE	S-V1
VTS		73	1	1	2	15	0.000000	K	.19567997E+09	.81284379E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	K	.19338245E+09	-.65424091E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	M	-.12877473E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	I	.15883500E+09	.97444505E+02	.60390027E+02	3	RAE	S-V1
VTS		73	1	1	2	15	0.000000	L	.35839096E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	I	.10355129E+09	.12632100E+03	.11401183E+02	2	RAE	S-V1
VTS		73	1	1	2	15	0.000000	M	.23568868E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	K	.23140453E+09	.11854852E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	L	.30540477E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	15	0.000000	Q	-.16033571E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	15	0.000000	Q	.14488456E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	15	0.000000	Q	.52880903E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	15	0.000000	7	.38368086E+03	0.	0.	1	RD	S-V1

AND		73	1	1	2 15	0.000000	L	.32139325E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2 15	0.000000	M	-.80171509E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2 15	0.000000	P	.96780416E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2 15	0.000000	L	.24435289E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2 15	0.000000	P	.19003510E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2 15	0.000000	M	.10856871E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2 15	0.000000	R	.24758452E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2 15	0.000000	R	.32152726E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2 15	0.000000	R	.20527397E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2 15	0.000000	J	.74000243E+08	.41367313E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2 15	0.000000	S	.20338112E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2 15	0.000000	N	.20185348E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2 15	0.000000	O	-.80865004E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2 15	0.000000	J	.71702719E+08	-.46459475E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2 15	0.000000	S	.13780630E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2 15	0.000000	J	.12785324E+09	-.12223232E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2 30	0.000000	1	.12204073E+09	.13639037E+03	.46371649E+02	1	RAE	S-V1
VTS		73	1	1	2 30	0.000000	K	.19644140E+09	.87771709E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2 30	0.000000	K	.19332331E+09	-.63967282E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2 30	0.000000	M	-.13041250E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2 30	0.000000	1	.15929667E+09	.97912020E+02	.61726804E+02	3	RAE	S-V1
VTS		73	1	1	2 30	0.000000	L	.35732420E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2 30	0.000000	1	.10575846E+09	.12343942E+03	.12528176E+02	2	RAE	S-V1
VTS		73	1	1	2 30	0.000000	M	.25015015E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2 30	0.000000	K	.23250342E+09	.12530574E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2 30	0.000000	L	.30690409E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2 30	0.000000	Q	-.14894119E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2 30	0.000000	Q	.11553282E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2 30	0.000000	Q	.57181029E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2 30	0.000000	7	.39332379E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2 30	0.000000	L	.32021463E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2 30	0.000000	M	-.92468045E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2 30	0.000000	P	.94894903E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2 30	0.000000	L	.24581741E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2 30	0.000000	P	.18785724E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2 30	0.000000	M	.13010256E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2 30	0.000000	R	.24830718E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2 30	0.000000	R	.32275950E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2 30	0.000000	R	.20933207E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2 30	0.000000	J	.74400675E+08	.47498540E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2 30	0.000000	S	.20402845E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2 30	0.000000	N	.20114563E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2 30	0.000000	O	-.76517233E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3

DUM		73	1	1	2	30	0.000000	J	.71282581E+08	-.46669897E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	30	0.000000	S	.14116155E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	30	0.000000	J	.12674496E+09	-.12401577E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	45	0.000000	1	.12240409E+09	.13635547E+03	.46380655E+02	1	RAE	S-V1
VTS		73	1	1	2	45	0.000000	K	.19725706E+09	.93326283E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	K	.19327120E+09	-.49545634E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	M	-.13050001E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	1	.15966456E+09	.98494202E+02	.63045695E+02	3	RAE	S-V1
VTS		73	1	1	2	45	0.000000	L	.35615338E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	1	.10803254E+09	.12077175E+03	.13790574E+02	2	RAE	S-V1
VTS		73	1	1	2	45	0.000000	M	.26316706E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	K	.23365425E+09	.13013821E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	L	.30850723E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	45	0.000000	Q	-.14312540E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	45	0.000000	Q	.86096704E-03	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	45	0.000000	C	.60709253E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	45	0.000000	7	.41114054E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2	45	0.000000	L	.31903356E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	45	.000000	M	-.10307644E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	45	0.000000	F	.92876895E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	45	0.000000	L	.24778130E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	45	0.000000	P	.18542443E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	45	0.000000	M	.14852230E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	45	0.000000	R	.24904023E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	45	0.000000	R	.32380190E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	45	0.000000	R	.21360342E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	45	0.000000	J	.74852972E+08	.52882125E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	45	0.000000	S	.20452135E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	45	0.000000	N	.20047468E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	45	0.000000	O	-.72663324E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2	45	0.000000	J	.70867111E+08	-.45398721E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	45	0.000000	S	.14462348E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	45	0.000000	J	.12562171E+09	-.12554545E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	0	0.000000	1	.12276818E+09	.13636730E+03	.46382294E+02	1	RAE	S-V1
VTS		73	1	1	3	0	0.000000	K	.19811832E+09	.97898113E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	K	.19323837E+09	-.20978677E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	M	-.12883216E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	1	.15993836E+09	.99205832E+02	.64346221E+02	3	RAE	S-V1
VTS		73	1	1	3	0	0.000000	L	.35489472E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	1	.11035482E+09	.11831111E+03	.15164279E+02	2	RAE	S-V1
VTS		73	1	1	3	0	0.000000	M	.27499577E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	K	.23484098E+09	.13332861E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	L	.31019113E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3

VTS	AND	73	1	1	3	0	0.000000	G	-.14289825E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	3	0	0.000000	Q	.56583320E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	0	0.000000	Q	.63511314E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	0	0.000000	7	.40713952E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	0	0.000000	L	.31786495E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	M	-.11178571E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	P	.90762461E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	0	0.000000	L	.24992824E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	P	.18276261E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	0	0.000000	M	.16394944E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	0	0.000000	R	.24978034E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	0	0.000000	R	.32465375E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	0	0.000000	R	.21804537E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	0	0.000000	J	.75350148E+08	.57464421E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	0	0.000000	S	.20486490E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	0	0.000000	N	.19983631E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	0	0.000000	O	-.69269872E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	0	0.000000	J	.70470197E+08	-.42531559E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	0	0.000000	S	.14814893E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	0	0.000000	J	.12448616E+09	-.12573429E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	15	0.000000	1	.12313137E+09	.13642543E+03	.46376856E+02	1	RAE	S-V1
VTS		73	1	1	3	15	0.000000	K	.19901618E+09	.10145519E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	K	.19323788E+09	.22379283E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	M	-.12524914E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	1	.16011783E+09	.10096478E+03	.65627552E+02	3	RAE	S-V1
VTS		73	1	1	3	15	0.000000	L	.35356614E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	1	.11270831E+09	.11604803E+03	.10627780E+02	2	RAE	S-V1
VTS		73	1	1	3	15	0.000000	M	.28585530E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	K	.23605012E+09	.13516759E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	L	.31193493E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	15	0.000000	Q	-.14824404E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	3	15	0.000000	Q	.26997233E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	15	0.000000	Q	.65640542E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	15	0.000000	7	.41133759E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	15	0.000000	L	.31672536E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	M	-.11843169E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	P	.88557447E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	15	0.000000	L	.25224331E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	P	.17989762E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	15	0.000000	M	.17657799E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	15	0.000000	R	.25052420E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	15	0.000000	R	.32531451E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	15	0.000000	R	.22261809E+00	0.	0.	2	3WR	S1V1-S1V2

DUM		73	1	1	3	15	0.000000	J	.75884816E+08	.61208955E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	15	0.000000	S	.20506464E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	15	0.000000	N	.19922662E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	15	0.000000	O	-.66278114E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	15	0.000000	J	.79136517E+08	-.38008309E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	15	0.000000	S	.15169669E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	15	0.000000	J	.12334180E+09	-.12748707E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	30	0.000000	I	.12349209E+09	.13652920E+03	.46364595E+02	1	RAE	S-V1
VTS		73	1	1	3	30	0.000000	K	.19994142E+09	.10398193E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	K	.19328312E+09	.80598180E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	M	-.11964747E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	I	.16020275E+09	.10109263E+03	.66888391E+02	3	RAE	S-V1
VTS		73	1	1	3	30	0.000000	L	.35218677E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	I	.11507780E+09	.11397144E+03	.18162231E+02	2	RAE	S-V1
VTS		73	1	1	3	30	0.000000	M	.29591537E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	K	.23727080E+09	.13594026E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	L	.31372013E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	30	0.000000	Q	-.15912185E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	3	30	0.000000	Q	-.26590424E-04	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	30	0.000000	Q	.67154003E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	30	0.000000	7	.41375919E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	30	0.000000	L	.31563249E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	M	-.12290785E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	P	.86386616E-01	0.	.10000000E+01	2	TDOA	V1V2-SV2
AND		73	1	1	3	30	0.000000	L	.25471297E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	F	.17685485E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	30	0.000000	M	.18664913E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	30	0.000000	R	.25126858E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	30	0.000000	R	.32578373E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	30	0.000000	R	.22728490E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	30	0.000000	J	.76449332E+08	.64094964E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	30	0.000000	S	.20512644E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	30	0.000000	N	.19864232E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	30	0.000000	O	-.63612328E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	30	0.000000	J	.69791027E+08	-.31827148E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	30	0.000000	S	.15522807E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	30	0.000000	J	.12219299E+09	-.12770729E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	45	0.000000	I	.12384883E+09	.13667774E+03	.46345725E+02	1	RAE	S-V1
VTS		73	1	1	3	45	0.000000	K	.20088476E+09	.10547731E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	K	.19338727E+09	.15316026E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	M	-.11198670E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	45	0.000000	I	.16019300E+09	.10231545E+03	.68126840E+02	3	RAE	S-V1
VTS		73	1	1	3	45	0.000000	L	.35077638E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3

VTS		73	1	1	3	45	0.000000	1	.11744971E+09	.11206942E+03	.19751365E+02	2	RAE	S-V1
VTS		73	1	1	3	45	0.000000	M	.30528921E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	45	0.000000	K	.23849465E+09	.13591647E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	L	.31553058E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	45	0.000000	Q	-.17546611E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	3	45	0.000000	Q	-.32384544E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	45	0.000000	Q	.68109566E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	45	0.000000	7	.41443551E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	45	0.000000	L	.31460467E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	M	-.12517182E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	P	.84192903E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	45	0.000000	L	.25732490E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	P	.17365905E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	45	0.000000	M	.19443000E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	45	0.000000	R	.25231033E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	45	0.000000	R	.32606112E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	45	0.000000	R	.23231241E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	45	0.000000	J	.77035928E+08	.66115652E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	45	0.000000	S	.20595634E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	45	0.000000	N	.19898087E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	45	0.000000	O	-.61187073E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	45	0.000000	J	.69538435E+08	-.24045636E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	45	0.000000	S	.15870724E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	45	0.000000	J	.12104495E+09	-.12730272E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	4	0	0.000000	1	.12420012E+09	.13686996E+03	.46320419E+02	1	RAE	S-V1
VTS		73	1	1	4	0	0.000000	K	.20183696E+09	.10595292E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	K	.19356279E+09	.23897568E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	M	-.10229190E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	1	.16008849E+09	.10376469E+03	.69340220E+02	3	RAE	S-V1
VTS		73	1	1	4	0	0.000000	L	.34935483E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	1	.11981198E+09	.11032978E+03	.21381320E+02	2	RAE	S-V1
VTS		73	1	1	4	0	0.000000	M	.31493094E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	K	.23971565E+09	.13534423E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	L	.31735248E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	4	0	0.000000	Q	-.19718713E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	4	0	0.000000	Q	-.62179390E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	4	0	0.000000	Q	.6[illegible]3807E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	4	0	0.000000	7	.41340363E+03	0.	0.	1	RD	S-V1
AND		73	1	1	4	0	0.000000	L	.31366028E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	M	-.12524770E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	P	.82036786E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	4	0	0.000000	L	.26006763E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	F	.17033413E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2

AND		73	1	1	4	0	0.000000	M	.20019679E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	4	0	0.000000	R	.25274636E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	4	0	0.000000	R	.32614652E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	4	0	0.000000	R	.23677046E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	4	0	0.000000	J	.77636833E+08	.67276291E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	4	0	0.000000	S	.20496045E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	4	0	0.000000	N	.19754050E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	4	0	0.000000	O	-.58913181E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	4	0	0.000000	J	.69362666E+08	-.14779062E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	4	0	0.000000	S	.16210166E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	4	0	0.000000	J	.11990367E+09	-.12618947E+04	.30000000E+01	2	R RD	V1-V2

EXIT SEGMENT 61 AT 1.2 SECONDS. EXECUTION TIME FOR SEGMENT 61 WAS .5 CP SECS.

D. TRACE INPUT FORMS

APPENDIX D

TRACE INPUT FORMS

INTRODUCTION

The engineering specification forms and load sheets that follow are very useful in expediting the preparation of TRACE input. Some of these forms bear former TRACE designations (TRACE-66 and TRACE66), which will be removed when the forms are updated.

TRAJECTORY ANALYSIS AND PROGRAMMING DEPARTMENT

TRACE66 (AD104A) **ENGINEERING REQUEST FORM**

GENERAL INFORMATION:

REQUESTER ______________________ TELEPHONE ________ DATE __________

PROBLEM NUMBER OR J.O. ______________________ DUE DATE __________

PROJECT ____

TYPE OF TRACE RUN:

EPHEMERIS GENERATION ( )
ORBIT DETERMINATION ( )
DATA GENERATION ( )
COVARIANCE ANALYSIS ( )

GENERAL INSTRUCTIONS:

IF A RERUN, USE DATA DECK LABELED ______________________

NEW DATA DECK TO BE SAVED: ( ) YES ( ) NO

DISPOSITION (TO BE COMPLETED BY PRODUCTION COORDINATOR)

SET UP BY ______________________ RUN ID __________ DATE __________

TAPE SAVED IF REQUIRED ______________________

JOB DISPOSITION AND RESULTS:

NOTE: ALL SPECIFIED INPUT UNITS MUST BE CONSISTENT.

TIME OF RUN:

CP ______________ PP ______________

DATE JOB COMPLETED ______________

DATA DECK LABELED AS ______________

AEROSPACE FORM 4138 REV 8-71

TRACE 66

ORBIT AND FORCE MODEL SPECIFICATIONS

RUN TITLE: ______________________________

EPOCH:

EPOCH		±1	2	±3	±4	±5	±6	±7	±8	VALUES
YEAR	________									________
MONTH	________	x	a	a	λ	ℓ_p	a	a_I	x_{BF}	________
DAY	________	y	δ	e	δ	δ_p	e	a_K	y_{BF}	________
TIME ZONE	___ ___	z	β	i	β	h_p	i	n	z_{BF}	________
HOUR	________	$\dot{x}$	A	Ω	A	h_a	Ω	L	$\dot{x}_{BF}$	________
MINUTE	________	$\dot{y}$	r	ω	r	t_p	ω	χ	$\dot{y}_{BF}$	________
SECOND	________	$\dot{z}$	v	ν	v	Δt	[illegible]	ψ	$\dot{z}_{BF}$	________

INITIAL CONDITIONS: INDICATE THE TYPE USED

NOTE: IF ICTYP IS NEGATIVE, THEN THE UNITS OF THE INITIAL CONDITIONS ARE ASSUMED TO BE INTERNAL.
LUNAR INITIAL CONDITIONS ARE TYPES 11 THROUGH 18, CORRESPONDING TO THE ABOVE EARTH-REFERENCED TYPES 1 THROUGH 8.

GRAVITY MODEL: CHECK ONE.

SPHERICAL ( ) STANDARD 6, 6 ( ) STANDARD 7, 6 ( )
C_3, C_5, C_6 ( ) STANDARD 8, 8 ( ) OTHER (ATTACH) ( )

SUN-MOON ATTRACTIONS: NO ( ) YES ( )

DRAG COEFFICIENT: $C_D A/W$ = ________ FT^2/LB

SEGMENTED DRAG COEFFICIENTS: $(C_D A/W)_1$ = ________

$(C_D A/W)_2$ = ________ t_2 = ________ MME $(C_D A/W)_6$ = ________ t_6 = ________ MME
$(C_D A/W)_3$ = ________ t_3 = ________ MME $(C_D A/W)_7$ = ________ t_7 = ________ MME
$(C_D A/W)_4$ = ________ t_4 = ________ MME $(C_D A/W)_8$ = ________ t_8 = ________ MME
$(C_D A/W)_5$ = ________ t_5 = ________ MME $(C_D A/W)_9$ = ________ t_9 = ________ MME

C_D **TABLES:** INDICATE THE OPTION TO BE USED AND ATTACH TABLES IF ANY

( ) NONE ( ) $C_D = f(t)$ ( ) $C_D = f(h)$

LINEAR WEIGHT LOSS: NO ( ) YES ( ) W_o = ______ W_{MIN} = ______ LBS
$\dot{W}$ = ________ LBS/MIN t_s = ________ MME t_f = ________ MME

INSTANTANEOUS WEIGHT CHANGES: NO ( ) YES ( ) ATTACH TABLES

ATMOSPHERE MODEL: CHECK ONE AND PROVIDE INPUTS AS REQUIRED

ARDC 1959 ( ) US STD 1962 ( )
EXPONENTIAL ( ); ρ_o = ________ β = ________ h = ________
NWL ( ); c_1 = ________ c_2 = ________ c_3 = ________
c_4 = ________ c_5 = ________ c_6 = ________
n = ________ i = ________

LOCKHEED-JACCHIA ( ); D1 = ________ D2 = ________ FLUX = ________
EMSC 1967 ( ); $\bar{F}_{10.7}$ = ________ $F_{10.7}$ = ________ k_p = ________
JACCHIA 1964 ( ); $\bar{F}_{10.7}$ = ________ $F_{10.7}$ = ________ a_p = ________
JACCHIA 1964 (MOD) ( ); $\bar{F}_{10.7}$ = ________ $F_{10.7}$ = ________ a_p = ________
CRL ( ); $\bar{F}_{10.7}$ = ________ $F_{10.7}$ = ________ k_c = ________

IF a_p, $F_{10.7}$, k_p, OR k_c ARE TO BE FUNCTIONS OF TIME, ATTACH TABLES

SOLAR RADIATION PRESSURE: NO ( ) YES ( )

A/W = ________ FT^2/LB C_p = ________ LBS/FT^2 $C_p A/W$ ________

ONBOARD ACCELEROMETER: NO ( ) YES ( ), ATTACH TABLES

FINITE THRUSTING: NO ( ) YES ( ); ATTACH TABLES

ORBIT ADJUSTS: NO ( ) YES ( ), ATTACH TABLES

INPUT LENGTH UNITS ARE IN ________ (ft, m, cm, km, er, etc.)

AEROSPACE FORM 6134 REV 9-71

TRACE66

GRAVITY MODEL SPECIFICATION

Check one: No normalization ( )
APL normalization ( )
KAULA normalization ( )

n	m	C_{nm}	S_{nm}	n	m	C_{nm}	S_{nm}

AEROSPACE FORM 4475

TRACE66

ATMOSPHERE AND C_D TABLES

Check one:
( ) a_p = f(t); with a maximum of 50 entries
( ) k_p = f(t); with a maximum of 50 entries
( ) k_c = f(t); with a maximum of 50 entries
( ) $F_{10.7}$ = f(t); with a maximum of 12 entries
( ) C_D = f(t); with a maximum of 25 entries
( ) C_D = f(h); with a maximum of 25 entries

t(MME) or h(ft)	f(t) or f(h)	t(MME) or h(ft)	f(t) or f(h)

AEROSPACE FORM 4480

TRACE66
EVENT SPECIFICATIONS

ONBOARD ACCELEROMETER:

T MME	SCALE FACTOR	BIAS FT/SEC²	T MME	SCALE FACTOR	BIAS FT/SEC²

FINITE THRUSTING:

TYPE	P_1	P_2	P_3	P_4
1	T_1 (FT/SEC²)	T_2 (1/MIN)	NOT USED	V (± FT/SEC)
2	T/W	C FT/SEC	A/G_O	V (± FT/SEC)
3	A (FT/SEC²)	α	β	γ
4	A (FT/SEC²)	$\dot\theta_Y$ (DEG)	$\dot\theta_P$ (DEG)	V (± FT/SEC)
5	A (FT/SEC²)	θ_Y (DEG)	θ_P (DEG)	V (±FT/SEC)
6	T (LB)	ℓ	m	n
7	T (LB)	$\dot\theta_Y$ (DEG)	$\dot\theta_P$ (DEG)	±V(± FT/SEC)
8	T (LB)	θ_Y (DEG)	θ_P (DEG)	±V(±FT/SEC)

T_S (MME)	T_F (MME)	TYPE	P_1	P_2	P_3	P_4

INSTANTANEOUS WEIGHT CHANGES:

T(MME)	ΔW(LBS)	T(MME)	ΔW(LBS)	T(MME)	ΔW(LBS)

ORBIT ADJUSTS:

T(MME)	TYPE	P_1	P_2	P_3

TYPE	P_1	P_2	P_3
1	$\dot{A}R$(FT/SEC)	$\dot{A}T$(FT/SEC)	$\dot{A}C$(FT/SEC)
2	K (FT/SEC)	θ_Y (DEG)	θ_P (DEG)
3	β (DEG)	A (DEG)	V(FT/SEC)

AEROSPACE FORM 4141 REV 5-71

TRACE-66

PARAMETER SPECIFICATIONS

PARAMETER IDENTIFICATION	P/Q	INITIAL VALUE *	BOUND	STANDARD DEVIATION

* THIS VALUE FIELD IS USED ONLY FOR OBSERVATION BIASES AND SCALE FACTORS.

AEROSPACE FORM 4146

TRACE66

ORBIT DETERMINATION SPECIFICATIONS

ALL PARAMETERS MUST BE SPECIFIED ON THE TRACE66 PARAMETER SPECIFICATION FORM.

OBSERVATIONS ARE TO BE INPUT BY;

( ) CARDS
( ) CARD IMAGE TAPE
( ) BINARY OBSERVATION TAPE

IF CARDS OR A CARD IMAGE TAPE ARE BEING USED AND THE OBSERVATION DATA TO BE USED IS A SUBSET OF THE DATA PROVIDED, THE BEGINNING AND END OF THE INTERVAL TO BE USED ARE GIVEN BY:

BEGINNING YEAR ______ MONTH ______ DAY ______ HOUR ______ MIN ______ SEC ______

END YEAR ______ MONTH ______ DAY ______ HOUR ______ MIN ______ SEC ______

STATION INPUTS: η_E AND η_R ARE THE INDICES OF REFRACTION USED TO COMPUTE REFRACTION CORRECTIONS FOR ELEVATION AND RANGE DATA. A "√" INDICATES THE NOMINAL VALUES ARE TO BE USED, A "O" INDICATES NO CORRECTIONS AND IF A NON-STANDARD INDEX OF REFRACTION IS TO BE USED, IT MUST BE PROVIDED.

STA NAME	LAT (DEG)	LONG (DEG)	HEIGHT (FEET)	INTERFEROMETER P	Q	η_E (312×10^{-6})	η_R (350×10^{-6})

OBSERVATION WEIGHTS (σ's):

STA	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ

SUPPLY THE REQUIRED INPUTS FOR THE FOLLOWING IF OTHER THAN NOMINAL.

______ MAXIMUM NUMBER OF ITERATIONS
______ RELATIVE CONVERGENCE TEST (.001)
______ ABSOLUTE CONVERGENCE TEST (0)
______ n FOR n-SIGMA EDITOR (100)

OPTIONS: CHECK THE OPTIONS DESIRED AND SUPPLY THE REQUIRED INPUT

( ) SPEED OF LIGHT CORRECTION
  ( ) POSITIVE CORRECTION
  ( ) NEGATIVE CORRECTION
( ) PRINT OBSERVATION RESIDUALS
( ) PRINT OBSERVATION PARTIAL DERIVATIVES
( ) PRINT ORDERED CORRELATION MATRIX
( ) PRINT CORRELATION MATRIX AFTER LAST ITERATION
( ) SUPPRESS CORRELATION MATRICES
( ) PRINT A^TA AND $(A^TA)^{-1}$ AFTER EACH ITERATION, OR LAST ITERATION ONLY
( ) PUNCH A^TA AFTER LAST ITERATION
( ) PUNCH SOLUTION VECTOR
( ) PRINTER PLOT OF OBSERVATION RESIDUALS AFTER LAST ITERATION
  DATA RATE IS ______ SEC
( ) GENERATE AND SAVE OBSERVATION RESIDUAL TAPE

AEROSPACE FORM 6137 REV 5-71

TRACE-66

TRAJECTORY OUTPUT SPECIFICATIONS

OUTPUT TIMES: TIMES ARE GIVEN AS MINUTES FROM EPOCH ( ) OR MIDNIGHT ( )

FROM	TO	EVERY	
________	________	________	MIN
________	________	________	
________	________	________	
________	________	________	
________	________	________	
________	________	________	
________	________	________	
________	________	________	
________	________	________	

SPECIAL OUTPUT TIMES: (√)

- $\beta = 90$ ( )
- MIN., MAX. ALTITUDE ( )
- SPECIAL LATITUDES ( )
- SPECIAL LONGITUDES ( )
- SPECIAL ALTITUDES ( )
- OBSERVATION TIMES ( )

SPECIAL

LAT.	LONG.	ALT.
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________

OUTPUT REQUESTED: (√)

STANDARD

- a) EVERY TIME ( )
- b) NODES ONLY ( )

ELEMENTS

- a) EVERY TIME ( )
- b) NODES ONLY ( )

GEOMAGNETIC LAT. AND LONG. ( )

SUN-MOON ANGLES

- a) STANDARD ( )
- b) OPTION Y ( )
- c) OPTION Z ( )

ECLIPSING

- a) STANDARD ( )
- b) OPTIONAL ( )

VARIATIONAL EQUATIONS

- a) STANDARD ( )
- b) OPTION B ( )
- c) OPTION C ( )

GROUND TRACK TAPE ( )

DIFFERENCE TAPE ( )

AEROSPACE FORM 6140 REV 6-66

TRACE66

COVARIANCE ANALYSIS SPECIFICATIONS

ALL PARAMETERS MUST BE SPECIFIED ON THE TRACE66 PARAMETER SPECIFICATION FORM.

OBSERVATION GENERATION SPECIFICATIONS MUST BE SUPPLIED ON THE TRACE66 DATA GENERATION SPECIFICATIONS - SHEET 1.

IF OBSERVATIONS ARE TO BE INPUT RATHER THAN GENERATED, INDICATE THE SOURCE

( ) CARDS ( ) CARD IMAGE TAPE ( ) BINARY OBSERVATION TAPE

IF CARDS OR A CARD IMAGE TAPE ARE BEING USED AND THE OBSERVATION DATA TO BE USED IS A SUBSET OF THE DATA PROVIDED, THE BEGINNING AND END OF THE INTERVAL TO BE USED ARE GIVEN BY:

BEGINNING YEAR ________ MONTH ________ DAY ________ HOUR ________ MIN ________ SEC. ________
END YEAR ________ MONTH ________ DAY ________ HOUR ________ MIN. ________ SEC. ________

STATION INPUTS: η_E AND η_R ARE THE INDICES OF REFRACTION USED TO COMPUTE REFRACTION CORRECTIONS FOR ELEVATION AND RANGE DATA. A "√" INDICATES THE NOMINAL VALUES ARE TO BE USED, A "O" INDICATES NO CORRECTIONS, AND IF A NON-STANDARD INDEX IS TO BE USED, IT MUST BE PROVIDED.

STA NAME	LAT (DEG)	LONG (DEG)	HEIGHT (FEET)	INTERFEROMETER P	Q	η_E (312×10^{-6})	η_R (350×10^{-6})

OBSERVATION WEIGHTS (σ's):

STA	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ

OUTPUT TIMES: TIMES ARE GIVEN IN MINUTES FROM EPOCH ( ) OR MIDNIGHT ( )

FROM ________ TO ________ EVERY ________ MIN.

OUTPUT REQUESTED: (√)

	P	Q
$C(P_0) = (A^TA)^{-1}$	( )	( )
CARTESIAN	( )	( )
ORBIT PLANE	( )	( )
SPHERICAL	( )	( )
ELEMENT	( )	( )
PERIOD, A_P, PER	( )	( )
EQUINOCTIAL	( )	( )
MEASUREMENT COVARIANCE	( )	( )
PRINT ∂P ∂Q	( )	
SAVE PLOT TAPE	( )	

IF A "√" IS USED THE ENTIRE COVARIANCE MATRIX WILL BE PRINTED. IF A "D" IS USED, ONLY THE SQUARE ROOT OF THE DIAGONAL WILL BE PRINTED.

INPUT A PRIORI UNCERTAINTIES	P PARAMETER	Q PARAMETER
NO A PRIORI INFORMATION	( )	
A^TA MATRIX GIVEN	( )	( )
$(A^TA)^{-1}$ MATRIX GIVEN	( )	
σ's GIVEN	( )	( )
C(Q) MATRIX GIVEN		( )

AEROSPACE FORM 4136 REV 5-71

TRACE66

DATA GENERATION SPECIFICATION SHEET 1

STATIONS									
SUPPLY VALUES FOR									
Δt (SEC)									
E MIN (DEG)									
E MAX (DEG)									
R MAX (NM)									
START TIME FROM MIDNIGHT OF EPOCH — DAY									
START TIME FROM MIDNIGHT OF EPOCH — HR									
START TIME FROM MIDNIGHT OF EPOCH — MIN									
STOP TIME FROM MIDNIGHT OF EPOCH — DAY									
STOP TIME FROM MIDNIGHT OF EPOCH — HR									
STOP TIME FROM MIDNIGHT OF EPOCH — MIN									
A_1 (DEG)									
A_2 (DEG)									

INDICATE THE REQUESTED DATA WITH A "$\surd$"

RANGE									
AZIMUTH									
ELEVATION									
RANGE RATE									
INTERFEROMETER $\dot{P}$									
INTERFEROMETER $\dot{Q}$									
INTERFEROMETER P									
INTERFEROMETER Q									
AZIMUTH RATE									
ELEVATION RATE									
$\ddot{f}$									
LATITUDE									
LONGITUDE									
SURFACE RANGE									
HEIGHT									
DOPPLER RATE									
LOOK ANGLE									
KAPPA									
ASPECT ANGLES									
ATTENUATION									
$\dot{x}, \dot{y}, \dot{z}$									
TOPOCENTRIC RT. ASC. AND DEC.									
GEOCENTRIC RT. ASC. AND DEC.									
HOUR ANGLE									
u, v									
$\ddot{A}$									
$\ddot{E}$									
TWO-WAY DOPPLER									
ANTENNA X, Y ANGLES									
TRANET DOPPLER									
GEOCEIVER RANGE Ranging or Diff(s)									
SGLS RANGE RATE									

AEROSPACE FORM 4136 REV 5-71

TRACE66

SIMULTANEOUS VEHICLE DATA GENERATION II SPECIFICATION SHEET

MEASUREMENT TYPE KEY

SYMBOL	DEFINITION
R	Range
AZ	Azimuth
EL	Elevation
$\dot{R}$	Range rate
Ax, Ay	Antenna angles
V2	Vehicle to vehicle range
V2D	Vehicle to vehicle range rate
S2	Station to vehicle to vehicle range sum
S2D	Station to vehicle to vehicle range rate sum
S3	Station to vehicle to vehicle to vehicle range sum
S3D	Station to vehicle to vehicle to vehicle range rate sum
V3	Vehicle to vehicle to vehicle range sum
V3D	Vehicle to vehicle to vehicle range rate sum
TDOA	Time difference of arrival
TOA	Time of arrival
3WR	Three way range
MP	Multi-path

INDICATE THE DESIRED MEASUREMENTS BY THEIR TYPES AND SUPPLY THE NECESSARY STATIONS AND VEHICLE IDENTIFICATION NUMBERS.

TYPE	STA	STA 2	VEHICLE 1	VEHICLE 2	VEHICLE 3

AEROSPACE FORM 4468

STATION CARDS

1. THE LOCATION FIELDS MUST HAVE A DECIMAL POINT.
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED MUST BE OF THE FORM $\pm$XX.

PROGRAMMER ____________ KEYPUNCHED ____________ VERIFIED ____________ DATE ____________ PAGE ______ OF ______

ST	I	E	R	D	T	FIELD 1	EXP.	FIELD 2	EXP.	FIELD 3	EXP.	P	Q
1 2 3	5	7	9	11	13	15 16 17 18 19 20 21 22 23 24 25 26	27 28 29	31 32 33 34 35 36 37 38 39 40 41 42	43 44 45	47 48 49 50 51 52 53 54 55 56 57 58	59 60 61	64 65 66	68 69 70
1 2 3	5	7	9	11	13	15 16 17 18 19 20 21 22 23 24 25 26	27 28 29	31 32 33 34 35 36 37 38 39 40 41 42	43 44 45	47 48 49 50 51 52 53 54 55 56 57 58	59 60 61	64 65 66	68 69 70

AEROSPACE FORM 3062 REV 11-72

TRACE – 66: SENSOR PARAMETER CARDS

1. THE INITIAL VALUE, BOUND AND SIGMA FIELDS MUST HAVE A DECIMAL POINT
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED MUST BE OF THE FORM ± XX.

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ____ OF ____

ST	PASS	NAME	Q	INITIAL VALUE	EXP	BOUND	EXP	SIGMA	EXP
1 2 3	4 5 6 7	9 10 11 12	14	16 17 18 19 20 21 22 23 24 25 26 27	28 29 30	32 33 34 35 36 37 38 39 40 41 42 43	44 45 46	48 49 50 51 52 53 54 55 56 57 58 59	60 61 62
1 2 3	4 5 6 7	9 10 11 12	14	16 17 18 19 20 21 22 23 24 25 26 27	28 29 30	32 33 34 35 36 37 38 39 40 41 42 43	44 45 46	48 49 50 51 52 53 54 55 56 57 58 59	60 61 62

AEROSPACE FORM 3981 REV 5-67

TRACE66 - VEHICLE INPUT

PROGRAMMER ________ KEYPUNCHED ________ VERIFIED ________ DATE ________ PAGE ____ OF ____

1	2	7	77
H	1		

SYMBOL	C (1/27/33)	LOCATION (2/28/34)	VALUE (7/33/39)
1	1	VEHID	
2	1	YEAR	
3	1	MNTH	
4	1	DAY	
5		TZNE	
6		HR	
7		MIN	
8		SEC	
9	1	ICTYP	
10		IC	
11		2	
12		3	
13		4	
14		5	
15		6	
16	1	IDRAG	
17		DRAG	

AEROSPACE FORM 4005 REV 6-71

H1: HEADER TO APPEAR ON OUTPUT

VEHID VEHICLE NUMBER
$0 \le$ VEHID ≤ 9999

YEAR/MNTH/DAY: EPOCH DATE

TZNE/HR/MIN/SEC: EPOCH TIME

ICTYP TYPE OF INITIAL CONDITIONS

ICTYP						
1	x,	y,	z,	$\dot{x}$,	$\dot{y}$,	$\dot{z}$
2	α,	δ,	β,	A,	r,	v
3	a,	e,	i,	Ω,	ω,	r
4	λ,	δ,	β,	A,	r,	v
5	ℓ_p,	δ_p,	h_p,	h_a,	i,	zf
6	a,	e,	i,	Ω,	ω,	M
7	a_f,	a_g,	N,	L,	χ,	Ψ
8	x_{BF},	y_{BF},	z_{BF},	$\dot{x}_{BF}$,	$\dot{y}_{BF}$,	$\dot{z}_{BF}$

Negative value of ICTYP indicates that initial conditions are in internal units.

NOTE: Above initial conditions refer to Earth as the central body. If ICTYP = ICTYP + 10 the above initial conditions refer to the Moon as the central body.

IC: INITIAL CONDITION INPUT

IDRAG: ATMOSPHERE MODEL
- 0 ARDC 1959
- 1 LOCKHEED JACCHIA
- 2 JACCHIA 1964
- 3 U. S. STANDARD 1962
- 6 LMSC 1967
- 7 EXPONENTIAL
- 8 CAMBRIDGE RESEARCH LABORATORY
- 9 NWL

DRAG: $C_D A/W$ (FT^2/LB)

TRACE - 66: DATA GENERATION I

1. A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *
2. IF THE EXPONENT IS TO BE USED IN THE R_{max} FIELD, IT MUST BE OF THE FORM ±XX

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ___ OF ___

ST	ΔT (sec)*	E_{min} (deg)*	E_{max} (deg)*	R_{max} (nm)*	EXP.	START TIME DY	START TIME HR	START TIME MIN*	STOP TIME DY	STOP TIME HR	STOP TIME MIN*	A_1 (deg)*	A_2 (deg)*
1 2 3	5 6 7 8 9 10 11 12	14 15 16 17 18 19	21 22 23 24 25 26	28 29 30 31 32 33	34 35 36	38 39	41 42	44 45 46 47 48 49 50	52 53	55 56	58 59 60 61 62 63 64	66 67 68 69 70 71	73 74 75 76 77 78

AEROSPACE FORM 3918 REV 5 67

DATA GENERATION II

PROGRAMMER ______________ KEYPUNCHED ______________ VERIFIED ______________ DATE ______________ PAGE ______ OF ______

1 2 3	ST
5	RANGE
6	AZIMUTN
7	ELEVATION
8	RANGE RATE
9	P DOT
10	Q DOT
11	P
12	Q
13	AZIMUTN RATE
14	ELEVATION RATE
15	R DOUBLE DOT
16	MUTUAL VISIBILITY
17	LATITUDE
18	LONGITUDE
19	SURFACE RANGE
20	HEIGHT
21	DOPPLER RATE
22	LOOK ANGLE
23	OBSERVATION VARIANCES
24	KAPPA
25	ASPECT ANGLES
26	ATTENUATION
27	$\dot{x}, \dot{y}, \dot{z}$
28	TOPOCENTRIC RA, D
29	GEOCENTRIC RA, D
30	HOUR ANGLE
31	U, V
32	ACCELEROMETER
33	A DOUBLE DOT
34	E DOUBLE DOT
35	2 WAY DOPPLER
36	ANTENNA
37	
38	TRANET
39	GEOCEIVER
40	SGLS
41	SAT.TRACKER DOPPLER
42	TIME OF ARRIVAL
43–64	

AEROSPACE FORM 3979 REV 12-72

TRACE 66
SIMULTANEOUS VEHICLE
DATA GENERATION II CARDS

PROGRAMMER ______________ KEYPUNCHED ______________ VERIFIED ______________ DATE ______________ PAGE ______ OF ______

S	T	A
1	2	3

T	O:1	O:2	O:3	V 1				V 2				V 3				S T A 2		
5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

T	O:1	O:2	O:3	V 1				V 2				V 3				S T A 2		
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

T	O:1	O:2	O:3	V 1				V 2				V 3				S T A 2		
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

T	O:1	O:2	O:3	V 1				V 2				V 3				S T A 2		
62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

AEROSPACE FORM 4454 REV 6-71

TRACE 66 – SIMULTANEOUS VEHICLE STAGE INPUT

1. A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *.

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ______ OF ______

	M	N*	ΔT*	D	T BEGIN						T END						T UPDATE						
					YR	MO	DY	HR	MN	SEC*	YR	MO	DY	HR	MN	SEC*	YR	MO	DY	HR	MN	SEC*	
1 2 3	4	6 7 8 9	11 12 13 14 15 16 17	19	21 22	23 24	25 26	27 28	29 30	31 32 33 34 35 36 37 38	40 41	42 43	44 45	46 47	48 49	50 51 52 53 54 55 56 57	59 60	61 62	63 64	65 66	67 68	69 70 71 72 73 74 75 76	77 78 79 80

AEROSPACE FORM 4464 REV 10-71

TRACE66 OBSERVATION DATA

1. A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *.
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED, MUST BE OF THE FORM ±XX.

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ____ OF ____

ST	PASS	YR	MO	DAY	HR	MIN	SECONDS *	C	T	NRA	OBSERVATION 1 *	EXP	OBSERVATION 2 *	EXP	OBSERVATION 3 *	EXP	VEN #
1 2 3	4 5 6 7	9 10	11 12	13 14	15 16	17 18	19 20 21 22 23 24 25 26	27	28	29 30	31 32 33 34 35 36 37 38 39 40 41 42	43 44 45	46 47 48 49 50 51 52 53 54 55 56 57	58 59 60	61 62 63 64 65 66 67 68 69 70 71 72	73 74 75	77 78 79 80

AEROSPACE FORM 3000 REV 8-71