

952-6497-1

GEMINI CATCH-UP

AND

RENDEZVOUS

ANALYSIS

AND

SIMULATION

REPORT #4

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DATE 31 December 1965

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TABLE OF CONTENTS

	<u>Page</u>
List of Figures	i
List of Tables	ii
I. Introduction	1
II. Functional Descriptions	2
Dynamic Simulator	2
Static Simulator	7
III. Detail Description of the Rendezvous Environment System	8
Appendix A - FORTRAN/FAP Program Listings	
Dynamic Environment (MAIN)	1
Executor Subroutine (DYNAMIC)	23
Catch-Up, Rendezvous Subroutine (DYNAMIC)	27
Static Environment (BENCH)	38
Executor Subroutine (STATIC)	47
Individual MQ Key Reading Subroutine	51
Quantization Subroutine	53
Disable/Enable Subroutine	55

TABLE OF CONTENTS (Continued)

	<u>Page</u>
Data Insertion Subroutine	57
Go-No-Go Subroutine	59
AGE Subroutine	61
Ascent Subroutine	63
Touchdown Predict Subroutine	65
Re-entry Subroutine	67
Accelerometer Subroutine	69
Wait 5 Milliseconds Subroutine	71
Gimbal Angle Subroutine	73
Self-Loading Tape Generation Subroutine	75
Position Integration Subroutine	84
Attitude Integration Subroutine	87
Control Subroutine	90
MQ Keys Reading Subroutine	94
Error Angle Subroutine	96
Tape Density Setting Subroutines	
High Density A7	98
High Density A9	100
Low Density B6	102 ²

TABLE OF CONTENTS (Continued)

	<u>Page</u>
IVI Set Zero Subroutine	/ 104
IVI Display Subroutine	/ 106
Tape File Skipping Subroutine	, 108
Appendix B - Sample Output	/ 109

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Dynamic Simulation Block Diagram	3
2	Functional Flow Diagram, Dynamic Environment	6
3	Detail Flow Diagram, Dynamic Environment	52

LIST OF TABLES

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Guidance Computer Output Variable Names	19
2	Input Data Supplied Only Once for Each Set of Dynamic Simulations (Type 1 Data)	30
3	Input Data Supplied for Each Dynamic Simulation (Type 2 Data)	31
4	Insertable Data - For Dynamic or Static Simulation - (Type 3 Data)	39
5	Inputs Necessary for Plotting (Type 4 Data)	45
6	Definition of Terms Used on Detail Dynamic Environment Flow Diagram	46

I. INTRODUCTION

A report describing the analysis and simulation work for the Catch-Up and Rendezvous modes completed through 30 March 1965 was issued on 29 April 1965. This report describes the work done on the FORTRAN simulations since that time.

Following is a list of the changes made to the simulation programs:

A. Static Simulation -

1. A tolerance generation scheme used for Acceptance and Pad Tests has been added.

B. Dynamic Simulation -

1. The integration scheme has been changed.
2. A change has been made to insure that the program will run only if the MQ keys are set properly.
3. All tape density setting are controlled by the program.
4. Errors are injected into the sines of the radar angles to simulate hardware errors.
5. Logic has been added to the automated output routine to account for Self-Test (Module III).

Appendix A of this report gives listings of all the programs used for FORTRAN simulations of the Catch-Up and Rendezvous modes. These listings as well as the explanations given in this report, should enable competent computer programmers with a knowledge of FORTRAN to duplicate the results obtained by IBM.

II. FUNCTIONAL DESCRIPTIONS

This section of the report is intended to present a general simplified description of the Catch-Up and Rendezvous simulation programs. In this perspective functional flow charts are presented without the required inputs or the simulation outputs but stripped down to the broad functional purposes of the simulation programs.

Dynamic Simulator

The Catch-Up and Rendezvous dynamic simulation is composed of:

- I. The Executor and Rendezvous programs of the Gemini Seventh System Math Flow, Module V.
- II. The Rendezvous Environment program which simulates the physical environment in which the Gemini guidance computer operates.
- III. The Control program which provides the interface between the Environment program and the simulated operational programs.

Figure 1 is a simplified Block Diagram of the Catch-Up and Rendezvous Dynamic Simulation Programs which shows the Environment program supplying the following quantities to the Executor and Rendezvous programs:

1. Three Gimbal Angles
2. Three Radar Parameters
3. Three Accelerometer Outputs
4. Several Discrete Inputs.

Simulation Cycle

The simulation cycle begins with the initialization of the Environment Program. When this has been completed transfer is made to the simulated guidance computer via the control program.

The guidance computer operates in a closed loop, transferring from Executor to Rendezvous and back to Executor. This loop continues until the control program indicates to the Executor that one simulated time increment has elapsed. The guidance computer loop is then broken in the Executor and transfer is to the Environment program through the control program.

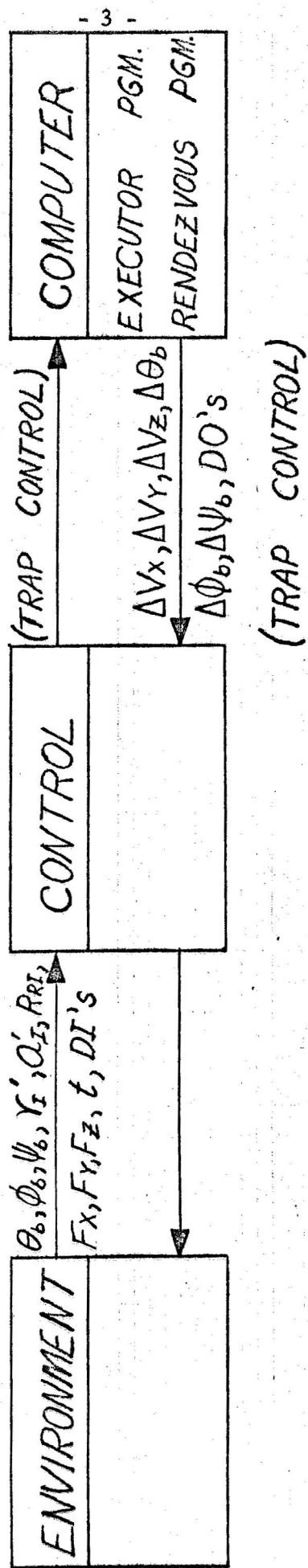


FIGURE 1
DYNAMIC SIMULATION BLOCK DIAGRAM

Simulation Cycle (continued)

One cycle is then made through the Environment program. During this cycle, the simulated physical environment is updated in accordance with the information received from the guidance computer. When the environment has been updated, transfer is to the guidance computer where the closed loop begins again.

The transfer cycle from the Environment program to the Executor, around the Executor-Rendezvous loop, and back to the Environment program continues until the simulated flight is terminated.

Figure 2 is a functional flow diagram of the Dynamic Environment program.

Function Sequence

The Environment program is initialized with input data to allow calculation of the target and spacecraft initial position and velocity. In addition, all logical decisions and variables which can be set by input data are initialized.

The mode status is checked and the appropriate discrete inputs are initialized, depending upon the mode.

The equations of motion for the target and spacecraft including spacecraft thrust terms are integrated for the time step of the Rendezvous program.

The accelerometer outputs are calculated in the navigation coordinate system. The applied incremental velocity components are calculated in the spacecraft coordinate system.

The spacecraft orbital parameters are calculated.

The elements of the inertial-to-navigation coordinate transformation matrix are calculated and the elements of the navigation-to-body coordinate transformation matrix are calculated.

The platform gimbal angles are calculated.

Sense light four (4) on the IBM 7090 is made to correspond to the condition of the Computer Running Light.

Function Sequence (continued)

The data insertion program indicator is checked and if it is time for data insertion, the pertinent data is read.

Radar data is calculated and checked to see whether it lies within the operating range of the Gemini radar. The radar ready discrete (DI 00) is turned ON or OFF, depending on the characteristics of the calculated radar data.

The spacecraft position is calculated in target-centered curvilinear coordinates.

The calculated values of the gimbal angles and radar data are saved while they are quantized, along with the accelerometer data, for use by the Rendezvous program.

Transfer is made to the control program to allow the Rendezvous program to be simulated for the Rendezvous time step.

On return from the control program, the gimbal angles and radar data are restored and the attitude error angles calculated by the simulated Rendezvous program are quantized.

Selected data is recorded both off-line and on-line.

A check is made to determine if the problem should be terminated.

Spacecraft attitude errors are used to calculate spacecraft correction maneuver rates. The attitude errors used may be those calculated in the simulated Gemini computer or they may be computed in the Environment program. If computer calculated errors about the platform are used, the pitch correction rate is limited to prevent excessive cross-coupling of attitude correction maneuvers.

The equations of motion of the spacecraft attitude are integrated over the time step of the Rendezvous program.

When the velocity to be added exceeds the thrusting capacity of the appropriate thrusters, the body thrust term is set to the thrust acceleration capacity. Also, discretely are set to indicate the zero or non-zero status of the IVI's.

The body acceleration terms are transformed to the inertial coordinate frame and transfer is back to the integration of the equations of motion.

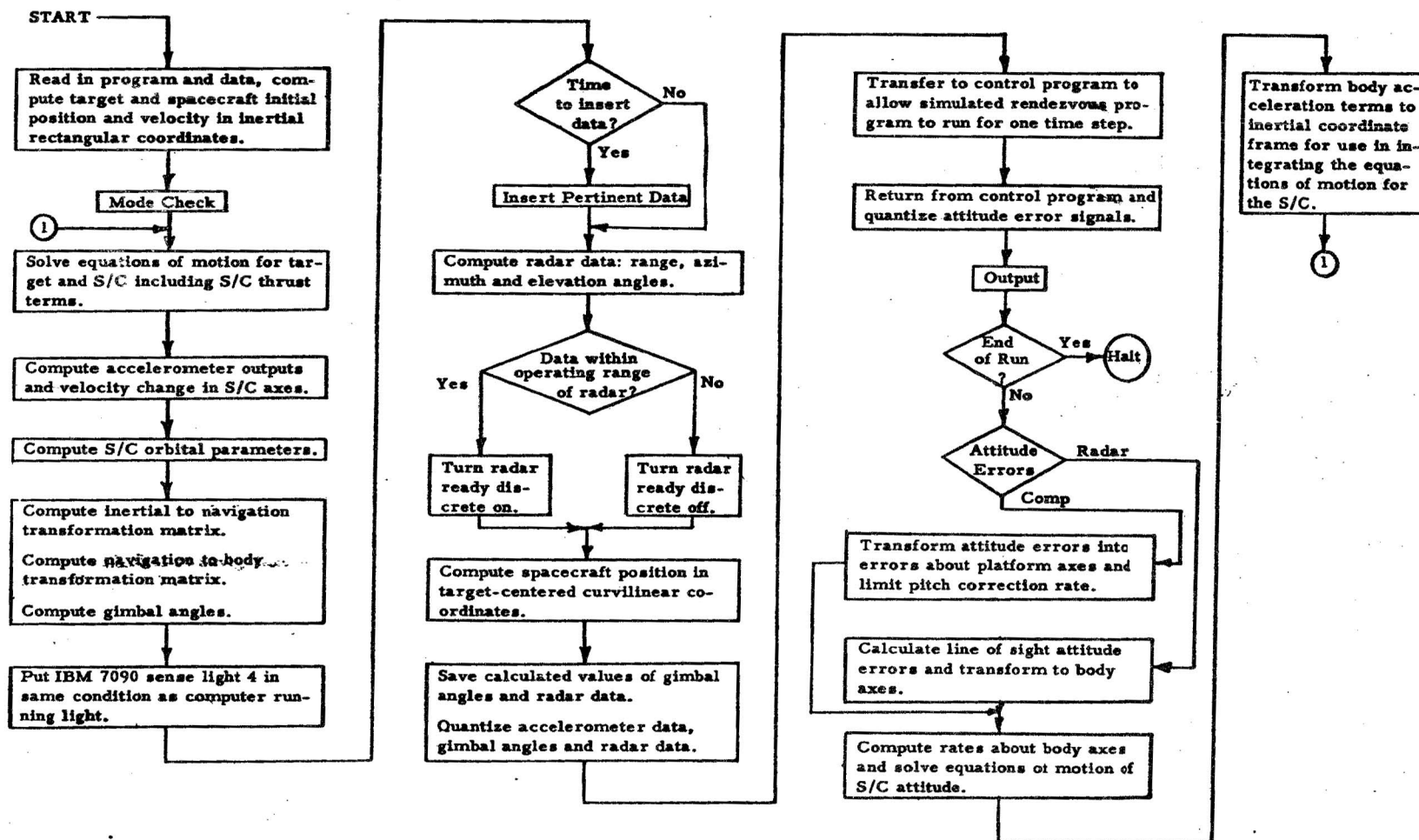


FIGURE 2
FUNCTIONAL FLOW DIAGRAM
DYNAMIC ENVIRONMENT

Static Simulator

Unlike the dynamic simulator, this simulator operates with inputs which are static. The inputs to the simulated Gemini Computer are not changed by the program but remain constant until they are changed by an input card. This data is read in using the method described in Table 4, page 39. Initially all quantities are zeroed and will remain zero unless another value is inserted. Time is updated by DT (usually 1.0 second) every cycle through the program. Thus, time in the Gemini computer and in the environment is advanced the same increment (DT) for each Gemini computation cycle executed.

Because of the static nature of the inputs, the programmer must have a working knowledge of the Rendezvous and Catch-Up math flow in order to be able to insert the proper quantities at the proper time. For example, the programmer must know what discrete turns the radar on and off and at what time in the mission the radar will be sampled if he wants to investigate the effects of bad radar data. He must also have this knowledge if he wants to use different radar data for several points used in calculating ΔV_T .

This program is used to generate tolerances for acceptance and pad test specifications. Because it is an open-loop operation as opposed to the closed-loop dynamic simulation, the static simulation has a much greater data manipulating capability than the dynamic simulation. Because of this capability, it is possible to test certain paths in the Catch-Up and Rendezvous Math Flow which are not easily traversed by the dynamic simulation.

This program has a much shorter execution time than the dynamic simulation. A complete Rendezvous mission can be simulated in two minutes. This is due to the fact that this simulation uses the full speed capability of the 7090 and that time is advanced by the same increment (DT, usually 1.0 second) for all computer cycles which actually are considerably less than one second.

III. DETAIL DESCRIPTION OF THE RENDEZVOUS ENVIRONMENT SYSTEM

This section is a detail description of the Dynamic Environment Flow Diagrams found on Pages 52, 53, 54, 55, and 56.

Dimension, Common, Equivalence

These statements are needed to set up the FORTRAN program.

SELFLD - Tape A7

The first step in the Rendezvous simulation is to generate a self-loading tape containing all the programs used in the simulation. This tape is generated on Tape A7 by calling the subroutine SELFLD. If it should be necessary to read the programs into the 7090 computer memory again, this can be done by putting the tape on drive A1 and pushing the CLEAR and LOAD TAPE buttons on the 7090 control console.

Clear Tables

Several data tables and all of common are cleared. This insures proper initialization of each run when several runs are made in sequence without stopping the computer.

Input Data

There are four types of input data:

1. Guidance computer output variable names. These names are used to label the outputs from the simulated guidance computer. They do not determine the quantities which are printed out. There are 165 names in all. The names used and the symbols for which they stand are listed in Table 1. The format of these data cards is given in Table 2.
2. Initial conditions, environment control variables, and spacecraft constants. These quantities and the format used to read them in are given in Table 3.

Input Data (continued)

3. Insertable Data. These data cards are used to simulate MDIU or DCS insertions or to change any variable in Common after the initialization of the Catch-Up and Rendezvous modes. If such insertions are not to be made during a given run, these cards should be eliminated from the data for that run. More information about these cards is given in Table 4.
4. Plot Data. These cards are used to specify the quantities to be plotted. If no plots are desired from a given run, these cards should be eliminated for that run. More information about these cards is given in Table 5.

Type 1 data is read in once for each set of runs. Type 2 data for the first run is read in, stored, and written on Tape A3 to provide a record of the values used.

The control variable LMDI is tested. If LMDI is non-zero, type 3 data will be read in and stored. As each card is read, the ILIST value on that card is tested. If ILIST is non-zero, another card is read. When a zero value of ILIST is sensed, reading of type 3 data is terminated and the stored type 3 data is recorded on Tape A3. If LMDI is zero, the program will not attempt to read type 3 data cards, and no data of type 3 should be included in the data for the run.

The control variable LOC is tested. If LOC is non-zero, type 4 data will be read in, stored, and recorded on Tape A3. If LOC is zero, the program will not attempt to read type 4 data cards, and no data of type 4 should be included in the data for the run.

When the end of the first run is reached, the control variable IEXIT is tested. If IEXIT is non-zero, there are no more runs to be made, and the simulation is terminated. If IEXIT is zero, there is at least one more run to be made. In this case the process of reading, testing, and recording data for the next run is repeated, beginning with type 2 data.

Test of MQ Key Settings - 57-58

The octal pattern set in the MQ keys is read and stored as the variable KOMBO. KOMBO is then compared with the input variable KEYSET. If the two variables do not agree, the program prints an error message to the operators and issues a Pause. When the START button on the control console is depressed, the MQ keys are read again, and a new value of KOMBO is set up. Only when KOMBO and KEYSET agree is the execution of the rest of the program allowed to continue.

Rendezvous Problem Initialization - 94-996

The Rendezvous problem is initialized by determining the positions and velocities of both the target and the spacecraft in inertial rectangular coordinates at the starting point for the flight to be simulated. This may be done in one of four ways:

1. Direct specification ($MACOP = 0$; $MACINT = 0$). The initial positions and velocities are specified by the input quantities.
2. Computation ($MACOP \neq 0$, $MACNTR = 0$, $MACINT = 0$). The initial positions and velocities are given in inertial polar coordinates and are then computed in inertial rectangular coordinates.
3. Alternate computation ($MACOP \neq 0$, $MACNTR \neq 0$, $MACINT = 0$). The initial target position and velocity are specified and computed as in 2. The initial spacecraft position and velocity are specified in components relative to the target and are then computed in inertial rectangular coordinates.
4. Reverse integration ($MACINT \neq 0$). The target and spacecraft positions and velocities for some point in time are determined by one of the three methods given above. The Rendezvous problem is initialized from some earlier point in time by integrating backwards in time for a time interval given by BINT. A single precision Cowells integration routine is used for this reverse integration. The time step used is 10 times the input integration time step (DT).

MODCR

The input variable MODCR is tested to ascertain which mode has been selected. If MODCR is less than one, Rendezvous has been selected; if MODCR is one, Catch-Up has been selected; and if MODCR is greater than one, Pre-Launch has been selected.

Selection of a particular mode sets the three mode discrete inputs for the guidance computer as follows:

<u>Rendezvous</u>	<u>Catch-Up</u>	<u>Pre-Launch</u>
DI 10 +	DI 10 -	DI 10 +
DI 11 -	DI 11 +	DI 11 +
DI 13 +	DI 13 -	DI 13 +

Position and Velocity Integration 101

This loop solves and integrates the equations of motion of both the target and spacecraft using a single-precision Cowells method in subroutine form. Spacecraft thrust terms, if any, are included in the computations. The time step used is equal to the input integration time step (DT).

Accelerometer Outputs - 71

The outputs of the integrating accelerometers in navigation coordinates and the total velocity change (ΔV) made along each of the spacecraft axes are computed by means of rectangular integration. There is little error with this method since the spacecraft thrust is either on or off over a complete time step and the spacecraft turning rates are low when thrust is applied.

Computation of Gimbal Angles - 72-602

The spacecraft orbital parameters and the inertial-to-navigation and navigation-to-spacecraft coordinate transformation matrices are computed. From these, the three platform gimbal angles are determined.

Computer Running Light - 603-552

Sense light four (4) on the 7090 control console is used to simulate the Computer Running Light in the Gemini spacecraft. The condition of this light is controlled by a discrete output (DO 05) from the guidance computer.

START COMP

The START COMP discrete input to the guidance computer, DI 21, may be set on (-) in one of the three following ways:

1. Depress Key 17 on the 7090 control console.
2. Enter the desired time of START COMP through the input variable STCT. When the simulated elapsed time reaches this value, DI 21 will be set (-).
3. By the data insertion technique described below (a type three special data insert).

In the FORTRAN simulation, a non-zero value for a discrete input or output indicates that the discrete has been set (-). The methods of setting DI 21 (-) set it to different values (2047, 4095, and 72191 respectively). Thus it is easy to tell which method was used to set the START COMP discrete.

START COMP (continued)

When LDI 21 is set (-), the quantity TSC is set equal to the simulated time (T). Thus a record is kept of the time at which START COMP was pushed.

Data Insertion

If LMDI $\neq$ 0, new values will be inserted for selected quantities at preselected times during the simulation. When the time for inserting a new value for a variable is reached, the value to be inserted is taken from the table of type 3 data read in at the start of the simulation. This new value is then used to update the variable in question.

Radar Parameters - 111-763

The line-of-sight distance (radar range) between target and spacecraft is computed using inertial position components. Radar range rate is calculated. The radar azimuth angle is computed based on the position of the target relative to the spacecraft.

The azimuth angle is checked to see if it falls in the range $\pm 25^\circ$. If the azimuth angle does fall in this range, its sine is computed and modified to simulate measurement errors. The elevation angle is computed and tested, and its sine is computed and modified to simulate measurement errors, if the test is passed.

The spacecraft turning rates are checked to see that they are no greater than 1.5° per second. If the turning rates do not exceed 1.5° per second, the radar information can be used accurately in computations.

If the radar angle tests and the turning rate tests are all passed, DI 00 is set (-) to indicate that the radar data is good and can be used in computations. If any of the tests are not passed, the radar data cannot be used and DI 00 is set (+). This means that the guidance computer will not read any information from the radar.

DI 00 can also be set (+) by setting the variable LQT to a non-zero value via a type 3 data insert. Thus loss of radar lock-on can be simulated any time during a run.

Flight Director Indicator Logic - 449-456

This logic determines whether error angles based on the radar angles (LRDFDI -) or error angles based on computer values (LRDFDI +) will be flown.

Relative State Vector Computation - 787

The inertial spacecraft state vector is transformed into an earth-centered rectangular coordinate system with Y axis intersecting the target and X and Y axes lying in the target orbital plane. The elements of the transformed state vector are used to compute the spacecraft state vector in a target-centered curvilinear coordinate system. The resulting relative state vector is included in the output for reference purposes only. It is not used in any other calculations.

Data Quantization - 920-424

If the necessary control variables are set to the proper values, the gimbal angle, accelerometer, and radar data can be quantized before being sent to the guidance computer. This simulates the quantization that would be placed on this data by the actual hardware. The unquantized gimbal angle and radar data is saved for off-line printout.

Control Program

As mentioned in Section II of this report, communication between the guidance computer and the simulated environment is established through a control program (CTRL 1).

The program uses the channel interrupt feature of the 7090 and allows the simulated guidance computer to run continuously. Since the Gemini computer has no fixed computation cycle in the Catch-Up and Rendezvous modes, this simulates the operation of the actual hardware.

When the Environment program calls CTRL 1, keys 21 through 35 on the 7090 console are read. The value set in these keys determines the relation between the operating times of the 7090 and the simulated guidance computer. For example, if the value 30g (i. e., 24_{10}) is placed in the keys, 24 milliseconds of 7090 operation will correspond to one time increment of operation of the Gemini computer.

The control program computes the number of words which can be written on a tape during the time interval specified by the setting in the keys. The computer then begins to write zeros on Tape B6. While this is being done, the Executor and Rendezvous subroutines are exercised in the manner described in Part II of this report. When the computed number of words has been written, the operation of the simulated guidance computer is interrupted in the Executor subroutine, and transfer is back to the Environment program.

Error Angle Quantization - 404-419

If the control variable LDB is set to a non-zero value, the attitude error angles will be quantized to either high or low range, depending on the size of the errors.

Output - 406-142

If certain conditions are met, one line of output will be written on A3 and printed on the on-line printer during each cycle through the Environment program. The conditions are:

1. Simulated time (T) is 10 seconds or less and Key 19 is down or
2. The Computer Running Light is ON, Key 19 is down, CTTG = 0, FIN = 0, and at least one of the IVI's is displaying a non-zero value or
3. Radar range (TRI) is no greater than a value specified by ESPR and Key 19 is down or
4. Key 15 is down or
5. IOLP $\neq$ 0.

The information contained in this one line of output is changed 150 seconds after the nominal time for applying the final vernier correction. Samples of both sets of variables provided are included in Appendix B.

In addition to the single line output, two pages of off-line output are written on Tape A3 at periodic intervals. A sample of each of these pages is included in Appendix B.

The frequency at which the two pages of output are written is governed by the quantity COINT. The actual writing times are biased by the value of the variable DELAY. For example, if

COINT = 50
DELAY = 0

two pages will be written out at

T = 0, 50, 100, 150, etc.

Output - 406-142 (continued)

If COINT = 100
 DELAY = 20

two pages will be written out at

T = 0, 20, 120, 220, 320, etc.

Every time the two pages of output are produced, the single line of output described above is also produced both on-line and off-line.

In addition to the controls given above, some other console keys can be used to govern both on-line and off-line output. These keys and their functions are listed in Table 6.

Digital Plotting - 123-10007

If LOC does not equal zero, data will be written on Tape A9. This data is then used to plot curves on the off-line plotter. A maximum of 50 quantities may be written out. This data is written out each computer cycle. The quantities to be written out are determined by type 4 data inputs.

Run Termination - 10008-654-336

A simulation run can be terminated in two ways. One method is to put Key 16 on the console DOWN. This will terminate all operation almost immediately. If Key 16 is not used, the run will be terminated when simulated time T becomes greater than the value of the input variable EOP.

When a run is terminated, an indication of the method of termination is written out on-line and off-line. If Key 16 is used, the contents of the computer is written on Tape A7. The run can be completed at a later time by placing the tape from A7 on drive A1 and pressing the CLEAR and LOAD TAPE buttons on the 7090 control console.

If Key 16 is DOWN, operation will terminate at this point. If Key 16 is UP and the control variable IEXIT = 0, transfer will be back to the beginning of the Environment program to begin another run. If IEXIT ≠ 0, there are no more runs to be made, and operation will terminate.

Attitude Computations - 655-706

If radar direction of the Flight Director Indicators is being simulated (LRDFDI -) the radar line-of-sight attitude errors are computed, normalized, and limited. The errors are then transformed into errors about body axes.

If the error angles calculated by the simulated guidance computer are being used, they will be subjected to two magnitude checks. If the roll error is greater than 0.04 radians, the yaw and pitch errors will be neglected. If the yaw error is greater than 0.04 radians, the pitch error will be neglected. The errors are transformed from navigational axes to body axes, and a pitch rate is selected based upon the magnitude of the commanded yaw angle. The three possible pitch rates are specified as input data.

The angular turning rates about the three spacecraft axes are computed and limited. The equations of motion of spacecraft attitude are then solved and integrated to determine the new attitude of the body. The spacecraft axial thrusts are set to zero prior to these computations.

IVI Zeroing - 811-33

The discrete output DO 11 from the guidance computer to the IVI's is checked to see if the channels should be zeroed. If so, the proper terms are set to zero. If the IVI's are being zeroed, no thrusting will be done.

Spacecraft Thrusting - 32-24

Spacecraft thrusting will be simulated only if all of the following conditions are fulfilled:

- (a) The thrust in question is desired. (Indicated by a non-zero value of the proper ITH).
- (b) START COMP has been pressed (LDI 21 (-)).
- (c) Simulated computer time CT is no less than the time to apply the first thrust.
- (d) T is at least 10 seconds greater than the time at which START COMP was pressed.
- (e) LDI 11 is (-), or LDI 11 is (+) and CTTG = 0.

Spacecraft Thrusting - 32-24 (continued)

The spacecraft thrust terms were all set to zero when the new attitude of the spacecraft was being computed. If all of the conditions listed above are fulfilled, the values of the thrust terms may be changed. The changes depend upon the reading of the IVI's. The X thrust term is computed as follows:

- (a) If $\Delta V_X = 0$,
X thrust term = 0
- (b) When ΔV_X is (+)
If $\Delta V_X > CATXBA - 0.5$
X thrust term = CATXBA
If $\Delta V_X \leq CATXBA - 0.5$
X thrust term = ΔV_{XB}
- (c) When ΔV_X is (-)
If $\Delta V_X < CATXFW - 0.5$
X thrust term = CATXFW
If $\Delta V_X \geq CATXFW - 0.5$
X thrust term = ΔV_{XB}

where: ΔV_X = value on the X channel of the IVI's
 ΔV_{XB} = velocity change to be added along the X axis
 CATXBA = thrust capability of the Aft X axis thruster
 CATXFW = thrust capability of the Forward X axis thruster.

The Y and Z thrust terms are computed in a similar manner except both directions of the Y and Z thrusters have the same thrust capacity.

IVI Discretes - 21-506

The three IVI channels are checked for zero readings. The following discrete signals are generated for the guidance computer as a result of these tests:

	<u>ΔV_X</u>	<u>ΔV_Y</u>	<u>ΔV_Z</u>
Zero	LDI 31 +	LDI 25 +	LDI 26 +
Non-Zero	LDI 31 -	LDI 25 -	LDI 26 -

Thrust Transformation - 509

The spacecraft thrust terms are transformed into the inertial coordinate frame. These terms are then used in the position and velocity integration loop to compute new positions and velocities for the target and the spacecraft.

This completes the detail description of the Dynamic Environment program.

TABLE 1

GUIDANCE COMPUTER OUTPUT VARIABLE NAMES

CA 11	}	Elements of the navigation axes to body axes coordinate transformation matrix (A 11 - A 33).
CA 12		
CA 13		
CA 21		
CA 22		
CA 23		
CA 31		
CA 32		
CA 33		
CAPT1	}	See note at end of this table.
CATXBI		
CCABI		
CCASI		
CCK 1	}	Clohessy-Wiltshire coefficients (CK 1 - CK 5, CKF, CKG).
CCK 2		
CCK 3		
CCK 4		
CCK 5		
CCKF		
CCKG		
CCPSIR		Cosine of second rotation (yaw) in the coordinate transformation from body axes to radar line-of-sight ($\cos \psi_R$).
CCRI	}	See note at end of this table.
CCRSI		
C0I		
C21		
CCTHR		Cosine of first rotation (pitch) in the coordinate transformation from body axes to radar line-of-sight ($\cos \Theta_R$).
CDEL		Orbital angle between successive intermediate velocity corrections (Δ).

TABLE 1
(continued)

CDPHSC CDPSSC CDTHSC	} Spacecraft attitude error angles (roll, pitch, yaw). ($\Delta\phi_{SC}$, $\Delta\theta_{SC}$, $\Delta\psi_{SC}$).
CDRRD	Range rate error (reference range rate minus range rate). $\Delta\dot{R}_R$
CDTM	Time interval between successive intermediate velocity corrections (ΔT_M).
CDTW	Logical timer used in gathering of radar data. Also a measure of the lateness of any radar point. Set to -1 if the point is missing (Δt_w).
CDTX	Constant time interval, either 100 or 20 seconds, used to increment T_X (ΔT_X).
CDV	Prior to START COMPUTATION, the total velocity change required for Rendezvous and braking. After START COMPUTATION, the integral part of the velocity change to be processed on the output delay line to a selected incremental velocity meter (ΔV).
CDVF	Estimated velocity change (braking impulse) necessary to match velocities of target and spacecraft at intercept (ΔV_f).
CDVI	Velocity change necessary to match positions of target and spacecraft (ΔV_i).
CDVT	Total velocity change necessary to match positions and velocities of target and spacecraft (Rendezvous). ΔV_T
CDVXB CDVYB CDVZB	} Desired velocity changes along the body X, Y, and Z axes (ΔV_{xb} , ΔV_{yb} , ΔV_{zb}).
CDVXM CDVYM CDVZM	} Negatives of the desired velocity changes along the navigation axes (ΔV_{XM} , ΔV_{YM} , ΔV_{ZM}).

TABLE 1
(continued)

CDVXS CDVYS CDVZS	} Velocity changes to be placed on the ΔV meters (ΔV_{XS} , ΔV_{YS} , ΔV_{ZS}).
CDVXZ CDVYZ CDVZZ	} Present readings of the ΔV meters (ΔV_{XO} , ΔV_{YO} , ΔV_{ZO}).
CDXD CDYD CDZD	} <u>Catch-Up</u> : Velocity changes desired to be made along the spacecraft navigation axes. <u>Rendezvous</u> : Velocity changes along the spacecraft navigation axes required for Rendezvous in the desired time ($\Delta \dot{X}$, $\Delta \dot{Y}$, $\Delta \dot{Z}$).
CDXFD CDYFD CDZFD	} Estimated velocity changes (braking impulses) along the target axes necessary to match target and spacecraft velocities at intercept ($\Delta \dot{X}_f$, $\Delta \dot{Y}_f$, $\Delta \dot{Z}_f$).
CFX CFY CFZ	} Sensed velocity changes along the navigation axes (F_X , F_Y , F_Z).
CM 1 CM 3 CM 4 CM 5 CM 6	} Constants used in computing spacecraft position in target coordinates (CM 1, CM 3 - CM 6).
CNS	Updated constant used to determine $\Delta \dot{X}$, $\Delta \dot{Y}$, and $\Delta \dot{Z}$ in the smoothing process (N_S).
COEFF	Quantity used in computing Clohessy-Wiltshire coefficients (COEFF).
COMGS	Spacecraft orbital angular velocity assuming the spacecraft is in a circular orbit with radius equal to the last computed value of r_S (ω_S).
CPHIB CPSIB CTHB	Spacecraft roll, pitch and yaw angles read from the spacecraft platform gimbals (ϕ_b , θ_b , ψ_b).

TABLE 1
(continued)

CPSIBC } CTHBC }	Commanded spacecraft attitude angles (pitch and yaw) computed in a pitch, yaw sequence (Θ_{bc} , ψ_{bc}).
CPSBCP } CTHBCP }	Commanded spacecraft attitude angles (pitch and yaw) computed in a yaw, pitch sequence. Used only for MDIU display to allow use of the attitude ball as back-up for the flight director needles of the attitude display group (ψ'_{bc} , Θ_{bc}).
CPSIBM } CTHBM }	Computed spacecraft pitch and yaw angles necessary to obtain radar lock-on (ψ_{bm} , Θ_{bm}).
CRA	The average value of five radar ranges for use in the range rate calculations (R_A).
CRLO	MDIU input variable used as a logical choice. Initialized to 0 in RZ 118. If set to any non-zero value, will cause the sines of the radar angles to be set to 0 (RLO).
CRR	<u>In Catch-Up:</u> Value of radar range transmitted via the DAS. This parameter is updated every cycle if a good radar point is taken. <u>In Rendezvous:</u> Value of radar range used in the relative position computations. This parameter is transmitted via the DAS and is displayed on the MDIU (R_R).
CRRD	Range rate ($\dot{R}_R$).
CRRG	The value of radar range the last time a good radar point was taken. This parameter is displayed on the MDIU (R_{RG}).
CRRI	Radar range read from the radar every computer cycle (R_{RI}).
CRRPI	Radar range read from the second sample taken in the two-point comparison routine (R_{RI}').
CRS	Distance from geocenter to the spacecraft (r_s).
CR 1	The average radar range the last time the range rate calculations were performed (R_1).

TABLE 1
(continued)

CSADPI	Sine of the radar elevation angle from the second sample of the two-point comparison routine ($\sin a_I''$).
CSAPG	The compensated value of the sine of the radar elevation angle the last time a good radar point was taken. This parameter is displayed on the MDIU ($\sin a_G'$).
CSAPI	Sine of the radar elevation angle read from the radar and compensated for measurement errors ($\sin a_I'$).
CSAPR	<u>In Catch-Up:</u> Compensated value of the sine of the radar elevation angle transmitted via the DAS. This parameter is updated every cycle if a good radar point is taken. <u>In Rendezvous:</u> Compensated value of the sine of the radar elevation angle used in the relative position computations and transmitted via the DAS ($\sin a'$).
CSPSIR	Sine of the second rotation (yaw) in coordinate transformation from body axes to radar line-of-sight ($\sin \psi_R$).
CSRDPI	Sine of the radar azimuth angle from the second sample of the two-point comparison routine ($\sin r_I''$).
CSRPG	The compensated value of the sine of the radar azimuth angle the last time a good radar point was taken. This parameter is displayed on the MDIU ($\sin r_G'$).
CSRPI	Sine of the radar azimuth angle read from the radar and compensated for measurement errors ($\sin r_I'$).
CSRPR	<u>In Catch-Up:</u> Compensated value of the sine of the radar azimuth angle transmitted via the DAS. This parameter is updated every cycle if a good radar point is taken. <u>In Rendezvous:</u> Compensated value of the sine of the radar azimuth angle used in the relative position computations and transmitted via the DAS ($\sin r'$).
CSRTI	See note at end of this table.

TABLE 1
(continued)

CSTD	Nominal time difference between radar position measurements used in determining the smoothed velocity of the spacecraft (t_d).
CSTD L	Time difference between radar position measurements, corrected for lateness of the radar measurements (t_{dL}).
CSTHR	Sine of the first rotation (pitch) in the coordinate transformation from body axes to radar line-of-sight ($\sin \Theta_R$).
CSTZ	Time constant set 23 seconds greater than the time at which the IVI channels are started driving toward zero. If all three channels of the IVI have not reached zero by the time $t = t_0$, a malfunction will have occurred and the IVI zeroing loop will be terminated (t_0).
CT	Elapsed time since initialization of mode. Read during each cycle through the Executor. However, during execution of the self-test, CT is updated by one second each cycle through the Rendezvous program (t).
CTD	Prior to the first thrust, the time interval between the last relative position computations made prior to START COMPUTATION and the midpoint of the first thrust. After the first thrust, the time interval between the midpoint of a thrust and a predicted spacecraft position after that thrust (T_D).
CTDAS	Elapsed time since initialization of mode. Read during each cycle through Executor. CT and CTDAS are equal <u>except</u> during execution of the self-test. (t_{DAS}).
CTDV	Time at which the first thrust should be applied ($T_{\Delta V}$).
CTLRP	Time of the last relative position computations (t_{LRP}).
CTM	Initially, the time of the first good radar point used in the relative position computations. After START COMPUTATION, the time of the midpoint of the first thrust. Incremented by ΔT_M to give the times of application of the intermediate thrusts (T_M).

TABLE 1
(continued)

CTRR	Variable used to determine whether or not the range rate calculations should be performed during the present cycle (TRR).
CTR1	The time the last range rate calculations were performed (t_{R1}).
CTX	Time constant incremented by ΔT_X . Used as a logical timer in the gathering of radar data (T_X).
CUDPHS CUDPSS CUDTHS	Unlimited values of spacecraft attitude error angles (roll, pitch, yaw). ($\Delta \phi_{SC}$, $\Delta \theta_{SC}$, $\Delta \psi_{SC}$).
CWSTD	Product of COMGS(ω_S) and CTD (T_D).
CWSTD L	Orbital angular difference between two radar position measurements, corrected for lateness of the measurements; or orbital angular distance to Rendezvous ($\omega_s t_{dL}$).
CWTTPR	Orbital angular distance to Rendezvous (ω_{TtPR}).
CX CY CZ	Spacecraft position coordinates in a rotating, curvilinear coordinate system centered in the target (X, Y, Z).
CXM CYM CZM	Spacecraft position coordinates at the midpoint of one of the correctional thrusts (X_M , Y_M , Z_M).
CXRD CYRD CZRD	Velocities along the target X, Y, and Z axes required for Rendezvous in the desired time ($\dot{X}_R$, $\dot{Y}_R$, $\dot{Z}_R$).
CXSD CYSD CZSD	Aggregate velocity changes along navigation axes required for Rendezvous. Divided by CNS to give CDXD, CDYD, and CDZD. ($\dot{X}_S$, $\dot{Y}_S$, $\dot{Z}_S$).
CXTD CYTD CZTD	Spacecraft velocities along the target X, Y, and Z axes computed from one pair of position measurements (X_t , Y_t , Z_t).

TABLE 1
(continued)

CXZ } CYZ } CZZ }	Values of CX, CY, and CZ extracted from the radar data table used in calculating CXTD, CYTD, and CZTD. (X_0 , Y_0 , Z_0).
FIN } FP }	See note at end of this table.
IC	Floating index used to denote the table location for storage of radar data. Ranges from zero to 10 prior to START COMPUTATION, from three to 10 after START COMPUTATION (i).
KC	Subscript index used for extracting data from the radar table for use in the smoothing equations (K).
K2C	Counter denoting the number of points yet to be smoothed. Ranges from zero to seven (K_2).
L	Counter used in the range rate calculations. Ranges from zero to five (L).
LC1	Logical choice serving two purposes: a) Initialized (-) to permit zeroing of the ΔV meters when the mode is initialized. Set (+) when all ΔV meters have been zeroed or 23 seconds after the meters are started driving toward zero, whichever occurs first. Always (+) thereafter except for temporary usage in (b). b) Set (-) at the start of the smoothing sequence. Reset (+) after the first set of Clohessy-Wiltshire constants have been computed (LC 1).
LC2	Logical choice always (+) prior to START COMPUTATION time in Rendezvous. Set (-) after seven computations of relative position have been made following a thrust. Reset (+) when smoothing has been completed prior to the next thrust (LC 2).
LC3	Logical choice always (+) prior to and always (-) after START COMPUTATION time (LC 3).

TABLE 1
(continued)

LC7	Logical choice serving three purposes: a) Always (+) until a good radar point is used in the relative position computation. Always (-) thereafter except for temporary usage in (b) and (c). b) Set (+) just prior to the computation of predicted radar pointing angles 80 seconds before a thrust. Reset (-) when the computations are completed. c) Set (+) after calculating the smoothed spacecraft velocity at the last radar point to allow calculation of the velocity changes required for Rendezvous from the extrapolated thrust midpoint. Reset (-) when the operation is completed (LC7).
LC8	Logical choice serving three purposes: a) Set (+) to allow initializing IVI outputs to desired velocity changes. Set (-) during the initialization. b) Set (-) to allow the same equations to be used for computing CK 4 and CKF, CK 5 and CKG. Set (+) when the computations are completed. c) Used to allow prediction of spacecraft position 80 seconds prior to a thrust only once for each thrust. Left in (-) state from use in (a). Set (+) just before prediction equations are solved (LC8).
LC10	Logical choice set (+) when it is time to perform the range rate calculations. Set (-) after these calculations are performed (LC10).
LC4C	Logical choice set (+) in all modes except Catch-Up to permit an initializing pass of Catch-Up when switching modes (LC4C).
LC4D	Logical choice set (+) in all modes except Rendezvous to permit an initializing pass of Rendezvous when switching modes (LC4D).

TABLE 1
(continued)

LC1J	Logical choice used to select one channel of the IVI for output processing. Set (-) for X channel, (0) for Y channel, and (+) for Z channel (LC1J).
LCA	Logical choice initialized to zero. If a non-zero value for LCA is inserted via the MDIU only the X channel of the IVI will be updated (LCA).
LCS	See note at end of this table.
LDI00	Discrete input indicating that radar is ready (-) or not ready (+) with valid data for the computer (DI 00).
LDI21	Discrete input indicating that the START COMPUTATION button has (-) or has not (+) been pushed (DI 21).
LDO05	Discrete output to turn Computer Running (START COMPUTATION) Light on (-) and off (+) (DO 05).
M	Control variable used to cause proper branching during the range rate calculations. M is set equal to zero during initialization and whenever range rate and range rate error are flagged to 9999. It remains zero whenever range rate and range rate error are 9999. All other times M equals one (M).
N	Control variable used in the two-point comparison routine. N is set to -1 prior to taking the first point; set to 0 after the first point is taken (N).
RDGD	Indicator set (+) if a good radar sample has been taken. Set (-) if a bad radar sample has been taken (RDGD).
RRDREF	Reference range rate ($\dot{R}_{RREF}$).
SW TEST TPC	See note at end of this table.
TSC	

TABLE 1
(continued)

TVX }
TVY }
TVZ }
TYC }

See note at end of this table.

NOTE: These quantities are used only in Module III.

TABLE 2

INPUT DATA SUPPLIED ONLY ONCE FOR EACH SET
OF DYNAMIC SIMULATIONS

(Type 1 Data)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 1 (FORMAT: 12A6)</u>		
1- 6	REM (1)	First output variable name
7-12	REM (2)	Second output variable name.
:	:	:
67-72	REM (12)	Twelfth output variable name.

Cards two through 13 are arranged in the same manner and specify the 13th through 165th output variable names.

<u>Card 14 (FORMAT: 12A6)</u>		
1- 6	REM (157)	157 th output variable name.
:	:	:
49-54	REM (165)	165 th output variable name.
55-72	Blank	

TABLE 3

INPUT DATA SUPPLIED FOR EACH DYNAMIC SIMULATION

(Type 2 Data)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 1 (FORMAT: 11X, I2, 1X, I2, 1X, I2, 10X, A6, A6)</u> 12A6		
1-11	Blank	Month of year.
12-13	NDATE1	
14	Blank	Day of year.
15-16	NDATE2	
17	Blank	Year.
18-19	NDATE3	
20-29	Blank	Run designation.
30-35	NRUN1	
36-41	NRUN2	
<u>Card 2 (FORMAT: 6E12.8)</u>		
1-12	EOP	Time to terminate run (sec.).
13-24	STCT	Time at which START COMP is to be pushed (sec.).
25-36	CTZ	Value to which time in the environment will be initialized (usually zero) (sec.).
37-48	CTE	Elapsed time from lift-off (sec.).
49-60	COINT	Number of simulated seconds between successive two-page outputs.
61-72	DELAY	Amount by which two-page output time will be biased (sec.).
<u>Card 3 (FORMAT: 6E12.8)</u>		
1-12	ESPR	Maximum radar range which will cause one line to be written out during each cycle through the environment (ft.).
13-24	DT	Number of simulated seconds per time increment (usually 1.0).
25-36	BINT	Time interval over which reverse integration is to be carried out (sec.).

columns 25-72 printed as run number

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 3 (FORMAT: 6E12.8) (continued)</u>		
37-48	CAPT	Target orbital period (sec.).
49-60	COMGT	Target orbital angular velocity, ω_T (rad/sec).
61-72	CSRT	Target orbital radius, r_T (ft.).
<u>Card 4 (FORMAT: 6E12.8)</u>		
1-12	XI	Spacecraft initialization parameters. See note at end of this table.
13-24	YI	
25-36	ZI	
37-48	DXI	
49-60	DYI	
61-72	DZI	
<u>Card 5 (FORMAT: 6E12.8)</u>		
1-12	XTI	Target initialization parameters. See note at end of this table.
13-24	YTI	
25-36	ZTI	
37-48	DXTI	
49-60	DYTI	
61-72	DZTI	
<u>Card 6 (FORMAT: 6E12.8)</u>		
1-12	RJ	Earth oblateness constant.
13-24	CATXBA	Aft.
25-36	CATXFW	Fwd.
37-48	CATYB	Lft. - Rt.
49-60	CATZB	Up - Dn.
61-72	XKRDR	Spacecraft thruster acceleration levels (ft/sec ²). Maximum reliable radar range, K_R (ft.). <i>Time between radar samples prior to START COMP.</i>
<u>Card 7 (FORMAT: 6E12.8)</u>		
1-12	CCAB	Radar elevation angle bias constant.
13-24	CCAS	Radar elevation angle slope constant.
25-36	CCRB	Radar azimuth angle bias constant.

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 7 (FORMAT: 6E12.8) (continued)</u>		
37-48	CCRS	Radar azimuth angle slope constant.
49-60	C0	Radar range rate bias constant (ft/sec).
61-72	C2	Radar range rate weighting factor (ft ² /sec).
<u>Card 8 (FORMAT: 6E12.8)</u>		
1-12	A 11	Elements of the spacecraft to inertial coordinate transformation matrix.
13-24	A 12	
25-36	A 13	
37-48	A 21	
49-60	A 22	
61-72	A 23	
<u>Card 9 (FORMAT: 6E12.8)</u>		
1-12	A 31	Elements of the spacecraft to inertial coordinate transformation matrix.
13-24	A 32	
25-36	A 33	
37-48	AKX 1	Platform misalignment and scale factor matrix elements.
49-60	AKX 2	
61-72	AKX 3	
<u>Card 10 (FORMAT: 6E12.8)</u>		
1-12	AKX 4	X accelerometer bias constant (ft/sec ²).
13-24	AKY 1	Platform misalignment and scale factor matrix elements.
25-36	AKY 2	
37-48	AKY 3	
49-60	AKY 4	Y accelerometer bias constant (ft/sec ²).
61-72	AKZ 1	Platform misalignment and scale factor matrix element.

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 11 (FORMAT: 6E12.8)</u>		
1-12	AKZ 2	Platform misalignment and scale factor matrix elements.
13-24	AKZ 3	
25-36	AKZ 4	
37-48	XKP 1	Spacecraft pitch rate gain factors.
49-60	XKP 2	
61-72	XKP 3	

Card 12 (FORMAT: 6E12.8)

1-12	XKR	Spacecraft roll rate gain factor.
13-24	XKY	Spacecraft yaw rate gain factor.
25-36	CCR	Radar range tolerance constant (ft.).
37-48	Blank CDVMAX	THRUST THRESHOLD
49-72	Blank	

Card 13 (FORMAT: 10I3, 7I6)

1- 3	ITH (1)	Variables used to control, in sequence, the thrusting maneuvers executed during a Rendezvous mission. If a particular ITH is equal to zero, the thrust maneuver associated with that ITH will not be made; if the ITH is not equal to zero, the thrust will be made.
4- 6	ITH (2)	
7- 9	ITH (3)	
10-12	ITH (4)	
13-15	ITH (5)	
16-18	ITH (6)	
19-21	ITH (7)	
22-24	ITH (8)	
25-27	ITH (9)	
28-30	ITH (10)	

31-36 MACOP = 0. Input data gives initial positions and velocities for spacecraft and target in earth centered inertial rectangular coordinates.

➤ 0: Input data gives initial position and velocity for target in inertial polar coordinates. Specification of initial position and velocity for spacecraft depends upon MACNTR.

< 0 Input data gives initial target position & velocity in rectangular ECI, sk in relative coordinates.

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 13 (FORMAT: 10I3, 7I6) (continued)</u>		
37-42	MACNTR	= 0. Input data gives initial position and velocity for spacecraft in inertial polar coordinates. ≠ 0. Input data gives initial spacecraft position and velocity in target centered curvilinear coordinates.
43-48	MACINT	= 0. No effect. ≠ 0. Reverse integration will be used to derive initial conditions for the Rendezvous problem from the input data.
49-54	MODCR	<1. Rendezvous mode selected. = 1. Catch-Up mode selected. >1. Pre-launch mode selected. Additional mode selection must be made with special data inputs.
55-60	NPF	Number of time increments per complete integration cycle (usually 1.0).
61-66	L0C	= 0. No effect. ≠ 0. Will cause data to be assembled for curve plotting. Type 4 data inputs must be included.
67-72	LMDI	= 0. No effect. <0. Simulated inputs for an operational simulation will be read in and inserted at the proper time. >0. Simulated inputs for a FORTRAN simulation will be read in and inserted at the proper time.

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
<u>Card 14 (FORMAT: 12I6)</u>		
1- 6	LFP	= 0. No effect. ≠ 0. Quantize accelerometer data.
7-12	LGANG	= 0. No effect. ≠ 0. Quantize gimbal angle data.
13-18	LRR	= 0. No effect. ≠ 0. Quantize radar range.
19-24	LSRA	= 0. No effect. ≠ 0. Quantize the sines of the radar angles.
25-30	LRM	= 0. No effect. ≠ 0. Limit radar range to a maximum value of 1,510,797 ft.
31-36	LDB	= 0. No effect. ≠ 0. Quantize spacecraft attitude error angles.
37-42	LFDI	= 0. Control the spacecraft to the attitude commanded by the Gemini computer if CRLO ≠ 0.
<i>< 0. Hold radar line of sight at all times</i>		
43-48	IEXIT	> 0. Prior to START COMP control the spacecraft to hold radar line-of-sight to the target. After START COMP control the spacecraft to the attitude commanded by the Gemini computer provided the other necessary conditions are met. = 0. Following the completion of the present run, data cards for another run will be read in.
54 49-72	LRST Blank	≠ 0. The present run is the last. The program will stop when the present run is completed. = 0. NO SELF TEST ≠ 0. SELF TEST - LOAD CHECK SUMS
55-72	Blank	

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
---------------	-----------------	-----------------

Card 15 (FORMAT: 012) *3E12.8*

1-12	KEYSET	Octal pattern of desired MQ key settings. Key DOWN = 1, key UP = 0.
------	--------	--

13 *48* Blank *Pitch, yaw, roll gimbal bearings*

NOTE: The spacecraft and target initialization parameters have different meanings, depending upon the values of the environment control variables MACOP and MACNTR.

If MACOP = 0.

XI	Spacecraft position (ft.).	Earth centered inertial rectangular coordinate frame.
YI		
ZI		
DXI	Spacecraft velocity (ft/sec).	
DYI		
DZI		
XTI	Target position (ft.).	
YTI		
ZTI		
DXTI	Target velocity (ft/sec).	
DYTI		
DZTI		

If MACOP > 0 and
MACNTR = 0.

XI	Longitude, θ_F (degrees)	Spacecraft	Earth centered inertial polar coordinate frame
YI	Latitude, ϕ_F (degrees)		
ZI	Radius, r_F (ft.)		
DXI	Flight Path Angle, γ_F (degrees)		
DYI	Heading Angle, ψ_F (degrees)		
DZI	Velocity, V_F (ft/sec)	Target	
XTI	Longitude, θ_T (degrees)		
YTI	Latitude, ϕ_T (degrees)		
ZTI	Radius, r_T (ft.)		
DXTI	Flight Path Angle, γ_T (degrees)		
DYTI	Heading Angle, ψ_T (degrees)	Target	
DZTI	Velocity, V_T (ft/sec)		

TABLE 3
(continued)

<u>COLUMN</u>	<u>VARIABLE</u>	<u>FUNCTION</u>
---------------	-----------------	-----------------

Card 15 (FORMAT: 012) (continued)

If MACOP $\neq$ 0 and MACNTR $\neq$ 0.			
XI	XTF	Spacecraft position (ft.).	Target centered curvilinear coordinate frame.
YI	YTF		
ZI	ZTF		
DXI	XDTF	Spacecraft velocity (ft/sec).	
DYI	YDTF		
DZI	ZDTF		
XTI	Same as for MACNTR = 0.		
YTI			
ZTI			
DXTI			
DYTI			
DZTI			

If $MACOP < 0$

Same as for $MACOP > 0$, $MACNTR \neq 0$

Same as for $MACOP = 0$

TABLE 4

INSERTABLE DATA
FOR DYNAMIC OR STATIC SIMULATIONS
 (Type 3 Data)

There is one card for each data input prepared as follows:

<u>COLUMN</u>	<u>TABLE</u>	<u>DESCRIPTION</u>
1- 6	S LIST	The SLIST table contains the symbolic name of the data input.
7-21	T LIST	The TLIST table contains the time when the data input shall be inserted into the program.
22-36	D LIST	The DLIST table contains the data to be inserted into the program.
37-40	I LIST	The ILIST table contains the position in the tables of the information associated with the data input.

Following is a tabulation of the SLIST names and the associated ILIST subscripts:

<u>SUBSCRIPT</u>	<u>SYMBOL</u>	<u>SUBSCRIPT</u>	<u>SYMBOL</u>
1	CDVXSP	36	CAPTI
2	CDVYSP	37	CATXBA
3	CDVZSP	38	CATXBI
4	CDPHSC	39	CCAB
5	CDPSSC	40	CCABI
6	CDTHSC	41	CCAS
7	AKX 1	42	CCASI
8	AKX 2	43	CCK 1
9	AKX 3	44	CCK 2
10	AKX 4	45	CCK 3
11	AKY 1	46	CCK 4
12	AKY 2	47	CCK 5
13	AKY 3	48	CCKF
14	AKY 4	49	CCKG
15	AKZ 1	50	CCPHIB
16	AKZ 2	51	CCPSIB
17	AKZ 3	52	CCPSIR
18	AKZ 4	53	CCR
19	ASFX	54	CCRB
20	ASFY	55	CCRBI
21	ASFZ	56	CCRI
22	C 0	57	CCRS
23	C 0I	58	CCRSI
24	C 2	59	CCTHB
25	C 21	60	CCTHR
26	CA 11	61	CCWSTD
27	CA 12	62	CCWTDL
28	CA 13	63	CCZT
29	CA 21	64	CDEL
30	CA 22	65	CDRRD
31	CA 23	66	CDTM
32	CA 31	67	CDTW
33	CA 32	68-78	CDTWT
34	CA 33	79	CDTWX
35	CAPT	80	CDTX

<u>SUBSCRIPT</u>	<u>SYMBOL</u>	<u>SUBSCRIPT</u>	<u>SYMBOL</u>
81	CDV	116	CNYC
82	CDVF	117	COEFF
83	CDVI	118	COINT
84	CDVT	119	COMGS
85	CDVXB	120	CPHIB
86	CDVXM	121	CPHIBC
87	CDVXS	122	CPSBCP
88	CDVXZ	123	CPSIB
89	CDVYB	124	CPSIBC
90	CDVYM	125	CPSIBM
91	CDVYS	126	CR 1
92	CDVYZ	127	CRA
93	CDVZB	128	CRLO
94	CDVZM	129	CRR
95	CDVZS	130	CRRD
96	CDVZZ	131	CRRG
97	CDXD	132	CRRI
98	CDXFD	133	CRRPI
99	CDYD	134	CRS
100	CDYFD	135	CSADPI
101	CDZD	136	CSAPG
102	CDZFD	137	CSAPI
103	CFX	138	CSAPR
104	CFY	139	CSPHIB
105	CFZ	140	CSPSIB
106	CM 1	141	CSPSIR
107	CM 3	142	CSRDPi
108	CM 4	143	CSRPG
109	CM 5	144	CSRPI
110	CM 6	145	CSRPR
111	CNPC	146	CSRT
112	CNS	147	CSRTI
113	CNVX	148	CSTD
114	CNVY	149	CSTD L
115	CNVZ	150	CSTHB

<u>SUBSCRIPT</u>	<u>SYMBOL</u>	<u>SUBSCRIPT</u>	<u>SYMBOL</u>
151	CSTHR	196	CYSD
152	CSTZ	197-207	CYT
153	CSWSTD	208	CYTD
154	CSWTDL	209	CYZ
155	CT	210	CZ
156	CTD	211	CZM
157	CTDAS	212	CZRD
158	CTDV	213	CZSD
159	CTHB	214-224	CZT
160	CTHBC	225	CZTD
161	CTHBCP	226	CZZ
162	CTHBM	227	DELAY
163	CTLRP	228	DONPRT
164	CTM	229	DT
165	CTR 1	230	DUM 1
166	CTRR	231	DUM 2
167	CTTG	232	DUM 3
168	CTW	233	DUM 4
169	CTX	234	DUM 5
170	CUDPHS	235	DUM 6
171	CUDPSS	236	DUM 7
172	CUDTHS	237	DUM 8
173	CWSTD	238	DUM 9
174	CWSTD L	239	DUM 10
175	CWTTPR	240	DUM 11
176	CX	241	DUM 12
177	CXM	242	DUM 13
178	CXRD	243	DUM 14
179	CXSD	244	DUM 15
180-190	CXT	245	DUM 16
191	CXTD	246	DUM 17
192	CXZ	247	DUM 18
193	CY	248	FIN
194	CYM	249	FP
195	CYRD	250	FXP

<u>SUBSCRIPT</u>	<u>SYMBOL</u>	<u>SUBSCRIPT</u>	<u>SYMBOL</u>
251	FXPP	286	LDI13
252	FYP	287	LDI20
253	FYPP	288	LDI21
254	FZP	289	LDI22
255	FZPP	290	LDI25
256	GC	291	LDI26
257	IC	292	LDI31
258	IEXIT	293	LDO01
259	IOLP	294	LDO05
260	IWRITE	295	LDO11
261	K2C	296	LDO12
262	KC	297	LDO13
263	KWRITE	298	LDO62
264	L	299	LDO63
265	LC1	300	LFDI
266	LC1J	301	LQT
267	LC2	302	M
268	LC3	303	N
269	LC4A	304	PHIB
270	LC4B	305	PINT
271	LC4C	306	PSIB
272	LC4D	307	RDGD
273	LC4E	308	RRDREF
274	LC4F	309	SRAA
275	LC4G	310	SREA
276	LC5	311	SW
277	LC7	312	TEST
278	LC8	313	TFTXV
279	LC10	314	TFTYV
280	LCA	315	TFTZV
281	LCS	316	THETAB
282	LCY	317	TIME
283	LDI00	318	TPC
284	LDI10	319	TRI
285	LDI11	320	TSC

SUBSCRIPT

SYMBOL

321	TVX
322	TVY
323	TVZ
324	TYC
325	XGRT
326	XGRTD
327	XKRDR
328	YGRT
329	YGRTD
330	ZGRT
331	ZGRTD

TABLE 5INPUTS NECESSARY FOR PLOTTING(Type 4 Data)Card 1

<u>COLUMN</u>	<u>QUANTITY AND/OR DESCRIPTION</u>
1- 2	Limit (number of quantities to be written out for plotting).
3-48	Blank.
49-54	*Symbolic name of first quantity to be written out.
55	Blank.
56-58	*Subscript of first quantity to be written out.
59-60	Blank.
61-66	*Symbolic name of second quantity to be written out.
67	Blank.
68-70	*Subscript of second quantity to be written out.
71-72	Blank.

If more than two quantities are desired, data cards of the following format must be read in. For each card after the first, a maximum of six quantities per card is allowed. The quantities are specified using the following format:

<u>COLUMN</u>	<u>QUANTITY AND/OR DESCRIPTION</u>
1- 6	*Symbolic name of third quantity.
7	Blank.
8-10	*Subscript of third quantity.
11-12	Blank.
13-18	*Symbolic name of fourth quantity.
19	Blank.
20-22	*Subscript of fourth quantity.
23-24	Blank.

This format is continued for the remainder of the second card and as many more cards as are necessary to generate the desired plot data.

* Note, the names of the quantities and the associated subscripts are listed in Table 4.

TABLE 6DEFINITION OF TERMS USED ON DETAIL DYNAMIC
ENVIRONMENT FLOW DIAGRAM

BINT	Time interval of reverse integration.
CATXBA CATXFW CATYB CATZB	See Table 3, Card 6.
CFX CFY CFZ	See Table 1.
CO	Base time for printout.
COINT	Number of simulated seconds per two-page printout.
CRLO	RLO. (See Table 1).
CT	See Table 1.
CTDV	$T \Delta V$. (See Table 1).
CTRL	7090 Control Program.
CTTG	Variable which controls thrusting for Catch-Up. = 0 Thrust to drive IVI to zero. ≠ 0 Don't thrust.
CTX	T_X . (See Table 1).
DELAY	Time shift of printout time.
DONPRT	Quantity used to control output for an operational simulation.
DREA DRAA DROLL	Attitude errors from radar line-of-sight orientation.

TABLE 6
(continued)

DTT	Time step used in integration scheme.
EOP	Time to terminate problem.
ESPR	Maximum radar range to initiate printout each computer cycle.
FIN	See note at the end of this table.
ICC	Subscript for selecting proper ITH thrust indicator.
IEXIT	See Table 3, Card 14.
ILIST (IPL)	Subscript of the simulated data inserts (Type 3 data).
INITIAL } INPASS }	Equal to zero for first pass through program. Non-zero thereafter.
IOLP	One line of output each cycle if ILOP $\neq$ 0.
IPL	Counter used for Type 3 data inputs.
ITH (ICC)	One of the ITH thrust indicators dependent upon the value of ICC. See Table 3, Card 13.
IWRITE	= 0 No effect. $\neq$ 0 Two pages of output every cycle.
JUMP	Used to aid in determining which thrust is being simulated.
KEY 14	Will generate two pages of output every computation cycle when depressed.
KEY 15	Over-ride key for on-line printing. Will cause one line to be printed on-line every computer cycle whenever pressed down.
KEY 16	Will cause the run to be terminated when pressed down.
KEY 17	Start Computation button. If KEY 17 is not used, start computation (LDI 21) will be set automatically when T = STCT.

TABLE 6
(continued)

KEY 19	Indicates desire for on-line output. When KEY 19 is down, one line will be printed on-line every computer cycle if one of the following conditions is true: 1. T is not greater than 10. 2. The START COMP light is ON, CTTG = 0, FIN = 0 and at least one of the following is true: $\Delta V_X \neq 0, \Delta V_Y \neq 0, \Delta V_Z \neq 0.$ 3. Radar range is less than the value of ESPR.
KEY 20	Will cause two pages of off-line output to be produced at intervals determined by COINT when pressed down.
KEYSET	See Table 3, Card 15.
KOMBO	Variable set equal to octal contents of MQ key. Must equal KEYSET before program will be executed.
KPLOT	Counter used in plotting routine.
LC 2	See Table 1.
LDB	See Table 3, Card 14.
LDI 00	Discrete input which signals radar ready (-) or not ready (+) with valid data for the computer.
LDI 10 } LDI 11 } LDI 13 }	Discrete inputs which indicate which computer mode has been selected.
LDI 21	Discrete input which indicates that the START COMP button has (-) or has not (+) been pushed.
LDI 25 } LDI 26 } LDI 31 }	Discrete inputs which indicate a zero (+) or non-zero (-) reading on the ΔV_Y , ΔV_Z , and ΔV_X meters respectively.
LDO 05	Discrete output used to turn the Computer Running (START COMP) Light on (-) or off (+).

TABLE 6
(continued)

LDO 11	Discrete output used to drive the ΔV meters to zero when set (-).
LDO 12 } LDO 13 }	Discrete outputs used to select one of the ΔV meters.
LDO 62	Discrete output used to reset the START COMP discrete to ignore the pushing of the START COMP button if sufficient time for the gathering of data has not elapsed.
LFDI } LFP } LGANG }	See Table 3, Card 14.
LIMIT	Number of quantities to be written out for plotting.
LMDI } LOC } LRM } LRR } LSRA }	See Table 3, Cards 13 and 14.
LQT	= 0 No effect. ≠ 0 Sets LDI 00 (+) indicating that the radar is not ready with valid data for the computer.
LRDFDI	- Control the spacecraft to hold radar line-of-sight to the target. + Control of the spacecraft to the attitude commanded by the Gemini computer.
MM	Control variable used in the attitude integration loop.
MACINT } MACNTR } MACOP } MODCR }	See Table 3, Card 13.
MUD 5	Control variable used to select one of two formats for on-line output.

TABLE 6
(continued)

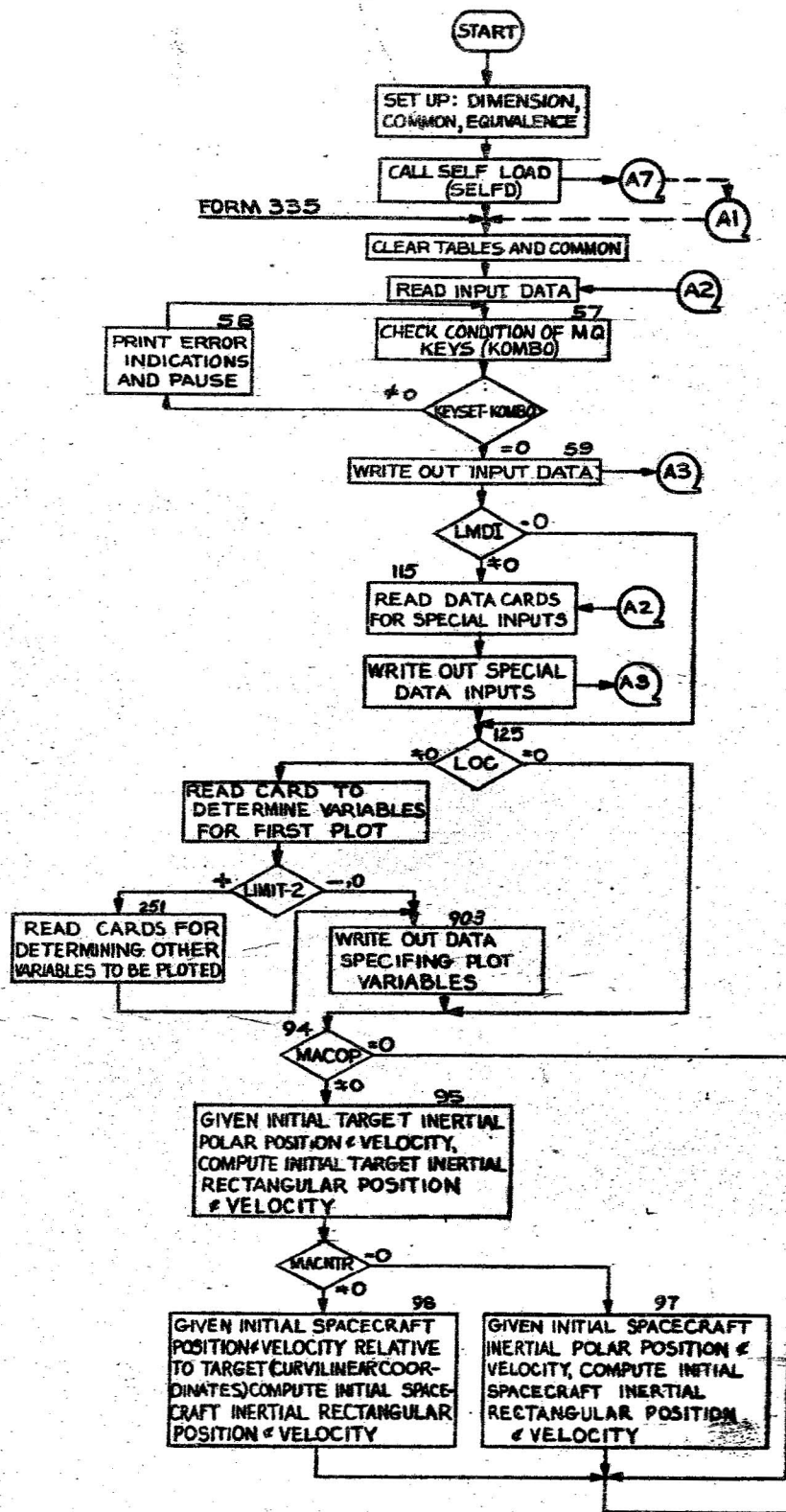
RAA	Radar azimuth angle.
REA	Radar elevation angle.
STCT	Start computation time.
T	Environment time.
TEST	See note at end of this table.
T_E	Elapsed time from lift-off.
T_M	See CTM in Table 1.
TRI	Radar range.
TRIDOT	Radar range rate.
TSC	Time at which START COMP was pressed.
$\left. \begin{array}{l} \Delta v_X \\ \Delta v_Y \\ \Delta v_Z \end{array} \right\}$	IVI readings.
$\left. \begin{array}{l} WXV \\ WYV \\ WZV \end{array} \right\}$	Turning rates about body axes.
XLIMIT	Maximum acceptable spacecraft turning rate.
W_{T^tPR}	See CWTTPR in Table 1.
ϕ_b	See CPHIB in Table 1. I
Θ_b	See CTHB in Table 1. I
ψ_b	See CPSIB in Table 1.

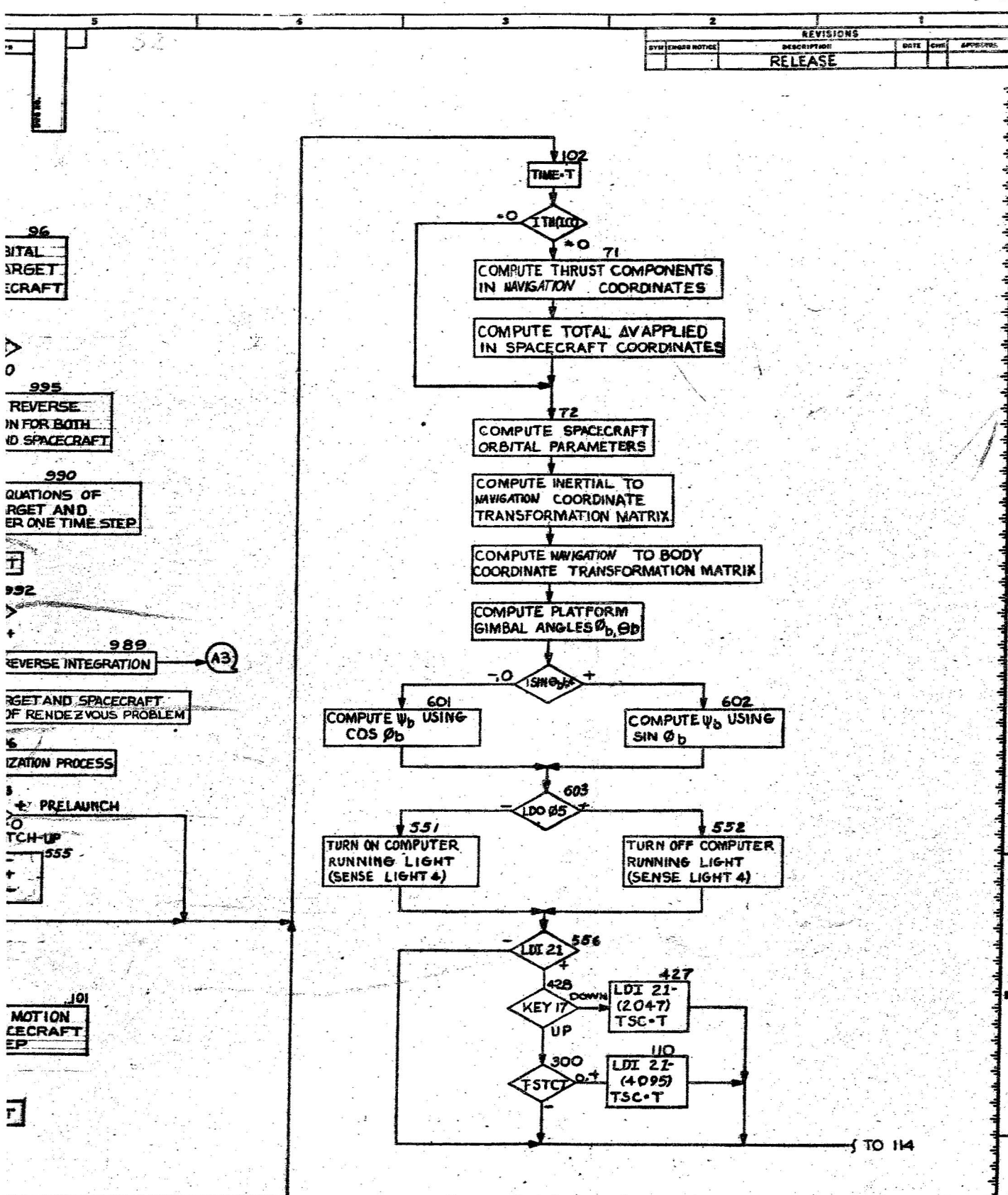
TABLE 6
(continued)

$\Delta \phi_{SC}$	See CDPHSC in Table 1.
$\Delta \theta_{SC}$	See CDTHSC in Table 1.
$\Delta \psi_{SC}$	See CDPSSC in Table 1.
ψ_{bc}	See CPSIBC in Table 1.

NOTE:

These quantities are used only in Module III.





96
BITAL
ARGET
ECRAFT

995
REVERSE
IN FOR BOTH
D SPACECRAFT

990
QUATIONS OF
RGET AND
ER ONE TIME STEP

992
+
989
REVERSE INTEGRATION

ARGET AND SPACECRAFT
OF RENDEZVOUS PROBLEM
6
IZATION PROCESS

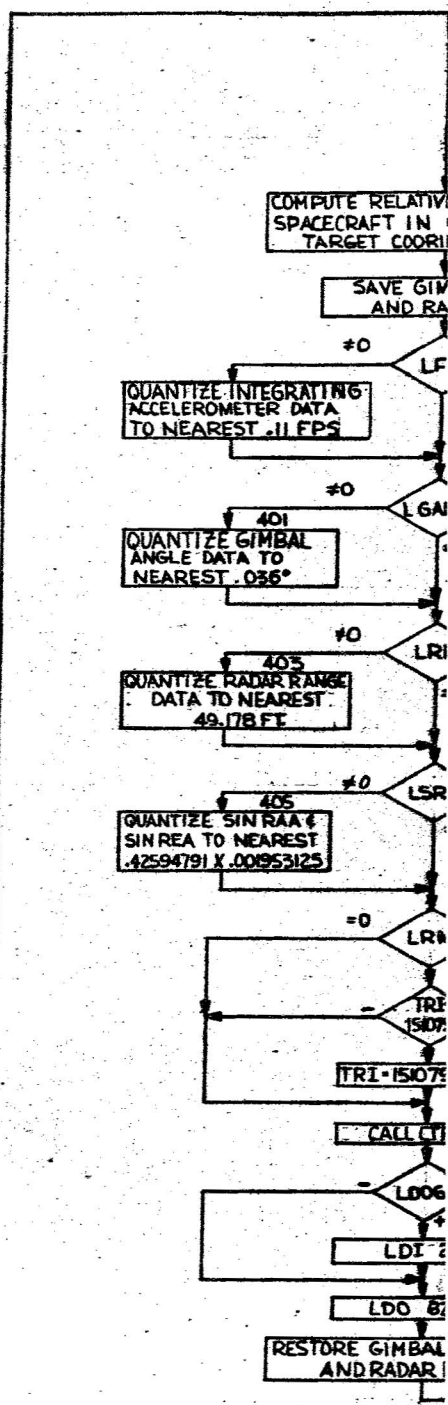
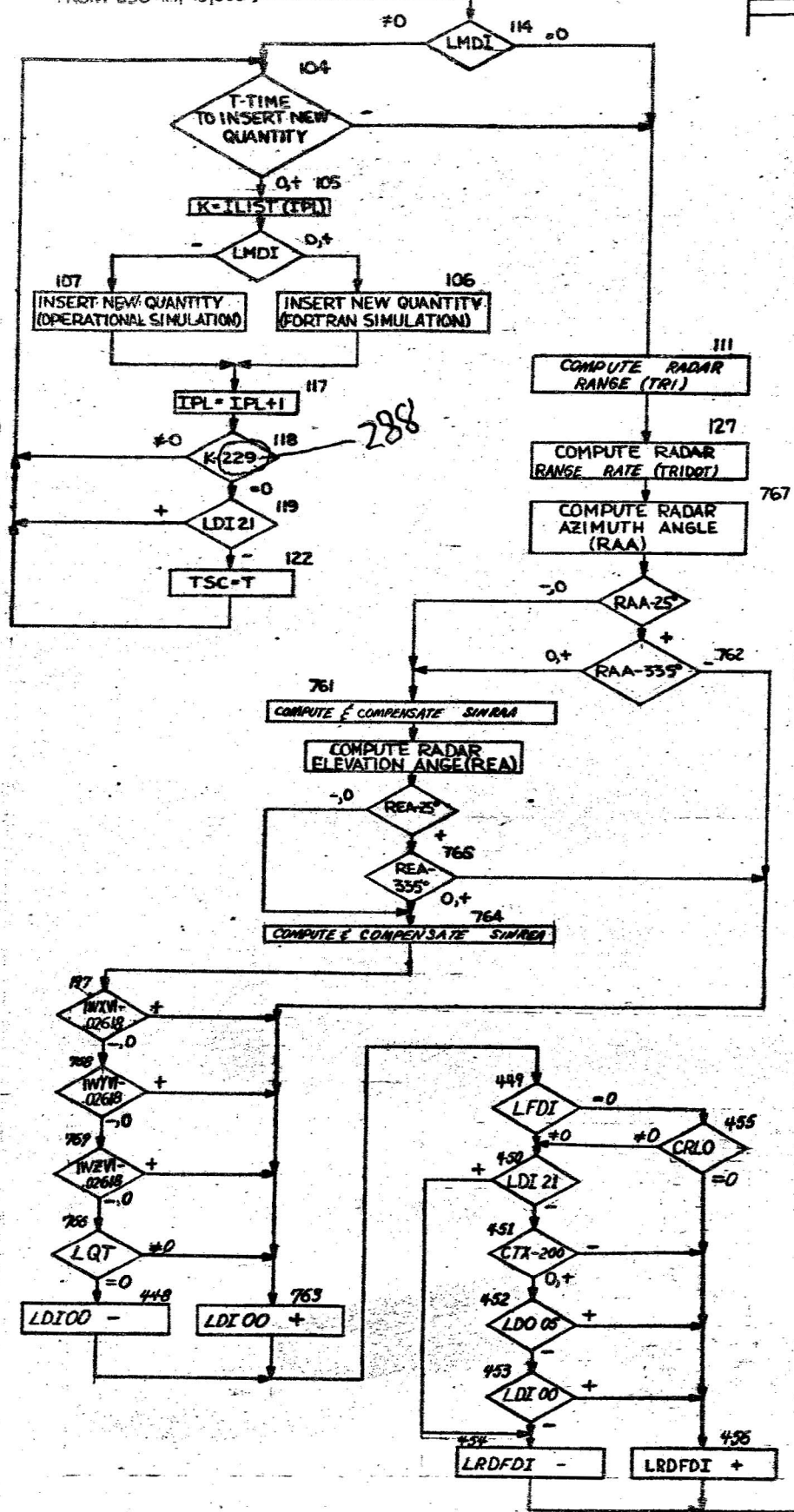
PRELAUNCH
ATCH-UP
555

101
MOTION
ECRAFT
EP

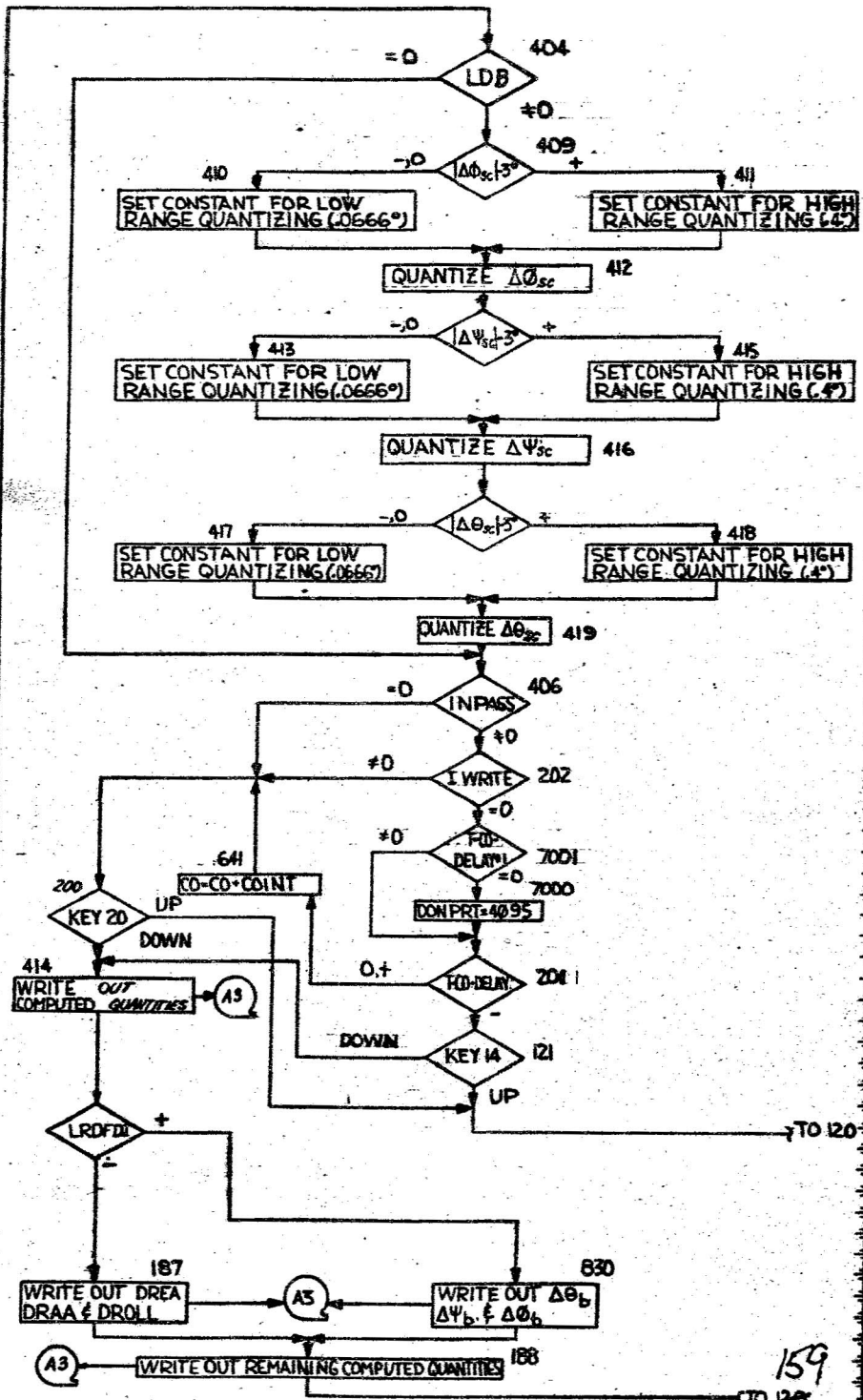
QTY	REQ	SYM	COL	DESCRIPTION	PART OR IDENTIFYING NO.	SPECIFICATION	MATERIAL OR NOTES	DATE	TEST	ITEM NO.
ONLY THE ITEM(S) LISTED ON THIS DRAWING AND IDENTIFIED BY VENDOR NAME(S), ADDRESS(ES), AND PART NUMBER(S) HAVE BEEN TESTED AND APPROVED BY IBM FOR USE IN () SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL (SEE SOURCE OF SUPPLY) COMMERCIAL PRODUCT MUST BE APPROVED TO AND COMPLETELY INTERCHANGEABLE WITH (SEE SOURCE OF SUPPLY) CHECK BLOCK ☒ IF APPLICABLE										
IDENT. OF SYM: V-VENDOR (SEE SPEC OR SOURCE) PART DWS R-REF QTY ALL DIMENSIONS AND TOLERANCES APPLY TO FINISHED PART UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON 2 PLACE DECIMALS 3 PLACE DECIMALS ANGLES MATL FINISH DRY TEST				DESIGNED <i>J. R. Riser</i> DESIGN CHECK <i>R. H. Hest</i> DRAWN <i>L. G.</i> BRASSING CHECK <i>J. R. Riser</i> DESIGN APPROVAL <i>R. H. Hest</i>		INTERNATIONAL BUSINESS MACHINES CORP. FEDERAL SYSTEMS DIVISION 500 MADISON AVE. NEW YORK, N.Y. TITLE ENVIRONMENTAL SYSTEM FOR GEMINI RENDEZVOUS CODE IDENT NO. 03640 SIZE F DRAWING NO. 65-554-0032 SCALE NONE WT SHEET 1 OF 5				

20
FROM 556 427 10,300 F

SOURCE OF SUPPLY			
VENDOR	VENDOR ADDRESS	VENDOR CODE	VENDOR CAT. OR P.



787
 POSITION OF CURVILINEAR
 MINUTES
 920
 ANGLES
 DATA
 420
 400
 402
 422
 423
 424
 408
 901
 214
 426
 ANGLES
 DATA



REFERENCE DRAWING

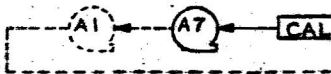
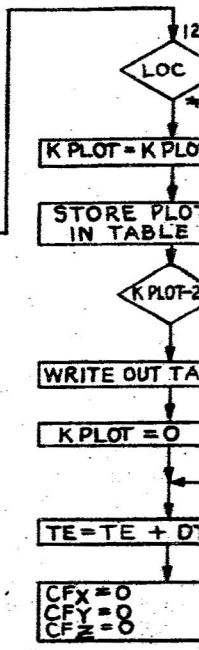
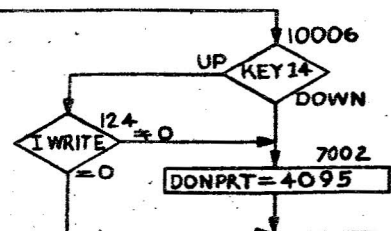
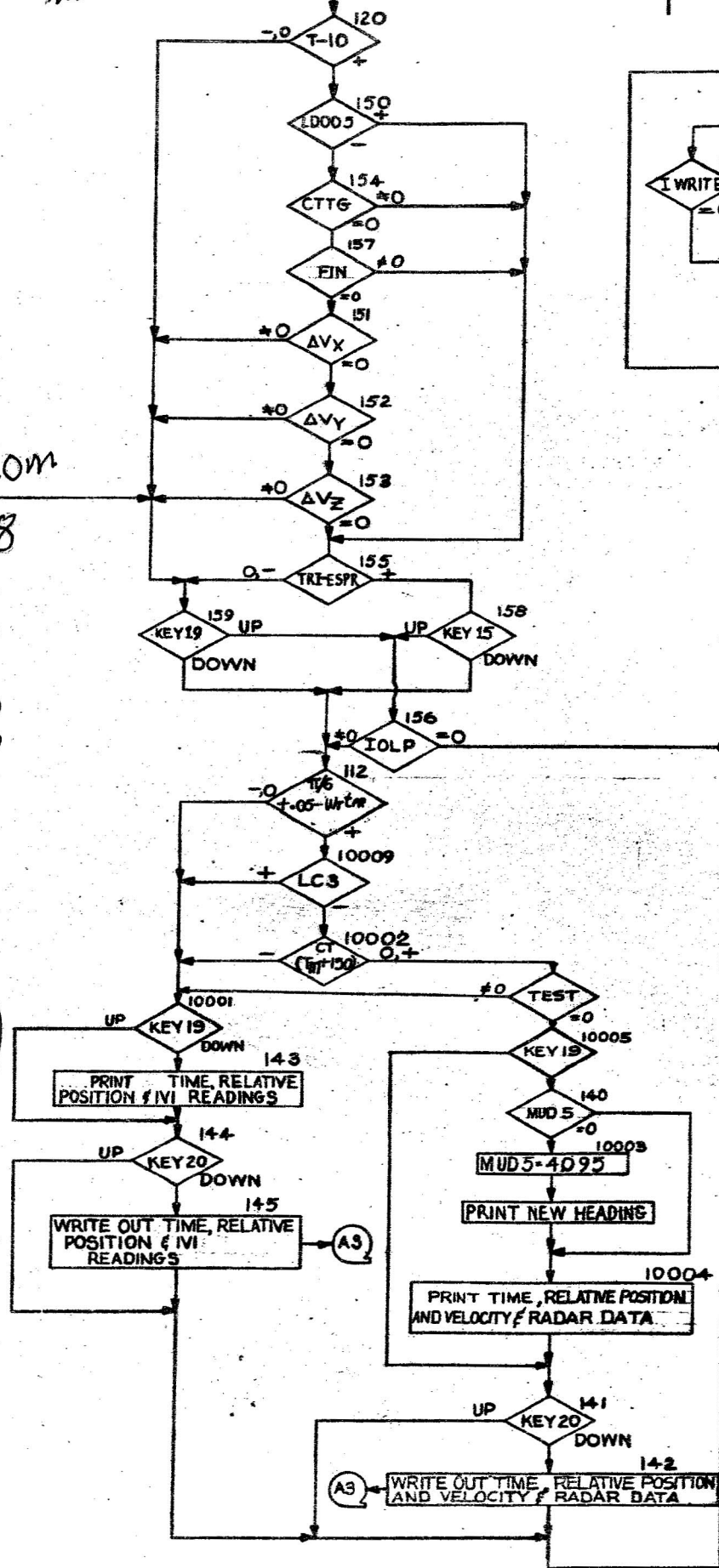
QTY	SYM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	SPECIFICATION	MATERIAL OR NOTES	CODE	ITEM
LIST OF MATERIAL OR PARTS LIST							
IDENT. OF SYM: V-VENDOR (SEE SPEC OR SOURCE) QTY R-REF QTY ALL DIMENSIONS AND TOLERANCES APPLY TO FINISHED PART UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 3 PLACE DECIMALS 3 PLACE DECIMALS ANGLES			DESIGNED: <i>J. R. Riser</i> DESIGN CHECK: <i>J. R. Riser</i> DRAWN: <i>LIG</i> DRAWING CHECK: <i>J. R. Riser</i> DESIGN APPROVAL: <i>E. H. Harty</i>				
ONLY THE ITEM(S) LISTED ON THIS DRAWING AND IDENTIFIED BY VENDOR NAME(S), ADDRESS(ES), AND PART NUMBER(S) HAVE BEEN TESTED AND APPROVED BY IBM FOR USE IN () SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY IBM			INTERNATIONAL BUSINESS MACHINES CORP. FEDERAL SYSTEMS DIVISION 550 MADISON AVE. NEW YORK, N.Y.				
COMMERCIAL PRODUCT MUST BE EQUAL TO AND COMPLETELY INTERCHANGEABLE WITH (SEE SOURCE OF SUPPLY)			TITLE: ENVIRONMENTAL SYSTEM FOR GEMINI RENDEZVOUS				
SPEC NUMBER		SOURCE ITEM NO.		CODE IDENT NO.		DRAWING NO.	
				03640 F		65-554-0032	
APPLICABLE IBM SPEC				CHECK BLOCK IF APPLICABLE		SHEET 2	

FROM 121

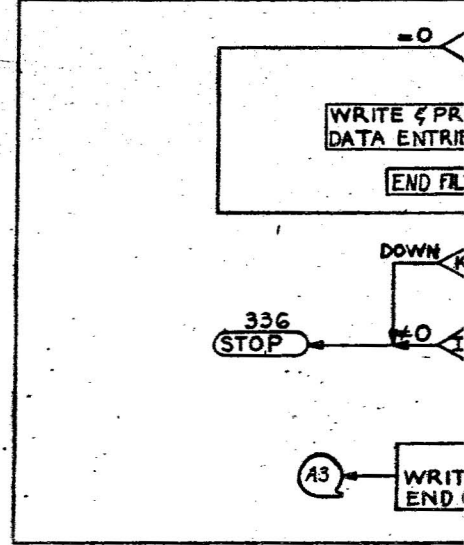
FROM 188

SOURCE OF SUPPLY

VENDOR VENDOR ADDRESS VENDOR CODE VENDOR CAT. OR P.

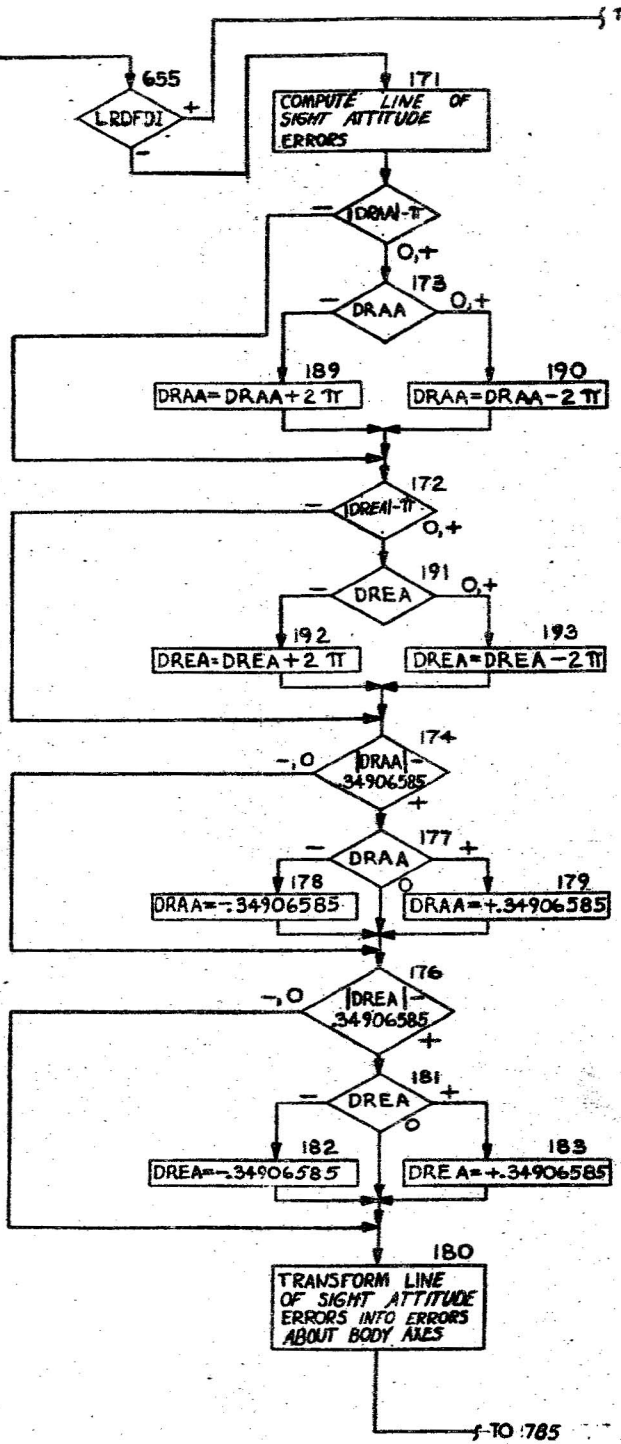
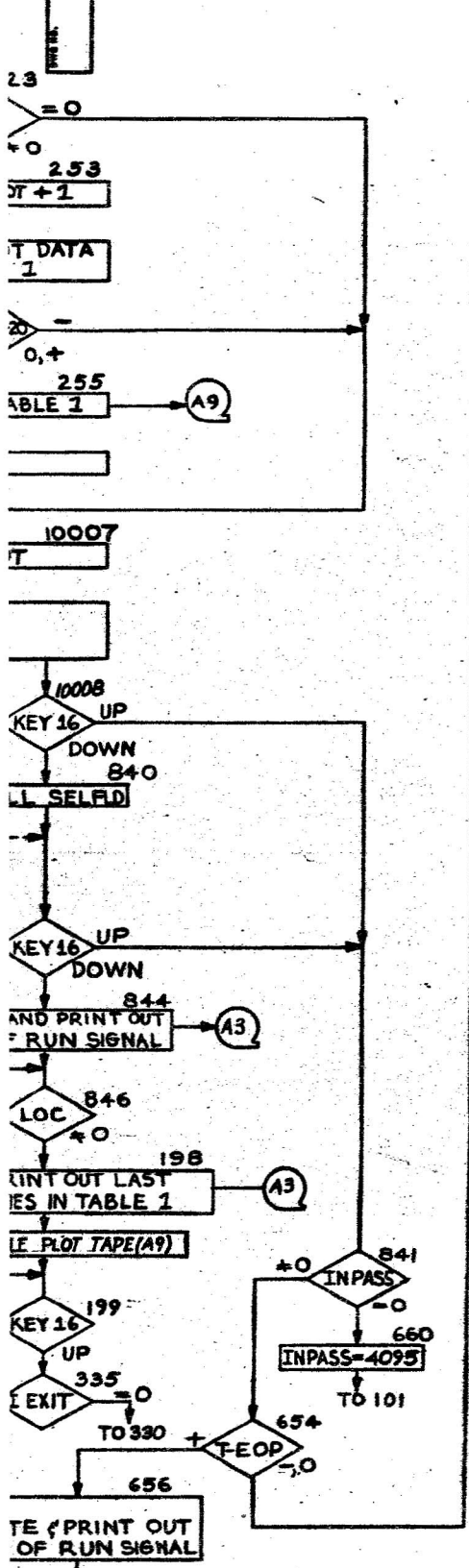


WRITE A
END OF



-54-

REVISIONS				
REV	ENGINEER	NOTICE	DESCRIPTION	DATE
			RELEASE	



REFERENCE DRAWING

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
1	ONLY THE ITEM(S) LISTED ON THIS DRAWING AND IDENTIFIED BY VENDOR NAME(S), ADDRESS(ES), AND PART NUMBER(S) HAVE BEEN TESTED AND APPROVED BY ISG FOR USE IN 1. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY ISG.			
2	COMMERCIAL PRODUCT(S) AS APPLICABLE TO AND COMPLETELY INTERCHANGEABLE WITH (SEE SOURCE OF SUPPLY).			

QTY REQD	SYM-BOL	DESCRIPTION OR IDENTIFYING NO.	PART OR IDENTIFYING NO.	SPECIFICATION	MATERIAL OR NOTES	DATE	ITEM NO.
LIST OF MATERIAL OR PARTS LIST							
IDENT. OF SYM-BOL: VENDOR ITEM SEE SPEC OR SOURCE OF SUPPLY		DESIGNED <i>F. R. R.</i>		DATE			
ALL DIMENSIONS AND TOLERANCES APPLY TO FINISHED PART		DESIGN CHECK <i>[Signature]</i>		INTERNATIONAL BUSINESS MACHINES CORP. FEDERAL SYSTEMS DIVISION NEW YORK, N.Y.			
RELIEF DIMENSIONS SHOWN IN DRAWING ARE IN INCHES. TOLERANCE IS .005 INCHES. DECIMALS. ANGLES		DRAWN <i>LIG</i>		TITLE			
MATERIAL		CHECKED <i>F. R. R.</i>		ENVIRONMENTAL SYSTEM FOR GEMINI RENDEZVOUS			
PART		DESIGN APPROVAL <i>E. H. W.</i>		CODE IDENT NO. SIZE DRAWING NO.			
PART TREAT				03640 F 65-554-0032			
				SCALE NONE WT SHEET 5			

FROM 170 F

851
TRANSFORM $\Delta\phi, \Delta\theta, \Delta\psi$ INTO
ERRORS ABOUT PLATFORM
AXES

770
|ROLL
ERROR| .04

61
YAW ERROR = 0

60
|YAW
ERROR| .04
362
PITCH ERROR = 0

130
TRANSFORM ERRORS ABOUT
PLATFORM AXES INTO ERRORS
ABOUT BODY AXES

131
 $\psi_{bc} \geq \frac{\pi}{2}$
-0
132
SIBC = ψ_{bc}
+
133
SIBC = $2\pi - \psi_{bc}$

135
USE FIRST PITCH
RATE (XKP1)

157
USE SECOND PITCH
RATE (XKP2)

158
USE THIRD PITCH
RATE (XKPS)

785
COMPUTE RATES ABOUT
BODY AXES

-0
|WXV| -X LIMIT

789
WXV -X LIMIT
790
WXV +X LIMIT

74
-0
|WYV| -X LIMIT

792
WYV
793
WYV -X LIMIT

791
|WZV| -X LIMIT

796
WZV
797
WZV -X LIMIT

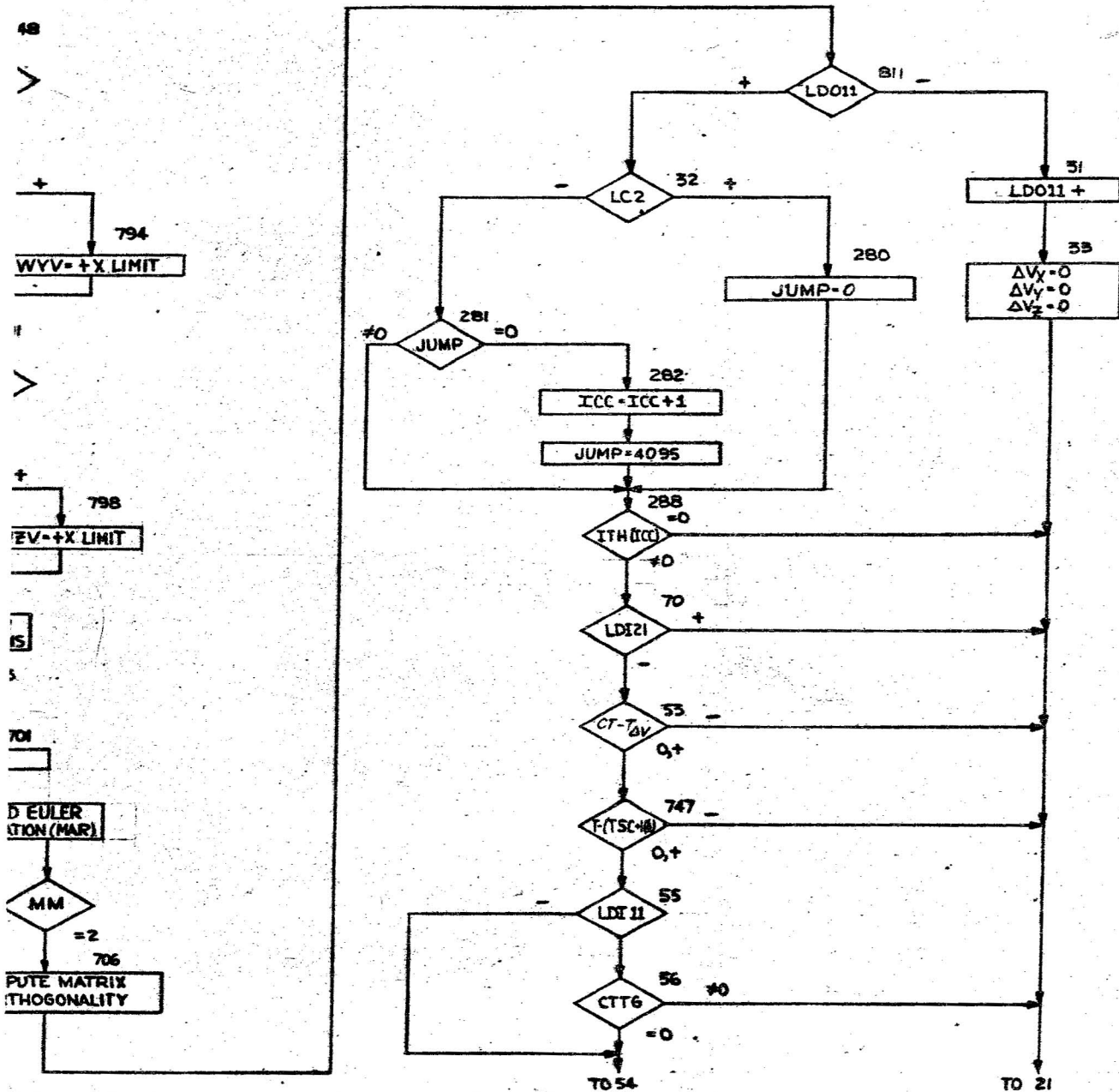
795
ZERO THRUSTER
ACCELERATION TERM

703
INITIAL
702
RETURN (PRT)

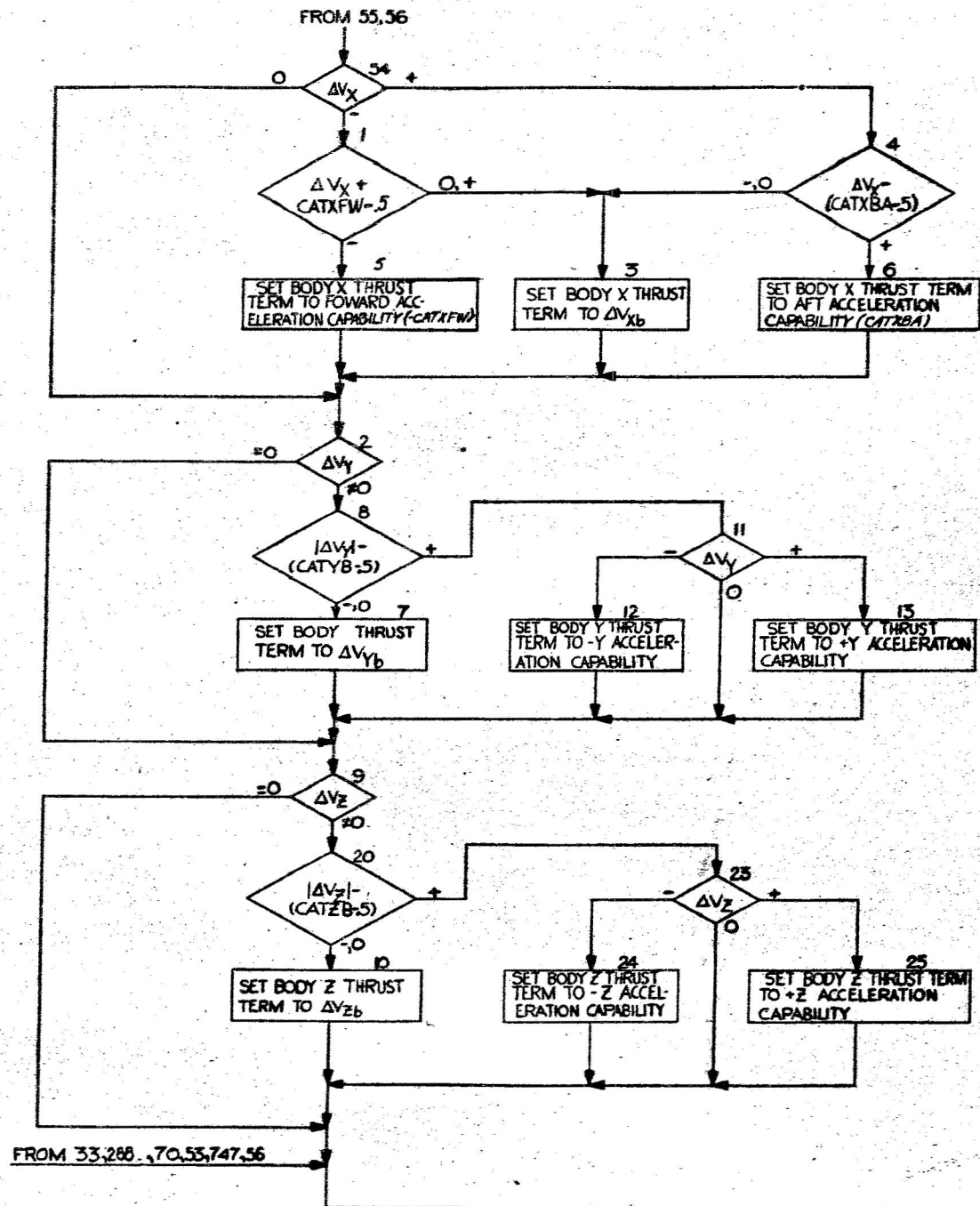
705
MODIFIED
INTEGRAL

705
SOLVE EQUATIONS
OF MOTION OF
SPACE CRAFT ATTITUDE

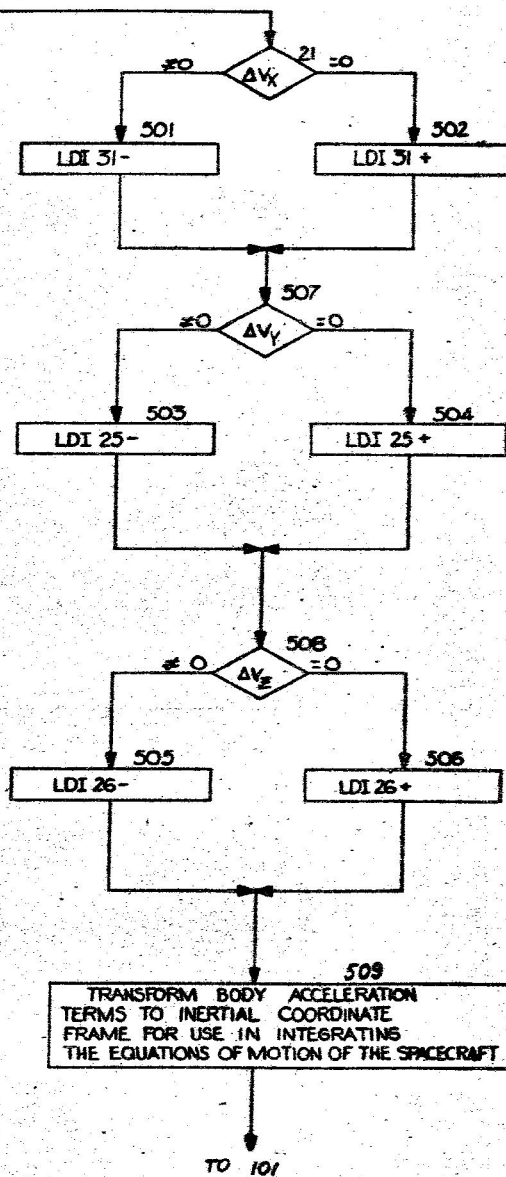
COMF
OR



QTY REQD	SYM BOL	ABBREVIATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	SPECIFICATION	MATERIAL OR NOTES	DATE TESTED	ITEM NO.
LIST OF MATERIAL OR PARTS LIST							
UNLESS NOTED BREAK CORNERS OUTSIDE MIN MAX INSIDE MIN MAX		DESIGNED <i>F. K...</i>	DATE	INTERNATIONAL BUSINESS MACHINES CORP. FEDERAL SYSTEMS DIVISION NEW YORK 22, N.Y.			
ALL DIMENSIONS AND TOLERANCES APPLY TO FINISHED PART UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON 2 PLACE DECIMALS DIMENSIONS ON 3 PLACE DECIMALS		CHECKED <i>[Signature]</i>		TITLE ENVIRONMENTAL SYSTEM FOR GEMINI RENDEZVOUS			
MATERIAL <i>[Blank]</i>		DRAWING CHECK <i>F. K...</i>		CODE IDENT NO. SIZE 03640 F 65-554-0032			
MARK (CASE DEPTH)		DESIGN APPROVAL <i>S.H. [Signature]</i>		SCALE NONE WT SHEET 4			



REVISIONS				
SYN	ISSUE NOTICE	DESCRIPTION	DATE	CHK
		RELEASE		



REFERENCE DRAWING

QTY REQD	SYM- BOL	NUMERICAL OR DESCRIPTION	PART OR IDENTIFYING NO.	SPECIFICATION	MATERIAL OR PARTS	QTY REQD OR NO.
LIST OF MATERIAL OR PARTS LIST						
UNLESS NOTED BREAK CORNERS OUTSIDE		DESIGNED <i>F. Reiser</i>	DATE	INTERNATIONAL BUSINESS MACHINES CORP. FEDERAL SYSTEMS DIVISION 500 MADISON AVE. NEW YORK 22, N. Y.		
INSIDE		DESIGN CHECK <i>[Signature]</i>		TITLE ENVIRONMENTAL SYSTEM FOR GEMINI RENDEZVOUS		
ALL DIMENSIONS AND TOLERANCES APPLY TO FINISHED PART		STANDARD 16		CODE IDENT NO. 03640 SIZE F		
HOLE CLOSURE SPECIFICATIONS ARE IN CHARGE TOLERANCE ON 2 PLACES 3 PLACES DECIMAL DECIMALS ANGLES		MANUFACTURE <i>F. Reiser</i>		55-554-0032		
MATERIAL		DESIGN APPROVAL <i>[Signature]</i>		SCALE NONE WT		
HARD		CASES (DEPTH)		SHEET 5		
SURF TREAT						

APPENDIX A

Listings of the FORTRAN/FAP programs
comprising the Catch-Up and Rendezvous Dynamic and
Static Simulation Programs.


```

DIMENSION CXT(11),CYT(11),CZT(11),CDTWT(11),VLIST(1),DLIST(100),
*ILIST(100),SLIST(100),TLIST(100)
DIMENSION REM(165),ITH(10),SC(14),TARG(14),TABLE1(50,20),
*PSLST(50),IPLST(50),RKK(50)
COMMON CDVXSP,CDVYSP,CDVZSP,CDPHSC,CDPSSC,CDTHSC,AKX1 ,AKX2 ,
1AKX3 ,AKX4 ,AKY1 ,AKY2 ,AKY3 ,AKY4 ,AKZ1 ,AKZ2 ,AKZ3 ,
2AKZ4 ,ASFX ,ASFY ,ASFZ ,CO ,COI ,C2 ,C2I ,CA11 ,
3CA12 ,CA13 ,CA21 ,CA22 ,CA23 ,CA31 ,CA32 ,CA33 ,CAPT ,
4CAPTI ,CATXBA,CATXBI,CCAB ,CCABI ,CCAS ,CCASI ,CCK1 ,CCK2 ,
5CCK3 ,CCK4 ,CCK5 ,CCKF ,CCKG ,CCPHIB,CCPSIB,CCPSIR,CCR ,
6CCRB ,CCRBI ,CCRI ,CCRS ,CCRSI ,CCTHB ,CCTHR ,CCWSTD,CCWTDL,
7CCZT ,CDEL ,CDRRD ,CDTM ,CDTW ,CDTWT ,CDTWX ,CDTX ,CDV ,
8CDVF ,CDVI ,CDVT ,CDVXB ,CDVXM ,CDVXS ,CDVXZ ,CDVYB ,CDVYM ,
9CDVYS ,CDVYZ ,CDVZB ,CDVZM ,CDVZS ,CDVZZ ,CDXD ,CDXFD ,CDYD
COMMON CDYFD ,CDZD ,CDZFD ,CFX ,CFY ,CFZ ,CMI ,CM3 ,
1CM4 ,CM5 ,CM6 ,CNPC ,CNS ,CNVX ,CNVY ,CNVZ ,CNYC ,
2COEFF ,COINT ,COMGS ,CPHIB ,CPHIBC,CPSBCP,CPSIB ,CPSIBC,CPSIBM,
3CR1 ,CRA ,CRLO ,CRR ,CRRD ,CRRG ,CRR1 ,CRRPI ,CRS ,
4CSADPI,CSAPG ,CSAPI ,CSAPR ,CSPHIB,CSPSIB,CSPSIR,CSRDP1,CSRPG ,
5CSRPI ,CSRPR ,CSRT ,CSRTI ,CSTD ,CSTD1 ,CSTHB ,CSTHR ,CSTZ ,
6CSWSTD,CSWTDL,CT ,CTD ,CTDAS ,CTDV ,CTHB ,CTHBC ,CTHBCP,
7CTHBM ,CTLRP ,CTM ,CTR1 ,CTRR ,CTTG ,CTW ,CTX ,CUDPHS,
8CUDPSS,CUDTHS,CWSTD ,CWSTD1,CWTTPR,CX ,CXM ,CXRD ,CXSD ,
9CXT ,CXTD ,CXZ ,CY ,CYM ,CYRD ,CYSD ,CYT ,CYTD
COMMON CYZ ,CZ ,CZM ,CZRD ,CZSD ,CZT ,CZTD ,CZZ ,
1DELAY ,DONPRT,DT ,DUM1 ,DUM2 ,DUM3 ,DUM4 ,DUM5 ,DUM6 ,
2DUM7 ,DUM8 ,DUM9 ,DUM10 ,DUM11 ,DUM12 ,DUM13 ,DUM14 ,DUM15 ,
3DUM16 ,DUM17 ,DUM18 ,FIN ,FP ,FXP ,FXPP ,FYP ,FYPP ,
4FZP ,FZPP ,GC ,IC ,IEXIT ,IOLP ,IWRITE,K2C ,KC ,
5KWRITE,L ,LC1 ,LC1J ,LC2 ,LC3 ,LC4A ,LC4B ,LC4C ,
6LC4D ,LC4E ,LC4F ,LC4G ,LC5 ,LC7 ,LC8 ,LC10 ,LCA ,
7LCS ,LCY ,LDI00 ,LDI10 ,LDI11 ,LDI13 ,LDI20 ,LDI21 ,LDI22 ,
8LDI25 ,LDI26 ,LDI31 ,LD001 ,LD005 ,LD011 ,LD012 ,LD013 ,LD062 ,
9LD063 ,LFDI ,LQT ,M ,N ,PHIB ,PINT ,PSIB ,RDGD
COMMON RRDREF,SRAA ,SREA ,SW ,TEST ,TFTXV ,TFTYV ,TFTZV ,
1THETAB,TIME ,TPC ,TRI ,TSC ,TVX ,TVY ,TVZ ,TYC ,
2XGRT ,XGRTD ,XKRDR ,YGRT ,YGRTD ,ZGRT ,ZGRTD
EQUIVALENCE (DELVX,CDVXSP),(DELVY,CDVYSP),(DELVZ,CDVZSP),(CDPHSC,
*DPHIB),(CDPSSC,DPSIB),(CDTHSC,DTHB),(VLIST,CDVXSP)
EQUIVALENCE (XI ,SC( 1)),(YI ,SC( 2)),(ZI ,SC( 3)),
1(TI ,SC( 4)),(DXI ,SC( 5)),(DYI ,SC( 6)),(DZI ,SC( 7)),
2(SCVM,SC( 8)),(RJ ,SC( 9)),(DTT ,SC(10)),(Q37 ,SC(11)),
3(Q38 ,SC(12)),(Q39 ,SC(13))
EQUIVALENCE (XTI ,TARG( 1)),(YTI ,TARG( 2)),(ZTI ,TARG( 3)),
1(TTI ,TARG( 4)),(DXTI,TARG( 5)),(DYTI,TARG( 6)),(DZTI,TARG( 7)),
2(TVM ,TARG( 8)),(RJJ ,TARG( 9)),(DTTP,TARG(10))
EQUIVALENCE (A11 ,RKK(50)),(A12 ,RKK(49)),(A13 ,RKK(48)),
1(A21 ,RKK(47)),(A22 ,RKK(46)),(A23 ,RKK(45)),(A31 ,RKK(44)),
2(A32 ,RKK(43)),(A33 ,RKK(42)),(DA11,RKK(41)),(DA12,RKK(40)),
3(DA13,RKK(39)),(DA21,RKK(38)),(DA22,RKK(37)),(DA23,RKK(36)),
4(DA31,RKK(35)),(DA32,RKK(34)),(DA33,RKK(33))
ZZ1=CLOCKF(XX)
CALL HDA7
CALL SELFLO
KT1= 5

```

```

KT2= 9
KT3=14
CALL LDB6
READ INPUT TAPE KT1,1032,(REM(I),I=1,165)
330 ZZ2=CLOCKF(XX)
DO 331 I= 1, 20
DO 331 J=1,50
331 TABLE1(J,I)=0.
DO 332 I= 1, 50
332 RKK(I)=0.
DO 333 I= 1,14
SC(I) =0.
333 TARG(I)=0.
DO 334 I= 1,331
334 VLIST(I)=0.
READ INPUT TAPE KT1,1010,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
READ INPUT TAPE KT1,1002, EOP ,STCT ,CTZ ,CTE ,COINT ,
1DELAY ,ESPR ,DT ,BINT ,CAPT ,COMGT ,CSRT ,XI ,YI ,
2ZI ,DXI ,DYI ,DZI ,XTI ,YTI ,ZTI ,DXTI ,DYTI ,
3DZTI ,RJ ,CATXBA,CATXFW,CATYB ,CATZB ,XKRDR ,CCAB ,CCAS ,
4CCRB ,CCRS ,CO ,C2 ,A11 ,A12 ,A13 ,A21 ,A22 ,
5A23 ,A31 ,A32 ,A33 ,AKX1 ,AKX2 ,AKX3 ,AKX4 ,AKY1 ,
6AKY2 ,AKY3 ,AKY4 ,AKZ1 ,AKZ2 ,AKZ3 ,AKZ4 ,XKP1 ,XKP2 ,
7XKP3 ,XKR ,XKY ,CCR
READ INPUT TAPE KT1,1001,(ITH(I),I=1,10) ,MACOP ,MACNTR,MACINT,
1MODCR ,NPF ,LOC ,LMDI
READ INPUT TAPE KT1,1012, LFP ,LGANG ,LRR ,LSRA ,
1LRM ,LDB ,LFDI ,IEXIT
READ INPUT TAPE KT1,1005,KEYSET
57 CALL KEYCN (KOMBO)
IF (KEYSET-KOMBO) 58,59,58
58 PRINT 1017,KEYSET
PAUSE
GO TO 57
59 WRITE OUTPUT TAPE KT2,1037, EOP ,STCT ,CTZ ,CTE ,COINT ,
1DELAY ,ESPR ,DT ,BINT ,CAPT ,COMGT ,CSRT ,XI ,YI ,
2ZI ,DXI ,DYI ,DZI ,XTI ,YTI ,ZTI ,DXTI ,DYTI ,
3DZTI ,RJ ,CATXBA,CATXFW,CATYB ,CATZB ,XKRDR
WRITE OUTPUT TAPE KT2,1038, CCAB ,CCAS ,CCRB ,CCRS ,CO ,
1C2 ,A11 ,A12 ,A13 ,A21 ,A22 ,A23 ,A31 ,A32 ,
2A33 ,AKX1 ,AKX2 ,AKX3 ,AKX4 ,AKY1 ,AKY2 ,AKY3 ,AKY4 ,
3AKZ1 ,AKZ2 ,AKZ3 ,AKZ4 ,XKP1 ,XKP2 ,XKP3
WRITE OUTPUT TAPE KT2,1039, XKR ,XKY ,CCR
WRITE OUTPUT TAPE KT2,1040,(ITH(I),I=1,10),MACOP ,MACNTR,MACINT,
1MODCR ,NPF ,LOC ,LMDI ,LFP ,LGANG ,LRR ,LSRA ,LRM ,
2LDB ,LFDI ,IEXIT
WRITE OUTPUT TAPE KT2,1011,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
PRINT 1013,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
IF (LMDI) 115,125,115
115 IPL=0
108 IPL=IPL+1
IF(IPL-100) 116,116,109
116 READ INPUT TAPE KT1,1050,SLIST(IPL),TLIST(IPL),DLIST(IPL),ILIST(IP
*L)
IF(ILIST(IPL)) 108,109,108
109 JK=IPL

```



```

WRITE OUTPUT TAPE KT2,1051
DO 113 I=1,JK
113 WRITE OUTPUT TAPE KT2,1052,SLIST(I),TLIST(I),DLIST(I),ILIST(I)
125 IF (LOC) 252,94,252
252 READ INPUT TAPE KT1,1014,LIMIT,(PSLST(LPL),IPLST(LPL),LPL=1,2)
IF (LIMIT-2) 903,903,251
251 READ INPUT TAPE KT1,1015,(PSLST(LPL),IPLST(LPL),LPL=3,LIMIT)
903 WRITE OUTPUT TAPE KT2,1016,(PSLST(LPL),IPLST(LPL),LPL=1,LIMIT)
CALL HDA9
94 IF (MACOP) 95,96,95
95 RT= ZTI
RAD=.01745329
THT=XTI*RAD
PHT=YTI*RAD
GAT=DXTI*RAD
PST=DYTI*RAD
CTHT=COSF(THT)
STHT=SINF(THT)
CPHT=COSF(PHT)
SPHT=SINF(PHT)
XTI=RT*CTHT*CPHT
YTI=RT*STHT*CPHT
ZTI=RT*SPHT
CGAT=COSF(GAT)
SGAT=SINF(GAT)
CPST=COSF(PST)
SPST=SINF(PST)
DXTI=DZTI*(CTHT*(CPHT*SGAT-SPHT*CPST*CGAT)-STHT*SPST*CGAT)
DYTI=DZTI*(STHT*(CPHT*SGAT-SPHT*CPST*CGAT)+CTHT*SPST*CGAT)
DZTI=DZTI*(SPHT*SGAT+CPHT*CPST*CGAT)
RDT=(XTI*DXTI+YTI*DYTI+ZTI*DZTI)/RT
IF (MACNTR) 98,97,98
98 RF=YI +RT
AZTF=ATN1F(ZI,RT)
AXTF=XI /RT
SINX=SINF(AXTF)
COSX=COSF(AXTF)
SINZ=SINF(AZTF)
COSZ=COSF(AZTF)
PHX=ARSINF(COSX*SPHT-SINX*CPHT*CPST)
SPHX =SINF(PHX)
CPHX =COSF(PHX)
DTHX=ARSINF(SINX*SPST/CPHX)
THX =THT -DTHX
PSX1 =COSF(DTHX)*CPST
PSX2 =SINF(DTHX)*SPST*SPHT
IF (XI ) 28,28,29
29 PSX=ARCCOSF(PSX1+PSX2)
GO TO 30
28 PSX=ARCCOSF(-PSX1+PSX2)
30 PHF=ARSINF(COSZ*SPHX+SINZ*CPHX*SINF(PSX))
DTHF=ARSINF(SINZ*COSF(PSX)/COSF(PHF))
THF =THX-DTHF
U233 =PHF/RAD
U234 =THF/RAD
ZI=RF*SINF(PHF)

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```

XI=RF*COSF(PHF)*COSF(THF)
YI=RF*COSF(PHF)*SINF(THF)
SF=YTI*DZTI-ZTI*DYTI
SG=ZTI*DXTI-XTI*DZTI
SH=XTI*DYTI-YTI*DXTI
SJ=SQRTF(SF**2+SG**2+SH**2)
HT=SJ/RT
BOB1=ZTI*SG-YTI*SH
BOB2=XTI*SH-ZTI*SF
BOB3=YTI*SF-XTI*SG
BOBL= SQRTF(BOB1**2+BOB2**2+BOB3**2)
P= BOB3*YI-BOB2*ZI
Q= BOB1*ZI-BOB3*XI
S= BOB2*XI-BOB1*YI
BIGD=2.E-8*(-SJ*RF**2/RT)*(DXI -RDT*AXTF-HT)
BIGE=2.E-8*RF*(DYI +RDT)
BIGF=2.E-8*RF*BOBL*DZI
BIGA=2.E-8*SG*ZI-2.E-8*SH*YI
BIGB=2.E-8*SH*XI-2.E-8*SF*ZI
BIGC=2.E-8*SF*YI-2.E-8*SG*XI
DEL= BIGA*YI*(4.E-16*S) + BIGB*ZI*(4.E-16*P) + BIGC*XI*(4.E-16*Q)
* - BIGC*YI*(4.E-16*P) - BIGB*XI*(4.E-16*S) - BIGA*ZI*(4.E-16*Q)
C11= YI*(4.E-16*S) - ZI*(4.E-16*Q)
C21= BIGB*(2.E-8*S) - BIGC*(2.E-8*Q)
C22= BIGA*(2.E-8*S) - BIGC*(2.E-8*P)
C31= 2.E-8*(BIGB*ZI-BIGC*YI)
C12= XI*(4.E-16*S) - ZI*(4.E-16*P)
C32= 2.E-8*(BIGA*ZI-BIGC*XI)
C13= XI*(4.E-16*Q) - YI*(4.E-16*P)
C23= BIGA*(2.E-8*Q) - BIGB*(2.E-8*P)
C33= 2.E-8*(BIGA*YI-BIGB*XI)
DELD=BIGD/DEL
DELE=BIGE/DEL
DELF=BIGF/DEL
DZI=C13*DELD-C23*DELE+C33*DELF
DYI=-C12*DELD+C22*DELE-C32*DELF
DXI=C11*DELD-C21*DELE+C31*DELF
GO TO 96
97 CTHF =COSF (XI *RAD)
STHF =SINF (XI *RAD)
CPHF =COSF( YI * RAD)
SPHF= SINF (YI * RAD)
XI=ZI *CTHF * CPHF
YI=ZI *STHF * CPHF
ZI=ZI *SPHF
CGAF = COSF(DXI* RAD)
SGAF =SINF(DXI* RAD)
CPSF= COSF(DYI * RAD)
SPSF= SINF (DYI * RAD)
DXI=DZI * (CTHF*(CPHF * SGAF- SPHF*CPSF*CGAF)- STHF*SPSF *CGAF)
DYI=DZI * (STHF * (CPHF* SGAF-SPHF* CPSF* CGAF)+ CTHF *SPSF* CGAF)
DZI=DZI * (SPHF * SGAF +CPHF * CPSF*CGAF)
96 TI=SQRTF(XI**2+YI**2+ZI**2)
TTI=SQRTF(XTI**2+YTI**2+ZTI**2)
RJJ=RJ
IF (MACINT) 995,996,995

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```

995 DXI=-DXI
    DYI=-DYI
    DZI=-DZI
    DXTI=-DXTI
    DYTI=-DYTI
    DZTI=-DZTI
    DTT=10.*DT
    DTP=DTT
990 CALL STATE (SC)
    CALL STATE (TARG)
    T=T+DTT
992 IF (T-BINT) 990,989,989
989 WRITE OUTPUT TAPE KT2,642,T,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
    WRITE OUTPUT TAPE KT2,643,XI,YI,ZI
    WRITE OUTPUT TAPE KT2,644,DXI,DYI,DZI
    WRITE OUTPUT TAPE KT2,645,XTI,YTI,ZTI
    WRITE OUTPUT TAPE KT2,644,DXTI,DYTI,DZTI
    DXI=-DXI
    DYI=-DYI
    DZI=-DZI
    DXTI=-DXTI
    DYTI=-DYTI
    DZTI=-DZTI
996 T=CTZ
    KPL0T= 0
    MUD5=0
851 ZZ=CLOCKF(XX)
    PRINT 1004
    CO=CTZ
    XLIMIT=.20
    GC=1.407654E+16
    RE=2.0925874E+07
    ICC=1
    JUMP=0
    LDI22=0
    MM=0
    IPL=1
    ITAG=0
    INPASS=0
    INITAL=0
    TRIDOT=0.
553 IF (MODCR-1) 554,555,102
554 LDI10=0
    LDI11=4095
    LDI13=0
    GO TO 102
555 LDI10=4095
    LDI11=0
    LDI13=4095
    GO TO 102
101 DTT=DT
    DTP=DTT
    CALL STATE (SC)
    CALL STATE (TARG)
    T=T+DTT
102 TIME =T

```

```

IF (ITH(ICC)) 71,72,71
71 DXPF0=P11*Q37+P21*Q38+P31*Q39
DYPF0=P12*Q37+P22*Q38+P32*Q39
DZPF0=P13*Q37+P23*Q38+P33*Q39
FXP=FXP+DXPF0*DT
FYP=FYP+DYPF0*DT
FZP=FZP+DZPF0*DT
FXP1=FXP
FYP1=FYP
FZP1=FZP
TFTXV=TFTXV+ABSF(FTXV)*DT
TFTYV=TFTYV+ABSF(FTYV)*DT
TFTZV=TFTZV+ABSF(FTZV)*DT
72 OMEGA=ATN1F((DZI*YI-DYI*ZI),(DZI*XI-DXI*ZI))
Q30=SINF(OMEGA)
Q31=COSF(OMEGA)
OIOTA=ARCCOSF((DYI*XI-DXI*YI)/(TI*SCVM))
OMU=ARCCOSF((XI*Q31+YI*Q30)/TI)
IF (ZI) 700,704,704
700 OMU=-OMU
704 Q32=SINF(OMU)
Q33=COSF(OMU)
Q34=SINF(OIOTA)
Q35=COSF(OIOTA)
P11=-Q32*Q31-Q33*Q30*Q35
P12=-Q33*Q31+Q32*Q30*Q35
P13=Q34*Q30
P21=Q33*Q31*Q35-Q32*Q30
P22=-Q33*Q30-Q32*Q31*Q35
P23=-Q31*Q34
P31=Q33*Q34
P32=-Q32*Q34
P33=Q35
PB11=A11*P11+A21*P21+A31*P31
PB12=A11*P12+A21*P22+A31*P32
PB13=A11*P13+A21*P23+A31*P33
PB21=A12*P11+A22*P21+A32*P31
PB22=A12*P12+A22*P22+A32*P32
PB23=A12*P13+A22*P23+A32*P33
PB31=A13*P11+A23*P21+A33*P31
PB32=A13*P12+A23*P22+A33*P32
PB33=A13*P13+A23*P23+A33*P33
PHIB=ATN1F(PB33,-PB23)
THETAB=ATN1F(-PB12,PB11)
Q82=ABSF(SINF(PHIB))
IF(Q82-.4)601,601,602
601 PSIB=ATN1F(-PB13,-PB23/COSF(PHIB))
GO TO 603
602 PSIB=ATN1F(-PB13,PB33/SINF(PHIB))
603 CONTINUE
IF (LDO05) 551,552,551
551 SENSE LIGHT 4
GO TO 556
552 IF(SENSE LIGHT 4) 556,556
556 IF(LDI 21) 114,428,114
428 CALL KEYS (17,KEY17)

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      IF (KEY17) 427,300,427
427 LDI21=2047
      TSC=T
      GO TO 114
300 IF (T-STCT) 114,110,110
110 LDI21=4095
      TSC=T
114 IF(LMDI) 104,111,104
104 IF(T-TLIST(IPL))111,105,105
105 K=ILIST(IPL)
      IF(LMDI) 107,106,106
106 VLIST(K)=DLIST(IPL)
      GO TO 117
107 CALL INSERT (ILIST(IPL),DLIST(IPL),SLIST(IPL))
117 IPL=IPL+1
118 IF(K-288) 104,119,104
119 IF(LDI21) 122,104,122
122 TSC=T
      GO TO 104
111 XRI=XTI-XI
      YRI=YTI-YI
      ZRI=ZTI-ZI
      TRI=SQRTF(XRI**2+YRI**2+ZRI**2)
126 IF(INPASS) 127,128,127
127 TRIDOT=(TRI-TRI1)/DT
128 TRI1=TRI
767 XRV=A11*XRI+A21*YRI+A31*ZRI
      YRV=A12*XRI+A22*YRI+A32*ZRI
      ZRV=A13*XRI+A23*YRI+A33*ZRI
      RAA=6.28318530-ATN1F(YRV,SQRTF(XRV**2+ZRV**2))
      IF (RAA-25./57.2957795) 761,761,762
762 IF (RAA-335./57.2957795) 763,761,761
761 SRAA=(SINF(RAA)-CCRB)/(1.+CCRS)
      REAPR=SQRTF(XRV**2+YRV**2)
      REA=ATN1F(ZRV,SIGNF(REAPR,XRV))
      IF (REA-25./57.2957795) 764,764,765
765 IF (REA-335./57.2957795) 763,764,764
764 SREA=(SINF(REA)-CCAB)/(1.+CCAS)
197 IF (ABSF(WXV )-.02618) 768,768,763
768 IF (ABSF(WYV )-.02618) 769,769,763
769 IF (ABSF(WZV )-.02618) 766,766,763
766 IF(LQT) 763,448,763
448 LDI00=4095
      GO TO 449
763 LDI00=0
449 IF(LFDI) 450,455,450
450 IF(LDI21) 451,454,451
451 IF(CTX-200.) 456,452,452
452 IF(LD005) 453,456,453
455 IF(CRLO) 450,456,450
453 IF(LDI00) 454,456,454
454 LRDFDI=4095
      GO TO 787
456 LRDFDI=0
787 RADTD=(XTI*DXTI+YTI*DYTI+ZTI*DZTI)/TTI
      GAMT=ARSINF(RADTD/TVM)

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```

    THET=ATN1F(YTI,XTI)
    PHIT=ARSINF(ZTI/TTI)
    PSIT=ATN1F((XTI-DYTI-YTI*DXTI),(TYI*DZTI-ZTI*RADTD))
    STHET=SINF(THET)
    CTHET=COSF(THET)
    SPHIT=SINF(PHIT)
    CPHIT=COSF(PHIT)
    SPSIT=SINF(PSIT)
    CPSIT=COSF(PSIT)
    T11=STHET*SPSIT+CTHET*CPSIT*SPHIT
    T12=CPHIT*CTHET
    T13=STHET*CPSIT-CTHET*SPSIT*SPHIT
    T21=-CTHET*SPSIT+STHET*CPSIT*SPHIT
    T22=CPHIT*STHET
    T23=-CTHET*CPSIT-STHET*SPSIT*SPHIT
    T31=-CPHIT*CPSIT
    T32=SPHIT
    T33=CPHIT*SPSIT
    XP=T11*XI+T21*YI+T31*ZI
    YP=T12*XI+T22*YI+T32*ZI
    ZP=T13*XI+T23*YI+T33*ZI
    XPD=T11*DXI+T21*DYI+T31*DZI
    YPD=T12*DXI+T22*DYI+T32*DZI
    ZPD=T13*DXI+T23*DYI+T33*DZI
    TEMP=ATN1F(XP,YP)
    IF(TEMP-3.14159265) 772,772,771
771 TEMP=TEMP-6.28318530
772 XGRT=TTI*TEMP
    TEMP2=XP**2+YP**2
    TEMP1=SQRTF(TEMP2)
    YGRT=TEMP1-TTI
    ZGRT=ZP
    CGAMT=COSF(GAMT)
    XGRTD=TTI*((YP*XPD-XP*YPD)/TEMP2+RADTD*TEMP+TVM*CGAMT
    YGRTD=-RADTD+(XP*XPD+YP*YPD)/TEMP1
    ZGRTD=ZPD
920 CONTINUE
    PHIBS=PHIB
    THBS=THETAB
    PSIBS=PSIB
    TRIS=TRI
    SRAAS=SRAA
    SREAS=SREA
    IF(LFP) 421,420,421
421 FXP=FXP+FXPSV
    FYP=FYP+FYPSPV
    FZP=FZP+FZPSV
    FXPS=FXP
    FYPSP=FYP
    FZPS=FZP
    CALL QUANT(FXP,.11)
    CALL QUANT(FYP,.11)
    CALL QUANT(FZP,.11)
    FXPSP=FXP
    FYPSP=FYP
    FZPSP=FZP

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```

FXPSV=FXPS-FXP
FYPSV=FYPS-FYP
FZPSV=FZPS-FZP
420 IF (LGANG) 401,400,401
401 CALL QUANT (PHIB ,.036/57.2957795)
    CALL QUANT (THETAB,.036/57.2957795)
    CALL QUANT (PSIB ,.036/57.2957795)
400 IF (LRR) 403,402,403
403 CALL QUANT (TRI ,.49.178)
402 IF (LSRA) 405,422,405
405 CALL QUANT (SRAA ,.42594791*.1953125E-2)
407 CALL QUANT (SREA ,.42594791*.1953125E-2)
422 IF (LRM) 423,408,423
423 IF (TRI-1510797.) 408,424,424
424 TRI=1510797.
408 CALL CTRL1
640 CONTINUE
    IF (LDO62) 426,901,426
901 LDI21=0
426 LDO62=4095
    PHIB =PHIBS
    THETAB=THBS
    PSIB =PSIBS
    TRI =TRIS
    SRAA =SRAAS
    SREA =SREAS
404 IF (LDB) 409,406,409
409 IF (ABSF(DPHIB)-3./57.2957795) 410,410,411
410 ARG2=.66666667E-1/57.2957795
    GO TO 412
411 ARG2=.66666667E-1*6./57.2957795
412 CALL QUANT (DPHIB,ARG2)
    IF (ABSF(DPSIB)-3./57.2957795) 413,413,415
413 ARG2=.66666667E-1/57.2957795
    GO TO 416
415 ARG2=.66666667E-1*6./57.2957795
416 CALL QUANT (DPSIB,ARG2)
    IF (ABSF(DTHB)-3./57.2957795) 417,417,418
417 ARG2=.66666667E-1/57.2957795
    GO TO 419
418 ARG2=.66666667E-1*6./57.2957795
419 CALL QUANT (DTHB,ARG2)
406 IF (INPASS) 202,200,202
202 IF (IWRITE) 200,7001,200
7001 IF (T-CO-DELAY+1.) 201,7000,201
7000 DONPRT=4095.
201 IF (T-CO-DELAY) 121,641,641
121 IF (KEY 14) 414,120,414
120 IF (T-10.) 159,159,150
150 IF (LDO 05) 154,155,154
154 IF (CTTG) 155,157,155
157 IF (FIN) 155,151,155
151 IF (DEL VX) 159,152,159
152 IF (DEL VY) 159,153,159
153 IF (DEL VZ) 159,155,159
155 IF (TRI- ESPRI) 159,159,158

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158 CALL KEYS (15,KEY15)
    IF(KEY15) 112,156,112
159 CALL KEYS (19,KEY19)
    IF(KEY19) 112,156,112
156 IF(IOLP) 112,10006,112
641 CO=CO+COINT
200 CALL KEYS (20,KEY20)
    IF (KEY20) 414,120,414
414 WRITE OUTPUT TAPE KT2,642,T,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
    WRITE OUTPUT TAPE KT2,643,XI,YI,ZI
    WRITE OUTPUT TAPE KT2,1007,XRV,YRV,ZRV
    WRITE OUTPUT TAPE KT2,644,DXI,DYI,DZI
    WRITE OUTPUT TAPE KT2,92,TI
    WRITE OUTPUT TAPE KT2,645,XTI,YTI,ZTI
    WRITE OUTPUT TAPE KT2,644,DXTI,DYTI,DZTI
    WRITE OUTPUT TAPE KT2,92,TTI
    WRITE OUTPUT TAPE KT2,82,XGRT,YGRT,ZGRT
    WRITE OUTPUT TAPE KT2,83,XGRTO,YGRTO,ZGRTO
    WRITE OUTPUT TAPE KT2,15,A11,A12,A13
    WRITE OUTPUT TAPE KT2,16,A21,A22,A23
    WRITE OUTPUT TAPE KT2,16,A31,A32,A33
    WRITE OUTPUT TAPE KT2,19,T11,T12,T13
    WRITE OUTPUT TAPE KT2,16,T21,T22,T23
    WRITE OUTPUT TAPE KT2,16,T31,T32,T33
    WRITE OUTPUT TAPE KT2,17,P11,P12,P13
    WRITE OUTPUT TAPE KT2,16,P21,P22,P23
    WRITE OUTPUT TAPE KT2,16,P31,P32,P33
    WRITE OUTPUT TAPE KT2,18,PB11,PB12,PB13
    WRITE OUTPUT TAPE KT2,16,PB21,PB22,PB23
    WRITE OUTPUT TAPE KT2,16,PB31,PB32,PB33
    WRITE OUTPUT TAPE KT2,646,TRI,RAA,REA
    WRITE OUTPUT TAPE KT2,659,TRIDOT,SRAA,SREA
    WRITE OUTPUT TAPE KT2,647,THETAB,PSIB,PHIB
    WRITE OUTPUT TAPE KT2,648,FXP1,FYP1,FZP1,FXPSP,FYPSP,FZPSP
    WRITE OUTPUT TAPE KT2,649,DELVX,DELVY,DELVZ
    WRITE OUTPUT TAPE KT2,650,FTXV,FTYV,FTZV
    WRITE OUTPUT TAPE KT2,651,TFTXV,TFTYV,TFTZV
    IF(LRDFDI) 187,830,187
187 WRITE OUTPUT TAPE KT2,652,DREA,DRAA,DROLL
    GO TO 188
830 WRITE OUTPUT TAPE KT2,652,DTHB,DPSIB,DPHIB
188 WRITE OUTPUT TAPE KT2,1008
    WRITE OUTPUT TAPE KT2,653,WYV,WZV,WXV
    WRITE OUTPUT TAPE KT2,27,OMU,OMEGA,OIOTA
999 WRITE OUTPUT TAPE KT2,1029,TIME,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
    WRITE OUTPUT TAPE KT2,1034
    WRITE OUTPUT TAPE KT2,1030,
        REM( 1),CT ,REM( 2),CA11 ,
1REM( 3),CA12 ,REM( 4),CA13 ,REM( 5),CDVT ,REM( 6),CWTTPR,
2REM( 7),CA21 ,REM( 8),CA22 ,REM( 9),CA23 ,REM( 10),CDVI ,
3REM( 11),CDEL ,REM( 12),CA31 ,REM( 13),CA32 ,REM( 14),CA33 ,
4REM( 15),CDVF ,REM( 16),CTM ,REM( 17),CSPSIR,REM( 18),CFX ,
5REM( 19),CX ,REM( 20),CDVXB ,REM( 21),CDTM ,REM( 22),CCPSIR,
6REM( 23),CFY ,REM( 24),CY ,REM( 25),CDVYB ,REM( 26),CTDV ,
7REM( 27),CSTHR ,REM( 28),CFZ ,REM( 29),CZ ,REM( 30),CDVZB ,
8REM( 31),TSC ,REM( 32),CCTHR ,REM( 33),CDVXS ,REM( 34),CXM ,
9REM( 35),CDVXM

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WRITE OUTPUT TAPE KT2,1030, REM( 36),CTDAS ,REM( 37),CM1 ,
1REM( 38),CDVYS ,REM( 39),CYN ,REM( 40),CDVYM ,REM( 41),CRLO ,
2REM( 42),CM3 ,REM( 43),CDVZS ,REM( 44),CZM ,REM( 45),CDVZM ,
3REM( 46),CPHIB ,REM( 47),CM4 ,REM( 48),CDV ,REM( 49),CXZ ,
4REM( 50),CDXD ,REM( 51),CPSIB ,REM( 52),CM5 ,REM( 53),CSTZ ,
5REM( 54),CYZ ,REM( 55),CDVD ,REM( 56),CTHB ,REM( 57),CM6 ,
6REM( 58),CTD ,REM( 59),CZZ ,REM( 60),CDZO ,REM( 61),CUDPHS ,
7REM( 62),COEFF ,REM( 63),CSTD ,REM( 64),CCRI ,REM( 65),CXTD ,
8REM( 66),CUDPSS ,REM( 67),CCK1 ,REM( 68),CSTD ,REM( 69),COI ,
9REM( 70),CYTD

WRITE OUTPUT TAPE KT2,1030, REM( 71),CUDTHS ,REM( 72),CCK2 ,
1REM( 73),CWSTD ,REM( 74),C2I ,REM( 75),CZTD ,REM( 76),CDPHSC ,
2REM( 77),CCK3 ,REM( 78),CWSTD ,REM( 79),CCABI ,REM( 80),CXRD ,
3REM( 81),CDPSSC ,REM( 82),CCK4 ,REM( 83),CNS ,REM( 84),CCASI ,
4REM( 85),CYRD ,REM( 86),CDTHSC ,REM( 87),CCK5 ,REM( 88),CTX ,
5REM( 89),CCRBI ,REM( 90),CZRD ,REM( 91),CPSIBC ,REM( 92),CCKF ,
6REM( 93),CDTX ,REM( 94),CCRSI ,REM( 95),CDXFD ,REM( 96),CTHBC ,
7REM( 97),CCKG ,REM( 98),CRA ,REM( 99),CATXBI ,REM(100),CDYFD ,
8REM(101),CPSBCP ,REM(102),TEST ,REM(103),CRI ,REM(104),CAPTI ,
9REM(105),CDZFD

WRITE OUTPUT TAPE KT2,1030, REM(106),CTHBCP ,REM(107),FIN ,
1REM(108),CDRRD ,REM(109),CSRTI ,REM(110),CXSD ,REM(111),CPSIBM ,
2REM(112),FP ,REM(113),RRDREF ,REM(114),CRS ,REM(115),CYSD ,
3REM(116),CTHBM ,REM(117),SW ,REM(118),CRRD ,REM(119),COMGS ,
4REM(120),CZSD ,REM(121),CRR ,REM(122),CRRPI ,REM(123),CRRG ,
5REM(124),CRR ,REM(125),CDVXZ ,REM(126),CSAPI ,REM(127),CSADPI ,
6REM(128),CSAPG ,REM(129),CSAPR ,REM(130),CDVYZ ,REM(131),CSRPI ,
7REM(132),CSRDP ,REM(133),CSRPG ,REM(134),CSRPR ,REM(135),CDVZZ ,
8REM(136),RDGD ,REM(137),CTRR ,REM(138),CTR1 ,REM(139),CTLRP ,
9REM(140),CDTW

WRITE OUTPUT TAPE KT2,1030, REM(141),TVX ,REM(142),TVY ,
1REM(143),TVZ ,REM(144),TYC ,REM(145),TPC

WRITE OUTPUT TAPE KT2,1019, REM(141),TVX ,REM(142),TVY ,
1REM(143),TVZ ,REM(144),TYC ,REM(145),TPC

WRITE OUTPUT TAPE KT2,1036, REM(146),LC1 ,REM(147),LC4C ,
1REM(148),LC10 ,REM(149),LDI00 ,REM(150),IC ,REM(151),LC1J ,
2REM(152),LC4D ,REM(153),LCA ,REM(154),LDI21 ,REM(155),KC ,
3REM(156),LC2 ,REM(157),LC7 ,REM(158),LCS ,REM(159),LD005 ,
4REM(160),K2C ,REM(161),LC3 ,REM(162),LC8 ,REM(163),N ,
5REM(164),M ,REM(165),L

WRITE OUTPUT TAPE KT2,1031,(CXT(I),CYT(I),CZT(I),CDTWT(I),I=1,11)
GO TO 159
112 IF (3.14159265/6.+0.05-CWTTPR) 10001,10001,10009
10009 IF (LC3) 10002,10001,10002
10002 IF (CT-(CTM+150.)) 10001,146,146
146 IF (TEST) 10001,10005,10001
10005 CALL KEYS (19,KEY19)
IF (KEY19) 140,141,140
140 IF (MUD5) 10004,10003,10004
10003 MUD5=4095
PRINT 1006
10004 PRINT 1009,T,XGRT,YGRT,ZGRT,XGRD,YGRD,ZGRD,TRI,TRIDOT,LDI00
141 CALL KEYS (20,KEY20)
IF (KEY20) 142,10006,142
142 WRITE OUTPUT TAPE KT2,1006
WRITE OUTPUT TAPE KT2,1009,T,XGRT,YGRT,ZGRT,XGRD,YGRD,ZGRD,TRI,

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      *TRIDOT,LDI00
      GO TO 10006
10001 CALL KEYS (19,KEY19)
      IF (KEY19) 143,144,143
143 PRINT 1003,T,XGRT,YGRT,ZGRT,CDVXSP,CDVYSP,CDVZSP,LDI21,LRDFDI
144 CALL KEYS (20,KEY20)
      IF (KEY20) 145,10006,145
145 WRITE OUTPUT TAPE KT2,1004
      WRITE OUTPUT TAPE KT2,1003,T,XGRT,YGRT,ZGRT,CDVXSP,CDVYSP,CDVZSP,
      *LDI21,LRDFDI
10006 CALL KEYS (14,KEY14)
      IF (KEY 14) 7002,124,7002
124 IF (IWRITE) 7002,123,7002
7002 DONPRT=4095.
123 IF (LOC) 253,10007,253
253 KPL0T=KPL0T+1
      DUM 1=XI
      DUM 2=YI
      DUM 3=ZI
      DUM 4=DXI
      DUM 5=DYI
      DUM 6=DZI
      DUM 7=XTI
      DUM 8=YTI
      DUM 9=ZTI
      DUM10=DXTI
      DUM11=DYTI
      DUM12=DZTI
      DUM13=LC1
      DUM14=LC2
      DUM15=LC3
      DUM16=LC5
      DUM17=LC7
      DUM18=LC8
      DO 904 JP=1,LIMIT
      IPSUB=IPLST(JP)
904 TABLE1(JP,KPL0T)=VLIST(IPSUB)
      IF (KPL0T-20) 10007,255,255
255 WRITE TAPE KT3,((TABLE1(LP1,LP2),LP1=1,LIMIT),LP2=1,20)
      KPL0T=0
10007 CTE=CTE+DT
      CFX=0.
      CFY=0.
      CFZ=0.
10008 CALL KEYS (16,KEY16)
      IF (KEY16) 840,841,840
840 CALL HDA7
      CALL SELFLO
      ZZ3=CLOCKF(XX)
      ZZ3=ZZ3-ZZ2
      CALL KEYS (16,KEY16)
      IF (KEY16) 844,841,844
844 PRINT 1301, NRUN1,NRUN2,ZZ3
      WRITE OUTPUT TAPE KT2,1301,NRUN1,NRUN2,ZZ3
846 IF (LOC) 198,199,198
198 WRITE OUTPUT TAPE KT2,1298,(TABLE1(JK,20),JK=1,LIMIT)

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PRINT 1298,(TABLE1(JK,20),JK=1,LIMIT)
END FILE KT3
199 CALL KEYS (16, KEY16)
IF (KEY16) 336,335,336
335 IF (IEXIT) 336,330,336
336 ZZ4=CLOCKF(XX)
ZZ4=ZZ4-ZZ1
PRINT 1302,ZZ4
WRITE OUTPUT TAPE KT2,1302,ZZ4
CALL EXIT
841 IF (INPASS)654,660,654
660 INPASS=4095
GO TO 101
654 IF (T-EOP)655,655,656
655 IF (LRDFDI) 171,831,171
171 DRAA=RAA
DREA=REA
DROLL=0.
IF (ABSF(DRAA)-3.14159265) 172,173,173
173 IF (DRAA) 189,190,190
189 DRAA=DRAA+6.28318530
GO TO 172
190 DRAA=DRAA-6.28318530
172 IF (ABSF(DREA)-3.14159265) 174,191,191
191 IF (DREA) 192,193,193
192 DREA=DREA+6.28318530
GO TO 174
193 DREA=DREA-6.28318530
174 IF (ABSF(DRAA)-.34906585) 176,176,177
177 IF (DRAA) 178,176,179
178 DRAA=-.34906585
GO TO 176
179 DRAA= .34906585
176 IF (ABSF(DREA)-.34906585) 180,180,181
181 IF (DREA) 182,180,183
182 DREA=-.34906585
GO TO 180
183 DREA= .34906585
180 EXV=0.
EZV=-DRAA
EYV=-DREA
XKP=XKP1
GO TO 785
831 EXP=-DPHIB
EYP=-DPSIB
EZP=DTHB
770 IF (ABSF(EXP)-.04) 60,60,61
61 EYP=0.
GO TO 362
60 IF (ABSF(EYP)-.04) 130,130,362
362 EZP=0.
130 EXV=EXP
EYV=-EZP
EZV=EYP
131 IF (CPSIBC-3.14159265/2.) 132,132,133
132 SIBC=CPSIBC

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GO TO 134
133 SIBC=2.*3.14159265-CPSIBC
134 IF(SIBC-1.) 135,135,136
135 XKP=XKP1
GO TO 785
136 IF(SIBC-1.5) 137,137,138
137 XKP=XKP2
GO TO 785
138 XKP=XKP3
785 WXV=XKR*EXV
WYV=XKP*EYV
WZV=XKY*EZV
IF(ABSF(WXV)-XLIMIT)748,748,749
749 IF(WXV)789,789,790
789 WXV=-XLIMIT
GO TO 748
790 WXV=XLIMIT
748 IF(ABSF(WYV)-XLIMIT)791,791,792
792 IF(WYV)793,793,794
793 WYV=-XLIMIT
GO TO 791
794 WYV=XLIMIT
791 IF(ABSF(WZV)-XLIMIT)795,795,796
796 IF(WZV)797,797,798
797 WZV=-XLIMIT
GO TO 795
798 WZV=XLIMIT
795 FTXV=0.
FTYV=0.
FTZV=0.
703 IF(INITAL)702,701,702
702 CALL PRT
701 INITAL=1
CALL MAR (9,DT/8.,RKK( 50), 25,8,MM)
GO TO (705,811),MM
705 DA11=WZV*A12-WYV*A13
DA12=WXV*A13-WZV*A11
DA13=WYV*A11-WXV*A12
DA21=WZV*A22-WYV*A23
DA22=WXV*A23-WZV*A21
DA23=WYV*A21-WXV*A22
DA31=WZV*A32-WYV*A33
DA32=WXV*A33-WZV*A31
DA33=WYV*A31-WXV*A32
CALL DEV
811 IF (LD011) 31,32,31
31 LD011=0
33 DELVX=0.
DELYY=0.
DELVZ=0.
GO TO 21
32 IF(LC2) 281,280,281
280 JUMP=0
GO TO 288
281 IF(JUMP) 288,282,288
282 ICC=ICC+1

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      JUMP=4095
288 IF (ITH(ICC)) 70, 21,70
   70 IF (LDI21) 53,21,53
   53 IF(CT-CTDV) 21,747,747
747 IF(T-(TSC + 10.)) 21,55,55
   55 IF(LDI 11) 54,56,54
   56 IF(CTTG) 21,54,21
   54 IF(DELVX) 1,2,4
     1 IF(DELVX+(CATXFW-0.5)) 5,3,3
     4 IF(DELVX-(CATXBA-0.5)) 3,3,6
     3 FTXV=CDVXB
     GO TO 2
     5 FTXV=-CATXFW
     GO TO 2
     6 FTXV= CATXBA
     2 IF(DELVY)8,9,8
     8 IF(ABSF(DELVY)-(CATYB-.5))7,7,11
     7 FTYV=CDVYB
     GO TO 9
    11 IF(DELVY)12,9,13
    12 FTYV=-CATYB
     GO TO 9
    13 FTYV=CATYB
     9 IF(DELVZ)20,21,20
    20 IF(ABSF(DELVZ)-(CATZB-.5))10,10,23
    10 FTZV=CDVZB
     GO TO 21
    23 IF(DELVZ)24,21,25
    24 FTZV=-CATZB
     GO TO 21
    25 FTZV=CATZB
    21 IF(DELVX) 501,502,501
502 LDI31=0
     GO TO 507
501 LDI31=4095
507 IF(DELVY) 503,504,503
504 LDI25=0
     GO TO 508
503 LDI25=4095
508 IF(DELVZ) 505,506,505
506 LDI26=0
     GO TO 509
505 LDI26=4095
509 Q37=FTXV*A11+FTYV*A12+FTZV*A13
    Q38=FTXV*A21+FTYV*A22+FTZV*A23
    Q39=FTXV*A31+FTYV*A32+FTZV*A33
     GO TO 101
656 ZZ3=CLOCKF(XX)
    ZZ3=ZZ3-ZZ2
    PRINT 1300, NRUN1,NRUN2,ZZ3
    WRITE OUTPUT TAPE KT2,1300,NRUN1,NRUN2,ZZ3
     GO TO 846
   14 FORMAT(1H ,17X,8HVELOCITY,32X,3E20.8)
   15 FORMAT(1H0/1H ,5X,6HMATRIX,6X,21HINERTIAL - SPACECRAFT,19X,3E20.8)
   16 FORMAT(1H ,57X,3E20.8)
   17 FORMAT(1H0/1H ,5X,6HMATRIX,6X,21HINERTIAL - NAVIGATION,19X,3E20.8)

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18 FORMAT(1H0/1H ,5X,6HMATRIX,6X,23HSPACECRAFT - NAVIGATION,17X,
*3E20.8)
19 FORMAT(1H0/1H ,5X,6HMATRIX,6X,17HTARGET - INERTIAL,23X,3E20.8)
27 FORMAT(1H0/1H ,5X,37HORBITAL PARAMETERS MU - OMEGA - IOTA,15X,3E2
*0.8)
82 FORMAT(1H ,17X,40HS/C IN TARG. CYLINDRICAL X-Y-Z POSITION,3E20.8)
83 FORMAT(1H ,43X,14HX-Y-Z VELOCITY,3E20.8)
92 FORMAT(1H ,17X,16HVECTOR MAGNITUDE,24X,E20.8)
642 FORMAT (1H1,5X,4HTIME,8X,18HFROM PROBLEM START,22X,E20.8,6X,
*5HDATE ,I2,1H/,I2,1H/,I2,7X,4HRUN ,A6,A6)
643 FORMAT (1H0/1H ,5X,6HGEMINI,6X,19HPOSITION - INERTIAL,21X,3E20.8)
644 FORMAT (1H ,17X,19HVELOCITY - INERTIAL,21X,3E20.8)
645 FORMAT (1H ,5X,6HTARGET,6X,19HPOSITION - INERTIAL,21X,3E20.8)
646 FORMAT (1H0/1H ,5X,5HRADAR,7X,35HRANGE - AZIMUTH (R) - ELEVATION (
*A),5X,3E20.8)
647 FORMAT (1H0,5X,13HGIMBAL ANGLES,19H THETA - PSI - PHI,20X,3E20
*.8)
648 FORMAT (1H0,5X,47HINTEGRATING ACCELEROMETER OUTPUTS - BEFORE COMP,
*5X,3E20.8/1H ,39X,12H- AFTER COMP,6X,3E20.8)
649 FORMAT(1H0,5X,12HDELTA V ,14HMETER READINGS,26X,3E20.8)
650 FORMAT(1H0/1H ,5X,12HTHRUSTER ,12HACCELERATION,28X,3E20.8)
651 FORMAT(1H0,5X,12HDELTA V ,13HTOTAL APPLIED,27X,3E20.8)
652 FORMAT(1H0/1H ,5X,12HERROR ANGLES,40X,3E20.8)
653 FORMAT (1H ,5X,13HTURNING RATES,39X,3E20.8)
659 FORMAT (1H ,17X,28HRATE - SINE R - SINE A,12X,3E20.8)
1000 FORMAT (1H1,(1H0,8E15.6))
1001 FORMAT (10I3,7I6)
1002 FORMAT (6E12.8)
1003 FORMAT (1H ,5X,F9.1,3F16.1,3F10.0,2I10)
1004 FORMAT (1H0,4X,10HTIME (SEC),3X,13HTRAILING (FT),3X,13HVERTICAL (F
*T),4X,12HOUT-OF-PLANE,3X,7HX-METER,3X,7HY-METER,3X,7HZ-METER,5X,5H
*LDI2I,4X,6HLRDFDI)
1005 FORMAT (0I2)
1006 FORMAT (1H0,6X,4HTIME,15X,22HRELATIVE POSITION (FT),14X,23HRELATIV
*E VELOCITY (FPS),6X,22HRADAR RANGE RANGE RATE,2X,5HLDI00/4X,
*9H(SECONDS),6X,8HTRAILING,6X,8HVERTICAL,2X,12HOUT-OF-PLANE,3X,8HTR
*AILING,3X,8HVERTICAL,2X,9HOUT-PLANE,7X,4H(FT),8X,5H(FPS))
1007 FORMAT (1H ,26X,24H- TARGET IN GEMINI FRAME,7X,3E20.8)
1008 FORMAT (1H ,67X,5HPITCH,16X,3HYAW,17X,4HROLL)
1009 FORMAT (1H ,3X,F9.1,3F14.1,3F11.2,F14.1,F11.2,I7)
1010 FORMAT (11X,I2,1X,I2,1X,I2,10X,A6,A6)
1011 FORMAT (1H0,5HDATE ,I2,1H/,I2,1H/,I2//1H ,4HRUN ,A6,A6)
1012 FORMAT (12I6)
1013 FORMAT (1H1,5HDATE ,I2,1H/,I2,1H/,I2//1H ,4HRUN ,A6,A6)
1014 FORMAT (I2,46X,2(A6,1X,I3,2X))
1015 FORMAT (6(A6,1X,I3,2X))
1016 FORMAT (1H0,5H PLOT,6X,4HSUB-/1H ,6HSYMBOL,4X,6HSCRIPT//
*(1H ,A6,5X,I3))
1017 FORMAT (1H0,43HOPERATOR ERROR - CHECK MQ KEYS - PUSH START/1H ,17H
*PROGRAM EXPECTS , 0I2 ,15H TO BE ENTERED////)
1019 FORMAT (5(1H ,A6,0I4,3X))
1029 FORMAT (1H1,7HTIME = ,E15.8,9H SECONDS.,52X,5HDATE ,I2,1H/,I2,1H/,
*I2,7X,4HRUN ,A6,A6/)
1030 FORMAT (5(1H ,A6,E15.8,2X))
1031 FORMAT (1H0,36H11 VALUES EACH OF X,Y,Z, AND DELTA T/(1H ,4E20.8))
1032 FORMAT (12A6)

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1034 FORMAT (1H,40H SIMULATED COMPUTER OUTPUTS ON THIS PAGE.//)
1036 FORMAT (5(1H,A6,1X,15,11X))
1037 FORMAT(1H1,6HEOP,E15.8,3X,6HSTCT,E15.8,3X,6HCTZ,E15.8,3X,
16HCTE,E15.8,3X,6HCOINT,E15.8/1H,6HDELAY,E15.8,3X,
26HESPR,E15.8,3X,6HDT,E15.8,3X,6HBINT,E15.8,3X,
36HCAPT,E15.8/1H,6HCOMGT,E15.8,3X,6HCSRT,E15.8,3X,
46HXI,E15.8,3X,6HYI,E15.8,3X,6HZI,E15.8/1H,
56HDXI,E15.8,3X,6HDVI,E15.8,3X,6HDZI,E15.8,3X,
66HXTI,E15.8,3X,6HYTI,E15.8/1H,6HZTI,E15.8,3X,
76HDXTI,E15.8,3X,6HDYTI,E15.8,3X,6HDZTI,E15.8,3X,
86HRJ,E15.8/1H,6HCATXBA,E15.8,3X,6HCATXFW,E15.8,3X,
96HCATYB,E15.8,3X,6HCATZB,E15.8,3X,6HXRDR,E15.8)
1038 FORMAT(1H,6HCCAB,E15.8,3X,6HCCAS,E15.8,3X,6HCCRB,E15.8,3X,
16HCCRS,E15.8,3X,6HCO,E15.8/1H,6HC2,E15.8,3X,
26HA11,E15.8,3X,6HA12,E15.8,3X,6HA13,E15.8,3X,
36HA21,E15.8/1H,6HA22,E15.8,3X,6HA23,E15.8,3X,
46HA31,E15.8,3X,6HA32,E15.8,3X,6HA33,E15.8/1H,
56HAKX1,E15.8,3X,6HAKX2,E15.8,3X,6HAKX3,E15.8,3X,
66HAKX4,E15.8,3X,6HAKY1,E15.8/1H,6HAKY2,E15.8,3X,
76HAKY3,E15.8,3X,6HAKY4,E15.8,3X,6HAKZ1,E15.8,3X,
86HAKZ2,E15.8/1H,6HAKZ3,E15.8,3X,6HAKZ4,E15.8,3X,
96HXP1,E15.8,3X,6HXP2,E15.8,3X,6HXP3,E15.8)
1039 FORMAT(1H,6HXR,E15.8,3X,6HXY,E15.8,3X,6HCR,E15.8)
1040 FORMAT(1H,7HITH(1),15,3X,7HITH(2),15,3X,7HITH(3),15,3X,7HITH(
14),15,3X,7HITH(5),15/1H,7HITH(6),15,3X,7HITH(7),15,3X,7HITH(
28),15,3X,7HITH(9),15,3X,7HITH(10),15/1H,6HMACOP,16,3X,
36HMACNTR,16,3X,6HMACINT,16,3X,6HMODCR,16,3X,6HNPF,16/1H,
46HLOC,16,3X,6HLMDI,16,3X,6HLFP,16,3X,6HLGANG,16,3X,
56HLRR,16/1H,6HLSRA,16,3X,6HLRM,16,3X,6HLDB,16,3X,
66HLFDI,16,3X,6HEXIT,16)
1050 FORMAT (A6,2E15.8,14)
1051 FORMAT (1H0,6HSYMBOL,8X,4HTIME,14X,4HDATA,10X,9HSUBSCRIPT//)
1052 FORMAT (1H,A6,2E18.8,16)
1298 FORMAT (1H,6E16.8)
1300 FORMAT (5H RUN,A6,A6,24H TERMINATED BY EOP AFTER,-2PF9.2,
*9H MINUTES.)
1301 FORMAT (5H RUN,A6,A6,27H TERMINATED BY KEY 16 AFTER,-2PF9.2,
*9H MINUTES.)
1302 FORMAT (17H THIS PROGRAM RAN,-2PF9.2,9H MINUTES.)
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

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STORAGE NOT USED BY PROGRAM

DEC OCT
7961 17431DEC OCT
32230 76746

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT					
AKX1	32555	77453	AKX2	32554	77452	AKX3	32553	77451	AKX4	32552	77450	AKY1	32551	77447
AKY2	32550	77446	AKY3	32549	77445	AKY4	32548	77444	AKZ1	32547	77443	AKZ2	32546	77442
AKZ3	32545	77441	AKZ4	32544	77440	ASFX	32543	77437	ASFY	32542	77436	ASFZ	32541	77435
COI	32539	77433	CO	32540	77434	C21	32537	77431	C2	32538	77432	CA11	32536	77430
CA12	32535	77427	CA13	32534	77426	CA21	32533	77425	CA22	32532	77424	CA23	32531	77423
CA31	32530	77422	CA32	32529	77421	CA33	32528	77420	CAPT1	32526	77416	CAPT	32527	77417
CATXBA	32525	77415	CATXBI	32524	77414	CCAB1	32522	77412	CCAB	32523	77413	CCASI	32520	77410
CCAS	32521	77411	CCK1	32519	77407	CCK2	32518	77406	CCK3	32517	77405	CCK4	32516	77404
CCK5	32515	77403	CCKF	32514	77402	CCKG	32513	77401	CCPHIB	32512	77400	CCPSIB	32511	77377
CCPSIR	32510	77376	CCRB1	32507	77373	CCRB	32508	77374	CCRI	32506	77372	CCR	32509	77375
CCRSI	32504	77370	CCRS	32505	77371	CCTHB	32503	77367	CTTHR	32502	77366	CCWSTD	32501	77365
CCWTDL	32500	77364	CCZT	32499	77363	CDEL	32498	77362	CDPHSC	32558	77456	CDPSSC	32557	77455
CDRRD	32497	77361	CDTHSC	32556	77454	CDTM	32496	77360	CDTW	32495	77357	CDTWT	32494	77356
CDTWX	32483	77343	CDTX	32482	77342	CDVF	32480	77340	CDVI	32479	77337	CDV	32481	77341
CDVT	32478	77336	CDVXB	32477	77335	CDVXM	32476	77334	CDVXSP	32561	77461	CDVXS	32475	77333
CDVXZ	32474	77332	CDVYB	32473	77331	CDVYM	32472	77330	CDVYSP	32560	77460	CDVYS	32471	77327
CDVYZ	32470	77326	CDVZB	32469	77325	CDVZM	32468	77324	CDVZSP	32559	77457	CDVZS	32467	77323
CDVZZ	32466	77322	CDXD	32465	77321	CDXFD	32464	77320	COYD	32463	77317	CDYFD	32462	77316
CDZD	32461	77315	CDZFD	32460	77314	CFX	32459	77313	CFY	32458	77312	CFZ	32457	77311
CM1	32456	77310	CM3	32455	77307	CM4	32454	77306	CM5	32453	77305	CM6	32452	77304
CNPC	32451	77303	CNS	32450	77302	CNVX	32449	77301	CNVY	32448	77300	CNVZ	32447	77277
CNYC	32446	77276	COEFF	32445	77275	COINT	32444	77274	COMGS	32443	77273	CPHIBC	32441	77271
CPHIB	32442	77272	CPSBCP	32440	77270	CPSIBC	32438	77266	CPSIBM	32437	77265	CPSIB	32439	77267
CR1	32436	77264	CRA	32435	77263	CRLO	32434	77262	CRRD	32432	77260	CRRG	32431	77257
CRR1	32430	77256	CRRPI	32429	77255	CRR	32433	77261	CRS	32428	77254	CSADPI	32427	77253
CSAPG	32426	77252	CSAPI	32425	77251	CSAPR	32424	77250	CSPHIB	32423	77247	CSPSIB	32422	77246
CSPSIR	32421	77245	CSROPI	32420	77244	CSRPG	32419	77243	CSRPI	32418	77242	CSRPR	32417	77241
CSRTI	32415	77237	CSRT	32416	77240	CSTD1	32413	77235	CSTD	32414	77236	CSTHB	32412	77234
CSTHR	32411	77233	CSTZ	32410	77232	CSWSTD	32409	77231	CSWTDL	32408	77230	CTDAS	32405	77225
CTD	32406	77226	CTDV	32404	77224	CTHBCP	32401	77221	CTHBC	32402	77222	CTHBM	32400	77220
CTHB	32403	77223	CTLRP	32399	77217	CTM	32398	77216	CTR1	32397	77215	CTRR	32396	77214
CT	32407	77227	CTTG	32395	77213	CTW	32394	77212	CTX	32393	77211	CUDPHS	32392	77210
CUDPSS	32391	77207	CUDTHS	32390	77206	CWSTD1	32388	77204	CWSTD	32389	77205	CWTPR	32387	77203
CXM	32385	77201	CXRD	32384	77200	CX	32386	77202	CXSD	32383	77177	CXTD	32371	77163
CXT	32382	77176	CXZ	32370	77162	CYM	32368	77160	CYRD	32367	77157	CY	32369	77161
CYSD	32366	77156	CYTD	32354	77142	CYT	32365	77155	CYZ	32353	77141	CZM	32351	77137
CZRD	32350	77136	CZ	32352	77140	CZSD	32349	77135	CZTD	32337	77121	CZT	32348	77134
CZZ	32336	77120	DELAY	32335	77117	DELVX	32561	77461	DELVY	32560	77460	DELVZ	32559	77457
DONPRT	32334	77116	DPH1B	32558	77456	DPS1B	32557	77455	DTHB	32556	77454	DT	32333	77115
DUM10	32323	77103	DUM11	32322	77102	DUM12	32321	77101	DUM13	32320	77100	DUM14	32319	77077
DUM15	32318	77076	DUM16	32317	77075	DUM17	32316	77074	DUM18	32315	77073	DUM1	32332	77114
DUM2	32331	77113	DUM3	32330	77112	DUM4	32329	77111	DUM5	32328	77110	DUM6	32327	77107
DUM7	32326	77106	DUM8	32325	77105	DUM9	32324	77104	DUMS	32314	77072	FP	32313	77071
FXPP	32311	77067	FXP	32312	77070	FYPP	32309	77065	FYP	32310	77066	FZPP	32307	77063
FZP	32308	77064	GC	32306	77062	IC	32305	77061	IEXIT	32304	77060	IOLP	32303	77057
IWRITE	32302	77056	K2C	32301	77055	KC	32300	77054	KWRITE	32299	77053	LC10	32283	77033
LC1J	32296	77050	LC1	32297	77051	LC2	32295	77047	LC3	32294	77046	LC4A	32293	77045
LC4B	32292	77044	LC4C	32291	77043	LC4D	32290	77042	LC4E	32289	77041	LC4F	32288	77040

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MAINT ENVIRONMENT - FERNEYHOUGH IBM OMEGA, N.Y.

20

NRUN2 6082 13702	DIOTA 6081 13701	OMEGA 6080 13700	DMU 6079 13677	P11 6078 13676
P12 6077 13675	P13 6076 13674	P21 6075 13673	P22 6074 13672	P23 6073 13671
P31 6072 13670	P32 6071 13667	P33 6070 13666	PB11 6069 13665	PB12 6068 13664
P813 6067 13663	PB21 6066 13662	PB22 6065 13661	PB23 6064 13660	PB31 6063 13657
P832 6062 13656	PB33 6061 13655	PHF 6060 13654	PHIBS 6059 13653	PHIT 6058 13652
PHT 6057 13651	PHX 6056 13650	P 6055 13647	PSIBS 6054 13646	PSIT 6053 13645
PST 6052 13644	PSX1 6051 13643	PSX2 6050 13642	PSX 6049 13641	Q30 6048 13640
Q31 6047 13637	Q32 6046 13636	Q33 6045 13635	Q34 6044 13634	Q35 6043 13633
Q82 6042 13632	Q 6041 13631	RAA 6040 13630	RAD 6039 13627	RADTD 6038 13626
RDT 6037 13625	REAPR 6036 13624	REA 6035 13623	RE 6034 13622	RF 6033 13621
RT 6032 13620	SF 6031 13617	SGAF 6030 13616	SGAT 6029 13615	SG 6028 13614
SH 6027 13613	SIBC 6026 13612	SINX 6025 13611	SINZ 6024 13610	SJ 6023 13607
SPHF 6022 13606	SPHIT 6021 13605	SPHT 6020 13604	SPHX 6019 13603	SPSF 6018 13602
SPSIT 6017 13601	SPST 6016 13600	SRAAS 6015 13577	SREAS 6014 13576	S 6013 13575
STCT 6012 13574	STHET 6011 13573	STHF 6010 13572	STHT 6009 13571	T11 6008 13570
T12 6007 13567	T13 6006 13566	T21 6005 13565	T22 6004 13564	T23 6003 13563
T31 6002 13562	T32 6001 13561	T33 6000 13560	TEMP1 5999 13557	TEMP2 5998 13556
TEMP 5997 13555	THBS 5996 13554	THET 5995 13553	THF 5994 13552	THT 5993 13551
THX 5992 13550	TR11 5991 13547	TRIDOT 5990 13546	TRIS 5989 13545	T 5988 13544
U233 5987 13543	U234 5986 13542	WXV 5985 13541	WYV 5984 13540	WZV 5983 13537
XKP1 5982 13536	XKP2 5981 13535	XKP3 5980 13534	XKP 5979 13533	XKR 5978 13532
XKY 5977 13531	XLINIT 5976 13530	XPD 5975 13527	XP 5974 13526	XRI 5973 13525
XRV 5972 13524	XX 5971 13523	YPD 5970 13522	YP 5969 13521	YRI 5968 13520
YRV 5967 13517	ZPD 5966 13516	ZP 5965 13515	ZRI 5964 13514	ZRV 5963 13513
ZZ1 5962 13512	ZZ2 5961 13511	ZZ3 5960 13510	ZZ4 5959 13507	ZZ 5958 13506

SYMBOLS AND LOCATIONS FOR SOURCE PROGRAM FORMAT STATEMENTS

EFN	LOC	EFN	LOC	EFN	LOC	EFN	LOC	EFN	LOC
81E	14 13467	81F	15 13461	81G	16 13447	81H	17 13444	81I	18 13432
81J	19 13416	81R	27 13404	81Z1	32 13371	81ZJ	33 13357	81ZS	92 13351
81K2	642 13342	81K3	643 13321	81K4	644 13307	81K5	645 13277	81K6	646 13265
81K7	647 13250	81K8	648 13235	81K9	649 13213	81KA	650 13202	81KB	651 13170
81KC	652 13157	81KD	653 13150	81KJ	659 13141	81V8	1000 13130	81V9	1001 13124
81VA	1002 13122	81VB	1003 13120	81VC	1004 13112	81VD	1005 13062	81VE	1006 13061
81VF	1007 13007	81VG	1008 12777	81VH	1009 12770	81VI	1010 12760	81VJ	1011 12752
81VK	1012 12741	81VL	1013 12737	81VM	1014 12726	81VN	1015 12722	81VO	1016 12717
81VP	1017 12702	81VR	1019 12660	81105	1029 12654	81106	1030 12636	81107	1031 12632
81108	1032 12620	8110A	1034 12616	8110C	1036 12605	8110D	1037 12601	8110E	1038 12426
8110F	1039 12253	8110G	1040 12241	8110Q	1050 12133	8110R	1051 12130	8110S	1052 12117
8118I	1298 12113	8118K	1300 12110	8118L	1301 12074	8118M	1302 12060		

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

	DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT				
1)	5944	13470		2)	5101	11755		3)	5120	12000		4)	32767	77777		6)	5155	12043
C1G1	5953	13501		C1G3	5954	13502		C1G4	5955	13503		C1G7	5956	13504		C1G8	5957	13505
D1170	4914	11462		D120P	605	01135		D121H	1666	03202		D1225	2097	04061		D1403	56	00070
D1422	2079	04037		D1429	2127	04117		D145A	4456	10550		D1522	2078	04036		D1529	2126	04116
E125	2096	04060		E127	2120	04110		E1129	2129	04121								

LOCATIONS OF NAMES IN TRANSFER VECTOR

MAIN7 ENVIRONMENT - FERNEYHOUGH IBM OMEGO, N.Y.

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
ARCOS	16 00020	ARSIN	15 00017	ATN1	14 00016	CLOCK	1 00001	COS	12 00014
CTRL1	22 00026	DEV	29 00035	EXIT	26 00032	HDA7	2 00002	HDA9	11 00013
INSERT	20 00024	KEYCN	7 00007	KEYS	19 00023	LDB6	4 00004	HAR	28 00034
PRT	27 00033	QUANT	21 00025	SELFLD	3 00003	SIN	13 00015	SQRT	17 00021
STATE	18 00022	(LEFT)	25 00031	(FIL)	9 00011	(FPT)	0 00000	(RTN)	6 00006
(SPH)	8 00010	(STB)	23 00027	(STH)	10 00012	(TSH)	5 00005	(WLR)	24 00030

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

ARCOS	ARSIN	ATN1	CLOCK	COS	CTRL1	DEV	EXIT	HDA7	HDA9
INSERT	KEYCN	KEYS	LDB6	HAR	PRT	QUANT	SELFLD	SIN	SQRT
STATE	(LEFT)	(FIL)	(FPT)	(RTN)	(SPH)	(STB)	(STH)	(TSH)	(WLR)

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC
330	83	00071	331	86	00077	332	88	00104	333	91	00113	334	93	00120
57	107	00451	58	109	00460	59	113	00473	115	129	01037	108	130	01042
116	132	01053	109	135	01077	113	138	01112	125	140	01136	252	141	01140
251	148	01166	903	153	01207	94	159	01231	95	160	01233	98	182	01444
29	197	01571	28	199	01600	30	200	01606	97	243	02466	96	257	02651
995	261	02711	990	269	02732	992	272	02743	989	273	02750	996	289	03100
851	292	03106	553	307	03160	554	308	03164	555	312	03173	101	316	03203
102	321	03220	71	323	03225	72	335	03332	700	341	03426	704	342	03430
601	368	03736	602	370	03757	603	371	03775	551	373	03777	552	375	04001
556	376	04003	428	377	04007	427	379	04016	300	382	04023	110	383	04030
114	385	04034	104	386	04040	105	387	04045	106	389	04055	107	391	04062
117	393	04077	118	394	04103	119	395	04111	122	396	04113	111	398	04122
126	402	04151	127	403	04153	128	404	04157	767	405	04161	762	410	04254
761	411	04264	765	415	04332	764	416	04342	197	417	04354	768	418	04361
769	419	04366	766	420	04373	448	421	04377	763	423	04402	449	424	04404
450	425	04406	451	426	04410	452	427	04415	455	428	04421	453	429	04425
454	430	04427	456	432	04432	787	433	04434	771	461	04760	772	462	04763
920	471	05052	421	479	05070	420	494	05141	401	495	05143	400	498	05173
403	499	05175	402	500	05202	405	501	05204	407	502	05214	422	503	05224
423	504	05226	424	505	05233	408	506	05235	640	507	05240	901	509	05244
426	510	05246	404	517	05264	409	518	05266	410	519	05276	411	521	05302
412	522	05306	413	524	05323	415	526	05327	416	527	05333	417	529	05350
418	531	05354	419	532	05360	406	533	05365	202	534	05367	7001	535	05373
7000	536	05402	201	537	05404	121	538	05411	120	539	05415	150	540	05422
154	541	05424	157	542	05430	151	543	05434	152	544	05440	153	545	05444
155	546	05450	158	547	05455	159	549	05466	156	551	05477	641	552	05503
200	553	05506	414	555	05515	187	614	06351	830	617	06370	188	619	06406
999	624	06450	112	647	10066	10009	648	10076	10002	649	10100	146	650	10107
10005	651	10113	140	653	10122	10003	654	10126	10004	656	10135	141	658	10170
142	660	10177	10001	664	10242	143	666	10251	144	668	10302	145	670	10311
10006	673	10351	124	675	10362	7002	676	10364	123	677	10366	253	678	10370
904	699	10501	255	701	10513	10007	710	10551	10008	714	10562	840	716	10571
844	722	10614	846	726	10647	198	727	10651	199	738	10710	335	740	10721
336	741	10723	841	748	10757	660	749	10763	654	751	10766	655	752	10772
171	753	10774	173	757	11010	189	758	11013	190	760	11017	172	761	11022
191	762	11030	192	763	11033	193	765	11037	174	766	11042	177	767	11050
178	768	11053	179	770	11056	176	771	11060	181	772	11066	182	773	11071
183	775	11074	180	776	11076	831	781	11107	770	784	11115	61	785	11123

MAIN7 ENVIRONMENT - FERNEYHOUGH IBM OMEGA, N.Y.

22

60	787	11126	362	788	11134	130	789	11136	131	792	11144	132	793	11153
133	795	11156	134	796	11162	135	797	11166	136	799	11171	137	800	11175
138	802	11200	785	803	11202	749	807	11221	789	808	11224	790	810	11227
748	811	11231	792	812	11237	793	813	11242	794	815	11245	791	816	11247
796	817	11255	797	818	11260	798	820	11263	795	821	11265	703	824	11273
702	825	11275	701	826	11300	705	829	11322	811	839	11424	31	840	11426
33	841	11430	32	845	11437	280	846	11443	281	848	11446	282	849	11452
288	851	11463	70	852	11465	53	853	11467	747	854	11474	55	855	11503
56	856	11507	54	857	11513	1	858	11516	4	859	11524	3	860	11532
5	862	11535	6	864	11540	2	865	11542	8	866	11544	7	867	11554
11	869	11557	12	870	11562	13	872	11565	9	873	11567	20	874	11571
10	875	11601	23	877	11604	24	878	11607	25	880	11612	21	881	11614
502	882	11620	501	884	11623	507	885	11625	504	886	11631	503	888	11634
508	889	11636	506	890	11642	505	892	11645	509	893	11647	656	897	11711

SUBROUTINE GEXEC

DIMENSION CXT(11),CVT(11),CZT(11),CDTWT(11)

COMMON CDVXSP,CDVYSP,CDVZSP,CDPHSC,CDPSSC,CDTHSC,AKX1,AKX2,

1AKX3,AKX4,AKY1,AKY2,AKY3,AKY4,AKZ1,AKZ2,AKZ3,

2AKZ4,ASFX,ASFY,ASFZ,CO,COI,C2,C2I,CA11,

3CA12,CA13,CA21,CA22,CA23,CA31,CA32,CA33,CAPT,

4CAPTI,CATXBA,CATXBI,CCAB,CCABI,CCAS,CCASI,CKK1,CKK2,

5CCK3,CCK4,CCK5,CCKF,CCKG,CCPHIB,CCPSIB,CCPSIR,CCR,

6CCRB,CCRB1,CCRI,CCRS,CCRSI,CCTHB,CCTHR,CCWSTD,CCWTDL,

7CCZT,CDEL,CDRRD,CDTM,CDTW,CDTWT,CDTWX,CDTX,CDV,

8CDVF,CDVI,CDVT,CDVXB,CDVXM,CDVXS,CDVXZ,CDVYB,CDVYM,

9CDVYS,CDVYZ,CDVZB,CDVZM,CDVZS,CDVZZ,CDXD,CDXFD,CDYD,

COMMON CDYFD,CDZD,CDZFD,CFX,CFY,CFZ,CM1,CM3,

1CM4,CM5,CM6,CNPC,CNS,CNVX,CNVY,CNVZ,CNYC,

2COEFF,COINT,COMGS,CPHIB,CPHIBC,CPSBCP,CPSIB,CPSIBC,CPSIBM,

3CR1,CRA,CRLO,CRR,CRRD,CRRG,CRR1,CRRPI,CRS,

4CSADPI,CSAPG,CSAPI,CSAPR,CSPHIB,CSPSIB,CSPSIR,CSRDP1,CSRPG,

5CSRPI,CSRPR,CSRT,CSRTI,CSTD,CSTD1,CSTHB,CSTHR,CSTZ,

6CSWSTD,CSWTDL,CT,CTD,CTDAS,CTDV,CTHB,CTHBC,CTHBCP,

7CTHBM,CTLRP,CTM,CTR1,CTRR,CTTG,CTW,CTX,CUDPHS,

8CUDPSS,CUDTHS,CWSTD,CWSTD1,CWTTPR,CX,CXM,CXRD,CXSD,

9CXT,CXTD,CXZ,CY,CYM,CYRD,CYSD,CYT,CYTD,

COMMON CYZ,CZ,CZM,CZRD,CZSD,CZT,CZTD,CZZ,

1DELAY,DONPRT,DT,DUM1,DUM2,DUM3,DUM4,DUM5,DUM6,

2DUM7,DUM8,DUM9,DUM10,DUM11,DUM12,DUM13,DUM14,DUM15,

3DUM16,DUM17,DUM18,FIN,FP,FXP,FXPP,FYP,FYPP,

4FZP,FZPP,GC,IC,IEXIT,IOLP,IWRITE,K2C,KC,

5KWRITE,L,LC1,LC1J,LC2,LC3,LC4A,LC4B,LC4C,

6LC4D,LC4E,LC4F,LC4G,LC5,LC7,LC8,LC10,LCA,

7LCS,LCY,LDI00,LDI10,LDI11,LDI13,LDI20,LDI21,LDI22,

8LDI25,LDI26,LDI31,LDO01,LDO05,LDO11,LDO12,LDO13,LDO62,

9LDO63,LFDI,LQT,M,N,PHIB,PINT,PSIB,RDGD,

COMMON RRDREF,SRAA,SREA,SW,TEST,TFTXV,TFTYV,TFTZV,

1THETAB,TIME,TPC,TRI,TSC,TVX,TVY,TVZ,TYC,

2XGRT,XGRTD,XKRDR,YGRT,YGRTD,ZGRT,ZGRTD,

EQUIVALENCE (DELVX,CDVXSP),(DELVY,CDVYSP),(DELVZ,CDVZSP),(CDPHSC,

*DPHIB),(CDPSSC,DPSIB),(CDTHSC,OTHB),(VLIST,CDVXSP)

MUD1=0

IF (MUD1) 2,3,2

3 CALL ENB (INTDD)

IF (LCX) 8,101,8

101 LC4A=0

LC4B=0

LC4C=0

LC4D=0

LC4E=0

LC4G=0

LCY=0

LCX=4095

8 IF (LCY) 105,102,105

102 LDO62=0

LDO05=0

CTDAS=0.

TIMEP=TIME

LCY=4095


```

105 CALL GONOGO
    CALL DSB
106 CTDAS=TIME-TIMEP
    CT=CTDAS
107 IF ((LDI20) 108,109,108
108 CALL AGE
109 IF((LDI11)115,110,115
110 IF ((LDI10) 113,112,113
112 LC4A=4095
    LC4B=0
    LC4C=0
    LC4D=0
    LC4E=0
    LC4G=0
    LCY=0
    GO TO 3
113 IF ((LDI13) 7,6,7
    6 CALL ASCENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
    GO TO 3
    7 CALL RNDZ
115 IF((LDI10)9,111,9
    9 CALL TDPRED (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
    GO TO 3
111 IF ((LDI13) 5,4,5
    4 CALL RNDZ
    5 CALL REENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
    GO TO 3
    2 RETURN
    END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

```

GEXEC7 EXECUTOR FOR MATH FLOW 7 RENDEZVOUS DYNAMIC SIMULATION

STORAGE NOT USED BY PROGRAM

DEC OCT
148 00224DEC OCT
32230 76746

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

	DEC	OCT
AKX1	32555	77453
AKY2	32550	77446
AKZ3	32545	77441
CO1	32539	77433
CA12	32535	77427
CA31	32530	77422
CATXBA	32525	77415
CCAS	32521	77411
CCK5	32515	77403
CCPSIR	32510	77376
CCRSI	32504	77370
CCWTDL	32500	77364
CDRRD	32497	77361
CDTWX	32483	77343
CDVT	32478	77336
CDVXZ	32474	77332
CDVYZ	32470	77326
CDVZZ	32466	77322
CDZD	32461	77315
CM1	32456	77310
CNPC	32451	77303
CNYC	32446	77276
CPHIB	32442	77272
CR1	32436	77264
CRR1	32430	77256
CSAPG	32426	77252
CSPSIR	32421	77245
CSRTI	32415	77237
CSTHR	32411	77233
CTD	32406	77226
CTHB	32403	77223
CT	32407	77227
CUDPSS	32391	77207
CXM	32385	77201
CXT	32382	77176
CYSD	32366	77156
CZRD	32350	77136
CZZ	32336	77120
DONPRT	32334	77116
DUM10	32323	77103
DUM15	32318	77076
DUM2	32331	77113
DUM7	32326	77106
FXPP	32311	77067
FZP	32308	77064
IWRITE	32302	77056
LC1J	32296	77050
LC4B	32292	77044

	DEC	OCT
AKX2	32554	77452
AKY3	32549	77445
AKZ4	32544	77440
CO	32540	77434
CA13	32534	77426
CA32	32529	77421
CATXBI	32524	77414
CCK1	32519	77407
CCKF	32514	77402
CCRB1	32507	77373
CCRS	32505	77371
CCZT	32499	77363
CDTHSC	32556	77454
CDTX	32482	77342
CDVXB	32477	77335
CDVVB	32473	77331
CDVZB	32469	77325
CDXD	32465	77321
CDZFD	32460	77314
CM3	32455	77307
CNS	32450	77302
COEFF	32445	77275
CPSBCP	32440	77270
CRA	32435	77263
CRRPI	32429	77255
CSAPI	32425	77251
CSRDP1	32420	77244
CSRT	32416	77240
CSTZ	32410	77232
CTDV	32404	77224
CTLRP	32399	77217
CTTG	32395	77213
CUDTHS	32390	77206
CXRD	32384	77200
CXZ	32370	77162
CYTD	32354	77142
CZ	32352	77140
DELAY	32335	77117
DPHIB	32558	77456
DUM11	32322	77102
DUM16	32317	77075
DUM3	32330	77112
DUM8	32325	77105
FXP	32312	77070
GC	32306	77062
K2C	32301	77055
LC1	32297	77051
LC4C	32291	77043

	DEC	OCT
AKX3	32553	77451
AKY4	32548	77444
ASFX	32543	77437
C2I	32537	77431
CA21	32533	77425
CA33	32528	77420
CCAB1	32522	77412
CCK2	32518	77406
CCKG	32513	77401
CCRB	32508	77374
CCTHB	32503	77367
CDEL	32498	77362
CDTH	32496	77360
CDVF	32480	77340
CDVXM	32476	77334
CDVYM	32472	77330
CDVZM	32468	77324
CDXFD	32464	77320
CFX	32459	77313
CM4	32454	77306
CNVX	32449	77301
COINT	32444	77274
CPSIBC	32438	77266
CRLO	32434	77262
CRR	32433	77261
CSAPR	32424	77250
CSRPG	32419	77243
CSTD1	32413	77235
CSWSTD	32409	77231
CTHBCP	32401	77221
CTM	32398	77216
CTW	32394	77212
CWSTD1	32388	77204
CX	32386	77202
CYM	32368	77160
CYT	32365	77155
CZSD	32349	77135
DELVX	32561	77461
DPSIB	32557	77455
DUM12	32321	77101
DUM17	32316	77074
DUM4	32329	77111
DUM9	32324	77104
FYPP	32309	77065
IC	32305	77061
KC	32300	77054
LC2	32295	77047
LC4D	32290	77042

	DEC	OCT
AKX4	32552	77450
AKZ1	32547	77443
ASFY	32542	77436
C2	32538	77432
CA22	32532	77424
CAPT1	32526	77416
CCAB	32523	77413
CCK3	32517	77405
CCPHIB	32512	77400
CCR1	32506	77372
CCTHR	32502	77366
CDPHSC	32558	77456
CDTW	32495	77357
CDVI	32479	77337
CDVXSP	32561	77461
CDVYSP	32560	77460
CDVZSP	32559	77457
CDYD	32463	77317
CFY	32458	77312
CM5	32453	77305
CNVY	32448	77300
COMGS	32443	77273
CPSIBM	32437	77265
CRRD	32432	77260
CRS	32428	77254
CSPHIB	32423	77247
CSRPI	32418	77242
CSTD	32414	77236
CSWTDL	32408	77230
CTHBC	32402	77222
CTR1	32397	77215
CTX	32393	77211
CWSTD	32389	77205
CXSD	32383	77177
CYRD	32367	77157
CYZ	32353	77141
CZTD	32337	77121
DELVY	32560	77460
DTHB	32556	77454
DUM13	32320	77100
DUM18	32315	77073
DUM5	32328	77110
FIN	32314	77072
FYP	32310	77066
IEXIT	32304	77060
KWRITE	32299	77053
LC3	32294	77046
LC4E	32289	77041

	DEC	OCT
AKY1	32551	77447
AKZ2	32546	77442
ASFZ	32541	77435
CA11	32536	77430
CA23	32531	77423
CAPT	32527	77417
CCASI	32520	77410
CCK4	32516	77404
CCPSIB	32511	77377
CCR	32509	77375
CCWSTD	32501	77365
CDPSSC	32557	77455
CDTWT	32494	77356
CDV	32481	77341
CDVXS	32475	77333
CDVYS	32471	77327
CDVZS	32467	77323
CDYFD	32462	77316
CFZ	32457	77311
CM6	32452	77304
CNVZ	32447	77277
CPHIBC	32441	77271
CPSIB	32439	77267
CRRG	32431	77257
CSADPI	32427	77253
CSPSIB	32422	77246
CSRPR	32417	77241
CSTHB	32412	77234
CTDAS	32405	77225
CTHBM	32400	77220
CTRR	32396	77214
CUDPHS	32392	77210
CWTTPR	32387	77203
CXTD	32371	77163
CY	32369	77161
CZM	32351	77137
CZT	32348	77134
DELVZ	32559	77457
DT	32333	77115
DUM14	32319	77077
DUM1	32332	77114
DUM6	32327	77107
FP	32313	77071
FZPP	32307	77063
IOLP	32303	77057
LC10	32283	77033
LC4A	32293	77045
LC4F	32288	77040

26
GEXEC7 EXECUTOR FOR MATH FLOW 7 RENDEZVOUS DYNAMIC SIMULATION

LC4G 32287 77037	LC5 32286 77036	LC7 32285 77035	LC8 32284 77034	LCA 32282 77032
LCS 32281 77031	LCY 32280 77030	LDI00 32279 77027	LDI10 32278 77026	LDI11 32277 77025
LDI13 32276 77024	LDI20 32275 77023	LDI21 32274 77022	LDI22 32273 77021	LDI25 32272 77020
LDI26 32271 77017	LDI31 32270 77016	LD001 32269 77015	LD005 32268 77014	LD011 32267 77013
LD012 32266 77012	LD013 32265 77011	LD062 32264 77010	LD063 32263 77007	LFDI 32262 77006
LQT 32261 77005	L 32259 77052	M 32260 77004	N 32259 77003	PHIB 32258 77002
PINT 32257 77001	PSIB 32256 77000	RDGD 32255 76777	RRDREF 32254 76776	SRAA 32253 76775
SREA 32252 76774	SW 32251 76773	TEST 32250 76772	TFTXV 32249 76771	TFTYV 32248 76770
TFIZV 32247 76767	THETAB 32246 76766	TIME 32245 76765	TPC 32244 76764	TRI 32243 76763
TSC 32242 76762	TVX 32241 76761	TVY 32240 76760	TVZ 32239 76757	TYC 32238 76756
VLIST 32561 77461	XGRTD 32236 76754	XGRT 32237 76755	XKRDR 32235 76753	YGRTD 32233 76751
YGRT 32234 76752	ZGRTD 32231 76747	ZGRT 32232 76750		

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENT

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
INTDD	147 00223	LCX	146 00222	MUD1	145 00221	TIMEP	144 00220		

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
2)	135 00207	3)	137 00211	6)	138 00212				

LOCATIONS OF NAMES IN TRANSFER VECTOR

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
AGE	3 00003	ASCENT	4 00004	DSB	2 00002	ENB	0 00000	GONOGO	1 00001
REENT	7 00007	RNDZ	5 00005	TDPRED	6 00006				

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

AGE	ASCENT	DSB	ENB	GONOGO	REENT	RNDZ	TDPRED
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EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC
3	11	00027	101	13	00035	8	21	00055	102	22	00061	105	27	00073
106	29	00075	107	31	00102	108	32	00104	109	33	00105	110	34	00111
112	35	00115	113	43	00134	6	44	00140	7	46	00151	115	47	00152
9	48	00154	111	50	00165	4	51	00171	5	52	00172	2	54	00203

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SUBROUTINE RNDZ
  DIMENSION GXT(11),CYT(11),CZT(11),CDTWT(11)
  COMMON CDVXSP,CDVYSP,CDVZSP,CDPHSC,CDPSSC,CDTHSC,AKX1 , AKX2 ,
1AKX3 ,AKX4 ,AKY1 ,AKY2 ,AKY3 ,AKY4 ,AKZ1 ,AKZ2 ,AKZ3 ,
2AKZ4 ,ASFX ,ASFY ,ASFZ ,CO ,COI ,CZ ,CZI ,CA11 ,
3CA12 ,CA13 ,CA21 ,CA22 ,CA23 ,CA31 ,CA32 ,CA33 ,CAPT ,
4CAPTI ,CATXBA ,CATXBI ,CCAB ,CCABI ,CCAS ,CCASI ,CCK1 ,CCK2 ,
5CCK3 ,CCK4 ,CCK5 ,CCKF ,CCKG ,CCPHIB ,CCPSIB ,CCPSIR ,CCR ,
6CCRB ,CCRBI ,CCRI ,CCRS ,CCRSI ,CCTHB ,CCTHR ,CCWSTD ,CCWTDL ,
7CCZT ,CDEL ,CDRRD ,CDTM ,CDTW ,CDTWT ,CDTWX ,CDTX ,CDV ,
8CDVF ,CDVI ,CDVT ,CDVXB ,CDVXM ,CDVXS ,CDVXZ ,CDVYB ,CDVYM ,
9CDVYS ,CDVYZ ,CDVZB ,CDVZM ,CDVZS ,CDVZZ ,CDXD ,CDXFD ,CDYD ,
  COMMON CDYFD ,CDZD ,CDZFD ,CFX ,CFY ,CFZ ,CM1 ,CM3 ,
1CM4 ,CM5 ,CM6 ,CNPC ,CNS ,CNVX ,CNVY ,CNVZ ,CNYC ,
2COEFF ,COINT ,COMGS ,CPHIB ,CPHIBC ,CPSBCP ,CPSIB ,CPSIBC ,CPSIBM ,
3CRI ,CRA ,CRLO ,CRR ,CRRD ,CRRG ,CRRI ,CRRPI ,CRS ,
4CSADPI ,CSAPG ,CSAPI ,CSAPR ,CSPHIB ,CSPSIB ,CSPSIR ,CSRDP ,CSRPG ,
5CSRPI ,CSRPR ,CSRT ,CSRTI ,CSTD ,CSTD ,CSTHB ,CSTHR ,CSTZ ,
6CSWSTD ,CSWTDL ,CT ,CTD ,CTDAS ,CTDV ,CTHB ,CTHBC ,CTHBCP ,
7CTHBM ,CTLRP ,CTM ,CTR1 ,CTRR ,CTTG ,CTW ,CTX ,CUDPHS ,
8CUDPSS ,CUDTHS ,CWSTD ,CWSTD ,CWTTTPR ,CX ,CXM ,CXRD ,CXSD ,
9CXT ,CXTD ,CXZ ,CY ,CYM ,CYRD ,CYSD ,CYT ,CYTD ,
  COMMON CYZ ,CZ ,CZM ,CZRD ,CZSD ,CZT ,CZTD ,CZZ ,
1DELAY ,DONPRT ,DT ,DUM1 ,DUM2 ,DUM3 ,DUM4 ,DUM5 ,DUM6 ,
2DUM7 ,DUM8 ,DUM9 ,DUM10 ,DUM11 ,DUM12 ,DUM13 ,DUM14 ,DUM15 ,
3DUM16 ,DUM17 ,DUM18 ,FIN ,FP ,FXP ,FXPP ,FYP ,FYPP ,
4FZP ,FZPP ,GC ,IC ,IEXIT ,IOLP ,IWRITE ,K2C ,KC ,
5KWRITE ,L ,LC1 ,LC1J ,LC2 ,LC3 ,LC4A ,LC4B ,LC4C ,
6LC4D ,LC4E ,LC4F ,LC4G ,LC5 ,LC7 ,LC8 ,LC10 ,LCA ,
7LCS ,LCY ,LDI00 ,LDI10 ,LDI11 ,LDI13 ,LDI20 ,LDI21 ,LDI22 ,
8LDI25 ,LDI26 ,LDI31 ,LD001 ,LD005 ,LD011 ,LD012 ,LD013 ,LD062 ,
9LD063 ,LFDI ,LQT ,M ,N ,PHIB ,PINT ,PSIB ,RDGD ,
  COMMON RRDREF ,SRAA ,SREA ,SW ,TEST ,TFTXV ,TFTYV ,TFTZV ,
1THETAB ,TIME ,TPC ,TRI ,TSC ,TVX ,TVY ,TVZ ,TYC ,
2XGRT ,XGRTD ,XKRDR ,YGRT ,YGRTD ,ZGRT ,ZGRTD
  EQUIVALENCE (DELVX,CDVXSP),(DELVY,CDVYSP),(DELVZ,CDVZSP),(CDPHSC,
*DPHIB),(CDPSSC,DPSIB),(CDTHSC,DTHB),(VLIST,CDVXSP)
  1 IF (LDI11) 101,109,101
101 IF(LC4D) 113,102,113
102 LC4D=4095
  LC4C=0
103 CWTTTPR=3.*3.14159265/2.
  CDEL=3.14159265/3.
  LC4A=0
  LC4B=0
  LC4E= 0
  LC4F=0
  LC4G=0
  LC24=4095
  LC24A=4095
  LC29=4095
  CRLO=0.
  DAS=CUREND
104 LC1=4095
  LC2=0

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LC3=0
LC5=0
LC7=0
LC8=0
IC=0
K2C=0
CTX=0.
M=0
LCA=0
CTR1=-20.
CTW=100.
CDTX=100.
CPSIBC=0.
CTHBC=0.
LCY=0
105 IF(IC-10) 106,106,108
106 CDTWT(IC+1)=-1.
107 IC=IC+1
GO TO 105
108 IC=0
2 CALL GEXEC
109 IF(LC4C) 113,110,113
110 LC4C=4095
LC4D=0
GO TO 103
113 CTRR=CT-CTR1-20.
IF(CTRR) 124,114,114
114 IF(CTRR-1.) 116,115,115
115 CRRD=9999.
M=0
CDRRD=9999.
116 LC10=0
L=0
CRA=0.
124 CALL GANG (CTHB,CPHIB,CPSIB,THETAB,PHIB,PSIB,CUDTHS,CUDPSS,CUDPHS,
*CTHBC,CPSIBC)
126 CALL ERRANG (CUDPHS,CUDPSS,CUDTHS,CDPHSC,CDPSSC,CDTHSC)
128 CDTM=CAPT *CDEL/6.28318530
129 CSPHIB=SINF(CPHIB)
CSPSIB=SINF(CPSIB)
CSTHB=SINF(CTHB)
CCPHIB=COSF(CPHIB)
CCPSIB=COSF(CPSIB)
CCTHB=COSF(CTHB)
130 CA11=CCPSIB * CCTHB
CA12=-CCPSIB*CSTHB
CA13=-CSPSIB
CA21=CSTHB*CSPHIB-CCTHB*CSPSIB*CCPHIB
CA22=CCTHB*CSPHIB+CSTHB*CSPSIB*CCPHIB
CA23=-CCPSIB*CCPHIB
CA31=CSTHB*CCPHIB+CCTHB*CSPSIB*CSPHIB
CA32=CCTHB*CCPHIB-CSTHB*CSPSIB*CSPHIB
CA33=CCPSIB*CSPHIB
132 IF (LC4B) 516,131,516
131 N=-1
133 LD063=0

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134 LD001=4095
135 CALL WAIT5
136 IF(LD100) 137,218,137
137 IF(N) 139,202,202
139 CRR1=TRI
    CSAPI=SREA
    CSRPI=SRAA
140 CSAPI=CSAPI+CCAB +CCAS *CSAPI
    CSRPI=CSRPI+CCRB +CCRS *CSRPI
141 IF(CRLO) 142,143,142
142 CSAPI=0.
    CSRPI=0.
    GO TO 145
143 IF(ABSF(CSRPI)-.406736643) 144,218,218
144 IF(ABSF(CSAPI)-.406736643) 145,218,218
145 IF(CRR1-XKRDR) 146,218,218
146 N=0
    GO TO 133
202 CRRPI=TRI
    CSADPI=SREA
    CSRDP1=SRAA
203 IF(ABSF(CRRPI-CRR1)-CCR ) 204,218,218
204 RDGD=0.
    CRRG =CRR1
    CSAPG=CSAPI
    CSRPG=CSRPI
205 IF(LC10) 219,206,219
206 L=L+1
207 CRA=CRA+CRRG
208 IF(L-5) 131,209,209
209 CRA=CRA/5.
210 IF(M) 212,211,212
211 M=1
    GO TO 216
212 CRRD=(CRA-CR1)/(CT-CTR1)
213 RRDREF=C0 +C2 *SQRTF(CRRG)
214 CORR0 =RRDREF-CRRD
216 CR1=CRA
    CTR1=CT
217 LC10=4095
    GO TO 2
218 RDGD=4095.
219 IF (K2C) 415,220,415
220 IF (3.14159265/6.+0.05-CWTTPR) 227,221,221
221 IF (CT-(CTM+150.)) 227,222,222
222 IF(LC3) 223,227,223
223 LD005=0
265 CDTW=0.
    GO TO 243
227 IF (LC1) 240,228,240
228 IF (LC40 ) 230,245,230
230 IF (LC7) 232,231,232
231 CTM=CT
232 IF (LC3) 247,233,247
233 IF (CTX- 750.) 234,235,235
234 LD062=0

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      GO TO 238
235 IF ((LDI21) 333,238,333
238 CDTW=CT-(CTM+CTX)
      IF ((CDTW) 239,241,241
239 IF ((CDTW+50.) 2,240,240
240 CALL IVISZS (LDI22,LC5,CSTZ,CT,LDO11,LDO12,LDO13,CDVXZ,CDVYZ,
      *CDVZZ,LDI25,LDI26,LDI31,LC1,LC1J)
      GO TO 2
241 IF (CDTW-CTW) 243,242,242
242 CDTW=-1.
      GO TO 246
243 IF (RDGD) 2,244, 2
244 LC7=4095
245 CTLRP=CT
      CRR=CRRG
      CSAPR=CSAPG
      CSRPR=CSRPG
229 IF (LC4D) 246,509,246
246 CTX=CTX+CDTX
      GO TO 301
247 CTW=20.
      CDTX=20.
248 IF (LC2) 259,249,259
249 IF (CT-(CTM+150.)) 250,251,251
250 IF (CT-CTDV) 512,510,510
251 IF (CTX-150.) 252,253,253
252 CTD=200.
      GO TO 331
253 IF (CTX-330.) 254,255,255
254 CTHBC=CTHBM
      CPSIBC=CPSIBM
      GO TO 238
255 LC2=4095
256 LDO05=0
257 CPSIBC=0.
      CTHBC=0.
258 CX=CXM
      CY=CYM
      CZ=CZM
      GO TO 2
259 CDTW=CT-(CTM+CDTM)
      IF ((CDTW) 260,241,241
260 IF (CDTW+80.) 240,261,261
261 IF (LC8) 262,263,262
262 CTD=CDTM-80.
      LC8=0
      GO TO 331
263 LDO05=4095
      GO TO 2
301 CSPSIR=-CSRPR
      CSTHR= (CSAPR)/SQRTF(1.-CSRPR **2)
302 CCPSIR=SQRTF(1.-CSPSIR**2)
      CCTHR=SQRTF(1.-CSTHR**2)
303 CM1=CCPSIR*CCTHR
304 CM3=(CM1*CA11)+(CSPSIR*CA21)+(CSAPR*CA31)
      CM4=-(CM1*CA13)-(CSPSIR*CA23)-(CSAPR*CA33)

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      CM5=(CM1*CA12)+(CSPSIR*CA22)+(CSAPR*CA32)
      CM6=CRR*(1.-CM5**2)/(2.*CSRT )
305 CX=CRR*CM3
      CY = CRR*(CM5-CM6)
      CZ=CRR*CM4
306 IF (CDTW) 311,307,307
307 CTHBM=6.28318530-ATN1F(CY,CX)
      CPSBCP=6.28318530-ATN1F(-CZ,CX)
      CPSIBM=6.28318530-ATN1F(-CZ,SQRTF(CX**2+CY**2))
      CTHBCP=6.28318530-ATN1F(CY,SQRTF(CX**2+CZ**2))
308 IF (CTHBCP-3.14159265) 311,309,309
309 CTHBCP=CTHBCP-6.28318530
311 IF (3.14159265/6.+0.05-CWTTPR) 313,312,312
312 IF (LC3) 315,313,315
313 IF (LC7) 316,314,316
314 LC7=4095
315 CTHBC=CTHBM
      CPSIBC=CPSIBM
      GO TO 2
316 IF (IC) 318,317,318
317 IC=10
      GO TO 319
318 IC=IC-1
319 CXT(IC+1)=CX
      CYT(IC+1)=CY
      CZT(IC+1)=CZ
      CDTWT(IC+1)=CDTW
      CDTWX=CDTW
320 CRS=CSRT +CY
      COMGS=SQRTF(1.407654E+16/CRS**3)
321 IF (LC2) 322,325,322
322 CWTTPR=CWTTPR-CDEL
323 IF (CDTW) 444,324,324
324 KC=0
      CSTD=CDTM-200.
      GO TO 401
325 IF (LC3) 2,326,2
326 IF (CTX-750.) 2,327,327
327 CSTD=1000.
328 IF (CDTWX) 2,329,329
329 KC=IC
      GO TO 401
330 CTD=250.
331 CWSTD=COMGS*CTD
      CSWSTD=SINF(CWSTD)
      CCWSTD=COSF(CWSTD)
332 CH27=1./COMGS
      CH28=2./COMGS
      CH29=4./COMGS
      CX=CX+CH28*CYRD-3.*(CXRD-2.*COMGS*CY)*CTD+(CH29*CXRD-6.*CY)*CSWSTD
      *-CH28*CYRD*CCWSTD
      CY=4.*CY-CH28*CXRD+(CH28*CXRD-3.*CY)*CCWSTD+CH27*CYRD*CSWSTD
      CZ=CZ*CCWSTD+CH27*CZRD*CSWSTD
      GO TO 334
333 LC7=0
      LC3=4095

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```

334 CSTD=1000.+CTD
335 IF (CTX-150.) 336,337,337
336 CTX=200.
      GO TO 338
337 IF (LC2) 338,328,338
338 LC7=0
      GO TO 307
401 LC1=4095
      CWSTDLC=CWTPR
      CXM=CX
      CYM=CY
      CZM=CZ
402 CSWTDL=SINF(CWSTDLC)
      CCWTDL=COSF(CWSTDLC)
      COEFF=COMGS/(3.*CWSTDLC*CSWTDLC-8.*(1.-CCWTDLC))
403 CCK1=COEFF*CSWTDLC
      CCK3=COEFF*2.*(1.-CCWTDLC)
      CCK2=2.*COMGS+CCK3
404 CCKF=COEFF*(4.*CSWTDLC-3.*CWSTDLC*CCWTDLC)
      CCKG=COMGS*CCWTDLC/CSWTDLC
405 IF (LC8) 408,406,408
406 LC8=4095
407 CCK4=CCKF
      CCK5=CCKG
      CCWTDLC=1.
      GO TO 404
408 LC8=0
409 IF (LC1) 410,421,410
410 LC1=0
411 CDXFD=CCK1*CX+CCK3*CY
      CDYFD=-CCK3*CX+CCKF*CY
      CDZFD=-CCKG*CZ
      CDVF=SQRTF(CDXFD**2+CDYFD**2+CDZFD**2)
412 CXSD=0.
      CYSD=0.
      CZSD=0.
      CNS=0.
413 K2C=7
414 CXRD=CCK1*CX+CCK2*CY
      CYRD=CCK3*CX+CCK4*CY
      CZRD=-CCK5*CZ
415 IF (KC) 417,416,417
416 KC=10
      GO TO 418
417 KC=KC-1
418 CXZ=CXT(KC+1)
      CYZ=CYT(KC+1)
      CZZ=CZT(KC+1)
419 IF (CDTWT(KC+1)) 424,420,420
420 CSTDL=CSTD-(CDTWT(KC+1)-CDTWX)
      CWSTDLC=CSTDLC*COMGS
      GO TO 402
421 CXTD=(CXZ-CX)*CCK1+CYZ*CCK3+CY*CCK2
      CYTD=(CX-CXZ)*CCK3+CYZ*CCKF-CY*CCK4
      CZTD=CZ*CCK5-CZZ*CCKG
422 CXSD=CXSD+CXTD-CXRD

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      CYSO=CYSO+CYTD-CYRD
      CZSD=CZSD+CZRD-CZTD
      CNS=CNS+1.
423  CDXD=CXSD/CNS
      CDYD=CYSO/CNS
      CDZD=CZSD/CNS
424  K2C=K2C-1
      IF (K2C) 425,427,425
425  CSTO=CSTO-CDTX
      GO TO 2
427  IF (LC2) 443,428,443
428  IF (CNS) 430,429,430
429  CDVT=0.
      GO TO 435
430  CDVI=SQRTF(CDXD**2+CDYD**2+CDZD**2)
431  CDVT =CDVI+CDVF
433  IF (CDVT-999.) 435,434,434
434  CDV=999.
      GO TO 436
435  CDV=INTF(CDVT)
436  IF (LC7) 437,439,437
437  LC7=0
438  CXRD=CXRD+CDXD
      CYRD=CYRD+CDYD
      CZRD=CZRD-CDZD
      GO TO 330
439  LC7=4095
440  IF (LC3) 501,441,501
441  CDVXSP=CDV
442  CDVXZ=CDV
      GO TO 2
443  IF (CNS) 445,444,445
444  CDXD=0.
      CDYD=0.
      CDZD=0.
445  LC2=0
446  IC=0
447  CTM=CTM+CDTM
448  IF (3.14159265/2.+0.05-CWTTPR) 449,2,2
449  CDZD=0.
      GO TO 2
501  IC=0
502  CTM=CTLRP+CTO
503  CTDV=CTM-CDVI/(2.*CATXBA)
504  CPSIBC=6.28318530-ATN1F(CDZD,SQRTF(CDXD**2+CDYD**2))
      CPSBCP=6.28318530-ATN1F(CDZD,CDXD)
505  CTHBC=6.28318530-ATN1F(CDYD,CDXD)
      CTHBCP=6.28318530-ATN1F(CDYD,SQRTF(CDXD**2+CDZD**2))
506  IF (CTHBCP-3.14159265) 508,507,507
507  CTHBCP=CTHBCP-6.28318530
508  IF (LC4B) 124,2,124
509  IF (LDI21) 510,504,510
510  LD005=4095
512  CALL ALIGNP (CFX,CFY,CFZ,FXP,FYP,FZP,AKX1,AKX2,AKX3,AKX4,AKY1,
      *AKY2,AKY3,AKY4,AKZ1,AKZ2,AKZ3,AKZ4,DT)
513  CDVXM=CDVXM+CFX

```

```

      CDVYM=CDVYM+CFY
      CDVZM=CDVZM+CFZ
514 IF (LC8) 517,515,517
515 LC8=4095
516 CDVXM=-CDXD
      CDVYM=-CDYD
      CDVZM=-CDZD
517 CDVXB=-(CA11*CDVXM+CA12*CDVYM+CA13*CDVZM)
      CDVYB=-(CA21*CDVXM+CA22*CDVYM+CA23*CDVZM)
      CDVZB=-(CA31*CDVXM+CA32*CDVYM+CA33*CDVZM)
519 IF(LCA) 520,521,520
520 LC1J=-4095
521 CTX=100
522 CALL IVIDS (CDVXS,CDVXB,CDVXZ,CDVYS,CDVYB,CDVYZ,CDVZS,CDVZB,
      *CDVZZ,LDI22,LC1J,LD012,LD013,CDV,CDVXSP,CDVYSP,CDVZSP)
      GO TO 2
      END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

```

STORAGE NOT USED BY PROGRAM

DEC OCT
1465 02671DEC OCT
32230 76746

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

	DEC	OCT
AKX1	32555	77453
AKY2	32550	77446
AKZ3	32545	77441
COI	32539	77433
CA12	32535	77427
CA31	32530	77422
CATXBA	32525	77415
CCAS	32521	77411
CKK5	32515	77403
CCPSIR	32510	77376
CCRSI	32504	77370
CCWTDL	32500	77364
CDRRD	32497	77361
CDTWX	32483	77343
CDVT	32478	77336
CDVXZ	32474	77332
CDVYZ	32470	77326
CDVZZ	32466	77322
CDZD	32461	77315
CM1	32456	77310
CNPC	32451	77303
CNYC	32446	77276
CPHIB	32442	77272
CR1	32436	77264
CRR1	32430	77256
CSAPG	32426	77252
CSPSIR	32421	77245
CS:TI	32415	77237
CSTHR	32411	77233
CTD	32406	77226
CTHB	32403	77223
CT	32407	77227
CUDPSS	32391	77207
CXM	32385	77201
CXT	32382	77176
CYSD	32366	77156
CZRD	32350	77136
CZZ	32336	77120
DONPRT	32334	77116
DUM10	32323	77103
DUM15	32318	77076
DUM2	32331	77113
DUM7	32326	77106
FAPP	32311	77067
FZP	32308	77064
IWRITE	32302	77056
LC1J	32296	77050
LC4B	32292	77044

	DEC	OCT
AKX2	32554	77452
AKY3	32549	77445
AKZ4	32544	77440
CO	32540	77434
CA13	32534	77426
CA32	32529	77421
CATXBI	32524	77414
CKK1	32519	77407
CKKF	32514	77402
CCRB1	32507	77373
CCRS	32505	77371
CCZT	32499	77363
CDTHSC	32556	77454
CDTX	32482	77342
CDVXB	32477	77335
CDVYB	32473	77331
CDVZB	32469	77325
CDXD	32465	77321
CDZFD	32460	77314
CM3	32455	77307
CNS	32450	77302
COEFF	32445	77275
CPSBCP	32440	77270
CRA	32435	77263
CRRPI	32429	77255
CSAPI	32425	77251
CSRDP1	32420	77244
CSRT	32416	77240
CSTZ	32410	77232
CTDV	32404	77224
CTLRP	32399	77217
CTTG	32395	77213
CUDTHS	32390	77206
CXRD	32384	77200
CKZ	32370	77162
CYTD	32354	77142
CZ	32352	77140
DELAY	32335	77117
DPHIB	32558	77456
DUM11	32322	77102
DUM16	32317	77075
DUM3	32330	77112
DUM8	32325	77105
FXP	32312	77070
GC	32306	77062
K2C	32301	77055
LC1	32297	77051
LC4C	32291	77043

	DEC	OCT
AKX3	32553	77451
AKY4	32548	77444
ASFX	32543	77437
C21	32537	77431
CA21	32533	77425
CA33	32528	77420
CCABI	32522	77412
CKK2	32518	77406
CKKG	32513	77401
CCRB	32508	77374
CCTHB	32503	77367
CDEL	32498	77362
CDTM	32496	77360
CDVF	32480	77340
CDVXM	32476	77334
CDVYM	32472	77330
CDVZM	32468	77324
CDXFD	32464	77320
CFX	32459	77313
CM4	32454	77306
CNVX	32449	77301
COINT	32444	77274
CPSIBC	32438	77266
CRLO	32434	77262
CRR	32433	77261
CSAPR	32424	77250
CSRPG	32419	77243
CSTDL	32413	77235
CSWSTD	32409	77231
CTHBCP	32401	77221
CTM	32398	77216
CTW	32394	77212
CWSTD	32388	77204
CX	32386	77202
CYM	32368	77160
CYT	32365	77155
CZSD	32349	77135
DELVX	32561	77461
DPSIB	32557	77455
DUM12	32321	77101
DUM17	32316	77074
DUM4	32329	77111
DUM9	32324	77104
FYPP	32309	77065
IC	32305	77061
KC	32300	77054
LC2	32295	77047
LC4D	32290	77042

	DEC	OCT
AKX4	32552	77450
AKZ1	32547	77443
ASFY	32542	77436
C2	32538	77432
CA22	32532	77424
CAPT1	32526	77416
CCAB	32523	77413
CKK3	32517	77405
CCPHIB	32512	77400
CCRI	32506	77372
CCTHR	32502	77366
CDPHSC	32558	77456
CDTW	32495	77357
CDVI	32479	77337
CDVXSP	32561	77461
CDVYSP	32560	77460
CDVZSP	32559	77457
CDYD	32463	77317
CFY	32458	77312
CM5	32453	77305
CNVY	32448	77300
COMGS	32443	77273
CPSIBM	32437	77265
CRRD	32432	77260
CRS	32428	77254
CSPHIB	32423	77247
CSRPI	32418	77242
CSTD	32414	77236
CSWTDL	32408	77230
CTHBC	32402	77222
CTR1	32397	77215
CTX	32393	77211
CWSTD	32389	77205
CXSD	32383	77177
CYRD	32367	77157
CYZ	32353	77141
CZTD	32337	77121
DELVY	32560	77460
DTHB	32556	77454
DUM13	32320	77100
DUM18	32315	77073
DUM5	32328	77110
FIN	32314	77072
FYP	32310	77066
IEXIT	32304	77060
KWRITE	32299	77053
LC3	32294	77046
LC4E	32289	77041

	DEC	OCT
AKY1	32551	77447
AKZ2	32546	77442
ASFZ	32541	77435
CA11	32536	77430
CA23	32531	77423
CAPT	32527	77417
CCASI	32520	77410
CKK4	32516	77404
CCPSIB	32511	77377
CCR	32509	77375
CCWSTD	32501	77365
CDPSSC	32557	77455
CDWT	32494	77356
CDV	32481	77341
CDVXS	32475	77333
CDVYS	32471	77327
CDVZS	32467	77323
CDYFD	32462	77316
CFZ	32457	77311
CM6	32452	77304
CNVZ	32447	77277
CPHIBC	32441	77271
CPSIB	32439	77267
CRRG	32431	77257
CSADPI	32427	77253
CSPSIB	32422	77246
CSRPR	32417	77241
CSTHB	32412	77234
CTDAS	32405	77225
CTHBM	32400	77220
CTRR	32396	77214
CUDPHS	32392	77210
CWTTPR	32387	77203
CXTD	32371	77163
CY	32369	77161
CZM	32351	77137
CZT	32348	77134
DELVZ	32559	77457
DT	32333	77115
DUM14	32319	77077
DUM1	32332	77114
DUM6	32327	77107
FP	32313	77071
FZPP	32307	77063
IOLP	32303	77057
LC10	32283	77033
LC4A	32293	77045
LC4F	32288	77040

RZ7M5 RENDEZVOUS FOR MODULE 5 OF MATH FLOW 7 FERNEYHOUGH, REINER

36

LC46 32287 77037	LC5 32286 77036	LC7 32285 77035	LC8 32284 77034	LCA 32282 77032
LCS 32281 77031	LCY 32280 77030	LD100 32279 77027	LD110 32278 77026	LD111 32277 77025
LD113 32276 77024	LD120 32275 77023	LD121 32274 77022	LD122 32273 77021	LD125 32272 77020
LD126 32271 77017	LD131 32270 77016	LD001 32269 77015	LD005 32268 77014	LD011 32267 77013
LD012 32266 77012	LD013 32265 77011	LD062 32264 77010	LD063 32263 77007	LFDI 32262 77006
LQT 32261 77005	L 32298 77052	M 32260 77004	N 32259 77003	PHIB 32258 77002
PINT 32257 77001	PSIB 32256 77000	RDGD 32255 76777	RRDREF 32254 76776	SRAA 32253 76775
SREA 32252 76774	SW 32251 76773	TEST 32250 76772	TFTXV 32249 76771	TFTYV 32248 76770
TFTZV 32247 76767	THETAB 32246 76766	TIME 32245 76765	TPC 32244 76764	TRI 32243 76763
TSC 32242 76762	TVX 32241 76761	TVY 32240 76760	TVZ 32239 76757	TYC 32238 76756
VLIST 32561 77461	XGRTD 32236 76754	XGRT 32237 76755	XKRDR 32235 76753	YGRTD 32233 76751
YGRT 32234 76752	ZGRTD 32231 76747	ZGRT 32232 76750		

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENT

	DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT
CH27	1464	02670	CH28	1463	02667	CH29	1462	02666	CUREND	1461	02665
LC24A	1459	02663	LC24	1458	02662	LC29	1457	02661			
									DAS	1460	02664

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

	DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT
1) 1448 02650			2) 1408 02600			3) 1416 02610			6) 1442 02642		
C1G1 1456 02660			D1403 34 00042			D143M 1206 02266			E1D 142 00216		
E1P 314 00472			E113 393 00611			E116 405 00625			E130 961 01701		
E138 1068 02054			E13C 1141 02165			E130 1228 02314			E144 1386 02552		
E1139 1127 02147			E113M 1205 02265			E120E 150 00226					
									C1G0 1455 02657		
									E1I 261 00405		
									E134 1040 02020		
									E110F 248 00370		

LOCATIONS OF NAMES IN TRANSFER VECTOR

	DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT
ALIGNP 9 00011			ATN1 8 00010			COS 4 00004			ERRANG 2 00002		
GEXEC 0 00000			IVIDS 10 00012			IVISZS 7 00007			SIN 3 00003		
WAIT5 5 00005									GANG 1 00001		
									SQRT 6 00006		

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

	ATN1	COS	ERRANG	GANG	GEXEC	IVIDS	IVISZS	SIN	SQRT
ALIGNP									
GEXEC									
WAIT5									

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC
1	9	00030	101	10	00032	102	11	00036	103	13	00043	104	25	00076
105	42	00142	106	43	00146	107	44	00150	108	46	00155	2	47	00160
109	48	00161	110	49	00165	113	52	00172	114	54	00202	115	55	00207
116	58	00217	124	61	00227	126	62	00243	128	63	00252	129	64	00256
130	70	00300	132	79	00364	131	80	00371	133	81	00373	134	82	00375
135	83	00377	136	84	00400	137	85	00402	139	86	00406	140	89	00414
141	91	00426	142	92	00430	143	95	00435	144	96	00442	145	97	00447
146	98	00453	202	100	00456	203	103	00464	204	104	00473	205	108	00503
206	109	00507	207	110	00512	208	111	00515	209	112	00522	210	113	00525
211	114	00531	212	116	00534	213	117	00543	214	118	00552	216	119	00555
217	121	00561	218	123	00564	219	124	00566	220	125	00572	221	126	00602
222	127	00612	223	128	00614	265	129	00616	227	131	00621	228	132	00626

RZ7M5 RENDEZVOUS FOR MODULE 5 OF MATH FLOW 7 FERNEYHOUGH, REINER

37

230	133 00630	231	134 00634	232	135 00636	233	136 00642	234	137 00646
235	139 00651	238	140 00655	239	142 00665	240	143 00672	241	145 00713
242	146 00720	243	148 00723	244	149 00727	245	150 00731	229	154 00741
246	155 00743	247	157 00747	248	159 00753	249	160 00757	250	161 00765
251	162 00772	252	163 00776	253	165 01001	254	166 01005	255	169 01012
256	170 01014	257	171 01016	258	173 01022	259	177 01031	260	179 01041
261	180 01046	262	181 01050	263	184 01056	301	186 01061	302	188 01074
303	190 01110	304	191 01113	305	195 01167	306	198 01203	307	199 01207
308	203 01257	309	204 01264	311	205 01267	312	206 01277	313	207 01303
314	208 01307	315	209 01311	316	212 01316	317	213 01322	318	215 01327
319	216 01334	320	221 01346	321	223 01364	322	224 01366	323	225 01371
324	226 01375	325	229 01405	326	230 01411	327	231 01416	328	232 01420
329	233 01424	330	235 01431	331	236 01433	332	239 01444	333	246 01555
334	248 01561	335	249 01564	336	250 01570	337	252 01573	338	253 01575
401	255 01600	402	260 01612	403	263 01637	404	266 01655	405	268 01675
406	269 01702	407	270 01704	408	274 01713	409	275 01715	410	276 01717
411	277 01721	412	281 01760	413	285 01770	414	286 01772	415	289 02014
416	290 02021	417	292 02025	418	293 02031	419	296 02037	420	297 02043
421	300 02055	422	303 02116	423	307 02135	424	310 02150	425	312 02155
427	314 02161	428	315 02166	429	316 02172	430	318 02175	431	319 02211
433	320 02214	434	321 02221	435	323 02224	436	324 02230	437	325 02232
438	326 02234	439	330 02246	440	331 02250	441	332 02254	442	333 02256
443	335 02261	444	336 02267	445	339 02275	446	340 02277	447	341 02302
448	342 02305	449	343 02315	501	345 02320	502	346 02324	503	347 02327
504	348 02340	505	350 02364	506	352 02410	507	353 02415	508	354 02420
509	355 02424	510	356 02426	512	357 02430	513	358 02454	514	361 02465
515	362 02471	516	363 02473	517	366 02501	519	369 02545	520	370 02547
521	371 02553	522	372 02555						

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    DIMENSION SLIST(1000),TLIST(1000),DLIST(1000),ILIST(1000),
    *REM(165),VLIST(1)
    DIMENSION CXT(11),CYT(11),CZT(11),CDTWT(11)
    DIMENSION JUMP(9),T(20),JSUB(20),SYM(20,50),ISUB(20,50),A(20,50),
    *B(20,50),D(20,50),TOL(20,50)
    COMMON CDVXSP,CDVYSP,CDVZSP,CDPHSC,CDPSSC,CDTHSC,AKX1 ,AKX2 ,
1AKX3 ,AKX4 ,AKY1 ,AKY2 ,AKY3 ,AKY4 ,AKZ1 ,AKZ2 ,AKZ3 ,
2AKZ4 ,ASFX ,ASFY ,ASFZ ,CO ,COI ,C2 ,C2I ,CA11 ,
3CA12 ,CA13 ,CA21 ,CA22 ,CA23 ,CA31 ,CA32 ,CA33 ,CAPT ,
4CAPTI ,CATXBA ,CATXBI ,CCAB ,CCABI ,CCAS ,CCASI ,CCK1 ,CCK2 ,
5CCK3 ,CCK4 ,CCK5 ,CCKF ,CCKG ,CCPHIB ,CCPSIB ,CCPSIR ,CCR ,
6CCRB ,CCRBI ,CCRI ,CCRS ,CCRSI ,CCTHB ,CCTHR ,CCWSTD ,CCWTDL ,
7CCZT ,CDEL ,CDRRD ,CDTM ,CDTW ,CDTWT ,CDTWX ,CDTX ,CDV ,
8CDVF ,CDVI ,CDVT ,CDVXB ,CDVXM ,CDVXS ,CDVXZ ,CDVYB ,CDVYM ,
9CDVYS ,CDVYZ ,CDVZB ,CDVZM ,CDVZS ,CDVZZ ,CDXD ,CDXFD ,COYD ,
    COMMON CDYFD ,CDZD ,CDZFD ,CFX ,CFY ,CFZ ,CM1 ,CM3 ,
1CM4 ,CM5 ,CM6 ,CNPC ,CNS ,CNVX ,CNVY ,CNVZ ,CNYC ,
2COEFF ,COINT ,COMGS ,CPHIB ,CPHIBC ,CPSBCP ,CPSIB ,CPSIBC ,CPSIBM ,
3CRI ,CRA ,CRLO ,CRR ,CRRD ,CRRG ,CRRI ,CRRPI ,CRS ,
4CSADPI ,CSAPG ,CSAPI ,CSAPR ,CSPHIB ,CSPSIB ,CSPSIR ,CSRDP ,CSRPG ,
5CSRPI ,CSRPR ,CSRT ,CSRTI ,CSTD ,CSTD ,CSTHB ,CSTHR ,CSTZ ,
6CSWSTD ,CSWTDL ,CT ,CTD ,CTDAS ,CTDV ,CTHB ,CTHBC ,CTHBCP ,
7CTHBM ,CTLRP ,CTM ,CTR1 ,CTRR ,CTTG ,CTW ,CTX ,CUDPHS ,
8CUDPSS ,CUDTHS ,CWSTD ,CWSTD ,CWTTPR ,CX ,CXM ,CXRD ,CXSD ,
9CXT ,CXTD ,CXZ ,CY ,CYM ,CYRD ,CYSD ,CYT ,CYTD ,
    COMMON CYZ ,CZ ,CZM ,CZRD ,CZSD ,CZT ,CZTD ,CZZ ,
1DELAY ,DONPRT ,DT ,DUM1 ,DUM2 ,DUM3 ,DUM4 ,DUM5 ,DUM6 ,
2DUM7 ,DUM8 ,DUM9 ,DUM10 ,DUM11 ,DUM12 ,DUM13 ,DUM14 ,DUM15 ,
3DUM16 ,DUM17 ,DUM18 ,FIN ,FP ,FXP ,FXPP ,FYP ,FYPP ,
4FZP ,FZPP ,GC ,IC ,IEXIT ,IOLP ,IWRITE ,K2C ,KC ,
5KWRITE ,L ,LC1 ,LC1J ,LC2 ,LC3 ,LC4A ,LC4B ,LC4C ,
6LC4D ,LC4E ,LC4F ,LC4G ,LC5 ,LC7 ,LC8 ,LC10 ,LCA ,
7LCS ,LCY ,LDI00 ,LDI10 ,LDI11 ,LDI13 ,LDI20 ,LDI21 ,LDI22 ,
8LDI25 ,LDI26 ,LDI31 ,LD001 ,LD005 ,LD011 ,LD012 ,LD013 ,LD062 ,
9LD063 ,LFDI ,LQT ,M ,N ,PHIB ,PINT ,PSIB ,ROGD ,
    COMMON RRDREF ,SRAA ,SREA ,SW ,TEST ,TFTXV ,TFTYV ,TFTZV ,
1THETAB ,TIME ,TPC ,TRI ,TSC ,TVX ,TVY ,TVZ ,TYC ,
2XGRT ,XGRTD ,XKRDR ,YGRT ,YGRTD ,ZGRT ,ZGRTD ,
    EQUIVALENCE (DELVX,CDVXSP),(DELVY,CDVYSP),(DELVZ,CDVZSP),(CDPHSC,
    *DPHIB),(CDPSSC,DPSIB),(CDTHSC,DTHB),(VLIST,CDVXSP)
    ZZ1=CLOCKF(XX)
    CALL SELFLO
    KT1=5
    KT2=9
    KT3=6
100 READ INPUT TAPE KT1,1032,(REM(I),I=1,165)
    READ INPUT TAPE KT1,1060,NUMRUN,LTOL,NST,NTOL,LSKIP
    WRITE OUTPUT TAPE KT2,1061,NUMRUN,LTOL,NST,NTOL,LSKIP
    NTR=1
    IF (LTOL) 200,155,200
200 IF (LSKIP) 201,202,201
201 READ INPUT TAPE KT1,1062,(JUMP(I),I=1,9)
    WRITE OUTPUT TAPE KT2,1063,(JUMP(I),I=1,9)
202 L=0
    WRITE OUTPUT TAPE KT2,1064

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203 L=L+1
    READ INPUT TAPE KT1,1065,T(L),JS,(SYM(L,K),ISUB(L,K),K=1,JS)
    WRITE OUTPUT TAPE KT2,1066,T(L),(SYM(L,K),ISUB(L,K),K=1,JS)
    JSUB(L)=JS
    IF (NST-L) 155,155,203
155 ZZ=CLOCKF(XX)
    DO 159 I=1,331
159 VLIST(I)=0.
    PTIME=0.
148 READ INPUT TAPE KT1,1000,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
    I=0
101 I=I+1
    READ INPUT TAPE KT1,1050,SLIST(I),TLIST(I),DLIST(I),ILIST(I)
102 IF (ILIST(I)) 103,103,101
103 J=I
104 WRITE OUTPUT TAPE KT2,1051
    DO 403 I=1,J
    WRITE OUTPUT TAPE KT2,1052,SLIST(I),TLIST(I),DLIST(I),ILIST(I)
403 CONTINUE
    WRITE OUTPUT TAPE KT2,1002,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
105 I=1
    LS=1
    IF (LSKIP) 214,107,214
214 IF (JUMP(NTR)) 107,107,204
204 CALL SKPN (JUMP(NTR),1,6)
107 IF (TIME-TLIST(I)) 114,108,108
108 K=ILIST(I)
109 VLIST(K)=DLIST(I)
110 I=I+1
    GO TO 107
114 IF (LD011) 115,122,115
115 LD011=0
    DELVX=0.
    DELVY=0.
    DELVZ=0.
122 IF (DELVX) 123,124,123
123 LDI31=4095
    GO TO 125
124 LDI31=0
125 IF (DELVY) 126,127,126
126 LDI25=4095
    GO TO 139
127 LDI25=0
139 IF (DELVZ) 140,141,140
140 LDI26=4095
    GO TO 128
141 LDI26=0
128 IF (LD005) 130,129,130
130 SENSE LIGHT 4
    GO TO 150
129 SENSE LIGHT 0
150 FXP=FXPP*DT/ASFX
    FYP=FYPP*DT/ASFY
    FZP=FZPP*DT/ASFZ
    IF (LD062) 152,151,152
151 LDI21=0

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152 LDD62=4095
    IF (LQT) 153,131,153
153 CALL QUANT (PHIB ,.036/57.2957795)
    CALL QUANT (THETAB,.036/57.2957795)
    CALL QUANT (PSIB ,.036/57.2957795)
    CALL QUANT (TRI ,.49.178)
    CALL QUANT (SREA ,.42594791*.1953125E-2)
    CALL QUANT (SRAA ,.42594791*.1953125E-2)
    CALL QUANT (FXP ,.11)
    CALL QUANT (FYP ,.11)
    CALL QUANT (FZP ,.11)
131 CALL GEXECB
    IF (LQT) 154,137,154
154 IF (ABSF(DPHIB)-3./57.2957795) 410,410,411
410 ARG2=.66666667E-1/57.2957795
    GO TO 412
411 ARG2=.66666667E-1*6./57.2957795
412 CALL QUANT (DPHIB ,ARG2)
    IF (ABSF(DPSIB)-3./57.2957795) 413,413,415
413 ARG2=.66666667E-1/57.2957795
    GO TO 416
415 ARG2=.66666667E-1*6./57.2957795
416 CALL QUANT (DPSIB ,ARG2)
    IF (ABSF(DTHB)-3./57.2957795) 417,417,418
417 ARG2=.66666667E-1/57.2957795
    GO TO 419
418 ARG2=.66666667E-1*6./57.2957795
419 CALL QUANT (DTHB ,ARG2)
137 IF (KWRITE) 138,132,138
138 KWRITE=0
    GO TO 133
132 IF (IWRITE) 133,143,133
143 IF (PINT) 144,205,144
144 IF (TIME-(PTIME+DELAY)) 205,145,145
145 PTIME=PTIME+PINT
133 WRITE OUTPUT TAPE KT2,1029,TIME,NDATE1,NDATE2,NDATE3,NRUN1,NRUN2
    WRITE OUTPUT TAPE KT2,1034
    WRITE OUTPUT TAPE KT2,1030,
        REM( 1),CT ,REM( 2),CA11 ,
1REM( 3),CA12 ,REM( 4),CA13 ,REM( 5),CDVT ,REM( 6),CWTPR ,
2REM( 7),CA21 ,REM( 8),CA22 ,REM( 9),CA23 ,REM(10),CDVI ,
3REM(11),CDEL ,REM(12),CA31 ,REM(13),CA32 ,REM(14),CA33 ,
4REM(15),CDVF ,REM(16),CTM ,REM(17),CSPSIR,REM(18),CFX ,
5REM(19),CX ,REM(20),CDVXB ,REM(21),CDTM ,REM(22),CCPSIR,
6REM(23),CFY ,REM(24),CY ,REM(25),CDVYB ,REM(26),CTDV ,
7REM(27),CSTHR ,REM(28),CFZ ,REM(29),CZ ,REM(30),CDVZB ,
8REM(31),TSC ,REM(32),CCTHR ,REM(33),CDVXS ,REM(34),CXM ,
9REM(35),CDVXM
    WRITE OUTPUT TAPE KT2,1030,
        REM(36),CTDAS ,REM(37),CM1 ,
1REM(38),CDVYS ,REM(39),CYM ,REM(40),CDVYM ,REM(41),CRLO ,
2REM(42),CM3 ,REM(43),CDVZS ,REM(44),CZM ,REM(45),CDVZM ,
3REM(46),CPHIB ,REM(47),CM4 ,REM(48),CDV ,REM(49),CXZ ,
4REM(50),CDXD ,REM(51),CPSIB ,REM(52),CM5 ,REM(53),CSTZ ,
5REM(54),CYZ ,REM(55),CDYD ,REM(56),CTHB ,REM(57),CM6 ,
6REM(58),CTD ,REM(59),CZZ ,REM(60),CDZD ,REM(61),CUDPHS ,
7REM(62),COEFF ,REM(63),CSTD ,REM(64),CCRI ,REM(65),CXTD ,
8REM(66),CUDPSS,REM(67),CCK1 ,REM(68),CSTDL ,REM(69),COI ,

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9REM( 70),CYTD
  WRITE OUTPUT TAPE KT2,1030,      REM( 71),CUDTHS,REM( 72),CCK2
1REM( 73),CWSTD ,REM( 74),CZT      REM( 75),CZTD ,REM( 76),CDPHSC
2REM( 77),CCK3 ,REM( 78),CWSTD,REM( 79),CCABI ,REM( 80),CXRD
3REM( 81),CDPSSC,REM( 82),CCK4 ,REM( 83),CNS ,REM( 84),CCASI
4REM( 85),CYRD ,REM( 86),CDTHSC,REM( 87),CCK5 ,REM( 88),CTX
5REM( 89),CCRBI ,REM( 90),CZRD ,REM( 91),CPSIBC,REM( 92),CCKF
6REM( 93),CDTX ,REM( 94),CCRSI ,REM( 95),CDXFD ,REM( 96),CTHBC
7REM( 97),CCKG ,REM( 98),CRA ,REM( 99),CATXBI,REM(100),CDYFD
8REM(101),CPSBCP,REM(102),TEST ,REM(103),CRI ,REM(104),CAPTI
9REM(105),CDZFD
  WRITE OUTPUT TAPE KT2,1030,      REM(106),CTHBCP,REM(107),FIN
1REM(108),CDRRD ,REM(109),CSRTI ,REM(110),CXSD ,REM(111),CPSIBM
2REM(112),FP ,REM(113),RRDREF,REM(114),CRS ,REM(115),CYSD
3REM(116),CTHBM ,REM(117),SW ,REM(118),CRRD ,REM(119),COMGS
4REM(120),CZSD ,REM(121),CRR1 ,REM(122),CRRPI ,REM(123),CRRG
5REM(124),CRR ,REM(125),CDVXZ ,REM(126),CSAPI ,REM(127),CSADPI
6REM(128),CSAPG ,REM(129),CSAPR ,REM(130),CDVYZ ,REM(131),CSRPI
7REM(132),CSRDP1,REM(133),CSRPG ,REM(134),CSRPR ,REM(135),CDVZZ
8REM(136),RDGD ,REM(137),CTRR ,REM(138),CTR1 ,REM(139),CTLRP
9REM(140),CDTW
  WRITE OUTPUT TAPE KT2,1030,      REM(141),TVX ,REM(142),TVY
1REM(143),TVZ ,REM(144),TYC ,REM(145),TPC
  WRITE OUTPUT TAPE KT2,1019,      REM(141),TVX ,REM(142),TVY
1REM(143),TVZ ,REM(144),TYC ,REM(145),TPC
  WRITE OUTPUT TAPE KT2,1036,      REM(146),LC1 ,REM(147),LC4C
1REM(148),LC10 ,REM(149),LDI00 ,REM(150),IC ,REM(151),LC1J
2REM(152),LC4D ,REM(153),LCA ,REM(154),LDI21 ,REM(155),KC
3REM(156),LC2 ,REM(157),LC7 ,REM(158),LCS ,REM(159),LDO05
4REM(160),K2C ,REM(161),LC3 ,REM(162),LC8 ,REM(163),N
5REM(164),M ,REM(165),L
  WRITE OUTPUT TAPE KT2,1031,(CXT(I),CYT(I),CZT(I),CDTWT(I),I=1,11)
  WRITE OUTPUT TAPE KT2,1004,CDVXSP,CDVYSP,CDVZSP
205 IF (LTOL) 206,134,206
206 IF (NST-LS) 134,207,207
207 IF (TIME-T(LS)) 134,208,208
208 JS=JSUB(LS)
  DO 209 K=1,JS
  IS=ISUB(LS,K)
  A(LS,K)=VLIST(IS)
209 CONTINUE
  LS=LS+1
134 TIME=TIME+DT
  IF (SENSE SWITCH 6) 142,135
142 PRINT 1053,TIME ,I
135 IF (ILIST(I)) 210,210,107
210 DO 211 L=1,NST
  JS=JSUB(L)
211 WRITE TAPE KT3,(A(L,K),K=1,JS)
  END FILE KT3
136 WRITE OUTPUT TAPE KT2,1001,NRUN1,NRUN2
  PRINT 1003,NRUN1,NRUN2
  ZZ=CLOCKF(XX)
157 IF (NUMRUN-NTR) 213,213,212
212 NTR=NTR+1
  GO TO 155

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213 IF (LTOL) 215,158,215
215 REWIND KT3
    NTR=0
    DO 216 L=1,NST
        JS=JSUB(L)
216 READ TAPE KT3,(A(L,K),K=1,JS)
217 CALL SKPN (1,1,6)
    DO 221 L=1,NST
        JS=JSUB(L)
221 READ TAPE KT3,(B(L,K),K=1,JS)
    DO 222 L=1,NST
        JS=JSUB(L)
        DO 222 K=1,JS
            D(L,K)=ABSF(A(L,K)-B(L,K))
222 TOL(L,K)=TOL(L,K)+D(L,K)
        NTR=NTR+1
        WRITE OUTPUT TAPE KT2,1067,NTR
    DO 219 L=1,NST
        JS=JSUB(L)
219 WRITE OUTPUT TAPE KT2,1068,T(L),(SYM(L,K),D(L,K),K=1,JS)
    IF (NTOL-NTR) 220,220,217
220 WRITE OUTPUT TAPE KT2,1069
    DO 218 L=1,NST
        JS=JSUB(L)
218 WRITE OUTPUT TAPE KT2,1068,T(L),(SYM(L,K),TOL(L,K),K=1,JS)
158 ZZ2=CLOCKF(XX)
    ZZ3=ZZ2-ZZ1
    PRINT 1005,ZZ3
    WRITE OUTPUT TAPE KT2,1005,ZZ3
156 CALL EXIT
1000 FORMAT (11X,I2,1X,I2,1X,I2,10X,A6,A6)
1001 FORMAT (12H END OF RUN ,A6,A6/1H1)
1002 FORMAT (6H DATE ,I2,1H/,I2,1H/,I2,10X,4HRUN ,A6,A6//)
1003 FORMAT (12H END OF RUN ,A6,A6)
1004 FORMAT (1H0,12HIVI READINGS,8X,9HAFT - FWD,13X,5HL - R,14X,
    *7HUP - DN/13X,3E20.8)
1005 FORMAT (1H0,16HTHIS PROGRAM RAN,-2PF9.2,9H MINUTES.)
1019 FORMAT (5(1H ,A6,014,3X))
1029 FORMAT (1H1,7HTIME = ,E15.8,9H SECONDS.,52X,5HDATE ,I2,1H/,I2,1H/,
    *I2,7X,4HRUN ,A6,A6/)
1030 FORMAT (5(1H ,A6,E15.8,2X))
1031 FORMAT (1H0,36H11 VALUES EACH OF X,Y,Z, AND DELTA T/(1H ,4E20.8))
1032 FORMAT (12A6)
1034 FORMAT (1H ,40HSIMULATED COMPUTER OUTPUTS ON THIS PAGE.//)
1036 FORMAT (5(1H ,A6,16,11X))
1050 FORMAT (A6,2E15.8,I4)
1051 FORMAT (1H1,6HSYMBOL,8X,4HTIME,14X,4HDATA,10X,1HI//)
1052 FORMAT (1H ,A6,2E18.8,I6)
1053 FORMAT (1H ,6HTIME =,E15.8,6H I =,I4)
1060 FORMAT (5(7X,I3))
1061 FORMAT (1H1,7HNUMRUN=,I3,7H LTOL=,I3,7H NST=,I3,7H NTOL=,I3,
    *7H LSKIP=,I3)
1062 FORMAT (9I3)
1063 FORMAT (1H0,8HJUMP(1)=,I3,2X,8HJUMP(2)=,I3,2X,8HJUMP(3)=,I3,2X,
    *8HJUMP(4)=,I3,2X,8HJUMP(5)=,I3,2X,8HJUMP(6)=,I3,2X,8HJUMP(7)=,I3,
    *2X,8HJUMP(8)=,I3,2X,8HJUMP(9)=,I3)

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1064 FORMAT (1H0//11H TIME (SEC),6X,22HSYMBOLS AND SUBSCRIPTS)
1065 FORMAT (F9.0,I3,6(1X,A6,I3)/(3X,A6,I3,1X,A6,I3,1X,A6,I3,
  *1X,A6,I3,1X,A6,I3,1X,A6,I3))
1066 FORMAT (1H0,F12.0,9(2X,A6,I4)/(15X,A6,I4,2X,A6,I4,2X,A6,I4,2X,A6,
  *I4,2X,A6,I4,2X,A6,I4,2X,A6,I4,2X,A6,I4,2X,A6,I4))
1067 FORMAT (1H1,29HTOLERANCES FROM TOLERANCE RUN,I3//5X,11HSAMPLE TIME
  *,20X,22HSYMBOLS AND TOLERANCES)
1068 FORMAT (1H0,F16.1,6X,4(3X,A6,E15.8)/(26X,A6,E15.8,3X,A6,E15.8,3X,
  *A6,E15.8,3X,A6,E15.8))
1069 FORMAT (1H1,25X,16HFINAL TOLERANCES//5X,11HSAMPLE TIME,20X,22HSYMB
  *OLS AND TOLERANCES)
      END(1,1,0,0,0,0,0,1,1,0,0,0,0,0,0,0)

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BENCH7

ENVIRONMENT FOR MATH FLOW 7

FERNEYHOUGH

44

STORAGE NOT USED BY PROGRAM

DEC OCT
12055 27427DEC OCT
32230 76746

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT		
AKX1	32555	77453	AKX2	32554	77452	AKX3	32553	77451	AKX4	32552	77450
AKY2	32550	77446	AKY3	32549	77445	AKY4	32548	77444	AKZ1	32547	77443
AKZ3	32545	77441	AKZ4	32544	77440	ASFX	32543	77437	ASFY	32542	77436
COI	32539	77433	CO	32540	77434	C2I	32537	77431	C2	32538	77432
CA12	32535	77427	CA13	32534	77426	CA21	32533	77425	CA22	32532	77424
CA31	32530	77422	CA32	32529	77421	CA33	32528	77420	CAPT1	32526	77416
CATXBA	32525	77415	CATXBI	32524	77414	CCABI	32522	77412	CCAB	32523	77413
CCAS	32521	77411	CCK1	32519	77407	CCK2	32518	77406	CCK3	32517	77405
CCK5	32515	77403	CCKF	32514	77402	CCKG	32513	77401	CCPHIB	32512	77400
CCPSIR	32510	77376	CCRB1	32507	77373	CCRB	32508	77374	CCRI	32506	77372
CCRSI	32504	77370	CCRS	32505	77371	CCTHB	32503	77367	CCTHR	32502	77366
CCWTDL	32500	77364	CCZT	32499	77363	CDEL	32498	77362	CDPHSC	32558	77456
CDRRD	32497	77361	CDTHSC	32556	77454	CDTM	32496	77360	CDTW	32495	77357
CDTWX	32483	77343	COTX	32482	77342	COVF	32480	77340	CDVI	32479	77337
CDVT	32478	77336	CDVXB	32477	77335	CDVXM	32476	77334	CDVXSP	32561	77461
CDVXZ	32474	77332	CDVYB	32473	77331	CDVYM	32472	77330	CDVYSP	32560	77460
CDVYZ	32470	77326	CDVZB	32469	77325	CDVZM	32468	77324	CDVZSP	32559	77457
CDVZZ	32466	77322	CDXD	32465	77321	CDXFD	32464	77320	CDYD	32463	77317
CDZD	32461	77315	CDZFD	32460	77314	CFX	32459	77313	CFY	32458	77312
CM1	32456	77310	CM3	32455	77307	CM4	32454	77306	CM5	32453	77305
CNPC	32451	77303	CNS	32450	77302	CNVX	32449	77301	CNVY	32448	77300
CNYC	32446	77276	COEFF	32445	77275	COINT	32444	77274	COMGS	32443	77273
CPHIB	32442	77272	CPSBCP	32440	77270	CPSIBC	32438	77266	CPSIBM	32437	77265
CR1	32436	77264	CRA	32435	77263	CRLO	32434	77262	CRRD	32432	77260
CRRI	32430	77256	CRRPI	32429	77255	CRR	32433	77261	CRS	32428	77254
CSAPG	32426	77252	CSAPI	32425	77251	CSAPR	32424	77250	CSPHIB	32423	77247
CSPSIR	32421	77245	CSRDP1	32420	77244	CSRPG	32419	77243	CSRPI	32418	77242
CSRTI	32415	77237	CSRT	32416	77240	CSTD	32413	77235	CSTD	32414	77236
CSTHR	32411	77233	CSTZ	32410	77232	CSTDL	32413	77235	CSTDL	32414	77236
CTD	32406	77226	CTDV	32404	77224	CSWSTD	32409	77231	CSWTDL	32408	77230
CTHB	32403	77223	CTLRP	32399	77217	CTHBCP	32401	77221	CTHBC	32402	77222
CT	32407	77227	CTTG	32395	77213	CTM	32398	77216	CTR1	32397	77215
CUDPSS	32391	77207	CUDTHS	32390	77206	CTW	32394	77212	CTX	32393	77211
CXM	32385	77201	CXRD	32384	77200	CWSTD	32388	77204	CWSTD	32389	77205
CXT	32382	77176	CXZ	32370	77162	CX	32386	77202	CXSD	32383	77177
CYSD	32366	77156	CYTD	32354	77142	CYM	32368	77160	CYRD	32367	77157
CZRD	32350	77136	CZ	32352	77140	CYT	32365	77155	CYZ	32353	77141
CZZ	32336	77120	DELAB	32335	77117	CZSD	32349	77135	CZTD	32337	77121
DONPRT	32334	77116	DELTX	32561	77461	DELVB	32561	77461	DELVB	32560	77460
DUM10	32323	77103	DPS1B	32558	77456	DPS1B	32557	77455	DTHB	32556	77454
DUM15	32318	77076	DUM11	32322	77102	DUM12	32321	77101	DUM13	32320	77100
DUM2	32331	77113	DUM16	32317	77075	DUM17	32316	77074	DUM18	32315	77073
DUM7	32326	77106	DUM3	32330	77112	DUM4	32329	77111	DUM5	32328	77110
FXPP	32311	77067	DUM8	32325	77105	DUM9	32324	77104	FIN	32314	77072
FZP	32308	77064	FXP	32312	77070	FYPP	32309	77065	FYP	32310	77066
IWRITE	32302	77056	GC	32306	77062	IC	32305	77061	IEXIT	32304	77060
LC1J	32296	77050	KZC	32301	77055	KC	32300	77054	KWRITE	32299	77053
LC4B	32292	77044	LC1	32297	77051	LC2	32295	77047	LC3	32294	77046
			LC4C	32291	77043	LC4D	32290	77042	LC4E	32289	77041

BENCH7 ENVIRONMENT FOR MATH FLOW 7 FERNEYHOUGH

45

LC4G 32287 77037	LC5 32286 77036	LC7 32285 77035	LC8 32284 77034	LCA 32282 77032
LCS 32281 77031	LCY 32280 77030	LD100 32279 77027	LD110 32278 77026	LD111 32277 77025
LDI13 32276 77024	LDI20 32275 77023	LDI21 32274 77022	LDI22 32273 77021	LDI25 32272 77020
LDI26 32271 77017	LDI31 32270 77016	LD001 32269 77015	LD005 32268 77014	LD011 32267 77013
LDO12 32266 77012	LDO13 32265 77011	LD062 32264 77010	LD063 32263 77007	LFDI 32262 77006
LQT 32261 77005	L 32298 77052	M 32260 77004	N 32259 77003	PHIB 32258 77002
PINT 32257 77001	PSIB 32256 77000	RDGD 32255 76777	RRDREF 32254 76776	SRAA 32253 76775
S.EA 32252 76774	SW 32251 76773	TEST 32250 76772	TFTXV 32249 76771	TFTYV 32248 76770
TFTZV 32247 76767	THETAB 32246 76766	TIME 32245 76765	TPC 32244 76764	TRI 32243 76763
TSC 32242 76762	TVX 32241 76761	TVY 32240 76760	TVZ 32239 76757	TYC 32238 76756
VLIST 32561 77461	XGRD 32236 76754	XGRT 32237 76755	XKRDR 32235 76753	YGRD 32233 76751
YGRT 32234 76752	ZGRD 32231 76747	ZGRT 32232 76750		

STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS

DEC OCT	DEC OCT	DEC OCT	DEC OCT	DEC OCT
A 5840 13320	B 4840 11350	DLIST 10054 23506	D 3840 07400	ILIST 9054 21536
ISUB 6840 15270	JSUB 7860 17264	JUMP 7889 17321	REM 8054 17566	SLIST 12054 27426
SYM 7840 17240	TLIST 11054 25456	TOL 2840 05430	T 7880 17310	

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENT

DEC OCT	DEC OCT	DEC OCT	DEC OCT	DEC OCT
ARG2 1840 03460	I 1839 03457	IS 1838 03456	J 1837 03455	JS 1836 03454
K 1835 03453	KT1 1834 03452	KT2 1833 03451	KT3 1832 03450	LSKIP 1831 03447
LS 1830 03446	LTOL 1829 03445	NDATE1 1828 03444	NDATE2 1827 03443	NDATE3 1826 03442
NRUN1 1825 03441	NRUN2 1824 03440	NST 1823 03437	NTOL 1822 03436	NTR 1821 03435
NUMRUN 1820 03434	PTIME 1819 03433	XX 1818 03432	ZZ1 1817 03431	ZZ2 1816 03430
ZZ3 1815 03427	ZZ 1814 03426			

SYMBOLS AND LOCATIONS FOR SOURCE PROGRAM FORMAT STATEMENTS

EFN LOC	EFN LOC	EFN LOC	EFN LOC	EFN LOC
81V8 1000 03413	81V9 1001 03405	81VA 1002 03400	81VB 1003 03370	81VC 1004 03364
81VD 1005 03346	81VR 1019 03336	81105 1029 03332	81106 1030 03314	81107 1031 03310
81108 1032 03276	8110A 1034 03274	8110C 1036 03263	8110Q 1050 03257	8110R 1051 03254
8110S 1052 03244	8110T 1053 03240	81114 1060 03232	81115 1061 03230	81116 1062 03213
81117 1063 03212	81118 1064 03157	81119 1065 03146	8111A 1066 03127	8111B 1067 03104
8111C 1068 03064	8111D 1069 03046			

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT	DEC OCT	DEC OCT	DEC OCT	DEC OCT
1) 1804 03414	2) 1539 03003	3) 1545 03011	4) 32767 77777	6) 1555 03023
C1G0 1806 03416	C1G1 1807 03417	C1G2 1808 03420	C1G3 1809 03421	C1G5 1810 03422
C1G6 1811 03423	C1101 1812 03424	C1202 1813 03425	D110F 153 00231	D1200 267 00413
D1226 1282 02402	D1424 1266 02362	D1428 1295 02417	D1524 1265 02361	D1600 266 00412
D1700 265 00411	E19 98 00142	E1F 155 00233	E1I 185 00271	E1R 286 00436
E1T 297 00451	E111 308 00464	E114 316 00474	E117 323 00503	E119 341 00525
E11B 348 00534	E11D 406 00626	E11P 475 00733		

LOCATIONS OF NAMES IN TRANSFER VECTOR

BENCH7

ENVIRONMENT FOR MATH FLOW 7

FERNEYHOUGH

46

	DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT		DEC	OCT
CLOCK	1	00001	EXIT	17	00021	GEXECB	9	00011	QUANT	8	00010	SELFLO	2	00002
SKPN	7	00007	(EFT)	13	00015	(FIL)	6	00006	(FPT)	0	00000	(RLR)	16	00020
(RTN)	4	00004	(RWT)	14	00016	(SPH)	10	00012	(STB)	11	00013	(STH)	5	00005
(TSB)	15	00017	(TSH)	3	00003	(WLR)	12	00014						

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

CLOCK	EXIT	GEXECB	QUANT	SELFLO	SKPN	(EFT)	(FIL)	(FPT)	(RLR)
(RTN)	(RWT)	(SPH)	(STB)	(STH)	(TSB)	(TSH)	(WLR)		

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC
100	42	00042	200	53	00115	201	54	00117	202	64	00143	203	66	00152
155	81	00235	159	83	00241	148	85	00247	101	88	00272	102	91	00312
103	92	00315	104	93	00317	403	97	00342	105	100	00362	214	103	00374
204	104	00400	107	106	00414	108	107	00421	109	108	00425	110	109	00427
114	111	00434	115	112	00437	122	116	00447	123	117	00452	124	119	00455
125	120	00457	126	121	00461	127	123	00465	139	124	00467	140	125	00471
141	127	00475	128	128	00477	130	129	00501	129	131	00504	150	132	00505
151	136	00526	152	137	00530	153	139	00535	131	148	00621	154	150	00627
410	151	00637	411	153	00643	412	154	00647	413	156	00664	415	158	00670
416	159	00674	417	161	00711	418	163	00715	419	164	00721	137	165	00726
138	166	00730	132	168	00734	143	169	00740	144	170	00742	145	171	00751
133	172	00754	205	196	02335	206	197	02337	207	198	02344	208	199	02351
209	203	02371	134	205	02403	142	207	02410	135	209	02420	210	210	02423
211	212	02432	136	218	02457	157	223	02501	212	224	02506	213	226	02514
215	227	02516	216	231	02534	217	236	02553	221	239	02567	222	248	02626
219	254	02661	220	261	02711	218	264	02724	158	270	02750	156	276	02771


```

SUBROUTINE GEXECB
  DIMENSION CXT(11),CYT(11),CZT(11),CDTWT(11)
  COMMON CDVXSP,CDVYSP,CDVZSP,CDPHSC,CDPSSC,CDTHSC,AKX1,AKX2,
1AKX3,AKX4,AKY1,AKY2,AKY3,AKY4,AKZ1,AKZ2,AKZ3,
2AKZ4,ASFX,ASFY,ASFZ,CO,COI,C2,C2I,CA11,
3CA12,CA13,CA21,CA22,CA23,CA31,CA32,CA33,CAPT,
4CAPTI,CATXBA,CATXBI,CCAB,CCABI,CCAS,CCASI,CKK1,CKK2,
5CCK3,CCK4,CCK5,CCKF,CCKG,CCPHIB,CCPSIB,CCPSIR,CCR,
6CCRB,CCRB1,CCRI,CCRS,CCRSI,CCTHB,CCTHR,CCWSTD,CCWTDL,
7CCZT,CDEL,CDRRD,CDTM,CDTW,CDTWT,CDTWX,CDTX,CDV,
8CDVF,CDVI,CDVT,CDVXB,CDVXM,CDVXS,CDVXZ,CDVYB,CDVYM,
9CDVYS,CDVYZ,CDVZB,CDVZM,CDVZS,CDVZZ,CDXD,CDXFD,CDYD,
  COMMON CDYFD,CDZD,CDZFD,CFX,CFY,CFZ,CM1,CM3,
1CM4,CM5,CM6,CNPC,CNS,CNVX,CNVY,CNVZ,CNYC,
2COEFF,COINT,COMGS,CPHIB,CPHIBC,CPSBCP,CPSIB,CPSIBC,CPSIBM,
3CR1,CRA,CRLD,CRR,CRRD,CRRG,CRR1,CRRPI,CRS,
4CSADPI,CSAPG,CSAPI,CSAPR,CSPHIB,CSPSIB,CSPSIR,CSRDP1,CSRPG,
5CSRPI,CSRPR,CSRT,CSRTI,CSTD,CSTD1,CSTHB,CSTHR,CSTZ,
6CSWSTD,CSWTDL,CT,CTD,CTDAS,CTDV,CTHB,CTHBC,CTHBCP,
7CTHBM,CTLRP,CTM,CTR1,CTRR,CTTG,CTW,CTX,CUDPHS,
8CUDPSS,CUDTHS,CWSTD,CWSTD1,CWTTPR,CX,CXM,CXRD,CXSD,
9CXT,CXTD,CXZ,CY,CYM,CYRD,CYSD,CYT,CYTD,
  COMMON CYZ,CZ,CZM,CZRD,CZSD,CZT,CZTD,CZZ,
1DELAY,DONPRT,DT,DUM1,DUM2,DUM3,DUM4,DUM5,DUM6,
2DUM7,DUM8,DUM9,DUM10,DUM11,DUM12,DUM13,DUM14,DUM15,
3DUM16,DUM17,DUM18,FIN,FP,FXP,FXPP,FYP,FYPP,
4FZP,FZPP,GC,IC,IEXIT,IOLP,IWRITE,K2C,KC,
5KWRITE,L,LC1,LC1J,LC2,LC3,LC4A,LC4B,LC4C,
6LC4D,LC4E,LC4F,LC4G,LC5,LC7,LC8,LC10,LCA,
7LCS,LCY,LDI00,LDI10,LDI11,LDI13,LDI20,LDI21,LDI22,
8LDI25,LDI26,LDI31,LDO01,LDO05,LDO11,LDO12,LDO13,LDO62,
9LDO63,LFDI,LQT,M,N,PHIB,PINT,PSIB,RDGD,
  COMMON RRDREF,SRAA,SREA,SW,TEST,TFTXV,TFTYV,TFTZV,
1THETAB,TIME,TPC,TRI,TSC,TVX,TVY,TVZ,TYC,
2XGRT,XGRTD,XKRDR,YGRT,YGRTD,ZGRT,ZGRTD
  EQUIVALENCE (DELVX,CDVXSP),(DELVY,CDVYSP),(DELVZ,CDVZSP),(CDPHSC,
*DPHIB),(CDPSSC,DPSIB),(CDTHSC,DTHB),(VLIST,CDVXSP)
  IF (LCX) 8,101,8
101 LC4A=0
  LC4B=0
  LC4C=0
  LC4D=0
  LC4G=0
  LCY=0
  LCX=4095
  8 IF (LCY) 105,102,105
102 LDO62=0
  LDO05=0
  CT=0.
  LCY=4095
105 CALL GONOGO
103 CT=CT+DT
111 IF (LDI32) 112,1016,112
112 CALL AGE
1016 IF (LDI11) 1025,1020,1025

```



```

1020 IF ((LDI10) 1021,1023,1021
1023 LC4A=0
      LC4B=0
      LC4C=0
      LC4D=0
      LC4G=0
      TEST=0.
      LCY=0
      RETURN
1021 IF ((LDI13) 7,6,7
      6 CALL ASCENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
      RETURN
      7 CALL RNDZ
      RETURN
1025 IF ((LDI10) 1032,1019,1032
1032 LC4A=0
      LC4B=0
      LC4C=0
      LC4D=0
      LC4G=0
      LDO05=0
      RETURN
1019 IF ((LDI13) 5,4,5
      4 CALL RNDZ
      RETURN
      5 CALL REENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
      RETURN
      END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

```

STORAGE NOT USED BY PROGRAM

DEC OCT
148 00224DEC OCT
32230 76746

STORAGE LOCATIONS FOR VARIABLES APPEARING IN COMMON STATEMENTS

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT					
AKX1	32555	77453	AKX2	32554	77452	AKX3	32553	77451	AKX4	32552	77450	AKY1	32551	77447
AKY2	32550	77446	AKY3	32549	77445	AKY4	32548	77444	AKZ1	32547	77443	AKZ2	32546	77442
AKZ3	32545	77441	AKZ4	32544	77440	ASFY	32543	77437	ASFY	32542	77436	ASFZ	32541	77435
COI	32539	77433	CO	32540	77434	C2I	32537	77431	C2	32538	77432	CA11	32536	77430
CA12	32535	77427	CA13	32534	77426	CA21	32533	77425	CA22	32532	77424	CA23	32531	77423
CA31	32530	77422	CA32	32529	77421	CA33	32528	77420	CAPT1	32526	77416	CAPT	32527	77417
CATXBA	32525	77415	CATXBI	32524	77414	CCABI	32522	77412	CCAB	32523	77413	CCASI	32520	77410
CCAS	32521	77411	CKK1	32519	77407	CKK2	32518	77406	CKK3	32517	77405	CKK4	32516	77404
CKK5	32515	77403	CKKF	32514	77402	CKKG	32513	77401	CCPHIB	32512	77400	CCPSIB	32511	77377
CCPSIR	32510	77376	CCRB1	32507	77373	CCRB	32508	77374	CCRI	32506	77372	CCR	32509	77375
CCRSI	32504	77370	CCRS	32505	77371	CCTHB	32503	77367	CCTHR	32502	77366	CCWSTD	32501	77365
CCWTDL	32500	77364	CCZT	32499	77363	CDEL	32498	77362	CDPHSC	32558	77456	CDPSSC	32557	77455
CDRRD	32497	77361	CDTHSC	32556	77454	CDTM	32496	77360	CDTW	32495	77357	CDWT	32494	77356
CDTHX	32483	77343	CDTX	32482	77342	CDVF	32480	77340	CDVI	32479	77337	CDV	32481	77341
CDVT	32478	77336	CDVXB	32477	77335	CDVXM	32476	77334	CDVXSP	32561	77461	CDVXS	32475	77333
CDVXZ	32474	77332	CDVYB	32473	77331	CDVYM	32472	77330	CDVYSP	32560	77460	CDVYS	32471	77327
CDVYZ	32470	77326	CDVZB	32469	77325	CDVZM	32468	77324	CDVZSP	32559	77457	CDVZS	32467	77323
CDVZZ	32466	77322	CDXD	32465	77321	CDXFD	32464	77320	CDYD	32463	77317	CDYFD	32462	77316
CDZD	32461	77315	CDZFD	32460	77314	CFX	32459	77313	CFY	32458	77312	CFZ	32457	77311
CM1	32456	77310	CM3	32455	77307	CM4	32454	77306	CM5	32453	77305	CM6	32452	77304
CNPC	32451	77303	CNS	32450	77302	CMVX	32449	77301	CMVY	32448	77300	CMVZ	32447	77277
CNYC	32446	77276	COEFF	32445	77275	COINT	32444	77274	COMGS	32443	77273	CPHIBC	32441	77271
CPHIB	32442	77272	CPSBCP	32440	77270	CPSIBC	32438	77266	CPSIBM	32437	77265	CPSIB	32439	77267
CR1	32436	77264	CRA	32435	77263	CRLO	32434	77262	CRRD	32432	77260	CRRG	32431	77257
CRRI	32430	77256	CRRPI	32429	77255	CRR	32433	77261	CRS	32428	77254	CSADPI	32427	77253
CSAPG	32426	77252	CSAPI	32425	77251	CSAPR	32424	77250	CSPHIB	32423	77247	CSPSIB	32422	77246
CSPSIR	32421	77245	CSRDP1	32420	77244	CSRPG	32419	77243	CSRPI	32418	77242	CSRPR	32417	77241
CSRTI	32415	77237	CSRT	32416	77240	CSTD1	32413	77235	CSTD	32414	77236	CSTHB	32412	77234
CSTHR	32411	77233	CSTZ	32410	77232	CSWSTD	32409	77231	CSWTDL	32408	77230	CTDAS	32405	77225
CTD	32406	77226	CTDV	32404	77224	CTHBCP	32401	77221	CTHBC	32402	77222	CTHBM	32400	77220
CTHB	32403	77223	CTLRP	32399	77217	CTM	32398	77216	CTR1	32397	77215	CTRR	32396	77214
CT	32407	77227	CTTG	32395	77213	CTW	32394	77212	CTX	32393	77211	CUDPHS	32392	77210
CUDPSS	32391	77207	CUDTHS	32390	77206	CWSTD1	32388	77204	CWSTD	32389	77205	CWTTPR	32387	77203
CXM	32385	77201	CXRD	32384	77200	CX	32386	77202	CXSD	32383	77177	CXTD	32371	77163
CXT	32382	77176	CXZ	32370	77162	CYM	32368	77160	CYRD	32367	77157	CY	32369	77161
CYSD	32366	77156	CYTD	32354	77142	CYT	32365	77155	CYZ	32353	77141	CZM	32351	77137
CZRD	32350	77136	CZ	32352	77140	CZSD	32349	77135	CZTD	32337	77121	CZT	32348	77134
CZZ	32336	77120	DELAY	32335	77117	DELX	32561	77461	DELVY	32560	77460	DELVZ	32559	77457
DONPRT	32334	77116	DPHIB	32558	77456	DPSIB	32557	77455	DTHB	32556	77454	DT	32333	77115
DUM10	32323	77103	DUM11	32322	77102	DUM12	32321	77101	DUM13	32320	77100	DUM14	32319	77077
DUM15	32318	77076	DUM16	32317	77075	DUM17	32316	77074	DUM18	32315	77073	DUM1	32332	77114
DUM2	32331	77113	DUM3	32330	77112	DUM4	32329	77111	DUM5	32328	77110	DUM6	32327	77107
DUM7	32326	77106	DUM8	32325	77105	DUM9	32324	77104	FIN	32314	77072	FP	32313	77071
FXPP	32311	77067	FYP	32312	77070	FYPP	32309	77065	FYP	32310	77066	FZPP	32307	77063
FZP	32308	77064	GC	32306	77062	IC	32305	77061	IEXIT	32304	77060	IOLP	32303	77057
IWRITE	32302	77056	K2C	32301	77055	KC	32300	77054	KWRITE	32299	77053	LC10	32283	77033
LC1J	32296	77050	LC1	32297	77051	LC2	32295	77047	LC3	32294	77046	LC4A	32293	77045
LC4B	32292	77044	LC4C	32291	77043	LC4D	32290	77042	LC4E	32289	77041	LC4F	32288	77040

EXECB7 EXECUTOR FOR MATH FLOW 7 BENCH

FERNEYHOUGH

50

LC4G 32287 77037	LC5 32286 77036	LC7 32285 77035	LC8 32284 77034	LCA 32282 77032
LCS 32281 77031	LCY 32280 77030	LD100 32279 77027	LD110 32278 77026	LD111 32277 77025
LDI13 32276 77024	LDI20 32275 77023	LDI21 32274 77022	LDI22 32273 77021	LDI25 32272 77020
LDI26 32271 77017	LDI31 32270 77016	LDO01 32269 77015	LDO05 32268 77014	LDO11 32267 77013
LDO12 32266 77012	LDO13 32265 77011	LDO62 32264 77010	LDO63 32263 77007	LFDI 32262 77006
LQT 32261 77005	L 32298 77052	M 32260 77004	N 32259 77003	PHIB 32258 77002
PINT 32257 77001	PSIB 32256 77000	RDGD 32255 76777	RRDREF 32254 76776	SRAA 32253 76775
SREA 32252 76774	SW 32251 76773	TEST 32250 76772	TFTXV 32249 76771	TFTYV 32248 76770
TFTZV 32247 76767	THETAB 32246 76766	TIME 32245 76765	TPC 32244 76764	TRI 32243 76763
TSC 32242 76762	TVX 32241 76761	TVY 32240 76760	TVZ 32239 76757	TYC 32238 76756
VLIST 32561 77461	XGRD 32236 76754	XGRT 32237 76755	XKRDR 32235 76753	YGRD 32233 76751
YGRT 32234 76752	ZGRD 32231 76747	ZGRT 32232 76750		

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENT

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
LCX	147 00223	LOI32	146 00222						

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
2)	137 00211	3)	139 00213	6)	140 00214				

LOCATIONS OF NAMES IN TRANSFER VECTOR

DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT	DEC	OCT
AGE	1 00001	ASCENT	2 00002	GONOGO	0 00000	REENT	4 00004	RNDZ	3 00003

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

AGE	ASCENT	GONOGO	REENT	RNDZ
-----	--------	--------	-------	------

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC	EFN	IFN	LOC
101	10	00022	8	17	00040	102	18	00044	105	22	00054	103	23	00055
111	24	00060	112	25	00062	1016	26	00063	1020	27	00067	1023	28	00073
1021	37	00115	6	38	00121	7	41	00135	1025	44	00142	1032	45	00144
1019	53	00164	4	54	00170	5	57	00175						

BINARY CARD NO. KEYS0000
00000

ENTRY KEYS

BINARY CARD NO. KEYS0001

00000	0500	00	0	00014	KEYS	CLA	=043000000
00001	0402	60	4	00001		SUB#	1,4
00002	0771	00	0	00022		ARS	18
00003	0621	00	0	00006		STA	LOC1
00004	0760	00	0	00004		ENK	**
00005	-0130	00	0	00000		XCL	**
00006	0771	00	0	00000	LOC1	ARS	**
00007	-0320	00	0	00013		ANA	=01
00010	0767	00	0	00022		ALS	18
00011	0601	60	4	00002		STO#	2,4
00012	0020	00	4	00003		TRA	3,4
						END	

LITERALS

00013 000000000001
00014 000043000000

POST PROCESSOR ASSEMBLY DATA

15 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM.

REFERENCES TO DEFINED SYMBOLS

0	KEYS	0
6	LOC1	3

NO ERROR IN ABOVE ASSEMBLY.

```
SUBROUTINE QUANT (A,B)
C ARGUMENT A IS THE FLOATING POINT VARIABLE TO BE QUANTIZED.
C ARGUMENT B IS THE VALUE OF THE LOW ORDER BIT.
1 IF (A) 2,5,3
2 A=A-B*.5
  GO TO 4
3 A=A+B*.5
4 A=B*INTF(A/B)
5 RETURN
  END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```


QUANT

54

STORAGE NOT USED BY PROGRAM

DEC OCT
57 00071

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

11 DEC OCT
55 00067

31 DEC OCT
48 00060

61 DEC OCT
49 00061

DEC OCT

DEC OCT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN IFN LOC
1 3 00026

EFN IFN LOC
2 4 00031

EFN IFN LOC
3 6 00037

EFN IFN LOC
4 7 00043

EFN IFN LOC
5 8 00054

BINARY CARD NO. DSBENB00
00000
00002

ENTRY DSB
ENTRY ENB

BINARY CARD NO. DSBENB01

00000	0564	00	0	00010	DSB	ENB	=00
00001	0020	00	4	00001		TRA	1,4
00002	0520	60	4	00001	ENB	ZET*	1,4
00003	0020	00	0	00006		TRA	*+3
00004	0564	00	0	00011		ENB	=02
00005	0020	00	4	00002		TRA	2,4
00006	0564	00	0	00012		ENB	=02000
00007	0020	00	4	00002		TRA	2,4
						END	

LITERALS

00010 000000000000
00011 000000000002
00012 000000002000

POST-PROCESSOR ASSEMBLY DATA

13 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

0	DSB	0
2	ENB	0

NO ERROR IN ABOVE ASSEMBLY.

```
SUBROUTINE INSERT (ILIST,DLIST,SLIST)  
RETURN  
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

INSERT DUMMY SUBROUTINE. OPERATIONAL PROGRAM USES A GENUINE SUB HERE.

58

STORAGE NOT USED BY PROGRAM

DEC OCT
19 00023

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
61 13 00015

DEC OCT

DEC OCT

DEC OCT

DEC OCT

SUBROUTINE GONOGO

RETURN

END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

GONOGO

60

STORAGE NOT USED BY PROGRAM

DEC OCT
19 00023

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

61 DEC OCT
13 00015

DEC OCT

DEC OCT

DEC OCT

DEC OCT

SUBROUTINE AGE
RETURN
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

AGE

62

STORAGE NOT USED BY PROGRAM

DEC OCT
19 00023

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

6) DEC OCT
13 00015

DEC OCT

DEC OCT

DEC OCT

DEC OCT

ASCENT

```
SUBROUTINE ASCENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)  
LC4A=0  
LC4B=4095  
LC4C=0  
LC4D=0  
LC4E=0  
LC4G=0  
LCY=0  
RETURN  
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

ASCENT

64

STORAGE NOT USED BY PROGRAM

DEC OCT
49 00061

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
21 41 00051

DEC OCT
61 43 00053

DEC OCT

DEC OCT

DEC OCT

TDPRED

```
SUBROUTINE TDPRED (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)  
LC4A=0  
LC4B=0  
LC4C=0  
LC4D=0  
LC4E=4095  
LC4G=0  
LCY =0  
RETURN  
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```


66

\$1

DEC OCT
32561 77461

OR OTHER

6) DEC 43 OCT 00053

DEC OCT

DEC OCT

REENT

0.7

```
SUBROUTINE REENT (LC4A,LC4B,LC4C,LC4D,LC4E,LC4G,LCY)
LC4A=0
LC4B=0
LC4C=0
LC4D=0
LC4E=0
LC4G=4095
LCY=0
RETURN
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

REENT

68

STORAGE NOT USED BY PROGRAM

DEC OCT
49 00061

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
2) 41 00051

DEC OCT
6) 43 00053

DEC OCT

DEC OCT

DEC OCT

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ALIGNP

64

```
SUBROUTINE ALIGNP(CFX,CFY,CFZ,FXP,FYP,FZP,AKX1,AKX2,AKX3,AKX4,AKY1,
1,AKY2,AKY3,AKY4,AKZ1,AKZ2,AKZ3,AKZ4,DTSC)
  FXP= FXP -DTSC*AKX4
  FYP= FYP -DTSC*AKY4
  FZP= FZP -DTSC*AKZ4
  CFX = AKX1*FXP + AKX2*FYP + AKX3* FZP
  CFY = AKY1*FXP + AKY2*FYP + AKY3*FZP
  CFZ = AKZ1*FXP + AKZ2*FYP + AKZ3*FZP
  FXP=0.
  FYP=0.
  FZP=0.
  RETURN
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

ALIGNP

70

STORAGE NOT USED BY PROGRAM

DEC OCT
132 00204

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
11 129 00201

DEC OCT
31 122 00172

DEC OCT
61 123 00173

DEC OCT

DEC OCT

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Multitech © DupliMat © Maste

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WAIT5

//

SUBROUTINE WAIT5

RETURN

END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

WAITS

72

STORAGE NOT USED BY PROGRAM

DEC OCT
19 00023

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
61 13 00015

DEC OCT

DEC OCT

DEC OCT

DEC OCT

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Digital® Master

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```
SUBROUTINE GANG (CTHB,CPHIB,CPSIB,THETAB,PHIB,PSIB,CUDTHS,CUDPSS,  
*CUDPHS,CTHBC,CPSIBC)  
CTHB=THETAB  
CPSIB=PSIB  
CPHIB=PHIB  
101 IF (1.57079633-CPSIB) 102,99,99  
102 IF (CPSIB-4.71238898) 103,99,99  
103 CPSIB=3.14159265-CPSIB  
104 IF (CPSIB) 105,106,106  
105 CPSIB=CPSIB+6.28318530  
106 IF (3.14159265-CTHB) 108,107,107  
107 CTHB=CTHB+3.14159265  
GO TO 109  
108 CTHB=CTHB-3.14159265  
109 IF (3.14159265-CPHIB) 111,110,110  
110 CPHIB=CPHIB+3.14159265  
GO TO 99  
111 CPHIB=CPHIB-3.14159265  
99 CUDPHS=CPHIB  
CUDTHS=CTHB-CTHBC  
CUDPSS=CPSIB-CPSIBC  
50 IF (ABSF(CUDPHS)-3.14159265) 60,51,51  
51 IF (CUDPHS) 52,53,53  
52 CUDPHS=CUDPHS+6.28318530  
GO TO 60  
53 CUDPHS=CUDPHS-6.28318530  
60 IF (ABSF(CUDPSS)-3.14159265) 70,61,61  
61 IF (CUDPSS) 62,63,63  
62 CUDPSS=CUDPSS+6.28318530  
GO TO 70  
63 CUDPSS=CUDPSS-6.28318530  
70 IF (ABSF(CUDTHS)-3.14159265) 74,71,71  
71 IF (CUDTHS) 72,73,73  
72 CUDTHS=CUDTHS+6.28318530  
GO TO 74  
73 CUDTHS=CUDTHS-6.28318530  
74 RETURN  
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

62

74

DEC OCT
186 00272

DEC OCT
32561 77461

DEC OCT
3) 176 00260

DEC OCT
6) 180 00264

DEC OCT

DEC OCT

DEC OCT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC
101	6	00113
106	11	00134
111	18	00161
53	26	00211
70	32	00234

EFN	IFN	LOC
102	7	00117
107	12	00141
99	19	00164
60	27	00214
71	33	00242

EFN	IFN	LOC
103	8	00123
108	14	00145
50	22	00174
61	28	00222
72	34	00245

EFN	IFN	LOC
104	9	00126
109	15	00150
51	23	00202
62	29	00225
73	36	00251

EFN	IFN	LOC
105	10	00131
110	16	00155
52	24	00205
63	31	00231
74	37	00254

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REGISTERED PRODUCT OF AMERSON CORP. CLEVELAND 17, OHIO. MADE IN U.S.A.

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

75

BINARY CARD NO. SELFLO00
00000

ENTRY SELFLO

BINARY CARD NO. SELFLO01

00000 0634 00 1 00031
00001 0634 00 2 00032
00002 0634 00 4 00033
00003 0500 00 0 00135
00004 -0760 00 0 00141
00005 0500 00 0 00137
00006 0601 00 0 00030
00007 0500 00 0 00136
00010 -0760 00 0 00144
00011 0500 00 0 00137
00012 0601 00 0 00027
00013 0774 00 1 00005
00014 0772 00 0 01207
00015 0776 00 0 01227
00016 0766 00 0 01227
00017 0540 00 0 00140
00020 0060 00 0 00020
00021 0022 00 0 00051
00022 0770 00 0 01207
00023 -0772 00 0 01207

SELFLO SXA XR1,1
SX A XR2,2
SX A XR4,4
CL A SLN1
SLT 1
CL A NOP
STO SLN1P
CL A SLN
SLT 4
CL A NOP
STO SLNNOP
WRITAG AXT 5,1
WRITE REWA 7
SDHA 7
WTBA 7
RCHA WTBIOC
TCOA *
TRCA TRCHK
WEFA 7
RUNA 7

SAVE INDEX REGISTERS FOR RETURN TO
CALLING PROGRAM

SAVE STATUS OF SENSE LIGHT ONE

SAVE STATUS OF SENSE LIGHT 1

WRITE TAPE REDUNDANCY CHECK ERROR ROUTINE

BINARY CARD NO. SELFLO02

00024 0074 00 4 00254
00025 0 77767 2 00242
00026 0020 00 0 00027
00027 0761 00 0 00000
00030 0761 00 0 00000
00031 0774 00 1 00000
00032 0774 00 2 00000
00033 0774 00 4 00000
00034 0020 00 4 00001
00035 0 77775 0 00003
00036 0060 00 0 00001
00037 0061 00 0 00002
00040 0020 00 0 00041
00041 0760 00 0 00163
00042 0020 00 0 00045
00043 -0022 00 0 00066
00044 0020 00 0 00047
00045 0022 00 0 00066
00046 0020 00 0 00047
00047 0074 00 4 00127

TSX CPY90,4
HTR PROP,2,-9
TRA SLNNOP
SLNNOP NOP
SLN1P NOP
XR1 AXT **,1
XR2 AXT **,2
XR4 AXT **,4
TRA 1,4
LOADER IOCD 3,-3
TCOA 1
TCOB 2
LOADR1
LOADR1 SWT 3
TRA **3
TRCB TCHECK
TRA ON
TRCA TCHECK
TRA ON
ON TSX REWIND,4

PRINT ON-LINE
TAPE HAS BEEN PROPERLY WRITTEN
RETURN TO CALLING PROGRAM
RESTORE SENSE LIGHT FOUR
RESTORE SENSE LIGHT ONE
RETURN TO CALLING PROGRAM

MONITOR - OR - NON MONITOR
NON MONITOR
MONITOR CHANNEL B CHECK
CHANNEL A CHECK
REWIND B7 OR A1

BINARY CARD NO. SELFLO03

00050 0020 00 0 00027
00051 2 00001 1 00014
00052 0074 00 4 00254
00053 0 77767 0 00143
00054 0074 00 4 00254
00055 0 77767 0 00154

TRA SLNNOP
TRCHK TIX WRITE,1,1
TSX CPY90,4
HTR TRCHK1,-9
TSX CPY90,4
HTR TRCHK2,-9

RETURN TO CALLING PROGRAM
WRITE TAPE REDUNDANCY CHECK ERROR ROUTINE
PRINT ON-LINE
5 ATTEMPTS TO WRITE A7 HAVE FAILED
MOUNT ANOTHER TAPE - HIT START OR

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

76

00056	0074	00	4	00254	TSX	CPY90,4	
00057	0	77767	2	00165	HTR	TRCHK3,2,-9	DEPRESS MQ 6 TO OMIT AND CONTINUE
00060	0420	00	0	00000	HPR		
00061	0760	00	0	00004	ENK		
00062	0131	00	0	00000	XCA		
00063	-0320	00	0	00253	ANA	MASK6	
00064	-0100	00	0	00027	TNZ	SLNNOP	RETURN TO CALLING PROGRAM
00065	0020	00	0	00013	TRA	WRITAG	TRY AGAIN
00066	-0760	00	0	00141	TCHECK SLT	1	TEST FIRST TRY INDICATOR
00067	0020	00	0	00071	TRA	**2	
00070	0020	00	0	00105	TRA	TPERR5	
00071	0074	00	4	00127	TSX	REWIND,4	
00072	0760	00	0	00141	SLN	1	TURN ON FIRST TRY INDICATOR
00073	0760	00	0	00163	RELOAD SWT	3	

BINARY CARD NO. SELFLOD4

00074	0020	00	0	00101	TRA	TAPEA1	
00075	0762	00	0	02227	RTBB	7	LOAD FROM B7 - MONITOR
00076	-0540	00	0	00142	RCHB	LTBIOC	
00077	-0544	00	0	00035	LCHB	LOADER	
00100	0020	00	0	00001	TRA	1	
00101	0762	00	0	01221	TAPEA1 RTBA	1	LOAD FROM A1 - NON MONITOR
00102	0540	00	0	00142	RCHA	LTBIOC	
00103	0544	00	0	00035	LCHA	LOADER	
00104	0020	00	0	00001	TRA	1	
00105	0074	00	4	00127	TPERR5 TSX	REWIND,4	REWIND B7 OR A1
00106	0074	00	4	00254	TSX	CPY90,4	PRINT ON-LINE
00107	0	77767	0	00176	HTR	ONBAD,,-9	TAPE LOADING REDUNDANCY ERROR
00110	0760	00	0	00163	SWT	3	
00111	0020	00	0	00124	TRA	TPERR6	
00112	0074	00	4	00254	TSX	CPY90,4	
00113	0	77767	0	00207	HTR	ONBAD1,,-9	TO RETRY HIT START - TO ACCEPT PUT MQ 6
00114	0074	00	4	00254	TSX	CPY90,4	
00115	0	77767	2	00220	HTR	ONBAD2,2,-9	DOWN - HIT START
00116	0420	00	0	00000	HPR		
00117	0760	00	0	00004	ENK		

BINARY CARD NO. SELFLOD5

00120	0131	00	0	00000	XCA		
00121	-0320	00	0	00253	ANA	MASK6	
00122	-0100	00	0	00027	TNZ	SLNNOP	RETURN TO CALLING PROGRAM
00123	0020	00	0	00073	TRA	RELOAD	TRY AGAIN
00124	0074	00	4	00254	TPERR6 TSX	CPY90,4	
00125	0	77767	0	00231	HTR	ONBAD3,,-9	TO ACCEPT HIT START OR CLEAR AND LOAD TAPE
00126	0	00000	0	00027	HTR	SLNNOP	RETURN TO CALLING PROGRAM
00127	0760	00	0	00163	REWIND SWT	3	REWIND B7 OR A1 SUBROUTINE
00130	0020	00	0	00133	TRA	**3	
00131	0772	00	0	02207	REWB	7	
00132	0020	00	0	00134	TRA	**2	
00133	0772	00	0	01201	REWA	1	
00134	0020	00	4	00001	TRA	1,4	
00135	0760	00	0	00141	SLN1 SLN	1	
00136	0760	00	0	00144	SLN SLN	4	
00137	0761	00	0	00000	NOP		
00140	-0	00004	0	00035	WTBIOC IOCP	LOADER,4	
00141	0	77774	0	00004	IOCO	4,,-4	

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

00142 -1 00003 0 00000 LTBI0C IOCT 0,,3
00143 056021636325 TRCHK1 BCI 9,5 ATTEMPTS TO WRITE A7 HAVE FAILED

BINARY CARD NO. SELFLOD6

00144 444763626063
00145 466066513163
00146 256021076030
00147 216525602621
00150 314325246060
00151 606060606060
00152 606060606060
00153 606060606060
00154 444664456360 TRCHK2 BCI 9,MOUNT ANOTHER TAPE - HIT START OR
00155 214546633025
00156 516063214725
00157 604060303163
00160 606263215163
00161 604651606060
00162 606060606060
00163 606060606060
00164 606060606060 TRCHK3 BCI 9,DEPRESS MQ 6 TO OMIT AND CONTINUE
00165 242547512562
00166 626044506006
00167 606346604644

BINARY CARD NO. SELFLOD7

00170 316360214524
00171 602346456331
00172 456425606060
00173 606060606060
00174 606060606060
00175 606060606060
00176 632147256043 ONBAD BCI 9,TAPE LOADING REDUNDANCY ERROR
00177 462124314527
00200 605125246445
00201 242145237060
00202 255151465160
00203 606060606060
00204 606060606060
00205 606060606060
00206 606060606060
00207 634660512563 ONBAD1 BCI 9,TO RETRY HIT START - TO ACCEPT PUT MQ 6
00210 517060303163
00211 606263215163
00212 604060634660
00213 212323254763

BINARY CARD NO. SELFLOD8

00214 604764636044
00215 506060606060
00216 606060606060
00217 606060606060
00220 244666456040 ONBAD2 BCI 9,DOWN - HIT START
00221 603031636062
00222 632151636060
00223 606060606060

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

78

00224 606060606060
 00225 606060606060
 00226 606060606060
 00227 606060606060
 00230 606060606060
 00231 634660212323
 00232 254763603031
 00233 636062632151
 00234 636046516023
 00235 432521516021
 00236 452460434621
 00237 246063214725

ONBAD3 BCI 9, TO ACCEPT HIT START OR CLEAR AND LOAD TAPE

BINARY CARD NO. SELFLOD9

00240 606060606060
 00241 606060606060
 00242 632147256021
 00243 076030216260
 00244 475146472551
 00245 254370602225
 00246 254560665131
 00247 636325456060
 00250 606060606060
 00251 606060606060
 00252 606060606060
 00253 *004000000000

PROP BCI 9, TAPE A7 HAS PROPERLY BEEN WRITTEN

MASK6 OCT 004000000000

MILITARY & NAVAL

MILITARY & NAVAL

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ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

80

	00330	0340	00	0	00452	CAS	TWOC		5687
TD	00331	-3	00000	0	00335	OP2A	TXL	OP3	IN 305
TD	00332	-3	00000	0	00353	OP2B	TXL	OP6	IN 205
	00333	1	00001	4	00334		TXI	**+1,4,1	5687
BINARY CARD NO. SELFLOD12									
	00334	0100	00	0	00401		TZE	OP7	IN15
	00335	-0754	00	0	00000	OP3	PXD	,0	5687
	00336	-0763	00	0	00003		LGL	3	5687
	00337	0737	00	2	00000		PAC	,2	5687
	00340	0340	00	0	00451		CAS	ONEC	5687
	00341	0020	00	0	00344		TRA	**3	5687
TD	00342	-3	00000	0	00351	OP3A	TXL	OP5	70
TD	00343	-3	00000	0	00351		TXL	OP5	71
	00344	-0500	00	0	00447		CAL	VARONE	72,73,74
	00345	-0602	00	1	00474		ORS	OP50+10,1	5687
	00346	-0602	60	1	00457	OP4	ORS*	OP30,1	5687
	00347	-0602	60	1	00460		ORS*	OP40,1	5687
TD	00350	-3	00000	0	00364	OP4A	TXL	OP1A	5687
	00351	-0500	00	0	00447	OP5	CAL	VARONE	5687
	00352	1	77770	2	00346		TXI	OP4,2,-8	5687
	00353	-0754	00	0	00000	OP6	PXD	,0	5687
	00354	-0763	00	0	00003		LGL	3	5687
	00355	-0100	00	0	00376		TNZ	OP2	5687
	00356	-0500	00	0	00447	OP6A	CAL	VARONE	5687
	00357	-0602	60	1	00460	OP6B	ORS*	OP40,1	5687
BINARY CARD NO. SELFLOD13									
TD	00360	-3	00000	0	00364	OP6C	TXL	OP1A	5687
	00361	-0754	00	0	00000	OP1	PXD	,0	5687
	00362	-0763	00	0	00003		LGL	3	5687
	00363	-0100	00	0	00376		TNZ	OP2	5687
	00364	-0534	00	1	00332	OP1A	LXD	OP28,1	5687
	00365	1	77777	1	00366		TXI	**+1,1,-1	5687
	00366	-0534	00	4	00372		LXD	OP18,4	5687
	00367	2	00001	4	00310		TIX	OP0,4,1	5687
	00370	3	00001	*1	00301		TXH	BEGIN1,1,1	5687
	00371	0520	00	0	00446		ZET	BLKTST	5687
TD	00372	-3	00000	0	00405	OP1B	TXL	OP16	5687
	00373	-0774	00	1	00017		AXC	15,1	5687
	00374	-0634	00	1	00446		SXD	BLKTST,1	5687
	00375	1	00063	1	00301		TXI	BEGIN1,1,51	5687
	00376	0737	00	2	00000	OP2	PAC	,2	5687
	00377	-0500	00	0	00447		CAL	VARONE	5687
TD	00400	-3	00000	0	00346		TXL	OP4	5687
	00401	-0754	00	0	00000	OP7	PXD	,0	5687
	00402	-0763	00	0	00003		LGL	3	5687
	00403	-0100	00	0	00376		TNZ	OP2	5687
BINARY CARD NO. SELFLOD14									
	00404	1	77775	4	00356		TXI	OP6A,4,-3	5687
	00405	0774	00	4	00000	OP16	AXT	0,4	5687
	00406	0774	00	2	00030		AXT	24,2	5687
	00407	0506	00	4	00475	OP17	CLA	OP50+11,4	5687
	00410	0601	00	2	00545		STO	CPYBLK+24,2	5687
	00411	0500	00	4	00514		CLA	OP50+26,4	5687

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7

00412 0601 00 2 00546 STO CPYBLK+25,2
 00413 -2 00002 2 00415 TNX OP18,2,2
 00414 1 00001 4 00407 TXI OP17,4,1
 00415 0060 00 0 00415 OP18 TCOA *
 00416 0766 00 0 01361 WPGA
 00417 -0520 00 0 00456 NZT OV72A
 00420 0020 00 0 00423 TRA **3
 00421 0600 00 0 00456 STZ OV72A
 00422 0760 00 0 01371 SPRA 9
 00423 0540 00 0 00445 RCHA OP20
 00424 0060 00 0 00424 TCOA *
 00425 -0520 00 0 00455 NZT OV72
 00426 0020 00 0 00440 OP14 TRA OP13,**
 00427 -0534 00 2 00455 LXD OV72,2

BINARY CARD NO. SELF15

00430 -0634 00 2 00456 SKD OV72A,2
 00431 0534 00 1 00306 LXA BEGIN3,1
 00432 1 00014 1 00433 TXI **1,1,12
 00433 0634 00 1 00306 SXA BEGIN3,1
 00434 0600 00 0 00455 STZ OV72
 00435 0020 00 0 00267 TRA BEGIN4
 00436 0766 00 0 01361 WPGA
 00437 0760 00 0 01361 SPRA 1
 00440 -0534 00 1 00331 OP13 LXD OP2A,1
 00441 -0534 00 2 00350 LXD OP4A,2
 00442 -0534 00 4 00360 LXD OP6C,4
 00443 0060 00 0 00443 TCOA *
 00444 0020 00 4 00002 TRA 2,4
 00445 0 00030 0 00515 OP20 IOCD CPYBLK,,24
 00446 0 00000 0 00000 BLKTST HTR 0
 00447 0 00000 0 00000 VARONE HTR 0
 00450 -000000000000 BT4 OCT 400000000000
 00451 +000000000001 ONEC DEC 1
 00452 +000000000002 TWOC DEC 2
 00453 +000000000004 FOURC DEC 4

BINARY CARD NO. SELF16

00454 +000000000000 SIXC DEC 6
 00455 0 00000 0 00000 OV72 HTR 0
 00456 0 00000 0 00000 OV72A HTR 0
 00457 0 00000 2 00464 OP30 HTR OP50+2,2
 00460 0 00000 4 00462 OP40 HTR OP50,4
 00461 0 00000 0 00000 HTR 0
 00462 OP50 BSS 12

BINARY CARD NO. SELF17

00476 0 00000 2 00503 HTR OP50+17,2
 00477 0 00000 4 00501 HTR OP50+15,4
 00500 0 00000 0 00000 HTR 0
 00501 BSS 12
 00515 CPYBLK BSS 24
 END

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ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7
POST PROCESSOR ASSEMBLY DATA

545 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

47	ON	44,	46							
450	BT4	313								
137	NOP	5,	11							
310	OP0	367								
361	OP1	324								
376	OP2	355,	363,	403						
335	OP3	323,	326,	331						
346	OP4	352,	400							
351	OP5	342,	343							
353	OP6	327,	332							
401	OP7	334								
136	SLN	7								
31	XR1	0								
32	XR2	1								
33	XR4	2								
451	ONEC	340								
440	OP13	426								
426	OP14	261								
405	OP16	302,	372							
407	OP17	414								
415	OP18	413								
364	OP1A	350,	360							
372	OP1B	310,	366							
445	OP20	423								
331	OP2A	254,	440							
332	OP2B	316,	364							
457	OP30	346								
342	OP3A	277,	301,	304						
460	OP40	347,	357							
350	OP4A	255,	441							
462	OP50	271,	272,	345,	407,	411,	457,	460,	476,	477
356	OP6A	404								
357	OP6B									
360	OP6C	256,	442							
455	OV72	265,	425,	427,	434					
242	PROP	25								
454	SIXC	322								
135	SLN1	3								
452	TWOC	330								
254	CPY90	24,	52,	54,	56,	106,	112,	114,	124	
453	FOURC	325								
253	MASK6	63,	121							
176	ONBAD	107								
456	OV72A	417,	421,	430						
30	SLN1P	6								
51	TRCHK	21								
14	WRITE	51								
301	BEGIN1	370,	375							
302	BEGIN2	267								
306	BEGIN3	260,	300,	431,	433					
267	BEGIN4	263,	435							

80

ROUTINE TO GENERATE A SELF-LOADING TAPE ON A7
POST PROCESSOR ASSEMBLY DATA

270	BEGIN5	266				
446	BLKTST	274,	317,	371,	374	
515	CPYBLK	410,	412,	445		
35	LOADER	77,	103,	140		
41	LOADR1	40				
142	LTBIOC	76,	102			
207	ONBAD1	113				
220	ONBAD2	115				
231	ONBAD3	125				
73	RELOAD	123				
127	REWIND	47,	71,	105		
0	SELFLD	0				
27	SLNNOP	12,	26,	50,	64,	122, 126
101	TAPEA1	74				
66	TCHECK	43,	45			
105	TPERR5	70				
124	TPERR6	111				
143	TRCHK1	53				
154	TRCHK2	55				
165	TRCHK3	57				
447	VARONE	315,	344,	351,	356,	377
13	WRITAG	65				
140	WTBIOC	17				

NO ERROR IN ABOVE ASSEMBLY.

SUBROUTINE STATE (W)

07

SUBROUTINE STATE (W)

CSTATE IBM-OWEGO, SINGLE-PRECISION COWELLS METHOD, (3) SCARBOROUGH

C

C

14 ARGUMENTS ARE REQUIRED FOR THIS SUBROUTINE.

C

THEY ARE AS FOLLOWS,

C

ARG1=X POSITION COMPONENT

C

ARG2=Y POSITION COMPONENT

C

ARG3=Z POSITION COMPONENT

C

ARG4=RADIUS MAGNITUDE

C

ARG5=X VELOCITY COMPONENT

C

ARG6=Y VELOCITY COMPONENT

C

ARG7=Z VELOCITY COMPONENT

C

ARG8=VELOCITY MAGNITUDE

C

ARG9=EARTH OBLATENESS CONSTANT, RJ

C

ARG10=TIME STEP SIZE

C

ARG11=X THRUST ACCELERATION

C

ARG12=Y THRUST ACCELERATION

C

ARG13=Z THRUST ACCELERATION

C

ARG14=NOT USED

C

ALL ARGUMENTS EXCEPT VELOCITY MAGNITUDE AND ARG14 MUST BE
INITIALLY SUPPLIED

C

C

DIMENSION W(14),R(14)

DO 1 I=1,14

1

R(I)=W(I)

3

DO 10 I=1,3

2

G=-.1407654E17/R(4)**3

Q3=R(9)*(2.0925874E7/R(4))**2

Q4=5.*(R(3)/R(4))**2

Q1=1.+Q3*(1.-Q4)

XDD=+G*R(1)*Q1+R(11)

YDD=+G*R(2)*Q1+R(12)

ZDD=+G*R(3)*(1.+Q3*(3.-Q4))+R(13)

GO TO (4,5,6),I

4

XP=R(1)

YP=R(2)

ZP=R(3)

XK1=XDD

YK1=YDD

ZK1=ZDD

T1=R(10)/2.

T2=R(10)**2/8.

R(1)=XP+T1*R(5)+T2*XDD

R(2)=YP+T1*R(6)+T2*YDD

R(3)=ZP+T1*R(7)+T2*ZDD

R(4)=SQRTF(R(1)**2+R(2)**2+R(3)**2)

GO TO 10

5

T1=T2*4.

R(1)=XP+R(10)*R(5)+T1*XDD

R(2)=YP+R(10)*R(6)+T1*YDD

R(3)=ZP+R(10)*R(7)+T1*ZDD

R(4)=SQRTF(R(1)**2+R(2)**2+R(3)**2)

XK2=XDD

YK2=YDD

ZK2=ZDD

GO TO 10

SUBROUTINE STATE (W)

00

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6   T1=R(10)/6.
    R(1)=XP+R(10)*(R(5)+T1*(XK1+2.*XK2))
    R(2)=YP+R(10)*(R(6)+T1*(YK1+2.*YK2))
    R(3)=ZP+R(10)*(R(7)+T1*(ZK1+2.*ZK2))
    R(4)=SQRTF(R(1)**2+R(2)**2+R(3)**2)
    R(5)=R(5)+T1*(XK1+4.*XK2+XDD)
    R(6)=R(6)+T1*(YK1+4.*YK2+YDD)
    R(7)=R(7)+T1*(ZK1+4.*ZK2+ZDD)
    R(8)=SQRTF(R(5)**2+R(6)**2+R(7)**2)
10  CONTINUE
    DO 20 I=1,14
20  W(I)=R(I)
    RETURN
    END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)

```

SUBROUTINE STATE (W)

STORAGE NOT USED BY PROGRAM

DEC OCT
348 00534

DEC OCT
32561 77461

STORAGE LOCATIONS FOR VARIABLES APPEARING IN DIMENSION AND EQUIVALENCE STATEMENTS

DEC OCT
R 347 00533

DEC OCT

DEC OCT

DEC OCT

DEC OCT

STORAGE LOCATIONS FOR VARIABLES NOT APPEARING IN COMMON, DIMENSION, OR EQUIVALENCE STATEMENT

DEC OCT
G 333 00515
T2 328 00510
YDD 323 00503
ZK1 318 00476

DEC OCT
Q1 332 00514
XDD 327 00507
YK1 322 00502
ZK2 317 00475

DEC OCT
Q3 331 00513
XK1 326 00506
YK2 321 00501
ZP 316 00474

DEC OCT
Q4 330 00512
XK2 325 00505
YP 320 00500

DEC OCT
T1 329 00511
XP 324 00504
ZDD 319 00477

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
11 312 00470
C1G0 315 00473

DEC OCT
21 293 00445
E14 80 00120

DEC OCT
31 296 00450
E16 187 00273

DEC OCT
61 305 00461

DEC OCT
91 311 00467

LOCATIONS OF NAMES IN TRANSFER VECTOR

DEC OCT
SQRT 0 00000

DEC OCT

DEC OCT

DEC OCT

DEC OCT

ENTRY POINTS TO SUBROUTINES NOT OUTPUT FROM LIBRARY

SQRT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN IFN LOC
1 5 00017
6 37 00274

EFN IFN LOC
3 6 00023
10 46 00432

EFN IFN LOC
2 7 00024
20 48 00435

EFN IFN LOC
4 15 00121

EFN IFN LOC
5 28 00213

86

Multithreaded Digital

Multithreaded Digital

AMERICAN-ANALOG CORPORATION CLEVELAND, OHIO 44103-1100

MODIFIED EULER INTEGRATION SUBROUTINE. ECKSTROM - IBM OWEGO.

BINARY CARD NO. MEDP3000

00000	ENTRY	MAR
00046	ENTRY	DEV
00122	ENTRY	PRT

BINARY CARD NO. MEDP3001

00000	0600	00	0	00133	MAR	STZ	COUNT
00001	0500	60	4	00002		CLA*	2,4
00002	0601	00	0	00127		STO	DT
00003	0500	60	4	00001		CLA*	1,4
00004	0771	00	0	00022		ARS	18
00005	0601	00	0	00130		STO	N
00006	0500	00	4	00003		CLA	3,4
00007	0400	00	0	00130		ADD	N
00010	0621	00	0	00053		STA	X1
00011	0621	00	0	00061		STA	X2
00012	0621	00	0	00062		STA	X3
00013	0621	00	0	00075		STA	X4
00014	0621	00	0	00101		STA	X5
00015	0621	00	0	00102		STA	X6
00016	0400	00	0	00130		ADD	N
00017	0621	00	0	00055		STA	XD1
00020	0621	00	0	00071		STA	XD2
00021	0621	00	0	00057		STA	XD3
00022	0400	00	0	00130		ADD	N
00023	0621	00	0	00054		STA	XP1

BINARY CARD NO. MEDP3002

00024	0621	00	0	00074		STA	XP2
00025	0400	00	0	00130		ADD	N
00026	0621	00	0	00056		STA	XDP1
00027	0621	00	0	00070		STA	XDP2
00030	0400	00	0	00130		ADD	N
00031	0621	00	0	00100		STA	XL1
00032	0621	00	0	00103		STA	XL2
00033	0621	00	0	00036		STA	XL3
00034	0634	00	1	00040		SXA	*+4,1
00035	0534	00	1	00130		LXA	N,1
00036	0600	00	1	00036	XL3	STZ	*,1
00037	2 00001	1	00036			TIX	*-1,1,1
00040	0774	00	1	00040		AXT	*,1
00041	0634	00	4	00047		SXA	S4,4
00042	0500	00	0	00131		CLA	D1
00043	0601	60	4	00006		STO*	6,4
00044	0600	00	0	00134		STZ	IND
00045	0020	00	4	00007		TRA	7,4
00046	0634	00	1	00106	DEV	SXA	EXIT,1
00047	0774	00	4	00047	S4	AXT	*,4

BINARY CARD NO. MEDP3003

00050	0534	00	1	00130		LXA	N,1
00051	0520	00	0	00134		ZET	IND
00052	0020	00	0	00070		TRA	XDP2
00053	0500	00	1	00053	X1	CLA	*,1

=I
= 0, V+N

MODIFIED EULER INTEGRATION SUBROUTINE. ECKSTROM - IBM OWEGO.

00054	0601 00 1 00054	XP1	STO	*,1	V+3N
00055	0500 00 1 00055	XD1	CLA	*,1	V+2N
00056	0601 00 1 00056	XDPI	STO	*,1	V+4N
00057	0560 00 1 00057	XD3	LDQ	*,1	V+2N
00060	0260 00 0 00127		FMP	DT	
00061	0300 00 1 00061	X2	FAD	*,1	V+N
00062	0601 00 1 00062	X3	STO	*,1	V+N
00063	2 00001 1 00053		TIX	X1,1,1	
00064	0500 00 0 00131		CLA	D1	
00065	0601 00 0 00134		STO	IND	
00066	0534 00 1 00106		LXA	EXIT,1	
00067	0020 00 0 00115		TRA	LD	
00070	0500 00 1 00070	XDPI	CLA	*,1	V+4N
00071	0300 00 1 00071	XD2	FAD	*,1	V+2N
00072	0241 00 0 00135		FDP	TWO	
00073	0260 00 0 00127		FMP	DT	

BINARY CARD NO. MEDP3004

00074	0300 00 1 00074	XP2	FAD	*,1	V+3N
00075	0601 00 1 00075	X4	STO	*,1	V+N
00076	-0600 00 0 00136		STQ	TEMP	
00077	0500 00 0 00136		CLA	TEMP	
00100	0300 00 1 00100	XL1	FAD	*,1	
00101	0300 00 1 00101	X5	FAD	*,1	
00102	0601 00 1 00102	X6	STO	*,1	
00103	-0600 00 1 00103	XL2	STQ	*,1	
00104	2 00001 1 00070		TIX	XDP2,1,1	
00105	0600 00 0 00134		STZ	IND	
00106	0774 00 1 00106	EXIT	AXT	*,1	
00107	0500 00 0 00133		CLA	COUNT	
00110	0400 00 0 00131		ADD	D1	
00111	0601 00 0 00133		STO	COUNT	
00112	0402 60 4 00005		SUB*	5,4	
00113	0100 00 0 00120		TZE	**5	
00114	0120 00 0 00120		TPL	**4	
00115	0500 00 0 00131	LD	CLA	D1	
00116	0601 60 4 00006		STO*	6,4	
00117	0020 00 4 00007		TRA	7,4	

BINARY CARD NO. MEDP3005

00120	0500 00 0 00132		CLA	D2	
00121	0020 00 0 00116		TRA	*-3	
00122	0600 00 0 00133	PRT	STZ	COUNT	
00123	0534 00 4 00047		LXA	S4,4	
00124	0500 60 4 00002		CLA*	2,4	
00125	0601 00 0 00127		STO	DT	
00126	0020 00 0 00115		TRA	LD	
00127	0 00000 0 00000	DT	PZE		
00130	0 00000 0 00000	N	PZE		
00131	0 00001 0 00000	D1	PZE	*,1	
00132	0 00002 0 00000	D2	PZE	*,2	
00133	0 00000 0 00000	COUNT	PZE		
00134	0 00000 0 00000	IND	PZE		
00135	+202400000000	TWO	DEC	2.	
00136	0 00000 0 00000	TEMP	PZE		
			END		

MODIFIED EULER INTEGRATION SUBROUTINE. ECKSTROM - IBM OWEEO.
POST PROCESSOR ASSEMBLY DATA

137 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

130	N	5,	7,	16,	22,	25,	30,	35,	50
131	D1	42,	64,	110,	115				
132	D2	120							
127	DT	2,	60,	73,	125				
115	LD	67,	126						
47	S4	41,	123						
53	X1	10,	63						
61	X2	11							
62	X3	12							
75	X4	13							
101	X5	14							
102	X6	15							
46	DEV	0							
134	IND	44,	51,	65,	105				
0	MAR	0							
122	PRT	0							
135	TWO	72							
55	XD1	17							
71	XD2	20							
57	XD3	21							
100	XL1	31							
103	XL2	32							
36	XL3	33							
54	XP1	23							
74	XP2	24							
106	EXIT	46,	66						
136	TEMP	76,	77						
56	XDPI	26							
70	XDPI	27,	52,	104					
133	COUNT	0,	107,	111,	122				

NO ERROR IN ABOVE ASSEMBLY.

90

REGISTERED PRODUCT OF
ABREX-SHAW-REUTEMAN CORPORATION CLEVELAND 17, OHIO "MADE IN U.S.A."

ENTRY CTRL1

BINARY CARD NO. TCTRL001

(TES)
GEXEC

MS DESIRED SCALED +17

NO. OF WORDS SCALED +21
NO. OF WORDS SCALED +17

SET UP IOCT COMMAND

00050	0500	00	0	00644	CLA	=077
00051	0221	00	0	00642	DVP	=01
00052	0520	00	0	00153	ZET	OFIND

LIBE

//

00053	0020	00	0	00063	TRA	**8
00054	0500	00	0	00151	CLA	SJ2
00055	0560	00	0	00152	LDQ	SJ3
00056	0763	00	0	00002	LLS	2
00057	0560	00	0	00150	LDQ	SJ1
00060	0520	00	0	00153	ZET	OFIND
00061	0020	00	0	00066	TRA	**5
00062	0140	00	0	00066	TOV	**4
00063	0500	00	0	00651	CLA	=02000000000000
00064	0763	00	0	00001	LLS	1
00065	0020	00	0	00054	TRA	*-9
00066	0774	00	4	00000	IXA4 AXT	0,4
00067	0774	00	2	00000	IXA2 AXT	0,2
00070	0774	00	1	00000	IXA1 AXT	0,1
00071	0021	00	0	00001	CENT TTR	\$GEXEC
00072	0634	00	4	00066	TENT SXA	IXA4,4
00073	0634	00	2	00067	SXA	IXA2,2

BINARY CARD NO. TCTRL004

00074	0634	00	1	00070	SXA	IXA1,1
00075	-0022	00	0	00076	TRCB	**1
00076	0564	00	0	00641	ENB	=0
00077	0600	00	0	00154	STZ	DIND
00100	0600	00	0	00153	STZ	OFIND
00101	-0600	00	0	00150	STQ	SJ1
00102	0765	00	0	00002	LRS	2
00103	0601	00	0	00151	STO	SJ2
00104	-0600	00	0	00152	STQ	SJ3
00105	-0140	00	0	00110	TNO	**3
00106	0500	00	0	00645	CLA	=077777
00107	0601	00	0	00153	STO	OFIND
00110	0760	00	0	00012	DCT	
00111	0020	00	0	00113	TRA	**2
00112	0020	00	0	00115	TRA	**3
00113	0500	00	0	00645	CLA	=077777
00114	0601	00	0	00154	STO	DIND
00115	0500	00	0	00014	CLA	12
00116	0621	00	0	00071	STA	CENT
00117	0774	00	1	00316	AXT	206,1

BINARY CARD NO. TCTRL005

00120	0500	00	1	00000	CLA	0,1
00121	0601	00	1	00474	STO	SAVE1,1
00122	2	00001	1	00120	TIX	*-2,1,1
00123	0774	00	1	00145	AXT	101,1
00124	0500	00	1	00145	CLA	101,1
00125	0601	00	1	00641	STO	SAVE2,1
00126	2	00001	1	00124	TIX	*-2,1,1
00127	0500	00	0	00645	CLA	=077777
00130	0601	00	0	00155	STO	INIT
00131	0774	00	4	00000	IXB4 AXT	0,4
00132	0774	00	2	00000	IXB2 AXT	0,2
00133	0774	00	1	00000	IXB1 AXT	0,1
00134	-0760	00	0	02000	ETTB	
00135	0020	00	0	00137	TRA	**2
00136	0020	00	4	00001	TRA	1,4

LIBE

00137	0772	00	0	02206	REMB	6
00140	0061	00	0	00140	TCOB	*
00141	0766	00	0	02226	WTBB	6
00142	-0540	00	0	00146	RCHB	CW2
00143	0061	00	0	00143	TCOB	*

BINARY CARD NO. TCTRL006

00144	0020	00	4	00001	TRA	1,4
00145	-1	00000	0	40000	CW1 IOCT	16384,0,0
00146	0	00012	0	40000	CW2 IOCD	16384,0,10
00147	0021	00	0	00072	LOCA TTR	TENT
00150	0	00000	0	00000	SJ1 PZE	0
00151	0	00000	0	00000	SJ2 PZE	0
00152	0	00000	0	00000	SJ3 PZE	0
00153	0	00000	0	00000	OFIND PZE	0
00154	0	00000	0	00000	DIND PZE	0
00155	0	00000	0	00000	INIT PZE	0
00474					SAVE1 BES	206
00641					SAVE2 BES	101
					END	

LITERALS

BINARY CARD NO. TCTRL007

00641	000000000000
00642	000000000001
00643	000000000002
00644	000000000077
00645	000000077777
00646	000001000000
00647	000007231463
00650	077777000000
00651	200000000000
00652	240000000000

LIBE

POST-PROCESSOR ASSEMBLY DATA

653 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

145	CW1	24,	26	
146	CW2	142		
150	SJ1	57,	101	
151	SJ2	54,	103	
152	SJ3	55,	104	
71	CENT	116		
154	DIND	45,	77,	114
155	INIT	30,	130	
70	IXA1	74		
67	IXA2	73		
66	IXA4	72		
133	IXB1	4		
132	IXB2	3		
131	IXB4	2		
147	LOCA	43		
72	TENT	147		
2	CTRL1	0		
1	GEXEC	71		
153	OFIND	52,	60,	100, 107
474	SAVE1	34,	121	
641	SAVE2	40,	125	
0	(TES)	5		

NO ERROR IN ABOVE ASSEMBLY.

94

BINARY CARD NO. KEYCN000
00000

ENTRY KEYCN

BINARY CARD NO. KEYCN001
00000 0760 00 0 00004
00001 -0600 60 4 00001
00002 0020 00 4 00002

KEYCN ENK **
STQ* 1,4
TRA 2,4
END

POST-PROCESSOR ASSEMBLY DATA

3 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

0 KEYCN 0

NO ERROR IN ABOVE ASSEMBLY.

ERRANG ERROR ANGLE SUBROUTINE

```
SUBROUTINE ERRANG (CUDPHS,CUDPSS,CUDTHS,CDPHSC,CDPSSC,CDTHSC)
1 IF (ABSF(CUDPHS)-20./57.2957795) 3, 3, 4
3 CDPHSC=CUDPHS
GO TO 7
4 IF (CUDPHS) 5, 6, 6
5 CDPHSC=-20./57.2957795
GO TO 7
6 CDPHSC=20./57.2957795
7 IF (ABSF(CUDPSS)-20./57.2957795) 8, 8, 9
8 CDPSSC=CUDPSS
GO TO 12
9 IF (CUDPSS) 10, 11, 11
10 CDPSSC=-20./57.2957795
GO TO 12
11 CDPSSC=20./57.2957795
12 IF (ABSF(CUDTHS)-20./57.2957795) 13, 14, 14
13 CDTHSC=CUDTHS
GO TO 2
14 IF (CUDTHS) 15, 16, 16
15 CDTHSC=-20./57.2957795
GO TO 2
16 CDTHSC=20./57.2957795
2 RETURN
END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```


ERRANG ERROR ANGLE SUBROUTINE

97

STORAGE NOT USED BY PROGRAM

DEC OCT
116 00164

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

1) DEC OCT
114 00162

3) DEC OCT
106 00152

6) DEC OCT
108 00154

DEC OCT

DEC OCT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC
1	3	00041
7	10	00070
12	17	00117
2	24	00146

EFN	IFN	LOC
3	4	00051
8	11	00100
13	18	00127

EFN	IFN	LOC
4	6	00054
9	13	00103
14	20	00132

EFN	IFN	LOC
5	7	00057
10	14	00106
15	21	00135

EFN	IFN	LOC
6	9	00065
11	16	00114
16	23	00143

Multilith & Dupliant & Waste

REPRODUCED FROM THE NATIONAL ARCHIVES AT COLLEGE PARK, MARYLAND

BINARY CARD NO. HDA70000
00000

ENTRY HDA7

BINARY CARD NO. HDA70001
00000 0776 00 0 01227
00001 0020 00 4 00001

HDA7 SDN 663
TRA 1,4
END

POST-PROCESSOR ASSEMBLY DATA

2 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

0 HDA7 0

NO ERROR IN ABOVE ASSEMBLY.

100

BINARY CARD NO. HDA90000

00000

ENTRY

HDA9

BINARY CARD NO. HDA90001

00000 0776 00 0 01231

HDA9

SDN

665

00001 0020 00 4 00001

TRA

1,4

END

101
POST PROCESSOR ASSEMBLY DATA

2 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

0 HDA9 0

NO ERROR IN ABOVE ASSEMBLY.

102

BINARY CARD NO. LDB60000
00000

ENTRY: LDB6

BINARY CARD NO. LDB60001
00000 0776 00 0 02206
00001 0020 00 4 00001

LDB6 SDN 1158
TRA 1,4
END

POST PROCESSOR ASSEMBLY DATA

2 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

0 LDB6 0

NO ERROR IN ABOVE ASSEMBLY.

ISZS

```
      SUBROUTINE IVISZS(LDI22,LC5,CSTZ,CT,LD011,LD012,LD013,CDVXZ,CDVYZ,  
1CDVZZ,LDI25,LDI26,LDI31,LC1,LC1J)  
301 IF (LDI22) 2,302,2  
302 IF (LC5) 308,323,308  
323 CSTZ=CT+23.  
303 LD012=0  
      LD013=4095  
      LD011=4095  
304 LD012=4095  
      LD011=4095  
305 LD013=0  
      LD011=4095  
306 LC5=4095  
307 CDVXZ=0.  
      CDVYZ=0.  
      CDVZZ=0.  
      GO TO 2  
308 IF (LDI25) 345,309,345  
309 IF (LDI26) 345,310,345  
310 IF (LDI31) 345,346,345  
345 IF (CSTZ-CT) 346,2,2  
346 LC1=0  
      LC5=0  
347 LC1J=-4095  
2    RETURN  
      END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

1525

105

STORAGE NOT USED BY PROGRAM

DEC OCT
115 00163

DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
21 105 00151

DEC OCT
31 107 00153

DEC OCT
61 109 00155

DEC OCT

DEC OCT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN IFN LOC
301 3 00057
305 11 00104
310 20 00131

EFN IFN LOC
302 4 00063
306 13 00110
345 21 00133

EFN IFN LOC
323 5 00067
307 14 00112
346 22 00137

EFN IFN LOC
303 6 00072
308 18 00121
347 24 00143

EFN IFN LOC
304 9 00100
309 19 00125
2 25 00145

IDS

```
      SUBROUTINE IVIDS (CDVXS,CDVXB,CDVXZ,CDVYS,CDVYB,CDVYZ,CDVZS,CDVZB,  
1CDVZZ,LDI22,LC1J,LDO12,LDO13,CDV,CDVXSP,CDVYSP,CDVZSP)  
326 CDVXS=CDVXB-CDVXZ  
    CDVYS=CDVYB-CDVYZ  
    CDVZS=CDVZB-CDVZZ  
327 IF (LDI22) 344,328,344  
328 IF (LC1J) 336,334,330  
330 LC1J=-4095  
331 LDO12=4095  
    LDO13=4095  
332 IF (CDVZS) 11,13,12  
    11 CDVZS=CDVZS-.5  
        GO TO 13  
    12 CDVZS=CDVZS+.5  
    13 CDV  = INTF(CDVZS)  
        CDVZSP=CDVZSP+CDV  
333 CDVZZ=CDVZZ+CDV  
    GO TO 344  
334 LC1J=4095  
335 LDO12=0  
    LDO13=4095  
339 IF (CDVYS) 14,16,15  
    14 CDVYS=CDVYS-.5  
        GO TO 16  
    15 CDVYS=CDVYS+.5  
    16 CDV  = INTF(CDVYS)  
        CDVYSP=CDVYSP+CDV  
340 CDVYZ=CDVYZ+CDV  
    GO TO 344  
336 LC1J=0  
337 LDO12=4095  
    LDO13=0  
341 IF (CDVXS) 17,19,18  
    17 CDVXS=CDVXS-.5  
        GO TO 19  
    18 CDVXS=CDVXS+.5  
    19 CDV  = INTF(CDVXS)  
        CDVXSP=CDVXSP+CDV  
342 CDVXZ=CDVXZ+CDV  
344 RETURN  
    END(1,1,0,0,0,0,1,1,0,0,0,0,0,0,0)
```

IDS

107

STORAGE NOT USED BY PROGRAM

DEC OCT
195 00303DEC OCT
32561 77461

LOCATIONS FOR OTHER SYMBOLS NOT APPEARING IN SOURCE PROGRAM

DEC OCT
2) 186 00272DEC OCT
3) 188 00274DEC OCT
6) 189 00275

DEC OCT

DEC OCT

EXTERNAL FORMULA NUMBERS WITH CORRESPONDING INTERNAL FORMULA NUMBERS AND OCTAL LOCATIONS

EFN	IFN	LOC
326	3	00125
332	11	00154
334	19	00201
16	26	00221
17	34	00245

EFN	IFN	LOC
327	6	00136
11	12	00157
335	20	00203
340	28	00230
18	36	00251

EFN	IFN	LOC
328	7	00142
12	14	00163
339	22	00207
336	30	00234
19	37	00254

EFN	IFN	LOC
330	8	00146
13	15	00166
14	23	00212
337	31	00236
342	39	00263

EFN	IFN	LOC
331	9	00150
333	17	00175
15	25	00216
341	33	00242
344	40	00266

ARGUMENT 1 IS THE NUMBER OF FILES TO BE SKIPPED GREATER THAN ZERO

ARGUMENT 2 IS THE CHANNEL SELECTED
CHANNEL A = 1
CHANNEL B = 2
ARGUMENT 3 IS THE TAPE DRIVE SETTING

BINARY CARD NO. SKIPN000
00000

ENTRY SKPN

BINARY CARD NO. SKIPN001

00000	0634	00	1	00020	SKPN
00001	0634	00	2	00021	
00002	0500	60	4	00001	
00003	-0734	00	1	00000	
00004	0500	60	4	00002	
00005	-0734	00	2	00000	
00006	0500	00	2	00025	
00007	0400	60	4	00003	
00010	0771	00	0	00022	
00011	0621	00	0	00012	
00012	0762	00	0	00000	A
00013	0522	00	2	00027	
00014	0522	00	2	00031	
00015	0522	00	2	00033	
00016	0020	00	0	00012	
00017	2	00001	1	00012	
00020	0774	00	1	00000	RTN
00021	0774	00	2	00000	
00022	0020	00	4	00004	
00023	+0022	00000000			CH

SXA	RTN,1
SXA	RTN+1,2
CLA*	1,4
PDX	0,1
CLA*	2,4
PDX	0,2
CLA	CH+2,2
ADD*	3,4
ARS	18
STA	A
RDS	**
XEC	CH+4,2
XEC	CH+6,2
XEC	CH+8,2
TRA	A
TIX	A,1,1
AXT	0,1
AXT	0,2
TRA	4,4
OCT	2200000000

BINARY CARD NO. SKIPN002

```
00024 +001200000000
00025 -0540 00 0 00033
00026 0540 00 0 00033
00027 0061 00 0 00014
00030 0060 00 0 00014
00031 -0030 00 0 00017
00032 0030 00 0 00017
00033 2 00000 0 00000 CWI
00034 0 00000 0 00000
```

```

OCT      1200000000
RCHB     CW1
RCHA     CW1
TCOB     A+2
TCOA     A+2
TEFB     RTN-1
TEFA     RTN-1
IORP     0,0,0
IOCD     0,0,0
END

```

ARGUMENT 1 IS THE NUMBER OF FILES TO BE SKIPPED GREATER THAN ZERO

* ARGUMENT 2 IS THE CHANNEL SELECTED
 * CHANNEL A = 1
 * CHANNEL B = 2
 * ARGUMENT 3 IS THE TAPE DRIVE SETTING

BINARY CARD NO. SKIPN000
 00000

ENTRY SKPN

BINARY CARD NO. SKIPN001

00000	0634	00	1	00020	SKPN	SXA	RTN,1
00001	0634	00	2	00021		SXA	RTN+1,2
00002	0500	60	4	00001		CLA*	1,4
00003	-0734	00	1	00000		PDX	0,1
00004	0500	60	4	00002		CLA*	2,4
00005	-0734	00	2	00000		PDX	0,2
00006	0500	00	2	00025		CLA	CH+2,2
00007	0400	60	4	00003		ADD*	3,4
00010	0771	00	0	00022		ARS	18
00011	0621	00	0	00012		STA	A
00012	0762	00	0	00000	A	RDS	**
00013	0522	00	2	00027		XEC	CH+4,2
00014	0522	00	2	00031		XEC	CH+6,2
00015	0522	00	2	00033		XEC	CH+8,2
00016	0020	00	0	00012		TRA	A
00017	2	00001	1	00012		TIX	A,1,1
00020	0774	00	1	00000	RTN	AXT	0,1
00021	0774	00	2	00000		AXT	0,2
00022	0020	00	4	00004		TRA	4,4
00023	+0022	00000000			CH	OCT	2200000000

BINARY CARD NO. SKIPN002

00024	+0012	00000000			OCT	1200000000
00025	-0540	00	0	00033	RCHB	CW1
00026	0540	00	0	00033	RCHA	CW1
00027	0061	00	0	00014	TCOB	A+2
00030	0060	00	0	00014	TCOA	A+2
00031	-0030	00	0	00017	TEFB	RTN-1
00032	0030	00	0	00017	TEFA	RTN-1
00033	2	00000	0	00000	CW1	IORP
00034	0	00000	0	00000		IOCD
						END

ARGUMENT 1 IS THE NUMBER OF FILES TO BE SKIPPED GREATER THAN ZERO
POST PROCESSOR ASSEMBLY DATA

35 IS THE FIRST LOCATION NOT USED BY THIS PROGRAM

REFERENCES TO DEFINED SYMBOLS

12	A	11,	16,	17,	27,	30
23	CH	6,	13,	14,	15	
33	CW1	25,	26			
20	RTN	0,	1,	31,	32	
0	SKPN	0				

NO ERROR IN ABOVE ASSEMBLY.

APPENDIX B

Sample on-line and off-line output.

ON-LINE OUTPUT

1356.0	211413.3	-88135.2	-560.0	14.	0.	0.	4095	0
1357.0	211239.8	-88135.5	-561.4	13.	0.	0.	4095	0
1358.0	211064.3	-88136.2	-561.6	12.	0.	0.	4095	0
1359.0	210888.8	-88137.2	-562.6	12.	0.	0.	4095	0
1360.0	210712.1	-88138.5	-563.2	11.	0.	0.	4095	0
1361.0	210535.3	-88139.5	-564.4	10.	0.	0.	4095	0
1362.0	210356.2	-88141.5	-565.1	9.	0.	0.	4095	0
1363.0	210177.1	-88143.5	-566.0	8.	0.	0.	4095	0
1364.0	209998.4	-88146.2	-566.9	7.	0.	0.	4095	0
1365.0	209816.7	-88148.5	-567.5	6.	0.	0.	4095	0
1366.0	209635.4	-88151.0	-568.4	6.	0.	0.	4095	0
1367.0	209452.7	-88154.0	-568.8	5.	0.	0.	4095	0
1368.0	209269.7	-88157.5	-569.8	4.	0.	0.	4095	0
1369.0	209086.1	-88161.0	-570.4	3.	0.	0.	4095	0
1370.0	208900.8	-88164.5	-571.3	2.	0.	0.	4095	0
1371.0	208715.9	-88168.5	-571.8	1.	0.	0.	4095	0
1430.0	19 683.9	-88291.0	-613.4	0.	0.	0.	4095	0
1530.0	179001.1	-87891.7	-674.4	0.	0.	0.	4095	4095
1630.0	160501.0	-86739.5	-729.6	0.	0.	0.	4095	4095
1730.0	142357.1	-84847.7	-775.1	0.	0.	0.	4095	0
1830.0	124736.8	-82247.5	-807.9	0.	0.	0.	4095	0
1930.0	107804.6	-78967.7	-829.5	0.	0.	0.	4095	0
2030.0	91717.6	-75055.0	-840.6	0.	0.	0.	4095	4095
2076.0	84640.2	-73057.7	-841.7	0.	0.	1.	4095	4095
2130.0	76599.5	-70578.5	-838.2	0.	0.	0.	4095	0
2230.0	62577.4	-65592.0	-823.9	0.	0.	0.	4095	4095
2330.0	49777.6	-60148.7	-796.6	0.	0.	0.	4095	4095
2430.0	38294.3	-54321.5	-756.9	0.	0.	0.	4095	0
2530.0	28210.0	-48190.0	-706.6	0.	0.	0.	4095	0
2630.0	19586.0	-41837.0	-645.4	0.	0.	0.	4095	0
2730.0	12456.6	-35347.2	-573.7	0.	0.	0.	4095	4095
2799.0	8424.6	-30835.2	-519.4	0.	0.	1.	4095	4095
2830.0	6837.6	-28810.5	-493.9	0.	0.	0.	4095	0
2930.0	2706.5	-22313.0	-406.2	0.	0.	0.	4095	0

TIME (SECONDS)	RELATIVE POSITION (FT)			RELATIVE VELOCITY (FPS)			RADAR RANGE RATE		LD100
	TRAILING	VERTICAL	OUT-OF-PLANE	TRAILING	VERTICAL	OUT-PLANE	(FT)	(FPS)	
3030.0	75.4	-15935.5	-314.5	-18.95	62.91	0.96	15938.2	-63.07	4095
3130.0	-1098.5	-9762.5	-217.4	-4.62	60.46	1.01	9826.1	-59.66	4095
3230.0	-874.1	-3873.2	-115.1	9.03	57.20	1.04	3970.9	-57.92	4095
3282.0	-225.7	-949.7	-60.1	15.80	55.19	1.05	977.1	-57.48	4095
3283.0	-210.0	-894.5	-59.0	15.93	55.15	1.05	919.9	-57.18	4095
3284.0	-194.4	-839.5	-57.6	16.06	55.11	1.05	862.5	-57.39	4095
3285.0	-177.4	-784.2	-56.9	16.19	55.07	1.05	805.4	-57.13	4095
3286.0	-161.8	-729.2	-56.0	16.31	55.03	1.05	748.0	-57.37	4095
3287.0	-144.8	-674.0	-54.6	16.44	54.99	1.05	690.8	-57.27	4095
3288.0	-127.9	-618.7	-53.9	16.57	54.95	1.05	633.7	-57.03	4095
3289.0	-112.2	-564.2	-52.7	16.70	54.91	1.05	576.8	-56.91	4095
3290.0	-95.2	-509.2	-51.9	16.82	54.87	1.05	519.8	-57.03	4095
3291.0	-78.3	-454.2	-50.5	16.95	54.83	1.05	462.9	-56.89	4095
3292.0	-61.3	-399.5	-49.6	17.08	54.79	1.05	406.4	-56.47	4095
3293.0	-44.4	-344.5	-48.6	17.20	54.75	1.05	350.2	-56.21	4095
3294.0	-27.4	-290.2	-47.7	17.33	54.70	1.05	294.5	-55.74	4095
3295.0	-9.1	-235.2	-47.0	17.46	54.66	1.05	239.5	-54.93	0
3296.0	9.0	-181.0	-45.9	17.58					

OFF - LINE OUTPUT : SHEET 1.

TIME	FROM PROBLEM START	0.17299999E 04	DATE 11/ 8/65	RUN 7M5-MVS-5.1
GEMINI	POSITION - INERTIAL	-0.21500326E 08	-0.36073972E 07	0.13602526E 06
	- TARGET IN GEMINI FRAME	0.17217291E 06	-0.91762207E 03	-0.88263404E 05
	VELOCITY - INERTIAL	0.37482695E 04	-0.21964563E 05	0.12298762E 05
	VECTOR MAGNITUDE	0.21801280E 08		
TARGET	POSITION - INERTIAL	-0.21562400E 08	-0.37700363E 07	0.22046330E 06
	VELOCITY - INERTIAL	0.39480667E 04	-0.21860373E 05	0.12261964E 05
	VECTOR MAGNITUDE	0.21890611E 08		
	S/C IN TARG. CYLINDRICAL X-Y-Z POSITION	0.17197191E 06	-0.89331999E 05	-0.87350976E 03
	X-Y-Z VELOCITY	-0.18165307E 03	0.15176138E 02	-0.26491699E 01
MATRIX	INERTIAL - SPACECRAFT	0.14561331E-00	0.74281510E-01	0.98655365E 00
		-0.86342735E 00	-0.47729865E-00	0.16337482E-00
		0.48301446E-00	-0.87560099E 00	-0.53614577E-02
MATRIX	TARGET - INERTIAL	-0.15557608E-00	-0.98500673E 00	-0.74550607E-01
		0.86154426E 00	-0.17222161E-00	0.47757845E-00
		-0.48325722E-00	0.10071137E-01	0.87542047E 00
MATRIX	INERTIAL - NAVIGATION	0.14784122E-00	0.98619548E 00	-0.74574780E-01
		-0.86292014E 00	0.16546750E-00	0.47748224E-00
		0.48323054E-00	-0.62394798E-02	0.87547091E 00
MATRIX	SPACECRAFT - NAVIGATION	0.10000038E 01	-0.22797333E-02	-0.26519224E-03
		-0.26465580E-03	-0.25803135E-03	-0.10000043E 01
		0.22830591E-02	0.10000014E 01	-0.25724678E-03
RADAR	RANGE - AZIMUTH α - ELEVATION β	0.19347981E 06	0.47427416E-02	0.58094794E 01
	RATE - SINE R - SINE A	-0.16779101E 03	0.16617562E-01	-0.36700781E-00
GIMBAL ANGLES	THETA - PSI - PHI	0.22797436E-02	0.26519108E-03	0.62829279E 01
INTEGRATING ACCELEROMETER OUTPUTS	- BEFORE COMP	0.	0.	-0.
	- AFTER COMP	0.	0.	-0.
DELTA V	METER READINGS	0.	0.	0.
THRUSTER	ACCELERATION	0.	0.	0.
DELTA V	TOTAL APPLIED	0.29239997E 02	0.	0.
ERROR ANGLES		0.23271056E-02	0.	0.
	PITCH		YAW	ROLL
TURNING RATES		-0.11635528E-02	-0.	-0.
ORBITAL PARAMETERS	MU - OMEGA - IOTA	0.12911297E-01	0.32965243E 01	0.50438696E 00

TIME # 0.17299999E 04 SECONDS.
SIMULATED COMPUTER OUTPUTS ON THIS PAGE.

DATE 11/ 8/65

RUN 7M5-MVS-5.1

CT 0.17299999E 04	CA11 0.99999683E 00	CA12 -0.25132741E-02	CA13 -0.	CDVT 0.56932953E 02
CWTTPR 0.33161255F 01	CA21 -0.93626756E-11	CA22 -0.37252785E-08	CA23 -0.99999999E 00	CDVI 0.29742391E 02
COFL 0.95993108E 00	CA31 0.25132741E-02	CA32 0.99999683E 00	CA33 -0.37252902E-08	CDVF 0.27190562E 02
CTM 0.12599999E 04	CSPSIR 0.55925804E-04	CFX 0.	CX 0.25875769E 06	CDVXB 0.49796902E-00
CDTM 0.82555399E 03	CCPSIR 0.99999999E 00	CFY 0.	CY -0.89824490E 05	CDVYB 0.80325780E-01
CTDV 0.12427079E 04	CSTHR 0.20269533E-02	CFZ 0.	CZ 0.48029104E 03	CDVZB 0.93393707E-02
TSC 0.10399999E 04	CCTHR 0.99999794E 00	CDVXS 0.49796902E-00	CXM 0.25875769E 06	CDVXM -0.41508873E-00
CTDAS 0.17299999E 04	CM1 0.99999794E 00	CDVYS 0.80325780E-01	CYM -0.89824490E 05	CDVYM -0.19550854E-00
CRIO 0.	CM3 0.91171844E 00	CDVZS 0.50933937E 00	CZM 0.48029104E 03	CDVZM 0.20973882E-00
CPHIR 0.62831853E 01	CM4 -0.18290102E-02	CDV 0.	CXZ 0.35970651E 06	CDXD 0.26155093E 02
CPSTB 0.	CM5 -0.41081146E-00	CSTZ 0.17529999E 04	CYZ -0.88809620E 05	CDYD 0.11745510E 02
CTHR 0.25132741E-02	CM6 0.41563545E-02	CTD 0.20000000E 03	CZZ -0.24712544E 04	CDZD -0.79097392E 01
CUDPHS 0.59604645E-07	COEFF -0.18606968E-02	CSTD 0.12000000E 04	CCRI 0.	CXTD -0.15663639E 03
CUDPSS 0.	CCK1 -0.12788025E-02	CSTD1 0.65000000E 03	COI 0.	CYTD -0.20640697E 01
CUDTHS 0.25132741E-02	CCK2 0.13132936E-02	CWSTD 0.23314618E-00	C2I 0.	CZTD 0.47834462E 01
CDPHSC 0.	CCK3 -0.10181683E-02	CWSTD1 0.75772510E 00	CCABI 0.	CXRD -0.18283807E 03
CDPSSC 0.	CCK4 -0.20427573E-02	CNS 0.70000000E 01	CCASI 0.	CYRD -0.13873315E 02
CDTHSC 0.23271056E-02	CCK5 0.12321033E-02	CTX 0.34000000E 03	CCRBI 0.	CZRD -0.31752948E 01
CPSTBC 0.	CCKF -0.88551982E-03	CDTX 0.20000000E 02	CCRSI 0.	CDXFD 0.26584303E 02
CTHBC 0.	CCKG 0.16961742E-02	CRA 0.	CATXBI 0.	CDYFD 0.47122745E 01
CPSBCP 0.62811790E 01	TEST 0.	CR1 0.21889127E 06	CAPTI 0.	CDZFD 0.32242788E 01
CTHBCP 0.42712694E-00	FIN 0.	CDRRD 0.99990000E 04	CSRTI 0.	CXSD 0.18308564E 03
CPSTBM 0.62813593E 01	FP 0.	RRDREF 0.33392908E 03	CRS 0.21797321E 08	CYSD 0.82218567E 02
CTHBM 0.42712772E-00	SW 0.	CRRD 0.99990000E 04	COMGS 0.11658516E-02	CZSD -0.55368175E 02
CRR1 0.21141621E 06	CRRPI 0.21771100E 06	CRRG 0.21771100E 06	CRR 0.21889127E 06	CDVXZ 0.
CSAPI -0.42225709E-00	CSADPI -0.35190618E-00	CSAPG -0.40428741E-00	CSAPR 0.20269533E-02	CDVYZ 0.
CSRPI 0.26960970E-02	CSRDP1 0.14142802E-01	CSRPG 0.26960970E-02	CSRPR -0.55925804E-04	CDVZZ 0.
RDGD 0.40950000E 04	CTRR 0.13000000E 03	CTR1 0.15800000E 04	CTLRP 0.15800000E 04	CDTW -0.35555398E 03
TVX 0.	TVY 0.	TVZ 0.	TYC 0.	TPC 0.
TVX 000000000000	TVY 000000000000	TVZ 000000000000	TYC 000000000000	TPC 000000000000
LC1 0	LC4C 0	LC10 0	LDI00 0	IC 4
LC1J -4095	LC4D 4095	LCA 0	LDI21 4095	KC 4
LC2 4095	LC7 4095	LCS 0	LDO05 0	K2C 0
LC3 4095	LC8 4095	N -1	M 0	L 0

11 VALUES EACH OF X,Y,Z. AND DELTA T

0.29777842E 06	-0.89328323E 05	-0.70728532E 03	-0.
0.31331852E 06	-0.89204617E 05	-0.11501496E 04	-0.
0.32879878E 06	-0.89072406E 05	-0.16303751E 04	-0.
0.34431585E 06	-0.88786081E 05	-0.19252704E 04	-0.
0.19956721E 06	-0.90832833E 05	-0.40035439E 03	-0.
0.20327564E 06	-0.91005729E 05	-0.40665068E 03	-0.
0.20694850E 06	-0.91116174E 05	-0.41285703E 03	-0.
0.21073224E 06	-0.91072698E 05	-0.27515465E 03	-0.
0.21446788E 06	-0.91116033E 05	-0.27928787E 03	-0.
0.21810985E 06	-0.91233986E 05	-0.13508210E 03	-0.
0.22186159E 06	-0.91194405E 05	-0.13705246E 03	-0.

TIME #SECD	TRAILING #FTD	VERTICAL #FTD	OUT-OF-PLANE	X-METER	Y-METER	Z-METER	LDI21	LRDFOI
1730.0	171971.9	-89332.0	-873.5	0.	0.	0.	4095	0