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SUBJECT: AN IBM-704 CODE FOR STUDYING PARTICLE ORBITS IN CYCLOTRON FIELDS

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Abstract

A 704 code is described for calculating general orbits in cyclotron fields. The field storage format is identical with that for the previously described equilibrium orbit code, No. 1482. Non-linear effects, with linearization of the axial motion can be very conveniently calculated.

An IBM-704 Code for Studying Particle Orbits in Cyclotron Fields

by

H. C. Owens and T. A. Welton

I. INTRODUCTION AND GENERAL DESCRIPTION

This program is the second of a series of IBM-704 codes designed to study the properties of orbits in arbitrary cyclotron field configurations. This report is a preliminary and somewhat sketchy description of the general orbit code. The code* is felt to be in good operating condition, but obviously no guarantees can be made. A fuller description, together with some useful modifications may be issued later. The first code of this series (ORNL designation is No. 1482) is a code for determining properties of equilibrium orbits and small oscillations. It has been incorporated into this program as a subroutine to enable the code to locate resonances, and to make use of the details of the small oscillations from the equilibrium orbit in choosing initial conditions for studying non-linear orbit properties. Code. No. 1482 is completely described in ORNL-CF-59-11-2. The general orbit code takes a particle with a specified initial momentum and follows its progress through the cyclotron. The equations of motion integrated are:

$$p_r' = Q - rB(r,\theta)$$

$$p' = (r/Q)p_r$$

$$p_z' = \left[r\ \partial B/\partial r - (p_r/Q)\ \partial B/\partial \theta\right] z$$

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*Sets of binary program cards can be obtained by writing to T. A. Welton, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee.

Because of the flexibility and complexity of this code, no complete guarantee can be given of its correctness. It has operated satisfactorily over a range of conditions. Errata will be circulated, if errors are discovered, and comments on possible malfunctions will be welcomed.

$$z = (r/Q)p_z$$

$$p'_{re} = Q_e - r_e B_e$$

$$r'_e = (r_e/Q_e)p_{re}$$

$$t' = (N/2\pi)E\ r/Q,$$

where:

prime means $d/d\theta$

$r(\theta)$ = radius as a function of θ for the orbit to be calculated

$p_r(\theta)$ = radial momentum as a function of θ for an arbitrary reference orbit in the median plane

$Q(\theta)$ = $(p^2 - p_r^2)^{1/2}$

p = magnitude of the particle momentum

z = axial displacement

p_z = axial momentum

$t(\theta)$ = $(N/2\pi)$ x time from $\theta = 0$

$r_e(\theta)$ = the value of $r(\theta)$ a particle will have if started on the equilibrium orbit and given acceleration each Runge-Kutta step

$p_{re}(\theta)$ = the value of $p_r(\theta)$ of the equilibrium orbit

$Q_e(\theta)$ = $\sqrt{p^2 - p_{re}^2}$

N = number of sectors

E = total relativistic energy.

Various combinations of these equations are allowed as explained in the operating instructions. The following units are used:

speed in units of c, so that velocity and β are identical

momentum in units of $m_o c$, where m_o is the particle rest mass

energy in units of $m_o c^2$

time in units of $a = c/\omega_o$

field in units of $b = m_o c\ \omega_o/e$.

If b is measured in units of 10^4 gauss, and the particles have charge number Z and mass number A (not necessarily integral), then:

$a = 313.0\ A/bz$ cm $= 123.21\ A/bz$ inches

$\omega_o/2\pi = Z/A\ (15.246\ b)$ Mc/sec.

The resonance hunt routine takes a given resonance and finds the momentum which will cause the operating point in the (ν_r, ν_z) plane to fall a given distance from a specified resonance line. The algarithm for this procedure is as follows.

If it is desired that $k = m\ \nu_r + n\ \nu_z$, then a function f(p) is defined:

$$f(p) = m\ \nu_r + n\ \nu_z - k \tag{1}$$

For convenience, $\nu_r^{res.}$ and $\nu_z^{res.}$ are chosen separately and must be input parameters. The number k is then calculated as $k = m\ \nu_r^{res.} + n\ \nu_z^{res.}$. Note that the values of ν_r and ν_z finally determined by the resonance hunt will not necessarily be identical with $\nu_r^{res.}$ and $\nu_z^{res.}$. A guess p_o is made for p and a corrected value p_1 is calculated by Newton's method:

$$f(p_o) + \frac{f(p_o + \Delta) - f(p_o)}{\Delta}\ (p_1 - p_o) = 0. \tag{2}$$

where:

$\nu_r^{res.}$, $\nu_z^{res.}$	are input parameters, used to determine k and the distance away from the resonance line
m,n	are integers specifying the resonance of interest
$\nu_r(p)$, $\nu_z(p)$	are the radial and axial frequencies, respectively, as found by the equilibrium orbit code
p_o	is the initial guess for the momentum. (Experience shows that the nearest entry in a reasonably small interval table of equilibrium orbit values is usually necessary and probably sufficient.)
Δ	is a standard increment by which the momentum is varied, to estimate df/dp
p_1	is the new momentum guess.

With $p = p_o$ and then $p = p_o + \Delta$, the equilibrium orbit code is run. $f(p_o)$ and $f(p_o + \Delta)$ are computed from which, using (1), a new guess, p_o, is computed. A test is made to see if $|f(p)| < \epsilon$, where $\epsilon << 1$. If $|f(p)| > \epsilon$, p_1 replaces p_o and the procedure is repeated until the condition is met. Check is made in case the procedure fails to converge, i.e. for $|f_n| > |f_{n-1}|$ the calculation stops and a diagnostic comment is printed on the printer.

If the resonance hunt is used, then the initial conditions are placed on an ellipse of the form

$$x(\Theta) = \sqrt{\frac{J_x}{\pi E}} \; (A \cos \psi_x + B \sin \psi_x) \tag{3}$$

$$p_x(\Theta) = \sqrt{\frac{J_x}{\pi E}} \; (C \cos \psi_x + D \sin \psi_x) \tag{4}$$

where:

θ = the starting angle

x, p_x are the deviations from the equilibrium orbit of the radial coordinate and momentum

J_x = an input number which determines the x-amplitude. (Action)

ψ_x = an input number which is the phase angle (in radians)

$A(\theta) = M_{12}\, M_{11}(\theta) - 1/2(M_{11} - M_{22})\, M_{12}(\theta)$

$B(\theta) = -\sin\sigma\ X_{12}(\theta)$

$C(\theta) = M_{12}\, M_{21}(\theta) - 1/2(M_{11} - M_{22})\, M_{22}(\theta)$

$D(\theta) = -\sin\sigma\ M_{22}(\theta)$

$E = M_{12} \sin\sigma$

where $\sigma = 2\pi\, \nu_x/N$, and the M_{ij} give details of the small oscillations. For the sake of brevity in this report, the reader is referred to ORNL-2765, pages 42-44, by M. M. Gordon and T. A. Welton, for explicit definitions of the M_{ij}. Exactly parallel definitions hold for the axial motion.

It will be observed that, with these definitions, if the amplitude is sufficiently small to allow neglect of non-linear effects, the ellipse defined is just an invariant ellipse. With this option it is possible to obtain as on-line printed output r, p_r, z, and p_z, a CRT plot at a pre-set interval of x and p_x, or a CRT plot at a pre-set interval of the variables $\sqrt{\frac{J_x}{\pi}} \cos \psi_x$ and $\sqrt{\frac{J_x}{\pi}} \sin \psi_x$. These arrangements have been made to facilitate obtaining neat and easily interpreted phase plots. Other alternatives can be easily arranged by the user.

II. OPERATING INSTRUCTIONS

The program is designed to be stored on, and used from, logical tape 3. The control subroutine reads the code into the memory from cards and then writes the code on tabe 3 in three parts. Part one has all of the code that is common to the modified equilibrium orbit code and the general orbit code. including the input parameters. Part two is the modified equilibrium orbit code including the resonance hunt routine and the initialization part of the curve plotter routine. Part three is the general orbit code. Once the program is written on tape 3, the program deck need not be loaded again. All that is needed to run the program, in addition to the parameter cards, is a load card and the proper transfer cards as explained below.

Two basic modes of operation are possible as follows:

A. Resonance Hunt Not Used

The code enters this mode if HNTRS = 0. The code must be furnished the initial momentum in PRES, the starting radius in RESR, and the starting radial momentum in PRRES. If plots are to be made, the radius of the equilibrium orbit at the plotting angle must be input in RBARP and the radial momentum in PRBRP. Other parameters possibly needed are, by number, 1, 2, 7, 8, 9, 17, 18-27, 31-40.

B. Resonance Hunt Used

The equilibrium orbit values of r and p_r, at the approximate p-value for resonance specified by PORES, must be input in RESR and PRRES, respectively. Other parameters possibly needed are numbers 1-40.

Several options for both A and B are allowed, and are controlled by either keywords or sense switches. These are:

1. Acceleration Options. If NACCE = 0, no acceleration will occur. If NACCE = 1 and NACON = 0, accelerating gaps will be spaced around the cyclotron. The first gap will come at the end of the Runge-Kutta step during which θ becomes larger than GAPL1 and each succeeding gap will occur at intervals of 2π/GAPPR, where GAPPR is the number of gaps per revolution. If NACCE = 1 and NACON = 1, acceleration will be given at the end of each Runge-Kutta step. Also, two additional radial equations will be integrated to update the equilibrium orbit, enabling r, p_r plots to be made with reference to the "central ray". Note: GAPPR must be a floating point number giving the number of times energy is supplied during one revolution in either of the options above.

2. Time Options. If TIMIN = 0, the energy gain per gap will be $\delta E = \delta/\text{GAPPR}$. If TIMIN = 1, $\delta E = \frac{\delta}{\text{GAPPR}} \left[(1-\epsilon)\cos(\theta-\omega t) + \epsilon \cos 3(\theta-\omega t)\right.$, where δ = DELTA, ϵ = EPSGP, and ω = OMEGA in the table of parameters.

3. Online Plot Options. If PLT = 0, no plots will be made. If PLT $\neq$ 0, then plots will begin at the Runge-Kutta step specified by SPLOT and continued at sector intervals specified by PLT. If sense switch 6 is up, r,p_r plots relative to the equilibrium orbit will be made. If s.s. 6 is down $\sqrt{\frac{J_x}{\pi}}\cos\psi$, $\sqrt{\frac{J_x}{\pi}}\sin\psi$, as defined in equations (3) and (4), will be made on the r and p_r axes, respectively.

4. Offline Plot Options. If PLOFF = 1, the following information will be written on tape 4:

0^{th} record	Nonsense word Run number (RUNNO) Key word (KYWRD)	Identification material for use in processing
1^{st} - K^{th} records	Nonsense word x_1 x_2 p_{x1} p_{x2} R P_r z_1 z_2 p_{z1} p_{z2} (not written if NZM = 0)	Written by equilibrium orbit code at the end of each Runge-Kutta step when resonance hunt is used. Written once for each picture.
K + 1 record	Nonsense word $\cos\sigma$ r $\cos\sigma$ z	Written once for each picture
K + 2 to end of 1^{st} orbit. One record each R.K. step	Nonsense word R_e P_{re} R P_r z P_z	Written by general orbit code at the end of each Runge-Kutta step for 1^{st} orbit computed
	End of File Mark	
	Nonsense word 1	Counter to indicate the orbit number
end of 1^{st} orbit.— end of 2^{nd} orbit. 1 record each R.K. step	Nonsense word R_e P_{re} R P_r z P_z	Written for 2^{nd} orbit
	End of File Mark	

intervals of PRINT Runge-Kutta steps. If sense switch 3 is down at the beginning of a series of runs, the printing will be online. If s.s. 3 is up, output will be on tape 6 ready for the offline tape printer.

5. Z-Motion Option. If NZM = 0, the z, p_z equations will not be integrated. If NZM = 1, the z, p_z equations will be integrated.

NOTE ON TRANSFER CARDS: The input parameters for each orbit must be followed by a transfer card as in the equilibrium orbit code. There is a difference, however; in this program the parameters are input at two different places requiring two different transfer addresses. The first parameters for each set of "NORNS" runs must be followed by a TRA 89 card and each set after that by a TRA 701 card. TRA must be punched in columns 8, 9, and 10, and the decimal address beginning in column 12.

III. INPUT PARAMETERS

The magnetic field data for this orbit code consists of values of B and $\frac{\partial B}{\partial \theta}$ stored on two tape drives in a uniform polar grid. The format must be identical in every respect with that dexcribed for code No. 1482. Note that the simplest of the possible assumptions has been made for the magnetic field off the median plane. This simplification seems to introduce but little error in the usual cyclotron field.

NY INP1 is used for loading parameters. The control word is set to load one word per card by giving the decimal location of that word in columns 1-6, the pseudo-operation indicating the mode of input in columns 8-10, and the word to be loaded beginning in column 12, but subject to the restrictions set up in NY INP1.

The following is the list of parameters for input:

Parameter	Decimal Location	Pseudo-operation	Type Number	Description
1 KYWRD	2756	OCT	OCTAL	-NORNS, --PRNTO, NACCE, NACON, PLT, PLOFF, NZM, TIMIN, HNTRS, where NORNS gives the number of orbits to be put on one picture. Two octal digits are allowed for this number. PRNTO gives the number of the Runge-Kutta step at the end of which the r, p_r and/or z, p_z printout begins. Three octal digits are allowed for this number. NACCE equals one or zero depending on whether acceleration is given each Runge-Kutta step or not. PLT-Plotting will be made every "PLT" true sector.* If PLT = 0, no plot will be made. PLOFF equals one or zero if the information for plotting will be stored each Runge-Kutta step on tape 4 or not. NZM equals one or zero if the z, p_z equations are to be integrated or not. TIMIN equals one or zero if the time equation is needed or not. HNTRS equals one or zero if the resonance hunt is to be made or not.
2 RUNNO	2757	DEC	INTEGER	Identification for each run. RUNNO will appear on all output and may be used as desired.
3 J_x	2758	DEC	Fl. Pt.	Amplitude parameter for the r, p_r ellipse on which the initial conditions are placed if the resonance hunt routine is used.
4 J_z	2759	DEC	Fl. Pt.	Amplitude parameter for the z, p_z ellipse.
5 PSIX	2760	DEC	Fl. Pt.	The phase angle for the r, p_r motion.

*"True sector" implies the range of θ for which fields are actually stored. This may be one or more sectors of the machine in the usual sense.

6	PSIZ	2761	DEC	Fl. Pt.	The phase angle for the z, p_z motion.
7	PRINT	2762	DEC	INTEGER	The z, p_z and/or r, p_r printout will be made every "PRINT". Runge-Kutta steps starting with the "PRNTO" R.K. step.
8	INRKS	2763	DEC	INTEGER	Starting Runge-Kutta step. To start at the beginning of the 1st R.K. step (theta = 0), set INRKS = 1, the 2nd R.K. step set INRKS = 2, etc.
9	SPLOT	2764	DEC	INTEGER	SPLOT denotes the R.K. step at the end of which r, p_r plots are to be started.
10	PORES	2765	DEC	Fl. Pt.	The initial guess for p at the resonance specified. The nearest entry in the 1482 output table has thus far proven accurate enough.
11	NURR	2766	DEC	Fl. Pt.	The specified value of the radial frequency at the resonance sought.
12	NUZR	2767	DEC	Fl. Pt.	The specified value of the vertical frequency at the resonance sought.
13	MRES	2768	DEC	Fl. Pt.	The coefficient of NURR used in denoting the resonance.
14	NRES	2769	DEC	Fl. Pt.	The coefficient of NUZR used in denoting the resonance.
15	DELPS	2770	DEC	Fl. Pt.	The increment by which p is varied during the resonance hunt. This parameter thus far has not proven critical. The value 0.001 will probably prove satisfactory.
16	EPIR	2771	DEC	Fl. Pt.	EPIR specifies the accuracy to which the resonance is desired.
17	T4NEW	2772	DEC	Fl. Pt.	T4NEW should be set equal to one or zero, according as tape 4 has information to be saved or not at the start of a session. If T4NEW = 0, the code will hunt for the sentinel word that marks the end of information to be saved.

18	MONTH	2773	BCD	Hollerith	NY INP1 requires that Hollerith information be input by first giving a word count which must be punched in column 12. Therefore, in inputting MONTH, DAY and YEAR, a 1 must be punched in column 12 followed by the appropriate number.
19	DAY	2774	BCD	Hollerith	Likewise.
20	YEAR	2775	BCD	Hollerith	Likewise
21	KFX	2776	DEC	INTEGER	The number of Runge-Kutta steps per sector.
22	NFL	2777	DEC	Fl. Pt.	The number of sectors per revolution.
23	NSTAR	2778	DEC	INTEGER	Number of sectors per true sector.* Same as NSTAR in 1482.
24	BKEY	2779	DEC	INTEGER	Field identification word. This must be the same as the first word in the identification record on the field storage tape. Note: Keyword on tape must be in decrement part of word like a Fortran integer, whereas BKEY must be in address position of word as in SAP input.
25	RIN	2780	DEC	Fl. Pt.	Minimum value of r for which fields are stored on tape.
26	MROT	2781	DEC	Fl. Pt.	Maximum value of r for which fields are stored on tape.
27	DELTAR	2782	DEC	Fl. Pt.	Increment in r for stored fields.
28	PRES	2783	DEC	Fl. Pt.	Input of p only if resonance hunt is not used.
29	RESR	2784	DEC	Fl. Pt.	Input for r at the equilibrium orbit specified by PORES if the resonance hunt is used or as initial R value if starting conditions are specified without using resonance hunt.

*Sector has the same connotation as period (or approximate sector). A true sector would be a superperiod. For most purposes, there is some redundance in the notation.

30	PRRES	2785	DEC	Fl. Pt.	Input for P_r at the equilibrium orbit specified by PORES if the resonance hunt is used or as initial P_r if the starting conditions are specified without using resonance hunt.
31	ADJPR	2786	DEC	Fl. Pt.	Used to adjust scale on P_x when (x, P_x) plots are being made. Ordinarily equals one and is stored in the code as such.
32	ZMAX	2787	DEC	Fl. Pt.	Used to stop the calculation when z becomes greater than ZMAX.
33	DELTA	2788	DEC	Fl. Pt.	Energy gain per revolution
34	NOREV	2789	DEC	Fl. Pt.	Number of revolutions per orbit.
35	OMEGA	2792	DEC	Fl. Pt.	Coefficient of time used in the gap crossing (r.f. frequency).
36	GAMMA	2793	DEC	Fl. Pt.	Used to start the particle out of phase when starting at some Runge-Kutta step other than the first ($\omega t = \theta$ + GAMMA).
37	EPSGP	2794	DEC	Fl. Pt.	Epsilon for the gap crossing where $\delta E = \delta/q\ [(1 - \epsilon)\cos(\theta - \omega t) + \epsilon \cos 3(\theta - \omega t).]$.
38	GAPL1	2795	DEC	Fl. Pt.	Specifies the location of the first accelerating gap and must be in units of radians. The energy will be imparted after the first R.K. step during which the azimuthal angle exceeds GAPL1. If the first gap comes at the end of the first R.K. step, small value (0.00001 is suggested) for GAPL1 must be inserted.
39	GAPPR	2796	DEC	Fl. Pt.	Number of gaps per revolution. Note: When acceleration is to be given each R.K. step, GAPPR must equal (NFL) x (KFX).
40	SCALE	2797	DEC	Fl. Pt.	Scale should equal the maximum value of x or p_x to be plotted. The scale factor printed on the picture will be one-fifth of scale.

41	PRBRP	2798	DEC	Fl. Pt.	The value of p_r at the equilibrium orbit, used for center of x, p_x plots when resonance hunt is <u>not</u> used.
42	RBARP	2799	DEC	Fl. Pt.	The value of r at the equilibrium orbit, used for center of x, p_x plots when resonance hunt is <u>not</u> used.

IV. SENSE SWITCHES

Sense Switch	Position	Use
1	Down	Subroutine NY INP1 is used which requires s.s. 1 down for card input.
	Up	Caution. NY INP1 will attempt to read input from tape 3 with a resultant stop in $(127)_8$.
2	Up	No effect on running of code.
	Down	Stops code in $(1113)_8$ at the end of the Runge-Kutta step. If start is hit, the next parameters will be read in and the calculation will proceed.
3	Up	Specified output will be offline. The information wanted will be written on tape unit 6. (This does not include the detailed information for plotting.)
	Down	Specified output will be online.
4	Up	No effect.
	Down	Film frame will be advanced as soon as current orbit is completed.
5*	Up	Calculation stops in $(2456)_8$ when picture overflows. Put s.s. 5 up, hit start to continue the same orbit. The plotting of points will cease until (r,p_r) falls within range.
	Down	Put s.s. 5 down, hit start to go to next case.

*Sense switch five is used only when the (r, p_r) plot exceeds the allowed scale.

6	Up	(x, p_x) plots will be made
	Down	Plots will be made of $\sqrt{\frac{J_x}{\pi}} \cos \psi$ and $\sqrt{\frac{J_x}{\pi}} \sin \psi$.

V. TEST CASE

To give the user a reference case, a set of input parameters has been included with the program deck. The only other input required is the field set (field set 103) and derivatives for the test case as described in the write-up of the equilibrium orbit code number 1482 (ORNL-CF-59-11-2). The test case takes eight particles, each having initial r and pr on the ellipse as described above, and follows them, one at a time, through ten revolutions. The output is under sense switch control as indicated above. The following is output: the information for offline plotting will be written on tape 4, the r, pr values will be output at the end of each sector either online or offline, on tape 6, according to the position of sense switch 3, and the phase plot of (x, px) or ($\sqrt{J_x/\pi}$ cos ψ, $\sqrt{J_x/\pi}$ sin ψ) will be made according to the position of sense switch 6. If cathode ray plotting is not available, the keyword (PLT = 0) must be changed to omit the plotting. Notice: the keyword NORNS is set equal one; thus each set of initial conditions is followed by a transfer to 89 card and each orbit phase plot will be on a separate picture. If it is desired to have all of the orbits on one picture, then set NORNS equal to eight $(10)_8$ and replace all but

the first transfer card by a transfer to 701. The last card before the two blank cards is a transfer to $(2580)_{10}$ which causes the final stop to be in $(5024)_{8}$.

```
                        00125          ORG 85
                               *       REM ORBIT CODE 1821, PART ONE OF TWO - H. OWENS
                                       ABS
     00125  0 07400 4 06075   LOAD     TSX INP1,4              A1
     00126  0 00001 0 00001                1,0,1
     00127  0 42000 0 00000            HPR
     00130  0 02000 0 00125            TRA LOAD
T    00131 -0 75400 0 00000            PXD                     A2   UNPACK KEYWORD
     00132  0 56000 0 05304            LDQ KYWRD
     00133 -0 76300 0 00006            LGL 6
     00134  0 60100 0 05400            STO NORNS                    NORNS GIVES NUMBER OF ORBITS
T    00135 -0 75400 0 00000            PXD                         PER PICTURE.
     00136 -0 76300 0 00011            LGL 9
     00137  0 60100 0 05401            STO PRNTO                    PRNTO = 0. NO PRINT OUT IS WANTED
T    00140 -0 75400 0 00000            PXD                          PRNTO SELECTS R.K.STEP RELATIVE TO
     00141 -0 76300 0 00003            LGL 3                        INRKS. TO START PRINT OUT
     00142  0 60100 0 05402            STO NACCE                    NACCE = 0 ACCELERATION IS
T    00143 -0 75400 0 00000            PXD                         NOT WANTED
     00144 -0 76300 0 00003            LGL 3
     00145  0 60100 0 05403            STO NACON                    NACON = 0 ACCELERATION IS
T    00146 -0 75400 0 00000            PXD                         NOT CONTINOUS.
     00147 -0 76300 0 00003            LGL 3
     00150  0 60100 0 05404            STO PLT                      PLT = 0 NO RUNNING PLOT
T    00151 -0 75400 0 00000            PXD                         IS TO BE MADE
     00152 -0 76300 0 00003            LGL 3
     00153  0 60100 0 05405            STO PLOFF                    PLOFF = 0 NO VALUES ARE TO
T    00154 -0 75400 0 00000            PXD                         BE STORE FOR PLOTTING
     00155 -0 76300 0 00003            LGL 3
     00156  0 60100 0 05406            STO NZM                      NZM = 0 Z MOTION NOT USED
T    00157 -0 75400 0 00000            PXD
     00160 -0 76300 0 00003            LGL 3
     00161  0 60100 0 05407            STO TIMIN                    TIMIN = 0 NO TIME EQUS. NEEDED
T    00162 -0 75400 0 00000            PXD
     00163 -0 76300 0 00003            LGL 3
     00164  0 60100 0 05410            STO HNTRS                    HNTRS = 0 1482 NOT NEEDED
     00165  0 76000 0 00166   INLZP    PSE 118                 A2.1 S.S.6 DWN PLOTS CIRCLE, UP PLOTS (X,PX)
     00166  0 02000 0 00170            TRA *+2
     00167  0 02000 0 00325            TRA PCIRC
     00170  0 50000 0 05404            CLA PLT
     00171  0 10000 0 00272            TZE REDDY+1
     00172  0 76000 0 00030            CFF
     00173  0 76000 0 00030            CFF
     00174  0 76000 0 00030            CFF
     00175  0 50000 0 05355            CLA SCALE
     00176  0 60100 0 00235            STO STPLT+5
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00177   0 60100 0 00236          STO STPLT+6
00200   0 76000 0 00002          CHS
00201   0 60100 0 00232          STO STPLT+2
00202   0 60100 0 00233          STO STPLT+3
00203   0 76000 0 00002          CHS
00204   0 40000 0 03210          ADD SHIFT
00205   0 24000 0 03226          FDH 10FL
00206  -0 60000 0 00237          STQ STPLT+7
00207  -0 60000 0 00240          STQ STPLT+8
00210   0 56000 0 00237          LDQ STPLT+7
00211   0 26000 0 03154          FMP SCAR
00212   0 07400 4 04006          TSX FLOFX,4
00213   0 00000 0 00043          PZE 35
00214   0 00000 0 00655          HTR BAST-3              SCALE IN WRONG
00215   0 07400 4 03111          TSX FRE,4
00216   0 76000 0 00003          SSP
00217  -0 60000 0 03223          STQ TEXT5+2
00220   0 76500 0 00036          LRS 30
00221   0 50000 0 03224          CLA PEROD
00222   0 76300 0 00036          LLS 30
00223   0 60100 0 03222          STO TEXT5+1
00224   0 50000 0 05305          CLA RUNNO
00225   0 07400 4 03111          TSX FRE,4
00226   0 60100 0 03212          STO TEXT1+1
00227  -0 60000 0 03213          STQ TEXT1+2
00230   0 07400 4 05736  STPLT   TSX PPCRV,4
00231   0 00000 0 00000          PZE 0,0,0
00232  -173400000000             DEC -.015625
00233  -173400000000             DEC -.015625
00234   0 01777 0 01777          PZE 1023,0,1023
00235  +173400000000             DEC .015625
00236  +173400000000             DEC .015625
00237  +177500000000             DEC .3125               DELTA X
00240  +177500000000             DEC .3125               DELT Y
00241   0 07400 4 02661          TSX PWSH,4
00242   0 07400 4 02700          TSX WTEX,4
00243   0 00003 0 03211          PZE TEXT1,0,3
00244   0 01703 0 00005          PZE 5,0,963
00245   0 07400 4 02700          TSX WTEX,4
00246   0 00001 0 03214          PZE TEXT2,0,1
00247   0 01703 0 00702          PZE 450,0,963
00250   0 07400 4 02700          TSX WTEX,4
00251   0 00003 0 03215          PZE TEXT3,0,3
00252   0 01703 0 01322          PZE 722,0,963
00253   0 07400 4 02700          TSX WTEX,4
```

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00254  0 00001 0 03220          PZE  TEXT4,0,1
00255  0 00723 0 01700          PZE  960,0,467
00256  0 07400 4 02700          TSX  WTEX,4
00257  0 00003 0 03221          PZE  TEXT5,0,3
00260  0 00024 0 00005          PZE  5,0,20
00261  0 07400 4 02700          TSX  WTEX,4
00262  0 00001 0 05325          PZE  MONTH,0,1
00263  0 01747 0 01726          PZE  982,0,999
00264  0 07400 4 02700          TSX  WTEX,4
00265  0 00001 0 05326          PZE  DAY,0,1
00266  0 01716 0 01726          PZE  982,0,974
00267  0 07400 4 02700          TSX  WTEX,4
00270  0 00001 0 05327          PZE  YEAR,0,1
00271  0 01665 0 01726  REDDY   PZE  982,0,949
00272  0 50000 0 05405          CLA  PLOFF
00273  0 10000 0 00321          TZE  BOXH1
00274  0 50000 0 05324          CLA  T4NEW
00275  0 10000 0 00303          TZE  *+6
00276  0 77200 0 00204          REW  4
00277  0 76600 0 00224          WTB  4
00300  0 70000 0 05426          CPY  COMMON
00301  0 70000 0 05424          CPY  ALL7S
00302  0 77200 0 00204          REW  4
00303  0 76200 0 00224          RTB  4
00304  0 70000 0 05426          CPY  COMMON
00305  0 70000 0 05426          CPY  COMMON
00306  0 76600 0 00333          IOD
00307  0 50000 0 05426          CLA  COMMON
00310  0 40200 0 05424          SUB  ALL7S
00311  0 10000 0 00313          TZE  *+2
00312  0 02000 0 00303          TRA  *-7
00313  0 76400 0 00204          BST  4
00314  0 76600 0 00224          WTB  4
00315  0 70000 0 03230          CPY  RKST4
00316  0 70000 0 05305          CPY  RUNNO
00317  0 70000 0 05304          CPY  KYWRD
00320  0 76600 0 00333          IOD
00321  0 50000 0 05410  BOXH1   CLA  HNTRS                A2.2
00322  0 10000 0 00324          TZE  *+2
00323  0 02000 0 00350          TRA  THRES
00324  0 02000 0 00004          TRA  4
00325  0 56000 0 05306  PCIRC   LDQ  JX
00326  0 26000 0 03225          FMP  5FL
00327  0 60100 0 05355          STO  SCALE
00330  0 56000 0 05425          LDQ  PI
```

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00331   0 26000 0 05415          FMP EPR
00332   0 07400 4 05537          TSX SQRT,4
00333   0 42000 0 00000          HPR
00334   0 60100 0 05426          STO COMMON
00335   0 56000 0 05412          LDQ BPR
00336   0 26000 0 05413          FMP CPR
00337   0 60100 0 05427          STO COMMON+1
00340   0 56000 0 05411          LDQ APR
00341   0 26000 0 05414          FMP DPR
00342   0 30200 0 05427          FSB COMMON+1
00343   0 60100 0 05427          STO COMMON+1
00344   0 50000 0 05426          CLA COMMON
00345   0 24000 0 05427          FDH COMMON+1
00346  -0 60000 0 05707          STQ COEF
00347   0 02000 0 00170          TRA INLZP+3
00350   0 02000 0 00543  THRES   TRA HTRES          TO GO THRU LAST TIME
00351   0 50000 0 01473          CLA NOP
00352   0 62200 0 02224          STD H2+2
00353   0 07400 4 02407          TSX ENTR,4
00354   0 50000 0 05423          CLA P
00355   0 60100 0 05337          STO PRES
00356   0 50000 0 05405          CLA PLOFF
00357   0 10000 0 00365          TZE *+6
00360   0 76600 0 00224          WTB 4
00361   0 70000 0 05426          CPY COMMON
00362   0 70000 0 03246          CPY CSR
00363   0 70000 0 03250          CPY CSZ
00364   0 76600 0 00333          IOD
00365   0 50000 0 05406  ZIC     CLA NZM
00366   0 10000 0 00435          TZE RIC
00367   0 56000 0 03250          LDQ CSZ
00370   0 26000 0 03250          FMP CSZ
00371   0 30200 0 03164          FSB 1FL
00372   0 76000 0 00002          CHS
00373   0 60100 0 05426          STO COMMON
00374   0 07400 4 05537          TSX SQRT,4
00375   0 42000 0 05537          HPR SQRT
00376   0 60100 0 00770          STO SINZ           SINZ = SIN(SIGMAZ)
00377   0 50000 0 03343          CLA Z1
00400   0 30200 0 03346          FSB PZ2
00401   0 40200 0 03210          SUB SHIFT
00402   0 60100 0 05426          STO COMMON
00403   0 56000 0 05426          LDQ COMMON
00404   0 26000 0 00776          FMP BS12
00405   0 60100 0 05427          STO COMMON+1
```

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00406  0 56000 0 03345        LDQ Z2
00407  0 26000 0 00775        FMP BS11
00410  0 30200 0 05427        FSB COMMON+1
00411  0 60100 0 05365        STO AICZ          AICZ = A FOR I.C. ON Z EUIPSE
00412  0 56000 0 05426        LDQ COMMON
00413  0 26000 0 01000        FMP BS22
00414  0 60100 0 05427        STO COMMON+1
00415  0 56000 0 03345        LDQ Z2
00416  0 26000 0 00777        FMP BS21
00417  0 30200 0 05427        FSB COMMON+1
00420  0 60100 0 05367        STO CICZ          CIRCZ = C FOR I.C. ON Z ELLIPSE
00421  0 56000 0 00770        LDQ SINZ
00422  0 26000 0 00776        FMP BS12
00423  0 76000 0 00002        CHS
00424  0 60100 0 05366        STO BICZ          BICZ = B FOR I.C. ON Z ELLIPSE
00425  0 56000 0 00770        LDQ SINZ
00426  0 26000 0 01000        FMP BS22
00427  0 76000 0 00002        CHS
00430  0 60100 0 05370        STO DICZ          DICZ = D FOR I.C. ON Z ELLIPSE
00431  0 56000 0 00770        LDQ SINZ
00432  0 26000 0 03345        FMP Z2
00433  0 76000 0 00003        SSP
00434  0 60100 0 05371        STO EICZ
00435  0 50000 0 03352  RIC   CLA X1
00436  0 30200 0 03355        FSB PX2
00437  0 40200 0 03210        SUB SHIFT
00440  0 60100 0 05430        STO COMMON+2
00441  0 56000 0 05430        LDQ COMMON+2
00442  0 26000 0 00772        FMP AS12
00443  0 60100 0 05427        STO COMMON+1
00444  0 56000 0 03354        LDQ X2
00445  0 26000 0 00771        FMP AS11
00446  0 30200 0 05427        FSB COMMON+1
00447  0 60100 0 05360        STO AICR
00450  0 56000 0 05430        LDQ COMMON+2
00451  0 26000 0 00774        FMP AS22
00452  0 60100 0 05427        STO COMMON+1
00453  0 56000 0 03354        LDQ X2
00454  0 26000 0 00773        FMP AS21
00455  0 30200 0 05427        FSB COMMON+1
00456  0 60100 0 05362        STO CICR          C FOR I.C. ON R ELLIPSE
00457  0 56000 0 03246        LDQ CSR
00460  0 26000 0 03246        FMP CSR
00461  0 30200 0 03164        FSB 1FL
00462  0 76000 0 00002        CHS
```

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00463  0 60100 0 05426          STO COMMON
00464  0 07400 4 05537          TSX SQRT,4
00465  0 42000 0 05537          HPR SQRT
00466  0 60100 0 00767          STO SINR
00467  0 56000 0 00767          LDQ SINR
00470  0 26000 0 00772          FMP AS12
00471  0 76000 0 00002          CHS
00472  0 60100 0 05361          STO BICR        B FOR I.C. ON R ELLIPSE
00473  0 56000 0 00767          LDQ SINR
00474  0 26000 0 00774          FMP AS22
00475  0 76000 0 00002          CHS
00476  0 60100 0 05363          STO DICR        D FOR I.C. ON R ELLIPSE
00477  0 56000 0 00767          LDQ SINR
00500  0 26000 0 03354          FMP X2
00501  0 76000 0 00003          SSP
00502  0 60100 0 05364          STO EICR        E FOR IC ON RELIPSE
00503  0 07400 4 05570          TSX COMIC,4
00504  0 50000 0 05404  PLTR    CLA PLT
00505  0 10000 0 00540          TZE BOXH6
00506  0 56000 0 05430          LDQ COMMON+2
00507  0 26000 0 01002          FMP AP12
00510  0 60100 0 05427          STO COMMON+1
00511  0 56000 0 03354          LDQ X2
00512  0 26000 0 01001          FMP AP11
00513  0 30200 0 05427          FSB COMMON+1
00514  0 60100 0 05411          STO APR         APR = A FOR PLOTTING ON CIRCLE
00515  0 56000 0 05430          LDQ COMMON+2
00516  0 26000 0 01004          FMP AP22
00517  0 60100 0 05427          STO COMMON+1
00520  0 56000 0 03354          LDQ X2
00521  0 26000 0 01003          FMP AP21
00522  0 30200 0 05427          FSB COMMON+1
00523  0 60100 0 05413          STO CPR         CPR = C FOR PLOTTING ON CIRCLE
00524  0 56000 0 00767          LDQ SINR
00525  0 26000 0 01002          FMP AP12
00526  0 76000 0 00002          CHS
00527  0 60100 0 05412          STO BPR         BPR = B FOR PLOTTING ON CIRCLE
00530  0 56000 0 00767          LDQ SINR
00531  0 26000 0 01004          FMP AP22
00532  0 76000 0 00002          CHS
00533  0 60100 0 05414          STO DPR         DPR = D FOR PLOTTING ON CIRCLE
00534  0 56000 0 00767          LDQ SINR
00535  0 26000 0 03354          FMP X2
00536  0 76000 0 00003          SSP
00537  0 60100 0 05415          STO EPR         EPR = E FOR PLOTTING ON CIRCLE
```

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00540   0 77200 0 00201  BOXH6  REW 1                    H6
00541   0 77200 0 00202         REW 2
00542   0 02000 0 00004         TRA 4
00543   0 56000 0 05320  HTRES  LDQ MRES
00544   0 26000 0 05316         FMP NURR
00545   0 60100 0 05426         STO COMMON
00546   0 56000 0 05321         LDQ NRES
00547   0 26000 0 05317         FMP NUZR
00550   0 30000 0 05426         FAD COMMON
00551   0 60100 0 01014         STO TEMPO+3              K(NURR,NUZR) IN COMMON
00552   0 50000 0 05315         CLA PORES
00553   0 60100 0 05423         STO P
00554   0 07400 4 01023  TSXEO  TSX EORBT,4
00555   0 56000 0 05320         LDQ MRES
00556   0 26000 0 03322         FMP NUR
00557   0 60100 0 05430         STO COMMON+2
00560   0 56000 0 05321         LDQ NRES
00561   0 26000 0 03323         FMP NUZ
00562   0 30000 0 05430         FAD COMMON+2
00563   0 60100 0 05430         STO COMMON+2             M(NUR)+N(NUZ)
00564   0 30200 0 01014         FSB TEMPO+3
00565   0 60100 0 01015         STO TEMPO+4
00566   0 76000 0 00003         SSP
00567   0 30200 0 01016         FSB TEMPO+5
00570  -0 12000 0 00572         TMI *+2
00571   0 00000 0 00627         HTR BADST                RESONANCE HUNT FAILED. HIT START
00572   0 50000 0 01015         CLA TEMPO+4              TO TRY NEW CASE
00573   0 76000 0 00003         SSP
00574   0 60100 0 01016         STO TEMPO+5
00575   0 30200 0 05323         FSB EPIR
00576  -0 12000 0 00351         TMI THRES+1              RESONANCE FOUND
00577   0 50000 0 05315         CLA PORES
00600   0 30000 0 05322         FAD DELPS
00601   0 60100 0 05423         STO P
00602   0 07400 4 02407         TSX ENTR,4
00603   0 56000 0 05320         LDQ MRES
00604   0 26000 0 03322         FMP NUR
00605   0 60100 0 05431         STO COMMON+3
00606   0 56000 0 05321         LDQ NRES
00607   0 26000 0 03323         FMP NUZ
00610   0 30000 0 05431         FAD COMMON+3
00611   0 30200 0 01014         FSB TEMPO+3
00612   0 60100 0 01017         STO TEMPO+6              F(PO+DELPS) IN TEMPO+6
00613   0 30200 0 01015         FSB TEMPO+4
00614   0 60100 0 01020         STO TEMPO+7
```

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00615   0 50000 0 05322          CLA DELPS
00616   0 24000 0 01020          FDH TEMPO+7
00617   0 26000 0 01015          FMP TEMPO+4
00620   0 60100 0 05426          STO COMMON
00621   0 50000 0 05315          CLA PORES
00622   0 30200 0 05426          FSB COMMON
00623   0 60100 0 05315          STO PORES
00624   0 60100 0 05423          STO P
00625   0 07400 4 02407          TSX ENTR,4
00626   0 02000 0 00555          TRA TSXEO+1
00627   0 07400 4 04064  BADST   TSX OUT,4
00630   0 42000 0 00000          HPR
00631   3 31450 0 00660          PTH BAST,0,13096
00632  -1 00000 0 00361          FVE 241
00633   0 50000 0 05405          CLA PLOFF
00634   0 10000 0 00654          TZE *+16
00635   0 76400 0 00204          BST 4
00636   0 76200 0 00224          RTB 4
00637   0 70000 0 05426          CPY COMMON
00640   0 70000 0 05426          CPY COMMON
00641   0 76600 0 00333          IOD
00642   0 50000 0 05426          CLA COMMON
00643   0 40200 0 05424          SUB ALL7S
00644  -0 10000 0 00647          TNZ *+3
00645   0 76400 0 00204          BST 4
00646   0 02000 0 00653          TRA *+5
00647   0 76600 0 00224          WTB 4
00650   0 70000 0 05426          CPY COMMON
00651   0 70000 0 05424          CPY ALL7S
00652   0 76400 0 00204          BST 4
00653   0 76600 0 00333          IOD
00654   0 77200 0 00203          REW 3
00655   0 76200 0 00223          RTB 3
00656   0 76200 0 00223          RTB 3
00657   0 00000 0 00540          HTR BOXH6
00660   262131432524     BAST    BCD  FAILED TO FIND RESONANCE. TO TRY FOR SAME OR NEW RESONANCE,
00661   606346602631
00662   452460512562
00663   464521452325
00664   336063466063
00665   517060264651
00666   606221442560
00667   465160452566
00670   605125624645
00671   214523257360
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00672  602124416462              BCD 3 ADJUST PARAMETERS, HIT START.
00673  636047215121
00674  442563255162
00675  0 76600 0 00224  STINF WTB 4
00676  0 70000 0 03347        CPY TIME                    NONSENSE WORD
00677  0 70000 0 03352        CPY X1
00700  0 70000 0 03354        CPY X2
00701  0 70000 0 03353        CPY PX1
00702  0 70000 0 03355        CPY PX2
00703  0 70000 0 03350        CPY R
00704  0 70000 0 03351        CPY PR
00705  0 50000 0 05406        CLA NZM
00706  0 10000 0 00713        TZE *+5
00707  0 70000 0 03343        CPY Z1
00710  0 70000 0 03345        CPY Z2
00711  0 70000 0 03344        CPY PZ1
00712  0 70000 0 03346        CPY PZ2
00713  0 76600 0 00333        IOD
00714  0 02000 0 02240        TRA H2+14
00715  0 50000 0 03352  STPL  CLA X1
00716  0 60100 0 01001        STO AP11
00717  0 50000 0 03354        CLA X2
00720  0 60100 0 01002        STO AP12
00721  0 50000 0 03353        CLA PX1
00722  0 60100 0 01003        STO AP21
00723  0 50000 0 03355        CLA PX2
00724  0 60100 0 01004        STO AP22
00725  0 50000 0 03343        CLA Z1
00726  0 60100 0 01005        STO BP11
00727  0 50000 0 03345        CLA Z2
00730  0 60100 0 01006        STO BP12
00731  0 50000 0 03344        CLA PZ1
00732  0 60100 0 01007        STO BP21
00733  0 50000 0 03346        CLA PZ2
00734  0 60100 0 01010        STO BP22
00735  0 50000 0 03350        CLA R
00736  0 60100 0 05357        STO RBARP
00737  0 50000 0 03351        CLA PR
00740  0 60100 0 05356        STO PRBRP
00741  0 02000 0 02231        TRA H2+7
00742  0 50000 0 03352  STOIC CLA X1
00743  0 60100 0 00771        STO AS11
00744  0 50000 0 03354        CLA X2
00745  0 60100 0 00772        STO AS12
00746  0 50000 0 03353        CLA PX1
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```
00747   0 60100 0 00773          STO AS21
00750   0 50000 0 03355          CLA PX2
00751   0 60100 0 00774          STO AS22
00752   0 50000 0 03343          CLA Z1
00753   0 60100 0 00775          STO BS11
00754   0 50000 0 03345          CLA Z2
00755   0 60100 0 00776          STO BS12
00756   0 50000 0 03344          CLA PZ1
00757   0 60100 0 00777          STO BS21
00760   0 50000 0 03346          CLA PZ2
00761   0 60100 0 01000          STO BS22
00762   0 50000 0 03350          CLA R
00763   0 60100 0 05374          STO RBAR
00764   0 50000 0 03351          CLA PR
00765   0 60100 0 05375          STO PRBAR
00766   0 02000 0 02235          TRA H2+11
00767   0 00000 0 00000  SINR
00770   0 00000 0 00000  SINZ
00771   0 00000 0 00000  AS11
00772   0 00000 0 00000  AS12
00773   0 00000 0 00000  AS21
00774   0 00000 0 00000  AS22
00775   0 00000 0 00000  BS11
00776   0 00000 0 00000  BS12
00777   0 00000 0 00000  BS21
01000   0 00000 0 00000  BS22
01001   0 00000 0 00000  AP11
01002   0 00000 0 00000  AP12
01003   0 00000 0 00000  AP21
01004   0 00000 0 00000  AP22
01005   0 00000 0 00000  BP11
01006   0 00000 0 00000  BP12
01007   0 00000 0 00000  BP21
01010   0 00000 0 00000  BP22
                 01011   TEMPO BSS 10
01023  -0 63400 1 03505  EORBT SXD JUNK+8,1
01024  -0 63400 2 03506         SXD JUNK+9,2
01025  -0 63400 4 03507         SXD JUNK+10,4
01026   0 53400 1 03161         LXA FX4,1          HUNTING FIELDS ON TAPE
01027   0 76200 0 00221         RTB 1              READ IDENTIFICATION RECORD
01030   0 70000 0 05426         CPY COMMON
01031   0 70000 1 05432  CAPY   CPY COMMON+4,1
01032   2 00001 1 01031         TIX CAPY,1,1       COPY 4 IDENT. WORDS
01033  -0 76000 0 00011         ETT                END OF TAPE TEST
01034   0 02000 0 02621         TRA ETT+3          END OF TAPE - TRANSFER TO REWIND
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```
01035   0 76600 0 00333          IOD
01036  -0 76000 0 00012          RTT                  REDUNDANCY TAPE TEST
01037   0 42000 0 00000          HPR                  STOP, TAPE ERROR-IN-KEYWORDS
01040   0 50000 0 05426          CLA COMMON
01041   0 77100 0 00022          ARS 18
01042   0 40200 0 05333          SUB BKEY
01043   0 10000 0 01051          TZE CAPY+16          CORRECT SET OF FIELDS FOUND
01044   0 76200 0 00221          RTB 1
01045   0 70000 0 05426          CPY COMMON
01046   0 02000 0 02616          TRA ETT
01047   0 02000 0 01026          TRA CAPY-3           END OF FILE TRANSFER
01050   0 02000 0 02616          TRA ETT              END OF RECORD TRANSFER
01051   0 50000 0 05427          CLA COMMON+1         CHECK MINIMUM R VALUE
01052   0 40200 0 05334          SUB RIN
01053   0 76000 0 00003          SSP
01054   0 40200 0 02623          SUB ETT+5
01055  -0 12000 0 01057          TMI CAPY+22
01056   0 42000 0 00000          HPR
01057   0 50000 0 05430          CLA COMMON+2         CHECK MAXIMUM R VALUE
01060   0 40200 0 05335          SUB MROT
01061   0 76000 0 00003          SSP
01062   0 40200 0 02623          SUB ETT+5
01063  -0 12000 0 01065          TMI CAPY+28
01064   0 42000 0 00000          HPR
01065   0 50000 0 05431          CLA COMMON+3         CHECH DELTA R VALUE
01066   0 40200 0 05336          SUB DELTAR
01067   0 76000 0 00003          SSP
01070   0 40200 0 02623          SUB ETT+5
01071  -0 12000 0 01073          TMI CAPY+34
01072   0 42000 0 00000          HPR
01073   0 76200 0 00222          RTB 2                HUNT CORRECT FIELD DERIVATIVES ON 2
01074   0 70000 0 05426          CPY COMMON
01075   0 70000 0 05426  CBPY    CPY COMMON
01076  -0 76000 0 00011          ETT
01077   0 02000 0 02624          TRA ETT+6
01100   0 76600 0 00333          IOD
01101  -0 76000 0 00012          RTT
01102   0 42000 0 00000          HPR
01103   0 50000 0 05426          CLA COMMON
01104   0 77100 0 00022          ARS 18
01105   0 40000 0 05333          ADD BKEY
01106   0 10000 0 01114          TZE FXK
01107   0 76200 0 00222          RTB 2
01110   0 70000 0 05426          CPY COMMON
01111   0 02000 0 02626          TRA ETT+8
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01112   0 02000 0 01073          TRA CBPY-2
01113   0 02000 0 02626          TRA ETT+8                END OF RECORD TRANSFER
01114   0 50000 0 05330  FXK     CLA KFX                  FLOAT K FIX
01115   0 07400 4 04026          TSX FXFLO,4              ENTER FIX-FLOAT ROUTINE
01116   0 00000 0 00043          PZE 35
01117   0 42000 0 00000          HPR
01120   0 60100 0 03240          STO KFL
01121   0 50000 0 03173          CLA 2PI
01122   0 60100 0 01016          STO TEMPO+5
01123   0 56000 0 03240          LDQ KFL                  A2
01124   0 26000 0 05331          FMP NFL
01125   0 60100 0 05426          STO COMMON               KNFL TO COMMON
01126   0 50000 0 03173          CLA 2PI
01127   0 24000 0 05426          FDH COMMON
01130  -0 60000 0 01504          STQ H1                   STORE H FOR RK1
01131  -0 60000 0 02222          STQ H2                   STORE H FOR RK2
01132   0 07400 4 02552 VARTRA   TSX SELP,4
01133   0 56000 0 05340          LDQ RESR
01134  -0 60000 0 03244          STQ INITR                BETA TO INITIAL R
01135  -0 60000 0 03365          STQ YRKY3-7              BETA TO R.K
01136  -0 60000 0 03350          STQ R                    BETA TO R.K
01137   0 50000 0 05331          CLA NFL                  A6
01140   0 24000 0 03173          FDH 2PI
01141  -0 60000 0 03235          STQ NO2PI                STORE N/2 PI
01142   0 50000 0 05341          CLA PRRES                A6.5 INITLIZE PR
01143   0 60100 0 03245          STO INITPR
01144   0 60100 0 03366          STO YRKY3-6
01145   0 60100 0 03351          STO PR
01146   0 50000 0 03171          CLA NURKY4
01147   0 60100 0 03170          STO NURKY3               NO. OF EQUATIONS TO RK1
01150   0 56000 0 05330          LDQ KFX                  A7
01151   0 20000 0 05332          MPY NSTAR
01152  -0 60000 0 05426          STQ COMMON
01153   0 76300 0 00001          LLS 1
01154  -0 60000 0 03237          STQ BEER                 BEER=(2KN*)*=NO. OF WORDS/RECORD
01155   0 50000 0 05426          CLA COMMON
01156   0 40200 0 05314          SUB SPLOT
01157   0 40000 0 03156          ADD FX1
01160   0 76700 0 00022          ALS 18
01161   0 60100 0 03331          STO RKSPL
01162   0 50000 0 05313          CLA INRKS
01163   0 40200 0 03156          SUB FX1
01164  -0 10000 0 01167          TNZ *+3
01165   0 50000 0 05313          CLA INRKS
01166   0 02000 0 01172          TRA *+4
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01167   0 50000 0 05426          CLA COMMON
01170   0 40200 0 05313          SUB INRKS
01171   0 40000 0 03157          ADD FX2
01172   0 76700 0 00022          ALS 18
01173   0 60100 0 03330          STO RKSIN
01174   0 60000 0 03236          STZ BEERT                ZERO TO BEERT
01175   0 53400 1 03237          LXA BEER,1       A7.5    BEER TO IR1
01176  -0 63400 1 02651          SXD TW,1
01177  -0 63400 1 01640          SXD TIXN,1               BEER TO DECREMENT
01200   0 50000 0 05334          CLA RIN                  SET FRIA INITIALLY WITH RIN
01201   0 60100 0 03265          STO FRIA
01202   0 60000 0 03253          STZ RHO1
01203   0 60000 0 03254          STZ RHO2
01204   0 60000 0 03257          STZ PRHO1
01205   0 60000 0 03260          STZ PRHO2
T       01206  -0 75400 0 00000  PXD              A8      ZERO ACCUMULATOR
01207   0 56000 0 03174          LDQ MAXSTO
01210   0 22000 0 03237          DVH BEER
01211  -0 60000 0 03241          STQ RAP                  NO. OF R VALUES IN APIARY=RAP
01212   0 60000 0 03262          STZ RSPAN        A8.5
01213   0 53400 2 03241          LXA RAP,2
01214   0 50000 0 03262          CLA RSPAN
01215   0 30000 0 05336  FAD1    FAD DELTAR
01216   0 60100 0 03262          STO RSPAN
01217   2 00001 2 01215          TIX FAD1,2,1             R INCREMENT IN APIARY=R SPAN (FLPT)
01220   0 56000 0 05331          LDQ NFL          A9
01221   0 26000 0 05331          FMP NFL
01222   0 60100 0 05426          STO COMMON               N SQ TO COMMON
01223   0 50000 0 03164          CLA 1FL                  MAYBE CHANGED TO 2FL
01224   0 24000 0 05426          FDH COMMON
01225  -0 60000 0 03263          STQ 1ONSQ                1/NSQ TO PERM. STORAGE
01226   0 26000 0 03233          FMP BETA         A10
01227   0 60100 0 03234          STO RAMP                 RAMP=R AMPLITUDE FOR P
01230   0 50000 0 03233          CLA BETA         A11
01231   0 30200 0 03234          FSB RAMP
01232   0 30200 0 05336          FSB DELTAR
01233   0 30200 0 05336          FSB DELTAR
01234   0 60100 0 03243          STO RMIN                 ESTIMATED R MIN. FOR P
01235   0 30200 0 05334          FSB RIN          A12
01236   0 24000 0 05336          FDH DELTAR
01237  -0 60000 0 05426          STQ COMMON               FL. PT. TAPE LOCATION
01240   0 50000 0 05426          CLA COMMON
01241   0 07400 4 04006          TSX FLOFX,4              ENTER FLOATING TO FIX ROUTINE
01242   0 00000 0 00043          PZE 35
01243   0 42000 0 00000          HPR
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01244   0 60100 0 03251          STO MTLOC          A13
01245   0 10000 0 01261          TZE A135
01246  -0 12000 0 01261          TMI A135
01247   0 53400 2 03251          LXA MTLOC,2        A14
01250   0 50000 0 03265          CLA FRIA                 INITIALLY FRIA CONTAINS RIN
01251   0 30000 0 05336  FAD2    FAD DELTAR
01252   0 60100 0 03265          STO FRIA
01253   2 00001 2 01251          TIX FAD2,2,1             FRIA=FIRST R IN APIARY
01254   0 53400 2 03251          LXA MTLOC,2
01255   0 76200 0 00221  SKIP    RTB 1                    SKIP TO INITIAL RECORD
01256   0 76200 0 00222          RTB 2
01257   2 00001 2 01255          TIX SKIP,2,1
01260   0 02000 0 01264          TRA A15
01261   0 60000 0 03251  A135    STZ MTLOC          A13.5
01262   0 50000 0 05334          CLA RIN
01263   0 60100 0 03265          STO FRIA
01264   0 53400 1 03241  A15     LXA RAP,1          A15   IR1 CONTAINS NUMBER OF RECORDS IN APIARY
01265   0 53400 2 03237  LXA1    LXA BEER,2               IR2 CONTAINS NUMBER OF FIELDS/R VALUE
01266   0 50000 0 03175          CLA MAP                  COPY LOOP FOR READING FIELDS
01267   0 40200 0 03236          SUB BEERT
01270   0 62100 0 01276          STA CPY
01271   0 60000 0 02603          STZ RETRY+9              ZEROCOUNTER
01272   0 76200 0 00221          RTB 1
01273   0 70000 0 05426          CPY COMMON
01274   0 02000 0 01276          TRA CPY
01275   0 02000 0 01306          TRA READER
01276   0 70000 2 00000  CPY     CPY 0,2
01277   2 00001 2 01276          TIX CPY,2,1
01300  -0 76000 0 00012          RTT                      REDUNDANCY TAPE CHECK
01301   0 07400 4 02572          TSX RETRY,4              FAILED, TRY AGAIN
01302   0 50000 0 03236          CLA BEERT
01303   0 40000 0 03237          ADD BEER
01304   0 60100 0 03236          STO BEERT
01305   2 00001 1 01265          TIX LXA1,1,1             INITIAL HIVE OF BEES IN APIARY
01306   0 76100 0 00000  READER  NOP
01307   0 60000 0 03236          STZ BEERT                LOAD IRS FOR READING DERIVATIVES
01310   0 53400 1 03241          LXA RAP,1
01311   0 53400 2 03237  LXA2    LXA BEER,2
01312   0 50000 0 03176          CLA MAD
01313   0 40200 0 03236          SUB BEERT
01314   0 62100 0 01322          STA CPYCAT
01315   0 60000 0 02615          STZ RETRY2+9             ZERO COUNTER FOR TRYING TO REREAD.
01316   0 76200 0 00222          RTB 2
01317   0 70000 0 05426          CPY COMMON
01320   0 02000 0 01322          TRA CPYCAT
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01321   0 02000 0 01340          TRA A154+6
01322   0 70000 2 00000 CPYCAT   CPY 0,2          COPY LOOP FOR DERIVATIVES
01323   2 00001 2 01322          TIX CPYCAT,2,1
01324  -0 76000 0 00012          RTT              REDUNDANCY TAPE CHECK
01325   0 07400 4 02604          TSX RETRY2,4     FAILED, TRY AGAIN
01326   0 50000 0 03236          CLA BEERT
01327   0 40000 0 03237          ADD BEER
01330   0 60100 0 03236          STO BEERT
01331   2 00001 1 01311          TIX LXA2,1,1     INITIAL BAND OF DER. IN MEMORY
01332   0 50000 0 03265  A154    CLA FRIA      A15.4
01333   0 76600 0 00333          IOD 219          I-O DELAY
01334   0 30000 0 03262          FAD RSPAN
01335   0 60100 0 03264          STO MARIA        MARIA=MAX R IN APIARY
01336   0 76100 0 00000          NOP
01337   0 02000 0 01346          TRA A154+12
01340   0 50000 0 02551          CLA Z28+7
01341   0 60100 0 01334          STO A154+2
01342   0 02000 0 01332          TRA A154
01343   0 76100 0 00000          NOP
01344   0 76100 0 00000          NOP
01345   0 76100 0 00000          NOP
01346   0 07400 4 01441          TSX OROUT,4      A16
01347   0 56000 0 03233          LDQ BETA         R1   CALCULATE AND STORE NEW R GUESS FOR NEW P
01350   0 26000 0 03253          FMP RHO1              WHERE R=BETA(1+RHO)
01351   0 30000 0 03233          FAD BETA
01352   0 60100 0 03244          STO INITR
01353   0 60100 0 03350          STO R
01354   0 60100 0 03365          STO YRKY3-7
01355   0 56000 0 05423          LDQ P            R2   CALCULATE AND STORE NEW PR GUESS FOR NEW P
01356   0 26000 0 03257          FMP PRHO1             PR=P(PRHO1)
01357   0 60100 0 03245          STO INITPR
01360   0 60100 0 03366          STO YRKY3-6
01361   0 60100 0 03351          STO PR
01362   0 07400 4 01441          TSX OROUT,4      R3
01363   0 50000 0 03253          CLA RHO1         R4
01364   0 30000 0 03253          FAD RHO1
01365   0 30200 0 03254          FSB RHO2
01366   0 60100 0 03252          STO RHO          RHO=2RHO1-RHO2
01367   0 50000 0 03257          CLA PRHO1
01370   0 30000 0 03257          FAD PRHO1
01371   0 30200 0 03260          FSB PRHO2
01372   0 60100 0 03256          STO PRHO         PRHO=2PRHO1-PRHO2
01373   0 56000 0 03233          LDQ BETA         R5
01374   0 26000 0 03252          FMP RHO
01375   0 30000 0 03233          FAD BETA
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01376   0 60100 0 03350          STO R
01377   0 60100 0 03244          STO INITR
01400   0 60100 0 03365          STO YRKY3-7                    R=BETA(1+RHO)=INITIAL R GUESS
01401   0 56000 0 05423          LDQ P                  R6
01402   0 26000 0 03256          FMP PRHO
01403   0 60100 0 03351          STO PR
01404   0 60100 0 03245          STO INITPR
01405   0 60100 0 03366          STO YRKY3-6                    PR=PXPRHO=INITIAL GUESS
01406   0 07400 4 01441  ENTER   TSX OROUT,4           R7     TRANSFER TO O-ROUTINE
01407   0 50000 0 03253          CLA RHO1               R8
01410   0 30200 0 03254          FSB RHO2
01411   0 60100 0 05426          STO COMMON
01412   0 56000 0 05426          LDQ COMMON
01413   0 26000 0 03166          FMP 3FL
01414   0 30000 0 03255          FAD RHO3
01415   0 60100 0 03252          STO RHO                        RHO=3RHO1-3RHO2+RHO3
01416   0 50000 0 03257          CLA PRHO1              R10
01417   0 30200 0 03260          FSB PRHO2
01420   0 60100 0 05426          STO COMMON
01421   0 56000 0 05426          LDQ COMMON
01422   0 26000 0 03166          FMP 3FL
01423   0 30000 0 03261          FAD PRHO3
01424   0 60100 0 03256          STO PRHO                       PRHO=3(PRHO1-PRHO2)+PRHO3
01425   0 56000 0 03233          LDQ BETA               R9
01426   0 26000 0 03252          FMP RHO
01427   0 30000 0 03233          FAD BETA
01430   0 60100 0 03350          STO R
01431   0 60100 0 03244          STO INITR
01432   0 60100 0 03365          STO YRKY3-7                    R=BETA(1+RHO) (3 PTS USED)
01433   0 56000 0 03256          LDQ PRHO               R11
01434   0 26000 0 05423          FMP P
01435   0 60100 0 03351          STO PR
01436   0 60100 0 03245          STO INITPR
01437   0 60100 0 03366          STO YRKY3-6                    PR=P(PRHO) (3PTSUSED)
01440   0 02000 0 01406          TRA ENTER
01441  -0 63400 4 03475  OROUT   SXD JUNK,4              0.05
01442   0 60000 0 03247          STZ TEMP2              01
01443   0 60000 0 03356  RENT    STZ THETA              02     INITIALIZE R.K.1+RK2
01444   0 60000 0 03353          STZ PX1
01445   0 60000 0 03354          STZ X2
01446   0 60000 0 03373          STZ YRKY3-1
01447   0 60000 0 03371          STZ YRKY3-3
01450   0 60000 0 03370          STZ YRKY3-4
01451   0 50000 0 03164          CLA 1FL                03
01452   0 60100 0 03352          STO X1
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01453   0 60100 0 03355          STO PX2
01454   0 60100 0 03372          STO YRKY3-2
01455   0 60100 0 03367          STO YRKY3-5
01456   0 60000 0 03271          STZ TC                  04.5 ZERO TEST COUNTER
01457   0 50000 0 03271          CLA TC                       ZERO TXI DECREMENT
01460   0 62200 0 01634          STD TXI
01461   0 50000 0 03237          CLA BEER                04
01462   0 77100 0 00001          ARS 1
01463   0 73400 1 00000          PAX 0,1                      BEER/2 TO IR1
01464   0 50000 0 03247          CLA TEMP2               05
01465   0 12000 0 01474          TPL 056
01466   0 50000 0 01651          CLA FORSU               05.5  SET UP ORDERS FOR Z-EQUATIONS
01467   0 62200 0 01637          STD CLAP+2
01470   0 50000 0 01473          CLA NOP
01471   0 62200 0 02117          STD K23
01472   0 02000 0 02175          TRA ZROUT
01473   0 76100 0 00000  NOP    NOP                          USED FOR SETTING ORDERS
01474   0 50000 0 01473  056    CLA NOP                 05.6
01475   0 62200 0 01637          STD CLAP+2
01476   0 53400 2 03171          LXA NURKY4,2            06    SET UP TO REENTER R.K.1
01477   0 60000 2 03475  STZ1   STZ QRKY3,2
01500   2 00001 2 01477          TIX STZ1,2,1
01501   0 50000 0 01651          CLA FORSU               07
01502   0 62200 0 02117          STD K23
01503   0 07400 4 03510  RK1    TSX RKY3,4              08    ENTER RUNGA-KUTTA WITH BEER/2 IN I.R.1
01504   0 42000 0 00000  H1     HPR
01505   2 00001 1 01503          TIX RK1,1,1             09
01506   0 50000 0 03350          CLA R                   010
01507   0 30200 0 03244          FSB INITR
01510   0 60100 0 05426          STO COMMON                   EPSILON R IN COMMON
01511   0 50000 0 03351          CLA PR
01512   0 30200 0 03245          FSB INITPR
01513   0 60100 0 05427          STO COMMON+1                 EPSILON PR IN COMMON+1
01514   0 76000 0 00003          SSP
01515   0 60100 0 05430          STO COMMON+2
01516   0 50000 0 05426          CLA COMMON
01517   0 76000 0 00003          SSP
01520   0 30000 0 05430          FAD COMMON+2
01521   0 30200 0 03177          FSB EPS
01522   0 60100 0 03247          STO TEMP2                    TO TEST FOR EQUI. ORBIT
01523   0 50000 0 03355          CLA PX2                      NEWR,PRGUESS
01524   0 30200 0 03164          FSB 1FL
01525   0 24000 0 03354          FDH X2
01526  -0 60000 0 05430          STQ COMMON+2                 (ALPHA22-1)/(ALPHA21) IN COMMON+2
01527   0 26000 0 05426          FMP COMMON
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01530   0 30200 0 05427          FSB COMMON+1
01531   0 60100 0 05431          STO COMMON+3                NUMERATOR OF A
01532   0 56000 0 05430          LDQ COMMON+2
01533   0 26000 0 03352          FMP X1
01534   0 30200 0 05430          FSB COMMON+2
01535   0 30200 0 03353          FSB PX1
01536   0 60100 0 05432          STO COMMON+4                DENOMINATOR OF A
01537   0 50000 0 05431          CLA COMMON+3
01540   0 24000 0 05432          FDH COMMON+4
01541  -0 60000 0 05427          STQ COMMON+1                A IN COMMON+1
01542   0 50000 0 03244          CLA INITR
01543   0 30200 0 05427          FSB COMMON+1
01544   0 60100 0 03244          STO INITR
01545   0 60100 0 03350          STO R
01546   0 60100 0 03365          STO YRKY3-7                 NEW R
01547   0 56000 0 05427          LDQ COMMON+1
01550   0 26000 0 03352          FMP X1
01551   0 30200 0 05427          FSB COMMON+1
01552   0 76000 0 00002          CHS
01553   0 30000 0 05426          FAD COMMON
01554   0 24000 0 03354          FDH X2
01555  -0 60000 0 05430          STQ COMMON+2                B IN COMMON+2
01556   0 50000 0 03245          CLA INITPR
01557   0 30200 0 05430          FSB COMMON+2
01560   0 60100 0 03245          STO INITPR
01561   0 60100 0 03351          STO PR
01562   0 60100 0 03366          STO YRKY3-6                 NEW PR GUESS STORED
01563   0 02000 0 01443          TRA RENT
01564   0 50000 0 03350  BEEP    CLA R                   B1
01565   0 30200 0 03265          FSB FRIA
01566   0 24000 0 05336          FDH DELTAR
01567  -0 60000 0 05426          STQ COMMON
01570   0 50000 0 05426          CLA COMMON              B2  FIX=NO. OF R VALUES R IS FROM APIARY
01571   0 07400 4 04006          TSX FLOFX,4
01572   0 00000 0 00043          PZE 35
01573   0 42000 0 00000          HPR                     B3  FLT=FIX FLOATED
01574   0 60100 0 03273          STO FIX
01575   0 10000 0 00627          TZE BADST
01576   0 07400 4 04026          TSX FXFLO,4
01577   0 00000 0 00043          PZE 35
01600   0 42000 0 00000          HPR
01601   0 60100 0 03274          STO FLT
01602   0 56000 0 03274          LDQ FLT                 B4  CALCULATE R2 FOR INTERPOLATION
01603   0 26000 0 05336          FMP DELTAR
01604   0 30000 0 03265          FAD FRIA
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01605   0 60100 0 03321          STO R2
01606   0 56000 0 03273          LDQ FIX          B5   INT=RELATIVE ADDRESS OF R2 FROM APIARY
01607   0 20000 0 03237          MPY BEER
01610  -0 60000 0 03272          STQ INT
01611   0 50000 0 03272          CLA INT          B6
01612   0 40000 0 03237          ADD BEER
01613   0 40000 0 03237          ADD BEER
01614   0 40000 0 03156          ADD FX1
01615   0 73400 1 00000          PAX 0,1               LOAD IR1 WITH REL. ADDRESS OF R4
01616   0 53400 2 03161          LXA FX4,2        B7   4 IN IR2
01617   0 50000 0 03271          CLA TC           B8
01620   0 76000 0 00001          LBT
01621   0 02000 0 01631          TRA INCTC             WHEN C(AC)35=0
01622   0 50000 0 01634          CLA TXI               WHEN C(AC)35=1
01623   0 40000 0 03207          ADD BIT
01624   0 62200 0 01634          STD TXI
01625   0 34000 0 02651          CAS TW
01626   0 00000 0 01626  TOFAR   HTR TOFAR            STOP  THETA TOO LARGE
01627   0 02000 0 01644          TRA SETDC             WHEN THETA=2 PI/N
01630   0 76100 0 00000          NOP
01631   0 50000 0 03271  INCTC   CLA TC               INCREASE TEST COUNTER
01632   0 40000 0 03156          ADD FX1
01633   0 60100 0 03271          STO TC
01634   1 00000 1 01635  TXI     TXI CLAP,1,0          ADVANCES THETA PICK-UP
01635   0 50000 1 17571  CLAP    CLA APIARY,1
01636   0 60100 2 03305          STO B5,2              FIELDS FOR INTERPOLATION STORED
01637   0 76100 0 01647          NOP BFORZ             NOP TO TRA TO PICK UP DTHETA
01640   2 00000 1 01642  TIXN    TIX NEXT,1,0          DECREMENT IR1 BY BEER
01641   0 76100 0 00000          NOP
01642   2 00001 2 01635  NEXT    TIX CLAP,2,1
01643   0 02000 0 01665          TRA RIGHT+1           ALL 4 FIELDS FOR INTER. STORED
01644  -0 75400 0 00000  SETDC   PXD
01645   0 62200 0 01634          STD TXI               SET UP INCREMENT FOR THETA=2 PI/N
01646   0 02000 0 01631          TRA INCTC
01647   0 50000 1 13371  BFORZ   CLA BTHETA,1
01650   0 60100 2 03312          STO DB5,2             B DERIVATIVES STORED TO INTERPOLATE
01651   0 02000 0 01640  FORSU   TRA TIXN
01652  -0 63400 1 03476  WRKY3   SXD JUNK+1,1     K1   STORE ALL I.R.S
01653  -0 63400 2 03477          SXD JUNK+2,2
01654  -0 63400 4 03500          SXD JUNK+3,4
01655   0 50000 0 03350          CLA R            K2   TEST ON SUFFICIENT FIELDS FOR INTERPOLATION
01656   0 30000 0 05336          FAD DELTAR
01657   0 60100 0 05426          STO COMMON
01660   0 56000 0 05426          LDQ COMMON
01661   0 50000 0 03264          CLA MARIA
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01662   0 04000 0 01664          TLQ RIGHT              K3
01663   0 42000 0 00000          HPR                        STOP NEED MORE FIELDS
01664   0 02000 0 01564  RIGHT   TRA BEEP               K5  TO PICK UP BEES AND DERIVATIVES
01665   0 50000 0 03350          CLA R                  K6
01666   0 30200 0 03321          FSB R2
01667   0 24000 0 05336          FDH DELTAR
01670  -0 60000 0 03270          STQ X                      X=(R-R2)/DELTA R
01671   0 26000 0 03270          FMP X                      X USED IN INTER. POLY.
01672   0 60100 0 03267          STO XSQ                    X SQUARED=XSQ
01673   0 56000 0 03267          LDQ XSQ
01674   0 26000 0 03270          FMP X
01675   0 60100 0 03266          STO XCUB                   X CUBED=XCUB
01676   0 30200 0 03270          FSB X                  K8  CALCULATE INTER. COEFF.=
01677   0 60100 0 05426          STO COMMON                 A1,A2,A3,ANDA4
01700   0 24000 0 03167          FDH 6FL
01701  -0 60000 0 03275          STQ A4                     A4=1/6(X CUBED-X)
01702   0 56000 0 05426          LDQ COMMON
01703   0 26000 0 03202          FMP HALF
01704   0 30200 0 03267          FSB XSQ
01705   0 30000 0 03164          FAD 1FL
01706   0 60100 0 03277          STO A2                     A2=(X CUBE-2X SQ-X+2)/2
01707   0 50000 0 05426          CLA COMMON
01710   0 30200 0 03270          FSB X
01711   0 30200 0 03267          FSB XSQ
01712   0 76000 0 00002          CHS
01713   0 24000 0 03165          FDH 2FL
01714  -0 60000 0 03276          STQ A3                     A3=-(X CUBE-X SQ-2X)/2
01715   0 50000 0 03267          CLA XSQ
01716   0 30200 0 03270          FSB X
01717   0 24000 0 03165          FDH 2FL
01720  -0 60000 0 05426          STQ COMMON                 (X SQ-X)/2 IN COMMON
01721   0 50000 0 05426          CLA COMMON
01722   0 30200 0 03275          FSB A4
01723   0 60100 0 03300          STO A1                     A1=-(X CUBE-3X SQ+2X)/6
01724   0 56000 0 03267          LDQ XSQ                K9  CALCULATE COEFFICIENTS FOR R DERIVATIVES
01725   0 26000 0 03202          FMP HALF
01726   0 60100 0 05426          STO COMMON                 1/2 X SQUARE IN COMMON
01727   0 30200 0 03203          FSB SIXTH
01730   0 60100 0 05432          STO COMMON+4               A4*=1/2X SQ-1/6
01731   0 50000 0 03270          CLA X
01732   0 30200 0 05426          FSB COMMON
01733   0 30200 0 03204          FSB THIRD
01734   0 60100 0 05427          STO COMMON+1               A1*=-X SQ/2+X-1/3
01735   0 56000 0 05426          LDQ COMMON
01736   0 26000 0 03166          FMP 3FL
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01737   0 60100 0 05426         STO COMMON
01740   0 30200 0 03270         FSB X
01741   0 30200 0 03164         FSB 1FL
01742   0 76000 0 00002         CHS
01743   0 60100 0 05431         STO COMMON+3                A3*=-3X SQ/2+X+1
01744   0 50000 0 05426         CLA COMMON
01745   0 30200 0 03270         FSB X
01746   0 30200 0 03270         FSB X
01747   0 30200 0 03202         FSB HALF
01750   0 60100 0 05430         STO COMMON+2                A2*=3X SQ/2-2X-1/2
01751   0 56000 0 05427         LDQ COMMON+1        K10     DBDR=A1*B1+A2*B2+A3*B3+A4*B4
01752   0 26000 0 03304         FMP B1
01753   0 60100 0 05427         STO COMMON+1                A1*B1 IN COMMON+1
01754   0 56000 0 05430         LDQ COMMON+2
01755   0 26000 0 03303         FMP B2
01756   0 30000 0 05427         FAD COMMON+1
01757   0 60100 0 05427         STO COMMON+1
01760   0 56000 0 05431         LDQ COMMON+3
01761   0 26000 0 03302         FMP B3
01762   0 30000 0 05427         FAD COMMON+1
01763   0 60100 0 05427         STO COMMON+1
01764   0 56000 0 05432         LDQ COMMON+4
01765   0 26000 0 03301         FMP B4
01766   0 30000 0 05427         FAD COMMON+1
01767   0 24000 0 05336         FDH DELTAR
01770  -0 60000 0 03315         STQ DBDR
01771   0 56000 0 03300         LDQ A1              K11     B=A1B1+A2B2+A3B3+A4B4
01772   0 26000 0 03304         FMP B1
01773   0 60100 0 05427         STO COMMON+1
01774   0 56000 0 03277         LDQ A2
01775   0 26000 0 03303         FMP B2
01776   0 30000 0 05427         FAD COMMON+1
01777   0 60100 0 05427         STO COMMON+1
02000   0 56000 0 03276         LDQ A3
02001   0 26000 0 03302         FMP B3
02002   0 30000 0 05427         FAD COMMON+1
02003   0 60100 0 05427         STO COMMON+1
02004   0 56000 0 03275         LDQ A4
02005   0 26000 0 03301         FMP B4
02006   0 30000 0 05427         FAD COMMON+1
02007   0 60100 0 03316         STO BEE
02010   0 56000 0 03351         LDQ PR              K12
02011   0 26000 0 03351         FMP PR
02012   0 60100 0 05426         STO COMMON                  PR SQUARED IN COMMON
02013   0 50000 0 03231         CLA PSQ
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02014   0 30200 0 05426          FSB COMMON
02015   0 60100 0 05426          STO COMMON                    P SQ-PR SQ IN COMMON
02016   0 07400 4 05537          TSX SQRT,4            K13     ENTER SQUARE ROOT ROUTINE
02017   0 42000 0 02017   SQRTQ  HPR SQRTQ
02020   0 60100 0 03314          STO QINV              K14     SQ RT(P SQ-PR SQ)=Q INVERSE
02021   0 50000 0 03164          CLA 1FL
02022   0 24000 0 03314          FDH QINV
02023  -0 60000 0 03317          STQ QBALL                     Q BALL=1/SQRT(PSQ-PRSQ)
02024   0 26000 0 03351          FMP PR                K15
02025   0 60100 0 05426          STO COMMON                    QPR IN COMMON
02026   0 56000 0 05426          LDQ COMMON
02027   0 26000 0 03350          FMP R
02030   0 60100 0 03451          STO VRKY3-7
02031   0 56000 0 03350          LDQ R                 K16
02032   0 26000 0 03316          FMP BEE
02033   0 30200 0 03314          FSB QINV
02034   0 76000 0 00002          CHS
02035   0 60100 0 03452          STO VRKY3-6                   F(PR)=Q INV-RB
02036   0 56000 0 03350          LDQ R                 K17
02037   0 26000 0 03315          FMP DBDR
02040   0 60100 0 05433          STO COMMON+5                  R(DBDR) IN COMMON+5
02041   0 30000 0 03316          FAD BEE
02042   0 60100 0 05430          STO COMMON+2                  B+R(DBDR) IN COMMON+2
02043   0 56000 0 03317          LDQ QBALL
02044   0 26000 0 03350          FMP R
02045   0 60100 0 05431          STO COMMON+3                  RQ IN COMMON+3
02046   0 56000 0 03317          LDQ QBALL
02047   0 26000 0 03317          FMP QBALL
02050   0 60100 0 05427          STO COMMON+1
02051   0 56000 0 05427          LDQ COMMON+1
02052   0 26000 0 03231          FMP PSQ
02053   0 60100 0 05427          STO COMMON+1                  (P SQUARED)(Q SQUARED) IN COMMON+1
02054   0 56000 0 05427          LDQ COMMON+1
02055   0 26000 0 05431          FMP COMMON+3
02056   0 60100 0 05432          STO COMMON+4                  P SQ R Q CUBED IN COMMON+4
02057   0 56000 0 03352          LDQ X1                K18
02060   0 26000 0 05426          FMP COMMON
02061   0 60100 0 05427          STO COMMON+1
02062   0 56000 0 03353          LDQ PX1
02063   0 26000 0 05432          FMP COMMON+4
02064   0 30000 0 05427          FAD COMMON+1
02065   0 60100 0 03453          STO VRKY3-5                   F(X1)=(Q PR)X1+(P SQ R Q CUBED)PX1
02066   0 56000 0 03354          LDQ X2                K19
02067   0 26000 0 05426          FMP COMMON
02070   0 60100 0 05427          STO COMMON+1
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02071  0 56000 0 03355          LDQ PX2
02072  0 26000 0 05432          FMP COMMON+4
02073  0 30000 0 05427          FAD COMMON+1
02074  0 60100 0 03455          STO VRKY3-3                F(X2)=(QR)X2+(P SQ R Q CUBED)PX2
02075  0 56000 0 05426          LDQ COMMON            K20
02076  0 26000 0 03353          FMP PX1
02077  0 60100 0 05427          STO COMMON+1
02100  0 56000 0 03352          LDQ X1
02101  0 26000 0 05430          FMP COMMON+2
02102  0 30000 0 05427          FAD COMMON+1
02103  0 76000 0 00002          CHS
02104  0 60100 0 03454          STO VRKY3-4                F(PX1)=(-QPR)PX1-(B+RDBDR)X1
02105  0 56000 0 05426          LDQ COMMON            K21
02106  0 26000 0 03355          FMP PX2
02107  0 60100 0 05427          STO COMMON+1
02110  0 56000 0 03354          LDQ X2
02111  0 26000 0 05430          FMP COMMON+2
02112  0 30000 0 05427          FAD COMMON+1
02113  0 76000 0 00002          CHS
02114  0 60100 0 03456          STO VRKY3-2                F(PX2) STORED
02115  0 50000 0 03164          CLA 1FL               K22
02116  0 60100 0 03457          STO VRKY3-1                F(THETA)
02117  0 02000 0 02171  K23     TRA KEXIT             K23
02120  0 56000 0 03300          LDQ A1                K24  THETA DERIVATIVE=A1 DB1+A2 DB2+A3 DB3+A4 DB4
02121  0 26000 0 03311          FMP DB1
02122  0 60100 0 05427          STO COMMON+1
02123  0 56000 0 03277          LDQ A2
02124  0 26000 0 03310          FMP DB2
02125  0 30000 0 05427          FAD COMMON+1
02126  0 60100 0 05427          STO COMMON+1
02127  0 56000 0 03276          LDQ A3
02130  0 26000 0 03307          FMP DB3
02131  0 30000 0 05427          FAD COMMON+1
02132  0 60100 0 05427          STO COMMON+1
02133  0 56000 0 03275          LDQ A4
02134  0 26000 0 03306          FMP DB4
02135  0 30000 0 05427          FAD COMMON+1
02136  0 60100 0 03320          STO DTHETA
02137  0 56000 0 05431          LDQ COMMON+3          K25
02140  0 26000 0 03232          FMP E
02141  0 60100 0 05427          STO COMMON+1
02142  0 56000 0 05427          LDQ COMMON+1
02143  0 26000 0 03235          FMP NO2PI
02144  0 60100 0 03450          STO VRKY3-8                F(T)=ERQN/2PI
02145  0 56000 0 03350          LDQ R                 K26
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02146   0 26000 0 03235          FMP  NO2PI
02147   0 60100 0 03443          STO  VRKY3-13                F(R AVE)=RN/2PI
02150   0 56000 0 05431          LDQ  COMMON+3          K27
02151   0 26000 0 03344          FMP  PZ1
02152   0 60100 0 03444          STO  VRKY3-12                F(Z1)=(RQ)PZ1
02153   0 56000 0 05431          LDQ  COMMON+3          K28
02154   0 26000 0 03346          FMP  PZ2
02155   0 60100 0 03446          STO  VRKY3-10                F(Z2)=(RQ)PZ2
02156   0 56000 0 05426          LDQ  COMMON            K29
02157   0 26000 0 03320          FMP  DTHETA
02160   0 30200 0 05433          FSB  COMMON+5
02161   0 76000 0 00002          CHS
02162   0 60100 0 05434          STO  COMMON+6
02163   0 56000 0 05434          LDQ  COMMON+6
02164   0 26000 0 03343          FMP  Z1
02165   0 60100 0 03445          STO  VRKY3-11                F(PZ1)=(R DBDR-Q PR DTHETA)Z1
02166   0 56000 0 05434          LDQ  COMMON+6          K30
02167   0 26000 0 03345          FMP  Z2
02170   0 60100 0 03447          STO  VRKY3-9                 F(PZ2)
02171  -0 53400 1 03476  KEXIT   LXD  JUNK+1,1
02172  -0 53400 2 03477          LXD  JUNK+2,2
02173  -0 53400 4 03500          LXD  JUNK+3,4
02174   0 02000 4 00001          TRA  1,4
02175   0 50000 0 03172  ZROUT   CLA  NURKY5              Z ROUT   13 EQUATIONS TO BE SOLVED R.K.2
02176   0 60100 0 03170          STO  NURKY3                  13 EQUATIONS TO BE SOLVED RK2
02177   0 53400 2 03170          LXA  NURKY3,2
02200   0 60000 2 03475  STZ2    STZ  QRKY3,2
02201   2 00001 2 02200          TIX  STZ2,2,1                Q BANK ZEROED
02202   0 60000 0 03345          STZ  Z2                Z2    INITIALIZE RK2
02203   0 60000 0 03344          STZ  PZ1
02204   0 60000 0 03362          STZ  YRKY3-10
02205   0 60000 0 03361          STZ  YRKY3-11
02206   0 60000 0 03347          STZ  TIME
02207   0 60000 0 03342          STZ  RAVE
02210   0 60000 0 03357          STZ  YRKY3-13
02211   0 60000 0 03364          STZ  YRKY3-8
02212   0 50000 0 03164          CLA  1FL               Z3
02213   0 60100 0 03343          STO  Z1
02214   0 60100 0 03346          STO  PZ2
02215   0 60100 0 03363          STO  YRKY3-9
02216   0 60100 0 03360          STO  YRKY3-12
02217   0 60100 0 03325          STO  MINA                    1FL IN CELL TO LOCATE MINIMUM R
02220   0 60000 0 03326          STZ  MAXA                    0 IN CELL TO LOCATE MAXIMUM R
02221   0 07400 4 03510  RK2     TSX  RKY3,4            Z4    ENTER RUNGA-KUTTA 2
02222   0 42000 0 00000  H2      HPR
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02223 -0 63400 1 03501          SXD JUNK+4,1                STORE I.R.1
02224  0 02000 0 02240          TRA NUGOON
02225  0 50000 0 03331          CLA RKSPL
02226  0 34000 0 03501          CAS JUNK+4
02227  0 02000 0 02231          TRA *+2
02230  0 02000 0 00715          TRA STPL
02231  0 50000 0 03330          CLA RKSIN
02232  0 34000 0 03501          CAS JUNK+4
02233  0 02000 0 02235          TRA *+2
02234  0 02000 0 00742          TRA STOIC
02235  0 50000 0 05405          CLA PLOFF
02236  0 10000 0 02240          TZE *+2
02237  0 02000 0 00675          TRA STINF
02240  0 50000 0 03350 NUGOON   CLA R                       Z5.5
02241  0 56000 0 03325          LDQ MINA
02242  0 04000 0 02244          TLQ NUGOON+4
02243  0 60100 0 03325          STO MINA
02244  0 56000 0 03326          LDQ MAXA
02245  0 04000 0 02247          TLQ NUGOON+7
02246  0 02000 0 02250          TRA GOON
02247  0 60100 0 03326          STO MAXA
02250 -0 53400 1 03501  GOON     LXD JUNK+4,1                Z6
02251  2 00001 1 02221          TIX RK2,1,1                     FINAL PASS THRU ORBIT COMPLETED
02252  0 56000 0 03354          LDQ X2                      Z7
02253  0 26000 0 03353          FMP PX1
02254  0 60100 0 05426          STO COMMON                      ALPHA 12 X ALPHA 21 IN COMMON
02255  0 56000 0 03352          LDQ X1                          ALPHA 11 X ALPHA 22
02256  0 26000 0 03355          FMP PX2
02257  0 30200 0 05426          FSB COMMON                      ALPHA DETERMINANT - 1
02260  0 30200 0 03164          FSB 1FL
02261  0 76000 0 00003          SSP
02262  0 30200 0 03200          FSB EPS2                        ABSOLUTE VALUE OF (ALPHADET.-1)
02263 -0 12000 0 02265          TMI PAT                         -EPSILON2
02264  0 00000 0 00000          HTR                             FLUNKED
02265  0 56000 0 03345  PAT     LDQ Z2                          PASSED ALPHA TEST
02266  0 26000 0 03344          FMP PZ1
02267  0 60100 0 05426          STO COMMON                      BETA 12 X BETA 21
02270  0 56000 0 03343          LDQ Z1
02271  0 26000 0 03346          FMP PZ2
02272  0 30200 0 05426          FSB COMMON
02273  0 30200 0 03164          FSB 1FL
02274  0 76000 0 00003          SSP
02275  0 30200 0 03200          FSB EPS2
02276 -0 12000 0 02300          TMI PBT
02277  0 00000 0 00000          HTR                             FLUNKED BETA TEST
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02300   0 50000 0 03352  PBT    CLA X1                    Z8
02301   0 30000 0 03355         FAD PX2
02302   0 24000 0 03165         FDH 2FL                        COS SIGMA R
02303  -0 60000 0 03246         STQ CSR                        IN CSR
02304   0 50000 0 03343         CLA Z1
02305   0 30000 0 03346         FAD PZ2
02306   0 24000 0 03165         FDH 2FL
02307  -0 60000 0 03250         STQ CSZ                        COS SIGMA Z IN CSZ
02310   0 50000 0 03350         CLA R                     Z8.3
02311   0 30200 0 03244         FSB INITR
02312   0 76000 0 00003         SSP
02313   0 60100 0 05426         STO COMMON
02314   0 50000 0 03351         CLA PR
02315   0 30200 0 03245         FSB INITPR
02316   0 76000 0 00003         SSP
02317   0 30000 0 05426         FAD COMMON
02320   0 60100 0 03313         STO EPI
02321   0 50000 0 03246         CLA CSR                   Z8.35
02322   0 07400 4 03672         TSX ARCOS,4
02323   0 00000 0 00627         HTR BADST                      COS(SIGMAR) OVER ONE PUSH START TO START NEW C
02324   0 60100 0 05426         STO COMMON
02325   0 56000 0 05426         LDQ COMMON
02326   0 26000 0 03235         FMP NO2PI
02327   0 60100 0 03322         STO NUR                        NUR=N/2PI ARC COS(SIGMA R)
02330   0 50000 0 03250  CALNU  CLA CSZ
02331   0 07400 4 03672         TSX ARCOS,4
02332   0 00000 0 00627         HTR BADST                      COS(SIGMAZ) OVER ONE. PUSH START TO START NEW
02333   0 60100 0 05426         STO COMMON
02334   0 56000 0 05426         LDQ COMMON
02335   0 26000 0 03235         FMP NO2PI
02336   0 60100 0 03323         STO NUZ                        NUZ=N/2PI ARC COS(SIGMA Z)
02337   0 02000 0 02350         TRA Z84
02340   0 50000 0 03246  CSRO   CLA CSR
02341   0 30000 0 03206         FAD FL90
02342   0 60100 0 03322         STO NUR                        COS R OVER ONE. 90+COS R OUTPUT
02343   0 02000 0 02330         TRA CALNU
02344   0 50000 0 03250         CLA CSZ
02345   0 30000 0 03206         FAD FL90
02346   0 60100 0 03323         STO NUZ                        COS Z OVER ONE, 90+COS Z OUTPUT
02347   0 02000 0 02350         TRA Z84
02350   0 50000 0 03326  Z84    CLA MAXA                  Z8.4
02351   0 30200 0 03325         FSB MINA
02352   0 24000 0 03165         FDH 2FL
02353  -0 60000 0 03327         STQ AMP                        AMP=(MAX R-MIN R)/2
02354   0 56000 0 03232         LDQ E
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02355   0 26000 0 03205          FMP FL938
02356   0 30200 0 03205          FSB FL938
02357   0 60100 0 05426          STO COMMON              (E-1)938.23 IN COMMON
02360   0 56000 0 05426          LDQ COMMON
02361   0 26000 0 03155          FMP AMORT
02362   0 60100 0 03324          STO KE                  KE=(E-1)938.23A
02363   0 50000 0 03254  Z9      CLA RHO2          Z9    ALL RHOS AND PRHOS
02364   0 60100 0 03255          STO RHO3          MOVED BACK ONE CELL
02365   0 50000 0 03253          CLA RHO1
02366   0 60100 0 03254          STO RHO2
02367   0 50000 0 03260          CLA PRHO2
02370   0 60100 0 03261          STO PRHO3
02371   0 50000 0 03257          CLA PRHO1
02372   0 60100 0 03260          STO PRHO2
02373   0 50000 0 03350          CLA R             Z10   RHO1=(R-BETA)/BETA
02374   0 30200 0 03233          FSB BETA
02375   0 24000 0 03233          FDH BETA
02376  -0 60000 0 03253          STQ RHO1
02377   0 50000 0 03351          CLA PR            Z11   PRHO1=PR/P
02400   0 24000 0 05423          FDH P
02401  -0 60000 0 03257          STQ PRHO1               PRHO1 STORED
02402   0 76100 0 00000          NOP
02403   0 50000 0 03171          CLA NURKY4        Z14
02404   0 60100 0 03170          STO NURKY3              NO. OF EQUATIONS=7
02405  -0 53400 4 03507          LXD JUNK+10,4
02406   0 02000 4 00001          TRA 1,4
02407  -0 63400 4 03507  ENTR    SXD JUNK+10,4
02410   0 07400 4 02555          TSX SELP+3,4
02411   0 56000 0 03233          LDQ BETA          Z16
02412   0 26000 0 03263          FMP 10NSQ
02413   0 60100 0 03234          STO RAMP                BETA/NSQ=R AMPLITUDE
02414   0 30000 0 03233          FAD BETA          Z17
02415   0 30000 0 05336          FAD DELTAR
02416   0 30000 0 05336          FAD DELTAR
02417   0 60100 0 03242          STO RMAX                R MAX=BETA+R AMP+2 DELTA R
02420   0 50000 0 03265          CLA FRIA          Z19
02421   0 30000 0 03262          FAD RSPAN
02422   0 56000 0 03242          LDQ RMAX          Z18
02423   0 04000 0 02542          TLQ Z28           Z20   IF BEES IN MEMORY EXIT O-ROUT
02424   0 50000 0 03233          CLA BETA          Z21
02425   0 30200 0 03234          FSB RAMP
02426   0 30200 0 05336          FSB DELTAR
02427   0 30200 0 05336          FSB DELTAR
02430   0 60100 0 03243          STO RMIN                R MIN=BETA-(R AMP+2 DELTA R)
02431   0 30200 0 05334          FSB RIN           Z22
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02432   0 24000 0 05336          FDH DELTAR
02433  -0 60000 0 05426          STQ COMMON
02434   0 50000 0 05426          CLA COMMON
02435   0 07400 4 04006          TSX FLOFX,4
02436   0 00000 0 00043          PZE 35
02437   0 42000 0 00000          HPR
02440   0 60100 0 05426          STO COMMON
02441   0 50000 0 03251          CLA MTLOC              Z23
02442   0 40000 0 03241          ADD RAP
02443   0 40200 0 05426          SUB COMMON
02444  -0 12000 0 03163          TMI FX6                Z24  STOP IN FX6 IF FIELDS DO NOT OVERLAP
02445   0 10000 0 02454          TZE Z27                Z25  TAPE LOCATED RIGHT
02446   0 60100 0 05427          STO COMMON+1           Z26
02447  -0 63400 2 03503          SXD JUNK+6,2
02450   0 53400 2 05427          LXA COMMON+1,2
02451   0 76400 0 00201  BST     BST 1
02452   0 76400 0 00202          BST 2
02453   2 00001 2 02451          TIX BST,2,1                 TAPE POSITIONED TO READ BEES
02454  -0 63400 1 03504  Z27     SXD JUNK+7,1
02455   0 53400 1 03241          LXA RAP,1
02456   0 60000 0 03236          STZ BEERT
02457   0 53400 2 03237  LXA5    LXA BEER,2
02460   0 50000 0 03175          CLA MAP
02461   0 40200 0 03236          SUB BEERT
02462   0 62100 0 02470          STA YPC
02463   0 60000 0 02603          STZ RETRY+9                 ZERO COUNTER FOR TRIALS OF M.T. READING
02464   0 76200 0 00221          RTB 1
02465   0 70000 0 05427          CPY COMMON+1
02466   0 02000 0 02470          TRA YPC
02467   0 02000 0 02500          TRA REREAD
02470   0 70000 2 00000  YPC     CPY 0,2
02471   2 00001 2 02470          TIX YPC,2,1
02472  -0 76000 0 00012          RTT                         REDUNDANCY TAPE CHECK
02473   0 07400 4 02572          TSX RETRY,4                 FAILED, TRY AGAIN
02474   0 50000 0 03236          CLA BEERT
02475   0 40000 0 03237          ADD BEER
02476   0 60100 0 03236          STO BEERT
02477   2 00001 1 02457          TIX LXA5,1,1
02500   0 76100 0 00000 REREAD   NOP
02501   0 76000 0 00144          SLN 4
02502   0 60000 0 03236          STZ BEERT
02503   0 53400 1 03241          LXA RAP,1
02504   0 53400 2 03237  LXA6    LXA BEER,2
02505   0 50000 0 03176          CLA MAD
02506   0 40200 0 03236          SUB BEERT
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02507   0 62100 0 02515          STA TACYPC
02510   0 60000 0 02615          STZ RETRY2+9              ZERO COUNTER FOR TRYING TO REREAD
02511   0 76200 0 00222          RTB 2
02512   0 70000 0 05427          CPY COMMON+1
02513   0 02000 0 02515          TRA TACYPC
02514   0 02000 0 02546          TRA Z28+4
02515   0 70000 2 00000 TACYPC   CPY 0,2
02516   2 00001 2 02515          TIX TACYPC,2,1
02517  -0 76000 0 00012          RTT                       REDUNDANCY TAPE CHECK
02520   0 07400 4 02604          TSX RETRY2,4              FAILED, TRY AGAIN
02521   0 50000 0 03236          CLA BEERT
02522   0 40000 0 03237          ADD BEER
02523   0 60100 0 03236          STO BEERT
02524   2 00001 1 02504          TIX LXA6,1,1
02525   0 50000 0 05426  Z275    CLA COMMON          Z27.5
02526   0 60100 0 03251          STO MTLOC                 MAGNETIC TAPE LOCATION STORED
02527   0 53400 1 03251          LXA MTLOC,1
02530   0 60000 0 03265          STZ FRIA
02531   0 76600 0 00333          IOD 219                   I-O DELAY
02532   0 50000 0 03265  THERE   CLA FRIA
02533   0 30000 0 05336          FAD DELTAR
02534   0 60100 0 03265          STO FRIA                  MTLOC(DELTA R) COMPUTED
02535   2 00001 1 02533          TIX THERE+1,1,1
02536   0 30000 0 05334          FAD RIN
02537   0 60100 0 03265          STO FRIA                  FRIA=RIN+(MTLOC)(DELTAR)
02540   0 30000 0 03262          FAD RSPAN
02541   0 60100 0 03264          STO MARIA                 MARIA=FRIA+R SPAN
02542  -0 53400 2 03503  Z28     LXD JUNK+6,2        Z28   REPLACING INDEX REG.
02543  -0 53400 1 03504          LXD JUNK+7,1
02544  -0 53400 4 03475          LXD JUNK,4
02545   0 02000 4 00001          TRA 1,4                   EXIT Z,O ROUTINES
02546   0 50000 0 02551          CLA Z28+7
02547   0 60100 0 02540          STO THERE+6
02550   0 02000 0 02525          TRA Z275
02551   0 50000 0 05335          CLA MROT
02552   0 50000 0 05423  SELP    CLA P                     INCREMENT P
02553   0 56000 0 05426          LDQ COMMON
02554   0 60100 0 05423          STO P
02555  -0 63400 4 05437          SXD COMMON+9,4            SAVE I.R.4
02556   0 56000 0 05423          LDQ P
02557   0 26000 0 05423          FMP P
02560   0 60100 0 03231          STO PSQ                   P SQUARED IN PERMANENT STORAGE
02561   0 30000 0 03164          FAD 1FL
02562   0 07400 4 05537          TSX SQRT,4                ENTER SQUARE ROOT ROUTINE
02563   0 42000 0 00000          HPR                       SQ.RT. ERROR RETURN
```

```
02564   0 60100 0 03232          STO E                    E=SQ.RT.(PSQ+1)
02565   0 50000 0 05423          CLA P
02566   0 24000 0 03232          FDH E
02567  -0 60000 0 03233          STQ BETA                 BETA=P/E
02570  -0 53400 4 05437          LXD COMMON+9,4           RESTORE I.R.4
02571   0 02000 4 00001          TRA 1,4
02572   0 50000 0 02603  RETRY   CLA RETRY+9              SET UP TO REREAD DRIVE 1
02573   0 40000 0 03156          ADD FX1
02574   0 60100 0 02603          STO RETRY+9
02575   0 40200 0 03162          SUB FX5                  DO NOT TRY MORE THAN 5 TIMES
02576  -0 12000 0 02600          TMI RETRY+6
02577   0 02000 0 02641          TRA WHICH1
02600   0 53400 2 03237          LXA BEER,2
02601   0 76400 0 00201          BST 1
02602   0 02000 4 77771          TRA -7,4                 END OF REREAD TAPE 1 LOOP
02603   0 00000 0 00000          HTR                      COUNTER FOR NUMBER OF TRIES AT READING
02604   0 50000 0 02615 RETRY2   CLA RETRY2+9             SET UP TO TRY TO REREAD DRIVE 2
02605   0 40000 0 03156          ADD FX1
02606   0 60100 0 02615          STO RETRY2+9
02607   0 40200 0 03162          SUB FX5
02610  -0 12000 0 02612          TMI RETRY2+6
02611   0 02000 0 02631          TRA WHICH
02612   0 53400 2 03237          LXA BEER,2
02613   0 76400 0 00202          BST 2
02614   0 02000 4 77771          TRA -7,4                 END OF REREAD TAPE 2 LOOP
02615   0 00000 0 00000          HTR                      COUNTER FOR REREADING DRIVE 2
02616  -0 76000 0 00011  ETT     ETT
02617   0 02000 0 02621          TRA ETT+3
02620   0 02000 0 01044          TRA CAPY+11
02621   0 77200 0 00201          REW 1                    REWIND AND STOP
02622   0 00000 0 00000          HTR                      STOP, END OF TAPE 1 AND REWOUND
02623  +155414336750             DEC .000001
02624   0 77200 0 00202          REW 2                    REWIND 2 AND
02625   0 00000 0 00000          HTR                      STOP
02626  -0 76000 0 00011          ETT
02627   0 02000 0 02624          TRA ETT+6
02630   0 02000 0 01107          TRA CBPY+10
02631   0 53400 2 03237  WHICH   LXA BEER,2
02632   0 76400 0 00202          BST 2
02633   0 76200 0 00222          RTB 2
02634   0 70000 0 05426          CPY COMMON
02635   0 70000 0 05426          CPY COMMON
02636   2 00001 2 02635          TIX *-1,2,1
02637   0 00000 0 00000          HTR                      STOP-TRIED TO READ RECORD FROM TAPE 2 5 TIME
02640   0 00000 0 00000          HTR                      STOP-BEER NOT = NUMBER OF DERIV. PER RECORD
```

```
02641   0 53400 2 03237 WHICH1 LXA BEER,2
02642   0 76400 0 00201        BST 1
02643   0 76200 0 00221        RTB 1
02644   0 70000 0 05426        CPY COMMON
02645   0 70000 0 05426        CPY COMMON
02646   2 00001 2 02645        TIX *-1,2,1
02647   0 00000 0 00000        HTR                          STOP-TRIED TO READ RECORD FROM TAPE 1 5 TIME
02650   0 00000 0 00000        HTR                          STOP-BEER NOT = NUMBER OF FIELDS PER RECORD
02651   1 00000 1 01635  TW    TXI CLAP,1,0                                                              0132
                               PREPARETOWRITETEXTONCATHODERAYTUBE                                        0133
                               BYBASICLINKAGE,    TSXPWSH,CSMALL,HORIZONTAL                              0134
                                                  TSXPWLH,CLARGE,HORIZONTAL                              0135
                                                  TSXPWSV,CSMALL,VERTICAL                                0136
                                                  TSXPWLV,CLARGE,VERTICAL                                0137
02652   0 50000 0 02766  PWLH  CLA WTEX+54           LARGE LETTERS                                       0138
02653   0 02000 0 02662        TRA PWSH+1                                                                0139
02654   0 50000 0 02765  PWSV  CLA WTEX+53           SMALL LETTERS                                       0140
02655   0 02000 0 02657        TRA PWLV+1                                                                0141
02656   0 50000 0 02766  PWLV  CLA WTEX+54           LARGE LETTERS                                       0142
02657   0 56000 0 03055        LDQ WTEX+109          VERTICAL WRITING                                    0143
02660   0 02000 0 02663        TRA PWSH+2                                                                0144
02661   0 50000 0 02765  PWSH  CLA WTEX+53           SMALL LETTERS                                       0145
02662   0 56000 0 02775        LDQ WTEX+61           HORIZONTAL WRITING                                  0146
02663   0 62100 0 02712        STA WTEX+10           DELTA POINT, DISTANCE                               0147
02664   0 40000 0 02677        ADD PWSH+14                                                               0148
02665   0 62100 0 02763        STA WTEX+51           DELTA CHARACTER, DISTANCE                           0149
02666   0 40000 0 02677        ADD PWSH+14                                                               0150
02667   0 62100 0 02670        STA PWSH+7                                                                0151
02670   0 50000 0 02670        CLA *                                                                     0152
02671   0 60100 0 02767        STO WTEX+55           DELTACOLUMN,DISTANCE                                0153
02672   0 76700 0 00001        ALS 1                                                                     0154
02673   0 60100 0 02770        STO WTEX+56           DISTANCEBETWEENCHARACTERS                           0155
02674  -0 60000 0 02742        STQ WTEX+34           DELTA POINT, DIRECTION                              0156
02675   0 76600 0 00030        WTV                   WRITECRT                                            0157
02676   0 02000 4 00001        TRA 1,4               READYTOWRITE                                        0158
02677 +000000000001            DEC 1                                                                     0159
                               WRITETEXTOFNWORDSSTOREDATZ                                                0160
                               P+0TSXWTEX,C                                                              0161
                               P+1PZEZ,0,N                                                               0162
                               P+2PZEX,0,Y           STARTATX,Y                                          0163
02700  -0 63400 1 03010  WTEX  SXD WTEX+72,1         PRESERVE INDEX REGISTERS                            0164
02701  -0 63400 2 03011        SXD WTEX+73,2                                                             0165
02702  -0 63400 4 03012        SXD WTEX+74,4                                                             0166
02703   0 50200 4 00002        CLS 2,4                                                                   0167
02704   0 56000 4 00002        LDQ 2,4
```

```
02705 -0 76300 0 00022      LGL 18                                                    0168
02706  0 60100 0 02771      STO WTEX+57                                               0169
02707 -0 50000 0 02771      CAL WTEX+57                                               0170
02710  0 53400 1 03010      LXA WTEX+72,1                                             0171
02711  0 60100 1 03077      STO WTEX+127,1      PREDETERMINEVERTICALPOINTPOSITIONS    0172
02712  0 40000 0 02712      ADD *                                                     0173
02713  2 00001 1 02711      TIX WTEX+9,1,1                                            0174
02714  0 50000 4 00001      CLA 1,4              LOCATE CODE WORDS                    0175
02715 -0 73400 2 00000      PDX 0,2                                                   0176
02716  0 77100 0 00022      ARS 18                                                    0177
02717  0 40000 4 00001      ADD 1,4                                                   0178
02720  0 62100 0 02721      STA WTEX+17                                               0179
02721 -0 50000 2 02721      CAL *,2             NEWWORDOFSIXCHARACTERS                0180
02722  0 60200 0 02772      SLW WTEX+58                                               0181
02723 -0 63400 2 02766      SXD WTEX+54,2        STORE WORD COUNT                     0182
02724  0 53400 4 03012      LXA WTEX+74,4                                             0183
02725  0 50000 0 03007      CLA WTEX+71          NEW CHARACTER                        0184
02726  0 56000 0 02772      LDQ WTEX+58                                               0185
02727 -0 76300 0 00006      LGL 6                                                     0186
02730 -0 60000 0 02772      STQ WTEX+58                                               0187
02731  0 73400 2 00000      PAX 0,2                                                   0188
02732  0 50000 2 03067      CLA WTEX+119,2       EXAMINE FOR BLANK CHARACTER          0189
02733  0 10000 0 02762      TZE WTEX+50                                               0190
02734  0 56000 2 03067      LDQ WTEX+119,2                                            0191
02735  0 53400 2 03011      LXA WTEX+73,2                                             0192
02736  0 53400 1 03010      LXA WTEX+72,1        NEW COLUMN                           0193
02737 -0 77300 0 00001      RQL 1                COPY LOOP                            0194
02740  0 16200 0 02744      TQP WTEX+36                                               0195
02741  0 50000 1 03077      CLA WTEX+127,1                                            0196
02742  0 00000 0 00000      PZE                 STORECOLUMNPOSITION                   0197
02743  0 02000 0 03104      TRA TEMP+5                                                0198
02744  2 00001 1 02737      TIX WTEX+31,1,1     REPEATLOOP                            0199
02745 -0 50000 0 02771      CAL WTEX+57                                               0200
02746  0 40000 0 02767      ADD WTEX+55                                               0201
02747  0 60200 0 02771      SLW WTEX+57                                               0202
02750  2 00001 2 02736      TIX WTEX+30,2,1                                           0203
02751  0 40000 0 02770      ADD WTEX+56          SPACE TO NEXT CHARACTER POSITION     0204
02752  0 60200 0 02771      SLW WTEX+57                                               0205
02753  2 00001 4 02725      TIX WTEX+21,4,1                                           0206
02754 -0 53400 2 02766      LXD WTEX+54,2        PICK UP WORD COUNT                   0207
02755  2 00001 2 02721      TIX WTEX+17,2,1                                           0208
02756 -0 53400 1 03010      LXD WTEX+72,1        RESTORE INDEX REGISTERS              0209
02757 -0 53400 2 03011      LXD WTEX+73,2                                             0210
02760 -0 53400 4 03012      LXD WTEX+74,4                                             0211
02761  0 02000 4 00003      TRA 3,4             TEXTCOMPLETED                         0212
```

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02762 -0 50000 0 02771        CAL WTEX+57            CHARACTER WAS BLANK
02763  0 40000 0 02763        ADD *
02764  0 02000 0 02752        TRA WTEX+42
02765  0 00000 0 03030        PZE WTEX+88           LOCATIONOFSMALLLETTERINFO
02766  0 00000 0 03050        PZE WTEX+104          LOCATIONOFLARGELETTERINFO
02767  0 00000 0 00000        PZE                   DELTACOLUMN
02770  0 00000 0 00000        PZE                   SPACEBETWEENCHARACTERS
02771  0 00000 0 00000        PZE                   POINTADDRESSESONCRT
02772  0 00000 0 00000        PZE                   CODETRANSIENTSTORAGE
                                  TABLEOF35-BITCHARACTERANDCONSTANTCODES
02773 +000642120301           OCT 000642120301
02774 +001303400000           OCT 001303400000        73    ,
02775  0 62100 0 02771        STA WTEX+57            HORIZONTAL WRITING
02776 +303214461303           OCT 303214461303        71    Z
02777 +006047401003           OCT 006047401003        70    Y
03000 +306240405143           OCT 306240405143        67    X
03001 +376401010177           OCT 376401010177        66    W
03002 +016306006007           OCT 016306006007        65    V
03003 +177004020077           OCT 177004020077        64    U
03004 +002017740201           OCT 002017740201        63    T
03005 +105054464242           OCT 105054464242        62    S
03006 +100200401002           OCT 100200401002        61    /
03007 +000000000000           OCT 000000000000        60    BLANK
03010  0 00000 0 00007        PZE 7
03011  0 00000 0 00005        PZE 5
03012  0 00000 0 00006        PZE 6
03013 +124343707052           OCT 124343707052        54    *
03014 +110526552422           OCT 110526552422        53    $
03015 +175114462276           OCT 175114462276        52    -0
03016 +376111452306           OCT 376111452306        51    R
03017 +175015050336           OCT 175015050336        50    Q
03020 +376110442206           OCT 376110442206        47    P
03021 +175014060276           OCT 175014060276        46    O
03022 +376020202177           OCT 376020202177        45    N
03023 +376020600577           OCT 376020600577        44    M
03024 +377004020100           OCT 377004020100        43    L
03025 +376101210501           OCT 376101210501        42    K
03026 +101004020077           OCT 101004020077        41    J
03027 +020100402010           OCT 020100402010        40    -
03030 -000002777775           OCT -2777775
03031  0 00025 0 00025        PZE 21,0,21
03032  0 00003 0 00003        PZE 3,0,3
03033 +203012107000           OCT 203012107000
03034 +001406000000           OCT 001406000000        33    .
03035 +175117762276           OCT 175117762276        32    +0
```

```
03036 +000007740000            OCT 000007740000        31   I
03037 +376100402177            OCT 376100402177        30   H
03040 +175014062371            OCT 175014062371        27   G
03041 +376110440201            OCT 376110440201        26   F
03042 +377114460301            OCT 377114460301        25   E
03043 +203774060276            OCT 203774060276        24   D
03044 +175014060242            OCT 175014060242        23   C
03045 +203774462266            OCT 203774462266        22   B
03046 +370221044574            OCT 370221044574        21   A
03047 +020103702010            OCT 020103702010        20   +
03050 -000003777774            OCT -3777774
03051  0 00034 0 00034         PZE 28,0,28
03052  0 00004 0 00004         PZE 4,0,4
03053 +020100402010            OCT 020100402010        14   -
03054 +050241205024            OCT 050241205024
03055  0 62200 0 02771         STD WTEX+57             VERTICAL WRITING
03056 +015114452236            OCT 015114452236        11   9
03057 +155114462266            OCT 155114462266        10   8
03060 +003610441203            OCT 003610441203        07   7
03061 +171124462260            OCT 171124462260        06   6
03062 +117054261271            OCT 117054261271        05   5
03063 +060241137620            OCT 060241137620        04   4
03064 +105014462266            OCT 105014462266        03   3
03065 +345114462306            OCT 345114462306        02   2
03066 +001027760000            OCT 001027760000        01   1
03067 +175014060276            OCT 175014060276        00   0
03070  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03071  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03072  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03073  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03074  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03075  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03076  0 00000 0 00000         PZE                    PREDETERMINEDCOLUMNPOSITIONS
03077  0 00000 0 00000   TEMP  PZE
03100 -0 30000 0 06055         UFA PPCRV+79
03101 -0 77300 0 00011         RQL 9
03102 -0 76300 0 00022         LGL 18
03103  0 02000 1 00001         TRA 1,1
03104 -0 60000 0 03110         STQ TEMP+9
03105  0 70000 0 02771         CPY WTEX+57             DISPLAY  POINT
03106  0 56000 0 03110         LDQ TEMP+9
03107  0 02000 0 02744         TRA WTEX+36
03110  0 00000 0 00000         PZE
                   00001   A   EQU 1
                   00002   B   EQU 2
```

```
                00004  C       EQU 4                                                                    0298
                                   BINARY TO BCD CONVERSION UNRESTRICTED INTEGERS                 BSFRE10000
03111 -0 63400 1 03152  FRE     SXD ABOX,1                                                          FRE10001
03112 -0 63400 2 03153          SXD BBOX,2                                                          FRE10002
03113  0 60200 0 05430          SLW COMMON+2                                                        FRE10003
03114  0 56000 0 05430          LDQ COMMON+2                                                        FRE10004
03115  0 76000 0 00000          CLM                                                                 FRE10005
03116  0 60100 0 05430          STO COMMON+2                                                        FRE10006
03117  0 60000 0 05426          STZ COMMON                                                          FRE10007
03120  0 60000 0 05427          STZ COMMON+1                                                        FRE10008
03121 -0 53400 2 03151          LXD FRE+32,2                                                        FRE10009
03122  0 53400 1 03151          LXA FRE+32,1                                                        FRE10010
03123 -0 75400 0 00000          PXD 0,0                                                             FRE10011
03124  0 22000 0 03150          DVH FRE+31                                                          FRE10012
03125  0 76700 1 00044          ALS 36,1                                                            FRE10013
03126  0 40000 2 05427          ADD COMMON+1,2                                                      FRE10014
03127  0 60100 2 05427          STO COMMON+1,2                                                      FRE10015
03130  1 77772 1 03131          TXI FRE+16,1,-6                                                     FRE10016
03131  0 50000 0 03147          CLA FRE+30                                                          FRE10017
03132  0 04000 0 03137          TLQ FRE+22                                                          FRE10018
03133 -3 00000 1 03135          TXL FRE+20,1,0                                                      FRE10019
03134  0 02000 0 03123          TRA FRE+10                                                          FRE10020
03135  0 53400 2 03147          LXA FRE+30,2                                                        FRE10021
03136  0 02000 0 03122          TRA FRE+9                                                           FRE10022
03137  0 50000 0 05426          CLA COMMON                                                          FRE10023
03140  0 36100 0 05430          ACL COMMON+2                                                        FRE10024
03141  0 60200 0 05426          SLW COMMON                                                          FRE10025
03142  0 50000 0 05426          CLA COMMON                                                          FRE10026
03143  0 56000 0 05427          LDQ COMMON+1                                                        FRE10027
03144 -0 53400 1 03152          LXD ABOX,1                                                          FRE10028
03145 -0 53400 2 03153          LXD BBOX,2                                                          FRE10029
03146  0 02000 4 00001          TRA 1,4                                                             FRE10030
03147  0 00000 0 00001          PZE 1                                                               FRE10031
03150  0 00000 0 00012          PZE 10                                                              FRE10032
03151  0 00000 0 00044          PZE 36,0,0
03152  0 00000 0 00000  ABOX
03153  0 00000 0 00000  BBOX
03154 +245564416672     SCAR    DEC 1.0E11
03155 +204700000000     AMORT   DEC 14.00               FACTOR USED IN CALCULATING KE
03156 +000000000001     FX1     DEC 1
03157 +000000000002     FX2     DEC 2
03160 +000000000003     FX3     DEC 3
03161 +000000000004     FX4     DEC 4
03162 +000000000005     FX5     DEC 5
03163 +000000000006     FX6     DEC 6                   USED AS A STOP FROM Z24
```

```
03164 +201400000000      1FL    DEC 1.000
03165 +202400000000      2FL    DEC 2.000
03166 +202600000000      3FL    DEC 3.000
03167 +203600000000      6FL    DEC 6.00
03170 +000000000015     NURKY3  DEC 13                  TEMPORARY USED BY RUNGA-KUTTA
03171 +000000000007     NURKY4  DEC 7                   NUMBER OF EQUATIONS USED TO FIND EQUILIBRIUM ORBIT
03172 +000000000015     NURKY5  DEC 13                  MAXIMUM NUMBER OF EQUATIONS USED
03173 +203622077323      2PI    DEC 6.2831852           FLOATING POINT 2 PI
03174 +000000004200     MAXSTO  DEC 2176                MAXIMUM STORAGE IN APIARY (FIXED POINT)
03175  0 00000 0 17571   MAP    HTR APIARY              MEMORY LOCATION OF APIARY
03176  0 00000 0 13371   MAD    HTR BTHETA              MEMORY LOCATION OF DERIVATIVES(BTHETA)
03177 +167406111564      EPS    DEC .001                EPSILON FOR ORBIT TEST(FL. PT.)
03200 +167406111564      EPS2   DEC .001                EPSILON FOR ALPHA AND BETA DETERMINANTS
03201 +000000000235      ST157  DEC 157
03202 +200400000000      HALF   DEC .500
03203 +176525252527      SIXTH  DEC .16666667
03204 +177525252524      THIRD  DEC .33333333
03205 +212725072702      FL938  DEC 938.23              938.23(FL. PT.)
03206 +207550000000      FL90   DEC 90.00
03207 +000001000000      BIT    OCT 000001000000        1 IN 17TH BIT
03210 +001000000000      SHIFT  OCT 001000000000
03211  606051644560      TEXT1  BCD 3  RUN
03212  606060606060
03213  606060606060
03214  475160606060      TEXT2  BCD 1PR
03215  475146223360      TEXT3  BCD 3PROB. 1821
03216  011002016060
03217  606060606060
03220  516060606060      TEXT4  BCD 1R
03221  606062234313      TEXT5  BCD 3  SCL=
03222  606060606060
03223  606060606060
03224 +000000000033      PEROD  OCT 000000000033
03225 +203500000000      5FL    DEC 5.0
03226 +204500000000      10FL   DEC 10.0
03227 +203400000000      4FL    DEC 4.0
03230  0 00000 0 00000   RKST4
03231  0 00000 0 00000   PSQ                          P-SQUARED
03232  0 00000 0 00000   E                            SQ RT(P SQUARED+1)
03233  0 00000 0 00000   BETA                         P/SQ RT(P SQUARED+1)
03234  0 00000 0 00000   RAMP                         BETA/N SQ (FLT. PT.)
03235  0 00000 0 00000   NO2PI                        FACTOR USED IN NU ROUTINE
03236  0 00000 0 00000   BEERT                        TEMPORARY TO AVOID SUBROUTINE TEMPS
03237  0 00000 0 00000   BEER                         NUMBER OF FIELDS PER R-VALUE=2KN*(FIXED INT.)
03240  0 00000 0 00000   KFL                          NUMBER OF RUNGA-KUTTA STEPS PER SECTOR(FL. PT)
```

```
03241  0 00000 0 00000  RAP      NUMBER OF RECORDS IN APIARY(FIXED PT)
03242  0 00000 0 00000  RMAX     MAXIMUM R FOR P(BY FORMULA)
03243  0 00000 0 00000  RMIN     MINIMUM R FOR P(BY FORMULA)
03244  0 00000 0 00000  INITR    INITIAL R FOR GIVEN ORBIT
03245  0 00000 0 00000 INITPR    INITIAL PR FOR GIVEN ORBIT
03246  0 00000 0 00000  CSR      COSINE SIGMA R
03247  0 00000 0 00000  TEMP2    TEMPORARY USED IN O-ROUTINE
03250  0 00000 0 00000  CSZ      COSINE SIGMA Z
03251  0 00000 0 00000  MTLOC    NUMBER OF BLOCKS HUNTED FORWARD FOR FIELDS
03252  0 00000 0 00000  RHO      USED IN GUESS FOR INITR
03253  0 00000 0 00000  RHO1
03254  0 00000 0 00000  RHO2
03255  0 00000 0 00000  RHO3
03256  0 00000 0 00000  PRHO     USED IN GUESS FOR INITPR
03257  0 00000 0 00000  PRHO1
03260  0 00000 0 00000  PRHO2
03261  0 00000 0 00000  PRHO3
03262  0 00000 0 00000  RSPAN    INCREMENT OF R IN APIARY=MARIA-FRIA
03263  0 00000 0 00000  10NSQ    1/N SQUARED(FL. PT.)
03264  0 00000 0 00000  MARIA    MAXIMUM R IN APIARY
03265  0 00000 0 00000  FRIA     FIRST R IN APIARY
03266  0 00000 0 00000  XCUB     X CUBED
03267  0 00000 0 00000  XSQ      X SQUARED
03270  0 00000 0 00000  X        X=(R-R2)/DELTA R
03271  0 00000 0 00000  TC       TEST COUNTER-EITHER 0 OR 1
03272  0 00000 0 00000  INT      RELATIVE ADDRESS OF R2 FROM APIARY
03273  0 00000 0 00000  FIX      NUMBER OF R VALUES BETWEEN R AND APIARY
03274  0 00000 0 00000  FLT      FIX FLOATED
03275  0 00000 0 00000  A4       A S ARE COEFFICIENTS
03276  0 00000 0 00000  A3       FOR INTERPOLATION WITH
03277  0 00000 0 00000  A2       CORRESPONDING B S AND DB S.
03300  0 00000 0 00000  A1
03301  0 00000 0 00000  B4       B VALUES FOR INTERPOLATION
03302  0 00000 0 00000  B3       WITH B GREATER THAN B2
03303  0 00000 0 00000  B2       AND LESS THAN B3
03304  0 00000 0 00000  B1
03305  0 00000 0 00000  B5
03306  0 00000 0 00000  DB4      THETA DERIVATIVE VALUES
03307  0 00000 0 00000  DB3      FOR INTERPOLATION-SAME
03310  0 00000 0 00000  DB2      ORDER AS FIELDS
03311  0 00000 0 00000  DB1
03312  0 00000 0 00000  DB5
03313  0 00000 0 00000  EPI      EPSILON=ERROR IN EQUILIBRIUM ORBIT
03314  0 00000 0 00000  QINV     =SQ. RT.(P SQ-PR SQ)
03315  0 00000 0 00000  DBDR     RADIAL DERIVATIVE OF B
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03316   0 00000 0 00000  BEE
03317   0 00000 0 00000  QBALL                          1/SQ. RT(P SQ-PR SQ)
03320   0 00000 0 00000 DTHETA                         THETA DERIVATIVE OF B
03321   0 00000 0 00000  R2
03322   0 00000 0 00000  NUR
03323   0 00000 0 00000  NUZ
03324   0 00000 0 00000  KE                             KE=938.23(E-1)A
03325   0 00000 0 00000  MINA                           ACTUAL MINIMUM R IN ORBIT
03326   0 00000 0 00000  MAXA                           ACTUAL MAXIMUM R FOUND IN ORBIT
03327   0 00000 0 00000  AMP                            (MAXIMUM R-MINIMUM R)/2 FOR EACH ORBIT
03330   0 00000 0 00000  RKSIN
03331   0 00000 0 00000  RKSPL
                 03332 TURKY3 BSS 8
                 03357  XRKY3 BES 13
                 03374  YRKY3 BES 13
                 03411  RRKY3 BES 13
                 03426  SRKY3 BES 13
                 03443  URKY3 BES 13
                 03460  VRKY3 BES 13
                 03475  QRKY3 BES 13
                 03475  JUNK  BSS 11
                        RKY3 MURA FLOATING POINT RUNGE-KUTTA                                    MURKY3
03510   0 50000 4 00001  RKY3   CLA 1,4                H TO AC                                 RKY30001
03511   0 60100 0 03336         STO TURKY3+4           SAVE H                                  RKY30002
03512  -0 63400 1 03337         SXD TURKY3+5,1         SAVE IR1                                RKY30003
03513  -0 63400 2 03340         SXD TURKY3+6,2         SAVE IR2                                RKY30004
03514  -0 63400 4 03341         SXD TURKY3+7,4         SAVE IR4                                RKY30005
03515  -0 53400 2 03666         LXD RKY3+110,2         SET IR2=4                               RKY30006
03516   0 50000 2 03672         CLA RKY3+114,2         SET SWITCH                              RKY30007
03517   0 62100 0 03527         STA RKY3+15                                                    RKY30008
03520   0 53400 1 03170         LXA NURKY3,1
03521   0 07400 4 01652         TSX WRKY3,4            COMPUTE F(I)                            RKY30010
03522   0 56000 1 03460         LDQ VRKY3,1            F(I)                                    RKY30011
03523   0 26000 0 03336         FMP TURKY3+4           FORM K(IJ)=H F(I)                       RKY30012
03524   0 10000 0 03526         TZE RKY3+14            IF ZERO,DO NOT ROUND                    RKY30013
03525  -0 50100 0 03653         ORA RKY3+99            ROUND                                   RKY30014
03526   0 76500 0 00043         LRS 35                 K(IJ) TO MQ                             RKY30015
03527   0 02000 0 00000         TRA 0                  SWITCH(TO EVALUATE EACH EQ.)            RKY30016
03530   0 50000 1 03475         CLA QRKY3,1            EPSILON(I) TERM                         RKY30017
03531   0 56000 0 03655         LDQ RKY3+101           CLEAR MQ                                RKY30018
03532   0 07400 4 03612         TSX RKY3+66,4          TO DOUBLE PRECISION FLOATING PT. ADD.   RKY30019
03533   0 30000 1 03374         FAD YRKY3,1            +Y(I)                                   RKY30020
03534   0 60100 1 03357         STO XRKY3,1            FOR NEXT EQUATION                       RKY30021
03535  -3 00001 2 03544         TXL RKY3+28,2,1        TO PREPARE FOR NEXT STEP                RKY30022
03536   2 00001 1 03522         TIX RKY3+10,1,1        LOOP,DONE AFTER N PASSES                RKY30023
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03537   2 00001 2 03516        TIX RKY3+6,2,1      LOOP,DONE AFTER 4 PASSES                          RKY30024
03540  -0 53400 1 03337        LXD TURKY3+5,1      RESTORE IR1                                       RKY30025
03541  -0 53400 2 03340        LXD TURKY3+6,2      RESTORE IR2                                       RKY30026
03542  -0 53400 4 03341        LXD TURKY3+7,4      RESTORE IR4                                       RKY30027
03543   0 02000 4 00002        TRA 2,4             OUT                                               RKY30028
03544   0 60100 1 03374        STO YRKY3,1         Y(I)                                              RKY30029
03545  -0 60000 1 03475        STQ QRKY3,1         SAVE EPSILON(I)TERM FOR NEXT STEP                 RKY30030
03546   0 02000 0 03536        TRA RKY3+22                                                           RKY30031
03547  -0 60000 1 03411        STQ RRKY3,1         K(I0)                                             RKY30032
03550   0 26000 0 03656        FMP RKY3+102        1/2 K(I0)                                         RKY30033
03551   0 60100 0 03332        STO TURKY3          STORE FOR DP FLOATING PT. ADD.                    RKY30034
03552  -0 60000 0 03333        STQ TURKY3+1                                                          RKY30035
03553   0 02000 0 03530        TRA RKY3+16         TO MAIN                                           RKY30036
03554  -0 60000 1 03426        STQ SRKY3,1         K(I1)                                             RKY30037
03555   0 26000 0 03657        FMP RKY3+103        (1-SQ.RT.1/2)K(I1)                                RKY30038
03556   0 60100 0 03332        STO TURKY3          STORE FOR DP FLOATING PT. ADD.                    RKY30039
03557  -0 60000 0 03333        STQ TURKY3+1                                                          RKY30040
03560   0 56000 1 03411        LDQ RRKY3,1         K(I0)                                             RKY30041
03561   0 26000 0 03660        FMP RKY3+104        (-1/2+SQ.RT.1/2)K(I0)                             RKY30042
03562   0 07400 4 03612        TSX RKY3+66,4       TO DOUBLE PRECISION FLOATING PT. ADD.             RKY30043
03563   0 02000 0 03530        TRA RKY3+16         TO MAIN                                           RKY30044
03564  -0 60000 1 03443        STQ URKY3,1         K(I2)                                             RKY30045
03565   0 26000 0 03661        FMP RKY3+105        (1+SQ.RT.1/2)K(I2)                                RKY30046
03566   0 60100 0 03332        STO TURKY3          STORE FOR DP FLOATING PT. ADD.                    RKY30047
03567  -0 60000 0 03333        STQ TURKY3+1                                                          RKY30048
03570   0 56000 1 03426        LDQ SRKY3,1         K(I1)                                             RKY30049
03571   0 26000 0 03662        FMP RKY3+106        (-SQ.RT.1/2)K(I1)                                 RKY30050
03572   0 07400 4 03612        TSX RKY3+66,4       TO DOUBLE PRECISION FLOATING PT. ADD.             RKY30051
03573   0 02000 0 03530        TRA RKY3+16         TO MAIN                                           RKY30052
03574  -0 60000 1 03460        STQ VRKY3,1         K(I3)                                             RKY30053
03575   0 26000 0 03663        FMP RKY3+107        (1/6)K(I3)                                        RKY30054
03576   0 60100 0 03332        STO TURKY3          STORE FOR DP FLOATING PT. ADD.                    RKY30055
03577  -0 60000 0 03333        STQ TURKY3+1                                                          RKY30056
03600   0 56000 1 03443        LDQ URKY3,1         K(I2)                                             RKY30057
03601   0 26000 0 03664        FMP RKY3+108        1/3(1+SQ.RT.1/2)K(I2)                             RKY30058
03602   0 07400 4 03612        TSX RKY3+66,4       TO DOUBLE PRECISION FLOATING PT. ADD.             RKY30059
03603   0 56000 1 03426        LDQ SRKY3,1         K(I1)                                             RKY30060
03604   0 26000 0 03665        FMP RKY3+109        1/3(1-SQ.RT.1/2)K(I1)                             RKY30061
03605   0 07400 4 03612        TSX RKY3+66,4       TO DOUBLE PRECISION FLOATING PT. ADD.             RKY30062
03606   0 56000 1 03411        LDQ RRKY3,1         K(I0)                                             RKY30063
03607   0 26000 0 03663        FMP RKY3+107        (1/6)K(I0)                                        RKY30064
03610   0 07400 4 03612        TSX RKY3+66,4       TO DOUBLE PRECISION FLOATING PT. ADD.             RKY30065
03611   0 02000 0 03530        TRA RKY3+16         TO MAIN                                           RKY30066
03612  -0 60000 0 03334        STQ TURKY3+2        DP FLOATING PT. ADD, STORE A(2)                   RKY30067
03613   0 30000 0 03332        FAD TURKY3          A(1)+B(1)                                         RKY30068
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03614  0 60100 0 03335     STO TURKY3+3       STORE MSP                                  RKY30069
03615 -0 75400 0 00000     PXD                CLEAR AC                                   RKY30070
03616  0 76300 0 00043     LLS 35             LSP TO AC                                  RKY30071
03617  0 30000 0 03334     FAD TURKY3+2       +A(2)                                      RKY30072
03620  0 30000 0 03333     FAD TURKY3+1       +B(2)                                      RKY30073
03621  0 30000 0 03335     FAD TURKY3+3       +MSP OF A(1)+B(1)                          RKY30074
03622  0 60100 0 03332     STO TURKY3         STORE MSP OF SUM                           RKY30075
03623  0 16200 0 03644     TQP RKY3+92                                                   RKY30076
03624 -0 12000 0 03641     TMI RKY3+89        HERE IF MQ-, OUT IF AC-                    RKY30077
03625  0 40200 0 03653     SUB RKY3+99        HERE IF MQ-,AC+,-1 IN 35TH BIT             RKY30078
03626  0 60100 0 03335     STO TURKY3+3                                                  RKY30079
03627  0 76000 0 00000     CLM                CLEAR MAGNITUDE AC                         RKY30080
03630 -0 77300 0 00011     RQL 9              SEPERATE CHARACTERISTIC                    RKY30081
03631 -0 76300 0 00033     LGL 27             FROM FRACTION OF LSP                       RKY30082
03632  0 10000 0 03647     TZE RKY3+95        IF ZERO,TRANSFER                           RKY30083
03633 -0 76000 0 00003     SSM                -FRACTION OF LSP                           RKY30084
03634  0 40000 0 03652     ADD RKY3+98        1-FRACTION                                 RKY30085
03635 -0 60000 0 03333     STQ TURKY3+1                                                  RKY30086
03636 -0 60200 0 03333     ORS TURKY3+1       COMBINE CHARACTERISTIC AND FRACTION        RKY30087
03637  0 50200 0 03333     CLS TURKY3+1       -LSP                                       RKY30088
03640  0 30000 0 03335     FAD TURKY3+3       +MSP                                       RKY30089
03641  0 60100 0 03332     STO TURKY3         MSP                                        RKY30090
03642 -0 60000 0 03333     STQ TURKY3+1       LSP                                        RKY30091
03643  0 02000 4 00001     TRA 1,4            OUT                                        RKY30092
03644  0 12000 0 03641     TPL RKY3+89        HERE IF MQ+,OUT IF AC+                     RKY30093
03645  0 40000 0 03653     ADD RKY3+99        HERE IF MQ+,AC-,+1 IN 35TH BIT             RKY30094
03646  0 02000 0 03626     TRA RKY3+78                                                   RKY30095
03647  0 50000 0 03332     CLA TURKY3         HERE IF LSP=0, REPLACE MSP                 RKY30096
03650  0 76500 0 00000     LRS                SIGN OF MSP REPLACES SIGN OF LSP           RKY30097
03651  0 02000 0 03641     TRA RKY3+89                                                   RKY30098
03652 +001000000000        OCT 001000000000   1 IN 8TH BIT                               RKY30099
03653  0 00000 0 00001     HTR 1              1 IN 35TH BIT                              RKY30100
03654  0 00000 0 03170     HTR NURKY3         NUMBER OF EQUATIONS                        RKY30101
03655  0 00000 0 00000     HTR                ZERO                                       RKY30102
03656 +200400000000        OCT 200400000000   1/2                                        RKY30103
03657 +177453730315        OCT 177453730315   1-SQ.RT.(1/2)                              RKY30104
03660 +176650117146        OCT 176650117146   -1/2+SQ.RT.(1/2)                           RKY30105
03661 +201665011715        OCT 201665011715   1+SQ.RT.(1/2)                              RKY30106
03662 -200552023632        OCT 600552023632   -SQ.RT.(1/2)                               RKY30107
03663 +176525252525        OCT 176525252525   1/6                                        RKY30108
03664 +200443261211        OCT 200443261211   1/3(1+SQ.RT.1/2)                           RKY30109
03665 +175617713146        OCT 175617713146   1/3(1-SQ.RT.1/2)                           RKY30110
03666  0 00004 0 03547     HTR RKY3+31,0,4    SWITCH CONSTANTS                           RKY30111
03667  0 00000 0 03554     HTR RKY3+36                                                   RKY30112
03670  0 00000 0 03564     HTR RKY3+44                                                   RKY30113
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03671  0 00000 0 03574          HTR RKY3+52                                    RKY30114
                 03672  ARCOS  BSS 76
                 04006  FLOFX  BSS 16
                 04026  FXFLO  BSS 30
                 04064  OUT    BSS 408
                 03356  THETA  SYN XRKY3-1
                 03355  PX2    SYN XRKY3-2
                 03354  X2     SYN XRKY3-3
                 03353  PX1    SYN XRKY3-4
                 03352  X1     SYN XRKY3-5
                 03351  PR     SYN XRKY3-6
                 03350  R      SYN XRKY3-7
                 03347  TIME   SYN XRKY3-8
                 03346  PZ2    SYN XRKY3-9
                 03345  Z2     SYN XRKY3-10
                 03344  PZ1    SYN XRKY3-11
                 03343  Z1     SYN XRKY3-12
                 03342  RAVE   SYN XRKY3-13
                 05303          ORG 2755
05303  0 02000 0 00004          TRA 4
05304  0 00000 0 00000  KYWRD                -NORNS,--PRNTO,NACCE,NACON,PLT,PLOFF,NZM,TIMIN,HNTRS.
05305  0 00000 0 00000  RUNNO
05306  0 00000 0 00000  JX                                AMPLITUDE OF R ELLIPSE
05307  0 00000 0 00000  JZ                                AMPLITUDE OF Z ELLIPSE
05310  0 00000 0 00000  PSIX                              PHASE OF R ELLIPSE
05311  0 00000 0 00000  PSIZ                              PHASE OF Z ELLIPSE
05312  0 00000 0 00000  PRINT
05313  0 00000 0 00000  INRKS                             STARTING R.K. STEP
05314  0 00000 0 00000  SPLOT                             R.K. STEP FOR STARTING PLOT
05315  0 00000 0 00000  PORES                             P GUESS FOR RESONANCE
05316  0 00000 0 00000  NURR                              NUR AT RESONANCE
05317  0 00000 0 00000  NUZR
05320  0 00000 0 00000  MRES                              COEFFICIENT OF NUR RESONANCE
05321  0 00000 0 00000  NRES                              COEFFICIENT OF NUZ RESONANCE
05322  0 00000 0 00000  DELPS                             DELTA P FOR RESONANCE HUNT
05323  0 00000 0 00000  EPIR                              SETS ACCURACY OF ACCEPTABLE RESONANCE
05324  0 00000 0 00000  T4NEW                             IS TAPE 4 NEW. IF T4NEW = 0. NO
05325  010060606060     MONTH  BCD 110
05326  076060606060     DAY    BCD 17
05327  051160606060     YEAR   BCD 159
05330 +000000000020     KFX    DEC 16            SAME AS KFL EXCEPT FIXED
05331 +202600000000     NFL    DEC 3.00          NUMBER OF SECTORS PER REVOLUTION
05332 +000000000001     NSTAR  DEC 1             NUMBER OF SECTORS PER FIELD CYCLE
05333 +000000000001     BKEY   DEC 1                  FIELD IDENTIFICATION WORD
05334 +000000000000     RIN    DEC 0             INITIAL R FOR FIELDS ON TAPE
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05335 +175631463146      MROT  DEC .10          MAXIMUM R FOR WHICH FIELDS ARE ON TAPE
05336 +167406111564     DELTAR DEC .001         DELTA R=INCREMENT IN R FOR STORED FIELDS
05337   0 00000 0 00000   PRES                        RESONANCE P
05340   0 00000 0 00000   RESR                        RESONANCE R
05341   0 00000 0 00000   PRRES                       RESONANCE PR
05342 +201400000000       ADJPR DEC 1.0
05343   0 00000 0 00000   ZMAX                        MAXIMUM Z STOP ORBIT IF Z = ZMAX
05344   0 00000 0 00000   DELTA                       ENERGY GAIN PER REV.
05345   0 00000 0 00000   NOREV                       NO. OF REV. PER ORBIT (EACH ORBIT)
05346   0 00000 0 00000   GPRIE                       USED TO CALCULATE DELTA PRE FOR GAP
05347   0 00000 0 00000   GPRIM                       USED TO CALCULATE DELTA PR FOR GAP
05350   0 00000 0 00000   OMEGA                       COEFFICIENT OF TIME
05351   0 00000 0 00000   GAMMA                       TO START ORBIT OUT OF PHAS
05352   0 00000 0 00000   EPSGP                       EPSILON FOR GAP CROSSING
05353   0 00000 0 00000   GAPL1                       INITIAL GAP LOCATION
05354   0 00000 0 00000   GAPPR                       NUMBER OF GAPS PER REVOLUTION
05355   0 00000 0 00000   SCALE                       SCALE ON (R,PR) PLOT. IF=0 USE CIRCLE.
05356   0 00000 0 00000   PRBRP
05357   0 00000 0 00000   RBARP
05360   0 00000 0 00000   AICR
05361   0 00000 0 00000   BICR
05362   0 00000 0 00000   CICR
05363   0 00000 0 00000   DICR
05364   0 00000 0 00000   EICR
05365   0 00000 0 00000   AICZ
05366   0 00000 0 00000   BICZ
05367   0 00000 0 00000   CICZ
05370   0 00000 0 00000   DICZ
05371   0 00000 0 00000   EICZ
05372   0 00000 0 00000   SIPSI                       SIN(PSIX)
05373   0 00000 0 00000   COPSI                       COS(PSIX)
05374   0 00000 0 00000   RBAR                        CENTER OF R ELLIPSE
05375   0 00000 0 00000   PRBAR
05376   0 00000 0 00000   RESZ                        RESONANCE Z
05377   0 00000 0 00000   RESPZ                       RESONANCE PZ
05400   0 00000 0 00000   NORNS                       NUMBER OF RUNS PER FRAME
05401   0 00000 0 00000   PRNTO                       R.K. STEP AT WHICH PRINT OUT IS STARTED
05402   0 00000 0 00000   NACCE                       NACCE NOT ZERO ACCELERATION IS USED
05403   0 00000 0 00000   NACON                       NACON NOT ZERO ACCELERATION IS CONTINUOUS
05404   0 00000 0 00000   PLT                         PLT NOT ZERO PLOT IS MADE EVERY PLT SECTION
05405   0 00000 0 00000   PLOFF                       PLOFF NOT ZERO (R,PR) AND (,PZ) INFO. SAVED ON
05406   0 00000 0 00000   NZM                         NZM NOT ZERO Z MOTION USED
05407   0 00000 0 00000   TIMIN                       TIMIN NOTZERO TIME EQUATION IS NEEDED
05410   0 00000 0 00000   HNTRS                       HNTRS NOT ZERO CODE 1482 USED TO FIND P RESONA
05411   0 00000 0 00000   APR
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05412   0 00000 0 00000   BPR
05413   0 00000 0 00000   CPR
05414   0 00000 0 00000   DPR
05415   0 00000 0 00000   EPR
05416   0 00000 0 00000   APZ
05417   0 00000 0 00000   BPZ
05420   0 00000 0 00000   CPZ
05421   0 00000 0 00000   DPZ
05422   0 00000 0 00000   EPZ
05423 +173507534121       P      DEC .02                  MOMENTUM
05424 -377777777777       ALL7S  OCT 777777777777
05425 +202622077323       PI     DEC 3.1415926
                    05426 COMMON BSS 10
                    05440  COS   BSS 63
                    05441  SIN   SYN COS+1
                    05537  SQRT  BSS 25
05570 -0 63400 4 05437    COMIC  SXD COMMON+9,4              PSIX = PHASE OF R ELLIPSE
05571   0 50000 0 05310          CLA PSIX
05572   0 07400 4 05440          TSX COS,4
05573   0 60100 0 05373          STO COPSI
05574   0 50000 0 05310          CLA PSIX
05575   0 07400 4 05441          TSX SIN,4
05576   0 60100 0 05372          STO SIPSI
05577   0 56000 0 05364          LDQ EICR
05600   0 26000 0 05425          FMP PI
05601   0 60100 0 05426          STO COMMON
05602   0 50000 0 05306          CLA JX
05603   0 24000 0 05426          FDH COMMON
05604 -0 60000 0 05426           STQ COMMON
05605   0 50000 0 05426          CLA COMMON
05606   0 07400 4 05537          TSX SQRT,4
05607   0 00000 0 00000          HTR
05610   0 60100 0 05426          STO COMMON
05611   0 56000 0 05360          LDQ AICR
05612   0 26000 0 05373          FMP COPSI
05613   0 60100 0 05427          STO COMMON+1
05614   0 56000 0 05372          LDQ SIPSI
05615   0 26000 0 05361          FMP BICR
05616   0 30000 0 05427          FAD COMMON+1
05617   0 60100 0 05427          STO COMMON+1
05620   0 56000 0 05427          LDQ COMMON+1
05621   0 26000 0 05426          FMP COMMON
05622   0 30000 0 05374          FAD RBAR                 RBAR=RFOREQUILIBRIUMORBIT
05623   0 60100 0 05340          STO RESR                      R I.C.
05624   0 56000 0 05362          LDQ CICR
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05625   0 26000 0 05373         FMP COPSI
05626   0 60100 0 05427         STO COMMON+1
05627   0 56000 0 05363         LDQ DICR
05630   0 26000 0 05372         FMP SIPSI
05631   0 30000 0 05427         FAD COMMON+1
05632   0 60100 0 05427         STO COMMON+1
05633   0 56000 0 05427         LDQ COMMON+1
05634   0 26000 0 05426         FMP COMMON
05635   0 30000 0 05375         FAD PRBAR
05636   0 60100 0 05341         STO PRRES                    PR I.C.
05637   0 50000 0 05406         CLA NZM
05640   0 10000 0 05705         TZE LEAVE
05641   0 50000 0 05311         CLA PSIZ                     PSIZ
05642   0 07400 4 05440         TSX COS,4
05643   0 60100 0 05373         STO COPSI
05644   0 50000 0 05311         CLA PSIZ
05645   0 07400 4 05441         TSX SIN,4
05646   0 60100 0 05372         STO SIPSI
05647   0 56000 0 05371         LDQ EICZ
05650   0 26000 0 05425         FMP PI
05651   0 60100 0 05426         STO COMMON
05652   0 50000 0 05307         CLA JZ
05653   0 24000 0 05426         FDH COMMON
05654  -0 60000 0 05426         STQ COMMON
05655   0 50000 0 05426         CLA COMMON
05656   0 07400 4 05537         TSX SQRT,4
05657   0 00000 0 00000         HTR
05660   0 60100 0 05426         STO COMMON
05661   0 56000 0 05365         LDQ AICZ
05662   0 26000 0 05373         FMP COPSI
05663   0 60100 0 05427         STO COMMON+1
05664   0 56000 0 05372         LDQ SIPSI
05665   0 26000 0 05366         FMP BICZ
05666   0 30000 0 05427         FAD COMMON+1
05667   0 60100 0 05427         STO COMMON+1
05670   0 56000 0 05427         LDQ COMMON+1
05671   0 26000 0 05426         FMP COMMON
05672   0 60100 0 05376         STO RESZ                     Z I.C. FOUND
05673   0 56000 0 05367         LDQ CICZ
05674   0 26000 0 05373         FMP COPSI
05675   0 60100 0 05427         STO COMMON+1
05676   0 56000 0 05370         LDQ DICZ
05677   0 26000 0 05372         FMP SIPSI
05700   0 30000 0 05427         FAD COMMON+1
05701   0 60100 0 05427         STO COMMON+1
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05702   0 56000 0 05427          LDQ COMMON+1
05703   0 26000 0 05426          FMP COMMON
05704   0 60100 0 05377          STO RESPZ
05705  -0 53400 4 05437  LEAVE   LXD COMMON+9,4
05706   0 02000 4 00001          TRA 1,4
05707   0 00000 0 00000  COEF
05710  -0 60000 0 06067  PLXY1   STQ PPCRV+89          STORE Y                                          0005
05711   0 56000 0 06065          LDQ PPCRV+87          SET LOW INTENSITY SIGNAL                         0006
05712   0 02000 0 05715          TRA PLXY2+2                                                            0007
05713  -0 60000 0 06067  PLXY2   STQ PPCRV+89          STORE Y                                          0008
05714   0 56000 0 06056          LDQ PPCRV+80          SET HIGH INTENSITY SIGNAL                        0009
05715  -0 60000 0 06070          STQ PPCRV+90                                                           0010
05716   0 30200 0 06061          FSB PPCRV+83         XMINUSMINIMUMX                                    0011
05717   0 76500 0 00043          LRS 35                                                                 0012
05720   0 26000 0 06062          FMP PPCRV+84         TIMESXSCALINGFACTOR                               0013
05721  -0 30000 0 06055          UFA PPCRV+79         FIXEDPOINT                                        0014
05722   0 76700 0 00022          ALS 18                                                                 0015
05723   0 40000 0 06057          ADD PPCRV+81          HORIZONTAL DISTANCE FROM LEFT OF GRAPH           0016
05724   0 62200 0 06070          STD PPCRV+90                                                           0017
05725   0 50000 0 06067          CLA PPCRV+89                                                           0018
05726   0 30200 0 06063          FSB PPCRV+85         YMINUSMINIMUMY                                    0019
05727   0 76500 0 00043          LRS 35                                                                 0020
05730   0 26000 0 06064          FMP PPCRV+86         TIMESYSCALINGFACTOR                               0021
05731  -0 30000 0 06055          UFA PPCRV+79         FIXEDPOINT                                        0022
05732   0 40000 0 06060          ADD PPCRV+82          VERTICAL DISTANCE FROM  BOTTOM OF GRAPH          0023
05733   0 62100 0 06070          STA PPCRV+90                                                           0024
05734   0 70000 0 06070          CPY PPCRV+90          ENTER THE POINT                                  0025
05735   0 02000 4 00001          TRA 1,4              RETURNTOPROGRAM                                   0026
                                 PREPARETOPLOTONCATHODERAYTUBE                                         0027
                                 P+0TSXPPCRV,C                                                         0028
                                 P+1PZEX,0,Y          MINIMUMX,YONTUBE                                 0029
                                 P+2DECX              MINIMUMXONGRAPH                                  0030
                                 P+3DECY              MINIMUMYONGRAPH                                  0031
                                 P+4PZEX,0,Y          MAXIMUMX,YONTUBE                                 0032
                                 P+5DECX              MAXIMUMXONGRAPH                                  0033
                                 P+6DECY              MAXIMUMYONGRAPH                                  0034
                                 P+7DECDELTAX         GRAPHVERTICALGRIDSPACING                         0035
                                 P+8DECDELTAY         GRAPHHORIZONTALGRIDSPACING                       0036
05736   0 76600 0 00030  PPCRV   WTV                  WRITECRTDISPLAY                                  0037
05737   0 50000 4 00001          CLA 1,4               STORE LOWER LIMITS OF PLOT ON TUBE               0038
05740   0 56000 4 00001          LDQ 1,4                                                                0039
05741   0 62200 0 06065          STD PPCRV+87                                                           0040
05742  -0 76300 0 00022          LGL 18                                                                 0041
05743   0 62200 0 06057          STD PPCRV+81                                                           0042
05744   0 62100 0 06060          STA PPCRV+82                                                           0043
```

```
17571 APIARY BES 2176
00125         END LOAD

SHARE ASSEMBLER STATISTICS

TAPE  TOTAL      1 FAIL      2 FAIL      3 FAIL      4 FAIL
INP    2095           0           0           0           0
LIB       0           0           0           0           0
COL    2107           0           0           0           0

NUMBER OF ON-LINE INPUT RECORDS          0

NUMBER OF OFF-LINE PRINT RECORDS      2126

NUMBER OF SYMBOLS,  DEF    344,DEFOP      0,UNDEF      0
```

```
05745 -0 60000 0 06061     STQ PPCRV+83
05746  0 50000 4 00006     CLA 6,4          CALCULATE RANGE OF Y ON GRAPH
05747  0 30200 4 00003     FSB 3,4
05750  0 60100 0 06067     STO PPCRV+89
05751  0 50000 4 00004     CLA 4,4          CALCULATE RANGE OF X AND Y ON TUBE
05752  0 40200 4 00001     SUB 1,4
05753  0 62100 0 06066     STA PPCRV+88
05754  0 77100 0 00022     ARS 18
05755 -0 50100 0 06055     ORA PPCRV+79     Y RANGE IN FLOATING POINT
05756  0 30000 0 06055     FAD PPCRV+79
05757  0 24000 0 06067     FDH PPCRV+89
05760 -0 60000 0 06064     STQ PPCRV+86     STORE Y SCALING FACTOR
05761  0 26000 4 00010     FMP 8,4          SCALEDELTAY
05762 -0 63400 1 03077     SXD TEMP,1
05763  0 07400 1 03100     TSX TEMP+1,1
05764  0 60100 0 06067     STO PPCRV+89     STOREHORIZONTALGRIDSPACING
05765  0 50200 0 06065     CLS PPCRV+87
05766  0 76500 0 00022     LRS 18           HORIZONTAL GRID LINE LOOP
05767  0 62100 0 06057     STA PPCRV+81
05770  0 76300 0 00022     LLS 18
05771  0 70000 0 06057     CPY PPCRV+81
05772  0 40200 0 06067     SUB PPCRV+89
05773  0 56000 0 06056     LDQ PPCRV+80
05774  0 04000 0 05766     TLQ PPCRV+24     REPEATLOOP
05775  0 50000 4 00003     CLA 3,4          SAVE MIN. Y AND LOCATE Y ORIGIN
05776  0 60100 0 06063     STO PPCRV+85
05777  0 10000 0 06071     TZE PPCRV+91
06000  0 12000 0 06013     TPL PPCRV+45
06001  0 50000 4 00006     CLA 6,4          THEST FOR  MAX Y LESS THAN 0.0
06002 -0 12000 0 06013     TMI PPCRV+45
06003  0 56000 4 00003     LDQ 3,4          CALCULATE LOCATION OF Y ORIGIN
06004  0 26000 0 06064     FMP PPCRV+86
06005 -0 30000 0 06055     UFA PPCRV+79
06006  0 40200 0 06060     SUB PPCRV+82
06007  0 62100 0 06057     STA PPCRV+81
06010  0 50200 0 06057     CLS PPCRV+81
06011  0 60100 0 06067     STO PPCRV+89
06012  0 70000 0 06067     CPY PPCRV+89     ENTER ORIGIN IN HIGH INTENSITY
06013  0 50000 4 00005     CLA 5,4          RANGE OF X ON GRAPH
06014  0 30200 4 00002     FSB 2,4
06015  0 60100 0 06067     STO PPCRV+89
06016  0 50000 0 06066     CLA PPCRV+88
06017 -0 50100 0 06055     ORA PPCRV+79     X RANGE ON TUBE IN FLOATING POINT
06020  0 30000 0 06055     FAD PPCRV+79
06021  0 24000 0 06067     FDH PPCRV+89
```

```
06022 -0 60000 0 06062          STQ  PPCRV+84          STORE X SCALING FACTOR                    0089
06023  0 26000 4 00007          FMP  7,4              SCALEDELTAX                               0090
06024  0 07400 1 03100          TSX  TEMP+1,1                                                   0091
06025 -0 53400 1 03077          LXD  TEMP,1                                                     0092
06026  0 60100 0 06067          STO  PPCRV+89         STOREVERTICALGRIDSPACING                  0093
06027  0 50200 0 06061          CLS  PPCRV+83                                                   0094
06030  0 62200 0 06060          STD  PPCRV+82          VERTICAL GRID LINE LOOP                  0095
06031  0 70000 0 06060          CPY  PPCRV+82                                                   0096
06032  0 40200 0 06067          SUB  PPCRV+89                                                   0097
06033  0 56000 0 06056          LDQ  PPCRV+80                                                   0098
06034  0 04000 0 06030          TLQ  PPCRV+58         REPEATLOOP                                0099
06035  0 50000 4 00002          CLA  2,4               SAVD MINIMUM X AND LOCATE X ORIGIN       0100
06036  0 60100 0 06061          STO  PPCRV+83                                                   0101
06037  0 10000 0 06073          TZE  PPCRV+93                                                   0102
06040  0 12000 4 00011          TPL  9,4              NOXORIGINONGRAPH                          0103
06041  0 50000 4 00005          CLA  5,4               TEST FOR MAX X LESS THAN 0.0             0104
06042 -0 12000 4 00011          TMI  9,4                                                        0105
06043  0 56000 4 00002          LDQ  2,4               CALCULATE LOCATION OF X ORIGIN           0106
06044  0 26000 0 06062          FMP  PPCRV+84                                                   0107
06045 -0 30000 0 06055          UFA  PPCRV+79                                                   0108
06046  0 76700 0 00022          ALS  18                                                         0109
06047  0 40200 0 06057          SUB  PPCRV+81                                                   0110
06050  0 62200 0 06060          STD  PPCRV+82                                                   0111
06051  0 50200 0 06060          CLS  PPCRV+82                                                   0112
06052  0 60100 0 06067          STO  PPCRV+89                                                   0113
06053  0 70000 0 06067          CPY  PPCRV+89          ENTER ORIGIN IN HIGH INTENSITY           0114
06054  0 02000 4 00011          TRA  9,4              PLOTREADY,RETURNTOPROGRAM                 0115
06055 +233000000000             OCT  233000000000      MAGIC NUMBER                             0116
06056 -002000000000             OCT  -2000000000       NEG. VALUE OF TUBE LIMIT + 1.0           0117
06057 +200000000000             OCT  200000000000     HORIZONTAL                                0118
06060 +100000000000             OCT  100000000000      VERTICAL                                 0119
06061 +000000000000             DEC  0.0              MINIMUMXONGRAPH                           0120
06062 +000000000000             DEC  0.0              XSCALINGFACTOR                            0121
06063 +000000000000             DEC  0.0              MINIMUMYONGRAPH                           0122
06064 +000000000000             DEC  0.0              YSCALINGFACTOR                            0123
06065  0 00000 0 00000          PZE                   TRANSIENTSTORAGE                          0124
06066  0 00000 0 00000          PZE                                                             0125
06067  0 00000 0 00000          PZE                                                             0126
06070  0 00000 0 00000          PZE                                                             0127
06071  0 50000 0 06060          CLA  PPCRV+82          MINIMUM Y IS 0.0                         0128
06072  0 02000 0 06007          TRA  PPCRV+41                                                   0129
06073  0 50000 0 06057          CLA  PPCRV+81          MINIMUM X IS 0.0                         0130
06074  0 02000 0 06050          TRA  PPCRV+74                                                   0131
                  06075  INP1    BSS  572
                  13371  BTHETA  BES  2176
```

```
                    00125           ORG 85
                          *         REM ORBIT CODE 1821, PART TWO OF TWO - H. OWENS
                                    ABS
00125   0 50200 0 05143             CLS FX5                 A3
00126   0 60100 0 05037             STO TRY1C
00127   0 60100 0 05040             STO TRY2C
00130   0 50000 0 05132             CLA NURKY4
00131   0 60100 0 05131             STO NURKY3
00132   0 50000 0 05403             CLA NACON
00133  -0 10000 0 00151             TNZ *+14
00134   0 50000 0 05131             CLA NURKY3
00135   0 40200 0 05141             SUB FX2
00136   0 60100 0 05131             STO NURKY3
00137   0 50000 0 05407             CLA TIMIN
00140  -0 10000 0 00151             TNZ *+9
00141   0 50000 0 05131             CLA NURKY3
00142   0 40200 0 05140             SUB FX1
00143   0 60100 0 05131             STO NURKY3
00144   0 50000 0 05406             CLA NZM
00145  -0 10000 0 00151             TNZ *+4
00146   0 50000 0 05131             CLA NURKY3
00147   0 40200 0 05141             SUB FX2
00150   0 60100 0 05131             STO NURKY3
00151   0 50000 0 05406             CLA NZM
00152   0 10000 0 00203             TZE BOXB6                   TRANS. IF NO Z MOTION
00153   0 50000 0 05124             CLA NOP                 B2   SET TRAS TO NOP IN
00154   0 62200 0 00327             STD TAPE2                   BOXE  J1
00155   0 62200 0 00540             STD READER
00156   0 62200 0 01476             STD BOXK9               B3
00157   0 62200 0 01613             STD BXK17                    SET TO SOLVE Z EQUS.
00160   0 50000 0 05053             CLA RTB2                B4
00161   0 62200 0 00502             STD HNTFD+2
00162   0 50000 0 05123             CLA TRA                 B4.1 SET PICK UP B ROUT
00163   0 62200 0 02176             STD TIXN-1                  TO GET B DER.
00164   0 77200 0 00202             REW 2                   B5   REWIND DRIVES AT
00165   0 77200 0 00201   BEND      REW 1                   B5.1 OUTSET
00166   0 50000 0 05402             CLA NACCE               C1   IS ACCELERATION
00167   0 10000 0 00214             TZE BOXC4                   USED
00170   0 50000 0 05353             CLA GAPL1
00171   0 60100 0 05056             STO GAPLO               C2   INITIALIZE GAP
00172   0 50000 0 05124             CLA NOP
00173   0 62200 0 01131             STD GSET                    CROSSING
00174   0 50000 0 05156             CLA 2PI                 C3   2PI/GAPPR = ADVGP
00175   0 24000 0 05354             FDH GAPPR                   IF MACHINE STOPS
00176  -0 60000 0 05045             STQ ADVGP
```

```
00177   0 50000 0 05344          CLA DELTA
00200   0 24000 0 05354          FDH GAPPR
00201  -0 60000 0 05061          STQ EPGAP
00202   0 02000 0 00221          TRA BOXD1
00203   0 50000 0 05123  BOXB6   CLA TRA
00204   0 62200 0 00327          STD TAPE2
00205   0 62200 0 00540          STD READER
00206   0 62200 0 01476          STD BOXK9
00207   0 62200 0 01613          STD BXK17
00210   0 50000 0 05124          CLA NOP
00211   0 62200 0 00502          STD HNTFD+2
00212   0 62200 0 02176          STD TIXN-1
00213   0 02000 0 00165          TRA BEND
00214   0 50000 0 05123  BOXC4   CLA TRA
00215   0 62200 0 01131          STD GSET
00216   0 50000 0 05123          CLA TRA
00217   0 62200 0 01667          STD KEQUI-2
00220   0 02000 0 00231          TRA BOXE1
00221   0 50000 0 05403  BOXD1   CLA NACON
00222   0 10000 0 00226          TZE *+4
00223   0 50000 0 05124          CLA NOP
00224   0 62200 0 01667          STD KEQUI-2
00225   0 02000 0 00231          TRA BOXE1
00226   0 50000 0 05123          CLA TRA
00227   0 62200 0 01667          STD KEQUI-2
00230   0 02000 0 00231          TRA BOXE1
00231   0 50000 0 05407  BOXE1   CLA TIMIN
00232  -0 10000 0 00237          TNZ BOXF8
00233   0 50000 0 05123          CLA TRA
00234   0 62200 0 01654          STD BXK18
00235   0 62200 0 02332          STD TAT
00236   0 02000 0 00242          TRA BOXF4
00237   0 50000 0 05124  BOXF8   CLA NOP
00240   0 62200 0 01654          STD BXK18
00241   0 62200 0 02332          STD TAT
00242   0 50000 0 05401  BOXF4   CLA PRNTO
00243  -0 10000 0 00247          TNZ BOXF5
00244   0 50000 0 05123          CLA TRA
00245   0 62200 0 01125          STD PSET
00246   0 02000 0 00252          TRA *+4
00247   0 50000 0 05124  BOXF5   CLA NOP
00250   0 62200 0 01125          STD PSET
00251   0 60000 0 05035          STZ RKST4
00252   0 50000 0 05404          CLA PLT
00253   0 10000 0 00256          TZE *+3
```

```
     IN WRONG

      EPGAP = ENERGY GAIN
     PER GAP
B6    SET TO TRANS. AROUND
     USING DRIVE 2
B7    SET TRANS AND NOPS
     TO LEAVE OUT Z MOTION

B8    SET NOP TO AVOID
     USING DRIVE 2
B9    SET PICK UP B ROUT.
     TO TRANS. AROUND DER.
C4    SET TO TRANSFER AROUND
     GAP CROSSING

C5    LEAVE OUT EQUILIBRIUM
     ORBIT EQUATIONS
D1
      NACON = 0 ACCELERATION
D2    IS DISCRETE

D3

F7    TIMIN = 0 NO TIME EQUS.
     NEEDED

F10   TO LEAVE TIME OUT K ROUT.
     TO LEAVE TIME OUT GAP CROSS.
F8    SET NOP TO USE TIME

     IN K ROUTINE
     IN GAP CROSSING.
F4    PRNTO = 0 NO PRINT OUT
     WILL BE MADE
F6

F5    FIX TO PRINT EVERY PRINT
     R.K. STEP
```

```
00254   0 50000 0 05124          CLA NOP
00255   0 02000 0 00257          TRA *+2
00256   0 50000 0 05123          CLA TRA
00257   0 62200 0 01136          STD BOXM1
00260   0 53400 1 05142  BOXJ1   LXA FX4,1              J1   HUNT RIGHT FIELD
00261   0 76200 0 00221          RTB 1                      SET
00262   0 70000 0 05426          CPY COMMON
00263   0 70000 1 05432  CAPY    CPY COMMON+4,1
00264   2 00001 1 00263          TIX CAPY,1,1
00265  -0 76000 0 00011          ETT
00266   0 00000 0 05125          HTR REWSTP                  END OF TAPE 1 IS REACHED
00267   0 76600 0 00333          IOD                        KEY WORDS MUST BE
00270  -0 76000 0 00012          RTT                        CHECKED, NO. OF WORDS PER
00271   0 07400 4 01355          TSX TRY51,4                BLOCK MUST BE CHECKED.
00272   0 50200 0 05143          CLS FX5                    HIT START, TAPES WILL
00273   0 60100 0 05037          STO TRY1C                  REWIND MACHINE WILL STOP
00274   0 50000 0 05426          CLA COMMON
00275   0 77100 0 00022          ARS 18
00276   0 40200 0 05333          SUB BKEY
00277   0 10000 0 00305          TZE CKRIN
00300   0 76200 0 00221          RTB 1
00301   0 70000 0 05426          CPY COMMON
00302   0 02000 0 01403          TRA ETT1
00303   0 02000 0 00260          TRA CAPY-3
00304   0 02000 0 01403          TRA ETT1
00305   0 50000 0 05427  CKRIN   CLA COMMON+1
00306   0 40200 0 05334          SUB RIN
00307   0 76000 0 00003          SSP
00310   0 40200 0 05152          SUB EPST
00311  -0 12000 0 00313          TMI CKMROT
00312   0 42000 0 00000          HPR                         RIN DOES NOT AGREE WITH
00313   0 50000 0 05430 CKMROT   CLA COMMON+2                VALUE ON TAPE
00314   0 40200 0 05335          SUB MROT
00315   0 76000 0 00003          SSP
00316   0 40200 0 05152          SUB EPST
00317  -0 12000 0 00321          TMI CKDLR
00320   0 42000 0 00000          HPR                         MROT DOES NOT AGREE
00321   0 50000 0 05431  CKDLR   CLA COMMON+3                WITH VALUE ON TAPE
00322   0 40200 0 05336          SUB DELTAR
00323   0 76000 0 00003          SSP
00324   0 40200 0 05152          SUB EPST
00325  -0 12000 0 00327          TMI TAPE2
00326   0 42000 0 00000          HPR                         DELTAR DOES NOT AGREE
00327   0 76100 0 00355  TAPE2   NOP BOXJ2              J1.1 FILLED IN WITH TRANSFER
00330   0 76200 0 00222          RTB 2                      IF DERIVATIVES NOT WANTED
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```
00331   0 70000 0 05426          CPY COMMON
00332   0 70000 0 05426          CPY COMMON
00333  -0 76000 0 00011          ETT
00334   0 00000 0 01401          HTR REW2                    END OF DERIVATIVE TAPE
00335   0 76600 0 00333          IOD                        HIT START WILL REWIND 2
00336  -0 76000 0 00012          RTT
00337   0 07400 4 01367          TSX TRY52,4                 KEYWORD ON DERIVATIVE
00340   0 50200 0 05143          CLS FX5                    TAPE READ WRONG
00341   0 60100 0 05037          STO TRY1C
00342   0 50000 0 05426          CLA COMMON
00343   0 77100 0 00022          ARS 18
00344   0 40000 0 05333          ADD BKEY                    BKEY = -KBEY
00345   0 10000 0 00355          TZE BOXJ2
00346   0 76200 0 00222          RTB 2
00347   0 70000 0 05426          CPY COMMON
00350   0 02000 0 00352          TRA *+2
00351   0 02000 0 00330          TRA TAPE2+1
00352  -0 76000 0 00011          ETT
00353   0 00000 0 01401          HTR REW2
00354   0 02000 0 00346          TRA *-6
00355   0 50000 0 05330  BOXJ2  CLA KFX                     J2   FLOAT K FX
00356   0 07400 4 03044          TSX FXFLO,4
00357   0 00000 0 00043          PZE 35
00360   0 00000 0 01206          HTR TRAAL
00361   0 60100 0 05121          STO KFL
00362   0 56000 0 05121          LDQ KFL                 J3.1
00363   0 26000 0 05331          FMP NFL
00364   0 60100 0 05426          STO COMMON
00365   0 50000 0 05156          CLA 2PI
00366   0 24000 0 05426          FDH COMMON
00367  -0 60000 0 01110          STQ H                       H COMPUTED
00370   0 50000 0 05426          CLA COMMON
00371   0 07400 4 03024          TSX FLOFX,4
00372   0 00000 0 00043          PZE 35
00373   0 00000 0 01206          HTR TRAAL
00374   0 60100 0 05036          STO RKSPR
00375   0 50000 0 05337          CLA PRES
00376   0 60100 0 05423          STO P
00377   0 50000 0 05340          CLA RESR
00400   0 60100 0 05272          STO R
00401   0 56000 0 05423          LDQ P                   J3.2
00402   0 26000 0 05423          FMP P
00403   0 60100 0 05064          STO PSQ
00404   0 30000 0 05144          FAD 1FL
00405   0 07400 4 05537          TSX SQRT,4
```

```
00406   0 00000 0 01206          HTR TRAAL
00407   0 60100 0 05066          STO E                          E = SQRT(PSQ+1)
00410   0 50000 0 05423          CLA P
00411   0 24000 0 05066          FDH E
00412  -0 60000 0 05065          STQ BETA                       BETA COMPUTED = P/E
00413   0 56000 0 05330          LDQ KFX                 J4
00414   0 20000 0 05332          MPY NSTAR
00415  -0 60000 0 05041          STQ SBEER                      K NSTAR = SBEER
00416   0 76300 0 00001          LLS 1
00417  -0 60000 0 05063          STQ BEER                       2K NSTAR = NO. BEES IN RECORD
00420   0 53400 1 05063          LXA BEER,1
00421  -0 63400 1 05127          SXD TW1,1
00422  -0 63400 1 05130          SXD TW2,1
00423  -0 63400 1 02264          SXD NEXT2-2,1
00424  -0 63400 1 02177          SXD TIXN,1
00425   0 50000 0 05406          CLA NZM                 J4.1
00426  -0 10000 0 00432          TNZ CRAP
00427   0 50000 0 05060          CLA MAXSTO              J4.2
00430   0 76700 0 00001          ALS 1
00431   0 60100 0 05060          STO MAXSTO
00432  -0 75400 0 00000  CRAP    PXD                     J4.3
00433   0 56000 0 05060          LDQ MAXSTO
00434   0 22000 0 05063          DVH BEER
00435  -0 60000 0 05070          STQ RAP                        RAP = NO. R BLOCKS IN APIARY
00436   0 60000 0 05062          STZ BEERT
00437   0 60000 0 05031          STZ RSPAN
00440   0 53400 2 05070          LXA RAP,2
00441   0 50000 0 05031          CLA RSPAN
00442   0 30000 0 05336          FAD DELTAR
00443   2 00001 2 00442          TIX *-1,2,1
00444   0 60100 0 05031          STO RSPAN
00445   0 50000 0 05272          CLA R                   J4.4
00446   0 30200 0 05334          FSB RIN
00447   0 24000 0 05336          FDH DELTAR
00450  -0 60000 0 05042          STQ LOCR
00451   0 50000 0 05042          CLA LOCR
00452   0 07400 4 03024          TSX FLOFX,4
00453   0 00000 0 00043          PZE 35
00454   0 00000 0 01206          HTR TRAAL
00455   0 60100 0 05042          STO LOCR
00456   0 50000 0 05070          CLA RAP                 J4.5
00457   0 40200 0 05042          SUB LOCR
00460   0 40200 0 05042          SUB LOCR
00461   0 10000 0 00475          TZE TPRGT
00462   0 12000 0 00475          TPL TPRGT
```

```
00463   0 50200 0 05070          CLS RAP                 J4.6
00464   0 77100 0 00001          ARS 1
00465   0 40000 0 05042          ADD LOCR
00466   0 60100 0 05426          STO COMMON
00467   0 53400 1 05426          LXA COMMON,1
00470   0 50000 0 05334          CLA RIN
00471   0 30000 0 05336          FAD DELTAR
00472   2 00001 1 00471          TIX *-1,1,1
00473   0 60100 0 05067          STO FRIA
00474   0 02000 0 00500          TRA HNTFD
00475   0 50000 0 05334  TPRGT   CLA RIN                 J4.7 TAPE LOCATED RIGHT
00476   0 60100 0 05067          STO FRIA                    AT START.
00477   0 02000 0 00504          TRA READB
00500   0 53400 1 05426  HNTFD   LXA COMMON,1            J4.8
00501   0 76200 0 00221          RTB 1                   J4.9
00502   0 76200 0 00222          RTB 2                        FILLED IN WITH NOP IF
00503   2 00001 1 00501          TIX *-2,1,1             J1.11 MO Z MOTION.
00504   0 53400 1 05070  READB   LXA RAP,1              J1.12
00505   0 53400 2 05063          LXA BEER,2              F4.13
00506   0 50000 0 05051          CLA MAP                 J4.14
00507   0 40200 0 05062          SUB BEERT
00510   0 62100 0 00517          STA CPY
00511   0 50200 0 05143          CLS FX5                 J4.15
00512   0 60100 0 05037          STO TRY1C
00513   0 76200 0 00221          RTB 1
00514   0 70000 0 05426          CPY COMMON
00515   0 02000 0 00517          TRA CPY
00516   0 02000 0 00536          TRA ENDF                     END OF FILE REACHED
00517   0 70000 2 00000  CPY     CPY 0,2                 J4.17
00520   2 00001 2 00517          TIX CPY,2,1
00521   0 02000 0 00523          TRA NOREX
00522   0 00000 0 01206          HTR TRAAL               J4.18 STOP. WRONG NUMBER OF
00523  -0 76000 0 00012  NOREX   RTT                     J4.19 BEES PER RECORD
00524   0 07400 4 01343          TSX READ1,4
00525   0 50000 0 05062          CLA BEERT               J4.20
00526   0 40000 0 05063          ADD BEER
00527   0 60100 0 05062          STO BEERT
00530   2 00001 1 00505          TIX READB+1,1,1         J4.21
00531   0 76600 0 00333  IOD     IOD                     J4.33 INPUT OUTPUT DELAY
00532   0 50000 0 05067          CLA FRIA
00533   0 30000 0 05031          FAD RSPAN
00534   0 60100 0 05032          STO MARIA                    MARIA = MAX. R IN APIARY
00535   0 02000 0 00540          TRA *+3
00536   0 50000 0 05335  ENDF    CLA MROT
00537   0 02000 0 00534          TRA *-3
```

```
00540   0 76100 0 00567 READER NOP  BJ434          J4.22 FILLED IN WITH TRA
00541   0 60000 0 05062        STZ  BEERT          J4.23 NO Z MOTION
00542   0 53400 1 05070        LXA  RAP,1          J4.24
00543   0 53400 2 05063  LXA2  LXA  BEER,2         J4.25
00544   0 50000 0 05052        CLA  MAD            J4.26
00545   0 40200 0 05062        SUB  BEERT
00546   0 62100 0 00555        STA  CPYCAT
00547   0 50200 0 05143        CLS  FX5            F4.27
00550   0 60100 0 05040        STO  TRY2C
00551   0 76200 0 00222        RTB  2              J4.28
00552   0 70000 0 05426        CPY  COMMON
00553   0 02000 0 00555        TRA  *+2
00554   0 02000 0 00567        TRA  BJ434               END OF FILE REACHED
00555   0 70000 2 00000 CPYCAT CPY  0,2            J4.29 PUT RMAX = MARIA
00556   2 00001 2 00555        TIX  *-1,2,1
00557   0 02000 0 00561        TRA  NDEX
00560   0 00000 0 00000        HTR                      STOP.NUMBEROFDERIVATIES
00561  -0 76000 0 00012  NDEX  RTT                 J4.30 PER RECORD, TAPE 2, WRONG
00562   0 07400 4 01331        TSX  READ2,4
00563   0 50000 0 05062        CLA  BEERT          J4.31 PUSH START TO TRY TO READ
00564   0 40000 0 05063        ADD  BEER               AGAIN.
00565   0 60100 0 05062        STO  BEERT
00566   2 00001 1 00543        TIX  LXA2,1,1       J4.32 DERIVATIVES IN MEMORY
00567   0 76600 0 00333  BJ434 IOD
00570   0 50200 0 05345        CLS  NOREV          J4.34
00571   0 60100 0 05046        STO  REVCO
00572   0 50000 0 05337        CLA  PRES
00573   0 60100 0 05423        STO  P
00574   0 50000 0 05340        CLA  RESR
00575   0 60100 0 05272        STO  R
00576   0 50000 0 05341        CLA  PRRES
00577   0 60100 0 05271        STO  PR
00600   0 50000 0 05406        CLA  NZM
00601   0 10000 0 00606        TZE  *+5
00602   0 50000 0 05376        CLA  RESZ
00603   0 60100 0 05267        STO  Z
00604   0 50000 0 05377        CLA  RESPZ
00605   0 60100 0 05266        STO  PZ
00606   0 50000 0 05403        CLA  NACON
00607   0 10000 0 00614        TZE  *+5
00610   0 50000 0 05374        CLA  RBAR
00611   0 60100 0 05264        STO  RE
00612   0 50000 0 05375        CLA  PRBAR
00613   0 60100 0 05263        STO  PRE
00614   0 76000 0 00163        PSE  115                 S.S.3 DOWN GIVES ON-LINE PRINT
```

```
00615  0 02000 0 00644          TRA SETOF
00616  0 50000 0 05133          CLA FVE
00617  0 60100 0 01025          STO HED+8
00620  0 60100 0 01033          STO HED+14
00621  0 60100 0 01043          STO TITL1-2
00622  0 60100 0 01050          STO TITL1+3
00623  0 60100 0 01056          STO HEAD1-2
00624  0 60100 0 01320          STO OUT1-2
00625  0 60100 0 01327          STO OUT1+5
00626  0 50000 0 05134          CLA FVE+1
00627  0 60100 0 01210          STO TRAAL+2
00630  0 60100 0 02012          STO POPR+3
00631  0 60100 0 02040          STO RLRGE+4
00632  0 60100 0 02064          STO ZLRGE+4
00633  0 60100 0 02107          STO RSMLL+3
00634  0 60100 0 02454          STO HALT+3
00635  0 50000 0 05124          CLA NOP
00636  0 60100 0 02455          STO HALT+4
00637  0 60100 0 02041          STO RLRGE+5
00640  0 60100 0 02065          STO ZLRGE+5
00641  0 60100 0 02110          STO RSMLL+4
00642  0 60100 0 02013          STO POPR+4
00643  0 02000 0 00672          TRA *+23
00644  0 50000 0 05135  SETOF  CLA PON
00645  0 60100 0 01025          STO HED+8
00646  0 60100 0 01033          STO HED+14
00647  0 60100 0 01043          STO TITL1-2
00650  0 60100 0 01050          STO TITL1+3
00651  0 60100 0 01056          STO HEAD1-2
00652  0 50000 0 05136          CLA PON+1
00653  0 60100 0 01320          STO OUT1-2
00654  0 60100 0 01327          STO OUT1+5
00655  0 50000 0 05137          CLA PON+2
00656  0 60100 0 02012          STO POPR+3
00657  0 60100 0 02454          STO HALT+3
00660  0 60100 0 02107          STO RSMLL+3
00661  0 60100 0 02064          STO ZLRGE+4
00662  0 60100 0 02040          STO RLRGE+4
00663  0 60100 0 01210          STO TRAAL+2
00664  0 50000 0 05134          CLA FVE+1
00665  0 60100 0 02013          STO POPR+4
00666  0 60100 0 02455          STO HALT+4
00667  0 60100 0 02041          STO RLRGE+5
00670  0 60100 0 02065          STO ZLRGE+5
00671  0 60100 0 02110          STO RSMLL+4
```

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00672   0 60000 0 05043          STZ TC1                    ZERO TEST COUNTER
00673   0 60000 0 05044          STZ TC2
00674   0 50000 0 05043          CLA TC1
00675   0 62200 0 02173          STD TXI1                   ZERO TXI DECREMENT PICK B
00676   0 62200 0 02261          STD TXI2
00677   0 53400 1 05131          LXA NURKY3,1               J4.36 ROUTINE
00700   0 50000 1 05273          CLA R+1,1                  J4.37
00701   0 60100 1 05243          STO YRKY3,1
00702   0 60000 1 05203          STZ QRKY3,1
00703   2 00001 1 00700          TIX *-3,1,1
00704   0 50000 0 05407          CLA TIMIN                  J4.38
00705  -0 10000 0 00710          TNZ *+3
00706   0 60000 0 05265          STZ TIME                   J4.39
00707   0 60000 0 05235          STZ YRKY3-6
00710   0 50000 0 05406          CLA NZM                    J4.40
00711  -0 10000 0 00716          TNZ *+5
00712   0 60000 0 05267          STZ Z                      J4.41
00713   0 60000 0 05266          STZ PZ
00714   0 60000 0 05237          STZ YRKY3-4
00715   0 60000 0 05236          STZ YRKY3-5
00716   0 50000 0 05403          CLA NACON                  J4.42
00717  -0 10000 0 00724          TNZ *+5
00720   0 60000 0 05264          STZ RE                     J4.43
00721   0 60000 0 05263          STZ PRE
00722   0 60000 0 05234          STZ YRKY3-7
00723   0 60000 0 05233          STZ YRKY3-8
00724   0 60000 0 05033          STZ RKST1                  J4.44
00725   0 60000 0 05034          STZ RKST2
00726   0 60000 0 05035          STZ RKST4
00727   0 60000 0 05270          STZ THETA
00730   0 50000 0 05313          CLA INRKS
00731   0 40200 0 05140          SUB FX1
00732  -0 10000 0 00735          TNZ *+3
00733   0 53400 1 05041          LXA SBEER,1
00734   0 02000 0 01015          TRA HED
00735   0 50000 0 05041          CLA SBEER                  J4.46
00736   0 40200 0 05313          SUB INRKS
00737   0 40000 0 05140          ADD FX1
00740   0 73400 1 00000          PAX 0,1
00741   0 50000 0 05313          CLA INRKS                  J4.47
00742   0 40200 0 05140          SUB FX1
00743   0 73400 2 00000          PAX 0,2
00744   0 50000 0 05270          CLA THETA
00745   0 30000 0 01110          FAD H
00746   2 00001 2 00745          TIX *-1,2,1
```

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00747   0 60100 0 05270          STO THETA
00750   0 60100 0 05240          STO YRKY3-3
00751   0 30000 0 05351          FAD GAMMA                J4.48
00752   0 24000 0 05350          FDH OMEGA
00753   0 50000 0 05407          CLA TIMIN
00754   0 10000 0 00757          TZE *+3
00755  -0 60000 0 05265          STQ TIME                 J4.49
00756  -0 60000 0 05235          STQ YRKY3-6
00757   0 50000 0 05313          CLA INRKS
00760   0 40200 0 05140          SUB FX1
00761   0 76700 0 00001          ALS 1
00762   0 73400 2 00000          PAX 0,2
00763  -0 63400 2 02173          SXD TXI1,2
00764  -0 63400 2 02261          SXD TXI2,2
00765   0 50000 0 05402          CLA NACCE
00766   0 10000 0 01000          TZE *+10
00767   0 50000 0 05056          CLA GAPLO                J4.411
00770   0 30200 0 05151          FSB RONDO
00771   0 34000 0 05270          CAS THETA
00772   0 02000 0 01000          TRA *+6
00773   0 76100 0 00000          NOP
00774   0 50000 0 05056          CLA GAPLO
00775   0 30000 0 05045          FAD ADVGP
00776   0 60100 0 05056          STO GAPLO
00777   0 02000 0 00770          TRA *-7
01000   0 50000 0 05313          CLA INRKS                J4.412
01001   0 40200 0 05314          SUB SPLOT
01002   0 12000 0 01007          TPL *+5
01003   0 50000 0 05404          CLA PLT
01004   0 40200 0 05140          SUB FX1
01005   0 60100 0 05055          STO PLTT
01006   0 02000 0 01010          TRA *+2
01007   0 60000 0 05055          STZ PLTT
01010   0 50000 0 05313          CLA INRKS
01011   0 40200 0 05140          SUB FX1
01012   0 60100 0 05033          STO RKST1
01013   0 60100 0 05034          STO RKST2
01014   0 60100 0 05035          STO RKST4
01015   0 50200 0 05140      HED CLS FX1
01016   0 60100 0 05116          STO PNT
01017   0 50000 0 05401          CLA PRNTO
01020   0 10000 0 01107          TZE H-1
01021   0 07400 4 03102          TSX OUT,4
01022   0 00000 0 01206          HTR TRAAL
01023   3 03750 0 01060          PTH HEAD1,0,2024
```

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01024 -0 00040 0 05305          FOR RUNNO,0,32
01025  1 00000 0 00006          PON 6,0,0
01026  0 50000 0 05406          CLA NZM
01027  0 10000 0 01045          TZE TITL1
01030  0 07400 4 03102          TSX OUT,4
01031  0 00000 0 01206          HTR TRAAL
01032  3 23530 0 01062          PTH HEAD2,0,10072
01033  1 00000 0 00006          PON 6,0,0
01034  0 07400 4 03102          TSX OUT,4
01035  0 00000 0 01206          HTR TRAAL
01036 -3 11640 0 05272          SVN R,0,5024
01037 -3 11651 0 05271          SVN PR,0,5033
01040 -3 11662 0 05267          SVN Z,0,5042
01041 -3 11673 0 05266          SVN PZ,0,5051
01042 -0 00106 0 05034          FOR RKST2,0,70
01043  1 00060 0 00006          PON 6,0,48
01044  0 02000 0 01057          TRA HEAD1-1
01045  0 07400 4 03102  TITL1  TSX OUT,4
01046  0 00000 0 01206          HTR TRAAL
01047  3 23530 0 01074          PTH HEAD3,0,10072
01050  1 00000 0 00006          PON 6,0,0
01051  0 07400 4 03102          TSX OUT,4
01052  0 00000 0 01206          HTR TRAAL
01053 -3 11652 0 05272          SVN R,0,5034
01054 -3 11664 0 05271          SVN PR,0,5044
01055 -0 00106 0 05034          FOR RKST2,0,70
01056  1 00060 0 00006          PON 6,0,48
01057  0 02000 0 01107          TRA H-1
01060  605164456045     HEAD1  BCD 2 RUN NUMBER
01061  644422255160
01062  606060606060     HEAD2  BCD              R        PR        Z        PZ                 R.K.S.
01063  606060605160
01064  606060606060
01065  475160606060
01066  606060607160
01067  606060606060
01070  477160606060
01071  606060606060
01072  606060606060
01073  513342336233
01074  606060606060     HEAD3  BCD                       R        PR                           R.K.S.
01075  606060606060
01076  606060606060
01077  605160606060
01100  606060604751
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01101  606060606060
01102  606060606060
01103  606060606060
01104  606060606060
01105  513342336233
01106  0 53400 1 05041        LXA SBEER,1          J5
01107  0 07400 4 02526        TSX RKY3,4
01110  0 00000 0 00000  H     HTR
01111  0 76000 0 00162        PSE 114                   PUT S.S. 2 DOWN TO STOP RUN.
01112  0 02000 0 01114        TRA *+2
01113  0 00000 0 01206        HTR TRAAL                 HIT START TO RUN NEXT CASE
01114  0 50000 0 05033        CLA RKST1            J5.1
01115  0 40000 0 05140        ADD FX1
01116  0 60100 0 05033        STO RKST1
01117  0 50000 0 05034        CLA RKST2
01120  0 40000 0 05140        ADD FX1
01121  0 60100 0 05034        STO RKST2
01122  0 50000 0 05035        CLA RKST4
01123  0 40000 0 05140        ADD FX1
01124  0 60100 0 05035        STO RKST4
01125  0 76100 0 01131  PSET  NOP *+4              L1   CHANGED NOP TO TRA TO LEAVE OUT
01126  0 50000 0 05035        CLA RKST4            L1.1 PRINT OUT.
01127  0 40200 0 05401        SUB PRNTO
01130  0 12000 0 01301        TPL BOXJ6
01131  0 76100 0 01136  GSET  NOP *+5              L2   CHANGED TO TRA IF NO
01132  0 50000 0 05270        CLA THETA            L2.1 ACCELERATION WANTED
01133  0 30000 0 05151        FAD RONDO
01134  0 30200 0 05056        FSB GAPLO
01135  0 12000 0 02273        TPL GAP
01136  0 76100 0 01143  BOXM1 NOP BOXO1            M1   CHANGED TO TRA TO LEAVE OUT PLOT
01137  0 50000 0 05033        CLA RKST1            M1.1
01140  0 34000 0 05314        CAS SPLOT
01141  0 02000 0 01143        TRA *+2
01142  0 02000 0 01411        TRA BOXM2                 TRANS. TO TEST FOR ONLINE PLOT
01143  0 50000 0 05405  BOXO1 CLA PLOFF             O1
01144  0 10000 0 01160        TZE BXO11
01145  0 76600 0 00224        WTB 4                O1.2 STORE DATA FOR PLOTS
01146  0 70000 0 05426        CPY COMMON                NONSENSE WORD
01147  0 70000 0 05264        CPY RE
01150  0 70000 0 05263        CPY PRE
01151  0 70000 0 05272        CPY R
01152  0 70000 0 05271        CPY PR
01153  0 70000 0 05267        CPY Z
01154  0 70000 0 05266        CPY PZ
01155  0 70000 0 05033        CPY RKST1
```

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01156   0 76600 0 00333          IOD
01157   0 02000 0 01160          TRA BXO11
01160   0 50000 0 05034  BXO11   CLA RKST2              O1.1
01161   0 40200 0 05036          SUB RKSPR
01162   0 10000 0 01166          TZE BOXO2                    END OF REVOLUTION
01163   2 00001 1 01107          TIX H-1,1,1                  END OF TRUE SCETOR
01164   0 60000 0 05033          STZ RKST1
01165   0 02000 0 01106          TRA H-2
01166   0 60000 0 05033  BOXO2   STZ RKST1
01167   0 50000 0 05353          CLA GAPL1
01170   0 60100 0 05056          STO GAPLO
01171   0 60000 0 05034          STZ RKST2
01172   0 60000 0 05270          STZ THETA
01173   0 60000 0 05240          STZ YRKY3-3
01174   0 50000 0 05407          CLA TIMIN
01175   0 10000 0 01202          TZE *+5                O2.1
01176   0 50000 0 05350          CLA OMEGA              O2.2
01177   0 30200 0 05156          FSB 2PI
01200   0 60100 0 05265          STO TIME
01201   0 60100 0 05235          STO YRKY3-6
01202   0 50000 0 05046          CLA REVCO              O2.3
01203   0 40000 0 05140          ADD FX1
01204   0 60100 0 05046          STO REVCO
01205  -0 10000 0 01106          TNZ H-2                      ORBIT NOT COMPLETE
01206   0 07400 4 03102  TRAAL   TSX OUT,4              G1    SKIP TO CHANNEL 1
01207   0 00000 0 01206          HTR TRAAL
01210   1 00001 0 00006          PON 6,0,1
01211   0 76000 0 00164          PSE 116          PUT S.S.4 DOWN TO ADVANCE FILM AT END OF ORBIT
01212   0 02000 0 01214          TRA *+2
01213   0 76000 0 00030          CFF
01214   0 50000 0 02466          CLA HALTO
01215   0 60100 0 02451          STO HALT
01216   0 50000 0 05400          CLA NORNS
01217   0 40200 0 05140          SUB FX1
01220   0 60100 0 05400          STO NORNS              G2
01221  -0 10000 0 01257          TNZ RELOD              O2.4
01222   0 50000 0 05404  FIXTP   CLA PLT                O2.5 FIX TO PLOT AXES AND PICKUP
01223   0 10000 0 01227          TZE CFF+1                   NEW KEYWORD AND PARAMETERS
01224   0 76000 0 00030          CFF
01225   0 76000 0 00030          CFF
01226   0 76000 0 00030  CFF     CFF
01227   0 50000 0 05405          CLA PLOFF              O2.7
01230   0 10000 0 01247          TZE TSKPI
01231   0 50000 0 05057          CLA ENDFI              O2.8
01232   0 40000 0 05140          ADD FX1
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01233   0 60100 0 05057          STO ENDFI
01234   0 77000 0 00204          WEF 4
01235   0 76600 0 00224          WTB 4
01236   0 70000 0 05034          CPY RKST2                    NONSENSE FOR FORTRAN
01237   0 70000 0 05057          CPY ENDFI
01240   0 76600 0 00333          IOD
01241   0 76600 0 00224          WTB 4
01242   0 70000 0 05426          CPY COMMON                   NONSENSE FOR FORTRAN
01243   0 70000 0 05424          CPY ALL7S
01244   0 76600 0 00333          IOD
01245   0 60000 0 05057          STZ ENDFI
01246   0 76400 0 00204          BST 4
01247   0 77200 0 00203  TSKPI   REW 3                        02.9
01250   0 50000 0 05406          CLA NZM
01251   0 10000 0 01253          TZE *+2
01252   0 77200 0 00202          REW 2
01253   0 77200 0 00201          REW 1
01254   0 76200 0 00223          RTB 3
01255   0 76200 0 00223          RTB 3
01256   0 02000 0 00004          TRA 4
01257   0 50000 0 05405  RELOD   CLA PLOFF
01260   0 10000 0 01271          TZE *+9
01261   0 77000 0 00204          WEF 4                        02.43
01262   0 50000 0 05057          CLA ENDFI
01263   0 40000 0 05140          ADD FX1
01264   0 60100 0 05057          STO ENDFI
01265   0 76600 0 00224          WTB 4
01266   0 70000 0 05034          CPY RKST2
01267   0 70000 0 05057          CPY ENDFI
01270   0 76600 0 00333          IOD
01271   0 07400 4 03732  LOAD    TSX INP1,4                   A1   READ PARAMETERS INTO
01272   0 00001 0 00001                1,0,1                      MEMORY
01273   0 00000 0 01206          HTR TRAAL
01274   0 02000 0 01271          TRA LOAD
01275   0 50000 0 05410          CLA HNTRS                    02.46
01276   0 10000 0 01300          TZE *+2
01277   0 07400 4 05570          TSX COMIC,4
01300   0 02000 0 00567          TRA BJ434
01301   0 50000 0 05116  BOXJ6   CLA PNT
01302   0 40000 0 05140          ADD FX1
01303   0 60100 0 05116          STO PNT
01304  -0 10000 0 01131          TNZ GSET
01305   0 50200 0 05312          CLS PRINT
01306   0 60100 0 05116          STO PNT
01307   0 50000 0 05406          CLA NZM
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01310   0 10000 0 01322          TZE OUT1
01311   0 07400 4 03102          TSX OUT,4
01312   0 00000 0 01206          HTR TRAAL
01313  -3 11640 0 05272          SVN R,0,5024
01314  -3 11651 0 05271          SVN PR,0,5033
01315  -3 11662 0 05267          SVN Z,0,5042
01316  -3 11673 0 05266          SVN PZ,0,5051
01317  -0 00106 0 05034          FOR RKST2,0,70
01320   1 00060 0 00006          PON 6,0,48
01321   0 02000 0 01131          TRA GSET
01322   0 07400 4 03102  OUT1    TSX OUT,4
01323   0 00000 0 01206          HTR TRAAL
01324  -3 11652 0 05272          SVN R,0,5034
01325  -3 11664 0 05271          SVN PR,0,5044
01326  -0 00106 0 05034          FOR RKST2,0,70
01327   1 00060 0 00006          PON 6,0,48
01330   0 02000 0 01131          TRA GSET
01331   0 76400 0 00202  READ2   BST 2
01332   0 53400 2 05063          LXA BEER,2
01333   0 50000 0 05040          CLA TRY2C
01334   0 40000 0 05140          ADD FX1
01335   0 60100 0 05040          STO TRY2C
01336  -0 12000 0 01342          TMI RETRY4
01337   0 42000 0 00000          HPR                    STOP. TRIED TO READ TAPE
01340   0 77200 0 00202          REW 2                  2 FIVE TIMES. PUSH SART
01341   0 00000 0 01206          HTR TRAAL
01342   0 02000 4 77767 RETRY4   TRA -9,4
01343   0 76400 0 00201  READ1   BST 1
01344   0 53400 2 05063          LXA BEER,2
01345   0 50000 0 05037          CLA TRY1C
01346   0 40000 0 05140          ADD FX1
01347   0 60100 0 05037          STO TRY1C
01350  -0 12000 0 01354          TMI RETRY3
01351   0 42000 0 00000          HPR                    STOP. TRIED TO READ TAPE 1
01352   0 77200 0 00201          REW 1                  FIVE TIMES. PUSH START WILL
01353   0 00000 0 00000          HTR                    REWIND 1 AND STOP
01354   0 02000 4 77771 RETRY3   TRA -7,4
01355   0 76400 0 00201  TRY51   BST 1
01356   0 50000 0 05037          CLA TRY1C
01357   0 40000 0 05140          ADD FX1
01360   0 60100 0 05037          STO TRY1C
01361  -0 12000 0 01366          TMI RETRY
01362   0 42000 0 00000          HPR                    STOP. TRIED TO READ TAPE 1
01363   0 77200 0 00201          REW 1                  FIVE TIMES. PUSH START.
01364   0 00000 0 01206          HTR TRAAL
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01365   0 76100 0 00000          NOP                    MAGNETIC TAPE 1 IN ERROR
01366   0 02000 4 77767  RETRY   TRA -9,4
01367   0 76400 0 00202  TRY52   BST 2
01370   0 50000 0 05037          CLA TRY1C
01371   0 40000 0 05140          ADD FX1
01372   0 60100 0 05037          STO TRY1C
01373  -0 12000 0 01400          TMI TRYAG
01374   0 42000 0 00000          HPR                     STOP, TRIED TO READ TAPE 2
01375   0 77200 0 00202          REW 2                  FIVE TIMES, PUSH START WILL
01376   0 00000 0 01206          HTR TRAAL
01377   0 76100 0 00000          NOP                    TAPE 2 IN ERROR.
01400   0 02000 4 77767  TRYAG   TRA -9,4
01401   0 77200 0 00202  REW2    REW 2
01402   0 00000 0 00000          HTR                     STOP TAPE 2 AT END
01403  -0 76000 0 00011  ETT1    ETT
01404   0 02000 0 01406          TRA ETT1+3
01405   0 02000 0 00276          TRA CAPY+11
01406   0 42000 0 00000          HPR                     END OF TAPE 1 REACHED
01407   0 77200 0 00201          REW 1                  HIT START, WILL REWIND 1
01410   0 00000 0 00000          HTR
01411   0 50000 0 05055  BOXM2   CLA PLTT
01412   0 40000 0 05140          ADD FX1
01413   0 60100 0 05055          STO PLTT
01414   0 34000 0 05404          CAS PLT
01415   0 02000 0 01417          TRA *+2
01416   0 02000 0 01420          TRA *+2
01417   0 02000 0 01143          TRA BOXO1
01420   0 60000 0 05055          STZ PLTT
01421   0 02000 0 02400          TRA PLOTR
01422  -0 63400 1 05160  WRKY3   SXD JUNK,1          K1    STORE ALL I.R.S
01423  -0 63400 2 05161          SXD JUNK+1,2
01424  -0 63400 4 05162          SXD JUNK+2,4
01425   0 50000 0 05272          CLA R                K2    R+DELTAR-MARIA TEST
01426   0 30000 0 05336          FAD DELTAR                ON SUFF. FIELDS
01427   0 56000 0 05032          LDQ MARIA
01430   0 04000 0 02034          TLQ RLRGE
01431   0 50000 0 05272          CLA R
01432   0 30200 0 05336          FSB DELTAR
01433   0 56000 0 05067          LDQ FRIA                R GREATER THAN SHOULD BE.
01434   0 04000 0 01436          TLQ *+2
01435   0 02000 0 02104          TRA RSMLL
01436   0 02000 0 02123  RIGHT   TRA BEEP              K5    TO PICK UP BEES AND
01437   0 50000 0 05272          CLA R                K6  DERIVATES
01440   0 30200 0 05073          FSB R2                    INTERPOLATION ROUTINE
01441   0 24000 0 05336          FDH DELTAR
```

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01442 -0 60000 0 05071          STQ X
01443  0 26000 0 05071          FMP X
01444  0 60100 0 05072          STO XSQ
01445  0 56000 0 05072          LDQ XSQ
01446  0 26000 0 05071          FMP X
01447  0 60100 0 05030          STO XCUB
01450  0 30200 0 05071          FSB X
01451  0 60100 0 05426          STO COMMON
01452  0 24000 0 05147          FDH 6FL
01453 -0 60000 0 05074          STQ A4                    A4 = 1/6(XCUBED-X)
01454  0 56000 0 05426          LDQ COMMON
01455  0 26000 0 05157          FMP HALF
01456  0 30200 0 05072          FSB XSQ
01457  0 30000 0 05144          FAD 1FL
01460  0 60100 0 05076          STO A2                    A2 = (XCUBE-2XSQ-X+2)*1/2
01461  0 50000 0 05426          CLA COMMON
01462  0 30200 0 05071          FSB X
01463  0 30200 0 05072          FSB XSQ
01464  0 76000 0 00002          CHS
01465  0 24000 0 05145          FDH 2FL
01466 -0 60000 0 05075          STQ A3                    A3 = -(XCUBE-XSQ-2X)*1/2
01467  0 50000 0 05072          CLA XSQ
01470  0 30200 0 05071          FSB X
01471  0 24000 0 05145          FDH 2FL
01472 -0 60000 0 05426          STQ COMMON
01473  0 50000 0 05426          CLA COMMON
01474  0 30200 0 05074          FSB A4
01475  0 60100 0 05077          STO A1                    A1 = -(XCUBE-3XSQ+2X)*1/6
01476  0 76100 0 01544  BOXK9   NOP BXK11            K9   CALCULATE COEFFICIENTS
01477  0 56000 0 05072          LDQ XSQ                   FOR R DERIVATIES
01500  0 26000 0 05157          FMP HALF
01501  0 60100 0 05426          STO COMMON
01502  0 30200 0 05155          FSB SIXTH
01503  0 60100 0 05432          STO COMMON+4              A4* = 1/2XSQ -1/6
01504  0 50000 0 05071          CLA X
01505  0 30200 0 05426          FSB COMMON
01506  0 30200 0 05154          FSB THIRD
01507  0 60100 0 05427          STO COMMON+1              A1* = -XSQ/2 + X - 1/3
01510  0 56000 0 05426          LDQ COMMON
01511  0 26000 0 05146          FMP 3FL
01512  0 60100 0 05426          STO COMMON
01513  0 30200 0 05071          FSB X
01514  0 30200 0 05144          FSB 1FL
01515  0 76000 0 00002          CHS
01516  0 60100 0 05431          STO COMMON+3              A3* = -3XSQ/2+X+1
```

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01517   0 50000 0 05426          CLA COMMON
01520   0 30200 0 05071          FSB X
01521   0 30200 0 05071          FSB X
01522   0 30200 0 05157          FSB HALF
01523   0 60100 0 05430          STO COMMON+2                    A2* = 3XSQ/2-2X-1/2
01524   0 56000 0 05427          LDQ COMMON+1            K10
01525   0 26000 0 05103          FMP B1                          DBDR = A1*B1+A2*B2+A3*B3
01526   0 60100 0 05427          STO COMMON+1            +A4*B4
01527   0 56000 0 05430          LDQ COMMON+2
01530   0 26000 0 05102          FMP B2
01531   0 30000 0 05427          FAD COMMON+1
01532   0 60100 0 05427          STO COMMON+1
01533   0 56000 0 05431          LDQ COMMON+3
01534   0 26000 0 05101          FMP B3
01535   0 30000 0 05427          FAD COMMON+1
01536   0 60100 0 05427          STO COMMON+1
01537   0 56000 0 05432          LDQ COMMON+4
01540   0 26000 0 05100          FMP B4
01541   0 30000 0 05427          FAD COMMON+1
01542   0 24000 0 05336          FDH DELTAR
01543  -0 60000 0 05114          STQ DBDR
01544   0 56000 0 05077  BXK11   LDQ A1                    K11
01545   0 26000 0 05103          FMP B1
01546   0 60100 0 05427          STO COMMON+1
01547   0 56000 0 05076          LDQ A2
01550   0 26000 0 05102          FMP B2
01551   0 30000 0 05427          FAD COMMON+1
01552   0 60100 0 05427          STO COMMON+1
01553   0 56000 0 05075          LDQ A3
01554   0 26000 0 05101          FMP B3
01555   0 30000 0 05427          FAD COMMON+1
01556   0 60100 0 05427          STO COMMON+1
01557   0 56000 0 05074          LDQ A4
01560   0 26000 0 05100          FMP B4
01561   0 30000 0 05427          FAD COMMON+1
01562   0 60100 0 05026          STO B                           B=A1B1+A2B2+A3B3
01563   0 56000 0 05271          LDQ PR                  K12     +A4B4
01564   0 26000 0 05271          FMP PR
01565   0 60100 0 05426          STO COMMON                      PR SQ = COMMON
01566   0 50000 0 05064          CLA PSQ
01567   0 30200 0 05426          FSB COMMON
01570   0 60100 0 05426          STO COMMON
01571   0 07400 4 05537          TSX SQRT,4              K13
01572   0 02000 0 02007          TRA POPR
01573   0 60100 0 05112          STO QINV                K14     QINV = SQRT(PSQ-PRSQ)
```

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01574   0 50000 0 05144          CLA 1FL
01575   0 24000 0 05112          FDH QINV
01576  -0 60000 0 05113          STQ QBALL                    QBALL = 1/SQRT(PSQ-PRSQ)
01577   0 26000 0 05271          FMP PR                 K15
01600   0 60100 0 05426          STO COMMON                   Q PR IN COMMON
01601   0 56000 0 05426          LDQ COMMON
01602   0 26000 0 05272          FMP R
01603   0 60100 0 05212          STO VRKY3-1                  RDOT = RQ(PR)
01604   0 56000 0 05272          LDQ R                  K16
01605   0 26000 0 05026          FMP B
01606   0 30200 0 05112          FSB QINV
01607   0 76000 0 00002          CHS
01610   0 60100 0 05211          STO VRKY3-2                  (PR)DOT = QINV-RB
01611   0 50000 0 05144          CLA 1FL
01612   0 60100 0 05210          STO VRKY3-3                  THETA DOT = 1
01613   0 76100 0 01654  BXK17   NOP BXK18             K17   SOLVE A PZ EQUS.
01614   0 56000 0 05272          LDQ R
01615   0 26000 0 05114          FMP DBDR
01616   0 60100 0 05433          STO COMMON+5                 R(DBDR) IN COMMON+5
01617   0 56000 0 05077          LDQ A1
01620   0 26000 0 05110          FMP DB1
01621   0 60100 0 05427          STO COMMON+1
01622   0 56000 0 05076          LDQ A2
01623   0 26000 0 05107          FMP DB2
01624   0 30000 0 05427          FAD COMMON+1
01625   0 60100 0 05427          STO COMMON+1
01626   0 56000 0 05075          LDQ A3
01627   0 26000 0 05106          FMP DB3
01630   0 30000 0 05427          FAD COMMON+1
01631   0 60100 0 05427          STO COMMON+1
01632   0 56000 0 05074          LDQ A4
01633   0 26000 0 05105          FMP DB4
01634   0 30000 0 05427          FAD COMMON+1
01635   0 60100 0 05027          STO DTHETA
01636   0 56000 0 05426          LDQ COMMON
01637   0 26000 0 05027          FMP DTHETA
01640   0 76000 0 00002          CHS
01641   0 30000 0 05433          FAD COMMON+5
01642   0 60100 0 05427          STO COMMON+1
01643   0 56000 0 05427          LDQ COMMON+1
01644   0 26000 0 05267          FMP Z
01645   0 60100 0 05206          STO VRKY3-5                  PZ DOT = R(DBDR)Z-Q(PR)Z(DTHETA)
01646   0 56000 0 05272          LDQ R
01647   0 26000 0 05113          FMP QBALL
01650   0 60100 0 05427          STO COMMON+1
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01651   0 56000 0 05427          LDQ COMMON+1
01652   0 26000 0 05266          FMP PZ
01653   0 60100 0 05207          STO VRKY3-4                 Z DOT = (RQ)PZ
01654   0 76100 0 01667  BXK18   NOP KEQUI-2          K18    SOLVE TIME EQU.
01655   0 50000 0 05331          CLA NFL
01656   0 24000 0 05156          FDH 2PI
01657   0 26000 0 05066          FMP E
01660   0 60100 0 05427          STO COMMON+1
01661   0 56000 0 05427          LDQ COMMON+1
01662   0 26000 0 05272          FMP R
01663   0 60100 0 05427          STO COMMON+1
01664   0 56000 0 05427          LDQ COMMON+1
01665   0 26000 0 05113          FMP QBALL
01666   0 60100 0 05205          STO VRKY3-6                 TIME DOT = (N/2PI)ERQ
01667   0 76100 0 01775          NOP KEXIT
01670   0 02000 0 02211          TRA BEEPE                   TO PICK UP BS FOR
01671   0 50000 0 05264  KEQUI   CLA RE                      THE EQUILIBRIUM ORBIT
01672   0 30200 0 05054          FSB R2E
01673   0 24000 0 05336          FDH DELTAR
01674  -0 60000 0 05071          STQ X
01675   0 26000 0 05071          FMP X
01676   0 60100 0 05072          STO XSQ
01677   0 56000 0 05072          LDQ XSQ
01700   0 26000 0 05071          FMP X
01701   0 60100 0 05030          STO XCUB
01702   0 30200 0 05071          FSB X
01703   0 60100 0 05426          STO COMMON
01704   0 24000 0 05147          FDH 6FL
01705  -0 60000 0 05074          STQ A4
01706   0 56000 0 05426          LDQ COMMON
01707   0 26000 0 05157          FMP HALF
01710   0 30200 0 05072          FSB XSQ
01711   0 30000 0 05144          FAD 1FL
01712   0 60100 0 05076          STO A2
01713   0 50000 0 05426          CLA COMMON
01714   0 30200 0 05071          FSB X
01715   0 30200 0 05072          FSB XSQ
01716   0 76000 0 00002          CHS
01717   0 24000 0 05145          FDH 2FL
01720  -0 60000 0 05075          STQ A3
01721   0 50000 0 05072          CLA XSQ
01722   0 30200 0 05071          FSB X
01723   0 24000 0 05145          FDH 2FL
01724  -0 60000 0 05426          STQ COMMON
01725   0 50000 0 05426          CLA COMMON
```

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01726   0 30200 0 05074          FSB A4
01727   0 60100 0 05077          STO A1
01730   0 56000 0 05077          LDQ A1                    COMPUTE B FOR E.O.
01731   0 26000 0 05103          FMP B1
01732   0 60100 0 05426          STO COMMON
01733   0 56000 0 05076          LDQ A2
01734   0 26000 0 05102          FMP B2
01735   0 30000 0 05426          FAD COMMON
01736   0 60100 0 05426          STO COMMON
01737   0 56000 0 05075          LDQ A3
01740   0 26000 0 05101          FMP B3
01741   0 30000 0 05426          FAD COMMON
01742   0 60100 0 05426          STO COMMON
01743   0 56000 0 05074          LDQ A4
01744   0 26000 0 05100          FMP B4
01745   0 30000 0 05426          FAD COMMON
01746   0 60100 0 05026          STO B
01747   0 56000 0 05263          LDQ PRE
01750   0 26000 0 05263          FMP PRE
01751   0 60100 0 05426          STO COMMON
01752   0 50000 0 05064          CLA PSQ
01753   0 30200 0 05426          FSB COMMON
01754   0 60100 0 05426          STO COMMON
01755   0 07400 4 05537          TSX SQRT,4
01756   0 00000 0 01206          HTR TRAAL
01757   0 60100 0 05047          STO QINVE
01760   0 50000 0 05144          CLA 1FL
01761   0 24000 0 05047          FDH QINVE
01762  -0 60000 0 05050          STQ QBALE
01763   0 26000 0 05263          FMP PRE
01764   0 60100 0 05426          STO COMMON
01765   0 56000 0 05426          LDQ COMMON
01766   0 26000 0 05264          FMP RE
01767   0 60100 0 05204          STO VRKY3-7               RE DOT = (RE) Q (PRE)
01770   0 56000 0 05264          LDQ RE
01771   0 26000 0 05026          FMP B
01772   0 30200 0 05047          FSB QINVE
01773   0 76000 0 00002          CHS
01774   0 60100 0 05203          STO VRKY3-8               PRE DOT = QINVE - (RE) B
01775   0 50000 0 05406  KEXIT   CLA NZM
01776   0 10000 0 02003          TZE *+5
01777   0 50000 0 05267          CLA Z
02000   0 76000 0 00003          SSP
02001   0 30200 0 05343          FSB ZMAX
02002   0 12000 0 02060          TPL ZLRGE
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02003 -0 53400 1 05160          LXD JUNK,1
02004 -0 53400 2 05161          LXD JUNK+1,2
02005 -0 53400 4 05162          LXD JUNK+2,4
02006  0 02000 4 00001          TRA 1,4                        END OF K ROUTINE
02007  0 07400 4 03102  POPR    TSX OUT,4
02010  0 00000 0 01206          HTR TRAAL
02011  3 35374 0 02015          PTH NEGSQ,0,15100
02012  1 00001 0 00006          PON 6,0,1
02013 -1 00000 0 00361          FVE 241
02014  0 00000 0 01206          HTR TRAAL
02015  625051637447     NEGSQ   BCD  SQRT(PSQ-PRSQ) IMAGINARY. PARAMETERS PROBABLY IN WRONG.
02016  625040475162
02017  503460314421
02020  273145215170
02021  336047215121
02022  442563255162
02023  604751462221
02024  224370603145
02025  606651464527
02026  336060606060
02027  303163606263             BCD 5HIT START TO GO TO NEXT CASE.
02030  215163606346
02031  602746606346
02032  604525676360
02033  232162253360
02034  0 07400 4 03102  RLRGE   TSX OUT,4
02035  0 00000 0 01206          HTR TRAAL
02036  3 31454 0 02043          PTH ROMAR,0,13100
02037 -0 00057 0 05046          FOR REVCO,0,47
02040  1 00001 0 00006          PON 6,0,1
02041 -1 00000 0 00361          FVE 241
02042  0 00000 0 01206          HTR TRAAL
02043  516046652551     ROMAR   BCD 8R OVER RMAX. HAD           REVOLUTIONS TO RUN.
02044  605144216733
02045  603021246060
02046  606060606060
02047  606051256546
02050  436463314645
02051  626063466051
02052  644533606060
02053  303163606263             BCD 5HIT START TO RUN NEXT CASE.
02054  215163606346
02055  605164456045
02056  256763602321
02057  622533606060
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02060   0 07400 4 03102  ZLRGE TSX OUT,4
02061   0 00000 0 01206        HTR TRAAL
02062   3 31454 0 02067        PTH ZOZMX,0,13100
02063  -0 00057 0 05046        FOR REVCO,0,47
02064   1 00001 0 00006        PON 6,0,1
02065  -1 00000 0 00361        FVE 241
02066   0 00000 0 01206        HTR TRAAL
02067   716046652551    ZOZMX BCD 8Z OVER ZMAX. HAD          REVOLUTIONS TO RUN.
02070   607144216733
02071   603021246060
02072   606060606060
02073   606051256546
02074   436463314645
02075   626063466051
02076   644533606060
02077   303163606263           BCD 5HIT START TO RUN NEXT CASE.
02100   215163606346
02101   605164456045
02102   256763602321
02103   622533606060
02104   0 07400 4 03102  RSMLL TSX OUT,4
02105   0 00000 0 01206        HTR TRAAL
02106   3 21602 0 02112        PTH RLRIN,0,9090
02107   1 00001 0 00006        PON 6,0,1
02110  -1 00000 0 00361        FVE 241
02111   0 00000 0 01206        HTR TRAAL
02112   516043256262    RLRIN BCD 9R LESS THAN RMIN. HIT START TO GO ON TO NEXT CASE.
02113   606330214560
02114   514431453360
02115   303163606263
02116   215163606346
02117   602746604645
02120   606346604525
02121   676360232162
02122   253360606060
02123   0 50000 0 05272  BEEP  CLA R
02124   0 30200 0 05067        FSB FRIA
02125   0 24000 0 05336        FDH DELTAR
02126  -0 60000 0 05426        STQ COMMON
02127   0 50000 0 05426        CLA COMMON
02130   0 07400 4 03024        TSX FLOFX,4
02131   0 00000 0 00043        PZE 35
02132   0 00000 0 01206        HTR TRAAL
02133   0 60100 0 05115        STO FIX
02134   0 10000 0 01206        TZE TRAAL
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02135   0 07400 4 03044          TSX FXFLO,4
02136   0 00000 0 00043          PZE 35
02137   0 00000 0 01206          HTR TRAAL
02140   0 60100 0 05122          STO FLT
02141   0 56000 0 05122          LDQ FLT
02142   0 26000 0 05336          FMP DELTAR
02143   0 30000 0 05067          FAD FRIA
02144   0 60100 0 05073          STO R2
02145   0 56000 0 05115          LDQ FIX
02146   0 20000 0 05063          MPY BEER
02147  -0 60000 0 05117          STQ INT
02150   0 50000 0 05117          CLA INT
02151   0 40000 0 05063          ADD BEER
02152   0 40000 0 05063          ADD BEER
02153   0 40000 0 05140          ADD FX1
02154   0 73400 1 00000          PAX 0,1
02155   0 53400 2 05142          LXA FX4,2
02156   0 50000 0 05043          CLA TC1
02157   0 76000 0 00001          LBT
02160   0 02000 0 02170          TRA INCTC
02161   0 50000 0 02173          CLA TXI1
02162   0 40000 0 05150          ADD BIT
02163   0 62200 0 02173          STD TXI1
02164   0 34000 0 05127          CAS TW1
02165   0 00000 0 01206  TOFAR   HTR TRAAL
02166   0 02000 0 02203          TRA SETDC
02167   0 76100 0 00000          NOP
02170   0 50000 0 05043  INCTC   CLA TC1
02171   0 40000 0 05140          ADD FX1
02172   0 60100 0 05043          STO TC1
02173   1 00000 1 02174  TXI1    TXI CLAP1,1,0
02174   0 50000 1 17767  CLAP1   CLA APIARY,1
02175   0 60100 2 05104          STO B5,2
02176   0 76100 0 02206          NOP BFORZ          CHANGED TO TRA IF Z MOTION USED
02177   2 00000 1 02201  TIXN    TIX NEXT,1,0
02200   0 76100 0 00000          NOP
02201   2 00001 2 02174  NEXT    TIX CLAP1,2,1
02202   0 02000 0 01437          TRA RIGHT+1
02203  -0 75400 0 00000  SETDC   PXD
02204   0 62200 0 02173          STD TXI1
02205   0 02000 0 02170          TRA INCTC
02206   0 50000 1 13032  BFORZ   CLA BTHETA,1
02207   0 60100 2 05111          STO DB5,2
02210   0 02000 0 02177  FORSU   TRA TIXN
02211   0 50000 0 05264  BEEPE   CLA RE
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02212   0 30200 0 05067          FSB FRIA
02213   0 24000 0 05336          FDH DELTAR
02214  -0 60000 0 05426          STQ COMMON
02215   0 50000 0 05426          CLA COMMON
02216   0 07400 4 03024          TSX FLOFX,4
02217   0 00000 0 00043          PZE 35
02220   0 00000 0 01206          HTR TRAAL
02221   0 60100 0 05115          STO FIX
02222   0 10000 0 02104          TZE RSMLL
02223   0 07400 4 03044          TSX FXFLO,4
02224   0 00000 0 00043          PZE 35
02225   0 00000 0 01206          HTR TRAAL
02226   0 60100 0 05122          STO FLT
02227   0 56000 0 05122          LDQ FLT
02230   0 26000 0 05336          FMP DELTAR
02231   0 30000 0 05067          FAD FRIA
02232   0 60100 0 05054          STO R2E
02233   0 56000 0 05115          LDQ FIX
02234   0 20000 0 05063          MPY BEER
02235  -0 60000 0 05117          STQ INT
02236   0 50000 0 05117          CLA INT
02237   0 40000 0 05063          ADD BEER
02240   0 40000 0 05063          ADD BEER
02241   0 40000 0 05140          ADD FX1
02242   0 73400 1 00000          PAX 0,1
02243   0 53400 2 05142          LXA FX4,2
02244   0 50000 0 05044          CLA TC2
02245   0 76000 0 00001          LBT
02246   0 02000 0 02256          TRA INTC2
02247   0 50000 0 02261          CLA TXI2
02250   0 40000 0 05150          ADD BIT
02251   0 62200 0 02261          STD TXI2
02252   0 34000 0 05130          CAS TW2
02253   0 00000 0 02253  TOFR    HTR TOFR
02254   0 02000 0 02270          TRA STDC
02255   0 76100 0 00000          NOP
02256   0 50000 0 05044  INTC2   CLA TC2
02257   0 40000 0 05140          ADD FX1
02260   0 60100 0 05044          STO TC2
02261   1 00000 1 02262  TXI2    TXI CLAP2,1,0
02262   0 50000 1 17767  CLAP2   CLA APIARY,1
02263   0 60100 2 05104          STO B5,2
02264   2 00000 1 02266          TIX NEXT2,1,0
02265   0 76100 0 00000          NOP
02266   2 00001 2 02262  NEXT2   TIX CLAP2,2,1
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02267   0 02000 0 01671          TRA KEQUI
02270  -0 75400 0 00000   STDC   PXD
02271   0 62200 0 02261          STD TXI2
02272   0 02000 0 02256          TRA INTC2
02273   0 50000 0 05056   GAP    CLA GAPLO
02274   0 30000 0 05045          FAD ADVGP
02275   0 60100 0 05056          STO GAPLO
02276   0 56000 0 05066          LDQ E
02277   0 26000 0 05113          FMP QBALL
02300   0 60100 0 05426          STO COMMON
02301   0 56000 0 05426          LDQ COMMON
02302   0 26000 0 05272          FMP R
02303   0 60100 0 05426          STO COMMON
02304   0 56000 0 05426          LDQ COMMON
02305   0 26000 0 05061          FMP EPGAP
02306   0 60100 0 05426          STO COMMON
02307   0 56000 0 05426          LDQ COMMON
02310   0 26000 0 05347          FMP GPRIM
02311   0 30000 0 05271          FAD PR
02312   0 60100 0 05271          STO PR
02313   0 50000 0 05403          CLA NACON
02314   0 10000 0 02332          TZE *+14
02315   0 56000 0 05066          LDQ E
02316   0 26000 0 05050          FMP QBALE
02317   0 60100 0 05426          STO COMMON
02320   0 56000 0 05426          LDQ COMMON
02321   0 26000 0 05264          FMP RE
02322   0 60100 0 05426          STO COMMON
02323   0 56000 0 05426          LDQ COMMON
02324   0 26000 0 05061          FMP EPGAP
02325   0 60100 0 05426          STO COMMON
02326   0 56000 0 05426          LDQ COMMON
02327   0 26000 0 05346          FMP GPRIE
02330   0 30000 0 05263          FAD PRE
02331   0 60100 0 05263          STO PRE
02332   0 76100 0 02361   TAT    NOP LTO
02333   0 56000 0 05350          LDQ OMEGA
02334   0 26000 0 05265          FMP TIME
02335   0 30200 0 05270          FSB THETA
02336   0 76000 0 00002          CHS
02337   0 60100 0 05426          STO COMMON
02340   0 56000 0 05426          LDQ COMMON
02341   0 26000 0 05146          FMP 3FL
02342   0 07400 4 05440          TSX COS,4
02343   0 60100 0 05427          STO COMMON+1
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02344   0 50000 0 05426          CLA COMMON
02345   0 07400 4 05440          TSX COS,4
02346   0 60100 0 05426          STO COMMON
02347   0 30200 0 05427          FSB COMMON+1
02350   0 60100 0 05427          STO COMMON+1
02351   0 56000 0 05427          LDQ COMMON+1
02352   0 26000 0 05352          FMP EPSGP
02353   0 30200 0 05426          FSB COMMON
02354   0 76000 0 00002          CHS
02355   0 60100 0 05426          STO COMMON
02356   0 56000 0 05426          LDQ COMMON                  COMMON = PHASE DEPENDENCE OF
02357   0 26000 0 05061          FMP EPGAP                  GAP ENERGY
02360   0 02000 0 02362          TRA *+2
02361   0 50000 0 05061  LTO     CLA EPGAP
02362   0 30000 0 05066          FAD E
02363   0 60100 0 05066          STO E
02364   0 56000 0 05066          LDQ E
02365   0 26000 0 05066          FMP E
02366   0 30200 0 05144          FSB 1FL
02367   0 07400 4 05537          TSX SQRT,4
02370   0 42000 0 05537          HPR SQRT
02371   0 60100 0 05423          STO P
02372   0 24000 0 05066          FDH E
02373  -0 60000 0 05065          STQ BETA
02374   0 56000 0 05423          LDQ P
02375   0 26000 0 05423          FMP P
02376   0 60100 0 05064          STO PSQ
02377   0 02000 0 01136          TRA BOXM1
02400   0 76000 0 00166  PLOTR   PSE 118              IF S.S. 6 DOWN PLOTS WILL BE ON CIRCLE.
02401   0 02000 0 02507          TRA RLSRB
02402   0 50000 0 05272          CLA R
02403   0 30200 0 05357          FSB RBARP
02404   0 60100 0 05426          STO COMMON
02405   0 50000 0 05271          CLA PR
02406   0 30200 0 05356          FSB PRBRP
02407   0 60100 0 05427          STO COMMON+1
02410   0 56000 0 05427          LDQ COMMON+1
02411   0 26000 0 05412          FMP BPR
02412   0 60100 0 05430          STO COMMON+2
02413   0 56000 0 05426          LDQ COMMON
02414   0 26000 0 05414          FMP DPR
02415   0 30200 0 05430          FSB COMMON+2
02416   0 60100 0 05430          STO COMMON+2
02417   0 56000 0 05430          LDQ COMMON+2
02420   0 26000 0 05707          FMP COEF
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02421   0 60100 0 05431          STO COMMON+3
02422   0 56000 0 05413          LDQ CPR
02423   0 26000 0 05426          FMP COMMON
02424   0 60100 0 05430          STO COMMON+2
02425   0 56000 0 05427          LDQ COMMON+1
02426   0 26000 0 05411          FMP APR
02427   0 30200 0 05430          FSB COMMON+2
02430   0 60100 0 05430          STO COMMON+2
02431   0 56000 0 05430          LDQ COMMON+2
02432   0 26000 0 05707          FMP COEF
02433   0 60100 0 05432          STO COMMON+4
02434   0 50000 0 05431  TSTOV   CLA COMMON+3
02435   0 76000 0 00003          SSP
02436   0 30200 0 05355          FSB SCALE
02437   0 12000 0 02451          TPL HALT
02440   0 50000 0 05432          CLA COMMON+4
02441   0 76000 0 00003          SSP
02442   0 30200 0 05355          FSB SCALE
02443   0 12000 0 02451          TPL HALT
02444   0 50000 0 05431          CLA COMMON+3
02445   0 56000 0 05432          LDQ COMMON+4
02446   0 76600 0 00030          WTV
02447   0 07400 4 05710          TSX PLXY1,4
02450   0 02000 0 01143          TRA BOXO1
02451   0 07400 4 03102  HALT    TSX OUT,4
02452   0 00000 0 01206          HTR TRAAL
02453   3 35374 0 02470          PTH OVER1,0,15100
02454   1 00001 0 00006          PON 6,0,1
02455  -1 00000 0 00361          FVE 241
02456   0 42000 0 00000          HPR
02457   0 76000 0 00165          PSE 117
02460   0 02000 0 02462          TRA *+2
02461   0 02000 0 02465          TRA *+4
02462   0 50000 0 02467          CLA HALTO+1
02463   0 60100 0 02451          STO HALT
02464   0 02000 0 01143          TRA BOXO1
02465   0 02000 0 01206          TRA TRAAL
02466   0 07400 4 03102  HALTO   TSX OUT,4
02467   0 02000 0 01143          TRA BOXO1
02470   473123636451     OVER1   BCD  PICTURE OVERFLOWED. PUT S.S. 5 DWN TO GO TO NEXT CASE. LEAVE
02471   256046652551
02472   264346662524
02473   336047646360
02474   623362336005
02475   602466456063
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02476  466027466063
02477  466045256763
02500  602321622533
02501  604325216525
02502  316360644773          BCD 5IT UP, HIT START TO CONTINUE.
02503  603031636062
02504  632151636063
02505  466023464563
02506  314564253360
02507   0 50000 0 05403  RLSRB CLA NACON
02510  -0 10000 0 02521        TNZ *+9
02511   0 56000 0 05271        LDQ PR
02512   0 26000 0 05342        FMP ADJPR
02513   0 30200 0 05356        FSB PRBRP
02514   0 60100 0 05432        STO COMMON+4
02515   0 50000 0 05272        CLA R
02516   0 30200 0 05357        FSB RBARP
02517   0 60100 0 05431        STO COMMON+3
02520   0 02000 0 02434        TRA TSTOV
02521   0 50000 0 05263        CLA PRE
02522   0 60100 0 05356        STO PRBRP
02523   0 50000 0 05264        CLA RE
02524   0 60100 0 05357        STO RBARP
02525   0 02000 0 02511        TRA RLSRB+2
                               RKY3 MURA FLOATING POINT RUNGE-KUTTA                    MURKY3
02526   0 50000 4 00001  RKY3  CLA 1,4              H TO AC                          RKY30001
02527   0 60100 0 05257        STO TURKY3+4         SAVE H                           RKY30002
02530  -0 63400 1 05260        SXD TURKY3+5,1       SAVE IR1                         RKY30003
02531  -0 63400 2 05261        SXD TURKY3+6,2       SAVE IR2                         RKY30004
02532  -0 63400 4 05262        SXD TURKY3+7,4       SAVE IR4                         RKY30005
02533  -0 53400 2 02704        LXD RKY3+110,2       SET IR2=4                        RKY30006
02534   0 50000 2 02710        CLA RKY3+114,2       SET SWITCH                       RKY30007
02535   0 62100 0 02545        STA RKY3+15                                           RKY30008
02536   0 53400 1 05131        LXA NURKY3,1
02537   0 07400 4 01422        TSX WRKY3,4          COMPUTE F(I)                     RKY30010
02540   0 56000 1 05213        LDQ VRKY3,1          F(I)                             RKY30011
02541   0 26000 0 05257        FMP TURKY3+4         FORM K(IJ)=H F(I)                RKY30012
02542   0 10000 0 02544        TZE RKY3+14          IF ZERO,DO NOT ROUND             RKY30013
02543  -0 50100 0 02671        ORA RKY3+99          ROUND                            RKY30014
02544   0 76500 0 00043        LRS 35               K(IJ) TO MQ                      RKY30015
02545   0 02000 0 00000        TRA 0                SWITCH(TO EVALUATE EACH EQ.)     RKY30016
02546   0 50000 1 05203        CLA QRKY3,1          EPSILON(I) TERM                  RKY30017
02547   0 56000 0 02673        LDQ RKY3+101         CLEAR MQ                         RKY30018
02550   0 07400 4 02630        TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD. RKY30019
02551   0 30000 1 05243        FAD YRKY3,1          +Y(I)                            RKY30020
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02552  0 60100 1 05273     STO XRKY3,1          FOR NEXT EQUATION                          RKY30021
02553 -3 00001 2 02562     TXL RKY3+28,2,1      TO PREPARE FOR NEXT STEP                   RKY30022
02554  2 00001 1 02540     TIX RKY3+10,1,1      LOOP,DONE AFTER N PASSES                   RKY30023
02555  2 00001 2 02534     TIX RKY3+6,2,1       LOOP,DONE AFTER 4 PASSES                   RKY30024
02556 -0 53400 1 05260     LXD TURKY3+5,1       RESTORE IR1                                RKY30025
02557 -0 53400 2 05261     LXD TURKY3+6,2       RESTORE IR2                                RKY30026
02560 -0 53400 4 05262     LXD TURKY3+7,4       RESTORE IR4                                RKY30027
02561  0 02000 4 00002     TRA 2,4              OUT                                        RKY30028
02562  0 60100 1 05243     STO YRKY3,1          Y(I)                                       RKY30029
02563 -0 60000 1 05203     STQ QRKY3,1          SAVE EPSILON(I)TERM FOR NEXT STEP          RKY30030
02564  0 02000 0 02554     TRA RKY3+22                                                     RKY30031
02565 -0 60000 1 05253     STQ RRKY3,1          K(I0)                                      RKY30032
02566  0 26000 0 02674     FMP RKY3+102         1/2 K(I0)                                  RKY30033
02567  0 60100 0 05253     STO TURKY3           STORE FOR DP FLOATING PT. ADD.             RKY30034
02570 -0 60000 0 05254     STQ TURKY3+1                                                    RKY30035
02571  0 02000 0 02546     TRA RKY3+16          TO MAIN                                    RKY30036
02572 -0 60000 1 05233     STQ SRKY3,1          K(I1)                                      RKY30037
02573  0 26000 0 02675     FMP RKY3+103         (1-SQ.RT.1/2)K(I1)                         RKY30038
02574  0 60100 0 05253     STO TURKY3           STORE FOR DP FLOATING PT. ADD.             RKY30039
02575 -0 60000 0 05254     STQ TURKY3+1                                                    RKY30040
02576  0 56000 1 05253     LDQ RRKY3,1          K(I0)                                      RKY30041
02577  0 26000 0 02676     FMP RKY3+104         (-1/2+SQ.RT.1/2)K(I0)                      RKY30042
02600  0 07400 4 02630     TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD.      RKY30043
02601  0 02000 0 02546     TRA RKY3+16          TO MAIN                                    RKY30044
02602 -0 60000 1 05223     STQ URKY3,1          K(I2)                                      RKY30045
02603  0 26000 0 02677     FMP RKY3+105         (1+SQ.RT.1/2)K(I2)                         RKY30046
02604  0 60100 0 05253     STO TURKY3           STORE FOR DP FLOATING PT. ADD.             RKY30047
02605 -0 60000 0 05254     STQ TURKY3+1                                                    RKY30048
02606  0 56000 1 05233     LDQ SRKY3,1          K(I1)                                      RKY30049
02607  0 26000 0 02700     FMP RKY3+106         (-SQ.RT.1/2)K(I1)                          RKY30050
02610  0 07400 4 02630     TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD.      RKY30051
02611  0 02000 0 02546     TRA RKY3+16          TO MAIN                                    RKY30052
02612 -0 60000 1 05213     STQ VRKY3,1          K(I3)                                      RKY30053
02613  0 26000 0 02701     FMP RKY3+107         (1/6)K(I3)                                 RKY30054
02614  0 60100 0 05253     STO TURKY3           STORE FOR DP FLOATING PT. ADD.             RKY30055
02615 -0 60000 0 05254     STQ TURKY3+1                                                    RKY30056
02616  0 56000 1 05223     LDQ URKY3,1          K(I2)                                      RKY30057
02617  0 26000 0 02702     FMP RKY3+108         1/3(1+SQ.RT.1/2)K(I2)                      RKY30058
02620  0 07400 4 02630     TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD.      RKY30059
02621  0 56000 1 05233     LDQ SRKY3,1          K(I1)                                      RKY30060
02622  0 26000 0 02703     FMP RKY3+109         1/3(1-SQ.RT.1/2)K(I1)                      RKY30061
02623  0 07400 4 02630     TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD.      RKY30062
02624  0 56000 1 05253     LDQ RRKY3,1          K(I0)                                      RKY30063
02625  0 26000 0 02701     FMP RKY3+107         (1/6)K(I0)                                 RKY30064
02626  0 07400 4 02630     TSX RKY3+66,4        TO DOUBLE PRECISION FLOATING PT. ADD.      RKY30065
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02627  0 02000 0 02546    TRA RKY3+16          TO MAIN                                  RKY30066
02630 -0 60000 0 05255    STQ TURKY3+2         DP FLOATING PT. ADD, STORE A(2)          RKY30067
02631  0 30000 0 05253    FAD TURKY3           A(1)+B(1)                                RKY30068
02632  0 60100 0 05256    STO TURKY3+3         STORE MSP                                RKY30069
02633 -0 75400 0 00000    PXD                  CLEAR AC                                 RKY30070
02634  0 76300 0 00043    LLS 35               LSP TO AC                                RKY30071
02635  0 30000 0 05255    FAD TURKY3+2         +A(2)                                    RKY30072
02636  0 30000 0 05254    FAD TURKY3+1         +B(2)                                    RKY30073
02637  0 30000 0 05256    FAD TURKY3+3         +MSP OF A(1)+B(1)                        RKY30074
02640  0 60100 0 05253    STO TURKY3           STORE MSP OF SUM                         RKY30075
02641  0 16200 0 02662    TQP RKY3+92                                                   RKY30076
02642 -0 12000 0 02657    TMI RKY3+89          HERE IF MQ-, OUT IF AC-                  RKY30077
02643  0 40200 0 02671    SUB RKY3+99          HERE IF MQ-,AC+,-1 IN 35TH BIT           RKY30078
02644  0 60100 0 05256    STO TURKY3+3                                                  RKY30079
02645  0 76000 0 00000    CLM                  CLEAR MAGNITUDE AC                       RKY30080
02646 -0 77300 0 00011    RQL 9                SEPERATE CHARACTERISTIC                  RKY30081
02647 -0 76300 0 00033    LGL 27               FROM FRACTION OF LSP                     RKY30082
02650  0 10000 0 02665    TZE RKY3+95          IF ZERO,TRANSFER                         RKY30083
02651 -0 76000 0 00003    SSM                  -FRACTION OF LSP                         RKY30084
02652  0 40000 0 02670    ADD RKY3+98          1-FRACTION                               RKY30085
02653 -0 60000 0 05254    STQ TURKY3+1                                                  RKY30086
02654 -0 60200 0 05254    ORS TURKY3+1         COMBINE CHARACTERISTIC AND FRACTION      RKY30087
02655  0 50200 0 05254    CLS TURKY3+1         -LSP                                     RKY30088
02656  0 30000 0 05256    FAD TURKY3+3         +MSP                                     RKY30089
02657  0 60100 0 05253    STO TURKY3           MSP                                      RKY30090
02660 -0 60000 0 05254    STQ TURKY3+1         LSP                                      RKY30091
02661  0 02000 4 00001    TRA 1,4              OUT                                      RKY30092
02662  0 12000 0 02657    TPL RKY3+89          HERE IF MQ+,OUT IF AC+                   RKY30093
02663  0 40000 0 02671    ADD RKY3+99          HERE IF MQ+,AC-,+1 IN 35TH BIT           RKY30094
02664  0 02000 0 02644    TRA RKY3+78                                                   RKY30095
02665  0 50000 0 05253    CLA TURKY3           HERE IF LSP=0, REPLACE MSP               RKY30096
02666  0 76500 0 00000    LRS                  SIGN OF MSP REPLACES SIGN OF LSP         RKY30097
02667  0 02000 0 02657    TRA RKY3+89                                                   RKY30098
02670 +001000000000       OCT 001000000000     1 IN 8TH BIT                             RKY30099
02671  0 00000 0 00001    HTR 1                1 IN 35TH BIT                            RKY30100
02672  0 00000 0 05131    HTR NURKY3           NUMBER OF EQUATIONS                      RKY30101
02673  0 00000 0 00000    HTR                  ZERO                                     RKY30102
02674 +200400000000       OCT 200400000000     1/2                                      RKY30103
02675 +177453730315       OCT 177453730315     1-SQ.RT.(1/2)                            RKY30104
02676 +176650117146       OCT 176650117146     -1/2+SQ.RT.(1/2)                         RKY30105
02677 +201665011715       OCT 201665011715     1+SQ.RT.(1/2)                            RKY30106
02700 -200552023632       OCT 600552023632     -SQ.RT.(1/2)                             RKY30107
02701 +176525252525       OCT 176525252525     1/6                                      RKY30108
02702 +200443261211       OCT 200443261211     1/3(1+SQ.RT.1/2)                         RKY30109
02703 +175617713146       OCT 175617713146     1/3(1-SQ.RT.1/2)                         RKY30110
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02704   0 00004 0 02565          HTR RKY3+31,0,4     SWITCH CONSTANTS                    RKY30111
02705   0 00000 0 02572          HTR RKY3+36                                             RKY30112
02706   0 00000 0 02602          HTR RKY3+44                                             RKY30113
02707   0 00000 0 02612          HTR RKY3+52                                             RKY30114
                  02710  ARCOS   BSS 76
                  03024  FLOFX   BSS 16
                  03044  FXFLO   BSS 30
                  03102  OUT     BSS 408
                  03732  INP1    BSS 572
05026   0 00000 0 00000  B                    MAGNETIC FIELD OBTAINED BY INTERPOLATION
05027   0 00000 0 00000 DTHETA                THETA DERIVATIVE OF B
05030   0 00000 0 00000  XCUB                 X CUBED
05031   0 00000 0 00000  RSPAN                INCREMENT OF R IN APIARY=MARIA-FRIA
05032   0 00000 0 00000  MARIA                MAXIMUM R IN APIARY
05033   0 00000 0 00000  RKST1                     COUNTER TO TEST FOR PLOTTING
05034   0 00000 0 00000  RKST2                     COUNTER TO TEST FOR END OF REV.
05035   0 00000 0 00000  RKST4                     COUNTER TO TEST FOR PRINT OUT
05036   0 00000 0 00000  RKSPR                     NO. OF R.K. STIPS PER REV.
05037   0 00000 0 00000  TRY1C                     COUNTER TO REREAD TAPE 1
05040   0 00000 0 00000  TRY2C                     COUNTER TO REREAD TAPE 2
05041   0 00000 0 00000  SBEER                     K*NSTAR
05042   0 00000 0 00000  LOCR                      LOCATION OF R ON TAPE
05043   0 00000 0 00000  TC1                       TEST COUNTER FOR B PICK UP
05044   0 00000 0 00000  TC2                       TEST COUNTER FOR B PICK UP
05045   0 00000 0 00000  ADVGP                     2+I/GAPPR TO ADVANCE GAP
05046   0 00000 0 00000  REVCO                     REVOLUTION COUNTER
05047   0 00000 0 00000  QINVE                     SQ.RT.(PSQ-PRSQ) FOR RE
05050   0 00000 0 00000  QBALE                     1/QINVE
05051   0 76100 0 17767  MAP    NOP APIARY
05052   0 76100 0 13032  MAD    NOP BTHETA
05053   0 76200 0 00222  RTB2   RTB 2
05054   0 00000 0 00000  R2E                       R FOR INTERPOLATING AT EQUI. ORBIT
05055   0 00000 0 00000  PLTT                      PLOT TEMP. TO TEST FOR PLT TH TRUE SEC.
05056   0 00000 0 00000  GAPLO                     GAP LOCATION
05057   0 00000 0 00000  ENDFI                     COUNTER TELL NUMBER OF FILES PER PICTURE
05060  +000000004735     MAXSTO DEC 2525          MAXIMUM STORAGE IN APIARY
05061   0 00000 0 00000  EPGAP                     DELTA/GAPPR = ENERGY GAIN PER GAP
05062   0 00000 0 00000  BEERT                     TEMP FOR PICK UP ROUTINE
05063   0 00000 0 00000  BEER                      IKNSTAR = NO. WORDS PER RECORD
05064   0 00000 0 00000  PSQ                       R SQUARED
05065   0 00000 0 00000  BETA                      P/E
05066   0 00000 0 00000  E                         SQ. RT. (PSQ+1)
05067   0 00000 0 00000  FRIA                      FIRST R IN APIARY
05070   0 00000 0 00000  RAP                       NO. RECORD IN APIARY
05071   0 00000 0 00000  X                         FOR INTERPOLATION
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05072  0 00000 0 00000  XSQ                          FOR INTERPOLATION
05073  0 00000 0 00000  R2
05074  0 00000 0 00000  A4
05075  0 00000 0 00000  A3
05076  0 00000 0 00000  A2                           TEMPS FOR INTERPOLATING
05077  0 00000 0 00000  A1
05100  0 00000 0 00000  B4
05101  0 00000 0 00000  B3
05102  0 00000 0 00000  B2
05103  0 00000 0 00000  B1
05104  0 00000 0 00000  B5
05105  0 00000 0 00000  DB4
05106  0 00000 0 00000  DB3
05107  0 00000 0 00000  DB2                          TEMPS FOR INTERPOLATING
05110  0 00000 0 00000  DB1
05111  0 00000 0 00000  DB5
05112  0 00000 0 00000  QINV                         SQ.RT.(PSQ-PRSQ)
05113  0 00000 0 00000  QBALL                        1/QINV
05114  0 00000 0 00000  DBDR                         DERIVATIVE OF B W.R.T. R
05115  0 00000 0 00000  FIX                          TEMP USED IN BEEP
05116  0 00000 0 00000  PNT
05117  0 00000 0 00000  INT
05120  0 00000 0 00000  RMAX
05121  0 00000 0 00000  KFL
05122  0 00000 0 00000  FLT                          TEMP USED IN BEEP
05123  0 02000 0 00000  TRA    TRA                   USED IN SETTING CODE
05124  0 76100 0 00000  NOP    NOP                   USED IN SETTING CODE
05125  0 77200 0 00201 REWSTP REW 1
05126  0 00000 0 00000         HTR
05127  1 00000 1 02174  TW1    TXI CLAP1,1,0
05130  1 00000 1 02262  TW2    TXI CLAP2,1,0
05131 +000000000010     NURKY3 DEC 8
05132 +000000000010     NURKY4 DEC 8
05133 -1 00000 0 00364  FVE    FVE 244
05134 -1 00000 0 00361         FVE 241
05135  1 00000 0 00006  PON    PON 6,0,0
05136  1 00060 0 00006         PON 6,0,48
05137  1 00001 0 00006         PON 6,0,1
05140 +000000000001     FX1    OCT 000000000001
05141 +000000000002     FX2    OCT 000000000002
05142 +000000000004     FX4    OCT 000000000004
05143 +000000000005     FX5    OCT 000000000005
05144 +201400000000     1FL    DEC 1.0
05145 +202400000000     2FL    DEC 2.0
05146 +202600000000     3FL    DEC 3.0
```

```
05147 +203600000000      6FL    DEC 6.0
05150 +000001000000      BIT    OCT 000001000000      1 IN 17TH BIT
05151 +155414336750      RONDO. DEC .000001
05152 +155414336750      EPST   DEC .000001
05153 +001000000000      SHIFT  OCT 001000000000
05154 +177525252524      THIRD  DEC .33333333
05155 +176525252527      SIXTH  DEC .16666667
05156 +203622077326      2PI    DEC 6.2831854
05157 +200400000000      HALF   DEC .5
                  05160  JUNK   BSS 11
                  05203  QRKY3  BES 8
                  05213  VRKY3  BES 8
                  05223  URKY3  BES 8
                  05233  SRKY3  BES 8
                  05243  YRKY3  BES 8
                  05253  RRKY3  BES 8
                  05253 TURKY3  BSS 8
                  05273  XRKY3  BES 8
                  05263    PRE  SYN XRKY3-8
                  05264   RE    SYN XRKY3-7
                  05265  TIME   SYN XRKY3-6
                  05266   PZ    SYN XRKY3-5
                  05267   Z     SYN XRKY3-4
                  05270  THETA  SYN XRKY3-3
                  05271   PR    SYN XRKY3-2
                  05272   R     SYN XRKY3-1
                  05303         ORG 2755
05303   0 02000 0 00004         TRA 4
05304   0 00000 0 00000  KYWRD          -NORNS,--PRNTO,NACCE,NACON,PLT,PLOFF,NZM,TIMIN,HNTRS.
05305   0 00000 0 00000  RUNNO
05306   0 00000 0 00000  JX             AMPLITUDE OF R ELLIPSE
05307   0 00000 0 00000  JZ             AMPLITUDE OF Z ELLIPSE
05310   0 00000 0 00000  PSIX           PHASE OF R ELLIPSE
05311   0 00000 0 00000  PSIZ           PHASE OF Z ELLIPSE
05312   0 00000 0 00000  PRINT
05313   0 00000 0 00000  INRKS          STARTING R.K. STEP
05314   0 00000 0 00000  SPLOT          R.K. STEP FOR STARTING PLOT
05315   0 00000 0 00000  PORES          P GUESS FOR RESONANCE
05316   0 00000 0 00000  NURR           NUR AT RESONANCE
05317   0 00000 0 00000  NUZR
05320   0 00000 0 00000  MRES           COEFFICIENT OF NUR RESONANCE
05321   0 00000 0 00000  NRES           COEFFICIENT OF NUZ RESONANCE
05322   0 00000 0 00000  DELPS          DELTA P FOR RESONANCE HUNT
05323   0 00000 0 00000  EPIR           SETS ACCURACY OF ACCEPTABLE RESONANCE
05324   0 00000 0 00000  T4NEW          IS TAPE 4 NEW. IF T4NEW = 0. NO
```

```
05325  010060606060      MONTH BCD 110
05326  076060606060      DAY   BCD 17
05327  051160606060      YEAR  BCD 159
05330 +000000000020      KFX   DEC 16          SAME AS KFL EXCEPT FIXED
05331 +202600000000      NFL   DEC 3.00        NUMBER OF SECTORS PER REVOLUTION
05332 +000000000001      NSTAR DEC 1           NUMBER OF SECTORS PER FIELD CYCLE
05333 +000000000001      BKEY  DEC 1                FIELD IDENTIFICATION WORD
05334 +000000000000      RIN   DEC 0           INITIAL R FOR FIELDS ON TAPE
05335 +175631463146      MROT  DEC .10         MAXIMUM R FOR WHICH FIELDS ARE ON TAPE
05336 +167406111564     DELTAR DEC .001        DELTA R=INCREMENT IN R FOR STORED FIELDS
05337   0 00000 0 00000  PRES                       RESONANCE P
05340   0 00000 0 00000  RESR                       RESONANCE R
05341   0 00000 0 00000  PRRES                      RESONANCE PR
05342 +201400000000      ADJPR DEC 1.0
05343   0 00000 0 00000  ZMAX                       MAXIMUM Z STOP ORBIT IF Z = ZMAX
05344   0 00000 0 00000  DELTA                      ENERGY GAIN PER REV.
05345   0 00000 0 00000  NOREV                      NO. OF REV. PER ORBIT (EACH ORBIT)
05346   0 00000 0 00000  GPRIE                      USED TO CALCULATE DELTA PRE FOR GAP
05347   0 00000 0 00000  GPRIM                      USED TO CALCULATE DELTA PR FOR GAP
05350   0 00000 0 00000  OMEGA                      COEFFICIENT OF TIME
05351   0 00000 0 00000  GAMMA                      TO START ORBIT OUT OF PHAS
05352   0 00000 0 00000  EPSGP                      EPSILON FOR GAP CROSSING
05353   0 00000 0 00000  GAPL1                      INITIAL GAP LOCATION
05354   0 00000 0 00000  GAPPR                      NUMBER OF GAPS PER REVOLUTION
05355   0 00000 0 00000  SCALE                      SCALE ON (R,PR) PLOT. IF=0 USE CIRCLE.
05356   0 00000 0 00000  PRBRP
05357   0 00000 0 00000  RBARP
05360   0 00000 0 00000  AICR
05361   0 00000 0 00000  BICR
05362   0 00000 0 00000  CICR
05363   0 00000 0 00000  DICR
05364   0 00000 0 00000  EICR
05365   0 00000 0 00000  AICZ
05366   0 00000 0 00000  BICZ
05367   0 00000 0 00000  CICZ
05370   0 00000 0 00000  DICZ
05371   0 00000 0 00000  EICZ
05372   0 00000 0 00000  SIPSI                      SIN(PSIX)
05373   0 00000 0 00000  COPSI                      COS(PSIX)
05374   0 00000 0 00000  RBAR                       CENTER OF R ELLIPSE
05375   0 00000 0 00000  PRBAR
05376   0 00000 0 00000  RESZ                       RESONANCE Z
05377   0 00000 0 00000  RESPZ                      RESONANCE PZ
05400   0 00000 0 00000  NORNS                      NUMBER OF RUNS PER FRAME
05401   0 00000 0 00000  PRNTO                      R.K. STEP AT WHICH PRINT OUT IS STARTED
```

```
05402   0 00000 0 00000  NACCE                          NACCE NOT ZERO ACCELERATION IS USED
05403   0 00000 0 00000  NACON                          NACON NOT ZERO ACCELERATION IS CONTINUOUS
05404   0 00000 0 00000  PLT                            PLT NOT ZERO PLOT IS MADE EVERY PLT SECTION
05405   0 00000 0 00000  PLOFF                          PLOFF NOT ZERO (R,PR) AND (,PZ) INFO. SAVED ON
05406   0 00000 0 00000  NZM                            NZM NOT ZERO Z MOTION USED
05407   0 00000 0 00000  TIMIN                          TIMIN NOTZERO TIME EQUATION IS NEEDED
05410   0 00000 0 00000  HNTRS                          HNTRS NOT ZERO CODE 1482 USED TO FIND P RESONA
05411   0 00000 0 00000  APR
05412   0 00000 0 00000  BPR
05413   0 00000 0 00000  CPR
05414   0 00000 0 00000  DPR
05415   0 00000 0 00000  EPR
05416   0 00000 0 00000  APZ
05417   0 00000 0 00000  BPZ
05420   0 00000 0 00000  CPZ
05421   0 00000 0 00000  DPZ
05422   0 00000 0 00000  EPZ
05423 +173507534121      P      DEC .02                 MOMENTUM
05424 -377777777777      ALL7S  OCT 777777777777
05425 +202622077323      PI     DEC 3.1415926
                   05426 COMMON BSS 10
                   05440  COS   BSS 63
                   05441  SIN   SYN COS+1
                   05537  SQRT  BSS 25
05570 -0 63400 4 05437   COMIC  SXD COMMON+9,4          PSIX = PHASE OF R ELLIPSE
05571   0 50000 0 05310         CLA PSIX
05572   0 07400 4 05440         TSX COS,4
05573   0 60100 0 05373         STO COPSI
05574   0 50000 0 05310         CLA PSIX
05575   0 07400 4 05441         TSX SIN,4
05576   0 60100 0 05372         STO SIPSI
05577   0 56000 0 05364         LDQ EICR
05600   0 26000 0 05425         FMP PI
05601   0 60100 0 05426         STO COMMON
05602   0 50000 0 05306         CLA JX
05603   0 24000 0 05426         FDH COMMON
05604 -0 60000 0 05426          STQ COMMON
05605   0 50000 0 05426         CLA COMMON
05606   0 07400 4 05537         TSX SQRT,4
05607   0 00000 0 00000         HTR
05610   0 60100 0 05426         STO COMMON
05611   0 56000 0 05360         LDQ AICR
05612   0 26000 0 05373         FMP COPSI
05613   0 60100 0 05427         STO COMMON+1
05614   0 56000 0 05372         LDQ SIPSI
```

```
05615   0 26000 0 05361         FMP BICR
05616   0 30000 0 05427         FAD COMMON+1
05617   0 60100 0 05427         STO COMMON+1
05620   0 56000 0 05427         LDQ COMMON+1
05621   0 26000 0 05426         FMP COMMON
05622   0 30000 0 05374         FAD RBAR                RBAR=RFOREQUILIBRIUMORBIT
05623   0 60100 0 05340         STO RESR                     R I.C.
05624   0 56000 0 05362         LDQ CICR
05625   0 26000 0 05373         FMP COPSI
05626   0 60100 0 05427         STO COMMON+1
05627   0 56000 0 05363         LDQ DICR
05630   0 26000 0 05372         FMP SIPSI
05631   0 30000 0 05427         FAD COMMON+1
05632   0 60100 0 05427         STO COMMON+1
05633   0 56000 0 05427         LDQ COMMON+1
05634   0 26000 0 05426         FMP COMMON
05635   0 30000 0 05375         FAD PRBAR
05636   0 60100 0 05341         STO PRRES               PR I.C.
05637   0 50000 0 05406         CLA NZM
05640   0 10000 0 05705         TZE LEAVE
05641   0 50000 0 05311         CLA PSIZ                PSIZ
05642   0 07400 4 05440         TSX COS,4
05643   0 60100 0 05373         STO COPSI
05644   0 50000 0 05311         CLA PSIZ
05645   0 07400 4 05441         TSX SIN,4
05646   0 60100 0 05372         STO SIPSI
05647   0 56000 0 05371         LDQ EICZ
05650   0 26000 0 05425         FMP PI
05651   0 60100 0 05426         STO COMMON
05652   0 50000 0 05307         CLA JZ
05653   0 24000 0 05426         FDH COMMON
05654  -0 60000 0 05426         STQ COMMON
05655   0 50000 0 05426         CLA COMMON
05656   0 07400 4 05537         TSX SQRT,4
05657   0 00000 0 00000         HTR
05660   0 60100 0 05426         STO COMMON
05661   0 56000 0 05365         LDQ AICZ
05662   0 26000 0 05373         FMP COPSI
05663   0 60100 0 05427         STO COMMON+1
05664   0 56000 0 05372         LDQ SIPSI
05665   0 26000 0 05366         FMP BICZ
05666   0 30000 0 05427         FAD COMMON+1
05667   0 60100 0 05427         STO COMMON+1
05670   0 56000 0 05427         LDQ COMMON+1
05671   0 26000 0 05426         FMP COMMON
```

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05672   0 60100 0 05376          STO RESZ                    Z I.C. FOUND
05673   0 56000 0 05367          LDQ CICZ
05674   0 26000 0 05373          FMP COPSI
05675   0 60100 0 05427          STO COMMON+1
05676   0 56000 0 05370          LDQ DICZ
05677   0 26000 0 05372          FMP SIPSI
05700   0 30000 0 05427          FAD COMMON+1
05701   0 60100 0 05427          STO COMMON+1
05702   0 56000 0 05427          LDQ COMMON+1
05703   0 26000 0 05426          FMP COMMON
05704   0 60100 0 05377          STO RESPZ
05705  -0 53400 4 05437  LEAVE   LXD COMMON+9,4
05706   0 02000 4 00001          TRA 1,4
05707   0 00000 0 00000  COEF
05710  -0 60000 0 06067  PLXY1   STQ PPCRV+89              STORE Y                                          0005
05711   0 56000 0 06065          LDQ PPCRV+87              SET LOW INTENSITY SIGNAL                         0006
05712   0 02000 0 05715          TRA PLXY2+2                                                                0007
05713  -0 60000 0 06067  PLXY2   STQ PPCRV+89              STORE Y                                          0008
05714   0 56000 0 06056          LDQ PPCRV+80              SET HIGH INTENSITY SIGNAL                        0009
05715  -0 60000 0 06070          STQ PPCRV+90                                                               0010
05716   0 30200 0 06061          FSB PPCRV+83            XMINUSMINIMUMX                                     0011
05717   0 76500 0 00043          LRS 35                                                                     0012
05720   0 26000 0 06062          FMP PPCRV+84            TIMESXSCALINGFACTOR                                0013
05721  -0 30000 0 06055          UFA PPCRV+79            FIXEDPOINT                                         0014
05722   0 76700 0 00022          ALS 18                                                                     0015
05723   0 40000 0 06057          ADD PPCRV+81              HORIZONTAL DISTANCE FROM LEFT OF GRAPH           0016
05724   0 62200 0 06070          STD PPCRV+90                                                               0017
05725   0 50000 0 06067          CLA PPCRV+89                                                               0018
05726   0 30200 0 06063          FSB PPCRV+85            YMINUSMINIMUMY                                     0019
05727   0 76500 0 00043          LRS 35                                                                     0020
05730   0 26000 0 06064          FMP PPCRV+86            TIMESYSCALINGFACTOR                                0021
05731  -0 30000 0 06055          UFA PPCRV+79            FIXEDPOINT                                         0022
05732   0 40000 0 06060          ADD PPCRV+82              VERTICAL DISTANCE FROM  BOTTOM OF GRAPH          0023
05733   0 62100 0 06070          STA PPCRV+90                                                               0024
05734   0 70000 0 06070          CPY PPCRV+90              ENTER THE POINT                                  0025
05735   0 02000 4 00001          TRA 1,4                 RETURNTOPROGRAM                                    0026
                                 PREPARETOPLOTONCATHODERAYTUBE                                              0027
                                 P+0TSXPPCRV,C                                                              0028
                                 P+1PZEX,0,Y             MINIMUMX,YONTUBE                                   0029
                                 P+2DECX                 MINIMUMXONGRAPH                                    0030
                                 P+3DECY                 MINIMUMYONGRAPH                                    0031
                                 P+4PZEX,0,Y             MAXIMUMX,YONTUBE                                   0032
                                 P+5DECX                 MAXIMUMXONGRAPH                                    0033
                                 P+6DECY                 MAXIMUMYONGRAPH                                    0034
                                 P+7DECDELTAX            GRAPHVERTICALGRIDSPACING                           0035
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                                                P+8DECDELTAY      GRAPHHORIZONTALGRIDSPACING                        0036
05736   0 76600 0 00030  PPCRV WTV                                WRITECRTDISPLAY                                  0037
05737   0 50000 4 00001        CLA 1,4                            STORE LOWER LIMITS OF PLOT ON TUBE               0038
05740   0 56000 4 00001        LDQ 1,4                                                                             0039
05741   0 62200 0 06065        STD PPCRV+87                                                                        0040
05742  -0 76300 0 00022        LGL 18                                                                              0041
05743   0 62200 0 06057        STD PPCRV+81                                                                        0042
05744   0 62100 0 06060        STA PPCRV+82                                                                        0043
05745  -0 60000 0 06061        STQ PPCRV+83                                                                        0044
05746   0 50000 4 00006        CLA 6,4                            CALCULATE RANGE OF Y ON GRAPH                    0045
05747   0 30200 4 00003        FSB 3,4                                                                             0046
05750   0 60100 0 06067        STO PPCRV+89                                                                        0047
05751   0 50000 4 00004        CLA 4,4                            CALCULATE RANGE OF X AND Y ON TUBE               0048
05752   0 40200 4 00001        SUB 1,4                                                                             0049
05753   0 62100 0 06066        STA PPCRV+88                                                                        0050
05754   0 77100 0 00022        ARS 18                                                                              0051
05755  -0 50100 0 06055        ORA PPCRV+79                       Y RANGE IN FLOATING POINT                        0052
05756   0 30000 0 06055        FAD PPCRV+79                                                                        0053
05757   0 24000 0 06067        FDH PPCRV+89                                                                        0054
05760  -0 60000 0 06064        STQ PPCRV+86                       STORE Y SCALING FACTOR                           0055
05761   0 26000 4 00010        FMP 8,4                          SCALEDELTAY                                        0056
05762  -0 63400 1              SXD TEMP,1                                                                          0057
05763   0 07400 1              TSX TEMP+1,1                                                                        0058
05764   0 60100 0 06067        STO PPCRV+89                     STOREHORIZONTALGRIDSPACING                         0059
05765   0 50200 0 06065        CLS PPCRV+87                                                                        0060
05766   0 76500 0 00022        LRS 18                             HORIZONTAL GRID LINE LOOP                        0061
05767   0 62100 0 06057        STA PPCRV+81                                                                        0062
05770   0 76300 0 00022        LLS 18                                                                              0063
05771   0 70000 0 06057        CPY PPCRV+81                                                                        0064
05772   0 40200 0 06067        SUB PPCRV+89                                                                        0065
05773   0 56000 0 06056        LDQ PPCRV+80                                                                        0066
05774   0 04000 0 05766        TLQ PPCRV+24                     REPEATLOOP                                         0067
05775   0 50000 4 00003        CLA 3,4                            SAVE MIN. Y AND LOCATE Y ORIGIN                  0068
05776   0 60100 0 06063        STO PPCRV+85                                                                        0069
05777   0 10000 0 06071        TZE PPCRV+91                                                                        0070
06000   0 12000 0 06013        TPL PPCRV+45                                                                        0071
06001   0 50000 4 00006        CLA 6,4                            THEST FOR  MAX Y LESS THAN 0.0                   0072
06002  -0 12000 0 06013        TMI PPCRV+45                                                                        0073
06003   0 56000 4 00003        LDQ 3,4                            CALCULATE LOCATION OF Y ORIGIN                   0074
06004   0 26000 0 06064        FMP PPCRV+86                                                                        0075
06005  -0 30000 0 06055        UFA PPCRV+79                                                                        0076
06006   0 40200 0 06060        SUB PPCRV+82                                                                        0077
06007   0 62100 0 06057        STA PPCRV+81                                                                        0078
06010   0 50200 0 06057        CLS PPCRV+81                                                                        0079
06011   0 60100 0 06067        STO PPCRV+89                                                                        0080
```

```
06012   0 70000 0 06067      CPY PPCRV+89          ENTER ORIGIN IN HIGH INTENSITY                0081
06013   0 50000 4 00005      CLA 5,4               RANGE OF X ON GRAPH                           0082
06014   0 30200 4 00002      FSB 2,4                                                             0083
06015   0 60100 0 06067      STO PPCRV+89                                                        0084
06016   0 50000 0 06066      CLA PPCRV+88                                                        0085
06017  -0 50100 0 06055      ORA PPCRV+79          X RANGE ON TUBE IN FLOATING POINT             0086
06020   0 30000 0 06055      FAD PPCRV+79                                                        0087
06021   0 24000 0 06067      FDH PPCRV+89                                                        0088
06022  -0 60000 0 06062      STQ PPCRV+84          STORE X SCALING FACTOR                        0089
06023   0 26000 4 00007      FMP 7,4             SCALEDELTAX                                   0090
06024   0 07400 1            TSX TEMP+1,1                                                        0091
06025  -0 53400 1            LXD TEMP,1                                                          0092
06026   0 60100 0 06067      STO PPCRV+89        STOREVERTICALGRIDSPACING                      0093
06027   0 50200 0 06061      CLS PPCRV+83                                                        0094
06030   0 62200 0 06060      STD PPCRV+82          VERTICAL GRID LINE LOOP                       0095
06031   0 70000 0 06060      CPY PPCRV+82                                                        0096
06032   0 40200 0 06067      SUB PPCRV+89                                                        0097
06033   0 56000 0 06056      LDQ PPCRV+80                                                        0098
06034   0 04000 0 06030      TLQ PPCRV+58        REPEATLOOP                                    0099
06035   0 50000 4 00002      CLA 2,4               SAVD MINIMUM X AND LOCATE X ORIGIN            0100
06036   0 60100 0 06061      STO PPCRV+83                                                        0101
06037   0 10000 0 06073      TZE PPCRV+93                                                        0102
06040   0 12000 4 00011      TPL 9,4             NOXORIGINONGRAPH                              0103
06041   0 50000 4 00005      CLA 5,4               TEST FOR MAX X LESS THAN 0.0                  0104
06042  -0 12000 4 00011      TMI 9,4                                                             0105
06043   0 56000 4 00002      LDQ 2,4               CALCULATE LOCATION OF X ORIGIN                0106
06044   0 26000 0 06062      FMP PPCRV+84                                                        0107
06045  -0 30000 0 06055      UFA PPCRV+79                                                        0108
06046   0 76700 0 00022      ALS 18                                                              0109
06047   0 40200 0 06057      SUB PPCRV+81                                                        0110
06050   0 62200 0 06060      STD PPCRV+82                                                        0111
06051   0 50200 0 06060      CLS PPCRV+82                                                        0112
06052   0 60100 0 06067      STO PPCRV+89                                                        0113
06053   0 70000 0 06067      CPY PPCRV+89          ENTER ORIGIN IN HIGH INTENSITY                0114
06054   0 02000 4 00011      TRA 9,4             PLOTREADY,RETURNTOPROGRAM                     0115
06055 +233000000000          OCT 233000000000      MAGIC NUMBER                                  0116
06056 -002000000000          OCT -2000000000       NEG. VALUE OF TUBE LIMIT + 1.0                0117
06057 +200000000000          OCT 200000000000      HORIZONTAL                                    0118
06060 +100000000000          OCT 100000000000      VERTICAL                                      0119
06061 +000000000000          DEC 0.0             MINIMUMXONGRAPH                               0120
06062 +000000000000          DEC 0.0             XSCALINGFACTOR                                0121
06063 +000000000000          DEC 0.0             MINIMUMYONGRAPH                               0122
06064 +000000000000          DEC 0.0             YSCALINGFACTOR                                0123
06065   0 00000 0 00000      PZE                 TRANSIENTSTORAGE                              0124
06066   0 00000 0 00000      PZE                                                               0125
```

```
06067  0 00000 0 00000          PZE                                          012
06070  0 00000 0 00000          PZE                                          012
06071  0 50000 0 06060          CLA PPCRV+82          MINIMUM Y IS 0.0       012
06072  0 02000 0 06007          TRA PPCRV+41                                 012
06073  0 50000 0 06057          CLA PPCRV+81          MINIMUM X IS 0.0       013
06074  0 02000 0 06050          TRA PPCRV+74                                 013
                  13032 BTHETA BES 2525
                  17767 APIARY BES 2525
                  01271        END LOAD
                  00001 0 TEMP
```

SHARE ASSEMBLER STATISTICS

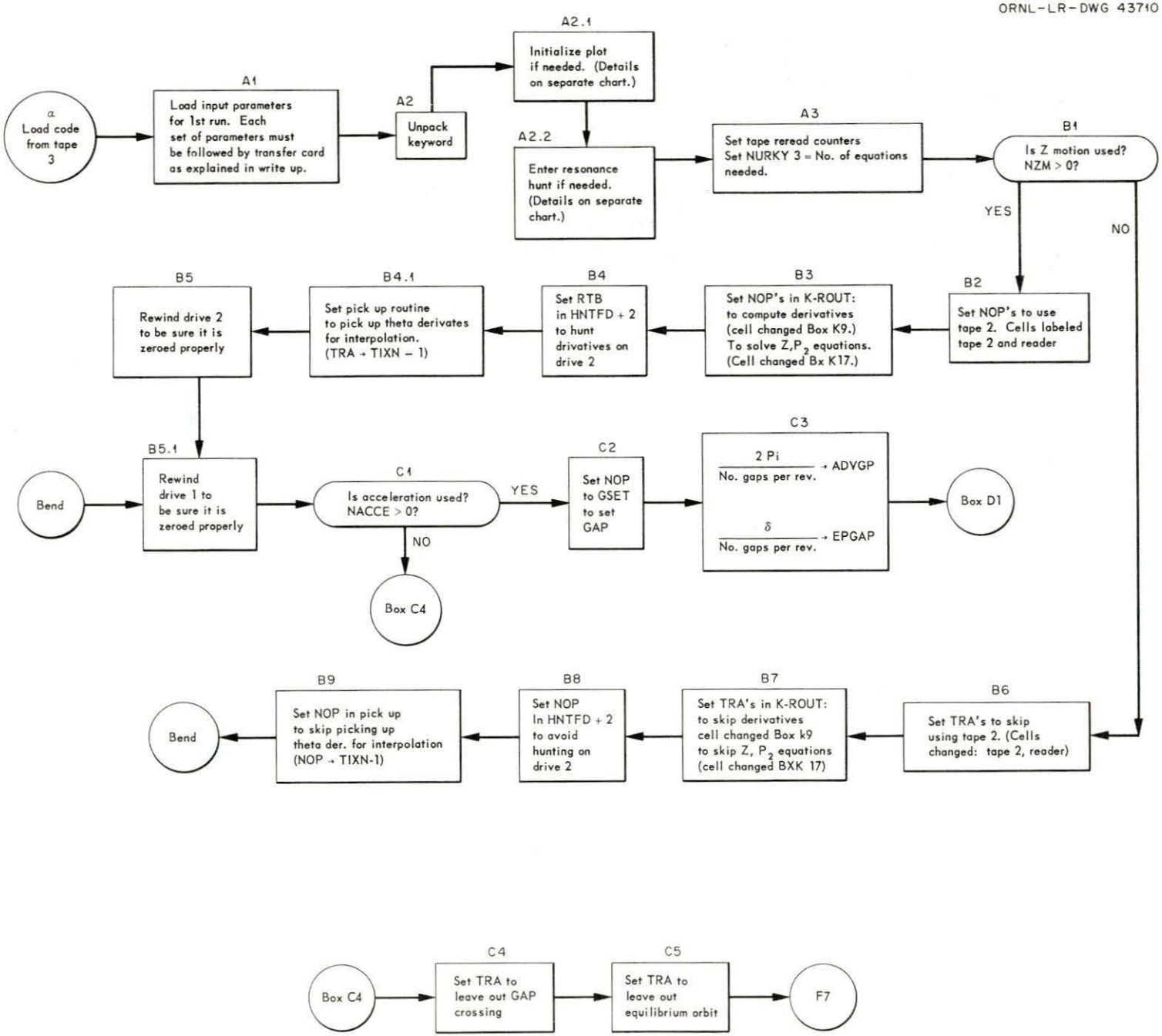
TAPE	TOTAL	1 FAIL	2 FAIL	3 FAIL	4 FAIL
INP	1734	0	0	0	0
LIB	0	0	0	0	0
COL	1734	0	0	0	0

NUMBER OF ON-LINE INPUT RECORDS 0

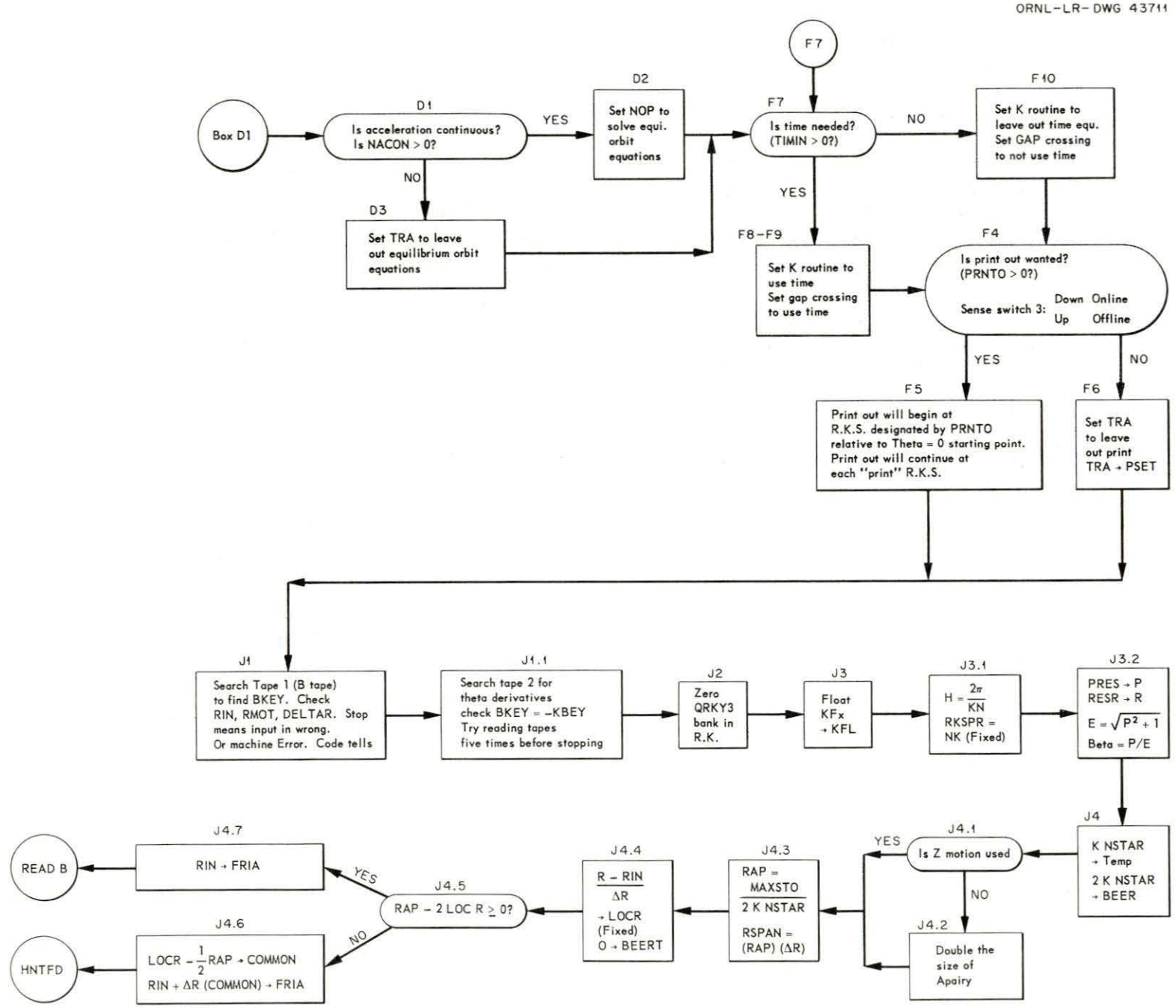
NUMBER OF OFF-LINE PRINT RECORDS 1819

NUMBER OF SYMBOLS, DEF 305,DEFOP 0,UNDEF 1

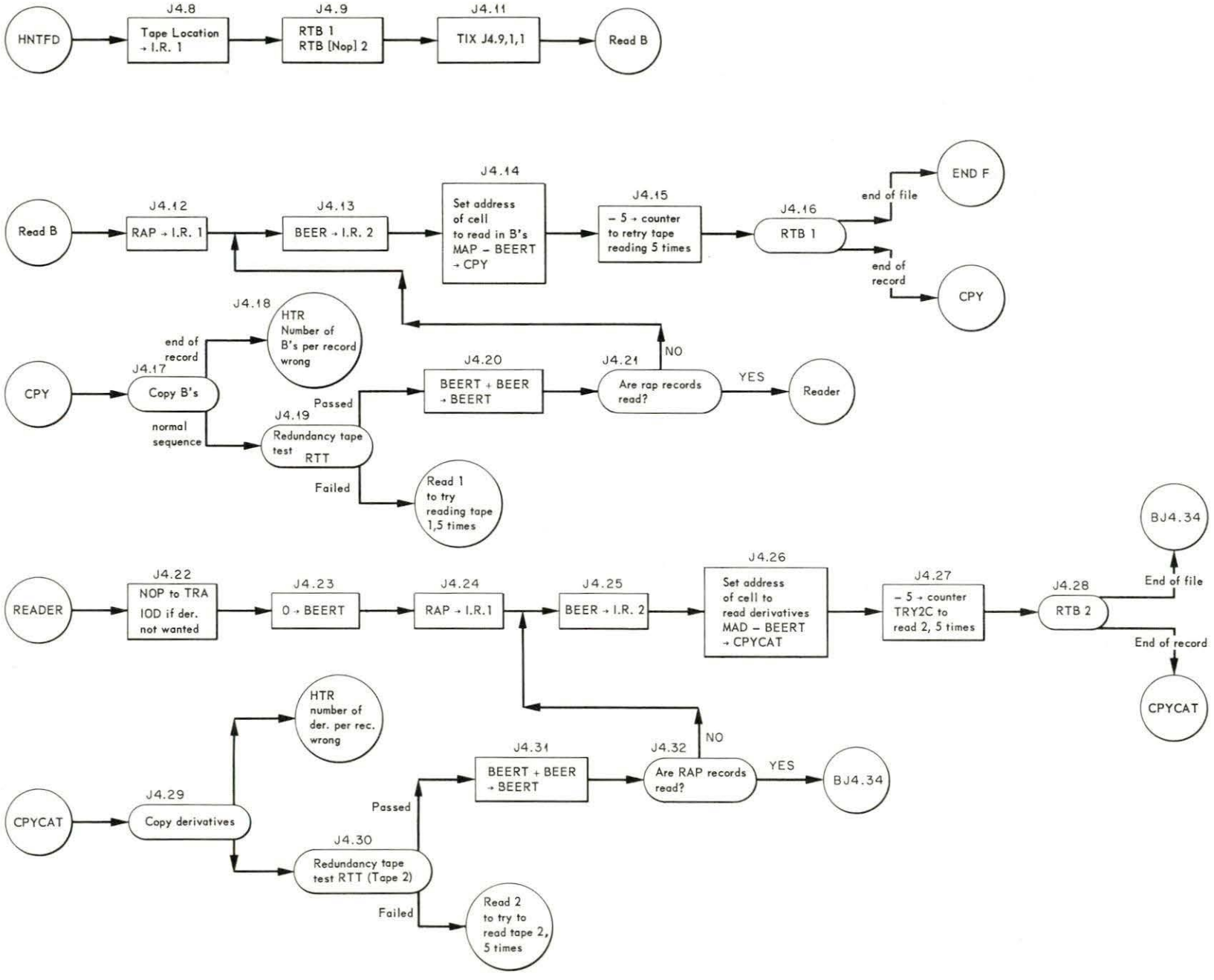
UNCLASSIFIED
ORNL-LR-DWG 43710

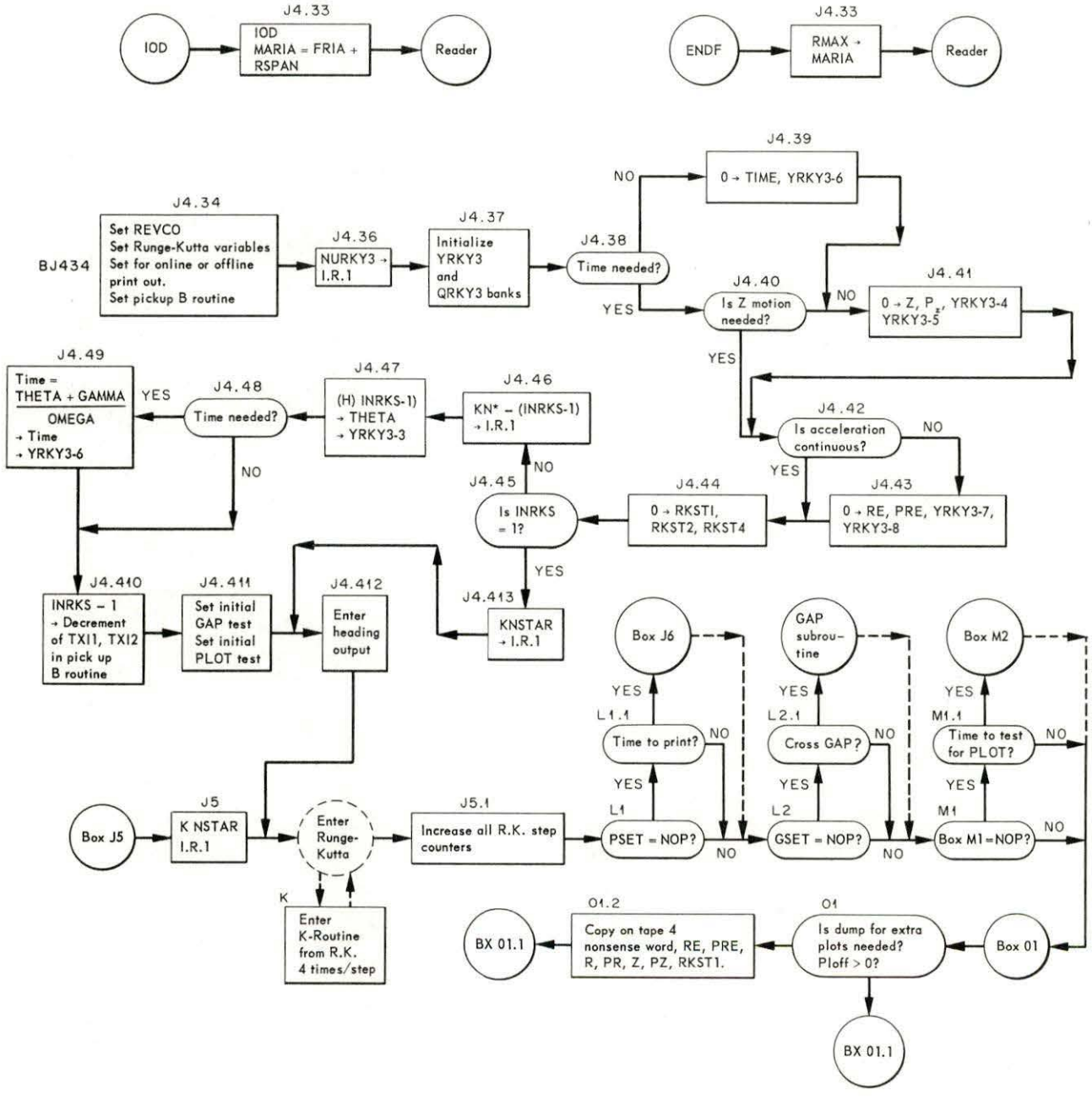


UNCLASSIFIED
ORNL-LR-DWG 43711



UNCLASSIFIED
ORNL-LR-DWG 43712




J4.33
IOD
MARIA = FRIA + RSPAN
Reader
J4.33
ENDF
RMAX → MARIA
Reader
J4.39
NO
0 → TIME, YRKY3-6
J4.34
BJ434
Set REVCO
Set Runge-Kutta variables
Set for online or offline print out.
Set pickup B routine
J4.36
NURKY3 → I.R.1
J4.37
Initialize YRKY3 and QRKY3 banks
J4.38
Time needed?
YES
J4.40
Is Z motion needed?
NO
J4.41
0 → Z, P_z, YRKY3-4 YRKY3-5
YES
J4.49
Time = THETA + GAMMA / OMEGA → Time → YRKY3-6
YES
J4.48
Time needed?
NO
J4.47
(H) INRKS-1) → THETA → YRKY3-3
J4.46
KN* – (INRKS-1) → I.R.1
J4.42
Is acceleration continuous?
NO
YES
J4.45
NO
Is INRKS = 1?
J4.44
0 → RKSTI, RKST2, RKST4
J4.43
0 → RE, PRE, YRKY3-7, YRKY3-8
YES
J4.410
INRKS – 1 → Decrement of TXI1, TXI2 in pick up B routine
J4.411
Set initial GAP test
Set initial PLOT test
J4.412
Enter heading output
J4.413
KNSTAR → I.R.1
Box J6
GAP subroutine
Box M2
YES
L1.1
Time to print?
NO
YES
L2.1
Cross GAP?
NO
YES
M1.1
Time to test for PLOT?
NO
YES
L1
PSET = NOP?
NO
YES
L2
GSET = NOP?
NO
YES
M1
Box M1 = NOP?
NO
Box J5
J5
K NSTAR I.R.1
Enter Runge-Kutta
J5.1
Increase all R.K. step counters
K
Enter K-Routine from R.K. 4 times/step
01.2
Copy on tape 4 nonsense word, RE, PRE, R, PR, Z, PZ, RKST1.
01
Is dump for extra plots needed? Ploff > 0?
Box 01
BX 01.1
BX 01.1

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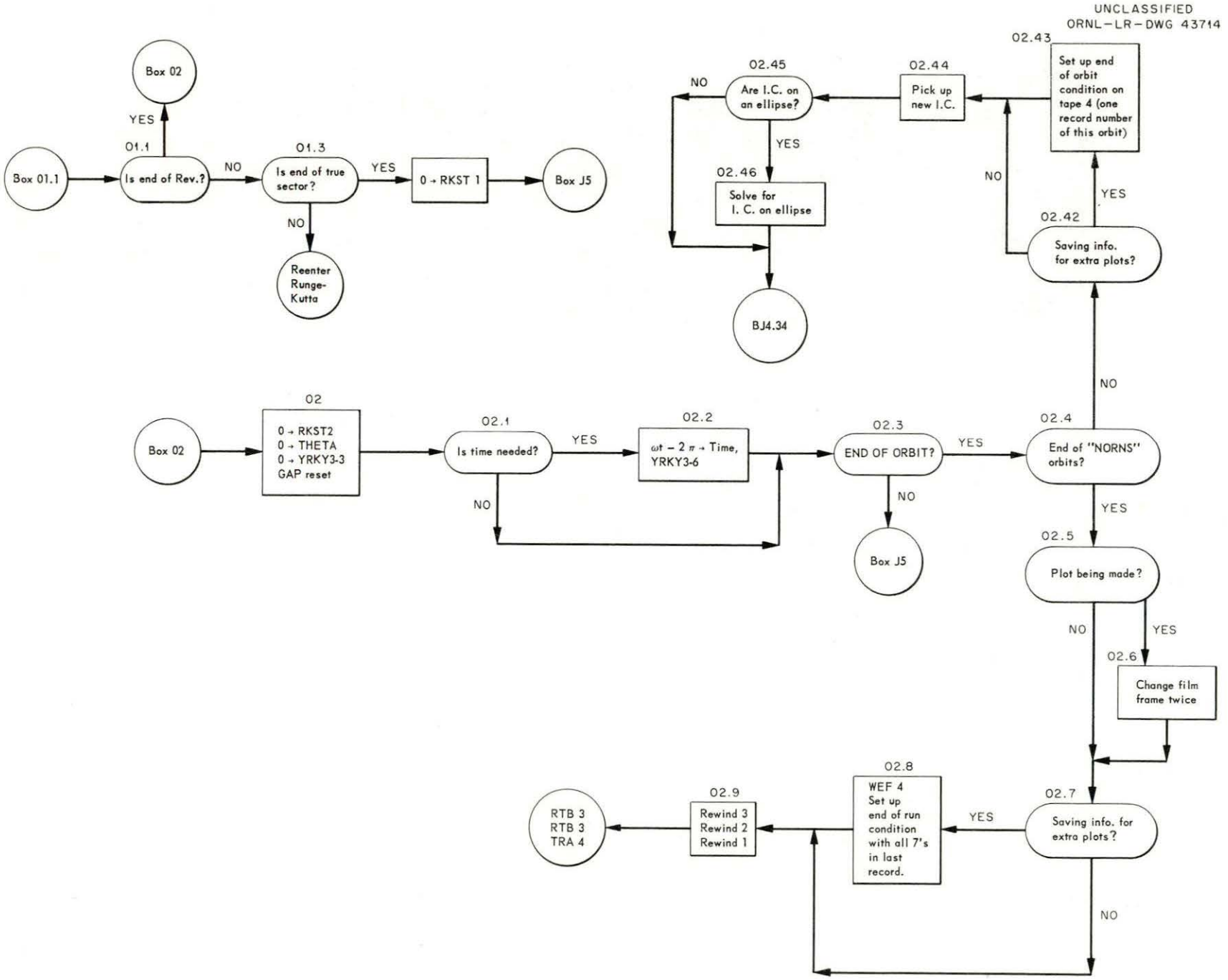

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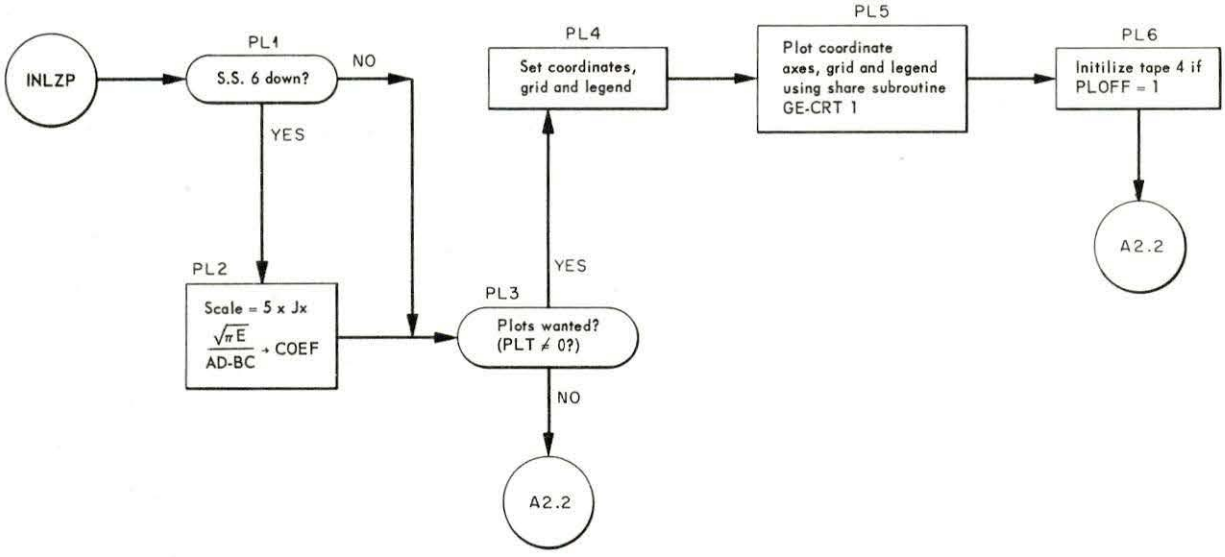

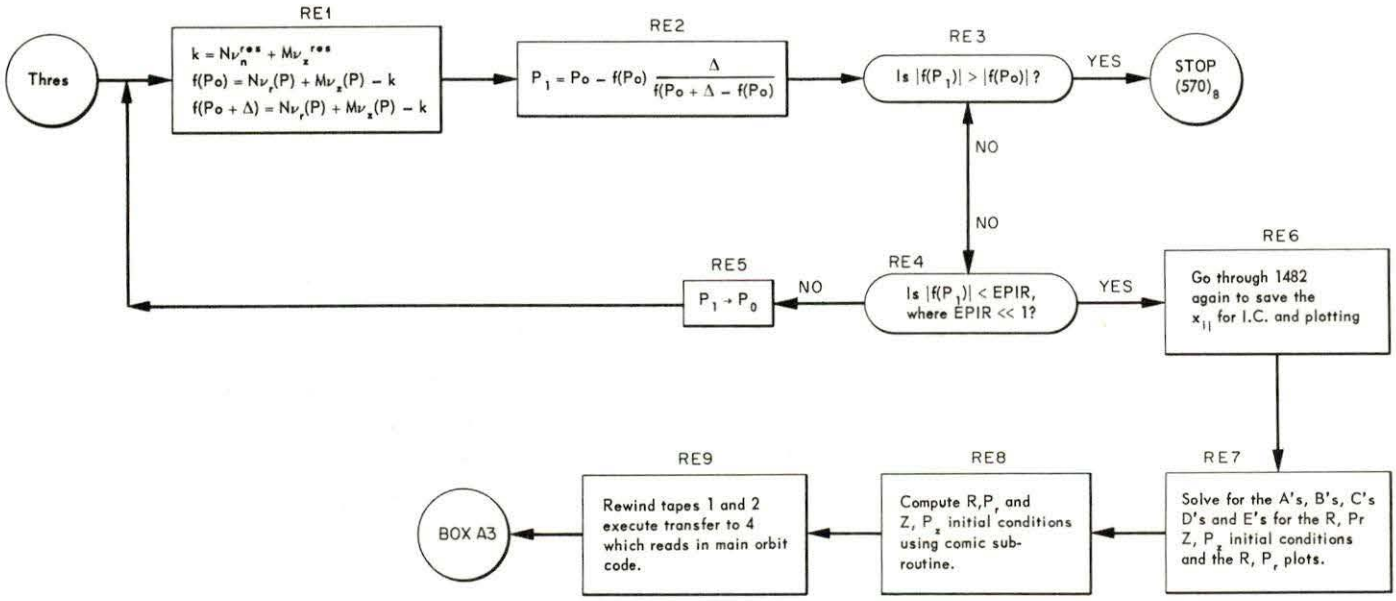

Internal:

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2. R. S. Bender
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4. F. T. Howard
5. R. S. Livingston
6. J. A. Martin
7-11. H. C. Owens
12. A. Simon
13-22. T. A. Welton
23-42. Laboratory Records

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49. B. L. Cohen, U. of Pittsburgh
50. J. H. Cook, UCLA
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