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A Two-Dimensional Hydrodynamics and Radiation Transport Program

by

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YØKIFER: A TWO-DIMENSIONAL HYDRODYNAMICS AND RADIATION TRANSPORT PROGRAM

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ABSTRACT

The YØKIFER program has been written to calculate the coupled hydrodynamics and radiation transport problem in two-dimensional (R-Z) cylindrical geometry. The hydrodynamics are computed by the ICED-ALE method, the radiation transport by either the Monte Carlo or S_n method.

This report is a description of the program and a guide to its use.

INTRODUCTION

YØKIFER solves the coupled hydrodynamics and radiation transport problem in two-dimensional cylindrical (R-Z) geometry. It is written in Fortran IV and is run under the CRØS system on the CDC-7600 computer. A few subroutines are written in CØMPASS.

This report has been written for those using the program and is limited to a description of the program and its operation. Persons interested in details of either the physics or the numerical methods involved are directed to the following references.

The hydrodynamics problem is solved by the ICED-ALE method of the YAQUI program. Reference 1 is the basic reference for the hydrodynamics. The radiation transport problem is solved by either the Monte Carlo or S_n method for which references 2 and 3, respectively, are the basic references.

I. OVERVIEW OF THE YØKIFER PROGRAM AND DESCRIPTION OF THE MAIN PROGRAM

This section describes the YØKIFER Program as a whole and the main overlay. Also described are subroutines and calculations applicable to the entire program.

A. Program Organization

The program consists of the main program, YØKIFER (Overlay 0,0) and four primary overlays.

1,0	ØFFWEGØ	Input and Problem Setup
2,0	YØKKY	Hydrodynamics
3,0	MCRT	Radiation Transport (Nongrey, Monte Carlo)
4,0	GREYSN	Radiation Transport (Grey, S_n)

Appendix A contains a list of overlays and subroutines, a list of the common blocks and the overlays in which they are used, and a list of the file sets that YØKIFER uses.

B. Input

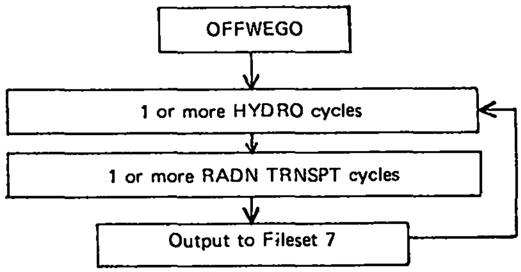
There are two different forms of input to YØKIFER. The input reading is controlled by Sense Switch 1.

Bubble input	Sense Switch 1	ON
Purd input	Sense Switch 1	OFF (default)

Bubble input is produced by rotating the results of a one-dimensional starter calculation (e.g. RADFLØ) through 90° to produce bubble input cards. Appendix A lists the required input cards. Purd input will be described in a separate report.

C. General Order of Calculations

Calculations proceed in the order shown schematically in Fig. 1:



The selection of Monte Carlo or S_n radiation transport calculations is governed by Sense Switch 2.

Monte Carlo	Sense Switch 2	ON
S_n	Sense Switch 2	OFF(default)

The calculation is terminated just before the time limit on the JØB card is reached.

D. OVERLAY 0,0 - YØKIFER

YØKIFER is the main program, which calls the primary overlays, writes data on Fileset 7, and produces dump tapes at regular intervals.

1. Variables Computed by YØKIFER

TTL	Time limit on the job card (s).
T1	CP time at the beginning of the cycle (s).
T2	CP time at the end of the cycle (s).
TCYCLE	Length of a calculation cycle (s). TCYCLE = T2-T1
TDUMP	Length of computing time until the next release (stage) of Fileset 7 to tape (s).
NDUMP	Number of 60-bit words written on Fileset 7.

2. Dump Procedure

Data are copied to Fileset 7 before YØKKY is entered whenever the problem time is greater than the problem output time TØUT. (The determination of TØUT is described in Sec. E.7.) Periodically, Fileset 7 is released from disk to magnetic tape. A new, blank tape is used each time.

Initially, TDUMP is set to 900 CP seconds, or TTL, whichever is smaller. After each cycle is calculated, TDUMP is reduced by TCYCLE. Fileset 7 is released to tape whenever TDUMP < 2 × TCYCLE. After each tape stage, TDUMP is reset to 900 s or TTL-T2, whichever is smaller.

Initially NDUMP is set to 0. When data are copied to Fileset 7, NDUMP is incremented by the approximate number of words dumped. When NDUMP $\geq 10^6$, Fileset 7 is dumped to tape and NDUMP is reset to 0.

Each dump tape contains all data copied to Fileset 7 since the previous dump tape was written.

E. General Topics

1. YØKIFER Mesh

The YØKIFER mesh is a two-dimensional grid, in R-Z cylindrical geometry. (The hydrodynamics program is written to handle X-Y cartesian geometry also, but the radiation transport programs cannot do this.) Each cell is a volume of revolution about the z-axis with a quadrilateral cross section. (Initially, the cross sections are rectangular, but not necessarily of uniform size.) Because no physical variables depend on a third coordinate, the mesh can always be represented two-dimensionally by a grid in the R-Z plane.

The mesh consists of IBAR cells in the radial direction and JBAR cells in the axial direction, and the left boundary is the cylindrical axis. These cells are called the "real mesh." For computational purposes, a single row of dummy cells is added at the bottom, on the right, and at the top, for a total of IP1 = IBAR + 1 cells radially and JP2 = JBAR + 2 cells axially. The maximum allowable value of IBAR and JBAR is 100. The maximum number of cells (including dummy cells) is 7200.

I is the radial cell index, $1 \leq I \leq$ IP1; and J is the axial cell index, $1 \leq J \leq$ JP2.

The single computationally equivalent index, IJ, is frequently used:

IJ = (J-1) (IP1) + 1.

The cell index I, J, or IJ refers to the lower left-hand vertex of the cell.

Figure 2 shows the basic mesh conventions. Because cell and vertex properties depend on the properties of neighboring cells and vertices, a standard notation has been developed to describe the neighbor cells (Fig. 3). The coordinate positions of the vertices are given by

- X_{ij} Radial coordinate of vertex ij
- Y_{ij} Axial coordinate of vertex ij
- R_{ij} Geometry indicator. R_{ij} = 1 for slab geometry, $R_{ij} = X_{ij}$ for cylindrical geometry.

The mechanics of setting up a mesh are described in Sec. II.

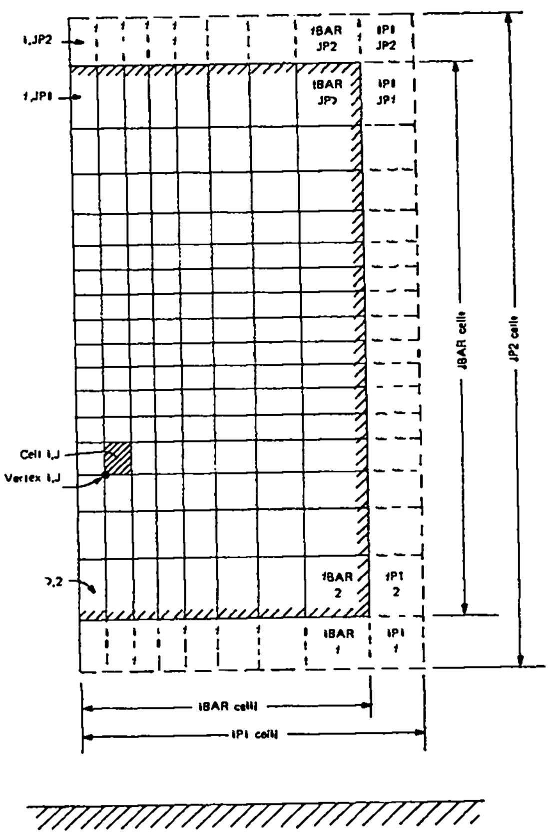


Fig. 2. The basic mesh conventions.

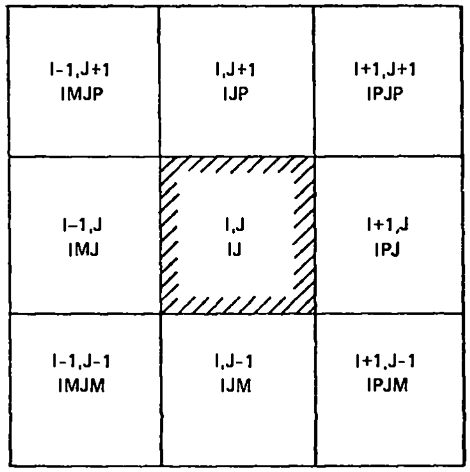


Fig. 3. Neighbor cell notation.

2. YØKIFER Mesh Variables

The principal mesh variables used throughout the program are described below. Other mesh variables are used locally within the program and are described by comments at the places where they are used.

- SIE_{ij} Specific internal energy at the center of cell ij (J/mg).
- $TEMP_{ij}$ Temperature at the center of cell ij (eV).
- $RØ_{ij}$ Density at the center of cell ij (mg/cm^3).
- P_{ij} Pressure at the center of cell ij (MPa).
- U_{ij} Radial fluid speed at vertex ij (km/s).
- V_{ij} Axial fluid speed at vertex ij (km/s).
- $RVØL_{ij}$ 2π/volume of cell ij, in cylindrical geometry (1/km^3).

3. Storage of Mesh Variables

Because SCM is not large enough to contain all of the mesh data, most mesh variables are stored in LCM and periodically read into SCM (usually) three rows at a time. NQ words are provided for each cell, and the mesh data needed for any given cell are therefore stored in NQ adjacent locations. At present, NQ = 18. Appendix A contains a tabulation of the cell variables stored in the NQ locations for different parts of the program. Mesh data are written into and out of LCM by subroutine LØØP (Sec. F. 1.) for one entire row of cells at each call.

4. YØKIFER Units

Unless otherwise indicated, the units of all YØKIFER variables are as follows.

Time	s	
Length	km	$(10^5 cm)$
Volume	km^3	$(10^{15} cm^3)$
Velocity	km/s	$(10^5 cm/s)$
Acceleration	km/s^2	$(10^5 cm/s^2)$
Density	mg/cm^3	$(10^{-3} g/cm^3)$
Energy	J	$(10^7 ergs)$
Specific energy	J/mg	$(10^{10} ergs/g)$
Energy density	J/km^3	$(10^{-8} ergs/cm^3)$
Pressure	$mg\text{-}km^2/cm^3\text{-}s^2$	$(10^7 dynes/cm^2$ = MPa)
Temperature	eV	(11 605.4 K)
Absorption coefficient	km^{-1}	$(10^{-5} cm)$
Frequency	s^{-1}	

The physical constants used are:

c = speed of light = 3.0×10^5 km/s,

a = radiation density constant = 137.214 $\times 10^8$ $J/km^3\text{-}eV^4$.

5. Equation of State and Opacity Data

The equation of state and opacity data are read from Fileset 6:

NØPT — Number of temperatures for which data are tabulated (30).

NØPD — Number of densities for which data are tabulated (9).

NFRQ — Number of wavelengths for which absorption coefficients are tabulated (100).

FREQ(K) — Wavelengths (Å). K = 1, NFRQ, in order of decreasing wavelengths.

ØPTMP(I) — Log_{10} temperatures (eV) for which data are tabulated. I = 1, NØPT, in order of ascending temperatures.

ØPDEN(J) — Log_{10} densities (g/cm^3) for which data are tabulated. J = 1, NØPD, in order of increasing densities.

ØPSIG(K,I,J) — Log_{10} absorption coefficients (1/cm). K = 1, NFRQ; I = 1, NØPT; J = 1, NØPD.

SPTBL(I,J) — Log_{10} Planck mean absorption coefficients (1/cm). I = 1, NØPT; J = 1, NØPD.

SPTBL(I,J) — Log_{10} Rosseland mean absorption coefficients (1/cm). I = 1, NØPT; J = 1, NØPD.

The mean absorption coefficients YØKIFER uses are controlled by Sense Switch 3.

Planck mean	Sense Switch 3	ON
Rosseland mean	Sense Switch 3 (default)	OFF

PTAB(I,J) — Log_{10} pressures $(dynes/cm^3)$. I = 1, NØPT; J = 1, NØPD.

ETAB(I,J) — Log_{10} specific internal energies (ergs/g). I = 1, NØPT; J = 1, NØPD.

BTBL(I,J) — Radiation derivatives, = $\partial \rho I/\partial aT^4$. I = 1, NØPT; J = 1, NØPD.

The data are arranged on the tape in a single file. (NWL is the number of words in the record, and it is not needed by the program.)

Record 1	NØPD, NØPT, NFRQ
Record 2	FREQ
Record 3	NWL, ØPTMP(1), ØPDEN(1), ØPSIG(K,1,1)
Record 4	NWL, ØPTMP(2), ØPDEN(1), ØPSIG(K,2,1)
Record 5	NWL, ØPTMP(3), ØPDEN(1), ØPSIG(K,3,1)
...	...
Record 272	NWL, ØPTMP(NØPT), ØPDEN(NØPD), ØPSIG(K,NØPT,NØPD)
Record 273	SPTBL (Planck)
Record 274	SPTBL (Rosseland)
Record 275	PTAB
Record 276	ETAB
Record 277	BTBL

6. Time and Time Interval Calculations

The program is permeated by the messy calculation of problem times and time intervals. Four main variables are involved:

TIME — Radiation transport (R) time,

DTR — Radiation transport (R) time interval,

T	Hydrodynamic (H) time,
DT	Hydrodynamic (H) time interval.

In the following discussion, this notation is used:

$TIME_m$	Time at the start of R cycle m,
DTR_m	Time interval of R cycle m,
T_n	Time at the start of H cycle n,
DT_n	Time interval of H cycle n.

Hydrodynamic Time Calculations. The hydrodynamic overlay (YØKKY) is called if and only if T = TIME. The status of the time variables when YØKKY is called is:

$TIME_m$	Starting time of the next R cycle,
DTR_m	Time interval of the next R cycle,
T_n	Starting time of the next H cycle,
DT_{n-1}	Time interval of the last H cycle (of no interest, now).

At the start of PHASE1 within YØKKY, the new H cycle begins and the hydrodynamic calculations occur. The calculated quantities are

DT_n	Time interval for the next H cycle = $\min(DT_n', 5 \times DTR_m)$.
T_{n+1}	Time at the end of the next H cycle = $T_n + DT_n$. When $T_n = TIME_m$, T_{n+1} may exceed $TIME_{m+1}$.

DT_n' is a time interval based on the hydrodynamic constraints described in Sec. III. The $5 \times DTR_m$ limitation restricts the number of R cycles between H cycles to about five. At the end of YØKKY, T_{n+1} is compared with $TIME_{m+1} = TIME_m + DTR_m$:

$T_{n+1} < TIME_{m+1}$	Another H cycle is calculated. If another H cycle is calculated, its DT_n is subject to the additional restriction that $DT_n \le TIME_m + DTR_m - T_n$.
$T_{n+1} \ge TIME_{m+1}$	YØKKY is exited and a radiation transport overlay is called.

Radiation Transport Time Calculations. The radiation transport overlays (MCRT or GREYSN) are called only if $T \ge TIME + DTR$. The status of the four variables at the beginning of an R cycle is:

$TIME_m$	Starting time of the next R cycle
DTR_m	Time interval of the next R cycle
T_{n+1}	Time at the end of the last H cycle
DT_n	Time interval of the last H cycle

The time interval calculations for R cycle m + 1 occur throughout the overlays during the calculation of R cycle m:

$$DTR_{m+1} = \min(DTR_{m+1}', 10 \times DT_n).$$

DTR_{m+1}' is a time interval based on radiation transport constraints and described in Secs. IV and V. The $10 \times DT_n$ limitation restricts the number of H cycles between R cycles to about 10. The problem time is advanced at the end of each radiation cycle.

$$TIME_{m+1} = TIME_m + DTR_m.$$

A number of checks and adjustment are made.

$TIME_{m+1} < T_n$.	When this condition applies, another R cycle is calculated. $TIME_{m+2} = TIME_{m+1} + DTR_{m+1}$ is compared with T_n. If $TIME_{m+2} > T_n$, the time interval is reduced to $DTR_{m+1} = T_n - TIME_{m+1}$.
$TIME_{m+1} = T_n$.	When this condition applies, the radiation transport overlay is exited and YØKKY is called.

Getting Started. The time calculations are initialized as follows. $TIME_1$ and DTR_1 are the input numbers TIME and DTR. T_1 = TIME and $DT_0 = 0$ are set by ØFFWEGØ. When PHASE1 is first called (at the beginning of H cycle 1), DT_1 = DTR and $T_2 = T_1 + DT_1$.

7. Output

During every cycle there are several short prints (also written on film), and at less frequent intervals more detailed output is written on film. These less frequent times are called TØUT. TØUT is set to provide detailed output n times per decade of elapsed problem-time. If t is the elapsed problem time at the start of the decade, output occurs at elapsed times ft, f^2t, ..., $f^nt = 10t$; hence, $f = \sqrt[n]{10}$. The output overlays (2,2;3,3; and 4,3) are called only when T ≥ TØUT. Initially (in ØFFWEGØ) TØUT = TSTART, the problem starting time. This causes YØKØUT, the hydrodynamic output program, to be called on cycle 0. It is in YØKØUT that all subsequent changes in TØUT are made.

In cycle 0 TØUT = DTR.

In later cycles TØUT = f(TØUT-TSTART) + TSTART.

The factor f is presently set at 1.15, which corresponds to n ~ 16 outputs/decade.

8. Dumps and Restarts

At the output times, TØUT, data are written on Fileset 7, and at less frequent intervals, Fileset 7 is staged to tape. The data written on Fileset 7 include all data needed to restart the problem and other data that are useful to analyze in detail after the problem is run. Data are not written on Fileset 7 after every cycle because of the enormous volume involved. Fileset 7 is staged to tape when:

One reel of tape has accumulated (NDUMP > 10^6).

Fifteen CP minutes have elapsed since the last tape was written.

The time limit from the job card is approaching.

Dump tape data are read and analyzed by the program NEXTWAY, described in Appendix B. The dump tapes contain as many problem cycles as may happen to be written on them. The mechanics of the dump procedure were described in Sec. D; the structure of the dump file is in Table A-VII in Appendix A.

F. Subroutines

1. Subroutine LØØP

LØØP, a highly efficient subroutine originally written for YAQUI, is used to transfer data between SCM and LCM. LØØP maintains the NQ values for each cell in three rows of mesh cells in SCM -- the row for which calculations are being made and the rows immediately above and below. To aid in interpreting the source code listing, the general form of a calculation using LØØP is shown below.

CALL START

The bottom three rows of cell data are read into small core. The indices of the first cell in each row (IJM, IJ, IJP) are set.

DØ 9 J = 2, J2

Each time through this loop, mesh data are computed for row J. J2 = JP1 for cell-centered quantities, J2 = JP2 for vertex quantities.

DØ 8 I = 1, I2

Each time through this loop, mesh data are computed for cell I in row J. I2 = IBAR for cell-centered quantities, I2 = IP1 for vertex quantities.

Set cell indices

Set indices for cells to the right and left of I, as needed, IPJ = IJ + NQ, IPJP = IJP + NQ, etc.

Calculate desired data

Increment cell indices

Set indices for the next cell in row I, as needed, IJ = IPJ, IPJ = IPJP, etc.

8 CØNTINUE

CALL LØØP

Write data for row IJM into LCM, reset indices IJ and IJP to IJM and IJ, and read data for IJP into SCM.

9 CØNTINUE

CALL DØNE

Compute data for two top rows and write into LCM.

2. SEARCH (XBAR, X, N, NDX, and MFLAG)

SEARCH is an extremely fast binary search routine. Given a table of N values of X, and a value XBAR, SEARCH finds NDX such that X(NDX) ≤ XBAR < X(NDX + 1). MFLAG is a returned error flag.

3. DBLINT (K, X, Y, XT, YT, TAB, N1, M, MCØLS, and NDIM

DBLINT performs double linear interpolation of tabulated data. TAB(I,J) is a tabulated function of XT(I) and YT(J), I = 1, MCØLS: J = 1, M. TAB(I,J) is dimensioned for (MCØLS,M). NDIM is the actual number of I values tabulated. DBLINT returns as a function value the interpolated value of TAB which corresponds to X and Y. Normally K = N1 = 0, but K, N ≠ 0 allows use of triply subscripted tables.

4. GETEMP (XP, ZP, X, Y, Z, NX, and NY)

Z(I,J) is tabulated as a function of X(I), I = 1, NX and Y(J), J = 1, NY. Given the values of X, Z, XP, and ZP, GETEMP computes the corresponding value of Y by inverse interpolation. The subroutine is used with equation of state data to compute temperatures when densities and specific internal energies are known.

5. PAKFNØ and UNPKFN

PAKFNØ packs three floating point words into a single word. The packed words have a seven bit exponent. UNPKFN unpacks the single word back into three words. These subroutines save significant amounts of space in return for decreasing the significant figures to six.

II. ØFFWEGØ, THE INPUT AND SETUP OVERLAY

Overlay 1,0 (ØFFWEGØ) is used to read input data and to set up the initial mesh, values of mesh variables, and marker particle distributions.

A. Overview of the Overlay

The setup overlay is ØFFWEGØ (Overlay 1,0), which reads card and tape input data and sets up the problem. There are no secondary overlays; the work is done by subroutines MESHMKR, PARTGEN, PARDEN, NSTART, and FILMCØ.

B. ØFFWEGØ

1. Equation of State and Opacity Data

Equation of state and opacity data are read from Fileset 6. The input wavelengths are converted to frequencies (1/s), and, where necessary, units are changed from those of the tabulated data to YØKIFER units. The frequency-dependent opacities, ØPSIG, are stored as a linear array, SIGA, in LCM.

SIGA(IJK) corresponds to ØPSIG(I,J,K) where the equivalent subscript is IJK = K + (I-1)*NFRQ + (J-1)*NØPT*NFRQ. I, J, and K are the temperature, density, and frequency indices, respectively.

2. Dump Tape Input

ØFFWEGØ reads the dump file, Fileset 7. If the end-of-information is encountered on the first reading, one assumes that there is no dump input and that initial data are to be read from cards. If data are found on Fileset 7, the file is read until the end-of-information is encountered. When this occurs, the last dump on the file has been stored in the computer and is thus used to restart the problem.

3. ØFFWEGØ Input Cards

ØFFWEGØ reads the following data from cards:

NAME — Problem identification.

TIME — Starting time of the problem (s).

DTR — Initial radiation time interval (s).

CYL — Geometry parameter. CYL = 0.0 for slab geometry, CYL = 1.0 for cylindrical geometry. It is not possible at present to run radiation transport calculations in slab geometry.

GRDVEL — Rezone parameter (Sec. III).

ALPHA — Radiation transport implicitness parameter (Secs. IV and V).

IBAR, JBAR, IUNF, JUNF, JMID, DR, DZ, and FREZ — Quantities that define the mesh (Sec. C-1 and C-2).

A0, A0M, B0, XI, MU, LAM, ØM, EPS, ASQ, GM1, GR, and GZ — Parameters used in the hydrodynamic calculations (Sec. III).

REZY0 — Axial coordinate (true altitude) of the "center" of the mesh (km). This value defines the mesh altitude and, in practice, usually corresponds to the coordinate at the center of the bubble.

YBASE — Axial coordinate of the bottom of the real mesh (true altitude). YBASE is not independent of other input quantities (Sec. C-2).

The program operates on the assumption that the altitude at REZY0 = 0. The input value of REZY0 is saved for reference, but all other altitudes (Y_{ij},YBASE) are converted to true altitude-REZY0.

REZRØN Ambient density at REZY0 (mg/cm^3).

REZSIE Ambient specific internal energy (excluding radiation) at REZY0 (J/mg).

4. Parameters Set and Computed by ØFFWEGØ

ØFFWEGØ sets initial values of some parameters and precomputes others. These parameters are defined and described in the following sections, which describe the parts of the program in which they are used.

5. Subroutine Calls

MESHMKR is called to read and compute initial values for the mesh variables X, R, Y, U, V, SIE, TEMP, RØ, and RVØL. PARTGEN or PARDEN is called by MESHMKR to compute marker particle positions for Bubble or Purd input problems, respectively. FILMCØ is called to compute film-plotting parameters.

6. Marker Particle Cells

ITAB(k) is the equivalent index of the cell containing the k^{th} marker particle: ITAB = (J-1)*IP1 + I.

7. Mesh Variables

ØFFWEGØ computes the mesh variables:

M_{ij} Mass of cell ij ($mg/km^3/2\pi$-cm^3).

E_{ij} Total specific material energy in cell ij (internal + kinetic) (J/mg).

RM_{ij} Reciprocal mass associated with vertex ij (2π-cm^3/mg-km^3). The mass associated with a vertex is 1/4 the mass of the four adjacent cells.

8. ØFFWEGØ Output

ØFFWEGØ prints the job number, the date, all input data, and parameters whose values are as set by ØFFWEGØ.

C. Subroutine MESHMKR

MESHMKR establishes the initial values of the mesh variables X, Y, R, U, V, RØ, SIE, TEMP, and RVØL.

1. Uniform Mesh

MESHMKR computes the coordinates X, Y, and R for a uniform mesh of IBAR × JBAR cells with specified cell dimensions DR and DZ. The coordinate at the vertex, J = JMID, is Y = REZY0; that at the bottom of the mesh is Y = YBASE. The input value of YBASE, for a uniform mesh, must be REZY0-DZ*JMID.

2. Nonuniform Mesh

The nonuniform mesh is computed when FREZ ≠ 1.0. The nonuniform mesh contains a total of IBAR × JBAR cells. There is an inner, uniform region IUNF × JUNF cells, for which the inner part of the previously computed uniform mesh is used. In the outer parts of the mesh, the cells grow (or shrink) by amounts that depend on the value specified for FREZ. At the bottom of the mesh Y = YBASE. The FREZ input value for a nonuniform mesh must be computed accurately using the formula

$$\mathrm{REZY0} = \mathrm{YBASE} + \frac{\mathrm{JUNF}}{2} \times \mathrm{DZ} + \frac{f}{1-f} \times \mathrm{DZ} \times \left(1-f^{|\mathrm{JUNF}/2-\mathrm{JMID}|}\right),$$

where f = FREZ and MESHMKR sets Y_2 = YBASE. A nonuniform mesh is illustrated in Fig. 4. The algorithms used to determine the coordinates are

$$x_i = x_{i-1} + f(x_{i-1}-x_{i-2}),\ i = \mathrm{IUNF} + 2,\ \mathrm{IP1},$$

where f = FREZ and $x_i = X_{ij}$.

$$y_j = -t + \frac{f\Delta z}{1-f}(1-f^{\Delta_j}),\ j = 2,\ \mathrm{JB\O T}-1,$$

where f = FREZ, $y_j = Y_{ij}$, Δz = DZ,

$t = \mathrm{TJ} = \frac{\mathrm{JUNF}}{2}(\mathrm{DZ})$,

Δ_j = JDB = |J-JBØT|, and

JBØT = JMID + 2 -JUNF/2.

$$y_j = t + \frac{f\Delta z}{1-f}(1-f^{\Delta_j}),\ j = \mathrm{JT\O P} + 1,\ \mathrm{JP2},$$

where f = FREZ, $y_j = Y_{ij}$, Δz = DZ,

$t = \mathrm{TJ} = \frac{\mathrm{JUNF}}{2}(\mathrm{DZ})$,

Δ_j = JDT = |J-JTØP|, and

JTØP = JMID + JUNF/2.

3. Background Mesh Variables

Ambient values of U, V, RØ, and SIE are placed in every mesh cell by one of two methods

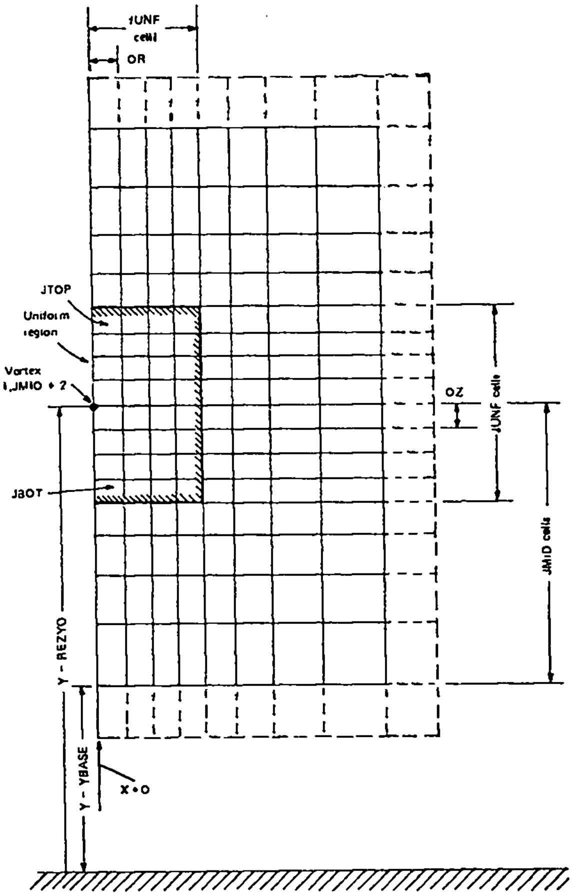


Fig. 4. A nonuniform mesh.

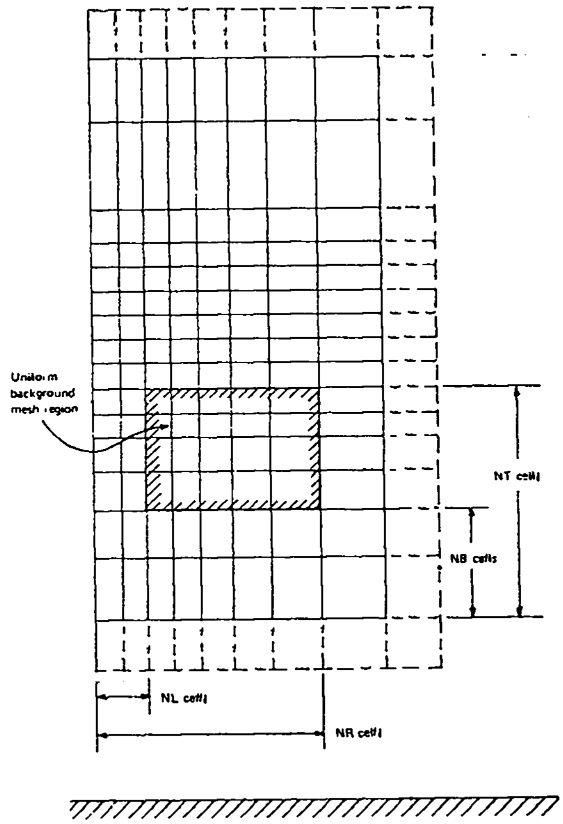


Fig. 5. Background mesh input.

Uniform Regions. The data read for each uniform background region are

NB	Number of real cells below the region
NR	Number of real cells to the left of the right boundary of the region
NT	Number of real cells below the top of the region
NL	Number of real cells to the left of the region
UI	Input radial velocity in region (km/s)
VI	Input axial velocity in region (km/s)
RØI	Input density in region (mg/cm^3)
SIEI	Input specific internal energy in region (J/mg) (radiation not included)

Figure 5 shows a uniform background region. U_{ij}, V_{ij}, $RØ_{ij}$, SIE_{ij} are set equal to UI, VI, RØI, and SIEI, respectively, for each cell in the region. $TEMP_{ij}$ = TEMPI is interpolated from the equation of state. The total cell internal energies are found from SIE + a($TEMP^4$)/RØ. The input data and the interpolated temperatures are printed.

Exponential Atmosphere. Densities that decrease exponentially with increasing altitude are computed for each row. The input value is ρ = REZRØN, assumed appropriate at y = REZYO. Temperatures corresponding to the local density and the input ambient energy, REZSIE, are interpolated from the equation of state tables. The specific internal energies are found from REZSIE + a($TEMP^4$)/RØ, where RØ varies exponentially. The density, specific internal energy, and temperature are printed for each row of cells.

4. Bubble Input

Bubble input, read only for Bubble input problems, consists of the specification of mesh variables in the upper right-hand quadrant of an R-Z plane. These values are reflected to the lower right quadrant, and if required, the right semicircle is reflected to form the left semicircle.

The variables used in the code are:

IBUB, JBUB	Indices of vertex corresponding to the center of the bubble
II, JJ	Temporary indices of cell into which data are to be placed. Typically, II and JJ begin at 1.
RØI	Density in cell II, JJ
SIEI	Specific internal energy in cell II, JJ
VI	Axial velocity at vertex II, JJ
UI	Radial velocity at vertex II, JJ

The actual cell indices corresponding to the bubble location in the mesh are computed from:

Quadrant	Indices
Upper Right	I=II+IBUB-1, J+JJ+JBUB-1
Lower Right	I=II+IBUB-1, J+JBUB-JJ
Upper Left	I=IBUB-II, J=JJ+JBUB-1
Lower Left	I=IBUB-II, J=JBUB-JJ

These mesh variables are assigned to the appropriate cells and vertices, destroying that part of the background mesh. Temperatures are computed from the equation of state as previously described, and all Bubble input is printed. Bubble input is illustrated in Fig. 6, but we note that one is not restricted to spherical bubble data.

D. Subroutine NSTART

NSTART is called by MESHMKR and is used only in Purd input problems.

E. Subroutine PARTGEN

PARTGEN generates marker particles for Bubble input problems and is called by MESHMKR. In addition to marking fluid positions, the marker particles are used to define the "region of interest" in film plots. For Bubble input problems, the particle regions generally coincide with the bubbles.

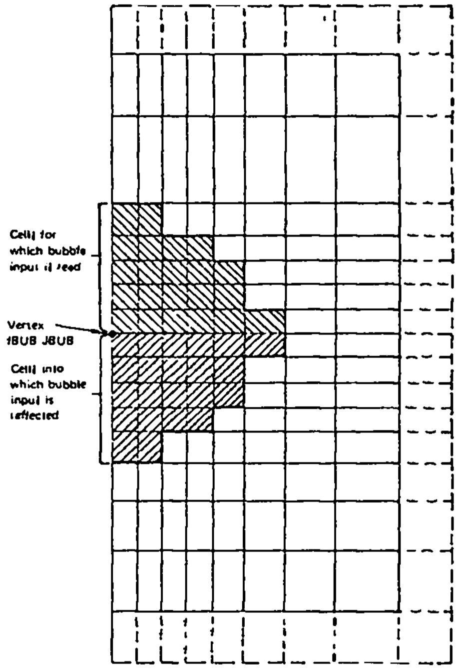


Fig. 6. Bubble input.

Particles may be generated in one or more regions of the mesh. The regions may be either circular or rectangular. The data that define the regions and the numbers of particles in them are read from cards.

DRPAR	Radial spacing of particles in the region (km).
DZPAR	Axial spacing of particles in the region (km).
XC	Radial coordinate. Center of circular region or left boundary of rectangular region (km).
YC	Axial coordinate. Center of circular region or bottom boundary of a rectangular region (km).
XD	Radius of a circular region or right boundary of a rectangular region (km).
YD	Top boundary of a rectangular region (km). YD ≡ 0 for a circular region.

A maximum of 1000 particles can be generated, and for both information and plotting purposes they should cover the area of the bubbles. If DRPAR and DZPAR equal DR and DZ, respectively, there will be one particle per cell. The number of particles can be increased by making DRPAR and DZPAR smaller. Generally, the bubble is a semicircle along the axis, and XC = 0, YC = REZY0, XD = Bubble radius, and YD = 0.

Variables computed by PARTGEN are

- $XPAR_k$ Radial coordinate of the k^{th} particle (km).
- $YPAR_k$ Axial coordinate of the k^{th} particle (km). XPAR and YPAR are stored in LCM block YLC2.
- NPT Total particles generated (1000 maximum).
- PYB Minimum value of YPAR (in all particle regions) (km).
- PYT Maximum value of YPAR (in all particle regions) (km).
- PXR Maximum value of XPAR (in all particle regions) (km).

All input data are printed.

F. Subroutine PARDEN

PARDEN is called by MESHMKR, and it generates marker particles for PURD input problems.

G. Subroutine FILMCØ

FILMCØ computes certain parameters associated with film plots. It is called initially by ØFFWEGØ, and during each hydrodynamic cycle by REZØNE. It resides with the main overlay, YØKIFER, so the subroutine and its results are available throughout the program.

Variables computed by FILMCØ are:

- XL Left boundary of the mesh, XL = 0.
- XR Right boundary of the mesh, $XR = \max(X_{ij})$.
- YB Bottom boundary of the mesh, $YB = \min(Y_{ij})$.
- YT Top boundary of the mesh, $YT = \max(Y_{ij})$. The maxima and minima are over the boundaries of real cells.
- IXL 4020 coordinate of XL
- IXR 4020 coordinate of XR
- IYB 4020 coordinate of YB
- IYT 4020 coordinate of YT
  Also computed and stored are the corresponding floating point values, FIXL, FIXR, FIYB, and FIYT.
- XCØNV Factor for converting radial coordinates to film coordinates, XCØNV = (FIYT-FIXL)/(XR-XL).
- YCØNV Factor for converting axial coordinates to film coordinates, YCØNV = (FIYT-FIYB)/(YT-YB).

The region of interest is defined by the particle generator subroutine PARTGEN or PARDEN. Region of interest plots eliminate plotting those parts of the mesh in which nothing in particular is happening. The corresponding quantities for the region of interest are:

PXL, PXR, PYB, PYT
IPXL, IPXR, IPYB, IPYT
FIPXL, FIPXR, FIPYB, FIPYT
PXCØNV, PYCØNV

The present region of interest definitions are:

PYB = PYB - 3×PXR
PYT = PYT + 2×PXR
PXR = 3×PXR

PYB, PYT, and PXR on the right are values computed by PARTGEN or PARDEN.

III. HYDRODYNAMICS CALCULATIONS

The hydrodynamics calculations are done by Overlay 2,0 (YØKKY), a modification of YAQUI. The basic YAQUI hydrodynamic calculations are unchanged. The differences between YØKKY and YAQUI (other than spelling) are mostly associated with the input and output, and with the fact that YØKKY has been divided into several overlays that communicate with the radiation programs. Properties of the original YAQUI program are described in detail in Ref. 1.

A. Overview of the Overlay

The main overlay, YØKKY, calls the five secondary overlays and decides whether the problem time is right for changing from hydrodynamic to radiation transport calculations.

1. Overlay 2,1 - PHASE0

PHASE0 performs the final calculations for each cycle. It interpolates total pressures and produces a short print of quantities of interest for each hydrodynamic cycle.

2. Overlay 2,2 - YØKØUT

YØKØUT, the hydrodynamic output program, is called only at output times, TØUT. The output is for the previously computed hydrodynamic cycle.

3. Overlay 2,3 - PHASE1

The hydrodynamic cycle begins in PHASE1, which performs the explicit Lagrangian calculations of YAQUI.

4. Overlay 2,4 - PHASE2

The implicit Lagrangran calculation (pressure iteration) is done in PHASE2.

5. Overlay 2,5 - PHASE3

In PHASE3, the mesh is rezoned and the Eulerian (transport) phase of YAQUI is solved to give final values of all mesh variables.

B. PHASE0

1. Variables Computed by PHASE0

P_{ij} Pressure in cell ij computed by interpolation in the equation of state table PTAB, (mg-km^2/cm^3-s = MPa).

TIAMB Total ambient internal energy in the mesh (J).

TI Total internal energy (in excess of ambient), including radiation (J).

TK Total kinetic energy (J).

EPØT Total potential energy (J).

TE Total kinetic and internal (in excess of ambient) energy (J).

UMØM Proportional to radial momentum of the material in the mesh (mg/km^4/2π-cm-s).

VMØM Proportional to axial momentum of the material in the mesh (mg-km^4/2π-cm-s).

CIRC Line integral of the velocities around the edge of the mesh.

TMAX Maximum specific internal energy in the mesh (J/mg). ITM and JTM are the indices of the cell containing TMAX.

TGMX Maximum specific internal energy gradient in the mesh (J/mg-km). ITG and JTG are the indices of the cell containing TGMX.

TMDT Time at the beginning of the hydro cycle (s). TMDT = T - DT.

Output

The following data are printed and written on film:

NCYC, TMDT, T, DT, NUMIT
TE, TI, TK, EPØT, TIAMB
UMØM, VMØM, CIRC
TMAX, ITM, JTM
TGMX, ITG, JTG
DTV, IDTV, JDTV } Computed by YØKØUT,
DTC, IDTC, JDTC } PHASE2, and PHASE3.

C. YØKØUT

YØKØUT is called only at output times, TØUT, and it computes the value for the next output time. YØKØUT plots two zone plots, two velocity vector plots, and one velocity direction plot. Plotting is controlled by the index NTHRU.

NTHRU = -1 Zones in the entire mesh.

NTHRU = 0 Velocity vectors in the entire mesh; zones in the region of interest.

NTHRU = 1,2 Velocity vectors and directions in the region of interest.

The region of interest is defined in Sec. II. Contour plots of density, specific internal energy, vorticity, and magnitude of velocity are plotted in the region of interest.

The coding for a long print on film is included, but this section of the program is by-passed on all cycles except cycle 0 to save film. The long print gives, for each cell, I, J, X, Y, U, V, SIE, RØ, 1/RVØL, D, and P. D is $\vec{\nabla}\cdot\vec{v}$ in 1/s.

1. Subroutine PARPLØT

PARPLØT, called by YØKØUT, plots the marker particles in the region of interest.

D. PHASE1

1. Time Interval Calculation

PHASE1 calculates the hydrodynamic time interval.

NCYC Hydrodynamic cycle number, for the cycle to be started in PHASE1, incremented to NCYC = NCYC + 1.

DT Hydrodynamic time interval for the cycle to be calculated. For the first cycle (NCYC=1), DT=DTR, the input radiation transport time interval.

In all subsequent cycles, the hydrodynamic cycle time interval is DT = min (DTV, DTC), where DTV is the viscous stress time interval computed in PHASE2 and DTC is the convective flux time interval computed in PHASE3.

New maximum values of DTV and DTC are set in PHASE1. DTV = DTC = DT × DTFAC, where DTFAC is a factor that causes the time interval to change so as to hold the number of pressure iterations in PHASE2 down to a small number (~5). DTFAC = $\frac{20}{15+NUMIT}$ where NUMIT is the number of iterations required on the previous cycle. DTFAC has a maximum value of 1.25.

The values of DTV and DTC are recomputed by PHASE2 and PHASE3.

T Initially in PHASE1 this is the time at the end of the hydrodynamic cycle just finishing, and it is incremented (T = T + DT) to the time at the end of the hydrodynamic cycle to be started.

2. Mesh Variables

PHASE1 makes one pass through the mesh loop and computes the following variables:

$UTIL_{ij}$	Explicit Lagrangian radial velocity component
$VTIL_{ij}$	Explicit Lagrangian axial velocity component
$GRIR_{ij}$	Radial velocity increment
$GRIZ_{ij}$	Axial velocity increment
E_{ij}	A geometric quantity
$DELSM_{ij}$	A geometric quantity
$RØL_{ij}$	$= RØ_{ij}$
$RCSQ_{ij}$	Reciprocal sound velocity squared

$$RCSQ_{ij} = \frac{1}{ASQ + GGM1*SIE_{ij}} ,$$

where GGM1 = GM1*(1+GM1) (ambient cells) and

$$GGM1 = \frac{P_{ij}}{RØ_{ij}SIE_{ij}}\left(1+\frac{P_{ij}}{RØ_{ij}SIE_{ij}}\right)$$

(other cells).

PHASE1 utilizes the improved node coupler that smooths vertex velocities by the velocities of all eight surrounding vertices.

3. Subroutine NADD

NADD is called by PHASE1 for Purd problems only.

E. PHASE2

The variables computed by PHASE2 are:

PL_{ij}	Gas pressures obtained by iteration.
NUMIT	Number of pressure iterations required (500 maximum).
$ETIL_{ij}$	Explicit Lagrangian internal energy.
DTV	Tentative value of DT based on viscous stresses. It is the minimum of such values for all cells and the value originally computed in PHASE1. The cell is IDTV, JDTV.

F. PHASE3

PHASE3 computes the final values of the mesh variables X, Y, R, MP, RMP, EP = SIE, U, V, RVØL, and RØ. The temperature is computed from SIE by the iterative scheme described in Sec. IV. DTC, the convective flux time interval is also computed in PHASE3. DTC is computed for each cell, and the final value is the minimum of the value over all cells and the value previously computed in PHASE1. The cell is IDTC, JDTC. PHASE3 calls subroutines REZØNE (to rezone the mesh), PARTMØV (to move the marker particles), and FILMCØ (to modify the film plotting parameters).

1. REZØNE

REZØNE is called by PHASE3 when the rezone parameter (an input number) GRDVEL = 2.0 or when the S_n radiation transport calculation is being used. (GRDVEL = 0.0 and GRDVEL = 1.0, respectively, represent Eulerian or pure Lagrangian rezones that are handled by PHASE3.) The outside of the mesh is moved with velocities FC3 (down), FCP2 (up), and FCX (to the right). These quantities depend on the arrival of velocities at the outer part of the mesh and on the appearance of nonambient internal energies (such as by radiation) at the edge of the mesh. The latter calculation is not presently activated. For S_n radiation transport problems, the mesh lines are moved, but they remain either vertical or horizontal, thus retaining the rectangular cells and representing continuously rezoned Eulerian geometry. A mesh that is not rectangular can be relaxed to rectangularity by setting the variable mesh "stiffener" parameter FSTF = 1.0*RDT. The rezone constants are printed.

2. PARTMØV

PARTMØV moves marker particles to new positions based on the velocity at the particle location. New values of PYB, PYT, and PXR are computed to redefine the region of interest in film plots.

IV. MONTE CARLO SOLUTION OF THE RADIATION TRANSPORT PROBLEM

The Monte Carlo radiation transport calculations are done by Overlay 3, 0 (MCRT).

A. Overview of the Overlay

The main Monte Carlo radiation transport program is MCRT (Overlay 3,0). MCRT computes variables used throughout the radiation calculation and calls the three secondary overlays.

1. Overlay 3, 1 - REEFER*

REEFER performs the Monte Carlo solution to the radiation transport problem. Its principal function is to generate and follow statistical particles. In Subroutine WALK (called by REEFER), the particles pursue the random walk and meet their statistical fates. REEFER generates NSP (internally set to 10) source particles in each cell in which the temperature exceeds a specified threshold value, TEMIT (internally set to 0.05 eV). REEFER sets values of the following parameters for each particle.

A random position in the cell,
A random direction of travel,
A random frequency (photon energy),

An energy "weight" equal to the cell emission energy divided NSP.

In WALK, the particles move from their initial positions, with the above initial properties, until one of the following randomly selected events occurs:

The particle collides and is absorbed, and the walk is terminated.
The particle collides and is scattered.
The particle energy is reduced to a negligible value (set by EDEATH).
The particle leaves the mesh, and the walk terminates.
The radiation time interval ends.

When a particle is scattered, its random variables are reset as follows.

Its position is the point where the scattering collision occurred.
A new random direction of travel is sampled (isotropic).
A new random frequency (photon energy) is sampled.
The energy is equal to the energy of the particle before the scattering.

If a particle has not died when the time interval ends, it becomes a "census" particle and its parameters are stored on Fileset 1, so that its random walk can be continued on the following radiation transport cycle. The overlay REEFER reads Fileset 1 for census particles from the previous cycle, before new (source) particles are initialized.

When any particle (source or census) undergoes NPCMAX scatterings, its parameters are sent to the "bank." The value of NPCMAX is set by ØFFWEGØ and is presently 50. Characteristics of particles sent to the bank are are also stored on Fileset 1 and are read by REEFER after all census and source particles have been completed. REEFER splits each bank particle into NBP particles. The value of NBP is set by ØFFWEGØ and is presently three. Each sibling particle is characterized as follows.

*One who reefs (naut); a short coat or jacket of thick cloth.

Its position is the point where the parent particle was deposited in the bank.
The direction of travel is the same as that of the parent.
The frequency (photon energy) is the same as that of the parent.
The energy is the energy of the original particle, divided by NBP.

These sibling particles, in turn, may be deposited in the bank eventually during their random walk, and it is not uncommon to produce many particle progeny during each cycle. As the particles move around the mesh (in WALK), an exponential energy loss is associated with each move, and the energy is deposited (the weight scored) along the path of the move. When a particle is absorbed, dies from lack of energy, leaves the mesh, or goes to census, its energy is scored at the place where the event occurs, by saving the coordinates of each sample. The original particle energies, the energy scores, and the energies of the terminated particles (except census particles) are stored on Fileset 3, for use by overlay ESTEP. Also stored on Fileset 3 are the particle frequencies. Fileset 3 is included in the problem dump tapes so that these data can be analyzed.

2. Overlay 3.2 - ESTEP

ESTEP reads the particle production and deposition energies, and coordinates, from Fileset 3 and uses them to advance the internal energies, and hence temperatures, in each mesh cell.

3. Overlay 3.3 - LISTING

LISTING is called at output times (TØUT) and writes (on film) detailed mesh data associated with the Monte Carlo calculation.

B. MCRT

1. Mesh Variables

MCRT does one mesh loop calculation and computes mesh variables and their spatial integrals. These variables are stored in LCM unless otherwise noted.

$CENTX_{ij}$ Radial coordinate of the centroid of cell ij (km).

$CENTY_{ij}$ Axial coordinate of the centroid of cell ij (km).

The centroids represent the positions of cell-centered mesh variables, and they are the arithmetic means of the radial and axial coordinates of the vertices. CENTX and CENTY are set to 0 when I = IP1, to simlify subroutine CENTRØY.

$BETALC_{ij}$ Radiation derivative in cell ij.

$SIGPLC_{ij}$ Mean absorption coefficient in cell ij (1/km).

BETALC and SIGPLC are computed by double logarithmic interpolation in the equation of state tables BTBL and SPTBL, respectively,

$FSCAT_{ij}$ Absorption probability in cell ij (stored in SCM).

FSN_{ij} Identical to $FSCAT_{ij}$.

FSCAT is computed from

$$FSCAT = \frac{1}{1+c(ALPHA)\,(BETALC_{ij})\,(SIGPLC_{ij})\,(DTØLD)},$$

where ALPHA is an input quantity and DTØLD is the radiation time interval. When ALPHA = 0, FSCAT = 1; there is no scattering, and the calculation that walks each particle to absorption is explicit. When ALPHA = 1, scattering is maximized and the calculation is fully implicit, allowing both absorption and scattering.

$RZEDEN_{ij}$ Total energy to be radiated from cell ij during the radiation transport cycle (J).

$$RZEDEN_{ij} = a \times c \times (FSCAT_{ij})(BETALC_{ij})(SIGPLC_{ij}) \times (TEMP_{ij}^{4})\,(DTØLD)\,Volume_{ij},$$

where $Volume = 2\pi/RVØL_{ij}$.

SIEMIN Smallest amount of internal energy (J) in any cell in which the temperature exceeds TEMIT.

SIEMIN is used to determine the death energy of statistical particles. The cell containing SIEMIN is IJMIN, and the temperature and density in the cell are TMIN (eV) and DMIN (mg/cm^3), respectively.

EINT Total internal energy (including radiation) in the mesh (J).

EKIN Total kinetic energy in the mesh (J).

EALL Total internal and kinetic energy in the mesh (J).

URTØT Total radiation energy in the mesh (J).

2. Time Interval

The time interval for the next radiation transport cycle is calculated in MCRT.

TIME Initially, the problem time at the beginning of the radiation transport cycle (s).

At the end of MCRT, TIME is advanced to the value at the end of the cycle (and the beginning of the next cycle). Initially, DTR is the time interval for the radiation cycle, but throughout MCRT it is the time interval of the next cycle. The original value is retained in DTØLD.

T2 Time at the end of the cycle T2 = TIME + DTR, where TIME and DTR have their initial values.

DTR, the time interval for the next radiation transport cycle is calculated by MCRT. The inconsistencies introduced by using the time interval for cycle m+1 on values at the beginning of cycle m are negligible. This method is used to avoid recomputing quantities available during the MCRT calculation. The energy radiated from a cell during a cycle is $RZEDEN_{ij}$. We require that this not exceed 15% of the total energy (E_{ij}) in any cell where the temperature exceeds TEMIT.

$$\left(\frac{RZEDEN_{ij}}{DTR}\right) \times DTR \leq 0.15 \times E_{ij}$$

Let DTR in the denominator be the value for the current cycle, (DTØLD). Also let the value in the numerator be that for next cycle, and solve for the latter;

$$DTR = \min \left(\frac{0.15 \times E_{ij} \times DT\emptyset LD}{RZEDEN_{ij}}\right)$$

At the end of MCRT, DTR may be reduced, if necessary, to complete an even number of radiation cycles per hydrodynamic cycle. Before the possible reduction, DTØLDER = DTR. Later values of DTR are based on DTØLDER rather than the reduced value of DTR, which is usually very small.

3. Output

MCRT prints

NCYC, TIME(at start of cycle), T2, DTØLD
URTØT, EINT, EKIN, EALL
IJMIN, SIEMIN, TMIN, DMIN

C. REEFER

1. Variables Computed by REEFER

JCEN Initially, the number of census particles carried over from the previous cycle.

At the end of REEFER, JCEN is the number of census particles carried over to the following cycle.

IBANK The number of particles to be withdrawn from the bank on each pass through the bank particle calculation.

On the first pass, it is the number (after splitting) of original source and census particles sent to the bank. On each subsequent pass, it is the number (after splitting) of particles from the previous pass deposited in the bank.

ID Number of words of energy deposition data currently stored in the buffer array EBLØCK.

When ID = NBUF = 6000, EBLØCK is dumped to Fileset 3 and ID is reset to 0. NBUF is a fixed parameter set by ØFFWEGØ.

NFLUSH Total number of particles for which deposition data are written on Fileset 3.

The following indices are totaled separately for census particles, source particles, and for each pass through the bank calculation.

NGEN Number of particles started.

NCEN Number of particles sent to census (for processing on the next radiation cycle).

NBANK Number of particles sent to the bank.

NDIE Number of particles that die from either absorption, or loss of energy (in WALK).

IESCAP Number of particles that leave the mesh (in WALK).

NMØVE The number of particle moves (in

WALK several moves may be required to effect a collision).

NCØL The number of particle collisions (in WALK).

The random variables that define particles are listed below:

Statistical particle positions are defined by three coordinates rather than the two coordinates required by all other space-dependent variables in the program. A(1), A(2), and A(3), are the x, y, and z components of the particle position (km). Before WALK changes them, these are called XA1, XA2, XA3, respectively. The corresponding R-Z coordinates are:

Radial coordinate RHØP = $\left[A(1)^2+A(2)^2\right]^{1/2}$

Axial coordinate ZP = A(3).

The initial positions of census and bank particles are the positions recorded at census or deposited in the bank. The initial positions of source particles are randomly sampled in the cells in which they are started. The random positions are chosen by assigning a random weighting factor to each cell vertex.

ØMEGA(1), ØMEGA(2), and ØMEGA(3), the x, y, and z components of the particle direction vector.

Before WALK changes them, these are called XØMEGA1, XØMEGA2, and XØMEGA3, respectively. The initial directions of census and bank particles are the same as those of the particles that arrived at census or the bank. The initial directions of source particles are randomly chosen polar and azimuthal angles.

FREQP Particle frequency (1/s).

Before WALK changes it, FREQP is called XFREQP. For census and bank particles, the initial frequencies are the same as those of the parent particles. For starting source particles, FREQP is a random variable chosen by subroutine PFREQ.

EPART Particle energy (J).

Before WALK changes it, EPART is called XEPART. This is the weight that is used to score the results of random particle walks. The weight is given according to particle type as follows.

Census Particles. Usually, EPART is the energy with which the particle was sent to census during the previous cycle. If however, EPART for a census particle is subsequently found greater than $RZEDEN_{ij}$ (the energy to be radiated in cell ij, where the census particle is located), EPART is reduced to RZEDEN. Furthermore, no single particle is allowed to carry more energy than RZEDEN/10. Thus, if the particle energy is larger than this, the census particle is split into NCP particles so that the energy of each, EPART, is less than RZEDEN/10. Whenever census particles are generated in a cell ij, $RZEDEN_{ij}$ is reduced by the energy carried by the particles.

Source Particles. NSP = 10 source particles are started in each cell where the temperature exceeds TEMIT = 0.05 eV. The energy of each particle is EPART = RZEDEN/NSP.

Bank Particles. Each particle sent to the bank (with energy EPART') is split into NBP = 3 daughter particles, each with energy EPART = EPART'/NBP.

I, J Indices of the cell in which the particle is generated.

For source particles, I and J are known because particles are generated in particular cells. I and J are known for bank particles because WALK always knows in which cell a particle lies and deposits this information with the parent particle parameters. For census particles, the cell in which the particle lay when it was sent to census is known, but, because the mesh will generally have been rezoned in the meantime, the particle may be in a different cell. Subroutine WHERE is called to find I and J for census particles.

T1 The time when WALK is called (s).

For census and source particles, T1 = TIME. For bank particles, T1 is the time the particle was sent to the bank.

EDEATH Particle death energy (J).

Particles whose energy is less than EDEATH are terminated by WALK. For census and source particles, EDEATH is 1% of EPART, or 1% of SIEMIN, whichever is smaller. For the first bank calculation, EDEATH = EDIE. On subsequent bank calculations, EDEATH is 1% of SIEMIN.

EDIE Minimum value of EDEATH for all source particles (J).

IDIE As input to WALK, this identifies the particle type as:

IDIE = 0 Census or source particle,

IDIE = 1 Bank particle.

As output from WALK, IDIE identifies the particle type as:

IDIE = 0 Escaped or dead particle,

IDIE = 1 Bank or census particle.

ERAD Total energy of all source particles (J).

ECEN1 Total energy of all input census particles (J).

ECEN Total energy of all output census particles (J).

EMC Total energy radiated (ERAD+ECEN1) in the particle population.

2. REEFER Data Storage

Particle production and energy deposition data are stored on Fileset 3, two words per particle, in floating point and integer packed format.

Word 1	Bits	59-40	Radial coordinate
		39-20	Axial coordinate
		19-0	Energy
Word 2	Bits	59-18	Frequency
		17-9	I
		8-0	J

The coordinates represent the position where the particle was produced or the energy was deposited. The energy is either the negative of the original source particle energy (the emission energy), or the energy deposited at a score. Word 1 is floating point data packed by PAKFNØ. The frequency in Word 2 is truncated, and the integers I and J are stored in the low-order bits. Census and bank particle data are read from Fileset 1 and written on Fileset 2, eight words per particle.

Word	Census	Bank
1	A(1)	A(1)
2	A(2)	A(2)
3	A(3)	A(3)
4	ØMEGA(1)	ØMEGA(1)
5	ØMEGA(2)	ØMEGA(2)
6	ØMEGA(3)	ØMEGA(3)
7	EPART	-EPART
8	FREQP(bits 59-18)	FREQP(bits 59-40)
	I(bits 17-9)	T1(bits 39-20)
	J(bits 8-0)	I(bits 17-9)
		J(bits 8-0)

For census particles, FREQP is truncated as described above, but not packed. For bank particles, FREQP and T1 are packed by Subroutine PAKFNØ.

3. REEFER Output

The indices NGEN, NCEN, NBANK, NDIE, IESCAP, NMØVE, and NCØL are printed for census particles, for source particles, and for each pass through the bank particles. Also printed are NFLUSH, EMC, ERAD, and ECEN1.

4. Subroutine WALK

Length of Particle Movements.

DMØVE Distance the particle moves. Generally WALK will move a particle several times between its initial position and its final position (collision, absorption, escape, or census). DMØVE is the minimum of the following:

DCEN Collision Distance. Initially, DCEN = c(T2-T1), where T2-T1 is the time remaining in the radiation transport cycle, and c is the speed of light. After each particle move, DCEN is reduced by DMØVE.

DCØL Collision Distance. Initially, DCØL is the length of a random number of mean free paths. The initial value of DCØL is given by RMFP × DMFP. RMFP is a randomly sampled number of mean free paths. RMFP can vary from 0 to ∞, it is usually less than 1 and it is sampled from RMFP = $|\ln(\gamma)|$, where γ is a random number.

After each particle move, RMFP is reduced by an appropriate amount and DCØL is recomputed.

DMFP = length of a mean free path at the particle location; where DMFP = 1.0/SIGNU and SIGNU is the absorption coefficient dependent on the temperature and density at the particle location, and on the particle frequency. The weighting factors for computing density and temperature at the particle position are found by subroutine CENTRØY; the subscript of the absorption coefficient, by subroutine SUBSCR.

DCELL Nominal move distance.

Because mesh properties vary continuously, DMFP is a continuous function of particle position. To approximate this continuous change, mesh properties are re-evaluated whenever a particle moves. The nominal move distance is the minimum dimension of the cell in which the particle lies.

5. Energy Scores

When a particle moves, its energy is reduced by

$$ESCØRE = (EPART) \left[1-e^{(-FSP)(DMØVE)(SIGNU)}\right],$$

where FSP is the absorption probability at the original position of the particle (the weight factors for computing FSP are found by CENTRØY). The energy, ESCØRE, is deposited at a position RHØD, ZD, midway between the initial and final particle positions. The new particle position and energy are then computed. Subroutine WHERE is called to determine the indices I and J of the cell in which the particle lies after the move. Tests are next made to determine whether the particle went to census, went to collision, went out of the mesh, ran out of energy, or merely moved while randomly seeking one of the aforementioned fates. If the particle went to census, its remaining energy is deposited (scored) at its final position and IDIE is set to 1 to tell REEFER to store the particle parameters on Fileset 1. If the particle left the mesh, its remaining energy and final position (outside the mesh) are saved on Fileset 3, and IESCAP is incremented. If the particle ran out of energy, its remaining energy is deposited (scored) at its final position and NDIE is incremented. If the particle underwent a collision, NPCØL is incremented. The particle will have been absorbed (with a probability FSP), or scattered (with a probability 1-FSP) at the collision. If the particle was absorbed, the remaining energy is deposited (scored) at the point of collision and NDIE is incremented. If the particle was scattered (and NPCØL≤NPCMAX) the particle is continued (reemitted). Its random frequency and direction after scattering are computed by subroutines PFREQ and PØMEGA, respectively. The local mesh properties are recomputed using subroutine CENTRØY. If the number of collisions exceeds NPCMAX, the particle is deposited in the bank. If it is deposited, the particle energy is made negative and IDIE is set to 1 to tell REEFER to store the particle parameters on Fileset 1.

6. Subroutine FLUSH

FLUSH is a utility routine called by WALK and REEFER. This routine writes particle production and energy deposition data (stored in the buffer EBLØCK) on Fileset 3. FLUSH is called by WALK when the counter ID = NBUF, and by REEFER after the last deposition has been made. ID is reset to 0, and NFLUSH is incremented by the number of particles (ID/2) for which data were written.

7. Subroutine CENTRØY

CENTRØY is called by WALK, and it computes interpolation factors for determining the values of the cell-centered mesh variables at the position of a particle in a cell whose indices are I and J.

ISC I+1 if the particle is in the right side of I, J.
I-1 if the particle is in the left side of I, J.

JSC J+1 if the particle is in the top part of I, J.
J-1 if the particle is in the bottom part of I, J.

$CWGT_1$ Weight factor for cell ISC, J.

$CWGT_2$ Weight factor for cell I, JSC.

$CWGT_3$ Weight factor for cell I, J.

The value of mesh variable z at a position x, y in cell i, j can be approximated by a linear combination of three known values of z:

$$z_3 = z(x_3,y_3) \quad z_1 = z(x_1,y_1) \quad z_2 = z(x_2,y_2).$$

x_3,y_3 is the centroid of cell I, J.

x_1,y_1 is the centroid of cell ISC, J.

x_2,y_2 is the centroid of cell I, JSC.

The three known values of z form a plane, where

$$z = w_1 z_1 + w_2 z_2 + w_3 z_3.$$

let

$$\delta x_1 = x_1 - x_3 \qquad \delta y_1 = y_1 - y_3$$

$$\delta x_2 = x_2 - x_3 \qquad \delta y_2 = y_2 - y_3$$

$$\delta x = x - x_3 \qquad \delta y = y - y_3$$

then

$$w_1 = \frac{\delta x \delta y_2 - \delta x_2 \delta y}{\delta x_1 \delta y_2 - \delta x_2 \delta y_1} ,$$

$$w_2 = \frac{\delta x_1 \delta y - \delta x \delta y_1}{\delta x_1 \delta y_2 - \delta x_2 \delta y_1} ,$$

$$w_3 = 1 - w_1 - w_2 .$$

The weight factors w_1, w_2, and w_3 are represented by $CWGT_1$, $CWGT_2$, and $CWGT_3$, respectively, in the program. In a rectangular mesh, $\delta y_1 = \delta x_2 = 0$ and the weights are

$$w_1 = \frac{\delta x}{\delta x_1} , \; w_2 = \frac{\delta y}{\delta y_2} , \; w_3 = 1 - w_1 - w_2 .$$

Special provisions are made for the mesh boundaries.

At the left boundary (i-1=0), or the right boundary (i+1=IP1), set $\delta x = \delta x_2 = 0$.

$$w_1 = 0, \quad w_2 = \frac{\delta y}{\delta y_2} , \quad w_3 = 1 - w_2 .$$

At the bottom (j-1=1), or the top (j+1=JP2), set $\delta y = \delta y_1 = 0$.

$$w_1 = \frac{\delta x}{\delta x_1} , \quad w_2 = 0 , \quad w_3 = 1 - w_1 .$$

At the corners, both conditions apply, and

$$w_1 = w_2 = 0 , \quad w_3 = 1 .$$

8. Subroutine WHERE

WHERE is called by REEFER and its purpose is to solve the general problem:

Given a position r, z, find the cell i, j in which it is located.

Start with an initial guess i, j. In row j, move to the left (west) until a cell is found whose west boundary is west of r, z. Let this cell be i-k, j (k=0,1,2,...i-1).

If the r-values of both northwest and southwest vertices are west of r, then r is in the cell.

If the r-values of both northwest and southwest vertices are east of r, then r is in the next cell.

If one vertex is east of r and the other is west of r, a test is made to determine whether r is east or west of the line connecting the vertices.

If k > 0, the particle is in i-k, j, and i is set to i-k.

If k = 0 (the original cell), a similar procedure is followed moving east.

When the value of i is determined, the testing is done both south and north in column i, to find j. If j is different from the original j, the entire process is repeated, because the i-value that is correct for one value of j may be wrong for another.

An improved version of WHERE is in preparation.

9. Subroutine SUBSCR

SUBSCR, called by WALK, is used to find the frequency-dependent absorption coefficient at a particle position. The equation of state variables ØPTMP(J), ØPDEN(K), and FREQ(I) are tabulated. Analytic expressions have been found for

J as a function of ØPTMP,

K as a function of ØPDEN,

I as a function of FREQ.

Given the particle frequency and the temperature and density at a position, I, J and K can be computed. The combined subscript of the frequency-dependent absorption coefficient is

IJK = I + (J-1)*NFRQ + (K-1)+NØPT*NFRQ.

Note that frequency-dependent absorption coefficients are taken directly from the tabulated data and are not interpolated, and that this routine is data dependent.

10. Subroutine PFREQ

PFREQ, called by WALK, is used to sample random frequencies of statistical particles. The frequency (eV) is given by the Planckian distribution when

$$\nu = -\frac{1}{\zeta(k)} \ln (\gamma_1, \gamma_2, \gamma_3, \gamma_4) T \quad ,$$

where the γ's are uniform random numbers on (0,1) and T is the temperature (eV).

$$\zeta(k) = \min [m, \gamma\zeta(\infty)] \quad ,$$

where $\zeta(\infty) = \sum_{n=1}^{\infty} \frac{1}{n^4} = 1.0823$ and γ is a random number uniform on (0,1).

m is defined as the smallest integer for which

$$\zeta(m) = \sum_{n=1}^{m} \frac{1}{n^4} \geq \gamma\zeta(\infty) \quad .$$

The factor 2.41814×10^{14} is the conversion between $h\nu$ (energy) and ν(frequency) units, expressed in eV/s^{-1}.

11. Subroutine PØMEGA

PØMEGA samples random direction vectors for statistical particles from the isotropic density function.

D. ESTEP

The variables computed by ESTEP are:

$EPART_{ij}$ Total energy deposited by particles in cell ij (J).

$EMSN_{ij}$ Total energy emitted by particles in cell ij (J).

ELØST Total energy of particles that escape from the mesh (J).

EABS Total energy of particles absorbed in the mesh (J).

EEMIT Total energy of emitted particles (J).

RA Normalizing factor for absorptions.

RE Normalizing factor for emissions. RE and RA are the ratios of EMC (the total energy of all particles, computed by REEFER when the particles are generated) to the total emission and absorption energies of the particles actually retrieved by ESTEP. The ratios differ very slightly from 1 because of the loss of significance caused by packing the data. All energies are normalized by RE or RA to conserve energy. The packing errors are random, so the solution accuracy is limited by statistical error.

SIE_{ij} Specific internal energy in cell ij (J/mg). SIE_{ij} is based on the original internal energy, increased by the energy absorbed in the cell and decreased by the energy emitted in the cell:

$$SIE_{ij} = SIE_{ij} + \frac{EPART_{ij} - EMSN_{ij}}{RØ_{ij}} \times \text{volume} \quad .$$

$TEMP_{ij}$ Temperature in cell ij (eV).

The calculated total specific internal energy of the cell contains the radiation term, aT^4. It is necessary to find a

$$SIE = I(\rho,T) + aT^4 \quad ,$$

where I is the equation of state internal energy for the material in the cell and does not include the radiation term. An iterative procedure is used. On the same graph, (Fig. 7)

I. $I = SIE - aT^4$ vs T ,

II. $I(\rho,T)$ vs T .

Curve I decreases from SIE when T = 0, to 0 at some high value of T. Curve II has a positive slope. The intersection of the two curves corresponds to the T being sought. The minimum value of the solution is the ambient temperature TLØW = TAMB, and the maximum value is that at which the first curve goes to 0, THIGH. Guess a value of T midway between THIGH

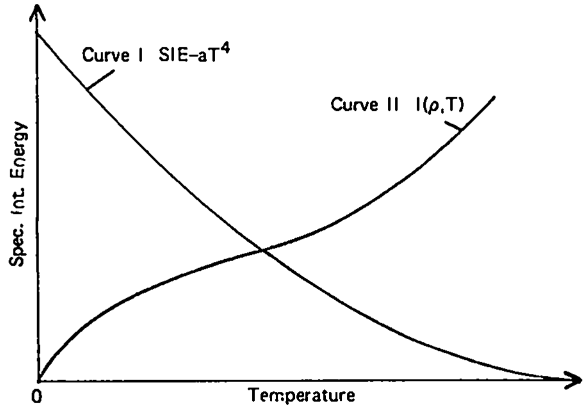


Fig. 7. Calculation of temperature from internal energy.

and TLØW and determine the value of both curves. If curve I is above curve II, the intersection is at a higher temperature value, so set TLØW = T. If curve II is above curve I, the intersection is at a lower value, so set THIGH = T. Repeat the process until THIGH and TLØW are the same.

TMAX Maximum temperature in the mesh (eV).

DMAX Maximum density in the mesh (mg/cm^3).

DMIN Minimum density in the mesh (mg/cm^3).

ETØT Total energy deposited by particles (J).

TAVG Midpoint of the time interval (s).

THY Total energy lost from the mesh, summed over all cycles (J).

The following quantities are printed and written on tape:

ETØT, EABS, ELØST, EEMIT, ECEN, RE, RA RAVG, TMAX, DMAX, DMIN, and THY.

E. LISTING

LISTING writes REEFER mesh data on film, and it is called only at output times, TØUT. The data written, for each cell, are

I, J Cell indices.

X, Y Radial and axial coordinates of the (lower left-hand vertex) of the cell.

EPART, EMSN, TEMP, FSN, SIGPLC, BETALC, and RZEDEN.

V. S_n SOLUTION OF THE RADIATION TRANSPORT PROBLEM

Overlay 4, 0 (GREYSN) computes a grey (one frequency group) solution to the radiation transport problem, using the S_n method.

A. Overview of the Overlay

The primary overlay for the S_n radiation transport is GREYSN, Overlay 4.0, which computes variables used in the calculation and calls the secondary overlays.

1. Overlay 4.1 CYLSN

CYLSN performs the S_n solution to the radiation transport problem in RZ geometry.

2. Overlay 4.2 SNESTEP

SNESTEP uses the energy fluxes computed by CYLSN to advance the internal energies and temperatures in the mesh cells.

3. Overlay 4, 3 SNØUT

SNØUT is the output program for the S_n overlay, and it is called only at output times, TØUT.

B. Calculations of Overlay 4

1. GREYSN

GREYSN initializes parameters

ALPHA Implicitness parameter, originally read as input by ØFFWEGØ ($0 \le$ ALPHA ≤ 1). ALPHA = 0 leads to an explicit calculation (no scattering); ALPHA = 1, to an implicit calculation.

ISN Order of the S_n calculation, originally set to ISN = 4 by ØFFWEGØ.

Both parameters are stored in common block CRIMSN by ØFFWEGØ. GREYSN does one mesh loop calculation and computes mesh variables and some totals of mesh variables.

$CENTX_{ij}$ Radial coordinate of the centroid of cell ij (km).

$CENTY_{ij}$ Axial coordinate of the centroid of cell ij (km).

CENTX and CENTY are the arithmetic means of the radial and axial coordinates, respectively, of the cell vertices. They are not used by GREYSN, but are required for the analysis of dump tapes.

SIGPLC$_{ij}$ — Planck or Rosseland mean absorption coefficient (1/km) associated with the temperature and density in cell ij, interpolated from the equation of state table, SPTBL.

RZEDEN$_{ij}$ — Explicit radiation source in cell ij $(J/km^3\text{-sr})$.

$$RZEDEN_{ij} = 3.2757 \times 10^{14}\ (SIGPLC_{ij})(TEMP_{ij}{}^4)$$

where the constant is $\frac{ac}{4\pi}$.

FSN$_{ij}$ — Absorption probability for radiation in cell ij.

$$FSN_{ij} = \frac{1.0}{1+c\,(ALPHA\ \ (BP_{ij})\ \ (SIGPLC_{ij})\ \ (DTR)},$$

where BP_{ij} is the radiation derivative associated with the temperature and density in the cell and is interpolated from the equation of state table, BTBL. When ALPHA = 0, FSN = 1 and there is no scattering.

AVINT$_{ij}$ — The average intensity is set to 0 in all cells before the start of the iteration.

RSN$_i$ — Radial coordinate of vertex i = X(I,2) (km).

ZSN$_j$ — Axial coordinate of vertex j = Y(1,J) (km).

ESN — Total energy radiated (J).

$$ESN = 8\pi^2 \sum_{ij} (RZEDEN_{ij})/(RV\text{Ø}L_{ij}) \quad .$$

The principal time interval calculation is in SNESTEP, but the time interval is shortened, if necessary, at the end of GREYSN.

2. CYLSN

CYLSN computes the S_n constants, SNCØN(I) I = 1, 181.

These constants are computed by subroutine SNGEN on the first cycle and on any subsequent cycle when ISN is changed.

B$_i$ — Area of the top of cell i (for all j) (km^2), $= \pi(RSN_{i+1}^2 - RSN_i^2)$.

The rest of CYLSN is devoted to the S_n iteration.

AVØLD$_{ij}$ — Average intensities from the previous iteration.

AVINT$_{ij}$ — Newly computed average intensities.

In GREYSN, AVINT$_{ij}$ has been set to 0 for all ij. On each iteration in CYLSN, AVØLD$_{ij}$ = AVINT$_{ij}$, and AVINT$_{ij}$ is recomputed by subroutine SWEEP.

The process is continued until AVINT$_{ij}$ ≈ AVØLD$_{ij}$ for all ij.

ISTEP is the iteration counter. For explicit calculations (ALPHA = SNCØN(182) = 0.0), only one pass is made through SWEEP.

The calling arguments of the subroutines in the CYLSN overlay are summarized in Table I.

SWEEP. Subroutine SWEEP is called by CYLSN. SWEEP and its dependent subroutines IN and ØUT perform the S_n calculation.

The mesh variables computed by SWEEP are:

AVINT$_{ij}$ — Average intensity of radiation in cell ij. $(J/cm^2\text{-s-sr})$,

EMØMLC$_{ij}$ — Vertical component of radiation flux in cell ij $(J/cm^2\text{-s})$,

UMØMLC$_{ij}$ — Horizontal component of radiation flux in cell ij $(J/cm^2\text{-s})$,

FØUTLC$_{ij}$ — Net rate of flow of energy out of cell ij (J/s),

TABLE I
SUBROUTINE PARAMETERS

CYLSN	SWEEP	IN,ØUT	REMARKS
ZSN	ZSN		Defined in text
RSN	RSN	R	Defined in text
B	B	B	Defined in text
SNCØN(LBET1)	BET1	BETA	S_n constant
SNCØN(LBET2)	BET2		S_n constant
SNCØN(LU)	U	U	S_n constant
SNCØN(LE|	E	E	S_n constant
SNCØN(LW)	W	W	S_n constant
AL	AL	AL	Defined in text
BR	BR	BH	Defined in text
BB	BB	BV	Defined in text
IBAR	IT	IT	Defined in text
JBAR	JT	JT	Defined in text
NN	NN	NN	NN = ISN/2
MM	MM		MM = ISN(ISN+2)/8
AVINT	AVINT		Oefined in text
AVØLD	AVØLD		Defined in text
	S	S	Defined in text
	CT	CT	Defined in text
	UMØM	UMØM	Defined in text
	EMØM	EMØM	Defined in text
	FØUT	FØUT	Defined in text
	1.0, -1.0	ES	-1.0 in downward calc, 1.0 in upward calc.
	DZP	DZP	DZP = 2*DZ
	DZ	DZ	DZ = $ZSN_{j+1} - ZSN_j$
	JM1	J	JM1 = index of row being calculated − 1
	AVNEW	AVNEW	Defined in text
	M1		M1 = MM + 1
	M2		M2 = 2MM

$$SUM = \sum_{ij} FØUTLC_{ij} .$$

SWEEP computes the constant M2 = 2*MM, the total number of angles for which fluxes are to be calculated. The maximum permissible value of M2 is 72.

SWEEP calculations are done one row at a time, and they utilize row variables, (which are the mesh variables for the row), and intensities.

$FØUT_i = FØUTLC_{ij}$.
$EMØM_i = EMØMLC_{ij}$.
$UMØM_i = UMØMLC_{ij}$.
$AVNEW_i = AVINT_{ij}$.
$CT_i = SIGPLC_{ij}$.
$S_i = (RZEDEN_{ij})(FSN_{ij}) + (AVØLD_{ij})(1-FSN_{ij})(SIGPLC_{ij})$ (radiation source).

$BB_{i,m}$	Vertical intensity for direction m, m = 1, M2.
$BR_{j-1,m}$	Horizontal intensity for direction m, m = 1, M2.
$AL_{k,i}$	Angular flux k = 1, NN

The maximum dimensions of the variables are:

Row variables	I = 100
BB	I = 100, M = 72 I × M = 7200
BR	J = 101, M = 72 (J-1) × M = 7200
AL	K = 8, I = 100, K × I = 800

SWEEP first computes the downward flux row by row, starting with row JP1. The downward intensities at the top of the mesh (BB) and the inward intensities from the right (BR) are set to 0. The row variables, $FØUT_i$, $EMØM_i$, and $UMØM_i$ are set to 0, and $AVNEW_i$, CT_i, and S_i are computed.

Subroutine IN is called to compute row variables and new intensities, from right to left, and ØUT is called to work from left to right.

When the row has been calculated, the row variables are stored as mesh variables.

When the bottom row is reached, the process is reversed and the calculation is made from bottom to top. The upward intensities at the bottom of the mesh are set to 0. The row variables $FØUT_i$, $EMØM_i$, and $UMØM_i$ are initialized to the corresponding values of the mesh variables.

3. SNESTEP

SNESTEP advances the energies and temperatures in the mesh cells.

$$SIE_{ij} = \frac{(-FØUTLC_{ij})(DTØLD)(RVØL_{ij})}{2\pi \times 10^{-15}(RØ_{ij})} + SIE_{ij} ,$$

where DTØLD is the time interval of the radiation transport cycle. $TEMP_{ij}$ is found from SIE_{ij} by the iterative procedure described in Sec. IV.

Other variables computed are:

SIETØT	Internal energy, in excess of ambient, (including radiation) in the mesh (J).
URTØT	Radiation energy in the mesh (J).
PWR	Total radiation along the mesh boundaries (J/s).
ELØST	Total energy lost from mesh during time step (J).
EABS	Energy absorption rate during time step (J/s).
PWR2	Time rate of change of internal energy (J/s).

The radiation transport time interval is calculated by SWEEP.

DTR	Initially, the radiation time interval for the cycle being calculated, then the interval for the following cycle.
DTØLD	Interval for the cycle being calculated.

During the cycle being calculated, let $ECELL_{ij}$ be the total internal energy in cell ij and $PMARK = |FØUTLC_{ij}|$, the rate of energy change in cell ij. The energy change in cell ij during the cycle is (PMARK)(DTR). DTR must be such that the energy change does not exceed 15% of $ECELL_{ij}$, in any cell where $TEMP_{ij} > 0.1$ eV. Then,

$$XDTR_{ij} = 0.15\ (ECELL_{ij})/PMARK_{ij},$$
$$DTR = \min(XDTR_{ij}) .$$

DTR may be modified further by GREYSN.

4. SNØUT

SNØUT plots the magnitude and direction of radiation in each cell. These are two plots, one of the entire mesh and another of the region of interest around the bubble.

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APPENDIX A

INSTANT YØKIFER

TABLE A-I

YØKIFER PROGRAM ORGANIZATION

Overlay 0, 0	YØKIFER	Overlay 3, 0	MCRT
	LØØP		PAKFNØ
	FILMCØ		UNPKFN
	GETEMP	Overlay 3, 1	REEFER
	DBLINT		FLUSH
	SEARCH		PØMEGA
Overlay 1, 0	ØFFWEGØ		PFREQ
	MESHMKR		SUBSCR
	PARDEN		CRØSS
	PARTGEN		CENTRØY
	NSTART		WALK
Overlay 2, 0	YØKKY		WHERE
Overlay 2, 1	PHASE0	Overlay 3, 2	ESTEP
Overlay 2, 2	YØKØUT	Overlay 3, 3	LISTING
	PARPLØT		
Overlay 2, 3	PHASE1		
	NADD	Overlay 4, 0	GREYSN
Overlay 2, 4	PHASE2	Overlay 4, 1	CYLSN
Overlay 2, 5	PHASE3		SWEEP
	REZØNE		IN
	PARTMØV		ØUT
			SNGEN
		Overlay 4, 2	SNESTEP
		Overlay 4, 3	SNØUT

TABLE A-II

YØKIFER COMMON BLOCKS

Common	ØFFWEGØ	YØKKY	MCRT	GREYSN	DUMP
STATE	x	x	x	x	
RED	x	x	x	x	x
PINK	x	x	x	x	
ØRANGE	x	x			x
WHITE	x	x			x
YELLØW		x			x
GREEN	x		x		x
BLUE	x				
LAVNDER			x		
SILVER	x	x		x	x
CRIMSN	x			x	x
SNØWITE				x	
MAUVE			x		
SENSE	x	x	x	x	

TABLE A-III

YØKIFER FILES

YØKKY	Class 2 Permfile
File 1	YØKIFER program
File 2	Equation of state and opacity data
File 3	NEXTWAY program
PURD	Purd input data
	PURD is identical to Fileset 4.
YØKIFER	Overlay file
Fileset 1	Census particle storage file
Fileset 2	Temporary census and bank particle storage file
Fileset 3	Energy deposition data file
Fileset 4	Purd input file
	Fileset 4 is identical to File 1 of PURD
Fileset 6	Equation of state and opacity data file
	Fileset 6 is identical to File 2 of YØKKY
Fileset 7	Dump file
Fileset 12	Film file

TABLE A-IV

STØRAGE OF MESH VARIABLES

I	ØFFWEGØ	YØKKY	MCRT	GREYSN	DUMP
1	X,XPAR	X,XPAR	X	X	X,XPAR
2	R,YPAR	R,YPAR	R	R	R,YPAR
3	Y	Y	Y	Y	Y
4	U	U	U	U	U
5	V	V	V	V	V
6	RØ	RØ	RØ	RØ	RØ
7		MP,RMP,RCSQ	CENTX	CENTX	CENTX
8	E	E,ETIL	CENTY	CENTY	CENTY
9	RVØL	RVØL	RVØL	RVØL	RVØL
10	M,RM	M,RM,VP			RM
11		P,PL,EP,UP			
12		UTIL,UL,CQ		EMØMLC	
13		VTIL,VL		UMØMLC	
14		RØL	BETALC	FØUTLC	
15	SIE	SIE	SIE	SIE	SIE
16		DELSM	SIGPLC	SIGPLC	SIGPLC
17		UG,GRIR	RZEDEN	RZEDEN	RZEDFN
18		VG,GRIZ	FSN	FSN	FSN

TABLE A-V

YØKIFER INPUT CARDS

```
A,      GENERAL INPUT CARDS
        7 CARDS
        READ BY OFFWEGO

CARD 1        HEADER CARD
              FORMAT        12A6
        NAME          PROBLEM IDENTIFICATION

CARD 2        UNIVERSAL AND RADIATION TRANSPORT DATA
              FORMAT        6E12.4
        TIME          PROBLEM STARTING TIME
        DTR           INITIAL HYDRO AND RADIATION TRANSPORT TIME INTERVAL
        CYL           1,0 FOR CYLINDRICAL GEOMETRY
                      0,0 FOR PLANE GEOMETRY
        GROVEL        0,0 FOR PURE EULERIAN CALCULATION
                      1,0 FOR PURE LAGRANGIAN CALCULATION
                      2,0 FOR REZONE
                      GROVEL IS NOT USED IN SN CALCULATIONS
        ALPHA         0,0 FOR FULLY EXPLICIT RADIATION TRANSPORT CALCULATION
                      1,0 FOR FULLY IMPLICIT RADIATION TRANSPORT CALCULATION
                      (0,0 GIVES SMALLEST TIME INTERVAL, 1.0 GIVES LARGEST)

CARD 3        BASIC MESH DATA
              FORMAT        2I6, 2E12.4
        IBAR          NUMBER OF CELLS (RADIAL)
        JBAR          NUMBER OF CELLS (AXIAL)
        YBASE         Y-COORDINATE OF VERTEX 1,2
        REZYP         Y-COORDINATE OF VERTEX 1,JMID+2

CARD 4        VARIABLE MESH DATA
              FORMAT        3I6, 6X, 3E12.4
        IUNF          NUMBER OF UNIFORM CELLS (RADIAL)
                      FOR A UNIFORM MESH IUNF=IBAR
        JUNF          NUMBER OF UNIFORM CELLS (AXIAL)
                      FOR A UNIFORM MESH JUNF=JBAR
        JMID          NUMBER OF REAL CELLS BELOW REZY.
                      THE AXIAL INDEX OF THE VERTEX AT THE MIDPOINT OF
                      THE UNIFORM REGION IS JMID+2
        DR            INITIAL INTERVAL IN UNIFORM REGION (RADIAL)
        DZ            INITIAL INTERVAL IN UNIFORM REGION (AXIAL)
        FREZ          EXPANSION RATE OF ZONES OUTSIDE OF UNIFORM REGION
                      FOR A UNIFORM MESH FREZ=1,0

CARD 5        HYDRODYNAMIC CONSTANTS
              FORMAT        6E12.4
        A0            (α0) COEFFICIENT IN PHASES MOMENTUM EQUATIONS
                      USE 0,1
        A0M           (α0) COEFFICIENT IN PHASES ENERGY AND MOMENTUM
                      EQUATIONS
                      USE 1,0
        B0            (β0) COEFFICIENT IN PHASES MASS, ENERGY, AND MOMENTUM
                      EQUATIONS
                      USE 0.0
        XI            (ξ) DETERMINES FORM OF VISCOSITY (XX) (- PROGRAM)
                      +1,0, 0,0, OR 1,0
```

TABLE A-V (Cont.)

```
                USE -1,0
     MU         (μ)  INPUT VISCOSITY COEFFICINT
                USE 0,1
     LAM        (λ)  INPUT VISCOSITY COEFFICINT
                USE 0,6

CARD 6     HYDRODYNAMIC CONSTANTS
           FORMAT      3E12.4
     OM         (ω)  PHASE2 RELAXATION PARAMETER
                USE 1,0
     EPS        (ε)  PHASE 3 ITERATION CONVERGENCE CRITERION
                USE 0.00001
     ASQ        (a²)  ZERO TEMPERATURE SOUND SPEED
                USE 1,0E-15

CARD 7     HYDRODYNAMIC CONSTANTS
           FORMAT      5E12.4
     GM1        (γ -1)  GAMMA-1 (AMBIENT)
                USE 0,4
     GR         RADIAL GRAVITY
                USE 0,0
     GZ         AXIAL GRAVITY
                USE -0,01
     REZRON     INITIAL AMBIENT DENSITY AT REZY0
     REZSIE     AMBIENT SPECIFIC INTERNAL ENERGY

B.   UNIFORM BACKGROUND MESH INPUT
     READ BY MESHMKR

UNIFORM REGION CARD     FIRST REGION
          FORMAT 4I6, 4E12.4
     NB         NUMBER OF REAL CELLS BELOW REGION
     NR         NUMBER OF CELLS BETWEEN AXIS AND RIGHT BOUNDARY
                OF REGION
     NT         NUMBER OF REAL CELLS BELOW TOP OF REGION
     NL         NUMBER OF CELLS BETWEEN AXIS AND LEFT BOUNDARY OF
                REGION
     UI         RADIAL VELOCITY IN REGION
     VI         AXIAL VELOCITY IN REGION
     ROI        DENSITY IN REGION
     SIEI       SPECIFIC INTERNAL ENERGY IN REGION

UNIFORM REGION CARD     SECOND REGION

...                     ...

UNIFORM REGION CARD     LAST REGION

FINAL CARD
     FINAL CARD INDICATES THAT NO MORE BACKGROUND MESH INPUT CARDS ARE
     TO BE READ
     0     IN COLUMN 12 CAUSES PROGRAM TO COMPUTE EXPONENTIAL ATMOSPHERE
           BACKGROUND,
     1000  IN COLUMNS 9-12 CAUSES BYPASS OF EXP ATM CALCN

C,   BUBBLE INPUT
     READ BY MESHMKR
     OMIT IN PURD INPUT PROBLEMS
```

```
LOCATION CARD           FIRST BUBBLE
          FORMAT        2I6
     IBUB        INDEX OF VERTEX AT BUBBLE CENTER (RADIAL)
     JBUB        INDEX OF VERTEX AT BUBBLE CENTER (AXIAL)

BUBBLE DATA DECK        FIRST BUBBLE
          1 CARD FOR EACH CELL IN BUBBLE
          FORMAT        2I5, 4E15,5
     II          RADIAL INDEX
     JJ          AXIAL INDEX
     ROI         DENSITY OF CELL
     SIEI        SPECIFIC INTERNAL ENERGY OF CELL
     VI          AXIAL VELOCITY AT VERTEX
     UI          RADIAL VELOCITY AT VERTEX

BLANK CARD              FIRST BUBBLE
     BLANK CARD INDICATES END OF BUBBLE DATA DECK

LOCATION CARD           SECOND BUBBLE
BUBBLE DATA DECK        SECOND BUBBLE
BLANK CARD              SECOND BUBBLE

...                     ...

LOCATION CARD           LAST BUBBLE
BUBBLE DATA DECK        LAST BUBBLE
BLANK CARD              LAST BUBBLE

FINAL BLANK CARD
     FINAL BLANK CARD INDICATES THERE ARE NO MORE BUBBLES TO BE READ

D,   PARTICLE INPUT
     READ BY PARTGEN
     OMIT IN PURD INPUT PROBLEMS

PARTICLE REGION CARD    FIRST PARTICLE REGION
          FORMAT        6E12,4
     DRPAR       PARTICLE SPACING (RADIAL)
     DZPAR       PARTICLE SPACING (AXIAL)
     XC          RADIAL COORDINATE OF LEFT BOUNDARY OF PARTICLE REGION
                 OR CENTER OF CIRCLE
     YC          AXIAL COORDINATE OF BOTTOM OF REGION
                 OR CENTER OF CIRCLE
     XD          RADIAL COORDINATE OF RIGHT BOUNDARY OF REGION
                 OR RADIUS OF CIRCLE
     YD          AXIAL COORDINATE OF TOP OF REGION
                 YD = 0.0 FOR CIRCLE

PARTICLE REGION CARD    SECOND PARTICLE REGION

..                      ...

PARTICLE REGION CARD    LAST PARTICLE REGION

BLANK CARD
     BLANK CARD INDICATES NO MORE PARTICLE REGIONS TO BE READ
```

TABLE A-VI

YØKIFER CONTROL CARDS

0. $JØB (NAME= , CL=U, PL= , TL= , UA= ,AC=
LC=400000)

Cards 1-14 are always required

1. $JDF (SCT=200)
2. $OPERM(FS=YØKKY, ØAC=JDØ,FSI=JDFSI)
3. $REWIND (YØKKY)
4. $ØPEN (S=ØLDPL, SCT=10000)
5. $CØPYF (I=YØKKY, Ø=ØLDPL, N=1)
6. $REWIND (ØLDPL)
7. $ØPEN (FS=FSET6, SCT=10000)
8. $CØPYF (I=YØKKY, Ø=FSET6,N=2)
9. $REWIND (FSET6)
10. $AFSREL (FS=YØKKY)
11. $UPDATE (ASF=F)
12. $AFSREL (FS=ØLDPL)
13. $RUN (C=S, I=CØMPILE)
14. $AFSREL (FS=CØMPILE)

Cards 15-22 are required only for PURD input problems and may be omitted for Standard input problems.

Cards 23-26 are always required.

23. $ØPEN (FS=FILM, SCT=10000, BUF=512)
24. $ØPEN (FS=FSET1, SCT=10000, BUF=512, DEV=DISKA)
25. $ØPEN (FS=FSET2, SCT=10000, BUF=512, DEV=DISKB)
26. $ØPEN (FS=FSET3, SCT=10000, BUF=512, DEV=DISKA)

Card 27 is required only for PURD input problems and may be omitted for Standard input problems.

Card 28 is required for restart problems and must be omitted in new problems.

28. $CREATE (FS=FSET7, SCT=10000, PREMT=XX)

Card 29a is used when a tape dump is required, card 29b is used when a dump is not required.

29a. $ØPEN (FS=FSET7, SCT=10000, BUF=512, ADISP=TAPE)
29b. $OPEN (FS=FSET7, SCT=10000, BUF=512)

Card 30 is required for Standard input problems and must be omitted for PURD input problems.

30. $ØNSWCH (1)

Card 31 is required for Monte Carlo, omitted for Sn

31. $ØNSWCH (2)

Card 32 is required to read Planck mean opacities. Omitted for Rosseland means.

32. $ØNSWCH (3)

Cards 33, 34 are always required.

33. $LDGØ (LC=300000, SETA=I)
34. $STØP.

Unused control cards may be placed behind card 34.

TABLE A-VII

STRUCTURE CF FILESET 7 - DUMP FILE

Fileset 7 contains dumps for 1 or more cycles.

For each cycle:

File 1 Record 1	Common blocks RED, SILVER, ØRANGE, WHITE, YELLØW, GREEN, CRIMSN
File 2 Record 1	LCM block YLC1 (mesh variables)
Record 2	LCM block YLC2 (marker particle data)
File 3 Record 1	Census particle data from Fileset 1 (Monte Carlo)
	Average radiation intensities from Fileset 1. (Sn)
File 4 Record 1	Energy deposition data from Fileset 3 (Monte Carlo)
	Empty file (Sn)

APPENDIX B

THE NEXTWAY PROGRAM

NEXTWAY reads dump tapes from YØKIFER and plots the information on them. The program generates a uniform mesh and interpolates the values of the mesh variables to find their values at the centers of the uniform cells. These values are plotted. The plots produced are:

a. Velocity vectors
b. Three-dimensional plot, rear view
c. Three-dimensional plot, rear view
d. Variable vs radius, through the bubble center
e. Variable vs axial coordinate, along the axis

Plots b, c, d, and e are plotted for each of the following variables:

1.	TEMP	Temperature (eV)
2.	SIE	Specific internal energy (J/mg)
3.	RØ	Density (mg/cm^3)
4.	SKE	Specific kinetic energy (J/mg)
5.	RZEDEN	Radiation source density (J/cm^3)
6.	SIGPLC	Mean absorption coefficient (1/km)
7.	P	Pressure (M-Pa)
8.	1-FSN	Radiation scattering probability
9.	AVINT	Average radiation intensity (S_n only)

For Monte Carlo calculations, the following additional plots are made:

f. Spectrum of production particles (W/eV vs eV)
g. Spectrum of energy depositions (W/eV vs eV)
h. Spectrum of escaped particles (W/eV vs eV)
i. Spectrum of census particles (W/eV vs eV)
j. Map of production particles
k. Map of energy depositions
l. Map of census particles

<u>Input Cards</u>

Card 1	Format 2I6
NXE	Number of cells, radially, in the uniform mesh. Default: IBAR
NYE	Number of cells, axially, in the uniform mesh. Default: JBAR
Card 2	Format 3E12.4
XR	Right boundary of the uniform mesh (km). Default: X_{ij}, at IP1,2
YT	Top boundary of the uniform mesh (km). Default: Y_{ij}, at 1, JP2
YB	Bottom boundary of the uniform mesh (km). Default: Y_{ij}, at 1,2
Cards 3-5	Format 6E12.4
$SCALEB_i$	$SCALEB_i$ is the minimum ordinate on graphs of mesh variable i.
$SCALER_i$	$SCALER_i$ is the maximum ordinate on graphs of mesh variable i. i refers to the variable numbers (1-9), above. The default values are 0 and 1.5 × maximum value of the variable, and default values are used when $SCALER_i = 0$.

<u>Output Cards</u>

NEXTWAY punches a complete set of input cards that contain either the previous input values or the default values. The cards may be used in subsequent calculations to maintain uniform graph scales from one tape to the next.

APPENDIX C

SAMPLE YØKIFER PROBLEM

```
SAMPLE PROBLEM                                                                     1.  (Header)
  0.09       0.0001       1.0          2.0          1.0                            2.
   34    68  0.0          0.21266                                                  3.
   20    40   20          0.010633     0.010633     1.1                            4.
   0.1       1.0          0.0          -1.0         0.1          0.6               5.
 1.0         1.000E-05    1.000E-15                                                6.
    0.4      0.0          -0.01        1.2          0.210                          7.
    0                                                                              Background Mesh
    1    22                                                                        Bubble Coordinates
   1    1    .16715E-01    .14215E+03   0.           0.                             Bubble Input
   2    1    .16482E-01    .14340E+03   0.           -.97405E-01
   3    1    .15765E-01    .14049E+03   0.           .20660E-01
   4    1    .15678E-01    .13862E+03   0.           .47920E-01
   5    1    .15920E-01    .13527E+03   0.           .44087E-01
   6    1    .16599E-01    .13026E+03   0.           .40373E-01
   7    1    .17523E-01    .12375E+03   0.           -.19926E-01
   8    1    .18810E-01    .11097E+03   0.           -.42262E-01
   9    1    .22200E-01    .90066E+02   0.           -.25553E-01
  10    1    .30170E-01    .64466E+02   0.           -.52142E-02
  11    1    .42959E-01    .46143E+02   0.           .19662E-01
  12    1    .10529E+00    .18199E+02   0.           .91198E-01
  13    1    .26498E+00    .50252E+01   0.           .21146E+00
  14    1    .48079E+00    .22653E+01   0.           .347[illegible]
  15    1    .94772E+00    .10976E+01   0.           [illegible]E-01
  16    1    .16702E+01    .71019E+00   0.           .38295E-01
  17    1    .27825E+01    .54368E+00   [illegible]  .31167E-01
  18    1    .25877E+01    .37877[illegible]  [illegible]2299E-01  .19165E-01
  19    1    .13055E+01    [illegible]  .59321E-02   .14526E-01
  20    1    .12041E+0[illegible]  [illegible]000E+00  .31855E-02  .68596E-02
  21    1    [illegible]   .21000E+00   .91680E-03   .16533E-02
   1    [illegible]  [illegible]00E+01  .21000E+00  0.   .88885E-03
             .12041E+01    .21030E+00   .54952E-01   0.
   [illegible]  20  .12039E+01  .21029E+00  .26936E-01  .30953E-02
   3   20    .12035E+01    .21026E+00   .21007E-01   .56656E-02
   4   20    .12030E+01    .21022E+00   .12194E-01   .72077E-02
   5   20    .12000E+01    .21000E+00   .52932E-02   .72622E-02
   6   20    .12000E+01    .21000E+00   .31001E-02   .49583E-02
   7   20    .12000E+01    .21000E+00   .19648E-02   .13865E-02
   8   20    .12000E+01    .21000E+00   .70265E-03   .11422E-02
   9   20    .12000E+01    .21000E+00   0.           .71110E-03
   1   21    .12000E+01    .21000E+00   .47239E-02   0.
   2   21    .12000E+01    .21000E+00   .21657E-02   .21510E-03
   3   21    .12000E+01    .21000E+00   .17778E-02   .39861E-03
   4   21    .12000E+01    .21000E+00   .12064E-02   .52015E-03
   5   21    .12000E+01    .21000E+00   0.           .55175E-03
    0
    0
 0.010633    0.010633     0.0          0.21266      0.2          0.0               Marker Particle Input
    0
    0
```

Sample Problem - Input

RCAYOK ICF 08/02/74

SAMPLE PROBLEM

PROBLEM STARTING TIME 9.0000E-02 SEC

GENERAL DATA

TIME	9.0000E-02	DTR	1.0000E-05	CYL	1.0000E+00	GRDVEL	2.0000E+00

RADN TRANSPORT DATA

ALPHA	1.0000E+00

MESH CONSTANTS

IBAR	34	JBAR	68	YBASE	0.	REZY0	2.1266E-01
IUNF	20	JUNF	40	JMID	20		
DR	1.0633E-02	DZ	1.0633E-02	FREZ	1.1000E+00		

HYDRODYNAMICS CONSTANTS

A0	1.0000E-01	A0M	1.0000E+00	B0	0.	KXI	-1	MU	1.0000E-01
LAM	6.0000E-01	OM	1.0000E+00	EPS	1.0000E-05	ASQ	1.0000E-15	GM1	4.0000E-01
GR	0.	GZ	-1.0000E-02	REZRON	1.2000E+00	REZSIE	2.1000E-01		

CONSTANTS SET BY OFFWEGO

NQ	18	NOT	630				
NBUF	6000	NSP	1	NBP	3	NPCMAX	50
TAMB	2.5267E-02	TEMIT	5.0000E-02	ANC	5.0000E-02		

BACKGROUND MESH VARIABLES

EXPONENTIAL ATMOSPHERE CALCULATION

J	RO	SIE	TEMP
2	1.2300E+00	2.1000E-01	2.5267E-02
3	1.2284E+00	2.1000E-01	2.5267E-02
4	1.2269E+00	2.1000E-01	2.5267E-02
5	1.2253E+00	2.1000E-01	2.5267E-02
6	1.2238E+00	2.1000E-01	2.5267[illegible]
7	1.2222E+00	2.1000E-01	2.[illegible]-02
8	1.2207E+00	2.1000E-0[illegible]	[illegible]267E-02
9	1.2191E+00	2.10[illegible]	2.5267E-02
10	1.2176E+00	[illegible]-01	2.5267E-02
11	1.2161E+[illegible]	[illegible].1000E-01	2.5267E-02
12	1.2[illegible]	2.1000E-01	2.5267E-02
13	[illegible]3E+00	2.1000E-01	2.5267E-02
	1.0126E+00	2.1000E-01	2.5267E-02
68	9.9672E-01	2.1000E-01	2.5267E-02
69	9.7951E-01	2.1000E-01	2.5267E-02
70	9.6092E-01	2.1000E-01	2.5267E-02

Sample Problem - ØFFWEGØ Output

BUBBLE VARIABLES

IBUB 1 JBUB 22

II	JJ	ROI	SIEI	UI	VI	TEMPI
1	1	1.6715E-02	1.4215E+02	0.	0.	1.9657E+00
2	1	1.6482E-02	1.4340E+02	-9.7405E-02	0.	1.9693E+00
3	1	1.5765E-02	1.4049E+02	2.0660E-02	0.	1.9575E+00
4	1	1.5678E-02	1.3862E+02	4.7920E-02	0.	1.9508E+00
5	1	1.5920E-02	1.3527E+02	4.4087E-02	0.	1.9398E+00
6	1	1.6599E-02	1.3026E+02	4.0373E-02	0.	1.9240E+00
7	1	1.7523E-02	1.2375E+02	-1.9926E-02	0.	[illegible]
8	1	1.8810E-02	1.1097E+02	-4.2262E-02	0.	[illegible]-02
9	1	2.2200E-02	9.0066E+01	-2.555[illegible]	[illegible]	2.5963E-02
10	1	3.0170E-02	6.4466E+0[illegible]	[illegible]	[illegible]E-02	2.5733E-02
11	1	4.2959E-02	[illegible]	[illegible]E-02	3.9921E-02	2.5447E-02
12	1	1.[illegible]	[illegible]	1.9165E-02	2.2299E-02	2.5298E-02
13	1	[illegible]	2.1018E-01	1.4526E-02	5.9321E-03	2.5288E-02
[illegible]	[illegible]	[illegible]000E+00	2.1000E-01	6.8596E-03	3.1855E-03	2.5267E-02
[illegible]	[illegible]	1.2000E+00	2.1000E-01	1.6533E-03	9.1680E-04	2.5267E-02
[illegible]	[illegible]	1.2000E+00	2.1000E-01	8.8885E-04	0.	2.5267E-02
1	20	1.2041E+00	2.1030E-01	0.	5.4952E-02	2.5302E-02
2	20	1.2039E+00	2.1029E-01	3.0953E-03	2.6936E-02	2.5301E-02
3	20	1.2035E+00	2.1026E-01	5.6656E-03	2.1007E-02	2.5297E-02
4	20	1.2030E+00	2.1022E-01	7.2077E-03	1.2194E-02	2.5293E-02
5	20	1.2000E+00	2.1000E-01	7.2622E-03	5.2932E-03	2.5267E-02
6	20	1.2000E+00	2.1000E-01	4.9583E-03	3.1001E-03	2.5267E-02
7	20	1.2000E+00	2.1000E-01	1.3865E-03	1.9648E-03	2.5267E-02
8	20	1.2000E+00	2.1000E-01	1.1422E-03	7.0265E-04	2.5267E-02
9	20	1.2000E+00	2.1000E-01	7.1110E-04	0.	2.5267E-02
1	21	1.2000E+00	2.1000E-01	0.	4.7239E-03	2.5267E-02
2	21	1.2000E+00	2.1000E-01	2.1510E-04	2.1657E-03	2.5267E-02
3	21	1.2000E+00	2.1000E-01	3.9861E-04	1.7778E-03	2.5267E-02
4	21	1.2000E+00	2.1000E-01	5.2015E-04	1.2064E-03	2.5267E-02
5	21	1.2000E+00	2.1000E-01	5.5175E-04	0.	2.5267E-02

PARTICLE REGIONS

DRPAR 1.0633E-02 DZPAR 1.0633E-02

XC 0. YC 2.1266E-01 XD 2.0000E-01 YD 0.

556 PARTICLES GENERATED

Sample Problem - ØFFWEGØ Output (continued)

```
PROBLEM CYCLE      0       HYDRO

T      9.0000E-02 TO  9.0000E-02       DT    0.                        1 ITERS

TE       3.9804E+13        TI      3.5094E+13       TK      4.7105E+12       EPOT    1.9178E+13       TIAMB  4.2044E+14

UMOM     2.3669E-03        VMOM    8.3481E-09       CIRC   -3.0656E-04

TMAX     1.4341E+02        ITM              1       JTM             23
TGMX     2.7772E+03        ITG              3       JTG             32

DTV           IIIII        IDTV             R       JDTV             R
DTC           IIIII        IDTC             R       JDTC             R

REZONE CONSTANTS
VTB      3.7921E-01        VTT     9.3106E-08       UT      2.4518E-08
FC3      6.2380E-01        FCP2    7.6406E-10       FCX     6.2689E-01
```

Sample Problem - YØKKY Output

```
PROBLEM CYCLE      1       RADN TRANSPORT

TIME   9.0000E-02 TO  9.0010E-02       DTR  1.0000E-05

INITIAL ENERGIES
RADN     7.3413E+08        INT     4.5563E+14       KIN     4.6687E+12       TOTAL   4.6030E+14

IJMIN          1226        SIEMIN 3.9273E+09        UMIN    9.4762E-01       TMIN    1.1769E-01

PARTICLES
                    NGEN        NCEN       NBANK       NDIE      IESCAP      NMOVE       NCOL

SOURCE               476           0          67        253         156      11402       5752
BANK                 201           0          90        111           0       6888       6888
BANK                 270           0         118        152           0       9546       9526
BANK                 354           0          56        298           0       7684       7496
BANK                 168           0           0        168           0        168          0

      37302 DEPOSITION SAMPLES DUMPED TO FSET3

PARTICLE ENERGIES
EMC      6.3629E+12        ERAD    6.3629E+12       ECEN1   0.

FINAL RADIATION ENERGIES
EMC      6.3629E+12        EABS    6.3624E+12       ELOST   4.4198E+08       EEMIT   6.3629E+12
ECEN     0.                RE      9.9963E-01       RA      1.0003E+00

PABS     6.3624E+17        PLOST   4.4198E+13       PEMIT   6.3629E+17

TAVG     9.0005E-02        TMAX    1.9693E+00       UMAX    3.9035E+00       DMIN    1.5678E-02       THY     4.4198E+08

CP       5.3919E+01        CYCLF   1.8923E+01       TDUMP   2.5108E+02       NDUMP          0
```

Sample Problem - MCRT Output

```
PROBLEM CYCLE    33       SN RADN TRANS

TIME  9.5058E-02 TO  9.5181E-02       DTR  1.2289E-04       ISN      4

ESN     2.0137E+19

CYLSN POWER
SUM     3.9146E+13

    1 SN ITERATIONS

ENERGIES
SIE     3.5796E+13       URTOT  5.5038E+08       ELOST -1.1830E+04       EABS    3.3831E+10

POWER
PWR     9.6262E+07       PWR2  -3.9146E+13

TIME INTERVAL DATA
DTR     1.1414E-03       IJDT          913       POWER  3.9199E+12       ECELL  2.9827E+10

TAVG    9.5120E-02       TMAX   1.9304E+00       DMAX   3.7153E+00       DMIN   1.4366E-02

CP      2.7141E+02       CYCLE  1.8005E+01       TDUMP  2.9776E+01       NDUMP      576270
```

Sample Problem - GREYSN Output

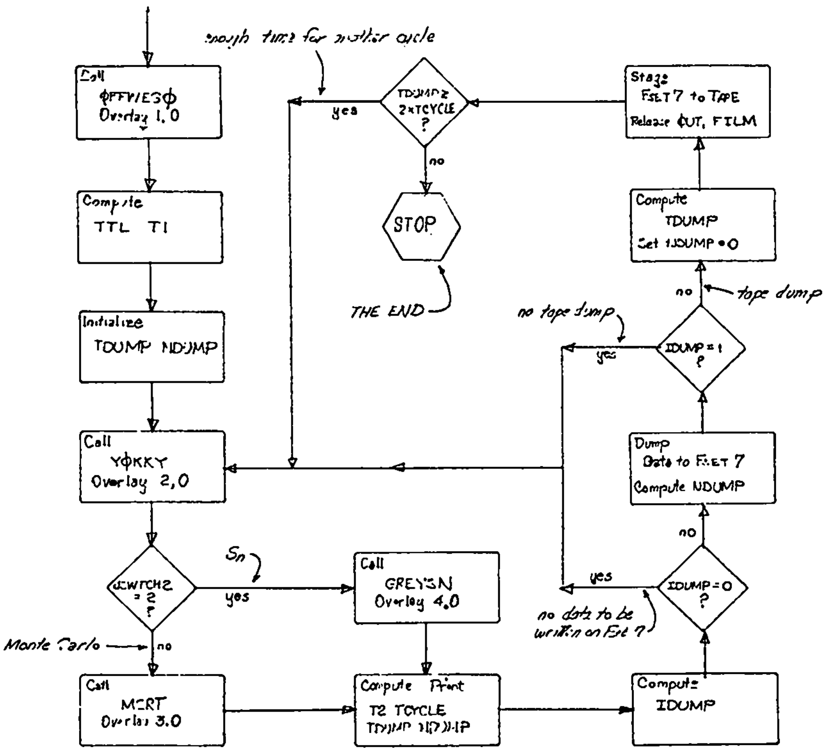
```
DATA WRITTEN ON FSET 7

TAPE DUMP AT  9.5181E-02
```

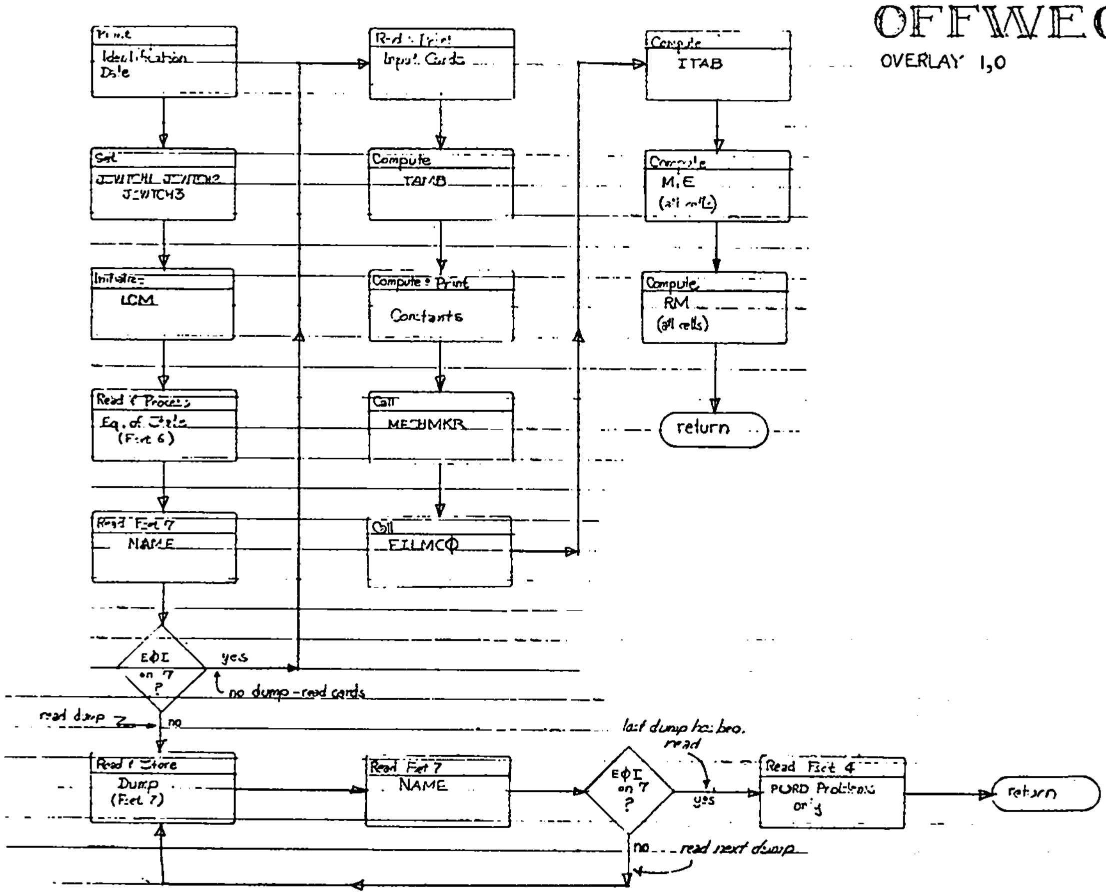
Dump Indicators

APPENDIX D.
FLOW DIAGRAMS OF THE YØKIFER
OVERLAYS AND SELECTED SUBROUTINES

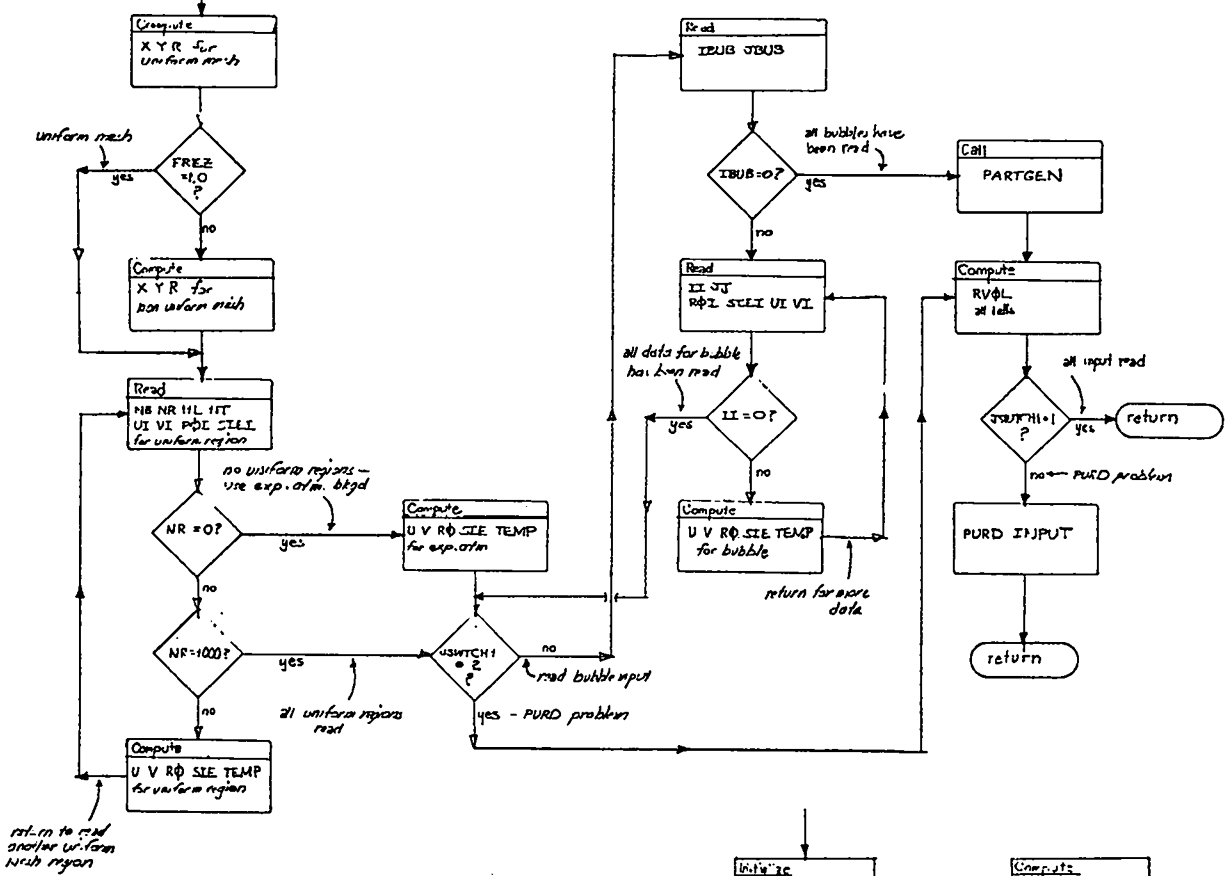
YOKIFER
OVERLAY 0,0

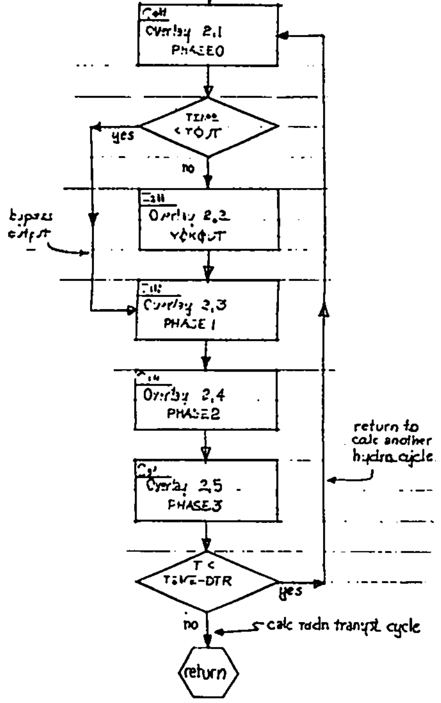


OFFWEGO
OVERLAY 1,0



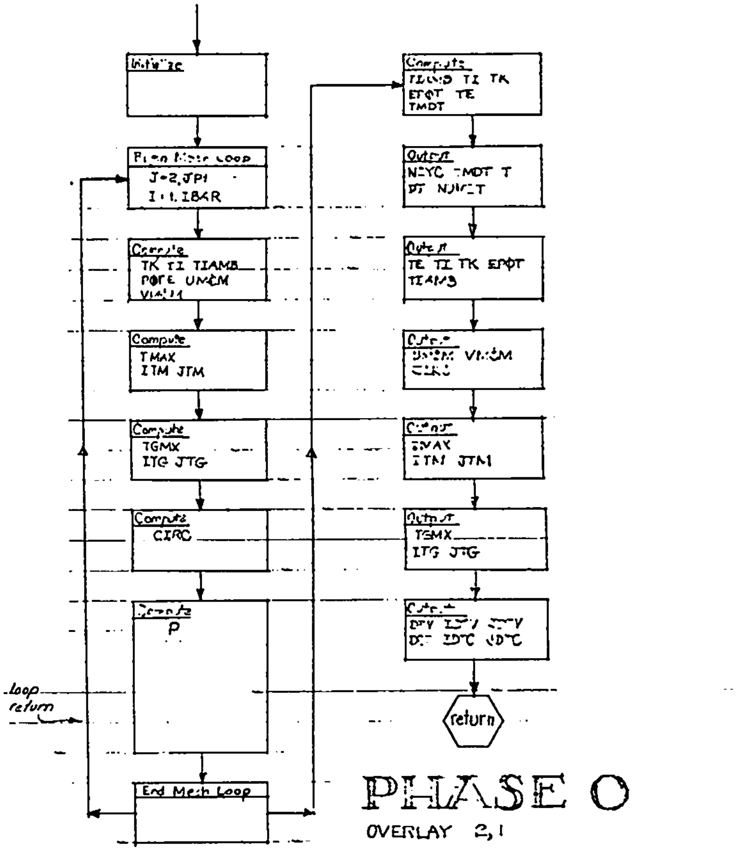
MESHMKR





YOKKY

OVERLAY 2,0

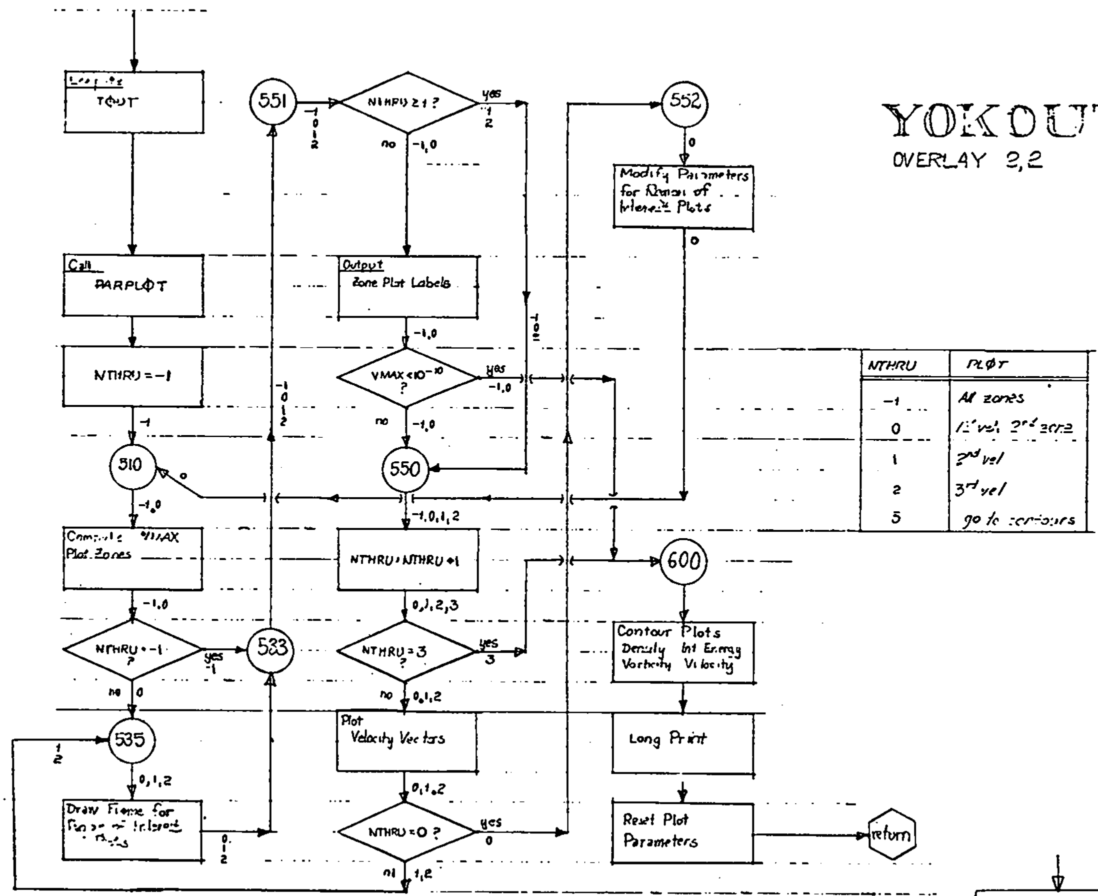


PHASE 0

OVERLAY 2,1

YOKOUT

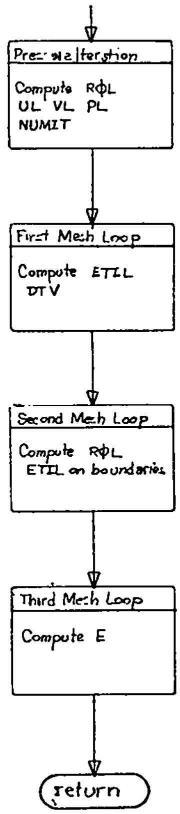
OVERLAY 2,2



NTHRU	PLOT
-1	All zones
0	1st vel, 2nd zone
1	2nd vel
2	3rd vel
5	go to contours

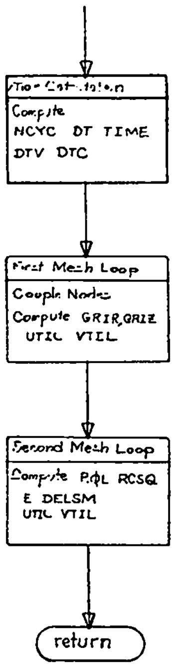
PHASE 2

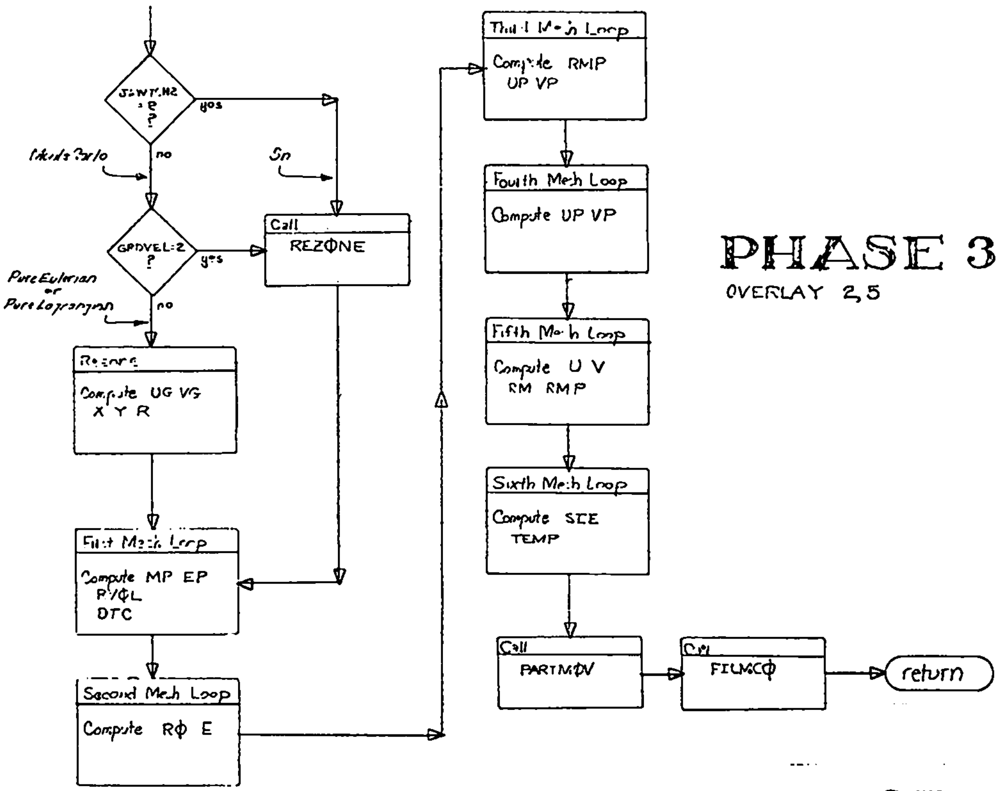
OVERLAY 2,4



PHASE 1

OVERLAY 2,3



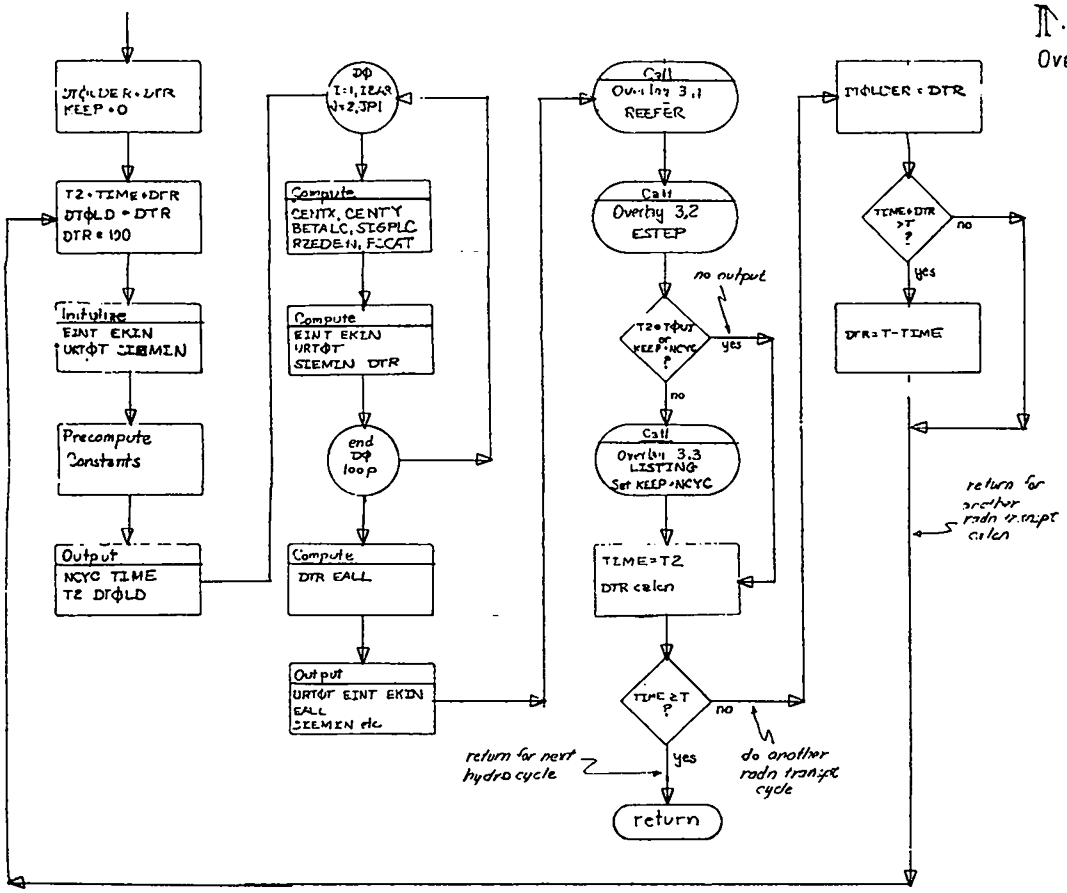


PHASE 3

OVERLAY 2,5

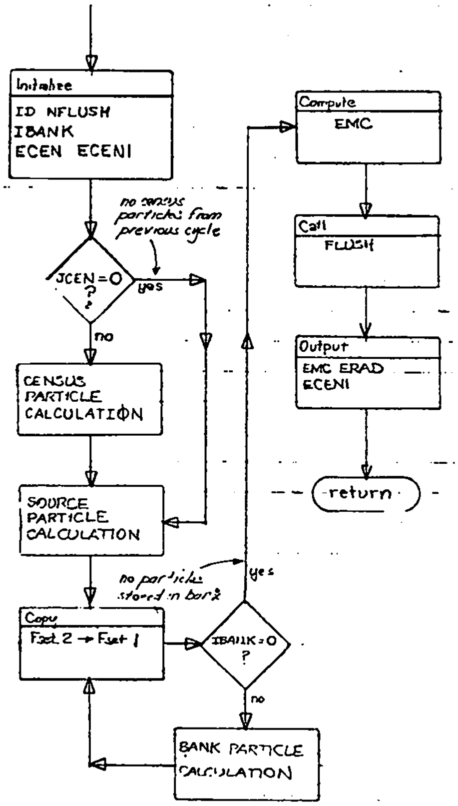
MCRT

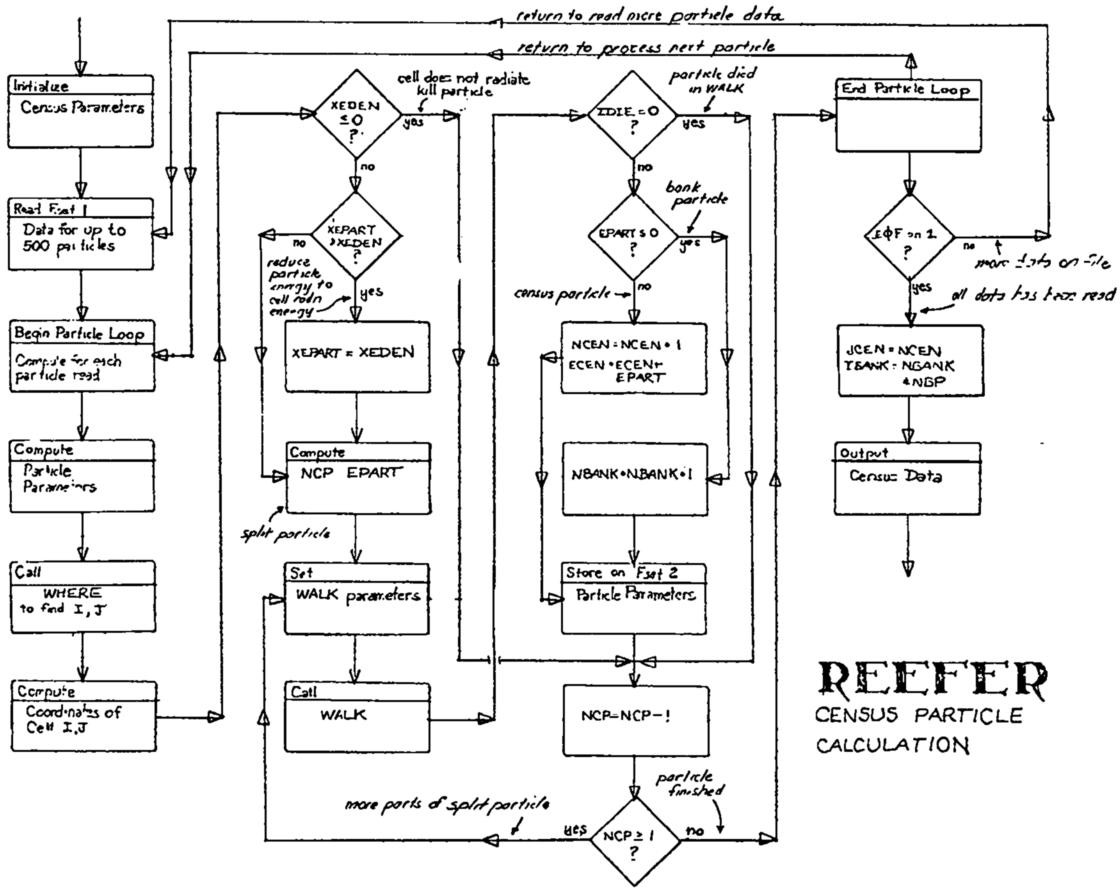
OVERLAY 3,0



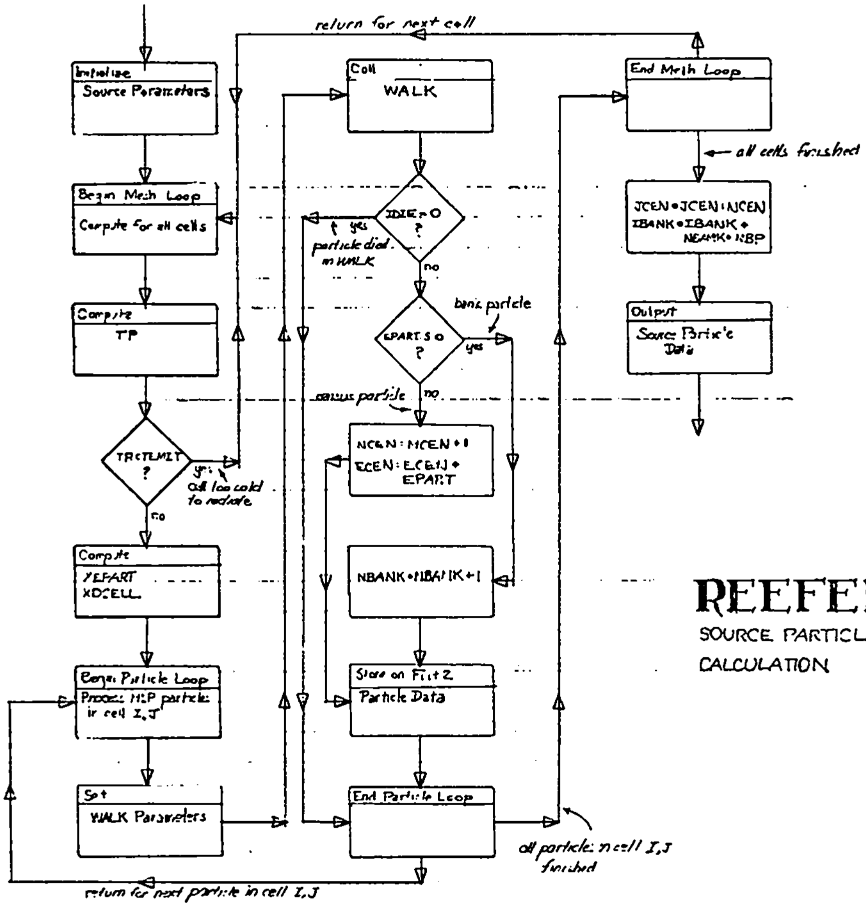
REEFER

OVERVIEW

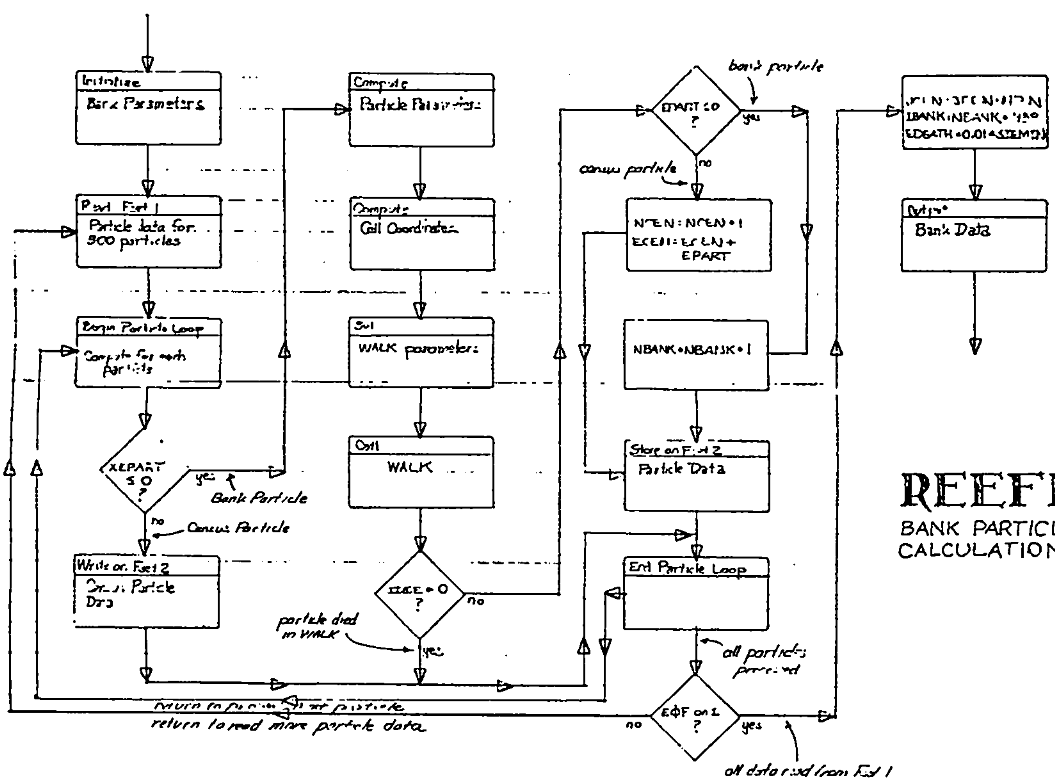




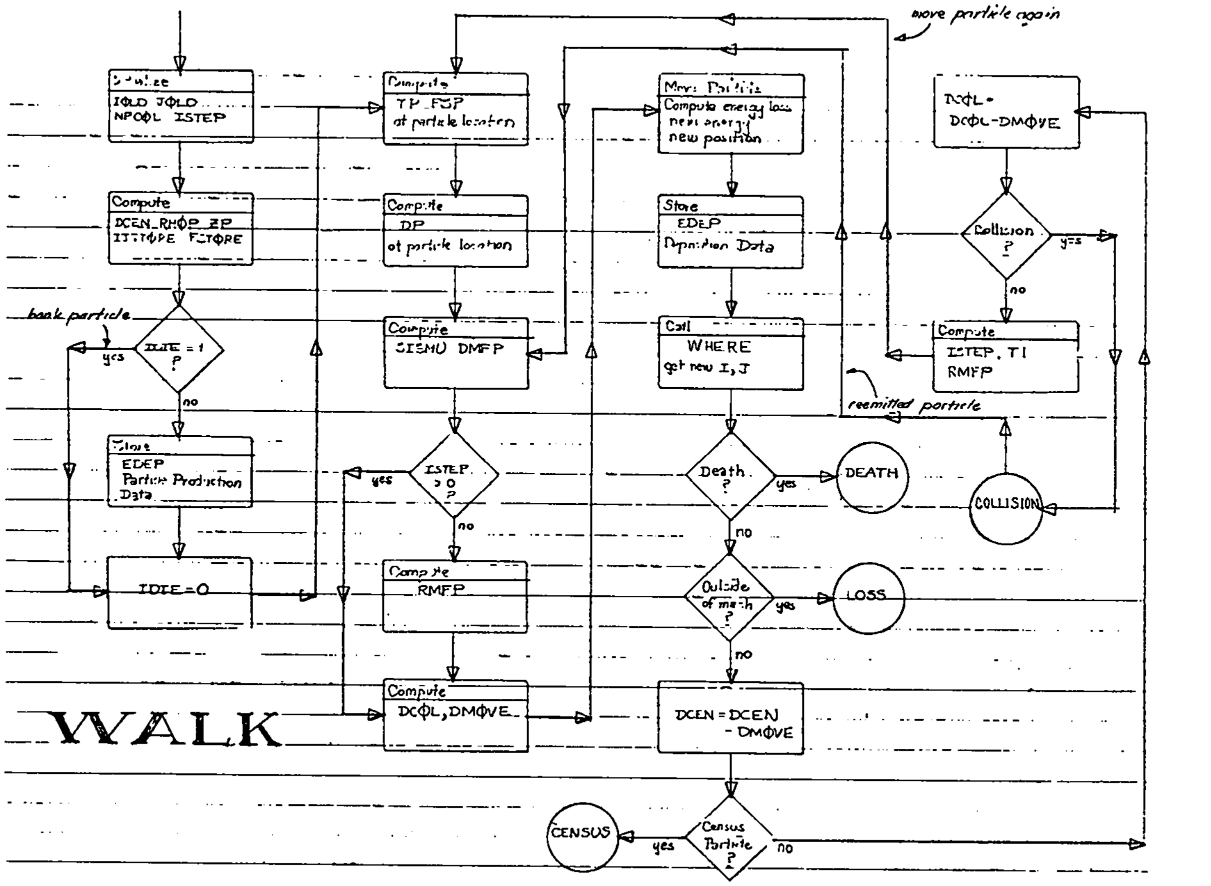
REEFER
CENSUS PARTICLE CALCULATION

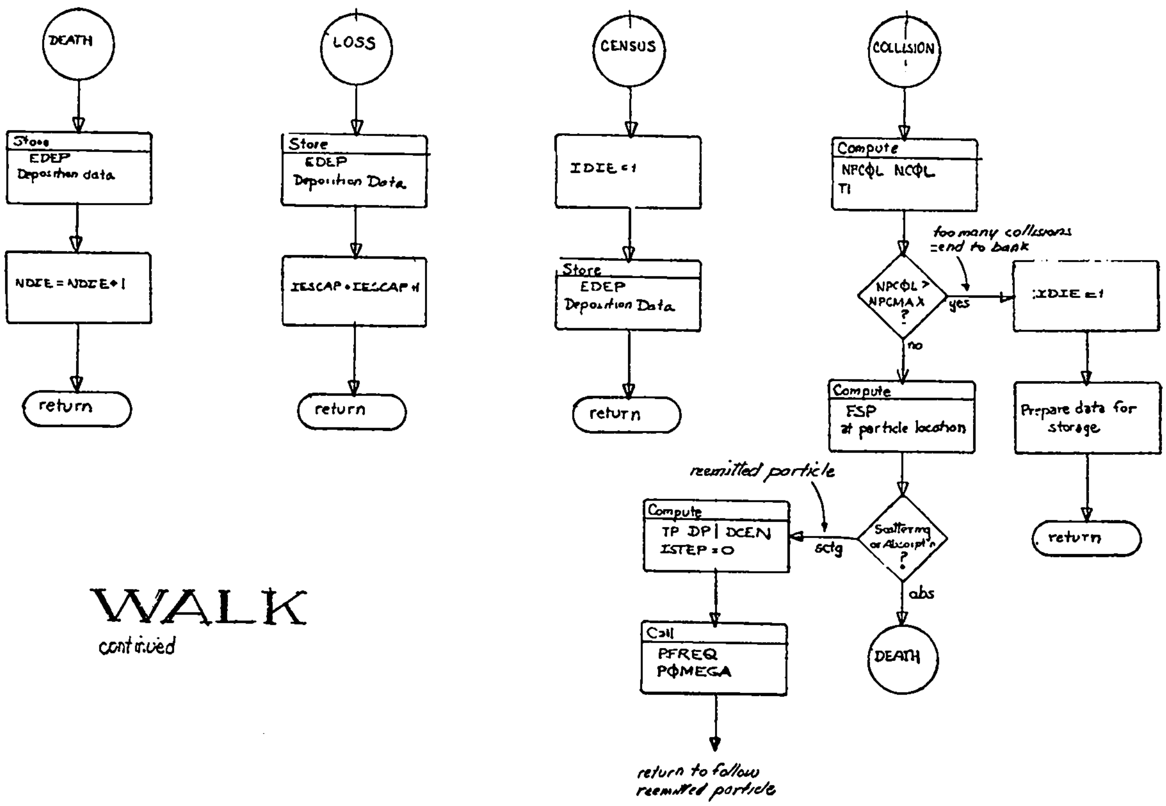


REEFER
SOURCE PARTICLE
CALCULATION



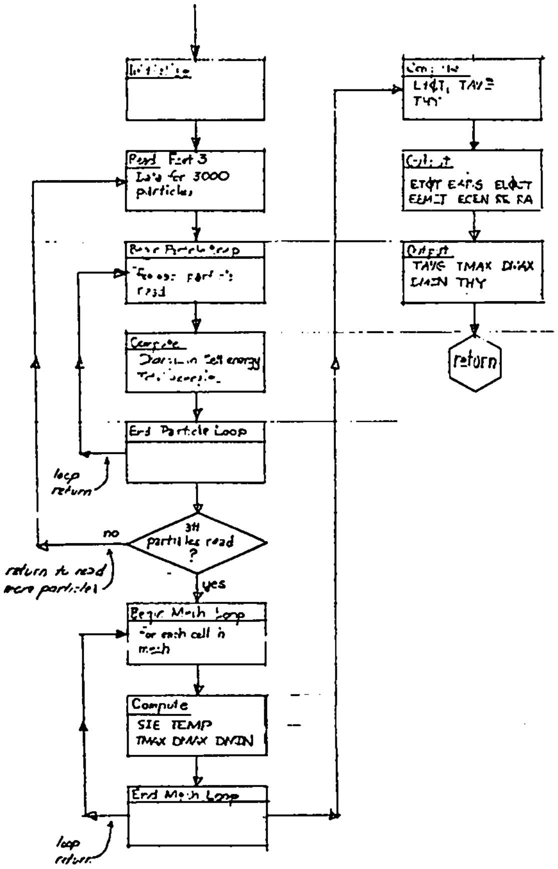
REEFER
BANK PARTICLE
CALCULATION


move particle again
Compute
TP FSP
at particle location
Compute
DP
at particle location
Compute
DCEN RHOP ZP
Store
EDEP
Deposition Data
Collision
?
yes
no
bank particle
yes
no
Compute
SIGMU DMFP
Call
WHERE
get new I, J
Compute
ISTEP, TI
RMFP
reemitted particle
Store
EDEP
Particle Production
Data
ISTEP
> 0
?
Death
?
DEATH
COLLISION
IDIE=0
Compute
RMFP
Outside
of mesh
?
LOSS
WALK
Compute
DCØL, DMØVE
DCEN = DCEN
- DMØVE
CENSUS
Census
Particle
?
yes
no


DEATH
LOSS
CENSUS
COLLISION
Store
EDEP
Deposition data
Store
EDEP
Deposition Data
IDIE =1
Compute
NPCØL NCØL
TI
too many collisions
send to bank
Store
EDEP
Deposition Data
NPCØL >
NPCMAX
?
yes
no
return
return
return
Compute
FSP
at particle location
Prepare data for
storage
reemitted particle
Compute
TP DP | DCEN
ISTEP = 0
sctg
Scattering
or Absorption
?
abs
return
WALK
continued
Call
PFREQ
PØMEGA
DEATH
return to follow
reemitted particle

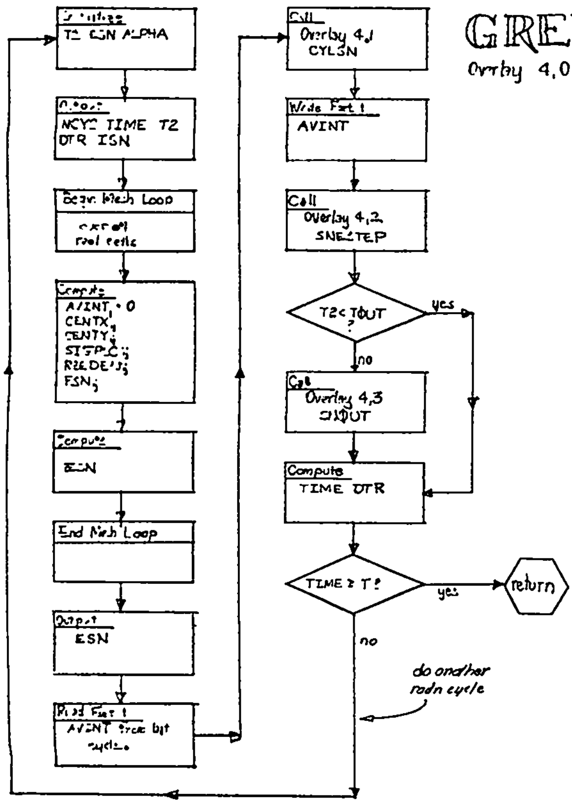
ESTEP

OVERLAY 3,2



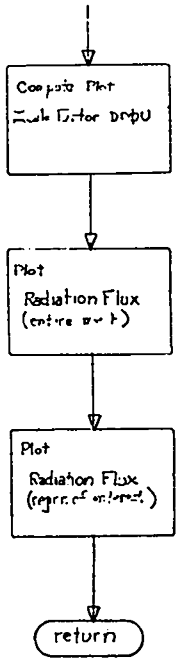
GREYSN

Ovrlay 4,0



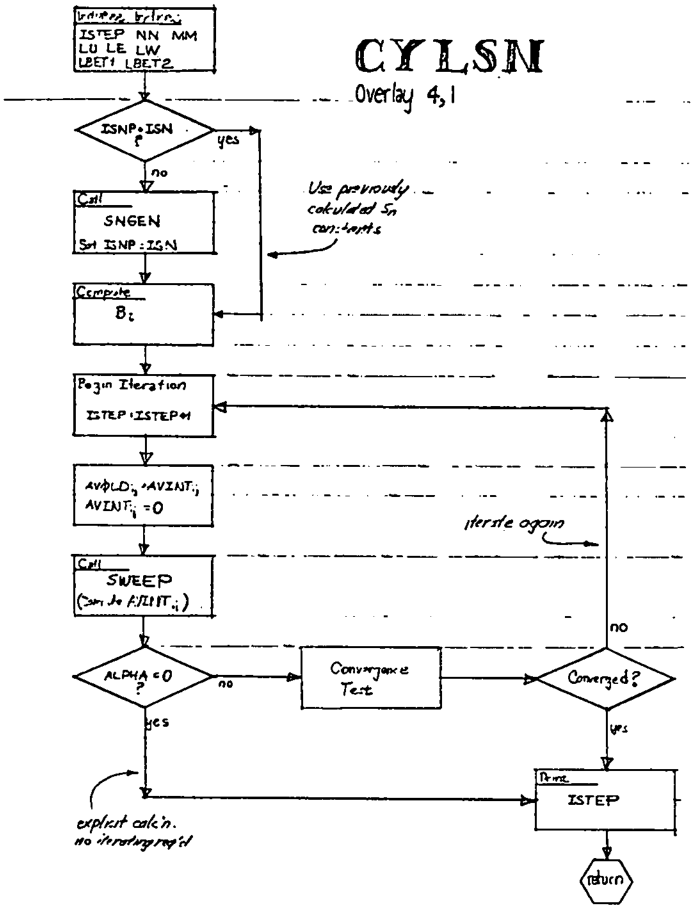
SNOUT

OVERLAY 4,3

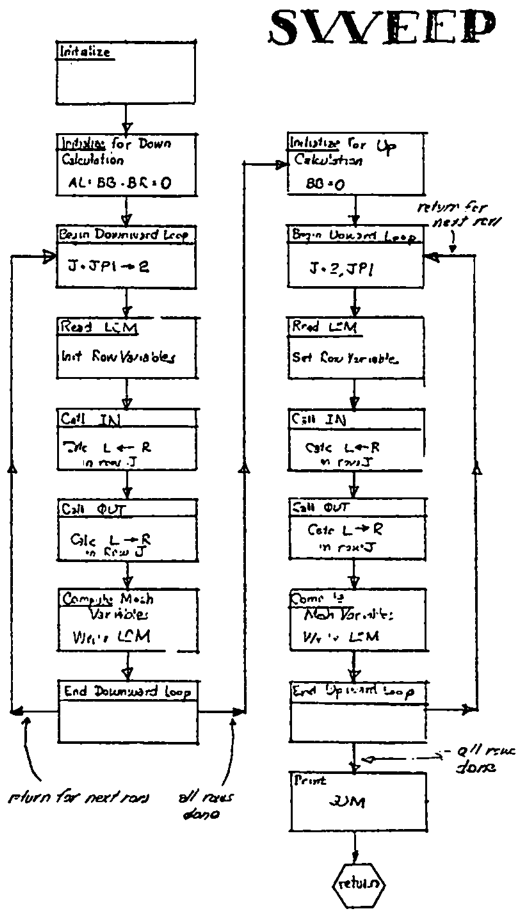


CYLSN

Overlay 4,1



SWEEP



APPENDIX E

INDEX LISTING OF THE YØKIFER PROGRAM

SEARCH, DBLTNT, GETEMP, PAKFNØ, and UNPKFN are written in CØMPASS and are not included in this listing.

```
 1         OVERLAY (YOKIFER, 0, 0)                                             YOKIFER    2
 1         PROGRAM YOKIFER (INP, OUT, FILM, FSET1, FSET2, FSET3, FSET4,        YOKIFER    3
          1 FSET6, FSET7, FSET12=FILM)                                         YOKIFER    4
 2         COMMON /STATE/     NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),          ALLKOM     2
          1                   FREQ(100), SPTBL(300), PTAB(300), ETAB(300),     ALLKOM     3
          2                   BTBL(300)                                        ALLKOM     4
 3         COMMON /YSC1/      AASC(5454)                                       ALLKOM     5
 4         COMMON /PINK/      I, IJ, IJM, IJP, J                               ALLKOM     6
 5         LCM /YLC1/         AA1(131000)                                      ALLKOM     7
 6         LCM /YLC2/         AA2(131000)                                      ALLKOM     8
 7         LCM /RLC1/         SIGA(30000)                                      ALLKOM     9
 8         COMMON /RED/       NAME(12), DT, DTK, EM10, GROVEL, IBAR, IJPS,     ALLKOM    10
          1                   IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,        ALLKOM    11
          2                   JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,    ALLKOM    12
          3                   TEMP(7500), T, TIME, TOUT, TSTART, THY           ALLKOM    13
 9         COMMON /SILVER/    FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,           SILVER     2
          1                   IPXL, IPXR, IPYB, IPY1, IXL, IXR, IYB,           SILVER     3
          2                   IY1, PXCONV, PXL, PXR, PYB, PYCONV, PYT,         SILVER     4
          3                   RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT          SILVER     5
10         COMMON /ORANGE/    ANC, ASC, A0, A0FAC, A0M, B0, COLAMC, CYL,       ORANGE     2
          1                   DTPOS, EPS, GM1, GR, GZ, IM1,                    ORANGE     3
          2                   IECP, JP2, ITAB(1000), JNM, JP4, KXI, LAM,       ORANGE     4
          3                   LJP2, ML, NPT, NQ18, NQ12, NUMIT, OM,            ORANGE     5
          4                   OMANC, OMCYL, REZRON, REZYO, THIRD, VTEM         ORANGE     6
11         COMMON /WHITE/     NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT     ORANGE     7
12         COMMON /YELLOW/    DTC, DTCSAV, DTO2, DTV, DTVSAV,                  YELLOW     2
          1                   DVOY, IOTC, IDTV, JDTC, JDTV, ROT                YELLOW     3
13         COMMON /GREEN/     ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMIT       GREEN      2
14         COMMON /CRIMSN/    SNCON(183), ZZ                                   CRIMSN     2
15         COMMON /SENSE/     JSWTCH1, JSWTCH2, JSWTCH3                        SENSE      2
16    2001 FORMAT             (1H0, 5HCP    ,1PE12.4,6X,6H CYCLE,1PE12.4,6X,   YOKIFER   12
          1                   6H TDUMP,1PE12.4,6X,6H NDUMP,I12/1H1)            YOKIFER   13
17    2002 FORMAT             (1H0,*TAPE DUMP AT*,1PE12.4)                     YOKIFER   14
18    2003 FORMAT             (1H0,*DATA WRITTEN ON FSET 7*)                   YOKIFER   15
       C                                                                       YOKIFER   16
19         CALL OVERLAY (7LYOKIFER, 1, 0, 0)                                   YOKIFER   17
20         CALL REMARK (10HOFFWEGO    )                                        YOKIFER   18
21         REWIND 7                                                            YOKIFER   19
22         CALL OPEN (5LFSET7,2LST,512)                                        YOKIFER   20
23         CALL GETQ (4LKTLM,KTIL)                                             YOKIFER   21
24         TTL=27.5E-09*FLOAT(KTTL)-30.0                                       YOKIFER   22
25         CALL SECOND (T)                                                     YOKIFER   23
26         TDUMP=AMIN1(900.0,TIL)                                              YOKIFER   24
27         NDUMP=0                                                             YOKIFER   25
28      21 CALL OVERLAY (7LYOKIFER, 2, 0, 0)                                   YOKIFER   26
```

```
      CALL REMARK (10HYAOUI      )                                  YOKIFER   27
      IF (JSWTCH2.EQ.2) GO TO 22                                    YOKIFER   28
      CALL OVERLAY (7LYOKIFER, 3, 0, 0)                             YOKIFER   29
      CALL REMARK (10HHCRT       )                                  YOKIFER   30
      GO TO 23                                                      YOKIFER   31
   22 CALL OVERLAY (7LYOKIFER, 4, 0, 0)                             YOKIFER   32
      CALL REMARK (10HGREYSN     )                                  YOKIFER   33
   23 CALL SECOND (T2)                                              YOKIFER   34
      TCYCLE=T2-T1                                                  YOKIFER   35
      TDUMP=TDUMP-TCYCLE                                            YOKIFER   36
      PRINT 2001,        T2, TCYCLE, TDUMP, NDUMP                   YOKIFER   37
      T1=T2                                                         YOKIFER   38
      IDUMP=0                                                       YOKIFER   39
      IF (TIME.GE.TOUT) IDUMP=1                                     YOKIFER   40
      IF (TDUMP.LE.2.0*TCYCLE) IDUMP=2                              YOKIFER   41
      IF (NDUMP.GE.1000000) IDUMP=2                                 YOKIFER   42
      IF (IDUMP.EQ.0) GO TO 21                                      YOKIFER   43
      CALL OPEN (5LFSET1,2LST,4608)                                 YOKIFER   44
      CALL OPEN (5LFSET3,2LST,4608)                                 YOKIFER   45
      CALL OPEN (5LFSET7,2LST,4608)                                 YOKIFER   46
      NDUMP=NDUMP+100000                                            YOKIFER   47
      IZZ=LOCF(ZZ)-LOCF(NAME)+1                                     YOKIFER   48
      WRITE (7)          (NAME(I), I=1,IZZ)                         YOKIFER   49
      ENDFILE 7                                                     YOKIFER   50
      NECS=NQI*JP2                                                  YOKIFER   51
      NDUMP=NDUMP+NECS                                              YOKIFER   52
      WRITE (7)          (AA1(I), I=1,NECS)                         YOKIFER   53
      NECS=2*NPT                                                    YOKIFER   54
      NDUMP=NDUMP+NECS                                              YOKIFER   55
      WRITE (7)          (AA2(I), I=1,NECS)                         YOKIFER   56
   32 ENDFILE 7                                                     YOKIFER   57
   33 CALL RDBUF (SLFSET1,AASC,4600,LENGTH,LSTATUS)                 YOKIFER   58
      CALL WTBUF (SLFSET7,AASC,LENGTH)                              YOKIFER   59
      NDUMP=NDUMP+LENGTH                                            YOKIFER   60
      IF (LSTATUS.LT.208) GO TO 33                                  YOKIFER   61
      WRITE (7)                                                     YOKIFER   62
      ENDFILE 7                                                     YOKIFER   63
   34 CALL RDBUF (SLFSET3,AASC,4600,LENGTH,LSTATUS)                 YOKIFER   64
      CALL WTBUF (SLFSET7,AASC,LENGTH)                              YOKIFER   65
      NDUMP=NDUMP+LENGTH                                            YOKIFER   66
      WRITE (7)                                                     YOKIFER   67
      ENDFILE 7                                                     YOKIFER   68
      PRINT 2003                                                    YOKIFER   69
      REWIND 1                                                      YOKIFER   70
      REWIND 3                                                      YOKIFER   71
      CALL OPEN (SLFSET1,2LST,512)                                  YOKIFER   72
      CALL OPEN (SLFSET3,2LST,512)                                  YOKIFER   73
      CALL OPEN (SLFSET7,2LST,512)                                  YOKIFER   74
      IF (IDUMP.EQ.1) GO TO 21                                      YOKIFER   75
      CALL ADV()                                                    YOKIFER   76
      TDUMP=AMIN1(900.0+T2,TTL-T2)                                  YOKIFER   77
      NDUMP=0                                                       YOKIFER   78
      PRINT 2002,        TIME                                       YOKIFER   79
      WRITE (12,2002)    TIME                                       YOKIFER   80
      REWIND 7                                                      YOKIFER   81
      CALL DATAREL (SLFSET7)                                        YOKIFER   82
      CALL AFSREL(4LFILM)                                           YOKIFER   83
      CALL AFSREL(3LOUT)                                            YOKIFER   84
      CALL OPEN (6LFSET12,2LST,512)                                 YOKIFER   85
      REWIND 7                                                      YOKIFER   86
      IF (TDUMP.GE.2.0*TCYCLE) GO TO 21                             YOKIFER   87
      STOP                                                          YOKIFER   88
      END                                                           YOKIFER   89
```

SINGLY REFERENCED VARIABLES

32	-	59*	DTVSAV	-R	12CO	GRDVEL	-R	8CO	ITAB	(I)	10CO	NCYC	-I	8CO	PYB	-R	9CO	THY	-R	8CO
34	-	66*	DVDY	-R	12CO	GREEN	-	(3CN	ITV	-I	8CO	NFRQ	-I	2CO	PYCONV	-R	9CO	TNEUT	-R	11CO
ADV	-	78SU	EMID	-R	8CO	G2	-R	10CO	IXL	-I	9CO	NOPD	-I	2CO	PYT	-R	9CO	TSTART	-R	8CO
ALPHA	-R	13CO	EPS	-R	10CO	IBAR	-I	8CO	IXR	-I	9CO	NOPT	-I	2CO	ROT	-R	12CO	VTEM	-R	10CO

```
ANC      -R   10CO   ETAB    ()R    2CO   IOTC    -I  12CO   IYB      -I   9CO   NPCMAX  -I  (3CO   RED      -    8CN   VV       -R   9CO
ANGLES  ()R  (1CO   FIPXL   -R     9CO   IOTV    -I  12CO   IYI      -I   9CO   NQ      -I   8CO   RETURN   -   90F   WHITE    -   11CN
ASW      -R   10CO   FIPXR   -R     9CO   IECP    -I  10CO   J        -I   4CO   NQIB    -I  10CO   REZRUN   -R  10CC   XCONV    -R   9CO
AO       -R   10CO   FIPYB   -R     9CO   IJ      -I   4CO   JBAP     -I   8CO   NQI2    -I  (0CO   REZSIE   -R   8CO   XL       -R   9CO
AOFAC    -R   (0CO   FIXL    -R     9CO   IJM     -I   ACO   JCEN     -I  13CO   NRVALS  -I  (1CO   REZYO    -R  10CO   XR       -R   9CO
AOM      -R   10CO   FIXR    -R     9CO   IJP     -I   4CO   JUIC     -I  12CO   NSP     -(  (3CO   RIBAR    -R   9CO   YB       -R   4CO
BTBL    ()R    2CO   FIYB    -R     9CO   IJPS    -I   8CO   JUIV     -I  12CO   NUMIT   -I  10CO   RLCI     -    7CN   YCONV    -R   9CO
BO       -R   (0CO   FLOAT   -     24SU   IMI     -I  (0CO   JNM      -I  10CO   CM      -R  13CO   RVALS   ()R  11CO   YELLOW   -   12CN
COLAMU   -R   10CO   FREG    ()R    2CO   INF     -I   1AG   JPI      -I   8CO   CMANC   -R  13CD   SENSE    -   15CN   YLCI     -    5CN
CRIMSN   -    14CN   FSETI   -R     1AG   IPXL    -I   9CO   JP4      -I  10CO   CMCYL   -R  (CCO   SIGA    ()R   7LC   YLC2     -    6CN
CYL      -R   (0CO   FSET12  -R     1AG   IPXR    -I   9CO   JSWTCH1  -I  15CO   CPDEN   ()R   2CO   SILVER   -    9CN   YOKIFER  -    1SU
DATAREL  -    84SU   FSE12   -R     1AG   IPYB    -I   9CO   JSWTCH3  -I  (5CO   CPTMP   ()R   2CO   SNCON   ()R  14CO   YSCI     -    3CN
DI       -R    8CO   FSE13   -R     (AG   IPYT    -I   9CO   KXI      -I  10CO   ORANGE  -   (0CN   SPTBL   ()R   2CO   YT       -R   9CO
DTC      -R   (2CD   FSET4   -R     1AG   IP1     -I   8CO   LAM      -I  10CO   CUT     -R   1AG   STATE    -    2CN
DTCSAV   -R   12CO   FSE16   -R     1AG   IP2     -I  10CO   LJP2     -I  10CO   PINK    -    4CN   T        -R   8CG
DTO2     -R   12CO   FSE17   -R     (AG   ISCF1   -I   8CO   MU       -I  10CO   FTAB    ()R   2CO   TAMB     -R   8CC
DTPOS    -R   11CO   GLTG    -     23SU   ISCF2   -I   8CO   NANGLS   -I  11CO   PXCONV  -R   9CO   TEMIT    -R  13CO
DTR      -R    8LO   GMI     -R    10CO   ISC2    -I   8CO   NBP      -I  13CO   PXL     -R   9CO   TEMP    ()R   8CC
DIV      -R   12CO   GR      -R    10CO   ISC3    -I   8CO   NBUF     -I  13CO   PXR     -R   9CO   THIRD    -R  10CC
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-

MULTIPLY-REFERENCED VARIABLES
      21 -    28*     45      77      89
      22 -    31      34SU
      23 -    33SU    36SU
      33 -    61*     63
    2001 -    16*     39PR
    2002 -    17*     61PR    82WR
    2003 -    18*     71PR
AASC    ()R    3CO    60AG    61AG    66AG    67AG
AA1     ()R    5LC    55WR
AA2     ()R    6LC    58WR
AFSREL   -    85SU    86SU
AMINI    -    20SU    79SU
COMMON   -     2F      3F      4F      8F      9F     10F     11F     12F     13F     14F     15F
ENDFILE  -    52F     59F     65F     70F
FILM     -R    1AG    (AG
FORMAT   -    16F     17F     18F
I        -I    4CO    51WR    51WR    55WR    55WR    58WR    58WR
IDUMP    -I   41=     42=     43=     44=     45      77
IZZ      -I   50=     51WR
JP2      -I    8CO    53
JSWTCH2  -I   (5CO    31
KITL     -I   23AG    24
LCM      -     5F      6F      7F
LENGTH   -I   61AG    61AG    62      66AG    67AG    68
LOCF     -    50SU    5.SU
LSTATUS  -I   60AG    63      66AG
NAME    ()I    8CO    5.      51WR
NDUMP    -I    8CO    27=     39PR    44      49=     49      54=     54      57=     57      62=     62      68=     68      80=
NECS     -I   53=     54      55WR    56=     57      58WR
NPI      -I   11CO    56
NQI      -I    8CO    53
OPEN     -    22SU    46SU    47SU    48SU    74SU    75SU    76SU    87SU
OVERLAY  -    19SU    28SU    31SU    34SU
PRINT    -    39F     71F     81F
RDBUF    -    60SU    66SU
REMARK   -    20SU    29SU    32SU    35SU
REWIND   -    21SU    72F     73F     83F     88F
SECOND   -    25SU    36SU
TCYCLE   -R   37=     38      39PR    43      89
TDUMP    -R   26=     38=     38      39PR    43      79=     89
TIME     -R    8CO    42      61PR    62WR
TOUT     -R    8CO    42
TTL      -R   24=     26      79
T1       -R   25AG    37      40=
T2       -R   36AG    37      39PR    40      79      79
WRITE    -    51F     55F     58F     64F     69F     82F
WTBUF    -    61SU    67SU
ZZ       -R   (4CO    5.
```

```
      SUBROUTINE LOOP                                                   LOOP       2
      COMMON /STATE/    NOPI, NCPO, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM     2
     1                  FREQ(100), SPTBL(300), PTAB(300), FTAB(300),    ALLKOM     3
     2                  BTBL(300)                                       ALLKOM     4
      COMMON /YSC1/     AASC(5454)                                      ALLKOM     5
      COMMON /PINK/     I, IJ, IJM, IJP, J                              ALLKOM     6
      LCM /YLC1/        AA1(131000)                                     ALLKOM     7
      LCM /YLC2/        AA2(131000)                                     ALLKOM     8
      LCM /KLC1/        SIGA(30000)                                     ALLKOM     9
      COMMON /RED/      NAME(12), OT, OTR, FM10, GROVEL, IBAR, IJPS,    ALLKOM    10
     1                  IPF, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM    11
     2                  JP1, JP2, NCYC, NOUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM    12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM    13
      CALL ECWR (AASC(IJMS),IECW,NQI,NE)                                LOOP       4
      IECW = IECW + NQI                                                 LOOP       5
      GO TO (10,20,30) IBUF                                             LOOP       6
   10 IJP = IJPS = 1                                                    LOOP       7
      IJ  = ISC3                                                        LOOP       8
      IJM = IJMS = ISC2                                                 LOOP       9
      IBUF = 2                                                          LOOP      10
      GO TO 40                                                          LOOP      11
   20 IJP = IJPS = ISC2                                                 LOOP      12
      IJ  = 1                                                           LOOP      13
      IJM = IJMS = ISC3                                                 LOOP      14
      IBUF = 3                                                          LOOP      15
      GO TO 40                                                          LOOP      16
      ENTRY START                                                       LOOP      17
      IJPS = 1                                                          LOOP      18
      IECR = IECW = 0                                                   LOOP      19
      CALL ECRD (AASC(IJPS),IECR,NQI,NE)                                LOOP      20
      IECR = IECR + NQI                                                 LOOP      21
      IJPS = ISC2                                                       LOOP      22
      CALL ECRD (AASC(IJPS),IECR,NQI,NE)                                LOOP      23
      IECR = IECR + NQI                                                 LOOP      24
   30 IJP  = IJPS = ISC3                                                LOOP      25
      IJ = ISC2                                                         LOOP      26
      IJM = IJMS = IBUF = 1                                             LOOP      27
   40 CALL ECRD (AASC(IJPS),IECR,NQI,NE)                                LOOP      28
      IECR = IECR + NQI                                                 LOOP      29
      RETURN                                                            LOOP      30
      ENTRY DONE                                                        LOOP      31
      CALL ECWR (AASC(IJMS),IECW,NQI,NE)                                LOOP      32
      IECW = IECW + NQI                                                 LOOP      33
      GO TO (50,60,70) IBUF                                             LOOP      34
   50 IJMS = ISC2                                                       LOOP      35
      GO TO 80                                                          LOOP      36
   60 IJMS = ISC3                                                       LOOP      37
      GO TO 80                                                          LOOP      38
   70 IJMS = 1                                                          LOOP      39
   80 CALL ECWR (AASC(IJMS),IECW,NQI,NE)                                LOOP      40
      RETURN                                                            LOOP      41
      ENTRY LOOPD                                                       LOOP      42
  100 CALL ECWR (AASC(IJS),IECW,NQI,NE)                                 LOOP      43
      IECW = IECW - NQI                                                 LOOP      44
      GO TO (110,120,140) IBUF                                          LOOP      45
  110 IBUF = 2                                                          LOOP      46
      IJ = ISCF1                                                        LOOP      47
      IJS = 1                                                           LOOP      48
      IJM = ISCF2                                                       LOOP      49
      IJMS = ISC2                                                       LOOP      50
      GO TO 130                                                         LOOP      51
      ENTRY STARTD                                                      LOOP      52
      IJMS = ISC2                                                       LOOP      53
      IECR = IECW = ITV                                                 LOOP      54
      CALL ECRD (AASC(IJMS),IECR,NQI,NE)                                LOOP      55
      IECR = IECR - NQI                                                 LOOP      56
  120 IJM = ISCF1                                                       LOOP      57
      IJMS = IBUF = 1                                                   LOOP      58
      IJ = ISCF2                                                        LOOP      59
      IJS = ISC2                                                        LOOP      60
  130 IF (IECR.LT.0) GO TO 150                                          LOOP      61
```

```
67         CALL ECHO (AASC(IJMS),IECR,NQI,NE)                 LOOP     62
68         IECR = IECR - NQI                                  LOOP     63
69   140   RETURN                                             LOOP     64
70   150   IBUF = 3                                           LOOP     65
71         GO TO 100                                          LOOP     66
72         ENTRY RINCW                                        LOOP     67
73         IEC = (J-1) * NQI                                  LOOP     68
74         CALL ECRD (AASC(I),IEC,NQI,NE)                     LOOP     69
75         RETURN                                             LOOP     70
76         ENTRY SETIJ                                        LOOP     71
77         IJ = (I-1) * NQ + 1                                LOOP     72
78         RETURN                                             LOOP     73
79         ENTRY WIROW                                        LOOP     74
80         IEC = (J-1)*NQI                                    LOOP     75
81         CALL ECWR (AASC(I),IEC,NQI,NE)                     LOOP     76
82         RETURN                                             LOOP     77
83         END                                                LOOP     78

 SINGLY REFERENCED VARIABLES
  AA1   ()R  5LC   E1AB   ()R  2CO  JP2   -I  8CO   NOPD   -I  2CO  REZSIE -R  8CO   STARTO -  57EN  TOUT   -R  8CO
  AA2   ()R  6LC   FREG   ()R  2CO  LOCP  -   1SU   NOPT   -I  2CO  RLCI   -   7CN   STATE  -   2CN  TSTART -R  8CO
  BTBL  ()R  2CO   GRDVEL -R   6CO  LOCPD -  47EN   OPOEN  ()R 2CO  RIROW  -  72EN   T      -R  8CO  WIROW  -  79EN
  DONE  -   36EN   I6AR   -I   8CO  NAME  ()I 8CO   OPIMP  ()R 2CO  SETIJ  -  76EN   TAMH   -R  8CO  YLCI   -   5CN
  DT    -R   8CO   IFC    -I   8CO  NCYC  -I  8CO   PINK   -   4CN  SIGA   ()R 7LC   TEMP   ()R 8CO  YLC2   -   6CN
  DTR   -R   8CO   J6AR   -I   8CO  NOLMP -I  8CO   PIAB   ()R 2CO  SPTBL  ()R 2CO   THY    -R  8CO  YSCI   -   3CN
  EMIO  -R   8CO   JPI    -I   8CO  NFRQ  -I  2CO   REO    -   8CN  START  -  22EN   TIML   -R  8CC
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
      10 -   11    12*
      20 -   11    17*
      30 -   10    3*
      40 -   16    21    33*
      50 -   39    41*
      60 -   39    42*
      70 -   39    44*
      80 -   41    43    45*
     100 -   48*   71
     110 -   50    51*
     120 -   50    62*
     130 -   56    66*
     140 -   59    69*
     150 -   66    70*
AASC   ()R   3CO   9AG   25AG  28AG  33AG  37AG  45AG  48AG  60AG  67AG  74AG  81AG
COMMON  -    2F    3F    4F    8F
ECRD    -    25SU  26SU  33SU  60SU  67SU  74SU
ECWR    -    9SU   37SU  45SU  48SU  81SU
ENTRY   -    22F   36F   47F   57F   72F   76F   79F
I      -I    4CO   77
IBUF   -I    11    15=   20=   32=   39    50    51=   63=   70=
IEC    -I    73=   74AG  80=   81AG
IECR   -I    24=   25AG  26=   26    28AG  29=   29    33AG  34=   34    59=   60AG  61=   61    66    67AG  68=
             68
IECW   -I    9AG   10=   15    24=   37AG  38=   38    45AG  48AG  49=   49    59=
IJ     -I    4CO   13=   18=   31=   52=,  64=   77=
IJM    -I    4CO   14=   19=   32=   54=   62=
IJMS   -I    9AG   14=   19=   32=   37AG  40=   42=   44=   45AG  55=   58=   61AG  63=   67AG
IJP    -I    4CO   12=   17=   30=
IJPS   -I    6CO   12=   17=   23=   25AG  27=   28AG  30=   33AG
IJS    -I    4FAG  53=   65=
ISCF1  -I    8CO   52    62
ISCF2  -I    6CO   54    64
ISC2   -I    6CO   14    17    27    31    40    55    58    65
ISC3   -I    6CO   13    19    30    42
IIV    -I    8CO   59
J      -I    4CO   73    80
LCH     -    5F    6F    7F
NE     -I    9AG   25AG  28AG  33AG  37AG  45AG  46AG  60AG  67AG  74AG  81AG
NQ     -I    8CO   77
NQI    -I    8CO   9AG   10    25AG  26    28AG  29    33AG  34    37AG  38    45AG  48AG  49    60AG  61    67AG
             68    73    74AG  80    81AG
RETURN  -    35F   46F   69F   75F   78F   82F
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      SUBROUTINE FILMCO                                                 FILMCO     2
      COMMON /STATE/    NOPT, NCPD, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM     2
     1                  FREQ(300), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM     3
     2                  BTBL(300)                                       ALLKOM     4
      COMMON /YSC1/     AASC(5454)                                      ALLKOM     5
      COMMON /PINK/     I, IJ, IJM, IJP, J                              ALLKOM     6
      LCM /YLC1/        AA1(131000)                                     ALLKOM     7
      LCM /YLC2/        AA2(131000)                                     ALLKOM     8
      LCM /RLC1/        SIGA(30000)                                     ALLKOM     9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,    ALLKOM    10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM    11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM    12
     3                  TEMP(750), T, TIME, TOUT, TSTART, THY           ALLKOM    13
      COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,          SILVER     2
     1                  IPXL, IPXR, IPYB, IPY1, IXL, IXR, IYB,          SILVER     3
     2                  IY1, PXCONV, PXL, PXR, PYB, PYCONV, PYT,        SILVER     4
     3                  RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT         SILVER     5
      COMMON /ORANGE/   ANC, ASC, AD, AUFAL, AOP, BU, CCLAMU, CYL,      ORANGE     2
     1                  DTPOS, EPS, GM1, GM, GZ, IM1,                   ORANGE     3
     2                  IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,      ORANGE     4
     3                  LJP2, MU, NP1, NQIM, NQI2, NUMIT, OM,           ORANGE     5
     4                  OMINC, OMCYL, REZRUN, REZYU, THIRO, VTEM        ORANGE     6
      COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), INEUT    ORANGE     7
      COMMON /SENSE/    JSWTCH1, JSWTCH2, JSWTCH3                       SENSE      2
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL   2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),         EQVREAL    3
     2                  (AASC(7),MP,RMP,RCSQ,CENTX),                    EQVREAL    4
     3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),         EQVREAL    5
     4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),      EQVREAL    6
     5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                   EQVREAL    7
     6                  (AASC(13),VTIL,VL,UMOMLC),                      EQVREAL    8
     7                  (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),   EQVREAL    9
     8                  (AASC(16),DELSM,SIGPLC),                        EQVREAL   10
     9                  (AASC(17),GRIR,UG,RZLDEN),                      EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                          EQVREAL   12
      REAL              LAM, LAMD, M, MP, MU, MUO2                      EQVREAL   13
      DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),       DIMEN      2
     2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),  DIMEN      3
     3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),  DIMEN      4
     4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),      DIMEN      5
     5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
     6                  UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),        DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),    DIMEN      8
     8                  RZLDEN(1), GRIZ(1), VG(1), FSN(1)               DIMEN      9
      XL = 0.0                                                          FILMCO     9
      YB = 1.E+20                                                       FILMCO    10
      XR = YT = -YB                                                     FILMCO    11
      RIBAR=1.0/FLOAT(IBAR)                                             FILMCO    12
      CALL START                                                        FILMCO    13
      DO 129 J=2,JP2                                                    FILMCO    14
      DO 119 I=1,IP1                                                    FILMCO    15
      XR = AMAX1(XR,X(IJ))                                              FILMCO    16
      YB = AMIN1(YB,Y(IJ))                                              FILMCO    17
      YT = AMAX1(YT,Y(IJ))                                              FILMCO    18
  119 IJ = IJ + NQ                                                      FILMCO    19
      CALL LOOP                                                         FILMCO    20
  129 CONTINUE                                                          FILMCO    21
      VV = 0.9*XR*RIBAR                                                 FILMCO    22
      FIYB=964.0                                                        FILMCO    23
      FIYT=4.0                                                          FILMCO    24
      FIXL=100.0                                                        FILMCO    25
      FIXR=1000.0                                                       FILMCO    26
      XD   = XR/(YT-YB)                                                 FILMCO    27
      IF (XD.LT.1.0) FIXR=FIXL+XD*(FIYB-FIYT)                           FILMCO    28
      IF (XD.GT.1.0) FIYT=FIYB-(FIXR-FIXL)/XD                           FILMCO    29
      XCONV = (FIXR-FIXL)/(XR-XL)                                       FILMCO    30
      YCONV = (FIYT-FIYB)/(YT-YB)                                       FILMCO    31
      IXL = FIXL                                                        FILMCO    32
      IXR = FIXR                                                        FILMCO    33
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```
      IYB = FIYB                                               FILMCO   34
      IYT = FIYT                                               FILMCO   35
      PXL=0.0                                                  FILMCO   36
      PYB=AMAX1 (PYB,YB)                                       FILMCO   37
      PYT=AMIN1(PYT,YT)                                        FILMCO   38
      PXR=AMIN1(PXR,XR)                                        FILMCO   39
      PYB=AMAX1(PYB-3.0*PXR,YB)                                FILMCO   40
      PYT=AMIN1(PYT+2.0*PXR,YT)                                FILMCO   41
      PXR=AMIN1(2.0*PXR,XR)                                    FILMCO   42
      FIPYB=904.0                                              FILMCO   43
      FIPYT=4.0                                                FILMCO   44
      FIPXL=100.0                                              FILMCO   45
      FIPXR=1100.0                                             FILMCO   46
      XD = PXR/(PYT-PYB)                                       FILMCO   47
      IF (XD.LT.1.0) FIPXR=FIPXL+XD*(FIPYB-FIPYT)              FILMCO   48
      IF (XD.GT.1.0) FIPYT=FIPYB-(FIPXR-FIPXL)/XD              FILMCO   49
      PXCONV = (FIPXR-FIPXL)/(PXR-PXL)                         FILMCO   50
      PYCONV = (FIPYT-FIPYB)/(PYT-PYB)                         FILMCO   51
      IFXL = FIPXL                                             FILMCO   52
      IFXR = FIPXR                                             FILMCO   53
      IFYB = FIPYB                                             FILMCO   54
      IFYT = FIPYT                                             FILMCO   55
      RETURN                                                   FILMCO   56
      END                                                      FILMCO   57
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SINGLY REFERENCED VARIABLES
 AA1     ()R   5LC   DJR      -R    8CO  IJPS     -I    8CO  JSWTCH3 -I  12CO  NQIB    -I  10CO  REZRON  -R  10CO  THY     -R   8CO
 AA2     ()R   6LC   EMIL     -R    8CO  JM1      -I   10CO  KXJ     -I  10CO  NQI2    -I  10CO  REZSIE  -R   8CO  TIME    -R   8CO
 ANC     -R   10CO   EPS      -R   10CO  IP2      -I   10CO  LAMU    -R  14RL  NRVALS  -I  11CO  REZYO   -R  10CO  TNEUT   -R  11CO
 ANGLES  ()R  11CO   EQUIVAL  -    13F   ISCF1    -I    8CO  LJP2    -I  10CO  NUMI1   -I  10CO  RLC1    -    7CN  TOUT    -R   8CO
 ASQ     -R   10CD   EJAE     ()R   2CO  ISCF2    -I    8CO  LOOP    -   27SU  CM      -R  11CO  RVALS   ()R 11CO  TSTART  -R   8CO
 AD      -R   10CO   FILMCC   -     1SU  ISC2     -I    8CO  MUU2    -R  14RL  CMANC   -R  10CO  SENSE   -   12CN  VTEM    -R  10CO
 ADFAC   -R   10CO   FLOAT    -    19SU  ISC3     -I    8CO  NAME    ()I  8CO  CMCYL   -R  10CO  SIGA    ()R  7LC  WHITE   -   11CN
 ACM     -R   10CO   FREQ     ()R   2CC  ITAB     ()I  10CO  NANGLS  -I  11CO  CPOEN   ()R  2CO  SILVER  -    9CN  YLC1    -    5CN
 BTBL    ()R   2CD   GMI      -R   10CO  ITV      -I    8CO  NCYC    -I   8CO  CPTMP   ()R  2CO  SPTBL   ()R  2CO  YLC2    -    6CN
 BD      -R   10CU   GR       -R   16CO  JBAR     -I    8CO  NDUMP   -I   8CO  CRANGE  -   10CN  START   -   20SU  YSC1    -    3CN
 COLAMU  -R   10CO   GROVEL   -R    8CO  JNM      -I   10CO  NFRQ    -I   2CO  FINK    -    4CN  STATE   -    2CN
 CYL     -R   10CU   GZ       -R   10CO  JP1      -I    8CU  NOPO    -I   2CO  PTAB    ()R  2CO  T       -R   8CO
 DIMENSI -    15F    IELF     -I   10CO  JP4      -I   10CO  NOFT    -I   2CO  REAL    -   14F   TAMB    -R   8CO
 HT      -R    6CO   IJM      -I    4CO  JSWTCH1  -I   12CO  NPI     -I  10CO  RED     -    8CN  TEMP    ()R  8CO
 DTPOS   -R   10CU   IJ       -I    4CO  JSWTCH2  -I   12CU  NNI     -I   8CO  RETURN  -   63F   THINU   -R  10CO
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MULTIPLY-REFERENCED VARIABLES
    119 -      22UU    26*
    129 -      21UU    26*
AA5C    ()R     3CU    13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ
               13EQ    13EQ
AMAX1   -      23SU    25SU   44SU   47SU
AMIN1   -      24SU    45SU   46SU   48SU   49SU
BETALC  ()R    13EQ    15DI
CEGTX   ()R    13EQ    15DI
CEGTY   ()R    13EQ    15DI
COMMON  -       2F      3F     4F     8F     9F    10F    11F    12F
CO      ()R    13EQ    15DI
DELSM   ()R    13EQ    15DI
E       ()R    13EQ    15DI
EMORLC  ()R    13EQ    15DI
EP      ()R    13EQ    15DI
E11L    ()R    13EQ    15DI
FIPXL   -R      9CU    52=     55     56     57     59
FIPXR   -R      9CU    53=     55=    56     57     60
FIPYB   -R      9CU    50=     55     56     58     61
FIPYT   -R     51=     55      56=    58     62
FIXL    -R      9CU    32=     35     36     37     39
FIXR    -R      9CU    33=     35=    36     37     40
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FIYB     -R     9CO    3 =    35     36     38     41
FIYT     -R    31=     35     36=    38     42
FOUTLC  ()R    13EQ   15OI
FSN     ()R    13EQ   1501
GRIR    ()R    13EQ   1501
GRIZ    ()R    13EQ   1501
I        -I     4CO   2200
IBAR     -I     8CO   19
IJ       -I     4CO   23     24     25     26=    26
IPXL     -I     9CO   59=
IPXR     -I     9CO   6 =
IPYB     -I     9CO   61=
IPYT     -I     9CO   62=
IP1      -I     8CO   2200
IXL      -I     9CO   39=
IXR      -I     9CO   4 =
IYB      -I     9CO   41=
IYT      -I     9CO   42=
J        -I     4CO   2100
JP2      -I     8CO   2100
LAM      -R    10CO   14RL
LCM      -      5F     6F     7F
M       ()R    13EQ   14RL   1501
M'      ()R    13EQ   14RL   1501
MU       -R    1 CO   14RL
NQ       -I     8CO   26
P       ()R    13EQ   1501
PL      ()R    13EQ   1501
PXCONV   -R     9CO   57=
PXL      -R     9CO   45=    57
PXR      -R     9CO   46=    46     47     48     49=    49     54     57
PY)      -R     9CO   44=    44     47=    47     54     58
PYCONV   -R     9CO   58=
PYT      -R     9CO   45=    45     48=    48     54     58
R       ()R    13EQ   1501
RCSN    ()R    13EQ   1501
RIBAR    -R     9CO   19=    29
RM      ()R    13EQ   1501
RMP     ()R    13EQ   1501
RU      ()R    13EQ   1501
RUL     ()R    13EQ   1501
RVOL    ()R    13EQ   1501
RZEDEN  ()R    13EQ   1501
SIE     ()R    13EQ   1501
SIGPLC  ()R    13EQ   1501
U       ()R    13EQ   1501
UG      ()R    13EQ   1501
UL      ()R    13EQ   1501
UMOMLC  ()R    13EQ   1501
UP      ()R    13EN   1501
UTIL    ()R    13EQ   1501
V       ()R    13EQ   1501
VG      ()R    13EQ   1501
VL      ()R    13EQ   1501
VP      ()R    13EQ   1501
VTIL    ()R    13EQ   1501
VV       -R     9CO   29=
X       ()R    13EQ   1501   23
XCONV    -R     9CO   37=
XU       -R    34=    35     35     36     36     54=    55     55     56     56
XL       -R     9CO   16=    37
XPAR    ()R    13EQ   1501
XR       -R     9CO   18=    23=    23     29     34     37     46     49
Y       ()R    13EQ   1501   24     25
YB       -R     9CO   17=    18     24=    24     34     38     44     47
YCONV    -R     9CO   36=
YPAR    ()R    13EQ   1501
YT       -R     9CO   16=    25=    25     34     38     45     48
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```

```
 1          OVERLAY (YOKIFER, 1, 0)                                                    OFFWEGO      2

 1          PROGRAM OFFWEGO                                                            OFFWEGO      3
       C                                                                               OFFWEGO      4
       C    ---   OFFWEGO READS AND MODIFIES INPUT                                     OFFWEGO      5
       C                                                                               OFFWEGO      6
 2          COMMON /STATE/      NOPI, NCPU, NFRQ, OPTMP(30), OPDEN(10),                ALLKOM       2
          1                     FREQ(100), SPTBL(300), PTAB(300), ETAB(300),           ALLKOM       3
          2                     BTBL(300)                                              ALLKOM       4
 3          COMMON /YSC1/       AASC(5454)                                             ALLKOM       5
 4          COMMON /PINK/       I, JJ, JJP, IJP, J                                     ALLKOM       6
 5          LCM /YLC1/          AA1(131000)                                            ALLKOM       7
 6          LCM /YLC2/          AA2(131000)                                            ALLKOM       8
 7          LCM /RLC1/          SIGA(30000)                                            ALLKOM       9
 8          COMMON /RED/        NAME(12), DT, OTR, EMI0, GROVEL, IBAR, IJPS,           ALLKOM      10
          1                     IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,              ALLKOM      11
          2                     JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,          ALLKOM      12
          3                     TEMP(7500), T, TIME, IOUT, TSTART, IHY                 ALLKOM      13
 9          COMMON /SILVER/     FIPXL, FIPXR, FIPYB, FIPYT, FIXL, FIXR, FIYB,          SILVER       2
          1                     IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,                 SILVER       3
          2                     IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,               SILVER       4
          3                     RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT                SILVER       5
 1          COMMON /ORANGE/     ANC, ASH, AU, AOFAC, AOM, BO, COLAMC, CYL,             ORANGE       2
          1                     DTPUS, EPS, GP, GH, GZ, IH,                            ORANGE       3
          2                     IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,             ORANGE       4
          3                     LJP2, MU, NP1, NQ(H, NQ12, NUMIT, OM,                  ORANGE       5
          4                     OMANC, OMCYL, REZRUN, REZYO, THIRU, VTEM               ORANGE       6
 11         COMMON /WHITE/      NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT           ORANGE       7
 12         COMMON /GREEN/      ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMIT             GREEN        2
 13         COMMON /CRIMSN/     SNCON(123), ZZ                                         CRIMSN       2
 14         COMMON /SENSE/      JSWTCH1, JSWTCH2, JSWTCH3                              SENSE        2
 15         COMMON /BLUE/       DR, DZ, FREZ, JUNF, JMIO,                              BLUE         2
          1                     JUNFOZ, RADX(7500), ROMFR, YBASE                       BLUE         3
 16         EQUIVALENCE         (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),       EQVREAL      2
          1                     (AASC(4),U), (AASC(5),V), (AASC(6),RO),                EQVREAL      3
          2                     (AASC(7),MP,RMP,RCSQ,CENTX),                           EQVREAL      4
          3                     (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),                EQVREAL      5
          4                     (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),             EQVREAL      6
          5                     (AASC(12),UTIL,UL,CQ,EMOMLC),                          EQVREAL      7
          6                     (AASC(13),VTIL,VL,UMOMLC),                             EQVREAL      8
          7                     (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),          EQVREAL      9
          8                     (AASC(16),DELSM,SIGPLC),                               EQVREAL     10
          9                     (AASC(17),GRIR,UG,RZEDEN),                             EQVREAL     11
          1                     (AASC(18),GRIZ,VG,FSN)                                 EQVREAL     12
 17         REAL                LAM, LAMO, M, MP, MU, MUOZ                             EQVREAL     13
 18         DIMENSION           X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),              DIMEN        2
          2                     V(1), RC(1), MP(1), RMP(1), RCSQ(1), CENTX(1),         DIMEN        3
          3                     E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),         DIMEN        4
          4                     VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),             DIMEN        5
          5                     UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),               DIMEN        6
          6                     UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),               DIMEN        7
          7                     SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),           DIMEN        8
          8                     RZEDEN(1), GRIZ(1), VG(1), FSN(1)                      DIMEN        9
 19         DIMENSION           XTAB(101), YTAB(151)                                   OFFWEGO     16
 20         DIMENSION           OPS(6100)                                              OFFWEGO     17
 21         LOGICAL             EOI                                                    OFFWEGO     18
 22    1001 FORMAT              (12A6)                                                 OFFWEGO     19
 23    1003 FORMAT              (6E12.4)                                               OFFWEGO     20
 24    1004 FORMAT              (2I6,5E12.4)                                           OFFWEGO     21
 25    1005 FORMAT              (3I6,6X,4E12.4)                                        OFFWEGO     22
 26    2001 FORMAT              (1H ,12A6)                                             OFFWEGO     23
 27    2002 FORMAT              (1H ,*GENERAL DATA*/6H TIME  ,1PE12.4,6X,              OFFWEGO     24
          1                     6H OTR  ,1PE12.4,6X,6H CYL  ,1PE12.4,6X,               OFFWEGO     25
          2                     7H GROVEL,1PE11.4)                                     OFFWEGO     26
```

```
 2003 FORMAT        (1H ,*RADN TRANSPORT DATA*/6H ALPHA,1PE12.4)
 2004 FORMAT        (1H ,*MESH CONSTANTS*/6H IBAR ,I12,6X,
     1              6H JBAR ,I12,6X,6H YBASE,1PE12.4,6X,
     2              6H REZYO,1PE12.4)
 2005 FORMAT        (6H IUNF ,I12,6X,6H JUNF ,I12,6X,6H JMID ,I12/
     1              6H DR    ,1PE12.4,6X,6H DZ    ,1PE12.4,6X,
     2              6H FREZ ,1PE12.4)
 2006 FORMAT        (1H0,*HYDRODYNAMICS CONSTANTS*/6H AO    ,
     1              1PE12.4,6X,6H APM   ,1PE12.4,6X,6H RO    ,1PE12.4,
     2              6X,6H NXI   ,I12,6X,6H MU    ,1PE12.4/6H LAM   ,
     3              1PE12.4,6X,6H OM    ,1PE12.4,6X,6H EPS   ,
     4              1PE12.4,6X,6H ASQ   ,1PE12.4,6X,6H GM    ,
     5              1PE12.4/6H GR    ,1PE12.4,6X,6H GZ    ,1PE12.4,
     6              6X,7H REZRON,1PE11.4,6X,7H REZSIE,1PE11.4)
 2008 FORMAT        (1H0,A10,6X,A10)
 2009 FORMAT        (1H0,*PROBLEM STARTING TIME*,1PE12.4,* SEC*)
 2010 FORMAT        (1H ,*CONSTANTS SET BY OFFWEGO*/
     1              6H IQ    ,I12,6X,6H NQI   ,I12/6H NSUF ,I12,
     2              6X,6H NSP   ,I12,6X,6H NOP   ,I12,6X,
     3              7H NPCMAX,I11)
 2012 FORMAT        (6H TAMB ,1PE12.4,6X,6H TEMIT,1PE12.4,6X,
     2              6H ANC   ,1PE12.4)
C
      CALL GETQ (ALKJBN, JNM)
      CALL DATE1 (D2)
      PRINT 2008,       JNM, D2
      WRITE (12,2008)   JNM, D2
      CALL SSWTCH (1,JSWTCH1)
      CALL SSWTCH (2,JSWTCH2)
      CALL SSWTCH (3,JSWTCH3)
C     ---    SET LCM
      IECS=0
   22 NECS=131000-IECS
      NECS=MIN0(NECS,5454)
      CALL ECWR (AASC, IECS, NECS, NE)
      IECS=IECS+5454
      IF ((ECS.LT.131000) GO TO 22
C     ---    READ EQUATION OF STATE INPUT
      READ  (6)            NOPT, NOPD, NFRQ
      READ  (6)            FREQ
      DO 33 K=1,NFRQ
      FFLQ(K)=3.0E+18/FREQ(K)
   33 CONTINUE
      DO 42 J=1,NOPD
      DO 41 I=1,NOPT
      READ  (6)            NWL, OPTMP(I), OPDEN(J), OPSIG
      DO 41 K=1,NFRQ
      IJK=K+((I-1)*NFRQ+(J-1)*NOPT*NFRQ
      SIGA(IJK)=OPSIG(K)+5.0
   41 CONTINUE
      OPDEN(J)=OPDEN(J)+3.0
   42 CONTINUE
      NSTATE=NOPD*NOPT
      READ  (6)            SPTBL
      IF (JSWTCH3.EQ.1) READ (6) PTAB
      IF (JSWTCH3.EQ.2) READ (6) SPTBL
      READ  (6)            PTAB
      READ  (6)            ETAB
      READ  (6)            BTBL
      I=0
      J=1
      DO 44 IJ=1,NSTATE
      I=I+1
      SPTBL(IJ)=SPTBL(IJ)+5.0
      IF (I.EQ.2) SPTBL(IJ-1)=2.0*SPTBL(IJ)-SPTBL(IJ-1)
      PTAB(IJ)=PTAB(IJ)-7.0
      ETAB(IJ)=ETAB(IJ)-10.0
      IF (I.LT.NOPT) GO TO 44
```

```
      I=                                                                OFFWEGO   95
      J=J+1                                                             OFFWEGO   96
   44 CONTINUE                                                          OFFWEGO   97
      CALL AFSREL (SLFSET6)                                             OFFWEGO   98
C     ---   CHECK FOR DUMP OR CARDS                                     OFFWEGO   99
      READ  (7)           NAME                                          OFFWEGO  100
      IF (EOI(7)) GO TO 11                                              OFFWEGO  101
      REWIND 7                                                          OFFWEGO  102
      NDALL=LOCF(ZZ)-LOCF(NAME(1))+1                                    OFFWEGO  103
      CALL OPEN (SLFSET1,2LST,4608)                                     OFFWEGO  104
      CALL OPEN (SLFSET3,2LST,4608)                                     OFFWEGO  105
      CALL OPEN (SLFSET7,2LST,4608)                                     OFFWEGO  106
      READ  (7)           (NAME(I), I=1,NDALL)                          OFFWEGO  107
C     ---   READ DUMP                                                   OFFWEGO  108
    3 READ  (7)                                                         OFFWEGO  109
      IF (EOF,7) 4,4                                                    OFFWEGO  110
      NECS=NDI*JP2                                                      OFFWEGO  111
      READ  (7)           (AA)(I), I=1,NECS)                            OFFWEGO  112
      NECS=2*NP1                                                        OFFWEGO  113
      READ  (7)           (AA2(I), I=1,NECS)                            OFFWEGO  114
    5 READ  (7)                                                         OFFWEGO  115
      IF (EOF,7) 6,6                                                    OFFWEGO  116
    6 REWIND 3                                                          OFFWEGO  117
      CALL COPYF (SLFSET7,SLFSET1)                                      OFFWEGO  118
      CALL COPYF (SLFSET7,SLFSET3)                                      OFFWEGO  119
      READ  (7)           (NAME(I), I=1,NDALL)                          OFFWEGO  120
      IF (EOI(7)) GO TO 7                                               OFFWEGO  121
      GO TO 3                                                           OFFWEGO  122
    7 CALL OPEN (SLFSET1,2LST,512)                                      OFFWEGO  123
      CALL OPEN (SLFSET3,2LST,512)                                      OFFWEGO  124
      CALL OPEN (SLFSET7,2LST,512)                                      OFFWEGO  125
      IF (JSWICH1.EQ.1) RETURN                                          OFFWEGO  126
      CALL OPEN (SLFSET4,2LST,4608)                                     OFFWEGO  127
      CALL SKIPR (SLFSET4,2,4)                                          OFFWEGO  128
   61 READ  (4)           KSTEP, T2                                     OFFWEGO  129
      IF (EOI(4)) GO TO 63                                              OFFWEGO  130
      IF (T2.GT.T) GO TO 62                                             OFFWEGO  131
      READ  (4)                                                         OFFWEGO  132
      READ  (4)                                                         OFFWEGO  133
      GO TO 61                                                          OFFWEGO  134
   62 BACKSPACE 4                                                       OFFWEGO  135
      BACKSPACE 4                                                       OFFWEGO  136
      BACKSPACE 4                                                       OFFWEGO  137
      GO TO 64                                                          OFFWEGO  138
   63 JSWICH1=1                                                         OFFWEGO  139
   64 CALL OPEN (SLFSET4,2LST,512)                                      OFFWEGO  140
      RETURN                                                            OFFWEGO  141
C     ---   READ CARD INPUT                                             OFFWEGO  142
   11 NC=18                                                             OFFWEGO  143
      READ  1001,         NAME                                          OFFWEGO  144
      READ  1003,         TIME, DTR, CYL, GROVEL, ALPHA                 OFFWEGO  145
      READ  1004,         IBAR, JBAR, YBASE, REZYO                      OFFWEGO  146
      READ  1005,         IUNF, JUNF, JMID, DR, DZ, FREZ                OFFWEGO  147
      READ  1003,         A0, AUM, B0, X1, MU, LAM                      OFFWEGO  148
      READ  1003,         OM, EPS, ASQ                                  OFFWEGO  149
      READ  1003,         GM1, GR, GZ, REZROM, REZSIE                   OFFWEGO  150
      KX1=INT(X1)                                                       OFFWEGO  151
      TSTART=TIME                                                       OFFWEGO  152
C     ---   WRITE INPUT                                                 OFFWEGO  153
      PRINT 2001,         NAME                                          OFFWEGO  154
      WRITE (12, 2001)    NAME                                          OFFWEGO  155
      PRINT 2009,         TSTART                                        OFFWEGO  156
      WRITE (12,2009)     TSTART                                        OFFWEGO  157
      PRINT 2002,         TIME, DTR, CYL, GROVEL                        OFFWEGO  158
      WRITE (12,2002)     TIME, DTR, CYL, GROVEL                        OFFWEGO  159
      PRINT 2003,         ALPHA                                         OFFWEGO  160
      WRITE (12,2003)     ALPHA                                         OFFWEGO  161
      PRINT 2004,         IBAR, JBAR, YBASE, REZYO                      OFFWEGO  162
```

```
      WRITE (12,2014)   IBAR, JBAR, YBASE, REZYO
      PRINT 2005,       IUNF, JUNF, JMID, UR, OZ, FREZ
      WRITE (12,2005)   IUNF, JUNF, JMID, UP, OZ, FREZ
      PRINT 2006,       AO, ALM, BO, KXI, MU, LAM, OM, EPS, ASQ, GM1,
     1                  GR, GZ, REZRON, REZSIE
      WRITE (12,2006)   AO, ALM, BO, KXI, MU, LAM, OM, EPS, ASQ, GM1,
     1                  GR, GZ, REZRON, REZSIE
C     ---   COMPUTE AMBIENT TEMPERATURE
      XP=ALOG10(REZRON)
      ZP=ALOG10(REZSIE)
      YP=GETEMP(XP, ZP, OPGEN, OPTMP, ETAB, NOPD, NOPT)
      TAMO=EXP10(YP)
C     ---   SET CONSTANTS
   12 IM1   = IBAR - 1
      YBASE=YBASE-REZYO
      IP1=IBAR+1
      IP2   = IBAR + 2
      JP1=JBAR+1
      JP2=JBAR+2
      JP4   = JBAR + 4
      T=TIME
      OT=0.0
      OTPOS=OTR
      NQIB = NQ * IBAR
      OMCYL = 1.-CYL
      NQI   = NQ * IP1
      NQI2=NQI+NQI
      ISC2  = NQI + 1
      ISC3  = ISC2 + NQI
      IIV   = JP1 * NQI
      ISCF1 = ISC2 - NQ
      ISCF2 = ISCF1 + NQI
      LJP2 = JP2 - JP2/3 * 3
      IF (LJP2.EQ.0) LJP2 = 3
      LJP2 = LJP2*NQI -NQ +1
      IECP=LOCF(AA2)
      NCYC=0
      EMIO = 1.E-10
      ANC=0.05
      OMANC = 1.-ANC
      CCLAMU=1.5/(LAM+MU+MU+EMIO)
      AFRAC=0.2
      THIRD = 1./3.
      ICON   = MAX0(IUNF,1)
      JCON   = MAX0(JUNF,2)
      JCONO2 = JUNF/2
      IF (JMID.EQ.0) JMID=JBAR/2
      IF (FREZ.NE.1.) RCMFR = 1./(1.-FREZ)
      TPY=0.5
      VJLM=0.5
      NLMIT=1
      NPT=0
      JCEN=0
      NCUF=6000
      TEMIT=0.05
      NPCMAX=50
      NSP=10
      NBP=3
      ISN=4
      DO 125 I=1,181
      SNCON(I)=0.0
  125 CONTINUE
      SNCON(182)=ALPHA
      SNCON(183)=MOVE(ISN)
      TCUT=TIME
      PRINT 2011,       NQ, NQI, NBUF, NSP, NBP, NPCMAX
      WRITE (12,2011)   NQ, NQI, NBUF, NSP, NBP, NPCMAX
      PRINT 2012,       TAMO, TEMIT, ANC
```

```
      WRITE (12,2002)  TAMB, TENIT, ANC
C     ---   MESH INPUT
      CALL MESHMKR
C     ---   SET UP FILM PLOT COORDINATES
      CALL FILMCO
C     ---   COMPUTE XTAB YTAB ITAB
      CALL START
      DO 139 J=2,JP2
      YTAB(J) = Y(IJ)
      IF (J.GT.2) GO TO 139
      DO 129 I=1,IP1
      XTAB(I) = X(IJ)
  129 IJ = IJ + NQ
  13  CALL LOOP
  139 CONTINUE
      LPB=NPT+NPT
      NPPT = 0
  140 CALL ECHO (AASC,IECP,LPB,KE)
      KP = 1
  150 DO 159 J=2,JP2
      IF (YTAB(J).GT.YPAR(KP)) GO TO 160
  159 CONTINUE
  160 DO 169 I=1,IP1
      IF (XTAB(I).GT.XPAR(KP)) GO TO 170
  169 CONTINUE
  170 NPPT = NPPT + 1
      ITAB(NPPT) = (J-2)*IP1+I-1
      IF (NPPT.EQ.NPT) GO TO 200
      KP=KP+2
      GO TO 150
C     ---   COMPUTE M E
  200 CALL START
      DO 229 J=2,JP1
      DO 219 I=1,IBAR
      IPJ = IJ + NQ
      IPJP = IJP + NQ
      M(IJ)=RO(IJ)/RVOL(IJ)
      E(IJ) = SIE(IJ)+.125*(U(IPJ)**2+U(IPJP)**2+U(IJP)**2+U(IJ)**2
     1                    +V(IPJ)**2+V(IPJP)**2+V(IJP)**2+V(IJ)**2)
      IJ = IPJ
  219 IJP = IPJP
      CALL LOOP
  229 CONTINUE
      CALL DONE
C     ---   COMPUTE RM
  300 CALL STARTD
      DO 359 JJ=2,JP2
      J = JP4 - JJ
      DO 349 II=1,IP1
      I = IP2 - II
      IMJ = IJ - NQ
      IMJM = IJM -NQ
      XX = 0.0
      IF (I.NE.IP1 .AND. J.NE.2  ) XX = M(IJM)
      IF (I.NE.IP1 .AND. J.NE.JP2) XX = XX+M(IJ)
      IF (I.GE.1   .AND. J.NE.JP2) XX = XX+M(IMJ)
      IF (I.NE.1   .AND. J.NE.2  ) XX = XX+M(IMJM)
  340 RM(IJ) = 4./XX
      IJ = IMJ
  349 IJM = IMJM
      CALL LOOPD
  359 CONTINUE
      RETURN
      END
```

```
SINGLY REFERENCED VARIABLES
      5 -    97*    ECWR     -   46SU   IJPS    -I    8CO   LOGICAL -   21F    PINK    -     4CN   RLC1    -     7CN   XL      -R   9CO
    120 -   152*    EQUIVAL -    16F    INT     -   132SU   LOOPO   -  261SU   PXCONV  -R    9CO   RVALS  ()R   11CO   XR      -R   9CO
    140 -   221*    FILMCC  -  209SU    IPXL    -1    9CO   MESHMKR -  208SU   PXL     -R    9CO   SENSE   -    14CN   YB      -R   9CO
    300 -   246*    FIPXL   -R  9CO     IPXR    -1    9CO   MINO    -   45SU   PXR     -R    9CO   SILVER  -     9CN   YCONV   -R   9CO
    340 -   258*    FIPXR   -R  9CO     IPYB    -1    9CO   MOVE    -  202SU   PYB     -R    9CO   SKIPR   -   110SU   YLC1    -    5CN
 AFSREL  -   82SU   FIPYB   -R  9CO     IPYT    -1    9CO   MOD2    -R  17RL   PYCONV  -R    9CO   STARTD  -   246SU   YLC2    -    6CN
 ANGLES ()R  11CO   FIXL    -R  9CO     IXL     -1    9CO   NANGLS  -1  11CO   PYT     -R    9CO   STATE   -     2CN   YSC1    -    3CN
 BLUE    -   15CN   FIXR    -R  9CO     IXR     -1    9CO   NOOMP   -1   8CO   GEXF10  -   151SU   TEMP   ()R    8CO   YT      -R   9CO
 CRIMSN  -   13CN   FIYB    -R  9CO     IYB     -1    9CO   NRVALS  -1  11CO   RADX   ()R  15CO   TNEO1   -R   11CO
 DATE)   -   37SU   GETEMP  -  154SU    IY1     -1    9CO   NWL     -1  56PD   REAL    -     17F   VV      -R    9CO
 DONE    -  245SU   GOTO    -   36SU    KSTEP   -1 (1)1)0   OFFWEGO -    1SU   RED     -     8CN   WHITE   -    11CN
 ECHO    -  221SU   GREEN   -   12CN    LAMD    -R   17RL   ORANGE  -   11CN   RIBAR   -R    9CO   XCONV   -R    9CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
      3 -    91*    104
      4 -    92     92     93*
      6 -    96     96     99*
      7 -   103    105*
     11 -    84    124*
     22 -    44*    46
     33 -  5100     53*
     41 -  5500   5700     65*
     42 -  5400     62*
     44 -  7200     76     81*
     61 -   111*   116
     62 -   113    117*
     63 -   112    121*
     64 -   12     122*
    125 - (96)10   200*
    129 -  21400   216*
    13  -   213    217*
    139 -  21100   218*
    15  -   223*   233
    159 -  22300   225*
    16  -   224    226*
    169 -  22600   228*
    17  -   227    229*
    200 -   231    234*
    219 -  23600   242*
    229 -  23500   244*
    349 -  24900   26 *
    359 -  24700   262*
   1001 -    22*   125RD
   1003 -    23*   120RD  129RD  130RD  131RD
   1004 -    24*   127RD
   1005 -    25*   126RD
   2001 -    26*   134FR  135WR
   2002 -    27*   136FR  139WR
   2003 -    28*   1  FR  141WR
   2004 -    29*   142PR  143WR
   2005 -    30*   144FR  145WR
   2006 -    31*   146PR  147WR
   2008 -    32*    36FR   39WR
   2009 -    33*   136FR  137WR
   2011 -    34*   214PR  215WR
   2012 -    35*   206PR  207WR
 AASC   ()R   3CO   16EQ   16EQ   16EQ   16EG   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ   16EQ
             16EQ   16EQ   46AG   221AG
 AA1    ()R   5LC   94RD
 AA2    ()R   6LC   96RD   174
 ALPHA   -R  12CO  126RD  140PR  141WR  201
 ANC     -R  11CO  177=   178    206PR  207WR
 A3Q     -R  10CO  13 RD  146PR  147WR
 A       -R  10CO  129RD  146PR  147WR
 AOFAC   -R  10CO  182=
 AOM     -R  11CO  129RD  146PR  147WR
 BACKSPA -   117F  118F   119F
 BETALC ()R  16EQ  1801
```

```
BTBL     ()R      2CU    69RU
B.       -R      1?CU   129RU   146PR   147WR
CE.TX    ()R     16EQ    180I
CENTY    ()R     16EQ    180I
COLAMU   -R      1?CU   179=
COMMON   -        2F      3F      4F      8F      9F     10F     11F     12F     13F     14F     15F
COPYF    -      109SU   11?SU
CQ       ()R     16EQ    180I
CYL      -R      1?CU   126RU   138PR   139WR   163
DELSM    ()R     16EQ    180I
DIMENSI  -       18F     19F     20F
DR       -R      15CU   128RU   144PR   145WR
DI       -R       8CU   16?=
DIPOS    -R      10CU   16?=
DTR      -R       8CU   126RU   138PR   139WR   161
DZ       -R      15CO   128RU   144PR   145WR
D?       -R      37AG    38PR    39WR
E        ()R     16EQ    180I   240=
EMOMLC   ()R     16EQ    180I
EMIO     -R       8CU   176=    179
EOF      -       92F     98F
EOI      -       21LG    84SU   1?3SU   112SU
EP       ()R     16EQ    180I
EPS      -R      1?CU   13?RU   146PR   147WR
ETAB     ()R      2CO    68RU    77=     77     150
ETIL     ()R     16EQ    180I
FORMAT   -       22F     23F     24F     25F     26F     27F     28F     29F     30F     31F     32F     33F     34F     35F
FOUTLC   ()R     16EQ    180I
FREQ     ()R      2CU    5?RU    52=     52
FREZ     -R      15CO   128RU   144PR   145WR   186     186
FSN      ()R     16EQ    180I
GMI      -R      1?CO   131RU   146PR   147WR
GR       -R      1?CU   131RU   146PR   147WR
GRDVEL   -R       8CU   126RU   138PR   139WR
GRIR     ()R     16EQ    180I
GRIZ     ()R     16EQ    180I
GZ       -R      1?CO   131RU   146PR   147WR
I        -I       4CO   5500    56RU    58      70=     73=     73      75      78      79=     90RD    9?RD    94RU    94RD    96RO    96RD   10?RU
                112RU   19600   199    21400   215    22600   227     23?    23600   250=    254     255     256     257
IBAR     -I       8CU   127RU   142PR   143WR   152     154     155     162    23600
IECP     -I      1?CU   174=   221AG
IECS     -I      42=     44     46AG     47=     47      48
II       -I     24900   25?


IJ       -I       4CO   7200    74      74      75      75      75      76      76      77      77     212     215     216=    216     237     239
                 239    239     240     240     240     240     241=    251     255     258     259=
IJK      -I      58=     59
IJM      -I       4CU   252     254     260=
IJP      -I       4CU   238     240     240     242=
IMJ      -I      251=   256     259
IMJM     -I      252=   257     260
IMI      -I      1?CO   152=
IPJ      -I      237=    24     240     241
IPJP     -I      236=   24?     240     242
IPI      -I       8CU   154=    164    21400   22600   230    24900   254     255
IP2      -I      1?CU   155=    25?
ISCF1    -I       8CU   169=    170
ISCF2    -I       8CO   17?=
ISC2     -I       8CU   166=    167     169
ISC3     -I       8CU   167=
ISN      -I      197=   242
ITAB     ()I     1?CU   23?=
ITV      -I       8CU   168=
IUNF     -I      15CO   128RU   144PR   145WR   182=    182
J        -I       4CU   5400    56RD    58      61      61      71=     80=     80     21100   212     213    22300   224     230    23500   248=
                 254    255     256     257
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JBAR     -1     8CO    127RO  142PR  143WR  156    157    158    185
JCEN     -1     12CO   191=
JJ       -1     247DO  74B
JM10     -1     15CO   128RO  144PR  145WR  185    185=
JNM      -1     ( CO   36AG   38PR   394R
JP1      -1     8CO    156=   168    235DO
JP2      -1     8CO    93     157=   171    171    21100  223DO  24700  255    256
JP4      -1     1 CO   158=   248
JSWTCH1  -1     14CO   4 AG   1 8    121=
JSWTCH2  -1     14CO   41AG
JSWTCH3  -1     (4CO   42AG   65     66
JUNF     -1     128RO  144PR  145WR  (83=   183    184
JUNFU2   -1     15CO   189=
K        -1     5(DO   52     52     57DO   58     59
KP       -1     222=   224    227    232=   232
KXI      -1     1 CO   132=   146PR  147WR
LAM      -R     1 CO   17RL   129RO  146PR  147WR  (79
LCM      -      5F     6F     7F
LJP2     -1     1 CO   171=   172    172=   (73=   173
LOCF     -      86SU   80SU   174SU
LOOP     -      2(7SU  243SU
LPB      -1     219=   221AO
M        ()R    16EQ   17RL   1801   239=   254    255    256    257
MAX0     -      162SU  163SU
MP       ()R    1LEQ   17RL   (801
MU       -R     1 CO   17RL   129RO  146PR  (47WR  179    179
NAME     ()1    8CO    63RO   66     90RO   102RD  125RD  134PR  135WR
NBP      -1     12CO   196=   204PR  205WR
NBUF     -(     12CO   192=   204PR  205WR
NCYC     -1     8CO    175=
NDALL    -1     86=    9 RO   (02RO
NE       -1     46AG   221AG
NECS     -1     44=    45=    45     46AG   93=    94RD   95=    96RO
NFRQ     -1     2CO    49RO   51DC   57DO   58     58
NOPU     -1     2CO    49RO   54DO   63     150
NOPT     -1     2CO    49RD   55DO   58     63     78     150
NPCMAX   -1     (2CO   194=   2 4PR  205WR
NPPT     -1     229=   229=   229    230    231
NPI      -1     1 CO   95     198=   219    219    231
NQ       -1     8CO    164=   162    164    169    173    204PR  205WR  216    237    238    251    252
NQ1      -1     8CO    93     164=   165    165    166    167    168    170    173    204PR  2 5WR
NQ18     -1     1 CO   162=
NQ12     -1     ( CO   165=
NSP      -1     12CO   195=   2 4PR  205WR
NSTATE   -1     63=    72DO
NUMI1    -1     1 CO   169=
OM       -R     1 CO   13 RO  146PR  147WR
OMANC    -R     1 CO   176=
OMCYL    -R     10CO   163=
OPDEN    ()R    2CO    56RO   61=    61     150
OPEN     -      87SU   86SU   89SU   105SU  106SU  107SU  109SU  122SU
OPSIG    ()R    2001   50RO   59
OPTMP    ()R    2CO    56RO   150
P        ()R    16EQ   1801
PL       ()R    16EQ   1801
PRINT    -      38F    134F   136F   138F   140F   142F   144F   146F   204F   206F
PTAB     ()R    2CO    65RO   67RO   76=    76
QLDG10   -      14ESU  149SU
R        ()R    16EQ   1801
RCSQ     ()R    16EQ   1801
READ     -      49F    5 F    56F    64F    65F    66F    67F    68F    69F    83SU   90F    91F    94F    96F    97F    102SU  111F
                114F   115F   125F   126F   127F   128F   129F   130F   131F
RETURN   -      10EF   123F   263F
REWIND   -      85F    99F
REZRON   -R     1 CO   130RO  146PR  147WR  148
REZSIE   -R     8CO    131RO  146PR  147WR  149
REZYO    -R     1 CO   127RO  142PR  143WR  153
RM       ()R    16EQ   1601   258=
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RMP      ((R    16EQ    180I
RO       ()R    16EQ    180I   239
ROL      ()R    16EQ    180I
ROMFR    -R     15CO    186=
RVOL     ()R    16EQ    180I   239
RZEDEN   ()R    16EQ    180I
SIE      ()R    16EQ    180I   240
SIGA     ()R     7LC     59=
SIGPLC   ()R    16EQ    180I
SNCON    ()R    13CO    199=   2.1=    202=
SPTBL    ()R     2CO     64RO   66RO    74=     74      75=     75      75
SSWTCH   -      4 SU    41SU    42SU
START    -     21 SU   234SU
T        -R      8CO    113    159=
TAMB     -R      8CO    151=   2 6PR   207WR
TEMIT    -R     12CO    193=   2.6PR   207WR
THIRD    -R     1 CO    161=
THY      -R      8CO    187=
TIME     -R      8CO    126RO  133     138PR   139WR   159     203
TOUT     -R      8CO    213=
TSTART   -R      8CO    133=   136PR   137WR
T2       -R    11 RO    113
 U       ()R    16EQ    180I   240     240     240     240
 UG      ()R    16EQ    180I
 UL      ()R    16EQ    180I
 UMOMLC  ()R    16EQ    180I
 UP      ()R    16EQ    180I
 UTIL    ()R    16EQ    180I
 V       ()R    16EQ    180I   240     240     240     240
 V3      ()R    16EQ    180I
 VL      ()R    16EQ    180I
 VP      ()R    16EQ    180I
 VTEM    -R     1 CO    168=
 VTIL    ()R    16EQ    180I
 WRITE   -      39F     135F   137F    139F    141F    143F    145F    147F    205F    207F
 X       ()R    16EQ    180I   215
 XI      -R    129RO    132
 XF      -R    14F=     15 .
 XPAR    ()R    16EQ    180I   227
 XTAB    ()R    190I    215=   227
 XX      -R    253=     254=   255=    255     256=    256     257=    257     258
 Y       ()R    16EQ    180I   212
 YBASE   -R     15CO    127RO  142PR   143WR   153=    153
 YP      -R    15 =     151
 YPAR    ()R    16EQ    180I   224
 YTAB    ()R    190I    212=   224
 ZP      -R    149=     15 .
 ZZ      -R     13CO    86
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 1          SUBROUTINE MESHMKR                                              MESHMKR    2
 2          COMMON /STATE/    NOP1, NOPO, NFRQ, OPTMP(30), OPDEN(10),       ALLKOM     2
           1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),  ALLKOM     3
           2                  BTBL(300)                                     ALLKCM     4
 3          COMMON /YSC1/     AASC(5454)                                    ALLKOM     5
 4          COMMON /PINK/     I, IJ, IJM, IJP, J                            ALLKOM     6
 5          LCM /YLC1/        AA1(131409)                                   ALLKCM     7
 6          LCM /YLC2/        AA2(131406)                                   ALLKCM     8
 7          LCM /RLC1/        SIGA(360000)                                  ALLKOM     9
 8          COMMON /RED/      NAME(12), DT, DTR, EMIO, GRIIVEL, IBAR, IJPS, ALLKOM    10
           1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,     ALLKOM    11
           2                  JP1, JP2, NCYC, NDUMP, NQ, NQ1, REZSIE, TAMB, ALLKOM    12
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     3                   TEMP(7500), T, TIME, TOUT, ISTART, THY             ALLKOM    13
      COMMON /SILVER/    FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,             SILVER     2
     1                   IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,             SILVER     3
     2                   IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,           SILVER     4
     3                   RIBAR, VV, XCCNV, XL, XR, YB, YCONV, YT            SILVER     5
      COMMON /ORANGE/    ANC, ASG, A:, AOFAC, AOM, BO, COLAML, CYL,         ORANGE     2
     1                   DIPUS, EPS, GM1, GR, GZ, IM1,                      ORANGE     3
     2                   IECF, IP2, ITAB(1000), JNM, JP4, KXI, LAM,         ORANGE     4
     3                   LJP2, MU, NPI, NQ1H, NQI2, NUM(T, OM,              ORANGE     5
     4                   OMANC, OMCYL, REZRON, REZYO, TOIRO, VTEM           ORANGE     6
      COMMON /WHITE/     NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT       ORANGE     7
      COMMON /BLUE/      OR, OZ, FREZ, (INF, JMIO,                          BLUE       2
     1                   JUNFOZ, NADX(7500), ROMFR, YBASE                   BLUE       3
      COMMON /SENSE/     JSWTCH1, JSWTCH2, JSWTCH3                          SENSE      2
      EQUIVALENCE        (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),   EQVREAL    2
     1                   (AASC(4),U), (AASC(5),V), (AASC(6),RO),            EQVREAL    3
     2                   (AASC(7),MP,RMP,RCSQ,CENTX),                       EQVREAL    4
     3                   (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),            EQVREAL    5
     4                   (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),         EQVREAL    6
     5                   (AASC(12),UTIL,UL,CU,EMOMLC),                      EQVREAL    7
     6                   (AASC(13),VTIL,VL,UMOMLC),                         EQVREAL    8
     7                   (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),      EQVREAL    9
     8                   (AASC(16),DELSM,SIGPLC),                           EQVREAL   10
     9                   (AASC(17),GRIR,UG,RZQUEN),                         EQVREAL   11
     1                   (AASC(18),GRIZ,VG,FSN)                             EQVREAL   12
      REAL               LAM, LAMO, MM, MP, MU, MOU2                        EQVREAL   13
      DIMENSION          X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),          DIMEN      2
     2                   V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),     DIMEN      3
     3                   E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),     DIMEN      4
     4                   VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),         DIMEN      5
     5                   UL(1), CU(1), EMOMLC(1), VTIL(1), VL(1),           DIMEN      6
     6                   UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),           DIMEN      7
     7                   SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),       DIMEN      8
     8                   RZQUEN(1), GRIZ(1), VG(1), FSN(1)                  DIMEN      9
 1000 FORMAT             (1216)                                             MESHMKR   10
 1001 FORMAT             (416,4E12.4)                                       MESHMKR   11
 1009 FORMAT             (1H1,*BACKGROUND MESH VARIABLES*)                  MESHMKR   12
 1010 FORMAT             (1H0,5HRB    ,I12,6X,6H NR    ,I12,6X,6H NT    ,   MESHMKR   13
     1                   I12,6X,6H NL    ,I12/6H RO    ,1PE12.4,6X,         MESHMKR   14
     2                   6H SIE    ,1PE12.4,6X,6H U    ,1PE12.4,            MESHMKR   15
     3                   6X,6H V    ,1PE12.4,6X,6H TEMP ,1PE12.4)           MESHMKR   16
 1018 FORMAT             (1H0,*BUBBLE VARIABLES*/ 6H IBUB ,I12,6X,          MESHMKR   17
     1                   6H JBUB ,I12//6H    II,6H    JJ,12X,               MESHMKR   18
     2                   12H        RCI,12H        SIEI,                    MESHMKR   19
     3                   12H         UI,12H          VI,                    MESHMKR   20
     4                   12H       TEMPI/)                                  MESHMKR   21
 1019 FORMAT             (216,12X,1P5E12.4)                                 MESHMKR   22
 1020 FORMAT             (2I5,4E15.5)                                       MESHMKR   23
 1051 FORMAT             (I12,1P3E12.4)                                     MESHMKR   30
 1050 FORMAT             (1H0,*EXPONENTIAL ATMOSPHERE CALCULATION*/         MESHMKR   31
     1                   12H          J,12H          RO,                    MESHMKR   32
     2                   12H         SIE,12H        TEMP/)                  MESHMKR   33
C                                                                           MESHMKR   34
      DIMENSION          PURHO(100), PUROV(100), PUROM(4,100),              MESHMKR   35
     1                   PURUE(4,100), MATL(4), MAT(100)                    MESHMKR   36
C     ---   INITIALIZE                                                      MESHMKR   37
      PRINT 1009                                                            MESHMKR   38
C     ---   COMPUTE UNIFORM COORDINATES                                     MESHMKR   39
      XX=0.0                                                                MESHMKR   40
      YY=-FLOAT(JM(0))*OZ                                                   MESHMKR   41
      CALL START                                                            MESHMKR   42
      DO 229 J=2,JP2                                                        MESHMKR   43
      DO 219 I=1,IP1                                                        MESHMKR   44
      X(IJ) = XX                                                            MESHMKR   45
      Y(IJ) = YY                                                            MESHMKR   46
      R(IJ) = XX*CYL+OMCYL                                                  MESHMKR   47
      IF(J.NE.2) GO TO 2?2                                                  MESHMKR   48
      Y(IJ)=YBASE                                                           MESHMKR   49
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          Y(IJM)=YY-DZ                                                  MESHMKR  50
          X(IJM)=XX                                                     MESHMKR  51
          R(IJM)=R(IJ)                                                  MESHMKR  52
  202     IF (J.NE.JP2) GO TO 204                                       MESHMKR  53
          Y(IJP)=YY+DZ                                                  MESHMKR  54
          X(IJP)=XX                                                     MESHMKR  55
          R(IJP)=R(IJ)                                                  MESHMKR  56
  204     IJP=IJP+NQ                                                    MESHMKR  57
          IJM=IJM+NQ                                                    MESHMKR  58
          XX = XX + DR                                                  MESHMKR  59
          IJ=IJ+NQ                                                      MESHMKR  60
  219     CONTINUE                                                      MESHMKR  61
          XX = 0.                                                       MESHMKR  62
          YY = YY + DZ                                                  MESHMKR  63
          CALL LOOP                                                     MESHMKR  64
  229     CONTINUE                                                      MESHMKR  65
          CALL DONE                                                     MESHMKR  66
C      ---    COMPUTE VARIABLE COORDINATES                              MESHMKR  67
          IF (FREZ.EQ.1.0) GO TO 300                                    MESHMKR  68
          JMID=JMID+2                                                   MESHMKR  69
          JTOP=JMID+JUNFO2                                              MESHMKR  70
          JBOT=JMID-JUNFO2                                              MESHMKR  71
          TJ   = FLOAT(JUNFC2) * DZ                                     MESHMKR  72
          CALL START                                                    MESHMKR  73
          DO 249 J=2,JP2                                                MESHMKR  74
          DO 239 I=1,IP1                                                MESHMKR  75
          IMJ = IJ - NQ                                                 MESHMKR  76
          IF (I.GT.IUNF+1) X(IJ) = X(IMJ) + FREZ*(X(IMJ)-X(IMJ-NQ))     MESHMKR  77
          R(IJ) = X(IJ)*CYL + UNCYL                                     MESHMKR  78
          JDT = IABS(J-JTOP)                                            MESHMKR  79
          JDB = IABS(J-JBOT)                                            MESHMKR  80
          IF (J.LT.JBOT) Y(IJ)=-TJ-DZ*FREZ*(1.0-FREZ**JDB)*ROMFR        MESHMKR  81
          IF (J.GT.JTOP) Y(IJ)= TJ+DZ*FREZ*(1.0-FREZ**JDT)*ROMFR        MESHMKR  82
          IF (J.EQ.2) Y(IJ)=YBASE                                       MESHMKR  83
          IJ=IJ+NQ                                                      MESHMKR  84
  239     CONTINUE                                                      MESHMKR  85
          CALL LOOP                                                     MESHMKR  86
  249     CONTINUE                                                      MESHMKR  87
          CALL DONE                                                     MESHMKR  88
C      ---    UNIFORM MESH VARIABLES                                    MESHMKR  89
  300     READ  1001,        NB, NR, NT, NL, UI, VI, ROI, SIEI          MESHMKR  90
          IF (NR.EQ. ) GO TO 400                                        MESHMKR  91
          IF (NR.EQ.1000) GO TO 500                                     MESHMKR  92
          XP=ALOG10(ROI)                                                MESHMKR  93
          XP=AMAX1(XP,ORDEN(1))                                         MESHMKR  94
          XP=AMIN1(XP,ORDEN(NOPO))                                      MESHMKR  95
          ZP=ALOG10(SIEI)                                               MESHMKR  96
          YP=GETEMP (XP, ZP, ORDEN, OPTMP, ETAB, NOPO, NOPT)            MESHMKR  97
          IF (YP.GT.OPTMP(NOPT)) YP=OPTMP(NOPT)                         MESHMKR  98
          TEMPI=GEXP10(YP)                                              MESHMKR  99
          PRINT 1013,        NB, NR, NT, NL, ROI, SIEI, UI, VI, TEMPI   MESHMKR 100
          WRITE (12,1010)    NB, NR, NT, NL, ROI, SIEI, UI, VI, TEMPI   MESHMKR 101
          RROI=137.214E-07*TEMPI**4/ROI                                 MESHMKR 102
          NB2 = NB + 2                                                  MESHMKR 103
          NR1 = NR + 1                                                  MESHMKR 104
          NT2 = NT + 2                                                  MESHMKR 105
          NL1 = NL + 1                                                  MESHMKR 106
          DO 329 J=NB2,NT2                                              MESHMKR 107
          CALL NIRO                                                     MESHMKR 108
          IJSC=(J-1)*IP1+NL                                             MESHMKR 109
          DO 319 I=NL1,NR1                                              MESHMKR 110
          CALL SETIJ                                                    MESHMKR 111
          IJSC=IJSC+1                                                   MESHMKR 112
          U(IJ)=UI                                                      MESHMKR 113
          V(IJ)=VI                                                      MESHMKR 114
          RO(IJ) = ROI                                                  MESHMKR 115
          SIE(IJ)=E(IJ)=SIEI+RROI                                       MESHMKR 116
          TEMP(IJSC)=TEMPI                                              MESHMKR 117
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  319 CONTINUE                                                          MESHMKR  118
      CALL W1ROW                                                        MESHMKR  119
  329 CONTINUE                                                          MESHMKR  120
      IF (NG2.NE.2) GO TO 300                                           MESHMKR  121
      J=1                                                               MESHMKR  122
      CALL R1ROW                                                        MESHMKR  123
      DO 359 I=1,IP1                                                    MESHMKR  124
      CALL SETIJ                                                        MESHMKR  125
      RO(IJ)=RO1                                                        MESHMKR  126
      SIE(IJ)=E(IJ)=SIE1*RHO1                                           MESHMKR  127
  359 CONTINUE                                                          MESHMKR  128
      CALL W1ROW                                                        MESHMKR  129
      GO TO 300                                                         MESHMKR  130
C     ---    EXPONENTIAL ATMOSPHERE                                     MESHMKR  131
  420 XX=GM1*REZSIE                                                     MESHMKR  132
      YY = .5*ABS(GZ)                                                   MESHMKR  133
      PRINT 1054                                                        MESHMKR  134
      WRITE (12,1054)                                                   MESHMKR  135
      CALL START                                                        MESHMKR  136
      YJC2=0.5*(Y(IJP)+Y(IJ))+REZY0                                     MESHMKR  137
      ROSAV = REZRON*EXP(-GZ*(REZY0-YJC2)/XX)                           MESHMKR  138
      FNUM  = (Y(IJP)-Y(IJ))*YY                                         MESHMKR  139
      FDEN  = FNUM*FREZ                                                 MESHMKR  140
      ROJ1  = ROSAV*(XX+FNUM)/(XX-FDEN)                                 MESHMKR  141
      DO 459 I=1,IP1                                                    MESHMKR  142
      RO(IJ) = ROSAV                                                    MESHMKR  143
      RO(IJM) = ROJ1                                                    MESHMKR  144
      SIE(IJ)=SIE(IJM)=REZSIE                                           MESHMKR  145
      U(IJ)=U(IJM)=V(IJ)=V(IJM)=0.0                                     MESHMKR  146
      IJ = IJ + NQ                                                      MESHMKR  147
      IJM=IJM+NQ                                                        MESHMKR  148
  459 CONTINUE                                                          MESHMKR  149
      CALL LOOP                                                         MESHMKR  150
      DO 479 J=3,JP1                                                    MESHMKR  151
      FDEN = (Y(IJP)-Y(IJ))*YY                                          MESHMKR  152
      FNUM = (Y(IJ)-Y(IJM))*YY                                          MESHMKR  153
      ROSAV = ROSAV*(XX-FNUM)/(XX+FDEN)                                 MESHMKR  154
      DO 469 I=1,IP1                                                    MESHMKR  155
      RO(IJ) = ROSAV                                                    MESHMKR  156
      SIE(IJ)=REZSIE                                                    MESHMKR  157
      U(IJ)=V(IJ)=0.0                                                   MESHMKR  158
      IJ=IJ+NQ                                                          MESHMKR  159
  469 CONTINUE                                                          MESHMKR  160
      CALL LOOP                                                         MESHMKR  161
  479 CONTINUE                                                          MESHMKR  162
      FNUM = FNUM*FREZ                                                  MESHMKR  163
      FDEN = FDEN*FREZ                                                  MESHMKR  164
      ROJP2 = ROSAV*(XX-FNUM)/(XX+FDEN)                                 MESHMKR  165
      DO 489 I=1,IP1                                                    MESHMKR  166
      RO(IJ) = ROJP2                                                    MESHMKR  167
      SIE(IJ)=REZSIE                                                    MESHMKR  168
      U(IJ)=V(IJ)=0.0                                                   MESHMKR  169
      IJ=IJ+NQ                                                          MESHMKR  170
  489 CONTINUE                                                          MESHMKR  171
      CALL DONE                                                         MESHMKR  172
      CALL START                                                        MESHMKR  173
      DO 499 J=2,JP2                                                    MESHMKR  174
      IJSC=(J-1)*IP1+1                                                  MESHMKR  175
      XP=ALOG10(RO(IJ))                                                 MESHMKR  176
      XP=AMAX1(XP,OPDEN(1))                                             MESHMKR  177
      XP=AMIN1(XP,OPDEN(NOPD))                                          MESHMKR  178
      ZP=ALOG10(SIE(IJ))                                                MESHMKR  179
      YP=GLTEMP (XP, ZP, OPDEN, OPTMP, ETAB, NOPD, NOPT)                MESHMKR  180
      IF (YP.GT.OPTMP(NOPT)) YP=OPTMP(NOPT)                             MESHMKR  181
      TEMP(IJSC)=EXP10(YP)                                              MESHMKR  182
      PRINT 1051,      J, RO(IJ), SIE(IJ), TEMP(IJSC)                   MESHMKR  183
      WRITE (12,1051)  J, RO(IJ), SIE(IJ), TEMP(IJSC)                   MESHMKR  184
      DO 498 I=1,IP1                                                    MESHMKR  185
```

```
      IJSC=IJSC+1
      TEMP(IJSC)=TEMP(IJSC-1)
      RROI=137.214E-07*TEMP(IJSC)**4/RO(IJ)
      SIE(IJ)=SIE(IJ)+RROI
      IJ=IJ+NQ
  498 CONTINUE
      CALL LOOP
  499 CONTINUE
      CALL DONE
C     ---   BUBBLE INPUT
  500 IF (JSWICH1.EQ.2) GO TO 520
      READ  1000,        IBUB, JBUB
      IF (IBUB.EQ.0) GO TO 505
      PRINT 1018,        IBUB, JBUB
      WRITE (12,1018)    IBUB, JBUB
  501 READ  1020,        II, JJ, ROI, SIEI, VI, UI
      IF (II.EQ.0) GO TO 500
      I=II+IBUB-1
      J=JJ+JBUB-1
      CALL RIROW
      CALL SETIJ
      RO(IJ)=ROI
      XP=ALOG10(ROI)
      XP=AMIN1(XP,OPDEN(NOPO))
      XP=AMAX1(XP,OPDEN(1))
      ZP=ALOG10(SIEI)
      YP=GLTEMP(XP, ZP, OPDEN, OPTMP, ETAB, NOPO, NOPT)
      IF (YP.GT.OPTMP(NOPT)) YP=OPTMP(NOPT)
      TEMPI=EXP10(YP)
      PRINT 1019,        II, JJ, ROI, SIEI, UI, VI, TEMPI
      WRITE (12,1019)    II, JJ, ROI, SIEI, UI, VI, TEMPI
      IJSC=(J-1)*IP+I
      TEMP(IJSC)=TEMPI
      RROI=137.214E-07*TEMPI**4/ROI
      SIE(IJ)=SIEI+RROI
      U(IJ)=UI
      V(IJ)=VI
      CALL WIROW
      IF (IBUB.EQ.1) GO TO 502
      I=IBUB-II
      IF (I.LE.0) GO TO 502
      IJSC=(J-1)*IP+I
      CALL RIROW
      CALL SETIJ
      RO(IJ)=ROI
      SIE(IJ)=SIEI+RROI
      TEMP(IJSC)=TEMPI
      CALL WIROW
      I=I+1
      CALL RIROW
      CALL SETIJ
      U(IJ)=-UI
      V(IJ)=VI
      CALL WIROW
      I=II+IBUB-1
  502 J=J-2*JJ+1
      CALL RIROW
      CALL SETIJ
      RO(IJ)=ROI
      SIE(IJ)=SIEI+RROI
      IJSC=(J-1)*IP+I
      TEMP(IJSC)=TEMPI
      CALL WIROW
      J=J+1
      CALL RIROW
      CALL SETIJ
      U(IJ)=UI
      V(IJ)=-VI
```

```
          CALL WIROW                                                        MESHMKR  254
          IF (IBOB.EQ.0) GO TO 503                                          MESHMKR  255
          J=J-1                                                             MESHMKR  256
          I=IBOB-11                                                         MESHMKR  257
          IF (I.LE.0) GO TO 503                                             MESHMKR  258
          IJSC=(J-1)*IP1+1                                                  MESHMKR  259
          CALL RIROW                                                        MESHMKR  260
          CALL SETIJ                                                        MESHMKR  261
          RO(IJ)=RO1                                                        MESHMKR  262
          SIE(IJ)=SIEI*RHO1                                                 MESHMKR  263
          TEMP(IJSC)=TEMP1                                                  MESHMKR  264
          CALL WIROW                                                        MESHMKR  265
          I=I+1                                                             MESHMKR  266
          J=J+1                                                             MESHMKR  267
          CALL RIROW                                                        MESHMKR  268
          CALL SETIJ                                                        MESHMKR  269
          U(IJ)=-UI                                                         MESHMKR  270
          V(IJ)=-VI                                                         MESHMKR  271
          CALL WIROW                                                        MESHMKR  272
      503 GO TO 50(                                                         MESHMKR  273
C         ---   GENERATE MARKER PARTICLES                                   MESHMKR  274
      505 CALL PARIGEN                                                      MESHMKR  275
C         ---   CALCULATE RVOL                                              MESHMKR  276
      520 CALL START                                                        MESHMKR  277
          DO 549 J=2,JP1                                                    MESHMKR  278
          IJSC=(J-1)*IP1                                                    MESHMKR  279
          DO 539 I=1,IBAR                                                   MESHMKR  280
          IPJ = IJ+NQ                                                       MESHMKR  281
          IPJP = IJP+NQ                                                     MESHMKR  282
          IJSC=IJSC+1                                                       MESHMKR  283
          X1=X(IPJ)                                                         MESHMKR  284
          X2=X(IPJP)                                                        MESHMKR  285
          X3=X(IJP)                                                         MESHMKR  286
          X4=X(IJ)                                                          MESHMKR  287
          Y1=Y(IPJ)                                                         MESHMKR  288
          Y2=Y(IPJP)                                                        MESHMKR  289
          Y3=Y(IJP)                                                         MESHMKR  290
          Y4=Y(IJ)                                                          MESHMKR  291
          R1=R(IPJ)                                                         MESHMKR  292
          R2=R(IPJP)                                                        MESHMKR  293
          R3=R(IJP)                                                         MESHMKR  294
          R4=R(IJ)                                                          MESHMKR  295
          RVOL(IJ)=8.0/((R1+R2+R3+R4)*((X1-X3)*(Y2-Y4)-(Y1-Y3)*(X2-X4)))    MESHMKR  296
          IF (JSWTCH3.EQ.1) GO TO 538                                       MESHMKR  297
          XR=X1+X2+X3+X4                                                    MESHMKR  298
          YR=Y1+Y2+Y3+Y4                                                    MESHMKR  299
          RADX(IJSC)=0.25*QSQRT(XR**2+YR**2)                                MESHMKR  300
      538 IJ=IPJ                                                            MESHMKR  301
          IJP=IPJP                                                          MESHMKR  302
      539 CONTINUE                                                          MESHMKR  303
          CALL LOOP                                                         MESHMKR  304
      549 CONTINUE                                                          MESHMKR  305
          CALL DONE                                                         MESHMKR  306
          IF (JSWTCH1.EQ.1) RETURN                                          MESHMKR  307
C                                                                           MESHMKR  457
          RETURN                                                            MESHMKR  458
          END                                                               MESHMKR  459
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	EPS	-R	10CO	IPYB	-I	9CO	JSWTCH3	-I	13CO	NRVALS	-I	11CO	PYT	-R	9CO	TNEUT	-R	11CO
AA2	()R	6LC	EQUIVAL	-	14F	IPYT	-I	9CO	KXI	-I	10CO	NUMIT	-I	10CO	QSQRT	-	282SU	TOUT	-R	8CO
ABS	-	118SU	EXP	-	123SU	IP2	-I	10CO	LAMO	-R	15RL	CM	-R	10CU	REAL	-	15F	TSTART	-R	8CO
ANC	-R	16CO	FIPXL	-R	9CO	ISCF1	-I	8CO	LJP2	-I	10CO	CMANC	-R	10CO	RED	-	8CN	VTEM	-R	10CO
ANGLES	()R	11CO	FIPXR	-R	9CO	ISCF2	-I	8CO	MAT	()I	2601	CRANGE	-	10CN	RIBAR	-R	9CO	VV	-R	9CO
ASQ	-R	10CO	FIPYB	-R	9CC	ISC2	-I	8CO	MATL	()I	2601	PARIGEN	-	258SU	RLC1	-	7CN	WHITE	-	11CN
AV	-R	10CO	FIXL	-R	9CO	ISC3	-I	8CO	MESHMKR	-	(SU	FINK	-	4CN	RVALS	()R	11CU	XCONV	-R	9CO

```
AUFAC   -R  11CU   FIXR    -R   9CC   IIAB     ()I  10CO  MU02    -R  15RL   PTAB    ()R  2CO   SENSE   -    13CN  XL     -R  9CU
AUM     -R  11CU   FIYB    -R   9CC   ITV      -I    8CO  NAME    ()I  8CO   PURUE   ()R  26D1  SIGA    ()R  7LL   YB     -R  9CU
BLUE    -   12CH   F)EG    ()R  2CO   IXL      -I    9CO  NANGLS  -I   11CO  PURUM   ()R  26D1  S(LVER  -    9CN   YCONV  -R  9CU
BTBL    ()R  2CO   GR      -R   1.CO  IXR      -I    9CO  NCYC    -I   8CO   PURU((  ()R  26D1  SPTBL   ()R  2CO   YLC1   -   5CN
B0      -R  1(CU   GRUVEL  -R   8CO   IYB      -I    9CO  NUUMP   -I   8CO   PURUV   ()R  26D1  STATE   -    2CN   YLC2   -   6CN
CULAMU  -R  1eCU   ICCF    -I   1:CO  IYT      -I    9CO  NFRO    -I   2CO   PXCONV  -R   9CO   T       -R   8CO   YSC1   -   3CN
OT      -R   8CU   IJPS    -(   8CO   JBAR     -I    8CO  NP1     -I   1CCO  PXL     -R   9CU   TAMB    -R   8CO   YT     -R  9CU
OTPOS   -R  1.CO   IM      -I   11CO  JNP      -I   1(CD  NQ1     -I   8CO   PXR     -R   9CO   THIRU   -R   10CO
OTR     -R   8CU   IPXL    -I   9CO   JP4      -I   10CO  NQ1B    -I   10CO  FYP     -R   9CO   THY     -R   8CC
EMIO    -R   6CU   IPXP    -I   9CO   JS*TCH2  -I   13CO  NQ12    -I   1.CO  FYCONV  -R   9CU   TIME    -R   8CU
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
  202 -     36      41*
  204 -     41      45*
  219 -     32DU    49*
  229 -     31DU    53*
  239 -     62UU    72*
  249 -     61UU    74*
  300 -     55      76*     1.7     116
  319 -     96UU    1(4*
  329 -     93UU    116*
  359 -    11(UU    114*
  400 -     77      117*
  459 -    127DU    134*
  469 -    14(UU    145*
  479 -    13(UU    147*
  489 -    151UU    156*
  498 -    17 UU    176*
  499 -    159DU    178*
  500 -     78      18 *    166
  501 -    185*     257
  502 -    2J6      21.     225*
  503 -    239      242     257*
  505 -    182      258*
  520 -    181      259*
  538 -    279      263*
  539 -    262UU    285*
  549 -    26(UU    287*
 1000 -     17*     181RU
 1001 -     18*     76RU
 1009 -     19*     27PR
 101( -     2(*     86PR    87WR
 1018 -     21*     163PR   164WR
 1019 -     22*     199PR   2(0WR
 1020 -     23*     165RU
 1050 -     25*     1(9PR   12(WR
 1051 -     24*     166PR   169WR

AASC    ()R    3CU    14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
               14EQ   14EQ
AMAX1   -      8.SU   162SU  194SU
AMIN1   -      81SU   163SU  193SU
BETALC  ()R    14EQ   1601
CENTX   ()R    14EQ   1601
CENTY   ()R    (4EQ   1601
COMMON  -      (F     3F     4F     8F     9F     (0F    11F    12F    13F
CQ      ()R    (4EQ   1601
CYL     -R     1:CO   35     65
DELSM   ()R    (4EQ   1601
DIMENSI -      1(F    26F
DONE    -      54SU   75SU   157SU  179SU  288SU
DR      -R     (2CO   47
DZ      -R     12CD   29     38     42     51     59     68     69
E       ()R    14EQ   1601   1(2=   1(3=   174=
EMOPLC  ()R    (4EQ   1601
EP      ()R    14EQ   (601
ETAB    ()R    2CU    83     165    196
ETIL    ()R    (4EQ   (601
```

```
FOEN    -R   125=    126     137=    139     149=    149     150
FLOAT   -     29SU    59SU
FNUM    -R   124=    125     126     138=    139     148=    148     150
FORMAT  -     17F     16F     19F     20F     21F     22F     23F     24F     25F
FOOTLC  ()R   14EQ    16U1
FREZ    -R    12CO    55      64      68      68      69      69      125     148     149
FSN     ()R   14EQ    16U1
GETEMP  -     83SU    165SU   196SU
GMI     -R    11CO    117
GRIR    ()R   14EQ    16U1
GRIZ    ()R   14EQ    16U1
GZ      -R    11CO    118     123
I       -I    4CO     3200    6200    64      9600    11000   12700   14000   15100   17000   187=    201     209=    210     211     218=    218
              224=    231     241=    242     243     250=    250     26200
IABS    -     66SU    67SU
IBAR    -I    8CO     26200
IBUB    -I    181RU   182     183PR   184WR   187     208     209     224     239     241
II      -I    185RU   186     187     199PR   200WR   219     224     241
IJ      -I    4CO     33      34      35      37      41      44      48=     48      63      64      65      65      68      69      70      71=
              71      99      100     101     102     112     112     113     113     122     124     128     130     131     131     132=    132
              137     138     141     142     143     143     144=    144     152     153     154     154     155=    155     161     164     168PR
              166PR   169RR   169WR   173     174     174     174     175=    175     191     204     205     206     214     215     221     222
              228     229     236     237     246     247     254     255     263     269     273     277     278     283=
IJM     -I    4CO     38      39      40      46=     46      129     130     131     131     133=    133     138
IJP     -I    4CO     42      43      44      45=     45      122     124     137     264     268     272     276     284=
IJSC    -I    95=     98=     98      163     160=    167     168PR   169WR   171=    171     172     172     173     201=    202     211=    216
              23 =    231     243=    248     261=    265=    265     282
IMJ     -I    63=     64      64      64
IPJ     -I    263=    266     273     274     283
IPJP    -I    264=    267     271     275     284
IPI     -I    6CO     3200    6200    95      11000   12700   14000   15100   160     17000   201     211     230     243     261
IUNF    -I    12CO    64
J       -I    4CO     3100    36      41      6100    66      67      68      69      70      93DC    95      108=    13600   15900   160     168PR
              169WR   166=    201     211     225=    225     230     233=    233     240=    240     243     251=    251     26000   261
JBOT    -I    58=     67      68
JBUB    -I    181RU   183PR   184WR   188
JOB     -I    67=     68
JDT     -I    66=     69
JJ      -I    185RU   186     199PR   200WR   225
JMID    -I    12CO    29      56=     56      57      58
JP1     -I    8CO     13600   26000
JP2     -I    8CO     3100    41      6100    15900
JSWTCH1 -I    13CO    188     279     289
JTOP    -I    57=     60      69
JUNF02  -I    14CO    57      58      59
LAM     -I    11CO    15RL
LCM     -     5F      6F      7F
LOOP    -     52SU    73SU    135SU   146SU   177SU   266SU
M       ()R   14EU    15RL    16U1
MP      ()R   14EQ    15RL    16U1
MU      -R    1 CO    15RL
NB      -I    76RU    86PR    87WR    89
NB2     -I    89=     9300    97
NL      -I    76RU    86PR    87WR    92      95
NLI     -I    92=     9600
NOPU    -I    2CO     81      83      163     165     193     196
NOPT    -I    2CO     83      84      84      165     166     166     196     197     197
NQ      -I    6CO     45      46      48      63      64      71      132     133     144     155     175     263     264
NR      -I    76RU    77      78      86PR    87WR    90
NRI     -I    9 =     9600
NT      -I    76RU    86PR    87WR    91
NT2     -I    91=     9300
ONCYL   -R    1 CO    35      65
OPOEN   ()R   2CO     6.      81      83      162     163     165     193     194     196
OPTMP   ()R   2CO     83      84      84      165     166     166     196     197     197
P       ()R   14EQ    16U1
PL      ()R   14EQ    16U1
PRINT   -     27F     66F     119F    168F    183F    199F
```

```
GEXP10   -    85SU   167SU  198SU
GLOG10   -    79SU   62SU   161SU  164SU  192SU  195SU
R        ()R  14EQ   16U1   35=    40=    40     44=    44     65=    274    275    276    277
RADX     ()R  12CD   282=
RCSQ     ()R  14EQ   16U1
READ     -    76F    (E)F   165F
RETURN   -    289F   29.F
REZRUN   -R   11CO   123
REZSIE   -R   6CO    117    130    142    153
REZYU    -R   15CU   122    123
RM       ()R  14EQ   16U1
RMP      ()R  14EQ   16U1
RO       ()R  14EQ   16U1   11=    112=   128=   129=   141=   152=   161    168PR  169WR  173    191=   214=   228=   246=
ROI      -R   76RO   79     86PR   87WR   88     101    112    185RO  191    192    199PR  200WR  203    214    228    246
ROJP2    -R   15.=   152
ROJI     -R   126=   129
ROL      ()R  14EQ   16U1
ROMFR    -R   12CO   68     69
ROSAV    -R   123=   126    128    139=   139    141    150
RROI     -R   88=    102    113    173=   174    203=   204    215    229    247
RVOL     ()R  14EQ   16U1   278=
RZEDEN   ()R  14EQ   16U1
R1       -R   274=   276
RIROW    -    94SU   119SU  189SU  212SU  219SU  226SU  234SU  244SU  252SU
R2       -R   275=   278
R3       -R   276=   278
R4       -R   277=   278
SETIJ    -    97SU   111SU  190SU  213SU  220SU  227SU  235SU  245SU  253SU
SIE      ()R  14EQ   16U1   112=   113=   130=   130=   142=   153=   164    168PR  169WR  174=   174    204=   215=   229=   247=
SIEI     -R   76RO   82     86PR   87WR   102    113    185RO  195    199PR  200WR  204    215    229    247
SIGPLC   ()R  14EQ   16U1
START    -    3'SU   61SU   121SU  158SU  259SU
TEMP     ()R  2CO    163=   167=   168PR  169WR  172=   172    173    202=   216=   231=   248=
TEMPI    -R   82=    86PR   87WR   88     103    198=   199PR  200WR  202    203    216    231    248
TJ       -R   59=    68     69
U        ()R  14EQ   16U1   99=    131=   131=   143=   154=   205=   221=   236=   254=
UG       ()R  14EQ   16U1
UI       -R   76RO   86PR   117WR  99     185RO  199PR  200WR  205    221    236    254
UL       ()R  14EQ   16U1
UMOMCC   ()R  14EQ   16U1
UP       ()R  14EQ   16U1
UTIL     ()R  14EQ   16U1
V        ()R  14EQ   16U1   110=   131=   131=   143=   154=   206=   222=   237=   255=
VG       ()R  14EQ   16U1
VI       -R   76RO   86PR   87WR   110    185RO  199PR  200WR  206    222    237    255
VL       ()R  14EQ   16U1
VP       ()R  14EQ   16U1
VTIL     ()R  14EQ   16U1
WRITE    -    67F    12 F   169F   184F   200F
WIROW    -    115SU  115SU  2.7SL  217SU  223SU  232SU  238SU  249SU  256SU
X        ()R  14EQ   16U1   33=    39=    43=    64=    64     64     64     65     266    267    268    269
XP       -R   79=    8 =    8.     81=    81     83     161=   162=   162    163=   163    165    192=   193=   193    194=   194
              196
XPAR     ()R  14EQ   16U1
XR       -R   9CO    28 =   282
XX       -R   28=    33     35     39     43     47=    47     50=    117=   123    126    126    139    139    150    150
X1       -R   266=   278    280
X2       -R   267=   278    280
X3       -R   268=   278    28.
X4       -R   269=   278    28.
Y        ()R  14EQ   16U1   34=    37=    38=    42=    68=    69=    70=    122    122    124    124    137    137    138    138
              27     271    272    273
YBASE    -R   12CO   37     70
YJC2     -R   122=   123
YP       -R   83=    84     84=    85     165=   166    166=   167    196=   197    197=   198
YPAR     ()R  14EQ   16U1
YR       -R   281=   282
YY       -R   29=    34     38     42     51=    51     118=   124    137    138
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Y1       -R  27 =    276     281
Y2       -R  271=    278     281
Y3       -R  272=    278     281
Y4       -R  273=    278     281
ZP       -R   62=     63     164=    165    195=    196
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+


  1            SUBROUTINE PARTGEN                                                  PARTGEN     2
  2            COMMON /STATE/    NOPT, NOPD, NFRG, OPTMP(30), OPDEN(10),           ALLKOM      2
              1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),      ALLKOM      3
              2                  BTBL(300)                                         ALLKOM      4
  3            COMMON /YSC1/     AASC(5454)                                        ALLKOM      5
  4            COMMON /PINK/     I, IJ, IJM, IJP, J                                ALLKOM      6
  5            LCM /YLC1/        AA1(131000)                                       ALLKOM      7
  6            LCM /YLC2/        AA2(131000)                                       ALLKOM      8
  7            LCM /RLC1/        SIGA(30000)                                       ALLKOM      9
  8            COMMON /RED/      NAME(12), DT, DTR, EMIG, GROVEL, IBAR, IJPS,      ALLKOM     10
              1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,         ALLKOM     11
              2                  JP1, JP2, NCYC, NOUMP, NO, NOI, REZSIE, TAMB,     ALLKOM     12
              3                  TEMP(7500), T, TIME, TOUT, ISTART, THY            ALLKOM     13
  9            COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,            SILVER      2
              1                  IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,            SILVER      3
              2                  IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,          SILVER      4
              3                  RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT           SILVER      5
 10            COMMON /ORANGE/   ANC, ASQ, AO, AOFAL, ACM, BO, COLAMU, CYL,        ORANGE      2
              1                  DIPOS, EPS, GMJ, GR, GZ, IN1,                     ORANGE      3
              2                  IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,        ORANGE      4
              3                  LJP2, MO, NPT, NUTH, NU12, NUMIT, OM,             ORANGE      5
              4                  ORANC, OMCYL, REZRUN, REZYG, THIRD, VTEM          ORANGE      6
 11            COMMON /WRITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT      ORANGE      7
 12            COMMON /BLUE/     DR, DZ, FREZ, JUNF, JMIO,                         BLUE        2
              1                  JUNFOZ, RADX(7500), ROMFR, YBASE                  BLUE        3
 13            EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y(, EQVREAL     2
              1                  (AASC(4),U), (AASC(5),V(, (AASC(6),RO),           EQVREAL     3
              2                  (AASC(7),MP,RMP,RCSQ,CENTX),                      EQVREAL     4
              3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),           EQVREAL     5
              4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),        EQVREAL     6
              5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                     EQVREAL     7
              6                  (AASC(13),VTIL,VL,UMOMLC(,                        EQVREAL     8
              7                  (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),     EQVREAL     9
              8                  (AASC(16),DELSM,SIGPLC),                          EQVREAL    10
              9                  (AASC(17),GRIR,UG,RZEDEN),                        EQVREAL    11
              1                  (AASC(18),GRIZ,VG,,SN)                            EQVREAL    12
 14            REAL              LAM, LAMO, M, MP, MO, MUOZ                        EQVREAL    13
 15            DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),         DIMEN       2
              2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),    DIMEN       3
              3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),    DIMEN       4
              4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),        DIMEN       5
              5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),          DIMEN       6
              6                  UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),          DIMEN       7
              7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),      DIMEN       8
              8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                 DIMEN       9
 16        900 FORMAT            (6E12.4)                                          PARTGEN     9
 17        910 FORMAT            (1H0,5HDRPAR,1PE12.4,6X,6H DZPAR,1PE12.4/         PARTGEN    10
              1                  6H XC    ,1PE12.4,6X,6H YC    ,1PE12.4,6X,        PARTGEN    11
              2                  6H XD    ,1PE12.4,6X,6H YD    ,1PE12.4)           PARTGEN    12
 18        920 FORMAT            (1H0,I5,* PARTICLES GENERATED*)                   PARTGEN    13
 19        930 FORMAT            (1H0,*PARTICLE REGIONS*)                          PARTGEN    14
         C                                                                         PARTGEN    15
 20            PYB=PYT=PXR=0.0                                                     PARTGEN    16
 21            KP=0                                                                PARTGEN    17
 22            PRINT 930                                                           PARTGEN    18
 23        110 READ  900,        DRPAR, DZPAR, XC, YC, XD, YD                      PARTGEN    19
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```
      IF (ORPAR.LE.0.0) GO TO 290                                      PARTGEN   20
      IF (NPT.GE.1000) GO TO 100                                       PARTGEN   21
      PRINT 910,        ORPAR, DZPAR, XC, YC, XO, YO                   PARTGEN   22
      WRITE (12,910)    ORPAR, DZPAR, XC, YC, XO, YO                   PARTGEN   23
      YC=YC-REZYO                                                      PARTGEN   24
      XRITE=XC+XO                                                      PARTGEN   25
      PXR=AMAX1(PXR,XRITE)                                             PARTGEN   26
      IF (YO.LT.EPIO) GO TO 112                                        PARTGEN   27
      YTOP=YO-REZYO                                                    PARTGEN   28
      YBOT=YC                                                          PARTGEN   29
      GO TO 113                                                        PARTGEN   30
  112 YTOP=YC+XO                                                       PARTGEN   31
      YBOT=YC-XO                                                       PARTGEN   32
  113 PYB=AMIN1(PYB,YBOT)                                              PARTGEN   33
      PYT=AMAX1(PYT,YTOP)                                              PARTGEN   34
  200 YTE=YBOT+0.5*DZPAR                                               PARTGEN   35
  210 XTE=XC+0.5*ORPAR                                                 PARTGEN   36
  220 IF (YO.LE.0.0.AND.(YTE-YC)**2+(XTE-XC)**2.GT.XO**2) GO TO 240    PARTGEN   37
      XPAR(KP) = XTE                                                   PARTGEN   38
      YPAR(KP) = YTE                                                   PARTGEN   39
      KP=KP+2                                                          PARTGEN   40
      NPT = NPT+1                                                      PARTGEN   41
      IF (NPT.GE.1000) GO TO 100                                       PARTGEN   42
  229 IF (YO.GT.EPIO) GO TO 230                                        PARTGEN   43
      XX=2.0*XC-XTE                                                    PARTGEN   44
      IF (XX.LE.0.0) GO TO 230                                         PARTGEN   45
      XPAR(KP)=XX                                                      PARTGEN   46
      YPAR(KP)=YTE                                                     PARTGEN   47
      KP=KP+2                                                          PARTGEN   48
      NPT=NPT+1                                                        PARTGEN   49
      IF (NPT.GE.1000) GO TO 100                                       PARTGEN   50
  230 XTE = XTE+ORPAR                                                  PARTGEN   51
      IF (XTE.LE.XC+XO) GO TO 220                                      PARTGEN   52
  240 YTE = YTE+DZPAR                                                  PARTGEN   53
      IF (YTE.LE.YTOP) GO TO 210                                       PARTGEN   54
      GO TO 100                                                        PARTGEN   55
  290 LPB=NP1+NPT                                                      PARTGEN   56
      CALL ECWR (ARSC, IECP, LPB, NE)                                  PARTGEN   57
      PRINT 920,        NPT                                            PARTGEN   58
      WRITE (12,920)    NPT                                            PARTGEN   59
      RETURN                                                           PARTGEN   60
      END                                                              PARTGEN   61
```

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SINGLY REFERENCED VARIABLES
   200 -   39*   DIR     -R    8CO   IJ      -I    4CO   IYB     -I    9CO   NOPD    -I    2CO   RADX    ()R  12CO   TIME    -R    8CO
   229 -   47*   DZ      -R   12CO   IJM     -I    4CO   IY1     -I    9CO   NOPT    -I    2CO   READ    -     23F   TNEUT   -R   11CO
 AA1     ()R   5LC   ECWR    -    61SU   IJP     -I    4CO   J       -I    4CO   NQ      -I    8CO   REAL    -     14F   TOUT    -R    8CO
 AA2     ()R   6LC   EPS     -R   10CO   IJPS    -I    8CO   JBAR    -I    8CO   NQI     -I    8CO   RED     -     8CN   TSTART  -R    8CO
 AMINI   -    37SU   EQUIVAL -    13F    IMI     -I   10CO   JMID    -I   12CO   NQIB    -I   10CO   RETURN  -     64F   VIEW    -R   10CO
 ANC     -R   10CO   ETAB    ()R   2CO   IPXL    -I    9CO   JNM     -I   10CO   NQI2    -I   10CO   REZHON  -R   10CO   VV      -R    9CO
 ANGLES  ()R  11CO   FIPXL   -R    9CO   IPXR    -I    9CO   JP1     -I    8CO   NRVALS  -I   10CO   REZSIE  -R    8CO   WHITE   -    11CN
 ASQ     -R   14CO   FIPXR   -R    9CO   IPYB    -I    9CO   JP2     -I    8CO   NUMIT   -I   10CO   RIBAR   -R    9CO   XCONV   -R    9CO
 AO      -R   10CO   FIPYB   -R    9CO   IPYT    -I    9CO   JP4     -I   10CO   OM      -R   10CO   RLC1    -     7CN   XL      -R    9CO
 AQFAC   -R   11CO   FIXL    -R    9CO   IP1     -I    8CO   JUMP02  -I   12CO   OMANC   -R   10CO   ROMFR   -R   12CO   XR      -R    9CO
 AUM     -R   11CO   FIXR    -R    9CO   IP2     -I   10CO   KAI     -I   10CO   OMCYL   -R   10CO   RVALS   ()R  11CO   YB      -R    9CO
 BLUE    -    12CN   FIYB    -R    9CO   ISCF1   -I    8CO   LAMD    -R   14RL   OPOEN   ()R   2CO   SIGA    ()R   7LC   YBASE   -R   12CO
 BTBL    ()R   2LU   FREQ    ()R   2CO   ISCF2   -I    8CO   LJP2    -I   10CO   OPIMP   ()R   2CO   SILVER  -     9CN   YCONV   -R    9CO
 BU      -R   11CO   FREZ    -R   12CO   ISC2    -I    8CO   MUU2    -R   14RL   CHANGE  -    10CN   SPTBL   ()R   2CO   YLC1    -     5CN
 COLAMU  -R   10CO   UMI     -R   11CO   ISC3    -I    8CO   NAME    ()I   8CO   PARTGEN -     15U   STATE   -     2CN   YLC2    -     6CN
 CYL     -R   11CO   GR      -R   10CO   ITAB    ()I  10CO   NANGLS  -I   11CO   PINK    -     4CN   T       -R    8CO   YSC1    -     3CN
 DIMENSI -     15F   GRUVEL  -R    8CO   ITV     -I    8CO   NCYC    -I    8CO   PTAB    ()R   2CO   TAMB    -R    8CO   YT      -R    9CO
 DR      -R   12CO   GZ      -R   10CO   IUNF    -I   12CO   NDUMP   -I    8CO   PXCONV  -R    9CO   TEMP    ()R   8CO
 DT      -R    8CO   I       -I    4CO   IXL     -I    9CO   NE      -I   61AG   PXL     -R    9CO   THIRD   -R   10CO
 DIPOS   -R   11CO   IBAR    -I    8CO   IXR     -I    9CO   NFRQ    -I    2CO   PYCONV  -R    9CO   THY     -R    8CO
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MULTIPLY-REFERENCED VARIABLES
   100 -   23*   25   46   54   59
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        112 -     31       35*
        113 -     34       37*
        210 -     41*      56
        220 -     41*      56
        230 -     47       49       55*
        240 -     41       57*
        290 -     24       61*
        900 -     16*      23RD
        910 -     17*      26PR     27WR
        920 -     16*      62PR     63WR
        930 -     19*      22PR
AASC     ()R       3CO     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EC     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ
                   13EQ    13EQ     61AG
AMAXI     -        38SU    38SU
BETALC   ()R       13EQ    1501
CENTX    ()R       13EQ    1501
CENTY    ()R       13EQ    1501
COMMON    -        2F      3F       4F       8F       9F       10F      11F      12F
CQ       ()R       13EQ    1501
DELSM    ()R       13EQ    1501
DRPAR     -R       23RD    24       26PR     27WR     40       55
DZPAR     -R       23RD    26PR     27WR     39       57
E        ()R       13EQ    1501
EMOMLC   ()R       13EQ    1501
EMIO      -R       6CO     31       47
EP       ()R       13EQ    1501
ETIL     ()R       13EQ    1501
FORMAT    -        16F     17F      18F      19F
FOUTLC   ()R       13EQ    1501
FSN      ()R       13EQ    1501
GRIR     ()R       13EQ    1501
GRIZ     ()R       13EQ    1501


IECP      -I       11CO    61AG
KP        -I       21=     42       43       44=      44       50       51       52=      52
LAM       -R       14CO    14RL
LCM       -        5F      6F       7F
LPB       -I       6=      61AG
M        ()R       13EQ    14RL     1501
MP       ()R       13EQ    14RL     1501
MJ        -R       1CO     14RL
NPT       -I       11CO    25       45=      45       46       53=      53       54       60       60       62PR     63WR
P        ()R       13EQ    1501
PL       ()R       13EQ    1501
PRINT     -        22F     26F      62F
PXR       -R       9CO     2=       30=      30
PYB       -R       9CO     2=       37=      37
PYT       -R       9CO     2=       38=      38
R        ()R       13EQ    1501
RCSQ     ()R       13EQ    1501
REZYO     -R       1CO     28       32
RM       ()R       13EQ    1501
RMP      ()R       13EQ    1501
RO       ()R       13EQ    1501
ROL      ()R       13EQ    1501
RVOL     ()R       13EQ    1501
RZEDEN   ()R       13EQ    1501
SIE      ()R       13EQ    1501
SIGPLC   ()R       13EQ    1501
U        ()R       13EQ    1501
UG       ()R       13EQ    1501
UL       ()R       13EQ    1501
UMOMLC   ()R       13EQ    1501
UP       ()R       13EQ    1501
UTIL     ()R       13EQ    1501
V        ()R       13EQ    1501
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VG       (}R     )3EQ    1501
VL       (}R     13EQ    1501
VP       (}R     13EQ    1501
VTIL     (}R     13EQ    1501
WRITE    -       27F     63F
X        (}R     13EQ    1501
XC       -R      23RD    26PR    27WR    29      40      41      48      56
XD       -R      23RD    26PR    27WR    29      35      36      41      56
XPAR     (}R     13EQ    1501    42=     50=
XRITE    -R      29=     30
XTE      -R      4'=     41      42      48      55=     55      56
XX       -R      46=     49      50
Y        (}R     13EQ    1501
YBOT     -R      33=     36=     37      39
YC       -R      23RD    26PR    27WR    28=     28      33      35      36      41
YD       -R      23RD    26PR    27WR    31      32      41      47
YPAR     (}R     13EQ    1501    43=     51=
YTE      -R      39=     41      43      51      57=     57      58
YTOP     -R      32=     35=     38      58
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1             OVERLAY (YOKIFER, 2, 0)                                                        YORKY       2

  1            PROGRAM YORKY                                                                  YORKY       3
  2            COMMON /STATE/      NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),                    ALLKOM      2
              1                    FRLQ(100), SPTBL(300), PTAB(300), ETAB(300),               ALLKOM      3
              2                    BTBL(300)                                                  ALLKOM      4
  3            COMMON /YSCI/       AASC(5454)                                                 ALLKOM      5
  4            COMMON /PINK/       I, IJ, IJP, IJP, J                                         ALLKOM      6
  5            LCM /YLC1/          AA1(131000)                                                ALLKOM      7
  6            LCM /YLC2/          AA2(131000)                                                ALLKOM      8
  7            LCM /RLC1/          SIGA(30000)                                                ALLKOM      9
  8            COMMON /RED/        NAMC(12), DT, DTR, EMIO, GRDVEL, IBAR, IJPS,               ALLKOM     10
              1                    IPI, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,                  ALLKOM     11
              2                    JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,              ALLKOM     12
              3                    TEMP(7500), T, TIML, TOUT, TSTART, THY                     ALLKOM     13
  9            COMMON /YELLOW/     DTC, DTCSAV, DTO2, DTV, DTVSAV,                            YELLOW      2
              1                    DVOY, IDTC, IDTV, JDTC, JDTV, ROT                          YELLOW      3
 10            COMMON /ORANGE/     ABC, ASQ, AO, AOFAC, AOM, B9, COLAMU, CYL,                 ORANGE      2
              1                    DTPOS, EPS, GM, GR, GZ, IMI,                               ORANGE      3
              2                    IECH, IP2, ITAB(1000), JNM, JP4, KXI, LAM,                 ORANGE      4
              3                    LJP2, MU, NPI, NQIH, NQI2, NUMIT, OM,                      ORANGE      5
              4                    OMANC, CMCYL, REZRON, REZYC, THIRD, VIEM                   ORANGE      6
 11            COMMON /WHITE/      NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT               ORANGE      7
 12            EQUIVALENCE         (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),           EQVREAL     2
              1                    (AASC(4),U), (AASC(5),V), (AASC(6),RO),                    EQVREAL     3
              2                    (AASC(7),MP,RMP,RCSQ,CENTX),                               EQVREAL     4
              3                    (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),                    EQVREAL     5
              4                    (AASC(10),C,RM,VP), (AASC(11),P,PL,EP,UP),                 EQVREAL     6
              5                    (AASC(12),UTIL,HL,CQ,EMOMLC),                              EQVREAL     7
              6                    (AASC(13),VTIL,VL,UMOMLC),                                 EQVREAL     8
              7                    (AASC(14),RCL,BETALC,FOUILC), (AASC(15),SIE),              EQVREAL     9
              8                    (AASC(16),DELSM,SIGPLC),                                   EQVREAL    10
              9                    (AASC(17),GRIR,UG,RZEDEN),                                 EQVREAL    11
              1                    (AASC(18),GRIZ,VG,FSN)                                     EQVREAL    12
 13            REAL                LAM, LAMD, M, MP, MU, MUO2                                 EQVREAL    13
 14            DIMENSION           X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),                  DIMEN       2
              2                    V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),             DIMEN       3
              3                    E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),             DIMEN       4
              4                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),                 DIMEN       5
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                             UL(I), CN(I), EMOMLC(I), VTIL(I), VL(I),           DIMEN     6
                             UMOMLC(I), ROL(I), BETALC(I), FOUTLC(I),           DIMEN     7
                             SIE(I), DELSM(I), SIGPLC(I), GRIR(I), UG(I),       DIMEN     8
                             RZEDEN(I), GRIZ(I), VG(I), FSN(I)                  DIMEN     9
      11 CALL OVERLAY (7LYCKIFER, 2, 1, 0)                                      YOKKY     9
         CALL REMARK (13HYAQUI PHASE 0)                                         YOKKY    10
         IF (TIME.LT.TOUT) GO TO 12                                             YOKKY    11
         CALL OVERLAY (7LYCKIFER, 2, 2, 0)                                      YOKKY    12
         CALL REMARK (13HYAQUI OUTPUT )                                         YOKKY    13
      12 CALL OVERLAY (7LYCKIFER, 2, 3, 0)                                      YOKKY    14
         CALL REMARK (13HYAQUI PHASE 1)                                         YOKKY    15
         CALL OVERLAY (7LYCKIFER, 2, 4, 0)                                      YOKKY    16
         CALL REMARK (13HYAQUI PHASE 2)                                         YOKKY    17
         CALL OVERLAY (7LYCKIFER, 2, 5, 0)                                      YOKKY    18
         CALL REMARK (13HYAQUI PHASE 3)                                         YOKKY    19
         IF ((+EMTO.LT.TIME+DTR) GO TO 11                                       YOKKY    20
         RETURN                                                                 YOKKY    21
         END                                                                    YOKKY    22

 SINGLY REFERENCED VARIABLES
  AA1     ()R    5LC   DT02     -R    9CO   IDTV    -I    9CO   JBAP    -I    8CO   NOPD    -I    2CO   PTAB    ()R    2CO   THY     -R    8CO
  AA2     ()R    6LC   DTMCS    -R   10CO   IECP    -I   10CO   JDTC    -I    9CO   NOP1    -I    2CO   ROT     -R     9CO   TNEU1   -R   11CO
  ANG     -R    10CO   DTV      -R    9CO   IJ      -I    4CO   JDTV    -I    9CO   NPT     -I   10CO   REAL    -     13F    TSTART  -R    8CO
  ANGLES  ()R   11CO   DTVSAV   -R    9CO   IJM     -I    4CO   JNM     -I   10CO   NQ      -I   10CO   RED     -      8CN   VTEM    -R   10CO
  ASQ     -R    10CO   DVDY     -R    9CO   IJP     -I    4CO   JP1     -I    8CO   NQ1     -I    8CO   RETURN  -     27F    WHITE   -    11CN
  A0      -R    10CO   EPS      -R   11CO   IJPS    -I    6CO   JP2     -I    8CO   NQIB    -I   10CO   REZRON  -R    10CO   YELLOW  -     9CN
  ACFAC   -R    10CO   EQUIVAL  -    12F    IMI     -I   10CO   JP4     -I   10CO   NQI2    -I   10CO   REZSIE  -R     8CO   YLC1    -     5CN
  AOM     -R    10CO   ETAB     ()R   2CO   IP1     -I    8CO   KX(     -I   10CO   NRVALS  -I   10CO   REZYO   -R    10CO   YLC2    -     6CN
  BTBL    ()R    2CO   FREQ     ()R   2CO   IP2     -I   10CO   LAMD    -R   13RL   NUMIT   -I   10CO   RLC1    -      7CN   YOKKY   -     1SU
  B0      -R    10CO   GRI      -R   10CO   ISCF1   -I    8CO   LJP2    -I   10CO   CM      -R   10CO   RVALS   ()R   11CO   YSC1    -     3CN
  COLAMU  -R    10CO   GP       -R   10CO   ISCF2   -I    8CO   MUU2    -R   13RL   CMANC   -R   10CO   SIGA    ()R    7LC
  CYC     -R    10CO   GROVEL   -R    8CO   ISC2    -I    9CO   NAGE    ()I   8CO   CMCYL   -R   10CO   SPTHL   ()R    2CO
  DIMENSI -     14F    GZ       -R   10CO   ISC3    -I    8CO   NANGLS  -I   11CO   CPDEN   ()R   2CO   STATE   -      2CN
  DT      -R     8CO   I        -I    4CO   ITAB    ()I  10CO   NCYC    -I    8CO   CPTMP   ()R   2CO   TAMB    -R     8CO
  DTC     -R     9CO   IMAR     -I    8CO   ITV     -I    8CO   NDUMP   -I    8CO   ORANGE  -    10CN   TEMP    ()R    8CO
  DTLSAV  -R     9CO   IDTC     -I    9CO   J       -I    4CO   NFRQ    -I    2CO   PINK    -     4CN   THIRD   -R    10CO
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 MULTIPLY-REFERENCED VARIABLES
      11 -      15*    26
      12 -      17     20SU
 AASC     ()R    3CO   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ
                12EQ   12EQ
 BETALC   ()R   12EQ   14DI
 CENTX    ()R   12EQ   14DI
 CENTY    ()R   12EQ   14DI
 COMMON   -      2F     3F     4F     8F     9F    10F    11F
 CO       ()R   12EQ   14DI
 DELSM    ()R   12EQ   14DI
 DTR      -R     8CO   26
 E        ()R   12EQ   14DI
 EMOMLC   ()R   12EQ   14DI
 EMTO     -R     8CO   26
 EP       ()R   12EQ   14DI
 ETIL     ()R   12EQ   14DI
 FOUTLC   ()R   12EQ   14DI
 FSN      ()R   12EQ   14DI
 GRIR     ()R   12EQ   14DI
 GRIZ     ()R   12EQ   14DI
 LAM      -R    10CO   13RL
 LCM      -      5F     6F     7F
 M        ()R   12EQ   13RL   14DI
 MP       ()R   12EQ   13RL   14DI
 MU       -R    10CO   13RL
 OVERLAY  -     15SU   18SU   20SU   22SU   24SU
 P        ()R   12EQ   14DI
 PL       ()R   12EQ   14DI
 R        ()R   12EQ   14DI
 RCSQ     ()R   12EQ   14DI
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REMARK  -     16SU   19SU    21SU   23SU   25SU
RM      ()R   12EQ   14UI
RMP     ()R   12EQ   14UI
RO      ()R   12EQ   14UI
ROL     ()R   12EQ   14UI
RVOL    ()R   12EQ   14UI
RZEDEN  ()R   12EQ   14UI
SIE     ()R   12EQ   14UI
SIGPLC  ()R   12EQ   14UI
T       -R    ECO    26
TIME    -R    ECO    17      26
TOUT    -R    ECO    17
U       ()R   12EQ   14UI
UG      ()R   12EQ   14UI
UL      ()R   12EQ   14UI
UMOMLC  ()R   12EQ   14UI
UP      ()R   12EQ   14UI
UTIL    ()R   12EQ   14UI
V       ()R   12EQ   14UI
VG      ()R   12EQ   14UI
VL      ()R   12EQ   14UI
VP      ()R   12EQ   14UI
VTIL    ()R   12EQ   14UI
X       ()R   12EQ   14UI
XPAR    ()R   12EQ   14UI
Y       ()R   12EQ   14UI
YPAR    ()R   12EQ   14UI
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 1          OVERLAY (YOKIFER, 2, 1)                                              PHASE0     2


 1          PROGRAM PHASE0                                                       PHASE0     3
 2          COMMON /STATE/     NOPT, NCPD, NFRQ, OPTMP(30), CPDEN(10),           ALLKOM     2
           1                   FREQ(100), SPTBL(300), PTAB(300), ETAB(300),      ALLKOM     3
           2                   BTBL(300)                                         ALLKOM     4
 3          COMMON /YSC1/      AASC(5454)                                        ALLKOM     5
 4          COMMON /PINK/      I, IJ, IJM, IJP, J                                ALLKOM     6
 5          LCM /YLC1/         AA1(131000)                                       ALLKOM     7
 6          LCM /YLC2/         AA2(131000)                                       ALLKOM     8
 7          LCM /RLC1/         SIGA(30000)                                       ALLKOM     9
 8          COMMON /RED/       NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,      ALLKOM    10
           1                   IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,         ALLKOM    11
           2                   JP1, JP2, NCYC, NOUMP, NQ, NOI, REZSIE, TAMB,     ALLKOM    12
           3                   TEMP(7500), 1, TIME, TOUT, TSTART, THY            ALLKOM    13
 9          COMMON /YELLOW/    DTC, DTCSAV, DTO2, DTV, DTVSAV,                   YELLOW     2
           1                   DVOY, IDTC, IDIV, JDTC, JDIV, RDT                 YELLOW     3
10          COMMON /ORANGE/    ANC, ASG, AO, ADFAC, ADM, BO, COLAMU, CYL,        ORANGE     2
           1                   DIPUS, EPS, GM1, GR, GZ, IM1,                     ORANGE     3
           2                   IECP, IP2, ITAB(1000), JNM, JP4, KX1, LAM,        ORANGE     4
           3                   LJP2, MC, NPT, NUIH, NUI2, NUMIT, OM,             ORANGE     5
           4                   OMANC, CHCYL, REZROU, REZYU, THIRD, VTEM          ORANGE     6
11          COMMON /WHITE/     NRVALS, RVALS(73), NANGLS, ANGLES(35), INEUT      ORANGE     7
12          EQUIVALENCE        (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),  EQVREAL    2
           1                   (AASC(4),U), (AASC(5),V), (AASC(6),RO),           EQVREAL    3
           2                   (AASC(7),RP,RMP,RCSQ,CENTX),                      EQVREAL    4
           3                   (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),           EQVREAL    5
           4                   (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),        EQVREAL    6
           5                   (AASC(12),UTIL,GL,CQ,EMOMLC),                     EQVREAL    7
           6                   (AASC(13),VTIL,VL,UMOMLC),                        EQVREAL    8
           7                   (AASC(14),ROL,RETALC,FOUTLC), (AASC(15),SIE),     EQVREAL    9
           8                   (AASC(16),...LSM,SIGPLC),                         EQVREAL   10
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     9                    (AASC((7),GRIR,UG,RZEDEN),                    EQVREAL   11
     1                    (AASC(18),GRIZ,VG,FSN)                        EQVREAL   12
      REAL                LAM, LAMD, M, MP, MU, MUO2                    EQVREAL   13
      DIMENSION           X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),     DIMEN      2
     2                    V(1), RO(1), RP(1), RMP(1), RCSQ(1), CENTX(1), DIMEN     3
     3                    E(1), EIL(1), CENTY(1), RVOL(1), M(1), RM(1), DIMEN      4
     4                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),    DIMEN      5
     5                    UL(1), CD(1), EMOMLC(1), VTIL(1), VL(1),      DIMEN      6
     6                    UMOMLC(1), ROL(1), RETALC(1), FOUTLC(1),      DIMEN      7
     7                    SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),  DIMEN      8
     8                    RZEDEN(1), GRIZ(1), VG(1), FSN(1)             DIMEN      9
      LEXT                DBLINT                                      - PHASE0     9
 4001 FORMAT              (1H0,*PROBLEM CYCLE*,I6,6X,*HYDRO*//          PHASE0    10
     1                    * T    *,1PE12.4,* TI*,1PE12.4,6X,*DT *,1PE12.4, PHASE0 11
     2                    6X,I6,* ITERS*)                               PHASE0    12
 4002 FORMAT              (1H0,5HTE    ,1PE12.4,6X,6H TI    ,1PE12.4,6X, PHASE0   13
     1                    6H TK    ,1PE12.4,6X,6H EPCT ,1PE12.4,6X,     PHASE0    14
     2                    6H TIAMB,1PE12.4)                             PHASE0    15
 4004 FORMAT              (1H0,5HUMOM ,1PE12.4,6X,6H VMOM ,1PE12.4,6X,  PHASE0    16
     1                    6H CIRC ,1PE12.4)                             PHASE0    17
 4005 FORMAT              (1H0,5HTMAX ,1PE12.4,6X,6H ITM  ,I12,6X,      PHASE0    18
     1                    6H JTM  ,I12)                                 PHASE0    19
 4006 FORMAT              (6H TGMX ,1PE12.4,6X,6H IIG  ,I12,6X,         PHASE0    20
     1                    6H JIG  ,I12)                                 PHASE0    21
 4007 FORMAT              (1H0,5HUDIV  ,1PE12.4,6X,6H IDTV ,I12,6X,     PHASE0    22
     1                    6H JDTV ,I12/6H UTC  ,1PE12.4,6X,6H IDTC ,I12, PHASE0   23
     2                    6X,6H JDTC ,I12)                              PHASE0    24
C      ---   INITIALIZE                                                 PHASE0    25
      UTVSAV = UTCSAV = 0.0                                             PHASE0    26
      CIRC=POTE=TK=TI=UMOM=VMOM=TIAMB=0.0                               PHASE0    27
      TMAX=TGMX=0.0                                                     PHASE0    28
      ITM=IIG=JTM=JIG=0                                                 PHASE0    29
C      ---   COMPUTE PRESSURES AND ENERGIES                             PHASE0    30
      CALL START                                                        PHASE0    31
      DO 199 J=2,JP1                                                    PHASE0    32
      IJSC=(J-1)*IP1                                                    PHASE0    33
      JJ=(J-1)*IP1+IBAR                                                 PHASE0    34
      TEMP4=TEMP(JJ)**4                                                 PHASE0    35
      DO 189 I=1,IBAR                                                   PHASE0    36
      IPJ = IJ + NQ                                                     PHASE0    37
      IPJP = IJP + NQ                                                   PHASE0    38
      IJSC=IJSC+1                                                       PHASE0    39
      XMSENG=RO(IJ)/RVOL(IJ)                                            PHASE0    40
      SPENGK=0.125*(U(IPJ)**2+U(IPJP)**2+U(IJP)**2+U(IJ)**2             PHASE0    41
     1              +V(IPJ)**2+V(IPJP)**2+V(IJP)**2+V(IJ)**2)           PHASE0    42
      TK=TK+SPENGK*XMSENG                                               PHASE0    43
      UMOM=UMOM+0.25*XMSENG*(U(IPJ)+U(IPJP)+U(IJP)+U(IJ))               PHASE0    44
      VMOM=VMOM+0.25*XMSENG*(V(IPJ)+V(IPJP)+V(IJP)+V(IJ))               PHASE0    45
      TI=TI+XMSENG*SIE(IJ)                                              PHASE0    46
      TIAMB=TIAMB+REZSIE*XMSENG+137.214E-07*TEMP4/RVOL(IJ)              PHASE0    47
      POTE=POTE+(Y(IJ)+REZY1)/RM(IJ)                                    PHASE0    48
      IF(I.EQ.IBAR.OR.J.EQ.JP1) GO TO 170                               PHASE0    49
      IF(SIE(IJ).LT.TMAX) GO TO 160                                     PHASE0    50
      ITM=I                                                             PHASE0    51
      JTM=J                                                             PHASE0    52
      TMAX=SIE(IJ)                                                      PHASE0    53
  160 SAVA=(X(IPJ)-X(IJ))**2+(Y(IPJ)-Y(IJ))**2                          PHASE0    54
      SAVB=(X(IJP)-X(IJ))**2+(Y(IJP)-Y(IJ))**2                          PHASE0    55
      SAVA=ABS(SIE(IJ)-SIE(IPJ))/QSQRT(SAVA)                            PHASE0    56
      SAVB=ABS(SIE(IJ)-SIE(IJP))/QSQRT(SAVB)                            PHASE0    57
      SAV=AMAX1(SAVA,SAVB)                                              PHASE0    58
      IF(SAV.LT.TGMX) GO TO 170                                         PHASE0    59
      IIG=I                                                             PHASE0    60
      JIG=J                                                             PHASE0    61
      TGMX=SAV                                                          PHASE0    62
  170 CONTINUE                                                          PHASE0    63
      IF (J.EQ.JP1) POTE=POTE+(Y(IJP)+REZYH)/RM(IJP)                    PHASE0    64
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59        IF (I,EG.J    ) CIRC = CIHC + 0,5*(V(IJ)+V(IJP))*(Y(IJPT-Y(IJ))
60        IF (I.EG.IM) ) CIRC = CIRC - 0.5*(V(IJ)+V(IJP))*(Y(IJP)-Y(IJ))
61        IF (J.EG,3   ) CIRC = CIRC - 0,5*(U(IJ)+U(IPJ))*(X(IPJ)-X(IJ((
62        IF JJ.EG.JBAR) CIRC = CIRC + 0.5*(U(IJ)+U(IPJ))*(X(IPJ)-X(IJ))
63        RCI=RC(IJ)
64        X1=GLOG10(RC1)
65        X2=GLOG10(TEMP(IJSC))
66        X3=DBLINT (0, X1, X2, OPDEN, OPTMP, PTAB, 0, NOPT, NOPO, NOPT)
67        P(IJ)=GEXP10(X3)
68        P(IJ)=P(IJ)+45.7386E-(7*]EMP(IJSC)**4
69    18C IJP = IPJP
70        IJM=IJM+NG
71        IJ=IPJ
72    189 CONTINUE
73        PCTE=POTE+(Y(IJ)+REZY,J/RM(IJ)
74        IF (J,EG.JP1) POTE=POTE+(Y(IJP)+REZY()/RM(IJP)
75        CALL LOOP
76    199 CONTINUE
77        CALL DONE
      C   ---    COMPUTE ENERGIES
78        TIAMB=TIAMB*6.283184E+15
79        TI=TI*6.283184E+15-TIAMB
80        TK=TK*6.283184E+15
81        PCTE=POTE*6.283184E+15
82        EPOT=-POTE*CZ
83        TE=TI+TK
      C   ---    MONITOR PRINT
84        TMO=T-DT
85        PRINT 4001,      NCYC, TMDT, T, DT, NUMIT
86        WRITE (12,4001)  NCYC, TMDT, T, DT, NUMIT
87        PRINT 4002,      TE, TI, TK, EPOT, TIAMB
88        WRITE (12,4002)  TE, TI, TK, EPOT, TIAMB
89        PRINT 4004,      UMOM, VMOM, CIRC
90        WRITE (12,4004)  UMOM, VMOM, CIRC
91        PRINT 4005,      TMAX, IJM, JTM
92        WRITE (12,4005)  TMAX, IJM, JTM
93        PRINT 4006,      TGMX, IJG, JTG
94        WRITE (12,4006)  TGMX, ITG, JTG
95        PRINT 4007,      DTV, IDTV, JDTV, DTC, IDTC, JDTC
96        WRITE (12,4007)  DTV, IDTV, JDTV, DTC, IDTC, JDTC
97        RETURN
98        END
SINGLY REFERENCED VARIABLES
    180 -    69*    CYL      -R  10CO  GR      -R  10CO  JP4     -1  10CO  NQIB   -1  10CO  RETURN  -    97F   TOUT    -R   8CO
 AA1    ()R   5LC   DIMENSI  -   14F   GRDVEL  -R   8CO  KXI     -1  10CO  NQI2   -1  10CO  REZRON  -R  10CO  TSTART  -R   8CO
 AA2    ()R   6LC   DONE     -   775U  IECP    -L  10CO  LAMO    -R  13RL  NRVALS -1  11CO  RLC1    -    7CN  VTEM    -R  10CO
 AMAXI  -   525U    DTUZ     -R   9CO  IJPS    -I   8CO  LEXT    -   15F   CM     -R  10CO  RVALS   ()R 11CO  WHITE   -   11CN
 ANC    -R  11LO    DIPCS    -R  11CO  IP2     -1  10CO  LJP2    -1  10CO  CMANC  -R  15CO  SIGA    ()R  7LC  YELLOW  -    9CN
 ANGLES ()R 11CO    DJR      -R   8CO  ISCF1   -1   8CO  LOOP    -   755U  CMCYL  -R  10CD  SPTBL   ()R  2CO  YLC1    -    5CN
 ASG    -R  14CU    DVDY     -R   9CO  ISCF2   -1   8CO  MUO2    -R  13RL  CRANGE -   10CN  START   -   265U  YLC2    -    6CN
 AD     -R  16CU    ENIC     -R   6CO  ISC2    -1   8CO  NAME    ()I* 8CO  PHASEO -    15U  STATE   -    2CN  YSC1    -    3CN
 AQFAC  -R  16LU    EPS      -R  10CO  ISC3    -(   8CO  NANGLS  -1  11CO  PINK   -    4CN  TAMB    -R   8CO
 AGM    -R  10CU    EQUIVAL  -   12F   ITAU    ()I 10CO  NDUMP   -1   8CO  GEXP10 -   675U  THIRD   -R  10CO
 BIBL   ()R   2CO   ETAB     ()R  2CO  IIV     -1   8CO  NFRQ    -1   2CC  RDT    -R   9CO  THY     -R   8CO
 BD     -R  11CO    FREG     ()R  2CO  JNM     -1  10CO  NP1     -1  10CO  REAL   -   13F   TIME    -R   8CO
 COLAMU -R  10CO    GN1      -R  10CO  JP2     -1   8CO  NQI     -I   8CO  RED    -    8CN  INEUT   -R  11CO
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MULTIPLY-REFERENCED VARIABLES
   160 -     44      48*
   170 -     43      53      57*
   189 -     3100    72*
   199 -     2700    76*
   4001 -    16*     85PR    86WR
   4002 -    17*     87PR    88WR
   4004 -    18*     89PR    90WR
   4005 -    19*     91PR    92WR
   4006 -    20*     93PR    94WR
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4007	-	21*	95PR	96WR														
AASC	()R	3CO	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ	12EQ
		12EQ	12EQ															
ABS	-	50SU	51SU															
BETALI	()R	12EQ	14DI															
CENTX	()R	12EQ	14DI															
CENTY	()R	12EQ	14DI															
CIRC	-R	23=	59=	59	60=	60	61=	61	62=	62	89PR	90WR						
COMMON	-	2F	3F	4F	8F	9F	10F	11F										
CQ	()R	12EQ	14DI															
DBLINT	-	15LX	66SU															
DELSM	()R	12EQ	14DI															
DT	-R	6CO	64	65PR	66WR													
DTC	-R	9CO	95PR	96WR														
DTCSAV	-R	9CO	22=															
DTV	-R	9CO	95PR	96WR														
DTVSAV	-R	9CO	22=															
E	()R	12EQ	14DI															
EMOMLC	()R	12EQ	14DI															
EP	()R	12EQ	14DI															
EPD1	-R	82=	87PR	88WR														
ETIL	()R	12EQ	14DI															
FORMAT	-	16F	17F	18F	19F	20F	21F											
FOUTLC	()R	12EQ	14DI															
FSN	()R	12EQ	14DI															
GRIR	()R	12EQ	14DI															
GRIZ	()R	12EQ	14DI															
GZ	-R	11CO	82															
I	-I	4CO	3100	43	45	54	59	61										
IBAR	-I	6CO	29	3100	43													
IDTC	-I	9CO	95PR	96WR														
IDTV	-I	9CO	95PR	96WR														
IJ	-I	4CO	32	35	35	36	36	38	39	40	41	42	42	44	47	48	48	49
		49	50	51	59	59	60	60	61	61	62	62	63	67	68	68	71=	73
		73																
IJM	-I	4CO	70=	70														
IJP	-I	4CO	33	36	36	38	39	49	49	51	58	58	59	59	60	60	60=	74
		74																
IJSC	-I	26=	34=	34	65	68												
IM1	-I	11CO	6.															
IPJ	-I	32=	36	36	38	39	48	48	50	61	61	62	62	71				
IPJP	-I	33=	36	36	38	39	69											
IP1	-I	8CO	28	29														
ITG	-I	25=	54=	93PR	94WR													
ITM	-I	25=	45=	91PR	92WR													
J	-I	4CO	2700	28	29	43	46	55	58	61	62	74						
JBAR	-I	6CO	62															
JDTC	-I	9CO	95PR	96WR														
JDTV	-I	9CO	95PR	96WR														
JJ	-I	29=	3.															
JP1	-I	8CO	2700	43	58	74												
JTG	-I	25=	55=	93PR	94WR													
JTM	-I	25=	46=	91PR	92WR													
LAM	-R	11CO	13RL															
LCM	-	5F	6F	7F														
M	()R	12EQ	13RL	14DI														
MP	()R	12EQ	13RL	14DI														
MU	-R	11CO	13RL															
NCYC	-I	8CO	85PR	86WR														
NOPD	-I	2CO	66															
NOPT	-I	2CO	66	66														
NQ	-I	8CO	32	33	70													
NUMIT	-I	11CO	65PR	66WR														
OPDEN	()R	2CO	66															
OPTMP	()R	2CO	66															
P	()R	12EQ	14DI	67=	68=	68												
PL	()R	12EQ	14DI															

POTE	-R	23=	42=	42	58=	58	73=	73	74=	74	81=	81	82		
PRINT	-	85F	87F	89F	91F	93F	95F								
PIAB	()R	2CO	66												
QLOGIO	-	64SU	65SU												
QSQPI	-	5 SU	51SU												
R	()R	12EQ	1401												
RCSO	()R	12EQ	1401												
REZSIE	-R	6CO	41												
REZYO	-R	11CO	42	56	73	74									
RM	()R	12EQ	1401	42	58	73	74								
RMP	()R	12EQ	1401												
RO	()R	12EQ	1401	35	63										
ROL	()R	12EQ	1401												
ROT	-R	63=	64												
RVOL	()R	12EQ	1401	35	41										
RZEDEN	()R	12EQ	1401												
SAV	-R	52=	53	56											
SAVA	-R	48=	50=	50	52										
SAVB	-R	49=	51=	51	52										
SIE	()R	12EQ	1401	40	44	47	50	50	51	51					
SIGPLC	()R	12EQ	1401												
SPENOK	-R	36=	37												
T	-R	6CO	84	85PR	86WR										
TE	-R	83=	87PR	88WR											
TEMP	()R	6CO	36	65	68										
TEMP4	-R	3· =	41												
TGMX	-R	24=	53	56=	93PR	94WR									
TI	-R	23=	40=	40	79=	79	83	87PR	88WR						
TIAMB	-R	23=	41=	41	78=	78	79	87PR	88WR						
TK	-R	23=	37=	37	80=	80	83	87PR	88WR						
TMAX	-R	24=	44	47=	91PR	92WR									
TMOT	-R	84=	85PR	86WR											
U	()R	12EQ	1401	36	36	36	36	38	38	38	38	61	61	62	62
UG	()R	12EQ	1401												
UL	()R	12EQ	1401												
UMOM	-R	23=	38=	38	89PR	90WR									
UMOMLC	()R	12EQ	1401												
UP	()R	12EQ	1401												
UTIL	()R	12EQ	1401												
V	()R	12EQ	1401	36	36	36	36	39	39	39	39	59	59	60	60
VG	()R	12EQ	1401												
VL	()R	12EQ	1401												
VMOM	-R	23=	39=	39	89PR	90WR									
VP	()R	12EQ	1401												
VTIL	()R	12EQ	1401												
WRITE	-	86F	88F	90F	92F	94F	96F								
X	()R	12EQ	1401	48	48	49	49	61	61	62	62				
XMSENG	-R	35=	37	38	39	40	41								
XPAR	()R	12EQ	1401												
X1	-R	64=	66												
X2	-R	65=	66												
X3	-R	66=	67												
Y	()R	12EQ	1401	42	48	48	49	49	58	59	59	60	60	73	74
YPAR	()R	12EQ	1401												

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      PROGRAM YOKOUT                                                   YOKOUT     3
      COMMON /STATE/   IOPT, NCPO, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM     2
     1                 FREQ(100), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM     3
     2                 BTBL(300)                                       ALLKOM     4
      COMMON /YSC1/    AASC(5454)                                      ALLKOM     5
      COMMON /PINK/    I, IJ, IJM, IJP, J                              ALLKOM     6
      LCM /YLC1/       AA1(131000)                                     ALLKOM     7
      LCM /YLC2/       AA2(131000)                                     ALLKCM     8
      LCM /HLC1/       SIGA(30000)                                     ALLKOM     9
      COMMON /REO/     NAME(12), DT, DTR, EMIN, GRDVEL, IBAR, IJPS,    ALLKOM    10
     1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM    11
     2                 JP1, JP2, NCYC, NUUMP, NQ, NQI, RE7SIE, TAMB,   ALLKOM    12
     3                 TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM    13
      COMMON /SILVER/  FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,          SILVER     2
     1                 IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,          SILVER     3
     2                 IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,        SILVER     4
     3                 RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT         SILVER     5
      COMMON /YELLOW/  DTC, DTCSAV, DTC2, DTV, DTVSAV,                 YELLOW     2
     1                 DVOY, IDTC, IDTV, JDTC, JDTV, RDT               YELLOW     3
      COMMON /ORANGE/  ANC, ASQ, A0, A0FAC, AXIM, B0, COLAMU, CYL,     ORANGE     2
     1                 DTPOS, EPS, GM1, GR, GZ, IM1,                   ORANGE     3
     2                 IELP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,      ORANGE     4
     3                 LOP2, MU, NPT, NQIM, NQI2, NUMIT, OM,           ORANGE     5
     4                 OMAGC, OMCYL, REZRUN, REZY0, THIRD, VTEM        ORANGE     6
      COMMON /WRITE/   NRVALS, RVALS(73), NANGLS, ANGLES(35), INEUT    ORANGE     7
      DIMENSION        X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),       DIMEN      2
     2                 V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),  DIMEN      3
     3                 E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),  DIMEN      4
     4                 VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),      DIMEN      5
     5                 UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
     6                 UMOMLC(1), ROL(1), RETALC(1), FOUTLC(1),        DIMEN      7
     7                 SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),    DIMEN      8
     8                 RZEDEN(1), GRIZ(1), VG(1), FSN(1)               DIMEN      9
      EQUIVALENCE      (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL   2
     1                 (AASC(4),U), (AASC(5),V), (AASC(6),RO),         EQVREAL    3
     2                 (AASC(7),MP,RMP,RCSQ,CENTX),                    EQVREAL    4
     3                 (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),         EQVREAL    5
     4                 (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),      EQVREAL    6
     5                 (AASC(12),UTIL,UL,CQ,EMOMLC),                   EQVREAL    7
     6                 (AASC(13),VTIL,VL,UMOMLC),                      EQVREAL    8
     7                 (AASC(14),ROL,RETALC,FOUTLC), (AASC(15),SIE),   EQVREAL    9
     8                 (AASC(16),DELSM,SIGPLC),                        EQVREAL   10
     9                 (AASC(17),GRIR,UG,RZEDEN),                      EQVREAL   11
     1                 (AASC(18),GRIZ,VG,FSN)                          EQVREAL   12
      REAL             LAM, LAMD, M, MP, MU, MU02                      EQVREAL   13
      DIMENSION        IX1(1), IX2(1), IY1(1), IY2(1), XCO(4),         YOKOUT    10
     1                 YCO(4), CON(100), AT(100)                       YOKOUT    11
      DIMENSION        TIC(2)                                          YOKOUT    12
      EQUIVALENCE (AT,IX1),(AT(2),IX2),(AT(3),IY1),(AT(4),IY2),(AT(5), YOKOUT    13
     1 XCO),(AT(9),YCO),(F1,CON)                                       YOKOUT    14
 4008 FORMAT           (1H1,*YAQUI OUTPUT*//6H      I,6H      J,       YOKOUT    15
     1                 12H            X,12H            Y,12H        U, YOKOUT    16
     2                 12H            V,12H          SIE,12H       RO, YOKOUT    17
     3                 12H          VOL,12H            D,              YOKOUT    18
     4                 12H            P/)                              YOKOUT    19
 4009 FORMAT           (2I6,1P9E12.4)                                  YOKOUT    20
 4080 FORMAT           (2X,A10,6X,6H T    ,1PE12.4,6X,6H NCYC ,I6/     YOKOUT    21
     1                 2X,12A6)                                        YOKOUT    22
 4087 FORMAT           (2H(T,I3,6H,F6.3))                              YOKOUT    23
 4088 FORMAT           (F9.3)                                          YOKOUT    24
 4090 FORMAT           (* ISOPYCNICS*)                                 YOKOUT    25
 4100 FORMAT           (* ISOTHERMS*)                                  YOKOUT    26
 4101 FORMAT           (1PE12.3)                                       YOKOUT    27
 4102 FORMAT           (1X,*L= *,1PE10.3)                              YOKOUT    28
 4103 FORMAT           (1X,*U= *,1PE10.3)                              YOKOUT    29
 4110 FORMAT           (* VORTICITY*)                                  YOKOUT    30
 4111 FORMAT           (* MAGNITUDE OF VELOCITY*)                      YOKOUT    31
 4120 FORMAT           (6H MIN  ,1PE12.4,6X,6H MAX  ,1PE12.4,6X,       YOKOUT    32
```

```
     1                  6H L     ,1PE12.4,6X,6H H     ,1PE12.4,6X,
     2                  6H DU    ,1PE12.4)
  412 FORMAT            (* MAXIMUM VORTICITY AT I =*,I3,*  J =*,I3)
  414 FORMAT            (* ZONES*/6H DRMIN,1PE12.4,6X,6H DRMAX,1PE12.4,
     1                  6X,6H DZMIN,1PE12.4,6X,6H DZMAX,1PE12.4/
     2                  6H XR    ,1PE12.4,6X,6H YB    ,1PE12.4,6X,
     3                  6H YT    ,1PE12.4)
  4150 FORMAT           (* VELOCITY VECTORS*/6H VMAX ,1PE12.4)
C
      IF (NCYC.EQ.0) TOUT=TIME+DTR
      IF (NCYC.GT.0) TOUT=1.15*(TOUT-TSTART)+TSTART
      IF (TOUT-T.GT.10.0*DT) TOUT=T+10.0*DT
      CALL OPEN (6LFSE112,2LS1,13312)
C     ---   PLOT PARTICLES
      CALL PARPLOT
C     ---   PLOT ZONES
      NTHRU=-1
      YCONVP=YCONV
      XCONVP=XCONV
      YLB=YB
   51 CONTINUE
      CALL ADV(1(
      DRMIN = DZMIN = 1.E+20
      DRMAX = DZMAX = VMAX = 0.
      CALL START
      DO 549 J=2,JP1
      DO 539 I=1,IBAR
      IPJ = IJ + NQ
      IPJP = IJP + NQ
      VMAX = AMAX1 (VMAX,ABS(U(IJ)),ABS(V(IJ)))
      X1 = X(IPJ)
      X2 = X(IPJP)
      X3 = X(IJP)
      X4 = X(IJ)
      Y1 = Y(IPJ)
      Y2 = Y(IPJP)
      Y3 = Y(IJP)
      Y4 = Y(IJ)
      X14=(X1-X4)**2+(Y1-Y4)**2
      X23=(X2-X3)**2+(Y2-Y3)**2
      Y21=(X2-X1)**2+(Y2-Y1)**2
      Y34=(X3-X4)**2+(Y3-Y4)**2
      DRMIN = AMIN1(DRMIN,X14,X23)
      DRMAX = AMAX1(DRMAX,X14,X23)
      DZMIN = AMIN1(DZMIN,Y21,Y34)
      DZMAX = AMAX1(DZMAX,Y21,Y34)
      IX1=FIXL+(X1-XL)*XCONVP
      IX2=FIXL+(X2-XL)*XCONVP
      IX3=FIXL+(X3-XL)*XCONVP
      IX4=FIXL+(X4-XL)*XCONVP
      IY1=FIYB+(Y1-YLB)* YCONVP
      IY2=FIYB+(Y2-YLB)* YCONVP
      IY3=FIYB+(Y3-YLB)* YCONVP
      IY4=FIYB+(Y4-YLB)* YCONVP
      IF(IY1.GT.IYB.OR.IY1.LT.IYT) GO TO 530
      IF(IY2.GT.IYB.OR.IY2.LT.IYT) GO TO 530
      IF(IX1.GT.IXR) GO TO 530
      IF(IX2.GT.IXR) GO TO 530
      IF (I.EQ.1) CALL DRV (IX3,IY3,IX4,IY4)
      IF (J.EQ.2) CALL DRV (IX4,IY4,IX1,IY1)
      CALL DRV (IX1,IY1,IX2,IY2)
      CALL DRV (IX2,IY2,IX3,IY3)
   53 IJ = IPJ
  539 IJP = IPJP
      CALL LOOP
  549 CONTINUE
      DRMIN=DSQRT(DRMIN)
      DRMAX=DSQRT(DRMAX)
```

```
      DZMIN=DSQRT(DZMIN)                                                YOKOUT 101
      DZMAX=DSQRT(DZMAX)                                                YOKOUT 102
      IF(NFRU.EQ.-1) GO TO 533                                          YOKOUT 103
  535 CALL DRV(IXL,IYT,IXR,IYT)                                         YOKOUT 104
      CALL DRV(IXR,IYT,IXR,IYB)                                         YOKOUT 105
      CALL DRV(IXR,IYB,IXL,IYB)                                         YOKOUT 106
      CALL DRV(IXL,IYB,IXL,IYT)                                         YOKOUT 107
      NYUP=YUP                                                          YOKOUT 108
      YUPI=NYUP                                                         YOKOUT 109
      NYLB=YLB+1                                                        YOKOUT 110
      YLBI=NYLB                                                         YOKOUT 111
      IX2=IXL+8                                                         YOKOUT 112
      IX3=IXR-8                                                         YOKOUT 113
      IY2=IYB-8                                                         YOKOUT 114
      IY3=IYT+8                                                         YOKOUT 115
      NEXP=3.321*ALOG10(0.1*(PYT-PYB))                                  YOKOUT 116
      IF(NEXP.LE.0) NEXP=NEXP-1                                         YOKOUT 117
      DTIC=2.**NEXP                                                     YOKOUT 118
      XTIC=0.                                                           YOKOUT 119
      YTIC=YLBI                                                         YOKOUT 120
  534 YTIC=YTIC-DTIC                                                    YOKOUT 121
      IF(YTIC.GT.YLB ) GO TO 534                                        YOKOUT 122
      YTIC=YTIC+DTIC                                                    YOKOUT 123
  532 IYI=FIYB+(YTIC-YLB)*YCONVP                                        YOKOUT 124
      IF(IYI.LT.IYT) GO TO 531                                          YOKOUT 125
      CALL DRV(IXL,IYI,IX2,IYI)                                         YOKOUT 126
      CALL DRV(IX3,IYI,IXR,IYI)                                         YOKOUT 127
      IWRITE=FLOAT(IYI)*0.0625                                          YOKOUT 128
      CALL LINCNT(IWRITE)                                               YOKOUT 129
      WRITE (12,4000)   YTIC                                            YOKOUT 130
      YTIC=YTIC+DTIC                                                    YOKOUT 131
      GO TO 532                                                         YOKOUT 132
  531 IXI=FIXL+(XTIC-XL)*XCONVP                                         YOKOUT 133
      IF(IXI.GT.IXR) GO TO 533                                          YOKOUT 134
      CALL DRV(IXI,IYB,IXI,IY2)                                         YOKOUT 135
      CALL DRV(IXI,IY3,IXI,IYT)                                         YOKOUT 136
      IWRITE=FLOAT(IXI)*0.125                                           YOKOUT 137
      ENCODE(11,4087,TIC) IWRITE                                        YOKOUT 138
      JWRITE=FLOAT(IYB)*0.0625+1.0                                      YOKOUT 139
      CALL LINCNT(JWRITE)                                               YOKOUT 140
      WRITE (12,TIC)   XTIC                                             YOKOUT 141
      XTIC=XTIC+DTIC                                                    YOKOUT 142
      GO TO 531                                                         YOKOUT 143
  533 CONTINUE                                                          YOKOUT 144
      GO TO 551                                                         YOKOUT 145
  552 CONTINUE                                                          YOKOUT 146
      YUP=PYT                                                           YOKOUT 147
      YLB=PYB                                                           YOKOUT 148
      XCONVP=PXCONV                                                     YOKOUT 149
      YCONVP=PYCONV                                                     YOKOUT 150
      FIYBO=FIYB                                                        YOKOUT 151
      FIYTO=FIYT                                                        YOKOUT 152
      FIXRO=FIXR                                                        YOKOUT 153
      FIXLO=FIXL                                                        YOKOUT 154
      IYBO=IYB                                                          YOKOUT 155
      IYTO=IYT                                                          YOKOUT 156
      IXRO=IXR                                                          YOKOUT 157
      IXLO=IXL                                                          YOKOUT 158
      FIYB=FIPYB                                                        YOKOUT 159
      FIYT=FIPYT                                                        YOKOUT 160
      FIXL=FIPXL                                                        YOKOUT 161
      FIXR=FIPXR                                                        YOKOUT 162
      IYB=IPYB                                                          YOKOUT 163
      IYT=IPYT                                                          YOKOUT 164
      IXL=IPXL                                                          YOKOUT 165
      IXR=IPXR                                                          YOKOUT 166
      GO TO 510                                                         YOKOUT 167
```

```
  551 CONTINUE
      IF(NTHRU.GE.1) GO TO 550
      CALL LINCNT(59)
      WRITE (12,4140)   DRMIN, DRMAX, DZMIN, DZMAX, XR, YB, YT
      WRITE ((2,4060)   JNM, T, NCYC, NAME
      IF(VMAX.LT.EMIC) GO TO 600
C     ---   VELOCITY VECTOR PLOT
  550 NTHRU=NTHRU+1
      IF (NTHRU EQ.3) GO TO 600
      DROU = VV/VMAX
      CALL ADV(1(
      CALL START
      DO 599 J=2,JP2
      DO 589 I=1,IP1
      IF (NTHRU.EQ.2) DROU=0.5*VV/DSQRT(U(IJ)**2+V(IJ)**2+EMIO)
      IY1=FIYB+(Y(IJ)-YLB)*YCONVP
      IF(IY1.GT.IYB.OR.IY1.LT.IYT) GO TO 589
      IY2=FIYB+(Y(IJ)+V(IJ)*DROU-YLB)*YCONVP
      IF(IY2.GT.IYB.OR.IY2.LT.IYT) GO TO 589
      IX1=FIXL+(X(IJ)-XL)*XCONVP
      IF(IX1.GT.IXR) GO TO 589
      IX2=FIXL+(X(IJ)-XL+U(IJ)*DROU)*XCONVP
      IF(IX2.GT.IXR) GO TO 589
  580 CALL DRV (IX1,IY1,IX2,IY2)
      CALL PLT (IX1,IY1,16)
  589 IJ = IJ + NQ
      CALL LOOP
  599 CONTINUE
      CALL LINCNT(60)
      WRITE ((2,4150)   VMAX
      WRITE ((2,4060)   JNM, T, NCYC, NAME
      IF(NTHRU.EQ.0) GO TO 552
      GO TO 555
C     --- CONTOUR PLOTS
  600 L=0
  610 L = L+1
      IF (L.EQ.5.AND.NCYC.GT.0) GO TO 490
      GO TO (620,620,640,620,400) L
  620 CALL START
      DO 639 J=2,JP1
      DO 629 I=1,IBAR
      CQ(IJ)=RO(IJ)
      IF(L.EQ.2) CQ(IJ)=SIE(IJ)
      IPJ=IJ+NQ
      IPJP=IJP+NQ
      IF (L.EQ.4) CQ(IJ)=0.25*DSQRT((U(IJ)+U(IPJ)+U(IPJP)+U(IJP))**2
     1  + ( V(IJ)+V(IPJ)+V(IPJP)+V(IJP))**2)
      IJP=IJP+NQ
  629 IJ = IJ + NQ
      CALL LOOP
  639 CONTINUE
      CALL DONE
      GO TO 700
  640 CALL START
      WMAX=EMIO
      DO 659 J=2,JP1
      DO 649 I=1,IBAR
      IPJ = IJ + NQ
      IPJP = IJP + NQ
      X1 = X(IPJ)
      Y1 = Y(IPJ)
      U1 = U(IPJ)
      V1 = V(IPJ)
      X2 = X(IPJP)
      Y2 = Y(IPJP)
      U2 = U(IPJP)
      V2 = V(IPJP)
      X3 = X(IJP)
```

```
      Y3 = Y(IJP)                                                  YOKOUT  236
      U3 = U(IJP)                                                  YOKOUT  237
      V3 = V(IJP)                                                  YOKOUT  238
      X4 = X(IJ)                                                   YOKOUT  239
      Y4 = Y(IJ)                                                   YOKOUT  240
      U4 = U(IJ)                                                   YOKOUT  241
      V4 = V(IJ)                                                   YOKOUT  242
      F1 = .125*RVOL(IJ)*(R(IPJ)+R(IPJP)+R(IJP)+R(IJ))             YOKOUT  243
      CQ(IJ) = R1*((U1+L4)*(X1-X4)+(V1+V4)*(Y1-Y4)                 YOKOUT  244
     2            +(U2+U1)*(X2-X1)+(V2+V1)*(Y2-Y1)                 YOKOUT  245
     3            +(U3+U2)*(X3-X2)+(V3+V2)*(Y3-Y2)                 YOKOUT  246
     4            +(U4+U3)*(X4-X3)+(V4+V3)*(Y4-Y3))                YOKOUT  247
      WSAV=WMAX                                                    YOKOUT  248
      WMAX=AMAX1(WMAX,ABS(CQ(IJ)))                                 YOKOUT  249
      IF(WSAV.NE.WMAX) ISVW=I                                      YOKOUT  250
      IF(WSAV.NE.WMAX) JSVW=J                                      YOKOUT  251
      IJ = IPJ                                                     YOKOUT  252
  649 IJP = IPJP                                                   YOKOUT  253
      CALL LOOP                                                    YOKOUT  254
  659 CONTINUE                                                     YOKOUT  255
      CALL DONE                                                    YOKOUT  256
  700 GMN = 1.E+6                                                  YOKOUT  257
      GMX = -GMN                                                   YOKOUT  258
      CALL START                                                   YOKOUT  259
      DO 719 J=2,JP1                                               YOKOUT  260
      DO 709 I=2,IBAR                                              YOKOUT  261
      GMN = AMIN1 (CQ(IJ),GMN)                                     YOKOUT  262
      GMX = AMAX1 (CQ(IJ),GMX)                                     YOKOUT  263
  709 IJ = IJ + NQ                                                 YOKOUT  264
      CALL LOOP                                                    YOKOUT  265
  719 CONTINUE                                                     YOKOUT  266
  720 CONTINUE                                                     YOKOUT  267
      IF (L.EQ.4) GO TO 745                                        YOKOUT  268
      XX = GMX/(GMN+EM10)                                          YOKOUT  269
      IF (XX.LE.2.0) GO TO 735                                     YOKOUT  270
      K=10.0/ALOG10(XX)                                            YOKOUT  271
      XX = K+1                                                     YOKOUT  272
      DQ = 10.**(1./XX)                                            YOKOUT  273
      K=ALOG10(GMN)                                                YOKOUT  274
      XX = 10.**(K-1)                                              YOKOUT  275
      K = 1                                                        YOKOUT  276
  72n XX = XX*DQ                                                   YOKOUT  277
      IF (XX.LT.GMN) GO TO 720                                     YOKOUT  278
  730 CON(K) = XX                                                  YOKOUT  279
      IF (XX.GT.GMX) GO TO 740                                     YOKOUT  280
      K = K+1                                                      YOKOUT  281
      XX = XX*DQ                                                   YOKOUT  282
      GO TO 730                                                    YOKOUT  283
  735 XX = GMX-GMN                                                 YOKOUT  284
      IF (ABS(XX).LT.1.E-3*AMAX1(ABS(GMX),ABS(GMN))) GO TO 610     YOKOUT  285
      DQ = .1*(XX+.001)                                            YOKOUT  286
      DO 739 K=1,11                                                YOKOUT  287
  739 CON(K) = GMN+(FLOAT(K-1))*DQ                                 YOKOUT  288
      K = 11                                                       YOKOUT  289
  740 CALL ADV(1)                                                  YOKOUT  290
      IWRITE=50                                                    YOKOUT  291
      KRG=K-1                                                      YOKOUT  292
      DO 781 KK = 1 , KRG                                          YOKOUT  293
      IF(KK.NE.1) GO TO 782                                        YOKOUT  294
      ENCODE(14,4102,BCD) CON(KK)                                  YOKOUT  295
      GO TO 783                                                    YOKOUT  296
  782 IF(KK.NE.KRG) GO TO 784                                      YOKOUT  297
      ENCODE(14,4103,BCD) CON(KK)                                  YOKOUT  298
  783 CALL WLCH(452,IWRITE,14,BCD,1)                               YOKOUT  299
      GO TO 781                                                    YOKOUT  300
  784 ENCODE(10,4101,BCD) CON(KK)                                  YOKOUT  301
      CALL WLCH(500,IWRITE,10,BCD,1)                               YOKOUT  302
  781 IWRITE=IWRITE+16                                             YOKOUT  303
```

```
      CALL LINCNT(58)
      GO TO (750,760,770,765), L
  745 CON(1)=-0.001*GMX
      CON(2)=0.001*GMX
      CON(3)=0.005*GMX
      CON(4)=0.010*GMX
      CON(5)=0.050*GMX
      CON(6)=0.100*GMX
      CON(7)=0.300*GMX
      CON(8)=0.500*GMX
      CON(9)=0.700*GMX
      CON(10)=0.8*GMX
      CON(11)=0.9*GMX
      CON(12)=0.99*GMX
      CON(13)=1.01*GMX
      K=13
  747 CONTINUE
      GO TO 740
  750 WRITE(12,4090)
      GO TO 780
  765 WRITE(12,4111)
      GO TO 780
  760 WRITE(12,4100)
      GO TO 780
  770 WRITE(12,4110)
      WRITE (12,4121)   ISVW, JSVW
  780 WRITE (12,4120)   GMN, GMX, CON(1), CON(K-1), DG
      WRITE (12,4080)   JNM, T, NCYC, NAME
      CALL START
      DO 899 J=2,JBAR
      CALL LOOP
      DO 869 I=1,IBAR
      IPJ = IJ + NQ
      IPJM = IJM + NQ
      N = 0
      DO 879 KK=1,K
      K1 = K2 = K3 = K4 = 0
      IF (CG(IJM)  .LE.CON(KK)) K1=1
      IF (CG(IPJM).LE.CON(KK)) K2=1
      IF (CG(IJ)   .LE.CON(KK)) K3=1
      IF (CG(IPJ)  .LE.CON(KK)) K4=1
      IF (K1*K2*K3*K4 .NE. 0 .OR. K1+K2+K3+K4 .EQ. 0) GO TO 879
      IF (N.GT.0) GO TO 800
      IJB = IJM
      IJA = IJ
      DO 799 JJ=1,2
      DO 789 II=1,2
      IPJB = IJB+NQ
      IPJA = IJA+NQ
      N = N+1
      XCU(N) = .25*(X(IPJB)+X(IPJA)+X(IJA)+X(IJB))
      YCU(N) = .25*(Y(IPJB)+Y(IPJA)+Y(IJA)+Y(IJB))
      IJA = IPJA
  789 IJB = IPJB
      IJB = IJ
  799 IJA = IJP
  800 LL = 0
      IF (K1+K3.NE.1) GO TO 810
      IC1 = 1
      IC2 = 3
      IJ1 = IJM
      IJ2 = IJ
      ASSIGN 810 TO KR1
      GO TO 840
  810 IF (K1+K2.NE.1) GO TO 820
      IC1 = 1
      IC2 = 2
      IJ1 = IJM
```

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      IJ2 = IPJM                                                        YOKOUT 372
      ASSIGN 820 TO KRI                                                 YOKOUT 373
      GO TO 840                                                         YOKOUT 374
  820 IF (K2+K4.NE.1) GO TO 830                                         YOKOUT 375
      IC1 = 2                                                           YOKOUT 376
      IC2 = 4                                                           YOKOUT 377
      IJ1 = IPJM                                                        YOKOUT 378
      IJ2 = IPJ                                                         YOKOUT 379
      ASSIGN 830 TO KRI                                                 YOKOUT 380
      GO TO 840                                                         YOKOUT 381
  830 IF (K3+K4.NE.1) GO TO 879                                         YOKOUT 382
      IC1 = 3                                                           YOKOUT 383
      IC2 = 4                                                           YOKOUT 384
      IJ1 = IJ                                                          YOKOUT 385
      IJ2 = IPJ                                                         YOKOUT 386
      ASSIGN 879 TO KRI                                                 YOKOUT 387
  840 LL = LL+1                                                         YOKOUT 388
      XX = (CON(KK)-CQ(IJ1))/(CQ(IJ2)-CQ(IJ1))                          YOKOUT 389
      IX1(LL)=FIXL+(XCO(IC1)+XX*(XCO(IC2)-XCO(IC1))-XL)*XCONVP          YOKOUT 390
      IY1(LL)=FIYB+(YCO(IC1)+XX*(YCO(IC2)-YCO(IC1))-YLB)*YCONVP         YOKOUT 391
      IF(IY1(LL).GT.IYB.OR.IY1(LL).LT.IYT) GO TO 881                    YOKOUT 392
      IF(IX1(LL).LT.IXL.OR.IX1(LL).GT.IXR)) GO TO 881                   YOKOUT 393
      IF (LL.LT.2) GO TO KRI                                            YOKOUT 394
      CALL DRV (IX1,IY1,IX2,IY2)                                        YOKOUT 395
      IF(KK.EQ.5) CALL PLT(IX1,IY1,16)                                  YOKOUT 396
      IF (KK.EQ.1)    CALL PLT (IX1,IY1,35)                             YOKOUT 397
      IF (KK.EQ.K-1) CALL PLT (IX1,IY1,24)                              YOKOUT 398
  881 LL=0                                                              YOKOUT 399
      IF((J2.EQ.IPJM) GO TO KRI                                         YOKOUT 400
  879 CONTINUE                                                          YOKOUT 401
      IJM = IPJM                                                        YOKOUT 402
      IJ = IPJ                                                          YOKOUT 403
  889 IJP = IJP+NG                                                      YOKOUT 404
  899 CONTINUE                                                          YOKOUT 405
      CALL START                                                        YOKOUT 406
      CALL DRV(IXL,IYT,IXR,IYT)                                         YOKOUT 407
      CALL DRV(IXR,IYT,IXR,IYB)                                         YOKOUT 408
      CALL DRV(IXR,IYB,IXL,IYB)                                         YOKOUT 409
      CALL DRV(IXL,IYB,IXL,IYT)                                         YOKOUT 410
      KYOP=YOP                                                          YOKOUT 411
      YOP1=KYOP                                                         YOKOUT 412
      KYLB=YLB+1.                                                       YOKOUT 413
      YLB1=KYLB                                                         YOKOUT 414
      IX2=IXL+8                                                         YOKOUT 415
      IX3=IXR-8                                                         YOKOUT 416
      IY2=IYB-8                                                         YOKOUT 417
      IY3=IYT+8                                                         YOKOUT 418
      NEXP=3.321*ALOG10(0.1*(PYT-PYB))                                  YOKOUT 419
      IF(NEXP.LE.0) NEXP=NEXP-1                                         YOKOUT 420
      DTIC=2.**NEXP                                                     YOKOUT 421
      XTIC=0.                                                           YOKOUT 422
      YTIC=YLB1                                                         YOKOUT 423
  584 YTIC=YTIC-DTIC                                                    YOKOUT 424
      IF(YTIC.GT.YLB ) GO TO 584                                        YOKOUT 425
      YTIC=YTIC+DTIC                                                    YOKOUT 426
  582 IY1=FIYB+(YTIC-YLB)*YCONVP                                        YOKOUT 427
      IF(IY1.LT.IYT) GO TO 581                                          YOKOUT 428
      CALL DRV(IXL,IY1,IX2,IY1)                                         YOKOUT 429
      CALL DRV(IX3,IY1,IXR,IY1)                                         YOKOUT 430
      IHITE=FLOAT(IY1)*0.0625                                           YOKOUT 431
      CALL L(NCNT,IHITE)                                                YOKOUT 432
      WRITE (12,4088)    YTIC                                           YOKOUT 433
      YTIC=YTIC+DTIC                                                    YOKOUT 434
      GO TO 582                                                         YOKOUT 435
  581 IX1=FIXL+(XTIC-XL)*XCONVP                                         YOKOUT 436
      IF(IX1.GT.IXR) GO TO 583                                          YOKOUT 437
      CALL DRV(IX1,IYB,IX1,IY2)                                         YOKOUT 438
      CALL DRV(IX1,IY3,IX1,IYT)                                         YOKOUT 439
```

```
      IHITE=FLOAT(IX1)*0.125
      ENCODE(7,4087,TIC) IHITE
      JPITE=FLOAT(IY8)*0.0625+1.0
      CALL LINCNT(JPITE)
      WRITE (12,TIC)    XTIC
      XTIC=XTIC+DTIC
      GO TO 581
  581 CONTINUE
      GO TO 610
C     ---    LONG PRINT AND FILM
  420 CALL ADV(1)
      LINES=0
      CALL START
      DO 489 J=1,JP2
      DO 479 I=1,IP1
      IPJM = IJM + NQ
      IPJ  = IJ + NQ
      D=PRV=PRSIE=0.0
      IF (J.EQ.1) GO TO 450
      IF (I.EQ.IP1 .OR. J.EQ.JP2) GO TO 450
      PRSIE = SIE(IJM)
      PRV=1./RVOL(IJM)
      X1 = X(IPJM)
      Y1 = Y(IPJM)
      R1 = R(IPJM)
      U1 = U(IPJM)
      V1 = V(IPJM)
      X2 = X(IPJ)
      Y2 = Y(IPJ)
      R2 = R(IPJ)
      U2 = U(IPJ)
      V2 = V(IPJ)
      X3 = X(IJ)
      Y3 = Y(IJ)
      R3 = R(IJ)
      U3 = U(IJ)
      V3 = V(IJ)
      X4 = X(IJM)
      Y4 = Y(IJM)
      R4 = R(IJM)
      U4 = U(IJM)
      V4 = V(IJM)
      D = .25*RVOL(IJM)*((R1+R2)*((U1+U2)*(Y2-Y1)+(V1+V2)*(X1-X2))
     1                 +(R2+R3)*((U2+U3)*(Y3-Y2)+(V2+V3)*(X2-X3))
     2                 +(R3+R4)*((U3+U4)*(Y4-Y3)+(V3+V4)*(X3-X4))
     3                 +(R4+R1)*((U4+U1)*(Y1-Y4)+(V4+V1)*(X4-X1)))
  450 IF (LINES.EQ.0) WRITE (12,4008)
      LINES=LINES+1
      IF (LINES.GT.50) LINES=0
      WRITE (12,4009)    I, J, X(IJM), Y(IJM), U(IJM), V(IJM), PRSIE,
     1                   RO(IJM), PRV, D, P(IJM)
  46  IJ = IPJ
  479 IJM = IPJM
      CALL LOOP
  489 CONTINUE
C     ---    RESTORE FILM PARAMETERS
  490 CALL EMPTY
      FIYB=FIYB0
      FIYT=FIYT0
      FIXR=FIXR0
      FIXL=FIXL0
      IYB=IYB0
      IYT=IYT0
      IXR=IXR0
      IXL=IXL0
      CALL OPEN (6LFSET12,2LS1,S12)
      CALL ADV(1)
```

```
486            RETURN                                                                YOKOUT    507
467            END                                                                   YOKOUT    508
 SINGLY REFERENCED VARIABLES
     460 -  471*     CYL      -R  11CO   GR       -R  ()CO   JUTC     -I  10CO   NQIb     -I  11CO   RDT      -R  10CO   TEMP    ()R   8CO
     580 -  (E)*     UIL      -R  1:CC   GRDVEL   -R   8CO   JUIV     -I  11CO   NQI2     -1  11CO   REAL     -   15F    THIRO   -R  11CO
     710 -  252*     UICSAV   -R  1:CO   GZ       -R  11CO   JJ       -I 33400   NRVALS   -I  12CO   REO      -    8CN   THY     -R   6CO
     747 -  3.5*     UIU2     -R  1:CC   IDTC     -I  10CO   JP4      -I  11CO   NUMIT    -I  11CO   RETURN   -  486F   TNEUT   -R  12CO
 AA1      ()R   5LC  UJFCS    -R  1(CO   IUIV     -I  10CO   KXI      -I  11CO   UM       -R  ()CO   REZHON   -R  11CO   VIEM    -R  11CO
 AA2      ))R   6LC  UIV      -R  10CO   IECP     -I  11CO   LAMU     -R  15RL   CMANC    -R  ()CO   REZSIE   -R   8CO   WHITE   -   12CN
 ANC      -R   11CU  UIVSAV   -R  10CC   II       -I 335(0   LUP2     -I  11CO   UPCYL    -R  ()CO   REZYU    -R  11CC   YELLOW  -   10CN
 ANGLES   ()R  12CU  UVCY     -R  1:CO   IJPS     -(   8CO   MUU2     -R  15RL   CPCEN    ()R  2CO   RIBAR    -R   9CO   YLC1    -    5CN
 ASG      -R   11CO  LMPTY    -  4755U   IP2      -I  11CU   NANGLS   -I  12CO   CPTMP    ()R  2CO   RLCI     -    7CN   YLC2    -    6CN
 A0       -R   1(CU  EPS      -R  11CC   ISCF1    -I   8CO   NUUMP    -(   8CO   ORANGE   -   1(CN   RVALS   ()R  12CC   YOKOUT  -    15U
 A0FAC    -R   1(CU  EJAB     ()R  2CO   ISCF2    -I   8CU   NFRQ     -I   2CO   PAPPLOT  -   395U   SIGA    ()R   7LC   YSC1    -    3CN
 A0N      -R   1(CU  FIPYI    -R 1SI :   ISC2     -I   8CU   NUPO     -I   2CO   PINK     -    4CN   SILVER   -    9CN
 BTBL     ))R   2CU  FREG     ()R  2CO   ISC3     -I   8CU   NOPT     -(   2CC   PTAB    ()R   2CO   SPTBL   ()R   2CO
 BC       -R   11CU  FI       -R  1BEG   IJAB     ()1 11CU   NPT      -I  11CO   PXL      -R   9CO   STATE    -    2CN
 COLANU,  -R   (ICU  GN(      -R  11CC   ITV      -I   8CC   NWI      -I   8CO   PXR      -R   9CO   TAMB     -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
   400 -    194     434*
   456 -    442     443     407*
   479 -    43600   47?*
   489 -    43700   474*
   490 -    193     475*
   51. -     44*    (58
   530 -     78      79      8.      8I      86*
   531 -    116     124*    134
   532 -    (15*    123
   533 -     94     125     135*
   534 -    112*    113
   535 -     95*    19.
   539 -     5.00    87*
   549 -     49100   89*
   550 -    (8.     165*
   551 -    136     159*
   552 -    137*    169
   581 -    4(3     421*    431
   582 -    412*    42.
   583 -    422     432*
   584 -    4(9*    41.
   589 -    (7100   174     176     178     180     (83*
   599 -    17.00   185*
   600 -    164     166     191*
   610 -    192*    27.     433
   620 -    194     194     194     195*
   629 -    (9700   2.4*
   639 -    .(9600  206*
   640 -    194     219*
   649 -    21200   238*
   659 -    2((00   24 *
   700 -    2(R     242*
   709 -    24600   249*
   719 -    24500   251*
   72. -    262*    263
   730 -.   264*    268
   735 -    255     269*
   739 -    27200   273*
   740 -    265     275*    3.6
   745 -    253     291*
   750 -    291     307*
   760 -    290     311*
   765 -    290     319*
   770 -    290     313*
   780 -    3.8     31.     312     315*
   781 -    27600   265     288*
   782 -    279     282*
   783 -    28(     284*
```

```
     784 -   282     280*
     789 -   335DO   342*
     799 -   334DO   344*
     800 -   331     345*
     810 -   346     351AS  353*
     820 -   353     358AS  360*
     830 -   36.     365AS  367*
     840 -   352     359    366    373*
     879 -   324DO   23.    367    372AS  386*
     881 -   377     378    384*
     889 -   32?DO   369*
     899 -   31?DO   39.*
    4008 -    19*    467WR
    4009 -    20*    47.WR
    4080 -    21*    163WR  188WR  316WR
    4087 -    22*    129EC  426EC
    4088 -    23*    121WR  418WR
    4090 -    24*    3.7WR
    4100 -    25*    311WR
    4101 -    26*    280EC
    4102 -    27*    28.EC
    4103 -    28*    283EC
    4110 -    29*    313WR
    4111 -    3.*    319WR
    4120 -    31*    315WR
    4121 -    32*    314WR
    4140 -    33*    162WR
    4150 -    34*    187WR
AASC    ()R    3CO   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
              14EQ   14EQ
ABS     -     53SU   53SU   234SU  270SU  270SU  270SU
AOV     -     45SU   166SU  275SU  434SU  485SU
AMAXI   -     53SU   67SU   69SU   234SU  248SU  270SU
AMINI   -     66SU   66SU   247SU
ASSIGN  -     351F   350F   365F   372F
AT      ()R   16DI   18EQ   18EQ   18EQ   18EQ   18EQ   18EQ
BCD     -R    28?EC  283EC  284AG  286EC  287AG
BETALC  ()R   13DI   14EQ
CENTX   ()R   13DI   14EQ
CENTY   ()R   13DI   14EQ
COMMON  -     ?F     3F     4F     8F     9F     10F    11F    12F
CON     ()R   16DI   16EQ   264=   273=   280EC  283EC  286EC  291=   292=   293=   294=   295=   296=   297=   298=   299=   300=
              3()=   302=   3.3=   315WR  315WR  326    327    328    329    374
CQ      ()R   13DI   14EQ   198=   199=   202=   232=   234    247    248    326    327    328    329    374    374    374
D       -R    441=   460=   470WR
DELSM   ()R   13DI   14EQ
DIMENSI -     13F    16F    17F
DONE    -     207SU  241SU
DQ      -R    256=   262    267    271=   273    315WR
DRMAX   -R    47=    67=    67     91=    91     162WR
DRMIN   -R    46=    66=    66     90=    90     162WR
DROU    -R    167=   172=   175    179
DRV     -     87SU   83SU   84SU   85SU   95SU   96SU   97SU   98SU   117SU  118SU  126SU  127SU  181SU  380SU  392SU  393SU  394SU
              395SU  414SU  415SU  423SU  424SU
DT      -R    6CO    37     37
DTIC    -R    1?9=   112    114    122    133    406=   409    411    419    430
DTR     -R    8CO    35
DZMAX   -R    47=    69=    69     93=    93     162WR
DZMIN   -R    46=    68=    68     92=    92     162WR
E       ()R   13DI   14EQ
EMOMLC  ()R   13DI   14EQ
EMIL    -R    6CO    164    172    210    254
ENCODE  -     129F   28 F   263F   286F   426F
EP      ()R   13DI   14EQ
EQUIVAL -     14F    18F
ETIL    ()R   13DI   14EQ
FIPXL   -R    9CO    152
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FIPXR   -R    9CO   153
FIPYO   -R    9CO   155
FIXL    -R    9CO   71     71     72     73     124    145    152=   177    179    375    421    479=
FIXLO   -R   145=   479
FIXR    -R    9CO   144    153=   478=
FIXRO   -R   144=   476
FIYB    -R    9CO   74     75     76     77     115    142    150=   173    175    376    412    476=
FIYBO   -R   142=   476
FIYT    -R   143    151=   477=
FIYTO   -R   143=   477
FLOAT   -    119SU  128SU  130SU  273SU  416SU  425SU  427SU
FORMAT  -    19F    20F    21F    22F    23F    24F    25F    26F    27F    28F    29F    30F    31F    32F    33F    34F
FOUTLC  ()R  130I   14EG
FSN     ()P  130I   14EG
GRIR    ()R  130I   14EG
GRIZ    ()R  130I   14EG
I       -I    4CO   5 00   62     17100  19700  21200  235    24600  32000  43800  443    470WR
IBAR    -I    6CO   5 00   19700  21200  24600
IC1     -I   347=   354=   361=   368=   375    375    376    376
IC2     -I   348=   355=   362=   369=   375    376
IJ      -I    4CO   51     53     53     57     61     66=    172    172    173    175    175    177    179    179    183=   183
             195    196    199    199    200    202    202    202    204=   204    213    227    228    229    230    231    231
             232    234    237=   247    248    249=   249    321    328    333    343    350    370    388=   440    456    457
             458    459    460    471=
IJA     -I   333=   337    339    340    341=   344=
IJB     -I   332=   336    339    340    342=   343=
IJM     -I    4CO   322    326    332    349    350    387=   439    444    445    461    462    463    464    465    466    470WR
             470WR  470WR  470WR  470WR  470WR  472=
IJP     -I    4CO   52     56     60     87=    201    202    202    203=   203    214    223    224    225    226    231    238=
             344    389=   389
IJ1     -I   349=   356=   363=   370=   374    374
IJ2     -I   351=   357=   364=   371=   374    365
IMI     -I   11CO   32 00
IPJ     -I   51=    54     58     86     200=   202    202    213=   215    216    217    218    231    237    321=   329    364
             371    388    446=   451    452    453    454    455    471
IPJA    -I   337=   339    340    341
IPJB    -I   336=   339    340    342
IPJM    -I   322=   327    357    363    385    387    439=   446    447    448    449    450    472
IPJP    -I   52=    55     59     87     201=   202    202    214=   219    220    221    222    231    238
IPXL    -I    9CO   156
IPXR    -I    9CO   157
IPYB    -I    9CO   154
IPYT    -I    9CO   155
IP1     -I    6CO   17100  43800  443
IRITE   -I   119=   128AG  128=   129EC  276=   284AG  287AG  288=   288    416=   417AG  425=   426EC
ISVW    -I   235=   314WR
IXL     -I    9CO   95AG   97AG   98AG   98AG   103    117AG  149    156=   378    392AG  394AG  395AG  395AG  400    414AG  483=
IXLO    -I   149=   483
IXR     -I    9CO   80     81     95AG   96AG   96AG   97AG   104    118AG  125    148    157=   178    180    378    392AG  393AG
             393AG  394AG  401    415AG  422    482=
IXRO    -I   148=   482
IX1     ()I  1EDI   18EG   70=    80     83AG   84AG   124=   125    126AG  126AG  127AG  127AG  128    177=   178    181AG  182AG
             372=   374    376    380AG  381AG  382AG  383AG  421=   422    423AG  423AG  424AG  424AG  425
IX2     ()I  16OC   18EG   71=    81     84AG   85AG   103=   117AG  179=   180    181AG  382AG  400=   414AG
IX3     -I   72=    82AG   85AG   104    118AG  401=   415AG
IX4     -I   73=    84AG   83AG
IYB     -I    9CO   78     79     96AG   97AG   97AG   98AG   105    126AG  130    146    154=   174    176    377    393AG  394AG
             394AG  395AG  402    423AG  427    464=
IYBO    -I   146=   484
IYT     -I    9CO   78     79     95AG   95AG   96AG   98AG   106    116    127AG  147    155=   174    176    377    392AG  392AG
             393AG  395AG  413    413    424AG  481=
IYTO    -I   141=   481
IY1     ()I  1EDI   18EG   74=    78     78     83AG   84AG   115=   116    117AG  117AG  118AG  118AG  119    173=   174    174
             181AG  182AG  376=   377    377    380AG  381AG  382AG  383AG  412=   413    414AG  414AG  415AG  415AG  416
IY2     ()I  1EDI   18EG   75=    79     79     84AG   85AG   105=   126AG  175=   176    176    181AG  380AG  402=   423AG
IY3     -I   76=    82AG   85AG   106=   127AG  403=   424AG
IY4     -I   77=    82AG   83AG
J       -I    4CO   49OO   83     17600  19600  21100  236    24500  31800  437C0  442    443    470WR
JBAR    -I    8CO   31900
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JHM      -I   ()CU   16.(=   186WR   316WR
JP1      -I    6CO   4400    1960)C  21100   24500
JP2      -I    6CO   17 00   43700   443
JRITE    -I   13.=   131AG   427=    428AG
JSVR     -I   236=   314WR
K        -I   256=   257     259=    261     261=    264     266=    266     27200   273     273     274=    277     304=    315WR   32400   383
KK       -I   27600  279     28.EC   282     283EC   286EC   32400   326     327     328     329     374     381     382     383
KRG      -I   277=   27000   282
KR1      -I   351AS  358AS   365AS   372AS   379     365
K1       -I   325=   326=    33.     330     346     353
K2       -I   325=   327=    330     330     353     360
K3       -I   325=   328=    333     330     346     367
K4       -I   325=   329=    330     330     360     367
L        -I   (9)=   (92=    192     193     194     199     202     253     290
LAM      -R    11CU  15RL
LCM      -     5F    6F      7F
LINCNT   -    (2 SU  131SU   161SC   186SU   285SU   417SU   428SU
LINES    -I   435=   467     466=    468     469     469=
LL       -I   345=   373=    373     375     376     377     377     378     378     379     384=
LOOP     -     86SU  184SU   2 5SU   239SU   256SU   319SU   473SU
M        ()R   1301  14LG    15RL
MP       ()R   1301  14LG    15RL
MU       -R    11CU  15RL
N        -I   323=   331     338=    338     339     340
NAME     ()I   6CO   163WR   188WR   316WR
NCYC     -I    6CO   35      36      163WR   188WR   193     316WR
NEXP     -I   107=   108     108=    108     109     404=    405     405=    405     406
NQ       -I    6CO   51      52      183     200     201     203     204     213     214     249     321     322     336     337     389     439
              446
NTHRU    -I    41=   94      160     165=    165     166     172     189
NYLB     -I   101=   102     398=    399
NYUP     -I    99=   100     396=    397
OPEN     -     3BSU  484SU
P        ()R   1301  14LG    470WR
PL       ()R   1301  14EC
PLT      -    182SU  381SU   382SU   383SU
PRSIE    -R   441=   444=    470WR
PFI      -R   441=   445=    47.WR
PXCONV   -R    9CO   14
PYB      -R    9CO   117     139     444
PYCONV   -R    9CO   141
PYI      -R    9CO   1.7     138     444
QLOGIO   -    175U   256SU   259SU   444SU
QMRI     -R   247=   243     247=    247     254     259     263     269     270     273     315WR
QRX      -R   243=   240=    248     254     265     269     270     291     292     293     294     295     296     297     298     299     300
              3.(    3.2     3.3     31SWR
QSQRT    -     9.SU  91SU    92SU    93SU    172SU   2.2SU
R        ()R   1301  14LG    231     231     231     231     448     453     458     463
RCSQ     ()R   1301  14LG
RM       ()R   1301  14LG
RMP      ()R   1301  14LG
RO       ()R   1301  14LG    198     470WR
ROL      ()R   1301  14LG
RVOL     ()R   1301  14EC    231     445     466
RZERO    ()R   1301  14LG
R1       -R   231=   232     448=    466     466
R2       -R   452=   466     466
R3       -R   458=   466     466
R4       -R   463=   466     466
SIE      ()R   1301  14LG    199     444
SIGPLC   ()R   1301  14LG
START    -     48SU  169SU   195SU   219SU   244SU   317SU   391SU   436SU
T        -R    6CO   37      37      163WR   188WR   316WR
TIC      ()R   17C1  129EC   132WR   426EC   429DR
TIME     -R    6CO   35
TOUT     -R    6CO   35=     36=     36      37      37=
TSTART   -R    6CO   36      36
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```
U        ()R   1301   14EU   53    172   179   202   202   202   202   202   217   221   225   229   449   454   459   464
               47-WR
UG       ()R   1301   14EU
UL       ()R   1301   14EU
UMOMLC   ()R   1301   14EU
UP       ()R   1301   14EU
UTIL     ()R   1301   14EU
U1       -R    217=   232    232   449=  466   466
U2       -R    221=   232    232   454=  466   466
U3       -R    225=   232    232   459=  466   466
U4       -R    229=   232    232   464=  466   466
V        ()R   1301   14EU   53    172   175   202   202   202   202   218   222   226   230   450   455   460   465
               47-WR
VG       ()R   1301   14EU
VL       ()R   1301   14EU
VMAX     -R    47=    53=    53    164   167   187WR
VP       ()R   1301   14EU
VTIL     ()R   1301   14EU
VV       -R    9CU    167    172
V1       -R    218=   232    232   450=  466   466
V2       -R    222=   232    232   455=  466   466
V3       -R    226=   232    232   460=  466   466
V4       -R    230=   232    232   465=  466   466
WLCH     -     28450  28750
WMAX     -R    211=   233    234=  234   235   236
WRITE    -     (2)F   132F   162F  163F  187F  188F  307F  309F  311F  313F  314F  315F  316F  418F  429F  467F  470F
WSAV     -R    233=   235    236
X        ()R   1301   14EU   54    55    56    57    177   179   215   219   223   227   339   339   339   339   446
               451    456    461   470WR
XCO      ()R   1601   16EU   339=  375   375   375
XCONV    -R    9CU    42
XCONVP   -R    42=    70     71    72    73    124   140=  177   179   375   421
XL       -R    9CU    70     71    72    73    124   177   179   375   421
XPAR     ()R   1301   14EU
XR       -R    9CU    162WR
XTIC     -R    111=   124    132WR 133=  133   407=  421   429WR 430=  430
XX       -R    254=   255    256   257=  258   260=  262=  262   263   264   265   267=  267   269=  270   271   374=
               375    376
X1       -R    54=    62     64    70    215=  232   232   446=  466   466
X14      -R    62=    66     67
X2       -R    55=    63     64    71    219=  232   232   451=  466   466
X23      -R    63=    66     67
X3       -R    56=    63     65    72    223=  232   232   456=  466   466
X4       -R    57=    62     65    73    227=  232   232   461=  466   466
Y        ()R   1301   14EU   58    59    60    61    173   175   216   220   224   228   340   340   340   340   447
               452    457    462   470WR
YB       -R    9CU    43     162WR
YCO      ()R   1601   16EU   340=  376   376   376
YCONV    -R    9CU    41
YCONVP   -R    41=    74     75    76    77    115   141=  173   175   376   412
YLB      -R    43=    74     75    76    77    111   113   115   139=  173   175   376   398   410   412
YLB1     -R    112=   113    399=  408
YPAR     ()R   1301   14EU
YT       -R    9CU    162WR
YTIC     -R    111=   112=   112   113   114=  114   115   121WR 122=  122   408=  409=  409   410   411=  411   412
               416WR  419=   419
YUP      -R    99     136=   396
YUPI     -R    100=   397=
Y1       -R    58=    62     64    74    216=  232   232   447=  466   466
Y2       -R    59=    63     64    75    220=  232   232   452=  466   466
Y21      -R    64=    68     69
Y3       -R    61=    63     65    76    224=  232   232   457=  466   466
Y34      -R    65=    68     69
Y4       -R    61=    62     65    77    228=  232   232   462=  466   466
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      SUBROUTINE PARPLOT                                              PARPLOT    2
      COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),        ALLKOM     2
     1                  FREQ(100), SPTHL(310), PTAB(300), ETAB(300),   ALLKOM     3
     2                  BTBL(300)                                      ALLKOM     4
      COMMON /YSCI/     AASC(5454)                                     ALLKOM     5
      COMMON /PINK/     I, IJ, IJM, IJP, J                             ALLKOM     6
      LCM /YLCI/        AA1(131400)                                    ALLKOM     7
      LCM /YLC2/        AA2(131400)                                    ALLKOM     8
      LCM /RLCI/        SIGA(39900)                                    ALLKOM     9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,   ALLKOM    10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,      ALLKOM    11
     2                  JP1, JP2, NCYC, NUUMP, NQ, NQI, RE/SIE, TAMB,  ALLKOM    12
     3                  TEMP(7500), I, TIME, TOUT, TSTART, THY         ALLKOM    13
      COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,        SILVER     2
     1                  IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,         SILVER     3
     2                  IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,       SILVER     4
     3                  RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT        SILVER     5
      COMMON /YELLOW/   DTC, DTCSAV, DTO2, DTV, DIVSAV,                YELLOW     2
     1                  DVOY, IDTC, IDTV, JDTC, JDTV, RDT              YELLOW     3
      COMMON /ORANGE/   ANC, ASG, AO, AUFAC, AOM, BO, COLAMU, CYL,     ORANGE     2
     1                  DIPOS, EPS, GM, GR, GZ, IM,                    ORANGE     3
     2                  IECP, IP2, ITAB(10,6), JNM, JP4, KXI, LAM,     ORANGE     4
     3                  LJP2, MU, NPT, NQIM, NQI2, NUMII, OM,          ORANGE     5
     4                  OMANC, OMCYL, REZRON, REZYO, THIRD, VTEM       ORANGE     6
      COMMON /WHITE/    DRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT   ORANGE     7
      DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),      DIMEN      2
     2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1), DIMEN      3
     3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1), DIMEN      4
     4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),     DIMEN      5
     5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),       DIMEN      6
     6                  HMOMLC(1), ROL(1), RETALC(1), FOUTLC(1),       DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),   DIMEN      8
     8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)              DIMEN      9
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL  2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),        EQVREAL    3
     2                  (AASC(7),MP,RMP,RCSQ,CENTX),                   EQVREAL    4
     3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),        EQVREAL    5
     4                  (AASC(10),M,RM,VP), (AASC(11),P,UL,EP,UP),     EQVREAL    6
     5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                  EQVREAL    7
     6                  (AASC(13),VTIL,VL,HMOMLC),                     EQVREAL    8
     7                  (AASC(14),ROL,RETALC,FOUTLC), (AASC(15),SIE),  EQVREAL    9
     8                  (AASC(16),DELSM,SIGPLC),                       EQVREAL   10
     9                  (AASC(17),GRIR,UG,RZEDEN),                     EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                         EQVREAL   12
      REAL              LAM, LAMO, M, MP, MU, MUO2                     EQVREAL   13
      DIMENSION         TIL(2)                                         PARPLOT    9
 3090 FORMAT            (1H ,*PARTICLES*/6X6H PDR  ,1PE12.4,6X,6H POZ  , PARPLOT  10
     1                  1PE12.4,6X,6H PXR  ,1PE12.4,6X,6H PYB  ,       PARPLOT   11
     2                  1PE12.4,6X,6H PYT  ,1PE12.4)                   PARPLOT   12
 3095 FORMAT            (2X,A10,6X,6H T    ,1PE12.4,6X,6H NCYC ,I6/    PARPLOT   13
     1                  2X,12A6)                                       PARPLOT   14
 4067 FORMAT            (2H(T,I3,6H,F6.3))                             PARPLOT   15
 4068 FORMAT            (F9.0)                                         PARPLOT   16
      CALL ADV(1)                                                      PARPLOT   17
      YLP=PYT                                                          PARPLOT   18
      YLB=PYB                                                          PARPLOT   19
      CALL FRAME (IPXL,IPXR,IPYT,IPYB)                                 PARPLOT   20
      CALL FRAME (IPXL,IPXR,IPYT,IPYB)                                 PARPLOT   21
      YTIC=AINT(PTOP) + 1.                                             PARPLOT   22
      IX2=IPXL+8                                                       PARPLOT   23
      IX3=IPXR-8                                                       PARPLOT   24
      IY2=IPYB-8                                                       PARPLOT   25
      IY3=IPYT+8                                                       PARPLOT   26
      NEXP=3.321*ALOG10(0.1*(YOP-YLB))                                 PARPLOT   27
      IF(NEXP.LE.0) NEXP=NEXP-1                                        PARPLOT   28
      DTIC=2.**NEXP                                                    PARPLOT   29
      XTIC=0.                                                          PARPLOT   30
 3021 YTIC=YTIC-DTIC                                                   PARPLOT   31
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      ITIC=FIPYB+(YTIC-YLB)*PYCONV                                    PARPLOT  32
      IF(ITIC.LT.IPYB) GO TO 3021                                      PARPLOT  33
      YTIC=YTIC+DTIC                                                   PARPLOT  34
 3022 IYI=FIPYB+(YTIC-YLB)*PYCONV                                      PARPLOT  35
      IF(IYI.LT.IPYT) GO TO 3023                                       PARPLOT  36
      CALL DRV(IPXL,IYI,IX2,IYI)                                       PARPLOT  37
      CALL DRV( IX3,IYI,IPXR,IYI)                                      PARPLOT  38
      IRITE=FLOAT(IYI)*0.0625                                          PARPLOT  39
      CALL LINCNT(IRITE)                                               PARPLOT  40
      WRITE (12,4088)  YTIC                                            PARPLOT  41
      YTIC=YTIC+DTIC                                                   PARPLOT  42
      GO TO 3022                                                       PARPLOT  43
 3023 IXI=FIPXL+(XTIC-PXL) *PXCONV                                     PARPLOT  44
      IF(IXI.GT.IPXR) GO TO 3024                                       PARPLOT  45
      CALL DRV(IXI,IPYB,IXI,IY2)                                       PARPLOT  46
      CALL DRV(IXI, IY3,IXI,IPYT)                                      PARPLOT  47
      IRITE=FLOAT(IXI)*0.125                                           PARPLOT  48
      ENCODE(11,4087,TIC) IRITE                                        PARPLOT  49
      JRITE=FLOAT(IYB)*0.0625+1.0                                      PARPLOT  50
      CALL LINCNT(JRITE)                                               PARPLOT  51
      WRITE (12,TIC)  XTIC                                             PARPLOT  52
      XTIC=XTIC+DTIC                                                   PARPLOT  53
      GO TO 3023                                                       PARPLOT  54
 3024 CONTINUE                                                         PARPLOT  55
      CALL LINCNT(56)                                                  PARPLOT  56
      WRITE (12,3090) PDR, PDZ, PXR, PYB, PYT                          PARPLOT  57
      WRITE (12,3095)   JNM, I, NCYC, NAME                             PARPLOT  58
 3000 LPB=NPI+NPT                                                      PARPLOT  59
      NPPT = 0                                                         PARPLOT  60
 3010 CALL ECHO (AASC,IECP,LPB,NE)                                     PARPLOT  61
      KP = 1                                                           PARPLOT  62
 3020 IF (XPAR(KP).LT.0.) GO TO 3050                                   PARPLOT  63
      IXI = FIPXL + (XPAR(KP)-PXL)*PXCONV                              PARPLOT  64
      IYI=FIPYB+(YPAR(KP)-YLB)*PYCONV                                  PARPLOT  65
      IF((IYI.GT.IYB).O.(IYI.LT.IYT)) GO TO 3050                       PARPLOT  66
      CALL PLT (IXI,IYI,-2)                                            PARPLOT  67
 3050 NPPT = NPPT + 1                                                  PARPLOT  68
      IF (NPPT.EQ.NPT) GO TO 3060                                      PARPLOT  69
      KP=KP+2                                                          PARPLOT  70
      GO TO 3020                                                       PARPLOT  71
 3060 RETURN                                                           PARPLOT  72
      END                                                              PARPLOT  73
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SINGLY REFERENCED VARIABLES

3000 - 63*	UTCSAV -R 10CO	GR -R 11CO	ITV -I 8CO	NOPT -I 2CO	PTOP -R 26	TIME -R 8CO
3010 - 65*	UTOC -R 10CO	GRDVEL -R 8CO	IXL -I 9CO	NQ -I 8CO	RDT -R 10CO	TNEUT -R 12CO
AA1 ()R 5LC	UTFCS -R 11CO	GZ -R ()CO	IXR -I 9CO	NQI -I 8CO	REAL - 15F	TOUT -R 8CO
AA2 ()R 6LC	DTH -R 8CC	I -I 4CO	J -I 4CO	NQI8 -I 11CO	RED - 8CN	TSTART -R 8CO
ADV - 21SU	DTV -R 10CO	IBAR -I 8CO	JBAR -I 8CO	NQI2 -I ()CO	RETURN - 76F	VTEM -R 11CO
AINT - 26SU	DIVSAV -R 10CO	IDTC -I 10CO	JDTC -I 10CO	NRVALS -I 12CO	REZRON -R 11CO	VV -R 9CO
ALOGIO - 31SU	DVDY -R 10CO	IDTV -I 10CO	JDTV -I 10CO	NUMIT -I 11CO	REZSIE -R 8CO	WRITE - 12CN
ANC -R 11CO	ECHO - 65SU	IJ -I 4CO	JP1 -I 8CO	OM -R ()CO	REZYO -R 11CO	XCONV -R 9CO
ANGLES ()R 12CO	EMIU -R 8CO	IJM -I 4CO	JP2 -I 8CO	OMANC -R 11CO	RIBAR -R 9CO	XL -R 9CO
ASG -R ()CO	ENCODE - 53F	IJP -I 4CO	JP4 -I 11CO	OMCYL -R 11CO	RLCI - 7CN	XR -R 9CO
AO -R ()CO	EPS -R 11CO	IJPS -I 8CO	KXI -I 11CO	OPOEN ()R 2CO	RVALS ()R 12CO	Y8 -R 9CO
AONAC -R ()CO	EQUIVAL - 14F	IMI -I ()CO	LAMB -R 15RL	OPTMP ()R 2CO	SIGA ()R 7LC	YCONV -R 9CO
AGM -R 1(CO	ETAB ()R 2CO	IP1 -I 8CO	LJP2 -I 11CO	ORANGE - ()CN	SILVER - 9CN	YELLOW - 10CN
BTBL ()R 2CO	FIPXR -R 9CO	IP2 -I 11CO	MOD2 -R 15RL	PARPLOT - 1SU	SPTBL ()R 2CO	YLC1 - 5CN
BO -R 11CO	FIXL -R 9CO	ISCF1 -I 8CO	NANGLS -I 12CO	PDR -R 61WR	STATE - 2CN	YLC2 - 6CN
COLAMO -R 11CO	FIXR -R 9CO	ISCF2 -I 8CO	NOUMP -I 8CO	PDZ -R 61WR	TAMB -R 8CO	YSC1 - 3CN
CYL -R ()CO	FIYB -R 9CO	ISC2 -I 8CO	NE -I 6SAG	PINK - 4CN	TEMP ()R 8CO	YT -R 9CO
DT -R 8CO	FREQ ()R 2CO	ISC3 -I 8CO	NFRO -I 2CO	PLT - 1SU	THINO -R 11CO	
DTC -R ()CO	GMI -R 11CO	ITAB ()I 11CO	NOPO -I 2CO	PTAB ()R 2CO	THY -R 8CO	

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MULTIPLY-REFERENCED VARIABLES

3020 -	67*	75	
3021 -	35*	37	
3022 -	39*	47	
3023 -	40	48*	58

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    3024 -    49     59*
    3050 -    67     73     72*
    3060 -    73     76*
    3090 -    17*    61*R
    3095 -    18*    62*R
    4087 -    19*    53EC
    4088 -    20*    45*R
AASC     ()R   3CO   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
               14EQ   14EQ   65AG
BETALC   ()R   13DI   14EQ
CENTA    ()R   13DI   14EQ
CENTY    ()R   13DI   14EQ
COMMUN   -     2F     3F     4F     8F     9F     10F    11F    12F
CQ       ()R   13DI   14EQ
DELSM    ()R   13DI   14EQ
DIMENSI  -     13F    16F
DRV      -     41SU   42SU   50SU   51SU
DTIC     -R    33=    35     38     46     57
E        ()R   13DI   14EQ
EMOMLC   ()R   13DI   14EQ
EP       ()R   13DI   14EQ
ETIL     ()R   13DI   14EQ
FIPXL    -R    9CO    48     68
FIPYB    -R    9CO    36     39     69
FLOAT    -     43SU   52SU   54SU
FORMAT   -     17F    18F    19F    20F
FOUTLC   ()R   13DI   14EQ
FRAME    -     24SU   25SU
FSN      ()R   13DI   14EQ
GR1R     ()R   13DI   14EQ
GR1Z     ()R   13DI   14EQ
IECP     -I    11CO   65AG
IPXL     -I    9CO    24AG   25AG   27     41AG
IPXR     -I    9CO    24AG   25AG   28     42AG   49
IPYB     -I    9CO    24AG   25AG   29     37     50AG
IPYT     -I    9CO    24AG   25AG   30     40     51AG
IRITE    -I    43=    44AG   52=    53EC
ITIC     -I    36=    37
IX1      -I    46=    49     50AG   50AG   51AG   51AG   52     68=    71AG
IX2      -I    27=    41AG
IX3      -I    26=    42AG
IYB      -I    9CO    54     70
IYT      -I    9CO    70
IY1      -I    39=    40     41AG   41AG   42AG   42AG   43     69=    70     70     71AG
IY2      -I    29=    50AG
IY3      -I    3 =    51AG
JNM      -I    11CO   62*R
JRITE    -I    54=    55AG
KP       -I    66=    67     68     69     74=    74
LAM      -R    11CO   15RL
LCM      -     4F     6F     7F
LINCNT   -     44SU   55SU   61SU
LPB      -I    63=    65AG
M        ()R   13DI   14EQ   15RL
MP       ()R   13DI   14EQ   15RL
MU       -R    11CO   15RL
NAME     ()I   8CO    62*R
NCYC     -I    8CO    62*R
NEXP     -I    31=    32     32=    32     33
NPPT     -I    64=    72=    72     73
NPT      -I    11CO   63     63     73
P        ()R   13DI   14EQ
PL       ()R   13DI   14EQ
PXCONV   -R    9CO    48     68
PXL      -R    9CO    48     68
PXR      -R    9CO    61*R
PYB      -R    9CO    23     61WR
PYCONV   -R    9CO    36     39     69
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PY1      -R     9CU    22     61WR
R        ()R    1301   14EQ
RCSQ     ()R    1301   14EQ
RM       ()R    1301   14EQ
RMP      ()R    1301   14EQ
RO       ()R    1301   14EQ
ROL      ()R    1301   14EQ
RVOL     ()R    1301   14EQ
RZEDEN   ()R    1301   14EQ
SIE      ()R    1301   14EQ
SIGPLC   ()R    1301   14EQ
T        -R     8CU    62WR
TIC      ()R    1E01   53EC   56WR
U        ()R    1301   14EQ
UG       ()R    1301   14EQ
UL       ()R    1301   14EQ
UMOMLC   ()R    1301   14EQ
UP       ()R    1301   14EQ
UTIL     ()R    1301   14EQ
V        ()R    1301   14EQ
VG       ()R    1301   14EQ
VL       ()R    1301   14EQ
VP       ()R    1301   14EQ
VTIL     ()R    1301   14EQ
WRITE    -      45F    56F    61F    62F
X        ()R    1301   14EQ
XPAR     ()R    1301   14EQ   67     68
XTIC     -R     34=    46     56WR   57=    57
Y        ()R    1301   14EQ
YLB      -R     23=    31     36     39     69
YPAR     ()R    1301   14EQ   69
YTIC     -R     26=    35=    35     36     38=    38     39     45WR   46=    46
YUP      -R     22=    31
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 1           OVERLAY (YOKIFER, 2, 3)                                                    PHASE1     2
 1           PROGRAM PHASE1                                                             PHASE1     3
 2           COMMON /STATE/    NOP1, NCPO, NFRQ, OPTMP(30), OPDEN(10),                  ALLKOM     2
            1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),             ALLKOM     3
            2                  BTBL(300)                                                ALLKOM     4
 3           COMMON /YSC1/     AASC(5454)                                               ALLKOM     5
 4           COMMON /PINK/     I, IJ, IJM, IJP, J                                       ALLKOM     6
 5           LCM /YLC1/        AA1(131000)                                              ALLKOM     7
 6           LCM /YLC2/        AA2(131000)                                              ALLKOM     8
 7           LCM /RLC1/        SIGA(36039)                                              ALLKOM     9
 8           COMMON /RED/      NAME(12), DT, UTR, EM10, GROVEL, IBAR, IJPS,             ALLKOM    10
            1                  IP1, ISCF1, ISCF2, ISC2, ISC3, I1V, JBAR,                ALLKOM    11
            2                  JP1, JP2, NCYC, NUUMP, NQ, NQI, REZSIE, TAMB,            ALLKOM    12
            3                  TEMP(7500), T, TIME, 1UUT, ISTART, IHY                   ALLKOM    13
 9           COMMON /YELLOW/   UTC, UTCSAV, DTO2, UTV, UTVSAV,                          YELLOW     2
            1                  DVDY, IUTC, IDIV, JUTC, JUTV, ROT                        YELLOW     3
10           COMMON /ORANGE/   ANC, XSG, AO, AOFXC, AGM, BP, COLAMU, CYL,               ORANGE     2
            1                  DIPOS, EPS, GMI, GM, GZ, IM1,                            ORANGE     3
            2                  IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,               ORANGE     4
            3                  LJP2, MU, NPT, NQ18, NQ12, NUMIT, OM,                    ORANGE     5
            4                  OMANC, CNCYL, REZRUN, REZYG, THIRU, VTEM                 ORANGE     6
11           COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT             ORANGE     7
12           COMMON /SENSE/    JSWTCH1, JSWTCH2, JSWTCH3                                SENSE      2
13           EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),         EQVREAL    2
            1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),                  EQVREAL    3
            2                  (AASC(7),MP,RMP),RCSQ,CENTX),                            EQVREAL    4
            3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),                  EQVREAL    5
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     4                (AASC(11),V,RM,VP), (AASC(11),P,PL,EP,UP),          EQVREAL     6
     5                (AASC(12),UTIL,UL,CQ,EMOMLC),                        EQVREAL     7
     6                (AASC(13),VTIL,VL,UMOMLC),                           EQVREAL     8
     7                (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),        EQVREAL     9
     8                (AASC(16),DELSM,SIGPLC),                             EQVREAL    10
     9                (AASC(17),GRIR,UG,RZEDEN),                           EQVREAL    11
     1                (AASC(18),GRIZ,VG,FSN)                               EQVREAL    12
      REAL            LAM, LAMD, M, MP, MU, MUO2                           EQVREAL    13
      DIMENSION       X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),            DIMEN       2
     2                V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),       DIMEN       3
     3                E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),       DIMEN       4
     4                VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),           DIMEN       5
     5                UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),             DIMEN       6
     6                UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),             DIMEN       7
     7                SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),         DIMEN       8
     8                RZEDEN(1), GRIZ(1), VG(1), FSN(1)                    DIMEN       9
C     ---   INCREMENT TIME                                                 PHASE1     10
      NCYC=NCYC+1                                                          PHASE1     11
      IF (NCYC.EQ.1) DT=DTR                                                PHASE1     12
      IF (NCYC.GT.1) DT=DTPOS=AMIN1(DTV,DTC)                               PHASE1     13
      CTFAC=2./(15.+FLOAT(NUMIT))                                          PHASE1     14
      DTV = DTC = DT*DTFAC                                                 PHASE1     15
      DT=AMIN1(DT,5.0*DTR)                                                 PHASE1     16
      IF (T.NT.TIME) DT=AMIN1(DT,TIME+DTR-T)                               PHASE1     17
      T = T + DT                                                           PHASE1     18
      RDT   = 1./DT                                                        PHASE1     19
      DTO2  = .5*DT                                                        PHASE1     20
C     ---   ADD NEUTRON ENERGY                                             PHASE1     21
      IF (JSWTCH.EQ.2) CALL NADD                                           PHASE1     22
C     ---   COUPLE ALTERNATE NODES                                         PHASE1     23
 1007 CALL START                                                           PHASE1     24
      YT=ANC*RDT                                                           PHASE1     25
      DO 1099 J=2,JP2                                                      PHASE1     26
      DO 1089 I=1,IP1                                                      PHASE1     27
      IMJ=IJ-NQ                                                            PHASE1     28
      IPJ=IJ+NQ                                                            PHASE1     29
      IMJM=IJM-NQ                                                          PHASE1     30
      IPJM=IJM+NQ                                                          PHASE1     31
      IMJP=IJP-NQ                                                          PHASE1     32
      IPJP=IJP+NQ                                                          PHASE1     33
      XX=YY=1.0                                                            PHASE1     34
      U5=U(IJ)                                                             PHASE1     35
      V5=V(IJ)                                                             PHASE1     36
      IF (I.EQ.1) GO TO 1002                                               PHASE1     37
      U4=U(IMJ)                                                            PHASE1     38
      V4=V(IMJ)                                                            PHASE1     39
      GO TO 1011                                                           PHASE1     40
 1002 U4=U(IPJ)                                                            PHASE1     41
      V4=V(IPJ)                                                            PHASE1     42
      XX=-1.0                                                              PHASE1     43
 1011 IF (I.EQ.IP1) GO TO 1012                                             PHASE1     44
      U6=U(IPJ)                                                            PHASE1     45
      V6=V(IPJ)                                                            PHASE1     46
      GO TO 1021                                                           PHASE1     47
 1012 U6=U(IMJ)                                                            PHASE1     48
      V6=V(IMJ)                                                            PHASE1     49
      XX=-1.0                                                              PHASE1     50
 1021 IF (J.EQ.2) GO TO 1022                                               PHASE1     51
      U2=U(IJM)                                                            PHASE1     52
      V2=V(IJM)                                                            PHASE1     53
      GO TO [illegible]                                                    PHASE1     54
 1022 U2=U(IJP)                                                            PHASE1     55
      V2=V(IJP)                                                            PHASE1     56
      YY=-1.0                                                              PHASE1     57
 1031 IF (J.EQ.JP2) GO TO 1032                                             PHASE1     58
      U8=U(IJP)                                                            PHASE1     59
      V8=V(IJP)                                                            PHASE1     60
      GO TO [illegible]                                                    PHASE1     61
```

```
 1032 UE=U(IJM)                                         PHASE1  62
      VE=V(IJM)                                         PHASE1  63
      YY=0.0                                            PHASE1  64
 1041 IF (I.EQ.1) GO TO 1042                            PHASE1  65
      IF (J.EQ.2) GO TO 1044                            PHASE1  66
      U1=U(IMJM)                                        PHASE1  67
      V1=V(IMJM)                                        PHASE1  68
      GO TO 1051                                        PHASE1  69
 1042 IF (J.EQ.2) GO TO 1043                            PHASE1  70
      U1=U(IPJM)                                        PHASE1  71
      V1=V(IPJM)                                        PHASE1  72
      XX=0.0                                            PHASE1  73
      GO TO 1051                                        PHASE1  74
 1043 U1=U(IPJP)                                        PHASE1  75
      V1=V(IPJP)                                        PHASE1  76
      XX=YY=0.0                                         PHASE1  77
      GO TO 1051                                        PHASE1  78
 1044 U1=U(IMJP)                                        PHASE1  79
      V1=V(IMJP)                                        PHASE1  80
      YY=0.0                                            PHASE1  81
 1051 IF (I.EQ.IP1) GO TO 1052                          PHASE1  82
      IF (J.EQ.2) GO TO 1054                            PHASE1  83
      U3=U(IPJM)                                        PHASE1  84
      V3=V(IPJM)                                        PHASE1  85
      GO TO 1061                                        PHASE1  86
 1052 IF (J.EQ.2) GO TO 1053                            PHASE1  87
      U3=U(IMJM)                                        PHASE1  88
      V3=V(IMJM)                                        PHASE1  89
      XX=0.0                                            PHASE1  90
      GO TO 1061                                        PHASE1  91
 1053 U3=U(IMJP)                                        PHASE1  92
      V3=V(IMJP)                                        PHASE1  93
      XX=YY=0.0                                         PHASE1  94
      GO TO 1061                                        PHASE1  95
 1054 U3=U(IPJP)                                        PHASE1  96
      V3=V(IPJP)                                        PHASE1  97
      YY=0.0                                            PHASE1  98
 1061 IF (I.EQ.1) GO TO 1062                            PHASE1  99
      IF (J.EQ.JP2) GO TO 1064                          PHASE1  100
      U7=U(IMJP)                                        PHASE1  101
      V7=V(IMJP)                                        PHASE1  102
      GO TO 1071                                        PHASE1  103
 1062 IF (J.EQ.JP2) GO TO 1063                          PHASE1  104
      U7=U(IPJP)                                        PHASE1  105
      V7=V(IPJP)                                        PHASE1  106
      XX=0.0                                            PHASE1  107
      GO TO 1071                                        PHASE1  108
 1063 U7=U(IPJM)                                        PHASE1  109
      V7=V(IPJM)                                        PHASE1  110
      XX=YY=0.0                                         PHASE1  111
      GO TO 1071                                        PHASE1  112
 1064 U7=U(IMJM)                                        PHASE1  113
      V7=V(IMJM)                                        PHASE1  114
      YY=0.0                                            PHASE1  115
 1071 IF (I.EQ.IP1) GO TO 1072                          PHASE1  116
      IF (J.EQ.JP2) GO TO 1074                          PHASE1  117
      U9=U(IPJP)                                        PHASE1  118
      V9=V(IPJP)                                        PHASE1  119
      GO TO 1081                                        PHASE1  120
 1072 IF (J.EQ.JP2) GO TO 1073                          PHASE1  121
      U9=U(IMJP)                                        PHASE1  122
      V9=V(IMJP)                                        PHASE1  123
      XX=0.0                                            PHASE1  124
      GO TO 1081                                        PHASE1  125
 1073 U9=U(IMJM)                                        PHASE1  126
      V9=V(IMJM)                                        PHASE1  127
      XX=YY=0.0                                         PHASE1  128
      GO TO 1081                                        PHASE1  129
```

```
    174 U9=U(IPJM)
        V9=V(IPJM)
        YY=0.0
    181 FLAGU=FLAGV=0.0
        IF (U5.EQ.AMAX1(U4,U5,U6).OR.U5.EQ.AMIN1(U4,U5,U6)) FLAGU=1.0
        IF (U5.EQ.AMAX1(U2,U5,U8).OR.U5.EQ.AMIN1(U2,U5,U8)) FLAGU=1.0
        IF (V5.EQ.AMAX1(V2,V5,V8).OR.V5.EQ.AMIN1(V2,V5,V8)) FLAGV=1.0
        IF (V5.EQ.AMAX1(V4,V5,V6).OR.V5.EQ.AMIN1(V4,V5,V6)) FLAGV=1.0
        IF (U5.EQ.AMAX1(U1,U5,U9).OR.U5.EQ.AMIN1(U1,U5,U9)) FLAGU=1.0
        IF (U5.EQ.AMAX1(U3,U5,U7).OR.U5.EQ.AMIN1(U3,U5,U7)) FLAGU=1.0
        IF (V5.EQ.AMAX1(V3,V5,V7).OR.V5.EQ.AMIN1(V3,V5,V7)) FLAGV=1.0
        IF (V5.EQ.AMAX1(V1,V5,V9).OR.V5.EQ.AMIN1(V1,V5,V9)) FLAGV=1.0
        UAV=0.125*(U1+U2+U3+U4+U6+U7+U8+U9)-U5
        VAV=0.125*(V1+V2+V3+V4+V6+V7+V8+V9)-V5
        AX=GX*YI*FLAGU*UAV
        AY=GZ*YI*FLAGV*VAV
        UTIL(IJ) = (U(IJ)+DT*AX)*XX
        VTIL(IJ) = (V(IJ)+DT*AY)*YY
        GMIX(IJ)=(AX-GX)*XX*DT
        GMIZ(IJ)=(AY-GZ)*YY*DT
        IJ = IPJ
        IJP=IJP+NQ
        IJM=IJM+NQ
    189 CONTINUE
        CALL LOOP
    199 CONTINUE
        CALL DONE
C       ---   COMPUTE UTIL VTIL & DELSM ROL RCSQ
   1100 CALL START
        DO 1299 J=2,JP
        DO 1199 I=1,IBAR
        IPJ = IJ + NQ
        IPJP = IJP + NQ
        IMJ=IJ-NQ
        RCL(IJ)=RC(IJ)
        XGM1=P(IJ)/(RO(IJ)*SIE(IJ))
        GGM1=XGM1*(1.0+XGM1)
        RCSQ(IJ)=1.0/(ASQ+GGM1*SIE(IJ))
        X1 = X(IPJ)
        Y1 = Y(IPJ)
        R1 = R(IPJ)
        U1 = U(IPJ)
        V1 = V(IPJ)
        X2 = X(IPJP)
        Y2 = Y(IPJP)
        R2 = R(IPJP)
        U2 = U(IPJP)
        V2 = V(IPJP)
        X3 = X(IJP)
        Y3 = Y(IJP)
        R3 = R(IJP)
        U3 = U(IJP)
        V3 = V(IJP)
        X4 = X(IJ)
        Y4 = Y(IJ)
        R4 = R(IJ)
        U4 = U(IJ)
        V4 = V(IJ)
        X24=X2-X4
        Y24=Y2-Y4
        X31=X3-X1
        Y31=Y3-Y1
        U24=U2-U4
        V24=V2-V4
        U31=U3-U1
        V31=V3-V1
        UCR=(U1+U2+U3+U4)/(R1+R2+R3+R4)*CYL
        XY=X24*Y31-X31*Y24
```

```
      RXY=1./XY
      CELAREA=0.5*XY
      CURL=RXY*(U24*Y31-U31*Y24)
      UVDY=RXY*(V31*X24-V24*X31)
      UVDYR=RXY*(U31*X24+V24*Y31-U24*X31-V31*Y24)
      RR13 = .5*(R1+R3)
      RR24 = .5*(R2+R4)
      U1U2M1 = UTO2*RM(IPJ)
      U1U2M2 = UTO2*RM(IPJP)
      U1U2M3 = UTO2*RM(IJP)
      U1U2M4 = UTO2*RM(IJ)
      D=(UUUR+UVDY)*(1.+UUR*DT) + UUR
      XXA=2./(Y24**2+Y31**2)*CELAREA**2
      YYA=2./(X24**2+X31**2)*CELAREA**2
      XX=USQRT(XXA)
      E(IJ)=XX
      YY=USQRT(YYA)
      DELSH(IJ)=2.*DT*(XXA+YYA)/(XXA*YYA)
      IF (RXI.LE.0.0) GO TO 113
      AK = RO(IJ)**RXI
      GO TO 114
  113 VELIJ = U4**2 + V4**2
      VELMX = 0.7 * AMAX1(ABS(U4*XX)+ABS(V4*YY))
      AK=RO(IJ)*COL*(MU*(DTO2*VELIJ+VELMX)+EMU)
  114 LAMD=AMIN1(D,0.0)*AK*LAM
      RLO2=0.5*AK*RO
      PIXX=4.*RLO2*UUUR+LAMD
      PIYY=4.*RLO2*UVDY+LAMD
      PIXY=2.*RLO2*UUVYR
      PITH=.25*XY*(4.*RUO2*UUR+LAMD*CYL)
      YY=Y24*P(IJ)
      XX=RR24*(PIXY*X24-PIXX*Y24)
      UTIL(IPJ)  = UTIL(IPJ)  +U1U2M1*(XX+R1*YY-PITH)
      UTIL(IJP)  = UTIL(IJP)  -U1U2M3*(XX+R3*YY+PITH)
      XX = RR13*(PIXY*X31-PIXX*Y31)
      YY=Y31*P(IJ)
      UTIL(IPJP) = UTIL(IPJP)+U1U2M2*(XX+R2*YY-PITH)
      UTIL(IJ)   = UTIL(IJ)   -U1U2M4*(XX+R4*YY+PITH)
      PYYMP=PIYY-P(IJ)
      XX = RR24*(PYYMP*X24-PIXY*Y24)
      VTIL(IPJ)  = VTIL(IPJ)  +U1U2M1*XX
      VTIL(IJP)  = VTIL(IJP)  -U1U2M3*XX
      XX = RR13*(PYYMP*X31-PIXY*Y31)
      VTIL(IPJP) = VTIL(IPJP)+U1U2M2*XX
      VTIL(IJ)   = VTIL(IJ)   -U1U2M4*XX
      IJ = IPJ
      IJP=IPJP
 1199 CONTINUE
      UTIL(IJ) = UTIL(IJP) = UTIL(IJP-NQIB) = UTIL(IJ-NQIB) = 0.
      IF (J.NE.2)   GO TO 122
      DO 121 IJ=ISC2,ISCF2,NQ
      VTIL(IJ)=0.0
  121 CONTINUE
  122 IF (J.NE.JP1) GO TO 124
      DO 123 IJP=IJPS,IJP2,NQ
      VTIL(IJP)=0.0
  123 CONTINUE
  124 CALL LOOP
 1299 CONTINUE
      CALL DONE
C
      RETURN
      END
```

SINGLY REFERENCED VARIABLES

1000	-	27*	DIVSAV	-R	9C0	IPZ	-I	10C0	NADD	-	26S0	CHANC	-R	1JC0	REZSIE	-R	8C0	TNEUT	-R	11C0		
1100	-	16"*	EPS	-R	10C0	ISCF1	-I	HC0	NAGE	()I	8C0	CNCYL	-R	1C0	REZY0	-R	10C0	TOUT	-R	8C0		
AA1	()R	5LC	EQUIVAC	-	13F	ISC3	-I	8C0	NANGLS	-I	11C0	CPDEN	()R	2C0	RLCI	-	7CN	TSTART	-R	8C0		
AA2	()R	6LC	ETAB	()R	2C0	IYAD	()I	10C0	NUMP	-I	8C0	CPTMP	()R	2C0	RVALS	()R	11C0	VTEM	-R	10C0		

```
ANGLES  )(R   )(CO    FLOAT    -     19SU   ITV      -1    8CO   NFRW    -I   2CO   CRANGE   -    ((CN    SENSE   -    12CN   WHITE   -   11CN
AC       -R   )(CO    FRCG     ()R   2CO    JBAR     -1    8CO   NOPO    -I   2CO   PHASE1   -    1SU     SIGA    ()R  7LC    YELLOW  -    9CN
AOFAC    -R   ((CO    GMI      -R    1(CO   JD1C     -1    9CO   NOPT    -I   2CO   PINK     -    4CN     SPTBL   ()R  2CO    YLC1    -    5CN
AOM      -R   (.CO    GROVEL   -R    9CO    JD1V     -1    9CO   NP)     -I   1(CO  PTAU     ()R  2CO     STATE   -    2CN    YLC2    -    6CN
BTBL    ()R    7CO    IU1C     -1    9CO    JGM      -1   10CO   NG1     -I   8CO   REAL     -    (4F     TAMB    -R   8CO    YSCI    -    3CN
BL       -R   1'CO    IU1V     -1    9CO    JP4      -1   10CO   NG12    -I   10CO  REJ      -    8CN     TEMP    ()R  8CO
DIMENSI  -    (5F     (LCF     -1    1 CO   JSWTCH2  -1   12CO   NRVALS  -I   11CO  RETURN   -   26(F     THIRD   -R   10CO
UTCSAV   -R    9CO    IM(      -1    ((CO   JSWTCH3  -1   12CO   OH      -R   10CO  REZRUN  -R   ((CO     THY     -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
  1 02 -     41       44*
  1011 -     43       47*
  (012 -     47       51*
  1021 -     5.       54*
  1022 -     54       58*
  1031 -     57       61*
  1032 -     6)       65*
  1041 -     64       66*
  1042 -     68       73*
  1043 -     73       70*
  1044 -     69       82*
  1051 -     72       77      81     85*
  1052 -     85       9 *
  1053 -     9(       95*
  1054 -     86       99*
  1061 -     89       99      98     1(2*
  1062 -     1(c      1(7*
  1063 -     1-7      112*
  1064 -     1.3      110*
  1071 -     (-6      11(     115    119*
  1072 -     119      124*
  1073 -     124      129*
  1074 -     12-      135*
  1081 -     123      128     132    136*
  1089 -     3(00     156*
  1099 -     2900     158*
  113u -     2(8      22(*
  1140 -     22(      224*
  1199 -     16200    247*
  1210 -     25(00    252*
  1220 -     249      253*
  1230 -     25400    256*
  1240 -     253      257*
  1299 -     16(00    258*
AASC    ()R    3CO    13EQ   13EQ   (3EQ   13EQ   (3EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ
               13EQ   (3EQ
ABS      -    222SU   222SU
AK       -R   2)9=    223=    224    225
AMAXI    -    (37SU   136SU   139SU  14(SU  141SU  142SU  143SU  144SU  222SU
AMINI    -     18SU   21SU    22SU   137SU  138SU  139SU  140SU  (41SU  142SU  143SU  144SU  224SU
ANC      -R   1 CO    26
ASQ      -R   1.CO    )69
AX       -R   147=    149     151
AY       -R   148=    15.     152
BETALC  )(R   12EQ    1501
CELAREA  -R   2(-1=   212     2(3
CENTX   ()R   13EQ    1501
CENTY   ()R   13EQ    (501
COLAMU   -R   ( CO    223
COMMON   -    2F      3F      4F     8F     9F     10F    11F    12F
CQ      ()R   13EQ    (501
CYL      -R   1 CO    (98     229
D        -R   2()=    224
DELSM   ()R   13EQ    1501    217=
DONE     -    154SU   259SU
D1       -R   FCO     (7=     18=    20     21=    21     22=    22     23     24     25     149    150    151    152    211    217
D?       -R   9CO     18      2 =
DIFAC    -R   19=     2
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DT02     -R    9C0   25=   2 7   208   209   210   223
DT02M1   -R   2 7=   232   24
DT02M2   -R   2 e=   236   243
DT02M3   -R   2 5=   233   24(
DT02M4   -R   21 =   237   244
DTPUS    -R   ( CO   18=
DIR      -R   8CO    17    2(    22
DIV      -R   5CO    18    2.=
DUOP     -R   2 2=   21(   226
DUVYR    -R   2 4=   226
DVDY     -R   9CO   2.3=   21(   227
E        ()R  13EQ   150(  215=
EQOPLC   ()R  13EQ   1501
ENID     -R   1CO    223
EP       ()R  13EQ   1501
ETTL     ()R  13EQ   1501
FLAGU    -R   136=   137=   138=   141=   142=   147
FLAGV    -R   136=   139=   14 =   143=   144=   148
FOUTLC   ()R  13EQ   1501
FSN      ()R  13EQ   1501
GGM1     -R   166=   169
GR       -R   1.CO   147    151
GR(R     ()R  13EQ   1501   151=
GRIZ     ()R  13EQ   1501   152=
GZ       -R   1 CO   146    152
HR13     -R   2 5=   234    242
HR24     -R   2 6=   231    239
I        -I    4CO   3 00   4V    47    68    85    102   119   16200
IHAR     -I    8CO   16200
IJ       -I    4CO   31     32    38    39    149   149   150   150   151   152   153=  163   165   166   166   167
              167    167    169   169   185   186   187   188   189   210   215   217   219   223   230   235   237
              237    236    244   244   245=  248   248   25000 251
IJM      -I    4CO   33     34    55    56    65    66    155=  155
IJP      -I    4CO   35     36    58    59    62    63    154=  154   164   180   181   182   183   184   209   233
              233    24(    24(   246=  248   248   25400 255
IJPS     -I    8CO   25400
IMJ      -I   31=    41     42    51    52    165=
IMJM     -I   33=    7      7(    91    92    116   117   129   130
IMJP     -I   35=    82     83    95    96    104   105   125   126
IPJ      -I   32=    44     45    48    49    153   163=  170   171   172   173   174   207   232   232   240   240
              245
IPJM     -I   34=    74     75    87    88    112   113   133   134
IPJP     -I   36=    78     79    99    100   108   109   121   122   164=  175   176   177   178   179   208   236
              234    243    243   246
IPI      -I    8CO   3 00   47    85    119
ISCR2    -I    6CO   25 00
ISC2     -I    8CO   25 00
J        -I    4CO   2900   54    61    69    73    86    90    103   107   120   124   16100 249   253
JP1      -I    8CO   16100  253
JP2      -I    8CO   2900   6(    103   107   120   124
JSWTCH1  -I   12(0   26
KXI      -I   ((CO   218    219
LAM      -R   1 CO   14RL   224
LAMD     -R   14RL   224=   226   227   229
LC       -    5F     6F     7F
LOC2     -I   ( CO   25400
LOOP     -    15750  25750
M        ()R  13EQ   14RL   1501
MP       ()R  13EQ   14RL   1501
MU       -R   1 CO   14RL   225
MU02     -R   14RL   225=   226   227   228   229
NCYC     -I    6CO   16=    16    17    18
NQ       -I    6CO   31     32    33    34    35    36    154   155   163   164   165   25000 25400
NQ18     -I   1 CO   246    248
NUM11    -I   1 CO   19
P        ()R  13EQ   1501   167   230   235   238
PITH     -R   229=   232    233   236   237
PIXX     -R   228=   231    234
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PIXY	-R	228=	231	234	239	242												
PIYY	-R	227=	236															
PL	()R	13EQ	150I															
PYYMP	-R	236=	239	242														
QSQRT	-	214SU	216SU															
R	()R	13EQ	150I	172	177	182	187											
RCSQ	()R	13EQ	150I	169=														
RDI	-R	5CU	24=	26														
RM	()R	13EQ	150I	207	208	209	210											
RMP	()R	13EQ	150I															
RO	()R	13EQ	150I	166	167	219	223											
ROL	()R	13EQ	150I	166=														
RVOL	()R	13EQ	150I															
RXY	-R	201=	202	203	204													
RZEDEN	()R	13EQ	150I															
R1	-R	172=	198	205	232													
R2	-R	177=	198	206	236													
R3	-R	182=	198	205	233													
R4	-R	187=	198	206	237													
SIE	()R	13EQ	150I	167	169													
SIGPLC	()R	13EQ	150I															
START	-	275U	16 5U															
T	-R	6CU	22	22	23=	23												
TIME	-R	6CU	22	22														
U	()R	13EQ	150I	38	41	44	48	51	55	58	62	65	70	74	78	82	87	91
		95	99	104	108	112	116	121	125	129	133	149	173	178	183	188		
UAV	-R	145=	147															
UG	()R	13EQ	150I															
UL	()R	13EQ	150I															
UMOMLC	()R	13EQ	150I															
UOR	-R	196=	211	21(	229													
UP	()R	13EQ	150I															
UTIL	()R	13EQ	150I	149=	232=	232	233=	233	236=	236	237=	237	248=	248=	248=	248=		
U1	-R	71=	74=	78=	82=	141	141	145	173=	196	198							
U2	-R	55=	58=	138	138	145	178=	194	198									
U24	-R	194=	202	204														
U3	-R	67=	91=	95=	99=	142	142	145	183=	196	198							
U31	-R	196=	202	204														
U4	-R	41=	44=	137	137	145	188=	194	198	221	222							
U5	-R	38=	137	137	137	137	136	138	138	138	141	141	141	141	142	142	142	142
		145																
U6	-R	48=	51=	137	137	145												
U7	-R	104=	108=	112=	116=	142	142	145										
U8	-R	62=	65=	138	138	145												
U9	-R	121=	125=	129=	133=	141	141	145										
V	()R	13EQ	150I	39	42	45	49	52	56	59	63	66	71	75	79	83	88	92
		96	100	105	109	113	117	122	126	130	134	150	174	179	184	189		
VAV	-R	146=	148															
VELIJ	-R	221=	223															
VELMX	-R	222=	223															
VG	()R	13EQ	150I															
VL	()R	13EQ	150I															
VP	()R	13EQ	150I															
VTIL	()R	13EQ	150I	150=	240=	240	241=	241	243=	243	244=	244	251=	255=				
V1	-R	71=	75=	79=	83=	144	144	146	174=	197								
V2	-R	56=	59=	139	139	146	179=	195										
V24	-R	195=	203	204														
V3	-R	88=	92=	96=	100=	143	143	146	184=	197								
V31	-R	197=	203	204														
V4	-R	42=	45=	140	140	146	189=	195	221	222								
V5	-R	39=	139	139	139	139	140	140	140	140	143	143	143	143	144	144	144	144
		146																
V6	-R	49=	52=	140	140	146												
V7	-R	105=	109=	113=	117=	143	143	146										
V8	-R	63=	66=	139	139	146												
V9	-R	122=	126=	130=	134=	144	144	146										
X	()R	13EQ	150I	172	175	180	185											
XGMI	-R	167=	168	168														

```
XPAR    (1R    13EG   150I
XX      -R    37=    46=    53=    76=    80=    93=    97=    110=   114=   127=   131=   149    151    214=   215    222    231=
              232    233    234=   236    237    239=   240    241    242=   243    244
XXA     -R    212=   214    217    217
XY      -R    199=   20(    2,1    229
X1      -R    17 =   192
X2      -R    175=   19
X24     -R    19 =   199    2 3    204    213    231    239
X3      -R    18 =   192
X31     -P    192=   199    2 3    204    213    234    242
X4      -R    185=   19
Y       (1R   13EG   1501   17(    176    181    186
YPAR    (1R   13EG   150I
YY      -R    37=    6 =    67=    80=    84=    97=    101=   114=   118=   131=   135=   150    152    216=   222    230=   232
              233    235=   236    237
YYA     -R    213=   216    217    217
Y1      -R    28=    147    148    171=   193
Y2      -R    176=   191
Y24     -R    191=   199    2 2    204    212    230    231    239
Y3      -R    181=   193
Y31     -R    192=   199    2 2    204    212    234    235    242
Y4      -R    182=   191
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
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 1          OVERLAY (YCKIFER, 2, 4)                                                        PHASE2      2
 1          PROGRAM PHASE2                                                                 PHASE2      3
 2          COMMON /STATE/      NOPT, NOPO, NFRQ, OPTMP(30), OPOEN(10),                    ALLKOM      2
           1                    FREQ(100), SPTBL(300), PTAB(300), ETAB(300),               ALLKOM      3
           2                    BTBL(300)                                                  ALLKOM      4
 3          COMMON /YSC1/       AASC(5454)                                                 ALLKOM      5
 4          COMMON /PIRK/       I, IJ, IJM, IJP, J                                         ALLKOM      6
 5          LCM /YLC1/          AA1(131000)                                                ALLKOM      7
 6          LCM /YLC2/          AA2(131000)                                                ALLKOM      8
 7          LCM /RLC1/          SIGA(30000)                                                ALLKOM      9
 8          COMMON /REO/        NAME(12), DT, DTR, EM10, GRUVEL, IBAR, IJPS,               ALLKOM     10
           1                    IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,                  ALLKOM     11
           2                    JP1, JP2, NCYC, NOUMP, NQ, NQI, REZSIE, TAMB,              ALLKOM     12
           3                    TEMP(7500), T, TIME, TOUT, TSTART, THY                     ALLKOM     13
 9          COMMON /YELLOW/     DTC, DTCSAV, DTO2, JTV, DTVSAV,                            YELLOW      2
           1                    DVOY, IOTC, IDIV, JOTC, JOTV, ROT                          YELLOW      3
 10         COMMON /ORANGE/     ABC, ASQ, AO, ACFAC, AOM, CQ, COLAMU, CYL,                 ORANGE      2
           1                    DTPUS, EPS, GM1, GR, GZ, IN1,                              ORANGE      3
           2                    IECP, IP2, ITAB(100), JNM, JP4, KXI, LAM,                  ORANGE      4
           3                    LJP2, MU, NP1, NQ1R, NQ12, NUMIT, OM,                      ORANGE      5
           4                    OMANC, CMCYL, REZHUN, REZYJ, IHIRU, VIEM                   ORANGE      6
 11         COMMON /WRITE/      NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT               ORANGE      7
 12         EQUIVALENCE         (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),           EQVREAL     2
           1                    (AASC(4),U), (AASC(5),V), (AASC(6),RO),                    EQVREAL     3
           2                    (AASC(7),MP,RMP,RCSQ,CENTX),                               EQVREAL     4
           3                    (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),                    EQVREAL     5
           4                    (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),                 EQVREAL     6
           5                    (AASC(12),UTIL,UL,LQ,EMOMLC),                              EQVREAL     7
           6                    (AASC(13),VTIL,VL,UMOMLC),                                 EQVREAL     8
           7                    (AASC(14),ROL,BETHLC,FUUTLC), (AASC(15),SIE),              EQVREAL     9
           8                    (AASC(16),DELSM,SIGPLC),                                   EQVREAL    10
           9                    (AASC(17),QHIR,UG,RZEDEN),                                 EQVREAL    11
           1                    (AASC(18),GRIZ,VG,FSN)                                     EQVREAL    12
 13         REAL                LAM, LAMU, M, MP, MU, MU02                                 EQVREAL    13
 14         DIMENSION           X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),                  DIMEN       2
           2                    V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),             DIMEN       3
           3                    L(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),             DIMEN       4
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     4                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),        DIMEN
     5                    UL(1), CQ(1), EKOMLC(1), VTIL(1), VL(1),          DIMEN
     6                    UKOMLC(1), ROL(1), FETALC(1), FOUTLC(1),          DIMEN
     7                    SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),      DIMEN
     8                    RZEDEN(1), GRIZ(1), VG(1), FSN(1)                 DIMEN
 4050 FORMAT              (1H ,*ITERATION LIMIT EXCEEDED RUN MAY ABORT*)    PHASE2
C     ---   INITIALIZE ITERATION CONSTANTS                                  PHASE2
 2000 NLMIT = 0                                                             PHASE2
      NCSTI1 = 1                                                            PHASE2
      PLMAX = EM10                                                          PHASE2
C     ---   BEGIN ITERATION                                                 PHASE2
 2010 CALL START                                                            PHASE2
      DO 2099 J=2,JP1                                                       PHASE2
      DO 2089 I=1,IBAR                                                      PHASE2
      IPJ = IJ + NQ                                                         PHASE2
      IPJP = IJP + NQ                                                       PHASE2
      X1 = X(IPJ)                                                           PHASE2
      Y1 = Y(IPJ)                                                           PHASE2
      R1 = R(IPJ)                                                           PHASE2
      U1 = UL(IPJ)                                                          PHASE2
      V1 = VL(IPJ)                                                          PHASE2
      X2 = X(IPJP)                                                          PHASE2
      Y2 = Y(IPJP)                                                          PHASE2
      R2 = R(IPJP)                                                          PHASE2
      U2 = UL(IPJP)                                                         PHASE2
      V2 = VL(IPJP)                                                         PHASE2
      X3 = X(IJP)                                                           PHASE2
      Y3 = Y(IJP)                                                           PHASE2
      R3 = R(IJP)                                                           PHASE2
      U3 = UL(IJP)                                                          PHASE2
      V3 = VL(IJP)                                                          PHASE2
      X4 = X(IJ)                                                            PHASE2
      Y4 = Y(IJ)                                                            PHASE2
      R4 = R(IJ)                                                            PHASE2
      U4 = UL(IJ)                                                           PHASE2
      V4 = VL(IJ)                                                           PHASE2
      XUG=1./(R4+R3+R2+R1)*CYL                                              PHASE2
      XVG=1./((X1-X3)*(Y2-Y4)-(X2-X4)*(Y1-Y3))                              PHASE2
      UCR=(U1+U2+U3+U4)*XUG                                                 PHASE2
      RAR=XVG                                                               PHASE2
      DUDX=((U1-U3)*(Y2-Y4)-(U2-U4)*(Y1-Y3))*RAR                            PHASE2
      DVDY=((V2-V4)*(X1-X3)-(V1-V3)*(X2-X4))  *RAR                          PHASE2
      D=(DUDX+DVDY)*(1.+UCR*DT)+UCR                                         PHASE2
      S = ROT*(ROL(IJ)-RO(IJ))+ROL(IJ)*D                                    PHASE2
      DEL2=2.*DELSM(IJ)                                                     PHASE2
      RA=RCSQ(IJ)*(ROT+D)+DEL2                                              PHASE2
      DP = -OM*S/RA                                                         PHASE2
      ROL(IJ) = ROL(IJ) + RCSQ(IJ)*DP                                       PHASE2
      PLMAX = AMAX1(PLMAX,ABS(PL(IJ)))                                      PHASE2
      IF (ABS(DP).LE.EPS*PLMAX) GO TO 2080                                  PHASE2
C     ---   TEST FOR CONVERGENCE IN CELL                                    PHASE2
      NCSTI1 = 1                                                            PHASE2
C     ---   ADJUST UL VL PL FOR NEXT ITERATION                              PHASE2
      PL(IJ) = PL(IJ)+DP                                                    PHASE2
      Y24 = Y2-Y4                                                           PHASE2
      Y31 = Y3-Y1                                                           PHASE2
      XR13= .5*(R1+R3)*(X1-X3)                                              PHASE2
      XR24= .5*(R2+R4)*(X2-X4)                                              PHASE2
      XX = DTU2*DP                                                          PHASE2
      DTU2M1 = XX*RM(IPJ)                                                   PHASE2
      DTU2M2 = XX*RM(IPJP)                                                  PHASE2
      DTU2M3 = XX*RM(IJP)                                                   PHASE2
      DTU2M4 = XX*RM(IJ)                                                    PHASE2
      UL(IPJ)    = U1+DTU2M1*R1*Y24                                         PHASE2
      UL(IPJP)   = U2+DTU2M2*R2*Y31                                         PHASE2
      UL(IJP)    = U3-DTU2M3*R3*Y24                                         PHASE2
      UL(IJ)     = U4-DTU2M4*R4*Y31                                         PHASE2
      IF (J.EQ.2)    GO TO 2060                                             PHASE2
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            VL(IPJ)   = V1-UTO2H1*XR24                                PHASE2    72
            VL(IJ)    = V4-U102H4*XR13                                PHASE2    73
      2090  IF (J.EQ.JP1) GO TO 2100                                  PHASE2    74
            VL(IPJP)  = V2+UTO2H2*XR13                                PHASE2    75
            VL(IJP)   = V3+U102H3*XH24                                PHASE2    76
      2100  IJ = IPJ                                                  PHASE2    77
      2089  IJP = IPJP                                                PHASE2    78
            UL(IJ) = UL(IJP) = UL(IJP-NQIB) = UL(IJ-NQIB) = 0.        PHASE2    79
            CALL LOOP                                                 PHASE2    80
      2099  CONTINUE                                                  PHASE2    81
            CALL DONE                                                 PHASE2    82
      C     ---   TEST ITERATION CONSTANTS                            PHASE2    83
            NLRIT = NLRIT+1                                           PHASE2    84
            IF(ITEST.EQ.1) GO TO 2500                                 PHASE2    85
            ITEST = 0                                                 PHASE2    86
            IF (NLRIT.LT.500) GO TO 2010                              PHASE2    87
            PRINT 4130                                                PHASE2    88
      C     ---   ITERATION FINISHED   COMPUTE ETIL                   PHASE2    89
      2500  CONTINUE                                                  PHASE2    90
             CALL START                                               PHASE2    91
            DO 2589 J=2,JPJ                                           PHASE2    92
            DO 2580 I=1,IBAR                                          PHASE2    93
            IJ=I+J-NQ                                                 PHASE2    94
            IPJ=IJ+NQ                                                 PHASE2    95
            IPJP=IJP+NQ                                               PHASE2    96
            X1=X(IPJ)                                                 PHASE2    97
            Y1=Y(IPJ)                                                 PHASE2    98
            R1=R(IPJ)                                                 PHASE2    99
            U1L= UL(IPJ)                                              PHASE2   100
            U1 = U(IPJ)                                               PHASE2   101
            V1L=VL(IPJ)                                               PHASE2   102
            V1= V(IPJ)                                                PHASE2   103
            X2=X(IPJP)                                                PHASE2   104
            Y2=Y(IPJP)                                                PHASE2   105
            R2=R(IPJP)                                                PHASE2   106
            U2L= UL(IPJP)                                             PHASE2   107
            U2 = U(IPJP)                                              PHASE2   108
            V2L=VL(IPJP)                                              PHASE2   109
            V2 =V(IPJP)                                               PHASE2   110
            X3=X(IJP)                                                 PHASE2   111
            Y3=Y(IJP)                                                 PHASE2   112
            R3=R(IJP)                                                 PHASE2   113
            U3L=UL(IJP)                                               PHASE2   114
            U3 =U(IJP)                                                PHASE2   115
            V3L=VL(IJP)                                               PHASE2   116
            V3 =V(IJP)                                                PHASE2   117
            X4= X(IJ)                                                 PHASE2   118
            Y4= Y(IJ)                                                 PHASE2   119
            R4= R(IJ)                                                 PHASE2   120
            U4L= UL(IJ)                                               PHASE2   121
            U4 = U(IJ)                                                PHASE2   122
            V4L=VL(IJ)                                                PHASE2   123
            V4 = V(IJ)                                                PHASE2   124
             X24=X2-X4                                                PHASE2   125
             X31=X3-X1                                                PHASE2   126
             Y24=Y2-Y4                                                PHASE2   127
             Y31=Y3-Y1                                                PHASE2   128
             R12=R1+R2                                                PHASE2   129
             R34=R3+R4                                                PHASE2   130
             RR13= .5*(R1+R3)                                         PHASE2   131
             RR24= .5*(R2+R4)                                         PHASE2   132
             U12=U1+U2                                                PHASE2   133
             U34=U3+U4                                                PHASE2   134
            XY=X24*Y31-X31*Y24                                        PHASE2   135
            RXY=1./XY                                                 PHASE2   136
            CELAREA=0.5*XY                                            PHASE2   137
            U1R=(U12*U34)/(R12*R34) *CYL                              PHASE2   138
            U24M=U2-U4                                                PHASE2   139
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```
      U13M=U1-U3                                                        PHASE2 140
      V24M=V2-V4                                                        PHASE2 141
      V13M=V1-V3                                                        PHASE2 142
      DUDX=RXY*(U24M*Y31+U13M*Y24)                                      PHASE2 143
      DVDY=RXY*(-V13M*X24-V24M*X31)                                     PHASE2 144
      DUVYR=RXY*(-U13M*X24+V24M*Y31-U24M*X31+V13M*Y24)                  PHASE2 145
      D=(DUDX+DVDY)*(1.0+DUR*D))+DUR                                    PHASE2 146
      XX=E(IJ)                                                          PHASE2 147
      YY=DSQRT(2.0/(X24**2+X31**2))*CELAREA                             PHASE2 148
      IF (KXI.LT.0) GO TO 2572                                          PHASE2 149
      AK = RO(IJ)**KXI                                                  PHASE2 150
      GO TO 2577                                                        PHASE2 151
 2572 CC4 = U4**2 + V4**2                                               PHASE2 152
      VC4 = AMAX1(ABS(U4*XX),ABS(V4*YY))                                PHASE2 153
      AK=RO(IJ)*CCLAMU*(U1U2*UU4+VD4**.7)                               PHASE2 154
 2577 ALAM = AK*LAM                                                     PHASE2 155
      AMU = AK*MU                                                       PHASE2 156
      LAMD = AMIN1(0.,.)*ALAM                                           PHASE2 157
      MUO2 = .5*AMU                                                     PHASE2 158
      FMUO2=4.*MUO2                                                     PHASE2 159
      PIXX=FMUO2*DUDX+LAMD                                              PHASE2 160
      PIYY=FMUO2*DVDY+LAMD                                              PHASE2 161
      PIXY=2.*MUO2*DUVYR                                                PHASE2 162
      PITH=-.25*X)*(FMUO2*DUR+LAMD*CYL)                                 PHASE2 163
      XX1=RR24*(PIXY*X24-PIXX*Y24)                                      PHASE2 164
      XX2=RR13*(PIXY*X31-PIXX*Y31)                                      PHASE2 165
      XX3=-RR24*PIXY*Y24                                                PHASE2 166
      XX4=-RR13*PIXY*Y31                                                PHASE2 167
      XX = XX*XX                                                        PHASE2 168
      YY = YY*YY                                                        PHASE2 169
      DQ=RO(IJ)*OMANC*XX*YY/(2.0*(ALAM+2.0*AMU)*(XX+YY)+EMIO)           PHASE2 170
      DQ=ABS(DQ)                                                        PHASE2 171
      DTV = AMIN1(.5*DQ,DTV)                                            PHASE2 172
      IF(DTVSAV.NE.DTV) IDTV=I                                          PHASE2 173
      IF(DTVSAV.NE.DTV) JDTV=J                                          PHASE2 174
      DTVSAV=DTV                                                        PHASE2 175
      XR13= .5*(R1+R3)*(X1-X3)                                          PHASE2 176
      XR24= .5*(R2+R4)*(X2-X4)                                          PHASE2 177
      GX=P(IJ)                                                          PHASE2 178
      GY=GX-PIYY                                                        PHASE2 179
      CELE=GX*(R1*Y24*(U1L+U1)+R2*Y31*(U2L+U2)-R3*Y24*(U3L+U3)-         PHASE2 180
     1 R4*Y31*(U4L+U4))-GY*(XR24*(V1L+V1)-XR13*(V2L+V2)-XR24*(V3L+V3)+  PHASE2 181
     2 XR13*(V4L+V4))                                                   PHASE2 182
      CELE=CELE+(U1L+U1)*(XX1-PITH)+(U2L+U2)*(XX2-PITH)-                PHASE2 183
     1 (U3L+U3)*(XX1+PITH)-(U4L+U4)*(XX2+PITH)+(V1L+V1)*XX3+            PHASE2 184
     2 (V2L+V2)*XX4-(V3L+V3)*XX3-(V4L+V4)*XX4                           PHASE2 185
      CELE=0.25*(CELE+DT*RVOL(IJ)/RO(IJ))                               PHASE2 186
      ETIL(IJ)=SIE(IJ)-CELE                                             PHASE2 187
       IJ=IPJ                                                           PHASE2 188
 2580   IJP=IPJP                                                        PHASE2 189
        CALL LUCP                                                       PHASE2 190
 2589   CONTINUE                                                        PHASE2 191
        CALL DONE                                                       PHASE2 192
C     ---   SET RCL AND ETIL ON BOUNDARIES                              PHASE2 193
      CALL START                                                        PHASE2 194
      IFAKE=IJ                                                          PHASE2 195
      DO 2740  J = 2 , JP1                                              PHASE2 196
      DO 2730  I = 1 , IBAR                                             PHASE2 197
      IFJ=IJ-NQ                                                         PHASE2 198
      IPJ=IJ+NQ                                                         PHASE2 199
      IPJP=IJP+NQ                                                       PHASE2 200
      IF(J.NE.2) GO TO 1501                                             PHASE2 201
      RCL(IJM)=RO(IJM)                                                  PHASE2 202
      ETIL(IJM)=ETIL(IJ)                                                PHASE2 203
      IF(I.NE.IFAP) GO TO 1511                                          PHASE2 204
      RCL(IJM+NQ)=RO(IJM+NQ)                                            PHASE2 205
      ETIL(IJM+NQ)=ETIL(IFAKE)                                          PHASE2 206
      GO TO 1502                                                        PHASE2 207
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 1501 IF(J.NE.JP1) GO TO 1502
      RCL(IJP)=RO(IJP)
 1502 IF(I.NE.IBAR) GO TO 1503
      RCL(IPJ)=RO(IPJ)
      ETIL(IPJ)=ETIL(IJ)
 1503 IJ=IPJ
      IJP=IPJP
 2710 IJM=IJM+NQ
      CALL LOOP
 2700 CONTINUE
      CALL DONE
C
      CALL START
      DO 2585 J = 2 , JP2
      DO 2584 I = 1 , IP1
      IMJ=IJ-NQ
      IPJ=IJ+NQ
      IMJM=IJM-NQ
      VTEMP=-.125/RN(IJ)*(GRIR(IJ)*(UTIL(IJ)+U(IJ))+GRIZ(IJ)*(VTIL(IJ)+
     1    V(IJ)))
      XX=1.
      YY=1.
      IF((I.EQ.1).O. (I.EQ.IP1)) XX=0.
      IF((J.EQ.2).O.(J.EQ.JP2)) YY=0.
      IF(XX*YY.EQ.0.) GO TO 1081
        E(IMJM)= E(IMJM)+VTEMP*RVOL(IMJM)/RO(IMJM)
        E(IJM)=  E(IJM)+VTEMP*RVOL(IJM)/RO(IJM)
        E(IMJ)=  E(IMJ)+VTEMP*RVOL(IMJ)/RO(IMJ)
        E(IJ)=   E(IJ)+VTEMP*RVOL(IJ)/RO(IJ)
      GO TO 1088
 1081 IF(I.NE.1) GO TO 1082
      IF((J.EQ.2).O.(J.EQ.JP2)) GO TO 1088
        E(IJM)=  E(IJM)+2.*VTEMP*RVOL(IJM)/RO(IJM)
        E(IJ)=   E(IJ)+2.*VTEMP*RVOL(IJ)/RO(IJ)
      GO TO 1088
 1082 IF(I.NE.IP1) GO TO 1085
      IF((J.EQ.2).O.(J.EQ.JP2)) GO TO 1088
        E(IMJ)=  E(IMJ)+2.*VTEMP*RVOL(IMJ)/RO(IMJ)
        E(IMJM)= E(IMJM)+2.*VTEMP*RVOL(IMJM)/RO(IMJM)
      GO TO 1088
 1085 IF(J.EQ.2) GO TO 1090
        E(IMJM)= E(IMJM)+2.*VTEMP*RVOL(IMJM)/RO(IMJM)
        E(IJM)=  E(IJM)+2.*VTEMP*RVOL(IJM)/RO(IJM)
      GO TO 1088
 1090   E(IJ)=   E(IJ)+2.*VTEMP*RVOL(IJ)/RO(IJ)
        E(IMJ)=  E(IMJ)+2.*VTEMP*RVOL(IMJ)/RO(IMJ)
 1088 CONTINUE
      IJ=IPJ
      IJP=IJP+NQ
 2584 IJM=IJM+NQ
      CALL LOOP
 2585 CONTINUE
      CALL DONE
C
      RETURN
      END
```

SINGLY REFERENCED VARIABLES

```
  2000  -    164    DTCSAV  -R   9CO  IJPS   -I   8CO  LJP2   -I  10CO  OPDEN  ()R   2CO  REZYO  -R  10CO  TOUT   -R   8CO
 AA1   ()R   5LC    DTFCS   -R  10CO  IM1    -I  10CO  NAMF   ()I   8CO  CPTMP  ()R   2CU  RLC1   -    7CN  TSTART -R   8CO
 AA2   ()R   6LC    DTR     -R   8CO  JP2    -I  10CO  NANGLS -I  11CO  CRANGE -   1.CN  RVALS  ()R  11CC  VTEM   -R  10CU
 AGL    -R  1?CU    EQUIVAL -   12F   ISCF1  -I   8CO  NCYC   -I   8CO  PHASE2 -    1SU  SIGA   ()R   7LC  WHITE  -   11CN
 ANGLES ()R 11CU    ETAB   ()R   2CO  ISCF2  -I   8CO  NDUMP  -I   8CO  FINK   -    4CN  SFTOL  ()R   2CO  YELLOW -    9CN
 ASQ    -R  1?CU    FORMAT  -   15F   ISC2   -I   8CO  NFRQ   -I   2CO  FRIGT  -   89F   STATE  -    2CN  YLC1   -    5CN
 AC     -R  1?CU    FREQ   ()R   2CO  ISC3   -I   8CO  NOPD   -I   2CO  PTAB   ()R   2CU  T      -R   8CC  YLC2   -    6CN
 AGFAC  -R  1?CU    GM1     -R  1?CO  ITAB   ()I  1?CO  NOPT   -I   2CO  GSCRT  -  1408SU  TAMB   -R   8CU  YSC1   -    3CN
 ALM    -R  1?CU    GR      -R  1?CO  ITV    -I   8CO  NP1    -I  1?CO  REAL   -    13F   TEMP   ()R   8CU
 B1BL  ()R   7CU    GROVEL  -R   8CO  JBAR   -I   8CO  NQ1    -I   8CO  REC    -    8CN  TFIRO  -R  10CC
 BC     -R  1?CU    GZ      -R  1?CO  JDTC   -I   9CO  NQ12   -I  10CO  RETURN -   254F  TFY    -R   8CC
```

```
DIMENSI -     14F      1U1C      -I    9CO     JHH       -I   1?CO    NRVALS  -1   11CO    REZRDN  -R   1.CO    TIME     -R   8CO
DIC      -R   9CO      1ECP      -I   1?CO     JP4       -1   1?CO    OMCYL   -R   10CO    REZSIE  -R   8CU     TIMEO(   -R   11CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
  1081 -   225     231*
  1082 -   231     236*
  1085 -   236     241*
  1088 -   23.     232     235    237*   240    244    247*
  1090 -   241     245*
  1501 -   196     199     2 3*
  1502 -   202     2U3     205*
  1503 -   2?5     208*
  2010 -   19*     86
  2060 -   73      76*
  2080 -   57      76      79*
  2089 -   2100    8.*
  2099 -   2?00    83*
  2500 -   86      9 *
  2572 -   149     152*
  2577 -   (5)     155*
  258? -   9300    165*
  2584 -   21600   25 *
  2585 -   21500   252*
  2589 -   9200    187*
  2700 -   19100   212*
  271? -   19200   21 *
  413? -   15*     69PH
AASC   ()R   3CO    12EQ    12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ   12EC   12EQ   12EQ   12EQ   12EQ   12EQ   12EQ
             12EQ   12EQ
ABS     -    565U   575U    1535U  1535U  1715U
AK      -R   15 =   154=    155    156
ALAM    -R   155=   157     17?
AMAXI   -    565U   1535U
AMINI   -    1575U  1725U
AMU     -R   156=   158     170
BETALC ()R   12EQ   1401
CELAREA -R   137=   148
CENTX  ()R   12EQ   1401
CENTY  ()R   12EQ   1401
COLAHD  -R   1 CO   154
COMMON  -    2F     3F      4F     8F     9F     10F    11F
CO     ()R   12EQ   1401
CYL     -R   1?CO   44      138    163
D       -R   5 =    5(      53     146=   157
DELE    -R   180=   181=    (8)    182=   182    183
DELSM  ()R   12EQ   1401    52
DEL2    -R   52=    53
DONE    -    845U   1885U   2135U  2535U
DP      -R   54=    55      57     59     64
DQ      -R   171=   171=    (71    172
DT      -R   8CO    5       146    182
DT02    -R   9CU    64      154
DT02M1  -R   65=    69      74
DT02M2  -R   66=    7?      77
DT02M3  -R   67=    71      78
DT02M4  -R   68=    72      75
DTV     -R   9CO    172=    172    173    174    175
DTVSAV  -R   9CO    173     174    175=
DUDX    -R   46=    5       143=   146    160
DUVYR   -R   145=   162
DVDY    -R   9CO    49=     5?     144=   146    161
E      ()R   12EQ   1401    147    226=   226    227=   227    228=   228    229=   229    233=   233    234=   234    238=   238
             239=   239     242=   242    243=   243    245=   245    246=   246
EMOMLC ()R   12EQ   1401
EM10    -R   8CO    16      170
EP     ()R   12EQ   1401
EPS     -R   1.CO   57
ETIL   ()R   12EQ   1401    163=   198=   198    201=   201    207=   207
```

```
FMU02   -R   159=   16     161    163
FOUILC  ()R   12EQ   1401
FSN     ()R   12EQ   1401
GRIA    ()R   12EQ   1401   22
GRIZ    ()R   12EQ   1401   22
HR13    -R   131=   165    167
HR24    -R   132=   164    166
I       -I    4C0    2100   9300   173    19200  199    205    21600  223    223    231    236
IHAR    -I    8C0    2100   9300   19200  199    205
IHIV    -I    9C0    173=
IFAKE   -I   191=   241
IJ      -I    4C0    22     39     40     41     42     43     51     51     51     52     53     55     55     55     56     59
              59     66     72     75     79=    81     81     94     95     118    119    122    121    122    123    124    147
              15     154    17     178    182    182    183    183    184=   190    193    194    198    207    206=   217    218
              22     22     220    220    220    220    220    229    229    229    229    234    234    234    234    245    245
              245    245    248=
IJM     -I    4C0    197    197    198    200    200    201    210=   210    219    227    227    227    227    233    233    233
              233    243    243    243    243    250=   250
IJP     -I    4C0    23     34     35     36     37     38     67     71     78     80=    81     81     96     111    112    113
              114    115    116    117    185=   195    204    204    204=   249=   249
IMJ     -I    94=    193=   217=   228    228    228    228    238    238    238    246    246    246    246
IMJM    -I   219=   220    226    226    226    239    239    239    239    242    242    242    242
IPJ     -I    22=    24     25     26     27     28     65     69     74     79     95=    97     98     99     100    101    102
              103    184    194=   206    206    207    208    218=   248
IPJP    -I    23=    29     30     31     32     33     66     70     77     80     96=    104    105    106    107    108    109
              11     165    195=   209
IPI     -I    8C0    21000  223    236
J       -I    4C0    2100   73     76     9200   174    19100  196    203    21500  224    224    232    232    237    237    241
JDTV    -I    9C0    174=
JPI     -I    8C0    2100   76     9200   19100  223
JP2     -I    8C0    21500  224    232    237
KXI     -I    1C0    149    152
LAM     -R    1C0    13RL   155
LAMD    -R    13RL   157=   160    161    163
LCM     -     5F     6F     7F
LOOP    -     82SU   1865U  2115U  2515U
M       ()R   12EQ   13RL   1401
MP      ()R   12EQ   13RL   1401
MU      -R    1C0    13RL   156
MU02    -R    13RL   158=   159    162
MUSTIT  -I    7=     58=    66     67=
NG      -I    8C0    22     23     94     95     96     193    194    195    200    200    201    210    217    218    219    249
              25
NQIB    -I    1C0    61     61
NUMIT   -I    1C0    16=    85=    65     88
OM      -R    1C0    54
OMANC   -R    1C0    17
P       ()R   12EQ   1401   178
P11H    -R   163=   161    161    161    161
P1XX    -R   16 =   164    165
P(XY    -R   162=   164    165    166    167
P1YY    -R   161=   179
PL      ()R   12EQ   1401   56     59=    59
PLMAX   -R    1R=    56=    56     57
QX      -R   178=   179    18
QY      -R   179=   18
R       ()R   12EQ   1401   26     31     36     41     99     106    113    120
RA      -R    5 =    54
RAR     -R    47=    46     49
RCSQ    ()R   12EQ   1401   53     55
ROT     -R    9C0    51     53
RM      ()R   12EQ   1401   65     66     67     68     220
RMP     ()R   12EQ   1401
RO      ()R   12EQ   1401   51     150    154    170    182    197    200    204    206    226    227    228    229    233    234
              236    239    242    243    245    246
ROL     ()R   12EQ   1401   51     51     55=    55     197=   200=   204=   206=
RVOL    ()R   12EQ   1401   182    226    227    228    229    233    234    238    239    242    243    245    246
RXY     -R   136=   143    144    145
```

FZELEN	()R	12EQ	1401															
R1	-R	28=	44	62	69	99=	129	131	176	180								
R12	-R	129=	136															
R2	-R	31=	44	63	70	106=	129	132	177	181								
R3	-R	30=	44	62	71	113=	130	131	176	180								
R34	-R	13 =	138															
R4	-R	41=	44	63	72	120=	130	132	177	180								
S	-R	51=	54															
SIE	()R	12EQ	1401	184														
SIGPLC	()R	12EQ	1401															
START	-	195U	915U	1695U	2145U													
U	()R	12EQ	1401	101	108	115	122	220										
UD4	-R	152=	154															
UG	()R	12EQ	1401															
UL	()R	12EQ	1401	27	32	37	42	69=	70=	71=	72=	81=	81=	81=	81=	100	107	114
		121																
UMOMLC	()R	12EQ	1401															
UOR	-R	46=	5	50	138=	146	146	163										
UP	()R	12EQ	1401															
UTIL	()R	12EQ	1401	220														
U1	-R	27=	46	48	69	101=	133	140	180	181								
U1L	-R	[illegible]	18	181														
U12	-R	132=	138															
U13M	-R	14.=	143	145														
U2	-R	32=	46	48	70	108=	133	139	180	181								
U2L	-R	107=	18	181														
U24M	-R	139=	143	145														
U3	-R	37=	46	48	71	115=	134	140	180	181								
U3L	-R	114=	18	181														
U34	-R	134=	138															
U4	-R	4.=	46	48	72	122=	134	139	152	153	180	181						
U4L	-R	121=	18	181														
V	()R	12EQ	1401	103	110	117	124	220										
VD4	-R	153=	154															
VG	()R	12EQ	1401															
VL	()R	12EQ	1401	28	33	38	43	74=	75=	77=	78=	102	109	116	123			
VP	()R	12EQ	1401															
VTEMP	-R	22 =	226	227	228	229	233	234	238	239	242	243	245	246				
VTIL	()R	12EQ	1401	22														
V1	-R	28=	49	74	103	142	180	181										
V1L	-R	112=	16	181														
V13M	-R	142=	144	145														
V2	-R	33=	49	77	110=	141	180	181										
V2L	-R	109=	18	181														
V24M	-R	141=	144	145														
V3	-R	38=	49	78	117=	142	180	181										
V3L	-R	116=	18	181														
V4	-R	43=	49	75	124=	141	152	153	180	181								
V4L	-R	123=	18	181														
X	()R	12EQ	1401	24	29	34	39	97	104	111	118							
XPAR	()R	12EQ	1401															
XR13	-R	62=	75	77	176=	180	180											
XR24	-R	63=	74	78	177=	180	180											
XUG	-R	44=	46															
XVG	-R	45=	47															
XX	-R	64=	65	66	67	68	147=	153	168=	168	168	170	170	221=	223=	225		
XX1	-R	164=	181	181														
XX2	-R	165=	181	181														
XX3	-R	166=	181	181														
XX4	-R	167=	181	181														
XY	-R	135=	136	137	163													
X1	-R	24=	45	49	62	97=	126	176										
X2	-R	29=	45	49	63	104=	125	177										
X24	-R	125=	135	144	145	146	164											
X3	-R	34=	45	49	62	111=	126	176										
X31	-R	128=	135	144	145	148	165											
X4	-R	39=	45	49	63	118=	125	177										
Y	()R	12EQ	1401	25	30	35	43	98	105	112	119							

```
YPAR    ()R    )2EU    (401
YY      -)I    )4F=    )53     169=    169     169     170     170     222=    224=    225
Y*      -R     25=     45      48      61      96=     128
Y2      -R     3 =     45      48      60      105=    127
Y24     -R     6 =     69      71      127=    135     143     145     164     166     180     180
Y3      -R     35=     45      48      61      (12=    (28
Y31     -R     61=     7       72      128=    135     143     145     165     167     189     180
Y4      -R     4.=     45      48      60      115=    127
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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      OVERLAY (YOKICER, 2, 5)                                                      PHASE3     2
      PROGRAM PHASE3                                                               PHASE3     3
      COMMON /STATE/    NCPI, NCPO, NFRQ, OPTMP(30), OPDEN(10),                    ALLKOM     2
     1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),               ALLKOM     3
     2                  BTBL(300)                                                  ALLKOM     4
      COMMON /YSCI/     AASC(5454)                                                 ALLKOM     5
      COMMON /PIJK/     I, IJ, IJM, IJP, J                                         ALLKOM     6
      LCM /YLC1/        AA1(131C40)                                                ALLKOM     7
      LCM /YLC2/        AA2(131CL0)                                                ALLKOM     8
      LCM /RLC1/        SIGA(31000)                                                ALLKOM     9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GRDVEL, IBAR, IJPS,               ALLKOM    10
     1                  IPI, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,                  ALLKOM    11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,              ALLKOM    12
     3                  TEMP(7500), T, TIME, IOUT, ISTART, THY                     ALLKOM    13
      COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,                     SILVER     2
     1                  IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,                     SILVER     3
     2                  IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,                   SILVER     4
     3                  RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT                    SILVER     5
      COMMON /YELLOW/   DTC, DTCSAV, DTCP, DTV, DTVSAV,                            YELLOW     2
     1                  DVDY, IDTC, IDTV, JDTC, JDTV, ROT                          YELLOW     3
      COMMON /ORANGE/   ANC, ASG, A0, AOFAC, ACM, B0, COLAMU, CYL,                 ORANGE     2
     1                  DTPOS, EPS, GM1, GM, GZ, IM1,                              ORANGE     3
     2                  IECP, IF2, IIAB(10.0), JNM, J04, KXI, LAM,                 ORANGE     4
     3                  LJP2, MU, NPT, NQ10, NQ12, NUM(T, OM,                      ORANGE     5
     4                  OMINC, OMCYL, REZPOR, REZYO, THIRU, VTEM                   ORANGE     6
      COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT               ORANGE     7
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),           EQVREAL    2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),                    EQVREAL    3
     2                  (AASC(7),MP,RMP,RCSQ,CENTX),                               EQVREAL    4
     3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),                    EQVREAL    5
     4                  (AASC(10),M,PM,VP), (AASC(11),P,PL,EP,UP),                 EQVREAL    6
     5                  (AASC(12),UTIL,UL,CQ,ENDMLC),                              EQVREAL    7
     6                  (AASC(13),VTIL,VL,OMUMLC),                                 EQVREAL    8
     7                  (AASC(14),RCL,RETALC,FOUTLC), (AASC(15),SIE),              EQVREAL    9
     8                  (AASC(16),DELSM,SIGPLC),                                   EQVREAL   10
     9                  (AASC(17),GRIR,UG,RZEDEN),                                 EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                                     EQVREAL   12
      REAL              LAM, LAMU, M, MP, MU, MU02                                 EQVREAL   13
      DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),                  DIMEN      2
     2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),             DIMEN      3
     3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),             DIMEN      4
     4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),                 DIMEN      5
     5                  UL(1), CQ(1), ENDMLC(1), VTIL(1), VL(1),                   DIMEN      6
     6                  OMUMLC(1), RCL(1), RETALC(1), FOUTLC(1),                   DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),               DIMEN      8
     8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                          DIMEN      9
      LEXT              DELIN)                                                     PHASE3    10
      DIMENSION         AT(100), FT(100)                                           PHASE3    11
C                                                                                  PHASE3    12
      DTO16=0.0625*DT                                                              PHASE3    13
      DELIN=1.0/12.0                                                               PHASE3    14
C     ---    TEST FOR REZONE                                                       PHASE3    15
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```
      IF (JSWICH2.EQ.2.OR.GROVEL.EQ.2,0) GO TO 3150                     PHASE3  16
C     ---   COMPUTE UG VG X Y R (EULERIAN OR LAGRANGIAN)                PHASE3  17
      CALL START                                                        PHASE3  18
      DO 3019 J=2,JP2                                                   PHASE3  19
      DO 3009 I=1,IP1                                                   PHASE3  20
      UG(IJ)=0.5*GROVEL*(UL(IJ)+U(IJ))                                  PHASE3  21
      VG(IJ)=0.5*GROVEL*(VL(IJ)+V(IJ))                                  PHASE3  22
      X(IJ)=X(IJ)+UG(IJ)*DT                                             PHASE3  23
      Y(IJ)=Y(IJ)+VG(IJ)*DT                                             PHASE3  24
      R(IJ)=X(IJ)*CYL+OMCYL                                             PHASE3  25
      IJ=IJ+NQ                                                          PHASE3  26
 3009 CONTINUE                                                          PHASE3  27
      CALL LOOP                                                         PHASE3  28
 3019 CONTINUE                                                          PHASE3  29
      CALL DONE                                                         PHASE3  30
      GO TO 3200                                                        PHASE3  31
C     ---   REZONE                                                      PHASE3  32
 3150 CALL REZONE                                                       PHASE3  33
C     ---   COMPUTE MP EP RVOL                                          PHASE3  34
 3200 CALL START                                                        PHASE3  35
      DO 3269 J=2,JP1                                                   PHASE3  36
      DO 3259 I=1,IBAR                                                  PHASE3  37
         IMJ = IJ-NQ                                                    PHASE3  38
         IPJ = IJ+NQ                                                    PHASE3  39
         IPJP = IJP+NQ                                                  PHASE3  40
      X1 = X(IPJ)                                                       PHASE3  41
      Y1 = Y(IPJ)                                                       PHASE3  42
      R1 = R(IPJ)                                                       PHASE3  43
      X2 = X(IPJP)                                                      PHASE3  44
      Y2 = Y(IPJP)                                                      PHASE3  45
      R2 = R(IPJP)                                                      PHASE3  46
      X3 = X(IJP)                                                       PHASE3  47
      Y3 = Y(IJP)                                                       PHASE3  48
      R3 = R(IJP)                                                       PHASE3  49
      X4 = X(IJ)                                                        PHASE3  50
      Y4 = Y(IJ)                                                        PHASE3  51
      R4 = R(IJ)                                                        PHASE3  52
      UL1 = UL(IPJ)                                                     PHASE3  53
      VL1 = VL(IPJ)                                                     PHASE3  54
      UL2 = UL(IPJP)                                                    PHASE3  55
      VL2 = VL(IPJP)                                                    PHASE3  56
      UL3 = UL(IJP)                                                     PHASE3  57
      VL3 = VL(IJP)                                                     PHASE3  58
      UL4 = UL(IJ)                                                      PHASE3  59
      VL4 = VL(IJ)                                                      PHASE3  60
      UL1=UG(IPJ)-0.5*(UL1+U(IPJ))                                      PHASE3  61
      VL1=VG(IPJ)-0.5*(VL1+V(IPJ))                                      PHASE3  62
      UL2=UG(IPJP)-0.5*(UL2+U(IPJP))                                    PHASE3  63
      VL2=VG(IPJP)-0.5*(VL2+V(IPJP))                                    PHASE3  64
      UL3=UG(IJP)-0.5*(UL3+U(IJP))                                      PHASE3  65
      VL3=VG(IJP)-0.5*(VL3+V(IJP))                                      PHASE3  66
      UL4=UG(IJ)-0.5*(UL4+U(IJ))                                        PHASE3  67
      VL4=VG(IJ)-0.5*(VL4+V(IJ))                                        PHASE3  68
      XP1=X1-UL1*DT                                                     PHASE3  69
      XP2=X2-UL2*DT                                                     PHASE3  70
      XP3=X3-UL3*DT                                                     PHASE3  71
      XP4=X4-UL4*DT                                                     PHASE3  72
      YP1=Y1-VL1*DT                                                     PHASE3  73
      YP2=Y2-VL2*DT                                                     PHASE3  74
      YP3=Y3-VL3*DT                                                     PHASE3  75
      YP4=Y4-VL4*DT                                                     PHASE3  76
      RP1=XP1*CYL+OMCYL                                                 PHASE3  77
      RP2=XP2*CYL+OMCYL                                                 PHASE3  78
      RP3=XP3*CYL+OMCYL                                                 PHASE3  79
      RP4=XP4*CYL+OMCYL                                                 PHASE3  80
      X12 = X1-X2                                                       PHASE3  81
      X23 = X2-X3                                                       PHASE3  82
      X34 = X3-X4                                                       PHASE3  83
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      X41 = X4-X1
      Y21 = Y2-Y1
      Y32 = Y3-Y2
      Y43 = Y4-Y3
      Y14 = Y1-Y4
      R12 = R1+R2
      R23 = R2+R3
      R34 = R3+R4
      R41 = R4+R1
      U12 = UL1+UL2
      U23 = UL2+UL3
      U34 = UL3+UL4
      U41 = UL4+UL1
      V12 = VL1+VL2
      V23 = VL2+VL3
      V34 = VL3+VL4
      V41 = VL4+VL1
      D = .25*RVOL(IJ)*(R12*(U12*Y21+V12*X12)+R23*(U23*Y32+V23*X23)
     1                 +R34*(U34*Y43+V34*X34)+R41*(U41*Y14+V41*X41))
      VOLR = VOLT = VOLC = 1./RVOL(IJ)
      IF (I.NE.IBAR) VOLR = 1./RVOL(IPJ)
      IF (J.NE.JP1 ) VOLT = 1./RVOL(IJP)
      IF (I.EQ.1) GO TO 3280
      FL = -FR
      AL = -AR
  323 IF (J.EQ.2) GO TO 3290
      FB = -FT(I)
      AB = -AT(I)
 3240 FR=((XP1*(Y1-YP2)+X1*(YP2-YP1)+XP2*(YP1-Y1))*(RP1+R1+RP2)+
     1 (X1*(Y2-YP2)+X2*(YP2-Y1)+XP2*(Y1-Y2))*(R1+R2+RP2))*TWELTH
      AR     = ARM*SIGN(1.,FR    )+RH*4.*FR    /(VOLR+VOLC)
      FT(I)=((XP3*(YP2-Y3)+XP2*(Y3-YP3)+X3*(YP3-YP2))*(RP3+RP2+R3)+
     1 (XP2*(Y2-Y3)+X2*(Y3-YP2)+X3*(YP2-Y2))*(RP2+R2+R3))*TWELTH
      AT(I) = ARM*SIGN(1.,FT(I))+RH*4.*FT(I)/(VOLT+VOLC)
      XX = AMAX1(ABS(FB),ABS(FR),ABS(FT(I)),ABS(FL))
      DTC = AMIN1(DTC,DTPOS*ARFAC/(XX*RVOL(IJ)+DTPOS*ABS(D)+EM10))
      IF (DTCSAV.NE.DTC) IDTC = I
      IF (DTCSAV.NE.DTC) JDTC = J
      DTCSAV = DTC
      MP(IJ) = RO(IJ)*VOLC
     1          +FR    *((1.-AR)     *ROL(IJ)+(1.+AR)     *ROL(IPJ))
     2          +FT(I)*((1.-AT(I))*ROL(IJ)+(1.+AT(I))*ROL(IJP))
     3          +FL    *((1.-AL)     *ROL(IJ)+(1.+AL)     *ROL(IMJ))
     4          +FB    *((1.-AB)     *ROL(IJ)+(1.+AB)     *ROL(IJM))
      ROE = RO(IJ)*ETIL(IJ)
      EP(IJ) = 1./MP(IJ)*(ROE*VOLC
     1          +FR    *((1.-AR)     *ROE+(1.+AR)     *RO(IPJ)*ETIL(IPJ))
     2          +FT(I)*((1.-AT(I))*ROE+(1.+AT(I))*RO(IJP)*ETIL(IJP))
     3          +FL    *((1.-AL)     *ROE+(1.+AL)     *RO(IMJ)*ETIL(IMJ))
     4          +FB    *((1.-AB)     *ROE+(1.+AB)     *RO(IJM)*ETIL(IJM)))
      RVOL(IJ)=8./((R1+R2+R3+R4)*((X1-X3)*(Y2-Y4)-(Y1-Y3)*(X2-X4)))
      IJ = IPJ
      IJP = IPJP
 3259 IJM = IJM + NQ
      CALL LOOP
 3269 CONTINUE
      CALL DONE
      GO TO 3300
 3280 FL=((X4*(YP4-Y3)+XP4*(Y3-Y4)+X3*(Y4-YP4))*(R4+RP4+R3)+
     1 (XP4*(YP3-Y3)+XP3*(Y3-YP4)+X3*(YP4-YP3))*(RP4+RP3+R3))*TWELTH
      AL     = ARM*SIGN(1.,FL)+RH*2.*FL*RVOL(IJ)
      IPJ=IJ
         GO TO 3230
 3290 FB=((X4*(Y1-YP4)+X1*(YP4-Y4)+XP4*(Y4-Y1))*(R4+R1+RP4)+
     1 (X1*(YP1-YP4)+XP1*(YP4-Y1)+XP4*(Y1-YP1))*(R1+RP1+RP4))*TWELTH
      AB     = ARM*SIGN(1.,FB)+RH*2.*FB*RVOL(IJ)
         GO TO 3240
C     ---    COMPUTE ROE
```

```
 3300 CALL START
      DO 3309 J=2,JP1
      DO 3309 I=1,IBAR
      RC(IJ) = RP(IJ)*RVOL(IJ)
      E(IJ) = EP(IJ)
      IF (J.EQ.2    ) RO(IJM) = ROL(IJM)
      IF (J.EQ.JP1) RO(IJP) = ROL(IJP)
      IF (I.EQ.IBAR) RO(IJ+NQ) = ROL(IJ+NQ)
      IJM = IJM+NQ
      IJP = IJP+NQ
 3309 IJ = IJ + NQ
      CALL LOOP
 3319 CONTINUE
      CALL DONE
C     ---   COMPUTE RMP UP VP
      CALL STARTO
      DO 3399 JJ=2,JP2
      J = JP4-JJ
      DO 3389 II=1,IP1
      I = IP2-II
      IMJ = IJ-NQ
      IMJM = IJM-NQ
      XX = 0.
      IF (I.NE.IP1 .AND. J.NE.2   ) XX = MP(IJM)
      IF (I.NE.IP1 .AND. J.NE.JP2) XX = XX+MP(IJ)
      IF (I.NE.1    .AND. J.NE.JP2) XX = XX+MP(IMJ)
      IF (I.NE.1    .AND. J.NE.2   ) XX = XX+MP(IMJM)
      RMP(IJ) = 4./XX
      IJ = IMJ
 3389 IJM = IMJM
      CALL LOOPO
 3399 CONTINUE
 3400 CALL START
      DO 3499 J=2,JP2
      DO 3469 I=1,IP1
      XX = RMP(IJ)/RM(IJ)
      UP(IJ) = XX*UL(IJ)
      VP(IJ) = XX*VL(IJ)
 3469 IJ = IJ + NQ
      CALL LOOP
 3499 CONTINUE
      CALL DONE
C     ---   COMPUTE UP VP
      CALL START
      DO 3699 J=2,JP1
      DO 3599 I=1,IBAR
      IPJ = IJ+NQ
      IPJP = IJP+NQ
      X1  = X(IPJ)
      Y1  = Y(IPJ)
      R1  = R(IPJ)
      UL1 = UL(IPJ)
      UG1 = UG(IPJ)
      VL1 = VL(IPJ)
      VG1 = VG(IPJ)
      X2  = X(IPJP)
      Y2  = Y(IPJP)
      R2  = R(IPJP)
      UL2 = UL(IPJP)
      UG2 = UG(IPJP)
      VL2 = VL(IPJP)
      VG2 = VG(IPJP)
      X3  = X(IJP)
      Y3  = Y(IJP)
      R3  = R(IJP)
      UL3 = UL(IJP)
      UG3 = UG(IJP)
      VL3 = VL(IJP)
```

```
      VG3 = VG(IJP)                                                     PHASE3 220
      X4  = X(IJ)                                                       PHASE3 221
      Y4  = Y(IJ)                                                       PHASE3 222
      R4  = R(IJ)                                                       PHASE3 223
      UL4 = UL(IJ)                                                      PHASE3 224
      UG4 = UG(IJ)                                                      PHASE3 225
      VL4 = VL(IJ)                                                      PHASE3 226
      VG4 = VG(IJ)                                                      PHASE3 227
      XX = CTO16*ROL(IJ)                                                PHASE3 228
      UL13=0.5*(UL1+UL3+U(IPJ)+U(IJP))                                  PHASE3 229
      VL13=0.5*(VL1+VL3+V(IPJ)+V(IJP))                                  PHASE3 230
      UL24=0.5*(UL2+UL4+U(IPJP)+U(IJ))                                  PHASE3 231
      VL24=0.5*(VL2+VL4+V(IPJP)+V(IJ))                                  PHASE3 232
      F13 = XX*(R1+R3)*((UG1+UG3-UL13)*(Y3-Y1)+(VG1+VG3-VL13)*(X1-X3))  PHASE3 233
      F24 = XX*(R2+R4)*((UG2+UG4-UL24)*(Y2-Y4)+(VG2+VG4-VL24)*(X4-X2))  PHASE3 234
      FM1 = F24*RMP(IPJ)                                                PHASE3 235
      FM2 = F13*RMP(IPJP)                                               PHASE3 236
      FM3 = F24*RMP(IJP)                                                PHASE3 237
      FM4 = F13*RMP(IJ)                                                 PHASE3 238
      XX = 0.*4.*RVOL(IJ)/ROL(IJ)                                       PHASE3 239
      AL13 = A0*SIGN(1.,F13)+XX*F13                                     PHASE3 240
      AL24 = A0*SIGN(1.,F24)+XX*F24                                     PHASE3 241
      UPAL13 = 1.+AL13                                                  PHASE3 242
      UPAL24 = 1.+AL24                                                  PHASE3 243
      UMAL13 = 1.-AL13                                                  PHASE3 244
      CMAL24 = 1.-AL24                                                  PHASE3 245
      XX = UL3*CMAL24+UL1*UPAL24                                        PHASE3 246
      UP(IPJ)  = UP(IPJ) - FM1*XX                                       PHASE3 247
      UP(IJP)  = UP(IJP) + FM3*XX                                       PHASE3 248
      XX = UL4*CMAL13+UL2*UPAL13                                        PHASE3 249
      UP(IPJP) = UP(IPJP)- FM2*XX                                       PHASE3 250
      UP(IJ)   = UP(IJ)  + FM4*XX                                       PHASE3 251
      XX = VL3*CMAL24+VL1*UPAL24                                        PHASE3 252
      VP(IPJ)  = VP(IPJ) - FM1*XX                                       PHASE3 253
      VP(IJP)  = VP(IJP) + FM3*XX                                       PHASE3 254
      XX = VL4*CMAL13+VL2*UPAL13                                        PHASE3 255
      VP(IPJP) = VP(IPJP)- FM2*XX                                       PHASE3 256
      VP(IJ)   = VP(IJ)  + FM4*XX                                       PHASE3 257
      IJ = IPJ                                                          PHASE3 258
 3599 IJP = IPJP                                                        PHASE3 259
      UP(IJ) = UP(IJP) = UP(IJP-NQ18) = UP(IJ-NQ18) = 0.                PHASE3 260
      IF (J.NE.2) GO TO 3620                                            PHASE3 261
      DO 3610 IJ=ISC2,ISCF2,NQ                                          PHASE3 262
 3610 VP(IJ) = 0.                                                       PHASE3 263
 3620 IF (J.NE.JP1) GO TO 3640                                          PHASE3 264
      DO 3630 IJP=IJPS,IJP2,NQ                                          PHASE3 265
 3630 VP(IJP) = 0.                                                      PHASE3 266
 3640 CALL LOOP                                                         PHASE3 267
 3699 CONTINUE                                                          PHASE3 268
      CALL DONE                                                         PHASE3 269
C     ---   COMPUTE U V RM RMP                                          PHASE3 270
 3700 CALL START                                                        PHASE3 271
      DO 3719 J=2,JP2                                                   PHASE3 272
      DO 3709 I=1,IP1                                                   PHASE3 273
      U(IJ) = UP(IJ)                                                    PHASE3 274
      V(IJ) = VP(IJ)                                                    PHASE3 275
      RM(IJ) = RMP(IJ)                                                  PHASE3 276
      RMP(IJ)=0.                                                        PHASE3 277
 3709 IJ = IJ + NQ                                                      PHASE3 278
      CALL LOOP                                                         PHASE3 279
 3719 CONTINUE                                                          PHASE3 280
      CALL DONE                                                         PHASE3 281
C     ---   COMPUTE SIE TEMP                                            PHASE3 282
 3800 CALL START                                                        PHASE3 283
      DO 3899 J=2,JP1                                                   PHASE3 284
      IJSC=(J-1)*IP1                                                    PHASE3 285
      DO 3889 I=1,IBAR                                                  PHASE3 286
      IPJ = IJ+NQ                                                       PHASE3 287
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```
            IPJP = IJE+NU
            ILSC=IJSC+1
            SIE(IJ)=E(IJ)
      C     ---   SIE=SIE + DI*RAY PUTS IN THIN RADIATOR
            SIE(IJ)=AMAX((SIE(IJ),REZSIE)
            IF (SIE(IJ)-REZSIE,GT.1.0E-06) GO TO 3801
            ZI=IAMH
            GC TO 3812
       3801 ZR=RO(IJ)
            ZE=SIE(IJ)
            ZRINV=1.0/ZR
            ZRL=ULOG10(ZR)
            ZRL=AMIN1(ZRL,OPDEN(NOPD))
            ZRL=AMAX1(ZRL,OPDEN(1))
            TLOW=IAMB
            THIGH=QSQRT(ZE*ZR*0.[0728789E+07)
            THIGH=QSQRT(THIGH)
            ZT= .5*(TLOW+THIGH)
       3811 URI=137.214E-.7*ZT**4
            ZEI=ZE-URI*ZRINV
            ZIL=ULOG10(ZT)
            ZIL=AMIN1(ZTL,OPTMP(NOPT))
            ZE2L=UHLINT (., ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOPT)
            ZE2=UEXP10(ZE2L)
            ZUE=ZEI-ZE2
            IF (ZUE.GT.0.0) TLOW=ZT
            IF (ZUE.LT.0.0) THIGH=ZT
            ZT= .5*(TLOW+THIGH)
            IF (THIGH-TLOW.LT.1.0E-06*ZT) GO TO 3812
            GC TO 3811
       3812 TEMP(IJSC)=ZI
            IJP = IPJP
            IJ=IPJ
       3889 CONTINUE
            CALL LOUP
       3899 CONTINUE
            CALL UONE
      C     ---   MOVE PARTICLES
            CALL PARTMOV
      C     ---   RECOMPUTE PLOTTING COORDINATES
            CALL FILMCO
      C
            RETURN
            END
SINGLY REFERENCED VARIABLES
     3400 -   110*    EQUIVAL -    13F     IPXR    -I   9CO   LAND    -R  14RL   CRANGE  -   11CN   REZONE  -    35SU   TUUT    -R   8CO
     3700 -   255*    FILMCC  -  338SU     IPYB    -I   9CO   LEXI    -   16F    PARTMOV - 3.7SU   REZRON  -R   11CO   TSTART  -R   8CO
     3800 -   256*    FIPXL   -R   9CO     IPYT    -I   9CO   LUUPD   -  168SU   PHASE3  -    1SU   REZYO   -R   11CO   VTEM    -R  11CO
  AAI     ()R   5LC   FIPXR   -R   9CO     ISCFI   -I   8CO   MUU2    -R  14RL   PINK    -    4CN   RIBAR   -R    9CO   VV      -R   9CO
  AA2     ()R   6LC   FIPYB   -R   9CO     ISC3    -I   8CO   NAME    ()I  8CO   PTAB    ()R  2CO   RLCI    -     7CN   WHITE   -   12CN
  ANC     -R   11CO   FIXL    -R   9CO     ITAB    ()(  11CO  NANGLS  -I  12CO   PXCONV  -R   9CO   RVALS   ()R  12CC   XCONV   -R   9CO
  ANGLES  ()R  12CO   FIXR    -R   9CO     ITV     -I   8CO   NCYC    -I   8CO   PXL     -R   9CO   SIGA    ()R   7LC   XL      -R   9CO
  ASW     -R   11CO   FIYB    -R   9CO     IXL     -I   9CO   NOUMP   -I   8CO   PXR     -R   9CO   SILVER  -     9CN   XR      -R   9CO
  BTBL    ()R   2CO   FREQ    ()R  2CO     IXR     -I   9CO   NFRQ    -I   2CO   PYB     -R   9CO   SPTBL   ()R   2CC   YB      -R   9CO
  CULAMU  -R   11CO   GMI     -R  11CO     IYB     -I   9CO   NPI     -I  11CO   PYCONV  -R   9CO   STARTD  -  153SU   YCONV   -R   9CO
  DI02    -R   11CO   GR      -R  11CO     IYT     -I   9CO   NO(     -I   8CO   PYT     -R   9CO   STATE   -     2CN   YELLOW  -   10CN
  DIR     -R    8CO   GZ      -R  11CO     JBAR    -I   8CO   NIJ2    -I  11CO   GEXPIU  - 2.3SU   T       -R    8CC   YLCI    -    5CN
  DTV     -R   1(CO   IDIV    -I  11CO     JDTV    -I  11CO   NRVALS  -I  12CO   RUT     -R  1(CO   THIRD   -R   11CC   YLC2    -    6CN
  DTVSAV  -R   11CO   IECP    -I  11CO     JNM     -I  11CO   NUMIT   -I  11CO   REAL    -   14F    TRY     -R    8CC   YSCI    -    3CN
  DVUY    -R   11CO   IP.C    -I  11CO     JSWTCH2 -I  29     OM      -R  11CO   REO     -    8CN   TIME    -R    8CO   YT      -R   9CO
  EPS     -R   11CO   IPAL    -I   9CO     KXI     -I  11CO   OMINC   -R  11CO   RETURN  - 3.9F    TNEUT   -R   12CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
   3 09 -     2300    3 *
   3019 -     2200    32*
   315. -     2.      35*
   3200 -     34      36*
   3230 -     1.9*    135
```

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3249   -      112*     136
3259   -      3800     127*
3269   -      3700     129*
3280   -      1?6      132*
3290   -      1?9      136*
3300   -      131      139*
3309   -      14(00    149*
3319   -      14.00    151*
3389   -      15600    157*
3399   -      15400    169*
3489   -      17200    176*
3499   -      17100    178*
3599   -      18200    244*
361.   -      24700    248*
3629   -      246      249*
3630   -      25.00    251*
364.   -      249      252*
3699   -      18100    253*
3709   -      25700    262*
3719   -      25600    264*
3801   -      275      278*
3811   -      288*     299
3812   -      277      298      300*
3889   -      26900    3.3*
3899   -      26700    3:5*
AASC    (IR   3CO      13EG     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ     13EQ
              13EQ     13CU
AB      -R    11(=     121      121      123      123      137*
ABS     -     116SU    116SU    116SU    116SU    117SU
AL      -R    116=     121      121      123      123      133=
AL13    -R    225=     227      229
AL24    -R    226=     228      230
AMAX1   -     116SU    274SU    283SU
AMINI   -     117SU    282SU    291SU
AR      -R    108      113=     121      121      123      123
AT      (IR   1701     111      115=     121      121      123      123
A.      -R    11CU     225      226
AOFAC   -R    11CD     117
AOM     -R    11CU     113      115      133      137
ETALC   (IR   13EG     15UI
BU      -R    11CO     113      115      133      137      224
CENTX   (IR   13EQ     15UI
CENTY   (IR   13EQ     15UI
COMMUN  -     2F       3F       4F       8F       9F       10F      11F      12F
CQ      (IR   13EG     15UI
CYL     -R    11CO     28       78       79       80       81
D       -R    112=     117
DELINT  -     16LX     292SU
DELSM   (IR   13EQ     15UI
DIMENSI -     15F      17F
DONE    -     33SU     13 SU    152SU    179SU    254SU    265SU    306SU
DT      -R    8CU      18       26       27       70       71       72       73       74       75       76       77
DTC     -R    1.CO     117=     117      118      119      120
DTCSAV  -R    1.CO     118      119      120=
DTO16   -R    1E=      213
DIPOS   -R    11CO     117      117
E       11R   13EQ     15UI     143=     273
EMOMLC  (IR   13EQ     15UI
EMIO    -R    8CU      117
EP      (IR   13EQ     15UI     123=     143
ETAB    (IR   2CO      292
ETIL    (IR   13EQ     15UI     122      123      123      123      123
F6      -R    11.=     116      121      123      136=     137      137
FL      -R    107=     116      121      123      132=     133      133
FM1     -R    22.=     232      238
FM2     -R    221=     235      241
FM3     -R    222=     233      239
FM4     -R    223=     236      242
```

FOUTLC	(JR	13EQ	1501															
FR	-R	1.7	112=	113	113	116	121	123										
FSN	(JR	13EQ	1501															
FY	(JR	1 FUI	11	114=	115	115	116	121	123									
FI3	-R	218=	221	223	225	225												
F24	-R	219=	22	222	226	226												
GRUVEL	-R	ECO	2	24	25													
GRIR	(JR	13EQ	1501															
GRIZ	(JR	13EQ	1501															
I	-I	4CO	2300	3800	1(4	106	110	111	114	115	115	115	116	118	121	121	121	123
		123	123	14100	146	157=	161	162	163	164	17200	18200	25700	26900				
IBAR	-I	8CO	3800	1 4	14100	146	18200	26900										
IDTC	-I	1 CO	118=															
II	-I	15600	157															
IJ	-I	4CO	24	24	24	25	25	25	26	26	26	27	27	27	28	28	29=	29
		39	4.	51	52	53	60	61	68	68	69	69	102	103	117	121	121	121
		121	121	121	122	122	123	123	124	125=	133	134	137	142	142	142	143	143
		146	146	149=	149	158	162	165	166=	173	173	174	174	175	175	176=	176	183
		206	207	2.8	209	210	211	212	213	216	217	223	224	224	236	236	242	242
		243=	245	245	24700	248	258	258	259	259	260	260	261	262=	262	270	273	273
		274	274	275	278	279	302=											
IJM	-I	4CO	121	123	123	127=	127	144	144	147=	147	159	161	167=				
IJP	-I	4CO	41	48	49	50	58	59	66	66	67	67	(.5	121	123	123	126=	145
		145	148=	148	184	199	200	201	202	203	204	205	214	215	222	233	233	239
		239	244=	245	245	25000	251	271	301=									
IJPS	-I	8CO	25 00															
IJSC	-I	268=	272=	272	300													
IMJ	-I	39=	121	123	123	134=	158=	163	166									
IMJM	-I	159=	164	167														
IPJ	-I	4 =	42	43	44	54	55	62	62	63	63	104	121	123	123	125	183=	185
		186	167	188	189	19(	191	214	215	220	232	232	238	238	243	270=	302	
IPJP	-I	41=	45	46	47	56	57	64	64	65	65	126	184=	192	193	194	195	196
		197	198	216	217	221	235	235	241	241	244	271=	3.1					
IPI	-I	8CO	2300	15600	16.	162	17200	25700	268									
IP2	-I	11CO	157															
ISCF2	-I	8CO	24700															
ISC2	-I	8CO	24700															
J	-I	4CO	2200	3700	105	109	119	14000	144	145	155=	161	162	163	164	17100	18100	246
		249	25600	26700	268													
JDTC	-I	1(CO	119=															
JJ	-I	15400	155															
JP1	-I	6CO	3700	1 5	14000	145	16100	249	26700									
JP2	-I	FCO	2200	15400	162	163	17100	25600										
JP4	-I	11CO	155															
LAM	-R	11CO	14RL															
LCM	-	5F	6F	7F														
LJP2	-I	11CO	25 00															
LOOP	-	31SU	128SU	15.SU	177SU	252SU	263SU	304SU										
M	(JR	13EQ	14RL	1501														
MP	(JR	13EQ	14RL	1501	121=	123	142	161	162	163	164							
MU	-R	11CO	14RL															
NOPD	-I	2CO	262	292														
NOP1	-I	2CO	291	292	292													
NQ	-I	8CO	29	39	40	41	127	146	146	147	148	149	158	159	176	183	184	24700
		25.00	262	270	271													
NQIB	-I	11CO	245	245														
OMAL13''	-R	229=	234	24														
OMAL24	-R	23 =	231	237														
OMCYL	-R	11CO	26	78	79	80	81											
OPAL13	-R	.227=	234	24.														
OPAL24	-R	228=	231	237														
OPOEN	(JR	2CO	282	263	292													
OPIMP	(JR	2CO	291	292														
P	(JR	13EQ	1501															
PL	(JR	13EQ	1501															
QLOG10	-	281SU	29 SU															
QSQR1	-	285SU	266SU															
R	(JR	13EQ	1501	28=	44	47	50	53	187	194	201	208						

RCSQ	()R	13EQ	15OI														
REZSIE	-R	8CO	274	275													
RM	()R	13EQ	15OI	173	260=												
RMP	()R	13EQ	15OI	165=	173	220	221	222	223	260	261=						
RO	()R	13EQ	15OI	121	122	123	123	123	123	142=	144=	145=	146=	278			
ROE	-R	122=	123	123	123	123	123										
ROL	()R	13EQ	15OI	121	121	121	121	121	121	121	121	144	145	146	213	224	
RP1	-R	78=	112	136													
RP2	-R	79=	112	112	114	114											
RP3	-R	80=	114	132													
RP4	-R	81=	132	132	136	136											
RVOL	()R	13EQ	15OI	102	103	104	105	117	124=	133	137	142	224				
RZEDEN	()R	13EQ	15OI														
R1	-R	44=	91	93	112	112	124	136	136	187=	218						
R12	-R	91=	112														
R2	-R	47=	91	91	112	114	124	194=	219								
R23	-R	91=	102														
R3	-R	50=	91	92	114	114	124	132	132	201=	218						
R34	-R	92=	102														
R4	-R	53=	92	93	124	132	136	208=	219								
R41	-R	93=	102														
SIE	()R	13EQ	15OI	273=	274	274	275	279									
SIGN	-	113SU	115SU	133SU	137SU	225SU	226SU										
SIGPLC	()R	13EQ	15OI														
START	-	21SU	36SU	159SU	170SU	180SU	255SU	266SU									
TAMB	-R	8CO	276	284													
TEMP	()R	8CO	36 =														
TRIGH	-R	285=	266=	266	287	296=	297	298									
TLOW	-R	284=	287	295=	297	298											
TWELTH	-R	19=	112	114	132	136											
U	()R	13EQ	15OI	24	62	64	66	68	214	214	216	216	238=				
UD1	-R	62=	7														
UD2	-R	64=	71														
UD3	-R	66=	72														
UD4	-R	68=	73														
UG	()R	13EQ	15OI	24=	26	62	64	66	68	189	196	203	210				
UG1	-R	189=	218														
UG2	-R	196=	219														
UG3	-R	203=	218														
UG4	-R	21 =	219														
UL	()R	13EQ	15OI	24	54	56	58	60	174	188	195	202	209				
UL1	-R	54=	62	94	97	188=	214	231									
UL13	-R	214=	218														
UL2	-R	56=	64	94	95	195=	216	234									
UL24	-R	216=	219														
UL3	-R	58=	66	95	96	202=	214	231									
UL4	-R	60=	68	96	97	209=	216	234									
UMOMLC	()R	13EQ	15OI														
UP	()R	13EQ	15OI	174=	232=	232	233=	233	235=	235	236=	236	245=	245=	245=	245=	258
UR1	-R	288=	289														
UTIL	()R	13EQ	15OI														
U12	-R	94=	112														
U23	-R	95=	112														
U34	-R	96=	112														
U41	-R	97=	112														
V	()R	13EQ	15OI	25	63	65	67	69	215	215	217	217	259=				
VD1	-R	63=	74														
VD2	-R	65=	75														
VD3	-R	67=	76														
VD4	-R	69=	77														
VG	()R	13EQ	15OI	25=	27	63	65	67	69	191	198	205	212				
VG1	-R	191=	218														
VG2	-R	198=	219														
VG3	-R	205=	218														
VG4	-R	212=	219														
VL	()R	13EQ	15OI	25	55	57	59	61	175	190	197	204	211				
VL1	-R	55=	63	98	101	190=	215	237									
VL13	-R	215=	218														

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VL2     -R   57=    65     98     99     197=   217    240
VL24    -R   217=   219
VL3     -R   59=    67     99     100    204=   215    237
VL4     -R   61=    69     100    101    211=   217    240
VOLC    -R   103=   113    115    121    123
VOLR    -R   113=   114=   113
VOLT    -R   113=   115=   115
VP      ()R  13EU   1501   175=   238=   238    239=   239    241=   241    242=   242    248=   251=   259
VTIL    ()R  13EU   1501
V12     -R   98=    102
V23     -R   99=    102
V34     -R   100=   102
V41     -R   101=   102
X       ()R  13EU   1501   26=    26     28     42     45     48     51     185    192    199    206
XPAR    ()R  13EU   1501
XP1     -R   7 =    78     112    136
XP2     -R   71=    79     112    112    114    114
XP3     -R   72=    8      114    132
XP4     -R   73=    81     132    132    136    136
XX      -R   116=   117    160=   161=   162=   162    163=   163    164=   164    165    173=   174    175    213=   218    219
             224=   225    226    231=   232    233    234=   235    236    237=   238    239    240=   241    242
X1      -R   42=    7      82     85     112    112    124    136    136    185=   218
X12     -R   82=    112
X2      -R   45=    71     82     83     112    114    124    192=   219
X23     -R   83=    112
X3      -R   46=    72     83     84     114    114    124    132    132    199=   218
X34     -R   84=    112
X4      -R   51=    73     84     85     124    132    136    206=   219
X41     -R   85=    112
Y       ()R  13EU   1501   27=    27     43     46     49     52     186    193    200    207
YPAR    ()R  13EU   1501
YP1     -R   74=    112    112    136    136
YP2     -R   75=    112    112    112    112    114    114    114    114
YP3     -R   76=    114    114    132    132
YP4     -R   77=    132    132    132    132    136    136    136    136
Y1      -R   43=    74     86     89     112    112    112    112    124    136    136    136    136    186=   218
Y14     -R   89=    102
Y2      -R   46=    75     86     87     112    112    114    114    124    193=   219
Y21     -R   86=    112
Y3      -R   49=    76     87     88     114    114    114    114    124    132    132    132    132    200=   218
Y32     -R   87=    112
Y4      -R   52=    77     88     89     124    132    132    136    136    207=   219
Y43     -R   88=    112
ZUE     -R   294=   295    296
ZE      -R   279=   285    289
ZE1     -R   289=   294
ZE2     -R   293=   294
ZE2L    -R   292=   293
ZR      -R   278=   28     281    285
ZRINV   -R   28 =   289
ZRL     -R   281=   282=   282    283=   283    292
Z1      -R   270=   287=   288    290    295    296    297=   298    300
Z1L     -R   29 =   291=   291    292
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1              SUBROUTINE REZONE                                                   REZONE     2
2              COMMON /STATE/     NOPT, NOPU, NFRQ, OPTMP(30), OPDEN(10),          ALLKOM     2
             1                    FREQ(100), SPTBL(3000), PTAB(300), ETAB(300),    ALLKOM     3
             2                    BTBL(300)                                        ALLKOM     4
3              COMMON /YSC1/      AASC(5454)                                       ALLKOM     5
4              COMMON /PINK/      I, IJ, IJP, IJP, J                               ALLKOM     6
5              COM /YLC1/         AA1(131000)                                      ALLKOM     7
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  6        LCM /YLC2/        AA2(13(00))                                           ALLKOM     8
  7        LCM /RLC1/        SIGA(3(600))                                          ALLKOM     9
  8        COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,          ALLKOM    10
        1                    IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,             ALLKOM    11
        2                    JP1, JP2, NCYC, NOUMP, NQ, NQI, REZSIE, TAMB,         ALLKOM    12
        3                    TEMP(7500), T, TIME, TOUT, TSTART, THY                ALLKOM    13
  9        COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,                SILVER     2
        1                    IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,                SILVER     3
        2                    IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,              SILVER     4
        3                    RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT               SILVER     5
 10        COMMON /YELLOW/   DTC, DTCSAV, DTQ2, OTV, OTVSAV,                       YELLOW     2
        1                    DVLY, IUTC, IDTV, JUTC, JDTV, ROT                     YELLOW     3
 11        COMMON /ORANGE/   ANC, ASQ, AO, AOFAC, AOM, BH, CCLAMC, CYL,            ORANGE     2
        1                    DTPOS, EPS, GM1, GM, GZ, IMI,                         ORANGE     3
        2                    IECP, IP2, ITAH(1000), JNM, JP4, KXI, LAM,            ORANGE     4
        3                    LJP2, MC, NP1, NQ16, NQ12, NUMIT, ON,                 ORANGE     5
        4                    OMANC, CMCYL, REZRON, REZYC, THIRD, VTEM              ORANGE     6
 12        COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT          ORANGE     7
 13        COMMON /SENSE/    JSWTCH1, JSWTCH2, JSWTCH3                             SENSE      2
 14        EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),      EQVREAL    2
        1                    (AASC(4),U), (AASC(5),V), (AASC(6),RO),               EQVREAL    3
        2                    (AASC(7),MP,RMP,RCSG,CENTX),                          EQVREAL    4
        3                    (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),               EQVREAL    5
        4                    (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),            EQVREAL    6
        5                    (AASC(12),UTIL,UL,CQ,EMOMLC),                         EQVREAL    7
        6                    (AASC(13),VTIL,VL,OMOMLC),                            EQVREAL    8
        7                    (AASC(14),ROL,DETALC,FOUTLC), (AASC(15),SIE),         EQVREAL    9
        8                    (AASC(16),DELSM,SIGPLC),                              EQVREAL   10
        9                    (AASC(17),GRIR,UG,RZEDEN),                            EQVREAL   11
        1                    (AASC(18),GRIZ,VG,FSN)                                EQVREAL   12
 15        REAL              LAM, LAMD, M, MP, NQ, MU02                            EQVREAL   13
 16        DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),             DIMEN      2
        2                    V(1), RO(1), MP(1), RMP(1), RCSG(1), CENTX(1),        DIMEN      3
        3                    E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),        DIMEN      4
        4                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),            DIMEN      5
        5                    UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),              DIMEN      6
        6                    OMOMLC(1), ROL(1), DETALC(1), FOUTLC(1),              DIMEN      7
        7                    SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),          DIMEN      8
        8                    RZEDEN(1), GRIZ(1), VG(1), FSN(1)                     DIMEN      9
 17  2001  FORMAT            (1H0,*REZONE CONSTANTS*/6H VTB   ,1PE12.4,6X,         REZONE    10
        1                    6H VTT   ,1PE12.4,6X,6H UT    ,1PE12.4/               REZONE    11
        2                    6H FC3   ,1PE12.4,6X,6H FCP2  ,1PE12.4,6X,            REZONE    12
        3                    6H FCX   ,1PE12.4)                                    REZONE    13
     C                                                                             REZONE    14
 18        FSTF=0.2*ROT                                                            REZONE    15
 19        AREAF=-2.0                                                              REZONE    16
 20        SWTCH=0.5                                                               REZONE    17
 21        IF (JSWTCH2.EQ.2) SWTCH=0.0                                             REZONE    18
 22        VTB=VTT=UT=0.0                                                          REZONE    19
 23        FC3=FCX=FCP2=0.0                                                        REZONE    20
 24        IMESH=IBAR/2                                                            REZONE    21
 25        JBMESH=JP2/4                                                            REZONE    22
 26        JTMESH=JP2-JBMESH                                                       REZONE    23
 27        GM2=1.0+2.0/GM1                                                         REZONE    24
     C                                                                             REZONE    25
 28        CALL START                                                              REZONE    26
 29        DO 1058 J=2,JBAR                                                        REZONE    27
 30        DO 1047 I=1,IMI                                                         REZONE    28
 31        IFJ=IJ+NQ                                                               REZONE    29
 32        IFJP=IJP+NQ                                                             REZONE    30
 33        IF (J.LE.JBMESH) FC3=AMAX1(FC3,ABS(VL(IJ)))                             REZONE    31
 34        IF (J.GE.JTMESH) FCP2=AMAX1(FCP2,ABS(VL(IJ)))                           REZONE    32
 35        IF (I.GE.IMESH) FCX=AMAX1(FCX,ABS(UL(IJ)))                              REZONE    33
 36        IF (J.EQ.2) VTB=AMAX1(VTB,0.25*ROT*(Y(IJP)-Y(IJ))*                      REZONE    34
        1  (1.0-REZSIE/SIE(IJ)))                                                   REZONE    35
 37        IF (J.EQ.JBAR) VTT=AMAX1(VTT,0.25*ROT*(Y(IJP)-Y(IJ))*                   REZONE    36
        1  (1.0-REZSIE/SIE(IJ)))                                                   REZONE    37
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      IF (I.EQ.IP1) UT=AMAX1(UT,0.25*RDT*(X(IPJ)-X(IJ))*
     1 (1.0-REZSIE/SIE(IJ)))
      IJ=IPJ
      IPJ=IPJP
 1040 CONTINUE
      CALL LOOP
 1050 CONTINUE
      PRINT 2001,       VTB, VTT, UT, FC3, FCP2, FCX
      WRITE (12,2001)   VTB, VTT, UT, FC3, FCP2, FCX
C     FC3=FC3+VTB
C     FCP2=FCP2+VTT
C     FCX=FCX+UT
      FC3=GM2*FC3
      FCP2=GM2*FCP2
      FCX=GM2*FCX
C     ---   BROWNE AREA WEIGHTING ALGORITHM
      CALL START
      DO 1070 J=2,JP2
      DO 1060 I=1,IP1
      IPJ=IJ+NQ
      IMJ=IJ-NQ
      IF(I.EQ.1.OR.I.EQ.IP1.OR.J.EQ.2.OR.J.EQ.JP2) GO TO 1051
      IPJ=IJ+NQ
      IMJ=IJ-NQ
      IPJP=IJP+NQ
      UG(IJ)=SWTCH*(UL(IJ)+U(IJ))
      VG(IJ)=SWTCH*(VL(IJ)+V(IJ))
      X1=X(IMJ)
      X2=X(IJM)
      X3=X(IPJ)
      X4=X(IJP)
      X5=X(IJ)
      Y1=Y(IMJ)
      Y2=Y(IJM)
      Y3=Y(IPJ)
      Y4=Y(IJP)
      Y5=Y(IJ)
      RA1=2.0/((X1-X5)*(Y2-Y5)-(Y1-Y5)*(X2-X5))
      RA2=2.0/((X2-X5)*(Y3-Y5)-(Y2-Y5)*(X3-X5))
      RA3=2.0/((X3-X5)*(Y4-Y5)-(Y3-Y5)*(X4-X5))
      RA4=2.0/((X4-X5)*(Y1-Y5)-(Y4-Y5)*(X1-X5))
      DX5=((X5-0.5*(X1+X2))*RA1 +(X5-0.5*(X2+X3))*RA2
     1   +(X5-0.5*(X3+X4))*RA3 +(X5-0.5*(X4+X1))*RA4)/(RA1+RA2+RA3+RA4)
      DX5=AREAF*DX5
      DY5=((Y5-0.5*(Y1+Y2))*RA1 +(Y5-0.5*(Y2+Y3))*RA2
     1   +(Y5-0.5*(Y3+Y4))*RA3 +(Y5-0.5*(Y4+Y1))*RA4)/(RA1+RA2+RA3+RA4)
      DY5=AREAF*DY5
      DX5=DX5+0.25*(X1+X2+X3+X4)-X5
      DY5=DY5+0.25*(Y1+Y2+Y3+Y4)-Y5
      UG(IJ)=UG(IJ)+FSTF*DX5
      VG(IJ)=VG(IJ)+FSTF*DY5
      IF(J.EQ.3) UG(IJM)=UG(IJ)
      IF(I.EQ.2) VG(IMJ)=VG(IJ)
      GO TO 1059
 1051 CONTINUE
      IF(I.NE.1) GO TO 1052
      UG(IJ)=0.0
      GO TO 1053
 1052 IF(I.NE.IP1) GO TO 1053
      UG(IJ)=FCX
      VG(IJ)=VG(IMJ)
 1053 IF(J.NE.2) GO TO 1054
      VG(IJ)=-FC3
      GO TO 1055
 1054 IF(J.NE.JP2) GO TO 1055
      UG(IJ)=UG(IJM)
      VG(IJ)=FCP2
 1055 IF(I.NE.1.OR.J.GE.2) GO TO 1056
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            VG(IJ)=-FC3                                                       REZONE   106
      1056  IF(I.NE.IP(.OR.J.NE.2) GO TO 1057                                REZONE   107
            UG(IJ)=FCX                                                        REZONE   108
            VG(IJ)=-FC3                                                       REZONE   109
      1057  IF(I.NE.1.OR.J.NE.JP2) GO TO 1058                                 REZONE   110
            VG(IJ)=FCP2                                                       REZONE   111
      1058  IF(I.NE.IP1.OR.J.NE.JP2) GO TO 1059                               REZONE   112
            UG(IJ)=FCX                                                        REZONE   113
            VG(IJ)=FCP2                                                       REZONE   114
      1059  CONTINUE                                                          REZONE   115
            IJ=IPJ                                                            REZONE   116
            IJP=IJP+NQ                                                        REZONE   117
            IJM=IJM+NQ                                                        REZONE   118
      1060  CONTINUE                                                          REZONE   119
            CALL LOOP                                                         REZONE   120
      1070  CONTINUE                                                          REZONE   121
            CALL DONE                                                         REZONE   122
      C                                                                       REZONE   123
      1200  CALL START                                                        REZONE   124
            DO 1289 J=2,JP2                                                   REZONE   125
            DO 1279 I=1,IP1                                                   REZONE   126
            VG(IJ)=VG(IJ)+VTEP                                                REZONE   127
            X(IJ) = X(IJ)+UG(IJ)*DT                                           REZONE   128
            IF(J.NE.2( GO TO 1270                                             REZONE   129
            IF (Y(IJ)+REZYO+VG(IJ)*DT.LE.0.0) VG(IJ)=(-Y(IJ)-REZYO)*RDT       REZONE   130
      1270  CONTINUE                                                          REZONE   131
            Y(IJ) = Y(IJ)+VG(IJ)*DT                                           REZONE   132
            R(IJ) = X(IJ)*CYL+OMCYL                                           REZONE   133
      1279  IJ = IJ+NQ                                                        REZONE   134
            CALL LOOP                                                         REZONE   135
      1289  CONTINUE                                                          REZONE   136
            CALL DONE                                                         REZONE   137
      C                                                                       REZONE   138
            CALL START                                                        REZONE   139
            XX = EMI*REZSIE                                                   REZONE   140
            YY=ABS(GZ)/XX                                                     REZONE   141
            DO 1399 J=2,JP1                                                   REZONE   142
            DO 1389 I=1,IBAR                                                  REZONE   143
            IPJ = IJ + NQ                                                     REZONE   144
            IPJP=IJP+NQ                                                       REZONE   145
            Y4= .25*(Y(IJP)+Y(IPJP)+Y(IJ)+Y((PJ))                             REZONE   146
            IF (J.EQ.2) ROL(IJM)=REZRON*EXP((-Y(IJ)-Y(IPJ)+Y4)*YY)            REZONE   147
            IF (I.EQ.IBAR( ROL(IPJ)=REZRON*EXP((-Y(IPJ)-Y(IPJP)+Y4)*YY)       REZONE   148
            IF (J.EQ.JP1) ROL(IJP)=REZRON*EXP((-Y(IJP)-Y(IPJP)+Y4)*YY(        REZONE   149
            IJM = IJM + NQ                                                    REZONE   150
            IJP = IJP + NQ                                                    REZONE   151
      1389  IJ = (PJ                                                          REZONE   152
            CALL LOOP                                                         REZONE   153
      1399  CONTINUE                                                          REZONE   154
            CALL DONE                                                         REZONE   155
      C                                                                       REZONE   156
            RETURN                                                            REZONE   157
            END                                                               REZONE   158
SINGLY REFERENCED VARIABLES
   1200 -  1(6P    DIV      -R  10C0   IOTV   -I  10C0   JD(C     -I  10C0  NQI     -I   8C0  PYT     -R   9C0  TIME    -R   8C0
 AA1     ()R   5LC  DIVSAV   -R  1-C0   IECP   -I  11C0   JOTV     -I  1:C0  NQIB    -I  ()C0  REAL    -   15F   TNEUT   -R  12C0
 AA2     ()R   6LC  DVDY     -R  1:C0   IJPS   -I   8C0   JNM      -I  11C0  NQI2    -I  11C0  RED     -    8CN  TOUT    -R   8C0
 ANC     -R   11C0  EM1      -R   8C0   IPXL   -I   9C0   JP4      -I  11C0  NRVALS  -I  12C0  RETURN  -  147F   TSTART  -R   8C0
 ANGLES  ()R  12C0  EPS      -R  1(C0   IPXR   -I   9C0   JSWTCH1  -I  13C0  NUMIT   -I  11C0  REZONE  -   15U   VV      -R   9C0
 ASW     -R   1(C0  LOGIVAL  -   14F    IPYB   -I   9C0   JSWTCH3  -I  13C0  CM      -R  ((C0  RIBAR   -R   9C0  WHITE   -   12CN
 AC      -R   11C0  ETAB     ()R   2C0  IPYT   -I   9C0   KX1      -I  1(C0  CMANC   -R  ()C0  RLC1    -    7CN  WRITE   -   45F
 AGFAC   -R   1(C0  FIPXL    -R    9C0  IP2    -I  11C0   LAMD     -R  15R1  CPCEN   ()R   2C0  RVALS   ()R  12C0  XCONV   -R   9C0
 ADM     -R   (1C0  FIPXR    -R    9C0  ISCF1  -I   8C0   LJP2     -I  11C0  CPTMP   ()R   2C0  SENSE   -   13CN  XL      -R   9C0
 BFDL    ()R   2C0  FIPYB    -R    9C0  ISCF2  -I   8C0   MUU2     -R  15RL  CRANGE  -   ()CN  SIGA    ()R   7LC  XR      -R   9C0
 BH      -R   ((C0  F(XL     -R    9C0  ISC2   -I   8C0   NAME     ()I   8C0  PINK    -    4CN  SILVER  -    9CN  YR      -R   9C0
 COCAMU  -R   ()C0  FIXR     -R    9C0  ISC3   -I   8C0   NANGLS   -I  (2C0  PRINT   -   44F   SPTBL   ()R   2C0  YCONV   -R   9C0
 DIMENSI -    16F   FIYB     -R    9C0  ITAB   ()I  11C0   NCYC     -I   8C0  PIAB    ()R   2C0  STATE   -    2CN  YELLOW  -   10CN
 DJC     -R   1(C0  FORMAT   -    17F   I1V    -I   8C0   NOUMP    -I   8C0  PXCONV  -R   9C0  T       -R   8C0  YLC1    -    5CN
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DISAV   -R  11CO   FRER     (JR   2CO   IXL      -I   9CO   NFRW   -I   2CO   PXL      -R   9CO   TAMB   -R   8CO   YLC2   -    6CN
DIU2    -R  11CO   GR       -R   11CO   IXR      -I   9CO   NOPO   -I   2CO   PXR      -R   9CO   TEMP   (JR  8CC   YSC1   -    3CN
DIPOS   -R  11CO   GROVEL   -R   8CO    IYB      -I   9CO   NOPT   -I   2CO   PYB      -R   9CO   THIRD  -R  11CC   YT     -R   9CO
DIR     -R   8CO   IOIC     -I   1 CO   IYT      -I   9CO   NPC    -I  11CO   PYCOHV   -R   9CO   THY    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
  1040 -    3 DO    41*
  1050 -    29DO    43*
  1051 -    54      65*
  1052 -    66      69*
  1053 -    68      69     92*
  1054 -    92      95*
  1055 -    94      95     98*
  1056 -    98      10 *
  1057 -    10      103*
  1058 -    103     105*
  1059 -    84      105    1 8*
  1060 -    5100    112*
  1070 -    5 DO    114*
  1271 -    121     123*
  1279 -    118DO   126*
  1289 -    117DO   128*
  1389 -    134DO   143*
  1399 -    133DO   145*
  2001 -    17*     44PR   45WR
AASC    (JR   3CO   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
              14EQ  14EQ
ABS     -     33SU  34SU   35SU   132SU
AMAXI   -     33SU  34SU   35SU   36SU   37SU   38SU
AREAF   -R    19=   75     77
BETALC  (JR   14EQ  16OI
CENTX   (JR   14EQ  16OI
CENTY   (JR   14EQ  16OI
COMMON  -     2F    3F     4F     8F     9F     10F    11F    12F    13F
CR      (JR   14EQ  16OI
CYL     -R    11CO  125
DELSM   (JR   14EQ  16OI
DONE    -     115SU 129SU  146SU
DT      -R    8CO   12     122    124
DXS     -R    74=   75=    75     78=    78     80
DYS     -R    76=   77=    77     79=    79     81
E       (JR   14EQ  16OI
EMOMLC  (JR   14EQ  16OI
EP      (JR   14EQ  16OI
ETIL    (JR   14EQ  16OI
EXP     -     13ESU 139SU  141SU
FCP2    -R    23=   34=    34     44PR   45WR   47=    47     97     104    107
FCX     -R    23=   35=    35     44PR   45WR   48=    48     96     101    106
FC3     -R    23=   33=    33     44PR   45WR   46=    46     93     99     102
FOUTLC  (JR   14EQ  16OI
FSN     (JR   14EQ  16OI
FSIF    -R    16=   6      61
GMI     -R    11CO  27     131
GM2     -R    27=   40     47     48
GRIR    (JR   14EQ  16OI
GRIZ    (JR   14EQ  16OI
GZ      -R    11CO  132
I       -I    4CO   3 DO   35     38     5100   54     54     83     86     89     98     100    103    105    11800  13400  139
IBAR    -I    8CO   24     134DO  139
IJ      -I    4CO   31     33     34     35     36     36     37     37     38     38     39=    52     53     55     56     58
              58    58     59     59     59     64     69     80     80     81     81     82     83     87     90     91     93
              96    97     99     101    102    104    106    107    109=   119    119    120    120    120    122    122    122
              122   124    124    124    125    125    126=   126    135    137    138    143=
IJM     -I    4CO   61     66     82     96     111=   111    138    141=   141
IJP     -I    4CO   32     36     37     57     63     68     11 =   110    136    137    140    140    142=   142
IHESM   -I    24=   35
IMJ     -I    53=   56=    63     65     83     91
IMI     -I    11CO  3 DO   38
```

```
IPJ      -I   3)=    38     39     4U=    52=    55=    62     67     109    135=   137    (38    139    139    143
IPJP     -I   3c=    4      57=    136=   137    139    140
IPI      -I   UCU    5100   54     89     100    )05    1(800
J        -(   4CU    2900   33     34     36     37     5000   54     54     82     92     95     98     100    103    105    11700
              )2)    )3300  138    140
JBAR     -I   8CO    2900   37
JBMESH   -I   25=    26     33
JPI      -I   8CU    (330L  14
JP2      -I   8CU    25     26     5UDU   54     95     103    )05    11700
JSWTCU2  -I   )3CU   2)
JIMESH   -I   26=    34
LAM      -R   ))CU   )5RL
LCM      -    SF     6F     7F
LOOP     -    42SU   ()3SU  )27SU  144SU
M        ((R  (4EQ   (5RL   )601
MP       ()R  14EQ   )5RL   )601
MU       -R   11CU   15RL
N((      -I   8CO    3)     32     52     53     55     56     57     110    111    126    (35    136    141    142
UMCYL    -R   )1CU   )25
P        ()R  14EQ   )601
PL       ()R  (4EQ   )601
R        ()F  14EQ   )601   )c5=
RA1      -R   7 =    74     74     76     76
RA2      -R   7)=    74     74     76     76
RA3      -R   7c=    74     74     76     76
RA4      -R   73=    74     74     76     76
RCSQ     )R   )4EQ   )601
RDT      -R   ) CO   16     36     37     38     )22
REZRON   -R   1(CO   138    139    140
REZSIE   -R   8CU    36     37     38     )31
REZYU    -R   11CO   122    122
RM       ()R  )4EQ   1601
RMP      ()R  )4EQ   1601
RU       ))R  )4EQ   )601
ROL      ()R  (4EQ   1601   138=   139=   140=
RVOL     ()R  )4EQ   )601
RZEUEN   ()R  14EQ   )601
SIE      ()R  (4EQ   )601   36     37     38
SIGPLC   ()R  (4EQ   1601
STAR)    -    28SU   49SU   ()6SU  130SU
SWICH    -R   2 =    21=    58     59
U        ()R  )4EQ   )601   58
UO       ()R  )4EQ   1601   58=    80=    80     82=    82     87=    90=    96=    96     111=   106=   120
UL       ()R  14EQ   )601   35     58
UMDMLC   ()R  14EQ   (601
UP       ()R  14EQ   )601
UT       -R   22=    36=    38     44PR   45WR
UTIL     ((R  14EQ   )601
V        ()R  )4EQ   1601   59
VG       ()R  14EQ   1601   59=    81=    81     83=    83     91=    91     93=    97=    99=    102=   104=   107=   119=   119
              12c    122=   124
VL       ()R  14EQ   1601   33     34     59
VP       ()R  )4EQ   )601
VTB      -R   22=    36=    36     44PR   45WR
VIEM     -R   11CO   )19
VIIL     ()R  (4EQ   )601
VI1      -R   2c=    37=    37     44PR   45WR
X        ()R  (4EQ   1601   38     38     60     61     62     63     64     120=   120    125
XPAR     ()R  )4EQ   1601
XX       -R   13)=   132
X1       -R   6 =    7      73     74     74     78
X2       -R   61=    7      71     74     74     78
X3       -R   62=    71     72     74     74     78
X4       -R   63=    72     73     74     74     78
X5       -R   64=    7.     7.     71     71     72     72     73     73     74     74     74     74     78
Y        ()R  )4EQ   1601   36     36     37     37     65     66     67     68     69     122    122    124=   124    137    137
              137    137    138    138    139    139    140    14
YPAR     ()R  14EQ   1601
```

```
YY      -R  132=   138    139    140
Y1      -R   65=   7      73     76     76     79
Y2      -R   66=   7      71     76     76     79
Y3      -R   67=   71     72     76     76     79
Y4      -R   68=   72     73     76     76     79    137=   138    139    140
Y5      -R   69=   7      71     71     71     72    72     73     73     76     76     76     76     79
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-


  1           SUBROUTINE PARTMOV                                                  PARTMOV    2
  2           COMMON /STATE/   NOP1, NOPO, NFRO, UPTMP(30), OPDEN(10),            ALLKCM     2
             1                 FREQ(100), SPTBL(300), PTAB(300), ETAB(300),       ALLKCM     3
             2                 BTBL(300)                                          ALLKCM     4
  3           COMMON /YSC1/    AASC(5454(                                         ALLKCM     5
  4           COMMON /PINK/    I, IJ, IJM, IJP, J                                 ALLKCM     6
  5           LCM /YLC1/       AA1(131000)                                        ALLKCM     7
  6           LCM /YLC2/       AA2(131000)                                        ALLKCM     8
  7           LCM /RLC1/       SIGA(30000)                                        ALLKCM     9
  8           COMMON /RED/     NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,       ALLKCM    10
             1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,          ALLKOM    11
             2                 JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, IAMB,      ALLKCM    12
             3                 TEMP(7500), T, TIME, TOUT, TSTART, THY             ALLKOM    13
  9           COMMON /SILVER/  FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,             SILVER     2
             1                 IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,             SILVER     3
             2                 IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,           SILVER     4
             3                 RIBNG, VV, XCONV, XL, XR, YB, YCONV, YT            SILVER     5
 10           COMMON /YELLOW/  DTC, DTCSAV, DTO2, DTV, DTVSAV,                    YELLOW     2
             1                 DVOV, IDTC, IDTV, JDTC, JDTV, RCT                  YELLOW     3
 11           COMMON /ORANGE/  AGC, ASG, A0, A0FAC, ALM, B0, CCLAMU, CYL,         ORANGE     2
             1                 DTMUS, EPS, GM1, GR, GZ, IM1,                      ORANGE     3
             2                 IECP, IP2, JIAB(1000), JNM, JP4, KXI, LAM,         ORANGE     4
             3                 LJP2, MU, NP1, NQI1, NQI2, NUMIT, OM,              ORANGE     5
             4                 OMANC, CMCYL, REZRON, REZYO, THIRD, VTEM           ORANGE     6
 12           COMMON /WHITE/   NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT       ORANGE     7
 13           EQUIVALENCE      (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),   EQVREAL    2
             1                 (AASC(4),U), (AASC(5),V), (AASC(6),RO),            EQVREAL    3
             2                 (AASC(7),MP,RMP,RCSQ,CENTX),                       EQVREAL    4
             3                 (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),            EQVREAL    5
             4                 (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),         EQVREAL    6
             5                 (AASC(12),UTIL,UL,CU,EMOMLC(,                      EQVREAL    7
             6                 (AASC(13),VTIL,VL,UMOMLC),                         EQVREAL    8
             7                 (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),      EQVREAL    9
             8                 (AASC(16),DELSM,SIGPLC),                           EQVREAL   10
             9                 (AASC(17),GRIR,UG,RZEDEN),                         EQVREAL   11
             1                 (AASC(18),GRIZ,VG,FSN)                             EQVREAL   12
 14           REAL             LAM, LAMD, M, MP, MU, MU02                         EQVREAL   13
 15           DIMENSION        X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),          DIMEN      2
             2                 V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),     DIMEN      3
             3                 E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),     DIMEN      4
             4                 VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),         DIMEN      5
             5                 UL(1), CU(1), EMOMLC(1), VTIL(1), VL(1),           DIMEN      6
             6                 UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),           DIMEN      7
             7                 SIE(1), DELSM(1(, SIGPLC(1(, GRIR(1), UG(1),       DIMEN      8
             8                 RZEDEN(1), GRIZ(1), VG(1), FSN(1)                  DIMEN      9
 16      2001 FORMAT           (1H ,*PARTICLE TOSSED OUT*/9H PARTICLE,I9,         PARTMOV    9
                               9X,6H CELL ,I12)                                   PARTMOV   10
        C                                                                         PARTMOV   11
 17           NPP1 = JOLD = 0                                                     PARTMOV   12
 18           IECPX=IECP                                                          PARTMOV   13
 19           LPB=NQI                                                             PARTMOV   14
 20           PYB=1.0E+20                                                         PARTMOV   15
 21           PYT=PXR=-1.0E+20                                                    PARTMOV   16
```

```
 10  CALL ECHO (AASC,IECP,LP8,NE)                    PARTMOV  17
     KP = 1                                          PARTMOV  18
 11  NPPT = NPPT + 1                                 PARTMOV  19
     XTE = XPAR(KP)                                  PARTMOV  20
     IF (XTE.LT.0.) GO TO 150                        PARTMOV  21
     YTE = YPAR(KP)                                  PARTMOV  22
     ICEL = ITAB(NPPT)                               PARTMOV  23
     J = ICEL/IP1 + 1                                PARTMOV  24
     I = ICEL - (J-1)*IP1                            PARTMOV  25
     KKO= 0                                          PARTMOV  26
     ITEM =0                                         PARTMOV  27
     IF (J.EQ.JOLD) GO TO 116                        PARTMOV  28
 115 IEC=(J-1)*NQ1                                   PARTMOV  29
     JOLD =J                                         PARTMOV  30
     CALL ECHO (AASC(ISC2),IEC,NQI2,NE)              PARTMOV  31
 116 KKO=KKO+1                                       PARTMOV  32
     IF (KKO.GT.100) GO TO 490                       PARTMOV  33
     IJ = (I-1)*NQ + ISC2                            PARTMOV  34
     IPJ = IJ + NQ                                   PARTMOV  35
     IJP = IJ + NQ1                                  PARTMOV  36
     IPJP = IPJ + NQ1                                PARTMOV  37
     X1 = X(IPJ)                                     PARTMOV  38
     Y1 = Y(IPJ)                                     PARTMOV  39
     X2 = X(IPJP)                                    PARTMOV  40
     Y2 = Y(IPJP)                                    PARTMOV  41
     X3 = X(IJP)                                     PARTMOV  42
     Y3 = Y(IJP)                                     PARTMOV  43
     X4 = X(IJ)                                      PARTMOV  44
     Y4 = Y(IJ)                                      PARTMOV  45
     XP=XTE                                          PARTMOV  46
     YP=YTE                                          PARTMOV  47
     XPX3= XP-X3                                     PARTMOV  48
     YPY3= YP-Y3                                     PARTMOV  49
     Y13=Y1-Y3                                       PARTMOV  50
     X13= X1-X3                                      PARTMOV  51
     D13= Y13*XPX3 -X13*YPY3                         PARTMOV  52
     IF (D13.GE.0.0) GO TO 119                       PARTMOV  53
     Y23 =Y2-Y3                                      PARTMOV  54
     X23= X2-X3                                      PARTMOV  55
     D23= Y23*XPX3-X23*YPY3                          PARTMOV  56
     IF (D23.LT.0.0) GO TO 117                       PARTMOV  57
     D12=(YP-Y1)*(X2-X1) -(XP-X1)*(Y2-Y1)            PARTMOV  58
     IF (D12.LT.0.0) GO TO 118                       PARTMOV  59
     ITEM =1                                         PARTMOV  60
     DTRI =1./(Y23*X13-X23*Y13)                      PARTMOV  61
     GO TO 125                                       PARTMOV  62
 117 IF (J.EQ.JP1) GO TO 490                         PARTMOV  63
     J=J+1                                           PARTMOV  64
     GO TO 115                                       PARTMOV  65
 118 IF (I.EQ.IBAR) GO TO 490                        PARTMOV  66
     I=I+1                                           PARTMOV  67
     GO TO 116                                       PARTMOV  68
 119 X43= X4-X3                                      PARTMOV  69
     Y43=Y4-Y3                                       PARTMOV  70
     D34 =X43*YPY3 -Y43*XPX3                         PARTMOV  71
     IF (D34.LT.0.0) GO TO 120                       PARTMOV  72
     D14 =(YP-Y4)*(X1-X4) -(Y1-Y4)*(XP-X4)           PARTMOV  73
     IF (D14.LT.0.0) GO TO 121                       PARTMOV  74
     DTRI = 1./(Y13*X43 -X13*Y43)                    PARTMOV  75
     GO TO 125                                       PARTMOV  76
 120 IF (I.EQ.1) GO TO 490                           PARTMOV  77
     I=I-1                                           PARTMOV  78
     GO TO 116                                       PARTMOV  79
 121 IF (J.EQ.2) GO TO 490                           PARTMOV  80
     J=J-1                                           PARTMOV  81
     GO TO 115                                       PARTMOV  82
 125 U1 = U(IPJ)                                     PARTMOV  83
     V1 = V(IPJ)                                     PARTMOV  84
```

```
9      U2 = U(IPJP)                                         PARTMOV  85
91     V2 = V(IPJP)                                         PARTMOV  86
92     U3 = U(IJP)                                          PARTMOV  87
93     V3 = V(IJP)                                          PARTMOV  88
94     U4 = U(IJ)                                           PARTMOV  89
95     V4 = V(IJ)                                           PARTMOV  90
96     IF(ITER.EQ.1) GO TO 126                              PARTMOV  91
97     UK =(U34*U1 +U14*U3 +U13*U4)*DTRI                    PARTMOV  92
98     VK =(U34*V1 +U14*V3 +D13*V4)*DTRI                    PARTMOV  93
99     GC 10 128                                            PARTMOV  94
1,0   126 UK =(C23*U1-U13*U2 +D12*U3)*DTRI                  PARTMOV  95
1,1    VK =(U23*V1 -D13*V2 +D12*V3)*DTRI                    PARTMOV  96
1 2   128 CONTINUE                                          PARTMOV  97
1(3    XPAR(KP)=XTE+U1*UK                                   PARTMOV  98
1C4    YPAR(KP)=YTE+U1*VK                                   PARTMOV  99
1(5    PYB=AMIN1(PYB,YPAR(KP))                              PARTMOV 100
1,6    PYT=AMAX1(PYT,YPAR(KP))                              PARTMOV 101
1:7    PXR=AMAX1(PXR,XPAR(KP))                              PARTMOV 102
(,8    ITAB(NPPT) =(J-1)*IP( +I                             PARTMOV 103
1,9  15   IF (NPP).EQ.NPT) GO TO 160                        PARTMOV (04
11(    KF=LP+2                                              PARTMOV (05
111    IF (KF.LT.LPB) GO TO 11(                             PARTMOV 106
1(2    CALL ECWR (AASC,IECP,LPB,NE)                         PARTMOV 107
113    IECP = IECP + LPB                                    PARTMOV 108
114    GC 10 1,0                                            PARTMOV 109
115  16   CALL ECWR (AASC,IECP,LPB,NE)                      PARTMOV 110
116    ICCP=IECPX                                           PARTMOV 111
117    RETURN                                               PARTMOV (12
1(8  49   XPAR(KP) = -1.E+3                                 PARTMOV 113
119    PRINT 2(0),        NPPT, ITAB(NPPT)                  PARTMOV 114
12     GC 10 15^                                            PARTMOV (15
      C                                                     PARTMOV 116
121    END                                                  PARTMOV 117
SINGLY REFERENCED VARIABLES
 AAI     ()R   5LC   U(R     -R   8CO  GROVEL -R  8CO  IYB    -I  9CO  NOPT    -1  2CO  REAL    -  14F   TIME    -R  8CO
 AA2     ()R   6LC   UIV     -R  1(CO  GZ     -R 11CU  IYT    -I  9CO  NQIB    -1 ()CO  REO     -   8CN  TNEUT   -R 12CO
 AMIN1   -   1(55U   UIVSAV  -R  1(CO  IDTC   -1 19CO  JBAR   -1  8CO  NRVALS  -1 12CO  RETURN  - 117F   TOUT    -R  8CU
 ANL     -R  11CU    UVOY    -R  1(CO  IDIV   -1 10CO  JDTC   -I 1(CO  NUM11   -1 11CO  REZRON -R  11CO  TSTART  -R  8CU
 ANGLES  ()R (2CO    EMIL    -R   8CO  IJP    -1  4CO  JDIV   -1 1(CO  CM      -R 11CO  REZSIE -R   8CU  VTEM    -R 11CU
 ASW     -R  (1CU    EPS     -R  11CC  IJPS   -I  8CD  JNM    -1 11CO  CMANC   -R 11CO  REZYO  -R  11CO  VV      -R  9CU
 AU      -R  11CO    EQUIVAL -   13F   IM)    -I 11CO  JP2    -1  8CO  CMCYL   -R 11CO  RIBAR  -R   9CU  WHITE   -  12CN
 AUFAC   -R  11CO    E(AH   ()R   2CO  IPXL   -1  9CO  JP4    -I 11CO  CPDEN  ()R  2CO  RLC1   -    7CN  XCONV   -R  9CO
 AUM     -R  (1LO    FIPXL   -R   9CD  IPXR   -1  9CO  KX1    -I 11CO  CPTMP  ()R  2CO  RVALS  ()R 12CU  XL      -R  9CO
 BTBL    ()R   2LO   FIPXR   -R   9CO  IPYB   -1  9CO  LAMD   -R 14RL  CRANGE  - (1CN  SIGA   ()R  7LC   XR      -R  9CD
 BC      -R  (1CU    FIPTB   -R   9CO  IPYT   -1  9CO  LJP2   -1 11CO  PARTMOV -  15U  SILVER -    9CN  YR      -R  9CU
 COLAMU  -R  11CO    FIXL    -R   9CO  IP2    -I 11CU  MU02   -R 14RL  PINK    -  4CN  SPTBL  ()R  2CO  YCONV   -R  9CO
 CYL     -R  11LO    FIXR    -R   9CO  ISCF1  -1  9CO  NAME  ()1  8CO  PRINT   - 119F  STATE  -    2CN  YELLOW  -  10CL
 DIMERS1 -    15F    FIY6    -R   9CO  ISCF2  -1  8CO  NANGLS -I 12CO  PTAB   ()R  2CO  T      -R   8CC  YLC1    -   5CN
 DTC     -R  1 CO    TDHRAT  -   16F   ISC3   -1  8CO  NCYC   -I  8CO  PXCONV  -R  9CO  TAMB   -R   8CU  YLC2    -   6CN
 DTLSAV  -R  1-CU    FREG   ()R   2CO  ITV    -1  8CO  NUUMP  -I  8CO  PXL     -R  9CD  TEMP   ()R  8CC  Y5C1    -   3CN
 DTU2    -R  (^CO    GM1     -R  1(CO  IXL    -1  9CO  NFRN   -I  2CO  PYCONV  -R  9CO  THIRU  -R  11CU  YT      -R  9CO
 DTPUS   -R  11CO    GR      -R  11CO  IXR    -1  9CO  NUFO   -I  2CO  ROT     -R 1:CO  THY    -R   8CO
+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*+*
MULTIPLY-REFERENCED VARIABLES
   100 -   22*   1(4
   11( -   24*   111
   115 -   34*   7,     87
   116 -   33    37*    73     84
   117 -   62    68*
   118 -   64    71*
   119 -   58    74*
   12( -   77    62*
   121 -   79    85*
   125 -   67    81     88*
   126 -   96    1((*
   128 -   99    102*
   150 -   26    109*   120
   16( -   1,9   115*
```

```
   490  -    38     68     71     82     85     118*
  2001  -    16*    119PR
AASC    ()R  3CO    13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ   13EQ
             13EQ   13EQ   22AG   36AG   112AG  115AG
AMAX1   -    106SU  107SU
DETALC  ()R  13EQ   1501
CENTX   ()R  13EQ   1501
CENTY   ()R  13EQ   1501
COMMON  -    2F     3F     4F     8F     9F     10F    11F    12F
CQ      ()R  13EQ   1501
DELSM   ()R  13EQ   1501
D1      -R   8CO    103    104
D1R1    -R   66=    6 =    97     98     100    101
DI2     -R   63=    64     100    101
D13     -R   57=    58     97     98     100    101
D14     -R   78=    79     97     98
D23     -R   61=    62     100    101
D34     -R   76=    77     97     98
E       ()R  13EQ   1501
ECRD    -    22SU   36SU
ECWR    -    112SU  115SU
EMOMLC  ()R  13EQ   1501
EP      ()R  13EQ   1501
ETIL    ()R  13EQ   1501
FOUTLC  ()R  13EQ   1501
FSN     ()R  13EQ   1501
GR1R    ()R  13EQ   1501
GR1Z    ()R  13EQ   1501
I       -I   4CO    3 =    39     71     72=    72     82     83=    83     108
IBAR    -I   8CO    71
ICEL    -I   28=    29     30
IEC     -I   34=    36AG
IECP    -I   11CO   18     22AG   112AG  113=   113    115AG  116=
IECPX   -I   18=    116
IJ      -I   4CO    39=    40     41     49     50     94     95
IJP     -I   4CO    41=    47     48     92     93
IPJ     -I   4 =    42     43     44     88     89
IPJP    -I   42=    45     46     90     91
IP1     -I   6CO    29     30     108
ISC2    -I   8CO    36AG   39
ITAB    ()I  11CO   28     108=   119PR
ITEM    -I   32=    65=    96
J       -I   4CO    29=    30     33     34     35     68     69=    69     85     86=    86     108
JOLD    -I   17=    33     35=
JP1     -I   6CO    68
KKO     -I   31=    37=    37     38
KP      -I   23=    25     27     103    104    105    106    107    110=   110    111    118
LAM     -R   11CO   14RL
LCM     -    5F     6F     7F
LPB     -I   19=    22AG   111    112AG  113    115AG
M       ()R  13EQ   14RL   1501
MP      ()R  13EQ   14RL   1501
MU      -R   11CO   14RL
NE      -I   22AG   36AG   112AG  115AG
NBPT    -I   17=    24=    24     28     108    109    119PR  119PR
NPT     -I   11CO   109
NQ      -I   8CO    39     40
NQ1     -I   8CO    19     34     41     42
NQ12    -I   11CO   36AG
P       ()R  13EQ   1501
PL      ()R  13EQ   1501
PXR     -R   9CO    21=    107=   107
PYB     -R   9CO    2 =    105=   105
PYT     -R   9CO    21=    106=   106
R       ()R  13EQ   1501
RCSQ    ()R  13EQ   1501
RM      ()R  13EQ   1501
RMP     ()R  13EQ   1501
```

```
RO       ()R    13EQ   1501
ROL      ()R    13EQ   1501
RVOL     ()R    13EQ   1501
RZEDEN   ()R    13EQ   1501
SIE      ()R    13EQ   1501
SIGPLC   ()R    13EQ   1501
U        ()R    13EQ   1501   88     90     92     94
UG       ()R    13EQ   1501
UK        -R    97=    1L.=   1.3
UL       ()R    13EQ   1501
UMOMLC   ()R    13EQ   1501
UP       ()R    13EQ   1501
UTIL     ()R    13EQ   1501
U1        -R    88=    97     100
U2        -R    9 =    10
U3        -R    92=    97     100
U4        -R    94=    97
V        ()R    13EQ   1501   89     91     93     95
VG       ()R    13EQ   1501
VK        -R    98=    10)=   1 4
VL       ()R    13EQ   1501
VP       ()R    13EQ   1501
VTIL     ()R    13EQ   1501
V1        -R    89=    98     101
V2        -R    91=    101
V3        -R    93=    98     1 1
V4        -R    95=    98
X        ()R    13EQ   1501   43     45     47     49
XP        -R    51=    53     63     78
XPAR     ()R    13EQ   1501   25     103=   107    118=
XPX3      -R    53=    57     61     76
XTE       -R    25=    26     51     103
XI        -R    43=    56     63     63     78
XI3       -R    56=    57     66     80
X2        -R    45=    6      63
X23       -R    6 =    61     66
X3        -R    47=    53     56     60     74
X4        -R    49=    74     78     78
X43       -R    74=    76     8
Y        ()R    13EQ   1501   44     46     48     50
YP        -R    57=    54     63     78
YPAR     ()R    13EQ   1501   27     104=   105    106
YPY3      -R    54=    57     61     76
YTE       -R    27=    52     4
YI        -R    44=    55     63     63     78
YI3       -R    55=    57     66     80
Y2        -R    46=    59     63
Y23       -R    59=    61     66
Y3        -R    48=    54     55     59     75
Y4        -R    5 =    75     78     78
Y43       -R    75=    76     8
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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1              OVERLAY (YOKIFER, 3, 5)                                        MCRT        2
1              PROGRAM MCRT                                                   MCRT        3
          C                                                                   MCRT        4
          C    ---   MCRT SETS UP RADIATION TRANSPORT PROBLEMS                MCRT        5
          C                                                                   MCRT        6
2              COMMON /STATE/    NOPT, NOPO, NFRQ, OPTMP(30), OPDEN(10),      ALLKOM      2
              1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300), ALLKOM      3
              2                  BTBL(300)                                    ALLKOM      4
```

```
  3         COMMON /YSC1/     AASC(5454)                                          ALLKOM      5
  4         COMMON /PINK/     I, IJ, IJM, IJP, J                                  ALLKOM      6
  5         LCM /YLC1/        AA1(131000)                                         ALLKOM      7
  6         LCM /YLC2/        AA2(131000)                                         ALLKOM      8
  7         LCM /RLC1/        SIGA(30000)                                         ALLKOM      9
  8         COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,        ALLKOM     10
           1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,           ALLKOM     11
           2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,       ALLKOM     12
           3                  TEMP(7500), T, TIME, TOUT, TSTART, THY              ALLKOM     13
  9         COMMON /GREEN/    ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMI1          GREEN       2
 10         COMMON /LAVNDER/  DENS(7500), EBLOCK(6000), ECEN, EMC,                LAVNDER     2
           1                  FSCAT(7500), ID, IESCAP, NCOL, NDIE,                LAVNDER     3
           2                  NFLUSH, NMOVE, SIEMIN, T1, T2                       LAVNDER     4
 11         EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),    EQVREAL     2
           1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),             EQVREAL     3
           2                  (AASC(7),MP,RMP,RCSQ,CEN(X),                        EQVREAL     4
           3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),             EQVREAL     5
           4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),          EQVREAL     6
           5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                       EQVREAL     7
           6                  (AASC(13),VTIL,VL,UMOMLC),                          EQVREAL     8
           7                  (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),       EQVREAL     9
           8                  (AASC(16),DELSM,SIGPLC),                            EQVREAL    10
           9                  (AASC(17),GRIR,UG,RZEDEN),                          EQVREAL    11
           (                  (AASC(18),GRIZ,VG,FSN)                              EQVREAL    12
 12         REAL              LAM, LAMD, M, MP, MU, MU02                          EQVREAL    13
 13         DIMENSION         X(1(, XPAR(1), R(1), YPAR(1), Y(1), U(1),           DIMEN       2
           2                  V(1), RC(1), MP(1), RMP(1), RCSQ(1), CENTX(1(,      DIMEN       3
           3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1(,      DIMEN       4
           4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),          DIMEN       5
           5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),            DIMEN       6
           6                  UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),            DIMEN       7
           7                  SIE(1), DELSM(1(, SIGPLC(1), GRIR(1), UG(1),        DIMEN       8
           8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                   DIMEN       9
      C                                                                           MCRT       12
 14         LEXT              DBLINT                                              MCRT       13
      C                                                                           MCRT       14
 15    2001 FORMAT            (1H1,*PROBLEM CYCLE*,I6,6X,*RADON TRANSPORT*//      MCRT       15
           1                  * TIME*,1PE12.4,* T0*,1PE12.4,6X,*DTR*,1PE12.4)     MCRT       16
 16    2002 FORMAT            (1H ,*INITIAL ENERGIES*/6H RADON ,1PE12.4,          MCRT       17
           1                  6X,6H INT  ,1PE12.4,6X,6H KIN  ,1PE12.4,            MCRT       18
           2                  6X,6H TOTAL,1PE12,4)                                MCRT       19
 17    2003 FORMAT            (1H ,5HIJMIN,I12,6X,7H SIEMIN,1PE11,4,              MCRT       20
           1                  6X,6H UMIN ,1PE12.4,6X,6H TMIN ,1PE12,4)            MCRT       21
      C     ---   INITIALIZE VARIABLES                                            MCRT       22
 18         KEEP=0                                                                MCRT       23
 19         DTOLDER=DTR                                                           MCRT       24
 20       1 T2=TIME+DTR                                                           MCRT       25
 21         DTOLD=DTR                                                             MCRT       26
 22         DTR=100.0                                                             MCRT       27
 23         EINT=EKIN=ERTOT=0.0                                                   MCRT       28
 24         SIEMIN=1.0E+20                                                        MCRT       29
 25         XVOL=411.642E+13*DTOLD                                                MCRT       30
 26         XCAT=3.1E+05*DTOLD*ALPHA                                              MCRT       31
      C                                                                           MCRT       32
 27         PRINT 2001,       NCYC, TIME, T2, DTOLD                               MCRT       33
 28         WRITE (12,2001)   NCYC, TIME, T2, DTOLD                               MCRT       34
      C                                                                           MCRT       35
 29         CALL START                                                            MCRT       36
 30         DO 59 J=2,JP1                                                         MCRT       37
 31         IJSC=(J-1)*IP1                                                        MCRT       38
 32         DO 58 I=1,IBAR                                                        MCRT       39
 33         IPJ=IJ+NQ                                                             MCRT       40
 34         IPJP=IJP+NQ                                                           MCRT       41
 35         IJSC=IJSC+1                                                           MCRT       42
 36         CENTX(IJ)=0.25*(X(IJ)+X(IPJ)+X(IPJP)+X(IJP)(                          MCRT       43
 37         CENTY(IJ)=0.25*(Y(IJ)+Y(IPJ)+Y(IPJP)+Y(IJP)(                          MCRT       44
 38         IF (I.EQ.IBAR) CENTX(IPJ)=CENTY(IPJ)=0.0                              MCRT       45
 39         TF=TEMP(IJSC(                                                         MCRT       46
```

```
      TLOG=ALOG10(TP)
      IF (TLOG.GT.OPTMP(NOPT)) TLOG=OPTMP(NOPT)
      DENS(IJSC)=RO(IJ)
      DP=DENS(IJSC)
      DLOG=ALOG10(DP)
      IF (DLOG.LT.OPDEN(1)) DLOG=OPDEN(1)
      IF (DLOG.GT.OPDEN(NOPD)) DLOG=OPDEN(NOPD)
      BP=DBLINT (0,DLOG,TLOG,OPDEN,OPTMP,BTBL, 0,NOPT,NOPD,NOPT)
      BETALC(IJ)=BP
      SP=DBLINT (0,DLOG,TLOG,OPDEN,OPTMP,SPTBL,0,NOPT,NOPD,NOPT)
      SP=AEXP10(SP)
      SIGPLC(IJ)=SP
      FSCAT(IJSC)=1.0/(1.0+XCAT*BP*SP)
      FSG(IJ)=FSCAT(IJSC)
      TP4=TP**4
      RRVOL=6.283184/RVOL(IJ)
      RZEDEN(IJ)=SP*TP4*XVOL*RRVOL*FSCAT(IJSC)
      XX=1.0E+15*DP*RRVOL
      XSIE=XX*SIE(IJ)
      IF (TP.LT.TEMIT) GO TO 54
      XDTR=XSIE/RZEDEN(IJ)
      IF (XDTR.LT.DTR) DTR=XDTR
      IF (XSIE.GT.SIEMIN) GO TO 54
      SIEMIN=XSIE
      IJMIN=IJSC
      TMIN=TP
      DMIN=DP
   54 EINT=EINT+XSIE
      EKIN=EKIN+XX*0.125*(U(IJ)**2+U(IPJ)**2+U(IPJP)**2+U(IJP)**2+
     1 V(IJ)**2+V(IPJ)**2+V(IPJP)**2+V(IJP)**2)
      URTOT=URTOT+137.214E+08*TP4*RRVOL
      IJ=IPJ
      IJP=IPJP
   58 CONTINUE
      CALL LOOP
   59 CONTINUE
      CALL DONE
      DTR=DTR*DTOLDR*0.15
      EALL=EINT+EKIN
C
      PRINT 2002,       URTOT, EINT, EKIN, EALL
      WRITE (12,2002)   URTOT, EINT, EKIN, EALL
      PRINT 2003,       IJMIN, SIEMIN, DMIN, TMIN
      WRITE (12,2003)   IJMIN, SIEMIN, DMIN, TMIN
C
      REWIND 1
      REWIND 2
      REWIND 3
C     ---   PERFORM SOLUTION OF TRANSPORT EQUATION
      CALL OVERLAY (7LYCKIFER,3,1,6HRECALL)
      CALL REMARK (6HREEFER)
C     ---   EVALUATE ENERGY DEPOSITION AND ADVANCE TEMPERATURES
      CALL OVERLAY (7LYCKIFER,3,2,6HRECALL)
      CALL REMARK (6HESTEP )
C     ---   RADIATION TRANSPORT OUTPUT
      IF (T2.LT.TOUT) GO TO 61
      IF (KEEP.EQ.NCYC) GO TO 61
      CALL OVERLAY (7LYCKIFER,3,3,6HRECALL)
      KEEP=NCYC
      CALL REMARK (7HLISTING)
C
   61 TIME=T2
      DTR=AMIN1(DTR,10.0*DT)
      IF (TIME+EM10.GE.T) RETURN
      DTOLDR=DTR
      IF (TIME+DTR.GT.T+EM10) DTR=T-TIME
      GO TO 1
      END
```

```
SINGLY REFERENCED VARIABLES
 AA1      ()R   SLC   ETAB    ))R   2CO   ISCF2  -1   8CO   LAVNDER -    10CN  NCOL   -1  10CO  PINK    -   4CN  START   -  29SU
 AA2      ()R   6CC   FREG    ()R   2CO   ISC2   -1   8CO   LEXT    -    14F   NOIE   -1  10CO  PTAB   ()R  2CO  STATE   -   2CN
 AMINI    -     9SSU  GRUVEL  -R    8CO   ISC3   -1   9CO   LOGP    -    73SU  NOUMP  -1   8CO  QEXP10  -  50SU  TAMB   -R   8CO
 DIMENSI  -     13F   GREEN   -     9CN   ITV    -1   9GO   MCPT    -    1SU   NFLUSH -1  10CO  REAL    -  I2F   THY    -R   8CU
 DONE     -     75SU  IU      -I    1-CO  JBAR   -1   0CO   MU     -R    12RL  NFRQ   -1   2CO  RED     -   8CN  TSTART -R   8CU
 ERCOCK   ((R   )-CU  IESCAP  -I    16CO  JCEN   -1   9CO   MU02   -R    12RL  NMCVE  -1  (LCO  RETURN  -  96F   T1     -R  10CU
 ECEN     -R    ):CU  IJM     -1    4CO   JP2    -(   4CO   NAME   ()1   8CO   NPCMAX -1   9CO  REZSIE -R   8CO  YLC1    -   5GN
 EMC      -R    1-CU  IJPS    -1    8CO   LAM    -R  (2RL   NBP    -1    9CO   NQI    -1   8CO  RLC1    -   7CN  YLC2    -   6CN
 EQUIVAL  -     1)F   ISCF)   -I    6CO   LAMD   -R  12RL   NHUF   -1    9CO   NSP    -1   9CO  SIGA   ))R  7LC  YSC1    -   3CN
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
MULTIPLY-REFERENCED VARIABLES
      1 -    2 *    99
     54 -    59     62     67*
     58 -    3?00   72*
     59 -    3 00   74*
     61 -    69     9      94SU
   2001 -    15*    27PR   28WR
   2002 -    16*    78PR   79WR
   2003 -    17*    8.PR   81WR
AASC    ()R   3CU   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   ()EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ
              11EQ  11EQ
ALPHA   -R    9CU   26
BETALC  ()R   11EQ  1301   48=
BP      -R    47=   40     52
BTBL    ()R   2CU   47
CENTX   ()R   11EQ  1301   36=    38=
CENTY   ()R   11EQ  1301   37=    38=
COMMON  -     2F    3F     4F     8F     9F     10F
CQ      ()R   11EQ  1301
DBLINT  -     14LX  47SU   49SU
DELSM   ()R   11EQ  1301
DENS    ()R   1 CO  42=    43
DLOG    -R    44=   45     45=    46     46=    47     49
DMIN    -R    66=   6 PR   81WR
DP      -R    43=   44     57     66
DT      -R    6CU   95
DTOLD   -R    21=   25     26     27PR   28WR
DTOLDER -R    19=   76     97=
DTR     -R    6CU   19     2.     21     22=    61     61=    76=    76     95=    95     97     98     98=
E       ()R   11EQ  1301
EALL    -R    77=   76PR   79WR
EINT    -R    23=   67=    67     77     78PR   79WR
EKIN    -R    23=   66=    66     77     78PR   79WR
EMOMLC  ()R   11EQ  1301
EMIC    -R    8CU   96     96
EP      ()R   11EQ  1301
ETIL    ()R   11EQ  1301
FORMAT  -     15F   16F    17F
FOUTLC  ()R   11EQ  1301
FSCAT   ()R   1 CU  52=    53     56
FSN     ()R   11EQ  1301   53=
GRIR    ()R   11EQ  1301
GRIZ    ()R   11EQ  1301
I       -1    4CU   3200   36
IBAR    -1    8CO   3200   36
IJ      -1    4CO   33     36     36     37     37     42     48     51     53     55     56     58     60     68     68     70=
IJMIN   -I    64=   8 PR   81WR
IJP     -1    4CO   34     36     37     68     66     71=
IJSC    -1    31=   35=    35     39     42     43     52     53     56     64
IPJ     -1    33=   36     37     38     38     68     68     70
IPJP    -I    34=   36     37     68     68     71
IP1     -1    6CU   31
J       -1    4CU   3 00   31
JP1     -1    6CU   3 00
KEEP    -1    16=   9      92=
LCM     -     5F    6F     7F
M       ()R   11EQ  12RL   1301
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MF	()R	11EQ	12RC	1301					
NCYC	-I	8CO	27PR	28WR	90	92			
NOPD	-I	2CO	46	46	47	49			
NOPT	-I	2CO	41	41	47	47	49	49	
NO	-I	8CO	33	34					
OPOEN	()R	2CO	45	45	46	46	47	49	
OPTMP	()R	2CO	41	41	47	49			
OVERLAY	-	85SU	87SU	91SL					
P	()R	11EQ	1301						
PL	()R	11EQ	1301						
PRINT	-	27F	78F	80F					
QLOG10	-	47SU	44SU						
R	()R	11EQ	1301						
RCSQ	()R	11EQ	1301						
REMARK	-	86SU	88SU	93SU					
REWIND	-	62F	83F	84F					
RM	()R	11EQ	1301						
RMP	()R	11EQ	1301						
RO	()R	11EQ	1301	42					
ROL	()R	11EQ	1301						
RRVOL	-R	55=	56	57	69				
RVOL	()R	11EQ	1301	55					
RZEDEN	()R	11EQ	1301	56=	60				
SIE	()R	11EQ	1301	58					
STEMIN	-R	1 CO	24=	62	63=	80PR	81WR		
SIGPLC	()R	11EQ	1301	51=					
SP	-R	49=	5 =	5	51	52	56		
SPIBL	()R	CO	49						
T	-R	8CO	96	98	98				
TEMIT	-R	9CO	59						
TEMP	()R	6CO	39						
TIME	-R	8CO	2	27PR	28WR	94=	96	98	98
TLOG	-R	4 =	41	41=	47	49			
TMIN	-R	65=	8 PR	81WR					
TOUT	-R	FCO	69						
TP	-R	39=	4	54	59	65			
TP4	-R	54=	56	69					
T2	-R	1 CO	2 =	27PR	28WR	89	94		
U	()R	11EQ	1301	68	68	68	68		
UG	()R	11EQ	1301						
UL	()R	11EQ	1301						
UMOMLC	()R	11EQ	1301						
UP	()R	11EQ	1301						
URIOT	-R	23=	69=	69	78PR	79WR			
UTIL	()R	11EQ	1301						
V	()R	11EQ	1301	68	68	68	68		
VG	()R	11EQ	1301						
VL	()R	11EQ	1301						
VP	()R	11EQ	1301						
VTIL	()R	11EQ	1301						
WRITE	-	28F	79F	81F					
X	()R	11EQ	1301	36	36	36	36		
XCAT	-R	26=	52						
XDIR	-R	61=	61	61					
XPAR	()R	11EQ	1301						
XSIE	-R	58=	6	62	63	67			
XVOL	-R	25=	56						
XX	-R	57=	58	66					
Y	()R	11EQ	1301	37	37	37	37		
YEAR	()R	11EQ	1301						

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      OVERLAY (YOKIFER,3,1)                                            REEFER    2
      PROGRAM REEFER                                                   REEFER    3
C                                                                      REEFER    4
C     (R)AUIATING (E)ULERIAN (E)ARLY (F)IREBALL (E)XCLUDING (R)EACTIONS REEFER    5
C                                                                      REEFER    6
      COMMON /STATE/   NCPT, NCPD, NFRQ, UPTMP(30), OPDEN(10),         ALLKOM    2
     1                 FREQ(100), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM    3
     2                 BTBL(300)                                       ALLKOM    4
      COMMON /YSCI/    AASC(5454)                                      ALLKOM    5
      COMMON /PINK/    I, IJ, IJM, IJP, J                              ALLKOM    6
      LCM /YLC1/       AA1(131000)                                     ALLKOM    7
      LCM /YLC2/       AA2(131000)                                     ALLKOM    8
      LCM /BLC1/       SIGA(30000)                                     ALLKOM    9
      COMMON /RED/     NAME(12), DT, DTR, EM10, GRDVEL, IBAR, IJPS,    ALLKOM   10
     1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM   11
     2                 JP1, JP2, NCYC, NOUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM   12
     3                 TEMP(7500), T, TIME, TOUT, ISTART, THY          ALLKOM   13
      COMMON /GREEN/   ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMIT      GREEN     2
      COMMON /LAVNDER/ DENS(7500), EBLOCK(400,0), ECEN, EMC,           LAVNDER   2
     1                 FSCAT(7500), IU, IESCAP, NCOL, NDIE,            LAVNDER   3
     2                 NFLUSH, NMOVE, SIEMIN, (), T2                   LAVNDER   4
      EQUIVALENCE      (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL   2
     1                 (AASC(4),U), (AASC(5),V), (AASC(6),RO),         EQVREAL   3
     2                 (AASC(7),CP,RMP,RCSQ,CENTX),                    EQVREAL   4
     3                 (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),         EQVREAL   5
     4                 (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),      EQVREAL   6
     5                 (AASC(12),UTIL,UL,C(),EMOMLC),                  EQVREAL   7
     6                 (AASC(13),VTIL,VL,UMOMLC),                      EQVREAL   8
     7                 (AASC(14),RCL,HETALC,FOUTLC), (AASC(15),SIE),   EQVREAL   9
     8                 (AASC(16),DELSM,SIGPLC),                        EQVREAL  10
     9                 (AASC(17),GRIR,UG,RZCUEN),                      EQVREAL  11
     1                 (AASC(18),GRIZ,VG,FSN)                          EQVREAL  12
      REAL             LAM, LAMO, M, MP, MU, MU2                       EQVREAL  13
      DIMENSION        X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),       DIMEN     2
     2                 V(1), RO(1), MD(1), RMP(1), RCSQ(1), CENTX(1),  DIMEN     3
     3                 E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),  DIMEN     4
     4                 VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),      DIMEN     5
     5                 UL(1), C(1), EMOMLC(1), VTIL(1), VL(1),         DIMEN     6
     6                 UMOMLC(1), RCL(1), HETALC(1), FOUTLC(1),        DIMEN     7
     7                 SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),    DIMEN     8
     8                 RZEDEN(1), GRIZ(1), VG(1), FSN(1)               DIMEN     9
      COMMON /MAUVE/   MI, MJ, MG, MG1, RHOF, ZP, NCELL                REEFER   12
      DIMENSION        A(3), OMEGA(3), CBLOCK(4000), XFRQT(3)          REEFER   13
C                                                                      REEFER   14
 2004 FORMAT           (1H0,*PARTICLE ENERGIES*/6H EMC  ,1PE12.4,      REEFER   15
     1                 6X,6H EHAD ,1PE12.4,6X,6H ECEN1,1PE12.4)        REEFER   16
 2005 FORMAT           (1H0,I1),* DEPOSITION SAMPLES DUMPED TO FSET3*) REEFER   17
 2006 FORMAT           (1H0,*PARTICLES*/12X,12H        NGEN,           REEFER   18
     1                 12H        NCEN,12H        NBANK,               REEFER   19
     2                 12H        NDIE,12H      IESCAP,                REEFER   20
     3                 12H       NMOVE,12H        NCOL/)               REEFER   21
 2007 FORMAT           (12H CENSUS      ,7I12)                         REEFER   22
 2008 FORMAT           (12H SOURCE      ,7I12)                         REEFER   23
 2009 FORMAT           (12H BANK        ,7I12)                         REEFER   24
C     ---   INITIALIZE                                                 REEFER   25
      IU=.                                                             REEFER   26
      NFLUSH=                                                          REEFER   27
      IBANK=0                                                          REEFER   28
      MI=IBAR                                                          REEFER   29
      MJ=JP1                                                           REEFER   30
      MG=NQ                                                            REEFER   31
      MG1=NQI                                                          REEFER   32
      ECIE=1.0E+20                                                     REEFER   33
      ECEN1=0.0                                                        REEFER   34
      ECEN=0.0                                                         REEFER   35
      PRINT 2006                                                       REEFER   36
      WRITE (12,2006)                                                  REEFER   37
```

```
      CALL OPEN (SLFSET3,2LST,7168)
C     ---   FOLLOW PARTICLES LEFT FROM LAST CENSUS
      IF (JCEN.EQ.0) GO TO 12
      NCEN=JCEN
      JCEN=0
      NCEN=NBANK=NDIE=IESCAP=NMOVE=NCOL=0
      CALL OPEN (SLFSET1,2LST,4608)
    3 CALL RDBUF (SLFSET1, CBLOCK, 4000, LENGTH2, LSTATUS)
      DO 8 IJCEN=1,LENGTH2,8
      XEPART=CBLOCK(IJCEN+6)
      IF (XEPART.LE.0.0) GO TO 8
      XA1=CBLOCK(IJCEN)
      XA2=CBLOCK(IJCEN+1)
      XA3=CBLOCK(IJCEN+2)
      XOMEGA1=CBLOCK(IJCEN+3)
      XOMEGA2=CBLOCK(IJCEN+4)
      XOMEGA3=CBLOCK(IJCEN+5)
      XFREUP=CBLOCK(IJCEN+7)
      I=SHIFT(XFREUP,-9).AND.777B
      J=XFREUP.AND.777B
      XFREUP=XFREUP.AND.77777777777777000000B
      RHOP=GSQRT(XA1**2+XA2**2)
      ZP=XA3
      CALL WHERE (I,J)
      IF (I.LE.0.OR.I.GE.IP1) GO TO 8
      IF (J.LE.1.OR.J.GE.JP2) GO TO 8
      XOCELL=OCELL
      IJ=1
      IECS=(J-1)*NQI+(I-1)*NQ
      CALL ECRD (X(IJ),IECS,30,NE)
      Y(IJ)=X(IJ+2)
      Y(IJ+NQ)=X(IJ+NQ+2)
      IJP=IJ+NQ1
      IECS=IECS+NQ1
      CALL ECRD (X(IJP),IECS,30,NE)
      Y(IJP)=X(IJP+2)
      Y(IJP+NQ)=X(IJP+NQ+2)
      XEDEN=X(17)
      IF (XEDEN.LE.0.0) GO TO 8
      IF (XEPART.GT.XEDEN) XEPART=XEDEN
      NCP=10.0*XEPART/XEDEN
      IF (NCP.LT.1) NCP=1
      XNCP=NCP
      XEPART=XEPART/XNCP
      EPART=XEPART
      A(1)=XA1
      A(2)=XA2
      A(3)=XA3
      OMEGA(1)=XOMEGA1
      OMEGA(2)=XOMEGA2
      OMEGA(3)=XOMEGA3
      FREUP=XFREUP
      XEDEN=XEDEN-EPART
      ECEN1=ECEN1+EPART
      TI=TIME
      IDIE=0
      OCELL=XOCELL
      EDEATH=AMIN1(0.01*EPART,0.01*SIEMIN)
      CALL WALK (A, OMEGA, IDIE, FREUP, EPART, EDEATH)
      IF (IDIE.EQ.0) GO TO 7

      IF (EPART.LE.0.0) GO TO 5
      NCEN=NCEN+1
      ECEN=ECEN+EPART
      GO TO 6
    5 NBANK=NBANK+1
    6 CBLOCK(1)=A(1)
      CBLOCK(2)=A(2)
```

```
      CBLOCK(3)=A(3)
      CBLOCK(4)=OMEGA(1)
      CBLOCK(5)=OMEGA(2)
      CBLOCK(6)=OMEGA(3)
      CBLOCK(7)=EPART
      CBLOCK(8)=FREQP
      CALL WTBUF (5,FSE12, CBLOCK, 8)
    7 NCP=NCP-1
      IF (NCP.GE.1) GO TO 4
      IECS=IECS-NGI+16
      CALL ECWR (XEGEN,IECS,1,NE)
    8 CONTINUE
      IF (LSTATUS.EQ.1) GO TO 3
C
      REWIND 1
      CALL REMARK (26HCENSUS PARTICLES COMPLETED)
      JCEN=NCEN
      JBANK=NBANK*NSP
      PRINT 2007,       NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
      WRITE (12,2007)   NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
C     ---    ASSIGN SOURCE PARTICLES
   12 ERAD=0.0
      RNP=1.0/FLOAT(NSP)
      NGEN=0
      NCEN=NBANK=NDIE=IESCAP=NMOVE=NCOL=0
      CALL START
      DO 19 J=2,JP1
      IJSC=(J-1)*IP
      DO 18 I=1,IBAR
      IPJ=IJ+NQ
      IPJP=IJP+NQ
      IJSC=IJSC+1
      TP=TEMP(IJSC)
      IF (TP.LT.TEMIT) GO TO 17
      XEPART=RZEDEN(IJ)*RNP
      XOCELL=0.25*(X(IPJ)-X(IJ)+X(IPJP)-X(IJP)+Y(IJP)-Y(IJ)+
     1 Y(IPJP)-Y(IPJ))
      DO 16 K=1,NSP
      NGEN=NGEN+1
      RN1=RANDOM(DUMMY)
      RN2=RANDOM(DUMMY)
      RN3=RANDOM(DUMMY)
      RN4=RANDOM(DUMMY)
      XRN=1.0/(RN1+RN2+RN3+RN4)
      A(1)=XRN*(RN1*X(IJ)+RN2*X(IPJ)+RN3*X(IPJP)+RN4*X(IJP))
      A(2)=0.0
      A(3)=XRN*(RN1*Y(IJ)+RN2*Y(IPJ)+RN3*Y(IPJP)+RN4*Y(IJP))
      T1=TIME
      EPART=XEPART
      ERAD=ERAD+EPART
C
      CALL PFREQ (FREQP, TP)
      TH=3.141592*RANDOM(DUMMY)
      STH=SIN(TH)
      CTH=COS(TH)
      PH=6.283184*RANDOM(DUMMY)
      SPH=SIN(PH)
      CPH=COS(PH)
      OMEGA(1)=STH*CPH
      OMEGA(2)=STH*SPH
      OMEGA(3)=CTH
      IDIE=0
      DCELL=XOCELL
      EDEATH=AM(N1(1),1)*EPART,0.01*SIEMIN)
      IF (EDEATH.LT.EDIE) EDIE=EDEATH
      CALL WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)
      IF (IDIE.EQ.0) GO TO 16
C
```

```
      IF (EPART.LT.0.0) GO TO 14
      NCEN=NCEN+1
      ECEN=ECEN+EPART
      GO TO 15
   14 NBANK=NBANK+1
   15 CBLOCK(1)=A(1)
      CBLOCK(2)=A(2)
      CBLOCK(3)=A(3)
      CBLOCK(4)=OMEGA(1)
      CBLOCK(5)=OMEGA(2)
      CBLOCK(6)=OMEGA(3)
      CBLOCK(7)=EPART
      CBLOCK(8)=FREQP
      CALL WTBUF (SLFSET2, CBLOCK, 8)
   16 CONTINUE
   17 IJ=IPJ
      IJP=IFJP
   18 CONTINUE
      CALL LOOP
   19 CONTINUE
      CALL DONE
C
      CALL REMARK (26HSOURCE PARTICLES COMPLETED)
      JCEN=JCEN+NCEN
      IBANK=IBANK+NBANK*NBP
      PRINT 2008,       NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
      WRITE (12,2008)   NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
C     ---   PARTICLE BANK
   31 WRITE (2)
      ENDFILE 2
      REWIND 2
      CALL COPYF (SLFSET2,SLFSET1)
      REWIND 1
      REWIND 2
      IF (IBANK.EQ.0.0) GO TO 51
      NGEN=IBANK
      IBANK=0
      NCEN=NBANK=NDIE=IESCAP=NMOVE=NCOL=0
      RNBP=1.0/FLOAT(NBP)
      EDEATH=EDIE
      CALL OPEN (SLFSET1,2LST,4608)
      CALL OPEN (SLFSET2,2LST,4608)
   32 CALL RDBUF (SLFSET1, CBLOCK, 4000, LENGTH2, LSTATUS)
      DO 38 IJCEN=1,LENGTH2,8
      XEPART=CBLOCK(IJCEN+6)
      IF (XEPART.LT.0.0) GO TO 33
      CALL WTBUF (SLFSET2, CBLOCK(IJCEN), 8)
      GO TO 38
   33 XEPART=-XEPART
      XEPART=XEPART*RNBP
      XA1=CBLOCK(IJCEN)
      XA2=CBLOCK(IJCEN+1)
      XA3=CBLOCK(IJCEN+2)
      XOMEGA1=CBLOCK(IJCEN+3)
      XOMEGA2=CBLOCK(IJCEN+4)
      XOMEGA3=CBLOCK(IJCEN+5)
      XFREQP=CBLOCK(IJCEN+7)
      I=SHIFT(XFREQP,-9).AND.777B
      J=XFREQP.AND.777B
      CALL UNPKFN (XFREQP, XFRQT)
      XFREQP=XFRQT(1)
      T1=XFRQT(2)
      IJ=1
      IECS=(J-1)*NQ1+(I-1)*NQ
      CALL ECRD (X(IJ), IECS, 30, NE)
      Y(IJ)=X(IJ+2)
      Y(IJ+NQ)=X(IJ+NQ+2)
      IJP=IJ+NQ1
```

```
      IECS=IECS+NQI
      CALL ECRD (X(IJP), IECS, 30, NE)
      Y(IJP)=X(IJP+2)
      Y(IJP+NQ)=X(IJP+NQ+2)
      XDCELL=0.25*(X(IJ+NQ)-X(IJ)+X(IJP+NQ)-X(IJP)+
     1 Y(IJP)-Y(IJ)+Y(IJP+NQ)-Y(IJ+NQ))
      IJSC=(J-1)*IP(+I
      TP=TEMP(IJSC)
      DO 37 K=1,NBP
      A(1)=XA1
      A(2)=XA2
      A(3)=XA3
      OMEGA(1)=XOMEGA1
      OMEGA(2)=XOMEGA2
      OMEGA(3)=XOMEGA3
      EPART=XEPART
      FREQP=XFREQP
      DCELL=XDCELL
      IDIE=1
      CALL WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)
      IF (IDIE.EQ.0) GO TO 37
      IF (EPART.LE.0.0) GO TO 34
      NCEN=NCEN+1
      ECEN=ECEN+EPART
      GO TO 35
   34 NBANK=NBANK+1
   35 CBLOCK(1)=A(1)
      CBLOCK(2)=A(2)
      CBLOCK(3)=A(3)
      CBLOCK(4)=OMEGA(1)
      CBLOCK(5)=OMEGA(2)
      CBLOCK(6)=OMEGA(3)
      CBLOCK(7)=EPART
      CBLOCK(8)=FREQP
   36 CALL WIBUF (SLFSET2, CBLOCK, 8)
   37 CONTINUE
   38 CONTINUE
      IF (LSTATUS.EQ.1) GO TO 32
      REWIND 1
C
      CALL REMARK (24HBANK PARTICLES COMPLETED)
      JCEN=JCEN+NCEN
      IDANK=NBANK*NBP
      EDIE=0.0)*SIEMIN
      PRINT 2009,      NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
      WRITE (12,2009)  NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL
      GO TO 31
C
   51 EMC=ERAD+ECENI
      CALL FLUSH
      PRINT 2005,      NFLUSH
      WRITE (12,2005)  NFLUSH
      WRITE (3)
      ENDFILE 3
      REWIND 3
      CALL OPEN (SLFSET3,2LST,512)
C
      CALL OPEN (SLFSET1,2LST,512)
      CALL OPEN (SLFSET2,2LST,512)
      PRINT 2004,      EMC, ERAD, ECENI
      WRITE (12,2004)  EMC, ERAD, ECENI
      RETURN
      END
```

SINGLY REFERENCED VARIABLES

36	-	262*	EBLOCK	()R	10CO	IJP	-I	4CO	LAVNDER	-	10CN	NOFU	-I	2CO	RED	-	8CN	TAMB	-R	8CO
AA1	()R	5LC	ECWR	-	11FSU	IJPS	-I	8CO	LOUP	-	181SU	NOPT	-I	2CO	REEFER	-	1SU	THY	-R	8CO
AA2	()R	6LC	EDIC	-R	FCO	ISCF1	-I	8CO	MAUVE	-	14CN	NPCMAX	-I	9CO	RETURN	-	286F	TOUT	-R	8CL
ALPHA	-R	9CO	EQUIVAL	-	11F	ISCF2	-I	8CO	MU	-R	12RL	OPDEN	()R	2CO	REZSIE	-R	8CO	TSTART	-R	8CO

```
BTOL    ()R   2CO    ETAB    ()R   2CO    ISC2    -I    8CO   MOOP    -R   12RL   CPTMP  ()R   2CO   RLC1    -     7CN   T2      -R  10CU
COPYF   -   192SU    FCOSF   -   275SU    ISC3    -I    8CO   NAME    ()I   8CO   PFREQ  -   147SU   SIGA    ()R   7LC   UNPKFN  -  220SU
DENS    ()R  10CO    FREQ    ()R   2CO    ITV     -I    8CO   NBUF    -I    9CO   PINK   -     4CN   SPTHL   ()R   2CO   WHERE   -   56SU
DONE    -   163SU    FSCAT   ()R  10CO    JBAR    -I    8CO   NCYC    -I    8CO   PTAB   ()R   2CO   START   -   123SU  YLC1    -    5CN
DT      -R   8CO     GRUVEL  -R    8CO    LAP     -R   12RL   NDUMP   -I    8CO   GSGRT  -    545U   STATE   -     2CN   YLC2    -    6CN
DIR     -R   8CO     GREEN   -     9CN    LAPD    -R   12RL   NFRQ    -I    2CO   REAL   -     12F   T       -R    8CC   YSC1    -    3CN
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
      3 -    41*    112
      4 -    77*    118
      5 -    93     97*
      6 -    96     98*
      7 -    92     107*
      8 -    41DO   43      57      58      71     111*
     12 -    35     119*
     14 -    163    167*
     15 -    166    168*
     16 -    134DO  162    177*
     17 -    131    178*
     18 -    126DO  163*
     19 -    124DO  162*
     31 -    189*   273
     32 -    263*   265
     33 -    266    269*
     34 -    249    253*
     35 -    252    254*
     37 -    236DO  248     263*
     38 -    244DO  258     264*
     51 -    195    274*
   2004 -    16*    284PR   285WR
   2005 -    17*    276PR   277WR
   2006 -    18*    32PR    33WR
   2007 -    19*    117PR   118WR
   2008 -    20*    187PR   188WR
   2009 -    21*    271PR   272WR
A       ()R  15DI   78=     79=     80=     91AG    98      99      100     141=    142=    143=    161AG   168     169     170     237=    238=
             239=   247AG   254     255     256
AASC    ()R  3CO    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ
             11EQ   11EQ
AMIN1   -    95SU   159SU
BETALC  ()R  11EQ   1301
CBLOCK  ()R  15DI   4 AG    42      44      45      46      47      48      49      50      98=     99=     100=    101=    102=    103=    104=
             105=   106AG   168=    169=    170=    171=    172=    173=    174=    175=    176AG   203AG   205     207AG   211     212     213
             214    215     216     217     254=    255=    256=    257=    258=    259=    260=    261=    262AG
CENTA   ()R  11EQ   1301
CENTY   ()R  11EQ   1301
COMMUN  -    2F     3F      4F      8F      9F      10F     14F
COS     -    154SU  153SU
CPH     -R   153=   154
CQ      ()R  11EQ   1301
CTH     -R   155=   156
DCELL   -R   14CO   59      69=     158=    245=
DELSM   ()R  11EQ   1301
DIMENSI -    13F    15F
DUMMY   -R   136    137     138     139     148     151
E       ()R  11EQ   1301
ECEN    -R   14CO   31=     95=     95      165=    165     251=    251
ECENI   -R   34=    86=     86      274     284PR   285WR
EERD    -    62SU   67SU    225SU   230SU
EDEATH  -R   96=    91AG    159=    160     160     161AG   200=    247AG
EDIE    -R   29=    30      163=    200     270=
EMC     -R   14CO   274=    284PR   285WR
EMOMCC  ()R  11EQ   1301
ENDFILE -    19F    279F
EP      ()R  11EQ   1301
EPART   -R   77=    85      86      90      91AG    93      95      104     145=    146     159     161AG   163     165     174     243=    247AG
             249    251     260
ERAD    -R   119=   146=    146     274     284PR   285WR
```

```
ETIL     ()R    ]]EQ   130I
FLOAT    -      (24SU  ]99SU
FORMAT   -      ]6F    17F    18F    19F    20F    21F
FOUILC   ((R    ](EQ   1301
FREGP    -R     84=    91AG   1.5    147AG  161AG  175    244=   247AG  261
FS1      ((R    ](EQ   1301
GRIR     ((R    ]]EQ   1301
GRIZ     ()R    ()EQ   1301
I        -I     4CO    5(=    56AG   57     57     61     12600  218=   224    234
IBANK    -I     24=    ]16=   ]06=   186    195    196    197=   269=
IBAR     -I     5CO    25     126UC
II       -I     ( CO   22=
IOIE     -I     88=    91AG   92     157=   161AG  162    246=   247AG  248
IECS     -I     61=    62DG   66=    66     67AG   109=   109    110AG  224=   225AG  229=   229    230AG
IESCAP   -I     1 CO   3]=    ()7PR  ]]8WR  122=   187PR  188WR  198=   271PR  272WR
IJ       -I     4CO    6.=    62AG   63     63     64     64     65     127    132    133    133    141    143    178=   223=   225AG
                220    226    227    227    228    233    233    233    233
IJCEN    -I     4100   42     44     45     46     47     48     49     50     20400  205    207AG  211    212    213    214    215
                216    217
JP       -I     4CO    66=    67AG   68     68     69     69     128    133    133    141    143    179=   228=   230AG  231    231
                232    232    233    233    233    233
IJSC     -I     125=   129=   129    130    234=   235
IPJ      -I     127=   133    133    141    143    178
IPJP     -I     126=   133    133    141    143    179
IPI      -I     8CO    57     125    234
J        -I     4CO    52=    56AG   58     58     61     12400  125    219=   224    234
JCEN     -I     9CO    35     36     37=    115=   185=   185    268=   268
JPI      -I     8CO    26     12400
JP2      -I     6CO    56
K        -I     13400  23600U
LCM      -      5F     6F     7F
LENGTH2  -I     4 AG   4100   2 3AG  20400
LSTATUS  -I     4 AG   1(2    2 3AG  265
M        ()R    ]]EQ   12RL   1301
MI       -I     14CO   25=
MJ       -I     14CO   26=
MP       ()R    ]]EQ   12R(   1301
MR       -I     14CO   27=
MOI      -I     14CO   28=
NBANK    -I     38=    97=    97     116    117PR  118WR  122=   167=   167    186    187PR  188WR  198=   253=   253    269    271PR
                272WR
NBP      -I     9CO    116    186    199    23600  209
NCEN     -I     38=    94=    94     115    117PR  118WR  122=   164=   164    185    187PR  188WR  198=   250=   250    268    271PR
                272WR
NCOL     -I     ]1CO   38=    117PR  118WR  122=   187PR  188WR  198=   271PR  272WR
NCP      -I     73=    74     74=    75     107=   107    108
NOIE     -I     11CO   38=    117PR  118WR  122=   187PR  188WR  198=   271PR  272WR
NE       -I     62AG   67AG   110AG  225AG  230AG
NFLUSH   -I     (.CO   23=    276PR  277WR
NGEN     -I     36=    117PR  118WR  121=   135=   135    187PR  188WR  196=   271PR  272WR
NMOVE    -I     1.CO   38=    117PR  118WR  122=   187PR  188WR  198=   271PR  272WR
NQ       -I     8CO    27     61     64     64     69     69     127    128    224    227    227    232    232    233    233    233
                233
NQI      -I     8CO    28     61     65     66     109    224    228    229
NSP      -I     9CO    12L .  13400
OMEGA    ()R    15UI   81=    82=    83=    91AG   101    102    103    154=   155=   156=   161AG  171    172    173    240=   241=
                242=   247AG  257    258    259
OPEN     -      34SU   39SU   2.(SU  202SU  281SU  282SU  283SU
P        ()R    ]]EQ   1301
PH       -R     151=   152    153
PL       ()R    ]]EQ   1301
PRINT    -      32F    117F   187F   271F   276F   284F
R        ()R    ]]EQ   1201
RANDOM   -      136SU  137SU  138SU  139SU  148SU  151SU
RCSQ     ()R    ]]EQ   1301
ROBUF    -      4 SU   263SU
REMARK   -      1(4SU  164SU  267SU
REWIND   -      113F   191F   193SU  194SU  266F   280F
```

```
RROP     -R    14CO    54=
RM      ()R    1)EQ    1301
RMP     ()R    1)EQ    1301
RNBP     -R    199=    21
RNP      -R    12 =    132
RN1      -R    136=    14      141     143
RN2      -R    137=    14.     141     143
RN3      -R    138=    14.     141     143
RN4      -R    139=    14.     141     143
RO      ()R    ()EQ    1301
ROL     ()R    ()EQ    1301
RVOL    ()R    1)EQ    1301
RZEOEN  ()R    11EQ    1301    132
SHIFT    -     51SU    218SU
SIE     ()R    1)EQ    1301
SIEMIN   -R    1^CO    9!      159     270
SIGPLC  ()R    1)EQ    1301
SIN      -     149SU   152SU
SPH      -R    152=    155
STH      -R   *149=    154     155
TEHIT    -R    9CO     131
TEMP    ()R    8CO     13.     235
TH       -R    146=    149     153
TIME     -R    8CO     87      144
TP       -R    13 =    131     147AG   235=
TI       -R    1.CO    67=     144=    222=
U       ()R    11EQ    1301
UG      ()R    11EQ    1301
UL      ()R    11EQ    1301
UMOMLC  ()R    11EQ    1301
UP      ()R    ()EQ    1301
UTIL    ()R    1)EQ    1301
V       ()R    1)EQ    1301
VG      ()R    11EQ    1301
VL      ()R    11EQ    1301
VP      ()R    1)EQ    1301
VTIL    ()R    1)EQ    1301
WALK     -     91SU    161SU   247SU
WRITE    -     33F     118F    188F    189F    272F    277F    278F    285F
WIBUF    -     100SU   176SU   217SU   262SU
X       ()R    1)EQ    1301    62AG    63      64      67AG    68      69      70      133     133     133     133     141     141     141     141
               225AG   226     227     230AG   231     232     233     233     233     233
XA1      -R    44=     54      78      211=    237
XA2      -R    45=     54      79      212=    238
XA3      -R    46=     55      80      213=    239
XDCELL   -R    59=     69      133=    158     233=    245
XEUEN    -R    7 =     71      72      72      73      65=     65      110AG
XEPART   -R    42=     43      72      72=     73      76=     76      77      132=   *145     205=    206     209=    209     210=    210     243
XFREQP   -R    5 =     51      52      53=     53      64      217=    218     219     220AG   221=    244
XFRQ1   ()R    1SDI    221AG   221     222
XNCP     -R    75=     76
XOMEGA1  -R    47=     81      214=    240
XOMEGA2  -R    48=     82      215=    241
XOMEGA3  -R    49=     83      216=    242
XPAR    ()R    1)EQ    1301
XRN      -R    14 =    141     143
Y       ()R    1)EQ    1301    63=     64=     68=     69=     133     133     133     133     143     143     143     143     226=    227=    231=
               232=    233     233     233     233
YPAR    ()R    11EQ    1301
ZP       -R    14CO    55=
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  1          SUBROUTINE FLUSH                                                                          FLUSH       2
       C                                                                                               FLUSH       3
  2          COMMON /STATE/      NOPT, NOPO, NFRQ, OPTMP(30), OPOEN(10),                               ALLKOM      2
            1                    FREQ(100), SPTBL(300), PIAB(300), ETAB(300),                          ALLKOM      3
            2                    BTBL(300)                                                             ALLKOM      4
  3          COMMON /YSCI/       AASC(5454)                                                            ALLKOM      5
  4          COMMON /PINK/       I, IJ, IJM, IJP, J                                                    ALLKOM      6
  5          LCM /YLC1/          AA1(131000)                                                           ALLKOM      7
  6          LCM /YLC2/          AA2(131000)                                                           ALLKOM      8
  7          LCM /RLC1/          SIGA(30000)                                                           ALLKOM      9
  8          COMMON /RED/        NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,                          ALLKOM     10
            1                    IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,                             ALLKOM     11
            2                    JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,                         ALLKOM     12
            3                    TEMP(7500), T, TIME, TOUT, TSTART, THY                                ALLKOM     13
  9          COMMON /GREEN/      ALPHA, NHP, NBUF, NSP, NPCMAX, JCEN, TEMIT                            GREEN       2
 10          COMMON /LAVNOER/    DEMS(7500), EBLOCK(6000), ECEN, EMC,                                  LAVNOER     2
            1                    FSCAT(500), ID, IESCAP, NCOL, NOIE,                                   LAVNOER     3
            2                    NFLUSH, NMOVE, SIEMIN, T1, T2                                         LAVNOER     4
 11          EQUIVALENCE         (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),                      EQVREAL     2
            1                    (AASC(4),U), (AASC(5),V), (AASC(6),RO),                               EQVREAL     3
            2                    (AASC(7),MP,RMP,RCSQ,CENTX),                                          EQVREAL     4
            3                    (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),                               EQVREAL     5
            4                    (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),                            EQVREAL     6
            5                    (AASC(12),UTIL,UL,CQ,EMOMLC),                                         EQVREAL     7
            6                    (AASC(13),VTIL,VL,UMOMLC),                                            EQVREAL     8
            7                    (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),                         EQVREAL     9
            8                    (AASC(16),DELSM,SIGPLC),                                              EQVREAL    10
            9                    (AASC(17),GRIR,UG,RZDEN),                                             EQVREAL    11
            1                    (AASC(18),GRIZ,VG,FSN)                                                EQVREAL    12
 12          REAL                LAM, LAMD, M, MP, MU, MUO2                                            EQVREAL    13
 13          DIMENSION           X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),                             DIMEN       2
            2                    V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),                        DIMEN       3
            3                    E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),                        DIMEN       4
            4                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),                            DIMEN       5
            5                    UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),                              DIMEN       6
            6                    UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),                              DIMEN       7
            7                    SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),                          DIMEN       8
            8                    RZDEN(1), GRIZ(1), VG(1), FSN(1)                                      DIMEN       9
       C                                                                                               FLUSH       9
       C        THIS ROUTINE FLUSHES THE ENERGY DEPOSITION BUFFER TO DISK                              FLUSH      10
       C                                                                                               FLUSH      11
 14          CALL WTBUF (5LFSET3,EBLOCK,ID)                                                            FLUSH      12
       C                                                                                               FLUSH      13
 15          NFLUSH=NFLUSH+ID/2                                                                        FLUSH      14
 16          ID=0                                                                                      FLUSH      15
 17          RETURN                                                                                    FLUSH      16
 18          END                                                                                       FLUSH      17
 SINGLY REFERENCED VARIABLES
  AA1      ()R    5LC    ETAB    ()R    2CO   IJPS    -I    8CO   LAM      -R   12RL   NFRQ    -I   2CO   REAL     -    12F   TEMP    ()R    8CO
  AA2      ()R    6LC    FLUSH   -      1SU   IP1     -I    8CO   LAMD     -R   12RL   NMOVE   -I  10CO   RED      -    8CN   THY     -R     8CO
  ALPHA    -R     9CO    FREQ    ()R    2CO   ISCF1   -I    8CO   LAVNOER  -   10CN   NOPO    -I   2CO   RETURN   -    17F   TIME    -R     8CO
  BTBL     ()R    2CO    FSCAT   ()R   10CO   ISCF2   -I    8CO   MU       -R   12RL   NOPT    -I   2CO   REZSIE   -R   8CO   TOUT    -R     8CO
  DEMS     ()R   10CO    GROVEL  -R     8CO   ISC2    -I    8CO   MUO2     -R   12RL   NPCMAX  -I   9CO   RLC1     -    7CN   TSTART  -R     8CO
  DIMENSI  -     13F     GREEN   -      9CN   ISC3    -I    8CO   NAME     ()    8CO   NQ      -I   8CO   SIEMIN   -R  10CO   T1      -R    10CO
  DT       -R     8CO    I       -I     4CO   ITV     -I    8CO   NHP      -I    9CO   NQI     -I   8CO   SIGA     ()R  7LC   T2      -R    10CO
  DTR      -R     8CO    IBAR    -I     8CO   J       -I    4CO   NBUF     -I    9CO   NSP     -I   9CO   SPTBL    ()R  2CO   WTBUF   -     14SU
  ECEN     -R    10CO    IESCAP  -I    10CO   JBAR    -I    8CO   NCOL     -I   10CO   OPOEN   ()R  2CO   STATE    -    2CN   YLC1    -      5CN
  EMC      -R    10CO    IJ      -I     4CO   JCEN    -I    9CO   NCYC     -I    8CO   OPTMP   ()R  2CO   T        -R   8CO   YLC2    -      6CN
  EM10     -R     8CO    IJM     -I     4CO   JP1     -I    8CO   NOIE     -I   10CO   PINK    -    4CN   TAMB     -R   8CO   YSCI    -      3CN
  EQUIVAL  -     11F     IJP     -I     4CO   JP2     -I    8CO   NDUMP    -I    8CO   PIAB    ()R  2CO   TEMIT    -R   9CO
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 MULTIPLY-REFERENCED VARIABLES
AASC     ()R    3CO    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ
                11EQ   11EQ
BETALC   ()R    11EQ   13O1
CENTX    ()R    11EQ   13O1
CENTY    ()R    11EQ   13O1
COMMON   -      2F     3F      4F      8F      9F      10F
```

```
CQ       ()R    ])EQ    1301
DELSM    ()R    ])EQ    1301
E        ()R    ])EQ    1301
EBLOCK   ()R    ] CO    14AG
EMOMLC   ()R    ])EQ    1301
EP       ()R    ])EQ    1301
ETIL     ()R    ])EQ    1301
FOUTLC   ()R    ])EQ    1301
FSN      ()R    ])EQ    1301
GRIR     ()R    ])EQ    1301
GRIZ     ()R    ])EQ    1301
IO       -I     (0CO    (4AG     I5        ]6=
LCM      -       5F      6F      7F
M        ()R    ])EQ    12RL    1301
MP       ()R    ])EQ    12RL    1301
NFLUSH   -I     ]'CO    ]5=      (5
P        ()R    ])EQ    1301
PL       ()R    ])EQ    1301
R        ()R    ])EQ    1301
RCSQ     ()R    ])EQ    1301
RM       ()R    ])EQ    1301
RMP      ()R    ])EQ    1301
RO       ()R    ])EQ    1301
ROL      ()R    ])EQ    1301
RVOL     ()R    ])EQ    1301
RZEDEN   ()R    ])EQ    1301
SIE      ()R    ()EQ    1301
SIGPLC   ()R    ])EQ    1301
U        ()R    ])EQ    1301
UG       ()R    ])EQ    1301
UL       ()R    ])EQ    1301
UMOMLC   ()R    ])EQ    1301
UP       ()R    ])EQ    1301
UTIL     ()R    ])EQ    1301
V        ()R    ])EQ    1301
VG       ()R    ])EQ    1301
VL       ()R    ])EQ    1301
VP       ()R    ])EQ    1301
VTIL     ()R    ])EQ    1301
X        ()R    ])EQ    1301
XPAR     ()R    ])EQ    1301
Y        ()R    ])EQ    1301
YPAR     ()R    ()EQ    1301
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 1           SUBROUTINE POMEGA (A, OMEGA)                                   POMEGA     2
       C                                                                    POMEGA     3
 2           DIMENSION          A(3), B(3), OMEGA(3), Z(3), XP(3), YP(3), ZP(3)  POMEGA  4
 3           DATA               Z/0.0, 0.0, 1.0/                            POMEGA     5
       C     ---   INITIALIZE                                               POMEGA     6
 4           OMDIST=1.0/(OMEGA(1)**2+OMEGA(2)**2+OMEGA(3)**2)               POMEGA     7
       C     OMDIST=QSQRT(OMDIST)                                           POMEGA     8
 5           ADIST=1.0/(A(1)**2+A(2)**2+A(3)**2)                            POMEGA     9
 6           ADIST=QSQRT(ADIST)                                             POMEGA    10
 7           ZP(1)=OMEGA(1)*OMDIST                                          POMEGA    11
 8           ZP(2)=OMEGA(2)*OMDIST                                          POMEGA    12
 9           ZP(3)=OMEGA(3)*OMDIST                                          POMEGA    13
10           B(1)=A(1)*ADIST                                                POMEGA    14
11           B(2)=A(2)*ADIST                                                POMEGA    15
```

```
12              B(3)=A(3)*ADIST                                                    POMEGA   16
13              SEET=CROSS (ZP, B, YP)                                             POMEGA   17
14              IF (SHET.LT.1.0E-06) GO TO 11                                      POMEGA   18
15              UNITY=CROSS (YP, ZP, XP)                                           POMEGA   19
16              GO TO 31                                                           POMEGA   20
        C       ---    OMEGA PARALLEL TO A                                         POMEGA   21
17           11 STHT=CROSS (Z, B, YP)                                              POMEGA   22
18              IF (STHT.LT.1.0E-06) GO TO 21                                      POMEGA   23
19              STHT=1.0/STHT                                                      POMEGA   24
20              YP(1)=YP(1)*STHT                                                   POMEGA   25
21              YP(2)=YP(2)*STHT                                                   POMEGA   26
22              YP(3)=YP(3)*STHT                                                   POMEGA   27
23              UNITY=CROSS (YP, ZP, XP)                                           POMEGA   28
24              GO TO 31                                                           POMEGA   29
        C       ---    OMEGA PARALLEL TO A AND Z                                   POMEGA   30
25           21 XP(1)=YP(2)=1.0                                                    POMEGA   31
26              XP(2)=XP(3)=YP(1)=YP(3)=0.0                                        POMEGA   32
        C       ---    GENERAL CASE                                                POMEGA   33
27           31 RN1=2.0*RANDOM(DUMMY)-1.0                                          POMEGA   34
28              RN2=6.28318*RANDOM(DUMMY)                                          POMEGA   35
29              CTHT=RN1                                                           POMEGA   36
30              STHT=QSQRT(1.0-RN1**2)                                             POMEGA   37
31              CPHI=COS(RN2)                                                      POMEGA   38
32              SPHI=SIN(RN2)                                                      POMEGA   39
33              OMEGA(1)=(CPHI*XP(1)+SPHI*YP(1))*STHT+CTHT*ZP(1)                   POMEGA   40
34              OMEGA(2)=(CPHI*XP(2)+SPHI*YP(2))*STHT+CTHT*ZP(2)                   POMEGA   41
35              OMEGA(3)=(CPHI*XP(3)+SPHI*YP(3))*STHT+CTHT*ZP(3)                   POMEGA   42
36              OMDIST=1.0/(OMEGA(1)**2+OMEGA(2)**2+OMEGA(3)**2)                   POMEGA   43
37              OMDIST=QSQRT(OMDIST)                                               POMEGA   44
38              OMEGA(1)=OMEGA(1)*OMDIST                                           POMEGA   45
39              OMEGA(2)=OMEGA(2)*OMDIST                                           POMEGA   46
40              OMEGA(3)=OMEGA(3)*OMDIST                                           POMEGA   47
        C                                                                          POMEGA   48
41              RETURN                                                             POMEGA   49
42              END                                                                POMEGA   50
 SINGLY REFERENCED VARIABLES
  COS      -   31SU   DATA     -   3F    DIMENSI -   2F    POMEGA  -   1SU   RETURN  -   41F    SIN     -   32SU
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 MULTIPLY-REFERENCED VARIABLES
      11 -    14     17*
      21 -    18     25*
      31 -    16     24     27*
A        ()R   1AG    201    5      5      5      10     11     12
ADIST    -R    5=     6=     6      10     11     12
B        ()R   201    10=    11=    12=    13     17
CPHI     -R    31=    33     34     35
CROSS    -     13SU   15SU   17SU   23SU
CTHT     -R    29=    33     34     35
DUMMY    -R    27     28
OMDIST   -R    4=     7      8      9      36=    37=    37     38     39     40
OMEGA    ()R   1AG    201    4      4      4      7      8      9      33=    34=    35=    36     36     36     38=    38     39=
               39     40=    40
QSQRT    -     6SU    30SU   37SU
RANDOM   -     27SU   28SU
RN1      -R    27=    29     30
RN2      -R    28=    31     32
SHET     -R    13=    14
SPHI     -R    32=    33     34     35
STHT     -R    17=    18     19=    19     20     21     22     30=    33     34     35
UNITY    -R    15=    23=
XP       ()R   201    15     23     25=    26=    26=    33     34     35
YP       ()R   201    13     15     17     20=    20     21=    21     22=    22     23     25=    26=    26=    33     34     35
Z        ()R   201    30A    17
ZP       ()R   201    7=     8=     9=     13     15     23     33     34     35
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      SUBROUTINE PFREQ (FREQP, TP)                                      PFREQ    2
C                                                                       PFREQ    3
      COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM   2
     1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM   3
     2                  BTBL(300)                                       ALLKOM   4
      COMMON /YSC1/     AASC(5454)                                      ALLKOM   5
      COMMON /PINK/     I, IJ, IJM, IJP, J                              ALLKOM   6
      LCM /YLC1/        AA1(131300)                                     ALLKOM   7
      LCM /YLC2/        AA2(131300)                                     ALLKOM   8
      LCM /RLC1/        SIGA(30000)                                     ALLKOM   9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,    ALLKOM  10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM  11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM  12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM  13
C                                                                       PFREQ    5
    2 ZETAR=1.082323234*RANDOM(DUMMY)                                   PFREQ    6
      ZETAX=0.0                                                         PFREQ    7
      X=1.0                                                             PFREQ    8
    4 ZETAX=ZETAX+1.0/(X**4)                                            PFREQ    9
      IF (ZETAX.GE.ZETAR) GO TO 5                                       PFREQ   10
      X=X+1.0                                                           PFREQ   11
      GO TO 4                                                           PFREQ   12
    5 ZETAK=AMIN1(X,ZETAR)                                              PFREQ   13
      ZETAK=-1.0/ZETAK                                                  PFREQ   14
      RN1=RANDOM(DUMMY)                                                 PFREQ   15
      RN2=RANDOM(DUMMY)                                                 PFREQ   16
      RN3=RANDOM(DUMMY)                                                 PFREQ   17
      RN4=RANDOM(DUMMY)                                                 PFREQ   18
      FREQP=ZETAK*ALOG(RN1*RN2*RN3*RN4)*TP                              PFREQ   19
      FREQP=2.431814E+14*FREQP                                          PFREQ   20
      IF (FREQP.LT.FREQ(1).OR.FREQP.GT.FREQ(NFRQ)) GO TO 3              PFREQ   21
C                                                                       PFREQ   22
      RETURN                                                            PFREQ   23
      END                                                               PFREQ   24
```

```
 SINGLY REFERENCED VARIABLES
 AASC   ()R  3CO    ETAB   ()R  2CO    IP1    -I   8CO    JP1    -I   8CO    NQI    -I   8CO    RETURN  -    25F    TEMP   ()R  8CO
 AA1    ()R  5LC    GROVEL -R   8CO    ISCF1  -I   8CO    JP2    -I   8CO    OPDEN  ()R  2CO    REZSIE  -R   8CO    THY    -R   8CO
 AA2    ()R  6LC    I      -I   4CO    ISCF2  -I   8CO    NAME   ()I  8CO    OPTMP  ()R  2CO    RLC1    -    7CN    TIME   -R   8CO
 AMIN1  -    16SU   IBAR   -I   8CO    ISC2   -I   8CO    NCYC   -I   8CO    PFREQ  -    1SU    SIGA    ()R  7LC    TOUT   -R   8CO
 BTBL   ()R  2CO    IJ     -I   4CO    ISC3   -I   8CO    NDUMP  -I   8CO    PINK   -    4CN    SPTBL   ()R  2CO    TSTART -R   8CO
 DT     -R   8CO    IJM    -I   4CO    ITV    -I   8CO    NOPD   -I   2CO    PTAB   ()R  2CO    STATE   -    2CN    YLC1   -    5CN
 DTR    -R   8CO    IJP    -I   4CO    J      -I   4CO    NOPT   -I   2CO    ALOG   -    22SU   T       -R   8CO    YLC2   -    6CN
 EM10   -R   8CO    IJPS   -I   8CO    JBAR   -I   8CO    NQ     -I   8CO    RED    -    8CN    TAMB    -R   8CO    YSC1   -    3CN
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 MULTIPLY-REFERENCED VARIABLES
      3 -     9*     24
      4 -    12*     15
      5 -    13      16*
 COMMON  -     2F     3F    .4F     8F
 DUMMY   -R    9     18     19     20     21
 FREQ    ()R   2CO   24     24
 FREQP   -R    1AG   22=    23=    23     24     24
 LCM     -     5F     6F     7F
 NFRQ    -I    2CO   24
 RANDOM  -     9SU   18SU   19SO   20SU   21SU
 RN1     -R   18=    22
 RN2     -R   19=    22
 RN3     -R   20=    22
 RN4     -R   21=    22
 TP      -R    1AG   22
 X       -R   11=    12     14=    14     16
 ZETAK   -R   16=    17=    17     22
 ZETAR   -R    9=    13     16
 ZETAX   -R   10=    12=    12     13
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 1        SUBROUTINE SUBSCR (FREQP, TLOG, DLOG, IJK)                        SUBSCR      2
 2        COMMON /STATE/    NOPT, NOPO, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM      2
         1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM      3
         2                  BTBL(300)                                       ALLKOM      4
 3        COMMON /YSC1/     AASC(5454)                                      ALLKOM      5
 4        COMMON /PINK/     I, IJ, IJM, IJP, J                              ALLKOM      6
 5        LCM /YLC1/        AA1(131000)                                     ALLKOM      7
 6        LCM /YLC2/        AA2(131000)                                     ALLKOM      8
 7        LCM /RLC1/        SIGA(30000)                                     ALLKOM      9
 8        COMMON /RED/      NAME(12), DT, OTR, EM10, GROVEL, IBAR, IJPS,    ALLKOM     10
         1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM     11
         2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM     12
         3                  TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM     13
    C                                                                       SUBSCR      4
    C        THIS ROUTINE FINDS SUBSCRIPTS BY USING FITS TO THE RUN OF      SUBSCR      5
    C        NUMERICAL VALUE VERSUS INDEX,                                  SUBSCR      6
    C                                                                       SUBSCR      7
 9        DATA BL/-1.5867/,AL/0.713959/,BS/-84.92293/,AS/0.1818066/         SUBSCR      8
 10       DATA A/-0.16767/,B/0.83293/,C/1.0008/                             SUBSCR      9
    C                                                                       SUBSCR     10
 11       IF(TLOG.GT.0.(36721)GOTO5                                         SUBSCR     11
 12       XLOG=(TLOG-BL)*AL                                                 SUBSCR     12
 13       JSUB=GEXP(0(XLOG)                                                 SUBSCR     13
 14       GO TO6                                                            SUBSCR     14
 15     5 JSUB=(TLOG-BS)*AS                                                 SUBSCR     15
 16     6 KSUB=DLOG-OPDEN(1)                                                SUBSCR     16
 17       KSUB=KSUB+1                                                       SUBSCR     17
 18       JSUB=MIN0(JSUB,NOPT)                                              SUBSCR     18
 19       JSUB=MAX0(JSUB,1)                                                 SUBSCR     19
 20       KSUB=MIN0(KSUB,NOPO)                                              SUBSCR     20
 21       XLOG=CLOG10(FREQP)-14.38348)44                                    SUBSCR     21
 22       YLOG=(A*XLOG+B)*XLOG +C                                           SUBSCR     22
 23       ISUB=GEXP(0(YLOG(                                                 SUBSCR     23
 24       ISUB=MIN0(ISUB,NFRQ)                                              SUBSCR     24
 25       IJK=ISUB+(JSUB-1)*NFRQ+(KSUB-1)*NOPT*NFRQ                         SUBSCR     25
 26       RETURN                                                            SUBSCR     26
 27       END                                                               SUBSCR     27
```

```
SINGLY REFERENCED VARIABLES
 AASC   ()R  3C0   FREQ    ()R  2C0   IP1    -I  8C0   JP1    -I   8C0   OPTMP   ()R  2C0   SIGA    ()R  7LC   TIME    -R  8C0
 AA1    ()R  5LC   GROVEL  -R   4C0   ISCF1  -I  8C0   JP2    -I   8C0   PINK    -    4CN   SPTBL   ()R  2C0   TOUT    -R  8C0
 AA2    ()R  6LC   I       -I   4C0   ISCF2  -I  8C0   MAX0   -    19SU  PTAB    ()R  2C0   STATE   -    2CN   TSTART  -R  8C0
 BTBL   ()R  2C0   IBAR    -I   8C0   ISC2   -I  8C0   NAME   ()I  8C0   CLOG10  -    21SU  SUBSCR  -    1SU   YLC1    -   5CN
 DT     -R   8C0   IJ      -I   4C0   ISC3   -I  8C0   NCYC   -I   8C0   RED     -    8CN   T       -R   8C0   YLC2    -   6CN
 OTR    -R   6C0   IJM     -I   4C0   ITV    -I  8C0   NDUMP  -I   8C0   RETURN  -    26F   TAMB    -R   8C0   YSC1    -   3CN
 EM10   -R   8C0   IJP     -I   4C0   J      -I  4C0   NQ     -I   8C0   REZSIE  -R   8C0   TEMP    ()R  8C0
 ETAB   ()R  2C0   IJPS    -I   8C0   JBAR   -I  8C0   NQI    -I   8C0   RLC1    -    7CN   THY     -R   8C0
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
      5 -     11      15*
      6 -     14      16*
A        -R    10UA    22
AL       -R     9UA    12
AS       -R     9UA    15
B        -R    10UA    22
BL       -R     9UA    12
BS       -R     9UA    15
C        -R    10UA    22
COMMON   -      2F      3F      4F      8F
DATA     -      9F     10F
DLOG     -R     1AG    16
FREQP    -R     1AG    21
IJK      -I     1AG    25=
ISUB     -I    23=     24=     24      25
JSUB     -I    13=     15=     18=     18      19=     19      25
KSUB     -I    16=     17=     17      20=     20      25
LCM      -      5F      6F      7F
MIN0     -     18SU    20SU    24SU
NFRQ     -I     2C0    24      25      25
```

```
NDPO     -I     2CO    2.
NOPT     -I     2CO    18      25
OPDEN    (JR    2CO    16
QEXP10   -      13SO   20SO
TLOG     -R     1AG    11      12      15
XLOG     -R     12=    13      21=     22      22
YLOG     -R     22=    23
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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```
                                                                    CROSS      2
          FUNCTION CROSS (A,B,C)                                    CROSS      3
          DIMENSION      A(3), B(3), C(3)                           CROSS      4
          C(1)=A(2)*B(3)-A(3)*B(2)                                  CROSS      5
          C(2)=-A(1)*B(3)+A(3)*B(1)                                 CROSS      6
          C(3)=A(1)*B(2)-A(2)*B(1)                                  CROSS      7
          CROSS=QSQRT(C(1)**2+C(2)**2+C(3)**2)                      CROSS      8
          RETURN                                                    CROSS      9
          END
 SINGLY REFERENCED VARIABLES
  DIMENSI -     2F     QSQRT    -     6SU    RETURN   -     7F
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
A        (JR    1AG    2U1    3      3      4      4      5      5
B        (JR    1AG    2U1    3      3      4      4      5      5
C        (JR    1AG    2U1    3=     4=     5=     6      6      6
CROSS    -      1SU    6=
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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```
                                                                    CENTROY    2
          SUBROUTINE CENTROY (ISC, JSC, CWGT)                       CENTROY    3
C                                                                   CENTROY    4
          COMMON /MAUVE/    IBAR, JP1, NQ, NQI, RHOP, ZP, DCELL     CENTROY    5
          DIMENSION         CENTX(5), CENTY(5), XYECS(60), CWGT(3)  CENTROY    6
          CENTX(1)=CENTX(4)=0.0                                     CENTROY    7
          CENTY(1)=CENTY(4)=0.0                                     CENTROY    8
          IECS=(JSC-2)*NQI+(ISC-1)*NQ                               CENTROY    9
          IF (JSC.EQ.2) GO TO 3                                     CENTROY   10
          CALL ECHO (XYECS, IECS, 8, NE)                            CENTROY   11
          CENTX(1)=XYECS(7)                                         CENTROY   12
          CENTY(1)=XYECS(8)                                         CENTROY   13
        3 IECS=IECS+NQI-NQ                                          CENTROY   14
          CALL ECHO (XYECS, IECS, 48, NE)                           CENTROY   15
          CENTX(2)=XYECS(7)                                         CENTROY   16
          CENTX(5)=XYECS(7+NQ)                                      CENTROY   17
          CENTX(3)=XYECS(7+NQ+NQ)                                   CENTROY   18
          CENTY(2)=XYECS(8)                                         CENTROY   19
          CENTY(5)=XYECS(8+NQ)                                      CENTROY   20
          CENTY(3)=XYECS(8+NQ+NQ)                                   CENTROY   21
          IF (ISC.EQ.1) CENTX(2)=CENTY(2)=0.0                       CENTROY   22
          IF (JSC.EQ.JP1) GO TO 4                                   CENTROY   23
          IECS=IECS+NQI+NQ                                          CENTROY   24
          CALL ECHO (XYECS, IECS, 8, NE)                            CENTROY   25
          CENTX(4)=XYECS(1)                                         CENTROY   26
          CENTY(4)=XYECS(8)                                         CENTROY   27
C                                                                   CENTROY   28
        4 DX=RHOP-CENTX(5)                                          CENTROY   29
          DY=ZP-CENTY(5)
```

```
27             W1=W2=1.0                                                CENTROY  30
28             IF (DX.GE.0.0) GO TO 12                                  CENTROY  31
29             DXI=CENTX(2)-CENTX(5)                                    CENTROY  32
30             DYI=CENTY(2)-CENTY(5)                                    CENTROY  33
31             ISC=ISC-1                                                CENTROY  34
32             IF (ISC.GT.0) GO TO 13                                   CENTROY  35
33             W1=DYI=0.0                                               CENTROY  36
34             ISC=1                                                    CENTROY  37
35             GO TO 13                                                 CENTROY  38
36          12 DXI=CENTX(3)-CENTX(5)                                    CENTROY  39
37             DYI=CENTY(3)-CENTY(5)                                    CENTROY  40
38             ISC=ISC+1                                                CENTROY  41
39             IF (ISC.LE.IBAR) GO TO 13                                CENTROY  42
40             W1=DYI=0.0                                               CENTROY  43
41             ISC=IBAR                                                 CENTROY  44
42          13 IF (DY.GE.0.0) GO TO 14                                  CENTROY  45
43             DXJ=CENTX(1)-CENTX(5)                                    CENTROY  46
44             DYJ=CENTY(1)-CENTY(5)                                    CENTROY  47
45             JSC=JSC-1                                                CENTROY  48
46             IF (JSC.GE.2) GO TO 15                                   CENTROY  49
47             W2=DXJ=0.0                                               CENTROY  50
48             JSC=2                                                    CENTROY  51
49             GO TO 15                                                 CENTROY  52
50          14 DXJ=CENTX(4)-CENTX(5)                                    CENTROY  53
51             DYJ=CENTY(4)-CENTY(5)                                    CENTROY  54
52             JSC=JSC+1                                                CENTROY  55
53             IF (JSC.LE.JP1) GO TO 15                                 CENTROY  56
54             W2=DXJ=0.0                                               CENTROY  57
55             JSC=JP1                                                  CENTROY  58
56          15 XX=1.0/(DXI*DYJ-DXJ*DYI)                                 CENTROY  59
57             CWGT(1)=(DX*DYJ-DY*DXJ)*XX*W1                            CENTROY  60
58             CWGT(2)=(DY*DXI-DX*DYI)*XX*W2                            CENTROY  61
59             CWGT(3)=1.-CWGT(1)-CWGT(2)                               CENTROY  62
         C                                                              CENTROY  63
60             RETURN                                                   CENTROY  64
61             END                                                      CENTROY  65
 SINGLY REFERENCED VARIABLES
  CENTROY -    1SU   COMMON  -    2F    DCELL   -R    2CO   DIMENS1 -    3F    MAUVE   -    2CN   RETURN  -   60F
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
       3 -    7     11*
       4 -    2     25*
      12 -    28    36*
      13 -    32    35    39    42*
      14 -    42    5.*
      15 -    46    49    53    56*
CENTX   ()R   3UI   4=    4=    9=    13=   14=   15=   19=   23=   25    29    29    36    36    43    43    50
              50
CENTY   ()R   3UI   5=    5=    10=   16=   17=   18=   19=   24=   26    30    30    37    37    44    44    51
              51
CWGT    ()R   1AG   3UI   57=   58=   59=   59    59
DX      -R    25=   28    57    58
DXI     -R    29=   36=   56    58
DXJ     -R    43=   47=   50=   54=   56    57
DY      -R    26=   42    57    58
DYI     -R    30=   33=   37=   40=   56    58
DYJ     -R    44=   51=   56    57
ELRD    -     ESU   12SU  22SU
IBAR    -I    2CO   39    41
IECS    -I    6=    6AG   11=   11    12AG  21=   21    22AG
ISC     -I    1AG   6     19    31=   31    32    34=   38=   38    39    41=
JP1     -I    2CO   22    53    55
JSC     -I    1AG   6     7     20    45=   45    46    48=   52=   52    53    55=
NE      -I    6AG   12AG  22AG
NQ      -I    2CO   6     11    14    15    15    17    18    18    21
NQ1     -I    2CO   6     11    21
RHOP    -R    2CO   25
W1      -R    27=   33=   40=   57
```

```
W2      -R   27=    47=    54=    58
XX      -R   56=    57     58
XYECS   IJR   30I    8AC    9      10     12AG   13     14     15     16     17     18     22AG   23     24
ZP      -R   2CU    26
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

      SUBROUTINE WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)             WALK       2
C                                                                        WALK       3
C           THIS SUBROUTINE CARRIES A PARTICLE FROM VECTOR A TO THE      WALK       4
C           VECTOR SELECTED AS THE END OF ITS RANDOM WALK.               WALK       5
C                                                                        WALK       6
      COMMON /STATE/    NOPT, NCPD, NFRQ, OPTNP(30), OPDEN(10),          ALLKOM     2
     1                  FREQ(100), SPTBL(3:0), PTAB(300), ETAB(300),     ALLKOM     3
     2                  BTBL(300)                                        ALLKOM     4
      COMMON /YSC1/     AASC(5454)                                       ALLKOM     5
      COMMON /PINK/     I, IJ, IJP, IJP, J                               ALLKOM     6
      LCM /YLC1/        AA1(131000)                                      ALLKOM     7
      LCM /YLC2/        AA2(131000)                                      ALLKOM     8
      LCM /BLC1/        SIGA(30000(                                      ALLKOM     9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,     ALLKOM    10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,        ALLKOM    11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,    ALLKOM    12
     3                  TEMP(7500), 1, TIME, TOUT, TSTART, THY           ALLKOM    13
      COMMON /GREEN/    ALPHA, NBF, NBUF, NSP, NPCMAX, JCEN, TEMIT       GREEN      2
      COMMON /LAVNDER/  DENS(7500), EHLOCK(6000), ECEN, EMC,             LAVNDER    2
     1                  FSCAT(7500), ID, IESCAP, NCOL, NOIE,             LAVNDER    3
     2                  NFLUSH, NMOVE, SIEMIN, 11, 12                    LAVNDER    4
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),P,YPAR), (AASC(3),Y), EQVREAL    2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),          EQVREAL    3
     2                  (AASC(7),MP,RMP,RCSQ,CENTX),                     EQVREAL    4
     3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),          EQVREAL    5
     4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),       EQVREAL    6
     5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                    EQVREAL    7
     6                  (AASC(13),VTIL,VL,UMOMLC),                       EQVREAL    8
     7                  (AASC(14),RCL,HETALC,FOUTLC), (AASC(15),SIE),    EQVREAL    9
     8                  (AASC(16),DELSM,SIGPLC),                         EQVREAL   10
     9                  (AASC(17),GRIR,UG,RZEDEN),                       EQVREAL   11
     (                  (AASC(18),GRIZ,VG,FSN)                           EQVREAL   12
      REAL              LAM, LAMO, M, MP, MU, MU02                       EQVREAL   13
      DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),        DIMEN      2
     2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),   DIMEN      3
     3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),   DIMEN      4
     4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),       DIMEN      5
     5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),         DIMEN      6
     6                  UMOMLC(1), RCL(1), HETALC(1), FOUTLC(1),         DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),     DIMEN      8
     8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                DIMEN      9
      COMMON /MAUVE/    MI, MJ, MG, MGI, RHOP, ZP, DCELL                 WALK      12
      DIMENSION         A(3), OMEGA(3), CWGT(3), EDEP(3), XYECS(32)      WALK      13
      DATA              MASK /077777777777770000/                        WALK      14
 2001 FORMAT            (1H ,*ENERGY OUT OF RANGE*/6H I       ,I12,6X,   WALK      15
     1                  6H J      ,I12,6X,6H RHOP ,1PE12.4,6X,6H ZP    , WALK      16
     2                  1PE12.4,6X,6H E     ,2PE12.4)                    WALK      17
C     ---   INITIALIZE PARTICLE PROPERTIES                               WALK      18
      IF (EPART.LE.1.0E-20) GO TO 153                                    WALK      19
      ICLO=I                                                             WALK      20
      JCLO=J                                                             WALK      21
      NFCOL=0                                                            WALK      22
      ISTEP=0                                                            WALK      23
      DCEN=3.0E+05*(T2-T1)                                               WALK      24
      RHOP=SQRT (A(1)*A(1)+A(2)*A(2))                                    WALK      25
      ZP=A(3)                                                            WALK      26
```

```
      IJSTORE=SHIFT(I,9)+J
      FSTORE=FREQP.AND.MASK
      IF (IOTE.EQ.1) GO TO 3
      ELEP(1)=RHOP
      ELEP(2)=ZP
      ELEP(3)=-EPART
      ID1=ID+1
      CALL PARFNO (ELEP, EBLOCK(ID1), IRNG)
      IF (IRNG.NE.0) GO TO 201
      ID=ID+2
      EBLOCK(ID)=FSTORE.OR.IJSTORE
      IF (ID.EQ.NBUF) CALL FLUSH
    3 IOTE=0
C     ---   COMPUTE DENS TEMP FSCAT AT PARTICLE LOCATION
   10 IJSC=(JOLD-1)*IP1+IOLD
      IF (TEMP(IJSC).GT.(TAMB+1.0E-06)) GO TO 11
      FSP=FSCAT(IJSC)
      TF=TEMP(IJSC)
      DF=DENS(IJSC)
      GO TO 21
   11 ISC=IOLD
      JSC=JOLD
      CALL CENTROY (ISC, JSC, CWGT)
   12 IJSC1=(JOLD-1)*IP1+ISC
      IJSC2=(JSC-1)*IP1+IOLD
      TF=TEMP(IJSC1)*CWGT(1)+TEMP(IJSC2)*CWGT(2)+
     1 TEMP(IJSC)*CWGT(3)
      FSP=FSCAT(IJSC1)*CWGT(1)+FSCAT(IJSC2)*CWGT(2)+
     1 FSCAT(IJSC)*CWGT(3)
   13 DF=DENS(IJSC1)*CWGT(1)+DENS(IJSC2)*CWGT(2)+
     1 DENS(IJSC)*CWGT(3)
C     ---   COMPUTE MATERIAL OPACITY AND MEAN FREE PATH
   21 TLOG=ALOG10(TF)
      DLOG=ALOG10(DF)
      TLOG=AMIN1(TLOG,OPTMP(NOPT))
      DLOG=AMIN1(DLOG,OPDEN(NOPD))
      TLOG=AMAX1(TLOG,OPTMP(1))
      DLOG=AMAX1(DLOG,OPDEN(1))
      CALL SUBSCR (FREQP, TLOG, DLOG, IJK)
      CF=SIGA(IJK)
      SIGNU=DEXP10(CF)
      DMFP=1.0/SIGNU
C     ---   COMPUTE COLLISION DISTANCE
      IF (ISTEP.GT.0) GO TO 22
      RN1=RANDOM(DUMMY)
      RMFP=ABS(ALOG(RN1))
   22 DCOL=RMFP*DMFP
      DMOVE=AMIN1(DCOL,DCEN,DCELL)
C     ---   MOVE PARTICLES
   24 ENEW=EPART*EXP(-FSP*DMOVE*SIGNU)
      ESCORE=EPART-ENEW
      EPART=ENEW
      NMOVE=NMOVE+1
      A(1)=A(1)+DMOVE*OMEGA(1)
      A(2)=A(2)+DMOVE*OMEGA(2)
      A(3)=A(3)+DMOVE*OMEGA(3)
      ZO=ZP
      RHOO=RHOP
      ZP=A(3)
      RHOP=DSQRT (A(1)*A(1)+A(2)*A(2))
      IF (ESCORE.LE.1.0E-20) GO TO 28
      ZO=0.5*(ZP+ZO)
      RHOO=0.5*(RHOP+RHOO)
      ELEP(1)=RHOO
      ELEP(2)=ZO
      ELEP(3)=ESCORE
      ID1=ID+1
      CALL PARFNO (ELEP, EBLOCK(ID1), IRNG)
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```
      IF (IRNG.NE.0) GO TO 201
      ID=ID+2
      EBLOCK(ID)=FS(ORE.OR.IJSTORE
      IF(ID.EQ.NBUF)CALL FLUSH
C
   26 CALL WHERE (ICLD, JOLD)
      IJSTORE=SHIFT(IOLD,9)+JOLD
      IF (EPART.LE.LOEA10) GO TO 151
      IF (ICLD.GT.IBAR) GO TO 91
      IF (JOLD.LT.2.OR.JOLD.GT.JP() GO TO 91
      UCEN=UCEN-DMOVE
      IF (UCEN.LE.0.0( GO TO 81
      UCOL=UCOL-DMOVE
      IF (UCOL.LE.0.0) GO TO 10(
      ISTEP=ISTEP+1
      TI=TI+DMOVE*0.333333E-05
      RFFP=RMFP-DMOVE*SIGNU
      GO TO 10
C     ---    CENSUS PARTICLE
   81 ILIE=1
      FREQP=ISTORE.OR.IJSTORE
      EDEP(1)=RHOP
      EDEP(2)=ZP
      EDEP(3)=EPART
      ID=ID+1
      CALL PAKFNO (EDEP, EBLOCK(ID)), IRNG)
      IF (IRNG.NE.0) GO TO 201
      ID=ID+2
      EBLOCK(ID)=FREQP
      IF (ID.EQ.NBUF) CALL FLUSH
      RETURN
C     ---    PARTICLE ESCAPE FROM MESH
   91 IF (EPART.LE.1.0E-20) GO TO 93
      EDEP(1)=RHOP
      EDEP(2)=ZP
      EDEP(3)=EPART
      ID=ID+1
      CALL PAKFNO (EDEP, EBLOCK(ID)), IRNG(
      IF (IRNG.NE.0) GO TO 201
      ID=ID+2
      EBLOCK(ID)=FSTORE,OR.IJSTORE
      IF(ID.EQ.NBUF)CALL FLUSH
   93 IESCAP=IESCAP+1
      RETURN
C     ---    PARTICLE COLLISON
  151 NPCOL=NPCOL+1
      NCOL=NCOL+1
      TI=TI+DMOVE*0.333333E-05
      IF (NPCOL.GT.NPCMAX) GO TO 121
C     ---    INITIALIZE REEMITTED PARTICLE PROPERTIES
C     ---    FREQ AND DIRECTION OF REEMITTED PARTICLE
      IJSC=(JOLD-1)*IP)+IOLD
      IF (TEMP(IJSC).GT.(TAMB+1.0E-06)) GO TO 111
      FSP=FSCAT(IJSC)
      IF (RANDOM(DUMMY).GT.(1.0-FSP)) GO TO 151
      TP=TEMP(IJSC)
      UP=ULGS(IJSC)
      GO TO 115
  111 ISC=ICLD
      JSC=JOLD
      CALL CENTROY (ISC, JSC, CWGT(
      IJSC1=(JOLD-1)*IP)+ISC
      IJSC2=(JSC-1(*IP)+IOLD
      FSP=FSCAT(IJSC1)*CWGT(1)+FSCAT(IJSC2)*CWGT(2)+
     1 FSCAT(IJSC)*CWGT(3)
      IF (RANDOM(DUMMY).GT.(1.0-FSP)) GO TO 151
      TP=TEMP(IJSC1)*CWGT(1)+TEMP(IJSC2)*CWGT(2)+
     1 TEMP(IJSC)*CWGT(3)
```

```
          DF=DENS(IJSC1)*CWGT(1)+DENS(IJSC2)*CWGT(2)+DENS(IJSC3)*CWGT(3)       WALK     163
      115 ISTEP=0                                                              WALK     164
          CALL PFREQ (FREQP, TP)                                               WALK     165
          FSTORE=FREQP.AND.MASK                                                WALK     166
          CALL POMEGA (A, OMEGA)                                               WALK     167
          DCEG=3.0E+05*(12-T1)                                                 WALK     168
          GO TO 21                                                             WALK     169
C         ---   PARTICLE SPLIT                                                 WALK     170
      121 ICIE=1                                                               WALK     171
          EPART=-EPART                                                         WALK     172
          EDEP(1)=FREQP                                                        WALK     173
          EDEP(2)=EDEP(3)=11                                                   WALK     174
          CALL PAKFNO (EDEP, FSTORE, IRNG)                                     WALK     175
          FSTORE=FSTORE.AND.MASK                                               WALK     176
          FREQP=FSTORE.OR.IJSTORE                                              WALK     177
          RETURN                                                               WALK     178
C         ---   PARTICLE DEATH                                                 WALK     179
      151 IF (EPART.LE.1.0E-20) GO TO 153                                      WALK     180
          EDEP(1)=RHOP                                                         WALK     181
          EDEP(2)=ZP                                                           WALK     182
          EDEP(3)=EPART                                                        WALK     183
          ID=ID+1                                                              WALK     184
          CALL PAKFNO (EDEP, EBLOCK(ID1), IRNG)                                WALK     185
          IF (IRNG.NE.0) GO TO 201                                             WALK     186
          ID=ID+2                                                              WALK     187
          EBLOCK(ID)=FSTORE.OR.IJSTORE                                         WALK     188
          IF(ID.EQ.NBUF)CALL FLUSH                                             WALK     189
      153 NDIE=NDIE+1                                                          WALK     190
          RETURN                                                               WALK     191
C                                                                              WALK     192
      201 PRINT 2001,        I, J, EDEP                                        WALK     193
          RETURN                                                               WALK     194
C                                                                              WALK     195
          END                                                                  WALK     196
SINGLY REFERENCED VARIABLES
      12 -   48*    EMC      -R  10C0  IJPS   -I   8C0  MAUVE   -   14CN  NFRQ    -I   2C0  RED     -   8CN  TSTART -R  8CC
      13 -   52*    EMIO     -R   8C0  ISCF1  -I   8C0  MI      -I  14C0  NQ      -I   8C0  REZSIE  -R  8C0  WALK   -   1SU
      24 -   68*    EQUIVAL  -    1(F  ISCF2  -I   8C0  MJ      -I  14C0  NQI     -I   8C0  RLC1    -   7CN  WHERE  -   91SU
 AA1    ()R  5LC    ETAB     ()R  2C0  ISC2   -I   8C0  MQ      -I  14C0  NSP     -I   9C0  SIEMIN  -R  10CC XYECS  ()R 150I
 AA2    ()R  6LC    EXP      -   68SU  ISC3   -I   8C0  MQI     -I  14C0  PFREQ   -  149SU  SPTBL   ()R 2CC  YLC1   -   5CN
 ABS    -    65SU   FORMAT   -    17F  ITV    -I   8C0  MU      -R  12RL  PINK    -    4CN  STATE   -   2CN  YLC2   -   6CN
 ALPHA  -R   9CU    FREQ     ()R  2C0  JBAR   -I   8CU  MUU2    -R  12RL  POMEGA  -  151SU  SUBSCR  -   59SU YSC1   -   3CN
 BIBL   ()R  2C0    GROVEL   -R   8C0  JCEN   -I   9C0  NAME    ()I  8C0  PRINT   -  174F   T       -R  8C0
 DATA   -    16F    GREEN    -    9CN  JP2    -I   8C0  NBP     -I   9C0  PTAB    ()R  2C0  TEMIT   -R  9C0
 DT     -R   8CD    IJ       -I   4C0  LAM    -R  12RL  NCYC    -I   8C0  GEXP10  -   61SU  THY     -R  8C0
 DTR    -R   8CU    IJM      -I   4C0  LAMD   -R  12RL  NDUMP   -I   8C0  GLOG    -   65SU  TIME    -R  8C0
 ECEN   -R   1CC0   IJP      -I   4C0  LAVNDER -  10CN  NFLUSH  -I  10C0  REAL    -   12F   TOUT    -R  8C0
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
     3 -     26     36*
    10 -     39*    103
    11 -      4     45*
    21 -     44     53*    153
    22 -     63     66*
    28 -     79     91*
    81 -     97    104*
    91 -     94     95     116*
    93 -    116    126*
   101 -     99    128*
   111 -    133    139*
   115 -    138    148*
   121 -    131    154*
   151 -     93    135    145     162*
   153 -     18    162    172*
   201 -     34     87    111     122     168     174*
  2001 -    17*    174PR
A       ()R  1AG    150I    24    24    24    24    25    72=   72    73=   73    74=   74    77    78    78    78
             78     151AG
```

```
AASC     ()R    3CO    11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ
                11EQ   11EQ
AMAXI    -      57SU   58SU
AMINI    -      55SU   56SU   67SU
BETALC   ()R    11EQ   1301
CENTROY  -      47SU   141SU
CENTX    ()R    11EQ   1301
CENTY    ()R    11EQ   1301
COMMON   -      2F     3F     4F     8F     9F     10F    14F
CQ       ()R    11EQ   1301
CWGT     ()R    15D1   47AG   50     50     50     51     51     51     52     52     52     141AG  144    144    144    146    146
                146    147    147    147
DCELL    -R     14CO   67
DCEN     -R     23=    67     96=    96     97     152=
DCOL     -R     66=    67     98=    98     99
DELSM    ()R    11EQ   1301
DENS     ()R    11CO   43     52     52     52     137    147    147    147
DIMENSI  -      13F    15F
DLOG     -R     54=    56=    56     58=    58     59AG
DMFP     -R     62=    66
DMOVE    -R     67=    68     72     73     74     96     98     101    102    139
DP       -R     43=    52=    54     137=   147=
DUMMY    -R     64     135    145
E        ()R    11EQ   1301
EHLOCK   ()R    11CO   33AG   36=    86AG   89=    110AG  113=   121AG  124=   167AG  170=
EDEATH   -R     1AG    93
EDEP     ()R    15D1   29=    30=    31=    33AG   82=    83=    84=    86AG   106=   107=   108=   110AG  117=   118=   119=   121AG
                156=   157=   157=   158AG  163=   164=   165=   167AG  174PR
EMOMLC   ()R    11EQ   1301
ENEW     -R     68=    69     70
EP       ()R    11EQ   1301
EPART    -R     1AG    18     31     68     69     70=    93     108    116    119    155=   155    162    165
ESCORE   -R     69=    79     84
ETIL     ()R    11EQ   1301
FCUSR    -      31SU   95SU   114SU  125SU  171SU
FOUTLC   ()R    11EQ   1301
FREGP    -R     1AG    27     59AG   105=   113    149AG  150    156    160=
FSCAI    ()R    11CO   41     51     51     51     134    144    144    144
FSN      ()R    11EQ   1301
FSP      -R     41=    51=    68     134=   135    144=   145
FSTORE   -R     27=    36     89     105    124    150=   158AG  159=   159    160    170
GRIR     ()R    11EQ   1301
GRIZ     ()R    11EQ   1301
I        -I     4CO    19     26     174PR
IBAR     -I     8CO    94
IO       -I     11CO   32     35=    35     36     37     85     88=    88     89     90     109    112=   112    113    114    120
                123=   123    124    125    166    169=   169    171    171
IDIE     -I     1AG    28     38=    104=   154=
IOI      -I     32=    33AG   85=    86AG   109=   110AG  120=   121AG  166=   167AG
IESCAP   -I     11CO   126=   126
IJK      -I     59AG   60
IJSC     -I     39=    40     41     42     43     50     51     52     132=   133    134    136    137    144    146    147
IJSC1    -I     48=    50     51     52     142=   144    146    147
IJSC2    -I     49=    53     51     52     143=   144    146    147
IJSTORE  -I     26=    36     89     92=    105    124    160    170
IOLD     -I     19=    39     45     49     91AG   92     94     132    139    143
IPI      -I     8CO    39     48     49     132    142    143
IRNG     -I     33AG   34     86AG   87     110AG  111    121AG  122    158AG  167AG  168
ISC      -I     45=    47AG   48     139=   141AG  142
ISTEP    -I     22=    63     100=   100    148=
J        -I     4CO    20     26     174PR
JOLD     -I     21=    39     46     48     91AG   92     95     95     132    140    142
JPI      -I     8CO    95
JSC      -I     46=    47AG   49     140=   141AG  143
LOM      -      5F     6F     7F
M        ()R    11EQ   12RL   1301
MASK     -I     10OA   27     150    159
MP       ()R    11EQ   12RL   1301
```

```
NBUF     -I     9CO   37    90    114   125   171
NCOL     -I    11CO   129=  129
NOTE     -I    10CO   172=  172
NMOVE    -I    11CO   71=   71
NOPO     -I     2CO   56
NOPT     -I     2CO   55
NPCMAX   -I     9CO   131
NPCOL    -I    21=    128=  128   131
OMEGA    ()R    1AG   1501  72    73    74    151AG
OP       -R    61=    61
OPOEN    ()R    2CO   56    58
OPTMP    ()R    2CO   55    57
P        ()R   11EQ   1301
PAKFNO   -     33SU   86SU  110SU 121SU 158SU 167SU
PL       ()R   11EQ   1301
QLOG10   -     53SU   54SU
QSQRT    -     24SU   165SU
R        ()R   11EQ   1301
RANDOM   -     64SU   135SU 145SU
RCSQ     ()R   11EQ   1301
RETURN   -     115F   127F  161F  173F  175F
RHOU     -R    76=    81=   81    82
RHOP     -R    14CO   24=   29    76    78=   81    106   117   163
RM       ()R   11EQ   1301
RMFP     -R    65=    66    102=  102
RN       ()R   11EQ   1301
RNI      -R    64=    65
RO       ()R   11EQ   1301
ROL      ()R   11EQ   1301
RVOL     ()R   11EQ   1301
RZEUEN   ()R   11EQ   1301
SHIFT    -     26SU   92SU
SIE      ()R   11EQ   1301
SIGA     ()R    7LC   61
SIGNU    -R    61=    62    66    102
SIGPLC   ()R   11EQ   1301
TAMB     -R     8CO   4     133
TEMP     ()R    8CO   4     42    50    50    50    133   136   146   146   146
TLOG     -R    53=    55=   55    57=   57    59AG
TP       -R    42=    53=   53    136=  146=  149AG
T1       -R    17CO   23    101=  101   130=  130   152   157
T2       -R    14CO   23    152
U        ()R   11EQ   1301
UG       ()R   11EQ   1301
UL       ()R   11EQ   1301
UMOMLC   ()R   11EQ   1301
UP       ()R   11EQ   1301
UTIL     ()R   11EQ   1301
V        ()R   11EQ   1301
VG       ()R   11EQ   1301
VL       ()R   11EQ   1301
VP       ()R   11EQ   1301
VTIL     ()R   11EQ   1301
X        ()R   11EQ   1301
XPAR     ()R   11EQ   1301
Y        ()R   11EQ   1301
YPAR     ()R   11EQ   1301
ZO       -R    75=    82=   80    83
ZP       -R    14CO   25=   30    75    77=   80    107   118   164
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```

```
      SUBROUTINE WHERE (I, J)
C
      COMMON /MAUVE/    IBAR, JP1, NQ, NQI, RHOP, ZP, OCELL
      DIMENSION         XYECS(30)
C
      INEW=IOLD=I
      JNEW=JOLD=J
      IECS=(J-1)*NQI+(I-1)*NQ
      CALL ECRD (XYECS,IECS,30,NE)
      XSW=XYECS(1)
      YSW=XYECS(3)
      XSE=XYECS(NQ+1)
      YSE=XYECS(NQ+3)
      IECS=IECS+NQI
      CALL ECRD (XYECS,IECS,30,NE)
      XNW=XYECS(1)
      YNW=XYECS(3)
      XNE=XYECS(NQ+1)
      YNE=XYECS(NQ+3)
C     ---    WEST
   11 IF (INEW.LE.1) GO TO 91
      ITEST=0
      IF (RHOP.LT.XNW) ITEST=ITEST+1
      IF (RHOP.LT.XSW) ITEST=ITEST+1
      IF (ITEST-1) 91, 21, 31
   21 TEST=XSW+(XNW-XSW)*(ZP-YSW)/(YNW-YSW)
      IF (RHOP.GT.TEST) GO TO 91
   31 INEW=INEW-1
      XNE=XNW
      YNE=YNW
      XSE=XSW
      YSE=YSW
      IECS=(JNEW-1)*NQI+(INEW-1)*NQ
      CALL ECRD (XYECS,IECS,3,NE)
      XSW=XYECS(1)
      YSW=XYECS(3)
      IECS=IECS+NQI
      CALL ECRD (XYECS,IECS,3,NE)
      XNW=XYECS(1)
      YNW=XYECS(3)
      GO TO 11
C
   91 IF (INEW.NE.IOLD) GO TO 210
C     ---    EAST
  111 ITEST=0
      IF (RHOP.GT.XNE) ITEST=ITEST+1
      IF (RHOP.GT.XSE) ITEST=ITEST+1
      IF (ITEST-1) 210,121,131
  121 TEST=XSE+(XNE-XSE)*(ZP-YSE)/(YNE-YSE)
      IF (RHOP.LE.TEST) GO TO 211
  131 INEW=INEW+1
      IF (INEW.GT.IBAR) GO TO 401
      XNW=XNE
      YNW=YNE
      XSW=XSE
      YSW=YSE
      IECS=(JNEW-1)*NQI+INEW*NQ
      CALL ECRD (XYECS,IECS,3,NE)
      XSE=XYECS(1)
      YSE=XYECS(3)
      IECS=IECS+NQI
      CALL ECRD (XYECS,IECS,3,NE)
      XNE=XYECS(1)
      YNE=XYECS(3)
      GO TO 111
C     ---    SOUTH
  211 ITEST=0
      IF (ZP.LT.YSW) ITEST=ITEST+1
```

```
      IF (ZP.LT.YSE) ITEST=ITEST+1                                    WHERE     70
      IF (ITEST-1) 291,221,231                                        WHERE     71
  221 TEST=YSE+(YSW-YSE)*(RHOP-XSE)/(XSW-XSE)                          WHERE     72
      IF (ZP.GE.TEST) GO TO 291                                       WHERE     73
  231 JNEW=JNEW-1                                                     WHERE     74
      IF (JNEW.LT.2) GO TO 401                                        WHERE     75
      XNW=XSW                                                         WHERE     76
      YNW=YSW                                                         WHERE     77
      XNE=XSE                                                         WHERE     78
      YNE=YSE                                                         WHERE     79
      IECS=(JNEW-1)*NQI+(INEW-1)*NQ                                   WHERE     80
      CALL ECRD (XYECS,IECS,30,NE)                                    WHERE     81
      XSW=XYECS(1)                                                    WHERE     82
      YSW=XYECS(3)                                                    WHERE     83
      XSE=XYECS(NQ+1)                                                 WHERE     84
      YSE=XYECS(NQ+3)                                                 WHERE     85
      GO TO 211                                                       WHERE     86
C                                                                     WHERE     87
  291 IF (JNEW.NE.JOLD) GO TO 391                                     WHERE     88
C     ---   NORTH                                                     WHERE     89
  311 ITEST=0                                                         WHERE     90
      IF (ZP.GT.YNW) ITEST=ITEST+1                                    WHERE     91
      IF (ZP.GT.YNE) ITEST=ITEST+1                                    WHERE     92
      IF (ITEST-1) 391,321,331                                        WHERE     93
  321 TEST=YNE+(YNW-YNE)*(RHOP-XNE)/(XNW-XNE)                          WHERE     94
      IF (ZP.LT.TEST) GO TO 391                                       WHERE     95
  331 JNEW=JNEW+1                                                     WHERE     96
      IF (JNEW.GT.JP1) GO TO 401                                      WHERE     97
      XSW=XNW                                                         WHERE     98
      YSW=YNW                                                         WHERE     99
      XSE=XNE                                                         WHERE    100
      YSE=YNE                                                         WHERE    101
      IECS=JNEW*NQI+(INEW-1)*NQ                                       WHERE    102
      CALL ECRD (XYECS,IECS,30,NE)                                    WHERE    103
      XNW=XYECS(1)                                                    WHERE    104
      YNW=XYECS(3)                                                    WHERE    105
      XNE=XYECS(NQ+1)                                                 WHERE    106
      YNE=XYECS(NQ+3)                                                 WHERE    107
      GO TO 311                                                       WHERE    108
C                                                                     WHERE    109
  391 IF (JNEW.EQ.JOLD) GO TO 401                                     WHERE    110
      IOLD=INEW                                                       WHERE    111
      JOLD=JNEW                                                       WHERE    112
      GO TO 11                                                        WHERE    113
C                                                                     WHERE    114
  401 I=INEW                                                          WHERE    115
      J=JNEW                                                          WHERE    116
      OCELL=0.25*(XNE-XNW+XSE-XSW+YNW-YSW+YNE-YSE)                     WHERE    117
      RETURN                                                          WHERE    118
      END                                                             WHERE    119
```

SINGLY REFERENCED VARIABLES

```
 COMMON  -   2F    DIMENSI  -    3F     HAUVE   -    2CN   RETURN  -  107F     WHERE   -    1SU
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```

MULTIPLY-REFERENCED VARIABLES

```
   11 -    10*    31    103
   21 -    22     23*
   31 -    22     25*
   91 -    18     22     24     39*
  111 -    41*    6
  121 -    43     44*
  131 -    43     46*
  211 -    35     43     45     61*    79
  221 -    64     65*
  231 -    64     67*
  291 -    64     66     80*
  311 -    81*    99
  321 -    84     85*
  331 -    84     87*
```

```
      392 -     81      84      86      100*
      401 -     47      68      88      100*    104*
DCELL    -R     2CO     116=
ECRD     -      7SU     13SU    31SU    35SU    53SU    57SU    74SU    94SU
I        -I     1AG     4       6       104=
IBAR     -I     2CO     47
IECS     -I     6=      7AG     12=     12      13AG    30=     31AG    34=     34      35AG    52=     53AG    56=     56      57AG    73=     74AG
                93=     94AG
INEW     -I     4=      18      25=     25      30      39      46=     46      47      52      73      93      101     104
IOLD     -I     4=      39      101=
ITEST    -I     19=     20=     20      21=     21      22      40=     41=     41      42=     42      43      61=     62=     62      63=     63
                64      81=     82=     82      83=     83      84
J        -I     1AG     5       6       105=
JNEW     -I     5=      32      52      67=     67      68      73      80      87=     87      88      93      100     102     105
JOLD     -I     5=      80      100     102=
JP1      -I     2CO     88
NE       -I     7AG     13AG    31AG    35AG    53AG    57AG    74AG    94AG
NQ       -I     2CO     6       10      11      16      17      30      52      73      77      78      93      97      98
NQ1      -I     2CO     6       12      30      34      52      56      73      93
RHOP     -R     2CO     20      21      24      41      42      45      65      85
TEST     -R     23=     24      44=     45      65=     66      85=     86
XNE      -R     16=     26=     41      44      48      58=     71=     85      85      91      97=     106
XNW      -R     14=     20      23      26      36=     48=     69=     65      89      95=     106
XSE      -R     17=     28=     42      44      44      50      54=     65      65      71      77=     91=     106
XSW      -R     8=      21      23      23      28      32=     50=     65      69      75=     89=     106
XYECS    (}R    30I     7AG     8       9       10      11      13AG    14      15      16      17      31AG    32      33      35AG    36      37
                53AG    54      55      57AG    58      59      74AG    75      76      77      78      94AG    95      96      97      98
YNE      -R     17=     27=     44      49      59=     72=     83      85      85      92      98=     106
YNW      -R     15=     23      27      37=     49=     70=     82      85      90      96=     106
YSE      -R     11=     29=     44      44      51      55=     63      65      65      72      78=     92=     106
YSW      -R     9=      23      23      29      33=     51=     62      65      70      76=     90=     106
ZP       -R     2CO     23      44      62      63      66      82      83      86
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```
  1          OVERLAY (YOKIFEP,3,2)                                              ESTEP      2

  1          PROGRAM ESTEP                                                      ESTEP      3
       C                                                                        ESTEP      4
       C        THIS PROGRAM IS DESIGNED TO READ THE ENERGY DEPOSITION          ESTEP      5
       C        DATA AND SOLVE THE HEAT EQUATION TO GIVE NEW TEMPERATURES       ESTEP      6
       C                                                                        ESTEP      7
  2          COMMON /STATE/    OCPT, NCPU, NFRQ, OPTMP(30), OPDEN(10),          ALLKOM     2
            1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),     ALLKOM     3
            2                  BTBL(300)                                        ALLKOM     4
  3          COMMON /YSC1/     AASC(5454)                                       ALLKOM     5
  4          COMMON /PINK/     I, IJ, IJM, IJP, J                               ALLKOM     6
  5          LCM /YLC1/        AA1(131000)                                      ALLKOM     7
  6          LCM /YLC2/        AA2(131000)                                      ALLKOM     8
  7          LCM /RLC1/        SICA(30000)                                      ALLKOM     9
  8          COMMON /RED/      NAME(12), DT, DTR, EMIU, GRDVEL, IBAR, IJPS,     ALLKOM    10
            1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,        ALLKOM    11
            2                  JP1, JP2, NCYC, NDUMP, NQ, NQ1, REZSIE, TIMB,    ALLKOM    12
            3                  TEMP(7500), T, TIME, TOUT, TSTART, THY           ALLKOM    13
  9          COMMON /GREEN/    ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMIT       GREEN      2
 10          COMMON /LAVNDER/  DENS(7500), EBLOCK(6000), ECEN, EPC,             LAVNDER    2
            1                  FSCAT(7500), ID, IESCAP, NCOL, NDIE,             LAVNDER    3
            2                  NFLUSH, NMOVE, SIEMIN, I1, T2                    LAVNDER    4
 11          EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL    2
            1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),          EQVREAL    3
            2                  (AASC(7),RP,RRP,RCSQ,CENTX),                     EQVREAL    4
            3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),          EQVREAL    5
            4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),       EQVREAL    6
            5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                    EQVREAL    7
            6                  (AASC(13),VTIL,VL,UMOMLC),                       EQVREAL    8
            7                  (AASC(14),ROL,HETALC,FOOTLC), (AASC(15),SIE),    EQVREAL    9
            8                  (AASC(16),DELSM,SIGPLC),                         EQVREAL   10
```

```
     9               (AASC(17),GRIR,UG,R/ZOEN),
     1               (AASC(18),GRIZ,VG,FSN)
      REAL           LAM, LAMD, M, MP, MU, MU02
      DIMENSION      X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),
     2               V(1), RO(1), VP(1), RMP(1), RCSQ(1), CENTX(1),
     3               E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),
     4               VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),
     5               UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),
     6               UMOMLC(1), ROL(1), DETALC(1), FOUTLC(1),
     7               SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),
     8               RZEDEN(1), GRIZ(1), VG(1), FSN(1)
C
      DIMENSION      EDEP(3), EPART(7500), EMSN(7500)
      EQUIVALENCE    (FSCAT,EPART), (DENS,EMSN)
      LEXT           UBLINT
 2001 FORMAT         (1H0,*FINAL RADIATION ENERGIES*/
     1               6H EMC   ,1PE12.4,6X,6H EABS  ,1PE12.4,6X,
     2               6H ELOST ,1PE12.4,6X,6H EEMIT ,1PE12.4/
     3               6H ECEN  ,1PE12.4,6X,6H RE    ,1PE12.4,6X,
     4               6H RA    ,1PE12.4)
 2003 FORMAT         (1H0,5H TAVG  ,1PE12.4,6X,6H TMAX  ,1PE12.4,6X,
     1               6H UMAX  ,1PE12.4,6X,6H UMIN  ,1PE12.4,6X,
     2               6H TRY   ,1PE12.4)
 2004 FORMAT         (1H0,5HPABS  ,1PE12.4,6X,6H PLOST,1PE12.4,
     1               6X,6H PEMIT,1PE12.4)
C
      UMAX=-15.0
      UMIN=15.0
      IJTR=IP1*JP2
      DO 10 IJSC=1,IJTR
      EPART(IJSC)=0.0
      EMSN(IJSC)=0.0
   10 CONTINUE
C     ---   ENERGY DEPOSITION RETRIEVAL
      ELOST=0.0
      EABS=0.0
      EEMIT=0.0
      CALL OPEN (SLFSET3,2LST,/168)
   11 CALL RDBUF (SLFSET3, EBLOCK, NBUF, LENGTH2, LSTATUS)
      DO 29 K=1,LENGTH2,2
      CALL UNPKFN (EBLOCK(K), EDEP)
      FSTORE=EBLOCK(K+1)
      I=SHIFT(FSTORE,-9).AND.777B
      J=FSTORE.AND.777B
      IJSC=IP1*(J-1)+I
      IF (EDEP(3).LT.0.0) GO TO 27
      IF (I.GT.IBAR) GO TO 25
      IF (J.LT.2.OR.J.GT.JP1) GO TO 25
      EPART(IJSC)=EPART(IJSC)+EDEP(3)
      EABS=EABS+EDEP(3)
      GO TO 29
C     ---   COMPUTE ENERGY LOST FROM MESH
   25 EPART(IJSC)=EPART(IJSC)+EDEP(3)
      ELOST=ELOST+EDEP(3)
      GO TO 29
C     ---   COMPUTE EMISSION
   27 EMSN(IJSC)=EMSN(IJSC)-EDEP(3)
      EEMIT=EEMIT-EDEP(3)
C
   29 CONTINUE
      IF (LSTATUS.EQ.1) GO TO 11
      RE=EMC/EEMIT
      RA=EMC/(EABS+ELOST)
      EEMIT=EEMIT*RE
      EABS=EABS*RA
      ELOST=ELOST*RA
C     ---   ADVANCE CELL TEMPERATURES
      TMAX=0.0
      CALL START
```

```
          DO 40 J=2,JP1                                                  ESTEP    71
          IJSC=(J-1)*IP1                                                 ESTEP    72
          DO 39 I=1,IBAR                                                 ESTEP    73
          IPJ=IJ+NQ                                                      ESTEP    74
          IPJP=IJP+NQ                                                    ESTEP    75
          IJSC=IJSC+1                                                    ESTEP    76
          EMIT=EMSN(IJSC)*RE                                             ESTEP    77
          ABSOR=EPART(IJSC)*RA                                           ESTEP    78
          SIE(IJ)=SIE(IJ)+0.1591555E-15*RVOL(IJ)*(ABSOR-EMIT)/RO(IJ)     ESTEP    79
          SIE(IJ)=AMAX1(SIE(IJ),RLZSIE)                                  ESTEP    80
C                                                                        ESTEP    81
          IF (SIE(IJ)-RLZSIE.GT.1.0E-15) GO TO 36                        ESTEP    82
          ZT=TAMB                                                        ESTEP    83
          GO TO 38                                                       ESTEP    84
       36 ZR=RO(IJ)                                                      ESTEP    85
          ZE=SIE(IJ)                                                     ESTEP    86
          ZRINV=1.0/ZR                                                   ESTEP    87
          ZRL=ALOG10(ZR)                                                 ESTEP    88
          ZRL=AMIN1(ZRL,OPDEN(NOPD))                                     ESTEP    89
          ZRL=AMAX1(ZRL,OPDEN(1))                                        ESTEP    90
          TLOW=TAMB                                                      ESTEP    91
          THIGH=ZSQRT(ZE*ZR*0.05728789E+07)                              ESTEP    92
          THIGH=ZSQRT(THIGH)                                             ESTEP    93
          ZT=0.5*(TLOW+THIGH)                                            ESTEP    94
       37 ZE1=(37.2)4E-07*ZT**4                                          ESTEP    95
          ZE1=ZE-ZE1*ZRINV                                               ESTEP    96
          ZTL=ALOG10(ZT)                                                 ESTEP    97
          ZTL=AMIN1(ZTL,OPTMP(NOPT))                                     ESTEP    98
          ZE2L=ONLINT(0, ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOPT) ESTEP  99
          ZE2=EXP10(ZE2L)                                                ESTEP   100
          ZDE=ZE1-ZE2                                                    ESTEP   101
          IF (ZDE.GT.0.0) TLOW=ZT                                        ESTEP   102
          IF (ZDE.LT.0.0) THIGH=ZT                                       ESTEP   103
          ZT=0.5*(TLOW+THIGH)                                            ESTEP   104
          IF (THIGH-TLOW.LT.1.0E-06*ZT) GO TO 38                         ESTEP   105
          GO TO 37                                                       ESTEP   106
       38 TEMP(IJSC)=ZT                                                  ESTEP   107
          TMAX=AMAX1(TMAX,ZT)                                            ESTEP   108
          DMAX=AMAX1(DMAX,RO(IJ))                                        ESTEP   109
          DMIN=AMIN1(DMIN,RO(IJ))                                        ESTEP   110
          IJ=IPJ                                                         ESTEP   111
          IJP=IPJP                                                       ESTEP   112
          IJM=IPJM                                                       ESTEP   113
       39 CONTINUE                                                       ESTEP   114
          CALL LOOP                                                      ESTEP   115
       40 CONTINUE                                                       ESTEP   116
          CALL DONE                                                      ESTEP   117
C                                                                        ESTEP   118
          REWIND 3                                                       ESTEP   119
          CALL OPEN (SLFSET3,2LST,512)                                   ESTEP   120
          ETOT=EABS-ELOST                                                ESTEP   121
          TAVG=0.5*(TIME+12)                                             ESTEP   122
          THY=THY+ELOST                                                  ESTEP   123
          RDT=1.0/(12-TIME)                                              ESTEP   124
          PLOST=ELOST*RDT                                                ESTEP   125
          PABS=EABS*RDT                                                  ESTEP   126
          PEMIT=EEMIT*RDT                                                ESTEP   127
          PRINT 2001,          ETOT, EABS, ELOST, EEMIT, ECEN, RE, RA    ESTEP   128
          WRITE (12,2001)      ETOT, EABS, ELOST, EEMIT, ECEN, RE, RA    ESTEP   129
          PRINT 2004,          PABS, PLOST, PEMIT                        ESTEP   130
          WRITE (12,2004)      PABS, PLOST, PEMIT                        ESTEP   131
          PRINT 2003,          TAVG, TMAX, DMAX, DMIN, THY               ESTEP   132
          WRITE (12,2003)      TAVG, TMAX, DMAX, DMIN, THY               ESTEP   133
          RETURN                                                         ESTEP   134
          END                                                            ESTEP   135
```

```
SINGLY REFERENCED VARIABLES
 AA1      ()R    5LC   GROVEC  -R    8CO   ITV      -I   8CO   NAME    ()I   8CO   NQI     -I    8CO   RLC1     -    7CN   TSTART  -R   8CO
 AA2      ()R    6CC   GREEN   -     9CN   JBAR     -I   8CO   NBP     -I    9CO   NSP     -I    9CO   SHIFT    -   35SU   T1      -R  10CO
 ALPHA    -R     9CO   IO      -I   10CO   JCEN     -I   9CO   NCOL    -I   19CO   PINK    -     4CN   SIEMIN  -R  10CO   UNPKFN  -   33SU
 BIBL     ()R    2CO   IESCAP  -I   16CO   LAM      -R  12RL   NCYC    -I    8CO   PTAB    ()R   2CO   SIGA    ()R  7LC   YLC1    -    5CN
 DONE     -    1 3SU   IOPS    -I    6CO   LAMO     -R  12RL   NOIE    -I   14CO   CEXP10  -    66SU   SPTBL   ()R  2CO   YLC2    -    6CN
 DT       -R     8CO   IPUM    -I   99     LAVNDER  -   10CN   NOOMP   -I    8CO   RDBUF   -    31SU   START    -   57SU   YSC1    -    3CN
 DTR      -R     8CO   ISCF1   -I    8CO   LEXT     -   16F    NFLOSH  -I   10CO   REAL    -    12F    STATE    -    2CN
 EMIO     -R     6CO   ISCF2   -I    8CO   LOOP     -  101SU   NFRQ    -I    2CO   RED     -     8CN   T       -R   8CO
 ESTEP    -      1SU   ISC2    -I    8CO   MU       -R  12RL   NMOVE   -I   10CO   RETURN  -   119F    TEMIT   -R   9CO
 FREQ     ()R    2CO   ISC3    -I    8CO   MUC2     -R  12RL   NFCMAX  -I    9CO   REWIND  -   1:4F    TOUT    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
     10 -      2300    26*
     11 -      31*     5.
     25 -      39      4.      44*
     27 -      36      47*
     29 -      3200    43      46      49*
     36 -      66      71*
     37 -      81*     92
     38 -      7       91      93*
     39 -      6100    10.*
     40 -      5600    1.2*
   2001 -      17*     113PR   114WR
   2003 -      16*     117PR   118WR
   2004 -      19*     115PR   116WR
AASC    ()R     3CO    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ
               11EQ    11EQ
ABSOR   -R     65=     66
AMAX1   -      67SU    76SU    94SU    95SU
AMIN1   -      75SU    84SU    96SU
BETALC  ()R    11EQ    13OI
CENTX   ()R    10EQ    13OI
CENTY   ()R    11EQ    13OI
COMMON  -      2F      3F      4F      8F      9F      10F
CQ      ()R    11EQ    13OI
COLINT  -      10LX    65SU
DELSM   ()R    11EQ    13OI
DENS    ()R    1 CO    15EQ
DIMENSI -      13F     14F
DMAX    -R     2:=     95=     95      117PR   118WR
DMIN    -R     21=     96=     96      117PR   118WR
E       ()R    11EQ    13OI
EABS    -R     28=     42=     42      52      54=     54      106     111     113PR   114WR
EBLOCK  ()R    1 CO    31AG    33AG    34
ECEN    -R     1 CO    113PR   114WR
EDEP    ()R    14OI    33AG    38      41      42      44      45      47      48
EEMIT   -R     29=     46=     48      51      53=     53      112     113PR   114WR
ELOS1   -R     27=     45=     45      52      55=     55      106     108     110     113PR   114WR
EMC     -R     ( CO    51      52
EMIT    -R     64=     66
EMDMLC  ()R    11EQ    13OI
EMSN    ()R    14OI    15EQ    25=     47=     47      64
EP      ()R    11EQ    13OI
EPART   ()R    14OI    15EQ    24=     41=     41      44=     44      65
EQUIVAL -      11F     15F
ETAB    ()R    2CO     85
ETIL    ()R    11EQ    13OI
ETOT    -R     1:6=    113PR   114WR
FORMAT  -      17F     18F     19F
FOUTLC  ()R    11EQ    13OI
FSCAT   ()R    1 CO    15EQ
FSN     ()R    11EQ    13OI
FSTORE  -R     34=     35      36
GRIR    ()R    11EQ    13OI
GRIZ    ()R    11EQ    13OI
I       -I     4CO     35=     37      39      60DO
IBAR    -I     6CO     39      60DO
IJ      -I     4CO     61      66      66      66      66      67      67      68      71      72      95      96      97=
```

I.IM	-I	4C0	99=														
IJP	-I	4C0	62	98=													
IJSC	-I	2300	24	25	37=	41	41	44	44	47	47	59=	63=	63	64	65	93
IJTR	-I	22=	2300														
IPJ	-I	61=	97														
IPJP	-I	62=	98														
IPI	-I	8C0	22	37	59												
J	-I	4C0	36=	37	40	40	5800	59									
JP1	-I	8C0	4..	5800													
JP2	-I	8C0	22														
K	-I	3200	33AG	34													
LCM	-	5F	6F	7F													
LENGTH2	-I	31AG	3200														
LSTATUS	-I	31AG	5,														
M	()R	11EQ	12RL	1301													
MP	()R	11EQ	12RL	1301													
NBUF	-I	9C0	31AG														
NOPD	-I	2C0	75	65													
NOPT	-I	2C0	64	65	85												
NO	-I	6C0	61	62													
OPDEN	()R	2C0	75	76	85												
OPEN	-	3:S0	[illegible]														
OPTMP	()R	2C0	64	65													
P	()R	11EQ	1301														
PABS	-R	111=	115PR	116WR													
PEMIT	-R	112=	115PR	116WR													
PC	()R	11EQ	1301														
PLOST	-R	110=	115PR	116WR													
PRINT	-	113F	115F	117F													
QLOG10	-	74S0	83S0														
QSQRT	-	76S0	79S0														
R	()R	11EQ	1301														
RA	-R	52=	54	55	65	113PR	114WR										
RCSQ	()R	11EQ	1301														
ROT	-R	109=	11,	111	112												
RE	-R	51=	53	64	113PR	114WR											
REZSIE	-R	8C0	67	68													
RM	()R	11EQ	1301														
RMP	()R	11EQ	1301														
RO	()R	11EQ	1301	66	71	95	96										
ROL	()R	11EQ	1301														
RVOL	()R	11EQ	1301	66													
RZEDEN	()R	11EQ	1301														
SIE	()R	11EQ	1301	66=	66	67=	67	68	72								
SIGPLC	()R	11EQ	1301														
TAMB	-R	8C0	69	77													
TAVG	-R	117=	117PR	118WR													
TEMP	()R	8C0	93=														
THIGH	-R	78=	79=	79	80	89=	90	91									
THY	-R	8C0	108=	118	117PR	118WR											
TIME	-R	8C0	107	1,9													
TLOW	-R	77=	8.	88=	90	91											
TMAX	-R	56=	94=	94	117PR	118WR											
TS	-R	1..C0	107	1,9													
U	()R	11EQ	1301														
UG	()R	11EQ	1301														
UL	()R	11EQ	1301														
UMDMLC	()R	11EQ	1301														
UP	()R	11EQ	1301														
URI	-R	81=	82														
UTIL	()R	11EQ	1301														
V	()R	11EQ	1301														
VG	()R	11EQ	1301														
VL	()R	11EQ	1301														
VP	()R	11EQ	1301														
VTIL	()R	11EQ	1301														
WRITE	-	114F	116F	118F													
X	()R	11EQ	1301														
XPAR	()R	11EQ	1301														

```
Y         (JR     (IEU     130I
YPAR      ((R     11EU     13C1
ZDE       -R      87=      66      69
ZE        -R      72=      78      62
ZE1       -R      82=      67
ZE2       -R      86=      67
ZE2L      -R      85=      66
ZR        -R      71=      73      74      78
ZRINV     -R      73=      62
ZRL       -R      74=      75=     75      76=     76      85
ZT        -R      69=      8.=     63      83      88      89      90=     91      93      94
ZTL       -R      83=      64=     64      85
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

  1             OVERLAY (YOKIFER,3,3)                                                   LISTING     2

  1             PROGRAM LISTING                                                         LISTING     3
          C                                                                             LISTING     4
          C     THIS SUBROUTINE PRINTS REEFER OUTPUT                                    LISTING     5
          C                                                                             LISTING     6
  2             COMMON /STATE/    NOPI, NOPD, NFRQ, OPTMP(30), OPDEN(10),               ALLKOM      2
               1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),          ALLKOM      3
               2                  BTBL(300)                                             ALLKOM      4
  3             COMMON /YSCI/     AASC(5454)                                            ALLKOM      5
  4             COMMON /PINK/     I, IJ, IJM, IJP, J                                    ALLKOM      6
  5             LCM /YLC1/        AA1(131000)                                           ALLKOM      7
  6             LCM /YLC2/        AA2(131000)                                           ALLKOM      8
  7             LCM /HLC1/        SIGA(30000)                                           ALLKOM      9
  8             COMMON /RED/      NAME((2), DT, DTH, EM10, GRDVEL, IRAR, IJPS,          ALLKOM     10
               1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,             ALLKOM     11
               2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,         ALLKOM     12
               3                  TEMP(7500), 1, TIME, TOUT, TSTART, THY                ALLKOM     13
  9             COMMON /GREEN/    ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TENIT            GREEN       2
 10             COMMON /LAVNUER/  DENS(7500), EBLOCK(6000), ECEN, EMC,                  LAVNUER     2
               1                  FSCAT(7500), IO, IESCAP, NCOL, NOIE,                  LAVNUER     3
               2                  NFLUSH, NMOVE, SIEM(N, 1), T2                         LAVNUER     4
 11             EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),      EQVREAL     2
               1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),               EQVREAL     3
               2                  (AASC(7),MP,RMP,RCSQ,CENTX),                          EQVREAL     4
               3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVCL),               EQVREAL     5
               4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),            EQVREAL     6
               5                  (AASC(12),UTIL,UL,CQ,EMUMLC),                         EQVREAL     7
               6                  (AASC(13),VTIL,VL,UMUMLC),                            EQVREAL     8
               7                  (AASC(14),RCL,BETALC,FOUTLC), (AASC(15),SIE),         EQVREAL     9
               8                  (AASC(16),DELSM,SIGPLC),                              EQVREAL    10
               9                  (AASC(17),GRIR,UG,RZEDEN),                            EQVREAL    11
               (                  (AASC(18),GRIZ,VG,FSN)                                EQVREAL    12
 12             REAL              LAM, LAMD, M, MP, MU, MU02                            EQVREAL    13
 13             DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),             DIMEN       2
               2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),        DIMEN       3
               3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),        DIMEN       4
               4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),            DIMEN       5
               5                  UL(1), CQ(1), EMUMLC(1), VTIL(1), VL(1),              DIMEN       6
               6                  UMUMLC(1), RCL(1), BETALC(1), FOUTLC(1),              DIMEN       7
               7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),          DIMEN       8
               8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                     DIMEN       9
          C                                                                             LISTING    12
 14             DIMENSION         EPART(7500), EMSN(7500)                               LISTING    13
 15             EQUIVALENCE       (FSCAT,EPART), (DENS, EMSN)                           LISTING    14
 16      2001   FORMAT            (1H(,*REEFER OUTPUT*//6H       I,6H      J,           LISTING    15
               1                  12H           X,12H           Y,12H        ABSN,      LISTING    16
               2                  12H        EMSN,12H        TEMP 12H       FSCAT,      LISTING    17
               3                  12H      SIGPLC,12H      BETALC,                      LISTING    18
               4                  12H      RZEDEN/)                                     LISTING    19
 17      2002   FORMAT            (2I6,1P9E12.4)                                        LISTING    20
          C                                                                             LISTING    21
```

```
18          CALL OPEN (6LFSET12,2LS1,(3312(
19          LINES=6
20          CALL START
21          DO 13 J=1,JP2
22          IJSC=(J-1)*IP)
23          DO 12 I=1,IP1
24          IPJM=IJM+NQ
25          IPJ=IJ+NQ
26          IJSC=IJSC+1
27          IF (LINES.EQ.0) WRITE (12,2001)
28          LINES=LINES+1
29          IF (LINES.GT.50) LINES=0
30          WRITE (12,2002)   I, J, X(IJM), Y(IJM), EPART(IJSC), EMSN(IJSC),
           1                   TEMP(IJSC), FSN(IJM), SIGPLC(IJM), BETALC(IJM),
           2                   RZEDEN(IJM)
31          IJ=IPJ
32          IJM=IPJM
33       12 CONTINUE
34          CALL LOOP
35       13 CONTINUE
36          CALL DONE
37          CALL OPEN (6LFSET12,2LS1,5I2)
      C
38          RETURN
39          END
```

```
SINGLY REFERENCED VARIABLES
 AA1     ()R   5LC   ETAB    ()R   2CO   ISC2     -I   8CO   MU      -R  12RL  NMOVE   -I  1LCO  RED     -    8CN  TEMIT   -R   9CO
 AA2     ()R   6LC   FREQ    ()R   2CO   ISC3     -I   8CO   MU02    -R  12RL  NOPD    -I   2CO  RETURN  -   38F   THY     -R   8CO
 ALPHA   -R    9CO   GRUVEL  -R    8CO   ITV      -I   8CO   NAME    ()I  8CO  NOPT    -I   2CO  REZSIE  -R   8CO  TIME    -R   8CO
 BTBL    ()R   2CO   GREEN   -     9CN   JBAR     -I   8CO   NBP     -I   9CO  NPCMAX  -I   9CO  RLCI    -    7CN  TOUT    -R   8CO
 DONE    -    36SU   IBAH    -I    8CO   JCEN     -I   9CO   NBUF    -I   9CO  NQI     -I   8CO  SIEMIN  -R  10CO  TSTART  -R   8CO
 DT      -R    8CO   IU      -I   10CO   JPI      -I   8CO   NCOL    -I  10CO  NSP     -I   9CO  SIGA    ()R  7LC  T1      -R  10CO
 DTR     -R    8CO   ILSCAP  -I   10CO   LAP      -R  12RL   NCYC    -I   8CO  OPDEN   ()R  2CO  SPTBL   ()R  2CO  T2      -R  10CO
 EBLOCK  ()R  12CO   IJP     -I    4CO   LAPD     -R  12RL   NOTE    -I  10CO  OPTMP   ()R  2CO  START   -   20SU  YLC1    -    5CN
 ECEN    -R   10CO   IJPS    -I    8CO   LAVIDEN  -   10CN   NOOMP   -I   8CO  PINK    -    4CN  STATE   -    2CN  YLC2    -    6CN
 EHL     -R   10CO   ISCF1   -I    8CO   LISTING  -    1SU   NFLUSH  -I  10CO  FTAB    ()R  2CO  T       -R   8CO  YSCI    -    3CN
 EMIO    -R    8CO   ISCF2   -I    8CO   LOOP     -   34SU   NFRQ    -I   2CO  REAL    -   12F   TAMH    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
     12 -     2300    33*
     13 -     2100    35*
   2001 -     16*     27WR
   2002 -     17*     30WR
AASC     ()R    3CO   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ
                11EQ  11EQ
BETALC   ()R   11EQ   1301   30WR
CENTX    ()R   11EQ   1301
CENTY    ()R   11EQ   1301
COMMON   -       2F     3F     4F     8F     9F    10F
CQ       ()R   11EQ   1301
DELSM    ()R   11EQ   1301
DENS     ()R   11CO   15EQ
DIMENSI  -      13F    14F
E        ()R   11EQ   1301
EMOMLC   'JR   11EQ   1301
EMSN     ()R   1401   15EQ   30WR
EP       ()R   11EQ   1301
EPART    ()R   1401   15EQ   3JWR
EQUIVAL  -      11F    15F
ETIL     ()R   11EQ   1301
FORMAT   -      16F    17F
FOUTLC   ()R   11EQ   1301
FSCAI    ()R   11CO   15EQ
FSN      ()R   11EQ   1301   30WR
GRIR     ()R   11EQ   1301
GRIZ     ()R   11EQ   1301
I        -I     4CO   2300   3JWR
IJ       -I     4CO   25     31=
```

```
IJM      -1     4CO    24     30WR   30WR   30WR   30WR   30WR   30WR   32=
IJSC     -1     22=    26=    26     30WR   30WR   30WR
IPJ      -1     25=    31
IPJM     -1     24=    32
IPI      -1     8CO    22     2300
J        -1     4CO    2100   22     30WR
JP2      -1     5CO    2100
LCM      -      5F     6F     7F
LINES    -1     19=    27     28=    28     29     29=
M        ()R    ))EQ   12RL   1301
MP       ()R    ))EQ   12R)   1301
NQ       -1     8CO    24     25
OPEN     -      (ESU   3750
P        ()R    ()EQ   1301
PL       ()R    ()EQ   1301
R        ()R    ))EQ   1301
RCSQ     ()R    ))EQ   1301
RM       ()R    ))EQ   1301
RMP      ()R    ))EQ   1301
RO       ()R    ))EQ   1301
ROL      ()R    ))EQ   )301
RVOL     ()R    ))EQ   1301
RZEDEN   ()R    ))EQ   1301   30WR
SIE      ()R    ))EQ   1301
SYOPLC   ()R    ))EQ   1301   30WR
TEMP     ()R    6CO    30WR
U        ()R    ))EQ   (301
UG       ()R    ))EQ   1301
UL       ()R    ))EQ   1301
UMOMLC   ()R    ))EQ   1301
UP       ()R    ))EQ   (301
UTIL     ))R    ))EQ   (301
V        ()R    ))EQ   (301
VG       ()R    ))EQ   )301
VL       ()R    ))EQ   )301
VP       ()R    ))EQ   1301
VTIL     ()R    ))EQ   1301
WRITE    -      21F    3 F
X        ()R    ))EQ   (301   30WR
XPAR     ()R    ))EQ   1301
Y        ()R    ))EQ   1301   30WR
YPAR     ()R    ))EQ   (301
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                                                                GREYSN    2
 1          OVERLAY (YOKIFER, 4, 0)
                                                                GREYSN    3
 1          PROGRAM GREYSN
                                                                GREYSN    4
      C                                                         GREYSN    5
      C        GREYSN PERFORMS A GREY, SN RADIATION TRANSPORT SOLUTION
      C                                                         GREYSN    6
 2          COMMON /STATE/   NCP1, NCPD, NFRQ, OPTMP(30), OPDEN(10),   ALLKOM    2
           1                 FREQ(300), SPTBL(300), PTAB(300), ETAB(300),   ALLKOM    3
           2                 BTBL(300)                                 ALLKOM    4
 3          COMMON /YSC1/    AASC(5454)                                ALLKOM    5
 4          COMMON /PINK/    I, IJ, IJM, IJP, J                        ALLKOM    6
 5          LCM /YLC1/       AA1(131000)                               ALLKOM    7
 6          LCM /YLC2/       AA2(131000)                               ALLKOM    8
 7          LCM /RLC1/       SIGA(30000)                               ALLKOM    9
 8          COMMON /RED/     NAME(12), DT, DTR, EM10, GRDVEL, IBAR, IJPS,   ALLKOM   10
           1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,   ALLKOM   11
           2                 JP1, JP2, NCYC, NDUMP, NG, NQI, REZSIE, TAMB,   ALLKOM   12
           3                 TEMP(7500), T, TIME, TOUT, TSTART, THY    ALLKOM   13
 9          COMMON /CRIMSN/  SNCON(183), ZZ                            CRIMSN    2
10          COMMON /SILVER/  FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,    SILVER    2
           1                 IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,    SILVER    3
           2                 IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYI,  SILVER    4
           3                 RIBAR, VV, XCONV, XL, XR, YB, YCONV, YI   SILVER    5
```

```
 11          EQUIVALENCE      (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL    2
            1                 (AASC(4),U), (AASC(5),V), (AASC(6),RO),          EQVREAL    3
            2                 (AASC(7),MP,RMP,RCSQ,CENTX),                    EQVREAL    4
            3                 (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),          EQVREAL    5
            4                 (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),       EQVREAL    6
            5                 (AASC(12),UTIL,UL,CQ,EMOMLC),                   EQVREAL    7
            6                 (AASC(13),VTIL,VL,UMOMLC),                      EQVREAL    8
            7                 (AASC(14),ROL,BETALC,FOULC), (AASC(15),SIE),     EQVREAL    9
            8                 (AASC(16),DELSM,SIGPLC),                        EQVREAL   10
            9                 (AASC(17),GRIR,UG,RZEDEN),                      EQVREAL   11
            1                 (AASC(18),GRIZ,VG,FSN)                          EQVREAL   12
 12          REAL             LAM, LAMD, M, MP, MU, MU02                      EQVREAL   13
 13          DIMENSION        X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),       DIMEN      2
            2                 V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),  DIMEN      3
            3                 E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),  DIMEN      4
            4                 VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),      DIMEN      5
            5                 UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
            6                 UMOMLC(1), ROL(1), BETALC(1), FOULC(1),         DIMEN      7
            7                 SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),    DIMEN      8
            8                 RZEDEN(1), GRIZ(1), VG(1), FSN(1)               DIMEN      9
 14          COMMON /SNOWITE/ ISN, AVINT(7500), RSN(101), ZSN(102)           GREYSN    12
 15          LEXT             DBLINT                                          GREYSN    13
       C                                                                      GREYSN    14
 16      2002 FORMAT          (1H ,*PROBLEM CYCLE*,I6,6X,*SN RADN TRANS*//    GREYSN    15
            1                 * TIME*,1PE12.4,* TO*,1PE12.4,6X,*DTR*,1PE12.4, GREYSN    16
            2                 9X,*ISN*,I6)                                    GREYSN    17
 17      2003 FORMAT          (1H ,5HESN  ,1PE12.4)                           GREYSN    18
                                                                              GREYSN    19
       C                                                                      GREYSN    20
 18       401 T2=TIME+DTR                                                     GREYSN    21
 19           ESN=0.0                                                         GREYSN    22
 20           ALPHA=SNCON(182)                                                GREYSN    23
 21           ISN=MOVE(SNCON(183))                                            GREYSN    24
 22           PRINT 2002,      NCYC, TIME, T2, DTR, ISN                       GREYSN    25
 23           WRITE (12,2002)  NCYC, TIME, T2, DTR, ISN                       GREYSN    26
       C      ---   COMPUTE SIGPLC RZEDEN FSN                                 GREYSN    27
 24           RSN(1)=0.0                                                      GREYSN    28
 25           CALL START                                                      GREYSN    29
 26           DO 429 J=2,JP1                                                  GREYSN    30
 27           IJSC=(J-1)*IP1                                                  GREYSN    31
 28           ZSN(J)=Y(IJ)                                                    GREYSN    32
 29           IF (J.EQ.JP1) ZSN(J+1)=Y(IJP)                                   GREYSN    33
 30           DO 428 I=1,IBAR                                                 GREYSN    34
 31           IPJ=IJ+NQ                                                       GREYSN    35
 32           IPJP=IJP+NQ                                                     GREYSN    36
 33           IJSC=IJSC+1                                                     GREYSN    37
 34           IF (J.EQ.2) RSN(I+1)=X(IPJ)                                     GREYSN    38
 35           AVINT(IJSC)=0.0                                                 GREYSN    39
 36           CENTX(IJ)=0.25*(X(IJ)+X(IPJ)+X(IPJP)+X(IJP))                    GREYSN    40
 37           CENTY(IJ)=0.25*(Y(IJ)+Y(IPJ)+Y(IPJP)+Y(IJP))                    GREYSN    41
 38           TLOG=ALOG10(TEMP(IJSC))                                         GREYSN    42
 39           DLOG=ALOG10(RO(IJ))                                             GREYSN    43
 40           DLOG= AMIN1(DLOG,OPDEN(NOPD))                                   GREYSN    44
 41           SP= DBLINT(0,DLOG,TLOG,OPDEN,OPTMP,SPTBL,0,NOPT,NOPD,NOPT)      GREYSN    45
 42           SP=DEXP10(SP)                                                   GREYSN    46
 43           SIGPLC(IJ)=SP                                                   GREYSN    47
 44           RZEDEN(IJ)=3.2757E+14*SP*TEMP(IJSC)**4                          GREYSN    48
 45           ESN=ESN*RZEDEN(IJ)/RVOL(IJ)                                     GREYSN    49
 46           BP=DBLINT (0, DLOG, TLOG, OPDEN, OPTMP, BTBL, 0, NOPT, NOPD, NOPT) GREYSN 50
 47           XFSN=1.0+3.0E+05*ALPHA*BP*SP*DTR                                GREYSN    51
 48           FSN(IJ)=1.0/XFSN                                                GREYSN    52
 49           IJ=IPJ                                                          GREYSN    53
 50           IJP=IPJP                                                        GREYSN    54
 51       428 CONTINUE                                                        GREYSN    55
 52           CALL LOOP                                                       GREYSN    56
 53       429 CONTINUE                                                        GREYSN    57
 54           CALL DONE                                                       GREYSN    58
 55           ESN=76.9568*ESN                                                 GREYSN    59
 56           PRINT 2003,      ESN                                            GREYSN    60
       C
```

```
57          REWIND 1                                                              GREYSN    61
58          CALL RDBUF (5LFSET1, AVINT, 7500, LENGTH2, LSTATUS)                   GREYSN    62
59          CALL OVERLAY (7LYCKIFER, 4, 1, 6HRECALL)                              GREYSN    63
60          REWIND 1                                                              GREYSN    64
61          IJMAX=IPI*JPI                                                         GREYSN    65
62          CALL WTBUF (5LFSET1, AVINT, IJMAX)                                    GREYSN    66
      C                                                                           GREYSN    67
63          CALL OVERLAY (7LYCKIFER, 4, 2, 6HRECALL)                              GREYSN    68
64          CALL REMARK (7HSNESTEP)                                               GREYSN    69
65          IF (T2.LT.TOUT) GO TO 441                                             GREYSN    70
66          CALL OVERLAY (7LYCKIFER, 4, 3, 6HRECALL)                              GREYSN    71
67          CALL REMARK (7HSNOUT  )                                               GREYSN    72
68      441 TIME=T2                                                               GREYSN    73
69          DTR=AMIN1(DTR,10.0*DT)                                                GREYSN    74
70          IF (TIME+EMIO.GE.T) GO TO 501                                         GREYSN    75
71          IF (TIME+DTR.GT.T+EM)) DTR=T-TIME                                     GREYSN    76
72          GO TO 401                                                             GREYSN    77
      C                                                                           GREYSN    78
73      501 WRITE (1)                                                             GREYSN    79
74          WRITE (3)                                                             GREYSN    80
75          ENDFILE 1                                                             GREYSN    81
76          ENDFILE 3                                                             GREYSN    82
77          REWIND 1                                                              GREYSN    83
78          REWIND 3                                                              GREYSN    84
79          RETURN                                                                GREYSN    85
80          END                                                                   GREYSN    86
```

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SINGLY REFERENCED VARIABLES
 AA1      ()R    5CO    FIYB     -R   10CO   ISC2    -I    8CO   LEXT      -    1SF   PXCONV  -R   10CO   RIBAR   -R   10CO   XCONV   -R   10CO
 AA2      ()R    6LC    FREG     ()R   2CO   ISC3    -I    8CO   LOOP      -   52SU   PXL     -R   10CO   RLC1    -     7CN   XL      -R   10CO
 CRIMSN   -      9CN    GROVEL   -R    8CO   ITV     -I    8CO   LSTATUS  -I   58AG   PXR     -R   10CO   SIGA    ()R   7LC   XR      -R   10CO
 DIMENSI  -      13F    GREYSN   -     1SU   IXL     -I   10CO   MOVE      -   21SU   PYB     -R   10CO   SILVER  -    10CN   YB      -R   10CO
 DONE     -     545U    IJM      -I    4CO   IXR     -I   10CO   MU       -R   12RL   PYCONV  -R   10CO   SNOWIIE -    14CN   YCONV   -R   10CO
 EQUIVAL  -      11F    IJPS     -I    6CO   IYB     -I   10CO   MUU2     -R   12RL   PYT     -R   10CO   START   -    25SU   YLC1    -     5CN
 ETAB     ()R    2CO    IPAL     -I   10CO   IYI     -I   10CO   NAME     ()I   8CO   GEXP10  -    42SU   STATE   -     2CN   YLC2    -     6CN
 FIDXL    -R    10CO    IPXR     -I   10CO   JBAR    -I    8CO   NUUMP    -I    8CO   RDBUF   -    58SU   TAMB    -R    8CO   YSC1    -     3CN
 FIPXR    -R    10CO    IPYB     -I   10CO   JP2     -I    8CO   NFRU     -I    2CO   REAL    -    12F    THY     -R    8CO   YT      -R   10CO
 FIPYB    -R    10CO    IPYT     -I   10CO   LAM     -R   12RL   NNI      -I    8CO   RED     -     8CN   TSTART  -R    8CO   ZZ      -R    9CO
 FIXL     -R    10CO    ISCF1    -I    8CO   LAMO    -R   12RL   PINK      -    4CN   RETURN  -    79F    VV      -R   10CO
 FIXR     -R    10CO    ISCF2    -I    8CO   LENGTH2 -I   58AG   PTAB     ()R   2CO   REZSIE  -R    8CO   WTBUF   -    62SU
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MULTIPLY-REFERENCED VARIABLES
   401 -     18*     72
   428 -     30UU    51*
   429 -     26UU    53*
   441 -     65      68SU
   501 -     70      73*
  2002 -     10*     22PR    23WR
  2003 -     17*     50FR
AASC     ()R    3CO     11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ    11EQ
                11EQ    11EQ
ALPHA    -R     21=     47
AMIN1    -      4-SU    69SU
AVINT    ()R    14CO    35=     58AG    62AG
BETALC   ()R    11EQ    1301
BP       -R     40=     47
BTBL     ()R    2CO     40
CENTX    ()R    11EQ    1301    36=
CENTY    ()R    11EQ    1301    37=
COMMON   -      2F      3F      4F      8F      9F      10F     14F
CQ       ()R    11EQ    1301
DBLINT   -      15LX    41SU    46SU
DELSM    ()R    11EQ    1301
DLOG     -R     39=     40=     40      41      46
DT       -R     8CO     69
DTR      -R     8CO     18      22PR    23WR    47      69=     69      71      71=
E        ()R    11EQ    1301
```

```
EMOMLC  ()R    1)EQ    1301
EMIO    -R     8CO     71      71
ENDFILE -      75F     76F
EP      ()R    1)EQ    1301
ESN     -R     19=     45=     45      55=     55      56PR
ETIL    ()R    11EQ    1301
FORMAT  -      16F     17F
FOUTLC  ()R    1)EQ    1301
FSN     ()R    1)EQ    1301    48=
GRIR    ()R    1)EQ    1301
GRIZ    ()R    1)EQ    1301
I       -I     4CO     3 00    34
IBAR    -I     8CO     3 00
IJ      -I     4CO     28      31      36      36      37      37      39      43      44      45      45      48      49=
IJMAX   -I     61=     62RG
IJP     -I     4CO     29      32      36      37      50=
IJSC    -I     27=     33=     33      35      38      44
IPJ     -I     31=     34      36      37      49
IPJP    -I     32=     36      37      50
IPI     -I     8CO     27      61
ISN     -I     14CO    21=     22PR    23WR
J       -I     4CO     2600    27      28      29      29      34
JPI     -I     8CO     2600    29      61
LIM     -      5F      6F      7F
M       ()R    1)EQ    12RL    1301
MP      ()R    1)EQ    12RL    1301
NCYC    -I     8CO     22PR    23WR
NOPD    -I     2CO     4.      41      46
NOPT    -I     2CO     41      41      46      46
NQ      -I     8CO     31      32
OPDEN   ()R    2CO     41      41      46
OPTMP   ()R    2CO     41      46
OVERLAY -      59SO    63SO    66SO
P       ()R    11EQ    1301
PL      ()R    1)EQ    1301
PRINT   -      22F     56F
QLOGIO  -      38SO    39SO
R       ()R    1)EQ    1301
RCSQ    ()R    1)EQ    1301
REMARK  -      64SO    67SO
REWIND  -      57F     61F     77F     78F
RM      ()R    1)EQ    1301
RMP     ()R    1)EQ    1301
RO      ()R    1)EQ    1301    39
ROL     ()R    1)EQ    1301
RSN     ()R    14CO    24=     34=
RVDL    ()R    1)EQ    1301    45
RZEDEN  ()R    1)EQ    1301    44=     45
SIE     ()R    1)EQ    1301
SIGPLC  ()R    1)EQ    1301    43=
SNCON   ()R    9CO     2       21
SP      -R     41=     42=     42      43      44      47
SPTBL   ()R    2CO     41
T       -R     8CO     7.      71      71
TEMP    ()R    8CO     38      44
TIME    -R     8CO     18      22PR    23WR    68=     70      71      71
TLOG    -R     36=     41      46
TOUT    -R     8CO     65
T2      -R     18=     22PR    23WR    65      68
U       ()R    1)EQ    1301
UG      ()R    1)EQ    1301
UL      ()R    1)EQ    1301
UMOMLC  ()R    1)EQ    1301
UP      ()R    1)EQ    1301
UTIL    ()R    1)EQ    1301
V       ()R    1)EQ    1301
VG      ()R    1)EQ    1301
VL      ()R    1)EQ    1301
VP      ()R    1)EQ    1301
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VTIL     ()R     (FEQ    1301
WRITE     -      23F     73F     74F
X        ()R     1)EQ    1301    34     36     36     36     36
XFSN     -R      47=     48
XPAR     ()R     1)EQ    1301
Y        ()R     1)EQ    1301    28     29     37     37     37     37
YPAR     ()R     1)EQ    1301
ZSN      ()R     14CO    28=     29=
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  1          OVERLAY (YOKIFER, 4, 1)                                                   CYCLSN      2

  1          PROGRAM CYLSN                                                             CYCLSN      3
       C                                                                               CYCLSN      4
       C        2D CYLINDRICAL SN RADIATION TRANSPORT CODE BY BILL REED (14)           CYCLSN      5
       C                                                                               CYCLSN      6
  2          COMMON /STATE/     NOPT, NCPD, NFRQ, OPTMP(30), OPDEN(10),                ALLKOM      2
            1                   FREQ(100), SPTBL(300), PTAB(300), ETAB(300),           ALLKOM      3
            2                   BTBL(300)                                              ALLKOM      4
  3          COMMON /YSCI/      AASC(5454)                                             ALLKOM      5
  4          COMMON /PINK/      I, IJ, IJM, IJP, J                                     ALLKOM      6
  5          LCM /YLC1/         AA1(131000)                                            ALLKOM      7
  6          LCM /YLC2/         AA2(131000)                                            ALLKOM      8
  7          LCM /RLC1/         SIGA(30000)                                            ALLKOM      9
  8          COMMON /RED/       NAME(12), DT, DTR, EM1G, GROVEL, IBAR, IJPS,           ALLKOM     10
            1                   IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,              ALLKOM     11
            2                   JP1, JP2, NCYC, NOUMP, NQ, NQI, REZSIE, TAMB,          ALLKOM     12
            3                   TEMP(7500), T, TIME, TOUT, TSTART, THY                 ALLKOM     13
  9          COMMON /CRIMSN/    SNCON(183), ZZ                                         CRIMSN      2
 10          COMMON /SNOWI1E/   ISN, AVINT(7500), RSN(101), ZSN(102)                   CYCLSN      9
 11          DIMENSION          AVOLD(7500), BR(7200), BB(7200),                       CYCLSN     10
            1                   B(100), AL(800)                                        CYCLSN     11
 12          EQUIVALENCE        (AASC(4001),B), (AASC(4101),AL)                        CYCLSN     12
 13          EQUIVALENCE        (ISNP, SNCON(1))                                       CYCLSN     13
 14     2001 FORMAT             (1HL,I5,* SN ITERATIONS*)                              CYCLSN     14
       C     ---   OBTAIN SN CONSTANTS                                                 CYCLSN     15
 15          ISTEP=0                                                                   CYCLSN     16
 16          NN=ISN/2                                                                  CYCLSN     17
 17          MM=(ISN*(ISN+2))/8                                                        CYCLSN     18
 18          LU=2                                                                      CYCLSN     19
 19          LE=LU+MM                                                                  CYCLSN     20
 20          LW=LE+MM                                                                  CYCLSN     21
 21          LBET1=LW+MM                                                               CYCLSN     22
 22          LBET2=LBET1+MM                                                            CYCLSN     23
 23          IF(ISNP.EQ.ISN) GO TO 5                                                   CYCLSN     24
 24          CALL SNGEN (SNCON(LU), SNCON(LE), SNCON(LW), SNCON(LBET1),                CYCLSN     25
            1 SNCON(LBET2), ISN, MM)                                                   CYCLSN     26
 25          ISNP=ISN                                                                  CYCLSN     27
       C     ---   CALCULATE AREA ELEMENTS                                             CYCLSN     28
 26        5 DO 10 I=1,IBAR                                                            CYCLSN     29
 27          B(I)=3.14159Z*(RSN(I+1)**2-RSN(I)**2)                                     CYCLSN     30
 28       10 CONTINUE                                                                  CYCLSN     31
       C                                                                               CYCLSN     32
 29       11 ISTEP=ISTEP+1                                                             CYCLSN     33
 30          DO 12 J=2,JP1                                                             CYCLSN     34
 31          IJSC=(J-1)*IP1                                                            CYCLSN     35
 32          DO 12 I=1,IBAR                                                            CYCLSN     36
 33          IJSC=IJSC+1                                                               CYCLSN     37
 34          AVOLD(IJSC)=AVINT(IJSC)                                                   CYCLSN     38
 35          AVINT(IJSC)=0.0                                                           CYCLSN     39
 36       12 CONTINUE                                                                  CYCLSN     40
       C                                                                               CYCLSN     41
 37          CALL SWEEP (ZSN, RSN, B, SNCON(LBET1), SNCON(LBET2), SNCON(LU),           CYCLSN     42
            1 SNCON(LE), SNCON(LW), AL, BR, BB, IBAR, JBAR, NN, MM, AVINT,             CYCLSN     43
            2 AVOLD)                                                                   CYCLSN     44
       C                                                                               CYCLSN     45
```

```
38          IF (SNCON(IB2).EQ.0.0) GO TO 31                                CYCLSN   46
39          ERR=0.0                                                        CYCLSN   47
40          DO 22 J=2,JP1                                                  CYCLSN   48
41          IJSC=(J-1)*IP1                                                 CYCLSN   49
42          DO 22 I=1,IBAR                                                 CYCLSN   50
43          IJSC=IJSC+1                                                    CYCLSN   51
44          IF (AVINT(IJSC).EQ.0.0) GO TO 22                               CYCLSN   52
45          ERR=AMAX1(ERR,ABS(1.0-AVOLD(IJSC)/AVINT(IJSC)))                CYCLSN   53
46       22 CONTINUE                                                       CYCLSN   54
      C                                                                    CYCLSN   55
47          IF (ERR.GT.1.0E-06) GO TO 11                                   CYCLSN   56
      C                                                                    CYCLSN   57
48       31 PRINT 2001,        ISTEP                                       CYCLSN   58
49          WRITE (12,2001)    ISTEP                                       CYCLSN   59
50          RETURN                                                         CYCLSN   60
51          END                                                            CYCLSN   61
```

```
SINGLY REFERENCED VARIABLES
 AAI     ()R   5LC    DIR      -R   8CO   IJPS    -I   8CO   NDUMP   -I   8CO   PRINT   -    48F   SPTBL  ()R   2CO   TSTART  -R   8CO
 AA2     ()R   6LC    ERIU     -R   8CO   ISCF1   -I   8CO   NFRQ    -I   2CO   PTAB   ()R   2CO   STATE   -    2CN   WRITE   -    49F
 ABS     -     45SU   ETAB    ()R   2CO   ISCF2   -I   8CO   NDPU    -I   2CO   REO     -    8CO   SWEEP   -   37SU   YLC1    -    5CN
 AMAXI   -     45SU   FORMAT   -    14F   ISC2    -I   8CO   NOPT    -I   2CO   RETURN  -    50F   T       -R   8CO   YLC2    -    6CN
 BTBL    ()R   2CO    FREG    ()R   2CO   ISC3    -I   8CO   NQ      -I   8CO   REZSIE  -R   8CO   TAMB    -R   8CO   YSC1    -    3CN
 CHIMSN  -     9CN    GROVEL   -R   8CO   ITV     -I   8CO   NQI     -I   8CO   RLC1    -    7CN   TEMP   ()R   8CO   ZZ      -R   9CU
 CYLSN   -     1SU    IJ       -I   4CO   JP2     -I   8CO   OPDEN  ()R   2CO   SIGA   ()R   7LC   THY     -R   8CO
 DIMENSI -     1IF    IJM      -I   4CO   NAME   ()I   8CO   OPINP  ()R   2CO   SNGEN   -   24SU   TIME    -R   8CO
 DT      -R    8CO    IJP      -I   4CO   NCYC    -I   8CO   PINK    -    4CN   SNCWITE -   19CN   TOUT    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
       S -      23     26*
      1U -      26UU   28*
      11 -      29*    47
      12 -      30UU   32UU   36*
      22 -      40UU   42UU   44     46*
      31 -      38     48*
    2001 -      14*    48PR   49WR
AASC     ()R    3CU    12EQ   12EQ
AL       ()R    10DI   12EU   37AG
AVINT    ()R    11CO   34     35=    37AG   44     45
AVOLU    ()R    11UI   34=    37AG   45
B        ()R    11UI   12EU   27=    37AG
BB       ()R    11UI   37AG
BR       ()R    10UI   37AG
COMMUN   -      2F     3F     4F     8F     9F     10F
EQUIVAL  -      12F    13F
ERR      -R     39=    45=    45     47
I        -I     4CO    26UU   27     27     27     32UU   42UU
IBAR     -I     6CO    26UU   32UU   37AG   42UU
IJSC     -I     31=    33=    33     34     34     35     41=    43=    43     44     45     45
IP1      -I     6CU    31     41
ISN      -I     10CO   16     17     17     23     24AG   25
ISNP     -I     13EQ   23     25=
ISTEP    -I     15=    29=    29     48PR   49WR
J        -I     4CU    30UU   31     40UU   41
JBAR     -I     6CU    37AG
JP1      -I     6CU    30UU   40UU
LBET1    -I     20=    22     24AG   37AG
LBET2    -I     22=    24AG   37AG
LCM      -      5F     6F     7F
LE       -I     19=    2      24AG   37AG
LU       -I     18=    19     24AG   37AG
LW       -I     21=    21     24AG   37AG
MM       -I     17=    19     20     21     22     24AG   37AG
NN       -I     16=    37AG
RSN      ()R    11CU   27     27     37AG
SNCON    ()R    9CO    13EU   24AG   24AG   24AG   24AG   24AG   37AG   37AG   37AG   37AG   37AG   38
ZSN      ()R    10CU   37AG
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```

```
      SUBROUTINE SWEEP (ZSN, RSN, B, BET1, BET2, U, E, W, AL,              SWEEP    2
     1 BR, BB, IT, J1, NN, MM, AVINT, AVOLD)                               SWEEP    3
C                                                                          SWEEP    4
      COMMON /STATE/   NOPT, NCPO, OFRQ, OPTMP(30), OPDEN(10),             ALLKOM   2
     1                 FREQ(100), SPJBL(300), PTAB(300), ETAB(300),        ALLKOM   3
     2                 BTBL(300)                                           ALLKOM   4
      COMMON /YSC1/    AASC(5454)                                          ALLKOM   5
      COMMON /PINK/    I, IJ, IJM, IJP, J                                  ALLKOM   6
      LCM /YLC1/       AA1(131000)                                         ALLKOM   7
      LCM /YLC2/       AA2(131000)                                         ALLKOM   8
      LCM /RFC1/       SIGA(30000)                                         ALLKOM   9
      COMMON /RED/     NAME(2), DT, DTR, EM10, GROVEL, IBAR, IJPS,         ALLKOM  10
     1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,           ALLKOM  11
     2                 JP1, JP2, NCYC, NDUMP, NQ, NQ1, REZSIE, TAMB,       ALLKOM  12
     3                 TEMP(7500), T, TIME, IOUT, TSTART, THY              ALLKOM  13
      COMMON /CRIMSN/  SNJUN(183), ZZ                                      CRIMSN   2
      DIMENSION        EMOM(100), UMOM(100), FOUT(100), CT(100),           SWEEP    7
     1                 S(100), BR(JT,1), BB(IT,1),                         SWEEP    8
     2                 AL(MM,1), ZSN(1), RSN(1), B(1), BET1(1),            SWEEP    9
     3                 BET2(1), U(1), E(1), W(1),                          SWEEP   10
     4                 AVINT(1), AVOLD(1), AVNEW(100)                      SWEEP   11
      EQUIVALENCE      (AASC(4901),EMOM), (AASC(5001),UMOM),               SWEEP   12
     1                 (AASC(5101),FOUT), (AASC(5201),CT),                 SWEEP   13
     2                 (AASC(5301),S), (AASC(3901),AVNEW)                  SWEEP   14
 2001 FORMAT           (1H0,*CYLSN POWER*/6H SUM  ,1PE12.4)                SWEEP   15
C                                                                          SWEEP   16
      M1=MM+1                                                              SWEEP   17
      M2=2*MM                                                              SWEEP   18
      I2=MAX0(IBAR,JBAR)                                                   SWEEP   19
      I2=I2*M2                                                             SWEEP   20
      SUM=0.0                                                              SWEEP   21
C                                                                          SWEEP   22
C     ---   CALCULATE FLUX IN DOWNWARD DIRECTION                           SWEEP   23
C                                                                          SWEEP   24
      DO 142 I=1,800                                                       SWEEP   25
      AL(I)=0.0                                                            SWEEP   26
  142 CONTINUE                                                             SWEEP   27
      DO 143 I=1,I2                                                        SWEEP   28
      BB(I)=BR(I)=0.0                                                      SWEEP   29
  143 CONTINUE                                                             SWEEP   30
C                                                                          SWEEP   31
      IECS=NQ1*JP1                                                         SWEEP   32
      DO 200 JJ=1,JBAR                                                     SWEEP   33
      J=JP2-JJ                                                             SWEEP   34
      JM1=J-1                                                              SWEEP   35
      IECS=IECS-NQ1                                                        SWEEP   36
      CALL ECRD (AASC, IECS, NQ1, NE)                                      SWEEP   37
      DZ=ZSN(J+1)-ZSN(J)                                                   SWEEP   38
      DZP=6.2831853*DZ                                                     SWEEP   39
      IJ=I2                                                                SWEEP   40
      IJSC=(J-1)*IP1                                                       SWEEP   41
      DO 198 I=1,IBAR                                                      SWEEP   42
      IJSC=IJSC+1                                                          SWEEP   43
      EMOM(I)=UMOM(I)=FOUT(I)=0.0                                          SWEEP   44
      AVNEW(I)=0.0                                                         SWEEP   45
      CT(I)=AASC(IJ+4)                                                     SWEEP   46
      S(I)=AASC(IJ+5)*AASC(IJ+6)+AVOLD(IJSC)*(1.0-AASC(IJ+6))*CT(I)        SWEEP   47
      IJ=IJ+NQ                                                             SWEEP   48
  198 CONTINUE                                                             SWEEP   49
C     ---   INWARD SWEEP                                                   SWEEP   50
      CALL IN (BR, BB, AL, RSN, B, BET1,U, E, W, S, CT, UMOM, EMOM,        SWEEP   51
     1 FOUT, -1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)                    SWEEP   52
C     ---   OUTWARD SWEEP                                                  SWEEP   53
      CALL OUT (BR, BB(1,M1), AL, RSN, B, BET2, U, E, W, S, CT, UMOM,      SWEEP   54
     1 EMOM, FOUT, -1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)              SWEEP   55
C                                                                          SWEEP   56
      IJ=I2                                                                SWEEP   57
      IJSC=(J-1)*IP1                                                       SWEEP   58
      DO 199 I=1,IBAR                                                      SWEEP   59
```

```
      IJSC=IJSC+1
      AVINT(IJSC)=AVNEW(I)
      AASC(IJ)=EMOM(I)
      AASC(IJ+1)=UMOM(I)
      AASC(IJ+2)=FOUT(I)
      IJ=IJ+NQ
  195 CONTINUE
      CALL ECWR (AASC, IECS, NQI, NE)
  200 CONTINUE
C
C     ---    CALCULATE FLUX IN UPWARD DIRECTION
C
      DO 243 I=1,12
      BR(I)=0.0
  243 CONTINUE
C
      IECS=0
      DO 300 J=2,JP1
      JM1=J-1
      IECS=IECS+NQI
      CALL ECRD (AASC, IECS, NQI, NE)
      DZ=ZSN(J+1)-ZSN(J)
      DZP=6.2831853078*DZ
      IJ=12
      IJSC=(J-1)*IP1
      DO 298 I=1,IBAR
      IJSC=IJSC+1
      EMOM(I)=AASC(IJ)
      UMOM(I)=AASC(IJ+1)
      FOUT(I)=AASC(IJ+2)
      AVNEW(I)=AVINT(IJSC)
      CT(I)=AASC(IJ+4)
      S(I)=AASC(IJ+5)*AASC(IJ+6)+AVOLD(IJSC)*(1.0-AASC(IJ+6))*CT(I)
      IJ=IJ+NQ
  298 CONTINUE
C     ---    INWARD SWEEP
      CALL IN (BR(1,M1), BB, AL, RSN, B, BET1, U, E, W, S, CT, UMOM,
     1 EMOM, FOUT, 1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)
C     ---    OUTWARD SWEEP
      CALL OUT (BR(1,M1), BB(1,M1), AL, RSN, B, BET2, U, E, W, S, CT,
     1 UMOM, EMOM, FOUT, 1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)
C
      IJ=12
      IJSC=(J-1)*IP1
      DO 299 I=1,IBAR
      IJSC=IJSC+1
      AVINT(IJSC)=AVNEW(I)
      AASC(IJ)=EMOM(I)
      AASC(IJ+2)=FOUT(I)
      AASC(IJ+1)=UMOM(I)
      SUM=SUM+FOUT(I)
      IJ=IJ+NQ
  299 CONTINUE
      CALL ECWR (AASC, IECS, NQI, NE)
  300 CONTINUE
C
      PRINT 2001,       SUM
      WRITE (12,2001)   SUM
      RETURN
      END
```

SINGLY REFERENCED VARIABLES

AA1	IR	5CC	EQUIVAL	-	11F	ISCF1	-I	8CO	NDUMP	-I	8CO	PTAB	IR	2CO	STATE	-	2CN	TSTART	-R	8CO
AA2	IR	6CC	ETAB	IR	2CO	ISCF2	-I	8CO	NFRQ	-I	2CO	RED	-	8CN	SWEEP	-	1S0	WRITE	-	94F
BTBL	IR	2CO	FORMAT	-	12F	ISC2	-I	8CO	NOPD	-I	2CO	RETURN	-	95F	T	-R	8CO	YLC1	-	5CN
CHINSN	-	9CO	FREQ	IR	2CC	ISC3	-I	8CO	NOPT	-I	2CO	REZSIE	-R	8CO	TAMB	-R	8CO	YLC2	-	6CN
DIMENSI	-	1rF	GRLVEL	-R	8CO	ITV	-I	8CO	OPDEN	IR	2CO	RLC1	-	7CN	TEMP	IR	8CO	YSC1	-	3CN
DT	-R	8CO	IJK	-I	4CO	MAXO	-	15S0	OPIMP	IR	2CO	SIGA	IR	7CC	THY	-R	8CO	ZZ	-R	9CO

```
 DTR      -R   BCU   1JP     -1   4CO   NAME   ()1    8CU   PINK    -    4CN   SNCON  ()R   9CO   TIME    -R   8CO
 EMIO     -R   BCU   1JFS    -1   HCO   NCYC   -1     8CU   PRINT   -    93F   2PTBL  ()R   2CO   TOUT    -R   8CD
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
     142 -    18DU   2.*
     143 -    21DU   23*
     198 -    34DU   41*
     199 -    46UU   53*
     200 -    25UU   55*
     243 -    56DU   56*
     298 -    68DU   77*
     299 -    82DU   9 *
     300 -    6(DO   92*
    2001 -    (2*    93PR   94WR
AASC    ()R    3CU   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   29AG   38     39     39     39     49=    50=    51=    54AG   63AG
               70    71     72     74     75     75     75     85=    86=    87=    91AG
AL      ()R    1AG   1(O1   19=    42AG   43AG   78AG   79AG
AVINI   ()R    1AG   1.O1   48=    73     84=
AVNEW   ()R    1(DI  11EQ   37=    42AG   43AG   48     73=    78AG   79AG   84
AVOLD   ()R    1AG   1(O1   39     75
B       ()R    1AG   1(O1   42AG   43AG   76AG   79AG
BB      ()R    1AG   1(O1   22=    42AG   43AG   57=    78AG   79AG
BET1    ()R    1AG   1.O1   42AG   78AG
BET2    ()R    1AG   1;O1   43AG   79AG
BR      ()R    1AG   1.O1   22=    42AG   43AG   78AG   79AG
COMMON   -     2F    3F     4F     8F     9F
CT      ()R    (.DI  11EQ   36=    39     42AG   43AG   74=    75     78AG   79AG
DZ       -R    3'=   31     42AG   43AG   64=    65     78AG   79AG
DZP      -R    31=   42AG   43AG   65=    78AG   79AG
E       ()R    (AG   1 O1   42AG   43AG   78AG   79AG
ECRD     -     29SU  63SU
ECWR     -     54SU  91SU
ERDM    ()R    1/O1  11EQ   36=    42AG   43AG   49     70=    78AG   79AG   85
FOUT    ()R    1(DI  11EQ   36=    42AG   43AG   51     72=    78AG   79AG   86     88
I        -1    4CU   18UU   19     21DU   22     22     3400   36     36     36     37     38     39     39     4600   48     49
               57    51     56UU   57     68DC   70     71     72     73     74     75     75     8200   84     85     86     87
               88
IBAR     -1    8CU   15     340C   42AG   43AG   46DD   6800   78AG   79AG   8200
IECS     -1    24=   26=    28     29AG   54AG   59=    62=    62     63AG   91AG
IJ       -I    4CO   32=    38     39     39     39     40=    40     44=    49     50     51     52=    52     66=    70     71
               72    74     75     75     75     76=    76     80=    85     86     87     89=    89
IJSC     -I    33=   35=    35     39     45=    47=    47     48     67=    69=    69     73     75     81=    83=    83     84
IN       -     42SU  76SU
IP1      -1    8CU   33     45     67     81
IT       -1    1AG   1(UI
IS       -1    15=   16=    16     210U   5600
J        -1    4CU   26=    27     30     30     33     45     6000   61     64     64     67     81
JBAR     -1    8CU   15     250C   42AG   43AG   78AG   79AG
JJ       -1    25DO  26
JM1      -1    27=   42AG   43AG   61=    78AG   79AG
JP1      -1    8CU   24     60DO
JP2      -1    8CO   26
JT       -1    1AG   1.UI
LCM      -     5F    6F     7F
MM       -I    (AG   13     14
M1       -I    13=   43AG   78AG   79AG   79AG
M2       -I    14=   16
NE       -1    29AG  54AG   63AG   91AG
NN       -1    (AG   1(UI   42AG   43AG   78AG   79AG
NQ       -1    8CU   40     52     76     89
NQI      -1    8CU   24     28     29AG   54AG   62     63AG   91AG
OUT      -     43SU  79SU
RSN     ()R    (AG   1(UI   42AG   43AG   78AG   79AG
S       ()R    10DI  11EQ   39=    42AG   43AG   75=    78AG   79AG
SUM      -R    17=   88=    88     93PR   94WR
U       ()R    1AG   1.UI   42AG   43AG   78AG   79AG
UMOM    ()R    ((DI  11EQ   36=    42AG   43AG   5V     71=    78AG   79AG   87
W       ()R    1AG   1.UI   42AG   43AG   76AG   79AG
ZSN     ()R    1AG   1.UI   30     30     64     64
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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```
      SUBROUTINE IN (BH,BV,AL,R,B,BETA,U,E,W,S,CT,UMOM,EMOM,FOUT,ES,
     1 DZP,DZ,I1,JT,NN,J, AVNEW)
      DIMENSION BH(JT,1),BV(IT,1),AL(NN,1),R(1),B(1),BETA(1),U(1),
     1 E(1),W(1),S(1),CT(1),UMOM(1),EMOM(1),FOUT(1)
      DIMENSION        AVNEW(1)
      DO 100 II=1,I1
      I=I1+1-II
      M=0
      DO 100 K=1,NN
      DO 100 L=1,K
      M=M+1
      AA=U(M)*DZP*R(I+1)
      BB=E(M)*B(I)
      CC=DZP*(R(I+1)-R(I))*BETA(M)
      T=(AA*BH(J,M)+BB*BV(I,M)+CC*AL(K,I)+B(I)*DZ*S(I)) / (AA+BB+CC+
     1 E(I)*DZ*CT(I))
      FOUT(I)=FOUT(I)+W(M)*(U(M)*DZP*(T*R(I)-BH(J,M)*R(I+1))+BB*
     1 (T-BV(I,M)))
      UMOM(I)=UMOM(I)-W(M)*U(M)*T
      EMOM(I)=EMOM(I)+W(M)*E(M)*ES*T
      AVNEW(I)=AVNEW(I)+0.07957749*W(M)*T
      BH(J,M)=T
      BV(I,M)=T
      AL(K,I)=T
  100 CONTINUE
      RETURN
      END
```

```
SINGLY REFERENCED VARIABLES
 IN       -     1S0   L        -1   END   RETURN  -    22F
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
   100 -      400    700    600    21*
AA       -R    11=    13     13
AL       ()R   1AG    201    13     26=
AVNEW    ()R   1AG    301    17=    17
B        ()R   1AG    201    11     13     13
BB       -R    11=    13     13     14
BETA     ()R   1AG    201    12
BH       ()R   1AG    201    13     14     18=
BV       ()R   1AG    201    13     14     19=
CC       -R    12=    13     13
CT       ()R   1AG    201    13
DIMENSI  -     2F     3F
DZ       -R    1AG    13     13
DZP      -R    1AG    1.     12     14
E        ()R   1AG    201    11     16
EMOM     ()R   1AG    201    16=    16
ES       -R    1AG    16
FOUT     ()R   1AG    201    14=    14
I        -I    5=     1.     11     12     12     13     13     13     13     13     13     14     14     14     14     14     15
               15     16     16     17     17     19     20
II       -I    400    5
I1       -I    1AG    201    400    5
J        -I    1AG    13     14     18
JT       -I    1AG    201
K        -I    700    600    13     20
M        -I    6=     9=     9      10     11     12     13     13     14     14     14     14     15     15     16     16     17
               18     19
NN       -I    1AG    201    700
R        ()R   1AG    201    1.     12     12     14     14
S        ()R   1AG    201    13
T        -R    13=    14     14     15     16     17     18     19     20
U        ()R   1AG    201    12     14     15
UMOM     ()R   1AG    201    15=    15
W        ()R   1AG    201    14     15     16     17
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```

```
 1          SUBROUTINE OUT (BR,BV,AL,R,B,BETA,U,E,W,S,CT,UMOM,EMOM,FOUT,ES,    OUT   2
           1 DZP,DZ,IT,J1,NN,J, AVNEW)                                         OUT   3
 2          DIMENSION BR(J1,1),BV(IT,1),AL(NN,1),R(1),B(1),BETA(1),U(1),       OUT   4
           1 E(1),W(1),S(1),CT(1),UMOM(1),EMOM(1),FOUT(1)                      OUT   5
 3          DIMENSION        AVNEW(1)                                          OUT   6
 4          DO 100 I=1,IT                                                      OUT   7
 5          DO 100 K=1,NN                                                      OUT   8
 6          KA=(K*(K+1))/2+1                                                   OUT   9
 7          DO 100 L=1,K                                                       OUT  10
 8          M=KA-L                                                             OUT  11
 9          AA=U(M)*DZP*R(I)                                                   OUT  12
10          BB=E(M)*B(I)                                                       OUT  13
11          CC=DZP*(R(I+1)-R(I))*BETA(M)                                       OUT  14
12          T=(AA*BR(J,M)+BB*BV(I,M)+CC*AL(K,I)+B(I)*DZ*S(I)) / (AA+BB+CC+     OUT  15
           1 B(I)*DZ*CT(I))                                                    OUT  16
13          FOUT(I)=FOUT(I)+W(M)*(U(M)*DZP*(T*R(I+1)-BR(J,M)*R(I))+BB*         OUT  17
           1 (T-BV(I,M)))                                                      OUT  18
14          UMOM(I)=UMOM(I)+W(M)*U(M)*T                                        OUT  19
15          EMOM(I)=EMOM(I)+W(M)*E(M)*ES*T                                     OUT  20
16          AVNEW(I)=AVNEW(I)+0.07957749*W(M)*T                                OUT  21
17          BR(J,M)=T                                                          OUT  22
18          BV(I,M)=T                                                          OUT  23
19          AL(K,I)=T                                                          OUT  24
20      100 CONTINUE                                                           OUT  25
21          RETURN                                                             OUT  26
22          END                                                                OUT  27
```

```
SINGLY REFERENCED VARIABLES
 OUT      -     1SU    RETURN  -    21F
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 MULTIPLY-REFERENCED VARIABLES
   100  -      4DO     5DO     7DO     20*
AA       -R    9=      12      12
AL       ()R   1AG     2DI     12      19=
AVNEW    ()R   1AG     3DI     16=     16
B        ()R   1AG     2DI     10      12      12
BB       -R    10=     12      12      13
BETA     ()R   1AG     2DI     11
BR       ()R   1AG     2DI     12      13      17=
BV       ()R   1AG     2DI     12      13      18=
CC       -R    11=     12      12
CT       ()R   1AG     2DI     12
DIMENSI  -     2F      3F
DZ       -R    1AG     12      12
DZP      -R    1AG     9       11      13
E        ()R   1AG     2DI     10      15
EMOM     ()R   1AG     2DI     15=     15
ES       -R    1AG     15
FOUT     ()R   1AG     2DI     13=     13
I        -I    4DO     9       10      11      11      12      12      12      12      12      12      13      13      13      13      13      14
               14      15      15      16      16      18      19
IT       -I    1AG     2DI     4DO
J        -I    1AG     12      13      17
J1       -I    1AG     2DI
K        -I    5DO     6       6       7DO     12      19
KA       -I    6=      8
L        -I    7DO     8
M        -I    8=      9       10      11      12      12      13      13      13      13      14      14      15      15      16      17      18
NN       -I    1AG     2DI     5DO
R        ()R   1AG     2DI     9       11      11      13      13
S        ()R   1AG     2DI     12
T        -R    12=     13      13      14      15      16      17      18      19
U        ()R   1AG     2DI     9       13      14
UMOM     ()R   1AG     2DI     14=     14
W        ()R   1AG     2DI     13      14      15      16
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

```
      SUBROUTINE SNGEN (U, E, W, BET1, BET2, N, MM)
C
      DIMENSION          U(1), E(1), W(1), BET1(1), BET2(1)
C
      M=(N*(N+2))/8
      I=N/2
      IF (N.GT.16) GO TO 180
      GO TO (100,110,120,130,140,150,160,170), I
  100 W(1)=1.0
      U(1)=.57735027
      E(1)=U(1)
      GO TO 240
  110 U(2)=0.90444905
      U(1)=0.30163878
      W(1)=0.33333333
      W(2)=W(1)
      W(3)=W(1)
      GO TO 190
  120 U(1)=0.23009194
      U(2)=0.68813432
      U(3)=0.94557676
      W(1)=0.16944656
      W(2)=0.16388677
      W(3)=W(1)
      W(4)=W(2)
      W(5)=W(2)
      W(6)=W(1)
      GO TO 190
  130 U(1)=0.19232747
      U(2)=0.57735027
      U(3)=0.79352178
      U(4)=0.96229948
      W(1)=0.11678847
      W(2)=0.09325523
      W(3)=W(2)
      W(4)=W(1)
      W(5)=W(2)
      W(6)=0.09010320
      W(7)=W(2)
      W(8)=W(2)
      W(9)=W(2)
      W(10)=W(1)
      GO TO 190
  140 U(1)=0.16962228
      U(2)=0.50714192
      U(3)=0.69686020
      U(4)=0.84500612
      U(5)=0.97080262
      W(1)=0.089642043
      W(2)=0.167288705
      W(3)=0.055780071
      W(4)=W(2)
      W(5)=W(1)
      W(6)=W(2)
      W(7)=0.053133609
      W(8)=W(7)
      W(9)=W(2)
      W(10)=W(3)
      W(11)=W(7)
      W(12)=W(3)
      W(13)=W(2)
      W(14)=W(2)
      W(15)=W(1)
      GO TO 190
  150 U(1)=0.15395746
      U(2)=0.45769112
      U(3)=0.62869660
      U(4)=0.76225828
      U(5)=0.87568027
```

```
      U(8)=0.97600932                                                   SNGEN  71
      W(1)=0.07332178                                                   SNGEN  72
      W(2)=0.05266740                                                   SNGEN  73
      W(3)=0.04161495                                                   SNGEN  74
      W(4)=W(3)                                                         SNGEN  75
      W(5)=W(2)                                                         SNGEN  76
      W(6)=W(1)                                                         SNGEN  77
      W(7)=W(2)                                                         SNGEN  78
      W(8)=0.03695667                                                   SNGEN  79
      W(9)=0.03249018                                                   SNGEN  80
      W(10)=W(8)                                                        SNGEN  81
      W(11)=W(2)                                                        SNGEN  82
      W(12)=W(3)                                                        SNGEN  83
      W(13)=W(9)                                                        SNGEN  84
      W(14)=W(9)                                                        SNGEN  85
      W(15)=W(3)                                                        SNGEN  86
      W(16)=W(3)                                                        SNGEN  87
      W(17)=W(8)                                                        SNGEN  88
      W(18)=W(3)                                                        SNGEN  89
      W(19)=W(2)                                                        SNGEN  90
      W(20)=W(2)                                                        SNGEN  91
      W(21)=W(1)                                                        SNGEN  92
      GO TO 190                                                         SNGEN  93
  100 U(1)=0.14238965                                                   SNGEN  94
      U(2)=0.42948076                                                   SNGEN  95
      U(3)=0.57735027                                                   SNGEN  96
      U(4)=0.69990185                                                   SNGEN  97
      U(5)=0.80398498                                                   SNGEN  98
      U(6)=0.89605866                                                   SNGEN  99
      U(7)=0.97951538                                                   SNGEN 100
      W(1)=0.062170628                                                  SNGEN 101
      W(2)=0.043325697                                                  SNGEN 102
      W(3)=0.033217605                                                  SNGEN 103
      W(4)=0.031837060                                                  SNGEN 104
      W(5)=W(3)                                                         SNGEN 105
      W(6)=W(2)                                                         SNGEN 106
      W(7)=W(1)                                                         SNGEN 107
      W(8)=W(2)                                                         SNGEN 108
      W(9)=0.030486324                                                  SNGEN 109
      W(10)=0.024545116                                                 SNGEN 110
      W(11)=W(10)                                                       SNGEN 111
      W(12)=W(9)                                                        SNGEN 112
      W(13)=W(2)                                                        SNGEN 113
      W(14)=W(3)                                                        SNGEN 114
      W(15)=W(10)                                                       SNGEN 115
      W(16)=0.019984453                                                 SNGEN 116
      W(17)=W(10)                                                       SNGEN 117
      W(18)=W(3)                                                        SNGEN 118
      W(19)=W(4)                                                        SNGEN 119
      W(20)=W(10)                                                       SNGEN 120
      W(21)=W(10)                                                       SNGEN 121
      W(22)=W(4)                                                        SNGEN 122
      W(23)=W(3)                                                        SNGEN 123
      W(24)=W(9)                                                        SNGEN 124
      W(25)=W(3)                                                        SNGEN 125
      W(26)=W(2)                                                        SNGEN 126
      W(27)=W(2)                                                        SNGEN 127
      W(28)=W(1)                                                        SNGEN 128
      GO TO 190                                                         SNGEN 129
  170 U(1)=0.13344572                                                   SNGEN 130
      U(2)=0.39119433                                                   SNGEN 131
      U(3)=0.53689587                                                   SNGEN 132
      U(4)=0.65075610                                                   SNGEN 133
      U(5)=0.74746822                                                   SNGEN 134
      U(6)=0.83302700                                                   SNGEN 135
      U(7)=0.91058181                                                   SNGEN 136
      U(8)=0.98263079                                                   SNGEN 137
      W(1)=0.05415425                                                   SNGEN 138
      W(2)=0.03679653                                                   SNGEN 139
```

```
      W(3)=0.02777273
      W(4)=0.02560264
      W(5)=W(4)
      W(6)=W(3)
      W(7)=W(2)
      W(8)=W(1)
      W(9)=W(2)
      W(10)=-.02494275
      W(11)=-.01962325
      W(12)=-.01879762
      W(13)=W(11)
      W(14)=W(10)
      W(15)=W(2)
      W(16)=W(3)
      W(17)=W(11)
      W(18)=-.01544601
      W(19)=W(18)
      W(20)=W(11)
      W(21)=W(3)
      W(22)=W(4)
      W(23)=W(12)
      W(24)=W(18)
      W(25)=W(12)
      W(26)=W(4)
      W(27)=W(4)
      W(28)=W(11)
      W(29)=W(11)
      W(30)=W(4)
      W(31)=W(3)
      W(32)=W(10)
      W(33)=W(3)
      W(34)=W(2)
      W(35)=W(2)
      W(36)=W(1)
      GO TO 190
C     ---   SN SET NOT FOUND IN LIBRARY
  180 CONTINUE
      CALL EXIT
  190 K=I+1
      DO 210 J=2,I
      LA=I+1-J
      DO 200 L=1,LA
      U(K)=U(L)
  200 K=K+1
  210 CONTINUE
      K=1
      DO 230 J=1,I
      LA=I+1-J
      DO 220 L=1,LA
      E(K)=U(J)
  220 K=K+1
  230 CONTINUE
  240 DO 250 J=1,M
      W(J)=3.14159265358979*W(J)
  250 CONTINUE
C     ---   REORDER SN LIBRARY
      K=1
      L=MM
  260 T=U(K)
      U(K)=U(L)
      U(L)=T
      T=E(K)
      E(K)=E(L)
      E(L)=T
      T=W(K)
      W(K)=W(L)
      W(L)=T
      K=K+1
      L=L-1
```

```
214          IF (K.LT.L) GO TO 260                                          SNGEN     209
       C     ---   CALCULATE BETA COEFFICIENTS                              SNGEN     210
205          M=1                                                            SNGEN     211
206          DO 320 L=1,I                                                   SNGEN     212
207          TP=0.0                                                         SNGEN     213
208          DO 310 J=1,L                                                   SNGEN     214
209          T=TP+W(M)*U(M)                                                 SNGEN     215
210          BET1(M)=TP/W(M)                                                SNGEN     216
211          BET2(M)=1/W(M)                                                 SNGEN     217
212          TP=T                                                           SNGEN     218
213      310 M=M+1                                                          SNGEN     219
214      320 CONTINUE                                                       SNGEN     220
       C                                                                    SNGEN     221
215          RETURN                                                         SNGEN     222
216          END                                                            SNGEN     223
 SINGLY REFERENCED VARIABLES
  DIMENSI -    2F     EXIT    -  173SU   RETURN  -  215F     SNGEN    -      1SU
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
     100 -      6      7*
     110 -      6     11*
     120 -      6     17*
     130 -      6     27*
     140 -      6     42*
     150 -      6     63*
     160 -      6     91*
     170 -      6    127*
     180 -      5    172*
     190 -     16     26      41      62      90     126     171     174*
     200 -   17700   179*
     210 -   17500   18 *
     220 -   18400   186*
     230 -   18200   187*
     240 -     11    188*
     250 -   18800   19 *
     260 -    193*   214
     310 -   20800   213*
     320 -   20600   214*
BET1   0R    FAG     200   211=
BET2   0R    FAG     201   211=
E      0R    FAG     201     9=    185=   196    197=   197    198*
I      -I     4=       6    174   17500   176   18200   183   20600
J      -I  17500     176  18200   183    185   18800   189    189   20800
K      -I   174=     176   179=   179    181=   185   186=   186    191=   193    194    196    197    199    200    202*   202
            214
L      -I  17700     178  18400   192=   194    195    197    198    200    201    203=   203    204   20600  20800
LA     -I   176=   17700   183=  18400
M      -I     3=   18800   205=   209    209    210    210    211    211    213=   213
MM     -I    FAG     192
N      -I    FAG       3      3      4      5
T      -R   193=     195   196=   198    199=   201    209=   211    212
TP     -R   207=     209   210    212=
U      0R    FAG     201     8=      9     11=    12=    17=    18=    19=    27=    28=    29=    30=    42=    43=    44=    45=
            46=      63=    64=    65=    66=    67=    68=    91=    92=    93=    94=    95=    96=    97=   127=   128=   129=
           130=     131=   132=   133=   134=   176=   176    185    193    194=   194    195=   209
W      0R    FAG     201     7=     13=    14=    14     15=    15     20=    21=    22=    22     23=    23     24=    24     25=
            25       31=    32=    33=    33     34=    34     35=    35     36=    37=    37     38=    38     39=    39     40=
            41       47=    48=    49=    50=    50     51=    51     52=    52     53=    54=    54     55=    55     56=    56
            57=      57     58=    58     59=    59     60=    60     61=    61     69=    70=    71=    72=    72     73=    73
            74=      74     75=    75     76=    77=    78=    78     79=    79     80=    80     81=    81     82=    82     83=
            83       84=    84     85=    85     86=    86     87=    87     88=    88     89=    89     98=    99=   100=   101=
           102=     102    103=   103    104=   104    105=   105    106=   107=   108=   108    109=   109    110=   110    111=
           111      112=   112    113=   114=   114    115=   115    116=   116    117=   117    118=   118    119=   119    120=
           120      121=   121    122=   122    123=   123    124=   124    125=   125    135=   136=   137=   138=   139=   139
           140 =    140    141=   141    142=   142    143=   143    144=   145=   146=   147=   147    148=   148    149=   149
           150=     150    151=   151    152=   153=   153    154=   154    155=   155    156=   156    157=   157    158=   158
           159=     159    160=   160    161=   161    162=   162    163=   163    164=   164    165=   165    166=   166    167=
           167      168=   168    169=   169    170=   170    189=   189    199    200=   200    201=   209    210    211
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
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      OVERLAY (YOKIFER, 4, 2)                                             SNESTEP    2
      PROGRAM SNESTEP                                                     SNESTEP    3
C                                                                         SNESTEP    4
C        THIS PROGRAM IS DESIGNED TO READ THE ENERGY DEPOSITION           SNESTEP    5
C        DATA AND SOLVE THE HEAT EQUATION TO GIVE NEW TEMPERATURES        SNESTEP    6
C        MODIFICATIONS HAVE BEEN MADE TO COMMUNICATE WITH THE S-N CODE    SNESTEP    7
C        8/24/73--M. T. S.                                                SNESTEP    8
C                                                                         SNESTEP    9
      COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),           ALLKOM     2
     1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),      ALLKOM     3
     2                  BTBL(300)                                         ALLKOM     4
      COMMON /YSC1/     AASC(54540)                                       ALLKOM     5
      COMMON /PINK/     I, IJ, IJM, IJP, J                                ALLKOM     6
      LCM /YLC1/        AA1(131000)                                       ALLKOM     7
      LCM /YLC2/        AA2(131000)                                       ALLKOM     8
      LCM /RLC1/        SIGA(30000)                                       ALLKOM     9
      COMMON /RED/      NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJ2S,      ALLKOM    10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,         ALLKOM    11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TAMB,     ALLKOM    12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY            ALLKOM    13
      COMMON /CRIMSN/   SNCON(1+3), ZZ                                    CRIMSN     2
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),  EQVREAL    2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),RO),           EQVREAL    3
     2                  (AASC(7),MP,RMP,RCSQ,CENTX),                      EQVREAL    4
     3                  (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),           EQVREAL    5
     4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),        EQVREAL    6
     5                  (AASC(12),UTIL,UL,CQ,EMOMLC),                     EQVREAL    7
     6                  (AASC(13),VTIL,VL,UMOMLC),                        EQVREAL    8
     7                  (AASC(14),RCL,RETALC,FOUTLC), (AASC(15),SIE),     EQVREAL    9
     8                  (AASC(16),DELSM,SIGPLC),                          EQVREAL   10
     9                  (AASC(17),GRIR,UG,RZEDEN),                        EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                            EQVREAL   12
      REAL              LAM, LAMD, M, MP, MU, MUU2                        EQVREAL   13
      DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),         DIMEN      2
     2                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),    DIMEN      3
     3                  E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),    DIMEN      4
     4                  VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),        DIMEN      5
     5                  UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),          DIMEN      6
     6                  UMOMLC(1), RCL(1), RETALC(1), FOUTLC(1),          DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),      DIMEN      8
     8                  RZEDEN(1), GRIZ(1), VG(1), FSN(1)                 DIMEN      9
      LEXT              OBCINT                                            SNESTEP   14
 2003 FORMAT            (1H ,5HTAVG ,1PE12.4,6X,6H TMAX ,1PE12.4,6X,      SNESTEP   15
     1                  6H UMAX ,1PE12.4,6X,6H UMIN ,1PE12.4)             SNESTEP   16
 2005 FORMAT            (1H ,*ENERGIES*/6H SIE   ,1PE12.4,6X,6H UR101,    SNESTEP   17
     1                  1PE12.4,6X,6H ELOST,1PE12.4,6X,6H EABS ,          SNESTEP   18
     2                  1PE12.4)                                          SNESTEP   19
 2006 FORMAT            (1H0,*POWER*/6H PWR   ,1PE12.4,6X,6H PWR2 ,       SNESTEP   20
     1                  1PE12.4)                                          SNESTEP   21
 2007 FORMAT            (1H0,*TIME INTERVAL DATA*/6H DTR   ,1PE12.4,      SNESTEP   22
     1                  6X,6H IJOT ,I12,6X,6H POWER,1PE12.4,6X,           SNESTEP   23
     2                  6H ECELL,1PE12.4)                                 SNESTEP   24
C                                                                         SNESTEP   25
      TMAX=0.0                                                            SNESTEP   26
      UMAX=-15.0                                                          SNESTEP   27
      UMIN=15.0                                                           SNESTEP   28
      PWR=0.0                                                             SNESTEP   29
      SIETOT=0.0                                                          SNESTEP   30
      UR101=0.0                                                           SNESTEP   31
      USIE=0.0                                                            SNESTEP   32
      CTOLD=DTR                                                           SNESTEP   33
      DTR=100.0                                                           SNESTEP   34
      ELOST=0.0                                                           SNESTEP   35
      EABS=0.0                                                            SNESTEP   36
C     ---   ADVANCE CELL ENERGIES AND TEMPERATURES                        SNESTEP   37
      CALL START                                                          SNESTEP   38
      DO 40 J=2,JP1                                                       SNESTEP   39
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      DO 39 I=1,IBAR
      IPJ=IJ+NQ
      IJSC=(J-1)*(P1+1
      FOUTLC(IJ)=-FOUTLC(IJ)
      IF (FOUTLC(IJ).GT.0.0) EABS=EABS+FOUTLC(IJ)
      IF (I.EQ.IBAR.OR.J.EQ.2.OR.J.EQ.JP)) PWR=PWR+FOUTLC(IJ(
      VOL=6.283184/PVOL(IJ)
      XX=FOUTLC(IJ)*DTOLD
      DSIE=DSIE+XX
      ABSPEN=XX/VOL
      IF (TEMP(IJSC).LE.0.1) GO TO 35
      IF (FOUTLC(IJ).EQ.0.0) GO TO 35
      ECELL=SIE(IJ)*RO(IJ)*VOL*1.0E+15
      PMARK=ABS(FOUTLC(IJ))
      XDTR=0.15*ECELL/PMARK
      IF (DTR.LT.XDTR) GO TO 35
      DTR=XDTR
      IJOT=IJSC
      POWER=PMARK
      ECELLOT=ECELL
   35 DELSIE=ABSPEN/RO(IJ)*1.0E-15
      SIE(IJ)=SIE(IJ)+DELSIE
      SIETOT=SIETOT+(SIE(IJ)-REZSIE)*RO(IJ)*VOL*1.0E+15
C
      ZR=RO(IJ)
      IF (SIE(IJ)-REZSIE.GT.1.0E-06) GO TO 36
      ZT=TAMB
      ZE=SIE(IJ)
      GO TO 38
   36 ZE=SIE(IJ)
      ZRINV=1.0/ZR
      ZRL=ALOG10(ZR)
      TLOW=TAMB
      THIGH=DSQRT(ZE*ZR*0.00728789E+07)
      THIGH=DSQRT(THIGH)
      ZT=0.5*(TLOW+THIGH)
   37 UR1=137.214E-07*ZT**4
      ZE1=ZE-UR1*ZRINV
      ZTL=ALOG10(ZT)
      ZE2L=ORLINT (0, ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOPT)
      ZE2=ALEXP10(ZE2L)
      ZCE=ZE1-ZE2
      IF (ZCE.GT.0.0) TLOW=ZT
      IF (ZCE.LT.0.0) THIGH=ZT
      ZT=0.5*(THIGH+TLOW)
      IF (THIGH-TLOW.LE.1.0E-06*ZT) GO TO 38
      GO TO 37
   38 TEMP(IJSC)=AMAX1(ZT,TAMB)
      TMAX=AMAX1(TMAX,TEMP(IJSC))
      DMIN=AMIN1(DMIN,RO(IJ))
      DMAX=AMAX1(DMAX,RO(IJ))
      URTOT=URTOT+137.214E+08*(TEMP(IJSC)**4)*VOL
      IJ=IPJ
   39 CONTINUE
      END LOOP
   40 CONTINUE
      CALL DONE
C
      PWR=PWR/FLOAT(2*IBAR+JBAR)
      PWR2=DSIE/DTOLD
      TAVG=TIME+0.5*DTOLD
      ELOST=-PWR*DTOLD
      EABS=EABS*DTOLD
      PRINT 2005,       SIETOT, URTOT, ELOST, EABS
      WRITE (12,2005)   SIETOT, URTOT, ELOST, EABS
      PRINT 2006,       PWR, PWR2
      WRITE (12,2006)   PWR, PWR2
      PRINT 2007,       DTR, IJOT, POWER, ECELLOT
      WRITE (12,2007)   DTR, IJOT, POWER, ECELLOT
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 96           PRINT 2003,        TAVG, TMAX, UMAX, UMIN                                        SNESTEP    109
 99           WRITE (12,2003)    TAVG, TMAX, UMAX, UMIN                                        SNESTEP    110
        C                                                                                      SNESTEP    111
110           RETURN                                                                           SNESTEP    112
        C                                                                                      SNESTEP    113
111           END                                                                              SNESTEP    114


 SINGLY REFERENCED VARIABLES
  AA1      ()R    5LC   U1       -R    8CO   IJPS    -I   8CO   LAMO    -R  11RL   NFRQ    -1   2CO   RLC1     -    7CN   THY     -R   8CU
  AA2      ()R    6LC   EMIC     -R    8CO   ISCF1   -I   8CO   LEXT    -   13F    NQI     -1   8CO   SIGH    ()R   7LC   TOUT    -R   8CU
  ABS      -     445U   EQUIVAL  -    10F    ISCF2   -I   8CO   LOOP    -   845U   PINN    -    4CN   SNCON   ()R   9CO   TSTART  -R   8CU
  AMIN1    -     795U   FLOAT    -    875U   ISC2    -I   8CO   MU      -R  11RL   PTAB    ()R  2CO   SNESTEP  -    15U   YLC1     -   5CN
  BTBL     ()R    2CU   FREQ     ()R   2CC   ISC3    -1   8CO   MU12    -R  11RL   CEXP10   -  785U   SPTBL   ()R   2CO   YLC2     -   6CN
  CRIMSN   -      9CN   GROVEL   -R    8CO   ITV     -I   8CO   NAME    ()1  8CO   REAL     -   11F   START    -   295U   YSC1     -   3CN
  DIMENSI  -     12F    IJM      -1    4CO   JP2     -1   8CO   NCYC    -1   8CO   RED      -    8CN   STATE    -    2CN   ZZ      -R   9CU
  DONE     -     865U   IJP      -1    4CO   LAP     -R  11RL   NDUMP   -1   8CO   RETURN   -  100F   1        -R   8CU
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
       35 -     41      42      46      51*
       36 -     55      59*
       37 -     66*     76
       38 -     58      75      77*
       39 -     3100    63*
       40 -     3100    65*
     2003 -     14*     98PR    99WR
     2005 -     15*     92PR    93WR
     2006 -     16*     94PR    95WR
     2007 -     17*     96PR    97WR
 AASC    ()R    3CO     1 EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ
                10EQ    1 EQ
 ABSMEM  -R     41=     51
 AMAX1   -      775U    785U    805U
 BETALC  ()R    1 EQ    1201
 CENTX   ()R    1 EQ    1201
 CENTY   ()R    1 EQ    1201
 COMMON  -      2F      3F      4F      8F      9F
 CQ      ()R    1 EQ    1201
 DBLINT  -      13LX    695U
 DELSIE  -R     51=     52
 DELSM   ()R    1 EQ    1201
 DMAX    -R     19=     6 =     80      98PR    99WR
 DMIN    -R     20=     79=     79      98PN    99WR
 DSIE    -R     24=     39=     39      88
 DTOLD   -R     25=     38      88      89      90      91
 DTR     -R     8CU     25      26=     46      47=     96PR    97WR
 E       ()R    1 EQ    1201
 EANS    -R     28=     35=     35      91=     91      92PR    93WR
 ECELL   -R     43=     45      50
 ECELLD1 -R     5 =     96PR    97WR
 ECOST   -R     27=     9 =     92PR    93WR
 EMOMLC  ()R    1 EQ    1201
 EP      ()R    1 EQ    1201
 ETAB    ()R    2CO     69
 ETIL    ()R    1 EQ    1201
 FORMAT  -      14F     15F     16F     17F
 FOUILC  ()R    1 EQ    1201    34=     34      35      35      36      38      42      44
 FSN     ()R    1 EQ    1201
 GRIR    ()R    1 EQ    1201
 GRIZ    ()R    1 EQ    1201
 I       -1     4CO     3100    33      36
 IBAR    -1     8CO     3100    36      87
 IJ      -I     4CO     32      34      34      35      35      36      37      38      42      43      43      44      51      52      52      53
                53      54      55      57      59      79      80      82=
 IJDT    -1     48=     96PR    97WR
 IJSC    -1     33=     41      48      77      78      81
 IPJ     -1     32=     82
 IPI     -I     8CO     33
```

J	-I	4CO	3.00	33	36	36				
JBAP	-I	8CO	67							
JPI	-I	6CO	3.00	36						
LCM	-	5F	6F	7F						
M	()R	10EQ	11RL	1201						
MP	()R	10EQ	11RL	1201						
NOPD	-I	2CO	69							
NOPT	-I	2CO	69	69						
NQ	-I	8CO	32							
OPDEN	()R	2CO	69							
OPTMP	()R	2CO	69							
P	()R	10EQ	1201							
PL	()R	10EQ	1201							
PMARK	-R	44=	45	49						
POWER	-R	49=	96PR	97WR						
PRINT	-	92F	94F	96F	98F					
PWR	-R	21=	36=	36	87=	87	90	94PR	95WR	
PWR2	-R	86=	94PR	95WR						
QLOG10	-	61SU	68SU							
QSQRT	-	63SU	64SU							
R	()R	10EQ	1201							
RCSQ	()R	10EQ	1201							
REZSIE	-R	8CO	53	55						
RM	()R	10EQ	1201							
RMP	()R	10EQ	1201							
RO	()R	10EQ	1201	43	51	53	54	79	80	
ROL	()R	10EQ	1201							
RVOL	()R	10EQ	1201	37						
RZEDEN	()R	10EQ	1201							
SIE	()R	10EQ	1201	43	52=	52	53	55	57	59
SIETOT	-R	22=	53=	53	92PR	93WR				
SIGPLC	()R	10EQ	1201							
TAMB	-R	8CO	56	62	77					
TAVG	-R	89=	96PR	99WR						
TEMP	()R	6CO	41	77=	78	81				
THIGH	-R	63=	64=	64	65	73=	74	75		
TIME	-R	6CO	69							
TLOW	-R	62=	65	72=	74	75				
TMAX	-R	18=	78=	78	98PR	99WR				
U	()R	10EQ	1201							
UG	()R	10EQ	1201							
UL	()R	10EQ	1201							
UMOMLC	()R	10EQ	1201							
UP	()R	10EQ	1201							
URTOT	-R	23=	81=	81	92PR	93WR				
URI	-R	66=	67							
UTIL	()R	10EQ	1201							
V	()R	10EQ	1201							
VG	()R	10EQ	1201							
VL	()R	10EQ	1201							
VOL	-R	37=	43	43	53	81				
VP	()R	10EQ	1201							
VTIL	()R	10EQ	1201							
WRITE	-	93F	95F	97F	99F					
X	()R	10EQ	1201							
XDTR	-R	45=	46	47						
XPAR	()R	10EQ	1201							
XX	-R	38=	39	40						
Y	()R	10EQ	1201							
YPAR	()R	10EQ	1201							
ZDE	-R	71=	72	73						
ZE	-R	59=	63	67						
ZE1	-R	67=	71							
ZE2	-R	57=	70=	71						
ZE2L	-R	69=	71							
ZR	-R	54=	60	61	63					
ZRINV	-R	6 =	67							
ZRL	-R	61=	69							
Z1	-R	56=	65=	66	69	72	73	74=	75	77

```
  1         OVERLAY (YOKIFER, 4, 3)                                      SNOUT     2

  1         PROGRAM SNOUT                                                SNOUT     3
       C                                                                 SNOUT     4
       C      THIS CODE GIVES OUTPUT FOR THE S*N CALCULATIONS            SNOUT     5
       C                                                                 SNOUT     6
  2         COMMON /STATE/     IOPT, NCPO, NFRQ, UPTMP(30), OPLEN(10),   ALLKOM    2
           1                   FREQ(100), SPTHL(300), PTAB(300), ETAB(300),  ALLKOM    3
           2                   BIBL(300)                                 ALLKOM    4
  3         COMMON /YSC1/      AASC(5454)                                ALLKOM    5
  4         COMMON /PINK/      I, IJ, IJM, IJP, J                        ALLKOM    6
  5         LCM /YLC1/         AA1(131000)                               ALLKOM    7
  6         LCM /YLC2/         AA2(131000)                               ALLKOM    8
  7         LCM /RLC1/         SIGA(30000)                               ALLKOM    9
  8         COMMON /RED/       NAME(12), DT, DTR, EM10, GROVEL, IBAR, IJPS,  ALLKOM   10
           1                   IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,  ALLKOM   11
           2                   JP1, JP2, NCYC, NUUMP, NO, NQI, REZSIE, TAMB,  ALLKOM   12
           3                   TEMP(7500), T, TIME, TOUT, TSTART, THY     ALLKOM   13
  9         COMMON /CRIMSN/    SNCON(183), ZZ                            CRIMSN    2
 10         COMMON /SILVER/    FIPXL, FIPXR, FIPYB, FIXL, FIXR, FIYB,    SILVER    2
           1                   IPXL, IPXR, IPYB, IPYT, IXL, IXR, IYB,    SILVER    3
           2                   IYT, PXCONV, PXL, PXR, PYB, PYCONV, PYT,  SILVER    4
           3                   RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT   SILVER    5
 11         EQUIVALENCE        (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y), EQVREAL  2
           1                   (AASC(4),U), (AASC(5),V), (AASC(6),RO),   EQVREAL   3
           2                   (AASC(7),MP,RMP,RCSQ,CENTX),              EQVREAL   4
           3                   (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),   EQVREAL   5
           4                   (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),  EQVREAL   6
           5                   (AASC(12),UTIL,UL,CQ,EMOMLC),             EQVREAL   7
           6                   (AASC(13),VTIL,VL,UMOMLC),                EQVREAL   8
           7                   (AASC(14),ROL,BETALC,FOUTLC), (AASC(15),SIE),  EQVREAL   9
           8                   (AASC(16),DELSM,SIGPLC),                  EQVREAL  10
           9                   (AASC(17),GRIR,UG,RZEDEN),                EQVREAL  11
           1                   (AASC(18),GRIZ,VG,FSN)                    EQVREAL  12
 12         REAL               LAM, LAMD, M, MP, MU, MUO2                EQVREAL  13
 13         DIMENSION          X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),  DIMEN     2
           2                   V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTX(1),  DIMEN     3
           3                   E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1),  DIMEN     4
           4                   VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),  DIMEN     5
           5                   UL(1), CQ(1), EMOMLC(1), VTIL(1), VL(1),  DIMEN     6
           6                   UMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),  DIMEN     7
           7                   SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),  DIMEN     8
           8                   RZEDEN(1), GRIZ(1), VG(1), FSN(1)         DIMEN     9
 14         DIMENSION          TITLE(5)                                  SNOUT    12
 15         COMMON /SNOWITE/   ISN, AVINT(7500), RSN(101), ZSN(102)      SNOUT    13
 16    2408 FORMAT             (6H RFLUX,1PE12.4,8H    ZFLUX,1PE12.4,    SNOUT    14
           1                   12H J/CU KM-SEC)                          SNOUT    15
       C     ---  FLUX DIAGRAM SHOWING RADIATION FLOW                    SNOUT    16
 17         UMAX=VMAX=0.                                                 SNOUT    17
 18         DR=DZ=1.0E+36                                                SNOUT    18
 19         CALL START                                                   SNOUT    19
 20         DO 419 J=2,JP1                                               SNOUT    20
 21         DO 418 I=1,IBAR                                              SNOUT    21
 22         XU=ABS(UMOMLC(IJ))                                           SNOUT    22
 23         XV=ABS(EMOMLC(IJ))                                           SNOUT    23
 24         UMAX=AMAX1(XU,UMAX)                                          SNOUT    24
 25         VMAX=AMAX1(XV,VMAX)                                          SNOUT    25
 26         IF (J.EQ.2) DR=AMIN1(DR,RSN(I+1)-RSN(I))                     SNOUT    26
 27         IF (I.EQ.1) DZ=AMIN1(DZ,ZSN(J+1)-ZSN(J))                     SNOUT    27
 28         IJ=IJ+NQ                                                     SNOUT    28
 29     418 CONTINUE                                                     SNOUT    29
 30         CALL LOOP                                                    SNOUT    30
 31     419 CONTINUE                                                     SNOUT    31
 32         CALL DONE                                                    SNOUT    32
```

```
      DR=AMIN1(DR,DZ)
      DROU=1.2*DR/AMAX1(UMAX,VMAX)
C
      CALL ADV(1)
      CALL FRAME(IXL,IXR,IYT,IYB)
      CALL START
      DO 435 J=2,JP1
      Y1=ZSN(J)
      DO 434 I=1,IBAR
      X1=RSN(I)
      X2=X1+UMOMLC(IJ)*DROU
      Y2=Y1+EMOMLC(IJ)*DROU
      IX1=FIXL+X1*XCONV
      IX2=FIXL+X2*XCONV
      IY1=FIYB+(Y1-YB)*YCONV
      IY2=FIYB+(Y2-YB)*YCONV
      CALL DRV(IX1,IY1,IX2,IY2)
      IJ=IJ+NQ
  434 CONTINUE
      CALL LOOP
  435 CONTINUE
      CALL DONE
      ENCODE (50,2408,TITLE) UMAX,VMAX
      JYB=IYB+10
      JXL=10
      CALL DLCH (JXL, JYB, 49, TITLE, 2)
C
      CALL ADV(1)
      CALL FRAME (IPXL, IPXR, IPYT, IPYB)
      CALL START
      DO 445 J=2,JP1
      Y1=ZSN(J)
      IF (Y1.LT.PYB.OR.Y1.GT.PYT) GO TO 445
      DO 444 I=1,IBAR
      X1=RSN(I)
      IF (X1.LT.PXL.OR.X1.GT.PXR) GO TO 443
      X2=X1+UMOMLC(IJ)*DROU
      Y2=Y1+EMOMLC(IJ)*DROU
      IX1=FIPXL+X1*PXCONV
      IX2=FIPXL+X2*PXCONV
      IY1=FIPYB+(Y1-YB)*PYCONV
      IY2=FIPYB+(Y2-YB)*PYCONV
      CALL DRV (IX1, IY1, IX2, IY2)
  443 IJ=IJ+NQ
  444 CONTINUE
      CALL LOOP
  445 CONTINUE
      CALL DONE
      CALL DLCH (JXL, JYB, 49, TITLE, 2)
      CALL ADV(1)
C
      RETURN
      END
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	FIPXR	-R	1?CO	ISC2	-I	8CO	NCYC	-I	8CO	RED	-	8CN	STATE	-	2CN	YLC1	-	5CN
AA2	()R	6LC	FIXR	-R	1?CO	ISC3	-I	8CO	NDUMP	-I	8CO	RETURN	-	6?F	T	-R	8CO	YLC2	-	6CN
AVINT	()R	15CO	FORMAT	-	16F	ISN	-I	15CO	NFRQ	-I	2CO	REZSIE	-R	8CO	TAMB	-R	8CO	YSC1	-	3CN
BTOL	()R	2CO	FREQ	()R	2CO	ITV	-I	8CO	NUPQ	-I	2CO	RIBAR	-R	10CO	TEMP	()R	8CO	YT	-R	10CO
CRIMSN	-	9CN	GROVEL	-R	8CC	JBAR	-I	8CO	NOPT	-I	2CO	RLC1	-	7CN	THY	-R	8CO	ZZ	-R	9CO
DT	-R	8CO	IJM	-I	4CO	JP2	-I	8CO	NQI	-I	8CO	SIGA	()R	7LC	TIME	-R	8CO			
DTR	-R	8CO	IJP	-I	4CO	LAM	-R	12RL	OPDEN	()R	2CO	SILVER	-	10CN	TOUT	-R	8CO			
EM10	-R	8CO	IJPS	-I	8CO	LAMD	-R	12RL	OPIMP	()R	2CO	SNCON	()R	9CO	TSTART	-R	8CC			
ENCODE	-	54F	IFJ	-I	8CO	MU	-R	12RL	PINK	-	4CN	SNOUT	-	1SU	VV	-R	10CO			
EQUIVAL	-	11F	ISCF1	-I	8CO	MUC2	-R	12NL	PTAB	()R	2CO	SNOWITE	-	15CN	XL	-R	10CO			
ETAB	()R	2CO	ISCF2	-I	8CO	NAME	()I	8CO	REAL	-	12F	SPTBL	()R	2CO	XR	-R	10CO			

```
MULTIPLY-REFERENCED VARIABLES
    418 -     2100    29*
    419 -     2.00    31*
    434 -     4.0U    5 *
    435 -     3600    52*
    443 -     66      74*
    444 -     6400    75*
    445 -     6100    63      77*
   2408 -     16*     54EC
AASC     ()R   3CO    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ
              10EQ    10EQ
ABS       -    22SU   23SU
AOV       -    35SU   58SU    8 SU
AMAX1     -    24SU   25SU    34SU
AMIN1     -    26SU   27SU    33SU
BETALC   ()R   10EQ   1301
CENTX    ()R   10EQ   1301
CENTY    ()R   10EQ   1301
COMMON    F    /F     3F      4F      8F      9F      10F     15F
CQ       ()R   10EQ   1301
DELSM    ()R   10EQ   1301
DIMENSI   -    13F    14F
OLCR      -    57SU   79SU
OONE      -    37SU   53SU    78SU
DR       -R    18=    20=     26      33=     33      34
DROU     -R    34=    42      43      67      68
DRV       -    46SU   73SU
DZ       -R    18=    27=     27      33
E        ()R   10EQ   1301
EMOMLC   ()R   10EQ   1301    23      43      68
EP       ()R   10EQ   1301
ETIL     ()R   10EQ   1301
FIPXL    -R    1.CO   69      70
FIPYB    -R    1.CO   71      72
FIXL     -R    1.CO   44      45
FIYB     -R    1.CO   46      47
FOUTLC   ()R   10EQ   1301
FRAME     -    36SU   59SU
FSN      ()R   10EQ   1301
GRIR     ()R   10EQ   1301
GRIZ     ()R   10EQ   1301
I        -I    4CO    2100    26      26      27      4000    41      6400    65
IBAR     -I    8CO    2100    4000    6400
IJ       -I    4CO    22      23      28=     28      42      43      49=     49      67      68      74=     74
IPXL     -I    1.CO   59AG
IPXR     -I    1.CO   59AG
IPYB     -I    1.CO   59AG
IPYT     -I    1.CO   59AG
IXL      -I    1.CO   36AG
IXR      -I    1.CO   36AG
IX1      -I    44=    48AG    69=     73AG
IX2      -I    45=    48AG    7 =     73AG
IYB      -I    1 CO   36AG    55
IY1      -I    1.CO   36AG
IY1      -I    46=    48AG    71=     73AG
IY2      -I    47=    48AG    72=     73AG
J        -I    4CO    2 00    26      27      27      3800    39      6100    62
JP1      -I    8CO    2 00    3800    6100
JXL      -I    56=    57AG    79AG
JYB      -I    55=    57AG    79AG
LCM       -    5F     6F      7F
LOOP      -    30SU   51SU    76SU
N        ()R*  10EQ   12RL    1301
MP       ()R   10EQ   12RL    1301
NQ       -I    8CO    28      49      74
P        ()R   10EQ   1301
PL       ()R   10EQ   1301
PXCONV   -R    1.CO   69      70
PXL      -R    1.CO   66
```

PXR	-R	1 CU	66						
PYB	-R	(CU	63						
PYCONV	-R	(·CU	7(	72					
PYT	-R	) CU	63						
R	()R	))EQ	1301						
RCSQ	()R	))EQ	1301						
RH	()R	))EQ	1301						
RMP	()R	))EQ	1301						
RO	()R	))EQ	1301						
ROL	()R	))EQ	1301						
RSN	()R	15CU	20	26	41	65			
RVOL	()R	))EQ	1301						
RZEHEN	()R	))EQ	1301						
SIE	()R	))EQ	1301						
SIGPLC	()R	))EQ	(301						
START	-	1SU	37SU	67SU					
TITLE	()R	140I	54LC	57AG	79AG				
U	()R	))EQ	130I						
UG	()R	))EQ	1301						
UL	()R	))EQ	130I						
UMAX	-R	)/=	24=	24	34	54EC			
UMOMLC	()R	))EQ	1301	22	42	67			
UP	()R	))EQ	130I						
UTIL	()R	))EQ	130I						
V	()R	))EQ	130I						
VG	()R	))EQ	1301						
VL	()R	))EQ	1301						
VMAX	-R	)/=	25=	25	34	54EC			
VP	()R	))EQ	1301						
VTIL	()R	))EQ	(30I						
X	()R	))EQ	1301						
XCONV	-R	1·CU	44	45					
XPAR	()R	))EQ	130I						
XH	-R	22=	24						
XV	-R	23=	25						
X1	-R	41=	42	44	65=	66	66	67	69
X2	-R	42=	45	67=	70				
Y	()R	))EQ	(30I						
YB	-R	) CU	46	47	71	72			
YCONV	-R	(·)CU	46	47					
YPAR	()R	))EQ	1301						
Y1	-R	39=	43	46	62=	63	63	68	71
Y2	-R	43=	47	66=	72				
ZSN	()R	15CU	27	27	39	62			

+-+

MASTER INDEX

LIST OF ALL VARIABLES DEFINED IN INPUT
C MEANS VARIABLE WAS DEFINED IN COMMON IN THAT ROUTINE
D MEANS VARIABLE WAS DEFINED IN OTHER DECLARATIONS
NON-BLANK NUMERIC IS NUMBER OF NON-DECLARATORY REFERENCES
S PRECEDING MEANS SUBROUTINE(PROGRAM,FUNCTION) NAME
L PRECEDING MEANS COMMON(LCM) NAME
F PRECEDING MEANS FORTRAN KEYWORD
* PRECEDING MEANS VARIABLE IS DECLARED, NOT USED ANYWHERE

VARIABLE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE
A	REEFER	210	PCHEGA	7D	SUBSCR	1D	CROSS	7D	WALK	18D	HOWFAR	4D						
AA	IN	3	OL1	3														
AASC	YOKIFER	4C	LCOP	11C	FILMCO	CD	OFFWEGO	2CD	MESHMKR	CD	PARIGEN	1CD	YOKKY	CD	PHASEO	CD	YOKOUT	CD
	PARPLOT	1CD	PHASE1	CD	PHASE2	CD	PHASE3	CD	REZONE	CD	PARIMOV	4CD	MCRT	CD	REEFER	CD	FLUSH	CD
	PFREQ	C	SCBSCR	C	WALK	CD	ESTEP	CD	LISTING	CD	GREYSN	CD	CYLSN	CD	SWEEP	21CD	SNESTEP	CD
	SNOUT	CD																
AA1	YOKIFER	1D	LCOP	D	FILMCO	D	OFFWEGO	1D	MESHMKR	D	PARIGEN	D	YOKKY	D	PHASEO	D	YOKOUT	D
	PARPLOT	D	PHASE1	D	PHASE2	D	PHASE3	D	REZONE	D	PARIMOV	D	MCRT	D	REEFER	D	FLUSH	D
	PFREQ	D	SCBSCR	D	WALK	D	ESTEP	D	LISTING	D	GREYSN	D	CYLSN	D	SWEEP	D	SNESTEP	D
	SNOUT	D																

	AA2	YOKIFER 1D	LOOP D	FILMCO D	OFFWEGO 2D	MESHMKR D	PARTGEN D	YOKKY D	PHASE0 D	YOKOUT D
		PARPLOT D	PHASE1 D	PHASE2 D	PHASE3 D	REZONE D	PARTMOV D	MCRT D	REEFER D	FLUSH D
		PFREQ D	SUBSCR D	WALK D	ESTEP D	LISTING D	GREYSN D	CYLSN D	SWEEP D	SNESTEP D
		SNOUT D								
	AB	PHASE1 6								
S	ABS	MESHMKR 1	PHASE0 2	YOKOUT 6	PHASE1 2	PHASE2 5	PHASE3 5	REZONE 4	WALK 1	HOWFAR 2
		CYLSN 1	SNESTEP 1	SNOUT 2						
	ABSMEM	SNESTEP 2								
	ABSOR	ESTEP 2								
	AD	HOWFAR 1D								
	ADIST	POMEGA 6								
S	ADV	YOKIFER 1	YOKOUT 5	PARPLOT 1	SNOUT 3					
S	AFSREL	YOKIFER 2	OFFWEGO 1							
S	AINT	PARPLOT 1								
	AK	PHASE1 4	PHASE2 4							
	AL	PHASE3 6	SUBSCR 1D	CYLSN 1D	SWEEP 6D	IN 3D	OUT 3D			
	ALAM	PHASE0 3								
S	ALOG10	PARPLOT 1								
	ALPHA	YOKIFER C	OFFWEGO 4C	MCRT 1C	REEFER C	FLUSH C	WALK C	ESTEP C	LISTING C	GREYSN 2
	AL13	PHASE3 3								
	AL24	PHASE3 3								
S	AMAX1	FILMCO 4	MESHMKR 3	PARTGEN 2	PHASE0 1	YOKOUT 6	PHASE1 9	PHASE2 2	PHASE3 3	REZONE 6
		PARTMOV 2	WALK 2	ESTEP 4	CYLSN 1	SNESTEP 3	SNOUT 3			
S	AMIN1	YOKIFER 2	FILMCO 5	MESHMKR 3	PARTGEN 1	YOKOUT 3	PHASE1 12	PHASE2 2	PHASE3 3	PARTMOV 1
		MCRT 1	REEFER 2	PFREQ 1	WALK 3	HOWFAR 1	ESTEP 3	GREYSN 2	SNESTEP 1	SNOUT 3
	AMU	PHASE2 3								
	ANC	YOKIFER C	FILMCO C	OFFWEGO 4C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT C
		PHASE1 1C	PHASE2 C	PHASE3 C	REZONE C	PARTMOV C				
	*ANGLES	YOKIFER C	FILMCO C	OFFWEGO C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT C
		PHASE1 C	PHASE2 C	PHASE3 C	REZONE C	PARTMOV C				
	AR	PHASE0 6								
	AREAF	REZONE 3								
	AS	SUBSCR 1D								
	ASQ	YOKIFER C	FILMCO C	OFFWEGO 3C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT C
		PHASE1 1C	PHASE2 C	PHASE3 C	REZONE C	PARTMOV C				
F	ASSIGN	YOKOUT 4								
	AT	YOKOUT D	PHASE3 6D							
	AVINT	GREYSN 3C	CYLSN 5C	SWEEP 4D	SNOUT C					
	AVNEW	SWEEP 6D	IN 3D	OUT 3D						
	AVOLD	CYLSN 3D	SWEEP 3D							
	AX	PHASE1 3								
	AY	PHASE1 3								
	AQ	YOKIFER C	FILMCO C	OFFWEGO 3C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT C
		PHASE1 C	PHASE2 C	PHASE3 2C	REZONE C	PARTMOV C				
	AQFAC	YOKIFER C	FILMCO C	OFFWEGO 1C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT C
		PHASE1 C	PHASE2 C	PHASE3 1C	REZONE C	PARTMOV C				
	AQM	YOKIFER C	FILMCO C	OFFWEGO 3C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C	PARPLOT [illegible]
		PHASE1 C	PHASE2 C	PHASE3 4C	REZONE C	PARTMOV C				
	B	POMEGA 5D	SUBSCR 1D	CROSS 7D	CYLSN 2D	SWEEP 5D	IN 4D	OUT 4D		
F	BACKSPA	OFFWEGO 3								
	BB	CYLSN 1D	SWEEP 7D	IN 4	OUT 4					
	BCO	YOKOUT 5								
	BETA	IN 2D	OUT 2D							
	BETALL	FILMCO D	OFFWEGO D	MESHMKR D	PARTGEN D	YOKKY D	PHASE0 D	YOKOUT D	PARPLOT D	PHASE1 D
		PHASE2 D	PHASE3 D	REZONE D	PARTMOV D	MCRT 1D	REEFER D	FLUSH D	WALK D	ESTEP D
		LISTING 1D	GREYSN D	SNESTEP D	SNOUT D					
	BE11	SWEEP 3D	SNGEN 2D							
	BE12	SWEEP 3D	SNGEN 2D							
	BH	IN 4D	OUT 4D							
	BL	SUBSCR 1D								
L	BLUE	OFFWEGO 1	MESHMKR 1	PARTGEN 1						
	BP	MCRT 3	GREYSN 2							
	BR	CYLSN 1D	SWEEP 6D							
	BS	SUBSCR 1D								
	BTBL	YOKIFER C	LOOP C	FILMCO C	OFFWEGO 1C	MESHMKR C	PARTGEN C	YOKKY C	PHASE0 C	YOKOUT C
		PARPLOT C	PHASE1 C	PHASE2 C	PHASE3 C	REZONE C	PARTMOV C	MCRT 1C	REEFER C	FLUSH C
		PFREQ C	SUBSCR C	WALK C	ESTEP C	LISTING C	GREYSN 1C	CYLSN C	SWEEP C	SNESTEP C
		SNOUT C								
	BV	IN 4D	OUT 4D							

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  60        YOKIFER   C   FILMCO    C   OFFWEGO  3C  MESHMKR   C  PARTGEN   C  YOKKY     C  PHASE0    C  YOKOUT    C  PARPLOT   C
            PHASE1    C   PHASE2    C   PHASE3   5C  REZONE    C  PARTMOV   C
  C         SUBSCR   10   CROSS    7D
  CBLOCK    REEFER  460
  CC        IN        3   OUT       3
  CELAREA   PHASE1    3   PHASE2    2
S CENTROY   CENTROY   1   WALK      2
  CENTX     FILMCO    0   OFFWEGO   D  MESHMKR   D  PARTGEN   0  YOKKY     D  PHASE0    0  YOKOUT    D  PARPLOT   0  PHASE1    D
            PHASE2    0   PHASE3    D  REZONE    D  PARTMOV   0  MCRT     2D  REEFER    0  FLUSH     D  CENTROY 170  WALK      D
            ESTEP     0   LISTING   D  GREYSN   10  SNESTEP   D  SNOUT     D
  CENTY     FILMCO    0   OFFWEGO   D  MESHMKR   0  PARTGEN   D  YOKKY     D  PHASE0    D  YOKOUT    0  PARPLOT   0  PHASE1    D
            PHASE2    0   PHASE3    0  REZONE   1D  PARTMOV   D  MCRT     20  REEFER    D  FLUSH     D  CENTROY 170  WALK      D
            ESTEP     0   LISTING   D  GREYSN   1D  SNESTEP   D  SNOUT     D
  CIRC      PHASE   1C
  COLARU    YOKIFER   C   FILMCO    C  OFFWEGO  1C  MESHMKR   C  PARTGEN   C  YOKKY     C  PHASE0    C  YOKOUT    C  PARPLOT   C
            PHASE1   1C   PHASE2   1C  PHASE3    C  REZONE    C  PARTMOV   C
F COMMON    YOKIFER  1C   LOOP      4  FILMCO    8  OFFWEGO  11  MESHMKR   9  PARTGEN   8  YOKKY     7  PHASE0    7  YOKOUT    8
            PARPLOT   8   PHASE1    8  PHASE2    7  PHASE3    8  REZONE    9  PARTMOV   8  MCRT      6  REEFER    7  FLUSH     6
            PFREQ     4   SUBSCR    4  CENTROY   1  WALK      7  HOWFAR    1  WHERE     1  ESTEP     6  LISTING   6  GREYSN    7
            CYLSN     6   SWEEP     5  SNESTEP   5  SNOUT     7
  CON       YOKOUT  250
S COPYF     OFFWEGO   2   REEFER    1
S COS       REEFER    2   POMEGA    1
  CPH       REEFER    2
  CPH1      POMEGA    4
  CO        FILMCO    0   OFFWEGO   0  MESHMKR   D  PARTGEN   0  YOKKY     D  PHASE0    0  YOKOUT  140  PARPLOT   0  PHASE1    D
            PHASE2    D   PHASE3    0  REZONE    D  PARTMOV   0  MCRT      D  REEFER    D  FLUSH     D  WALK      D  ESTEP     D
            LISTING   0   GREYSN    D  SNESTEP   D  SNOUT     D
L CRIMSN    YOKIFER   1   OFFWEGO   1  GREYSN    1  CYLSN     1  SWEEP     1  SNESTEP   1  SNOUT     1
S CROSS     POMEGA    4   CROSS     2
  C1        SWEEP    60   IN       20  OUT      2D
  CTR       REEFER    2
  CTHT      POMEGA    4
  CWGT      CENTROY  60   WALK    2.D
  CYL       YOKIFER   C   FILMCO    C  OFFWEGO  4C  MESHMKR  2C  PARTGEN   C  YOKKY     C  PHASE0    C  YOKOUT    C  PARPLOT   C
            PHASE1   2C   PHASE2   3C  PHASE3   5C  REZONE   1C  PARTMOV   C
S CYLSN     CYLSN     1
  D         YOKOUT    3   PHASE1    2  PHASE2    5  PHASE3    2  HOWFAR    8
S DATAREL   YOKIFER   1
F DATA      POMEGA    1   SUBSCR    2  WALK
S DATE1     OFFWEGO   1
  DBLINT    PHASE    1D   PHASE3   1D  MCRT     2D  ESTEP    1D  GREYSN   2D  SNESTEP  1D
  DCELL     REEFER   4C   CENTROY   C  WALK     1C  WHERE    1C
  DCEN      WALK      6
  DCOL      WALK      5
  DD        HOWFAR   11
  DELE      PHASE1    6
  DELSIG    SNESTEP   2
  DELSM     FILMCO    D   OFFWEGO   D  MESHMKR   D  PARTGEN   D  YOKKY     D  PHASE0    0  YOKOUT    D  PARPLOT   D  PHASE1   1D
            PHASE2   1D   PHASE3    D  REZONE    D  PARTMOV   D  MCRT      D  REEFER    D  FLUSH     D  WALK      D  ESTEP     D
            LISTING   0   GREYSN    D  SNESTEP   D  SNOUT     D
  DEL2      PHASE2    2
  DENS      MCRT     2C   REEFER    C  FLUSH     C  WALK     8C  ESTEP    CD  LISTING  CD
F DIMENS1   FILMCO    1   OFFWEGO   3  MESHMKR   2  PARTGEN   1  YOKKY     1  PHASE0    1  YOKOUT    3  PARPLOT   2  PHASE1    1
            PHASE2    1   PHASE3    2  REZONE    1  PARTMOV   1  MCRT      1  REEFER    2  FLUSH     1  POMEGA    1  CROSS     1
            CENTROY   1   WALK      2  HOWFAR    1  WHERE     1  ESTEP     2  LISTING   2  GREYSN    1  CYLSN     1  SWEEP     1
            IN        2   OUT       2  SNGEN     1  SNESTEP   1  SNOUT     2
  DISC      HOWFAR    7
S DLCIR     SNOUT     2
  DLOG      MCRT      7   SUBSCR    2  WALK      6  GREYSN    5
  DMAX      ESTEP     5   SNESTEP   3
  DMFP      WALK      2
  DMIN      MCRT      3   ESTEP     5  SNESTEP   5
  DMOVE     WALK      4
  DNEG      HOWFAR    7
S DONE      LOOP      1   OFFWEGO   1  MESHMKR   5  PHASE0    1  YOKOUT    2  PHASE1    2  PHASE2    4  PHASE3    7  REZONE    3
            MCRT      1   REEFER    1  ESTEP     1  LISTING   1  GREYSN    1  SNESTEP   1  SNOUT     3
  DP        PHASE2    5   MCRT      4  WALK      5
  DPLS      HOWFAR    7
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  DN        YOKCUT   6    PHASE2   4
  DR        OFFWEGO  3C   MESHMKR  1C   PARTGEN  C    SNOUT    6
  DRMAX     YOKCUT   6
  DRMIN     YOKCUT   6
  DROO      YOKCUT   4    SNOUT    5
  DRPAR     PARTGEN  6
S DRV       YOKCUT   22   PARPLOT  4    SNOUT    2
  DSIE      SNESTEP  4
  DT        YOKIFER  C    LOOP     C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   3C   YOKOUT   2C
            PARPLOT  C    PHASE1   16C  PHASE2   3C   PHASE3   11C  REZONE   3C   PARTMOV  2C   MCRT     1C   REEFER   C    FLUSH    C
            PFREQ    C    SLBSCR   C    WALK     C    ESTEP    C    LISTING  C    GREYSN   1C   CYLSN    C    SWEEP    C    SNESTEP  C
            SNOUT    C
  DTC       YOKIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   2C   PHASE2   C    PHASE3   5C   REZONE   C
            PARTMOV  C
  DTCSAV    YOKIFER  C    YOKKY    C    PHASE0   1C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   3C   REZONE   C
            PARTMOV  C
  DTFAC     PHASE1   2
  DTIC      YOKCUT   1C   PARPLOT  5
  DTOLD     MCRT     5    SNESTEP  6
  DTOLDER   MCRT     3
  DT016     PHASE3   2
  DT02      YOKIFER  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C    PHASE1   6C   PHASE2   2C   PHASE3   C    REZONE   C
            PARTMOV  C
  DT02P1    PHASE1   3    PHASE2   3
  DT02P2    PHASE1   3    PHASE2   3
  DT02P3    PHASE1   3    PHASE2   3
  DT02P4    PHASE1   3    PHASE2   3
  DTPDS     YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
            PHASE1   1C   PHASE2   C    PHASE3   2C   REZONE   C    PARTMOV  C
  DTH       YOKIFER  C    LOOP     C    FILMCO   C    OFFWEGO  4C   MESHMKR  C    PARTGEN  C    YOKKY    1C   PHASE0   C    YOKOUT   1C
            PARPLOT  C    PHASE1   3C   PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  C    MCRT     13C  REEFER   C    FLUSH    C
            PFREQ    C    SLBSCR   C    WALK     C    ESTEP    C    LISTING  C    GREYSN   8C   CYLSN    C    SWEEP    C    SNESTEP  6C
            SNOUT    C
  DTRI      PARTMOV  C
  DTV       YOKIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   2C   PHASE2   5C   PHASE3   C    REZONE   C
            PARTMOV  C
  DTVSAV    YOKIFER  C    YOKKY    C    PHASE0   1C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   3C   PHASE3   C    REZONE   C
            PARTMOV  C
  DUDR      PHASE1   3
  DUDX      PHASE2   5
  DUMMY     REEFER   6    PCHEGA   2    PFREQ    5    WALK     3
  DUVYR     PHASE1   2    PHASE2   2
  DVDY      YOKIFER  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C    PHASE1   3C   PHASE2   5C   PHASE3   C    REZONE   C
            PARTMOV  C
  DX        CENTRDY  4    HOWFAR   5
  DX1       CENTRDY  4
  DXJ       CENTRDY  6
  DX5       REZONE   6
  DY        CENTRDY  4    HOWFAR   11
  DY1       CENTRDY  6
  DYJ       CENTRDY  4
  DY5       REZONE   6
  DZ        OFFWEGO  3C   MESHMKR  7C   PARTGEN  C    SWEEP    8    IN       3    OUT      3    SNOUT    4
  DZMAX     YOKCUT   6
  DZMIN     YOKCUT   6
  DZP       SWEEP    6    IN       4    OUT      4
  DZPAR     PARTGEN  5
  D1L       HOWFAR   5
  D12       PARTMOV  4
  D13       PARTMOV  6
  D14       PARTMOV  4
  D2        OFFWEGO  3
  D23       PARTMOV  4
  D34       PARTMOV  4
  E         FILMCO   D    OFFWEGO  1D   MESHMKR  3D   PARTGEN  D    YOKKY    D    PHASE0   D    YOKOUT   D    PARPLOT  D    PHASE1   1D
            PHASE2   25D  PHASE3   2D   REZONE   D    PARTMOV  D    MCRT     D    REEFER   D    FLUSH    D    WALK     D    ESTEP    D
            LISTING  D    GREYSN   D    SWEEP    5D   IN       3D   OUT      3D   SNGEN    7D   SNESTEP  D    SNOUT    D
  EABS      ESTEP    1    SNESTEP  7
  EALL      MCRT     3
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  EDLOCK    MCRJ      C   REEFER   C   FLUSH    1C  WALK     (4C  ESTEP     3C  LISTING   C
  ECELL     SNESTEP   3
  ECELLDT   SNESTEP   3
  ECEN      MCRT      C   REEFER   7C  FLUSH    C   WALK     C    ESTEP     2C  LISTING   C
  ECCNT     REEFER    6
S ECHD      LOOP      6   OFFWEGO  1   PARPLOT  1   PARTMOV  2    REEFER    4   CENTRCY   3   WHERE    8   SWEEP    2
S ECWR      LOOP      5   OFFWEGO  1   PARTGEN  (   PARTMOV  2    REEFER    1   SWEEP     2
  EDLATIC   REEFER    6   WALK     2
  EDEP      WALK    750   ESTEP    80
  EDIE      REEFER    5
  EEMIT     ESTEP     9
  EIGT      MCRT      6
  EKIN      MCRT      0
  ELOST     ESTEP    11   SNESTEP  4
  EMC       MCRT      C   REEFER   3C  FLUSH    C   WALK     C    ESTEP     2C  LISTING   C
  EMIT      ESTEP     2
  EMOH      SWEEP    8D   IN       30  OUT      3D
  EMUMLC    FILMCO    0   OFFWEGO  0   MESHMKR  0   PARTGEN  0    YOKKY     D   PHASE0    D   YOKOUT   D   PARPLOT  D   PHASE1   D
            PHASE2    0   PHASE3   D   REZONE   0   PARTMOV  D    MCRT      D   REEFER    D   FLUSH    D   WALK     D   ESTEP    D
            LISTING   0   GREYSN   D   SNESTEP  D   SNOUT    30
S EMPTY     YOKOUT    1
  ENSH      ESTEP    40   LISTING  1D
  EMID      YOKIFER   C   LOOP     C   FILMCO   C   OFFWEGO  2C   MESHMKR   C   PARTGEN   2C  YOKKY    1C  PHASE0   C   YOKOUT   4C
            PARPLOT   C   PHASE(   1C  PHASE2   2C  PHASE3   1C   REZONE    C   PARTMOV   C   MCRT     2C  REEFER   C   FLUSH    C
            PFRED     C   SUBSCR   C   WALK     C   ESTEP    C    LISTING   C   GREYSN    2C  CYLSN    C   SWEEP    C   SNESTEP  C
            SNOUT     C
F ENCODE    YOKOUT    5   PARPLOT  (   SNOUT    1
F ENDFILE   YOKIFER   4   REEFER   2   GREYSN   2
  ENEW      WALK      3
F ENTRY     LOOP      7
F EOF       OFFWEGO   2
  EOI       OFFWEGO  30
  EP        FILMCO    0   OFFWEGO  D   MESHMKR  0   PARTGEN  D    YOKKY     D   PHASE0    D   YOKOUT   D   PARPLOT  D   PHASE1   D
            PHASE2    0   PHASE3   7D  REZONE   0   PARTMOV  D    MCRT      D   REEFER    D   FLUSH    D   WALK     D   ESTEP    D
            LISTING   0   GREYSN   D   SNESTEP  0   SNOUT    D
  EPART     REEFER   2:   WALK     14  ESTEP    60  LISTING  1D
  EPUT      PHASE.    3
  EPS       YOKIFER   C   FILMCO   C   OFFWEGO  3C  MESHMKR  C    PARTGEN   C   YOKKY     C   PHASE0   C   YOKOUT   C   PARPLOT  C
            PHASE1    C   PHASE2   1C  PHASE3   C   REZONE   C    PARTMOV   C
F EQUIVAL   FILMCO    1   OFFWEGO  1   MESHMKR  (   PARTGEN  1    YOKKY     1   PHASE0    1   YOKOUT   2   PARPLOT  1   PHASE1   1
            PHASE2    1   PHASE3   (   REZONE   1   PARTMOV  1    MCRT      1   REEFER    1   FLUSH    1   WALK     1   ESTEP    2
            LISTING   2   GREYSN   1   CYLSN    2   SWEEP    1    SNESTEP   1   SNOUT     1
  ERAD      REEFER    6
  ERR       CYLSN     4
  ES        IN        2   OUT      2
  ESCORE    WALK      3
  ESN       GREYSN    6
S ESTEP     ESTEP     1
  ETAB      YOKIFER   C   LOOP     C   FILMCO   C   OFFWEGO  4C   MESHMKR   3C  PARTGEN   C   YOKKY    C   PHASE0   C   YOKOUT   C
            PARPLOT   C   PHASE(   C   PHASE2   C   PHASE3   1C   REZONE    C   PARTMOV   C   MCRT     C   REEFER   C   FLUSH    C
            PFREW     C   SUBSCR   C   WALK     C   ESTEP    1C   LISTING   C   GREYSN    C   CYLSN    C   SWEEP    C   SNESTEP  1C
            SNOUT     C
  ETIL      FILMCO    D   OFFWEGO  D   MESHMKR  D   PARTGEN  D    YOKKY     D   PHASE0    D   YOKOUT   D   PARPLOT  D   PHASE1   D
            PHASE.   7D   PHASE3   5D  REZONE   0   PARTMOV  D    MCRT      D   REEFER    D   FLUSH    D   WALK     D   ESTEP    D
            LISTING   0   GREYSN   D   SNESTEP  0   SNOUT    D
  EJUT      ESTEP     3
S EXIT      SNGEN     1
S EXP       MESHMKR   1   REZONE   3   WALK
  F8        PHASE.    7
  FCP2      REZONE    1'
  FCX       REZONE    1.
  FC3       REZONE    1,
  FDEN      MESHMKR   7
  ILM       YOKIFER   2
S FILMCO    FILMCO    1   OFFWEGO  1   PHASE3   1
  FIPXL     YOKIFER   C   FILMCO   5C  OFFWEGO  C   MESHMKR  C    PARTGEN   C   YOKOUT    1C  PARPLOT  2C  PHASE3   C   REZONE   C
            PARTMOV   C   GREYSN   C   SNOUT    2C
  FIPXR     YOKIFER   C   FILMCO   5C  OFFWEGO  C   MESHMKR  C    PARTGEN   C   YOKOUT    1C  PARPLOT  C   PHASE3   C   REZONE   C
            PARTMOV   C   GREYSN   C   SNOUT    C
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  FIPYB    YOKIFER   C  FILMCO   5C  OFFWEGO   C  MESHMKR   C  PARTGEN   C  YOKOUT  1C  PARPLOT 3C  PHASE3   C  REZONE   C
           PARTMOV   C  GREYSN    C  SNOUT    2C
  FIPYT    FILMCO    5  YOKOUT    1
  FIXL     YOKIFER   C  FILMCO   5C  OFFWEGO   C  MESHMKR   C  PARTGEN   C  YOKOUT 12C  PARPLOT  C  PHASE3   C  REZONE   C
           PARTMOV   C  GREYSN    C  SNOUT    2C
  FIXLO    YOKOUT    2
  FIXR     YOKIFER   C  FILMCO   5C  OFFWEGO   C  MESHMKR   C  PARTGEN   C  YOKOUT  3C  PARPLOT  C  PHASE3   C  REZONE   C
           PARTMOV   C  GREYSN    C  SNOUT     C
  FIXRO    YOKOUT    2
  FIYB     YOKIFER   C  FILMCO   5C  OFFWEGO   C  MESHMKR   C  PARTGEN   C  YOKOUT 12C  PARPLOT  C  PHASE3   C  REZONE   C
           PARTMOV   C  GREYSN    C  SNOUT    2C
  FIYBO    YOKOUT    2
  FIYT     FILMCO    5  YOKOUT    3
  FIYTO    YOKOUT    2
  FL       PHASE3    7
  FLAGU    PHASE1    6
  FLAGV    PHASE1    6
S FLUAT    YOKIFER   1  FILMCO    1  MESHMKR   2  YOKOUT    7  PARPLOT   3  PHASE1   (  REEFER   2  SNESTEP  1
S FLUSH    REEFER    1  FLUSH     1  WALK      5
  FMUOP    PHASE2    4
  FM1      PHASE3    3
  FM2      PHASE3    3
  FM3      PHASE3    3
  FM4      PHASE3    3
  FNUM     MESHMKR   8
F FORMAT   YOKIFER   3  OFFWEGO  14  MESHMKR   9  PARTGEN   4  PHASE0    6  YOKOUT  16  PARPLOT  4  PHASE2   1  REZONE   1
           PARTMOV   1  MCRT      3  REEFER    6  WALK      1  ESTEP     3  LISTING  2  GREYSN   2  CYLSN    1  SWEEP    1
           SNESTEP   4  SNOUT     1
  FOUT     SWEEP    90  IN       30  OUT      3D
  FOUTLC   FILMCO    D  OFFWEGO   D  MESHMKR   D  PARTGEN   D  YOKKY     D  PHASE0   D  YOKOUT   D  PARPLOT  D  PHASE1   D
           PHASE2    D  PHASE3    D  REZONE    D  PARTMOV   D  MCRT      D  REEFER   D  FLUSH    D  WALK     D  ESTEP    D
           LISTING   D  GREYSN    D  SNESTEP  8D  SNOUT     D
  FR       PHASE3    7
S FRAME    PARPLOT   2  SNOUT     2
  FREQ     YOKIFER   C  LOOP      C  FILMCO    C  OFFWEGO  3C  MESHMKR   C  PARTGEN  C  YOKKY    C  PHASE0   C  YOKOUT   C
           PARPLOT   C  PHASE1    C  PHASE2    C  PHASE3    C  REZONE    C  PARTMOV  C  MCRT     C  REEFER   C  FLUSH    C
           PFREQ    2C  SUBSCR    C  WALK      C  ESTEP     C  LISTING   C  GREYSN   C  CYLSN    C  SWEEP    C  SNESTEP  C
           SNOUT     C
  FREQP    REEFER    9  PFREQ     6  SUBSCR    2  WALK      9
  FREZ     OFFWEGO  5C  MESHMKR  9C  PARTGEN   C
  FSCAT    MCRT     3C  REEFER    C  FLUSH     C  WALK     8C  ESTEP    CD  LISTING CD
  FSET1    YOKIFER   (
  FSET12   YOKIFER   1
  FSET2    YOKIFER   1
  FSET3    YOKIFER   1
  FSET4    YOKIFER   1
  FSET6    YOKIFER   1
  FSET7    YOKIFER   1
  FSN      FILMCO    D  OFFWEGO   D  MESHMKR   D  PARTGEN   D  YOKKY     D  PHASE0   D  YOKOUT   D  PARPLOT  D  PHASE1   D
           PHASE2    D  PHASE3    D  REZONE    D  PARTMOV   D  MCRT     1D  REEFER   D  FLUSH    D  WALK     D  ESTEP    D
           LISTING  1D  GREYSN   1D  SNESTEP   D  SNOUT     D
  FSP      WALK      7
  FSTF     REZONE    3
  FSTORE   WALK     11  ESTEP     3
  FT       YOKOUT    D  PHASE3   7D
  FT3      PHASE3    5
  F24      PHASE3    5
S GETEMP   OFFWEGO   1  MESHMKR   3
S GETQ     YOKIFER   1  OFFWEGO   1
  GGM1     PHASE1    2
  GM1      YOKIFER   C  FILMCO    C  OFFWEGO  3C  MESHMKR  1C  PARTGEN   C  YOKKY    C  PHASE0   C  YOKOUT   C  PARPLOT  C
           PHASE1    C  PHASE2    C  PHASE3    C  REZONE   2C  PARTMOV   C
  GM2      REZONE    4
  GR       YOKIFER   C  FILMCO    C  OFFWEGO  3C  MESHMKR   C  PARTGEN   C  YOKKY    C  PHASE0   C  YOKOUT   C  PARPLOT  C
           PHASE1   2C  PHASE2    C  PHASE3    C  REZONE    C  PARTMOV   C
  GRUVEL   YOKIFER   C  LOOP      C  FILMCO    C  OFFWEGO  3C  MESHMKR   C  PARTGEN  C  YOKKY    C  PHASE0   C  YOKOUT   C
           PARPLOT   C  PHASE1    C  PHASE2    C  PHASE3   3C  REZONE    C  PARTMOV  C  MCRT     C  REEFER   C  FLUSH    C
           PFREQ     C  SUBSCR    C  WALK      C  ESTEP     C  LISTING   C  GREYSN   C  CYLSN    C  SWEEP    C  SNESTEP  C
           SNOUT     C
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L GREEN    YOKIFER  1    OFFWEGO  1    MCRT     1    REEFER   1    FLUSH    1    WALK     1    ESTEP    1    LISTING  1
S GREYSN   GREYSN   1
  GRIR     FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   10
           PHASE2   10   PHASE3   0    REZONE   0    PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
           LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
  GRIZ     FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   10
           PHASE2   10   PHASE3   0    REZONE   0    PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
           LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
  GZ       YOKIFER  C    FILMCO   C    OFFWEGO  3C   MESHMKR  2C   PARTGEN  C    YOKKY    C    PHASE0   1C   YOKOUT   C    PARPLOT  C
           PHASE1   2C   PHASE2   C    PHASE3   C    REZONE   1C   PARTMOV  C
S HOWFAR   HOWFAR   1
  HR13     PHASE1   3    PHASE2   3
  HR24     PHASE1   3    PHASE2   3
  I        YOKIFER  6C   LOOP     1C   FILMCO   1C   OFFWEGO  36C  MESHMKR  24C  PARTGEN  C    YOKKY    C    PHASE0   6C   YOKOUT   11C
           PARPLOT  C    PHASE1   8C   PHASE2   11C  PHASE3   29C  REZONE   16C  PARTMOV  9C   MCRT     2C   REEFER   9C   FLUSH    C
           PFREQ    C    SUBSCR   C    WALK     3C   HOWFAR   10   WHERE    4    ESTEP    4C   LISTING  2C   GREYSN   2C   CYLSN    6C
           SWEEP    34C  IN       24   OUT      24   SNGEN    8    SNESTEP  3C   SNOUT    6C
S IABS     MESHMKR  2
  IBARK    REEFER   8
  IBAR     YOKIFER  C    LOOP     C    FILMCO   1C   OFFWEGO  8C   MESHMKR  1C   PARTGEN  C    YOKKY    C    PHASE0   3C   YOKOUT   4C
           PARPLOT  C    PHASE1   1C   PHASE2   5C   PHASE3   6C   REZONE   3C   PARTMOV  1C   MCRT     2C   REEFER   2C   FLUSH    C
           PFREQ    C    SUBSCR   C    CENTROY  2C   WALK     1C   WHERE    1C   ESTEP    2C   LISTING  C    GREYSN   1C   CYLSN    4C
           SWEEP    9C   SNESTEP  3C   SNOUT    3C
  IBOB     MESHMKR  1C
  IBUF     LOOP     9
  ICEL     PARTMOV  3
  IC1      YOKOUT   6
  IC2      YOKOUT   6
  ID       MCRT     C    REEFER   1C   FLUSH    3C   WALK     25C  ESTEP    C    LISTING  C
  IDIE     REEFER   9    WALK     5
  IDIC     YOKIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   1C   REZONE   C
           PARTMOV  C
  IDIV     YOKIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   1C   PHASE3   C    REZONE   C
           PARTMOV  C
  IDUMP    YOKIFER  6
  IDI      WALK     1
  IEC      LOOP     4    PARTMOV  2
  IECP     YOKIFER  C    FILMCO   C    OFFWEGO  2C   MESHMKR  C    PARTGEN  1C   YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  1C
           PHASE1   C    PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  7C
  IECPX    PARTMOV  2
  IECR     LOOP     18
  IECS     OFFWEGO  6    REEFER   13   CENTROY  6    WHERE    19   SWEEP    10
  IECW     LOOP     12
  IESCAP   MCRT     C    REEFER   9C   FLUSH    C    WALK     2C   ESTEP    C    LISTING  C
  IFAKE    PHASE2   2
  II       OFFWEGO  2    MESHMKR  8    YOKOUT   1    PHASE3   2    IN       2
  IJ       YOKIFER  C    LOOP     6C   FILMCO   5C   OFFWEGO  27C  MESHMKR  81C  PARTGEN  C    YOKKY    C    PHASE0   34C  YOKOUT   54C
           PARPLOT  C    PHASE1   42C  PHASE2   70C  PHASE3   99C  REZONE   62C  PARTMOV  7C   MCRT     16C  REEFER   25C  FLUSH    C
           PFREQ    C    SUBSCR   C    WALK     C    ESTEP    13C  LISTING  2C   GREYSN   13C  CYLSN    C    SWEEP    29C  SNESTEP  24C
           SNOUT    12C
  IJA      YOKOUT   6
  IJB      YOKOUT   6
  IJLEN    REEFER   19
  IJOUT    SNESTEP  3
  IJK      OFFWEGO  2    SUBSCR   2    WALK     2
  IJM      YOKIFER  C    LOOP     5C   FILMCO   C    OFFWEGO  3C   MESHMKR  12C  PARTGEN  C    YOKKY    C    PHASE0   2C   YOKOUT   22C
           PARPLOT  C    PHASE1   8C   PHASE2   23C  PHASE3   12C  REZONE   9C   PARTMOV  C    MCRT     C    REEFER   C    FLUSH    C
           PFREQ    C    SUBSCR   C    WALK     C    ESTEP    1C   LISTING  8C   GREYSN   C    CYLSN    C    SWEEP    C    SNESTEP  C
           SNOUT    C
  IJMAX    GREYSN   2
  IJMIN    MCRT     3
  IJMS     LOOP     14
  IJP      YOKIFER  C    LOOP     3C   FILMCO   C    OFFWEGO  4C   MESHMKR  13C  PARTGEN  C    YOKKY    C    PHASE0   17C  YOKOUT   19C
           PARPLOT  C    PHASE1   24C  PHASE2   27C  PHASE3   41C  REZONE   14C  PARTMOV  5C   MCRT     6C   REEFER   22C  FLUSH    C
           PFREQ    C    SUBSCR   C    WALK     C    ESTEP    2C   LISTING  C    GREYSN   5C   CYLSN    C    SWEEP    C    SNESTEP  C
           SNOUT    C
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  IJPS     YOKIFER   0   LOOP     80   FILMCO    0   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0
           PARPLOT   0   PHASE1   10   PHASE2    0   PHASE3   10   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK      0   ESTEP     0   LISTING   0   GREYSN    0   CYLSN     0   SWEEP     0   SNESTEP   0
           SNOUT     0
  IJS      LOOP      3
  IJSC     MESHMKR  25   PHASE0    5   PHASE3    4   MCRT     10   REEFER    6   WALK     16   ESTEP    16   LISTING   6   GREYSN    6
           CYLSN    12   SWEEP    17   SNESTEP   6
  IJSC1    WALK      8
  IJSC2    WALK      8
  IJSTORE  WALK      8
  IJTR     ESTEP     2
  IJ1      YOKOUT    6
  IJ2      YOKOUT    6
  IMESH    REZONE    2
  IMJ      OFFWEGO   3   MESHMKR   4   PHASE1    6   PHASE2   15   PHASE3    8   REZONE    6
  IMJM     OFFWEGO   3   PHASE1    9   PHASE2   13   PHASE3    3
  IMJP     PHASE1    9
  IM1      YOKIFER   0   FILMCO    0   OFFWEGO  10   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0   10   YOKOUT   10   PARPLOT   0
           PHASE1    0   PHASE2    0   PHASE3    0   REZONE   20   PARTMOV   0
S IN       SWEEP     2   IN        1
  INEW     HOWFAR    6   WHERE    14
  INP      YOKIFER   1
S IN1      OFFWEGO   1
  IOLD     WALK     10   HOWFAR   30   WHERE     3
  IPJ      OFFWEGO   4   MESHMKR   5   PHASE0   13   YOKOUT   26   PHASE1   18   PHASE2   26   PHASE3   33   REZONE   15   PARTMOV   6
           MCRT      8   REEFER    6   ESTEP     2   LISTING   2   GREYSN    5   SNESTEP   2
  IPJA     YOKOUT    4
  IPJB     YOKOUT    4
  IPJM     YOKOUT   13   PHASE1    9   ESTEP     1   LISTING   2
  IPJP     OFFWEGO   4   MESHMKR   5   PHASE0    6   YOKOUT   14   PHASE1   21   PHASE2   21   PHASE3   29   REZONE    7   PARTMOV   5
           MCRT      6   REEFER    6   ESTEP     2   GREYSN    4
  IPXL     YOKIFER   0   FILMCO   10   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKOUT   10   PARPLOT  40   PHASE3    0   REZONE    0
           PARTMOV   0   GREYSN    0   SNOUT    10
  IPXR     YOKIFER   0   FILMCO   10   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKOUT   10   PARPLOT  50   PHASE3    0   REZONE    0
           PARTMOV   0   GREYSN    0   SNOUT    10
  IPYB     YOKIFER   0   FILMCO   10   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKOUT   10   PARPLOT  50   PHASE3    0   REZONE    0
           PARTMOV   0   GREYSN    0   SNOUT    10
  IPYT     YOKIFER   0   FILMCO   10   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKOUT   10   PARPLOT  50   PHASE3    0   REZONE    0
           PARTMOV   0   GREYSN    0   SNOUT    10
  IP1      YOKIFER   0   LOOP      0   FILMCO   10   OFFWEGO  80   MESHMKR 140   PARTGEN   0   YOKKY     0   PHASE0   20   YOKOUT   30
           PARPLOT   0   PHASE1   40   PHASE2   30   PHASE3   70   REZONE   60   PARTMOV  30   MCRT     10   REEFER   30   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK     60   ESTEP    30   LISTING  20   GREYSN   20   CYLSN    20   SWEEP    40   SNESTEP  10
           SNOUT     0
  IP2      YOKIFER   0   FILMCO    0   OFFWEGO  20   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0   PARPLOT   0
           PHASE1    0   PHASE2    0   PHASE3   10   REZONE    0   PARTMOV   0
  IRITE    YOKOUT   13   PARPLOT   4
  IRNG     WALK     11
  ISC      CENTRGY  11   WALK      6
  ISCF1    YOKIFER   0   LOOP     20   FILMCO    0   OFFWEGO  20   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0
           PARPLOT   0   PHASE1    0   PHASE2    0   PHASE3    0   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK      0   ESTEP     0   LISTING   0   GREYSN    0   CYLSN     0   SWEEP     0   SNESTEP   0
           SNOUT     0
  ISCF     YOKIFER   0   LOOP     20   FILMCO    0   OFFWEGO  10   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0
           PARPLOT   0   PHASE1   10   PHASE2    0   PHASE3   10   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK      0   ESTEP     0   LISTING   0   GREYSN    0   CYLSN     0   SWEEP     0   SNESTEP   0
           SNOUT     0
  ISC2     YOKIFER   0   LOOP     80   FILMCO    0   OFFWEGO  30   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0
           PARPLOT   0   PHASE1   10   PHASE2    0   PHASE3   10   REZONE    0   PARTMOV  20   MCRT      0   REEFER    0   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK      0   ESTEP     0   LISTING   0   GREYSN    0   CYLSN     0   SWEEP     0   SNESTEP   0
           SNOUT     0
  ISC3     YOKIFER   0   LOOP     40   FILMCO    0   OFFWEGO  10   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0
           PARPLOT   0   PHASE1    0   PHASE2    0   PHASE3    0   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0
           PFREQ     0   SUBSCR    0   WALK      0   ESTEP     0   LISTING   0   GREYSN    0   CYLSN     0   SWEEP     0   SNESTEP   0
           SNOUT     0
  ISN      OFFWEGO   2   GREYSN   30   CYLSN    60   SNOUT     0
  ISNP     CYLSN    20
  ISTEP    WALK      5   CYLSN     5
  ISUB     SUBSCR    4
  ISVW     YOKOUT    2
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IT	SWEEP	10	IN	30	OUT	20												
ITAB	YOKIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	3C								
ITEM	PARTMOV	3																
ITEST	WHERE	24																
ITG	PHASE	4																
ITIC	PARPLOT	2																
ITM	PHASE	4																
ITV	YOKIFER	C	LOOP	1C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C	MORT	C	REEFER	C	FLUSH	C
	PFREQ	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
	SNOUT	C																
IUNF	OFFWEGO	5C	MESHMKR	1C	PARTGEN	C												
IXL	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	16C	PARPLOT	C	PHASE3	C	REZONE	C
	PARTMOV	C	GREYSN	C	SNOUT	1C												
IXL0	YOKOUT	2																
IXH	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	C	PHASE3	C	REZONE	C
	PARTMOV	C	GREYSN	C	SNOUT	1C												
IXH0	YOKOUT	2																
IX1	YOKOUT	290	PARPLOT	9	SNOUT	4												
IX2	YOKOUT	120	PARPLOT	2	SNOUT	4												
IX3	YOKOUT	7	PARPLOT	2														
IX4	YOKOUT	3																
IYB	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	2C	PHASE3	C	REZONE	C
	PARTMOV	C	GREYSN	C	SNOUT	2C												
IYB0	YOKOUT	2																
IYT	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	1C	PHASE3	C	REZONE	C
	PARTMOV	C	GREYSN	C	SNOUT	1C												
IYT0	YOKOUT	2																
IY1	YOKOUT	310	PARPLOT	11	SNOUT	4												
IY2	YOKOUT	140	PARPLOT	2	SNOUT	4												
IY3	YOKOUT	7	PARPLOT	2														
IY4	YOKOUT	3																
IZZ	YOKIFER	2																
IZ	SWEEP	5																
J	YOKIFER	C	LOOP	2C	FILMCO	1C	OFFWEGO	20C	MESHMKR	32C	PARTGEN	C	YOKKY	C	PHASE0	10C	YOKOUT	12C
	PARPLOT	C	PHASE1	14C	PHASE2	16C	PHASE3	20C	REZONE	20C	PARTMOV	12C	MORT	2C	REEFER	10C	FLUSH	C
	PFREQ	C	SUBSCR	C	WALK	3C	WHERE	4	ESTEP	6C	LISTING	3C	GREYSN	6C	CYLSN	4C	SWEEP	12C
	IN	4	CUT	4	SNGEN	9	SNESTEP	4C	SNOUT	8C								
JBAR	YOKIFER	C	LOOP	C	FILMCO	C	OFFWEGO	7C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	1C	YOKOUT	1C
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	2C	PARTMOV	C	MORT	C	REEFER	C	FLUSH	C
	PFREQ	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	1C	SWEEP	6C	SNESTEP	1C
	SNOUT	C																
JBMESH	REZONE	3																
JBOT	MESHMKR	3																
JBOB	MESHMKR	4																
JCEN	YOKIFER	C	OFFWEGO	1C	MORT	C	REEFER	6C	FLUSH	C	WALK	C	ESTEP	C	LISTING	C		
JOB	MESHMKR	2																
JOT	MESHMKR	2																
JOTC	YOKIFER	C	YOKKY	C	PHASE0	2C	YOKOUT	C	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	1C	REZONE	C
	PARTMOV	C																
JOTV	YOKIFER	C	YOKKY	C	PHASE0	2C	YOKOUT	C	PARPLOT	C	PHASE1	C	PHASE2	1C	PHASE3	C	REZONE	C
	PARTMOV	C																
JJ	OFFWEGO	2	MESHMKR	5	PHASE0	2	YOKOUT	1	PHASE3	2	SWEEP	2						
JMID	OFFWEGO	5C	MESHMKR	5C	PARTGEN	C												
JMT	SWEEP	6																
JNEW	HOWFAR	4	WHERE	15														
JNM	YOKIFER	C	FILMCO	C	OFFWEGO	3C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	3C	PARPLOT	1C
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C								
JOLD	PARTMOV	3	WALK	11	HOWFAR	3C	WHERE	4										
JP1	YOKIFER	C	LOOP	C	FILMCO	C	OFFWEGO	3C	MESHMKR	2C	PARTGEN	C	YOKKY	C	PHASE0	4C	YOKOUT	4C
	PARPLOT	C	PHASE1	2C	PHASE2	5C	PHASE3	7C	REZONE	2C	PARTMOV	1C	MORT	1C	REEFER	2C	FLUSH	C
	PFREQ	C	SUBSCR	C	CENTROY	3C	WALK	1C	WHERE	1C	ESTEP	2C	LISTING	C	GREYSN	3C	CYLSN	2C
	SWEEP	2C	SNESTEP	2C	SNOUT	3C												
JP2	YOKIFER	1C	LOOP	C	FILMCO	1C	OFFWEGO	9C	MESHMKR	4C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	3C
	PARPLOT	C	PHASE1	6C	PHASE2	9C	PHASE3	6C	REZONE	8C	PARTMOV	C	MORT	C	REEFER	1C	FLUSH	C
	PFREQ	C	SUBSCR	C	WALK	C	ESTEP	1C	LISTING	1C	GREYSN	C	CYLSN	C	SWEEP	1C	SNESTEP	C
	SNOUT	C																

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  JP4       YOKIFER  C   FILMCO   C   OFFWEGO 2C  MESHMKR  C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C
            PHASE1   C   PHASE2   C   PHASE3  1C  REZONE   C   PARTMOV  C
  JRITE     YOKOUT   4   PARPLOT  2
  JSC       CENTROY 12   WALK     6
  JSUB      SUBSCH   7
  JSVW      YOKOUT   2
  JSWTCH1   YOKIFER  C   FILMCO   C   OFFWEGO 3C  MESHMKR 3C   PHASE1  1C   REZONE   C
  JSWTCH2   YOKIFER 1C   FILMCO   C   OFFWEGO 1C  MESHMKR  C   PHASE1   C   PHASE3   C   REZONE  1C
  JSWTCH3   YOKIFER  C   FILMCO   C   OFFWEGO 3C  MESHMKR  C   PHASE1   C   REZONE   C
  JT        SWEEP   10   IN      10   OUT     10
  J1G       PHASE    4
  JTM       PHASE    4
  JTMESH    REZONE   2
  JTUP      MESHMKR  3
  JURF      OFFWEGO  6
  JURFC2    OFFWEGO 1C   MESHMKR 3C   PARTGEN  C
  JXL       SNOUT    3
  JYB       SNOUT    3
  K         OFFWEGO  6   YOKOUT  17   REEFER   2   ESTEP    3   IN       4   OUT      6   SNGEN   18
  KA        OUT      2
  KEEP      MCRT     3
  KK        YOKOUT  15
  KKU       PARTMOV  4
  KP        OFFWEGO  5   PARTGEN  9   PARPLOT  6   PARTMOV.12
  KRG       YOKOUT   3
  KR1       YOKOUT   6
  KSTEP     OFFWEGO  1
  KSUB      SUBSCH  17
  KTTL      YOKIFER  2
  KX1       YOKIFER  C   FILMCO   C   OFFWEGO 3C  MESHMKR  C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C
            PHASE1  2C   PHASE2  2C   PHASE3   C  REZONE   C   PARTMOV  C
  K1        YOKOUT   6
  K2        YOKOUT   6
  K3        YOKOUT   6
  K4        YOKOUT   6
  L         YOKOUT   9   IN       1   OUT      2   SNGEN   15
  LA        SNGEN    4
  LAM       YOKIFER  C   FILMCO  CD   OFFWEGO 4CD MESHMKR CD   PARTGEN CD   YOKKY   CD   PHASE0  CD   YOKOUT  CD   PARPLOT CD
            PHASE1 1CD   PHASE2 1CD   PHASE3  CD  REZONE  CD   PARTMOV CD   MCRT     D   REEFER   D   FLUSH    D   WALK     D
            ESTEP    D   LISTING  D   GREYSN   D  SNESTEP  D   SNOUT    D
  LAMD      FILMCO   D   OFFWEGO  D   MESHMKR  D  PARTGEN  D   YOKKY    D   PHASE0   D   YOKOUT   D   PARPLOT  D   PHASE1  4D
            PHASE2  4D   PHASE3   D   REZONE   D  PARTMOV  D   MCRT     D   REEFER   D   FLUSH    D   WALK     D   ESTEP    D
            LISTING  D   GREYSN   D   SNESTEP  D  SNOUT    D
L LAVNUER   MCRT     1   REEFER   1   FLUSH    1  WALK     1   ESTEP    1   LISTING  1
  LBET1     CYLSN    4
  LBET2     CYLSN    3
F LCM       YOKIFER  3   LTOP     3   FILMCO   3  OFFWEGO  3   MESHMKR  3   PARTGEN  3   YOKKY    3   PHASE0   3   YOKOUT   3
            PARPLOT  3   PHASE1   3   PHASE2   3  PHASE3   3   REZONE   3   PARTMOV  3   MCRT     3   REEFER   3   FLUSH    3
            PFREQ    3   SUBSCH   3   WALK     3  ESTEP    3   LISTING  3   GREYSN   3   CYLSN    3   SWEEP    3   SNESTEP  3
            SNOUT    3
  LE        CYLSN    4
  LENGTH    YOKIFER  6
  LENGTH2   REEFER   4   ESTEP    2   GREYSN   1
F LEAT      PHASE    1   PHASE3   1   MCRT     1  ESTEP    1   GREYSN   1   SNESTEP  1
S LINCNT    YOKOUT   7   PARPLOT  3
  LINES     YOKOUT   6   LISTING  6
S LISTING   LISTING  1
  LJP2      YOKIFER  C   FILMCO   C   OFFWEGO 5C  MESHMKR  C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C
            PHASE1  1C   PHASE2   C   PHASE3  1C  REZONE   C   PARTMOV  C
  LL        YOKOUT  11
S LOCF      YOKIFER  2   OFFWEGO  3
F LOGICAL   OFFWEGO  1
S LOOP      LOOP     1   FILMCO   1   OFFWEGO  2  MESHMKR  6   PHASE0   1   YOKOUT   7   PHASE1   2   PHASE2   4   PHASE3   7
            REZONE   4   MCRT     1   REEFER   1  ESTEP    1   LISTING  1   GREYSN   1   SNESTEP  1   SNOUT    3
S LOOPD     LOOP     1   OFFWEGO  1   PHASE3   1
  LPB       OFFWEGO  2   PARTGEN  2   PARPLOT  2  PARTMOV  6
  LSTATUS   YOKIFER  3   REEFER   4   ESTEP    2  GREYSN   1
  LU        CYLSN    4
  LW        CYLSN    4
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  M         FILMCO    0   OFFWEGO  50   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0   PARPLOT   0   PHASE1    0
            PHASE2    0   PHASE3    0   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0   WALK      0   ESTEP     0
            LISTING   0   GREYSN    0   IN       19   OUT      17   SNGEN    11   SNESTEP   0   SNOUT     0
  MASK      WALK     30
 *MA1       MESHMKR   0
 *MA1L      MESHMKR   0
L MAUVE     REEFER    1   CENTROY   1   WALK      1   HOWFAR    1   WHERE     1
S MAXII     OFFWEGO   2   SUBSCR    1   SWEEP     1
S MCRT      MCRT      1
S MESHMKR   OFFWEGO   1   MESHMKR   1
  MI        REEFER   10   WALK      C
S MINU      OFFWEGO   1   SUBSCR    3
  MJ        REEFER   1C   WALK      C
  MM        CYLSN     7   SWEEP     3   SNGEN     2
S MOVE      OFFWEGO   (   GREYSN    1
  MP        FILMCO    0   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0   PARPLOT   0   PHASE1    0
            PHASE2    0   PHASE3   70   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0   WALK      0   ESTEP     0
            LISTING   0   GREYSN    0   SNESTEP   0   SNOUT     0
  MQ        REEFER   1C   WALK      C
  MQ1       REEFER   1C   WALK      C
  MU        YOKIFER   C   FILMCO   CD   OFFWEGO 5CD   MESHMKR  CD   PARTGEN  CD   YOKKY    CD   PHASE0   CD   YOKOUT   CD   PARPLOT  CD
            PHASE1  1CD   PHASE2  1CD   PHASE3   CD   REZONE   CD   PARTMOV  CD   MCRT      D   REEFER    D   FLUSH     D   WALK      D
            ESTEP     0   LISTING   0   GREYSN    0   SNESTEP   0   SNOUT     0
  MU02      FILMCO    0   OFFWEGO   0   MESHMKR   0   PARTGEN   0   YOKKY     0   PHASE0    0   YOKOUT    0   PARPLOT   0   PHASE1   50
            PHASE2   30   PHASE3    0   REZONE    0   PARTMOV   0   MCRT      0   REEFER    0   FLUSH     0   WALK      0   ESTEP     0
            LISTING   0   GREYSN    0   SNESTEP   0   SNOUT     0
  MUSTIT    PHASE2    4
  M1        SWEEP     5
  M2        SWEEP     2
  N         YOKOUT    6   SNGEN     5
S NAUD      PHASE1    1
  NAME      YOKIFER  2C   LOOP      C   FILMCO    C   OFFWEGO  7C   MESHMKR   C   PARTGEN   C   YOKKY     C   PHASE0    C   YOKOUT   3C
            PARPLOT  1C   PHASE1    C   PHASE2    C   PHASE3    C   REZONE    C   PARTMOV   C   MCRT      C   REEFER    C   FLUSH     C
            PFREQ     C   SUBSCR    C   WALK      C   ESTEP     C   LISTING   C   GREYSN    C   CYLSN     C   SWEEP     C   SNESTEP   C
            SNOUT     C
 *NANGLS    YOKIFER   C   FILMCO    C   OFFWEGO   C   MESHMKR   C   PARTGEN   C   YOKKY     C   PHASE0    C   YOKOUT    C   PARPLOT   C
            PHASE1    C   PHASE2    C   PHASE3    C   REZONE    C   PARTMOV   C
  NB        MESHMKR   4
  NBANK     REEFER   18
  NBP       YOKIFER   C   OFFWEGO  3C   MCRT      C   REEFER   5C   FLUSH     C   WALK      C   ESTEP     C   LISTING   C
  NBUF      YOKIFER   C   OFFWEGO  3C   MCRT      C   REEFER    C   FLUSH     C   WALK     5C   ESTEP    1C   LISTING   C
  NB2       MESHMKR   3
  NCEN      REEFER   18
  NCOL      MCRT      C   REEFER   9C   FLUSH     C   WALK     2C   ESTEP     C   LISTING   C
  NCP       REEFER    7
  NCYC      YOKIFER   C   LOOP      C   FILMCO    C   OFFWEGO  1C   MESHMKR   C   PARTGEN   C   YOKKY     C   PHASE0   2C   YOKOUT   6C
            PARPLOT  1C   PHASE1   4C   PHASE2    C   PHASE3    C   REZONE    C   PARTMOV   C   MCRT     4C   REEFER    C   FLUSH     C
            PFREQ     C   SUBSCR    C   WALK      C   ESTEP     C   LISTING   C   GREYSN   2C   CYLSN     C   SWEEP     C   SNESTEP   C
            SNOUT     C
  NDALL     OFFWEGO   3
  NOTE      MCRT      C   REEFER   9C   FLUSH     C   WALK     2C   ESTEP     C   LISTING   C
  NDUMP     YOKIFER 14C   LOOP      C   FILMCO    C   OFFWEGO   C   MESHMKR   C   PARTGEN   C   YOKKY     C   PHASE0    C   YOKOUT    C
            PARPLOT   C   PHASE1    C   PHASE2    C   PHASE3    C   REZONE    C   PARTMOV   C   MCRT      C   REEFER    C   FLUSH     C
            PFREQ     C   SUBSCR    C   WALK      C   ESTEP     C   LISTING   C   GREYSN    C   CYLSN     C   SWEEP     C   SNESTEP   C
            SNOUT     C
  NE        LOOP     11   OFFWEGO   2   PARTGEN   (   PARPLOT   1   PARTMOV   4   REEFER    5   CENTROY   3   WHERE     6   SWEEP     4
  NECS      YOKIFER   6   OFFWEGO   8
  NEXP      YOKOUT   17   PARPLOT   5
  NFLUSH    MCRT      C   REEFER   3C   FLUSH    2C   WALK      C   ESTEP     C   LISTING   C
  NFRQ      YOKIFER   C   LOOP      C   FILMCO    C   OFFWEGO  5C   MESHMKR   C   PARTGEN   C   YOKKY     C   PHASE0    C   YOKOUT    C
            PARPLOT   C   PHASE1    C   PHASE2    C   PHASE3    C   REZONE    C   PARTMOV   C   MCRT      C   REEFER    C   FLUSH     C
            PFREQ    1C   SUBSCR   3C   WALK      C   ESTEP     C   LISTING   C   GREYSN    C   CYLSN     C   SWEEP     C   SNESTEP   C
            SNOUT     C
  NGEN      REEFER   11
  NL        MESHMKR   5
  NL1       MESHMKR   2
  NMOVE     MCRT      C   REEFER   9C   FLUSH     C   WALK     2C   ESTEP     C   LISTING   C
  NN        CYLSN     2   SWEEP    50   IN       20   OUT      20
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  NOPD     YOKIFER  C    LCOP     C    FILMCO   C    OFFWEGO  4C   MESHMKR  6C   PARTGEN  C    YOKKY    C    PHASE0   1C   YOKOUT   C
           PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   2C   REZONE   C    PARTMOV  C    MCRT     4C   REEFER   C    FLUSH    C
           PFREQ    C    SLBSCR   1C   WALK     1C   ESTEP    2C   LISTING  C    GREYSN   3C   CYLSN    C    SWEEP    C    SNESTEP  1C
           SNOUT    C
  NOPT     YOKIFER  C    LCOP     C    FILMCO   C    OFFWEGO  6C   MESHMKR  9C   PARTGEN  C    YOKKY    C    PHASE0   2C   YOKOUT   C
           PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   3C   REZONE   C    PARTMOV  C    MCRT     6C   REEFER   C    FLUSH    C
           PFREQ    C    SLBSCR   2C   WALK     1C   ESTEP    3C   LISTING  C    GREYSN   4C   CYLSN    C    SWEEP    C    SNESTEP  2C
           SNOLT    C
  NPCMAX   YOKIFER  C    OFFWEGO  3C   MCRT     C    REEFER   C    FLUSH    C    WALK     1C   ESTEP    C    LISTING  C
  NPCOL    WALK     4
  NPPT     OFFWEGO  5    PARPLOT  4    PARTMOV  8
  NPT      YOKIFER  1C   FILMCO   C    OFFWEGO  5C   MESHMKR  C    PARTGEN  11C  YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  3C
           PHASE1   C    PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  1C
  NQ       YOKIFER  C    LCOP     1C   FILMCO   1C   OFFWEGO  12C  MESHMKR  13C  PARTGEN  C    YOKKY    C    PHASE0   3C   YOKOUT   17C
           PARPLOT  C    PHASE1   13C  PHASE2   17C  PHASE3   29C  REZONE   14C  PARTMOV  2C   MCRT     2C   REEFER   17C  FLUSH    C
           PFREQ    C    SLBSCR   C    CENTROY  9C   WALK     C    WHERE    13C  ESTEP    2C   LISTING  2C   GREYSN   2C   CYLSN    C
           SWEEP    4C   SNESTEP  1C   SNOUT    3C
  NQ1      YOKIFER  1C   LCOP     21C  FILMCO   C    OFFWEGO  11C  MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C
           PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  4C   MCRT     C    REEFER   8C   FLUSH    C
           PFREQ    C    SLBSCR   C    CENTROY  3C   WALK     C    WHERE    8C   ESTEP    C    LISTING  C    GREYSN   C    CYLSN    C
           SWEEP    7C   SNESTEP  C    SNOUT    C
  NQ1B     YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   2C   PHASE2   2C   PHASE3   2C   REZONE   C    PARTMOV  C
  NQ12     YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   C    PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  1C
  NR       MESHMKR  1
 *NRVALS   YOKIFER  C    FILMCO   C    OFFWEGO  C    MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   C    PHASE2   C    PHASE3   C    REZONE   C    PARTMOV  C
  NR1      MESHMKR  2
  NSP      YOKIFER  C    OFFWEGO  3C   MCRT     C    REEFER   2C   FLUSH    C    WALK     C    ESTEP    C    LISTING  C
  NSTATE   OFFWEGO  2
  NT       MESHMKR  4
  NTHRU    YOKOUT   8
  NT2      MESHMKR  2
  NUMIT    YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C
           PHASE1   1C   PHASE2   4C   PHASE3   C    REZONE   C    PARTMOV  C
  NWL      OFFWEGO  1
  NYL8     YOKOUT   4
  NYUP     YOKOUT   4
  N1       HOWFAR   5
  N2       HOWFAR   5
S OFFWEGO  OFFWEGO  (
  OM       YOKIFER  C    FILMCO   C    OFFWEGO  3C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   C    PHASE2   1C   PHASE3   C    REZONE   C    PARTMOV  C
  OMAL13   PHASE3   3
  OMAL14   PHASE3   3
  OMANC    YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   C    PHASE2   1C   PHASE3   C    REZONE   C    PARTMOV  C
  OMCYL    YOKIFER  C    FILMCO   C    OFFWEGO  1C   MESHMKR  2C   PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
           PHASE1   C    PHASE2   C    PHASE3   5C   REZONE   1C   PARTMOV  C
  OMDIST   POMEGA   1(
  OMEGA    REEFER   210  POMEGA   190  WALK     40   HOWFAR   40
  OMEGAD   HOWFAR   10
  OP       WALK     2
  OPAL13   PHASE3   3
  OPAL14   PHASE3   3
  OPDEG    YOKIFER  C    LCOP     C    FILMCO   C    OFFWEGO  4C   MESHMKR  9C   PARTGEN  C    YOKKY    C    PHASE0   1C   YOKOUT   C
           PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   3C   REZONE   C    PARTMOV  C    MCRT     6C   REEFER   C    FLUSH    C
           PFREQ    C    SLBSCR   1C   WALK     2C   ESTEP    3C   LISTING  C    GREYSN   3C   CYLSN    C    SWEEP    C    SNESTEP  1C
           SNOUT    C
S OPEN     YOKIFER  8    OFFWEGO  8    YOKOUT   2    REEFER   7    ESTEP    2    LISTING  2
  OPSIG    OFFWEGO  2D
  OPIMP    YOKIFER  C    LCOP     C    FILMCO   C    OFFWEGO  2C   MESHMKR  9C   PARTGEN  C    YOKKY    C    PHASE0   1C   YOKOUT   C
           PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   2C   REZONE   C    PARTMOV  C    MCRT     4C   REEFER   C    FLUSH    C
           PFREQ    C    SLBSCR   C    WALK     2C   ESTEP    2C   LISTING  C    GREYSN   2C   CYLSN    C    SWEEP    C    SNESTEP  1C
           SNOUT    C
L ORANGE   YOKIFER  1    FILMCO   1    OFFWEGO  1    MESHMKR  1    PARTGEN  1    YOKKY    1    PHASE0   1    YOKOUT   1    PARPLOT  1
           PHASE1   1    PHASE2   1    PHASE3   1    REZONE   1    PARTMOV  1
S OUT      YOKIFER  1    SWEEP    2    OUT      1
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S OVERLAY  YOKIFER   4    YCKKY     5    MCRT      3    GREYSN    3
  P        FILMCO    0    OFFWEGO   0    MESHMKR   0    PARTGEN   0    YOKKY     0    PHASE0   30    YOKOUT   10    PARPLOT   0    PHASE1   40
           PHASE2   10    PHASE3    0    REZONE    0    PARTMOV   0    MCRT      0    REEFER    0    FLUSH     0    WALK      0    HOWFAR    7
           ESTEP     0    LISTING   0    GREYSN    0    SNESTEP   0    SNOUT     0
  PABS     ESTEP     3
S PARFNO   WALK      6
S PARPLOT  YOKOUT    1    PARPLOT   1
S PARTGEN  MESHMKR   1    PARTGEN   1
S PARTMOV  PHASE3    1    PARTMOV   1
  PCR      PARPLOT   1
  PDZ      PARPLOT   1
  PEMIT    ESTEP     3
S PFREQ    REEFER    1    PFREQ     1    WALK      1
  PH       REEFER    3
S PHASE0   PHASE0    1
S PHASE1   PHASE1    1
S PHASE2   PHASE2    1
S PHASE3   PHASE3    1
L PINK     YOKIFER   1    LOOP      1    FILMCO    1    OFFWEGO   1    MESHMKR   1    PARTGEN   1    YOKKY     1    PHASE0    1    YOKOUT    1
           PARPLOT   1    PHASE1    1    PHASE2    1    PHASE3    1    REZONE    1    PARTMOV   1    MCRT      1    REEFER    1    FLUSH     1
           PFREQ     1    SUBSCR    1    WALK      1    ESTEP     1    LISTING   1    GREYSN    1    CYLSN     1    SWEEP     1    SNESTEP   1
           SNOUT     1
  PITH     PHASE1    5    PHASE2    5
  PIXX     PHASE1    3    PHASE2    3
  PIXY     PHASE1    5    PHASE2    5
  PIYY     PHASE1    2    PHASE2    2
  PL       FILMCO    0    OFFWEGO   0    MESHMKR   0    PARTGEN   0    YOKKY     0    PHASE0    0    YOKOUT    0    PARPLOT   0    PHASE1    0
           PHASE2   30    PHASE3    0    REZONE    0    PARTMOV   0    MCRT      0    REEFER    0    FLUSH     0    WALK      0    ESTEP     0
           LISTING   0    GREYSN    0    SNESTEP   0    SNOUT     0
  PLMAX    PHASE2    4
  PLUST    ESTEP     3
S PLT      YOKOUT    4    PARPLOT   1
  PMARK    SNESTEP   3
S POMEGA   POMEGA    1    WALK      1
  POTE     PHASE    12
  POWER    SNESTEP   3
F PRINT    YOKIFER   3    OFFWEGO  13    MESHMKR   6    PARTGEN   3    PHASE1    6    PHASE2    1    REZONE    1    PARTMOV   1    MCRT      3
           REEFER    6    WALK      1    ESTEP     3    GREYSN    2    CYLSN     1    SWEEP     1    SNESTEP   4
  PRSIE    YOKOUT    3
  PRV      YOKOUT    3
  PTAB     YOKIFER   C    LOOP      C    FILMCO    C    OFFWEGO  4C    MESHMKR   C    PARTGEN   C    YOKKY     C    PHASE0   1C    YOKOUT    C
           PARPLOT   C    PHASE1    C    PHASE2    C    PHASE3    C    REZONE    C    PARTMOV   C    MCRT      C    REEFER    C    FLUSH     C
           PFREQ     C    SUBSCR    C    WALK      C    ESTEP     C    LISTING   C    GREYSN    C    CYLSN     C    SWEEP     C    SNESTEP   C
           SNOUT     C
  PTUP     PARPLOT   1
 *PUHUL    MESHMKR   0
 *PUHUP    MESHMKR   0
 *PUHUU    MESHMKR   0
 *PUHUV    MESHMKR   0
  PWR      SNESTEP   8
  PWR2     SNESTEP   3
  PXCONV   YOKIFER   C    FILMCO   1C    OFFWEGO   C    MESHMKR   C    PARTGEN   C    YOKOUT   1C    PARPLOT  2C    PHASE3    C    REZONE    C
           PARTMOV   C    GREYSN    C    SNOUT    2C
  PXL      YOKIFER   C    FILMCO   2C    OFFWEGO   C    MESHMKR   C    PARTGEN   C    YOKOUT    C    PARPLOT  2C    PHASE3    C    REZONE    C
           PARTMOV   C    GREYSN    C    SNOUT    1C
  PXR      YOKIFER   C    FILMCO   8C    OFFWEGO   C    MESHMKR   C    PARTGEN  3C    YOKOUT    C    PARPLOT  1C    PHASE3    C    REZONE    C
           PARTMOV  3C    GREYSN    C    SNOUT    1C
  PYB      YOKIFER   C    FILMCO   6C    OFFWEGO   C    MESHMKR   C    PARTGEN  3C    YOKOUT   3C    PARPLOT  2C    PHASE3    C    REZONE    C
           PARTMOV  3C    GREYSN    C    SNOUT    1C
  PYCONV   YOKIFER   C    FILMCO   1C    OFFWEGO   C    MESHMKR   C    PARTGEN   C    YOKOUT   1C    PARPLOT  3C    PHASE3    C    REZONE    C
           PARTMOV   C    GREYSN    C    SNOUT    2C
  PYT      YOKIFER   C    FILMCO   6C    OFFWEGO   C    MESHMKR   C    PARTGEN  3C    YOKOUT   3C    PARPLOT  2C    PHASE3    C    REZONE    C
           PARTMOV  3C    GREYSN    C    SNOUT    1C
  PYYMP    PHASE1    3
  Q        HOWFAR    4
S QEXPIO   OFFWEGO   1    MESHMKR   3    PHASE0    1    PHASE3    1    MCRT      1    SUBSCR    2    WALK      1    ESTEP     1    GREYSN    1
           SNESTEP   1
S QLOG     PFREQ     1    WALK      1
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S QLOGIU   OFFWEGO  2   MESHMKR  6   PHASE0   2   YOKOUT   4   PHASE3   2   MCRT     2   SUBSCR   1   WALK     2   ESTEP    2
           GREYSN   2   SNESTEP  2
  QMN      YOKOUT  11
  QMA      YOKOUT  21
S QSORT    MESHMKR  1   PHASE0   2   YOKOUT   6   PHASE1   2   PHASE2   1   PHASE3   2   REEFER   1   POMEGA   3   CROSS    1
           WALK     2   ESTEP    2   SNESTEP  2
  QX       PHASE2   3
  QY       PHASE2   2
  R        FILMCO   0   OFFWEGO  0   MESHMKR 1?0  PARTGEN  0   YOKKY    0   PHASE0   0   YOKOUT  80   PARPLOT  0   PHASE1  40
           PHASE2  60   PHASE3  90   REZONE  10   PARTMOV  0   MCRT     0   REEFER   0   FLUSH    0   WALK     0   HOWFAR   2
           ESTEP    0   LISTING  0   GREYSN   0   IN      60   OUT     60   SNESTEP  0   SNOUT    0
  RA       PHASE2   2   ESTEP    6
  RAUX     OFFWEGO  C   MESHMKR 1C   PARTGEN  C
S RANDOM   REEFER   6   POMEGA   2   PFREQ    5   WALK     3
  RAR      PHASE2   3
  RA1      REZONE   5
  RA2      REZONE   5
  RA3      REZONE   5
  RA4      REZONE   5
  RCSQ     FILMCO   0   OFFWEGO  0   MESHMKR  0   PARTGEN  0   YOKKY    0   PHASE0   0   YOKOUT   0   PARPLOT  0   PHASE1  10
           PHASE2  20   PHASE3   0   REZONE   0   PARTMOV  0   MCRT     0   REEFER   0   FLUSH    0   WALK     0   ESTEP    0
           LISTING  0   GREYSN   0   SNESTEP  0   SNOUT    0
S RDBUF    YOKIFER  2   REEFER   2   ESTEP    1   GREYSN   1
  RDT      YOKIFER  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C   PHASE1  2C   PHASE2  2C   PHASE3   C   REZONE  5C
           PARTMOV  C   ESTEP    4
  RE       ESTEP    5
F READ     OFFWEGO 26   MESHMKR  3   PARTGEN  (
F REAL     FILMCO   1   OFFWEGO  (   MESHMKR  1   PARTGEN  1   YOKKY    1   PHASE0   )   YOKOUT   1   PARPLOT  1   PHASE1   1
           PHASE2   1   PHASE3   )   REZONE   1   PARTMOV  1   MCRT     1   REEFER   1   FLUSH    1   WALK     1   ESTEP    1
           LISTING  1   GREYSN   1   SNESTEP  1   SNOUT    1
L REU      YOKIFER  1   LOOP     1   FILMCO   1   OFFWEGO  1   MESHMKR  1   PARTGEN  (   YOKKY    1   PHASE0   1   YOKOUT   1
           PARPLOT  1   PHASE1   1   PHASE2   1   PHASE3   1   REZONE   1   PARTMOV  )   MCRT     1   REEFER   1   FLUSH    1
           PFREQ    1   SUBSCR   1   WALK     1   ESTEP    1   LISTING  1   GREYSN   1   CYLSN    1   SWEEP    1   SNESTEP  1
           SNOUT    1
S REEFER   REEFER   1
S REMARK   YOKIFER  4   YOKKY    5   MCRT     3   REEFER   3   GREYSN   2
F RETURN   YOKIFER  1   LOOP     6   FILMCO   1   OFFWEGO  3   MESHMKR  2   PARTGEN  1   YOKKY    1   PHASE0   1   YOKOUT   1
           PARPLOT  1   PHASE1   1   PHASE2   1   PHASE3   1   REZONE   1   PARTMOV  1   MCRT     1   REEFER   1   FLUSH    1
           POMEGA   1   PFREQ    1   SUBSCR   1   CROSS    1   CENTROY  1   WALK     5   HOWFAR   1   WHERE    1   ESTEP    1
           LISTING  1   GREYSN   1   CYLSN    1   SWEEP    1   IN       1   OUT      (   SNGEN    1   SNESTEP  1   SNOUT    1
F REWIND   YOKIFER  5   OFFWEGO  2   MCRT     3   REEFER   6   ESTEP    1   GREYSN   4
S REZONE   PHASE3   1   REZONE   1
  REZRON   YOKIFER  C   FILMCO   C   OFFWEGO 4C   MESHMKR 1C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C
           PHASE1   C   PHASE2   C   PHASE3   C   REZONE  3C   PARTMOV  C
  REZSIE   YOKIFER  C   LOOP     C   FILMCO   C   OFFWEGO 4C   MESHMKR 4C   PARTGEN  C   YOKKY    C   PHASE0  1C   YOKOUT   C
           PARPLOT  C   PHASE1   C   PHASE2   C   PHASE3  2C   REZONE  4C   PARTMOV  C   MCRT     C   REEFER   C   FLUSH    C
           PFREQ    C   SUBSCR   C   WALK     C   ESTEP   2C   LISTING  C   GREYSN   C   CYLSN    C   SWEEP    C   SNESTEP 2C
           SNOUT    C
  REZYO    YOKIFER  C   FILMCO   C   OFFWEGO 4C   MESHMKR 2C   PARTGEN 2C   YOKKY    C   PHASE0  4C   YOKOUT   C   PARPLOT  C
           PHASE1   C   PHASE2   C   PHASE3   C   REZONE  2C   PARTMOV  C
  RHOD     WALK     4
  RHOP     REEFER  1C   CENTROY 1C   WALK    8C   WHERE   8C
  RIBAR    YOKIFER  C   FILMCO  2C   OFFWEGO  C   MESHMKR  C   PARTGEN  C   YOKOUT   C   PARPLOT  C   PHASE3   C   REZONE   C
           PARTMOV  C   GREYSN   C   SNOUT    C
L RICI     YOKIFER  1   LOOP     1   FILMCO   1   OFFWEGO  1   MESHMKR  1   PARTGEN  1   YOKKY    1   PHASE0   1   YOKOUT   1
           PARPLOT  1   PHASE1   1   PHASE2   1   PHASE3   1   REZONE   1   PARTMOV  1   MCRT     1   REEFER   1   FLUSH    1
           PFREQ    1   SUBSCR   1   WALK     1   ESTEP    1   LISTING  1   GREYSN   (   CYLSN    1   SWEEP    1   SNESTEP  1
           SNOUT    1
  RM       FILMCO   0   OFFWEGO 10   MESHMKR  0   PARTGEN  0   YOKKY    0   PHASE0  40   YOKOUT   0   PARPLOT  0   PHASE1  40
           PHASE2  50   PHASE3  20   REZONE   0   PARTMOV  0   MCRT     0   REEFER   0   FLUSH    0   WALK     0   ESTEP    0
           LISTING  0   GREYSN   0   SNESTEP  0   SNOUT    0
  RMEP     WALK     4
  RMP      FILMCO   0   OFFWEGO  0   MESHMKR  0   PARTGEN  0   YOKKY    0   PHASE0   0   YOKOUT   0   PARPLOT  0   PHASE1   0
           PHASE2   0   PHASE3  80   REZONE   0   PARTMOV  0   MCRT     0   REEFER   0   FLUSH    0   WALK     0   ESTEP    0
           LISTING  0   GREYSN   0   SNESTEP  0   SNOUT    0
  RNBP     REEFER   2
  RNP      REEFER   2
  RN1      REEFER   4   POMEGA   3   PFREQ    2   WALK     2
  RN2      REEFER   4   POMEGA   3   PFREQ    2
```

RN3	REEFER	4	PFREW	2														
RN4	REEFER	4	PFREG	2														
RO	FILMCO	0	OFFWEGO	10	MESHMKR	140	PARTGEN	0	YOKKY	0	PHASE0	20	YOKOUT	20	PARPLOT	0	PHASE1	40
	PHASE2	210	PHASE3	110	REZONE	0	PARTMOV	0	MCRT	10	REEFER	0	FLUSH	0	WALK	0	ESTEP	40
	LISTING	0	GREYSN	10	SNESTEP	60	SNOUT	0										
ROE	PHASE3	6																
ROI	MESHMKR	16																
ROJP7	MESHMKR	2																
ROJ1	MESHMKR	2																
ROL	FILMCO	0	OFFWEGO	0	MESHMKR	0	PARTGEN	0	YOKKY	0	PHASE0	0	YOKOUT	0	PARPLOT	0	PHASE1	10
	PHASE2	80	PHASE3	130	REZONE	30	PARTMOV	0	MCRT	0	REEFER	0	FLUSH	0	WALK	0	ESTEP	0
	LISTING	0	GREYSN	0	SNESTEP	0	SNOUT	0										
ROMFR	OFFWEGO	1C	MESHMKR	2C	PARTGEN	C												
ROSAV	MESHMKR	7																
RO1	PHASE	2																
RP1	PHASE3	3																
RP2	PHASE3	5																
RP3	PHASE3	3																
RP4	PHASE3	5																
RROI	MESHMKR	11																
RRVOL	MCRT	4																
RSN	GREYSN	2C	CYLSN	3C	SWEEP	50	SNOUT	4C										
*RVALS	YOKIFER	C	FILMCO	C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C								
RVOL	FILMCO	0	OFFWEGO	10	MESHMKR	10	PARTGEN	0	YOKKY	0	PHASE0	20	YOKOUT	30	PARPLOT	0	PHASE1	0
	PHASE2	130	PHASE3	100	REZONE	0	PARTMOV	0	MCRT	10	REEFER	0	FLUSH	0	WALK	0	ESTEP	10
	LISTING	0	GREYSN	10	SNESTEP	10	SNOUT	0										
RXY	PHASE1	4	PHASE2	4														
RZEDEN	FILMCO	0	OFFWEGO	0	MESHMKR	0	PARTGEN	0	YOKKY	0	PHASE0	0	YOKOUT	0	PARPLOT	0	PHASE1	0
	PHASE2	0	PHASE3	0	REZONE	0	PARTMOV	0	MCRT	20	REEFER	10	FLUSH	0	WALK	0	ESTEP	0
	LISTING	10	GREYSN	20	SNESTEP	0	SNOUT	0										
R1	MESHMKR	2	YOKOUT	5	PHASE1	4	PHASE2	9	PHASE3	10								
R1ROW	LOOP	1	MESHMKR	9														
R12	PHASE2	2	PHASE3	2														
R2	MESHMKR	2	YOKOUT	3	PHASE1	4	PHASE2	9	PHASE3	8								
R23	PHASE3	2																
R3	MESHMKR	2	YOKOUT	3	PHASE1	4	PHASE2	9	PHASE3	10								
R34	PHASE2	2	PHASE3	2														
R4	MESHMKR	2	YOKOUT	3	PHASE1	4	PHASE2	9	PHASE3	8								
R41	PHASE3	2																
S	PHASE2	2	SWEEP	60	IN	20	OUT	20										
SAV	PHASE	3																
SAVA	PHASE	4																
SAVB	PHASE	4																
SBET	POMEGA	2																
S SECOND	YOKIFER	2																
L SENSE	YOKIFER	1	FILMCO	1	OFFWEGO	1	MESHMKR	1	PHASE1	1	REZONE	1						
SE11J	LOOP	1	MESHMKR	9														
S SHIFT	REEFER	2	WALK	2	ESTEP	1												
SIE	FILMCO	0	OFFWEGO	10	MESHMKR	150	PARTGEN	0	YOKKY	0	PHASE0	70	YOKOUT	20	PARPLOT	0	PHASE1	20
	PHASE2	10	PHASE3	50	REZONE	30	PARTMOV	0	MCRT	10	REEFER	0	FLUSH	0	WALK	0	ESTEP	60
	LISTING	0	GREYSN	0	SNESTEP	70	SNOUT	0										
SIEI	MESHMKR	14																
SIEMIG	MCRT	5C	REEFER	3C	FLUSH	C	WALK	C	ESTEP	C	LISTING	C						
SIETOT	SNESTEP	5																
SIGA	YOKIFER	0	LOOP	0	FILMCO	0	OFFWEGO	10	MESHMKR	0	PARTGEN	0	YOKKY	0	PHASE0	0	YOKOUT	0
	PARPLOT	0	PHASE1	0	PHASE2	0	PHASE3	0	REZONE	0	PARTMOV	0	MCRT	0	REEFER	0	FLUSH	0
	PFREG	0	SUBSCR	0	WALK	10	ESTEP	0	LISTING	0	GREYSN	0	CYLSN	0	SWEEP	0	SNESTEP	0
	SNOUT	0																
S SIGN	PHASE3	6	HOWFAR	3														
SIGNU	WALK	4																
SIGPLC	FILMCO	0	OFFWEGO	0	MESHMKR	0	PARTGEN	0	YOKKY	0	PHASE0	0	YOKOUT	0	PARPLOT	0	PHASE1	0
	PHASE2	0	PHASE3	0	REZONE	0	PARTMOV	0	MCRT	10	REEFER	0	FLUSH	0	WALK	0	ESTEP	0
	LISTING	10	GREYSN	10	SNESTEP	0	SNOUT	0										
L SILVEN	YOKIFER	1	FILMCO	1	OFFWEGO	1	MESHMKR	1	PARTGEN	1	YOKOUT	1	PARPLOT	1	PHASE3	1	REZONE	1
	PARTMOV	1	GREYSN	1	SNOUT	1												
S SIN	REEFER	2	POMEGA	1														
S SKIPR	OFFWEGO	1																
SLOPC	HOWFAR	5																

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  SLOPE2   ROWFAR    6
  SNCO     YOKIFER   C   OFFWEGO  3C   GREYSN   2C   CYLSN   1CO  SWEEP     C   SNESTEP  C   SNOUT    C
S SNESTEP  SNESTE    1
S SNGEN    CYLSN     1   SNGEN    1
S SNOUT    SNOUT     1
L SNOWITE  GREYSN    1   CYLSN    1    SNOUT    1
  SP       MCRT      6   GREYSN   6
  SPENOK   PHASE     2
  SPH      REEFER    2
  SPHI     POMEGA    4
  SPTBL    YOKIFER   C   LOOP     C    FILMCO   C    OFFWEGO 7C   MESHMKR   C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C
           PARPLOT   C   PHASE1   C    PHASE2   C    PHASE3  C    REZONE    C   PARTMOV  C   MCRT    1C   REEFER   C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK     C    ESTEP   C    LISTING   C   GREYSN  1C   CYLSN    C   SWEEP    C   SNESTEP  C
           SNOUT     C
S SSWTCH   OFFWEGO   3
S START    LOOP      1   FILMCO   1    OFFWEGO  2    MESHMKR 5    PHASE0    1   YOKOUT   8   PHASE1   2   PHASE2   4   PHASE3   7
           REZONE    4   MCRT     1    REEFER   1    ESTEP   1    LISTING   1   GREYSN   1   SNESTEP  1   SNOUT    3
S STARTO   LOOP      1   OFFWEGO  1    PHASE3   1
L STATE    YOKIFER   1   LOOP     1    FILMCO   1    OFFWEGO 1    MESHMKR   1   PARTGEN  1   YOKKY    1   PHASE0   1   YOKOUT   1
           PARPLOT   1   PHASE1   1    PHASE2   1    PHASE3  1    REZONE    1   PARTMOV  1   MCRT     1   REEFER   1   FLUSH    1
           PFREQ     1   SUBSCR   1    WALK     1    ESTEP   1    LISTING   1   GREYSN   1   CYLSN    1   SWEEP    1   SNESTEP  1
           SNOUT     1
  STH      REEFER    3
  STHT     POMEGA   11
S SUBSCR   SUBSCR    1   WALK     1
  SUM      SWEEP     5
S SWEEP    CYLSN     1   SWEEP    1
  SWICH    REZONE    4
  S2       ROWFAR    2
  T        YOKIFER   C   LOOP     C    FILMCO   C    OFFWEGO 2C   MESHMKR   C   PARTGEN  C   YOKKY   1C   PHASE0  3C   YOKOUT  5C
           PARPLOT  1C   PHASE1  4C    PHASE2   C    PHASE3  C    REZONE    C   PARTMOV  C   MCRT    3C   REEFER   C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK     C    ESTEP   C    LISTING   C   GREYSN  3C   CYLSN    C   SWEEP    C   IN       9
           OUT       9   SNGEN    9    SNESTEP  C    SNOUT   C
  TAMB     YOKIFER   C   LOOP     C    FILMCO   C    OFFWEGO 3C   MESHMKR   C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C
           PARPLOT   C   PHASE1   C    PHASE2   C    PHASE3 2C    REZONE    C   PARTMOV  C   MCRT     C   REEFER   C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK    2C    ESTEP  2C    LISTING   C   GREYSN   C   CYLSN    C   SWEEP    C   SNESTEP 3C
           SNOUT     C
  TAVG     ESTEP     3   SNESTEP  3
  TCYCLE   YOKIFER   5
  TDUMP    YOKIFER   7
  TE       PHASE     3
  TEMIT    YOKIFER   C   OFFWEGO 3C    MCRT    1C    REEFER 1C    FLUSH     C   WALK     C   ESTEP    C   LISTING  C
  TEMP     YOKIFER   C   LOOP     C    FILMCO   C    OFFWEGO C    MESHMKR 11C   PARTGEN  C   YOKKY    C   PHASE0  3C   YOKOUT   C
           PARPLOT   C   PHASE1   C    PHASE2   C    PHASE3 1C    REZONE    C   PARTMOV  C   MCRT    1C   REEFER  2C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK   10C    ESTEP  1C    LISTING  1C   GREYSN  2C   CYLSN    C   SWEEP    C   SNESTEP 4C
           SNOUT     C
  TEMPI    MESHMKR  13
  TEMP4    PHASE     2
  TEST     WHERE     8
  TGMX     PHASE     5
  TH       REEFER    3
  THIGH    PHASE3    7   ESTEP    7    SNESTEP  7
  THIRD    YOKIFER   C   FILMCO   C    OFFWEGO 1C    MESHMKR C    PARTGEN   C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT  C
           PHASE1    C   PHASE2   C    PHASE3   C    REZONE  C    PARTMOV   C
  THY      YOKIFER   C   LOOP     C    FILMCO   C    OFFWEGO 1C   MESHMKR   C   PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C
           PARPLOT   C   PHASE1   C    PHASE2   C    PHASE3  C    REZONE    C   PARTMOV  C   MCRT     C   REEFER   C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK     C    ESTEP  4C    LISTING   C   GREYSN   C   CYLSN    C   SWEEP    C   SNESTEP  C
           SNOUT     C
  TI       PHASE     8
  TIAMB    PHASE     8
  TIC      YOKOUT   40   PARPLOT 20
  TIME     YOKIFER  3C   LOOP     C    FILMCO   C    OFFWEGO 6C   MESHMKR   C   PARTGEN  C   YOKKY   2C   PHASE0   C   YOKOUT  1C
           PARPLOT   C   PHASE1  2C    PHASE2   C    PHASE3  C    REZONE    C   PARTMOV  C   MCRT    7C   REEFER  2C   FLUSH    C
           PFREQ     C   SUBSCR   C    WALK     C    ESTEP  2C    LISTING   C   GREYSN  7C   CYLSN    C   SWEEP    C   SNESTEP-1C
           SNOUT     C
  TITLE    SNOUT    30
  TJ       MESHMKR   3
  TK       PHASE     8
  TLOG     MCRT      5   SUBSCR   4    WALK     6    GREYSN  3
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TLOW	PHASE3	5	ESTEP	5	SNESTEP	5												
TMAX	PHASE3	5	ESTEP	5	SNESTEP	5												
TMUT	PHASE3	3																
TMIN	MCRT	3																
*TNEUT	YOKIFER	C	FILMCO	C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C								
TOUT	YOKIFER	1C	LEOP	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YOKKY	1C	PHASE0	C	YOKOUT	5C
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C	MCRT	1C	REEFER	C	FLUSH	C
	PFREQ	C	SCBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	1C	CYLSN	C	SWEEP	C	SNESTEP	C
	SNOUT	C																
TP	MCRT	5	REEFER	4	PFREQ	2	WALK	6	SNGEN	4								
TP4	MCRT	3																
TSTART	YOKIFER	C	LEOP	C	FILMCO	C	OFFWEGO	3C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	2C
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C	MCRT	C	REEFER	C	FLUSH	C
	PFREQ	C	SCBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
	SNOUT	C																
TTL	YOKIFER	3																
TWELTH	PHASE3	5																
T1	YOKIFER	3	MCRT	C	REEFER	3C	FLUSH	C	WALK	7C	ESTEP	C	LISTING	C				
T2	YOKIFER	6	OFFWEGO	2	MCRT	5C	REEFER	C	FLUSH	C	WALK	2C	ESTEP	2C	LISTING	C	GREYSN	5
U	FILMCO	D	OFFWEGO	4D	MESHMKR	9D	PARTGEN	D	YOKKY	D	PHASE0	12D	YOKOUT	16D	PARPLOT	D	PHASE1	30D
	PHASE2	5D	PHASE3	1:D	REZONE	1D	PARTMOV	4D	MCRT	4D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SWEEP	5D	IN	4D	OUT	4D	SNGEN	46D	SNESTEP	D	SNOUT	D		
UAV	PHASE1	2																
UD1	PHASE3	2																
UD2	PHASE3	2																
UD3	PHASE3	2																
UD4	PHASE2	2	PHASE3	2														
UG	FILMCO	D	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D
	PHASE2	D	PHASE3	17D	REZONE	12D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
UG1	PHASE3	2																
UG2	PHASE3	2																
UG3	PHASE3	2																
UG4	PHASE3	2																
UI	MESHMKR	11																
UK	PARTMOV	3																
UL	FILMCO	D	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D
	PHASE2	16D	PHASE3	1:D	REZONE	2D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
UL1	PHASE3	7																
UL13	PHASE3	2																
UL2	PHASE3	7																
UL24	PHASE3	2																
UL3	PHASE3	7																
UL4	PHASE3	7																
UMAX	SNOUT	5																
UMOM	PHASE	5	SWEEP	8D	IN	3D	OUT	3D										
UMOMLL	FILMCO	D	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D
	PHASE2	D	PHASE3	D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	3D										
UNITY	PUMEGR	2																
S UNFKFN	REEFER	1	ESTEP	1														
UOR	PHASE1	4	PHASE2	7														
UP	FILMCO	D	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D
	PHASE2	D	PHASE3	14D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
URTOT	MCRT	5	SNESTEP	5														
URT	PHASE3	2	ESTEP	2	SNESTEP	2												
UT	REZONE	5																
UTIL	FILMCO	D	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	13D
	PHASE2	1D	PHASE3	D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
	LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
U1	YOKOUT	6	PHASE1	1.	PHASE2	9	PARTMOV	3										
UJL	PHASE2	3																
UJ2	PHASE2	2	PHASE3	2														
UJ3M	PHASE2	3																
U2	YOKOUT	6	PHASE1	8	PHASE2	9	PARTMOV	2										
U2L	PHASE2	3																

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U23     PHASE3   2
U24     PHASE1   3
U24M    PHASE2   3
U3      YOKOUT   6    PHASE1   1[illegible]  PHASE2   9    PARTMOV  3
U3L     PHASE2   3
U31     PHASE1   3
U34     PHASE2   2    PHASE3   2
U4      YOKOUT   6    PHASE1   1[illegible]  PHASE2   11   PARTMOV  2
U4L     PHASE2   3
U41     PHASE3   2
U5      PHASE1   16
U6      PHASE1   5
U7      PHASE1   7
U8      PHASE1   5
U9      PHASE1   7
V       FILMCO   0    OFFWEGO  40   MESHMKR  90   PARTGEN  0    YOKKY    0    PHASE0   120  YOKOUT   160  PARPLOT  0    PHASE1   300
        PHASE2   50   PHASE3   110  REZONE   10   PARTMOV  40   MCRT     40   REEFER   0    FLUSH    0    WALK     0    ESTEP    0
        LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
VAV     PHASE1   2
V01     PHASE3   2
V02     PHASE3   2
V03     PHASE3   2
V04     PHASE2   2    PHASE3   2
VELIJ   PHASE1   2
VELMX   PHASE1   2
VG      FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   0
        PHASE2   0    PHASE3   180  REZONE   180  PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
        LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
VG1     PHASE3   2
VG2     PHASE3   2
VG3     PHASE3   2
VG4     PHASE3   2
VI      MESHMKR  11
VK      PARTMOV  3
VL      FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   0
        PHASE2   120  PHASE3   1 0  REZONE   30   PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
        LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
VL1     PHASE3   7
VL13    PHASE3   2
VL2     PHASE3   7
VL24    PHASE3   2
VL3     PHASE3   7
VL4     PHASE3   7
VMAX    YOKOUT   6    SNOUT    5
VMUM    PHASE[illegible]   5
VOL     SNESTEP  5
VOLC    PHASE3   5
VOLR    PHASE3   3
VOLT    PHASE3   3
VP      FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   0
        PHASE2   0    PHASE3   120  REZONE   0    PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
        LISTING  0    GREYSN   0    SNESTEP  11   SNOUT    0
VT8     REZONE   5
VTEM    YOKIFEM  C    FILMCO   C    OFFWEGO  1C   MESHMKR  C    PARTGEN  C    YOKKY    C    PHASE0   C    YOKOUT   C    PARPLOT  C
        PHASE1   C    PHASE2   C    PHASE3   C    REZONE   1C   PARTMOV  C
VTEMP   PHASE2   13
VTIL    FILMCO   0    OFFWEGO  0    MESHMKR  0    PARTGEN  0    YOKKY    0    PHASE0   0    YOKOUT   0    PARPLOT  0    PHASE1   110
        PHASE2   10   PHASE3   0    REZONE   0    PARTMOV  0    MCRT     0    REEFER   0    FLUSH    0    WALK     0    ESTEP    0
        LISTING  0    GREYSN   0    SNESTEP  0    SNOUT    0
VTJ     REZONE   5
VV      YOKIFEM  C    FILMCO   1C   OFFWEGO  C    MESHMKR  C    PARTGEN  C    YOKOUT   2C   PARPLOT  C    PHASE3   C    REZONE   C
        PARTMOV  C    GREYSN   C    SNOUT    C
V1      YOKOUT   6    PHASE1   9    PHASE2   7    PARTMOV  3
V1L     PHASE2   3
V12     PHASE3   2
V13M    PHASE2   3
V2      YOKOUT   6    PHASE1   7    PHASE2   7    PARTMOV  2
V2L     PHASE2   3
V23     PHASE3   2
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	V24	PHASE1	3																
	V24N	PHASE2	3																
	V3	YOKOUT	6	PHASE1	9	PHASE2	7	PARTMOV	3										
	V3L	PHASE2	3																
	V31	PHASE1	3																
	V34	PHASE3	2																
	V4	YOKOUT	6	PHASE1	9	PHASE2	9	PARTMOV	2										
	V4L	PHASE2	3																
	V41	PHASE3	2																
	V5	PHASE1	18																
	V6	PHASE1	5																
	V7	PHASE1	7																
	V8	PHASE1	5																
	V9	PHASE1	7																
	W	SWEEP	50	IN	50	OUT	50	SNGEN	990										
S	WALK	REEFER	3	WALK	1														
S	WHERE	REEFER	1	WALK	1	WHERE	1												
L	WRITE	YOKIFER	1	FILMCO	1	OFFWEGO	1	MESHMKR	1	PARTGEN	1	YOKKY	1	PHASE0	1	YOKOUT	1	PARPLOT	1
		PHASE1	1	PHASE2	1	PHASE3	1	REZONE	1	PARTMOV	1								
S	WLCH	YOKOUT	2																
	WMAX	YOKOUT	0																
F	WRITE	YOKIFER	6	OFFWEGO	1?	MESHMKR	5	PARTGEN	2	PHASE0	6	YOKOUT	17	PARPLOT	4	REZONE	1	MCRT	3
		REEFER	8	ESTEP	3	LISTING	2	GREYSN	3	CYLSN	1	SWEEP	1	SNESTEP	4				
	WSAV	YOKOUT	3																
S	WTBUF	YOKIFER	2	REEFER	4	FLUSH	1	GREYSN	1										
	W1	CENTROY	4																
	W1ROW	COGP	1	MESHMKR	9														
	W2	CENTROY	4																
	X	FILMCO	10	OFFWEGO	10	MESHMKR	120	PARTGEN	0	YOKKY	0	PHASE0	80	YOKOUT	190	PARPLOT	0	PHASE1	40
		PHASE2	80	PHASE3	110	REZONE	10?	PARTMOV	40	MCRT	40	REEFER	250	FLUSH	0	PFREQ	5	WALK	0
		ESTEP	0?	LISTING	10	GREYSN	50	SNESTEP	0	SNOUT	0								
	XA1	REEFER	5																
	XA2	REEFER	5																
	XA3	REEFER	5																
	XC	PARTGEN	8																
	XCAT	MCRT	2																
	XCO	YOKOUT	40																
	XCONV	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	2C												
	XCONVP	YOKOUT	11																
	XD	FILMCO	1C	PARTGEN	8	HOWFAR	4C												
	XDCELL	REEFER	6																
	XDIR	MCRT	3	SNESTEP	3														
	XEDEN	REEFER	8																
	XEPART	REEFER	17																
	XFREQP	REEFER	12																
	XFRGT	REEFER	30																
	XFSN	GREYSN	2																
	XGM1	PHASE1	3																
	XI	OFFWEGO	2																
	XL	YOKIFER	C	FILMCO	2C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	9C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	C												
	XLUG	SUBSCR	5																
	XMSENG	PHASE1	6																
	XNCP	REEFER	2																
	XNE	WHERE	12																
	XNW	WHERE	11																
	XOMEGA1	REEFER	4																
	XOMEGA2	REEFER	4																
	XOMEGA3	REEFER	4																
	XP	OFFWEGO	2	MESHMKR	18	PARTMOV	4	POMEGA	80										
	XPAR	FILMCO	0	OFFWEGO	10	MESHMKR	0	PARTGEN	20	YOKKY	0	PHASE0	0	YOKOUT	0	PARPLOT	20	PHASE1	0
		PHASE2	0	PHASE3	0	REZONE	0	PARTMOV	40	MCRT	0	REEFER	0	FLUSH	0	WALK	0	ESTEP	0
		LISTING	0	GREYSN	0	SNESTEP	0	SNOUT	0										
	XPX3	PARTMOV	4																
	XP1	PHASE3	4																
	XP2	PHASE3	6																
	XP3	PHASE3	4																
	XP4	PHASE2	6																

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  XR        YOKJFER   C   FILMCO    8C  OFFWEGO   C   MESHMKR  2C   PARTGEN   C   YOKOUT   1C   PARPLOT   C   PHASE3    C   REZONE    C
            PARTMOV   C   GREYSN    C   SNOUT     C
  XRITE     PARTGEN   2
  XRW       REEFER    3
  XR13      PHASE2    6
  XR24      PHASE2    6
  XSE       WHERE    13
  XS1E      MCR1      5
  XSW       WHERE    12
  XTAB      OFFWEGO  20
  XTE       PARTGEN   7   PARTMOV   4
  XT1C      YOKOUT   1C   PARPLOT   5
  XU        SNOUT     2
  XUG       PHASE2    2
  XV        SNOUT     2
  XVG       PHASE2    2
  XVOL      MCRT      2
  XX        OFFWEGO   9   MESHMKR  16   PARTGEN   3   YOKOUT   19   PHASE1   28   PHASE2   15   PHASE3   32   REZONE    2   MCR1      3
            CENTRUY   3   SNESTEP   3
  XXA       PHASE1    4
  XX1       PHASE2    3
  XX2       PHASE2    3
  XX3       PHASE2    3
  XX4       PHASE2    3
  XY        PHASE1    4   PHASE2    4
  XYECS     CENTRUY 130   WALK      0   WHERE   320
  X1        MESHMKR   3   PHASE0    2   YOKOUT   10   PHASE1    2   PHASE2    7   PHASE3   11   REZONE    6   PARTMOV   5   SNOUT     8
  X12       PHASE3    2
  X13       PARTMOV   4
  X14       YOKOUT    3
  X2        MESHMKR   3   PHASE0    2   YOKOUT   10   PHASE1    2   PHASE2    7   PHASE3    9   REZONE    6   PARTMOV   3   SNOUT     4
  X23       YOKOUT    3   PHASE3    2   PARTMOV   3
  X24       PHASE1    7   PHASE2    6
  X3        MESHMKR   3   PHASE0    2   YOKOUT   10   PHASE1    2   PHASE2    7   PHASE3   11   REZONE    6   PARTMOV   5
  X31       PHASE1    7   PHASE2    6
  X34       PHASE3    2
  X4        MESHMKR   3   YOKOUT   10   PHASE1    2   PHASE2    7   PHASE3    9   REZONE    6   PARTMOV   4
  X41       PHASE3    2
  X43       PARTMOV   3
  X5        REZONE   14
  Y         FILMCO   20   OFFWEGO  10   MESHMKR 190   PARTGEN   0   YOKKY     0   PHASE0  120   YOKOUT  190   PARPLOT   0   PHASE1   40
            PHASE2   60   PHASE3  100   REZONE  230   PARTMOV  40   MCRT     40   REEFER  2.0   FLUSH     0   WALK      0   ESTEP     0
            LISTING  10   GREYSN   60   SNESTEP   0   SNOUT     0
  YB        YOKJFER   C   FILMCO   8C   OFFWEGO   C   MESHMKR   C   PARTGEN   C   YOKOUT   2C   PARPLOT   C   PHASE3    C   REZONE    C
            PARTMOV   C   GREYSN    C   SNOUT    4C
  YBASE     OFFWEGO  5C   MESHMKR  2C   PARTGEN   C
  YBOT      PARTGEN   4
  YC        PARTGEN   9
  YCO       YOKOUT   40
  YCONV     YOKJFER   C   FILMCO   1C   OFFWEGO   C   MESHMKR   C   PARTGEN   C   YOKOUT   1C   PARPLOT   C   PHASE3    C   REZONE    C
            PARTMOV   C   GREYSN    C   SNOUT    2C
  YCONVP    YOKOUT   11
  YD        PARTGEN   7   MCWFAR   4C
L YELLOW    YOKJFER   1   YOKKY     1   PHASE0    1   YOKOUT    1   PARPLOT   1   PHASE1    1   PHASE2    1   PHASE3    1   REZONE    1
            PARTMOV   1
  YJC2      MESHMKR   2
  YLB       YOKOUT   15   PARPLOT   5
  YLB1      YOKOUT    4
L YLC1      YOKJFER   1   LCUP      1   FILMCO    1   OFFWEGO   1   MESHMKR   1   PARTGEN   1   YOKKY     1   PHASE0    1   YOKOUT    1
            PARPLOT   1   PHASE1    1   PHASE2    1   PHASE3    1   REZONE    1   PARTMOV   1   MCR1      1   REEFER    1   FLUSH     1
            PFREQ     1   SLBSCH    1   WALK      1   ESTEP     1   LISTING   1   GREYSN    1   CYLSN     1   SWEEP     1   SNESTEP   1
            SNOUT     1
L YLC2      YOKJFER   1   LCUP      1   FILMCO    1   OFFWEGO   1   MESHMKR   1   PARTGEN   1   YOKKY     1   PHASE0    1   YOKOUT    1
            PARPLOT   1   PHASE1    1   PHASE2    1   PHASE3    1   REZONE    1   PARTMOV   1   MCR1      1   REEFER    1   FLUSH     1
            PFREQ     1   SLBSCH    1   WALK      1   ESTEP     1   LISTING   1   GREYSN    1   CYLSN     1   SWEEP     1   SNESTEP   1
            SNOUT     1
  YLOG      SUBSCH    2
  YNE       WHERE    12
  YNW       WHERE    11
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S YOKIFER	YOKIFER	1																
S YOKKY	YOKKY	1																
S YOKOUT	YOKOUT	1																
YP	OFFWEGO	2	MESHMKR	12	PARTMOV	4	POMEGA	160										
YPAR	FILMCO	0	OFFWEGO	10	MESHMKR	0	PARTGEN	20	YOKKY	0	PHASE0	0	YOKOUT	0	PARPLOT	10	PHASE1	0
	PHASE2	0	PHASE3	0	REZONE	0	PARTMOV	40	MCRT	0	REEFER	0	FLUSH	0	WALK	0	ESTEP	0
	LISTING	0	GREYSN	0	SNESTEP	0	SNOUT	0										
YPY3	PARTMOV	4																
YP1	PHASE3	5																
YP2	PHASE3	9																
YP3	PHASE3	5																
YP4	PHASE3	9																
YR	MESHMKR	2																
L YSC1	YOKIFER	1	LCOP	1	FILMCO	1	OFFWEGO	1	MESHMKR	1	PARTGEN	1	YOKKY	1	PHASE0	1	YOKOUT	1
	PARPLOT	1	PHASE1	1	PHASE2	1	PHASE3	1	REZONE	1	PARTMOV	1	MCRT	1	REEFER	1	FLUSH	1
	PFREG	1	SCBSCR	1	WALK	1	ESTEP	1	LISTING	1	GREYSN	1	CYLSN	1	SWEEP	1	SNESTEP	1
	SNOUT	1																
YSE	WHERE	13																
YSW	WHERE	12																
YT	YOKIFER	C	FILMCO	7C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	C	PHASE3	C	REZON.	C
	PARTMOV	C	GREYSN	C	SNOUT	C												
YTAB	OFFWEGO	20																
YTE	PARTGEN	7	PARTMOV	3														
YT1C	YOKOUT	21	PARPLOT	10														
YTOP	PARTGEN	4																
YUP	YOKOUT	3	PARPLOT	2														
YUP1	YOKOUT	2																
YY	MESHMKR	13	PHASE1	21	PHASE2	10	REZONE	4										
YYA	PHASE1	4																
Y1	MESHMKR	3	YOKOUT	16	PHASE1	5	PHASE2	6	PHASE3	15	REZONE	6	PARTMOV	5	SNOUT	8		
Y13	PARTMOV	4																
Y14	PHASE3	2																
Y2	MESHMKR	3	YOKOUT	13	PHASE1	2	PHASE2	6	PHASE3	11	REZONE	6	PARTMOV	3	SNOUT	4		
Y21	YOKOUT	3	PHASE3	2														
Y23	PARTMOV	3																
Y24	PHASE1	8	PHASE2	11														
Y3	MESHMKR	3	YOKOUT	10	PHASE1	2	PHASE2	6	PHASE3	15	REZONE	6	PARTMOV	5				
Y31	PHASE1	8	PHASE2	11														
Y32	PHASE3	2																
Y34	YOKOUT	3																
Y4	MESHMKR	3	YOKOUT	1[illegible]	PHASE1	2	PHASE2	6	PHASE3	11	REZONE	1[illegible]	PARTMOV	4				
Y43	PHASE3	2	PARTMOV	3														
YS	REZONE	14																
Z	POMEGA	10																
ZD	WALK	4																
ZDE	PHASE3	3	ESTEP	3	SNESTEP	3												
ZE	PHASE3	3	ESTEP	3	SNESTEP	3												
ZETAK	PFREG	1																
ZETAR	PFREG	3																
ZETAX	PFREG	4																
ZE1	PHASE3	2	ESTEP	2	SNESTEP	2												
ZE2	PHASE3	2	ESTEP	2	SNESTEP	3												
ZE2L	PHASE3	2	ESTEP	2	SNESTEP	2												
ZP	OFFWEGO	2	MESHMKR	6	REEFER	1C	POMEGA	90	CENTROY	1C	WALK	8C	WHERE	8C				
ZR	PHASE3	4	ESTEP	4	SNESTEP	4												
ZRINV	PHASE3	2	ESTEP	2	SNESTEP	2												
ZRL	PHASE3	6	ESTEP	6	SNESTEP	2												
ZSN	GREYSN	2C	CYLSN	1C	SWEEP	5D	SNOUT	4C										
ZT	PHASE3	9	ESTEP	13	SNESTEP	9												
ZTL	PHASE3	4	ESTEP	4	SNESTEP	2												
ZZ	YOKIFER	1C	OFFWEGO	1C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C	SNOUT	C				