LA-5704-MS

UC-32
Reporting Date: July 1974
Issued: January 1975

c.3

YØKIFER:
A Two-Dimensional Hydrodynamics and Radiation Transport Program

by

Richard C. Anderson
M. T. Sandford II

UC-32

los alamos
scientific laboratory
of the University of California
LOS ALAMOS, NEW MEXICO 87544

UNITED STATES
ATOMIC ENERGY COMMISSION
CONTRACT W-7405-ENG. 36

An Equal Opportunity Employer

Work performed under the joint auspices of the US Atomic Energy Commission and the Defense Nuclear Agency.

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22151
Price: Printed Copy $7.60 Microfiche $2.25

YØKIFER: A TWO-DIMENSIONAL HYDRODYNAMICS AND RADIATION TRANSPORT PROGRAM

by

Richard C. Anderson and M. T. Sandford II

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.

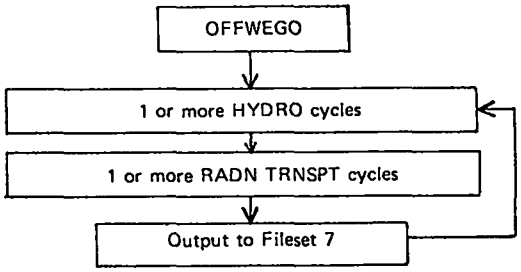
Bubble input	Sense Switch 1	ON
Purd input	Sense Switch 1	OFF (default)

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.

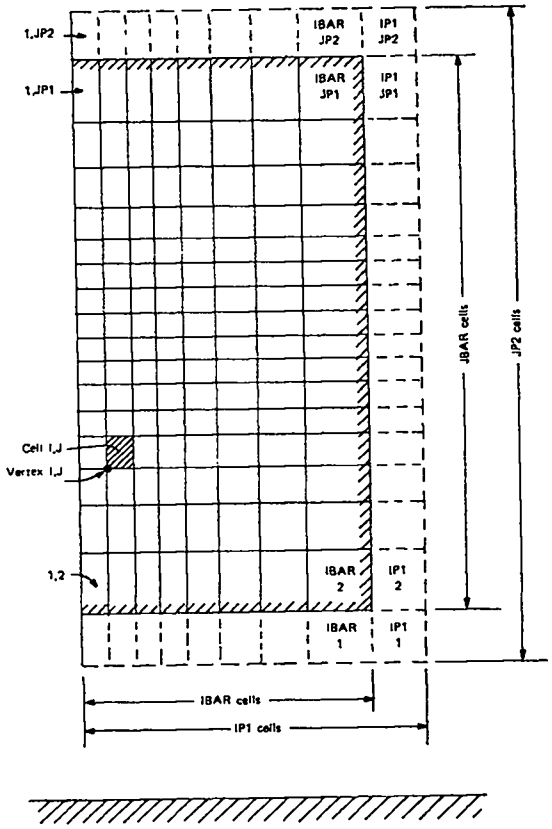


Fig. 2. The basic mesh conventions.

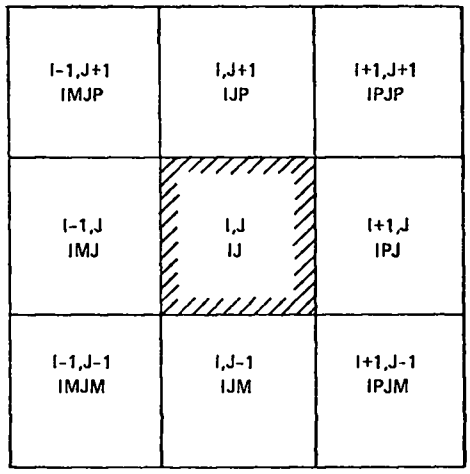


Fig. 3. Neighbor cell notation.

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).
- $R\emptyset_{ij}$ 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).
- $RV\emptyset L_{ij}$ 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	(10^5cm)
Volume	km^3	($10^{15}cm^3$)
Velocity	km/s	(10^5cm/s)
Acceleration	km/s^2	($10^5cm/s^2$)
Density	mg/cm^3	($10^{-3}g/cm^3$)
Energy	J	(10^7ergs)
Specific energy	J/mg	(10^{10}ergs/g)
Energy density	J/km^3	($10^{-8}ergs/cm^3$)
Pressure	$mg\text{-}km^2/cm^3\text{-}s^2$	($10^7dynes/cm^2$ = 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 = 137.214×10^8 $J/km^3\text{-}eV^4$.

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 $DT_n \leq TIME_m + DTR_m - T_n$.

$T_{n+1} \geq TIME_{m+1}$ 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 $T \geq TIME + DTR$. 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 $\neq$ 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

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

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 = IUNF + 2, IP1,

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

$y_j = -t + \frac{f\Delta z}{1-f}(1-f^{\Delta j})$, j = 2, JBØT-1,

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

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

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 = JTØP + 1, JP2,

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

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

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

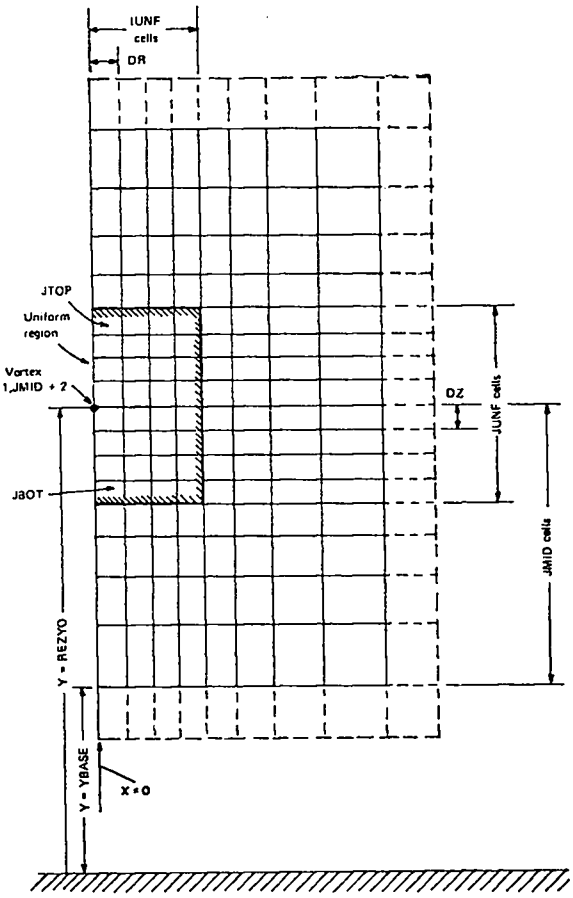


Fig. 4. A nonuniform mesh.

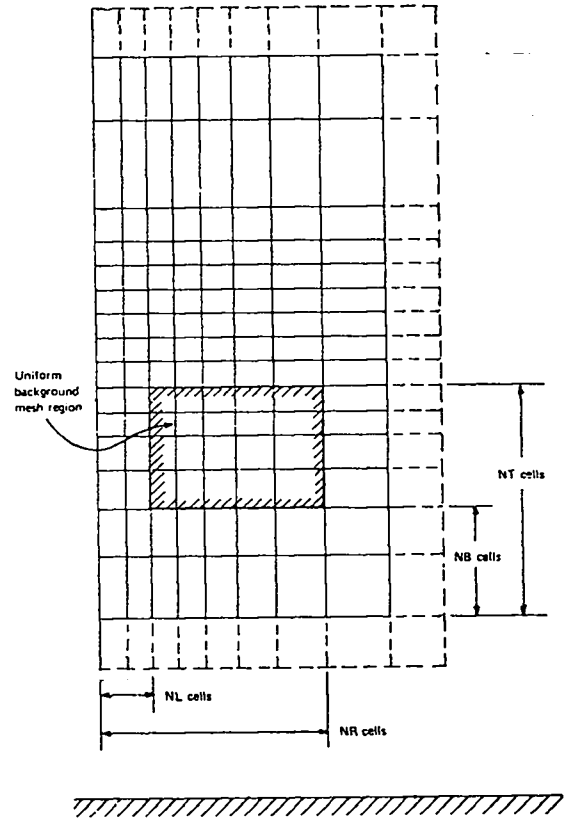


Fig. 5. Background mesh input.

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}, $R\emptyset_{ij}$, 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 = REZY0. 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.

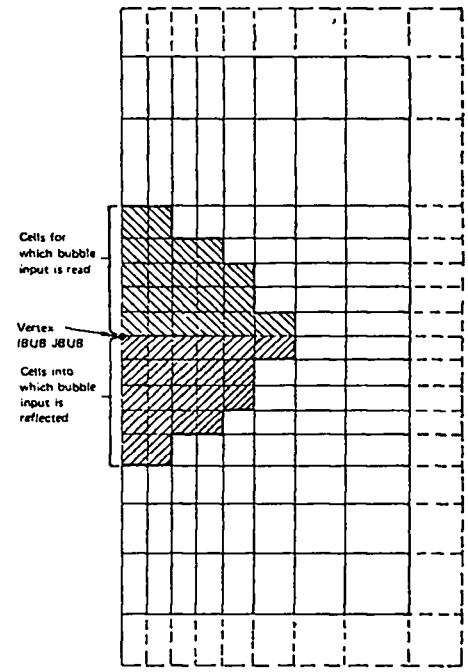


Fig. 6. Bubble input.

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, ($mg\text{-}km^2/cm^3\text{-}s$ = 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 ($mg/km^4/2\pi\text{-}cm\text{-}s$).

VMØM Proportional to axial momentum of the material in the mesh ($mg\text{-}km^4/2\pi\text{-}cm\text{-}s$).

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 = $\frac{20}{15+\text{NUMIT}}$ 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

$R\emptyset L_{ij}$ — $= R\emptyset_{ij}$

$RCSQ_{ij}$ — Reciprocal sound velocity squared

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

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

and

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

(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;

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

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

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

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:

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

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

$$z = w_1z_1 + w_2z_2 + w_3z_3.$$

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

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

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 hν (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:

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

$TEMP_{ij}$ 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

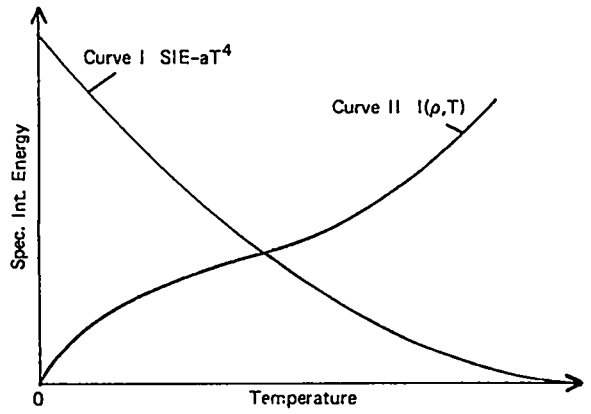


Fig. 7. Calculation of temperature from internal energy.

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 ($0 \leq$ 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-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).

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

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.

$AV\emptyset LD_{ij}$ 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, $AV\emptyset LD_{ij} = AVINT_{ij}$, and $AVINT_{ij}$ is recomputed by subroutine SWEEP.

The process is continued until $AVINT_{ij} \approx AV\emptyset LD_{ij}$ 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-s-sr),

$EM\emptyset MLC_{ij}$ Vertical component of radiation flux in cell ij (J/cm^2-s),

$UM\emptyset MLC_{ij}$ Horizontal component of radiation flux in cell ij (J/cm^2-s),

$F\emptyset UTLC_{ij}$ 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		Defined 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.

ACKNOWLEDGMENTS

The authors gratefully acknowledge their indebtedness to the many people whose assistance and support have made the YØKIFER program possible.

E. M. Jones for assistance in adapting the hydrodynamics program YAQUI to YØKIFER.

W. H. Reed, and H. G. Horak for writing the S_n program and adapting it to YØKIFER.

J. W. Kodis for subroutine PARTMØV and for improved versions of other subroutines to be incorporated into YØKIFER in the future.

LASL groups T-4 and J-15 for providing the equation of state and opacity data.

L. W. Fullerton for the subroutines SEARCH, PAKFNØ, and UNPKFN.

H. M. Peek and J. Zinn for their encouragement and support.

REFERENCES

1. A. A. Amsden and C. W. Hirt, "YAQUI: An Arbitrary Lagrangian-Eulerian Computer Program for Fluid Flow at all Speeds," Los Alamos Scientific Laboratory report LA-5100 (March 1973).

2. M. T. Sandford II and R. C. Anderson "Two Dimensional Implicit Radiation Hydrodynamics," J. Comput. Phys. 13, 130-157 (1973).

3. K. D. Lathrop and F. W. Bunkley "TWØTRAN-II: An Interfaced, Exportable Version of the TWØTRAN Code for Two-Dimensional Transport," Los Alamos Scientific Laboratory report LA-4848-MS (July 1973).

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		FLUSR
	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

	ØPFWEGØ	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
GRDVEL 0.0 FOR PURE EULERIAN CALCULATION
1.0 FOR PURE LAGRANGIAN CALCULATION
2.0 FOR REZONE
GRDVEL 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
REZYB 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 REZYB
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 (α_0) COEFFICIENT IN PHASES MOMENTUM EQUATIONS
USE 0.1
A0M (α_0) COEFFICIENT IN PHASES ENERGY AND MOMENTUM
EQUATIONS
USE 1.0
B0 (β_0) COEFFICIENT IN PHASES MASS, ENERGY, AND MOMENTUM
EQUATIONS
USE 0.0
XI (ξ) DETERMINES FORM OF VISCOSITY (AXI IN 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 RURD 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 RURD 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.    $CØPYP (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

Input Cards

Card 1 Format 216

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 $SCALER_i = 0$.

Output Cards

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
  0.09          0.0001        1.0          2.0          1.0
   34    68     0.0           0.21266
   20    40      20           0.010633     0.010633     1.1
   0.1           1.0           0.0         -1.0          0.1          0.6
  1.0            1.000E-05     1.000E-15
    0.4          0.0          -0.01         1.2          0.210
     0
     1    22
     1     1     .16715E-01     .14215E+03     0.              0.
     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     0.[illegible]01 .31167E-01
    18     1     .25877E+01     .37877E[illegible]  .[illegible]99E-01 .19165E-01
    19     1     .13055E+01     [illegible]0   .59321E-02      .14526E-01
    20     1     .12041E+01     .[illegible]000E+00 .31855E-02 .68596E-02
    21     1     .[illegible]   .21000E+00     .91680E-03      .16533E-02
     1     2     .[illegible]000E+01 .21000E+00 0.              .88885E-03
                 .12041E+01     .21030E+00     .54952E-01      0.
     3    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
      0
      0
```

1. (Header)
2.
3.
4.
5.
6.
7.

Background Mesh
Bubble Coordinates
Bubble Input

Marker Particle Input

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        AAM    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        TFMIT  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  2.5267E-02
          7  1.2222E+00  2.1000E-01  2.5267E-02
          8  1.2207E+00  2.1000E-01  2.5267E-02
          9  1.2191E+00  2.1000E-01  2.5267E-02
         10  1.2176E+00  2.1000E-01  2.5267E-02
         11  1.2161E+00  2.1000E-01  2.5267E-02
         12  1.2145E+00  2.1000E-01  2.5267E-02
         13  1.2130E+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  9.6292E-01  2.1000E-01  2.5267E-02
```

32

BUBBLE VAPIABLES

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]
9	1	2.2200E-02	9.0066E+01	-2.555[illegible]	[illegible]	2.5963E-02
10	1	3.0170E-02	6.4466E+01	[illegible]	[illegible]E-02	2.5733E-02
11	1	4.2959E-02	[illegible]	[illegible]E-02	3.9921E-02	2.5447E-02
12	1	1.0[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
		1.0000E+00	2.1000E-01	6.8596E-03	3.1855E-03	2.5267E-02
		1.2000E+00	2.1000E-01	1.6533E-03	9.1680E-04	2.5267E-02
	[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

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	DMIN	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	DMAX	3.9035E+00	DMIN	1.5678E-02
CP	5.3919E+01	CYCLE	1.8923E+01	TDUMP	2.5108E+02	NDUMP	0

THY 4.4198E+08

Sample Problem - MCRT Output

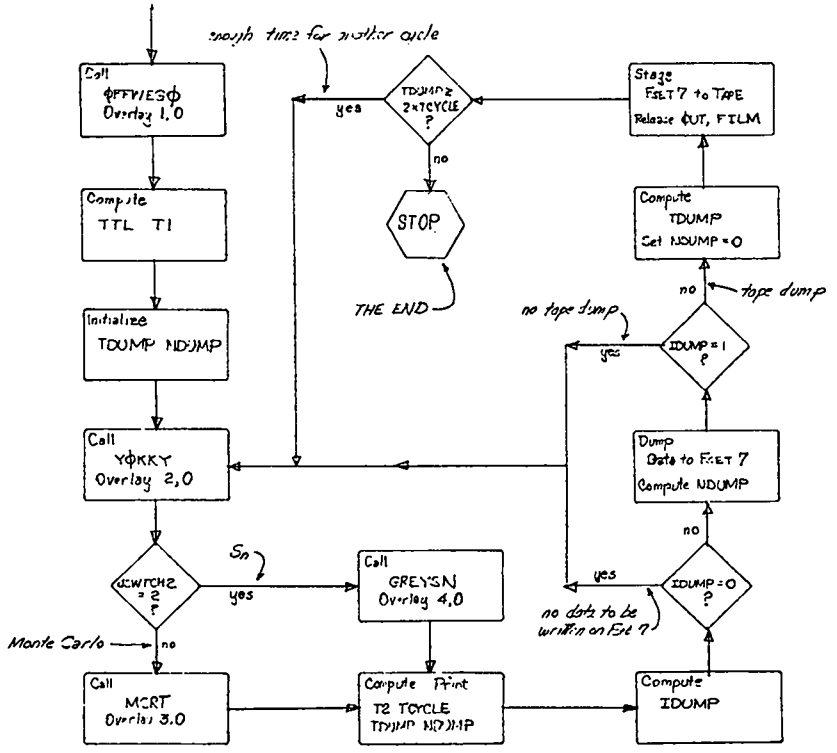
```
 PROBLEM CYCLE    33      SN RADN TRANS

 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
```

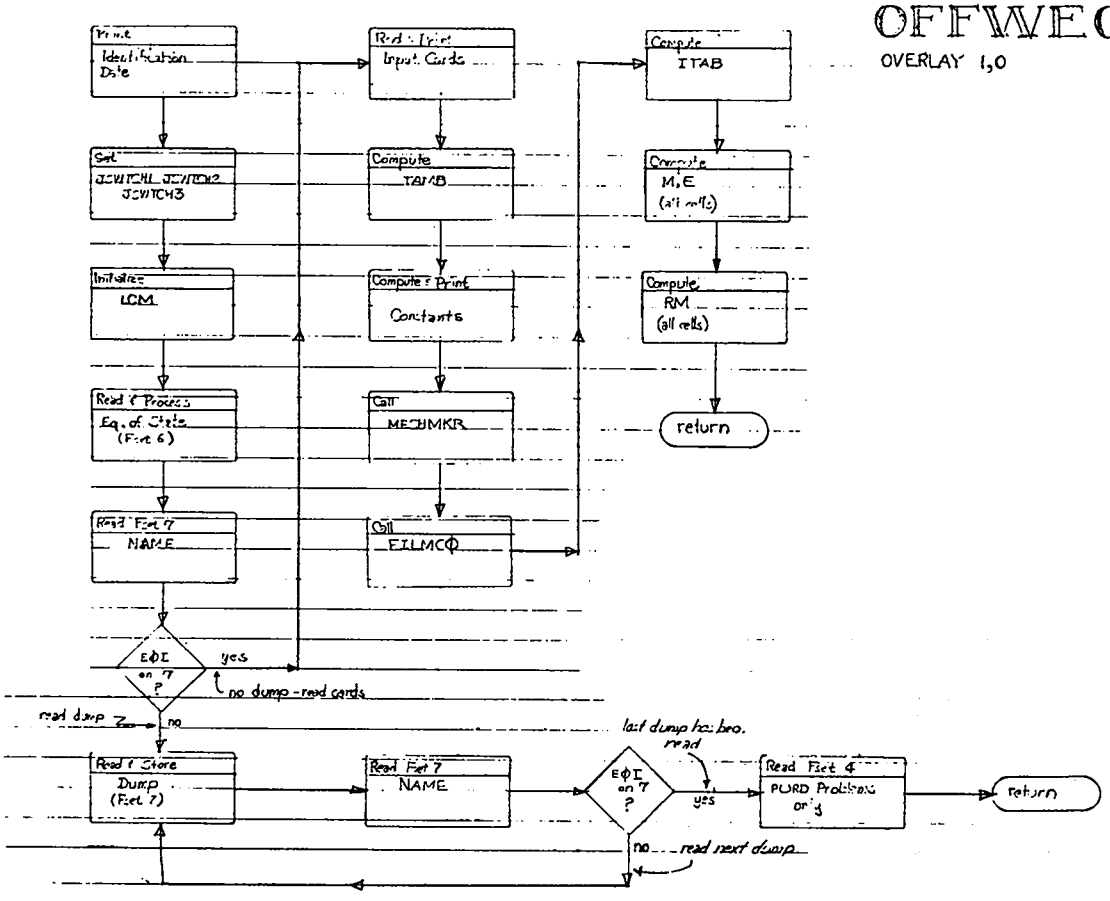
Sample Problem - GREYSN Output

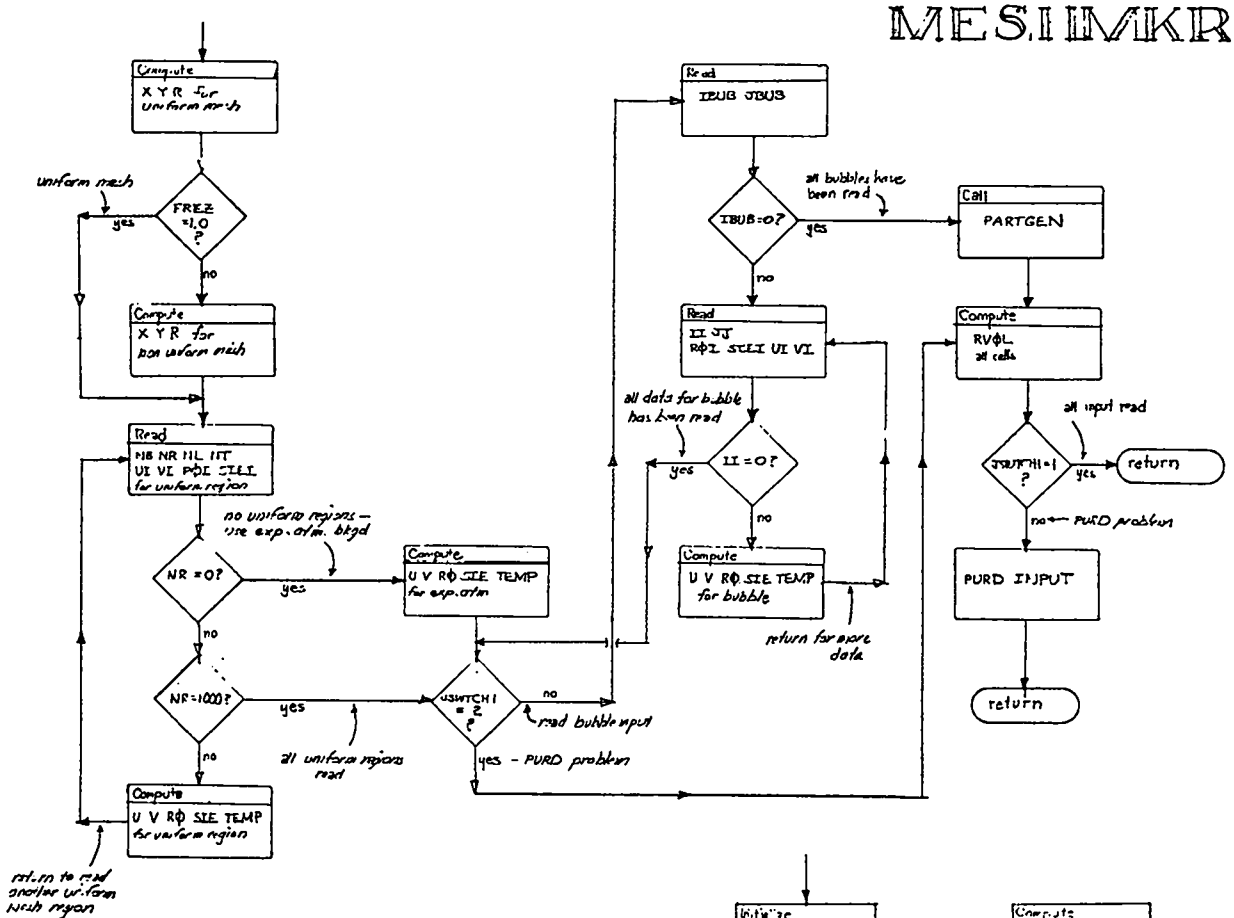
```
 DATA WRITTEN ON FSET 7

 TAPE DUMP AT  9.5181E-02
```

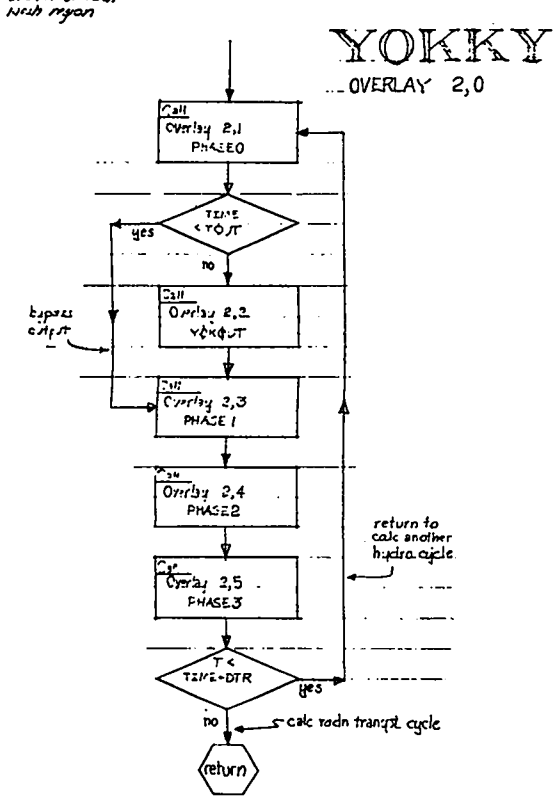
Dump Indicators

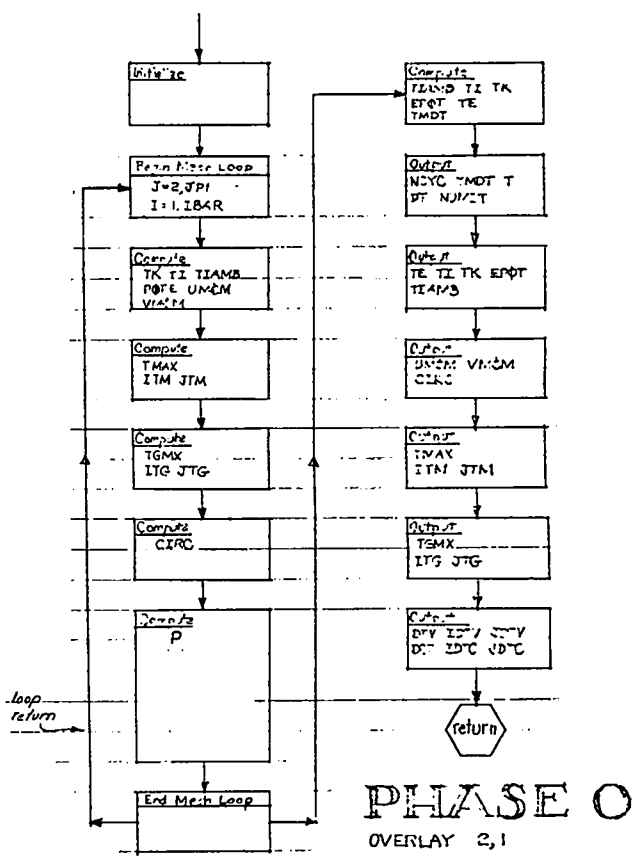
APPENDIX D.
FLOW DIAGRAMS OF THE YØKIFER
OVERLAYS AND SELECTED SUBROUTINES

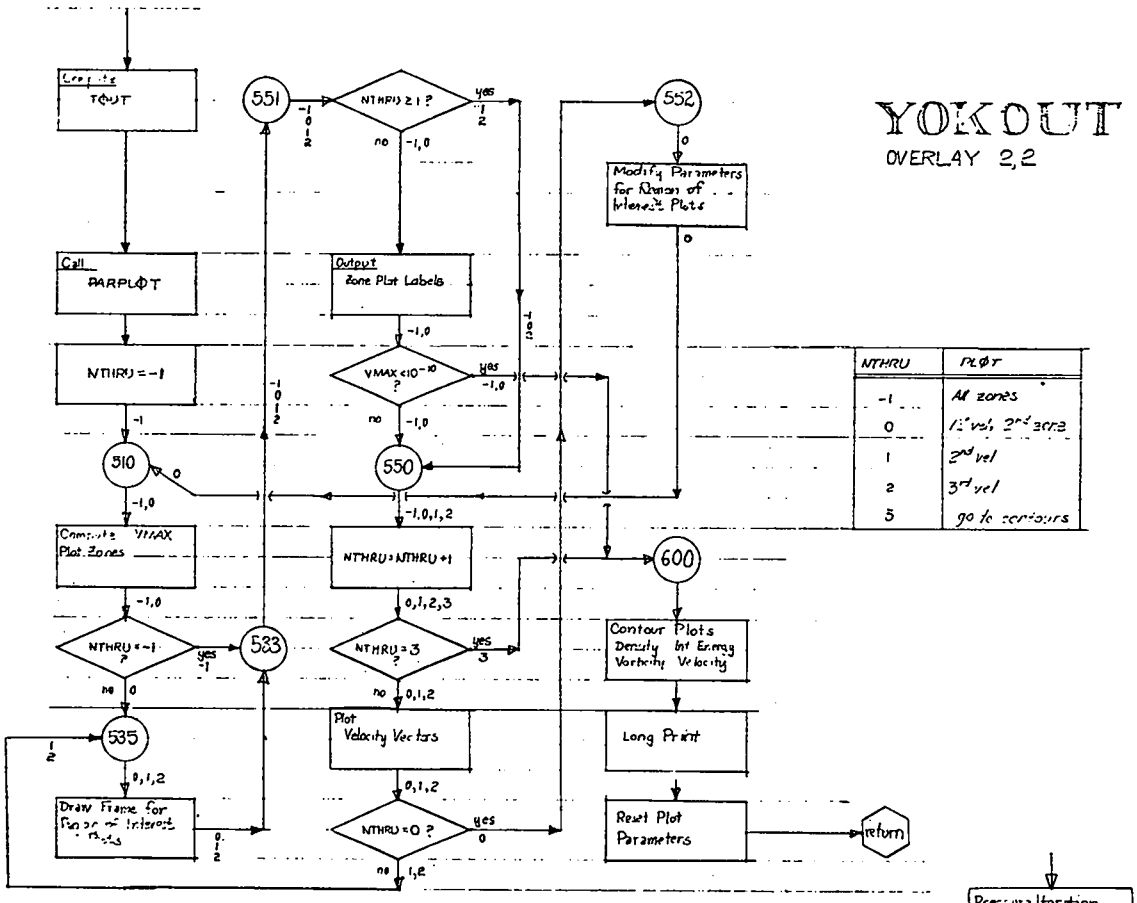


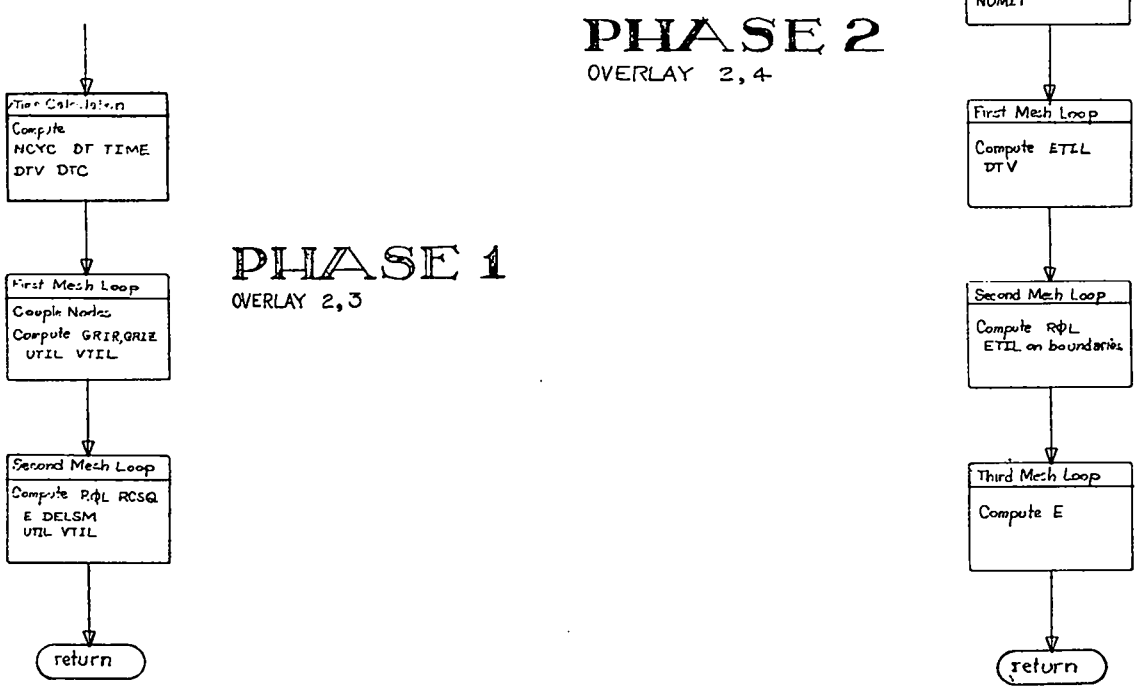


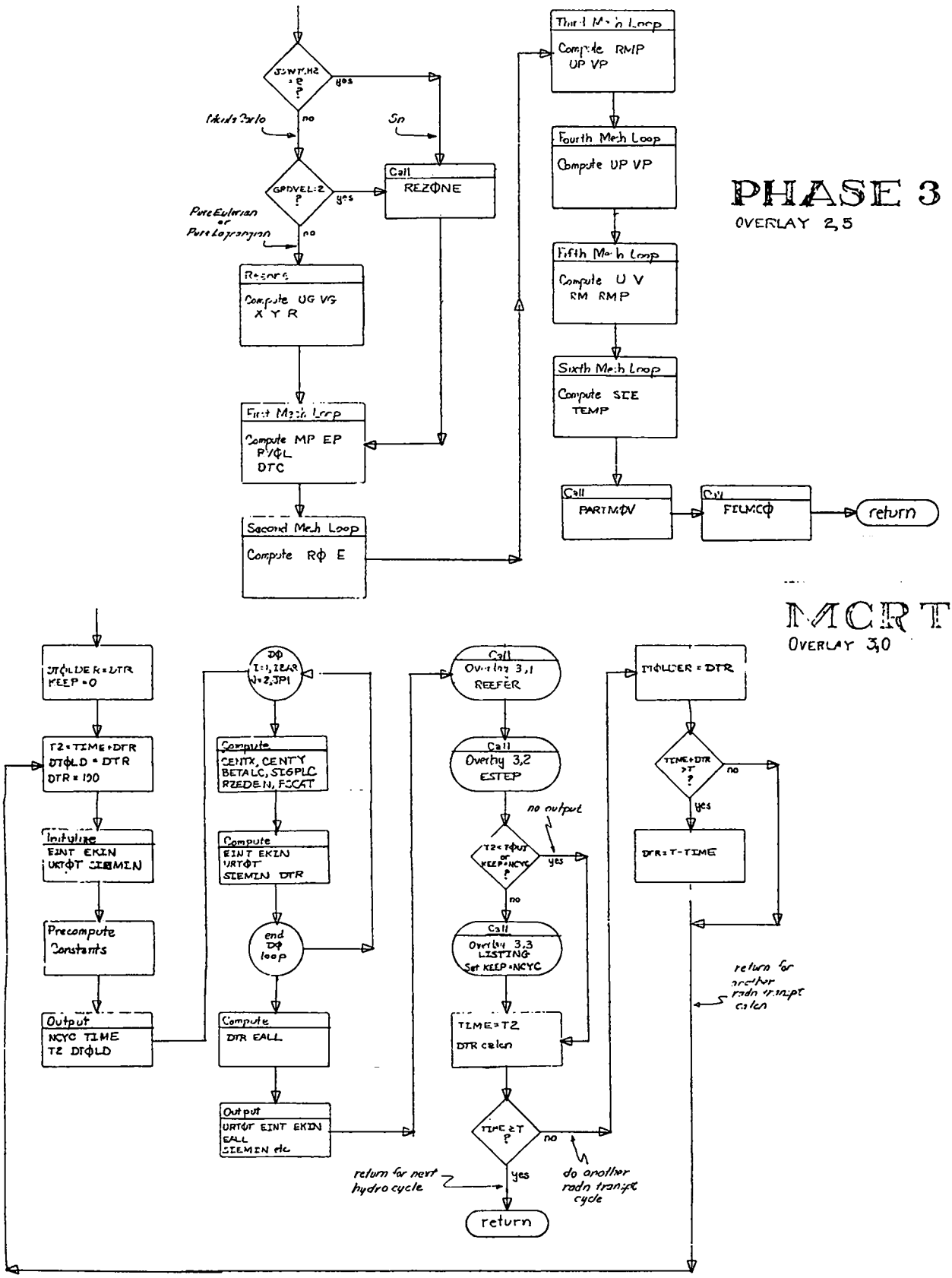

MESHMKR
Compute
X Y R for uniform mesh
uniform mesh
FREZ =1.0 ?
yes
no
Compute
X Y R for non uniform mesh
Read
NB NR NIL IIT UI VI PØI STEI for uniform region
NR =0?
yes
no uniform regions – use exp. orth. bkgd
Compute
U V RØ SIE TEMP for exp. orth
NR=1000?
yes
all uniform regions read
no
Compute
U V RØ SIE TEMP for uniform region
return to read another uniform mesh region
Read
IBUB JBUB
IBUB=0?
yes
all bubbles have been read
Call
PARTGEN
no
Read
II JJ RØI STEI UI VI
all data for bubble has been read
II =0?
yes
no
Compute
U V RØ SIE TEMP for bubble
return for more data
SWITCH1 = 2 ?
no
read bubble input
yes – PURD problem
Compute
RVØL at cells
all input read
JSWITCH1=1 ?
yes
return
no ← PURD problem
PURD INPUT
return


YOKKY
... OVERLAY 2,0
Call Overlay 2,1 PHASE0
TIME < TOUT
yes
no
bypass output
Call Overlay 2,2 VØKØUT
Call Overlay 2,3 PHASE1
Call Overlay 2,4 PHASE2
Call Overlay 2,5 PHASE3
return to calc another hydro cycle
T < TIME+DTR
yes
no
calc radn transpt cycle
return


Initialize
Perform Main Loop
J=2,JP1
I=1,IBAR
Compute
TK TI TIAMB PØRE UMØM VISCM
Compute
TMAX ITM JTM
Compute
TGMX ITG JTG
Compute
CIRC
Compute
P
End Mesh Loop
loop return
Compute
TIAMB TI TK ETØT TE TMDT
Output
NCYC TMDT T DT NJI/CT
Output
TE TI TK ETØT TIAMB
Output
UMØM VISCM CIRC
Output
TMAX ITM JTM
Output
TGMX ITG JTG
return
PHASE 0
OVERLAY 2,1

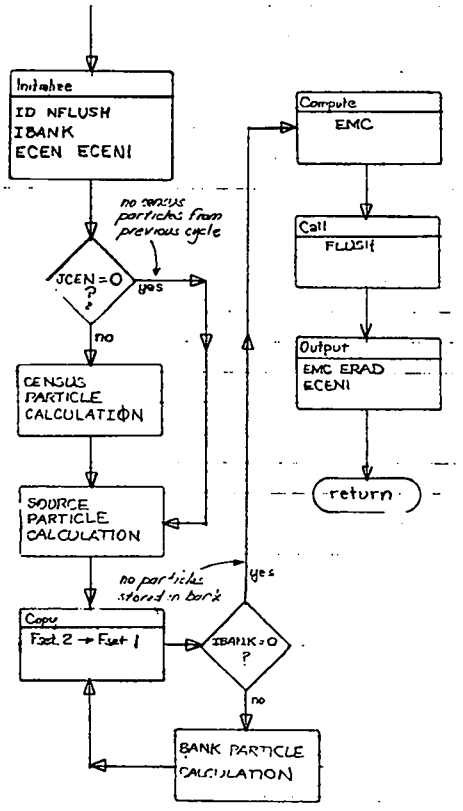

YOKOUT
OVERLAY 2,2
Compute TOUT
551
NTHRU ≥ 1 ?
yes
no
552
Modify Parameters for Renun of Interest Plots
Call PARPLOT
Output Zone Plot Labels
NTHRU = -1
VMAX < 10^-10 ?
yes
no
510
550
Compute VMAX Plot Zones
NTHRU = NTHRU + 1
600
NTHRU = -1 ?
533
NTHRU = 3 ?
Contour Plots Density Int Energy Vorticity Velocity
535
Plot Velocity Vectors
Long Print
Draw Frame for Zones of Interest
NTHRU = 0 ?
Reset Plot Parameters
return
NTHRU
PLOT
-1
All zones
0
1st vel, 2nd zone
1
2nd vel
2
3rd vel
3
go to contours

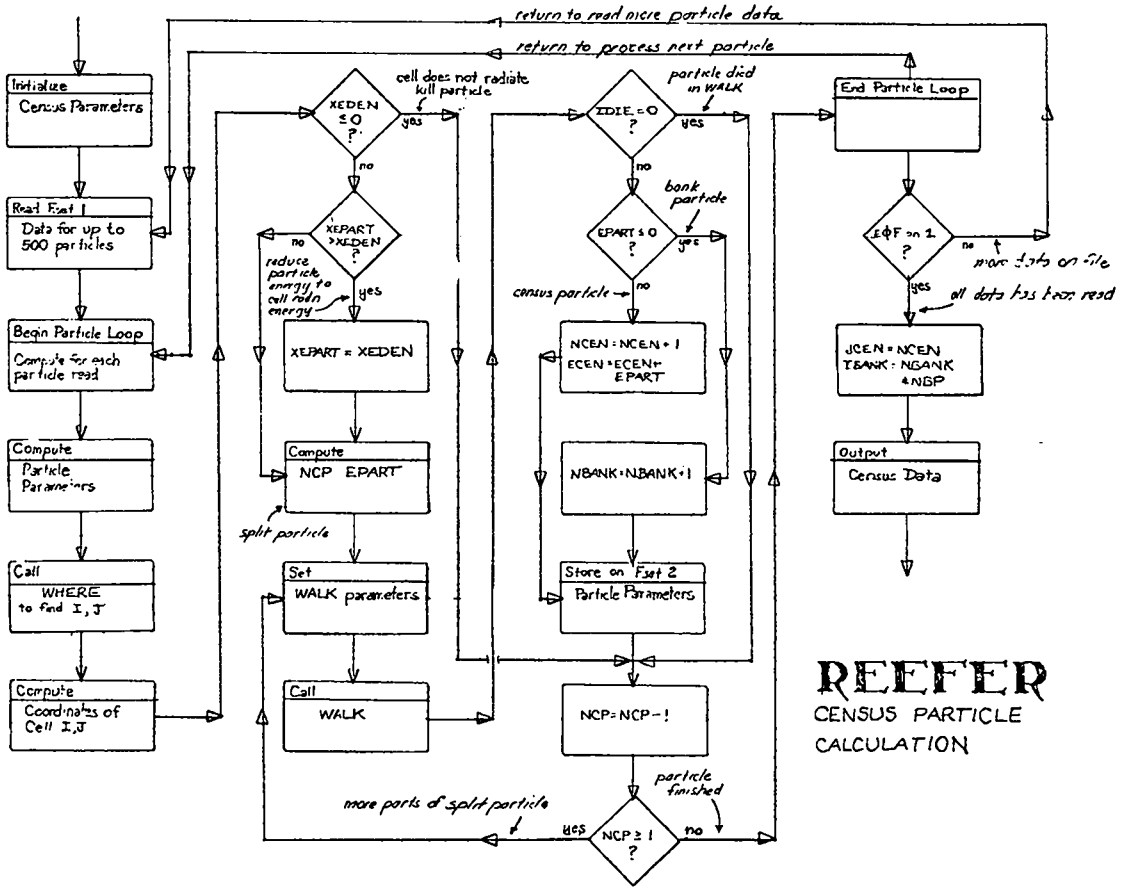

PHASE 2
OVERLAY 2,4
Pressure Iteration
Compute RQL UL VL PL NUMIT
First Mesh Loop
Compute ETIL DTV
Second Mesh Loop
Compute RQL ETIL on boundaries
Third Mesh Loop
Compute E
return
PHASE 1
OVERLAY 2,3
Time Calculation
Compute NCYC DT TIME DTV DTC
First Mesh Loop
Couple Nodes
Compute GRIR,GRIZ UTIL VTIL
Second Mesh Loop
Compute RQL RCSQ E DELSM UTIL VTIL
return


PHASE 3
OVERLAY 2,5
Third Mesh Loop
Compute RMP UP VP
Fourth Mesh Loop
Compute UP VP
Fifth Mesh Loop
Compute U V RM RMP
Sixth Mesh Loop
Compute SIE TEMP
Call PARTMOV
Call FELMCΦ
return
Call REZONE
Pure Eulerian or Pure Lagrangian
Second Mesh Loop
Compute RΦ E
First Mesh Loop
Compute MP EP PΨΦL DTC
Compute UG VG X Y R
yes
no
Sn
yes
no
MCRT
OVERLAY 3,0
DTΦLDR=DTR KEEP=0
T2=TIME+DTR DTΦLD=DTR DTR=190
Initialize EINT EKIN URTΦT SIEMIN
Precompute Constants
Output NCYC TIME T2 DTΦLD
DΦ I=1,IEAR J=2,JP1
Compute CENTX, CENTY BETALC, SIGPLC RZEDEN, FICAT
Compute EINT EKIN URTΦT SIEMIN DTR
end DΦ loop
Compute DTR EALL
Output URTΦT EINT EKIN EALL SIEMIN etc
Call Overlay 3,1 REEFER
Call Overlay 3,2 ESTEP
T2<TPUT or KEEP=NCYC ?
no output
yes
no
Call Overlay 3,3 LISTING Set KEEP=NCYC
TIME=T2 DTR calcn
TIME ≥ T ?
no
yes
return for next hydro cycle
do another radn transpt cycle
return
MΦLDER=DTR
TIME+DTR >T ?
no
yes
DTR=T-TIME
return for another radn transpt calcn

REEFER

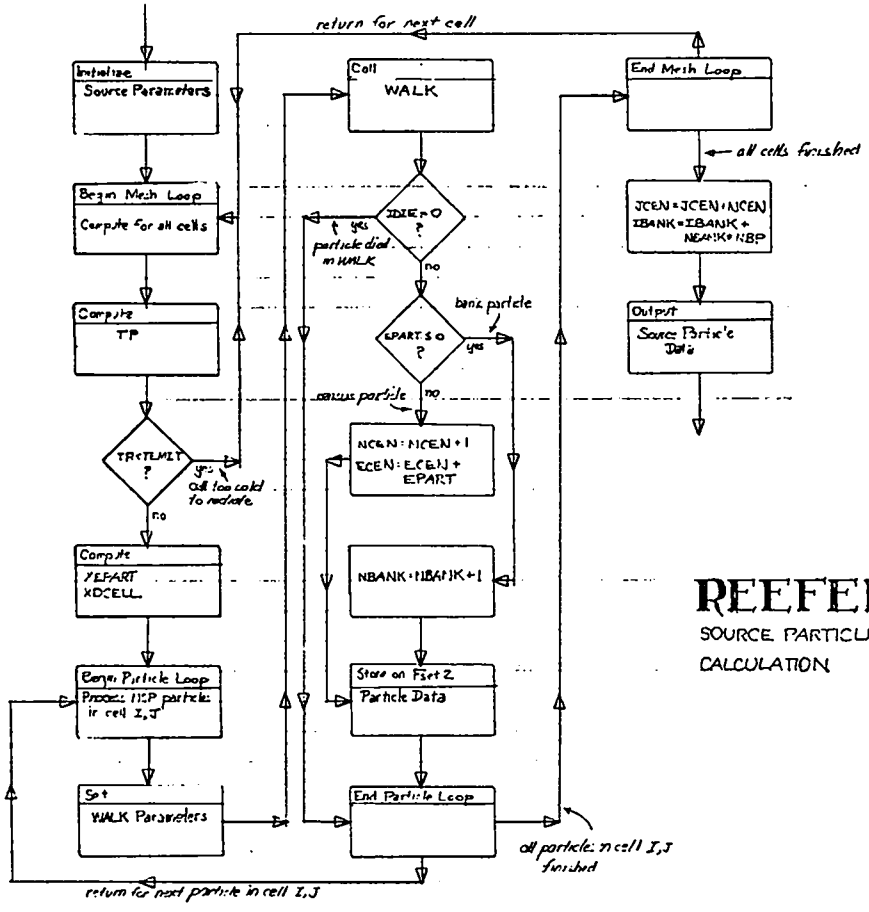
OVERVIEW





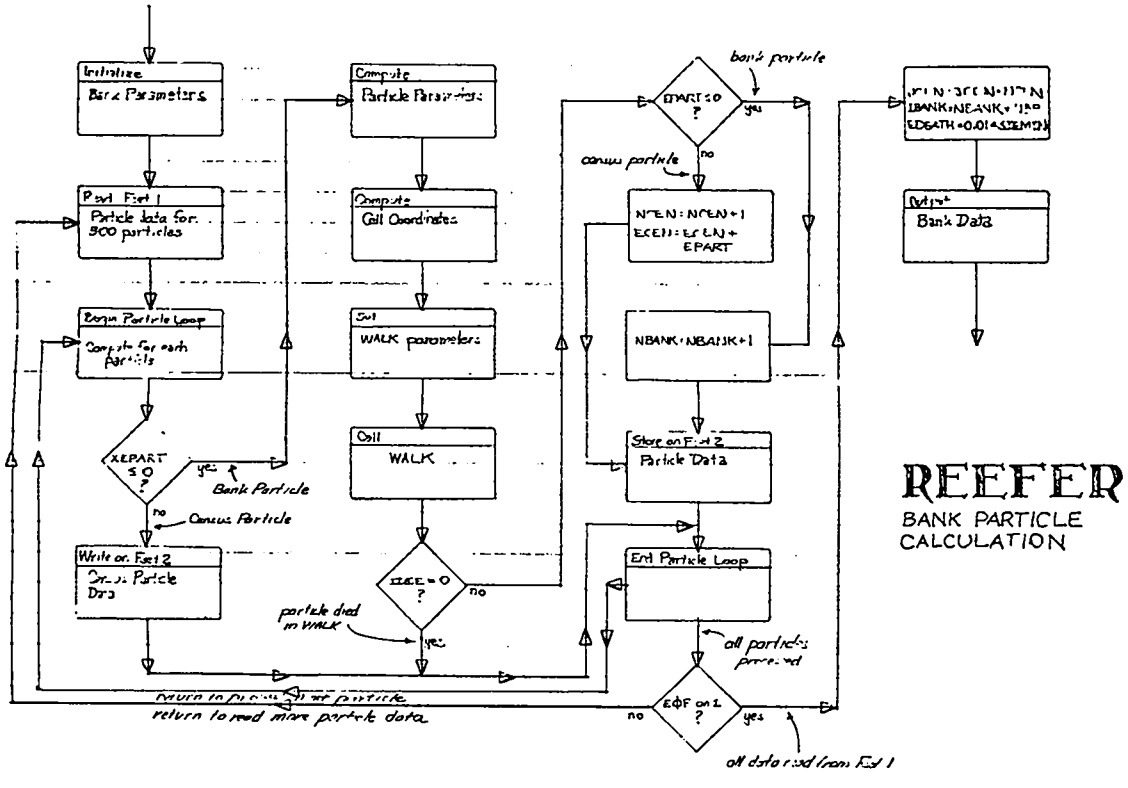
REEFER

CENSUS PARTICLE CALCULATION



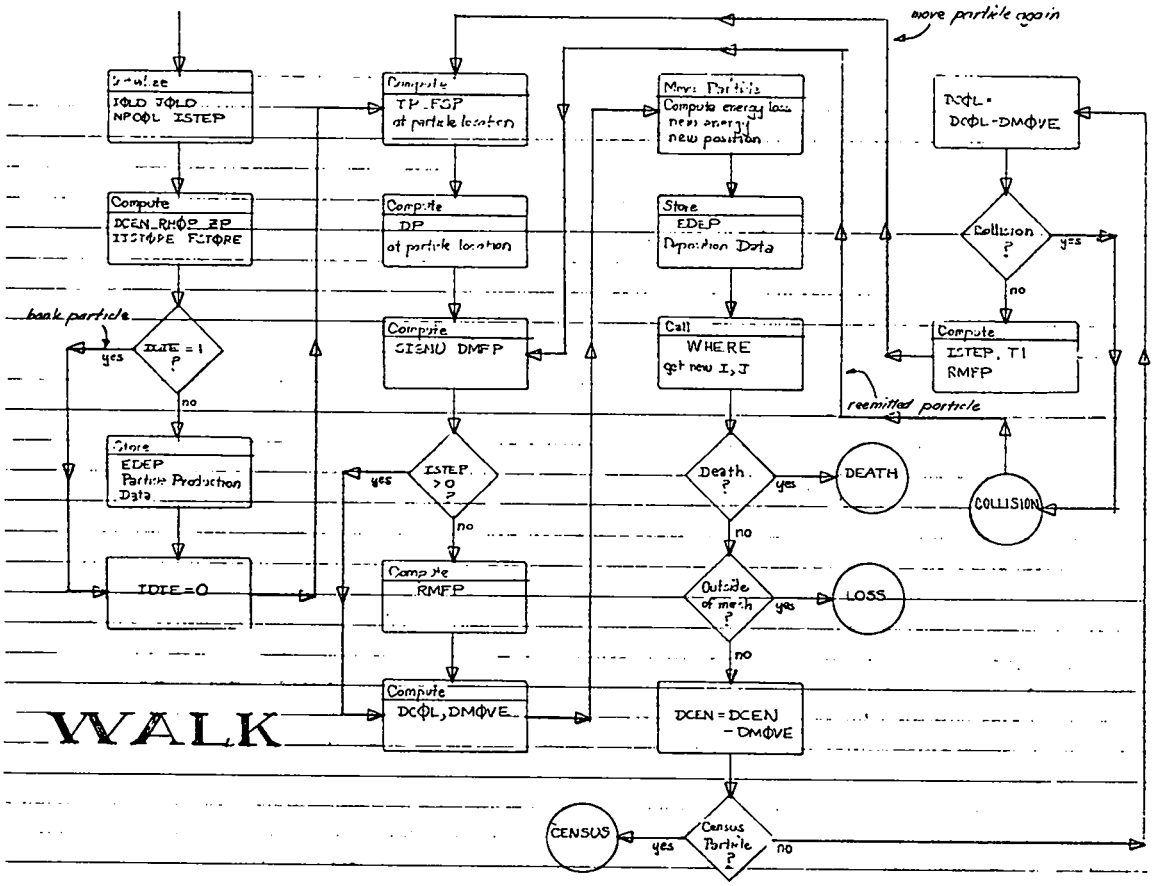
REEFER

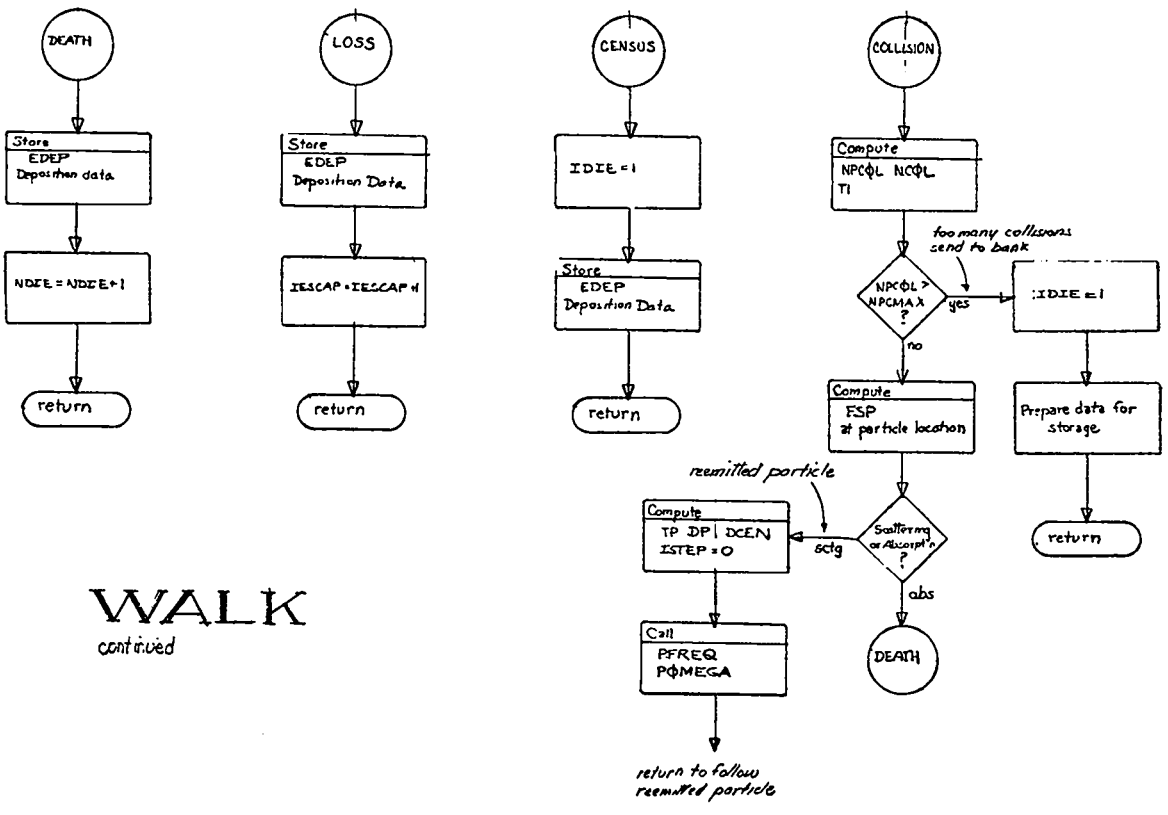
SOURCE PARTICLE CALCULATION



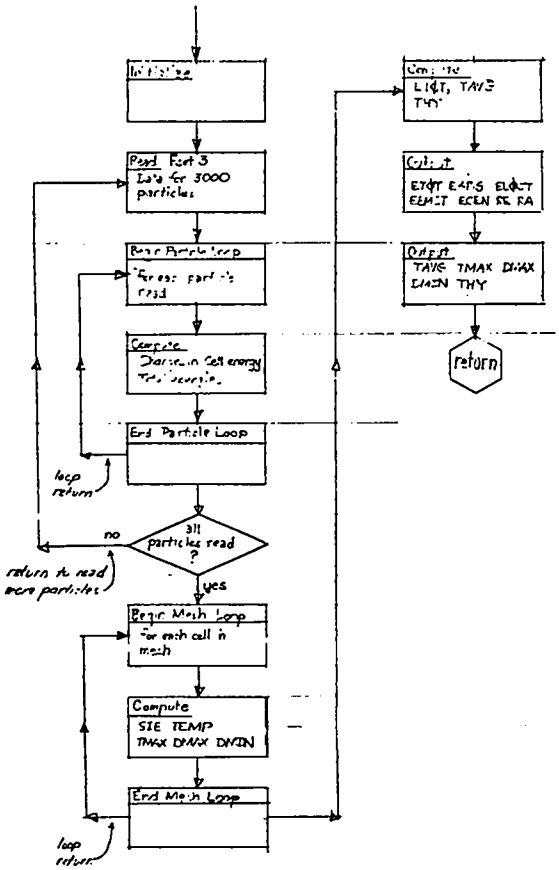
REEFER

BANK PARTICLE CALCULATION



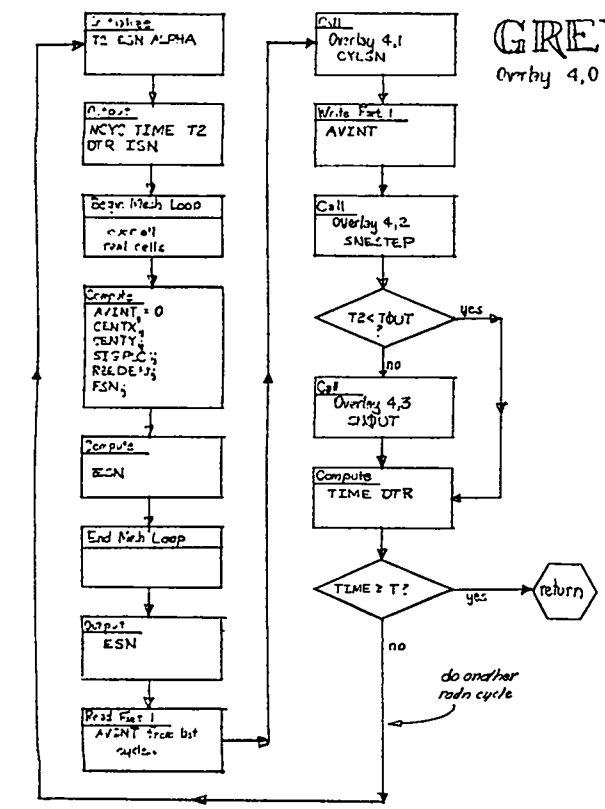


WALK
continued



ESTEP

OVERLAY 3,2

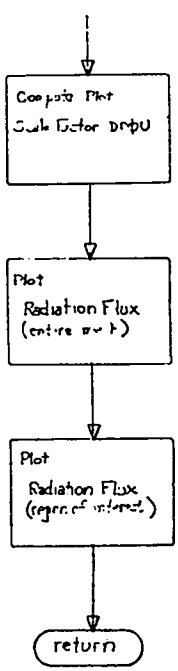


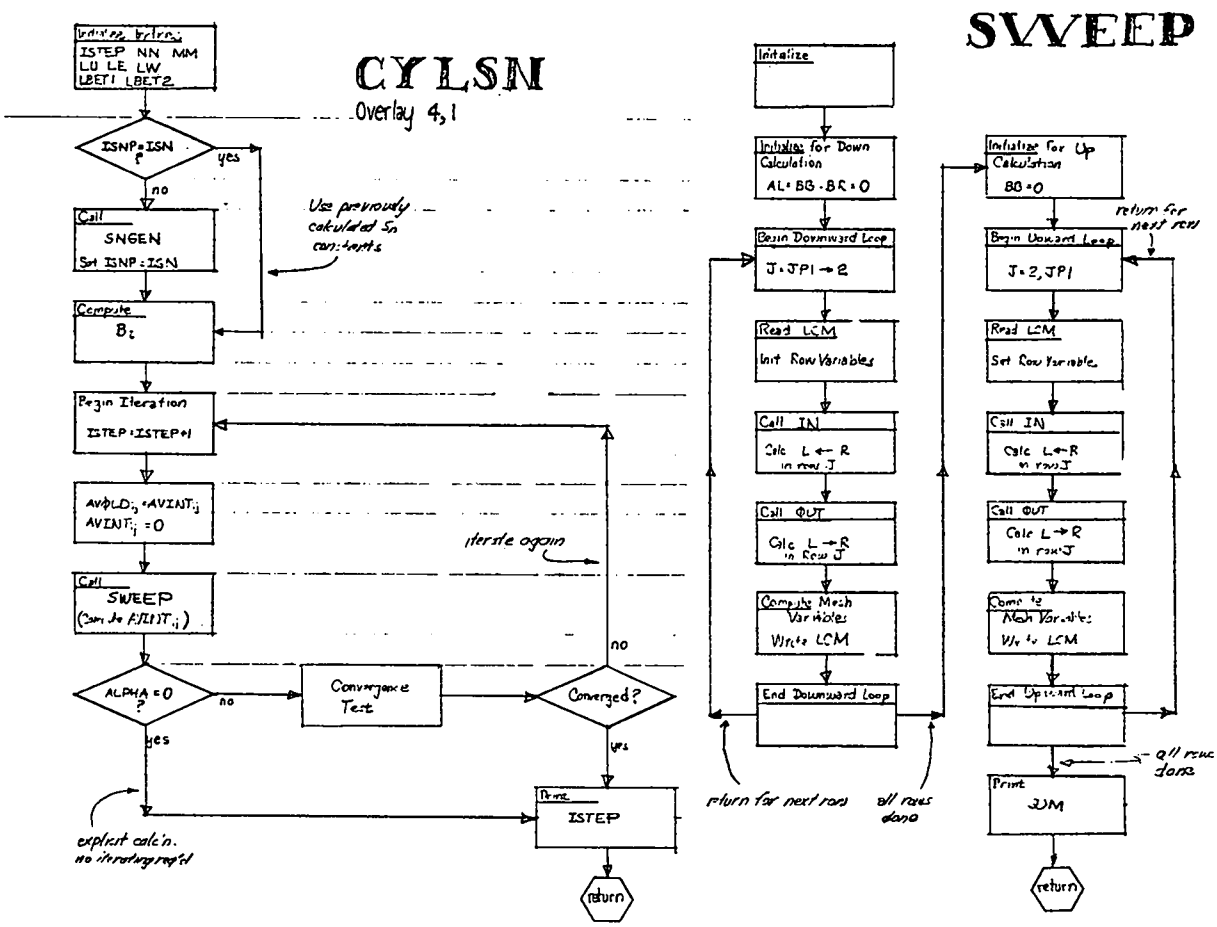
GREYSN

Overlay 4,0

SNOUT

OVERLAY 4,3




CYLSN
Overlay 4,1
Initialize Options
ISTEP NN MM
LU LE LW
LBET1 LBET2
ISNP=ISN ?
yes
no
Call
SNGEN
Set ISNP=ISN
Use previously calculated S_n constants
Compute
B_i
Begin Iteration
ISTEP=ISTEP+1
$AVPHI_j = AVINT_j$
$AVINT_j = 0$
iterate again
Call
SWEEP
(Compute $PHIINT_{ij}$)
ALPHA=0 ?
no
Convergence Test
Converged?
no
yes
yes
explicit calc'n. no iterations req'd
Print
ISTEP
return
SWEEP
Initialize
Initialize for Down Calculation
AL=BG=BR=0
Begin Downward Loop
J=JP1→2
Read LCM
Init Row Variables
Call IN
Calc L←R in row J
Call OUT
Calc L→R in Row J
Compute Mesh Variables
Write LCM
End Downward Loop
return for next row
all rows done
Initialize for Up Calculation
BG=0
return for next row
Begin Upward Loop
J=2,JP1
Read LCM
Set Row Variables
Call IN
Calc L←R in row J
Call OUT
Calc L→R in row J
Compute Mesh Variables
Write LCM
End Upward Loop
all rows done
Print
JUM
return

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(30), 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 /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/   ANG, ASG, A0, A0FAC, A0M, B0, COLAMG, CYL,      ORANGE     2
            1                  DTPOS, EPS, GM1, GR, GZ, IM1,                  ORANGE     3
            2                  IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,     ORANGE     4
            3                  LJP2, ML, NPT, NQIB, NQI2, NUMIT, OM,          ORANGE     5
            4                  OMANG, OMCYL, REZRUN, REZYO, THIRD, VTEM       ORANGE     6
11           COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT   ORANGE     7
12           COMMON /YELLOW/   DTG, DTGSAV, DTG2, DTV, DTVSAV,                YELLOW     2
            1                  DVDY, IDTG, IDTV, JDTG, JDTV, RDT              YELLOW     3
13           COMMON /GREEN/    ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMII     GREEN      2
14           COMMON /CRIMSN/   SNGON(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, 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 (4LRTLM,RTTL)                                          YOKIFER    21
24           TTL=27.5E-09*FLOAT(RTTL)-30.0                                    YOKIFER    22
25           CALL SECOND (T1)                                                 YOKIFER    23
26           TDUMP=AMIN1(900.0,TTL)                                           YOKIFER    24
27           NDUMP=0                                                          YOKIFER    25
28        21 CALL OVERLAY (7LYOKIFER, 2, 0, 0)                                YOKIFER    26
```

```
      CALL REMARK (10HYAQUI     )                                    YOKIFER    27
      IF (JSWTCH2.EQ.2) GO TO 22                                     YOKIFER    28
      CALL OVERLAY (7LYCKIFER, 3, 0, 0)                              YOKIFER    29
      CALL REMARK (10HMCRT      )                                    YOKIFER    30
      GO TO 23                                                       YOKIFER    31
   22 CALL OVERLAY (7LYCKIFER, 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+10000                                              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 (5LFSET1,AASC,4600,LENGTH,LSTATUS)                  YOKIFER    58
      CALL WTBUF (5LFSET7,AASC,LENGTH)                               YOKIFER    59
      NDUMP=NDUMP+LENGTH                                             YOKIFER    60
      IF (LSTATUS.LT.2048) GO TO 33                                  YOKIFER    61
      WRITE (7)                                                      YOKIFER    62
      ENDFILE 7                                                      YOKIFER    63
   34 CALL RDBUF (5LFSET3,AASC,4600,LENGTH,LSTATUS)                  YOKIFER    64
      CALL WTBUF (5LFSET7,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 (5LFSET1,2LST,512)                                   YOKIFER    72
      CALL OPEN (5LFSET3,2LST,512)                                   YOKIFER    73
      CALL OPEN (5LFSET7,2LST,512)                                   YOKIFER    74
      IF (IDUMP.EQ.1) GO TO 21                                       YOKIFER    75
      CALL ADV(1)                                                    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 (5LFSET7)                                         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  12C0  GRDVEL -R   8C0  ITAB  (1I  10C0  NCYC  -I   8C0  PYB   -R   9C0  THY   -R   8C0
     34 -  66*  DVDY   -R  12C0  GREEN  -   13C0  ITV   -I   8C0  NFRQ  -I   2C0  PYCONV -R   9C0  TNEUT -R  11C0
ADV     -  78SU EMIU   -R   8C0  G2     -R  10C0  IXL   -I   9C0  NOPD  -I   2C0  PYT   -R   9C0  TSTART -R  8C0
ALPHA   -R  13C0 EPS    -R  10C0  IBAR   -I   8C0  IXR   -I   9C0  NOPT  -I   2C0  RDT   -R  12C0  VTEM  -R  10C0
```

ANC	-R	10C0	ETAB	()R	2C0	IDTC	-I	12C0	IYB	-I	9C0	MPCMAX	-I	13C0	RED	-	8CN	VV	-R	9C0
ANGLES	()R	11C0	FIPXL	-R	9C0	IDTV	-I	12C0	IYT	-I	9C0	NQ	-I	8C0	RETURN	-	90F	WHITE	-	11CN
ASW	-R	10C0	FIPXR	-R	9C0	IECP	-I	10C0	J	-I	4C0	NQIB	-I	10C0	REZRON	-R	10C0	XCONV	-R	9C0
A0	-R	10C0	FIPYB	-R	9C0	IJ	-I	4C0	JBAR	-I	8C0	NQI2	-I	10C0	REZSIE	-R	8C0	XL	-R	9C0
A0FAC	-R	10C0	FIXL	-R	9C0	IJP	-I	4C0	JCEN	-I	13C0	NRVALS	-I	11C0	REZY0	-R	10C0	XR	-R	9C0
A0M	-R	10C0	FIXR	-R	9C0	IJP	-I	4C0	JDTC	-I	12C0	NSP	-I	13C0	RIBAR	-R	9C0	YB	-R	9C0
BTBL	()R	2C0	FIYB	-R	9C0	IJPS	-I	8C0	JDTV	-I	12C0	NUMIT	-I	10C0	RLC1	-	7CN	YCONV	-	9C0
B0	-R	10C0	FLOAT	-	24SU	IM1	-I	10C0	JNM	-I	10C0	OM	-R	15C0	RVALS	()R	11C0	YELLOW	-	12CN
COLARO	-R	10C0	FREG	()R	2C0	INF	-I	1AG	JP1	-I	8C0	OMANC	-R	10C0	SENSE	-	15CN	YLC1	-	5CN
CRIMSN	-	14CN	FSET1	-R	1AG	IPXL	-I	9C0	JP4	-I	10C0	OMCYL	-R	10C0	SIGA	()R	7LC	YLC2	-	6CN
CYL	-R	10C0	FSET12	-R	1AG	IPXR	-I	9C0	JSWTCH1	-I	15C0	OPDEN	()R	2C0	SILVER	-	9CN	YORIFER	-	1SU
DATAREL	-	84SU	FSET2	-R	1AG	IPYB	-I	9C0	JSWTCH3	-I	15C0	OPTMP	()R	2C0	SNCON	()R	14C0	YSC1	-	3CN
D1	-R	8C0	FSET3	-R	1AG	IPYT	-I	9C0	KXI	-I	10C0	ORANGE	-	10CN	SPTOL	()R	2C0	YT	-R	9C0
DTC	-R	12C0	FSET4	-R	1AG	IP1	-I	8C0	LAM	-I	10C0	OUT	-R	1AG	STATE	-	2CN			
DTCSAV	-R	12C0	FSET6	-R	1AG	IP2	-I	10C0	LJP2	-I	10C0	PINK	-	4CN	T	-R	8C0			
DTD2	-R	12C0	FSET7	-R	1AG	ISCF1	-I	8C0	MU	-I	10C0	PTAB	()R	2C0	TAMB	-R	8C0			
DTPOS	-R	10C0	GLTG	-	23SU	ISCF2	-I	8C0	NANGLS	-I	11C0	PXCONV	-R	9C0	TEMIT	-R	13C0			
DTR	-R	8C0	GM1	-R	10C0	ISC2	-I	8C0	NBP	-I	13C0	PXL	-R	9C0	TEMP	()R	8C0			
DTV	-R	12C0	GR	-R	10C0	ISC3	-I	8C0	NBUF	-I	13C0	PXR	-R	9C0	THIRD	-R	10C0			

MULTIPLY-REFERENCED VARIABLES

21	-	28*	45	77	89							
22	-	31	34SU									
23	-	33SU	36SU									
33	-	61*	63									
2001	-	16*	39PR									
2002	-	17*	81PR	82WR								
2003	-	18*	71PR									
AASC	()R	3C0	61AG	66AG	67AG							
AA1	()R	5LC	55WR									
AA2	()R	6LC	58WR									
AFSREL	-	85SU	86SU									
AMIN1	-	26SU	79SU									
COMMON	-	2F	3F	4F	8F	9F	10F	11F	12F	13F	14F	15F
ENDFILE	-	52F	59F	65F	70F							
FILM	-R	1AG	1AG									
FORMAT	-	16F	17F	18F								
I	-I	4C0	51WR	51WR	55WR	55WR	58WR	58WR				
IDUMP	-I	41=	42=	43=	44=	45	77					
IZZ	-I	50=	51WR									
JP2	-I	8C0	53									
JSWTCH4	-I	15C0	3C									
KTTL	-I	23AG	24									
LCM	-	5F	6F	7F								
LENGTH	-I	61AG	61AG	62	66AG	67AG	68					
LOCF	-	50SU	52SU									
LSTATUS	-I	66AG	63	66AG								
NAME	()I	8C0	5.	51WR								
NDUMP	-I	8C0	27=	39PR	44	49=	49	54=	54	57=	57	62=	62	68=	68	80=
NECS	-I	53=	54	55WR	56=	57	58WR					
NPT	-I	10C0	56									
NQI	-I	8C0	53									
OPEN	-	22SU	46SU	47SU	48SU	74SU	75SU	76SU	87SU			
OVERLAY	-	19SU	28SU	31SU	34SU							
PRINT	-	39F	71F	81F								
RDBUF	-	64SU	66SU									
REMARK	-	21SU	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	8C0	42	61PR	82WR							
TOUT	-R	8C0	42									
TTL	-R	24=	26	79								
T1	-R	25AG	37	43=								
T2	-R	36AG	37	39PR	40	79	79					
WRITE	-	51F	55F	58F	64F	69F	82F					
WTBUF	-	61SU	67SU									
ZZ	-R	14C0	5C									

```
      SUBROUTINE LOOP                                                   LOOP      2
      COMMON /STATE/    NOPT, NOPD, 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(131600)                                     ALLKOM    8
      LCM /RLC1/        SIGA(30000)                                     ALLKOM    9
      COMMON /RED/      NAME(12), DT, DTR, FM10, GRDVEL, IBAR, IJPS,    ALLKOM   10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM   11
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, RE/SIE, 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 8                                                           LOOP     36
   60 IJMS = ISC3                                                       LOOP     37
      GO TO 8                                                           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 ECRD (AASC(1,JMS),IECR,NOI,NE)                                  LOOP      62
68            IECR = IECR - NOI                                                    LOOP      63
69      140   RETURN                                                               LOOP      64
70      150   IBUF = 3                                                             LOOP      65
71            GO TO 100                                                            LOOP      66
72            ENTRY WIROW                                                          LOOP      67
73            IEC = (J-1) * NOI                                                    LOOP      68
74            CALL ECRD (AASC(1),IEC,NOI,NE)                                       LOOP      69
75            RETURN                                                               LOOP      70
76            ENTRY SETIJ                                                          LOOP      71
77            IJ = (I-1) * NO + 1                                                  LOOP      72
78            RETURN                                                               LOOP      73
79            ENTRY WIRCW                                                          LOOP      74
80            IEC = (J-1)*NOI                                                      LOOP      75
81            CALL ECWR (AASC(1),IEC,NOI,NE)                                       LOOP      76
82            RETURN                                                               LOOP      77
83            END                                                                  LOOP      78
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	EIAB	()R	2C0	JP2	-I	8C0	NOPD	-I	2C0	REZSIE	-R	8C0	STARTD	-	57EN	TOUT	-R	8C0
AA2	()R	6LC	FREG	()R	2C0	LOCP	-	1SU	NOPT	-I	2C0	RLCI	-	7CN	STATE	-	2CN	TSTART	-R	8C0
BTBL	()R	2C0	GROVEL	-R	8C0	LOCPD	-	47EN	OPUEN	()R	2C0	RIROW	-	72EN	T	-R	8C0	WIROW	-	79EN
DONE	-	36EN	IBAR	-I	8C0	NAME	()I	8C0	OPIMP	()R	2C0	SETIJ	-	76EN	TAMB	-R	8C0	YLC1	-	5CN
DT	-R	8C0	IP1	-I	8C0	NCYC	-I	8C0	PINK	-	4CN	SIGA	()R	7LC	TEMP	()R	8C0	YLC2	-	6CN
DTR	-R	8C0	JBAR	-I	8C0	NDUMP	-I	8C0	PTAB	()R	2C0	SPTBL	()R	2C0	THY	-R	8C0	YSC1	-	3CN
EM10	-R	8C0	JP1	-I	8C0	NFRQ	-I	2C0	REU	-	8CN	START	-	22EN	TIML	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

10	-	11	12*																
20	-	11	17*																
30	-	11	3 *																
40	-	16	21	33*															
50	-	34	4 *																
60	-	39	42*																
70	-	39	44*																
80	-	41	43	45*															
100	-	48*	71																
110	-	50	51*																
120	-	51	62*																
130	-	56	66*																
140	-	59	69*																
150	-	66	7 *																
AASC	()R	3C0	9A6	25AG	28AG	33AG	37AG	45AG	48AG	60AG	67AG	74AG	81AG						
COMMON	-	2F	3F	4F	8F														
ECRD	-	25SU	28SU	33SU	60SU	67SU	74SU												
ECWR	-	9SU	37SU	45SU	48SU	81SU													
ENTRY	-	22F	36F	47F	57F	72F	76F	79F											
I	-I	4C0	77																
IBUF	-I	11	15=	20=	32=	39	50	51=	63=	70=									
IEC	-I	73=	74AG	81=	81AG														
IECR	-I	24=	25AG	26=	26	28AG	29=	29	33AG	34=	34	59=	60AG	61=	61	66	67AG	68=	
		68																	
IECW	-I	9A6	10=	15	24=	37AG	38=	38	45AG	48AG	49=	49	59=						
IJ	-I	4C0	13=	18=	31=	52=	64=	77=											
IJM	-I	4C0	14=	19=	32=	54=	62=												
IJMS	-I	9A6	14=	19=	32=	37AG	40=	42=	44=	45AG	55=	58=	60AG	63=	67AG				
IJP	-I	4C0	12=	17=	30=														
IJPS	-I	6C0	12=	17=	23=	25AG	27=	28AG	30=	33AG									
IJS	-I	4BAG	53=	65=															
ISCF1	-I	8C0	52	62															
ISCF2	-I	8C0	54	64															
ISC2	-I	8C0	14	17	27	31	40	55	58	65									
ISC3	-I	6C0	13	19	30	42													
ITO	-I	6C0	59																
J	-I	4C0	73	80															
LCM	-	5F	6F	7F															
NE	-I	9A6	25AG	28AG	33AG	37AG	45AG	48AG	60AG	67AG	74AG	81AG							
NO	-I	8C0	77																
NOI	-I	8C0	9A6	10	25AG	26	28AG	29	33AG	34	37AG	38	45AG	48AG	49	60AG	61	67AG	
		68	73	79AG	80	81AG													
RETURN	-	35F	40F	69F	75F	78F	82F												

```
      SUBROUTINE FILMCO                                                 FILMCO     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
      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 /YLC1/        SIGA(30000)                                     ALLKOM     9
      COMMON /RED/      NAME(10), DT, DTR, EM10, GROVEL, 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(500), 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 /ORANGE/   ANC, ASC, AO, AOFAC, AOP, BO, CCLAMD, CYL,     ORANGE     2
     1                  DTPOS, EPS, GM1, GR, GZ, IM1,                   ORANGE     3
     2                  IECP, IP2, IIAB(1000), JNM, JP4, KKI, LAM,      ORANGE     4
     3                  LJP2, MU, NP1, NQIM, NUIZ, NUMIT, OM,           ORANGE     5
     4                  OMANC, OMCYL, REZRUN, REZYU, THIRD, VTEM        ORANGE     6
      COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT    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),MO),         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,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
      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), 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), 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
      XL = 0.6                                                          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 + NG                                                      FILMCO    19
      CALL LOOP                                                         FILMCO    20
  129 CONTINUE                                                          FILMCO    21
      VV = 0.9**XR*RIBAR                                                FILMCO    22
      FIYB=9*0.0                                                        FILMCO    23
      FIYT=4.0                                                          FILMCO    24
      FIXL=100.0                                                        FILMCO    25
      FIXR=1000.0                                                       FILMCO    26
      XL  = 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
```

```
41            IYB = FIYB                                                    FILMCO    34
42            IYT = FIYT                                                    FILMCO    35
43            PAL=1.0                                                       FILMCO    36
44            PYB=AMAX1 (PYB,YB)                                            FILMCO    37
45            PYT=AMIN1(PYT,YT)                                             FILMCO    38
46            PXR=AMIN1(PXR,XR)                                             FILMCO    39
47            PYB=AMAX1(PYB-3.0*PXR,YB)                                     FILMCO    40
48            PYT=AMIN1(PYT+2.0*PXR,YT)                                     FILMCO    41
49            PXR=AMIN1(3.0*PXR,XR)                                         FILMCO    42
50            FIPYB=900.0                                                   FILMCO    43
51            FIPYT=4.0                                                     FILMCO    44
52            FIPXL=100.0                                                   FILMCO    45
53            FIPXR=1000.0                                                  FILMCO    46
54            AD = PXR/(PYT-PYB)                                            FILMCO    47
55            IF (AD.LT.1.0) FIPXR=FIPXL+AD*(FIPYB-FIPYT)                   FILMCO    48
56            IF (AD.GT.1.0) FIPYT=FIPYB-(FIPXR-FIPXL)/AD                   FILMCO    49
57            PXCONV = (FIPXR-FIPXL)/(PXR-PXL)                              FILMCO    50
58            PYCONV = (FIPYT-FIPYB)/(PYT-PYB)                              FILMCO    51
59            IPXL = FIPXL                                                  FILMCO    52
60            IPXR = FIPXR                                                  FILMCO    53
61            IPYB = FIPYB                                                  FILMCO    54
62            IPYT = FIPYT                                                  FILMCO    55
63            RETURN                                                        FILMCO    56
64            END                                                           FILMCO    57
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	DIR	-R	8C0	IJPS	-I	8C0	JSWTCH3	-I	12C0	NQIB	-I	10C0	REZRON	-R	10C0	THY	-R	8C0
AA2	()R	6LC	EMIL	-R	8C0	IM1	-I	10C0	KX1	-I	10C0	NQI2	-I	10C0	REZSIE	-R	8C0	TIME	-R	8C0
ANC	-R	10C0	EPS	-R	10C0	IP2	-I	10C0	LAMD	-R	14RL	NRVALS	-I	11C0	REZY0	-R	10C0	TNEUT	-R	11C0
ANGLES	()R	11C0	EQUIVAL	-	13F	ISCF1	-I	8C0	LJP2	-I	10C0	NUMIT	-I	10C0	RLC1	-	7CN	TOUT	-R	8C0
ASU	-R	10C0	ETAB	()R	2C0	ISCF2	-I	8C0	LOOP	-	27SU	OM	-R	11C0	RVALS	()R	11C0	TSTART	-R	8C0
AU	-R	10C0	FILMCC	-	1SU	ISC2	-I	8C0	MUD2	-R	14RL	OMANC	-R	10C0	SENSE	-	12CN	VTEM	-R	10C0
AUFAC	-R	10C0	FLOAT	-	19SU	ISC3	-I	8C0	NAME	()I	8C0	OMCYL	-R	10C0	SIGA	()R	7LC	WHITE	-	11CN
AUM	-R	10C0	FREG	()R	2C0	ITAB	()I	10C0	NANGLS	-I	11C0	OPDEN	()R	2C0	SILVER	-	9CN	YLC1	-	5CN
BTBL	()R	2C0	GA1	-R	10C0	ITV	-I	8C0	NCYC	-I	8C0	OPTMP	()R	2C0	SPTBL	()R	2C0	YLC2	-	6CN
BU	-R	10C0	GR	-R	10C0	JBAR	-1	8C0	NDUMP	-I	8C0	ORANGE	-	10CN	START	-	20SU	YSC1	-	3CN
COLAMU	-R	10C0	GRDVEL	-R	8C0	JNP	-I	10C0	NERR	-I	2C0	PINK	-	4CN	STATE	-	2CN			
CYL	-R	10C0	GZ	-R	10C0	JP1	-I	8C0	NOPD	-I	2C0	PTAB	()R	2C0	T	-R	8C0			
DIMENSI	-	15F	IELP	-I	10C0	JP4	-1	10C0	NP1	-I	10C0	REAL	-	14F	TAMB	-R	8C0			
DT	-R	8C0	IJK	-I	4C0	JSWTCH1	-I	12C0	NP4	-I	10C0	RED	-	8CN	TEMP	()R	8C0			
DTPOS	-R	10C0	IJS	-I	4C0	JSWTCH2	-I	12C0	NQI	-I	8C0	RETURN	-	69F	THIRD	-R	10C0			

MULTIPLY-REFERENCED VARIABLES

119 -	22D0	23*																	
129 -	21D0	23*																	
AASC ()R	3C0	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6	13E6
	13E6	13E6																	
AMAX1 -	23SU	25SU	44SU	47SU															
AMIN1 -	24SU	46SU	46SU	48SU	49SU														
BETALC ()R	13E6	15D1																	
CENTA ()R	13E6	15D1																	
CENTY ()R	13E6	15D1																	
COMMON -	4F	3F	4F	8F	9F	10F	11F	12F											
CW ()R	13E6	15D1																	
DELSM ()R	13E6	15D1																	
E ()R	13E6	15D1																	
EMOMLC ()R	13E6	15D1																	
EP ()R	13E6	15D1																	
ETIL ()R	13E6	15D1																	
FIPXL -R	9C0	52=	55	56	57	59													
FIPXR -R	9C0	53=	55=	56	57	60													
FIPYB -R	9C0	51=	55	56	58	61													
FIPYT -R	51=	55	56=	58	62														
FIXL -R	9C0	32=	35	36	37	39													
FIXR -R	9C0	33=	35=	36	37	40													

```
FIYB     -R    9C0   3 =    35      36      38      41
FIYT     -R   31=    35     36=     38      42
FOUTLC   ()R   13E0  150I
FSN      ()R   13E0  150I
GRIR     ()R   13E0  150I
GRIZ     ()R   13E0  150I
I        -I    4C0   220C
IBAR     -I    8C0   19
IJ       -I    4C0   23      29      25      26=     26
IPXL     -I    9C0   59=
IPXR     -I    9C0   6 =
IPYB     -I    9C0   61=
IPYT     -I    9C0   62=
IPI      -I    8C0   2200
IXL      -I    9C0   39=
IXR      -I    9C0   4 =
IYB      -I    9C0   41=
IYT      -I    9C0   42=
J        -I    4C0   2100
JP2      -I    8C0   2100
LAM      -R    10C0  14RL
LCM      -     5F     6F     7F
M        ()R   13E0  14RL   150I
M1       ()R   13E0  14RL   150I
MU       -R    10C0  14RL
NQ       -I    8C0   26
P        ()R   13E0  150I
PL       ()R   13E0  150I
PXCONV   -R    9C0   57=
PXL      -R    9C0   43=     57
PXR      -R    9C0   46=     46      47      48      49=     49      54      57
PYB      -R    9C0   44=     44      47=     47      54      58
PYCONV   -R    9C0   58=
PYT      -R    9C0   45=     45      48=     48      54      58
R        ()R   13E0  150I
RCSQ     ()R   13E0  150I
RIBAR    -R    9C0   19=     29
RM       ()R   13E0  150I
RMP      ()R   13E0  150I
RO       ()R   13E0  150I
ROL      ()R   13E0  150I
RVOL     ()R   13E0  150I
RZEDEN   ()R   13E0  150I
SIE      ()R   13E0  150I
SIGPLC   ()R   13E0  150I
U        ()R   13E0  150I
UG       ()R   13E0  150I
UL       ()R   13E0  150I
UMOMLC   ()R   13E0  150I
UP       ()R   13E0  150I
UTIL     ()R   13E0  150I
V        ()R   13E0  150I
VG       ()R   13E0  150I
VL       ()R   13E0  150I
VP       ()R   13E0  150I
VTIL     ()R   13E0  150I
VV       -R    9C0   29=
X        ()R   13E0  150I    23
XCONV    -R    9C0   37=
XD       -R   34=    35      35      36      36      54=     55      55      56      56
XL       -R    9C0   16=     37
XPAR     ()R   13E0  150I
XR       -R    9C0   18=     23=     23      29      34      37      46      49
YB       -R    9C0   17=     18      24=     24      34      38      44      47
YCONV    -R    9C0   38=
YPAR     ()R   13E0  150I
YT       -R    9C0   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/    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 /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, NOI, REASIE, 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, IAL, IXR, IYB,         SILVER     3
              2                  IYT, PACONV, PXL, PXR, PYB, PYCONV, PYT,       SILVER     4
              3                  RIBPR, VV, XCONV, XL, XR, YB, YCONV, YT        SILVER     5
      1        COMMON /ORANGE/   ANC, ASG, AV, AVFAC, AVM, BO, COLAMB, CYL,     ORANGE     2
              1                  DTPOS, EPS, GM1, GR, GZ, IM1,                  ORANGE     3
              2                  IECP, IP2, ITAB(100), JNM, JP4, KXI, LAM,      ORANGE     4
              3                  LJP2, MU, NP1, NQIR, NU12, NUMIT, OM,          ORANGE     5
              4                  OMARC, OMCYL, REZRON, REZYO, THIRD, VTEN       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(183), ZZ                                CRIMSN     2
     14        COMMON /SENSE/    JSWTCH1, JSWTCH2, JSWTCH3                      SENSE      2
     15        COMMON /BLUE/     DR, DZ, FREZ, IUNF, JMID,                      BLUE       2
              1                  JUNFOR, 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),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,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, LAMD, 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), RP(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         OPSIG(100)                                     OFFWEGO   17
     21        LOGICAL           E01                                            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            (1H1,12A6)                                     OFFWEGO   23
     27   2002 FORMAT            (1H ,*GENERAL DATA*/6H TIME ,1PE12.4,6X,       OFFWEGO   24
              1                  6H DTR  ,1PE12.4,6X,6H CYL  ,1PE12.4,6X,       OFFWEGO   25
              2                  7H GRDVEL,1PE11.4)                             OFFWEGO   26
```

```
      2003 FORMAT              (1H ,*RADN TRANSPORT DATA*/6H ALPHA,1PE12.4)      OFFWEGO   27
      2004 FORMAT              (1H ,*MESH CONSTANTS*/6H IBAR ,I12,6X,           OFFWEGO   28
     1                         6H JBAR ,I12,6X,6H YBASE,1PE12.4,6X,             OFFWEGO   29
     2                         6H REZYO,1PE12.4)                                OFFWEGO   30
      2005 FORMAT              (6H IONE ,I12,6X,6H JUNE ,I12,6X,6H JMID ,I12/   OFFWEGO   31
     1                         6H DR   ,1PE12.4,6X,6H DZ   ,1PE12.4,6X,        OFFWEGO   32
     2                         6H FREZ ,1PE12.4)                                OFFWEGO   33
      2006 FORMAT              (1H0,*HYDRODYNAMICS CONSTANTS*/6H AO   ,         OFFWEGO   34
     1                         1PE12.4,6X,6H AOM  ,1PE12.4,6X,6H BO   ,1PE12.4, OFFWEGO   35
     2                         6X,6H RXI  ,I12,6X,6H MU   ,1PE12.4/6H LAM  ,    OFFWEGO   36
     3                         1PE12.4,6X,6H OM   ,1PE12.4,6X,6H EPS  ,         OFFWEGO   37
     4                         1PE12.4,6X,6H ASQ  ,1PE12.4,6X,6H GM1  ,         OFFWEGO   38
     5                         1PE12.4/6H GR   ,1PE12.4,6X,6H GZ   ,1PE12.4,   OFFWEGO   39
     6                         6X,7H REZRGN,1PE11.4,6X,7H REZSIE,1PE11.4)       OFFWEGO   40
      2008 FORMAT              (1H0,A10,6X,A10)                                 OFFWEGO   41
      2009 FORMAT              (1H ,*PROBLEM STARTING TIME*,1PE12.4,* SEC*)     OFFWEGO   42
      2011 FORMAT              (1H ,*CONSTANTS SET BY OFFWEGO*/                 OFFWEGO   43
     1                         6H NO   ,I12,6X,6H NOI  ,I12/6H NBUF ,I12,      OFFWEGO   44
     2                         6X,6H NSP  ,I12,6X,6H NBP  ,I12,6X,              OFFWEGO   45
     3                         7H NPCMAX,I11)                                   OFFWEGO   46
      2012 FORMAT              (6H TAMB ,1PE12.4,6X,6H TEMIT,1PE12.4,6X,        OFFWEGO   47
     2                         6H ANG  ,1PE12.4)                                OFFWEGO   48
C                                                                               OFFWEGO   49
      CALL GETO (4LKJOB, JNM)                                                   OFFWEGO   50
      CALL DATE1 (DZ)                                                           OFFWEGO   51
      PRINT 2008,        JNM, DZ                                                OFFWEGO   52
      WRITE (12,2008)    JNM, DZ                                                OFFWEGO   53
      CALL SSWTCH (1,JSWTCH1)                                                   OFFWEGO   54
      CALL SSWTCH (2,JSWTCH2)                                                   OFFWEGO   55
      CALL SSWTCH (3,JSWTCH3)                                                   OFFWEGO   56
C     ---   SET LCM                                                           OFFWEGO   57
      IECS=0                                                                    OFFWEGO   58
   22 NECS=131000-IECS                                                          OFFWEGO   59
      NECS=MIN0(NECS,5454)                                                      OFFWEGO   60
      CALL ECHR (AASC, IECS, NECS, NE)                                          OFFWEGO   61
      IECS=IECS+5454                                                            OFFWEGO   62
      IF (IECS.LT.131000) GO TO 22                                              OFFWEGO   63
C     ---   READ EQUATION OF STATE INPUT                                      OFFWEGO   64
      READ  (6)          NOPT, NOPD, NFRQ                                       OFFWEGO   65
      READ  (6)          FREQ                                                   OFFWEGO   66
      DO 33 K=1,NFRQ                                                            OFFWEGO   67
      FREQ(K)=3.0E+18/FREQ(K)                                                   OFFWEGO   68
   33 CONTINUE                                                                  OFFWEGO   69
      DO 42 J=1,NOPD                                                            OFFWEGO   70
      DO 41 I=1,NOPT                                                            OFFWEGO   71
      READ  (6)          NWL, OPTMP(I), OPDEN(J), OPSIG                         OFFWEGO   72
      DO 41 K=1,NFRQ                                                            OFFWEGO   73
      IJK=K+(I-1)*NFRQ+(J-1)*NOPT*NFRQ                                          OFFWEGO   74
      SIGA(IJK)=OPSIG(K)+5.0                                                    OFFWEGO   75
   41 CONTINUE                                                                  OFFWEGO   76
      OPDEN(J)=OPDEN(J)+3.0                                                     OFFWEGO   77
   42 CONTINUE                                                                  OFFWEGO   78
      NSTATE=NOPD*NOPT                                                          OFFWEGO   79
      READ  (6)          SPTBL                                                  OFFWEGO   80
      IF (JSWTCH3.EQ.1) READ (6) PTAB                                           OFFWEGO   81
      IF (JSWTCH3.EQ.2) READ (6) SPTBL                                          OFFWEGO   82
      READ  (6)          PTAB                                                   OFFWEGO   83
      READ  (6)          ETAB                                                   OFFWEGO   84
      READ  (6)          BTBL                                                   OFFWEGO   85
      I=0                                                                       OFFWEGO   86
      J=1                                                                       OFFWEGO   87
      DO 44 IJ=1,NSTATE                                                         OFFWEGO   88
      I=I+1                                                                     OFFWEGO   89
      SPTBL(IJ)=SPTBL(IJ)+5.0                                                   OFFWEGO   90
      IF (I.EQ.2) SPTBL(IJ-1)=2.0*SPTBL(IJ)-SPTBL(IJ-1)                         OFFWEGO   91
      PTAB(IJ)=PTAB(IJ)-7.0                                                     OFFWEGO   92
      ETAB(IJ)=ETAB(IJ)-10.0                                                    OFFWEGO   93
      IF (I.LT.NOPT) GO TO 44                                                   OFFWEGO   94
```

```
79          I=
80          J=J+1
81       44 CONTINUE
82          CALL AFSREL (SLFSET6)
         C     ---   CHECK FOR DUMP OR CARDS
83          READ  (7)          NAME
84          IF (EOI(7)) GO TO 11
85          REWIND 7
86          NDALL=LOCF(ZZ)-LOCF(NAME(1))+1
87          CALL OPEN (SLFSET1,2LST,4608)
88          CALL OPEN (SLFSET3,2LST,4608)
89          CALL OPEN (SLFSET7,2LST,4608)
90          READ  (7)          (NAME(I), I=1,NDALL)
         C     ---   READ DUMP
91        3 READ  (7)
92          IF (EOF,7) 4,4
93          NECS=NO1*JP2
94          READ  (7)          (AA1(I), I=1,NECS)
95          NECS=2*NPT
96          READ  (7)          (AA2(I), I=1,NECS)
97        5 READ  (7)
98          IF (EOF,7) 6,6
99        6 REWIND 3
100         CALL COPYF (SLFSET7,SLFSET1)
101         CALL COPYF (SLFSET7,SLFSET3)
102         READ  (7)          (NAME(I), I=1,NDALL)
103         IF (EOI(7)) GO TO 7
104         GO TO 3
105       7 CALL OPEN (SLFSET1,2LST,512)
106         CALL OPEN (SLFSET3,2LST,512)
107         CALL OPEN (SLFSET7,2LST,512)
108         IF (JSWICH1.EQ.1) RETURN
109         CALL OPEN (SLFSET4,2LST,4608)
110         CALL SKIPR (SLFSET4,2,4)
111      61 READ  (4)          KSTEP, T2
112         IF (EOI(4)) GO TO 63
113         IF (T2.GT.T) GO TO 62
114         READ  (4)
115         READ  (4)
116         GO TO 61
117      62 BACKSPACE 4
118         BACKSPACE 4
119         BACKSPACE 4
120         GO TO 64
121      63 JSWICH1=1
122      64 CALL OPEN (SLFSET4,2LST,512)
123         RETURN
         C     ---   READ CARD INPUT
124      11 NG=18
125         READ  1001,        NAME
126         READ  1003,        TIME, DTR, CYL, GRDVEL, ALPHA
127         READ  1004,        IBAR, JBAR, YBASE, REZYO
128         READ  1005,        IUNF, JUNF, JMID, DR, DZ, FREZ
129         READ  1003,        A0, AOM, B0, XI, MU, LAM
130         READ  1003,        OM, EPS, ASG
131         READ  1003,        GM1, GM, GZ, REZRON, REZSIE
132         NA1=INT(A1)
133         TSTART=TIME
         C     ---   WRITE INPUT
134         PRINT 2001,        NAME
135         WRITE (12, 2001)   NAME
136         PRINT 2009,        TSTART
137         WRITE (12,2009)    TSTART
138         PRINT 2002,        TIME, DTR, CYL, GRDVEL
139         WRITE (12,2002)    TIME, DTR, CYL, GRDVEL
140         PRINT 2003,        ALPHA
141         WRITE (12,2003)    ALPHA
142         PRINT 2004,        IBAR, JBAR, YBASE, REZYO

OFFWEGO    95
OFFWEGO    96
OFFWEGO    97
OFFWEGO    98
OFFWEGO    99
OFFWEGO   100
OFFWEGO   101
OFFWEGO   102
OFFWEGO   103
OFFWEGO   104
OFFWEGO   105
OFFWEGO   106
OFFWEGO   107
OFFWEGO   108
OFFWEGO   109
OFFWEGO   110
OFFWEGO   111
OFFWEGO   112
OFFWEGO   113
OFFWEGO   114
OFFWEGO   115
OFFWEGO   116
OFFWEGO   117
OFFWEGO   118
OFFWEGO   119
OFFWEGO   120
OFFWEGO   121
OFFWEGO   122
OFFWEGO   123
OFFWEGO   124
OFFWEGO   125
OFFWEGO   126
OFFWEGO   127
OFFWEGO   128
OFFWEGO   129
OFFWEGO   130
OFFWEGO   131
OFFWEGO   132
OFFWEGO   133
OFFWEGO   134
OFFWEGO   135
OFFWEGO   136
OFFWEGO   137
OFFWEGO   138
OFFWEGO   139
OFFWEGO   140
OFFWEGO   141
OFFWEGO   142
OFFWEGO   143
OFFWEGO   144
OFFWEGO   145
OFFWEGO   146
OFFWEGO   147
OFFWEGO   148
OFFWEGO   149
OFFWEGO   150
OFFWEGO   151
OFFWEGO   152
OFFWEGO   153
OFFWEGO   154
OFFWEGO   155
OFFWEGO   156
OFFWEGO   157
OFFWEGO   158
OFFWEGO   159
OFFWEGO   160
OFFWEGO   161
OFFWEGO   162
```

```
      WRITE (12,2004)   IBAR, JBAR, YBASE, REZYC                          OFFWEGO  163
      PRINT 2005,       IUNF, JUNF, JMID, DR, DZ, FREZ                     OFFWEGO  164
      WRITE (12,2005)   IUNF, JUNF, JMID, DR, DZ, FREZ                     OFFWEGO  165
      PRINT 2006,       AO, AOM, BO, KXI, MU, LAM, OM, EPS, ASQ, GM1,      OFFWEGO  166
     1                  GR, GZ, REZRON, REZSIE                             OFFWEGO  167
      WRITE (12,2006)   AO, AOM, BO, KXI, MU, LAM, OM, EPS, ASQ, GM1,      OFFWEGO  168
     1                  GR, GZ, REZRON, REZSIE                             OFFWEGO  169
C     ---   COMPUTE AMBIENT TEMPERATURE                                    OFFWEGO  170
      XP=ALOG10(REZRON)                                                    OFFWEGO  171
      ZP=ALOG10(REZSIE)                                                    OFFWEGO  172
      YP=GETEMP(XP, ZP, OPDEN, OPTMP, ETAB, NOPD, NOPT)                    OFFWEGO  173
      TAMB=GRAD1 (YP)                                                      OFFWEGO  174
C     ---   SET CONSTANTS                                                  OFFWEGO  175
12    IM1   = IBAR - 1                                                     OFFWEGO  176
      YBASE=YBASE-REZYC                                                    OFFWEGO  177
      IP1=IBAR+1                                                           OFFWEGO  178
      IP2   = IBAR + 2                                                     OFFWEGO  179
      JP1=JBAR+1                                                           OFFWEGO  180
      JP2=JBAR+2                                                           OFFWEGO  181
      JP4   = JBAR + 4                                                     OFFWEGO  182
      T=TIME                                                               OFFWEGO  183
      DT=0.0                                                               OFFWEGO  184
      OTPOS=OTR                                                            OFFWEGO  185
      NGIB = NG * IBAR                                                     OFFWEGO  186
      OMCYL = 1.-CYL                                                       OFFWEGO  187
      NGI   = NG * IP1                                                     OFFWEGO  188
      NG12=NGI+NGI                                                         OFFWEGO  189
      ISC2  = NGI + 1                                                      OFFWEGO  190
      ISC3  = ISC2 + NGI                                                   OFFWEGO  191
      ITV   = JP1 * NGI                                                    OFFWEGO  192
      ISCF1 = ISC2 - NG                                                    OFFWEGO  193
      ISCF2 = ISCF1 + NGI                                                  OFFWEGO  194
      LJP2 = JP2 - JP2/3 * 3                                               OFFWEGO  195
      IF (LJP2.EQ.0) LJP2 = 3                                              OFFWEGO  196
      LJP2 = LJP2*NGI -NG +1                                               OFFWEGO  197
      IECP=LOCF(AAZ)                                                       OFFWEGO  198
      NCYC=0                                                               OFFWEGO  199
      EM10 = 1.E-10                                                        OFFWEGO  200
      ANC=0.05                                                             OFFWEGO  201
      OMANC = 1.-ANC                                                       OFFWEGO  202
      CCLAMD=1.5/(LAM+ML+MU+EM10)                                          OFFWEGO  203
      ALPAC=0.2                                                            OFFWEGO  204
      TRIMD = 1./3.                                                        OFFWEGO  205
      IUNF   = MAX0(IUNF,1)                                                OFFWEGO  206
      JUNF   = MAX0(JUNF,2)                                                OFFWEGO  207
      JUNF02 = JUNF/2                                                      OFFWEGO  208
      IF (JMID.EQ.0) JMID=JBAR/2                                           OFFWEGO  209
      IF (FREZ.NE.1.) RCMFR = 1./(1.-FREZ)                                 OFFWEGO  210
      TRY=1.0                                                              OFFWEGO  211
      VILM=0.0                                                             OFFWEGO  212
      NLMIT=1                                                              OFFWEGO  213
      NPT=0                                                                OFFWEGO  214
      JCEN=1                                                               OFFWEGO  215
      NBUF=6000                                                            OFFWEGO  216
      TEMIT=0.05                                                           OFFWEGO  217
      NPCMAX=50                                                            OFFWEGO  218
      NSP=10                                                               OFFWEGO  219
      NBP=3                                                                OFFWEGO  220
      ISN=4                                                                OFFWEGO  221
      DO 125 I=1,181                                                       OFFWEGO  222
      SACON(I)=0.0                                                         OFFWEGO  223
  125 CONTINUE                                                             OFFWEGO  224
      SACON(182)=ALPHA                                                     OFFWEGO  225
      SACON(183)=MOVE(ISN)                                                 OFFWEGO  226
      TOUT=TIME                                                            OFFWEGO  227
      PRINT 2011,       NG, NGI, NBUF, NSP, NBP, NPCMAX                    OFFWEGO  228
      WRITE (12,2011)   NG, NGI, NBUF, NSP, NBP, NPCMAX                    OFFWEGO  229
      PRINT 2012,       TAMB, ITMIT, ANC                                   OFFWEGO  230
```

```
      WRITE (12,2012)   TAMB, TEMIT, ANC                                  OFFWEGO  231
C     ---   MESH INPUT                                                    OFFWEGO  232
      CALL MESHMKR                                                        OFFWEGO  233
C     ---   SET UP FILM PLOT COORDINATES                                  OFFWEGO  234
      CALL FILMCO                                                         OFFWEGO  235
C     ---   COMPUTE ATAB YTAB ITAB                                        OFFWEGO  236
      CALL START                                                          OFFWEGO  237
      DO 139 J=2,JP2                                                      OFFWEGO  238
      YTAB(J) = Y(IJ)                                                     OFFWEGO  239
      IF (J.GT.2) GO TO 130                                               OFFWEGO  240
      DO 129 I=1,IP1                                                      OFFWEGO  241
      XTAB(I) = X(IJ)                                                     OFFWEGO  242
129   IJ = IJ + NQ                                                        OFFWEGO  243
13    CALL LOOP                                                           OFFWEGO  244
139   CONTINUE                                                            OFFWEGO  245
      LPB=NPT*NPT                                                         OFFWEGO  246
      NPPT = 0                                                            OFFWEGO  247
141   CALL ECHO (AASC,IECP,LPB,KE)                                        OFFWEGO  248
      KP = 1                                                              OFFWEGO  249
150   DO 159 J=2,JP2                                                      OFFWEGO  250
      IF (YTAB(J).GT.YPAR(KP)) GO TO 160                                  OFFWEGO  251
159   CONTINUE                                                            OFFWEGO  252
160   DO 169 I=1,IP1                                                      OFFWEGO  253
      IF (XTAB(I).GT.XPAR(KP)) GO TO 170                                  OFFWEGO  254
169   CONTINUE                                                            OFFWEGO  255
170   NPPT = NPPT + 1                                                     OFFWEGO  256
      ITAB(NPPT) = (J-2)*IP1+I-1                                          OFFWEGO  257
      IF (NPPT.EQ.NPT) GO TO 200                                          OFFWEGO  258
      KP=KP+2                                                             OFFWEGO  259
      GO TO 150                                                           OFFWEGO  260
C     ---   COMPUTE M E                                                   OFFWEGO  261
200   CALL START                                                          OFFWEGO  262
      DO 229 J=2,JP1                                                      OFFWEGO  263
      DO 219 I=1,IBAR                                                     OFFWEGO  264
      IPJ = IJ + NQ                                                       OFFWEGO  265
      IPJP = IJP + NQ                                                     OFFWEGO  266
      M(IJ)=RO(IJ)/RVOL(IJ)                                               OFFWEGO  267
      E(IJ) = SIE(IJ)+.125*(U(IPJ)**2+U(IPJP)**2+U(IJP)**2+U(IJ)**2       OFFWEGO  268
     1                      +V(IPJ)**2+V(IPJP)**2+V(IJP)**2+V(IJ)**2)     OFFWEGO  269
      IJ = IPJ                                                            OFFWEGO  270
219   IJP = IPJP                                                          OFFWEGO  271
      CALL LOOP                                                           OFFWEGO  272
229   CONTINUE                                                            OFFWEGO  273
      CALL DONE                                                           OFFWEGO  274
C     ---   COMPUTE RM                                                    OFFWEGO  275
300   CALL STARTD                                                         OFFWEGO  276
      DO 359 JJ=2,JP2                                                     OFFWEGO  277
      J = JP4 - JJ                                                        OFFWEGO  278
      DO 349 II=1,IP1                                                     OFFWEGO  279
      I = IP2 - II                                                        OFFWEGO  280
      IMJ = IJ - NQ                                                       OFFWEGO  281
      IMJM = IJM -NQ                                                      OFFWEGO  282
      XX = 0.0                                                            OFFWEGO  283
      IF (I.NE.IP1 .AND. J.NE.2  ) XX = M(IJM)                            OFFWEGO  284
      IF (I.NE.IP1 .AND. J.NE.JP2) XX = XX+M(IJ)                          OFFWEGO  285
      IF (I.NE.1   .AND. J.NE.JP2) XX = XX+M(IMJ)                         OFFWEGO  286
      IF (I.NE.1   .AND. J.NE.2  ) XX = XX+M(IMJM)                        OFFWEGO  287
340   RM(IJ) = 4./XX                                                      OFFWEGO  288
      IJ = IMJ                                                            OFFWEGO  289
349   IJM = IMJM                                                          OFFWEGO  290
      CALL LOOPD                                                          OFFWEGO  291
359   CONTINUE                                                            OFFWEGO  292
      RETURN                                                              OFFWEGO  293
      END                                                                 OFFWEGO  294
```

SINGLY REFERENCED VARIABLES

```
      5 -   97*    ECWR     -   46SU   IJPS    -I   8C0   LOGICAL -   21F   PINK    -   4CN   RLC1    -   7CN   XL      -R  9C0
    120 -  152*    EQUIVAL  -   16F    INT     -  132SU   LOOPD   -  261SU  PXCONV  -R  9C0   RVALS   ()R 11C0   XR      -R  9C0
    140 -  221*    FILMCC   -  209SU   IPXL    -I   9C0   MESHMKR -  208SU  PXL     -R  9C0   SENSE   -   14CN   YB      -R  9C0
    300 -  246*    FIPAL    -R  9C0    IPXR    -I   9C0   MINO    -   45SU  PXR     -R  9C0   SILVER  -   9CN   YCONV   -R  9C0
    340 -  256*    FIPAR    -R  9C0    IPYB    -I   9C0   MOVE    -  202SU  PYB     -R  9C0   SKIPR   -  110SU   YLC1    -   5CN
  AFSREL -   82SU  FIPYB    -R  9C0    IPYT    -I   9C0   MUO2    -R  17RL  PYCONV  -R  9C0   STARTU  -  246SU   YLC2    -   6CN
  ANGLES ()R 11C0  FIXL     -R  9C0    IXL     -I   9C0   NANGLS  -I  11C0  PYT     -R  9C0   STATE   -   2CN   YSC1    -   3CN
  BLUE   -   15CN  FIXR     -R  9C0    IXR     -I   9C0   NOOMP   -I   8C0  QEXP10  -  151SU  TEMP    ()R  8C0   YT      -R  9C0
  CRIMSN -   13CN  FIYB     -R  9C0    IYB     -I   9C0   NRVALS  -I  11C0  RADX    ()R 15C0   TREQI   -R  11C0
  DATE1  -   37SU  GETEMP   -  150SU   IYT     -I   9C0   NWL     -I  56RD  REAL    -   17F   VV      -R  9C0
  DONE   -  245SU  GLIN     -   36SU   KSTEP   -I 111RD  OFFWEGO -   1SU   REQ     -   8CN   WHITE   -   11CN
  ECRD   -  261SU  GREEN    -   12CN   LAMD    -R  17RL  ORANGE  -   14CN  RIBAR   -R  9C0   XCONV   -R  9C0
```

MULTIPLY-REFERENCED VARIABLES

```
      3 -   91*   104
      4 -   92    92     93*
      6 -   98    98     99*
      7 -  103   105*
     11 -   84   124*
     22 -   44*   46
     33 -  51D0   53*
     41 -  55D0  57D0   60*
     42 -  54D0   62*
     44 -  72D0   78     81*
     61 -  111*  116
     62 -  113   117*
     63 -  112   121*
     64 -  12-   122*
    125 -  196D0 200*
    129 -  214D0 216*
    13- -  213   217*
    139 -  211D0 218*
    15- -  223*  233
    159 -  223D0 225*
    160 -  224   226*
    169 -  226D0 228*
    17- -  227   229*
    200 -  231   234*
    219 -  236D0 242*
    229 -  235D0 244*
    349 -  249D0 26 *
    359 -  247D0 262*
   1001 -   22*  125RD
   1003 -   23*  128RD  129RD  130RD  131RD
   1004 -   24*  127RD
   1005 -   25*  126RD
   2001 -   26*  134FR  135WR
   2002 -   27*  136FR  139WR
   2003 -   28*  14-FR  141WR
   2004 -   29*  142FR  143WR
   2005 -   3-*  144FR  145WR
   2006 -   31*  146FR  147WR
   2008 -   32*   38FR   39WR
   2009 -   33*  136FR  137WR
   2011 -   34*  204FR  205WR
   2012 -   35*  206FR  207WR
AASC   ()R   3C0   16EQ   16EQ   16EQ   16EQ   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   12C0  126RD  140FR  141WR  201
ANC    -R   10C0  177=   178    206PR  207WR
A3Q    -R   10C0  132RD  146FR  147WR
A-     -R   10C0  129RD  146FR  147WR
AOFAC  -R   10C0  18-=
AOM    -R   10C0  129RD  146FR  147WR
BACKSPA -  117F  118F   119F
BETALC ()R  16EQ   16D1
```

BYBL	()R	2C0	69RD															
BX	-R	10C0	129RD	146PR	147WR													
CENTA	()R	16E0	180I															
CENTY	()R	16E0	180I															
COLAMU	-R	10C0	179=															
COMMON	-	2F	3F	4F	8F	9F	10F	11F	12F	13F	14F	15F						
COPYR	-	1009S0	1015S0															
CX	()R	16E0	180I															
CYL	-R	10C0	126RD	138PR	139WR	163												
DELSM	()R	16E0	180I															
DIMENSI	-	18F	19F	20F														
DR	-R	15C0	128RD	144PR	145WR													
DT	-R	8C0	163=															
DTPOS	-R	10C0	161=															
DTR	-R	8C0	126RD	138PR	139WR	161												
DZ	-R	15C0	128RD	144PR	145WR													
DZ	-R	37A6	38PR	39WR														
E	()R	16E0	180I	240=														
EMOMLC	()R	16E0	180I															
EMIO	-R	8C0	176=	179														
EOF	-	9CF	98F															
EOI	-	21L6	845S0	1.3S0	112S0													
EP	()R	16E0	180I															
EPS	-R	10C0	13.RD	146PR	147WR													
ETAB	()R	2C0	68RD	77=	77	150												
ETIL	()R	16E0	180I															
FORMAT	-	22F	23F	24F	25F	26F	27F	28F	29F	30F	31F	32F	33F	34F	35F			
FOUTLC	()R	16E0	180I															
FREQ	()R	2C0	5 RD	52=	52													
FREZ	-R	15C0	128RD	144PR	145WR	186	186											
FSN	()R	16E0	180I															
GMI	-R	10C0	131RD	146PR	147WR													
GR	-R	10C0	131RD	146PR	147WR													
GRDVEL	-R	8C0	126RD	138PR	139WR													
GRIR	()R	16E0	180I															
GRIZ	()R	16E0	180I															
GZ	-R	10C0	131RD	146PR	147WR													
I	-I	4C0	5500	56RD	58	70=	73=	73	75	78	79=	90RD	90RD	94RD	94RD	96RD	96RD	102RD
		112RD	19600	199	21400	215	22600	227	230	23600	250=	254	255	256	257			
IBAR	-I	8C0	127RD	142PR	143WR	152	154	155	162	23600								
IECP	-I	10C0	174=	221A6														
IECS	-I	43=	44	46A6	47=	47	48											
II	-I	24900	25.															
IJ	-I	4C0	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	4C0	252	254	260=													
IJP	-I	4C0	238	240	240	242=												
IMJ	-I	251=	256	259														
IMJM	-I	252=	257	260														
IMI	-I	10C0	152=															
IPJ	-I	237=	24	240	241													
IPJP	-I	238=	240	240	242													
IPI	-I	8C0	154=	164	21400	22600	230	24900	254	255								
IP2	-I	10C0	155=	250														
ISCR1	-I	8C0	169=	176														
ISCR2	-I	8C0	17 =															
ISC2	-I	8C0	166=	167	169													
ISC3	-I	8C0	167=															
ISN	-I	197=	2.2															
ITAB	()I	10C0	23.=															
ITV	-I	8C0	166=															
IUNF	-I	15C0	128RD	144PR	145WR	182=	182											
J	-I	4C0	5400	56RD	58	61	61	71=	80=	80	21100	212	213	22300	224	230	23500	248=
		254	255	256	257													

```
JBAR      -I     8CO   127RD   142PR   143WR   156     157     158     185
JCEN      -I    14CO   191=
JJ        -I   247DO   248
JMID      -I    15CO   128RD   144PR   145WR   185     185=
JNM       -I     1 CO    36A6    38PR    39WR
JP1       -I     8CO   156=    168     235DO
JP2       -I     8CO    93     157=    171     171     211DO   223DO   247DO   255     256
JP4       -I    14CO   156=    248
JSWTCH1   -I    14CO    41A6    118     121=
JSWTCH2   -I    14CO    41A6
JSWTCH3   -I    14CO    42A6    65      66
JUNF      -I   128RD   144PR   145WR   183=    183     184
JUNFO2    -I    15CO   184=
K         -I    51DO    52      52      57DO    58      59
KP        -I   222=    224     227     232=    232
KXI       -I    14CO   132=    146PR   147WR
LAM       -R    14CO    17RL   149RD   146PR   147WR   179
LCM       -      5F      6F      7F
LJP2      -I    14CO   171=    172     172=    173=    173
LOCF      -    86SU    86SU   174SU
LOOP      -   217SU   243SU
LPB       -I   219=    221A6
M         ()R   16EQ    17RL    18D1   239=    254     255     256     257
MAXO      -   182SU   183SU
MP        ()R   16EQ    17RL    18D1
MU        -R    14CO    17RL   129RD   146PR   147WR   179     179
NAME      ()I    8CO    83RD    86      90RD   102RD   125RD   134PR   135WR
NBP       -I    12CO   196=    204PR   205WR
NBUF      -I    12CO   192=    204PR   205WR
NCYC      -I     8CO   175=
NDALL     -I    86=     91RD   102RD
NE        -I    46A6   221A6
NECS      -I    44=     45=     45      46A6    93=     94RD    95=     96RD
NFRD      -I     2CO    49RD    51DC    57DO    58      58
NOPD      -I     2CO    49RD    54DO    63     150
NOPT      -I     2CO    49RD    55DO    58      63      78     150
NPCMAX    -I    12CO   194=    204PR   205WR
NPPT      -I   220=    229=    229     230     231
NPT       -I    14CO    95     196=    219     219     231
NQ        -I     8CO   124=    162     164     169     173     204PR   205WR   216     237     238     251     252
NQI       -I     8CO    93     164=    165     165     166     167     168     170     173     204PR   205WR
NQIB      -I    14CO   162=
NQI2      -I    14CO   165=
NSP       -I    14CO   195=    204PR   205WR
NSTATE    -I    63=    72DO
NUMIT     -I    14CO   189=
OM        -R    14CO   143RD   146PR   147WR
OMANC     -R    14CO   178=
OMCYL     -R    14CO   163=
OPDEN     ()R    2CO    56RD    61=     61     150
OPEN      -    87SU    88SU    89SU   105SU   106SU   107SU   109SU   122SU
OPSIG     ()R   20D1    56RD    59
OPTMP     ()R    2CO    56RD   150
P         ()R   16EQ    18D1
PL        ()R   16EQ    18D1
PRINT     -     38F    134F    136F    138F    140F    142F    144F    146F    204F    206F
PTAB...   ()R     2CO    65RD    67RD    76=     76
QLOG10    -    14ESU   149SU
R         ()R   16EQ    18D1
RCSQ      ()R   16EQ    18D1
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    203F
REWIND    -     85F     99F
REZRUN    -R    14CO   131RD   146PR   147WR   148
REZSIE    -R     8CO   131RD   146PR   147WR   149
REZYU     -R    14CO   127RD   142PR   143WR   153
RM        ()R   16EQ    18D1   258=
```

```
RMP      ()R    16EW    18D1
RO       ()R    16EW    18D1   239
ROL      ()R    16EW    18D1
ROMFR    -R     15CU    186=
RVOL     ()R    16EW    18D1   239
RZEDEN   ()R    16EW    18D1
SIE      ()R    16EW    18D1   240
SIGA     ()R     7LC    59=
SIGPLC   ()R    16EW    18D1
SNCON    ()R    13CU    199=   2.1=   202=
SPTBL    ()R     2CU    64RD    66RD   74=    74     75=    75     75
SSWTCH   -      4?5U    415U    425U
START    -     21?5U   23450
T        -R      8CU    113     159=
TAMB     -R      8CU    151=    2 6PR  207WR
TEMIT    -R     12CU    193=    2.6PR  207WR
THIRD    -R     1 CU    181=
TMY      -R      8CU    187=
TIME     -R      8CU    126RD   133    138PR  139WR  159    203
TOUT     -R      8CU    2C3=
TSTART   -R      8CU    133=    136PR  137WR
T2       -R    111RD    113
U        ()R    16EW    18D1   240    240    240    240
UG       ()R    16EW    18D1
UL       ()R    16EW    18D1
UMOMLC   ()R    16EW    18D1
UP       ()R    16EW    18D1
UTIL     ()R    16EW    18D1
V        ()R    16EW    18D1   240    240    240    240
VG       ()R    16EW    18D1
VL       ()R    16EW    18D1
VP       ()R    16EW    18D1
VTEN     -R     1 CU    186=
VTIL     ()R    16EW    18D1
WRITE    -      39F     135F   137F   139F   141F   143F   145F   147F   205F   207F
X        ()R    16EW    18D1   215
XI       -R    129RD    132
XP       -R    148=     150.
XPAR     ()R    16EW    18D1   227
XTAB     ()R    19D1    215=   227
XX       -R    253=     254=   255=   255    256=   256    257=   257    258
Y        ()R    16EW    18D1   212
YBASE    -R     15CU    147RD  142PR  143WR  153=   153
YP       -R    150=     151
YPAR     ()R    16EW    18D1   224
YTAB     ()R    19D1    212=   224
ZP       -R    145=     15.
ZZ       -R     13CU    86
```

```
1           SUBROUTINE MESHMKR                                              MESHMKR    2
2           COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),       ALLKOM     2
           1                  FREW(100), SPTBL(360), PTAB(300), ETAB(300),  ALLKOM     3
           2                  HTBL(300)                                     ALLKOM     4
3           COMMON /YSC1/     AASC(5454)                                    ALLKOM     5
4           COMMON /PIAR/     I, IJ, IJM, IJP, J                            ALLKOM     6
5           LCM /YLC1/        AA1(131409)                                   ALLKOM     7
6           LCM /YLC2/        AA2(131006)                                   ALLKOM     8
7           LCM /RLC1/        SIGA(36000)                                   ALLKOM     9
8           COMMON /RED/      NAME(14), DT, DTR, EM10, GRDVEL, IRAR, IJPS,  ALLKOM    10
           1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,     ALLKOM    11
           2                  JP1, JP2, NCYC, NDUMP, NO, NOI, 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 /ORANGE/  ANC, ASC, AS, AUFAC, AOM, BQ, COLAML, CYL,           ORANGE     2
      1                 DTPOS, EPS, GM1, GR, GZ, IM1,                        ORANGE     3
      2                 IECP, IP2, ITAB(1000), JNM, JP4, KXI, LAM,           ORANGE     4
      3                 LJP2, MU, NPT, NQ10, NQ12, NUMIT, OM,                ORANGE     5
      4                 OMANC, OMCYL, REZRON, REZYB, THIRD, VTEM             ORANGE     6
11     COMMON /WHITE/   NRVALS, RVALS(73), NUMGLS, ANGLES(35), TNEUT         ORANGE     7
12     COMMON /BLUE/    DR, DZ, FREZ, IUNF, JM1D,                            BLUE       2
      1                 JUNFOR, RADX(7500), ROMFR, YBASE                     BLUE       3
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),PP,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,CO,EMOMLC),                        EQVREAL    7
      6                 (AASC(13),VTIL,VL,OMOMLC),                           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,REZDEN),                           EQVREAL   11
      1                 (AASC(18),GRIZ,VG,FSN)                               EQVREAL   12
15     REAL             LAM, LAMO, M, MP, MU, MUO2                           EQVREAL   13
16     DIMENSION        X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),            DIMEN      2
      2                 V(1), RO(1), PP(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), CO(1), EMOMLC(1), VTIL(1), VL(1),             DIMEN      6
      6                 OMOMLC(1), ROL(1), BETALC(1), FOUTLC(1),             DIMEN      7
      7                 SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),         DIMEN      8
      8                 REZDEN(1), GRIZ(1), VG(1), FSN(1)                    DIMEN      9
17   1000 FORMAT        (12I6)                                               MESHMKR   10
18   1001 FORMAT        (4I6,4E12.4)                                         MESHMKR   11
19   1009 FORMAT        (1H0,*BACKGROUND MESH VARIABLES*)                    MESHMKR   12
20   1010 FORMAT        (1H0,5HNR    ,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
21   1015 FORMAT        (1H0,*BUBBLE VARIABLES*/ 6H IBUB ,I12,6X,            MESHMKR   17
      1                 6H JBUB ,I12//6H    II,6H    JJ,12X,               MESHMKR   18
      2                 12H          RGI,12H         SIEI,                   MESHMKR   19
      3                 12H           UI,12H          VI,                    MESHMKR   20
      4                 12H        TEMPI/)                                   MESHMKR   21
22   1019 FORMAT        (2I6,12X,1P5E12.4)                                   MESHMKR   22
23   1020 FORMAT        (2I5,4E15.5)                                         MESHMKR   23
24   1051 FORMAT        (I12,1P3E12.4)                                       MESHMKR   30
25   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
26     DIMENSION        PURDU(100), PURDV(100), PURDM(4,100),                MESHMKR   35
      1                 PURDE(4,100), MATL(4), MAT(100)                      MESHMKR   36
     C     ---   INITIALIZE                                                  MESHMKR   37
27     PRINT 1009                                                           MESHMKR   38
     C     ---   COMPUTE UNIFORM COORDINATES                                 MESHMKR   39
28     XX=0.0                                                               MESHMKR   40
29     YY=-FLOAT(JM1D)*DZ                                                   MESHMKR   41
30     CALL START                                                           MESHMKR   42
31     DO 229 J=2,JP2                                                       MESHMKR   43
32     DO 219 I=1,IP1                                                       MESHMKR   44
33     X(IJ) = XX                                                           MESHMKR   45
34     Y(IJ) = YY                                                           MESHMKR   46
35     R(IJ) = XX*CYL+OMCYL                                                 MESHMKR   47
36     IF(J.NE.2) GO TO 212                                                 MESHMKR   48
37     Y(IJ)=YBASE                                                          MESHMKR   49
```

```
      Y(IJK)=YY-DZ                                                      MESHMKR  50
      X(IJK)=XX                                                         MESHMKR  51
      R(IJK)=R(IJ)                                                      MESHMKR  52
  240 IF (J.NE.JP2) GO TO 244                                           MESHMKR  53
      Y(IJP)=YY+DZ                                                      MESHMKR  54
      X(IJP)=XX                                                         MESHMKR  55
      R(IJP)=R(IJ)                                                      MESHMKR  56
  244 IJP=IJP+NG                                                        MESHMKR  57
      IJM=IJM+NG                                                        MESHMKR  58
      XX = XX + DR                                                      MESHMKR  59
      IJ=IJ+NG                                                          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(JUNFO2) * DZ                                        MESHMKR  72
      CALL START                                                        MESHMKR  73
      DO 249 J=2,JP2                                                    MESHMKR  74
      DO 239 I=1,IP1                                                    MESHMKR  75
      IMJ = IJ - NG                                                     MESHMKR  76
      IF (I.GT.(UNF+1) X(IJ) = X(IMJ) + FREZ*(X(IMJ)-X(IMJ-NG))         MESHMKR  77
      R(IJ) = X(IJ)*CYL + ONCYL                                         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+NG                                                          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  (10,1)          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,DPDEN(1))                                             MESHMKR  94
      XP=AMIN1(XP,DPDEN(NOPD))                                          MESHMKR  95
      ZP=ALOG10(SIEI)                                                   MESHMKR  96
      YP=GETEMP (XP, ZP, DPDEN, DPTMP, ETAB, NOPD, NOPT)                MESHMKR  97
      IF (YP.GT.DPTMP(NOPT)) YP=DPTMP(NOPT)                             MESHMKR  98
      TEMP1=EXP10(YP)                                                   MESHMKR  99
      PRINT 101,          NB, NR, NT, NL, ROI, SIEI, UI, VI, TEMP1      MESHMKR 100
      WRITE (12,101)      NB, NR, NT, NL, ROI, SIEI, UI, VI, TEMP1      MESHMKR 101
      RKOI=137.214E-07*TEMP1**4/ROI                                     MESHMKR 102
      NR2 = NB + 2                                                      MESHMKR 103
      NR1 = NR + 1                                                      MESHMKR 104
      NT2 = NT + 2                                                      MESHMKR 105
      NL1 = NL + 1                                                      MESHMKR 106
      DO 329 J=NR2,NT2                                                  MESHMKR 107
      CALL RIRO4                                                        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+RKOI                                           MESHMKR 116
      TEMP(IJSC)=TEMP1                                                  MESHMKR 117
```

```
      319 CONTINUE                                                      MESHMKR  118
          CALL RIROW                                                    MESHMKR  119
      329 CONTINUE                                                      MESHMKR  120
          IF (NB2.NE.2) GO TO 300                                       MESHMKR  121
          J=1                                                           MESHMKR  122
          CALL RIROW                                                    MESHMKR  123
          DO 359 I=1,IP1                                                MESHMKR  124
          CALL SETIJ                                                    MESHMKR  125
          RO(IJ)=ROI                                                    MESHMKR  126
          SIE(IJ)=E(IJ)=SIEI+RHOI                                       MESHMKR  127
      359 CONTINUE                                                      MESHMKR  128
          CALL RIROW                                                    MESHMKR  129
          GO TO 300                                                     MESHMKR  130
C         ---   EXPONENTIAL ATMOSPHERE                                  MESHMKR  131
      400 XX=GM1*REZSIE                                                 MESHMKR  132
          YY = .5*ABS(GZ)                                               MESHMKR  133
          PRINT 1050                                                    MESHMKR  134
          WRITE (12,1050)                                               MESHMKR  135
          CALL START                                                    MESHMKR  136
          YJC2=0.5*(Y(IJP)+Y(IJ))+REZY0                                 MESHMKR  137
          ROSAV = REZRHO*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 + NG                                                  MESHMKR  147
          IJM=IJM+NG                                                    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+NG                                                      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+NG                                                      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=OLTEMP (XP, ZP, OPDEN, OPTMP, ETAB, NOPD, NOPT)            MESHMKR  180
          IF (YP.GT.OPTMP(NOPT)) YP=OPTMP(NOPT)                         MESHMKR  181
          TEMP(IJSC)=ALEXP10(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
```

```
171           IJSC=IJSC+1                                                    MESHMKR  186
172           TEMP(IJSC)=TEMP(IJSC-1)                                        MESHMKR  187
173           RHOI=137.214E-07*TEMP(IJSC)**4/RO(IJ)                          MESHMKR  188
174           SIE(IJ)=E(IJ)=SIE(IJ)+RHOI                                     MESHMKR  189
175           IJ=IJ+NU                                                       MESHMKR  190
176         498 CONTINUE                                                     MESHMKR  191
177           CALL LOOP                                                      MESHMKR  192
178         499 CONTINUE                                                     MESHMKR  193
179           CALL DONE                                                      MESHMKR  194
C           ---   PUBBLE INPUT                                             MESHMKR  195
180         500 IF (JSWTCH).EQ.2) GO TO 520                                  MESHMKR  196
181           READ  1000,        IBUB, JBUB                                  MESHMKR  197
182           IF (IBUB.EQ.0) GO TO 505                                       MESHMKR  198
183           PRINT 1018,        IBUB, JBUB                                  MESHMKR  199
184           WRITE (12,1018)    IBUB, JBUB                                  MESHMKR  200
185         501 READ  1020,        II, JJ, ROI, SIEI, VI, UI                MESHMKR  201
186           IF (II.EQ.) GO TO 500                                          MESHMKR  202
187           I=II+IBUB-1                                                    MESHMKR  203
188           J=JJ+JBUB-1                                                    MESHMKR  204
189           CALL RTROW                                                     MESHMKR  205
190           CALL SETIJ                                                     MESHMKR  206
191           RO(IJ)=ROI                                                     MESHMKR  207
192           XP=ALOG10(ROI)                                                 MESHMKR  208
193           XP=AMIN1(XP,OPDEN(NOPD))                                       MESHMKR  209
194           XP=AMAX1(XP,OPDEN(1))                                          MESHMKR  210
195           ZP=ALOG10(SIEI)                                                MESHMKR  211
196           YP=GLITEMP(XP, ZP, OPDEN, OPTMP, ETAB, NOPD, NOPT)             MESHMKR  212
197           IF (YP.GT.OPTMP(NOPT)) YP=OPTMP(NOPT)                          MESHMKR  213
198           TEMPI=10EXP10(YP)                                              MESHMKR  214
199           PRINT 1019,        II, JJ, ROI, SIEI, UI, VI, TEMPI            MESHMKR  215
200           WRITE (12,1019)    II, JJ, ROI, SIEI, UI, VI, TEMPI            MESHMKR  216
201           IJSC=(J-1)*IPI+I                                               MESHMKR  217
202           TEMP(IJSC)=TEMPI                                               MESHMKR  218
203           RHOI=137.214E-07*TEMPI**4/ROI                                  MESHMKR  219
204           SIE(IJ)=SIEI+RHOI                                              MESHMKR  220
205           U(IJ)=UI                                                       MESHMKR  221
206           V(IJ)=VI                                                       MESHMKR  222
207           CALL WTROW                                                     MESHMKR  223
208           IF (IBUB.EQ.1) GO TO 502                                       MESHMKR  224
209           I=IBUB-II                                                      MESHMKR  225
210           IF (I.LE.0) GO TO 502                                          MESHMKR  226
211           IJSC=(J-1)*IPI+I                                               MESHMKR  227
212           CALL RTROW                                                     MESHMKR  228
213           CALL SETIJ                                                     MESHMKR  229
214           RO(IJ)=ROI                                                     MESHMKR  230
215           SIE(IJ)=SIEI+RHOI                                              MESHMKR  231
216           TEMP(IJSC)=TEMPI                                               MESHMKR  232
217           CALL WTROW                                                     MESHMKR  233
218           I=I+1                                                          MESHMKR  234
219           CALL RTROW                                                     MESHMKR  235
220           CALL SETIJ                                                     MESHMKR  236
221           U(IJ)=-UI                                                      MESHMKR  237
222           V(IJ)=VI                                                       MESHMKR  238
223           CALL WTROW                                                     MESHMKR  239
224           I=II+IBUB-1                                                    MESHMKR  240
225         502 J=J-2*JJ+1                                                   MESHMKR  241
226           CALL RTROW                                                     MESHMKR  242
227           CALL SETIJ                                                     MESHMKR  243
228           RO(IJ)=ROI                                                     MESHMKR  244
229           SIE(IJ)=SIEI+RHOI                                              MESHMKR  245
230           IJSC=(J-1)*IPI+I                                               MESHMKR  246
231           TEMP(IJSC)=TEMPI                                               MESHMKR  247
232           CALL WTROW                                                     MESHMKR  248
233           J=J+1                                                          MESHMKR  249
234           CALL RTROW                                                     MESHMKR  250
235           CALL SETIJ                                                     MESHMKR  251
236           U(IJ)=UI                                                       MESHMKR  252
237           V(IJ)=-VI                                                      MESHMKR  253
```

```
238           CALL WIKOW                                                    MESHMKR  254
239           IF (IBUB.EQ.1) GO TO 503                                      MESHMKR  255
24            J=J-1                                                         MESHMKR  256
241           I=IBUB-II                                                     MESHMKR  257
242           IF (I.LE.0) GO TO 503                                         MESHMKR  258
243           IJSC=(J-1)*IP1+I                                              MESHMKR  259
244           CALL WIKOW                                                    MESHMKR  260
245           CALL SETIJ                                                    MESHMKR  261
246           RC(IJ)=RKOI                                                   MESHMKR  262
247           SIE(IJ)=SIEI*RKOI                                             MESHMKR  263
248           TEMP(IJSC)=TEMPI                                              MESHMKR  264
249           CALL WIKOW                                                    MESHMKR  265
250           I=I+1                                                         MESHMKR  266
251           J=J+1                                                         MESHMKR  267
252           CALL WIKOW                                                    MESHMKR  268
253           CALL SETIJ                                                    MESHMKR  269
254           U(IJ)=-UI                                                     MESHMKR  270
255           V(IJ)=-VI                                                     MESHMKR  271
256           CALL WIKOW                                                    MESHMKR  272
257       503 GO TO 501                                                     MESHMKR  273
          C   ---   GENERATE MARKER PARTICLES                              MESHMKR  274
258       505 CALL PARTGEN                                                  MESHMKR  275
          C   ---   CALCULATE RVOL                                         MESHMKR  276
259       520 CALL START                                                    MESHMKR  277
260           DO 549 J=2,JP1                                                MESHMKR  278
261           IJSC=(J-1)*IP1                                                MESHMKR  279
262           DO 539 I=1,IBAR                                               MESHMKR  280
263           IPJ = IJ+NQ                                                   MESHMKR  281
264           IPJP = IJP+NQ                                                 MESHMKR  282
265           IJSC=IJSC+1                                                   MESHMKR  283
266           X1=X(IPJ)                                                     MESHMKR  284
267           X2=X(IPJP)                                                    MESHMKR  285
268           X3=X(IJP)                                                     MESHMKR  286
269           X4=X(IJ)                                                      MESHMKR  287
270           Y1=Y(IPJ)                                                     MESHMKR  288
271           Y2=Y(IPJP)                                                    MESHMKR  289
272           Y3=Y(IJP)                                                     MESHMKR  290
273           Y4=Y(IJ)                                                      MESHMKR  291
274           R1=R(IPJ)                                                     MESHMKR  292
275           R2=R(IPJP)                                                    MESHMKR  293
276           R3=R(IJP)                                                     MESHMKR  294
277           R4=R(IJ)                                                      MESHMKR  295
278           RVOL(IJ)=8.0/((R1+R2+R3+R4)*((X1-X3)*(Y2-Y4)-(Y1-Y3)*(X2-X4)))  MESHMKR  296
279           IF (JSWTCH1.EQ.1) GO TO 538                                   MESHMKR  297
280           XR=X1+X2+X3+X4                                                MESHMKR  298
281           YR=Y1+Y2+Y3+Y4                                                MESHMKR  299
282           RADA(IJSC)=0.25*USQRT(XR**2+YR**2)                            MESHMKR  300
283       538 IJ=IPJ                                                        MESHMKR  301
284           IJP=IPJP                                                      MESHMKR  302
285       539 CONTINUE                                                      MESHMKR  303
286           CALL LOOP                                                     MESHMKR  304
287       549 CONTINUE                                                      MESHMKR  305
288           CALL DONE                                                     MESHMKR  306
289           IF (JSWTCH1.EQ.1) RETURN                                      MESHMKR  307
          C                                                                 MESHMKR  457
290           RETURN                                                        MESHMKR  458
291           END                                                           MESHMKR  459
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	EPS	-R	10C0	IPYB	-I	9C0	JSWTCH3	-I	13C0	NRVALS	-I	11C0	PYT	-R	9C0	TNEUT	-R	11C0
AA2	()R	6LC	EQUIVAL	-	14F	IPYT	-I	9C0	KAI	-I	10C0	NUMIT	-I	10C0	QSQRT	-	282SU	TOUT	-R	8C0
ABS	-	118SU	EXP	-	123SU	IP2	-I	10C0	LAMD	-R	15RL	OM	-R	10C0	REAL	-	15F	TSTART	-R	8C0
ANC	-R	10C0	FIPXL	-R	9C0	ISCF1	-I	8C0	LJP2	-I	10C0	OMANC	-R	10C0	RED	-	8CN	VTEM	-R	10C0
ANGLES	()R	11C0	FIPYB	-R	9C0	ISCF2	-I	8C0	MAI	()I	26DI	ORANGE	-	10CN	RIBAR	-R	9C0	VV	-R	9C0
ASU	-R	10C0	FIPYT	-R	9C0	ISC2	-I	8C0	MAIL	()I	26DI	PARTGEN	-	258SU	RLC1	-	7CN	WHITE	-	11CN
AU	-R	10C0	FIXL	-R	9C0	ISC3	-I	8C0	MESHMKR	-	1SU	PIAA	-	4CN	RVALS	()R	11C0	XCONV	-R	9C0

ANFAC	-R	11C0	FIAR	-R	9C0	ITAB	()I	10C0	MUD2	-R	15RL	PTAB	()R	2C0	SENSE	-	13CN	XL	-R	9C0
AUM	-R	11C0	FIYB	-R	9C0	ITY	-I	8C0	NAME	()I	8C0	PURDE	()R	26DI	SIGA	()R	7LC	YB	-R	9C0
BLUE	-	12CN	FREG	()R	2C0	IXL	-I	9C0	NANGLS	-I	11C0	PURUM	()R	26DI	SILVER	-	9CN	YCONV	-R	9C0
BTBL	()R	2C0	GR	-R	14C0	IXR	-I	9C0	NCYC	-I	8C0	PURUU	()R	26DI	SPTBL	()R	2C0	YLC1	-	5CN
BU	-R	11C0	GROVEL	-R	8C0	IYB	-I	9C0	NDUMP	-I	8C0	PURUV	()R	26DI	STATE	-	2CN	YLC2	-	6CN
CULAMU	-R	10C0	ILCP	-I	13C0	IYT	-I	9C0	NFRQ	-I	2C0	PXCONV	-R	9C0	T	-R	8C0	YSC1	-	3CN
DT	-R	8C0	IOPS	-I	8C0	JBAR	-I	8C0	NPT	-I	10C0	PXL	-R	9C0	TAMB	-R	8C0	YT	-R	9C0
DTPOS	-R	14C0	IMJ	-I	11C0	JNP	-I	10C0	NUI	-I	8C0	PXR	-R	9C0	THIRD	-R	10C0			
DTR	-R	8C0	IPAL	-I	9C0	JP4	-I	10C0	NUIH	-I	10C0	PYP	-R	9C0	THY	-R	8C0			
EMIO	-R	8C0	IPAR	-I	9C0	JS*TCM2	-I	13C0	NUI2	-I	11C0	PYCONV	-R	9C0	TIME	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

202 -	36	41*	
204 -	41	45*	
219 -	3200	49*	
229 -	3100	53*	
239 -	6200	72*	
249 -	6100	74*	
300 -	55	76*	107 116
319 -	9600	104*	
329 -	9300	106*	
359 -	11100	114*	
400 -	77	117*	
459 -	12700	134*	
469 -	14100	145*	
479 -	13800	147*	
489 -	15100	156*	
498 -	17 00	176*	
499 -	15900	178*	
500 -	78	18 *	166
501 -	185*	257	
502 -	208	21.	225*
503 -	239	242	257*
505 -	182	256*	
520 -	18.	259*	
538 -	279	283*	
539 -	26200	285*	
549 -	26800	287*	
1000 -	17*	181RD	
1001 -	18*	70RD	
1009 -	19*	27PR	
1010 -	20*	86PR	87WR
1018 -	21*	183PR	184WR
1019 -	22*	199PR	200WR
1020 -	23*	165RD	
1050 -	25*	119PR	120WR
1051 -	24*	166PR	169WR

AASC	()R	3C0	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ	14EQ
		14E0	14E6																
AMAX1	-	8.5U	1625U	1945U															
AMIN1	-	8150	1635U	1935U															
BETALC	()R	14EQ	1601																
CENTA	()R	14EQ	1601																
CENTY	()R	14EQ	1601																
COMMON	-	2F	3F	4F	8F	9F	10F	11F	12F	13F									
CU	()R	14EQ	1601																
CYL	-R	1?C0	35	165															
DELSM	()R	14EQ	1601																
DIMENSI	-	10F	20F																
DONE	-	5450	7550	1575U	1795U	2885U													
DR	-R	12C0	47																
DZ	-R	12C0	29	38	42	51	59	68	69										
E	()R	14EQ	1601	102=	113=	174=													
EMOMLC	()R	14EQ	1601																
EP	()R	14EQ	1601																
ETAB	()R	2C0	83	165	196														
ETIL	()R	14EQ	1601																

```
FOEN    -R  125=  126   137=  139   149=  149   150
FLOAT   -   2950  5950
FNUM    -R  124=  125   126   138=  139   148=  148   150
FORMAT  -   17F   18F   19F   20F   21F   22F   23F   24F   25F
FOUTLC  ()R 14E0  16D1
FREZ    -R  12C0  55    64    68    6E    69    69    125   148   149
FSN     ()R 14E0  16D1
GETEMP  -   8350  16550 19650
GM1     -R  11C0  117
GRIR    ()R 14E0  16D1
GRIZ    ()R 14E0  16D1
GZ      -R  11C0  118   123
I       -I  4C0   3200  6200  64    96D0  11600 12700 14000 15100 17000 187=  201   209=  210   211   218=  218
            224=  23:   241=  242   243   250=  250   26200
IABS    -   6650  6750
IBAR    -I  8C0   26200
IBUB    -I  181RD 182   183PR 184WR 187   208   209   224   239   241
II      -I  185RD 186   187   199PR 200WR 209   224   241
IJ      -I  4C0   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
            168PR 169WR 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  4C0   38    39    40    46=   46    129   130   131   131   133=  133   138
IJP     -I  4C0   42    43    44    45=   45    122   124   137   264   268   272   276   284=
IJSC    -I  95=   98=   98    103   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   270   274   283
IPJP    -I  264=  267   271   275   284
IPI     -I  8C0   32D0  62D0  95    116D0 127D0 140D0 151D0 160   170D0 201   211   230   243   261
IUNF    -I  12C0  64
J       -I  4C0   3100  36    41    61D0  66    67    68    69    70    930C  95    108=  136D0 159D0 160   168PR
            169WR 180=  201   211   225=  225   230   233=  233   240=  240   243   251=  251   260D0 261
JBOT    -I  58=   67    68
JBUB    -I  181RD 183PR 184WR 188
JUB     -I  67=   68
JUT     -I  66=   69
JJ      -I  185RD 186   199PR 200WR 225
JMID    -I  12C0  29    56=   56    57    58
JP1     -I  8C0   13600 26900
JP2     -I  8C0   3100  41    61D0  159D0
JSWTCH1 -I  13C0  18:   279   289
JTOP    -I  57=   66    69
JUNF02  -I  12C0  57    58    59
LAM     -R  11C0  15RL
LCM     -   5F    6F    7F
LOOP    -   52SU  73SU  135SU 146SU 177SU 206SU
M       ()R 14E0  15RL  16D1
MP      ()R 14E0  15RL  16D1
MU      -R  1 C0  15RL
N0      -I  78RD  86PR  87WR  89
NM2     -I  89=   9300  1 7
NL      -I  78RD  86PR  87WR  92    95
NL1     -I  9E=   9600
NOPD    -I  8C0   81    83    163   165   193   196
NOPT    -I  8C0   83    84    84    165   166   166   196   197   197
NQ      -I  8C0   45    46    48    63    64    71    132   133   144   155   175   263   264
NR      -I  76RD  77    78    86PR  87WR  90
NR1     -I  9 =   9600
NT      -I  78RD  86PR  87WR  91
NT2     -I  91=   9300
OMCYL   -R  1 C0  35    65
OPDEN   ()R 12C0  8.    81    83    162   163   165   193   194   196
OPTMP   ()R 8C0   83    84    84    165   166   166   196   197   197
P       ()R 14E0  16D1
PL      ()R 14E0  16D1
PRINT   -   27F   86F   119F  168F  183F  199F
```

```
QEXP10  -     85SU  167SU  196SU
QLOG10  -     79SU   82SU  161SU  164SU  192SU  195SU
R       ()R   14EU  160I    35=    40=    40     44=    44     65=   274   275   276   277
RADX    ()R   12CU  282=
RCSQ    ()R   14EU  160I
READ    -     7EF   181F   185F
RETURN  -     28SF  29:F
REZRUN  -R    1:CU  123
REZSIE  -R     8CU  117    130    142    153
REZYU   -R    15CU  122    123
RM      ()R   14EU  160I
RMP     ()R   14EU  160I
RO      ()R   14EU  160I   1 1=   112=   128=   129=   141=   152=   161   168PR  169WR  173   191=  214=  228=  246=
RO1     -R    7ERU   79     88PR   87WR   88     101    112    185RD  191   192   199PR  200WR  203   214   228   246
ROJP2   -R    15..=  152
ROJ1    -R    12E=   129
ROL     ()R   14EU  160I
ROMER   -R    12CU   86     89
ROSAV   -R    123=   126    128    139=   139    141    150
RRO1    -R    88=    102    113    173=   174    200=   204    215    229   247
RVOL    ()R   14EU  160I   278=
RZEDEN  ()R   14EU  160I
R1      -R    274=   278
R1ROW   -     94SU  114SU  189SU  212SU  219SU  226SU  234SU  244SU  252SU
R2      -R    275=   278
R3      -R    276=   278
R4      -R    277=   278
SETIU   -     97SU  111SU  194SU  213SU  220SU  227SU  235SU  245SU  253SU
SIE     ()R   14EU  160I   112=   113=   130=   136=   142=   153=   164   168PR  169WR  174=  174   204=  215=  229=  247=
SIEI    -R    7ERU   82     88PR   87WR   102    113    185RD  195   199PR  200WR  204   215   229   247
SIGPLC  ()R   14EU  160I
START   -     3:SU   6:SU  121SU  158SU  259SU
TEMP    ()R    8CU  163=   167=   168PR  169WR  172=   172    173   202=  216=  231=  248=
TEMP1   -R    85=    88PR   87WR   88     103    198=   199PR  200WR  202   203   216   241   248
TJ      -R    59=    68     69
U       ()R   14EU  160I   99=    131=   131=   143=   154=   205=   221=  236=  254=
UG      ()R   14EU  160I
UI      -R    7ERU   88PR   87WR   99     185RD  199PR  200WR  205    221   236   254
UL      ()R   14EU  160I
UMOMLC  ()R   14EU  160I
UP      ()R   14EU  160I
UTIL    ()R   14EU  160I
V       ()R   14EU  160I   111=   131=   131=   143=   154=   206=   222=  237=  255=
VG      ()R   14EU  160I
VI      -R    7ERU   88PR   87WR   100    185RD  199PR  200WR  206    222   237   255
VL      ()R   14EU  160I
VP      ()R   14EU  160I
VTIL    ()R   14EU  160I
WPITE   -     87F   12:F   189F   184F   200F
WIROW   -     1:9SU  115SU  2:7SU  217SU  223SU  232SU  238SU  249SU  256SU
X       ()R   14EU  160I   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   14EU  160I
XR      -R     9CU  26 =   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    280
X4      -R    269=   278    280
Y       ()R   14EU  160I   34=    37=    38=    42=    68=    69=    70=   122   122   124   124   137   137   138   138
              27     271    272    273
YBASE   -R    12CU   37     70
YJC2    -R    12E=   123
YP      -R    83=    84     84=    85     165=   166    166=   167    196=  197   197=  198
YPAR    ()R   14EU  160I
YR      -R    281=   282
YY      -R    29=    34     38     42     51=    51     118=   124    137   138
```

```
Y1      -R  27 =   270    281
Y2      -R  271=   270    281
Y3      -R  272=   270    281
Y4      -R  273=   270    281
ZP      -R   62=    63    164=   165    195=   196
```

```
      SUBROUTINE PARTGEN                                                    PARTGEN    2
      COMMON /STATE/     NOPT, NOPD, NERG, OPTMP(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, IJK, IJP, J                                 ALLKOM     6
      COM /YLC1/         AA1(131000)                                        ALLKOM     7
      COM /YLC2/         AA2(131000)                                        ALLKOM     8
      COM /RLC1/         SIGA(30000)                                        ALLKOM     9
      COMMON /RED/       NAME(12), DT, DTR, EMIG, GRDVEL, IRAR, 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
      COMMON /SILVER/    FIPAL, FIPXR, FIPYB, FIXL, FIXR, FIYB,             SILVER     2
     1                   IPAL, IPXR, IPYB, IPYT, IAL, IXR, IYB,             SILVER     3
     2                   IYT, PACONV, PXL, PXR, PYB, PYCONV, PYT,           SILVER     4
     3                   RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT            SILVER     5
      COMMON /ORANGE/    ANC, ASG, AU, AUFAC, AUM, BO, COLAMU, CYL,         ORANGE     2
     1                   DTPOS, EPS, GM, GR, GZ, IM1,                       ORANGE     3
     2                   IECP, IP2, ITAB(10:0), JNM, JP4, KXI, LAM,         ORANGE     4
     3                   LUPZ, MU, NPT, NQIM, NQI2, NUMIT, ON,              ORANGE     5
     4                   ORANC, OMCYL, REZRUN, REZYU, THIND, VTEM           ORANGE     6
      COMMON /WHITE/     NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT       ORANGE     7
      COMMON /BLUE/      DR, DZ, FREZ, IUNP, JMID,                          BLUE       2
     1                   JUNFOZ, RADX(7500), ROMFR, YBASE                   BLUE       3
      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,UL,CQ,EMOMLC),                      EQVREAL    7
     6                   (AASC(13),VTIL,VL,UMUMLC),                         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,R/EDEN),                         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), 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                   REZEDEN(1), GRIZ(1), VG(1), FSN(1)                 DIMEN      9
  930 FORMAT             (6E12.4)                                           PARTGEN    9
  910 FORMAT             (1H0,5HDRPAR,1PE12.4,6A,6H DZPAR,1PE12.4/          PARTGEN   10
     1                   6H XC    ,1PE12.4,6A,6H YC    ,1PE12.4,6A,       PARTGEN   11
     2                   6H XD    ,1PE12.4,6A,6H YD    ,1PE12.4)          PARTGEN   12
  920 FORMAT             (1H0,I5,* PARTICLES GENERATED*)                    PARTGEN   13
  930 FORMAT             (1H0,*PARTICLE REGIONS*)                           PARTGEN   14
C                                                                           PARTGEN   15
      PYB=PYT=PXR=0.0                                                       PARTGEN   16
      KP=1                                                                  PARTGEN   17
      PRINT 930                                                             PARTGEN   18
  100 READ  950,         DRPAR, DZPAR, XC, YC, XD, YD                       PARTGEN   19
```

```
      IF (DRPAR.LE.0.0) GO TO 290                                          PARTGEN   20
      IF (NPT.GE.1000) GO TO 100                                           PARTGEN   21
      PRINT 910,        DRPAR, DZPAR, XC, YC, XD, YD                       PARTGEN   22
      WRITE (12,910)    DRPAR, DZPAR, XC, YC, XD, YD                       PARTGEN   23
      YC=YC-REZYC                                                          PARTGEN   24
      XWRITE=XC+XD                                                         PARTGEN   25
      PXR=AMAX1(PXR,XWRITE)                                                PARTGEN   26
      IF (YD.LT.EM10) GO TO 112                                            PARTGEN   27
      YTOP=YD-REZYC                                                        PARTGEN   28
      YBOT=YC                                                              PARTGEN   29
      GO TO 113                                                            PARTGEN   30
  112 YTOP=YC+XD                                                           PARTGEN   31
      YBOT=YC-XD                                                           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*DRPAR                                                     PARTGEN   36
  220 IF (YD.LE.0.0.AND.(YTE-YC)**2+(XTE-XC)**2.GT.XD**2) GO TO 240        PARTGEN   37
      XPAR(NP) = XTE                                                       PARTGEN   38
      YPAR(NP) = YTE                                                       PARTGEN   39
      NP=NP+2                                                              PARTGEN   40
      NPT = NPT+1                                                          PARTGEN   41
      IF (NPT.GE.1000) GO TO 100                                           PARTGEN   42
  229 IF (YD.GT.EM10) GO TO 230                                            PARTGEN   43
      XX=2.0*XC-XTE                                                        PARTGEN   44
      IF (XX.LE.0.0) GO TO 230                                             PARTGEN   45
      XPAR(NP)=XX                                                          PARTGEN   46
      YPAR(NP)=YTE                                                         PARTGEN   47
      NP=NP+2                                                              PARTGEN   48
      NPT=NPT+1                                                            PARTGEN   49
      IF (NPT.GE.1000) GO TO 100                                           PARTGEN   50
  230 XTE = XTE+DRPAR                                                      PARTGEN   51
      IF (XTE.LE.XC+XD) 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=NPT+NPT                                                          PARTGEN   56
      CALL ECHR (XPSC, IECP, LPB, NE)                                      PARTGEN   57
      PRINT 920,        NPT                                                PARTGEN   58
      WRITE (12,920)    NPT                                                PARTGEN   59
      RETURN                                                               PARTGEN   60
      END                                                                  PARTGEN   61
```

SINGLY REFERENCED VARIABLES

200	-	39*	DIR	-R	8C0	IJ	-I	4C0	IYB	-I	9C0	NOPD	-I	2C0	RADX	()R	12C0	TIME	-R	8C0
229	-	47*	DZ	-R	12C0	IJM	-I	4C0	IYT	-I	9C0	NOPT	-I	2C0	READ	-	23F	TNEUT	-R	11C0
AA1	()R	5LC	ELWR	-	615U	IJP	-I	4C0	J	-I	4C0	NQ	-I	8C0	REAL	-	14F	TOUT	-R	8C0
AA2	()R	6LC	EPS	-R	10C0	IJPS	-I	8C0	JBAR	-I	8C0	NQI	-I	8C0	RED	-	8CN	TSTART	-R	8C0
ANIN1	-	37SU	EQUIVAL	-	13F	IMI	-I	10C0	JMID	-I	12C0	NQIB	-I	1C0	RETURN	-	64F	VTEM	-R	10C0
ANC	-R	1*C0	ETAB	()R	2C0	IPXL	-I	9C0	JNM	-I	10C0	NQI2	-I	1C0	REZRUN	-R	10C0	VV	-R	9C0
ANGLES	()R	11C0	FIPAL	-R	9C0	IPXR	-I	9C0	JP1	-I	8C0	NRVALS	-I	11C0	REZSIE	-R	8C0	WHITE	-	11CN
ASU	-R	16C0	FIPAR	-R	9CC	IPYB	-I	9C0	JP2	-I	8C0	NUMIT	-I	10C0	RIBAR	-R	9C0	XCONV	-R	9C0
AU	-R	17C0	FIPYB	-R	9C0	IPYT	-I	9C0	JP4	-I	10C0	OM	-R	10C0	RLC1	-	7CN	XL	-R	9C0
AUFAC	-R	1*C0	FIAL	-R	9C0	IP1	-I	8C0	JUMP02	-I	12C0	OMANC	-R	10C0	RCMFR	-R	12CC	XR	-R	9C0
AUM	-R	1CC0	FIAR	-R	9C0	IP2	-I	10C0	KAI	-I	10C0	OMCYL	-R	10C0	RVALS	()R	11C0	YB	-R	9C0
BLUE	-	12CN	FIYB	-R	9C0	ISCF1	-I	8C0	LAMD	-R	14RL	OPDEN	()R	2C0	SIGA	()R	7LC	YBASE	-R	12C0
BTBL	()R	2C0	FREC	()R	2C0	ISCF2	-I	8C0	LJP2	-I	10C0	OPTMP	()R	2C0	SILVER	-	9CN	YCONV	-R	9C0
BU	-R	19C0	FREQ	-R	12C0	ISC2	-I	8C0	MUUP	-R	14RL	ORANGE	-	1*CN	SPTBL	()R	2C0	YLC1	-	5CN
COLAMU	-R	1*C0	GMI	-R	10C0	ISC3	-I	8C0	NAME	()I	8C0	PARTGEN	-	15U	STATE	-	2CN	YLC2	-	6CN
CYL	-R	1CC0	GR	-R	10C0	ITAB	()I	10C0	NANGLS	-I	11C0	PINK	-	4CN	T	-R	8C0	YSC1	-	3CN
DIMENSI	-	15F	GROUVEL	-R	8C0	ITV	-I	8C0	NCYC	-I	8C0	PTAB	()R	2C0	TAMB	-R	8C0	YT	-R	9C0
DR	-R	12C0	GZ	-R	10C0	IUAF	-I	12C0	NDUMP	-I	8C0	PXCONV	-R	9C0	TEMP	()R	8C0			
DT	-R	8C0	I	-I	4C0	IXL	-I	9C0	NE	-I	61AG	PXL	-R	9C0	THIRD	-R	10C0			
DTPOS	-R	1*C0	IBAR	-I	8C0	IXR	-I	9C0	NFRO	-I	2C0	PYCONV	-R	9C0	THY	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

100 - 23* 25 40 54 59

```
     112 -     31      35*
     113 -     34      37*
     210 -     4:*     56
     220 -     41*     56
     230 -     47      49      55*
     240 -     41      57*
     290 -     24      6:*
     900 -     16*     23RD
     910 -     17*     26PR    27WR
     920 -     18*     62PR    63WR
     930 -     19*     22PR
AASC      ()R    3C0     13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ
                 13EQ    13EQ    61AG
AMAX1     -      3:SU    3850
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     8C0     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     1:C0    61AG
KP        -I     21=     42      43      44=     44      50      51      52=     52
LAM       -R     1:C0    14RL
LCM       -      5F      6F      7F
LPB       -I     6:=     61AG
M         ()R    13EQ    14RL    1501
MP        ()R    13EQ    14RL    1501
MJ        -R     1:C0    14RL
NPT       -I     1:C0    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     9C0     2:=     36=     36
PYB       -R     9C0     2:=     37=     37
PYT       -R     9C0     2:=     38=     38
R         ()R    13EQ    1501
RCSQ      ()R    13EQ    1501
REZYO     -R     1:C0    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
SAE       ()R    13EQ    1501
STGPLC    ()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
```

```
VG      ()R   13E0   15D1
VL      ()R   13E0   15D1
VP      ()R   13E0   15D1
VTIL    ()R   13E0   15D1
WRITE   -     27F    63F
X       ()R   13E0   15D1
XC      -R    23R0   26PR   27WR   29     40     41     48     56
XD      -R    23R0   26PR   27WR   29     35     36     41     56
XPAR    ()R   13E0   15D1   42=    50=
XWRITE  -R    29=    36
XTE     -R    40=    41     42     48     55=    55     56
XX      -R    46=    49     56
Y       ()R   13E0   15D1
YBOT    -R    33=    36=    37     39
YC      -R    23R0   26PR   27WR   28=    28     33     35     36     41
YD      -R    23R0   26PR   27WR   31     32     41     47
YPAR    ()R   13E0   15D1   43=    51=
YTE     -R    39=    41     43     51     57=    57     58
YTOP    -R    32=    35=    38     58
```

```
)           OVERLAY (YOKIPER, 2, 0)                                          YOKKY      2


 1           PROGRAM YOKKY                                                   YOKKY      3
 2           COMMON /STATE/     NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),      ALLKOM     2
            1                   FREQ(100), SPTHL(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(131,900)                                 ALLKOM     7
 6           LCM /YLC2/         AA2(131,900)                                 ALLKOM     8
 7           LCM /RLC1/         SIGA(300,90)                                 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, NU, NQI, REZSIE, TAMB, ALLKOM    12
            3                   TEMP(75,6), T, TIME, TOUT, TSTART, THY       ALLKOM    13
 9           COMMON /YELLOW/    DTC, DTCSAV, DTO2, DTV, DTVSAV,              YELLOW     2
            1                   DVDY, IDTC, IDTV, JDTC, JDTV, RDT            YELLOW     3
10           COMMON /ORANGE/    ANC, ASQ, AQ, AQFAC, AQM, BQ, COLAMC, CYL,   ORANGE     2
            1                   DTPOS, EPS, GR1, GR, GZ, IM1,                ORANGE     3
            2                   IECP, IP2, ITAB(1000), JNM, JP4, KKI, LAM,   ORANGE     4
            3                   LJP2, MU, NPT, NQIM, NQ12, NUMIT, OM,        ORANGE     5
            4                   OMANG, OMCYL, REZRUN, REZYC, THIRD, VTEM     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,CENTA),                 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,OMVPLC),                   EQVREAL   8
            7                   (AASC(14),RGL,RETALC,FOUTLC), (AASC(15),SIE), EQVREAL  9
            8                   (AASC(16),DELSM,SIGPLC),                     EQVREAL  10
            9                   (AASC(17),GRIR,UG,REZDEN),                   EQVREAL  11
            1                   (AASC(18),GRIZ,VG,PSN)                       EQVREAL  12
13           REAL               LAM, LAMD, 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), CENTA(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), CR(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
                6                   UMOMLC(1), AUL(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
15          11 CALL OVERLAY (7LYCKIFER, 2, 1, 0)                                    YOKKY      9
16             CALL REMARK (13HYAQUI PHASE 0)                                       YOKKY     10
17             IF (TIME.LT.TOUT) GO TO 12                                           YOKKY     11
18             CALL OVERLAY (7LYCKIFER, 2, 2, 0)                                    YOKKY     12
19             CALL REMARK (13HYAQUI OUTPUT )                                       YOKKY     13
20          12 CALL OVERLAY (7LYCKIFER, 2, 3, 0)                                    YOKKY     14
21             CALL REMARK (13HYAQUI PHASE 1)                                       YOKKY     15
22             CALL OVERLAY (7LYOKIFER, 2, 4, 0)                                    YOKKY     16
23             CALL REMARK (13HYAQUI PHASE 2)                                       YOKKY     17
24             CALL OVERLAY (7LYCKIFER, 2, 5, 0)                                    YOKKY     18
25             CALL REMARK (13HYAQUI PHASE 3)                                       YOKKY     19
26             IF (T+EMIO.LT.TIME+DTR) GO TO 11                                     YOKKY     20
27             RETURN                                                               YOKKY     21
28             END                                                                  YOKKY     22
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	DTU2	-R	9C0	IDTV	-I	9C0	JHAP	-I	8C0	NOPU	-I	2C0	PTAB	()R	2C0	THY	-R	8C0
AA2	()R	6LC	DTPOS	-R	10C0	IECP	-I	10C0	JDTC	-I	9C0	NOPT	-I	2C0	RDT	-R	9C0	TNEUT	-R	11C0
ANG	-R	10C0	DTV	-R	9C0	IJ	-I	4C0	JDTV	-I	9C0	NPT	-I	10C0	REAL	-	13F	TSTART	-R	8C0
ANGLES	()R	11C0	DTVSAV	-R	9C0	IJM	-I	4C0	JNN	-I	10C0	NQ	-I	8C0	RED	-	8CN	VTEM	-R	10C0
ASQ	-R	10C0	DVDY	-R	9C0	IJP	-I	4C0	JP1	-I	8C0	NQI	-I	8C0	RETURN	-	27F	WHITE	-	11CN
A0	-R	10C0	EPS	-R	10C0	IJPS	-I	8C0	JP2	-I	8C0	NQIB	-I	10C0	REZRON	-R	10C0	YELLOW	-	9CN
ACPAC	-R	10C0	EWOIVAL	-	12F	IM1	-I	10C0	JP4	-I	10C0	NQI2	-I	10C0	REZSIE	-R	8C0	YLC1	-	5CN
AOM	-R	10C0	ETAB	()R	2C0	IP1	-I	8C0	KKI	-I	10C0	NRVALS	-I	11C0	REZY0	-R	10C0	YLC2	-	6CN
BTBL	()R	2C0	FREG	()R	2C0	IP2	-I	10C0	LAMD	-R	13RL	NUMIT	-I	10C0	RLC1	-	7CN	YOKKY	-	1SU
B0	-R	10C0	GM1	-R	10C0	ISCF1	-I	8C0	LJP2	-I	10C0	OM	-R	10C0	RVALS	()R	11C0	YSC1	-	3CN
COLAMU	-R	10C0	GR	-R	10C0	ISCF2	-I	8C0	MUU2	-R	13RL	OMANC	-R	10C0	SIGA	()R	7LC			
CYL	-R	10C0	GRUVEL	-R	8C0	ISC2	-I	9C0	NAME	()I	8C0	OMCYL	-R	10C0	SPTHL	()R	2C0			
DIMENSI	-	14F	GZ	-R	10C0	ISC3	-I	8C0	NANGLS	-I	11C0	OPDEN	()R	2C0	STATE	-	2CN			
DT	-R	8C0	I	-I	4C0	ITAB	()I	10C0	NCYC	-I	8C0	OPTMP	()R	2C0	TAMB	-R	8C0			
DTC	-R	9C0	IDAM	-I	8C0	ITV	-I	8C0	NDUMP	-I	8C0	ORANGE	-	10CN	TEMP	()R	8C0			
DTCSAV	-R	9C0	IDTC	-I	9C0	J	-I	4C0	NERR	-I	2C0	PINK	-	4CN	THIRD	-R	10C0			

MULTIPLY-REFERENCED VARIABLES

```
    11 -    15*     26
    12 -    17      2*SU
AASC    ()R     8C0     12E0    14E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0    12E0
                12E0    12E0
BETALC  ()R     12E0    14U1
CENTA   ()R     12E0    14U1
CENTT   ()R     12E0    14U1
COMMON  -       2F      3F      4F      8F      9F      10F     11F
CQ      ()R     12E0    14U1
DELSM   ()R     12E0    14U1
DTR     -R      8C0     26
E       ()R     12E0    14U1
EMOMLC  ()R     12E0    14U1
EMIO    -R      8C0     26
EP      ()R     12E0    14U1
ETIL    ()R     12E0    14U1
FOUTLC  ()R     12E0    14U1
FSN     ()R     12E0    14U1
GRIR    ()R     12E0    14U1
GRIZ    ()R     12E0    14U1
LAM     -R      10C0    13RL
LCM     -       9F      6F      7F
M       ()R     12E0    13RL    14U1
MP      ()R     12E0    13RL    14U1
MU      -R      10C0    13RL
OVERLAY -       15SU    18SU    20SU    22SU    24SU
P       ()R     12E0    14U1
PL      ()R     12E0    14U1
R       ()R     12E0    14U1
RCSQ    ()R     12E0    14U1
```

```
REMARK  -     16SU   19SU   21SU   23SU   25SU
RM      ()R   12EU   1401
RMP     ()R   12EU   1401
RO      ()R   12EU   1401
ROL     ()R   12EU   1401
RVOL    ()R   12EU   1401
RZEDEN  ()R   12EU   1401
SIE     ()R   12EU   1401
SIGPLC  ()R   12EU   1401
T       -R     8CU   26
TIME    -R     8CU   17     26
TOUT    -R     8CU   17
U       ()R   12EU   1401
UG      ()R   12EU   1401
UL      ()R   12EU   1401
UMOMLC  ()R   12EU   1401
UP      ()R   12EU   1401
UTIL    ()R   12EU   1401
V       ()R   12EU   1401
VG      ()R   12EU   1401
VL      ()R   12EU   1401
VP      ()R   12EU   1401
VTIL    ()R   12EU   1401
X       ()R   12EU   1401
XPAR    ()R   12EU   1401
Y       ()R   12EU   1401
YPAR    ()R   12EU   1401
```

```
1           OVERLAY (YOKIFER, 2, 1)                                          PHASE0     2


1           PROGRAM PHASE0                                                   PHASE0     3
2           COMMON /STATE/    NOPT, NCPD, NERO, 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 /HLC1/        SIGA(30000)                                    ALLKOM     9
8           COMMON /RED/      NAME(14), DT, DTR, EM10, GRDVEL, 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 /YELLOW/   DTC, DTCSAV, DTO2, DTV, DTVSAV,                YELLOW     2
           1                  DVDY, IDTC, IDTV, JDTC, JDTV, RDT              YELLOW     3
10          COMMON /ORANGE/   ANC, ASC, A0, A0FAC, AQM, B0, COLAMU, CYL,     ORANGE     2
           1                  DTMOS, EPS, GM1, GR, GZ, IM1,                  ORANGE     3
           2                  IECM, IP2, ITAB(1000), JNM, JP4, KXI, LAM,     ORANGE     4
           3                  LJP2, NC, NPT, NQIM, NQI2, NUMIT, OM,          ORANGE     5
           4                  OMANC, OMCYL, REZRON, REZYO, THIRD, VTEM       ORANGE     6
11          COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(45), 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),RP,RMP,ROSW,CENTA),                   EQVREAL    4
           3                  (AASC(8),E,ETIL,CENTT), (AASC(9),RVOL),        EQVREAL    5
           4                  (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),     EQVREAL    6
           5                  (AASC(12),UTIL,UL,CW,EMOMLC),                  EQVREAL    7
           6                  (AASC(13),VTIL,VL,OMOMLC),                     EQVREAL    8
           7                  (AASC(14),ROL,RETALC,FOUTLC), (AASC(15),SIE),  EQVREAL    9
           8                  (AASC(16),UG,USR,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), RP(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), GRIM(1), UG(1),        DIMEN     8
     8                    RZEDEN(1), GRIZ(1), VG(1), FSN(1)                   DIMEN     9
15    LEAT                DBLINT                                              PHASE0    9
16  4001 FORMAT           (1H0,*PROBLEM CYCLE*,I6,6X,*HYDRO*//                PHASE0    10
     1                    * T   *,1PE12.4,* TO*,1PE12.4,6X,*DT *,1PE12.4,     PHASE0    11
     2                    6X,I6,* ITERS*)                                     PHASE0    12
17  4002 FORMAT           (1H0,5HTE   ,1PE12.4,6X,6H TI   ,1PE12.4,6X,        PHASE0    13
     1                    6H TK   ,1PE12.4,6X,6H EPOT ,1PE12.4,6X,            PHASE0    14
     2                    6H TIAMB,1PE12.4)                                   PHASE0    15
18  4004 FORMAT           (1H ,5HUMOM ,1PE12.4,6X,6H VMOM ,1PE12.4,6X,        PHASE0    16
     1                    6H CIRC ,1PE12.4)                                   PHASE0    17
19  4005 FORMAT           (1H0,5HTMAX ,1PE12.4,6X,6H ITM  ,I12,6X,            PHASE0    18
     1                    6H JTM  ,I12)                                       PHASE0    19
20  4006 FORMAT           (6H TGMX ,1PE12.4,6X,6H ITG  ,I12,6X,               PHASE0    20
     1                    6H JTG  ,I12)                                       PHASE0    21
21  4007 FORMAT           (1H0,5HDTV  ,1PE12.4,6X,6H IDTV ,I12,6X,            PHASE0    22
     1                    6H JDTV ,I12/6H DTC  ,1PE12.4,6X,6H IDTC ,I12,      PHASE0    23
     2                    6X,6H JDTC ,I12)                                    PHASE0    24
C     ---   INITIALIZE                                                        PHASE0    25
22    DTVSAV = DTCSAV = 0.0                                                   PHASE0    26
23    CIRC=POTE=TK=TI=UMOM=VMOM=TIAMB=0.0                                     PHASE0    27
24    TMAX=TGMX=0.0                                                           PHASE0    28
25    ITM=ITG=JTM=JTG=0                                                       PHASE0    29
C     ---   COMPUTE PRESSURES AND ENERGIES                                    PHASE0    30
26    CALL START                                                              PHASE0    31
27    DO 199 J=2,JP1                                                          PHASE0    32
28    IJSC=(J-1)*IP1                                                          PHASE0    33
29    JJ=(J-1)*IP1+IBAR                                                       PHASE0    34
30    TEMP4=TEMP(JJ)**4                                                       PHASE0    35
31    DO 189 I=1,IBAR                                                         PHASE0    36
32    IJ = IJSC + I                                                           PHASE0    37
33    IJP = IJ + NQ                                                           PHASE0    38
34    IJSC=IJSC+1                                                             PHASE0    39
35    AMSENG=RO(IJ)/RVOL(IJ)                                                  PHASE0    40
36    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
37    TK=TK+SPENGK*AMSENG                                                     PHASE0    43
38    UMOM=UMOM+0.25*AMSENG*(U(IPJ)+U(IPJP)+U(IJP)+U(IJ))                     PHASE0    44
39    VMOM=VMOM+0.25*AMSENG*(V(IPJ)+V(IPJP)+V(IJP)+V(IJ))                     PHASE0    45
40    TI=TI+AMSENG*SIE(IJ)                                                    PHASE0    46
41    TIAMB=TIAMB+REZSIE*AMSENG+137.214E-07*TEMP4/RVOL(IJ)                    PHASE0    47
42    POTE=POTE+(Y(IJ)+REZYO)/RM(IJ)                                          PHASE0    48
43    IF(I.EQ.IBAR.OR.J.EQ.JP1) GO TO 170                                     PHASE0    49
44    IF(SIE(IJ).LT.TMAX) GO TO 160                                           PHASE0    50
45    ITM=I                                                                   PHASE0    51
46    JTM=J                                                                   PHASE0    52
47    TMAX=SIE(IJ)                                                            PHASE0    53
48  160 SAVA=(X(IPJ)-X(IJ))**2+(Y(IPJ)-Y(IJ))**2                              PHASE0    54
49    SAVB=(X(IJP)-X(IJ))**2+(Y(IJP)-Y(IJ))**2                                PHASE0    55
50    SAVA=ABS(SIE(IJ)-SIE(IPJ))/DSQRT(SAVA)                                  PHASE0    56
51    SAVB=ABS(SIE(IJ)-SIE(IJP))/DSQRT(SAVB)                                  PHASE0    57
52    SAV=AMAX1(SAVA,SAVB)                                                    PHASE0    58
53    IF(SAV.LT.TGMA) GO TO 170                                               PHASE0    59
54    ITG=I                                                                   PHASE0    60
55    JTG=J                                                                   PHASE0    61
56    TGMA=SAV                                                                PHASE0    62
57  170 CONTINUE                                                              PHASE0    63
58    IF (J.EQ.JP1) POTE=POTE+(Y(IJP)+REZYO)/RM(IJP)                          PHASE0    64
```

```
59            IF (I.EQ.1    ) CIRC = CIRC + 0.5*(V(IJ)+V(IJP))*(Y(IJP)-Y(IJ))      PHASE0     65
60            IF (I.EQ.IM1  ) CIRC = CIRC - 0.5*(V(IJ)+V(IJP))*(Y(IJP)-Y(IJ))      PHASE0     66
61            IF (J.EQ.3    ) CIRC = CIRC - 0.5*(U(IJ)+U(IPJ))*(X(IPJ)-X(IJ))      PHASE0     67
62            IF (J.EQ.JBAR) CIRC = CIRC + 0.5*(U(IJ)+U(IPJ))*(X(IPJ)-X(IJ))      PHASE0     68
63            RCI=RC(IJ)                                                           PHASE0     69
64            X1=ALOG10(RCI)                                                       PHASE0     70
65            X2=ALOG10(TEMP(IJSC))                                                PHASE0     71
66            X3=DBLINT (0, X1, X2, OPTEN, OPTMP, PTAB, 0, NOPT, NOPD, NOPT)       PHASE0     72
67            P(IJ)=DEXP10(X3)                                                     PHASE0     73
68            P(IJ)=P(IJ)+45.7386E-17*TEMP(IJSC)**4                                PHASE0     74
69      180   IJP = IPJP                                                           PHASE0     75
70            IJM=IJM+NG                                                           PHASE0     76
71            IJ=IPJ                                                               PHASE0     77
72          180 CONTINUE                                                           PHASE0     78
73            POTE=POTE+(Y(IJ)+REZYC)/RM(IJ)                                       PHASE0     79
74            IF (J.EQ.JP1) POTE=POTE+(Y(IJP)+REZYC)/RM(IJP)                       PHASE0     80
75            CALL LOOP                                                            PHASE0     81
76      199   CONTINUE                                                             PHASE0     82
77            CALL DONE                                                            PHASE0     83
        C     ---   COMPUTE ENERGIES                                               PHASE0     84
78            TIAMB=TIAMB*6.2831854E+15                                            PHASE0     85
79            TI=TI*6.2831854E+15-TIAMB                                            PHASE0     86
80            TK=TK*6.2831854E+15                                                  PHASE0     87
81            POTE=POTE*6.2831854E+15                                              PHASE0     88
82            EPOT=-POTE*CZ                                                        PHASE0     89
83            TE=TI+TK                                                             PHASE0     90
        C     ---   MONITOR PRINT                                                  PHASE0     91
84            TOUT=T-DT                                                            PHASE0     92
85            PRINT 4001,       NCYC, IMDT, T, DT, NUMIT                           PHASE0     93
86            WRITE (12,4001)   NCYC, IMDT, T, DT, NUMIT                           PHASE0     94
87            PRINT 4002,       TE, TI, TK, EPOT, TIAMB                            PHASE0     95
88            WRITE (12,4002)   TE, TI, TK, EPOT, TIAMB                            PHASE0     96
89            PRINT 4004,       UMOM, VMOM, CIRC                                   PHASE0     97
90            WRITE (12,4004)   UMOM, VMOM, CIRC                                   PHASE0     98
91            PRINT 4005,       TMAX, ITM, JTM                                     PHASE0     99
92            WRITE (12,4005)   TMAX, ITM, JTM                                     PHASE0    100
93            PRINT 4006,       TGMX, ITG, JTG                                     PHASE0    101
94            WRITE (12,4006)   TGMX, ITG, JTG                                     PHASE0    102
95            PRINT 4007,       DTV, IDTV, JDTV, DTC, IDTC, JDTC                   PHASE0    103
96            WRITE (12,4007)   DTV, IDTV, JDTV, DTC, IDTC, JDTC                   PHASE0    104
97            RETURN                                                               PHASE0    105
98            END                                                                  PHASE0    106
```

SINGLY REFERENCED VARIABLES

180 -	69*	CYL	-R	10C0	GR	-R	10C0	JP4	-I	10C0	NQIB	-I	10C0	RETURN	-	97F	TOUT	-R	8C0
AA1	()R	5LC	DIMENSI	-	14F	GRDVEL	-R	8C0	KXI	-I	10C0	NQI2	-I	10C0	REZRON	-R	10C0	TSTART	-R	8C0
AA2	()R	6LC	DONE	-	775U	IECP	-I	10C0	LAMD	-R	13RL	NRVALS	-I	11C0	RLC1	-	7CN	VTEM	-R	10C0
AMAX1	-	525U	DTOC	-R	9C0	IJPS	-I	8C0	LEAT	-	15F	OM	-R	10C0	RVALS	()R	11C0	WHITE	-	11CN
ANC	-R	1CC0	DTPOS	-R	10C0	IP2	-I	10C0	LJP2	-I	10C0	OMANC	-R	10C0	SIGA	()R	7LC	YELLOW	-	9CN
ANGLES	()R	11C0	DTR	-R	8C0	ISCF1	-I	8C0	LOOP	-	755U	OMCYL	-R	10C0	SPTBL	()R	2C0	YLC1	-	5CN
ASQ	-R	1AC0	DVDT	-R	9C0	ISCF2	-I	8C0	MUD2	-R	13RL	ORANGE	-	10CN	START	-	265U	YLC2	-	6CN
AU	-R	1CC0	EN1C	-R	8C0	ISC2	-I	8C0	NAME	()I	8C0	PHASE0	-	15U	STATE	-	2CN	YSC1	-	3CN
AUFAC	-R	18C0	EPS	-R	10C0	ISC3	-I	8C0	NANGLS	-I	11C0	PINK	-	4CN	TAMB	-R	8C0			
AUM	-R	19C0	EQUIVAL	-	12F	ITAB	()I	10C0	NDUMP	-I	8C0	QEXP10	-	675U	THIRD	-R	10C0			
BTBL	()R	2C0	ETAB	()R	2C0	ITV	-I	8C0	NFRQ	-I	2C0	RDT	-R	9C0	THY	-R	8C0			
BU	-R	17C0	FNEG	()R	2C0	JNM	-I	10C0	NPT	-I	10C0	REAL	-	13F	TIME	-R	8C0			
COLAMU	-R	1AC0	GR1	-R	10C0	JP2	-I	8C0	NQI	-I	8C0	RED	-	8CN	TNEUT	-R	11C0			

MULTIPLY-REFERENCED VARIABLES

160 -	44	48*	
170 -	43	53	57*
189 -	3100	72*	
199 -	2700	76*	
4001 -	16*	85PR	88WR
4002 -	17*	87PR	88WR
4004 -	18*	89PR	90WR
4005 -	19*	91PR	92WR
4006 -	20*	93PR	94WR

```
   4007 -    21#    95PR   96WR
AASC   ()R    3C0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0   12E0
             12E0   12E0
ABS    -     50S0   51S0
BETALI ()R   12E0   14D1
CENTA  ()R   12E0   14D1
CENTY  ()R   12E0   14D1
CIRC   -R    23=    59=    59     60=    60     61=    61     62=    62     89PR   90WR
COMMON -      2F     3F     4F      8F     9F     10F    11F
CU     ()R   12E0   14D1
DBLINT -     15LX   66S0
DELSM  ()R   12E0   14D1
DT     -R     8C0    84     85PR   86WR
DTC    -R     9C0    95PR   96WR
DTCSAV -R     9C0    22=
DTV    -R     9C0    95PR   96WR
DTVSAV -R     9C0    22=
E      ()R   12E0   14D1
EMORLC ()R   12E0   14D1
EP     ()R   12E0   14D1
EPOT   -R    82=    87PR   88WR
ETIL   ()R   12E0   14D1
FORMAT -     18F    17F    18F    19F    20F    21F
FOUTLC ()R   12E0   14D1
FSN    ()R   12E0   14D1
GRIR   ()R   12E0   14D1
GRIZ   ()R   12E0   14D1
GZ     -R    17C0   82
I      -I     4C0   3100   43     45     54     59     60
IBAR   -I     6C0   29     3100   43
IDTC   -I     9C0   95PR   96WR
IDTV   -I     9C0   95PR   96WR
IJ     -I     4C0   32     35     35     36     36     38     39     40     41     42     42     44     47     48     48     49
              45     5C     51     59     59     60     60     61     61     62     62     63     67     68     68     71=    73
              73
IJM    -I     4C0   7C=    7C
IJP    -I     4C0   33     36     36     38     39     49     49     51     58     58     59     59     60     60     6C=    74
              74
IJSC   -I    28=    34=    34     65     68
IM1    -I    17C0   6
IPJ    -I    3C=    36     36     38     39     48     48     50     61     61     62     62     71
IPJP   -I    33=    36     36     38     39     69
IPI    -I     8C0   28     29
ITG    -I    25=    54=    93PR   94WR
ITM    -I    25=    45=    91PR   92WR
J      -I     4C0   27D0   28     29     43     46     55     58     61     62     74
JBAR   -I     6C0   62
JDTC   -I     9C0   95PR   96WR
JDTV   -I     9C0   95PR   96WR
JJ     -I    29=    3
JP1    -I     8C0   27D0   43     58     74
JTG    -I    25=    55=    93PR   94WR
JTM    -I    25=    46=    91PR   92WR
LAM    -R    17C0   13RL
LCM    -      5F     6F     7F
M      ()R   12E0   13RL   14D1
MP     ()R   12E0   13RL   14D1
MU     -R    17C0   13RL
NSYC   -I     8C0   85PR   86WR
NOPD   -I     2C0   66
NOPT   -I     2C0   66     66
NU     -I     8C0   32     33     70
NUMIT  -I    17C0   85PR   86WR
OPDEN  ()R    2C0   66
OPTMP  ()R    2C0   66
P      ()R   12E0   14D1   67=    68=    68
PL     ()R   12E0   14D1
```

POTE	-R	23=	4C=	4C	58=	58	73=	73	74=	74	81=	81	82		
PRINT	-	85F	87F	89F	91F	93F	95F								
PTAB	()R	2CU	66												
QCOG10	-	6450	6550												
QSUM1	-	5 50	5150												
R	()R	12EU	1401												
RC50	()R	12EU	1401												
REZSIE	-R	6CU	41												
REZYU	-R	1FCU	42	58	73	74									
RM	()R	12EU	1401	42	58	73	74								
RMP	()R	12EU	1401												
RO	()R	12EU	1401	35	63										
ROL	()R	12EU	1401												
ROT	-R	63=	64												
RVOL	()R	12EU	1401	35	41										
RZEOEN	()R	12EU	1401												
SAV	-R	52=	53	56											
SAVA	-R	48=	50=	50	52										
SAVB	-R	49=	51=	51	52										
SIE	()R	12EU	1401	43	44	47	50	50	51	51					
SIGPLC	()R	12EU	1401												
SPENGK	-R	36=	37												
T	-R	8CU	84	85PR	86WR										
TE	-R	83=	87PR	88WR											
TEMP	()R	8CU	3C	65	68										
TEMP4	-R	3C=	41												
TGMX	-R	24=	53	56=	93PR	94WR									
TI	-R	23=	4C=	43	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									
TMDT	-R	84=	85PR	86WR											
U	()R	12EU	1401	36	36	36	36	38	38	38	38	61	61	62	62
UG	()R	12EU	1401												
UL	()R	12EU	1401												
UMOM	-R	23=	38=	38	89PR	90WR									
UMOMLC	()R	12EU	1401												
UP	()R	12EU	1401												
UTIL	()R	12EU	1401												
V	()R	12EU	1401	36	36	36	36	39	39	39	39	59	59	60	60
VG	()R	12EU	1401												
VL	()R	12EU	1401												
VMOM	-R	23=	39=	39	89PR	90WR									
VP	()R	12EU	1401												
VTIL	()R	12EU	1401												
WRITE	-	86F	88F	90F	92F	94F	96F								
X	()R	12EU	1401	48	48	49	49	61	61	62	62				
XMSENG	-R	35=	37	38	39	40	41								
XPAR	()R	12EU	1401												
X1	-R	64=	66												
X2	-R	65=	66												
X3	-R	66=	67												
Y	()R	12EU	1401	42	48	48	49	49	58	59	59	60	60	73	74
YPAR	()R	12EU	1401												

```
      PROGRAM YCKOUT                                                    YOKOUT     3
      COMMON /STATE/    NOPT, NCPD, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM     2
     1                  FREQ(100), SPTBL(300), PTAB(300), ETAB(300),    ALLKOM     3
     2                  HTBL(300)                                       ALLKOM     4
      COMMON /YSCL/     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 /RLC1/        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, NDUMP, NQ, NQI, REYSIE, TAMB,   ALLKOM    12
     3                  TEMP(300), 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                  DVDY, IDTC, IDTV, JDTC, JDTV, RDT               YELLOW     3
      COMMON /ORANGE/   ANC, ASG, A0, AOPAC, AJM, BO, COLAML, CYL,      ORANGE     2
     1                  DTPOS, EPS, GM1, GR, GZ, IM1,                   ORANGE     3
     2                  IELP, IP2, ITAB(100), JNP, JP4, KXI, LAM,       ORANGE     4
     3                  LJP2, NC, NPT, NQIB, NQI2, NUMIT, OM,           ORANGE     5
     4                  OMANG, OMCYL, REYRON, REZYO, THIRD, VTEM        ORANGE     6
      COMMON /WHITE/    NRVALS, 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), PP(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), CO(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
     6                  OMOMLL(1), ROL(1), RETALC(1), FOUTLC(1),        DIMEN      7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),    DIMEN      8
     8                  REYDEN(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),PP,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,CO,EMOMLC),                   EQVREAL    7
     6                  (AASC(13),VTIL,VL,OMOMLC),                      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,REYDEN),                      EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                          EQVREAL   12
      REAL              LAM, LAMD, M, MP, MU, MUOC                      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),(FT,CON)                                        YOKOUT    14
 4000 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            (1PE10.3)                                       YOKOUT    27
 4102 FORMAT            (1X,*L= *,1PE10.3)                              YOKOUT    28
 4103 FORMAT            (1X,*H= *,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,          YORKOUT   33
     2                 6H DD   ,1PE12.4)                                 YORKOUT   34
  412) FORMAT          (* MAXIMUM VORTICITY AT I =*,I3,*  J =*,I3)       YORKOUT   35
  414) FORMAT          (* ZONES*/6H DRMIN,1PE12.4,6X,6H DRMAX,1PE12.4,   YORKOUT   36
     1                 6X,6H DZMIN,1PE12.4,6X,6H DZMAX,1PE12.4/          YORKOUT   37
     2                 6H XR   ,1PE12.4,6X,6H YB   ,1PE12.4,6X,          YORKOUT   38
     3                 6H Y1   ,1PE12.4)                                 YORKOUT   39
  416) FORMAT          (* VELOCITY VECTORS*/6H VMAX ,1PE12.4)             YORKOUT   40
C                                                                         YORKOUT   41
      IF (NCYC.EQ.0) TOUT=TIME+DTR                                        YORKOUT   42
      IF (NCYC.GT.0) TOUT=1.15*(TOUT-TSTART)+TSTART                       YORKOUT   43
      IF (TOUT-T.GT.10.0*DT) TOUT=T+10.0*DT                               YORKOUT   44
      CALL OPEN (6HPSET12,2LST,I3312)                                     YORKOUT   45
C     ---   PLOT PARTICLES                                                YORKOUT   46
      CALL PARPLOT                                                        YORKOUT   47
C     ---   PLOT ZONES                                                    YORKOUT   48
      NTHRU=-1                                                            YORKOUT   49
      YCONVP=YCONV                                                        YORKOUT   50
      XCONVP=XCONV                                                        YORKOUT   51
      YLB=YB                                                              YORKOUT   52
   51 CONTINUE                                                            YORKOUT   53
      CALL ADV(1)                                                         YORKOUT   54
      DRMIN = DZMIN = 1.E+20                                              YORKOUT   55
      DRMAX = DZMAX = VMAX = 0.                                           YORKOUT   56
      CALL START                                                          YORKOUT   57
      DO 549 J=2,JP1                                                      YORKOUT   58
      DO 539 I=1,IMAX                                                     YORKOUT   59
      IPJ = IJ + NU                                                       YORKOUT   60
      IPJP = IJP + NU                                                     YORKOUT   61
      VMAX = AMAX1 (VMAX,ABS(U(IJ)),ABS(V(IJ)))                           YORKOUT   62
      X1 = X(IPJ)                                                         YORKOUT   63
      X2 = X(IPJP)                                                        YORKOUT   64
      X3 = X(IJP)                                                         YORKOUT   65
      X4 = X(IJ)                                                          YORKOUT   66
      Y1 = Y(IPJ)                                                         YORKOUT   67
      Y2 = Y(IPJP)                                                        YORKOUT   68
      Y3 = Y(IJP)                                                         YORKOUT   69
      Y4 = Y(IJ)                                                          YORKOUT   70
      X14=(X1-X4)**2+(Y1-Y4)**2                                           YORKOUT   71
      X23=(X2-X3)**2+(Y2-Y3)**2                                           YORKOUT   72
      Y21=(X2-X1)**2+(Y2-Y1)**2                                           YORKOUT   73
      Y34=(X3-X4)**2+(Y3-Y4)**2                                           YORKOUT   74
      DRMIN = AMIN1(DRMIN,X14,X23)                                        YORKOUT   75
      DRMAX = AMAX1(DRMAX,X14,X23)                                        YORKOUT   76
      DZMIN = AMIN1(DZMIN,Y21,Y34)                                        YORKOUT   77
      DZMAX = AMAX1(DZMAX,Y21,Y34)                                        YORKOUT   78
      IX1=FIXL+(X1-XL)*XCONVP                                             YORKOUT   79
      IX2=FIXL+(X2-XL)*XCONVP                                             YORKOUT   80
      IX3=FIXL+(X3-XL)*XCONVP                                             YORKOUT   81
      IX4=FIXL+(X4-XL)*XCONVP                                             YORKOUT   82
      IY1=FIYB+(Y1-YLB)* YCONVP                                           YORKOUT   83
      IY2=FIYB+(Y2-YLB)* YCONVP                                           YORKOUT   84
      IY3=FIYB+(Y3-YLB)* YCONVP                                           YORKOUT   85
      IY4=FIYB+(Y4-YLB)* YCONVP                                           YORKOUT   86
      IF (IY1.GT.IYB.OR.IY1.LT.IYT) GO TO 530                             YORKOUT   87
      IF (IY2.GT.IYB.OR.IY2.LT.IYT) GO TO 530                             YORKOUT   88
      IF (IX1.GT.IXR) GO TO 530                                           YORKOUT   89
      IF (IX2.GT.IXR) GO TO 530                                           YORKOUT   90
      IF (I.EQ.1) CALL DRV (IX3,IY3,IX4,IY4)                              YORKOUT   91
      IF (J.EQ.2) CALL DRV (IX4,IY4,IX1,IY1)                              YORKOUT   92
      CALL DRV (IX1,IY1,IX2,IY2)                                          YORKOUT   93
      CALL DRV (IX2,IY2,IX3,IY3)                                          YORKOUT   94
   53 IJ = IPJ                                                            YORKOUT   95
  539 IJP = IPJP                                                          YORKOUT   96
      CALL LOOP                                                           YORKOUT   97
  549 CONTINUE                                                            YORKOUT   98
      DRMIN=DSQRT(DRMIN)                                                  YORKOUT   99
      DRMAX=DSQRT(DRMAX)                                                  YORKOUT  100
```

```
      DZMIN=DSQRT(DZMIN)
      DZMAX=DSQRT(DZMAX)
      IF(INTERU. EQ.-1) GO TO 533
  535 CALL DRV(IXL,IY1,IXR,IYT)
      CALL DRV(IXR,IYT,IXR,IYB)
      CALL DRV(IXR,IYB,IXL,IYB)
      CALL DRV(IXL,IYB,IXL,IYT)
      NYUP=YUP
      YUP1=NYUP
      NYLB=YLB+1
      YLB1=NYLB
      IXC=IXL+8
      IX3=IXR-8
      IYC=IYH-8
      IY3=IYT+8
      NEXP=3.321*QLOG10(0.1*(PYT-PYB))
      IF(NEXP.LE.0) NEXP=NEXP-1
      DTIC=2.**NEXP
      XTIC=0.
      YTIC=YLB1.
  534 YTIC=YTIC-DTIC
      IF(YTIC.GT.YLB ) GO TO 534
      YTIC=YTIC+DTIC
  532 IY1=FIYB+(YTIC-YLB)*YCONVP
      IF(IY1.LT.IYT) GO TO 531
      CALL DRV(IXL,IY1,IX2,IY1)
      CALL DRV(IX3,IY1,IXR,IY1)
      IWITE=FLOAT(IY1)*0.0625
      CALL LINCNT(IWITE)
      WRITE (12,400)   YTIC
      YTIC=YTIC+DTIC
      GO TO 532
  531 IX1=FIXL+(XTIC-XL)*XCONVP
      IF(IX1.GT.IXR) GO TO 533
      CALL DRV(IX1,IYB,IX1,IY2)
      CALL DRV(IX1,IY3,IX1,IYT)
      IWITE=FLOAT(IX1)*0.125
      ENCODE(11,4_87,TIC) IWITE
      JWITE=FLOAT(IYB)*0.0625+1.0
      CALL LINCNT(JWITE)
      WRITE (12,TIC)    XTIC
      XTIC=XTIC+DTIC
      GO TO 531
  533 CONTINUE
      GO TO 551
  552 CONTINUE
      YUP=PYT
      YLB=PYB
      XCONVP=PXCONV
      YCONVP=PYCONV
      FIYB=FIYB
      FIYT=FIYT
      FIXR=FIXR
      FIXL=FIXL
      IYB=IYB
      IYT=IYT
      IXR=IXR
      IXL=IXL
      FIYB=FIPYB
      FIYT=FIPYT
      FIXL=FIPXL
      FIXR=FIPXR
      IYB=IPYB
      IYT=IPYT
      IXL=IPXL
      IXR=IPXR
      GO TO 510
```

```
YOROUT  101
YOROUT  102
YOROUT  103
YOROUT  104
YOROUT  105
YOROUT  106
YOROUT  107
YOROUT  108
YOROUT  109
YOROUT  110
YOROUT  111
YOROUT  112
YOROUT  113
YOROUT  114
YOROUT  115
YOROUT  116
YOROUT  117
YOROUT  118
YOROUT  119
YOROUT  120
YOROUT  121
YOROUT  122
YOROUT  123
YOROUT  124
YOROUT  125
YOROUT  126
YOROUT  127
YOROUT  128
YOROUT  129
YOROUT  130
YOROUT  131
YOROUT  132
YOROUT  133
YOROUT  134
YOROUT  135
YOROUT  136
YOROUT  137
YOROUT  138
YOROUT  139
YOROUT  140
YOROUT  141
YOROUT  142
YOROUT  143
YOROUT  144
YOROUT  145
YOROUT  146
YOROUT  147
YOROUT  148
YOROUT  149
YOROUT  150
YOROUT  151
YOROUT  152
YOROUT  153
YOROUT  154
YOROUT  155
YOROUT  156
YOROUT  157
YOROUT  158
YOROUT  159
YOROUT  160
YOROUT  161
YOROUT  162
YOROUT  163
YOROUT  164
YOROUT  165
YOROUT  166
YOROUT  167
```

```
      551  CONTINUE                                                          YORDUT  168
           IF(NTHRU.GE.1) GO TO 550                                          YORDUT  169
           CALL LINCNT(59)                                                   YORDUT  170
           WRITE (12,414C)   DRMIN, DRMAX, DZMIN, DZMAX, XR, YB, YT          YORDUT  171
           WRITE (12,40BC)   JNM, T, NCYC, NAME                              YORDUT  172
           IF(VMAX.LT.EM1C) GO TO 6_0                                        YORDUT  173
     C     ---   VELOCITY VECTOR PLOT                                        YORDUT  174
      550  NTHRU=NTHRU+1                                                     YORDUT  175
           IF (NTHRU EQ.3) GO TO 600                                         YORDUT  176
           DROU = VV/VMAX                                                    YORDUT  177
           CALL ADV(1)                                                       YORDUT  178
           CALL START                                                        YORDUT  179
           DO 599 J=2,JP2                                                    YORDUT  180
           DO 589 I=1,IP1                                                    YORDUT  181
           IF (NTHRU.EQ.2) DROU=.5*VV/QSQRT(U(IJ)**2+V(IJ)**2+EM10)          YORDUT  182
           IY1=FIYB+(Y(IJ)-YLB)*YCONVP                                       YORDUT  183
           IF(IY1.GT.IYB.OR.IY1.LT.IYT) GO TO 589                            YORDUT  184
           IY2=FIYB+(Y(IJ)+V(IJ)*DROU-YLB)*YCONVP                            YORDUT  185
           IF(IY2.GT.IYB.OR.IY2.LT.IYT) GO TO 589                            YORDUT  186
           IX1=FIXL+(X(IJ)-XL)*XCONVP                                        YORDUT  187
           IF(IX1.GT.IXR) GO TO 589                                          YORDUT  188
           IX2=FIXL+(X(IJ)-XL+U(IJ)*DROU)*XCONVP                             YORDUT  189
           IF(IX2.GT.IXR) GO TO 589                                          YORDUT  190
      580  CALL DRV (IX1,IY1,IX2,IY2)                                        YORDUT  191
           CALL PLT (IX1,IY1,16)                                             YORDUT  192
      589  IJ = IJ + NQ                                                      YORDUT  193
           CALL LOOP                                                         YORDUT  194
      599  CONTINUE                                                          YORDUT  195
           CALL LINCNT(60)                                                   YORDUT  196
           WRITE (12,415C)   VMAX                                            YORDUT  197
           WRITE (12,40BC)   JNM, T, NCYC, NAME                              YORDUT  198
           IF(NTHRU.EQ.C) GO TO 552                                          YORDUT  199
           GO TO 535                                                         YORDUT  200
     C     ---   CONTOUR PLOTS                                               YORDUT  201
      600  L=0                                                               YORDUT  202
      610  L = L+1                                                           YORDUT  203
           IF (L.EQ.5.AND.NCYC.GT.0) GO TO 490                               YORDUT  204
           GO TO (620,620,640,620,400) L                                     YORDUT  205
      620  CALL START                                                        YORDUT  206
           DO 639 J=2,JP1                                                    YORDUT  207
           DO 629 I=1,IMAR                                                   YORDUT  208
           CQ(IJ)=RO(IJ)                                                     YORDUT  209
           IF(L.EQ.2) CQ(IJ)=SIE(IJ)                                         YORDUT  210
           IPJ=IJ+NQ                                                         YORDUT  211
           IPJP=IJP+NQ                                                       YORDUT  212
           IF (L.EQ.4) CQ(IJ)=0.25*QSQRT((U(IJ)+U(IPJ)+U(IPJP)+U(1JP))**2    YORDUT  213
          1  + ( V(IJ)+V(IPJ)+V(IPJP)+V(IJP))**2)                           YORDUT  214
           IJP=IJP+NQ                                                        YORDUT  215
      629  IJ = IJ + NQ                                                      YORDUT  216
           CALL LOOP                                                         YORDUT  217
      639  CONTINUE                                                          YORDUT  218
           CALL DONE                                                         YORDUT  219
           GO TO 700                                                         YORDUT  220
      640  CALL START                                                        YORDUT  221
           XMAX=EM10                                                         YORDUT  222
           DO 659 J=2,JP1                                                    YORDUT  223
           DO 649 I=1,IMAR                                                   YORDUT  224
           IPJ = IJ + NQ                                                     YORDUT  225
           IPJP = IJP + NQ                                                   YORDUT  226
           X1 = X(IPJ)                                                       YORDUT  227
           Y1 = Y(IPJ)                                                       YORDUT  228
           U1 = U(IPJ)                                                       YORDUT  229
           V1 = V(IPJ)                                                       YORDUT  230
           X2 = X(IPJP)                                                      YORDUT  231
           Y2 = Y(IPJP)                                                      YORDUT  232
           U2 = U(IPJP)                                                      YORDUT  233
           V2 = V(IPJP)                                                      YORDUT  234
           X3 = X(IJP)                                                       YORDUT  235
```

```
      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
      R1 = .125*RVOL(IJ)*(R(IPJ)+R(IPJP)+R(IJP)+R(IJ))                   YOKOUT  243
      CQ(IJ) = R1*((U1+L2)*(X1-X4)+(V1+V4)*(Y1-Y4)                       YOKOUT  244
     2             +(U2+L1)*(X2-X1)+(V2+V1)*(Y2-Y1)                      YOKOUT  245
     3             +(U3+L2)*(X3-X2)+(V3+V2)*(Y3-Y2)                      YOKOUT  246
     4             +(U4+L3)*(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 QMN = 1.E+6                                                        YOKOUT  257
      QMX = -QMN                                                         YOKOUT  258
      CALL START                                                         YOKOUT  259
      DO 719 J=2,JP1                                                     YOKOUT  260
      DO 709 I=1,IBAR                                                    YOKOUT  261
      QMN = AMIN1 (CQ(IJ),QMN)                                           YOKOUT  262
      QMX = AMAX1 (CQ(IJ),QMX)                                           YOKOUT  263
  709 IJ = IJ + N                                                        YOKOUT  264
      CALL LOOP                                                          YOKOUT  265
  719 CONTINUE                                                           YOKOUT  266
  710 CONTINUE                                                           YOKOUT  267
      IF (L.EQ.4) GO TO 745                                              YOKOUT  268
      XX = QMX/(QMN+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
      DG = 10.**(1./XX)                                                  YOKOUT  273
      K=ALOG10(QMN)                                                      YOKOUT  274
      XX = 10.**(K-1)                                                    YOKOUT  275
      K = 1                                                              YOKOUT  276
  720 XX = XX*DG                                                         YOKOUT  277
      IF (XX.LT.QMN) GO TO 720                                           YOKOUT  278
  730 CON(K) = XX                                                        YOKOUT  279
      IF (XX.GT.QMX) GO TO 740                                           YOKOUT  280
      K = K+1                                                            YOKOUT  281
      XX = XX*DG                                                         YOKOUT  282
      GO TO 730                                                          YOKOUT  283
  735 XX = QMX-QMN                                                       YOKOUT  284
      IF (ABS(XX).LT.1.E-3*AMAX1(ABS(QMX),ABS(QMN))) GO TO 610           YOKOUT  285
      DG = .1*(XX+.001)                                                  YOKOUT  286
      DO 739 K=1,11                                                      YOKOUT  287
  739 CON(K) = QMN+(FLOAT(K-1))*DG                                       YOKOUT  288
      K = 11                                                             YOKOUT  289
  740 CALL ADV(1)                                                        YOKOUT  290
      IRITE=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,IRITE,14,BCD,1)                                      YOKOUT  299
      GO TO 781                                                          YOKOUT  300
  784 ENCODE(10,4101,BCD) CON(KK)                                        YOKOUT  301
      CALL WLCH(500,IRITE,10,BCD,1)                                      YOKOUT  302
  781 IRITE=IRITE+16                                                     YOKOUT  303
```

```
      CALL LINCNT(58)
      GO TO (756,760,770,765) L
  745 CON(1)=-0.1*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)=0.95*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)    ISYM, JSYM
  780 WRITE (12,4120)    GMN, GMX, CON(1), CON(K-1), DG
      WRITE (12,4060)    JNM, T, NCYC, NAME
      CALL START
      DO 899 J=2,JBAR
      CALL LOOP
      DO 869 I=1,IM1
      IPJ = IJ + NU
      IPJM = IJM + NU
      N = 0
      DO 879 KK=1,K
      K1 = K2 = K3 = K4 = 0
      IF (CU(IJM) .LE.CON(KK)) K1=1
      IF (CU(IPJM).LE.CON(KK)) K2=1
      IF (CU(IJ)  .LE.CON(KK)) K3=1
      IF (CU(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 880
      IJB = IJM
      IJA = IJ
      DO 799 JJ=1,2
      DO 789 II=1,2
      IPJB = IJM+NU
      IPJA = IJA+NU
      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
  880 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
```

```
YORKOUT  304
YORKOUT  305
YORKOUT  306
YORKOUT  307
YORKOUT  308
YORKOUT  309
YORKOUT  310
YORKOUT  311
YORKOUT  312
YORKOUT  313
YORKOUT  314
YORKOUT  315
YORKOUT  316
YORKOUT  317
YORKOUT  318
YORKOUT  319
YORKOUT  320
YORKOUT  321
YORKOUT  322
YORKOUT  323
YORKOUT  324
YORKOUT  325
YORKOUT  326
YORKOUT  327
YORKOUT  328
YORKOUT  329
YORKOUT  330
YORKOUT  331
YORKOUT  332
YORKOUT  333
YORKOUT  334
YORKOUT  335
YORKOUT  336
YORKOUT  337
YORKOUT  338
YORKOUT  339
YORKOUT  340
YORKOUT  341
YORKOUT  342
YORKOUT  343
YORKOUT  344
YORKOUT  345
YORKOUT  346
YORKOUT  347
YORKOUT  348
YORKOUT  349
YORKOUT  350
YORKOUT  351
YORKOUT  352
YORKOUT  353
YORKOUT  354
YORKOUT  355
YORKOUT  356
YORKOUT  357
YORKOUT  358
YORKOUT  359
YORKOUT  360
YORKOUT  361
YORKOUT  362
YORKOUT  363
YORKOUT  364
YORKOUT  365
YORKOUT  366
YORKOUT  367
YORKOUT  368
YORKOUT  369
YORKOUT  370
YORKOUT  371
```

```
      IJ2 = IPJM                                                        YORDUT  372
      ASSIGN 820 TO KK1                                                 YORDUT  373
      GO TO 840                                                         YORDUT  374
820   IF (K2+K4.NE.1) GO TO 830                                         YORDUT  375
      IC1 = 2                                                           YORDUT  376
      IC2 = 4                                                           YORDUT  377
      IJ1 = IPJM                                                        YORDUT  378
      IJ2 = IPJ                                                         YORDUT  379
      ASSIGN 830 TO KK1                                                 YORDUT  380
      GO TO 840                                                         YORDUT  381
830   IF (K3+K4.NE.1) GO TO 879                                         YORDUT  382
      IC1 = 3                                                           YORDUT  383
      IC2 = 4                                                           YORDUT  384
      IJ1 = IJ                                                          YORDUT  385
      IJ2 = IPJ                                                         YORDUT  386
      ASSIGN 879 TO KK1                                                 YORDUT  387
840   LL = LL+1                                                         YORDUT  388
      XX = (CON(KK)-CG(IJ1))/(CG(IJ2)-CG(IJ1))                          YORDUT  389
      IX1(LL)=FIXL+(XCO(IC1)+XX*(XCO(IC2)-XCO(IC1))-XL)*XCONVP          YORDUT  390
      IY1(LL)=FIYB+(YCO(IC1)+XX*(YCO(IC2)-YCO(IC1))-YLB)*YCONVP         YORDUT  391
      IF(IY1(LL).GT.IYB.OR.IY1(LL).LT.IYT) GO TO 881                    YORDUT  392
      IF(IX1(LL).LT.IXL.O.(IX1(LL).GT.IXR)) GO TO 881                   YORDUT  393
      IF (LL.LT.2) GO TO KK1                                            YORDUT  394
      CALL DRV (IX1,IY1,IX2,IY2)                                        YORDUT  395
      IF(KK.EQ.5) CALL PLT(IX1,IY1,16)                                  YORDUT  396
      IF (KK.EQ.1)   CALL PLT (IX1,IY1,35)                              YORDUT  397
      IF (KK.EQ.K-1) CALL PLT (IX1,IY1,24)                              YORDUT  398
881   LL=0                                                              YORDUT  399
      IF(IJ2.EQ.IPJM) GO TO KK1                                         YORDUT  400
879   CONTINUE                                                          YORDUT  401
      IJM = IPJM                                                        YORDUT  402
      IJ = IPJ                                                          YORDUT  403
889   IJP = IJP+NG                                                      YORDUT  404
899   CONTINUE                                                          YORDUT  405
      CALL START                                                        YORDUT  406
      CALL DRV(IXL,IYT,IXR,IYT)                                         YORDUT  407
      CALL DRV(IXR,IYT,IXR,IYB)                                         YORDUT  408
      CALL DRV(IXR,IYB,IXL,IYB)                                         YORDUT  409
      CALL DRV(IXL,IYB,IXL,IYT)                                         YORDUT  410
      NYOP=YOP                                                          YORDUT  411
      YLB1=NYOP                                                         YORDUT  412
      NYLB=YLB+1.                                                       YORDUT  413
      YLB1=NYLB                                                         YORDUT  414
      IX2=IXL+8                                                         YORDUT  415
      IX3=IXR-8                                                         YORDUT  416
      IY2=IYB-8                                                         YORDUT  417
      IY3=IYT+8                                                         YORDUT  418
      NEXP=3.321*GLOG10(0.1*(PYT-PYB))                                  YORDUT  419
      IF(NEXP.LE.0) NEXP=NEXP-1                                         YORDUT  420
      DTIC=2.**NEXP                                                     YORDUT  421
      XTIC=1.                                                           YORDUT  422
      YTIC=YLB1                                                         YORDUT  423
584   YTIC=YTIC-DTIC                                                    YORDUT  424
      IF(YTIC.GT.YLB ) GO TO 584                                        YORDUT  425
      YTIC=YTIC+DTIC                                                    YORDUT  426
582   IY1=FIYB+(YTIC-YLB)*YCONVP                                        YORDUT  427
      IF(IY1.LT.IYT) GO TO 581                                          YORDUT  428
      CALL DRV(IXL,IY1,IX2,IY1)                                         YORDUT  429
      CALL DRV(IX3,IY1,IXR,IY1)                                         YORDUT  430
      IWITE=FLOAT(IY1)*0.0625                                           YORDUT  431
      CALL LINCNT(IWITE)                                                YORDUT  432
      WRITE (12,4088)   YTIC                                            YORDUT  433
      YTIC=YTIC+DTIC                                                    YORDUT  434
      GO TO 582                                                         YORDUT  435
581   IX1=FIXL+(XTIC-XL)*XCONVP                                         YORDUT  436
      IF(IX1.GT.IXR) GO TO 583                                          YORDUT  437
      CALL DRV(IX1,IYB,IX1,IY2)                                         YORDUT  438
      CALL DRV(IX1,IY3,IX1,IY1)                                         YORDUT  439
```

```
      IRITE=FLOAT(IXL)*0.125                                            YOKOUT  440
      ENCODE(11,406,TIC) IRITE                                          YOKOUT  441
      JRITE=FLOAT(IYB)*0.0025+1.0                                       YOKOUT  442
      CALL LINCRT(JRITE)                                                YOKOUT  443
      WRITE (12,TIC)    XTIC                                            YOKOUT  444
      XTIC=XTIC+DTIC                                                    YOKOUT  445
      GO TO 561                                                         YOKOUT  446
  560 CONTINUE                                                          YOKOUT  447
      GO TO 610                                                         YOKOUT  448
C     ---   LONG PRINT AND FILM                                         YOKOUT  449
  450 CALL ADV(1)                                                       YOKOUT  450
      LINES=1                                                           YOKOUT  451
      CALL START                                                        YOKOUT  452
      DO 469 J=1,JP2                                                    YOKOUT  453
      DO 479 I=1,IP1                                                    YOKOUT  454
      IPJM = IJM + NW                                                   YOKOUT  455
      IPJ  = IJ  + NW                                                   YOKOUT  456
      D=PRV=PRSIE=0.0                                                   YOKOUT  457
      IF (J.EQ.1) GO TO 450                                             YOKOUT  458
      IF (I.EQ.IP1 .OR. J.EQ.JP2) GO TO 450                             YOKOUT  459
      PRSIE = SIE(IJM)                                                  YOKOUT  460
      PRV=1./RVOL(IJM)                                                  YOKOUT  461
      X1 = X(IPJM)                                                      YOKOUT  462
      Y1 = Y(IPJM)                                                      YOKOUT  463
      R1 = R(IPJM)                                                      YOKOUT  464
      U1 = U(IPJM)                                                      YOKOUT  465
      V1 = V(IPJM)                                                      YOKOUT  466
      X2 = X(IPJ)                                                       YOKOUT  467
      Y2 = Y(IPJ)                                                       YOKOUT  468
      R2 = R(IPJ)                                                       YOKOUT  469
      U2 = U(IPJ)                                                       YOKOUT  470
      V2 = V(IPJ)                                                       YOKOUT  471
      X3 = X(IJ)                                                        YOKOUT  472
      Y3 = Y(IJ)                                                        YOKOUT  473
      R3 = R(IJ)                                                        YOKOUT  474
      U3 = U(IJ)                                                        YOKOUT  475
      V3 = V(IJ)                                                        YOKOUT  476
      X4 = X(IJM)                                                       YOKOUT  477
      Y4 = Y(IJM)                                                       YOKOUT  478
      R4 = R(IJM)                                                       YOKOUT  479
      U4 = U(IJM)                                                       YOKOUT  480
      V4 = V(IJM)                                                       YOKOUT  481
      D = .25*RVOL(IJM)*((R1+R2)*((U1+U2)*(Y2-Y1)+(V1+V2)*(X1-X2))      YOKOUT  482
     1                  +(R2+R3)*((U2+U3)*(Y3-Y2)+(V2+V3)*(X2-X3))      YOKOUT  483
     2                  +(R3+R4)*((U3+U4)*(Y4-Y3)+(V3+V4)*(X3-X4))      YOKOUT  484
     3                  +(R4+R1)*((U4+U1)*(Y1-Y4)+(V4+V1)*(X4-X1)))     YOKOUT  485
  450 IF (LINES.EQ.1) WRITE (12,408)                                    YOKOUT  486
      LINES=LINES+1                                                     YOKOUT  487
      IF (LINES.GT.50) LINES=0                                          YOKOUT  488
      WRITE (12,406)   I, J, X(IJM), Y(IJM), U(IJM), V(IJM), PRSIE,     YOKOUT  489
     1                 RO(IJM), PRV, D, F(IJM)                          YOKOUT  490
   46 IJ = IPJ                                                          YOKOUT  491
  479 IJM = IPJM                                                        YOKOUT  492
      CALL LOOP                                                         YOKOUT  493
  469 CONTINUE                                                          YOKOUT  494
C     ---   RESTORE FILM PARAMETERS                                     YOKOUT  495
  490 CALL EMPTY                                                        YOKOUT  496
      FIYB=FIYB0                                                        YOKOUT  497
      FIYT=FIYT0                                                        YOKOUT  498
      FIXR=FIXR0                                                        YOKOUT  499
      FIXL=FIXL0                                                        YOKOUT  500
      IYB=IYB0                                                          YOKOUT  501
      IYT=IYT0                                                          YOKOUT  502
      IXR=IXR0                                                          YOKOUT  503
      IXL=IXL0                                                          YOKOUT  504
      CALL OPEN (6LPSET12,2LST,512)                                     YOKOUT  505
      CALL ADV(1)                                                       YOKOUT  506
```

```
486          RETURN                                                          YOKOUT    507
487          END                                                             YOKOUT    508
 SINGLY REFERENCED VARIABLES
      460 -  471*    CYL     -R  11CO   GR      -R  11CO   JDTC    -I  10CO   NQIB    -I  11CO   RDT     -R  10CO   TEMP   ()R   8CO
      580 -  161*    DTC     -R  10CC   GRDVEL  -R   8CO   JDTV    -I  10CO   NQI2    -I  11CO   REAL    -   15F    THIRD   -R  11CO
      710 -  252*    DTCSAV  -R  10CO   GZ      -R  11CO   JJ      -I 334DO   NRVALS  -I  12CO   RED     -    8CN   THY     -R   8CO
      747 -  3.5*    DTO2    -R  10CO   IDTC    -I  10CO   JP4     -I  11CO   NUMIT   -I  11CO   RETURN  -  486F    TNEUT   -R  12CO
 AA1     ()R   5LC   DTPCS   -R  11CO   IDTV    -I  10CO   KXI     -I  11CO   OM      -R  11CO   REZRON  -R  11CO   VTEM    -R  11CO
 AA2     ()R   6LC   DTV     -R  10CO   IECP    -I  11CO   LAMD    -R  15RL   CMANC   -R  11CO   REZSIE  -R   8CO   WHITE   -  12CN
 ANC      -R  11CO   DTVSAV  -R  10CO   II      -I 335DO   LOP2    -I  11CO   OMCYL   -R  11CO   REZYO   -R  11CC   YELLOW  -  10CN
 ANGLES  ()R  12CO   DVDY    -R  10CO   IJPS    -I   8CO   MUO2    -R  15RL   CPCEN  ()R   2CO   RIBAR   -R   9CO   YLC1    -   5CN
 ASW      -R  11CO   EFFTY   -  475SU   IP2     -I  11CO   NANGLS  -I  12CO   CPTMP  ()R   2CO   RLC1    -    7CN   YLC2    -   6CN
 AO       -R  11CO   EPS     -R  11CC   ISCF1   -I   8CO   NDUMP   -I   8CO   ORANGE  -   11CN   RVALS  ()R  12CC   YOKOUT  -   1SU
 AOFAC    -R  11CO   ETAB   ()R   2CO   ISCF2   -I   8CO   NFRG    -I   2CO   PAPPLOT -  395U    SIGA   ()R   7LC   YSC1    -   3CN
 AON      -R  11CO   FIPYT   -R 151     ISC2    -I   8CO   NOPD    -I   2CO   PINK    -    4CN   SILVER  -    9CN
 BTBL    ()R   2CO   FREG   ()R   2CO   ISC3    -I   8CO   NOPT    -I   2CC   PTAB   ()R   2CO   SPTBL  ()R   2CO
 BC       -R  11CO   FI      -R  18EG   ITAB   ()I  11CO   NPT     -I  11CO   PXL     -R   9CO   STATE   -    2CN
 COLAMU   -R  11CO   GMI     -R  11CC   ITV     -I   8CO   NOI     -I   8CO   PXR     -R   9CO   TAMB    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
   400 -   194     434*
   450 -   442     443     467*
   479 -   438DO   47.*
   489 -   437DO   474*
   490 -   193     475*
   510 -    44*    158
   530 -    78      79      80      81      86*
   531 -   116     124*    134
   532 -   115*    123
   533 -    94     125     135*
   534 -   112*    113
   535 -    95*    19.
   539 -    5.DO    87*
   549 -    49DO    89*
   550 -   16.     165*
   551 -   136     159*
   552 -   137*    169
   581 -   413     421*    431
   582 -   412*    42.
   583 -   422     432*
   584 -   419*    41.
   589 -   171DO   174     176     178     180     183*
   599 -   17.DO   185*
   600 -   164     166     191*
   610 -   192*    27..    433
   620 -   194     194     194     195*
   629 -   197DO   204*
   639 -   196DO   206*
   640 -   194     209*
   649 -   212DO   236*
   659 -   211DO   24 *
   700 -   218     242*
   709 -   246DO   249*
   719 -   245DO   251*
   720 -   262*    263
   730 -   264*    268
   735 -   255     269*
   739 -   272DO   273*
   740 -   265     275*    306
   745 -   253     291*
   750 -   291     307*
   760 -   290     311*
   765 -   290     309*
   770 -   290     313*
   780 -   308     31.     312     315*
   781 -   270DO   265     288*
   782 -   279     282*
   783 -   281     284*
```

```
      784 -    282     286*
      789 -   335DD    342*
      799 -   334DD    344*
      800 -    331     345*
      810 -    346     351AS  353*
      820 -    353     358AS  360*
      830 -     36     365AS  367*
      840 -    352     359    366    373*
      879 -   324DD     23.    367    372AS  386*
      881 -    377     378    384*
      889 -   32CDD    389*
      899 -   31EDD    39.*
     4008 -     19*    467WR
     4009 -     20*    47.WR
     4080 -     21*    163WR  188WR  316WR
     4087 -     22*    129EC  426EC
     4088 -     23*    121WR  418WR
     4090 -     24*    30.7WR
     4100 -     25*    311WR
     4101 -     26*    286EC
     4102 -     27*    28.EC
     4103 -     28*    283EC
     4110 -     29*    315WR
     4111 -     3.*    309WR
     4120 -     31*    315WR
     4121 -     32*    314WR
     4140 -     33*    162WR
     4150 -     34*    167WR
AASC    ()R    3C0    14E6   14E6   14E6   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
                14E0   14E6
ABS     -      535U   535U   234SU  270SU  270SU  270SU
AUV     -      455U   1665U  275SU  434SU  485SU
AMAX1   -      535U   675U   695U   234SU  248SU  270SU
AMIN1   -      665U   665U   247SU
ASSIGN  -      351F   356F   365F   372F
AT      ()R    16D1   16E6   16E6   18EQ   18EQ   18EQ
BCD     -R     2H0EC  283LC  284AG  286EC  287AG
BETALC  ()R    13D1   14E6
CENTA   ()R    13D1   14E6
CENTY   ()R    13D1   14E6
COMMUN  -       CF     3F     4F     PF     9F     10F    11F    12F
CON     ()R    16D1   16E6   264=   273=   280EC  283EC  286EC  291=   292=   293=   294=   295=   296=   297=   298=   299=   300*
               301=   302=   303=   315WR   315WR   326    327    328    329    374
CQ      ()R    13D1   14E6   198=   199=   202=   232=   234    247    248    326    327    328    329    374    374    374
D       -R     441=   460=   470WR
DELSM   ()R    13D1   14E6
DIMENSI -      13F    16F    17F
DONE    -      267SU  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     8C0    37     37
DTIC    -R     109=   112    114    122    133    406=   409    411    419    430
DTR     -R     8C0    35
DZMAX   -R     47=    69=    69     93=    93     162WR
DZMIN   -R     46=    68=    68     92=    92     162WR
E       ()R    13D1   14E6
EMORLC  ()R    13D1   14E6
EMIC    -R     8C0    164    172    210    254
ENCODE  -      129F   28 F   283F   286F   426F
EP      ()R    13D1   14E0
EQUIVAL -      14F    16F
ETIL    ()R    13D1   14E0
FIPAL   -R     9C0    152
```

```
FIPXR   -R     9C0  153
FIPYB   -R     9C0  15
FIXL    -R     9C0  7.    71    72    73    124   145   152=  177   179   375   421   479=
FIXLO   -R  145=   479
FIXR    -R     9C0  144   153=  478=
FIXRO   -R  144=   478
FIYB    -R     9C0  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   -   115SU  120SU 135SU 273SU 416SU 425SU 427SU
FORMAT  -   19F    20F   21F   22F   23F   24F   25F   26F   27F   28F   29F   30F   31F   32F   33F   34F
FOUTLC  (IR 130I   146G
FSN     (IR 130I   146G
GRIR    (IR 130I   146G
GRIZ    (IR 130I   146G
I       -I     4C0  5 0C  62    17100 19700 21200 235   24600 32000 43800 443   470WR
IBAR    -I     8C0  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     4C0  51    53    53    57    61    66=   172   172   173   175   175   177   179   179   183=  183
               196  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     4C0  322   326   332   349   350   387=  439   444   445   461   462   463   464   465   466   470WR
               47 WR 47 WR 470WR 470WR 470WR 472=
IJP     -I     4C0  52    56    60    87=   201   202   202   203=  203   214   223   224   225   226   231   238=
               344  369=  389
IJ1     -I  349=   356=  363=  370=  374   374
IJ2     -I  351=   357=  364=  371=  374   385
IM1     -I     11C0 32 0C
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     9C0  156
IPXR    -I     9C0  157
IPYB    -I     9C0  154
IPYT    -I     9C0  155
IPI     -I     8C0  17100 43800 443
IRITE   -I  119=   12.A0  120=  129EC 276=  284AG 287AG 288=  288   416=  417AG 425=  426EC
ISVW    -I  235=   314WR
IXL     -I     9C0  95AG  97AG  98AG  98AG  103   117AG 149   156=  378   392AG 394AG 395AG 395AG 400   414AG 483=
IXLO    -I  149=   483
IXR     -I     9C0  8.    81    95AG  96AG  96AG  97AG  104   118AG 125   148   157=  178   180   378   392AG 393AG
               393AG 394AG 4.1   415AG 422   482=
IXRO    -I  146=   482
IX1     (I  16D1   16EG  70=   80    83AG  84AG  124=  125   126AG 126AG 127AG 127AG 128   177=  178   181AG 182AG
               375=  378   378   380AG 381AG 382AG 383AG 421=  422   423AG 423AG 424AG 424AG 425
IX2     (I  16D1   16EG  71=   81    84AG  85AG  103=  117AG 179=  180   181AG 382AG 400=  414AG
IX3     -I  72=    82AG  85AG  104   118AG 401=  415AG
IX4     -I  73=    82AG  83AG
IYB     -I     9C0  78    79    96AG  97AG  97AG  98AG  105   126AG 130   146   154=  174   176   377   393AG 394AG
               394AG 395AG 402   423AG 427   480=
IYBO    -I  146=   480
IYT     -I     9C0  78    79    95AG  95AG  96AG  98AG  106   116   127AG 147   155=  174   176   377   392AG 392AG
               393AG 395AG 4.3   413   424AG 481=
IYTO    -I  147=   481
IY1     (I  16D1   16EG  74=   78    78    83AG  84AG  115=  116   117AG 117AG 118AG 118AG 119   173=  174   174
               181AG 182AG 378=  377   377   380AG 381AG 382AG 383AG 412=  413   414AG 414AG 415AG 415AG 416
IY2     (I  16D1   16EG  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     4C0  4900  83    176D0 196D0 211D0 236   245D0 318D0 437D0 442   443   470WR
JBAR    -I     8C0  31800
```

JNM	-I	11C0	163**	188WR	316WR													
JP1	-I	8C0	4900	19000	21100	24500												
JP2	-I	8C0	17 00	43700	443													
JRITE	-I	13:=	13146	427=	42846													
JSVR	-I	236=	31444															
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=	27800	282														
KR1	-I	351AS	356AS	365AS	372AS	379	385											
K1	-I	325=	326=	330	330	346	353											
K2	-I	325=	327=	330	330	353	360											
K3	-I	325=	328=	330	330	346	367											
K4	-I	325=	329=	330	330	360	367											
L	-I	191=	192=	192	193	194	199	202	253	290								
LAM	-R	11C0	15RL															
LCM	-	5F	6F	7F														
LINCNT	-	12?SU	131SU	161SU	186SU	286SU	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	1M43U	2 5SU	239SU	25?SU	319SU	473SU										
M	()R	13D1	14E6	15RL														
MP	()R	13D1	14E6	15RL														
MU	-R	11C0	15RL															
N	-I	323=	331	338=	338	339	340											
NAME	()I	8C0	163WR	188WR	316WR													
NCYC	-I	8C0	35	36	163WR	188WR	193	316WR										
NEXP	-I	107=	108	108=	108	109	404=	405	405=	405	406							
NQ	-I	8C0	51	52	183	200	201	203	204	213	214	249	321	322	336	337	389	439
		44*																
NTHRU	-I	41=	94	100	165=	165	166	172	189									
NYLB	-I	101=	102	398=	399													
NYUP	-I	99=	101	396=	397													
OPEN	-	3RSU	4845U															
P	()R	13D1	14E6	470WR														
PL	()R	13D1	14E6															
PLT	-	182SU	381SU	384SU	383SU													
PRSIE	-R	441=	444=	470WR														
PT	-R	441=	445=	470WR														
PXCONV	-R	9C0	14															
PYB	-R	9C0	137	139	404													
PYCONV	-R	9C0	141															
PYT	-R	9C0	137	138	404R													
QLOG10	-	1?7SU	256SU	259SU	445U													
QMN	-R	247=	243	247=	247	254	259	263	269	270	273	315WR						
QMX	-R	243=	248=	248	254	265	269	270	291	292	293	294	295	296	297	298	299	300
		31	312	313	315WR													
QSQRT	-	9?SU	91SU	92SU	93SU	172SU	2?2SU											
R	()R	13D1	14E6	231	231	231	231	448	453	458	463							
RCSU	()R	13D1	14E6															
RM	()R	13D1	14E6															
RMP	()R	13D1	14E6															
RO	()R	13D1	14E6	198	470WR													
ROL	()R	13D1	14E6															
RVOL	()R	13D1	14E6	231	445	466												
RZFDEN	()R	13D1	14E6															
R1	-R	231=	232	448=	466	466												
R2	-R	459=	466	466														
R3	-R	456=	466	466														
R4	-R	462=	466	466														
SIE	()R	13D1	14E6	199	444													
SIOPLC	()R	13D1	14E6															
START	-	48SU	189SU	195SU	219SU	244SU	317SU	391SU	436SU									
T	-R	8C0	37	37	163WR	188WR	316WR											
TIC	()R	17D1	129EC	132WR	426EC	429WR												
TIME	-R	8C0	35															
TOUT	-R	8C0	35=	36=	36	37	37=											
TSTART	-R	8C0	36	36														

```
U         ()R   130I   140U    53    172    179    202    202    202    202    217    221    225    229    449    454    459    464
                47*WR
UG        ()R   130I   140U
UL        ()R   130I   140U
UMOMLC    ()R   130I   140U
UP        ()R   130I   140U
UTIL      ()R   130I   140U
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   130I   140U    53    172    175    202    202    202    202    218    222    226    230    450    455    460    465
                47*WR
VG        ()R   130I   140U
VL        ()R   130I   140U
VMAX      -R    47=    53=    53    164    167    187WR
VP        ()R   130I   140U
VTIL      ()R   130I   140U
VV        -R    9C0    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     -     121F   132F   162F   163F   187F   188F   307F   309F   311F   313F   314F   315F   316F   418F   429F   467F   470F
WSAV      -R    233=   235    236
X         ()R   130I   140U    54     55     56     57    177    179    215    219    223    227    339    339    339    339    446
                451    456    461    470WR
XCO       ()R   160I   160U   339=   375    375    375
XCONV     -R    9C0    42
XCONVP    -R    42=    70     71     72     73    124    140=   177    179    375    421
XL        -R    9C0    70     71     72     73    124    177    179    375    421
XPAR      ()R   130I   140U
XR        -R    9C0    162WR
XTIC      -R    11.=   124    132WR  133=   133    407=   421    429WR  430=   430
XX        -R    254=   255    256    257=   258    269=   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   130I   140U    58     59     60     61    173    175    216    220    224    228    340    340    340    340    447
                456    457    462    470WR
YB        -R    9C0    43     162WR
YCO       ()R   160I   160U   345=   376    376    376
YCONV     -R    9C0    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
YLBI      -R    112=   111    394=   408
YPAR      ()R   130I   140U
YT        -R    9C0    162WR
YTIC      -R    111=   112=   114    113    114=   114    115    121WR  122=   122    408=   409=   409    410    411=   411    412
                418WR  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    454=   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
```

```
      SUBROUTINE PARPLOT                                                PARPLOT    2
      COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),         ALLKOM     2
     1                  FREQ(100), SPTHL(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, GMDVEL, IBAR, IJPS,    ALLKOM    10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,       ALLKOM    11
     2                  JP1, JP2, NCYC, NDUMP, NW, NQI, RE/SIE, TAMB,   ALLKOM    12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM    13
      COMMON /SILVER/   FIPAL, FIPXR, FIPYB, FIXL, FIXR, FIYB,         SILVER     2
     1                  IPAL, 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, DTVSAV,                YELLOW     2
     1                  DVOY, IDTC, IDTV, JDTC, JDTV, RDT               YELLOW     3
      COMMON /ORANGE/   ANG, ASG, A0, AUFAC, AUM, B0, COLAMU, 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, NPT, NQIB, NQI2, NUMIT, OM,           ORANGE     5
     4                  OMANG, OMCYL, REZRUN, REZYO, THIRU, VTEM        ORANGE     6
      COMMON /WHITE/    NRVALS, 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), RP(1), RMP(1), RCSQ(1), CENTA(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), CO(1), EMOMLC(1), VTIL(1), VL(1),        DIMEN      6
     6                  OMOMLC(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),RP,RMP,RCSQ,CENTA),                    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,CO,EMOMLC),                   EQVREAL    7
     6                  (AASC(13),VTIL,VL,OMOMLC),                      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
3.90  FORMAT            (1H0,*PARTICLES*/6H PDR  ,1PE12.4,6X,6H PDZ  ,  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
3.95  FORMAT            (2X,A10,6X,6H T    ,1PE12.4,6X,6H NCYC ,I6/     PARPLOT   13
     1                  2X,12A6)                                        PARPLOT   14
4.07  FORMAT            (2H(T,I3,6H,F6.3))                              PARPLOT   15
4.08  FORMAT            (F9.3)                                          PARPLOT   16
      CALL ADV(1)                                                       PARPLOT   17
      YUP=PYT                                                           PARPLOT   18
      YLO=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=3.32*ALOG10(0.1*(YUP-YLB))                                   PARPLOT   27
      IF(NEXP.LE.0) NEXP=NEXP-1                                         PARPLOT   28
      DTIC=2.**NEXP                                                     PARPLOT   29
      XTIC=0.                                                           PARPLOT   30
3.21  YTIC=YTIC-DTIC                                                    PARPLOT   31
```

```
      ITIC=FIPYB+(YTIC-YLB)*PYCONV                                      PARPLOT   32
      IF(ITIC.LT.IPYB) GO TO 3021                                       PARPLOT   33
      YTIC=YTIC+DTIC                                                    PARPLOT   34
3022  IY1=FIPYB+(YTIC-YLB)*PYCONV                                       PARPLOT   35
      IF(IY1.LT.IPY1) GO TO 3023                                        PARPLOT   36
      CALL DRV(IPXL,IY1,IX2,IY1)                                        PARPLOT   37
      CALL DRV( IX3,IY1,IPAR,IY1)                                       PARPLOT   38
      IWIDE=FLOAT(IY1)*0.0625                                           PARPLOT   39
      CALL LINCNT(IWIDE)                                                PARPLOT   40
      WRITE (12,4086)   YTIC                                            PARPLOT   41
      YTIC=YTIC+DTIC                                                    PARPLOT   42
      GO TO 3022                                                        PARPLOT   43
3023  IX1=FIPXL+(XTIC-PXL) *PXCONV                                      PARPLOT   44
      IF(IX1.GT.IPXR) GO TO 3024                                        PARPLOT   45
      CALL DRV(IX1,IPYB,IX1,IY2)                                        PARPLOT   46
      CALL DRV(IX1, IY3,IX1,IPYT)                                       PARPLOT   47
      IWIDE=FLOAT(IX1)*0.125                                            PARPLOT   48
      ENCODE(11,4087,TIC) IWIDE                                         PARPLOT   49
      JWIDE=FLOAT(IYB)*0.0625+1.0                                       PARPLOT   50
      CALL LINCNT(JWIDE)                                                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, T, NCYC, NAME                              PARPLOT   58
3000  LPB=NPT+NPT                                                       PARPLOT   59
      NPPT = 0                                                          PARPLOT   60
3010  CALL ECRD (AASC,IECP,LPB,NE)                                      PARPLOT   61
      KP = 1                                                            PARPLOT   62
3020  IF (XPAR(KP).LT.0.) GO TO 3050                                    PARPLOT   63
      IX1 = FIPXL + (XPAR(KP)-PXL)*PXCONV                               PARPLOT   64
      IY1=FIPYB+(YPAR(KP)-YLB)*PYCONV                                   PARPLOT   65
      IF((IY1.GT.IY0).O.(IY1.LT.IYT)) GO TO 3050                        PARPLOT   66
      CALL PLT (IX1,IY1,P2)                                             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
```

SINGLY REFERENCED VARIABLES

3000 -	63*	DTCSAV	-R	10C0	GR	-R	11C0	ITV	-I	8C0	NOPT	-I	2C0	PTOP	-R	26	TIME	-R	8C0
3010 -	65*	DTOC	-R	10C0	GRDVEL	-R	8C0	IXL	-I	9C0	NQ	-I	8C0	RDT	-R	10C0	TNEUT	-R	12C0
AA1 ()R	5LC	DTPOS	-R	11C0	GZ	-R	11C0	IXR	-I	9C0	NQI	-I	8C0	REAL	-	15F	TOUT	-R	8C0
AA2 ()R	6LC	DTR	-R	8C0	I	-I	4C0	J	-I	4C0	NQIB	-I	11C0	RED	-	8CN	TSTART	-R	8C0
ADV -	21SU	DTV	-R	10C0	IBAR	-I	8C0	JBAR	-I	8C0	NQI2	-I	11C0	RETURN	-	76F	VTEM	-R	11C0
AINT -	26SU	DTVSAV	-R	10C0	IDTC	-I	10C0	JDTC	-I	10C0	NRVALS	-I	12C0	REZRON	-R	11C0	VV	-R	9C0
ALOG10 -	31SU	DVDT	-R	10C0	IDTV	-I	10C0	JDTV	-I	10C0	NUMIT	-I	11C0	REZSIE	-R	8C0	WHITE	-	12CN
ANC -R	11C0	ECRD	-	65SU	IJ	-I	4C0	JP1	-I	8C0	OM	-R	11C0	REZY0	-R	11C0	XCONV	-R	9C0
ANGLES ()R	12C0	EM10	-R	8C0	IJM	-I	4C0	JP2	-I	8C0	OMANC	-R	11C0	RIBAR	-R	9C0	XL	-R	9C0
ASU -R	11C0	ENCODE	-	53F	IJP	-I	4C0	JP4	-I	11C0	OMCYL	-R	11C0	RLC1	-	7CN	XR	-R	9C0
AU -R	11C0	EPS	-R	11C0	IJPS	-I	8C0	KX1	-I	11C0	OPDEN ()R		2C0	RVALS ()R		12C0	YB	-R	9C0
AUMAC -R	11C0	EQUIVAL	-	14F	IM1	-I	11C0	LAMD	-R	15RL	OPTMP ()R		2C0	SIGA ()R		7LC	YCONV	-R	9C0
AUM -R	11C0	ETAB ()R		2C0	IP1	-I	8C0	LJP2	-I	11C0	ORANGE -		11CN	SILVER -		9CN	YELLOW -		10CN
BTBL ()R	2C0	FIPAR	-R	9C0	IP2	-I	11C0	MUU2	-R	15RL	PARPLOT -		1SU	SPTBL ()R		2C0	YLC1 -		5CN
BU -R	11C0	FIXL	-R	9C0	ISCF1	-I	8C0	NANGLS	-I	12C0	PDR	-R	61WR	STATE -		2CN	YLC2 -		6CN
COLAMU -R	11C0	FIXR	-R	9C0	ISCF2	-I	8C0	NDUMP	-I	8C0	PDZ	-R	61WR	TAMB	-R	8C0	YSC1 -		3CN
CYL -R	11C0	FIYB	-R	9C0	ISC2	-I	8C0	NE	-I	65AG	PINK -		4CN	TEMP ()R		8C0	YT	-R	9C0
DT -R	8C0	FREQ ()R		2C0	ISC3	-I	8C0	NFREQ	-I	2C0	PLT -		71SU	THIRD	-R	11C0			
DTC -R	11C0	GM1	-R	11C0	ITAB ()I		11C0	NUMD	-I	2C0	PTAB ()R		2C0	THY	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

3020 -	67*	75
3021 -	35*	37
3022 -	39*	47
3023 -	46	48* 58

```
   3024 -    49      59*
   3050 -    67      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
COMMON  -     2F      3F      4F      8F      9F      10F     11F     12F
CU      ()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
GRIR    ()R   13DI    14EQ
GRIZ    ()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    28=     42AG
IYB     -I    9CO     54      70
IYT     -I    9CO     70
IYI     -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     -     5F      6F      7F
LINCNT  -     44SU    55SU    66SU
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
NEAP    -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      61*R
PYCONV  -R    9CO     36      39      69
```

```
PYT      -R    9C0    22      61WR
R        ()R   13D1   14EQ
RCSQ     ()R   13D1   14EQ
RM       ()R   13D1   14EQ
RMP      ()R   13D1   14EQ
RO       ()R   13D1   14EQ
ROL      ()R   13D1   14EQ
RVOL     ()R   13D1   14EQ
RZEDEN   ()R   13D1   14EQ
SIE      ()R   13D1   14EQ
SIGPLC   ()R   13D1   14EQ
T        -R    8C0    62WR
TIC      ()R   16D1   53EQ    56WR
U        ()R   13D1   14EQ
UG       ()R   13D1   14EQ
UL       ()R   13D1   14EQ
UMOMLC   ()R   13D1   14EQ
UP       ()R   13D1   14EQ
UTIL     ()R   13D1   14EQ
V        ()R   13D1   14EQ
VG       ()R   13D1   14EQ
VL       ()R   13D1   14EQ
VP       ()R   13D1   14EQ
VTIL     ()R   13D1   14EQ
WRITE    -     45F    56F     61F     62F
X        ()R   13D1   14EQ
XPAR     ()R   13D1   14EQ    67      68
XTIC     -R    34=    46      56WR    57=     57
Y        ()R   13D1   14EQ
YLB      -R    23=    31      36      39      69
YPAR     ()R   13D1   14EQ    69
YTIC     -R    26=    35=     35      36      38=     38      39      45WR    46=     46
YUP      -R    22=    31
```

```
1           OVERLAY (YOKIFER, 2, 3)                                          PHASE1     2
1           PROGRAM PHASE1                                                   PHASE1     3
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(36000)                                   ALLKOM     9
8           COMMON /RED/       NAME(16), DT, DTR, EM10, GRDVEL, 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 /YELLOW/    DTC, DTCSAV, DTO2, DTV, DTVSAV,               YELLOW     2
           1                   DVOY, IDTC, IDTV, JDTC, JDTV, RDT             YELLOW     3
10          COMMON /ORANGE/    ANG, ASG, AO, AOFAC, AOM, BP, COLAMU, CYL,    ORANGE     2
           1                   DTPOS, EPS, GM1, GR, GZ, IM1,                 ORANGE     3
           2                   IECP, IP2, ITAB(10 0), JNM, JP4, KXI, LAM,    ORANGE     4
           3                   LJP2, MU, NPT, NQ10, NQ12, NUMIT, OM,         ORANGE     5
           4                   OMANG, OMCYL, REZRUN, REZYG, THIRD, VTEM      ORANGE     6
11          COMMON /WHITE/     RRVALS, RVALS(73), RANGLS, ANGLES(35), TNEUT  ORANGE     7
12          COMMON /SENSE/     JSWITCH1, JSWITCH2, 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,CENTA),                  EQVREAL    4
           3                   (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),       EQVREAL    5
```

```
      4                  (AASC(1),R,RP,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,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
14    REAL               LAM, LAMD, M, MP, MU, MUD2                       EQVREAL   13
15    DIMENSION          X(1), APAR(1), R(1), YPAR(1), Y(1), U(1),        DIMEN      2
      2                  V(1), RO(1), PP(1), RMP(1), RCSQ(1), CENTA(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), 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
C     ---   INCREMENT TIME                                                PHASE1    10
16    NCYC=NCYC+1                                                         PHASE1    11
17    IF (NCYC.EQ.1) DT=DTR                                               PHASE1    12
18    IF (NCYC.GT.1) DT=DTPOS=AMIN1(DTV,DTC)                              PHASE1    13
19    DTFAC=2.0/(15.+FLOAT(NUMIT))                                        PHASE1    14
20    DTV = DTC = DT*DTFAC                                                PHASE1    15
21    DT=AMIN1(DT,5.0*DTR)                                                PHASE1    16
22    IF (T.GT.TIME) DT=AMIN1(DT,TIME+DTR-T)                              PHASE1    17
23    T = T + DT                                                          PHASE1    18
24    RDT   = 1./DT                                                       PHASE1    19
25    DT02  = .5*DT                                                       PHASE1    20
C     ---   ADD NEUTRON ENERGY                                            PHASE1    21
26    IF (JSWTCH.EQ.2) CALL NADD                                          PHASE1    22
C     ---   COUPLE ALTERNATE NODES                                        PHASE1    23
27  1000  CALL START                                                       PHASE1    24
28    YI=ANC*RDT                                                          PHASE1    25
29    DO 1999 J=2,JP2                                                     PHASE1    26
30    DO 1989 I=1,IP1                                                     PHASE1    27
31    IMJ=IJ-NQ                                                           PHASE1    28
32    IPJ=IJ+NQ                                                           PHASE1    29
33    IMJM=IJM-NQ                                                         PHASE1    30
34    IPJM=IJM+NQ                                                         PHASE1    31
35    IMJP=IJP-NQ                                                         PHASE1    32
36    IPJP=IJP+NQ                                                         PHASE1    33
37    XX=YY=1.0                                                           PHASE1    34
38    UE=U(IJ)                                                            PHASE1    35
39    VE=V(IJ)                                                            PHASE1    36
40    IF (I.EQ.1) GO TO 1002                                              PHASE1    37
41    UW=U(IMJ)                                                           PHASE1    38
42    VW=V(IMJ)                                                           PHASE1    39
43    GO TO 1011                                                          PHASE1    40
44 1002 UW=U(IPJ)                                                         PHASE1    41
45    VW=V(IPJ)                                                           PHASE1    42
46    XX=-1.0                                                             PHASE1    43
47 1011 IF (I.EQ.IP1) GO TO 1012                                          PHASE1    44
48    UE=U(IPJ)                                                           PHASE1    45
49    VE=V(IPJ)                                                           PHASE1    46
50    GO TO 1021                                                          PHASE1    47
51 1012 UE=U(IMJ)                                                         PHASE1    48
52    VE=V(IMJ)                                                           PHASE1    49
53    XX=-1.0                                                             PHASE1    50
54 1021 IF (J.EQ.2) GO TO 1022                                            PHASE1    51
55    US=U(IJM)                                                           PHASE1    52
56    VS=V(IJM)                                                           PHASE1    53
57    GO TO 1031                                                          PHASE1    54
58 1022 UE=U(IJP)                                                         PHASE1    55
59    VE=V(IJP)                                                           PHASE1    56
60    YY=-1.0                                                             PHASE1    57
61 1031 IF (J.EQ.JP2) GO TO 1032                                          PHASE1    58
62    UN=U(IJP)                                                           PHASE1    59
63    VN=V(IJP)                                                           PHASE1    60
64    GO TO 1041                                                          PHASE1    61
```

```
      1 32 U6=U(IJM)                                                    PHASE1  62
           V6=V(IJM)                                                    PHASE1  63
           YY=0.0                                                       PHASE1  64
      1 41 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
      1 42 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
      1 43 U1=U(IPJP)                                                   PHASE1  75
           V1=V(IPJP)                                                   PHASE1  76
           XX=YY=0.0                                                    PHASE1  77
           GO TO 1051                                                   PHASE1  78
      1 44 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
      1 53 U3=U(IMJP)                                                   PHASE1  92
           V3=V(IMJP)                                                   PHASE1  93
           XX=YY=0.0                                                    PHASE1  94
           GO TO 1061                                                   PHASE1  95
      1 54 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
      1 62 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
      1 64 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
      1 72 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
```

```
      1 74 US=U(IPJM)                                                                    PHASE1  130
           VS=V(IPJM)                                                                    PHASE1  131
           YY=Y.0                                                                        PHASE1  132
      1 81 FLAGU=FLAGV=0.0                                                               PHASE1  133
           IF (U5.EQ.AMAX1(U4,U5,U6).OR.U5.EQ.AMIN1(U4,U5,U6)) FLAGU=1.0                 PHASE1  134
           IF (U5.EQ.AMAX1(U2,U5,U8).OR.U5.EQ.AMIN1(U2,U5,U8)) FLAGU=1.0                 PHASE1  135
           IF (V5.EQ.AMAX1(V2,V5,V8).OR.V5.EQ.AMIN1(V2,V5,V8)) FLAGV=1.0                 PHASE1  136
           IF (V5.EQ.AMAX1(V4,V5,V6).OR.V5.EQ.AMIN1(V4,V5,V6)) FLAGV=1.0                 PHASE1  137
           IF (U5.EQ.AMAX1(U1,U5,U9).OR.U5.EQ.AMIN1(U1,U5,U9)) FLAGU=1.0                 PHASE1  138
           IF (U5.EQ.AMAX1(U3,U5,U7).OR.U5.EQ.AMIN1(U3,U5,U7)) FLAGU=1.0                 PHASE1  139
           IF (V5.EQ.AMAX1(V3,V5,V7).OR.V5.EQ.AMIN1(V3,V5,V7)) FLAGV=1.0                 PHASE1  140
           IF (V5.EQ.AMAX1(V1,V5,V9).OR.V5.EQ.AMIN1(V1,V5,V9)) FLAGV=1.0                 PHASE1  141
           UAV=0.125*(U1+U2+U3+U4+U5+U7+U8+U9)-U5                                        PHASE1  142
           VAV=0.125*(V1+V2+V3+V4+V6+V7+V8+V9)-V5                                        PHASE1  143
           AX=GR+Y1*FLAGU*UAV                                                            PHASE1  144
           AY=GZ+Y1*FLAGV*VAV                                                            PHASE1  145
           UTIL(IJ) = (U(IJ)+DT*AX)*XX                                                   PHASE1  146
           VTIL(IJ) = (V(IJ)+DT*AY)*YY                                                   PHASE1  147
           GM1R(IJ)=(AX-GR)*XX*DT                                                        PHASE1  148
           GM1Z(IJ)=(AY-GZ)*YY*DT                                                        PHASE1  149
           IJ = IPJ                                                                      PHASE1  150
           IJP=IJP+NG                                                                    PHASE1  151
           IJM=IJM+NG                                                                    PHASE1  152
      1 89 CONTINUE                                                                      PHASE1  153
           CALL LOOP                                                                     PHASE1  154
 1799      CONTINUE                                                                      PHASE1  155
           CALL DONE                                                                     PHASE1  156
      C    ---   COMPUTE UTIL VTIL E DELSM ROL RCSQ                                     PHASE1  157
 1100      CALL START                                                                    PHASE1  158
           DO 1299 J=2,JM1                                                               PHASE1  159
           DO 1199 I=1,IBAR                                                              PHASE1  160
           IPJ = IJ + NG                                                                 PHASE1  161
           IPJP = IJP + NG                                                               PHASE1  162
           IMJ=IJ-NG                                                                     PHASE1  163
           ROL(IJ)=RO(IJ)                                                                PHASE1  164
           XGM1=P(IJ)/(RO(IJ)*SIE(IJ))                                                   PHASE1  165
           GGM1=XGM1*(1.0+XGM1)                                                          PHASE1  166
           RCSQ(IJ)=1.0/(ASQ+GGM1*SIE(IJ))                                               PHASE1  167
           X1 = X(IPJ)                                                                   PHASE1  168
           Y1 = Y(IPJ)                                                                   PHASE1  169
           R1 = R(IPJ)                                                                   PHASE1  170
           U1 = U(IPJ)                                                                   PHASE1  171
           V1 = V(IPJ)                                                                   PHASE1  172
           X2 = X(IPJP)                                                                  PHASE1  173
           Y2 = Y(IPJP)                                                                  PHASE1  174
           R2 = R(IPJP)                                                                  PHASE1  175
           U2 = U(IPJP)                                                                  PHASE1  176
           V2 = V(IPJP)                                                                  PHASE1  177
           X3 = X(IJP)                                                                   PHASE1  178
           Y3 = Y(IJP)                                                                   PHASE1  179
           R3 = R(IJP)                                                                   PHASE1  180
           U3 = U(IJP)                                                                   PHASE1  181
           V3 = V(IJP)                                                                   PHASE1  182
           X4 = X(IJ)                                                                    PHASE1  183
           Y4 = Y(IJ)                                                                    PHASE1  184
           R4 = R(IJ)                                                                    PHASE1  185
           U4 = U(IJ)                                                                    PHASE1  186
           V4 = V(IJ)                                                                    PHASE1  187
           X24=X2-X4                                                                     PHASE1  188
           Y24=Y2-Y4                                                                     PHASE1  189
           X31=X3-X1                                                                     PHASE1  190
           Y31=Y3-Y1                                                                     PHASE1  191
           U24=U2-U4                                                                     PHASE1  192
           V24=V2-V4                                                                     PHASE1  193
           U31=U3-U1                                                                     PHASE1  194
           V31=V3-V1                                                                     PHASE1  195
           UCR=(U1+U2+U3+U4)/(R1+R2+R3+R4)*CYL                                           PHASE1  196
           XY=X2*Y31-X31*Y24                                                             PHASE1  197
```

```
                RXY=1.0/XY                                                      PHASE1   198
                CELAREA=0.5*XY                                                  PHASE1   199
                UUUR=RXY*(U24*Y31-U31*Y24)                                      PHASE1   200
                UVDY=RXY*(V31*X24-V24*X31)                                      PHASE1   201
                ULVTH=RXY*(U31*X24+V24*Y31-U24*X31-V31*Y24)                     PHASE1   202
                RR13 = .5*(R1+R3)                                               PHASE1   203
                RR24 = .5*(R2+R4)                                               PHASE1   204
                DTO2M1 = DTO2*RM(IPJ)                                           PHASE1   205
                DTO2M2 = DTO2*RM(IPJP)                                          PHASE1   206
                DTO2M3 = DTO2*RM(IJP)                                           PHASE1   207
                DTO2M4 = DTO2*RM(IJ)                                            PHASE1   208
                D=(UUUR*DVDY)*(1.+UUR*U1) + UUR                                 PHASE1   209
                XXA=2./(Y24**2+Y31**2)*CELAREA**2                               PHASE1   210
                YYA=2./(X24**2+X31**2)*CELAREA**2                               PHASE1   211
                XX=SQRT(XXA)                                                    PHASE1   212
                E(IJ)=XX                                                        PHASE1   213
                YY=SQRT(YYA)                                                    PHASE1   214
                DELSM(IJ)=2.*DT*(XXA+YYA)/(XXA*YYA)                             PHASE1   215
                IF (AXI.LT.0) GO TO 113                                         PHASE1   216
                AK = RO(IJ)**AXI                                                PHASE1   217
                GO TO 1146                                                      PHASE1   218
  113           VELIJ = U**2 + V**2                                             PHASE1   219
                VELMX = 0.7 * AMAX1(ABS(U*XX)+ABS(V*YY))                        PHASE1   220
                AK=RO(IJ)*COLAMU*(DTO2*VELIJ+VELMX)*EM10                        PHASE1   221
 1146           LAMD=AMIN1(0.1,0.)*AK*LAMD                                      PHASE1   222
                RLUD=0.5*AK*RO                                                  PHASE1   223
                PIXX=4.*MU02*UUUR*LAMD                                          PHASE1   224
                PIYY=4.*MU02*UVDY*LAMD                                          PHASE1   225
                PIXY=2.*MU02*UUVYR                                              PHASE1   226
                PITH=0.25*XY*(4.*MU02*UUR*LAMD*CYL)                             PHASE1   227
                YY=Y24*P(IJ)                                                    PHASE1   228
                XX=RR24*(PIXY*X24-PIXX*Y24)                                     PHASE1   229
                UTIL(IPJ)  = UTIL(IPJ) +UTO2M1*(XX+R1*YY-PITH)                  PHASE1   230
                UTIL(IJP)  = UTIL(IJP) -UTO2M3*(XX+R3*YY+PITH)                  PHASE1   231
                XX = RR13*(PIXY*X31-PIXX*Y31)                                   PHASE1   232
                YY=Y31*P(IJ)                                                    PHASE1   233
                UTIL(IPJP) = UTIL(IPJP)+UTO2M2*(XX+R2*YY-PITH)                  PHASE1   234
                UTIL(IJ)   = UTIL(IJ)  -UTO2M4*(XX+R4*YY+PITH)                  PHASE1   235
                PYYMP=PIYY-P(IJ)                                                PHASE1   236
                XX = RR24*(PYYMP*X24-PIXY*Y24)                                  PHASE1   237
                VTIL(IPJ)  = VTIL(IPJ) +UTO2M1*XX                               PHASE1   238
                VTIL(IJP)  = VTIL(IJP) -UTO2M3*XX                               PHASE1   239
                XX = RR13*(PYYMP*X31-PIXY*Y31)                                  PHASE1   240
                VTIL(IPJP) = VTIL(IPJP)+UTO2M2*XX                               PHASE1   241
                VTIL(IJ)   = VTIL(IJ)  -UTO2M4*XX                               PHASE1   242
                IJ = IPJ                                                        PHASE1   243
                IJP=IPJP                                                        PHASE1   244
 1199           CONTINUE                                                        PHASE1   245
                UTIL(IJ) = UTIL(IJP) = UTIL(IJP-NG1M) = UTIL(IJ-NG1B) = 0.      PHASE1   246
                IF (J.NE.2)  GO TO 122                                          PHASE1   248
                DO 1217 IJ=ISC2,ISCF2,NG                                        PHASE1   249
                VTIL(IJ)=0.0                                                    PHASE1   250
 1217           CONTINUE                                                        PHASE1   251
  122           IF (J.NE.JP1) GO TO 1246                                        PHASE1   252
                DO 123  IJP=IJPS,IJP2,NG                                        PHASE1   253
                VTIL(IJP)=0.0                                                   PHASE1   254
  123           CONTINUE                                                        PHASE1   255
  124           CALL LOOP                                                       PHASE1   256
 1299           CONTINUE                                                        PHASE1   257
                CALL DONE                                                       PHASE1   258
C                                                                               PHASE1   259
                RETURN                                                          PHASE1   260
                END
SINGLY REFERENCED VARIABLES
    1000 -   27*    DIVSAV  -R   9C0   IP2     -I  10C0   NADD    -   26S0   CMANC   -R  10C0   REZSIE  -R   8C0   TNEUT   -R  11C0
    1100 -   16**   EPS     -R  10C0   ISCF1   -I   8C0   NAME    ()I   8C0   CMCYL   -R  12C0   REZY0   -R  10C0   TOUT    -R   8C0
AAI      ()R   5LC   EQUIVAL -   13F   ISC3    -I   8C0   NANGLS  -I  11C0   CPDEN   ()R   2C0   RLC1    -    7C0   TSTART  -R   8C0
AAZ      ()R   6LC   ETAB    ()R   2C0   ITAB    ()I  10C0   NDUMP   -I   8C0   CPTAP   ()R   2C0   RVALS   ()R  11C0   VTEM    -R  10C0
```

```
ANGLES ()R  11C0   FLOAT   -    19SU   ITV     -I   8C0   NFRW   -I   2C0   ORANGE  -   1(CN  SENSE   -   12CN  WHITE   -  11CN
AC     -R   1(C0   FREQ   ()R    7C0   JBAR    -I   8C0   NOPD   -I   2C0   PHASE1  -    15U  SIGA   ()R   7LC  YELLOW  -   9CN
AOFAC  -R   1(C0   GM1     -R   1(C0   JDTC    -I   9C0   NOPT   -I   2C0   PINK    -    4CN  SPTBL  ()R   2C0  YLC1    -   5CN
ACM    -R   1(C0   GROVEL  -R    8C0   JDTV    -I   9C0   NPT    -I  1(C0   PTAB   ()R   2C0  STATE   -    2CN  YLC2    -   6CN
BTBL  ()R    7C0   IDTC    -I    9C0   JNP     -I  1(C0   NO1    -I   8C0   REAL    -    14F  TAMB    -R   8C0  YSC1    -   3CN
BC     -R   1(C0   IDTV    -I    9C0   JP4     -I  1(C0   NO12   -I  1(C0   RED     -    8CN  TEMP   ()R   8C0
DIMENS1 -    15F   ILCF    -I   1(C0   JSWTCH2 -I  12C0   NRVALS -I  11C0   RETURN  -   20(F  THIRD   -R  10C0
DTCSAV -R    9C0   IM1     -I   1(C0   JSWTCH3 -I  12C0   OM     -R  10C0   REZHON -R   1(C0  THY     -R   8C0
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
  1 02 -    4(     44*
  1011 -    43     47*
  1012 -    47     51*
  1021 -    5(     54*
  1022 -    54     58*
  1031 -    57     61*
  1032 -    61     65*
  1041 -    64     66*
  1042 -    68     73*
  1043 -    73     76*
  1044 -    69     82*
  1051 -    72     77      81      85*
  1052 -    85     9(*
  1053 -    9(     95*
  1054 -    86     99*
  1061 -    89     94      98      1(2*
  1062 -    1(2    1(7*
  1063 -    1(7    112*
  1064 -    1(3    116*
  1071 -    1(6    111     115     119*
  1072 -    119    124*
  1073 -    124    129*
  1074 -    12(    135*
  1081 -    123    128     132     136*
  1089 -     3(00  156*
  1099 -     2900  158*
  113( -    216    221*
  1140 -    22(    224*
  1199 -    16200  247*
  1210 -    25(00  252*
  1220 -    249    253*
  1230 -    25400  256*
  1240 -    253    257*
  1299 -    16100  258*
AASC   ()R    3C0    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ
             13EQ    13EQ
ABS     -   222SU   222SU
AK     -R   219=    223=    224     225
AMAX1   -   137SU   138SU   139SU   140SU   141SU   142SU   143SU   144SU   222SU
AMIN1   -    18SU    21SU    22SU   137SU   138SU   139SU   140SU   141SU   142SU   143SU   144SU   224SU
ANC    -R    1(C0   26
ASQ    -R    1(C0   169
AX     -R   147=    149     151
AY     -R   148=    15(     152
BETALC ()R   13EQ   1501
CELAREA -R  2(1=    212     213
CENTA  ()R   13EQ   1501
CENTY  ()R   13EQ   1501
COLAMU -R    1(C0   223
COMMON  -     2F     3F      4F      8F      9F     10F     11F     12F
CQ     ()R   13EQ   1501
CYL    -R    1(C0   198     229
D      -R   211=    224
DELSM  ()R   13EQ   1501    217=
DONE    -   154SU   259SU
DT     -R    6C0    17=     18=     20      21=     21      22=     22      23      24      25      149     150     151     152     211     217
DT1    -R    5C0    18      2(=
DTFAC  -R   19=     2(
```

```
PIXY     -R  228=  231   234   239   242
PIYY     -R  227=  236
PL       ()R   13EB  1501
PYYMP    -R  236=  239   242
QSQRT    -   2145U 2165U
R        ()R   13EB  1501  172   177   182   187
RCSQ     ()R   13EB  1501  169=
RDI      -R    9CU   24=   28
RM       ()R   13EB  1501  207   208   209   210
RMP      ()R   13EB  1501
RO       ()R   13EB  1501  166   167   219   223
ROL      ()R   13EB  1501  166=
RVOL     ()R   13EB  1501
RXY      -R  206=  212   213   214
RZEDEN   ()R   13EB  1501
R1       -R  176=  196   225   232
R2       -R  177=  196   226   236
R3       -R  186=  196   225   233
R4       -R  187=  196   226   237
SIE      ()R   13EB  1501  167   169
SIGHLC   ()R   13EB  1501
START    -   2755U 1635U
T        -R    8CU   22    22    23=   23
TIME     -R    8CU   22    22
U        ()R   13EB  1501  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   13EB  1501
UL       ()R   13EB  1501
UMOMLC   ()R   13EB  1501
UOR      -R  196=  211   211   229
UP       ()R   13EB  1501
UTIL     ()R   13EB  1501  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=  212   214
U3       -R   67=   91=   95=   99=  142   142   145   183=  196   198
U31      -R  196=  212   214
U4       -R   41=   44=  137   137   145   186=  194   198   221   222
U5       -R   38=  137   137   137   137   138   138   138   138   141   141   141   141   142   142   142   142
               145
U6       -R   46=   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   13EB  1501  35    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   13EB  1501
VL       ()R   13EB  1501
VP       ()R   13EB  1501
VTIL     ()R   13EB  1501  154=  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=  213   214
V3       -R   88=   92=   96=  100=  143   143   146   184=  197
V31      -R  197=  213   214
V4       -R   42=   45=  140   140   146   189=  195   221   222
V5       -R   35=  139   139   139   139   140   140   140   140   143   143   143   143   144   144   144   144
               140
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   13EB  1501  174   175   180   185
XGMI     -R  167=  168   168
```

```
XPAR     ()R   13E6   1501
XX       -R    37=    46=    53=    76=    86=    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=   219    217    217
XY       -R    199=   20     2,1    229
X1       -R    17 =   192
X2       -R    175=   19
X24      -R    19 =   199    2 3    2c4    213    231    239
X3       -R    18 =   192 -
X31      -R    192=   199    2 3    2c4    213    234    242
X4       -R    185=   19
Y        ()R   13E6   1501   171    176    181    186
YPAR     ()R   13E6   1501
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    26=    147    148    171=   193
Y2       -R    176=   191
Y24      -R    191=   199    2 2    2c4    212    230    231    239
Y3       -R    181=   193
Y31      -R    193=   199    2 2    2c4    212    234    235    242
Y4       -R    186=   191
```

```
1            OVERLAY (YCKIPER, 2, 4)                                          PHASE2    2
1            PROGRAM PHASE2                                                   PHASE2    3
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 /PIKR/      I, IJ, IJM, IJP, J                            ALLKOM    6
5            COM /YLC1/         AA1(131000)                                   ALLKOM    7
6            COM /YLC2/         AA2(131200)                                   ALLKOM    8
7            COM /HLC1/         SIGA(30000)                                   ALLKOM    9
8            COMMON /RED/       NAME(12), DT, DTR, EM10, GRDVEL, IBAR, IJPS,  ALLKOM   10
            1                   IP1, ISCF1, ISCF2, ISC4, 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 /YELLOW/    DTC, DTCSAV, DTO2, DTV, DTVSAV,               YELLOW    2
            1                   DVDY, IDTC, IDTV, JDTC, JDTV, ROT             YELLOW    3
10           COMMON /ORANGE/    AMC, ASC, A0, ACFAC, AOM, B0, COLAMU, CYL,    ORANGE    2
            1                   DTPOS, EPS, GM1, GR, GZ, IM1,                 ORANGE    3
            2                   IECP, IP2, ITAB(1000), JNP, JP4, KXI, LAM,    ORANGE    4
            3                   LOP2, MU, NPT, NQIB, NQI2, NUMIT, OM,         ORANGE    5
            4                   OMANG, OMCYL, REZRUN, REZYU, THIRD, VTEM      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),RP,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,UMVMLC),                    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,REZEDEN),                   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), RCSG(1), CENTX(1), DIMEN     3
            3                   E(1), ETIL(1), CENTY(1), RVOL(1), M(1), RM(1), DIMEN     4
```

```
     *                    VP(1), P(1), PL(1), EP(1), UP(1), UTIL(1),        DIMEN     5
     5                    UL(1), CW(1), EMOMLC(1), VTIL(1), VL(1),          DIMEN     6
     6                    UMOMLC(1), RUL(1), RETALC(1), FOUTLC(1),          DIMEN     7
     7                    SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),      DIMEN     8
     8                    RZELEN(1), GRIZ(1), VG(1), FSA(1)                 DIMEN     9
15   4130 FORMAT          (1H ,*ITERATION LIMIT EXCEEDED RUN MAY ABORT*)    PHASE2    9
     C      ---   INITIALIZE ITERATION CONSTANTS                            PHASE2    10
16   2000   NLMIT = 0                                                       PHASE2    11
17          NLSTIT = 1                                                      PHASE2    12
18          PLMAX = EM10                                                    PHASE2    13
     C      ---   BEGIN ITERATION                                           PHASE2    14
19   2010   CALL START                                                      PHASE2    15
2            DO 2099 J=2,JM1                                               PHASE2    16
21           DO 2089 I=1,IBAR                                              PHASE2    17
22           IJ = I + NU                                                   PHASE2    18
23           IJP = IJ + NU                                                 PHASE2    19
24           X1 = X(IPJ)                                                   PHASE2    20
25           Y1 = Y(IPJ)                                                   PHASE2    21
26           R1 = R(IPJ)                                                   PHASE2    22
27           U1 = UL(IPJ)                                                  PHASE2    23
28           V1 = VL(IPJ)                                                  PHASE2    24
29           X2 = X(IPJP)                                                  PHASE2    25
3            Y2 = Y(IPJP)                                                  PHASE2    26
31           R2 = R(IPJP)                                                  PHASE2    27
32           U2 = UL(IPJP)                                                 PHASE2    28
33           V2 = VL(IPJP)                                                 PHASE2    29
34           X3 = X(IJP)                                                   PHASE2    30
35           Y3 = Y(IJP)                                                   PHASE2    31
36           R3 = R(IJP)                                                   PHASE2    32
37           U3 = UL(IJP)                                                  PHASE2    33
38           V3 = VL(IJP)                                                  PHASE2    34
39           X4 = X(IJ)                                                    PHASE2    35
4            Y4 = Y(IJ)                                                    PHASE2    36
41           R4 = R(IJ)                                                    PHASE2    37
42           U4 = UL(IJ)                                                   PHASE2    38
43           V4 = VL(IJ)                                                   PHASE2    39
44           XVG=1.E/(R4+R3+R2+R1)*CYL                                     PHASE2    40
45           XVG=1.E/((X1-X3)*(Y2-Y4)-(X2-X4)*(Y1-Y3))                     PHASE2    41
46           UGR=(U1+U2+U3+U4)*XVG                                         PHASE2    42
47           RAR=XVG                                                       PHASE2    43
48           DUDX=((U1-U3)*(Y2-Y4)-(U2-U4)*(Y1-Y3))*RAR                    PHASE2    44
49           DVDY=((V2-V4)*(X1-X3)-(V1-V3)*(X2-X4)) *RAR                   PHASE2    45
5            D=(DUDX+DVDY)*(1.+UGR*DT)+UGR                                 PHASE2    46
51           S = RDT*(ROL(IJ)-RO(IJ))+ROL(IJ)*D                            PHASE2    47
52           DEL2=2.*DELSM(IJ)                                             PHASE2    48
53           RA=RCSQ(IJ)*(RDT+D)*DEL2                                      PHASE2    49
54           DP = -GM*S/RA                                                 PHASE2    50
55           ROL(IJ) = ROL(IJ) + RCSQ(IJ)*DP                               PHASE2    51
56           PLMAX = AMAX1(PLMAX,ABS(PL(IJ)))                              PHASE2    52
57           IF (ABS(DP).LE.EPS*PLMAX) GO TO 2080                          PHASE2    53
     C      ---   TEST FOR CONVERGENCE IN CELL                             PHASE2    54
58           NLSTIT = 1                                                    PHASE2    55
     C      ---   ADJUST UL VL PL FOR NEXT ITERATION                        PHASE2    56
59           PL(IJ) = PL(IJ)+DP                                            PHASE2    57
6            Y24 = Y2-Y4                                                   PHASE2    58
61           Y31 = Y3-Y1                                                   PHASE2    59
62           XR13= .5*(R1+R3)*(X1-X3)                                      PHASE2    60
63           XR24= .5*(R2+R4)*(X2-X4)                                      PHASE2    61
64           XX = DTU2*D**F                                                PHASE2    62
65           DTU2M1 = XX*RM(IPJ)                                           PHASE2    63
66           DTU2M2 = XX*RM(IPJP)                                          PHASE2    64
67           DTU2M3 = XX*RM(IJP)                                           PHASE2    65
68           DTU2M4 = XX*RM(IJ)                                            PHASE2    66
69           UL(IPJ)  = U1+DTU2M1*R1*Y24                                   PHASE2    67
7            UL(IPJP) = U2+DTU2M2*R2*Y31                                   PHASE2    68
71           UL(IJP)  = U3-DTU2M3*R3*Y24                                   PHASE2    69
72           UL(IJ)   = U4-DTU2M4*R4*Y31                                   PHASE2    70
73           IF (J.EQ.2)   GO TO 2060                                      PHASE2    71
```

```
      VL(IPJ)   = V1-DT02M1*XR24                                          PHASE2     72
      VL(IJ)    = V4-DT02M4*XR13                                          PHASE2     73
2600  IF (J.EQ.JP1) GO TO 2680                                            PHASE2     74
      VL(IPJP) = V2+DT02M2*XR13                                           PHASE2     75
      VL(IJP)  = V3+DT02M3*XR24                                           PHASE2     76
2680  IJ = IPJ                                                            PHASE2     77
2689  IJP = IPJP                                                          PHASE2     78
      UL(IJ) = UL(IJP) = UL(IJP-NGIB) = UL(IJ-NGIB) = 0.                  PHASE2     79
      CALL LOOP                                                           PHASE2     80
2699  CONTINUE                                                            PHASE2     81
      CALL DONE                                                           PHASE2     82
C     ---   TEST ITERATION CONSTANTS                                      PHASE2     83
      NLIMIT = NUMIT+1                                                    PHASE2     84
      IF(NUSTIT.EQ.0) GO TO 2500                                          PHASE2     85
      NUSTIT = 0                                                          PHASE2     86
      IF (NUMIT.LT.500) GO TO 2610                                        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,JP1                                                     PHASE2     92
      DO 2580 I=1,IBAR                                                    PHASE2     93
      IMJ=IJ-NG                                                           PHASE2     94
      IPJ=IJ+NG                                                           PHASE2     95
      IPJP=IJP+NG                                                         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
      HR13= .5*(R1+R3)                                                    PHASE2    131
      HR24= .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
      UCR=(U12*U34)/(R12*R34) *CYL                                        PHASE2    138
      U24M=U2-U4                                                          PHASE2    139
```

```
14          U13M=U1-U3                                                      PHASE2  140
141         V24M=V2-V4                                                      PHASE2  141
142         V13M=V1-V3                                                      PHASE2  142
143         DUDX=RXY*(U24M*Y31+U13M*Y24)                                    PHASE2  143
144         DVDY=RXY*(-V13M*X24-V24M*X31)                                   PHASE2  144
145         DUVYR=RXY*(-U13M*X24+V24M*Y31-U24M*X31+V13M*Y24)                PHASE2  145
146         D=(DUDX+DVDY)*(1.0+DUDR*DT)+DUDR                                PHASE2  146
147         AA=E(IJ)                                                        PHASE2  147
148         YY=USQRT(2.0/(X24**2+X31**2))*CELAREA                           PHASE2  148
149         IF (RXI.LT.0) GO TO 2572                                        PHASE2  149
15          AK = RO(IJ)**RXI                                                PHASE2  150
151         GO TO 2577                                                      PHASE2  151
152   2572  UL4 = U4**2 + V4**2                                             PHASE2  152
153         VL4 = AMAX1(ABS(U4*XX),ABS(V4*YY))                              PHASE2  153
154         AK=RO(IJ)*CCLAMD*(DTU2*UL4+VD4**2.7)                            PHASE2  154
155   2577  ALAM = AK*ALAM                                                  PHASE2  155
156         AMU = AK*AMU                                                    PHASE2  156
157         LAMD = AMIN1(0.,.5)*ALAM                                        PHASE2  157
158         MU2 = .5*AMU                                                    PHASE2  158
159         FMU2=4.*MU2                                                     PHASE2  159
16          PIXX=FMU2*DUDX+LAMD                                             PHASE2  160
161         PIYY=FMU2*DVDY+LAMD                                             PHASE2  161
162         PIXY=2.0*MU2*DUVYR                                              PHASE2  162
163         PITH=.25*XI*(FMU2*UDR+LAMD*CYL)                                 PHASE2  163
164         XX1=HR24*(PIXY*X24-PIXX*Y24)                                    PHASE2  164
165         XX2=HR13*(PIXY*X31-PIXX*Y31)                                    PHASE2  165
166         XX3=-HR24*PIXY*Y24                                              PHASE2  166
167         XX4=-HR13*PIXY*Y31                                              PHASE2  167
168         XX = XX*XX                                                      PHASE2  168
169         YY = YY*YY                                                      PHASE2  169
17          DG=RO(IJ)*OMARG*XX*YY/(2.0*(ALAM+2.0*AMU)*(XX+YY)*EM10)         PHASE2  170
171         DG=ABS(DG)                                                      PHASE2  171
172         DTV = AMIN1(.5*DG,DTV)                                          PHASE2  172
173         IF(DTVSAV.NE.DTV) IDTV=I                                        PHASE2  173
174         IF(DTVSAV.NE.DTV) JDTV=J                                        PHASE2  174
175         DTVSAV=DTV                                                      PHASE2  175
176         XR13= .5*(R1+R3)*(X1-X3)                                        PHASE2  176
177         XR24= .5*(R2+R4)*(X2-X4)                                        PHASE2  177
178         GX=P(IJ)                                                        PHASE2  178
179         GY=GX-PIYY                                                      PHASE2  179
18          DELE=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
181         DELE=DELE+(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
182         DELE=0.25*DELE*DT*RVOL(IJ)/RO(IJ)                               PHASE2  186
183         ETIL(IJ)=SIE(IJ)-DELE                                           PHASE2  187
184           IJ=IPJ                                                        PHASE2  188
185   2581    IJP=IPJP                                                      PHASE2  189
186           CALL LOOP                                                     PHASE2  190
187   2584    CONTINUE                                                      PHASE2  191
188           CALL DONE                                                     PHASE2  192
      C     ---   SET RCL AND ETIL ON BOUNDARIES                            PHASE2  193
189         CALL START                                                      PHASE2  194
19          IFARE=IJ                                                        PHASE2  195
191         DO 2711 J = 2 , JP1                                             PHASE2  196
192         DO 2711 I = 1 , IBAR                                            PHASE2  197
193         IPJ=IJ-NU                                                       PHASE2  198
194         IPJ=IJ+NU                                                       PHASE2  199
195         IPJP=IJP+NO                                                     PHASE2  200
196         IF(J.NE.2) GO TO 1501                                           PHASE2  201
197         RCL(IJN)=RO(IJN)                                                PHASE2  202
198         ETIL(IJN)=ETIL(IJ)                                              PHASE2  203
199         IF(I.NE.IBAR) GO TO 1501                                        PHASE2  204
2.0         RCL(IJP+NU)=RO(IJP+NU)                                          PHASE2  205
201         ETIL(IJP+NO)=ETIL(IFARE)                                        PHASE2  206
2.2         GO TO 1502                                                      PHASE2  207
```

```
      15 1  IF(J.NE.JP1) GO TO 15:2                                          PHASE2  208
            RCL(IJP)=RO(IJP)                                                 PHASE2  209
      15 2  IF(I.NE.IMAX) GO TO 1503                                         PHASE2  210
            RCL(IPJ)=RO(IPJ)                                                 PHASE2  211
            ETIL(IPJ)=ETIL(IJ)                                               PHASE2  212
      15 3  IJ=IPJ                                                           PHASE2  213
            IJP=IPJP                                                         PHASE2  214
      271.  IJM=IJM+NG                                                       PHASE2  215
            CALL LOOP                                                        PHASE2  216
      27..  CONTINUE                                                         PHASE2  217
            CALL DONE                                                        PHASE2  218
      C                                                                      PHASE2  219
            CALL START                                                       PHASE2  220
            DO 2565 J = 2 , JP2                                              PHASE2  221
            DO 2564 I = 1 , IP1                                              PHASE2  222
            IMJ=IJ-NG                                                        PHASE2  223
            IPJ=IJ+NG                                                        PHASE2  224
            IMJM=IJM-NG                                                      PHASE2  225
            VTEMP=-.125/RO(IJ)*(GRIR(IJ)*(UTIL(IJ)+U(IJ))+GRIZ(IJ)*(VTIL(IJ)+PHASE2  226
           1        V(IJ)))                                                  PHASE2  227
            XX=1.                                                            PHASE2  228
            YY=1.                                                            PHASE2  229
            IF((I.EQ.1).O. (I.EQ.IP1)) XX=0.                                 PHASE2  230
            IF((J.EQ.2).O.(J.EQ.JP2)) YY=0.                                  PHASE2  231
            IF(XX*YY.EQ.0.) GO TO 1081                                       PHASE2  232
              E(IMJM)=  E(IMJM)+VTEMP*RVOL(IMJM)/RO(IMJM)                    PHASE2  233
              E(IJM)=  E(IJM)+VTEMP*RVOL(IJM)/RO(IJM)                        PHASE2  234
              E(IMJ)=  E(IMJ)+VTEMP*RVOL(IMJ)/RO(IMJ)                        PHASE2  235
              E(IJ)=  E(IJ)+VTEMP*RVOL(IJ)/RO(IJ)                            PHASE2  236
            GO TO 1088                                                       PHASE2  237
      1081  IF(I.NE.1) GO TO 1082                                            PHASE2  238
            IF((J.EQ.2).O.(J.EQ.JP2)) GO TO 1088                             PHASE2  239
              E(IJM)=  E(IJM)+2.*VTEMP*RVOL(IJM)/RO(IJM)                     PHASE2  240
              E(IJ)=  E(IJ)+2.*VTEMP*RVOL(IJ)/RO(IJ)                         PHASE2  241
            GO TO 1088                                                       PHASE2  242
      1082  IF(I.NE.IP1) GO TO 1085                                          PHASE2  243
            IF((J.EQ.2).O.(J.EQ.JP2)) GO TO 1088                             PHASE2  244
              E(IMJ)=  E(IMJ)+2.*VTEMP*RVOL(IMJ)/RO(IMJ)                     PHASE2  245
              E(IMJM)=  E(IMJM)+2.*VTEMP*RVOL(IMJM)/RO(IMJM)                 PHASE2  246
            GO TO 1088                                                       PHASE2  247
      1085  IF(J.EQ.2) GO TO 1090                                            PHASE2  248
              E(IMJM)=  E(IMJM)+2.*VTEMP*RVOL(IMJM)/RO(IMJM)                 PHASE2  249
              E(IJM)=  E(IJM)+2.*VTEMP*RVOL(IJM)/RO(IJM)                     PHASE2  250
            GO TO 1088                                                       PHASE2  251
      1090  E(IJ)=  E(IJ)+2.*VTEMP*RVOL(IJ)/RO(IJ)                           PHASE2  252
            E(IMJ)=  E(IMJ)+2.*VTEMP*RVOL(IMJ)/RO(IMJ)                       PHASE2  253
      1088  CONTINUE                                                         PHASE2  254
            IJ=IPJ                                                           PHASE2  255
            IJP=IJP+NG                                                       PHASE2  256
      2564  IJM=IJM+NG                                                       PHASE2  257
            CALL LOOP                                                        PHASE2  258
      2565  CONTINUE                                                         PHASE2  259
            CALL DONE                                                        PHASE2  260
      C                                                                      PHASE2  261
            RETURN                                                           PHASE2  262
            END                                                              PHASE2  263
```

SINGLY REFERENCED VARIABLES

```
    2000 -  16*   DTLSAV -R   9C0   IJPS   -I   8C0   LJP2   -I  10C0   OPDEN  ()R   2C0   REZYO  -R  10C0   TOUT   -R   8C0
AAJ    ()R   5LC   DTPCS  -R  10C0   IM1    -I  10C0   NAME   ()I   8C0   OPTMP  ()R   2C0   RLC1   -    7CN   TSTART -R   8C0
AAZ    ()R   6LC   DTM    -R   8C0   IP2    -I  10C0   NANGLS -I  11C0   CHANGE -    1.CN  RVALS  ()R  11C0   VTEM   -R  10C0
ANG    -R  1*C0   EQUIVAL -   12F   ISCF1  -I   8C0   NCYC   -I   8C0   PHASE2 -    1SU   SIGA   ()R   7LC   WHITE  -   11CN
ANGLES ()R  11C0   ETAB   ()R   2C0   ISCF2  -I   8C0   NDUMP  -I   8C0   PIAR   -    4CN   SPTOL  ()R   2C0   YELLOW -    9CN
ASW    -R  1*C0   FORMAT -    15F   ISC2   -I   8C0   NFRQ   -I   2C0   PRINT  -    89F   STATE  -    2CN   YLC1   -    5CN
AC     -R  1*C0   FREQ   ()R   2C0   ISC3   -I   8C0   NOPD   -I   2C0   PTAB   ()R   2C0   T      -R   8CC   YLC2   -    6CN
AOPAC  -R  1*C0   GM1    -R  1*C0   ITAB   ()I  10C0   NOPT   -I   2C0   QSORT  -   14BSU  TAMB   -R   8C0   YSC1   -    3CN
AON    -R  1*C0   GR     -R  1*C0   ITV    -I   8C0   NPT    -I  1*C0   REAL   -    13F   TEMP   ()R   8C0
BTBL   ()R   2C0   GRDVEL -R   8C0   JBAR   -I   8C0   NQ1    -I   8C0   REC    -    8CN   THIRD  -R  10CC
BC     -R  1*C0   GZ     -R  1*C0   JDTC   -I   9C0   NQ1P   -I  10C0   RETURN -   254F   THY    -R   8C0
```

```
DIMENSI -   14F    1010    -I   9CO    ORR         -I  11CO   NRVALS  -I  11CO   REZRON  -R  1.CO   TIME      -R   8CO
DTC     -R  9CO    1ECP    -I   10CO   OP4         -I  10CO   OMCYL   -R  10CO   REZSIE  -R  8CO    TIMEOUT   -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     203     205*
  1503 -     205     206*
  2010 -      15*     86
  2060 -      73      76*
  2080 -      57      76      79*
  2089 -     2100     8.*
  2099 -     2700     83*
  2500 -      86      9 *
  2572 -     149     152*
  2577 -     151     155*
  258. -     9300    165*
  2584 -    21600    25 *
  2585 -    21500    252*
  2589 -     9200    187*
  2700 -    19100    212*
  2719 -    19200    21 *
  413. -      15*    69PR
AASC      ()R    3CO     12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ    12EQ
                 12EQ    12EQ
ABS        -     56SU    57SU    153SU   153SU   171SU
AK        -R     15 =    154=    155     156
ALAM      -R     155=    157     17.
AMAX1      -     56SU    153SU
AMIN1      -     157SU   172SU
AMU       -R     156=    158     170
BETALC    ()R    12EQ    1401
CELAREA   -R     137=    148
CENTX     ()R    12EQ    1401
CENTY     ()R    12EQ    1401
COLAND    -R     1 CO    154
COMMON     -     2F      3F      4F      8F      9F      10F     11F
CQ        ()R    12EQ    1401
CYL       -R     1.CO    44      138     163
D         -R     5 =     51      53      146=    157
DELE      -R     180=    161=    161     182=    182     183
DELSM     ()R    12EQ    1401    52
DEL2      -R     52=     53
DONE       -     84SU    166SU   213SU   253SU
DP        -R     54=     55      57      59      64
DQ        -R     170=    171=    171     172
DT        -R     8CO     5       146     182
DT02      -R     9CO     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     18      170
EP        ()R    12EQ    1401
EPS       -R     1.CO    57
ETIL      ()R    12EQ    1401    163=    198=    198     201=    201     207=    207
```

```
YPAR    ()R   12EW   1401
YY      -R   14E=   153     169=   169     169     176     170     222=    224=    225
YA      -R   29=    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      112=    128
Y31     -R   61=    7       72      128=    135     143     145     165     167     180     180
Y4      -R   4 =    45      48      60      119=    127
```

```
1           OVERLAY (YOKIPER, 2, 5)                                          PHASE3     2
1           PROGRAM PHASE3                                                   PHASE3     3
2           COMMON /STATE/    NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),        ALLKOM     2
           1                  FREQ(100), SPTBL(310), 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           COM /YLC1/        AA1(131C00)                                    ALLKOM     7
6           COM /YLC2/        AA2(131C00)                                    ALLKOM     8
7           COM /RLC1/        SIGA(3P000)                                    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, 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, DTDP, DTV, DTVSAV,                YELLOW     2
           1                  DVDY, IDTC, IDTV, JDTC, JDTV, RDT              YELLOW     3
11          COMMON /ORANGE/   ANG, ASG, AZ, AUFAC, AUM, BO, COLAML, CYL,     ORANGE     2
           1                  DTPOS, EPS, GM1, GR, GZ, IM1,                  ORANGE     3
           2                  IECP, IP2, ITAB(10C0), JNM, JP4, KXI, LAM,     ORANGE     4
           3                  LJP2, MU, NPT, NQ10, NQI2, NUMIT, ON,          ORANGE     5
           4                  ORANG, OMCYL, REZPON, 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,CENTA),                   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,ENOMLC),                  EQVREAL    7
           6                  (AASC(13),VTIL,VL,UMOMLC),                     EQVREAL    8
           7                  (AASC(14),RQL,RETALC,FOUTLC), (AASC(15),SIE),  EQVREAL    9
           8                  (AASC(16),DELSM,SIGPLC),                       EQVREAL   10
           9                  (AASC(17),GRIR,UG,REZDEN),                     EQVREAL   11
           1                  (AASC(18),GRIZ,VG,FSN)                         EQVREAL   12
14          REAL              LAM, LAMD, M, MP, MU, MUO2                     EQVREAL   13
15          DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),      DIMEN      2
           C                  V(1), RO(1), MP(1), RMP(1), RCSQ(1), CENTA(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), ENOMLC(1), VTIL(1), VL(1),       DIMEN      6
           6                  UMOMLC(1), RQL(1), RETALC(1), FOUTLC(1),       DIMEN      7
           7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),   DIMEN      8
           8                  REZDEN(1), GRIZ(1), VG(1), FSN(1)              DIMEN      9
16          REAL              DELINT                                         PHASE3    10
17          DIMENSION         AT(100), FT(100)                               PHASE3    11
      C                                                                      PHASE3    12
18          DTOLD=0.0625*DT                                                  PHASE3    13
19          TWELTH=1.0/12.0                                                  PHASE3    14
      C     ---   TEST FOR REZONE                                           PHASE3    15
```

```
      IF (JSWITCH2.EQ.2.OR.GRDVEL.EQ.2.0) GO TO 3150                    PHASE3  16
      ---   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*GRDVEL*(UL(IJ)+U(IJ))                                  PHASE3  21
      VG(IJ)=0.5*GRDVEL*(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+NW                                                          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-NW                                                    PHASE3  38
         IPJ = IJ+NW                                                    PHASE3  39
         IPJP = IPJ+NW                                                  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-XP2                                                      PHASE3  81
      X23 = X2-X3                                                       PHASE3  82
      X34 = X3-X4                                                       PHASE3  83
```

```
      X41 = X4-X1                                                       PHASE3     84
      Y21 = Y2-Y1                                                       PHASE3     85
      Y32 = Y3-Y2                                                       PHASE3     86
      Y43 = Y4-Y3                                                       PHASE3     87
      Y14 = Y1-Y4                                                       PHASE3     88
      R12 = R1+R2                                                       PHASE3     89
      R23 = R2+R3                                                       PHASE3     90
      R34 = R3+R4                                                       PHASE3     91
      R41 = R4+R1                                                       PHASE3     92
      UL12 = UL1+UL2                                                    PHASE3     93
      UL23 = UL2+UL3                                                    PHASE3     94
      UL34 = UL3+UL4                                                    PHASE3     95
      UL41 = UL4+UL1                                                    PHASE3     96
      VL12 = VL1+VL2                                                    PHASE3     97
      VL23 = VL2+VL3                                                    PHASE3     98
      VL34 = VL3+VL4                                                    PHASE3     99
      VL41 = VL4+VL1                                                    PHASE3    100
      D = .25*RVOL(IJ)*(R12*(U12*Y21+V12*X12)+R23*(U23*Y32+V23*X23)     PHASE3    101
     1                 +R34*(U34*Y43+V34*X34)+R41*(U41*Y14+V41*X41))    PHASE3    102
      VOLR = VOLT = VOLC = 1./RVOL(IJ)                                  PHASE3    103
      IF (I.NE.IMAX) VOLR = 1./RVOL(IPJ)                                PHASE3    104
      IF (J.NE.JPI ) VOLT = 1./RVOL(IJP)                                PHASE3    105
      IF (I.EQ.1) GO TO 323                                             PHASE3    106
      FL = -FR                                                          PHASE3    107
      AL = -AR                                                          PHASE3    108
  323 IF (J.EQ.2) GO TO 325                                             PHASE3    109
      FB = -FT(I)                                                       PHASE3    110
      AB = -AT(I)                                                       PHASE3    111
  324 FR=((XP1*(Y1-YP2)+X1*(YP2-YP1)+XP2*(YP1-Y1))*(RP1+R1+RP2)+        PHASE3    112
     1 (X1*(Y1-YP2)+X2*(YP2-Y1)+XP2*(Y1-Y2))*(R1+R2+RP2))*TWELTH        PHASE3    113
      AR    = ARM*SIGN(1.,FR   )+BIG*.FR   /(VOLR+VOLC)                 PHASE3    114
      FT(I)=((XP3*(YP2-Y3)+XP2*(Y3-YP3)+X3*(YP3-YP2))*(RP3+RP2+R3)+     PHASE3    115
     1 (XP2*(Y2-Y3)+X2*(Y3-YP2)+X3*(YP2-Y2))*(RP2+R2+R3))*TWELTH        PHASE3    116
      AT(I) = ARM*SIGN(1.,FT(I))+BIG**.FT(I)/(VOLT+VOLC)                PHASE3    117
      XX = AMAX1(ABS(FB),ABS(FR),ABS(FT(I)),ABS(FL))                    PHASE3    118
      DTC = AMIN1(DTC,DTPOS*AREAC/(XX*RVOL(IJ)+DTPOS*ABS(D)+EM10))      PHASE3    119
      IF (DTCSAV.NE.DTC) IDTC = I                                       PHASE3    120
      IF (DTCSAV.NE.DTC) JDTC = J                                       PHASE3    121
      DTCSAV = DTC                                                      PHASE3    122
      RP(IJ) = RO(IJ)*VOLC                                              PHASE3    123
     1         +FR   *((1.-AR)   *ROL(IJ)+(1.+AR)   *ROL(IPJ))         PHASE3    124
     2         +FT(I)*((1.-AT(I))*ROL(IJ)+(1.+AT(I))*ROL(IJP))         PHASE3    125
     3         +FL   *((1.-AL)   *ROL(IJ)+(1.+AL)   *ROL(IMJ))         PHASE3    126
     4         +FB   *((1.-AB)   *ROL(IJ)+(1.+AB)   *ROL(IJM))         PHASE3    127
      ROE = RO(IJ)*ETIL(IJ)                                             PHASE3    128
      EP(IJ) = 1./RP(IJ)*(ROE*VOLC                                      PHASE3    129
     1         +FR   *((1.-AR)   *ROE+(1.+AR)   *RO(IPJ)*ETIL(IPJ))    PHASE3    130
     2         +FT(I)*((1.-AT(I))*ROE+(1.+AT(I))*RO(IJP)*ETIL(IJP))    PHASE3    131
     3         +FL   *((1.-AL)   *ROE+(1.+AL)   *RO(IMJ)*ETIL(IMJ))    PHASE3    132
     4         +FB   *((1.-AB)   *ROE+(1.+AB)   *RO(IJM)*ETIL(IJM)))   PHASE3    133
      RVOL(IJ)=8./((R1+R2+R3+R4)*((X1-X3)*(Y2-Y4)-(Y1-Y3)*(X2-X4)))     PHASE3    134
      IJ = IPJ                                                          PHASE3    135
      IJP = IPJP                                                        PHASE3    136
 3259 IJM = IJM + NG                                                    PHASE3    137
      CALL LOOP                                                         PHASE3    138
 3269 CONTINUE                                                          PHASE3    139
      CALL DONE                                                         PHASE3    140
      GO TO 3300                                                        PHASE3    141
  326 FL=((X4*(YP4-Y3)+XP4*(Y3-Y4)+X3*(Y4-YP4))*(R4+RP4+R3)+            PHASE3    142
     1 (XP4*(YP3-Y3)+XP3*(Y3-YP4)+X3*(YP4-YP3))*(RP4+RP3+R3))*TWELTH     PHASE3    143
      AL    = ARM*SIGN(1.,FL)+BIG**2.*FL*RVOL(IJ)                       PHASE3    144
      IMJ=IJ                                                            PHASE3    145
         GO TO 3230                                                     PHASE3    146
  329 FB=((X4*(Y1-YP4)+X1*(YP4-Y4)+XP4*(Y4-Y1))*(R4+R1+RP4)+            PHASE3    147
     1 (X1*(YP1-YP4)+XP1*(YP4-Y1)+XP4*(Y1-YP1))*(R1+RP1+RP4))*TWELTH     PHASE3    148
      AB    = ARM*SIGN(1.,FB)+BIG**2.*FB*RVOL(IJ)                       PHASE3    149
         GO TO 3240                                                     PHASE3    150
C     ---   COMPUTE RO E                                                PHASE3    151
```

```
      3319  CALL START
            DO 3319 J=2,JP1
            DO 3319 I=1,IBAR
            RO(IJ) = MP(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
      3319  IJ = IJ + NQ
            CALL LOOP
      3319  CONTINUE
            CALL DONE
      C     ---   COMPUTE RMP UP VP
            CALL START0
            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 LOOP0
      3399  CONTINUE
      3400  CALL START
            DO 3499 J=2,JP2
            DO 3489 I=1,IP1
            XX = RMP(IJ)/RM(IJ)
            UP(IJ) = XX*UL(IJ)
            VP(IJ) = XX*VL(IJ)
      3489  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)
            ULC  = UL(IPJP)
            UGC  = UG(IPJP)
            VLC  = VL(IPJP)
            VGC  = VG(IPJP)
            X3   = X(IJP)
            Y3   = Y(IJP)
            R3   = R(IJP)
            ULJ  = UL(IJP)
            UGJ  = UG(IJP)
            VLJ  = VL(IJP)
```

```
PHASE3   152
PHASE3   153
PHASE3   154
PHASE3   155
PHASE3   156
PHASE3   157
PHASE3   158
PHASE3   159
PHASE3   160
PHASE3   161
PHASE3   162
PHASE3   163
PHASE3   164
PHASE3   165
PHASE3   166
PHASE3   167
PHASE3   168
PHASE3   169
PHASE3   170
PHASE3   171
PHASE3   172
PHASE3   173
PHASE3   174
PHASE3   175
PHASE3   176
PHASE3   177
PHASE3   178
PHASE3   179
PHASE3   180
PHASE3   181
PHASE3   182
PHASE3   183
PHASE3   184
PHASE3   185
PHASE3   186
PHASE3   187
PHASE3   188
PHASE3   189
PHASE3   190
PHASE3   191
PHASE3   192
PHASE3   193
PHASE3   194
PHASE3   195
PHASE3   196
PHASE3   197
PHASE3   198
PHASE3   199
PHASE3   200
PHASE3   201
PHASE3   202
PHASE3   203
PHASE3   204
PHASE3   205
PHASE3   206
PHASE3   207
PHASE3   208
PHASE3   209
PHASE3   210
PHASE3   211
PHASE3   212
PHASE3   213
PHASE3   214
PHASE3   215
PHASE3   216
PHASE3   217
PHASE3   218
PHASE3   219
```

```
      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 = DT016*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
      OMAL13 = 1.-AL13                                                  PHASE3  242
      OMAL24 = 1.-AL24                                                  PHASE3  243
      OMAL13 = 1.-AL13                                                  PHASE3  244
      OMAL24 = 1.-AL24                                                  PHASE3  245
      XX = UL3*OMAL24+UL1*OMAL24                                        PHASE3  246
      UP(IPJ)  = UP(IPJ) - FM1*XX                                       PHASE3  247
      UP(IJP)  = UP(IJP) + FM3*XX                                       PHASE3  248
      XX = UL4*OMAL13+UL2*OMAL13                                        PHASE3  249
      UP(IPJP) = UP(IPJP)- FM2*XX                                       PHASE3  250
      UP(IJ)   = UP(IJ)  + FM4*XX                                       PHASE3  251
      XX = VL3*OMAL24+VL1*OMAL24                                        PHASE3  252
      VP(IPJ)  = VP(IPJ) - FM1*XX                                       PHASE3  253
      VP(IJP)  = VP(IJP) + FM3*XX                                       PHASE3  254
      XX = VL4*OMAL13+VL2*OMAL13                                        PHASE3  255
      VP(IPJP) = VP(IPJP)- FM2*XX                                       PHASE3  256
      VP(IJ)   = VP(IJ)  + FM4*XX                                       PHASE3  257
      IJ = IPJ                                                          PHASE3  258
3699  IJP = IPJP                                                        PHASE3  259
      UP(IJ) = UP(IJP) = UP(IJP-NQIB) = UP(IJ-NQIB) = 0.                PHASE3  260
      IF (J.NE.2)  GO TO 3620                                           PHASE3  261
      DO 3617 IJ=ISC2+ISCF2,NQ                                          PHASE3  262
3617  VP(IJ) = 0.                                                       PHASE3  263
3620  IF (J.NE.JP2) GO TO 3640                                          PHASE3  264
      DO 3630 IJP=IJPS+LJP2,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 3719 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
3719  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
      ISC=(J-1)*IP1                                                     PHASE3  285
      DO 3889 I=1,IBAR                                                  PHASE3  286
      IPJ = IJ+NQ                                                       PHASE3  287
```

```
271           IPJP = IJP+NQ                                                  PHASE3   288
272           IJSC=IJSC+1                                                    PHASE3   289
273           SIE(IJ)=E(IJ)                                                  PHASE3   290
      C       ---   SIE=SIE + DT*RAY PUTS IN THIN RADIATOR                  PHASE3   291
274           SIE(IJ)=AMAX1(SIE(IJ),REZSIE)                                  PHASE3   292
275           IF (SIE(IJ)-REZSIE.GT.1.0E-06) GO TO 3801                      PHASE3   293
276           ZT=TAMB                                                        PHASE3   294
277           GO TO 3812                                                     PHASE3   295
278    3811   ZR=RO(IJ)                                                      PHASE3   296
279           ZE=SIE(IJ)                                                     PHASE3   297
280           ZRINV=1.0/ZR                                                   PHASE3   298
281           ZRL=ALOG10(ZR)                                                 PHASE3   299
282           ZRL=AMIN1(ZRL,OPDEN(NOPD))                                     PHASE3   300
283           ZRL=AMAX1(ZRL,OPDEN(1))                                        PHASE3   301
284           TLOW=TAMB                                                      PHASE3   302
285           THIGH=QSQRT(ZE*ZR*0.6078789E+07)                               PHASE3   303
286           THIGH=QSQRT(THIGH)                                             PHASE3   304
287           ZT= .5*(TLOW+THIGH)                                            PHASE3   305
288    3811   ORI=137.214E-07*ZT**4                                          PHASE3   306
289           ZE1=ZE-ORI*ZRINV                                               PHASE3   307
290           ZTL=ALOG10(ZT)                                                 PHASE3   308
291           ZTL=AMIN1(ZTL,OPTMP(NOPT))                                     PHASE3   309
292           ZE2L=ORLINT(1, ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOPT) PHASE3 310
293           ZE2=10.**(ZE2L)                                                PHASE3   311
294           ZDE=ZE1-ZE2                                                    PHASE3   312
295           IF (ZDE.GT.0.0) TLOW=ZT                                        PHASE3   313
296           IF (ZDE.LT.0.0) THIGH=ZT                                       PHASE3   314
297           ZT= .5*(TLOW+THIGH)                                            PHASE3   315
298           IF (THIGH-TLOW.LT.1.0E-06*ZT) GO TO 3812                       PHASE3   316
299           GO TO 3811                                                     PHASE3   317
300    3812   TEMP(IJSC)=ZT                                                  PHASE3   318
301           IJP = IPJP                                                     PHASE3   319
302           IJ=IPJ                                                         PHASE3   320
303    3809   CONTINUE                                                       PHASE3   321
304           CALL LOOP                                                      PHASE3   322
305    3899   CONTINUE                                                       PHASE3   323
306           CALL DONE                                                      PHASE3   324
      C       ---   MOVE PARTICLES                                          PHASE3   325
307           CALL PARTMOV                                                   PHASE3   326
      C       ---   RECOMPUTE PLOTTING COORDINATES                          PHASE3   327
308           CALL FILMCO                                                    PHASE3   328
      C                                                                    PHASE3   329
309           RETURN                                                         PHASE3   330
310           END                                                            PHASE3   331
```

SINGLY REFERENCED VARIABLES

3400	-	176*	EQUIVAL	-	13F	IPXR	-I	9C0	LAND	-R	14RL	ORANGE	-	11CN	REZONE	-	35SU	TOUT	-R	8C0
3700	-	255*	FILMCO	-	308SU	IPYB	-I	9C0	LEAT	-	16F	PARTMOV	-	3.7SU	REZHON	-R	11C0	TSTART	-R	8C0
3800	-	256*	FIPXL	-R	9C0	IPYT	-I	9C0	LOOPD	-	168SU	PHASE3	-	1SU	REZY0	-R	11C0	VTEM	-R	11C0
AA1	()R	5LC	FIPXR	-R	9C0	ISCF1	-I	8C0	MUU2	-R	14RL	PINK	-	4CN	RIBAR	-R	9C0	VV	-R	9C0
AA2	()R	6LC	FIPYB	-R	9C0	ISC3	-I	8C0	NAME	()I	8C0	PTAB	()R	2C0	RLC1	-	7CN	WHITE	-	12CN
ANC	-R	11C0	FIAL	-R	9C0	ITAB	()I	11C0	NANGLS	-I	12C0	PXCONV	-R	9C0	RVALS	()R	12C0	XCONV	-R	9C0
ANGLES	()R	12C0	FIAR	-R	9C0	ITV	-I	8C0	NCYC	-I	8C0	PXL	-R	9C0	SIGA	()R	7LC	XL	-R	9C0
ASW	-R	11C0	FIYB	-R	9C0	IXL	-I	9C0	NOUMP	-I	8C0	PXR	-R	9C0	SILVER	-	9CN	XR	-R	9C0
BTOL	()R	2C0	FMEM	()R	2C0	IXR	-I	9C0	NPRO	-I	2C0	PYB	-R	9C0	SPTOL	()R	2C0	YB	-R	9C0
COLAMB	-R	11C0	GR1	-R	11C0	IYB	-I	9C0	NPT	-I	11C0	PYCONV	-R	9C0	STARTD	-	153SU	YCONV	-R	9C0
DT02	-R	11C0	GR	-R	11C0	IYT	-I	9C0	NUI	-I	8C0	PYT	-R	9C0	STATE	-	2CN	YELLOW	-	10CN
DTR	-R	8C0	GZ	-R	11C0	JBAR	-I	8C0	NUI2	-I	11C0	QEXP10	-	2.35U	T	-R	8C0	YLC1	-	5CN
DTV	-R	11C0	IDIV	-I	11C0	JDTV	-I	10C0	NRVALS	-I	12C0	RDT	-R	1.0C0	THIRD	-R	11C0	YLC2	-	6CN
DTVSAV	-R	11C0	IELP	-I	11C0	JNN	-I	11C0	NUMIT	-I	11C0	REAL	-	14F	TMY	-R	8C0	YSC1	-	3CN
DVDY	-R	11C0	IPJ	-I	11C0	JSWTCH2	-I	20	OM	-R	11C0	REO	-	8CN	TIME	-R	8C0	YT	-R	9C0
EPS	-R	11C0	IPAL	-I	9C0	KXI	-I	11C0	OMANC	-R	11C0	RETURN	-	3.9F	TAEUT	-R	12C0			

MULTIPLY-REFERENCED VARIABLES

3 09	-	230U	3 *
3019	-	240U	32*
3150	-	2	35*
3200	-	34	36*
3230	-	1.9*	135

```
3249 -    112*   138
3259 -     3800  127*
3269 -     3700  129*
3280 -     136   132*
3290 -     134   136*
3300 -     131   139*
3309 -    14100  149*
3319 -    14000  151*
3389 -    15600  157*
3399 -    15400  169*
3489 -    17200  170*
3499 -    17100  178*
3599 -    18200  244*
3611 -    24700  246*
3629 -     246   249*
3630 -    25100  251*
3640 -     249   252*
3699 -    16100  253*
3709 -    25700  262*
3719 -    25600  264*
3801 -     275   278*
3811 -     288*  299
3812 -     277   298
3889 -    26900  300*
3899 -    26700  305*
```

AASC	()R		300	13EQ																									
AB	-R		13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ	13EQ
ABS	-		111=	121	121	123	123	137=																					
AL	-R		116SU	116SU	116SU	116SU	117SU																						
AL13	-R		120=	121	121	123	123	133=																					
AL24	-R		225=	227	229																								
AMAX1	-		226=	226	230																								
AMIN1	-		116SU	274SU	283SU																								
AR	-R		117SU	282SU	291SU																								
AT	()R		108	113=	121	121	123	123																					
A-	-R		170I	111	115=	121	121	123																					
AOFAC	-R		110	225	226			123	123																				
AOM	-R		110	117																									
ESTALC	()R		110	113	115	133	137																						
BU	-R		13EQ	150I																									
CENTX	()R		110	113	115	133	137	224																					
CENTY	()R		13EQ	150I																									
COMMON	-		13EQ	150I																									
CQ	()R		2F	3F	4F	8F	9F	10F	11F	12F																			
CYL	-R		13EQ	150I																									
D	-R		110	26	78	79	80	81																					
DELINT	-		102=	117																									
DELSM	()R		16LX	294SU																									
DIMENSI	-		13EQ	150I																									
DONE	-		15F	17F																									
DT	-R		335U	13 SU	152SU	179SU	254SU	265SU	306SU																				
DTC	-R		8CU	18	26	27#	70	71	72	73	74	75	76	77															
DTCSAV	-R		110	117=	117	118	119	120=																					
DTOLD	-R		110	116	119	119	120																						
DTPOS	-R		16=	213																									
E	-R		110	117	117																								
EMOMLC	()R		13EQ	150I	143=	273																							
EMLO	-R		8CU	150I																									
EP	()R		13EQ	117																									
ETAB	()R		8CU	150I	143=	143																							
ETIL	()R		13EQ	292																									
F6	-R		11=	150I	122	123	123	123	123																				
FL	-R		107=	116	121	123	136=	137	137																				
FM1	-R		227=	232	238	123	132=	133	133																				
FM2	-R		221=	235	241																								
FM3	-R		222=	233	239																								
FM4	-R		223=	236	242																								

```
JOUTLC  ()R   13E0   1501
FR      -R    107    112=   113   113   116   121   123
FSN     ()R   13E0   1501
FT      ()R   1701   11     114=  115   115   116   121   123
F13     -R    218=   221    223   225   225
F24     -R    219=   22     222   226   226
GROVEL  -R    8C0    2      24    25
GRIR    ()R   13E0   1501
GRIZ    ()R   13E0   1501
I       -I    4C0    2300   3800  104   106   110   111   114   115   115   119   116   118   121   121   121   123
              123    123    14100 146   157=  161   162   163   164   17200 18200 25700 26900
IBAR    -I    8C0    3800   104   14100 146   18200 26900
IDIC    -I    1 C0   118=
II      -I    15600  157
IJ      -1    4C0    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    208   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     -1    4C0    121    123   123   127=  127   144   144   147=  147   159   161   167=
IJP     -1    4C0    41     48    49    50    58    59    66    66    67    67    105   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    -1    8C0    25 00
IJSC    -1    268=   272=   272   300
IMJ     -1    39=    121    123   123   134=  158=  163   166
IMJM    -1    159=   164    167
IPJ     -1    4 =    42     43    44    54    55    62    62    63    63    104   121   123   123   125   183=  185
              186    187    188   189   190   191   214   215   220   232   232   238   238   243   270=  302
IPJP    -1    41=    45     46    47    56    57    64    64    65    65    126   164=  192   193   194   195   196
              197    198    216   217   221   235   235   241   241   244   271=  3.1
IP1     -1    8C0    2300   15600 167   162   17200 25700 268
IP2     -1    11C0   157
ISCR2   -1    8C0    24700
ISC2    -1    8C0    24700
J       -1    4C0    2200   3700  105   109   119   14000 144   145   155=  161   162   163   194   17100 18100 246
              249    25000  26700 268
JDIC    -1    11C0   119=
JJ      -1    15400  155
JP1     -1    8C0    3700   104   14000 145   18100 249   26700
JP2     -1    8C0    2200   15400 162   163   17100 25600
JP4     -1    11C0   155
LAM     -R    11C0   14RL
LCM     -     3F     6F     7F
LJP2    -1    11C0   25 00
LOOP    -     315U   126SU  155U  177SU 252SU 263SU 304SU
M       ()R   13E0   14RL   1501
MP      ()R   13E0   14RL   1501  121=  123   142   161   162   163   164
MU      -R    11C0   14RL
NOP0    -1    2C0    282    292
NOP1    -1    2C0    291    292
NQ      -1    8C0    29     39    40    41    127   146   146   147   148   149   158   159   176   183   184   24700
              25100  282    270   271
NQIB    -1    11C0   245    245
OMAL13  -R    229=   234    24
OMAL24  -R    23 =   231    237
OMCYL   -R    11C0   28     78    79    80    81
OPAL13  -R    227=   234    24
OPAL24  -R    228=   231    237
OPDEN   ()R   2C0    282    283   292
OPIMP   ()R   2C0    291    292
P       ()R   13E0   1501
PL      ()R   13E0   1501
QLOG10  -     28ISU  29 SU
QSQRT   -     285SU  286SU
R       ()R   13E0   1501  28=   44    47    50    53    187   194   201   208
```

```
RCSQ     ()R    13EQ    1501
REZSIE   -R      8CQ    274     275
RM       ()R    13EQ    1501    173     260=
RMP      ()R    13EQ    1501    165=    173     220     221     222     223     260     261=
RO       ()R    13EQ    1501    121     122     123     123     123     123     142=    144=    145=    146=    278
ROE      -R     122=    123     123     123     123     123     123
ROL      ()R    13EQ    1501    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     8 =     114     132
RP4      -R     81=     132     132     136     136
RVOL     ()R    13EQ    1501    1 2     103     104     105     117     124=    133     137     142     224
RZEDEN   ()R    13EQ    1501
R1       -R     44=     9       93      112     112     124     136     136     187=    218
R12      -R     9       102
R2       -R     47=     9       91      112     114     124     194=    219
R23      -R     91=     102
R3       -R     5       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    1501    273=    274     274     275     279
SIGN     -      11350   11550   13350   137SQ   225SQ   226SQ
SIGPLC   ()R    13EQ    1501
START    -      215Q    350Q    139SQ   170SQ   180SQ   255SQ   266SQ
TAMB     -R      8CQ    276     264
TEMP     ()R     8CQ    36 =
THIGH    -R     285=    286=    286     287     296=    297     298
TLOW     -R     284=    287     295=    297     298
TWELTH   -R      19=    112     114     132     136
U        ()R    13EQ    1501    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    1501    24=     26      62      64      66      68      189     196     203     215
UG1      -R     189=    218
UG2      -R     196=    219
UG3      -R     203=    218
UG4      -R     21 =    219
UL       ()R    13EQ    1501    24      54      56      58      60      174     188     195     202     239
UL1      -R     54=     62      94      97      188=    214     241
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     6 =     66      96      97      209=    216     234
UMOMLC   ()R    13EQ    1501
UP       ()R    13EQ    1501    174=    232=    232     233=    233     235=    235     236=    236     245=    245=    245=    245=    258
UR1      -R     288=    289
UTIL     ()R    13EQ    1501
U12      -R     94=     112
U23      -R     95=     112
U34      -R     96=     112
U41      -R     97=     112
V        ()R    13EQ    1501    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    1501    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    1501    25      55      57      59      61      175     190     197     204     211
VL1      -R     55=     63      98      101     190=    215     237
VL13     -R     215=    218
```

```
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   103=   114=   113
VOLT      -R   103=   115=   115
VP        ()R  13E6   1501   175=   238=   238    239=   239    241=   241    242=   242    248=   251=   259
VTIL      ()R  13E6   1501
V12       -R   98=    102
V23       -R   99=    102
V34       -R   100=   102
V41       -R   101=   102
X         ()R  13E6   1501   26=    26     28     42     45     48     51     185    192    199    206
XPAR      ()R  13E6   1501
XP1       -R   70=    78     112    136
XP2       -R   71=    79     112    112    114    114
XP3       -R   72=    80     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=    70     82     85     112    112    124    136    136    185=   218
X12       -R   82=    102
X2        -R   45=    71     82     83     112    114    124    192=   219
X23       -R   83=    102
X3        -R   46=    72     83     84     114    114    124    132    132    199=   218
X34       -R   84=    102
X4        -R   51=    73     84     85     124    132    136    206=   219
X41       -R   85=    102
Y         ()R  13E6   1501   27=    27     43     46     49     52     186    193    200    207
YPAR      ()R  13E6   1501
YP1       -R   74=    110    112    136    136
YP2       -R   75=    110    112    112    112    114    114    114    114
YP3       -R   76=    110    114    132    132
YP4       -R   77=    132    136    132    132    136    136    136    136
YY        -R   43=    74     86     89     112    112    112    112    124    136    136    136    136    186=   218
Y14       -R   85=    102
Y2        -R   46=    75     86     87     112    112    114    114    124    193=   219
Y21       -R   86=    102
Y3        -R   49=    76     87     88     114    114    114    114    124    132    132    132    132    200=   218
Y32       -R   87=    102
Y4        -R   52=    77     88     89     124    132    132    136    136    207=   219
Y43       -R   88=    102
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
ZT        -R   276=   287=   288    290    295    296    297=   298    300
ZTL       -R   29 =   291=   291    292
```

```
1           SUBROUTINE REZONE                                                    REZONE    2
2           COMMON /STATE/     NOPT, NOPD, NFRQ, OPTMP(30), OPDEN(10),           ALLKOM    2
           1                   FREQ(100), SPTBL(3.0), PTAB(300), ETAB(300),      ALLKOM    3
           2                   BTBL(300)                                         ALLKOM    4
3           COMMON /YSCL/      AASC(5454)                                        ALLKOM    5
4           COMMON /PINK/      I, JJ, IJK, IJP, J                                ALLKOM    6
5           COM /YLCL/         AA1(131000)                                       ALLKOM    7
```

```
      LCM /YLC2/        AA2(131*60)                                          ALLKOM     8
      LCM /RLC1/        SIGA(3600)                                           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, NDUMP, NQ, NQI, REZSIE, 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                  DVLY, IDTC, IDTV, JDTC, JDTV, RDT                    YELLOW     3
      COMMON /ORANGE/   ANC, ASQ, AQ, AQFAC, AQM, BB, COLAMD, CYL,          ORANGE     2
     1                  DTPOS, EPS, GM1, GK, GZ, IM1,                        ORANGE     3
     2                  IECP, IP2, ITAM(100), JNM, JP4, KXI, LAM,            ORANGE     4
     3                  LJP2, MC, NP1, NQIB, NUI2, NUMIT, OM,                ORANGE     5
     4                  OMANC, OMCYL, REZMUN, REZYC, THIRD, VTEM             ORANGE     6
      COMMON /WHITE/    NRVALS, RVALS(73), NANGLS, ANGLES(35), TNEUT         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,CU,EMOMLC),                        EQVREAL    7
     6                  (AASC(13),VTIL,VL,UMUMLC),                           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,REZDEN),                           EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                               EQVREAL   12
      REAL              LAM, LAMD, 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), 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                  REZDEN(1), GRIZ(1), VG(1), FSN(1)                    DIMEN      9
 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
      FSTF=0.2*RDT                                                          REZONE    15
      AREAF=-2.F                                                            REZONE    16
      SWTCH=0.5                                                             REZONE    17
      IF (JSWTCH2.EQ.2) SWTCH=0.0                                           REZONE    18
      VTB=VTT=UT=0.0                                                        REZONE    19
      FC3=FCX=FCP2=0.0                                                      REZONE    20
      IMESH=IBAR/2                                                          REZONE    21
      JBMESH=JP2/4                                                          REZONE    22
      JTMESH=JP2-JBMESH                                                     REZONE    23
      GM2=1.F+2.0/GM1                                                       REZONE    24
C                                                                           REZONE    25
      CALL START                                                            REZONE    26
      DO 150 J=2,JBAR                                                       REZONE    27
      DO 140 I=1,IM1                                                        REZONE    28
      IJ=IJ+NQ                                                              REZONE    29
      IJP=IJP+NQ                                                            REZONE    30
      IF (J.LE.JBMESH) FC3=AMAX1(FC3,ABS(VL(IJ)))                           REZONE    31
      IF (J.GE.JTMESH) FCP2=AMAX1(FCP2,ABS(VL(IJ)))                         REZONE    32
      IF (I.GE.IMESH) FCX=AMAX1(FCX,ABS(UL(IJ)))                            REZONE    33
      IF (J.EQ.2) VTB=AMAX1(VTB,0.25*RDT*(Y(IJP)-Y(IJ))*                    REZONE    34
     1 (1.0-REZSIE/SIE(IJ)))                                                REZONE    35
      IF (J.EQ.JBAR) VTT=AMAX1(VTT,0.25*RDT*(Y(IJP)-Y(IJ))*                 REZONE    36
     1 (1.0-REZSIE/SIE(IJ)))                                                REZONE    37
```

```
      IF (1.EQ.IP1) UT=AMAX1(UT,0.25*RDT*(X(IPJ)-X(IJ))*
     1 (1.0-RELSIZE/SIZE(IJ)))                                          REZONE  38
                                                                        REZONE  39
      I=IPJ                                                             REZONE  40
      IPJ=IPJP                                                          REZONE  41
    1 40 CONTINUE                                                       REZONE  42
      CALL LOOP                                                         REZONE  43
    1 50 CONTINUE                                                       REZONE  44
      PRINT 2101,        VTB, VTT, UT, FC3, FCP2, FCX                   REZONE  45
      WRITE (12,2001)    VTB, VTT, UT, FC3, FCP2, FCX                   REZONE  46
C     FC3=FC3+VTB                                                       REZONE  47
C     FCP2=FCP2+VTT                                                     REZONE  48
C     FCX=FCX+UT                                                        REZONE  49
      FC3=GM2*FC3                                                       REZONE  50
      FCP2=GM2*FCP2                                                     REZONE  51
      FCX=GM2*FCX                                                       REZONE  52
C     ---   PROWNE AREA WEIGHTING ALGORITHM                           REZONE  53
      CALL START                                                        REZONE  54
      DO 1070 J=2,JP2                                                   REZONE  55
      DO 1060 I=1,IP1                                                   REZONE  56
      IPJ=IJ+NQ                                                         REZONE  57
      IMJ=IJ-NQ                                                         REZONE  58
      IF(I.EQ.1.OR.I.EQ.IP1.OR.J.EQ.2.OR.J.EQ.JP2) GO TO 1051           REZONE  59
      IPJ=IJ+NQ                                                         REZONE  60
      IMJ=IJ-NQ                                                         REZONE  61
      IPJP=IJP+NQ                                                       REZONE  62
      UG(IJ)=SWITCH*(UL(IJ)+U(IJ))                                      REZONE  63
      VG(IJ)=SWITCH*(VL(IJ)+V(IJ))                                      REZONE  64
      X1=X(IMJ)                                                         REZONE  65
      X2=X(IJM)                                                         REZONE  66
      X3=X(IPJ)                                                         REZONE  67
      X4=X(IJP)                                                         REZONE  68
      X5=X(IJ)                                                          REZONE  69
      Y1=Y(IMJ)                                                         REZONE  70
      Y2=Y(IJM)                                                         REZONE  71
      Y3=Y(IPJ)                                                         REZONE  72
      Y4=Y(IJP)                                                         REZONE  73
      Y5=Y(IJ)                                                          REZONE  74
      RA1=2.0/((X1-X5)*(Y2-Y5)-(Y1-Y5)*(X2-X5))                         REZONE  75
      RA2=2.0/((X2-X5)*(Y3-Y5)-(Y2-Y5)*(X3-X5))                         REZONE  76
      RA3=2.0/((X3-X5)*(Y4-Y5)-(Y3-Y5)*(X4-X5))                         REZONE  77
      RA4=2.0/((X4-X5)*(Y1-Y5)-(Y4-Y5)*(X1-X5))                         REZONE  78
      DX5=((X5-0.5*(X1+X2))*RA1 +(X5-0.5*(X2+X3))*RA2                   REZONE  79
     1    +(X5-0.5*(X3+X4))*RA3 +(X5-0.5*(X4+X1))*RA4)/(RA1+RA2+RA3+RA4) REZONE  80
      DX5=AREAF*DX5                                                     REZONE  81
      DY5=((Y5-0.5*(Y1+Y2))*RA1 +(Y5-0.5*(Y2+Y3))*RA2                   REZONE  82
     1    +(Y5-0.5*(Y3+Y4))*RA3 +(Y5-0.5*(Y4+Y1))*RA4)/(RA1+RA2+RA3+RA4) REZONE  83
      DY5=AREAF*DY5                                                     REZONE  84
      DX5=DX5+0.25*(X1+X2+X3+X4)-X5                                     REZONE  85
      DY5=DY5+0.25*(Y1+Y2+Y3+Y4)-Y5                                     REZONE  86
      UG(IJ)=UG(IJ)+FSTF*DX5                                            REZONE  87
      VG(IJ)=VG(IJ)+FSTF*DY5                                            REZONE  88
      IF(J.EQ.3) UG(IJM)=UG(IJ)                                         REZONE  89
      IF(I.EQ.2) VG(IMJ)=VG(IJ)                                         REZONE  90
      GO TO 1 59                                                        REZONE  91
    1 51 CONTINUE                                                       REZONE  92
      IF(I.NE.1) GO TO 1052                                             REZONE  93
      UG(IJ)=0.0                                                        REZONE  94
      GO TO 1053                                                        REZONE  95
    1 52 IF(I.NE.IP1) GO TO 1053                                        REZONE  96
      UG(IJ)=FCX                                                        REZONE  97
      VG(IJ)=VG(IPJ)                                                    REZONE  98
    1 53 IF(J.NE.2) GO TO 1054                                          REZONE  99
      VG(IJ)=-FC3                                                       REZONE 100
      GO TO 1 55                                                        REZONE 101
    1 54 IF(J.NE.JP2) GO TO 1055                                        REZONE 102
      UG(IJ)=UG(IJM)                                                    REZONE 103
      VG(IJ)=FCP2                                                       REZONE 104
    1 55 IF(I.NE.1.OR.J.NE.2) GO TO 1056                                REZONE 105
```

```
 99           VG(IJ)=-FC3                                                        REZONE   106
100      1056 IF(I.NE.IP1.OR.J.NE.2) GO TO 1057                                  REZONE   107
101           VG(IJ)=FCX                                                         REZONE   108
102           VG(IJ)=-FC3                                                        REZONE   109
103      1057 IF(I.NE.1.OR.J.NE.JP2) GO TO 1058                                  REZONE   110
104           VG(IJ)=FCF2                                                        REZONE   111
105      1058 IF(I.NE.IP1.OR.J.NE.JP2) GO TO 1059                                REZONE   112
106           VG(IJ)=FCX                                                         REZONE   113
107           VG(IJ)=FCF2                                                        REZONE   114
108      1059 CONTINUE                                                           REZONE   115
109           IJ=IPJ                                                             REZONE   116
110           IJM=IJP*NQ                                                         REZONE   117
111           IJP=IJM*NQ                                                         REZONE   118
112       1 00 CONTINUE                                                          REZONE   119
113           CALL LOOP                                                          REZONE   120
114       1 70 CONTINUE                                                          REZONE   121
115           CALL DONE                                                          REZONE   122
              C                                                                  REZONE   123
116      1200 CALL START                                                         REZONE   124
117           DO 1289 J=2,JP2                                                    REZONE   125
118           DO 1279 I=1,IP1                                                    REZONE   126
119           VG(IJ)=VG(IJ)+VTEM                                                 REZONE   127
120           X(IJ) = X(IJ)+UG(IJ)*DT                                            REZONE   128
121           IF(J.NE.2) GO TO 1279                                              REZONE   129
122           IF (Y(IJ)+REZYO+VG(IJ)*DT.LE.0.0) VG(IJ)=(-Y(IJ)-REZYO)*RDT        REZONE   130
123      1279 CONTINUE                                                           REZONE   131
124           Y(IJ) = Y(IJ)+VG(IJ)*DT                                            REZONE   132
125           R(IJ) = X(IJ)*CYL+OMCYL                                            REZONE   133
126      1279 IJ = IJ+NG                                                         REZONE   134
127           CALL LOOP                                                          REZONE   135
128      1289 CONTINUE                                                           REZONE   136
129           CALL DONE                                                          REZONE   137
              C                                                                  REZONE   138
130           CALL START                                                         REZONE   139
131           XX = GM1*REZSIE                                                    REZONE   140
132           YY=ABS(GZ)/XX                                                      REZONE   141
133           DO 1389 J=2,JP1                                                    REZONE   142
134           DO 1389 I=1,IBAR                                                   REZONE   143
135           IPJ = IJ + NQ                                                      REZONE   144
136           IPJP=IJP+NQ                                                        REZONE   145
137           Y4= .25*(Y(IJP)+Y(IPJP)+Y(IJ)+Y(IPJ))                              REZONE   146
138           IF (J.EQ.2) ROL(IJM)=REZRON*EXP((-Y(IJ)-Y(IPJ)+Y4)*YY)             REZONE   147
139           IF (I.EQ.IBAR) ROL(IPJ)=REZRON*EXP((-Y(IPJ)-Y(IPJP)+Y4)*YY)        REZONE   148
140           IF (J.EQ.JP1) ROL(IJP)=REZRON*EXP((-Y(IJP)-Y(IPJP)+Y4)*YY)         REZONE   149
141           IJM = IJM + NG                                                     REZONE   150
142           IJP = IJP +NG                                                      REZONE   151
143      1389 IJ = IPJ                                                           REZONE   152
144           CALL LOOP                                                          REZONE   153
145      1399 CONTINUE                                                           REZONE   154
146           CALL DONE                                                          REZONE   155
              C                                                                  REZONE   156
147           RETURN                                                             REZONE   157
148           END                                                                REZONE   158
SINGLY REFERENCED VARIABLES
   1200 -  1167    DIV      -R  10C0   IDIV     -I  10C0   JDIC     -I  10C0   NQI      -I   8C0   PYT      -R   9C0   TIME     -R   8C0
 AA1     ()R   5LC   DIVSAV   -R  10C0   IECP     -I  11C0   JDIV     -I  10C0   NQIB     -I  11C0   REAL     -   15F   TNEUT    -R  12C0
 AA2     ()R   6LC   DVDY     -R  10C0   IJPS     -I   8C0   JNM      -I  11C0   NQI2     -I  11C0   RED      -    8CN  TOUT     -R   8C0
 ANG      -R  11C0   EM1      -R   8C0   IPXL     -I   9C0   JP4      -I  11C0   NRVALS   -I  12C0   RETURN   -  147F   TSTART   -R   8C0
 ANGLES ()R   12C0   EPS      -R  11C0   IPXR     -I   9C0   JSWTCH1  -I  13C0   NUMIT    -I  11C0   REZONE   -   1SC   VV       -R   9C0
 ASW      -R  11C0   EQOIVAL  -   14F   IPYB     -I   9C0   JSWTCH3  -I  13C0   OM       -R  11C0   RIBAR    -R   9C0   WHITE    -  12CN
 AX       -R  11C0   ETAB     ()R   2C0   IPYT     -I   9C0   KX1      -I  11C0   OMANG    -R  11C0   RLC1     -   7CN   WRITE    -   45F
 AXFAC    -R  11C0   FIPAL    -R   9C0   IP2      -I  11C0   LAMD     -R  15RL   OPDEN    ()R  2C0   RVALS    ()R  12C0   XCONV    -R   9C0
 AYM      -R  11C0   FIPAR    -R   9C0   ISCF1    -I   8C0   LJP2     -I  11C0   OPTMP    ()R  2C0   SENSE    -   13CN  XL       -R   9C0
 BIBL     ()R   2C0   FIPYB    -R   9C0   ISCF2    -I   8C0   MUU2     -R  15RL   ORANGE    -   11CN  SIGA     ()R   7LC  XR       -R   9C0
 BO       -R  11C0   FIAL     -R   9C0   ISC2     -I   8C0   NAME     ()I   8C0   PINK     -    4CN  SILVER   -   9CN   YH       -R   9C0
 COLAMU   -R  11C0   FIAR     -R   9C0   ISC3     -I   8C0   NANGLS   -I  12C0   PRINT    -   44F   SPTBL    ()R  2C0   YCONV    -R   9C0
 DIMENSI  -   16F    FIYB     -R   9C0   ITAB     ()I  11C0   NCYC     -I   8C0   PTAB     ()R  2C0   STATE    -   2CN   YELLOW   -  10CN
 DTC      -R  10C0   FORMAT   -   17F   ITV      -I   9C0   NDUMP    -I   8C0   PXCONV   -R   9C0   T        -R   8C0   YLC1     -   5CN
```

```
DTGSAV  -R  11CO   FREW    ()R   2CO   IXL    -I  9CO  NFRW   -I   2CO  PXL     -R  9CO  TAMB   -R   8CO  YLC2   -    6CN
DT02    -R  11CO   GR      -R   11CO   IXR    -I  9CO  NOPD   -I   2CO  PXR     -R  9CO  TEMP   ()R  8CC  YSC1   -    3CN
DTPOS   -R  11CO   GRDVEL  -R    8CO   IYB    -I  9CO  NOPT   -I   2CO  PYB     -R  9CO  THIRD  -R  11CC  YT     -R   9CO
DTR     -R   8CO   IDTC    -I   1CO    IYT    -I  9CO  NPT    -I  11CO  PYCONV  -R  9CO  THY    -R   8CC
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
MULTIPLY-REFERENCED VARIABLES
   1040 -    3 DO    41*
   1050 -   29DO     43*
   1051 -   54       85*
   1052 -   86       89*
   1053 -   88       89     92*
   1054 -   92       95*
   1055 -   94       95     98*
   1056 -   98       10 *
   1057 -   100      103*
   1058 -   103      105*
   1059 -   84       105    1 8*
   1060 -   51DO     112*
   1070 -   52DO     114*
   1270 -   121      123*
   1279 -   118DO    126*
   1289 -   117DO    128*
   1389 -   134DO    143*
   1399 -   133DO    145*
   2001 -   17*      44PR   45WR
AASC    ()R   3CO    14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ   14EQ
              14EQ   14EQ
ABS     -    33SU    34SU   35SU   132SU
AMAX1   -    33SU    34SU   35SU   36SU   37SU   38SU
AREAF   -R   19=     75     77
BETALC  ()R  14EQ    16DI
CENTX   ()R  14EQ    16DI
CENTY   ()R  14EQ    16DI
COMMON  -    2F      3F     4F     8F     9F     10F    11F    12F    13F
CQ      ()R  14EQ    16DI
CYL     -R   11CO    125
DELSM   ()R  14EQ    16DI
DONE    -    115SU   129SU  146SU
DT      -R   8CO     12     122    124
DX5     -R   74=     75=    75     78=    78     80
DY5     -R   76=     77=    77     79=    79     81
E       ()R  14EQ    16DI
EMOMLC  ()R  14EQ    16DI
EP      ()R  14EQ    16DI
ETIL    ()R  14EQ    16DI
EXP     -    138SU   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  ()R  14EQ    16DI
FSN     ()R  14EQ    16DI
FSTF    -R   16=     8      81
GM1     -R   11CO    27     131
GM2     -R   27=     46     47     48
GRIR    ()R  14EQ    16DI
GRIZ    ()R  14EQ    16DI
GZ      -R   11CO    132
I       -I   4CO     3 DO   35     38     51DO   54     54     83     86     89     98     100    103    105    118DO  134DO  139
IBAR    -I   6CO     24     134DO  139
IJ      -I   4CO     31     33     34     35     36     36     37     37     38     38     39=    52     53     55     56     58
             56      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    132
             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
IMESM   -I   24=     35
IMJ     -I   53=     56=    63     65     83     91
IMI     -I   11CO    3 DO   38
```

```
YY      -R  132=   136    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     70     71     71     72     72     73     73     76     76     76     76     79
```

```
      SUBROUTINE PARTMOV                                                    PARTMOV   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
      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(14), DT, DTR, EM10, GRDVEL, IRAR, IJPS,        ALLKOM   10
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,           ALLKOM   11
     2                  JP1, JP2, NCYC, NDUMP, NU, NOI, REZSIE, TAMB,       ALLKOM   12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY              ALLKOM   13
      COMMON /SILVER/   FIPXL, FIPXR, FIPYB, FIAL, FIXR, FIYB,             SILVER    2
     1                  IPAL, IPAR, IPYB, IPYT, IXL, IXR, IYB,              SILVER    3
     2                  IYT, PXCONV, PAL, PXR, PYB, PYCONV, PYT,            SILVER    4
     3                  RIBAR, VV, XCONV, XL, XR, YB, YCONV, YT             SILVER    5
      COMMON /YELLOW/   DTC, DTCSAV, DTO2, DTV, DTVSAV,                     YELLOW    2
     1                  DVDY, IDTC, IDTV, JDTC, JDTV, RCT                   YELLOW    3
      COMMON /ORANGE/   ANC, ASC, AO, AOFAC, ASM, BO, CCLAMC, CYL,          ORANGE    2
     1                  DTFOS, EPS, GM1, GR, GZ, IM1,                       ORANGE    3
     2                  IECP, IP2, ITAB(1000), JNP, JP4, KXI, LAM,          ORANGE    4
     3                  LJP2, MU, NPT, NQIN, NQI2, NUMIT, ON,               ORANGE    5
     4                  ONANC, ONCYL, REZRON, REZYO, THIRD, 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),PP,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,CU,EMOMLC),                       EQVREAL   7
     6                  (AASC(13),VTIL,VL,UPOMLC),                          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,REZDEN),                          EQVREAL  11
     1                  (AASC(18),GRIZ,VG,FSN)                              EQVREAL  12
      REAL              LAM, LAMD, MP, 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), PP(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                  UPOMLC(1), ROL(1), RETALC(1), FOUTLC(1),            DIMEN     7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),        DIMEN     8
     8                  REZDEN(1), GRIZ(1), VG(1), FSN(1)                   DIMEN     9
 2001 FORMAT            (1H ,*PARTICLE TOSSED OUT*/9H PARTICLE,I9,          PARTMOV   9
                        9X,6H CELL ,I12)                                    PARTMOV  10
C                                                                           PARTMOV  11
      NPT = JOLD = 0                                                        PARTMOV  12
      IECPA=IECP                                                            PARTMOV  13
      LPO=NQI                                                               PARTMOV  14
      PYB=1.7E+20                                                           PARTMOV  15
      PYT=PAR=-1.0E+20                                                      PARTMOV  16
```

```
      10    CALL ECHO (AASC,IECP,LPB,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 =1                                                       PARTMOV  27
            IF (J.EQ.JOLD) GO TO 116                                      PARTMOV  28
      115   IEC=(J-1)*NGI                                                 PARTMOV  29
            JOLD =J                                                       PARTMOV  30
            CALL ECHO (AASC(ISC2),IEC,NGI2,NE)                            PARTMOV  31
      116   KKO=KKO+1                                                     PARTMOV  32
            IF (KKO.GT.100) GO TO 490                                     PARTMOV  33
            IJ = (I-1)*NG + ISC2                                          PARTMOV  34
            IPJ = IJ + NG                                                 PARTMOV  35
            IJP = IJ + NGI                                                PARTMOV  36
            IPJP = IPJ + NGI                                              PARTMOV  37
            X1 = A(IPJ)                                                   PARTMOV  38
            Y1 = Y(IPJ)                                                   PARTMOV  39
            X2 = A(IPJP)                                                  PARTMOV  40
            Y2 = Y(IPJP)                                                  PARTMOV  41
            X3 = A(IJP)                                                   PARTMOV  42
            Y3 = Y(IJP)                                                   PARTMOV  43
            X4 = A(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
```

```
                U2 = U(IPJP)                                                    PARTMOV   85
                V2 = V(IPJP)                                                    PARTMOV   86
                U3 = U(IJP)                                                     PARTMOV   87
                V3 = V(IJP)                                                     PARTMOV   88
                U4 = U(IJ)                                                      PARTMOV   89
                V4 = V(IJ)                                                      PARTMOV   90
                IF(ITEM.EQ.1) GO TO 126                                         PARTMOV   91
                UK =(U34*U1 +U14*U3 +U13*U4)*DTRI                               PARTMOV   92
                VK =(U34*V1 +U14*V3 +U13*V4)*DTRI                               PARTMOV   93
                GO TO 128                                                       PARTMOV   94
      126       UK =(U23*U1-U13*U2 +U12*U3)*DTRI                                PARTMOV   95
                VK =(U23*V1 -U13*V2 +U12*V3)*DTRI                               PARTMOV   96
      128       CONTINUE                                                        PARTMOV   97
                XPAR(KP)=XTE+DT*UK                                              PARTMOV   98
                YPAR(KP)=YTE+DT*VK                                              PARTMOV   99
                PYB=AMIN1(PYB,YPAR(KP))                                         PARTMOV  100
                PYT=AMAX1(PYT,YPAR(KP))                                         PARTMOV  101
                PXR=AMAX1(PXR,XPAR(KP))                                         PARTMOV  102
                ITAB(NPPT) =(J-1)*IP1 +I                                        PARTMOV  103
      15        IF (NPPT.EQ.NPT) GO TO 160                                      PARTMOV  104
                NE=NP+2                                                         PARTMOV  105
                IF (KP.LT.LPB) GO TO 110                                        PARTMOV  106
                CALL ECHR (AASC,IECP,LPB,NE)                                    PARTMOV  107
                IECP = IECP + LPB                                               PARTMOV  108
                GO TO 120                                                       PARTMOV  109
      16        CALL ECHR (AASC,IECP,LPB,NE)                                    PARTMOV  110
                IECP=IECPX                                                      PARTMOV  111
                RETURN                                                          PARTMOV  112
      49        XPAR(KP) = -1.E+3                                               PARTMOV  113
                PRINT 2001,        NPPT, ITAB(NPPT)                             PARTMOV  114
                GO TO 150                                                       PARTMOV  115
          C                                                                     PARTMOV  116
                END                                                             PARTMOV  117
```

SINGLY REFERENCED VARIABLES

AAI	()R	5LC	DTR	-R	8C0	GRDVEL	-R	8C0	IYB	-I	9C0	NOPT	-I	2C0	REAL	-	14F	TIME	-R	8C0
AA2	()R	6LC	DTV	-R	10C0	GZ	-R	11C0	IYT	-I	9C0	NQIB	-I	11C0	RED	-	8CN	TNEUT	-R	12C0
AMINI	-	155D	DTVSAV	-R	10C0	IDTC	-I	10C0	JBAR	-I	8C0	NRVALS	-I	12C0	RETURN	-	117F	TOUT	-R	8C0
ANG	-R	11C0	DVDT	-R	10C0	IDTV	-I	10C0	JDTC	-I	10C0	NUMIT	-I	11C0	REZRUN	-R	11C0	TSTART	-R	8C0
ANGLES	()R	12C0	EMI	-R	8C0	IJM	-I	4C0	JDTV	-I	10C0	OM	-R	11C0	REZSIE	-R	8C0	VTEM	-R	11C0
ASW	-R	11C0	EPS	-R	11C0	IJPS	-I	8C0	JNM	-I	11C0	OMANG	-R	11C0	REZYO	-R	11C0	VV	-R	9C0
A0	-R	11C0	EQUIVAL	-	13F	IM1	-I	11C0	JP2	-I	8C0	OMCYL	-R	11C0	RIBAR	-R	9C0	WHITE	-	12CN
A0FAC	-R	11C0	ETAM	()R	2C0	IPXL	-I	9C0	JP4	-I	11C0	OPDEN	()R	2C0	RLC1	-	7CN	XCONV	-R	9C0
A0M	-R	11C0	FIPAL	-R	9C0	IPXR	-I	9C0	KK1	-I	11C0	OPTMP	()R	2C0	RVALS	()R	12C0	XL	-R	9C0
BTOL	()R	2C0	FIPAR	-R	9C0	IPYB	-I	9C0	LAMD	-R	14RL	ORANGE	-	11CN	SIGA	()R	7LC	XR	-R	9C0
B0	-R	11C0	FIPTB	-R	9C0	IPYT	-I	9C0	LJM2	-I	11C0	PARTMOV	-	15U	SILVER	-	9CN	YM	-R	9C0
COLAMU	-R	11C0	FIAL	-R	9C0	IP2	-I	11C0	MU02	-R	14RL	PINK	-	4CN	SPTOL	()R	2C0	YCONV	-R	9C0
CYL	-R	11C0	FIAR	-R	9C0	ISCF1	-I	9C0	NAME	()I	8C0	PRINT	-	119F	STATE	-	2CN	YELLOW	-	10CN
DIMENSI	-	15F	FIYB	-R	9C0	ISCF2	-I	8C0	NANGLS	-I	12C0	PTAB	()R	2C0	T	-R	8C0	YLC1	-	5CN
DTC	-R	11C0	FORMAT	-	16F	ISC3	-I	8C0	NCYC	-I	8C0	PXCONV	-R	9C0	TAMB	-R	8C0	YLC2	-	6CN
DTCSAV	-R	11C0	FREE	()R	2C0	ITV	-I	8C0	NDUMP	-I	8C0	PXL	-R	9C0	TEMP	()R	8C0	YSC1	-	3CN
DTO2	-R	11C0	GM1	-R	11C0	IXL	-I	9C0	NFRQ	-I	2C0	PYCONV	-R	9C0	THIRD	-R	11C0	YT	-R	9C0
DTPOS	-R	11C0	GR	-R	11C0	IXR	-I	9C0	NOPD	-I	2C0	RDT	-R	11C0	THY	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

```
   100 -    22*   114
   110 -    24*   111
   115 -    34*     7      87
   116 -    33      37*    73      84
   117 -    62      68*
   118 -    64      71*
   119 -    58      74*
   120 -    77      82*
   121 -    79      85*
   125 -    67      81      88*
   126 -    96     102*
   128 -    99     102*
   150 -    26     109*    120
   160 -   119     115*
```

```
    *90  -    38      68      71      82      85      118*
   2001  -    18*   119PR
AASC    ()R    3CU     13EG    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ    13EQ
              13EW    15CG    22AG    36AG    112AG   115AG
AMAX1   -    106SU   107SU
BETALC  ()R    13EW    15DI
CENTX   ()R    13EW    15DI
CENTY   ()R    13EW    15DI
COMMON  -     2F      3F      4F      8F      9F      10F     11F     12F
CQ      ()R    13EW    15DI
DELSM   ()R    13EW    15DI
DT      -R     2CU     103     1.4
DIRI    -R    66=     6 =     97      98      100     101
DI2     -R    63=     64      100     101
DI3     -R    57=     58      97      98      100     101
DI4     -R    78=     79      97      98
DJ3     -R    61=     62      100     101
DJ4     -R    70=     77      97      98
E       ()R    13EW    15DI
ECRD    -     22SU    36SU
ECWR    -    112SU   115SU
EMOMLC  ()R    13EW    15DI
EP      ()R    13EW    15DI
ETIL    ()R    13EW    15DI
FOUTLC  ()R    13EW    15DI
FSN     ()R    13EW    15DI
GRIR    ()R    13EW    15DI
GRIZ    ()R    13EW    15DI
I       -I     4CU     3 =     39      71      72=     72      82      83=     83      108
IHAR    -I     8CU     71
ICEL    -I    28=     29      30
IEC     -I    34=     36AG
IECP    -I    11CU    18      22AG    112AG   113=    113     115AG   116=
IECPX   -I    18=     116
IJ      -I     4CU     39=     40      41      49      50      94      95
IJP     -I     4CU     41=     47      48      92      93
IPJ     -I     4 =     42      43      44      88      89
IPJP    -I    42=     45      46      90      91
IPI     -I     8CU     29      30      108
ISC2    -I     8CU     36AG    39
ITAB    ()I    11CU    28      108=    119PR
ITEM    -I    32=     65=     96
J       -I     4CU     29=     32      33      34      35      68      69=     69      85      86=     86      108
JOLD    -I    17=     33      35=
JPI     -I     8CU     68
KKO     -I    31=     37=     37      38
KP      -I    23=     25      27      103     104     105     106     107     110=    110     111     118
LAM     -R    11CU    14RL
LCM     -     5F      6F      7F
LPB     -I    19=     22AG    111     112AG   113     115AG
M       ()R    13EW    14RL    15DI
MP      ()R    13EW    14RL    15DI
MU      -R    11CU    14RL
NC      -I    22AG    36AG    112AG   115AG
NBPT    -I    17=     24=     24      28      108     109     119PR   119PR
NPI     -I    11CU    109
NU      -I     8CU     39      40
NUI     -I     8CU     19      34      41      42
NUI2    -I    11CU    36AG
P       ()R    13EW    15DI
PL      ()R    13EW    15DI
PXR     -R     9CU     21=     17=     117
PYR     -R     9CU     2 =     15=     105
PYT     -R     9CU     21=     16=     106
R       ()R    13EW    15DI
RCSQ    ()R    13EW    15DI
RM      ()R    13EW    15DI
RMP     ()R    13EW    15DI
```

```
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=     10.=    1.3
UL        ()R    13EQ    1501
UMOMLC    ()R    13EQ    1501
UP        ()R    13EQ    1501
UTIL      ()R    13EQ    1501
U1        -R     86=     97      100
U2        -R     9?=     10
U3        -R     96=     97      100
U4        -R     94=     97
V         ()R    13EQ    1501    89      91      93      95
VG        ()R    13EQ    1501
VK        -R     98=     101=    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
X1        -R     43=     56      63      63      78
X13       -R     56=     57      66      80
X2        -R     45=     0       63
X23       -R     0 =     61      66
X3        -R     47=     53      56      60      74
X4        -R     49=     74      78      78
X43       -R     74=     76      0
Y         ()R    13EQ    1501    44      46      48      50
YP        -R     52=     54      63      78
YPAR      ()R    13EQ    1501    27      104=    105     106
YPY3      -R     54=     57      61      76
YTE       -R     27=     52      4
Y1        -R     44=     55      63      63      78
Y13       -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?
```

```
1           OVERLAY (YOKIFER, 3, 0)                                          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, NGPD, 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)                                         ALLKOM     8
      LCM /RLC1/        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, NDUMP, NG, NGI, REZSIE, TAMB,       ALLKOM    12
     3                  TEMP(500), T, TIME, TOUT, TSTART, THY               ALLKOM    13
      COMMON /GREEN/    ALPHA, NHP, NBUF, NSP, NPCMAX, JCEN, TEMIT          GRLEN      2
      COMMON /LAVNDER/  DENS(500), EBLOCK(6000), ECEN, EMC,                 LAVNDER    2
     1                  FSCAT(500), ID, IESCAP, NCOL, NDIE,                 LAVNDER    3
     2                  NFLUSH, NMOVE, SIEMIN, T1, 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),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,REZDEN),                          EQVREAL   11
     1                  (AASC(18),GRIZ,VG,FSN)                              EQVREAL   12
      REAL              LAM, LAMD, M, MP, MU, MUOZ                          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                  REZDEN(1), GRIZ(1), VG(1), FSN(1)                   DIMEN      9
C                                                                           MCRT      12
      LEAT              DBLINT                                              MCRT      13
C                                                                           MCRT      14
 2001 FORMAT            (1H1,*PROBLEM CYCLE*,I6,6X,*RADN TRANSPORT*//       MCRT      15
     1                  * TIME*,1PE12.4,* DT*,1PE12.4,6X,*DTR*,1PE12.4)     MCRT      16
 2002 FORMAT            (1H0,*INITIAL ENERGIES*/6H RADN ,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
 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
      KEEP=0                                                                MCRT      23
      DTOLDER=DTR                                                           MCRT      24
    1 T2=TIME+DTR                                                           MCRT      25
      DTOLD=DTR                                                             MCRT      26
      DTR=100.0                                                             MCRT      27
      EINT=EKIN=URTOT=0.0                                                   MCRT      28
      SIEMIN=1.0E+20                                                        MCRT      29
      AVOL=41.642E+13*DTOLD                                                 MCRT      30
      ACAT=3.0E+05*DTOLD*ALPHA                                              MCRT      31
C                                                                           MCRT      32
      PRINT 2001,       NCYC, TIME, T2, DTOLD                             MCRT      33
      WRITE (12,2001)   NCYC, TIME, T2, DTOLD                             MCRT      34
C                                                                           MCRT      35
      CALL START                                                            MCRT      36
      DO 59 J=2,JP1                                                         MCRT      37
      IJSC=(J-1)*IP1                                                        MCRT      38
      DO 58 I=1,IBAR                                                        MCRT      39
      IPJ=IJ+NQ                                                             MCRT      40
      IPJP=IJP+NQ                                                           MCRT      41
      IJSC=IJSC+1                                                           MCRT      42
      CENTA(IJ)=0.25*(X(IJ)+X(IPJ)+X(IPJP)+X(IJP))                          MCRT      43
      CENTY(IJ)=0.25*(Y(IJ)+Y(IPJ)+Y(IPJP)+Y(IJP))                          MCRT      44
      IF (I.EQ.IBAR) CENTA(IPJ)=CENTY(IPJ)=0.0                              MCRT      45
      TE=TEMP(IJSC)                                                         MCRT      46
```

```
      TLOG=GLOG10(TP)                                                   MCRT     47
      IF (TLOG.GT.OPTMP(NOPT)) TLOG=OPTMP(NOPT)                         MCRT     48
      DENS(IJSC)=RO(IJ)                                                 MCRT     49
      DP=DENS(IJSC)                                                     MCRT     50
      DLOG=GLOG10(DP)                                                   MCRT     51
      IF (DLOG.LT.OPDEN(1)) DLOG=OPDEN(1)                               MCRT     52
      IF (DLOG.GT.OPDEN(NOPD)) DLOG=OPDEN(NOPD)                         MCRT     53
      BP=DBLINT (0,DLOG,TLOG,OPDEN,OPTMP,BTBL, 0,NOPT,NOPD,NOPT)       MCRT     54
      BETALC(IJ)=BP                                                     MCRT     55
      SP=DBLINT (0,DLOG,TLOG,OPDEN,OPTMP,SPTBL,0,NOPT,NOPD,NOPT)       MCRT     56
      SP=GEXP10(SP)                                                     MCRT     57
      SIGPLC(IJ)=SP                                                     MCRT     58
      FSCAT(IJSC)=1.0/(1.0+XCAT*BP*SP)                                  MCRT     59
      FS(IJ)=FSCAT(IJSC)                                                MCRT     60
      TP4=TP**4                                                         MCRT     61
      RRVOL=6.283184/RVOL(IJ)                                           MCRT     62
      RZEDEN(IJ)=SP*TP4*XVOL*RRVOL*FSCAT(IJSC)                          MCRT     63
      XX=1.0E+15*DP*RRVOL                                               MCRT     64
      XSIE=XX*SIE(IJ)                                                   MCRT     65
      IF (TP.LT.TEMIT) GO TO 54                                         MCRT     66
      XDTR=XSIE/RZEDEN(IJ)                                              MCRT     67
      IF (XDTR.LT.DTR) DTR=XDTR                                         MCRT     68
      IF (XSIE.GT.SIEMIN) GO TO 54                                      MCRT     69
      SIEMIN=XSIE                                                       MCRT     70
      IJMIN=IJSC                                                        MCRT     71
      TMIN=TP                                                           MCRT     72
      DMIN=DP                                                           MCRT     73
   54 EINT=EINT+XSIE                                                    MCRT     74
      EKIN=EKIN+XX*0.125*(U(IJ)**2+U(IPJ)**2+U(IPJP)**2+U(IJP)**2+      MCRT     75
     1 V(IJ)**2+V(IPJ)**2+V(IPJP)**2+V(IJP)**2)                         MCRT     76
      URTOT=URTOT+137.214E-08*TP4*RRVOL                                 MCRT     77
      IJ=IPJ                                                            MCRT     78
      IJP=IPJP                                                          MCRT     79
   58 CONTINUE                                                          MCRT     80
      CALL LOOP                                                         MCRT     81
   59 CONTINUE                                                          MCRT     82
      CALL DONE                                                         MCRT     83
      DTR=DTR*DTOLDER*0.15                                              MCRT     84
      EALL=EINT+EKIN                                                    MCRT     85
C                                                                       MCRT     86
      PRINT 2002,       URTOT, EINT, EKIN, EALL                         MCRT     87
      WRITE (12,2002)   URTOT, EINT, EKIN, EALL                         MCRT     88
      PRINT 2003,       IJMIN, SIEMIN, DMIN, TMIN                       MCRT     89
      WRITE (12,2003)   IJMIN, SIEMIN, DMIN, TMIN                       MCRT     90
C                                                                       MCRT     91
      REWIND 1                                                          MCRT     92
      REWIND 2                                                          MCRT     93
      REWIND 3                                                          MCRT     94
C     ---   PERFORM SOLUTION OF TRANSPORT EQUATION                      MCRT     95
      CALL OVERLAY (7LYCKIFER,3,1,6HRECALL)                             MCRT     96
      CALL REMARK (6HREEFER)                                            MCRT     97
C     ---   EVALUATE ENERGY DEPOSITION AND ADVANCE TEMPERATURES         MCRT     98
      CALL OVERLAY (7LYCKIFER,3,2,6HRECALL)                             MCRT     99
      CALL REMARK (6HESTEP )                                            MCRT    100
C     ---   RADIATION TRANSPORT OUTPUT                                  MCRT    101
      IF (T2.LT.TOUT) GO TO 61                                          MCRT    102
      IF (KEEP.EQ.NCYC) GO TO 61                                        MCRT    103
      CALL OVERLAY (7LYCKIFER,3,3,6HRECALL)                             MCRT    104
      KEEP=NCYC                                                         MCRT    105
      CALL REMARK (7HLISTING)                                           MCRT    106
C                                                                       MCRT    107
   61 TIME=T2                                                           MCRT    108
      DTR=AMIN1(DTR,10.0*DT)                                            MCRT    109
      IF (TIME+EMIC.GE.T) RETURN                                        MCRT    110
      DTOLDER=DTR                                                       MCRT    111
      IF (TIME+DTR.GT.T+EMIC) DTR=T-TIME                                MCRT    112
      GO TO 1                                                           MCRT    113
      END                                                               MCRT    114
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	ETAB	()R	2C0	ISCF2	-I	8C0	LAVNDER	-	10CN	NCOL	-I	10C0	PINK	-	4CN	START	-	29SU
AA2	()R	6LC	FREG	()R	2C0	ISC2	-I	8C0	LEXT	-	14F	NDIE	-I	10C0	PTAB	()R	2C0	STATE	-	2CN
AMIN1	-	95SU	GRDVEL	-R	8C0	ISC3	-I	9C0	LOOP	-	73SU	NDUMP	-I	8C0	QEXP10	-	50SU	TAMB	-R	8C0
DIMENSI	-	13F	GREEN	-	9CN	ITV	-I	9C0	MCMT	-	1SU	NFLUSH	-I	10C0	REAL	-	12F	THY	-R	8C0
DONE	-	75SU	IU	-I	10C0	JBAR	-I	8C0	MU	-R	12RL	NFRO	-I	2C0	REU	-	8CN	TSTART	-R	8C0
EHLOCK	()R	1?C0	IESCAP	-I	10C0	JCEN	-I	9C0	MUO2	-R	12RL	NMOVE	-I	10C0	RETURN	-	96F	T1	-R	10C0
ECEN	-R	1?C0	IJM	-I	4C0	JP2	-I	8C0	NAME	()I	8C0	NPCMAX	-I	9C0	REZSIE	-R	8C0	YLC1	-	5CN
EMC	-R	1?C0	IJPS	-I	8C0	LAM	-R	12RL	NBP	-I	9C0	NQI	-I	8C0	RLC1	-	7CN	YLC2	-	6CN
EQUIVAL	-	11F	ISCF1	-I	8C0	LAMD	-R	12RL	NHOF	-I	9C0	NSP	-I	9C0	SIGA	()R	7LC	YSC1	-	3CN

MULTIPLY-REFERENCED VARIABLES

1	-	2 *	99																
54	-	59	62	67*															
58	-	3?00	72*																
59	-	3 00	74*																
61	-	89	9	94SU															
2001	-	15*	27PR	28WR															
2002	-	16*	78PR	79WR															
2003	-	17*	8?PR	81WR															
AASC	()R	3C0	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ
		11EQ	11EQ																
ALPHA	-R	9C0	26																
BETALC	()R	11EQ	13D1	48=															
BP	-R	47=	48	52															
BTBL	()R	2C0	47																
CENTX	()R	11EQ	13D1	36=	38=														
CENTY	()R	11EQ	13D1	37=	38=														
COMMON	-	2F	3F	4F	8F	9F	10F												
CQ	()R	11EQ	13D1																
DBLINT	-	14LX	47SU	49SU															
DELSM	()R	11EQ	13D1																
DENS	()R	1 C0	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	8C0	95																
DTOLD	-R	21=	25	26	27PR	28WR													
DTOLDER	-R	19=	76	97=															
DTR	-R	8C0	19	2?	21	22=	61	61=	76=	76	95=	95	97	98	98=				
E	()R	11EQ	13D1																
EALL	-R	77=	78PR	79WR															
EINT	-R	23=	67=	67	77	78PR	79WR												
EKIN	-R	23=	68=	68	77	78PR	79WR												
EMOMLC	()R	11EQ	13D1																
EMLC	-R	8C0	96	98															
EP	()R	11EQ	13D1																
ETIL	()R	11EQ	13D1																
FORMAT	-	15F	16F	17F															
FOUTLC	()R	11EQ	13D1																
FSCAT	()R	1 C0	52=	53	56														
FSN	()R	11EQ	13D1	53=															
GRIR	()R	11EQ	13D1																
GRIZ	()R	11EQ	13D1																
I	-I	4C0	32D0	36															
IBAR	-I	8C0	32D0	38															
IJ	-I	4C0	33	36	36	37	37	42	48	51	53	55	56	58	60	68	68	70=	
IJMIN	-I	64=	8 PR	81WR															
IJP	-I	4C0	34	36	37	68	68	71=											
IJSC	-I	31=	35=	35	39	42	43	52	53	56	64								
IPJ	-I	33=	36	37	38	38	68	68	70										
IPJP	-I	34=	36	37	68	68	71												
IP1	-I	8C0	31																
J	-I	4C0	3 00	31															
JP1	-I	8C0	3 00																
KEEP	-I	18=	9	92=															
LCM	-	5F	6F	7F															
M	()R	11EQ	12RL	13D1															

```
MP          ()R    11E0    12BL    13D1
NCYC        -I      8C0    27PR    28WR    90      92
NOPD        -I      7C0    46      46      47      49
NOPT        -I      4C0    41      41      47      47      49      49
NU          -I      8C0    33      34
OPDEN       ()R     2C0    45      45      46      46      47      49
OPTMP       ()R     2C0    41      41      47      49
OVERLAY     -       85S0   67S0    91SL
P           ()R    11E0    13D1
PL          ()R    11E0    13D1
PRINT       -       27F     7BF     8DF
QLOG10      -       47S0   44S0
R           ()R    11E0    13D1
RCSQ        ()R    11E0    13D1
REMARK      -       8CS0   88S0    93S0
REWIND      -       82F     83F     84F
RM          ()R    11E0    13D1
RMP         ()R    11E0    13D1
RO          ()R    11E0    13D1    42
ROL         ()R    11E0    13D1
RRVOL       -R     55=     56      57      69
RVOL        ()R    11E0    13D1    55
RZEDEN      ()R    11E0    13D1    56=     60
SIE         ()R    11E0    13D1    58
SYEMIN      -R     1 C0    24=     62      63=     80PR    81WR
SIGPLC      ()R    11E0    13D1    51=
SP          -R     49=     5 =     5       51      52      56
SPTBL       ()R     2C0    49
T           -R      8C0    96      98      98
TEMIT       -R      9C0    59
TEMP        ()R     8C0    39
TIME        -R      8C0    2       27PR    28WR    94=     96      98      98
TLOG        -R     4 =     41      41=     47      49
TMIN        -R     65=     8 PR    81WR
TOUT        -R      2C0    89
TP          -R     39=     4       54      59      65
TP4         -R     54=     56      69
T2          -R     1 C0    2 =     27PR    28WR    89      94
U           ()R    11E0    13D1    68      68      68      68
UG          ()R    11E0    13D1
UL          ()R    11E0    13D1
UMOMLC      ()R    11E0    13D1
UP          ()R    11E0    13D1
URTOT       -R     23=     69=     69      78PR    79WR
UTIL        ()R    11E0    13D1
V           ()R    11E0    13D1    68      68      68      68
VG          ()R    11E0    13D1
VL          ()R    11E0    13D1
VP          ()R    11E0    13D1
VTIL        ()R    11E0    13D1
WRITE       -       28F     79F     81F
X           ()R    11E0    13D1    36      36      36      36
XCAT        -R     2C=     52
XDTR        -R     60=     61      61
XPAR        ()R    11E0    13D1
XSIE        -R     58=     6       62      63      67
XVOL        -R     25=     56
XX          -R     57=     58      68
Y           ()R    11E0    13D1    37      37      37      37
YPAR        ()R    11E0    13D1
```

```
      1        OVERLAY (YOKIFER,3,1)                                          REEFER     2
      1        PROGRAM REEFER                                                 REEFER     3
      C                                                                       REEFER     4
      C     (R)ADIATING (E)ULERIAN (E)ARLY (F)IREHALL (E)XCLUDING (R)EACTIONS REEFER     5
      C                                                                       REEFER     6
      2        COMMON /STATE/    NCPT, NCPD, NFRQ, DPTMP(30), DPDEN(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, GRDVEL, IBAR, IJPS,  ALLKOM    10
               1                 IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,     ALLKOM    11
               2                 JP1, JP2, NCYC, NDUMP, NG, NGI, REZSIE, TAMB, 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(60^0), 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), EQUVREAL    2
               1                 (AASC(4),U), (AASC(5),V), (AASC(6),RHO),      EQUVREAL    3
               2                 (AASC(7),MP,RMP,RCSQ,CENTX),                  EQUVREAL    4
               3                 (AASC(8),E,ETIL,CENTY), (AASC(9),RVOL),       EQUVREAL    5
               4                 (AASC(10),M,RM,VP), (AASC(11),P,PL,EP,UP),    EQUVREAL    6
               5                 (AASC(12),UTIL,UL,CQ,EMOMLC),                 EQUVREAL    7
               6                 (AASC(13),VTIL,VL,UMOMLC),                    EQUVREAL    8
               7                 (AASC(14),RQL,RETALC,FOUTLC), (AASC(15),SIE), EQUVREAL    9
               8                 (AASC(16),DELSM,SIGPLC),                      EQUVREAL   10
               9                 (AASC(17),GRIR,UG,RZEDEN),                    EQUVREAL   11
               1                 (AASC(18),GRIZ,VG,FSN)                        EQUVREAL   12
     12        REAL              LAM, LAMD, M, MP, MU, MUU2                    EQUVREAL   13
     13        DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),     DIMEN      2
               2                 V(1), RHO(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), RQL(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
     14        COMMON /MAUVE/    MI, MJ, MG, MGI, RMOF, ZP, DCELL              REEFER    12
     15        DIMENSION         A(3), OMEGA(3), CBLOCK(4000), XFRQT(3)        REEFER    13
      C                                                                       REEFER    14
     16   2004 FORMAT            (1H0,*PARTICLE ENERGIES*/6H EMC  ,1PE12.4,    REEFER    15
               1                 6X,6H ERAD ,1PE12.4,6X,6H ECEN1,)PE12.4)      REEFER    16
     17   2005 FORMAT            (1H0,I11,* DEPOSITION SAMPLES DUMPED TO FSET3*) REEFER    17
     18   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
     19   2007 FORMAT            (12H CENSUS      ,7I12)                       REEFER    22
     20   2008 FORMAT            (12H SOURCE      ,7I12)                       REEFER    23
     21   2009 FORMAT            (12H BANK        ,7I12)                       REEFER    24
      C      ---   INITIALIZE                                                 REEFER    25
     22        ID=0              ;                                             REEFER    26
     23        NFLUSH=0          ;                                             REEFER    27
     24        IBANK=0           ;                                             REEFER    28
     25        MI=IBAR           ;                                             REEFER    29
     26        MJ=JP1            ;                                             REEFER    30
     27        MG=NG             ;                                             REEFER    31
     28        MGI=NGI           ;                                             REEFER    32
     29        EDIE=1.0E*20      ;                                             REEFER    33
     30        ECEN1=0.0         ;                                             REEFER    34
     31        ECEN=0.0          ;                                             REEFER    35
     32        PRINT 2006        ;                                             REEFER    36
     33        WRITE (12,2006)   ;                                             REEFER    37
```

```
      CALL OPEN (5LFSET3,2LST,7168)                                     REEFER   36
C     ---   FOLLOW PARTICLES LEFT FROM LAST CENSUS                      REEFER   39
      IF (IJCEN.EQ.0) GO TO 12                                          REEFER   40
      NCEN=IJCEN                                                        REEFER   41
      IJCEN=0                                                           REEFER   42
      NCEN=NBANK=NDIE=ICSCAP=NMOVE=NCOL=0                               REEFER   43
      CALL OPEN (5LFSET1,2LST,4608)                                     REEFER   44
    3 CALL RDBUF (5LFSET1, CBLOCK, 4000, LENGTH2, LSTATUS)              REEFER   45
      DO 6 IJCEN=1,LENGTH2,8                                            REEFER   46
      XEPART=CBLOCK(IJCEN+6)                                            REEFER   47
      IF (XEPART.LE.0.0) GO TO 8                                        REEFER   48
      XA1=CBLOCK(IJCEN)                                                 REEFER   49
      XA2=CBLOCK(IJCEN+1)                                               REEFER   50
      XA3=CBLOCK(IJCEN+2)                                               REEFER   51
      XOMEGA1=CBLOCK(IJCEN+3)                                           REEFER   52
      XOMEGA2=CBLOCK(IJCEN+4)                                           REEFER   53
      XOMEGA3=CBLOCK(IJCEN+5)                                           REEFER   54
      XFREQP=CBLOCK(IJCEN+7)                                            REEFER   55
      I=SHIFT(XFREQP,-9).AND.777B                                       REEFER   56
      J=XFREQP.AND.777B                                                 REEFER   57
      XFREQP=XFREQP.AND.777777777777700000B                             REEFER   58
      RRUP=CSQRT(XA1**2+XA2**2)                                         REEFER   59
      ZP=XA3                                                            REEFER   60
      CALL WHERE (I,J)                                                  REEFER   61
      IF (I.LE.0.OR.I.GE.IP1) GO TO 8                                   REEFER   62
      IF (J.LE.1.OR.J.GE.JP2) GO TO 8                                   REEFER   63
      XLOCELL=LOCELL                                                    REEFER   64
      I=I                                                               REEFER   65
      IECS=(J-1)*NG1+(I-1)*NG                                           REEFER   66
      CALL ECHO (X(IJ),IECS,30,NE)                                      REEFER   67
      Y(IJ)=X(IJ+2)                                                     REEFER   68
      Y(IJ+NG)=X(IJ+NG+2)                                               REEFER   69
      IJP=IJ+NG1                                                        REEFER   70
      IECS=IECS+NG1                                                     REEFER   71
      CALL ECHO (X(IJP),IECS,30,NE)                                     REEFER   72
      Y(IJP)=X(IJP+2)                                                   REEFER   73
      Y(IJP+NG)=X(IJP+NG+2)                                             REEFER   74
      XEDEN=X(17)                                                       REEFER   75
      IF (XEDEN.LE.0.0) GO TO 8                                         REEFER   76
      IF (XEPART.GT.XEDEN) XEPART=XEDEN                                 REEFER   77
      NCP=10.0*XEPART/XEDEN                                             REEFER   78
      IF (NCP.LT.1) NCP=1                                               REEFER   79
      XNCP=NCP                                                          REEFER   80
      XEPART=XEPART/XNCP                                                REEFER   81
      EPART=XEPART                                                      REEFER   82
      A(1)=XA1                                                          REEFER   83
      A(2)=XA2                                                          REEFER   84
      A(3)=XA3                                                          REEFER   85
      OMEGA(1)=XOMEGA1                                                  REEFER   86
      OMEGA(2)=XOMEGA2                                                  REEFER   87
      OMEGA(3)=XOMEGA3                                                  REEFER   88
      FREQP=XFREQP                                                      REEFER   89
      XEDEN=XEDEN-EPART                                                 REEFER   90
      ECEN=ECEN+EPART                                                   REEFER   91
      TI=TIME                                                           REEFER   92
      IDIE=0                                                            REEFER   93
      LOCELL=XLOCELL                                                    REEFER   94
      EDEATH=AMIN1(0.01*EPART,0.01*SIEMIN)                              REEFER   95
      CALL WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)                  REEFER   96
      IF (IDIE.EQ.0) GO TO 7                                            REEFER   97
                                                                        REEFER   98
      IF (EPART.LE.0.0) GO TO 5                                         REEFER   99
      NCEN=NCEN+1                                                       REEFER  100
      ECEN=ECEN+EPART                                                   REEFER  101
      GO TO 6                                                           REEFER  102
    5 NBANK=NBANK+1                                                     REEFER  103
    6 CBLOCK(1)=A(1)                                                    REEFER  104
      CBLOCK(2)=A(2)                                                    REEFER  105
```

```
      CBLOCK(3)=A(3)                                                    REEFER  106
      CBLOCK(4)=OMEGA(1)                                                REEFER  107
      CBLOCK(5)=OMEGA(2)                                                REEFER  108
      CBLOCK(6)=OMEGA(3)                                                REEFER  109
      CBLOCK(7)=EPART                                                   REEFER  110
      CBLOCK(8)=FREQP                                                   REEFER  111
      CALL MOVE (OFFSET2, CBLOCK, 8)                                    REEFER  112
    7 NCP=NCP-1                                                         REEFER  113
      IF (NCP.GE.1) GO TO 4                                             REEFER  114
      IECS=IECS-NGI+16                                                  REEFER  115
      CALL ECWR (AEDEN,IECS,1,NE)                                       REEFER  116
    8 CONTINUE                                                          REEFER  117
      IF (LSTATUS.EQ.1) GO TO 3                                         REEFER  118
C                                                                       REEFER  119
      REWIND 1                                                          REEFER  120
      CALL REMARK (26HCENSUS PARTICLES COMPLETED)                       REEFER  121
      JCEN=NCEN                                                         REEFER  122
      IBANK=NBANK*NSP                                                   REEFER  123
      PRINT 2007,       NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL    REEFER  124
      WRITE (12,<007)   NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL    REEFER  125
C     ---   ASSIGN SOURCE PARTICLES                                     REEFER  126
   12 ERAD=0.0                                                          REEFER  127
      RNP=1./FLOAT(NSP)                                                 REEFER  128
      NGEN=0                                                            REEFER  129
      NCEN=NBANK=NDIE=IESCAP=NMOVE=NCOL=0                               REEFER  130
      CALL START                                                        REEFER  131
      DO 19 J=2,JP1                                                     REEFER  132
      IJSC=(J-1)*IP1                                                    REEFER  133
      DO 18 I=1,IBAR                                                    REEFER  134
      IJ=I+IJSC                                                         REEFER  135
      IPJ=IJ+NQ                                                         REEFER  136
      IPJP=IPJ+NQ                                                       REEFER  137
      IJSC=IJSC+1                                                       REEFER  138
      TP=TEMP(IJSC)                                                     REEFER  139
      IF (TP.LT.TEMIT) GO TO 17                                         REEFER  140
      XEPART=RZEDEN(IJ)*RNP                                             REEFER  141
      XDCELL=.25*(X(IPJ)-X(IJ)+X(IPJP)-X(IJP)+Y(IPJ)-Y(IJ)+             REEFER  142
     1 Y(IPJP)-Y(IPJ))                                                  REEFER  143
      DO 16 K=1,NSP                                                     REEFER  144
      NGEN=NGEN+1                                                       REEFER  145
      RN1=RANDOM(DUMMY)                                                 REEFER  146
      RN2=RANDOM(DUMMY)                                                 REEFER  147
      RN3=RANDOM(DUMMY)                                                 REEFER  148
      RN4=RANDOM(DUMMY)                                                 REEFER  149
      ARN=1./(RN1+RN2+RN3+RN4)                                          REEFER  150
      A(1)=ARN*(RN1*X(IJ)+RN2*X(IPJ)+RN3*X(IPJP)+RN4*X(IJP))            REEFER  151
      A(2)=0.0                                                          REEFER  152
      A(3)=ARN*(RN1*Y(IJ)+RN2*Y(IPJ)+RN3*Y(IPJP)+RN4*Y(IJP))            REEFER  153
      II=IIMP                                                           REEFER  154
      EPART=XEPART                                                      REEFER  155
      ERAD=ERAD+EPART                                                   REEFER  156
C                                                                       REEFER  157
      CALL PFREQ (FREQP, TP)                                            REEFER  158
      TH=3.141592*RANDOM(DUMMY)                                         REEFER  159
      STH=SIN(TH)                                                       REEFER  160
      CTH=COS(TH)                                                       REEFER  161
      PH=6.283184*RANDOM(DUMMY)                                         REEFER  162
      SPH=SIN(PH)                                                       REEFER  163
      CPH=COS(PH)                                                       REEFER  164
      OMEGA(1)=STH*CPH                                                  REEFER  165
      OMEGA(2)=STH*SPH                                                  REEFER  166
      OMEGA(3)=CTH                                                      REEFER  167
      IDIE=0                                                            REEFER  168
      DCELL=XDCELL                                                      REEFER  169
      EDEATH=AMIN1(0.01*EPART,0.01*SIEMIN)                              REEFER  170
      IF (EDEATH.LT.EDIE) EDIE=EDEATH                                   REEFER  171
      CALL WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)                  REEFER  172
      IF (IDIE.EQ.0) GO TO 16                                           REEFER  173
C
```

```
      IF (EPART.LT.0.0) GO TO 14                                        REEFER  174
      NCEN=NCEN+1                                                       REEFER  175
      ECEN=ECEN+EPART                                                   REEFER  176
      GO TO 15                                                          REEFER  177
   14 NBANK=NBANK+1                                                     REEFER  178
   15 CBLOCK(1)=A(1)                                                    REEFER  179
      CBLOCK(2)=A(2)                                                    REEFER  180
      CBLOCK(3)=A(3)                                                    REEFER  181
      CBLOCK(4)=OMEGA(1)                                                REEFER  182
      CBLOCK(5)=OMEGA(2)                                                REEFER  183
      CBLOCK(6)=OMEGA(3)                                                REEFER  184
      CBLOCK(7)=EPART                                                   REEFER  185
      CBLOCK(8)=FREQP                                                   REEFER  186
      CALL WTBUF (5LFSET2, CBLOCK, 8)                                   REEFER  187
   16 CONTINUE                                                          REEFER  188
   17 IJ=IPJ                                                            REEFER  189
      IJP=IPJP                                                          REEFER  190
   18 CONTINUE                                                          REEFER  191
      CALL LOOP                                                         REEFER  192
  *19 CONTINUE                                                          REEFER  193
      CALL DONE                                                         REEFER  194
C                                                                       REEFER  195
      CALL REMARK (26HSOURCE PARTICLES COMPLETED)                       REEFER  196
      JCEN=JCEN+NCEN                                                    REEFER  197
      IBANK=IBANK+NBANK+NBP                                             REEFER  198
      PRINT 200,       NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL     REEFER  199
      WRITE (12,200)   NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL     REEFER  200
C     ---   PARTICLE BANK                                               REEFER  201
   31 WRITE (2)                                                         REEFER  202
      ENDFILE 2                                                         REEFER  203
      REWIND 2                                                          REEFER  204
      CALL COPYF (5LFSET2,5LFSET1)                                      REEFER  205
      REWIND 1                                                          REEFER  206
      REWIND 2                                                          REEFER  207
      IF (IBANK.EQ.0.0) GO TO 51                                        REEFER  208
      NGEN=1HANK                                                        REEFER  209
      IBANK=0                                                           REEFER  210
      NCEN=NBANK=NDIE=IESCAP=NMOVE=NCOL=0                               REEFER  211
      RNBP=1.0/FLOAT(NBP)                                               REEFER  212
      ECEN1H=EDIE                                                       REEFER  213
      CALL OPEN (5LFSET1,2LST,4608)                                     REEFER  214
      CALL OPEN (5LFSET2,2LST,4608)                                     REEFER  215
   32 CALL RDBUF (5LFSET1, CBLOCK, 4000, LENGTH2, LSTATUS)              REEFER  216
      DO 38 IJCEN=1,LENGTH2,8                                           REEFER  217
      XEPART=CBLOCK(IJCEN+6)                                            REEFER  218
      IF (XEPART.LT.0.0) GO TO 33                                       REEFER  219
      CALL WTBUF (5LFSET2, CBLOCK(IJCEN), 8)                            REEFER  220
      GO TO 38                                                          REEFER  221
   33 XEPART=-XEPART                                                    REEFER  222
      XEPART=XEPART*RNBP                                                REEFER  223
      XA1=CBLOCK(IJCEN)                                                 REEFER  224
      XA2=CBLOCK(IJCEN+1)                                               REEFER  225
      XA3=CBLOCK(IJCEN+2)                                               REEFER  226
      XOMEGA1=CBLOCK(IJCEN+3)                                           REEFER  227
      XOMEGA2=CBLOCK(IJCEN+4)                                           REEFER  228
      XOMEGA3=CBLOCK(IJCEN+5)                                           REEFER  229
      XFREQP=CBLOCK(IJCEN+7)                                            REEFER  230
      I=SHIFT(XFREQP,-9).AND.777B                                       REEFER  231
      J=XFREQP.AND.777B                                                 REEFER  232
      CALL UNPKEN (XFREQP, XFRQT)                                       REEFER  233
      XFREQP=XFRQT(1)                                                   REEFER  234
      T1=XFRQT(2)                                                       REEFER  235
      IJ=1                                                              REEFER  236
      IECS=(J-1)*NQ1+(I-1)*NQ                                           REEFER  237
      CALL ECRU (X(IJ), IECS, 30, NE)                                   REEFER  238
      Y(IJ)=X(IJ+2)                                                     REEFER  239
      Y(IJ+NQ)=X(IJ+NQ+2)                                               REEFER  240
      IJP=IJ+NQ1                                                        REEFER  241
```

```
229           IECS=IECS+NQI                                                    REEFER  242
230           CALL ECHO (X(IJP), IECS, 30, NE)                                 REEFER  243
231           Y(IJP)=X(IJP+2)                                                  REEFER  244
232           Y(IJP+NQ)=X(IJP+NQ+2)                                            REEFER  245
233           XDCELL=0.25*(X(IJ+NQ)-X(IJ)+X(IJP+NQ)-X(IJP)+                    REEFER  246
             1 Y(IJP)-Y(IJ)+Y(IJP+NQ)-Y(IJ+NQ))                                REEFER  247
234           IJSC=(J-1)*IP1+I                                                 REEFER  248
235           TP=TEMP(IJSC)                                                    REEFER  249
236           DO 37 K=1,NBP                                                    REEFER  250
237           A(1)=XA1                                                         REEFER  251
238           A(2)=XA2                                                         REEFER  252
239           A(3)=XA3                                                         REEFER  253
240           OMEGA(1)=XOMEGA1                                                 REEFER  254
241           OMEGA(2)=XOMEGA2                                                 REEFER  255
242           OMEGA(3)=XOMEGA3                                                 REEFER  256
243           EPART=XEPART                                                     REEFER  257
244           FREQP=XFREQP                                                     REEFER  258
245           DCELL=XDCELL                                                     REEFER  259
246           IDIE=1                                                           REEFER  260
247           CALL WALK (A, OMEGA, IDIE, FREQP, EPART, EDEATH)                 REEFER  261
248           IF (IDIE.EQ.0) GO TO 37                                          REEFER  262
249           IF (EPART.LE.0.0) GO TO 34                                       REEFER  263
250           NCEN=NCEN+1                                                      REEFER  264
251           ECEN=ECEN+EPART                                                  REEFER  265
252           GO TO 35                                                         REEFER  266
253        34 NBANK=NBANK+1                                                    REEFER  267
254        35 CBLOCK(1)=A(1)                                                   REEFER  268
255           CBLOCK(2)=A(2)                                                   REEFER  269
256           CBLOCK(3)=A(3)                                                   REEFER  270
257           CBLOCK(4)=OMEGA(1)                                               REEFER  271
258           CBLOCK(5)=OMEGA(2)                                               REEFER  272
259           CBLOCK(6)=OMEGA(3)                                               REEFER  273
260           CBLOCK(7)=EPART                                                  REEFER  274
261           CBLOCK(8)=FREQP                                                  REEFER  275
262        36 CALL WTBUF (5LFSET2, CBLOCK, 8)                                  REEFER  276
263        37 CONTINUE                                                         REEFER  277
264        38 CONTINUE                                                         REEFER  278
265           IF (LSTATUS.EQ.1) GO TO 32                                       REEFER  279
266           REWIND 1                                                         REEFER  280
      C                                                                       REEFER  281
267           CALL REMARK (24HBANK PARTICLES COMPLETED)                        REEFER  282
268           JCEN=JCEN+NCEN                                                   REEFER  283
269           IBANK=NBANK*NBP                                                  REEFER  284
270           EDIE=0.01*SIEMIN                                                 REEFER  285
271           PRINT 2009,       NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL   REEFER  286
272           WRITE (12,2009)   NGEN, NCEN, NBANK, NDIE, IESCAP, NMOVE, NCOL   REEFER  287
273           GO TO 31                                                         REEFER  288
      C                                                                       REEFER  289
274        51 EMC=EMAD+ECEN1                                                   REEFER  290
275           CALL FLUSH                                                       REEFER  291
276           PRINT 2005,       NFLUSH                                         REEFER  292
277           WRITE (12,2005)   NFLUSH                                         REEFER  293
278           WRITE (3)                                                        REEFER  294
279           ENDFILE 3                                                        REEFER  295
280           REWIND 3                                                         REEFER  296
281           CALL OPEN (5LFSET3,2LST,512)                                     REEFER  297
      C                                                                       REEFER  298
282           CALL OPEN (5LFSET1,2LST,512)                                     REEFER  299
283           CALL OPEN (5LFSET2,2LST,512)                                     REEFER  300
284           PRINT 2004,       EMC, EMAD, ECEN1                               REEFER  301
285           WRITE (12,2004)   EMC, EMAD, ECEN1                               REEFER  302
286           RETURN                                                           REEFER  303
287           END                                                              REEFER  304
SINGLY REFERENCED VARIABLES
     36 -  262*    EBLOCK ()R  10C0   IJM     -I   4C0   LAVNDER -  10CN   NOPD   -I   2C0   RED    -    8CN   TAMB   -R   8C0
 AA1    ()R   5LC   ECWR   -  11CSU   IJPS    -I   8C0   LOOP   - 181SU   NOPT   -I   2C0   REEFER -   1SU   THY    -R   8C0
 AA2    ()R   6LC   EPIC   -R   8C0   ISCF1   -I   8C0   MAUVE  -  14CN   NPCMAX -I   9C0   RETURN -  286F   TOUT   -R   8CC
 ALPHA  -R   9C0   EQUIVAL -   11F   ISCF2   -I   8C0   MU     -R  12RL   OPDEN  ()R   2C0   REZSIE -R   8C0   TSTART -R   8C0
```

```
  BTOL    ()R   2C0   ETAB    ()R   2C0   ISC2    -I   8C0   MOOP    -R  12RL   OPTMP   ()R   2C0   RLC1    -     7CN   T2      -R  10C0
  COPYF   -   192SU   FLOSH   -   275SU   ISC3    -I   8C0   NAME    ()I   8C0   PFREQ   -   147SU   SIGA    ()R   7LC   UNPKFN  -   22USU
  DENS    ()R  10C0   FREE    ()R   2C0   ITV     -I   8C0   NBUF    -I   9C0   PIAR    -     4CN   SPTAL   ()R   2C0   WHERE   -   56SU
  DONE    -   163SU   FSCAT   ()R  10C0   JBAR    -I   8C0   NCYC    -I   8C0   PTAB    ()R   2C0   START   -   123SU   YLC1    -     5CN
  DT      -R   8C0   GROVEL   -R   8C0   LAR     -R  12RL   NDUMP   -I   8C0   QSORT   -    54SU   STATE   -     2CN   YLC2    -     6CN
  DTR     -R   8C0   GREEN   -     9CN   LARD    -R  12RL   NERR    -I   2C0   REAL    -    12F   T       -R   8C0   YSC1    -     3CN
```

MULTIPLY-REFERENCED VARIABLES

```
     3 -    41*   112
     4 -    77*   108
     5 -    93     97*
     6 -    96     98*
     7 -    92    107*
     8 -   41D0    43     57     58     71    111*
    12 -    35    119*
    14 -   163    167*
    15 -   166    168*
    16 -  134D0   162    177*
    17 -   131    178*
    18 -  12600   181*
    19 -  12400   182*
    31 -   185*   273
    32 -   203*   205
    33 -   206    209*
    34 -   249    253*
    35 -   252    254*
    37 -  23600   248    263*
    38 -  20400   268    269*
    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   15D1    78=    79=    80=    91AG   98     99     100    141=   142=   143=   161AG  168    169    170    237=   238=
                239=   247AG  254    255    256
AASC    ()R    3C0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0
              11E0   11E0
AMINI   -     9.5U   159SU
BETALC  ()R   11E0   13D1
CBLOCK  ()R   15D1    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   11E0   13D1
CENTY   ()R   11E0   13D1
COMMON  -     2F     3F     4F     8F     9F     10F    14F
COS     -   15.5U   153SU
CPR     -R  153=    154
CQ      ()R   11E0   13D1
CTR     -R  15.=    156
DCELL   -R   14C0    59     89=    158=   245=
DELSM   ()R   11E0   13D1
DIMENSI -     13F    15F
DUMMY   -R   136     137    138    139    148    151
E       ()R   11E0   13D1
ECEN    -R   14C0    31=    95=    95     165=   165    251=   251
ECENI   -R    30=    86=    86     274    284PR  285WR
ECRD    -     62SU   67SU   229SU  230SU
EUCATH  -R   91=     91AG   159=   160    160    161AG  200=   247AG
EUTE    -R   29=    103     163=   200    270=
EMC     -R   14C0   274=   284PR  285WR
EMUMLC  ()R   11E0   13D1
ENDFILE -     19.F   279F
EP      ()R   11E0   13D1
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
```

```
RHOP      -R    14CU    54=
RM        ()R   11EU    130I
RMP       ()R   11EU    130I
RNBP      -R    149=    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   11EU    130I
ROL       ()R   11EU    130I
RVOL      ()R   11EU    130I
RZEDEN    ()R   11EU    130I    132
SHIFT     -     51SU    218SU
SIE       ()R   11EU    130I
SIEMIN    -R    1?CU    9?      159     270
SIGPLC    ()R   11EU    130I
SIN       -     149SU   152SU
SPM       -R    152=    155
STM       -R    149=    154     155
TEMIT     -R    9CU     131
TEMP      ()R   8CU     13?     235
TM        -R    148=    149     153
TIME      -R    8CU     87      144
TP        -R    13?=    131     147AG   235=
TI        -R    1?CU    87=     144=    222=
U         ()R   11EU    130I
UG        ()R   11EU    130I
UL        ()R   11EU    130I
UMOMLC    ()R   11EU    130I
UP        ()R   11EU    130I
UTIL      ()R   11EU    130I
V         ()R   11EU    130I
VG        ()R   11EU    130I
VL        ()R   11EU    130I
VP        ()R   11EU    130I
VTIL      ()R   11EU    130I
WALK      -     91SU    161SU   247SU
WRITE     -     33F     118F    188F    189F    272F    277F    278F    285F
WTBUF     -     166SU   170SU   2?7SU   262SU
X         ()R   11EU    130I    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=     89      133=    158     233=    245
XEDEN     -R    7?=     71      72      72      73      85=     85      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
XFRQT     ()R   150I    220AG   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   11EU    130I
XRN       -R    14?=    141     143
Y         ()R   11EU    130I    63=     64=     68=     69=     133     133     133     133     143     143     143     143     226=    227=    231=
                232=    233     234     233     233
YPAR      ()R   11EU    130I
ZP        -R    14CU    55=
```

```
      SUBROUTINE FLUSH                                                  FLUSH     2
C                                                                       FLUSH     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
      COM /YLC1/        AA1(131000)                                     ALLKOM    7
      COM /YLC2/        AA2(131000)                                     ALLKOM    8
      COM /RLC1/        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, NDUMP, NQ, NQI, REZSIE, TAMB,   ALLKOM   12
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY          ALLKOM   13
      COMMON /GREEN/    ALPHA, NBP, NBUF, NSP, NPCMAX, JCEN, TEMIT      GREEN     2
      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
      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
      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                                                                       FLUSH     9
C         THIS ROUTINE FLUSHES THE ENERGY DEPOSITION BUFFER TO DISK     FLUSH    10
C                                                                       FLUSH    11
      CALL WTBUF (SLFSET3,EBLOCK,ID)                                    FLUSH    12
C                                                                       FLUSH    13
      NFLUSH=NFLUSH+ID/2                                                FLUSH    14
      IL=1                                                              FLUSH    15
      RETURN                                                            FLUSH    16
      END                                                               FLUSH    17
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	ETAB	()R	2C0	IJPS	-I	8C0	LAM	-R	12RL	NFRQ	-I	2C0	REAL	-	12F	TEMP	()R	8C0
AA2	()R	6LC	FLUSH	-	1SU	IP1	-I	8C0	LAMD	-R	12RL	NMOVE	-I	1;C0	RED	-	8CN	THY	-R	8C0
ALPHA	-R	9C0	FREQ	()R	2C0	ISCF1	-I	8C0	LAVNDER	-	10CN	NOPD	-I	2C0	RETURN	-	17F	TIME	-R	8C0
BTBL	()R	2C0	FSCAT	()R	10C0	ISCF2	-I	8C0	MU	-R	12RL	NOPT	-I	2C0	REZSIE	-R	8C0	TOUT	-R	8C0
DENS	()R	10C0	GRDVEL	-R	8C0	ISC2	-I	8C0	MUO2	-R	12RL	NPCMAX	-I	9C0	RLC1	-	7CN	TSTART	-R	8C0
DIMENSI	-	13F	GREEN	-	9CN	ISC3	-I	8C0	NAME	()I	8C0	NQ	-I	8C0	SIEMIN	-R	10C0	T1	-R	10C0
DT	-R	8C0	I	-I	4C0	ITV	-I	8C0	NBP	-I	9C0	NQI	-I	8C0	SIGA	()R	7LC	T2	-R	10C0
DTR	-R	8C0	IBAR	-I	8C0	J	-I	4C0	NBUF	-I	9C0	NSP	-I	9C0	SPTBL	()R	2C0	WTBUF	-	14SU
ECEN	-R	10C0	IESCAP	-I	10C0	JBAR	-I	8C0	NCOL	-I	10C0	OPDEN	()R	2C0	STATE	-	2CN	YLC1	-	5CN
EMC	-R	10C0	IJ	-I	4C0	JCEN	-I	9C0	NCYC	-I	8C0	OPTMP	()R	2C0	T	-R	8C0	YLC2	-	6CN
EM10	-R	8C0	IJM	-I	4C0	JP1	-I	8C0	NDIE	-I	10C0	PINK	-	4CN	TAMB	-R	8C0	YSC1	-	3CN
EQUIVAL	-	11F	IJP	-I	4C0	JP2	-I	8C0	NDUMP	-I	8C0	PTAB	()R	2C0	TEMIT	-R	9C0			

MULTIPLY-REFERENCED VARIABLES

AASC	()R	3C0	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ
		11EQ	11EQ																
BETALC	()R	11EQ	13D1																
CENTX	()R	11EQ	13D1																
CENTY	()R	11EQ	13D1																
COMMON	-	2F	3F	4F	8F	9F	10F												

```
CO       ()R    11EQ    1301
DELSM    ()R    11EQ    1301
E        ()R    11EQ    1301
EBLOCK   ()R    1 CO    14A6
EMOMLC   ()R    11EQ    1301
EP       ()R    11EQ    1301
ETIL     ()R    11EQ    1301
FOUTLC   ()R    11EQ    1301
FSN      ()R    11EQ    1301
GRIR     ()R    11EQ    1301
GRIZ     ()R    11EQ    1301
IO        -I    10CO    14A6    15      16=
LCM       -      SF      0F      7F
M        ()R    11EQ    12RL    1301
MP       ()R    11EQ    12RL    1301
NFLUSH    -I    1'CO    15=     15
P        ()R    11EQ    1301
PL       ()R    11EQ    1301
R        ()R    11EQ    1301
RCSQ     ()R    11EQ    1301
RM       ()R    11EQ    1301
RMP      ()R    11EQ    1301
RO       ()R    11EQ    1301
ROL      ()R    11EQ    1301
RVOL     ()R    11EQ    1301
RZEDEN   ()R    11EQ    1301
SIE      ()R    11EQ    1301
SIGPLC   ()R    11EQ    1301
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
```

```
 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=DSQRT(OMDIST)                                            POMEGA     8
 5          ADIST=1.0/(A(1)**2+A(2)**2+A(3)**2)                             POMEGA     9
 6          ADIST=DSQRT(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                                                    OMEGA    16
13            SBET=CROSS (ZP, B, YP)                                             OMEGA    17
14            IF (SBET.LT.1.0E-06) GO TO 11                                      OMEGA    18
15            UNITY=CROSS (YP, ZP, XP)                                           OMEGA    19
16            GO TO 31                                                           OMEGA    20
        C     ---   OMEGA PARALLEL TO A                                          OMEGA    21
17         11 STHT=CROSS (Z, B, YP)                                              OMEGA    22
18            IF (STHT.LT.1.0E-09) GO TO 21                                      OMEGA    23
19            STHT=1.0/STHT                                                      OMEGA    24
20            YP(1)=YP(1)*STHT                                                   OMEGA    25
21            YP(2)=YP(2)*STHT                                                   OMEGA    26
22            YP(3)=YP(3)*STHT                                                   OMEGA    27
23            UNITY=CROSS (YP, ZP, XP)                                           OMEGA    28
24            GO TO 31                                                           OMEGA    29
        C     ---   OMEGA PARALLEL TO A AND Z                                    OMEGA    30
25         21 XP(1)=YP(2)=1.0                                                    OMEGA    31
26            XP(2)=XP(3)=YP(1)=YP(3)=0.0                                        OMEGA    32
        C     ---   GENERAL CASE                                                 OMEGA    33
27         31 RN1=2.0*RANDOM(DUMMY)-1.0                                          OMEGA    34
28            RN2=6.28318*RANDOM(DUMMY)                                          OMEGA    35
29            CTHT=RN1                                                           OMEGA    36
30            STHT=SQRT(1.0-RN1**2)                                              OMEGA    37
31            CPHI=COS(RN2)                                                      OMEGA    38
32            SPHI=SIN(RN2)                                                      OMEGA    39
33            OMEGA(1)=(CPHI*XP(1)+SPHI*YP(1))*STHT+CTHT*ZP(1)                   OMEGA    40
34            OMEGA(2)=(CPHI*XP(2)+SPHI*YP(2))*STHT+CTHT*ZP(2)                   OMEGA    41
35            OMEGA(3)=(CPHI*XP(3)+SPHI*YP(3))*STHT+CTHT*ZP(3)                   OMEGA    42
36            OMDIST=1.0/(OMEGA(1)**2+OMEGA(2)**2+OMEGA(3)**2)                   OMEGA    43
37            OMDIST=SQRT(OMDIST)                                                OMEGA    44
38            OMEGA(1)=OMEGA(1)*OMDIST                                           OMEGA    45
39            OMEGA(2)=OMEGA(2)*OMDIST                                           OMEGA    46
40            OMEGA(3)=OMEGA(3)*OMDIST                                           OMEGA    47
        C                                                                        OMEGA    48
41            RETURN                                                             OMEGA    49
42            END                                                                OMEGA    50
 SINGLY REFERENCED VARIABLES
  COS     -   31SU   DATA    -    3F    DIMENSI -    2F    OMEGA  -    1SU   RETURN  -   41F    SIN     -   32SU
 MULTIPLY-REFERENCED VARIABLES
     11 -    14     17
     21 -    18     25
     31 -    16     29     27
A       ()R    1A6    2D1    5      5      5      10     11     12
ADIST   -R     5=     6      6      10     11     12
B       ()R    2D1    1.     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    1A6    2D1    4      4      4      7      8      9      33=    34=    35=    36     36     36     38=    38     39=
               39     41     40
QSQRT   -      6SU    3 SU   37SU
RANDOM  -      27SU   26SU
RN1     -R     27=    29     30
RN2     -R     28     31     32
SBET    -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    2D1    15     23     25=    26=    26=    33     34     35
YP      ()R    2D1    13     15     17     20=    20     21=    21     22=    22     23     25=    26=    26=    33     34     35
Z       ()R    2D1    3DA    17
ZP      ()R    2D1    7=     8=     9=     13     15     23     33     34     35
```

```
      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(131000)                                     ALLKOM    8
      LCM /RLC1/        SIGA(30000)                                     ALLKOM    9
      COMMON /RED/      NAME(12), DT, DTH, EM10, GRDVEL, 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
      ZETAR=1.982323234*RANDOM(DUMMY)                                   PFREQ     6
      ZETAA=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 ZETAR=AMIN1(X,ZETAR)                                              PFREQ     13
      ZETAR=-1.0/ZETAR                                                  PFREQ     14
      RN1=RANDOM(DUMMY)                                                 PFREQ     15
      RN2=RANDOM(DUMMY)                                                 PFREQ     16
      RN3=RANDOM(DUMMY)                                                 PFREQ     17
      RN4=RANDOM(DUMMY)                                                 PFREQ     18
      FREQP=ZETAR*ALOG(RN1*RN2*RN3*RN4)*TP                              PFREQ     19
      FREQP=2.4*A10**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	3C0	ETAB	()R	2C0	IP1	-I	8C0	JP1	-I	8C0	NQI	-I	8C0	RETURN	-	25F
AA1	()R	5LC	GRDVEL	-R	8C0	ISCF1	-I	8C0	JP2	-I	8C0	OPDEN	()R	2C0	REZSIE	-R	8C0
AA2	()R	6LC	I	-I	4C0	ISCF2	-I	8C0	NAME	()I	8C0	OPTMP	()R	2C0	RLC1	-	7CN
AMIN1	-	165U	IBAR	-I	8C0	ISC2	-I	8C0	NCYC	-I	8C0	PFREQ	-	1SU	SIGA	()R	7LC
BTBL	()R	2C0	IJ	-I	4C0	ISC3	-I	8C0	NDUMP	-I	8C0	PINK	-	4CN	SPTBL	()R	2C0
DT	-R	8C0	IJM	-I	4C0	ITV	-I	8C0	NOPD	-I	2C0	PTAB	()R	2C0	STATE	-	2CN
DTH	-R	8C0	IJP	-I	4C0	J	-I	4C0	NOPT	-I	2C0	CLOG	-	22SU	T	-R	8C0
EM10	-R	8C0	IJPS	-I	8C0	JBAR	-I	8C0	NQ	-I	8C0	RED	-	8CN	TAMB	-R	8C0

TEMP	()R	8C0	THY	-R	8C0	TIME	-R	8C0	TOUT	-R	8C0	TSTART	-R	8C0	YLC1	-	5CN
YLC2	-	6CN	YSC1	-	3CN												

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	2C0	24	24													
FREQP	-R	18G	22=	23=	23	24	24										
LCM	-	5F	6F	7F													
NFRQ	-I	2C0	24														
RANDOM	-	9SU	18SU	19SU	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											
ZETAR	-R	16=	17=	17	22												
ZETAR	-R	9=	13	18													
ZETAX	-R	11=	12=	12	13												

```
1            SUBROUTINE SUBSCR (FREQP, TLOG, DLOG, IJK)                          SUBSCR     2
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 /YLC1/         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, 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/-0.16787/,B/0.83293/,C/1.0008/                              SUBSCR     9
      C                                                                          SUBSCR    10
11           IF(TLOG.GT.0.136721)GOTO5                                          SUBSCR    11
12           XLOG=(TLOG-BL)*AL                                                  SUBSCR    12
13           JSUB=GEXP10(XLOG)                                                  SUBSCR    13
14           GOTO6                                                              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,NOPD)                                               SUBSCR    20
21           XLOG=GLOG10(FREQP)-14.38348144                                     SUBSCR    21
22           YLOG=(A*XLOG+B)*XLOG +C                                            SUBSCR    22
23           ISUB=GEXP10(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	GRDVEL	-R	8C0	ISCF1	-I	8C0	JP2	-I	8C0	PINK	-	4CN	SPTBL	()R	2C0	TOUT	-R	8C0
AA2	()R	6LC	I	-I	4C0	ISCF2	-I	8C0	MAX0	-	195U	PTAB	()R	2C0	STATE	-	2CN	TSTART	-R	8C0
BTBL	()R	2C0	IBAR	-I	8C0	ISC2	-I	8C0	NAME	()I	8C0	QLOG10	-	215U	SUBSCR	-	1SU	YLC1	-	5CN
DT	-R	8C0	IJ	-I	4C0	ISC3	-I	8C0	NCYC	-I	8C0	RED	-	8CN	T	-R	8C0	YLC2	-	6CN
DTR	-R	8C0	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	17DA	22				
AL	-R	9DA	12				
AS	-R	9DA	15				
B	-R	17DA	22				
BL	-R	9DA	12				
BS	-R	9DA	15				
C	-R	17DA	22				
COMMON	-	2F	3F	4F	8F		
DATA	-	9F	11F				
DLOG	-R	1A6	16				
FREQP	-R	1A6	21				
IJK	-I	1A6	25=				
ISUB	-I	23=	24=	24	25		
JSUB	-I	13=	15=	16=	18	19=	19	25
KSUB	-I	16=	17=	17	20=	20	25
LCM	-	5F	6F	7F			
MIN0	-	185U	2 SU	24SU			
NFRQ	-I	2C0	24	25	25		

```
NOPD     -I    2CU   2:
NOPT     -I    2CU   18      25
OPDEN    ()R   2CU   16
QEXP10   -     13SU  23SU
TLOG     -R    1AG   11      12      15
ALOG     -R    12=   13      21=     22      22
YLOG     -R    22=   23
```

```
1            FUNCTION CROSS (A,B,C)                                          CROSS     2
2            DIMENSION          A(3), B(3), C(3)                             CROSS     3
3            C(1)=A(2)*B(3)-A(3)*B(2)                                        CROSS     4
4            C(2)=-A(1)*B(3)+A(3)*B(1)                                       CROSS     5
5            C(3)=A(1)*B(2)-A(2)*B(1)                                        CROSS     6
6            CROSS=QSQRT(C(1)**2+C(2)**2+C(3)**2)                            CROSS     7
7            RETURN                                                          CROSS     8
8            END                                                             CROSS     9
 SINGLY REFERENCED VARIABLES
  DIMENSI -    2F    QSQRT   -    6SU   RETURN  -    7F
```

```
 MULTIPLY-REFERENCED VARIABLES
A        ()R   1AG   2U1   3       3       4       4       5       5
B        ()R   1AG   2U1   3       3       4       4       5       5
C        ()R   1AG   2U1   3=      4=      5=      6       6       6
CROSS    -     1SU   6=
```

```
1            SUBROUTINE CENTROY (ISC, JSC, CWGT)                             CENTROY   2
     C                                                                       CENTROY   3
2            COMMON /MAUVE/     IBAR, JP1, NQ, NQ1, RHOP, ZP, DCELL          CENTROY   4
3            DIMENSION          CENTX(5), CENTY(5), XYECS(60), CWGT(3)       CENTROY   5
4            CENTX(1)=CENTX(4)=0.0                                           CENTROY   6
5            CENTY(1)=CENTY(4)=0.0                                           CENTROY   7
6            IECS=(JSC-2)*NQ1+(ISC-1)*NQ                                     CENTROY   8
7            IF (JSC.EQ.2) GO TO 3                                           CENTROY   9
8            CALL ECHO (XYECS, IECS, 8, NE)                                  CENTROY  10
9            CENTX(1)=XYECS(7)                                               CENTROY  11
10           CENTY(1)=XYECS(8)                                               CENTROY  12
11         3 IECS=IECS+NQ1-NQ                                                CENTROY  13
12           CALL ECHO (XYECS, IECS, 48, NE)                                 CENTROY  14
13           CENTX(2)=XYECS(7)                                               CENTROY  15
14           CENTX(5)=XYECS(7+NQ)                                            CENTROY  16
15           CENTX(3)=XYECS(7+NQ+NQ)                                         CENTROY  17
16           CENTY(2)=XYECS(8)                                               CENTROY  18
17           CENTY(5)=XYECS(8+NQ)                                            CENTROY  19
18           CENTY(3)=XYECS(8+NQ+NQ)                                         CENTROY  20
19           IF (ISC.EQ.1) CENTX(2)=CENTY(2)=0.0                             CENTROY  21
20           IF (JSC.EQ.JP1) GO TO 4                                         CENTROY  22
21           IECS=IECS+NQ1+NQ                                                CENTROY  23
22           CALL ECHO (XYECS, IECS, 8, NE)                                  CENTROY  24
23           CENTX(4)=XYECS(7)                                               CENTROY  25
24           CENTY(4)=XYECS(8)                                               CENTROY  26
     C                                                                       CENTROY  27
25         4 DX=RHOP-CENTX(5)                                                CENTROY  28
26           DY=ZP-CENTY(5)                                                  CENTROY  29
```

```
      W1=W2=1.0                                                          CENTROY   30
      IF (DX.GE.0.0) GO TO 12                                            CENTROY   31
      DX1=CENTX(2)-CENTX(5)                                              CENTROY   32
      DY1=CENTY(2)-CENTY(5)                                              CENTROY   33
      ISC=ISC-1                                                          CENTROY   34
      IF (ISC.GT.0) GO TO 13                                             CENTROY   35
      W1=DY1=0.0                                                         CENTROY   36
      ISC=1                                                              CENTROY   37
      GO TO 13                                                           CENTROY   38
   12 DX1=CENTX(3)-CENTX(5)                                              CENTROY   39
      DY1=CENTY(3)-CENTY(5)                                              CENTROY   40
      ISC=ISC+1                                                          CENTROY   41
      IF (ISC.LE.IBAR) GO TO 13                                          CENTROY   42
      W1=DY1=0.0                                                         CENTROY   43
      ISC=IBAR                                                           CENTROY   44
   13 IF (DY.GE.0.0) GO TO 14                                            CENTROY   45
      DXJ=CENTX(1)-CENTX(5)                                              CENTROY   46
      DYJ=CENTY(1)-CENTY(5)                                              CENTROY   47
      JSC=JSC-1                                                          CENTROY   48
      IF (JSC.GE.2) GO TO 15                                             CENTROY   49
      W2=DXJ=0.0                                                         CENTROY   50
      JSC=2                                                              CENTROY   51
      GO TO 15                                                           CENTROY   52
   14 DXJ=CENTX(4)-CENTX(5)                                              CENTROY   53
      DYJ=CENTY(4)-CENTY(5)                                              CENTROY   54
      JSC=JSC+1                                                          CENTROY   55
      IF (JSC.LE.JP1) GO TO 15                                           CENTROY   56
      W2=DXJ=0.0                                                         CENTROY   57
      JSC=JP1                                                            CENTROY   58
   15 XX=1.0/(DX1*DYJ-DXJ*DY1)                                           CENTROY   59
      CWGT(1)=(DX*DYJ-DY*DXJ)*XX*W1                                      CENTROY   60
      CWGT(2)=(DY*DX1-DX*DY1)*XX*W2                                      CENTROY   61
      CWGT(3)=1.0-CWGT(1)-CWGT(2)                                        CENTROY   62
C                                                                        CENTROY   63
      RETURN                                                             CENTROY   64
      END                                                                CENTROY   65
```

SINGLY REFERENCED VARIABLES

CENTROY - 1SU COMMON - 2F DCELL -R 2C0 DIMENSI - 3F MAUVE - 2CN RETURN - 60F

MULTIPLY-REFERENCED VARIABLES

3 -	7	11*															
4 -	8	45*															
12 -	28	36*															
13 -	32	35	39	42*													
14 -	42	5.*															
15 -	46	49	53	56*													
CENTX ()R	3D1	4=	4=	9=	13=	14=	15=	19=	23=	25	29	29	36	36	43	43	50
	50																
CENTY ()R	3D1	5=	5=	10=	16=	17=	18=	19=	24=	26	30	30	37	37	44	44	51
	51																
CWGT ()R	1AG	3D1	57=	58=	59=	59	59										
DX -R	25=	28	57	58													
DX1 -R	29=	36=	56	58													
DXJ -R	43=	47=	54=	54=	56	57											
DY -R	26=	42	57	58													
DY1 -R	30=	33=	37=	43=	56	58											
DYJ -R	44=	51=	56	57													
ELRD -	8SU	12SU	22SU														
IBAR -I	2C0	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	2C0	2	53	55													
JSC -I	1AG	6	7	20	45=	45	46	48=	52=	52	53	55=					
NE -I	6AG	12AG	22AG														
NQ -I	2C0	6	11	14	15	15	17	18	18	21							
NQI -I	2C0	6	11	21													
RHOP -R	2C0	25															
W1 -R	27=	33=	46=	57													

```
W2      -R   27=    47=    54=    58
XX      -R   56=    57     58
XYECS   ()R   301    8AG    9      10      12AG   13      14      15      16      17      18      22AG   23      24
ZP      -R    2CU    26
```

```
      SUBROUTINE WALK (A, OMEGA, IDIE, FREWP, 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                  FREW(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, 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, GRDVEL, 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
      COMMON /GREEN/    ALPHA, AMP, NBUF, NSP, NPCMAX, JCEN, TEMII              GREEN   2
      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
      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,CENTA),                            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,CW,EMOMLC),                           EQVREAL 7
     6                  (AASC(13),VTIL,VL,UMOMLC),                              EQVREAL 8
     7                  (AASC(14),ROL,HETALC,FOUTLC), (AASC(15),SIE),           EQVREAL 9
     8                  (AASC(16),DELSM,SIGPLC),                                EQVREAL 10
     9                  (AASC(17),GRIR,UG,REZDEN),                              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), 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), CW(1), EMOMLC(1), VTIL(1), VL(1),                DIMEN   6
     6                  UMOMLC(1), ROL(1), HETALC(1), FOUTLC(1),                DIMEN   7
     7                  SIE(1), DELSM(1), SIGPLC(1), GRIR(1), UG(1),            DIMEN   8
     8                  REZDEN(1), GRIZ(1), VG(1), FSN(1)                       DIMEN   9
      COMMON /MAUVE/    MI, MJ, MG, MGI, RMOP, ZP, DCELL                        WALK    12
      DIMENSION         A(3), OMEGA(3), CWGT(3), EDEP(3), XYECS(32)             WALK    13
      DATA              MASK /07777777777777[0_0000/                            WALK    14
 2001 FORMAT            (1H0,*ENERGY CUT OF RANGE*/6H I     ,I12,6X,            WALK    15
     1                  6H J     ,I12,6X,6H RMOP ,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
      ICLU=I                                                                    WALK    20
      JCLU=J                                                                    WALK    21
      NFCOL=0                                                                   WALK    22
      ISTEP=0                                                                   WALK    23
      DCEN=3.0E+05*(T2-T1)                                                      WALK    24
      RMOP=SQRT (A(1)*A(1)+A(2)*A(2))                                           WALK    25
      ZP=A(3)                                                                   WALK    26
```

```
      ISTORE=SHIFT(I,9)+J                                              WALK
      FSTORE=FREQP.AND.MASK                                            WALK
      IF (IDIE.EQ.1) GO TO 3                                           WALK
      EDEP(1)=RHOP                                                     WALK
      EDEP(2)=ZP                                                       WALK
      EDEP(3)=-EPART                                                   WALK
      ID1=ID+1                                                         WALK
      CALL PARFAO (EDEP, EBLOCK(ID1), IRNG)                            WALK
      IF (IRNG.NE.0) GO TO 201                                         WALK
      ID=ID+2                                                          WALK
      EBLOCK(ID)=FSTORE.OR.ISTORE                                      WALK
      IF (ID.EQ.NBUF) CALL FLUSH                                       WALK
    3 IDIE=0                                                           WALK
C     ---   COMPUTE DENS TEMP FSCAT AT PARTICLE LOCATION               WALK
   10 ISC=(JOLD-1)*IP1+IOLD                                            WALK
      IF (TEMP(ISC).GT.(TAMB+1.0E-06)) GO TO 11                        WALK
      FSP=FSCAT(ISC)                                                   WALK
      TP=TEMP(ISC)                                                     WALK
      DP=DENS(ISC)                                                     WALK
      GO TO 21                                                         WALK
   11 ISC=IOLD                                                         WALK
      JSC=JOLD                                                         WALK
      CALL CENTROY (ISC, JSC, CWGT)                                    WALK
   12 ISC1=(JOLD-1)*IP1+ISC                                            WALK
      ISC2=(JSC-1)*IP1+IOLD                                            WALK
      TP=TEMP(ISC1)*CWGT(1)+TEMP(ISC2)*CWGT(2)+                        WALK
     1 TEMP(ISC)*CWGT(3)                                               WALK
      FSP=FSCAT(ISC1)*CWGT(1)+FSCAT(ISC2)*CWGT(2)+                     WALK
     1 FSCAT(ISC)*CWGT(3)                                              WALK
   13 DP=DENS(ISC1)*CWGT(1)+DENS(ISC2)*CWGT(2)+                        WALK
     1 DENS(ISC)*CWGT(3)                                               WALK
C     ---   COMPUTE MATERIAL OPACITY AND MEAN FREE PATH                WALK
   21 TLOG=ALOG10(TP)                                                  WALK
      DLOG=ALOG10(DP)                                                  WALK
      TLOG=AMIN1(TLOG,OPTMP(NOPT))                                     WALK
      DLOG=AMIN1(DLOG,OPDEN(NOPD))                                     WALK
      TLOG=AMAX1(TLOG,OPTMP(1))                                        WALK
      DLOG=AMAX1(DLOG,OPDEN(1))                                        WALK
      CALL SUBSCR (FREQP, TLOG, DLOG, IJK)                             WALK
      OP=SIGA(IJK)                                                     WALK
      SIGNU=OEXP10(OP)                                                 WALK
      DMFP=1.0/SIGNU                                                   WALK
C     ---   COMPUTE COLLISION DISTANCE                                 WALK
      IF (ISTEP.GT.0) GO TO 22                                         WALK
      RN1=RANDOM(DUMMY)                                                WALK
      RMFP=ABS(ALOG(RN1))                                              WALK
   22 DCOL=RMFP*DMFP                                                   WALK
      DMOVE=AMIN1(DCOL,DCEN,DCELL)                                     WALK
C     ---   MOVE PARTICLES                                             WALK
   24 ENEW=EPART*EXP(-FSP*DMOVE*SIGNU)                                 WALK
      ESCORE=EPART-ENEW                                                WALK
      EPART=ENEW                                                       WALK
      NMOVE=NMOVE+1                                                    WALK
      A(1)=A(1)+DMOVE*OMEGA(1)                                         WALK
      A(2)=A(2)+DMOVE*OMEGA(2)                                         WALK
      A(3)=A(3)+DMOVE*OMEGA(3)                                         WALK
      ZL=ZP                                                            WALK
      RHOO=RHOP                                                        WALK
      ZP=A(3)                                                          WALK
      RHOP=SQRT (A(1)*A(1)+A(2)*A(2))                                  WALK
      IF (ESCORE.LE.1.0E-20) GO TO 28                                  WALK
      ZL=0.5*(ZP+ZL)                                                   WALK
      RHOO=0.5*(RHOP+RHOO)                                             WALK
      EDEP(1)=RHOO                                                     WALK
      EDEP(2)=ZO                                                       WALK
      EDEP(3)=ESCORE                                                   WALK
      ID1=ID+1                                                         WALK
      CALL PARFAO (EDEP, EBLOCK(ID1), IRNG)                            WALK
```

```
      IF (IRNG.NE.0) GO TO 201                                          WALK       95
      ID=ID+2                                                           WALK       96
      EBLOCK(ID)=FSTORE.OR.ISTORE                                       WALK       97
      IF(ID.EQ.NBUF)CALL FLUSH                                          WALK       98
C                                                                       WALK       99
   28 CALL WHERE (ICLD, JOLD)                                           WALK      100
      ISTORE=SHIFT(IOLD,9)+JOLD                                         WALK      101
      IF (EPART.LE.EDEATH) GO TO 151                                    WALK      102
      IF (ICLD.GT.IMAX) GO TO 91                                        WALK      103
      IF (JOLD.LT.2.OR.JOLD.GT.JP1) GO TO 91                            WALK      104
      DCEN=DCEN-DMOVE                                                   WALK      105
      IF (DCEN.LE.0.0) GO TO 81                                         WALK      106
      DCOL=DCOL-DMOVE                                                   WALK      107
      IF (DCOL.LE.0.0) GO TO 101                                        WALK      108
      ISTEP=ISTEP+1                                                     WALK      109
      TI=TI+DMOVE*0.333333E-05                                          WALK      110
      RMFP=RMFP-DMOVE*SIGNO                                             WALK      111
      GO TO 10                                                          WALK      112
C     ---   CENSUS PARTICLE                                           WALK      113
   81 ICEN=1                                                            WALK      114
      FREQP=FSTORE.OR.ISTORE                                            WALK      115
      EDEP(1)=RMFP                                                      WALK      116
      EDEP(2)=ZP                                                        WALK      117
      EDEP(3)=EPART                                                     WALK      118
      ID1=ID+1                                                          WALK      119
      CALL PARFND (EDEP, EBLOCK(ID1), IRNG)                             WALK      120
      IF (IRNG.NE.0) GO TO 201                                          WALK      121
      ID=ID+2                                                           WALK      122
      EBLOCK(ID)=FREQP                                                  WALK      123
      IF (ID.EQ.NBUF) CALL FLUSH                                        WALK      124
      RETURN                                                            WALK      125
C     ---   PARTICLE ESCAPE FROM MESH                                 WALK      126
   91 IF (EPART.LE.1.0E-20) GO TO 93                                    WALK      127
      EDEP(1)=RMFP                                                      WALK      128
      EDEP(2)=ZP                                                        WALK      129
      EDEP(3)=EPART                                                     WALK      130
      ID1=ID+1                                                          WALK      131
      CALL PARFND (EDEP, EBLOCK(ID1), IRNG)                             WALK      132
      IF (IRNG.NE.0) GO TO 201                                          WALK      133
      ID=ID+2                                                           WALK      134
      EBLOCK(ID)=FSTORE.OR.ISTORE                                       WALK      135
      IF(ID.EQ.NBUF)CALL FLUSH                                          WALK      136
   93 IESCAP=IESCAP+1                                                   WALK      137
      RETURN                                                            WALK      138
C     ---   PARTICLE COLLISON                                         WALK      139
  101 NPCOL=NPCOL+1                                                     WALK      140
      NCOL=NCOL+1                                                       WALK      141
      TI=TI+DMOVE*0.333333E-05                                          WALK      142
      IF (NPCOL.GT.NPCMAX) GO TO 121                                    WALK      143
C     ---   INITIALIZE REEMITTED PARTICLE PROPERTIES                  WALK      144
C     ---   FREQ AND DIRECTION OF REEMITTED PARTICLE                  WALK      145
      ISC=(JOLD-1)*IP1+IOLD                                             WALK      146
      IF (TEMP(ISC).GT.(TAMB+1.0E-06)) GO TO 111                        WALK      147
      FSP=FSCAT(ISC)                                                    WALK      148
      IF (RANDOM(DUMMY).GT.(1.0-FSP)) GO TO 151                         WALK      149
      TP=TEMP(ISC)                                                      WALK      150
      DP=DENS(ISC)                                                      WALK      151
      GO TO 115                                                         WALK      152
  111 ISC=IOLD                                                          WALK      153
      JSC=JOLD                                                          WALK      154
      CALL CENTRD (ISC, JSC, CWGT)                                      WALK      155
      ISC1=(JOLD-1)*IP1+ISC                                             WALK      156
      ISC2=(JSC-1)*IP1+IOLD                                             WALK      157
      FSP=FSCAT(ISC1)*CWGT(1)+FSCAT(ISC2)*CWGT(2)+                      WALK      158
     1 FSCAT(ISC)*CWGT(3)                                               WALK      159
      IF (RANDOM(DUMMY).GT.(1.0-FSP)) GO TO 151                         WALK      160
      TP=TEMP(ISC1)*CWGT(1)+TEMP(ISC2)*CWGT(2)+                         WALK      161
     1 TEMP(ISC)*CWGT(3)                                                WALK      162
```

```
147           DR=DENS(IJSC1)*CWGT(1)+DENS(IJSC2)*CWGT(2)+DENS(IJSC)*CWGT(3)      WALK     163
148        115 ISTEP=0                                                           WALK     164
149           CALL PFREQ (FREQP, TP)                                             WALK     165
150           FSTORE=FREQP.AND.MASK                                              WALK     166
151           CALL POMEGA (A, OMEGA)                                             WALK     167
152           DCEN=3.0E+05*(T2-T1)                                               WALK     168
153           GO TO 21                                                           WALK     169
          C      ---   PARTICLE SPLIT                                           WALK     170
154        121 ILIE=1                                                            WALK     171
155           EPART=-EPART                                                       WALK     172
156           ELEP(1)=FREQP                                                      WALK     173
157           ELEP(2)=EDEP(3)=T1                                                 WALK     174
158           CALL PARFND (EDEP, FSTORE, IRNG)                                   WALK     175
159           FSTORE=FSTORE.AND.MASK                                             WALK     176
160           FREQP=FSTORE.OR.IJSTORE                                            WALK     177
161           RETURN                                                             WALK     178
          C      ---   PARTICLE DEATH                                           WALK     179
162        151 IF (EPART.LE.1.0E-20) GO TO 153                                   WALK     180
163           EDEP(1)=RHOP                                                       WALK     181
164           EDEP(2)=ZP                                                         WALK     182
165           EDEP(3)=EPART                                                      WALK     183
166           ID1=ID+1                                                           WALK     184
167           CALL PARFND (EDEP, EBLOCK(ID1), IRNG)                              WALK     185
168           IF (IRNG.NE.0) GO TO 201                                           WALK     186
169           ID=ID+2                                                            WALK     187
170           EBLOCK(ID)=FSTORE.OR.IJSTORE                                       WALK     188
171           IF(ID.EQ.NBUF)CALL FLUSH                                           WALK     189
172        153 NDIE=NDIE+1                                                       WALK     190
173           RETURN                                                             WALK     191
          C                                                                     WALK     192
174        201 PRINT 2001,        I, J, EDEP                                     WALK     193
175           RETURN                                                             WALK     194
          C                                                                     WALK     195
176           END                                                                WALK     196
```

SINGLY REFERENCED VARIABLES

12 -	48*	EMC	-R	10C0	IJPS	-I	8C0	MAUVE	-	14CN	NFRQ	-I	2C0	RED	-	8CN	TSTART	-R	8C0
13 -	52*	EM10	-R	8C0	ISCF1	-I	8C0	MI	-I	14C0	NQ	-I	8C0	REZSIE	-R	8C0	WALK	-	1SU
24 -	68*	EQUIVAL	-	11F	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	10C0	XYECS	()R 15DI
AA2	()R	6LC	EXP	-	68SU	ISC3	-I	8C0	MQI	-I	14C0	PFREQ	-	149SU	SPTBL	()R	2C0	YLC1	- 5CN
ABS	-	65SU	FORMAT	-	17F	ITV	-I	8C0	MU	-R	12RL	PINK	-	4CN	STATE	-	2CN	YLC2	- 6CN
ALPHA	-R	9C0	FREQ	()R	2C0	JBAR	-I	8C0	MUO2	-R	12RL	POMEGA	-	151SU	SUBSCR	-	59SU	YSC1	- 3CN
BTBL	()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	8C0	IJ	-I	4C0	LAM	-R	12RL	NCYC	-I	8C0	QEXP10	-	61SU	THY	-R	8C0		
DTR	-R	8C0	IJM	-I	4C0	LAMD	-R	12RL	NDUMP	-I	8C0	RLCG	-	65SU	TIME	-R	8C0		
ECEN	-R	10C0	IJP	-I	4C0	LAVNDER	-	10CN	NFLUSH	-I	10C0	REAL	-	12F	TOUT	-R	8C0		

MULTIPLY-REFERENCED VARIABLES

3 -	28	38*						
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 1501 24 24 24 24 25 72= 72 73= 73 74= 74 77 78 78 78
78 151AG

```
NBUF     -I    9C0   37      90     114     125     171
NCOL     -I    1?C0  129=    129
NDIE     -I    1?C0  172=    172
NMOVE    -I    1?C0  71=     71
NOPD     -I    2C0   56
NOPT     -I    2C0   55
NPCMAX   -I    9C0   131
NPCOL    -I    21=   128=    128     131
OMEGA    ()R   1AG   150I    72      73      74      151AG
OP       -R    61=   61
OPDEN    ()R   2C0   56      58
OPTMP    ()R   2C0   55      57
P        ()R   11EQ  130I
PARENO   -     33SU  86SU    110SU   121SU   158SU   167SU
PL       ()R   11EQ  130I
QLOG10   -     53SU  54SU
QSQRT    -     24SU  76SU
R        ()R   11EQ  130I
RANDOM   -     64SU  135SU   145SU
RCSQ     ()R   11EQ  130I
RETURN   -     115F  127F    161F    173F    175F
RHOD     -R    76=   81=     81      82
RHOP     -R    14C0  24=     29      76      78=     81      106     117     163
RM       ()R   11EQ  130I
RMFP     -R    65=   66      102=    102
RMS      ()R   11EQ  130I
RNI      -R    64=   65
RO       ()R   11EQ  130I
ROL      ()R   11EQ  130I
RVOL     ()R   11EQ  130I
RZERO    ()R   11EQ  130I
SHIFT    -     26SU  92SU
SIE      ()R   11EQ  130I
SIGA     ()R   7LC   6?
SIGNU    -R    61=   62      68      102
SIGPLC   ()R   11EQ  130I
TAMB     -R    8C0   4       133
TEMP     ()R   8C0   4       42      50      50      50      133     136     146     146     146
TLOG     -R    53=   55=     55      57=     57      59AG
TP       -R    42=   5?=     53      136=    146=    149AG
T1       -R    14C0  23      101=    101     130=    130     152     157
T2       -R    14C0  23      152
U        ()R   11EQ  130I
UG       ()R   11EQ  130I
UL       ()R   11EQ  130I
UMOMLC   ()R   11EQ  130I
UP       ()R   11EQ  130I
UTIL     ()R   11EQ  130I
V        ()R   11EQ  130I
VG       ()R   11EQ  130I
VL       ()R   11EQ  130I
VP       ()R   11EQ  130I
VTIL     ()R   11EQ  130I
X        ()R   11EQ  130I
XPAR     ()R   11EQ  130I
Y        ()R   11EQ  130I
YPAR     ()R   11EQ  130I
ZD       -R    75=   8?=     80      83
ZP       -R    14C0  25=     30      75      77=     80      107     118     164
```

```
      SUBROUTINE WHERE (I, J)                                          WHERE       2
C                                                                      WHERE       3
      COMMON /MAUVE/    IBAR, JP1, NQ, NQI, RHOP, ZP, DCELL          WHERE       4
      DIMENSION         XYECS(30)                                    WHERE       5
C                                                                      WHERE       6
      INEW=IOLD=I                                                      WHERE       7
      JNEW=JOLD=J                                                      WHERE       8
      IECS=(J-1)*NQI+(I-1)*NQ                                          WHERE       9
      CALL ECHO (XYECS,IECS,30,NE)                                     WHERE      10
      ASW=AYECS(1)                                                     WHERE      11
      YSW=AYECS(3)                                                     WHERE      12
      ASE=AYECS(NQ+1)                                                  WHERE      13
      YSE=AYECS(NQ+3)                                                  WHERE      14
      IECS=IECS+NQI                                                    WHERE      15
      CALL ECHO (XYECS,IECS,30,NE)                                     WHERE      16
      ANW=AYECS(1)                                                     WHERE      17
      YNW=AYECS(3)                                                     WHERE      18
      ANE=AYECS(NQ+1)                                                  WHERE      19
      YNE=AYECS(NQ+3)                                                  WHERE      20
C     ---   WEST                                                       WHERE      21
   11 IF (INEW.LE.1) GO TO 91                                          WHERE      22
      ITEST=0                                                          WHERE      23
      IF (RHOP.LT.ANW) ITEST=ITEST+1                                   WHERE      24
      IF (RHOP.LT.ASW) ITEST=ITEST+1                                   WHERE      25
      IF (ITEST-1) 91, 21, 31                                          WHERE      26
   21 TEST=ASW+(XNW-XSW)*(ZP-YSW)/(YNW-YSW)                            WHERE      27
      IF (RHOP.GT.TEST) GO TO 91                                       WHERE      28
   31 INEW=INEW-1                                                      WHERE      29
      ANE=ANW                                                          WHERE      30
      YNE=YNW                                                          WHERE      31
      ASE=ASW                                                          WHERE      32
      YSE=YSW                                                          WHERE      33
      IECS=(JNEW-1)*NQI+(INEW-1)*NQ                                    WHERE      34
      CALL ECHO (XYECS,IECS,3,NE)                                      WHERE      35
      ASW=AYECS(1)                                                     WHERE      36
      YSW=AYECS(3)                                                     WHERE      37
      IECS=IECS+NQI                                                    WHERE      38
      CALL ECHO (XYECS,IECS,3,NE)                                      WHERE      39
      ANW=AYECS(1)                                                     WHERE      40
      YNW=AYECS(3)                                                     WHERE      41
      GO TO 11                                                         WHERE      42
C                                                                      WHERE      43
   91 IF (INEW.NE.IOLD) GO TO 211                                      WHERE      44
C     ---   EAST                                                       WHERE      45
  111 ITEST=0                                                          WHERE      46
      IF (RHOP.GT.ANE) ITEST=ITEST+1                                   WHERE      47
      IF (RHOP.GT.ASE) ITEST=ITEST+1                                   WHERE      48
      IF (ITEST-1) 211,121,131                                         WHERE      49
  121 TEST=ASE+(XNE-ASE)*(ZP-YSE)/(YNE-YSE)                            WHERE      50
      IF (RHOP.LE.TEST) GO TO 211                                      WHERE      51
  131 INEW=INEW+1                                                      WHERE      52
      IF (INEW.GT.IBAR) GO TO 401                                      WHERE      53
      ANW=ANE                                                          WHERE      54
      YNW=YNE                                                          WHERE      55
      ASW=ASE                                                          WHERE      56
      YSW=YSE                                                          WHERE      57
      IECS=(JNEW-1)*NQI+INEW*NQ                                        WHERE      58
      CALL ECHO (XYECS,IECS,3,NE)                                      WHERE      59
      ASE=AYECS(1)                                                     WHERE      60
      YSE=AYECS(3)                                                     WHERE      61
      IECS=IECS+NQI                                                    WHERE      62
      CALL ECHO (XYECS,IECS,3,NE)                                      WHERE      63
      ANE=AYECS(1)                                                     WHERE      64
      YNE=AYECS(3)                                                     WHERE      65
      GO TO 111                                                        WHERE      66
C     ---   SOUTH                                                      WHERE      67
  211 ITEST=0                                                          WHERE      68
      IF (ZP.LT.YSW) ITEST=ITEST+1                                     WHERE      69
```

```
 63          IF (ZP.LT.YSE) ITEST=ITEST+1                                      WHERE    70
 64          IF (ITEST-1) 291,221,231                                          WHERE    71
 65      221 TEST=YSE+(YSW-YSE)*(RHOP-XSE)/(XSW-XSE)                           WHERE    72
 66          IF (ZP.GE.TEST) GC TO 291                                         WHERE    73
 67      231 JNEW=JNEW-1                                                       WHERE    74
 68          IF (JNEW.LT.2) GO TO 401                                          WHERE    75
 69          XNW=XSW                                                           WHERE    76
 70          YNW=YSW                                                           WHERE    77
 71          XNE=XSE                                                           WHERE    78
 72          YNE=YSE                                                           WHERE    79
 73          IECS=(JNEW-1)*NQI+(INEW-1)*NQ                                     WHERE    80
 74          CALL ECRD (XYECS,IECS,30,NE)                                      WHERE    81
 75          XSW=XYECS(1)                                                      WHERE    82
 76          YSW=XYECS(3)                                                      WHERE    83
 77          XSE=XYECS(NQ+1)                                                   WHERE    84
 78          YSE=XYECS(NQ+3)                                                   WHERE    85
 79          GC TO 211                                                         WHERE    86
       C                                                                       WHERE    87
 80      291 IF (JNEW.NE.JOLD) GO TO 391                                       WHERE    88
       C     ---   NORTH                                                       WHERE    89
 81      311 ITEST=0                                                           WHERE    90
 82          IF (ZP.GT.YNW) ITEST=ITEST+1                                      WHERE    91
 83          IF (ZP.GT.YNE) ITEST=ITEST+1                                      WHERE    92
 84          IF (ITEST-1) 391,321,331                                          WHERE    93
 85      321 TEST=YNE+(YNW-YNE)*(RHOP-XNE)/(XNW-XNE)                           WHERE    94
 86          IF (ZP.LT.TEST) GC TO 391                                         WHERE    95
 87      331 JNEW=JNEW+1                                                       WHERE    96
 88          IF (JNEW.GT.JP1) GO TO 401                                        WHERE    97
 89          XSW=XNW                                                           WHERE    98
 90          YSW=YNW                                                           WHERE    99
 91          XSE=XNE                                                           WHERE   100
 92          YSE=YNE                                                           WHERE   101
 93          IECS=JNEW*NQI+(INEW-1)*NQ                                         WHERE   102
 94          CALL ECRD (XYECS,IECS,30,NE)                                      WHERE   103
 95          XNW=XYECS(1)                                                      WHERE   104
 96          YNW=XYECS(3)                                                      WHERE   105
 97          XNE=XYECS(NQ+1)                                                   WHERE   106
 98          YNE=XYECS(NQ+3)                                                   WHERE   107
 99          GC TO 311                                                         WHERE   108
       C                                                                       WHERE   109
100      391 IF (JNEW.EQ.JOLD) GO TO 401                                       WHERE   110
101          IOLD=INEW                                                         WHERE   111
102          JOLD=JNEW                                                         WHERE   112
103          GC TO 11                                                          WHERE   113
       C                                                                       WHERE   114
104      401 I=INEW                                                            WHERE   115
105          J=JNEW                                                            WHERE   116
106          DCELL=0.25*(XNE-XNW+XSE-XSW+YNW-YSW+YNE-YSE)                      WHERE   117
107          RETURN                                                            WHERE   118
108          END                                                               WHERE   119
 SINGLY REFERENCED VARIABLES
  COMMON  -    2F    DIMENSI -    3F     MADVE   -    2CN    RETURN  -  107F    WHERE   -    1SU
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
      11 -     14*      36      103
      21 -     22       23*
      31 -     22       25*
      91 -     18       22       24       39*
     111 -     41*      6
     121 -     43       44*
     131 -     43       46*
     211 -     39       43       45       61*      79
     221 -     64       65*
     231 -     64       67*
     291 -     64       66       80*
     311 -     81*      99
     321 -     84       85*
     331 -     84       87*
```

```
    391 -    81      89      86     100*
    401 -    47      66      88     100#    104*
DCELL     -R    2CU   106=
ECRD      -     75U   135U    31SU    35SU    53SU    57SU    74SU    94SU
I         -I    1AG     4       6     104=
IBAR      -I    2CU    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=     2.=     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=     36      52     67=     67     68      73      80     87=     87     88     93     100     102     105
JOLD      -I     5=     80     100     102=
JP1       -I    2CU    88
NE        -I    7AG    13AG    31AG    35AG    53AG    57AG    74AG    94AG
NO        -I    2CU     6      10      11      16      17      30      52     73      77     78     93      97      98
NQI       -I    2CU     6      12      30      34      52      56      73     93
RHOP      -R    2CU    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=    25      23      26     36=     48=     69=     85     89     95=    106
XSE       -R    17=    26=     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   301    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    2CU    23      44      62     63      66      82      83     86
```

```
      1            OVERLAY (YOKIFER,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/    NOPT, NOPO, NERO, 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, GRDVEL, IBAR, IJPS, ALLKOM   10
                  1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,    ALLKOM   11
                  2                  JP1, JP2, NCYC, NDUMP, NQ, NQI, REZSIE, TIMB, 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 /LAVNDER/  DENS(7500), SBLOCK(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,XMAX), (AASC(2),R,YMAX), (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,UPUMLC),                   EQVREAL   8
                  7                  (AASC(14),ROL,HFTALC,FOUTLC), (AASC(15),SIE), EQVREAL   9
                  8                  (AASC(16),DELSP,SIGPLC),                     EQVREAL  10
```

```
     5                  (AASC(17),GRIR,UG,R/EDEN),                          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), RP(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), RUL(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
      C
14    DIMENSION          EDEP(3), EPART(7500), EMSN(7500)                    ESTEP     13
15    EQUIVALENCE        (FSCAT,EPART), (DENS,EMSN)                          ESTEP     14
16    LEXT               UBLINT                                              ESTEP     15
17    2001 FORMAT        (1H0,*FINAL RADIATION ENERGIES*/                    ESTEP     16
     1                  6H EMC  ,1PE12.4,6X,6H EABS ,1PE12.4,6X,            ESTEP     17
     2                  6H ELOST,1PE12.4,6X,6H EEMIT,1PE12.4/               ESTEP     18
     3                  6H ECEN ,1PE12.4,6X,6H RE   ,1PE12.4,6X,            ESTEP     19
     4                  6H RA   ,1PE12.4)                                   ESTEP     20
18    2003 FORMAT        (1H0,5HTAVG ,1PE12.4,6X,6H TMAX ,1PE12.4,6X,        ESTEP     21
     1                  6H DMAX ,1PE12.4,6X,6H DMIN ,1PE12.4,6X,            ESTEP     22
     2                  6H TMY  ,1PE12.4)                                   ESTEP     23
19    2004 FORMAT        (1H0,5HPABS ,1PE12.4,6X,6H PLOST,1PE12.4,           ESTEP     24
     1                  6X,6H PEMIT,1PE12.4)                                ESTEP     25
      C                                                                      ESTEP     26
                                                                             ESTEP     27
20        DMAX=-15.0                                                         ESTEP     28
21        DMIN=15.0                                                          ESTEP     29
22        IJTR=IP1*JP2                                                       ESTEP     30
23        DO 10 IJSC=1,IJTR                                                  ESTEP     31
24        EPART(IJSC)=0.0                                                    ESTEP     32
25        EMSN(IJSC)=0.0                                                     ESTEP     33
26     10 CONTINUE                                                           ESTEP     34
      C      ---   ENERGY DEPOSITION RETRIEVAL                              ESTEP     35
27        ELOST=0.0                                                          ESTEP     36
28        EABS=0.0                                                           ESTEP     37
29        EEMIT=0.0                                                          ESTEP     38
30        CALL OPEN (5LFSET3,2LST,7168)                                      ESTEP     39
31     11 CALL RDBUF (5LFSET3, EBLOCK, NBUF, LENGTH2, LSTATUS)               ESTEP     40
32        DO 29 K=1,LENGTH2,2                                                ESTEP     41
33        CALL UNPKEN (EBLOCK(K), EDEP)                                      ESTEP     42
34        FSTORE=EBLOCK(K+1)                                                 ESTEP     43
35        I=SHIFT(FSTORE,-9).AND.777B                                        ESTEP     44
36        J=FSTORE.AND.777B                                                  ESTEP     45
37        IJSC=IP1*(J-1)+I                                                   ESTEP     46
38        IF (EDEP(3).LT.0.0) GO TO 27                                       ESTEP     47
39        IF (I.GT.IRAD) GO TO 25                                            ESTEP     48
40        IF (J.LT.2.OR.J.GT.JP1) GO TO 25                                   ESTEP     49
41        EPART(IJSC)=EPART(IJSC)+EDEP(3)                                    ESTEP     50
42        EABS=EABS+EDEP(3)                                                  ESTEP     51
43        GO TO 29                                                           ESTEP     52
      C      ---   COMPUTE ENERGY LOST FROM MESH                            ESTEP     53
44     25 EPART(IJSC)=EPART(IJSC)+EDEP(3)                                    ESTEP     54
45        ELOST=ELOST+EDEP(3)                                                ESTEP     55
46        GO TO 29                                                           ESTEP     56
      C      ---   COMPUTE EMISSION                                         ESTEP     57
47     27 EMSN(IJSC)=EMSN(IJSC)-EDEP(3)                                      ESTEP     58
48        EEMIT=EEMIT-EDEP(3)                                                ESTEP     59
      C                                                                      ESTEP     60
49     29 CONTINUE                                                           ESTEP     61
50        IF (LSTATUS.EQ.1) GO TO 11                                         ESTEP     62
51        RE=EMC/EEMIT                                                       ESTEP     63
52        RA=EMC/(EABS+ELOST)                                                ESTEP     64
53        EEMIT=EEMIT*RE                                                     ESTEP     65
54        EABS=EABS*RA                                                       ESTEP     66
55        ELOST=ELOST*RA                                                     ESTEP     67
      C      ---   ADVANCE CELL TEMPERATURES                                ESTEP     68
56        TMAX=0.0                                                           ESTEP     69
57        CALL START                                                         ESTEP     70
```

```
      DO 40 J=2,JP1                                                     ESIEP   71
      IJSC=(J-1)*IP1                                                    ESIEP   72
      DO 39 I=1,IBAR                                                    ESIEP   73
      IPJ=IJ+NQ                                                         ESIEP   74
      IPJP=IJP+NQ                                                       ESIEP   75
      IJSC=IJSC+1                                                       ESIEP   76
      EMIT=EMSN(IJSC)*RE                                                ESIEP   77
      ABSOR=EPART(IJSC)*RA                                              ESIEP   78
      SIE(IJ)=SIE(IJ)+0.159155E-15*RVOL(IJ)*(ABSOR-EMIT)/RO(IJ)         ESIEP   79
      SIE(IJ)=AMAX1(SIE(IJ),RELZSIE)                                    ESIEP   80
C                                                                       ESIEP   81
      IF (SIE(IJ)-RELZSIE.GT.1.0E-06) GO TO 36                          ESIEP   82
      ZT=TAMB                                                           ESIEP   83
      GO TO 38                                                          ESIEP   84
   36 ZR=RO(IJ)                                                         ESIEP   85
      ZE=SIE(IJ)                                                        ESIEP   86
      ZRINV=1.0/ZR                                                      ESIEP   87
      ZRL=ALOG10(ZR)                                                    ESIEP   88
      ZRL=AMIN1(ZRL,OPDEN(NOPD))                                        ESIEP   89
      ZRL=AMAX1(ZRL,OPDEN(1))                                           ESIEP   90
      TLOW=TAMB                                                         ESIEP   91
      THIGH=SQRT(ZE*ZR*0.05728789E+07)                                  ESIEP   92
      THIGH=SQRT(THIGH)                                                 ESIEP   93
      ZT=0.5*(TLOW+THIGH)                                               ESIEP   94
   37 ZR1=137.214E-07*ZT**4                                             ESIEP   95
      ZE1=ZE-ZR1*ZRINV                                                  ESIEP   96
      ZTL=ALOG10(ZT)                                                    ESIEP   97
      ZTL=AMIN1(ZTL,OPTMP(NOPT))                                        ESIEP   98
      ZE2L=UNLINT(0, ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOMT) ESIEP   99
      ZE2=ALEXP10(ZE2L)                                                 ESIEP  100
      ZDE=ZE1-ZE2                                                       ESIEP  101
      IF (ZDE.GT.0.0) TLOW=ZT                                           ESIEP  102
      IF (ZDE.LT.0.0) THIGH=ZT                                          ESIEP  103
      ZT=0.5*(TLOW+THIGH)                                               ESIEP  104
      IF (THIGH-TLOW.LT.1.0E-06*ZT) GO TO 38                            ESIEP  105
      GO TO 37                                                          ESIEP  106
   38 TEMP(IJSC)=ZT                                                     ESIEP  107
      TMAX=AMAX1(TMAX,ZT)                                               ESIEP  108
      DMAX=AMAX1(DMAX,RO(IJ))                                           ESIEP  109
      DMIN=AMIN1(DMIN,RO(IJ))                                           ESIEP  110
      IC=IPJ                                                            ESIEP  111
      ICP=IPJP                                                          ESIEP  112
      ICM=IPJM                                                          ESIEP  113
   39 CONTINUE                                                          ESIEP  114
      CALL LOOP                                                         ESIEP  115
   40 CONTINUE                                                          ESIEP  116
      CALL DONE                                                         ESIEP  117
C                                                                       ESIEP  118
      REWIND 3                                                          ESIEP  119
      CALL OPEN (SUBSET3,2LST,512)                                      ESIEP  120
      ETOT=EABS+ELOST                                                   ESIEP  121
      TAVG=0.5*(TIME+T2)                                                ESIEP  122
      THY=TMY+ELOST                                                     ESIEP  123
      RDT=1.0/(T2-TIME)                                                 ESIEP  124
      ELOST=ELOST*RDT                                                   ESIEP  125
      EABS=EABS*RDT                                                     ESIEP  126
      EEMIT=EEMIT*RDT                                                   ESIEP  127
      PRINT 2000,       ETOT, EABS, ELOST, EEMIT, ECEN, RE, RA          ESIEP  128
      WRITE (12,2001)   ETOT, EABS, ELOST, EEMIT, ECEN, RE, RA          ESIEP  129
      PRINT 2004,       PABS, PLOST, PEMIT                              ESIEP  130
      WRITE (12,2004)   PABS, PLOST, PEMIT                              ESIEP  131
      PRINT 2003,       TAVG, TMAX, DMAX, DMIN, THY                     ESIEP  132
      WRITE (12,2003)   TAVG, TMAX, DMAX, DMIN, THY                     ESIEP  133
      RETURN                                                            ESIEP  134
      END                                                               ESIEP  135
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	GROVEL	-R	8C0	ITV	-I	8C0	NAME	()I	8C0	NGI	-I	8C0	RLC1	-	7CN	TSTART	-R	8C0
AA2	()R	6LC	GREEN	-	9CN	JBAR	-I	8C0	NBP	-I	9C0	NSP	-I	9C0	SHIFT	-	35SU	T1	-R	10C0
ALPHA	-R	9C0	ID	-I	10C0	JCEN	-I	9C0	NCOL	-I	10C0	PINK	-	4CN	SIEMIN	-R	10C0	UNPKFN	-	33SU
BTBL	()R	2C0	IESCAP	-I	10C0	LAM	-R	12RL	NCYC	-I	8C0	PTAB	()R	2C0	SIGA	()R	7LC	YLC1	-	5CN
DONE	-	135U	IJPS	-I	8C0	LAMD	-R	12RL	NDIE	-I	10C0	QEXPIO	-	66SU	SPTBL	()R	2C0	YLC2	-	6CN
DT	-R	8C0	IPJM	-I	99	LAVNDER	-	10CN	NDUMP	-I	8C0	RDBUF	-	31SU	START	-	57SU	YSC1	-	3CN
DTR	-R	8C0	ISCP1	-I	8C0	LEAT	-	16F	NFLUSH	-I	10C0	REAL	-	12F	STATE	-	2CN			
EM10	-R	6C0	ISCP2	-I	8C0	LOOP	-	101SU	NFRQ	-I	2C0	RED	-	8CN	T	-R	8C0			
ESTEP	-	1SU	ISCZ	-I	8C0	MU	-R	12RL	NMOVE	-I	10C0	RETURN	-	119F	TEMIT	-R	9C0			
FREQ	()R	2C0	ISCJ	-I	8C0	MUC2	-R	12RL	NPCMAX	-I	9C0	REWIND	-	134F	TOUT	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

10	-	23D0	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	-	6700	10. *																
40	-	5800	102*																
2001	-	17*	113PR	114WR															
2003	-	16*	117PR	118WR															
2004	-	19*	115PR	116WR															
AASC	()R	3C0	11E0	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ
		11EQ	11EQ																
ABSOR	-R	65=	66																
AMAX1	-	87SU	76SU	94SU	95SU														
AMIN1	-	75SU	84SU	96SU															
BETALC	()R	11EQ	13D1																
CENTA	()R	11EQ	13D1																
CENTY	()R	11EQ	13D1																
COMMUN	-	2F	3F	4F	8F	9F	10F												
CQ	()R	11EQ	13D1																
DELINT	-	10LA	85SU																
DELSM	()R	11EQ	13D1																
DENS	()R	1.CO	15C0																
DIMENSI	-	13F	14F																
DMAX	-R	2.=	95=	95	117PR	118WR													
DMIN	-R	21=	96=	96	117PR	118WR													
E	()R	11EQ	13D1																
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	14D1	33AG	38	41	42	44	45	47	48									
EEMIT	-R	29=	48=	48	51	53=	53	112	113PR	114WR									
ELOST	-R	27=	45=	45	52	55=	55	106	108	110	113PR	114WR							
EMC	-R	1 CO	51	52															
EMIT	-R	64=	66																
EMOMLC	()R	11EQ	13D1																
EMSN	()R	14D1	15EQ	25=	47=	47	64												
EP	()R	11EQ	13D1																
EPART	()R	14D1	15EQ	24=	41=	41	44=	44	65										
EQUIVAL	-	11F	15F																
ETAB	()R	2C0	85																
ETIL	()R	11EQ	13D1																
ETOT	-R	106=	113PR	114WR															
FORMAT	-	17F	18F	19F															
FOUTLC	()R	11EQ	13D1																
FSCAT	()R	1 CO	15EQ																
FSN	()R	11EQ	13D1																
FSTORE	-R	34=	35	36															
GRIR	()R	11EQ	13D1																
GRIZ	()R	11EQ	13D1																
I	-I	4C0	35=	37	39	6000													
IBAR	-I	8C0	39	60D0															
ID	-I	4C0	61	66	66	66	66	67	67	68	71	72	95	96	97=				

```
Y       ()R    11E6    1501
YPAR    ()R    11E6    1361
ZDE     -R     87=     86      89
ZE      -R     72=     78      82
ZE1     -R     82=     87
ZE2     -R     86=     87
ZE2L    -R     85=     86
ZR      -R     71=     73      74      78
ZRINV   -R     73=     82
ZRL     -R     74=     75=     75      76=     76      85
ZT      -R     69=     8.=     81      83      88      89      90=     91      93      94
ZTL     -R     83=     84=     84      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/     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             COM /YLC1/         AA1(131000)                                ALLKOM      7
  6             COM /YLC2/         AA2(131600)                                ALLKOM      8
  7             COM /RLC1/         SIGA(30000)                                ALLKOM      9
  8             COMMON /RED/       NAME(12), DT, DTR, EMI0, GRDVEL, 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, TEMIT  GREEN      2
 10             COMMON /LAVNDER/   DENS(7500), ERLOCK(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,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,EMGMLC),              EQVREAL     7
      6                           (AASC(13),VTIL,VL,UMOMLC),                 EQVREAL     8
      7                           (AASC(14),RCL,BETALC,FOUTLC), (AASC(15),SIE),  EQVREAL 9
      8                           (AASC(16),DELSM,SIGPLC),                   EQVREAL    10
      9                           (AASC(17),GRIR,VG,REDEN),                  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), EMGMLC(1), VTIL(1), VL(1),   DIMEN       6
      6                           UMOMLC(1), RCL(1), BETALC(1), FOUTLC(1),   DIMEN       7
      7                           SIE(1), DELSM(1), SIGPLC(1), GRIR(1), VG(1),  DIMEN    8
      8                           REDEN(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             (1H1,*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     REDEN/)                             LISTING    19
 17      2002   FORMAT             (2I6,1P4E12.4)                             LISTING    20
       C                                                                      LISTING    21
```

```
      CALL OPEN (6LFSET12,2LST,13312)                                    LISTING    22
      LINES=0                                                            LISTING    23
      CALL START                                                         LISTING    24
      DO 13 J=1,JP2                                                      LISTING    25
      IJSC=(J-1)*IP                                                      LISTING    26
      DO 12 I=1,IP1                                                      LISTING    27
      IJM=IJM+NQ                                                         LISTING    28
      IJ=IJ+NQ                                                           LISTING    29
      IJSC=IJSC+1                                                        LISTING    30
      IF (LINES.EQ.0) WRITE (12,2001)                                    LISTING    31
      LINES=LINES+1                                                      LISTING    32
      IF (LINES.GT.50) LINES=0                                           LISTING    33
      WRITE (12,2002)   I, J, X(IJM), Y(IJM), EPART(IJSC), EMSN(IJSC),   LISTING    34
     1                  TEMP(IJSC), FSN(IJM), SIGPLC(IJM), BETALC(IJM),  LISTING    35
     2                  RZEDEN(IJM)                                      LISTING    36
      IJ=IPJ                                                             LISTING    37
      IJM=IPJM                                                           LISTING    38
   12 CONTINUE                                                           LISTING    39
      CALL LOOP                                                          LISTING    40
   13 CONTINUE                                                           LISTING    41
      CALL DONE                                                          LISTING    42
      CALL OPEN (6LFSET12,2LST,512)                                      LISTING    43
C                                                                        LISTING    44
      RETURN                                                             LISTING    45
      END                                                                LISTING    46
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	ETAB	()R	2C0	ISC2	-I	8C0	MU	-R	12RL	NMOVE	-I	10C0	RED	-	8CN	TEMIT	-R	9C0
AA2	()R	6LC	FREQ	()R	2C0	ISC3	-I	8C0	MU02	-R	12RL	NOPD	-I	2C0	RETURN	-	38F	THY	-R	8C0
ALPHA	-R	9C0	GRDVEL	-R	8C0	ITV	-I	8C0	NAME	()I	8C0	NOPT	-I	2C0	REZSIE	-R	8C0	TIME	-R	8C0
BTBL	()R	2C0	GREEN	-	9CN	JBAR	-I	8C0	NBP	-I	9C0	NPCMAX	-I	9C0	RLC1	-	7CN	TOUT	-R	8C0
DONE	-	365U	IBAR	-I	8C0	JCEN	-I	9C0	NBUF	-I	9C0	NQI	-I	8C0	SIEMIN	-R	10C0	TSTART	-R	8C0
DT	-R	8C0	ID	-I	10CC	JP1	-I	8C0	NCOL	-I	10C0	NSP	-I	9C0	SIGA	()R	7LC	T1	-R	10C0
DTR	-R	8C0	ILSCAP	-I	10C0	LAM	-R	12RL	NCYC	-I	8C0	OPDEN	()R	2C0	SPTOL	()R	2C0	T2	-R	10C0
EBLOCK	()R	10C0	IJP	-I	4C0	LAMD	-R	12RL	NDIE	-I	10C0	OPTMP	()R	2C0	START	-	205U	YLC1	-	5CN
ECEN	-R	10C0	IJPS	-I	8C0	LAMUNDER	-	10CN	NDUMP	-I	8C0	PINK	-	4CN	STATE	-	2CN	YLC2	-	6CN
EMC	-R	10C0	ISCP1	-I	8C0	LISTING	-	1SU	NFLUSH	-I	10C0	PTAB	()R	2C0	T	-R	8C0	YSC1	-	3CN
EM10	-R	8C0	ISCP2	-I	8C0	LOOP	-	345U	NFRQ	-I	2C0	REAL	-	12F	TAMB	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

```
    12 -    2300   33*
    13 -    2100   35*
  2001 -    16*    27#R
  2002 -    17*    3 #R
AASC    ()R   3C0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0   11E0
              11E0   11E0
BETALC  ()R   11E0  13D1   30#R
CENTA   ()R   11E0  13D1
CENTY   ()R   11E0  13D1
COMMON  -     2F    3F     4F     8F     9F     10F
CQ      ()R   11E0  13D1
DELSM   ()R   11E0  13D1
DENS    ()R   10C0  15E0
DIMENSI -     13F   14F
E       ()R   11E0  13D1
EMOMLC  ()R   11E0  13D1
EMSN    ()R   14D1  15E0   30#R
EP      ()R   11E0  13D1
EPART   ()R   14D1  15E0   30#R
EQUIVAL -     11F   15F
ETIL    ()R   11E0  13D1
FORMAT  -     16F   17F
FOUTLC  ()R   11E0  13D1
FSCAT   ()R   10C0  15E0
FSN     ()R   11E0  13D1   30#R
GRIR    ()R   11E0  13D1
GRIZ    ()R   11E0  13D1
I       -I    9C0   2300   30#R
IJ      -I    4C0   25     31*
```

```
IJM      -I    4C0    24      33WR    30WR    30WR    30WR    30WR    30WR    32=
IJSC     -I    22=    26=     26      30WR    30WR    30WR
IPJ      -I    25=    31
IPJM     -I    24=    32
IPI      -I    8C0    22      2300
J        -I    4C0    2100    22      30WR
JP2      -I    8C0    2100
LCM      -     5F     6F      7F
LINES    -I    19=    27      28=     28      29      29=
M        ()R   11E0   12KL    13U1
MP       ()R   11E0   12KL    13U1
NQ       -I    8C0    24      25
OPEN     -     16SU   37SU
P        ()R   11E0   13U1
PL       ()R   11E0   13U1
R        ()R   11E0   13U1
RCSQ     ()R   11E0   13U1
RM       ()R   11E0   13U1
RMP      ()R   11E0   13U1
RO       ()R   11E0   13U1
ROL      ()R   11E0   13U1
RVOL     ()R   11E0   13U1
RZEDEN   ()R   11E0   13U1    30WR
SIE      ()R   11E0   13U1
SIGPLC   ()R   11E0   13U1    30WR
TEMP     ()R   8C0    30WR
U        ()R   11E0   13U1
UG       ()R   11E0   13U1
UL       ()R   11E0   13U1
UMOMLC   ()R   11E0   13U1
UP       ()R   11E0   13U1
UTIL     ()R   11E0   13U1
V        ()R   11E0   13U1
VG       ()R   11E0   13U1
VL       ()R   11E0   13U1
VP       ()R   11E0   13U1
VTIL     ()R   11E0   13U1
WRITE    -     27F    3 F
X        ()R   11E0   13U1    30WR
XPAR     ()R   11E0   13U1
Y        ()R   11E0   13U1    30WR
YPAR     ()R   11E0   13U1
```

```
1           OVERLAY (YOKIPER, 4, 0)                                          GREYSN    2

1           PROGRAM GREYSN                                                   GREYSN    3
                                                                             GREYSN    4
C                                                                            GREYSN    5
C           GREYSN PERFORMS A GREY, SN RADIATION TRANSPORT SOLUTION          GREYSN    6
C
2           COMMON /STATE/   NOPT, NCPD, NERQ, 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, 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(2500), 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
```

```
      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,CG,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), CG(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
      COMMON /SNOWHITE/ ISN, AVINT(7500), RSN(101), ZSN(102)              GREYSN   12
      EXT               DBLINT                                            GREYSN   13
C                                                                         GREYSN   14
 2002 FORMAT            (1H0,*PROBLEM CYCLE*,I6,6X,*SN RADN TRANS*//      GREYSN   15
     1                  * TIME*,1PE12.4,* TO*,1PE12.4,6X,*DTR*,1PE12.4,   GREYSN   16
     2                  6X,*ISN*,I6)                                      GREYSN   17
 2003 FORMAT            (1H0,5HESN  ,1PE12.4)                             GREYSN   18
C                                                                         GREYSN   19
  401 T2=TIME+DTR                                                         GREYSN   20
      ESN=0.0                                                             GREYSN   21
      ALPHA=SNCON(182)                                                    GREYSN   22
      ISN=MOVE(SNCON(183))                                                GREYSN   23
      PRINT 2002,       NCYC, TIME, T2, DTR, ISN                          GREYSN   24
      WRITE (12,2002)   NCYC, TIME, T2, DTR, ISN                          GREYSN   25
C     ---   COMPUTE SIGPLC RZEDEN FSN                                     GREYSN   26
      RSN(1)=0.0                                                          GREYSN   27
      CALL START                                                          GREYSN   28
      DO 429 J=2,JP1                                                      GREYSN   29
      IJSC=(J-1)*IP1                                                      GREYSN   30
      ZSN(J)=Y(IJ)                                                        GREYSN   31
      IF (J.EQ.JP1) ZSN(J+1)=Y(IJP)                                       GREYSN   32
      DO 428 I=1,IBAR                                                     GREYSN   33
      IPJ=IJ+NU                                                           GREYSN   34
      IPJP=IJP+NO                                                         GREYSN   35
      IJSC=IJSC+1                                                         GREYSN   36
      IF (J.EQ.2) RSN(I+1)=X(IPJ)                                         GREYSN   37
      AVINT(IJSC)=0.0                                                     GREYSN   38
      CENTX(IJ)=0.25*(X(IJ)+X(IPJ)+X(IPJP)+X(IJP))                        GREYSN   39
      CENTY(IJ)=0.25*(Y(IJ)+Y(IPJ)+Y(IPJP)+Y(IJP))                        GREYSN   40
      TLOG=ALOG10(TEMP(IJSC))                                             GREYSN   41
      DLOG=ALOG10(RO(IJ))                                                 GREYSN   42
      DLOG= AMIN1(DLOG,CPDEN(NOPD))                                       GREYSN   43
      SP= DBLINT(0,DLOG,TLOG,OPDEN,OPTMP,SPTBL,0,NOPT,NOPD,NOPT)          GREYSN   44
      SP=EXP10(SP)                                                        GREYSN   45
      SIGPLC(IJ)=SP                                                       GREYSN   46
      RZEDEN(IJ)=3.2757E+14*SP*TEMP(IJSC)**4                              GREYSN   47
      ESN=ESN+RZEDEN(IJ)/RVOL(IJ)                                         GREYSN   48
      BP=DBLINT (0, DLOG, TLOG, OPDEN, OPTMP, BTBL, 0, NOPT, NOPD, NOPT)  GREYSN   49
      XFSN=1.0+3.0E+05*ALPHA*BP*SP*DTR                                    GREYSN   50
      FSN(IJ)=1.0/XFSN                                                    GREYSN   51
      IJ=IPJ                                                              GREYSN   52
      IJP=IPJP                                                            GREYSN   53
  428 CONTINUE                                                            GREYSN   54
      CALL LOOP                                                           GREYSN   55
  429 CONTINUE                                                            GREYSN   56
      CALL DONE                                                           GREYSN   57
      ESN=10.9568*ESN                                                     GREYSN   58
      PRINT 2003,       ESN                                               GREYSN   59
C                                                                         GREYSN   60
```

```
      REWIND 1                                                          GREYSN     61
      CALL RDBUF (5LFSET1, AVINT, 7500, LENGTH2, LSTATUS)               GREYSN     62
      CALL OVERLAY (7LYCKIFER, 4, 1, 6HRECALL)                          GREYSN     63
      REWIND 1                                                          GREYSN     64
      IJMAX=IP1*JP1                                                     GREYSN     65
      CALL WTBUF (5LFSET1, AVINT, IJMAX)                                GREYSN     66
C                                                                       GREYSN     67
      CALL OVERLAY (7LYCKIFER, 4, 2, 6HRECALL)                          GREYSN     68
      CALL REMARK (7HSNESTEP)                                           GREYSN     69
      IF (T2.LT.TOUT) GO TO 441                                         GREYSN     70
      CALL OVERLAY (7LYCKIFER, 4, 3, 6HRECALL)                          GREYSN     71
      CALL REMARK (7HSNCUT )                                            GREYSN     72
  441 TIME=T2                                                           GREYSN     73
      DTR=AMIN1(DTR,10.0*DT)                                            GREYSN     74
      IF (TIME+EMIO.GE.T) GO TO 501                                     GREYSN     75
      IF (TIME+DTR.GT.T+EMIO) DTR=T-TIME                                GREYSN     76
      GO TO 401                                                         GREYSN     77
C                                                                       GREYSN     78
  501 WRITE (1)                                                         GREYSN     79
      WRITE (3)                                                         GREYSN     80
      ENDFILE 1                                                         GREYSN     81
      ENDFILE 3                                                         GREYSN     82
      REWIND 1                                                          GREYSN     83
      REWIND 3                                                          GREYSN     84
      RETURN                                                            GREYSN     85
      END                                                               GREYSN     86
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	FIYB	-R	14C0	ISC2	-I	8C0	LEXT	-	15F	PXCONV	-R	10C0	RIBAR	-R	10C0	XCONV	-R	10C0
AA2	()R	6LC	FREG	()R	2C0	ISC3	-I	8C0	LOOP	-	52SU	PXL	-R	10C0	RLC1	-	7CN	XL	-R	10C0
CRIMSN	-	9CN	GROVEL	-R	8C0	ITV	-I	8C0	LSTATUS	-I	58AG	PXR	-R	10C0	SIGA	()R	7LC	XR	-R	10C0
DIMENSI	-	13F	GREYSN	-	1SU	IXL	-I	10C0	MOVE	-	21SU	PYB	-R	10C0	SILVER	-	10CN	YB	-R	10C0
DONE	-	54SU	IJP	-I	4C0	IXR	-I	10C0	MU	-R	12RL	PYCONV	-R	10C0	SNOWITE	-	14CN	YCONV	-R	10C0
EQUIVAL	-	11F	IJPS	-I	8C0	IYB	-I	10C0	MUD2	-R	12RL	PYT	-R	10C0	START	-	25SU	YLC1	-	5CN
ETAB	()R	2C0	IPAL	-I	10C0	IYT	-I	10C0	NAME	()I	8C0	QEXP10	-	42SU	STATE	-	2CN	YLC2	-	6CN
FIPAL	-R	10C0	IPAR	-I	10C0	JBAR	-I	8C0	NDUMP	-I	8C0	RDBUF	-	58SU	TAMB	-R	8C0	YSC1	-	3CN
FIPXB	-R	10C0	IPYB	-I	10C0	JP2	-I	8C0	NERG	-I	2C0	REAL	-	12F	THY	-R	8C0	YT	-R	10C0
FIPYB	-R	10C0	IPYT	-I	10C0	LAM	-R	12RL	NG1	-I	8C0	RED	-	8CN	TSTART	-R	8C0	ZZ	-R	9C0
FIAL	-R	10C0	ISCF1	-I	8C0	LAMD	-R	12RL	PINK	-	4CN	RETURN	-	79F	VV	-R	10C0			
FIXR	-R	10C0	ISCF2	-I	8C0	LENGTH2	-I	58AG	PTAB	()R	2C0	REZSIE	-R	8C0	WTBUF	-	62SU			

MULTIPLY-REFERENCED VARIABLES

```
   401 -     18*   72
   428 -     30D0  51*
   429 -     26D0  53*
   441 -     65    68SU
   501 -     7     73*
  2002 -     16*   22PR   23WR
  2003 -     17*   56PR
AASC   ()R   3C0   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ   11EQ
             11EQ  11EQ
ALPHA  -R    2(=   47
AMIN1  -     4?SU  69SU
AVINT  ()R   14C0  35=    58AG   62A6
BETALC ()R   11EQ  13D1
BP     -R    46=   47
BTBL   ()R    2C0  46
CENTA  ()R   11EQ  13D1   36=
CENTY  ()R   11EQ  13D1   37=
COMMON -      2F    3F     4F     8F     9F     10F    14F
CQ     ()R   11EQ  13D1
DBLINT -      15LX  41SU   46SU
DELSM  ()R   11EQ  13D1
DLOG   -R    39=   4(=    40     41     46
DT     -R     8C0  69
DTR    -R     8C0  18     22PR   23WR   47     69=    69     71     71=
E      ()R   11EQ  13D1
```

```
VTIL    ()R    11E4    13D1
WRITE   -      23F     73F     74F
X       ()R    11E4    13D1    34      36      36      36      36
XFSN    -R     47=     48
XPAR    ()R    11E4    13D1
Y       ()R    11E4    13D1    28      29      37      37      37      37
YPAR    ()R    11E4    13D1
ZSN     ()R    14C0    28=     29=
```

```
 1            OVERLAY (YOKIPER, 4, 1)                                          CYCLSN     2

 1            PROGRAM CYLSN                                                    CYCLSN     3
       C                                                                       CYCLSN     4
       C       2D CYLINDRICAL SN RADIATION TRANSPORT CODE BY BILL REED (T4)    CYCLSN     5
       C                                                                       CYCLSN     6
 2             COMMON /STATE/    NOPT, NGPD, NERG, 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 /PIAR/     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, 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 /SNOWITE/  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(4801),B), (AASC(4101),AL)              CYCLSN    12
13             EQUIVALENCE       (ISNP, SNCON(1))                             CYCLSN    13
14        2001 FORMAT            (1H0,15,* 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)=3.141592*(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(IBA2).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

AA1	()R	5LC	DIR	-R	8C0	IJPS	-I	8C0	NDUMP	-I	8C0	PRINT	-	48F	SPTBL	()R	2C0	TSTART	-R	8C0
AA2	()R	6LC	ERMX	-R	8C0	ISCF1	-I	8C0	NPRO	-I	2C0	PTAB	()R	2C0	STATE	-	2CN	WRITE	-	49F
ABS	-	45SU	ETAB	()R	2C0	ISCF2	-I	8C0	NOPD	-I	2C0	RED	-	8CN	SWEEP	-	37SU	YLC1	-	5CN
AMAX1	-	45SU	FORMAT	-	14F	ISC2	-I	8C0	NOPT	-I	2C0	RETURN	-	5CF	T	-R	8C0	YLC2	-	6CN
BTBL	()R	2C0	FREE	()R	2C0	ISC3	-I	8C0	NQ	-I	8C0	REZSIE	-R	8C0	TAMB	-R	8C0	YSC1	-	3CN
CHIMSN	-	9CN	GRDVEL	-R	8C0	ITV	-I	8C0	NQI	-I	8C0	RLC1	-	7CN	TEMP	()R	8C0	ZZ	-R	9C0
CYLSN	-	1SU	IJ	-I	4C0	JP2	-I	8C0	OPDEN	()R	2C0	SIGA	()R	7LC	THY	-R	8C0			
DIMENSI	-	1)F	IJM	-I	4C0	NAME	()I	8C0	OPIMP	()R	2C0	SNGEN	-	24SU	TIME	-R	8C0			
DT	-R	8C0	IJP	-I	4C0	NCYC	-I	8C0	PINK	-	4CN	SNCWITE	-	1SCN	TOUT	-R	8C0			

MULTIPLY-REFERENCED VARIABLES

5	-	23	26*									
10	-	28D0	28*									
11	-	29*	47									
12	-	3.D0	32D0	36*								
22	-	41D0	42D0	44	46*							
31	-	36	48*									
2001	-	14*	48PR	49WR								
AASC	()R	3C0	12E0	12E0								
AL	()R	11D1	12E0	37AG								
AVINT	()R	1?C0	34	35=	37AG	44	45					
AVOLD	()R	11D1	34=	37AG	45							
B	()R	11D1	12E0	27=	37AG							
BB	()R	11D1	37AG									
BR	()R	11D1	37AG									
COMMON	-	2F	3F	4F	8F	9F	10F					
EQUIVAL	-	12F	13F									
ERR	-R	39=	45=	45	47							
I	-I	4C0	26D0	27	27	32D0	42D0					
IBAR	-I	8C0	26D0	32D0	37AG	42D0						
IJSC	-I	31=	33=	33	34	34	35	41=	43=	43	44	45	45
IP1	-I	8C0	31	41								
ISN	-I	1?C0	16	17	17	23	24AG	25				
ISNP	-I	13E0	23	25=								
ISTEP	-I	15=	29=	29	48PR	49WR						
J	-I	4C0	3.D0	31	40D0	41						
JBAR	-I	8C0	37AG									
JP1	-I	8C0	3.D0	40D0								
LBET1	-I	21=	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	2?=	21	24AG	37AG							
MM	-I	17=	19	20	21	22	24AG	37AG				
NN	-I	16=	37AG									
RSN	()R	1?C0	27	27	37AG							
SNCON	()R	9C0	13E0	24AG	24AG	24AG	24AG	24AG	37AG	37AG	37AG	37AG	37AG	38
ZSN	()R	1?C0	37AG									

```
      SUBROUTINE SWEEP (ZSN, RSN, B, BET1, BET2, U, E, W, AL,
     1 BR, BB, IT, JT, NN, MM, AVINT, AVOLD)
C
      COMMON /STATE/    NOPT, NCPD, NFRG, OPTMP(30), OPDEN(10),
     1                  FREQ(100), SPTSL(300), PTAB(300), ETAB(300),
     2                  BTBL(300)
      COMMON /YSCL/     AASC(5454)
      COMMON /PINK/     I, IJ, IJM, IJP, J
      LCM /YLCL/        AA1(131000)
      LCM /YLC2/        AA2(131000)
      LCM /RICL/        SIGA(30000)
      COMMON /RED/      NAME(14), DT, DTR, EM10, GROVEL, IBAR, IJPS,
     1                  IP1, ISCF1, ISCF2, ISC2, ISC3, ITV, JBAR,
     2                  JP1, JP2, NCYC, NDUMP, NQ, NQ1, REZSIE, TAMB,
     3                  TEMP(7500), T, TIME, TOUT, TSTART, THY
      COMMON /CHIMSN/   SMCON(183), ZZ
      DIMENSION         EMOM(100), UMOM(100), FOUT(100), CT(100),
     1                  S(100), BR(JT,1), BB(IT,1),
     2                  AL(MM+1), ZSN(1), RSN(1), B(1), BET1(1),
     3                  BET2(1), U(1), E(1), W(1),
     4                  AVINT(1), AVOLD(1), AVNEW(100)
      EQUIVALENCE       (AASC(4901),EMOM), (AASC(5001),UMOM),
     1                  (AASC(5101),FOUT), (AASC(5201),CT),
     2                  (AASC(5301),S), (AASC(3901),AVNEW)
 2001 FORMAT            (1H0,*CYLSN POWER*/6H SUM  ,1PE12.4)
C
      M1=MM+1
      M2=2*MM
      I2=MAX0(IBAR,JBAR)
      I2=I2+M2
      SUM=0.0
C
C     ---   CALCULATE FLUX IN DOWNWARD DIRECTION
C
      DO 142 I=1,800
      AL(I)=0.0
  142 CONTINUE
      DO 143 I=1,I2
      BB(I)=BR(I)=0.0
  143 CONTINUE
C
      IECS=NQ1*JP1
      DO 200 JJ=1,JBAR
      J=JP2-JJ
      JM1=J-1
      IECS=IECS-NQ1
      CALL ECHO (AASC, IECS, NQ1, NE)
      DZ=ZSN(J+1)-ZSN(J)
      DZP=0.2831853*DZ
      I=I2
      IJSC=(J-1)*IP1
      DO 198 I=1,IBAR
      IJSC=IJSC+1
      EMOM(I)=UMOM(I)=FOUT(I)=0.0
      AVNEW(I)=0.0
      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
  198 CONTINUE
C     ---   INWARD SWEEP
      CALL IN (BR, BB, AL, RSN, B, BET1,U, E, W, S, CT, UMOM, EMOM,
     1 FOUT, -1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)
C     ---   OUTWARD SWEEP
      CALL OUT (BR, BB(1,M1), AL, RSN, B, BET2, U, E, W, S, CT, UMOM,
     1 EMOM, FOUT, -1.0, DZP, DZ, IBAR, JBAR, NN, JM1, AVNEW)
C
      I=I2
      IJSC=(J-1)*IP1
      DO 199 I=1,IBAR
```

```
      I=ISC+
      AVINT(IJSC)=AVNEW(I)
      AASC(IJ)=EMOM(I)
      AASC(IJ+1)=UMOM(I)
      AASC(IJ+2)=FOUT(I)
      I=IJ+NG
  195 CONTINUE
      CALL ECHR (AASC, IECS, NQI, NE)
  200 CONTINUE
C
C     ---   CALCULATE FLUX IN UPWARD DIRECTION
C
      DO 243 I=1,I2
      BB(I)=0.0
  243 CONTINUE
C
      IECS=0
      DO 300 J=2,JP1
      JM1=J-1
      IECS=IECS+NQI
      CALL ECHO (AASC, IECS, NQI, NE)
      DZ=ZSN(J+1)-ZSN(J)
      DZP=0.2631053(6*DZ
      I=I2
      ISC=(J-1)*IP1
      DO 298 I=1,IBAR
      ISC=ISC+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)
      I=IJ+NG
  298 CONTINUE
C     ---   INWARD SWEEP
      CALL IN (BB(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 (BB(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
      I=I2
      ISC=(J-1)*IP1
      DO 299 I=1,IBAR
      ISC=ISC+1
      AVINT(IJSC)=AVNEW(I)
      AASC(IJ)=EMOM(I)
      AASC(IJ+2)=FOUT(I)
      AASC(IJ+1)=UMOM(I)
      SUM=SUM+FOUT(I)
      I=IJ+NG
  299 CONTINUE
      CALL ECHR (AASC, IECS, NQI, NE)
  300 CONTINUE
C
      PRINT 2001,       SUM
      WRITE (12,2001)   SUM
      RETURN
      END
```

```
SWEEP     60
SWEEP     61
SWEEP     62
SWEEP     63
SWEEP     64
SWEEP     65
SWEEP     66
SWEEP     67
SWEEP     68
SWEEP     69
SWEEP     70
SWEEP     71
SWEEP     72
SWEEP     73
SWEEP     74
SWEEP     75
SWEEP     76
SWEEP     77
SWEEP     78
SWEEP     79
SWEEP     80
SWEEP     81
SWEEP     82
SWEEP     83
SWEEP     84
SWEEP     85
SWEEP     86
SWEEP     87
SWEEP     88
SWEEP     89
SWEEP     90
SWEEP     91
SWEEP     92
SWEEP     93
SWEEP     94
SWEEP     95
SWEEP     96
SWEEP     97
SWEEP     98
SWEEP     99
SWEEP    100
SWEEP    101
SWEEP    102
SWEEP    103
SWEEP    104
SWEEP    105
SWEEP    106
SWEEP    107
SWEEP    108
SWEEP    109
SWEEP    110
SWEEP    111
SWEEP    112
SWEEP    113
SWEEP    114
SWEEP    115
SWEEP    116
SWEEP    117
SWEEP    118
SWEEP    119
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	EQUIVAL	-	11F	ISCF1	-I	8C0	NDUMP	-I	8C0	PTAB	()R	2C0	STATE	-	2CN	TSTART	-R	8C0
AA2	()R	6LC	ETAB	()R	2C0	ISCF2	-I	8C0	NFRQ	-I	2C0	RED	-	8CN	SWEEP	-	1SU	WRITE	-	94F
BTBL	()R	2C0	FORMAT	-	12F	ISC2	-I	8C0	NOPO	-I	2C0	RETURN	-	95F	T	-R	8C0	YLC1	-	5CN
CRIMSN	-	9CN	FREQ	()R	2CC	ISC3	-I	8C0	NOPT	-I	2C0	REZSIE	-R	8C0	TAMB	-R	8C0	YLC2	-	6CN
DIMENSI	-	1CF	GRLVEL	-R	8C0	ITV	-I	8C0	OPVEN	()R	2C0	RLC1	-	7CN	TEMP	()R	8C0	YSC1	-	3CN
DT	-R	8C0	IJK	-I	4C0	MAXO	-	15SU	OPTMP	()R	2C0	SIGA	()R	7LC	THY	-R	8C0	ZZ	-R	9C0

```
DTR      -R   8CO   IJP     -1   4CO   NAME   ()I   8CO   PINK    -    4CN   SNCON  ()R   9CO   TIME    -R   8CO
EMIO     -R   8CO   IJPS    -1   8CO   NCYC   -I    8CO   PRINT   -    93F   SPTBL  ()R   2CO   TOUT    -R   8CO
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
 MULTIPLY-REFERENCED VARIABLES
    142 -      18DO    2.*
    143 -      21DO    23*
    198 -      34DO    41*
    199 -      46DO    53*
    200 -      25DO    55*
    243 -      56DO    56*
    298 -      68DO    77*
    299 -      82DO    9·*
    300 -      60DO    92*
   2001 -      12*     93PR    94WR
AASC    ()R    3CO     11EQ    11EG    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     10DI    19=     42AG    43AG    78AG    79AG
AVINT   ()R    1AG     10DI    48=     73      84=
AVNEW   ()R    10DI    11EQ    37=     42AG    43AG    48      73=     78AG    79AG    84
AVOLD   ()R    1AG     10DI    39      75
B       ()R    1AG     10DI    42AG    43AG    78AG    79AG
BB      ()R    1AG     10DI    22=     42AG    43AG    57=     78AG    79AG
BET1    ()R    1AG     10DI    42AG    78AG
BET2    ()R    1AG     10DI    43AG    79AG
BR      ()R    1AG     10DI    22=     42AG    43AG    78AG    79AG
COMMON  -      2F      3F      4F      8F      9F
CT      ()R    10DI    11EQ    38=     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    1AG     10DI    42AG    43AG    78AG    79AG
ECRD    -      29SU    63SU
ECWR    -      54SU    91SU
EROM    ()R    10DI    11EQ    36=     42AG    43AG    49      70=     78AG    79AG    85
FOUT    ()R    10DI    11EQ    36=     42AG    43AG    51      72=     78AG    79AG    86      88
I       -I     4CO     18DO    19      21DO    22      22      34DO    36      36      36      37      38      39      39      46DO    48      49
               50      51      56DO    57      68DO    70      71      72      73      74      75      75      82DO    84      85      86      87
               88
IBAR    -I     8CO     15      34DO    42AG    43AG    46DO    68DO    78AG    79AG    82DO
IECS    -I     24=     28=     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    78SU
IP1     -I     8CO     33      45      67      81
IT      -I     1AG     10DI
IS      -I     15=     16=     16      21DO    56DO
J       -I     4CO     26=     27      30      30      33      45      60DO    61      64      64      67      81
JBAR    -I     8CO     15      25DO    42AG    43AG    78AG    79AG
JJ      -I     25DO    26
JM1     -I     27=     42AG    43AG    61=     78AG    79AG
JP1     -I     8CO     24      60DO
JP2     -I     8CO     26
JT      -I     1AG     10DI
LCM     -      5F      6F      7F
MM      -I     1AG     13      14
M1      -I     13=     43AG    78AG    79AG    79AG
M2      -I     14=     16
NE      -I     29AG    54AG    63AG    91AG
NN      -I     1AG     10DI    42AG    43AG    78AG    79AG
NQ      -I     8CO     40      52      76      89
NQI     -I     8CO     24      28      29AG    54AG    62      63AG    91AG
OUT     -      43SU    79SU
RSN     ()R    1AG     10DI    42AG    43AG    78AG    79AG
S       ()R    10DI    11EQ    39=     42AG    43AG    75=     78AG    79AG
SUM     -R     17=     88=     88      93PR    94WR
U       ()R    1AG     10DI    42AG    43AG    78AG    79AG
UMOM    ()R    10DI    11EQ    36=     42AG    43AG    50      71=     78AG    79AG    87
W       ()R    1AG     10DI    42AG    43AG    78AG    79AG
ZSN     ()R    1AG     10DI    30      30      64      64
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```

```
      1           SUBROUTINE IN  (BH,BV,AL,R,B,BETA,U,E,W,S,CT,UMOM,EMOM,FOUT,ES,     IN         2
                 1 DZP,DZ,IT,JT,NN,  AVNEW)                                          IN         3
      2           DIMENSION BH(JT,1),BV(IT,1),AL(NN,1),R(1),B(1),BETA(1),U(1),       IN         4
                 1 E(1),W(1),S(1),CT(1),UMOM(1),EMOM(1),FOUT(1)                      IN         5
      3           DIMENSION         AVNEW(1)                                        IN         6
      4           DO 100 II=1,IT                                                    IN         7
      5           I=IT+1-II                                                         IN         8
      6           M=1                                                               IN         9
      7           DO 100 K=1,NN                                                     IN        10
      8           DO 100 L=1,K                                                      IN        11
      9           M=M+1                                                             IN        12
     10           AA=U(M)*DZP*R(I+1)                                                IN        13
     11           BB=E(M)*B(I)                                                      IN        14
     12           CC=DZP*(R(I+1)-R(I))*BETA(M)                                      IN        15
     13           T=(AA*BH(J,M)+BB*BV(I,M)+CC*AL(K,I)+B(I)*DZ*S(I)) / (AA+BB+CC+    IN        16
                 1 E(1)*DZ*CT(1))                                                    IN        17
     14           FOUT(I)=FOUT(I)+W(M)*(U(M)*DZP*(T*R(1)-BH(J,M)*R(I+1))+BB*        IN        18
                 1 (T-BV(I,M)))                                                      IN        19
     15           UMOM(I)=UMOM(I)-W(M)*U(M)*T                                       IN        20
     16           EMOM(I)=EMOM(I)+W(M)*E(M)*ES*T                                    IN        21
     17           AVNEW(I)=AVNEW(I)+0.07957749*W(M)*T                               IN        22
     18           BH(J,M)=T                                                         IN        23
     19           BV(I,M)=T                                                         IN        24
     20           AL(K,I)=T                                                         IN        25
     21       100 CONTINUE                                                          IN        26
     22           RETURN                                                            IN        27
     23           END                                                               IN        28
```

SINGLY REFERENCED VARIABLES

IN	-	JSU	L	-I	6DO	RETURN	-	22F

MULTIPLY-REFERENCED VARIABLES

100	-	4D0	7D0	8D0	21*													
AA	-R	17=	13	13														
AL	()R	1A6	2D1	13	20=													
AVNEW	()R	1A6	3D1	17=	17													
B	()R	1A6	2D1	11	13	13												
BB	-R	11=	13	13	14													
BETA	()R	1A6	2D1	12														
BH	()R	1A6	2D1	13	14	18=												
BV	()R	1A6	2D1	13	14	19=												
CC	-R	12=	13	13														
CT	()R	1A6	2D1	13														
DIMENSI	-	2F	3F															
DZ	-R	1A6	13	13														
DZP	-R	1A6	12	12	14													
E	()R	1A6	2D1	11	16													
EMOM	()R	1A6	2D1	16=	16													
ES	-R	1A6	16															
FOUT	()R	1A6	2D1	14=	14													
I	-I	5=	12	11	12	12	13	13	13	13	13	13	14	14	14	14	14	15
		15	16	16	17	17	19	20										
II	-I	4D0	5															
II	-I	1A6	2D1	4D0	5													
J	-I	1A6	13	14	18													
JT	-I	1A6	2D1															
K	-I	7D0	8D0	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	1A6	2D1	7D0														
R	()R	1A6	2D1	12=	12	12	14	14										
S	()R	1A6	2D1	13														
T	-R	13=	14	14	15	16	17	18	19	20								
U	()R	1A6	2D1	10	14	15												
UMOM	()R	1A6	2D1	15=	15													
W	()R	1A6	2D1	14	15	16	17											

```
  1            SUBROUTINE CUT (BH,BV,AL,N,M,BETA,U,E,W,S,CT,UMOM,EMOM,FOUT,ES,     OUT        2
                1 DZP,DZ,IT,JT,NN,J, AVNEW)                                       OUT        3
  2            DIMENSION BH(JT,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*BH(J,M)+BB*BV(I,M)+CC*AL(K,I)+H(I)*DZ*S(I)) / (AA+BB+CC+    OUT       15
                1 R(I)*DZ*CT(I))                                                  OUT       16
 13            FOUT(I)=FOUT(I)+W(M)*(U(M)*DZP*(T*R(I+1)-BH(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)+0.07957747*W(M)*T                               OUT       21
 17            BH(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 - 100 RETURN - 21F

MULTIPLY-REFERENCED VARIABLES

		100 =	400	500	700	20*													
AA	-R	9=	12	12															
AL	()R	1A6	201	12	19=														
AVNEW	()R	1A6	301	16=	16														
B	()R	1A6	201	10	12	12													
BH	-R	11=	12	12	13														
BETA	()R	1A6	201	11															
BH	()R	1A6	201	12	13	17=													
BV	()R	1A6	201	12	13	18=													
CC	-R	11=	12	12															
CT	()R	1A6	201	12															
DIMENSI	-	2F	3F																
DZ	-R	1A6	12	12															
DZP	-R	1A6	9	11	13														
E	()R	1A6	201	10	15														
EMOM	()R	1A6	201	15=	15														
ES	-R	1A6	15																
FOUT	()R	1A6	201	13=	13														
I	-I	400	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	1A6	201	400															
J	-I	1A6	12	13	17														
JT	-I	1A6	201																
K	-I	500	6	6	700	12	19												
KA	-I	6=	8																
L	-I	700	8																
M	-I	8=	9	10	11	12	12	13	13	13	13	14	14	15	15	16	17	18	
NN	-I	1A6	201	500															
R	()R	1A6	201	9	11	11	13	13											
S	()R	1A6	201	12															
T	-R	12=	13	13	14	15	16	17	18	19									
U	()R	1A6	201	9	13	14													
UMOM	()R	1A6	201	14=	14														
W	()R	1A6	201	13	14	15	16												

```
      SUBROUTINE SNGEN (U, E, W, BET1, BET2, N, MM)                     SNGEN     2
C                                                                       SNGEN     3
      DIMENSION         U(1), E(1), W(1), BET1(1), BET2(1)              SNGEN     4
C                                                                       SNGEN     5
      M=(N*(N+2))/8                                                     SNGEN     6
      I=N/2                                                             SNGEN     7
      IF (N.GT.16) GO TO 180                                            SNGEN     8
      GO TO (100,110,120,130,140,150,160,170), I                        SNGEN     9
  100 W(1)=1.0                                                          SNGEN    10
      U(1)=.57735027                                                    SNGEN    11
      E(1)=U(1)                                                         SNGEN    12
      GO TO 240                                                         SNGEN    13
  110 U(2)=0.90444965                                                   SNGEN    14
      U(1)=0.30163878                                                   SNGEN    15
      W(1)=0.33333333                                                   SNGEN    16
      W(2)=W(1)                                                         SNGEN    17
      W(3)=W(1)                                                         SNGEN    18
      GO TO 190                                                         SNGEN    19
  120 U(1)=0.23609194                                                   SNGEN    20
      U(2)=0.68818432                                                   SNGEN    21
      U(3)=0.94557678                                                   SNGEN    22
      W(1)=0.10944656                                                   SNGEN    23
      W(2)=0.16388677                                                   SNGEN    24
      W(3)=W(1)                                                         SNGEN    25
      W(4)=W(2)                                                         SNGEN    26
      W(5)=W(2)                                                         SNGEN    27
      W(6)=W(1)                                                         SNGEN    28
      GO TO 190                                                         SNGEN    29
  130 U(1)=0.19232747                                                   SNGEN    30
      U(2)=0.57735027                                                   SNGEN    31
      U(3)=0.79352178                                                   SNGEN    32
      U(4)=0.96229948                                                   SNGEN    33
      W(1)=0.11678847                                                   SNGEN    34
      W(2)=0.49325523                                                   SNGEN    35
      W(3)=W(2)                                                         SNGEN    36
      W(4)=W(1)                                                         SNGEN    37
      W(5)=W(2)                                                         SNGEN    38
      W(6)=0.09010320                                                   SNGEN    39
      W(7)=W(2)                                                         SNGEN    40
      W(8)=W(2)                                                         SNGEN    41
      W(9)=W(2)                                                         SNGEN    42
      W(10)=W(1)                                                        SNGEN    43
      GO TO 190                                                         SNGEN    44
  140 U(1)=0.16962268                                                   SNGEN    45
      U(2)=0.50714192                                                   SNGEN    46
      U(3)=0.69686020                                                   SNGEN    47
      U(4)=0.84500612                                                   SNGEN    48
      U(5)=0.97080262                                                   SNGEN    49
      W(1)=0.08964293                                                   SNGEN    50
      W(2)=0.16728705                                                   SNGEN    51
      W(3)=0.05578071                                                   SNGEN    52
      W(4)=W(2)                                                         SNGEN    53
      W(5)=W(1)                                                         SNGEN    54
      W(6)=W(2)                                                         SNGEN    55
      W(7)=0.05313309                                                   SNGEN    56
      W(8)=W(7)                                                         SNGEN    57
      W(9)=W(2)                                                         SNGEN    58
      W(10)=W(3)                                                        SNGEN    59
      W(11)=W(7)                                                        SNGEN    60
      W(12)=W(3)                                                        SNGEN    61
      W(13)=W(2)                                                        SNGEN    62
      W(14)=W(2)                                                        SNGEN    63
      W(15)=W(1)                                                        SNGEN    64
      GO TO 190                                                         SNGEN    65
  150 U(1)=0.15395746                                                   SNGEN    66
      U(2)=0.45769112                                                   SNGEN    67
      U(3)=0.62869660                                                   SNGEN    68
      U(4)=0.76225828                                                   SNGEN    69
      U(5)=0.87568027                                                   SNGEN    70
```

```
      U(0)=0.97n00932
      W(1)=0.07332178
      W(2)=0.05266740
      W(3)=0.04161495
      W(4)=W(3)
      W(5)=W(2)
      W(6)=W(1)
      W(7)=W(2)
      W(8)=0.03e95667
      W(9)=0.03249018
      W(10)=W(8)
      W(11)=W(2)
      W(12)=W(3)
      W(13)=W(9)
      W(14)=W(9)
      W(15)=W(3)
      W(16)=W(3)
      W(17)=W(8)
      W(18)=W(3)
      W(19)=W(2)
      W(20)=W(2)
      W(21)=W(1)
      GO TO 190
  180 U(1)=0.14238965
      U(2)=0.42948676
      U(3)=0.57735027
      U(4)=0.69990185
      U(5)=0.80398498
      U(6)=0.89605866
      U(7)=0.97951538
      W(1)=0.06217628
      W(2)=0.04332597
      W(3)=0.03321705
      W(4)=0.03183760
      W(5)=W(3)
      W(6)=W(2)
      W(7)=W(1)
      W(8)=W(2)
      W(9)=0.03048324
      W(10)=0.02454516
      W(11)=W(10)
      W(12)=W(9)
      W(13)=W(2)
      W(14)=W(3)
      W(15)=W(10)
      W(16)=0.01998453
      W(17)=W(10)
      W(18)=W(3)
      W(19)=W(4)
      W(20)=W(10)
      W(21)=W(10)
      W(22)=W(4)
      W(23)=W(3)
      W(24)=W(9)
      W(25)=W(3)
      W(26)=W(2)
      W(27)=W(2)
      W(28)=W(1)
      GO TO 190
  170 U(1)=0.13344572
      U(2)=0.39119433
      U(3)=0.53609687
      U(4)=0.65075610
      U(5)=0.74746822
      U(6)=0.83302706
      U(7)=0.91058161
      U(8)=0.98203079
      W(1)=0.05415425
      W(2)=0.03679653
```

```
SNGEN   71
SNGEN   72
SNGEN   73
SNGEN   74
SNGEN   75
SNGEN   76
SNGEN   77
SNGEN   78
SNGEN   79
SNGEN   80
SNGEN   81
SNGEN   82
SNGEN   83
SNGEN   84
SNGEN   85
SNGEN   86
SNGEN   87
SNGEN   88
SNGEN   89
SNGEN   90
SNGEN   91
SNGEN   92
SNGEN   93
SNGEN   94
SNGEN   95
SNGEN   96
SNGEN   97
SNGEN   98
SNGEN   99
SNGEN  100
SNGEN  101
SNGEN  102
SNGEN  103
SNGEN  104
SNGEN  105
SNGEN  106
SNGEN  107
SNGEN  108
SNGEN  109
SNGEN  110
SNGEN  111
SNGEN  112
SNGEN  113
SNGEN  114
SNGEN  115
SNGEN  116
SNGEN  117
SNGEN  118
SNGEN  119
SNGEN  120
SNGEN  121
SNGEN  122
SNGEN  123
SNGEN  124
SNGEN  125
SNGEN  126
SNGEN  127
SNGEN  128
SNGEN  129
SNGEN  130
SNGEN  131
SNGEN  132
SNGEN  133
SNGEN  134
SNGEN  135
SNGEN  136
SNGEN  137
SNGEN  138
SNGEN  139
```

```
      W(3)=0.12777273                                                   SNGEN  140
      W(4)=0.02560264                                                   SNGEN  141
      W(5)=W(4)                                                         SNGEN  142
      W(6)=W(3)                                                         SNGEN  143
      W(7)=W(2)                                                         SNGEN  144
      W(8)=W(1)                                                         SNGEN  145
      W(9)=W(2)                                                         SNGEN  146
      W(10)=0.02494275                                                  SNGEN  147
      W(11)=0.01962325                                                  SNGEN  148
      W(12)=0.01879762                                                  SNGEN  149
      W(13)=W(11)                                                       SNGEN  150
      W(14)=W(10)                                                       SNGEN  151
      W(15)=W(2)                                                        SNGEN  152
      W(16)=W(3)                                                        SNGEN  153
      W(17)=W(11)                                                       SNGEN  154
      W(18)=0.01544601                                                  SNGEN  155
      W(19)=W(18)                                                       SNGEN  156
      W(20)=W(11)                                                       SNGEN  157
      W(21)=W(3)                                                        SNGEN  158
      W(22)=W(4)                                                        SNGEN  159
      W(23)=W(12)                                                       SNGEN  160
      W(24)=W(10)                                                       SNGEN  161
      W(25)=W(12)                                                       SNGEN  162
      W(26)=W(4)                                                        SNGEN  163
      W(27)=W(4)                                                        SNGEN  164
      W(28)=W(11)                                                       SNGEN  165
      W(29)=W(11)                                                       SNGEN  166
      W(30)=W(4)                                                        SNGEN  167
      W(31)=W(3)                                                        SNGEN  168
      W(32)=W(10)                                                       SNGEN  169
      W(33)=W(3)                                                        SNGEN  170
      W(34)=W(2)                                                        SNGEN  171
      W(35)=W(2)                                                        SNGEN  172
      W(36)=W(1)                                                        SNGEN  173
      GO TO 190                                                         SNGEN  174
C     ---   SN SET NOT FOUND IN LIBRARY                                 SNGEN  175
  180 CONTINUE                                                          SNGEN  176
      CALL EXIT                                                         SNGEN  177
  190 K=1+1                                                             SNGEN  178
      DO 210 J=2,I                                                      SNGEN  179
      LA=1+1-J                                                          SNGEN  180
      DO 200 L=1,LA                                                     SNGEN  181
      U(K)=U(L)                                                         SNGEN  182
  200 K=K+1                                                             SNGEN  183
  210 CONTINUE                                                          SNGEN  184
      K=1                                                               SNGEN  185
      DO 230 J=1,I                                                      SNGEN  186
      LA=1+1-J                                                          SNGEN  187
      DO 220 L=1,LA                                                     SNGEN  188
      E(K)=U(J)                                                         SNGEN  189
  220 K=K+1                                                             SNGEN  190
  230 CONTINUE                                                          SNGEN  191
  240 DO 250 J=1,M                                                      SNGEN  192
      W(J)=3.14159265358979*W(J)                                        SNGEN  193
  250 CONTINUE                                                          SNGEN  194
C     ---   REORDER SN LIBRARY                                          SNGEN  195
      K=1                                                               SNGEN  196
      L=MM                                                              SNGEN  197
  260 T=U(K)                                                            SNGEN  198
      U(K)=U(L)                                                         SNGEN  199
      U(L)=T                                                            SNGEN  200
      T=E(K)                                                            SNGEN  201
      E(K)=E(L)                                                         SNGEN  202
      E(L)=T                                                            SNGEN  203
      T=W(K)                                                            SNGEN  204
      W(K)=W(L)                                                         SNGEN  205
      W(L)=T                                                            SNGEN  206
      K=K+1                                                             SNGEN  207
      L=L-1                                                             SNGEN  208
```

```
214           IF (M.LT.L) GO TO 260                                          SNGEN   209
      C       ---   CALCULATE BETA COEFFICIENTS                              SNGEN   210
215           M=1                                                            SNGEN   211
216           DO 320 L=1,I                                                   SNGEN   212
217           TP=0.0                                                         SNGEN   213
218           DO 310 J=1,L                                                   SNGEN   214
219           T=TP+W(M)*U(M)                                                 SNGEN   215
220           BETA1(M)=TP/W(M)                                               SNGEN   216
221           BETA2(M)=T/W(M)                                                SNGEN   217
222           TP=T                                                           SNGEN   218
223     310   M=M+1                                                          SNGEN   219
224     320   CONTINUE                                                       SNGEN   220
      C                                                                      SNGEN   221
225           RETURN                                                         SNGEN   222
226           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     42*
    140 -       6     63*
    150 -       6     91*
    160 -       6    127*
    170 -       5    172*
    190 -      16     26      41      62      90     126     171     174*
    200 -  17700  179*
    210 -  17500  18 *
    220 -  18400  186*
    230 -  18600  187*
    240 -     1   188*
    250 -  18800  19 *
    460 -  193*   204
    310 -  20800  213*
    320 -  21000  214*
BETA    ()R    1A6     201   213=
BETA2   ()R    1A6     201   211=
E       ()R    1A6     201     9=   185=   196    197=   197    198=
I       -1      4=       6   174   17500  176   18200   183   20600
J       -1  17500   176   18200   183   185   18800   189   189    20800
K       -1   174=   178   179=   179   181=   185   186=   186   191=   193   194   196   197   199   200   202=   202
             204
L       -1  17700   178   18400   192=   194   195   197   198   200   201   203=   203   204   20600   20800
LA      -1   176=  17700   183=  18400
M       -1     3=  18800   215=   209   209   210   210   211   211   213=   213
MM      -1    1A6   192
N       -1    1A6     3       3       4       5
T       -R   193=   195   196=   198   199=   201   209=   211   212
TP      -R   207=   209   210   212=
U       ()R    1A6     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=
             131=   131=   132=   133=   134=   178=   178   185   193   194=   194   195=   209
W       ()R    1A6     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=
              46     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    62=    70=    80     81=     81    82=     82    83=
              74=    74     75=     75    76=     77=   78=     78    79=     79    80=    80     81=     81    82=     82    83=
              82     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=
              12    121=   121     122=  122     123=  123     124=  124     125=   125    135=   136=   137=   138=   139=   139
              14=   14     141=    141   142=    142   143=    143   144=    145=   146=   147=   147    148=    148   149=   149
             151=   151    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
```

```
1          OVERLAY (YOKIFER, 4, 2)                                          SNESTEP    2


1          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
2          COMMON /STATE/    NOPT, NOPD, NERG, 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          COM /YLC1/        AA1(131000)                                   ALLKOM     7
6          COM /YLC2/        AA2(131000)                                   ALLKOM     8
7          COM /RLC1/        SIGA(30000)                                   ALLKOM     9
8          COMMON /RED/      NAME(12), DT, DTR, EM10, GRDVEL, IBAR, IJBS,  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 /CRIMSN/   SNCON(183), ZZ                                CRIMSN     2
10         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,RCSC,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,CU,EMOMLC),                 EQVREAL    7
          6                  (AASC(13),VTIL,VL,UMUMLC),                    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
11         REAL              LAM, LAMD, M, MP, MU, MUG2                    EQVREAL   13
12         DIMENSION         X(1), XPAR(1), R(1), YPAR(1), Y(1), U(1),     DIMEN      2
          2                  V(1), RO(1), MP(1), RMP(1), RCSC(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), 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
13         LEAT              DBLINT                                        SNESTEP   14
14      2003 FORMAT          (1H0,5HTAVG ,1PE12.4,6X,6H TMAX ,1PE12.4,6X,  SNESTEP   15
          1                  6H DMAX ,1PE12.4,6X,6H DMIN ,1PE12.4)         SNESTEP   16
15      2005 FORMAT          (1H0,*ENERGIES*/6H SIE  ,1PE12.4,6X,6H UNTOT, SNESTEP   17
          1                  1PE12.4,6X,6H ELOST,1PE12.4,6X,6H EABS ,      SNESTEP   18
          2                  1PE12.4)                                      SNESTEP   19
16      2006 FORMAT          (1H0,*POWER*/6H PWR  ,1PE12.4,6X,6H PWR2 ,    SNESTEP   20
          1                  1PE12.4)                                      SNESTEP   21
17      2007 FORMAT          (1H0,*TIME INTERVAL DATA*/6H DTR  ,1PE12.4,   SNESTEP   22
          1                  6X,6H IJDT ,I12,6X,6H POWER,1PE12.4,6X,       SNESTEP   23
          2                  6H ECELL,1PE12.4)                             SNESTEP   24
C                                                                           SNESTEP   25
18         TMAX=0.0                                                         SNESTEP   26
19         DMAX=-15.0                                                       SNESTEP   27
20         DMIN=15.0                                                        SNESTEP   28
21         PWR=0.0                                                          SNESTEP   29
22         SIETOT=0.0                                                       SNESTEP   30
23         UNTOT=0.0                                                        SNESTEP   31
24         USIE=0.0                                                         SNESTEP   32
25         DTOLD=DTR                                                        SNESTEP   33
26         DTR=100.0                                                        SNESTEP   34
27         ELOST=0.0                                                        SNESTEP   35
28         EABS=0.0                                                         SNESTEP   36
C          ---   ADVANCE CELL ENERGIES AND TEMPERATURES                     SNESTEP   37
29         CALL START                                                       SNESTEP   38
30         DO 40 J=2,JP1                                                    SNESTEP   39
```

```
      DO 39 I=1,IBAR                                                    SNESTEP   40
      IPJ=IJ+NQ                                                         SNESTEP   41
      IJSC=(J-1)*IP1+1                                                  SNESTEP   42
      FOUTLC(IJ)=-FOUTLC(IJ)                                            SNESTEP   43
      IF (FOUTLC(IJ).GT.0.0) EABS=EABS+FOUTLC(IJ)                       SNESTEP   44
      IF (I.EQ.IBAR.OR.J.EQ.2.OR.J.EQ.JP1) PWR=PWR+FOUTLC(IJ)           SNESTEP   45
      VOL=6.283184/PVOL(IJ)                                             SNESTEP   46
      XX=FOUTLC(IJ)*DTOLD                                               SNESTEP   47
      DSIE=DSIE+XX                                                      SNESTEP   48
      ABSMEM=XX/VOL                                                     SNESTEP   49
      IF (TEMP(IJSC).LE.0.1) GO TO 35                                   SNESTEP   50
      IF (FOUTLC(IJ).EQ.0.0) GO TO 35                                   SNESTEP   51
      ECELL=SIE(IJ)*RO(IJ)*VOL*1.0E+15                                  SNESTEP   52
      PMARK=ABS(FOUTLC(IJ))                                             SNESTEP   53
      ADTR=0.15*ECELL/PMARK                                             SNESTEP   54
      IF (DTR.LT.ADTR) GO TO 35                                         SNESTEP   55
      DTR=ADTR                                                          SNESTEP   56
      IJDT=IJSC                                                         SNESTEP   57
      POWER=PMARK                                                       SNESTEP   58
      ECELLDT=ECELL                                                     SNESTEP   59
   35 DELSIE=ABSMEM/RO(IJ)*1.0E-15                                      SNESTEP   60
      SIE(IJ)=SIE(IJ)+DELSIE                                            SNESTEP   61
      SIETOT=SIETOT+(SIE(IJ)-RELSIE)*RO(IJ)*VOL*1.0E+15                 SNESTEP   62
C                                                                       SNESTEP   63
      ZR=RO(IJ)                                                         SNESTEP   64
      IF (SIE(IJ)-RELSIE.GT.1.0E-06) GO TO 36                           SNESTEP   65
      ZT=TAMB                                                           SNESTEP   66
      ZE=SIE(IJ)                                                        SNESTEP   67
      GO TO 38                                                          SNESTEP   68
   36 ZE=SIE(IJ)                                                        SNESTEP   69
      ZRINV=1.0/ZR                                                      SNESTEP   70
      ZRL=ALOG10(ZR)                                                    SNESTEP   71
      TLOW=TAMB                                                         SNESTEP   72
      THIGH=DSQRT(ZE*ZR*0.00728789E+07)                                 SNESTEP   73
      THIGH=DSQRT(THIGH)                                                SNESTEP   74
      ZT=0.5*(TLOW+THIGH)                                               SNESTEP   75
   37 UR1=137.214E-07*ZT**4                                             SNESTEP   76
      ZE1=ZE-UR1*ZRINV                                                  SNESTEP   77
      ZTL=ALOG10(ZT)                                                    SNESTEP   78
      ZE2L=UMLINT (0, ZRL, ZTL, OPDEN, OPTMP, ETAB, 0, NOPT, NOPD, NOPT) SNESTEP  79
      ZE2=EXP10(ZE2L)                                                   SNESTEP   80
      ZDE=ZE1-ZE2                                                       SNESTEP   81
      IF (ZDE.GT.0.0) TLOW=ZT                                           SNESTEP   82
      IF (ZDE.LT.0.0) THIGH=ZT                                          SNESTEP   83
      ZT=0.5*(THIGH+TLOW)                                               SNESTEP   84
      IF (THIGH-TLOW.LE.1.0E-06*ZT) GO TO 38                            SNESTEP   85
      GO TO 37                                                          SNESTEP   86
   38 TEMP(IJSC)=AMAX1(ZT,TAMB)                                         SNESTEP   87
      TMAX=AMAX1(TMAX,TEMP(IJSC))                                       SNESTEP   88
      DMIN=AMIN1(DMIN,RO(IJ))                                           SNESTEP   89
      DMAX=AMAX1(DMAX,RO(IJ))                                           SNESTEP   90
      URTOT=URTOT+137.214E-08*(TEMP(IJSC)**4)*VOL                       SNESTEP   91
      IJ=IPJ                                                            SNESTEP   92
   39 CONTINUE                                                          SNESTEP   93
      CALL LOOP                                                         SNESTEP   94
   40 CONTINUE                                                          SNESTEP   95
      CALL DONE                                                         SNESTEP   96
C                                                                       SNESTEP   97
      PWR=PWR/FLOAT(2*IBAR+JBAR)                                        SNESTEP   98
      PWR2=DSIE/DTOLD                                                   SNESTEP   99
      TAVG=TIME+0.5*DTOLD                                               SNESTEP  100
      ELOST=-PWR*DTOLD                                                  SNESTEP  101
      EABS=EABS*DTOLD                                                   SNESTEP  102
      PRINT 2005,       SIETOT, URTOT, ELOST, EABS                      SNESTEP  103
      WRITE (12,2005)   SIETOT, URTOT, ELOST, EABS                      SNESTEP  104
      PRINT 2006,       PWR, PWR2                                       SNESTEP  105
      WRITE (12,2006)   PWR, PWR2                                       SNESTEP  106
      PRINT 2007,       DTR, IJDT, POWER, ECELLDT                       SNESTEP  107
      WRITE (12,2007)   DTR, IJDT, POWER, ECELLDT                       SNESTEP  108
```

```
 96           PRINT 2003,      TAVG, TMAX, DMAX, DMIN                    SNESTEP  109
 99           WRITE (12,2003)  TAVG, TMAX, DMAX, DMIN                    SNESTEP  110
      C                                                                  SNESTEP  111
100           RETURN                                                     SNESTEP  112
      C                                                                  SNESTEP  113
111           END                                                        SNESTEP  114
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	DT	-R	8C0	IJPS	-I	8C0	LAMD	-R	11RL	NFRQ	-I	2C0	RLC1	-	7CN	THY	-R	8CU
AA2	()R	6LC	EM16	-R	8C0	ISCF1	-I	8C0	LEXT	-	13F	NQI	-I	8C0	SIGA	()R	7LC	TOUT	-R	8CU
ABS	-	445U	EQUIVAL	-	10F	ISCF2	-I	8C0	LUUP	-	84SU	PINA	-	4CN	SNCUN	()R	9C0	TSTART	-R	8CU
AMIN1	-	795U	FLOAT	-	875U	ISC2	-I	8C0	MU	-R	11RL	PTAB	()R	2C0	SNESTEP	-	1SU	YLC1	-	5CN
BTBL	()R	2C0	FREU	()R	2C0	ISC3	-I	8C0	MUU2	-R	11RL	QEXP10	-	745U	SPTBL	()R	2C0	YLC2	-	6CN
CRIMSN	-	9CN	GRUVEL	-R	8C0	ITV	-I	8CU	NAME	()1	8C0	REAL	-	11F	START	-	295U	YSC1	-	3CN
DIMENSI	-	12F	IJM	-1	4C0	JP2	-1	8C0	NCYC	-I	8C0	RED	-	8CN	STATE	-	2CN	ZZ	-R	9CU
DONE	-	865U	IJP	-I	4C0	LAP	-R	11RL	NDUMP	-I	8C0	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    83*
    40 -    3100    85*
  2003 -    14*     98PR    99WR
  2005 -    15*     92PR    93WR
  2006 -    16*     94PR    95WR
  2007 -    17*     96PR    97WR
AASC    ()R   3C0     10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ    10EQ
              10EQ    10EQ
ABSMEM  -R    4C=     51
AMAX1   -     77SU    78SU    80SU
BETALC  ()R   10EQ    12D1
CENTA   ()R   10EQ    12D1
CENTY   ()R   10EQ    12D1
COMMON  -     2F      3F      4F      8F      9F
CQ      ()R   10EQ    12D1
DBLINT  -     13LX    695U
DELSIE  -R    51=     52
DELSM   ()R   10EQ    12D1
DMAX    -R    19=     81=     80      98PR    99WR
DMIN    -R    20=     79=     79      98PR    99WR
DSIE    -R    24=     39=     39      88
DTOLD   -R    25=     38      88      89      90      91
DTR     -R    8C0     23      26=     46      47=     90PR    97WR
E       ()R   10EQ    12D1
EABS    -R    28=     35=     85      91=     91      92PR    93WR
ECELL   -R    43=     45      50
ECELLD1 -R    56=     96PR    97WR
ECOST   -R    27=     91=     92PR    93WR
EMOMLC  ()R   10EQ    12D1
EP      ()R   10EQ    12D1
ETAB    ()R   2C0     69
ETIL    ()R   10EQ    12D1
FORMAT  -     14F     15F     16F     17F
FOUTLC  ()R   10EQ    12D1    34=     34      35      35      36      38      42      44
FSN     ()R   10EQ    12D1
GRIR    ()R   10EQ    12D1
GRIZ    ()R   10EQ    12D1
I       -I    4C0     3100    33      36
IBAR    -I    8C0     3100    86      87
IJ      -I    4C0     32      34      34      35      35      36      37      38      42      43      43      44      51      52      52      53
              53      54      55      57      59      79      80      82=
IOUT    -I    48=     96PR    97WR
IJSC    -I    33=     41      48      77      78      81
IPJ     -I    32=     82
IPI     -I    8C0     33
```

```
J         -I    4C0   3.00    33      36      36
JMAP      -I    8C0   87
JPI       -I    8C0   3.00    36
LCM       -     5F     6F     7F
M         ()R   1EEQ  11KL    12DI
MP        ()R   1EEQ  11KL    12DI
NOPD      -I    2C0   69
NOPT      -I    2C0   69      69
NQ        -I    8C0   32
OPDEN     ()R   2C0   69
OPTMP     ()R   2C0   69
P         ()R   1EEQ  12DI
PL        ()R   1EEQ  12DI
PMARK     -R    44=   45      49
POWER     -R    45=   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   1EEQ  12DI
RCSQ      ()R   1EEQ  12DI
RESIE     -R    8C0   53      55
RM        ()R   1EEQ  12DI
RMP       ()R   1EEQ  12DI
RO        ()R   1EEQ  12DI    43      51      53      54      79      80
ROL       ()R   1EEQ  12DI
RVOL      ()R   1EEQ  12DI    37
RZEDEN    ()R   1EEQ  12DI
SIE       ()R   1EEQ  12DI    43      52=     52      53      55      57      59
SIETOT    -R    22=   53=     53      92PR    93WR
SIGPLC    ()R   1EEQ  12DI
TAMB      -R    8C0   56      62      77
TAVG      -R    89=   96PR    99WR
TEMP      ()R   8C0   41      77=     78      81
THIGH     -R    63=   64=     64      65      73=     74      75
TIME      -R    8C0   69
TLOW      -R    62=   65      72=     74      75
TMAX      -R    18=   78=     78      98PR    99WR
U         ()R   1EEQ  12DI
UG        ()R   1EEQ  12DI
UL        ()R   1EEQ  12DI
UMOMLC    ()R   1EEQ  12DI
UP        ()R   1EEQ  12DI
URTOT     -R    23=   81=     81      92PR    93WR
URI       -R    66=   67
UTIL      ()R   1EEQ  12DI
V         ()R   1EEQ  12DI
VG        ()R   1EEQ  12DI
VL        ()R   1EEQ  12DI
VOL       -R    37=   42      43      53      81
VP        ()R   1EEQ  12DI
VTIL      ()R   1EEQ  12DI
WRITE     -     93F   95F     97F     99F
X         ()R   1EEQ  12DI
XDTR      -R    45=   46      47
XPAR      ()R   1EEQ  12DI
XX        -R    38=   39      40
Y         ()R   1EEQ  12DI
YPAR      ()R   1EEQ  12DI
ZDE       -R    71=   72      73
ZE        -R    59=   63      67
ZE1       -R    67=   71
ZE2       -R    57=   70=     71
ZE2L      -R    64=   70
ZR        -R    54=   60      61      63
ZRINV     -R    60=   67
ZRL       -R    61=   69
ZT        -R    56=   65=     66      68      72      73      74=     75      77
```

```
ZIL    -R   68=    69
```

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

      PROGRAM SNOUT                                                    SNOUT     3
C                                                                      SNOUT     4
C       THIS CODE GIVES OUTPUT FOR THE S#N CALCULATIONS                SNOUT     5
C                                                                      SNOUT     6
      COMMON /STATE/    NOPT, NCPD, NFRQ, OPTMP(30), OPDEN(10),        ALLKOM    2
     1                  FREQ(100), SPTHL(300), PTAB(300), ETAB(300),   ALLKOM    3
     2                  BTHL(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(14), 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
      COMMON /CRIMSN/   SNCON(183), ZZ                                 CRIMSN    2
      COMMON /SILVER/   FIPAL, FIPXR, FIPYB, FIXL, FIXR, FIYB,        SILVER    2
     1                  IPAL, 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
      EQUIVALENCE       (AASC(1),X,XPAR), (AASC(2),R,YPAR), (AASC(3),Y),  EQVREAL  2
     1                  (AASC(4),U), (AASC(5),V), (AASC(6),MO),        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
      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), 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
      DIMENSION         TITLE(5)                                       SNOUT    12
      COMMON /SNOWITE/  ISN, AVINT(7500), RSN(101), ZSN(102)           SNOUT    13
 2400 FORMAT            (6H RFLUX,1PE12.4,4H   ZFLUX,1PE12.4,          SNOUT    14
     1                  12H J/CU KM-SEC)                               SNOUT    15
C     ---   FLUX DIAGRAM SHOWING RADIATION FLOW                        SNOUT    16
      UMAX=VMAX=0.                                                     SNOUT    17
      DR=DZ=1.0E+36                                                    SNOUT    18
      CALL START                                                       SNOUT    19
      DO 419 J=2,JP1                                                   SNOUT    20
      DO 418 I=1,IBAR                                                  SNOUT    21
      XL=ABS(UMOMLC(IJ))                                               SNOUT    22
      XV=ABS(EMOMLC(IJ))                                               SNOUT    23
      UMAX=AMAX1(XU,UMAX)                                              SNOUT    24
      VMAX=AMAX1(XV,VMAX)                                              SNOUT    25
      IF (J.EQ.2) DR=AMIN1(DR,RSN(I+1)-RSN(I))                         SNOUT    26
      IF (I.EQ.1) DZ=AMIN1(DZ,ZSN(J+1)-ZSN(J))                         SNOUT    27
      IJ=IJ+NG                                                         SNOUT    28
  418 CONTINUE                                                         SNOUT    29
      CALL LOOP                                                        SNOUT    30
  419 CONTINUE                                                         SNOUT    31
      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
```

```
SNOUT      33
SNOUT      34
SNOUT      35
SNOUT      36
SNOUT      37
SNOUT      38
SNOUT      39
SNOUT      40
SNOUT      41
SNOUT      42
SNOUT      43
SNOUT      44
SNOUT      45
SNOUT      46
SNOUT      47
SNOUT      48
SNOUT      49
SNOUT      50
SNOUT      51
SNOUT      52
SNOUT      53
SNOUT      54
SNOUT      55
SNOUT      56
SNOUT      57
SNOUT      58
SNOUT      59
SNOUT      60
SNOUT      61
SNOUT      62
SNOUT      63
SNOUT      64
SNOUT      65
SNOUT      66
SNOUT      67
SNOUT      68
SNOUT      69
SNOUT      70
SNOUT      71
SNOUT      72
SNOUT      73
SNOUT      74
SNOUT      75
SNOUT      76
SNOUT      77
SNOUT      78
SNOUT      79
SNOUT      80
SNOUT      81
SNOUT      82
SNOUT      83
SNOUT      84
SNOUT      85
```

SINGLY REFERENCED VARIABLES

AA1	()R	5LC	FIPAR	-R	10C0	ISC2	-I	8C0	NCYC	-I	8C0	RED	-	8CN	STATE	-	2CN	YLC1	-	5CN
AA2	()R	6LC	FIXR	-R	10C0	ISC3	-I	8C0	NDUMP	-I	8C0	RETURN	-	81F	T	-R	8C0	YLC2	-	6CN
AVINT	()R	15C0	FORMAT	-	16F	ISN	-I	15C0	NFRQ	-I	2C0	REZSIE	-R	8C0	TAMB	-R	8C0	YSC1	-	3CN
BTBL	()R	2C0	FREQ	()R	2C0	ITV	-I	8C0	NOPD	-I	2C0	RIBAR	-R	13C0	TEMP	()R	8C0	YT	-R	10C0
CRIMSN	-	9CN	GROVEL	-R	8C0	JBAR	-I	8C0	NOPT	-I	2C0	RLC1	-	7CN	THY	-R	8C0	ZZ	-R	9C0
DT	-R	8C0	IJM	-I	4C0	JP2	-I	8C0	NQI	-I	8C0	SIGA	()R	7LC	TIME	-R	8C0			
DTH	-R	8C0	IJP	-I	4C0	LAM	-R	12RL	OPDEN	()R	2C0	SILVER	-	10CN	TOUT	-R	8C0			
EMIO	-R	8C0	IJPS	-I	8C0	LAMD	-R	12RL	OPTMP	()R	2C0	SNCON	()R	9C0	TSTART	-R	8C0			
ENCODE	-	54F	IPJ	-I	8C0	MU	-R	12RL	PINK	-	4CN	SNOUT	-	13U	VV	-R	10C0			
EQUIVAL	-	11F	ISCF1	-I	8C0	MUG2	-R	12RL	PTAB	()R	2C0	SNORITE	-	15CN	XL	-R	10C0			
ETAB	()R	2C0	ISCF2	-I	8C0	NAME	()I	8C0	REAL	-	12F	SPTBL	()R	2C0	XR	-R	10C0			

MULTIPLY-REFERENCED VARIABLES

418	-	21D0	29*															
419	-	2·D0	31*															
434	-	4·D0	5 *															
435	-	38D0	52*															
443	-	66	74*															
444	-	64D0	75*															
445	-	61D0	63	77*														
2408	-	16*	54EC															
AASC	()R	3C0	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ	11EQ
		11EQ	11EQ															
ABS	-	22SU	23SU															
ADV	-	35SU	58SU	8 SU														
AMAX1	-	24SU	25SU	34SU														
AMIN1	-	26SU	27SU	33SU														
BETALC	()R	11EQ	13D1															
CENTA	()R	11EQ	13D1															
CENTY	()R	11EQ	13D1															
COMMON	-	4F	3F	4F	8F	9F	10F	15F										
CQ	()R	11EQ	13D1															
DELSM	()R	11EQ	13D1															
DIMENSI	-	13F	14F															
DLCH	-	57SU	79SU															
DONE	-	37SU	53SU	78SU														
DR	-R	18=	26=	26	33=	33	34											
DROU	-R	34=	42	43	67	68												
DRV	-	48SU	73SU															
DZ	-R	18=	27=	27	33													
E	()R	11EQ	13D1															
EMOMLC	()R	11EQ	13D1	23	43	68												
EP	()R	11EQ	13D1															
ETIL	()R	11EQ	13D1															
FIPXL	-R	1·C0	69	70														
FIPYB	-R	1·C0	71	72														
FIXL	-R	1·C0	44	45														
FIYB	-R	1·C0	46	47														
FOUTLC	()R	11EQ	13D1															
FRAME	-	36SU	59SU															
FSN	()R	11EQ	13D1															
GRIR	()R	11EQ	13D1															
GRIZ	()R	11EQ	13D1															
I	-I	4C0	21D0	26	26	27	40D0	41	64D0	65								
IBAR	-I	8C0	21D0	40D0	64D0													
IJ	-I	4C0	22	23	28=	28	42	43	49=	49	67	68	74=	74				
IPXL	-I	1·C0	59AG															
IPXR	-I	1·C0	59AG															
IPYB	-I	1·C0	59AG															
IPYT	-I	1·C0	59AG															
IXL	-I	1·C0	36AG															
IXR	-I	1·C0	36AG															
IX1	-I	44=	48AG	69=	73AG													
IX2	-I	45=	48AG	70=	73AG													
IYB	-I	1·C0	36AG	55														
IYT	-I	1·C0	36AG															
IY1	-I	46=	48AG	71=	73AG													
IY2	-I	47=	48AG	72=	73AG													
J	-I	4C0	22 D0	26	27	27	38D0	39	61D0	62								
JP1	-I	8C0	22 D0	38D0	61D0													
JXL	-I	56=	57AG	79AG														
JYB	-I	55=	57AG	79AG														
LCM	-	5F	6F	7F														
LOOP	-	31SU	51SU	76SU														
N	()R*	11EQ	12RL	13D1														
NP	()R	11EQ	12RL	13D1														
NQ	-I	8C0	22	49	74													
P	()R	11EQ	13D1															
PL	()R	11EQ	13D1															
PXCONV	-R	1·C0	69	70														
PXL	-R	1·C0	66															

```
PXR      -R    1 CO    66
PYB      -R    1 CO    63
PYCONV   -R    1 CO    71      72
PYT      -R    1 CO    63
R        ()R   11EQ    13D1
RCSD     ()R   11EQ    13D1
RM       ()R   11EQ    13D1
RMP      ()R   11EQ    13D1
RO       ()R   11EQ    13D1
ROL      ()R   11EQ    13D1
RSN      ()R   15CD    20      26      41      65
RVOL     ()R   11EQ    13D1
RZEDEN   ()R   11EQ    13D1
SIE      ()R   11EQ    13D1
SIGPLC   ()R   11EQ    13D1
START    -     14SD    37SD    62SD
TITLE    ()R   14DI    54LC    57AG    79AG
U        ()R   11EQ    13D1
UG       ()R   11EQ    13D1
UL       ()R   11EQ    13D1
UMAX     -R    17=     24=     24      34      54EC
UMOMLC   ()R   11EQ    13D1    22      42      67
UP       ()R   11EQ    13D1
UTIL     ()R   11EQ    13D1
V        ()R   11EQ    13D1
VG       ()R   11EQ    13D1
VL       ()R   11EQ    13D1
VMAX     -R    17=     25=     25      34      54EC
VP       ()R   11EQ    13D1
VTIL     ()R   11EQ    13D1
X        ()R   11EQ    13D1
XCONV    -R    1 CO    44      45
XPAR     ()R   11EQ    13D1
XU       -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   11EQ    13D1
YB       -R    1 CO    46      47      71      72
YCONV    -R    1 CO    46      47
YPAR     ()R   11EQ    13D1
Y1       -R    39=     43      46      62=     63      63      68      71
Y2       -R    43=     47      68=     72
ZSN      ()R   15CD    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	21D	FORTRAN	7D	SUBSCR	1D	CROSS	7D	WALK	18D	HOWFAR	4D						
AA	IN	3	OUT	3														
AASC	YOKIFER	4C	LCOP	11C	FILMCO	CD	OFFWEGO	2CD	MESHMKR	CD	PARTGEN	1CD	YOKKY	CD	PHASE0	CD	YOKOUT	CD
	PARPLOT	1CD	PHASE1	CD	PHASE2	CD	PHASE3	CD	REZONE	CD	PARTMOV	4CD	MCRT	CD	REEFER	CD	FLUSH	CD
	PFREG	C	SUBSCR	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	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
	PFREG	D	SUBSCR	D	WALK	D	ESTEP	D	LISTING	D	GREYSN	D	CYLSN	D	SWEEP	D	SNESTEP	D
	SNOUT	D																

```
   AAZ      YORIFER  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    PHASE2   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   11D
   ADIST    POMEGA   6
S ADV       YORIFER  1    YOKOUT   5   PARPLOT  1   SNOUT    3
S AFSREL    YORIFER  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     PHASE2   3
S ALOG10    PARPLOT  1
   ALPHA    YORIFER  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     YORIFER  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
   ANG      YORIFER  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   YORIFER  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       PHASE3   6
   AREAF    REZONE   3
   AS       SUBSCR   1D
   ASU      YORIFER  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    8D   IN       3D  OUT      3D
   AVOLD    CYLSN    3D   SWEEP    3D
   AX       PHASE1   3
   AY       PHASE1   3
   AZ       YORIFER  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
   AZIAC    YORIFER  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
   AZM      YORIFER  C    FILMCO   C   OFFWEGO  3C  MESHMKR  C    PARTGEN  C   YOKKY    C   PHASE0   C   YOKOUT   C   PARPLOT   C
            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   CUT      4
   BCD      YOKOUT   5
   BETA     IN       2D   CUT      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
   BET1     SWEEP    3D   SNGEN    2D
   BET2     SWEEP    3D   SNGEN    2D
   BH       IN       4D   CUT      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     YORIFER  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   CUT      4D
```

```
   BD       YORIFER   C    FILMCO    C    OFFWEGO  3C   MESHMKR   C    PARTGEN   C    YORKY     C    PHASE0    C    YOKOUT    C    PARPLOT   C
            PHASE1    C    PHASE2    C    PHASE3   5C   REZONE    C    PARTMOV   C
   C        SUBSCR    1D   CROSS     7D
   CBLOCK   REEFER    46D
   CC       IN        3    OUT       3
   CELAREA  PHASE1    3    PHASE2    2
S  CENTROY  CENTROY   1    WALK      2
   CENTX    FILMCO    D    OFFWEGO   D    MESHMKR  D    PARTGEN   D    YORKY     D    PHASE0    D    YOKOUT    D    PARPLOT   D    PHASE1    D
            PHASE2    D    PHASE3    D    REZONE   D    PARTMOV   D    MCRT      2D   REEFER    D    FLUSH     D    CENTROY   17D  WALK      D
            ESTEP     D    LISTING   D    GREYSN   1D   SNESTEP   D    SNOUT     D
   CENTY    FILMCO    D    OFFWEGO   D    MESHMKR  D    PARTGEN   D    YORKY     D    PHASE0    D    YOKOUT    D    PARPLOT   D    PHASE1    D
            PHASE2    D    PHASE3    D    REZONE   D    PARTMOV   D    MCRT      2D   REEFER    D    FLUSH     D    CENTROY   17D  WALK      D
            ESTEP     D    LISTING   D    GREYSN   1D   SNESTEP   D    SNOUT     D
   CIRC     PHASE     11
   COLAMO   YORIFER   C    FILMCO    C    OFFWEGO  1C   MESHMKR   C    PARTGEN   C    YORKY     C    PHASE0    C    YOKOUT    C    PARPLOT   C
            PHASE1    1C   PHASE2    1C   PHASE3   C    REZONE    C    PARTMOV   C
F  COMMON   YORIFER   11   LOOP      4    FILMCO   8    OFFWEGO   11   MESHMKR   9    PARTGEN   8    YORKY     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    WHERE     1    ESTEP     6    LISTING   6    GREYSN    7
            CYLSN     6    SWEEP     5    SNESTEP  5    SNOUT     7
   CON      YOKOUT    25D
S  COPYF    OFFWEGO   2    REEFER    1
S  COS      REEFER    2    POMEGA    1
   CPM      REEFER    2
   CPMI     POMEGA    4
   CQ       FILMCO    D    OFFWEGO   D    MESHMKR  D    PARTGEN   D    YORKY     D    PHASE0    D    YOKOUT    14D  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     D
L  CRIMSN   YORIFER   1    OFFWEGO   1    GREYSN   1    CYLSN     1    SWEEP     1    SNESTEP   1    SNOUT     1
S  CROSS    POMEGA    4    CROSS     2
   CT       SWEEP     6D   IN        2D   OUT      2D
   CTM      REEFER    2
   CTMT     POMEGA    4
   CWGT     CENTROY   6D   WALK      2.D
   CYL      YORIFER   C    FILMCO    C    OFFWEGO  4C   MESHMKR   2C   PARTGEN   C    YORKY     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    7    MOWFAR    8
S  DATAREL  YORIFER   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       MOWFAR    8
   DELE     PHASE     6
   DELSIL   SNESTEP   2
   DELSM    FILMCO    D    OFFWEGO   D    MESHMKR  D    PARTGEN   D    YORKY     D    PHASE0    D    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   D    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    YORKY     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    MOWFAR   1    WHERE     1    ESTEP     2    LISTING   2    GREYSN    1    CYLSN     1    SWEEP     1
            IN        2    OUT       2    SNGEN    1    SNESTEP   1    SNOUT     2
   DISC     MOWFAR    7
S  DLOH     SNOUT     2
   DLOG     MCRT      7    SUBSCR    2    WALK     6    GREYSN    5
   DMAX     ESTEP     5    SNESTEP   5
   DMEP     WALK      2
   DMIN     MCRT      3    ESTEP     5    SNESTEP  5
   DMOVE    WALK      1C
   DNEG     MOWFAR    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     MOWFAR    7
```

	DQ	YORCUT	6	PHASE2	4														
	DR	OFFWEGO	3C	MESHMKR	1C	PARTGEN	C	SNOUT	6										
	DRMAX	YORCUT	6																
	DRMIN	YORCUT	6																
	DROU	YORCUT	4	SNOUT	5														
	DRPAR	PARTGEN	6																
S	DRV	YORCUT	22	PARPLOT	4	SNOUT	2												
	DSTE	SNESTEP	4																
	DT	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	3C	YORCUT	2C
		PARPLOT	C	PHASE1	1AC	PHASE2	3C	PHASE3	11C	REZONE	3C	PARTMOV	2C	MCRT	1C	REEFER	C	FLUSH	C
		PFREQ	C	SLOSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSA	1C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	DTC	YORIFER	C	YORKY	C	PHASE0	2C	YORCUT	C	PARPLOT	C	PHASE1	2C	PHASE2	C	PHASE3	5C	REZONE	C
		PARTMOV	C																
	DTCSAV	YORIFER	C	YORKY	C	PHASE0	1C	YORCUT	C	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	3C	REZONE	C
		PARTMOV	C																
	DTFAC	PHASE1	2																
	DT1C	YORCUT	1C	PARPLOT	5														
	DTOLD	MCRT	5	SNESTEP	6														
	DTOLDER	MCRT	3																
	DTO16	PHASE3	2																
	DTO2	YORIFER	C	YORKY	C	PHASE0	C	YORCUT	C	PARPLOT	C	PHASE1	6C	PHASE2	2C	PHASE3	C	REZONE	C
		PARTMOV	C																
	DTO2M1	PHASE1	3	PHASE2	3														
	DTO2M2	PHASE1	3	PHASE2	3														
	DTO2M3	PHASE1	3	PHASE2	3														
	DTO2M4	PHASE1	3	PHASE2	3														
	DTPOS	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YORCUT	C	PARPLOT	C
		PHASE1	1C	PHASE2	C	PHASE3	2C	REZONE	C	PARTMOV	C								
	DTR	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	4C	MESHMKR	C	PARTGEN	C	YORKY	1C	PHASE0	C	YORCUT	1C
		PARPLOT	C	PHASE1	3C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C	MCRT	13C	REEFER	C	FLUSH	C
		PFREQ	C	SLOSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSA	8C	CYLSN	C	SWEEP	C	SNESTEP	6C
		SNOUT	C																
	DTRI	PARTMOV	6																
	DTV	YORIFER	C	YORKY	C	PHASE0	2C	YORCUT	C	PARPLOT	C	PHASE1	2C	PHASE2	5C	PHASE3	C	REZONE	C
		PARTMOV	C																
	DTVSAV	YORIFER	C	YORKY	C	PHASE0	1C	YORCUT	C	PARPLOT	C	PHASE1	C	PHASE2	3C	PHASE3	C	REZONE	C
		PARTMOV	C																
	DUDR	PHASE1	3																
	DUDX	PHASE2	5																
	DUMMY	REEFER	6	PCMEGA	2	PFREQ	5	WALK	3										
	DUVYR	PHASE1	2	PHASE2	2														
	DVDY	YORIFER	C	YORKY	C	PHASE0	C	YORCUT	C	PARPLOT	C	PHASE1	3C	PHASE2	5C	PHASE3	C	REZONE	C
		PARTMOV	C																
	DX	CENTROY	4	NCWPAR	5														
	DX1	CENTROY	4																
	DXJ	CENTROY	6																
	DX5	REZONE	6																
	DY	CENTROY	4	NCWPAR	11														
	DY1	CENTROY	6																
	DYJ	CENTROY	4																
	DY5	REZONE	6																
	DZ	OFFWEGO	3C	MESHMKR	7C	PARTGEN	C	SWEEP	8	IN	3	OUT	3	SNOUT	4				
	DZMAX	YORCUT	6																
	DZMIN	YORCUT	6																
	DZP	SWEEP	6	IN	4	OUT	4												
	DZPAR	PARTGEN	5																
	4L	NCWPAR	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	YORKY	D	PHASE0	D	YORCUT	D	PARPLOT	D	PHASE1	1D
		PHASE2	2D	PHASE3	2D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
		LISTING	D	GREYSA	D	SWEEP	5D	IN	3D	OUT	3D	SAGEN	7D	SNESTEP	D	SNOUT	D		
	EABS	ESTEP	3	SNESTEP	7														
	EALL	MCRT	3																

```
  ENLOCK   MCRT     C   REEFER   C   FLUSH    1C   WALK    14C   ESTEP    3C   LISTING   C
  ECELL    SNESTEP  3
  ECELLOT  SNESTEP  3
  ECEN     MCRT     C   REEFER   7C  FLUSH    C    WALK    C     ESTEP    2C   LISTING   C
  ECENI    REEFER   6
S ECND     LOOP     6   OFFWEGO  1   PARPLOT  1    PARTMOV 2     REEFER   4    CENTRCY   3   WHERE  8   SWEEP  2
S ECNR     LOOP     5   OFFWEGO  1   PARTGEN  1    PARTMOV 2     REEFER   1    SWEEP     2
  EDEATH   REEFER   6   WALK     2
  EDEP     WALK     2D  ESTEP    8D
  EDIE     REEFER   5
  EEMIT    ESTEP    9
  EINT     MCRT     6
  ERIN     MCRT     6
  ELOST    ESTEP    11  SNESTEP  4
  EMC      MCRT     C   REEFER   3C  FLUSH    C    WALK    C     ESTEP    2C   LISTING   C
  EMIT     ESTEP    2
  EMOM     SWEEP    8D  IN       3D  OUT      3D
  EMOMLC   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
S EMPTY    YOKOUT   1
  ENSN     ESTEP    4D  LISTING  1D
  EMIN     YOKIFER  C   LOOP     C   FILMCO   C    OFFWEGO 2C    MESHMKR  C    PARTGEN   2C  YOKKY  1C  PHASE0 C   YOKOUT 4C
           PARPLOT  C   PHASE1   1C  PHASE2   2C   PHASE3  1C    REZONE   C    PARTMOV   C   MCRT   2C  REEFER C   FLUSH  C
           PFREQ    C   SLOSCR   C   WALK     C    ESTEP   C     LISTING  C    GREYSN    2C  CYLSN  C   SWEEP  C   SNESTEP C
           SNOUT    C
F ENCODE   YOKOUT   5   PARPLOT   1   SNOUT    1
F ENDFILE  YOKIFER  4   REEFER    2   GREYSN   2
  ENEW     WALK     3
F ENTRY    LOOP     7
F EOF      OFFWEGO  2
  EOI      OFFWEGO  3D
  EP       FILMCO   D   OFFWEGO  D   MESHMKR  D    PARTGEN D     YOKKY    D    PHASE0    D   YOKOUT D   PARPLOT D   PHASE1 D
           PHASE2   D   PHASE3   2D  REZONE   D    PARTMOV D     MCRT     D    REEFER    D   FLUSH  D   WALK   D   ESTEP  D
           LISTING  D   GREYSN   D   SNESTEP  D    SNOUT   D
  EPART    REEFER   2   WALK     14  ESTEP    6D   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  1    PARTGEN 1     YOKKY    1    PHASE0    1   YOKOUT 2   PARPLOT 1   PHASE1 1
           PHASE2   1   PHASE3   1   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   PHASE1   C   PHASE2   C    PHASE3  1C    REZONE   C    PARTMOV   C   MCRT   C   REEFER C   FLUSH  C
           PFREQ    C   SLOSCR   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
           PHASE2   7D  PHASE3   5D  REZONE   D    PARTMOV D     MCRT     D    REEFER    D   FLUSH  D   WALK   D   ESTEP  D
           LISTING  D   GREYSN   D   SNESTEP  D    SNOUT   D
  ETOT     ESTEP    3
S EXIT     SNGEN    1
S EXP      MESHMKR  1   REZONE   3   WALK
  FB       PHASE2   7
  FCH2     REZONE   1
  FCX      REZONE   1
  FCY      REZONE   1
  FDEN     MESHMKR  7
  FILM     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
```

	FIPYB	YORIFER	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														
	FIAL	YORIFER	C	FILMCO	5C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	2C												
	FIALG	YOKOUT	2																
	FIAR	YORIFER	C	FILMCO	5C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	3C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	C												
	FIARG	YOKOUT	2																
	FIYB	YORIFER	C	FILMCO	5C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	2C												
	FIYBG	YOKOUT	2																
	FIYT	FILMCO	5	YOKOUT	3														
	FIYTG	YOKOUT	2																
	FL	PHASE3	7																
	FLAGU	PHASE1	6																
	FLAGV	PHASE1	6																
S	FLOAT	YORIFER	1	FILMCO	1	MESHMKR	2	YOKOUT	7	PARPLOT	3	PHASE1	1	REEFER	2	SNESTEP	1		
S	FLUSH	REEFER	1	FLUSH	1	WALK	5												
	FMOD	PHASE2	4																
	FM1	PHASE3	3																
	FM2	PHASE3	3																
	FM3	PHASE3	3																
	FM4	PHASE3	3																
	FNUM	MESHMKR	8																
F	FORMAT	YORIFER	3	OFFWEGO	1A	MESHMKR	9	PARTGEN	4	PHASE0	6	YOKOUT	1D	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	9D	IN	3D	OUT	3D												
	FOUTLG	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	YORIFER	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	YORIFER	1																
	FSET12	YORIFER	1																
	FSET2	YORIFER	1																
	FSET3	YORIFER	1																
	FSET4	YORIFER	1																
	FSET6	YORIFER	1																
	FSET7	YORIFER	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														
	F13	PHASE3	5																
	F24	PHASE3	5																
S	GETEMP	OFFWEGO	1	MESHMKR	3														
S	GETQ	YORIFER	1	OFFWEGO	1														
	GGM1	PHASE1	2																
	GM1	YORIFER	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	YORIFER	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								
	GRDVEL	YORIFER	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																

```
L GREEN    YORIFER  1    OFFWEGO  1    MCRT     1    REEFER   1    FLUSH    1    WALK     1    ESTEP    1    LISTING  1
S GREYSN   GREYSN   1
  GRIR     FILMCO   D    OFFWEGO  D    MESHMKR  D    PARTGEN  D    YOKKY    D    PHASE0   D    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  D    GREYSN   D    SNESTEP  D    SNOUT    D
  GRIZ     FILMCO   D    OFFWEGO  D    MESHMKR  D    PARTGEN  D    YOKKY    D    PHASE0   D    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  D    GREYSN   D    SNESTEP  D    SNOUT    D
  GZ       YORIFER  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        YORIFER  6C   LOOP     1C   FILMCO   1C   OFFWEGO  3C   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    SLOSCR   C    WALK     3C   HOWFAR   10   WHERE    4    ESTEP    4C   LISTING  2C   GREYSN   2C   CYLSN    6C
           SWEEP    34C  IN       24   OUT      24   SNOEN    8    SNESTEP  3C   SNOUT    6C
S IABS     MESHMKR  2
  IBANK    REEFER   8
  IBAR     YORIFER  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    SLOSCR   C    CENTROY  2C   WALK     1C   WHERE    1C   ESTEP    2C   LISTING  C    GREYSN   1C   CYLSN    4C
           SWEEP    9C   SNESTEP  3C   SNOUT    3C
  IBUR     MESHMKR  17
  IBUF     LOOP     9
  ICEL     PARTMOV  3
  IC1      YORCUT   8
  IC2      YORCUT   6
  ID       MCRT     C    REEFER   1C   FLUSH    3C   WALK     25C  ESTEP    C    LISTING  C
  IDIE     REEFER   9    WALK     5
  IDIC     YORIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   C    PHASE3   1C   REZONE   C
           PARTMOV  C
  IDIV     YORIFER  C    YOKKY    C    PHASE0   2C   YOKOUT   C    PARPLOT  C    PHASE1   C    PHASE2   1C   PHASE3   C    REZONE   C
           PARTMOV  C
  IDUMP    YORIFER  6
  IDX      WALK     17
  IEC      LOOP     4    PARTMOV  2
  IECP     YORIFER  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  8    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       YORIFER  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    SLOSCR   C    WALK     C    ESTEP    13C  LISTING  2C   GREYSN   13C  CYLSN    C    SWEEP    29C  SNESTEP  24C
           SNOUT    12C
  IJA      YORCUT   6
  IJB      YORCUT   6
  IJCEN    REEFER   19
  IJDT     SNESTEP  3
  IJK      OFFWEGO  2    SLOSCR   2    WALK     2
  IJM      YORIFER  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    SLOSCR   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      YORIFER  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    SLOSCR   C    WALK     C    ESTEP    2C   LISTING  C    GREYSN   5C   CYLSN    C    SWEEP    C    SNESTEP  C
           SNOUT    C
```

	IJPS	YORIFER	C	LOOP	8C	FILMCO	C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C
		PARPLOT	C	PHASE1	1C	PHASE2	C	PHASE3	1C	REZONE	C	PARTMOV	C	MCRT	C	REEFER	C	FLUSH	C
		PFREO	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	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																
	IJJ	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	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	1C	YOKOUT	1C	PARPLOT	C
		PHASE1	C	PHASE2	C	PHASE3	C	REZONE	2C	PARTMOV	C								
S	IN	SWEEP	2	IN	1														
	INEW	NOWPAR	6	WHERE	14														
	INP	YORIFER	1																
S	IN1	OFFWEGO	1																
	IOLD	WALK	1C	NOWPAR	3C	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										
	IPAL	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	4C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	1C												
	IPAR	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	5C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	1C												
	IPYB	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	5C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	1C												
	IPYT	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	5C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	1C												
	IP1	YORIFER	C	LOOP	C	FILMCO	1C	OFFWEGO	8C	MESHMKR	14C	PARTGEN	C	YOKKY	C	PHASE0	2C	YOKOUT	3C
		PARPLOT	C	PHASE1	4C	PHASE2	3C	PHASE3	7C	REZONE	6C	PARTMOV	3C	MCRT	1C	REEFER	3C	FLUSH	C
		PFREO	C	SUBSCR	C	WALK	6C	ESTEP	3C	LISTING	2C	GREYSN	2C	CYLSN	2C	SWEEP	4C	SNESTEP	1C
		SNOUT	C																
	IP2	YORIFER	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								
	IRITE	YOKOUT	13	PARPLOT	4														
	IRNG	WALK	11																
	ISC	CENTROY	11	WALK	6														
	ISCF1	YORIFER	C	LOOP	2C	FILMCO	C	OFFWEGO	2C	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
		PFREO	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	ISCF	YORIFER	C	LOOP	2C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C
		PARPLOT	C	PHASE1	1C	PHASE2	C	PHASE3	1C	REZONE	C	PARTMOV	C	MCRT	C	REEFER	C	FLUSH	C
		PFREO	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	ISC2	YORIFER	C	LOOP	8C	FILMCO	C	OFFWEGO	3C	MESHMKR	C	PARTGEN	C	YOKKY	C	PHASE0	C	YOKOUT	C
		PARPLOT	C	PHASE1	1C	PHASE2	C	PHASE3	1C	REZONE	C	PARTMOV	2C	MCRT	C	REEFER	C	FLUSH	C
		PFREO	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	ISC3	YORIFER	C	LOOP	4C	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
		PFREO	C	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C
		SNOUT	C																
	ISN	OFFWEGO	2	GREYSN	3C	CYLSN	6C	SNOUT	C										
	ISNP	CYLSN	20																
	ISTEP	WALK	5	CYLSN	5														
	ISUB	SUBSCR	4																
	ISYM	YOKOUT	2																

IT	SWEEP	1D	IN	3D	OUT	2D													
ITAB	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C	
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	3C									
ITEM	PARTMOV	3																	
ITEST	WHERE	34																	
ITG	PHASE	4																	
ITIC	PARPLOT	2																	
ITM	PHASE	4																	
ITV	YORIFER	C	LOOP	1C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C	MORT	C	REEFER	C	FLUSH	C	
	FFREW	C	SLOSCR	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	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	16C	PARPLOT	C	PHASE3	C	REZONE	C	
	PARTMOV	C	GREYSN	C	SNOUT	1C													
IXL0	YORCUT	2																	
IXR	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	C	PHASE3	C	REZONE	C	
	PARTMOV	C	GREYSN	C	SNOUT	1C													
IXR0	YORCUT	2																	
IX1	YORCUT	290	PARPLOT	9	SNOUT	4													
IX2	YORCUT	120	PARPLOT	2	SNOUT	4													
IX3	YORCUT	7	PARPLOT	2															
IX4	YORCUT	3																	
IYR	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	2C	PHASE3	C	REZONE	C	
	PARTMOV	C	GREYSN	C	SNOUT	2C													
IYR0	YORCUT	2																	
IY1	YORIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	22C	PARPLOT	1C	PHASE3	C	REZONE	C	
	PARTMOV	C	GREYSN	C	SNOUT	1C													
IY10	YORCUT	2																	
IY1	YORCUT	310	PARPLOT	11	SNOUT	4													
IY2	YORCUT	140	PARPLOT	2	SNOUT	4													
IY3	YORCUT	7	PARPLOT	2															
IY4	YORCUT	3																	
IZZ	YORIFER	2																	
IZ	SWEEP	5																	
J	YORIFER	C	LOOP	2C	FILMCO	1C	OFFWEGO	2EC	MESHMKR	32C	PARTGEN	C	YORKY	C	PHASE0	10C	YOKOUT	12C	
	PARPLOT	C	PHASE1	14C	PHASE2	16C	PHASE3	20C	REZONE	20C	PARTMOV	1AC	MORT	2C	REEFER	10C	FLUSH	C	
	FFREW	C	SLOSCR	C	WALK	3C	WHERE	4	ESTEP	6C	LISTING	3C	GREYSN	6C	CYLSN	4C	SWEEP	12C	
	IN	4	OUT	4	SNGEN	9	SNESTEP	4C	SNOUT	8C									
JBAR	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	7C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	1C	YOKOUT	1C	
	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	2C	PARTMOV	C	MORT	C	REEFER	C	FLUSH	C	
	FFREW	C	SLOSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	1C	SWEEP	6C	SNESTEP	1C	
	SNOUT	C																	
JBMESH	REZONE	3																	
JBOJ	MESHMKR	3																	
JBOB	MESHMKR	4																	
JCEN	YORIFER	C	OFFWEGO	1C	MORT	C	REEFER	8C	FLUSH	C	WALK	C	ESTEP	C	LISTING	C			
JDB	MESHMKR	2																	
JDJ	MESHMKR	2																	
JDJC	YORIFER	C	YORKY	C	PHASE0	2C	YOKOUT	C	PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	1C	REZONE	C	
	PARTMOV	C																	
JDJV	YORIFER	C	YORKY	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													
JM1	SWEEP	6																	
JNEW	NOWFAR	4	WHERE	15															
JNM	YORIFER	C	FILMCO	C	OFFWEGO	3C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	3C	PARPLOT	1C	
	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C									
JOLD	PARTMOV	3	WALK	11	NOWFAR	3C	WHERE	4											
JP1	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	3C	MESHMKR	2C	PARTGEN	C	YORKY	C	PHASE0	4C	YOKOUT	4C	
	PARPLOT	C	PHASE1	2C	PHASE2	5C	PHASE3	7C	REZONE	2C	PARTMOV	1C	MORT	1C	REEFER	2C	FLUSH	C	
	FFREW	C	SLOSCR	C	CENTROY	3C	WALK	1C	WHERE	1C	ESTEP	2C	LISTING	C	GREYSN	3C	CYLSN	2C	
	SWEEP	2C	SNESTEP	2C	SNOUT	3C													
JP2	YORIFER	1C	LOOP	C	FILMCO	1C	OFFWEGO	9C	MESHMKR	4C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	3C	
	PARPLOT	C	PHASE1	6C	PHASE2	4C	PHASE3	6C	REZONE	8C	PARTMOV	C	MORT	C	REEFER	1C	FLUSH	C	
	FFREW	C	SLOSCR	C	WALK	C	ESTEP	1C	LISTING	1C	GREYSN	C	CYLSN	C	SWEEP	1C	SNESTEP	C	
	SNOUT	C																	

```
   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     SUBSCR   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  1C  REZONE  1C
   JSWTCH3  YOKIFER  C  FILMCO   C  OFFWEGO  3C  MESHMKR  C   PHASE1  C   REZONE  C
   JT       SWEEP    1D 1A       1D OUT     1D
   JTG      PHASE    4
   JTM      PHASE    4
   JTMESH   REZONE   2
   JTOP     MESHMKR  3
   JUNF     OFFWEGO  6
   JUNFO2   OFFWEGO  1C MESHMKR  3C  PARTGEN  C
   JXL      SNOUT    3
   JYB      SNOUT    3
   K        OFFWEGO  6  YOKOUT  17  KEEFER  2  ESTEP  3  IN  4  OUT  6  SNGEN  18
   KA       OUT      2
   KEEP     MCRT     3
   KK       YOKOUT   15
   KKO      PARTMOV  4
   KP       OFFWEGO  5  PARTGEN  9  PARPLOT  6  PARTMOV.12
   KRG      YOKOUT   3
   KR1      YOKOUT   6
   KSTEP    OFFWEGO  1
   KSUB     SUBSCR   6
   KTIL     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  KEEFER  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  KEEFER  D  FLUSH   D  WALK     D  ESTEP   D
            LISTING  D  GREYSN   D  SNESTEP  D  SNOUT   D
L LAVNDER   MCRT     1  KEEFER   1  FLUSH   1  WALK     1  ESTEP   1  LISTING 1
   LBET1    CYLSN    4
   LBET2    CYLSN    3
F LCM       YOKIFER  3  LOOP     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  KEEFER  3  FLUSH   3
            PFREQ    3  SUBSCR   3  WALK    3  ESTEP    3  LISTING  3  GREYSN   3  CYLSN  3  SWEEP   3  SNESTEP 3
            SNOUT    3
   LE       CYLSN    4
   LENGTH   YOKIFER  6
   LENGTH2  KEEFER   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
   LOP2     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 LOLF      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  KEEFER   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  KEEFER   4  ESTEP    2  GREYSN   1
   LU       CYLSN    4
   LW       CYLSN    4
```

```
  M       FILMCO   D   OFFWEGO  5D  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   IN      19   OUT      17  SNGEN    11  SNESTEP  D   SNOUT    D
  MASK    WALK    3D
 *MAT     MESHMKR  D
 *MATL    MESHMKR  D
L MAUVE   REEFER   1   CENTROY  1   WALK     1   HOWFAR   1   WHERE    1
S MAXN    OFFWEGO  2   SUBSCR   1   SWEEP    1
S MCRT    MCRT     1
S MESHMKR OFFWEGO  1   MESHMKR  1
  MI      REEFER  1C   WALK     C
S MINO    OFFWEGO  1   SUBSCR   3
  MJ      REEFER  1C   WALK     C
  MM      CYLSN    7   SWEEP    3   SNGEN    2
S MOVE    OFFWEGO  1   GREYSN   1
  MP      FILMCO   D   OFFWEGO  D   MESHMKR  D   PARTGEN  D   YOKKY    D   PHASE0   D   YOKOUT   D   PARPLOT  D   PHASE1   D
          PHASE2   D   PHASE3  7D   REZONE   D   PARTMOV   D   MCRT     D   REEFER   D   FLUSH    D   WALK     D   ESTEP    D
          LISTING  D   GREYSN   D   SNESTEP  D   SNOUT    D
  MQ      REEFER  1C   WALK     C
  MQ1     REEFER  1C   WALK     C
  MU      YORIFER  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    D   LISTING  D   GREYSN   D   SNESTEP  D   SNOUT    D
  MU02    FILMCO   D   OFFWEGO  D   MESHMKR  D   PARTGEN  D   YOKKY    D   PHASE0   D   YOKOUT   D   PARPLOT  D   PHASE1  5D
          PHASE2  3D   PHASE3   D   REZONE   D   PARTMOV   D   MCRT     D   REEFER   D   FLUSH    D   WALK     D   ESTEP    D
          LISTING  D   GREYSN   D   SNESTEP  D   SNOUT    D
  MUSTIT  PHASE2   4
  M1      SWEEP    5
  MP      SWEEP    2
  N       YOKOUT   6   SNGEN    5
S NADD    PHASE1   1
  NAME    YORIFER 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  YORIFER  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  1B
  NBP     YORIFER  C   OFFWEGO  3C   MCRT     C   REEFER  5C   FLUSH    C   WALK     C   ESTEP    C   LISTING  C
  NBUF    YORIFER  C   OFFWEGO  3C   MCRT     C   REEFER   C   FLUSH    C   WALK    5C   ESTEP   1C   LISTING  C
  NBZ     MESHMKR  3
  NCEN    REEFER  1B
  NCOL    MCRT     C   REEFER  9C   FLUSH    C   WALK    2C   ESTEP    C   LISTING  C
  NCP     REEFER   7
  NCYC    YORIFER  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   C   CYLSN    C   SWEEP    C   SNESTEP  C
          SNOUT    C
  NDALL   OFFWEGO  3
  NDIE    MCRT     C   REEFER  9C   FLUSH    C   WALK    2C   ESTEP    C   LISTING  C
  NDUMP   YORIFER 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  1   PARPLOT  1   PARTMOV  4   REEFER   5   CENTROY  3   WHERE    6   SWEEP    4
  NEGS    YORIFER  8   OFFWEGO  8
  NEXP    YOKOUT  1C   PARPLOT  5
  NFLUSH  MCRT     C   REEFER  3C   FLUSH   2C   WALK     C   ESTEP    C   LISTING  C
  NFRQ    YORIFER  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   5D   IN      2D   OUT     2D
```

	NOPD	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	4C	MESHMKR	6C	PARTGEN	C	YORKY	C	PHASE0	1C	YOKOUT	C
		PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	2C	REZONE	C	PARTMOV	C	MORT	4C	REEFER	C	FLUSH	C
		PFREO	C	SLOSCR	1C	WALK	1C	ESTEP	2C	LISTING	C	GREYSN	3C	CYLSN	C	SWEEP	C	SNESTEP	1C
		SNOUT	C																
	NOPT	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	6C	MESHMKR	9C	PARTGEN	C	YORKY	C	PHASE0	2C	YOKOUT	C
		PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	3C	REZONE	C	PARTMOV	C	MORT	6C	REEFER	C	FLUSH	C
		PFREO	C	SLOSCR	2C	WALK	1C	ESTEP	3C	LISTING	C	GREYSN	4C	CYLSN	C	SWEEP	C	SNESTEP	2C
		SNOUT	C																
	NPCMAX	YORIFER	C	OFFWEGO	3C	MORT	C	REEFER	C	FLUSH	C	WALK	1C	ESTEP	C	LISTING	C		
	NPCOL	WALK	4																
	NPPT	OFFWEGO	5	PARPLOT	4	PARTMOV	8												
	NPT	YORIFER	1C	FILMCO	C	OFFWEGO	5C	MESHMKR	C	PARTGEN	11C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	3C
		PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	1C								
	NQ	YORIFER	C	LOOP	1C	FILMCO	1C	OFFWEGO	12C	MESHMKR	13C	PARTGEN	C	YORKY	C	PHASE0	3C	YOKOUT	17C
		PARPLOT	C	PHASE1	13C	PHASE2	17C	PHASE3	24C	REZONE	14C	PARTMOV	2C	MORT	2C	REEFER	17C	FLUSH	C
		PFREO	C	SLOSCR	C	CENTROY	9C	WALK	C	WHERE	13C	ESTEP	2C	LISTING	2C	GREYSN	2C	CYLSN	C
		SWEEP	4C	SNESTEP	1C	SNOUT	3C												
	NQ1	YORIFER	1C	LOOP	21C	FILMCO	C	OFFWEGO	11C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C
		PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	4C	MORT	C	REEFER	8C	FLUSH	C
		PFREO	C	SLOSCR	C	CENTROY	3C	WALK	C	WHERE	8C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C
		SWEEP	7C	SNESTEP	C	SNOUT	C												
	NQ1B	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	2C	PHASE2	2C	PHASE3	2C	REZONE	C	PARTMOV	C								
	NQ12	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	1C								
	NR	MESHMKR	6																
	*NRVALS	YORIFER	C	FILMCO	C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	C	PHASE2	C	PHASE3	C	REZONE	C	PARTMOV	C								
	NR1	MESHMKR	2																
	NSP	YORIFER	C	OFFWEGO	3C	MORT	C	REEFER	2C	FLUSH	C	WALK	C	ESTEP	C	LISTING	C		
	NSTATE	OFFWEGO	2																
	NT	MESHMKR	4																
	NTHRU	YOKOUT	8																
	NT2	MESHMKR	2																
	NUMIT	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	2C	YOKOUT	C	PARPLOT	C
		PHASE1	1C	PHASE2	4C	PHASE3	C	REZONE	C	PARTMOV	C								
	NWL	OFFWEGO	1																
	NYLB	YOKOUT	4																
	NYUP	YOKOUT	4																
	N1	HOWFAR	5																
	N2	HOWFAR	5																
S	OFFWEGO	OFFWEGO	1																
	OM	YORIFER	C	FILMCO	C	OFFWEGO	3C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	C	PHASE2	1C	PHASE3	C	REZONE	C	PARTMOV	C								
	OMAL13	PHASE3	3																
	OMAL2	PHASE3	3																
	OMANC	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	C	PHASE2	1C	PHASE3	C	REZONE	C	PARTMOV	C								
	OMCYL	YORIFER	C	FILMCO	C	OFFWEGO	1C	MESHMKR	2C	PARTGEN	C	YORKY	C	PHASE0	C	YOKOUT	C	PARPLOT	C
		PHASE1	C	PHASE2	C	PHASE3	5C	REZONE	1C	PARTMOV	C								
	OMDIST	POMEGA	1C																
	OMEGA	REEFER	21D	POMEGA	19D	WALK	5D	HOWFAR	4D										
	OMEGAD	HOWFAR	11D																
	OP	WALK	2																
	OPAL13	PHASE3	3																
	OPAL24	PHASE3	3																
	OPDEN	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	4C	MESHMKR	9C	PARTGEN	C	YORKY	C	PHASE0	1C	YOKOUT	C
		PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	3C	REZONE	C	PARTMOV	C	MORT	6C	REEFER	C	FLUSH	C
		PFREO	C	SLOSCR	1C	WALK	2C	ESTEP	3C	LISTING	C	GREYSN	3C	CYLSN	C	SWEEP	C	SNESTEP	1C
		SNOUT	C																
S	OPEN	YORIFER	8	OFFWEGO	8	YOKOUT	2	REEFER	7	ESTEP	2	LISTING	2						
	OPSIG	OFFWEGO	2D																
	OPTMP	YORIFER	C	LOOP	C	FILMCO	C	OFFWEGO	2C	MESHMKR	9C	PARTGEN	C	YORKY	C	PHASE0	1C	YOKOUT	C
		PARPLOT	C	PHASE1	C	PHASE2	C	PHASE3	2C	REZONE	C	PARTMOV	C	MORT	4C	REEFER	C	FLUSH	C
		PFREO	C	SLOSCR	C	WALK	2C	ESTEP	2C	LISTING	C	GREYSN	2C	CYLSN	C	SWEEP	C	SNESTEP	1C
		SNOUT	C																
L	ORANGE	YORIFER	1	FILMCO	1	OFFWEGO	1	MESHMKR	1	PARTGEN	1	YORKY	1	PHASE0	1	YOKOUT	1	PARPLOT	1
		PHASE1	1	PHASE2	1	PHASE3	1	REZONE	1	PARTMOV	1								
S	OUT	YORIFER	1	SWEEP	2	OUT	1												

```
S OVERLAY  YOKIFER  4   YOKKY   5   MCRT    3   GREYSN  3
  P        FILMCO   D   OFFWEGO  D  MESHMKR  D  PARTGEN  D  YOKKY    D  PHASE0  3D  YOKOUT  1D  PARPLOT  D  PHASE1  4D
           PHASE2  1D   PHASE3   D  REZONE   D  PARTMOV  D  MCRT     D  REEFER   D  FLUSH    D  WALK    D  MOWFAR  7
           ESTEP    D   LISTING  D  GREYSN   D  SNESTEP  D  SNOUT    D
  PASS     ESTEP   3
S PARFND   WALK    6
S PARPLOT  YOKOUT  1   PARPLOT  1
S PARTGEN  MESHMKR 1   PARTGEN  1
S PARTMOV  PHASE3  1   PARTMOV  1
  PDR      PARPLOT 1
  PDZ      PARPLOT 1
  PEMIT    ESTEP   3
S PFREG    REEFER  1   PFREG    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   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   SUBSCR   1   WALK    1   ESTEP    1  LISTING  1  GREYSN   1  CYLSN    1  SWEEP    1  SNESTEP 1
           SNOUT   1
  PITH     PHASE1  5   PHASE2   5
  PIAX     PHASE1  3   PHASE2   3
  PIXY     PHASE1  5   PHASE2   5
  PIYY     PHASE1  2   PHASE2   2
  PL       FILMCO   D  OFFWEGO  D  MESHMKR  D  PARTGEN  D  YOKKY    D  PHASE0   D  YOKOUT  D  PARPLOT  D  PHASE1  D
           PHASE2  3D   PHASE3   D  REZONE   D  PARTMOV  D  MCRT     D  REEFER   D  FLUSH    D  WALK    D  ESTEP   D
           LISTING  D   GREYSN   D  SNESTEP  D  SNOUT    D
  PLMAX    PHASE2  4
  PLOST    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 1?   MESHMKR  6  PARTGEN  3  PHASE0   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     YOKIFE   C  LCOP     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
           PFREG    C  SUBSCR   C   WALK    C   ESTEP    C  LISTING  C  GREYSN   C  CYLSN    C  SWEEP   C  SNESTEP C
           SNOUT    C
  PTUP     PARPLOT  1
 *PUNDE    MESHMKR  D
 *PUNDF    MESHMKR  D
 *PUNDG    MESHMKR  D
 *PUNDV    MESHMKR  D
  PWR      SNESTEP  8
  PWR2     SNESTEP  3
  PXCONV   YOKIFER  C   FILMCO  1C  OFFWEGO  C  MESHMKR  C  PARTGEN  C  YOKOUT  1C  PARPLOT  2C  PHASE2  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        MOWFAR   4
S QEAPIU   OFFWEGO  1   MESHMKR  3   PHASE0  1   PHASE3  1   MCRT   1   SUBSCR  2   WALK   1   ESTEP  1   GREYSN  1
           SNESTEP  1
S QLUG     PFREG    1   WALK     1
```

```
S GLOGIO    OFFWEGO  2    MESHMKR  6    PHASE0   2    YOKOUT   4    PHASE3   2    MCRT     2    SUBSCR   1    WALK     2    ESTEP    2
            GREYSN   2    SNESTEP  2
  GMN       YOKOUT  11
  GMX       YOKOUT  21
S GSQRT     MESHMKR  1    PHASE0   2    YOKOUT   6    PHASE1   2    PHASE2   1    PHASE3   2    REEFER   1    POMEGA   3    CROSS    1
            WALK     2    ESTEP    2    SNESTEP  2
  GX        PHASE2   3
  GY        PHASE2   2
  R         FILMCO   0    OFFWEGO  D    MESHMKR 1AD   PARTGEN  D    YOKKY    D    PHASE0   D    YOKOUT  8D    PARPLOT  D    PHASE1  4D
            PHASE2  6D    PHASE3  9D    REZONE   1D    PARTMOV  D    MCRT     D    REEFER   D    FLUSH    D    WALK     D    HOWFAR   2
            ESTEP    D    LISTING  D    GREYSN   D    IN       6D   OUT      6D   SNESTEP  D    SNOUT    D
  RA        PHASE2   2    ESTEP    6
  RADX      OFFWEGO  C    MESHMKR  1C   PARTGEN  C
S RANDOM    REEFER   6    POMEGA   2    PFREQ    5    WALK     3
  RAM       PHASE2   3
  RAJ       REZONE   5
  RA2       REZONE   5
  RA3       REZONE   5
  RA4       REZONE   5
  RCSQ      FILMCO   0    OFFWEGO  D    MESHMKR  0    PARTGEN  D    YOKKY    D    PHASE0   D    YOKOUT   D    PARPLOT  D    PHASE1  1D
            PHASE2  2D    PHASE3   D    REZONE   D    PARTMOV  D    MCRT     D    REEFER   D    FLUSH    D    WALK     D    ESTEP    D
            LISTING  0    GREYSN   D    SNESTEP  D    SNOUT    D
S RDDUF     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  1
F REAL      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    WALK     1    ESTEP    1
            LISTING  1    GREYSN   1    SNESTEP  1    SNOUT    1
L RED       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
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      1    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
  REZY      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   C    OFFWEGO  C    MESHMKR  C    PARTGEN  C    YOKOUT   C    PARPLOT  C    PHASE3   C    REZONE   C
            PARTMOV  C    GREYSN   C    SNOUT    C
L RLCL      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
  RM        FILMCO   0    OFFWEGO 1D    MESHMKR  D    PARTGEN  D    YOKKY    D    PHASE0  4D    YOKOUT   D    PARPLOT  D    PHASE1  4D
            PHASE2  5D    PHASE3  2D    REZONE   D    PARTMOV  D    MCRT     D    REEFER   D    FLUSH    D    WALK     D    ESTEP    D
            LISTING  D    GREYSN   D    SNESTEP  D    SNOUT    D
  RMEP      WALK     4
  RMP       FILMCO   D    OFFWEGO  D    MESHMKR  D    PARTGEN  D    YOKKY    D    PHASE0   D    YOKOUT   D    PARPLOT  D    PHASE1   D
            PHASE2   D    PHASE3  8D    REZONE   D    PARTMOV  D    MCRT     D    REEFER   D    FLUSH    D    WALK     D    ESTEP    D
            LISTING  D    GREYSN   D    SNESTEP  D    SNOUT    D
  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	FFREG	2														
	RN4	REEFER	4	FFREG	2														
	R0	FILMCO	0	OFFWEGO	1D	MESHMKR	14D	PARTGEN	D	YOKKY	D	PHASE0	2D	YOKOUT	2D	PARPLOT	D	PHASE1	4D
		PHASE2	21D	PHASE3	11D	REZONE	D	PARTMOV	D	MCRT	1D	REEFER	D	FLUSH	D	WALK	D	ESTEP	4D
		LISTING	D	GREYSN	1D	SNESTEP	6D	SNOUT	D										
	R0L	PHASE3	6																
	R01	MESHMKR	16																
	R0UP2	MESHMKR	2																
	R0U1	MESHMKR	2																
	R0L	FILMCO	0	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	1D
		PHASE2	8D	PHASE3	13D	REZONE	3D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D
		LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
	R0MFR	OFFWEGO	1C	MESHMKR	2C	PARTGEN	C												
	R0SAV	MESHMKR	7																
	R0T	PHASE0	2																
	R1	PHASE3	3																
	R2	PHASE3	5																
	R3	PHASE3	3																
	R4	PHASE3	5																
	R801	MESHMKR	1(																
	RRVOL	MCRT	4																
	RSN	GREYSN	2C	CYLSN	3C	SWEEP	5D	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	1D	MESHMKR	1D	PARTGEN	D	YOKKY	D	PHASE0	2D	YOKOUT	3D	PARPLOT	D	PHASE1	D
		PHASE2	13D	PHASE3	19D	REZONE	D	PARTMOV	D	MCRT	1D	REEFER	D	FLUSH	D	WALK	D	ESTEP	1D
		LISTING	D	GREYSN	1D	SNESTEP	1D	SNOUT	D										
	RXY	PHASE1	4	PHASE2	4														
	RZEDEN	FILMCO	0	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	2D	REEFER	1D	FLUSH	D	WALK	D	ESTEP	D
		LISTING	1D	GREYSN	2D	SNESTEP	D	SNOUT	D										
	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	6D	IN	2D	OUT	2D										
	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						
	SETIJ	LOOP	1	MESHMKR	9														
S	SHIFT	REEFER	2	WALK	2	ESTEP	1												
	SIE	FILMCO	0	OFFWEGO	1D	MESHMKR	15D	PARTGEN	D	YOKKY	D	PHASE0	7D	YOKOUT	2D	PARPLOT	D	PHASE1	2D
		PHASE2	1D	PHASE3	5D	REZONE	3D	PARTMOV	D	MCRT	1D	REEFER	D	FLUSH	D	WALK	D	ESTEP	6D
		LISTING	D	GREYSN	D	SNESTEP	7D	SNOUT	D										
	SIEI	MESHMKR	14																
	SIEMIN	MCRT	5C	REEFER	3C	FLUSH	C	WALK	C	ESTEP	C	LISTING	C						
	SIETOT	SNESTEP	5																
	SIGA	YOKIFER	D	LOOP	D	FILMCO	D	OFFWEGO	1D	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
		PFREG	D	SUBSCR	D	WALK	1D	ESTEP	D	LISTING	D	GREYSN	D	CYLSN	D	SWEEP	D	SNESTEP	D
		SNOUT	D																
S	SIGN	PHASE3	6	HOMFAR	3														
	SIGNU	WALK	4																
	SIGPLC	FILMCO	0	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										
L	SILVER	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	SNIPR	OFFWEGO	1																
	SLOPE	HOMFAR	5																

```
   SLOPE2  HOWFAR  6
   SNOW    YORIFER  C   OFFWEGO  3C   GREYSN   2C   CYLSN   11CD  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
   SPENGR  PHASE   2
   SPH     REEFER  2
   SPHI    POMEGA  4
   SPTBL   YORIFER  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  SLOSCR   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  STARTU  LOOP     1   OFFWEGO  1   PHASE3   1
L  STATE   YORIFER  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   SLOSCR   1   WALK     1   ESTEP    1   LISTING  1   GREYSN   1   CYLSN    1   SWEEP    1   SNESTEP  1
           SNOUT    1
   STH     REEFER  3
   STHI    POMEGA  11
S  SUBSCR  SUBSCR  1   WALK     1
   SUM     SWEEP   5
S  SWEEP   CYLSN   1   SWEEP    1
   SWICH   REZONE  4
   S2      HOWFAR  2
   T       YORIFER  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  SLOSCR   C   WALK     C   ESTEP    C   LISTING  C   GREYSN   3C  CYLSN    C   SWEEP    C   IN       9
           OUT      9  SNGEN    9   SNESTEP  C   SNOUT    C
   TAMB    YORIFER  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  SLOSCR   C   WALK     2C  ESTEP    2C  LISTING  C   GREYSN   C   CYLSN    C   SWEEP    C   SNESTEP  3C
           SNOUT    C
   TAVG    ESTEP   3   SNESTEP  3
   TCYCLE  YORIFER  5
   TDUMP   YORIFER  7
   TE      PHASE   3
   TEMIT   YORIFER  C  OFFWEGO  3C  MCRT     1C  REEFER   1C  FLUSH    C   WALK     C   ESTEP    C   LISTING  C
   TEMP    YORIFER  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  SLOSCR   C   WALK     1CC ESTEP    1C  LISTING  1C  GREYSN   2C  CYLSN    C   SWEEP    C   SNESTEP  4C
           SNGLT    C
   TEMPI   MESHMKR 13
   TEMP4   PHASE   2
   TEST    WHERE   8
   TGMA    PHASE   5
   TH      REEFER  3
   THIGH   PHASE3  7   ESTEP    7   SNESTEP  7
   THIRD   YORIFER  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     YORIFER  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  SLOSCR   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  4D  PARPLOT  2D
   TIME    YORIFER  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  SLOSCR   C   WALK     C   ESTEP    2C  LISTING  C   GREYSN   7C  CYLSN    C   SWEEP    C   SNESTEP- 1C
           SNOUT    C
   TITLE   SNOUT   3D
   TJ      MESHMKR 3
   TK      PHASE   8
   TLOG    MCRT    5   SLOSCR   4   WALK     6   GREYSN   3
```

TLOW	PHASE3	5	ESTEP	5	SNESTEP	5															
TMAX	PHASE3	5	ESTEP	5	SNESTEP	5															
TMDT	PHASE3	3																			
TMIN	MCRT	3																			
*TNEUT	YORIFER	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	YORIFER	1C	LOOP	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	SUBSCR	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	YORIFER	C	LOOP	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	SUBSCR	C	WALK	C	ESTEP	C	LISTING	C	GREYSN	C	CYLSN	C	SWEEP	C	SNESTEP	C			
	SNOUT	C																			
TTL	YORIFER	3																			
TWELTH	PHASE3	5																			
T1	YORIFER	3	MCRT	C	REEFER	3C	FLUSH	C	WALK	7C	ESTEP	C	LISTING	C							
T2	YORIFER	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	1ED	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	1ED	REZONE	1ED	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	1ED	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													
UMOMLC	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	POMEGA	2																			
S UNPKFN	REEFER	1	ESTEP	1																	
UOM	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																	
UR1	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													
U1L	PHASE2	3																			
U12	PHASE2	2	PHASE3	2																	
U13M	PHASE2	3																			
U2	YOKOUT	6	PHASE1	8	PHASE2	9	PARTMOV	2													
U2L	PHASE2	3																			

U23	PHASE3	2																	
U24	PHASE1	3																	
U24M	PHASE2	3																	
U3	YOKOUT	6	PHASE1	10	PHASE2	9	PARTMOV	3											
U3L	PHASE2	3																	
U31	PHASE1	3																	
U34	PHASE2	2	PHASE3	2															
U4	YOKOUT	6	PHASE1	10	PHASE2	11	PARTMOV	2											
U4L	PHASE2	3																	
U41	PHASE3	2																	
U5	PHASE1	18																	
U6	PHASE1	5																	
U7	PHASE1	7																	
U8	PHASE1	5																	
U9	PHASE1	7																	
V	FILMCO	0	OFFWEGO	4D	MESHMKR	9D	PARTGEN	D	YOKKY	D	PHASE0	12D	YOKOUT	16D	PARPLOT	D	PHASE1	30D	
	PHASE2	5D	PHASE3	10D	REZONE	1D	PARTMOV	4D	MCRT	4D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D	
	LISTING	0	GREYSK	D	SNESTEP	D	SNOUT	D											
VAV	PHASE1	2																	
VD1	PHASE3	2																	
VD2	PHASE3	2																	
VD3	PHASE3	2																	
VD4	PHASE2	2	PHASE3	2															
VELIJ	PHASE1	2																	
VELMX	PHASE1	2																	
VG	FILMCO	0	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D	
	PHASE2	0	PHASE3	18D	REZONE	18D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D	
	LISTING	0	GREYSK	D	SNESTEP	D	SNOUT	D											
VG1	PHASE3	2																	
VG2	PHASE3	2																	
VG3	PHASE3	2																	
VG4	PHASE3	2																	
VI	MESHMKR	11																	
VK	PARTMOV	3																	
VL	FILMCO	0	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D	
	PHASE2	12D	PHASE3	10D	REZONE	3D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D	
	LISTING	0	GREYSK	D	SNESTEP	D	SNOUT	D											
VL1	PHASE3	7																	
VL13	PHASE3	2																	
VL2	PHASE3	7																	
VL24	PHASE3	2																	
VL3	PHASE3	7																	
VL4	PHASE3	7																	
VMAX	YOKOUT	6	SNOUT	5															
VMOM	PHASE2	5																	
VOL	SNESTEP	5																	
VOLC	PHASE3	5																	
VOLR	PHASE3	3																	
VOLT	PHASE3	3																	
VP	FILMCO	0	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	D	
	PHASE2	0	PHASE3	12D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D	
	LISTING	0	GREYSK	D	SNESTEP	D	SNOUT	D											
VTB	REZONE	5																	
VTEM	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	1C	PARTMOV	C									
VTEMP	PHASE2	13																	
VTIL	FILMCO	0	OFFWEGO	D	MESHMKR	D	PARTGEN	D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	D	PHASE1	11D	
	PHASE2	1D	PHASE3	D	REZONE	D	PARTMOV	D	MCRT	D	REEFER	D	FLUSH	D	WALK	D	ESTEP	D	
	LISTING	0	GREYSK	D	SNESTEP	D	SNOUT	D											
VTI	REZONE	5																	
VV	YOKIFER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	2C	PARPLOT	C	PHASE3	C	REZONE	C	
	PARTMOV	C	GREYSK	C	SNOUT	C													
VI	YOKOUT	6	PHASE1	9	PHASE2	7	PARTMOV	3											
V1L	PHASE2	3																	
V14	PHASE3	2																	
V13M	PHASE2	3																	
V2	YOKOUT	6	PHASE1	7	PHASE2	7	PARTMOV	2											
V2L	PHASE2	3																	
V23	PHASE3	2																	

	V24	PHASE1	3																
	V24M	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	KEEPER	3	WALK	1														
S	WHERE	KEEPER	1	WALK	1	WHERE	1												
L	WHITE	YORIPER	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	YORCUT	2																
	WMAX	YORCUT	6																
F	WRITE	YORIPER	6	OFFWEGO	1%	MESHMKR	5	PARTGEN	2	PHASE0	6	YOKOUT	17	PARPLOT	4	REZONE	1	MCRT	3
		KEEPER	8	ESTEP	3	LISTING	2	GREYSN	3	CYLSN	1	SWEEP	1	SNESTEP	4				
	WSAV	YORCUT	3																
S	WTBUF	YORIPER	2	KEEPER	4	FLUSH	1	GREYSN	1										
	WJ	CENTROY	4																
	WINDW	LOOP	1	MESHMKR	9														
	W2	CENTROY	4																
	X	FILMCO	1D	OFFWEGO	1D	MESHMKR	12D	PARTGEN	D	YOKKY	D	PHASE0	8D	YOKOUT	19D	PARPLOT	D	PHASE1	4D
		PHASE2	8D	PHASE3	11D	REZONE	1CD	PARTMOV	4D	MCRT	4D	KEEPER	25D	FLUSH	D	PFREQ	5	WALK	D
		ESTEP	D	LISTING	1D	GREYSN	5D	SNESTEP	D	SNOUT	D								
	XA1	KEEPER	5																
	XA2	KEEPER	5																
	XA3	KEEPER	5																
	XC	PARTGEN	8																
	XCAT	MCRT	2																
	XCO	YOKOUT	4D																
	XCONV	YORIPER	C	FILMCO	1C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	1C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	2C												
	XCONVP	YORCUT	11																
	XD	FILMCO	1C	PARTGEN	8	HOMFAR	4C												
	XDWELL	KEEPER	6																
	XDIR	MCRT	3	SNESTEP	3														
	XEDER	KEEPER	8																
	XEPART	KEEPER	17																
	XFREQP	KEEPER	12																
	XFRMT	KEEPER	3D																
	XFSN	GREYSN	6																
	XGM1	PHASE1	3																
	XI	OFFWEGO	6																
	XL	YORIPER	C	FILMCO	2C	OFFWEGO	C	MESHMKR	C	PARTGEN	C	YOKOUT	9C	PARPLOT	C	PHASE3	C	REZONE	C
		PARTMOV	C	GREYSN	C	SNOUT	C												
	XLOG	SUBSCR	5																
	XMSENG	PHASE1	6																
	XNEP	KEEPER	2																
	XNE	WHERE	12																
	XNW	WHERE	11																
	XOMEGA1	KEEPER	4																
	XOMEGA2	KEEPER	4																
	XOMEGA3	KEEPER	4																
	XP	OFFWEGO	2	MESHMKR	18	PARTMOV	4	POMEGA	8D										
	XPAR	FILMCO	D	OFFWEGO	1D	MESHMKR	D	PARTGEN	2D	YOKKY	D	PHASE0	D	YOKOUT	D	PARPLOT	2D	PHASE1	D
		PHASE2	D	PHASE3	D	REZONE	D	PARTMOV	4D	MCRT	D	KEEPER	D	FLUSH	D	WALK	D	ESTEP	D
		LISTING	D	GREYSN	D	SNESTEP	D	SNOUT	D										
	XPA3	PARTMOV	4																
	XP1	PHASE3	4																
	XP2	PHASE3	6																
	XP3	PHASE3	4																
	XP4	PHASE3	6																

	XR	YORIFER	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																
	XRN	REEFER	3																
	XR13	PHASE2	6																
	XR24	PHASE2	6																
	XSE	WHERE	13																
	XSIE	MCRT	5																
	XSW	WHERE	12																
	XTAB	OFFWEGO	2D																
	XTE	PARTGEN	7	PARTMOV	4														
	XTIC	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	9	YOKOUT	19	PHASE1	28	PHASE2	15	PHASE3	32	REZONE	2	MCRT	3
		CENTROY	3	SNESTEP	3														
	XXA	PHASE1	4																
	XX1	PHASE2	3																
	XX2	PHASE2	3																
	XX3	PHASE2	3																
	XX4	PHASE2	3																
	XY	PHASE1	4	PHASE2	4														
	XYECS	CENTROY	13D	WALK	D	WHERE	32D												
	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	2D	OFFWEGO	1D	MESHMKR	19D	PARTGEN	D	YOKKY	D	PHASE0	12D	YOKOUT	19D	PARPLOT	D	PHASE1	4D
		PHASE2	8D	PHASE3	1AD	REZONE	23D	PARTMOV	4D	MCRT	4D	REEFER	2.D	FLUSH	D	WALK	D	ESTEP	D
		LISTING	1D	GREYSN	6D	SNESTEP	D	SNOUT	D										
	YB	YORIFER	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												
	YBUT	PARTGEN	4																
	YC	PARTGEN	9																
	YCO	YOKOUT	4D																
	YCONV	YORIFER	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	MCWEAR	4C														
L	YELLOW	YORIFER	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														
	YLBI	YOKOUT	4																
L	YLC1	YORIFER	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
		PFREQ	1	SUBSCR	1	WALK	1	ESTEP	1	LISTING	1	GREYSN	1	CYLSN	1	SWEEP	1	SNESTEP	1
		SNOUT	1																
L	YLC2	YORIFER	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
		PFREQ	1	SUBSCR	1	WALK	1	ESTEP	1	LISTING	1	GREYSN	1	CYLSN	1	SWEEP	1	SNESTEP	1
		SNOUT	1																
	YLOG	SUBSCR	2																
	YNE	WHERE	12																
	YNW	WHERE	11																

```
S YOKIFER  YOKIFER  1
S YOKKY    YOKKY    1
S YOKOUT   YOKOUT   1
  YP       OFFWEGO  2    MESHMKR 12   PARTMOV  4    POMEGA  16D
  YPAR     FILMCO   D    OFFWEGO 1D   MESHMKR  D    PARTGEN 2D   YOKKY   D   PHASE0  D   YOKOUT  D   PARPLOT 1D  PHASE1  D
           PHASE2   D    PHASE3  D    REZONE   D    PARTMOV 4D   MCRT    D   REEFER  D   FLUSH   D   WALK    D   ESTEP   D
           LISTING  D    GREYSN  D    SNESTEP  D    SNOUT   D
  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    SCRSCR  1    WALK     1    ESTEP   1    LISTING 1    GREYSN  1   CYLSN   1   SWEEP   1   SNESTEP 1
           SNOUT    1
  YSL      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  2D
  YTE      PARTGEN  7    PARTMOV  3
  YTIC     YOKOUT   21   PARPLOT 1C
  YTOP     PARTGEN  4
  YUP      YOKOUT   3    PARPLOT  2
  YUPI     YOKOUT   2
  YY       MESHMKR  1    PHASE1  21   PHASE2  1C   REZONE   4
  YYA      PHASE1   4
  Y1       MESHMKR  3    YOKOUT  1A   PHASE1   5   PHASE2   6   PHASE3  15   REZONE  9   PARTMOV  5   SNOUT   8
  Y13      PARTMOV  4
  Y14      PHASE3   2
  Y2       MESHMKR  3    YOKOUT  17   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  1C   PHASE1   2   PHASE2   6   PHASE3  15   REZONE  6   PARTMOV  5
  Y31      PHASE1   8    PHASE2  11
  Y3C      PHASE3   2
  Y34      YOKOUT   3
  Y4       MESHMKR  3    YOKOUT  1E   PHASE1   2   PHASE2   6   PHASE3  11   REZONE  1C  PARTMOV  4
  Y43      PHASE3   2    PARTMOV  3
  Y5       REZONE   14
  Z        POMEGA   1D
  ZD       WALK     4
  ZDE      PHASE3   3    ESTEP    3   SNESTEP  3
  ZE       PHASE3   3    ESTEP    3   SNESTEP  3
  ZETAK    PFREG    4
  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  9D   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   1D   SNESTEP  9
  ZTL      PHASE3   4    ESTEP    4   SNESTEP  2
  ZZ       YOKIFER  1C   OFFWEGO 1C   GREYSN   C    CYLSN    C   SWEEP    C   SNESTEP  C   SNOUT   C
```