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MELCOR Accident Consequence Code System (MACCS)

Programmer's Reference Manual

Prepared by J. A. Rollstin, D. I. Chanin, H-N Jow

Sandia National Laboratories

Prepared for
U.S. Nuclear Regulatory Commission

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ABSTRACT

This report describes the MACCS computer code. The purpose of this code is to simulate the impact of severe accidents at nuclear power plants on the surrounding environment. MACCS has been developed for the U.S. Nuclear Regulatory Commission to replace the previously used CRAC2 code, and it incorporates many improvements in modeling flexibility in comparison to CRAC2.

The principal phenomena considered in MACCS are atmospheric transport, mitigative actions based on dose projections, dose accumulation by a number of pathways including food and water ingestion, early and latent health effects, and economic costs.

The MACCS code can be used for a variety of applications. These include (1) probabilistic risk assessment (PRA) of nuclear power plants and other nuclear facilities, (2) sensitivity studies to gain a better understanding of the parameters important to PRA, and (3) cost-benefit analysis.

This report is composed of three volumes. Volume I, the User's Guide, describes the input data requirements of the MACCS code and provides directions for its use as illustrated by three sample problems. Volume II, the Model Description, describes the underlying models that are implemented in the code, and Volume III, the Programmer's Reference Manual, describes the code's structure and database management.

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FOREWORD

This report provides the documentation of the MACCS computer code, which performs probabilistic calculations of potential offsite consequences of the atmospheric releases of radioactive material in reactor accidents. Sandia National Laboratories (SNL) developed the code for the U.S. Nuclear Regulatory Commission (NRC). The report consists of three volumes -- Volume I being the User's Guide; Volume II, the Model Description; and Volume III, the Programmer's Reference Manual.

With the publication of this report, the MACCS code is released for use within the NRC and for the benefit of other interested users. The MACCS code supersedes the earlier NRC consequence codes, namely, CRAC and CRAC2. The code, its formatted data files, and two pre-processor programs, namely, DOSFAC and MAXGC, which generate certain types of data for the code, are available on magnetic tape from the National Energy Software Center, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.

The MACCS code has evolved through several draft versions. The current version (i.e., Version 1.5), simply called MACCS, has been substantially improved and subjected to rigorous quality assurance and verification processes. Idaho National Engineering Laboratory (INEL) performed line-by-line checking of the individual code modules to (a) assess the internal and interfacing consistencies and (b) verify that the FORTRAN statements correctly represent the algorithms, statistical techniques, input data requirements, and output capabilities. INEL's efforts were to ensure that the intended models were implemented into a consistent and essentially error-free computer code as specified by state-of-the-art coding standards for large scientific computer programs. Mr. Ulf Tveten, Institute of Energy Technology, Kjeller, Norway, under a subcontract from SNL, performed a comprehensive review of the chronic exposure pathway modeling in MACCS and compared it with those in the latest versions of the consequence codes that are being used, or planned to be completed in the near future, in several member countries of the Organization for Economic Cooperation and Development (OECD). INEL, Mr. Tveten, and SNL were interactively involved in the processes of quality assurance, verification, review, identification of errors and implementation of their correction, and model updating. These processes were largely completed before the MACCS code was used for consequence analysis for the *second draft of* NUREG-1150. INEL's quality assurance and verification report will be published as NUREG/CR-5376. Mr. Tveten's chronic exposure pathway review report will be published as NUREG/CR-5377.

An NRC effort is under way for comparing MACCS with similar codes of earlier vintage using the benchmark problems of the International Consequence Code Comparison Study. This study was sponsored by the OECD, Nuclear Energy Agency (NEA), Committee on the Safety of Nuclear Installations (CSNI), and was completed in 1983. The staff findings will be published as NUREG-1364. Further, it is also planned that MACCS will participate in the forthcoming NEA/CSNI-sponsored consequence code comparison study scheduled to be completed in 1992. Several other new generation consequence codes from the OECD member countries will also participate in the study. The NRC staff will be assisted by Brookhaven National Laboratory in performing the required analysis using MACCS for the study.

Some of the major new features of MACCS are: (a) improved approximation of the Gaussian crosswind concentration profile, (b) improved health effect models, (c) improved weather sampling, (d) treatment of multiphase release with capability for treatment of change in the wind direction at the reactor between the release phases, (e) detailed chronic exposure pathway modeling, (f) inclusion of inhalation of resuspended radionuclides as an early exposure pathway, (g) provision for more complex emergency response and long-term protective measures, and (h) code flexibility, so that virtually all model parameters can now be provided by the user via input.

The item (h) above is a very useful feature of MACCS that will facilitate the analysis of consequence uncertainties due to uncertainties in the model parameters. However, the user now has to prepare much more data, involving multiple disciplines, for input. This introduces the potential for an inexperienced user to produce distorted results because of improper or inconsistent data.

MACCS continues to use a straight line Gaussian plume dispersion and transport model like its predecessors, CRAC and CRAC2. Although this model is very convenient for probabilistic calculations of consequences using a large number of weather samples, care should be exercised in the MACCS applications to any deterministic, or real-time, situations because of such limitations of the model.

Additional improvements in MACCS will be undertaken in the near future. These include incorporation of latent cancer effect models for high-LET radiation (discussed in the BEIR IV report) and any changes that may be dictated by the recently revised assessment of latent cancer risks of radiation (discussed in the BEIR V report). Research for improvements in these areas is under way. In the longer term, additional areas for improvement will be identified by comparing MACCS with other full-scope consequence codes, such as CONDOR (United Kingdom), UFOMOD (Federal Republic of Germany), and COSYMA (Commission of the European Communities).

The MACCS code represents a significant advancement in the development of severe accident analysis methods. Comments based on use of the code would be greatly appreciated and should be forwarded to the undersigned.

Brian W. Sheron

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1.0 PROGRAMMER'S OVERVIEW

1.1 Introduction

Sandia National Laboratories has developed a new severe accident risk assessment code, MACCS, for the U.S. Nuclear Regulatory Commission. MACCS models the off-site consequences of radioactive releases from nuclear power plant accidents. The following phenomena are modeled in the MACCS code:

atmospheric transport and deposition,
mitigative actions,
dosimetry,
health effects, and
economic costs.

The MACCS code is available on magnetic tape from the National Energy Software Center, Argonne National Laboratories, 9700 Cass Ave., Argonne, IL, 60439.

The objectives in developing MACCS were (1) to develop a code structure that facilitates the performance of sensitivity and uncertainty analyses, (2) to provide flexibility for performing site-specific consequence analyses, (3) to provide a modular structure that permits incorporation of future modeling improvements, and (4) to provide a portable program which can be used on most large computer systems. The coding conforms to the FORTRAN 77 ANSI standard.

This report describes the modular organization and data structures incorporated in MACCS Version 1.5, hereafter referred to simply as MACCS. The remainder of Chapter 1 presents (1) a description of the structure of MACCS, (2) a brief description of MACCS user input processing, (3) a hierarchical organization chart of the MACCS subprograms, (4) a listing of the MACCS subprograms in the order in which they appear in the code, (5) an alphabetical listing of the subprograms included in the various MACCS modules, (6) a diagram depicting the sequence of calculations performed by the various modules of MACCS, and (7) a diagram illustrating the flow of data between the various modules. Chapter 2 examines the various subprograms contained in MACCS by summarizing their purpose, their external references, and their interactions with other parts of the code. Chapter 3 contains a discussion of the data structures found in MACCS; argument lists, common blocks, and binary files.

It is not the intent of this document to provide a discussion of the input parameters required by the MACCS code nor is it the intent to provide a discussion of the models implemented by the MACCS code. A complete discussion of the input parameters can be found in Volume I, the User's Guide, and a description of the implemented models can be found in Volume II, the Model Description.

1.2 MACCS Structure

This section is intended to provide an understanding of the general sequence of the MACCS calculations.

A detailed picture of the code structure can be obtained from the internal documentation of MACCS. The program itself begins with a set of comment cards which present the hierarchical control structure of MACCS in graphical form. A replica of these comment cards is included in this document as Section 1.4.

Every subroutine or function program unit in MACCS begins with a stylized block of information that states: (1) the purpose of the program unit, (2) the name(s) of the program unit which reference it, (3) a glossary of the variables it utilizes, (4) a glossary of the program units it references, (5) the name and date of its authorship, and (6) a history of its modification.

The program units within MACCS are arranged in the order in which they are first referenced. A chronological listing of routines found in MACCS is included in this document as Section 1.5.

A MACCS calculation consists of three phases: (1) input processing and validation, (2) phenomenological modeling, and (3) output processing.

The calculations begin with the processing of all input to the code. Extensive error checking is utilized so that any detectable input errors are located and diagnosed before attempting to perform the modeling phase of the calculations. Upon the detection of an error, the program will try to validate as much of the subsequent input as possible in order to facilitate the debugging process. However, execution of the program will be terminated before an attempt is made to perform the next phase.

The phenomenological modeling occurs during the second phase of the calculations. The sequence in which the phenomena are evaluated closely follows the temporal order of events in the real world which would occur in the event of a reactor accident. The phenomenological models are for the most part based on empirical data and the solutions they entail are usually analytical in nature and computationally straightforward.

The modeling phase of MACCS is subdivided into three parts: ATMOS, EARLY, and CHRONC. ATMOS treats the atmospheric transport, dispersion, and deposition of radioactive material released to the environment. EARLY models the effect of the accident on the surrounding area during the emergency action period which can have a duration of up to one week. CHRONC considers the impact during all time subsequent to the emergency action period. A partial list of the sequence of phenomenological modeling in the ATMOS, EARLY, and CHRONC modules is given in Chapter 1 of Volume I of this report, the User's Guide.

The data needed to define the ATMOS, EARLY, and CHRONC modules are specified through three user input files with the names: ATMOS, EARLY, and CHRONC.

Though it is necessary to exercise the ATMOS module each time the MACCS code is run, the exercising of the EARLY and CHRONC modules is dependent on the needed output. For instance, if the user is only interested in the air and ground concentrations as a function of distance, only the ATMOS module need be exercised. On the other hand, if a sensitivity study on emergency response assumptions is to be performed, it would not be necessary to exercise the CHRONC module. Of the three phenomenological modules in MACCS, the ATMOS module is the only one which must always be exercised.

The OUTPUT module generates complementary cumulative distribution functions (CCDF's) of the user-requested results from the EARLY and CHRONC modules. There is currently no provision for the production of CCDF results from the ATMOS calculations.

A CCDF is generated internally for all user-requested consequence measures. For each CCDF, the code produces a one-line summary describing various aspects of the distribution function which is written to the List Output File. For any subset of the results, the user can cause the code to print out the entire CCDF table.

The results from the OUTPUT module are presented individually for each emergency response strategy requested, and also as a weighted sum of the combined results. Consequences calculated by both EARLY and CHRONC (e.g., cancer cases) are presented individually as well as combined into overall sums. In addition, the weighting fractions associated with the individual emergency response scenarios of EARLY (up to three are allowed) are combined automatically according to the values of "fraction of the people" or "fraction of the time" as specified by the user.

In addition to being able to handle multiple emergency response scenarios, a single run of the MACCS code can also handle multiple source terms and multiple weather trials (if weather category sampling is being used). The OUTPUT module will print a description of all the results for each source term before going on to the next source term. The code is currently dimensioned to handle up to 60 source terms.

1.3 Input Processing

The user input files for MACCS are processed by a free-field input processor, INPRE, which was developed to facilitate the portability and ease of maintainance of the MACCS code. The INPRE package is portable without modification to any computer system with an ANSI standard FORTRAN compiler.

The format of the input files was designed to maximize their readability. The input processor permits the user to freely intersperse comments with the data making the input files essentitally self-documenting. Because

of the requirements of the INPRE free-field processor, certain restrictions are necessary on the format of the input data files. For a detailed description of these restrictions consult Volume I of this report, the User's Guide.

1.4 Program Structure Charts

The following charts are a graphical representation of the hierarchical control structure of the MACCS code, and appear as a set of comment cards at the beginning of the MACCS code.

The charts should be read from the top down and left to right. A "+" beneath a subprogram name indicates that a graphical representation of that subprogram's external references will follow.

```
                                MACCS - (Main Program)
                                         *
 ****************************************************************************
 *     *     *     *     *     *     *     *     *     *     *     *
MXXETC MXXCPU MXXDAT MXXCLK INPUT GETSTM DAYHOU BINSAM USRSUP CONMET RANSAM OUTPUT
                             +           +     +     +     +     +     +
```

```
                                INPUT - (Process all user and auxillary input)
                                         *
 ****************************************************************************
 *    *   *     *     *     *     *     *     *       *     *     *
INPBEG * ATMODL ATPROB INPREL PUTSTM INPEND EARINP REDSTG   PUTSTG CHRINP OUTCON
 *    *   +     +     *     *           +     *       *     +     +
 *    *             *******   *               ********    *
 *    *             *     *   *               *      *    *
 *    *             *   DECAY *             INEVAC INPEMR *
 *    *             *         *               *      *    *
 ************************************************************
                            *
          (INPRE free-format input processing package)
              (CGET1, IGET1, RGET1, RGETN, ERRLOC,
       IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH, SORT)
```

```
                            ATMODL - (ATMOS user input model description)
                                     *
      ************************************************
      *       *       *       *       *       *       *
    INPGEO  INPISO  INPWET  INPDRY  INPDIS  INPEXP  INPLRS
      *       *       *       *       *       *       *
      ************************************************
                              *
            (INPRE free-format input processing package)
    (CGET1, IGET1, IGETN, LGET1, LGETN, RGET1, RGETN, ERRLOC,
          IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH)
```

```
                           ATPROB -(ATMOS user input problem description)
                                    *
                 ***********************************
                 *     *       *       *       *
                 *   INPWAK  INPREL  INPMET  INPOPT
                 *     *       *       +       *
                 *     *     *******           *
                 *     *     *     *           *
                 *     *     *   DECAY         *
                 *     *     *                 *
                 ***********************************
                              *
           (INPRE free-format input processing package)
            (CGET1, IGET1, LGET1, RGET1, RGETN, ERRLOC,
          IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH)
```

```
                    INPMET - (Process weather definition data)
                      *
   ****************************************
   *         *         *         *         *
 INPM1     INPM2     INPM3     INPM4     INPM5
   *         *         *         *         *
*******      *         *      *******      *
*     *      *         *      *     *      *
*  WRDMET    *         *      *  WBNMET    *
*     *      *         *      *     *      *
*     *      *         *      *  WNDRZB    *
*     *      *         *      *            *
*********************************************
                      *
        (INPRE free-format input processing package)
        (IGET1, IGETN, RGET1, RGETN, ERRLOC, ERRFIL,
       IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH)
```

```
                          EARINP - (Process input and define the models)
                            *
*****************************************************************************
*     *     *      *              *         *     *     *     *     *     *
INMISC  *  EDCINP  INEVAC         INPOPU    INPEMR  *  INEFAT  *  INACAN  *
*     *     *      *              *         *     *     *     *     *     *
*   INORGA  *  ************    ************  *  INDFAC  *  INEINJ  *     *
*     *     *  *     *     *    *     *     *  *     *     *     *     *     *
*     *     *  *  EVRADI  *    *  CMPTBL  *  *  *     *     *     *     *     *
*     *     *  *     *  EVNETW  *     *  MATCH  *     *     *     *     *     *
*     *     *  *     *     *    *     *     *  *     *     *     *     *     *
*     *     *  *     *  ******  ************  *     *     *     *     *     *
*     *     *  *     *  *    *       *        *     *     *     *     *     *
*     *     *  *********  EVROOT     *        *     *     *     *     *     *
*     *     *     *                  *        *     *     *     *     *     *
*****************************************************************     *
                *                                                     *
                *                                  *************************
                *                                  *
                *          ************************************************
                *          *     *     *     *     *     *     *     *
                *        INOUT1 INOUT2 INOUT3 INOUT4 INOUT5 INOUT6 INOUT7 INOUT8
                *          *     *     *     *     *     *     *     *
                *          ************************************************
                *                                  *
                ************************************
                            *
        (INPRE free-format input processing package)
   (CGET1, IGET1, IGETN, LGET1, RGET1, RGETN, DOCCDF, ERRLOC, ERRFIL,
        IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH)
```

```
                                  CHRINP - (Process CHRONC input)
                                     *
  ******************************************************************************
  *                     *                          *        *        *        *
OPNERL                INPCHR                     MODLDF   SDFINP   EXCINP   STGRDA
  *                     *                          *        *
  *    ************************************        *    *********************
  *    *      *         *     *      *      *      *    *      *      *     *
  *  INCHRN STPATH    IXOT9 IXOT10 IXOT11 IXOT12    *  CXPTBL KMPTBL MXTCH CKINDX
  *    *      *         *     *      *      *      *
  *    *    ******      *     *      *      *      *
  *    *    *    *      *     *      *      *      *
  *    *    *  RDISTB   *     *      *      *      *
  *    *    *    *      *     *      *      *      *
  ***************************************************
                        *
       (INPRE free-format input processing package)
  (CGET1, IGET1, IGETN, LGET1, RGET1, RGETN, DOCCDF, ERRLOC)
      IMDIGT, IMLGCL, IMNTGR, IMREAL, RDSTRG, SEARCH)
```

```
                        OUTCON - (Generates result names and opens output files)
                          *
              ***************************************************
              *                  *                              *
             HEDEAR             COPCHR                         HEDCHR
              *                                                 *
  ************************************************      **********************
  *      *      *      *      *      *      *      *      *      *      *      *
RESNM1 RESNM2 RESNM3 RESNM4 RESNM5 RESNM6 RESNM7 RESNM8 RXSNM9 RXNM10 RXNM11 RXNM12
  *            *      *      *      *      *      *      *      *             *
  *           COMPRS  *      *      *      *      *      *      *             *
  *                   *      *      *      *      *      *      *             *
  ******************************************************************************
                                  *
                                DISRAN
                                  *
                                DIST1
```

```
                        DAYHOU - (Sampling from a given start time)
                          *
                  ***************************
                  *        *        *        *
                ADJTIM   WSAMPL  WBNDRY   CONTRL
                          *                +
                      ************
                      *          *
                    WINCTM     WGTMET
```

```
                    BINSAM - (Weather bin category sampling)
                       *
  ***********************************************
  *        *        *        *        *        *
WRANBN   RANDOM   ADJTIM   WSAMPL   WBNDRY   CONTRL
  *                          *                  +
RANDOM                   ***********
                         *         *
                       WINCTM    WGTMET
```

```
                    USRSUP - (5 days of weather supplied by user)
                       *
                  *************
                  •           •
                WBNDRY      CONTRL
                              +
```

```
                    CONMET - (Constant weather condtions)
                       •
                  *************
                  *           *
                WBNDRY      CONTRL
                              +
```

```
                    RANSAM - (Stratified random sampling)
                       *
  ************************************
  *        *        *        *        *
RANDOM   ADJTIM   WSAMPL  WBNDRY   CONTRL
                    *                +
                 **********
                 *        *
               WINCTM   WGTMET
```

```
                    CONTRL - (Simulation executive controller)
                       *
  ****************************
  *        *        *        *
ATMOUT   GETSTG   EAROUT   CHROUT
  +                +        +
```

```
                                ATMOUT - (Main program for the ATMOS module)
                                  *
  ************************************************************************
  *      *      *      *      *      *      *      *      *      *
CAUGHT  AREA   WASHOU  FSGYIN  FSGZIN  FSGY   FSGZ   DECAY   PLMRIS  SIGTEX
                                                            *
                                                           VELADJ
```

```
                              EAROUT - (Main program for the EARLY module)
                                *
  ***********************************************************************
  *      *      *      *      *      *      *      *      *      *
CENZER  EGEOM  EPCALC  RELZON  ESTAT  EMOVE  FATRIS  INJRIS  CANRIS  STOEAR
         ●              +      *      *                              +
       CLSHIN                 ******   *
         *                    *    *   *
        POL2                  *  INCDOS *
                              *      *
                              ************
                              *        *
                            EDOSIN   CENACU
```

```
                              RELZON - (Relocation zone dosimetry calculations)
                                *
                  ************************************
                  *        *      *        *       *
                EDOSIN   INCDOS   *      INCREM  ZERREM
                                  *        *
                                  *    *********
                                  *    *       *
                                  *  CENZER    *
                                  ●            *
                                  ***************
                                         *
                                       CENACU
```

```
                                STOEAR - (Generates the EARLY results)
                                  *
    *******************************************************
    *      *      *      *      *      *      *      *
  OUTPT1 OUTPT2 OUTPT3 OUTPT4 OUTPT5 OUTPT6 OUTPT7 OUTPT8
    *                                                 ●
    *******************************************************
                                  *
                                EFFGET
```

```
                          CHROUT - (Main program from the CHRONC module)
                            *
              ****************************************
              *                *          *         ●
            CHRNDF           SGCPLN     WGCPLN    CRNRSK
              *                                     *
  **********************       ******************************************
  ●     *     *     *          *     ●     *     *     *     *     *
BLDTBL GNDRES TRFRCT WTRTRF   DIRDEP INITLZ EMRGPH INTRPH LNGTPH LOKSEE STOCHR
                                                         +             +
```

```
                          LNGTPH - (Long-term phase doses and costs)
                            *
                ******************************
                *              *              *
              LTPROJ         CSTEFF         LTACUM
                *              ●
              LTMACT         CSTDCN
```

```
                          STOCHR - (Generates the CHRONC results)
                            *
  ************************************************************************
  *      *      *      *      *      *      *      *      *      *
OXTPT1 OXTPT4 OXTPT5 OXTPT6 OXTPT7 OXTPT8 OXTPT9 OXPT10 OXPT11 OXPT12
  *                                  *      *      *      *      *
  ****************************************    DOSGET ECCGET   *********
                  *                                              *
                CASGET                                          GETIMP
```

```
                          OUTPUT - (Generates CCDF and summary tables)
                            *
              **********************************
              *          *                   *
            READ1      READ2                PRINT
                         *                   *
                       DO1CDF          ****************
                         *             *     ●      ●
                      ********       SOLID  QUANTL  NOTFOU
                      *      *                *
                   GNBIN1 GNBIN2          EXPINT
                     *
                   ILOG10
```

1.5 MACCS Subprograms

The following is a list of the subprograms in the MACCS in the order in which they appear in the code. FORTRAN functions and entry points are noted.

```
MXXETC
MXXCPU
MXXCLK
MXXDAT
ABORT
INPUT
INPBEG
INPEND
CGET1    (FUNCTION)
DOCCDF   (FUNCTION)
IGET1    (FUNCTION)
IGETN
LGET1    (FUNCTION)
LGETN
RGET1    (FUNCTION)
RGETN
RDSTRG
IMLGCL   (FUNCTION)
IMNTGR   (FUNCTION)
IMDIGT   (FUNCTION)
IMREAL   (FUNCTION)
SEARCH
SORT
ERRFIL
ERRLOC
ATMODL
INPGEO
INPISO
INPWET
INPDRY
INPDIS
INPEXP
INPLRS
ATPROB
INPWAK
INPREL
PUTSTM
GETSTM   (ENTRY POINT IN PUTSTM)
INPMET
INPM1
WRDMET
INPM2
INPM3
INPM4
WBNMET
WNDRZB
```

```
INPM5
INPOPT
EARINP
INMISC
INORGA
EDCINP
INEVAC
INPOPU
CMPTBL
MATCH
EVRADI
EVNETW
EVROOT
INPEMR
INDFAC
INEFAT
INEINJ
INACAN
INOUT1
INOUT2
INOUT3
INOUT4
INOUT5
INOUT6
INOUT7
INOUT8
REDSTG
PUTSTG
GETSTG  (ENTRY POINT IN PUTSTG)
CHRINP
OPNERL
MODLDF  (ENTRY POINT IN OPNERL)
INPCHR
INCHRN
STPATH
RDISTB
IXOT9
IXOT10
IXOT11
IXOT12
SDFINP
CXPTBL
KMPTBL  (ENTRY POINT IN CXPTBL)
MXTCH
CKINDX
EXCINP
STGRDA
OUTCON
HEDEAR
RESNM1  (FUNCTION)
DISRAN  (FUNCTION)
DIST1
```

```
COMPRS
RESNM2   (FUNCTION)
RESNM3   (FUNCTION)
RESNM4   (FUNCTION)
RESNM5   (FUNCTION)
RESNM6   (FUNCTION)
RESNM7   (FUNCTION)
RESNM8   (FUNCTION)
COPCHR
HEDCHR
RXSNM9   (FUNCTION)
RXNM10   (FUNCTION)
RXNM11   (FUNCTION)
RXNM12   (FUNCTION)
DAYHOU
RANDOM
RANSAM
USRSUP
CONMET
WBNDRY
ADJTIM
WSAMPL
WGTMET
WINCTM
BINSAM
WRANBN
CONTRL
ATMOUT
AREA     (FUNCTION)
CAUGHT   (FUNCTION)
VELADJ   (FUNCTION)
WASHOU   (FUNCTION)
FSGY     (FUNCTION)
FSGYIN   (ENTRY POINT IN FSGYIN)
FSGZ     (FUNCTION)
FSGZIN
DECAY
PLMRIS   (FUNCTION)
SIGTEX   (FUNCTION)
EAROUT
EGEOM
CLSHIN   (FUNCTION)
POL2     (FUNCTION)
EPCALC
RELZON
ESTAT
CENACU
CENZER   (ENTRY POINT IN CENACU)
EDOSIN
INCDOS
EMOVE
ZERREM
```

INCREM
FATRIS
INJRIS
CANRIS
STOEAR
OUTPT1
EFFGET (FUNCTION)
OUTPT2
OUTPT3
OUTPT4
OUTPT5
OUTPT6
OUTPT7
OUTPT8
CHROUT
CHRNDF
BLDTBL
GNDRES
TRFRCT
WTRTRF
SGCPLN
WGCPLN
CRNRSK
DIRDEP
INITLZ
EMRGPH
INTRPH
LNGTPH
LTPROJ
LTMACT
CSTEFF
CSTDCN
LTACUM
LOKSEE
STOCHR
OXTPT1
CASGET
OXTPT4
OXTPT5
OXTPT6
OXTPT7
OXTPT8
OXTPT9
DOSGET
OXPT10
ECCGET
OXPT11
OXPT12
GETIMP
OUTPUT
READ1
READ2

```
DO1CDF
GNBIN1
ILOG10  (FUNCTION)
GNBIN2
PRINT
SOLID
QUANTL
EXPINT  (FUNCTION)
NOTFOU  (FUNCTION)
```

1.6 Subprogram Listing By Modules

The MACCS program is organized into four modules: ATMOS, EARLY, CHRONC, AND OUTPUT. This section gives a listing of the subprograms in each module. Within each module, the subprograms are listed in alphabetical order.

ATMOS:

ABORT	LGETN	EPCALC	OUTPT2	DIRDEP	OXTPT1
ADJTIM	PLMRIS	ERRFIL	OUTPT3	DISRAN	OXTPT4
AREA	PUTSTM	ERRLOC	OUTPT4	DIST1	OXTPT5
ATMODL	RANDOM	ESTAT	OUTPT5	DOCCDF	OXTPT6
ATMOUT	RANSAM	EVNETW	OUTPT6	DOSGET	OXTPT7
ATPROB	RDSTRG	EVRADI	OUTPT7	ECCGET	OXTPT8
BINSAM	RGET1	EVROOT	OUTPT8	EMGRPH	OXTPT9
CAUGHT	RGETN	FATRIS	POL2	ERRFIL	RDISTB
CGET1	SEARCH	HEDEAR	PUTSTG	ERRLOC	RDSTRG
CONMET	SIGTEX	IGET1	RDSTRG	EXCINP	RGET1
CONTRL	SORT	IGETN	REDSTG	GETIMP	RGETN
DAYHOU	USRSUP	IMDIGT	RELZON	GNDRES	RXNM10
DECAY	VELADJ	IMLGCL	RESNM1	HEDCHR	RXNM11
ERRFIL	WASHOU	IMNTGR	RESNM2	IGET1	RXNM12
ERRLOC	WBNDRY	IMREAL	RESNM3	IGETN	RXSNM9
FSGY	WBNMET	INACAN	RESNM4	IMDIGT	SDFINP
FSGZ	WGTMET	INCDOS	RESNM5	IMLGCL	SEARCH
IGET1	WINCTM	INCREM	RESNM6	IMNTGR	SGCPLN
IGETN	WNDRZB	INDFAC	RESNM7	IMREAL	SORT
IMDIGT	WRANBN	INEFAT	RESNM8	INCHRN	STGRDA
IMLGCL	WRDMET	INEINJ	RGET1	INITLZ	STOCHR
IMNTGR	WSAMPL	INEVAC	RGETN	INPBEG	STPATH
IMREAL		INJRIS	SEARCH	INPCHR	TRFRCT
INPBEG		INMISC	SORT	INPEND	WGCPLN
INPDIS	EARLY:	INORGA	STOEAR	INPUT	WTRTRF
INPDRY	ABORT	INOUT1	ZERREM	INTRPH	
INPEND	CANPIS	INOUT2		IXOT9	
INPEXP	CENACU	INOUT3		IXOT10	OUTPUT:
INPGEO	CGET1	INOUT4	CHRONC:	IXOT11	ABORT
INPISO	CLSHIN	INOUT5	ABORT	IXOT12	DO1CDF
INPLRS	CMPTBL	INOUT6	BLDTBL	LGET1	EXPINT
INPM1	COMPRS	INOUT7	CASGET	LGETN	GNBIN1
INPM2	CONTRL	INOUT8	CGET1	LNGTPH	GNBIN2
INPM3	DISRAN	INPBEG	CHRINP	LOKSEE	ILOG10
INPM4	DIST1	INPEMR	CHRNDF	LTACUM	NOTFOU
INPM5	DOCCDF	INPEND	CHROUT	LTMACT	OUTPUT
INPMET	EARINP	INPOPU	CKINDX	LTPROJ	PRINT
INPOPT	EAROUT	INPUT	CONTRL	MXTCH	QUANTL
INPREL	EDCINP	LGET1	COPCHR	OPNERL	READ1
INPUT	EDOSIN	LGETN	CRNRSK	OUTCON	READ2
INPWAK	EFFGET	MATCH	CSTDCN	OXPT10	SOLID
INPWET	EGEOM	OUTCON	CSTEFF	OXPT11	
LGET1	EMOVE	OUTPT1	CXPTBL	OXPT12	

1.7 Sequential Flow Diagram

The following figure illustrates the sequence of calculations performed by the various modules of MACCS. It shows the internal looping structure used to perform calculations for multiple source terms, weather trials, and emergency response assumptions.

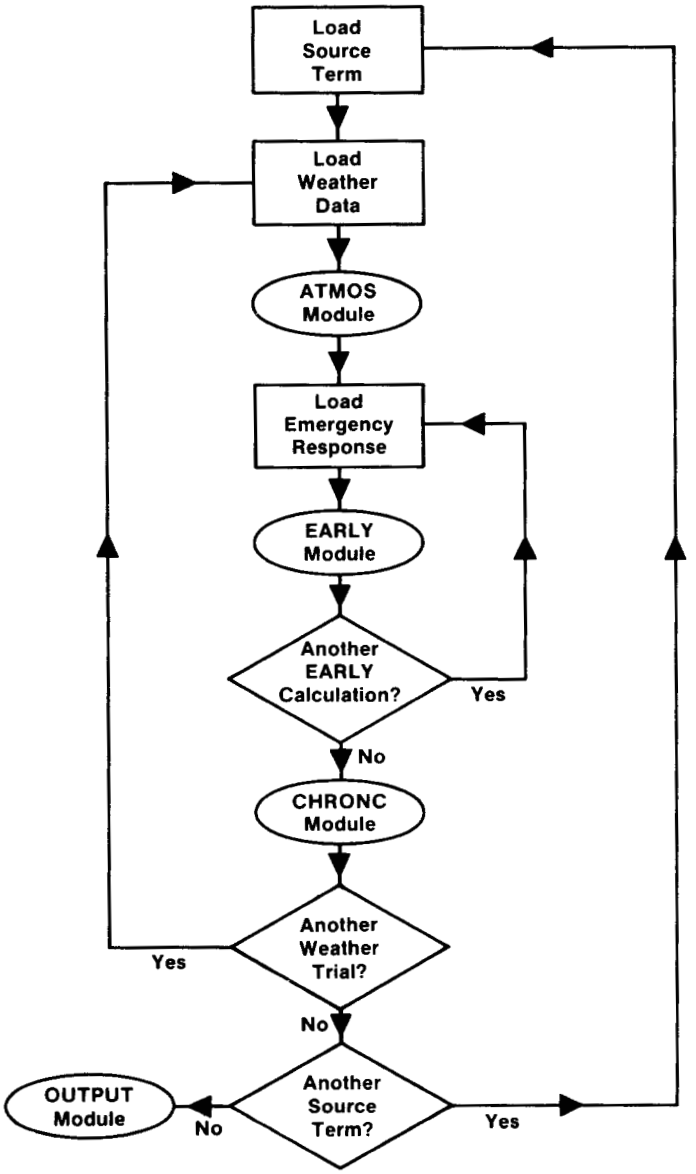

Figure 1.1 Sequential Flow Diagram

1.8 Data Flow Diagram

The following figure illustrates the direction of data flow between the various modules of MACCS.

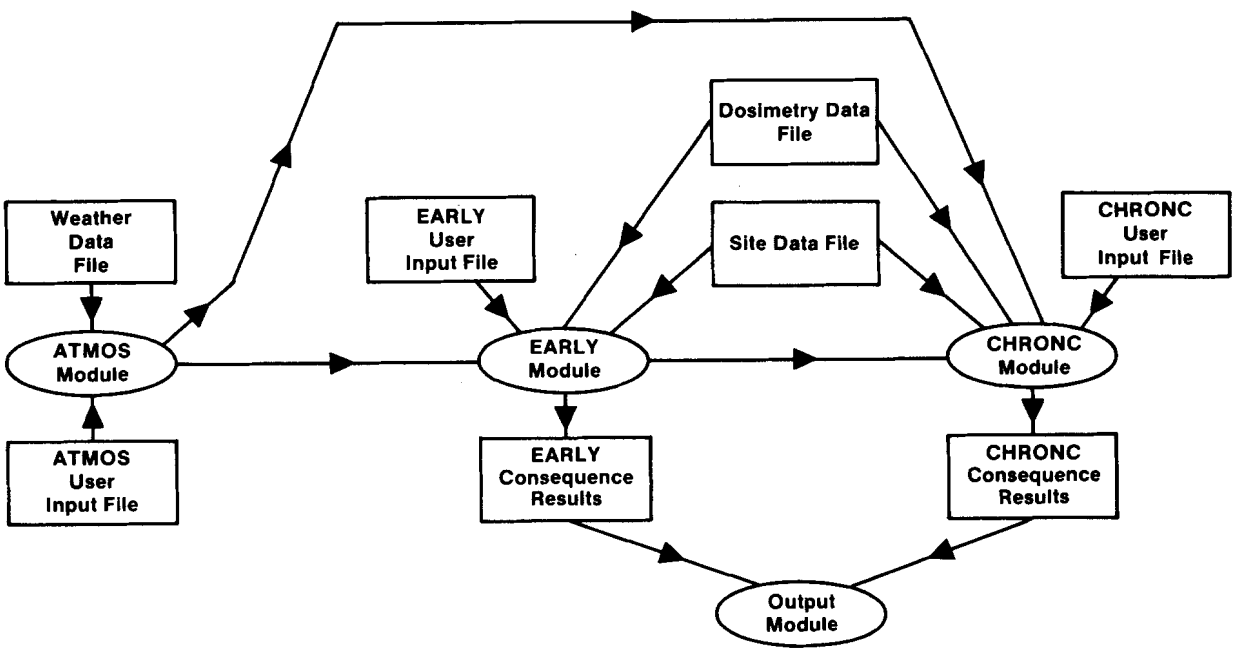

Figure 1.2 Data Flow Diagram

2.0 MACCS SUBPROGRAMS

2.1 MACCS Subprogram Overview

The MACCS program is organized into the following modules: ATMOS, EARLY, CHRONC, and OUTPUT. Within each module, the subprograms are generally organized in the following order: (1) input processing, (2) modeling or arithmetic calculations, and (3) output processing.

Both SUBROUTINE and FUNCTION statements appear in the code, and ENTRY statements are used in both types of subprograms.

This chapter is intended to give a description of the MACCS code subprograms and their interactions. Section 2.2 contains a tree depicting the calling structure of the code, Section 2.3 contains a description of each subprogram, and Section 2.4 contains a description of the named statement functions found in the MACCS Code.

2.2 Detailed Calling Structure

The calling structure tree found in this section is intended to give an overall picture of the order of the calls made to subprograms within the MACCS code. The flow of the tree is from the top to bottom and from left to right. The layout of the tree makes the levels of the various calls readily apparent to the reader. It should be noted that calls to INPRE routines are accompanied by the name of the variable being fetched in parentheses. When a call to a given routine appears more than once in a subprogram, each call is shown in the structure charts of this chapter. It is possible that the program logic will cause multiple executions of a single call. There is no indication in the tree of whether or not that may occur. The calling structure of individual subroutines is presented in Appendix A. These charts depict the multiple calls made which arise as a result of program logic.

To keep the tree as simple a possible, two blocks of structure have been removed from the main tree and added to the end of this section. The first block starting on page 2-28 contains the structure of the subprograms which are called many times within MACCS. Most notable among these is the INPRE input processing routines. Within the main tree, an asterisk following the subprogram name indicates those routines.

The second block of structure separated from the main tree is the subtree which emanates from the subroutine CONTRL. This subtree begins on page 2-30 and contains the simulation and output processing routines for the EARLY, CHRONC, and OUTPUT modules.

CALLING STRUCTURE TREE OF THE MACCS CODE

```
MACCS--+-MXXETC
!      +-MXXCPU--+-ABORT
!      +-MXXDAT
!      +-MXXCLK
!      +-INPUT---+-INPBEG--+-ABORT
!      !         !         +-SEARCH
!      !         !         +-SORT
!      !         !         +-ABORT
!      !         !
!      !         !-ERRLOC
!      !         +-ABORT
!      !         +-ATMODL--+-INPGEO--+-IGET1-*
!      !         !         !         ! (NUMRAD)
!      !         !         !         !
!      !         !         !         +-RGETN---+-RGET1-*
!      !         !         !         ! (SPAEND)
!      !         !         !         !
!      !         !         !         +-ERRLOC
!      !         !         !
```

```
!       !       !       !
!       !       !       +-INPISO--+-IGET1-*
!       !       !       !         ! (NUMISO)
!       !       !       !         !
!       !       !       !         +-IGET1-*
!       !       !       !         ! (MAXGRP)
!       !       !       !         !
!       !       !       !         +-LGETN---+-LGET1-*
!       !       !       !         ! (WETDEP)
!       !       !       !         !
!       !       !       !         +-LGETN---+-LGET1-*
!       !       !       !         ! (DRYDEP)
!       !       !       !         !
!       !       !       !         +-CGET1-*
!       !       !       !         ! (NUCNAM)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         !
!       !       !       !         +-CGET1-*
!       !       !       !         ! (PARENT)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         !
!       !       !       !         +-IGETN---+-IGET1-*
!       !       !       !         ! (IGROUP)
!       !       !       !         !
!       !       !       !         +-RGETN---+-RGET1-*
!       !       !       !         ! (HAFLIF)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !
!       !       !       !
!       !       !       +-INPWET--+-RGET1-*
!       !       !       !         !  (CWASH1)
!       !       !       !         !
!       !       !       !         +-RGET1-*
!       !       !       !           (CWASH2)
!       !       !       !
!       !       !       !
!       !       !       +-INPDRY--+-IGET1-*
!       !       !       !         ! (NPSGRP)
!       !       !       !         !
!       !       !       !         +-RGETN---+-RGET1-*
!       !       !       !           (VDEPOS)
!       !       !       !
!       !       !       !
!       !       !       +-INPDIS--+-RGETN---+-RGET1-*
!       !       !       !         ! (CYSIGA)
!       !       !       !         !
!       !       !       !         +-RGETN---+-RGET1-*
!       !       !       !         ! (CYSIGB)
!       !       !       !         !
```

```
!       !         !         !         !
!       !         !         !         +-RGETN---+-RGET1-*
!       !         !         !         ! (CZSIGA)
!       !         !         !         !
!       !         !         !         +-RGETN---+-RGET1-*
!       !         !         !         ! (CZSIGB)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !         !  (YSCALE)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !           (ZSCALE)
!       !         !         !
!       !         !         !
!       !         !         +-INPEXP--+-RGET1-*
!       !         !         !         ! (TIMBAS)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !         ! (BRKPNT)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !         ! (XPFAC1)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !           (XPFAC2)
!       !         !         !
!       !         !         !
!       !         !         +-INPLRS--+-RGET1-*
!       !         !                   ! (SCLCRW)
!       !         !                   !
!       !         !                   +-RGET1-*
!       !         !                   ! (SCLADP)
!       !         !                   !
!       !         !                   +-RGET1-*
!       !         !                     (SCLEFP)
!       !         !
!       !         !
!       !         +-ATPROB--+-CGET1-*
!       !         !         ! (ATNAM1)
!       !         !         !
!       !         !         +-INPWAK--+-RGET1-*
!       !         !         !         ! (BUILDW)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !           (BUILDH)
!       !         !         !
!       !         !         !
!       !         !         +-INPREL--+-CGET1-*
!       !         !         !         ! (ATNAM2)
!       !         !         !         !
!       !         !         !         +-IGET1-*
!       !         !         !         ! (NUMREL)
```

```
!       !       !       !       !
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (PLHEAT)
!       !       !       !       !
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (PLHITE)
!       !       !       !       !
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (PLUDUR)
!       !       !       !       !
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (PDELAY)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (PSDIST)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGET1-*
!       !       !       !       ! (OALARM)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (MAXRIS)
!       !       !       !       !
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (REFTIM)
!       !       !       !       !
!       !       !       !       +-CGET1-*
!       !       !       !       ! (CORINV)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (CORINV)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-ERRLOC
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (CORSCA)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       ! (RELFRC)
!       !       !       !       !
!       !       !       ! *     +-DECAY
!       !       !       !
!       !       !       !
!       !       !       +-INPMET--+-INPM1---+-IGET1-*
!       !       !       !         !         ! (METCOD)
!       !       !       !         !         !
!       !       !       !         !         +-WRDMET-+-ERRFIL
!       !       !       !         !         !        +-ERRFIL
!       !       !       !         !         !        +-ERRFIL
```

```
!       !       !       !       !       !
!       !       !       !       !       +-ABORT
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-INPM2---+-IGET1-*
!       !       !       !       !         ! (LIMSPA)
!       !       !       !       !         !
!       !       !       !       !         +-RGET1-*
!       !       !       !       !         ! (BNDMXH)
!       !       !       !       !         !
!       !       !       !       !         +-IGET1-*
!       !       !       !       !         ! (IBDSTB)
!       !       !       !       !         !
!       !       !       !       !         +-RGET1-*
!       !       !       !       !         ! (BNDRAN)
!       !       !       !       !         !
!       !       !       !       !         +-RGET1-*
!       !       !       !       !           (BNDWND)
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-INPM3---+-IGET1-*
!       !       !       !       !         ! (ISTRDY)
!       !       !       !       !         !
!       !       !       !       !         +-IGET1-*
!       !       !       !       !          (ISTRHR)
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-INPM4---+-IGET1-*
!       !       !       !       !         ! (NSMPLS)
!       !       !       !       !         !
!       !       !       !       !         +-IGET1-*
!       !       !       !       !         ! (IRSEED)
!       !       !       !       !         !
!       !       !       !       !         +-IGET1-*
!       !       !       !       !         ! (NRNINT)
!       !       !       !       !         !
!       !       !       !       !         +-RGETN--+-RGET1-*
!       !       !       !       !         ! (RNDSTS)
!       !       !       !       !         !
!       !       !       !       !         +-ERRLOC
!       !       !       !       !         +-ERRLOC
!       !       !       !       !         +-IGET1-*
!       !       !       !       !         ! (NRINTN)
!       !       !       !       !         !
!       !       !       !       !         +-RGETN--+-RGET1-*
!       !       !       !       !         ! (RNRATE)
!       !       !       !       !         !
!       !       !       !       !         +-ERRLOC
!       !       !       !       !         +-ERRLOC
!       !       !       !       !         +-IGET1-*
!       !       !       !       !         ! (NSBINS)
!       !       !       !       !         !
```

```
!       !       !       !       !       !
!       !       !       !       !       +-IGETN--+-IGET1-*
!       !       !       !       !       ! (INDXBN)
!       !       !       !       !       !
!       !       !       !       !       +-IGETN--+-IGET1-*
!       !       !       !       !       ! (INWGHT)
!       !       !       !       !       !
!       !       !       !       !       +-WBNMET-+-WNDRZB
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-INPM5---+-RGETN--+-RGET1-*
!       !       !       !               ! (HRMXHT)
!       !       !       !               !
!       !       !       !               +-IGETN--+-IGET1-*
!       !       !       !               ! (IHRSTB)
!       !       !       !               !
!       !       !       !               +-RGETN--+-RGET1-*
!       !       !       !               ! (HRRAIN)
!       !       !       !               !
!       !       !       !               +-RGETN--+-RGET1-*
!       !       !       !               ! (HRWNDV)
!       !       !       !               !
!       !       !       !               +-IGETN--+-IGET1-*
!       !       !       !                (IHRDIR)
!       !       !       !
!       !       !       !
!       !       !       +-INPOPT--+-LGET1-*
!       !       !               ! (ENDAT1)
!       !       !               !
!       !       !               +-IGET1-*
!       !       !               ! (IDEBUG)
!       !       !               !
!       !       !               +-CGET1-F
!       !       !               ! (NUCOUT)
!       !       !               !
!       !       !               +-ERRLOC
!       !       !
!       !       !
!       !       +-ABORT
!       !       +-INPBEG--+-ABORT
!       !       !         +-SEARCH
!       !       !         +-SORT
!       !       !         +-ABORT
!       !       !
!       !       !
!       !       +-INPREL--+-CGET1-*
!       !       !         ! (ATNAM2)
!       !       !         !
!       !       !         +-IGET1-*
!       !       !         ! (NUMREL)
!       !       !         !
!       !       !         +-RGETN---+-RGET1-*
!       !       !         ! (PLHEAT)
```

```
!       !          !          !
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (PLHITE)
!       !          !          !
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (PLUDUR)
!       !          !          !
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (PDELAY)
!       !          !          !
!       !          !          +-ERRLOC
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (PSDIST)
!       !          !          !
!       !          !          +-ERRLOC
!       !          !          +-RGET1-*
!       !          !          ! (OALARM)
!       !          !          !
!       !          !          +-IGET1-*
!       !          !          ! (MAXRIS)
!       !          !          !
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (REFTIM)
!       !          !          !
!       !          !          +-CGET1-*
!       !          !          ! (CORINV)
!       !          !          !
!       !          !          +-RGET1-*
!       !          !          ! (CORINV)
!       !          !          !
!       !          !          +-ERRLOC
!       !          !          +-ERRLOC
!       !          !          !
!       !          !          +-RGET1-*
!       !          !          ! (CORSCA)
!       !          !          !
!       !          !          +-ERRLOC
!       !          !          +-RGETN---+-RGET1-*
!       !          !          ! (RELFRC)
!       !          !          !
!       !          !          +-DECAY
!       !          !
!       !          !
!       !          +-ABORT
!       !          +-PUTSTM--+-ERRLOC
!       !          !          +-ERRLOC
!       !          !          +-(**ENTRY-GETSTM)
!       !          !
!       !          !
!       !          +-ABORT
!       !          +-INPEND
!       !          !
```

```
!       !         !
!       !         +-INPBEG--+-ABORT
!       !         !         +-SEARCH
!       !         !         +-SORT
!       !         !         +-ABORT
!       !         !
!       !         !
!       !         +-EARINP--+-INMISC--+-CGET1-*
!       !         !         !         ! (EANAM1)
!       !         !         !         !
!       !         !         !         +-LGET1-*
!       !         !         !         ! (ENDAT2)
!       !         !         !         !
!       !         !         !         +-IGET1*
!       !         !         !         ! (IPLUME)
!       !         !         !         !
!       !         !         !         +-IGET1-*
!       !         !         !         ! (NUMFIN)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-LGET1-*
!       !         !         !         ! (OVRRID)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (WINROS)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-IGET1-*
!       !         !         !         ! (IPRINT)
!       !         !         !         !
!       !         !         !         +-LGET1-*
!       !         !         !           (RISCAT)
!       !         !         !
!       !         !         !
!       !         !         +-INORGA--+-IGET1-*
!       !         !         !         ! (NUMORG)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (ORGNAM)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !
!       !         !         !
!       !         !         +-EDCINP--+-ERRFIL
!       !         !         !
!       !         !         +-INEVAC--+-CGET1-*
!       !         !         !         ! (EANAM2)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (WTNAME)
!       !         !         !         !
```

```
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (WTFRAC)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (LASMOV)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (IEVACU)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (INIEVA)
!       !       !       !       !
!       !       !       !       +-IGETN--+-IGET1-*
!       !       !       !       ! (LASEVA)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EDELAY)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-EVRADI-+-RGET1-*
!       !       !       !       !          (ESPEED)
!       !       !       !       +-EVNETW-+-IGET1-*
!       !       !       !                 ! (ISORC)
!       !       !       !                 !
!       !       !       !                 +-IGET1-*
!       !       !       !                 ! (JSORC)
!       !       !       !                 !
!       !       !       !                 +-IGET1-*
!       !       !       !                 ! (NEXTND)
!       !       !       !                 !
!       !       !       !                 +-IGET1-*
!       !       !       !                 ! (NEXTND)
!       !       !       !                 !
!       !       !       !                 +-IGET1-*
!       !       !       !                 ! (NEXTND)
!       !       !       !                 !
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-ERRLOC
!       !       !       !                 +-EVROOT
!       !       !       !
!       !       !       !
!       !       !       +-INPOPU--+-CGET1-*`
!       !       !       !         ! (POPFLG)
!       !       !       !         !
!       !       !       !         +-RGET1-*
!       !       !       !         ! (POPDEN)
!       !       !       !         !
```

```
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (IBEGIN)
!       !       !       !       !
!       !       !       !       +-ERRFIL
!       !       !       !       !
!       !       !       !       +-CMPTBL--+-ERRFIL
!       !       !       !       +-CMPTBL--+-ERRFIL
!       !       !       !       +-MATCH---+-ERRFIL
!       !       !       !       +-ERRFIL
!       !       !       !       +-MATCH---+-ERRFIL
!       !       !       !       +-ERRFIL
!       !       !       !
!       !       !       !
!       !       !       +-INPEMR--+-RGET1-*
!       !       !       !       ! (TTOSH1)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (SHELT1)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (LASHE2)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGET1-*
!       !       !       !       ! (TTOSH2)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (SHELT2)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (ENDEMP)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (TIMHOT)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (TIMNRM)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (DOSHOT)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (DOSNRM)
!       !       !       !       !
!       !       !       !       +-CGET1-*
!       !       !       !       ! (CRIORG)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !
!       !       !       !
!       !       !       +-INDFAC--+-RGETN--+-RGET1-*
!       !       !       !       ! (CSFACT)
```

```
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (PROTIN)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (BRRATE)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (SKPFAC)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (GSHFAC)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (RESCON)
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !         (RESHAF)
!       !       !       !
!       !       !       !
!       !       !       +-INEFAT--+-IGET1-*
!       !       !       !       ! (NUMEFA)
!       !       !       !       !
!       !       !       !       +-CGET1-*
!       !       !       !       ! (ORGNAM)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EFFACA)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EFFACB)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !         (EFFTHR)
!       !       !       !
!       !       !       !
!       !       !       +-INEINJ--+-IGET1-*
!       !       !       !       ! (NUMEIN)
!       !       !       !       !
!       !       !       !       +-CGET1-*
!       !       !       !       ! (EINAME)
!       !       !       !       !
!       !       !       !       +-CGET1-*
!       !       !       !       ! (ORGNAM)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EISUSC)
!       !       !       !       !
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EITHRE)
!       !       !       !       !
```

```
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (EIFACA)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !           (EIFACB)
!       !         !         !
!       !         !         !
!       !         !         +-INACAN--+-IGET1-*
!       !         !         !         ! (NUMACA)
!       !         !         !         !
!       !         !         !         +-RGET1-*
!       !         !         !         ! (ACTHRE)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (ACNAME)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (ORGNAM)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (ACSUSC)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (DOSEFA)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (DOSEFB)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (CFRISK)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !           (CIRISK)
!       !         !         !
!       !         !         !
!       !         !         +-INOUT1--+-IGET1-*
!       !         !         !         ! (NUM1)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! ('NAME OF THE HEALTH EFFECT')
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-IGETN--+-IGET1-*
!       !         !         !         ! (I1DIS1)
!       !         !         !         !
```

```
!       !         !         !         !
!       !         !         !         +-IGETN--+-IGET1-*
!       !         !         !         ! (I2DIS1)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-DOCCDF-*
!       !         !         !
!       !         !         !
!       !         !         +-INOUT2--+-IGET1-*
!       !         !         !         ! (NUM2)
!       !         !         !         !
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (RISTHR)
!       !         !         !         !
!       !         !         !         +-DOCCDF-*
!       !         !         !
!       !         !         !
!       !         !         +-INOUT3--+-IGET1-*
!       !         !         !         ! (NUM3)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (ORGNAM)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-RGETN--+-RGET1-*
!       !         !         !         ! (DOSTH3)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (DOSFLG)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-DOCCDF
!       !         !         !
!       !         !         !
!       !         !         +-INOUT4--+-IGET1-*
!       !         !         !         ! (NUM4)
!       !         !         !         !
!       !         !         !         +-IGETN--+-IGET1-*
!       !         !         !         ! (I1DIS4)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! ('NAME OF THE HEALTH EFFECT')
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-DOCCDF-*
!       !         !         !
```

```
!       !       !       !
!       !       !       +-INOUT5--+-IGET1-*
!       !       !       !         ! (NUM5)
!       !       !       !         !
!       !       !       !         +-CGET1-*
!       !       !       !         ! (ORGNAM)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         !
!       !       !       !         +-IGETN--+-IGET1-*
!       !       !       !         ! (I1DIS5)
!       !       !       !         !
!       !       !       !         +-IGETN--+-IGET1-*
!       !       !       !         ! (I2DIS5)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-DOCCDF-*
!       !       !       !
!       !       !       !
!       !       !       +-INOUT6--+-IGET1-*
!       !       !       !         ! (NUM6)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-CGET1-*
!       !       !       !         ! (ORGNAM)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-CGET1-*
!       !       !       !         ! (PATHNM)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-ERRLOC
!       !       !       !         +-IGETN--+-IGET1-*
!       !       !       !         ! (I1DIS6)
!       !       !       !         !
!       !       !       !         +-IGETN--+-IGET1-*
!       !       !       !         ! (I2DIS6)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-DOCCDF-*
!       !       !       !
!       !       !       !
!       !       !       +-INOUT7--+-IGET1-*
!       !       !       !         ! (NUM7)
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-CGET1-*
!       !       !       !         ! ('NAME OF THE HEALTH EFFECT')
!       !       !       !         !
!       !       !       !         +-ERRLOC
!       !       !       !         +-ERRLOC
!       !       !       !         +-ERRLOC
!       !       !       !         !
```

```
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-ERRLOC
!       !         !         !         +-IGETN--+-IGET1-*
!       !         !         !         ! (I1DIS7)
!       !         !         !         !
!       !         !         !         +-IGETN--+-IGET1-*
!       !         !         !         ! (I2DIS7)
!       !         !         !         !
!       !         !         !         +-ERRLOC
!       !         !         !         +-DOCCDF-*
!       !         !         !
!       !         !         !
!       !         !         +-INOUT8--+-IGET1-*
!       !         !                   ! (NUM8)
!       !         !                   !
!       !         !                   +-CGET1-*
!       !         !                   ! ('NAME OF THE HEALTH EFFECT')
!       !         !                   !
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-ERRLOC
!       !         !                   +-IGETN--+-IGET1-*
!       !         !                   ! (I1DIS8)
!       !         !                   !
!       !         !                   +-IGETN--+-IGET1-*
!       !         !                   ! (I2DIS8)
!       !         !                   !
!       !         !                   +-ERRLOC
!       !         !                   +-DOCCDF-*
!       !         !
!       !         !
!       !         +-ABORT
!       !         +-ERRLOC
!       !         +-ABORT
!       !         +-INPBEG--+-ABORT
!       !         !         +-SEARCH
!       !         !         +-SORT
!       !         !         +-ABORT
!       !         !
!       !         !
!       !         +-REDSTG--+-INEVAC--+-CGET1-*
!       !         !         !         ! (EANAM2)
!       !         !         !         !
!       !         !         !         +-CGET1-*
!       !         !         !         ! (WTNAME)
!       !         !         !         !
```

```
!       !       !       !       !
!       !       !       !       +-RGET1-*
!       !       !       !       ! (WTFRAC)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (LASMOV)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (IEVACU)
!       !       !       !       !
!       !       !       !       +-IGET1-*
!       !       !       !       ! (INIEVA)
!       !       !       !       !
!       !       !       !       +-IGETN--+-IGET1-*
!       !       !       !       ! (LASEVA)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-RGETN--+-RGET1-*
!       !       !       !       ! (EDELAY)
!       !       !       !       !
!       !       !       !       +-ERRLOC
!       !       !       !       +-EVRADI-+-RGET1-*
!       !       !       !       !          (ESPEED)
!       !       !       !       +-EVNETW-+-IGET1-*
!       !       !       !                ! (ISORC)
!       !       !       !                !
!       !       !       !                +-IGET1-*
!       !       !       !                ! (JSORC)
!       !       !       !                !
!       !       !       !                +-IGET1-*
!       !       !       !                ! (NEXTND)
!       !       !       !                !
!       !       !       !                +-IGET1-*
!       !       !       !                ! (NEXTND)
!       !       !       !                !
!       !       !       !                +-IGET1-*
!       !       !       !                ! (NEXTND)
!       !       !       !                !
!       !       !       !                +-ERRLOC
!       !       !       !                +-ERRLOC
!       !       !       !                +-ERRLOC
!       !       !       !                +-ERRLOC
!       !       !       !                +-ERRLOC
!       !       !       !                +-ERRLOC
!       !       !       !                +-EVROOT
!       !       !       !
!       !       !       !
!       !       !       +-INPEMR--+-RGET1-*
!       !       !                 ! (TTOSH1)
!       !       !                 !
!       !       !                 +-RGET1-*
!       !       !                 ! (SHELT1)
!       !       !                 !
```

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!       !           !                     !
!       !           !                     +-IGET1-*
!       !           !                     ! (LASHE2)
!       !           !                     !
!       !           !                     +-ERRLOC
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (SHELT2)
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (ENDEMP)
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (TIMHOT)
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (TIMNRM)
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (DOSHOT)
!       !           !                     !
!       !           !                     +-RGET1-*
!       !           !                     ! (DOSNRM)
!       !           !                     !
!       !           !                     +-CGET1-*
!       !           !                     ! (CRIORG)
!       !           !                     !
!       !           !                     +-ERRLOC
!       !           !
!       !           !
!       !           +-ABORT
!       !           +-PUTSTG--+-ERRLOC
!       !           !         +-ERRLOC
!       !           !         +-(**ENTRY-GETSTG)
!       !           !
!       !           !
!       !           +-ABORT
!       !           +-INPEND
!       !           +-INPBEG--+-ABORT
!       !           !         +-SEARCH
!       !           !         +-SORT
!       !           !         +-ABORT
!       !           !
!       !           !
!       !           +-CHRINP--+-OPNERL--+-(***ENTRY-MODLDF)
!       !           !         !         +-ERRLOC
!       !           !         !
!       !           !         !
!       !           !         +-INPCHR--+-INCHRN--+-CGET1-*
!       !           !         !         !         ! (CHNAME)
!       !           !         !         !         !
```

```
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (EVACST)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (RELCST)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (TMPIND)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (TMPACT)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DSCRTI)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DSCRLT)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (CRTOCR)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (LVLDEC)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TIMDEC)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (DSRFCT)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (CDFRM)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (CDNFRM)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRFDL)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRNFDL)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TFWKF)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TFWKNF)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DLBCST)
!       !       !       !       !       !
```

```
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DPRATE)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DSRATE)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (POPCST)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NGWTRM)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (GWCOEF)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TGWHLF)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NRWTRM)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (RWCOEF)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TRWHLF)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (FRACLD)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (FRCFRM)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (FRMPRD)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (DPFRCT)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (VALWF)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (FRFIM)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (VALWNF)
!       !       !       !       !       !
!       !       !       !       !       +-RGET1-*
!       !       !       !       !       ! (FRNFIM)
!       !       !       !       !       !
```

```
!       !       !       !       !       !
!       !       !       !       !       +-IGETN---+-IGET1-*
!       !       !       !       !       ! (KSWTCH)
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-STPATH--+-LGET1-*
!       !       !       !       !       ! (COUPLD)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NFICRP)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMCRP)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRCTCH)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRCTCM)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRCTCB)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NUMWPI)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMWPI)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (WSHFRI)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (WSHRTA)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (WINGF)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NFIISO)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMIPI)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (DCYPMH)
!       !       !       !       !       !
```

```
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (DCYPBH)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TFMLK)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TFBF)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (TCROOT)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (DCYPCH)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (DCYPCM)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (DCYPCB)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (FPLSCH)
!       !       !       !       !       !
!       !       !       !       !       +-IGET1-*
!       !       !       !       !       ! (NTTRM)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (CTCOEF)
!       !       !       !       !       !
!       !       !       !       !       +-RDISTB-*
!       !       !       !       !       ! (CTHALF)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMCRP)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TGSBEG)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (TGSEND)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (FRCTFL)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMIPI)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (PSCMLK)
```

```
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (PSCOTH)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (NAMIPI)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !       ! (GCMAXR)
!       !       !       !       !       !
!       !       !       !       !       +-RGETN---+-RGET1-*
!       !       !       !       !         (QROOT)
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-IXOT9---+-IGET1-*
!       !       !       !       !       ! (NXUM9)
!       !       !       !       !       !
!       !       !       !       !       +-CGET1-*
!       !       !       !       !       ! (ORGNAN)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-IGETN---+-IGET1-*
!       !       !       !       !       ! (IX1DS9)
!       !       !       !       !       !
!       !       !       !       !       +-IGETN---+-IGET1-*
!       !       !       !       !       ! (IX2DS9)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-DOCCDF-*
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-IXOT10--+-IGET1-*
!       !       !       !       !       ! (NXUM10)
!       !       !       !       !       !
!       !       !       !       !       +-IGETN---+-IGET1-*
!       !       !       !       !       ! (I1DS10)
!       !       !       !       !       !
!       !       !       !       !       +-IGETN---+-IGET1-*
!       !       !       !       !       ! (I2DS10)
!       !       !       !       !       !
!       !       !       !       !       +-ERRLOC
!       !       !       !       !       +-DOCCDF-*
!       !       !       !       !
!       !       !       !       !
!       !       !       !       +-IXOT11--+-IGET1-*
!       !       !       !       !       ! (NXUM11)
!       !       !       !       !       !
!       !       !       !       !       +-LGET1-*
!       !       !       !       !       ! (FLAG11)
!       !       !       !       !       !
!       !       !       !       !       +-DOCCDF-*
!       !       !       !       !
```

```
!       !           !           !           !
!       !           !           !           +-IXOT12--+-IGET1-*
!       !           !           !                     ! (NXUM12)
!       !           !           !                     !
!       !           !           !                     +-IGETN---+-IGET1-*
!       !           !           !                     ! (I1DS12)
!       !           !           !                     !
!       !           !           !                     +-IGETN---+-IGET1-*
!       !           !           !                     ! (I2DS12)
!       !           !           !                     !
!       !           !           !                     +-ERRLOC
!       !           !           !                     +-DOCCDF-*
!       !           !           !
!       !           !           !
!       !           !           +-ABORT
!       !           !           +-MODLDF--+-ERRLOC
!       !           !           +-ABORT
!       !           !           +-SDFINP--+-CXPTBL--+-(***ENTRY-KMPTBL)
!       !           !           !           +-CXPTBL--+-(***ENTRY-KMPTBL)
!       !           !           !           +-CXPTBL--+-(***ENTRY-KMPTBL)
!       !           !           !           +-CXPTBL--+-(***ENTRY-KMPTBL)
!       !           !           !           +-KMPTBL
!       !           !           !           +-KMPTBL
!       !           !           !           +-MXTCH
!       !           !           !           +-MXTCH
!       !           !           !           +-MXTCH
!       !           !           !           +-MXTCH
!       !           !           !           +-CKINDX
!       !           !           !           +-MXTCH
!       !           !           !           +-CKINDX
!       !           !           !           +-MXTCH
!       !           !           !           +-MXTCH
!       !           !           !           +-MXTCH
!       !           !           !
!       !           !           !
!       !           !           +-ABORT
!       !           !           +-EXCINP--+-ABORT
!       !           !           +-ABORT
!       !           !           +-STGRDA
!       !           !
!       !           !
!       !           +-ABORT
!       !           +-INPEND
!       !           +-OUTCON--+-HEDEAR--+-RESNM1--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           !                   +-DIST1--+-ABORT
!       !                     !           +-RESNM2
!       !                     !           +-RESNM3--+-COMPRS--+-ABORT
!       !                     !           +-RESNM4--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           +-RESNM5--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           +-RESNM6--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           +-RESNM7--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           +-RESNM8--+-DISRAN--+-DIST1--+-ABORT
!       !                     !           +-ABORT
```

```
!       !                   !
!       !                   +-COPCHR
!       !                   +-HEDCHR--+-RXSNM9--+-DISRAN--+-DIST1--+-ABORT
!       !                             !         +-ABORT
!       !                             !
!       !                             +-RXNM10--+-DISRAN--+-DIST1--+-ABORT
!       !                             !         +-ABORT
!       !                             !
!       !                             +-RXNM11--+-ABORT
!       !                             !
!       !                             +-RXNM12--+-DISRAN--+-DIST1--+-ABORT
!       !                             !         +-ABORT
!       !                             !
!       !                             +-ABORT
!       !
!       !
!       +-MXXCPU--+-ABORT
!       +-ABORT
!       +-GETSTM
!       +-DAYHOU--+-ADJTIM
!       !         +-WSAMPL--+-WINCTM
!       !         !         +-WGTMET--+-ABORT
!       !         !
!       !         !
!       !         +-WBNDRY
!       !         +-CONTRL-+ (CONTINUED ON PAGE 2-30)
!       !
!       !
!       +-BINSAM--+-WRANBN--+-RANDOM
!       !         +-RANDOM
!       !         +-ADJTIM
!       !         +-WSAMPL--+-WINCTM
!       !         !         +-WGTMET--+-ABORT
!       !         !
!       !         +-WBNDRY
!       !         +-CONTRL-+ (CONTINUED ON PAGE 2-30)
!       !
!       !
!       +-USRSUP--+-WBNDRY
!       !         +-CONTRL-+ (CONTINUED ON PAGE 2-30)
!       !
!       !
!       +-CONMET--+-WBNDRY
!       !         +-CONTRL-+ (CONTINUED ON PAGE 2-30)
!       !
!       !
!       +-RANSAM--+-ABORT
!       !         +-RANDOM
!       !         +-ADJTIM
!       !         +-WSAMPL--+-WINCTM
!       !         !         +-WGTMET--+-ABORT
!       !         !
```

```
!       !         !
!       !         +-WBNDRY
!       !         +-CONTRL-+ (CONTINUED ON PAGE 2-30)
!       !
!       !
!       +-MXXCPU--+-ABORT
!       +-OUTPUT--+-READ1---+-ABORT
!       !         +-READ2---+-ABORT
!       !         !         +-ABORT
!       !         !         +-DO1CDF--+-GNBIN1--+-ILOG10
!       !         !         !         +-GNBIN2
!       !         !         !
!       !         !         +-DO1CDF--+-GNBIN1--+-ILOG10
!       !         !         !         +-GNBIN2
!       !         !         !
!       !         !         +-DO1CDF--+-GNBIN1--+-ILOG10
!       !         !                   +-GNBIN2
!       !         !
!       !         !
!       !         +-PRINT---+-SOLID
!       !                   +-QUANTL--+-EXPINT
!       !                   !         +-EXPINT
!       !                   !         +-EXPINT
!       !                   !         +-EXPINT
!       !                   !         +-EXPINT
!       !                   !
!       !                   !
!       !                   +-NOTFOU
!       !                   +-NOTFOU
!       !                   +-NOTFOU
!       !                   +-NOTFOU
!       !                   +-NOTFOU
!       !
!       +-MXXCPU--+-ABORT
!       !
```

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

* FREQUENTLY USED ROUTINES

  CGET1---+-SEARCH
          +-RDSTRG--+-IMLGCL
                    +-IMNTGR--+-IMDIGT
                    +-IMREAL--+-IMDIGT
                              +-IMNTGR

  DOCCDF--+-ABORT
          +-SEARCH
          +-RDSTRG--+-IMLGCL
                    +-IMNTGR--+-IMDIGT
                    +-IMREAL--+-IMDIGT
                              +-IMNTGR

  IGET1---+-SEARCH
          +-RDSTRG--+-IMLGCL
                    +-IMNTGR--+-IMDIGT
                    +-IMREAL--+-IMDIGT
                              +-IMNTGR

  LGET1---+-SEARCH
          +-RDSTRG--+-IMLGCL
                    +-IMNTGR--+-IMDIGT
                    +-IMREAL--+-IMDIGT
                              +-IMNTGR

  RDISTB--+-CGET1-*
          ! (NAMISO)
          !
          +-ERRLOC
          +-RGETN---+-RGET1-*
          ! (CLM2VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM3VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM4VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM5VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM6VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM7VR)
          !
          +-RGETN---+-RGET1-*
          ! (CLM8VR)
```

```
        !
        +-RGETN---+-RGET1-*
        ! (CLM9VR)
        +-RGETN---+-RGET1-*
        ! (CLMAVR)
        !
        +-RGETN---+-RGET1-*
          (CLMBVR)

RGET1---+-SEARCH
        +-RDSTRG--+-IMLGCL
                  +-IMNTGR--+-IMDIGT
                  +-IMREAL--+-IMDIGT
                            +-IMNTGR
```

```
****************************************
SUBROUTINE CONTRL

  CONTRL--+-ATMOUT--+-CAUGHT
          !         +-AREA
          !         +-AREA
          !         +-AREA
          !         +-AREA
          !         +-WASHOU
          !         +-FSGYIN
          !         +-FSGZIN
          !         +-FSGY--+-**(ENTRY-FSGYIN)
          !         +-FSGZ--+-**(ENTRY-FSGZIN)
          !         +-DECAY
          !         +-PLMRIS--+-VELADJ
          !         +-SIGTEX
          !
          !
          +-GETSTG
          +-EAROUT--+-CENZER
          !         +-EGEOM---+-CLSHIN--+-POL2----+-ABORT
          !         +-EPCALC--+-ABORT
          !         +-RELZON--+-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         +-ZERREM
          !         !         +-EDOSIN
          !         !         +-INCREM--+-CENZER
          !         !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         !
          !         !         !
          !         !         +-ZERREM
          !         !         +-EDOSIN
          !         !         +-INCREM--+-CENZER
          !         !                   +-CENACU--+-(**ENTRY-CENZER)
          !         !
          !         !
          !         +-ESTAT---+-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         +-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         +-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         +-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         +-EDOSIN
          !         !         +-INCDOS
          !         !         +-CENACU--+-(**ENTRY-CENZER)
          !         !         !
```

```
!          !          !
!          !          +-EDOSIN
!          !          +-INCDOS
!          !          +-CENACU--+-(**ENTRY-CENZER)
!          !          +-EDOSIN
!          !          +-INCDOS
!          !          +-CENACU--+-(**ENTRY-CENZER)
!          !
!          !
!          +-EMOVE---+-EDOSIN
!          !          +-CENACU--+-(**ENTRY-CENZER)
!          !
!          !
!          +-FATRIS
!          +-INJRIS
!          +-CANRIS
!          +-STOEAR--+-OUTPT1--+-EFFGET--+-ABORT
!                    !         +-EFFGET--+-ABORT
!                    !         +-EFFGET--+-ABORT
!                    !         +-EFFGET--+-ABORT
!                    !         +-EFFGET--+-ABORT
!                    !
!                    !
!                    +-OUTPT2
!                    +-OUTPT3
!                    +-OUTPT4--+-ABORT
!                    +-OUTPT5
!                    +-OUTPT6--+-ABORT
!                    +-OUTPT7--+-ABORT
!                    +-OUTPT8--+-EFFGET--+-ABORT
!                              +-EFFGET--+-ABORT
!                              +-EFFGET--+-ABORT
!                              +-EFFGET--+-ABORT
!                              +-EFFGET--+-ABORT
!
!
+-CHROUT--+-CHRNDF--+-BLDTBL
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         +-GNDRES
          !         !
```

```
!          !
!          +-TRFRCT
!          +-WTRTRF
!
!
+-SGCPLN--+-ABORT
+-WGCPLN
+-CRNRSK--+-DIRDEP
           +-INITLZ
           +-EMRGPH
           +-INTRPH
           +-LNGTPH--+-LTPROJ--+-LTMACT
           !         !
           !         +-CSTEFF--+-CSTDCN
           !         +-LTACUM
           !
           +-LOKSEE
           +-STOCHR--+-OXTPT1--+-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !
                     !
                     +-OXTPT4--+-ABORT
                     +-OXTPT5
                     +-OXTPT6--+-ABORT
                     +-OXTPT7--+-ABORT
                     +-OXTPT8--+-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !         +-CASGET--+-ABORT
                     !
                     !
                     +-OXTPT9--+-DOSGET
                     !         +-DOSGET
                     !         +-DOSGET
                     !         +-DOSGET
                     !         +-DOSGET
                     !
                     !
                     +-OXPT10--+-ECCGET
                     !         +-ECCGET
                     !         +-ECCGET
                     !         +-ECCGET
                     !         +-ECCGET
                     !
                     !
                     +-OXPT11--+-GETIMP
                     !         +-GETIMP
                     !         +-GETIMP
                     !         !
```

```
!          !
!          +-GETIMP
!          +-GETIMP
!
!
+-OXPT12--+-GETIMP
          +-GETIMP
          +-GETIMP
          +-GETIMP
          +-GETIMP
```

2.3 Subprogram Descriptions

A description of each subprogram in MACCS is given in this section. These profiles are arranged in alphabetical order by the names of the routines. Each profile contains the following information: (1) the name of the subprogram, (2) the type of subprogram, (3) a statement of the general purpose of the subprogram, (4) the specific task accomplished, (5) a list of the subprograms by which it is called, and (7) a list of the subprograms which it calls. The calls made by each subprogram are divided into those which are made unconditionally and those which are made conditionally. When a conditional call is made, the necessary condition is indicated.

```
Name:  MACCS
       Type:  Main program
       Module:  ATMOS, EARLY, CHRONC, OUTPUT
       Purpose -
          General:   Overall control
          Specific:  Controls the input processing, calculations, and
                     output processing for the ATMOS, EARLY, CHRONC, and
                     OUTPUT modules.
       Called By:
       Calls:
          Unconditional:
             INPUT, MXXETC, MXXCPU, MXXDAT, MXXCLK
          Conditional:
             ABORT  - error was detected in input
             GETSTM - more than one source term is being used
             OUTPUT - EARLY module is being exercised
             Conditional on weather sampling technique desired:
                BINSAM - multiple trials using weather category bin
                         sampling,
                CONMET - single weather trial with constant conditions,
                DAYHOU - single weather sequence starting at user-
                         specified day and hour in the year,
                RANSAM - stratified random sampling based on user-
                         specified number of samples per day, or
                USRSUP - user-specified day and hour start time for a
                         single weather trial.
```

Name: ABORT
Type: Subroutine
Module: ATMOS, EARLY, CHRONC, OUTPUT
Purpose -
General: Error processing
Specific: Forces an abort and writes an error message to identify the routine in which the error was found.
Called By: CASGET, CHRINP, COMPRS, DIST1, DOCCDF, EFFGET, EPCALC, EXCINP, HEDCHR, HEDEAR, INPM1, INPUT, LTACUM, MACCS, MXXCPU, OUTPT4, OUTPT6, OUTPT7, OUTPUT, OXTPT4, OXTPT6, OXTPT7, POL2, RANSAM, READ1, READ2, RXNM10, RXNM11, RXNM12, RXSNM9, SGCPLN, WGTMET
Calls: None

Name: ADJTIM
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Calculates a new value for the weather sequence start time (day and hour) so the release of the risk-dominant plume will coincide with the start time selected by the weather sampling routines.
Called By: BINSAM, DAYHOU, RANSAM
Calls: None

Name: AREA
Type: Function
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Calculates the area under the line segment which starts at the origin and has a specified slope.
Called By: ATMOUT
Calls: None

Name: ATMODL
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Controls the processing of the input data from the ATMOS User Input File which defines the following characteristics of the atmospheric model:
geometric grid being used,
nuclide data (name, parent, half-life),
wet deposition model,
dispersion parameter data,

```
                    plume expansion factors, and
                    scaling factors for the plume rise model.
Called By:  INPUT
Calls:
   Unconditional:
      INPGEO
   Conditional:
      Number of radial spatial elements and the endpoint distances
      of the radial spatial elements have been read from the input
      data files and the values found are within acceptable ranges
         INPDIS, INPDRY, INPEXP, INPISO, INPLRS, INPWET


Name:  ATMOUT
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Modeling simulation
          Specific:  Models the dispersion of a single Gaussian plume
                     under the influence of constant wind direction using
                     the following submodels:
                        Pasquill-Gifford-Turner type dispersion
                          coefficients,
                        plume rise dependent on wind speed, stability
                          class, and inversion lid,
                        reflection of the plume by the ground and by the
                          inversion lid at a constant lid height,
                        washout dependent on the rain rate,
                        dry deposition dependent on particle size, and
                        two-member radioactive decay chains.
       Called By:  CONTRL
       Calls:
          Unconditional:
             DECAY, FSGY
          Conditional:
             AREA   - rainfall is occurring
             CAUGHT - plume heat is nonzero for the release
             FSGYIN - explicit multiple reflections are being used and
                      there is a change in the stability class
                    - explicit multiple reflections are not being used
                      and there is a change in the stability class
             FSGZ   - explicit multiple reflections are being used
             FSGZIN - explicit multiple reflections are being used and
                      there is a change in the stability class
             PLMRIS - plume rise occurs
             SIGTEX - more than the minimal output is desired
             WASHOU - rainfall is occurring


Name:  ATPROB
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
```

General: Input processing
Specific: Define the characteristics of the atmospheric problem by processing the following input data from the ATMOS User Input File:
building size for wake effects,
release inventory of all nuclides,
weather sampling stragegy being used, and
desired output options.
Called By: INPUT
Calls:
Unconditional:
CGET1, INPMET, INPOPT, INPREL, INPWAK

Name: BINSAM
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Performs weather category bin sampling.
Called By: MACCS
Calls:
Unconditional:
ADJTIM, CONTRL, RANDOM, WBNDRY, WRANBN, WSAMPL

Name: BLDTBL
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Build daughter table of forward links as well as backward links.
Called By: CHRNDF
Calls: None

Name: CANRIS
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates the risk of cancer from acute exposure for all spatial elements.
Called By: EAROUT
Calls: None

Name: CASGET
Type: Subroutine
Module: CHRONC
Purpose -
General: Model simulation

Specific: Calculates the number of cases of cancer occurring in a specified grid element for all releases which have been requested.
Called By: OXTPT1, OXTPT8
Calls:
Conditional:
ABORT - invalid option code was detected

Name: CAUGHT
Type: Logical Function
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Determines if the plume is caught in the building wake.
Called By: ATMOUT
Calls: None

Name: CENACU
Type: Subroutine
Entry: CENZER
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Increments the centerline dose arrays for the accumulated doses.
Called By: EMOVE, ESTAT, INCREM, RELZON
Calls: None

Name: CENZER
Type: Entry
Host: CENACU
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Zeroes out the centerline dose arrays to start or restart dose accumulations.
Called By: EAROUT, INCREM
Calls: None

Name: CGET1
Type: Function
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processor
Specific: Returns a single character value from the input database.

```
Called By:  ATPROB, INACAN, INCHRN, INEFAT, INEINJ, INEVAC,
            INMISC, INORGA, INOUT1, INOUT3, INOUT4, INOUT5,
            INOUT6, INOUT7, INOUT8, INPEMR, INPISO, INPOPT,
            INPOPU, INPREL, IXOT9,  STPATH
Calls:
   Conditional:
      RDSTRG - no error was detected in the column pointer
               for finding the data
      SEARCH - no error was detected in the column pointer
               for finding the data or in the length of the
               record ID


Name:  CHRINP
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Defines the characteristics of the chronic effects
                     model by processing the following data files:
                        CHRONC User Input File,
                        Site Data File, and
                        Dose Conversion File.
       Called By:  INPUT
       Calls:
          Unconditional:
             OPNERL, INPCHR
          Conditional:
             ABORT - error was detected in the CHRONC User Input File
             No errors were detected in CHRONC User Input File.
                ABORT - the long-term critical organ was not defined on
                        CHRONC organ list.
                MODLDF
                Critical organ was correctly defined
                   ABORT  - error was detected in the Site Data File.
                   SDFINP - uniform regional data is not being used
                   Regional data was correctly defined
                      ABORT - error was detected in the Dose Conversion
                              File
                      EXCINP
                      No error was detected in the Dose Conversion File
                         STGRDA


Name:  CHRNDF
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Integrate exposure over various time periods for an
                     initial unit of each nuclide.
       Called By:  CHROUT
```

Calls:
Unconditional:
BLDTBL, GNDRES, TRFRCT, WTRTRF

Name: CHROUT
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Controls the CHRONC simulation for a single weather trial.
Called By: CONTRL
Calls:
Unconditional:
CRNRSK
Conditional:
CHRNDF - initial unit concentrations of each radionuclide
SGCPLN - straight line dispersion model is being used
WGCPLN - wind shift dispersion model is being used

Name: CKINDX
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Check to verify that the indices in the array of indices for i spatial intervals and j wind directions do not exceed the upper bound for the indices in that array.
Called By: SDFINP
Calls: None

Name: CLSHIN
Type: Function
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Returns the cloudshine correction factor for a given distance (in standard deviations) from a plume of a given size (in meters of sigma y).
Called By: EGEOM
Calls:
Unconditional:
POL2

Name: CMPTBL
Type: Subroutine
Module: EARLY

Purpose -
General: Error processing
Specific: Check to see if the number of items on the Site Data File is the same as the number of items required by the model.
Called By: INPOPU
Calls:
Conditional:
ERRFIL - number of items defined on Site Data File and the number defined by the model are in conflict

Name: COMPRS
Type: Subroutine
Module: EARLY
Purpose -
General: Output processing
Specific: Changes multiple blanks in a character string to a single blank.
Called By: RESNM3
Calls:
Conditional:
ABORT - found a string too long for the routine to handle

Name: CONMET
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Runs a single trial of constant weather.
Called By: MACCS
Calls:
Unconditional:
CONTRL, WBNDRY

Name: CONTRL
Type: Subroutine
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Modeling simulation
Specific: Controls the entire modeling simulation of MACCS.
Called By: BINSAM, CONMET, DAYHOU, RANSAM, USRSUP
Calls:
Unconditional:
ATMOUT
Conditional:
EARLY module is to be exercised.
EAROUT
GETSTG - more than one emergency response strategy is requested

CHRONC module is to be exercised.
CHROUT

Name: COPCHR
Type: Subroutine
Module: CHRONC
Purpose -
General: Output processing
Specific: Sets up the CHRONC code to produce the results that are produced by both EARLY and CHRONC.
Called By: OUTCON
Calls: None

Name: CRNRSK
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Calculates the chronic risks resulting from the current trial.
Called By: CHRINP, CHROUT
Calls:
Unconditional:
DIRDEP, EMRGPH, INITLZ, STOCHR
Conditional:
Plume passage occurred over the spatial element.
INTRPH
LNGTPH
Flag indicates the table of doses and costs is to be printed.
LOKSEE

Name: CSTDCN
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Calculates the costs of decontamination of farm property according to the level of decontamination required.
Called By: CSTEFF
Calls: None

Name: CSTEFF
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation

Specific: Computes the costs of the projected decontamination and interdiction and decides if it is cost effective to implement these actions.
Called By: LNGTPH
Calls:
Conditional:
CSTDCN - decontamination efforts are required

Name: CXPTBL
Type: Subroutine
Entry: KMPTBL
Module: CHRONC
Purpose -
General: Input processing
Specific: Check to see that the number of items on the Site Data File is the same as the number of items required by the model.
Called By: SDFINP
Calls: None

Name: DAYHOU
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Sample a specific weather sequence from the Meteorological Data File starting at a user-specified day and hour.
Called By: MACCS
Calls:
Unconditional:
ADJTIM, CONTRL, WBNDRY, WSAMPL

Name: DECAY
Type: Subroutine
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Decays all nuclides and stores the new inventory in an array.
Called By: ATMOUT, INPREL
Calls: None

Name: DIRDEP
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation

Specific: Compute the food pathway transfer factors from pasture and other crops for directly deposited nuclides.
Called By: CRNRSK
Calls: None

Name: DISRAN
Type: Character*12 Function
Module: EARLY, CHRONC
Purpose -
General: Output processing
Specific: Returns a text string describing the distance range from the beginning of one spatial interval to the end of another spatial interval.
Called By: RESNM1, RESNM4, RESNM5, RESNM6, RESNM7, RESNM8
RXNM10, RXNM12, RXSNM9
Calls:
Unconditional:
DIST1

Name: DIST1
Type: Subroutine
Module: CHRONC
Purpose -
General: Output processing
Specific: Returns a character string describing a distance.
Called By: DISRAN
Calls:
Conditional:
ABORT - spatial intervals exceed the maximum allowable distance

Name: DO1CDF
Type: Subroutine
Module: OUTPUT
Purpose -
General: Output processing
Specific: Updates the CCDF for a single consequence value and keeps track of the following values:
mean,
probaility of being non-zero, and
peak trial.
Called By: READ2
Calls:
Conditional:
GNBIN1 - binned magnitudes were not previously generated
GNBIN2 - new maximum value was detected

```
Name:  DOCCDF
       Type:  Logical Function
       Module:  EARLY, CHRONC
       Purpose -
          General:  Input processing
          Specific:  Returns a logical value to indicate if a CCDF is
                     requested for a particular input parameter.
       Called By:  INOUT1, INOUT2, INOUT3, INOUT4, INOUT5, INOUT6,
                   INOUT7, INOUT8, IXOT9,  IXOT10, IXOT11, IXOT12,
       Calls:
          Unconditional:
             RDSTRG
          Conditional:
             ABORT  - data is not found in the correct column of the
                      input record
             SEARCH - no error was detected in the length of the record
                      ID


Name:  DOSGET
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates the population dose to a selected organ
                     in a spatial element via the 12 pathways.
       Called By:  OXTPT9
       Calls:  None


Name:  EARINP
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the characteristics of the early effects
                     model by processing the EARLY User Input File.
       Called By:  INPUT
       Calls:
          Unconditional:
             INMISC, INORGA
          Conditional:
             No error was detected in list of organs
                EDCINP, INACAN, INDFAC, INEFAT, INEINJ, INEVAC, INOUT1,
                INOUT2, INOUT3, INOUT4, INOUT5, INOUT6, INOUT7, INOUT8,
                INPEMR, INPOPU


Name:  EAROUT
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling simulation
```

Specific: Calculates the results from the EARLY module for a [illegible] strategy.

Called By: CONTRL

Calls:

Unconditional:

CANRIS, CENZER, EMOVE, ESTAT, FATRIS, INJRIS, RELZON, STOEAR

Conditional:

First emergency response strategy is being considered

EGEOM, EPCALC

Name: ECCGET

Type: Subroutine

Module: CHRONC

Purpose -

General: Modeling simulation

Specific: Calculates the 12 cost measures for a single spatial element.

Called By: OXPT10

Calls: None

Name: EDCINP

Type: Subroutine

Module: EARLY

Purpose -

General: Input processing

Specific: Reads the dose conversion factors for the EARLY module.

Called By: EARINP

Calls:

Conditional:

ERRFIL - an empty Dose Conversion File was encountered

Name: EDOSIN

Type: Subroutine

Module: EARLY

Purpose -

General: Modeling simulation

Specific: Calculates the doses received by a person in a spatial element under the plume centerline when that person is in the spatial element during a given time period.

Called By: EMOVE, ESTAT, RELZON

Calls: None

Name: EFFGET

Type: Function

Module: EARLY

Purpose -
General: Modeling simulation
Specific: Returns the number of a given health effect within a spatial element.
Called By: OUTPT1, OUTPT8
Calls:
Conditional:
ABORT - invalid output code was detected

Name: EGEOM
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates the following geometric factors for the early dosimetry model:
average height of the Gaussian over the fine grid elements, and
cloudshine correction factors for the fine grid elements.
Called By: EAROUT
Calls:
Conditional:
CLSHIN - mean of sigma-z is nonzero

Name: EMOVE
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Accumulates the doses over the fine grid elements for moving individuals.
Called By: EAROUT
Calls:
Conditional:
Evacuation occurs
EDOSIN
Straight line dispersion model is being used and the plume travels over the grid element
CENACU

Name: EMRGPH
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Calculates the emergency phase cost parameters.
Called By: CRNRSK
Calls: None

```
Name:  EPCALC
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates the intermediate dosimetry parameters for
                     all spatial intervals and all plume segments.
       Called By:  EAROUT
       Calls:
          Conditional:
             ABORT - invalid dispersion flag value was detected
                   - wind direction data is unavailable when using wind-
                     shift model


Name:  ERRFIL
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input error processing
          Specific:  Identify errors encountered within the auxillary
                     input data files and identify the location of the
                     error.
       Called By:  CMPTBL, EDCINP, INPOPU, MATCH, WRDMET
       Calls:  None


Name:  ERRLOC
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input error monitoring
          Specific:  Identify calling subroutine and variable name if an
                     error was encountered during the search for input
                     data.
       Called By:  EVNETW, INACAN, INEFAT, INEINJ, INEVAC, INMISC,
                   INORGA, INOUT1, INOUT3, INOUT4, INOUT5, INOUT6,
                   INOUT7, INOUT8, INPEMR, INPGEO, INPISO, INPM4,
                   INPOPT, INPREL, INPUT,  IXOT9,  IXOT10, IXOT12,
                   MODLDF, PUTSTG, PUTSTM, RDISTB, STPATH
       Calls:  None


Name:  ESTAT
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling stimulation
          Specific:  Accumulates the doses to stationary individuals in
                     the sheltering and evacuation rings of the emergency
                     response zone.
       Called By:  EAROUT
```

```
Calls:
   Conditional:
      People are in an evacuation or sheltering zone
         EDOSIN - normal activity before sheltering or evacuation
                - sheltering or evacuation occurs
         INCDOS - normal activity before sheltering or evacuation
                - sheltering or evacuation occurs
         Straight line dispersion model is being used
              CENACU - normal activity before sheltering or
                       evacuation
                     - sheltering or evacuation occurs


Name:  EVNETW
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the evacuation network data making a list of
                     the root nodes.
       Called By:  INEVAC
       Calls:
          Unconditional:
             IGET1
          Conditional:
             ERRLOC - spatial element in the movement zone is duplicated
                    - missing spatial element in the movement zone
                No error was detected in the definition of the spatial
                elements in the movement zone
                ERRLOC - nonadjacent spatial elements are being used in
                         the evacuation network
                       - null destination is incorrectly used for a
                         spatial element in the evacuation network
                       - loop in the evacuation network was detected
                EVROOT - no error was detected in the definition of the
                         evacuation network


Name:  EVRADI
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Define the radial evaculation data and create an
                     evacuation network to represent it making a list of
                     the root nodes for the network.
       Called By:  INEVAC
       Calls:
          Unconditional:
             RGET1
```

Name: EVROOT
Type: Subroutine
Module: EARLY
Purpose -
General: Input processing
Specific: Makes a list of the root nodes within an evacuation zone.
Called By: EVNETW
Calls: None

Name: EXCINP
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Read in the dose conversion factors to CHRONC.
Called By: CHRINP
Calls:
Conditional:
ABORT - empty data file was encountered

Name: EXPINT
Type: Function
Module: OUTPUT
Purpose -
General: Output processing
Specific: Returns a logarithmic base 10 interpolation to find the consequence value corresponding to a particular quantile.
Called By: QUANTL
Calls: None

Name: FATRIS
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates the risk of early fatality from short term exposure (1 - 7 days) for all spatial elements.
Called By: EAROUT
Calls: None

Name: FSGY
Type: Function
Entry: FSGYIN
Module: ATMOS
Purpose -
General: Modeling simulation

Specific: Uses the Pasquill-Gifford formula to calculate sigma y as a function of the stability class and the along-wind distance.
Called By: ATMOUT
Calls: None

Name: FSGYIN
Type: Entry
Host: FSGY
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Uses the Pasquill-Gifford formula to calculate sigma y as a function of the stability class and the along-wind distance.
Called By: ATMOUT
Calls: None

Name: FSGZ
Type: Function
Entry: FSGZIN
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Uses the Pasquill-Gifford formula to calculate sigma z as a function of stability class and along-wind distance
Called By: ATMOUT
Calls: None

Name: FSGZIN
Type: Entry
Host: FSGZ
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Uses the Pasquill-Gifford formula to calculate sigma z as a function of stability class and along-wind distance
Called By: ATMOUT
Calls: None

Name: GETIMP
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation

Specific: Calculates the extent of the following long-term actions:
Decontamination,
Interdiction,
Condemnation,
Milk disposal, and
Crop disposal.

Called By: OXPT11, OXPT12
Calls: None

Name: GETSTG
Type: Entry
Host: PUTSTG
Module: EARLY
Purpose -
General: Input processing
Specific: Fetches the evacuation strategy input parameters when more than one evacuation strategy is being used.

Called By: CONTRL
Calls: None

Name: GETSTM
Type: Entry
Host: PUTSTM
Module: ATMOS
Purpose -
General: Input processing
Specific: Fetch the additional source term data blocks if there is more than one source term being used.

Called By: MACCS
Calls: None

Name: GNBIN1
Type: Subroutine
Module: OUTPUT
Purpose -
General: Output processing
Specific: Generates the initial bin magnitudes for a single result (binning always starts at a power of ten).

Called By: DO1CDF
Calls:
Unconditional:
ILOG10

Name: GNBIN2
Type: Subroutine
Module: OUTPUT

Purpose -
General: Output processing
Specific: Regenerates bin magnitudes for a single result when a new maximum consequence is found.
Called By: DO1CDF
Calls: None

Name: GNDRES
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Compute the groundshine or resuspension pathway dosimetry factors.
Called By: CHRNDF
Calls: None

Name: HEDCHR
Type: Subroutine
Module: CHRONC
Purpose -
General: Output processing
Specific: Loads the data necessary to generate results for the CHRONC module.
Called By: OUTCON
Calls:
Unconditional:
RXNM10, RXNM11, RXNM12, RXSNM9
Conditional:
ABORT - number of results requested exceeds the maximum allowed

Name: HEDEAR
Type: Subroutine
Module: EARLY
Purpose -
General: Output processing
Specific: Prepares the list of requested results for the EARLY module.
Called By: OUTCON
Calls:
Unconditional:
RESNM1, RESNM2, RESNM3, RESNM4, RESNM5, RESNM6
RESNM7, RESNM8
Conditional:
ABORT - number of results requested exceeds the maximum allowed

Name: IGET1
Type: Function
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processor
Specific: Returns a single integer value from the input database.
Called By: EVNETW, IGETN, INACAN, INCHRN, INEFAT, INEINJ, INEVAC, INMISC, INORGA, INOUT1, INOUT2, INOUT3, INOUT4, INOUT5, INOUT6, INOUT7, INOUT8, INPDRY, INPEMR, INPGEO, INPISO, INPM1, INPM2, INPM3, INPM4, INPOPT, INPOPU, INPREL, IXOT9, IXOT10, IXOT12, STPATH,
Calls:
Conditional:
RDSTRG - no error was detected in the column pointer for finding data
SEARCH - no error was detected in the column pointer for finding the data or in the length of the record ID

Name: IGETN
Type: Subroutine
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processor
Specific: Returns an array of integer values from the input database.
Called By: INCHRN, INEVAC, INOUT1, INOUT4, INOUT5, INOUT6, INOUT7, INOUT8, INPISO, INPM4, INPM5, IXOT9, IXOT10, IXOT12
Calls:
Conditional:
IGET1 - no error was detected in the length of the record ID

Name: ILOG10
Type: Function
Module: OUTPUT
Purpose -
General: Output processing
Specific: Returns the nearest power of 10 less than the argument.
Called By: GNBIN1
Calls: None

Name: IMDIGT
Type: Logical Function
Module: ATMOS, EARLY, CHRONC

Purpose -
General: Input processing
Specific: Determines if a character string is composed of only numeric digits.
Called By: IMNTGR, IMREAL
Calls: None

Name: IMLGCL
Type: Logical Function
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processing
Specific: Determines if a character string is of type logical.
Called By: RDSTRG
Calls: None

Name: IMNTGR
Type: Logical Function
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processing
Specific: Determines if a character string is of type integer.
Called By: RDSTRG, IMREAL
Calls:
Conditional:
IMDIGT - no error was detected in the length of the string to be read

Name: IMREAL
Type: Logical Function
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processing
Specific: Determines if a character string is of type real.
Called By: RDSTRG
Calls:
Conditional:
No error was detected in length or content of the string to to be read.
IMDIGT, IMNTGR

Name: INACAN
Type: Subroutine
Module: EARLY
Purpose -
General: Input processing
Specific: Defines the model for the cancer risk from acute exposure.

```
        Called By:  EARINP
        Calls:
           Unconditional:
              IGET1
           Conditional:
              Number of cancer types is nonzero and is correctly defined.
                 CGET1
                 ERRLOC - organ name is not on the list of organs
                 IGET1
                 RGET1
                 RGETN


Name:   INCDOS
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Modeling simulation
           Specific:  Accumulates the doses to stationay individuals over
                      the fine grid.
        Called By:  ESTAT,  RELZON
        Calls:  None


Name:   INCHRN
        Type:  Subroutine
        Module:  CHRONC
        Purpose -
           General:  Input processing
           Specific:  Processes the user input for the CHRONC models.
        Called By:  INPCHR
        Calls:
           Unconditional:
              CGET1, IGET1, IGETN, RGET1, RGETN


Name:   INCREM
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Modeling simulation
           Specific:  Recalculates the dose received by individuals in a
                      spatial element for a single plume segment if either
                      hot spot or normal relocation is required.
        Called By:  RELZON
        Calls:
           Conditional:
              Straight line dispersion model is being used with no angular
              displacement from the center of the spatial element
                 CENZER - first plume is being considered
                 CENACU
```

```
Name:  INDFAC
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines protection and exposure factors for the
                     EARLY dosimetry model.
       Called By:  EARINP
       Calls:
          Unconditional:
             RGET1, RGETN


Name:  INEFAT
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Processes input data for the early fatality risk
                     model.
       Called By:  EARINP
       Calls:
          Unconditional:
             IGET1, CGET1
          Conditional:
             Number of early fatality effects is nonzero and is correctly
             defined.
                ERRLOC - organ name is not found on the list of organs
                CGET1
                RGETN


Name:  INEINJ
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Processes the input data for the early injury
                     models.
       Called By:  EARINP
       Calls:
          Unconditional:
             IGET1
          Conditional:
             Number of early injury effects is nonzero and is correctly
             defined.
                CGET1
                ERRLOC - organ name is not found on the list of organs
                RGETN
```

Name: INEVAC
Type: Subroutine
Module: EARLY
Purpose -
General: Input processing
Specific: Processes the evacuation data.
Called By: EARINP, REDSTG
Calls:
Unconditional:
CGET1, IGET1, IGETN, RGET1, RGETN
Conditional:
Evacuation zone exists and the outermost ring of zone is correctly defined
IGET1
Innermost ring of the evacuation zone is correctly defined
ERRLOC - evacuation rings are not concentric
- nonzero delay time has been defined for an undefined evacuation ring
EVNETW - network evacuation is to be used
EVRADI - radial evacuation is to be used

Name: INITLZ
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Initializes all CHRONC cost, dose, and action arrays.
Called By: CRNRSK
Calls: None

Name: INJRIS
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates the risk of early injury for all spatial elements.
Called By: EAROUT
Calls: None

Name: INMISC
Type: Subroutine
Module: EARLY
Purpose -
General: Input processing

```
   Specific:  Defines the following input information for the run:
                 EARLY scenario for title card,
                 flag to skip the CHRONC module,
                 flag for the kind of plume travel pattern,
                 number of fine grid subdivisions within each
                    coarse grid element,
                 flag if a windrose is to be supplied by user,
                 windrose array if it is user-supplied,
                 level of debug output desired, and
                 flag if the output is to include a breakdown of
                    the relative contribution to the mean from
                    each weather category bin.
Called By:  EARINP
Calls:
   Unconditional:
      CGET1, IGET1, LGET1, RGETN
   Conditional:
      ERRLOC - odd number of fine grid elements is being used in
               each coarse grid element
             - error is detected in the windrose array data


Name:  INORGA
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the list of organs for the early health
                     effects.
       Called By:  EARINP
       Calls:
          Unconditional:
             CGET1, IGET1
          Conditional:
             ERRLOC - skin appears on the list of organs more than once
                    - an organ other than skin is designated as organ
                      number 1


Name:  INOUT1
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the the options for result number 1:
                        Total number of given health effects within
                           a range of distances,
                        Early deaths and early injuries, and
                        Latent cancer deaths and injuries.
       Called By:  EARINP
       Calls:
```

```
        Unconditional:
           IGET1
        Conditional:
           Number of health effects desired is nonzero and is correctly
           defined
              CGET1
              Names of the health effects are correctly defined
                 ERRLOC - no early fatality model is defined
                        - name of injury was not found on the list of
                          injuries
                        - no latent cancer models is defined
                        - name of cancer death or cancer injury was
                          not found on the list of cancer names
                        - invalid effect name is being used
                 IGETN
                 All input data for the health effects is correctly
                 defined
                     ERRLOC - inner ring of the region of interest
                              lies outside the outer ring
                     DOCCDF


Name:   INOUT2
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 2:
                         Furthest distance at which a given probability
                         of death is exceeded.
        Called By:  EARINP
        Calls:
           Unconditional:
              IGET1
           Conditional:
              Number of types of effect is nonzero and is correctly
              defined
                 RGETN
                 All input data for the health effects is correctly
                 defined
                    DOCCDF


Name:   INOUT3
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 3:
                         Number of people whose "acute" dose to a given
                         organ exceeds a given threshold.
        Called By:  EARINP
```

```
        Calls:
           Unconditional:
              IGET1
           Conditional:
              Number of health effects is nonzero and is correctly defined
                 CGET1
                 DOCCDF
                 ERRLOC - organ name is not found on the list of organs
                        - incorrect flag value was found for type of dose
                          being calculated
                        - acute dose factors for an organ have been
                          requested but were not defined
                 RGETN


Name:   INOUT4
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 4:
                         Average individual risk of a given effect at a
                         given distance.
        Called By:  EARINP
        Calls:
           Unconditional:
              IGET1
           Conditional:
              Number of effects is nonzero and is correctly defined
                 CGET1
                 IGETN
                 Names of health effects is correctly defined
                    DOCCDF
                    ERRLOC - no early fatality model is defined
                           - injury name is not found on the list
                             of injuries
                           - no latent cancer model is defined
                           - cancer death name or cancer injury name
                             is not found on the list of latent
                             cancers
                    IGETN


Name:   INOUT5
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 5:
                         Total population dose to a given organ between
                         two distances.
        Called By:  EARINP
```

```
        Calls:
           Unconditional:
             IGET1
           Conditional:
             Number of results is nonzero and is correctly defined
             CGET1
             ERRLOC - organ name is not found on the list of organs
             IGETN
             All input data for health effects is correctly defined
                ERRLOC - outer ring of the region of interest is not
                         outside the inner ring
                DOCCDF


Name:   INOUT6
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 6:
                         Centerline dose by pathway between a range of
                         distances.
        Called By:  EARINP
        Calls:
           Unconditional:
              IGET1
           Conditional:
              Number of health effects is nonzero and is correctly defined
                 CGET1
                 ERRLOC - radial evacuation is not being used for a
                          straightline plume
                        - organ name is not found on the list of organs
                        - acute doses have been requested but have not
                          been defined
                        - pathway name is not on the list of pathway names
                 IGETN
                 All input data for health effects is correctly defined
                    DOCCDF


Name:   INOUT7
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Defines the options for result number 7:
                         Centerline risk of a given effect between a
                            range of distances,
                         Early deaths and injuries, and
                         Latent cancer deaths and injuries.
        Called By:  EARINP
```

```
Calls:
   Unconditional:
      IGET1
   Conditional:
      Number of health effects is nonzero and is correctly defined
         CGET1
         ERRLOC - radial evacuation is not used with a
                  straightline plume
      Name of the organ is correctly defined
         ERRLOC - name of the injury is not found on the list of
                  injuries
                - no latent cancer model is defined
                - name of cancer death or cancer injury is not on
                  the list of latent cancers
                - invalid name for the health effect was detected
         IGETN
      All input data for the health effect is correctly defined
         ERRLOC - outer ring of the region of interest is not
                  outside the inner ring
         DOCCDF


Name:  INOUT8
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the options for result number 8:
                        Population weighted risk of a given health effect
                        between two distances.
       Called By:  EARINP
       Calls:
          Unconditional:
             IGET1
          Conditional:
             Number of health effects is correctly defined
                CGET1
                Name of the health effect is correctly defined
                   ERRLOC - early fatality model is not defined
                          - name of early injury is not found on
                            the early injury list
                          - latent cancer model is not defined
                          - name of latent cancer death or injury is
                            not found on the cancer list
                          - invalid effect name was detected
                   All input data for health effects is correctly defined
                      ERRLOC- inner ring of the region of interest lies
                              outside the outer ring
                      IGETN
                      DOCCDF
```

```
Name:  INPBEG
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processing
          Specific:  Sets up a database for storing the user input data
                     for a single file.
       Called By:  INPUT
       Calls:
          Unconditional:
             SORT
          Conditional:
             SEARCH - multiple source terms or more than one emergency
                      response strategy is being used


Name:  INPCHR
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Controls the processing of the CHRONC User
                     Input File.
       Called By:  CHRINP
       Calls:
          Unconditional:
             INCHRN, IXOT9, IXOT10, IXOT11, IXOT12, STPATH


Name:  INPDIS
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Loads the dispersion parameter data from the ATMOS
                     User Input File needed for defining the atmospheric
                     model.
       Called By:  ATMODL
       Calls:
          Unconditional:
             RGET1, RGETN


Name:  INPDRY
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Loads the dry deposition data from the ATMOS User
                     Input File needed to define the atmospheric model.
       Called By:  ATMODL
```

Calls:
Unconditional:
IGET1, RGETN

Name: INPEMR
Type: Subroutine
Module: EARLY
Purpose -
General: Input processing
Specific: Defines the emergency response zone.
Called By: EARINP, REDSTG
Calls:
Unconditional:
CGET1, IGET1, RGET1
Conditional:
ERRLOC - outer shelter zone is not outside the evacuation zone

Name: INPEND
Type: Subroutine
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processing
Specific: Closes a user input file when it is no longer needed.
Called By: INPUT
Calls: None

Name: INPEXP
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Defines the plume expansion factor parameters.
Called By: ATMODL
Calls:
Unconditional:
RGET1

Name: INPGEO
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Defines the geometric grid to be used.
Called By: ATMODL

```
        Calls:
           Unconditional:
              IGET1
           Conditional:
              No error was detected in the number or range of spatial
              elements in the radial direction.
                 ERRLOC - spatial endpoint distances are not increasing
                 RGETN


Name:   INPISO
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Defines nuclide data used in the atmospheric model.
        Called By:  ATMODL
        Calls:
           Unconditional:
              IGET1
           Conditional:
              ERRLOC - duplicate nuclide name was detected
                     - unrecognizable parent name was detected
                     - daughter and parent have the same half-life
              Number of nuclides is correctly defined
                 IGET1
                 Number of nuclide groups is correctly defined
                    CGET1
                    ERRLOC - duplicate nuclide name was detected
                    IGETN
                    LGETN
                    RGETN
                    No duplicate nuclide name is used
                       CGET1
                       ERRLOC - unrecognizable parent was detected
                       All input data for nuclides and parents is
                       correctly defined
                          ERRLOC - daughter and parent have the same
                                   half-life


Name:   INPLRS
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Defines the critical wind speed and the scaling
                      factors to allow for modification of the plume rise
                      model:
                         critical wind speed,
                         A-D plume rise, and
                         E-F plume rise.
```

```
        Called By:  ATMODL
        Calls:
           Unconditional:
              RGET1


Name:   INPM1
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Defines the meteorological code and loads the
                      weather file with a year's weather data into a
                      storage array.
        Called By:  INPMET
        Calls:
           Unconditional:
              IGET1
           Conditional:
              ABORT - error was found in the augmented T-M-Y
                      meteorological data file
              WRDMET - meteorological code is 1,2, or 5


Name:   INPM2
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Loads the weather sampling boundary condition
                      weather parameters.
        Called By:  INPMET
        Calls:
           Unconditional:
              IGET1
              RGET1


Name:   INPM3
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Loads the accident start time (day and hour) for
                      weather sampling.
        Called By:  INPMET
        Calls:
           Unconditional:
              IGET1
```

```
Name:  INPM4
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Loads the rain bin data for weather sampling.
       Called By:  INPMET
       Calls:
          Unconditional:
             ERRLOC - rain interval distances not monotonically
                      increasing
                    - rain interval endpoints and spatial interval
                      endpoints do not coincide
                    - rain intensity breakpoints not monotonically
                      increasing
                    - error was detected in the specification of the
                      rain intensity intervals
             IGET1
             RGETN
             WBNMET
             No weather samples are to be taken from each bin
                IGET1
                IGETN


Name:  INPM5
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Loads 120 hours of weather data for the weather
                     sampling.
       Called By:  INPMET
       Calls:
          Unconditional:
             IGETN, RGETN


Name:  INPMET
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Defines the characteristics of the weather sampling
                     to be used by processing data from the ATMOS User
                     Input File.
       Called By:  ATPROB
       Calls:
          Unconditional:
             INPM1
```

```
      Conditional:
         User-specified day and hour of a single sequence on the
         meteorological file to be used
            INPM2, INPM3
         Weather category bin sampling or random sampling
         stratified by day of the year to be used
            INPM2, INPM4
         ATMOS user input file specifies 120 hours of weather
         to be used
            INPM2, INPM3, INPM5
         Single weather trial with constant conditions to be used
            INPM2, INPM3


Name:  INPOPT
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Defines output options for the ATMOS module.
       Called By:  ATPROB
       Calls:
          Unconditional:
             IGET1, LGET1
          Conditional:
             Name of the nuclide is needed on the dispersion listing
                CGET1
                ERRLOC - nuclide name was not found


Name:  INPOPU
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Defines the population distribution surrounding the
                     site (can either be uniform density or user-supplied
                     on Site Data File).
       Called By:  EARINP
       Calls:
          Unconditional:
             CGET1
          Conditional:
              ERRFIL - empty data file was encountered
                     - incorrect designation was made of the
                       population distribution to be used
              Population surrounding the site is correctly defined
                 Uniform population is being used
                    RGET1
                    Population density is correctly defined
                       IGET1
```

```
                    Population location is correctly defined
                       CMPTBL
                       MATCH
                       Spatial distances are correctly defined
                          ERRFIL - spatial intervals defined in the
                                   Site Data File conflict with
                                   those in the model
                          MATCH


Name:  INPREL
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Processes input data defining the release
                     description of the plume.
       Called By:  ATPROB, INPUT
       Calls:
          Unconditional:
             CGET1, IGET1, RGETN
          Conditional:
             Plume duration is correctly defined
                RGETN
                Time of release is correctly defined
                   CGET1
                   ERRLOC - plume segment overlaps the preceding plume
                          - error was detected in the particle size
                            distribution
                          - duplicate core inventory specifications
                            are given for a nuclide
                          - no core inventory specifications are given
                            for a nuclide
                   IGET1
                   RGET1
                   RGET1 - core inventory specifications are correctly
                           defined
                   RGETN
                   All input data for the release is correctly defined
                      DECAY


Name:  INPUT
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processing
          Specific:  Controls the processing of all user input for the
                     ATMOS, EARLY, AND CHRONC modules and sets the
                     framework for the simulation portion of the
                     calculations.
       Called By:  MACCS
```

Calls:

Unconditional:

ATMODL, INPBEG

Conditonal:

ABORT - more than 60 source terms are being requested
- error was detected in the ATMOS model definition
- error was detected in the release description input data
- error was detected in processing the change cards in the ATMOS User Input File
- error was detected in the EARLY model input data
- more than 3 emergency response strategies are being requested
- error was detected in the input data when more than one emergency response strategy is being used
- error was detected in processing the change cards in the EARLY User Input File
- error was detected in the input data for the CHRONC module

ATPROB - no errors were detected in the ATMOS model definition

CHRINP - CHRONC module is to be exercised

EARINP - no errors were detected in the input data for the ATMOS module

ERRLOC - more than 60 source terms are being requested
- more than 3 emergency response strategies are being requested

INPBEG - more than one source term is being supplied
- no errors were detected in the input data for the ATMOS module and EARLY is to be exercised
- more than one emergency response strategy is being used
- no errors were detected in the input data for the EARLY module and CHRONC is to be exercised

INPEND - more than one source term is being supplied and no error was detected in the ATMOS input data
- more than one emergency response strategy is being used and no error was detected in the EARLY input data
- want to exercise the CHRONC module and no error was detected in input data

INPREL - more than one source term being supplied

OUTCON - no errors were detected in the input data for all modules being exercised

PUTSTG - no error was detected in the EARLY change case when more than one emergency response strategy is being requested

PUTSTM - more than one source term is being supplied and there were no errors detected in the release description input data

REDSTG - more than one emergency response strategy is being requested

```
Name:  INPWAK
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Processes input data defining the building
                     dimensions (width and height) to be used in the
                     treatment of the building wake effects.
       Called By:  ATPROB
       Calls:
          Unconditional:
             RGET1


Name:  INPWET
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Loads the wet deposition data from the ATMOS User
                     Input File.
       Called By:  ATMODL
       Calls:
          Unconditional:
             RGET1


Name:  INTRPH
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Modeling simulation
          Specific:  Establishes the intermediate phase response.
       Called By:  CRNRSK
       Calls:  None


Name:  IXOT9
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Defines the options for result number 9:
                        Long-term population dose broken down by the 12
                        long-term pathways.
       Called By:  INPCHR
       Calls:
          Unconditional:
             IGET1
          Conditional:
             Number of results is nonzero and is correctly defined
                CGET1
```

```
            ERRLOC - organ name is not found on the organ list
            IGETN
            No error was detected in the input data
               ERRLOC - inner ring of the region of interest is
                        outside the outer ring
               DOCCDF


Name:  IXOT10
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Defines the options for result number 10:
                        Economic cost measures:
                           Total costs,
                           Decontamination costs,
                           Interdiction costs,
                           Condemnation costs,
                           Milk disposal costs, and
                           Crop disposal costs.
       Called By:  INPCHR
       Calls:
          Unconditional:
             IGET1
          Conditional:
             Number of results is nonzero and is correctly defined
                IGETN
                No error was detected in the input data
                   ERRLOC - inner ring of the region of interest is
                            outside the outer ring
                   DOCCDF


Name:  IXOT11
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Defines the options for result number 11:
                        Maximum distance of a specified long-term
                        action:
                           Decontamination,
                           Interdiction,
                           Condemnation,
                           Milk disposal, and
                           Crop disposal.
       Called By:  INPCHR
       Calls:
          Unconditional:
             LGET1
```

```
      Conditional:
         Distance results flag is correctly defined
            DOCCDF


Name:  IXOT12
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Defines the options for result number 12:
                        Impact of a specified long-term action:
                           Area of decontamination, interdiction,
                              condemnation, milk disposal, crop
                              disposal, and
                           Population residing on decontaminated,
                              interdicted, or condemned land.
       Called By:  INPCHR
       Calls:
          Unconditional:
             IGET1
          Conditional:
             Number of results is nonzero and is correctly defined
                IGETN
                No error was detected in the input data
                   ERRLOC - inner ring of the region of interest is
                            outside the outer ring
                   DOCCDF


Name:  KMPTBL
       Type:  Entry
       Host:  CXPTBL
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Checks to see that the number of items on the Site
                     Data File is the same as the number of items
                     required by the model.
       Called By:  SDFINP
       Calls:  None


Name:  LGET1
       Type:  Function
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processor
          Specific:  Returns a single logical value from the input
                     database.
       Called By:  INMISC, INPOPT, IXOT11, LGETN, STPATH
```

Calls:
Conditional:
RDSTRG - no error was detected in the column pointer for finding the data
SEARCH - no error detected in column pointer for finding data or in length of record ID

Name: LGETN
Type: Subroutine
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processor
Specific: Returns an array of logical values from the input database
Called By: INPISO
Calls:
Conditional:
LGET1 - no error was detected in the length of the record ID

Name: LNGTPH
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Controls the calculation of the long-term chronic dose and economic risk.
Called By: CRNRSK
Calls:
Unconditional:
CSTEFF, LTACUM, LTPROJ

Name: LOKSEE
Type: Subroutine
Module: CHRONC
Purpose -
General: Output processing
Specific: Prints a summary of the resulting doses and costs for a given spatial interval which were accumulated during the long-term phase.
Called By: CRNRSK
Calls: None

Name: LTACUM
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation

Specific: Accumulates the doses and costs resulting from the actions taking place in the long-term phase.
Called By: LNGTPH
Calls: None

Name: LTMACT
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Computes the required long-term actions to meet the habitability critera (the level of decontamination and any subsequent period of decay required).
Called By: LTPROJ
Calls: None

Name: LTPROJ
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Calculates the long-term actions required to meet long-term dose criteria.
Called By: LNGTPH
Calls:
Conditional:
LTMACT - land was declared uninhabitable

Name: MATCH
Type: Subroutine
Module: EARLY
Purpose -
Generl: Error monitoring
Specific: Check to see that Site Data File key separator is the same as the separator read from the Site Data File.
Called By: INPOPU
Calls:
Conditional:
ERRFIL - separator read from Site Data File does not match the key separator

Name: MODLDF
Type: Entry
Host: OPNERL
Module: CHRONC
Purpose -
General: Input processing

Specific: Copies common blocks used by EARLY into common blocks used by CHRONC.
Called By: CHRINP
Calls:
Conditional:
ERRFIL - invalid value of POPFLG used

Name: MXTCH
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Check to see that the Site Data File key separator is the same as the separator read from the Site Data File.
Called By: SDFINP
Calls: None

Name: MXXCLK
Type: Subroutine
Module: MAIN
Purpose -
General: Arm of the operating system
Specific: Gets the current time.
Called By: MACCS
Calls: None

Name: MXXCPU
Type: Subroutine
Module: MAIN
Purpose -
General: Arm of the operating system
Specific: Gets the CPU clock.
Called By: MACCS
Calls:
Conditional:
ABORT - VAX/VMS is not being used

Name: MXXDAT
Type: Subroutine
Module: MAIN
Purpose -
General: Arm of the operating system
Specific: Gets the date.
Called By: MACCS
Calls: None

Name: MXXETC
Type: Subroutine
Module: MAIN
Purpose -
General: Arm of the operating system
Specific: Defines the computer and operating system, and contains any necessary machine dependent initialization.
Called By: MACCS
Calls: None

Name: NOTFOU
Type: Function
Module: OUTPUT
Purpose -
General: Output processing
Specific: Returns the character string "not-found" if the value of the variable in question equals -1, otherwise it returns the value of variable.
Called By: PRINT
Calls: None

Name: OPNERL
Type: Subroutine
Entry: MODLDF
Module: CHRONC
Purpose -
General: Input processing
Specific: Copies the modeling data from common blocks used by EARLY into common blocks used by CHRONC.
Called By: CHRINP
Calls:
Conditional:
ERRLOC - invalid flag value is used to indicate population data

Name: OUTCON
Type: Subroutine
Module: EARLY, CHRONC
Purpose -
General: Output processing
Specific: Prepares for writing the results from both EARLY and CHRONC and writes the header records on each file used to control the output module.
Called By: INPUT
Calls:

Conditional:
Exercising the EARLY module
HEDEAR
COPCHR
Exercising the CHRONC module
HEDCHR

Name: OUTPT1
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates result number 1:
Total number of a given health effect due to the dose received during the emergency phase for people within a range of distances:
Early deaths and injuries, and
Latent cancer deaths and injuries.
Called By: STOEAR
Calls:
Conditional:
Straightline dispersion model is being used
EFFGET
EFFGET - complex rotation around the circle is needed because the spatial element is not under the plume but the element is contaminated
Wind shift dispersion model with rotation is being used and the element is contaminated
EFFGET
Wind shift dispersion model without rotation is being used and the element is contaminated
EFFGET

Name: OUTPT2
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates result number 2:
Furthest distance at which a given probability of an early death is exceeded.
Called By: STOEAR
Calls: None

Name: OUTPT3
Type: Subroutine
Module: EARLY

Purpose -
General: Modeling simulation
Specific: Calculates result number 3:
Number of people whose dose to a given organ exceeds a specified threshold (either acute or lifetime dose may be used for the calculation).
Called By: STOEAR
Calls: None

Name: OUTPT4
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates result nuber 4:
Average risk of a given effect at a given distance through 360 degrees.
Called By: STOEAR
Calls:
Conditional:
ABORT - invalid output request was detected

Name: OUTPT5
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates result number 5:
Total long-term population dose to a given organ between two distances.
Called By: STOEAR
Calls: None

Name: OUTPT6
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Calculates result number 6:
Centerline dose to a selected organ by various pathways at various distances.
Called By: STOEAR
Calls:
Conditional:
ABORT - invalid output request was detected

```
Name:  OUTPT7
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates result number 7:
                        Centerline risk of a given effect at
                           various distances,
                        Early deaths and injuries, and
                        Latent cancer deaths and injuries.
       Called By:  STOEAR
       Calls:
          Conditional:
             ABORT - invalid output request was detected
                   - invalid option code was detected


Name:  OUTPT8
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates result number 8:
                        Population weighted risk of a given health
                        effect between 2 distances.
       Called By:  STOEAR
       Calls:
          Conditional:
             Population in the spatial element is nonzero and
             straightline dispersion model is being used
                EFFGET
                EFFGET - complex rotation around circle is needed
                         because the spatial element is not under
                         the plume but the element is contaminated
             Wind shift dispersion model with rotation is being used
             and the element is contaminated
                EFFGET
             wind shift dispersion model without rotation is being
             used and the element is contaminated
                EFFGET


Name:  OUTPUT
       Type:  Subroutine
       Module:  OUTPUT
       Purpose -
          General:  Output processing
          Specific:  Controls the generation of the summary output
                     information.
       Called By:  MACCS
       Calls:
```

```
      Unconditional:
         READ1
      Conditional:
         ABORT - error was detected in the header records for the
                 result files
         No error was detected in the header records for the result
         files
            READ2
            PRINT


Name:  OXTPT1
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 1:
                        Total cases of a given health effect resulting
                        from material deposited between a range of
                        distances:
                           Cancer injury,
                           Cancer death, and
                           Total cancer.
       Called By:  STOCHR
       Calls:
          Conditional:
             Straightline dispersion model is being used
                CASGET
                CASGET - complex rotation around circle is needed
                         because the spatial element is not under
                         the plume but the element is contaminated
             Wind shift dispersion model with rotation is being used
             and the element is contaminated
                CASGET
             Wind shift dispersion model without rotation is being
             used and the element is contaminated
                CASGET


Name:  OXTPT4
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 4:
                        Average on-grid risks of a given effect
                        at a given distance through 360 degrees.
       Called By:  STOCHR
       Calls:
          Conditional:
             ABORT - invalid option code was detected
```

```
Name:  OXTPT5
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 5:
                        Total population dose to a given organ
                        resulting from material deposited  between
                        two distances.
       Called By:  STOCHR
       Calls:  None


Name:  OXTPT6
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 6:
                        Peak occurence dose vs distance for a
                        selected organ by a specified pathway.
       Called By:  STOCHR
       Calls:
          Conditional:
             ABORT - invalid option was requested


Name:  OXTPT7
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 7:
                        Peak occurrence risk vs distance of a given
                          effect,
                        Individual latent cancer deaths, and
                        Individual latent cancer injuries.
       Called By:  STOCHR
       Calls:
          Conditional:
             ABORT - invalid option code was detected


Name:  OXTPT8
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 8:
                        Population-weighted risk of a given health
                        effect between two distances.
```

```
        Called By:  STOCHR
        Calls:
           Conditional:
              Straightline dispersion model is being used
                 CASGET
                 CASGET - complex rotation around circle is needed
                          because the spatial element is not under the
                          plume but the element is contaminated
              Wind shift dispersion model with rotation is being used and
              the element is contaminated
                 CASGET
              wind shift dispersion model without rotation is being used
              and the element is contaminated
                 CASGET


Name:   OXTPT9
        Type:  Subroutine
        Module:  CHRONC
        Purpose -
           General:  Model simulation
           Specific:  Calculates result number 9:
                         Population dose to the selected organ
                         in a given region by the 12 pathways.
        Called By:  STOCHR
        Calls:
           Conditional:
              Straightline dispersion model is being used
                 DOSGET
                 DOSGET - complex rotation around circle is needed
                          because the spatial element is not under the
                          plume but the element is contaminated
              Wind shift dispersion model with rotation is being used
              and the element is contaminated
                 DOSGET
              Wind shift dispersion model without rotation is being used
              and the element is contaminated
                 DOSGET


Name:   OXPT10
        Type:  Subroutine
        Module:  CHRONC
        Purpose -
           General:  Model simulation
           Specific:  Calculates result number 10:
                         Set of 12 economic cost measures produced
                         for a user-specified region.
        Called By:  STOCHR
        Calls:
```

```
      Conditional:
         Straightline dispersion model is being used
            ECCGET
            ECCGET - complex rotation around circle is needed
                     because the spatial element is not under
                     the plume but the element is contaminated
         Wind shift dispersion model with rotation is being used and
         the element is contaminated
            ECCGET
         Wind shift dispersion model without rotation is being used
         the element is contaminated
            ECCGET


Name:  OXPT11
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 11:
                       Maximum impact distance of a given long-term
                       action:
                          Decontamination,
                          Interdiction,
                          Condemnation,
                          Milk disposal, and
                          Crop disposal.
       Called By:  STOCHR
       Calls:
          Conditional:
             Straightline dispersion model is being used
                GETIMP
                GETIMP- complex rotation around circle is needed
                        because the spatial element is not under the
                        plume but the element is contaminated
             Wind shift dispersion model with rotation is being used
             and the element is contaminated
                GETIMP
             Wind shift dispersion model without rotation is being
             used and the element is contaminated
                GETIMP


Name:  OXPT12
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Model simulation
          Specific:  Calculates result number 12:
                        Impact of the long-term actions (measures of
                        farmland area and number of people
                        affected by the actions):
```

Decontamination,
Interdiction,
Condemnation,
Milk disposal, and
Crop disposal.

Called By: STOCHR
Calls:
Conditional:
Straightline dispersion model is being used
GETIMP
GETIMP - complex rotation around circle is needed because the spatial element is not under the plume but the element is contaminated
Wind shift dispersion model with rotation is being used and the element is contaminated
GETIMP
Wind shift dispersion model without rotation is being used and the element is contaminated
GETIMP

Name: PLMRIS
Type: Function
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Calculates change in plume height resulting from plume rise.
Called By: ATMOUT
Calls:
Unconditional:
VELADJ

Name: POL2
Type: Function
Module: EARLY
Purpose -
General: Modeling simulation
Specific: Performs bilinear interpolation from a table of values.
Called By: CLSHIN
Calls:
Conditional:
ABORT - value desired in the x- or y- direction is outside the intended endpoints in that direction

Name: PRINT
Type: Subroutine
Module: OUTPUT

```
        Purpose -
           General:  Output processing
           Specific:  Prints the results for each cohort and an
                      overall result for a single source term.
        Called By:  OUTPUT
        Calls:  NOTFOU, QUANTL, SOLID


Name:   PUTSTG
        Type:  Subroutine
        Entry:  GETSTG
        Module:  EARLY
        Purpose -
           General:  Input processing
           Specific:  Stores the evacuation strategy input parameters when
                      more that one evacuation strategy is being used.
        Called By:  INPUT
        Calls:
           Conditional:
              ERRLOC - error was detected in the identifiers for the
                       different emergency response strategies
                     - error was detected in the weighting fractions


Name:   PUTSTM
        Type:  Subroutine
        Entry:  GETSTM
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Stores the source term data when more than one
                      source term is being used.
        Called By:  INPUT
        Calls:
           Conditional:
              ERRLOC - repetition of a source term name was detected
                     - identical source term change cases was detected


Name:   QUANTL
        Type:  Subroutine
        Module:  OUTPUT
        Purpose -
           General:  Output processing
           Specific:  Estimates quantile values for a CCDF table.
        Called By:  PRINT
        Calls:  EXPINT
```

```
Name:  RANDOM
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Returns a pseudo-random number on the interval
                     0 to 1 using a shuffled linear-congruential
                     generator.
       Called By:  BINSAM, RANSAM, WRANBN
       Calls:  None


Name:  RANSAM
       Type:  Subroutine
       Module:  ATMOS
       Purpose -
          General:  Input processing
          Specific:  Performs a random stratified sampling based on a
                     user-specified number of daily stratified random
                     samples to be taken.
       Called By:  MACCS
       Calls:
          Conditional:
             ABORT - invalid number of samples was requested
             No error was detected in the number of samples
             requested
                ADJTIM, CONTRL, RANDOM, WBNDRY, WSAMPL


Name:  RDISTB
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Input processing
          Specific:  Processes tables of ingestion pathway nuclide data
                     from the CHONC User Input File.
       Called By:  STPATH
       Calls:
          Unconditional:
             CGET1
          Conditional:
             No error detected in reading the nuclide name
                ERRLOC - error was detected in the order of the
                         nuclide names
                Ordering of th nuclide names was correct
                   RGETN - one call per food ingestion model crop


Name:  RDSTRG
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
```

```
        Purpose -
           General:  Input processing
           Specific:  Converts a record string to a character value, a
                      logical value, a real value, or an integer value.
        Called By:  CGET1, IGET1, DOCCDF, LGET1, RGET1
        Calls:
           Conditional:
              End of record was not encountered and the string
              length and format length are compatible
                 IMLGCL
                 IMNTGR - record string is not logical
                 IMREAL - record string is not logical or an integer


Name:   READ1
        Type:  Subroutine
        Module:  OUTPUT
        Purpose -
           General:  Output processing
           Specific:  Reads the header records on the binary results files
                      being processed in order to ensure their validity
                      and to obtain the information necessary to generate
                      the CCDF bins.
        Called By:  OUTPUT
        Calls:
           Conditional:
              ABORT - no CHRONC result files were found
                    - run ID mismatch was detected
                    - error was detected while reading the CHRONC
                      result file
                    - number of CHRONC results exceeds the maximum
                      allowed
                    - duplicate results were detected
                    - error was detected in the layout of the CHRONC
                      result file


Name:   READ2
        Type:  Subroutine
        Module:  OUTPUT
        Purpose -
           General:  Output processing
           Specific:  Reads all result files to accumulate the probability
                      distribution (CCDF) of each result for all cohorts
                      for a single source term.
        Called By:  OUTPUT
        Calls:  ABORT, DO1CDF
```

```
Name:  REDSTG
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Input processing
          Specific:  Loads the common blocks used to define the
                     emergency response strategy.
       Called By:  INPUT
       Calls:
          Unconditional:
             INEVAC, INPEMR


Name:  RELZON
       Type:  Subroutine
       Module:  EARLY
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates the doses received by all individuals
                     exposed outside the emergency response zone with
                     consideration given to relocation.
       Called By:  EAROUT
       Calls:
          Unconditional:
             EDOSIN, INCDOS
          Conditional:
             Straight line dispersion is being used
                CENACU
             Normal relocation occurs in the spatial element
                EDOSIN
                INCREM
                ZERREM
             Hot spot relocation occurs in the spatial element
                EDOSIN
                INCREM
                ZERREM


Name:  RESNM1
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 1 effect:
                        Total cases of a given health effect within a
                        range of distances:
                           Early deaths and injuries, and
                           Latent cancer deaths and injuries.
       Called By:  HEDEAR
       Calls:
          Unconditional
             DISRAN
```

```
Name:  RESNM2
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 2 effect:
                        Furthest distance at which a given
                        probability of early death is exceeded.
       Called By:  HEDEAR
       Calls:  None


Name:  RESNM3
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 3 effect:
                        Number of people whose dose to a given organ
                        exceeds a threshold (dose used can be either
                        acute or lifetime).
       Called By:  HEDEAR
       Calls:
          Unconditional:
             COMPRS


Name:  RESNM4
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 4 effect:
                        Average risk of a given health effect at a
                        given distance through 360 degrees.
       Called By:  HEDEAR
       Calls:
          Unconditional:
             DISRAN


Name:  RESNM5
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 5 effect:
                        Total population dose to a given organ between
                        two distances.
       Called By:  HEDEAR
       Calls:
          Unconditional:
             DISRAN
```

```
Name:  RESNM6
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 6 effect:
                        Dose to an organ via a specific pathway
                        between two distances.
       Called By:  HEDEAR
       Calls:
          Unconditional:
             DISRAN


Name:  RESNM7
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 7 effect:
                        Centerline risk versus distance for a given
                        effect:
                           Early deaths and injuries, and
                           Latent cancer deaths and injuries.
       Called By:  HEDEAR
       Calls:
          Unconditional:
             DISRAN


Name:  RESNM8
       Type:  Function
       Module:  EARLY
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 8 effect:
                        Population-weighted risk of a given health
                        effect between two distances.
       Called By:  HEDEAR
       Calls:
          Unconditional:
             DISRAN


Name:  RGET1
       Type:  Function
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processor
          Specific:  Returns a single real value from the input
                     database
```

```
Called By:  EVRADI, INACAN, INCHRN, INDFAC, INEVAC, INPDIS,
            INPEMR, INPEXP, INPLRS, INPM2,  INPOPU, INPREL,
            INPWAK, INPWET, RGETN
Calls:
   Conditional:
      RDSTRG - no error was detected in the column pointer
               for finding data
      SEARCH - no error was detected in the column pointer
               for finding the data or in the length of the
               record ID


Name:  RGETN
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processor
          Specific:  Returns an array of real values from the input
                     database.
       Called By:  INACAN, INCHRN, INDFAC, INEFAT, INEINJ, INEVAC,
                   INMISC, INOUT2, INOUT3, INPDIS, INPDRY, INPGEO,
                   INPISO, INPM4,  INPM5,  INPREL, RDISTB, STPATH,
       Calls:
          Conditional:
             RGET1 - no error was detected in the length of the
                     record ID


Name:  RXNM10
       Type:  Function
       Module:  CHRONC
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 10 effect:
                        Cost of requested economic effect:
                           Total, and
                           Decontamination.
       Called By:  HEDCHR
       Calls:
          Conditional:
             ABORT - invalid number of results were requested
             DISRAN - no error was detected in the number of
                      results requested


Name:  RXNM11
       Type:  Function
       Module:  CHRONC
       Purpose -
          General:  Output processing
          Specific:  Returns the name of the requested type 11 effect:
                        Population and area dependent distances for
                        mitigative actions:
```

Decontamination,
Interdiction,
Condemnation, and
Disposal.

Called By: HEDCHR
Calls:
Conditional:
ABORT - invalid number of results were requested

Name: RXNM12
Type: Function
Module: CHRONC
Purpose -
General: Output processing
Specific: Returns the name of the requested type 12 effect:
Area and population involved in mitigative action:
Decontamination,
Interdiction,
Condemnation,
Milk disposal, and
Crop disposal.

Called By: HEDCHR
Calls:
Conditional:
ABORT - invalid number of results were requested
DISRAN - no error was detected in the number of results requested

Name: RXSNM9
Type: Function
Module: CHRONC
Purpose -
General: Output processing
Specific: Returns the name of the requested type 9 effect:
Long-term population dose in a given region by specified pathway.

Called By: HEDCHR
Calls:
Conditional:
ABORT - invalid number of results were requested
DISRAN - no error was detected in the number of results requested

Name: SDFINP
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing

```
   Specific:  Processes and checks input data from the
              Site Data File.
Called By:  CHRINP
Calls:
   Unconditional:
      CXPTBL, KMPTBL
   Conditional:
      No error was detected in reading the number of
      watersheds
         KMPTBL
         No error was detected in reading the input data
            CKINDX
            MXTCH


Name:  SEARCH
       Type:  Subroutine
       Module:  ATMOS, EARLY, CHRONC
       Purpose -
          General:  Input processing
          Specific:   Locate a record with a specific ID using
                      a binary search.
       Called By:  CGET1, DOCCDF, IGET1, INPBEG, LGET1, RGET1,
       Calls:  None


Name:  SGCPLN
       Type:  Subroutine
       Module:  CHRONC
       Purpose -
          General:  Modeling simulation
          Specific:  Calculates ground concentrations for the spatial
                     grid elements
       Called By:  CHROUT
       Calls:
          Conditional:
             ABORT - error was detected in the definition of the number
                     of fine grid elements over which the plume passes


Name:  SIGTEX
       Type:  Function
       Module:  ATMOS
       Purpose -
          General:  Modeling simulation
          Specific:  Returns the character string "uniform" if uniform
                     mixing is being used or returns a character string
                     with the value of sigma z.
       Called By:  ATMOUT
       Calls:  None
```

Name: SOLID
Type: Subroutine
Module: OUTPUT
Purpose -
General: Output processing
Specific: Writes a page of characters to help locate sections of the output listing.
Called By: PRINT
Calls: None

Name: SORT
Type: Subroutine
Module: ATMOS, EARLY, CHRONC
Purpose -
General: Input processing
Specific: Sorts n values of a character array cards in increasing order of the first m characters of the cards by using a pointer array.
Called By: INPBEG,
Calls: None

Name: STGRDA
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Define the regional characteristics when the Site Data File is not being used.
Called By: CHRINP
Calls: None

Name: STOCHR
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Controls the calculation of the chronic effects and economic costs needed for the requested output.
Called By: CRNRSK
Calls:
Unconditional:
OXTPT1, OXTPT4, OXTPT5, OXTPT6, OXTPT7, OXTPT8, OXTPT9, OXPT10, OXPT11, OXPT12

Name: STOEAR
Type: Subroutine
Module: EARLY
Purpose -
General: Modeling simulation

```
      Specific:  Controls the calculations of the emergency phase
                 results.
   Called By:  EAROUT
   Calls:
      Unconditional:
         OUTPT1, OUTPT2, OUTPT3, OUTPT4, OUTPT5, OUTPT6,
         OUTPT7, OUTPT8


Name:  STPATH
   Type:  Subroutine
   Module:  CHRONC
   Purpose -
      General:  Input processing
      Specific:  Processes the input data for the ingestion pathway
                 for both food and water ingestion.
   Called By:  INPCHR
   Calls:
      Unconditional:
         IGET1, LGET1
      Conditional:
         No error was detected in the number of defined crops in
         the food ingestion pathway
            CGET1
            Crop names were defined correctly
               ERRLOC - crop name was used twice
               IGET1
               RGETN
               No error was detected in the number of water
               pathway nuclides
                  CGET1
                  No error was detected in the names of the water
                  pathway nuclides
                     ERRLOC - water ingestion nuclide was not
                              found in the nuclide table
                     IGET1
                     RGETN
                     No error detected in the number of nuclides
                     in the food ingestion pathway
                        CGET1
                        No error was detected in the names of the
                        nuclides in food ingestion pathway
                           ERRLOC - food ingestion pathway nuclide
                                    was specified twice
                                  - ordering of food ingestion
                                    nuclides and water ingestion
                                    nuclides was incorrect
                                  - food ingestion pathway nuclide
                                    was not on the list of nuclides
                                  - crop name mismatch occurred
                           IGET1
                           RDISTB
                           RGETN
```

Crop names were correctly defined
CGET1
RGETN
Water ingestion nuclide was correctly defined
CGET1
ERRLOC - mismatch occurred in the nuclide name
RGETN
No mismatch occurred in the nuclide name
RGETN

Name: TRFRCT
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Compute the current growing season and the long-term transfer factors for crops, milk, and meat.
Called By: CHRNDF
Calls: None

Name: USRSUP
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Uses the five days of user-supplied weather data for a single weather trial.
Called By: MACCS
Calls:
Unconditional:
CONTRL, WBNDRY

Name: VELADJ
Type: Function
Module: ATMOS
Purpose -
General: Modeling simulation
Specific: Adjusts the wind speed to account for the height of the plume.
Called By: PLMRIS
Calls: None

Name: WASHOU
Type: Function
Module: ATMOS

Purpose -
General: Modeling simulation
Specific: Calculates the fraction of material remaining after wet deposition.
Called By: ATMOUT
Calls: None

Name: WBNDRY
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Defines the weather boundary data.
Called By: BINSAM, CONMET, DAYHOU, RANSAM, USRSUP
Calls: None

Name: WBNMET
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Determine bins (groupings) for one year of meteorological data by scanning the meteorological input data.
Called By: INPM4
Calls:
Unconditional:
WNDRZB

Name: WGCPLN
Type: Subroutine
Module: CHRONC
Purpose -
General: Modeling simulation
Specific: Calculates the wind shift ground concentrations in the plane.
Called By: CHROUT
Calls: None

Name: WGTMET
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Takes current meteorological hour and prepares the following data needed for the user-specified hour:
Stability,

Wind velocity and direction,
Mixing height, and
Rate of precipitation.

Called By: WSAMPL
Calls:
Conditional:
ABORT - mixing layer height was defined below the minimum allowed

Name: WINCTM
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Increments the hour and day for weather sampling.
Called By: WSAMPL
Calls: None

Name: WNDRZB
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Compute the windrose from the meteorological data in the bins.
Called By: WBNMET
Calls: None

Name: WRANBN
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Initializes the weather bin codes used for weather category bin sampling.
Called By: BINSAM
Calls:
Unconditional:
RANDOM

Name: WRDMET
Type: Subroutine
Module: ATMOS
Purpose -
General: Input processing
Specific: Reads the augmented T-M-Y meteorological data (yearly weather data).
Called By: INPM1

```
        Calls:
           Unconditional:
              ERRFIL - an empty data file was found
                     - morning mixing height in season was not within
                       the valid range
                     - afternoon mixing height in season was not within
                       the valid range


Name:   WSAMPL
        Type:  Subroutine
        Module:  ATMOS
        Purpose -
           General:  Input processing
           Specific:  Fills array with 120 consecutive hours of weather
                      data from the Meteorological Data File.
        Called By:  BINSAM, DAYHOU, RANSAM
        Calls:
           Unconditional:
              WGTMET
           Conditional:
              WINCTM - hour of data considered was not the first


Name:   WTRTRF
        Type:  Subroutine
        Module:  CHRONC
        Purpose -
           General:  Input processing
           Specific:  Compute the transfer factors for the water ingestion
                      pathway which correspond to direct deposition onto
                      the waterbody or washoff to the waterbody.
        Called By:  CHRNDF
        Calls:  None


Name:   ZERREM
        Type:  Subroutine
        Module:  EARLY
        Purpose -
           General:  Modeling simuation
           Specific:  Zeroes out the dose accumulated for each of the grid
                      elements which require hot spot or normal relocation
                      so new doses can be accumulated.
        Called By:  RELZON
        Calls:  None
```

2.4 Statement Functions

In addition to function subprograms, several statement functions have been incorporated into the MACCS code. A description is given for each of these named statement functions. Included in the description are the following: (1) the name, (2) the module in which it is found, (3) the definition, and (4) the subprogram(s) in which it is found.

Name: AVLINT
Module: EARLY
Definition: A linearly interpolated value for the single decay constant which fits the two data points corresponding to the 8-hour dose and the 168-hour dose
Host Subprogram(s): EPCALC

Name: DOSFRM
Module: CHRONC
Definition: The farm area dependent dose
Host Subprogram(s): OXTPT5

Name: DOSPOP
Module: CHRONC
Definition: The resident population dependant dose
Host Subprogram(s): OXTPT5

Name: DOSWAT
Module: CHRONC
Definition: The water ingestion dose
Host Subprogram(s): OXTPT5, OXTPT7

Name: GAUHIT
Module: ATMOS
Definition: The average height of the Gaussian distribution between a range of sigmas from the centerline
Host Subprogram(s): EGEOM

Name: GAUINT
Module: ATMOS
Definition: A linearly interpolated value for the area under the Gaussian curve from 0 to X
Host Subprogram(s): EGEOM

Name: IMXHT
Module: ATMOS
Definition: The mixing height for the specified current meteorological hour
Host Subprogram(s): WGTMET

Name: IRANE
Module: ATMOS
Definition: The rate of precipitation for the specified current meteorological hour
Host Subprogram(s): WGTMET

Name: ISTAB
Module: ATMOS
Definition: The weather stability for the specified current meteorological hour
Host Subprogram(s): WBNMET, WGTMET

Name: IWDIR
Module: ATMOS
Definition: The wind direction for the specified current meteorological hour
Host Subprogram(s): WBNMET, WGTMET

Name: IWSPD
Module: ATMOS
Definition: The wind speed for the specified current meteorological hour
Host Subprogram(s): WBNMET, WGTMET

Name: MRAIN
Module: ATMOS
Definition: The rate of precipitation for the specified current meteorological hour
Host Subprogram(s): WBNMET

3.0 MACCS DATA STRUCTURES

3.1 Database Management

The MACCS code uses three means of data storage and transmission: argument lists on external references, COMMON blocks, and binary sequential files. These database management techniques are all implemented in a straightforward fashion and their significant features are described in this chapter.

The use of argument lists to transmit information between program units is well documented internally within MACCS and there is no need to describe their usage in this document. Every Subroutine and Function of MACCS contains a stylized glossary at its beginning which includes a brief description of all the FORTRAN variables it utilizes. All of the variables in the argument lists are described in these glossaries.

COMMON blocks are used extensively to transmit information between the various program units of MACCS. As with the variables in argument lists, the glossary of each routine provides a brief description of every variable in COMMON which it references. Hidden EQUIVALENCE statements are implemented by using different variable lists for the same COMMON block for the following COMMON blocks: CDATE, IRAIN, M2, REUSE1, AND REUSE2.

The only aspect of COMMON usage which needs to be explained is the reuse of memory in order to minimize the amount of memory necessary to run the code. After the input processing phase of the calculations is completed, the code calculates all of the consequence measures for a single weather trial before going on to the next trial.

For each weather trial, the code first uses the ATMOS module to calculate the atmospheric transport and deposition, following this, the EARLY module calculates the consequences resulting from the emergency phase period, and the CHRONC module in turn calculates the long-term consequences.

Both the EARLY and the CHRONC module store their calculated consequences on binary sequential files for later processing by the OUTPUT module. When all of the consequences have been calculated and stored, control transfers to the OUTPUT module which reads the files of consequence measures and constructs the CCDFs.

Because of the way in which the calculations are distributed among these modules, two large common blocks in the code are used for more than one purpose. This is done among the EARLY, CHRONC, and OUTPUT modules as follows.

In the EARLY module, COMMON /REUSE1/ is used to store the doses it calculates. It is referenced for this purpose in EAROUT, RELZON, INCDOS, EMOVE, ZERREM, FATRIS, INJRIS, CANRIS, OUTPT3, and OUTPT5.

In the CHRONC module, COMMON /REUSE1/ is used to store doses. It is referenced for this purpose in INITLZ, INTRPH, CSTEFF, CSTDCN, LTACUM, LOKSEE, CASGET, OXTPT4, OXTPT5, OXTPT6, OXTPT7, and DOSGET.

In the CHRONC module, COMMON /REUSE2/ is used to store ground concentrations. It is referenced for this purpose in SGCPLN, WGCPLN, LNGTPH, LTMACT, CSTDCN, and LTACUM.

In the OUTPUT module, COMMON /REUSE1/ is used to store the probability of exceeding specified consequence levels for the CCDFs (the bin probabilities). It is referenced for this purpose in READ2, DO1CDF, GNBIN2, and PRINT.

In the OUTPUT module, COMMON /REUSE2/ is used to store the consequence level associated with each bin of the CCDF (the bin magnitudes). It is referenced for this purpose in READ2, DO1CDF, GNBIN1, GNBIN2, and PRINT.

The EARLY module can calculate consequences for up to three emergency response strategies. These are stored as binary sequential files on FORTRAN unit numbers 31 to 33. If the CHRONC module is being exercised, it writes a similar file to unit 34.

At the beginning of each of these files is a header record which uniquely determines the date and time of the MACCS run which produced it. This header is written by Subroutine STOEAR on the EARLY result files, and by Subroutine STOCHR on the CHRONC result file. Subroutine READ1 of the OUTPUT module reads this header record from all of the result files and verifies that all of the result files were produced by the same run of MACCS.

For each weather trial, Subroutine STOEAR writes a record of information on the EARLY result files which specifies the trial number, weather sequence probability, weather category, day, and hour. The actual consequence measures are written to the EARLY result files by Subroutines OUTPT1, OUTPT2, OUTPT3, OUTPT4, OUTPT5, OUTPT6, OUTPT7, and OUTPT8.

Analogously to STOEAR, Subroutine STOCHR writes the same information identifying the weather trial on the CHRONC result file. The actual consequence measures are written to the CHRONC result file by Subroutines OXTPT1, OXTPT4, OXTPT5, OXTPT6, OXTPT7, OXTPT8, OXTPT9, OXPT10, OXPT11, and OXPT12.

The binary result files produced by both EARLY and CHRONC are then processed by Subroutine READ2 in order to generate the CCDFs.

The remainder of Chapter 3 is devoted to the COMMON blocks found in the MACCS code. Section 3.2 provides a description of the named COMMON blocks, Section 3.3 gives a description of each use of unnamed COMMON blocks, Section 3.4 provides a trail of the subprograms in which each named COMMON block variable is used, and Section 3.5 provides a description of each COMMON block variable used in the MACCS code.

3.2 Named COMMON Blocks Usage

A description of each COMMON block used in MACCS is given in this section. Included in each description are the following: (1) the name, (2) the variables and arrays it contains, and (3) a list of the routines by which it is used.

MACCS NAMED COMMON BLOCK USAGE

```
Name:  ACANCR
       Contains -
          Variables:  ACTHRE, NUMACA
          Arrays:  ACSUSC, CFRISK, CIRISK, DOSEFA, DOSEFB, INDXAC
       Used by:  INACAN, INOUT1, INOUT4, INOUT7, INOUT8, OPNERL,
                 CANRIS, EFFGET, OUTPT4, OUTPT7

Name:  ACNAME
       Contains -
          Variables:
          Arrays:  ACNAME
       Used by:  INACAN, INOUT1, INOUT4, INOUT7, INOUT8, OPERNL,
                 CANRIS

Name:  ATMDAT
       Contains -
          Variables:  MAXRIS, OALARM
          Arrays:  AIRCON, AVGHIT, GRNCON, HTFCTR, IDIREC, SIGYM,
                   SIGZM,  TIMCEN, TIMOVH
       Used by:  INPREL, PUTSTM, ADJTIM, CONTRL, ATMOUT, EGEOM,
                 EPCALC, ESTAT,  EMOVE,  SGCPLN, WGCPLN

Name:  ATMOPT
       Contains -
          Variables:  IDEBUG, NUCOUT
          Arrays:
       Used by:  INPOPT, DAYHOU, RANSAM, WSAMPL, BINSAM, ATMOUT,

Name:  ATNAM1
       Contains -
          Varables:  ATNAM1
          Arrays:
       Used by:  ATPROB, PRINT
```

```
Name:  ATNAM2
       Contains -
          Variables:
          Arrays:  ATNAM2
       Used by:  INPREL, PUTSTM, PRINT


Name:  BILWAK
       Contains -
          Variables:  BUILDH, BUILDW
          Arrays:
       Used by:  INPWAK, ATMOUT, CAUGHT


Name:  BINAVG
       Contains -
          Variables:
          Arrays:  BINAVG
       Used by:  READ2, DO1CDF, PRINT


Name:  BINNED
       Contains -
          Variables:
          Arrays:  BINNED
       Used by:  READ2, DO1CDF


Name:  CCANCR
       Contains -
          Variables:  NUMCNC
          Arrays:  ACFRSK, ACIRSK, INDXCA
       Used by:  OPNERL, CASGET, OXTPT4, OXTPT7


Name:  CCDF
       Contains -
          Variables:
          Arrays:  CCDF
       Used by:  HEDEAR, HEDCHR, PRINT


Name:  CDATE
       Contains -
          Variables:  KDAY, KHOUR
          Arrays:
       Used by:  DAYHOU, RANSAM, WSAMPL, BINSAM

       Contains -
          Variables:  JDAY, JHOUR
          Arrays:
       Used by:  WGTMET, WINCTM
```

```
Name:  CENCAN
       Contains -
          Variables:
          Arrays:  CCANFA, CCANIN
       Used by:  CANRIS, OUTPT7


Name:  CENDOS
       Contains -
          Variables:
          Arrays:  CENCD, CENGD, CENPID, CENRES, CENSKI
       Used by:  EAROUT, CENACU, FATRIS, INJRIS, CANRIS, OUTPT6


Name:  CENFAT
       Contains -
          Variables:
          Arrays:  CENFAT
       Used by:  FATRIS, CANRIS, OUTPT7


Name:  CENINJ
       Contains -
          Variables:
          Arrays:  CENINJ
       Used by:  INJRIS, OUTPT7


Name:  CHNAME
       Contains -
          Variables:  CHNAME
          Arrays:
       Used by:  INCHRN, PRINT


Name:  CNTDTA
       Contains -
          Variables:  DTACNT
          Arrays:
       Used by:  WBNMET


Name:  COHAVG
       Contains -
          Variables:
          Arrays:  COHAVG
       Used by:  READ2, DO1CDF, PRINT
```

Name: COUPLD
Contains -
Variables: COUPLD
Arrays:
Used by: STPATH, LTPROJ

Name: CROPDT
Contains -
Variables:
Arrays: FRCTCB, FRCTCH, FRCTCM, FRCTFL
Used by: STPATH, SDFINP, TRFRCT

Name: CRPTIM
Contains -
Variables: THRVST, TIMACC, TSEEDG
Arrays: TGSBEG, TGSEND
Used by: STPATH, SDFINP, CHROUT, DIRDEP, LTPROJ, LTACUM

Name: CRPTRF
Contains -
Variables: NTTRM
Arrays: CTCOEF, CTHALF
Used by: STPATH, DIRDEP

Name: CRTOCR
Contains -
Variables: CRTOCR
Arrays:
Used by: OPNERL, INCHRN

Name: CSTINT
Contains -
Variables:
Arrays: CSTIF, CSTINF
Used by: INITLZ, CSTEFF, LOKSEE, ECCGET, GETIMP

Name: DAUTR
Contains -
Variables:
Arrays: IDAUGT
Used by: BLDTBL, GNDRES

Name: DCCOST
Contains -
Variables:
Arrays: CSTDF, CSTDNF, CSTLF, CSTLNF, TRMDRL
Used by: INITLZ, CSTEFF, CSTDCN, LOKSEE, ECCGET, GETIMP

Name: DCFACT
Contains -
Variables:
Arrays: CDCF, GRDCF, IDCF, IGDCF, SDCF, SDV
Used by: EDCINP, INOUT3, INOUT6, EPCALC

Name: DECMOD
Contains -
Variables: LVLDEC
Arrays: CDFRM, CDNFRM, DLBCST, DSRFCT, FRFDL, FRNFDL, TFWKF, TFWKNF, TIMDEC
Used by: INCHRN, CHRNDF, LTMACT, CSTDCN, LTACUM

Name: DIRB
Contains -
Variables:
Arrays: IDRB
Used by: WBNMET, WNDRZB

Name: DIRCTF
Contains -
Variables:
Arrays: DTFMLK, DTFOTH
Used by: DIRDEP, LTACUM

Name: DISPY
Contains -
Variables: YSCALE
Arrays: CYSIGA, CYSIGB
Used by: INPDIS, FSGY, FSGYIN

Name: DISPZ
Contains -
Variables: ZSCALE
Arrays: CZSIGA, CZSIGB
Used by: INPDIS, FSGZ, FSGZIN

```
Name:  DOSFAC
       Contains -
          Variables:  RESCON, RESLAM
          Arrays:  AVL168, CLDFAC, GAULEV, IWINDT, MAXFIN, PCF,
                   PGF168, PGPF,   PIF,    PRSF,   PSF,    SIGMAY,
                   TSTART, TSTOP
       Used by:  INDFAC, EGEOM,  EPCALC, RELZON, ESTAT, CENACU,
                 EDOSIN, INCDOS, EMOVE,  INCREM, SGCPLN, WGCPLN


Name:  DOSFAX
       Contains -
          Variables:
          Arrays:  GDF, RDF
       Used by:  EXCINP, CHRNDF


Name:  DOSTIM
       Contains -
          Variables:  DSCRLT, DSCRTI, TMEPND, TMIPND, TMPACT
          Arrays:  TINTRD
       Used by:  OPNERL, INCHRN, CHRNDF, INTRPH, LTPROJ, LTMACT,
                 LTACUM


Name:  DRYCON
       Contains -
          Variables:  NPSGRP
          Arrays:  VDEPOS
       Used by:  INPDRY, INPREL, ATMOUT


Name:  DSPFLG
       Contains -
          Variables:
          Arrays:  DSPCRP, DSPMLK
       Used by:  INITLZ, LTPROJ, LTACUM, LOKSEE, ECCGET, GETIMP


Name:  DTFRCT
       Contains -
          Variables:
          Arrays:  DTFBPT, DTFCPT, DTFMPT
       Used by:  TRFRCT, DIRDEP


Name:  DTTRFT
       Contains -
          Variables:
          Arrays:  DTFBP, DTFCP, DTFMP
       Used by:  DIRDEP
```

Name: EADFAC
Contains -
Variables:
Arrays: BRRATE, CSFACT, GSHFAC, PROTIN, SKPFAC
Used by: INDFAC, OPNERL, EPCALC, EDOSIN

Name: EANAM1
Contains -
Variables: EANAM1
Arrays:
Used by: INMISC, PRINT

Name: EANAM2
Contains -
Variables:
Arrays: EANAM2
Used by: INEVAC, PUTSTG, PRINT

Name: ECNDTA
Contains -
Variables:
Arrays: ASFP, DPF, FRMFRC, VFRM, VNFRM
Used by: SDFINP, STGRDA, CASGET, OXTPT5, DOSGET, ECCGET

Name: EDOSES
Contains -
Variables:
Arrays: CD, GD, PID, RESID, SDD
Used by: CENACU, EDOSIN, INCDOS, EMOVE, INCREM

Name: EFATAL
Contains -
Variables: NUMEFA
Arrays: EFFACA, EFFACB, EFFTHR, INDXEF
Used by: INEFAT, INOUT1, INOUT4, INOUT7, INOUT8, FATRIS

Name: EFFEC1
Contains -
Variables:
Arrays: EFFEC1
Used by: OUTPT1, OXTPT1,

```
Name:  EFFNM1
       Contains -
          Variables:
          Arrays:  EFFNM1
       Used by:  INOUT1, RESNM1


Name:  EFFNM4
       Contains -
          Variables:
          Arrays:  EFFNM4
       Used by:  INOUT4, RESNM4


Name:  EFFNM7
       Contains -
          Variables:
          Arrays:  EFFNM7
       Used by:  INOUT7, RESNM7


Name:  EFFNM8
       Contains -
          Variables:
          Arrays:  EFFNM8
       Used by:  INOUT8, RESNM8


Name:  EINAME
       Contains -
          Variables:
          Arrays:  EINAME
       Used by:  INEINJ, INOUT1, INOUT4, INOUT7, INOUT8, INJRIS


Name:  EINJUR
       Contains -
          Variables:  NUMEIN
          Arrays:  EIFACA, EIFACB, EISUSC, EITHRE, INDXEI
       Used by:  INEINJ, INOUT1, INOUT4, INOUT7, INOUT8, INJRIS,
                 EFFGET, OUTPT4, OUTPT7


Name:  ERLCST
       Contains -
          Variables:  EVACST, EVCOST, RELCST, RLCOST
          Arrays:
       Used by:  INCHRN, ECCGET
```

```
Name:  EXPAND
       Contains -
          Variables:  BRKPNT, TIMBAS, XPFAC1, XPFAC2
          Arrays:
       Used by:  INPEXP, CONTRL

Name:  EXPFAC
       Contains -
          Variables:  EXPFAC
          Arrays:
       Used by:  CONTRL, FSGY

Name:  FDINGM
       Contains -
          Variables:  NFICRP, NFIISO
          Arrays:  NDXFII
       Used by:  STPATH, RDISTB, SDFINP, EXCINP, TRFRCT, WTRTRF,
                 DIRDEP, LTPROJ, LTACUM

Name:  FRACLD
       Contains -
          Variables:  FRACLD
          Arrays:
       Used by:  INCHRN, STGRDA

Name:  FRCFRM
       Contains -
          Variables:  DPFRCT, FRCFRM, FRMPRD
          Arrays:
       Used by:  INCHRN, STGRDA

Name:  FRCLND
       Contains -
          Variables:
          Arrays:  FRCLND
       Used by:  SDFINP, STGRDA, CASGET, OXTPT5, DOSGET

Name:  FRMDAT
       Contains -
          Variables:
          Arrays:  FMAREA
       Used by:  STGRDA, ECCGET, GETIMP
```

```
Name:  GLOBAL
       Contains -
          Variables:  ANGMAX, IEVACU, IPLUME, NUMCOR, NUMFIN,
                      NUMISO, NUMORG, NUMRAD, NUMREL, NUMTRI
          Arrays:  SPAGEN, SPAEND, SPALEN
       Used by:  MACCS,  INPGEO, INPISO, INPREL, INPM2,  INPM4,
                 WBNMET, INPOPT, INMISC, INORGA, EDCINP, INEVAC,
                 INPOPU, EVRADI, EVNETW, EVROOT, INPEMR, INEFAT,
                 INEINJ, INACAN, INOUT1, INOUT3, INOUT4, INOUT5,
                 INOUT6, INOUT7, INOUT8, CHRINP, OPNERL, STPATH,
                 IXOT9,  IXOT10, IXOT12, SDFINP, CKINDX, EXCINP,
                 STGRDA, HEDEAR, DIST1,  HEDCHR, DAYHOU, RANSAM,
                 USRSUP, CONMET, CONTRL, ATMOUT, DECAY,  EAROUT,
                 EGEOM,  EPCALC, RELZON, ESTAT,  CENACU, CENZER,
                 EDOSIN, INCDOS, EMOVE,  ZERREM, INCREM, FATRIS,
                 INJRIS, CANRIS, OUTPT1, OUTPT2, OUTPT3, OUTPT4,
                 OUTPT5, OUTPT6, OUTPT7, OUTPT8, CHROUT, BLDTBL,
                 GNDRES, SGCPLN, WGCPLN, CRNRSK, INITLZ, INTRPH,
                 LTPROJ, LTMACT, CSTDCN, LTACUM, LOKSEE, OXTPT1,
                 OXTPT4, OXTPT5, OXTPT6, OXTPT7, OXTPT8, OXTPT9,
                 OXPT10, OXPT11, OXPT12, READ2


Name:  GRDDTA
       Contains -
          Variables:
          Arrays:  AREA
       Used by:  STGRDA, CASGET, OXTPT5, DOSGET


Name:  GSWTHR
       Contains -
          Variables:  GSF, NGWTRM
          Arrays:  GWCOEF, TGWHLF
       Used by:  OPNERL, INCHRN, CHRNDF


Name:  HEADER
       Contains -
          Variables:  HEADER
          Arrays:
       Used by:  MACCS, STOEAR, STOCHR, READ1, PRINT,


Name:  HGTMIX
       Contains -
          Variables:
          Arrays:  HGTMIX
       Used by:  WRDMET, WGTMET
```

```
Name:  ICRTRO
       Contains -
          Variables:  ICRTRO
          Arrays:
       Used by:  OPNERL, CHRNDF, INTRPH


Name:  IDNTFI
       Contains -
          Variables:  IDNTFI
          Arrays:
       Used by:  INPOPU, CMPTBL, SDFINP, CXPTBL


Name:  IFF
       Contains -
          Variables:  IFF
          Arrays:
       Used by:  MACCS, RANDOM


Name:  IHITIT
       Contains -
          Variables:
          Arrays:  IHITIT
       Used by:   EPCALC, ESTAT,  FATRIS, INJRIS, CANRIS, OUTPT1,
                  OUTPT2, OUTPT5, OUTPT8, CRNRSK, LOKSEE, OXTPT1,
                  OXTPT5, OXTPT8, OXTPT9, OXPT10, OXPT11, OXPT12


Name:  INDREG
       Contains -
          Variables:
          Arrays:  INDREG
       Used by:  SDFINP, STGRDA, CASGET, OXTPT5, DOSGET, ECCGET


Name:  INDWTR
       Contains -
          Variables:
          Arrays:  INDWTR
       Used by:   SDFINP, STGRDA, CASGET, OXTPT5, DOSGET


Name:  INDXS
       Contains -
          Variables:  IDIR, INTRVL
          Arrays:
       Used by:  CRNRSK, EMRGPH, INTRPH, LTPROJ, LTMACT, CSTEFF,
                 CSTDCN, LTACUM, LOKSEE
```

```
Name:  IPOINT
       Contains -
          Variables:  IC, IPOINT
          Arrays:
       Used by:  CGET1, DOCCDF, IGET1, LGET1, RGET1


Name:  INPRC2
       Contains -
          Variables:
          Arrays:  CRDFLG, IPNT
       Used by:  INPBEG, INPEND, CGET1, SEARCH, SORT, DOCCDF,
                 IGET1, LGET1, RGET1


Name:  INPRC3
       Contains -
          Variables:  NBLANK, NCHANG, NCMMNT, NDPLCT, NREC,
                      NRECT,  NTRMNT
          Arrays:
       Used by:  INPBEG, INPEND, SEARCH, SORT


Name:  IPRINT
       Contains -
          Variables:  IPRINT
          Arrays:
       Used by:  INMISC, EDCINP, EAROUT, EGEOM, EPCALC, ESTAT,
                 FATRIS, INJRIS, CANRIS


Name:  IRAIN
       Contains -
          Variables:
          Arrays:  MRAIN
       Used by:  WRDMET, WGTMET, BINSAM

       Contains -
          Variables:
          Arrays:  KRAIN
       Used by:  WBNMET


Name:  ISOCRP
       Contains -
          Variables:
          Arrays:  DCYPCB, DCYPCH, DCYPCM, FPLSCH
       Used by:  STPATH, TRFRCT
```

```
Name:  ISOGRP
       Contains -
          Variables:  MAXGRP
          Arrays:  HAFLIF, IGROUP, LAMBDA, PARENT
       Used by:  INPISO, INPREL, EDCINP, ATMOUT, DECAY, BLDTBL,
                 GNDRES, WTRTRF, DIRDEP


Name:  ISONAM
       Contains -
          Variables:
          Arrays:  NUCNAM
       Used by:  INPISO, INPREL, INPOPT, EDCINP, STPATH,
                 EXCINP, ATMOUT


Name:  ISOORG
       Contains -
          Variables:
          Arrays:  DFING
       Used by:  EXCINP, TRFRCT, WTRTRF


Name:  ISOTDT
       Contains -
          Variables:
          Arrays:  DCYPBH, DCYPMH, TFBF, TFMLK
       Used by:  STPATH, TRFRCT


Name:  ITERMS
       Contains -
          Variables:
          Arrays:  TRMIRL
       Used by:  INITLZ, INTRPH, LOKSEE, ECCGET


Name:  IUNIT
       Contains -
          Variables:
          Arrays:  IUNIT
       Used by:  READ1, READ2


Name:  IXOUT1
       Contains -
          Variables:  NXUM1
          Arrays:  IX1DS1, IX2DS1, IXCOD1
       Used by:  COPCHR, OXTPT1
```

Name: IXOUT4
Contains -
Variables: NXUM4
Arrays: IX1DS4, IXCOD4
Used by: COPCHR, OXTPT4

Name: IXOUT5
Contains -
Variables: NXUM5
Arrays: IX1DS5, IX2DS5, IXDEX5
Used by: COPCHR, OXTPT5

Name: IXOUT6
Contains -
Variables: NXUM6
Arrays: IX1DS6, IX2DS6, IXDEX6, IXPATH
Used by: COPCHR, OXTPT6

Name: IXOUT7
Contains -
Variables: NXUM7
Arrays: IX1DS7, IX2DS7, IXCOD7
Used by: COPCHR, OXTPT7

Name: IXOUT8
Contains -
Variables: NXUM8
Arrays: IX1DS8, IX2DS8, IXCOD8
Used by: COPCHR, OXTPT8

Name: KKPRNT
Contains -
Variables: KTDPNT, KTRPNT
Arrays:
Used by: CHRINP, INCHRN, EXCINP

Name: KOPRNT
Contains -
Variables: KSWDSC, KSWRSK
Arrays:
Used by: INCHRN, CRNRSK

Name: KPRINT
Contains -
Variables: KCEPNT, KDFPNT, KDTPNT, KGCPNT, KLTPNT, KWTPNT
Arrays:
Used by: INCHRN, TRFRCT, DIRDEP, EMRGPH

Name: LASEMR
Contains -
Variables: LASEMR
Arrays:
Used by: RELZON, ESTAT

Name: LONGTF
Contains -
Variables:
Arrays: TFLMLK, TFLOTH
Used by: TRFRCT, LTACUM

Name: LRACTN
Contains -
Variables:
Arrays: LRACTN
Used by: INITLZ, LTPROJ, CSTEFF, CSTDCN, LTACUM, LOKSEE, ECCGET, GETIMP

Name: LTACTN
Contains -
Variables:
Arrays: LTACTN, LVELDC
Used by: INITLZ, LTMACT, CSTEFF, CSTDCN, LTACUM, LOKSEE, ECCGET, GETIMP

Name: LTFCTR
Contains -
Variables:
Arrays: TFLBPT, TFLCPT, TFLMPT
Used by: TRFRCT

Name: M1
Contains -
Variables: METCOD
Arrays:
Used by: MACCS, INPMET, INPM1, INPM4, INMISC

Name: M2
Contains -
Variables: BNDMXH, BNDRAN, BNDWND, IBDSTB, LIMSPA
Arrays:
Used by: INPM2, WBNDRY

Contains -
Variables: BNDMXH, BNDRAN, BNDWND, IDBSTB, LIMSPA
Arrays:
Used by: CONMET

Name: M3
Contains -
Variables: ISTRDY, ISTRHR
Arrays:
Used by: INPM3, DAYHOU, USRSUP, CONMET

Name: M4
Contains -
Variables: IRSEED, NRNINT, NRINTN, NSBINS, NSMPLS
Arrays: INDXBN, INWGHT, IRNRAT, RDISTS, RNRATE
Used by: INPM4, WBNMET, RANSAM, RANDOM

Name: M5
Contains -
Variables:
Arrays: HRMXHT, HRRAIN, HRWNDV, IHRDIR, IHRSTB
Used by: INPM5, USRSUP

Name: MACHIN
Contains -
Variables: MACHIN
Arrays:
Used by: MXXETC, MXXCPU, MXXCLK, MXXDAT

Name: MAXNRS
Contains -
Variables: MAXNRS
Arrays:
Used by: HEDEAR, HEDCHR, READ1

Name: MAXOCU
Contains -
Variables:
Arrays: CONMAX, MAXDIR, MAXTRI
Used by: READ2, DO1CDF, PRINT

```
Name:  METB
       Contains -
          Variables:  NBIN, NTOT
          Arrays:  IDRBIN, IRAND, IWGHT, SPACE
       Used by:  INPM4, WBNMET, WNDRZB, BINSAM, WRANBN


Name:  METDAT
       Contains -
          Variables:  LIMSP1
          Arrays:  HTMXLR, ISTAB, RNMM, WINDIR, WINDSP
       Used by:  WBNDRY, WSAMPL, CONTRL, ATMOUT, CONMET


Name:  METDTA
       Contains -
          Variables:
          Arrays:  HEIGHT, MONTHS, ROSE
       Used by:  WRDMET, WBNMET, WGTMET


Name:  METOUT
       Contains -
          Variables:  IBINUM, IDAY, IHOUR, ISECON, ITRIAL,
                      PRBMET
          Arrays:
        Used by:  MACCS,  WBNMET, DAYHOU, RANSAM, USRSUP, CONMET,
                  ADJTIM, BINSAM, CONTRL, STOEAR, CHROUT, STOCHR


Name:  MULREL
       Contains -
          Variables:
          Arrays:  PDELAY, PLHEAT, PLHITE, PLUDUR, PSDIST,
                   REFTIM, RELINV
       Used by:  INPREL, PUTSTM, ADJTIM, CONTRL, ATMOUT


Name:  NAMCRP
       Contains -
          Variables:
          Arrays:  NAMCRP
       Used by:  STPATH, SDFINP, DIRDEP


Name:  NAMRGN
       Contains -
          Variables:
          Arrays:  NMRGN
       Used by:  SDFINP, STGRDA
```

```
Name:  NAMWPI
       Contains -
          Variables:
          Arrays:  NAMWPI
       Used by:  STPATH, RDISTB, SDFINP, EXCINP


Name:  NCHRFL
       Contains -
          Variables:  NCHRFL
          Arrays:
       Used by:  OUTCON, READ1


Name:  NETWOR
       Contains -
          Variables:  INIEVA, LASMOV
          Arrays:  EDELAY, LASEVA, NEXTND
       Used by:  INEVAC, EVRADI, EVNETW, EVROOT, INPEMR, PUTSTG,
                 RELZON, ESTAT,  EMOVE


Name:  NUMGRD
       Contains -
          Variables:  NEND, NINC, NINCM1, NUMFNT
          Arrays:
       Used by:  CHRINP, SGCPLN, WGCPLN


Name:  NUMPAG
       Contains -
          Variables:  NUMPAG
          Arrays:
       Used by:  OUTPUT, PRINT


Name:  NUMRES
       Contains -
          Variables:  NUMRES
          Arrays:
       Used by:  HEDEAR, HEDCHR, READ1, READ2, PRINT


Name:  NUMVAL
       Contains -
          Variables:
          Arrays:  NUMVAL
       Used by:  HEDEAR, COPCHR, OUTPT1, OUTPT3, OUTPT5, OUTPT8,
                 READ1,  READ2, DO1CDF
```

```
Name:  NXMORG
       Contains -
          Variables:  NXMORG
          Arrays:
       Used by:  OPNERL, IXOT9,  EXCINP, COPCHR, CHRNDF, TRFRCT,
                 WTRTRF, DIRDEP, INITLZ, INTRPH, CSTEFF, CSTDCN,
                 LTACUM, LOKSEE, CASGET


Name:  NXMRES
       Contains -
          Variables:  NXMRES
          Arrays:
       Used by:  COPCHR, HEDCHR, READ1


Name:  NXMVAL
       Contains -
          Variables:
          Arrays:  NXMVAL
       Used by:  COPCHR, HEDCHR, OXTPT1, OXTPT5, OXTPT8,
                 OXTPT9, OXPT10, OXPT11, OXPT12, READ1


Name:  ORGNAM
       Contains -
          Variables:
          Arrays:  ORGNAM
       Used by:  INORGA, EDCINP, INEFAT, INEINJ, INACAN, INOUT3,
                 INOUT5, INOUT6, OPNERL, RESNM3, RESNM5, RESNM6,
                 COPCHR, EAROUT, EPCALC, INJRIS


Name:  ORGNDX
       Contains -
          Variables:  MEND, MSTRT
          Arrays:
       Used by:  CHRNDF, GNDRES


Name:  OUTCOM
       Contains -
          Variables:  IBEGIN, NFILES
          Arrays:  IRESID
       Used by:  READ1, READ2, PRINT


Name:  OXGNAM
       Contains -
          Variables:
          Arrays:  OXGNAM
       Used by:  OPNERL, IXOT9, EXCINP, COPCHR, RXSNM9, LOKSEE,
```

```
Name:  PATHNM
       Contains -
          Variables:
          Arrays:  PATHNM
       Used by:  EARINP, INOUT6, RESNM6


Name:  PHYCON
       Contains -
          Variables:  PI, SQRHPI, SQR2PI, TWOPI
          Arrays:
       Used by:  MACCS,  INPOPU, STGRDA, ATMOUT, EMOVE,  FATRIS,
                 INJRIS, CANRIS, EGEOM,  OUTPT1, OUTPT3, OUTPT4,
                 OUTPT5, OUTPT8, OXTPT1, OXPTP4, OXTPT5, OXTPT8,
                 OXTPT9, OXPT10, OXPT11, OXPT12


Name:  PLUMRS
       Contains -
          Variables:  SCLADP, SCLCRW, SCLEFP
          Arrays:
       Used by:  INPLRS, CAUGHT, PLMRIS


Name:  PNZERO
       Contains -
          Variables:
          Arrays:  PNZERO
       Used by:  READ2, DO1CDF, PRINT


Name:  POPDAT
       Contains -
          Variables:
          Arrays:  POPDAT
       Used by:  INPOPU, EFFGET, OUTPT3, OUTPT5, OUTPT8, CASGET,
                 OXTPT5, OXTPT8, DOSGET, ECCGET, GETIMP


Name:  POPFLG
       Contains -
          Variables:  POPFLG
          Arrays:
       Used by:  INPOPU, OPNERL


Name:  PSCDIR
       Contains -
          Variables:
          Arrays:  PSCMLK, PSCOTH
       Used by:  STPATH, LTPROJ
```

Name: RELOCA
Contains -
Variables: DOSHOT, DOSNRM, ENDEMP, INDORG, TIMHOT, TIMNRM
Arrays:
Used by: INPEMR, PUTSTG, OPNERL, EPCALC, RELZON, EDOSIN, EMRGPH

Name: RESLT1
Contains -
Variables: NUM1
Arrays: CCDF1, I1DIS1, I2DIS1, IECOD1
Used by: INOUT1, HEDEAR, RESNM1, COPCHR, OUTPT1

Name: RESLT2
Contains -
Variables: NUM2
Arrays: CCDF2, RISTHR
Used by: INOUT2, HEDEAR, RESNM2, COPCHR, OUTPT2

Name: RESLT3
Contains -
Variables: NUM3
Arrays: CCDF3, DOSTH3, IDOSE3, INDEX3
Used by: INOUT3, HEDEAR, RESNM3, COPCHR, OUTPT3

Name: RESLT4
Contains -
Variables: NUM4
Arrays: CCDF4, I1DIS4, IECOD4
Used by: INOUT4, HEDEAR, RESNM4, COPCHR, OUTPT4

Name: RESLT5
Contains -
Variables: NUM5
Arrays: CCDF5, I1DIS5, I2DIS5, INDEX5
Used by: INOUT5, HEDEAR, RESNM5, COPCHR, OUTPT5

Name: RESLT6
Contains -
Variables: NUM6
Arrays: CCDF6, I1DIS6, I2DIS6, INDEX6, IPATHW
Used by: INOUT6, HEDEAR, RESNM6, COPCHR, OUTPT6

Name: RESLT7
Contains -
Variables: NUM7
Arrays: CCDF7, I1DIS7, I2DIS7, IECOD7
Used by: INOUT7, HEDEAR, RESNM7, COPCHR, OUTPT7

Name: RESLT8
Contains -
Variables: NUM8
Arrays: CCDF8, I1DIS8, I2DIS8, IECOD8
Used by: INOUT8, HEDEAR, RESNM8, COPCHR, OUTPT8

Name: RESLT9
Contains -
Variables: NXUM9
Arrays: CXDF9, IX1DS9, IX2DS9, IXCOD9
Used by: IXOT9, HEDCHR, RXSNM9, OXTPT9

Name: RESNAM
Contains -
Variables:
Arrays: RESNAM
Used by: HEDEAR, COPCHR, READ1, PRINT

Name: RETCOD
Contains -
Variables:
Arrays: RETCOD
Used by: RELZON, ESTAT, EMRGPH, LOKSEE

Name: REUSE1
Contains -
Variables:
Arrays: PADIT1, T1DOSE, T2DOSE
Used by: EAROUT, RELZON, INCDOS, EMOVE, ZERREM, INCREM, FATRIS, INJRIS, CANRIS, OUTPT3, OUTPT5

Contains -
Variables:
Arrays: DMDOSE, DODOSE, DSDXPS, DSFOOD, DSWKF, DSWKNF, GSDOSE, PADIT1, REDOSE, RMDOSE, RODOSE, WDDOSE, WWDOSE
Used by: INITLZ, INTRPH, CSTEFF, CSTDCN, LTACUM, LOKSEE, CASGET, OXTPT4, OXTPT5, OXTPT6, OXTPT7, DOSGET

Name: REUSE1 (continued)
Contains -
Variables:
Arrays: BINPRB
Used by: READ2, DO1CDF, GNBIN2, PRINT

Name: REUSE2
Contains -
Variables:
Arrays: AGRNDC, PADIT2
Used by: SGCPLN, WGCPLN, INTRPH, LTPROJ, LTMACT, CSTDCN, LTACUM

Contains -
Variables:
Arrays: BINMAG
Used by: READ2, DO1CDF, GNBIN1, GNBIN2, PRINT

Name: REWTHR
Contains -
Variables: NRWTRM, RINHL, RPF
Arrays: RWCOEF, TRWHLF
Used by: OPNERL, INCHRN, CHRNDF

Name: RISCAN
Contains -
Variables:
Arrays: CANINJ, CANFAT
Used by: CANRIS, EFFGET, OUTPT4

Name: RISCAT
Contains -
Variables: RISCAT
Arrays:
Used by: INMISC, PRINT

Name: RISFAT
Contains -
Variables:
Arrays: FATAVG, RISFAT
Used by: EAROUT, FATRIS, CANRIS, EFFGET, OUTPT2, OUTPT4

Name: RISINJ
Contains -
Variables:
Arrays: RISINJ
Used by: INJRIS, EFFGET, OUTPT4

Name: ROOTS
Contains -
Variables: NROOTS
Arrays: ROOT
Used by: EVRADI, EVROOT, PUTSTG, EMOVE

Name: ROSEBI
Contains -
Variables:
Arrays: ROSEBI
Used by: WNDRZB, INMISC, OPNERL, DO1CDF

Name: ROTATE
Contains -
Variables: OVRRID
Arrays: WINROS
Used by: INMISC, OPNERL

Name: RSLT10
Contains -
Variables: NXUM10
Arrays: CXDF10, I1DS10, I2DS10
Used by: IXOT10, HEDCHR, RXNM10, OXPT10

Name: RSLT11
Contains -
Variables: CXDF11, NXUM11
Arrays:
Used by: IXOT11, HEDCHR, OXPT11

Name: RSLT12
Contains -
Variables: NXUM12
Arrays: CXDF12, I1DS12, I2DS12
Used by: IXOT12, HEDCHR, RXNM12, OXPT12

Name: RTINTR
Contains -
Variables:
Arrays: GCMAXR, QROOT
Used by: STPATH, LTPROJ, LTACUM

```
Name:  RXSNAM
       Contains -
          Variables:
          Arrays:  RXSNAM
       Used by:  COPCHR, HEDCHR, READ1


Name:  SAVMET
       Contains -
          Variables:
          Arrays:  IBINUM, IDAY, IHOUR, PRBMET
       Used by:  READ2, DO1CDF, PRINT


Name:  SITEDT
       Contains -
          Variables:  DPRATE, DSRATE, FRFIM, FRNFIM, POPCST,
                      VALWF,  VALWNF
          Arrays:
       Used by:  INCHRN, STGRDA, CSTEFF, ECCGET


Name:  SRCTRM
       Contains -
          Variables:  ISRCTM, NSRCTM
          Arrays:
       Used by:  MACCS,  INPUT,  INPREL, PUTSTM, CONTRL, STOEAR,
                 STOCHR, OUTPUT, PRINT


Name:  SRZONE
       Contains -
          Variables:  LASHE1, LASHE2, SHELT1, SHELT2, TTOSH1, TTOSH2
          Arrays:
       Used by:  INPEMR, PUTSTG, RELZON, ESTAT


Name:  STOPME
       Contains -
          Variables:  ENDAT1, ENDAT2
          Arrays:
       Used by:  MACCS, INPUT, INPOPT, INMISC,  OUTCON, CONTRL,
                 READ1, PRINT


Name:  STRTGY
       Contains -
          Variables:  ISTRTG, NSTRTG
          Arrays:
       Used by:  INPUT, INEVAC, PUTSTG, CONTRL, EAROUT, STOEAR,
                 READ1, READ2,  PRINT
```

Name: TDECON
Contains -
Variables: TDECON
Arrays:
Used by: LTPROJ, LTMACT, CSTEFF, LTACUM

Name: TERMS
Contains -
Variables:
Arrays: TRMEVA, TRMREL
Used by: EMRGPH, INITLZ, LOKSEE, ECCGET

Name: TRCMPL
Contains -
Variables:
Arrays: TCROOT
Used by: STPATH, TRFRCT

Name: UNFSWT
Contains -
Variables: UNFSWT
Arrays:
Used by: CHRINP, OPNERL, STGRDA

Name: WATRM
Contains -
Variables: NUMWPA, NUMWPI
Arrays:
Used by: STPATH, SDFINP, WTRTRF, LTACUM

Name: WETCON
Contains -
Variables: CWASH1, CWASH2
Arrays:
Used by: INPWET, WASHOU

Name: WETDRY
Contains -
Variables:
Arrays: DRYDEP, WETDEP
Used by: INPISO, ATMOUT, BLDTBL

```
Name:  WTFRAC
       Contains -
          Variables:
          Arrays:  WTFRAC
       Used by:  INEVAC, PUTSTG, READ2, PRINT


Name:  WTNAME
       Contains -
          Variables:  WTNAME
          Arrays:
       Used by:  INEVAC, READ2, PRINT


Name:  WTRDAT
       Contains -
          Variables:
          Arrays:  TFLPD, TFLPW
       Used by:  WTRTRF, LTACUM


Name:  WTRDTA
       Contains -
          Variables:
          Arrays:  WINGF, WSHFRI, WSHRTA
       Used by:  STPATH, SDFINP, WTRTRF
```

3.3 Unnamed COMMON Block Usage

A description of the usage of the unnamed COMMON block is given in this section. The description includes: (1) a listing of the incorporated variables and arrays, and (2) the subprograms which use those contents.

Contains -
   Variables: CLOC
   Arrays: CARD
Used by: INPEND, CGET1, DOCCDF, IGET1, LGET1, RGET1, SEARCH, SORT

Contains -
   Variables:
   Arrays: APDCLG, APDCLR, APDCWG, APINLG, APINLR, APNOLG,
           APNOLR, PPAPIG, PPAPIR, PPDCLG, PPDCLR, PPINLG,
           PPINLR, PPNOLG, PPNOLR
Used by: MACCS, CHRNDF, INTRPH, LTPROJ, LTMACT, CSTDCN, LTACUM

3.4 Variable Trail

In this section, a description is given of the way in which each COMMON block variable and array is utilized in the various subprograms of the MACCS code. For each variable or array, the description includes the following: (1) the name of the parameter, (2) the name of the common block in which it is included, (3) the names of the subprograms which utilize that variable, and (4) the use made of the variable.

When a variable is used by a subprogram, an indication is made as to whether the current value of the parameter is used without modification or whether the parameter value is modified within that subprogram. Two types of modification procedures are included: those in which the value is modified by direct assignment of a new value and those in which the value is modified when the variable or array is used as a parameter in the argument list for a called subprogram.

Common Block Variables and Arrays

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
ACFRSK	CCANCR	OPNERL		X	
		CASGET	X		
		OXTPT4	X		
		OXTPT7	X		
ACIRSK	CCANCR	OPNERL		X	
		CASGET	X		
		OXTPT7	X		
ACNAME	ACNAME	INACAN		X	
		INOUT1	X		
		INOUT4	X		
		INOUT7	X		
		INOUT8	X		
		OPNERL	X		
		CANRIS	X		
ACSUSC	ACANCR	INACAN			X
		OPNERL	X		
		CANRIS	X		
ACTHRE	ACANCR	INACAN		X	
		CANRIS	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
AGRNDC	REUSE2	SGCPLN		X	
		WGCPLN		X	
		INTRPH	X		
		LTPROJ	X		
		LTMACT	X		
		CSTDCN	X		
		LTACUM	X		
AIRCON	ATMDAT	ATMOUT		X	
		EPCALC	X		
ANGMAX	GLOBAL	EGEOM		X	
		EMOVE	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT1	X		
		OUTPT3	X		
		OUTPT4	X		
		OUTPT5	X		
		OUTPT8	X		
		OXTPT1	X		
		OXTPT4	X		
		OXTPT5	X		
		OXTPT8	X		
		OXTPT9	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		
AREA	GRDDTA	STGRDA		X	
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
ASFP	ECNDTA	SDFINP		X	
		STGRDA		X	
		ECCGET	X		
ATNAM1	ATNAM1	ATPROB		X	
		PRINT	X		
ATNAM2	ATNAM2	INPREL		X	
		PUTSTM	X		
		PRINT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
AVGHIT	ATMDAT	ATMOUT		X	
		EGEOM	X		
AVL168	DOSFAC	EPCALC		X	
		EDOSIN	X		
BINAVG	BINAVG	READ2		X	
		DO1CDF	X		
		PRINT	X		
BINMAG	REUSE2	READ2		X	
		DO1CDF	X		
		GNBIN1		X	
		GNBIN2		X	
		PRINT	X		
BINNED	BINNED	READ2		X	
		DO1CDF		X	
BINPRB	REUSE1	READ2		X	
		DO1CDF		X	
		GNBIN2		X	
		PRINT	X		
BNDMXH	M2	INPM2		X	
		INPM5	X		
		CONMET	X		
BNDRAN	M2	INPM2		X	
		CONMET	X		
		WBNDRY	X		
BNDWND	M2	INPM2		X	
		CONMET	X		
		WBNDRY	X		
BRKPNT	EXPAND	INPEXP		X	
		CONTRL	X		
BRRATE	EADFAC	INDFAC			X
		OPNERL	X		
		EDOSIN	X		
BUILDH	BILWAK	INPWAK		X	
		ATMOUT	X		
		CAUGHT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
BUILDW	BILWAK	INPWAK		X	
		ATMOUT	X		
CANFAT	RISCAN	CANRIS		X	
		EFFGET	X		
		OUTPT4	X		
CANINJ	RISCAN	CANRIS		X	
		EFFGET	X		
CCANFA	CENCAN	CANRIS		X	
		OUTPT7	X		
CCANIN	CENCAN	CANRIS		X	
		OUTPT7	X		
CCDF	CCDF	HEDEAR		X	
		HEDCHR		X	
		PRINT	X		
CCDF1	RESLT1	INOUT1		X	
		HEDEAR	X		
CCDF2	RESLT2	INOUT2		X	
		HEDEAR	X		
CCDF3	RESLT3	INOUT3		X	
		HEDEAR	X		
CCDF4	RESLT4	INOUT4		X	
		HEDEAR	X		
CCDF5	RESLT5	INOUT5		X	
		HEDEAR	X		
CCDF6	RESLT6	INOUT6		X	
		HEDEAR	X		
CCDF7	RESLT7	INOUT7		X	
		HEDEAR	X		
CCDF8	RESLT8	INOUT8		X	
		HEDEAR	X		
CD	EDOSES	EDOSIN		X	
		CENACU	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
CDCF	DCFACT	EDCINP		X	
		EPCALC	X		
CDFRM	DECMOD	INCHRN			X
		CSTDCN	X		
CDNFRM	DECMOD	INCHRN			X
		CSTDCN	X		
CENCD	CENDOS	EAROUT	X		
		CENACU		X	
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT6	X		
CENFAT	CENFAT	FATRIS		X	
		CANRIS	X		
		OUTPT7	X		
CENGD	CENDOS	CENACU		X	
		EAROUT	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT6	X		
CENINJ	CENINJ	INJRIS		X	
		OUTPT7	X		
CENPID	CENDOS	CENACU		X	
		EAROUT	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT6	X		
CENRES	CENDOS	CENACU		X	
		EAROUT	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT6	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
CENSKI	CENDOS	CENACU		X	
		EAROUT	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT6	X		
CFRISK	ACANCR	INACAN			X
		OPNERL	X		
		CANRIS	X		
CHNAME	CHNAME	INCHRN		X	
		PRINT	X		
CIRISK	ACANCR	INACAN			X
		OPNERL	X		
		CANRIS	X		
CLDFAC	DOSFAC	EGEOM		X	
		CENACU	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
COHAVG	COHAVG	READ2		X	
		DO1CDF		X	
		PRINT	X		
CONMAX	MAXOCU	READ2		X	
		DO1CDF		X	
		PRINT	X		
COUPLD	COUPLD	STPATH		X	
		LTPROJ	X		
CRDFLG	INPRC2	INPBEG		X	
		INPEND		X	
		CGET1		X	
		DOCCDF		X	
		IGET1		X	
		LGET1		X	
		RGET1		X	
CRTOCR	CRTOCR	OPNERL	X		
		INCHRN		X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
CSFACT	EADFAC	INDFAC			X
		EDOSIN	X		
CSTDF	DCCOST	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
CSTDNF	DCCOST	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
CSTIF	CSTINT	INITLZ		X	
		CSTEFF		X	
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
CSTINF	CSTINT	INITLZ		X	
		CSTEFF		X	
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
CSTLF	DCCOST	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
CSTLNF	DCCOST	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
CTCOEF	CRPTRF	STPATH			X
		DIRDEP	X		
CTHALF	CRPTRF	STPATH			X
		DIRDEP	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
CWASH1	WETCON	INPWET		X	
		WASHOU	X		
CWASH2	WETCON	INPWET		X	
		WASHOU	X		
CXDF9	RESLT9	IXOT9		X	
		HEDCHR	X		
CXDF10	RSLT10	IXOT10		X	
		HEDCHR	X		
CXDF11	RSLT11	IXOT11		X	
		HEDCHR	X		
CXDF12	RSLT12	IXOT12		X	
		HEDCHR	X		
CYSIGA	DISPY	INPDIS			X
		FSGY	X		
CYSIGB	DISPY	INPDIS			X
		FSGY	X		
CZSIGA	DISPZ	INPDIS			X
		FSGZ	X		
CZSIGB	DISPZ	INPDIS			X
		FSGZ	X		
DCYPBH	ISOTDT	STPATH			X
		TRFRCT	X		
DCYPCB	ISOCRP	STPATH			X
		TRFRCT	X		
DCYPCH	ISOCRP	STPATH			X
		TRFRCT	X		
DCYPCM	ISOCRP	STPATH			X
		TRFRCT	X		
DCYPMH	ISOTDT	STPATH			X
		TRFRCT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
DFING	ISOORG	EXCINP		X	
		TRFRCT	X		
		WTRTRF	X		
DLBCST	DECMOD	INCHRN		X	
		CSTDCN	X		
DMDOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		DOSGET	X		
DODOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		DOSGET	X		
DOSEFA	ACANCR	INACAN			X
		OPNERL	X		
		CANRIS	X		
DOSEFB	ACANCR	INACAN			X
		OPNERL	X		
		CANRIS	X		
DOSHOT	RELOCA	IMPEMR		X	
		RELZON	X		
DOSNRM	RELOCA	IMPEMR		X	
		RELZON	X		
DOSTH3	RESLT3	INOUT3			X
		RESNM3	X		
		OUTPT3	X		
DPF	ECNDTA	SDFINP		X	
		STGRDA		X	
		ECCGET	X		
DPFRCT	FRCFRM	INCHRN		X	
		STGRDA	X		
DPRATE	SITEDT	INCHRN		X	X
		CSTEFF	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
DRYDEP	WETDRY	INPISO			X
		BLDTBL	X		
		ATMOUT	X		
DSCRLT	DOSTIM	INCHRN		X	
		LTPROJ	X		
		LTMACT	X		
DSCRTI	DOSTIM	INCHRN		X	
		INTRPH	X		
DSDXPS	REUSE1	INITLZ		X	
		LTACUM		X	
		CASGET	X		
		OXTPT4	X		
		OXTPT5	X		
		OXTPT6	X		
		OXTPT7	X		
DSFOOD	REUSE1	INITLZ		X	
		LTACUM		X	
		CASGET	X		
		OXTPT5	X		
DSPCRP	DSPFLG	INITLZ		X	
		LTPROJ		X	
		LTACUM	X		
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
DSPMLK	DSPFLG	INITLZ		X	
		LTPROJ		X	
		LTACUM	X		
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
DSRATE	SITEDT	INCHRN		X	
		CSTEFF	X		
DSRFCT	DECMOD	INCHRN			X
		LTMACT	X		
		LTACUM	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
DSWKF	REUSE1	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
DSWKNF	REUSE1	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
DTACNT	CNTDTA	WBNMET		X	
DTFBP	DTTRFT	DIRDEP		X	
DTFBPT	DTFRCT	TRFRCT		X	
		DIRDEP	X		
DTFCP	DTTRFT	DIRDEP		X	
DTFCPT	DTFRCT	TRFRCT		X	
		DIRDEP	X		
DTFMLK	DIRCTF	DIRDEP		X	
		LTACUM	X		
DTFMP	DTTRFT	DIRDEP		X	
DTFMPT	DTFRCT	TRFRCT		X	
		DIRDEP	X		
DTFOTH	DIRCTF	DIRDEP		X	
		LTACUM	X		
EANAM1	EANAM1	INMISC		X	
		PRINT	X		
EANAM2	EANAM2	INEVAC		X	
		PUTSTG	X		
		PRINT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
EDELAY	NETWOR	INEVAC			X
		ESTAT	X		
		EMOVE	X		
EFFACA	EFATAL	INEFAT			X
		FATRIS	X		
EFFACB	EFATAL	INEFAT			X
		FATRIS	X		
EFFEC1	EFFEC1	OUTPT1		X	
		OXTPT1		X	
EFFNM1	EFFNM1	INOUT1		X	
		RESNM1	X		
EFFNM4	EFFNM4	INOUT4		X	
		RESNM4	X		
EFFNM7	EFFNM7	INOUT7		X	
		RESNM7	X		
EFFNM8	EFFNM8	INOUT8		X	
		RESNM8	X		
EFFTHR	EFATAL	INEFAT			X
		FATRIS	X		
EIFACA	EINJUR	INEINJ			X
		INJRIS	X		
EIFACB	EINJUR	INEINJ			X
		INJRIS	X		
EINAME	EINAME	INEINJ		X	
		INOUT1	X		
		INOUT4	X		
		INOUT7	X		
		INOUT8	X		
		INJRIS	X		
EISUSC	EINJUR	INEINJ			X
EITHRE	EINJUR	INEINJ			X
		INJRIS	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
ENDAT1	STOPME	INPOPT		X	
		INPUT	X		
		MACCS	X		
		OUTCON	X		
		CONTRL	X		
ENDAT2	STOPME	INPOPT		X	
		INPUT	X		
		INMISC		X	
		CONTRL	X		
		READ1	X		
		PRINT	X		
ENDEMP	RELOCA	INPEMR		X	
		PUTSTG		X	
		OPNERL	X		
		RELZON	X		
		EDOSIN	X		
		EMRGPH	X		
EVACST	ERLCST	INCHRN		X	
EVCOST	ERLCST	INCHRN		X	
		ECCGET	X		
EXPFAC	EXPFAC	CONTRL		X	
		FSGY	X		
FATAVG	RISFAT	EAROUT		X	
		FATRIS		X	
		EFFGET	X		
		OUTPT4	X		
FMAREA	FRMDAT	STGRDA		X	
		ECCGET	X		
		GETIMP	X		
FPLSCH	ISOCRP	STPATH			X
		TRFRCT	X		
FRACLD	FRACLD	INCHRN		X	
		STGRDA	X		
FRCFRM	FRCFRM	INCHRN		X	
		STGRDA	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
FRCLND	FRCLND	SDFINP		X	
		STGRDA		X	
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
FRCTCB	CROPDT	STPATH			X
		TRFRCT	X		
FRCTCH	CROPDT	STPATH			X
		TRFRCT	X		
FRCTCM	CROPDT	STPATH			X
		TRFRCT	X		
FRCTFL	CROPDT	STPATH			X
		SDFINP		X	
		TRFRCT	X		
FRFDL	DECMOD	INCHRN			X
		CSTDCN	X		
FRFIM	SITEDT	INCHRN		X	
		CSTEFF	X		
FRMFRC	ECNDTA	SDFINP		X	
		STGRDA		X	
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
FRMPRD	FRCFRM	INCHRN		X	
		STGRDA	X		
FRNFDL	DECMOD	INCHRN			X
		CSTDCN	X		
FRNFIM	SITEDT	INCHRN		X	
		CSTEFF	X		
GAULEV	DOSFAC	EGEOM		X	
		INCDOS	X		
		INCREM	X		
		SGCPLN	X		
		WGCPLN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
GCMAXR	RTINTR	STPATH			X
		LTPROJ	X		
GD	EDOSES	EDOSIN		X	
		CENACU	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
GDF	DOSFAX	EXCINP		X	
		CHRNDF	X		
GRDCF	DCFACT	EDCINP		X	
		EPCALC	X		
GRNCON	ATMDAT	ATMOUT		X	
		EPCALC	X		
		SGCPLN	X		
		WGCPLN	X		
GSDOSE	REUSE1	INITLZ		X	
		INTRPH	X		
		LTACUM		X	
		LOKSEE	X		
		OXTPT4	X		
		OXTPT6	X		
		DOSGET	X		
GSF	GSWTHR	OPNERL		X	
		CHRNDF	X		
GSHFAC	EADFAC	INDFAC			X
		OPNERL	X		
		EPCALC	X		
		EDOSIN	X		
GWCOEF	GSWTHR	INCHRN			X
		CHRNDF	X		
HAFLIF	ISOGRP	INPISO			X
HEADER	HEADER	MACCS		X	
		STOEAR	X		
		STOCHR	X		
		READ1	X		
		PRINT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
HEIGHT	METDTA	WRDMET		X	
HGTMIX	HGTMIX	WRDMET		X	
		WGTMET	X		
HRMXHT	M5	INPM5		X	
		USRSUP	X		
HRRAIN	M5	INPM5			X
		USRSUP	X		
HRWNDV	M5	INPM5			X
		USRSUP	X		
HTFCTR	ATMDAT	ATMOUT		X	
		EPCALC	X		
HTMXLR	METDAT	USRSUP		X	
		CONMET		X	
		WBNDRY		X	
		WSAMPL			X
		ATMOUT	X		
I1DIS1	RESLT1	INOUT1			X
		RESNM1	X		
		COPCHR	X		
		OUTPT1	X		
I1DIS4	RESLT4	INOUT4			X
		RESNM4	X		
		COPCHR	X		
		OUTPT4	X		
I1DIS5	RESLT5	INOUT5			X
		RESNM5	X		
		COPCHR	X		
		OUTPT5	X		
I1DIS6	RESLT6	INOUT6			X
		HEDEAR	X		
		COPCHR	X		
		OUTPT6	X		
I1DIS7	RESLT7	INOUT7			X
		HEDEAR	X		
		COPCHR	X		
		OUTPT7	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
I1DIS8	RESLT8	INOUT8			X
		RESNM8	X		
		COPCHR	X		
		OUTPT8	X		
I1DS10	RSLT10	IXOT10			X
		RXNM10	X		
		OXPT10	X		
I1DS12	RSLT12	IXOT12			X
		RXNM12	X		
		OXPT12	X		
I2DIS1	RESLT1	INOUT1			X
		RESNM1	X		
		COPCHR	X		
		OUTPT1	X		
I2DIS5	RESLT5	INOUT5			X
		RESNM5	X		
		COPCHR	X		
		OUTPT5	X		
I2DIS6	RESLT6	INOUT6			X
		HEDEAR	X		
		COPCHR	X		
		OUTPT6	X		
I2DIS7	RESLT7	INOUT7			X
		HEDEAR	X		
		COPCHR	X		
		OUTPT7	X		
I2DIS8	RESLT8	INOUT8			X
		RESNM8	X		
		COPCHR	X		
		OUTPT8	X		
I2DS10	RSLT10	IXOT10			X
		RXNM10	X		
		OXPT10	X		
I2DS12	RSLT12	IXOT12			X
		RXNM12	X		
		OXPT12	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
IBEGIN	OUTCOM	READ1		X	
		READ2	X		
		PRINT		X	
IBDSTB	M2	INPM2			X
		WBNDRY	X		
IBINUM	METOUT	DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
IBINUM	SAVMET	READ2		X	
		DO1CDF	X		
		PRINT	X		
IC	IPOINT	CGET1		X	X
		DOCCDF		X	X
		IGET1		X	X
		LGET1		X	X
		RGET1		X	X
ICRTRO	ICRTRO	OPNERL		X	
		CHRNDF	X		
IDAUGT	DAUTR	BLDTBL		X	
		GNDRES	X		
IDAY	METOUT	WBNMET		X	
		DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		ADJTIM		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		CHROUT	X		
		STOCHR	X		
IDAY	SAVMET	READ2		X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
IDBSTB	M2	CONMET	X		
IDCF	DCFACT	EDCINP		X	
		INOUT2	X		
		INOUT6	X		
		EPCALC	X		
IDEBUG	ATMOPT	INPOPT		X	
		DAYHOU	X		
		RANSAM	X		
		WSAMPL	X		
		BINSAM	X		
		ATMOUT	X		
IDIR	INDXS	CRNRSK		X	
		EMRGPH	X		
		INTRPH	X		
		LTPROJ	X		
		LTMACT	X		
		CSTEFF	X		
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
IDIREC	ATMDAT	CONTRL		X	
		EPCALC	X		
IDNTFI	IDNTFI	INPOPU		X	
		CMPTBL	X		
		SDFINP		X	
		CXPTBL	X		
IDOSE3	RESLT3	INOUT3		X	
		RESNM3	X		
		OUTPT3	X		
IDRB	DIRB	WBNMET		X	
		WNDRZB	X		
IDRBIN	METB	WBNMET		X	
		WNDRZB	X		
		BINSAM	X		
		WRANBN	X		
IECOD1	RESLT1	INOUT1		X	
		COPCHR	X		
		OUTPT1	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
IECOD4	RESLT4	INOUT4		X	
		COPCHR	X		
		OUTPT4	X		
IECOD7	RESLT7	INOUT7		X	
		COPCHR	X		
		OUTPT7	X		
IECOD8	RESLT8	INOUT8		X	
		COPCHR	X		
		OUTPT8	X		
IEVACU	GLOBAL	INEVAC		X	
		OPNERL	X		
IFF	IFF	MACCS		X	
		RANDOM		X	
IGDCF	DCFACT	EDCINP		X	
		EPCALC	X		
IGROUP	ISOGRP	INPISO			X
		INPREL	X		
		BLDTBL	X		
		ATMOUT	X		
IHITIT	IHITIT	EPCALC		X	
		ESTAT	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT1	X		
		OUTPT2	X		
		OUTPT5	X		
		OUTPT8	X		
		CRNRSK	X		
		LOKSEE	X		
		OXTPT1	X		
		OXTPT5	X		
		OXTPT8	X		
		OXTPT9	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
IHOUR	METOUT	DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		ADJTIM		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
IHOUR	SAVMET	READ2		X	
IHRDIR	M5	INPM5			X
		USRSUP	X		
IHRSTB	M5	INPM5			X
		USRSUP	X		
INDEX3	RESLT3	INOUT3		X	
		RESNM3	X		
		OUTPT3	X		
INDEX5	RESLT5	INOUT5		X	
		RESNM5	X		
		COPCHR	X		
		OUTPT5	X		
INDEX6	RESLT6	INOUT6		X	
		RESNM6	X		
		COPCHR	X		
		OUTPT6	X		
INDORG	RELOCA	INPEMR		X	
		OPNERL	X		
		EPCALC	X		
		RELZON	X		
INDREG	INDREG	SDFINP		X	
		STGRDA		X	
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
		ECCGET	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
INDWTR	INDWTR	SDFINP		X	
		STGRDA		X	
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
INDXAC	ACANCR	INACAN		X	
		CANRIS	X		
INDXBN	M4	INPM4			X
		WBNMET	X		
INDXCA	CCANCR	OPNERL		X	
		CASGET	X		
		OXTPT4	X		
		OXTPT7	X		
INDXEF	EFATAL	INEFAT		X	
		FATRIS	X		
INDXEI	EINJUR	INEINJ		X	
		INJRIS	X		
INIEVA	NETWOR	INEVAC		X	
		EVRADI	X		
		EVNETW	X		
		EVROOT	X		
		INPEMR	X		
INTRVL	INDXS	CRNRSK		X	
		EMRGPH	X		
		INTRPH	X		
		LTPROJ	X		
		LTMACT	X		
		CSTEFF	X		
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
INWGHT	M4	INPM4			X
		WBNMET	X		
IPATHW	RESLT6	INOUT6		X	
		RESNM6	X		
		COPCHR	X		
		OUTPT6	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
IPLUME	GLOBAL	INMISC		X	
		INOUT6	X		
		INOUT7	X		
		OPNERL	X		
		HEDEAR	X		
		HEDCHR	X		
		EAROUT	X		
		EPCALC	X		
		RELZON	X		
		ESTAT	X		
		EMOVE	X		
		INCREM	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT1	X		
		OUTPT2	X		
		OUTPT3	X		
		OUTPT5	X		
		OUTPT6	X		
		OUTPT7	X		
		OUTPT8	X		
		CHROUT	X		
		CRNRSK	X		
		INITLZ	X		
		OXTPT1	X		
		OXTPT4	X		
		OXTPT5	X		
		OXTPT6	X		
		OXTPT7	X		
		OXTPT8	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		
IPNT	INPRC2	INPBEG		X	
		CGET1	X		
		DOCCDF	X		
		IGET1	X		
		LGET1	X		
		RGET1	X		
		SEARCH	X		
		SORT		X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
IPOINT	IPOINT	CGET1		X	X
		DOCCDF		X	X
		IGET1		X	X
		LGET1		X	X
		RGET1		X	X
IPRINT	IPRINT	INMISC		X	
		EDCINP	X		
		EAROUT	X		
		EGEOM	X		
		EPCALC	X		
		ESTAT	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
IRAND	METB	BINSAM		X	
		WRANBN		X	
IRESID	OUTCOM	READ1		X	
		READ2	X		
		PRINT	X		
IRNRAT	M4	INPM4		X	
		WBNMET	X		
IRSEED	M4	INPM4		X	
		RANDOM	X		
ISECON	METOUT	MACCS		X	
		DAYHOU	X		
		RANSAM	X		
		ADJTIM		X	
		BINSAM	X		
		CONTRL	X		
ISRCTM	SRCTRM	INPUT		X	
		MACCS		X	
		INPREL	X		
		PUTSTM	X		
		GETSTM	X		
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
		OUTPUT		X	
		PRINT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
ISTAB	METDAT	USRSUP		X	
		CONMET		X	
		WBNDRY		X	
		WSAMPL			X
		ATMOUT	X		
ISTRDY	M3	INPM3		X	
		DAYHOU	X		
		USRSUP	X		
		CONMET	X		
ISTRHR	M3	INPM3		X	
		DAYHOU	X		
		USRSUP	X		
		CONMET	X		
ISTRTG	STRTGY	INPUT		X	
		INEVAC	X		
		PUTSTG	X		
		CONTRL		X	
		EAROUT	X		
		STOEAR	X		
		READ1		X	
ITRIAL	METOUT	DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
IUNIT	IUNIT	READ1		X	
		READ2	X		
IWGHT	METB	WBNMET		X	
		BINSAM	X		
		WRANBN	X		
IWINDT	DOSFAC	EPCALC		X	
		RELZON	X		
		ESTAT	X		
		EMOVE	X		
		INCREM	X		
		WGCPLN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
IX1DS1	IXOUT1	COPCHR		X	
		OXTPT1	X		
IX1DS4	IXOUT4	COPCHR		X	
		OXTPT4	X		
IX1DS5	IXOUT5	COPCHR		X	
		OXTPT5	X		
IX1DS6	IXOUT6	COPCHR		X	
		OXTPT6	X		
IX1DS7	IXOUT7	COPCHR		X	
		OXTPT7	X		
IX1DS8	IXOUT8	COPCHR		X	
		OXTPT8	X		
IX1DS9	RESLT9	IXOT9			X
		RXSMN9	X		
		OXTPT9	X		
IX2DS1	IXOUT1	COPCHR		X	
		OXTPT1	X		
IX2DS5	IXOUT5	COPCHR		X	
		OXTPT5	X		
IX2DS6	IXOUT6	COPCHR		X	
		OXTPT6	X		
IX2DS7	IXOUT7	COPCHR		X	
		OXTPT7	X		
IX2DS8	IXOUT8	COPCHR		X	
		OXTPT8	X		
IX2DS9	RESLT9	IXOT9			X
		RXSNM9	X		
		OXTPT9	X		
IXCOD1	IXOUT1	COPCHR		X	
		OXTPT1	X		
IXCOD4	IXOUT4	COPCHR		X	
		OXTPT4	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
IXCOD7	IXOUT7	COPCHR		X	
		OXTPT7	X		
IXCOD8	IXOUT8	COPCHR		X	
		OXTPT8	X		
IXCOD9	RESLT9	IXOT9		X	
		RXSNM9	X		
		OXTPT9	X		
IXDEX5	IXOUT5	COPCHR		X	
		OXTPT5	X		
IXDEX6	IXOUT6	COPCHR		X	
		OXTPT6	X		
IXPATH	IXOUT6	COPCHR		X	
		OXTPT6	X		
JDAY	CDATE	WINCTM		X	
		WGTMET	X		
JHOUR	CDATE	WINCTM		X	
		WGTMET	X		
KCEPNT	KPRINT	INCHRN		X	
		DIRDEP	X		
		EMRGPH	X		
		INTRPH	X		
		LTMACT	X		
		CSTDCN	X		
		LTACUM	X		
KDAY	CDATE	DAYHOU		X	
		RANSAM		X	
		WSAMPL	X		
		BINSAM		X	
KDFPNT	KPRINT	INCHRN		X	
		GNDRES	X		
KDTPNT	KPRINT	INCHRN		X	
		DIRDEP	X		
KGCPNT	KPRINT	INCHRN		X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
KHOUR	CDATE	DAYHOU		X	
		RANSAM		X	
		WSAMPL	X		
		BINSAM		X	
KLTPNT	KPRINT	INCHRN		X	
		TRFRCT	X		
KRAIN	IRAIN	WBNMET		X	
KSWDSC	KOPRNT	INCHRN		X	
		CRNRSK	X		
KSWRSK	KOPRNT	INCHRN		X	
KTDPNT	KKPRNT	INCHRN		X	
		EXCINP	X		
KTRPNT	KKPRNT	INCHRN		X	
KWTPNT	KPRINT	INCHRN		X	
		WTRTRF	X		
LAMBDA	ISOGRP	INPISO		X	
		EDCINP	X		
		GNDRES	X		
		WTRTRF	X		
		DECAY	X		
		DIRDEP	X		
LASEMR	LASEMR	RELZON		X	
		ESTAT	X		
LASEVA	NETWOR	INEVAC			X
		EVROOT	X		
		INPEMR	X		
		RELZON	X		
		ESTAT	X		
		EMOVE	X		
LASHE1	SRZONE	INPEMR		X	
		PUTSTG		X	
		RELZON	X		
		ESTAT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
LASHE2	SRZONE	INPEMR		X	
		RELZON	X		
		ESTAT	X		
LASMOV	NETWOR	INEVAC		X	
		EVRADI	X		
		EVNETW	X		
		EVROOT	X		
		PUTSTG		X	
		EMOVE	X		
LIMSP1	METDAT	WBNDRY		X	
		ATMOUT	X		
LIMSPA	M2	INPM2		X	
		CONMET		X	
		WBNDRY	X		
LRACTN	LRACTN	INITLZ		X	
		LTPROJ		X	
		CSTEFF	X		
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
LTACTN	LTACTN	INITLZ		X	
		LTMACT		X	
		CSTEFF		X	
		LTACUM	X		
		LOKSEE	X		
		ECCGET	X		
		GETIMP	X		
LVELDC	LTACTN	INITLZ		X	
		LTMACT		X	
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
LVLDEC	DECMOD	INCHRN		X	
		LTMACT	X		
		LTACUM	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
MACHIN	MACHIN	MXXETC		X	
		MXXCPU	X		
		MXXCLK	X		
		MXXDAT	X		
MAXDIR	MAXOCU	READ2		X	
		DO1CDF		X	
MAXFIN	DOSFAC	EGEOM		X	
		EPCALC	X		
		INCDOS	X		
		INCREM	X		
		SGCPLN	X		
		WGCPLN	X		
MAXGRP	ISOGRP	INPISO		X	
		INPREL	X		
		ATMOUT	X		
MAXNRS	MAXNRS	HEDEAR		X	
		HEDCHR	X		
		READ1	X		
MAXRIS	ATMDAT	INPREL		X	
		PUTSTM	X		
		GETSTM		X	
		ADJTIM	X		
		EPCALC	X		
MAXTRI	MAXOCU	READ2		X	
		DO1CDF		X	
		PRINT	X		
MEND	ORGNDX	CHRNDF		X	
		GNDRES	X		
METCOD	M1	MACCS	X		
		INPMET	X		
		INPM1		X	
		INPM4	X		
		INMISC	X		
MONTHS	METDTA	WRDMET		X	
		WBNMET	X		
		WGTMET	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
MRAIN	IRAIN	WRDMET		X	
		WGTMET	X		
		BINSAM	X		
MSTRT	ORGNDX	CHRNDF		X	
		GNDRES	X		
NAMCRP	NAMCRP	STPATH		X	
		SDFINP	X		
		DIRDEP	X		
NAMWPI	NAMWPI	STPATH		X	
		RDISTB	X		
		SDFINP	X		
		EXCINP	X		
NBIN	METB	INPM4		X	
		WBNMET	X		
		WNDRZB	X		
		WRANBN	X		
NBLANK	INPRC3	INPBEG		X	
NCHANG	INPRC3	INPBEG		X	
NCHRFL	NCHRFL	OUTCON		X	
		READ1		X	
NCMMNT	INPRC3	INPBEG		X	
NDPLCT	INPRC3	INPBEG		X	
NDXFII	FDINGM	EXCINP		X	
		DIRDEP	X		
		WTRTRF	X		
		LTPROJ	X		
		LTACUM	X		
NEND	NUMGRD	CHRINP		X	
		SGCPLN	X		
NEXTND	NETWOR	EVRADI		X	
		EVNETW		X	
		EVROOT	X		
		EMOVE	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
NFICRP	FDINGM	STPATH		X	
		RDISTB	X		
		SDFINP	X		
		TRFRCT	X		
		DIRDEP	X		
NFIISO	FDINGM	STPATH		X	
		RDISTB	X		
		EXCINP	X		
		TRFRCT	X		
		DIRDEP	X		
		LTPROJ	X		
		LTACUM	X		
NFILES	OUTCOM	READ1		X	
		READ2	X		
		PRINT	X		
NGWTRM	GSWTHR	INCHRN		X	
		CHRNDF	X		
NINC	NUMGRD	CHRINP		X	
		WGCPLN	X		
NINCM1	NUMGRD	CHRINP		X	
		SGCPLN	X		
		WGCPLN	X		
NMRGN	NAMRGN	SDFINP		X	
		STGRDA		X	
NPSGRP	DRYCON	INPDRY		X	
		INPREL	X		
		ATMOUT	X		
NREC	INPRC3	INPBEG		X	
		INPEND	X		
		SEARCH	X		
		SORT	X		
NRECT	INPRC3	INPBEG		X	
NRINTN	M4	INPM4		X	
		WBNMET	X		
NRNINT	M4	INPM4		X	
		WBNMET	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
NROOTS	ROOTS	EVRADI		X	
		EVROOT		X	
		PUTSTG		X	
		EMOVE	X		
NRWTRM	REWTHR	INCHRN		X	
		CHRNDF	X		
NSBINS	M4	INPM4		X	
		WBNMET	X		
NSMPLS	M4	INPM4		X	
		WBNMET	X		
		RANSAM	X		
NSRCTM	SRCTRM	INPUT		X	X
		MACCS	X		
		PUTSTM	X		
		GETSTM	X		
		OUTPUT	X		
		PRINT	X		
NSTRTG	STRTGY	INPUT		X	X
		PUTSTG	X		
		CONTRL	X		
		READ1	X		
		READ2	X		
		PRINT	X		
NTOT	METB				
NTRMNT	INPRC3	INPBEG		X	
NTTRM	CRPTRF	STPATH		X	
		DIRDEP	X		
NUCNAM	ISONAM	INPISO		X	
		INPREL	X		
		INPOPT	X		
		EDCINP	X		
		STPATH	X		
		EXCINP	X		
		ATMOUT	X		
NUCOUT	ATMOPT	INPOPT		X	
		ATMOUT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
NUM1	RESLT1	INOUT1		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT1	X		
NUM2	RESLT2	INOUT2		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT2	X		
NUM3	RESLT3	INOUT3		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT3	X		
NUM4	RESLT4	INOUT4		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT4	X		
NUM5	RESLT5	INOUT5		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT5	X		
NUM6	RESLT6	INOUT6		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT6	X		
NUM7	RESLT7	INOUT7		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT7	X		
NUM8	RESLT8	INOUT8		X	
		HEDEAR	X		
		COPCHR	X		
		OUTPT8	X		
NUMACA	ACANCR	INACAN		X	
		INOUT1	X		
		INOUT4	X		
		INOUT7	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
		INOUT8	X		
		OPNERL	X		
		CANRIS	X		
		EFFGET	X		
		OUTPT4	X		
		OUTPT7	X		
NUMCNC	CCANCR	OPNERL		X	
		CASGET	X		
		OXTPT4	X		
		OXTPT7	X		
NUMCOR	GLOBAL	MACCS		X	
		INMISC	X		
		INPOPU	X		
		EVRADI	X		
		EVNETW	X		
		EVROOT	X		
		CHRINP	X		
		OPNERL	X		
		SDFINP	X		
		CKINDX	X		
		STGRDA	X		
		HEDEAR	X		
		HEDCHR	X		
		EAROUT	X		
		EGEOM	X		
		EPCALC	X		
		RELZON	X		
		ESTAT	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT1	X		
		OUTPT2	X		
		OUTPT3	X		
		OUTPT4	X		
		OUTPT5	X		
		OUTPT8	X		
		WGCPLN	X		
		CRNRSK	X		
		INITLZ	X		
		OXTPT1	X		
				O X T P T 4	X

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
		OXTPT5	X		
		OXTPT6	X		
		OXTPT7	X		
		OXTPT8	X		
		OXTPT9	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		
NUMEFA	EFATAL	INEFAT		X	
		INOUT1	X		
		INOUT4	X		
		INOUT7	X		
		INOUT8	X		
		FATRIS	X		
NUMEIN	EINJUR	INEINJ		X	
		INOUT1	X		
		INOUT4	X		
		INOUT7	X		
		INOUT8	X		
		INJRIS	X		
		EFFGET	X		
		OUTPT4	X		
		OUTPT7	X		
NUMFIN	GLOBAL	INMISC		X	
		CHRINP	X		
		EAROUT	X		
		EGEOM	X		
		EPCALC	X		
		RELZON	X		
		INCDOS	X		
		EMOVE	X		
		ZERREM	X		
		INCREM	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT2	X		
		OUTPT3	X		
		OUTPT5	X		
		SGCPLN	X		
		WGCPLN	X		
NUMFNT	NUMGRD	CHRINP		X	
		WGCPLN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
NUMISO	GLOBAL	INPISO		X	
		INPREL	X		
		INPOPT	X		
		EDCINP	X		
		STPATH	X		
		EXCINP	X		
		BLDTBL	X		
		GNDRES	X		
		ATMOUT	X		
		DECAY	X		
		EPCALC	X		
		SGCPLN	X		
		WGCPLN	X		
		INTRPH	X		
		LTPROJ	X		
		LTMACT	X		
		CSTDCN	X		
		LTACUM	X		
NUMORG	GLOBAL	INORGA		X	
		EDCINP	X		
		INPEMR	X		
		INEFAT	X		
		INEINJ	X		
		INACAN	X		
		INOUT3	X		
		INOUT5	X		
		INOUT6	X		
		OPNERL	X		
		EAROUT	X		
		EPCALC	X		
		CENACU	X		
		EDOSIN	X		
		INCDOS	X		
		EMOVE	X		
		ZERREM	X		
		INCREM	X		
NUMPAG	NUMPAG	OUTPUT		X	
		PRINT	X		
NUMRAD	GLOBAL	INPGEO		X	
		INPM2	X		
		INPM4	X		
		INEVAC	X		
		INPOPU	X		
		INPEMR	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
		INOUT1	X		
		INOUT4	X		
		INOUT5	X		
		INOUT6	X		
		INOUT7	X		
		INOUT8	X		
		IXOT9	X		
		IXOT10	X		
		IXOT12	X		
		SDFINP	X		
		CKINDX	X		
		STGRDA	X		
		ATMOUT	X		
		EAROUT	X		
		EGEOM	X		
		EPCALC	X		
		RELZON	X		
		ESTAT	X		
		EMOVE	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT2	X		
		OUTPT3	X		
		SGCPLN	X		
		WGCPLN	X		
		CRNRSK	X		
		INITLZ	X		
		LOKSEE	X		
		OXTPT1	X		
		OXTPT8	X		
		OXPT11	X		
NUMREL	GLOBAL	INPREL		X	
		CONTRL	X		
		EGEOM	X		
		EPCALC	X		
		RELZON	X		
		ESTAT	X		
		EMOVE	X		
		SGCPLN	X		
		WGCPLN	X		
NUMRES	NUMRES	HEDEAR		X	
		HEDCHR	X		
		READ1		X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
		READ2	X		
		PRINT	X		
NUMTRI	GLOBAL	DAYHOU		X	
		WBNMET		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		READ2	X		
NUMVAL	NUMVAL	HEDEAR		X	
		COPCHR	X		
		OUTPT1	X		
		OUTPT3	X		
		OUTPT5	X		
		OUTPT8	X		
		READ1		X	
		READ2	X		
		DO1CDF	X		
NUMWPA	WATRM	STPATH		X	
		SDFINP	X		
		WTRTRF	X		
		LTACUM	X		
NUMWPI	WATRM	STPATH		X	
		SDFINP	X		
		WTRTRF	X		
		LTACUM	X		
NXMORG	NXMORG	OPNERL		X	
		IXOT9	X		
		EXCINP	X		
		CHRNDF	X		
		TRFRCT	X		
		WTRTRF	X		
		COPCHR	X		
		DIRDEP	X		
		INITLZ	X		
		INTRPH	X		
		CSTEFF	X		
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
		CASGET	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
NXMRES	NXMRES	COPCHR		X	
		HEDCHR		X	
		READ1	X		
NXMVAL	NXMVAL	COPCHR		X	
		HEDCHR		X	
		OXTPT5	X		
		OXTPT8	X		
		OXTPT9	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		
		READ1	X		
NXUM1	IXOUT1	COPCHR		X	
		OXTPT1	X		
NXUM4	IXOUT4	COPCHR		X	
		OXTPT4	X		
NXUM5	IXOUT5	COPCHR		X	
		OXTPT5	X		
NXUM6	IXOUT6	COPCHR		X	
		OXTPT6	X		
NXUM7	IXOUT7	COPCHR		X	
		OXTPT7	X		
NXUM8	IXOUT8	COPCHR		X	
		OXTPT8	X		
NXUM9	RESLT9	IXOT9		X	
		HEDCHR	X		
		OXTPT9	X		
NXUM10	RSLT10	IXOT10		X	
		HEDCHR	X		
		OXPT10	X		
NXUM11	RSLT11	IXOT11		X	
		HEDCHR	X		
		OXPT11	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
NXUM12	RSLT12	IXOT12		X	
		HEDCHR	X		
		OXPT12	X		
OALARM	ATMDAT	INPREL		X	
		PUTSTM	X		
		GETSTM		X	
		ESTAT	X		
		EMOVE	X		
ORGNAM	ORGNAM	INORGA		X	
		EDCINP	X		
		INPEMR	X		
		INEFAT	X		
		INEINJ	X		
		INACAN	X		
		INOUT3	X		
		INOUT5	X		
		INOUT6	X		
		OPNERL	X		
		RESNM3	X		
		RESNM5	X		
		RESNM6	X		
		COPCHR	X		
		EAROUT	X		
		EPCALC	X		
		INJRIS	X		
OVRRID	ROTATE	INMISC		X	
		OPNERL	X		
OXGNAM	OXGNAM	OPNERL		X	
		IXOT9	X		
		EXCINP	X		
		COPCHR	X		
		RXSNM9			
		LOKSEE	X		
PARENT	ISOGRP	INPISO		X	
		BLDTBL	X		
		DECAY	X		
PATHNM	PATHNM	EARINP		X	
		INOUT6	X		
PCF	DOSFAC	EPCALC		X	
		EDOSIN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
PDELAY	MULREL	INPREL			X
		ADJTIM	X		
		CONTRL	X		
		ATMOUT	X		
PGF168	DOSFAC	EPCALC		X	
		EDOSIN	X		
PGPF	DOSFAC	EPCALC		X	
		EDOSIN	X		
PI	PHYCON	MACCS		X	
		INPOPU	X		
		STGRDA	X		
		ATMOUT	X		
		EMOVE	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
		OUTPT1	X		
		OUTPT3	X		
		OUTPT4	X		
		OUTPT5	X		
		OUTPT8	X		
		OXTPT1	X		
		OXTPT4	X		
		OXTPT5	X		
		OXTPT8	X		
		OXTPT9	X		
		OXPT10	X		
		OXPT11	X		
		OXPT12	X		
PID	EDOSES	EDOSIN		X	
		CENACU	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
PIF	DOSFAC	EPCALC		X	
		EDOSIN	X		
PLHEAT	MULREL	INPREL			X
		PUTSTM	X		
		GETSTM		X	
		ATMOUT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
PLHITE	MULREL	INPREL			X
		ATMOUT	X		
PLUDUR	MULREL	INPREL			X
		CONTRL	X		
		ATMOUT	X		
PNZERO	PNZERO	READ2		X	
		DO1CDF		X	
		PRINT	X		
POPCST	SITEDT	INCHRN		X	
		CSTEFF	X		
		ECCGET	X		
POPDAT	POPDAT	INPOPU		X	
		EFFGET	X		
		OUTPT3	X		
		OUTPT5	X		
		OUTPT8	X		
		CASGET	X		
		OXTPT5	X		
		OXTPT8	X		
		DOSGET	X		
		ECCGET	X		
		GETIMP	X		
POPFLG	POPFLG	INPOPU		X	
		OPNERL	X		
PRBMET	METOUT	DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
PRBMET	SAVMET	READ2		X	
		GETIMP	X		
PROTIN	EADFAC	INDFAC		X	
		OPNERL	X		
		EDOSIN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
PRSF	DOSFAC	EPCALC		X	
		EDOSIN	X		
PSCMLK	PSCDIR	STPATH			X
		LTPROJ	X		
PSCOTH	PSCDIR	STPATH			X
		LTPROJ	X		
PSDIST	MULREL	INPREL			X
		ATMOUT	X		
PSF	DOSFAC	EPCALC		X	
		EDOSIN	X		
QROOT	RTINTR	STPATH			X
		LTPROJ	X		
		LTACUM	X		
RDF	DOSFAX	EXCINP		X	
		CHRNDF	X		
RDISTS	M4	INPM4		X	X
		WBNMET	X		
REDOSE	REUSE1	INITLZ		X	
		INTRPH		X	
		LTACUM		X	
		LOKSEE	X		
		OXTPT6	X		
		DOSGET	X		
REFTIM	MULREL	INPREL			X
		CONTRL	X		
		ATMOUT	X		
RELCST	ERLCST	INCHRN		X	
RELINV	MULREL	INPREL		X	
		ATMOUT	X		
RESCON	DOSFAC	INDFAC		X	
		EDOSIN	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
RESID	EDOSES	EDOSIN		X	
		CENACU	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
RESLAM	DOSFAC	INDFAC		X	
		EDOSIN	X		
RESNAM	RESNAM	HEDEAR		X	
		COPCHR	X		
		READ1		X	
		PRINT	X		
RETCOD	RETCOD	RELZON		X	
		ESTAT		X	
		EMRGPH	X		
		LOKSEE	X		
RINHL	REWTHR	OPNERL		X	
		CHRNDF	X		
RISCAT	RISCAT	INMISC		X	
		PRINT	X		
RISFAT	RISFAT	EAROUT		X	
		FATRIS		X	
		CANRIS	X		
		OUTPT2	X		
RISINJ	RISINJ	INJRIS		X	
		EFFGET	X		
		OUTPT4	X		
RISTHR	RESLT2	INOUT2			X
		RESNM2	X		
		OUTPT2	X		
RLCOST	ERLCST	INCHRN		X	
		ECCGET	X		
RMDOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		DOSGET	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
RNMM	METDAT	USRSUP		X	
		CONMET		X	
		WBNDRY		X	
		WSAMPL			X
		ATMOUT	X		
RNRATE	M4	INPM4		X	X
		WBNMET	X		
RODOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		DOSGET	X		
ROOT	ROOTS	EVRADI		X	
		EVROOT		X	
		EMOVE	X		
ROSE	METDTA				
ROSEBI	ROSEBI	WNDRZB		X	
		INMISC		X	
		OPNERL	X		
		DO1CDF	X		
RPF	REWTHR	OPNERL		X	
RWCOEF	REWTHR	INCHRN			X
		CHRNDF	X		
RXSNAM	RXSNAM	COPCHR		X	
		HEDCHR		X	
		READ1	X		
SCLADP	PLUMRS	INPLRS		X	
		PLMRIS	X		
SCLCRW	PLUMRS	INPLRS		X	
		CAUGHT	X		
SCLEFP	PLUMRS	INPLRS		X	
		PLMRIS	X		
SDCF	DCFACT	EDCINP		X	
		EPCALC	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
SDD	EDOSES	EDOSIN		X	
		CENACU	X		
		INCDOS	X		
		EMOVE	X		
		INCREM	X		
SDV	DCFACT	EDCINP		X	
		EPCALC	X		
SHELT1	SRZONE	INPEMR		X	
		ESTAT	X		
SHELT2	SRZONE	IMPEMR		X	
		ESTAT	X		
SIGMAY	DOSFAC	EPCALC		X	
		EMOVE	X		
SIGYM	ATMDAT	ATMOUT		X	
		EGEOM	X		
		EPCALC	X		
SIGZM	ATMDAT	ATMOUT		X	
		EGEOM	X		
SKPFAC	EADFAC	INDFAC			X
		EDOSIN	X		
SPACE	METB	WRANBN		X	
SPACEN	GLOBAL	INPGEO		X	
		INPOPU	X		
		EVRADI	X		
		ATMOUT	X		
		EAROUT	X		
		EGEOM	X		
		EPCALC	X		
		EMOVE	X		
		FATRIS	X		
		INJRIS	X		
		CANRIS	X		
SPAEND	GLOBAL	INPGEO		X	X
		INPM4	X		
		INPOPU	X		
		SDFINP	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
		STGRDA	X		
		DIST1	X		
		ATMOUT	X		
		OUTPT2	X		
		OXPT11	X		
SPALEN	GLOBAL	INPGEO		X	
		ATMOUT	X		
SQR2PI	PHYCON	MACCS		X	
		EGEOM	X		
		ATMOUT	X		
		EMOVE	X		
SQRHPI	PHYCON	MACCS		X	
		ATMOUT	X		
T1DOSE	REUSE1	EAROUT		X	
		INCDOS		X	
		EMOVE		X	
		ZERREM		X	
		INCREM		X	
		FATRIS	X		
		INJRIS	X		
		OUTPT3	X		
T2DOSE	REUSE1	EAROUT		X	
		RELZON	X		
		INCDOS		X	
		EMOVE		X	
		ZERREM		X	
		INCREM		X	
		CANRIS	X		
		OUTPT3	X		
		OUTPT5	X		
TCROOT	TRCMPL	STPATH			X
		TRFRCT	X		
TDECON	TDECON	LTPROJ		X	
		LTMACT		X	
		CSTEFF	X		
		LTACUM	X		
TFBF	ISOTDT	STPATH			X
		TRFRCT	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
TFLBPT	LTFCTR	TRFRCT		X	
TFLCPT	LTFCTR	TRFRCT		X	
TFLMLK	LONGTF	TRFRCT		X	
		LTACUM	X		
TFLMPT	LTFCTR	TRFRCT		X	
TFLOTH	LONGTF	TRFRCT		X	
		LTACUM	X		
TFLPD	WTRDAT	WTRTRF		X	
		LTACUM	X		
TFLPW	WTRDAT	WTRTRF		X	
		LTACUM	X		
TFMLK	ISOTDT	STPATH			X
		TRFRCT	X		
TFWKF	DECMOD	INCHRN			X
		CSTDCN	X		
TFWKNF	DECMOD	INCHRN			X
		CSTDCN	X		
TGSBEG	CRPTIM	STPATH			X
		SDFINP		X	
		DIRDEP	X		
TGSEND	CRPTIM	STPATH			X
		SDFINP		X	
		DIRDEP	X		
TGWHLF	GSWTHR	INCHRN			X
		CHRNDF	X		
THRVST	CRPTIM	STPATH			X
		SDFINP		X	
		LTPROJ	X		
		LTACUM	X		
TIMACC	CRPTIM	CHROUT		X	
		DIRDEP	X		
		LTPROJ	X		
		LTACUM	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
TIMBAS	EXPAND	INPEXP		X	
		CONTRL	X		
TIMCEN	ATMDAT	ATMOUT		X	
		EPCALC	X		
TIMDEC	DECMOD	INCHRN			X
		CHRNDF	X		
		LTMACT	X		
		CSTDCN	X		
		LTACUM	X		
TIMHOT	RELOCA	INPEMR		X	
		OPNERL	X		
		RELZON	X		
		EMRGPH	X		
TIMNRM	RELOCA	INPEMR		X	
		OPNERL	X		
		RELZON	X		
		EMRGPH	X		
TIMOVH	ATMDAT	ATMOUT		X	
		EPCALC	X		
TINTRD	DOSTIM	CHRNDF		X	
		LTMACT	X		
		LTACUM	X		
TMEPND	DOSTIM	OPNERL		X	
		INCHRN	X		
		CHRNDF	X		
		INTRPH	X		
TMIPND	DOSTIM	INCHRN		X	
		CHRNDF	X		
TMPACT	DOSTIM	INCHRN		X	
		CHRNDF	X		
TRMDRL	DCCOST	INITLZ		X	
		CSTEFF		X	
		CSTDCN		X	
		LOKSEE	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
TRMEVA	TERMS	INITLZ		X	
		EMRGPH		X	
		LOKSEE	X		
		ECCGET	X		
TRMIRL	ITERMS	INITLZ		X	
		INTRPH		X	
		LOKSEE	X		
		ECCGET	X		
TRMREL	TERMS	INTILZ		X	
		EMRGPH		X	
		LOKSEE	X		
		ECCGET	X		
TRWHLF	REWTHR	INCHRN			X
		CHRNDF	X		
TSEEDG	CRPTIM	STPATH		X	
		SDFINP		X	
		LTPROJ	X		
		LTACUM	X		
TSTART	DOSFAC	EPCALC		X	
		RELZON	X		
		ESTAT	X		
		EDOSIN	X		
TSTOP	DOSFAC	EPCALC		X	
		EDOSIN	X		
TTOSH1	SRZONE	INPEMR		X	
		ESTAT	X		
TTOSH2	SRZONE	IMPEMR		X	
		ESTAT	X		
TWOPI	PHYCON	MACCS		X	
		EGEOM	X		
		EMOVE	X		
UNFSWT	UNFSWT	CHRINP	X		
		OPNERL		X	
		STGRDA	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
VALWF	SITEDT	INCHRN		X	
		STGRDA	X		
		CSTEFF	X		
VALWNF	SITEDT	INCHRN		X	
		STGRDA	X		
		CSTEFF	X		
VDEPOS	DRYCON	INPDRY			X
		ATMOUT	X		
VFRM	ECNDTA	SDFINP		X	
		STGRDA		X	
		ECCGET	X		
VNFRM	ECNDTA	SDFINP		X	
		STGRDA		X	
		ECCGET	X		
WDDOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
WETDEP	WETDRY	INPISO			X
		ATMOUT	X		
WINDIR	METDAT	USRSUP		X	
		CONMET		X	
		WBNDRY		X	
		WSAMPL			X
		CONTRL	X		
WINDSP	METDAT	USRSUP		X	
		CONMET		X	
		WBNDRY		X	
		WSAMPL			X
		ATMOUT	X		
WINGF	WTRDTA	STPATH			X
		SDFINP		X	
		WTRTRF	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified: Assignment	Value Modified: Argument
WINROS	ROTATE	INMISC			X
		OPNERL	X		
WSHFRI	WTRDTA	STPATH			X
		WTRTRF	X		
WSHRTA	WTRDTA	STPATH		X	X
		WTRTRF	X		
WTFRAC	WTFRAC	INEVAC		X	
		PUTSTG	X		
		READ2	X		
		PRINT	X		
WTNAME	WTNAME	INEVAC		X	
		READ2	X		
		PRINT	X		
WWDOSE	REUSE1	INITLZ		X	
		LTACUM		X	
		LOKSEE	X		
		CASGET	X		
		OXTPT5	X		
		DOSGET	X		
XPFAC1	EXPAND	INPEXP		X	
		CONTRL	X		
XPFAC2	EXPAND	INPEXP		X	
		CONTRL	X		
YSCALE	DISPY	INPDIS		X	
		FSGY	X		
ZSCALE	DISPZ	INPDIS		X	
		FSGZ	X		

3.6 COMMON Block Variable Definitions

In this section each variable and array found in either named or unnamed COMMON blocks is defined. When a variable or array is a component of a named COMMON block, the name of that COMMON block is indicated at the end of the definition.

ACFRSK - combined alpha dose effectiveness factors and cancer death risk factor for each cancer effect /CCANCR/

ACIRSK - combined alpha dose effectiveness factors and cancer injury risk factor for each cancer effect /CCANCR/

ACNAME - names of cancer effects that can result from acute exposure /ACNAME/

ACSUSC - fraction of the population which is susceptible to each cancer effect /ACANCR/

ACTHRE - dose threshold for using the linear dose response formula /ACANCR/

AGRNDC - average ground concentration of each nuclide in each coarse grid element /REUSE2/

AIRCON - time integrated air concentration at the plume height /ATMDAT/

ANGMAX - greatest value of halfwidth in radians of the plume over all spatial intervals /GLOBAL/

APDCLG - long-term groundshine dose accumulation after decontamination

APDCLR - long-term resuspension inhalation dose accumulation after decontamination

APDCWG - long-term groundshine dose accumulation for decontamination workers

APINLG - long-term groundshine dose accumulation after interdiction

APINLR - long-term resuspension inhalation dose accumulation after interdiction

APNOLG - long-term groundshine dose accumulation when no mitigative actions are taken

APNOLR - long-term resuspension inhalation dose accumulation when no mitigative actions are taken

AREA - area of each grid element /GRDDTA/

ASFP - average annual farm sales for each region /ECNDTA/

ATNAM1 - descriptive title for the ATMOS input /ATNAM1/

ATNAM2 - descriptive title for the particular single choice of assumptions being made about the plume /ATNAM2/

AVGHIT - average plume height over a given spatial interval /ATMDAT/

AVL168 - intermediate value used in interpolating the groundshine dose /DOSFAC/

BINAVG - accumulated mean consequence for each weather sampling bin /BINAVG/

BINMAG - consequence values for each bin of the CCDF table /REUSE2/

BINNED - flag indicating that the bin magnitudes have been generated /BINNED/

BINPRB - probabilities for each bin of the CCDF table /REUSE1/

BNDMXH - boundary weather mixing layer height in meters /M2/

BNDRAN - boundary weather rain rate /M2/

BNDWND - boundary weather wind speed /M2/

BRKPNT - break point for the expansion formula change /EXPAND/

BRRATE - breathing rate for the following:
- evacuees while moving
- normal activity in sheltering and evacuation zone
- sheltered activity

/EADFAC/

BUILDH - building width /BILWAK/

BUILDW - building height /BILWAK/

CANFAT - risk of cancer fatality from acute exposure in each coarse grid element /RISCAN/

CANINJ - risk of cancer injury for acute exposure in each coarse grid element /RISCAN/

CARD - input record

CCANFA - centerline risk of cancer fatality /CENCAN/

CCANIN - centerline risk of cancer injury /CENCAN/

CCDF - flag indicating whether a CCDF table is to be produced /CCDF/

CCDF1 - flag indicating that a CCDF table is being requested for a type 1 EARLY effect /RESLT1/

CCDF2 - flag indicating that a CCDF table is being requested for a type 2 EARLY effect /RESLT2/

CCDF3 - flag indicating that a CCDF table is being requested for a type 3 EARLY effect /RESLT3/

CCDF4 - flag indicating that a CCDF table is being requested for a type 4 EARLY effect /RESLT4/

CCDF5 - flag indicating that a CCDF table is being requested for a type 5 EARLY effect /RESLT5/

CCDF6 - flag indicating that a CCDF table is being requested for a type 6 EARLY effect /RESLT6/

CCDF7 - flag indicating that a CCDF table is being requested for a type 7 EARLY effect /RESLT7/

CCDF8 - flag indicating that a CCDF table is being requested for a type 8 EARLY effect /RESLT8/

CD - centerline cloudshine dose /EDOSES/

CDCF - cloudshine dose conversion factor for each nuclide-organ pair /DCFACT/

CDFRM - cost per unit area of farm decontamination for the various LVLDEC levels /DECMOD/

CDNFRM - cost per person of the nonfarm decontamination for the various LVLDEC levels /DECMOD/

CENCD - centerline cloudshine dose /CENDOS/

CENFAT - centerline risk of fatality /CENFAT/

CENGD - centerline groundshine dose /CENDOS/

CENINJ - centerline risk of injury /CENINJ/

CENPID - centerline plume inhalation cloudshine dose /CENDOS/

CENRES - centerline resuspension inhalation dose /CENDOS/

CENSKI - centerline skin deposition dose /CENDOS/

CFRISK - cancer death risk factor /ACANCR/

CHNAME - descriptive title for the CHRONC input file /CHNAME/

CIRISK - cancer injury risk factor /ACANCR/

CLDFAC - cloudshine correction factor for each fine spatial element /DOSFAC/

CLOC - temporary storage used during input processing

COHAVG - accumulated mean consequence value for a given result for a given cohort /COHAVG/

CONMAX - maximum consequence value observed for a given result for a given cohort /MAXOCU/

COUPLD - flag indicating the long-term and growing season mitigative actions are to be performed in a dependent fashion /COUPLD/

CRDFLG - flag for record accessed for value during input /INPRC2/

CRTOCR - critical organ name for the chronic resuspension pathway /CRTOCR/

CSFACT - cloudshine shielding factors for the following groups:
- evacuees while moving
- normal activity in sheltering and evaculation zone
- sheltered activity

/EADFAC/

CSTDF - cost of farm decontamination per unit area for each coarse grid element /DCCOST/

CSTDNF - cost of non-farm decontamination per person for each coarse grid element /DCCOST/

CSTIF - depreciation cost per unit area from the temporary interdiction of farm property in each coarse grid element /CSTINT/

CSTINF - depreciation cost per person from the temporary interdiction of non-farm property in each coarse grid element /CSTINT/

CSTLF - labor cost per unit area for the decontamination of farm property for each coarse grid element /DCCOST/

CSTLNF - labor cost per person for the decontamination of non-farm property for each coarse grid element /DCCOST/

CTCOEF - direct deposition transfer coefficients for the CHRONC ingestion model /CRPTRF/

CTHALF - direct deposition transfer half-lives for the CHRONC ingestion model /CRPTRF/

CWASH1 - washout coefficient number 1, linear factor /WETCON/

CWASH2 - washout coefficient number 2, exponential factor /WETCON/

CXDF9 - flag indicating that a CCDF table is being requested for the type 9 CHRONC result /RESLT9/

CXDF10 - flag indicating that a CCDF table is being requested for the type 10 CHRONC result /RSLT10/

CXDF11 - flag indicating that a CCDF table is being requested for the type 11 CHRONC result /RSLT11/

CXDF12 - flag indicating that a CCDF table is being requested for the type 12 CHRONC result /RSLT12/

CYSIGA - linear term of the expression for sigma-y for the six stability classes /DISPY/

CYSIGB - exponential term of the expression for sigma-y for the six stability classes /DISPY/

CZSIGA - linear term of the expression for sigma-z for the six stability classes /DISPZ/

CZSIGB - exponential term of the expression for sigma-z for the six stability classes /DISPZ/

DCYPBH - retention fractions for the nuclides in meat following losses due to processing and decay /ISOTDT/

DCYPCB - retention fractions for the nuclides in the crops for the time period between harvest and the time of consumption by dairy animals /ISOCRP/

DCYPCH - retention fractions for the nuclides in the crops for the time period between harvest and the time of consumption by man /ISOCRP/

DCYPCM - retention fractions for the nuclides in the crops for the time period between harvest the time of consumption by meat animals /ISOCRP/

DCYPMH - retention fractions for the nuclides in milk following losses due to processing and decay /ISOTDT/

DFING - ingestion dose factor for each nuclide /ISOORG/

DLBCST - labor cost of decontamination worker /DECMOD/

DMDOSE - direct deposition dose to each organ via milk from a given spatial grid element /REUSE1/

DODOSE - direct deposition dose to each organ via non-milk crops from a given spatial grid element /REUSE1/

DOSEFA - dose effectiveness factor alpha for cancer from acute exposure /ACANCR/

DOSEFB - dose effectiveness factor beta for cancer from acute exposure /ACANCR/

DOSHOT - hot spot relocation groundshine dose criterion threshold /RELOCA/

DOSNRM - normal relocation groundshine dose criterion threshold /RELOCA/

DOSTH3 - dose thresholds use for type 3 EARLY result /RESLT3/

DPF - fraction of the regional farm sales that comes from dairy products /ECNDTA/

DPFRCT - average fraction of farm sales resulting from dairy products in the economic region /FRCFRM/

DPRATE - depreciation rate during interdiction period /SITEDT/

DRYDEP - flag to indicate if dry deposition occurs for each nuclide /WETDRY/

DSCRLT - dose criterion for long-term phase relocation /DOSTIM/

DSCRTI - dose criterion for intermediate phase relocation /DOSTIM/

DSDXPS - direct exposure dose for a given organ in a given grid element /REUSE1/

DSFOOD - food ingestion dose for a given organ in a given grid element /REUSE1/

DSPCRP - flag indicating disposal of non-milk crops will occur /DSPFLG/

DSPMLK - flag indicating disposal of milk crop will occur /DSPFLG/

DSRATE - annual societal discount rate during interdiction period /SITEDT/

DSRFCT - dose reduction factors corresponding to various levels of decontamination /DECMOD/

DSWKF - dose to decontamination workers for farmland area in a given grid element /REUSE1/

DSWKNF - dose to decontamination workers for non-farm property in a given grid element /REUSE1/

DTACNT - bin count /CNTDTA/

DTFBP - direct transfer factor for meat dose to the population for each nuclide-crop-organ triplet /DTTRFT/

DTFBPT - direct transfer fraction for meat dose term /DTFRCT/

DTFCP - direct transfer factor for crop dose to the population for each nuclide-crop-organ triplet /DTTRFT/

DTFCPT - direct transfer fraction for crop dose term /DTFRCT/

DTFMLK - direct transfer factor for the milk pathway for each nuclide-organ pair /DIRCTF/

DTFMP - direct transfer factor for milk dose to the population for each nuclide-crop-organ triplet /DTTRFT/

DTFMPT - direct transfer fraction for milk dose term /DTFRCT/

DTFOTH - direct transfer factor for non-milk pathway for each nuclide-organ pair /DIRCTF/

EANAM1 - descriptive title for the EARLY input file /EANAM1/

EANAM2 - description of the emergency response scenario being used /EANAM2/

EDELAY - evacuation delay times for the three evacuation zones /NETWOR/

EFFACA - early fatality parameter alpha for all early fatalities /EFATAL/

EFFACB - early fatality parameter beta for all early fatalities /EFATAL/

EFFEC1 - total cases of the given type 1 (EARLY or CHRONC) health effect /EFFEC1/

EFFNM1 - name of the health effect associated with each type 1 EARLY effect /EFFNM1/

EFFNM4 - name of the health effect associated with each type 4 EARLY effect /EFFNM4/

EFFNM7 - name of the health effect associated with each type 7 EARLY effect /EFFNM7/

EFFNM8 - name of the health effect associated with each type 8 EARLY effect /EFFNM8/

EFFTHR - early fatality threshold dose /EFATAL/

EIFACA - early fatality hazard function alpha factors for all early injuries /EINJUR/

EIFACB - early fatality hazard function beta factors for all early injuries /EINJUR/

EINAME - names of early injuries defined in the model /EINAME/

EISUSC - susceptible population fraction table /EINJUR/

EITHRE - early injury dose threshold table /EINJUR/

ENDAT1 - flag to indicate that only the ATMOS module is to be run /STOPME/

ENDAT2 - flag to indicate that CHRONC will not be run /STOPME/

ENDEMP - duration of the emergency phase expressed in seconds from plume arrival /RELOCA/

EVACST - evacuation cost /ERLCST/

EVCOST - evacuation cost /ERLCST/

EXPFAC - expansion factor for a given plume segment /EXPFAC/

FATAVG - average risk of fatality in a given coarse grid element /RISFAT/

FMAREA - farm area in each spatial grid element /FRMDAT/

FPLSCH - retention fractions following processing and preparation of crop prior to consumption by man /ISOCRP/

FRACLD - fraction of the area in the region that is land /FRACLD/

FRCFRM - fraction of land in the region that is devoted to farming /FRCFRM/

FRCLND - total land fraction of each grid element /FRCLND/

FRCTCB - fraction of the crop consumed by meat animals /CROPDT/

FRCTCH - fraction of the crop consumed by man /CROPDT/

FRCTCM - fraction of the crop consumed by dairy animals /CROPDT/
FRCTFL - fraction of farmland in region devoted to that crop /CROPDT/

FRFDL - fraction of the farmland decontamination cost is due to labor for the various decontamination levels /DECMOD/

FRFIM - fraction of farm wealth of the region is due to improvements /SITEDT/

FRMFRC - regional farmland fraction /ECNDTA/

FRMPRD - average value of annual farm production in the region /FRCFRM/

FRNFDL - fraction of the non-farm decontamination cost which is due to labor for the various LVLDEC levels /DECMOD/

FRNFIM - fraction of the non-farm wealth of the region which is due to improvements /SITEDT/

GAULEV - average height of the Gaussian over all fine grid elements /DOSFAC/

GCMAXR - maximum permissible ground concentration for long-term ingestion model /RTINTR/

GD - centerline groundshine dose /EDOSES/

GDF - groundshine dose rate factor /DOSFAX/

GRDCF - groundshine dose conversion factor /DCFACT/

GRNCON - ground concentration at midpoint of a given spatial element /ATMDAT/

GSDOSE - groundshine dose to a given organ in a given coarse grid element /REUSE1/

GSF - groundshine shielding factor for the site /GSWTHR/

GSHFAC - groundshine shielding factor for the following groups:
- evacuees while moving
- normal activity in sheltering and evaculation zone
- sheltered activity

/EADFAC/

GWCOEF - groundshine weathering coefficients /GSWTHR/

HAFLIF - radiological half-lives of all the nuclides /ISOGRP/

HEADER - identification information for the current set of user input assumptions /HEADER/

HEIGHT - mixing layer height /METDTA/

HGTMIX - mixing layer height /HGTMIX/

HRMXHT - mixing layer heights for 120 hours /M5/

HRRAIN - rainfall rates for 120 hours /M5/

HRWNDV - wind speeds for 120 hours /M5/

HTFCTR - ratio of ground level to centerline air concentration /ATMDAT/

HTMXLR - mixing layer height for each hour /METDAT/

I1DIS1 - inner limit on the region of interest for type 1 EARLY results /RESLT1/

I1DIS4 - inner limit on the region of interest for type 4 EARLY results /RESLT4/

I1DIS5 - inner limit on the region of interest for type 5 EARLY results /RESLT5/

I1DIS6 - inner limit on the region of interest for type 6 EARLY results /RESLT6/

I1DIS7 - inner limit on the region of interest for type 7 EARLY results /RESLT7/

I1DIS8 - inner limit on the region of interest for type 8 EARLY results /RESLT8/

I1DS10 - inner limit on the region of interest for type 10 CHRONC results /RSLT10/

I1DS12 - inner limit on the region of interest for type 12 CHRONC results /RSLT12/

I2DIS1 - outer limit on the region of interest for type 1 EARLY results /RESLT1/

I2DIS5 - outer limit on the region of interest for type 5 EARLY results /RESLT5/

I2DIS6 - outer limit on the region of interest for type 6 EARLY results /RESLT6/

I2DIS7 - outer limit on the region of interest for type 7 EARLY results /RESLT7/

I2DIS8 - outer limit on the region of interest for type 8 EARLY results /RESLT8/

I2DS10 - outer limit on the region of interest for type 10 CHRONC results /RSLT10/

I2DS12 - outer limit on the region of interest for type 12 CHRONC results /RSLT12/

IBDSTB - boundary weather stability class /M2/

IBEGIN - spatial interval at which the population begins /OUTCOM/

IBINUM - bin number for given weather trial /METOUT/ /SAVMET/

IC - column counter for reading input data /IPOINT/

ICRTRO - index of the critical organ for the long-term model /ICRTRO/

IDAUGT - index of daughters of a given nuclide /DAUTR/

IDAY - day in the year of given weather trial start time /METOUT/ /SAVMET/

IDBSTB - stability class for constant weather option /M2/

IDCF - inhalation dose conversion factor for each nuclide-organ pair /DCFACT/

IDEBUG - debug print option controller /ATMOPT/

IDIR - direction index /INDXS/

IDIREC - direction in which a given plume travels /ATMDAT/

IDNTFI - identifier of one site data characteristic /IDNTFI/

IDOSE3 - flag indicating the type of dose to use for type 3 EARLY result /RESLT3/

IDRB - weather bin data summaries for each weather class in each direction /DIRB/

IDRBIN - weather bin data summaries for each weather class in each direction /METB/

IECOD1 - type 1 EARLY health effects code /RESLT1/

IECOD4 - type 4 EARLY health effects code /RESLT4/

IECOD7 - type 7 EARLY health effects code /RESLT7/

IECOD8 - type 8 EARLY health effects code /RESLT8/

IEVACU - evacuation model flag /GLOBAL/

IFF - flag to force reinitilization of the random number generator (not used with current random number generator) /IFF/

IGDCF - groundshine dose conversion factor following plume passage for each nuclide-organ pair /DCFACT/

IGROUP - nuclide group number for each nuclide /ISOGRP/

IHITIT - logical flag indicating ground contamination in a given spatial grid element /IHITIT/

IHOUR - hour in the day of a given weather trial start time /METOUT/ /SAVMET/

IHRDIR - wind directions for 120 hours /M5/

IHRSTB - stability class indices for 120 hours /M5/

INDEX3 - indices to the organs used for type 3 EARLY results /RESLT3/

INDEX5 - indices to the organs used for type 5 EARLY results /RESLT5/

INDEX6 - indices to the organs used for type 6 EARLY results /RESLT6/

INDORG - index to the critical organ for relocation /RELOCA/

INDREG - economic regional index for each grid element /INDREG/

INDWTR - regional watershed index for each grid element /INDWTR/

INDXAC - index to the cancer effect organs /ACANCR/

INDXBN - bin number index /M4/

INDXCA - organ index for the cancer effects /CCANCR/

INDXEF - index to the early fatality organs /EFATAL/

INDXEI - index to the early injury organs /EINJUR/

INIEVA - first spatial interval in the evacuation zone /NETWOR/

INTRVL - index to the current spatial interval /INDXS/

INWGHT - number of weather sequences requested from each bin /M4/

IPATHW - pathway codes for type 6 EARLY results /RESLT6/

IPLUME - dispersion model option code:
1 straightline
2 wind-shift with rotation
3 wind-shift without rotation
/GLOBAL/

IPNT - pointer array for sorting records during input /INPRC2/

IPOINT - pointer for reading datum on an input record /IPOINT/

IPRINT - level of debug output desired /IPRINT/

IRAND - random number /METB/

IRESID - residence code for module(s) /OUTCOM/

IRNRAT - table of rain intensity breakpoints /M4/

IRSEED - initial seed for random number generator /M4/

ISECON - start time in seconds /METOUT/

ISRCTM - loop counter on the source terms used by ATMOS /SRCTRM/

ISTAB - stability class for each hour /METDAT/

ISTRDY - day of the year for start time /M3/

ISTRHR - hour of the day for start time /M3/

ISTRTG - loop counter on the emergency response scenarios used by EARLY /STRTGY/

ITRIAL - sequence number of a given weather trial /METOUT/

IUNIT - unit number from which to read the user input file /IUNIT/

IWGHT - bin weights /METB/

IWINDT - transformed wind direction used in the dosimetry calculations /DOSFAC/

IX1DS1 - inner limit on the region of interest for type 1 CHRONC results /IXOUT1/

IX1DS4 - inner limit on the region of interest for type 4 CHRONC results /IXOUT4/

IX1DS5 - inner limit on the region of interest for type 5 CHRONC results /IXOUT5/

IX1DS6 - inner limit on the region of interest for type 6 CHRONC results /IXOUT6/

IX1DS7 - inner limit on the region of interest for type 7 CHRONC results /IXOUT7/

IX1DS8 - inner limit on the region of interest for type 8 CHRONC results /IXOUT8/

IX1DS9 - inner limit on the region of interest for type 9 CHRONC results /RESLT9/

IX2DS1 - outer limit on the region of interest for type 1 CHRONC results /IXOUT1/

IX2DS5 - outer limit on the region of interest for type 5 CHRONC results /IXOUT5/

IX2DS6 - outer limit on the region of interest for type 6 CHRONC results /IXOUT6/

IX2DS7 - outer limit on the region of interest for type 7 CHRONC results /IXOUT7/

IX2DS8 - outer limit on the region of interest for type 8 CHRONC results /IXOUT8/

IX2DS9 - outer limit of the region of interest for type 9 CHRONC result /RESLT9/

IXCOD1 - type 1 CHRONC health effects code /IXOUT1/

IXCOD4 - type 4 CHRONC health effects code /IXOUT4/

IXCOD7 - type 7 CHRONC health effects code /IXOUT7/

IXCOD8 - type 8 CHRONC health effects code /IXOUT8/

IXCOD9 - index to the CHRONC organ to be used for the type 9 CHRONC result /RESLT9/

IXDEX5 - indices to the organs used for type 5 CHRONC results /IXOUT5/

IXDEX6 - indices to the organs used for type 6 CHRONC results /IXOUT6/

IXPATH - pathway codes to type 6 CHRONC results /IXOUT6/

JDAY - start day for weather sampling /CDATE/

JHOUR - start hour for weather sampling /CDATE/

KCEPNT - print control for chronic/economic detail print /KPRINT/

KDAY - starting day for weather sampling /CDATE/

KDFPNT - print control for dose factor print /KPRINT/

KDTPNT - print control for direct deposit transfer factor print /KPRINT/

KGCPNT - print control for ground concentration print /KPRINT/

KHOUR - starting hour for weather sampling /CDATE/

KLTPNT - print control for long-term transfer factor print /KPRINT/

KRAIN - measure of rain which fell /IRAIN/

KSWDSC - print control switch for chronic doses and costs /KOPRNT/

KSWRSK - print control switch for chronic risks /KOPRNT/

KTDPNT - control switch for print of transfer and dose factors /KKPRNT/

KTRPNT - control switch for print of each trial /KKPRNT/

KWTPNT - print control for water pathway transfer factor print /KPRINT/

LAMBDA - radiological decay constants for each nuclide /ISOGRP/

LASEMR - last ring of the emergency response zone /LASEMR/

LASEVA - outer bounds on the three evacuation zones /NETWOR/

LASHE1 - last ring of the inner shelter zone /SRZONE/

LASHE2 - last ring of the outer shelter zone /SRZONE/

LASMOV - last ring in the evacuation movement zone /NETWOR/

LIMSP1 - limiting spatial interval for measured weather data /METDAT/

LIMSPA - last spatial interval for measured weather /M2/

LRACTN - length of time for root uptake interdiction in a given grid element /LRACTN/

LTACTN - long-term action code for grid element /LTACTN/

LVELDC - level of decontamination effort required for a given grid element /LTACTN/

LVLDEC - number of levels of decontamination /DECMOD/

MACHIN - machine being run on to flag portability /MACHIN/

MAXDIR - wind direction which produced the last maximum consequence /MAXOCU/

MAXFIN - number of fine grid elements from centerline which fall under the plume /DOSFAC/

MAXGRP - maximum number of nuclide groups allowed /ISOGRP/

MAXNRS - maxumum number of results that can be produced /MAXNRS/

MAXRIS - selection of risk dominant plume /ATMDAT/

MAXTRI - last weather trial producing the maximum consequence /MAXOCU/

MEND - ending index for organs /ORGNDX/

METCOD - meteorological sampling option code
  1 user-specified day and hour in the year (from MET file)

2 weather category bin sampling
3 120 hours of weather specified on the atmos user input file
4 costant met (boundary weather used from the start)
5 stratified random samples for each day of the year
/M1/

MONTHS - monthly array used for weather sampling /METDTA/

MRAIN - measure of rain which fell /IRAIN/

MSTRT - starting index for organs /ORGNDX/

NAMCRP - crop name /NAMCRP/

NAMWPI - water ingestion pathway nuclide name /NAMWPI/

NBIN - number of defined weather bins /METB/

NBLANK - number of blank records encountered during input /INPRC3/

NCHANG - number of change records encountered during input /INPRC3/

NCHRFL - number of CHRONC results files /NCHRFL/

NCMMNT - number of comment records encountered during input /INPRC3/

NDPLCT - number of duplicate records encountered during input /INPRC3/

NDXFII - nuclide index for each food ingestion nuclide /FDINGM/

NEND - one more than one-half the number of fine grid subdivisions used by the model /NUMGRD/

NEXTND - triplets representing the path from each spatial element /NETWOR/

NFICRP - number of defined crops in the chronic food ingestion model /FDINGM/

NFIISO - number of nuclides in the chronic food ingestion model /FDINGM/

NFILES - total number of result files to be processed /OUTCOM/

NGWTRM - number of terms in the groundshine weathering /GSWTHR/

NINC - one-half the number of fine grid subdivisions used by the model /NUMGRD/

NINCM1 - one less than one-half the number of fine grid subdivisions used by the model /NUMGRD/

NMRGN - name of the economic region /NAMRGN/

NPSGRP - number of particle size groups defined in the model /DRYCON/

NREC - counter for number of input records /INPRC3/

NRECT - counter for total number of input records read /INPRC3/

NRINTN - number of rain intensity levels for the rain bins /M4/

NRNINT - number of rain distance intervals for the rain bins /M4/

NROOTS - number of root nodes in the evacuation network /ROOTS/

NRWTRM - number of terms in the resuspension weathering equation /REWTHR/

NSBINS - number of bins to be sampled /M4/

NSMPLS - number of samples to be taken per bin /M4/

NSRCTM - total number of the source terms being used by ATMOS /SRCTRM/

NSTRTG - total number of emergency response scenarios used by EARLY /STRTGY/

NTOT - /METB/

NTRMNT - number of terminator records read during input /INPRC3/

NTTRM - number of terms in the crop transfer function /CRPTRF/

NUCNAM - name of each nuclide /ISONAM/

NUCOUT - name of the nuclide requested /ATMOPT/

NUM1 - number of type 1 EARLY results requested /RESLT1/

NUM2 - number of type 2 EARLY results requested /RESLT2/

NUM3 - number of type 3 EARLY results requested /RESLT3/

NUM4 - number of type 4 EARLY results requested /RESLT4/

NUM5 - number of type 5 EARLY results requested /RESLT5/

NUM6 - number of type 6 EARLY results requested /RESLT6/

NUM7 - number of type 7 EARLY results requested /RESLT7/

NUM8 - number of type 8 EARLY results requested /RESLT8/

NUMACA - number of acute exposure cancer effects /ACANCR/

NUMCNC - number of types of cancer that can result from chronic exposure /CCANCR/

NUMCOR - number of coarse grid elements in the angular direction /GLOBAL/

NUMEFA - number of early fatality effects /EFATAL/

NUMEIN - number of early injury effects /EINJUR/

NUMFIN - number of fine grid subdivisions used by the model /GLOBAL/

NUMFNT - total number of fine grid subdivisions /NUMGRD/

NUMISO - number of nuclides defined in the model /GLOBAL/

NUMORG - number of organs defined for the health effects model /GLOBAL/

NUMPAG - page counter on the output listing /NUMPAG/

NUMRAD - number of radial spatial elements /GLOBAL/

NUMREL - number of plume segments released /GLOBAL/

NUMRES - total number of results to be written on the EARLY output file /NUMRES/

NUMTRI - number of weather trials in the run /GLOBAL/

NUMVAL - number of result values to be produced for each result in a single trial /NUMVAL/

NUMWPA - number of watersheds /WATRM/

NUMWPI - number of nuclides in the water ingestion pathway model /WATRM/

NXMORG - number of organs used by the CHRONC module /NXMORG/

NXMRES - total number of results to be written to the CHRONC output file /NXMRES/

NXMVAL - number of consequence values written for all CHRONC results /NXMVAL/

NXUM1 - number of type 1 CHRONC results requested /IXOUT1/

NXUM4 - number of type 4 CHRONC results requested /IXOUT4/

NXUM5 - number of type 5 CHRONC results requested /IXOUT5/

NXUM6 - number of type 6 CHRONC results requested /IXOUT6/

NXUM7 - number of type 7 CHRONC results requested /IXOUT7/

NXUM8 - number of type 8 CHRONC results requested /IXOUT8/

NXUM9 - number of type 9 CHRONC results requested /RESLT9/

NXUM10 - number of type 10 CHRONC results requested /RSLT10/

NXUM11 - number of type 11 CHRONC results requested /RSLT11/

NXUM12 - number of type 12 CHRONC results requested /RSLT12/

OALARM - time after accident initiation when accident reaches general emergency conditions, or when plant personnel can reliably predict that general emergency conditions will be attained /ATMDAT/

ORGNAM - names of organs defined for the health effects /ORGNAM/

OVRRID - flag indicating an override of the windrose for ATMOS /ROTATE/

OXGNAM - names of the organs defined in the CHRONC model /OXGNAM/

PARENT - array of parent of each nuclide /ISOGRP/

PATHNM - pathway names for EARLY results of type 6 /PATHNM/

PCF - precalculated cloudshine dose factor /DOSFAC/

PDELAY - time of release for each plume (after scram) /MULREL/

PGF168 - precalculated 168 hour groundshine dose factor /DOSFAC/

PGPF - precalculated groundshine dose factor used during plume passage /DOSFAC/

PI - geometric pi /PHYCON/

PID - centerline plume inhalation dose /EDOSES/

PIF - precalculated direct inhalation dose factor /DOSFAC/

PLHEAT - heat content of each release segment /MULREL/

PLHITE - height of each plume segment at release /MULREL/

PLUDUR - duration of release of each plume segment /MULREL/

PNZERO - probability of exceeding zero for a given result /PNZERO/

POPCST - urban population removal cost /SITEDT/

POPDAT - population residing in the coarse grid spatial element /POPDAT/

POPFLG - flag indicating whether uniform or site file population distribution is being used /POPFLG/

PPAPIG - projection/accumulation groundshine dose for intermediate phase

PPAPIR - projection/accumulation resuspension inhalation dose for the intermediate phase

PPDCLG - projected long-term groundshine dose following decontamintion

PPDCLR - projected long-term resuspension inhalation dose following decontamination

PPINLG - projected long-term groundshine dose following interdiction

PPINLR - projected long-term resuspension inhalation dose following interdiction

PPNOLG - projected long-term groundshine dose without mitigative actions

PPNOLR - projected long-term resuspension inhalation dose without mitigative actions

PRBMET - probability of any given weather trial /METOUT/ /SAVMET/

PROTIN - protection factor for inhalation for the following groups:
- evacuees while moving
- normal activity in sheltering and evaculation zone
- sheltered activity

/EADFAC/

PRSF - precalculated resuspension inhalation dose factor /DOSFAC/

PSCMLK - permissible ground concentration for milk production /PSCDIR/

PSCOTH - permissible ground concentration for non-milk production /PSCDIR/

PSDIST - particle size distribution for each nuclide group /MULREL/

PSF - precalculated skin dose factor /DOSFAC/

QROOT - annual depletion rate for a nuclide in the soil /RTINTR/

RDF - resuspension inhalation dose factor /DOSFAX/

RDISTS - interval endpoints for rain /M4/

REDOSE - resuspension dose to a given organ from a given grid element /REUSE1/

REFTIM - reference times for disperesion and radioactive decay /MULREL/

RELCST - relocation cost /ERLCST/

RELINV - release inventory for each nuclide /MULREL/

RESCON - resuspension inhalation model concentration coefficient /DOSFAC/

RESID - resuspension inhalation dose /EDOSES/

RESLAM - resuspension decay constant /DOSFAC/

RESNAM - result names /RESNAM/

RETCOD - return codes for each coarse grid element /RETCOD/

RINHL - inhalation rate for individuals /REWTHR/

RISCAT - flag indicating the breakdown of risk by weather category bins is to be presented to show their relative contribution to the mean /RISCAT/

RISFAT - risk of early death in each fine spatial element /RISFAT/

RISINJ - risk of a given injury in a given coarse grid element /RISINJ/

RISTHR - risk threshold for early death (fatal radius definition) /RESLT2/

RLCOST - relocation cost /ERLCST/

RMDOSE - long-term root uptake milk dose to a given organ from a given coarse grid element /REUSE1/

RNMM - rain rate for each hour /METDAT/

RNRATE - rain intensity breakpoints for the weather binning /M4/

RODOSE - long-term root uptake non-milk dose to a given organ from a given coarse grid element /REUSE1/

ROOT - pointers to the root nodes in the network /ROOTS/

ROSE - /METB/

ROSEBI - windrose probability for each bin for the wind blowing in each direction /ROSEBI/

RPF - resuspension protection factor /REWTHR/

RWCOEF - resuspension concentration coefficients /REWTHR/

RXSNAM - names of the chronic results /RXSNAM/

SCLADP - scaling factor for the A-D stability plume rise formula /PLUMRS/

SCLCRW - scaling factor for the critical wind speed for the entrainment of a buoyant plume /PLUMRS/

SCLEFP - scaling factor for the E-F stability plume rise formula /PLUMRS/

SDCF - skin dose conversion factor for each nuclide /DCFACT/

SDD - skin deposition dose /EDOSES/

SDV - skin dose deposition velocity for each nuclide /DCFACT/

SHELT1 - shelter duration in the inner shelter zone /SRZONE/

SHELT2 - shelter duration in the outer shelter zone /SRZONE/

SIGMAY - sigma-y at each spatial element centerpoint /DOSFAC/

SIGYM - average sigma y over the spatial interval /ATMDAT/

SIGZM - average sigma z over the spatial interval /ATMDAT/

SKPFAC - skin protection factor for the following groups:
- evacuees while moving
- normal activity in sheltering and evaculation zone
- sheltered activity

/EADFAC/

SPACE - spacing in bins for random sampling of weather /METB/

SPACEN - distances to the spacial element centerpoints /GLOBAL/

SPAEND - radial distances to the spatial element endpoints /GLOBAL/

SPALEN - length of each spatial interval /GLOBAL/

SQR2PI - square root of two pi /PHYCON/

SQRHPI - square root to one-half pi /PHYCON/

TLDOSE - doses for acute effects /REUSE1/

T2DOSE - doses for latent effects /REUSE1/

TCROOT - transfer factor from soil-to-plant by root-uptake /TRCMPL/

TDECON - time at which projected dose satisfies the long-term dose criterion /TDECON/

TFBF - biological transfer fractions for meat /ISOTDT/

TFLBPT - long-term transfer factor for meat dose term /LTFCTR/

TFLCPT - long-term transfer factor for crop dose term /LTFCTR/

TFLMLK - long-term transfer factor for milk pathway /LONGTF/

TFLMPT - long-term transfer factor for milk dose term /LTFCTR/

TFLOTH - long-term transfer factor for non-milk pathway /LONGTF/

TFLPD - direct liquid pathway transfer factor from the water pathway for each nuclide-organ pair for each watershed /WTRDAT/

TFLPW - washoff liquid pathway transfer factor from the water pathway for each nuclide-organ pair for each watershed /WTRDAT/

TFMLK - biological transfer fractions for milk /ISOTDT/

TFWKF - fraction of the time workers in the farm areas spend in decontamination work for the various levels of decontamination /DECMOD/

TFWKNF - fraction of the time workers in the non-farm areas spend in decontamination work for the various levels of decontamination /DECMOD/

TGSBEG - growing season start time /CRPTIM/

TGSEND - growing season end time /CRPTIM/

TGWHLF - half-life for groundshine weathering terms /GSWTHR/

THRVST - time of the harvest season /CRPTIM/

TIMACC - time of the accident /CRPTIM/

TIMBAS - time base for the expansion factor /EXPAND/

TIMCEN - time from scram for plume to reach the center of a given spatial interval /ATMDAT/

TIMDEC - decontamination times corresponding to the various levels of decontamination /DECMOD/

TIMHOT - hot spot relocation time in sec. from plume arrival /RELOCA/

TIMNRM - normal relocation time in sec. from plume arrival /RELOCA/

TIMOVH - time duration over which plume is over center of a given spatial interval /ATMDAT/

TINTRD - interdiction periods corresponding to the tabulated pathway factors stored in: PPINLG, PPINLR, APINLG, APINLR /DOSTIM/

TMEPND - time at which the emergency phase ends /DOSTIM/

TMIPND - end of the intermediate phase period measured from the time of accident initiation /DOSTIM/

TMPACT - action period (i.e. the projection period) from the start of the long-term phase /DOSTIM/

TRMDRL - relocation period of temporary interdiction for decontamination of a given grid element /DCCOST/

TRMEVA - duration of the evacuation period from a given grid element /TERMS/

TRMIRL - duration of the intermediate phase relocation from a given grid element /ITERMS/

TRMREL - duration of relocation from a given grid element /TERMS/

TRWHLF - half-lives corresponding to the resuspension concentration coefficients RWCOEF /REWTHR/

TSEEDG - day of the year on which a given crop is planted /CRPTIM/

TSTART - time at which exposure starts at centerpoint of each spatial element /DOSFAC/

TSTOP - time at which exposure stops at centerpoint of each spatial element /DOSFAC/

TTOSH1 - time to take shelter in the inner shelter zone given in seconds from OALARM /SRZONE/

TTOSH2 - time to take shelter in the outer shelter zone given in seconds from OALARM /SRZONE/

TWOPI - two times pi /PHYCON/

UNFSWT - uniform regional data switch to use Site Data File /UNFSWT/

VALWF - value of farm wealth /SITEDT/

VALWNF - non-farm wealth, property and improvements for the region /SITEDT/

VDEPOS - deposition velocity of each particle size group /DRYCON/

VFRM - average regional farm value /ECNDTA/

VNFRM - average regional non-farm value /ECNDTA/

WDDOSE - direct water deposition dose to a given organ in a given coarse grid element /REUSE1/

WETDEP - flag to indicate if washout occurs for each nuclide /WETDRY/

WINDIR - wind direction for each hour /METDAT/

WINDSP - wind speed for each hour /METDAT/

WINGF - water ingestion factor /WTRDTA/

WINROS - table of windrose probabilities /ROTATE/

WSHFRI - initial washoff fraction /WTRDTA/

WSHRTA - annual washoff rate /WTRDTA/

WTFRAC - weighting fraction applicable to the emergency response scenario being used /WTFRAC/

WTNAME - type of weighting (time or people) to be applied to the emergency scenarios /WTNAME/

WWDOSE - washoff water deposition dose to a given organ in a given coarse grid element via a given watershed /REUSE1/

XPFAC1 - exponential expansion factor number 1 /EXPAND/

XPFAC2 - exponential expansion factor number 2 /EXPAND/

YSCALE - linear scaling factor for the sigma-y function /DISPY/

ZSCALE - linear scaling factor for the sigma-z function /DISPZ/

APPENDIX A

A.0 INDIVIDUALIZED SUBPROGRAM CALLING STRUCTURE

A.1 Introduction

A detailed individualized calling structure chart is depicted for both the main program and any subprograms which themselves call other subprograms during their execution. The calling structure charts are intended to give the programmer a visual depiction of the following: (1) the sequence of calls being made within a given subprogram, (2) an indication of whether there are single or multiple calls of a particular subprogram, and (3) whether the calls are unconditional or conditional. It is not the intention that the calling structure charts give an intricate accounting of all the flow patterns through any given subprogram, only those patterns which affect the routines being called.

Not all subprograms found in MACCS are depicted in the following charts. Only those subprograms which themselves call more than one subprogram are, in fact, represented. The subprograms are presented in the same order in which they appear in the MACCS code. An outline of the included subprograms precedes the presentation of the calling structure charts as an aid in determining whether or not a particular subroutine has been included. The numbering system used in the outline is based on the "level" at which a particular subroutine is found within MACCS. The main program of MACCS is considered to be the first level, any routine called by the main program to be at the second level, any routine called by a second level subprogram to be at the third level, etc. The numbering system used to identify the structure calling charts has the following consecutive parts:

Roman numeral	- indicates the second level subprogram (i.e., a subprogram called by the Main Program) which eventually leads to the call of subroutine being considered.
Capital letter	- indicates the third level subprogram (i.e., a subprogram called by a second level routine) which eventually leads to the call of the subprogram being considered.
Number	- ...fourth level...
Small letter	- ...fifth level...
Number	- ...sixth level...
Small letter	- etc.

Each calling structure chart is read from the top down and left to right unless otherwise indictated by a direction arrow. Each diagram has a

main line of flow from top to bottom along the left side with loop and branching structures emanating from that line of flow. Three types of structures are depicted within the charts as shown below:

```
*                    *                    *
*******              *  *******           ***>****
*     *              *  *     *           *      *
*     *              ****     *           *      *
*     *              *  *     *           *      *
*******              *  *******           ***<****
*                    *                    *

 IF-ENDIF              DO Loop              GO TO
   or
IF-ELSE-ENDIF
```

Additional symbols used within the charts and their associated meanings are described in Table A.1.

TABLE A.1 Key to the Interpretation of Symbols Used in the Calling Stucture Charts

Symbol	Interpretation
*	Normal flow of the subprogram
^	The indicated subroutine will subsequently be depicted with a calling structure chart
x	IF and ENDIF statements at the first level
o	ELSEIF
xx	IF and ENDIF statements when in constraints a previous IF statement
$	Assignment of a function value
>>> or <<<	Return
> and <	
or	GO TO and subsequent reentry point from GO TO
< and >	
n	Nested do loops when outer loops do not directly affect the call
m	IF-ELSIF-ELSEIF-....-ENDIF structure which allows call to subprogram to be bypassed

When a subprogram makes a single call to a single subprogram, no chart is provided to illustrate the calling structure. Instead, when the calling subprogram first appears on a structure chart an indication is made that it in turn will made a single call and the following symbols are used to indicate if the subsequent call is unconditional or conditional:

Symbol	Interpretation
((!** called subprogram))	Unconditional call
((?** called subprogra))	Conditional call

A.2 Outline for Individualized Calling Structure Charts

PROGRAM STRUCTURE CHARTS OUTLINE

```
MACCS

   I.  INPUT

      1A.  INPBEG
      1B.  ATMODL

         IB1.  INPGEO

            IB1a.  IGET1
            IB1b.  RGETN

         IB2.  INPISO

            IB2a.  LGETN
            IB2b.  CGET1
            IB2c.  IGETN

         IB3.  INPWET

            IB3a.  LGET1

         IB4.  INPDRY
         IB5.  INPDIS
         IB6.  INPEXP
         IB7.  INPLRS

      1C.  ATPROB

         IC1.  INPWAK
         IC2.  INPMET

            IC2a.  INPM1

               IC2a1.  WRDMET

            IC2b.  INPM2
            IC2c.  INPM3
            IC2d.  INPM4
            IC2e.  INPM5

         IC3.  INPOPT

            IC3a.  LGET1
```

ID. INPREL
IE. PUTSTM
IF. EARINP

IF1. INMISC
IF2. INORGA
IF3. INEVAC

IF3a. EVNETW

IF4. INPOPU
IF5. INPEMR
IF6. INDFAC
IF7. INEFAT
IF8. INEINJ
IF9. INACAN
IF10. INOUT1

IF10a. DOCCDF

IF11. INOUT2
IF12. INOUT3
IF13. INOUT4
IF14. INOUT5
IF15. INOUT6
IF16. INOUT7
IF17. INOUT8

IG. REDSTG
IH. PUTSTG
II. CHRINP

II1. OPNERL
II2. INPCHR

II2a. INCHRN
II2b. STPATH

112b1. RDISTB

II2c. IXOT9
II2d. IXOT10
II2e. IXOT11
II2f. IXOT12

II3. MODLDF - E
II4. SDFINP

IJ. OUTCON

IJ1. HEDEAR

IJ1a. DIST1

IJ2. COPCHR
IJ3. HEDCHR

IJ3a. RXSNM9
IJ3b. RXNM10
IJ3c. RXNM11
IJ3d. RXNM12

II. GETSTM
III. DAYHOU

IIIA. WSAMPL
IIIB. CONTRL

IIIB1. ATMOUT
IIIB2. GETSTG - E
IIIB3. EAROUT

IIIB3a. RELZON

IIIB3a1. INCREM

IIIB3b. ESTAT
IIIB3c. EMOVE
IIIB3d. STOEAR

IIIB4. CHROUT

IIIB4a. CHRNDF
IIIB4b. CRNRSK

IIIB4b1. LNGTPH
IIIB4b2. STOCHR

IV. BINSAM
V. USRSUP
VI. CONMET
VII. RANSAM
VIII. OUTPUT

V111A. READ2

VIIIA1. DO1CDF

A.3 Individualized Subroutine Calling Structure Charts

```
MACCS
        *
      MXXETC
        *
      MXXCPU - ((?*** ABORT))
        *
      MXXDAT
        *
      MXXCLK
        *
      INPUT^
        *
      MXXCPU
        *
        x*****
        x  ABORT
        *
        *  ****
        *  *  x******
        *  *  *  {GETSTM^}
        *  *  x******
        *  *  *
        *  *  x*****************************************
        *  *  o*********************************        *
        ****  o************************        *        *
        *  *  o**************        *        *        *
        *  *  o*****        *        *        *        *
        *  *  *  RANSAM^  CONMET^  USRSUP^  BINSAM^  DAYHOU^
        *  *  ******        *        *        *        *
        *  *  x*****************************************
        *  ****
        *
      MXXCPU
        x******
        *   OUTPUT^
        *******
        *
      MXXCPU
        *
```

I. SUBROUTINE INPUT

```
    •
  INPBEG^
    x******************
    *                 ERRLOC
  ATMODL^               *
    •                 ABORT
    xx****
    •  ATPROB^
    xx****
    xx******************
    xx                ABORT
    x      ******
    x***  *    xx****
    *  *  *    *  INPBEG
    *  *  *    *    •
    *  ****    •  INPREL^
    *  *  *    *    xx********
    *  *  *    xx**xx      ABORT
    •  *  *  PUTSTM^
    *  *  *    xx*******
    x***  ****xx     ABORT
  INPEND
    x*>>>
    *
    x*****
    *  INPBEG
    *    *
    *  EARINP^
    x*****
    x*********************************
    x                                 ABORT
    x*************************
    oo**  ******             ERRLOC
    *  •  *    xx****          *
    •  *  *    *  INPBEG    ABORT
    *  *  *    •    *
    *  *  *    *  REDSTG^
    •  ****    *    xx*********
    *  •  *    xx**xx       ABORT
    *  •  *  PUTSTG^
    •  *  *    xx******
    oo**  ****xx    ABORT
    x
  INPEND
    x**>****************
    x*****              *
    *  INPBEG           *
    *    *              *
    *  CHRINP^          *
    x*****              *
    x**********         *
    x       ABORT       *
  INPEND                •
    ***<****************
  OUTCON^
    *
```

IA. SUBROUTINE INPBEG

```
        *
        ***<*************
        x**>*********************
        *               *       *
        x**>******************   *
        *               *   *   *
        x*****          *   *   *
        *    xx*****    *   *   *
        *  SEARCH  *    *   *   *
        *    xx*****    *   *   *
        x*****          *   *   *
        *               *   *   *
        x**>**************   *   *
        ***<******************   *
       SORT                     *
        **>>>                   *
        ***<**********************
        *
```

IB. SUBROUTINE ATMODL

```
        *
       INPEGO^
        x*>>>
        *
       INPISO^
        *
       INPWET^
        *
       INPDRY^
        *
       INPDIS^
        *
       INPEXP^
        *
       INPLRS^
        *
```

IB1. SUBROUTINE INPGEO

```
        *
      [IGET1^] - (NUMRAD)
        x*>>>
        x
       RGETN^ - (SPAEND)
        x*>>>
        x
        *  ****
        ****  x*****
        *  *  x  ERRLOC
        *  ****    **>>>
        *
```

IB1a. FUNCTION IGET1

```
*
$
x*>>>
x
****<******************
x*************        *
*          SEARCH     *
*            xx*>>>   *
x***********xx        *
RDSTRG^               *
x***>******************
*
x***
*  xx**
*  *  $
*  xx**
x***
*
```

IB1b. SUBROUTINE RGETN

```
*
x*>>>
x
*  *******
*  *  [RGET1]
****     x*>>>
*  ******x
*
```

IB2. SUBROUTINE INPISO

```
   *
[IGET1] - (NUMISO)
   x*>>>
   x
[IGET1] - (MAXGRP)
   x*>>>
   x
 LGETN^ - (WETDEP)
   *
 LGETN - (DRYDEP)
   *
   *  ******
   *  *  [CGET1^] - (NUCNAM)
   *  *    x**>******************
   ****    x                     *
   *  *    x***  ****            *
   *  *    *  ****  xx***        *
   *  *    x***  **xx  ERRLOC    *
   *  ******              **>****
   *                             *
   *  *******                    *
   *  *  [CGET1] - (PARENT)      *
   *  *     x**>******************
   *  *     x                     *
   *  *     x**>************      *
   *  *     x*****        *       *
   *  *     x  ERRLOC     *       *
   *  *     *    **>**************
   *  *     ***<************      *
   *  *******                     *
   ***<***************************
  IGETN^ - (IGROUP)
   *
  RGETN - (HAFLIF)
   x*>>>
   *
   *  ****
   *  *  x***
   ****  *  xx****
   *  *  x*xx  ERRLOC
   *  ****       **>>>
   *
```

IB2a. SUBROUTINE LGETN

```
   *
   x*>>>
   x
   *  *******
   *  *  [LGET1]
   ****     x*>>>
   *  ******x
   *
```

IB2b. FUNCTION CGET1

```
        *
        $
        x*>>>
        x
        ****<******************
        x*************        *
        *           SEARCH     *
        *             xx*>>>   *
        x***********xx         *
      RDSTRG^                  ●
        x***>******************
        *
        x***
        *  xx**
        *  *  $
        ●  xx**
        x***
        ●
```

IB2c. SUBROUTINE IGETN

```
        *
        x*>>>
        x
        *  *******
        *  *  [IGET1]
        ****     x*>>>
        *  ******x
        *
```

IB3. SUBROUTINE INPWET

```
        *
     [RGET1^] - (CWASH1)
        *
     [RGET1] - (CWASH2)
        ●
```

IB3a. FUNCTION RGET1

```
  *
  $
  x*>>>
  x
  ****<******************
  x*************        *
  *          SEARCH     *
  *            xx*>>>   *
  x***********xx        *
RDSTRG^                 *
  x***>******************
  *
  x***
  *  xx**
  *  *  $
  *  xx**
  x***
  *
```

IB4. SUBROUTINE INPDRY

```
   *
[IGET1] - (NPSGRP)
   *
 RGETN - (VDEPOS)
   *
```

IB5. SUBROUTINE INPDIS

```
   *
 RGETN - (CYSIGA)
   *
 RGETN - (CYSIGB)
   *
 RGETN - (CZSIGA)
   *
 RGETN - (CZSIGB)
   *
[RGET1] - (YSCALE)
   *
[RGET1] - (ZSCALE)
   *
```

IB6. SUBROUTINE INPEXP

```
    •
[RGET1] - (TIMBAS)
    •
[RGET1] - (BRKPNT)
    *
[RGET1] - (XPFAC1)
    •
[RGET1] - (XPFAC2)
    •
```

IB7. SUBROUTINE INPLRS

```
    *
[RGET1] - (SCLCRW)
    •
[RGET1] - (SCLADP)
    *
[RGET1] - (SCLEFP)
    *
```

IC. SUBROUTINE ATPROB

```
    •
[CGET1] - (ATNAM1)
    *
 INPWAK^
    *
 INPREL
    •
 INPMET^
    *
 INPOPT^
    *
```

IC1. SUBROUTINE INPWAK

```
    •
[RGET1] - (BUILDW)
    •
[RGET1] - (BUILDH)
    *
```

IC2. SUBROUTINE INPMET

```
*
INPM1^
*
x*****************************
o*********************        *
o*************       *        *
o*****       *     INPM2     *
*  INPM2   INPM2     *      INPM2^
*    *       *     INPM3     *
*  INPM3   INPM4^    *      INPM3^
*    *       *     INPM5^    *
*    *       *       *       *
x*****************************
*
```

IC2a. SUBROUTINE INPM1

```
*
[CGET1] - (METCOD)
*
x*****
*  WRDMET^
x*****
*
x*****
x  ABORT
*
```

IC2a1. SUBROUTINE WRDMET

```
*
x*>>>
x
*  ****
*  *  x*****
*  *  *  ERRFIL
****  x*****
*  *  x*****
*  *  *  ERRFIL
*  *  x*****
*  ****
*
x*>>>
*
ERRFIL
*
```

IC2b. SUBROUTINE INPM2

```
*
[IGET1] - (LIMSPA)
*
[RGET1] - (BNDMXH)
*
[IGET1] - (IBDSTB)
*
[RGET1] - (BNDRAN)
*
[RGET1] - (BNDWND)
*
```

IC2c. SUBROUTINE INPM3

```
   *
[IGET1] - (ISTRDY)
   *
[IGET1] - (ISTRHR)
   *
```

IC2d. SUBROUTINE INPM4

```
   *
[IGET1] - (NSMPLS)
   *
[IGET1] - (IRSEED)
   *
   x*>>>
   ●
[IGET1] - (NRNINT)
   *
 RGETN - (RNDSTS)
   *
   *  ****
   *  *  x****
   *  *  *   xx****
   ****  *   ●  ERRLOC
   *  *  *   *   ***>****
   ●  *  x**xx          *
   *  ****              *
   *                    *
   *  ******            *
   *  *    x*****>***   *
   ****  ERRLOC     *   *
   *  *    x**>**********
   *  *    ***<******   *
   *  ******            *
   ***<******************
[IGET1] - (NRINTN)
   *
 RGETN - (RNRATE)
   x**>***************
   *                 *
   *  ****           *
   *  *  x*****      *
   ****  *  ERRLOC   *
   ●  ***x    **>****
   *                 *
   x********         *
   x     ERRLOC      *
   *       ***>******
   ***<**************
   x******
   *  [IGET1] - (NSBINS)
   *     *
   *   IGETN - (INDXBN)
   *     *
   *   IGETN - (INWGHT)
   x******
   *
 WBNMET - ((!** WNDRZB))
   *
```

IC2e. SUBROUTINE INPM5

```
  *
RGETN - (HRMXHT)
  *
IGETN - (IHRSTB)
  *
RGETN - (HRRAIN)
  *
RGETN - (HRWNDV)
  *
IGETN - (IHRDIR)
  *
```

IC3. SUBROUTINE INPOPT

```
  *
[LGET1^] - (ENDAT1)
  *
[IGET1] - (IDEBUG)
  x*>>>
  *
[CGET1] - (NUCOUT)
  x*>>>
  x*****
  *  ERRLOC
  x*****
  *
```

IC3a. FUNCTION LGET1

```
  *
  $
  x*>>>
  x
  ****<******************
  x*************        *
  *          SEARCH     *
  *            xx*>>>   *
  x***********xx        *
RDSTRG^                 *
  x***>******************
  *
  x***
  *  xx**
  *  *  $
  *  xx**
  x***
  *
```

ID. SUBROUTINE INPREL

```
      *
    [CGET1] - (ATNAM2)
      *
    [IGET1] - (NUMREL)
      *
     RGETN - (PLHEAT)
      *
     RGETN - (PLHITE)
      *
     RGETN - (PLUDUR)
      x*>>>
      x
     RGETN - (PDELAY)
      x*>>>
      *
      *  ****
      *  *  x****
      ****  *  ERRLOC
      *  ●  x****
      *  ****
      *  ******
      *  *  RGETN - (PSDIST)
      *  *    **>***********
      ****    x******      *
      *  *    *   ERRLOC   *
      *  *    x******      *
      *  *    **<***********
      *  ******
    [RGET1] - (OALARM)
      *
    [IGET1] - (MAXRIS)
      *
     RGETN - (REFTIM)
      *
      *  *******
      *  *  [CGET1] - (NAME)
      *  *     x*****  ****
      *  *     ●    ****  xx****
      *  *     *    *  **xx    xx*********
      *  *     *    *        ERRLOC   [RGET1] - (CORINV)
      *  *     *  ERRLOC       **>************
      ****     x*****          xx*********   *
      *  *     **<***********<**             *
      *  *******                              *
    [RGET1] - (CORSCA)                        *
      *                                       *
      *  ****                                 *
      *  ●  x*****                            *
      ****  * ERRLOC                          *
      *  *  x*****                            *
      ●  ****                                 ●
      **<*************************************
      *  ******
      ****  RGETN - (RELFRC)
      *  ******
   <<<*x  ******
      ****  DECAY
      *  ******
      *
```

IE. SUBROUTINE PUTSTM

```
*
x*>>>
x***
•  xx****
x*xx  ERRLOC
x***    **>>>
*  xx******
x*xx      *
*        ERRLOC
x*>>>     **>>>
GETSTM - E
*
```

IF. SUBROUTINE EARINP

```
*
INMISC^
*
INORGA^
x*>>>
*
EDCINP - ((?** ERRFIL))
*
INEVAC^
•
INPOPU^
*
INPEMR^
*
INDFAC^
*
INEFAT^
*
INEINJ^
*
INACAN^
*
INOUT1^
*
INOUT2^
•
INOUT3^
*
INOUT4^
*
INOUT5^
*
INOUT6^
*
INOUT7^
*
INOUT8^
*
```

IF1. SUBROUTINE INMISC

```
   *
[CGET1] - (EANAM1)
   *
[LGET1] - (ENDAT2)
   *
[IGET1] - (IPLUME)
   *
[IGET1] - (NUMFIN)
   *
   x*****
   *  ERRLOC
   x*****
[LGET1] - (OVRRID)
   *
   x*****
   *  RGETN - (WINROS)
   *    xxmmmm
   *    *  ERRLOC
   *    xxmmmm
   x*****
[IGET1] - (IPRINT)
   *
[LGET1] - (RISCAT)
   *
```

IF2. SUBROUTINE INORGA

```
   *
[IGET1] - (NUMORG)
   *
   *  ******
   ****  [CGET1] - (ORGNAM)
   *  *    x**>**
   *  *****x    *
   **<***********
   x************  ****
   o*****      ****  xx****
   *  ERRLOC   *  **xx  ERRLOC
   *    *      *          **>>>
   x************
   *
```

IF3. SUBROUTINE INEVAC

```
   *
[CGET1] - (EANAM2)
   *
[CGET1] - (WTNAME)
   *
[RGET1] - (WTFRAC)
   *
[IGET1] - (LASMOV)
   x*>>>
   x
[IGET1] - (IEVACU)
   *
[IGET1] - (INIEVA)
   x*>>>
   x
 IGETN - (LASEVA)
   x*>>>
   x
   x*****
   *  ERRLOC
   x*****
 RGETN - (EDELAY)
   x***  ****
   *  *  *  xx****
   *  ****  *  ERRLOC
   *  ●  *  xx****
   x***  ****
   x**************
   o*****        *
   *  EVNETW^  EVRADI - ((!** [RGET1 - (ESPEED) ))
   *    *       *
   x**************
   *
```

IF3a. SUBROUTINE EVNETW

```
*
●  *******
*  *  [IGET1] - (ISORC)
*  *     x**>************************
*  *     x                          *
●  *  [IGET1] - (JSORC)             *
*  *     x**>************************
*  *     x                          *
****     x*********                 *
*  *     *     [IGET1] - (NEXTND)   *
*  *     *        xx*>***************
*  ●   ERRLOC  [IGET1] - (NEXTND)   *
*  *     ●        xx*>***************
*  *     *     [IGET1] - (NEXTND)   *
*  *     *        xx*>***************
●  *     x*********                 *
*  *******                          *
***<*********************************
●
*  nnnn
***n  x*****
*  n  x  ERRLOC
*  nnnn    x*>>>
*
*  nnnn
*  n  x***
*  n  n  xx****
●  n  n  *  ERRLOC
***n  n  xx****
*  n  n  xx****
*  n  n  ●  ERRLOC
*  n  n  xx****
●  n  x***
*  nnnn
*
●  nnnn
*  n  xx****
***n  n  ERRLOC
●  n  xx****
*  n  n
*  n  xx****
●  nnxx  ERRLOC
●          x*>>>
x*****
*  EVROOT
x*****
●
```

IF4. SUBROUTINE INPOPU

```
   *
[CGET1] - (POPFLG)
  x*>>>
  x
  x*****************
  o******       [RGET1] - (POPDEN)
  *   ERRFIL       xx*>>>
  *     x*>>>   [IGET1] - (IBEGIN)
  *                xx*>>>
  x*****************
  x**>**********************
 CMPTBL - ((?** ERRFIL))   *
  *                        *
 CMPTBL                    *
  x*>>>                    *
 MATCH - ((?** ERRFIL))    *
  x*>>>                    *
  *    ****                *
  ******  x*****           *
  *    ***x  ERRFIL        *
 MATCH          x*>>>      *
  x*>>>                    *
  ****<********************
 ERRFIL
  *
```

IF5. SUBROUTINE INPEMR

```
   *
[RGET1] - (TTOSH1)
   *
[RGET1] - (SHELT1)
   *
[IGET1] - (LASHE2)
   *
   x*****
   *  ERRLOC
   x*****
   *
[RGET1] - (TTOSH1)
   *
[RGET1] - (SHELT2)
   *
[RGET1] - (ENDEMP)
   *
[RGET1] - (TIMHOT)
   *
[RGET1] - (TIMNRM)
   *
[RGET1] - (DOSHOT)
   *
[RGET1] - (DOSNRM)
   *
[CGET1] - (CRIORG)
   *
   x***  ****
   *  ****  xx*>>>
   *     **xx
   *     *
   *  ERRLOC
   x*****
   *
```

IF6. SUBROUTINE INDFAC

```
   ●
 RGETN - (CSFACT)
   ●
 RGETN - (PROTIN)
   *
 RGETN - (BRRATE)
   *
 RGETN - (SKPFAC)
   *
 RGETN - (GSHFAC)
   *
[RGET1] - (RESCON)
   ●
[RGET1] - (RESHAF)
   ●
```

IF7. SUBROUTINE INEFAC

```
   *
[IGET1] - (NUMEFA)
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (NAME)
   ●  *     x******  ****
   ****   ERRLOC  ****  xx*>*
   *  ●     x******  **xx   *
   *  *******               *
   ***<**********************
 RGETN - (EFFACA)
   *
 RGETN - (EFFACB)
   ●
 RGETN - (EFFTHR)
   ●
```

IF8. SUBROUTINE INEINJ

```
   *
[IGET1] - (NUMEIN)
   *
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (EINAME)
   ****     x*>**
   *  ******x   ●
   ***<**********
   *  *******
   ●  *  [CGET1] - (NAME)
   *  *     x*****  ****
   *  *     *    ****  xx*>*
   ****     ●    *  **xx   *
   *  *     *  ERRLOC      *
   *  *     x*****         *
   *  *     ***<************
   *  *******
 RGETN - (EISUSC)
   *
 RGETN - (EITHRE)
   *
 RGETN - (EIFACA)
   *
 RGETN - (EIFACB)
   *
```

IF9. SUBROUTINE INACAN

```
   •
[IGET1] - (NUMACA)
   x*>>>
   x
[RGET1] - (ACTHRE)
   •
   •  *******
   *  *  [CGET1] - (ACNAME)
   ****     x*>***
   *  ******x    *
   ***<***********
   *  *******
   *  *  [CGET1] - (NAME)
   •  •     x***  ****
   *  *     *  ****  xx*>**
   ****     x***  **xx    •
   *  •   ERRLOC          *
   *  •     ***<***********
   *  *******
   •
 RGETN - (ACSUSC)
   •
 RGETN - (DOSEFA)
   *
 RGETN - (DOSEFB)
   *
 RGETN - (CFRISK)
   •
 RGETN - (CIRISK)
   *
```

IF10. SUBROUTINE INOUT1

```
   *
[IGET1] - (NUM1)
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (NAME)
   *  *     x*>>>
   *  *     x
   *  *     x*****************************
   *  *     o*****                        xx*****
   *  *     *    xx*>****               ERRLOC  *
   *  *     *    *      *                xx*****
   *  *     *  ERRLOC   *                 *
   *  *     *    ***>***************************
   *  ●     *    ***<****                 *   *
   *  *     *    **************************   *
   *  *     *                             *   *
   *  *     o******                       *   *
   *  *     *     xxmmmmmmmmmmmmmmmm      *   *
   *  *     *     xx*******>**   ERRLOC   *   *
   ****     *   ERRLOC       *     m      *   *
   *  *     ●     **>***************************
   *  *     *     ***<********     m      *   *
   *  *     *     xxmmmmmmmmmmmmmmmm      *   *
   *  *     *     **************************   ●
   *  *     *                             *   *
   *  *     o******                       *   *
   *  *     *     xxmmmmmmmmmmmmmmmm      *   *
   ●  *     *     xx**>*******   ERRLOC   *   *
   *  *     *   ERRLOC       *     m      *   *
   *  *     *     **>***************************
   *  *     *     ***<********     m      *   *
   *  *     *     xxmmmmmmmmmmmmmmmm      *   *
   *  *     *     **************************   *
   *  *   ERRLOC                          *   *
   *  *     x*****************************   *
   *  *     ***<*******************************
   *  *******
 IGETN - (I1DIS1)
   *
 IGETN - (I2DIS1)
   *  ****
   *  *  x*****
   ****  *  ERRLOC
   *  *  x*****
   *  ****
   ●  x******
   ****  [DOCCDF^]
   *  x******
   *
```

IF10a. LOGICAL FUNCTION DOCCDF

```
  *
  $
  x*****
  x  ABORT
  *
  x*****
  *  SEARCH
  *    x*>>>
  x*****
RDSTRG
  x*>>>
  ●
  x*****
  *    $
  *
```

IF11. SUBROUTINE INOUT2

```
  ●
[IGET1] - (NUM2)
  x*>>>
  x
RGETN - (RISTHR)
  x*>>>
  x  *******
  ****  [DOCCDF]
  ●  *******
  ●
```

IF12. SUBROUTINE INOUT3

```
  *
[IGET1] - (NUM3)
  x*>>>
  x
  *  *******
  *  *  [CGET1] - (NAME)
  *  ●     x*****
  ****     ●    xx*>****
  *  *     *  ERRLOC   *
  *  *     x*****      *
  *  *     ***<*********
  ●  *******
  *
RGETN - (DOSTH3)
  ●
  *  *******
  *  *  [CGET1] - (NAME)
  *  *     xmmmmm
  *  *     *  ERRLOC
  *  *     xmmmmm
  *  *******
  *
  xmmmmm
  *  ERRLOC
  xmmmmm
  *
  *  *******
  ****  [DOCCDF]
  ●  *******
  *
```

IF13. SUBROUTINE INOUT4

```
   *
[IGET1] - (NUM4)
   x*>>>
   x
 IGETN - (I1DIS4)
   *
   *  *******
   *  *  [CGET1] - (NAME)
   *  *     x*>>>
   *  *     x
   *  *     x*************************
   *  *     o*****                    xx****
   *  *     *    xx**>******       ERRLOC *
   *  *     *    *         *         xx****
   *  *     *  ERRLOC      *         *
   *  *     *    ***>*********************
   *  *     *    ***<*******         *   *
   *  *     *    *********************   *
   *  *     *                        *   *
   *  *     o*****                   *   *
   *  *     *    xxmmmmmmmmmmmmm     *   *
   ****     *    *           ERRLOC  *   *
   *  *     *    xx**>*****   m      *   *
   *  *     *  ERRLOC     *   m      *   *
   *  *     *    ***>*********************
   *  *     *    ***<******   m      *   *
   *  *     *    xxmmmmmmmmmmmmm     *   *
   *  *     *    *********************   *
   *  *     *                        *   *
   *  *     o*****                   *   *
   *  *     *    xxmmmmmmmmmmmmm     *   *
   *  *     *    *           ERRLOC  *   *
   *  *     *    xx**>*****   m      *   *
   *  *     *  ERRLOC     *   m      *   *
   *  *     *    *************************
   *  *     *    ***<******   m      *   *
   *  *     *    xxmmmmmmmmmmmmm     *   *
   *  *     *    *********************   *
   *  *   ERRLOC                     *   *
   *  *     x*************************   *
   *  *     ***<***************************
   *  *******
   *  ******
   **** DOCCDF
   *  ******
   *
```

IF14. SUBROUTINE INOUT5

```
   *
[IGET1] - (NUM5)
   x*>>>
   x
   ●  *******
   *  *  [CGET1] - (NAME)
   *  *     x******
   *  *     *     xx*>****
   *  *     ●   ERRLOC   *
   *  *     x******      *
   *  *     ***<**********
   *  *******
   *
 IGETN - (I1DIS5)
   *
 IGETN - (I2DIS5)
   *
   *  ****
   ●  *  x*****
   ****  *  ERRLOC
   *  ●  x*****
   ●  ****
   *
   *  *******
   ****  [DOCCDF]
   *  *******
   *
```

IF15. SUBROUTINE INOUT6

```
   *
[IGET1] - (NUM6)
   x*>>>
   x
   x*****
   x  ERRLOC
   *    **>>>
   *
   *  *******
   *  *  [CGET1] - (NAME)
   *  *     x*****
   ****     *    xx**>***
   *  *     ●  ERRLOC   *
   *  *     x*****      *
   *  *     ***<*********
   *  *******
   ●
   *  *******
   ●  *     x**>************************
   *  *  [CGET1] - (NAME)              *
   *  *     *                           *
   ●  *     x*****     ****             *
   *  *     *    *******  xxmmmm        *
   ****     ●    *     ****  ERRLOC     *
   *  *     *  ERRLOC          ***>*****
   *  *     x*****                      *
   *  ●     ***<************************
   ●  *******
   *
 IGETN - (I1DIS6)
   ●
 IGETN - (I2DIS6)
   x*>>>
   *
   *  ****
   *  *  x*****
   ****  *  ERRLOC
   ●  *  x*****
   ●  ****
   *
   *  *******
   ****  [DOCCDF]
   *  *******
   ●
```

IF16. SUBROUTINE INOUT7

```
   *
[IGET1] - (NUM7)
   x*>>>
   x
   x*****
   x  ERRLOC
   *    **>>>
   *
   *  *******
   *  *  [CGET1] - (NAME)
   *  *     x*>>>
   *  *     x
   *  *     x*****
   *  *     *    xx*****
   *  *     ●  ERRLOC  ●
   *  *     ●    xx*****
   *  *     *    *****************
   *  *     *                    *
   *  *     o*****               ●
   *  *     *    xx*>****        *
   *  *     *  ERRLOC   *        *
   *  *     *    ***>*****************
   *  *     *    **<*****         *   *
   *  *     ●    *****************   *
   *  *     *                    *   *
   *  *     o*****               *   *
   *  *     *    xxmmmmm         *   *
   ****     *    ●   ERRLOC      *   *
   *  *     *    *     ***********   *
   *  *     *    *                *   *
   *  *     *    xx**>******      *   *
   *  *     *    *         *      *   *
   *  *     *  ERRLOC      ●      *   *
   *  *     *    ***>*****************
   *  *     ●    **<********      *   *
   *  *     *    *****************   *
   *  *     *                    *   *
   *  *     o*****               *   *
   *  *     *    xxmmmmm         *   *
   *  *     *    *   ERRLOC      *   *
   *  *     *    *     ***********   *
   *  *     *    *                *   *
   *  *     *    xx**>******      *   *
   *  *     *  ERRLOC      ●      *   *
   *  *     *    ***>*****************
   *  *     *    **<********      *   *
   *  *     *    *****************   *
   *  *     *                    *   *
   *  *   ERRLOC                 *   *
   *  *     x*********************   *
   *  *     ***<**********************
   *  *******
   *
 IGETN - (I1DIS7)
   *
 IGETN - (I2DIS7)
   x*>>>
   x  ****
   *  *  x*****
   ****  *  ERRLOC
   *  ●  x*****
   *  ****
   ●  *******
   ****  [DOCCDF]
   *  *******
   *
```

IF17. SUBROUTINE INOUT8

```
   ●
[IGET1] - (NUM8)
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (NAME)
   *  *     x*>>>
   *  *     x
   *  *     x*****
   *  *     *    xx*****
   *  *     *  ERRLOC  *
   *  *     ●    xx*****
   *  *     *    ***>**********
   *  *     *                  *
   *  *     o*****             *
   *  *     *    xx*>*****     *
   *  *     *    *       *     *
   *  *     *  ERRLOC    *     *
   *  *     *    ***>***************
   *  *     *    ***<*****     *   *
   *  *     *    ******************
   *  *     *                  *   *
   *  *     o*****             *   *
   *  *     *    xxmmmmm       *   *
   *  *     *    *   ERRLOC    *   *
   *  *     *    *     ********    *
   ****     *    *             *   *
   *  *     *    xx*>****      *   *
   *  *     *  ERRLOC   *      *   *
   *  *     *    ***>***************
   *  *     *    **<*****      *   *
   *  *     ●    **************    *
   *  *     *                  *   *
   *  *     o*****             *   *
   *  *     *    xxmmmmm       *   *
   *  *     *    *   ERRLOC    *   *
   *  *     *    *     ********    *
   *  *     *    *             *   *
   *  *     *    xx*>****      *   *
   *  *     *  ERRLOC   *      *   *
   *  *     *    ***>***************
   *  *     *    **<*****      *   *
   *  *     *    **************    *
   *  *   ERRLOC                 *   *
   *  *     x******************    ●
   *  *     ***********************
   *  *******
   *
IGETN - (I1DIS8)
   *
IGETN - (I2DIS8)
   x*>>>
   x  ****
   *  *  x*****
   ****  *  ERRLOC
   *  *  x*****
   *  ****
   *  *******
   ****  [DOCCDF]
   *  *******
   ●
```

IG. SUBROUTINE REDSTG

```
  *
INEVAC
  *
INPEMR
  *
```

IH. SUBROUTINE PUTSTG

```
  *
  x*>>>
  xmmmmm
  x  ERRLOC
  *    **>>>
  *
  xmmmmm
  *  ERRLOC
  xmmmmm
  x*>>>
GETSTG - E
  *
```

II. SUBROUTINE CHRINP

```
  *
OPNERL^
  *
INPCHR^
  x******
  x   ABORT
  *
{MODLDF^}
  x******
  x   ABORT
  *
  x******
  *   SDFINP^
  *     xx*****
  x****xx   ABORT
  *
EXCINP - ((?*** ABORT))
  x******
  x   ABORT
  *
STGRDA^
  *
```

II1. SUBROUTINE OPERNL

```
  *
  **>>>
  *
MODLDF - E
  *
  x******
ERRLOC  *
  x******
  *
```

II2. SUBOUTINE INPCHR

```
  *
 INCHRN^
  •
 STPATH^
  *
 IXOT9^
  *
 IXOT10^
  *
 IXOT11^
  *
 IXOT12^
  *
```

II2a. SUBROUTINE INCHRN

```
   *
[CGET1] - (CHNAME)
   *
[RGET1] - (EVACST)
   •
[RGET1] - (RELCST)
   *
[RGET1] - (TMPIND)
   *
[RGET1] - (TMPACT)
   *
[RGET1] - (DSCRTI)
   *
[RGET1] - (DSCRLT)
   *
[CGET1] - (CRTOCR)
   •
[IGET1] - (LVLDEC)
   *
 RGETN - (TIMDEC)
   •
 RGETN - (DSRFCT)
   *
 RGETN - (CDFRM)
   •
 RGETN - (CDNFRM)
   *
 RGETN - (FRFDL)
   •
 RGETN - (FRNFDL)
   *
 RGETN - (TFWKF)
   *
 RGETN - (TFWKNF)
   *
[RGET1] - (DLBCST)
   *
[RGET1] - (DPRATE)
   *
[RGET1] - (DSRATE)
   *
[RGET1] - (POPCST)
   *
[IGET1] - (NGWTRM)
   *
```

(continued on next page)

```
   *
 RGETN - (GWCOEF)
   *
 RGETN - (TGWHLF)
   *
[IGET1] - (NRWTRM)
   *
 RGETN - (RWCOEF)
   *
 RGETN - (TRWHLF)
   *
[RGET1] - (FRACLD)
   *
[RGET1] - (FRCFRM)
   *
[RGET1] - (FRMPRD)
   *
[RGET1] - (DPFRCT)
   *
[RGET1] - (VALWF)
   *
[RGET1] - (FRFIM)
   *
[RGET1] - (VALWNF)
   *
[RGET1] - (FRNFIM)
   *
 IGETN - (KSWTCH)
   *
```

II2b. SUBROUTINE STPATH

```
   *
[LGET1] - (COUPLD)
   *
[IGET1] - (NFICRP)
   x*>>>
   x  *******
   *  *  [CGET1] - (NAMCRP)
   *  *     x*>>>
   ****     x
   *  *     x*******
   *  *******    ERRLOC
   *               **>>>
 RGETN - (FRCTCH)
   *
 RGETN - (FRCTCM)
   *
 RGETN - (FRCTCB)
   *
 IGET1 - (NUMWPI)
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (NAMWPI)
   *  *     x*>>>
   ****     x
   *  *     x******
   *  *     x   ERRLOC
   *  *******     **>>>
   *
```

(continued on next page)

```
  *  ******
  *  *    x**>*****
  *  *    *       *
  ****  ERRLOC    *
  *  *    **>>>   *
  *  *            *
  *  *    ***<*****
  *  ******
  *
RGETN - (WSHFRI)
  *
RGETN - (WSHRTA)
  *
RGETN - (WINGF)
  *
[IGET1] - (NFIISO)
  x*>>>
  x
  *  *******
  *  *  [CGET1] - (NAMIPI)
  *  *     x*>>>
  ****     x
  *  *     x******
  *  *******   ERRLOC
  *              **>>>
  *  ****
  ****  x*****
  *  *  x  ERRLOC
  *  ****    **>>>
  *
  *  ******
  *  *    x**>******
  *  *    *        *
  *  *  ERRLOC     *
  ****    *>>>     *
  *  *    ***<******
  *  ******
  *
RGETN - (DCYPMH)
  *
RGETN - (DCYPBH)
  *
RGETN - (TFMLK)
  *
RGETN - (TFBF)
  *
RDISTB^ - (TCROOT)
  *
RDISTB - (DCYPCH)
  *
RDISTB - (DCYPCM)
  *
RDISTB - (DCYPCB)
  *
RDISTB - (FPLSCH)
  *
[IGET1] - (NTTRM)
  *
  *  ******
  *  *  RDISTB - (CTCOEF)
  ****    *
  *  *  RDISTB - (CTHALF)
  *  ******
  *
```

(continued on next page)

```
 *  *******
 *  *  [CGET1] - (NAMCRP)
 *  *     x*>>>
 ****     x
 *  *     x******
 *  *     x   ERRLOC
 *  *******     **>>>
 *
RGETN - (TGSBEG)
 *
RGETN - (TGSEND)
 *
RGETN - (FRCTFL)
 *
 *  *******
 *  *  [CGET1] - (NAMIPI)
 *  *     x*>>>
 ****     x
 *  *     x******
 *  *     x   ERRLOC
 *  *******     **>>>
 *
RGETN - (PSCMLK)
 *
RGETN - (PSCOTH)
 *
 *  *******
 *  *  [CGET1] - (NAMIPI)
 *  *     x**>>>
 ****     x
 *  *     x******
 *  *     x   ERRLOC
 *  *******     **>>>
 *
RGETN - (GCMAXR)
 *
RGETN - (QROOT)
 *
```

II2b1. SUBROUTINE RDISTB

```
*
*  *******
*  *  [CGET1] - (NAMISO)
*  *    x*>>>
****    x
*  *    x*******
*  *    x    ERRLOC
*  ******      **>>>
*
x*>>>
x
RGETN - (CLM2NM)
x*>>>
x
RGETN - (CLM3NM)
x*>>>
x
RGETN - (CLM4NM)
x*>>>
x
RGETN - (CLM5NM)
x*>>>
x
RGETN - (CLM6NM)
x*>>>
x
RGETN - (CLM7NM)
x*>>>
x
RGETN - (CLM8NM)
x*>>>
x
RGETN - (CLM9NM)
x*>>>
x
RGETN - (CLMANM)
x*>>>
x
RGETN - (CLMBNM)
*
```

II2c. SUBROUTINE IXOT9

```
   *
[IGET1] - (NXUM9)
   x*>>>
   x
   *  *******
   *  *  [CGET1] - (ORGNAM)
   *  *     x*****   ****
   *  *     *    ****    **>**
   ****     *    *   ****    *
   *  *     *  ERRLOC        *
   *  *     x*****           *
   *  *     **<***************
   *  *******
   *
 IGETN - (IX1DS9)
   *
 IGETN - (IX2DS9)
   x*>>>
   *  ****
   *  *  x*****
   ****  *  ERRLOC
   *  *  x*****
   *  ****
   *
   *  *******
   ****  [DOCCDF]
   *  *******
   *
```

II2d. SUBROUTINE IXOT10

```
   *
[IGET1] - (NXUM10)
   x*>>>
   x
 IGETN - (I1DS10)
   *
 IGETN - (I2DS10)
   x*>>>
   *  ****
   *  *  x*****
   ****  *  ERRLOC
   *  *  x*****
   *  ****
   *
   *  *******
   ****  [DOCCDF]
   *  *******
   *
```

II2e. SUBROUTINE IXOT11

```
   *
[LGET1] - (FLAG11)
   x*>>>
   x
[DOCCDF]
   *
```

II2f. SUBROUTINE IXOT12

```
      *
    [IGET1] - (NXUM12)
      x*>>>
      x
     IGETN - (I1DS12)
      *
     IGETN - (I2DS12)
      x*>>>
      x  ****
      *  *  x*****
      ****  *  ERRLOC
      *  *  x*****
      *  ****
      *
      *  *******
      ****  [DOCCDF]
      *  *******
      *
```

II3. ENTRY MODLDF
(DEPICTED IN SUBROUTINE OPERNL - IIA)

114. SUBROUTINE SDFINP

```
  *
CXPTBL - ((!*** KMPTBL - E))
  ●
CXPTBL
  ●
CXPTBL
  *
CXPTBL
  *
{KMPTBL^}
  x*>>>
  x
{KMPTBL}
  x*>>>
  x
 MXTCH
  x*>>>
  *
  *  ****
  *  *  x***
  ****  *  xx*>>>
  ●  ●  x***
  ●  ****
  *
MXTCH
  x*>>>
MXTCH
  x*>>>
MXTCH
  x*>>>
MXTCH
  x*>>>
CKINDX
  *
MXTCH
  x*>>>
  ●
  *  nnnn
  ●  n  x***
  ***n  n  xx*>>>
  *  n  x***
  ●  nnnn
  ●
  ●  ****
  *  ●  x***
  ****  ●  xx*>>>
  ●  *  x***
  *  ****
  *
MXTCH
  x*>>>
  ●  nnnn
  *  n  x***
  ***n  n  xx*>>>
  *  n  x***
  *  nnnn
  ●
MXTCH
  x*>>>
  ●  ****
  ●  *  x***
  ****  *  xx*>>>
  ●  *  x***
  *  ****
  *
  ●
```

IJ. SUBROUTINE OUTCON

```
  *
HEDEAR^
  *
COPCHR
  *
  x******
  *   HEDCHR^
  x******
  *
```

IJ1. SUBROUTINE HEDEAR

```
    *
    *  *******
    ****     x**>*****************************************
    *  *  [RESNM1] - ((!*** DISRAN^))                    *
    *  *******                                           *
    *                                                    *
    *  *******                                           *
    ****     x**>*****************************************
    *  *  [RESNM2]                                       *
    *  *******                                           *
    *                                                    *
    *  *******                                           *
    ****     x**>*****************************************
    *  *  [RESNM3] - ((!*** COMPRS)) - ((?*** ABORT)))   *
    *  *******                                           *
    *                                                    *
    *  *******                                           *
    ****     x**>*****************************************
    *  *  [RESNM4] - ((!*** DISRAN))                     *
    *  *******                                           *
    *                                                    *
    *  *******                                           *
    ****     x**>*****************************************
    *  *  [RESNM5] - ((!*** DISRAN))                     *
    *  *******                                           *
    *                                                    *
    *  nnnnnnn                                           *
    ***n     x**>*****************************************
    *  n  [RESNM6] - ((!*** DISRAN))                     *
    *  nnnnnnn                                           *
    *                                                    *
    *  nnnnnnn                                           *
    ***n     x**>*****************************************
    *  n  [RESNM7] - ((!*** DISRAN))                     *
    *  nnnnnnn                                           *
    *                                                    *
    *  *******                                           *
    ****     x**>*****************************************
    *  *  [RESNM8] - ((!*** DISRAN))                     *
    *  *******                                           *
****x                                                    *
*   ***<****************************************************
****x
    *
    x*****
    x   ABORT
    *
```

IJ1a. FUNCTION DISRAN

```
  *
DIST1 - ((?*** ABORT))
  *
DIST1
  *
  $
  *
  $
  $
  *
```

IJ3. SUBROUTINE HEDCHR

```
        *
        *  nnnnnn
        ***n    x**>******
        *  n [RXSNM9^]    *
        *  nnnnnn         *
        *                 *
        *  nnnnnn         *
        ***n    x**>******
        *  n [RXNM10^]    *
        *  nnnnnn         *
        *                 *
        *  nnnnnn         *
        ***n    x**>******
        *  n [RXNM11^]    *
        *  nnnnnn         *
        *                 *
        *  nnnnnn         *
        ***n    x**>******
        *  n [RXNM12^]    *
        *  nnnnnn         *
    *****x                *
    *   ***<**************
    *****x
        x*****
        x  ABORT
        *
```

IJ3a. FUNCTION RXSNM9

```
  *
  x********
ABORT  [DISRAN]
          $
  x********
  *
```

IJ3b. FUNCTION RXNM10

```
  *
  x********
ABORT  [DISRAN]
          $
  x********
  *
```

IJ3c. FUNCTION RXNM11

```
  *
  x*******
ABORT    $
         *
  x*******
  *
```

IJ3d. FUNCTION RXNM12

```
  *
  x********
ABORT  [DISRAN]
  *       $
  x********
  *
```

II. ENTRY GETSTM
(DEPICTED IN SUBROUTINE PUTSTM - IE)

III. SUBROUTINE DAYHOU

```
  *
ADJTIM
  *
WSAMPL^
  *
WBNDRY
  *
CONTRL^
  *
```

IIIA. SUBROUTINE WSAMPL

```
  *
  *  *******
  *  *     x*******
  *  *     *    WINCTM
  ****     x*******
  *  *   WGTMET - ((?*** ABORT))
  *  *******
  *
```

IIIB. SUBROUTINE CONTRL

```
  *
ATMOUT^
  *
  *  ******
  *  *    x*******
  ****    *  {GETSTG^}
  *  *    x*******
  *  *  EAROUT^
  *  ******
  *
  x*****
  *  CHROUT^
  x*****
  *
```

IIIB1. SUBROUTINE ATMOUT

```
  •
  x******
  *  [CAUGHT]
  x******
  *
  *  ******
  *  *    x*>>>
  *  *    ****<*********
  *  *    x******      •
  *  *    *   [AREA]   *
  *  *    *     *      *
  *  *    •   [AREA]   *
  *  *    *     *      •
  *  *    •   [AREA]   *
  *  *    *     *      *
  *  *    *   [AREA]   *
  *  *    *     *      *
  *  *    *  [WASHOU]  *
  *  *    x******      •
  ****    x**>**********
  *  *    •
  *  *    ***<*****************************************
  •  •    x****************                            •
  *  *    *               xx******                     *
  •  •    xx*****      {FSGYIN}  *                     *
  •  •    *  {FGYSIN}     *      *                     *
  *  •    xx*****      {FSGZIN}  *                     *
  •  •    *               xx******                     *
  •  •  [FSGY]            *                            *
  *  *    *            [FSGY] - ((!***FSGYIN - E))    *
  •  *    *               •                            *
  *  *    *            [FSGZ]   ((!***FSGZIN - E))    *
  *  *    x****************                            *
  •  *    x**>*****************************************
  *  •  DECAY
  *  *    x******
  •  •    *  [PLMRIS] - ((!*** VELADJ))
  *  *    x******
  *  *    *
  •  •    x******
  •  •    *  [SIGTEX]
  *  *    x******
  •  ******
  •
```

IIIB2. ENTRY GETSTG
(DEPICTED IN SUBROUTINE PUTSTG - IH)

IIIB3. SUBROUTINE EAROUT

```
  *
CENZER
  *
  x*****
  *  EGEOM -((?***[CLSHIN])) -((!***[POL2])) -((?***ABORT))
  *    *
  *  EPCALC - ((?*** ABORT)
  x*****
  *
RELZON^
  *
ESTAT^
  *
EMOVE^
  *
FATRIS
  *
INJRIS
  *
CANRIS
  *
STOEAR^
  *
```

IIIB3a. SUBROUTINE RELZON

```
*
*  nnnnnn
*  n  EDOSIN
*  n    n
***n  INCDOS
*  n    x*****
*  n    n  CENACU - ((!*** CENZER - E))
*  n    x*****
*  nnnnnn
*
*  ****  ****
●  *  *  *  x*****
*  *  ****  *  ZERREM
*  *  ●  *  x*****
*  *  *  ****
*  *  *
*  *  x***  ******
*  *  ●  *  *  EDOSIN   ****
*  *  *  ****    *      *  xx****
●  *  *  *  *    ********  *  INCREM^
*  *  x***  ******      *  xx****
*  *  *                 ****
*  *  *  ****  ****
*  *  *  *  *  *  x*****
****  *  ●  ****  *    *
*  *  *  *  ●  *  *~ZERREM
*  *  *  ●  ●  *  x*****
●  *  *  *  ●  ****
*  *  *  *  *
*  *  ****  x***  ******
*  *  *  *  *  ****  EDOSIN
*  *  *  *  *  *  ******
*  *  *  *  *  *
*  *  *  *  *  ●  ****
*  *  *  *  *  *  ●  xx****
*  *  *  *  *  ****  *  INCDOS
*  *  *  ●  *  *  *  xx****
*  *  *  *  x***  ****
*  *  *  ****
*  ****
*
```

IIIB3a1. SUBROUTINE INCREM

```
●
x*****
●  CENZER
x*****
CENACU
*
```

IIIB3b. SUBROUTINE ESTAT

```
*
*  nnnn
*  n  x***
*  n  n  x*************************************
*  n  n  o***************************        *
*  n  n  o******************        *        *
*  n  n  o**********       *        *        xx**
*  n  n  o***      *       *        *        * (#)
*  n  n  *  xx**   *       *        *        xx**
*  n  n  *  * (#)  xx**    xx**     xx**     *
***n  n  *  *  *   * (#)   * (#)    * (#)    *
*  n  n  *  * (#)  xx**    xx**     xx**     xx**
*  n  n  *  xx**   *       *        *        * (#)
*  n  n  *  *      *       *        *        xx**
*  n  n  x*************************************
*  n  x***
*  nnnn
*
```

WHERE (#) IS THE FOLLOWING PIECE OF CODE

```
      *
    EDOSIN
      *
    INCDOS
      x*****
      *  CENACU
      x*****
      *
```

IIIB3c. SUBROUTINE EMOVE

```
*
x*>>>
*
*  nnnnnn
*  n    x***>*****************
*  n    x                    *
*  n    n***<*************   *
*  n    x*>***********    *  *
***n    x******      *    *  *
*  n  EDOSIN  *     *    *  *
*  n    x******     *    *  *
*  n    n  CENACU   *    *  *
*  n    x*****      *    *  *
*  n    ***<*********    *  *
*  n    ****>*************   *
*  N    n********************
*  nnnnnn
*
```

IIIB3d. SUBROUTINE STOEAR

```
  *
OUTPT1 - ((?*** EFFGET)) - ((?*** ABORT))
  *
OUTPT2
  *
OUTPT3
  *
OUTPT4 - ((?*** ABORT))
  *
OUTPT5
  *
OUTPT6 - ((?*** ABORT))
  *
OUTPT7 - ((?*** ABORT))
  *
OUTPT8 - ((?*** EFFGET)
  *
```

IIIB4. SUBROUTINE CHROUT

```
  *
  x********
  *     CHRNDF^
  x********
  *
  x********
WGCPLN  SGCPLN - ((?*** ABORT))
  x********
   *
CRNRSK^
    *
```

IIIB4a. SUBROUTINE CHRNDF

```
  *
BLDTBL
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  ●
GNDRES
  ●
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  *
GNDRES
  ●
TRFRCT
  *
WTRTRF
 *
```

IIIB4b. SUBROUTINE CRNRSK

```
  *
DIRDRP
  ●
INITLZ
  *
  ●  ****  ******
  *  ●  *  ●  EMRGPH
  *  *  *  *    x******
  *  ●  ●  ●    *   INTRPH
  *  *  ****    *     ●
  ****  ●  ●    ●   LNGTPH^
  *  *  *  *    x******
  ●  ●  ●  ******
  *  *  *
  *  ●  x*****
  *  *  ●  LOKSEE
  ●  *  x*****
  *  ****
  *
STOCHR^
  *
```

IIIB4b1. SUBROUTINE LNGTPH

```
  *
LTPROJ - ((?*** LTMACT))
  *
CSTEFF - ((?*** CSTDCN))
  *
LTACUM
  *
```

IIIB4b2. SUBROUTINE STOCHR

```
  *
OXPT1 - ((?*** CASGET)) - ((?*** ABORT))
  *
OXPT4 - ((?*** ABORT))
  *
OXPT5
  *
OXPT6 - ((?*** ABORT))
  *
OXPT7 - ((?*** ABORT))
  *
OXPT8 - ((?*** CASGET))
  *
OXPT9 - ((?*** DOSGET))
  *
OXPT10 - ((?*** ECCGET))
  *
OXPT11 - ((?*** GETIMP))
  *
OXPT12 - ((?*** GETIMP))
  *
```

IV. SUBROUTINE BINSAM

```
  *
WRANBN - ((!*** RANDOM))
  *
RANDOM
  *
ADJTIM
  *
WSAMPL
  *
WBNDRY
  *
CONTRL
  *
```

V. SUBROUTINE USRSUP

```
  *
WBNDRY
  *
CONTRL
  *
```

VI. SUBROUTINE CONMET

```
  *
WBNDRY
  *
CONTRL
  *
```

VII. SUBROUTINE RANSAM

```
  *
  x******
  x   ABORT
  *
ADJTIM
  *
WSAMPL
  *
WBNDRY
  *
CONTRL
  *
```

VIII. SUBOUTINE OUTPUT

```
  *
READ1 - ((?*** ABORT))
  *
  x*****
  x  ABORT
  *
  *    ******
  ******  READ2^
  *    ******
  *
PRINT^
  *
```

VIIIB. SUBROUTINE READ2

```
*
*  ****
*  *  x*****
*  *  x  ABORT
*  *  *
●  ●  ●  ******
*  *  *  *    xmmmmmm
*  ●  ●  *  ABORT   m
*  *  *  *          m
*  *  *  *    xmmmmmm
*  *  *  *    ●
*  *  *  *    *  nnnnnn
*  *  *  *    ***n  DO1CDF
*  *  *  *    *  nnnnnn
****  ****    ●
*  *  *  *    xx**>**********************
*  *  *  *    *                         *
*  *  *  *    xx*********************   ●
*  *  *  *    oo***  nnnn           *   *
*  *  *  *    *   *  n  xx****      *   *
*  *  *  *    *   ***n  n  DO1CDF   *   *
*  *  *  *    ●   ●  n  xx****      *   *
*  *  *  *    *   *  nnnn           *   *
*  *  *  *    *   *                 *   *
*  *  *  *    *   *   ***************   *
*  *  *  *    *   *   *                 *
*  *  *  *    *   ●   *  nnnn           *
*  *  *  *    *   ●   *  n  xx****      ●
*  *  *  *    ●   ●   ***n  n  DO1CDF   ●
*  *  *  *    *   *   ●  n  xx****      *
*  *  *  *    ●   *   *  nnnn           ●
*  *  *  *    xx*******                 *
*  *  *  *    ***<**********************
*  ****  ******
*
```

VIIIB1. SUBROUTINE DO1CDF

```
*
x*>>>
*
x***********
o*****     xx**
*    *     *  xx****
*  GNBIN2  *  *  GNBIN1 - ((!*** [ILOG10]))
*    *     *  xx****
●    *     xx**
x***********
●
```

VIIIC. SUBROUTINE PRINT

```
*
x*****
*  SOLID
x*****
*
*  ******
*  *    x*****
*  *  SOLID  *
*  *    x*****
*  *    *
*  *    *  nnnn
*  *    *  n  x**>****************************
*  *    *  n  x******                         *
*  *    *  n  n   QUANTL - ((?*** EXPINT))    *
*  *    *  n  n     *                         *
*  *    *  n  n  [NOTFOU]                     *
*  *    *  n  n     *                         *
****    ***n  n  [NOTFOU]                     *
*  *    *  n  n     *                         *
*  *    *  n  n  [NOTFOU]                     *
*  *    *  n  n     *                         *
*  *    *  n  n  [NOTFOU]                     *
*  *    *  n  n     *                         *
*  *    *  n  n  [NOTFOU]                     *
*  *    *  n  x******                         *
*  *    *  n  n**<****************************
*  ******  nnnn
*
```

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COMMON block variables, See name of individual COMMON block variable

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

(COMMON block variables continued)

COMMON blocks, See name of individual COMMON block

(COMMON blocks continued)

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11. ABSTRACT (200 words or less)

This report describes the MACCS computer code. The purpose of this code is to simulate the impact of severe accidents at nuclear power plants on the surrounding environment. MACCS has been developed for the U.S. Nuclear Regulatory Commission to replace the previous CRAC2 code and it incorporates many improvements in modeling flexibility in comparison to CRAC2.

The principal phenomena considered in MACCS are atmospheric transport, mitigative actions based on dose projection, dose accumulation by a number of pathways including food and water ingestion, early and latent health effects, and economic costs.

The MACCS code can be used for a variety of applications. These include (1) probabilistic risk assessment (PRA) of nuclear power plants and other nuclear facilities, (2) sensitivity studies to gain a better understanding of the parameters important to PRA, and (3) cost-benefit analysis.

This report is composed of three volumes. Volume I, the User's Guide, describes the input data requirements of the MACCS code and provides directions for its use as illustrated by three sample problems. Volume II, the Model Description, describes the underlying models that are implemented in the code, and Volume III, the Programmer's Reference Manual, describes the code's structure and database management.

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