
MELCOR Accident Consequence Code System (MACCS)

Programmer's Reference Manual

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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.

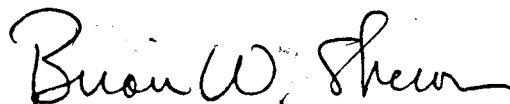
Some of the major new features of MACCS are: (a) improved approximation of the Gaussian crosswind concentration profile, (b) improved health effect models, (c) improved weather sampling, (d) treatment of multiphase release with capability for treatment of change in the wind direction at the reactor between 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, Director
Division of Systems Research
Office of Nuclear Regulatory Research

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 maintenance 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 essentially 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.

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DO NOT REPRODUCE
THIS PAGE

MACCS - (Main Program)

```

*****
*       *       *       *       *       *       *       *       *
* .     .     .     .     .     .     .     .     .     .
* *****
*   *   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
* *****
*

```

INPUT - (Process all user and auxillary input)

```

*****
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
* INPBEG * ATMODL ATPROB INPREL PUTSTM INPEND EARINP REDSTG  PUTSTG CHRINP OUTCON
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
*   *   *   *   *   *   *   *   *   *   *   *   *   *
* *****
*

```

(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 INPDY INPDY 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)

```

*****
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
* *****
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
*   *   *   *   *   *
* *****
*

```

(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    *          *          *          *          *
*          *          *          *          *          *          *
*          *          *          *          *          *          *
*          *          *          *          *          *          *
*****
```

(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 *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*****
*
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*****
*
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*          *          *          *          *          *          *          *
*****
```

(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
*
* *****

```

(INFRE 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
* * * * *
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

```

                CHRPUT - (Main program from the CHRONC module)
                *
                *****
                *           *           *           *
                *      CHRND  *      SGCPLN  *      WGCPLN  *      CRNRSK  *
                *           *           *           *
                *****
                *           *           *           *           *           *           *
                *   ●       *           *           *           *           *           *
                BLDTEL 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 OXTPT10 OXTPT11 OXTPT12
                *           *           *           *           *           *           *
                *****                DOSGET ECCGET                *****
                *                           *                           *
                *   CASGET    *                           *   GETIMP

```

```

                OUTPUT - (Generates CCDF and summary tables)
                *
                *****
                *           *           *
                *   READ1   *   READ2   *   PRINT   *
                *           *           *
                *         DO1CDF          *****
                *           *           *           *
                *   ●       *           *           *           *
                *         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
INPDY
INPDIS
INPEXP
INPLRS
ATPROB
INPWAK
INPREL
PUTSTM
GETSTM (ENTRY POINT IN PUTSTM)
INPMET
INPM1
WRDMET
INPM2
INPM3
INPM4
WBNMET
WNRZB

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 (ENTRY POINT IN OPNERL)
MODLDF
INPCHR
INCHRN
STPATH
RDISTB
IXOT9
IXOT10
IXOT11
IXOT12
SDFINP
CXPTBL (ENTRY POINT IN CXPTBL)
KMPTBL
MXTCH
CKINDX
EXCINP
STGRDA
OUTCON
HEDEAR
RESNML (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
CHRNDP
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)

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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	WNRZB	INFAC	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
INPDY	ABORT	INOUT1	ZERREM	INTRPH	
INPEND	CANFIS	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	MOVE	OUTPT1	CXPTBL	OXPT12	

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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.

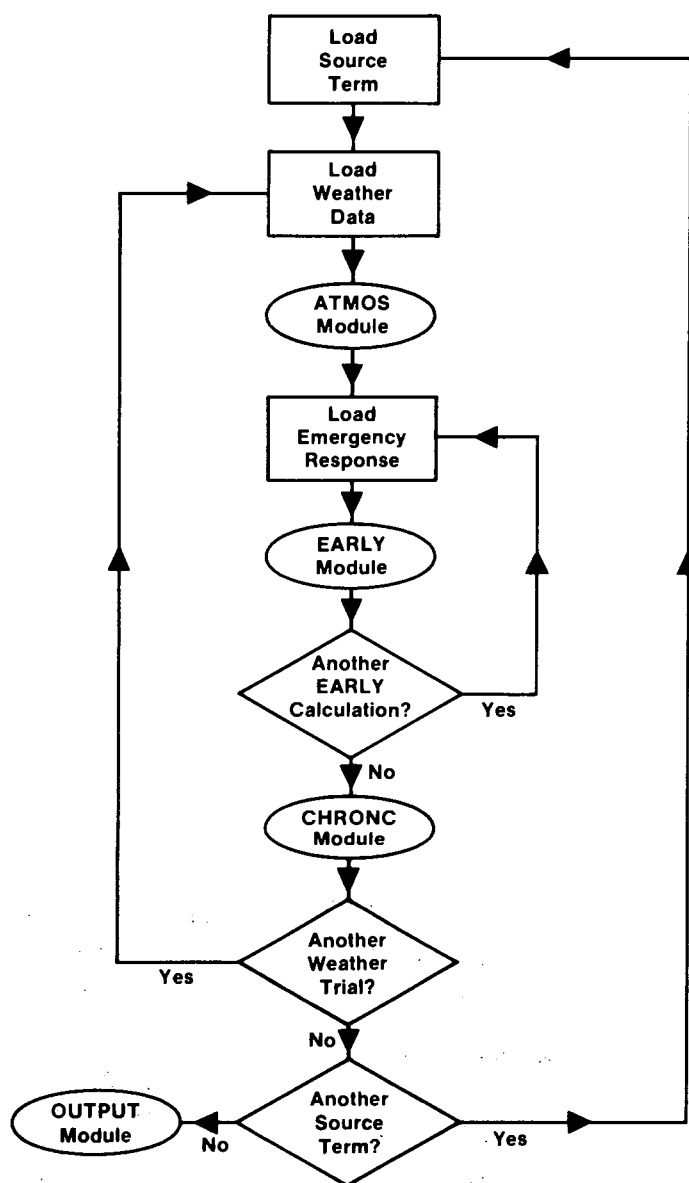


Figure 1.1 Sequential Flow Diagram

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1.8 Data Flow Diagram

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

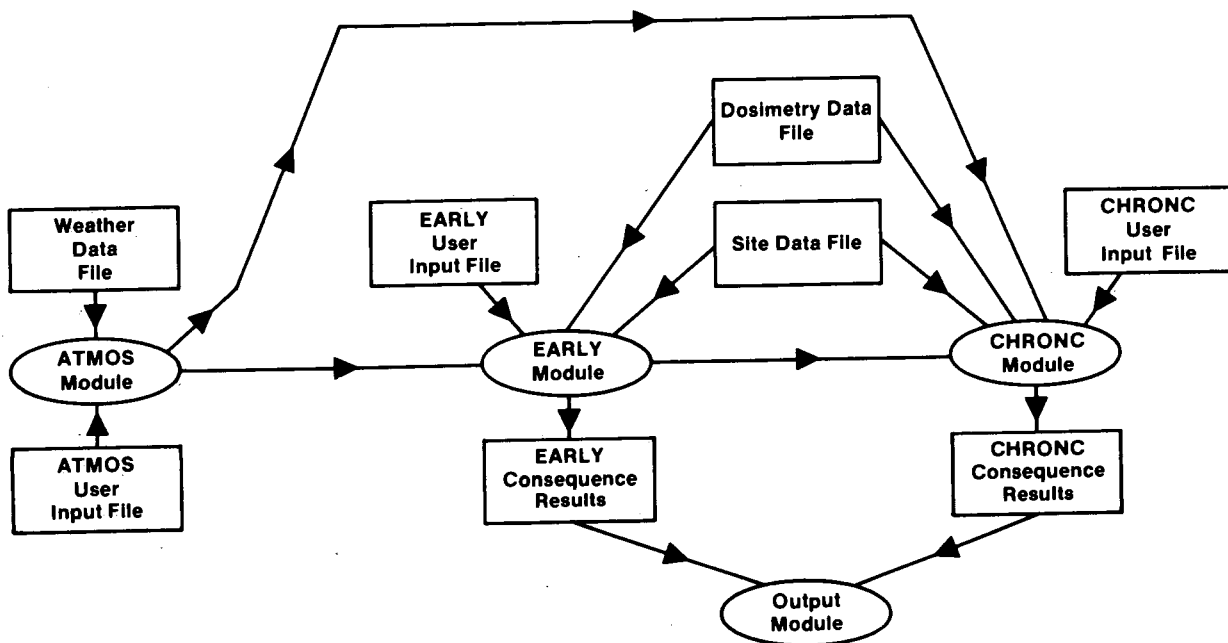


Figure 1.2 Data Flow Diagram

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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.

8-7

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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 as 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
!      !          !          !          !
```


!	!	!	!	!
!	!	!	!	+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-*
! (BNDLAN)
!
+-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)
!

```


!	!	!	!
!	!	!	+ -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-*
!          !      !      !      ! (OVERRID)
!          !      !      !      !
!          !      !      !      +-RGETN---RGET1-*
!          !      !      !      ! (WINROS)
!          !      !      !      !
!          !      !      !      +-ERRLOC
!          !      !      !      +-IGET1-*
!          !      !      !      ! (IPRINT)
!          !      !      !      !
!          !      !      !      +-LGET1-*
!          !      !      !      ! (RISCAT)
!          !      !      !      !
!          !      !      !      !
!          !      !      !      +-INORGA--+-IGET1-*
!          !      !      !      ! (NUMORG)
!          !      !      !      !
!          !      !      !      +-CGET1-*
!          !      !      !      ! (ORGNAM)
!          !      !      !      !
!          !      !      !      +-ERRLOC
!          !      !      !      +-ERRLOC
!          !      !      !      !
!          !      !      !      !
!          !      !      !      +-EDCINP---ERRFIL
!          !      !      !      !
!          !      !      !      +-INEVAC---CGET1-*
!          !      !      !      ! (EANAM2)
!          !      !      !      !
!          !      !      !      +-CGET1-*
!          !      !      !      ! (WTNAME)
!          !      !      !      !
!          !      !      !      !

```


!	!	!	!	!	
!	!	!	!	!	+ - 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
!      !      !      !      !      !

```


!	!	!	!	!
!	!	!	!	+ -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
!	!	!	!	+ -ERRLOC
!	!	!	!	+ -EVROOT
!	!	!	!	!
!	!	!	!	!
!	!	!	!	+ -INPEMR - - + -RGET1 -*
!	!	!	!	! (TTOSH1)
!	!	!	!	!
!	!	!	!	+ -RGET1 -*
!	!	!	!	! (SHELT1)
!	!	!	!	!

!	!	!	!	!	!
!	!	!	!	!	!+-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)
!	!	!	!	!	!

!	!	!	!	!	!
!	!	!	!	!	+-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)


```

!      !      !
!      !      !      +- 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))
!         !         !
!         !         !

```



```

!           !
!           +-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
+-GETIMP

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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.

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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, INPDY, 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 strategy 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: CHRNDP

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: CHRNDP

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: CKINDEX
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: DOICDF
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,
probability 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 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

INCOS - 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 evacuation 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: DOLCDF

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: DOI CDF
Calls: None

Name: GNDRES
Type: Subroutine
Module: CHRONC
Purpose -
General: Input processing
Specific: Compute the groundshine or resuspension pathway
dosimetry factors.
Called By: CHR NDF
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, INPDY,
 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

Conditional:

- 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 criteria (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 -
General: 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 number 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 occurrence 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 than 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, DOICDF

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, INPDY, 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:
WNRZB

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: WDRZB

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: INPML

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: CHRNDP

Calls: None

Name: ZERREM

Type: Subroutine

Module: EARLY

Purpose -

General: Modeling simulation

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

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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, DOLCDF, 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, DOLCDF, 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, OPNERL,
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 -

Variables: 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, DOLCDF, PRINT

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

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, DOI1CDF, 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: NTRM
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, FRNF DL,
TFWK F, TFWKNF, TIMDEC
Used by: INCHRN, CHR NDF, LTMACT, CSTDCN, LTACUM

Name: DIRB
Contains -
Variables:
Arrays: IDR B
Used by: WBNMET, W NDRZB

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

Name: DISPY
Contains -
Variables: YSCALE
Arrays: CYSIGA, CYSIGL
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: INPDY, 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, PROTIM, 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, INJNIS

Name: EINJUR
Contains -
Variables: NUMEIN
Arrays: EIFACA, EIFACB, EISUSC, EITHRE, INDXEI
Used by: INEINJ, INOUT1, INOUT4, INOUT7, INOUT8, INJNIS,
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: DPFRCCT, 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: SPACEN, 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,
INJNIS, 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: HGTMIK
Contains -
Variables:
Arrays: HGTMIK
Used by: WRDMET, WGTMET

Name: ICRTRO
Contains -
Variables: ICRTRO
Arrays:
Used by: OPNERL, CHRNDP, 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, OXTPT10, OXTPT11, OXTPT12

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, NCMNT, 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, INJNIS, CANRIS

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

Contains -
 Variables:
 Arrays: KRAIN
 Used by: WBNMET

Name: ISOCR
 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: KTD PNT, 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,
 KWPNT
 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, IDBSTB, 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, WNRZB, 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, IHOURL, 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, CHRNDP, 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, INJRS

Name: ORGNDX
Contains -
Variables: MEND, MSTRT
Arrays:
Used by: CHRNDP, 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, OXPT4, 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, DOI1CDF, 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: RESULT1
Contains -
Variables: NUM1
Arrays: CCDF1, I1DIS1, I2DIS1, IECOD1
Used by: INOUT1, HEDEAR, RESNM1, COPCHR, OUTPT1

Name: RESULT2
Contains -
Variables: NUM2
Arrays: CCDF2, RISTHR
Used by: INOUT2, HEDEAR, RESNM2, COPCHR, OUTPT2

Name: RESULT3
Contains -
Variables: NUM3
Arrays: CCDF3, DOSTH3, IDOSE3, INDEX3
Used by: INOUT3, HEDEAR, RESNM3, COPCHR, OUTPT3

Name: RESULT4
Contains -
Variables: NUM4
Arrays: CCDF4, I1DIS4, IECOD4
Used by: INOUT4, HEDEAR, RESNM4, COPCHR, OUTPT4

Name: RESULT5
Contains -
Variables: NUM5
Arrays: CCDF5, I1DIS5, I2DIS5, INDEX5
Used by: INOUT5, HEDEAR, RESNM5, COPCHR, OUTPT5

Name: RESULT6
Contains -
Variables: NUM6
Arrays: CCDF6, I1DIS6, I2DIS6, INDEX6, IPATHW
Used by: INOUT6, HEDEAR, RESNM6, COPCHR, OUTPT6

Name: RESULT7
Contains -
Variables: NUM7
Arrays: CCDF7, I1DIS7, I2DIS7, IECOD7
Used by: INOUT7, HEDEAR, RESNM7, COPCHR, OUTPT7

Name: RESULT8
Contains -
Variables: NUM8
Arrays: CCDF8, I1DIS8, I2DIS8, IECOD8
Used by: INOUT8, HEDEAR, RESNM8, COPCHR, OUTPT8

Name: RESULT9
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,
WDDOSE
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, CHRNDP

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, DOI CDF

Name: ROTATE
Contains -
Variables: OVERRID
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, IHOURL, PRBMET
Used by: READ2, DOLCDF, 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

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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, CHRNDP, INTRPH, LTPROJ, LTMACT, CSTDCN, LTACUM

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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	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
AGRND	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 PRINT	X	X	
ATNAM2	ATNAM2	INPREL PUTSTM PRINT	X X	X	

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

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

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

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

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

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

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

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	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	Argument
IDBSTB	M2	CONMET	X		
IDCF	DCFACT	EDCINP			X
		INOUT2	X		
		INOUT6	X		
		EPCALC	X		
IDDEBUG	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	
EPCALC	X				
IDNTFI	IDNTFI	INPOPU			X
		CMPTBL	X		
		SDFINP			X
		CXPTBL	X		
IDOSE3	RESLT3	INOUT3			X
		RESNM3	X		
		OUTPT3	X		
IDRB	DIRB	WBNMET			X
		WNRZB	X		
IDRBIN	METB	WBNMET			X
		WNRZB	X		
		BINSAM	X		
		WRANBN	X		
IECOD1	RESLT1	INOUT1			X
		COPCHR	X		
		OUTPT1	X		

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	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		
OXTPT10	X				
OXTPT11	X				
OXTPT12	X				

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
IHOURL	METOUT	DAYHOU		X	
		RANSAM		X	
		USRSUP		X	
		CONMET		X	
		ADJTIM		X	
		BINSAM		X	
		CONTRL	X		
		STOEAR	X		
		STOCHR	X		
IHOURL	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	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		
INDEXF	EFATAL	INEFAT		X	
		FATRIS	X		
INDEXEI	EINJUR	INEINJ		X	
		INJRIS	X		
INIEVA	NETWORK	INEVAC		X	
		EVRADI	X		
		EVNETW	X		
		EVROOT	X		
		INPEMR	X		
INTRVL	INDXS	CRNSRK		X	
		EMRGPH	X		
		INTRPH	X		
		LTPROJ	X		
		LTMACT	X		
		CSTEFF	X		
		CSTDCN	X		
		LTACUM	X		
		LOKSEE	X		
		INWGHT	M4	INPM4	
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	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	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 OXTPT1	X	X	
IX1DS4	IXOUT4	COPCHR OXTPT4	X	X	
IX1DS5	IXOUT5	COPCHR OXTPT5	X	X	
IX1DS6	IXOUT6	COPCHR OXTPT6	X	X	
IX1DS7	IXOUT7	COPCHR OXTPT7	X	X	
IX1DS8	IXOUT8	COPCHR OXTPT8	X	X	
IX1DS9	RESLT9	IXOT9 RXSMN9 OXTPT9	X X		X
IX2DS1	IXOUT1	COPCHR OXTPT1	X	X	
IX2DS5	IXOUT5	COPCHR OXTPT5	X	X	
IX2DS6	IXOUT6	COPCHR OXTPT6	X	X	
IX2DS7	IXOUT7	COPCHR OXTPT7	X	X	
IX2DS8	IXOUT8	COPCHR OXTPT8	X	X	
IX2DS9	RESLT9	IXOT9 RXSNM9 OXTPT9	X X		X
IXCOD1	IXOUT1	COPCHR OXTPT1	X	X	
IXCOD4	IXOUT4	COPCHR OXTPT4	X	X	

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

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
K HOUR	C DATE	DAYHOU		X	
		RANSAM		X	
		WSAMPL	X		
		BINSAM		X	
K LTPNT	K PRINT	INCHRN		X	
		TRFRCT	X		
K RAIN	I RAIN	WBNMET		X	
K SWDSC	K OPRNT	INCHRN		X	
		CRNRSK	X		
K SWRSK	K OPRNT	INCHRN		X	
K TDPNT	K KPRNT	INCHRN		X	
		EXCINP	X		
K TRPNT	K KPRNT	INCHRN		X	
K WTPNT	K PRINT	INCHRN		X	
		WTRTRF	X		
LAMBDA	I SOGRP	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	Argument
LASHE2	SRZONE	INPEMR RELZON ESTAT	X X	X	
LASMOV	NETWOR	INEVAC EVRADI EVNETW EVROOT PUTSTG EMOVE	X X X X	X	
LIMSP1	METDAT	WBNDRY ATMOUT	X	X	
LIMSPA	M2	INPM2 CONMET WBNDRY	X	X X	
LRACTN	LRACTN	INITLZ LTPROJ CSTEFF CSTDCN LTACUM LOKSEE ECCGET GETIMP	X X X X X	X X	
LTACTN	LTACTN	INITLZ LTMACT CSTEFF LTACUM LOKSEE ECCGET GETIMP	X X X X	X X X	
LVELDC	LTACTN	INITLZ LTMACT CSTDCN LTACUM LOKSEE	X X X	X X	
LVLDEC	DECMOD	INCHRN LTMACT LTACUM	X X	X	

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
MACHIN	MACHIN	MXXETC		X	
		MXXCPU	X		
		MXXCLK	X		
		MXXDAT	X		
MAXDIR	MAXOCU	READ2		X	
		DOICDF		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	
		DOICDF		X	
		PRINT	X		
MEND	ORGNDX	CHRNDP		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	Argument
MRain	IRain	WRDMET		X	
		WGTMET	X		
		BINSAM	X		
MSTRT	ORGNDX	CHRNDP			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		
		WDRZB	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	EVRAID			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	
		CHRNDP	X		
NINC	NUMGRD	CHRINP		X	
		WGCPLN	X		
NINCM1	NUMGRD	CHRINP		X	
		SGCPLN	X		
		WGCPLN	X		
NMRGN	NAMRGN	SDFINP		X	
		STGRDA		X	
NPSGRP	DRYCON	INPDYR		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	Argument
NROOTS	ROOTS	EVRADI		X	
		EVROOT		X	
		PUTSTG		X	
		EMOVE	X		
NRWTRM	REWTHR	INCHRN		X	
		CHRNDP	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	
NTRM	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	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 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	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				
OVERRID	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	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	EDOSSES	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	Argument
PLHITE	MULREL	INPREL ATMOUT	X		X
PLUDUR	MULREL	INPREL CONTRL ATMOUT	X X		X
PNZERO	PNZERO	READ2 DOICDF PRINT	X	X X	
POPCST	SITEDT	INCHRN CSTEFF ECCGET	X X	X	
POPDAT	POPDAT	INPOPU EFFGET OUTPT3 OUTPT5 OUTPT8 CASGET OXTPT5 OXTPT8 DOSGET ECCGET GETIMP	X X X X X X X X X X	X	
POPFLG	POPFLG	INPOPU OPNERL	X	X	
PRBMET	METOUT	DAYHOU RANSAM USRSUP CONMET BINSAM CONTRL STOEAR STOCHR	X X X X X	X X X X X	
PRBMET	SAVMET	READ2 GETIMP	X	X	
PROTIN	EADFAC	INDFAC OPNERL EDOSIN	X X	X	

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

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
RESID	EDOSSES	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	
		CHRNDP	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	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	WDRZB		X		
		INMISC		X		
		OPNERL	X			
		DOICDF	X			
RPF	REWTHR	OPNERL		X		
RWCOEF	REWTHR	INCHRN			X	
		CHRNDP	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	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	INPEMR		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	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 LTACUM	X	X	
TFLMPT	LTFCTR	TRFRCT		X	
TFLOTH	LONGTF	TRFRCT LTACUM	X	X	
TFLPD	WTRDAT	WTRTRF LTACUM	X	X	
TFLPW	WTRDAT	WTRTRF LTACUM	X	X	
TFMLK	ISOTDT	STPATH TRFRCT	X		X
TFWKF	DECMOD	INCHRN CSTDCN	X		X
TFWKNF	DECMOD	INCHRN CSTDCN	X		X
TGSBEG	CRPTIM	STPATH SDFINP DIRDEP	X	X	X
TGSEND	CRPTIM	STPATH SDFINP DIRDEP	X	X	X
TGWHLF	GSWTHR	INCHRN CHRNDP	X		X
THRVEST	CRPTIM	STPATH SDFINP LTPROJ LTACUM	X X	X	X
TIMACC	CRPTIM	CHROUT DIRDEP LTPROJ LTACUM	X X X	X	

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

Name	Common Block	Subprogram Used By	Value Unchanged	Value Modified	
				Assignment	Argument
TRMEVA	TERMS	INITLZ		X	
		EMRGPH		X	
		LOKSEE	X		
		ECCGET	X		
TRMIRL	ITERMS	INITLZ		X	
		INTRPH		X	
		LOKSEE	X		
		ECCGET	X		
TRMREL	TERMS	INITLZ		X	
		EMRGPH		X	
		LOKSEE	X		
		ECCGET	X		
TRWHLF	REWTHR	INCHRN			X
		CHRNDP	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	INPEMR		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	Argument
VALWF	SITEDT	INCHRN STGRDA CSTEFF	X X	X	
VALWNF	SITEDT	INCHRN STGRDA CSTEFF	X X	X	
VDEPOS	DRYCON	INPDRY ATMOUT	X		X
VFRM	ECNDDTA	SDFINP STGRDA ECCGET	X	X X	
VNFRM	ECNDDTA	SDFINP STGRDA ECCGET	X	X X	
WDDOSE	REUSE1	INITLZ LTACUM LOKSEE CASGET OXTPT5 DOSGET	X X X X	X X	
WETDEP	WETDRY	INPISO ATMOUT	X		X
WINDIR	METDAT	USRSUP CONMET WBNDRY WSAMPL CONTRL	X	X X X	X
WINDSP	METDAT	USRSUP CONMET WBNDRY WSAMPL ATMOUT	X	X X X	X
WINGF	WTRDTA	STPATH SDFINP WTRTRF	X	X	X

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

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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/
- AGRNDG - 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/
 BINA VG - accumulated mean consequence for each weather sampling bin
 /BINA VG/
 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/
 CDFRM - 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 evacuation 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 /ISOCR/ /
 DCYPCH - retention fractions for the nuclides in the crops for the time
 period between harvest and the time of consumption by man
 /ISOCR/ /
 DCYPCM - retention fractions for the nuclides in the crops for the time
 period between harvest the time of consumption by meat animals
 /ISOCR/ /
 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 /NETWORK/

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 /ISOCR/
 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/
FRNF DL - 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 /EDOSSES/
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 evacuation 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/
HGT MIX - mixing layer height /HGT MIX/
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/
 IDRIB - weather bin data summaries for each weather class in each
 direction /DIRB/
 IDRIBIN - 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/
 IGDCE - 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/

I HOUR - 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 /RESULT3/

INDEX5 - indices to the organs used for type 5 EARLY results /RESULT5/

INDEX6 - indices to the organs used for type 6 EARLY results /RESULT6/

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 /RESULT6/

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
/STRTRY/
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/

KTD PNT - 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/
 LASHL1 - last ring of the inner shelter zone /SRZONE/
 LASHL2 - 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 - maximum 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 constant 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/
 NCMNT - 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 /NMPAG/
 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/
 OVERRID - 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 decontamination
 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 evacuation 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 evacuation 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/

T1DOSE - 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/
 THRST - 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 /ECNDDTA/
VNFRM - average regional non-farm value /ECNDDTA/
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 /WTRDDTA/
WINROS - table of windrose probabilities /ROTATE/
WSHFRI - initial washoff fraction /WTRDDTA/
WSHRTA - annual washoff rate /WTRDDTA/
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

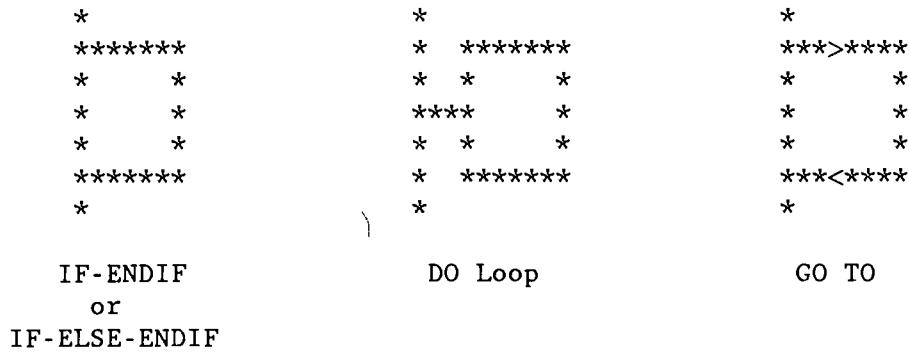
A detailed individualized calling structure chart is depicted for both the main program and any subprograms which themselves call other subprograms during their execution. The calling structure charts are intended to give the programmer a visual depiction of the following: (1) the sequence of calls being 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 indicated 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:



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 Structure 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 4~~

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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. INPDY

IB5. INPOIS

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

II2b1. 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. CHRNDP
IIIB4b. CRNRSK

IIIB4b1. LNGTPH
IIIB4b2. STOCHR

IV. BINSAM
V. USRSUP
VI. CONMET
VII. RANSAM
VIII. OUTPUT

V111A. READ2

V111A1. DO1CDF

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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*****
* * * 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*** ***** •
* • * ***** X*** •
* • 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 INPDY

```
*
[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^
* * * 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 - ((!** WDRZB))  
*  
*
```

IC2e. SUBROUTINE INPMS

```
*  
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)
*
[LG1] - (ENDAT2)
*
[IG1] - (IPLUME)
*
[IG1] - (NUMFIN)
*
X*****
* ERRLOC
X*****
[LG1] - (OVERRID)
*
X*****
* RGETN - (WINROS)
*   XXmmmm
*   * ERRLOC
*   * XXmmmm
X*****
[IG1] - (IPRINT)
*
[LG1] - (RISCAT)
*
```

IF2. SUBROUTINE INORGA

```
*
[IG1] - (NUMORG)
*
* *****
**** [CG1] - (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****
* nnnx 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)
•
```


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)
* * Xmmmmmm
* * * ERRLOC
* * Xmmmmmm
* *****
*
Xmmmmmm
* ERRLOC
Xmmmmmm
*
* *****
**** [DOCCDF]
* *****
*

```


IF13. SUBROUTINE INOUT4

```
•
[IGET1] - (NUM4)
X*>>>
X
IGETN - (I1DIS4)
*
* *****
* * [CGET1] - (NAME)
* * X*>>>
* * X
* * X*****
* * O***** XX****
* * * XX**>***** ERRLOC *
* * * * * XX****
* * * ERRLOC * *
* * * ***>*****
* * * ***<***** * *
* * * *****
* * * * *
* * * O***** * *
* * * XXmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm * *
* * * * ERRLOC * *
* * * XX**>***** m * *
* * * ERRLOC * m * *
* * * ***>*****
* * * ***<***** m * *
* * * XXmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm * *
* * * *****
* * * O***** * *
* * * XXmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm * *
* * * * ERRLOC * *
* * * XX**>***** m * *
* * * ERRLOC * m * *
* * * *****
* * * ***<***** m * *
* * * XXmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm * *
* * * *****
* * * 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***** *
* * * xxmmmm *
**** * * ERRLOC *
* * * * *****
* * * *
* * • XX**>***** *
* * * ERRLOC • *
* * • ***>*****
* * * **<***** *
* * * *****
* * *
• • ERRLOC *
• • X***** •
* * ***<*****
• *****
*
IGETN - (I1D1S7)
*
IGETN - (I2D1S7)
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*****
* * * XXmmmmmm
* * * * ERRLOC *
* * * *****
* * *
* * * X*>*****
* * * ERRLOC *
* * * ***>*****
* * * **<*****
* * * *****
* * *
* * * O*****
* * * XXmmmmmm
* * * * ERRLOC *
* * * *****
* * *
* * * XX*>*****
* * * ERRLOC *
* * * ***>*****
* * * **<*****
* * * *****
* * * ERRLOC *
* * * X*****
* * * *****
* * *****
*
*
* IGETN - (I1DIS8)
*
* IGETN - (I2DIS8)
* X*>>>
* X *****
* * X*****
* * * ERRLOC
* * X*****
* * *****
* * *****
* * [DOCCDF]
* *****
*
```

IG. SUBROUTINE REDSTG

```
•  
INEVAC  
*  
INPEMR  
*
```

IH. SUBROUTINE PUTSTG

```
*  
X*>>>  
Xmmmmmm  
X ERRLOC  
* **>>>  
*  
Xmmmmmm  
• ERRLOC  
Xmmmmmm  
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^  
•
```

III. SUBROUTINE OPERNL

```
•  
**>>>  
*  
MODLDF - E  
•  
X*****  
ERRLOC •  
X*****  
*
```

112. SUBROUTINE INPCHR

```
*  
INCHRN^  
*  
STPATH^  
*  
IXOT9^  
*  
IXOT10^  
*  
IXOT11^  
*  
IXOT12^  
*
```

112a. SUBROUTINE INCHRN

```
*  
[CGET1] - (CHNAME)  
*  
[RGET1] - (EVACST)  
*  
[RGET1] - (RELCST)  
*  
[RGET1] - (TMPIND)  
*  
[RGET1] - (TMPACT)  
*  
[RGET1] - (DSCRTI)  
*  
[RGET1] - (DSCRLT)  
*  
[CGET1] - (CRTOCR)  
*  
[IGET1] - (LVLDEC)  
*  
RGETN - (TIMDEC)  
*  
RGETN - (DSRFACT)  
*  
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)
*

```

I12b. SUBROUTINE STPATH

```

*
[LG1] - (COUPLD)
*
[IGET1] - (NFICRP)
X*>>>
X *****
• * [CG1] - (NAMCRP)
* * X*>>>
**** X
• • X*****
• ***** ERRLOC
* ***** **>>>

RGETN - (FRCTCH)
*
RGETN - (FRCTCM)
*
RGETN - (FRCTCB)
•
[IG1] - (NUMWPI)
X*>>>
X *****
• * [CG1] - (NAMWPI)
• • X*>>>
**** X
• * X*****
* * X ERRLOC
* ***** **>>>
*

```

(continued on next page)


```

* *****
* *   X**>*****
* *   *
* *   *
**** ERRLOC *
* *   **>>> *
* *   *
* *   ***<*****
* *****
*
RGETN - (WSHFRI)
*
RGETN - (WSHRTA)
*
RGETN - (WINGF)
*
[IGET1] - (NFIISO)
X**>>>
X
* *****
* * [CGET1] - (NAMAPI)
* *   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)
*

```

112c. SUBROUTINE IXOT9

```

•
[IGET1] - (NXUM9)
X*>>>
X
• *****
• • [CGET1] - (ORGNAM)
• * X***** ****
* * • **** **>***
**** • • **** •
* * • ERRLOC •
* • X***** •
* * **<*****
• *****
•
IGETN - (IX1DS9)
*
IGETN - (IX2DS9)
X*>>>
• ****
• • X*****
**** * ERRLOC
* • X*****
* ****
*
• *****
**** [DOCCDF]
• *****
•

```

112d. SUBROUTINE IXOT10

```

•
[IGET1] - (NXUM10)
X*>>>
X
IGETN - (I1DS10)
•
IGETN - (I2DS10)
X*>>>
• ****
• • X*****
**** * ERRLOC
* * X*****
• ****
*
• *****
**** [DOCCDF]
* *****
*

```

112e. SUBROUTINE IXOT11

```

•
[LGET1] - (FLAG11)
X*>>>
X
[DOCCDF]
*

```

112f. SUBROUTINE IXOT12

```
•
[IGET1] - (NXUM12)
X*>>>
X
IGETN - (11DS12)
•
IGETN - (12DS12)
X*>>>
X *****
* * X*****
**** * ERRLOC
* • X*****
• *****
*
* *****
**** [DOCCDF]
* *****
*
```

113. ENTRY MODLDF
(DEPICTED IN SUBROUTINE OPERNL - IIA)

114. SUBROUTINE SDFINP

```

      •
      CXPTBL - ((I*** 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)) *
* ***** *
* * *
* nnnnnn *
***n X**>*****
* n [RESNM6] - ((!*** DISRAN)) *
* nnnnnn *
* * *
* nnnnnn *
***n X**>*****
* n [RESNM7] - ((!*** DISRAN)) *
* nnnnnn *
* * *
* ***** *
**** 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

```
*
* *****
* ABORT [DISRAN]
*          $
* *****
*
```

IJ3c. FUNCTION RXNM11

```
*
* *****
* ABORT $
*
* *****
*
```

IJ3d. FUNCTION RXNM12

```
*
* *****
* ABORT [DISRAN]
*          $
* *****
*
```

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

```

*
0  ATMOUT^
*
* *****
* * X*****
**** * (GETSTG^
* * X*****
* * EAROUT^
* *****
*
* *****
* * CHROUT^
* *****
*

```

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*****
0 * *****
*

```

0

II1B2. ENTRY GETSTG
(DEPICTED IN SUBROUTINE PUTSTG - IH)

0

II1B3. SUBROUTINE EAROUT

```
*  
CENZER  
*  
X*****  
* EGEOM -((?***[CLSHIN])) -((!***[POL2])) -((?***ABORT))  
* *  
* EPCALC - ((?*** ABORT)  
X*****  
*  
RELZON^  
*  
ESTAT^  
*  
EMOVE^  
*  
FATRIS  
*  
INJRIS  
*  
CANRIS  
*  
STOEAR^  
*
```

111B3a. SUBROUTINE RELZON

```

*
* nnnnnn
* n EDOSIN
* n n̄
***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*** *****
* ● ● ****
* ****
*

```

111B3a1. SUBROUTINE INCREM

```

*
x*****
● CENZER
x*****
CENACU
●

```

II183b. SUBROUTINE ESTAT

```

*
* nnnn
* n x***
* n n x*****
* n n o*****
* n n o*****
* n n o*****
* n n o*** * * * XX**
* n n * 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*****
*

```

II183c. 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*****
•   CHRND^
X*****
•
X*****
WGCPLN SGCPN - ((?*** ABORT))
X*****
•
CRNRSK^
•
```


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  0  
*
```

VIII. SUBROUTINE OUTPUT

```
*  
READ1 - ((?*** ABORT))  
*  
X*****  
X  ABORT  
*  
*  *****  
***** READ2^  
*  *****  
*  
PRINT^  
*
```

VIII B. SUBROUTINE READ2

```

*
* ****
*  X*****
*  X  ABORT
*  *  *
*  *  * *****
*  *  *  Xnnnnnnn
*  *  *  ABORT  m
*  *  *  m
*  *  *  Xnnnnnnn
*  *  *  *
*  *  *  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*****
*  *  *  ***<*****
*  *  *  *
*  *  *  **** *****
*

```

VIII B1. 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 n *
* * * n n [NOTFOU]
* * * n x*****
* * * n n**<*****
* ***** nnnn
*

```

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